



FAIRBANKS CORRECTIONAL CENTER EPDM ROOF REPLACEMENT SPECIFICATIONS

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ALASKA DEPARTMENT OF TRANSPORTATION
AND STATEWIDE PUBLIC FACILITIES

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SECTION 02 26 00
HAZARDOUS MATERIALS ASSESSMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. A Hazardous Materials Assessment for the proposed construction has been completed as part of this design. Potentially hazardous materials in the work area are identified in this specification. All sample locations and results collected as part of this assessment are identified on the project drawings. This section and the project drawings represent the entirety of the Hazardous Materials Assessment for this project. A standalone Hazardous Materials Assessment Report is not available.

1.02 USE OF INFORMATION

- A. This Hazardous Materials Assessment is provided for the Contractor's information and use in the planning and performance of work in areas containing hazardous or potentially hazardous materials as outlined in Paragraph 1.03.
 - 1. The information provided in the Hazardous Materials Assessment is based on samples collected in various locations within the identified project area. The Department cannot guarantee or warrant that actual conditions encountered may vary from the information presented in these reports.
 - 2. The data reported in this Hazardous Materials Assessment is accurate to the best of the Department's knowledge. The requirements contained in these project documents and in the relevant state and federal regulations pertaining to the performance of work in areas containing hazardous or potentially hazardous materials provide guidance for the contractor for performance of work in these areas. The Department disclaims all responsibility for the Contractor's erroneous conclusions regarding the information presented in these reports; the requirements contained in these project documents; and the requirements of applicable state and federal regulations pertaining to performance of work in these areas.
 - 3. The Contractor shall be responsible for obtaining additional information if Contractor deems it necessary to carry out the work.
- B. It is highly recommended that the Contractor visit the site to acquaint themselves with existing conditions.

1.03 HAZARDOUS MATERIALS NOTIFICATION

- A. Suspect asbestos containing materials (ACM) within the expected work areas have been tested for asbestos.
 - 1. The silver reflective coating is ACM
 - a. The silver coating covers the entirety of roof sections 5A, 5B, 6A, 6B, and 6C as labeled in project documents.
 - b. This coating is assumed to extend beneath patches and repairs.
- B. Lead containing material was not identified in the single inspected drain. However, if identified in other drains, it shall be handled and disposed of appropriately during roof work.
- C. Notification of Potential Hazards: Asbestos, lead and other potentially hazardous materials are present in the buildings that may impact the work of all trades. Regulated air contaminants, including asbestos may also be present in settled and concealed dust in and on architectural, structural, mechanical, and electrical components or systems associated with this project. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Divisions 0, 1 and 2 for specific information concerning disturbing, removing, and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

1.04 REFERENCE STANDARDS

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of conflict the most stringent shall apply.
 - 1. Title 29 Codes of Federal Regulations (CFR), Department of Labor (USDOL)
 - a. Part 1910 General Occupational Safety and Health Standards
 - b. Part 1926 Safety and Health Regulations for Construction
 - 2. Title 40 CFR, Environmental Protection Agency (EPA)
 - a. Part 61 National Emission Standards for Hazardous Air Pollutants
 - b. Part 311 Worker Protection Part 763 Asbestos
 - c. Part 763 Asbestos
 - 3. State of Alaska Administrative Codes (AAC)
 - a. 8 AAC 61 Occupational Safety and Health Standards
 - b. 18 AAC 60 Solid Waste Management
 - 4. State of Alaska Statutes
 - a. AS 18.31 Health and Safety - Asbestos
 - b. AS 45.50.477 Titles Relating to Industrial Hygiene
 - 5. Public Law 101-637
 - a. Asbestos School Hazard Abatement Reauthorization Act

1.05 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Work Plan: The Contractor shall submit a demolition and/or abatement work plan for review by the Engineer. The work plan shall:
 - 1 Be submitted to the engineer no less than 30 days prior to the scheduled start of demolition.
 - 2. Document the methods and means that shall be used to complete all work involving ACM.
 - 3. Document how the Contractor will comply with all applicable local, state, and federal regulations and requirements.
 - 4. Identify Daily/Interim and Final submittals that will be delivered to document this work.
 - 5. Provide abatement firm experience and abatement worker qualifications and certifications
 - 6. The Hazardous Materials Work Plan may be submitted as part of the Demolition Work Plan.
- C. Daily/Interim: The Contractor shall submit all daily quality control forms, logs, air monitoring results and other documentation require by regulation to the Engineer within 48 hours of completing the shift.
- D. Closeout: The Contractor shall submit final abatement reports, disposal receipts, and other final project documentation to the Engineer within 7 days of receiving the documentation from the vendor or facility.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION 02 26 00

