PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes limited scope general construction materials and methods for application with mechanical installations as follows:

1. Access panels and doors in walls, ceilings, and floors for access to mechanical materials and equipment.
2. Mechanical equipment nameplate data.
3. Concrete for bases and housekeeping pads.
4. Non-shrink grout for equipment installations.
5. Sleeves for mechanical penetrations.
6. Drip Pans with detection.
7. Miscellaneous metals for support of mechanical materials and equipment.
8. Wood grounds, nailers, blocking, fasteners, and anchorage for support of mechanical materials and equipment.
9. Joint sealers for sealing around mechanical materials and equipment.
10. Sealing penetrations through noise critical spaces.
11. Plenum insulation for enclosure of combustible items located within fire-rated plenums.
12. Firestopping

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 07 Section “Penetration Firestopping” for material and methods for firestopping systems.
2. Division 23 Section "Basic Piping Materials and Methods," for materials and methods for mechanical sleeve seals.
3. Division 23 Section “Direct Digital Controls for HVAC” for integration with building automation system of leak detection system “Water Present” alarm.
4. Division 26 Section “Common Work Results for Electrical” required electrical devices.
5. Division 26 Sections "Enclosed Switches and Circuit Breakers" for field-installed disconnects.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Division 01 and Division 23 Section General Mechanical Requirements.

1. Product data for the following products:

    a) Access panels and doors.
    b) Joint sealers.
    c) Through and membrane-penetration firestopping systems.
    d) Plenum insulation.

2. Shop drawings detailing fabrication and installation for metal fabrications, and wood supports and anchorage for mechanical materials and equipment.
3. Welder certificates, signed by Contractor, certifying that welders comply with requirements specified under "Quality Assurance" article of this Section.
4. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of utility services and details for dust and noise control.

    a) Coordinate sequencing with construction phasing and Owner occupancy specified in Division 01 Section "Summary of Work."

5. Through and Membrane Penetration Firestopping Systems Product Schedule: Submit a schedule for each piping system penetration that includes UL listing, location, wall or floor rating and installation drawing for each penetration fire stop system.

    a) Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.03 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.

1. Provide UL Label on each fire-rated access door.

C. Through and Membrane Penetration Firestopping Systems Installer Qualifications: A firm experienced in installing penetration firestopping systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

1.04 NOISE CRITICAL SPACES

A. Many areas of the building, referred to as "noise-critical spaces", require special attention (special acoustical provisions and restrictions). The table below designates the noise-critical spaces; noise levels due to equipment, ductwork, grilles, registers, terminal devices, diffusers, etc., shall permit attaining sound pressure levels in all 8 octave bands in occupied spaces conforming to RC levels per ASHRAE handbook as indicated.

Space	RC Levels
Theatre	25
Teleconference Rooms	25
Meeting/Banquet Rooms	30
Clinic Exam Rooms	30
Conference Rooms	30
Classrooms	30
Library	25
Offices	30
Open Offices	40
Study Areas	30

PART 2 - PRODUCTS AND MATERIALS

2.01 ACCESS TO EQUIPMENT

A. Refer to Architectural documents for specification of Access Panels and Access Doors.

2.02 MECHANICAL EQUIPMENT NAMEPLATE DATA

A. For each piece of power operated mechanical equipment, provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance's, and similar essential data. Locate nameplates in an accessible location.

2.03 CONCRETE EQUIPMENT BASES/HOUSEKEEPING PADS

A. Provide concrete equipment bases and housekeeping pads for various pieces of floor mounted mechanical equipment. Concrete equipment bases/housekeeping pads shall generally conform to the shape of the piece of equipment it serves with a minimum 4" margin around the equipment and supports.

B. Form concrete equipment bases and housekeeping pads using framing lumber or steel channel with form release agent. Chamfer top edges and corners. Trowel tops and sides of each base/pad to a smooth finish, equal to that of the floors.

C. Concrete equipment bases and housekeeping pads shall be made of a minimum 28 day, 4000 psi concrete conforming to American Concrete Institute Standard Building Code for Reinforced Concrete (ACI 318-99) and the latest applicable recommendations of the ACI standard practice manual. Concrete shall be composed of cement conforming to ASTM C 150 Type I, aggregate conforming to ASTM C33, and potable water. All exposed exterior concrete shall contain 5 to 7 percent air entrainment.

