

SECTION 33 40 00
STORM SEWER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies materials and procedures for construction of outside, underground storm sewer systems that are complete and ready for operation. This includes piping, structures and all other incidentals.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Handle manholes according to manufacturer's written rigging instructions.

1.3 COORDINATION

- A. Coordinate connection to storm sewer main with the COR.

1.4 SUBMITTALS

- A. Manufacturers' Literature and Data shall be submitted, as one package, for pipes, fittings and appurtenances, including jointing materials, hydrants, valves and other miscellaneous items.

1.5 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 for Testing and Materials (ASTM):
 - A185/A185M-07.....Steel Welded Wire Reinforcement, Plain, for Concrete
 - A536-84(2009).....Ductile Iron Castings
 - A615/A615M-09b.....Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - C33/C33M-08.....Concrete Aggregates
 - C150/C150M-11.....Portland Cement
 - C443-10.....Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - C478-09.....Precast Reinforced Concrete Manhole Sections
 - C857-07.....Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 - C891-09.....Installation of Underground Precast Concrete Utility Structures
 - C913-08.....Precast Concrete Water and Wastewater Structures
 - C923-08.....Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
 - C990-09.....Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
 - C1103-03(2009).....Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
 - C1173-08.....Flexible Transition Couplings for Underground Piping Systems
 - C1433-10.....Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

- C1479-10.....Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
- D448-08.....Sizes of Aggregate for Road and Bridge Construction
- D698-07e1.....Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
- D1056-07.....Flexible Cellular Materials—Sponge or Expanded Rubber
- D1785-06.....Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D3034-08.....Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- D3350-10.....Polyethylene Plastics Pipe and Fittings Materials
- D5926-09.....Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
- F477-10.....Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F794-03(2009).....Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
- F810-12.....Smoothwall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields
- F891-10.....Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core
- F894-07.....Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
- F949-10.....Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
- F1668-08.....Construction Procedures for Buried Plastic Pipe
- C. American Association of State Highway and Transportation Officials (AASHTO):
- M198-10.....Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- D. American Water Works Association(AWWA):
- C900-07.....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
- M23-2nd ed.....PVC Pipe "Design And Installation"
- E. American Society of Mechanical Engineers (ASME):
- A112.36.2M-1991.....Cleanouts

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements. The Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.2 PE PIPE AND FITTINGS

- A. PE drainage pipe and fittings; ASTM F810, SDR 35 with smooth waterway for coupling joints.

1. Silt-tight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soil-tight Couplings: AASHTO M252, corrugated, matching tube and fittings.
3. Pipe shall be produced from PE certified by the resin producer as meeting the requirements of ASTM D3350, minimum cell class 335434C.

2.3 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials
 1. For concrete pipes: ASTM C443, 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.
- C. Unshielded, Flexible Couplings: Couplings shall be an elastomeric sleeve with // stainless-steel shear ring and // corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, flexible couplings shall be elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, flexible couplings shall be elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.4 CLEANOUTS

- A. Cast-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2.5 MANHOLES AND CATCH BASINS

- A. Standard Precast Concrete Manholes:
 1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 2. Diameter: 48 inches minimum unless otherwise indicated.
 3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
 4. Base Section: 6 inch minimum thickness for floor slab and 4-inch (102 mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
 5. Riser Sections: 4 inch minimum thickness, and lengths to provide depth indicated.
 6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
 7. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
 8. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.
 9. Steps: If total depth from floor of manhole to finished grade is greater than 60 inches.
 10. Adjusting Rings: Reinforced-concrete rings, 6 to 9 inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.
- B. Manhole Frames and Covers:

1. Description: Ferrous; Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.6 CONCRETE FOR MANHOLES AND CATCH BASINS

- A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
 1. Cement: ASTM C150, Type II.
 2. Fine Aggregate: ASTM C33, sand.
 3. Coarse Aggregate: ASTM C33, crushed gravel.
 4. Water: Potable.
- B. Concrete Design Mix: 4000 psi minimum, compressive strength in 28 days.
 1. Reinforcing Fabric: ASTM A185, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A615, Grade 60 deformed steel.
- C. Manhole Channels and Benches: Channels shall be the main line pipe material. Include benches in all manholes and catch basins.
 1. Channels: Main line pipe material or concrete invert. Height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope. Invert Slope: Same slope as the main line pipe. Bench to be concrete, sloped to drain into channel. Minimum of 6 inch slope from main line pipe to wall sides.

PART 3 - EXECUTION

3.1 PIPE BEDDING

- A. The bedding surface of the pipe shall provide a firm foundation of uniform density throughout the entire length of pipe. Concrete pipe requirements are such that when no bedding class is specified, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform with the lowest one-fourth of the outside portion of circular pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall not be more than the length, depth, and width required for properly making the particular type of joint. Plastic pipe bedding requirements shall meet the requirements of ASTM D2321. Bedding, haunching and initial backfill shall be either Class IB or Class II material. Corrugated metal pipe bedding requirements shall conform to ASTM A798.

3.2 PIPING INSTALLATION

- A. Drawing plans and details indicate general location and arrangement of existing underground storm drainage piping. Intercept existing piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Modify existing piping as necessary to install new manhole. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 1. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.
 2. Support pipe on compacted bedding material.
 3. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.
 4. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.
 5. Interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.

6. Do not walk on pipe in trenches until covered by layers of shading to a depth of 12 inches (300 mm) over the crown of the pipe.

3.3 GRADING

- A. Raise or lower new manhole and structure frame and cover in area to finish grade.
- B. During periods when work is progressing, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

3.4 MANHOLE INSTALLATION

- A. Install manhole, complete with appurtenances and accessories indicated. Install precast concrete manhole sections with sealants according to ASTM C891.
- B. Set tops of frames and covers flush with finished surface of manholes. Set tops at grade.

3.5 IDENTIFICATION

- A. Install green warning tape directly over piping and at outside edge of underground structures.

3.6 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred.
 1. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 3. Reinspect and repeat procedure until results are satisfactory.

3.7 TESTING OF STORM SEWERS:

- A. Test new and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
- B. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water.

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