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All demolition activities shall be coordinated with the Contracting Officer to ensure the integrity of the secure prison perimeter, including demolition, movement of demolition equipment, temporary storage of demolished materials, and access to the secure prison yard areas.
- C. The project contains hazardous materials and part of the demolition includes the abatement of the same. See Hazardous Material requirement specified elsewhere.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Provide, erect, and maintain temporary barriers and security devices.
 - 3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 5. Do not close or obstruct roadways or sidewalks without permit.
 - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Do not begin removal until receipt of notification to proceed from Contracting Officer.
- C. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations, and specified requirements.

3.02 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Contracting Officer before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. Remove abandoned pipe, ducts, conduits, and equipment; cap stub and tag with identification.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch as specified for patching new work.

3.03 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof-mounted curbs.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Concealed wood blocking, nailers, and supports.
- E. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

- A. AWWA U1 - Use Category System: User Specification for Treated Wood; 2017.
- B. PS 20 - American Softwood Lumber Standard; 2015.
- C. WWP A G-5 - Western Lumber Grading Rules; 2017.

1.04 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials and fasteners..

1.05 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: Kiln-dry or MC15.
- C. Miscellaneous Framing, Blocking, Nailers, Parapet Blocking, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.04 FACTORY WOOD TREATMENT

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

- b. Treat lumber in contact with roofing, flashing, or waterproofing.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

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

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.04 ROOF-RELATED CARPENTRY

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

3.05 CLEANING

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Elastomeric roofing membrane, adhered conventional application.
- B. Insulation, flat and tapered.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Flashings.
- F. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.
- C. Section 07 72 00 - Roof Accessories: Roof-mounted units; prefabricated curbs.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2017a.
- D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.
- E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- F. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.
- G. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2012).
- H. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2014.
- I. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.
- J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- K. NRCA (RM) - The NRCA Roofing Manual; 2018.
- L. NRCA (WM) - The NRCA Waterproofing Manual; 2005.
- M. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- B. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- C. Samples for Verification: Submit two samples 12 by 12 inches in size illustrating insulation.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Contracting Officer's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the 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 documented experience, and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 100 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide 20 year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
 - 1. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks and blow off to 90 mph winds specified in this section and in compliance with ASCE 7.

PART 2 PRODUCTS

3.01 MANUFACTURERS

- A. EPDM Membrane Materials:
 - 1. Carlisle Roofing Systems, Inc; Sure-Seal EPDM: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products, LLC; Rubberguard EPDM: www.firestonebpco.com.
 - 3. Johns Manville; JM EPDM: www.jm.com/#sle.

3.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Elastomeric Membrane Roofing: One ply membrane, fully adhered, over vapor retarder and insulation.
- B. Roofing Assembly Requirements:
 - 1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.

- C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
 - 1. Minimum 2 layers of molded polystyrene or polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application: Any of the types specified.
 - 1. Tapered polyisocyanurate or molded polystyrene board.

3.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637/D4637M.
 - 1. Thickness: 0.060 inch (60 mil).
 - 2. Sheet Width: 76 inch, minimum; factory-fabricate into largest sheets possible.
 - 3. Color: Black.
 - 4. Tensile Strength: 1305 psi, measured in accordance with ASTM D412.
 - 5. Tear Strength: 150 lbf/inch, measured in accordance with ASTM D624.
 - 6. Water Vapor Permeability: 0.10 perm inch, measured in accordance with ASTM E96/E96M.
 - 7. Brittleness Temperature: -49 degrees F, measured in accordance with ASTM D746.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Vapor Retarder: Liquid or hot mop applied to existing concrete roof deck; Class 1, 10 Mils min, compatible with roofing and insulation materials.
- D. Flexible Flashing Material: Same material as membrane; complying with the following:

3.04 DECK SHEATHING AND COVER BOARDS

- A. Cover Boards: Rigid cover board applied over insulation with adhesives.
 - 1. Cover board recommended by membrane manufacture, compatible with fully adhered roof membrane and meeting the requirements for wind uplift load resistance.