D. Unless otherwise specified or shown on the structural drawings, reinforce equipment bases and housekeeping pads with No. 4 reinforcing bars conforming to ASTM A 615 or 6x6 – W2.9 x W2.9 welded wire mesh conforming to ASTM A185. Reinforcing bars shall be placed 24” on center with a minimum of two bars each direction.

E. Provide galvanized anchor bolts for all equipment placed on concrete equipment bases and housekeeping pads or on concrete slabs. Anchor bolts size, number and placement shall be as recommended by the Manufacturer of the equipment.

F. Concrete equipment bases and housekeeping pads shall have height as specified on the drawings or minimum height if not specified in accordance with the following table:

Equipment	Minimum Height
Furnaces, Exterior Equipment Less than or equal to 20 tons and Other Equipment Not Listed	3-1/2”
Air Handling Units w/TSP less than or equal to 3.5”, Boilers (See Note 1)	3-1/2”
Chillers, Condensate Pumps, Base Mounted Pumps up to 30 HP, Air Handling Units w/TSP greater than 3.5”, All Vertical Inline Pumps, (See Note 1)	5-1/2”

NOTES:

1. Height of equipment bases applies to equipment installed on slab-on-grade. For equipment installed on floors above grade and/or roof, reference the drawings.

2. Coordinate final pad heights for air handling units with required condensate trap depths. Increase pad heights as needed to allow for unit trap height and required slope to drain.

2.04 GROUT

A. Provide nonshrink, nonmetallic grout conforming to ASTM C 1107, Grade B, in premixed and factory-packaged containers.

B. Grout shall have post-hardening, volume-adjusting, dry, non-staining, non-corrosive, non-gaseous, hydraulic-cement characteristics and shall be as recommended by manufacturer for interior and exterior applications.

C. Grout shall have 5,000 psi, 28-day compressive strength design mix.

2.05 PENETRATIONS

A. Sleeves:

1. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A-53 grade A or 12 gauge (0.1084 inches) welded galvanized steel formed to a true circle concentric to the pipe.
2. Sheet-Metal Sleeves: 10 gauge (0.1382 inches), galvanized steel, round tube closed with welded longitudinal joint.

B. Frames for rectangular openings attached to forms and of a maximum dimension established by the Architect. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, provide 18 gauge (0.052 inches) welded galvanized steel. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, provide 10 gauge (0.1382 inches) welded galvanized steel. Notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural Drawings.

2.06 DRIP PANS

A. Drip pans for pipes in protected areas shall be 20 gauge galvanized steel with 2” lapped and soldered joints. Drip pan shall have a depth of 2” and a width of 6” in addition to the diameter of the associated pipe. Provide 3/4” galvanized pipe with male NPT outlet at low point of drip pan. Connect ¾” type “L” copper indirect drain line to drip pan outlet. Route and discharge to receptor with air gap outside of the protected area.

B. Drip pan supports shall be ¼" X 2" galvanized bar stock welded to the drip pan without holes. Provide ¼" galvanized threaded rods through bar stock on each side of the drip pan and attached with 2 nuts per rod. Attach rods to structure with MSS SP-58 compliant components.

C. Flood Detector: Flood detector switch utilizing hydrophilic pad and stainless steel sensor array to detect moisture. Switch shall be provided with integral feet to prevent pad from contacting the pan. Provide with solid state electronics and double throw relay to allow switch to shut down unit and provide an auxiliary alarm output.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a) Diversitech
b) RCT/Aquaguard
c) Approved equivalent

2.07 MISCELLANEOUS METALS

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Fasteners: Zinc-coated, type, grade, and class as required.

2.08 MISCELLANEOUS LUMBER

A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.

B. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less that 15/32 inches.

2.09 JOINT SEALERS

A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

B. Colors: As selected by the Architect from manufacturer's standard colors.

C. Nonacid Curing Sealer: One-part, nonacid-curing, silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.

1. Manufacturers:

a) Dow Corning, Dowsil 790.
b) Dow Corning, Dowsil 795.
c) GE, Silglaze II SCS 2350.
d) GE, Silpruf SCS 2000.
e) Owens Corning, Energy Complete.
f) Pecora, 864 NST.
g) Tremco, Spectrem 1.
h) Tremco, Spectrem 2.

