DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

SPECIAL PROVISION

Section 550—Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe

Replace Section 550 with the following:

550.1 General Description

This work includes furnishing and installing the following:

- Storm drain pipe
- Side drain pipe
- Pipe-arch culverts
- Elliptical pipe
- Flared end sections
- Safety end sections
- Tapered pipe inlets

Install structures according to the Specifications and the details shown on the Plans, or as directed by the Engineer.

550.1.01 Definitions

Side Drain – All driveway pipes (commercial, non-commercial, residential, utility, farm, logging, and mining).

Storm Drain Pipe –All pipe used in the highway drainage system that receives surface water through inlets and conveys the water through conduits to a pipe outlet

Thermoplastic Pipe – High Density Polyethylene (HDPE), Polypropylene (PP) and Polyvinyl Chloride (PVC).

General Provisions 101 through 150.

550.1.02 Related References

A. Standard Specifications

Section 205—Roadway Excavation

Section 207—Excavation and Backfill for Minor Structures

Section 208—Embankments

Section 645—Repair of Galvanized Coatings

Section 812—Backfill Materials

Section 815—Graded Aggregate

Section 834—Masonry Materials

Section 840—Corrugated Aluminum Alloy Pipe

Section 841—Iron Pipe

Section 843—Concrete Pipe

Section 844—Steel Pipe

Section 845—Thermoplastic Pipe

Section 847—Miscellaneous Pipe

Section 848—Pipe Appurtenances

B. Referenced Documents

General Provisions 101 through 150.

GDOT Manual on Drainage Design for Highways

Ga. Std. 1030D

Ga. Std. 1030P

GDT 136

ASTM C 1479

ASTM D 2321

550.1.03 Submittals

General Provisions 101 through 150.

550.2 Materials

Ensure materials meet the requirements of the following Specifications:

Material	Section
Backfill Materials	207
Graded Aggregate	815
Reinforced Concrete Pipe	843.2.01
Nonreinforced Concrete Pipe	843.2.02
Mortar And Grout	834.2.03
Bituminous Plastic Cement	848.2.05
Rubber Type Gasket Joints (Concrete Pipe)	848.2.01
Preformed Plastic Gaskets	848.2.06
Corrugated Steel Pipe	844.2.01
Bituminous Coated Corrugated Steel Pipe	844.2.02
Corrugated Aluminum Alloy Pipe	840.2.01
Bituminous Coated Corrugated Aluminum Pipe	840.2.03
Aluminized Type 2 Corrugated Steel Pipe	844.2.06
Ductile Iron Pipe, Fittings and Joints	841
Precoated, Galvanized Steel Culvert Pipe	844.2.05
Smooth Lined Corrugated High Density (HDPE) Polyethylene Culvert Pipe	845.2.01
Polyvinyl Chloride (PVC) Profile Wall Drain Pipe	845.2.02
Polyvinyl Chloride (PVC) Corrugated Smooth Interior Drain Pipe	845.2.03
Smooth Lined Corrugated Polypropylene (PP) Pipe	845.2.05
Miscellaneous Pipe	847

Use any of the following types of pipe:

Rigid Pipe Types

- Reinforced concrete
- Nonreinforced concrete
- Ductile Iron

Flexible Pipe Types

- Corrugated steel or Aluminum
- Smooth-lined corrugated high density polyethylene (HDPE)
- Polyvinyl Chloride (PVC) Profile Wall Drain Pipe
- Polyvinyl Chloride (PVC) Corrugated Smooth Interior Drain Pipe
- Precoated, Galvanized Steel Culvert Pipe (Polymer)
- Smooth Lined Corrugated Polypropylene (PP) Pipe

Use the type of pipe designated on the Plans, or acceptable alternate types when applicable. For a listing of acceptable alternate pipe types see the GDOT Approved Material Selections List in Chapter **7**– Storm Drain Design of the Department's Manual on Drainage Design for Highways. This document summarizes general applications for pipe.

For concrete, corrugated steel and aluminum pipes see Ga. Std. 1030D for minimum thicknesses, minimum cover, maximum fill, allowable pipe diameters and trench construction detail.

For thermoplastic pipes see Ga. Std. 1030P for minimum cover, maximum fill, allowable pipe diameters and trench construction details.

A. Thermoplastic Pipe Project Restrictions

Thermoplastic pipe is restricted to the following project conditions:

1. Storm Drain
   a. Travel Bearing: ADT less than 15,000
   b. Non-Travel Bearing: Non-Interstate
2. Side Drain
   a. Allowed on all projects

550.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

550.3 Construction Requirements

550.3.01 Personnel

General Provisions 101 through 150.

550.3.02 Equipment

General Provisions 101 through 150.

550.3.03 Preparation and Backfill

Before installing pipe, shape the foundation material as shown on the Plans.

