

TECHNICAL MANUAL CERTIFICATION SHEET

University of Oregon
942 Olive Street
Eugene, Oregon 97401

CLIENT:

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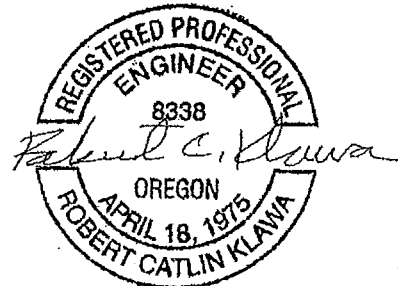
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EXPIRATION DATE: JUNE 30, 2017

MECHANICAL ENGINEER:

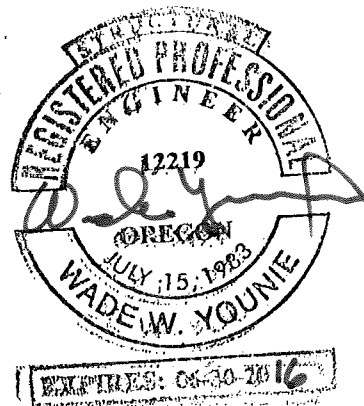
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EXPIRES 12-31-15

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EXPIRES: 06-30-2016

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DOCUMENT 00010

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SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sealants and joint backing, and accessories.
- B. Related Sections:
 - 1. Section 08110 – Steel Doors and Frames
 - 2. Section 08800 - Glazing: Glazing sealants and accessories.
 - 3. Section 09260 - Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C792 - Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants.
 - 2. ASTM C834 - Standard Specification for Latex Sealants.
 - 3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 5. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - 6. ASTM D1667 - Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
- B. South Coast Air Quality Management District: SCAQMD Rule for Adhesive and Sealant Applications.

1.3 DEFINITIONS

- A. Sealant Products: Any material with adhesive properties that is used to fill, seal, waterproof gaps or joints between two surfaces. Sealant products include sealant, primers and caulk
- B. Type: Defines whether products are premixed or require mixing at job site.
 - 1. Type M: Multi-component products which require job-site mixing.
 - 2. Type S: Single component products furnished in prepackaged cartridges or other forms in which no job-site mixing is required.
- C. Grade: Defines the flow characteristics of the sealant.
 - 1. Grade P: Products having sufficient flow to fill joints in horizontal surfaces and remain level and smooth at temperatures as low as 40 degrees Fahrenheit (4.4 degrees Celsius).
 - 2. Grade NS: Nonsag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping when applied at temperatures between 40 degrees F (4.4 degrees C) and 122 degrees F (50 degrees C).

- D. Class (ASTM C719): Identifies sealants according to their tested movement capabilities in percent of joint width.
 - 1. Standard Classes: 25, 50, 100/-50 (extension/compression).
 - 2. Design to minimum 4 times anticipated movement to accommodate design tolerances and movement based on thermal expansion.
- E. Uses:
 - 1. Use T: Classifies sealants designed for joints in surfaces subject to pedestrian and vehicular traffic.
 - 2. Use NT: Non-traffic exposure.
 - 3. Use I: Sealants designed for immersion in water.
 - 4. Use M, G, A: Refers to sealants which remain adhered, within given parameters, to various standard specimens. (Mortar, Glass, Aluminum)
 - 5. Use O: Substrate materials other than M, G, and A. (Color anodized aluminum, other metals, painted surfaces, brick, stone, tile and wood, etc.)

1.4 SUBMITTALS

- A. Section 01330 - Submittal and Shop Drawings.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.5 QUALITY ASSURANCE

- A. Perform building joint work in accordance with ASTM C 1193.
- B. Compatibility: ASTM C 1087; determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
- C. Joint tolerance: Comply with Manufacturer's limitation recommendations.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience, three successfully completed projects of similar scope and complexity and approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.8 COORDINATION

- A. Section 01320 - Project Schedule and Coordination.
- B. Coordinate Work with sections referencing this section.

1.9 WARRANTY

- A. Warrant installed sealants and accessories against water infiltration, air infiltration, adhesive failure, cohesive failure and other forms of deterioration and it's compatibility with adjacent sealants for a period of five (5) years.
- B. Upon notification of defects within warranty period, make necessary repairs and replacements at Owner's convenience. Repair and replacement shall include resultant damage to adjacent materials and systems.

PART 2 PRODUCTS

2.1 MATERIALS – GENERAL

- A. Hardness (ASTM C661):
 - 1. Determine sealant's proper hardness or consistency in consultation with manufacturer, considering joint movement and exposure for joint size indicated.
 - 2. 15 to 25 Shore A Durometer: For vertical wall joints not subject to vandalism.
 - 3. 25 to 40 Shore A Durometer: For horizontal joints exposed to light traffic or vertical joints subject to vandalism.
 - 4. 35 to 60 Shore A Durometer: For sidewalk joints.
- B. Modulus of Elasticity: In general for elastomeric sealants, provide sealants having the lowest modulus of elasticity consistent with degree of exposure to wear, abrasion and vandalism. Sealants exposed to traffic shall have strength and elasticity sufficiently high to resist damage by traffic.
- C. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application.
- D. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168. Maximum VOC of 50 grams per liter.
- E. Color: If not otherwise indicated, or chosen at time of submittals, provide color of exposed joint sealers to closely match finish color of adjacent surfaces

2.2 JOINT SEALERS

- A. Manufacturers:
 - 1. BASF Construction Chemicals.
 - 2. Dow Corning Corp.
 - 3. GE Silicones.
 - 4. LymTal International.

5. Pecora Corp.
 6. Sika Corp
 7. Tremco Sealants & Waterproofing
 8. Substitutions: Section 01600 - Product Requirements.
- B. Low Modulus Silicone Sealant (Sealant Type S-1): Single component, high performance, general purpose, exterior, non-traffic; ASTM C920, Type S, Grade NS, Class 100/-50, Uses M, G, and A. One of the following or approved equal:
1. "Spectrem 1" (Tremco).
 2. "Sikasil WS-290" (Sika).
 3. "Sonolastic 150 with VLM" (BASF).
 4. "790 Building Sealant" (Dow Corning Corp.).
 5. "Pecora 890 NST" (Pecora).
 6. Approved Equal.
 7. Color: Colors as selected.
 8. Applications: See schedule.
- C. Low Modulus Polyurethane Sealant (Sealant Type S-2): Single component, high performance, general purpose, exterior, non-traffic; ASTM C920, Type S, Grade NS, Class 25, Uses M, G, A. One of the following or approved equal:
1. "Dymonic FC" (Tremco).
 2. "Sikaflex-15 LM" (Sika).
 3. "Sonolastic NP 1" (BASF).
 4. "Iso-Flex 830" (LymTal International).
 5. Approved Equal.
 6. Color: Colors as selected.
 7. Applications: See schedule.
- D. Semi-Self Leveling Traffic Bearing Polyurethane Sealant (Sealant Type S-3): Single component, semi-self-leveling, exterior traffic bearing, moisture cure, sealant, ASTM C920, Grade P, Class 25, Use T.
1. "Vulcum 45 SSL" (Tremco).
 2. "Sikaflex-1C SL" (Sika).
 3. "Sonolastic SL 1" (BASF).
 4. Approved Equal.
 5. Color: Colors as selected.
 6. Applications: Use for exterior pedestrian and vehicular traffic bearing joints.
- E. Exterior Metal Lap Joint Sealant (Sealant Type S-4) Butyl or polyisobutylene, non-drying, non-skinning, non-curing gunnable sealant or butyl mastic tape.
1. "Tremco Butyl Sealant" (Tremco).
 2. "BC-158 Butyl Rubber Sealant" (Pecora Corporation).
 3. Approved equal.
 4. Applications: Use for concealed sealant bead in sheet metal work and concealed sealant bead in siding overlaps.
- F. Acrylic-Latex Interior Sealant (Sealant Type S-5): Single component, general purpose, paintable, interior emulsion type sealant, ASTM C 384.
1. "Tremflex 834" (Tremco).
 2. "Sonolac" (BASF).

3. "AC-20 Acrylic Laytex Caulk" (Pecora Corporttion).
 4. Approved equal.
 5. Color: Colors as selected.
 6. Applications: Use for interior joints between door and window frames and wall surfaces, and other interior joints for which no other type of sealant is indicated.
- G. Silicone Sanitary Sealant (Sealant 6): Single component white silicone; ASTM C920, Type S, Class 25, Grade NS, Uses A, G, O; mold and mildew resistant.
1. "Pecora 898" (Pecora).
 2. "Omniplus" (BASF).
 3. "Sanitary SCS1700" (General Electric).
 4. Applications: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen shower room, and rest room counter tops and wall surfaces.
- H. Acoustical Sealant (Sealant 7): Single component, general purpose, butyl or acrylic sealant; ASTM C920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
1. "Acoustical Sealant" (Tremco).
 2. "Pecora BA-98 Acoustic Sealant" (Pecora).
 3. Applications: Use for concealed locations only at acoustically rated construction.
 4. Provide sealant bead between top stud runner and structure and between bottom stud track and floor.

2.3 MISCELLANEOUS MATERIALS

- A. Exterior Foam Expansion Joint Filler (Filler Type F-1): 1/2 inch x 4 inch, highly resilient, 99% recovery, closed cell foam with 3/8 inch x 1/2 inch removable sealant reservoir joint cap.
1. ASTM D5249 TYPE 2.
 2. Compression @ 50%: 13 psi.
 3. "Flexible Foam" (Masco).
 4. "Ceramar Flexible Foam" (W.R. Meadows, Inc.).
 5. "Expansion-Joint Filler" (BASF).
 6. Approved Equal.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Primer: Non-staining, high solids, low VOCs type, recommended by sealant manufacturer for joint surfaces and conditions.
- D. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber, D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.
- D. Verify joint dimensions are within manufacturer's established tolerances.

3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Perform acoustical sealant application work in accordance with ASTM C919.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant in continuous beads or rivers free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Provide masking tapes or other precautions to prevent migration or spillage of materials onto adjoining surfaces.
- H. Tool joints concave or as detailed.

3.4 CLEANING

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Execution Requirements: Protecting installed construction.
- B. Protect sealants until cured.

3.6 SCHEDULE

- A. Exterior Joints for Which No Other Sealant Type is Indicated: As directed by Architect.
- B. Control and Expansion Joints in Paving: Type S-3.
- C. Lap Joints in Exterior Sheet Metal Work: Type S-4.
- D. Exterior Joints At Unpainted Substrate Materials: Type S-1.
 - 1. Metal siding at aluminum windows.
 - 2. Butt joints in exterior metal work and siding.
- E. Exterior Joints At Substrates Scheduled to be Painted. Type S-2.
 - 1. Wood or fiber cement siding at aluminum windows.
 - 2. Butt joints in exterior wood work and siding.
 - 3. Field painted metal door frames.
- F. Under Exterior Door Thresholds: Type S-2.
- G. Interior Joints Between Door and Window Frames and Wall Surfaces: Type S5.
- H. Other Interior Joints for Which No Other Type of Sealant is Indicated: Type S-5.
- I. Joints Between Plumbing Fixtures and Walls and Floors, and Between Counter tops and Walls: Type S-6.
- J. Joints in Walls Scheduled To Receive Sound Batt Insulation: S-7.

END OF SECTION

SECTION 01010 SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Work by Contractor.
 2. Work by Owner.
 3. Contractor designed elements.
 4. Contractor use of Site.
 5. Work Sequence.
 6. Owner Occupancy.

1.02 WORK BY CONTRACTOR

- A. Interior and exterior remodeling of existing building. Work includes gutting existing interiors, new interior construction, re-roofing, and some exterior masonry and windows.

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- B. Contractor's Duties:
1. Provide and pay for labor, materials, tools, equipment, superintendence, temporary facilities and services necessary for proper execution and completion of Work.
 2. Pay legally required sales, consumer and use taxes.
 3. Secure and pay for:
 - a. All other required permits, governmental fees and licenses, not paid for by Owner.
 4. Owner will pay for:
 - a. City of Eugene Permit fees.
 - b. Utility hook-up fees, water meters, pits and meter valves.
 5. Comply with building codes, ordinances and regulations of public authorities having jurisdiction, including, but not limited to, following:
 - a. State of Oregon 2014 Edition Structural Specialty Code
 - b. City of Eugene Building Department
 6. Comply with Contract Documents 942 Olive Street dated September xxxxxx, 2014
- C. Pre-Bid Conference: TBD
- D. Agreement Form: Construct work under University of Oregon Contract.

1.03 WORK BY OWNER AND OTHERS

- A. Owner may award separate contracts which will commence and be executed during construction period of this Contract. Cooperate and coordinate with Owner's separate contractors.
- B. Items noted NIC (Not In Contract) or OFOI (Owner Furnished, Owner Installed) will be furnished and installed by Owner during construction period of this Contract.

1.04 CONTRACTOR DESIGNED ELEMENTS

- A. Where work of this Contract requires bidder/designer structural, mechanical and electrical design, comply with following requirements:
 - 1. Submit Shop Drawings and Calculations to Architect for review.
 - 2. All Shop Drawings and Calculations shall be stamped by registered Engineer licensed in State of Oregon.
 - 3. Submit Shop Drawings and Calculations to City of Corvallis for approval and permits.
- B. Sections describing Contractor Engineered Elements:
 - 1. Division 15 – Mechanical & Plumbing.

1.05 CONTRACTOR USE OF SITE

- A. Confine operations at Site to areas permitted by Owner. Limit use of premises for Work and storage to allow for work by Owner's separate Contractors.
- B. Do not encumber Site with materials or equipment. Do not bury any demolition or construction materials on site. No disposal or recycling on university property outside construction area unless approved by Project Manager.
- C. Do not load structure with weight that will endanger structure. Costs for special structural analysis regarding loading of structure shall be borne by Contractor.
- D. Gain access to roof areas only when work requires it, and then by exterior means only, unless otherwise directed by Owner. Access to roof areas through interior of building permitted at Owner approved locations and times only.
- E. Do not interrupt electric, gas, water, steam or other service to existing structure without prior notice to Owner, and then only at specific time and for specific duration approved by Owner.
- F. Assume full responsibility for protection and safekeeping of products stored on premises.
- G. Move stored products which interfere with operations of Owner. No stockpiling of waste on-site beyond the period necessary for sorting and accumulation of practical quantities for transport off-site.
- H. Obtain and pay for use of additional storage or work areas required for operations.
- I. Time Restrictions for Performing Work: Conform to City requirements for noise control in residential neighborhoods. The University may limit work times beyond that set by City code.

1.06 WORK SEQUENCE

- A. Construct work in stages to accommodate Owner's Completion Schedule and early occupancy requirements during construction period. Coordinate Construction Schedule and operations with Architect and Owner.
 - 1. Early occupancy for specific areas: To be scheduled with Owner and Contractor.
 - 2. Substantial Completion: Refer to Agreement.
- B. Coordinate with Building Official for Building Department requirements for early occupancy.

1.07 OWNER OCCUPANCY: (Not Applicable)

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01040 COORDINATION

PART 1 GENERAL

1.01 SUMMARY:

- A. Section Includes:
 - 1. General Coordination.
 - 2. Mechanical and Electrical Coordination.
 - 3. Clearances.

1.02 GENERAL COORDINATION

- A. Coordinate:
 - 1. Work of all subcontractors.
 - 2. Changes, with Architect and Owner's Representative.
 - 3. Inspection and testing service.
 - 4. Construction Schedule with Architect and Owner's Representative.
 - 5. Start-up, inspection and acceptance of equipment.
- B. Early order all materials and/or equipment requiring long lead time. Contractor will be reimbursed for early order items upon certification of receipt and storage of same in licensed, bonded warehouse, or delivery to Project Site and suitable storage. If stored off-site, provide insurance certificate to Owner prior to request for reimbursement.
- C. Contract Documents are arranged for convenience only and do not necessarily determine which trades perform various portions of Work.

1.03 MECHANICAL AND ELECTRICAL COORDINATION

- A. Mechanical and Electrical Drawings are diagrammatic. Additional offsets and bends may be required by field conditions, or governing building codes, or Architect may make minor adjustments in fixture, outlet, grilles, louver, ventilator, or appliance locations prior to rough-in work. Coordinate installation of additional offsets and bends in systems where required.
- B. Coordinate rough-in, plumbing and wiring requirements for equipment with equipment supplier. Install rough-in, plumbing and wiring in accordance with equipment manufacturer's printed instructions.

1.04 CLEARANCES

- A. Provide adequate clearance between Architectural, Structural, Mechanical and Electrical Systems. Verify physical dimensions of equipment with its available space. Check access routes through concealed spaces.
- B. Review Drawings for possible conflicts prior to rough-in. Verify that equipment will fit in space provided. Resolve conflicts in rough-in work with Architect prior to start of installation.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01200
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Schedule of values.
- B. Applications for payment.
- C. Change procedures.
- D. Defect assessment.
- E. Alternates.

1.2 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702.
- B. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.
- D. Include in each line item, amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.
- E. Include separately from each line item, direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.3 APPLICATIONS FOR PAYMENT

- A. Submit 3 copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702.
- B. Summary Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.

- D. An applications for payment must be accompanied by all wage certificates for the billing period as stipulated in the Agreement.
- E. Payment Period: Submit at intervals stipulated in the Agreement.
- F. Submit with transmittal letter as specified for Submittals in Section 01330 - Submittal Procedures.
- G. Submit waivers stipulated in the Agreement.
- H. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Partial release of liens from major subcontractors and vendors.
 - 2. Affidavits attesting to off-site stored products.
 - 3. Construction progress schedules, revised and current.
- I. Final Payment:
 - 1. Prior to final payment(s) all required as-built and O&M documentation as listed in Section 01700 must be received by the Owner.
 - 2. Prior to any final payment(s) all keys checked out to the Contractor(s) and/or Consultant(s) must be returned to DPS and a receipt of return provided to PM by DPS.

1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.
- C. The Architect/Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within 5 days.
- D. Contractor may propose changes by submitting a request for change to Architect/Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full.
- E. Stipulated Sum/Price Change Order: Based on Proposal Request or Notice of Change and Contractor's fixed price quotation.
- F. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

- G. Construction Change Directive: Architect/Engineer may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- H. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
- I. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- J. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- K. Change Order Forms: AIA G701 Change Order.
- L. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- M. Correlation Of Contractor Submittals:
- N. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
- O. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- P. Promptly enter changes in Project Record Documents.

1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer/Owner.
- D. Defective Work will be partially repaired to instructions of Architect/Engineer/Owner and unit sum/price will be reduced at discretion of Architect/Engineer/Owner.
- E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

- F. Authority of Architect/Engineer/Owner to assess defects and identify payment adjustments, is final.
- G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

1.6 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work.
- C. Schedule of Alternates:
 - 1. **Alternate No. 1:** Casework.
 - a. Base Bid Item: No casework at Break Area.
 - b. Alternate Item: Section 06410 adds casework at Break Area. As shown in Drawings including cost for materials, fabrication, and installation of cabinetry and counter tops.
 - 2. **Alternate No. 2:** Exterior Steel Canopy.
 - a. Base Bid Item: No canopy at Main Entry.
 - b. Alternate Item: Section 05500 and Drawings including cost for materials, fabrication, installation and finishing of steel canopy.
 - 3. **Alternate No. 3:** Replacing Overhead Door
 - a. Base Bid Item: Existing door to remain.
 - b. Alternate Item: Section 08360 and Drawings including cost for materials, fabrication, and installation of new overhead door in existing track.
 - 4. **Alternate No. 4:** New Exterior window in existing opening.
 - a. Base Bid Item: Masonry infill of existing opening including paint and interior finishes.
 - b. Alternate Item: Section 08110 and Drawings, Room #103 including cost for materials, fabrication, installation of new window in existing masonry opening and partial masonry infill including paint and interior finishes.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01210 PROJECT MEETINGS

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Pre-Construction Meeting.
2. Progress Meetings.
3. Pre-Installation Conference.
4. Special Called Meetings.
5. Requests for Information (RFI).

1.02 MEETINGS

A. Pre-Construction Meeting:

1. Owner's Representative, Architect, Contractor schedule date and time for a Pre-Construction meeting preferable held at jobsite as soon as possible after Contractor receives signed contract or Notice to Proceed to review responsibilities and procedures.
2. Attendance: Owner's Representative, Architect, Contractor, and Contractor's major sub-contractors.
3. Location: On-site at FS or conducted by the Lead Consultant with PM.
4. Meeting minutes shall be by the Lead Consultant and distributed to all attendees.
3. Minimum Agenda (subject to addition as needed):
 - a. Designation of key personnel and complete list of sub-contractors with contact information.
 - b. Construction schedule.
 - c. Owner occupancy, schedule, and activities requiring accommodation and/or coordination.
 - d. Impacts to building operations, building systems, and/or building occupants.
 - e. Site safety and access specific to project.
 - f. Critical work sequencing and long-lead items.
 - g. Procedures for processing field decisions, Change Orders, RFI's, testing & inspecting, applications or payment, submittals, etc.
 - h. Distribution of Contract Documents as needed.
 - i. Use of the site, campus premises, and existing building(s).
 - j. Work restrictions.
 - k. Temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. Site security.
 - p. Progress cleaning.
 - q. Submittal schedule.
 - r. ALL shut-off locations.
 - s. Define plan to reduce impact to building users regarding application of finishes, paints, adhesives, etc.
 - t. Utility meter removals or connections.
 - u. Facilities EH&S items include but are not limited to the following:
 - i. List of emergency contacts and contact information.
 - ii. Process for accessing emergency assistance.
 - iii. Process for spills & clean-up.
 - iv. EH&S expectations regarding maintaining safe conditions for UO employees, students, visitors, construction workers, etc. including odors, egress, avoidance of fire alarms, etc.

- v. If applicable, EH&S expectations regarding compliance with erosion control permits.

B. Construction Progress Meeting Requirements:

1. Location: Meeting location shall be onsite and conducted by the GC or CM.
2. Frequency: Scheduled by Owner's Representative, normally once every week. Refer also to Owner / Contractor Agreement for special requirements.
3. Meeting minutes shall be by the GC or CM and distributed to attendees and to individuals requesting courtesy copies.
4. Courtesy meeting minutes shall be provided to N&TS.
5. Agenda items at a minimum and/or applicable include the following; list is subject addition as needed:
 - a. Overall construction schedule progress and status.
 - b. 2 to 3 week detailed schedule of coming weeks' activities and needed shutdowns.
 - c. Owner schedule and activities requiring accommodation and/or coordination.
 - d. Submittal schedule and status.
 - e. Site access & utilization and any changes due to construction or delivery activities.
 - f. Work hours and notification of evening or weekend events needing notification to campus.
 - g. Status of correction of deficient items.
 - h. Field observations.
 - i. RFI progress, status, and/or outstanding responses.
 - j. Proposal Request progress, status, and outstanding questions / responses.
 - k. Pending changes.
 - l. Change Order status and budget update(s).
 - m. Payment request status

B. Pre-Installation Conferences:

1. Conduct Pre-Installation Conference before each activity that requires coordination with other construction activities Specification Sections requiring Pre-Installation conferences include: 03300 Cast-In-Place Concrete, 04220 Concrete Unit Masonry and 07525 Modified Bitumen Roofing.
2. Attendees: Architect, Contractor, Subcontractor(s) involved, manufacturer's representative if required by manufacturer or these specifications. Code enforcement personnel or Inspector if required by local codes.
3. Agenda: Review progress of other activities and preparations for activity under consideration, including time schedules, manufacturer's preparation and installation recommendations, safety requirements, weather limitations, substrate acceptability, compatibility problems, and inspection and testing requirements.
4. Contractor conducts and records significant discussions, agreements and disagreements of each conference. It is recommended that this meeting be held directly before/ after a Progress Meeting. Schedule Pre-Installation Conference not later than seven days prior to a Progress Meeting.

D. Special Called Meetings: As called by Architect or Owner's Representative, or Contractor.

1.03 REQUEST FOR INFORMATION

- A. When field conditions or contents of Contract Documents require clarification or verification by Architect, following procedure is required:

1. Present item or items requiring clarification/verification at Progress Meeting for discussion. (Critical or emergency items contact Architect at once.)
 2. If it is determined that an item or items do not require RFI submittals, Architect includes clarification/verification determination in Progress Meeting Report.
 3. If it is determined that item or items do require written RFI submittal, prepare each on an RFI form. RFI form available from Architect upon request. Design Clarification/Verification Request (DCVR) or other forms are unacceptable.
 4. Record each RFI in a log, identifying each RFI-#, subject, date submitted, date of response, and disposition.
- B. Route and copy RFI's in same manner as correspondence.
- C. Architect responds to submitted RFI's within seven days in space provided on RFI. If change order is indicated, change order request also listed or attached.
- D. If agreement regards clarification/verification acceptable to both parties cannot be reached, see General Conditions and Supplementary Conditions for procedures to resolve conflict.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01300
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Construction Standard Substitution Request Process Requirement
- D. Cutting and patching.
- E. Special procedures.

1.2 RELATED SECTIONS

- A. Appendix B: U of O Constructions Standard Substitution Request Form

1.3 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements [, with provisions for accommodating items installed later].
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas [except as otherwise indicated], conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion [and for portions of Work designated for Owner's [partial] occupancy].
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 FIELD ENGINEERING

- A. Verify set-backs and easements; confirm drawing dimensions and elevations.
- B. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- C. Maintain complete and accurate log of control and survey work as Work progresses.

1.5 CONSTRUCTION STANDARD SUBSTITUTION REQUEST PROCESS REQUIREMENTS

- A. The Construction Standard Substitution Request Process is for design teams / consultants (only) to request variance and/or substitution of items, strategies, etc. from the March 2011 edition of the Campus Construction Standards.
- B. A formal Construction Standard Substitution Request and FS approval is required prior to any deviation from the Construction Standards. Only upon prior approval can they be included in SD, DD, or CD documents for review or implementation
 - 1. If deviations from the Construction Standards are included in project design or construction documents generated by the design team / consultants and the deviation did not obtain prior Owner approval through the Construction Standard Substitution Request process the cost of revision and/or redesign will be the responsibility of the design team / consultants and not the UO project.
 - 2. If deviations from the Construction Standards are included in project construction documents generated by the design team / consultants and the deviation did not obtain prior Owner approval through the Construction Standard Substitution Request process the cost of any resulting change order to revise and/or redesign the item/condition will be the responsibility of the design team / consultants and not the UO project.
- C. Submit requests using the provided Construction Standard Substitution Request form.
 - 1. Requests may take the form of a 2-part request process as needed but this approach must be indicated at submission of the request.
 - 2. Part 1 may consist of initial proposal/substitution information for Owner feedback of viability and whether or not the design team should proceed with further investigation towards a substitution.
 - 3. Part 2 would then include all the required information listed below for final Owner approval of substitution.
- D. Submit four (4) complete copies of each request and the required supporting documentation for consideration to the Project Planner (PP).
 - 1. • The PP will log and distribute these copies to internally designated FS personnel for review.
- E. Identify the design strategy, product, fabrication, or installation Standard to be substituted, including the Standard section number and page number
- F. Documentation: Show compliance with requirements for substitutions and the following as it applies.

1. Statement(s) indicating why the Standard method, product, or material cannot be provided.
 2. Coordination information, including a list of changes or modifications needed to other parts of the design or work that will be necessary to accommodate proposed substitution.
 3. Comparison(s) of significant qualities of the proposed substitution with those of the design or work; may include attributes such as performance, weight, size, durability, maintainability, serviceability, visual effect, and specific features and requirements.
 4. Product and/or material data including drawings and descriptions of products / materials and fabrication and installation procedures.
 5. Sample(s) where applicable or requested.
 6. List of similar installations for completed projects with project names and addresses and names and addresses of Architects and Owners
 7. Show compliance with current building code and acceptable to authorities having jurisdiction.
- Comparison of design and construction schedules using proposed substitution, including effect on the overall contract time. For example, if the Standard design method, material, product, or method of construction cannot be provided within the contract time, include a letter from the manufacturer, on manufacturer's letterhead, stating the lack of availability or delay in delivery. Likewise, for a substitution of an accelerated availability, include a letter from the manufacturer, on manufacturer's letterhead, stating the availability or accelerated delivery.
8. Cost information, including a proposal of change, if any, in the construction estimate.
 9. The proposed substitution complies with performance, maintenance, and serviceability requirements in the Construction Standards and is appropriate for applications indicated.
 10. Section 01 30 00 – Administrative Requirements continued

G. Owner Facilities Action:

1. Designated FS personnel review and approval is required for substitution requests varying from the approved Construction Standards.
2. If necessary, FS will request additional information, documentation, or discussion to evaluate a substitution request; through the PP.
3. PP will notify Architect / Consultant of approval or rejection of proposed substitution(s).

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:

1. Structural integrity of element.
 2. Integrity of weather-exposed or moisture-resistant elements.
 3. Efficiency, maintenance, or safety of element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching [including excavation and fill,] to complete Work, and to:
1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and non-conforming Work.
 4. Remove samples of installed Work for testing.
 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire resistant material to full thickness of penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products [and salvaged products] for patching and extending work.
- B. Employ [original] [skilled and experienced] installer to perform alteration work.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.

- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to [original] [or] [specified] condition.
- I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to [specified] [renewed] condition for each material, with neat transition to adjacent finishes.
- J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- L. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review.
- M. Trim existing doors to clear new floor finish.
- N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- O. Finish surfaces as specified in individual product sections.

3.3 FORMS

- A. Appendix B: U of O CONSTRUCTION STANDARDS SUBSTITUTION REQUEST

END OF SECTION

SECTION 01310 SUBMITTALS

PART 1 GENERAL

1.01 SUMMARY:

- A. Section Includes:
 - 1. Submittal Procedures.
 - 2. Progress Schedule.
 - 3. Product Data.
 - 4. Shop Drawings.
 - 5. Samples.
 - 6. Quantity of Required Submittals.

1.02 SUBMITTAL PROCEDURES

- A. Review submittals prior to submission; Contractor's signature shall indicate Contractor has reviewed submittals and certifies that they are complete, correct, in compliance with Contract Documents, and suitable for Project.
- B. Forward all submittals required by each Specification Section to Architect for review. Architect will review, recommend approval or not, and forward to Owner's Representative for final approval. Notify Architect in writing at time of submission of deviation in submittals from requirements of Contract Documents.
- C. Architect will review submittals for general conformance with design concept and general compliance with information given in Contract Documents, and return submittals without further review when requiring revision and resubmittal with corrections noted thereon.
- D. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals unless Architect gives written acceptance of specific deviations.
- E. Corrections: Immediately incorporate all required corrections in submittals, and resubmit for further review, if required.

1.03 PROGRESS SCHEDULE

- A. Content: Show product and installation dates for major products. Show dates for enclosing interior space, mechanical system completion, substantial completion, final completion and occupancy. Show dates for submittal and approval of all items specified with submittal requirements.
- B. Updating: Indicate progress of each activity, show revised completion dates. Provide listing of current and anticipated accelerations and delays. Describe proposed corrective action when required.
- C. Submit Progress Report bi-weekly with comparison to baseline schedule.

1.04 PRODUCT DATA

- A. Submit manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other descriptive data on specified manufactured products and systems.
- B. Identify data sheets with section and paragraph numbers where product or system is specified.
- C. Equipment and systems shall meet performance data even when specified by manufacturer's name and catalog number.

1.05 SHOP DRAWINGS

- A. Submit Shop Drawings showing connections, details, dimensions, finishes and fasteners.
- B. Identify related Shop Drawings which will be submitted at later date.
- C. Index Shop Drawings to master index. Cross reference drawing and detail numbers in Contract Documents.

1.06 SAMPLES

- A. Office Samples: Submit office samples of size and quantity specified or of sufficient size and quantity to clearly illustrate functional characteristics of product, material or system with integrally related parts and attachment devices.
- B. Field Samples: Construct each sample complete, including work of all trades required in finish work. After approval, where appropriate, field samples may be incorporated into Project. When directed, remove from site field samples not incorporated into Project.

1.07 QUANTITY OF REQUIRED SUBMITTALS

- A. Shop Drawings & Product Data: Submit four (4) copies unless otherwise specified.
- B. Office and Field Samples: Refer to Section covering specific product, material or system, for size and quantity required.
- C. Refer to Section 01700 for requirements for submittal of extra materials for maintenance and repair.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01400 QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY:

- A. Section Includes:
 - 1. Regulatory Agency Compliance.
 - 2. Owner's Inspections and Testing.

1.02 REGULATORY AGENCY COMPLIANCE

- A. Comply with requirements of Contract Documents and regulatory agencies having jurisdiction.
 - 1. State of Oregon Structural Specialty Code, 2014 Edition.
 - 2. City of Eugene, Bureau of Buildings, Environmental Services, Transportation, Parks.
 - 3. Oregon Department of Environmental Quality (DEQ).

1.03 OWNER'S INSPECTIONS AND TESTING

- A. Owner reserves right to perform inspections and tests of materials, appliances and equipment delivered to Site or incorporated into Work, to assure compliance with Contract Documents.
 - 1. Unless otherwise specified, Owner shall employ and pay costs for independent testing laboratory and/or engineering consultants that may be required to perform Owner elected inspections and tests.
 - 2. Should initial tests indicate non-compliance with Contract Documents, both initial tests and subsequent retesting occasioned by non-compliance shall be performed by same agency, and all costs, including additional Architect's services made necessary by such failure, shall be borne by Contractor.
- B. Grant representatives of testing agency and engineering consultant access to Work at all or any times. Provide all job site facilities necessary for representatives to perform their respective functions.
- C. Notify Laboratory at least 24 hours in advance of operations to allow for personnel assignments and test scheduling.
- D. If results of tests and inspections indicate work is below requirements of Contract Documents, that portion of work is subject to replacement or repair, as directed by Architect.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01500 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Temporary Utilities
2. Security and Access to Construction Sites
3. Protection of Existing Asbestos Containing Materials
4. Utility Availability to Contractor
5. Temporary Lighting
6. Temporary Heat and Ventilation
7. Security for Contractor Equipment and Materials
8. First Aid
9. Fire Protection
10. Construction Aids and Barriers
11. Access, Parking and Traffic
12. Temporary Barriers & Enclosures
13. Field Office and Sheds
14. Tree and Plant Protection & Preservation (Not applicable)
15. Trash Disposal
16. Project Identification

B. General Requirements:

1. Unless written approval is obtained, construction must not obstruct private or public streets, driveways, pedestrian walkways, ADA routes, fire lanes, egress of occupied buildings, etc.
2. Coordinate construction detour routes for bikes, pedestrians, vehicles, etc. with FS Exterior Supervisor, PP, PM, and as needed DPS.
3. All scaffolding use requires qualified and certified erectors following OSHA guidelines.
4. Protection of existing conditions:
 - a. Restore permanent facilities used during construction to their specified and/or original condition.
 - b. Contact documents shall include provisions to fully protect existing conditions.

1.02 TEMPORARY UTILITIES:

- A. ALL shut-off locations are to be documented for emergency purposes prior to pre-construction meeting.
- B. Documentation of locations is to be distributed to PM, Facilities Zone Supervisor, DPS, EH&S, and any others determined by individual projects.

1.03 SECURITY AND ACCESS TO CONSTRUCTION SITES

- A. DPS and PM are to be consulted to determine strategies to be implemented.
- B. UO Fire Marshal and EH&S consultation regarding egress routes from the project site and adjacent buildings to be provided and maintained at all times.
- C. ADA routes must be provided and maintained at all times from the site & adjacent buildings.
- D. Parking within site fencing is controlled and managed by the GC.

- E. If the project does not have site fencing then parking is restricted by issued parking permits through DPS in designated locations only. Parking permits are requested of DPS by the PM.

1.04 PROTECTION OF EXISTING ASBESTOS CONTAINING MATERIALS

- A. Due to the age of many facilities, asbestos containing materials were known to be present before demolition and remediation.
- B. UO will provide information on known asbestos containing materials and locations to design consultant for inclusion into construction contract documents
- C. Contract documents shall include requirements related to asbestos containing materials:
 - Shall not be disturbed
 - If disturbed, what actions are to be taken?
 - Provide protection for asbestos containing materials to prevent disturbance

1.05 UTILITY AVAILABILITY TO CONTRACTOR

- A. Provide water and electricity required for construction operations.
 - 1. Contractor is responsible for both temporary utility connections and disconnects, and shall obtain City approval prior to accomplishing either.
 - 2. Provide adequate number of portable sanitary facilities on job site to accommodate size of construction crew.
 - 3. Contractor is responsible for temporary connection and removal of telephone service to on-site construction office.
- B. Temporary Power: Provide power to all areas of site for temporary lighting, temporary heating and ventilating, temporary communications systems, construction equipment and testing equipment. Contractor may use permanent power system after obtaining written approval.
- C. Temporary Water: Provide service standpipe inside Project area with one 3/4 inch diameter hose bib at 20 psi minimum discharge pressure.

1.06 TEMPORARY LIGHTING

- A. Provide temporary lighting throughout construction period as required by governing agencies. Provide additional lighting for finish work when required.

1.07 TEMPORARY HEAT AND VENTILATION

- A. Minimum Interior Temperatures: After temporary enclosures are installed, provide heating sufficient to prevent moisture levels detrimental to construction processes and materials in work areas for 24 hours per day.
- C. Minimum Interior Ventilation: Provide local exhaust ventilation to prevent harmful dispersal of hazardous substances into atmosphere at all times. Provide ventilation for materials being cured.

1.08 SECURITY FOR CONTRACTOR EQUIPMENT AND MATERIALS

- A. Secure covered storage or fenced areas deemed necessary by Contractor shall be provided and constructed by Contractor. Provide temporary locks and doors at all openings after building is enclosed.

1.09 FIRST AID

- A. Provide required first aid facilities as required by OSHA governing regulations.

1.10 FIRE PROTECTION

- A. Fire Safety: Take precautions to prevent possibility of fire resulting from construction operations. Particularly avoid hazardous accumulations of rubbish and unsecured flammable materials.
- B. Fire Fighting Equipment: Provide emergency fire extinguishers of adequate type and quantity, properly maintained. Obtain local fire department approval of emergency fire extinguishers.

1.11 CONSTRUCTION AIDS AND BARRIERS

- A. Erosion Control: Contractor is responsible to meet all DEQ Erosion Control Standards, and to obtain and pay for Storm Water Erosion Control Facilities Permits.
- B. Provide ramps, ladders, stairs, guardrails, chutes and material hoists. Construct and maintain to requirements of governing agencies. Furnish for safety of public and construction personnel.
- C. Provide barriers to protect materials, equipment, new work, construction personnel and public.
- D. Completely remove temporary materials and equipment upon completion of construction.
- E. Repair damage caused by installation of temporary items and restore finishes to specified condition.

1.12 ACCESS, PARKING AND TRAFFIC

- A. Arrange with Owner's Representative for use of existing site for access parking and traffic.
- B. Provide barricades, warning signs, flagmen or other traffic regulators which may become necessary for protection of public, construction personnel or property.
- C. Comply with applicable environmental noise regulations.

1.13 FIELD OFFICE AND SHEDS

- A. Provide temporary field office with following facilities until project completion:
 - 1. Lighting: As required.
 - 2. Telephone & FAX: Provide one direct line telephone. Provide one FAX machine on dedicated line. Toll calls paid by party making call.
 - 3. Emergency first aid facilities.
 - 4. Identification sign.
 - 5. ABC type portable fire extinguisher.
- B. Provide following facilities in temporary buildings used for material and equipment storage:
 - 1. Ventilation: Where required for material being stored.
 - 2. Fire extinguisher: One ABC type portable fire extinguisher.

3. Temperatures: As required for materials being stored.

1.14 TRASH DISPOSAL

- A. Remove all trash and excess material from site.
- B. On-Site Disposal: Disposal of waste material on-site shall be limited to sod and clean earth. On-site disposal sites will be as determined by Owner's Representative.
- D. Off-Site Disposal: Disposal of unusable waste materials and building debris waste items caused by construction operations shall be off-site and shall be responsibility of Contractor. Recycling is encouraged.

1.15 PROJECT IDENTIFICATION

- A. Only two types of signs fixed to construction fencing are allowed:
 - a. One sign to identify the project, project purpose, project rendering and design team.
 - b. One sign to list the general and sub-contractors.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01600 MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Material and Equipment Selection.
 - 2. Manufacturer's Instructions.
 - 3. Transportation and Handling.
 - 4. Storage and Protection.
 - 5. Product Options.
 - 6. Owner-Furnished Products

1.02 MATERIAL AND EQUIPMENT SELECTION

- A. Comply with Standards and Specifications including: size, make, type and quality specified, or as approved in writing by Architect.
- B. Manufactured and Fabricated Products:
 - 1. Design, fabricate and assemble in accordance with best engineering and shop practices.
 - 2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - 3. Two or more items of same kind shall be identical and by same manufacturer.
 - 4. Provide products suitable for service conditions.
 - 5. Adhere to equipment capacities, sizes and dimensions shown or specified unless variations are specifically approved in writing.
- C. Do not use material or equipment for any purpose other than that for which it is designed or is specified. All products and materials must be commercial grade at a minimum; **no** residential grade products.
- D. Fabricate and install equipment to deliver its full rated capacity at efficiency for which it was designed.
- E. Select and install equipment to operate at full capacity without excessive noise or vibration.
- F. Provide electrical products with U.L. Label, or as approved by local inspection authority.

1.03 MANUFACTURER'S INSTRUCTIONS

- A. Perform work in accordance with manufacturer's printed installation instructions, obtain and distribute copies of such instructions to parties involved in installation.
- B. Maintain one set of complete instructions at job site during installation and until completion.
- C. Handle, install, connect, clean, condition and adjust products in strict accordance with manufacturer's printed instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, notify Architect for clarification.
 - 2. Do not proceed with work without clear instructions.
- D. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

- A. All construction deliveries must be made to the project site at attention of the contractor; **not** to FS Receiving.
- B. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at site.
 - 1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 - 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and assure products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.05 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
 - 1. Store products subject to damage by elements in weather-tight enclosures.
 - 2. Maintain temperature and humidity within ranges required by manufacturer's instructions.
 - 3. Protect equipment and systems from moisture, chemical or mechanical damage before and after installation.
 - 4. Protect shafts and bearing housings from rust.
- B. Exterior Storage:
 - 1. Store fabricated products above ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
 - 2. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Inspection: Arrange storage in manner to provide easy access for inspection. Make periodic inspections for stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.
- D. Owner will not be liable for theft, vandalism or damages to goods under Contractor control that are stored on Owner's property. Replacement and replacement cost will be the responsibility of the Contractor.
- E. Protection after installation:
 - 1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations.
 - 2. Plug or cap pipe and conduit openings to prevent entrance of foreign matter.
 - 3. Remove when no longer needed.

1.06 PRODUCT OPTIONS

- A. For products specified only by reference standard, select any product meeting that standard.
- B. For products specified by naming one or more products of manufacturers, submit product information to Architect review and approval prior to installation.

- C. For products specified by naming only one product and manufacturer, there is no option.
- D. References in Specifications to equipment, material, articles, or patented processes by trade name, make or catalog number shall be regarded as establishing standard of quality and shall not be construed as limiting competition.
- E. Material requiring Architect's approval shall be submitted through Material Submittal process prior to being used, installed, or incorporated into Project.

