

CITY OF CUMMING DEPARTMENT OF UTILITIES

Stormwater System Technical Standards Manual

Adopted April 7, 2020



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LIST OF ABBREVIATIONS AND TERMS

ABC	Aggregate base course	HORIZ	Horizontal
ACB	Asphalt concrete base	ID	Inside diameter
ACI	American Concrete Institute	IE	Invert Elevation
ACPA	American Concrete Pipe	INV	Invert
	Association	IP, IPS	Iron Pipe Size
AISC	American Institute of Steel	JB	Junction Box
	<u>Construction</u>	MH	Manhole
ANSI	American National Standards	MH F/C	Manhole frame and cover
	Institute	MSL	Mean Sea Level
APWA	American Public Works Association	MS4	Municipal Separate Storm Sewer
ASCE	American Society of Civil		System
	Engineers	NIST	National Institute of Standards and
ASTM	American Society for Testing		<u>Technology</u>
	Materials	NSC	National Safety Council
BM	Bench Mark	OC	On Center
BOC	Back of Curb	OD	Outside diameter
СВ	Catch Basin	OSHA	Occupational Safety & Health
C/C	Center to Center		Administration
FOC	Face of Curb	PL	Property line
CFS	Cubic Feet per second	PP	Power pole
CIP	Cast Iron pipe	PSI	Pounds per square inch
CIPP	Cured in Place Pipe	PSF	Pounds per square foot
CL	Centerline	PVC	Polyvinyl Chloride
CCMP	Coated Corrugated Metal Pipe	PVMT	Pavement
CMP	Corrugated Metal Pipe	Q	Rate of flow
CO	Clean out	R	Radius
COL	Column	RCP	Reinforced concrete pipe
CONC	Concrete	RDWY	Roadway
CONSTR	Construction	REINF	Reinforced / Reinforcing
DI	Drop Inlet	RET	Retaining Wall
DWCB	Double Wing Catch Basin	R/W	Right-of-way (City, County, State
EG	Existing Grade		Roadways)
ELEV	Elevation	SD	Storm Drain
EX	Existing	SECT	Section
EPD	Environmental Protection Division	SJ	Slip Joint
FG	Finished Grade	SWCB	Single Wing Catch Basin
FPS	Feet per second	TRANS	Transition
GA	Gauge	UL	Underwriters' Laboratories LLC
GDOT	<u>Georgia Department of</u>	UPC	Utility Protection Center, (Ga. 811)
	<u>Transportation</u>	V	Velocity of flow
GALV	Galvanized	VERT	Vertical
GPM	Gallons per minute	,	
GSMM	Georgia Stormwater Management		
	Manual		



"Authority" shall mean the City of Cumming Utilities.

"Contractor" shall mean the individual, firm or corporation undertaking the execution of the Work under the terms of the contract and acting through its agents and employees.

"Standards" and/or "Specifications" shall refer to the <u>Stormwater System Technical</u> <u>Standards Manual</u> and includes the stormwater standard construction details for Cumming Utilities.

"Work" of the contractor shall include all labor, material, equipment, skills, transportation, tools, machinery, and other equipment and things useful and necessary to complete the contract.

"Owner" shall mean the project owner and/or developer and/or property owner as an individual or a collective.

"Municipal Separate Storm Sewer System" or MS4 means a conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels or storm drains, owned or operated by a municipality or other public body, designed or used for collecting or conveying storm water runoff and is not a combined sewer or part of a Publicly Owned Treatment Works.



SECTION 100 GENERAL

101 PURPOSE OF THIS DOCUMENT

- 1. This City of Cumming Stormwater System Technical Standards Manual provides standard design direction and construction standards for improvements within the City of Cumming City Limits. The technical specifications herein govern all stormwater infrastructure that is connected in any manner to the City's MS4 system, whether publicly or privately maintained. This includes certain private works, as well as improvements installed within existing City right-of-way and easements. The City shall interpret and apply these Standards in a manner which achieves their intent and is not limited strictly to new construction.
- 2. These Standards shall apply to, regulate, and guide preparation and design of construction plans for utilities and drainage, site access, and related public improvements. These Standards also set guidelines for any private infrastructure that connects to the City's MS4 system with connection to the City's storm sewer system which involve drainage, grading, greenspace, and related improvements. The goal of these standards is to protect and promote the health, safety, and general welfare of the public as well as conserving and protecting the natural, economic, and scenic resources of the community.

102 USE OF THIS DOCUMENT

- 1. This document shall be used jointly with the City's Comprehensive plans, including Cumming's Water, Sewer and Stormwater Master Plans which provide utility services to the community such as water supply, sewer conveyance, stormwater management and flood control. Minimum requirements for stormwater system work unless otherwise specified herein, shall conform with provisions of the Georgia Stormwater Management Manual and the Georgia Erosion and Sediment Control Manual. This document and the related standard details are downloadable in electronic format at <u>www.cummingutilities.com</u> for developers, contractors, and engineers in preparing plans, documents, and construction of public improvements within the City limits.
- 2. This Manual is updated regularly to reflect current minimum and uniform requirements from the City of Cumming adopted Codes and Ordinances. They shall be applied jointly with the latest issue of federal and state regulations. When the provisions of any other statue, ordinance, or regulation are more restrictive than the provisions of this Manual, the provisions of the more restrictive regulation shall apply.
- 3. The City of Cumming reserves the right to revise/update this Stormwater System Technical Standards Manual without notice, as well as revise/update specific construction specifications to achieve their intent and compliance with the City's master plans and/or a more stringent or restrictive requirement by another agency having jurisdiction.