Prepare structure excavations, foundation and backfill according to Section 207. Except, use the following foundation and backfill material requirements for thermoplastic pipe installations:

1. For storm drain applications (cross and longitudinal) use graded aggregate material meeting Section 815.
   a. 20 ft (6.1 m) maximum fill height for High Density (HDPE) Polyethylene Culvert Pipe.
   b. 25 ft (7.6 m) maximum fill height for Polyvinyl Chloride (PVC) and Polypropylene (PP) Pipe.

2. For side drain applications (driveway) use backfill material based on fill height.
    a. Fill heights up to 10 ft (3 m), use normal backfill material meeting the following soil classes per Subsection 810.2.01.
        - High Density (HDPE) Polyethylene Culvert Pipe use Class II B2 soil or better.
        - Polyvinyl Chloride (PVC) and Polypropylene (PP) Pipe use Class II B3 soil or better.
        - If the required soil Class is not available use graded aggregate material meeting Section 815.
    b. Fill heights above 10 ft (3 m), use graded aggregate material meeting Section 815.

550.3.04 Fabrication

General Provisions 101 through 150.

550.3.05 Construction

A. Drainage

Provide necessary temporary drainage. Periodically remove any debris or silt constricting the pipe flow to maintain drainage throughout the life of the Contract.

B. Damage

Protect the structure by providing sufficient depth and width of compacted backfill before allowing construction over a culvert. Repair damage or displacement from traffic or erosion occurring after installing and backfilling at no additional cost to the Department.

C. Installation

Check vertical and horizontal alignment of the pipe culvert or pipe barrel by sighting along the crown, invert and sides of the pipe, and by checking for sagging, faulting and invert heaving. Repair any issues involving incorrect horizontal and/or vertical alignment before backfilling pipe.

1. Concrete Pipe

   Install Concrete Pipe according to ASTM C 1479 and as per plans. Lay sections in a prepared trench with the socket ends pointing upstream. Join section using rubber gasket installed according to Subsection 848.2.01 and the manufacturer's recommendations.
2. Ductile Iron Pipe

   Lay pipe sections in a prepared trench, with bells pointing upstream. Construct joints according to Subsection 841.2.02.A.
3. Corrugated Metal

   Lay pipe sections in a prepared trench, with outside laps of circumferential joints pointing upstream and longitudinal joints at the sides. Join the sections with coupling bands, fastened by two or more bolts. Before backfilling the structure:
    a. Repair areas of damaged coatings and exposed base metal according to applicable AASHTO Standard Specification specified in Section 844.
4. Thermoplastic Pipe

   Install smooth-lined corrugated HDPE, PVC, and smooth-lined polypropylene pipe according to ASTM D 2321 and as per plans using backfill requirements in Subsection 550.3.03. Use fitting and couplings that comply with the joint performance criteria of AASHTO Standard Specifications for Highway Bridges, Division II. Ensure all joints are "silt tight" as stated in the AASHTO bridge specifications.
5. Specials (Wyes, Tees, and Bends)

   Install wyes, tees, and bends as shown on the Plans or as directed.
6. Tapered Pipe Inlets

   Locate and install tapered pipe inlet end sections as shown on the Plans or as directed.

7. Elongation

   Elongate metal pipe as shown on the Plans. Order the elongation of the vertical axis of the pipe to be done in the shop.

   Ensure the manufacturer ships metal pipe with wire ties in the pipe ends. Remove wire-ties immediately after completing the fill.

8. Flared End Sections

   Use flared end sections on the inlet, outlet, or on both ends of storm drain pipe, according to Plan details.

550.3.06 Quality Acceptance

The Engineer will visually inspect all pipe for alignment, deflection, cracking, joint separation, sagging, or other exterior damage. The Department may elect to conduct Quality Assurance verifications of any pipe inspections. These verifications will be performed by Department personnel.

The Department will require video inspection on projects that have more than 500 linear feet of storm drain pipe and on routes with an AADT greater than 3,000 vehicles. Conduct video inspection in accordance with the requirements of this Specification and GDT 136 on 20% of all storm drain pipe and 10% of all side drain pipe installations. The Engineer will randomly select installations to be tested.

Unless the Engineer directs otherwise, schedule the video inspections for the selected locations no sooner than 30 days after completing pipe installations to be tested.

A. Post Installation Inspection

Before post installation inspection, dewater installed pipe (if necessary) and provide the Engineer with a post installation inspection schedule. Notify the Engineer at least seven days in advance of beginning inspection. Perform post installation inspections once compacted backfill has reached a depth of 8 feet or after completion of the pipe installation and final cover, which includes the embankment and all non-asphalt bases and/or subgrades. Notify the Engineer if distresses or locations of improper installation are discovered. When camera testing shows distresses or improper installation in the installed pipe, the Engineer may require additional sections to be tested or may require corrective action.

