

APPENDIX L

	Stormwater drainage design should generally conform to FHWA "HEC-22, Urban Drainage Design Manual" and GDOT "Manual on Drainage Design for Highways".
	Provide culverts, storm sewer pipes, storm sewer structures, channels, etc. according to GDOT standards, details, and specifications whenever possible. Provide construction details, design calculations, and other information as appropriate for all other features (e.g. proprietary components, modifications to GDOT structures).
	<p>Culverts and storm sewer pipes shall satisfy the following criteria:</p> <ul style="list-style-type: none"> a. Minimum pipe cover: <ul style="list-style-type: none"> i. Outside roadway: 18 inches ii. Within roadway: 24 inches iii. Berming or trenching is not allowed to achieve minimum or maximum cover. b. Minimum pipe slopes: <ul style="list-style-type: none"> i. RCP or smooth-walled HDPE: 0.5% ii. CMP or rough-walled HDPE: 1.0% iii. Pipes with slopes flatter than those shown above will be considered for approval on a case-by-case basis. A full-flow velocity of 2.5 feet per second or greater is strongly recommended. c. Maximum pipe slopes: <ul style="list-style-type: none"> i. RCP: 10% ii. CMP or HDPE: 14% iii. Anchor collars or other restraining devices may be required for steeper slopes.
	All culverts and storm sewer pipes beneath public roadways shall be reinforced concrete.
	Culverts and storm sewer pipe material types, directional changes, slope changes, or transitions are permitted only at structures with surface access (e.g. junction box with manhole, catch basin). Collars, couplers, adapters, tees, blind junctions, etc. are not acceptable transitions.
	All pre-cast manholes shall be provided with a minimum of 9 inches clearance on each side of connecting pipe between all cut-outs or penetrations.
	All catch basin structures at cul-de-sacs shall be offset 1.0 foot from the back of curb.
	Use concrete spillway (GDOT Standard 9013, Type III) at the end of curb and gutter, where applicable.
	Use concrete flared end sections (GDOT Standard 1120) at driveway crossings within the right-of-way and other applications adjacent to vehicular traffic.
	<p>Construction plans shall include profiles and calculations demonstrating proper design of culverts and storm sewer systems. The following criteria shall be satisfied:</p> <ul style="list-style-type: none"> a. Label all structures with appropriate type, GDOT standard/detail number, or other description. b. Show size, material type, class or gauge, percent slope, and length of all culverts and storm sewer pipes. c. Provide invert and top elevations for all storm sewer structures. Provide throat elevations for all weir inlet structures located in sumps. d. Show drainage areas (incremental and cumulative), runoff coefficients, times of concentration, rainfall intensities, peak flow rates (incremental and cumulative), peak flow velocities, gutter spread widths, headwater elevations, etc. e. Culverts and storm sewer systems shall be designed using Hydraulic Grade Line (HGL) calculations, and shall appropriately reflect downstream conditions and project requirements. Specifically: <ul style="list-style-type: none"> i. Supporting information shall be provided for the assumed starting tailwater elevation. ii. Longitudinal culverts and storm sewer pipes (i.e. those that run along the roadway) shall be designed for the 25-year storm event. The 25-year hydraulic grade line (HGL) must be contained within the pipe. iii. Transverse culverts and storm sewer pipes (i.e. those that cross under the roadway) shall be designed for the 100-year storm event. The 100-year HGL must be at least 12 inches below the lowest pavement elevation. iv. The HGL shall be shown for both the 25-year and 100-year storm events, wherever a system discharges into a stormwater management facility, floodplain, or other area of significant flow restriction. f. Additional or more stringent criteria as the City determines necessary to protect public safety, private property, etc.

	Channels shall be designed for the 25-year storm event, at minimum.
	Channels must be protected against erosion during the design storm event, by using appropriate permanent vegetation, riprap, turf reinforcement mat, drop structures, etc.
	Construction plans shall include profiles, cross-sections, and calculations demonstrating proper design of channels.