SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:

1. Pipe, duct and un-isolated equipment hangers, anchors and supports.
2. Sleeves, escutcheons.
3. Through-penetration firestopping in fire-rated construction and through-penetration smokestopping in smoke partitions, including methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

1.02 RELATED DOCUMENTS

A. Section 23 05 01 – HVAC General Provisions

B. Section 23 05 48 – Vibration and Seismic Controls for HVAC

C. Section 23 07 00 – Insulation for HVAC

D. Section 23 21 13 – Hydronic Piping

E. Section 23 23 00 – Refrigerant Piping and Accessories

F. Section 23 31 00 – HVAC Ducts and Casings

1.03 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below:

A. ASME –American Society of Mechanical Engineers

1. ASME B16.9: Factory-Made Wrought Steel Buttwelding Fittings

B. ASTM – American Society for Testing and Materials

1. ASTM A123/A123M: Standard Specification for Zinc Coating (Hot-Dip Galvanized) Coatings on Iron and Steel Product
2. ASTM B695-04: Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
3. ASTM C1107/C1107M: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
4. ASTM E814: Standard Test Method for Fire Tests of Penetration Firestop Systems

C. CIE – Commission Internationale de L'EclairageL CIE 170-1 Fundamental Chromaticity Diagram with Physiological Axes

D. DIN – Deutsches Institut fur Normung: DIN 4726 Warm Water Surface Heating Systems and Radiator Connecting Systems - Plastics Piping Systems and Multilayer Piping Systems

E. ISO – International Organization for Standardization: ISO 9001 Quality Management Systems

F. MSS – Manufacturers Standardization Society

1. MSS-SP-58: Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation
2. MSS-SP-69: Pipe Hangers and Supports - Selection and Application
3. MSS-SP-89: Pipe Hangers and Supports - Fabrication and Installation Practices

G. UL – Underwriters Laboratories Inc.

1. UL 1479: Standard for Fire Tests of Penetration Firestops
2. UL Fire Resistance: Fire Resistance Directory set

a. Through-penetration firestop devices (UL-XHCR)
b. Fire resistance ratings (UL-BXUV)
c. Through-penetration firestop systems (UL-XHEZ)
d. Fill, void, or cavity material (UL-XHHW)

3. UL Building Materials: Building Materials Directory
4. UL Component Listing Test Criteria
5. Warnock Hersey Mark (Certification of Building Products)

1.04 QUALITY ASSURANCE

A. Hangers and supports to be constructed and applied according to the following standards:

1. Duct Hangers: Provide hangers as required per SMACNA Standards for ductwork pressure classification.
2. Firestopping materials shall have been tested to provide fire rating at least equal to that of the construction.
3. Deliver products in original, unopened packaging with legible manufacturer’s identification.
4. Mechanical sleeve seals shall be manufactured in an ISO 9001:2008 certified facility.
5. Submit written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer’s data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

1.05 SUBMITTALS

A. Include on ductwork and piping shop drawings a layout of masonry and concrete floor and wall sleeve locations for pipes and ducts. Include elevations and sleeve sizes.

B. Submit product data on through-penetration firestop. Submittal data for firestopping systems shall include the UL System Numbers listed in the UL Building Materials Directory under which the material was tested in accordance with ASTM E814 (UL 1479) for use in a Through-Penetration Firestop System. Where there is a firestop application that has not been tested by UL, obtain from the manufacturer an engineered judgment that the proposed application of the firestop product is suitable. Submit the engineered judgment to the Authority Having Jurisdiction.

1. Product Data: Manufacturer's specifications and technical data including detailed specification of construction and fabrication, manufacturer's installation instructions and details of each proposed assembly identifying intended products and applicable UL system number or UL classified devices.
2. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements:

    a. Manufacturer or manufacturer's representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.

C. Submit details of hangers, anchors and supports for each pipe size and service, ductwork and individual pieces of equipment.

D. Submit joint sealer guarantee as described in Paragraph 1.04A.5.

E. Submit load calculations for multiple or trapeze pipe hangers as required in Paragraphs 2.02B and 3.01R.

F. Submit ICBO Evaluation Reports as required in Paragraph 3.01D.

G. Submit shop drawings indicating support methods, point loadings, etc. as described in Paragraph 3.01E.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Pipe Hangers: Anvil, Fee & Mason, Elcen, Tube-Turn, F&S, Pipe Shields, B-Line Kindorf, Michigan Hanger, Power Strut, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by specified manufacturers is acceptable.

