

SECTION 22 06 00 - PIPING SYSTEMS AND ACCESSORIES
INTERIOR BUILDING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

- A. Schedule of all pipe materials, fittings and connections to be utilized on this Project.

PART 2 – PRODUCTS

Refer to EXHIBIT "A" - PIPING MATERIALS (PLUMBING)
For piping material, fitting and connections to be used on this project.

Refer to EXHIBIT "B" - PIPING MATERIALS (FIRE PROTECTION)
for piping material, fitting and connections to be used on this project.

2.1 GENERAL

- A. All piping and fittings used on this Project shall be new and marked with manufacturer's name; and shall comply with all applicable ASTM and ANSI Standards.

2.2 STEEL PIPING AND FITTINGS

- A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40, or extra strong (Schedule 80) weight; black or galvanized finish as called for; ends chamfered for welding, threaded for screwed (threaded) connections or roll-grooved for grooved mechanical connections. Pipe used for all fire protection systems shall be UL listed and FM approved.
- B. Fittings: Same material and pressure class as adjoining pipe.
 - 1. Welded fittings: Factory forged, seamless construction, butt weld type, chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets," "Thredolets" or "Sockolets" acceptable. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable. Socket weld type, 2000 psi wp, where called for.

2. Screwed fittings: Malleable iron, black or galvanized finish as called for; drainage type where called for; fittings shall be UL listed and FM approved for all fire protection systems.

C. Joints and Connections:

1. Screwed (threaded) connections:
 - a) Unions: ASA malleable cast iron, bronze to iron seat, 300 lb. wwp; for sizes 2 in. and smaller.
 - b) Flanges: Cast iron companion type; for sizes 2-1/2 in. and larger.
2. Welded connections:
 - a) Flanges: Welding neck type. Slip-on type not to be provided except where called for, and shall not be provided in conjunction with butterfly valves.
3. Grooved mechanical connections:
 - a) Couplings of malleable iron (ASTM A470) or ductile iron (ASTM A536) with painted coating, designed for roll-grooved piping.
 - b) Gaskets suitable for water service -30°F to 230°F of EPDM, Grade E.
 - c) Bolts and nuts: Heat treated, hex head carbon steel (ASTM A183) cadmium plated or zinc electroplated.
 - d) Fittings: Elbows, tees, laterals, reducers, adapters as required. Same construction as couplings.
 - e) Design equipment: Victaulic, rigid system, Style 07 couplings.
 - f) Fire protection systems: UL listed and FM approved; 175 psi wwp; use a gasket and coupling system similar to Victaulic Flush-Seal for all dry type systems; follow all terms of listings/approvals.

D. Makes: Conac, Grinnell or Victaulic.

E. Gauge And Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

2.3 **THINWALL STEEL PIPE - FIRE PROTECTION SYSTEMS ONLY**

- A. Pipe: ASTM A53, or A135, with wall thickness of .120 in. for 2-1/2 in. through 4 in.; .134 in. for 5 in. through 6 in.; and .188 in. for 8 in; Black or galvanized finish as called for; ends chamfered for welding or roll grooved for mechanical grooved connection.

2.4 COPPER PIPE AND SOLDER FITTINGS

- A. Pipe: Above ground - hard temper, ASTM B88; Type K, L, M, or DWV, as called for. Soft temper only as called for. Plans show copper tube sizes.
- B. Below ground - Soft temper, ASTM B88; Type K.
- C. Copper is not allowed for urinal waste (above or below ground).
- D. Tees, Elbows, Reducers: Wrought copper; solder end connections; ASTM B62, ASTM B16.22.
- E. Unions And Flanges: 2 in. and smaller use unions, solder type, wrought copper, ground joint, 150 lb. swp; 2-1/2 in. and over use flanges, wrought copper, companion type, ASME drilled, solder connection, 150 lb. swp.
- F. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.
- G. Make: Harris "Stay-Safe 50" and "Bright", Englehart "Silverbright 100", Willard Industries "Solder Safe (silver bearing)", Canfield "Watersafe".

2.5 COPPER PRESS FITTINGS

- A. Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22 and CSA. and performance criteria of IAPMO PS 117.
- B. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
- C. Press ends shall have SC (Smart Connect™) feature design (leakage path). In ProPress 1/2" to 4" dimensions the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. ProPress 2 1/2" to 4" Shall Have a Stainless Steel Grip Ring.

2.6 COPPER PIPE AND BRAZED FITTINGS

- A. Pipe: Type K or L, ASTM B819 (medical gases), ASTM B88 (medical vacuum and WAGD).
- B. Tees, Elbows, and Reducers: Wrought copper (ASME B16.22 or ASME B16.50).
- C. Unions and Flanges: Unions for 2 in. and smaller. Brazed type cast bronze ground joint, 150 lb. swp; flanged for 2-1/2 in. and larger, brazed type, cast bronze, companion type, gasketed and bolted, ASME drilled 150 lb. swp.
- D. Brazing Materials: Silver brazing alloy, Airco Sil-45 or "Sil-Fos".

2.7 **CROSSLINKED POLYETHYLENE (PEX) TUBE AND FITTINGS**

- A. PEX-a (Engel-method crosslinked polyethylene), ASTM F876 and F877 (CAN/CSA-B137.5), SDR 9, CTS, 1/2 inch (16mm) through 3 inch (75mm) nominal pipe size.
- B. PEX Pipe Material
 - 1. Pre-sleeved piping
 - a) High-density polyethylene (HDPE) corrugated sleeved PEX-a (Engel-method crosslinked polyethylene), ASTM F876 and F877 (CAN/CSA-B137.5), SDR 9, CTS, 1/2 inch (16mm) and 3/4 inch (19 mm) nominal pipe size.
 - 2. Pre-insulated piping
 - a) Factory fabricated and assembled PEX-a piping with a closed-cell polyethylene foam insulation, 1/2 inch (16mm) through 2 inch (51mm) nominal pipe size.
 - b) Insulation shall not be exposed to groundwater
- C. Fittings
 - 1. Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types:
 - a) Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".
 - 2. Multiport tees and elbows: Multiple-outlet fitting complying with ASTM F877 (CAN/CSA B137.5); with ASTM F1960 inlets and outlets.
 - 3. Manifolds: Multiple-outlet assembly with ASTM F 1960 outlets.
 - a) Type L copper branch manifold with lead-free brass valve outlets.
 - b) Type L copper branch manifold without valves, with lead-free brass outlets.
 - 4. PEX-to-metal transition fittings:
 - a) Manufacturers: Provide fittings from the same manufacturer of the piping.

- b) Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types:
 - c) PEX-a to thread transition: One-piece Lead free (LF) brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - d) PEX-a to copper sweat transition: One-piece lead free (LF) brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - e) PEX-a to copper press transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - f) PEX-a to flange transition: Two-piece fitting with one steel flange conforming to ASME B 16.5 and one lead free (LF) brass adapter conforming to ASTM F1960.
 - g) PEX-a to groove transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - h) PEX-a to water meter transition: Two-piece fitting with one NPSM union thread and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
5. PEX-to-thermoplastic transition fittings:
- a) PEX-a to CPVC transition: Thermoplastic fitting with one spigot or socket end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

2.8 HIGH PURITY POLYPROPYLENE PIPING AND FITTINGS

A. Piping:

- 1. Schedule 40 or 80 polypropylene produced without additives or pigments.
- 2. Piping to be sterilized and capped by manufacturer.

B. Fittings:

- 1. Material to be identical to pipe.

2. Joints shall be made by fusion weld method.
 3. Fittings to be sterilized and packed in individual bags.
- C. Valves: Material to be identical to pipe, joints made by fusion welding only.
- D. Design Equipment: Orion "Whiteline".
- E. Make: Enfield, Orion Fitting, Inc.

2.9 BRASS PIPE AND FITTINGS

- A. Piping: ASTM B43, semi-annealed, red brass not less than 85% copper; chrome plated where called for.
- B. Fittings: Cast brass, sps, malleable iron pattern, reinforced corresponding to weight of pipe; chrome plate where called for.

