

PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

- A. This Section specifies piping materials and installation methods common to more than one Section of Division 22 and includes joining materials, piping specialties and basic piping installation instructions.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 22 Section "Common Work Results for Plumbing," for materials and methods for sleeve materials.

1.02 DEFINITIONS

- A. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content $\leq 0.25\%$ per Safe Drinking Water Act as amended January 4th 2011 Section 1417.

1.03 SUBMITTALS

- A. Refer to Division 1 and Division 22 Section "General Plumbing Requirements" for administrative and procedural requirements for submittals.
- B. Product Data: Submit product data on the following items:
 - 1. Escutcheons
 - 2. Dielectric Unions
 - 3. Dielectric Flanges and Flange Kits
 - 4. Mechanical Sleeve Seals
 - 5. Wall Pipes
 - 6. Strainers
 - 7. Flexible Connectors
- C. Quality Control Submittals:
 - 1. Submit welders' certificates specified in Quality Assurance below.
- D. Submit certification that specialties and fittings for domestic water distribution comply with NSF 61 Annex G and / or NSF 372.
- E. Submit a schedule of dissimilar metal joints and dielectric waterway fittings, unions, flanges or flange kits. Include joint type materials, connection method and proposed dielectric waterway fittings, unions and flanges to isolate dissimilar metals. Include minimum and maximum torque requirements for flange connections to valves. Refer to the individual piping system specification sections

in Division 22 for specifications for piping materials and fittings relative to that particular system and additional requirements.

- F. Submit certification that fittings and specialties are manufactured in plants located in the United States or certified that they comply with applicable ANSI and ASTM standards.

1.04 QUALITY ASSURANCE

- A. Welder's Qualifications: All welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
- B. Welding procedures and testing shall comply with ANSI Standard B31.9 - Standard Code for Building Services Piping and The American Welding Society, Welding Handbook.
- C. Soldering and Brazing procedures shall conform to ANSI B9.1 Standard Safety Code for Plumbing Refrigeration.
- D. Pipe specialties and fittings shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.
- E. Comply with NSF 61 Annex G and / or NSF 372 for wetted surfaces of specialties and fittings containing no more than 0.25% lead by weight for domestic water distribution.

PART 2 - PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide piping materials and specialties from one of the following:
 - 1. Pipe Escutcheons:
 - a) AWI Manufacturing.
 - b) Keeney Manufacturing Company
 - c) Wal-Rich Corp.
 - d) Jones Stephens Corp.
 - 2. Dielectric Unions:
 - a) JOMAR International
 - b) Smith Cooper International
 - c) Watts Regulator Co.
 - d) Zurn Industries
 - 3. Dielectric Flanges and Flange Kits:
 - a) Calpico, Inc.
 - b) FMC Technologies

- c) Pipeline Seal & Insulator, Inc.
 - d) Tampa Rubber and Gasket Co., inc.
 - e) Watts Industries Inc.; Water Products Div.
 - f) Zurn Industries, Inc.; Wilkins Div.
- 4. Strainers – 2” and smaller:
 - a) Apollo
 - b) Hammond
 - c) Milwaukee
 - d) NIBCO
- 5. Strainers – 2-1/2” and larger:
 - a) Metraflex Co.
 - b) Watts Regulator Co.
 - c) Zurn Industries, Inc.; Wikins Div.
- 6. Mechanical Sleeve Seals:
 - a) Advance Products & Systems
 - b) Calpico, Inc.
 - c) GPT Industries/Link Seal
 - d) Metraflex Co.
 - e) Proco Products, Inc.
- 7. Metal Flexible Connectors:
 - a) United Flexible, Inc.
 - b) Hyspan
 - c) Mason Industries, Inc.
 - d) Mercer Rubber Co.
 - e) Metraflex Co.
 - f) Proco Products, Inc.
 - g) Resistoflex
 - h) Tyler Pipe; Gustin-Bacon Div.
- 8. Wall Pipes
 - a) Josam Mfg. Co.
 - b) Smith (Jay R) Mfg. Co.
 - c) Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
 - d) Watts Industries, Inc.
 - e) Zurn Industries, Inc.; Hydromechanics Div.