103 TRAFFIC CONTROL AND SAFETY

- 1. It is the responsibility of the General Contractor, any subcontractor, their employees, and inspectors of job sites to observe all safety regulations. Deficiencies in safety measures noted should be immediately reported to the Contractor's superintendent.
- 2. Traffic control within the state of Georgia right-of-way shall comply with Section 107.09 of the State of Georgia D.O.T. Standard Construction Specifications, or Sections 104.05 and 107.07 of the U.S. Manual on Uniform Traffic Control Devices for Streets and Highways, latest editions. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. The City's authorized representative shall have the right to limit the extent of open trench or land area cleared at any one time.



SECTION 200 DESIGN CRITERIA

201 GENERAL

- 1. This section provides guidance for the criteria and design methods that will govern the location, alignment, type, slope and size of storm water conduits. This includes the hydraulic aspects of storm drains and their appurtenances as part of a complete storm drainage network for managing stormwater runoff. Additionally, impacts for flood control should be considered for any developments adjacent to or within a future floodplain area.
- 2. The minimum hydraulic design storm shall be the 25-year return frequency storm for stormwater management of any development. Included in the design shall be evaluation of the overall storm drainage system for the 100-year return frequency storm.
- 3. Any new development or redevelopment shall not increase discharge rates to basin downstream. The Director of Utilities or his assigns will make the determination as to whether a new development will or will not increase discharge rate.

202 STORM DRAIN LOCATION

- 1. Storm water pipelines shall be installed withing the right-of-way and behind the back of curb.
- 2. Drainage lines, ditches and drainage ways located outside of the public right-of way require developers obtain, at their own expense, any drainage easements, for storm utilities installed along roadways. Easements shall be conveyed to the City on City approved easement document.
- 3. Storm drainage infrastructure located within the Georgia DOT right-of-way requires a utility permit through the Georgia Utilities Permitting System (GUPS) prior to installation of any stormwater infrastructure.
- 4. Storm drainage work located within the County right-of-way requires an approved Utility Permit from the Forsyth County Department of Engineering. The contractor shall be responsible for obtaining such permit.



203 MINIMUM DESIGN CRITERIA

- 1. Minimum design criteria required for public storm drain systems are as follows:
 - A. It is prohibited to discharge stormwater from a larger pipe size into a smaller pipe size, even if the capacity of the smaller pipe is greater due to a steeper slope.
 - B. All storm drainage designs, at a minimum, shall meet the Georgia Stormwater Management Manual (GSMM), latest edition.
 - C. Georgia Department of Transportation (GDOT) standards shall be used as a minimum in determining class of reinforced concrete pipes under fill, depth of cover and method of back-filling and pipe installation. Trench construction for storm drainage pipe shall also meet OSHA standards for safety.
 - D. All storm drain pipes shall be Reinforced Concrete Pipe (RCP).
 - E. Minimum diameter for RCP shall be 18-inches.
 - F. Manufacturer's certification of the pipe specifications for each pipe may be required before installation.
 - G. Changes to the approved construction plans associated with the Land Disturbance Permit (LDP) may be required by the City Engineer based on field conditions with all costs of such changes to be paid by the developer.

204 WATER QUALITY

- 1. The water quality of stormwater runoff depends on a variety of factors including magnitude and duration of rainfall events, soil types, time between storms, land use type and specific activity, illicit connections or illegal dumping, and the ratio of the runoff per volume to the receiving water flow volumes. The stormwater management policy adopted by the City of Cumming recognizes that the use of structural and non-structural controls for stormwater management programs are beneficial in controlling pollution of the receiving waters.
- 2. As a minimum, best management practices (BMPs) shall be used in stormwater plans in project design and construction. BMPs may be temporary or permanent and include a maintenance and activities schedule for drainage facilities, soil erosion and sedimentation control practices. All development within City limits must comply with the Soil Erosion and Sedimentation Control Ordinances as minimum structural and non-structural standards for project design. Water quality measures shall be installed and as-built verified in accordance with the City of Cumming Post -Development Stormwater Management Ordinances.



205 HYDROLOGY AND HYDRAULICS

- 1. The rational method shall be used to determine the size of all storm drainage pipes in accordance with the methodology provided in the Georgia Stormwater Management Manual. Piped storm drainage systems shall be designed using the 25-year storm event.
- 2. Catch basins and/or drop inlets shall be designed by the developer's engineer or registered surveyor to state highway GDOT standards and subject to approval by the city engineer.
- 3. Catch basins shall be located at low points of streets and at all points where the gutter spread exceeds one-half of the width of the travel lane or 8 feet whichever is smaller. Flows shall be based on a 10-year design storm event and shall be calculated as described in the Georgia Stormwater Management Manual. Gutter spread calculations shall be included on the construction plans.
- 4. Maximum flow velocity, actual or full flow should not exceed 15 fps. Maximum outlet velocity, actual or full flow should not exceed 6 fps without adequate energy dissipation devices installed at the pipe outlet.
- 5. Complete flow, velocity, and hydraulic grade line computations shall be provided for all portions of a piped system. Hydraulic grade lines shall be shown on the storm drainage profiles for the 25-year design storm event. Hydraulic grade line shall not be higher than the top of barrel at the 25-year storm event due to any tailwater or backwater effect from downstream structures.
- 6. Minimum 20-foot storm drainage easement shall be provided on all stormwater infrastructure (pipes and open channels) on private property. The easement width may be increased depending on the depth of the pipe or the width of the open channel. Sufficient easement width shall be granted to allow for future maintenance activities.
- 7. Minimum cover shall be 18 inches on all drainage pipes. Maximum cover shall be as defined in GDOT Standard Construction Details and/or in accordance with the AASHTO LRFD Bridge Construction Specifications, Section 27 or ASTM C1479.