3.05 INSULATION

- A. Expanded Polystyrene (EPS) Board Insulation for crickets: Complies with ASTM C578,
 - 1. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
 - 2. Type and Board Density: Type IX, 1.80 pcf (29 kg/cu m), minimum.
 - 3. Type and Thermal Resistance, R-value: Type IX, 4.2 (0.74) per 1 inch thickness at 75 degrees F mean temperature using ASTM C177 test method.
- B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II:
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F. Minimum R-5.6 per inch at 75 degrees.
 - 2. Board Size: 48 by 96 inch.
 - 3. Board Thickness: 2.0 inch minimum, 4.0 inch maximum per layer.

3.06 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; elastomeric material compatible with membrane.
- B. Membrane Adhesive: As recommended by membrane manufacturer.
- C. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- D. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- E. Insulation Adhesive: As recommended by insulation manufacturer.

- F. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Asphaltic with mineral granule surface or Roofing membrane manufacturer's standard.
 - 2. Size: As indicated.

PART 3 EXECUTION

4.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

4.02 CONCRETE DECK PREPARATION

- A. Fill surface honeycomb and variations with latex filler.
- B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

4.03 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE

- A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Extend vapor retarder under cant strips and blocking to deck edge.
 - 2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
- B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- C. Attachment of Insulation: Embed insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.
- D. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- G. Do not apply more insulation than can be covered with membrane in same day.

4.04 MEMBRANE APPLICATION

- A. Apply elastomeric membrane roofing system in accordance with manufacturer's recommendations and NRCA (WM) applicable requirements.
- B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- C. Shingle joints on sloped substrate in direction of drainage.
- D. Overlap edges and ends and seal seams by contact tape, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 6 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to termination bars.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and related flashings.

4.05 CLEANING

- A. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- B. Repair or replace defaced or damaged finishes caused by work of this section.

4.06 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and parapet copings.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.
- C. Section 06 10 00 - Rough Carpentry: Wood blocking for batten seams.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. CDA A4050 - Copper in Architecture - Handbook; current edition.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 22 gage, 0.023 inch thick base metal.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 22 gage, 0.023 inch thick base metal, shop pre-coated with PVDF coating.
 - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Contracting Officer from manufacturer's standard colors.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with batten seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

2.03 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 INSTALLATION

- A. Secure copings in place with hidden continuous cleat and fasteners on public side exposed to view, using hemmed edge locked into continuous cleat. Use exposed gasketed screws on backside of coping at 2'-0" on center minimum. Provide solid support under copings with a slope of 1/4 inch per foot minimum, unless otherwise indicated on the Drawings.
- B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. New Curbs.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- B. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Contracting Officer's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.06 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

- A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 - 1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
 - 2. Sheet Metal Material:
 - a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
 - 3. Provide layouts and configurations indicated on drawings.
- B. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
 - 1. Provide preservative treated wood nailers along top of curb.
 - 2. Insulate inside curbs with minimum 6 inch thick fiberglass insulation.
 - 3. Height Above Finished Roof Surface: 8 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install hatch in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

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

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion and seismic joint cover assemblies for roof and parapet surfaces.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

1.04 SUBMITTALS

- A. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- B. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- C. Samples: Submit two samples 12 inch long, illustrating profile, dimension, color, and finish selected.
- D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

- A. Roof Joints Subject to Seismic Movement:
 - 1. Manufacturers: Subject to compliance with specified requirements, provide one of the following systems, in configurations indicated on the drawings:
 - a. John Manville, Expand-O-Flash.
 - b. Construction Specialties, Inc., Type BRJ Expansion Joint Cover..
 - c. Nystrom, Roof Bellow System.

2.02 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
 - 5. Prefabricated Transitions: Provide prefabricated transitions where seismic joints intersect walls, parapets, headwalls, and where seismic joints change direction.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
- B. Resilient Seals:

1. For Roof Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
- C. Anchors and Fasteners: As recommended by cover manufacturer.
- D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

END OF SECTION

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE

- A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.02 WORK INCLUDED

- A. The work to be included in these and all other plumbing subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.
- B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

- A. Related Work Specified Elsewhere:
 - 1. Heating, Ventilating and Air Conditioning (HVAC) Specifications: Division 23.
 - 2. Electrical Specifications: Division 26.
 - 3. Motors and Connections: Division 26.
 - 4. Starters and Disconnects: Division 26.
- B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all plumbing equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 22 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.
- C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

- A. NFPA 70 National Electrical Code (NEC).
- B. IMC International Mechanical Code.
- C. UPC Uniform Plumbing Code.
- D. IECC International Energy Conservation Code.
- E. IFC International Fire Code.
- F. IFGC International Fuel Gas Code.
- G. IBC International Building Code.