2.02 PIPE AND FITTINGS

- A. Refer to the individual piping system specification sections in Division 22 for specifications on piping and fittings relative to that particular system.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

- A. Refer to individual Division 22 Piping Sections for special joining materials not listed below.
- B. Welding Materials: AWS D10.12; Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.
- C. Brazing Materials: AWS A5.8; Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.
- D. Soldering Materials: ASTM B32; Refer to individual piping system specifications for solder appropriate for each respective system.
- E. Gaskets for Flanged Joints: ASME B16.21; Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.04 PIPING SPECIALTIES

- A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.
- B. Unions:
 - 1. Malleable-iron, Class 150 for low pressure service and class 300 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.
 - 2. Bronze, Class 125, with lead free cast bronze body meeting ASTM B584, for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; solder or female threaded ends.
- C. Dielectric Unions: Factory-fabricated with lead free cast bronze body meeting ASTM B584 and galvanized steel body with plastic dielectric gasket, class 125 for low pressure service and class 250 for high pressure service, and appropriate end connections for the pipe materials in which installed (screwed or soldered) to effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.
- D. Dielectric Flanges and Flange Kits:

1. Full faced gasket with same outside diameter and bolt hole arrangement as the flange. Pressure rating of 200psi for low pressure service and 400 psi for high pressure service at a continuous operating temperature of 180F.
 2. Steel washers, thermoplastic washers and bolt isolation sleeves or thermoplastic combination washers and bolt sleeves.
 3. Lead free cast bronze meeting ASTM B584, class 125 solder type or cast iron class 125 threaded type for low pressure service and bronze class 250 solder type or cast iron class 250 threaded type for high pressure service.
- E. Y-Type Strainers: Provide strainers full line size of connecting piping, with ends matching piping system materials. Screens for 4" and smaller shall be Type 304 stainless steel mesh with 0.062" perforations and screens for 5" and larger shall be Type 304 stainless steel, with 0.125" perforations.
1. For low pressure applications, cast iron strainers shall have 125 psi working pressure rating and cast bronze strainers shall have 150 psi working pressure rating. For high pressure applications, cast iron strainers shall have 250 psi working pressure rating and cast bronze strainers shall have 300 psi working pressure rating.
 2. Solder Ends, 2" and Smaller: Lead free cast bronze body meeting ASTM B584, screwed screen retainer with centered blowdown fitted with pipe plug.
 3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, with FDA fused epoxy coating, bolted screen retainer with off-center blowdown fitted with pipe plug.
- F. Sleeves:
1. Sleeve: Refer to Division 22 Section "Common Work Results for Plumbing" for sleeve materials.
- G. Mechanical Sleeve Seals: Modular Plumbing type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
- H. Flexible Connectors: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections.
1. Stainless-Steel-Hose, Flexible Connectors: For 2" and smaller, corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include ANSI 150# 304 stainless-steel nipples with screwed connections, welded to hose.
 2. Bronze Hose, Flexible Connectors: For 2" and smaller, corrugated bronze inner tubing covered with bronze wire braid. Include ANSI 150# brass nipples with screwed connections, braised to hose.
 3. Stainless-Steel-Hose, Flexible Connectors: For 2-1/2" and larger, corrugated, stainless-steel, inner tubing covered with stainless-steel wire

braid. Include ANSI 150# 304 stainless-steel nipples or flanges, welded to hose.

2.05 WALL PIPES

- A. Cast-iron sleeve with integral clamping flange with clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.06 WALL SLEEVES

- 1. Steel sleeve of schedule 40 pipe meeting ASTM A53B with 2" wide metal plate meeting ASTM A36 welded all around. Hot dip galvanized inside and out.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's installation instructions.

3.02 PREPARATION

- A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.03 INSTALLATIONS

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.
- B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated otherwise.
- C. Install piping free of sags and bends and with ample space between piping to permit proper insulation applications.
- D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on the Drawings.
- E. Install horizontal piping as high as possible allowing for specified slope and coordination with other components. Install vertical piping tight to columns or

walls. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

- F. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- G. Support piping from structure. Do not support piping from ceilings, equipment, ductwork, conduit and other non-structural elements.
- H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap.
- I. Verify final equipment locations for roughing in.

3.04 PIPING PROTECTION

- A. Protect piping during construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

3.05 PENETRATIONS

- A. Plumbing penetrations occur when piping penetrate concrete slabs, concrete or masonry walls, or fire / smoke rated floor and wall assemblies.
- B. Above Grade Concrete or Masonry Penetrations
 - 1. Provide sleeves for pipes passing through above grade concrete or masonry walls, concrete floor or roof slabs. Sleeves are not required for core drilled holes in existing masonry walls, concrete floors or roofs. Provide sleeves as follows:
 - a) Provide schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.
 - b) Provide galvanized sheet metal for sleeves 6 inches in diameter and larger, thickness shall be 10 gauge (0.1382 inches).
 - c) Provide welded galvanized sheet metal for rectangular sleeves with the following minimum metal thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 18 gauge (0.052 inches).
 - 2) 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, thickness shall be 10 gauge (0.1382 inches).

