SECTION 15060 - BASIC PIPING MATERIALS AND METHODS

Include the following information into specifications prepared for use on University of Cincinnati projects. This information is supplemental and not intended to be a complete specification.

PART 1 - GENERAL

1.01 SUMMARY

This section complements other Div 15 piping sections. Coordinate & edit. Refer to specific piping system sections listed under “Related Sections” below, for: piping, fittings; and joining material.

A. Section Includes

1. Escutcheons
2. Unions
3. Dielectric unions
4. Dielectric waterway fittings
5. Y-type strainers
6. Basket strainers
7. Suction diffusers
8. Sleeves
9. Mechanical sleeve seals

B. Related Sections

1. 07270 - Firestopping
2. 15010 - Basic Mechanical Requirements
3. 15101 - Valves
4. 15140 - Supports and Anchors
5. 15240 - Vibration Isolation and Expansion
6. 15410 - Plumbing Piping
7. 15510 - Hydronic Piping
8. 15520 - Steam and Steam Condensate Piping
9. 15530 - Refrigerant Piping

1.02 SUBMITTALS

A. Product Data

1. Escutcheons
2. Dielectric Unions and Fittings
3. Mechanical Sleeve Seals
4. Strainers and suction diffusers

1.03 QUALITY ASSURANCE

Check for local safety code governing welded pipe installation.

A. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping".
2. Certify each welder passed American Welding Society (AWS) qualification tests for processes involved and certification is current.
B. Prepare coordination drawings in accordance with Sections 01042 and 15010.

PART 2 - PRODUCTS

2.01 ESCUTCHEONS

A. Following manufacturers may comply with requirements, but the list is not limited.

*Use above for non-proprietary or below for semi-proprietary specification.*

A. Manufacturers

1. Chicago Specialty Manufacturing Company
2. Sanitary-Dash Manufacturing Company
3. Grinnell

B. Construction

*Coordinate with University and select for the specific application.*

1. Manufactured wall, ceiling, and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.
2. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.
3. Outside Diameter: Completely cover opening.
   a. Finish: Rough brass.
   b. Finish: Polished chrome plate.
5. Cast Brass: Split casting, with concealed hinge and set-screw.
   a. Finish: Rough brass.
   b. Finish: Polished chrome plate.
7. Stamped Steel: One-piece, with spring clips and chrome plated finish.

*Most commonly used.*

8. Stamped Steel: Split plate, with concealed hinge, set-screw, and chrome plated finish.
9. Stamped Steel: Split plate, with concealed hinge, spring-clips, and chrome plated finish.
10. Stamped Steel: Split plate, with exposed-rivet hinge, set-screw, and chrome plated finish.
11. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome plated finish.
12. Cast-Iron Floor Plate: One-piece casting.

2.02 UNIONS

A. Following manufacturers may comply with requirements, but the list is not limited.

*Use above for non-proprietary or below for semi-proprietary specification.*

A. Manufacturers

1. Eclipse, Inc., Rockford, IL
2. Perfection Corporation, Madison, OH
3. Watts Regulator Company, Andover, MA

B. Construction

1. Malleable-iron, hexagonal stock; Female threaded ends.
Or
1. Forged Steel, Class 3000; Butt welded ends.
2. Metal-to-metal bronze seating surfaces.
3. Class 150 for low pressure service and class 250 for high pressure service.

2.03 DIELECTRIC UNIONS

A. Following manufacturers may comply with requirements, but the list is not limited.

Use above for non-proprietary or below for semi-proprietary specification.

A. Manufacturers
1. Eclipse, Inc., Rockford, IL
2. Perfection Corporation, Madison, OH
3. Watts Regulator Company, Andover, MA

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping systems materials.
2. Insulating Material: Suitable for system fluid, pressure, and temperature.

Revise pressure ratings and temperatures in 5 para's below as required, or add other options for specific applications.

3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F temperature.
4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.
5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum pressure to suit system pressures.
6. Dielectric Couplings: Galvanized-steel coupling, having inert and non-corrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F temperature.
7. Dielectric Nipples: Electroplated steel nipple, having inert and non-corrosive, thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 deg F temperature.
8. Isolate dissimilar metals, prevent galvanic action and stop corrosion. Factory certified to isolate 600 volt potential on a dry line with no flashover.

