

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 31.
 - 2. Division 23.
 - 3. Division 22.

1.2 SUMMARY

- A. This Section includes sanitary drainage and vent piping, and storm drainage piping inside building and to locations indicated.

1.3 SUBMITTALS

- A. General: See Division 23 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals for the following:
 - 1. Cast-iron soil piping.
 - 2. Galvanized steel piping.
 - 3. Copper tubing.
 - 4. ABS piping.
- C. Reports and Certificates: Provide submittals of the following:
 - 1. Test Reports specified in "Field Quality Control."
- D. Shop Drawings: None required.

1.4 DEFINITIONS

- A. Service Entrance Piping: Drainage piping at entry into building between outside building sewer piping and inside drainage piping.
- B. Soil, Waste, and Vent Piping: Piping inside building that conveys wastewater and vapors from fixtures and equipment throughout the building.
- C. Rainwater Piping: Piping inside building that conveys storm drainage from building.
- D. Force-Main Piping: Drainage piping, under pressure.
- E. ABS: Acrylonitrile-butadiene-styrene plastic.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Systems: 10-foot head of water.
 - 2. Storm Drainage Systems: 10-foot head of water.
 - 3. Sewage, Force-Main Piping Systems: 50 psig.

1.6 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

1.7 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- C. Comply with the latest version of CISPI 301-04a and ASTM 888-04a.

PART 2 – PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 CAST-IRON SOIL PIPING

- A. Hubless Pipe and Fittings: CISPI 301, ASTM A 888, pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - 1. Couplings: Assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 neoprene rubber sleeve with integral, center pipe stop.
 - a. Standard Duty Couplings: Complying with CISPI 310, Type 301 stainless steel, minimum 0.0075-inch (36 gage) stainless steel corrugated shield, and stainless steel bands.
 - b. Heavy-Duty Couplings: Complying with FM 1680 Class 1, Type 304 stainless steel, minimum 0.016-inch (28 gage) stainless steel shield, and stainless steel bands.

2.3 GALVANIZED STEEL PIPING

- A. Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.
 - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
 - 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
 - 3. Cast-Iron, Threaded, Drainage Fittings: ASME B16.12, galvanized.

2.4 COPPER TUBING

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Copper ACR Tube: ASTM B 280, copper air-condition and refrigerant tube.
 - 1. Copper Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.

2.5 ABS PIPING

- A. ABS Pipe: ASTM D 2661, Schedule 40, solid wall.
 - 1. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

2.6 PVC PIPING

- A. PVC Pipe: ASTM D 2241-76 and D 2466-76 PVC schedule 40 drain pipe and fittings.

2.7 VALVES

- A. Refer to Division 23 for general-duty valves. Use valves specified for "Domestic Water Systems" applications.
- B. ENCASEMENT FOR UNDERGROUND METAL PIPING
- C. Description: ASTM A 674 or AWWA C105, [high-density, crosslaminated PE film of 0.004-inch] [or] [LLDPE film of 0.008-inch] minimum thickness.
- D. Form: [Sheet] [or] [tube].
- E. Color: [Black] [or] [natural].

PART 3 – EXECUTION

3.1 EXCAVATION

- A. Refer to Division 31 for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following:
 - 1. Hubless, cast-iron soil pipe and fittings:
 - a. Couplings: Standard duty couplings.
 - b. Couplings: Heavy-duty couplings.
 - 2. 1-1/4- and 1-1/2-Inch NPS: Copper drainage tube; wrought copper, solder-joint drainage fittings; and soldered joints.
 - 3. ABS pipe, ABS socket fittings, and solvent-cemented joints.
- D. Underground, Soil, Waste, and Vent Piping: Use the following:
 - 1. Hubless, cast-iron soil pipe and fittings:
 - a. Couplings: [Standard][Heavy]-duty couplings.
- E. Above and Belowground Rainwater and Overflow Rainwater Piping: Use the following:
 - 1. Hubless, cast-iron soil pipe and fittings:
 - a. Couplings: [Standard][Heavy]-duty couplings.
- F. Aboveground, Sewage Force Mains: Use the following:
 - 1. Galvanized steel pipe and cast-iron, threaded fittings.
- G. Indirect Drain Piping: Use the following:
 - 1. Copper DWV tube; wrought copper, solder-joint drainage fittings; and soldered joints.
- H. Condensate Drain Piping: Use the following for air washers, air-cooling coils, overflow from evaporative coolers and similar air-conditioning equipment:
 - 1. Copper ACR tube; wrought copper, solder-joint ACR fittings; and soldered joints.
- I. Condensate Drain Piping: Use for fuel burning condensing appliances.
 - 1. PVC pipe and fittings.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use gate or ball valves.

