

SECTION 221414 - STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Hubless cast iron soil pipe and fittings
 - 2. Copper tube and fittings.
 - 3. PVC pipe and fittings.
 - 4. Specialty pipe fittings.
 - 5. Encasement for underground metal piping.
- B. Related Requirements:
 - 1. Section 220523.12 "Ball Valves for Plumbing Piping"
 - 2. Section 220523.14 "Check Valves for Plumbing Piping"
 - 3. Section 221323 "Sanitary Waste Interceptors"
 - 4. Section 221429 "Sump Pumps" for storm drainage pumps.

1.02 ACTION SUBMITTALS

- A. Product Data:
 - 1. Hubless cast iron soil pipe and fittings
 - 2. Copper tube and fittings.
 - 3. PVC pipe and fittings.
 - 4. Specialty pipe fittings.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.03 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports: Inspection reports signed by authorities having jurisdiction.

1.04 QUALITY ASSURANCE

- A. Provide materials bearing label, stamp, or other markings of specified testing agency.

1.05 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Components and installation are to be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot head of water.
 - 2. Storm Drainage, Force-Main Piping: 50 psig.

2.02 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AB & I Foundry; a part of the McWane family of companies.
 - 2. Charlotte Pipe and Foundry Company.
 - 3. Tyler Pipe; a part of McWane family of companies.
- B. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark and NSF certification mark.
 - 2. Standards: ASTM A888 and CISPI 301.
- C. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Charlotte Pipe and Foundry Company.
 - c. Dallas Specialty & Mfg. Co.
 - d. Fernco Inc.
 - e. Ideal Tridon Group.
 - f. Matco-Norca.
 - g. MIFAB, Inc.
 - h. Mission Rubber Company, LLC; a division of MCP Industries.
 - 2. Standard: ASTM C1277 or ASTM C1540.
 - 3. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.04 COPPER TUBE AND FITTINGS

- A. Copper Tube:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cambridge-Lee Industries, LLC.
 - b. Cerro Flow Products, LLC.
 - c. Wieland Copper Products, LLC.
 - 2. Copper Tube, Drawn Temper: ASTM B88, Type L.
 - 3. Copper Tube, Annealed Temper: ASTM B88, Type L.
- B. Copper Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. NIBCO INC.
 - 2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
 - 3. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 4. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
 - 5. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - a. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

- C. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.05 PVC PIPE AND FITTINGS

A. PVC Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. JM Eagle.
 - c. National Pipe and Plastic, Inc.
 - d. North America Pipe Corporation.
 - e. Silver-line Plastics.
2. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
3. Solid-Wall schedule 40 PVC Pipe: ASTM D2665 drain, waste, and vent.
4. Cellular-Core PVC Pipe: NOT ALLOWED

B. PVC Socket Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. NIBCO INC.
 - c. North America Pipe Corporation.
2. Standard: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
3. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Adhesive Primer: ASTM F656.

1. Verify adhesive primer has a VOC content of 550 g/L or less.
2. Verify adhesive primer complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Solvent Cement: ASTM D2564.

1. Verify solvent cement has a VOC content of 510 g/L or less.

2.06 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dallas Specialty & Mfg. Co.
 - 2) Fernco Inc.
 - 3) Mission Rubber Company, LLC; a division of MCP Industries.
 - b. Standard: ASTM C1173.

- c. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C564 rubber.
 - 2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
 - 3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.
- 4. Shielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dallas Specialty & Mfg. Co.
 - 2) Fernco Inc.
 - 3) Mission Rubber Company, LLC; a division of MCP Industries.
 - b. Standard: ASTM C1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - d. End Connections: Same size as and compatible with pipes to be joined.
- 5. Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) EBAA Iron Sales, Inc.
 - 3) Ford Meter Box Company, Inc. (The).
 - 4) JCM Industries, Inc.
 - 5) Romac Industries, Inc.
 - b. Standard: AWWA C219.
 - c. Description: Metal, sleeve-type couplings same size as pipes to be joined, and with pressure rating at least equal to and ends compatible with pipes to be joined.
 - d. Center-Sleeve Material: Manufacturer's standard.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:
 - 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 - 2. Dielectric Unions:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) A.Y. McDonald Mfg. Co.
 - 2) HART Industrial Unions, LLC.
 - 3) Jomar Valve.
 - 4) Matco-Norca.
 - 5) WATTS; A Watts Water Technologies Company.
 - 6) Zurn Industries, LLC.
 - b. Description:
 - 1) Standard: ASSE 1079.