1.05 PROJECT RECORD DRAWINGS

- A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.
- B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.
- C. At completion of project, deliver these drawings to the Owner and obtain a written receipt.

1.06 SUBMITTALS

- A. See General Conditions and the General Requirements in Division 01 regarding submittals.
- B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections.

An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.

- C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.
- D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

1.07 OPERATING AND MAINTENANCE MANUALS

- A. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor.
- B. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:
 - 1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
 - 2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
 - 3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
 - 4. Identification numbers of all parts and nearest sources for obtaining parts and services.
 - 5. Written summary of instructions to Owner.
 - 6. All manufacturers' warranties and guarantees.
 - 7. Contractors Warranty Letter.
- C. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

1.08 HANDLING

- A. See General Conditions and the General Requirements in Division 01 regarding material handling.
- B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.09 SUBSTITUTIONS

- A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.
- B. In accordance with the General Conditions and the General Requirements in Division 01, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The Owner shall be the final authority regarding acceptability of substitutes.

1.10 DIMENSIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.
- B. Any differences, which may be found, shall be submitted to the Owner for consideration before proceeding with the work.

1.11 MANUFACTURER'S DIRECTIONS

- A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Architect/Engineer of any such conflicts before installation.

1.12 PERMITS, FEES, ETC.

- A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.13 TESTING

- A. The Contractor under each section shall at his own expenses perform the various tests as specified and required by the Architect and as required by applicable code, the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.14 TERMINOLOGY

- A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.
- B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.
- C. The use of the word "shall" conveys a mandatory condition to the contract.
- D. "This section" refers to the section in which the statement occurs.
- E. "The project" includes all work in progress during the construction period.
- F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.15 SCHEDULE OF WORK

- A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.16 COOPERATION AND CLEANING UP

- A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.
- B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.17 WARRANTY

- A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect/Engineer, shall be repaired and/or replaced to the complete satisfaction of the Architect/Engineer. Guarantee shall be in accordance with Division 01.

1.18 COMPLETION REQUIREMENTS

- A. In accordance with the General Conditions and the General Requirements in Division 01, before acceptance and final payment, the Contractor shall furnish:
 - 1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
 - 2. Contractors One Year Warranty.
 - 3. All Manufacturers' Guarantees.
 - 4. Operation and Maintenance Manuals.

1.19 INSPECTION OF SITE - REMODEL PROJECTS

- A. The accompanying plans do not indicate completely the existing plumbing and mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.20 RELOCATION OF EXISTING INSTALLATIONS

- A. There are portions of the existing plumbing, mechanical and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of his particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.21 SALVAGE MATERIALS

- A. The Contractor shall remove existing fixtures, equipment and other items associated with the plumbing systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the Architect/Engineer), they shall be removed.
- B. All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. Contractor shall deliver any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.
- B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

- A. No materials containing asbestos in any form shall be allowed.
- B. No solder or flux containing lead shall be used on this project.
- C. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be "lead free" in accordance with the Safe Drinking Water Act, Section 1417. "Lead free" materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.

- D. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.03 PIPE HANGERS AND SUPPORTS

- A. Acceptable Manufacturers:
1. Anvil.
 2. B-Line Systems, Inc.
 3. Erico.
 4. PHD Manufacturing, Inc.
 5. Tolco.
- B. Plumbing Piping - DWV:
1. Conform to ANSI/MSS SP58.
 2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, 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 spacers and hanger rods.
 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 7. Vertical Support: Steel riser clamp.
 8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with neoprene isolation pad.
- C. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180° segments, minimum 12 inches long at pipe support.
- D. Shield for Insulated Piping 2 Inches and Larger: Hard block, calcium silicate insert, 180° segment, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.
- E. Shields for Vertical Copper Pipe Risers: Galvanized steel pipe.

