

## CHAPTER 9

### MISCELLANEOUS

#### 9.4 Culverts and Piped Drainage Systems

##### 9.4.1 Drainage Improvements Required

Storm water conveyance facilities, which may include but are not limited to culverts, storm drainage pipes, catch basins, drop inlets, junction boxes, headwalls, gutter, swales, channels, and ditches, shall be provided for the protection of public right-of-way and private properties adjoining project sites and/or public rights-of-way. Storm water conveyance facilities which are designed to carry runoff from more than one parcel, existing or proposed, shall meet the requirements of these regulations.

##### 9.4.2 Design Criteria – General

9.4.2.1 All storm water conveyance facility design calculations shall be certified by the authorized registered professional (refer to Subsection 9.3.1.1).

9.4.2.2 Methods to calculate storm water flows shall be in accordance with this manual. The USGS Method shall be used where applicable to check the magnitude of peak flows when other hydrologic methods recommended in the manual are used.

9.4.2.3 All portions of a storm water conveyance system which drain areas falling within the same size category above shall be analyzed using the same methodology.

9.4.2.4 Run-off coefficients used for the Rational Method and runoff Curve Numbers used for the SCS Method shall be consistent with those shown in City of Lawrenceville Storm Water Design Manual.

9.4.2.5 Smooth interior corrugated polyethylene (PE) pipe shall not be used or installed under the road surface of existing or proposed to be dedicated public streets except where authorized for use by the Georgia DOT.

##### 9.4.3 Design Criteria – Culverts

9.4.3.1 Culverts or pipe systems designed to convey water from one side of a public right-of-way to the other shall be designed to pass the fully developed peak flow associated with a 100-year storm with at least 1.5 feet of freeboard between the 100-year ponding elevation and the centerline of the road, without raising the 100-year flood elevation on

upstream properties, and in accordance with Floodplain Management Ordinance. Fully developed flows shall be based on the Land Use Plan adopted by the City.

- 9.4.3.2 The 100-year ponding limits at and upstream of the culvert shall be shown on the Development Plans and on the Final Plat (if applicable).
- 9.4.3.3 The minimum allowable culvert diameter shall be 18 inches.
- 9.4.3.4 Culvert design is to be in accordance with the methods contained in this manual and shall include a thorough analysis of both inlet and outlet control conditions.

#### 9.4.4 Piped Collection Systems

- 9.4.4.1 The preliminary design (initial pipe sizing and profiles design) of piped collection systems required under 8.3.1 herein shall be based upon conveyance of the peak flows associated with a fully developed 25-year storm with the hydraulic grade line (HGL) being one foot or more below the top of each structure, gutter line or proposed final ground surface elevation, whichever is lowest.
- 9.4.4.2 Once the preliminary design of a piped collection system has been prepared, it shall be analyzed for its behavior during conditions of 100-year flow, with the objective of this analysis being to ascertain the quantities of flow and flow paths followed by flows exceeding the capacity of the system, whether these pond at inlets or flow along the ground's surface.
- 9.4.4.3 Based on the analysis of 100-year conditions, the preliminary design shall be revised where necessary to produce a final design for which the likelihood of dwelling flooding, major property damage, or substantial public access and/or utility interruption shall be less than one chance in 100 years.
- 9.4.4.4 The minimum allowable pipe diameter shall be 15 inches.
- 9.4.4.5 Catch basins shall be spaced so that the spread in the street for a 10-year design flow shall not exceed eight (8) feet as measured from the face of the curb. Gutter spread calculations shall be submitted to the department for review and approval prior to the issuance of a Development Permit.

9.4.4.6 Complete flow, velocity, and hydraulic grade line computations, shall be provided for all portions of a piped collection system. Hydraulic grade lines shall be shown on the storm drainage profiles contained with the Development Plans for the 25-year storm.

