

## SECTION 33 46 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 RELATED WORK

- A. Materials and Testing Report Submittals: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Erosion and Sediment Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- C. Concrete Work, Reinforcing, Placement and Finishing: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.

##### 1.3 ABBREVIATIONS

- A. HDPE: High-density polyethylene
- B. PE: Polyethylene

##### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe and fittings in direct sunlight.

##### 1.5 COORDINATION

- A. Coordinate exterior utility lines with placement of crypts and work of other sections.

##### 1.6 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.

1.7 SUBMITTALS

- A. Submit the accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data shall be submitted, as one package, for pipes, fittings and appurtenances, including jointing materials, hydrants, valves and other miscellaneous items.

1.8 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..... Steel Welded Wire Reinforcement, Plain, for Concrete
  - A242/A242M..... High-Strength Low-Alloy Structural Steel
  - A536 ..... Ductile Iron Castings
  - A615/A615M..... Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - C33/C33M ..... Concrete Aggregates
  - C150/C150M ..... Portland Cement
  - C443 ..... Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
  - C478 ..... Precast Reinforced Concrete Manhole Sections
  - C891 ..... Installation of Underground Precast Concrete Utility Structures
  - C913 ..... Precast Concrete Water and Wastewater Structures
  - C923 ..... Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
  - C990 ..... Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
  - C1173 ..... Flexible Transition Couplings for Underground Piping Systems
  - C1433 ..... Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
  - C1479 ..... Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
  - D448 ..... Sizes of Aggregate for Road and Bridge Construction
  - D1056 ..... Flexible Cellular Materials—Sponge or Expanded Rubber
  - D2321 ..... Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
  - D3034 ..... Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - D3350 ..... Polyethylene Plastics Pipe and Fittings Materials
  - D4101 ..... Polypropylene Injection and Extrusion Materials

- D5926 ..... Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
- F477 ..... Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F714 ..... Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- F949 ..... Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
- F1417 ..... Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
- F1668 ..... Construction Procedures for Buried Plastic Pipe
  
- C. American Association of State Highway and Transportation Officials (AASHTO):
  - M198 ..... Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
  - M252 ..... Corrugated Polyethylene Drainage Pipe
  
- D. American Water Works Association(AWWA):
  - C105/A21.5 ..... Polyethylene Encasement for Ductile iron Pipe Systems
  - C110 ..... Ductile-Iron and Gray-Iron Fittings
  - C900 ..... 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 ..... Cleanouts
  
- F. American Concrete Institute (ACI):
  - 318 ..... Structural Commentary and Commentary
  - 350/350M ..... Environmental Engineering Concrete Structures and Commentary
  
- G. National Stone, Sand and Gravel Association (NSSGA): Quarried Stone for Erosion and Sediment Control

## 1.9 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 furnish all manufacturers' and suppliers' 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. 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. Corrugated PE drainage pipe and fittings, NPS 3 to NPS; ASTM F714, SDR 21 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.

## 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 manholes: 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.
- F. Connection to existing concrete manhole: Flexible connector boot; complying with ASTM C923; Kor-N-Seal or similar producing a water-tight connection between pipe and manhole.

## 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.
  - 1. Top-Loading Classification(s): Heavy Duty.
  - 2. Pipe fitting and riser to cleanout shall be same material as main pipe line.

- B. Plastic Cleanouts shall have PVC body with PVC threaded plug. Pipe fitting and riser to cleanout shall be of same material as main line pipe.
- C. Frame and Cover: Precast Concrete or Ductile Iron; marked "D" to indicate drain; as indicated on Drawings.

## 2.5 DRAIN INLETS, FRAMES AND GRATES

- A. Frame and Cover for Gratings: Frame and cover for gratings shall be cast gray iron conforming to ASTM A48; cast ductile iron conforming to ASTM A536. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the Drawings.
- B. Catch Basins: Concrete for precast sections shall have a minimum compressive strength of 5,000 psi at 28 days, ASTM A615, Grade 60 reinforcing steel, rated for AASHTO HS20-44 loading with 30 percent impact, and conform to ASTM C857.

## 2.6 RIP RAP

- A. As specified under 31 20 00, EARTH MOVING.

## 2.7 WARNING TAPE

- A. Standard, 4-Mil polyethylene 3 inch wide tape, green with black letters, and imprinted with "CAUTION BURIED STORM SEWER BELOW".
- B. Locating Wire: No. 14, Green, Type TW plastic-coated copper tracer wire shall be installed with non-metallic irrigation main lines.

## 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. 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.

### 3.2 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 with cover as shown on the Drawings.
- C. 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, wildlife 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 layers of shading to a depth of 12 inches over the crown of the pipe.
  7. Warning tape shall be continuously placed 12 inches above storm sewer piping.
- D. Install fittings with cleanouts for changes in direction. Use fittings for branch connections unless direct tap into existing storm sewer is indicated.
- E. 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.
- F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- G. 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.

### 3.3 REGRADING

- A. Raise or lower existing manholes and structures frames and covers 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 to finished grade or as detailed on the Drawings. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover.
- 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.

### 3.4 CONNECTIONS TO EXISTING VA-OWNED 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 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast iron soil pipe fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use Medium-Duty, top-loading classification cleanouts in unpaved areas.
  - 2. Use Extra-Heavy-Duty, top-loading classification cleanouts in paved or future pavement areas.
- B. Set cleanout frames and covers in earth in cast in-place concrete block, 18 inches in diameter by 6 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface. Use 18 inches in diameter by 6 inches deep concrete collar in asphalt pavement areas.

### 3.6 DRAIN INLET GRATE AND FRAME

- A. Set frames in concrete as indicated on Drawings.
- B. Form connection from inlet to manhole base; dowel connection from new concrete to existing concrete. Provide reinforcing similar to that shown on Drawings for drain inlet.

### 3.7 CONNECTIONS

- A. 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, 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, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection and per manufacturer's recommendation for resilient connector. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall. On outside of pipe, manhole, or structure wall, use epoxy-bonding compound as interface between new and existing concrete and piping materials, or per manufacturer's recommendation.

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.
- B. 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 IDENTIFICATION

- A. Install warning tape directly over piping and at outside edge of underground structures. Place locating wire as indicated in Drawings.

### 3.9 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. 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.
  1. Submit separate reports 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. Reinspect and repeat procedure until results are satisfactory.

### 3.10 TESTING OF STORM SEWERS:

- A. Submit separate report for each test.
- B. Test new piping systems, 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.
  2. Submit separate report for each test.

3. Air test gravity sewers. Plastic Pipes conform to ASTM F1417, after consulting with pipe manufacturer. Testing of individual joints shall conform to ASTM C1103.
- C. Leaks and loss in test pressure constitute defects that must be repaired. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.11 CLEANING

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

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