1.07 OWNER FURNISHED ITEMS

- A. Reference drawings for locations, quantities, and scope.
- B. Typical work by FS includes but not limited to: (OFCL, Owner Furnished Contractor Installed; OFOI Owner Furnished Owner Installed)
 - a. Room numbering; See Appendix – Room Numbering Guide
 - b. Specification of and providing of door hardware; OFCL.
 - c. Exterior trash cans. Custom UO design and order, OFOI.
 - d. Exterior benches; OFCL.
 - e. Toilet dispenser accessories; OFCL.
 - f. Exterior light poles, globes, lamps, and junction box; OFCL.
 - g. Interior signage on small to medium projects only; OFOI.
 - h. Exterior building marker signage; OFOI.
 - i. Wall clocks; OFCL.
 - j. Waste receptacles for all spaces; OFOI.
 - k. Ash posts or smoking stations. OFOI; Custom UO fabrication.
 - l. Walk off mats; OFOI.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01700 EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Substantial Completion.
2. Cleaning prior to Request for Substantial Completion Inspection.
3. Cleaning prior to Contractor's Request of Final Acceptance Inspection..
4. Construction Waste Management
5. Contract Completion.
6. Final Review
7. Project Record Documents.
8. Design Team Record Document Requirements/deliverables at Project Closeout.
9. General Contractor As-Built document requirements/deliverables at Project Closeout.
10. Operations and Maintenance Manuals
11. Warranty Requirements.
12. Demonstration & Training.
13. Release of Claims.
14. Schedule of Closeout Submittals.

1.02 SUBSTANTIAL COMPLETION

- A. Submit written notice to Architect that work, or designated portion thereof, is substantially complete. Architect will review work within seven (7) days.
- B. If Architect determines that work is not substantially complete, Architect will immediately notify Contractor in writing. Contractor shall complete work and submit second written notice of substantial completion to Architect. Architect will re-review work.
- C. When Architect concurs that work is substantially complete, Architect will prepare punch-list of items to be completed or corrected. Architect will submit punch-list to Contractor for Contractor's written acceptance and correction of deficiencies.

1.03 CLEANING PRIOR TO REQUEST FOR SUBSTANTIAL COMPLETION INSPECTION:

- A. Remove labels that are not required as permanent labels.
- B. Clean exposed hard-surfaced finishes including glass, metals, stone, concrete, painted surfaces, plastics, tile, wood, special coatings, and similar surfaces, to a dirt free condition, free of dust, stains, films, and similar noticeable distracting substances.
- C. Clean concrete floors in non-occupied spaces.
- D. Clean lighting fixtures and lamps of ALL dust and debris.
- E. Remove crates, cartons, and other flammable waste materials or trash from work areas. Building(s) shall be turned over free of concealed garbage, trash, and rodent infestation. If any of the preceding is revealed, or odors from them occur, they shall be removed by the Contractor at Contractor's expense.

- F. Restore all surrounding property to its original condition.
- G. Elevator shafts, electric closets, pipe, and duct shafts, chases, furred spaces, and similar spaces which are generally unfurnished, shall be cleaned and left free from rubbish, loose plaster, mortar drippings, extraneous construction materials, dirt, and dust.
- H. Rubbish and debris shall be lowered by way of chutes, hoists, or lowered in receptacles. Under no circumstances shall any rubbish or waste be dropped or thrown from one level to another within or outside the building(s).
- I. No marking, soiling, or other defacing of finished surfaces. In the event that finished surfaces become defaced, all costs for cleaning and restoring such surfaces to their originally intended condition shall be the responsibility and cost of the Contractor.
- J. Remove debris from and clean tops of all equipment, AHU, lights, etc. This includes mechanical rooms.
- K. Remove grease, dust, dirt, stains, manufacturer's labels, fingerprints, etc., from sight exposed surfaces. Repair, patch and touch up marred surfaces.
- L. Clean heating and cooling ducts, blowers, coils, fixtures, equipment, piping and grilles. Replace disposable air filters, and clean permanent filters. Flush water systems and disinfect domestic water lines.
- M. Broom clean interior paved surfaces and walks. Rake clean landscaped areas. Vacuum clean interior spaces. Wash interior and exterior glazing and mirrors.
- N. Maintain in cleaned conditions until final completion or Owner's Occupancy, whichever comes first.

1.04 CLEANING PRIOR TO CONTRACTOR REQUEST OF FINAL ACCEPTANCE INSPECTION

- A. Clean transparent materials, including mirrors and window or door glass, to a polished condition, removing substances that are noticeable as vision-obscuring materials.
- B. Turn the work over in immaculate condition inside and outside including the premises.
- C. Clean all work on the premises including walks, drives, curbs, paving, fences, grounds, and walls. Slick surfaces shall be left with a clear shine. Cleanup shall include removal of smudges, marks, stains, fingerprints, soil, dirt, paint, dust, lint, labels, discolorations, and other foreign materials.
- D. Clean all finished surfaces on interior and exterior of project including floors, walls, ceilings, windows, glass, doors, fixtures, hardware, and equipment.
- E. Clean and apply finish (including 'Anchor' wax) to all floors as recommended by the manufacturer.
- F. Wash exterior glass using a window-cleaning contractor specializing in such work.
- G. Remove temporary buildings and structures, fences, scaffolding, surplus materials, and rubbish of every kind from the site of the work. Repair these areas to be compatible with the surrounding finished conditions.
- H. Clean tops of all equipment, AHU, lights, etc. This includes mechanical rooms.

- I. Remove grease, dust, dirt, stains, manufacturer's labels, fingerprints, etc., from sight exposed surfaces. Repair, patch and touch up marred surfaces.
- J. Clean heating and cooling ducts, blowers, coils, fixtures, equipment, piping and grilles. Replace disposable air filters, and clean permanent filters. Flush water systems and disinfect domestic water lines.
- K. Broom clean interior paved surfaces and walks. Rake clean landscaped areas. Vacuum clean interior spaces. Wash interior and exterior glazing and mirrors.
- L. Maintain in cleaned conditions until final completion or Owner's Occupancy, whichever comes first.

1.05 CONSTRUCTION WASTE MANAGEMENT

- A. Salvage and Recycling Requirements: Our goal is to salvage and recycle as much non-hazardous demolition and construction waste as possible including any demolition and/or construction waste.
- B. Submittals:
 - Recycling Plan: Prior to preparation of the Waste Management Plan, submit the recycling plan to the PM and Architect for approval.
 - Waste Management Plan: Submit 3 copies of plan within 30 days of the Notice to Proceed.
 - Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste in weight generated by the Work.
- C. Record Keeping:
 - Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether or not the organization is tax exempt.
 - Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Include documentation for back-charge fees (if any) for improperly segregated waste.
 - Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- D. Provide recycling education and recycling information to Contractor and Subcontractor employees working on the project.
- E. Waste Management Plan Implementation:
 - Provide containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - i. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - ii. Comply with project requirements for controlling dust and dirt, environmental protection, and noise control.

1.06 CONTRACT COMPLETION

- A. Contractor shall insure that project is complete, including Final Review and acceptance by Owner, prior to scheduled completion date.
- B. Contractor is responsible for reimbursement for all expenses incurred in conducting re-reviews, including Architect, Owner's Representative, Structural Engineer, Civil Engineer, and Landscape Architect time spent re-reviewing work following first re-review for Substantial Completion and any subsequent re-reviews following initial Final Review.

1.07 FINAL REVIEW

- A. Submit written certificate that Contractor has reviewed Contract Documents, inspected Project, and work is completed in accordance with Contract Documents, equipment and systems have been tested in presence of Owner's Representative and are operational, and work is ready for Architect's Final Review. Architect will conduct Final Review within seven (7) days.
- B. Should Architect consider that work is incomplete or defective, Architect will notify Contractor in writing, listing incomplete or defective work. Contractor shall remedy deficiencies and send second written certification to Architect that work is complete. Architect will re-review work.
- C. When Architect finds that work is acceptable under Contract Documents, Architect will request Contractor to make closeout submittals.

1.06 PROJECT RECORD DOCUMENTS

- A. Maintain at site one copy of: Bid Documents, Contract Forms, Project Manual, Contract Drawings, Addenda, Change Orders, Reviewed Shop Drawings, Office Samples, Field Test Records, and Architect's supplemental Instructions.
- B. Store documents and samples in Contractor's field office separate from documents used for construction.
- C. Keep current record of documents and label "Project Record". Record location by dimension of concealed items, utility lines, and field changes of dimensions and changes in materials furnished on Project Record Documents. Record changes from Architect's Supplemental Instructions, Change Orders and Details not on Contract Drawings. Deliver to Architect for review and approval with request for Final Payment.
- D. Project Record Documents will be reviewed monthly, and Contractor is required to update Project Record Documents monthly. Review of updated Project Record Documents will be part of approval by Owner's Representative on monthly basis of Contractor's application for payment.

1.08 DESIGN TEAM RECORD DOCUMENT REQUIREMENTS/ DELIVERABLES AT PROJECTCLOSEOUT

- A. 1 complete full size and reproducible drawing set on 4mil Mylar; all drawings and disciplines (not just floor plans) to include Civil, Landscape, Architectural, Mechanical, Electrical, etc.
- B. 1 complete reproducible CD set of all AutoCAD drawing files, Revit models, etc.; including egress maps.

- C. 1 complete reproducible CD set of each drawing sheet in 'pdf' file format.
- D. 1 complete index of AutoCAD files and drawing layers.
- E. 2 complete full-size, reproducible drawing and specification sets on bond paper.

1.09 GENERAL CONTRACTOR: AS-BUILT DOCUMENT REQUIREMENTS / DELIVERABLES AT PROJECT CLOSEOUT:

- A. With all the following listed items, give particular attention to concealed products and portions of the work that are not clearly identified in the original submittal or cannot otherwise be readily discerned at a later date by direct observation.
 - 1. Original permit set of documents with sign off of inspections. Contractor should make copies of these sign offs for their records.
 - 2. 1 complete full-size, reproducible drawing sets on bond paper.
 - 3. 1 complete set of as-built specifications.
 - 4. 1 complete reproducible CD of as-built drawings and specifications in 'pdf' file format.
 - 5. 1 complete full-size reproducible drawing & specification set of Contractor's red-lines on bond paper.
 - 6. Complete digital set of all construction photographs by Contractor

1.10 OPERATIONS AND MAINTENANCE MANUALS

- A. Form of Manuals:
 - 7. Prepare data in form of instruction manuals for use by Owner's Representative. Use 8 1/2" x 11" manual format in three-ring binder.
 - 8. Include drawings, indexed tabs and title for each manual.
 - 9. Provide three (2) hard copies of manuals and all items listed below to Owner.
 - 10. Provide 1 complete reproducible CD of all listed items in "pdf" file format.
- B. Contents of Manual:
 - 1. All part numbers of manufacturers and suppliers
 - 2. Total quantities installed under the contract
 - 3. Manufacturer and supplier names and addresses.
 - 4. Complete manufacturer's serial number(s) or other identity symbols.
 - 5. Parts list that clearly identify every part in the item of equipment with the proper manufacturer's name, part nomenclature and number, local source, and list price.
 - 6. Draw-downs of all finish paint used.
 - 7. Recommended Spare Parts:
 - Furnish a list of recommended spare parts for each equipment item that will be needed to support that item of equipment for a 12-month period.
 - The quantities of spare parts recommended shall be based upon the quantity of like equipment items installed under the contract.
 - Storage shelf life of part, in months, if the part has a limited life.
 - Recommended quantity of part(s) to inventory and support the installed quantity of equipment in which the part appears for a period of 12 months.
 - Name, address, and phone number of the nearest supplier for the part.
 - 8. Normal Operating Instructions: Provide sufficient information that will permit a journeyman mechanic to adjust, startup, operate, and shutdown the equipment. Special startup precautions and other action items required before the equipment is put into service must be noted.

9. Emergency Operating Procedures: Detail description of the sequence of action to be taken in the event of a malfunction, either to permit a short period of continued operation or an emergency shutdown to prevent further damage to the unit and to the system.
10. Preventative Maintenance: Detail information to cover routine and special inspection requirements, including field adjustments, inspections for wear, adjustment changes, packing wear, lubrication points, frequency and specific lubrication type required, cleaning of the unit, type of solvent to use, and other measures applicable.
11. Calibration: Detailed data on what to calibrate, how to calibrate, when to calibrate, and procedures to enable checking the equipment for reliability; provide indications and data for test equipment, special tools and the location of test points.
12. Scale and Corrosion Control: Detailed information for prevention and removal of scale and corrosion.
13. Trouble Shooting Procedures: Detailed information and procedures for detecting and isolating malfunctions; provide detailed information concerning probable causes and applicable remedies.
14. Removal and Installation Instructions: Detailed information concerning the logical sequence of steps required to remove and install the item including instructions for the use of special tools and equipment.
15. Disassembly and Assembly Instructions: Detailed illustrations and text to show the logical procedure and provide the instructions necessary to disassemble and assemble the unit properly. The text shall include all checks and special precautions and list the use of special tools and equipment required to perform the assembly or disassembly.
16. Repair Instructions: Detailed repair procedures to bring the equipment up to the required operating standard including instruction for examining equipment and parts for needed repairs and adjustments, and tests or inspections required to determine whether old parts may be reused or must be replaced.
17. System Drawings: Detailed drawings, where applicable, that clearly show wiring diagrams, control diagrams, system schematics, pneumatic and fluid flow diagrams, etc., which pertain to the unit function. Drawings are required to show modifications to another manufacturer's standard unit which is incorporated into the assembly or packaged unit.
 - The Contractor shall provide diagrammatic drawings for each installed system, which shall show the placement of the system in relation to the building, and the physical location of each item or equipment installed within the system. Each installed item of equipment shown on the drawing will be identified by the equipment item model and/or serial/part number.
18. Special Tools and Test Equipment: Furnish a detailed list of the special tools and test equipment needed to perform repair and maintenance for each equipment item. The list shall contain the special tool and test equipment part number, size, quantity, price, manufacturer's name and address, and local supplier's name and address.
19. Warranties and Guarantees: Within each tabbed section of the O&M, include an executed copy of the specified warranty/guarantee covering the particular system, equipment item, or material.
 - This is to include both the manufacturer's warranty and the installing contractor's guarantee for workmanship and system operation. This copy of the particular warranty/guarantee is in addition to the original signed copies that are to be bound together separately.
 - Provide a separate binder containing all original project warranties and guarantees.
20. Field records on excavations, foundations, underground construction, wells, and similar work; if not already included in as-built drawings / documentation.
21. Accurate survey showing locations and elevations of underground lines, including invert elevations of drainage piping; if not already included in as-built drawings / documentation.
22. Surveys establishing lines and levels of buildings; if not already included in as-built drawings / documentation.
23. Load and/or performance testing.
24. Final inspection and deficiency corrections.

- aa. Prior to date of substantial completion the Architect and PM shall determine which (if any) samples or mock-ups are to be transmitted to the PM for record purposes.
 - bb. With all the above listed items, give particular attention to concealed products and portions of the work that are not clearly identified in the original submittal or cannot otherwise be readily discerned at a later date by direct observation.
- C. Contractor shall supply all commissioning and closeout documentation and/or verification not included in the O&M manuals or as-built documentation.
 - 1. This information is intended to be a consolidation of documentation and verification for the project commissioning and closeout process.
 - 2. Include documentation of training of FS personnel regarding operation of particular systems. Such documentation shall include identification of parties receiving training and date(s) of training.

1.11 WARRANTY REQUIREMENTS

- A. Minimum warranty for all material and workmanship, building envelope & penetration components excluded per above noted ORS, for a minimum of 1-year after date of substantial completion OR for the extended period of time determined by manufacturer's guarantee.
- B. Extended warranties may be required for specific items as noted in the following document.
- C. Correct immediately any failure caused by poor material or workmanship during warranty period; within 72 hours of notice.
- D. If the PM or FS personnel are required to proceed with repairs, the responsible party of the warranty will be billed for costs and damages when failing to comply.

1.12 DEMONSTRATION AND/OR TRAINING:

- A. Training & demonstration session of overview for all trades and response groups.
- B. In depth training & demonstration session for maintenance, technician, and service personnel. MUST be to a maintenance, technician, and/or service levels for ALL systems.
- C. Required hours will be listed in following standards.

1.13 RELEASE OF CLAIMS

- A. Provide consent of Surety for Final Payment.

1.14 SCHEDULE OF CLOSEOUT SUBMITTALS

- A. Closeout delivery of any and all closeout and/or overstock items to the PM requires formal transmittals for project records; including O&M manuals, extra materials, custom finish knives, etc.
- B. Closeout Manuals:
 - 1. Submit copies of Equipment and Systems Manual, and Warranties and Bonds Manual, one week prior to Final Review.
 - 2. All Guarantees and Warranties commence on date of Substantial Completion.
- C. Keys and Certificate of Occupancy:
 - 1. Submit two copies of keying schedule. Submit keys and key bands in quantities specified. Refer also to Section 08710.
 - 2. Obtain and submit Certificate of Occupancy and schedule date for warranty inspection.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 02225

MINOR DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolishing designated construction.
 - 2. Cutting and alterations for completion of the Work.
 - 3. Protecting items designated to remain.
 - 4. Removing designated items for reuse and Owner's retention.
 - 5. Removing demolished materials.
- B. Related Sections:
 - 1. Section 01 11 00 – Summary of Work.
 - 2. Section 01 50 00 - Temporary Facilities and Controls.
 - 3. Section 01 73 29 – Cutting and Patching.
 - 4. Division 1 – Hazardous Materials

1.2 REFERENCES

- A. Meet requirements of applicable provisions and recommendations of following:
 - 1. Occupational Safety and Health Administration (OSHA).
 - 2. Associated General Contractors of America (AGC): Manual of Accident Prevention in Construction.
 - 3. State of Oregon Basic Safety Code, Part IV Demolition.
 - 4. Oregon Department of Environmental Quality (DEQ).

1.3 SUBMITTALS

- A. Permits, Notices, Certificates:
 - 1. Permits and notices authorizing building demolition.
 - 2. Permit for transport and disposal of debris.
- B. Prior to start of Work, submit demolition procedures and operational sequence for Owner's review, including procedures and sequences for any discovered structural elements which differ from those shown in drawings.

1.4 QUALITY ASSURANCE

- A. Conform to applicable code requirements for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Obtain required permits from authorities having jurisdiction.

1.5 SCHEDULING

- A. Coordinate with Owner in scheduling noisy operations and waste removal that may impact adjacent neighbors.

1.6 PROJECT CONDITIONS

- A. Demolition procedures and temporary bracing details are responsibility of Contractor.
- B. Cost of repair of damage to existing and remaining construction occurring through negligence or carelessness of Contractor shall be borne by Contractor.
- C. Conduct demolition to minimize interference with adjacent occupied building areas.
- D. Protection:
 - 1. Erect, and maintain temporary barriers and security devices including: fences, guardrails, enclosures, warning signs, lights, and similar measures, for protection of the public and existing improvements indicated to remain.
 - 2. Erect and maintain weatherproof closures for exterior openings.
- E. Maintaining Traffic:
 - 1. Ensure minimum interference with roads, streets, driveways, sidewalks and adjacent facilities.
 - 2. Do not close or obstruct streets, sidewalks, alleys or passageways without authorization from agencies with jurisdiction.
 - 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.
- F. Coordinate with Owner's Representative regarding:
 - 1. Identification and preparation of areas required for access to portion of building necessary for execution of Work.
 - 2. Location of drop box or material stockpiles.
 - 3. Location of below-slab utility services in area to be excavated.
 - 4. Identification of items scheduled for Owner's salvage, and Owner's designated on-site storage area.
- G. Coordinate with project Structural Engineer for cutting of structural members.

1.7 HAZARDOUS MATERIALS PROCEDURES

- A. Owner has conducted Hazardous materials studies and removal.
- B. Asbestos Containing Materials (ACM) and other hazardous materials, including but limited to lead based paint, PCB Ballast, underground storage tanks:
 - 1. Immediately upon discovery of any suspected ACM or other hazardous materials, stop work and do not carry on any activity in that area which could disturb the suspected ACM or other hazardous materials.

2. Whenever ACM or suspected ACM or other hazardous materials are encountered in area of work, notify Owner's Representative immediately. In such event, Owner's Agent specializing in asbestos or other hazardous material abatement will evaluate circumstances and instruct Contractor on how and when to proceed.
3. Instruct workers at site to be alert for materials that may contain asbestos fibers or other hazardous materials, and to not disturb or attempt to remove such materials. Take precautions to prevent spread of asbestos fibers or other hazardous materials throughout project.
4. Asbestos fibers or other hazardous materials carried around work area or into existing building due to Contractor's carelessness or failure to follow above procedural precautions shall be removed, at Contractor's expense, in accordance with EPA Regulations and current Asbestos Hazard Emergency Response Act.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials necessary to completion of demolition work: As selected by Contractor and subject to Architect's review.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that portions of buildings scheduled for demolition are unoccupied.
- B. Verify that utility lines in demolition areas are shut off.

3.2 PREPARATION

- A. Existing Conditions:
 1. Before start of demolition or alteration work, determine location of existing utilities to remain, and protect such utilities during demolition and construction.
 2. Coordinate with Mechanical and Electrical for new and relocation work.
- B. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.
- C. Provide appropriate temporary signage including signage for exit or building egress.
- D. Maintain protected egress from and access to adjacent existing buildings at all times.

3.3 DEMOLITION

- A. Demolish and remove designated portions of existing building sections and specific items indicated on Drawings.
- B. Conduct demolition to minimize interference with adjacent and occupied building areas.
- C. Demolish in orderly and careful manner. Protect existing improvements and support structural members.
- D. Disconnect and remove utilities within demolition areas.
- E. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.
- F. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer.

3.4 DISPOSAL

- A. Remove demolished materials from site except where specifically noted otherwise.
- B. Remove materials as Work progresses.
- C. Transport demolition debris to acceptable, licensed landfill or recycling station.
- D. Remove temporary Work.

3.5 SALVAGE

- A. Carefully remove items scheduled for Owner's salvage, and place in designated on-site storage area.
- B. Protect items that are listed for salvage or for reinstallation.
- C. All other salvage, except that listed below, shall become property of Contractor.

3.6 SALVAGE SCHEDULE

- A. The following items are to be salvaged for reuse in this project:
 - 1. Designated doors, windows, and hardware.

3.7 CLEAN-UP

- A. Leave Site in clean condition ready for new construction.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Concrete Formwork.
 - 2. Concrete Reinforcement.
 - 3. Cast-In-Place Concrete.
 - 4. Concrete Hardener Sealer.
 - 5. Water repellent treatment for concrete.
 - 6. Positioning of items required by other Sections to be incorporated into concrete work.
- B. Related Sections:
 - 1. Section 05500 - Metal Fabrications.
 - 2. Section 06100 - Rough Carpentry.
- C. Comply with applicable provisions of current edition of following:
 - 1. American Concrete Institute (ACI):
 - a. ACI 301-10: Specifications for Structural Concrete for Buildings.
 - b. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - c. ACI 315: Manual of Standard Practice for Detailing Concrete Structures.
 - d. ACI 318: Building Code Requirements for Reinforced Concrete.
 - e. ACI 347: Recommended Practices for Concrete Formwork.
 - f. ACI SP-15: Field Reference Manual.
 - 2. Concrete Reinforcing Steel Institute (CRSI):
 - a. Manual of Standard Practice.
 - 3. American Society for Testing and Materials (ASTM).
 - 4. Oregon Structural Specialty Code, Chapter 19
 - 5. Structural notes on Drawings.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Furnish Testing Agency's Certification that materials furnished meet or exceed Contract Document requirements.
- C. Mix Proportions and Design Results: ASTM C94 "Ready Mixed Concrete". Submit written report to Architect for each proposed concrete mix at least 15 days prior to ordering. Provide submittals required by ACI 301, Section 4.1.2.
 - 1. Proportion mixes by either laboratory trial batch or field experience method, complying with ACI 301, Chapter 3.8 Method 1 or 2

2. Do not begin concrete production until mixes have been reviewed and accepted by Architect.
 3. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant.
 4. Do not use revised concrete mixes until submitted to and accepted by Architect.
 5. Notify Architect 48 hours prior to concrete placement.
- D. Shop Drawings: Submit for reinforcing. Indicate bar sizes, spacings, locations, quantities of reinforcing steel, bending and cutting schedules, and supporting and spacing devices.

1.03 PROJECT CONDITIONS

- A. Conveying: Convey concrete from mixer to place of final deposit by methods to prevent separation or loss of materials.
- B. Cold Weather Conditions: Do not place concrete when temperature is below 40 degrees F unless acceptable to Architect. Comply with recommendations of ACI 306.
- C. Hot Weather Conditions: Protect concrete to prevent excessive concrete temperatures or water evaporation which will impair required strength or serviceability of member or structure. Comply with recommendations of ACI 305.
- D. Place no concrete without testing unless acceptable to Architect/Engineer.

PART 2 PRODUCT

2.01 CONCRETE FORM MATERIALS

- A. For Concealed Concrete Surfaces use either of following:
1. CDX plywood.
 2. Board formed of suitable material, dressed on at least two edges and one side for tight fit. Selection subject to Architect's approval.
- B. For Exposed Concrete Surfaces use either of following:
1. MDO or HDO plywood.
 2. Steel forms.
- C. Accessories:
1. Form Ties: Snap type carbon steel with plastic cones 1" long, 11/16" diameter at large end, 3/8" diameter at small end.
 2. Form Release Agent: MagicKote, Noxcrete, or Burke Release.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, Grade 60. Conform to ACI 301, Ch.5, and structural notes on Drawings.

B. Tie Wire: Annealed steel, 16 ga. minimum.

C. Chairs and accessories:

1. Galvanized steel except over fill or membrane.
2. Over fill or membrane use only precast concrete blocks of suitable size and spacing.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C-150, Type I, cement. Use only one brand of approved cement for exposed concrete throughout Project.

1. Plain grey cement

B. Fine and Coarse Aggregate: ASTM C33, 3/4" maximum size, except topping slab aggregate shall be as approved by Architect.

C. Admixtures:

1. Water reducing admixture: ASTM C-494, Type A. Pozzolath 300N or approved substitute. Use one brand only.
2. Air Entrainment: ASTM C-260.
3. Chlorides: Do not use admixtures with chlorides.
4. The use of fly ash, other pozzolans, silica fume or slag shall conform to ACI 318 Sections 4.3.1 and 4.4.2. Maximum amount of fly ash shall be 25% of the total cementitious content unless reviewed and approved by structural engineer of record.
4. Do not use other admixtures without Architect's written approval.

D. Water: Clean potable and free from deleterious amounts of alkalies, salts or organic materials.

E. Concrete Hardener Sealer: Acrylic type, Mascocure, VOC 18, or approved substitute.

F. Water Repellent Treatment for Concrete: Thorosilane, by Thoro, or approved substitute.

G. Vapor Barrier: Provide under slab and as indicated on Drawings.

1. Moistop.
2. Tu-Tuf.

PART 3 EXECUTION

3.01 FORM CONSTRUCTION

A. Construct forms in accordance with requirements of ACI 347 and Chapter 6 of ACI 318.

B. Construct forms so that concrete members and structures are of correct size, shape, alignment, elevation and position.

- C. Build forms completely rigid and of sufficient strength to withstand hydraulic pressures resulting from rapid filling and heavy high frequency vibration.
- D. Prevent movement and leakage of forms and limit deflection to 1/360 of each component span.
- E. Thoroughly clean all forms. Condition and coat with form release agent prior to use.

3.02 EMBEDDED ANCHORAGES

- A. Set and build into Work anchorage devices, reglets and other embedded items required for other work attached to, or supported by, cast-in-place concrete.

3.03 JOINT CONSTRUCTION

- A. Provide construction, isolation, expansion and control joints as indicated or required.

3.04 REMOVAL OF FORMS

- A. Remove forms in accordance with requirements of ACI 318, Chapter 6, except do not remove any forms before expiration of following times from time of concrete placement:
 - 1. Footings: 24 hours.
- B. Permit no tool marks on exposed-to-view concrete when removing forms. Upon completion, remove runways and all temporary forms, including those concealed or buried.
- C. To facilitate float finishing of formed surfaces, remove forms at earliest time practicable without possibility of injury to concrete in accordance with ACI 318, Chapter 6, Pars. 6.2.1 and 6.2.2.

3.05 REINFORCEMENT

- A. Place reinforcement in accordance with ACI 318, Chapter 7.
- B. Lap continuous bars minimum 30 diameters, with minimum lap of 24", for all splices unless otherwise indicated.
- C. Clean reinforcement of loose scale or other deleterious material.
- D. Position, support and secure reinforcement against displacement.
- E. Locate and support with metal chairs, runners, bolsters, spacers and hangers as required.
- F. Set wire ties so ends are directed into concrete, not toward surfaces.

3.06 CONCRETE

- A. Minimum compressive strength at 28 days:

1. Interior Slabs: 3,000 psi, except as noted.
2. Footings: 4,000 psi.

B. Maximum Slump:

1. Conform to ACI 301 Section 4.2.2.2.
2. Slump shall be determined at point of placement.
3. Do not add water after concrete mix has left batching plant.

C. Admixtures:

1. Air Entrainment: 6% +/- 1 1/2%. Air entrainment required for exterior slabs.
2. Water Reduction: typical for all concrete.

3.07 MIXING AND PLACING

A. Vapor Barrier: Install underslab vapor barrier in accordance with Contract Documents and manufacturer's recommendations.

1. Handle material in manner to prevent rupture or damage.
2. Lap all joints 12" minimum to achieve positive vapor barrier.
3. Lap underslab vapor barrier with top lap placed in direction of spreading concrete.
4. Carry vapor barrier up behind joint filler strips at vertical surfaces. Trim off excess material after slab is poured.

B. Place no concrete until Special Inspector has reviewed and accepted fill, forms, and reinforcement.

1. Provide uniform slopes for proper drainage as indicated.
2. Mix and place concrete in accordance with requirements of ACI 318, Chapter 5.
3. Floor Flatness Tolerance: 1/4" variation in 10' maximum.

C. Joints:

1. Provide construction, isolation and control joints as indicated on Drawings, or as required on site by ACI standards. Coordinate with Architect for joint locations.
2. Except at indicated construction joints, cold joints are unacceptable. Do not allow surfaces to become sufficiently rigid to preclude making next placement monolithic through vibration.

D. Embedments: Place sleeves, pipe and conduit embedments in accordance with ACI 318, Ch. 6.

1. Set and build into concrete work anchorage devices, waterstops, reglets and other embedments required for attachment or support for work of other trades.
2. Secure embedments against displacement and protect from damage.

3.08 CONSOLIDATION

A. Consolidate placed concrete using mechanical vibrating equipment with supplemental hand rodding and tamping to work concrete around reinforcement, embedded items and into all parts of forms.

B. Operate vibrating equipment using only qualified workers under experienced supervision.

3.09 CURING

- A. Wet cure and cover concrete in accordance with ACI 318, Section 5.5.1. (Contractor's option: Provide spray-on liquid membrane in place of wet cure. Submit product data for Architect's review and acceptance.)
 - 1. Prevent concrete surfaces from drying out for not less than 7 days after placing concrete.
 - 2. Begin curing:
 - a. Flatwork immediately after finisher has completed 300 sq. ft. maximum of work.
 - b. Each section of formed work as soon after placing as practical.
 - 3. Use curing methods as specified or indicated.
 - 4. Bullfloat entire surface of slabs to true plane.
 - a. Float parallel to and then perpendicular to screeds.
 - b. Complete floating before free water collects on surface.
 - c. After surface water, if any, has evaporated, perform initial edging and jointing.
 - d. Use metal float on air-entrained concrete.
 - 5. Do not dust surface with dry cement or sand during finishing.

3.10 FINISHING

- A. Remove fins and projections. Patch defective areas and fill tie cone holes with cement grout.
- B. Exterior slabs:
 - 1. Steel Trowel to smooth dense surface.
 - 2. Finish with fine textured broom finish. Use plastic bristled push broom specifically manufactured for this purpose.
- C. Interior slabs:
 - 1. Steel trowel to smooth dense surface.
 - 2. Make minimum of 2 passes, but not more than necessary.
 - 3. Apply concrete hardener sealer to slabs scheduled to remain exposed; apply in accordance with manufacturer's printed instructions. Do not apply to floors scheduled to receive floor covering.

3.11 PROTECTION

- A. Cover and protect all permanently exposed concrete with heavy, non-staining kraft paper unless otherwise indicated.
- B. Use planks or plywood on slabs at points of heavy traffic where surfaces remain permanently exposed.
- C. Protect concrete surfaces to remain exposed from other concrete, mortar, cleaning of other construction, application of bituminous materials, and from scarring or other damage.
- D. Do not permit rain water or water used in curing to wash down over faces of exposed concrete.

3.12 ACCEPTANCE

- A. Contractor shall employ testing lab approved by Owner to perform tests in compliance with ASTM C39 for compressive strength tests, and provide Special Inspection for concrete and reinforcement placement as required by local agencies having jurisdiction. Refer also to notes on structural drawings.
- B. Acceptance or rejection of concrete: Comply with ACI 301, Chapter 18. Demolish rejected concrete and remove from project site in conformance with requirements of local authorities.
- C. Remove from Project all concrete which:
 - 1. Does not meet or exceed specified requirements.
 - 2. Contains wood, debris or other foreign material.
 - 3. Contains voids or rock pockets.
 - 4. Is not true to intended shape, alignment, grade, color, finish, and texture.
 - 5. Is not plumb and level where so intended.

END OF SECTION

SECTION 04065

MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes mortar and grout for masonry.
- B. Related Sections:
 - 1. Section 04820 - Reinforced Unit Masonry Assemblies.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 530 - Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
 - 1. ASTM C91 - Standard Specification for Masonry Cement.
 - 2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 - 3. ASTM C150 - Standard Specification for Portland Cement.
 - 4. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 5. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
 - 6. ASTM C476 - Standard Specification for Grout for Masonry.
 - 7. ASTM C780 - Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 8. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.

1.3 SUBMITTALS

- A. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- B. Mortar manufacturer's product data and installation instructions, indicating conformance of mortar to:
 - 1. Property requirements of ASTM C270.
 - 2. Requirements for compressive strength.
- C. Reports on grout indicating conformance of grout to:
 - 1. Property requirements of ASTM C476.
 - 2. Requirements for compressive strength.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.

- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Portland Cement: ASTM C150, Type I.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Hydrated Lime: ASTM C206, Type S
- D. Grout Aggregate: ASTM C404, fine
- E. Water: Clean and potable.
- F. Mortar Color: as selected to match adjacent construction.
- G. Calcium chloride is not permitted.
- H. Admixtures: As approved by Structural Engineer.

2.2 MORTAR AND MASONRY GROUT

- A. Mortar For Structural Masonry:
 - 1. ASTM C270, fine, type S using proportion specification.
 - 2. Comply with OSSC 2103.8.
 - 3. Compressive Strength: 1800 psi.
 - 4. Minimum Water Retention: 75%.
 - 5. Maximum Air Content: 18%.
 - 6. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.
- B. Grout For Structural Masonry:
 - 1. ASTM C476, fine type proportion specification with type I Portland Cement per ASTM C150.
 - 2. Compressive Strength: 2000 psi. determined in accordance with ASTM C1019.
 - 3. Highly fluid; 8-11 inches slump mixed in accordance with ASTM C476.
 - 4. Aggregate: Well graded, 3/8 inch minus crushed rock.

2.3 MIXING

- A. Mortar Mixing:

1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
 2. Achieve uniformly damp sand immediately before mixing process.
 3. Add mortar color and admixtures to achieve uniformity of mix and coloration.
 4. Re-temper only within two hours of mixing.
- B. Grout Mixing:
1. Mix grout in accordance with ASTM C94/C94M, modified to use ingredients complying with ASTM C476.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Request inspection of spaces to be grouted.

3.2 PREPARATION

- A. Apply bonding agent to existing concrete surfaces.

3.3 INSTALLATION

- A. Install mortar and grout in accordance with ACI 530.1 Specifications for Masonry Structures.

END OF SECTION

SECTION 04820
REINFORCED UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Structural concrete unit masonry (CMU), reinforcement, anchorage and accessories.
- B. Related Sections:
 - 1. Section 04065 - Masonry Mortar and Grout.
 - 2. Section 05500 - Metal Fabrications: Product requirements for steel lintels, fabricated steel items, and steel anchors for placement by this section.
 - 3. Section 07620 - Sheet Metal Flashing and Trim: Product requirements for reglets for flashings for placement by this section.
 - 4. Section 07840 - Firestopping: Firestopping at penetrations of masonry work.
 - 5. Section 07900 - Joint Sealers: Rod and sealant at control and expansion joints.
 - 6. Section 09900 – Paints and Coatings.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 530 - Building Code Requirements for Masonry Structures.
 - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
 - 1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 2. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 3. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- C. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Product Data:
 - 1. Submit data for masonry units anchors water repellent and other accessories.
 - 2. Indicate initial rate of absorption for clay brick.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

1.5 COORDINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate masonry work with installation of anchors for framing members.
- C. Coordinate masonry work with elevator installer for embedded brackets, hoisting beam connections, conduit sleeves, ledgers, and other items furnished by the elevator installer to be placed in masonry.

PART 2 PRODUCTS

2.1 REINFORCED UNIT MASONRY ASSEMBLIES

- A. Acceptable Manufacturers:
 - 1. Mutual Materials.
 - 2. Willamette Graystone.
 - 3. Substitutions: Section 01600 - Product Requirements.

2.2 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Concrete Masonry Units (CMU):
 - 1. ASTM C90, Type 1 (moisture controlled).
 - 2. Medium weight (approx. 115 PCF).
 - 3. Compressive Strength (f'm): 1,900 psi.
 - 4. Size: 8" x 8" x 16" with accessory shapes and sizes as required for corners, lintels, and jambs.

2.3 ACCESSORIES

- A. Single Wythe Joint Reinforcement (if specified): ASTM A82; truss type; 0.188 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized steel.
- B. Reinforcing Steel: ASTM A615, Grade 60, ASTM A706. Conform to ACI 301, Ch.5, and structural notes on Drawings.

- C. Anchor Rods: ASTM A307; Grade C; J-shaped or L-shaped; complete with washers and heavy hex nuts; sized for minimum 15 inch embedment; galvanized finish.
 - 1. Hot-Dipped Galvanizing: ASTM A153/A153M.
 - 2. Mechanical Galvanizing: ASTM B695; Class 55.
- D. Steel Lintels:
 - 1. Size as indicated on Drawings.
 - 2. Hot-dip galvanized.
- E. Mortar and Grout: As specified in Section 04065.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Place masonry to lines and levels indicated. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.
- C. Coursing of Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Match adjacent masonry.
- D. Placing And Bonding:
 - 1. Lay hollow masonry units with face shell bedding on head and bed joints.
 - 2. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
 - 3. Remove excess mortar as Work progresses.
 - 4. Interlock intersections and external corners.
 - 5. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.

6. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- E. Reinforced Masonry:
1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
 2. Place reinforcing, reinforcement bars, and grout as indicated on Drawings.
 3. Support and secure reinforcement from displacement. Maintain position within 1/2 inch of dimensioned position.
 4. Place and consolidate grout fill without displacing reinforcing.
 5. Place grout in accordance with ACI 530.1 Specification for Masonry Structures.
- F. Masonry Flashings:
1. Extend flashings horizontally through outer wythe above ledge or shelf angles and lintels, and turn down on outside face to form drip.
 2. Turn flashing up minimum 8 inches and bed into mortar joint of masonry backing.
 3. Lap end joints minimum 6 and seal watertight.
 4. Turn flashing, fold, and seal at corners, bends, and interruptions.
- G. Lintels:
1. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or indicated.
 2. Allow masonry lintels to attain specified strength before removing temporary supports.
- H. Built-In Work:
1. As work progresses, install built-in metal door frames, fabricated metal frames, anchor bolts, plates and other items to be built-in the work and furnished by other sections.
 2. Install built-in items plumb and level.
 3. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout or mortar.
 4. Do not build in materials subject to deterioration.
- I. Cutting And Fitting:
1. Cut and fit for conduit, sleeves etc. Coordinate with other sections of work to provide correct size, shape, and location.
 2. Obtain Architect/Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.
 3. Install rigid foam board insulation system in accordance with manufacturer's installation guidelines.
 4. Cut and fit boards to fit horizontally between brick veneer anchor ties and secure using tie manufacturer's recommended attachment system.
 5. Insulate gaps and penetrations with compatible spray foam insulation.

3.4 ERECTION TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- G. Maximum Variation for Steel Reinforcement:
 - 1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.
 - 2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
 - 3. Plus or minus 1 inch when distance is between 8 and 24 inches.
 - 4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
 - 5. Plus or minus 2 inches from location along face of wall.

3.5 FIELD QUALITY CONTROL

- A. Masonry Prism Testing:
 - 1. Test in accordance with ASTM C1314.
 - 2. Test three (3) prisms for each 5,000 square feet of masonry placed.

3.6 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.

3.7 PROTECTION OF FINISHED WORK

- A. Protect exposed external corners subject to damage.
- B. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.
- C. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes shop fabricated metal items.
 - 1. Miscellaneous steel sections for structural reinforcement of building.
 - 2. Miscellaneous metal items necessary for completion of Work and not found elsewhere.
 - 3. Handrails
 - 4. Steel Canopy (alternate).
 - 5. Non-shrink grout.
- B. Related Sections:
 - 1. Section 02225 - Minor Demolition.
 - 2. Section 09900 – Paints and Coatings.
 - 3. Section 01200 – Price and Payment Procedures (Alternates)

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 5. American Institute of Steel Construction (AISC):
 - a. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
 - b. Commentary of the AISC Specification, current edition.
 - 6. American Iron and Steel Institute (AISI):
 - a. a. Specification for the Design of Cold-Formed Steel Structural Members.
 - 7. American Society for Testing and Materials (ASTM)
 - 8. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 9. Structural Notes on Drawings.
- B. American Welding Society:
 - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - 2. AWS D1.1 - Structural Welding Code - Steel.
- C. SSPC: The Society for Protective Coatings:
 - 1. SSPC - Steel Structures Painting Manual.
 - 2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Welder's qualifications.
- C. Shop Drawings:
 - 1. Submit prior to fabrication.
 - 2. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.4 QUALITY ASSURANCE

- A. Welder's Qualifications:
 - 1. Perform shop and field welds by operators currently qualified by tests as prescribed in AWS Standard Qualification Procedure.
 - 2. Submit proof of qualification for all welders to Contracting Officer prior to fabrication.
 - 3. Special Inspection required for welding, as noted on Drawings.
- B. Finish joints in accordance with NOMMA Guideline 1.
- C. Comply with governing codes and regulations. Use experienced installer. Deliver, handle and store materials in accordance with manufacturer's recommendations.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver and handle materials to prevent distortion and other damage to components.
- B. Store steel at fabricating facilities protected from mechanical damage and loose rust.
 - 1. Store out of contact with ground.
 - 2. Protect steel from corrosion.
- C. Store packaged materials in original unopened packaging with manufacturer's labels intact and legible.
- D. Delivery of materials installed under other Sections:
 - 1. Deliver to Project anchor bolts and other anchorage devices to be embedded in cast-in-place concrete work prior to start of concrete operations.
 - 2. Provide setting drawings, templates and directions for installation for anchor bolts and other devices

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural W-Shapes: ASTM A992/A992M.
- B. Hollow Structural Section: ASTM A500, Grade B ($F_y=46$ ksi)
- C. Structural shapes, plates, and bars: ASTM A36/A36M.
- D. Steel Pipes: ASTM A53, Schedule 40.
- E. Bolts: ASTM A307.
- F. Nuts: ASTM A563 heavy hex type.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Shop Primer: SSPC Paint 15, Type 1, red oxide.
- I. Touch-Up Primer: Match shop primer.
- J. Non-Shrink Grout:
 - 1. Non-metallic grout conforming to ASTM C1107.
 - 2. Compressive strength: 7000 PSI at 28 days.