Video and laser profiling and measurement technology must be certified by the company performing the work to meet the requirements of GDT 136. Inspection contractor personnel completing remote inspections shall be NASSCO – PACP Certified Technicians. Testing performed by a company failing to meet these requirements will result in non-payment of the pipeline video inspection and non-certification of the pipe tested.

For video recorded, laser profiled pipe indicating deflection is in excess of Specification requirements, the Contractor may elect to further test the pipe with the use of a mandrel. Ensure mandrel meets requirements of GDT 136 and the Engineer has approved before use.

Mandrel or manual post installation inspection allowed for pipe diameters greater than 48 inches.

B. Requirements for Rigid Pipe – Concrete

1. Joints**:** Note differential movement, cracks, spalling, improper gasket placement, movement or settlement of pipe sections, and leakage in the inspection report. Repair or replace pipe sections to the satisfaction of the Engineer where joint separation is greater than 1 inch (25 mm). Repair or replace pipe sections where soil migration through the joint is occurring.
2. Longitudinal and Transverse Cracks: Cracks with a width less than 0.01 inch (0.25 mm) are considered hairline and minor and only need to be noted in the inspection report, no corrective action is necessary. When cracks exceed the cracking and installation thresholds indicated in the Rigid Pipe Remediation Table in Section 550.5.01.B, regardless of position in the wall of the pipe, measure the width, length, and locations of the cracks and diameter of the pipe, both horizontally and vertically, use remediation methods in accordance with recommendations of the pipe manufacturer and submit to the Engineer for review and approval an evaluation utilizing a Professional Engineer registered in the State of Georgia that takes into consideration structural integrity, environmental conditions, and the design service life of the pipe. Based on the evaluation, the Department may allow the pipe to remain in place if the cracking is remediated according to an approved remediation plan submitted in writing to the Engineer. Provide 10

business days for the Department to review the evaluation. When the pipe shows cracking 0.01 inch (0.25 mm) or greater and extending for a length of 12 inches (300mm), remediate or replace as directed by the Engineer. When the camera/video cracking results are called into question, the Department may require manual inspection measurements.

C. Requirements for Flexible Pipe – Thermoplastic, Corrugated Metal

1. Joints: Remediate pipe showing evidence of crushing at the joints. Note differential movement, improper joint sealing, movement or settlement of pipe sections, and leakage in the inspection report. Remediate joint separation of greater than 1 inch (25 mm) per manufacturer's recommendation. Repair or replace pipe sections where soil migration through the joint is occurring.
2. Cracks: Remediate cracks or splits in the interior wall of the pipe. Use remediation methods in accordance with recommendations of the pipe manufacturer and accepted and authorized by the Engineer.
3. Buckling, bulging, and racking: Note in the inspection report flat spots or dents at the crown, sides or flowline of the pipe due to racking. Note areas of wall buckling and bulging in the inspection report. The Engineer will determine if corrective action is necessary.
4. Deflection: If flexible pipes exceed the deflection and installation thresholds indicated in the Flexible Pipe Deduction Table in Section 550.5.01.C, provide the Department with an evaluation of each location conducted by a Professional Engineer registered in the State of Georgia addressing the severity of the deflection, structural integrity, environmental conditions, and design service life. Based on the evaluation, the Department may allow the pipe to remain in place at a reduced unit price as shown in the Flexible Pipe Deduction Table. Provide 10 business days for the Department to review the evaluation. When the pipe shows deflection 10 percent or greater, remove and replace. When the laser deflection results are problematic, the Department may require mandrel or manual testing.
5. Coating on Corrugated Metal: Note areas of the pipe where the original coating has been scratched, scoured or peeled.

550.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

550.4 Measurement

A. Excavation and Backfill

Foundation backfill materials Types I, II and III are measured according to Subsection 207.4, "Measurement."

Normal backfill is not measured separately.

No measurement will be made for graded aggregate used for structural backfill of thermoplastic pipe.

B. Flat Bottom and Circular Pipe (All Types)

The overall length of pipe installed, excluding tapered inlets, is measured in linear feet (meters), along the central axis of the diameter of the pipe. Wyes, tees, and bends are included in this measurement.

C. Pipe-Arches

The overall length of pipe-arch installed is measured in linear feet (meters), along the bottom center line of the pipe.

D. Multiple Installations

In multiple installations, each single line of culvert structure is measured separately.

E. Tapered Pipe Inlets

Tapered pipe inlet sections are measured as a unit; do not include them in the overall length of the pipe.

F. Flared-End Sections

Flared-end sections are measured separately by the unit and not included in the overall pipe length.

G. Smooth-Flow Pipe

Smooth-flow pipe is measured by the linear foot (meter) along the pipe invert.

H. Elliptical Pipe

Elliptical pipe is measured in linear feet (meters) along the bottom center line of the pipe.