2.04 HANGER RODS

- A. Steel Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded. Minimum Hanger Rod Sizes:

| PIPE AND TUBE SIZE (INCHES) | ROD SIZE (INCHES) |
|--------------------------------|----------------------|
| ¼-4 | 3/8 |
| 5-8 | 1/2 |

2.05 EQUIPMENT CURBS

- A. Fabricate curbs of wood or steel beam, unless specifically called out otherwise.

2.06 FLASHING

- A. Metal Flashing: 26-gauge minimum galvanized steel.
- B. Metal Counter Flashing: 22 gauge minimum galvanized steel.
- C. Flexible Flashing: 47-mil thick sheet butyl, compatible with roofing.
- D. Caps: Steel, 22-gauge minimum; 16 gauge at fire resistant elements.

PART 3 EXECUTION

3.01 DRAWINGS

- A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building

which affect the mechanical installation may not be shown. For additional details, see Architectural, Structural, and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

- A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NEC, NFPA, IECC, IFGC and IFC Standards; all local and state amendments to all codes and standards.
- B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.
- C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

- A. Verify all measurements on the job site.
- B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.
- C. Check all piping, equipment, etc. to clear openings.
- D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with current ADA and ANSI 117.1 standards.

3.04 OPERATING INSTRUCTIONS

- A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Plumbing Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

3.05 SYSTEM ADJUSTING

- A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all plumbing systems. Test all plumbing equipment, fixtures and piping for proper water distribution, drainage, pressure and flow, adjust systems as required to eliminate splashing, noise and vibration.

3.06 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

- A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.
- B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.
- C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.07 PAINTING

- A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of plumbing work:
 - 1. Factory applied prime and finish coats on plumbing equipment.
 - 2. Factory applied prime coat on access doors.
 - 3. Pipe identification where specified.
- B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.08 PIPE HANGERS AND SUPPORTS

- A. Support plumbing piping in accordance with the latest adopted edition of the UPC.
- B. Support horizontal piping as follows:

| MATERIALS | TYPES OF JOINTS | HORIZONTAL | VERTICAL |
|---------------------------------------|--------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Cast-Iron Hub-less | Shielded Coupling | Every other joint, unless over 4 feet then support each joint ^{1,2,3,4} | Base and each floor, not to exceed 15 feet |
| Copper Tube and Pipe | Soldered or Brazed | 1 ½ inches and smaller, 6 feet; 2 inches and larger, 10 feet | Each floor, not to exceed 10 feet ⁵ |
| Steel and Brass Pipe for Water or DWV | Threaded or Welded | ¾ inch and smaller, 10 feet; 1 inch and larger, 12 feet | Every other floor, not to exceed 25 feet ⁵ |
| Schedule 40 PVC and ABS DWV | Solvent Cemented | All sizes, 4 feet; allow for expansion every 30 feet ^{3,6} | Base and each floor' provide mid-story guides; provide for expansion every 30 feet ⁶ |
| Copper | Mechanical | In accordance with standards acceptable to the Authority Having Jurisdiction | |
| Steel and Brass | Mechanical | In accordance with standards acceptable to the Authority Having Jurisdiction | |

Notes:

- ¹ Support adjacent to joint, not to exceed 18 inches.
- ² Brace not to exceed 40 foot intervals to prevent horizontal movement.
- ³ Support at each horizontal branch connection.
- ⁴ Hangers shall not be placed on the coupling.
- ⁵ Vertical water lines shall be permitted to be supported in accordance with recognized engineering principles with regard to expansion and contraction, where first approved by the Authority Having Jurisdiction.
- ⁶ See the appropriate IAPMO Installation Standard for expansion and other special requirements.
- ⁷ See manufacturer installation instructions for additional requirements.
 - C. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
 - D. Place a hanger within 12 inches of each horizontal elbow.
 - E. Use hangers with 1-½ inch minimum vertical adjustment.
 - F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
 - G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
 - H. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
 - I. Support riser piping independently of connected horizontal piping.
 - J. Provide transverse seismic support for all piping systems.

3.09 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping penetrates weather or waterproofed walls, floors, and roofs.
- B. Flash vent pipes projecting 3 inches minimum above finished roof surface with pre-manufactured butyl boot.

3.10 INSTALLATION OF EQUIPMENT

- A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.
- B. Maintain manufacture recommended minimum clearances for access and maintenance.