2.2 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate to profiles indicated; fully welded, uniform, square and true, continuously weld exposed joints and grind smooth.
- C. Provide hot dip galvanized fasteners at exterior applications and where metal fabrication items are built into exterior walls.
- D. All welds shall be made by certified welders, to AWS standards, with E60XX or E70XX electrodes.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 2.03 WELDING

- A. Comply with AWS Code (D1.1) for procedures, appearance and quality of welds, and for methods used in correcting welding.
- B. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp.
- C. Grind welds on architecturally exposed items to make smooth, flush and ready for paint finish.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Comply with AISC Specifications and Code of Standard Practice.
- B. Install all work true and level and in accordance with reviewed Shop Drawings and Contract Documents.
 - 1. Bring assembled parts into close contact.
 - 2. Use drift pins only to position members.
 - 3. Do not enlarge or distort holes.
 - 4. Where required for proper alignment, provide slotted holes.
- C. Provide temporary shoring and bracing as necessary to achieve proper alignment, and of sufficient strength to bear imposed loads.
- D. Provide holes in members to permit connecting work of other trades when furnished with templates or necessary information.
- E. Support attached column bases with wedges or shims of type and in manner to permit installation of grout without interference or necessity for removal of wedges or shims.
- F. Field Assembly: Assemble steel to lines and elevations indicated, within AISC tolerances.
 - 1. Bring abutting surfaces in compression members into complete contact before fastening.
 - 2. Tighten and leave in place erection bolts in field assembly work. After removal of temporary bracing and erection clips, grind flush all tack welds at clip and brace locations which will be exposed-to-view in completed Work.

- G. Field Connections: Provide bolted connections, except where welded connections are indicated, as follows:
 - 1. Use high strength threaded fasteners (slip critical type connections) except where standard threaded fasteners are permitted.
 - 2. Tighten nuts of high strength bolted connections by turn of nut method per AISC requirements. Tighten nuts to snug condition per RCSC Specification for structural joints, subsection 8.c.
 - 3. Mark completely tightened bolts with identifying symbol.
 - 4. Use washers for bolt heads and nuts against wood members. Refer also to Section 06100.
- H. Gas Cutting: Field correction of fabrication errors in major structural framing members by gas cutting torch is NOT permitted. Minor members not in stress may be cut only if approved by Architect.
- I. I. Base Plates and Bearing Plates:
 - 1. Support base plates and large bearing plates on steel wedges or shims until supported members have been plumbed.
 - 2. Grout solid entire bearing area after plumbing.
 - 3. Mix place and cure grout in accordance with manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Wood framing.
 - 2. Glue Laminated Beams.
 - 3. Blocking for handrails and toilet accessories.
 - 4. OSB roof and wall sheathing.
 - 5. Preservative treatment of wood.
- B. Related Sections:
 - 1. Section 06200: Finish Carpentry.
 - 2. Section 13121: Unit Skylights.
 - 3. Section 10800: Toilet Accessories.
- C. Whenever wood from certified forests is available to meet these specifications, it will be preferred over comparable non-certified wood.

1.2 REFERENCES

- A. Applicable provisions of current edition of following:
 - 1. WCLIB "..Grading and Dressing Rules No. 16".
 - 2. WWPA "..Grading Western Lumber".
 - 3. U.S. Dept. of Comm. PS-1 "Product Standard PSI-66 Softwood Plywood".
 - 4. AWWPA "Book of Standards".
 - 5. National Design Specification for Wood Construction (NDS).
- B. Structural Notes on Drawings.

1.3 SUBMITTALS

- A. Certificates for treated wood: Certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with applicable standards.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

- A. Provide structural wood materials with grade stamps of WCLIB, WWPA as required and as modified herein.
 - 1. All lumber shall be free of noticeable warp or twist, with less than 5% showing "very light" warp, twist, bow, cup or crook per Rule 16.

- 2. Seal end grain of material prior to delivery to Project Site.
- B. Provide material with maximum moisture content 19% and free of mildew for all joists, studs, joist blocking, ledgers and beams. Contractor's option: air dried or KD.
- C. All blocking, sill plates, and nailers in contact with concrete or masonry, at or near grade or exposed to weather: Coast region Douglas Fir, Construction or No. 2, KD, WCLIB, S4S, pressure treated.
- D. Light Framing Lumber: Douglas Fir-Larch, S4S, No. 2 and better.
- E. Joists and Rafters: Douglas Fir-Larch, No. 2 and better, KD, S4S, except as noted otherwise.
- F. Posts: Douglas Fir, No.1, S4S.
- G. Beams 4x6 through 4x12: Douglas Fir-Larch, No. 2, S4S, except as noted otherwise.
- H. Beams 6x8 through 6x12: Douglas Fir-Larch, No. 1, S4S, except as noted otherwise.
- I. Glue Laminated Beams: Douglas Fir/Douglas Fir, 24F-V4 for simple spans, and 24F-V8 for continuous spans. Industrial Grade.
- J. Studs: Douglas Fir-Larch, No. 2 and better.

2.2 SHEATHING MATERIALS

- A. Roof Sheathing:
 - 1. Oriented strand-board: T&G edge, 15/32" thickness, span rating 32/16, Exterior grade, Exposure 1.
- B. Wall Sheathing:
 - 1. Oriented strand-board. Exterior grade.

2.3 FASTENERS AND ANCHORS

- A. Bolts and Nuts: ASTM A307 Grade A; with ASTM A563 hex nuts, and where indicated, flat washers ANSI B27.2.
- B. Anchor Bolts:
 - 1. ASTM 307, 5/8" diameter by 12" length, except as noted otherwise.
 - 2. Galvanize anchor bolts with nut and washer on one end and 2" right angle bend on opposite end for anchoring plates to concrete or concrete masonry units.
- C. Adhesive Anchors:
 - 1. Threaded Steel Rod Anchors: ASTM 307 or greater capacity.
 - 2. Reinforcement Bars: Grade 60, ASTM A615 or A706.
 - 3. Approved Adhesive Product for Concrete Embedment: Hilti HIT-RE 500-SD Adhesive System (ICC ER-2322).

4. Approved Adhesive Product for Masonry Embedment: Hilti HIT-HY 150 MAX Adhesive System (ICC ER-1967).
5. Refer to Structural Notes on Drawings.

D. Nails:

1. FF-N-101 common wire type.
2. Galvanized at exterior locations.

2.4 ACCESSORIES

A. Metal Framing Connectors:

1. Hot dipped galvanized steel, sized to suit framing conditions.
2. In contact with pressure treated material: Protective coating as recommended by connector/fastener manufacturer.
3. Acceptable Manufacturers: Simpson, Bowman or Silver.
4. Refer to Structural Notes on Drawings.

B. Metal Framing Connectors:

C. Sill Sealer: Roll stock.

2.5 FACTORY WOOD TREATMENT

A. Reference:

1. OSSC Section 2303.1.8.
2. OSSC Section 2304.11.

B. Wood Preservative (Pressure Treatment): AWP A U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne ACQ preservative.

1. Above ground application: Retention of 0.25 lbs per cu. ft.
2. Above ground protected from liquid water (sill plates): Retention of 0.25 lbs per cu. ft.
3. Ground contact or fresh water immersion: Retention of 0.40 lbs per cu. ft.
4. In-ground structural applications: Retention of 0.60 lbs per cu. ft.

C. Moisture Content After Treatment: Maximum 19 percent.

D. Treat trimmed sections, cuts, daps, or holes in pressure treated material with copper naphthenate in accordance with AWP A standard M4.

PART 3 EXECUTION

3.1 FRAMING

A. Set structural members level and plumb, in correct position.

B. Fasten framing in accordance with Oregon Structural Specialty Code and structural notes on Drawings.

- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- D. Place horizontal members, crown side up.
- E. Construct members full length without splices.
- F. Cut and fit blocking neatly, tightly fitted, and nail securely.
- G. Block or back as necessary to support all wall mounted items and items scheduled for future installation.
- H. Firestop all concealed spaces in wood stud framing at ceilings and 10 ft. maximum on center, and elsewhere as required by OSSC 2517(f).
- I. Obtain Architect's approval before cutting or boring structural components for passage of pipes and ducts.

3.2 SHEATHING

- A. Secure roof sheathing with longer edge (strength axis) perpendicular to framing members and with ends staggered and sheet ends over bearing.

END OF SECTION

SECTION 06200
FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fine Carpentry:
 - a. OSB wall panels.
 - b. White marker board walls.
 - c. Black chalk board wall panels.
 - d. Corrugated plastic wall panels.
- B. Related Requirements:
 - 1. Section 09900 - Paints and Coatings: Painting and finishing of non-prefinished carpentry items.
 - 2. Appendix A - Interior Finish Specifications.
 - 3. Section 09260 – Gypsum Board Assemblies: Blocking.

1.2 REFERENCE STANDARDS

- A. Architectural Woodwork Institute:
 - 1. AWI AWS - Architectural Woodwork Standards.
 - 2. WCLIB "Standard Grading and Dressing Rules No. 16".
 - 3. FSC Guidelines - Forest Stewardship Council Guidelines.
 - 4. Green Seal: GS-11 - Product Specific Environmental Requirements.
 - 5. Green Seal: GS-36 - Aerosol Adhesives.
 - 6. Hardwood Plywood and Veneer Association : HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
 - 7. South Coast Air Quality Management District: SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

- A. Samples:
 - 1. Submit two samples of all panels, 8” square minimum.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Interior Tack Board:
 - 1. Homosote
 - 2. Face: Unfinished natural color.
 - 3. Size: 4 foot x 8 foot x approx. ½” sheets. Field cut to fit where required.

- B. Interior Black Chalk Board Wall Panels:
 - 1. Masonite Backing: ¼"
 - 2. Face: Black chalk board
 - 3. Size: 4 foot x 8 foot x approx. ½" sheets. Field cut to fit where required.
 - 4. Accessories
 - a. Screws: Stainless steel.
 - b. Edge trim at joints with other materials: Galvanized 24 gauge sheet metal "z" flashing.
- C. Interior White Marker Board Wall Panels:
 - 1. Masonite Backing: ¼"
 - 2. Face: white marker board
 - 3. Size: 4 foot x 8 foot x approx. ½" sheets. Field cut to fit where required.
 - 4. Accessories
 - a. Screws: Stainless steel.
 - b. Edge trim at joints with other materials: Galvanized 24 gauge sheet metal "z" flashing.
- D. Interior Corrugated Plastic Wall Panels:
 - 1. Manufacturer: Palram or approved equal.
 - 2. Product: SunTuf
 - 3. Pattern: Square corrugations.
 - 4. Color: Clear.
 - 5. Light Transmission: 90%.
 - 6. Flame spread: Class C minimum.
 - 7. Panel Sizes: 28" x 8' or 12' length. Field cut to fit where required.
 - 8. Accessories
 - a. Fasteners: Stainless steel.
 - b. Edge trim at joints with other materials: Galvanized 24 gauge sheet metal "z" flashing.
 - c. Vertical Closer: wood.
 - d. Horizontal Closer: wood.
- E. Interior OSB Wall Panels:
 - 1. Panels: ½" OSB.
 - 2. Size: 4 foot x 8 foot x ½" sheets.
 - 3. Edge: Square.
 - 4. Finish: Section 0900 Painting – Clear finish, interior.
 - 5. Accessories
 - a. Screws: Stainless steel.
 - b. Edge trim at joints with other materials: Galvanized/stainless 24 gauge sheet metal "z" flashing.

PART 3 EXECUTION

3.1 PREPARATION

- A. Section 01 70 00 - Execution Requirements: Requirements for installation preparation.
- B. Examine existing conditions prior to installation of millwork items. Require necessary corrections be made prior to commencing installation.

- C. Prime paint surfaces of wood items and assemblies to be in contact with cementitious materials.

3.2 DEMOLITION

- A. Modify and extend existing finish carpentry installations using materials and methods as specified.

3.3 INSTALLATION

- A. Install work in accordance with AWI AWS Section 6..
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components.
- D. Install components with exposed wood/metal screws appropriate for the substrate.
- E. Install finish carpentry items plumb, level and without distortion, and in accordance with Contract Documents, manufacturer's recommendations, and reviewed Shop Drawings.
 - 1. Set items in place and securely anchor to prevent dislodging.
 - 2. Locate all joints over solid backing.
- F. Install all finish carpentry and related items not installed by others and necessary to complete Work.

END OF SECTION

SECTION 06410
CASEWORK (Alternate)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Counter tops: Solid surface countertops.
 - 2. Table top: Reclaimed wood.
 - 3. Cabinets.
 - a. Plastic laminate finished cabinets.
 - b. Cabinet hardware.
- B. Related Requirements:
 - 1. Section 01300 - Submittals.
 - 2. Division 1 – Alternates.
 - 3. Appendix A – Interior Finish Schedule.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute:
 - 1. ANSI A135.4 - Basic Hardboard.
 - 2. ANSI A156.9 - Cabinet Hardware.
 - 3. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. APA-The Engineered Wood Association:
 - 1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.
- C. Architectural Woodwork Institute:
 - 1. Architectural Woodwork Standards. (AWI AWS).
 - 2. Architectural Woodwork Quality Standards Illustrated.
- D. Forest Stewardship Council: FSC Guidelines.
- E. Green Guard Environmental Institute (GED): Indoor air quality standards.
- F. Green Seal: GS-36 - Aerosol Adhesives.
- G. Hardwood Plywood and Veneer Association:
 - 1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- H. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Submit for casework hardware and operating parts.
 - 2. Submit data on high pressure decorative laminates.
- C. Shop Drawings:
 - 1. Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- D. Samples: Submit for material, finish and color, for all fabricated items and for plastic laminates.
- E. Particle board formaldehyde emission data or Certification each composite wood product contains no added urea-formaldehyde resins.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Protect units from moisture damage.
- C. Maintain storage space relative humidity within ranges indicated in AWI AWS Section 2.

1.5 AMBIENT CONDITIONS

- A. Section 01500 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.
 - 1. Maintain relative humidity within ranges indicated in AWI AWS Section 2.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with AWI AWS, Section 10 Custom Grade.
- B. Surface Burning Characteristics: Maximum 200/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 QUALIFICATIONS

- A. Fabricator: Company specializing in fabricating products specified in this section with minimum three years documented experience.

1.8 EXISTING CONDITIONS

- A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.1 CUSTOM CASEWORK

- A. Plastic Laminate Finished Custom Casework: Frameless, flush overlay style, AWI AWS Section 10 Custom Grade.
 - 1. Exterior and Interior Exposed Surfaces: High pressure decorative laminate over medium density fiberboard.
- B. Casework Construction Details:
 - 1. Toe Base Finish: Rubber as specified in Section 09650.
 - 2. Solid Surface Countertops.
- C. Sustainability Requirements:
 - 1. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Composite Wood Products: Contain no added urea-formaldehyde resins.

2.2 MATERIALS

- A. Lumber Moisture Content Range: 5 percent.
- B. Hardwood Lumber: Maple species.
 - 1. Cut: Plain sawn.
 - 2. Finish: Section 09900
- C. High Pressure Laminate – PL-1 (HPDL): NEMA LD 3;
 - 1. Manufacturer: Formica
 - 2. Style: MicroDot Finish
 - 3. Color & Pattern: (exposed exterior surfaces): TBD
 - 4. Horizontal Surfaces: HGS; 0.048 inches (1.2 mm) thick.
 - 5. Vertical Surfaces: VGS; 0.028 inches (0.7 mm) thick.
 - 6. Cabinet Liner: CLS; 0.020 inches (0.5 mm) thick.
 - 7. Backing Sheet: BKL; 0.020 inches (0.5 mm) thick.
- D. Medium Density Fiberboard:
 - 1. ANSI A208.2, composed of wood fibers, medium density.
 - 2. Formaldehyde-free adhesive system.
 - 3. Approved product: “Meditate” by Sierra Pine Company.
- E. Hardwood Plywood: HPVA HP-1, lumber core, maple face species
 - 1. Veneer slicing: Plain sawn.
 - 2. Finish: Section 09900

- F. Synthetic Surfacing SF-1: Synthetic marble of **polyester** resins, with integral color and pattern. Stain resistant. See Appendix A, Interior Finish Specifications.
 - 1. Manufacturer: Formica.
 - 2. Color: Artic
 - 3. Sizes: ½”
- G. Provide all miscellaneous finish hardware, fasteners and securing and finish materials required for complete and proper completion of work.

2.3 FABRICATION

- A. Fabricate casework to AWI AWS Section 10 Custom Grade.
- B. Fabricate counter tops to AWI AWS Section 11 Custom Grade.
- C. Fabricate counter top, edges, and splash from solid surface material to the dimensions shown on the drawings.
- D. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- E. Cap exposed high pressure decorative laminate finish edges with material of same finish and pattern unless indicated otherwise.
- F. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
- G. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate plastic laminate joints minimum 18 inches from sink cut-outs.

2.4 FINISHES

- A. Finish in accordance with Section 09900.

2.5 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Nails and Staples: ASTM F1667.
- B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Shelf Rests: In-line bored holes 1-3/8 inches on center, to within 6 inches of top and bottom of opening with four support pins for each shelf.

- E. Reclaimed Wood Table Top:
 - 1. Supplier: Acme Lumber Co.
 - 2. Material: ALC#04, multi-color reclaimed wood including unfinished and painted.
- F. Drawer and Door Pulls: "U" shaped pull, steel with chrome satin finish (or satin stainless, satin nickel), 4 inch centers.
- G. Catches: Magnetic.
- H. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.
- I. Hinges: Butt Pivot Pin Knuckle disappearing type, steel with chrome satin finish. Self closing, fully concealed, opening angle of 95 degrees. Pivot slide hardware where indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Requirements for installation examination.
- B. Verify adequacy of backing and support framing.
- C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 PREPARATION

- A. Section 01700 - Execution Requirements: Requirements for installation preparation.

3.3 INSTALLATION

- A. Install casework in accordance with AWI AWS Section 10 Custom Grade.
- B. Set and secure casework and counter tops in place; rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.4 TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.

- B. Conform to AWI AWS Section 10 requirements for the following:
 - 1. Smoothness.
 - 2. Gaps.
 - 3. Flushness.
 - 4. Flatness.
 - 5. Alignment

3.5 ADJUSTING

- A. Section 01700 - Execution Requirements: Requirements for starting and adjusting.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Requirements for cleaning.
- B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Rigid board insulation for roofing.
 - 2. Thermal blanket insulation.
 - 3. Acoustical insulation.
- B. Related Sections:
 - 1. Section 07900 – Joint Sealers.
 - 2. Section 09250 – Gypsum Board Assemblies.
 - 3. Section 07530 - Single Ply Roofing: roof insulation.

1.2 REFERENCES

- A. American Society for Testing and Materials(ASTM):
 - 1. ASTM C665.
 - 2. ASTM C518 – Thermal Resistance Values.
 - 3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 4. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 5. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
 - 6. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 8. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - 9. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics
- B. U.S. Dept. of Comm. SPR R257 "Thermal Conductance Factors".
- C. NMWIA "Standards for Mineral Wool Building Insulation".
- D. NAIMA 202 - Standard for Flexible Fiberglass Insulation Systems in Metal Buildings.
- E. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.

- B. Product Data: Submit data on product characteristics.

1.4 QUALITY ASSURANCE

- A. Insulation Installed in Concealed Locations Surface Burning Characteristics, ASTM E84:
 - 1. Batt Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84
 - 2. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
 - 3. Other Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 BOARD INSULATION

- A. Board Insulation:
 - 1. Carlisle
 - 2. Owens Corning
 - 3. Dow Chemical
 - 4. Johns Manville, Insulation Group
- B. Glass Fiber Insulation:
 - 1. Certain Teed.
 - 2. Johns Manville, Insulation Group.
 - 3. Owens-Corning Fiberglas.
 - 4. SoundTex.
- C. Exterior Wall Board Insulation:
 - 1. Closed Cell Extruded Polystyrene Insulation:
 - 2. ASTM C578.
 - 3. Board Density: Nominal 1.5 lb/cu ft.
 - 4. Board Size: 48 inch width, by length as required.
 - 5. Thickness: 2 1/2 inches.
 - 6. Thermal Resistance: R-13.5.
 - 7. Approved product: Owens Corning Foamular 150.
- D. Thermal Batt Insulation for Concealed Exterior Wall Application:

1. ASTM C665.
 2. Kraft faced, pre-formed, glass fiber thermal batt.
 3. Thickness: Full depth of cavity.
 4. Width: As required to friction-fit tightly between framing members.
 5. R-Value: 3.5 per inch.
 - a. Minimum OSSC Energy Code R value: R 21.
 6. Flame spread/smoke developed: N/R.
 7. Recycled Content: Minimum 30% industrial waste and/or post consumer content.
 8. Formaldehyde-free binders.
- E. Thermal Batt Insulation for Exposed Exterior Wall Application:
1. ASTM C665.
 2. Foil faced, pre-formed, glass fiber thermal batt.
 3. Thickness: Full depth of cavity.
 4. Width: As required to friction-fit tightly between framing members.
 5. R-Value: 3.5 per inch.
 - a. Minimum OSSC Energy Code R value: R 21.
 6. Flame spread/smoke developed: Class C for sprinkled building: Flame spread 76-200, Smoke Developed 0-450.
 7. Recycled Content: Minimum 30% industrial waste and/or post consumer content.
 8. Formaldehyde-free binders.
- F. Sound Attenuation Batts:
1. Unfaced, preformed, glass fiber batt for use in interior partitions or ceilings.
 2. Thickness: 3½ inch.
 3. Width: As required to friction-fit tightly between framing members.
 4. Flame spread/smoke developed: 10/10.
 5. Recycled Content: Minimum 30% industrial waste and/or post consumer content.
 6. Formaldehyde-free binders.

2.2 ACCESSORIES

- A. Insulation Adhesive:
1. Type recommended by insulation manufacturer for application.
 2. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- B. Mechanical Fasteners:
1. Appropriate for purpose intended and approved by system manufacturer; length required for thickness of material with metal washers.
- C. Joint Tape: Insulation manufacturer's standard joint tape.
- D. Insulating Foam Sealant:
1. Professional grade bead-applied low pressure one or two-component polyurethane or icynene air sealant foam containing no CFC's, Penta-BDE's, VOC's or Urea Formaldehyde.
 2. Compliant with CAN/ULC-S710.
 3. UL Classified as a sealant.

4. Dow Chemical Great Stuff Pro or approved substitute.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.

3.2 EXTERIOR WALL BATT INSULATION

- A. Friction fit batt insulation between framing members.
- B. Fully insulate small areas between closely spaced framing members; end match neatly with ends fitted snugly; cut and fit insulation around pipes, conduits, outlet boxes, etc., as necessary to maintain insulation integrity.

3.3 INSTALLATION – EXTERIOR WALL BOARD INSULATION

- A. Install rigid foam board insulation system in accordance with manufacturer's installation guidelines.
- B. Install boards with long axis perpendicular to supports. Ensure end joints are fully supported.
- C. Install insulation boards to ensure board length spans not less than 3 framing supports.
- D. Cut and fit boards to suit project requirements.
- E. Cut and fit insulation tight to protrusions or interruptions to insulation plane.
- F. Secure boards to framing supports with mechanical screw-type fasteners spaced maximum 24 inches o.c.
- G. Tape insulation board joints.
- H. Insulate around penetrations with compatible spray foam insulation.

3.4 INSTALLATION –SOUND ATTENUATION BATT INSULATION

- A. Friction fit batt insulation between framing members.
- B. Fully insulate small areas between closely spaced framing members with fiberglass batt insulation or spray polyurethane foam insulation
- C. End match neatly with ends fitted snugly; cut and fit insulation around pipes, conduits, outlet boxes, etc., as necessary to maintain insulation integrity.

END OF SECTION

SECTION 07464

METAL WALL PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Metal wall panels.
 - 2. Moisture barriers.
- B. Related Sections:
 - 1. Section 07900 – Joint Sealers.
 - 2. Section 09620 – Gypsum Board Assemblies
 - 3. Section 05100 – Rough Framing.

1.2 REFERENCES

- A. Conform to applicable provisions of current edition of following:
 - 1. American Plywood Association (APA) Siding Performance Rating Standards PRP 108.
 - 2. HUD/FHA Materials Release 996.

PART 2 PRODUCTS

2.1 METAL PANEL SIDING

- A. Siding Manufacturers:
 - 1. Manufacturers:
 - a. Taylor Manufacturing
 - b. AEP Span
 - c. Substitutions per Division 1.
- B. Metal Panels:
 - 1. Manufacturer: Taylor Metal
 - 2. Style: 2 1/2" Corrugated Panel
 - 3. Finish: Bare Zincalume Plus Steel, AZ55-Clear Acrylic Coating per ASTM A-792
 - 4. Shape: Corrugated.
 - 5. Gauge: 26
 - 6. Size: Actual 24" coverage, 27 1/2" widths. Custom lengths 4' to 24'.
 - 7. Fasteners: Galvanized, exposed.
- C. Fasteners: As recommended by siding manufacturer for specific application and environmental conditions.
- D. Accessories:
 - 1. PVC Z-Flashing: Install at all horizontal panel joints.
 - 2. PVC H-Channel: Install at all vertical panel joints.

2.2 WEATHER RESISTANT BARRIER

- A. Weather Resistant Barrier:
 - 1. ASTM E 1677.
 - 2. Tensile Strength - ASTM D828: XMD 22 lbf/in.
 - 3. Water Resistance – AATCC 127: 5 hours – no leakage.
 - 4. Water Vapor Transmission – ASTM E96: Minimum 4.7 grains/hr through 1 square meter.
 - 5. Flame Spread: less than 25.
 - 6. Smoke Developed Index: less than 450
- B. Products:
 - 1. Wallshield by Vaproshield.
 - 2. Winflex by Bosig.
 - 3. JumboTex 60 by Fortifiber Building Systems Group.
 - 4. Approved substitute.

PART 3 EXECUTION

3.1 WEATHER RESISTANT BARRIER INSTALLATION

- A. Install in accordance with manufacturers instructions.
- B. Comply with ASTM E 2112 for flashing around door and window openings.
- C. Lap horizontal and vertical seams minimum 6". Lap to weather. Angled seams not permitted.
- D. Tape all horizontal and vertical seams and around penetrations.

3.2 SIDING INSTALLATION

- A. Apply bonding agent to existing concrete surfaces.

3.3 INSTALLATION

- A. Install all work in accordance with Contract Documents and Manufacturer's recommendations.
- B. Use siding manufacturer's recommended types and spacing of fasteners for specific application.
- C. Install siding panels plumb, level, in true alignment and weather-tight. Provide panel joints and install Z flashing only where backed by solid continuous backing and as approved by Architect.

END OF SECTION

SECTION 07530

SINGLE PLY ROOFING - MECHANICALLY ATTACHED

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Preparation for Reroofing.
 - 2. Roof insulation.
 - 3. Mechanically attached Fabric Reinforced Thermoplastic Polyolefin (TPO) roofing membrane.
 - 4. Flashings and Accessories.
- B. Related Sections:
 - 1. Section 07620 - Sheet Metal Flashing and Trim.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D6878 - ASTM D4434 - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
 - 2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - 3. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 4. ASTM D6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
 - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - 7. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
- B. FM Global:
 - 1. FM DS 1-28 - Design Wind Loads to Roof Systems.
 - 2. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components.
- C. National Roofing Contractors Association:
 - 1. NRCA - The NRCA Roofing and Waterproofing Manual.
- D. Single Ply Roofing Institute:
 - 1. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- E. Underwriters Laboratories Inc.: UL - Fire Resistance Directory.

1.3 SYSTEM DESCRIPTION

- A. Elastomeric Sheet Membrane Conventional Roofing System: One ply mechanically attached membrane system over cover board laid on wood deck.

1.4 DESIGN REQUIREMENTS

- A. Comply with applicable provisions of current edition of following:
 - 1. NRCA "Roofing Manual".
 - 2. Factory Mutual Engineering Corporation (FM): Roof Assembly Classification, FM Construction Bulletin 1-28, Class 1 Construction for wind uplift resistance.
 - 3. International Congress of Building Officials (ICBO): ICBO Reports on mechanically attached, single ply, insulated elastomeric sheet membrane roofing.
- B. Low Slope Membrane Roof Edge Securement: Conform to SPRI ES-1 for wind speeds determined from OSSC code.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Submit product data for sheet membrane, mechanical fasteners, elastic flashings, joint cover sheet, all accessory items and joint and crack sealants, with temperature range for application of membrane.
- B. Shop Drawings:
 - 1. Indicate cover board and membrane layout and seam locations. Include thickness, type and method of fastening.
 - 2. Locate roof drains, scuppers, roof mounted accessories, and all roof penetrations.
 - 3. Indicate joint and termination detail conditions, conditions of interface with other materials.
 - 4. Indicate flashing and parapet details.
- C. Submit Manufacturer's Installation Instructions. Include special precautions required for seaming membrane.
- D. Manufacturer's Certificate:
 - 1. Certify materials furnished meet or exceed specified requirements.
 - 2. Certify that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Roof Assembly Fire Classification: Minimum Class B when tested in accordance with ASTM E108 or UL 790.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in installation of single ply elastomeric sheet membrane roofing, with minimum of three years documented experience with comparable projects, and certified acceptable to roofing system Manufacturer.

1.8 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing Work of this section.
- B. Require attendance of parties directly concerned with work of this Section: Owner's Representative, Architect, Contractor, installer of each component of associated work, installers of other work in and around roofing which must follow roofing (including mechanical), Manufacturer's representative and other representatives directly concerned with performance of work.
- C. Review preparation and installation procedures and coordinating and scheduling required with related work.
- D. Perform visual and physical inspections to determine that materials, conditions and procedures comply with specified system.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply roofing membrane during inclement weather or ambient temperatures below Manufacturer's recommendations without proper weather protection.
- B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 WARRANTY

- A. Manufacturer's Warranty: Fifteen (15) year manufacturer's written warranty to cover materials and workmanship. Include all labor and materials for necessary repairs.
- B. Installers Warranty: Two (2) year installer's warranty.

PART 2 PRODUCTS

2.1 SINGLE PLY ROOFING - MECHANICALLY ATTACHED

- A. Manufacturers:
1. Johns Manville Roofing Group.
 2. Substitutes: As pre-approved by Architect.

2.2 COMPONENTS

- A. Parapet Plywood: 1/2" CDX plywood.
- B. Insulation: ASTM C1289, Type II, Class I, faced rigid cellular polyisocyanurate roof insulation, with the following characteristics:
1. Provide insulation package with R value greater than R 20 minimum required by OSSC Energy Code.
 2. Install boards no thicker than 1.5" If insulation package required is thicker than 1.5", install in multiple layers.
 3. Tapered insulation: Minimum factory slope 1/4" per foot.
- C. Insulation Adhesive: As recommended by insulation manufacturer.
- D. Insulation Joint Tape: Self adhering. As recommended by insulation manufacturer.
- E. Cover Board.
1. Basis of Design: Johns Manville Invinso FR Roof Board.
 2. 4' x 8' x 1/4" thick high density polyisocyanurate foam core with mineral coated fiberglass reinforced facers.
 3. Compressive Strength, D 1621: 150 psi.
 4. Flexural Strength, ASTM D 1037: 1500 psi.
 5. Moisture Vapor Permeance, ASTM E96: < 1 perm.
 6. Water Absorption ASTM C209: <4.0 %.
 7. Weight: 0.406 lb/ft .
- F. TPO Membrane: ASTM D6878; Fabric Reinforced Thermoplastic Polyolefin (TPO) roofing membrane.
1. Basis of Design: Johns Manville TPO.
 2. Thickness: 60 mils nominal.
 3. Color: White ES.
 4. Accelerated Weathering: Minimum of 24,000 hours without cracking or crazing as tested using ASTM G155.
 5. Minimum solar reflectance index (SRI) of 78 for 75 percent of roof area, calculated in accordance with ASTM E1980.

Properties	Test	Results
Tensile Strength	ASTM D751	Minimum 300 lbf
Elongation	ASTM D751	27%

Tear Strength	ASTM D751	Minimum 85 lb
Water Absorption	ASTM D 471	2.2%
Water Vapor Permeance (perms)	ASTM E96/E96M [desiccant method] [water method]	0g/m
Low Temperature Brittleness	ASTM D2137	-40°F

- G. Auxiliary Roofing Materials General: Materials recommended by roofing system manufacturer for intended use and compatibility with membrane roofing. Comply with applicable VOC limits for liquid -type materials.
- H. Flexible Flashing: Manufacturer's sheet flashing of same material, type, reinforcement, thickness, and color as sheet membrane.
- I. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors.
- J. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, pre-punched.
- K. Fasteners:
 - 1. Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
 - 2. Mechanical fasteners specifically designed and sized for fastening specified board-type roof cover board to deck type
 - 3. Johns Manville "All-Purpose #14" fasteners or approved equal.

2.3 ACCESSORIES

- A. Coping System: 24 gauge pre-painted galvanized steel, maximum possible lengths per location.
- B. Strip Reglet Devices: 24 gauge galvanized steel maximum possible lengths per location, with attachment flanges.
- C. Stack Boots: Flexible boot and collar for pipe stacks through membrane.
- D. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify deck is supported and secure.

- B. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains and suitable for installation of roof system. Fill knot holes or depressions with latex filler.
- C. Confirm dry deck by moisture meter with moisture content acceptable to roofing manufacturer.
- D. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips wood nailing strips and reglets are in place, as applicable.
- E. Verify surfaces and site conditions are ready to receive work.

3.2 RE-ROOF PREPARATION

- A. Remove all roofing membrane, surfacing, coverboards, insulation, fasteners, asphalt, pitch, adhesives, etc. Remove an area no larger than can be re-roofed in one day.
- B. Tear out all base flashings, counterflashings, pitch pans, pipe flashings, vents and like components necessary for application of new membrane.
- C. Remove any abandoned equipment curbs, skylights, smoke hatches, and penetrations.
- D. Verify wood decking is sound with tight joints. Replace unsound decking to match existing as required and as directed by Owner's representative. Seal joints of decking with tape.
- E. Verify HVAC equipment curbs provide minimum 8" base flashing height measured from the surface of the new membrane to the top of the flashing membrane.
- F. Verify condition of existing counter flashings intended for reuse and replace with new counter flashings as directed by membrane manufacturer's representative or Owner's representative.
- G. Immediately remove all debris from roof surface.
- H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PARAPET PLYWOOD INSTALLATION

- A. Install plywood on inside vertical surfaces of all parapets where required to provide acceptable substrate for new roofing.
- B. Fasteners as required for substrate.

3.4 INSULATION

- A. Insulation Application:
 - 1. Ensure roof/vapor retarder is clean and dry.
 - 2. Mechanically fasten insulation to deck.
 - 3. Place second layer of insulation with joints staggered minimum 6 inches from joints of first layer.
 - 4. Mechanically fasten boards at roof edge and field as recommended by manufacturer.

5. Place constant thickness first layer and tapered (or constant) thickness insulation second layer to required slope pattern.
6. Minimum Total Insulation Thickness: As required to achieve insulation R-Value of 20.
7. Place boards perpendicular to structure.
8. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
9. Lay tapered boards for distance of 24 inches back from roof drains for positive drainage.
10. Utilize factory saddles, crickets, and tapered edge strips.
11. Apply no more insulation than can be covered with membrane in same day.
12. Tape joints of insulation.

3.5 COVER BOARD INSTALLATION

- A. Install over insulation in accordance with manufacturer's installation instructions.
- B. Install cover board with long joints of cover board in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with cover board.
- C. Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. Minimum board width: 6 inches.
- F. Fasten with minimum 5 fasteners per 4' x 8' board.

3.6 ROOFING MEMBRANE INSTALLATION

- A. General:
 1. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
 2. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
 3. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and backnailing.
 4. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
 - a. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
 - b. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - c. Remove and discard temporary seals before beginning work on adjoining roofing.
 5. Do not permit any contact between TPO membrane materials and bituminous materials associated with previous roofing system.

- B. Mechanically Fastened Roofing Membrane Installation.
1. Install roofing membrane specification over area to receive roofing in accordance with roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
 2. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
 3. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
 4. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
 5. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - a. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - b. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - c. Remove and repair any unsatisfactory sections before proceeding with Work.
 6. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
 7. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
 8. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
 9. Through-Membrane Attachment: Secure roofing membrane using fastening plates or metal battens and mechanically fasten roofing membrane to roof deck. Cover battens and fasteners with a continuous cover strip.
 10. Install roofing membrane and auxiliary materials to tie in to existing roofing.
- C. Flashing Installation.
1. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
 2. Flash penetrations and field-formed inside and outside corners with sheet flashing.
 3. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
 4. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 CLEANING

- A. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their [documented] instructions.
- B. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect building surfaces against damage from roofing work.
- B. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07600 FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Flashing and sheet metal work.
 - 2. Scuppers.
- B. Related Sections:
 - 1. Section 07533 - Single Ply Roofing - Mechanically Attached.
- C. Comply with applicable provisions of current edition of following:
 - 1. SMACNA "Architectural Sheet Metal Manual".
 - 2. National Roofing Contractors' Association (NRCA) Details.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's specifications and installation recommendations for all manufactured items.
- B. Shop Drawings: Indicate all anchorages, connections and pertinent details.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Downspouts, scuppers, exposed flashing and other sheet metal accessories and work:
 - 1. Sizes and configurations as required. Refer also to paragraph 1.01.C above.
 - 2. Material: Galvalume Steel, minimum 24 ga., prefinished with Kynar baked enamel, color as selected by Architect. Locations indicated on Drawings.
- B. Sealants: G.E. silicon SCR 1600, 2-part sealant, Sonneborn Sonolastic, W.R. Grace Hornflex, PRC 250, or approved substitute. Refer also to Section 07900.
- C. Fasteners:
 - 1. Typical: Galvanized steel, prefinished to match item fastened, with neoprene washers.
 - 2. Concealed locations: Stainless Steel.
- D. Flexible Flashings: See Section 07533.

2.02 FABRICATION

- A. Fabricate each metal section in as long a run as possible, 10 ft. minimum. Provide expansion joints per SMACNA Manual.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Verify that surfaces which are to be covered with sheet metal are smooth and free from defects. Clean surfaces of dirt, rubbish and other foreign materials before starting sheet metal work.
- B. Install Work in accordance with Contract Documents, approved Shop Drawings, Manufacturer's Instructions, and SMACCNA Sheet Metal Manual.
- C. Use coated base sheet as underlayment for flashings. Install flashings plumb, straight, true and watertight. Connect units with specified joints and sealants. Fasten to surfaces as recommended by SMACCNA, with approved fasteners. Conceal fasteners on exposed surfaces. Insulate dissimilar metal and incompatible surfaces with asphalt paint or brushable type, non-hardening butyl rubber base sealant or approved substitute.
- D. Install flexible flashings at doors and windows in accordance with manufacturer's installation recommendations and as noted on Drawings.

END OF SECTION

SECTION 07840 FIRESTOPPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Firestopping and smoke seals.
- B. Related Sections:
 - 1. Section 07900 - Joint Sealers.
 - 2. Section 09260 - Gypsum Board Assemblies.
 - 3. Division 15 - Mechanical: mechanical work requiring firestopping.
 - 4. Division 16 - Electrical: electrical work requiring firestopping.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E814 - Test Method of Fire Tests of Through-Penetration Firestops.
 - 2. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. UL 1479 - Test Method of Fire Tests of Through-Penetration Firestops.
 - 2. UL 2079 - Tests for Fire Resistance of Building Joint Systems.

1.03 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.04 PERFORMANCE REQUIREMENTS

- A. Fireproofing Materials: ASTM E814 or UL 1479 to achieve required fire ratings.
- B. Description of Work: Provide firestopping and smoke seals for following areas and any others indicated on Drawings or in Specifications:
 - 1. All openings in fire-rated wall or floor assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, pipes, ducts, and other construction items.
 - 2. Expansion joints in fire-rated walls or floors.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data:
 - 1. Provide data on product characteristics, performance and limitation criteria for each type of material proposed for use.
 - 2. Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
 - 3. Provide Manufacturer's printed Preparation and Installation Instructions.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Samples: Provide samples of firestopping material upon Architect's request.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing products specified in this Section, with minimum of three years documented experience.
2. Applicator: Company specializing in performing work of this Section, with minimum of three years documented experience and approved by Manufacturer.

B. Regulatory Requirements:

1. Conform to 2010 Edition Oregon Structural Specialty Code and City of Portland requirements for through-penetration fire stops Flame (F) and Temperature (T) ratings.
2. F Rating : Minimum of one (1) hour, but not less than fire resistance rating of assembly penetrated.
3. T Rating: When required by Code authority. Based on measurement of temperature rise on penetrating item(s).
4. Fire Test: Conducted with minimum positive pressure differential of 0,01 inches of water column.
5. Provide Certificate of Compliance, from authority having jurisdiction, indicating approval of combustibility.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Conform to Manufacturer's printed instructions for installation and, when applicable, curing, in accordance with temperature and humidity.
2. Conform to Manufacturer's recommended ventilation and safety requirements.

B. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:

1. A/D Fire Protection Systems, Inc.
2. Hilti Corp.
3. 3-M Fire Protection Products.
4. Nelson Firestop Products.
5. Substitutions: Under provisions of Section 01600.

2.02 MATERIALS

A. General:

1. Materials shall be free of asbestos.

2. Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 3. Materials shall provide Flame (F) and Temperature (T) rating as required by Code. Refer to paragraph 1.06.B. above. F Rating, as tested by ASTM E-814 or UL 1479, shall be at least one (1) hour, but not less than fire resistance rating for assembly being penetrated.
 4. Materials shall conform to all applicable governing codes.
- B. Firestop Mortar: Single component Portland cement fly ash mortar. Requires no supports or anchoring devices to pass water hose stream tests. UL classified for both Flame (F) and Temperature (T) ratings. Firestop mortar shall restrict transmission of temperature and passage of flame, smoke and water.
- C. Firestop Sealant: Single component silicone sealant. Provide flexible, airtight, waterproof seal. Gun grade for walls and overhead application, and self-leveling for floor applications. UL classified for both Flame (F) and Temperature (T) ratings. Firestop sealant shall restrict transmission of temperature and passage of flame, smoke and water.
- D. Firestop Mastic: Single component water-based intumescent mastic sealant. UL classified for both Flame (F) and Temperature (T) ratings. Firestop mastic shall restrict transmission of temperature and passage of flame, smoke and water.
- E. Pillows: Asbestos-free fiberglass cloth bags filled with intumescent material. UL classified for both Flame (F) and Temperature (T) ratings.
- F. Sleeve: Prefabricated device used around plastic pipes in fire-rated floors and walls. UL classified for both Flame (F) and Temperature (T) ratings.
- G. Accessories: Primers, cleaners, anchoring devices, back-up materials, clips, supports, dams, and other materials required for complete and proper firestopping installation shall all be as recommended by Firestopping Manufacturer, and shall be suitable for specific application and fire rating requirements.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Field verify all site conditions necessary for proper installation prior to start of work. Field verify that openings are ready to receive work of this Section.
- B. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- C. Remove incompatible materials which may affect bond.
- D. Install backing materials to arrest liquid material leakage.
- E. Provide primers as required, which conform to Firestopping Manufacturer's recommendations for various substrates and conditions.

- F. Do not apply firestops to surfaces previously painted or treated with sealer, curing compound, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required in compliance with Firestop Manufacturer's instructions.
- G. Mask where necessary to protect adjoining surfaces. Remove excess material and stains on surfaces as required to leave such surfaces in clean, unmarked, undamaged condition.

3.03 APPLICATION

- A. Apply primer and materials in accordance with Contract Documents and Manufacturer's printed Application Instructions.
- B. Apply firestopping materials in sufficient thickness to achieve required ratings, and to uniform density and texture.
- C. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit, and other items requiring firestopping.
- D. Ensure that anchoring devices, back-up materials, clips, sleeves, supports, and other materials used in actual fire tests are installed.
- E. Install firestops with sufficient pressure to properly fill and seal openings to ensure effective smoke seal.
- F. Tool or trowel exposed surfaces. Remove excess firestop material promptly as work progresses and upon completion.