- 2) Pressure Rating: 150 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) WATTS; A Watts Water Technologies Company.
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 150 psig minimum at 180 deg F.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous.
4. Dielectric Nipples:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Anvil; an ASC Engineered Solution.
 - 2) Matco-Norca.
 - 3) Precision Plumbing Products.
 - b. Description: Electroplated steel nipple.
 - c. Standards: ASTM F492, ASME B1.20.1.
 - d. Pressure Rating: 300 psig at 225 deg F.
 - e. End Connections: Male threaded or grooved.
 - f. Lining: Inert and noncorrosive, propylene.

2.07 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A674 or AWWA C105/A 21.5.
- B. Material: High-density, crosslaminated polyethylene film of 0.004-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

PART 3 EXECUTION

3.01 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in "Earth Moving."

3.02 DELIVERY, STORAGE AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Pipes and fittings made of plastics such as Polyvinyl Chloride (PVC) etc shall be protected from exposure to direct sunlight.
- C. Pipes made of plastics shall be supported to prevent sagging and bending while stored on site.

3.03 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
- B. Install piping as indicated unless deviations from layout are approved on coordination drawings.

- C. Install piping in concealed locations.
 - 1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.
 - 1. Do not change direction of flow more than 90 degrees.
 - 2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- M. Install piping at the following minimum slopes unless otherwise indicated.
 - 1. Building Storm Drain 1/8 inch per foot (1%) downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Storm Drainage Piping: 1/8 inch per foot (1%) downward in direction of flow.
- N. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Ch IV, "Installation of Cast Iron Soil Pipe and Fittings."
- O. Install aboveground copper tubing in accordance with CDA's "Copper Tube Handbook."
- P. Aboveground PVC piping is not allowed..
- Q. Install underground PVC piping in accordance with ASTM D2321.
- R. Install force mains at elevations indicated.
- S. Plumbing Specialties:
 - 1. Install cleanouts in storm drainage gravity-flow piping in accessible locations.
 - a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
 - b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
 - 2. Install drains in storm drainage gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs.
 1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.04 JOINT CONSTRUCTION

- A. Hubless, Cast-Iron Soil Piping Coupled Joints: Join in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.
 1. Cut threads full and clean using sharp dies.
 2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
 - b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
 - c. Do not use pipe sections that have cracked or open welds.
- C. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.
- D. Plastic, Non-pressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendices.
- E. Joint Restraints and Sway Bracing:
 1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:
 - a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
 - b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
 - c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

3.05 INSTALLATION OF SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. Install transition couplings at joints of piping with small differences in ODs.
 2. In Drainage Piping: Shielded, non-pressure transition couplings.
 3. In Aboveground Force-Main Piping: Fitting-type transition couplings.
- B. Dielectric Fittings:
 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.06 INSTALLATION OF VALVES.

- A. General valve installation requirements for general-duty valve installations are specified in the following Sections:
 - 1. Section 220523.12 "Ball Valves for Plumbing Piping."
 - 2. Section 220523.14 "Check Valves for Plumbing Piping."
- B. Shutoff Valves:
 - 1. Install shutoff valve on each sump pump discharge.
 - 2. Install full port ball valve for piping NS 3 and smaller.
- C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

3.07 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
 - 4. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 5. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 7. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for cast iron and copper soil tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical cast iron and copper tubing and piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.

3.08 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. 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. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."
- D. Where installing piping adjacent to equipment allow space for service and maintenance of equipment.
- E. Make connections in accordance with the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.09 IDENTIFICATION

- A. Identify exposed storm drainage piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.10 FIELD QUALITY CONTROL

- A. 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.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping in accordance with 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.
 - a. 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.
 - a. Expose work that was covered or concealed before it was tested.
 3. Test Procedure:
 - a. Test storm drainage piping, except outside leaders, on completion of roughing-in.
 - b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
 - c. From 15 minutes before inspection starts until completion of inspection, water level must not drop.
 - d. Inspect joints for leaks.
 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 5. Using compressed air to pressure test any portion of the sanitary, waste, drain and vent system that is ABS, PVC or any other plastic/polymer material IS STRICTLY PROHIBITED BY THE INTERNATIONAL PLUMBING CODE and the Manufacturer.
 - a. Any ABS, PVC or any other plastic/polymer piping tested with compressed air SHALL BE completely removed and replaced at NO ADDITIONAL COST to the owner.
 6. Prepare reports for tests and require corrective action.
- E. 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.
 - a. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.
 - a. 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.

3.11 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.

3.12 PROTECTION

- A. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day and when work stops.
- C. Repair damage to adjacent materials caused by storm drainage piping installation.

3.13 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground storm drainage piping is to be the following:
 1. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.
- C. Underground storm drainage piping shall be the following:
 1. Solid-wall, schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.
- D. Aboveground storm drainage force mains is to be the following:
 1. Hard copper tube, Type L copper pressure fittings, and soldered joints.

3.14 INSULATION

- A. Refer to section 220719 "PLUMBING PIPING INSULATION" for insulation requirements.

END OF SECTION