D. High Humidity Sealer: One-part, mildew-resistant, silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.

1. Manufacturers:

a) Dow Corning, Dowsil 786.
b) GE, Momentum SCS1700.
c) Pecora, 898 Silicone NST.

E. Hybrid Joint Sealer: One-part, non-sag, paintable complying with ASTM C920, Type S, Grade NS, Class 50, recommended for exposed applications on interior and exterior locations involving joint movement of not more than plus or minus 50 percent.

1. Manufacturers:

a) BASF, MasterSeal NP 100.
b) Pecora, DyanTrol I-XL.
c) Tremco, Dymonic FC.

F. Acrylic Latex Joint Sealer: One-part, non-sag, mildew-resistant, paintable acrylic latex or siliconized acrylic latex, complying with ASTM C834, Type OP, Grade NF, recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.

1. Manufacturers:

a) Pecora, AC-20
b) Sherwin Williams 950A
c) Tremco, Tremflex 834

2.010 ACOUSTICAL SEALANTS

A. General: Penetrations by ducts, pipes and conduit through surfaces that are around and between noise critical spaces shall be sleeved, packed and sealed airtight with foam rod, non-hardening sealant and/or packing material as described herein.

B. Foam Rod: Foam backer rod shall be closed cell polyethylene suitable for use as a backing for non-hardening sealant.

C. Non-Hardening Sealant: Sealant for penetrations shall be non-hardening. Permanently flexible, approved firestop putty may be used in lieu of the sealant on foam rod in noise critical walls that are also fire rated.

D. Packing Material: Mineral fiber; non-combustible; resistant to water, mildew and vermin. Expanding resilient foams manufactured for this purpose are an acceptable alternative only if the material density is at least 15 pcf (40 kg/m3).

E. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Meeting ASTM E84 for a smoke flame spread index of less than 25 / 50.

F. Manufacturers:

1. Pecora, AC-20 FTR.
2. Pecora, AIS-919.
3. USG, SHEETROCK Acoustical Sealant.

2.011 PLENUM INSULATION

A. General: Combustible materials including, but not limited to, plastic pipe and plastic-coated cables that do not meet the minimum combustibility requirements of the applicable building codes may be installed in fire-rated plenums when enclosed within high-temperature insulation blanket where approved by the authority having jurisdiction.

B. Material: FyreWrap 0.5 Plenum Insulation, ETS Schaefer Plenumshield Blanket, Thermal Ceramics PlenumWrap+, Knauf Earthwool 1000, or equivalent utilizing light weight, high temperature blanket enhanced for biosolubility. The encapsulating material shall be aluminum foil with fiberglass reinforcing scrim covering.

C. Certification: Plenum insulation shall have an encapsulated flame spread rating less than 25 and a smoke developed rating of less than 50. The product shall be UL 1887 (Modified) listed, certified by ASTM E-136 for Non-combustibility and ASTM E-84/UL 723 for Surface Burning Characteristics.

D. Physical Properties: Plenum insulation shall be single 1" minimum layer with a density of 2 to 6 pounds per cubic foot.

2.012 FIRESTOPPING

A. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with UL 2079 or ASTM E814, or other NRTL acceptable to AHJ.

B. Manufacturers:

1. 3M Corp., Fire Barrier Sealant.
2. Hilti.
3. Owens Corning, Firestopping Insulation.
4. Pecora, AC-20 FTR.
5. RectorSeal.
6. Specified Technologies Inc., Firestop.
7. USG SHEETROCK Firecode Compound.
8. Tremco, Tremstop Fyre-Sil.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Install products in accordance with manufacturer's instructions.

3.02 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.03 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.04 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

3.05 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.
2. Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.

B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.06 PENETRATIONS:

A. New Construction:

1. Coordinate with Divisions 03 and 04 for installation of sleeves and sleeve seals integrally in cast-in-place, precast, and masonry walls and horizontal slabs where indicated on the Drawings or as required to support piping or ductwork penetrations.

B. Provide sleeves and/or box frames for openings in all concrete and masonry construction and fire or smoke partitions, for all mechanical work that passes through such construction; Coordinate with other trades and Divisions to dimension and lay out all such openings.

