# GENERAL

## SECTION INCLUDES

### Pipe and pipe fittings.

### Valves.

### Sanitary waste and vent piping system.

### Sump pump discharge piping system.

### Water piping systems.

### Process cooling water systems.

### Storm water piping system.

### Natural gas piping system.

## REFERENCE SECTION 23 05 00 FOR THE FOLLOWING:

### Quality assurance.

#### Valves: Manufacturer's name and pressure rating marked on valve body.

#### 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.

### References

### Submittals

### Operation and maintenance manuals.

### Project record documents

#### Record actual locations of valves.

### Delivery, storage, and handling

## REGULATORY REQUIREMENTS

### Perform Work in accordance with International Plumbing Code.

## ENVIRONMENTAL REQUIREMENTS

### Do not install underground piping when bedding is wet or frozen.

# PRODUCTS

# NOTE TO SPECIFIER: COORDINATE PLUMBING MATERIALS WITH FPC ENGINEERING EARLY IN THE DESIGN PHASE OF THE PROJECT. ALL SANITARY WASTE PIPING SERVING KITCHENS SHALL BE PVC OR CPVC (USE CPVC WHERE KITCHEN WASTE TEMPERATURE EXCEEDS 140 DEG F)

## SANITARY WASTE AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

### Cast Iron Pipe: ASTM A74, hub-and-spigot, service weight.

#### Fittings: Cast iron, ASTM A74, service weight.

#### Joints: ASTM C564 neoprene compression gasket system equivalent to Tyler Pipe Ty-Seal or Charlotte Pipe “Char-Seal”.

### Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

#### Fittings: Socket type (ASTM D 2665).

#### Joints: Adhesive Primer (ASTM F 656) and Solvent Cement (ASTM D 2564).

## SANITARY WASTE AND VENT PIPING, ABOVE GRADE

### Cast Iron Pipe: ASTM A888 and CISPI 301, hubless, service weight for piping.

#### Fittings: Cast iron, ASTM A888 and CISPI 301, service weight.

#### Couplings: Heavy duty couplings conforming to ASTM C 1540. Gaskets shall conform to ASTM C564.

### **NOTE TO SPECIFIER: INCLUDE INSULATION PIPE WRAP WHEN PVC IS USED IN CEILING AIR RETURN PLENUMS.**

### Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

#### Fittings: Socket type (ASTM D 2665).

#### Joints: Adhesive Primer (ASTM F 656) and Solvent Cement (ASTM D 2564).

## SUMP PUMP DISCHARGE PIPING

### Copper Tubing: ASTM B88, Type L, hard drawn.

#### Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze.

#### Joints: AWS A5.8, BCuP silver braze.

## WATER PIPING, BURIED

### Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end. Pipe and fittings shall have ANSI/AWWA C104/A21.4, cement-mortar lining for ductile-iron pipe and fittings for water. Pipe and fittings shall also have ANSI/AWWA C105/A21.5, polyethylene encasement for ductile iron pipe systems. Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze.

#### Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern. Provide manufacturer’s restraining joint system equivalent to U.S. Pipe HP-Lok. Ductile Iron (3” and larger) Pex (buried and sleeved)

#### Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

### Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated. Pipe and fittings shall have ANSI/AWWA C104/A21.4, cement-mortar lining for ductile-iron pipe and fittings for water. Pipe and fittings shall also have ANSI/AWWA C105/A21.5, polyethylene encasement for ductile iron pipe systems.

#### Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern. Provide manufacturer’s restraining joint system equivalent to U.S. Pipe HP-Lok.

#### Gaskets: AWWA C111, rubber.

## WATER PIPING, ABOVE GRADE

### Copper Tubing: ASTM B88, Type L, hard drawn.

#### Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.

#### Joints: ASTM B32, lead-free solder, Grade 95TA, for piping 1-1/2” and smaller. AWS A5.8, BCuP silver braze, for piping 2” and larger.