3.04 FIELD QUALITY CONTROL

- A. Immediately notify Architect or Owner's Representative if firestopping systems herein specified cannot meet performance requirements.
- B. Examine firestops to ensure proper installation and full compliance with this specification.
- C. All areas of work shall remain accessible until inspection to verify compliance with requirements.
- D. Correct unacceptable firestops and provide additional inspection, to verify compliance with requirements, at no additional cost.

3.05 CLEANING

- A. Clean work under provisions of Section 01700.
- B. Clean adjacent surfaces of firestopping materials.
- C. If visible in finished work, remove temporary dams after initial cure of firestops.
- D. Correct staining and discoloring on adjacent surfaces.
- E. Remove all debris and excess materials entirely from site, and leave work in neat and clean condition.

3.06 PROTECTION OF FINISHED WORK

- A. Protect finished work under provisions of Section 01500.
- B. Protect adjacent surfaces from damage by firestopping installation work.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sealants and joint backing, and accessories.
- B. Related Sections:
 - 1. Section 08110 – Steel Doors and Frames
 - 2. Section 08800 - Glazing: Glazing sealants and accessories.
 - 3. Section 09260 - Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C792 - Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants.
 - 2. ASTM C834 - Standard Specification for Latex Sealants.
 - 3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 5. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - 6. ASTM D1667 - Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
- B. South Coast Air Quality Management District: SCAQMD Rule for Adhesive and Sealant Applications.

1.3 DEFINITIONS

- A. Sealant Products: Any material with adhesive properties that is used to fill, seal, waterproof gaps or joints between two surfaces. Sealant products include sealant, primers and caulk
- B. Type: Defines whether products are premixed or require mixing at job site.
 - 1. Type M: Multi-component products which require job-site mixing.
 - 2. Type S: Single component products furnished in prepackaged cartridges or other forms in which no job-site mixing is required.
- C. Grade: Defines the flow characteristics of the sealant.
 - 1. Grade P: Products having sufficient flow to fill joints in horizontal surfaces and remain level and smooth at temperatures as low as 40 degrees Fahrenheit (4.4 degrees Celsius).
 - 2. Grade NS: Nonsag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping when applied at temperatures between 40 degrees F (4.4 degrees C) and 122 degrees F (50 degrees C).

- D. Class (ASTM C719): Identifies sealants according to their tested movement capabilities in percent of joint width.
 - 1. Standard Classes: 25, 50, 100/-50 (extension/compression).
 - 2. Design to minimum 4 times anticipated movement to accommodate design tolerances and movement based on thermal expansion.
- E. Uses:
 - 1. Use T: Classifies sealants designed for joints in surfaces subject to pedestrian and vehicular traffic.
 - 2. Use NT: Non-traffic exposure.
 - 3. Use I: Sealants designed for immersion in water.
 - 4. Use M, G, A: Refers to sealants which remain adhered, within given parameters, to various standard specimens. (Mortar, Glass, Aluminum)
 - 5. Use O: Substrate materials other than M, G, and A. (Color anodized aluminum, other metals, painted surfaces, brick, stone, tile and wood, etc.)

1.4 SUBMITTALS

- A. Section 01330 - Submittal and Shop Drawings.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.5 QUALITY ASSURANCE

- A. Perform building joint work in accordance with ASTM C 1193.
- B. Compatibility: ASTM C 1087; determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
- C. Joint tolerance: Comply with Manufacturer's limitation recommendations.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience, three successfully completed projects of similar scope and complexity and approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.8 COORDINATION

- A. Section 01320 - Project Schedule and Coordination.
- B. Coordinate Work with sections referencing this section.

1.9 WARRANTY

- A. Warrant installed sealants and accessories against water infiltration, air infiltration, adhesive failure, cohesive failure and other forms of deterioration and it's compatibility with adjacent sealants for a period of five (5) years.
- B. Upon notification of defects within warranty period, make necessary repairs and replacements at Owner's convenience. Repair and replacement shall include resultant damage to adjacent materials and systems.

PART 2 PRODUCTS

2.1 MATERIALS – GENERAL

- A. Hardness (ASTM C661):
 - 1. Determine sealant's proper hardness or consistency in consultation with manufacturer, considering joint movement and exposure for joint size indicated.
 - 2. 15 to 25 Shore A Durometer: For vertical wall joints not subject to vandalism.
 - 3. 25 to 40 Shore A Durometer: For horizontal joints exposed to light traffic or vertical joints subject to vandalism.
 - 4. 35 to 60 Shore A Durometer: For sidewalk joints.
- B. Modulus of Elasticity: In general for elastomeric sealants, provide sealants having the lowest modulus of elasticity consistent with degree of exposure to wear, abrasion and vandalism. Sealants exposed to traffic shall have strength and elasticity sufficiently high to resist damage by traffic.
- C. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application.
- D. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168. Maximum VOC of 50 grams per liter.
- E. Color: If not otherwise indicated, or chosen at time of submittals, provide color of exposed joint sealers to closely match finish color of adjacent surfaces

2.2 JOINT SEALERS

- A. Manufacturers:
 - 1. BASF Construction Chemicals.
 - 2. Dow Corning Corp.
 - 3. GE Silicones.
 - 4. LymTal International.

5. Pecora Corp.
 6. Sika Corp
 7. Tremco Sealants & Waterproofing
 8. Substitutions: Section 01600 - Product Requirements.
- B. Low Modulus Silicone Sealant (Sealant Type S-1): Single component, high performance, general purpose, exterior, non-traffic; ASTM C920, Type S, Grade NS, Class 100/-50, Uses M, G, and A. One of the following or approved equal:
1. "Spectrem 1" (Tremco).
 2. "Sikasil WS-290" (Sika).
 3. "Sonolastic 150 with VLM" (BASF).
 4. "790 Building Sealant" (Dow Corning Corp.).
 5. "Pecora 890 NST" (Pecora).
 6. Approved Equal.
 7. Color: Colors as selected.
 8. Applications: See schedule.
- C. Low Modulus Polyurethane Sealant (Sealant Type S-2): Single component, high performance, general purpose, exterior, non-traffic; ASTM C920, Type S, Grade NS, Class 25, Uses M, G, A. One of the following or approved equal:
1. "Dymonic FC" (Tremco).
 2. "Sikaflex-15 LM" (Sika).
 3. "Sonolastic NP 1" (BASF).
 4. "Iso-Flex 830" (LymTal International).
 5. Approved Equal.
 6. Color: Colors as selected.
 7. Applications: See schedule.
- D. Semi-Self Leveling Traffic Bearing Polyurethane Sealant (Sealant Type S-3): Single component, semi-self-leveling, exterior traffic bearing, moisture cure, sealant, ASTM C920, Grade P, Class 25, Use T.
1. "Vulcum 45 SSL" (Tremco).
 2. "Sikaflex-1C SL" (Sika).
 3. "Sonolastic SL 1" (BASF).
 4. Approved Equal.
 5. Color: Colors as selected.
 6. Applications: Use for exterior pedestrian and vehicular traffic bearing joints.
- E. Exterior Metal Lap Joint Sealant (Sealant Type S-4) Butyl or polyisobutylene, non-drying, non-skinning, non-curing gunnable sealant or butyl mastic tape.
1. "Tremco Butyl Sealant" (Tremco).
 2. "BC-158 Butyl Rubber Sealant" (Pecora Corporation).
 3. Approved equal.
 4. Applications: Use for concealed sealant bead in sheet metal work and concealed sealant bead in siding overlaps.
- F. Acrylic-Latex Interior Sealant (Sealant Type S-5): Single component, general purpose, paintable, interior emulsion type sealant, ASTM C 384.
1. "Tremflex 834" (Tremco).
 2. "Sonolac" (BASF).

3. "AC-20 Acrylic Laytex Caulk" (Pecora Corporation).
 4. Approved equal.
 5. Color: Colors as selected.
 6. Applications: Use for interior joints between door and window frames and wall surfaces, and other interior joints for which no other type of sealant is indicated.
- G. Silicone Sanitary Sealant (Sealant 6): Single component white silicone; ASTM C920, Type S, Class 25, Grade NS, Uses A, G, O; mold and mildew resistant.
1. "Pecora 898" (Pecora).
 2. "Omniplus" (BASF).
 3. "Sanitary SCS1700" (General Electric).
 4. Applications: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen shower room, and rest room counter tops and wall surfaces.
- H. Acoustical Sealant (Sealant 7): Single component, general purpose, butyl or acrylic sealant; ASTM C920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
1. "Acoustical Sealant" (Tremco).
 2. "Pecora BA-98 Acoustic Sealant" (Pecora).
 3. Applications: Use for concealed locations only at acoustically rated construction.
 4. Provide sealant bead between top stud runner and structure and between bottom stud track and floor.

2.3 MISCELLANEOUS MATERIALS

- A. Exterior Foam Expansion Joint Filler (Filler Type F-1): 1/2 inch x 4 inch, highly resilient, 99% recovery, closed cell foam with 3/8 inch x 1/2 inch removable sealant reservoir joint cap.
1. ASTM D5249 TYPE 2.
 2. Compression @ 50%: 13 psi.
 3. "Flexible Foam" (Masco).
 4. "Ceramar Flexible Foam" (W.R. Meadows, Inc.).
 5. "Expansion-Joint Filler" (BASF).
 6. Approved Equal.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Primer: Non-staining, high solids, low VOCs type, recommended by sealant manufacturer for joint surfaces and conditions.
- D. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber, D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.
- D. Verify joint dimensions are within manufacturer's established tolerances.

3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Perform acoustical sealant application work in accordance with ASTM C919.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant in continuous beads or rivers free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Provide masking tapes or other precautions to prevent migration or spillage of materials onto adjoining surfaces.
- H. Tool joints concave or as detailed.

3.4 CLEANING

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Execution Requirements: Protecting installed construction.
- B. Protect sealants until cured.

3.6 SCHEDULE

- A. Exterior Joints for Which No Other Sealant Type is Indicated: As directed by Architect.
- B. Control and Expansion Joints in Paving: Type S-3.
- C. Lap Joints in Exterior Sheet Metal Work: Type S-4.
- D. Exterior Joints At Unpainted Substrate Materials: Type S-1.
 - 1. Metal siding at aluminum windows.
 - 2. Butt joints in exterior metal work and siding.
- E. Exterior Joints At Substrates Scheduled to be Painted. Type S-2.
 - 1. Wood or fiber cement siding at aluminum windows.
 - 2. Butt joints in exterior wood work and siding.
 - 3. Field painted metal door frames.
- F. Under Exterior Door Thresholds: Type S-2.
- G. Interior Joints Between Door and Window Frames and Wall Surfaces: Type S5.
- H. Other Interior Joints for Which No Other Type of Sealant is Indicated: Type S-5.
- I. Joints Between Plumbing Fixtures and Walls and Floors, and Between Counter tops and Walls: Type S-6.
- J. Joints in Walls Scheduled To Receive Sound Batt Insulation: S-7.

END OF SECTION

SECTION 08110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.
 - 2. Steel sidelight, borrowed lite and transom frames.
 - 3. Interior window frames.
 - 4. Installation of hollow metal frames and doors furnished by owner.
- B. Related Sections:
 - 1. Division 08 Section "Flush Wood Doors".
 - 2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
 - 3. Division 08 Section "Door Hardware".
 - 4. Division 09 Sections "Painting" for field painting hollow metal doors and frames.
- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
 - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
 - 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
 - 10. ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
 - 11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.

12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.

2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 4. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
- B. COORDINATION
- C. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CECO Door Products.
 - 2. Curries Company.
 - 3. Security Metal Products.
 - 4. Steelcraft.
 - 5. Timely

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
- B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard polyurethane. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 3.2 or better.
 - 3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - 4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - 5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 - 3. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 - 4. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 12 gauge (0.081-inch -2.7-mm) thick steel sheet.
 - 5. Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - 6. Manufacturers Basis of Design:
 - a. CECO Door Products SQ/SU/SR Series.
 - b. Curries Company M/G Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 - 3. Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - 4. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.]
 - 5. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.]
 - 6. Frames for Wood Doors: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
 - 7. Frames for Borrowed Lights: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
 - 8. Manufacturers Basis of Design:
 - a. CECO Door Products SQ/SU/SR Series (Masonry Profile).
 - b. Curries Company M/G Series (Masonry Profile).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

4. Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.
 5. FEMA 361 Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS, INTERIOR WINDOWS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.
- E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.
1. Factory Glazing: Factory install glazing in doors as indicated. Doors with factory installed glass to include all of the required glazing material.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 3. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 4. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 5. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 6. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 7. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 8. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 10. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a) Two anchors per jamb up to 60 inches high.
 - b) Three anchors per jamb from 60 to 90 inches high.
 - c) Four anchors per jamb from 90 to 120 inches high.
 - d) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a) Three anchors per jamb up to 60 inches high.

- b) Four anchors per jamb from 60 to 90 inches high.
 - c) Five anchors per jamb from 90 to 96 inches high.
 - d) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - e) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
- 11. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- 12. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
- 13. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
- 14. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
- 15. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
- 16. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.
 - 2. Color: To be selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 08140 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Installation of recycled doors from Owner's stock pile.
- B. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for wood doors in steel frames.
 - 2. Division 08 Section "Door Hardware" for door hardware for flush wood doors and wood frames.
- C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.3 SUBMITTALS

- A. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the wood door supplier in order to prepare the doors and frames to receive the finish hardware items.
- B. Review Owner's stockpile of doors. Select doors and review issues with Owner and Architect. Submit shop drawings to indicate hardware group, door type and size, and location.

1.4 QUALITY ASSURANCE

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors".
- B. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Contractor to pick up doors from Owner and deliver them to the site or other staging area.
- B. Comply with requirements of referenced standard for storing, delivery, and installation.
- C. Package doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.
- D. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 – PRODUCT (not used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
- C. Recycled Doors from Owner's Stock: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.

- B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 08360

OVERHEAD DOOR– (Alternate)

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes refurbishing and remodeling of existing manual metal overhead door. Add Alternate replaces door on existing track.
- B. Related Sections:
 - 1. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.
 - 2. Section 08800 - Glazing: Glass for door lights.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E 283 – Standard Test Method for Determining Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
- B. Door and Access Systems Manufacturers Association International:
 - 1. DASMA 102 - Specifications for Sectional Overhead Type Doors.

1.3 SYSTEM DESCRIPTION

- A. Panels: Flush metal, insulated.
- B. Glass: Fixed single glazed lights.
- C. Lift Type: Standard lift operating style with track and hardware. Utilize existing track.
- D. Operation: Manual.
- E. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Product Data: Submit component construction, anchorage method, and hardware.

- D. Samples: Submit two exterior and interior panel finish samples, 6 x 6 inch in size, illustrating color and finish.
- E. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.
- F. Provide certification from manufacturer stating that overhead doors meet Oregon Energy Efficiency Specialty Code (OEESC) requirements for air leakage tested in accordance with ASTM E 283.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements: Closeout procedures.
- B. Operation and Maintenance Data:
 - 1. Include electrical control adjustment recommendations.
 - 2. Include data for motor and transmission, shaft and gearing, lubrication frequency, periodic adjustments required, and spare part sources.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with DASMA 102, Application Type Commercial.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified.
- C. Surface Burning Characteristics:
 - 1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- D. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.8 WARRANTY

- A. Section 01700 - Execution Requirements: Product warranties and product bonds.
- B. Furnish manufacturer's standard ten year warranty on paint and panel delamination.

PART 2 PRODUCTS

2.1 SECTIONAL OVERHEAD DOORS

- A. Manufacturers:
 - 1. Clopay Building Products Co.
 - 2. Overhead Door Corp.
 - 3. Raynor Manufacturing
 - 4. Wayne-Dalton Corp.
 - 5. Substitutions: Section 01600 - Product Requirements.
- B. Product Description: Steel overhead sectional doors, manual operation, stock configuration and hardware. Door Nominal Thickness: 2 inches thick.
- C. Flush Aluminum Panel Construction:
 - 1. Basis of Design: Overhead Door Corp. Series 511 Sectional Aluminum Door.
 - 2. Flush aluminum panels, insulated.
 - 3. Standard Finish: Clear anodized.
 - 4. Glazing: 2 rows of glazed openings full width of panel..
 - 5. Glazing: ½” insulated glass.
 - 6. Operation: Manual
 - 7. Size: Per Drawings.

2.2 ACCESSORIES

- A. Track: Galvanized steel angles, 0.094 inch thick (12 gauge); 2-5/16 x 4 inch size, continuous one piece for each side; galvanized steel mounting brackets minimum 1/4 inch thick.
- B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables capable of 50,000 cycles. Manual operation to require maximum exertion of 25 lbs force.
- D. Weatherstripping:
 - 1. Air Leakage: Certifiable maximum 1.57 psf @ 75 pascals as tested in accordance with ASTM E 283.
 - 2. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
 - 3. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
 - 4. Head Weatherstripping: EPDM rubber seal, one piece full length.
 - 5. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.
- E. Manually Operated Door Locks: Two inside side mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position.

2.3 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics: See Division 16.

- B. Motor Type:
 - 1. NEMA MG1.
 - 2. Manually operable in case of power failure.
 - 3. Transit speed of nominal 12 inches per second.
- C. Electric Door Operator:
 - 1. Size and capacity as recommended by door manufacturer, complete with NEMA approved electric motor and factory-prewired motor controls, remote control station and accessories.
 - 2. Side mounted on cross head shaft, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.
 - 3. Provide means to disengage motor to allow manual operation in event of power failure.
 - 4. Control Station: Standard three button (open-close-stop) momentary type, control for each electric operator; 24 volt circuit, surface mounted. Located at inside door jamb.
- D. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to reverse door upon striking object; hollow rubber covered to provide weatherstrip seal.
- E. Photoelectric Sensor: Furnish system which detects obstruction and reverses door without requiring door to contact obstruction.

2.4 FACTORY FINISHING

- A. Exterior Surfaces: Factory finished with primer and baked-on polyester topcoat. Color as selected by Architect.
- B. Interior Surfaces: Factory finished with primer and baked-on polyester topcoat. Color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify wall openings and overhead areas are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Coordinate with pre-engineered metal building manufacturer.
- D. Verify electric power is available and of correct characteristics.

3.2 PREPARATION

- A. Prepare opening to permit correct installation of door unit to perimeter air and vapor retarder seal.

3.3 INSTALLATION

- A. Anchor assembly to wall construction and building framing without distortion or stress.

- B. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- C. Fit and align door assembly including hardware.
- D. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
- E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- F. Install perimeter weatherstripping.

3.4 ERECTION TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Maximum Variation from Plumb: 1/16 inch.
- C. Maximum Variation from Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
- E. Maintain dimensional tolerances and alignment with adjacent work.

3.5 ADJUSTING

- A. Section 01700 - Execution Requirements: Testing, adjusting, and balancing.
- B. Adjust door assembly to smooth operation and in full contact with weatherstripping.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Clean doors, frames and glazing.
- C. Remove temporary labels and visible markings.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Execution Requirements: Protecting installed construction.
- B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08410

METAL-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Aluminum-framed storefront system.
 - 2. Aluminum and glass doors, frames and hardware.
- B. Related Sections:
 - 1. Section 07900 - Joint Sealers: System perimeter sealant and back-up materials.
 - 2. Section 08710 - Finish Hardware.
 - 3. Section 08800 - Glazing.

1.2 REFERENCES

- A. American Architectural Manufacturers Association/Window & Door Manufacturers Association:
 - 1. AAMA/WDMA 101/I.S.2 - Specification for Windows, Doors and Unit Skylights.
 - 2. AAMA SFM-1 - Aluminum Store Front and Entrance Manual.
- B. ASTM International:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 3. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 4. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- C. National Fenestration Rating Council Incorporated:
 - 1. NFRC 100 - Procedures for Determining Fenestration Product U-Factors.

1.3 SYSTEM DESCRIPTION

- A. Aluminum-framed storefront system including tubular aluminum sections, aluminum and glass entrances, shop fabricated, factory finished, glass and glazing, related flashings, anchorage and attachment devices.

1.4 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall, including building corners as calculated in accordance with applicable code, as tested in accordance with ASTM E330.

- B. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- C. Thermal Movement: Provide thermal expansion and contraction movement capability, resulting from minimum ambient temperature range through 120 degrees F which may cause storefront wall material temperature range through 180 degrees F. without causing detrimental effect to system components and anchorage.
- D. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior by weep drainage network.
- E. Deflection: Limit mullion deflection to:
 - 1. Normal to wall: 1/175 for spans under 13'-6".
 - 2. Parallel to wall: 75% of glass edge clearance.
- F. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of assembly surface area, measured at reference differential pressure across assembly of 1.57 psf as measured in accordance with AAMA/WDMA 101/I.S.2.
- G. Water Leakage: None, when as measured in accordance with AAMA/WDMA 101/I.S.2 with test pressure difference of 20 percent of design pressure, with minimum differential of 2.86 lbf/sq ft and maximum of 12.00 lbf/sq ft.
- H. Thermal and Solar Heat Transmittance of Assembly:
 - 1. U-Factor: Maximum 0.45.
 - 2. SHGC: Maximum 0.40.

1.5 SUBMITTALS

- A. Section 01330 - Submittal and Shop Drawings.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements, details including connections, anchorage, fastening, reinforcement, accessories and sealing methods.
- C. Product Data: Describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

1.6 QUALIFICATIONS

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years documented experience.

1.7 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no fewer than six months from date of shipment by manufacturer.

PART 2 PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

- A. Entrances, storefronts and windows shall be integrated system by single manufacturer.
- B. Manufacturers:
 - 1. Arcadia
 - 2. EFCO Corp.
 - 3. Kawneer Co., Inc.
 - 4. Trulite
 - 5. US Aluminum
 - 6. Substitutions: Section 01600 - Product Requirements.

2.2 MATERIALS

- A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper typical, 6061 alloy, T6 temper for extruded structural members.
- B. Sheet Aluminum: ASTM B209, 5005 alloy, H15 or H34 temper.
- C. Steel Shapes, Plates and Bars: ASTM A36.
- D. Glazing Stops: Closed cell PVC gaskets.
 - 1. Flexible, self-adhesive, non-extruding, polyvinyl chloride foam.
 - 2. ASTM D1667, Grade VE 41 BL, except provide higher compression deflection grade as necessary to maintain joints water tight and air tight.

2.3 COMPONENTS

- A. Aluminum Storefront Framing Members:
 - 1. Basis of Design: Kawneer Trifab VersaGlaze 451 front glass plane.
 - 2. Fabrication: stick fabrication or screw spline.
 - 3. Non-thermally broken, drainage holes, internal weep drainage system.
 - 4. Size: Nominal 2" x 4-1/2" section, unless otherwise indicated on Drawings.
 - 5. Provide miscellaneous anchorage devices, frame reinforcing, support brackets and wall bracing fabricated from steel shapes, bars and plates as required. Isolate dissimilar materials.
 - 6. Glass: 1" insulated glass as indicated on drawings and as specified in Section 08800.
- B. Aluminum Framed Glass Doors:
 - 1. Basis of Design: Kawneer 350 medium stile entrance.
 - 2. 2-1/4 inches thick, nominal 3 1/2 inch wide top rail and vertical stiles, nominal 6 inch wide bottom rail and square glazing stops.
 - 3. Thermal U-Factor: Maximum 0.80.
 - 4. Glazing Materials: Storefront manufacturer's standard types to suit application and to achieve weather, moisture, building code and air infiltration requirements.
- C. Hardware:

1. Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum designed to smoothly operate, tightly close, and securely aluminum-framed entrance doors.
 - a. Butt Hinges
 - b. Push Pull
 - c. Closer
 - d. Cylinder keylocked
 - e. Power Actuator
 - f. Weatherstripping
 - g. Sill Sweeps
 - h. 1/4" high threshold
- D. Flashings: Minimum 0.032 inch thick aluminum 0.025 inch thick stainless steel to match mullion sections where exposed.
- E. Sealant and Backing Materials:
 1. Sealant Used Within System (Not Used for Glazing): Manufacturer's standard materials to achieve weather, moisture, and air infiltration requirements.
 2. Perimeter Sealant: Specified in Section 07900.
- F. Fasteners and Anchors: as recommended by manufacturer.

2.4 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.
- E. Prepare components with internal reinforcement for door hardware.
- F. Reinforce framing members for imposed loads.

2.5 SHOP FINISHING

- A. Factory applied clear anodized aluminum.
- B. Concealed Steel Items: Primed with iron oxide paint.
- C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.
- D. Shop Primer for Steel Components: SSPC Paint 25 red oxide.
- E. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

- F. Extent of Finish:
 - 1. Apply factory coating to surfaces exposed at completed assemblies.
 - 2. Apply finish to surfaces cut during fabrication so no natural aluminum is visible in completed assemblies, including joint edges.
 - 3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify dimensions, tolerances, and method of attachment with other Work.
- C. Verify wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section.

3.2 INSTALLATION

- A. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- B. Provide alignment attachments and shims to permanently fasten system to building structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances.
- D. Provide thermal isolation where components penetrate or disrupt building insulation.
- E. Install sill flashings. Turn up ends and edges; seal to adjacent Work to form water tight dam.
- F. Coordinate attachment and seal of perimeter air and vapor retarder materials.
- G. Install insulating foam sealant in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Install integral flashings and integral joint sealers.
- I. Set thresholds in bed of mastic and secure.
- J. Install hardware using templates provided. Refer to Section 08710 for installation requirements.
- K. Coordinate installation of glass with Section 08800; separate glass from metal surfaces.
- L. Coordinate installation of perimeter sealants with Section 07900.

3.3 ERECTION TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.

- B. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- C. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

- A. Section 01700 - Execution Requirements: Testing, adjusting and balancing.
- B. Adjust operating hardware for smooth operation.

3.5 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Execution Requirements: Protecting installed construction.
- B. Protect finished Work from damage.

END OF SECTION

SECTION 08620
UNIT SKYLIGHTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manufactured plastic unit skylights with integral metal frame.
- B. Related Requirements:
 - 1. Section 07540 - Thermoplastic Single Ply Membrane Roofing: Roofing system and base flashing at skylight curb.
 - 2. Section 06100 – Rough Framing: Curbs for skylights.

1.2 REFERENCE STANDARDS

- A. American Architectural Manufacturers Association:
 - 1. AAMA 101 - Voluntary Performance Specification for Windows, Skylights and Glass Doors.
- B. ASTM International:
 - 1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 COORDINATION

- A. Section 01300 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work with installation of curbs specified elsewhere and roofing and flexible flashing systems.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit structural, thermal, and daylighting performance values.
- C. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.
- D. Manufacturer's Instructions: Submit special procedures, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- A. Test and label unit skylights in accordance with AAMA 101, including performance grade for positive and negative wind pressure.
- B. Light Transmitting Plastics: Class CC1 defined by applicable code when tested in accordance with ASTM D635 in thickness for intended use.
 - 1. Self Ignition Temperature: Minimum 650 degrees F when tested in accordance with ASTM D1929.
 - 2. Smoke Developed Index: Maximum 450 when tested in accordance with ASTM E84 or maximum 75 when tested in accordance with ASTM D2843 in thickness for intended use.

1.6 QUALIFICATIONS

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

1.7 WARRANTY

- A. Section 01700 - Execution Requirements: Requirements for warranties.
- B. Furnish five year manufacturer's warranty for unit skylights.

PART 2 PRODUCTS

2.1 UNIT SKYLIGHTS

- A. Manufacturer List:
 - 1. AIA Industries.
 - 2. American Skylites
 - 3. Lane-Aire Manufacturing Corp.
 - 4. Bristolite.
 - 5. Exarc Skylights Inc.
 - 6. Naturalite Skylights.
 - 7. Crystalite.
 - 8. Section 01600 - Product Requirements: Requirements for substitutions for other manufacturers and products.
- B. Product Description: Standard, factory-assembled, double dome glazing in curb mounted aluminum frame.
 - 1. Rectangular domed.
 - 2. Nominal Size: 48" x 72".
- C. Performance / Design Criteria:
 - 1. Primary Performance Requirements: AAMA 101 Designation CW30 Commercial or better.
 - 2. U-Value: Maximum 0.60.
 - 3. Solar Heat Gain Coefficient: Maximum 0.40.

4. Provide glazing system with minimum visible light transmittance of 56 percent for white skylights, maximum ultraviolet transmission of 2.0 percent and shading coefficient of 0.45 for white skylights.
5. Water Leakage: None, when measured in accordance with ASTM E331 with test pressure difference as defined by AAMA 101.
6. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 F degrees without causing detrimental effects to system or components.

2.2 COMPONENTS

- A. Double Glazing: Acrylic plastic dome; factory sealed.
 1. Outer Glazing: White translucent.
 2. Inner Glazing: Clear transparent.
- B. Frames:
 1. ASTM B221 Extruded 6063 T-5 aluminum thermally broken, reinforced welded corner joints, counterflashing to receive roofing flashing system, integral condensation collection gutter, glazing retainer;
 2. Finish: Clear anodized.

2.3 FABRICATION

- A. Factory-assembled unit consisting of plastic glazing, extruded aluminum glazing retainer, gaskets, inner frame designed to mount on separate curb.
- B. Fabricate free of visual distortion and defects.
- C. Fabricate to achieve leak proof, and weathertight assemblies.
- D. Fabricate components to allow for expansion and contraction with minimum clearance and shim spacing around perimeter of assembly.

2.4 ACCESSORIES

- A. Anchorage Devices: Type recommended by manufacturer.
- B. Counterflashings: Same metal type and finish as skylight frame.
- C. Protective Back Coating: Bituminous, FS TT-C-494.
- D. Sealant: Manufacturer's recommended sealants integral with each unit skylight installation, nonhardening, nonskinning, nondrying, nonmigrating butyl based sealants.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Requirements for installation examination.

- B. Verify openings and substrate conditions are ready to receive Work of this section.

3.2 PREPARATION

- A. Section 01700 - Execution Requirements: Requirements for installation preparation.
- B. Apply protective back coating on aluminum surfaces of skylight units to be in contact with cementitious materials or dissimilar metals.

3.3 INSTALLATION

- A. Install curb assembly, fastening securely to roof decking. Flash curb assembly into roof system.
- B. Place unit skylights and secure to curb assembly. Install integral setting sealant and counterflashing for watertight installation.
- C. Only waterproof and weathertight assemblies will be acceptable.

3.4 CLEANING

- A. Section 01700 - Execution Requirements: Requirements for cleaning.
- B. Remove protective material from prefinished aluminum surfaces.
- C. Wash down exposed surfaces; wipe surfaces clean.
- D. Remove excess sealant.

END OF SECTION

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes installation of commercial door hardware furnished by Owner for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware, power supplies, back-ups and surge protection.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section “Hollow Metal Doors and Frames”.
 - 2. Division 08 Section “Aluminum Storefront”.
 - 3. Division 08 Section “Flush Wood Doors”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 80 - Fire Doors and Windows.
 - 4. NFPA 101 - Life Safety Code.
 - 5. NFPA 105 - Installation of Smoke Door Assemblies.
 - 6. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS (not applicable)

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- C. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
 - 1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 - 3. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 - 4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to

authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

- a. Test Pressure: Positive pressure labeling.
- D. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- E. Keying: By Owner.
- F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- G. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.
 - a. Hager Companies (HA).
 - b. McKinney Products (MK).
- C. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".
- D. Key Registration List: Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.

- C. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass for doors, relites and interior windows.
 - 2. Glass for storefront systems.
 - 3. Acrylic for vision panels.
- B. Related Sections:
 - 1. Section 07900 - Joint Sealers: Sealant and back-up material other than glazing sealants.
 - 2. Section 08110 - Steel Doors and Frames: Glazed relites and interior windows.
 - 3. Section 08410 – Metal Framed Storefronts.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.
- B. ASTM International:
 - 1. ASTM C509 - Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
 - 2. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 3. ASTM C1036 - Standard Specification for Flat Glass.
 - 4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 5. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
 - 6. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
 - 7. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- C. Consumer Products Safety Commission:
 - 1. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing.
- D. Safety Glazing Certification Council (SGCC).
- E. Insulating Glass Certification Council (IGCC).
- F. Glass Association of North America:
 - 1. GANA - Sealant Manual.
 - 2. GANA - Glazing Manual.
 - 3. GANA - Laminated Glass Design Guide.

- G. National Fenestration Rating Council Incorporated:
 - 1. NFRC 100 - Procedures for Determining Fenestration Product U-Factors.
- H. National Fire Protection Association:
 - 1. NFPA 80 - Standard for Fire Doors, Fire Windows.
- I. Sealed Insulating Glass Manufacturer's Association (SIGMA) "Specification for Sealed Insulating Glass Units".
- J. Underwriters Laboratories Inc.:
 - 1. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Glass Thickness:
 - 1. As specified in Part 2 of this Section, or:
 - 2. If thickness is not specified in Part 2 of this Section, select minimum thickness in accordance with ASTM E1300 to resist dead loads, and positive and negative live loads acting normal to plane of glass in accordance with OSSC Building Code.
- B. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf force is applied to one panel at any point up to 42 inches above finished floor: less than thickness of glass.

1.4 SUBMITTALS

- A. Not required.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.

1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- B. Design glass under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Oregon.

PART 2 PRODUCTS

2.1 FLOAT GLASS MATERIALS

- A. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.
 - 1. Furnish annealed glass except where heat strengthened or tempered glass is required to meet specified performance requirements.

- B. Tempered (Safety) Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
 - 1. Furnish tempered glass where heat strengthened glass cannot meet specified performance requirements.
 - 2. Furnish tempered glass conforming to CPSC 16 CFR 1201 Category II at locations where safety glass is required by OSSC code and as indicated on Drawings.

2.2 FLOAT GLASS PRODUCTS

- A. Float Glass Manufacturers:
 - 1. AGC Flat Glass North America, Inc.
 - 2. Cardinal Glass Industries.
 - 3. Guardian Industries Corp.
 - 4. Pilkington North America, Inc.
 - 5. PPG Industries.
- B. Clear Glass: Annealed, and Tempered float glass as specified; Class 1 clear.
 - 1. Clear annealed glass (FG-CA).
 - 2. Clear tempered glass (FG-CT).
 - 3. Minimum Thickness, unless otherwise indicated:
 - a. 1/4 inch for all other applications.

2.3 INSULATED GLASS PRODUCTS

- 1. Clear annealed glass (FG-CA).
- 2. Clear tempered glass (FG-CT).
- 3. Minimum Thickness, unless otherwise indicated: 1"

2.4 GLAZING SEALANTS

- A. Glazing Sealants:
 - 1. Glazing Sealants: Comply with ASTM C1193.
 - 2. Manufacturer's standard sealants compatible with adjacent materials including glass, laminated glass core, insulating glass seals, and glazing channels.
 - 3. Confirm compatibility of glazing sealant with laminated glass interlayer, such as polyvinyl-butyl (PVB).
- B. Color: As selected.
- C. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.5 ACRYLIC GLAZING

- A. 1/4" clear acrylic glazed vision panels.

2.6 GLAZING ACCESSORIES

- A. Pre-Formed Glazing Tape: Material recommended by glass manufacturer 10 to 15 Shore A durometer hardness. Size to suit application.

- B. Setting Blocks: Elastomeric material recommended by glass manufacturer, compatible with insulating glass unit secondary seal. Hardness: 80 to 90 Shore A durometer. Length: 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area. Minimum 1/4 inch thick.
- C. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness, minimum 3 inch long x one half the height of glazing stop x thickness to suit application.
- D. Glazing Clips: Manufacturer's standard type.

2.7 FABRICATION

- A. Cut glass to fit each opening with minimum edge clearances and maximum bite on glass as recommended by glass manufacturer. Do not nip glass edges.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify openings for glazing are correctly sized and within acceptable tolerance.

3.2 PREPARATION

- A. Clean glazing channels, stops and rabbets of obstructions and deleterious substances which might impair work. Verify weeps are clear and ready to receive glazing.
- B. Comply with manufacturer's instructions for preparation of surfaces immediately before application of primer and glazing compounds or tapes.
- C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- D. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
- B. Comply with manufacturer's instructions and reference standards for installation of materials specified.
- C. Inspect glass immediately before installation. Do not install pieces which are improperly sized or have damaged edges, scratches, abrasions or other evidence of damage.
- D. Use setting blocks at sill of proper size to support glass in accordance with manufacturer's recommendations. Place in locations recommended by glass manufacturer.

- E. Completely conceal edge binding of insulating glass units with glazing material and extend material minimum 1/8 inch onto glass surfaces at each edge, to provide glazing seal independent of hermetic seal.
- F. Install exterior glass watertight and airtight, and capable of withstanding temperature changes, wind loading and impact from operation (doors and operable sash) without failure or breakage of glass, failure of seal, exudation of sealant and excessive deterioration of glazing materials.
- G. Install acrylic vision panels allowing for expansion.

3.4 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass, acrylic and adjacent surfaces. Use appropriate cleaning materials on acrylic to avoid scratching.

END OF SECTION

SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal stud wall framing.
 - 2. Metal channel ceiling framing.
 - 3. Gypsum board and joint treatment.
 - 4. Cementitious backer board.
- B. Related Requirements:
 - 1. Section 09900 – Painting.
 - 2. Section 09300 – Tile

1.2 REFERENCE STANDARDS

- A. Comply with applicable provisions of current edition of the following:
- B. ASTM International:
 - 1. ASTM C645 - Standards for Gypsum Board and Nonstructural Steel Framing and components.
 - 2. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - 3. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- C. Gypsum Association:
 - 1. GA 214 - Recommended Levels of Gypsum Board Finish.
 - 2. GA 216 - Application and Finishing of Gypsum Board.
 - 3. GA 600 - Fire Resistance Design Manual Sound Control.
- D. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C840, ASTM C1280, GA-214, GA-216 and GA-600.
- B. Fire Rated Wall Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Manufacturer and Product List:
 - 1. CertainTeed
 - 2. Georgia-Pacific
 - 3. National Gypsum Co.
 - 4. United States Gypsum Co.
 - 5. Section 01600 - Product Requirements: Requirements for substitutions for other manufacturers and products.
- B. Performance / Design Criteria:
 - 1. Select interior stud thickness to resist minimum 5 psf uniform load and maximum deflection of L/240.
 - 2. Exterior stud thickness to resist minimum wind pressure of 20 psf uniform load and maximum deflection of L/240.
 - 3. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated according to ASCE 7 and applicable codes.

2.2 COMPONENTS

- A. Framing Materials:
 - 1. Non-load Bearing Studs and Tracks: ASTM C645; galvanized sheet steel, minimum 25 gage, except use 20 gage where indicated or required for specified load and deflection criteria. Roll form to C shape. Stud sizes as indicated on drawings.
 - 2. Furring, Framing, and Accessories: ASTM C645. Provide deflection heads to separate from structure.
 - 3. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
 - 4. Seismic Bracing: As required for seismic performance requirements.
- B. Gypsum Board Materials: ASTM C1396/C1396M; Type X fire resistant where indicated on Drawings.
 - 1. Standard Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges on long sides.
 - a. Recycled Content:
 - b. Paper: 100% post-consumer.
 - 2. Gypsum: Maximum recycled content possible or minimum 95% synthetic gypsum, or combination of both.
 - 3. Moisture Resistant Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.
- C. Cementitious Backer Board: ANSI A118.9 for interior installations:
 - 1. ½ inch thick, maximum available length in place; ends square cut.

2.3 ACCESSORIES

- A. Gypsum Board Accessories: ASTM C1047; metal; corner beads, edge trim, and expansion joints.

- B. Metal Accessories: Galvanized steel.
- C. Joint Materials: ASTM C475/C475M; GA-216; reinforcing tape, joint compound, and water.
- D. Fasteners: ASTM C1002; length to suit application.
 - 1. Gypsum Board Screws: ASTM C1002; length to suit application.
 - 2. Screws for Steel Framing: Type S.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Requirements for installation examination.
- B. Verify site conditions are ready to receive work and opening dimensions are as instructed by manufacturer.

3.2 INSTALLATION

- A. Metal Stud Installation:
 - 1. Install studs in accordance with ASTM C754, GA-216 and GA-600.
 - 2. Metal Stud Spacing: 24 inches on center.
 - 3. Refer to Drawings for indication of stud framing to ceiling only. Attach ceiling runner securely ceiling framing in accordance with indicated details.
 - 4. Refer to Drawings for indication of partitions extending stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
 - 5. Door Opening Framing: Install double studs at door frame jambs. Blocking: Install blocking for support of plumbing fixtures, toilet accessories, hardware, and light fixtures.
- B. Ceiling Framing Installation:
 - 1. Install in accordance with ASTM C754 and GA-216.
 - 2. Coordinate location of hangers with other work.
 - 3. Install ceiling framing independent of walls, columns, and above ceiling work.
 - 4. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
 - 5. Laterally brace entire suspension system as required for seismic design category.
- C. Gypsum Board Installation:
 - 1. Install gypsum board in accordance with ASTM C840.
 - 2. Erect single and double layer in accordance with structural and fire resistance requirements, recommendations of Gypsum Association and as indicated on Drawings.
 - 3. Erect single layer fire rated gypsum board [vertically], with edges and ends occurring over firm bearing.
 - 4. Use screws when fastening gypsum board to metal furring or framing.
 - 5. Treat cut edges and holes in moisture resistant gypsum board with sealant.
 - 6. Place control joints consistent with lines of building spaces.

7. Place corner beads at external corners and as indicated on Drawings. Use longest practical length. Place edge trims where gypsum board abuts dissimilar materials and as indicated on Drawings.

D. Interior Joint Treatment:

1. Finish to ASTM C840. Level 3.
2. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
3. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.

3.3 TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

3.4 CORRECTION OF DEFECTIVE WORK

A. For one year after Final Acceptance, repair and repaint, at no additional cost, all surfaces with loose plaster, loose fasteners, or defective joints.

END OF SECTION

SECTION 09300

TILE

GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Ceramic tile walls.
- B. Related Sections:
 - 1. Section 09260- Gypsum Board Assemblies: Cementitious backer board.
 - 2. Appendix A – Interior Finish Specifications.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A108.1 - Installation of Ceramic Tile, A collection.
 - 2. ANSI A118.6 - Ceramic Tile Grouts.
 - 3. ANSI A137.1 - Ceramic Tile.
- B. Tile Council of America:
 - 1. TCA - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

- A. Section 01300 - Submittal Procedures.
- B. Product Data: Manufacturer's Specifications and installation & maintenance recommendations.
- C. Samples: Minimum 12" square for each color, pattern and type of tile, grouted as specified. Obtain Architect's approval of sample panels prior to delivering products to Project Site.
- D. Certificates:
 - 1. Tile: Conform to ANSI A137.1, state grade, tile type, identification marks for tile packages, name and location of Project, issued by manufacturer when tile is shipped.
 - 2. Mortars, adhesives, grouts: Manufacturer's certification that materials are suitable for intended use.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.

1.5 QUALIFICATIONS

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

- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Protect adhesives and grouts from freezing or overheating.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Do not install adhesives and grouts in unventilated environment.
- C. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

- A. Manufacturers:
 - 1. Dal Tile.
 - 2. Substitutions: Section 01600 - Product Requirements.
- B. Acceptable Setting Material Manufacturers:
 - 1. Hydroment
 - 2. Custom Building Products.
 - 3. Laticrete International, Inc

2.2 COMPONENTS

- A. Ceramic Wall Tile:
 - 1. CT-1
 - 2. Manufacturer: Dal Tile
 - 3. Name: Showscape
 - 4. Pattern: Chevron
 - 5. Color: Stylish White SH09
 - 6. Size: 12"x24"
 - 7. Finish: Gloss.
 - 8. Thickness: 3/8" Wall; 1/4" Jolly
 - 9. Grout Joint: 1/16"
 - 10. Layout Pattern: Stacked Bond.
- B. Ceramic Wall Tile - Accent:
 - 1. CT-2
 - 2. Manufacturer: Dal Tile

3. Name: Showscape
4. Pattern: Reverse Dot
5. Color: Stylish White SH09.
6. Size: 12"x24"
7. Finish: Gloss.
8. Thickness: 3/8" Wall; 1/4" Jolly
9. Grout Joint: 1/16"
10. Layout Pattern: Stacked Bond.

