

SECTION 334116 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specification Sections, apply to this Section.
- B. Georgia Department of Transportation Specifications and Details, latest edition or revision.

1.2 SUMMARY

- A. This Section includes gravity-flow, nonpressure storm drainage with the following components:
 - 1. Cleanouts.
 - 2. Drains.
 - 3. Precast concrete drainage structures.
- B. Related Sections include the following:
 - 1. Specification Section "Earthwork" for excavation, trenching, and backfilling requirements.

1.3 DEFINITIONS

- A. RCP: Reinforced Concrete Pipe.
- B. HDPE: High Density Polyethylene Plastic Pipe/Smooth Interior (and exterior) Corrugated Polyethylene Pipe.
- C. D.I.P.: Ductile Iron Pipe
- D. PVC: Polyvinyl Chloride Plastic Pipe.
- E. H.D.P.P.: High Density Polypropylene Plastic Pipe (Smooth Interior and Corrugated Exterior)

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Drainage Piping: Pipe shall be as specified under Part 2 - Products.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Special pipe fittings.
 - 2. Drains.
 - 3. Channel drainage systems.

- 4. Storage and leaching chambers.
- B. Shop Drawings: For the following:
 - 1. Drainage Structures: Include elevations, sections, details, frames and covers, reinforcing, thickness and grate type for each type structure indicated on the plans.
- C. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Handle manholes according to manufacturer's written rigging instructions.
- C. Handle stormwater inlets according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers that offer products complying with the specifications.

2.2 PIPING MATERIALS

- A. 12 Inch and Smaller Storm Sewers: Pipe and fittings shall meet all the requirements of ASTM-D 3034, SDR35, with gasketed joints meeting ASTM F-477, or HDPE (Smooth Interior Corrugated Polyethylene Pipe) as per AASHTO M294 or Contech A 2000 pipe for 12 inch and smaller drains will be acceptable. Joints and fittings for HDPE shall be as specified below.
- B. 15 Inch and Larger Storm Sewers: Refer to drawings for areas where a specified type of pipe must be used. Unless a specific type of pipe is called for on the Drawings, the Contractor shall have the option of installing one of the types of storm sewers listed below.
 - 1. Reinforced Concrete Pipe (RCP): Reinforced concrete pipe (RCP) shall meet the requirements of ASTM Designation C-76, Class III and the latest revisions thereof. Pipe

- joints shall be either tongue and groove with mortar joint or "O" ring type joints. Pipe shall meet GA D.O.T. Specifications and shall be stamped by D.O.T.
2. Ductile Iron Pipe (D.I.P.): Ductile iron pipe shall conform to AWWA C151 and shall be a minimum of Pressure Class 350. Fittings shall be in accordance with AWWA C153. Gaskets shall be in accordance with AWWA C111.
 3. Smooth Interior Corrugated Polyethylene Pipe (HDPE), 4"-60":
 - a. Polyethylene Pipe shall be high density polyethylene corrugated pipe with an integrally formed smooth interior.
 - b. This specification is applicable to nominal sizes 4-60 inch diameter. Requirements for test methods, dimensions, and markings are those found in AASHTO Designations M252 and M294.
 - c. Pipe and fittings shall be made of polyethylene compounds which meet or exceed the requirements of Type III, Category 4 or 5, Grade P33 or P34, Class C per ASTM D1248 with the applicable requirements defined in ASTM D1248. Clean, reworked material may be used.

Minimum parallel plate pipe stiffness values shall be as follows:

Diameter	Pipe Stiffness*
4"	50 psi
6"	50 psi
8"	50 psi
10"	50 psi
12"	45 psi
15"	42 psi
18"	40 psi
24"	34 psi
30"	28 psi
36"	22 psi
42"	20 psi
48"	18 psi
60"	14 psi

*Per ASTM Test Method D2412

- d. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely effect joining.
- e. The nominal size for pipe and fittings is based on the nominal inside diameter of the pipe. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Project Engineer.
- f. Joints shall be made with couplings with O-ring rubber gaskets.
- g. Installation shall be in accordance with ASTM Recommended Practice D2321 or as specified by the Project Engineer or local approving agency.
4. High Density Polypropylene Pipe (HDPP), 12"-60":
 - a. Polypropylene pipe shall have a smooth interior and annular exterior corrugations and meet or exceed ASTM F2881 and AASHTO M330.
 - b. Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2881 and shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant from the manufacturer shall be used on the gasket and bell during joint assembly.

- c. c. Installation shall be in accordance with ASTM D2321 and manufacturer's guidelines, with the exception that minimum cover in traffic areas for 12"-48" diameter pipes shall be one foot and for 60" diameter pipes, the minimum cover shall be 2 feet. Backfill for minimum cover situations shall consist of Class 1, Class 2 (minimum 90% SPD) or Class 3 (minimum 95%) material.

2.3 MISCELLANEOUS STORM APPURTENANCES

- A. Cast-in-place concrete shall have minimum compressive strength of 3000 psi at 28 days. Slump shall be 3" + 1". Reinforcing shall be sufficient to match ASTM C478.
- B. Brick: Brick for manholes and catch basins shall be first quality, sound, hard burned, perfect shaped brick, presenting a smooth regular shape. Brick shall not absorb more than 16 percent of water by weight when submerged in water for 24 hours, having been in a thoroughly dry state prior to placing in water. Where pre-cast structures are not feasible for use or at the Contractor's options, brick shall be used to form structures to the dimensions indicated for each structure on the detail sheets.
- C. Mortar: All cement used in mortar shall conform to ASTM Designation C150, and the latest revision thereof. All mortar used shall be composed of one part Portland Cement and two parts of fine sand.
- D. Cast Iron: Cast iron for manhole frames and covers and catch basin frames and grates, and manhole steps shall conform to the shape and dimensions shown on the Plans, and shall be clean and perfect, free from sand and blow holes or other defects. Cast iron shall conform to ASTM Designation A-48-74 for Class No. 30 gray cast iron.

2.4 CLEANOUTS

- A. Cleanouts: Shall be as shown on the plan details for storm sewer with countersunk, tapered-thread, brass closure plug, and concrete collar.
 - 1. Top-Loading Classification(s): Heavy duty.
 - 2. Sewer Pipe Fitting and Riser to Cleanout: Shall be as shown on the Drawings.

2.5 DRAINAGE STRUCTURES

- A. Standard Precast Concrete Drainage Structures: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 - 1. Base Section: 6-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
 - 2. Riser Sections: 6-inch minimum thickness, lengths to provide depth indicated, and diameter provided for piping and deflections as shown on plans.
 - 3. Top Section: Provide necessary adapters, brick construction, precast concrete trays and intermediate tops necessary to accommodate inlet tops as shown on the details.
 - 4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 - 5. Steps: Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 36-inches. Steps shall be as shown in the detail Drawings.

6. Pipe Connections: All pipe connection to precast concrete structures shall be grouted in place on both interior and exterior with full bed of grout.

2.6 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to details. Curb inlet hoods shall be USF 5167 standards, unless shown otherwise.
- B. Drop Inlets: Made with horizontal opening, of materials and dimensions according to details. Include heavy-duty frames and grates with H-20 load rating.
- C. Junction Boxes: Heavy-duty frames and grates (H-20 Load Rating) according to details.
- D. Catch Basins: Shall be constructed as indicated by Georgia Department of Transportation Standard Details (included by reference).
- E. Area Drains: Shall be as detailed on the Drawings.

2.7 PIPE OUTLETS

- A. Head Walls: Pre-Cast or Cast-in-place reinforced concrete, with apron and tapered sides, per details on the plans, or as referenced by Georgia Department of Transportation Standards.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Specification Section "Earthwork."

3.2 PIPING APPLICATIONS

- A. Gravity-Flow, Nonpressure Sewer Piping: Use the pipe materials previously specified for each run of pipe. Where a specific type of pipe has not been identified, the Contractor may freely choose from the available listed products.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated.
- 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.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into stormwater structure 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, at slope indicated.
 - 2. Install ductile-iron culvert piping according to ASTM A 716.
 - 3. Install ductile-iron and special fittings according to AWWA C600 or AWWA M41.
 - 4. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
 - 5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 6. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 7. Install HDPP piping according to ASTM D2321 (and manufacturer's guidelines where more stringent).
- F. Bed and haunch pipe per details shown on the Drawings.

3.4 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 - 1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
 - 2. Join corrugated PE piping according to CPPA 100 and the following:
 - a. Joints for pipe shall be watertight.
 - 3. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
 - 4. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 - 5. Join HDPP piping in accordance with ASTM F1417 or ASTM F2487. Joints shall be watertight.

3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 6 inches deep. Set with tops flush with surrounding earth grade.

3.6 DRAINAGE STRUCTURE INSTALLATION

- A. Construct catch basins to sizes and shapes indicated by each size and type of pipe specified.
- B. Set frames and grates to elevations indicated, secure to structure with full bed of mortar.

3.7 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping from building and downspouts as indicated on Plumbing and Architectural Drawings.
 - 1. Use commercially manufactured wye fittings for piping branch connections.
 - 2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making branch connections. Remove debris or other extraneous material that may accumulate.

3.8 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 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. 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.
- B. Contractor shall clean and pump out pipes and provide qualified personnel as necessary for all inspections by Owner, Architect or Engineer.
- C. Provide complete As-Built Survey of the constructed storm drainage system to include location of all downspout piping, downspout pipe cleanouts, pipe sizes, pipe types, pipe inverts, structure tops, throats and inverts, and complete data on all above ground and underground detention systems for verification and certification of proper installation and performance.

3.9 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.
- B. Clean all structures of dirt and superfluous materials.

END OF SECTION 334116