8. Maximum continuous run of pipe shall be as follows:

Table 2.1 - Maximum Continuous Length of Pipe					
Pipe Diameter (in.)	Max. Continuous Length				
18"	300'				
24" - 60"	400'				
Larger than 60"	500'				

- 9. Junction boxes or inlets shall be provided at all changes in pipe grades, direction or materials. All storm junction boxes shall have cast iron manhole frames and covers for access.
- 10. Buried junction boxes shall not be allowed.
- 11. All storm sewer junction box frames and covers shall be traffic rated in any paved area.
- 12. Frames and covers in paved areas shall be set at the required elevation and properly anchored to the masonry. Where junction boxes are constructed in paved areas, the top surface of the frame and cover shall conform to the exact same slope, crown and grade of the existing adjacent pavement.
- 13. Any existing channel flow shall not be constricted.
- 14. Subsurface drainage systems shall be installed to control the surplus ground water by intercepting side hill seepage or by lowering or regulating the ground water level where such conditions exist.
- 15. Energy dissipation devices, such as splash pads, riprap, stilling basins, etc., shall be provided at the outlet of every pipe. The design of these structures shall conform to the Georgia Stormwater Management Manual and the Georgia Erosion and Sediment Control Manual, latest editions.
- 16. Energy dissipation devices shall be located entirely within the project site and shall not encroach upon any required buffer. This includes side and rear setback buffers and that water discharges must be set back 10-feet from the property line and not negatively impact adjacent properties.



206 STORMWATER RUNOFF ANALYSIS

- 1. New development and redevelopment sites will comply with the City's Stormwater Management Ordinance and the GSMM. As required by the Ordinance, developers will submit a hydrology report that outlines existing and future hydrologic conditions as well as measures to prevent flooding and water quality degradation as a result of the increased development. The procedures for calculating the site's impact and allowable stormwater controls are articulated in the Stormwater Management Ordinance.
- 2. Basic data for the basin and site must be collected and provided in the hydrology/hydraulics report. The entire basin shall be considered based on the topography and existing conditions runoff. The following shall be included in the design and stormwater management hydrology report with any development or site plans.
- 3. Delineation of the larger drainage basin within which the site or development is located. The drainage basin shall be provided at an appropriate scale that can be utilized in the overall hydrology/hydraulics report evaluation. USGS quadrangle maps of the drainage basin area shall be used as a minimum standard map.
- 4. Site topography of the proposed development shall be provided with 2-foot contour intervals. The site topography map shall provide sufficient data to adequately describe and determine site stormwater runoff characteristics prior to development and following construction of the proposed improvements. The site topography map shall be at a scale that is legible.
- 5. Drainage features, natural or man-made, designed to receive discharge from proposed site improvements shall be identified on the drainage basin map and the site topography map. Sufficient data regarding the drainage features shall be provided to accurately characterize the features including but not limited to depth, width, side slopes and surface materials.
- 6. Soil characteristics of the proposed developed area as well as immediate downstream receiving areas shall be included in the design.
- 7. Construction plans and details are required for review by the City Planning and Zoning Department as well as the Cumming Utilities Department. A hydrology and hydraulics report of the project and associated basin, as outlined herein, shall be prepared and submitted to the City for review by the City Engineer. The hydrology report shall be stamped by a professional engineer licensed in the State of Georgia.
- 8. Rational method shall be used for designing conveyance systems and TR-20/TR-55 shall be used to size detention facilities and reservoirs.



- 9. Documentation of runoff generated by the selected methodology shall include data for the 2, 5, 25, 50, and 100-year return frequency storms. Runoff data shall be calculated for the drainage basin and site prior to development and after development.
- 10. All rainfall runoff computations require physical site characteristics expressed in numerical designation. Runoff coefficients utilized for the Rational Method shall be in accordance GSMM. Runoff curve numbers as established in the Natural Resources Conservation Service manual for hydraulic computations shall be utilized in SCS computation methods.
- 11. The Hydrology/Hydraulic Stormwater Management Report of the drainage basin area and site shall include input data, method of analysis, runoff generation, and routing calculations for on-site and off-site sub basin areas.

207 STORMWATER MANAGEMENT FACILITIES

- 1. Whenever a hydrology report indicates that an adverse impact from stormwater runoff is expected to result from the development of a property, that project shall be provided with stormwater detention facilities. The meaning of adverse impact shall apply to situations where the post developed discharge velocities and/or flows, up to and including the 100 year storm event, exceed those determined for the pre-developed conditions or where the downstream conditions indicated that the design flow exceeds the conveyance capacity of the receiving facility or potentially creates adverse conditions in downstream structures.
- 2. A hydrology report will be developed for projects required under the City of Cumming's Stormwater Management Ordinance. This report will identify Best Management Practices that mitigate stormwater runoff and water pollution concerns associated with the proposed development. The report will be prepared following the City's Ordinance and requirements in the GSMM. The purpose of this report shall be to formulate a plan to manage stormwater runoff so that stormwater runoff hazards are not created, and existing run-off related problems are not exacerbated, either upstream or downstream from or within the boundaries of the property being developed. The engineer shall be responsible for obtaining all information necessary for the report. Hydrologic analysis and detention pond hydraulics, pipe and open channel hydraulics, culvert hydraulics and water quality best management practices shall be certified by a professional engineer registered in the State of Georgia.
- 3. The hydrology report shall identify the locations and quantities of stormwater runoff entering and exiting the site for both pre- and post-development conditions.