##### Minimum 15% silver bearing filler material for copper-to-copper joints.

##### Minimum 45% silver bearing filler material for dissimilar metal joints.

### PROCESS COOLING WATER SYSTEMS

#### See Hydronic Piping Specification, section 23 21 13.

## STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

### Cast Iron Pipe: ASTM A74, hub-and-spigot, service weight.

#### Fittings: Cast iron, ASTM A74, service weight.

#### Joints: ASTM C564 neoprene gasket system equivalent to Tyler Pipe Ty-Seal or Charlotte Pipe “Char-Seal”.

### Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

#### Fittings: Socket type (ASTM D 2665).

#### Joints: Adhesive Primer (ASTM F 656) and Solvent Cement (ASTM D 2564).

## STORM WATER PIPING, ABOVE GRADE

### Cast Iron Pipe: ASTM A888 and CISPI 301, hubless, service weight for piping.

#### Fittings: Cast iron, ASTM A888 and CISPI 301, service weight.

#### Couplings: Heavy duty couplings conforming to ASTM C 1540. Gaskets shall conform to ASTM C564.

### **NOTE TO SPECIFIER: INCLUDE INSULATION PIPE WRAP WHEN PVC IS USED IN CEILING AIR RETURN PLENUMS.**

### Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

#### Fittings: Socket type (ASTM D 2665).

#### Joints: Adhesive Primer (ASTM F 656) and Solvent Cement (ASTM D 2564).

## NATURAL GAS PIPING, ABOVE GRADE

### Steel Pipe: ASTM A53 or A120, Schedule 40 black.

#### Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.

#### Joints: NFPA 54, threaded or welded to ANSI B31.1, ANSI B31.2, ANSI B31.9, ASME

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## FLANGES, UNIONS, AND COUPLINGS

### Pipe Size 2 Inches and Under:

#### Ferrous pipe: 150 psig malleable iron threaded unions.

#### Copper tube and pipe: 150 psig bronze unions with soldered joints.

### Pipe Size Over 2 Inches:

#### Ferrous pipe: 150 psig forged steel slip‑on flanges; 1/16 inch thick preformed neoprene gaskets.

#### Copper tube and pipe: 150 psig slip‑on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

### Dielectric Connections: Where connecting ferrous and non-ferrous piping materials, use “ClearFlow” nipples to separate piping materials.

## SWING CHECK VALVES

### Up to and including 2 Inches: Bronze swing disc, 125 psig working pressure.

### Over 2 Inches: Cast iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

## BALL VALVES

### Up to and including 4 inches: Bronze two piece body, chrome plated steel full-port ball, teflon seats and stuffing box ring, lever handle.

## GATE VALVES

### 3 Inches and larger: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged ends. Class 125, MSS SP-70.

### Chainwheel: On valves 6” and larger and installed higher than 8-feet above finished floor, provide sprocket rim, brackets, and chain compatible with valve.

## STRAINERS

### Size 2 inch and Under: Screwed bronze body for 250 psig working pressure, Y pattern with 20-mesh stainless steel perforated screen.

### Size 2‑1/2 inch and larger: Flanged cast iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

## GAS VALVES

### Gas Cocks 2 Inch and Smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.

### Gas Cocks 2-1/2 Inch and Larger: MSS SP-78; 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.

### Solenoid Valves: Aluminum body, 120 volts AC, 60 Hz, Class B continuous duty molded coils; NEMA 4 coil enclosure; electrically opened/electrically closed; dual coils; normally closed; UL and FM approved and labeled.

### Gas Line Pressure Regulators: Single stage, steel or aluminum jacketed, corrosion-resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends for 2-1/2 inch and larger; for inlet and outlet gas pressures, specific gravity, and volume flow indicated.

## CALIBRATED BALANCE VALVES

### Pre-Set Balance Feature. Valves to be designed to allow Installing Contractor to pre-set balance points for proportional system balance prior to system start-up in accordance with scheduled flow rates.

### Valve Design and Construction. All valves shall have a calibrated orifice or venturi section, two ¼” threaded pressure tap ports with integral seals, and memory stop to retain the set position. Valves should be rated for 125 psig working pressure and 250 Deg. F maximum operating temperature.

### Valves shall be selected based on flowrate, not on pipe size dimensions.

### Preformed Insulation. All vales to be provided with molded insulation to permit access for balance and read-out.

## DRAIN VALVES

### Equipped with hose adaptor fitting and cap.

# EXECUTION

## EXAMINATION

### Verify that excavations are to required grade, dry, and not over‑excavated.

## PREPARATION

### Ream pipe and tube ends. Remove burrs.

### Remove scale and dirt, on inside and outside, before assembly.

### Prepare piping connections to equipment with flanges or unions.

## INSTALLATION

### Any interior natural gas pressure regulators shall be vented to the exterior of the building per NFPA 54 / ANSI Z223.1.