C. The General Contractor will provide only those openings specifically indicated on the Architectural or Structural Drawings as being provided under the General Contractor's work.

D. The cutting of new or existing construction shall not be permitted except by written approval of the Architect.

E. Floor sleeves shall be fitted with means for attachment to forms and shall be of length to extend at least two inches above the floor level.

F. All sleeves shall be of ample size to allow for movement of conduit, duct or pipe and insulation through the sleeves without damage to the insulation.

G. Cut sleeves to length for mounting flush with both surfaces of walls.

H. Extend sleeves installed in floors 2 inches above finished floor level.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

J. Seal space outside of sleeves with approved joint compound for penetrations of gypsum board assemblies.

3.07 DRIP PANS

A. Provide drip pans in locations indicated on drawings.

B. Provide drip pans under piping or equipment that is installed in spaces that have sensitive electronics/electrical equipment such as electrical, IT/AV, telecom, data equipment, elevator machinery rooms, etc. Obtain approval from the Architect prior to installation.

C. Provide drip pans for piping directly above a two hour rated ceiling of an elevator machine room.

D. Provide drip pans, only with written approval obtained prior to installation, installed beneath piping above electrical rooms, telecom rooms, data rooms, servers or any other protected area not clearly indicated by drawings.

E. Provide drip pan supports every 4'-0".

F. Place flood detector in the lowest location in the drip pan. Interlock detector with the HVAC equipment per manufacturer's recommendations.

G. Wire flood detector to remote alarm, Diversitech Universal Alarm or equivalent. Coordinate location of the remote alarm with building owner prior to installation.

H. Coordinate interlock of "Water Present" alarm and "Cable Fault" alarm with building automation system. Refer to Division 23 Section "Direct Digital Controls for HVAC" for integration with building automation system and low voltage power wiring.

3.08 ACOUSTICAL PENETRATIONS

A. General: There shall be no direct contact of Sheet Metal or piping with shaft walls, floor slabs and/or partitions. All openings around pipes and ducts in the structure surrounding the mechanical equipment and surrounding noise-critical spaces shall be sealed, packed with caulking for the full depth of the penetration, as described herein.. This includes all slab penetrations and penetrations of noise critical walls.

B. Duct Penetrations: Where each duct passes through a wall, floor or ceiling of a noise critical space, there shall be a clear annular space of 1 inch between the duct and structure. After all of the ductwork is installed, the Contractor shall check the clearance, pack the voids full depth with packing material and caulk both ends with non-hardening sealant backed by foam rod or permanently flexible firestop material. Where there is not sufficient access space to pack around all sides of a duct (for example, at the underside of a slab), place a short stub duct in the wall, pack and caulk around it and then attach the inlet and outlet ducts to each end.

C. HVAC Piping:

1. Provide a steel sleeve cast or grouted into the structure. The internal diameter of the sleeve shall be 2 inches larger than the external diameter of the pipe passing through it. After all of the piping is installed in that area, verify the specified clearance and correct it, if necessary, to within 1/2 inch. Pack the void full depth with packing material sealed at both ends, 1 inch deep, with non-hardening sealant backed by foam rod.
2. Provide factory fabricated split seal clamp around the pipe filled with closed-cell neoprene sponge insulation, thickness as required to match adjacent insulation, minimum 3/4 inch. Cast or grout the sleeve into the structure. Provide fiberglass insulation if the pipe is subject to temperatures greater than 225 degrees F. Provide Mason Industries Type SWS or approved equal.

3.09 PLENUM INSULATION

A. General: Plenum insulation shall be installed as a single layer encapsulation applied directly on the surface of combustible items within fire-rated plenums where permitted by the local authority having jurisdiction

B. Overlap: Provide a minimum 1” perimeter and longitudinal overlap at all seams and joints. Seal all cut edges with aluminum foil tape. There shall be no exposed fiber.

C. Secure Attachment: Securely attach insulation using stainless steel tie wire or banding at locations and intervals as recommended by the manufacturer. The entire installation shall comply with the manufacturer's written installation instructions.

D. Approval: Plenum insulation shall not be installed where not allowed by local authority having jurisdiction. Do not install combustible material within fire-rated plenums where the use of plenum insulation is not approved.

END OF SECTION