- C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.
- D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.
- E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.
- F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION 22 05 00

SECTION 22 07 00
PLUMBING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping Insulation.
- B. Jackets and Accessories.

1.02 RELATED WORK

- A. Section 22 05 00 - Common Work Results for Plumbing.

1.03 REFERENCES

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B.
- C. ANSI/ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- D. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- E. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- F. ANSI/ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.
- G. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- H. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- I. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- J. ASTM C1427 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- K. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- L. ASTM E84 - Surface Burning Characteristics of Building Materials.
- M. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- N. NFPA 255 - Surface Burning Characteristics of Building Materials.
- O. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include product description, thickness for each service, and locations.
- C. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with three years minimum experience.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723, ASTM E84, or NFPA 255.
- D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.06 DELIVERY STORAGE AND HANDLING

- A. Division 01: General Requirements.

- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

1.08 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.09 WARRANTY

- A. Division 01: General Requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Certain-Teed.
- B. Johns Manville.
- C. Knauf.
- D. Owens-Corning.
- E. Pittsburgh - Corning.
- F. Substitutions: Under provisions of Division 01.

2.02 INSULATION - PIPING

- A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.23 at 75° F, rated from 0° F to 850° F, vapor retarder jacket of Kraft paper bonded to aluminum foil, self-sealing lap and butt strips; Johns Manville "Micro-Lok" or approved equal.
- B. Type E: Elastomeric foam; EPDM-based closed-cell flexible foam, ASTM C534; flexible cellular elastomeric in sheet or pre-formed tube, 'k' value of 0.26 at 75° F, max. service temp - 300° F, ASTM C534; max. flame spread = 50, max. smoke developed = 50, ASTM E84; UV-resistant coating/jacketing if exposed to sunlight; K-FLEX USA "Insul-Tube", "Insul-Sheet", or approved equal.

2.03 FIELD APPLIED JACKET

- A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
- B. Aluminum Jackets: ASTM B209; 0.016 inch thick; corrugated or textured finish, longitudinal slip joints.
- C. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.

2.04 INSULATION ACCESSORIES

- A. Adhesives: Waterproof and fire-retardant type.
- B. Canvas Lapping Adhesive: Fire resistive to NFPA 255.
- C. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.
- D. Joint Tape: Glass fiber cloth, open mesh.
- E. FSK Joint Tape; ASTM C1136 Foil-Scrim-Kraft (FSK) lamination coated with solvent acrylic pressure sensitive adhesive; capable of adhering to fibrous and sheet metal surfaces; tri-directionally reinforced 2x3 squares per inch fiberglass scrim; 9.5 mils thick, -40 to 240° F service temperatures; Venture Tape "1525CW" or approved equal.
- F. Tie Wire: Annealed steel, 16 gauge.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install materials after piping and equipment has been tested and approved.
- B. Clean surfaces for adhesives.

- C. Prepare surfaces in accordance with manufacturer's recommendations.

3.02 INSTALLATION - PIPING

- A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
- B. Continue insulation vapor barrier through penetrations except where prohibited by code.
- C. Locate insulation and cover seams in least visible locations.
- D. Neatly finish insulation at supports, protrusions, and interruptions.
- E. Provide insulated cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system, including under fitting jackets.
- F. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with metal jacket. Jacket seams shall be located on bottom side of horizontal piping.
- G. Fully insulate all piping including all spaces under jacketing.

3.03 SCHEDULE - PIPING

| PIPING | TYPE | PIPE SIZE Inch | MINIMUM INSULATION THICKNESS Inch |
|-------------------|------|-------------------|--------------------------------------------|
| Rain Leaders | A | All Sizes | 1" |
| Roof Drain Sumps | A | All Sizes | 2" |
| Vent Through Roof | A, E | All Sizes | 1" |

END OF SECTION 22 07 00

**SECTION 22 10 00
PLUMBING PIPING**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Sanitary Sewer Piping.
- B. Storm Drain Piping.

1.02 RELATED WORK

- A. Section 22 05 00 – Common Work Results for Plumbing.
- B. Section 22 07 00 - Plumbing Insulation.

1.03 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include data on pipe materials, pipe fittings, valves and accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 STORM DRAIN PIPING

- A. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION

- A. Route piping in orderly manner and maintain gradient.
- B. Install piping to conserve building space and not interfere with use of space.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide clearance for installation of insulation and access to valves and fittings.
- E. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- F. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- G. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Division 09.