### Install in accordance with manufacturer's instructions.

### Provide non‑conducting dielectric connections wherever jointing dissimilar metals.

### Route piping in orderly manner and maintain gradient.

### Install piping to conserve building space and not interfere with use of space.

### Group piping whenever practical at common elevations.

### Sleeve pipe passing through partitions, walls and floors as follows:

#### Install schedule 40 pipe sleeves at fire rated walls and floors. Seal with UL approved fire stopping material as specified in 23 05 30.

#### Install minimum 18 gage pipe sleeves at non rated walls.

#### Sleeves through floors should extend a minimum of 2” above finished floor.

#### Sleeves through walls should be flush with the wall surface.

#### All sleeves should be large enough to has insulated piping with crushing the insulation.

### Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

### Vent pipes shall extend minimum 12” above finish roof line or as required by code.

### Provide clearance for installation of insulation and access to valves and fittings.

### Provide access where valves and fittings are not exposed.

### Establish elevations of buried sanitary and storm piping outside the building to ensure not less than 3 ft. of cover.

### Establish elevations of buried water piping outside the building to ensure not less than 5 ft. of cover.

### Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

### Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.

### Install bell and spigot pipe with bell end upstream.

### Install valves with stems upright or horizontal, not inverted.

### Extend chains on valves with chainwheel operators down to maximum 5-feet above finished floor.

### Install cast iron soil pipe in accordance with the “Cast Iron Soil Pipe Handbook” latest edition, as published by the Cast Iron Soil Pipe Institute.

### Install strainers in horizontal pipe or in vertical pipe such that flow is downward. Do not install strainers in vertical pipe with flow upward.

### Install cast iron piping system according to CISPI Handbook.

### Install copper tubing under building slab according to CDA's "Copper Tube Handbook." Install ball valve directly upstream of each floor slab penetration.

### Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105.

### Install ball valve at all laboratory water connections to fume hoods and other laboratory equipment.

### Install natural gas shutoff valves at each required piece of equipment. Provide gas regulators as necessary to accommodate equipment pressure requirements. Coordinate with equipment vendor.

### Install plastic pipe below grade in accordance with ASTM D2321.

## APPLICATION

### Install unions downstream of valves and at equipment or apparatus connections.

### Install valves for shut‑off and to isolate equipment, part of systems, and vertical risers.

### Install ball valves for throttling, bypass, or manual flow control services.

### Provide spring loaded check valves on discharge of water pumps.

### Provide plug valves in natural gas systems for shut‑off service.

### Provide flow control valves in water recirculating systems where indicated. Balance flow to maintain hot water at all plumbing fixtures.

## CLEANOUTS

### Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

#### Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

#### Locate at each change in direction of piping greater than 45 degrees.

#### Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.

#### Locate at base of each vertical soil and waste stack.

#### Cleanouts serving piping in ceiling spaces shall not be located in the ceiling space, but shall be routed up thru the floor above and installed as floor cleanouts.

## ERECTION TOLERANCES

### Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum or as indicated on drawings. Maintain gradients.

### Slope water piping and arrange to drain at low points.

## PLUMBING PIPING PRESSURE TESTING

### Test for leaks and defects all new plumbing piping systems and parts of existing systems, which have been altered, extended or repaired. Submit copy of Pipe Pressure Test Log provided in section 22 05 00 for each section of piping tested. Refer to International Plumbing Code for general pipe pressure testing requirements (i.e., test pressure gauges, inspections, etc.).

### Leave uncovered and unconcealed all new, altered, extended, or replaced piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.

### Repair all leaks and defects using new materials and retest all plumbing systems until satisfactory results are obtained.

### Natural Gas Piping System.

#### Test in accordance with International Fuel Gas Code, NFPA 54, and local utility requirements.

## DISINFECTION OF WATER PIPING SYSTEMS

### After water systems have been pressure tested and flushed, each system (including distribution system to building) shall be cleaned and disinfected per AWWA C651. Note that procedures shall require two (2) consecutive sets of acceptable samples taken at least 24 hours apart.

### Take samples no sooner than 24 hours after flushing, from outlets and from water entry per AWWA 651, and analyze in accordance with AWWA C651.

### Samples shall be subject to bacteriological testing by a recognized 3rd party testing agency. Send test reports to Owner for review. If unsatisfactory bacteriological results are found, the system shall be disinfected and retested again until satisfactory results are obtained.

## SERVICE CONNECTIONS

### Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

### Provide new water service complete with approved backflow preventer and water meter with by‑pass valves.

#### Provide sleeve in wall for service main and seal at wall/floor with mechanical sleeve seals. Anchor service main inside to concrete wall/floor.

### Provide new gas service complete with gas meter and regulators.

END OF SECTION 22 10 00