#### 9.4.5 Energy Dissipation – Piped Systems and Culverts

9.4.5.1 Energy dissipation devices, such as splash pads, rip-rap, stilling basins, etc., shall be provided at the outlet of every culvert and piped collection system (please refer to the Standard Drawings.) Velocity protection shall be in accordance with this manual. Velocities for the fully developed 25-year flow shall not exceed the non-erosive velocity as shown in the design manual for the receiving conveyance.

9.4.5.2 Energy dissipation devices shall be located entirely within the project site, and shall not encroach upon any required buffer.

9.4.5.3 When uniform, graded stone rip-rap is used for energy dissipation, ultraviolet resistant filter fabric (200—pound test) shall be used between the stone layers.

#### 9.4.6 Minimum Pipe and Pipe Coating Requirements

9.4.6.1 Reinforced concrete pipe shall be in not less than 8 foot joint lengths. All joints shall be bell and spigot type, using an O-ring gasket conforming to ASTM C-443. Pipe shall be manufactured in accordance with AASHTO M-170 and/or ASTM C-76. Class of pipe and wall thickness shall be in accordance with 1030-D, Georgia D.O.T. specification, Table No. 1.

9.4.6.2 Aluminized steel coated pipe type 2 shall comply with AASHTO M-274 for the coating and AASHTO M-36 for the pipe fabrication. Aluminum alloy pipe shall comply with AASHTO M-196 for material and fabrication.

9.4.6.2.1 All corrugated aluminized or aluminum pipe not carrying a live stream located within a street right-of-way, drainage easement, or detention facility may be plain. All corrugated aluminized or aluminum pipe which will carry a live stream within a street right-of-way, drainage easement, or in a detention facility shall have paved inverts pursuant to AASHTO M-190, Type C, except that the pipe need not be fully coated.

9.4.6.2.2 See the Standard Drawings for the Minimum acceptable combinations of gages, diameters, and corrugation

configurations for corrugated aluminum pipe and pipe arches, and for corrugated aluminized steel pipe and pipe arches.

- 9.4.6.2.3 Each end of each pipe section, to be joined by a coupling band, shall have a minimum of two annular corrugations. Coupling bands shall be so constructed to lap on an equal portion of each of the pipe sections to be joined. The connecting bands shall have a minimum of two annular corrugations and fully engage, over the entire pipe periphery, one corrugation on each pipe. Bands shall be fabricated from the same material as the pipe. The minimum band gauges for aluminum pipe and aluminized pipe shall be as specified in AASHTO M-196, Section 19, and AASHTO M-36, Section 9, respectively.
- 9.4.6.2.4 Gaskets may be required as determined by the Department in the field, and shall be either sleeve type or O-ring type and shall meet the requirements for gaskets as specified in AASHTO M-36, Section 9.3.
- 9.4.6.3 Structural plate drainage structures shall conform to the following specifications:
  - 9.4.6.3.1 Corrugated steel structural plate pipe, pipe arches, and arches shall consist of galvanized plates, bolts and nuts of the size, shape and thickness as shown on the approved plans. These structures shall conform to the requirements of AASHTO M-167.
  - 9.4.6.3.2 Corrugated aluminum alloy structural plate pipe, pipe arches and arches shall consist of aluminum plates and galvanized bolts and nuts of the size, shape and thickness as shown on the approved plans. These structures shall conform to the requirements of AASHTO M-219.
- 9.4.6.4 Smooth Interior Corrugated Polyethylene Pipe
  - 9.4.6.4.1 This specification applies to high density polyethylene corrugated pipe with an integrally formed smooth interior. PE pipe manufacturers shall be approved by the Department of Transportation.
  - 9.4.6.4.2 This specification is applicable to nominal sizes 15” through 48” diameter. Requirements for test methods,

dimensions, and markings of pipe sizes 15” through 36” diameter are those found in AASHTO Designation M-294.

