

**SECTION 22 14 00
FACILITY STORM DRAINAGE**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section describes the requirements for storm drainage systems, including piping and all necessary accessories as designated in this section.
- B. A complete listing of all acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 09 91 00, PAINTING: Preparation and finish painting and identification of piping systems.
- D. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: Pipe Hangers and Supports, Materials Identification.
- E. Section 22 05 33, HEAT TRACING FOR PLUMBING PIPING.
- F. Section 23 07 11, PLUMBING INSULATION: Pipe Insulation.

1.3 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. American Society of Mechanical Engineers (ASME):
 - A112.6.4-2003 (R2012) Roof, Deck, and Balcony Drains
 - A13.1-2007 (R2013) Scheme for Identification of Piping Systems
 - B1.20.1-2013 Pipe Threads, General Purpose, Inch
 - B16.3-2011 Malleable Iron Threaded Fittings: Classes 150 and 300
 - B16.9-2012 Factory-Made Wrought Butt Welding Fittings
 - B16.11-2011 Forged Fittings, Socket-Welding and Threaded
 - B16.12-2009 (R2014) Cast Iron Threaded Drainage Fittings

B16.15-2013 Cast Copper Alloy Threaded

Fittings: Classes 125 and 250

B16.18-2012 Cast Copper Alloy Solder-Joint
Pressure Fittings

B16.22-2013 Wrought Copper and Copper Alloy
Solder-Joint Pressure Fittings

B16.23-2011 Cast Copper Alloy Solder Joint
Drainage Fittings - DWV

B16.29-2012 Wrought Copper and Wrought Copper
Alloy Solder-Joint Drainage Fittings - DWV

C. American Society of Sanitary Engineering (ASSE)

1079-2012 Performance Requirements for
Dielectric Pipe Unions

D. American Society for Testing and Materials (ASTM):

A47/A47M-1999 (R2014) Standard Specification
for Ferritic Malleable Iron Castings

A53/A53M-2012 Standard Specification for Pipe,
Steel, Black And Hot-Dipped, Zinc-coated Welded
and Seamless

A74-2013a Standard Specification for Cast Iron
Soil Pipe and Fittings

A183-2014 Standard Specification for Carbon
Steel Track Bolts and Nuts

A536-1984(R2014) Standard Specification for
Ductile Iron Castings

A888-2013a Standard Specification for Hubless
Cast Iron Soil Pipe and Fittings for Sanitary
and Storm Drain, Waste, and Vent Piping
Applications

C564-2014 Standard Specification for Rubber
Gaskets for Cast Iron Soil Pipe and Fittings

C1173-2010 (R2014) Standard Specification for
Flexible Transition Couplings for Underground
Piping Systems

D2000-2012 Standard Classification System for
Rubber Products in Automotive Applications

F477-2014 Standard Specification for
Elastomeric Seals (Gaskets) for Joining Plastic
Pipe

F1545-2015 Standard Specification for Plastic-
Lined Ferrous Metal Pipe, Fittings, and Flanges

E. American Welding Society (AWS):

A5.8M/A5.8 AMD1-2011 Specification for Filler
Metals for Brazing and Braze Welding

F. Cast Iron Soil Pipe Institute (CISPI):

301-2012 Standard Specification for Hubless
Cast Iron Soil Pipe and Fittings for Sanitary
and Storm Drain, Waste, and Vent Piping
Applications

310-2012 Standard Specification for Coupling
for Use in Connection with Hubless Cast Iron
Soil Pipe and Fittings for Sanitary and Storm
Drain, Waste, and Vent Piping Applications

G. International Code Council (ICC):

IPC-2015 International Plumbing Code

H. Manufacturers Standardization Society of the Valve and Fittings
Industry, Inc. (MSS):

SP-72-2010a Ball Valves with Flanged or Butt-
Welding Ends for General Service

SP-110-2010 Ball Valves Threaded, Socket-
Welding, Solder Joint, Grooved and Flared Ends

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in
accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND
SAMPLES.

B. Information and material submitted under this section shall be marked
"SUBMITTED UNDER SECTION 22 14 00, FACILITY STORM DRAINAGE", with
applicable paragraph identification.

C. Manufacturer's Literature and Data including: Full item description and
optional features and accessories. Include dimensions, weights,
materials, applications, standard compliance, model numbers, size, and
capacity.