I. Video Inspection

Video Inspection is measured by the linear feet of quantity of pipe inspected. When inspection above the quantity specified in the Contract is performed due to the possibility of additional distresses or non-compliance noted by the Department and the pipe is found to be in compliance, the Department will measure this quantity as Extra Work as per Specification 104.04. However, if additional distresses are found, the additional linear feet of video inspection will not be measured for payment.

J. Deduction for Pipe Deflection

Quantity of deflected pipe will be determined using the pipe inspection summarization report in accordance with GDT 136. Deductions will be made for pipe sections that do not meet the requirements of this specification in accordance with the table in sub-section 550.5.01. The section length is determined by the length of the pipe between joints where the failure occurred.

550.4.01 Limits

Excavation and normal backfill are not measured for payment.

550.5 Payment

A. Backfill

Foundation backfill material Type II and III will be paid for according to Section 207.

Foundation backfill material Type I will be paid for according to Section 205 or Section 206.

Graded aggregate used for structural backfill of thermoplastic pipe will not be paid for separately, payment will be included in the overall price bid for pipe.

B. Pipe Installations

Pipe installations complete in place and accepted will be paid for at the Contract Price for each item.

This payment is full compensation for excavating, furnishing, and hauling materials; installing, cutting pipe where necessary; repairing or replacing damaged sections; making necessary connections; strutting, elongating, providing temporary drainage; joining an extension to an existing structure where required; and removing, disposing of, or using excavated material as directed by the Engineer.

1. Smooth Flow Pipe

   The quantity of each diameter and steel thickness of smooth flow pipe as measured will be paid for at the Contract Unit Price per linear foot (meter) bid for the various sizes. Payment is full compensation for furnishing labor, materials, tools, O-ring mechanical joints, equipment, and incidentals to complete this Item, including removing and disposing excavation material.

2. Flared-End Sections

   Flared-end sections, measured as specified above, will be paid for at the Contract Unit Price for each section of the specified size.

Payment will also include sawing, removing, and replacing existing pavement removed to install a new drainage structure.

Payment for this item is made as follows:

One hundred percent of the Contract Price bid per linear foot (meter) is paid when the pipe is installed per the specifications including the required material documentation. The Contract Price is paid before post installation inspection.

C. Video Inspection

Include the cost of Video Inspection in the bid submitted for this pay item. Video Inspection will be paid for up to the maximum number of linear feet included in the contract. Testing performed by a company failing to meet the requirements of GDT 136 will result in non-payment of the pipeline video inspection and non-certification of the pipe tested.

D. Temporary Drainage

Temporary Drainage items will be paid for at 75% of contract price for each item when installed. The final 25% will be paid when the temporary drainage item is removed or filled with flowable fill as specified in the plans.

Payment will be made under:

Item No. 550	Storm drain pipe___ in (mm), Class ___	Per linear foot (meter)
Item No. 550	Side drain pipe___ in (mm), H=___	Per linear foot (meter)
Item No. 550	Pipe arch (span) ____in (mm) x (rise) ___in(mm)	Per linear foot (meter)
Item No. 550	Tapered pipe inlet ___ in (mm),	Per each
Item No. 550	Flared-end section ___ in (mm),	Per each
Item No. 550	Elliptical pipe___ in (mm) wide x ___ in (mm) high	Per linear foot (meter)
Item No. 550	Video Inspection	Per linear foot (meter)
Item No. 550	Storm drain pipe___ in (mm), Class ___, Temporary	Per linear foot (meter)
Item No. 550	Side drain pipe ___ in (mm), Class ___, Temporary	Per linear foot (meter)
Item No. 550	Flared-end section ___ in (mm), Temporary	Per each

550.5.01 Adjustments

A. Excavation

Excavation will not be paid for separately, but the other provisions of Section 205 and Section 208 shall govern.

B. Rigid Pipe

RIGID PIPE REMEDIATION TABLE	
Crack Width (inches)	Payment
Greater than or equal to 0.01 (0.25mm) and extend 12 in (300 mm) but less than or equal to 0.1 in (2.5 mm)	Remediate - 100% of the Unit Bid Price (1)
Greater than 0.1 in (2.5 mm)	Remediate or Replace (1)

(1) Provide in writing a method for repairing the observed cracking. Do not begin work until the method has been approved.

C. Flexible Pipe

FLEXIBLE PIPE DEDUCTION TABLE	
Amount of Deflection (%)	Payment
0.0 to 5.0	100% of the Unit Bid Price

5.1 to 7.5	75% of the Unit Bid Price (1)
7.6 to 9.9	50% of the Unit Bid Price (1)
10 or greater	Remove and Replace

(1) Provide Structural Analysis for Flexible Pipe. Based on the structural analysis, the pipe may be allowed to remain in place at the reduced price.

Office of Materials and Testing