- d) Schedule 40 PVC pipe sleeves are acceptable for use in areas without return air plenums.
 - 2. Extend pipe insulation for insulated pipe through floor, wall and roof penetrations, including fire rated walls and floors. The vapor barrier shall be maintained. Size sleeve for a minimum of 1" annular clear space between inside of sleeve and outside of insulation.
 - 3. Seal elevated floor, exterior wall and roof penetrations watertight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum of ½" of sealant.
- C. Underground, Exterior-Wall Penetrations: Provide galvanized steel wall sleeve. Wall sleeve is not required for existing concrete walls with core drilled penetrations. Size wall sleeves to allow for 1-inch or larger, if required by the mechanical sleeve seal manufacturer) annular clear space between pipe and sleeve. Provide mechanical sleeve seal.
- 1. Use type and number of sealing elements recommended by manufacturer for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - 2. Verify sleeve and mechanical sleeve seal installations for damage and faulty work. Verify watertight integrity of sleeves and mechanical sleeve seals installed below grade to seal against hydrostatic water pressure. If sleeve and or sleeve seal are not watertight, provide new wall sleeve and mechanical sleeve seal.
- D. Elevated Floor Penetrations of Waterproof Membrane:
- 1. Provide cast-iron wall pipes for sleeves, extend top of wall pipe minimum 1" above finish floor. Size wall pipe for minimum ½" annular space between pipe and wall pipe.
 - 2. Extend pipe insulation for insulated pipe through wall pipe. The vapor barrier shall be maintained. Size wall pipe for a minimum of 1" annular clear space between inside of sleeve and outside of insulation.
 - 3. Pack with mineral wool and seal both ends with minimum of ½" of waterproof sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.
 - 4. Secure waterproof membrane flashing between clamping flange and clamping ring. Comply with requirements for flashing specified in Division 7 Section "Sheet Metal Flashing and Trim."
 - 5. Extend bottom of wall pipe below floor slab as required and secure underdeck clamp to hold wall pipe rigidly in place.
- E. Interior Foundation Penetrations: Provide sleeves for horizontal pipe passing through or under foundation. Sleeves shall be cast iron soil pipe two nominal pipe sizes larger than the pipe served.

- F. Concrete Slab on Grade Penetrations:
1. Provide schedule 40 PVC pipe sleeves for vertical pressure pipe passing through concrete slab on grade. Sleeves shall be one nominal pipe size larger than the pipe served and two pipe sizes larger than pipe served for ductile iron pipes with restraining rods. Seal water-tight with silicone caulk.
 2. Provide ½" thick cellular foam insulation around perimeter of non-pressure pipe passing thru concrete slab on grade. Insulation shall extend to 2" above and below the concrete slab.
- G. Interior Penetrations of Non-Fire-Rated Walls: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of ½" of sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.
1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1" annular clear space between inside of sleeve and outside of insulation.
- H. Exterior Wall Penetrations: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of ½" of waterproof sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.
1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1" annular clear space between inside of sleeve and outside of insulation.
- I. Fire / Smoke Rated Floor and Wall Assemblies: Seal around penetrations of fire rated assemblies to maintain fire resistance rating of fire-rated assemblies. Coordinate fire ratings and locations with the architectural drawings. Install sealants in compliance with the manufacturer's UL listing. Refer to Division 22 Section "Common Work Results for Plumbing" for firestoppings and materials.
- J. Acoustical Barrier Penetrations: Where a pipe passes through a wall, ceiling or floor slab of a noise critical space, a steel sleeve shall be cast or grouted into the structure. Refer to Section "Basic Mechanical Materials and Methods" for noise critical spaces. The internal diameter of the sleeve shall be a minimum of 2 inches larger than the external diameter of the pipe. After the piping is installed, the Contractor shall check the clearance and correct it to within 1/2-inch. Contractor shall pack the void full depth with glass/mineral fiber insulation and seal at both ends, 1-inch deep, with sealant backed by foam rod.
1. Penetration of sound isolating ceilings by sprinkler pipes and heads shall be sleeved and sealed and shall have no rigid connections between them.

3.06 FITTINGS AND SPECIALTIES

- A. Use fittings for all changes in direction and all branch connections.

