

SECTION 33 30 00**SANITARY SEWER UTILITIES****PART 1 - GENERAL****1.1 DESCRIPTION**

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

1.2 RELATED WORK

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- B. General plumbing, protection of Materials and Equipment, and quality assurance: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- C. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

1.3 DEFINITIONS**1.4 ABBREVIATIONS**

- A. PVC: Polyvinyl chloride plastic
- B. DI: Ductile iron pipe

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store plastic piping protected from direct sunlight and support to prevent sagging and bending. Protect stored piping from moisture and dirt by elevating above grade. Protect flanges, fittings, and specialties from moisture and dirt.
- B. Handle manholes according to manufacturer's written rigging instructions.

1.6 COORDINATION

- A. Coordinate connection to sanitary sewer main with Public Utility company. (Approval from public utility has been obtained indicating that the downstream sanitary systems have sufficient capacity to handle the sanitary discharge from the facility.)
- B. Contractor to obtain approval from the Public Agency that the existing sanitary sewer systems have the capacity to handle the discharge from the facility.
- C. Coordinate exterior utility lines and connections to building lines up to 5 feet of building wall.

D. Coordinate connection to public sewer system with Public Utility Company.

1.7 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.

B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Sanitary Sewer lines and the extension, and/or modifications to Public Utility Systems.

1.8 SUBMITTALS:

A. Manufacturers' Literature and Data shall be submitted for the following as one package:

1. Pipe, Fittings, and, Appurtenances.
2. Jointing Material.
3. Manhole and Structure Material.

1.9 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):

A74-09.....Cast Iron Soil Pipe and Fittings

A185/A185M-07.....Steel Welded Wire Reinforcement, Plain, for
Concrete

A615/A615M-09b.....Deformed and Plain Carbon-Steel Bars for
Concrete Reinforcement

A746-99.....Ductile-Iron Gravity Sewer Pipe

C478-09.....Precast Reinforced Concrete Manhole Sections

C857-11.....Minimum Structural Design Loading for
Underground Precast Concrete Utility Structures

C890-11.....	Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
C913-08.....	Precast Concrete Water and Wastewater Structures
C923-08.....	Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
C924-02(2009).....	Testing Concrete Pipe Sewer Lines by Low- Pressure Air Test Method
C990-09.....	Joints for Concrete Pipe, Manholes, and precast Box Sections using Preformed Flexible Joint Sealants
C1173-10.....	Flexible Transition Couplings for Underground Piping Systems
C1440-08.....	Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems
C1460-08.....	Shielded Transition Couplings for Use With Dissimilar DWV Pipe and Fittings Above Ground
C1461-08.....	Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing systems for Above and below Ground Use
D2321-11.....	Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D3034-08.....	Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
F477-10.....	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F679-08.....	Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

F891-10.....Coextruded Poly(vinyl Chloride) (PVC) Plastic
Pipe With a Cellular Core

F949-10.....Poly(Vinyl Chloride) (PVC) Corrugated Sewer
Pipe With a Smooth Interior and Fittings

F1417-11.....Standard Test Method for Installation
Acceptance of Plastic Gravity Sewer Lines Using
Low-Pressure Air

F1668-08.....Construction Procedures for Buried Plastic Pipe

C. American Water Works Association (AWWA):

C105/A21.5-10.....Polyethylene Encasement for Ductile-Iron Pipe
Systems

C110-08.....Ductile-Iron and Gray-Iron Fittings

C111/A21.11-06.....Rubber Gasket Joints for Ductile Iron Pressure
Pipe and Fittings

C151/A21.51-09.....Ductile Iron Pipe, Centrifugally Cast

C153/A21.53-06.....Ductile Iron Compact Fittings for Water Service

C219-11.....Bolted, Sleeve-Type Couplings for Plain-End
Pipe

C512-07.....Air Release, Air/Vacuum and Combination Air
Valves for Water Works Service

C600-10.....Installation of Ductile-Iron Mains and Their
Appurtenances

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

D. American Society of Mechanical Engineers:

A112.14.1-2003.....Backwater Valves

A112.36.2M-1991.....Cleanouts

1.10 WARRANTY

A. 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 provide all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. All pipe and fittings used in the construction of force mains shall be rated to meet the system maximum operating pressure with a minimum of 150 psi (1035 kPa).
- C. 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 DUCTILE-IRON PIPE AND FITTINGS NA

2.3 PVC, GRAVITY SEWER PIPE AND FITTINGS

- A. PVC Gravity Sewer Piping:
 - 1. Pipe and Fittings shall conform to ASTM D3034.
 - 2. Gaskets: ASTM F477.
- B. PVC Cellular-Core Sewer Piping: NA
- C. PVC Corrugated Sewer Piping: NA
- D. PVC Type PSM Sewer Piping:
 - 1. Pipe shall conform to ASTM D3034.
 - 2. Fittings: ASTM D3034.
 - 3. Gaskets: ASTM F477.

2.4 PVC, PRESSURE PIPE AND FITTINGS NA

2.5 GRAVITY FLOW LINES WITH SECONDARY CONTAINMENT (ENCASEMENT) NA

2.6 PVC PRESSURE (FORCE) MAIN: NA

2.7 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C1173, elastomeric, sleeve type, reducing or transition coupling, for joining underground nonpressure piping. Include ends to match same sizes of main line piping and install corrosion-resistant metal tension bands and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Plastic Pipes: ASTM F477, elastomeric seal.
 - 2. For Dissimilar Pipes: PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Couplings shall be elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Couplings shall meet ASTM C1460 with elastomeric with full-length, corrosion-resistant outer shield with corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Couplings shall be elastomeric compression seal with dimensions to fit inside bell of larger mainline pipe and for spigot of smaller main line pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:

1. Coupling shall be ASTM C1461, sleeve-type, reducing-mechanical coupling, molded from ASTM C1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.8 PRESSURE-TYPE PIPE COUPLINGS NA

2.9 EXPANSION JOINTS AND DEFLECTION FITTINGS NA

2.10 BACKWATER VALVES NA

2.11 CLEANOUTS

A. PVC Cleanouts:

1. PVC body with PVC threaded plug: Cleanout shall be as per ASTM D3034. PVC sewer pipe fitting and riser to cleanout.
2. Cleanout Riser: Sewer pipe fitting on main line sewer and riser shall match main line piping.

2.12 MANHOLES NA

2.13 CONCRETE

- A. Cast-in-place concrete shall be 3500 psi minimum, with 0.45 maximum water/cementitious materials ratio.

B. Reinforcement

1. Reinforcing fabric shall be ASTM A185, steel, welded wire fabric, plain.
2. Reinforcing bars shall be ASTM A615, Grade 60 (420 MPa) deformed steel.

- C. Benches shall be concrete, sloped to drain into the channel. Provide 6 inches (150 mm) from the cut section of top of pipe to edge of manhole.

- D. Ballast and Pipe Supports shall be Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

2.14 WET WELL NA**2.15 ACID NEUTRALIZATION TANKS NA****2.16 OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT NA****2.17 AIR RELEASE VALVE FOR FORCE MAINS NA****2.18 WARNING TAPE**

- A. Warning tape shall be standard, 4 mil (0.1 mm) polyethylene 3 inch (76 mm) wide tape detectable type, green with black letters and imprinted with "CAUTION BURIED SEWER LINE BELOW".

PART 3 - EXECUTION**3.1 PIPING INSTALLATION**

- A. Drawing plans and details indicate the general location and arrangement of underground sanitary sewer 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 the low point, true to grades and alignment indicated on the drawings, 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 using lubricants, cements, and other installation requirements.
- C. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.
- D. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.
- E. 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.
- F. 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.
- G. Do not walk on pipe in trenches until covered by layers of bedding or backfill material to a depth of 12 inches (300 mm) over the crown of the pipe.
- H. Warning tape shall be continuously placed 12 inches (300 mm) above sewer pipe
- I. Install gravity-flow, non-pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
2. Install piping with overburden cover as shown on Drawings.
3. Install ductile iron, gravity sewer piping according to AWWA C600.
4. Install PVC gravity sewer according to ASTM D2321 and ASTM F1668.

3.2 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure, drainage piping according to the following:

1. Join ductile iron, gravity sewer piping according to AWWA C600 for push-on joints.
2. Join PVC piping according to ASTM D2321.
3. Join dissimilar pipe materials with nonpressure-type, rigid couplings.

B. Join force-main, pressure piping according to the following:

1. Join ductile iron pressure piping according to AWWA C600 for push-on joints.
2. Join PVC pressure piping according to manufacturer's recommendations.
3. Join dissimilar pipe materials with pressure-type couplings.

3.3 SEWER AND MANHOLE SUPPORTS, CONCRETE CRADLES WITHIN VAULTS NA

3.4 BUILDING SERVICE LINES

A. Install sanitary sewer service lines to point of connection where service is required and make connections as indicated on drawings.

3.5 MANHOLE INSTALLATION NA

3.6 WET WELLS NA

3.7 OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT NA

3.8 ACID NEUTRALIZING TANKS NA

3.9 BACKWATER VALVE INSTALLATION NA

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Cleanouts should be 6 inches (150 mm) in diameter and consist of a ductile iron 45 degree fitting on end of run, or combination Y fitting and 1/8 bend in the run with ductile iron pipe extension, water tight plug or cap and cast frame and cover flush with finished grade. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

3.11 CONNECTIONS

- A. Make connections to existing piping and underground manholes by coring and installing the pipe at the design invert. Install an elastomeric gasket around the pipe, and grout the interstitial space between the pipe and the core.
- B. Use commercially manufactured wye fittings for piping branch connections. Encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 1. Make branch connections from the side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500), by removing a section of the existing pipe.
 - 2. Make branch connections from the side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting an opening into existing unit large enough to allow 3 inches (76 mm) 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 or manhole wall, encase entering connection in concrete to provide additional support of collar from connection to undisturbed ground.
 - 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.12 AIR RELEASE VALVES NA**3.13 REGRADING**

- A. Raise or lower existing manholes and structures frames and covers, cleanout frames and covers and valve boxes in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Adjust the elevation of the cleanout pipe riser, and reinstall the cap or plug. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.
- B. During periods when work is progressing on adjusting manholes or structures cover elevations, 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.

3.14 CLOSING ABANDONED SANITARY SEWER SYSTEMS NA**3.15 PIPE SEPARATION****A. Horizontal Separation - Water Mains and Sewers:**

1. Existing and proposed water mains shall be at least 10 feet (3 m) horizontally from any proposed gravity flow and pressure (force main) sanitary sewer or sewer service connection.
2. Gravity flow mains and pressure (force) mains may be located closer than 10 feet (3 m) but not closer than 6 feet (1.8 m) to a water main when:
 - a. Local conditions prevent a lateral separation of 10 feet (3 m); and
 - b. The water main invert is at least 18 inches (450 mm) above the crown of the gravity sewer or 24 inches (600 mm) above the crown of the pressure (force) main; and the water main is in a separate trench separated by undisturbed earth.

3.16 IDENTIFICATION

- A. Install green warning tape directly over piping and at outside edges of underground manholes.

3.17 FIELD QUALITY CONTROL

- A. All systems shall be inspected and obtain the Resident Engineer's approval. Prior to final acceptance, provide a video record of all piping from the building to the municipal connection to show the lines are free from obstructions, properly sloped and joined.
- B. To inspect, thoroughly flush out the lines and manholes before inspection. Lamp test between structures and show full bore indicating sewer is true to line and grade. Lips at joints on the inside of gravity sewer lines are not acceptable.
1. Submit separate report for each system inspection.
 2. 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.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Re-inspect and repeat procedure until results are satisfactory.

C. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

1. Test plastic gravity sewer piping according to ASTM F1417.

2. Clean and isolate the section of sewer line to be tested. Plug or cap the ends of all branches, laterals, tees, wyes, and stubs to be included in the test to prevent air leakage. The line shall be pressurized to 4 psi (28 kPa) and allowed to stabilize. After pressure stabilization, the pressure shall be dropped to 3.5 psi (24 kPa) greater than the average back-pressure of any groundwater above the sewer.

3.18 CLEANING

A. Clean dirt and superfluous material from interior of piping.

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