

City of Valdosta Land Development Regulations

Chapter 332 Infrastructure and Site Improvements

Article 2 Drainage Systems

Section 332-21 Stormwater Drainage

The Developer shall provide adequate stormwater drainage in accordance with Chapter 310 of this LDR, the requirements contained in this Article, the latest edition of the Georgia Stormwater Management Manual, and the City of Valdosta Specifications for Construction. Storm drainage shall be piped unless the City Engineer waives the requirement due to hardship based on sound engineering practices and environmental conditions. The City Engineer may require that open ditches shall be paved. The Developer shall also provide drainage of springs or other groundwater drainage subject to the approval of the City Engineer.

Section 332-22 Drainage System Requirements

- (A) Drainage Improvements Required. Drainage systems may include, but are not limited to, culverts, storm sewer piping, 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 right-of-way. Drainage systems that are designed to carry runoff from more than one parcel, existing or proposed, and developments that carry runoff from streets or other public areas or right-of-way, shall meet the requirements of these regulations.
- (B) Standard Specifications. Unless otherwise specifically set forth herein, all of the materials, methods of construction and workmanship for the work covered in reference to drainage system construction shall conform to the most recent Standard Specifications of the GDOT "Standard Specifications, Construction of Transportation Systems," latest edition, and any amendments thereto, and the latest edition of the Georgia Stormwater Management Manual. For roads constructed with public funds, either wholly or in part, or for roads classified as Principal Arterials, Minor Arterials, or Collector Streets, materials that meet the GDOT design standards shall be used, unless an alternative is specifically approved by the City Engineer.
- (C) All drainage structures shall be constructed in accordance with the GDOT's and the City of Valdosta's current standard details, and the latest edition of the Georgia Stormwater Management Manual.
- (D) Design Criteria – General.
 - (1) All drainage system design calculations shall be certified by a Registered Professional Engineer, licensed in the State of Georgia.
 - (2) The methods utilized in calculating stormwater runoff and peak flows from any drainage basin or basins shall be appropriately selected based on the relative size of each basin and best engineering practice for recommended hydrologic methods and basin size limitations. These methods shall be consistent with the Georgia Storm Water Management Manual
 - (3) All portions of a drainage system, which drain areas falling within a specific category above, shall be analyzed using the same methodology.
 - (4) Runoff coefficients used for the Rational Method and runoff curve numbers used for the SCS Method shall be consistent with those shown in the "Georgia Storm Water Management Manual," latest edition.
 - (5) Culverts carrying live streams shall extend to where the crown of the pipe intersects the roadway slope. Pipes that do not carry live streams shall extend at least 50 feet beyond the front building setback lines; however, the City Engineer may require such pipes to extend farther, where necessary to provide an adequately protected building site on the property.

City of Valdosta Land Development Regulations

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

- (6) No drainage system piping shall be installed beneath or within the load bearing soil strata supporting any building or structure.

(E) Design Criteria – Cross Drain Culverts (Streams or Major Drainage Channels)

- (1) Cross drain 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.
- (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).
- (3) The minimum allowable culvert diameter shall be 15". Culvert design shall include a thorough analysis of both inlet and outlet control conditions.

(F) Design Criteria - Longitudinal Storm Sewer Piping

- (1) The preliminary design (initial pipe sizing and profile design) of longitudinal pipe collection systems shall be based upon conveyance of the peak flows associated with a fully developed 25-year storm with the hydraulic grade line (HGL) being 1 foot or more below the top of each structure, gutter line or proposed final ground surface elevation, whichever is lowest. All longitudinal piping within a Federal Emergency Management Agency (FEMA)-identified floodplain shall be sized to adequately convey the 100-year frequency storm event.
- (2) The minimum allowable pipe diameter shall be 15".
- (3) Storm sewer inlets or catch basins shall be provided and spaced so that the gutter spread for a 10-year design flow shall not exceed the following, as measured from the face of the curb:
 - (a) 4 feet or less based on the requirements of the GDOT Drainage Manual, if the street is classified as a Principal Arterial or Minor Arterial.
 - (b) 6 feet, if the street is classified as a Collector Street.
 - (c) 14 feet at any given section, but in no case greater than 6 feet on one side of the street, if the street is classified as a Local Street.
- (4) Gutter spread calculations shall be included in the hydrology study and on the Development Plans.
- (5) Complete pipe sizing, 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 and 100-year storms. A Storm Drainage Pipe Chart shall be provided with the construction drawings showing pipe identification, upstream structure label, pipe material, pipe size, pipe slope, basin area per inlet, inlet flow (CFS), upstream and downstream inverts, 25-year HGL, length, Q_{design} , Q_{max} , HGL at each end and velocity at the discharge point.
- (6) Where open drainage channels are proposed, flow, typical sections, velocity and specifications for non-erodible linings shall be provided. Calculations are to be based on the 25-year storm event.