In liquid system, dielectric unions may not completely stop galvanic action due to the ability of the fluid being conveyed to act as a conductor (electrolyte). Therefore, in piping systems conveying liquids consider the use of dielectric waterway fittings which insulate the inside of the metal casing to inhibit the internal formation of a galvanic local cell between the dissimilar metals in the water. Dielectric waterway fittings are available in sizes 1/4” to 4”, with threaded-to-threaded, threaded-to-mechanical (non-grooved) fittings, and threaded-to-grooved mechanical fittings.

2.04 DIELECTRIC WATERWAY FITTINGS

A. Following manufacturers may comply with requirements, but the list is not limited.
Use above for non-proprietary or below for semi-proprietary specification.

A. Manufacturers
   1. Epco Sales, Inc., Cleveland, Ohio
   2. Victaulic Company of American, Easton, PA

B. Construction
   1. Electroplated steel or brass nipple
   2. Inert and non-corrosive thermoplastic lining.

2.05 Y-TYPE STRAINERS

A. Manufacturers
   Basket style only.
   1. Armstrong Machine Works, Inc.; Three Rivers, MI
   2. Hoffman Specialty ITT; Fluid Handling Division; Indianapolis, IN
   3. Metraflex Co.; Chicago, IL
   4. Mueller Steam Specialty; Lumberton, NC
   5. O. C. Keckley; Skokie, IL
   6. R-P&C Valve, Inc.; Fairview, PA
   7. Spirax Sarco, Inc.; Allentown, PA
   8. The Trane Company; LaCrosse, WI
   9. Victaulic Company of America (low pressure applications only); Easton, PA
   10. Watts Regulator Company; Andover, MA
   11. Wheatly Gaso, Inc.; Tulsa, OK

B. Construction
   1. Material to match or be compatible with piping system.
   2. Full line size to match connecting pipe.

Other screen materials, perforation sizes and patterns available.

3. 304 stainless steel screens with perforations as specified below.
4. Copper Piping
   a. 2 in. and smaller: Class 250, cast bronze body, screwed connections, screen with 0.033 in. perforations.
   Select
   b. 2-1/2 in. and larger" [Class 150][Class 300], cast bronze body, flanged connections, screen with 0.045 in. perforations for 2-1/2 in. and 3 in. and 0.125 in.
   Select
   perforations [for WOG service and 0.062 in. perforations for steam service] for 4 in. and larger.
5. Steel Piping:
   a. 2 in. and smaller: Class 250, cast iron body, screwed connections, screen with 0.033 in. perforations. Screwed screen retainer with centered blowdown, fitted with pipe plug.
   Select
b. 2-1/2 in. and larger: [Class 125][Class 250], cast iron body, flanged connections, screen with 0.033 in. perforations for 2-1/2 in. and 3 in., 0.045 in. perforations. Bolted screen retainer with off-center blowdown, fitted with pipe plug.

Select

c. 4 in. to 6 in. and 0.125 in. perforations [for WOG service and 0.062 in. perforations for steam service] for 8 in. and larger. Bolted screen retainer with off-center blowdown, fitted with pipe plug.

2.06 BASKET STRAINERS

A. Manufacturers

1. Armstrong Machine Works, Inc.; Three Rivers, MI
2. Crane Company
3. Hayward Strainers, Inc.; Elizabeth, NJ
4. Metraflex Company; Chicago, IL
5. Mueller Steam Specialty; Lumberton, NC
6. Spirax Sarco, Inc.; Allentown, PA
7. Wheatly Gaso, Inc.; Tulsa, OK

B. Construction

Select

1. [Class 125][Class 250] cast iron body, flanged connections, stainless steel screen with 0.045 perforations for 6 in. and

Select

smaller and 0.125 in. perforations [for WOG service and 0.062 in. perforations for steam service] for 8 in. and larger.
2. Full line size to match connecting pipe.

2.07 SUCTION DIFFUSERS

A. Manufacturers

1. ITT Bell & Gossett; Morton Grove, IL
2. Taco, Inc.; Cranston, RI
3. Mueller Steam Specialty; Lumberton, NC
4. Amtrol, Inc.; W. Warwick, RI
5. Armstrong Pumps, Inc.; N. Tonawanda, NY
6. Victaulic Company of America; Easton, PA
7. Wheatly Gaso, Inc.; Tulsa, OK

B. Construction

1. Class 125 cast iron, angle type body with steel or iron straightening vanes and combination diffuser/strainer. Permanent strainer shall be stainless steel with 0.047 in. perforations and start-up strainer shall be 16 mesh bronze.
2. Provide a permanent magnet located within the flow stream and removable for cleaning.
3. Provide adjustable support foot to carry weight of suction piping.
4. Diffuser/strainer shall be designed to withstand pressure differential equal to pump shutoff head.
5. Body shall include plugged taps for suction gage port and blowdown connection.
6. Size to match connecting pipe and pump suction flange.