3.4 PIPING INSTALLATION, GENERAL

- A. Refer to Division 23 for basic piping installation.

3.5 SERVICE ENTRANCE PIPING INSTALLATION

- A. Refer to the appropriate Division 22 for sanitary and storm sewer piping outside the building.
- B. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated. Install cleanout and extension to grade at connections of building sanitary drains with building sanitary sewers.
- C. Extend building storm drain piping and connect to storm sewer piping in sizes and locations indicated. Install cleanout and extension to grade at connections of building storm drains and building storm sewers.
- D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 23 for sleeves and mechanical sleeve seals.

3.6 DRAINAGE AND VENT PIPING INSTALLATION

- A. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- B. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.
- C. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Soil, Waste, and Indirect Drain Piping: 1/4 per foot downward in direction of flow.
 - 2. Vent Piping: 1/8-inch per foot down toward vertical fixture vent.
 - 3. Condensate Drain and Indirect Drain Piping: 1/8-inch per foot downward in direction of flow.
 - 4. Rainwater and Overflow Rainwater Piping: 1/8-inch per foot downward in direction of flow.
- D. Install force mains at elevations indicated.
- E. Install engineered, sanitary drainage and vent systems in locations indicated and as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- F. Install engineered, controlled-flow, storm drainage systems in locations indicated. Comply with standards of authorities having jurisdiction.

- G. Sleeves are not required for cast-iron soil piping passing through concrete slab on grade if slab is without membrane waterproofing.

3.7 JOINT CONSTRUCTION

- A. Refer to Division 23 for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

3.8 VALVE INSTALLATION

- A. Shutoff Valves: Install shutoff valve on each pump discharge and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate valves for piping 2-1/2-inch NPS and larger.
- B. Check Valves: Install swing check valve on each pump discharge, downstream from shutoff valve.
- C. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
 - 1. Horizontal Piping: Horizontal backwater valves. [Use normally closed type, unless otherwise indicated.]
 - 2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
 - 3. Install backwater valves in accessible locations.
 - 4. Backwater valves are specified in Division 22.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 23 for pipe hanger and support devices. Install the following:
 - 1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
 - 2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet and less.
 - 3. Adjustable roller hangers, MSS Type 43, for individual, straight, horizontal runs longer than 100 feet.
 - 4. Spring cushion rolls, MSS Type 49, if indicated, for individual, straight, horizontal runs longer than 100 feet.
 - 5. Pipe rolls, MSS Type 44, for multiple, straight, horizontal runs 100 feet or longer. Support pipe rolls on trapeze.
 - 6. Spring hangers, MSS Type 52, for supporting base of vertical runs.
- B. Install supports and seismic restraints according to Division 23.
- C. Support vertical piping and tubing at base and at each floor (15-ft. maximum).
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

Nom. Pipe Size (Inches)	Cast-Iron Pipe Max. Span (Feet)	Copper Max. (Feet)	Span Min. Rod Diameter (Inches)
Up to 3/4	7	5	3/8
1	7	6	3/8
1-1/4	7	6	3/8
1-1/2	9	6	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
4	14	12	5/8
6	17	14	5/8

1. Support vertical cast-iron pipe and copper tube at each floor, not to exceed 15-feet.
2. Support horizontal hubless cast iron pipe at every other joint, unless over four feet, then support at every joint not to exceed 10-feet.
3. Support horizontal ABS pipe at every four feet. Allow for expansion every 30-feet.

- F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

- A. Connect service entrance piping to exterior sewage and drainage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage piping to service entrance piping, and extend to and connect to the following:
1. Plumbing Fixtures: Connect soil, waste, and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22.
 2. Plumbing Specialties: Connect soil, waste, and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22.
 3. Equipment: Connect waste piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.
- C. Connect force-main piping as indicated on drawings, and extend to and connect to the following:
1. Sump Pumps: Connect force-main piping to sump-pump discharge.
 2. Sewage Pumps: Connect force-main piping to sewage-pump discharge.
- D. Condensate from air washers, air-cooling coils, fuel burning condensing appliances, overflow from evaporative coolers, and similar air-conditioning equipment shall be collected and discharged to an approved plumbing fixture or disposal area.

3.11 FIELD QUALITY CONTROL

- A. Inspect soil, waste, and vent piping as follows:
1. Do not enclose, cover, or put piping into operation until it is 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.
 - a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
1. 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.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection (24 hours). Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare and submit reports for tests and required corrective action.
- C. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 2. 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 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
 4. Prepare and submit reports for tests and required corrective action.

3.12 CLEANING AND PROTECTING

- A. Clean interior of piping system. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION