

SECTION 22 14 00
FACILITY STORM DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

Storm drainage systems, including piping and all necessary accessories as designated in this section.

1.2 RELATED WORK

- A. Penetrations in rated enclosures: Section 07 84 00, FIRESTOPPING.
- B. Preparation and finish painting and identification of piping systems: Section 09 91 00, PAINTING.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- D. Pipe Insulation: Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Piping.
 - 2. Roof Drains.
 - 3. Cleanouts.
 - 4. All items listed in Part 2 - Products.
- C. Detailed shop drawing of clamping device and extensions when required in connection with the waterproofing membrane.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - A-A-59617.....Unions, Brass or Bronze Threaded, Pipe
Connections and Solder-Joint Tube Connections
- C. American National Standards Institute (ANSI):
 - American Society of Mechanical Engineers (ASME): (Copyrighted Society)
 - A13.1-96.....Scheme for Identification of Piping Systems
 - B16.3-98.....Malleable Iron Threaded Fittings ANSI/ASME
 - B16.9-01.....Factory-Made Wrought Steel Buttwelding Fittings
ANSI/ASME
 - B16.12-98.....Cast Iron Threaded Drainage Fittings ANSI/ASME

- B16.15-85(R 1994).....Cast Bronze Threaded Fittings ANSI/ASME
- B16.18-01.....Cast Copper Alloy Solder-Joint Pressure
Fittings ANSI/ASME
- B16.22-01.....Wrought Copper and Copper Alloy Solder Joint
Pressure Fittings ANSI/ASME
- D. American Society for Testing and Materials (ASTM):
- A47-99.....Ferritic Malleable Iron Castings Revision 1989
- A53-02.....Pipe, Steel, Black And Hot-Dipped, Zinc-coated
Welded and Seamless
- A74-03.....Cast Iron Soil Pipe and Fittings
- A183-83(R1998).....Carbon Steel Track Bolts and Nuts
- A536-84(R1999) E1.....Ductile Iron Castings
- A733-03.....Welded and Seamless Carbon Steel and Austenitic
Stainless Steel Pipe Nipples
- B32-03.....Solder Metal
- B61-02.....Steam or Bronze Castings
- B62-02.....Composition Bronze or Ounce Metal Castings
- C564-03.....Rubber Gaskets for Cast Iron Soil Pipe and
Fittings
- D2564-94.....Solvent Cements for Poly (Vinyl Chloride) (PVC)
Plastic Pipe and Fittings
- D2665-94 Revision A.....Poly (Vinyl Chloride) (PVC) Plastic Drain,
Waste, and Vent Pipe and Fittings
- D4101-03b.....Propylene Plastic Injection and Extrusion
Materials
- E. American Welding Society (AWS):
- A5.8-92.....Filler Metals for Brazing
- F. National Association of Plumbing - Heating - Cooling Contractors
(PHCC):
- National Standard Plumbing Code - Latest Edition
- G. Cast Iron Soil Pipe Institute (CISPI):
- 301-04.....Hubless Cast Iron Soil and Fittings
- H. International Association of Plumbing and Mechanical Officials (IAPMO):
- Uniform Plumbing Code - 2000
- IS6-93.....Installation Standard
- I. Factory Mutual (FM):
- a. Coupling Used in Hubless Cast Iron Systems for Drains, Waste and
Vent Systems.

PART 2 - PRODUCTS

2.1 STORM WATER DRAIN AND VENT PIPING

- A. Cast Iron Soil Pipe and Fittings: Used for interior waste and vent piping above crawl space. Pipe shall be plain end (no-hub) as required by selected jointing method:
 - 1. Material, (Pipe and Fittings): ASTM A74, C1SP1-301, Service Class.
 - 2. Joints:
 - a. Mechanical: Meet the requirements and criteria for pressure, leak, deflection and shear tests as outlined in Factory Mutual No. 1680 for Class 1 couplings.
 - 1) Stainless steel clamp type coupling of elastomeric sealing sleeve, ASTM C564 and a Series 300 stainless steel shield and clamp assembly. Sealing sleeve with center-stop to prevent contact between pipes/fittings being joined shall be marked ASTM C564.
 - b. Adapters: Where service weight pipe is connected to extra heavy pipe and extra heavy fittings of chair carriers, provide adapters or similar system to make tight, leakproof joints.
- B. Polyvinyl Chloride (PVC): Schedule 40. To be used in crawl space and below grade. Shall not be used where waste temperature may exceed 60°C (140°F), such as mechanical equipment rooms, and kitchen, SPD, and sterilizer areas. PVC shall not be used in waste risers due to higher noise than other specified material.
 - 1. Pipe: Shall be manufactured from Type I normal impact resins in conformance with ASTM D2665 and ASTM B16.12.
 - 2. Fittings:
 - a. Solvent Welded Socket Type: Use solvent cement, ASTM D2564.
 - b. Threaded Type: Molded threads only. Use tape or lubricant specifically intended for use with PVC plastic pipe.