- 4. All culverts, pipe systems and open channel flow systems shall be sized based on all on-site upstream areas being developed in accordance with the development plans and the off-site upstream areas being fully developed in accordance with the land use plan with no detention. Upstream detention may be included when determining flows, provided the engineer calculates the reduced flow by routing the developed flows through any stormwater facility included in the analysis rather than assuming that a reduction will occur. The engineer shall show that detention facilities used in the analysis will remain, be properly maintained and the storage volume and outlet structure is based on current conditions.
- 5. Stormwater facilities shall be designed using pre-developed flows based on existing conditions for all upstream areas including existing on-site lakes, ponds and detention facilities. Post developed flows shall be based on the upstream basin areas being developed as shown on the approved development plans and existing conditions for off-site upstream areas. Upstream detention may be included if it meets the conditions as described for culverts and pipe systems. Existing conditions shall be defined as the conditions of the site at the time the development permit is applied for. The existing condition shall include all on-site lakes, ponds, or detention facilities. Pre-developed flows shall be determined by routing the flows through these stormwater facilities.
- 6. The hydrology report shall comply with the City of Cumming's Stormwater Management Ordinance and shall include the following minimum information:
 - Cover sheet
 - Table of Contents
 - Narrative Summary
 - Numerical Summary
 - 10% Downstream Analysis
 - Hydrograph Printouts
 - Stage-Storage/ Outflow Relationships
 - Hydrograph Routing
 - Outlet Control Details
 - Basin Delineation Maps (Pre & Post, Tc flow paths, sub-basin CN)
 - Channel/Ditch Calculations
 - Pipe Chart (shown on plans also)
 - Gutter Spread Calculations
 - Downstream Sediment Analysis



- 7. All stormwater management facilities shall be constructed with a maximum 3:1 side slope with fence or 4:1 and less without fence. The fence shall be a minimum of 6-feet high and made of a durable material with a 12-foot wide access gate and sufficiently sized for maintenance equipment to service the facility. The fence shall comply with all applicable zoning requirements.
- 8. Stormwater management facilities shall be constructed in accordance with the approved plans and shall be in place and inspected prior to Certificate of Occupancy (CO). If the stormwater facility is planned to be a lake (wet detention pond), micro pool or constructed wetland, temporary detention facilities shall be provided and shall remain in place until the feature has become a functional stormwater management facility.

208 STORM DRAINS

- 1. The design storm used for sizing drainage lines and ditches shall be the 25-year return frequency. The stormwater management design shall also evaluate the storm drainage system to adequately address 100-year return frequency storms. Determination of the flow conditions, scour potential, and channel erosion resistance shall be standard procedure for all designs.
- 2. Inlets shall be constructed as part of the storm drainage system to intercept surface water and convey the stormwater to the storm drainage system. The following guidelines shall be used in design of inlets located in streets:
 - A. Inlets shall be located within the proposed street system based on the drainage area and the overall storm drainage system design.
 - B. Inlets shall be spaced and sized based on drainage area contributions and bypass quantities.
 - C. All inlets shall be constructed in accordance with the GDOT standards for construction.
 - D. Recessed inlets shall not decrease the width of the sidewalk.
 - E. Design and location of inlets shall take into consideration pedestrian and bicycle traffic. In particular, grate inlets shall be designed to assure safe passage of bicycles.
 - F. The use of slotted drains in public systems shall not be acceptable unless no other alternatives are available.



- G. Storm drainage system plans shall depict the location of all inlets and other storm drainage system structures including, but not limited to manholes, mains, laterals, ditches, culverts.
- H. For each inlet, data shall be submitted indicating the drainage area to the inlet, inlet time of concentration, design rainfall frequency, and peak flow.
- I. Catch basins shall not be located within radii at street intersections. If stormwater collection is necessary along radius, use GDOT 1019-A, Type "E" structure. Multiple grates should be used if volume warrants.

209 CULVERTS

- 1. All culvert designs shall be in accordance with the GSMM, latest edition and GDOT specifications, latest edition.
- 2. Minimum culvert size shall be 18" and inlet or outlet headwalls shall meet or exceed GDOT Construction Standard 1125, latest edition. Outlet headwalls shall include energy dissipation as part of the headwall for flows exceeding 6 fps.
- 3. Additional energy dissipation devices or structures may be required at outlets to control velocity.
- 4. Selection of culvert size shall be based on hydraulic calculation for inlet control and outlet control conditions. In outlet control conditions, the determination of tail water depth shall be included in the design.
- 5. The 100-year ponding limits at the upstream end of the culvert shall be indicated on the design plans and final plat if applicable.

Table 3.2 - Required Storm Events for Culvert Design					
	Storm Event (Recurrence				
Street Classification	Interval)				
Major Arterial Collector	100-year				
*Minor Collector	50-year				
*Dead End/ Alleays	25-year				
*Streets without alternative access routes, the design storm event shall be the 100-year event for all street classifications.					

6. Design storm events are as follows:



- 7. Minimum cover is one foot between the bottom of the base or sub-base, if used, and the exterior crown of culvert.
- 8. A minimum of six inches between underground utilities and the exterior crown of the culvert

210 OPEN CHANNELS

Open channels may be designed and constructed as an integral part of the storm drainage system. The function and characteristics of these channels may be altered by the addition or construction of channel linings. Three (3) main classifications of channel linings are recognized: vegetative, flexible, and rigid.