2.10 SOIL PIPE AND FITTINGS

- A. Hub and spigot pipe and fittings shall be service weight and conform to ASTM A74.
1. Joints shall be made with lead and oakum or neoprene compression gaskets with rubber conforming to ASTM C564. Gaskets shall be "Charlotte Seal", "Ty-Seal" or equal
- B. Hubless pipe and fittings shall conform to CISPI 301 and shall be permissible for above grade only.
1. Hubless Couplings shall conform to CISPI Standard 310 for standard couplings and be certified by NSF International or ASTM C1540 for heavy duty couplings where indicated. Gaskets shall conform to ASTM C564.
- C. Pipe and fittings manufacturers: Charlotte Pipe and Foundry Co., Tyler Pipe, AB&I Foundry.
- D. Hubless coupling manufacturers: Tyler Coupling, Mission Rubber Co, Anaco, Ideal.
- E. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International

2.11 PVC PIPE AND FITTINGS (DRAINAGE)

- A. Sanitary Waste and Vent
1. Pipe and fittings to be manufactured from a PVC compound with a cell classification of 12454 per ASTM D1784.

2. Pipe shall be solid wall type, schedule 40 dimensions and conform to ASTM D2665.
3. Molded fittings shall conform to ASTM D2665. Fabricated fittings shall conform to ASTM F1866.
4. Joints shall be socket type, and joined using solvent cement meeting ASTM D2564 and primers meeting ASTM F656.
5. PVC pipe installed below grade be installed in accordance with ASTM D2321.

2.12 CORRUGATED STAINLESS STEEL TUBING (CSST)

- A. Flexible fuel gas piping system to comply with and maintain IAPMO and ICC-ES listings to ICC-ES PMG LC1027 'Listing Criteria for Protective Jacketed Corrugated Stainless Steel Tubing (Minimum 36 Coulomb Charge Transfer)'. Flexible gas piping system also to be listed by CSA to ANSI LC 1/CSA 6.26 standard 'Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing'.
- B. Materials to be metallically shielded CSST manufactured from ASTM A240 Type-304 stainless steel.
- C. A protective jacket system over the CSST consisting of an electrically insulative polymer cover, a metallic shield layer, and a semi-conductive inner polymer layer.
- D. The piping system being UV-Resistant, and achieving ASTM E84 ratings of (25) for flame spread and (50) for smoke density.
- E. Mechanical fittings are to be manufactured from ASTM B16 Type-360 brass. Brass fittings include a jacket-lock feature to provide circumferential contact between the fitting assembly and outer polymer layer of the CSST.

2.13 SPECIAL FITTINGS

- A. Cast Iron to Lead Pipe: Red brass ferrules and wiped joints. Caulk ferrule into cast iron hub.
- B. Copper to Cast Iron: Cast bronze, cast iron to sweat adapter.
- C. Copper to Steel Piping:
 1. Cast bronze copper to iron male or female adapter with shoulder for drainage piping only.
 2. Dielectric pipe fittings.

- D. Steel to Cast Iron: Cast iron soil pipe connector with spigot and IPS male thread end (Manhoff fittings).
- E. No-Hub, Cast Iron, Glass, Polypropylene or High Silicon Cast Iron: Proper adapter to piping being connected.

2.14 FIBERGLASS REINFORCED PLASTIC PIPE AND FITTINGS (FRP)

- A. Suitable for continuous operation at a pressure of 300 psi maximum for 2 in., 200 psi maximum for 3 in. and a sustained temperature of 150°F maximum, with integral epoxy liner and a reinforced epoxy exterior coating. Fittings and pipe joints to be bell and spigot type, bonded with a resin catalyst adhesive to form a permanent pressure tight bond. Listed with Underwriter's Laboratories for below grade petroleum products piping.

2.15 POLYETHYLENE PIPING

- A. ASTM D2513, SDR11 polyethylene piping and fittings. Dupont, Plexco, Phillips, or approved equal.

2.16 CATHODIC PROTECTION FOR UNDERGROUND STEEL PIPING

- A. Provide cathodic protection for underground piping and systems. The cathodic protection system shall provide a flow of direct current from sacrificial anodes to the outer surface of the piping.
- B. Materials:
 - 1. Anodes shall be cast zinc or magnesium alloy anodes with 10 ft. long No. 12 Type TW lead wires silver soldered to a galvanized steel core. Anodes shall have sufficient number of lead wires to allow electrical connection from anode to each pipe. Anodes shall come packaged in a permeable cloth bag with prepared backfill consisting of 75% Gypsum, 20% Bentanite and 5% Sodium Sulphate. Weight of anode: 17 lbs. each.
 - 2. Coating: Coating shall be Scotchkote or Scotchwrap.
 - 3. Reference cell: Provide a portable copper-sulfate reference electrode for testing effectiveness of cathodic protection system.
 - 4. Test station: Cast iron manhole, 12 in. diameter; OPW #104A-12.
 - 5. Make: Harco Corporation, Corroco.

2.17 DIELECTRIC PIPE FITTINGS

- A. Tensile strength, ASME B16.8, union 250 psi, or flange design, 175 psi, pressure rating, at 210°F, threaded or solder joint, constructed to prevent gasket from

squeezing into internal opening.

- B. Make: Epco, Capitol Manufacturing, or Watts.

2.18 HANGERS, INSERTS AND SUPPORTS

- A. Hangers, Inserts, Clamps: Carpenter & Paterson, Central Iron, B-Line, ITT Grinnell.

- B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated or PVC coated where in contact with copper piping. Cadmium plated or galvanized for exterior.
2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.
3. Adjustable steel clevis type for piping 4 in. and larger.
4. Nuts and rods with electroplated zinc or cadmium (0.005 in. minimum) finish.

- C. Spacing Schedule:

Pipe Size	Steel	Copper	Plastic	Cast Iron	Rod Size
to 1"	8'	6'	3'	Each	3/8"
to 2"	10'	8'	3'	Horizontal	3/8"
to 4"	14'	10'	4'	Joint	
5" and over	14'	10'	4'	5' Maximum	5/8"
	14'	10'	4'	O.C.	3/4"

Over 8" To suite loading conditions.

- D. Cast Iron No-Hub Supports:

1. In accordance with manufacturers recommendations.
2. Vertical piping supported at each stack base and at each floor. Freestanding vertical pipe should be adequately staked or braced during construction to maintain alignment. Bases of stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction or by other methods approved by the Owner's Representative.
3. Horizontal piping supported within 24 in. each side of the coupling joint at 10 ft. intervals for 10 ft. pipe lengths and at 5 ft. intervals for 5 ft. pipe lengths. Supports or hangers placed to maintain alignment and grade with provision made to prevent shear. Greater than 3 in. diameter pipe

braced at changes of direction to prevent horizontal movement.

- E. Piping systems with material not listed above, supported and protected in accordance with manufacturer's recommendations.
- F. Inserts: Design equipment Grinnell Fig. #281, maximum loading 1000 lbs., galvanized finish, and Fig. #285, maximum loading 400 lbs. Make: Globestrut, Grinnell, Unistrut, B-Line.
- G. Supports:
 - 1. For weights under 1000 lbs.: "Drill-In" inserts equal to Phillips "Red Head" "U" Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.
 - 2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs.
 - 3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.
- H. Hangers for fire protection piping are as above, and in accordance with NFPA 13 and NFPA 14. Hangers and building attachments shall be UL listed and FM approved for fire protection service.
- I. Trapeze Hangers:
 - 1. For plumbing systems only.
 - 2. Hangers shall be supported with rod sized with a safety factor of four.
 - 3. May be manufactured type "U" shaped channel, or suitable angle iron or channel.
 - 4. Securely fasten piping to trapeze with "U" bolt or straps, dissimilar metals shall not touch, use isolation gaskets.
 - 5. Make: Globestrut, Kindorf, Unistrut, B-Line.

2.19 PIPING ACCESSORIES

- A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.
- B. Cleanout plugs, bushings, nipples, required for instruments and gauges to be

brass.

- C. Pipe Roll Stand: Cast iron roll stand. Make: Advanced Thermal Systems, Carpenter and Patterson, ITT Grinnell, Pipe Shields.

2.20 SLEEVES

- A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces.
2. Sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18 gauge minimum and braced to prevent collapsing.

2.21 SEALING ELEMENTS

- A. Waterproof Type:

1. Exterior walls, below grade, and above basement or vault floor: Synthetic rubber material with zinc plated bolts. Make: "Link-Seal" Series 200, 300 or 400, Pyropac.

2.22 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

- A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.23 EXPANSION LOOPS

- A. Provide expansion loops every 100 feet of straight linear pipe on all domestic water piping.

2.24 STACK SLEEVE

- A. With flashing clamp and threaded pipe sleeve extension.
- B. Design Equipment: Jay R. Smith Series 1720 with caulking recess and flashing clamp.
- C. Make: Josam, Jay R. Smith, Zurn, Wade.

2.25 PIPING MATERIALS AND SCHEDULE

- A. See Exhibit "A," "Schedule of Piping Materials" at end of this Section for Plumbing piping. See Exhibit "B," "Schedule of Piping Materials" at end of this Section for Fire Protection piping.

PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

- A. Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required to coordinate with other Work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

3.2 HANGERS, INSERTS AND SUPPORTS

- A. Piping shall not be supported by wires, band iron, chains, or from other piping, nor by vertical expansion bolts. Support piping with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing, using proper diameter rod for pipe size. Provide additional structural steel members, having one coat rustproof paint, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Provide continuous support or extra supports for plastic pipe per manufacturer's requirements. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible; "C" type not permitted on joists. Provide riser clamps for each riser at each floor. Use trapeze hangers where a group of piping can be installed.

3.3 PIPE CONNECTIONS

- A. No-Lead Solder Connections: Nonacid flux and clean off excess flux and solder.
- B. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat.
- C. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.
- D. Dielectric Pipe Fittings: Protect fittings from excessive heat.
- E. FRP Pipe Joints: Bonded with resin catalyst adhesive.
- F. Grooved Mechanical Joints: Lubricate and install gasket and couplings. Follow Manufacturer's recommendations.

3.4 WELDING

- A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded piping fabricated by qualified welder. Use certified welder where specifically required by code or insurance company. If indicated and permitted for fire protection systems, all provisions for welded pipe shall additionally be in accordance with NFPA Standard 13. Use full length pipe where possible; minimum distance between welds, 18 in. on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe.
- B. When welding galvanized pipe, apply cold galvanizing on joint following welding.

3.5 SLEEVES

- A. Provide for pipes passing through floors, walls or ceilings. Not required for existing floors which are core-drilled, except where floor is waterproofed. Extend 1/8 in. above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains use steel pipe sleeves 2 in. above floor. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating. Fill abandoned sleeves with concrete. Provide rubber grommet seals for pipes passing through ducts or air chambers or built-up housings.

3.6 SLEEVE PACKING

A. Seal Void Space At Sleeves As Follows:

1. Interior locations: Firmly pack with fiberglass and caulk.
2. Exterior walls above grade: Use sealing element.
3. Exterior walls below grade and above basement or vault floors: Use link-seal.
4. Cored holes: Use sealing element.
5. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods.
6. Waterproofed floors: Use waterproof sealing element, device or compound.

3.7 ESCUTCHEON PLATES

- A. Provide polished chrome escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.8 TESTS

- A. Refer to other Sections for testing of Plumbing and Fire Protection Systems.

3.9 PIPE LINE SIZING

- A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "A" - PIPING MATERIALS (PLUMBING)
(Notes at end of Exhibit "A")