2.2 PUMPED DRAIN PIPING

- A. Pipe: Copper tube, ASTM B88, Type K or L, drawn. For pipe 100 mm (4 inches) and larger, galvanized steel ASTM A53, seamless, standard weight may be used.
- B. Fittings for Copper Tube:
 - 1. Wrought copper or bronze castings conforming to ANSI B16.18 and B16.22. Unions shall be bronze, MSS SP-72, SP-110. Solder or braze joints.

2. Grooved fittings, 65 mm to 100 mm (2-1/2 to 4 inch) wrought copper ASTM A75 C12200, 125 to 150 mm (5 to 6 inch) bronze castings ASTM B584, CDA 844. Mechanical grooved couplings, ductile iron, ASTM A536 (Grade 65-45-12), malleable iron, ASTM A47 (Grade 32510) housing, with EPDM gasket, steel track head bolts, ASTM A183, coated with colored alkyd enamel.

C. Adapters: Provide adapters for joining screwed pipe to copper tubing.

D. Solder: ASTM B32 Composition Sb5. Provide non-corrosive flux.

2.3 CLEANOUTS

A. Same size as the pipe, up to 100 mm (4 inches); not less than 100 mm (4 inches) for larger pipe. Cleanouts for chemical waste drain pipe shall be of same material as the pipe. Cleanouts shall be easily accessible and shall be gastight and watertight. Provide a minimum clearance of 600 mm (24 inches) for the rodding.

B. In Floors: Floor cleanouts shall have cast iron body and frame with square adjustable scoriated secured nickel bronze top. Unit shall be vertically adjustable for a minimum of 50 mm (2 inches). When a waterproof membrane is used in the floor system, provide clamping collars on the cleanouts. Cleanouts shall consist of "Y" fittings and 3 mm (1/8 inch) bends with brass or bronze screw plugs. Cleanouts in the resilient tile floors, quarry tile and ceramic tile floors shall be provided with square top covers recessed for tile insertion. In the carpeted areas, provide carpet cleanout markers. Provide two way cleanouts where indicated on drawings.

C. Provide cleanouts at or near the base of the vertical stacks with the cleanout plug located approximately 600 mm (24 inches) above the floor. If there are no fixtures installed on the lowest floor, the cleanout shall be installed at the base of the stack. Extend the cleanouts to the wall access cover. Cleanout shall consist of sanitary tees. Furnish nickel-bronze square frame and stainless steel cover with minimum opening of 150 by 150 mm (6 by 6 inches) at each wall cleanout. Where the piping is concealed, a fixture trap or a fixture with integral trap, readily removable without disturbing concealed roughing work, shall be accepted as a cleanout equivalent providing the opening to be used as a cleanout opening is the size required by the NPHCC National Standard Plumbing Code.

D. In horizontal runs above grade, cleanouts shall consist of cast brass tapered screw plug in fitting or caulked/no hub cast iron ferrule.

Plain end (no-hub) piping in interstitial space or above ceiling may use plain end (no-hub) blind plug and clamp.

2.4 ROOF DRAIN CONNECTIONS

- A. Expansion Joints: Heavy cast iron with cast brass or copper expansion sleeve having smooth bearing surface working freely against a packing ring held in place and under pressure of a bolted gland ring, forming a water and air tight flexible joint. Asbestos packing is prohibited.
- B. Interior Downspouts: Provide an expansion joint, specified above, at top of run on straight, vertical runs of downspout piping 12 m (40 feet) long or more.