B. Sleeves: Pipe Shields, Insul, RK Industries

C. Pipe Wrap Tape: Polycen, Nassua, 3M

D. Firestop: Nelson, Dow, 3M, Hilti

E. Escutcheon Plates: Beaton & Corbin Manufacturing

F. Mechanical Sleeve Seals: Link-Seal, Calpico Pipe Linx, Metraflex Metraseal

2.02 GENERAL

A. Provide hangers of heavy construction suitable for the size of pipe to be supported. Materials shall be of steel, except pipe rolls of wrought or malleable iron.

1. Hangers for pipes six-inches or less shall be swivel ring, wrought pipe clamp, or adjustable wrought clevis type. Anvil Figure 260, MSS-SP 69, Type 1.
2. Hangers for ductile iron or cast iron pipes four-inches or less shall be swivel ring, wrought pipe clamp or adjustable wrought clevis type. Anvil Figure 590, MSS-SP 69, Type 1.
3. When an oversized clevis type hanger is used (i.e., insulate pipe) a pipe spacer shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt.

B. Multiple or trapeze pipe hangers shall be steel channels with welded spacers and hanger rods if hanger load calculations are submitted.

C. Wall support shall be welded steel bracket with hanger.

1. Light Duty Wall Support: Anvil Figure 194, MSS-SP 69, Type 31.
2. Medium Duty Wall Support: Anvil Figure 195, MSS-SP 69, Type 32.
3. Heavy Duty Wall Support: Anvil Figure 199, MSS-SP 69, Type 33.

D. Metal Framing Channels:

1. Provide perforated epoxy painted finish, 12-gauge minimum steel channels securely anchored to wall structure with interlocking, split type, bolt-secured, galvanized pipe/tubing clamps. B-Line type B22, S pattern with B-2000 series clamps, Power-Strut Type PS200 H with PS1200 clamps or equal.
2. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion, or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Power-Strut PS004T – PS106N Series or equal.

E. Support stationary vertical piping with carbon steel double bolt riser clamps attached to the pipe. Weld shear lugs to the pipe. In general, use one clamp for each two floors and one clamp at each floor for copper tubing. Where pipes are in open shafts, provide forged steel bar brackets fixed to wall. Riser clamps shall be copper plated when used with copper pipe. Locate riser clamp immediately under coupling or other fitting. Anvil Figure 261, MSS-SP-69, Type 8 for steel pipe; Anvil Figure CT121, MSS-SP-69, Type 8 for copper pipe.

F. Floor Support for Pipe:

1. Sizes up to 4 inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support. Anvil Figure 264, MSS-SP-69, Type 38.
2. Sizes 5 inches and over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support. Anvil Figure 265, MSS-SP-69, Type 38.
3. Provide pipe stanchions for support of pipe elbows at base of riser and vertical piping. Stanchions shall be complete with base plate and vent hole. Anvil Figures 62 and 63.

G. Select hangers and supports in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.

H. Hangers shall not be disengaged by movement of supported pipe.

I. Provide copper-plated or felt-lined hangers for copper piping or provide 10-mil pipe wrap tape on pipe at hangers. Tape shall extend a minimum of 2 inches beyond hanger saddle on both ends and be wrapped around pipe a minimum of 2 turns. Install vinyl-coated hangers for all plastic piping.

J. Steel hanger rods shall be threaded both ends, threaded one end, or continuous threaded, black finish. Provide rods complete with adjusting and lock nuts. Anvil Figures 146, 140 or 253.

K. Pipe Support Recommendations for Rigid Grooved Joint Systems: The maximum hanger spacing in the specification to ANSI/ASME B31.1 as noted and should be used only in conjunction with Victaulic 07 zero-flex rigid couplings. For flexible systems the hanger, support, spacing and location refer to the pipe support recommendations section in the Victaulic "Field Assembly and Installation Pocket Handbook" or equivalent provided by Grooved Joint Manufacturer.

L. Continuous Concrete Insert Channels:

1. Provide steel inserts with industry standard pre-galvanized finish, nominally 1⅝-inch wide by 1⅜-inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices.
2. Installed channels shall provide a load rating of 2,000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed for use with continuous concrete inserts are acceptable.
3. Select insert length to accommodate all pipe, duct, and conduit in the area.

