**PART 1 - GENERAL**

* 1. **PRINCIPLE WORK IN THIS SECTION**
		1. Pipe and pipe fittings.
		2. Valves.
		3. Sanitary sewer piping system.
		4. Domestic water piping system.
		5. Storm water piping system.
		6. Natural gas piping system.
		7. Insulation.
	2. **REFERENCES**
		1. Valves: Manufacturer's name and pressure rating marked on valve body.
	3. **SUBMITTALS**
		1. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.
		2. Provide manufacturers catalog information. Indicate valve data and ratings.

**PART 2 - PRODUCTS**

* 1. **MANUFACTURERS**
		1. Sleeved Roof Flashings:
			1. Smith.
			2. Stoneman.
		2. 'No Hub' Couplings:
			1. MG coupling.
			2. Clamp-All.
			3. Husky.
			4. Tyler.
		3. Gate, Globe, and Check Valves:
			1. Crane Co.
			2. Nibco, Inc.
			3. Hammond.
			4. Milwaukee.
		4. Ball Valves:
			1. Apollo.
			2. Nibco, Inc.
			3. Hammond.
			4. Milwaukee.
		5. Vent and Gas Cocks:
			1. Milwaukee.
			2. Apollo.
			3. Crane.
			4. Lunkeheimer.
		6. Insulation:
			1. Johns-Manville.
			2. Imcoa.
			3. Owens Corning.
			4. Armstrong.
			5. Certain-Teed.
		7. Plastic Piping
			1. Fuseal
	2. **PIPE**
		1. Sanitary and Storm Piping:
			1. General: Interior systems to extend to 5 ft. outside of building and connect to exterior systems.
			2. Soil, waste vent and storm piping, above ground interior:
1. Service weight cast iron soil pipe.
	* + 1. Soil, waste vent and storm piping, below ground, interior and exterior:
2. 2 in. thru 12 in. service weight cast iron pipe.
	* 1. Domestic water piping.
			1. Domestic water piping - interior: Type L copper, hard temper.
			2. Underground water piping, except water main: Type K copper, hard temper.
		2. Equipment vents, relief valve discharge indirect drains, and airvents: Type L copper tube.
		3. Natural gas piping:
			1. Above ground: Black steel, Schedule 40.
			2. Below ground: Polyethylene pipe, ASTM D2513 marked for gas service and bearing manufacturer’s name or trademark. An electrically continuous insulated no. 18 tracer wire or other approved material shall be installed with and attached to all underground piping and shall terminate above ground at each end of the pipe run.
	1. **PIPE FITTINGS:**
		1. Soil, waste, vent and storm above ground:
			1. Service weight cast iron fittings for cast iron pipe.
			2. "No-Hub" couplings for hubless pipe .
		2. Soil, waste, vent and storm below ground, interior and exterior:
			1. Service weight cast iron fittings for cast iron pipe.
			2. "Tyseal" joints by Tyler pipe.
		3. Domestic water piping:
			1. Underground copper pipe - wrought copper, flared type.
			2. Domestic water piping - interior: Copper pipe - wrought copper, solder sweat type.
		4. Equipment vents, relief valve discharge and indirect drains and airvents: Wrought copper, solder sweat type.
		5. Natural gas piping:
			1. Steel pipe: 150 lb. welded malleable iron.
			2. Polyethylene pipe: Polyethylene heat fusion or mechanical type.
	2. **ACCESSORIES**
		1. Dielectric Unions and Insulating Couplings:
			1. Similar to EPCO Model X or FX.
	3. **ESCUTCHEONS, FLASHINGS AND SLEEVES**
		1. Escutcheons: Polished chrome plated brass.
		2. Flashings for pipes through roofs: Similar to Stoneman 1100 series.