The minimum requirements for the design of open channels shall be based on the following criteria:

- A. Open channels shall be designed to accommodate the 25-year frequency storm as a minimum. Should open channels be located in areas where rainfalls exceeding 25-year return frequency storm would cause excessive damage to surrounding properties, additional capacity may be required.
- B. Maximum permissible velocity for grass lined channels is six (6) feet per second for the design storm. Flow velocities shall not exceed six (6) feet per second at transition locations where stormwater flow exits onto grass lining. Exceptions may be processed when an approved modeling method such as HEC-15 shows that the channel is stable under the proposed conditions.
- C. Roughness coefficients for the design of open channel drainage systems shall be based in the GSMM, latest edition.
- D. The minimum slope for grass lined channels shall be one (1%) percent.
- E. Public systems side slopes for grass lines channels shall be three (3) horizontal to one (1) vertical or flatter with the exception of roadside ditches (roadways design standards). Changes in direction of channels shall be accomplished using simple horizontal curves. The centerline curvature shall have a minimum radius of twice the top width of the design of flow.
- F. Concrete lined channels shall be designed to avoid hydraulic jumps. If hydraulic jumps are unavoidable, sufficient freeboard shall be provided. The channels shall be constructed of reinforced concrete.
- G. Appropriate energy dissipation devices shall be constructed in channels to control flow velocities.



H. Channel drop structures may be required to reduce channel velocities and reduce upstream and downstream channel slopes. Design of channel drop structures shall be accomplished to contain design flow in channel, maintain allowable velocities and minimize maintenance cost.

211 EROSION AND SEDIMENT CONTROL

- A. All land disturbing activities shall conform to the City of Cumming Erosion and Sedimentation Ordinance and the Manual for Erosion and Sediment Pollution Control in Georgia, latest editions. These regulations and procedures shall continue to apply until the project has been stabilized.
- B. Non-structural erosion control measures are encouraged where feasible. Other structural erosion control measures may include rip-rap, gabions, or other constructed facilities. The designer shall provide adequate calculations to the City Engineer for review of such facilities to determine required velocity control and appropriate soil and erosion control measures.
- C. Any project whose permit has lapsed shall immediately have all disturbed areas stabilized.





SECTION 300 MATERIALS SPECIFICATIONS

301 GENERAL:

- 1. Pipe installed within the right-of-way shall be reinforced concrete pipe and the class as determined by GDOT specifications, latest edition.
- 2. Broken Pipe showing defective workmanship shall be rejected. Among others, the following defects are specified as constituting poor workmanship and the presence of any or all of them in any culvert pipe shall constitute cause for rejection:
 - Uneven laps.
 - Elliptical shaping
 - Variation from a straight centerline
 - Ragged or diagonal sheared edges
 - Unfurnished ends
 - Illegible brand
 - Lack of rigidity
- 3. Any damage or displacement that occurs due to traffic or erosion shall be repaired or corrected at the developer's expense.

302 STORM DRAIN PIPE AND STRUCTURES

- 1. Acceptable pipe materials shall be Reinforced Concrete Pipe (RCP) and shall conform to GDOT specifications, latest edition.
- Reinforced concrete pipe shall be manufactured in accordance with AASHTO M-170 and/or ASTM C-76. All pipes shall be in joint lengths of not less than 8 feet. All joints shall be bell and spigot and shall be laid with the spigot end pointing downstream.
- 3. Class of pipe, cement and wall thickness shall be in accordance with GDOT standard specifications, latest edition.
- 4. Sections of the pipe which fail the air test, shall have the defects repaired, and the test shall be repeated.
- 5. The initial air testing, repair and repeat testing of the failed section of pipe shall be repeated at no added cost to the City until the testing requirements are met.
- 6. All joints using an O-ring type rubber gasket shall conform to ASTM C-443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe or meet the requirements of AASHTO M 198, Type A (culvert construction does not require a hydrostatic pressure test)



- 7. Rubber gasket joints shall be used with a groove or offset on the spigot and/or bell, and which fits against the shoulder or in the groove of the joint.
- 8. Outside right-of-way limits and for those areas which will have easement granted to the City, culverts shall be used. Installation shall be in accordance with Georgia Department of Transportation construction specifications, latest edition.
- Junction boxes shall be used for horizontal or vertical change in pipe direction. Precast, reinforced concrete junction box sections shall meet ASTM Standard C 478.
- 10. Catch basins, drop inlets, junction boxes, grate inlets and similar catchment structures within any right-of-way shall be constructed in accordance with Georgia Department of Transportation construction specifications and standards.
- 11. Catch basins installed along roadways with raised edge asphalt sections, shall include concrete transition lengths standards for construction. The construction of the transition curb shall be of concrete according to the construction standard details and tie into the raised edge asphalt. The face of the proposed catch basin shall be located at the back of the raised asphalt section "not at the gutter line".

303 PIPE END TREATMENTS

- 1. All headwalls shall be installed at the grade of the receiving water. Proper energy dissipation is required to prevent erosive velocities.
- 2. End treatments that conform to the slope may be precast concrete, reinforced concrete slope collars or grouted riprap. Concrete flared end sections shall conform to GDOT Detail 1120, latest edition. No metal end treatments will be accepted.

304 BEDDING

- 1. Reinforced concrete pipe storm drain shall be bedded and backfilled in accordance with the GDOT standard construction details.
- 2. All pipes shall be placed on stable earth of fine granular foundation. In floodplain areas and near live streams for areas of low bearing strength, non-uniform foundations, unstable soils, or in areas where rock is encountered at the foundation level, or in other locations where conditions warrant, a minimum of 6 inch graded aggregate base or stabilization stone is required. Geogrids or geotextiles may also be required by the engineer in problem areas.