2.08 SLEEVES

A. The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet-Metal: 10 gage for 6" diameter and larger, galvanized sheet metal, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends for less than 6" diameter.

Following are available with many end variation.

3. Cast-Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pipe, having plain ends and integral water stop, except where other features are specified.

Following are used for exterior wall pipe penetrations below grade, and permit some deflections of penetrating pipe. Link-type mechanical sleeve seals are not used.

4. Wall Penetration Systems:
   a. Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.
   b. Penetrating Pipe Deflection: 5 percent without leakage.
   c. Housing: Ductile-iron casting having waterstop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.
   d. Pipe Sleeve: AWWA C151, ductile-iron pipe.
   e. Housing-to-Sleeve Gasket: Rubber or neoprene, push-on type, of manufacturer's design.

Following sleeve is without seepage holes, and cannot serve in lieu of a floor drain.

5. Cast-Iron Sleeve Fittings:
   a. Commercially-made, sleeve having integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.

Retain following option, only when required.

   b. Underdeck Clamp: Clamping ring with set-screws.

Following 2 PVC sleeves may be prohibited by fire codes used in some jurisdictions.

6. PVC Plastic: Manufactured, permanent, with nailing flange for attaching to wooden forms.
8. PE Plastic: Manufactured, reusable, tapered, cup-shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

2.10 MECHANICAL SLEEVE SEALS

A. Modular, watertight, mechanical type. Components include interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve. Connecting bolts and pressure plates cause rubber sealing elements to expand when tightened.

PART 3 - EXECUTION
3.01 PIPING SYSTEMS INSTALLATIONS

A. General Locations and Arrangements

1. Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems.
2. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations.

Prepare bends or loops for pipe expansion and contraction. Prior approval of the University Architect is required to use expansion joints.

3. Install piping as indicated, except where deviations are specifically approved.
4. Bull head connections are prohibited, in any piping service.
5. No water, drain, steam or condensate line shall be designed nor installed over electrical switchgear, motor control centers, transformers, elevator shafts nor equipment rooms.
6. Use fittings for all changes in direction and all branch connections.
7. Install strainers on the supply side of each control valve, pressure reducing or regulating valve, and solenoid valve.
8. Install unions:
   a. Adjacent to valves on the downstream side.
   b. At the final connections to items of equipment.
   c. On each side of traps.
9. Install flanges in piping 2-1/2” and larger, adjacent to each valve and at the final connection to each piece of equipment.
10. Testing: Refer to individual piping system specification sections.

B. Conceal Pipe

1. In walls, pipe chases, utility spaces, above ceilings, below grade or floors, except in equipment rooms and service areas and unless shown otherwise on drawings.
2. Do not encase horizontal runs in solid partitions, except as shown.
3. Do not run piping through transformer vaults, telephone rooms, elevator equipment rooms and other electrical or electronic equipment spaces and enclosures.

C. Install Piping

1. Free of sags or bends and with ample space between piping to permit proper insulation applications.
2. Without springing, bending, or furring pipe.
3. Using fittings for offsets or changes in piping alignment.
4. Exposed piping at right angles or parallel to building walls. Diagonal runs not permitted, unless indicated on the drawings.
5. Tight to slabs, beams, joints, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1” clearance outside insulation.
6. Allow sufficient space above removable ceiling panels to allow for panel removal and light fixture access.
7. Group pipes in parallel to each other, spaced to permit applying full insulation and servicing of valves.

D. Install Drains

1. At low points in mains, risers and branch lines.
2. Use tee fitting.
3. 3/4” ball valve and select [short 3/4 threaded nipple and cap] or [hose connection with a brass cap and chain (as minimum)].
4. On 6” to 10” pipe, use 1” ball valve and plug.
5. On 12” and larger pipe, use 1-1/2” ball valve and plug.

Drains in mechanical rooms must be piped to floor drains. Drain valves to be no higher than 6’ above floors.

E. Install fittings for changes in direction and branch connections.
F. Install couplings according to manufacturer’s printed instructions.