		3. Sleeves; of following types as required:
			1. Schedule 40, galvanized steel pipe sleeves.
	4. **PACKINGS**
		1. Through fire rated partitions: Fire resistant sealing system acceptable to local jurisdiction.
	5. **VALVES, GENERAL**
		1. Provide valves of same manufacturer for all similar plumbing applications or systems. Valves, to have manufacturer's name and pressure rating clearly marked on outside of body.
		2. For copper tubing provide solder-joint valves, flare fittings, or IPS-to-copper adaptor, sized for use with tubing and respective valve.
		3. For flanged valves, provide streamline companion flanges, ANSI B16.5, 150 class psi.
		4. Provide valves rated not less than 125 psi steam working pressure, unless indicated otherwise.
		5. Provide valve materials suitable for service and temperature of respective systems, especially with respect to discs, plugs, balls, linings, gaskets, and lubricants of globe valves, plug cocks, ball valves, etc.
		6. Provide all ball valves with "full port."
	6. **SAFETY AND RELIEF VALVES**
		1. Section 22 11 19 – Plumbing Specialties.
	7. **VALVES - HOT AND COLD DOMESTIC WATER SERVICE**
		1. Bronze gate valves, 2 in. and under:
			1. Class #125, 200# WOG.
			2. Non-rising stem, non-asbestos packing.
			3. Screw-in bonnet, malleable Iron Handwheel.
			4. Solid disc.
			5. Threaded end - similar to Nibco T-113.
			6. Solder end - similar to Nibco S-113
		2. Bronze ball valves, 2 in. and under:
3. Class 150#, 600# WOG.
4. Two piece construction, blowout proof stem.
5. 15% glass filled PTFE seats.
6. Adjustable hex packing nut, PTFE packing.
7. Chrome plated brass ball.
8. Threaded end - similar to Nibco T-113.
9. Solder end - (shall have extended solder cups) - similar to Nibco S-113.
	* 1. Bronze check valves, 2 in. and under:
10. Class #125, 200# WOG.
11. Swing check.
12. Teflon disc, SS hinge pin.
13. Threaded end - similar to Milwaukee #509 T.
14. Solder end - similar to Milwaukee #1509 T.
	* 1. Iron gate valves, 2-1/2 in. and larger.
15. Class #125, 200# WOG.
16. IBBM.
17. OS&Y, non-asbestos packing.
18. Solid wedge disc.
19. Bolted bonnet.
20. Flanged end.
21. Nibco.
	* 1. Iron check valves, 2-1/2 in. and larger (flanged):
22. Class #125, 200# WOG.
23. IBBM.
24. Renewable seat and disc.
25. Bolted cap.
26. Swing check.
27. Flanged end.
28. Nibco.
	* 1. Iron check valves, 2-1/2 in. and larger (for pump discharge):
			1. Class #125.
			2. Globe design silent check.
	1. **COMPRESSED AIR SERVICE**
		1. Bronze ball valves, 2 in. and under:
29. Class 150#, 600# WOG.
30. Two piece construction, blowout proof stem.
31. 15% glass filled PTFE seats, PTFE packing.
32. Adjustable hex packing gland, chrome plated brass ball.
33. Threaded end.
34. Nibco
	1. **NATURAL GAS SYSTEM**
		1. Plug valves, 3 in. and larger:
			1. CI body and plug.
			2. Lubricated cast iron plug.
			3. Flanged ends.
			4. Wrench operated.
			5. #175 W.O.G.
			6. Similar to Rockwell Nordstrom No. 143.
		2. Plug valves, 2 1/2 in. and smaller:
			1. Bronze body and plug.
			2. Threaded ends.
			3. Square head.
			4. #125 W.O.G.
			5. Similar to Crane No. 250.
		3. At Appliances:
			1. Integral lever handle.
			2. Similar to Crane No. 298.