END OF SECTION 22 10 00

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Roof Drains.

1.02 RELATED WORK

- A. Section 22 05 00 - Common Work Results for Plumbing.
- B. Section 22 10 00 – Plumbing Piping.

1.03 REFERENCES

- A. ANSI A112.21.2 - Roof Drains.

1.04 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Trim: By same manufacturer for each product specified throughout.

1.05 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include sizes, rough-in requirements, service sizes, and finishes.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include fixture trim exploded view and replacement parts lists.
- C. Provide Manufacturer's parts list and maintenance information on specialties.

1.07 WARRANTY

- A. Provide manufacturer's warranty under provisions of Division 01.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – ROOF DRAINS

- A. JR Smith.
- B. Zurn.
- C. Substitutions: Under provisions of Division 01.

2.02 ROOF DRAINS

- A. Roof Drains (RD-1): ANSI A112.21.2; lacquered cast iron body with sump, cast iron dome strainer, membrane flange and membrane clamp with integral gravel stop, with adjustable underdeck clamp, roof sump receiver, waterproofing flange, leveling frame, adjustable extension sleeve (for insulation). Model 1015 manufactured by J.R. Smith.
- B. Roof Overflow Drains (OD): Lacquered cast iron body and clamp collar and bottom clamp ring; water dam extended to 2 inches above flood elevation; Model 1045 manufactured by J.R. Smith.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate of roof construction to receive drains to required invert elevations.

3.02 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.03 INSTALLATION

- A. Install components level and plumb
- B. Install specialties in accordance with manufacturer's instructions to permit intended performance.

END OF SECTION 22 40 00

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SCOPE

- A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.02 WORK INCLUDED

- A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.
- B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

- A. Related Work Specified Elsewhere:
 - 1. Plumbing Specifications: Division 22.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

- A. IMC International Mechanical Code.
- B. UPC Uniform Plumbing Code.
- C. IBC International Building Code.

1.05 PROJECT RECORD DRAWINGS

- A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.
- B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.
- C. At completion of project, deliver these drawings to the Architect and obtain a written receipt.

1.06 SUBMITTALS

- A. See General Conditions and the General Requirements in Division 01 regarding submittals.
- B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.
- C. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.
- D. Provide shop drawings with calculations for selection of seismic/wind restraints in accordance with IBC and ASCE 7, certified by a qualified professional engineer, licensed in the State of Alaska. Seismic calculations shall be based upon Seismic Category D.

1.07 HANDLING

- A. See General Conditions and the General Requirements in Division 01 regarding material handling.

- B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.08 SUBSTITUTIONS

- A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.
- B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The Architect/Engineer shall be the final authority regarding acceptability of substitutes.

1.09 DIMENSIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.
- B. Any differences, which may be found, shall be submitted to the Architect/Engineer for consideration before proceeding with the work.

1.10 MANUFACTURER'S DIRECTIONS

- A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Architect/Engineer of any such conflicts before installation.

1.11 PERMITS, FEES, ETC.

- A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.12 TESTING

- A. The Contractor under each section shall at his own expenses perform the various tests as specified and required by the Architect and as required by applicable code, the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.13 TERMINOLOGY

- A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.
- B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.
- C. The use of the word "shall" conveys a mandatory condition to the contract.
- D. "This section" refers to the section in which the statement occurs.
- E. "The project" includes all work in progress during the construction period.
- F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.14 SCHEDULE OF WORK

- A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.15 COOPERATION AND CLEANING UP

- A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.
- B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.16 WARRANTY

- A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect/Engineer, shall be repaired and/or replaced to the complete satisfaction of the Architect/Engineer. Guarantee shall be in accordance with Division 01.

1.17 COMPLETION REQUIREMENTS

- A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:
 - 1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
 - 2. Contractors One Year Warranty.
 - 3. All Manufacturers' Guarantees.