305 BACKFILL

- Backfill on all pipe installations shall be constructed using granular fill soils that meet USCS classification for coarse grained soils. (GDOT Standard Specifications Type I or Type II as specified in Sections 812.01 and 812.02) These materials shall be placed in layers of not more than 6-inch lifts. Compaction of these materials shall be accomplished by hand tamping or machine tamping. Required compaction levels are as follows:
 - A. Backfill within all street rights-of-way shall be compacted to 95% maximum density using the AASHTO Method T-99. The top 12" shall be compacted to 98% maximum density.
- 2. Backfill in all other areas not within the right-of-way shall be compacted to 95% maximum density using the AASHTO Method T-99.

306 SOIL AND ROCK STRUCTURES

- 1. Soil and rock structures shall include earthen embankments for roadways, earth and/or earth-rock structures for dam construction, dikes, containment embankments, and structural earth berms for the support of facilities or structures, impoundment of water, or diversion of runoff.
- 2. Earth and earth-rock structures do not include landscaping berms. For earthen dam construction, sufficient design information regarding the construction of the proposed impoundment embankment shall be provided. This data shall include the suitability of the materials and design cross-sections to ensure geometric stability of the structure.
- 3. Soil for embankments impounding water shall have at least 15% clay content and be compacted to a minimal of 95% of standard proctor dry density at or near optimum moisture content. For earthen structures, design data shall include sufficient information to indicate the stability of the soil structure and provisions to prevent piping, excess seepage, or undermining of the embankment.
- 4. Earthen structures that must comply with the GA Safe Dams Act shall be submitted to the Department of Natural Resources Dam Safety Division for review, and shall be designed by a registered professional engineer licensed in the state of Georgia with the special state certification for dams.



307 OPEN CHANNEL CONVEYANCE

1. Construction of swales shall be in accordance with the Manual for Erosion and Sediment Control in Georgia and the Georgia Stormwater Management Manual. All ditches or swales shall be constructed of stable soils suitable for the velocity and runoff capacity to be carried and soils shall support the intended grass species or final stabilization treatment.

308 GRASSING

1. Grassing and stabilization plantings shall be in accordance with the Manual for Erosion and Sediment Control in Georgia and shall be of an appropriate species for velocity control and stabilization of the areas receiving flows.



SECTION 400 CONSTRUCTION STANDARDS

401 EARTH EXCAVATION

- 1. Clearing and Grubbing Areas for stormwater line installation must be cleared and grubbed. All trees, stumps, brush, paving and other waste material must be removed from the site.
- 2. Protection of Existing Structures and Landscape No trees or shrubs will be removed without the approval of the Owner and the City of Cumming. All trees, shrubs, fences, mailboxes or other personal property damaged or removed, shall be replaced. Upon completion of the stormwater line installation, all disturbed areas shall be seeded, fertilized and mulched with hay. All seeding shall be approved by the City of Cumming. Care must be taken to ensure proper drainage of the area as approved by the City.
- 3. Excavation Methods Open cut excavations shall have vertical side slopes shored and braced. When necessary to achieve compaction in the lower and hunched areas, the sides of the trench should be sloped as necessary to maintain stability and meet OSHA standards. When sheeting is used, it shall be left in place until the backfilling is completed no less than twelve (12) inches above the top of the pipe. Then, the upper section of the sheeting may be removed. When the removal of sheeting endangers adjoining improvements, it will be left in place. All water shall be removed from trenches by pumping, bailing or draining. Groundwater encountered in the excavation shall be depressed to an elevation twelve (12) inches below the bottom of the excavation before pipe-laying may continue.
- 4. Disposal of Material All excess material and waste material should be disposed of immediately after the backfill operation has been completed.
- 5. Borrow When excavated material cannot be used as a suitable backfill, an approved borrow material shall be used.

402 ROCK EXCAVATION

- 1. Blasting When blasting is necessary for rock excavation, the explosives must be used, handled, and stored as prescribed by the laws and regulations of the State of Georgia and all local laws applicable. The blasting work must be done by an experienced person. Any damage occurring to persons or personal property due to blasting will be repaired at the Contractor's expense.
- 2. Disposal All rock larger than two (2) inches in diameter must be removed from the site and disposed of in a manner approved by the City of Cumming.



403 SUBSURFACE OBSTRUCTIONS

- 1. General It is the responsibility of the Contractor to locate and protect all underground utilities and structures. No utility is to be moved or disturbed without the approval of that utility company. Any damage caused during stormwater drainage installation to any other utility or structure shall be immediately reported to the City and repaired at the Contractor's expense. The Contractor shall be responsible for any expenses incurred as a result of damage to existing utilities. Contractors must adhere to all state laws and the rules of the Georgia Utility Protection Center (UPC).
- 2. Existing Underground Utilities and Obstructions Where known or unforeseen underground utilities or obstructions are encountered, minimum depth of cover, or the location and alignment may be changed, upon written approval of the City of Cumming.
- 3. Relocation of Services The City of Cumming shall have the right to determine the services which are to remain in place and the services which shall be relocated as best suits conditions as found, in accordance with the following:
 - A. Services to Remain in Place: Where the City of Cumming determines the services shall remain in place, minimum specified depths of cover for the pipe lines may be changed to avoid interference with such services.
 - B. Services to be Relocated: Where the City of Cumming determines the services shall be relocated, the Utility will make the necessary changes at its expense.