# INSULATION

* + 1. General:
			1. All insulation materials including jackets, facings adhesives, coatings and accessories are to be fire hazard rated and listed by Underwriters Laboratories, Inc. in conformance with UL723.
			2. Insulation thickness and 'R' value ratios to be in accordance with state energy code.
		2. Required Locations:
			1. Domestic hot water piping except where exposed at fixtures.
			2. Domestic hot water storage tanks.
			3. Domestic hot water heaters.
			4. All interior Condensate piping.
		3. Installation:
			1. Insulation protection shields and spacing blocks are required at pipe hanger locations.

**PART 3 - EXECUTION**

* 1. **INSTALLATION**
		1. Arrangement:
			1. Except for large scale details piping is diagrammatically indicated: Install generally as shown.
			2. Do not scale Drawings for exact location of piping.
			3. Install piping to best suit field conditions and coordinate with other trades.
			4. Each piping group to be in one plane, in so far as possible.
			5. Do not sleeve structural members without consent of Architect.
			6. Maintain 1 inch clearance from adjacent work, including insulation, except as noted or approved.
			7. Install piping concealed above ceilings or in walls unless otherwise indicated.
		2. Expansion, Contraction and Bending:
			1. Install piping with provisions for expansion and contraction: Provide expansion loops, swing joints, and/or expansion joints where indicated.
			2. Do not spring or force piping during installation.
		3. Sloping and Draining:
			1. Slope piping per general notes true to line and grade, and free of traps and air pockets.
		4. Strainers: Install ahead of all reduced pressure backflow preventers and pressure regulators.
		5. Gauges and Thermometers
			1. Locate thermometers and gauges to permit observation by personnel standing on floor.
			2. Maximum height of thermometer above finished floor to be 8 feet, provide remote reading thermometers if required.
			3. Provide instrument cocks at pressure gauges.
		6. Copper:
			1. Crimping of copper tubing prohibited.
			2. Isolate copper pipe and tubing from contact with steel hangers or stud wall construction.
			3. For branch drops and rises to plumbing fixtures, anchor branch to wall with drop-ear ell or tee.
		7. Coatings (buried piping): Reapply coal-tar coating on buried ferrous piping, after installation, to surfaces from which coating has been removed or scraped.
		8. Wrapping (buried piping): Provide a minimum of 20 mil thickness polyvinyl tape similar to Calpico V-20 for all buried copper lines.
	2. **SYSTEMS INSTALLATION**
		1. Domestic Water:
			1. Connect copper tubing to fixtures with hard brass fittings.
			2. Chrome plated where exposed at plumbing fixtures.
		2. Waste, Vent and Storm Water: Provide accessible cleanouts per local codes, and where indicated on drawings.
		3. Natural Gas:
			1. Make equipment connections with ground joint unions and gas cocks.
			2. Provide accessible shut-off valves:
				1. Each entrance to each building
				2. At each individual piece of equipment with gas connection.
	3. **PIPE JOINTING**
		1. Prohibited fittings:
			1. Bushings on pressure piping
			2. Clamp-on branch connections.
			3. No-hub couplings on pumped sanitary or wastewater discharge piping.
		2. Provide insulating couplings or dielectric unions at all connections of ferrous piping to non-ferrous piping.
		3. Unions: Provide unions or flanges to render all items in systems easily removable, including:
			1. Piping specialties.
			2. Both sides of pumps and equipment.
		4. Pipe Ends:
			1. Perform pipe cutting and end preparation to result in clean ends with full inside diameter.
			2. Grind and ream as necessary, burred ends of all pipe and tubing shall be reamed to the full bore of the pipe or tube and all chips shall be removed.
		5. Nipples:
			1. Close nipples not permitted.
			2. Provide extra heavy pipe for nipples where unthreaded portion is less than 1-1/2 in. long.
		6. Threaded Joints:
			1. Sealed with sealant compounds or teflon tape.
			2. Sealant compounds: Similar to John Crane or Rector Seal.
		7. Soldered and Brazed Joints:
			1. Use no-lead, solder for all copper piping.
			2. Clean surfaces to be jointed of oil, grease, rust and oxides:
		8. No-Hub Cast Iron Soil Pipe:
			1. Neoprene gaskets and cast iron split clamps secured by stainless steel bolts and nuts, similar to MG Coupling Co. or 24 gauge Type 304 stainless steel housing and clamp; similar to Clamp-all, Tyler or Husky.
			2. Where components are suspended in excess of 18 in. by means of non-rigid hangers, brace against horizontal movement (sway brace).
			3. 6 in. and larger: brace to prevent horizontal movement at every branch opening and change of direction by securing to building structure.
			4. Vertical piping shall be supported at each stack base and at each floor. Free standing vertical piping should be adequately staked or braced during construction to maintain alignment.
			5. Horizontal piping shall be supported within 24 in. of the Coupling joint at 10 ft. intervals for 10 foot pipe lengths and at 5 ft. intervals for 5 ft. Piping lengths. Supports or hangers should be properly placed to maintain alignment and grade with provision made to prevent shear.
	4. **ESCUTCHEONS, FLASHING AND SLEEVES**
		1. Escutcheons:
			1. Install at exposed piping penetrations of walls, floors and ceilings. "Exposed" means all finished rooms, including storage, janitor and mechanical rooms.
			2. Where piping is insulated, escutcheons shall fit insulation outside diameter.
		2. Flashings:
			1. Flash and counter-flash watertight all pipe and duct penetrations of roofs and exterior walls.
			2. Flash pipes through roofs with vandal caps for vents.