1. Pipe and Fittings.

2. Specialty Pipe Fittings.
 3. Cleanouts.
 4. Deck Drains.
 5. Expansion Joints.
- D. Detailed shop drawing of clamping device and extensions when required in connection with the waterproofing membrane.

1.5 QUALITY ASSURANCE

- A. Bio-Based Materials: For products designated by the USDA's Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.

1.6 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be in electronic version on compact disc or DVD inserted into a three-ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices such as damper and door closure interlocks shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.
- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them in Auto-CAD version 10 provided on compact disk or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall

not be deemed a conflict of interest or breach of the 'third party testing company' requirement.

- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 STORM WATER DRAIN PIPING

- A. Cast Iron Storm Pipe and Fittings:
1. Cast iron storm pipe and fittings shall be used for the following applications:
 - a. Pipe buried in or in contact with earth.
 - b. Extension of pipe to a distance of approximately 5 feet (1500 mm) outside of building walls.
 - c. Interior storm piping above grade.
 - d. All mechanical equipment rooms or other areas containing mechanical air handling equipment.
 2. The cast iron storm Pipe shall be bell and spigot, or hubless (plain end or no-hub) as required by selected jointing method.
 3. The material for all pipe and fittings shall be cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A-888, or ASTM A-74.
 4. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions. Couplings for hubless joints shall conform to CISPI 310. Joints for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM Standard C-564.
- B. Drain piping in locations where the outdoor conditions are subject to freezing shall be insulated.

2.3 SPECIALTY PIPE FITTINGS

- A. Transition pipe couplings shall join piping with small differences in outside diameters or be of different materials. End connections shall be of the same size and compatible with the pipes being joined. The transition coupling shall be unshielded, elastomeric, sleeve type reducing or transition pattern conforming with ASTM C1173 and include

shear ring and corrosion resistant metal tension band and tightening mechanism on each end. The transition coupling sleeve coupling shall be of the following material:

1. For cast iron soil pipes, the sleeve material shall be rubber conforming to ASTM C564.
2. For PVC soil pipes, the sleeve material shall be elastomeric seal conforming to ASTM F477 or PVC conforming to ASTM D5926.
3. Dissimilar pipes: The sleeve material shall be PVC conforming to ASTM D5926, or other material compatible with the pipe materials being joined.

2.4 CLEANOUTS

- A. Cleanouts shall be the same size as the pipe, up to 4 inches (100 mm); not less than 4 inches (100 mm) for larger pipe. Cleanouts shall be easily accessible and shall be gastight and watertight. A minimum clearance of 24 inches (600 mm) shall be provided for clearing a clogged storm sewer line.
- B. Floor cleanouts shall be gray iron housing with clamping device and round, secured, scoriated, gray iron cover conforming to ASME A112.36.2M. A gray iron ferrule with hubless, socket, inside calk or spigot connection and counter sunk, taper-thread, brass or bronze closure plug shall be included. The frame and cover material and finish shall be nickel-bronze copper alloy with a square shape. The cleanout shall be vertically adjustable for a minimum of 2 inches (50 mm). When a waterproof membrane is used in the floor system, clamping collars shall be provided on the cleanouts. Cleanouts shall consist of wye fittings and eighth bends with brass or bronze screw plugs. The loading classification for cleanouts in sidewalk areas or subject to vehicular traffic shall be heavy duty.

2.5 DECK DRAINS AND CONNECTIONS

- A. Deck Drains: Deck Drains (DD) shall be cast iron with clamping device for making watertight connection. Free openings through strainer shall be twice area of drain outlet. For deck drains not installed in connection with a waterproof membrane, a soft copper membrane shall be provided 12 inches (300 mm) in diameter greater than outside diameter of drain collar. Integral no-hub, soil pipe gasket or threaded outlet connection shall be provided.