C. Ceramic Wall Tile - Accent:

1. CT-3
2. Manufacturer: Dal Tile
3. Name: Showscape
4. Pattern: Solid.
5. Color: Stylish White SH09.
6. Size: 12"x24"
7. Finish: Gloss
8. Thickness: 3/8" Wall; 1/4" Jolly
9. Grout Joint: 1/16"
10. Layout Pattern: Stacked Bond.

D. Ceramic Wall Tile - Accent:

1. CT-4
2. Manufacturer: Dal Tile
3. Name: Showscape
4. Pattern: Chevron
5. Color: Vivid Green SH15.
6. Size: 12"x24"
7. Finish: Gloss
8. Thickness: 3/8" Wall; 1/4" Jolly
9. Grout Joint: 1/16"
10. Layout Pattern: Stacked Bond.

E. Ceramic Wall Tile - Accent:

1. CT-5
2. Manufacturer: Dal Tile
3. Name: Showscape
4. Pattern: Reverse Dot.
5. Color: Vivid Green SH15.
6. Size: 12"x24"
7. Finish: Gloss
8. Thickness: 3/8" Wall; 1/4" Jolly
9. Grout Joint: 1/16"
10. Layout Pattern: Stacked Bond.

F. Ceramic Wall Tile - Accent:

1. CT-6
2. Manufacturer: Dal Tile
3. Name: Showscape

4. Pattern: Solid.
 5. Color: Vivid Green SH15.
 6. Size: 12"x24"
 7. Finish: Gloss
 8. Thickness: 3/8" Wall; 1/4" Jolly
 9. Grout Joint: 1/16"
 10. Layout Pattern: Stacked Bond
- G. Ceramic Wall Tile - Accent:
1. CT-7
 2. Manufacturer: Dal Tile
 3. Name: Showscape
 4. Pattern: Reverse Dot.
 5. Color: Deep Gray SH12.
 6. Size: 12"x24"
 7. Finish: Gloss
 8. Thickness: 3/8" Wall; 1/4" Jolly
 9. Grout Joint: 1/16"
 10. Layout Pattern: Stacked Bond.
- H. Substrate leveling Compound:
1. Approved Product: 84 LatiLevel, by Laticrete International Inc.
 2. Primer: Laticrete Admix and Primer.
- I. Thin-Set Adhesive:
1. Approved Product: 254 Platinum, by Laticrete International Inc.
 2. Polymer fortified thin-set mortar.
 3. Comply with ANSI A118.4 and ANSI A118.11.
- J. Grout Materials:
1. Acceptable Product: SpectraLock Pro, by Laticrete International Inc.
 2. High performance epoxy grout.
 3. Comply with ANSI A118.3.
 4. Color: To be selected from manufacturer's standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive tile, setting beds or accessories prior to installation of tile.
- B. Verify surfaces are free from defects or conditions adversely affecting quality and execution of tile installation.

3.2 SUBSTRATE PREPARATION

- A. Repair and level substrate surface irregularities and cracks up to 1 inch in thickness:
 1. Prime surfaces in accordance with manufacturer's installation instructions.

2. Install self-leveling compound in accordance with manufacturer's installation instructions.
3. Surface deviation tolerance: 1/4" in 10'- 0".

- B. Protect surrounding work from damage.
- C. Vacuum clean surfaces.
- D. Prepare substrate surfaces for adhesive installation.

3.3 INSTALLATION

- A. Install tile, and grout in accordance with:
 1. TCA Handbook.
 2. Applicable requirements of ANSI A108.1 through A108.11.
 3. Manufacturer's recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Place edge strips at exposed tile edges.
- D. Align new joints with existing joints.
- E. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners neatly.
- F. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size.
 1. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- G. Allow tile to set for a minimum of 48 hours prior to grouting.
- H. Grout tile joints:
 1. Joint width: Uniform width. Joints aligned.
 2. Prepare and install in accordance with manufacturer's installation instructions.
- I. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 CLEANING

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Clean tile and grout surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Leave finished installation clean and free of cracked chipped, broken, unbonded or otherwise defective tile work.
- B. Protect installed ceramic tile work with kraft paper or other heavy covering during construction period to prevent damage and wear.

END OF SECTION

SECTION 09510
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Acoustical lay-in tiles.
2. Suspended metal grid ceiling system and perimeter trim.

B. Related Sections:

1. Division 15 - Mechanical: Ceiling grilles.
2. Division 16 - Electrical: Ceiling lighting.
3. Division 16 - Fire alarm components in ceiling systems.

C. Comply with applicable provisions of current edition of following:

1. Acoustical and Insulating Materials Assn. current bulletin.
2. UBC Standards 47-19 Ceiling Bracing.
3. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
4. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
7. ASTM E580/E580M - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
8. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
9. Green Seal: GS-11 - Product Specific Environmental Requirements.
10. Intertek Testing Services (Warnock Hersey Listed): WH - Certification Listings.
11. National Fire Protection Association: NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
12. Underwriters Laboratories Inc.:UL - Fire Resistance Directory.

1.02 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's specifications and installation recommendations.

C. Samples: For each panel and tile type.

D. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system. Indicate method of suspension where interference exists.

- E. Maintenance Material Submittals: Section 01700 - Execution Requirements: Requirements for maintenance material. Furnish extra materials equal to not less than 10% of each type acoustical material supplied. Furnish in full, unopened cartons only.

1.04 QUALIFICATIONS

- A. Manufacturer: All acoustical materials for each type shall be product of single Manufacturer.

PART 2 PRODUCT

2.01 MANUFACTURERS

- A. Acceptable Acoustical Lay-In Panel Manufacturers:
 - 1. Armstrong.
 - 2. USG
 - 3. Section 10600 – Product Requirements: Requirements for substitutions for other manufacturers and products.
- B. Acceptable Acoustical Lay-In Panel Manufacturers:
 - 1. Donn.
 - 2. Armstrong
 - 3. Chicago
 - 4. Section 10600 – Product Requirements: Requirements for substitutions for other manufacturers and products.

2.02 MATERIALS

- A. Hanger Wire: min. 12 ga. galv., pre-straightened, soft annealed, mild steel wire.
- B. Hanger Wire Framing: attachment devices with minimum carrying capacity of 5 times design load.
- C. Suspension System:
 - 1. Basis of Design Product: Donn DX/DXL, exposed grid, 15/16”.
 - 2. ASTM C635 intermediate duty.
 - 3. Main Beams: Rotary stitched double-web construction of 1-11/16” height with peaked top bulb and 15/16” wide bottom flange with prefinished steel capping.
 - 4. Cross Tees: Double-web construction, 1-3/8” height, 15/16: bottom flange with prefinished steel cap. Staked on end to allow cross tee removal. Pre-finished in baked enamel.
 - 5. Color: Black low gloss finish to match panels.
 - 6. Wall Moldings: Angle molding with hemmed and prefinished exposed flange.
 - 7. Hold Down clips: No 30 MSG spring steel, placed over cross tees at 2’ oc.
 - 8. Compression struts: As required.
- D. Acoustical Lay-In Panels:
 - 1. **ACT-1:** 2x4 ceiling tiles
 - a. Basis of Design Product: USG Premier Hi-Lite *ClimaPlus* Kapok unperforated Class A panels. Medium Texture.
 - b. USG No: 7057 G.

- c. Color: Flat black.
- d. Sizes: 24" x 48" x 5/8".
- e. Weight: 1.9 lbs/sf.
- f. Edge Profile: Square.
- g. Material: Fiberglass with washable vinyl face.
- h. Flame Spread: Class A, 25 or less. Smoke Developed: 50 or less.
- i. Surface Finish: Factory-applied vinyl with flat black finish #205.
- j. NRC Range: 0.50
- k. Light Reflectance: 0.76.
- l. Recycled Content: 39%

2.03 ACCESSORIES

- A. Touch-up Paint: Type and color to match acoustic and grid units.
- B. Acoustic Sealant: for perimeter moldings specified in Section 07900.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01700 - Execution Requirements: Requirements for installation examination.
- B. Verify layout of hangers will not interfere with other work.

3.02 INSTALLATION

- A. Lay-In Grid Suspension System:
 - 1. Install suspension system in accordance with ASTM C635, ASTM C636 and as supplemented in this section.
 - 2. Install suspension system in accordance with ASCE 7, ASTM E580/E580M and CISCA for Seismic Zone 3-4.
 - 3. Install system capable of supporting imposed loads with maximum deflection of 1/240 maximum.
 - 4. Locate system on room axis according to reflected plan.
 - 5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
 - 6. Locate system on room axis according to reflected plan.
 - 7. Install after major above ceiling work is complete. Coordinate location of hangers with other work. Install hanger clips during steel deck erection. Install additional hangers and inserts as required.
 - 8. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 - 9. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers to span extra distance.
 - 10. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Do not eccentrically load system, or produce rotation of runners.

11. Adjust suspension system to be level to within 1/8 inch in 12 feet.
12. Perimeter Molding:
 - a. Install edge molding at intersection of ceiling and vertical surfaces into bed of acoustic sealant.
 - b. Use longest practical lengths.
 - c. Miter corners.
 - d. Install at junctions with other interruptions.
13. Install light fixture boxes constructed of acoustic panel above light fixtures in accordance with UL assembly requirements and light fixture ventilation requirements.

B. Acoustic Units:

1. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
2. Lay directional patterned units [one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.
3. Install units after above ceiling work is complete.
4. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.
5. Cutting Acoustic Units:
6. Cut to fit irregular grid and perimeter edge trim.
7. Cut edges to match adjacent panels at field cut units.
8. Double cut and field paint exposed edges of tegular units.
9. Where round obstructions occur, install preformed closures to match perimeter molding.

3.03 TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09650 RESILIENT BASE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
- B. Related Sections:
 - 1. Section 01130 - Alternates.
 - 2. Section 01300 - Submittals.
 - 3. Section 01400 - Quality Control.

1.02 REFERENCES

- A. ASTM F2034 Type I - Standard Specification for Sheet Linoleum Flooring.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Experienced with the work of this Section, specializing in installing linoleum floor coverings with a record of successful in-service performance.
 - 2. Approved by Manufacturer.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data:
 - 1. Resilient base.
 - 2. Adhesives: Indicate VOC limits and recommended temperature and humidity range.
- C. Two samples of selected resilient base.

1.05 MAINTENANCE MATERIALS

- A. Replacement material in the amount of 0.5 percent of installed sheet flooring, for each type, color and pattern installed. Extra materials must precisely match materials installed, must be wrapped in suitable packaging and must be clearly labeled.

1.06 PROJECT CONDITIONS

- A. Maintain a temperature of 70⁰ F (21⁰ C) plus or minus 5⁰ F (3⁰ C) in spaces to receive resilient flooring products. Specified temperature shall be maintained at least 48 hours before, during, and 48 hours after the installation

PART 2 PRODUCT

2.01 RESILIENT BASE MATERIALS

A. Resilient Base:

1. Manufacturer: Flexco, Roppe, or approved substitute.
2. Type: Rubber base, commercial grade.
3. Style: Straight base, 4 inch and 6 inch heights as indicated on Drawings, color as selected by Architect.
4. Standard roll stock required. 48" base sections not acceptable.
5. Adhesive: As recommended by base manufacturer with low/no VOC.
6. Color: To be selected from manufacturer's standard colors.

2.02 MISCELLANEOUS ACCESSORIES

A. Adhesive:

1. Type recommended by manufacturer of resilient product for specific substrate conditions.
2. Toxicity/IEQ:
 - a. Provide adhesives with a VOC content no greater than 10 grams per liter per South Coast Air Quality Management District Rule #1168.
 - b. Comply with applicable regulations regarding toxic and hazardous materials, GS-36 for Commercial Adhesive.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of floor coverings.
- B. Mechanically remove adhesive, paint, oils, waxes, sealers and curing compounds on substrate not compatible with adhesive to be used. Do not use solvents except as approved by Owner's Representative.
- C. Remove ridges, bumps and other irregularities. Fill cracks, contraction joints, holes and depressions with subfloor filler as recommended by manufacturer to achieve smooth flat hard surface.
- D. Test substrate for moisture content and test concrete floors for alkalinity.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with manufacturer's published recommendations for installation in each area, extending resilient flooring into spaces that are partially concealed. Cut and fit tightly to fixtures, pipes, and other obstructions, as well as to walls and partitions.
- B. Inspect substrate for levelness and smoothness and require corrections to defects prior to start of work.
- C. Condition all flooring materials a minimum of 48 hours prior to starting installation. Maintain ambient temperature between 65 degrees F and 100 degrees F throughout installation and for 48 hours after completion.

3.03 INSTALLATION OF RESILIENT BASE

- A. Fit joints tightly and make vertical. Use maximum lengths to minimize joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions

3.03 CLEANING

- A. Initial Cleaning: Remove excess and waste materials promptly, and sweep or vacuum clean resilient flooring as soon as installation has been completed in each area. After adhesive has had adequate time to set, mop each area with damp mop and mild detergent.
- B. Final Cleaning: Remove scuff marks, excess adhesive, and other foreign substances, using only cleaning products and techniques recommended by manufacturer of resilient products.

END OF SECTION

SECTION 09685

CARPET TILE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Carpet Tile.
 - 2. Resilient Base.
 - 3. Accessories.
- B. Related Requirements:
 - 1. Appendix A - Interior Finish Specifications

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D2859 - Standard Specification for Ignition Characteristics of Finished Textile Floor Covering Materials.
- B. Carpet and Rug Institute:
 - 1. CRI Carpet Installation Standard - Standard for Installation of Commercial Carpet.
 - 2. CRI Green Label Plus Testing Program.
 - 3. CRI Model Specifications for Commercial Carpets.
- C. Consumer Products Safety Commission:
 - 1. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.
- D. National Fire Protection Association:
 - 1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

1.3 PRE-INSTALLATION MEETINGS

- A. Section 01300 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on specified products, describing physical [and performance] characteristics; sizes, patterns, colors available, and method of installation.

- C. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, and location of edge moldings and edge. Samples:
 - 1. Submit two 12 x 12 inch samples in size illustrating color and pattern for each carpet material specified.
 - 2. Submit samples for edge strips and all other exposed accessories for each color specified.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01700 - Execution Requirements: Requirements for maintenance materials.
- B. Extra Stock Materials:
 - 1. Furnish 10% overage of carpet tile of each type, color, and pattern specified.

1.7 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Floor Finishes: Comply with one of the following:
 - a. CPSC 16 CFR 1630 and ASTM D 2859.

1.8 AMBIENT CONDITIONS

- A. Section 01500 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. Store materials in area of installation for 48hours prior to installation.
- C. Maintain minimum 70 degrees F ambient temperature 1 day prior to, during and 24 hours after installation.
- D. Ventilate installation area during installation and for 3 days after installation.

PART 2 PRODUCTS

2.1 CARPET TILE

- A. Manufacturer List:
 - 1. Miliken Carpet
 - 2. Substitutions: Section 01300
- B. CPT-1: General CarpetTile
 - 1. Milliken Carpet

2. Collection: Color Field
3. Design Name: Color Field
4. Color Name: COL86 Chaetura
5. Construction: tufted, Textured Loop
6. Tile Size: 9.8" x 39.4"
7. Yarn Type: Milliken-Certified WearOn
8. Nylon Type 6,6
9. Stain Repel: StainSmart Tufted Face Weight: 15oz/yd
10. Finished Pile Height: 0.08"
11. Average Density: 6,541
12. Standard Backing: PVC-Free
13. Underscore ES Cushion

C. CPT-2 General Accent Tile

1. Milliken Carpet
2. Collection: Color Field
3. Design Name: Color Field
4. Color Name: COL187-12 Bronzesheen
5. Specifications: See CPT-1.

D. CPT-3: General Accent Tile

1. Milliken Carpet
2. Collection: Color Field
3. Design Name: Color Field
4. Color Name: COL195-75-141 Cobalt Green
5. Specifications: See CPT-1.

2.2 RESILIENT BASE

A. RB-1 General Wall Base

1. Manufacturer: Roppe.
2. Color: 114 Lunar Dust
3. Style: Straight, Continuous Length
4. Size: 4"

2.3 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by flooring material manufacturer.
- B. Moldings and Edge Strip Transitions: None.
- C. Adhesive System: Dot system recommended by manufacturer.
- D. Contact Adhesive: Recommended by carpet tile manufacturer for direct glue at ramps and elevation transitions. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Requirements for installation examination.
- B. Verify floor surfaces are smooth and flat within tolerances and are ready to receive work.

3.2 PREPARATION

- A. Section 01700 - Execution Requirements: Requirements for installation preparation.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.3 CARPET TILE INSTALLATION

- A. Install carpet tile in accordance with CRI Carpet Installation Standard.
- B. Do not mix carpet from different cartons unless from same dye lot.
- C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- D. Install carpet tile in ashlar pattern, with pile direction alternating to next unit, set parallel to building lines. Review decisions where aligning with existing conditions.
- E. Locate change of color or pattern between rooms under door centerline.
- F. Fully adhere carpet tile to substrate at ramps and elevation transitions.

3.4 RESILIENT BASE INSTALLATION

- A. Fit joints tightly and make vertical. Maintain minimum dimension of **18 inches** between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.5 CUTTING AND PATCHING OF EXISTING BROADLOOM CARPET

- A. Fold back existing carpet as required for new construction.

- B. Fully adhere repositioned carpet sections.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Requirements for cleaning.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum sheet carpet surfaces.

3.7 PROTECTION

- A. Section 01700 - Execution Requirements: Requirements for protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.
- C. Cover carpeting in traffic areas with protective non-staining building paper. Do not use plastic sheeting.

END OF SECTION

SECTION 09900
PAINTS AND COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Preparation of surfaces for paint coatings.
 - 2. Interior painting of new and existing surfaces.
 - 3. Exterior painting of new and existing surfaces.
- B. Related Sections:
 - 1. Section 04065 – Concrete Unit Masonry.
 - 2. Section 06200 - Finish Carpentry
 - 3. Section 08110 – Steel Doors and Frames.
 - 4. Section 09212 - Gypsum Board Assemblies.
 - 5. Appendix A – Interior Finish Specification.

1.2 REFERENCES

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. Painting and Decorating Contractors of America: PDCA - Architectural Painting Specification Manual.
- C. South Coast Air Quality Management District: SCAQMD Rule 1113 - Architectural Coatings.
- D. Green Seal Paints Standard GS-11.
- E. SSPC: The Society for Protective Coatings: SSPC.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 SUBMITTALS

- A. List of actual materials proposed, identified with Specification cross references.
- B. Product Data: Manufacturer's data on finishing products.
- C. Manufacturer's Installation Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.
- D. Samples:
 - 1. Two painted samples for each color and texture.

2. Keep accurate record of color samples and insure that paint supplied matches approved samples.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics: Fire Retardant Finishes: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum [three] years experience.
- B. Applicator: Company specializing in performing work of this section with minimum year's experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 AIR QUALITY REQUIREMENTS

- A. Comply with regulations of the South Coast Air Quality Management District (SCAQMD) for Architectural Coatings regulations effective 7/1/2002.
- B. Comply with all applicable local, regional, state and Federal Air Resources Board and Federal Lead Content Regulations.
- C. Non-Specialty Paint Products VOC Content Limits: Comply with the following:
 1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 2. Interior Clear Wood Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
 3. Exterior Flat Paint: 100 grams/liter (g/l).
 4. Exterior Non-Flat Paint: 150 g/l.
 5. Primers, sealers, and under coaters: 200 g/l.
 6. Stains: 250 g/l.
 7. Consult South Coast Air Quality Management District ruling for VOC limits of other types of coatings.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65 degrees F unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.10 EXTRA MATERIALS

- A. Supply 1 gallons of each color, type, and surface texture; store where directed.
- B. Label each container with color, type, texture, room locations, in addition to manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

- A. Manufacturers: Paint, Transparent Finishes, Stain, Primer Sealers.
 - 1. Benjamin Moore
 - 2. Fuller-O'Brien
 - 3. Miller Paint Co., Inc.
 - 4. Pittsburgh
 - 5. Rode Paint Company
 - 6. Sherwin/Williams Co.
 - 7. Witco
 - 8. Substitutions: Under provisions of Section 01 60 00.
- B. Products for each general purpose shall be of same manufacturer. Do not use products of different manufacturers over one another, except for shop prime coats specified in other sections.
- C. Coatings:
 - 1. General: Conform to PDCA Revised Table of Products, current Edition.
 - 2. Commercial quality and "best grade."
 - 3. Ready mixed, except field catalyzed coatings. Process pigments to soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
 - 4. Good flow and brushing properties; capable of drying or curing free of streaks or sags.
 - 5. Recycled Paint: Metro Paints may be used for Semi gloss Enamel (W) products.
 - 6. Coatings Types and Colors: See Appendix 'A' - Interior Finish Specifications.

- D. Maximum VOC Content:
 - 1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 2. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
 - 3. Interior Clear Wood Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.

2.2 ACCESSORY MATERIALS

- A. Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.
- B. Patching Materials: Latex filler.
- C. Fastener Head Cover Materials: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify surfaces are ready to receive Work as instructed by product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing
- B. Correct defects and clean surfaces capable of affecting work of this section.
- C. Seal with shellac marks which may bleed through surface finishes.
- D. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- E. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- F. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- G. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

- H. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
- I. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear sealer.
- J. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 EXISTING WORK

- A. Extend existing paint and coatings installations using materials and methods compatible with existing installations and as specified.

3.4 APPLICATION

- A. Comply with manufacturer's recommendations for application.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.
- D. Sand wood and metal surfaces lightly between coats to achieve required finish.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.
- G. Prime concealed surfaces of interior and exterior woodwork with primer paint.
- H. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.
- I. Finishing Mechanical And Electrical Equipment:
 - 1. Paint shop primed equipment.
 - 2. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 - 3. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished.
 - 4. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- J. Touch up and patch surfaces as required after the completion of work by other trades.

3.5 CLEANING

- A. Collect waste material which may constitute fire hazard, place in closed metal containers, and remove daily from site.
- B. Dispose of empty containers, excess paint, solvents, paint scrapings, rags and other debris to acceptable, licensed landfill or recycling station as required for hazardous materials.

3.6 COATING SYSTEMS

- A. Interior and Exterior Ferrous Metals. (Including doors and frames both inside and outside.)
 - 1. Prime Coat: Rust inhibitive metal primer (omit if pre-primed).
 - 2. Finish: 2 coats alkyd enamel, semi-gloss.
 - 3. Total Coating Thickness: 4.5 mils dry (minimum).
- B. Interior Gypsum Board (dry areas and non-wet walls).
 - 1. Prime Coat: High quality, high solids, drywall primer.
 - 2. Wall Finish: 2 coats Interior Latex Eggshell.
 - 3. Ceiling Finish: 2 coats Interior Latex Flat.
 - 4. Total Coating Thickness: 4.0 mils dry (minimum).
- C. Wood/OSB - Transparent:
 - 1. Finish: semi-gloss sealer.
- D. Wood Table Tops – Transparent:
 - 1. Finish: Urethane coating, semi-gloss.
 - 2. Coats: As required for thick protective coating.
- E. Existing Wood – no new finish.
- F. Exterior and Interior Existing and New Concrete Masonry Units
 - 1. One coat of block filler.
 - 2. One coat of primer sealer latex.
 - 3. One coat latex finish.
- G. Interior Glue-Laminated Wood.
 - 1. Finish: semi-gloss sealer.

END OF SECTION

SECTION 10160 TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Metal toilet compartments.
 - 2. Metal urinal screens.
- B. Related Sections:
 - 1. Section 06100 - Rough Carpentry.
 - 2. Section 10810 - Toilet Accessories.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's specifications and installation recommendations.
- C. Shop Drawings: Show layout, elevations, dimensions and tolerances, anchorage and connection details, and all other pertinent details.
- D. Samples: Provide samples for materials, finishes and colors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Accurate.
 - 2. Global.
 - 3. Knickerbocker.
 - 4. Sanymetal.
- B. Substitutions: Under provisions of Section 01600.

2.02 MATERIALS

- A. Toilet Compartments: Metal, flush type, floor mounted, complete with doors and all required fittings, slider type stall door lock, coat hooks and bumpers. ADA compliant hardware for 1 stall each in Women's' and Men's' restrooms. Baked enamel finish, color as selected by Architect from Manufacturer's standard colors.
- B. Urinal Screens: Metal, flush type, wall mounted, complete with all required anchors and fittings.

2.03 FABRICATION

- A. Metal Toilet Compartment, Door and Urinal Screen Construction:
 - 1. Hardware and fittings: stainless steel type 304.
 - 2. Face plates of panels: cold rolled, galvanized, bonderized, stretcher-leveled, furniture stock steel.
 - 3. Edge binding: galvanized, bonderized steel, suitable for die drawings without fracturing coating.
 - 4. Minimum thicknesses before galvanizing:
 - a. face plates: 20 ga.
 - b. reinforcements for anchoring devices: 14 ga.
- B. Finish: baked enamel, color selected by Architect from manufacturer's standard colors.
- C. Alter partitions to accept toilet accessories. Refer also to Section 10810.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Verify that blocking and vertical support is adequate before accepting substrate.
- B. Install all items in accordance with Contract Documents and Manufacturer's Instructions. Install plumb, true, level, rigid, and securely anchored.
- C. Conceal all evidence of cutting, drilling and fitting at wall.
- D. Clean all finish surfaces and leave free of defects at time of Final Acceptance.

END OF SECTION

SECTION 10440 SIGNS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Installation of Owner furnished signage.
- B. Related Sections:
 - 1. Section 01300 – Submittals.
 - 2. Section 01400 – Quality Controls.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01300.
 - 1. Product Data: Submit Manufacturer's specifications and installation recommendations.
 - 2. Samples: Submit for each size, style and color of letters or symbols used.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Interior and Exterior Signs: Furnished by Owner. Plaque type. Furnished by Owner, installed by contractor.
- B. Adhesives: Low emission type, as recommended by sign manufacturer for specific application.
- C. Exterior Vinyl Sign: Single color vinyl applied sign at entry. See drawings. Mounted to glass interior. Furnished by Owner, installed by contractor.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Verify that surfaces scheduled to receive interior signs are clean and free of substances which would impair or prevent adhesion.
- B. Install interior signage accurately positioned, properly aligned, and securely anchored to resist displacement. Install in accordance with Contract Documents and Manufacturer's printed mounting procedures.

3.01 SCHEDULE

- A. Interior:
 - 1. All interior Rooms including restrooms.
- B. Exterior:
 - 1. Front entry.
 - 2. Other entry doors.

END OF SECTION

SECTION 10522 FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire Extinguishers.

B. Related Sections:

1. Section 01300 - Submittals.
2. Section 01400 - Quality Controls.
3. Section 06100 - Rough Carpentry: Blocking for wall mounted items.

1.02 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Submit Manufacturer's specifications and installation recommendations.

1.03 WARRANTY

A. Provide Manufacturer's standard warranty against defects in workmanship and materials.

PART 2 PRODUCT

2.01 MANUFACTURERS

A. Acceptable Manufacturers:

1. Amerex.
2. J.L. Industries.

B. Substitutions: Under provisions of Section 01600

2.02 MATERIALS

A. Extinguishers:

1. Type: Fire Class ABC, dry chemical.
2. U.L. Rating: 4A-60BC.
3. Capacity: 10 lbs.
4. Range: 15 ft.
5. Construction: All metal.
6. Model: Amerex No. 456, or approved substitute.

B. Brackets:

1. Mounting Bracket: Manufacturer's standard wall mount bracket.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install fire extinguishers in accordance with:
 - 1. Contract Documents and Manufacturer's recommendations.
 - 2. Applicable codes.
- B. Assure that extinguishers are properly charged and serviced, and service tag securely fastened to each unit.

END OF SECTION

SECTION 10810 TOILET ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Installation of toilet accessories provided by Owner. Sizes and locations as indicated on Drawings.
- B. Related Sections:
 - 1. Section 01400 - Quality Controls.
 - 2. Section 09260 – Gypsum Board Assemblies.
 - 3. Section 06100 – Rough Framing (blocking).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Prior to application of substrate, inspect for adequate blocking for wall mounted items. Verify and coordinate rough-in dimensions and requirements for all items.
- B. Install items in locations shown on Drawings, plumb, true and in accordance with Manufacturer's Instructions.
- C. Adjust accessories for proper operation.
- D. After completion of installation, clean and polish exposed surfaces.

3.02 SCHEDULE

- A. Toilet Rooms: All accessories furnished by owner, installed by contractor.
 - 1. Grab bars.
 - 2. Mirror
 - 3. Toilet Paper Dispenser.
 - 4. Soap Dispenser.
 - 5. Towel Dispenser.
 - 6. Waste Receptacle.
 - 7. Feminine Product Dispenser
 - 8. Diaper Changing Station (1) only.
 - 9. Misc. Other Dispensers

END OF SECTION

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<i>type</i>	<i>code</i>	<i>specifications</i>	<i>notes</i>
I. Base – Rubber	RB-1	Roppe Color: 114 Lunar Dust Continuous Length	General Wall Base
II. Carpet	CPT-1	Milliken Collection: Color Field Design Name: Color Field Colour Name: COL86 Chaetura Construction: tufted, Textured Loop Tile Size: 9.8" x 39.4" Yarn Type: Milliken-Certified WearOn Nylon Type 6,6 Stain Repel: StainSmart Tufted Face Weight: 15oz/yd Finished Pile Height: 0.08" Average Density: 6,541 Standard Backing: PVC-Free Underscore ES Cushion	General Carpet Tile
	CPT-2	Milliken Collection: Color Field Design Name: Color Field Colour Name: COL187-12 Bronzesheen Construction: tufted, Textured Loop Tile Size: 9.8" x 39.4" Yarn Type: Milliken-Certified WearOn Nylon Type 6,6 Stain Repel: StainSmart Tufted Face Weight: 15oz/yd Finished Pile Height: 0.08" Average Density: 6,541 Standard Backing: PVC-Free Underscore ES Cushion	General Accent Tile
	CPT-3	Milliken Collection: Color Field Design Name: Color Field Colour Name: COL195-75-141 Cobalt Green Construction: tufted, Textured Loop Tile Size: 9.8" x 39.4" Yarn Type: Milliken-Certified WearOn Nylon Type 6,6 Stain Repel: StainSmart Tufted Face Weight: 15oz/yd Finished Pile Height: 0.08" Average Density: 6,541 Standard Backing: PVC-Free Underscore ES Cushion	General Accent Tile

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<i>type</i>	<i>code</i>	<i>specifications</i>	<i>notes</i>
III. Paint	PT-1	Miller Paint 0011 Sugar Dust Finish: Eggshell	General Wall Color
	PT-2	TBD	Accent Wall Color
	PT-3	TBD	Accent Wall Color
IV. Plastic Laminate	PL-1	Formica Style: MicroDot Finish Color: TBD	Lower Casework at Kitchenette
V. Solid Surface	SS-1	Formica Solid Elements Color: Arctic Thickness: ½"	Countertop at Kitchenette
VI. Tile	CT-1	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Chevron Color: Stylish White SH09 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom
	CT-2	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Reverse Dot Color: Stylish White SH09 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom
	CT-3	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Solid Color: Stylish White SH09 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom

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type	code	specifications	notes
	CT-4	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Chevron Color: Vivid Green SH15 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom
	CT-5	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Reverse Dot Color: Vivid Green SH15 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom
	CT-6	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Solid Color: Vivid Green SH15 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom
	CT-7	Dal Tile Name: Showscape Type: Ceramic Tile Pattern: Reverse Dot Color: Deep Gray SH12 Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Base Tile at Restroom

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type	code	specifications	notes
I. Base – Rubber	RB-1	Roppe Color: 114 Lunar Dust Continuous Length	General Wall Base
II. Carpet	CPT-1	Milliken Collection: Color Field Design Name: Color Field Colour Name: COL86 Chaetura Construction: tufted, Textured Loop Tile Size: 9.8" x 39.4" Yarn Type: Milliken-Certified WearOn Nylon Type 6,6 Stain Repel: StainSmart Tufted Face Weight: 15oz/yd Finished Pile Height: 0.08" Average Density: 6,541 Standard Backing: PVC-Free Underscore ES Cushion	General Carpet Tile
	CPT-2	Milliken Collection: Color Field Design Name: Color Field Colour Name: COL187-12 Bronzesheen Construction: tufted, Textured Loop Tile Size: 9.8" x 39.4" Yarn Type: Milliken-Certified WearOn Nylon Type 6,6 Stain Repel: StainSmart Tufted Face Weight: 15oz/yd Finished Pile Height: 0.08" Average Density: 6,541 Standard Backing: PVC-Free Underscore ES Cushion	General Accent Tile
	CPT-3	Milliken Collection: Color Field Design Name: Color Field Colour Name: COL195-75-141 Cobalt Green Construction: tufted, Textured Loop Tile Size: 9.8" x 39.4" Yarn Type: Milliken-Certified WearOn Nylon Type 6,6 Stain Repel: StainSmart Tufted Face Weight: 15oz/yd Finished Pile Height: 0.08" Average Density: 6,541 Standard Backing: PVC-Free Underscore ES Cushion	General Accent Tile

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type	code	specifications	notes
III. Paint	PT-1	Miller Paint 0011 Sugar Dust Finish: Eggshell	General Wall Color
	PT-2	TBD	Accent Wall Color
	PT-3	TBD	Accent Wall Color
IV. Plastic Laminate	PL-1	Formica Style: MicroDot Finish Color: TBD	Lower Casework at Kitchenette
V. Solid Surface	SS-1	Formica Solid Elements Color: Arctic Thickness: ½"	Countertop at Kitchenette
VI. Tile	CT-1	Dal Tile Name: Showscape Type: Ceramic Tile Style: TBD Color: Price Group 1 (actual color TBD) Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Wall Field Tile at Restroom
	CT-2	Dal Tile Name: Showscape Type: Ceramic Tile Style: TBD Color: Price Group 2 (actual color TBD) Finish: Gloss Size: 12"x24" Thickness: 3/8" Grout Joint Recommendation: 1/16" Grout: Color TBD	Accent Tile at Restroom

SECTION 21 00 00
BASIC FIRE SUPPRESSION REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section specifies the basic requirements for all Contractor installed equipment. It applies to all sections included in Division 21. The requirements herein are an expansion upon the requirements of Division 1.
- B. Provide all materials, labor and equipment required to install complete and fully operational fire protection systems as indicated by the contract drawings and this specification.
- C. Obtain and pay for all permits, licenses, fees and taxes applicable to this project as required by law.
- D. Cooperate with other trades in furnishing material and information required for installation and operation of mechanical items.
- E. Requirements for the following are included:
 - 1. Related work (other Contract Documents and specification sections) that must be combined with the requirements of this Section.
 - 2. Design performance.
 - 3. Delivery, storage, and handling.
 - 4. Quality assurance and standards.
 - 5. Submittals.
 - 6. Product quality, basic type, and finishes.
 - 7. Equipment identification.
 - 8. Excavation and backfill.
 - 9. Installation.
 - 10. Mounting and shimming.
 - 11. Inspection.
 - 12. Safety considerations.
 - 13. Cleaning, startup, and adjustments.

1.02 RELATED WORK

- A. This general section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the project equipment and systems:
 - 1. Division 1 sections included in this Project specifications.
 - 2. The Contract.
 - 3. General and specific mechanical specifications and drawings included in the project.

1.03 DEFINITIONS

- A. "Indicated": Refers to graphic representations, notes or schedules in the Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents.
 - 1. Terms such as "shown", "noted", "scheduled", and "specified", are used to notify or help the user to locate reference. Location is not limited.
- B. "Directed": Terms such as "directed", "Requested", "authorized", "selected", "approved", "required", and "permitted" mean directed by Architect/Engineer, approved by Architect/Engineer and similar phrases.

- C. "Approved": When used in conjunction with Architect/Engineer's action on contract submittals, applications, requests, is limited to Architect/Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- D. "Regulations": Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of Work.
- E. "Furnish": Means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.
- F. "Install": Describes operations at Project site including actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, supporting, isolating, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.
- G. "Provide": Means to furnish and install.
- H. "Installer": A contractor, or another entity engaged by the contractor, either as an employee, subcontractor, or contractor of a lower tier, to perform a particular construction activity including installation, erection, application or similar operations.
 - 1. Installers are required to be experienced in operations they are engaged to perform.
 - 2. The term "experience" means having successfully completed a minimum of three previous projects similar in scope and size to this Project and within the time frame indicated in the "Quality Assurance" section of the Specifications. In addition, it means being familiar with special requirements indicated and having complied with requirements of authorities having jurisdiction.
- I. "Project Site": Is defined as the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project.

1.04 DESIGN PERFORMANCE

- A. Compliance by the Contractor and/or Vendor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, suited to meet operating guarantees at the specified service conditions.

1.05 SUBMITTALS

- A. Product Data: Submit five complete sets of manufacturer's product data in a three ring binder for approval. Literature submitted shall clearly indicate the model number, capacity, rated operating conditions, size, weight, support requirements, electrical power requirements, utility (fuel, air, cooling water, etc.) requirements, and options furnished. Submittals shall include, but are not necessarily limited to the following;
 - 1. Fire Protection: Piping materials; valves; fittings; supports; switches; alarms; backflow devices; sprinkler heads and the like. Provide minimum 36 x 24 size system layout shop drawings. Provide hydraulic calculations.
 - 2. Calculations: Provide for sizing of all utility services, including fire sprinkler main and all building piping; thermal expansion and seismic restraints; and all other calculations and all other calculations consistent with good engineering practice. Include design criteria used and assumptions made.
- B. Operation and Maintenance Data: Submit three complete sets of manufacturer's literature bound in a three ring binder for approval. Data shall include installation, start-up, and maintenance instructions, parts lists, and wiring diagrams.

- C. Substitutions: System design was based upon the equipment and materials listed on the drawings and specifications herein. At contractor's option, another manufacturer's equipment of similar quality, capacity and features may be submitted for prior approval per Section 01 33 00. Prior permission to substitute does not relieve the contractor of the responsibility of including this information in the bound submittal packages.

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following codes, standards and specifications, except where more stringent requirements are shown or specified:
 - 1. State of Oregon "IBC".
 - 2. State of the Oregon "IMC".
 - 3. State of Oregon "UPC".
 - 4. State of Oregon "IFC".
 - 5. NFPA 13.
- B. Drawings: All drawings are diagrammatic and show general design, arrangement, and extent of the systems. Do not scale drawings for rough-in dimensions, nor use as shop drawings.
- C. Installer Qualifications: Company specializing in performing the work required with a minimum of five years documented experience.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Delivery: Deliver to site with manufacturer's labels intact and legible.
- B. Preparation for shipment:
 - 1. Each unit shall be suitably prepared for the shipment specified and for storage in accordance with manufacturer's instructions in a manner requiring no disassembly prior to operation.
 - 2. The Contractor shall be solely responsible for the adequacy of the Preparation for Shipment provisions employed with respect to materials and application.
 - 3. One complete set of Installations, Operating and Maintenance Instructions shall be packed and shipped with the equipment. This set is in addition to the sets that are to be sent directly to the Owner.
- C. Handling: Avoid damage. Comply with manufacturer's installation instruction requirements for rigging, unloading and transporting units.
- D. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping. Cap all pipe ends. Taping pipe ends is not adequate or allowable.

1.08 PROJECT CONDITIONS

- A. General: Provide products which are compatible with other portions of the work and provide products with the proper power characteristics and similar adaptations for the project.
- B. Arrangement: Arrange piping parallel with primary lines of the building construction and with a minimum 7 feet overhead clearance in unfinished equipment rooms where possible. Conceal all piping where possible unless indicated otherwise. Locate operating and control equipment properly to provide easy access for operation and maintenance. Give right-of-way to piping which must be sloped for drainage. Set all equipment level or as recommended by manufacturer.
- C. Coordination: Where several elements of the work must be sequenced and positioned in order to fit the available space, prepare shop drawings showing the actual physical dimensions (at

accurate scale) required for installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.

1.09 STANDARDS

- A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of five years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.
- B. Governing Standards: The following are typical standards generally referenced in these specifications and identified by their acronym. Factory Mutual (FM), Federal Specifications (FS), American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Manufacturer's Standardization Society of the Valve and Fitting Industry, Standard Practice (MSS SP-69), Underwriters Laboratory (UL) numbers are given.

1.10 WARRANTIES

- A. Contractor shall provide a 1 year warranty on all equipment, materials and workmanship for a period of one year from the date of owner's acceptance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

- A. Site Examination: Before starting work, carefully examine site and all Contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, rough-in dimensions and equipment locations before proceeding with any work.
- B. Utility Locations: The location of all utilities, wires, conduits, pipes, ducts, or other service facilities are shown in a general way only on the drawings and in some instances are taken from existing drawings. Ascertain whether any additional facilities other than those shown on the plans may be present and determine the exact location and elevations of all utilities prior to commencing installation.
- C. Discrepancies: Any error, conflict or discrepancy in Drawings, Specifications and/or existing conditions shall be reported immediately. Do not proceed with any questionable items of work until clarification of same has been made. Should rearrangement or re-routing of piping or ductwork be necessary, provide for approval the simplest layout possible for that particular portion of the work. Under no circumstances shall beams, girders, footings or columns be cut for mechanical items. Casting of pipes into concrete is prohibited unless so shown on Drawings.
- D. The Contractor shall cooperate with others to avoid interferences and delays in the construction work.
- E. Interference as a result of poor coordination or lack of cooperation with other trades shall be corrected at the Contractor's expense.

3.02 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1.
- B. Protection: During cutting and patching, protect adjacent installations. Provide temporary barriers to prevent the spread of dust and dirt outside of the immediate work area.

- C. Repair: Patch finished surfaces and building components using new materials to match the existing.
- D. Inspection: Upon written direction from the Architect, uncover and restore work to provide for observation of concealed work.

3.03 EQUIPMENT REMOVAL

- A. All removed equipment is the property of the Contractor unless indicated otherwise. Disconnect and remove all such equipment from the property. Cap all piping in walls, below floors, and/or above ceilings in finished rooms.
- B. Where equipment is to be reused, reconnect piping, wiring and/or controls to allow this equipment to function as it had prior to this renovation unless indicated otherwise.

3.04 MECHANICAL EQUIPMENT WIRING

- A. Provide all motor starters, control devices, and wiring complete from power source indicated on Drawings.
- B. Equipment and systems shown on the Drawings and/or specifications, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system controls for the actual selected equipment/system.

3.05 INSTALLATION

- A. Locating and Positioning Equipment: Observe all Codes and Regulations and good common practice in locating and installing equipment and material so that completed installation presents the least possible hazard. Maintain recommended clearances for repair and service to all equipment.
- B. Anchorage: Anchor and/or brace all mechanical equipment, piping and ductwork to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators.
- C. Where mounting heights or locations are not identified, install systems, equipment and materials to provide maximum headroom.
- D. Provide clearance for installation of insulation and access to valves, fittings, etc., on pipe systems.
- E. Install systems, materials and equipment giving right of way to systems required to be installed at a specific slope or operation by gravity.
- F. Installation shall be in accordance with the requirements of the equipment manufacturer, including special requirements for seismic restraints.
- G. Equipment Manufacturer's Responsibility and Services:
 - 1. A manufacturer's representative for major equipment and operating systems shall be provided as necessary to assist the Contractor during installation, and to provide written certification that the equipment has been installed as specified and in accordance with the manufacturer's representative.
 - 2. The manufacturer's representative shall provide the initial startup of equipment in the presence of the Owner.
 - a. Provide a pre-start check of all piping, valves, control devices, control panels, and equipment.
 - b. Calibrate and adjust equipment and controls for operation at the specified design and conditions.