404 PIPELINE INSTALLATION

- 1. Material Handling Proper and suitable tools and equipment for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe from being damaged. All pipe shall be carefully examined for cracks and other defects; if any pipe or other casting is discovered to be cracked, broken, or defective after being laid, it shall be removed and replaced with new material.
- 2. Trench Excavation Trenches shall be excavated to their required depth and width to provide for an efficient and safe working environment. Sections shall be laid in a prepared trench with bell ends pointing upstream. Joint sections using rubber gaskets as installed according to the manufacturer's recommendations. Check vertical and horizontal alignment of the pipe culvert or storm drain 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.



- 3. Bedding in Earth Trenches Where pipe is laid in earth excavated trenches, the bottom of such trenches shall be fine graded to a true line, the pipe lines shall not be laid on rock or other hard material. For unstable soils, over excavation of the trench bottom shall be filled to grade with compacted graded aggregate or suitable granular earth material, before bedding the pipe.
- Bedding in Rock Trenches Where pipe is laid in rock trenches, a minimum of six (6) inches of compacted crushed stone, or granular cushion shall be placed prior to backfill. The trench shall be backfilled from the lower bedding zones and haunches with native soils to a level at least one (1) foot over the top of the pipe.

405 <u>BACKFILL</u>

- 1. General Line and grade should be checked as the pipe is installed, and any discrepancies between the design and actual alignment and pipe invert elevations should be corrected prior to placing the backfill or fill over the pipe. Obtaining manhole invert levels for the preparation of as-built drawings, combined with visual inspection of the sewer or culvert, provide an additional check that pipe installation settlement has not occurred during backfill or fill operations.
- 2. Paved Roadways Backfill under permanent concrete or bituminous pavement shall be compacted graded aggregate. Compaction shall be 100% of the dry rodded unit weight in accordance with AASHTO T99. Compaction shall be accomplished by using a hand vibratory compactor.
- 3. Unpaved Roadways Backfill under gravel surfaced roadways and surface treated type bituminous roadways shall be backfilled using select material placed in six (6) inch layers thoroughly compacted for the full depth and width of the trench. Compaction shall be to 95% as determined by AASHTO T99. Compaction shall be accomplished by using a hand vibratory compactor.
- 4. Unpaved Areas Backfill in unpaved areas shall be select material compacted to 90% as determined by AASHTO T99, or compatible with the surrounding area.

406 ROAD CROSSINGS

- 1. Open street cuts shall be required for installation of RCP culverts and the following rules apply for such:
 - A. Construction work allowed between 9 A.M. and 4 P.M. on weekdays only, unless otherwise approved by the City of Cumming.
 - B. One (1) lane of traffic must be open at all times.



- C. Traffic control devices, as required by Georgia DOT, must be used to direct traffic.
- D. Repair of the street cut shall be in accordance with the standard details.
- E. If an open ditch is left unattended for any length of time, a 3/4 inch steel plate must be used to cover the ditch.
- 2. Tunneling When tunneling under roadways, the methods used must be in accordance with the rules and regulations of the Georgia DOT.

407 <u>REPLACEMENT OF PAVEMENT AND STRUCTURES</u>

Asphalt Pavement -

- A. Asphalt pavement replacement for stormwater lines installed under paved roadway surfaces shall be type "A" as detailed in the Standard Construction Drawings. Base course shall be placed and compacted immediately after backfilling and made level with adjacent existing paving.
- B. If compaction is sufficient after the base course is placed, the base course shall be removed to a sufficient depth to provide no less than two (2) inches of wearing course level with adjacent grade. A bituminous priming treatment shall be applied to the base course prior to the placing of the two (2) inch surface course.

Gravel Roadway Replacement -

A. The material used in restoring gravel roadways shall be the same as those which composed the wearing and base courses of the existing roadway. As a minimum, roadway material shall be equal to graded aggregate base conforming to the Georgia DOT Standard Specifications.

Driveway Replacement -

- A. Concrete driveways shall be constructed to the thickness of the adjoining wearing surface and base course shall be constructed of similar materials and dimensions as the original base course. As a minimum, 3,000 psi concrete shall be used as a wearing course, as detailed in the Standard Drawings.
- B. Asphalt driveways shall be repaired according to type "A" for private roads or driveways.



C. Gravel driveways shall be restored to their original condition and dimensions using materials similar to those already in place. As a minimum, gravel driveways shall be six (6) inches of No. 57 crushed stone or graded aggregated base (GAB) conforming to the Georgia DOT Standard Specifications.

Curb and Gutter Replacement -

- A. All curbs and combination curbs and gutters, which have been removed or disturbed in the progress of the work, shall be replaced at the Contractor's expense. Curbing shall be made to conform accurately in size, line, grade and materials with that adjoining. In restoring curbs, the subsoil and foundation material shall be well compacted so as to prevent any settlement.
- B. All granite curb shall be restored with material equal to that already in place.
- C. All concrete curbing shall have minimum 28 days compressive strength of 3000 psi.

Sidewalk Replacement -

- A. All sidewalks, disturbed in the process of the work, shall be constructed to the same grade, dimensions and materials as were originally in place.
- B. Where necessary to cut a sidewalk, entire slabs or squares shall be removed and replaced.
- C. The sub-base shall be thoroughly rolled or tamped and shall be set just before, if necessary, the concrete is placed, but shall show no pools of water.

408 FINAL ACCEPTANCE AND AS-BUILT DRAWINGS

A. As-built drawings shall be submitted to the City of Cumming for every project governed by this book of specifications. The City of Cumming will not permit the issuance of any certificate of occupancy or the approval of any final plat until appropriate as-built drawings are received. This includes both hard copies and electronic copy in a format acceptable to the City for use with the City's GIS database of the system.