(G) Energy Dissipation - Piped Systems and Culverts.

- (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. Outlet protection shall be

City of Valdosta Land Development Regulations

in accordance with the "Manual for Erosion and Sediment Control in Georgia," latest edition and Georgia Stormwater Management Manual.

- (2) Energy dissipation devices shall be located entirely within the project site, no closer than 20 feet from any property line unless otherwise approved by the City Engineer, and shall not encroach upon any required buffer.
 - (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.
- (H) Pipe Material Specifications. Pipe materials shall be provided in accordance with the Selection Guidelines for Storm Sewer Piping, based on application, traffic and flow conditions (See Standard Design and Construction Details).
- (1) Corrugated steel pipe and pipe arches are prohibited.
 - (2) Reinforced concrete pipe joints shall be not less than 8 feet in length, unless approved by the City Engineer for the installation of very large diameter pipe. 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 GDOT 1030-D.
 - (3) Corrugated aluminum alloy pipe shall be prohibited.
 - (4) Structural plate drainage structures shall be prohibited.
 - (5) Corrugated High-density Polyethylene Pipe – Smooth Lined Type "S".
 - (a) This specification is applicable to nominal sizes 18" in diameter or larger. Requirements for test methods, dimensions and markings of pipe sizes 18 through 36" in diameter are those found in AASHTO Designation M-294. HDPE pipe manufacturers shall be approved by the GDOT. HDPE pipe larger than 36" in diameter shall be subject to approval by the City of Valdosta.
 - (b) Pipes and fittings shall be made of polyethylene compounds that 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. 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 Valdosta.
 - (c) Joints shall be made with split couplings, corrugated to engage the pipe corrugations, and shall engage a minimum of four corrugations, two on each side of the pipe joint. Where required by the City of Valdosta, a neoprene gasket shall be utilized with the coupling to provide a soil-tight joint. Gaskets shall conform to ASTM F-477.
 - (d) Installation shall be in accordance with ASTM Recommended Practice D-2321 or as specified by the City of Valdosta. Certification from the manufacturer that the product was manufactured, tested and supplied in accordance with this specification shall be furnished to the City of Valdosta upon request.
- (I) Pipe Installation Standards. Reinforced concrete pipe shall be bedded and backfilled in the same manner. Corrugated high-density polyethylene pipe shall be bedded and backfilled in accordance with the GDOT Standard Specifications. In addition, prior to approval of a final plat, the City may require the submittal of certification from a mandrel testing agency indicating that any HDPE pipe installed does not exceed 5.0% deflection.
- (1) *Pipe Bedding.* All piping and structures shall be placed on stable earth, fine granular foundation, or rock backfill, the characteristics of which would be expected to provide long-term stability and allow for the pipe to be laid accurately. In all live stream pipe installations, in areas of low-bearing solid or non-uniform foundations, in areas where rock is encountered

City of Valdosta Land Development Regulations

at the foundation level or in other locations where conditions warrant, a minimum of 6" of crushed stone bedding is required, (maximum size of stone shall be ¾-inch). Geo-textiles or geo-grids also may be required by the City Engineer in unstable materials.

- (2) *Backfilling.* Backfill on all pipe installations shall be constructed using rock backfill material, as specified in GDOT Standards 812.01 and 812.02, respectively. These materials shall be placed in layers of not more than 6" loose. 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 98% maximum
 - (b) Backfill in all other areas shall be compacted to 95% maximum density, tested using the AASHTO Method T-99.
- (3) *Construction Loads and Minimum Cover.* The minimum cover for any pipe or culvert shall be 2 feet if within a right-of-way, or per the manufacturer's specifications if outside a right-of-way. Minimum cover shall be measured from the top of sub-grade elevations, to ensure adequate pipe protection from construction loads.
- (4) *Inspection of Pipe Installation.* All pipe shall be installed in a straight approach in strict accordance with the lines and grades shown in the approved construction drawings. The City Engineer shall provide periodic inspections of all drainage system installation, to insure compliance with these regulations. No cross drain piping or piping under the proposed paved surface shall be completely backfilled prior to the inspection of all pipe joints, bedding, initial backfill and compaction up to the pipe center line. A final inspection and approval of all pipe installation shall be required at the completion of construction activities, and prior to final plat approval.

(J) End Finish. Headwalls or other end treatments are required on all culverts and at the outlet of all piped collection systems.

- (1) Headwalls shall be pre-cast concrete or poured-in-place, with adequate steel reinforcement and concrete footings. Headwalls shall be required at any pipe inlet where erosion protection and slope stabilization is required.
- (2) Flared end sections shall be concrete only, in accordance with GDOT Standard 1120.
- (3) Safety end sections shall be concrete in accordance with GDOT standard 1122.

(K) Junction Boxes and Catch Basin.

- (1) *General Requirements.* A junction box, catch basin or other approved drainage structure shall be provided at all points where a change in the horizontal or vertical alignment of any pipe segment occurs, or at intervals not to exceed 300 feet. The change in directional flow in any junction box or catch basin shall not be greater than 90 degrees.
- (2) Junction boxes, catch basins, inlets and all other accessible drainage structures shall be constructed of brick or pre-cast, reinforced concrete minimum 4 feet square or larger. Structures shall be properly sized (diameter) and pre-cored (inlets and outlets) based on the dimensions(s) of piping to be connected. All pre-cast drainage structures with a finished depth greater than 4 feet shall be provided with accessible polypropylene composite steps spaced at not more than 12" vertically on center. All pre-cast drainage structures shall include a metal ring and cover, to provide access for maintenance personnel. Junction boxes shall require a Standard 310 (traffic rated) ring and cover, which shall either be cast in or grouted to the cone section.
- (3) Catch basins shall be constructed in accordance with GDOT Standards 1033D (Single Wing) or 1034D (Double Wing). All catch basins located along the radius of any cul-de-sac shall be constructed in accordance with GDOT Standard 1034D. The throat and top of each catch

City of Valdosta Land Development Regulations

basin shall be cast-in-place, and the edge of the top facing the travel lane shall include chamfered edges to prevent possible tire damage. The vertical opening of any catch basin, measured at the gutter line, shall not be less than 5-1/2" or greater than 8". Each catch basin top shall include a metal ring and cover (Standard 1033) to provide access for maintenance personnel.

- (4) Curb Inlets. The use of hood and grate curb inlets, in accordance with GDOT Standard 1019, may be used along curb radii less than 25 feet, but shall not be used in any cul-de-sac turnaround or at the low point of any sag vertical curve draining more than 300 linear feet of road surface.
 - (5) Finish. Drainage structures shall be set at the proper location and installed plumb. The tops of all drainage structures shall match final grade. The pipe end at the connection to any drainage structure shall not extend more than 6 in. past the interior wall of the structure, when measured at the centerline of the pipe. All pipe end connections shall be adequately sealed with a non-shrink grout. Both sides of pipe shall be grouted (inside and outside) for erosion and sediment control and to ensure complete seal of structure. All sediment and debris shall be removed from each structure prior to final inspection and approval. All drainage structures that are damaged during construction activities shall be repaired and or replaced, at the discretion of the City Engineer.
- (L) Special Structures. The use of special structures such as natural bottom arches and box culverts, are subject to the review and approval of the City Engineer. Special structures may be permitted in accordance with the latest "Georgia Department of Transportation, Standard Specifications, Construction of Transportation Systems," latest edition. Additional fees for review and inspection may be charged to the Developer. In addition, a separate maintenance bond may be required for the approved special structure.
- (M) Drainage Ditches and Swales.
- (1) Ditches, swales or channels shall be designed and constructed to convey at least the fully developed 25-year storm, with freeboard equal to 20% of the design flow depth, or 1 foot, whichever is greater. All channels that lie within a FEMA-indicated floodplain shall be designed to adequately convey the 100-year frequency storm event.
 - (2) Transition channels shall be provided at the inlet and outlet ends of all culverts and pipe systems, unless otherwise provided herein.
 - (3) The maximum flow rate and velocity at the project site's downstream property line shall not exceed the pre-developed flow rate and velocity.
 - (4) In cases of potential erosion due to irregular channel alignment, extreme velocities or excessive slopes, a paved ditch or concrete valley gutter may be required. However, if, in the opinion of the City Engineer, the expected long-term maintenance of an open or surface drainage system could prove impractical; a closed or piped drainage system design may be required.
 - (5) The cross-sectional shape of channels shall be as found in the Standard Design and Construction Details. "V"-shaped cross sections are not permitted in grassed channels.
 - (6) If the channel will be affected by backwater from culverts, bridges, other structures or floodplains; backwater curves shall be shown in profiles of the channel.
 - (7) Construction Standards. Ditches and channels shall be constructed to the line, grade and cross section specified on the approved plans and shall be free of gullies or other irregularities. Protective cover in grassed channels shall be installed as soon as practical, to prevent possible erosion. All ditches or channels constructed in fill material shall be lined with appropriately sized coarse aggregate or other approved materials, based on design velocities.

City of Valdosta Land Development Regulations

(N) Easement Requirements.

- (1) Easements, where required shall meet the requirements of Section 302-10(B) of this LDR.
- (2) Drainage easements for improved ditches, pipe construction and detention facilities shall be cleared, opened and stabilized at the time of development to control surface water run-off. Easements may not have a cross slope greater than 4:1 (horizontal: vertical).
- (3) Run-off slope and side slopes are to be specified by the Developer's engineer, according to good engineering practice. Drainage easements shall be provided according to the minimum requirements found in the "Table of Easements for Storm Drain Pipes and Systems" and shall conform to City standards.