- c. Provide a record of all startup events noting problems and their resolution.
- d. Provide a record of all set points for operational controls and devices.
- 3. Upon the completion of the equipment startup, provide instructional time with the Owner's personnel to review the operations and maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. The instructional time shall be scheduled through the Owner.
- 4. Upon completion of the inspections, startup, testing, and checkout procedures, the equipment manufacturer shall submit written notice to the Owner that the units are ready for use by the Owner. Provide a certificate of calibration for all equipment.

3.06 MOUNTING AND SHIMMING

- A. Mount and install equipment per manufacturer's recommendations. Provisions for mounting special equipment on spring isolators, snubbers, and inertia bases are specified in Division 21.
- B. Level the equipment by means of 304 stainless steel wedges (stainless steel plates and stainless steel shims). Wedge taper shall not be greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the equipment. Secure each pair of wedges in their final positions with one tack weld on each side after leveling is complete. Wedging shall be executed in a manner that will prevent a change in level or springing of the Baseplate when the anchor bolts are tightened.
 - 1. Adjust rotating equipment assemblies such that the driving units are properly aligned, plumb and level with the driven units and all interconnecting shafts and couplings.
 - 2. All rotating equipment shall be checked for proper alignment with dial indicators or laser after completion of grouting. The alignment must be within the tolerances required by the equipment manufacturer. The final alignment check shall be witnessed by the Owner.

3.07 INSPECTION

- A. The Contractor shall inspect his work to ensure the installation and workmanship is in accordance with these specifications and acceptable industry standards.
- B. All materials, equipment, and workmanship shall be subject to inspection at any time by the Owner. Contractor shall correct any work, materials, or equipment not in accordance with the Contract Documents.

3.08 SAFETY CONSIDERATIONS

- A. All equipment shall be installed with suitable access clearances that satisfy OSHA and code requirements for maintenance or removal of replaceable parts and components, and with necessary unions or flanges to perform the maintenance or removal without removing the connecting appurtenances.

3.09 CLEANING, START-UP, AND ADJUSTING

- A. The Contractors shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate start-up procedures, calibration, and system checkout with all project managers. Any system operational problems shall be diagnosed; all correctional procedures shall be initiated as required to bring out the system into compliance with the design, and the problem then shall be rechecked to verify that the system operates normally.

- B. Thoroughly clean all parts of the installation at the completion of the work. The Contractor shall clean up and remove from the premises all refuse material, crates, and rubbish arising from his work. All motors and bearings shall be lubricated in accordance with the manufacturer's service manuals prior to equipment start-up. Provide a lubrication schedule for every item of equipment furnished under this section. The schedule shall include the type of lubricant and the application frequency.

END OF SECTION

SECTION 21 05 00
FIRE PROTECTION BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, fittings, valves, and connections for sprinkler, standpipe and fire hose, and combination sprinkler and standpipe systems.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Preparation and painting of fire protection piping systems.
- B. Section 21 13 00 - Fire Suppression Sprinklers: Sprinkler systems design.

1.03 REFERENCE STANDARDS

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2010.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; 2010.
- C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 2011.
- D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 2011.
- E. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; 2009.
- F. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers; 2007.
- G. ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded; The American Society of Mechanical Engineers; 2011.
- H. ASME B16.25 - Buttwelding Ends; The American Society of Mechanical Engineers; 2012.
- I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 2009.
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- K. ASTM A135/A135M - Standard Specification for Electric-Resistance Welded Steel Pipe; 2009.
- L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2007.
- M. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2008.
- N. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2010.
- O. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- P. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

- Q. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Shop drawings shall be minimum 36 x 24 size.
- D. Project Record Documents: Record actual locations of components and tag numbering.
- E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.
- C. Conform to UL, FM, and Warnock Hersey requirements.
- D. Valves: Bear UL, FM, and Warnock Hersey label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Conform work to NFPA 13.
- B. Welding Materials and Procedures: Conform to ASME Code.

2.02 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 10, ASTM A53 Schedule 40, ASTM A135/A135M Schedule 10, ASTM A135/A135M UL listed light wall type, or ASTM A795 Schedule 40, black or galvanized.
 - 1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.5, buttweld ends, ASTM A 234/A 234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
 - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A 47/A 47M.

4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.03 FLEXIBLE SPRINKLER HOSE FITTINGS

- A. FlexHead Industries flexible sprinkler connections.

2.04 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Vertical Support: Steel riser clamp or angle ring.
- E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.05 GATE VALVES

- A. Up to and including 2 inches:
 1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.
- B. Over 2 inches:
 1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.
- C. Over 4 inches:
 1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.06 ANGLE VALVES

- A. Up to and including 2 inches:
 1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.
- B. Over 2 inches:
 1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.07 BALL VALVES

- A. Up to and including 2 inches:
 1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.

2.08 CHECK VALVES

- A. Up to and including 2 inches:
 1. Bronze body and swing disc, rubber seat, threaded ends.
- B. Over 2 inches:
 1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.

C. 4 inches and Over:

1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.09 DRAIN VALVES

A. Ball Valve:

1. Brass with cap and chain, 3/4 inch hose thread.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipes passing through partitions, walls, and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Inserts:
 1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- H. Pipe Hangers and Supports:
 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 2. Place hangers within 12 inches of each horizontal elbow.
 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 6. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 90 00.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- P. Provide gate or ball valves for shut-off or isolating service.
- Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- R. The fire sprinkler contractor shall coordinate and provide for the location of all fire sprinkler drain piping and drain receptor piping, whether or not indicated on the contract documents. The routing of low point drains to any location where there is no drain receptor is NOT acceptable.

END OF SECTION

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 21 05 00 - Fire Protection Basic Materials and Methods: Pipe, fittings, and valves.
- C. Division 26: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2010.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 3. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction and Fire Marshall for approval. Submit proof of approval to Architect/Engineer.
 - 4. Shop drawings shall be minimum 36 x 24 size.
- D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.
- F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

3. Sprinkler Wrenches: For each sprinkler type.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.
- B. Conform to UL requirements.
- C. Designer Qualifications: Design system under direct supervision of a recognized fire sprinkler contractor experienced in design of this type of work and licensed in Oregon.
- D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- E. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience approved by manufacturer.
- F. Equipment and Components: Provide products that bear UL label or marking.
- G. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

- A. Sprinkler System: Modify existing system. Provide coverage for entire building.
- B. Occupancy: Comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
 1. If test data is not available assume 2000 gpm at 20 psig.
 2. Revise design when test data available prior to submittals.
- D. Interface system with building fire and smoke alarm system.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- F. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners.

2.02 SPRINKLERS

- A. Suspended Ceiling Type: Recessed pendant type with matching push on escutcheon plate.
 1. Manufacturers:
 - a. Grinnell (GEM): www.simplexgrinnell.com.
 - b. Reliable: www.reliablesprinkler.com.
 - c. Central.
 2. Response Type: Quick or Standard.
 3. Coverage Type: Standard or Extended.
 4. Finish: Chrome plated.
 5. Escutcheon Plate Finish: Chrome plated.
 6. Fusible Link: Fusible solder link type or Glass bulb type, temperature rated for specific area hazard.
- B. Exposed Area Type: Standard type .
 1. Manufacturers:
 - a. Grinnell (GEM) Model "A": www.simplexgrinnell.com.
 - b. Central.

- c. Reliable: www.reliablesprinkler.com.
 - 2. Response Type: Quick or Standard.
 - 3. Coverage Type: Standard or Extended.
 - 4. Finish: Brass.
 - 5. Fusible Link: Fusible solder link type or Glass bulb type, temperature rated for specific area hazard.
- C. Sidewall Type: Recessed horizontal sidewall type with matching push on escutcheon plate.
- 1. Manufacturers:
 - a. Grinnell (GEM) Model "A", Universal Sidewall: www.simplexgrinnell.com.
 - b. Central.
 - c. Reliable: www.reliablesprinkler.com.
 - 2. Response Type: Quick or Standard.
 - 3. Coverage Type: Standard or Extended.
 - 4. Finish: Chrome plated.
 - 5. Escutcheon Plate Finish: Chrome plated.
 - 6. Fusible Link: Fusible solder link type or Glass bulb type, temperature rated for specific area hazard.
- D. Dry Sprinklers: Recessed pendant type with matching push on escutcheon plate.
- 1. Manufacturers:
 - a. Central.
 - b. Grinnell (BEW): www.simplexgrinnell.com.
 - c. Reliable: www.reliablesprinkler.com.
 - 2. Response Type: Quick or Standard.
 - 3. Coverage Type: Standard or Extended.
 - 4. Finish: Brass.
 - 5. Escutcheon Plate Finish: Brass.
 - 6. Fusible Link: Fusible solder link type or Glass bulb type, temperature rated for specific area hazard.

2.03 PIPING SPECIALTIES

- A. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC. Grinnell Model VSR-1.
- B. Supervisory Switches: As manufactured by Grinnell OSYSU-1 or OSYSU-2, Potter-Roemer Figure 6220, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Center sprinklers in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements.
- F. Provide oversize escutcheons on all sprinklers to allow for seismic movement.

- G. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- H. Flush entire piping system of foreign matter.
- I. Hydrostatically test entire system.
- J. Require test be witnessed by Fire Marshal and Architect/Engineer.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

3.03 START-UP AND TESTING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:
 - 1. Verify that specialty valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.
 - 2. Verify that specified tests of piping are complete.
 - 3. Check that damaged sprinkler and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
 - 4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
 - 5. Check that potable water supplies have correct type of backflow preventer.
 - 6. Check that hose valves and fire department connections have threads compatible with local fire department equipment and have correct pressure rating.
 - 7. Fill wet-pipe sprinkler systems with water.
 - 8. Energize circuits to electrical equipment and devices.
 - 9. Adjust operating controls and pressure settings.

3.04 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with at least 7 days advance notice.

END OF SECTION

SECTION 22 00 01
BASIC PLUMBING REQUIREMENTS - DESIGN BUILD

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section specifies the basic requirements for all Contractor installed equipment. It applies to all sections included in Division 22.
- B. Contractor shall provide complete engineering calculations and design of the plumbing system satisfying the direction and criteria of this specification and all other supporting documents and drawings.
- C. Provide all materials, labor and equipment required to install a complete and fully operational plumbing system as indicated by the contract drawings and this specification.
- D. Contractor shall not compromise or diminish any existing building system, service or function in his execution of the work. Any such potential impacts shall be immediately brought to the attention of the Architect/Engineer.
- E. The plumbing work scope includes, but is not necessarily limited to the following.
 - 1. Install work per all applicable codes and the design criteria contained herein.
 - 2. All water, waste, vent, storm and gas piping, including valves and fittings required for connection of all fixtures and devices shown on the architectural plans.
 - 3. Provide adequate isolation valves to allow maintenance without shut down of more than 20% of the occupant facilities at one time.
 - 4. Provide floor drains at water heaters, backflow devices and all other locations where conditions or equipment result in wet floors.
 - 5. Provide exterior hose hydrant at all entrances.
 - 6. Central, electric, domestic hot water heating system.
- F. Obtain and pay for all permits, licenses, fees and taxes applicable to this project as required by law.
- G. Cooperate with other trades in furnishing material and information required for installation and operation of mechanical items.
- H. Requirements for the following are included:
 - 1. Related work (other Contract Documents and specification sections) that must be combined with the requirements of this Section.
 - 2. Design performance.
 - 3. Delivery, storage, and handling.
 - 4. Quality assurance and standards.
 - 5. Submittals.
 - 6. Product quality, basic type, and finishes.
 - 7. Equipment identification.
 - 8. Design criteria.
 - 9. Excavation and backfill.
 - 10. Installation.
 - 11. Mounting and shimming.
 - 12. Inspection.
 - 13. Safety considerations.
 - 14. Cleaning, startup, and adjustments.

1.02 RELATED WORK

- A. This general section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the project equipment and systems:

1. Division 1 sections included in this Project specifications.
2. The Contract.
3. General and specific mechanical specifications and drawings included in the project.
4. Section 07 90 00 - Joint Protection.
5. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

CAUTION: Use of this Section without including all of the above listed items will result in omission of basic requirements.

1.03 DEFINITIONS

- A. "Indicated": Refers to graphic representations, notes or schedules in the Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents.
1. Terms such as "shown", "noted", "scheduled", and "specified", are used to notify or help the user to locate reference. Location is not limited.
- B. "Directed": Terms such as "directed", "Requested", "authorized", "selected", "approved", "required", and "permitted" mean directed by Architect/Engineer, approved by Architect/Engineer and similar phrases.
- C. "Approved": When used in conjunction with Architect/Engineer's action on contract submittals, applications, requests, is limited to Architect/Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- D. "Regulations": Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of Work.
- E. "Furnish": Means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.
- F. "Install": Describes operations at Project site including actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, supporting, isolating, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.
- G. "Provide": Means to furnish and install.
- H. "Installer": A contractor, or another entity engaged by the contractor, either as an employee, subcontractor, or contractor of a lower tier, to perform a particular construction activity including installation, erection, application or similar operations.
1. Installers are required to be experienced in operations they are engaged to perform.
 2. The term "experience" means having successfully completed a minimum of three previous projects similar in scope and size to this Project and within the time frame indicated in the "Quality Assurance" section of the Specifications. In addition, it means being familiar with special requirements indicated and having complied with requirements of authorities having jurisdiction.
- I. "Project Site": Is defined as the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project.

1.04 DESIGN PERFORMANCE

- A. Compliance by the Contractor and/or Vendor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, mechanically suited to meet operating guarantees at the specified service conditions.

1.05 SUBMITTALS

- A. Product Data: Submit five complete sets of manufacturer's product data in a three ring binder for approval. Literature submitted shall clearly indicate the reference specification number, model number, capacity, rated operating conditions, size, weight, support requirements, electrical power requirements, utility (fuel, air, cooling water, etc.) requirements, and options furnished. Submittals shall include, but are not necessarily limited to the following;
 - 1. Plumbing: Piping and insulation; Plumbing fixtures, including trim; insulation; valves; hangers and supports; equipment bases; isolators; water heaters; pumps and the like.
 - 2. Calculations: Provide for sizing of all utility services, including waste, water, and gas; water heater sizing; pumps head and flow sizing for all systems; thermal expansion and seismic restraints; and all other calculations consistent with good engineering practice. Include design criteria used and assumptions made.
- B. Operation and Maintenance Data: Submit three complete sets of manufacturer's literature bound in a three ring binder for approval. Data shall include installation, start-up, and maintenance instructions, parts lists, and wiring diagrams.
- C. Substitutions: System design was based upon the equipment and materials listed on the drawings and specifications herein. At contractor's option, another manufacturer's equipment of similar quality, capacity and features may be submitted for prior approval per Section 01 33 00. Prior permission to substitute does not relieve the contractor of the responsibility of including this information in the bound submittal packages.

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the latest versions of the following codes, standards and specifications, except where more stringent requirements are shown or specified:
 - 1. State of Oregon "IBC".
 - 2. State of Oregon "IMC".
 - 3. State of Oregon "UPC".
 - 4. State of Oregon "IFC".
 - 5. ANSI B31.9 "Building Service Piping".
 - 6. SMACNA - "HVAC Duct Construction Standards".
 - 7. NFPA - Sections 54 and 90B.
- B. Drawings: All drawings are diagrammatic and show general design, arrangement, and extent of the systems. Do not scale drawings for rough-in dimensions, nor use as shop drawings.
- C. Installer Qualifications: Company specializing in performing the work required with a minimum of five years documented experience.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Delivery: Deliver to site with manufacturer's labels intact and legible.
- B. Preparation for shipment:
 - 1. Each unit shall be suitably prepared for the shipment specified and for storage in accordance with manufacturer's instructions in a manner requiring no disassembly prior to operation.

2. The Contractor shall be solely responsible for the adequacy of the Preparation for Shipment provisions employed with respect to materials and application.
 3. One complete set of Installations, Operating and Maintenance Instructions shall be packed and shipped with the equipment. This set is in addition to the sets that are to be sent directly to the Owner.
- C. Handling: Avoid damage. Comply with manufacturer's installation instruction requirements for rigging, unloading and transporting units.
 - D. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping. Cap all pipe ends. Taping pipe ends is not adequate or allowable.

1.08 PROJECT CONDITIONS

- A. General: Provide products that are compatible with other portions of the work and provide products with the proper power characteristics and similar adaptations for the project.
- B. Arrangement: Arrange piping parallel with primary lines of the building construction and with a minimum 7 feet overhead clearance in unfinished equipment rooms where possible. Conceal all piping and ductwork where possible unless indicated otherwise. Locate operating and control equipment properly to provide easy access for operation and maintenance. Give right-of-way to piping which must be sloped for drainage. Set all equipment level or as recommended by manufacturer.
- C. Coordination: Where several elements of the work must be sequenced and positioned in order to fit the available space, prepare shop drawings showing the actual physical dimensions (at accurate scale) required for installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.

1.09 STANDARDS

- A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of five years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.
- B. Governing Standards: The following are typical standards generally referenced in these specifications and identified by their acronym. Federal Specifications (FS), American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Manufacturer's Standardization Society of the Valve and Fitting Industry, Standard Practice (MSS SP-69), Cast Iron Soil Pipe Institute (CISPI), Underwriters Laboratory (UL) numbers are given.

1.10 WARRANTIES

- A. Contractor shall provide a 1-year warranty on all equipment, materials and workmanship for a period of one year from the date of owner's acceptance.

1.11 EXTRA MATERIALS

- A. Provide three sets of faucet service kits for each type.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

- A. Site Examination: Before starting work, carefully examine site and all Contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, rough-in dimensions and equipment locations before proceeding with any work.
- B. Utility Locations: All on-site utilities to be new. See civil.
- C. Discrepancies: Any error, conflict or discrepancy in Specifications and/or existing conditions shall be reported immediately. Do not proceed with any questionable items of work until clarification of same has been made. Under no circumstances shall beams, girders, footings, or columns be cut for mechanical items. Casting of pipes into concrete is prohibited.

3.02 DESIGN CRITERIA

- A. Plumbing:
 - 1. Maximum domestic water piping velocity is to be 7 feet per second for cold water and 5 feet per second for hot water.
 - 2. Size vent and sanitary waste in accordance with UPC.
 - 3. Size storm drainage as required in accordance with UPC.
 - 4. Size water heater(s) in accordance with ASHRAE and ASPE recommendations.
 - 5. Provide pumped hot water recirculation, as required, capable of supplying hot water to all fixtures within 15 seconds.

3.03 EXCAVATION AND BACKFILL

- A. General: Perform all necessary excavation and backfill required for the installation of mechanical work. Any piping or other work damaged by the Contractor's operations shall be repaired at the Contractor's expense.
- B. Water: Keep all excavations free of standing water. Excavations damaged or softened by water or frost shall be reexcavated and filled back to original level with approved material at the Contractor's expense.
- C. Test: During the progress of the work for compacted fill, the Owner reserves the right to request compaction tests made under the direction of a testing laboratory.
- D. Trench Excavation: Excavate trenches to the necessary depth and width, removing rocks, unstable soil (silt, peat, etc.) roots and stumps. Width of trench shall be adequate for proper installation of piping or conduit.
- E. Foundation and Bedding:
 - 1. Proper preparation of foundation, placement of foundation material where required, and placement of bedding material shall precede the installation of the pipe. This shall include leveling of the trench bottom as well as placement and compaction of required bedding material to a uniform grade so that piping rests upon continuous and uniform bedding.
 - 2. Where excavation has been made below the required grade, the Contractor shall provide, place and compact suitable bedding material to restore the proper grade elevation.
- F. Provide tracer wire over top of piping.
 - 1. Construction:
 - a. Conductor: Solid or stranded copper per spec ASTM B-1.

- b. Insulation: High Molecular Weight Polyethylene (HMWPE) ASTM D-1248. Various insulation colors dependant on usage.
- c. Temperature: 70 degrees C dry and wet.
- d. Voltage: 20 and 30 Mil = 30 to 300 volts. 45 Mil = 600 volts.
- G. Backfilling: Upon acceptance of installed piping systems, trenches shall be backfilled in lifts. Backfill material shall be placed and compacted in lifts not to exceed 6 inches in depth to a height of 1 inch above the top of trench. Backfill shall be placed to obtain contact with the entire periphery of the pipe without disturbing pipe placement.
- H. Compaction: One of the following methods or combination thereof shall be required: (1) Mechanical Tamper, and (2) Vibratory Compactor. Compaction shall be sufficient to attain 95% of maximum density at optimum moisture content. Water "puddling" or "washing" is prohibited.
- I. Bedding/Backfill Material: Where native material has been removed, necessary foundation material consisting of 3/4 inch minus crushed rock or fill sand shall be placed and compacted to form a firm base of the required thickness. Backfill material shall be the same. Follow the pipe manufacturer's installation instructions when specified materials are specifically prohibited.

3.04 EQUIPMENT REMOVAL (NOT USED)

3.05 MECHANICAL EQUIPMENT WIRING

- A. Provide all motor starters, control devices, and wiring complete from power source indicated on Drawings.
- B. Equipment and systems shown on the Drawings and/or specified, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system controls for the actual selected equipment/system.

3.06 INSTALLATION

- A. Provide clearance for installation of insulation and access to valves, fittings, damper actuators, etc. on pipe and duct systems.
- B. Provide condensate drain piping to over nearest floor drain for all coils, furnaces, boilers, domestic water heaters and the likes.
- C. Flush clean and disinfect domestic water system.
- D. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers, and escutcheons.
- E. Locating and Positioning Equipment: Observe all Codes and Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain recommended clearances for repair and service to all equipment.
- F. Installation shall be in accordance with the requirements of the equipment manufacturer, including special requirements for seismic restraints.
- G. Equipment Manufacturer's Responsibility and Services:
 - 1. A manufacturer's representative for major equipment and operating systems shall be provided as necessary to assist the Contractor during installation, and to provide written

certification that the equipment has been installed as specified and in accordance with the manufacturer's representative.

2. The manufacturer's representative shall provide the initial startup of equipment in the presence of the Owner.
 - a. Provide a pre-start check of all piping, valves, control devices, control panels, and equipment.
 - b. Calibrate and adjust equipment and controls for operation at the specified design and conditions.
 - c. Provide a record of all startup events noting problems and their resolution.
 - d. Provide a record of all set points for operational controls and devices.
 3. Upon the completion of the equipment startup, provide instructional time with the Owner's personnel to review the operations and maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. The instructional time shall be scheduled through the Owner.
 4. Upon completion of the inspections, startup, testing, and checkout procedures, the equipment manufacturer shall submit written notice to the Owner that the units are ready for use by the Owner. Provide a certificate of calibration for all equipment.
- H. Anchorage: Anchor and/or brace all mechanical equipment, piping and ductwork to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators.

3.07 MOUNTING AND SHIMMING

- A. Mount equipment as shown on the Drawings. Provisions for mounting special equipment on spring isolators, snubbers, and inertia bases are specified in Section 22 05 48, Vibration Isolation and Sound and Seismic Controls for Plumbing Piping and Equipment.
- B. Level the equipment by means of 304 stainless steel wedges (stainless steel plates and stainless steel shims) or PVC/poly wedges in areas of extreme corrosive environments. Wedge taper shall not be greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the equipment. Secure each pair of wedges in their final positions with one tack weld on each side after leveling is complete. Wedging shall be executed in a manner that will prevent a change in level or springing of the Baseplate when the anchor bolts are tightened.
 1. Adjust rotating equipment assemblies such that the driving units are properly aligned, plumb and level with the driven units and all interconnecting shafts and couplings.
 2. All rotating equipment shall be checked for proper alignment with dial indicators or laser after completion of grouting. The alignment must be within the tolerances required by the equipment manufacturer. The final alignment check shall be witnessed by the Owner.

3.08 INSPECTION

- A. The Contractor shall inspect his work to ensure the installation and workmanship is in accordance with these specifications and acceptable industry standards for the work being done.
- B. All materials, equipment, and workmanship shall be subject to inspection at any time by the Owner. Contractor shall correct any work, materials, or equipment not in accordance with the Contract Documents.

3.09 SAFETY CONSIDERATIONS

- A. All equipment shall be installed with suitable access clearances that satisfy OSHA and code requirements for maintenance or removal of replaceable parts and components, and with

necessary inions or flanges to perform the maintenance or removal without removing the connecting appurtenances.

- B. Where equipment requiring periodic maintenance cannot be reached by normal walkways because of interference with ductwork, piping, or other obstructions the Contractor shall notify the Owner and propose an alternate safe means of access. These may include construction of an overhead platform with stairway or ladder ends and safety railings or handholds, or walk-through duct plenums with hinged access doors, or as required to meet OSHA standards for safe maintenance procedures.

3.10 CLEANING, START-UP, AND ADJUSTING

- A. The Contractors shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate start-up procedures, calibration, and system checkout with all project managers. Any system operational problems shall be diagnosed; all correctional procedures shall be initiated as required to bring out the system into compliance with the design, and the problem then shall be rechecked to verify that the system operates normally.
- B. Thoroughly clean all parts of the installation at the completion of the work. The Contractor shall clean up and remove from the premises all refuse material, crates, and rubbish arising from his work. Remove, clean, and reinstall all filters. Belt-drive tensions and alignments shall be checked. All motors and bearings shall be lubricated in accordance with the manufacturer's service manuals prior to equipment start-up. Provide a lubrication schedule for every item of equipment furnished under this section. The schedule shall include the type of lubricant and the application frequency.

END OF SECTION

SECTION 22 05 19
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pressure gages and pressure gage taps.
- B. Thermometers and thermometer wells.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2013.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
- C. Project Record Documents: Record actual locations of components and instrumentation.
- D. Operation and Maintenance Data: Section 01 70 00.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements. for additional provisions.
 - 2. Supply two bottles of red gage oil for static pressure gages.
 - 3. Supply two pressure gages with pulsation damper and two dial thermometers.

1.05 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAGES

- A. Manufacturers:
 - 1. Weksler; Model 401: www.weksler-gauges.com.
 - 2. Trerice; Model 700 Series: www.trerice.com.
 - 3. Ametek (U.S. Gauge); Model Series 540: www.ametekusg.com.
 - 4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Pressure Gages: ASME B40.100, drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1. Case: Steel with brass bourdon tube.
 - 2. Size: 4-1/2 inch diameter.
 - 3. Mid-Scale Accuracy: One percent.
 - 4. Scale: Psi and KPa.

2.02 PRESSURE GAGE TAPPINGS

- A. Manufacturers:
 - 1. Weksler: www.weksler-gauges.com.
 - 2. Trerice : www.trerice.com.
 - 3. Ametek (U.S. Gauge): www.ametekusg.com.
 - 4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gage Cock: Tee or lever handle, brass for maximum 150 psi.
 - 1. Product: Series A manufactured by Weksler.
- C. Ball Valve: Brass 1/4 inch NPT cock, for 200 psi. Lever handle.
 - 1. Product: A12 manufactured by Weksler, or approved equal.
- D. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
 - 1. Product: BBV4 manufactured by Weksler.
- E. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
 - 1. Product: WG41/WG42 manufactured by Weksler.
- F. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.
 - 1. Product: AO31 manufactured by Weksler.

2.03 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Weksler Glass Thermometer Corp; Model AS5N: www.wekslerglass.com.
 - 2. Trerice; Model A00: www.trerice.com.
 - 3. Ametek (U.S. Gauge); Model Fig. MN: www.ametekusg.com.
 - 4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear glass.
 - 3. Stem: 3/4 inch brass.
 - 4. Accuracy: 2 percent, per ASTM E77.
 - 5. Calibration: Degrees F and Degrees C.
- C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear glass.
 - 3. Stem: 3/4 inch NPT brass.
 - 4. Accuracy: 2 percent, per ASTM E77.
 - 5. Calibration: Degrees F and Degrees C.

2.04 DIAL THERMOMETERS

- A. Manufacturers:
 - 1. Weksler Glass Thermometer Corp; Model 5AA: www.wekslerglass.com.
 - 2. Trerice; Model B8560: www.trerice.com.

3. Ametek (U.S. Gauge); Model Series 6000: www.ametekusg.com.
 4. Other approved manufacturers: Ashcroft, Marshalltown, Weiss.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
1. Size: 5 inch diameter dial.
 2. Lens: Clear glass.
 3. Accuracy: 1 percent.
 4. Calibration: Degrees F and Degrees C.

2.05 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.06 TEST PLUGS

- A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.
- B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.
- C. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Viton core for temperatures up to 400 degrees F.
- D. Test Kit: Carrying case, internally padded and fitted containing two 3-1/2 inch diameter pressure gages, two gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.
- C. Install pressure gages with pulsation dampers. Provide needle valve to isolate each gage. Extend nipples to allow clearance from insulation.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- E. Coil and conceal excess capillary on remote element instruments.
- F. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- G. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- H. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- I. Locate test plugs adjacent to pressure gages and pressure gage taps.

3.02 SCHEDULES

A. Pressure Gages, Location and Scale Range:

1. Pumps, 0 to 100 psi.
2. Expansion tanks, 0 to 100 psi.

B. Stem Type Thermometers, Location and Scale Range:

1. Domestic hot water supply and recirculation, 0 to 150 degrees F.

END OF SECTION

SECTION 22 05 49
PLUMBING SEISMIC RESTRAINT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Seismic restraint of equipment and piping.

1.02 RELATED SECTIONS

- A. Section 22 00 00 - Basic Plumbing Requirements.
- B. Section 22 07 19 - Plumbing Piping Insulation.
- C. Section 22 10 05 - Plumbing Piping.
- D. Section 22 30 00 - Plumbing Equipment.
- E. Section 22 40 00 - Plumbing Fixtures.

1.03 QUALITY ASSURANCE

- A. Seismic Restraints:
 - 1. The Anchorage and/or seismic restraint of permanent equipment and associated systems listed below shall be designed to resist the total design seismic forces prescribed in the latest edition of the International Building Code.
 - a. All floor or roof-mounted equipment weighing 400 lbs or greater.
 - b. All suspended or wall-mounted equipment weighing 20 lbs or greater.
 - c. All vibration-isolated equipment weighing 20 lbs or greater.
 - d. All gas piping systems throughout the building.
 - e. All piping 1 1/4 inches nominal diameter and larger located in boiler, mechanical equipment and refrigeration mechanical rooms.
 - f. All piping 2 1/2 inches nominal diameter and larger.
 - g. Pipes, electrical conduit and ducts supported by a trapeze where none of those elements would individually require bracing, require bracing when the combined operating weight of all elements supported by the trapeze is 10 lbs/ft or greater.
 - B. All calculations shall be in accordance with Chapter 16 of the latest edition of the International Building Code.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 30 00:
 - 1. All anchorage and seismic restraints shall be designed and stamped by a professional engineer licensed in the state of the project location. Design shall include:
 - a. Number, size and location of anchors for floor or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both the unit to the curb and the curb to the structure. In addition, provide calculations or test data verifying the curb can accept the seismic loads.
 - b. Number, size and location of seismic restraint devices and anchors for vibration-isolated and suspended equipment. Provide calculations or test data verifying the horizontal and vertical ratings of the seismic restraint devices.
 - c. Number, size and location of braces and anchors for suspended piping and ductwork on shop drawings. In addition:
 - 1) The contractor must select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the International

- Building Code such as the 1999 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork and Electrical Systems.
- 2) Details or designs from separate seismic restraint guidelines are not acceptable. Installations not addressed by the selected system must be designed, detailed and submitted along with the shop drawings.
 - 3) Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional engineer licensed in the state of the project location who designed the layout of the braces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Amber Booth.
- B. Mason Industries, Inc.
- C. Kinetics Corporation.
- D. Vibrex.
- E. Substitutions: Under provisions of Section 01 60 00.

2.02 SEISMIC RESTRAINTS

A. General Requirements:

1. Seismic restraints shall be provided for all equipment, both supported and suspended, piping as listed above.
2. Bracing of piping shall be in accordance with provisions set forth in SMACNA seismic restraint manual.
3. Structural requirements for restraints, including their attachment to building structure, shall be reviewed and approved by the structural engineer.
4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment Products:

1. Seismic restraints shall consist of interlocking steel members restrained by shock absorbent neoprene materials compounded to bridge bearing specifications as previously noted in paragraph 1.03. Elastomeric materials shall be replaceable and be a minimum 3/4-inch thick. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8-inch, nor more than 1/4-inch. Type 1 - Seismic Snubbers: All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. The snubber shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type Z-1225 or Z-1011.
2. Each snubber shall be capable of restraint in all three mutually orthogonal directions. Type 2 - Seismic Sway Braces - Seismic sway braces shall consist of galvanized steel aircraft cables or steel angles/channels. Cables braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads with a minimum safety factor of 2. Brace end connections shall be steel assemblies that swivel to the final installation angle. Do not mix cable and steel braces to brace the same system or equipment. Steel angles, when required, shall be clamped to the threaded

hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps. Sway braces shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type SCB, SSB, SRC and UC.

3. Submittals shall include load versus deflection curves up to 1/2-inch on the x, y and z planes.
4. Mason Model Z-1011

C. Bracing of Pipes:

1. Provide seismic bracing of all piping as detailed below. (Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced).
 - a. Brace all gas piping.
 - b. Brace all piping located in boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that is 1-1/4-inch nominal diameter and larger.
 - c. Brace all pipes 2-1/2-inch nominal diameter and larger.
2. For all gas piping, as specified in 1(a) the bracing details, schedules, and notes may be used, except that transverse bracing shall be at 20 feet maximum, and longitudinal bracing shall be at 40 feet maximum.
3. Seismic braces for pipes on trapeze hangers may be used.
4. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints or where rigidly supported pipes connect to equipment with vibration isolators. For threaded piping, the flexibility may be provided by the installation of swing joints.
5. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12 inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints shall be braced or stabilized between floors.
6. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high, all risers shall be engineered individually.

D. Suspended Equipment and Piping:

1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable and the specified vibration isolation hanger with an added nut and neoprene and steel washer. The cable resists lateral and downward motion. The modified vibration hanger resists upward motion.
2. Cable attachment details, cable size, and the neoprene and steel washers shall be sized by the manufacturer and are to be indicated in the Shop Drawings.
3. Provide detailed Shop Drawings for approval in sufficient time to allow structural attachment work to be incorporated into the normal work sequence.

PART 3 EXECUTION

3.01 SEISMIC RESTRAINTS

A. General:

1. Install and adjust seismic restraints so that the equipment, piping, and ductwork supports are not degraded by the restraints.
2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:

1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.

2. Care must be taken so that a minimum 1/8-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:

1. Branch lines may not be used to brace main lines.
2. Transverse bracing shall be at 40 feet maximum except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes.
3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity equal to or greater than a longitudinal brace. The longitudinal braces and connections must be capable of resisting the additional force induced by expansion and contraction.
4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.

D. Suspended Equipment and Piping Cable Method:

1. Cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. Uplift and downward restraint nuts and washers for the Type HST hangers shall be adjusted so that there is a minimum 1/4-inch clearance.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.
- D. Labels.
- E. Lockout devices.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Safety Sign Company: www.safetysignco.com.
- C. Seton Identification Products: www.seton.com/aec.
- D. Substitutions: Not permitted.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: Black.
 - 2. Letter Height: 1/2 inch.
 - 3. Background Color: Yellow.
 - 4. Plastic: Conform to ASTM D709.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.05 LABELS

- A. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.

2.06 LOCKOUT DEVICES

- A. Lockout Hasps:
 - 1. Manufacturers:
 - a. Anodized aluminum or reinforced nylon hasp with erasable label surface; size minimum 7-1/4 x 3 inches.
- B. Valve Lockout Devices:
 - 1. Steel device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify pumps, heat transfer equipment, tanks, and water treatment devices with 8 x 4 inch plastic nameplates or 2 inch stencil painting. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.

- H. Identify valves in main and branch piping with tags.
- I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 09 90 00 - Painting and Coating: Painting insulation jacket.
- C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2013.
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2012.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
- B. Materials shall not contain pentabrominated diphenyl ethers (PBDEs) in amounts greater than allowed by Oregon law.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. Knauf Insulation; Pipe Insulation ASJ-SSL: www.knaufusa.com.
 - 2. Johns Manville; Micro-Lok: www.jm.com.
 - 3. Owens Corning Corp: www.owenscorning.com.
 - 4. CertainTeed Corporation: www.certainteed.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: ASTM C547 ; rigid molded, noncombustible.
 - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 850 degrees F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 ; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 650 degrees F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Vapor Barrier Lap Adhesive:
 - 1. Compatible with insulation.
- G. Insulating Cement/Mastic:
 - 1. ASTM C195; hydraulic setting on mineral wool.
- H. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- I. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Outdoor Breather Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

- K. Insulating Cement:
 - 1. ASTM C449/C449M.

2.03 JACKETS

- A. PVC Plastic:
 - 1. Manufacturers:
 - a. Johns Manville; Zeston 2000: www.jm.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 20 mil.
 - e. Connections: Brush on welding adhesive.
 - 3. Covering Adhesive Mastic:
 - a. Compatible with insulation.
- B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
 - 1. Lagging Adhesive:
 - a. Compatible with insulation.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Manufacturers:
 - a. Childers Products Co.: www.fosterproducts.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Thickness: 0.016 inch sheet.
 - 3. Finish: Embossed.
 - 4. Joining: Longitudinal slip joints and 2 inch laps.
 - 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch wide; 0.02 inch thick aluminum.
- D. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
 - 1. Thickness: 0.010 inch.
 - 2. Finish: Smooth.
 - 3. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Glass Fiber, Rigid, Insulation:
 - 1) Pipe Size Range: Under 2 inch.
 - 2) Thickness: 1 inch.
 - 3) Pipe Size Range: Over 2 inch.
 - 4) Thickness: 1-1/2 inch.
 - 2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch.
 - 3. Domestic Cold Water:
 - a. Glass Fiber, Rigid, Insulation:
 - 1) Pipe Size Range: 1 inch and under.
 - 2) Thickness: 1/2 inch.
 - 3) Pipe Size Range: Over 1 inch.
 - 4) Thickness: 1 inch.

4. Roof Drain Bodies: Flexible Duct Wrap with multi-purpose, foil-scrim-kraft jacket. Use tie-wire to secure in place. Minimum thickness: 1 inch.
5. Roof Drainage Within 10 Feet of the Exterior:
 - a. Glass Fiber, Rigid, Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch.
6. Roof Drainage Run Horizontal at Roof Level:
 - a. Glass Fiber, Rigid, Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch.

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Storm water.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels.
- C. Section 09 90 00 - Painting and Coating.
- D. Section 22 00 00 - Basic Plumbing Requirements - Design Build.
- E. Section 22 05 49 - Plumbing Seismic Restraint.
- F. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- G. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- D. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2014 (ANSI/ASME B31.9).
- E. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2013.
- F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; The American Society of Mechanical Engineers; 2013.
- G. ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Distribution Systems; The American Society of Sanitary Engineering; 2009.
- H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- I. ASTM B1 - Standard Specification for Hard-Drawn Copper Wire; 2007.
- J. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- K. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- M. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2004 (Reapproved 2011).

- N. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
 - O. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
 - P. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2009).
 - Q. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
 - R. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.
 - S. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
 - T. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2014.
 - U. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core; 2012.
 - V. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
 - W. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2009.
 - X. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2011
 - Y. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
 - Z. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
 - AA. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
 - AB. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
 - AC. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
 - AD. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
 - AE. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2013.
 - AF. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
 - AG. NSF 61 - Drinking Water System Components - Health Effects; 2014.
- 1.04 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- D. Project Record Documents: Record actual locations of valves.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Valve Repacking Kits: Two for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with all applicable local codes and standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) .
- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, water pressure rating.

1.06 REGULATORY REQUIREMENTS

- A. Perform work in accordance with applicable plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Store pipe on sleepers, a minimum of 4 inches above surrounding grade, at all times.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies. Mission Heavyweight, Husky 4000, Clamp-All 120 system, or approved.
- B. ABS Pipe: ASTM D2751 or ASTM F628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. ABS Pipe: ASTM D2751 or ASTM F628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.04 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies. Mission Heavyweight, Husky 4000, Clamp-All 120 system, or approved.
- B. ABS Pipe: ASTM D2680 or ASTM D2751.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.05 STORM WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. ABS Pipe: ASTM D2680 or ASTM D2751.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.06 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.07 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Tolco Inc.
2. Anvil.
3. Hubbard Enterprises/Holdrite.
4. Michigan Hanger Company, Inc.
5. PHD Manufacturing Co.
6. Superstrut.
7. Unistrut.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - a. Cold and Hot Pipe Sizes 6 Inches and Over: Double hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.
5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

C. Plumbing Piping - Drain, Waste, and Vent:

1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
4. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
6. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
8. Use non-metallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
9. For vertical midspan support of piping 4 inches and under, use Hubbard Enterprises/Holdrite Stout Bracket in conjunction with Hubbard Enterprises/Holdrite Stout Clamp or industry standard two-hole pipe clamp (MSS Type 26).
10. Secondary Pipe Positioning and Supports:
 - a. Makeshift, field-devised methods of plumbing pipe support, such as the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of

engineered methods that comply with IAPMO PS 42-96. These are to be Hubbard Enterprises/Holdrite support systems or approved equal.

E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.
7. Manufacturers:
 - a. Powers Fasteners, Inc.: www.powers.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 ACCESSORIES

A. Hanger Rods: Mild steel, threaded both ends, threaded on one end, or continuous threaded.

2.09 INSERTS

A. Manufacturers:

1. Anvil Fig. 281.
2. PHD Fig 951.
3. Michigan Hanger Model 355EG.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Inserts: Carbon steel case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.10 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel.

B. Metal Counterflashing: 22 gage thick galvanized steel.

C. Lead Flashing:

1. Waterproofing: 5 lb./sq.ft. sheet lead
2. Soundproofing: 1 lb./sq.ft. sheet lead.

D. Flexible Flashing: 1.85 inch thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.11 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors and Walls.

1. ProSet
2. Hilti

B. ASTM E-184 Sleeves for Pipes Through Rated Floors and Walls.

1. ProSet "Firestop Penetrators".
2. Hilti "Firestop" Systems.

C. Sealant: Acrylic; refer to Section 07 92 00 - Joint Sealant.

2.12 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Thunderline Link-Seal, Inc. Model Series LS.
2. NMP Corporation.

3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.13 FORMED STEEL CHANNEL

- A. Manufacturers:
 1. Unistrut Model Series P1000.
 2. Superstrut Model Series 1200.
 3. Michigan Hanger "O-Strut" Model A-12.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.14 FIRESTOPPING

- A. Manufacturers:
 1. Specified Technology Inc. (STI) Model SpecSeal Series 100.
 2. Dow Corning Corp.
 3. Hilti Corp.
 4. International Protective Coating Corp.
 5. 3M fire Protection Products.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 1. Silicone Firestopping Elastomeric Firestopping: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
 2. Foam Firestopping Compounds: Single or Multiple component foam compound.
 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 7. Firestop Pillows: Formed mineral fiber pillows.
- C. Color: As selected from manufacturer's full range of colors.

2.15 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
 1. Mineral fiberboard.
 2. Mineral fiber matting.
 3. Sheet metal.
 4. Plywood or particle board.