- 9.4.6.4.3 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 D-1248 with the applicable requirements defined in ASTM D-1248. Clean reworked material may be used.
- 9.4.6.4.4 The pipe and fittings shall be free of foreign inclusions and visible defects. For pipe sizes 15” diameter and greater, designed drainage perforations shall be permitted in corrugation valleys only. All holes of any kind in the corrugation crests or sidewalls shall be considered unacceptable. The ends of the pipe shall be cut and connected as recommended by the manufacturer.
- 9.4.6.4.5 The normal size for the 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 prior approval from the City of Lawrenceville.
- 9.4.6.4.6 Joints shall be made with split couplings, corrugated to engage the pipe corrugations, and shall engage a minimum of 4 corrugations, 2 on each side of the pipe joint. Where required by the City, a neoprene gasket shall be utilized with the coupling to provide a soil tight joint. Gaskets shall conform to ASTM F-477.
- 9.4.6.4.7 Installation shall be in accordance with ASTM Recommended Practice D-2321 or as specified by the City.
- 9.4.6.4.8 Certification from the manufacturer that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished to the City upon request.

#### 9.4.7 Pipe Length

- 9.4.7.1 Culverts carrying live streams shall extend to where the crown of the pipe intersects the roadway slope.
- 9.4.7.2 Pipes that do not carry live streams shall extend at least 50 feet beyond the front building setback lines, and may be required to extend farther where necessary to provide an adequately protected building site on

the property. In nonresidential subdivisions, these pipes may temporarily end at the right-of-way line, but shall be extended as part of a subsequent development permit approved for the individual site.

- 9.4.7.3 The length requirement, however, shall be subject to requirements for maintaining stream buffers in accordance with Georgia law or City regulations.

#### 9.4.8 Standard Specifications and pipe installations

- 9.4.8.1 Unless otherwise specifically set forth herein, all of the materials, methods of the construction, and workmanship for the work covered in reference to storm water conveyance facility construction shall conform to the most recent Standard Specifications of the Georgia Department of Transportation (Georgia DOT) or Gwinnett County standard drawings.
- 9.4.8.2 Allowable pipe material for all applications except as specified below are Aluminum Coated (Type 2) Corrugated Steel Pipe (ASP), Corrugated Aluminum Alloy Pipe, Smooth Lined Corrugated polyethylene Pipe (PE), or Reinforced Concrete Pipe (RCP). Usage is summarized in the table 9.4.81 below titled Pipe Material.
- 9.4.8.2 All roads constructed with public funds, either wholly or in part, or classified as major Thoroughfares, shall meet the Georgia DOT design standards.
- 9.4.8.3 Only Reinforced Concrete Pipe (RCP) shall be used for all dams unless the Georgia Safe dams Program requires another material.
- 9.4.8.4 Reinforced Concrete Pipe (RCP) shall be used under the roads.
- 9.4.8.5 The Department of Public Utilities may approve an alternative pipe material.

**Table 9.4.8.1**

**PIPE MATERIALS**

<b>PIPE MATERIAL</b>	CONCRETE	METAL	METAL	PLASTIC	PLASTIC
<b>TYPE OF INSTALLATION</b>					
		Aluminum Coated (Type 2)  Corrugated Steel AASHTO M-36 & AASHTO M-	Plain Uncoated Corrugated  Aluminum Alloy AASHTO-M-196	Corrugated Polyethylene AASHTO M-252	Smooth Lined Corrugated Polyethylene Type "S" and "D"  AASHTO M-294 & AASHTO MP7
Longitudinal Interstate and travel bearing	X				
Longitudinal Non-Interstate and Non travel bearing	X	X	X		X
Road Cross Drain Grade					
Road Side Drain	X	X	X		X
Permanent Slope Drain		X	X		
Perforated Underdrain		X	X	X	X
Dams	X				

#### 9.4.9 Headwalls, Junction Boxes, Catch Basins and any other structure

All headwalls, Junction Boxes, Catch Basins, and any other drainage structure shall meet Georgia D.O.T specifications. Headwalls are required for all culverts. All lids for the storm sewer structures shall be engraved as follows: Storm Sewer, City of Lawrenceville and a picture of a fish in the middle of the lid.

END OF SECTION 9.4