- B. Remake leaking joints using new materials.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install strainers on the supply side of each control valve, pressure reducing or regulating valve, solenoid valve, mixing valve, backflow preventer and elsewhere as indicated.
- E. Install unions at the final connection to each piece of equipment adjacent to each isolation valve or valve assembly for connections 2" and smaller. Install unions where indicated elsewhere on the drawings.
- F. Install flanges at the final connection to each piece of equipment, adjacent to each isolation valve or valve assembly in piping 2-1/2" and larger. Install flanges at each valve 2-1/2" and larger.
- G. Install dielectric unions for piping 2" and smaller to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum) for copper or brass connected to carbon steel, cast or ductile iron.
- H. Install dielectric flanges for piping 2-1/2" and larger to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum) for copper or brass connected to carbon steel, cast or ductile iron.
- I. Install dielectric unions for piping 2" and smaller to connect piping materials of dissimilar metals in wet piping systems (water) (except do not install dielectric unions in concealed spaces, instead, install dielectric waterway fittings) for copper or brass connected to carbon steel, cast or ductile iron.
- J. Install dielectric flanges for piping 2-1/2" and larger to connect piping materials of dissimilar metals in wet piping systems (water) (except do not install dielectric unions in concealed spaces, instead, install dielectric waterway fittings) for copper or brass connected to carbon steel, cast or ductile iron.
- K. Install dielectric flanges for piping 2-1/2" and larger for copper or brass pipe connections to carbon steel equipment connections, steel, ductile iron or cast iron valves and fittings.
- L. Dielectric Flange Installation:
 - 1. Provide brass nipples between the equipment connection and dielectric flange for screwed connections. Provide an iron flange for the equipment side and a bronze flange for the copper or brass piping side of the joint.
 - 2. Provide a bronze flange for the copper or brass piping connection to a cast iron, ductile iron or steel flange.
 - 3. Provide full face gasket with pressure rating equal to system served.

4. At each bolt provide, steel washers, thermoplastic washers and bolt isolation sleeves or thermoplastic combination washers and bolt sleeves.

3.07 JOINTS

A. Steel Pipe Joints:

1. Pipe 2" and Smaller: Thread pipe with tapered pipe threads in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten joint to leave not more than 3 threads exposed.
2. Pipe Larger Than 2":
 - a) Weld pipe joints (except for exterior water service pipe) in accordance with ASME Code for Pressure Piping, B31.
 - b) Weld pipe joints of exterior water service pipe in accordance with AWWA C206.
 - c) Install flanges on all valves, apparatus, and equipment. Weld pipe flanges to pipe ends in accordance with ASME B31.9 Code for Building Services Piping. Clean flange faces and install gaskets. Tighten bolts to torque specified by manufacturer of flange and flange bolts, to provide uniform compression of gaskets.

B. Non-ferrous Pipe Joints:

1. Brazed And Soldered Joints: For copper tube and fitting joints, braze joints in accordance with ANSI B31.9 - Standard Code for Building Services Piping and ANSI B9.1 - Standard Safety Code for Plumbing Refrigeration.
2. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emory cloth, 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.

C. Joints for other piping materials are specified within the respective piping system Sections.

3.08 FLEXIBLE CONNECTORS

A. Install flexible connectors for piping system connections on equipment side of shutoff valves for all Plumbing equipment, pumps, and where indicated on Drawings.

1. Install stainless steel connectors for domestic water copper equipment connections 2" and smaller.
2. Install flanged stainless steel connectors for flanged equipment connections 2-1/2" and larger.

B. Install connectors according to manufacturer's recommendations.

3.09 PIPE FIELD QUALITY CONTROL

- A. Testing: Refer to individual piping system specification sections.
- B. Inspection Report Form: Refer to the inspection report form at the end of this section for inspection data to be completed for each piping system. Submit completed forms to the Owner and Engineer.

END OF SECTION

PLUMBING & PLUMBING PIPING SYSTEMS
INSPECTION REPORT FORM

Project Name: _____
Project No: _____ Contractor Project No. _____
General Contractor: _____
Inspection Date: _____ Temperature: _____

System Inspected

Building: _____
Location/Description: _____
Service: _____

Inspection Results

Time of Inspection: _____
Approval to Insulate: Y N Approval to Cover in Wall: Y N
Approval to backfill Y N

Signatures

Witness: _____ Representing: _____
Witness: _____ Representing: _____
Witness: _____ Representing: _____

Remarks

Contractor Supervisor's signature: _____

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