M. Anchors shall be fabricated using welding steel shapes, plates, and bars to secure piping to the structure.

N. Concrete inserts shall be MSS-SP-69 Type 18 wedge type or universal concrete inserts.

1. Wedge type shall be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to ⅞-inch diameter. Wedge design shall allow the insert to be held by concrete in compression to maximize the load carrying capacity. Anvil Figure 281.
2. Universal type shall be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to ⅞-inch diameter. Anvil Figure 282.
3. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.

O. Drainage Piping: Provide MSS-SP-69 Type 8 or MSS-SP-69 Type 42 riser clamps for vertical piping, and MSS-SP-69 Type 52, spring hangers at the base of vertical piping.

2.03 SLEEVES

A. Construct sleeves for pipes passing through walls (other than foundation walls), floors,

partitions, hung or furred ceilings, etc., of minimum 18-gauge galvanized steel, flanged on each side of wall, partition, hung or furred ceiling, etc.

B. Provide standard weight galvanized steel pipe sleeves with welded anchor flanges at foundation walls and reinforced concrete or masonry walls.

C. Provide 20-gauge galvanized sheet metal sleeves, the full depth of floor or wall, for round ductwork passing through masonry or concrete and/or steel cellular floor construction. Rectangular ductwork shall be provided with framed openings through floor and wall construction.

D. Provide cast iron or fabricated “wall pipe” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Stack Sleeve Fittings: Provide manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing and underdeck clamping ring with setscrews.

F. Provide mechanical sleeve seals at exterior wall and tank wall penetrations. Seal shall be of the modular sealing element unit type, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements:**EPDM** interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: **Plastic.**Include two for each sealing element.

3. Connecting Bolts and Nuts: **Carbon steel with corrosion-resistant coating** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

G. Install escutcheons at exposed piping through floors, ceilings, walls and partitions in finished areas, within cabinets and millwork, and piping through all fire-rated separations. Provide manufactured wall and ceiling escutcheons and floor plates, with an inside diameter to closely fit around pipe, tube, and insulation of insulated piping and an outside diameter that completely covers opening. Escutcheons shall be cast iron or cast brass, deep-pattern escutcheons if required to conceal protruding fittings, sleeve hubs or firestopping projections.

2.04 PENETRATION FIRESTOP

A. Fire-Rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, and sound or vibration absorption, and at other construction gaps.

B. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

C. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and

that the system be symmetrical for wall applications. Systems or devices must be asbestos-free. Mortar systems must be Warnock Hersey approved.

D. Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

E. All firestopping products must be from a single manufacturer.

F. Through-penetration smokestopping at smoke partitions: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded in a non-fire rated smoke barrier.

G. Seal all pipe and duct penetrations through fire-rated construction with factory-built devices or with manufactured fill, void, or cavity materials “Classified” by Underwriters Laboratories Inc. for use as a Through-Penetration Firestop. All firestop devices and systems shall be approved for such use by the Authority Having Jurisdiction. The firesafing system used shall maintain the fire-resistance rating of the building component that is penetrated.

H. All materials shall be non-hardening and non-toxic. The firesafing system used shall accommodate expansion and contraction of the floating mechanical piping systems without damaging the firestop or reducing its effectiveness as a smoke barrier or water seal.

2.05 GROUT

A. Grout shall be slow-hardening after application, volume-adjusting, non-staining, non-corrosive, non-gaseous, and recommended for interior and exterior applications.

B. Provide ASTM C1107/C1107M, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.

C. Design Mix: 5,000 psi, 28-day compressive strength from a premixed and factory pre-package.

PART 3 – EXECUTION

3.01 HANGERS AND SUPPORTS

A. Deflection of pipes shall not exceed 1/240th (0.416 percent) of span. Support horizontal piping in accordance with the following schedule:

Pipe Size (inches)	Maximum Hanger Spacing (feet)								Hanger Rod Diameter (inches)		
	Steel	Cast Iron	Copper	Plastic					Steel / Cast Iron	Copper	Plastic
				CPVC	PVC	PP	PVDF	FG			
up to 1	7	–	5	3½	3	2¾	2½	10	⅜	⅜	⅜
1¼	9	–	7	3½	3	2¾	3	10	⅜	⅜	⅜
1½ & 2	9	5	8	3½	3½	2¾	3	10	⅜	⅜	⅜

Pipe Size (inches)	Maximum Hanger Spacing (feet)								Hanger Rod Diameter (inches)		
	Steel	Cast Iron	Copper	Plastic					Steel / Cast Iron	Copper	Plastic
				CPVC	PVC	PP	PVDF	FG			
2½	12	5	9	3½	3½	3½	3½	10	½	½	½
3	12	5	10	3½	3½	3½	3½	10	½	½	½
3½	–	5	11	–	–	–	–	–	⅝	½	–
4	12	5	12	4	4	4	4	10	⅝	½	⅝
5	12	5	13	4	4	4	4	10	⅝	½	⅝
6	12	5	14	4	4	4	4	10	¾	⅝	¾

