

SECTION 221413 – FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following storm drainage piping inside the building.
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
- B. Related Sections include the following:
 - 1. Division 22 Section "Sump Pumps."
 - 2. Division 33 Section "Storm Utility Drainage Piping" for storm drainage piping outside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

Revise pressure ratings in two subparagraphs below to suit Project. Coordinate with Division 22 Section "Storm Drainage Piping Specialties." Storm drainage piping may require higher rating if used in high-rise buildings.

- 1. Storm Drainage Piping: 10-foot head of water.
- 2. Storm Drainage, Force-Main Piping: 50 psig (345 kPa).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.7 PROJECT CONDITIONS

Retain paragraph below if interruption of existing storm-drainage service is required.

- A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of storm-drainage service.
 - 2. Do not proceed with interruption of storm-drainage service without Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- 2.3 Comply with requirements in "Piping Applications" Article for applications of pipe, tube, fitting, and joining methods for specific services, service locations, and pipe sizes.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ANACO-Husky; Series 4000.
 - 2) Clamp-All Corp.
 - 3) Mission Rubber Company; a division of MCP Industries, Inc.
 - 2. Standards: ASTM C 1277 and ASTM C 1540.
 - 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight. Include square-cut-grooved or threaded ends matching joining method.
- B. Galvanized-Cast-Iron Drainage Fittings: ASME B16.12, threaded.
- C. Steel-Pipe Pressure Fittings:
 - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M 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. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.
 - 4. Cast-Iron Flanges: ASME B16.1, Class 125.
 - 5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
- D. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International.
 - b. Grinnell Mechanical Products.
 - c. Shurjoint Piping Products.
 - d. Victaulic Co. of America.
 - 2. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536, ductile-iron casting; ASTM A 47/A 47M malleable-iron casting; or ASTM A 106/A 106M steel pipe with dimensions matching ASTM A 53/A 53M steel pipe, and complying with AWWA C606 for grooved ends.
 - 3. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys, EPDM-rubber gasket suitable for hot and cold water, and bolts and nuts.

2.6 DUCTILE-IRON PIPE AND FITTINGS

Pipe and fittings in paragraph and subparagraphs below are available in NPS 3 to NPS 24 (DN 80 to DN 600).

- A. Ductile-Iron, Mechanical-Joint Piping:
 - 1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
 - 2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
 - 3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

Fittings and couplings in paragraph and subparagraphs below are available in NPS 4 to NPS 24 (DN 100 to DN 600).

B. Ductile-Iron, Grooved-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51 with round-cut-grooved ends according to AWWA C606.
2. Ductile-Iron-Pipe Appurtenances:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Anvil International.
 - 2) Shurjoint Piping Products.
 - 3) Star Pipe Products.
 - 4) Victaulic Co. of America.
 - b. Grooved-End, Ductile-Iron Fittings: ASTM A 536, ductile-iron castings with dimensions matching AWWA C110/A21.10 ductile-iron pipe or AWWA C153/A21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends .
 - c. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water, and bolts and nuts.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Storm sewer and drainage piping outside the building are specified in Division 33 Section "Storm Utility Drainage Piping."
- B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Storm Drainage Piping Specialties."
- D. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.

Retain paragraph below if steel, force-main piping is required.

- E. Install underground, steel, force-main piping. Install encasement on piping according to ASTM A 674 or AWWA C105.

Retain paragraph and subparagraph below if ductile-iron, force-main piping is required.

- F. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
 - 1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- G. Install underground, ductile-iron, special pipe fittings according to AWWA C600.
 - 1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- H. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- I. 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."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- J. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
- L. Install force mains at elevations indicated.
- M. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. All roof drains shall be flashed with six pound sheet lead, 36 inches square, fitted to the clamping rings on the drains, and with outside edges of flashing worked into the roof construction to effect a watertight installation. Flashing and roofing shall be installed such that a uniform, gradual pitch is maintained to the drain.

3.2 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- C. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

3.3 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- B. Shutoff Valves: Install shutoff valve on each sump pump discharge.
 - 1. Install full-port ball valve for piping NPS 2 (DN 50) and smaller.
 - 2. Install gate valve for piping NPS 2-1/2 (DN 65) and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sump pump discharge.
- D. Backwater Valves: Install backwater valves in piping subject to backflow.
 - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
 - 2. Install backwater valves in accessible locations.
 - 3. Backwater valve are specified in Division 22 Section "Storm Drainage Piping Specialties."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.

- B. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10 mm) minimum rods.

Maximum spans below were taken from MSS SP-69 for water service and from model plumbing codes. Most restrictive piping and spacing dimensions are shown.

- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
 - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
 - 4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
 - 5. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
 - 6. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).
- F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4 (DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
 - 4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
 - 5. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
 - 6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
 - 7. NPS 6 (DN 150): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.
 - 8. NPS 8 to NPS 12 (DN 200 to DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.
- H. Install supports for vertical steel piping every 15 feet (4.5 m).
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Install horizontal backwater valves with cleanout cover flush with floor.
3. Comply with requirements for backwater valves, cleanouts and drains specified in Division 22 Section "Storm Drainage Piping Specialties."

C. Connect force-main piping to the following:

Edit two subparagraphs below to suit Project.

1. Storm Sewer: To exterior force main or storm manhole.
 2. Sump Pumps: To sump pump discharge.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 IDENTIFICATION

- A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

Portions of testing and inspecting requirements in this Article are taken from model plumbing codes. Edit if requirements vary.

- A. Drainage system shall be inspected and tested in accordance with State of Michigan Plumbing Code.
- B. 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.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- C. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- E. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, 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 storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Test Procedure: Test storm drainage 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-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 5. Prepare reports for tests and required corrective action.
- F. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, 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 was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of 50 psig (345 kPa) 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.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. 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.

3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground storm drainage piping shall be any of the following:
 1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and coupled joints.
 2. Galvanized-steel pipe, drainage fittings, and threaded joints.
- C. Underground storm drainage piping shall be any of the following:
 1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and coupled joints.

- D. Aboveground storm drainage force mains NPS 2 (DN 40) and smaller shall be any of the following:
 - 1. Galvanized-steel pipe, pressure fittings, and threaded joints.
- E. Aboveground storm drainage force mains NPS 2-1/2 (DN 65) and larger shall be any of the following:
 - 1. Steel pipe, pressure fittings, and threaded joints.
 - 2. Grooved-end steel pipe, grooved-joint system fittings and couplings, and grooved joints.
- F. Underground storm drainage force mains shall be any of the following:
 - 1. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile-iron fittings; glands, gaskets, and bolts; and mechanical joints.
 - 2. Include grooved-joint system fittings and couplings and grooved joints where indicated.

END OF SECTION 221413