2.5 WATERPROOFING

- A. Provide at points where pipes pass through membrane waterproofed floors or walls in contact with earth.
- B. Floors: Provide cast iron stack sleeve with flashing device and an underdeck clamp. After stack is passed through sleeve, provide a waterproofed caulked joint at top hub.
- C. Walls: See detail shown on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with the PHCC National Standard Plumbing Code and the following:
 - 1. Install branch piping from the piping system and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.
 - 2. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, except for plastic and glass, shall be reamed to full size after cutting.
 - 3. All pipe runs shall be laid out to avoid interference with other work.
 - 4. Install union and shut-off valve on pressure piping at connections to equipment.
 - 5. All gravity waste drain lines inside the building with vertical drops over 6 m (20 feet) shall be provided with joint restraint on the vertical drop and horizontal offset or branch below the vertical drop. Joint restraint shall be accomplished by threaded, soldered, lead and oakum or grooved joints or a combination of pipe clamps and tie-rods as detailed in NFPA 24. Vertical joint restraint shall be

provided from the fitting at the bottom of the vertical drop through every joint up to the riser clamp at the floor penetration of the floor above. Horizontal joint restraint shall be provided from the same fitting at the bottom of the vertical drop through every joint on the horizontal offset or branch for a minimum of 18 m (60 feet) or to anchoring point from the building structure. Joint restraint below ground shall be accomplished by thrust blocks detailed in NFPA 24.

6. Pipe Hangers, Supports And Accessories:

- a. All piping shall be supported per of the National Standard Plumbing Code, Chapter No. 8.
- b. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for Pipe supports shall be shop coated with red lead or zinc Chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
- c. Floor, Wall and Ceiling Plates, Supports, Hangers:
 - 1) Solid or split unplated cast iron.
 - 2) All plates shall be provided with set screws.
 - 3) Pipe Hangers: Height adjustable clevis type.
 - 4) Adjustable Floor Rests and Base Flanges: Steel.
 - 5) Concrete Inserts: "Universal" or continuous slotted type.
 - 6) Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
 - 7) Riser Clamps: Malleable iron or steel.
 - 8) Rollers: Cast iron.
 - 9) Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.
 - 10) Hangers and supports utilized with insulated pipe and tubing shall have 180 degree (min.) metal protection shield Centered on and welded to the hanger and support. The shield shall be 4 inches in length and be 16 gauge steel. The shield shall be sized for the insulation.
 - 11) Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 6 m (20 feet) for cast iron pipe additional support shall be

provided in the center of that span. Provide all necessary auxiliary steel to provide that support.

7. Install cast escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
8. Penetrations:
 - a. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal clearances between raceways and openings with the fire stopping materials.
 - b. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

B. Piping shall conform to the following:

1. Storm Water Drain and Vent Drain to main stacks:

Pipe Size	Minimum Pitch
80 mm (2.5 inches) and smaller	1 : 50 (1/4" to the foot).
80 mm (3 inches) and larger	1 : 100 (1/8" to the foot).

2. Exhaust Vent: Extend separately through roof. Sanitary vents shall not connect to exhaust vents.

3.2 TESTS

- A. General: Test system either in its entirety or in sections.
- B. Storm Water Drain: Conduct before trenches are backfilled or fixtures are connected. Conduct water test or air test, as directed.
 1. Water Test: If entire system is tested, tightly close all openings in pipes except highest opening, and fill system with water to point of overflow. If system is tested in sections, tightly plug each opening except highest opening of section under test, fill each section with water and test with at least a 3 m (10 foot) head of water. In testing successive sections, test at least upper 3 m (10 feet) of next preceding section so that each joint or pipe except upper most 3 m (10 feet) of system has been submitted to a test of at least a 3 m (10 foot) head of water. Keep water in system, or in

- portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.
2. Air Test: Maintain air pressure of 35 kPa (5 psi) gage for at least 15 minutes without leakage. Use force pump and mercury column gage.
 3. Final Tests: Either one of the following tests may be used.
 - a. Smoke Test: After fixtures are permanently connected and traps are filled with water, fill entire drainage and vent systems with smoke under pressure of 1.3 kPa (one inch of water) with a smoke machine. Chemical smoke is prohibited.
 - b. Peppermint Test: Introduce (two ounces) of peppermint into each line or stack.

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