<u>Service</u>	<u>Pipe Materials</u>	<u>Fittings</u>	<u>Connections</u>
Water Service	Ductile iron with cement lining	Bell & Spigot	Mechanical or grooved rubber gasket
<u>Domestic Water Interior:</u> Low Temp Hot (<120°), Cold, and Circulating (<120°), 3" and Smaller	Type L copper, CPVC, PEX	Wrought copper, CPVC, PEX	No-lead solder, ProPress, Solvent welded, PEX
<u>Domestic Water Interior:</u> High Temp Hot (>140°), Cold, and Circulating (>140°), 3" and Smaller	Type L copper, CPVC	Wrought Copper, CPVC	No-lead solder, ProPress, Solvent welded
<u>Domestic Water Interior</u> Hot, Cold, and Circulation, 4" and Larger	Schedule 40 Galvanized Steel, Type L copper	Galvanized Steel, Wrought Copper	Threaded, No-lead solder
Sanitary, Sanitary Vent, and Storm (Buried)	Service weight cast iron soil pipe; PVC	Cast iron hub and spigot; PVC	Lubricated rubber gasket; Solvent welded
Sanitary and Sanitary Vent and Storm (Not Buried)	Service weight or hubless cast iron soil pipe; DWV type copper; Schedule 40 galvanized steel (grooved); PVC	Cast iron hub and spigot, No-hub; wrought copper; Galvanized drainage; PVC	Lubricated rubber gasket, shielded rubber coupling and stainless clamp assembly; no-lead solder, Threaded; Grooved mechanical; Solvent welded
Indirect Waste	Type DWV copper, PVC	Wrought copper, PVC	No-lead solder, Solvent welded

Natural Gas (Exterior, Below Grade)	Schedule 40 steel factory coated, SDR 11 HDPE (polyethylene)	Butt welded, fusion welded	Welded, fusion welded
Natural Gas (Exterior Above Grade)	Schedule 40 steel, paint with three coats	Butt welded, paint with three coats	Welded
Natural Gas (Interior)	Schedule 40 black steel CSST (w/ LC1027 listing)	2" and smaller malleable 2-1/2" and over butt welded, CSST	Screwed and welded, CSST
Compressed Air (Shop and Industrial)	Schedule 40 black steel, Copper Type L	Malleable 3" and smaller Butt welded 4" and larger, Wrought Copper	Screwed or welded, Braze with silver solder "Sil-Fos"

NOTES FOR EXHIBIT A:

- NOTE 1: Exposed exterior natural gas: For steel pipe, one coat of alkyd primer and two coats of exterior acrylic latex glass enamel. Color as selected.
- NOTE 2: All exposed piping within finished areas shall be painted with a primer coat and two finish coats. Color per the Architect/Owner.
- NOTE 3: Use long radius elbows only for hot water return lines. Short radius elbows are not acceptable for hot water return lines.
- NOTE 4: On buried coated steel pipe, tape all joints with scotchwrap #50, 2in, wide, 50% overlap. Provide cathodic protection system.
- NOTE 5: PVC, CPVC and Pex piping shall not be used in ceiling spaces that are utilized as mechanical system return air plenums unless it is listed and labeled as having a flame spread index not greater than 25 and a smoke-developed index not greater than 50 when tested in accordance with ASTM E84 or UL 723.
- NOTE 6: Interior gas piping sizes are based on schedule 40 black steel. If CSST piping is used, plumbing contractor to verify correct pipe size.
- NOTE 7: Double wye fittings are not acceptable on sanitary/waste piping systems.

EXHIBIT "B" - PIPING MATERIALS (FIRE PROTECTION)

(Notes at end of Exhibit "B")

<u>Service</u>	<u>Pipe Materials</u>	<u>Fittings</u>	<u>Connections</u>
Sprinkler (wet)	Schedule 40, black steel 2" and smaller	Malleable or ductile iron	Threaded
	Schedule 40 CPVC 1-1/4" and smaller	Schedule 40 CPVC	Solvent welded
	Schedule 80 CPVC 1-1/2" – 2"	Schedule 80 CPVC	Solvent welded
	Schedule 10, black steel 2-1/2" and larger	Malleable or ductile iron	Roll grooved mechanical type couplings
Fire Service	Ductile Iron w/ cement lining	Bell & spigot	Mechanical or Grooved Rubber Gasket

NOTES FOR EXHIBIT B:

- NOTE 1: Use galvanized steel pipe and fittings for all aboveground exterior locations passing through exterior walls and where called for.
- NOTE 2: All exposed piping within finished areas shall be painted with a primer coat and two finish coats. Color per the Architect/Owner.
- NOTE 3: CPVC piping to be used in Light Hazard occupancy areas only.

END OF SECTION