

SECTION 33 40 00 STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies construction of outside, underground storm sewer systems. The storm sewer systems shall be complete and ready for operation, including all drainage structures, frames, grate and covers, connections to new buildings, structure service lines, existing storm sewer lines and existing drainage structures and all required incidentals.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 31 20 11, EARTH MOVING.
- C. Section 03 30 53, CAST-IN-PLACE CONCRETE.

1.3 QUALITY ASSURANCE

- A. Products Criteria:
 - 1. Multiple Units: 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.
- B. Manufacturers shall have manufacturing and quality control facilities capable of producing and assuring the quality of piping and structures specified.
- C. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to public storm sewer lines and the extension, and/or modifications to Public Utility systems.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submit the following documentation to the Owner for review prior to commencement of the work of this Section:
 - 1. Manufacturers' documentation (including product data sheets) for all specified products.
 - 2. Shop drawings showing fabrication and construction details for drainage structures.

- C. At project completion, submit record (as-built) drawings showing installed system as specified in this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. During loading, transporting and unloading, exercise care to prevent damage to all products furnished.
- B. Pipe shall be marked with manufacturer's identification symbol, size, date of manufacture, class of pipe, and applicable product Specification identification number.
- C. All materials shall be inspected upon delivery to the Site. Damaged or defective materials shall be rejected or repaired as determined by the Owner.

1.6 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. ASTM International (ASTM):
 - A48/A48M Standard Specification for Gray Iron Castings
 - A536..... Standard Specification for Ductile Iron Castings
 - A615/A615M..... Standard Specification for Deformed and Plain-Billet Steel Bars for Concrete Reinforcement
 - C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
 - C150 Standard Specification for Portland Cement
 - C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
 - C857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 - C923 Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals
 - C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

- D698 Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Standard Effort (12,400 ft-
lbf/ft³ (600 kN-m/m³))
- D2321..... Standard Practice for Underground Installation of
Thermoplastic Pipe for Sewers and Other Gravity-Flow
Applications
- D3034..... Standard Specification for Type PSM Poly(Vinyl Chloride)
(PVC) Sewer Pipe and Fittings
- D3212..... Standard Specification for Joints for Drain and Sewer
Plastic Pipes Using Flexible Elastomeric Seals
- F477 Standard Specification for Elastomeric Seals (Gaskets) for
Joining Plastic Pipe

NOTE: ASTM test methods shall be the current version as of the date of advertisement of
the project.

- C. Florida Department of Transportation (FDOT):
2013 Standard Specifications for Road & Bridge Construction

PART 2 - PRODUCTS

2.1 PIPING

- A. Gravity Lines (Pipe and Appurtenances):
1. Concrete:
 - a. Reinforced pipe, ASTM C76. Class III. Joints shall be watertight flexible joints made with rubber-type gaskets conforming to ASTM C443.
 2. Polyvinyl Chloride (PVC):
 - a. Pipe and Fittings, Type PSM PVC Pipe, shall conform to ASTM D3034, Type PSM, SDR 35. Pipe and fittings shall have elastomeric gasket joints providing a watertight seal when tested in accordance with ASTM D3212. Gaskets shall conform to ASTM F477. Solvent welded joints shall not be permitted.

2.2 JOINTING MATERIAL

- A. Concrete Pipe: Rubber gasket ASTM C443.
- B. Polyvinyl Chloride (PVC) Pipe:
1. PVC Plastic Pipe: Joints shall comply with ASTM D3212, Elastomeric Gaskets shall comply with ASTM F477 and as recommended by the manufacturer.

2.3 MANHOLES, INLETS AND CATCH BASINS

A. Manholes, inlets and catch basins shall be constructed of precast reinforced concrete rings, precast reinforced Sections, or cast-in-place concrete. Manholes, inlets and catch basins shall be in accordance with the details shown on the Drawings, and the following OWNER requirements:

1. Precast Reinforced Concrete Rings: Rings or Sections shall have an inside diameter as indicated on the drawings, and shall be not less than 1200 mm (48 inches) in diameter. Wall thickness shall conform to requirements of ASTM C76, except that lengths of the Sections may be shorter as conditions require. Tops shall conform to ASTM C478. Top Section shall be eccentric cone type. Steps on inside wall shall be in the same plane from bottom of structure to manhole cover.
2. Precast Reinforced Concrete Manhole Risers and Tops: Design, material and installation shall conform to requirements of ASTM C478. Top Sections shall be eccentric unless otherwise indicated on the Drawings. Steps on inside wall shall be in the same plane from bottom of structure to manhole cover.
3. Flat top manhole tops shall be reinforced concrete as detailed on the Drawings.
4. Precast 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 loading with 30 percent impact, and conform to ASTM C857.
5. Flexible sealing compound shall be packaged in extruded preformed shape, sized to completely fill the joint between precast Sections, and form permanently flexible watertight seal. The sealing compound shall be non-shrink and meet ASTM C990.
6. Frames and covers shall be gray cast iron conforming to ASTM A48. The frame and cover shall be rated for HS20 loading, and shall conform to the details shown on the Drawings. The bearing surface of the frame and cover shall be machine finished. The cover shall fit firmly on the frame without movement when subject to traffic.
7. Manhole steps, if required, shall be polypropylene plastic coated on a No. 4 deformed rebar conforming to ASTM C478. Steps shall be a minimum of 10 inches wide and project a minimum of 5 inches away from the wall. The top surface of the

step shall have a studded non-slip surface. Steps shall be placed at 12 inch centers.

- B. Frame and Cover for Gratings: Frame and cover for gratings shall be cast gray iron conforming to ASTM A48 or ductile iron conforming to ASTM A536. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the Drawings.

2.4 CONCRETE

- A. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. The cement shall be Type III conforming to ASTM C150. Concrete shall conform to the provisions of Section 03 30 53, CAST-IN-PLACE CONCRETE.

2.5 REINFORCING STEEL

- A. Reinforcing steel shall be deformed bars, ASTM A615, Grade 60 unless otherwise noted.

2.6 WARNING TAPE

- A. Standard, 4-Mil polyethylene 3 inch wide tape non-detectable type, purple with black letters, and imprinted with "CAUTION BURIED STORM SEWER BELOW".

PART 3 - EXECUTION

3.1 EXCAVATION FOR STORM DRAINS AND DRAINAGE STRUCTURES

- A. Excavation of trenches and for appurtenances and backfilling for storm drains shall be in accordance with the applicable portions of Section 31 20 00, EARTH MOVING.

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. 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.

3.3 GENERAL PIPING INSTALLATION

- A. Lay pipes true to line and grade. Gravity flow sewer shall be laid with bells facing upgrade.
- B. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.
- C. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.
- D. 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.
- E. 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.
- 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 lay sewer pipe in same trench with another pipe or other utility.
- H. 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.
- I. Install gravity sewer line in accordance with the provisions of these Specifications and the following standards:
 - 1. Reinforced Concrete Pipe: Comply with manufacturer's recommendations with gasketed joints.
 - 2. Polyvinyl Chloride (PVC) Piping: ASTM D2321.
- J. Warning tape shall be continuously placed 12 inches above storm sewer piping.

3.4 DRAINAGE STRUCTURES

- A. General:
 - 1. Circular Structures:
 - a. 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.

- b. Precast reinforced concrete manhole risers and tops. Install as specified for precast reinforced concrete rings.

B. Rectangular Structures:

- 1. Concrete work for cast-in-place reinforced concrete structures shall be constructed in accordance with Section 03 30 53, CAST-IN-PLACE CONCRETE, and as specified in Section 609 of the AHTD Standard Specifications.
- 2. Precast concrete base Section of structures shall be set on an 8-inch thick aggregate base course compacted to a minimum of 95 percent of the maximum density as determined by ASTM D698. Set precast concrete Section(s) on base Section (as applicable) true and plumb. Seal all joints with preform flexible gasket material.

- C. Do not construct cast-in-place concrete structures when air temperature is 32 degrees F or below.

- D. Invert channels shall be smooth and semicircular in shape conforming to inside of adjacent sewer Section. Make changes in direction of flow with a smooth curve of as large a radius as size of structure will permit. Make changes in size and grade of channels gradually and evenly. Construct invert channels by one of the listed methods:

- 1. Forming directly in concrete base of structure.
- 2. Building up with brick and mortar.

- E. Floor of structure outside the invert channels shall be smooth and slope toward channels not less than 1:12 (1 inch per foot) nor more than 1:6 (2 inches per foot). Bottom slab and benches shall be concrete.

- F. The wall that supports access steps shall be 90 degrees vertical from the floor of structure to manhole cover. Install steps per the manufacturer's recommendations. Steps shall not move or flex when used. All loose steps shall be replaced by the Contractor.

- G. Install each drop inlet and catch basin frame and grate on a mortar bed, and flush with the finish pavement. Frames and covers shall not move when subject to vehicular traffic. Install a concrete collar around the frame to protect the frame from moving until the adjacent pavement is placed. In unpaved areas, the rim elevation shall at finish grade.

Install an 8-inch thick by 12-inch diameter concrete collar around the perimeter of the frame. Slope the top of the collar away from the frame.

3.5 INSPECTION OF SEWERS

- A. Inspect and obtain the Owner's approval. Thoroughly flush out before inspection. Lamp between structures and show full bore indicating sewer is true to line and grade. Lip at joints on inside of sewer is prohibited.

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