			3. Provide counter-flashing sleeves.
			4. Other flashings shall be galvanized sheet metal.
		3. Sleeves:
			1. Provide membrane clamps at penetrations of membranes.
			2. Other concrete walls, floors and roofs:
1. Adjustable telescopic metal sleeves.
2. Tightly pack annular space between pipe and sleeve with approved compound.
	* + 1. For insulated piping, sleeve diameter shall not be less than diameter of insulation.
			2. Terminate sleeves flush with walls, and ceiling.
			3. For exposed vertical pipe, extend sleeves 1 in. above finished floor except where escutcheons are required.
			4. Packing through fire rated partitions shall be a fire resistant material acceptable to local jurisdiction.
		1. Separate piping through walls, other than concrete walls, from contact with wall construction materials. Use non-hardening caulking, fire rated where necessary.
	1. **ADJUSTMENT AND CLEANING**
		1. General:
			1. During installation, keep openings in piping closed to prevent entrance of foreign matter.
			2. Provide covers for floor drain gratings during construction to prevent use accumulation of debris.
			3. Clean pipe, fittings and valves internally.
		2. Water systems: Upon start-up fill with clean water.
	2. **FIELD QUALITY CONTROL - PIPING**
		1. Tests:
			1. Refer to other sections for tests to plumbing systems and other special piping systems.
			2. Notify Architect in writing one week before test.
			3. Furnish written report and certification that tests have been satisfactorily completed.
			4. Repair or replace leaks and defects without additional cost.
			5. All fusing procedures to be inspected and documented for acid waste system.
	3. **PROVIDE VALVES AT FOLLOWING LOCATIONS**
		1. In all branches or headers serving more than one fixture or piece of equipment.
		2. For shut-off of risers and branch mains.
		3. For branches from main or riser serving one fixture.
		4. On each side of all apparatus such as pumps, tanks, heaters, control valves, etc.
		5. For flushing, draining, and sterilizing the systems.
		6. Valves should be of domestic manufacture.
	4. **INSTALLATION, GENERAL**
		1. Pressure rating of valves same as piping in which installed.
		2. Install valves with stems upright or horizontal.
		3. Install swing checks in horizontal position.
		4. Provide silent check valves at discharge of pumps.
		5. Provide drain valves at main shut-off valves, low points of piping and apparatus.
		6. Locate wheel handles to clear obstructions when operated with hands.
		7. Locate equipment shut-off valves to be accessible without climbing over equipment.
	5. **VALVE APPLICATIONS**
		1. Gate Valves:
			1. Shut-off, sectionalizing and isolation.
			2. Drain valves.
		2. Globe and Angle Valves:
			1. Balancing water.
			2. Throttling: water, and air.
			3. By-pass.
		3. Plug cocks:
			1. Balancing and throttling: water.
			2. Shut-off: gas.
			3. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
	6. **FIELD QUALITY CONTROL - VALVES**
		1. Test operate valves from closed-to-open-to-closed position while valve is under test pressure.
		2. Test valve bonnets for tightness.
		3. Check all valves for packing. Replace leaking packing.
		4. Test temperature and pressure relief valves three times.
		5. Check all valves for lubricant. Service valves which do not operate smoothly with suitable lubricant before placing in operation.
	7. **TESTS - DRAINAGE SYSTEMS**
		1. Drainage and vent piping inside building and underground metallic piping (including house sewers) shall be tested as follows:
			1. Water tests: Water test: If tested in sections, fill each section with water to overflowing, from ten ft. above or floor-to-floor height, whichever is greater, so that all of each section, except the topmost, is tested with a head of at least ten ft.. For soil and drain lines located above food storage or preparation area, perform a minimum 25-foot standing water test. Water level shall remain constant throughout test without adding water for a minimum of two hours.
			2. Smoke test: Smoke test: After drainage connections have been completed and fixtures have been set, fill traps with water and introduce into entire system at base, thick penetrating smoke produced by a smoke machine. Chemical mixtures will not be allowed. As smoke appears at roof openings, close opening tight and apply pressure equivalent to one in. of water. Maintain test for a minimum of one hour.
	8. **INSTALLATION**
		1. Minimum Cover Underground Piping: Per local Codes.
		2. Piping:
			1. Free of traps.
			2. Grade and valve for complete control and drainage of system with drain cocks at low points and base of valved risers.
	9. **TESTS - WATER SYSTEMS**
		1. Inspect domestic water piping as follows:
			1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
			2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
				1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
				2. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
			3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
			4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
		2. Test domestic water piping as follows:
			1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
			2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
			3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
			4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
			5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
			6. Prepare reports for tests and required corrective action.
	10. **DISINFECTION**
		1. Cleansing and Disinfecting:
			1. Disinfect underground water mains after installation and test in accordance with requirements of local codes.
			2. Disinfect interior potable water distribution system in accordance with requirements of local codes.

# END OF SECTION