1. Promenade Decks: The deck drain shall have a flat, round, loose, non-slip, bronze grate set in square, non-slip, bronze frame with the integral flange not larger than 8 inches (200 mm) in diameter. The deck drain shall be provided with an adjustable drainage collar, which can be raised or lowered to meet the required deck height, sump receiver and deck clamp.
 2. Pedestrian Deck: The deck drain shall have a bronze promenade top 14 inches (356 mm) square, set in square secured frame support collar.
 3. Deck drains in areas subject to freezing shall have heat tape and shall be insulated.
- B. Expansion Joints: Expansions joints shall be 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.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. The pipe installation shall comply with the requirements of the IPC and these specifications.
- B. Branch piping shall be installed from the piping system and connect to all drains and outlets.
- C. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, except for glass, shall be reamed to remove burrs and a clean smooth finish restored to full pipe inside diameter.
- D. All pipe runs shall be laid out to avoid interference with other work/trades.
- E. Unless otherwise stated on the documents, minimum horizontal slope shall be one inch for every 8 feet (2.44 m) (1 percent slope) of pipe length.
- F. The piping shall be installed free of sags and bends.
- G. Changes in direction for storm drainage piping shall be made 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. Long turn double wye branch and 1/8 bend fittings shall be used if two drains are installed back to back or side by side with common drain pipe. Do not change direction of flow more than 90 degrees. Proper size of standard

increaser and reducers shall be used if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- H. Buried storm drainage piping shall be laid beginning at the low point of each system. Piping shall be installed true to grades and alignment indicated with unbroken continuity of invert. Hub ends shall be placed upstream. Required gaskets shall be installed according to manufacturer's written instruction for use of lubricants, cements, and other installation requirements. Bio-based materials shall be utilized when possible.
- I. Cast iron piping shall be installed according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings"

3.2 JOINT CONSTRUCTION

- A. Hub and spigot, cast iron piping with gasket joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hubless, cast iron piping shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless piping coupling joints.
- C. For threaded joints, thread pipe with tapered pipe threads according to ASME B1.20.1. The threads shall be cut full and clean using sharp disc cutters. Threaded pipe ends shall be reamed to remove burrs and restored to full pipe inside diameter. Pipe fittings and valves shall be joined as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is required by the pipe service
 - 2. Pipe sections with damaged threads shall be replaced with new undamaged sections of pipe at no additional time or cost to Government.

3.3 SPECIALTY PIPE FITTINGS

- A. Transition coupling shall be installed at pipe joints with small differences in pipe outside diameters.

3.4 PIPE HANGERS, SUPPORTS AND ACCESSORIES

- A. All piping shall be supported according to the IPC, Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, and these specifications.

- B. Hangers, supports, rods, inserts and accessories used for Pipe supports shall be shop coated with zinc Chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
- C. Horizontal piping and tubing shall be supported within 12 inches (200 mm) of each fitting or coupling.
- D. Horizontal cast iron piping shall be supported with the following maximum horizontal spacing and minimum hanger rod diameters:
 - 1. 4 to 5 inch (100 to 125 mm): 60 inches (1500 mm) with 5/8 inch (18 mm) rod.
 - 2. 6 to 8 inch (150 to 200 mm): 60 inches (1500 mm) with 3/4 inch (20 mm) rod.
- E. Miscellaneous materials shall be provided as specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. All necessary auxiliary steel shall be provided to provide that support.

3.5 INSULATION

- A. Install insulation in accordance with the requirements of Section 22 07 11, PLUMBING INSULATION.

3.6 TESTS

- A. Storm sewer system shall be tested either in its entirety or in sections.
- B. Storm Water Drain tests shall be conducted before trenches are backfilled or fixtures are connected. A water test or air test shall be conducted, as directed.
 - 1. If entire system is tested with water, tightly close all openings in pipes except the 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 10 feet (3 m) head of water. In testing successive sections, test at least upper 10 feet (3 m) of next preceding section so that each joint or pipe except upper most 10 feet (3 m) of system has been submitted to a test of at least a 10 feet (3 m) head of water. Water shall be kept in the system, or in portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.

2. For an air test, an air pressure of 5 psig (35 kPa) gauge shall be maintained for at least 15 minutes without leakage. A force pump and mercury column gauge shall be used for the test.
3. Final Tests: While either one of the following tests may be used, Contractor shall check with VA as to which test will be performed.
 - 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 inch (0.25 kPa) of water with a smoke machine. Chemical smoke is prohibited.
 - b. Peppermint Test: Introduce 2 ounces (0.06 L) of peppermint into each line or stack.
- C. COR shall witness all tests. Contractor shall coordinate schedules with the COR. Contractor shall provide a minimum of 10 working days prior to flushing, disinfection/sterilization, startup, and testing.

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