Table of Easements for Storm Drain Pipes and Systems

Diameter Of Pipe	Minimum Easement Width
18" to 36"	20 feet
42" to 72"	25 feet
Over 72"	30 feet
Multiple Pipes	Standard width plus 10 feet
Improved Ditches/Natural Watercourses	20 feet + width at top of ditch
* Additional width may be required by the City Engineer for deep installations	

- (4) Where a subdivision is traversed by a stream or other state waters, a stream buffer is required in conformity with Chapter 324 of this LDR.
- (5) Where a subdivision is traversed by a drainage way or channel other than state waters there shall be dedicated an access and maintenance easement measuring not less than 20 feet in width or at least 10 feet on each side of the top of bank, whichever is greater.

Section 332-23 Bridges and Concrete Box Culverts

- (A) The design and construction of bridges and concrete box culverts shall comply with all applicable standards of the GDOT and AASHTO.
- (B) The review and inspection of bridge and concrete box culvert design and construction are subject to additional fees, as may be set from time to time by the Mayor and City Council. Said fees shall cover the costs of an independent structural review and supplemental inspections, performed on behalf of the City at the discretion of the City Engineer, by an independent Registered Professional Engineer.
- (C) At the completion of bridge and/or concrete box culvert construction, the Designer and Engineer of Record shall provide written certification that the structure was constructed in accordance with the approved plans, all applicable standards of the GDOT and that the bridge or concrete box culvert is complete, structurally sound and safe to accommodate traffic.

Section 332-24 Walls

- (A) No wall or fence (other than approved noise abatement walls or walls used as a required buffer between two dissimilar zoning districts) shall be more than 8 feet in height. If an approved retaining

City of Valdosta Land Development Regulations

wall is to be located adjacent to a public street, the wall should not obstruct sight distance for motorists as determined by the City Engineer. See also Section 214-6 of this LDR.

- (B) When permanent grades are proposed with a resulting slope steeper than 1 foot vertical for every 3 feet of horizontal displacement (3:1), an appropriate retaining structure shall be designed by a Registered Professional Engineer to be constructed of reinforced concrete or other masonry materials designed by a Registered Professional Engineer in compliance with applicable regulations of the U. S. Occupational Safety and Health Administration. An engineered design may be substituted for the reinforced concrete design, at the discretion of the City Engineer. All structural components of the wall shall meet the minimum building codes for the proposed use.
- (C) When the necessity for an earth retaining structure is required for a vertical displacement of 30 in. or less, appropriate landscaping timbers, or an equivalent approved by the City Engineer, may be employed if no permanent structure is supported by the soil retained by the retaining wall.
- (D) Wall design will consider foundation drainage and select backfill material for the proposed conditions.
- (E) Walls shall be located in such a fashion as to not encroach upon existing or proposed drainage easements or drainage courses or floodplains to encumber the natural flow of surface runoff of stormwater except when designed and approved in a Stormwater Management Plan pursuant to Chapter 310 of this LDR. Walls shall be located at a distance from such water courses to allow for anticipated future maintenance of the easement to prevent a safety hazard to maintenance workers or to jeopardize the structural integrity of the wall.
- (F) Walls that are not attached to the permitted structure and require a foundation shall be permitted as a free-standing structure and shall be inspected, as prescribed by the permitting procedure. Walls will be inspected for conformance with the approved design. Any deviation from the approved design will require the Engineer of Record to submit a certification of the non-conforming structure along with supporting calculations to indicate that the construction is consistent with the initial design parameters. In the event the Inspector has not been provided ample opportunity to inspect the structure, the Developer must provide a certification of the construction by the Engineer of Record and geotechnical reports for concrete testing for strength and reinforcing steel specifications. Failure to comply with the requirements of this section will require that the remaining work cease and/or removal of non-conformance until the adequacy of structural integrity is demonstrated to the satisfaction of the City Engineer.
- (G) Retaining walls that are proposed for the purpose of stormwater retention must be designed in such a way that the walls are capable of a hydrostatic load, as measured from the top of the foundation footing to the highest elevation along the top of the wall. The hydrological design must allow for a free board dimension of 1 foot and an emergency overflow capacity equal to the allowable peak discharge for the 100-year storm event. The routing calculations should not take into account the existence of the emergency overflow. Place the overflow device above the projected 100-year flood elevation within the detention area.
- (H) Any construction that may impact or be within the right-of-way of an existing or proposed water or sanitary sewer easement must be approved by the utility providing service.

Section 332-25 through 332-30 *Reserved*