1.18 INSPECTION OF SITE - REMODEL PROJECTS

- A. The accompanying plans do not indicate completely the existing plumbing and mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.19 RELOCATION OF EXISTING INSTALLATIONS

- A. There are portions of the existing plumbing, mechanical and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of his particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.20 SALVAGE MATERIALS

- A. The Contractor shall remove existing equipment, duct, grilles and other items associated with the mechanical systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the Architect/Engineer), they shall be removed.
- B. All items or materials removed from the project shall be made available for the Owner's inspection. The Owner retains the option to claim any item or material. Contractor shall deliver any claimed item or material in good condition to the place designated by the Owner. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.
- B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

- A. No materials containing asbestos in any form shall be allowed.
- B. No solder or flux containing lead shall be used on this project.
- C. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.03 FLASHING

- A. Metal Flashing: 26-gauge minimum galvanized steel.
- B. Metal Counter Flashing: 22 gauge minimum galvanized steel.
- C. Flexible Flashing: 47-mil thick sheet butyl, compatible with roofing.
- D. Caps: Steel, 22-gauge minimum; 16 gauge at fire resistant elements.

2.04 EQUIPMENT CURBS

- A. Fabricate curbs of wood or steel beam, unless specifically called out otherwise.

2.05 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

- A. General:
 - 1. Seismic restraint designer shall coordinate all attachments with the structural engineer of record.
 - 2. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
 - 3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
 - 4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.
 - 5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.
- B. Friction from gravity loads shall not be considered resistance to seismic forces.

PART 3 EXECUTION

3.01 DRAWINGS

- A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see Architectural Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

- A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC and IBC Standards; all local and state amendments to all codes and standards.
- B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.
- C. Compliance with codes and ordinances shall be at the Contractor's expense.
- D. Install in accordance with manufacturer's instructions.

3.03 MEASUREMENTS

- A. Verify all measurements on the job site.

3.04 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

- A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.
- B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.
- C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.05 PAINTING

- A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of mechanical work:
 - 1. Factory applied prime and finish coats on mechanical equipment.
 - 2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.
 - 3. Factory applied prime coat on access doors.
 - 4. Pipe identification where specified.
- B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.06 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide curbs for mechanical roof installations 16 inches minimum high above roofing surface. Flexible sheet flash and counter-flash with sheet metal; seal watertight.
- C. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.07 SEISMIC RESTRAINT

- A. General:
 - 1. All equipment, piping and ductwork shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.
 - 2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.

3.08 INSTALLATION OF EQUIPMENT

- A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.
- B. Maintain manufacture recommended minimum clearances for access and maintenance.
- C. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

END OF SECTION 23 05 00

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Duct Materials.
 - 2. Ductwork Fabrication.

1.02 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Results for HVAC

1.03 REFERENCES

- A. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 4. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 - 5. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 6. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
 - 1. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- D. Underwriters Laboratories Inc.:
 - 1. UL 181 - Factory-Made Air Ducts and Connectors.

1.04 DEFINITIONS

- A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.
- B. Low Pressure: Three pressure classifications: ½ inch WG positive or negative static pressure and velocities less than 2,000 fpm; 1 inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2 inch WG positive or negative static pressure and velocities less than 2,500 fpm.
- C. Medium Pressure: Three pressure classifications: 3 inch WG positive or negative static pressure and velocities less than 4,000 fpm, 4 inch WG positive static pressure and velocities greater than 2,000 fpm, 6 inch WG positive static pressure and velocities greater than 2,000 fpm.
- D. High Pressure: 10 inch WG positive static pressure and velocities greater than 2,000 fpm.

1.05 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.06 SUBMITTALS

- A. See General Conditions and the General Requirements in Division 01 regarding submittals.

- B. Product Data: Submit data for duct materials.

1.07 CLOSEOUT SUBMITTALS

- A. Division 01 - General Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.08 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - General Requirements: Product requirements.
- B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- C. Maintain temperatures during and after installation of duct sealant.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.
- B. Steel Ducts: ASTM A568/A568M.
- C. Fasteners: Rivets, bolts, or sheet metal screws.
- D. Hanger Rod: ASTM A36/A36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30° divergence upstream of equipment and 45°convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- G. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- H. Use double nuts and lock washers on threaded rod supports.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Division 01 - General Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 12" and smaller.
- D. Install duct hangers and supports in accordance with Section 23 05 00.
- E. Use double nuts and lock washers on threaded rod supports.

3.03 SCHEDULES

- A. Ductwork Material Schedule:

| Air System | Material |
|---------------------|----------|
| Low Pressure Supply | Steel |
| Return and Relief | Steel |
| General Exhaust | Steel |

END OF SECTION 23 31 00