- 5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
 - 1. Furnish UL listed products.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
 - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 - 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.16 GATE VALVES

- A. Manufacturers:
 - 1. Hammond Valve Co.; Model IB640: www.hammondvalve.com.
 - 2. Nibco, Inc.; T-111: www.nibco.com.
 - 3. Milwaukee Valve Company; Model 148: www.milwaukeevalve.com.
 - 4. Stockham; Model B-100: www.stockham.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Up To and Including 3 Inches:
 - 1. MSS SP-80, Class 150, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

2.17 BALL VALVES

- A. Manufacturers:
 - 1. Hammond Valve Co.; Model 8501: www.hammondvalve.com.
 - 2. Nibco, Inc.; T-FP-600: www.nibco.com.
 - 3. Watts; Model FBV-1: www.watts.com.
 - 4. Stockham; Model S216-BR-R-T: www.stockham.com.
 - 5. Apollo; Model 70-100: www.conbraco.com.
 - 6. Milwaukee Valve Company; Model BA-125: www.milwaukeevalve.com.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Up to and including 3 inches:
 - 1. MSS SP 110, Class 150, 600 WOG, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle solder or threaded ends.

2.18 FLOW CONTROLS

- A. Manufacturers:
 - 1. ITT Bell & Gossett: www.bellgossett.com.
 - 2. Griswold Controls: www.griswoldcontrols.com.
 - 3. Taco, Inc.: www.taco-hvac.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.19 SWING CHECK VALVES

A. Manufacturers:

1. Hammond Valve; Model IB940: www.hammondvalve.com.
2. Nibco, Inc.; T-413: www.nibco.com.
3. Stockham; Model B-320: www.stockham.com.
4. Milwaukee Valve Company; Model F-2974: www.milwaukeevalve.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 3 Inches:

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

C. Over 3 Inches:

1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged ends.

2.20 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Hammond Valve; IR9354: www.hammondvalve.com.
2. Nibco, Inc.; Model F-910: www.nibco.com.
3. Milwaukee Valve Company; Model Series 1800: www.milwaukeevalve.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Class 125, globe style, iron body, bronze trim, stainless steel springs, bronze disc, seals, lug style ends.

2.21 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Watts Regulator Company: www.wattsregulator.com.
2. Cash-Acme: www.cashacme.com.
3. Zurn/Wilkins: www.zurn.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 2 Inches:

1. ASSE 1003, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:

1. ASSE 1003, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.22 RELIEF VALVES

A. Pressure Relief:

1. Manufacturers:

- a. Watts Regulator Company: www.wattsregulator.com.
 - b. Cash-Acme: www.cashacme.com.
 - c. Zurn/Wilkins: www.zurn.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:

1. Manufacturers:

- a. Watts Regulator Company: www.wattsregulator.com.

- b. Cash-Acme: www.cashacme.com.
 - c. Zurn/Wilkins: www.zurn.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.23 STRAINERS

- A. Manufacturers:
 - 1. Watts Regulator Company: www.wattsregulator.com.
 - 2. Hammond Valve: www.hammondvalve.com.
 - 3. Milwaukee Valve Company: www.milwaukeevalve.com.
 - 4. Apollo: www.conbraco.com.
 - 5. Stockham: www.stockham.com.
 - 6. Nibco, Inc.: www.nibco.com.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Size 2 inch and Under:
 - 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
 - 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 1-1/2 inch to 4 inch:
 - 1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.

- I. Establish elevations of buried piping outside the building to ensure not less than 2 ft of cover.
- J. Provide tracer wire over top of piping.
 - 1. Construction:
 - a. Conductor: Solid or stranded copper per spec ASTM B-1.
 - b. Insulation: High Molecular Weight Polyethylene (HMWPE) ASTM D-1248. Various insulation colors dependant on usage.
 - c. Temperature: 70 degrees C dry and wet.
 - d. Voltage: 20 and 30 Mil = 30 to 300 volts. 45 Mil = 600 volts.
- K. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- M. Provide support for utility meters in accordance with requirements of utility companies.
- N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- O. Excavate in accordance with specifications.
- P. Backfill in accordance with specifications.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Install water piping to ASME B31.9.
- S. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- T. Sleeve pipes passing through partitions, walls and floors.
- U. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. For pipe runs of 1 inch or less and ran high and tight to the structure, use Hubbard Enterprises/Holdrite #121 or #125 Series Brackets in conjunction with Hubbard Enterprises/Holdrite #260 or #400 Series Inserts or approved equal.
 - 6. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- V. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

8. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation.
11. Support cast iron drainage piping at every joint.
12. Support of pipe tubing and equipment is to be accomplished by means of engineered products specific to each application. Makeshift field devised methods will not be allowed.

3.04 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. Solder adapters to pipe.
- C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install ball valves for throttling, bypass, or manual flow control services.
- E. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

- A. Use existing 1 1/2 inch water service and existing 4 inch sanitary sewer main. Repair pipe "belly" on existing sanitary main.

END OF SECTION

SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof and floor drains.
- B. Cleanouts.
- C. Backflow preventers.
- D. Water hammer arrestors.
- E. Thermostatic mixing valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 40 00 - Plumbing Fixtures.
- C. Section 22 30 00 - Plumbing Equipment.
- D. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).
- C. ASME A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers; 2003.
- D. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2009 (ANSI/ASSE 1012).
- E. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Certificates: Certify that grease interceptors meet or exceed specified requirements.
- E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- F. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, and trap primers.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 DRAINS

A. Roof Drains: (RD-1)

1. Manufacturers:
 - a. Zurn Industries, Inc.: www.zurn.com.
 - b. Wade: www.wadedrains.com.
 - c. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - d. MIFAB Inc.: Model : www.mifab.com
 - e. Sioux Chief; Model 868-i: www.siuoxchief.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
2. Assembly: ASME A112.6.4.
3. Body: Lacquered cast iron with sump.
4. Strainer: Removable cast iron dome with vandal proof screws.
5. Accessories: Coordinate with roofing type, refer to Section _____:
 - a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
 - d. Waterproofing flange.
 - e. Controlled flow weir.
 - f. Leveling frame.
 - g. Adjustable extension sleeve for roof insulation.
 - h. Perforated or slotted ballast guard extension for inverted roof.
 - i. Perforated stainless steel ballast guard extension.

B. Roof Overflow Drains: (OD-1)

1. Manufacturers:
 - a. Zurn Industries, Inc.: www.zurn.com.
 - b. MIFAB Inc.: www.mifab.com.
 - c. Wade: www.wadedrains.com.
 - d. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - e. Sioux Chief; Model 868-istp2: www.siuoxchief.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
2. Lacquered cast iron body and clamp collar ; pipe extended to 2 inches above flood elevation.
3. Accessories: Coordinate with roofing type, refer to Architectural specifications.
 - a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
 - d. Waterproofing flange.
 - e. Controlled flow weir.
 - f. Leveling frame.
 - g. Adjustable extension sleeve for roof insulation.
 - h. Perforated or slotted ballast guard extension for inverted roof.
 - i. Perforated stainless steel ballast guard extension.

C. Downspout Nozzles:

1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company; Model 1770: www.jayrsmith.com.
 - b. MIFAB Inc.: www.mifab.com.
 - c. Wade: www.wadedrains.com.
 - d. Zurn Industries, Inc.: www.zurn.com.
 - e. Sioux Chief: www.sioxchief.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
2. Bronze round with offset bottom section.

D. Floor Drain (FD-1):

1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company; Model 2005-A/2005-B: www.jayrsmith.com.
 - b. MIFAB Inc.: www.mifab.com.
 - c. Wade: www.wadedrains.com.
 - d. Zurn Industries, Inc.: www.zurn.com.
 - e. Sioux Chief Finish Line; Model 833-NR/833-NQ: www.sioxchief.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

E. Floor Drain (FD-2):

1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company; Model 2110/2130: www.jayrsmith.com.
 - b. MIFAB Inc.: www.mifab.com.
 - c. Wade: www.wadedrains.com.
 - d. Zurn Industries, Inc.: www.zurn.com.
 - e. Sioux Chief Finish Line; Model 860-i: www.sioxchief.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable cast iron strainer with acid resistant coating.

F. Floor Sink (FS-1):

1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - b. MIFAB Inc.: www.mifab.com.
 - c. Wade: www.wadedrains.com.
 - d. Zurn Industries, Inc.: www.zurn.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Lacquered cast iron body with dome strainer and seepage flange.

2.02 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. MIFAB Inc.: www.mifab.com.
3. Wade: www.wadedrains.com.
4. Zurn Industries, Inc.: www.zurn.com.
5. Sioux Chief Finish Line: www.sioxchief.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas (CO-1):

1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company; Model 4250: www.jayrsmith.com.
 - b. Sioux Chief; Model 834-DNR: www.siouxchief.com.
2. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Interior Finished Floor Areas (CO-3):
 1. Lacquered cast iron body with anchor flange, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- D. Cleanouts at Interior Finished Wall Areas (CO-4):
 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.03 BACKFLOW PREVENTERS

- A. Manufacturers:
 1. Febco: www.febcoonline.com.
 2. Zurn Industries, Inc.: www.zurn.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reduced Pressure Backflow Preventers:
 1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.04 DOUBLE CHECK VALVE ASSEMBLIES

- A. Manufacturers:
 1. Febco: www.febcoonline.com.
 2. Zurn Industries, Inc.: www.zurn.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Double Check Valve Assemblies:
 1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.05 WATER HAMMER ARRESTORS

- A. Manufacturers:
 1. Jay R. Smith Manufacturing Company; Model Hydrotol: www.jayrsmith.com.
 2. MIFAB Inc.: www.mifab.com.
 3. Zurn Industries, Inc.: www.zurn.com.
 4. Precision Plumbing Products, Inc.: www.ppcinc.net.
 5. Sioux Chief: www.siouxchief.com.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Water Hammer Arrestors:
 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.06 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:
 - a. Powers: www.powerscontrols.com.
 - b. Leonard Valve Company: www.leonardvalve.com.
 - c. Symmons Industries, Inc.: www.symmons.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
3. Cabinet: 16 gage enameled steel, for surface mounting with keyed lock.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- E. Pipe relief from backflow preventer to nearest drain.
- F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories and sinks .
- G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

END OF SECTION

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water heaters.
- B. Expansion Tanks.
- C. Pumps.
 - 1. Circulators.

1.02 RELATED REQUIREMENTS

- A. Section 22 05 48 - Vibration Isolation and Sound and Seismic Controls for Plumbing Piping.
- B. Division 26: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2013.
- B. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
 - 1. Indicate heat exchanger dimensions, size of tappings, and performance data.
 - 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- D. Project Record Documents: Record actual locations of components.
- E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Pump Seals: Two of each type and size.

1.05 QUALITY ASSURANCE

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

- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 CERTIFICATIONS

- A. Water Heaters: NSF approved.
- B. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.
- C. Electric Water Heaters: UL listed and labeled to UL 174.
- D. Water Tanks: ASME labeled, to ASME (BPV VIII, 1).
- E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters, water storage tanks, packaged water heating systems, in-line circulator, submersible sump pumps, sump pumps, and sewage ejectors.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

- A. A.O. Smith Water Products Co.; Model DEN/DEL: www.hotwater.com.
- B. Bradford-White: www.bradfordwhite.com.
- C. Rheem Manufacturing Company: www.rheem.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMMERCIAL ELECTRIC WATER HEATERS

- A. Type: Factory-assembled and wired, electric, vertical storage.
- B. Electrical Characteristics:
 - 1. Refer to Division 26.
- C. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber or polyurethane encased in corrosion-resistant steel jacket; baked-on enamel finish.
- D. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
- E. Accessories: Provide:
 - 1. Water connections: Brass.
 - 2. Dip tube.
 - 3. Drain Valve.
 - 4. Anode: Magnesium.

- 5. Temperature and Pressure Relief Valve: ASME labelled.
- F. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

2.03 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc.: www.amtrol.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc.: www.taco-hvac.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge as indicated on drawings.

2.04 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 - 1. Armstrong Pumps Inc.: www.armstrongpumps.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc.: www.taco-hvac.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.
- G. Performance:
 - 1. Electrical Characteristics:
 - a. Refer to Division 26.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.
- C. Domestic Water Storage Tanks:
 - 1. Provide steel pipe support, independent of building structural framing members.
 - 2. Clean and flush after installation. Seal until pipe connections are made.
- D. Pumps:
 - 1. Provide air cock and drain connection on horizontal pump casings.
 - 2. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.

3. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
4. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework: Preparation of counters for sinks; lavatory tops.
- B. Section 07 90 05 - Joint Sealers: Seal fixtures to walls and floors.
- C. Section 22 10 05 - Plumbing Piping.
- D. Section 22 10 06 - Plumbing Piping Specialties.
- E. Section 22 30 00 - Plumbing Equipment.
- F. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- B. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units; 2005.
- C. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2009.
- D. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.
- E. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- F. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2012.
- G. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2011).
- H. ASME A112.19.2 - Ceramic Plumbing Fixtures; The American Society of Mechanical Engineers; 2013.
- I. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008 (R2013).
- J. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

- C. Samples: Submit two lavatory supply fittings.
- D. Manufacturer's Instructions: Indicate installation methods and procedures.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Faucet Washers: One set of each type and size.
 - 3. Extra Lavatory Supply Fittings: One set of each type and size.
 - 4. Extra Toilet Seats: One of each type and size.
 - 5. Flush Valve Service Kits: One for each type and size.

1.05 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of this section with minimum three years experience.

1.07 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.08 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept fixtures on site in factory packaging. Inspect for damage.
- C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.10 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 TANK TYPE WATER CLOSET (STANDARD AND ACCESSIBLE COMMERCIAL) WC-1

- A. Manufacturers:
 - 1. American Standard Model 211aa.104 "Champion Pro".

2. Kohler Model K-3422 "Wellworth".
3. Toto.
4. Substitutions: Section 01 60 00 - Product Requirements.
5. Bowl: ASME A112.19.2M; floor mounted, siphon jet, vitreous china, 12 inch rough-in, 2-3/8 inch fully glazed trapway, 16.5 inches high close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps vandal proof cover locking device. 1.28 gallon flush volume.
6. Seat: Solid white plastic, open front, extended back, brass bolts, without cover. American Standard Model 5901.110.020 "Laurel".
7. Floor Flange: Provide with brass bolts and rubber gasket.

2.02 WALL HUNG URINALS (STANDARD) UR-1

A. Manufacturers:

1. American Standard Model 6590.001 "Washbrook, Flowise".
2. Kohler Model K-4960-ET "Bardon".
3. Toto.
4. Substitutions: Section 01 60 00 - Product Requirements.
5. Urinal: ASME A112.19.2M; vitreous china, wall hung washout urinal with shields, integral trap, provide with American Standard Model 7301242-100 stainless steel strainer, 3/4 inch top spud, steel supporting hangers.
6. Exposed Flush Valve: ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, integral screwdriver stop, maximum 1 gallon flush volume. Sloan Royal #186-1.
7. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.
8. Urinal Cleanout: Cast iron body ferrule, threaded brass counter sunk cleanout plug, vandal proof stainless steel screw, stainless steel wall access cover.

2.03 WALL HUNG URINALS (ACCESSIBLE) UR-2

A. Manufacturers:

1. American Standard Model 6590.001 "Washbrook Flowise".
2. Kohler Model K-4960-ET "Bardon".
3. Toto.
4. Substitutions: Section 01 60 00 - Product Requirements.
5. Urinal: ASME A112.19.2M; vitreous china, wall hung washout urinal with shields, integral trap, stainless steel strainer, 3/4 inch top spud, steel supporting hangers. Provide with American Standard Model 7301242-100 strainer.
6. Exposed Flush Valve: ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, integral screwdriver stop; maximum 1 gallon flush volume. Sloan Royal #186-1.
7. Wall Mounted Carrier: ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.
8. Urinal Cleanout: Cast iron body ferrule, threaded brass counter sunk cleanout plug, vandal proof stainless steel screw, stainless steel wall access cover.

2.04 LAVATORIES (COUNTER MOUNT): ADA: LV-1

A. Manufacturers:

1. American Standard Model 0476.028 "Aqualyn".
2. Kohler Model K-2196-4 "Pennington".
3. Toto.

4. Substitutions: Section 01 60 00 - Product Requirements.
5. Vitreous China Counter Top Basin: ASME A112.19.2M; vitreous china self-rimming counter top lavatory, 20 x 17 inches with drillings on 4 inch centers, front overflow, seal of putty, caulking, or concealed vinyl gasket.
6. Metered Faucet: ASME A112.18.1; chrome plated metered mixing faucet with battery operated solenoid operator and infrared sensor, aerator and cover plate, inlet filter screen and open grid strainer. Delta 590 Series, Symmons Model S-6080-G "Ultra-Sense", Moen Model 8305 "FreeHand", Sloan Model EBF-85, Chicago Model Series 680.
7. Accessories:
 - a. Drain: open grid, chrome plated cast brass one piece top, 1/16 inch thick, tubular 1-1/4 inch tailpiece.
 - b. P-trap: 1-1/4 inch, 17 gage chrome plated brass with clean-out plug, box flange.
 - c. Supplies: chrome plated brass, heavy duty angle stop, 1/2 inch inlet by 3 inch long rigid horizontal nipple, combination vandal proof loose key handle, escutcheon.
 - d. Provide pop up waste on residential lavatories.
 - e. Rigid supplies.
 - f. Trap and waste insulated and offset to meet ADA compliance.
 - g. Brasscraft, Speedway, Eastman or McGuire.
 - h. Thermostatic mixing valve for electronic metered faucet(s). Provide Delta Model R2300-MIX, Symmons Model S-120-CK-NI, Sloan Model MIX-60/70 with recessed 16 gauge, galvanized steel access cabinet and 12 gauge hinged and lockable access door, Speakman Model G20-2030.

2.05 SERVICE SINK (MS-1)

- A. Manufacturers:
 1. Stern-Williams Model HL-1800.
 2. Mustee.
 3. Fiat.
 4. Substitutions: Section 01 60 00 - Product Requirements.
 5. Bowl: 24 x 24 x 12 inch high molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.
 6. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges. Cambridge/Delta Model 28T9, Moen Model 8230, Chicago Model 897, Speakman Model SC-5812-RCP.
 7. Accessories:
 - a. 5 feet of 1/2 inch diameter plain end reinforced rubber hose.
 - b. Hose clamp hanger.
 - c. Mop hanger.

2.06 SINKS (SINGLE COMPARTMENT, ADA) S-1

- A. Manufacturers:
 1. Just Model Series SL, "Stylist Group ADA Compliant".
 2. Elkay Model Series LRAD, "Lustertone"
 3. Moen.
 4. Substitutions: Section 01 60 00 - Product Requirements.
 5. Single Compartment Bowl: ASME A112.19.3; 22 x 22 x 6 inch outside dimensions, 18 gage thick, Type 304 stainless steel. Self-rimming and undercoated, with 1-1/2 inch chromed brass drain, 3-1/2 inch crumb cup and tailpiece, ledge back drilled for trim.

6. Trim: ASME A112.18.1; chrome plated brass supply with 8 inch swing spout, vandal proof water economy aerator with maximum 2.2 gpm flow, single lever handle. Delta Model 100-WFELHHDF, Symmons Model S-23-2, Moen Model 8710, Chicago Model 2300-8 "Marathon", Speakman Model SC-3762.
7. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, screwdriver stop, rigid supplies.

2.07 LAVATORY INSULATION KIT

A. Manufacturers:

1. Product Description: Where Lavatories are noted to be insulated for ADA compliance, provide the following: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white or gray color, for insulating tailpiece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- C. Verify that electric power is available and of the correct characteristics.
- D. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install work in accordance with all applicable codes.
- B. Install each fixture with trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall carriers and bolts.
- F. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.
- G. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- H. For ADA accessible water closets, install flush valve with handle to wide side of stall.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Section 01 70 00 - Execution Requirements: Testing, adjusting, and balancing.

- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.07 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Water Closet:
 - a. Standard: 15 inches to top of bowl rim.
 - b. Accessible: 18 inches to top of seat.
 - 2. Water Closet Flush Valves:
 - a. Standard: 11 inches min. above bowl rim.
 - b. Recessed: 10 inches min. above bowl rim.
 - 3. Urinal:
 - a. Standard: 22 inches to top of bowl rim.
 - b. Accessible: 17 inches to top of bowl rim.
 - 4. Lavatory:
 - a. Standard: 31 inches to top of basin rim.
 - b. Accessible: 34 inches to top of basin rim.

END OF SECTION

SECTION 23 00 01
BASIC HVAC REQUIREMENTS - DESIGN BUILD

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section specifies the basic requirements for all Contractor design and installed equipment. It applies to all sections included in Division 23.
- B. Contractor shall provide complete engineering calculations and design of the HVAC systems satisfying the direction and criteria of this specification and all other supporting documents and drawings.
- C. Provide the design and all materials, labor and equipment required to install a complete and fully operational HVAC systems as indicated by the contract drawings and this specification.
- D. Contractor shall not compromise or diminish any existing building system, service or function in his execution of the work. Any such potential impacts shall be immediately brought to the attention of the Architect/Engineer.
- E. The HVAC work scope includes, but is not necessarily limited to the following:
 - 1. Install work per all applicable codes and the design criteria contained herein.
 - 2. Provide gas-fired condensing furnaces for classrooms, offices, and work spaces. Provide cooling for computer room. Provide space for future cooling coil for other units.
 - 3. Provide continuous corridor and restroom ventilation and exhaust for 15 people at 20 cfm/person.
 - 4. Provide restroom exhaust.
 - 5. Provide ceiling fans for general circulation.
 - 6. Provide gas-fired heating and ventilating/make-up air unit for the 3D Printers/Polymers Shop. Provide general room exhaust. Provide source specific exhaust for the laser engraver.
 - 7. Provide exhaust at all locations subject to the build-up of temperature, humidity or odors.
- F. Obtain and pay for all permits, licenses, fees and taxes applicable to this project as required by law.
- G. Cooperate with other trades in furnishing material and information required for installation and operation of mechanical items.
- H. Requirements for the following are included:
 - 1. Related work (other Contract Documents and specification sections) that must be combined with the requirements of this Section.
 - 2. Design performance.
 - 3. Delivery, storage, and handling.
 - 4. Quality assurance and standards.
 - 5. Submittals.
 - 6. Product quality, basic type, and finishes.
 - 7. Equipment identification.
 - 8. Design criteria.
 - 9. Excavation and backfill.
 - 10. Installation.
 - 11. Mounting and shimming.
 - 12. Inspection.

13. Safety considerations.
14. Cleaning, startup, and adjustments.

1.02 RELATED WORK

- A. This general section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the project equipment and systems:
1. Division 1 sections included in this Project specifications.
 2. The Contract.
 3. General and specific mechanical specifications and drawings included in the project.
 4. Section 07 90 00 - Joint Sealants.
 5. Section 23 05 53 - Identification for HVAC Piping and Equipment.

CAUTION: Use of this Section without including all of the above listed items will result in omission of basic requirements.

1.03 DEFINITIONS

- A. "Indicated": Refers to graphic representations, notes or schedules in the Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents.
1. Terms such as "shown", "noted", "scheduled", and "specified", are used to notify or help the user to locate reference. Location is not limited.
- B. "Directed": Terms such as "directed", "Requested", "authorized", "selected", "approved", "required", and "permitted" mean directed by Architect/Engineer, approved by Architect/Engineer and similar phrases.
- C. "Approved": When used in conjunction with Architect/Engineer's action on contract submittals, applications, requests, is limited to Architect/Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- D. "Regulations": Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of Work.
- E. "Furnish": Means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.
- F. "Install": Describes operations at Project site including actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, supporting, isolating, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.
- G. "Provide": Means to furnish and install.
- H. "Installer": A contractor, or another entity engaged by the contractor, either as an employee, subcontractor, or contractor of a lower tier, to perform a particular construction activity including installation, erection, application or similar operations.
1. Installers are required to be experienced in operations they are engaged to perform.
 2. The term "experience" means having successfully completed a minimum of three previous projects similar in scope and size to this Project and within the time frame indicated in the "Quality Assurance" section of the Specifications. In addition, it means being familiar with special requirements indicated and having complied with requirements of authorities having jurisdiction.

- I. "Project Site": Is defined as the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project.

1.04 DESIGN PERFORMANCE

- A. Compliance by the Contractor and/or Vendor with the provisions of this Specification does not relieve him of the responsibilities of furnishing equipment and materials of proper design, mechanically suited to meet operating guarantees at the specified service conditions.

1.05 SUBMITTALS

- A. Product Data: Submit five complete sets of manufacturer's product data in a three ring binder for approval. Literature submitted shall clearly indicate the model number, capacity, rated operating conditions, size, weight, support requirements, electrical power requirements, utility (fuel, air, cooling water, etc.) requirements, and options furnished. Submittals shall include, but are not necessarily limited to the following;
 - 1. HVAC: Furnaces, make-up air unit, fans; piping; valves; supports and anchors; louvers; grilles; diffusers; controls and the like.
 - 2. Calculations: Provide for sizing of all utility services, including; heating and cooling loads; thermal expansion and seismic restraints; ventilation load calculations and all other calculations consistent with good engineering practice. Include design criteria used and assumptions made.
- B. Operation and Maintenance Data: Submit three complete sets of manufacturer's literature bound in a three ring binder for approval. Data shall include installation, start-up, and maintenance instructions, parts lists, and wiring diagrams.
- C. Substitutions: System design was based upon the equipment and materials listed on the drawings and specifications herein. At contractor's option, another manufacturer's equipment of similar quality, capacity and features may be submitted for prior approval per Section 01 33 00. Prior permission to substitute does not relieve the contractor of the responsibility of including this information in the bound submittal packages.
- D. Air Balancing Report: Provide five written reports stating the design air and hydronic flow requirements per, air inlet and air outlet and the final adjusted airflow volume for the same.

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the latest versions of the following codes, standards and specifications, except where more stringent requirements are shown or specified:
 - 1. State of Oregon "IBC".
 - 2. State of Oregon "IMC".
 - 3. State of Oregon "UPC".
 - 4. State of Oregon "IFC".
 - 5. ANSI B31.9 "Building Service Piping".
 - 6. SMACNA - "HVAC Duct Construction Standards".
 - 7. NFPA - Sections 54 and 90B.
- B. Drawings: Any drawings provided are diagrammatic and show general intent, arrangement, and extent of the systems. Do not scale drawings for rough-in dimensions, nor use as shop drawings.
- C. Installer Qualifications: Company specializing in performing the work required with a minimum of five years documented experience.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Delivery: Deliver to site with manufacturer's labels intact and legible.
- B. Preparation for shipment:
 - 1. Each unit shall be suitably prepared for the shipment specified and for storage in accordance with manufacturer's instructions in a manner requiring no disassembly prior to operation.
 - 2. The Contractor shall be solely responsible for the adequacy of the Preparation for Shipment provisions employed with respect to materials and application.
 - 3. One complete set of Installations, Operating and Maintenance Instructions shall be packed and shipped with the equipment. This set is in addition to the sets that are to be sent directly to the Owner.
- C. Handling: Avoid damage. Comply with manufacturer's installation instruction requirements for rigging, unloading and transporting units.
- D. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping. Cap all pipe ends. Taping pipe ends is not adequate or allowable.

1.08 PROJECT CONDITIONS

- A. General: Provide products that are compatible with other portions of the work and provide products with the proper power characteristics and similar adaptations for the project.
- B. Arrangement: Arrange ductwork and piping parallel with primary lines of the building construction and with a minimum 7 feet overhead clearance in unfinished equipment rooms where possible. Conceal all piping and ductwork where possible unless indicated otherwise. Locate operating and control equipment properly to provide easy access for operation and maintenance. Give right-of-way to piping which must be sloped for drainage. Set all equipment level or as recommended by manufacturer.
- C. Coordination: Where several elements of the work must be sequenced and positioned in order to fit the available space, prepare shop drawings showing the actual physical dimensions (at accurate scale) required for installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.

1.09 STANDARDS

- A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of five years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.
- B. Governing Standards: The following are typical standards generally referenced in these specifications and identified by their acronym. Federal Specifications (FS), American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Manufacturer's Standardization Society of the Valve and Fitting Industry, Standard Practice (MSS SP-69), Cast Iron Soil Pipe Institute (CISPI), Underwriters Laboratory (UL) numbers are given.

1.10 WARRANTIES

- A. Contractor shall provide a 1-year warranty on all equipment, materials and workmanship for a period of one year from the date of owner's acceptance.
- B. Provide five-year warranty on all refrigeration compressors.

1.11 EXTRA MATERIALS

- A. Provide one set of spare filters for each furnace unit.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

- A. Site Examination: Before starting work, carefully examine site and all Contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, rough-in dimensions and equipment locations before proceeding with any work.
- B. Utility Locations: All on-site utilities to be new. See Civil.
- C. Discrepancies: Any error, conflict or discrepancy in Specifications and/or existing conditions shall be reported immediately. Do not proceed with any questionable items of work until clarification of same has been made. Under no circumstances shall beams, girders, footings, or columns be cut for mechanical items. Casting of pipes into concrete is prohibited.

3.02 DESIGN CRITERIA

- A. HVAC:
 - 1. Summer design temperature shall be 95 degrees F DB/67WB.
 - 2. Prepare design load calculations in accordance with ASHRAE fundamentals, Carrier, Trane, or other approved computer load program.
 - 3. Provide 10% safety on cooling load and 20% safety on heating load calculations, including outside air ventilation.
 - 4. Supply air duct system shall meet current SMACNA recommendations for 1 inch WC construction.
 - 5. Noise levels within occupied areas of the building shall not exceed noise criteria (NC) levels of 25.
 - 6. Friction loss within the duct system shall not exceed 0.10 inches WC/100 ft.

3.03 EQUIPMENT REMOVAL (NOT USED)

3.04 MECHANICAL EQUIPMENT WIRING

- A. Provide all motor starters, control devices, and wiring complete from power source indicated on Drawings.
- B. Equipment and systems shown on the Drawings and/or specified, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system controls for the actual selected equipment/system.

3.05 INSTALLATION

- A. Provide clearance for installation of insulation and access to valves, fittings, damper actuators, etc. on pipe and duct systems.
- B. Provide condensate drain piping to over nearest floor drain for all coils, furnaces, domestic water heaters and the likes.
- C. Provide sheaves required for final air balance. Balance all HVAC systems to provide the amount of air indicated at each diffuser, grille or register.

- D. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and the fan has been test run under observation.
- E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- F. Locating and Positioning Equipment: Observe all Codes and Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain recommended clearances for repair and service to all equipment.
- G. Installation shall be in accordance with the requirements of the equipment manufacturer, including special requirements for seismic restraints.
- H. Equipment Manufacturer's Responsibility and Services:
 - 1. A manufacturer's representative for major equipment and operating systems shall be provided as necessary to assist the Contractor during installation, and to provide written certification that the equipment has been installed as specified and in accordance with the manufacturer's representative.
 - 2. The manufacturer's representative shall provide the initial startup of equipment in the presence of the Owner.
 - a. Provide a pre-start check of all piping, valves, control devices, control panels, and equipment.
 - b. Calibrate and adjust equipment and controls for operation at the specified design and conditions.
 - c. Provide a record of all startup events noting problems and their resolution.
 - d. Provide a record of all set points for operational controls and devices.
 - 3. Upon the completion of the equipment startup, provide instructional time with the Owner's personnel to review the operations and maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. The instructional time shall be scheduled through the Owner.
 - 4. Upon completion of the inspections, startup, testing, and checkout procedures, the equipment manufacturer shall submit written notice to the Owner that the units are ready for use by the Owner. Provide a certificate of calibration for all equipment.
- I. Anchorage: Anchor and/or brace all mechanical equipment, piping and ductwork to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators.

3.06 MOUNTING AND SHIMMING

- A. Mount equipment as shown on the Drawings. Provisions for mounting special equipment on spring isolators, snubbers, and inertia bases are specified in Section 23 05 48, Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.
- B. Level the equipment by means of 304 stainless steel wedges (stainless steel plates and stainless steel shims) or PVC/poly wedges in areas of extreme corrosive environments. Wedge taper shall not be greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the equipment. Secure each pair of wedges in their final positions with one tack weld on each side after leveling is complete. Wedging shall be executed in a manner that will prevent a change in level or springing of the Baseplate when the anchor bolts are tightened.
 - 1. Adjust rotating equipment assemblies such that the driving units are properly aligned, plumb and level with the driven units and all interconnecting shafts and couplings.

2. All rotating equipment shall be checked for proper alignment with dial indicators or laser after completion of grouting. The alignment must be within the tolerances required by the equipment manufacturer. The final alignment check shall be witnessed by the Owner.

3.07 INSPECTION

- A. The Contractor shall inspect his work to ensure the installation and workmanship is in accordance with these specifications and acceptable industry standards for the work being done.
- B. All materials, equipment, and workmanship shall be subject to inspection at any time by the Owner. Contractor shall correct any work, materials, or equipment not in accordance with the Contract Documents.

3.08 SAFETY CONSIDERATIONS

- A. All equipment shall be installed with suitable access clearances that satisfy OSHA and code requirements for maintenance or removal of replaceable parts and components, and with necessary inions or flanges to perform the maintenance or removal without removing the connecting appurtenances.
- B. Where equipment requiring periodic maintenance cannot be reached by normal walkways because of interference with ductwork, piping, or other obstructions the Contractor shall notify the Owner and propose an alternate safe means of access. These may include construction of an overhead platform with stairway or ladder ends and safety railings or handholds, or walk-through duct plenums with hinged access doors, or as required to meet OSHA standards for safe maintenance procedures.

3.09 CLEANING, START-UP, AND ADJUSTING

- A. The Contractors shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate start-up procedures, calibration, and system checkout with all project managers. Any system operational problems shall be diagnosed; all correctional procedures shall be initiated as required to bring out the system into compliance with the design, and the problem then shall be rechecked to verify that the system operates normally.
- B. Thoroughly clean all parts of the installation at the completion of the work. The Contractor shall clean up and remove from the premises all refuse material, crates, and rubbish arising from his work. Remove, clean, and reinstall all filters. Belt-drive tensions and alignments shall be checked. All motors and bearings shall be lubricated in accordance with the manufacturer's service manuals prior to equipment start-up. Provide a lubrication schedule for every item of equipment furnished under this section. The schedule shall include the type of lubricant and the application frequency.

END OF SECTION

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single phase electric motors.
- B. Three phase electric motors.

1.02 RELATED REQUIREMENTS

- A. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).
- B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; Institute of Electrical and Electronic Engineers; 2004.
- C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 20 horsepower.
- D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- E. Operation Data: Include instructions for safe operating procedures.
- F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors and their accessories, with minimum three years documented product development, testing, and manufacturing experience.
- B. Conform to NFPA 70.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for motors larger than 1 horsepower.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. G.E. Model "ECM".
- B. Reliance Electric/Rockwell Automation; Model E-Master: www.reliance.com.
- C. Baldor Model "Super-E".
- D. Marathon Model "XRI".
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service: Refer to Division 26 for required electrical characteristics.
- B. Nominal Efficiency:
- C. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 40 degrees C environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 - 4. Motors with frame sizes 254T and larger: Energy Efficient Type.
- D. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.
- E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor.
- F. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

- A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
- B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.
- C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
- D. Single phase motors for fans, pumps, and blowers: Capacitor start type.
- E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.
- F. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

- G. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.
- H. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.05 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.06 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.07 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.

- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26 29 13.
- I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- J. Sound Power Levels: To NEMA MG 1.
- K. Part Winding Start Above 254T Frame Size: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.
- L. Weatherproof Epoxy Motors: Epoxy seal windings using vacuum and pressure or coat windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.
- N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

3.02 SCHEDULE

- A. NEMA Open Motor Service Factors.
 - 1. 1/6-1/3 hp:
 - a. 3600 rpm: 1.35.
 - b. 1800 rpm: 1.35.
 - c. 1200 rpm: 1.35.
 - d. 900 rpm: 1.35.
 - 2. 1/2 hp:
 - a. 3600 rpm: 1.25.
 - b. 1800 rpm: 1.25.
 - c. 1200 rpm: 1.25.
 - d. 900 rpm: 1.15.
 - 3. 3/4 hp:
 - a. 3600 rpm: 1.25.
 - b. 1800 rpm: 1.25.
 - c. 1200 rpm: 1.15.

- d. 900 rpm: 1.15.
- 4. 1 hp:
 - a. 3600 rpm: 1.25.
 - b. 1800 rpm: 1.15.
 - c. 1200 rpm: 1.15.
 - d. 900 rpm: 1.15.
- 5. 1.5-150 hp:
 - a. 3600 rpm: 1.15.
 - b. 1800 rpm: 1.15.
 - c. 1200 rpm: 1.15.
 - d. 900 rpm: 1.15.
- B. Minimum Motor Efficiencies:
 - 1. Conform with applicable State Energy Code.

END OF SECTION

SECTION 23 05 49
HVAC SEISMIC RESTRAINT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Seismic restraint of equipment, piping and ductwork.

1.02 RELATED SECTIONS

- A. Section 23 00 00 - Basic HVAC Requirements.
- B. Section 23 31 00 - HVAC Ducts and Casings.
- C. Section 23 54 00 - Furnaces.
- D. Section 23 55 33 - Fuel-Fired Unit Heaters.

1.03 QUALITY ASSURANCE

A. Seismic Restraints:

- 1. The Anchorage and/or seismic restraint of permanent equipment and associated systems listed below shall be designed to resist the total design seismic forces prescribed in the latest edition of the International Building Code.
 - a. All floor or roof-mounted equipment weighing 400 lbs. or greater.
 - b. All suspended or wall-mounted equipment weighing 20 lbs. or greater.
 - c. All vibration-isolated equipment weighing 20 lbs. or greater.
 - d. All gas piping.
 - e. All piping 1 1/4 inches nominal diameter and larger located in boiler, mechanical equipment and refrigeration mechanical rooms.
 - f. All piping 2 1/2" inches nominal diameter and larger.
 - g. All ductwork 6 square feet and larger in cross sectional area.
 - h. All round ductwork 28 inches in diameter and larger.
 - i. Pipes, electrical conduit and ducts supported by a trapeze where none of those elements would individually require bracing, require bracing when the combined operating weight of all elements supported by the trapeze is 10 lbs/ft or greater.
- B. All calculations shall be in accordance with Chapter 16 of the latest edition of the International Building Code.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:

- 1. All anchorage and seismic restraints shall be designed and stamped by a professional engineer licensed in the state of the project location. Design shall include:
 - a. Number, size and location of anchors for floor or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both the unit to the curb and the curb to the structure. In addition, provide calculations or test data verifying the curb can accept the seismic loads.
 - b. Number, size and location of seismic restraint devices and anchors for vibration-isolated and suspended equipment. Provide calculations or test data verifying the horizontal and vertical ratings of the seismic restraint devices.
 - c. Number, size and location of braces and anchors for suspended piping and ductwork on shop drawings. In addition:
 - 1) The contractor must select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the International

- Building Code such as the 1999 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork and Electrical Systems.
- 2) Details or designs from separate seismic restraint guidelines are not acceptable. Installations not addressed by the selected system must be designed, detailed and submitted along with the shop drawings.
 - 3) Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional engineer licensed in the state of the project location who designed the layout of the braces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Amber Booth.
- B. Mason Industries, Inc.
- C. Kinetics Corporation.
- D. Vibrex.
- E. Substitutions: Under provisions of Section 01 60 00.

2.02 SEISMIC RESTRAINTS

- A. General Requirements:
 1. Seismic restraints shall be provided for all equipment, both supported and suspended, piping and ductwork as listed above.
 2. Bracing of piping and ductwork shall be in accordance with provisions set forth in SMACNA seismic restraint manual.
 3. Structural requirements for restraints, including their attachment to building structure, shall be reviewed and approved by the structural engineer.
 4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.
- B. Supported Equipment Products:
 1. Seismic restraints shall consist of interlocking steel members restrained by shock absorbent neoprene materials compounded to bridge bearing specifications as previously noted in paragraph 1.3. Elastomeric materials shall be replaceable and be a minimum 3/4-inch thick. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8-inch, nor more than 1/4-inch. Type 1 - Seismic Snubbers:
All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. The snubber shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type Z-1225 or Z-1011.
 2. Each snubber shall be capable of restraint in all three mutually orthogonal directions. Type 2 - Seismic Sway Braces - Seismic sway braces shall consist of galvanized steel aircraft cables or steel angles/channels. Cables braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads with a minimum safety factor of 2. Brace end connections shall be steel assemblies that swivel to the final installation angle. Do not mix cable and steel braces to brace the same system or equipment. Steel angles, when required, shall be clamped to the threaded

hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps. Sway braces shall be designed to accept horizontal and vertical seismic loads as defined in Section 1.03.B. Mason Type SCB, SSB, SRC and UC.

3. Submittals shall include load versus deflection curves up to 1/2-inch on the x, y and z planes.
4. Mason Model Z-1011

C. Bracing of Pipes:

1. Provide seismic bracing of all piping as detailed below. (Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced).
 - a. Brace all gas piping.
 - b. Brace all piping located in boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that is 1-1/4-inch nominal diameter and larger.
 - c. Brace all pipes 2-1/2-inch nominal diameter and larger.
2. For all gas piping, as specified in 1(a) the bracing details, schedules, and notes may be used, except that transverse bracing shall be at 20 feet maximum, and longitudinal bracing shall be at 40 feet maximum.
3. Seismic braces for pipes on trapeze hangers may be used.
4. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints or where rigidly supported pipes connect to equipment with vibration isolators. For threaded piping, the flexibility may be provided by the installation of swing joints.
5. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12 inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints shall be braced or stabilized between floors.
6. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high, all risers shall be engineered individually.

D. Bracing of Ductwork:

1. Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28 inches and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size (Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached).
2. Transverse bracing shall occur at the interval specified in the SMACNA tables or at both ends if the duct run is less than the specified interval. Transverse bracing shall be installed at each duct turn and at each end of a duct run, with a minimum of one brace at each end.
3. Longitudinal bracing shall occur at the interval specified in the SMACNA tables with at least one brace per duct run. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.

E. Suspended Equipment and Piping and Ductwork:

1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable and the specified vibration isolation hanger with an added nut and neoprene and steel washer. The cable resists lateral and downward motion. The modified vibration hanger resists upward motion.

2. Cable attachment details, cable size, and the neoprene and steel washers shall be sized by the manufacturer and are to be indicated in the Shop Drawings.
3. Provide detailed Shop Drawings for approval in sufficient time to allow structural attachment work to be incorporated into the normal work sequence.

PART 3 EXECUTION

3.01 SEISMIC RESTRAINTS

A. General:

1. Install and adjust seismic restraints so that the equipment, piping, and ductwork supports are not degraded by the restraints.
2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:

1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
2. Care must be taken so that a minimum 1/8-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:

1. Branch lines may not be used to brace main lines.
2. Transverse bracing shall be at 40 feet maximum except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes.
3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity equal to or greater than a longitudinal brace. The longitudinal braces and connections must be capable of resisting the additional force induced by expansion and contraction.
4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.

D. Bracing of Ductwork:

1. Hangers must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheet metal screws.
2. Group of ducts may be combined in larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
3. Walls, including gypsum board nonbearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.
4. Unbraced ducts shall be installed with a 6-inch minimum clearance to vertical ceiling hanger wires.

E. Suspended Equipment, Piping, and Ductwork Cable Method:

1. Cables shall be adjusted to a degree of slackness approved by the Structural Engineer.

2. Uplift and downward restraint nuts and washers for the Type HST hangers shall be adjusted so that there is a minimum 1/4-inch clearance.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.
- D. Labels.
- E. Lockout devices.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Safety Sign Company: www.safetysignco.com.
- C. Seton Identification Products: www.seton.com/aec.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: Black.
 - 2. Letter Height: 1/2 inch.
 - 3. Background Color: Yellow.
 - 4. Plastic: Conform to ASTM D709.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.05 LABELS

- A. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.

2.06 LOCKOUT DEVICES

- A. Lockout Hasps:
 - 1. Manufacturers:
 - a. Anodized aluminum or Reinforced nylon hasp with erasable label surface; size minimum 7-1/4 x 3 inches.
- B. Valve Lockout Devices:
 - 1. Steel device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with 8 x 4 inch plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Tag automatic controls, instruments, and relays. Key to control schematic.