Coordinate with Section 07270.

K. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, or floors, fire rated integrity shall be maintained. Refer to Section 07270 for special sealers and materials.

3.02 JOINTS

A. General

1. Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 15 specify piping installation requirements unique to the piping system.
2. Join pipe and fittings as follows and as specifically required in related piping system specification sections.
3. Ream pipe and tube ends and remove burrs. Bevel plain ends of steel pipe.
4. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
5. Remake leaking joints with new fittings.

Delete following joint methods not required on this project.

B. Steel Pipe Joints

1. Branch Connections
   a. Less than 2/3 main size, use weldolets, butt, or threaded type.
   b. Larger than 2/3 main size use weld tees, laterals, or crosses.
   c. Do not use shaped nipples.
2. Pipe 2” and Smaller
   a. Thread pipe with tapered pipe threads in accordance with ASME B1.20.1
   b. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter.
   c. Apply pipe joint lubricant or sealant suitable for service for which the pipe is intended, on male threads at each joint and tighten joint to leave not more than three threads exposed. No caulking permitted.
   d. Thoroughly remove metal particles from ends of pipe and clean each section of foreign material before it is assembled into system.
3. Pipe Larger Than 2”
   a. Weld pipe joints (except for exterior water service pipe) in accordance with AWS D10.12. "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to "Quality Assurance" article.
      - Weld pipe joints only when ambient temperature is above 0°F (-18°C) where possible.
      - Bevel pipe ends at 37.5 degree angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
- Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".
- Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which eliminate unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
- Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.

b. Weld pipe joints of exterior water service pipe in accordance with AWWA C206.

c. Flanges:
- Install adjacent to each valve, and at the final connection to each piece of equipment and elsewhere as shown on drawings.
- Clean and align flange surfaces parallel.
- Select proper gasket.
- Install gasket concentrically between flanges.
- Tighten bolts sequentially, gradually and uniformly in accordance with manufacturers recommendations, to provide uniform gasket compression.
- Lubricate bolt threads.

C. Fittings

1. Use for all changes in direction and all branch connections.
2. Do not use street elbows, bushings nor long threaded fittings.

Solder connections made with 95-5 solder have maximum operating pressure rating for 1-1/4 to 2-inch sizes of 400 psi at 100 °F, decreasing to 175 psi at 250 °F.

D. Copper Pipe Joints

1. Thoroughly clean tube surface and inside surface of cup of fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.

Flared compression fittings are permitted by the piping code for refrigerant lines not over 3/4” o.c., using annealed copper tubing, provided such joints are exposed for visual inspection.

4. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
5. Mechanical Joints: Flared compression fittings may be used for refrigerant lines 3/4” and smaller.

Use following option if acceptable on this project.

E. Copper Tubing Mechanically Formed Tee Connections: (Installers Option) In lieu of providing tee fittings in copper tubing, provide mechanically formed tee connections, in accordance with following:

1. Size and wall thickness of both run tube and branch tube are listed by manufacturer of forming equipment as "acceptable application."
2. Height of drawn collar is not less than three times wall thickness of run tubing.
3. End of branch tube is notched to conform to inner curve of run tube, and dimpled to set exact penetration depth into collar.
4. Resulting joint is minimum of three times as long as thickness of thinner joint member, and brazed using BCuP-3 series filler metal.

F. Copper Tubing Mechanically Formed Couplings: (Installers Option) In lieu of providing couplings in copper tubing, provide mechanically formed couplings, in accordance with following:
1. Form couplings by first annealing area at end of tube where expansion will occur. Insert tube expander to die size required and expand tube end to accept tubing of same size.
2. Resulting joint is minimum of three times as long as thickness of tube and braze using BCuP-3 series filler metal.

G. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards:
Delete para’s below not required for the project.
6. PVC to ABS (Non-Pressure) Transition: Procedure and solvent cement described in ASTM D 3138.

H. Plastic Pipe and Fitting Heat-Fusion Joints: Prepare pipe and fittings and join with heat-fusion equipment, according to manufacturer’s printed instructions.
1. Plain-End Pipe and Fittings: Butt joining.
2. Plain-End Pipe and Socket-Type Fittings: Socket-joining.

I. Piping Connections: Except as otherwise indicated make piping connections as specified below.
1. Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inches or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2 inches and larger, adjacent to flanged valves and a final connection to each piece of equipment having flanged pipe connection.

