

**SECTION 33 40 00
STORM SEWER UTILITIES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. 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 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 Association of State Highway and Transportation Officials (AASHTO):
- HB-17-2002.....Standard Specifications for Highway Bridges,
17th Edition
- M252-2009.....Standard Specification for Corrugated
Polyethylene Drainage Pipe
- M294-2015.....Standard Specification for Corrugated
Polyethylene Pipe, 300 to 1500 mm (12 to 60
In.) Diameter
- C. American Concrete Institute (ACI):
- 318-2014.....Building Code Requirements for Structural
Concrete and Commentary
- 350-2006.....Code Requirements for Environmental Engineering
Concrete Structures and Commentary
- D. American Society for Testing and Materials (ASTM):
- C150/C150M-2016.....Standard Specification for Portland Cement
- C443-2012.....Standard Specification for Joints for Concrete
Pipe and Manholes, Using Rubber Gaskets
- C478-2015.....Standard Specification for Circular Precast
Reinforced Concrete Manhole Sections
- C891-2011.....Standard Practice for Installation of
Underground Precast Concrete Utility Structures
- C923-2008 (R2013)e1.....Standard Specification for Resilient Connectors
Between Reinforced Concrete Manhole Structures,
Pipes, and Laterals

C990-2009 (R2014).....	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
D448-2012.....	Standard Classification for Sizes of Aggregate for Road and Bridge Construction
D3034-2015.....	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
F477-2014.....	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F714-2013.....	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
F1417-2011a (R2015).....	Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air
F1668-2008.....	Standard Guide for Construction Procedures for Buried Plastic Pipe

1.3 SUBMITTALS

- A. Product Data: Certification from the manufacturers attesting that the materials meet specification requirements.

1.4 QUALITY ASSURANCE

- A. Products Criteria:
 1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
 2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 COORDINATION

- A. Coordinate connection to storm sewer main with the Public Agency providing storm sewer off-site drainage.

1.7 WARRANTY

- A. Guaranty: Warranty of Construction, FAR clause 52.246-21.

- B. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of one year from final acceptance. Further, the Contractor will furnish all manufacturers' and suppliers' written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

- A. PVC Type PSM Sewer Piping:
1. Pipe: ASTM D3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends.
 2. Fittings: ASTM D3034, PVC with bell ends.
 3. Gaskets: ASTM F477, elastomeric seals.

2.2 PE PIPE AND FITTINGS

- A. Corrugated PE pipe and fittings, DN 300 to DN 1500 (NPS 12 to NPS 60); AASHTO M294, Type S with smooth waterway for coupling joints. Pipe shall be produced from PE certified by the resin producer as meeting the requirements of ASTM D3350, minimum cell class 335434C.
1. Soil-tight Couplings: AASHTO M252, corrugated, matching tube and fittings.
- B. Profile Wall PE Pipe: Pipe shall comply with ASTM F894, RSC 160 with bell and spigot ends.
1. Profile Wall PE Plastic Pipe Joints: Joints shall be as per ASTM F894, gasketed type with integral bell.

2.3 MANHOLES AND CATCH BASINS

- A. Standard Precast Concrete Manholes:
1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 2. Diameter: 1200 mm (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: 150 mm (6 inch) minimum thickness for floor slab and 100 mm (4 inch) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
 5. Riser Sections: 100 mm (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, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Adjusting Rings: Reinforced concrete rings, 150 to 225 mm (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; 600 mm (24 inch) ID by 175 to 225 mm (7 to 9 inch) riser with 100 mm (4 inch) minimum width flange and 660 mm (26 inch) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

PART 3 - EXECUTION

3.1 GENERAL

- A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 PIPE BEDDING

- A. The bedding surface of the pipe shall provide a firm foundation of uniform density throughout the entire length of 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.

3.3 PIPING INSTALLATION

- A. Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping

facing upstream. 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. Excavate bell holes only large enough to properly make the joint.
 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. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, 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 a depth of 300 mm (12 inches) over the crown of the pipe.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, nonpressure drainage piping according to the following:
1. Install piping pitched down in direction of flow.
 2. Install PE corrugated sewer piping according to ASTM D2321 with gasketed joints.
 3. Install PVC profile gravity sewer piping, according to ASTM D2321 and ASTM F1668.

3.4 CONNECTIONS TO EXISTING MANHOLES

- A. Make pipe connections and alterations to existing manholes so that finished work will conform as nearly as practicable to the applicable requirements specified for new manholes, including concrete and masonry work, cutting, and shaping.

3.5 MANHOLE INSTALLATION

- A. Install manholes, 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.
- C. Circular Structures:
 - 1. Precast concrete segmental blocks shall lay true and plumb. All horizontal and vertical joints shall be completely filled with mortar. Parge interior and exterior of structure with 15 mm (1/2 inch) or cement mortar applied with a trowel and finished to an even glazed surface.
 - 2. Precast reinforced concrete rings shall be installed true and plumb. The joints between rings and between rings and the base and top shall be sealed with a preform flexible gasket material specifically manufactured for this type of application. Adjust the length of the rings so that the eccentric conical top section will be at the required elevation. Cutting the conical top section is not acceptable.
 - 3. Precast reinforced concrete manhole risers and tops. Install as specified for precast reinforced concrete rings.

3.6 STORMWATER OUTLET INSTALLATION

- A. Construct riprap of broken stone.
- B. Install outlets that spill onto grade, with flared end sections that match pipe.
- C. Construct energy dissipaters at outlets.

3.7 CONNECTIONS

- A. Encase entire connection fitting, plus 150 mm (6 inch) overlap, with not less than 150 mm (6 inches) of concrete with 28-day compressive strength of 20 MPa (3000 psi).
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping.
 - 2. Make branch connections from side into existing piping, DN 100 to DN 500 (NPS 4 to NPS 20). Remove section of existing pipe, install wye fitting into existing piping.
 - 3. Make branch connections from side into existing piping, DN 525 (NPS 21) or larger, or to underground manholes and structures by cutting

- into existing unit and creating an opening large enough to allow 75 mm (3 inches) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.8 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
1. Close open ends of piping with at least 8 inch thick, brick masonry bulkheads.
 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Backfill to grade.

3.9 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Piping shall be free from obstructions, properly sloped and joined.

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.

3.10 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

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