- I. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- J. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2008.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Architect.
 - 2. Submit to the Construction Manager and HVAC controls contractor.
 - 3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
 - 5. Include at least the following in the plan:
 - a. Preface: An explanation of the intended use of the control system.
 - b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - d. Identification and types of measurement instruments to be used and their most recent calibration date.
 - e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - f. Final test report forms to be used.
 - g. Detailed step-by-step procedures for TAB work for each system and issue, including:
 - 1) Terminal flow calibration (for each terminal type).
 - 2) Diffuser proportioning.
 - 3) Branch/submain proportioning.
 - 4) Total flow calculations.
 - 5) Rechecking.
 - 6) Diversity issues.
 - h. Expected problems and solutions, etc.

- i. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
 - j. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
 - k. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
 - l. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - m. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - n. Method of checking building static and exhaust fan and/or relief damper capacity.
 - o. Proposed selection points for sound measurements and sound measurement methods.
 - p. Methods for making coil or other system plant capacity measurements, if specified.
 - q. Time schedule for TAB work to be done in phases (by floor, etc.).
 - r. Description of TAB work for areas to be built out later, if any.
 - s. Time schedule for deferred or seasonal TAB work, if specified.
 - t. False loading of systems to complete TAB work, if specified.
 - u. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - v. Interstitial cavity differential pressure measurements and calculations, if specified.
 - w. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
 - x. Procedures for formal progress reports, including scope and frequency.
 - y. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least once a week to Commissioning Authority and Construction Manager.
- E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- F. Progress Reports.
- G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- 1. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
 - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 4. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 7. Units of Measure: Report data in I-P (inch-pound) units only.
 - 8. Include the following on the title page of each report:

- a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Project altitude.
 - j. Report date.
- H. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.
- F. Pre-Qualified TAB Agencies:
 - 1. Northwest Engineering Service, Inc.
 - 2. Air Balancing Specialty.
 - 3. Pacific Air Coast Balancing.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.

6. Fans are rotating correctly.
 7. Volume dampers are in place and open.
 8. Access doors are closed and duct end caps are in place.
 9. Air outlets are installed and connected.
 10. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.
- 3.03 PREPARATION
- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.
- 3.04 ADJUSTMENT TOLERANCES
- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.
- 3.05 RECORDING AND ADJUSTING
- A. Field Logs: Maintain written logs including:
1. Running log of events and issues.
 2. Discrepancies, deficient or uncompleted work by others.
 3. Contract interpretation requests.
 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.
- 3.06 AIR SYSTEM PROCEDURE
- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.03 inches positive static pressure near the building entries.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Furnaces
 - 2. Fuel-Fired Packed Air Units
 - 3. Fans
 - 4. Air Filters

3.08 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer
 - 2. Model/Frame
 - 3. HP/BHP
 - 4. Phase, voltage, amperage; nameplate, actual, no load
 - 5. RPM
 - 6. Service factor
 - 7. Starter size, rating, heater elements
 - 8. Sheave Make/Size/Bore
- B. V-Belt Drives:
 - 1. Identification/location
 - 2. Required driven RPM
 - 3. Driven sheave, diameter and RPM

4. Belt, size and quantity
 5. Motor sheave diameter and RPM
 6. Center to center distance, maximum, minimum, and actual
- C. Air Moving Equipment:
1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Arrangement/Class/Discharge
 6. Air flow, specified and actual
 7. Return air flow, specified and actual
 8. Outside air flow, specified and actual
 9. Total static pressure (total external), specified and actual
 10. Inlet pressure
 11. Discharge pressure
 12. Sheave Make/Size/Bore
 13. Number of Belts/Make/Size
 14. Fan RPM
- D. Return Air/Outside Air:
1. Identification/location
 2. Design air flow
 3. Actual air flow
 4. Design return air flow
 5. Actual return air flow
 6. Design outside air flow
 7. Actual outside air flow
 8. Return air temperature
 9. Outside air temperature
 10. Required mixed air temperature
 11. Actual mixed air temperature
 12. Design outside/return air ratio
 13. Actual outside/return air ratio
- E. Exhaust Fans:
1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Air flow, specified and actual
 6. Total static pressure (total external), specified and actual
 7. Inlet pressure
 8. Discharge pressure
 9. Sheave Make/Size/Bore
 10. Number of Belts/Make/Size
 11. Fan RPM
- F. Duct Traverses:
1. System zone/branch

2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

G. Air Distribution Tests:

1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct Liner.
- C. Insulation jackets.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 09 90 00 - Painting and Coating: Painting insulation jackets.
- C. Section 23 05 53 - Identification for HVAC Piping and Equipment.
- D. Section 23 31 00 - HVAC Ducts and Casings: Glass mineral wool ducts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- D. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 1985 (Reapproved 2007).
- G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.
- H. ASTM C 1338 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2013.
- L. SMACNA (DCS) - HVAC Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- M. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).
- N. North American Insulation Manufacturers Association (NAIMA).
- O. National Fire Protection Association (NFPA).
- P. Underwriter's Laboratories (UL Environment).

Q. Underwriter's Laboratories Environmental (UL Environment).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section .
- C. Surface-Burning Characteristics: For insulation and related materials, UL/ULC Classified per UL 723 or meeting ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
- D. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
- E. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- F. Formaldehyde Free: Third party certified with UL Environment Validation.
- G. Biosoluble: As determined by research conducted by the International Agency for Research on Cancer (IARC) and supported by revised reports from the National Toxicology Program (NTP) and the California Office of Environmental Health Hazard Assessment. Certified by European Certification Board for Mineral Wool Products (EUCEB).
- H. Recycled Content: A minimum of 50 percent recycled glass content.
- I. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation Products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
- J. Living Building Challenge-Declare Red List Free.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

1.08 DEFINITIONS

- A. Thermal Conductivity (K value): Units of Btu-inch/hour per square foot per degree F.

- B. UL GREENGUARD: Provides independent third-party, Indoor Air Quality (IAQ) certification of products for emissions of respirable particles and Volatile Organic Compounds (VOC's), including formaldehyde and other specific product-related pollutants. Certification is based upon criteria used by EPA, OSHA, and WHO.
- C. ASJ+: All Service Jacket composed of aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film layer leaving no paper exposed.
- D. ASJ: All Service Jacket (no outer film).
- E. SSL+: Self-Sealing Lap with Advanced Closure System.
- F. SSL: Self-Sealing Lap.
- G. FSK: Foil Scrim Kraft; jacketing.
- H. PSK: Poly Scrim Kraft; jacketing.
- I. PVC: PolyVinyl Chloride.
- J. Glass Mineral Wool: Interchangeable with fiber glass, but replacing the term in the attempt to disassociate and differentiate Glass Mineral Wool from the potential health and safety of special purpose or reinforcement products that do not meet the bio solubility criteria of insulation made from glass. Rock Mineral Wool will replace the traditional Mineral Wool label. Both are used in lieu of the Mineral Mineral Wool label.
- K. Imperative 11, Red List - requires that manufacturers disclose the ingredients in their products to insure that they are free of Red List chemicals and materials. The Red List represents the "worst in class" materials, chemicals and elements known to pose serious risks to human health and the greater ecosystem.
- L. UL Environment Claims Validation (ECV): service and label tests a manufacturer's product and validates that the environmental claims they make in their marketing and packaging materials are factual. This Environmental Claims Validation (ECV) service will allow manufacturers to verify that their products contain a quantifiable amount of recycled content and, as such, help limit raw material extraction and reduce landfill waste.
- M. Recycled content - materials such as bottled glass collected at curbside or other collection sites after consumer use and/or materials used or created from one manufacturing process which are collected as scrap and placed back into another manufacturing process rather than being placed in a landfill or incinerated.
- N. Polybrominated diphenyl ethers (PBDE) such as Penta-BDE, Octa-BDE or Deca-BDE fire retardants: have been linked to adverse health effects after exposure in low concentrations.
- O. UL Classified: UL has tested and evaluated samples of the product with respect to certain properties of the product. UL Classifies products to:
 - 1. Applicable UL requirements.
 - 2. Standards for safety.
 - 3. Standards of other National and International organizations.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

2.02 GLASS MINERAL WOOL, FLEXIBLE

- A. Manufacturer:

1. Knauf Insulation; Atmosphere Duct Wrap with Ecos Technology: www.knaufusa.com.
 2. Johns Manville: www.jm.com.
 3. Owens Corning Corporation: www.ocbuildingspec.com.
 4. CertainTeed Corporation: www.certainteed.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
1. 'K' value: 0.29 at 75 degrees F, when tested in accordance with ASTM C177.
 2. Maximum Service Temperature: 250 degrees F.
 3. Maximum Water Vapor Sorption: <5.0 percent by weight per ASTM C1104.
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film (FSK).
 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Tie Wire: Annealed steel, 16 gage.

2.03 GLASS MINERAL WOOL, RIGID

- A. Manufacturer:
1. Knauf Insulation; Model; Model "Rigid Plenum Liner" W/ECOSE Technology: www.knaufusa.com.
 2. Johns Manville; Model; Model "Permacote Linacoustic R-300": www.jm.com.
 3. Owens Corning Corp: www.owenscorning.com.
 4. CertainTeed Corporation; Model "ToughGard® Rigid Liner Board": www.certainteed.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. ASTM C1071, Type II.
 2. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C177.
 3. Maximum service temperature: 250 degrees F.
 4. Maximum Water Vapor Sorption: 5.0 percent.
 5. Maximum Density: 4.25 lb/cu ft.
- C. UL/ULC Classified per UL 723. Comply with ASTM C 1071 Type I and Type II, NFPA 90A, and NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338 and meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824-"GREENGUARD Certification Program Method for Measuring Microbial Resistance ". UL/E validated to be formaldehyde free. DecaBDP Free.

2.04 INSULATION BOARD

- A. Manufacturer:
1. Knauf Insulation: w/ECOSE Technology: www.knaufusa.com.
 2. Johns Manville Corporation: www.jm.com.

3. Owens Corning Corp: www.owenscorning.com.
 4. CertainTeed Corporation: www.certainteed.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. ASTM C795.
 2. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C177.
 3. Maximum service temperature: 250 degrees F.
 4. Maximum Water Vapor Sorption: 5.0 percent.
 5. Maximum Density: 4.25 lb/cu ft.

2.05 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
 - a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M).
1. Thickness: 0.020 inch sheet.
 2. Finish: Embossed.
 3. Joining: Longitudinal slip joints and 2 inch laps.
 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.06 DUCT LINER

- A. Manufacturers:
1. Knauf Insulation; Model; Model "Atmosphere Duct Liner w/ECOSE Technology": www.knaufusa.com.
 2. Johns Manville; Model; Model "Permacote Linacoustic" or "Spiracoustic": www.jm.com.
 3. Owens Corning Corp: www.owenscorning.com.
 4. CertainTeed Corporation; Model "ToughGard® Duct Liner": www.certainteed.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: Non-corrosive, incombustible glass mineral wool complying with ASTM C 1071; mat faced air stream surface and edges coated with acrylic polymer.
1. Fungi Resistance: ASTM G 21.
 2. UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338
 3. Meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824-“GREENGUARD Certification Program Method for Measuring Microbial Resistance “
 4. DecaBDP Free.
 5. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 6. Service Temperature: Up to 250 degrees F.
 7. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 8. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.45.
 - b. 1 inch Thickness: 0.70.
 - c. 1-1/2 inches Thickness: 0.80.

- d. 2 inch Thickness: 0.85.
- C. Liner Fasteners: Galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with integral 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.
- D. Insulated ducts 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.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- F. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with mechanical fasteners and seal jacket joints with vapor barrier tape to match jacket.
 - 2. Secure board insulation without vapor barrier with mechanical fasteners (pins and speed washers).
 - 3. Install without sag on underside of duct. Use mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive or FSK tape made for duct wrap or FSK board.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- G. Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 100 percent coverage.
 - 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
 - 6. Refer to SMACNA publication, for transverse edges for velocities over 2500 fpm.

3.03 SCHEDULES

- A. Exhaust Ducts Within 10 ft of Exterior Openings:
 - 1. Flexible Glass Mineral Wool Duct Insulation: Minimum 2 inches thick or R-Value of 7.

B. Outside Air Intake Ducts:

1. Flexible Glass Mineral Wool Duct Insulation: Minimum 2 inches thick or R-Value of 7.

C. Supply Ducts:

1. Flexible Glass Mineral Wool Duct Insulation: Minimum 1 inches thick or R-Value of 3.3.

END OF SECTION

SECTION 23 10 05

FUEL PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Gas.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels.
- C. Section 09 90 00 - Painting and Coating.
- D. Section 23 05 49 - HVAC Seismic Restraint.
- E. Section 23 05 53 - Identification for HVAC Piping and Equipment.
- F. Section 26: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 2013.
- B. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2013 (ANSI/ASME B31.1).
- C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2013 (ANSI/ASME B31.9).
- D. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2013.
- F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2013.
- G. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.
- H. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006.
- I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010.
- J. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.
- K. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
- L. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- M. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Valve Repacking Kits: Two for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with all applicable local codes and standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) .
- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, water pressure rating.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with applicable plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Store pipe on sleepers, a minimum of 4 inches above surrounding grade, at all times.

1.08 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
 - 2. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.02 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Bronze threaded nipple, minimum 3 inches long, with impervious isolation liner. Victaulic "Clearflow".

2.03 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Tolco Inc.
2. Anvil.
3. Hubbard Enterprises/Holdrite.
4. Michigan Hanger Company, Inc.
5. PHD Manufacturing Co.
6. Superstrut.
7. Unistrut.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fuel Piping:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Vertical Support: Steel riser clamp.
 - a. Isolate riser clamp from structure by use of Hubbard Enterprises/Holdrite #274 or #278 riser pad or Owner-approved equivalent.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
9. Use non-metallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
10. For vertical midspan support of piping 4 inches and under, use Hubbard Enterprises/Holdrite Stout Bracket in conjunction with Hubbard Enterprises/Holdrite Stout Clamp or industry standard two-hole pipe clamp (MSS Type 26).
11. Secondary Pipe Positioning and Supports:
 - a. Makeshift, field-devised methods of plumbing pipe support, such as the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These are to be Hubbard Enterprises/Holdrite support systems or approved equal.

C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.
7. Manufacturers:

- a. Powers Fasteners, Inc.: www.powers.com.
- b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Hanger Rods: Mild steel, threaded both ends, threaded on one end, or continuous threaded.

2.05 INSERTS

- A. Manufacturers:
 - 1. Anvil Fig. 281.
 - 2. PHD Fig 951.
 - 3. Michigan Hanger Model 355EG.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Inserts: Carbon steel case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.06 FLASHING

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counterflashing: 22 gage thick galvanized steel.
- C. Lead Flashing:
 - 1. Waterproofing: 5 lb./sq.ft. sheet lead
 - 2. Soundproofing: 1 lb./sq.ft. sheet lead.
- D. Flexible Flashing: 1.85 inch thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.07 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Round Ductwork: Galvanized steel.
- D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- E. Sealant: Acrylic; refer to Section 07 90 05.

2.08 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Thunderline Link-Seal, Inc. Model Series LS.
 - 2. NMP Corporation.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.09 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Unistrut Model Series P1000.
 - 2. Superstrut Model Series 1200.
 - 3. Michigan Hanger "O-Strut" Model A-12.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.10 FIRESTOPPING

A. Manufacturers:

1. Specified Technology Inc. (STI) Model SpecSeal Series 100.
2. Dow Corning Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single or Multiple component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

C. Color: As selected from manufacturer's full range of colors.

2.11 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:

1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particle board.
5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:

1. Furnish UL listed products.
2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.

2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.12 BALL VALVES

A. Manufacturers:

1. Hammond Valve Co.; Model 8501/8901: www.hammondvalve.com.
2. Nibco, Inc.; Model T-FP-600/T-585-70: www.nibco.com.
3. Watts; Model FBV-1/B-6000: www.watts.com.
4. Stockham; Model S216-BR-R-T: www.stockham.com.
5. Apollo; Model 70-100: www.conbraco.com.
6. Milwaukee Valve Company; Model BA-125/BA-100: www.milwaukeevalve.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to and including 3 inches:

1. MSS SP 110, Class 150, 600 WOG, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle solder or threaded ends.

2.13 PLUG VALVES

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc.: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or threaded ends. Provide lever operator with set screw.

2.14 STRAINERS

A. Manufacturers:

1. Watts Regulator Company: www.wattsregulator.com.
2. Hammond Valve: www.hammondvalve.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Apollo: www.conbraco.com.
5. Stockham: www.stockham.com.
6. Nibco, Inc.: www.nibco.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Under:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

- #### A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Provide galvanized piping on all dry pipe systems.
- D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- E. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.
- 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 exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- N. Sleeve pipes passing through partitions, walls and floors.
- O. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. For pipe runs of 1 inch or less and ran high and tight to the structure, use Hubbard Enterprises/Holdrite #121 or #125 Series Brackets in conjunction with Hubbard Enterprises/Holdrite #260 or #400 Series Inserts or approved equal.
 - 6. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- P. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9 and MSS SP-89.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.

5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 23 05 48.
11. Support of pipe tubing and equipment is to be accomplished by means of engineered products specific to each application. Makeshift field devised methods will not be allowed.

3.04 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. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install ball valves for throttling, bypass, or manual flow control services.
- E. Provide plug valves in natural gas systems for shut-off service.

3.05 SERVICE CONNECTIONS

- A. Utilize existing gas meter. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Casing and plenums.
- C. Duct cleaning.
- D. Duct systems have been designed for metal duct.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 07 84 00 - Firestopping.
- D. Section 09 90 00 - Painting and Coating: Weld priming, weather resistant, paint or coating.
- E. Section 23 05 49 - HVAC Seismic Restraint.
- F. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- G. Section 23 33 00 - Air Duct Accessories.
- H. Section 23 37 00 - Air Outlets and Inlets.
- I. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2013.
- E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength; 2014.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- I. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- J. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- K. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

- L. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
- M. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- N. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.
- O. SMACNA (DCS) - HVAC Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials, duct liner, duct connections, and duct fittings.
- C. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
 - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
 - 2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
 - 3. Fittings.
 - 4. Reinforcing details and spacing.
 - 5. Seam and joint construction details.
 - 6. Penetrations through fire rated and other walls.
 - 7. Terminal unit, coil, and humidifier installations.
 - 8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- D. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.
- E. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed recommended fabrication and installation requirements.
- F. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 QUALITY ASSURANCE

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

1.06 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.07 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14.
Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 250 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
 - 4. For Use With Flexible Ducts: UL labeled.
 - 5. Products:
 - a. Duro-Dyne; Model DSW: www.durodyne.com.
 - b. Hard Cast; Model RTA 50: www.hardcast.com.
 - c. Hard Cast; Model "Versa-Grip" 102: www.hardcast.com.
 - d. Sika; Model "Sikaflex": www.sika.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 - 6. Other Types: As required.
 - 7. Manufacturers:
 - a. Powers Fasteners, Inc.: www.powers.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. All Ducts: Galvanized steel, unless otherwise indicated.
- G. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.

2.02 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, fibrous glass.
- C. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- D. Duct systems have been designed for metal duct.
- E. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

- F. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- G. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- H. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- I. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.
- J. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- K. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.03 DUCT MANUFACTURERS

- A. Streimer Sheet Metal: www.streimer.com.
- B. General Sheet Metal: www.gsmw.com.
- C. Arctic Sheet Metal: www.arcticsheetmetal.com.
- D. Arjae Sheet Metal: www.arjae.com.
- E. Robert Lloyd Sheet Metal: www.rlsm.net.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with polyethylene or aluminized vapor barrier film.
 - 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 - 3. Maximum Velocity: 4000 fpm.
 - 4. Temperature Range: -20 degrees F to 210 degrees F.
 - 5. Minimum Insulation: R-6
 - 6. Manufacturers:
 - a. ATCO.
 - b. Genflex.
 - c. Thermaflex.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.05 CASINGS

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized

expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
 - 1. Provide clear wire glass observation ports, minimum 6 X 6 inch size.
- D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with adhesive and draw bands
- E. Use sealant on all lapped round duct joint connections. Seal all ducts in accordance with State Energy Code.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- I. Install duct hangers and supports in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- J. Use double nuts and lock washers on threaded rod supports.
- K. Connect diffusers to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.
- L. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.03 SCHEDULES

- A. Ductwork Material Schedule:

AIR SYSTEM

MATERIAL

Supply (Heating Systems)	Steel, Aluminum
Supply (System with Cooling Coils)	Steel, Aluminum
Return and Relief	Steel, Aluminum
General Exhaust	Steel, Aluminum
Laser Engraver Exhaust	Steel, Aluminum
Outside Air Intake	Steel

B. Ductwork Pressure Class Schedule:

<u>AIR SYSTEM</u>	<u>PRESSURE CLASS</u>
Supply (Heating Systems)	1 inch wg
Supply (System with Cooling Coils)	1 inch wg (250 Pa)
Return and Relief	1/2 inch wg
General Exhaust	1 inch wg
Laser Engraver Exhaust	-8 inch wg

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Duct access doors.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 23 05 48 - Vibration Isolation and Sound and Seismic Controls for HVAC Piping and Equipment.
- C. Section 23 31 00 - HVAC Ducts and Casings.
- D. Division 26 - Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- B. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.
- D. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.
- E. Project Record Drawings: Record actual locations of access doors, test holes, fire dampers, and fire and smoke dampers.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:
 - 1. Carlisle HVAC Products: www.carlislehvac.com.
 - 2. Elgen Manufacturing: www.elgenmfg.com.
 - 3. Krueger: www.krueger-hvac.com.
 - 4. Ruskin Company: www.ruskin.com.
 - 5. Titus: www.titus-hvac.com.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
- C. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.02 BACKDRAFT DAMPERS - METAL

- A. Manufacturers:
 - 1. PCI Industries, Inc.; Pottorff Brand Model Series BD60: www.pottorff.com.
 - 2. Cesco; Model BAP-1: www.cescoproducts.com.
 - 3. Greenheck; Model Series EM: www.greenheck.com.
 - 4. Ruskin Company; Model Series BD/BDR: www.ruskin.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel or Extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Cesco; Model Series HF: www.cescoproducts.com.
 - 2. Greenheck; Model Series HAD/CAD: www.greenheck.com.
 - 3. Ruskin Company; Model series ADH/HARDD: www.ruskin.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
 - 1. Less Than 12 inches Square: Secure with sash locks.
 - 2. Up to 18 inches Square: Provide two hinges and two sash locks.
 - 3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Provide an additional hinge.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.04 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com.
 - 2. Elgen Manufacturing: www.elgenmfg.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - a. Net Fabric Width: Approximately 3 inches wide.
 - 2. Metal: 3 inches wide, 24 gage thick galvanized steel.
- D. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.
- E. Maximum Installed Length: 14 inch.

2.06 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Cesco; Model Series MGF/MGG: www.cescoproducts.com.
 - 2. Greenheck; Model Series MBD/MBDR: www.greenheck.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Splitter Dampers:
 - 1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .
 - 4. Product: EX-88 manufactured by Krueger.
- D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
 - 1. Fabricate for duct sizes up to 6 x 30 inch.
 - 2. Blade: 24 gage, minimum.
 - 3. Product: _____ manufactured by _____.
- E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1. Blade: 18 gage, minimum.
 - 2. Product: MD35 manufactured by Ruskin.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

1. Product: 515A manufactured by Young Regulator.

G. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

3. Where rod lengths exceed 30 inches provide regulator at both ends.

4. Products:

a. 443 Valcalox Regulator manufactured by Young Regulator.

b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 BAROMETRIC RELIEF DAMPERS

A. Manufacturers:

1. Greenheck: BR Series. www.greenheck.com.

B. Dampers shall consist of: 16 ga. insert mount galvanized steel hat channel frame with 5 in. depth; blades from 0.063 in. thick formed aluminum, eccentrically pivoted, 3/8 in. square plated steel axles with galvanized steel press-fit ball bearings; damper shall be equipped with pressure activated vinyl blade seals; and internal plated steel blade-to-blade linkage with blade mounted counterbalance weights.

C. Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 2 in. wg, velocities to 2000 fpm and temperatures to 180 degrees F. Testing and ratings to be in accordance with AMCA Standard 500D.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

- G. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 34 16
CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Laser engraver centrifugal exhaust fans.
- B. Motors and drives.
- C. Fan accessories.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- B. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.
- C. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).
- B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; American Bearing Manufacturers Association, Inc.; 2014.
- C. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2010.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).
- E. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/certified/search/company.aspx>.
- F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.
- G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2007.
- H. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.
- I. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.04 PERFORMANCE REQUIREMENTS

- A. Performance Ratings: Determined in accordance with AMCA 210 and bearing 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 300 degrees F.
- F. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

- G. Laser Engraver: Owner's proposed laser engraver requires 500 cfm at 6 inch wg. Verify with Owner and manufacturer's instructions prior to design and procurement.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate assembly of 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.
- D. Manufacturer's Instructions: Include complete installation instructions.
- E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Fan Belts: One set for each individual fan.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors, shafts, and bearings from weather and construction dust.

1.08 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck Model IPA.
- B. ACME Engineering and Manufacturing Corporation: www.acmefan.com.
- C. Loren Cook Company: www.lorencook.com.
- D. PennBarry: www.pennbarry.com.

2.02 GENERAL

- A. Base fan performance at standard conditions (density 0.075 lb. /ft³).
- B. Fans selected shall be capable of accommodating static pressure and flow variations of +/- 15% of scheduled values.
- C. Each fan shall be belt drive in AMCA arrangement as appropriate.
- D. Fans are to be equipped with lifting lugs.
- E. After fabrication, all carbon steel components shall be cleaned and chemically treated by a phosphatizing process to insure proper removal of grease, oil, scale, etc. Fan shall then be coated with a minimum of 2-4 mils of Permator (Polyester Urethane), electrostatically

applied and baked. Finish color shall be gray, RAL-7023. Coating must exceed 1,000-hour salt spray under ASTM B117 test method.

2.03 FAN HOUSING AND OUTLET

- A. Process or material handling fans shall be of the heavy duty type with the inlet diameters and outlet areas manufactured in accordance with the standards adopted by AMCA for industrial fans.
- B. Fan housing is to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.
- C. The housings on all fan sizes shall be of continuously welded heavy gauge steel. All interior and exterior surface steel shall be coated with a minimum of 2-4 mils of Permator (Polyester Urethane), electrostatically applied and baked. Finish color shall be gray, RAL-7023. No uncoated metal fan parts will be allowed.
- D. Housing and bearing support shall be constructed of welded structural steel members to prevent vibration and rigidly support the shaft and bearings.
- E. Either an OSHA compliant weatherhood, or a combination of an OSHA compliant belt guard and shaft guard shall be included to completely cover the motor pulley and belt(s).

2.04 FAN WHEEL

- A. The fan wheel shall be of the radial type. Wheels shall be statically and dynamically balanced to balance grade G6.3 per ANSI S2.19.
- B. Fan wheel shall be manufactured with continuously welded steel blades and coated with a minimum of 2-4 mils of Permator (Polyester Urethane), electrostatically applied and baked. Finish color shall be gray, RAL-7023.
- C. The wheel and fan inlet shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency.

2.05 FAN MOTORS AND DRIVE

- A. Motors shall meet or exceed EISA (Energy Independence and Security Act) efficiencies. Motors to be NEMA T-frame, 1800 or 3600 RPM, Open Drip Proof (ODP) [Totally Enclosed Fan Cooled (TEFC), Explosion Proof (EXP)] with a 1.15 service factor.
- B. Drive belts and sheaves shall be sized for 150% of the fan operating brake horsepower, and shall be readily and easily accessible for service, if required.
- C. Fan shaft to be turned and polished steel that is sized so the first critical speed is at least 25% over the maximum operating speed for each pressure class.
- D. Fan shaft bearings shall be Air Handling Quality, bearings shall be heavy-duty grease lubricated, self-aligning or roller pillow block type.
- E. Air Handling Quality bearings to be designed with low swivel torque to allow the outer race of the bearing to pivot or swivel within the cast pillow block. Bearings shall be 100% tested for noise and vibration by the manufacturer. Bearings shall be 100% tested to insure the inner race diameter is within tolerance to prevent vibration.
- F. Bearings shall be selected for a basic rating fatigue life (L-10) of 80,000 hours at maximum operating speed for each pressure class Average Life or (L-50) of 400,000 hours
- G. Bearings shall be fixed to the fan shaft using concentric mounting locking collars, which reduce vibration, increase service life, and improve serviceability. Bearings that use set screws shall not be allowed.

H. Bearings shall have Zerk fittings to allow for lubrication.

2.06 ACCESSORIES

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install fans with resilient mountings and flexible electrical leads. Refer to Section 22 05 48.
- C. Install flexible connections between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- D. Install fan restraining snubbers; refer to Section 23 05 49. Adjust snubbers to prevent tension in flexible connectors when fan is operating.
- E. Provide fixed sheaves required for final air balance.
- F. Provide safety screen where inlet or outlet is exposed.
- G. Pipe scroll drains to nearest floor drain.
- H. Provide backdraft dampers on discharge of exhaust fans and as indicated.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof exhausters.

1.02 RELATED REQUIREMENTS

- A. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2010.
- B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
- C. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).
- D. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/certified/search/company.aspx>.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2007.
- G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2014.
- H. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- I. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Fan Belts: Two sets for each individual fan.

1.05 QUALITY ASSURANCE

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

- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- G. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.02 ROOF EXHAUSTERS

- A. Manufacturers:
 - 1. Greenheck; Model G or GB: www.greenheck.com.
 - 2. Carnes; Model Series VE: www.carnes.com.
 - 3. Loren Cook Company; Model Series AC: www.lorencook.com.
 - 4. JenCoFan; Model RED or DB: www.jencofan.com.
 - 5. PennBarry; Model Domex: www.pennbarry.com.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- C. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- D. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, interior baffle with acoustic insulation, curb bottom, and factory installed nailer strip.
- E. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.
- F. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- G. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.03 ROOF EXHAUSTERS

A. Manufacturers:

1. Greenheck; Model CUE/CUBE: www.greenheck.com.
2. Carnes; Model Series VR: www.carnes.com.
3. Loren Cook Company; Model Series ACRU: www.lorencook.com.
4. JenCoFan; Model NBRTD: www.jencofan.com.
5. PennBarry; Model Fumex: www.pennbarry.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Product Requirements:

1. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
2. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
3. Fabrication: Conform to AMCA 99.
4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

C. Performance

1. Motor: NEMA MG 1, 2006.

D. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

E. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, interior baffle with acoustic insulation, curb bottom, ventilated double wall, hinged curb adapter, and factory installed nailer strip.

F. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.

G. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

H. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with stainless steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Install backdraft dampers on inlet to roof exhausters.
- F. Provide backdraft dampers on outlet from cabinet and ceiling exhaust fan and as indicated.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Roof hoods.

1.02 RELATED REQUIREMENTS

- A. Section 09 90 00 - Painting and Coating: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2012.
- B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.
- C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006 (R2011).
- D. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

1.06 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carnes Company HVAC: www.carnes.com.
- B. Krueger: www.krueger-hvac.com.
- C. Price Industries: www.price-hvac.com.
- D. Titus: www.titus-hvac.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORATED FACE CEILING DIFFUSERS

- A. Manufacturers:
 - 1. Carnes Model Series SPMB.

2. Price Model PDMC.
 3. Krueger Model 1240P.
 4. Titus Model PMC.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type: Perforated face with fully adjustable pattern and removable face.
 - C. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.
 - D. Fabrication: Steel with steel frame and baked enamel finish.
 - E. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 WALL SUPPLY REGISTERS/GRILLES

- A. Manufacturers:
 1. Carnes Model Series RTDB.
 2. Price Model Series 520.
 3. Krueger Model 880.
 4. Titus Model 300RL.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- D. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Manufacturers:
 1. Carnes Model Series RSAB.
 2. Price Model Series 530.
 3. Krueger Model S80.
 4. Titus Model 350RL.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting.
- D. Fabrication: Steel frames and blades, with factory off-white enamel finish.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.05 ROOF HOODS

- A. Manufacturers:
 1. Greenheck Model "Fabra Hood".
 2. CESCO Model EHA/IHA.
 3. Cook Model VI/VR.
 4. Carnes Model GI/GE.

5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards.
 - C. Fabricate of galvanized steel, minimum 16 gage base and 20 gage hood, or aluminum, minimum 16 gage base and 18 gage hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory prime coat finish.
 - D. Fabricate louver penthouses with mitered corners and reinforce with structural angles.
 - E. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.
 - F. Make hood outlet area minimum of twice throat area.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 90 00.

END OF SECTION

SECTION 23 54 00
FURNACES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Forced air furnaces.
- B. Controls.
- C. Evaporator coil units.
- D. Condensing units.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment: Additional requirements for fan motors.
- B. Section 23 05 49 - HVAC Seismic Restraint.
- C. Section 23 54 00 - Furnaces.
- D. Section 23 07 13 - Duct Insulation: Duct Liner.
- E. Section 23 10 05 - Fuel Piping.
- F. Section 23 31 00 - HVAC Ducts and Casings.
- G. Division 26: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

- A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2005.
- B. ARI 520 - Positive Displacement Refrigerant Compressors, Compressor Unit and Condensing Units; 1997.
- C. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Project Record Documents: Record actual locations of components and connections.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Filters: Two for each furnace.

1.05 QUALITY ASSURANCE

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

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturers warranty for solid state ignition modules.
- C. Provide ten year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 **GAS FIRED FURNACES, HIGH EFFICIENCY, CONDENSING**

- A. Manufacturers:
 - 1. Carrier Corporation; Model 58 MVB (or Bryant): www.carrier.com.
 - 2. Trane Inc.; Model XE-90: www.trane.com.
 - 3. Rheem; Model Classic 90 Plus: www.rheemac.com.
 - 4. Comfortmaker; Model C9MPD: www.comfortmaker.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Annual Fuel Utilization Efficiency (AFUE): 0.95 ("condensing").
- C. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.
 - 1. Safety certified by CSA in accordance with ANSI Z 21.47.
 - 2. Venting System: Direct.
 - 3. Combustion: Sealed
 - 4. Air Flow Configuration: Horizontal.
 - 5. Heating: Natural gas fired.
 - 6. Accessories:
 - a. Concentric roof termination kit.
- D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner. If not certified for combustible flooring, please provide additional steel base.
- E. Primary Heat Exchanger:
 - 1. Material: Stainless steel
 - 2. Shape: Clamshell type; wrap around design.
- F. Gas Burner:
 - 1. Atmospheric type with adjustable combustion air supply,

2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 3. Electronic pilot ignition, with electric spark igniter.
 4. Combustion air damper with synchronous spring return damper motor.
 5. Non-corrosive combustion air blower with permanently lubricated motor.
- G. Gas Burner Safety Controls:
1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 2. Flame rollout switch: Installed on burner box and prevents operation.
 3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- H. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
- I. Motor: Refer to Section 23 05 13; 1750 rpm single speed, permanently lubricated, hinge mounted.
- J. Air Filters: 1 inch thick urethane, washable type arranged for easy replacement.
- K. Operating Controls
1. Room Thermostat: Cycles burner to maintain room temperature setting.
 2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.

2.02 THERMOSTATS

- A. Manufacturers:
1. Honeywell: www.honeywell.com.
 2. Carrier Corporation: www.carrier.com.
 3. Trane Inc.: www.trane.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Room Thermostat: Low voltage, electric solid state microcomputer based room thermostat with remote sensor:
1. System selector switch (heat-off) and fan control switch (auto-on).
 2. Preferential rate control to minimize overshoot and deviation from setpoint.
 3. Set-up for four separate temperatures per day.
 4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
 5. Short cycle protection.
 6. Programming based on every day of the week.
 7. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
 8. Battery replacement without program loss.
 9. Thermostat display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.

- f. Day of week.
- g. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

2.03 EVAPORATOR COIL UNITS

- A. Manufacturers:
 - 1. Carrier Corporation: www.carrier.com.
 - 2. Trane Inc.: www.trane.com.
 - 3. Rheem: www.rheemac.com.
 - 4. Comfortmaker: www.comfortmaker.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction and Ratings: In accordance with ARI 210/240, and UL 207.
- C. Evaporator Coil: Copper tube aluminum fin assembly, galvanized or polymeric drain pan, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve, steel cabinet with baked enamel finish and insulation.
- D. Cooling Capacity:
 - 1. As indicated on the Drawing Schedules.

2.04 CONDENSING UNITS (UP TO 5 TONS)

- A. Manufacturers:
 - 1. Carrier Corporation; Model Series 24ACA3: www.carrier.com.
 - 2. Trane Inc.; Model Series TTA: www.trane.com.
 - 3. Rheem; Model : www.rheemac.com.
 - 4. Comfortmaker; Model : www.comfortmaker.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Compressor: ARI 520; hermetic, 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Furnish time delay control to prevent short cycling.
- C. Refrigeration Accessories: Filter Drier, high-pressure switch (manual reset), low-pressure switch (automatic reset), service valves and gage ports and thermometer well (in liquid line). Furnish thermostatic expansion valves. Furnish refrigerant piping, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- D. Air Cooled Condenser: ARI 520; aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- E. Refrigeration Operating Controls
 - 1. Room Thermostat: Cycles condensing unit and supply fan to maintain room temperature setting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and located correctly.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.

- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install gas fired furnaces in accordance with NFPA 54.
- D. Mount counterflow furnaces installed on combustible floors on additive base.
- E. Installation - Natural Gas Piping:
 - 1. Connect natural gas piping in accordance with NFPA 54.
 - 2. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.
 - 3. Install the following piping accessories on natural gas piping connections. Refer to Section 23 10 05.
 - a. Strainer.
 - b. Pressure gage.
 - c. Shutoff valve.
 - d. Pressure reducing valve.
- F. Pipe drain from Category III and IV gas-fired furnaces (heat exchanger and vent condensate disposal) to nearest floor drain or as allowed by code.
- G. Connect units to electric supply and connect controls remote from units.
- H. Install control components supplied with equipment and provide control wiring.

END OF SECTION

SECTION 23 55 33
FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuel fired packaged air units.
- B. Room thermostats.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment: Fan motors.
- B. Section 23 05 49 - HVAC Seismic Restraint.
- C. Section 23 07 13 - Duct Insulation: Duct Liner.
- D. Division 26: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013, Including All Addenda (ANSI/ASHRAE/IES Std 90.1).
- B. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.
- C. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Project Requirements, for additional provisions.
 - 2. Extra Filters: Two sets.

1.05 QUALITY ASSURANCE

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

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide ten year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 FUEL FIRED PACKAGED AIR UNITS

- A. Manufacturer: Reznor Model RDH.
- B. Other acceptable manufacturers offering equivalent products.
 - 1. Modine.
 - 2. Greenheck.
 - 3. Sterling.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet and supply fan assembly, and duct furnaces each consisting of heat exchanger and burner.
- D. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.
- E. Supply Fan: Centrifugal type rubber mounted with belt drive, variable pitch motor pulley.
- F. Filter: 1 inch thick glass fiber throw-away type, located to filter air before fan.
- G. Gas Fired Duct Furnace Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, heat exchanger, burner, controls, and accessories.
 - 1. Heat Exchanger: Aluminized steel welded construction.
 - 2. Gas Burner:
 - a. Atmospheric type with adjustable combustion air supply,
 - b. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - c. Electronic pilot ignition, with electric spark igniter.
 - d. Combustion air damper with synchronous spring return damper motor.
 - e. Non-corrosive combustion air blower with permanently lubricated motor.
 - 3. Gas Burner Safety Controls:
 - a. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 - b. Flame rollout switch: Installed on burner box and prevents operation.
 - c. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 - d. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
 - 4. Requirements:
 - a. Equipped with intermittent ignition device.
 - b. Equipped with power venting.
 - 5. Performance:
 - a. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.

H. Dampers:

1. Dampers: Outside dampers with damper operator. Outside air damper shall fall to closed position.
2. Gaskets: Fit dampers with edge gaskets, maximum leakage 5 percent at 2 inches wg pressure differential.
3. Damper Operator: 24 volt with gear train sealed in oil.
4. Control Sequence: Maintain selected space temperature.

I. Requirements:

1. Equipped with intermittent ignition device.
2. Equipped with power venting.

J. Disconnect Switch: Factory mount disconnect switch in control panel.

2.02 ROOF CURBS

- A. Roof curbs shall be constructed of galvanized steel. Curbs are to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support, and air seal for the unit. Curb gasketing shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit. Curbs shall be provided to fit level on the roof.
1. Provide seismic anchorage calculations and instructions for attaching the unit to structure.
 2. Provide elevated discharge curb as noted on the plans.
 3. Provide seismic spring vibration isolators.

2.03 ROOM THERMOSTATS

A. Manufacturers:

1. Honeywell: www.honeywell.com.
2. Johnson Controls, Inc.: www.johnsoncontrols.com.
3. Siemens Building Technologies, Inc.: www.sbt.siemens.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Room Thermostat: Electric solid state microcomputer based room thermostat with remote sensor:

1. Automatic switching from heating to cooling.
2. Thermostat display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System mode indication: Heating, system auto-off-on, fan auto-on.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with NFPA 90B.
- B. Install gas fired units in accordance with NFPA 54 and applicable codes.
- C. Install packaged air units with vibration isolation.
- D. Provide operating controls.
- E. Provide connection to electrical power systems; refer to Division 26.

END OF SECTION

U of O CONSTRUCTION STANDARDS SUBSTITUTION REQUEST

TO: _____ (Campus Planning Project Planner)

PROJECT: _____

STANDARD ITEM: _____

STANDARD SECTION NUMBER: _____ **PAGE NUMBER** _____

PROPOSED STANDARD SUBSTITUTION:

Attached data includes design or product description, specifications, drawings, photographs, performance and test data, product information, etc. adequate for evaluation of requested Standard substitution.

Attached data also includes description of changes to related and/or impacted building system(s) or component(s) that will result from the requested Standard substitution.

Proposing party certifies that the following items are correct unless noted & described in attachments:

1. Proposed Standard substitution does not affect U of O maintainability / serviceability.
2. Proposing party pays for changes to the building design and/or redesign caused by the Standard substitution.
3. Proposing party will supply appropriate detailing, specification, etc. for construction of the Standard substitution.
4. Proposed Standard substitution notes and describes all adverse effects on other trades, design schedule, drawing coordination, construction schedule, warranty requirements, project budget, etc.
5. Maintenance and service parts are available locally or readily obtainable for the proposed Standard substitution.

Proposing party further certifies function, appearance, and quality of proposed Standard substitution are equivalent or superior to the Standard.

Submitted by: _____
Name (printed or typed)

Signature

Firm Name (printed or typed)

Date (printed or typed)

Phone Number (printed or typed)

For use by Designated U of O Representative / Owner of Standard in question:

APPROVED

APPROVED AS NOTED

NOT APPROVED

RECEIVED TOO LATE

By, Printed Name: _____ **Date:** _____

By, Signature: _____

Remarks:

U of O CONSTRUCTION STANDARDS SUBSTITUTION REQUEST

TO: _____ (Campus Planning Project Planner)

PROJECT: _____

STANDARD ITEM: _____

STANDARD SECTION NUMBER: _____ **PAGE NUMBER** _____

PROPOSED STANDARD SUBSTITUTION:

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Name (printed or typed)

Signature

Firm Name (printed or typed)

Date (printed or typed)

Phone Number (printed or typed)

For use by Designated U of O Representative / Owner of Standard in question:

APPROVED

APPROVED AS NOTED

NOT APPROVED

RECEIVED TOO LATE

By, Printed Name: _____ **Date:** _____

By, Signature: _____

Remarks: