SECTION 02700 - STORM SEWER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site storm sewer drainage piping, structures, fittings, accessories, and pipe bedding.

B. Catch basins, manholes at junctions, inlets, drainage structures, precast or poured in place reinforced concrete structures, and appurtenances as shown on the plans.

1.02 RELATED DOCUMENTS/SECTIONS

A. Contract documents and drawings, construction details as shown on the plans, geotechnical engineering report, GA. D.O.T. Standards and Specifications, and Referenced Standards are included herein by reference, latest revision shall apply. Refer to appropriate related sections as applicable.

1.03 REFERENCED STANDARDS

A. AASHTO M36 - Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.

B. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-in. (457 mm) Drop.

C. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

D. ANSI/ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.

E. ANSI/ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

F. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

G. ANSI/ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

H. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

I. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

J. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

K. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb(4.54 Kg) Rammer and 18 inch (457 mm) Drop.

L. ANSI/ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

M. ANSI/ASTM D2729 - Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

N. ANSI/ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

O. ANSI/ASTM D3033 - Type PSP Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

P ANSI/ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

Q. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

R. ASTM D2922 - Test Methods for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).

S. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

T. ASTM C 923 – Standard Specifications for Resilient Connectors between Reinforced Concrete Manholes Structures and Pipes.

U. ASTM C478 – Specification for Precast Reinforced Concrete Manhole Sections

V. ASTM C 1107 – Specification for Non-Shrink Grout

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations. All bedding and trenching shall conform to the details shown on the construction plans. Any wet, spongy, or other unsuitable material shall be removed and/or stabilized at the

direction of the soils engineer.

1.05 SUBMITTALS

A. Provide data indicating pipe, pipe accessories, and manufacturer's warranties.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed specifications and/or referenced standards.

D. Pre-manufactured catch basins, trench drains or other special drainage equipment: Submit to Engineer manufacturer’s shop drawings, specifications, and warranties for approval prior to purchase or installation.

E. Brick structures, boxes, or manholes will not be allowed.

1.06 PROJECT RECORD DOCUMENTS

A. Submit complete, detailed as built drawings to Owner, Developer, and Architect upon completion of the work showing vertical and horizontal location. As built drawings shall be based on field run survey(s) and be sealed and signed by a registered surveyor in the State where the project is located. Provide three sets of original hard copies and one digital file in AutoCad or other acceptable digital format. Contractor is responsible for approval and verification of acceptable digital format. **As-built drawings will be required at a minimum 45 days prior to substantial completion.**

B. Accurately record actual locations of pipe runs, taps, connections, valves, tees, mechanical joints, connections, pipes, manholes, structures, sub-surface drain fields, septic tanks, lift stations, service taps or stubouts, type and size of material, and top and invert elevations of all structures.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities or other structures. All such uncharted utilities or structures shall be shown on as built drawings.

1.07 REGULATORY REQUIREMENTS

A. Conform to all applicable Federal, State, County, City, or local

jurisdiction requirements concerning storm sewer construction and safety.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated by the manufacturer prior to construction.

1.09 COORDINATION

A. Coordinate the Work with plumbing contractor for connection of storm sewer to foundation drainage system and roof drainage system outside building.

PART 2 - PRODUCTS

2.01 STORM SEWER STRUCTURES AND PIPE MATERIALS

A. All storm sewer structures, manholes, junctions, piping, joints, sealing, materials and installation shall conform, at a minimum, to the local authorities having jurisdiction standards and specifications. In the absence of local authority standards and specifications, all materials and construction shall conform, at a minimum, to the current Georgia Department of Transportation (GDOT) latest standards and specifications, and as specified herein, whichever is greater. The Contractor is responsible for verification of current applicable standards and specifications prior to construction.

B. All storm sewer pipe gauge shall conform to GADOT 1030D, current revision, and pipe manufacturer's specifications, whichever is greater. All storm sewer pipe, materials, joints, and installation is subject to the approval of the local authority having jurisdiction approval. Contractor shall verify local authority specifications and requirements prior to purchase.

C. REINFORCED CONCRETE PIPE

1. Comply with ANSI/ASTM C76, AASHTO M-170, Class III minimum, with Wall Type A, mesh reinforcement; bell and spigot end joints.
2. GADOT 1030D, latest edition, shall determine class of concrete pipe for design conditions. Contractor shall verify class of concrete pipe with supplier/manufacturer prior to purchase.
3. Concrete pipe sections may be joined with rubber type gasket joints, o-ring gasket joints, or preformed plastic gasket joints, installed per manufacturer's specifications. All joints shall provide

a permanent and secure watertight seal.
Reference ANSI/ASTM C443, rubber compression gasket joint.

D. CORRUGATED STEEL PIPE:

1. Minimum thickness is 12 gauge. All corrugated steel pipe shall be fully bituminous coated inside and out. Reference AASHTO M36 Type I, helical lock seam, coated inside and out with 0.050 inch (1.3 mm) minimum thick bituminous coating. All pipe carrying live streams or used for storm water detention shall have a fully paved invert.
2. Joints for corrugated steel pipe shall be made with bands of the same base metal, gauge, and coating or finish as the pipe. Bands shall be hugger type designed to fully engage at least one annular corrugation at the end of each corrugated pipe around its entire circumference. Minimum band width shall equal the centerline length of four (4) annular corrugations, connected with two neoprene "O" ring gaskets and two stainless steel bolts. Bands shall conform to current ASTM/AASHTO industry standards as to materials, securing bolts number, type, and placement, and installation. All joints shall provide a permanent and secure watertight seal. Install per manufacturer's specifications.

E. ALUMINUM COATED TYPE 2 CORRUGATED STEEL PIPE:

1. Conform to GADOT current specifications. Meet all requirements of AASHTO M36. Steel sheet used in fabrication shall conform to AASHTO M274, comply fully with AASHTO M274.
2. Minimum pipe thickness is 12 gauge. Comply with GADOT 1030D as minimum and manufacturer's specifications for design conditions, whichever is greater.
3. Pipe bedding graded aggregate shall not exceed 1 inch diameter. Extend pipe bedding to one-half pipe diameter each side. Minimum bedding depth below pipe is per pipe bedding detail or manufacturer's specifications, whichever is greater.
4. Comply at a minimum with manufacturer's specifications for bedding, installation, and pipe joints. All joints shall be permanent, secure and watertight, and meet H20 load rating. Provide submittal for pipe, joint type, installation, and manufacturer's specifications for approval by Engineer prior to purchase.
5. All pipe carrying live streams or used for storm water detention shall have a fully paved invert per AASHTO M-190.
6. Maintain minimum H20 load rating for all pipe installations.
7. Contractor shall verify prior to purchase that soil conditions meet manufacturer's specifications for Ph and resistivity.

F. HDPE PIPE SPECIFICATIONS:

1. Fine granular backfill to top of pipe required, maximum aggregate size 1 inch diameter. Comply with manufacturer's specifications for aggregate size and gradation, backfill, compaction, and installation. Minimum bedding depth below pipe is per pipe bedding detail or manufacturer's specifications, whichever is greater. Installation shall be in accordance with ASTM recommended practice D-2321, AASHTO Section 30, and GADOT standard specifications.
2. Comply with AASHTO M-294 AND AASHOT MP7, Type S & D. Provide submittal for pipe, joint type, installation, graded aggregate backfill, and manufacturer's specifications for approval by Engineer prior to purchase.
3. Watertight bell and spigot gasketed joints required. Gaskets shall conform to ASTM F-477.
4. 36 inch diameter or greater pipe shall be inspected and certified by a geotechnical engineer or manufacturer's representative.
5. Smooth bore dual walled pipe is minimum requirement.
6. Depths greater than ten (10) feet to invert of pipe not allowed without manufacturer's certification and documentation for pipe strength and integrity.
7. Provide submittal for approval by Engineer for pipe, joints, bedding, and installation prior to purchase.
8. Maintain minimum H20 load rating capability for installed pipe.
9. Contractor shall verify prior to purchase that soil conditions meet manufacturer's specifications for Ph and resistivity.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that trenches, excavations, dimensions, bedding, fill materials, and elevations conform to the plans and specifications and are ready to receive the work.

B. Contractor shall verify all existing storm sewer pipe, structures, and other utilities location, depth, invert, material, size, and condition **PRIOR TO CONSTRUCTION.** Contractor shall verify connection locations and inverts to existing storm sewer pipe or structures **PRIOR TO CONSTRUCTION.** Resolve any conflicts or problems prior to proceeding with the work.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with fine aggregate or as directed by the contracting officer. Verify all fill

material as suitable with the soils engineer prior to placement and compaction.

B. Remove large stones, debris, rock, roots, organic material, or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 02200 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated. Cut trenches sufficiently wide to enable installation and inspection. The minimum bedding for all pipes is Class B unless specified otherwise.

B. Place bedding material at trench bottom, level materials in continuous layers not exceeding 6 inches compacted depth. Minimum compaction for pipe trenches is 95% of standard proctor or greater as directed by the soils engineer.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - STORM SEWER

A. Install pipe, fittings, joints, and accessories in accordance with manufacturer's instructions. All pipe joints shall be permanent, secure and watertight.

B. Lay pipe to slope gradients noted on drawings, with maximum allowable variation from true slope of 1/8 inch in 10 feet, non cumulative.

C. Install pipe bedding aggregate at bottom, sides and over top of pipe where required and as shown on the drawings. Provide top cover to minimum compacted thickness of 12 inches, compact to minimum 95% standard proctor.

D. Refer to Section 02200 for trenching requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 02200 for field testing requirements for fill materials.

3.05 INSTALLATION – MANHOLES, JUNCTIONS, STRUCTURES

A. All manholes, junctions, or structures shall be precast reinforced concrete. Brick structures will not be allowed. Set all manholes plumb. Install per manufacturer's specifications.

B. All grout shall be nonmetallic, non-shrink cementitious type flowable expansive grout with minimum 28 day compressive strength of 6500 psi, conforming to ASTM C 1107, verify Type for field conditions prior to construction. Voids or gaps which exceed the maximum allowed for grout by the manufacturer specifications will require a structural repair or replacement as directed by the Engineer. Comply fully with grout manufacturer's specifications.

C. Manhole, junction, or structure riser sections shall be watertight and sealed per manufacturer's specifications and reference standards using preformed resilient gaskets. Joints between manholes or structures and base sections shall be grouted on the inside to provide a smooth surface. Manhole sections shall grouted to ring and covers on the inside.

D. All pipe or other penetrations into manholes, structures, or junctions shall be permanently sealed watertight. Fill all spaces between pipe or other connections and manholes, junctions, or structures completely with non-shrink cementitious concrete grout placed on inside and outside of manhole or structure, completely filling all voids. The exterior wall of the manhole or structure shall have a minimum 6 inch thick 2500 psi concrete collar poured tightly around the entire pipe perimeter and tight to the exterior wall, minimum extension past the pipe shall be 12 inches. Grout shall have minimum 28 day compressive strength of 6500 psi, installed in strict compliance with manufacturer's specifications.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 02200.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest, until the work meets specified requirements.

C. Frequency of Tests: As directed by the soils engineer (GE).

3.07 PROTECTION

A. Protect finished Work from damage during construction. Damaged work shall be replaced at the expense of the contractor.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 02700