(C)PVC: (Chlorinated) Polyvinyl Chloride Plastic; PP: Polypropylene plastic; PVDF: Polyvinylidene Fluoride Plastic; FG: Fiberglass

B. Provide hangers at each change in direction and both sides of valves 4-inch and larger. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item. Provide hanger on both sides of “no-hub” mechanical joints.

C. Support hangers from concrete inserts. Furnish, locate and set inserts. Construct inserts of malleable iron or pressed steel with space for rods of all sizes. Install inserts for pipes 3 inches and larger in size with a reinforcing rod ⅝-inch in diameter run through a slot in the insert specifically provided for this purpose.

D. If piping is required in a space where no inserts have been provided, drill holes in the slab (subject to Structural Engineer’s prior approval) and provide rods and hanger attached to an approved fishplate or install double expansion shields connected by a 2-inch by 2-inch angle, from which the hanger rod is to be suspended. For pipe size 2 inches and under use single shields but the hanger spacing shall be reduced to 5 feet. The carrying capacity and size of each shield shall be calculated on the basis of the spacing indicated above but the minimum size shall be ⅜-inch. Install additional shields of the same size so that the number of hangers is of adequate size to support the loads, which they carry. Shields may be used in concrete slabs only. Obtain from the expansion shield manufacturer an ICBO Evaluation Report for the product and submit to the Architect.

E. Regardless of the type of construction (i.e., concrete, concrete-deck-steel or other variations) take particular care to support main lines and large and heavy pipes in an approved manner, including the provision of supplementary steel, if required. Supplementary steel shall be mill-rolled sections. Submit shop drawings, indicating support methods, point loadings to the building structure and hanger locations for review sufficiently in advance of concrete pouring schedules to permit evaluation, critique and any necessary changes to handling and support methods.

F. Hangers shall be directly bolted to steel beams of building construction, where they occur if approved by the Structural Engineer. Smaller pipes shall be suspended from crosspieces of pipe or steel angles, which in turn, are securely fastened to building beams or hung from building concrete construction by means of rods and inserts. The intention is to provide supports which shall be amply strong and rigid for the load, but which will not weaken or unduly stress the building construction.

G. Provide approved roller support, floor stands, wall brackets, etc., for lines running near the floor or near walls, which can be supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a higher level than the pipe.

H. Do not hang piping or ductwork from supports for other services. Installed supports shall accommodate free expansion of the piping and duct system.

I. Wherever hangers using pipe rolls are used, provide approved steel pipe covering protection saddles, spot-welded to the piping at each hanger location.

J. Anchor piping where shown to localize expansion or to prevent undue strain on piping and branches. Anchors shall be entirely separate from hangers and of heavy forged or welded construction of approved design. All anchor designs, when submitted for approval, shall include piping reactions which respective anchors are capable of supporting. Provide indicated expansion loop.

K. Install anchors where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

L. Support copper tubing individually by approved hangers not more than 6 feet apart. Hangers for uncovered lines shall be specially designed for copper tubing and of exact outside diameter of tubing. Hangers for covered tubing shall be broad straps fitting outside of covering.

M. Hangers for insulated piping shall support the pipe without piercing the insulation. Refer to Section 23 07 00 – HVAC Insulation for insulation protection shields and pipe inserts.

N. For piping 4 inches and larger, support the elbows of the piping adjacent to pumps with steel supports from the concrete housekeeping pad, or from the inertia base where pump is mounted to prevent loading heavy weights of piping on pump flanges or casing. Where inertia base or spring vibration isolation is not provided, base elbows shall be supported on concrete pad with 1-inch neoprene pad.

O. Use hangers, which are vertically adjustable 1½-inch minimum after piping is erected. Install hangers so that ½-inch minimum clearance is maintained between finished covering of pipe and adjacent work.

P. Support riser piping independently of connected horizontal piping.

Q. Adjust hangers to obtain pipe slope where specified.

R. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior review.

S. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other debris, and align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

T. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123/A123M, 1½-ounces/square foot of surface,

each side. Mechanical galvanize threaded products, ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes shall be field-covered with zinc-rich paint of comparable thickness to factory coating. Corrosive atmospheres include the following locations:

1. Exterior locations, parking ramps.
2. Swimming pool equipment, chemical storage or hazardous waste storage rooms
3. Wet wells, meter pits
4. Sanitary and storm sewer pumping stations
5. Food service/kitchen areas, walk-in coolers/freezers
6. Locker/shower rooms

3.02 SLEEVES

A. Provide sleeves for pipe passing through floors, walls or partitions, hung or furred ceilings, of sufficient diameter to accommodate pipe covering where such is required. Locate sleeves secure in place so that an equal space is around the pipe, after the pipe is installed.

B. For sleeves at penetrations of metal deck, nail, screw or weld to the deck prior to the pouring of the deck concrete. Set sleeves in such a manner so that no concrete fills their interior during the concrete pouring and finishing operations.

C. For exposed pipes, caulk floor sleeves with firestop material watertight and project sleeve approximately 2 inches above the finished floor. Finish sleeves with specified flanges flush with the bottom of slab and also with the finished faces of wall.

D. Provide sleeves with an inside diameter at least ½-inch greater than outside of pipe served, including pipe insulation which must be continuous through sleeve.

E. Where piping penetrates walls (other than foundation walls), partitions, floor slabs, etc., pack space between piping and sleeve with mineral wool (for depth of sleeve), or firestop material.

F. Do not support pipes by resting clamps on sleeves. Clamps shall extend beyond sleeve and be supported outboard of sleeve in an approved manner. In no case shall sleeves be cut or slotted to accommodate pipe clamps.

G. Provide escutcheon plates for piping in sleeves passing through floors, walls, soffits, furrings, partitions, hung ceilings, etc., throughout the building where exposed. Exposed escutcheons shall be cast brass chromium plated bell type with setscrews, of sufficient diameter to include any required pipe insulation. Attach escutcheon to building material, not to pipe. Do not penetrate vapor barriers.

1. Split-casting, deep-pattern type cast-brass type with concealed hinge and set screw with polished chrome-plated and rough brass finish.
2. Split-casting, floor-plate type cast brass with concealed hinge and set screw.

H. Exterior-wall pipe penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install aboveground steel pipe for sleeves smaller than 6 inches.

2. Install aboveground cast-iron “wall pipes” for sleeves 6 inches and larger.
3. Install underground cast-iron “wall pipes” for all sleeves.
4. Mechanical Sleeve Seal Installation:

    a. Select type and number of sealing elements required for pipe material and size.
    b. Position pipe in center of sleeve.
    c. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve.
    d. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
    e. For wall thickness up to 12 inches provide one mechanical sleeve seal at the interior side of sleeve, for wall thickness greater than 12 inches provide two mechanical sleeve seals, one at the interior side of sleeve and one at the exterior side of sleeve.

3.03 FIRESTOPPING

A. Where space for future ducts, pipes and conduits is required, provide sleeves and fill with lightweight concrete or firestop.

B. Provide firestopping and grouting around pipes and ducts penetrating concrete slabs, concrete walls and masonry walls with cement grout in the sleeved opening extending full depth through wall or floor slab. Provide sheet metal cover over the insulation before applying grout. Around pipes and ducts through fire rated gypsum board construction, pack the annular space between the wall sleeve and the insulation sheet metal cover with noncombustible approved firestop material and finish with 20-gauge sheet metal collar on ducts and escutcheons on pipe where duct or pipework is exposed. Attach escutcheons to wall.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

D. Environmental Requirements:

    1. Provide adequate ventilation if using solvent.
    2. Provide forced-air ventilation during installation if required by manufacturer.
    3. Keep flammable materials away from sparks or flame.
    4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
    5. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

E. Clean surfaces that will be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect fitting, adhesion, or the required fire resistance.

F. Install penetration seal materials in accordance with the UL Fire Resistance Directory or Mortars per Warnock Hersey approval and in accordance with manufacturer’s instruction.

G. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

H. Where large openings are created in walls or floors to permit installation of pipes, ducts or other items, close unused portions of opening with firestopping material tested for the application. See UL Fire Resistance Directory or Warnock Hersey approvals.

I. Install smokestopping as specified for firestopping.

3.04 GROUTING

A. Mix, install and cure grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout. Provide forms as required for placement of grout. Avoid air entrapment during placement of grout.

C. Place grout, completely filling equipment bases.

D. Place grout on concrete bases and provide smooth bearing surface for equipment.

E. Place grout around anchors.

END OF SECTION 23 05 29