SECTION 500 STANDARD CONSTRUCTION DETAILS

- SW-1 JUNCTION BOX LID AND COVER
- SW-2 CURB TRANSITION AT CATCH BASIN
- SW-3 LOCATION OF CATCH BASIN
- SW-4 PRECAST CONCRETE FLARED END SECTIONS
- SW- 5 PRECAST CONCRETE HEADWALLS
- SW-6 PRECAST CONCRETE CATCH BASIN
- SW-7A CATCH BASIN CAST-IN-PLACE
- SW-7B CATCH BASIN DETAIL CAST-IN-PLACE
- SW-7C CATCH BASIN CAST-IN-PLACE
- SW-8 PRECAST CONCRETE CATCH BASIN
- SW-9A CONCRETE DROP INLET
- SW-9B DROP INLET DIMENSIONS
- SW-10 DROP INLET PRECAST
- SW-11 WEIR INLET DETAILS (PEDESTAL INLET)
- SW-12 DROP INLET DETAIL
- SW-13 DROP INLET PEDESTAL TOP AND WEIR
- SW-14A BICYCLE SAFTEY GRATE AND FRAME
- SW-14B BICYCLE SAFTEY GRATE DETAIL
- SW-15 ANTI-SEEP COLLAR
- SW-16 BEDDING DETAIL









FLARED END SECTION PRECAST CONCRETE

DEPARTMENT OF UTILITIES

CITY OF CUMMING

MATERIALS: CONCRETE: 4,000 PSI, TYPE I OR II CEMENT

D	Т	Α	В	С	L	Е	G	R1	R2	SLOPE	TONS
18"	4.50"	9"	27"	46"	73"	36"	2.50"	18.0"	13.5"	2:1	1.04
24"	4.50"	10"	43"	32"	75"	48"	3.00"	20.0"	15.0"	2.2:1	1.36
30"	4.75"	12"	54"	20"	74"	60"	3.50"	21.0"	16.0"	2.3:1	1.65
36"	4.75"	15"	63"	35"	98"	72"	4.00"	30.0"	22.0"	2.4:1	2.24
42"	5.00	21"	63"	35"	98"	78"	4.50"	33.0"	24.0"	2.4:1	3.15







SCALE: NOT TO SCALE

SW-4



6"

1

SCALE: NOT TO SCALE

PRECAST CONCRETE HEADWALLS

SW-5

<u>√</u> <u>4</u>			<u> </u>	• - - - - - - - - - - - - - - - - - - -				- 6"
ALL SIZE	W1	W2	H1	H2	D	Е	TONS	BLOCKS
3"	3'-2"	4'-9"	1'-3"	3'-2"	1'-2"	1'-9"	0.92	1
4"	4'-2"	8'-2"	2'-0"	4'-2"	1'-8"	2'-9"	1.73	3
36"	4'-8"	8'-8"	2'-4"	4'-8"	2'-4"	3'-3"	1.92	3
48"	5'-8"	10'-11"	3'-6"	5'-9"	3'-0"	4'-3"	3.33	4



7

9

11

3.77

5.30

7.31















ТҮРЕ В							
NORMAL W OR W1	MIN h	MIN H					
2" -0"	2'-7 1/2"	3'-9 1/2"					
2'-3"	2'-10"	4'-0"					
3'-0"	3'-8"	4'-10"					
3'-6 1/2"	4'-2 1/2"	5'-4 1/2"					
4'-2"	4'-10"	6'-0"					
4'-8 1/2"	5'-4 1/2"	6'-6 1/2"					
5'-3 1/2"	5'-11 1/2"	7'- 1 1/2"					
5'-10"	6'-6"	7'-8"					
6'-4 1/2"	7'-0 1/2"	8'-2 1/2"					
6'-11"	7'-7"	8'-9"					
7'-5 1/2"	8'-1 1/2"	9'- 3 1/2"					

CONCRETE DROP INLET

			ΤΥΡΕ Α			
D	W1	MIN. W2	W3	а	b	MIN. H
1'-3"	2'-0"	2'-6 1/2"	2'-7"	0'-3 1/2"	0'-6"	3'-3"
1'-6"	2'-0"	2'-9 1/2"	0	0'- 31/2"	0'-6"	3'-6"
2'-0"	2'-8"	4'-0 1/2"	3'-3"	0'- 7 1/2"	1'-1"	4'-9"
2'-6"	3'-4"	5'-11/2"	3'-11"	0'-11 1/2"	1'-8"	5'-10"
3'-0"	3'-10"	6'- 1/2"	4'-5"	1'-2 1/2"	2'- 1/4"	6'-10"
3'-6"	4'-5"	7'-2 1/2"	5'-0"	1'-6"	2'-7 1/4"	7'-11"
4'-0"	5'-0"	8'- 3 1/2"	5'-7"	1'-9 1/2"	3'- 1 1/4"	9'-0"
4'-6"	5'-7"	9' - 4 1/2"	6'-2"	2'-1"	3'-7 1/4"	10'-1"
5'-0"	6'-2"	10"- 5 1/2"	6'-9"	2'-4 1/2"	4'-1 1/2"	11'-2"
5'-6"	6'-9"	11'- 6 1/2"	7'-4"	2'-8"	4'-7 1/2"	12'-3"
6'-0"	7'-4"	12- 7 1/2"	7'-11"	2'-11 1/2"	5'-1 1/1"	13'-4"



DROP INLET DIMENSIONS

SCALE: NOT TO SCALE

SW-9B

DETAIL NUMBER:

LATEST REVISION