Modify dielectric connection type in 2 para’s below for the type to be used for each fluid.
3. Dry Piping Systems (Gas, Compressed Air, and Vacuum): Install dielectric unions and flanges to connect piping materials of dissimilar metals.

J. Joints for other piping materials are specified within respective piping system sections.

3.03 ESCUTCHEONS FOR PIPE PENETRATIONS OF CONCRETE AND MASONRY WALLS, WALL BOARD PARTITIONS, AND SUSPENDED CEILINGS ACCORDING TO THE FOLLOWING:
Modify following para’s as required to include escutcheons spec’d in Part 2.
1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons where required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast-brass or stamped-steel with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw or spring clips.

3.04 UNIONS

1. Install adjacent to each valve, and at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as required to make-up or disconnect piping and as shown on drawings.
2. Locate unions to permit removal of parts and equipment for inspection or cleaning, and in a position which will permit the valve device or part to be removed without disconnecting any piping except unions.

3.05 Dielectric Unions: Install to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum).

3.06 Dielectric Waterway Fittings: Install to connect piping materials of dissimilar metals in wet piping systems (water, steam).

May not need strainer in front of every valve. Use discretion.

3.07 STRainers: Install on the inlet side of each control valve, pressure reducing or regulating valve, solenoid valve, pump and elsewhere as shown on drawings.

3.08 BASKET STRainers

3.09 SUCTION STRainers

Use below for broad scope.

3.10 SLEEVES

1. Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals.
2. Where pipes pass through interior building walls, furnish machine cut sleeves minimum 1" larger than outside diameter of pipe and/or insulation. Coordinate with work of masons to properly locate sleeves so that sleeves are true to line, grade, position and plumb and level and ends of sleeves through walls are flush with the finished wall surface.
3. Where pipes pass through floors, furnish sleeves minimum 1" larger than outside diameter of pipe or insulation and set top of sleeve 1 in. above finished floor. Install floor sleeves under supervision of concrete work installer.
4. After installing pipe, caulk or grout sleeves through non fire walls to make watertight.
5. Provide sleeves for pipe installation under footings. Extend sleeves one foot beyond each side of footing.

Use below for narrow scope, delete items not required.

3.10 SLEEVES

Delete below when sleeves are required.
A. Sleeves not required for:
   1. Core drilled holes
   2. Holes performed by removable plastic sleeves.

B. Install sleeves for pipes passing through:
   1. Concrete and masonry walls.
   2. Concrete floor.
   3. Concrete roof slab
   5. Where indicated.

C. Install sleeves
   1. Build sleeves into new walls and slabs as work progresses.

Consider seismic design where required.

   2. Provide 1/4" annular clear space between sleeve and pipe insulation or pipe, if uninsulated.
   3. Cut sleeves to length for mounting flush with both surfaces, except for wet area floors.
   4. Wet area floors, mechanical equipment rooms:
      a. Extend sleeves to extend 2" above finished floor level.
      b. Floors with membrane waterproofing: secure flashing between flanges.

Delete grout sealing if not required.

   c. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified. Seal space outside of sleeve fitting with nonshrink, non-metallic grout.

Specify exact sealant by type, grade, class and use as required.

   5. Seal annular space between sleeve and pipe insulation or sleeve and pipe, with elastomeric joint sealant specified in Division 7, Section "Joint Sealants"; except:
      a. Below grade exterior wall penetrations.
      b. Above grade exterior wall penetrations.

Select from following two options and coordinate with Part 2.

   6. Below grade exterior wall penetration:
      a. Install cast-iron wall pipes for sleeves.
      b. Size for 1" annular clear space between pipe and sleeve for installation of mechanical seals.
      c. Seal penetration with mechanical sleeve seal in accordance with manufacturer's printed instructions.

Or

   6. Below grade exterior wall penetration:
      a. Install ductile-iron wall penetration system sleeve in accordance with manufacturers printed installation instructions.

7. Above grade exterior wall penetration:
   a. 6" and under, install steel pipe sleeve.
   b. 6" and larger, install Cast-iron "wall pipes" sleeves.

Or
b. 6” and larger, install sheet metal sleeve.
c. Size for 1” annular clear space between pipe and sleeve for installation of mechanical seal.
d. Seal penetration with mechanical sleeve seal in accordance with manufacturer's printed instructions.

3.11 FIELD QUALITY CONTROL

A. Testing: Refer to individual piping system specification sections.

END OF SECTION