SEMINOLE COUNTY PUBLIC WORKS ENGINEERING MANUAL

Chapter 1

Transportation Standards

(July 24, 2013)

Transportation Standards

Sec. 1.1. Introduction

The purpose of these Standards is to establish the minimum criteria for the design, construction and maintenance for all land development projects within Seminole County. All design, construction and maintenance for public and private streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, bicycle ways, trails, underpasses and overpasses used by the public for vehicular and pedestrian traffic, along with traffic control devices must conform to the latest versions of the Florida Department of Transportation (FDOT) "Manual of Uniform Minimum Standards of Design, Construction and Maintenance for Streets and Highways" (referred to as the "Florida Greenbook") (Section 336.045, Florida Statues), the FDOT Roadway and Traffic Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System, the Federal Highway Administration (FHWA) "Manual on Uniform Traffic Control Devices" (MUTCD) (Section 316.0745, Florida Statues) and the Florida Accessibility Code. Depending on the specific request, the County Engineer or his designee shall review any variance to the minimum criteria of the Transportation Standards. In accordance with Section 380.04(3)(a) of the Florida Statutes, roadway projects managed by state and local governments are exempt from these requirements.

1.1.1. Relationship to Florida Statutes

The Transportation Standards are to be consistent with Florida law. Consequently, all standards must be consistent with the latest editions of the FDOT "Greenbook," the FDOT Roadway and Traffic Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System and the MUTCD design guidelines.

1.1.2. Relationship to the Land Development Code

The Land Development Code (LDC) is oriented toward the development of individual sites and the process for receiving development approvals. It does not provide detailed specifications for infrastructure design. These standards provide guidelines that meet accepted standards of engineering practice and are mutually supportive and consistent with the LDC.

Sec. 1.2. Development Planning and Regulation

1.2.1. Level of Service

The County's Comprehensive Plan Transportation Element sets forth appropriate levels of service for County roadways.

1.2.2. Functional Classifications

All streets and highways in the State of Florida are classified based on their operational function and must be consistent with state and federal requirements. The functional classifications for all County roads and State roads are illustrated in the Seminole County Comprehensive Plan. The County Engineer or his or her designee shall determine the classification of roadways not listed.

See Sec. 1.11 Right-of-Way and Pavement Widths by Classification.

1.2.3. Access Design Standards

Access specifications concern access in general terms. The organization of this section is deliberate and begins with the major issue of protecting the roadway function, and concludes with the details of driveways and internal design.

A. Access Requirements

1. A minimum number of access points must be provided to serve the development adequately. Joint and Cross Access Easements, and dedication of access rights may be required to protect the safe and efficient operation of the accessed development.

2. To provide ease of ingress and egress for private property and to increase safety with the least interference to traffic flow on public streets, the number and location of driveways is regulated by the dedication of access rights to the County.

3. Street stubs or access rights to adjoining undeveloped areas should be provided where required by the County Engineer to give access to such areas or to provide for proper traffic circulation.

4. Street stubs in excess of 150 feet must be provided with a minimum stabilized turnaround in accordance with the Florida Fire Prevention Code or as approved by the County Engineer.

5. Auxiliary lanes, median modifications and other design features may be required, including cross-access agreements.

6. Every lot or parcel must be served from a publicly dedicated street; however, a developer may retain as private a local street if the following conditions are met:

a. Public right-of-way is not required in order to serve adjacent development that either exists or is projected.

b. A permanent access easement is granted for service and emergency vehicles and for maintenance of public and semi-public utilities.

c. A reciprocal easement for ingress and egress is granted for all residents of the development.

Note that all private roadways must be designed and constructed to County Standards.

7. All lots must front on a paved road. A development must abut, or have as its primary access, a street constructed to County standards as established herein. All abutting roadways providing direct access to the development must be paved to the nearest public paved road. Where paving is required on the abutting roadway beyond the development frontage, then paving only to the development access points may be allowed provided that in no case may the length of required paving be less than the length of the development's frontage along the abutting roadway.

8. Additional regulatory permits may be required prior to a building permit being issued. This is the responsibility of the applicant.

a. A FDOT driveway connection permit is required for all proposals to access State roads.

b. A County Site or Right-of-Way (ROW) use permit is required for all proposals to access any County right-of-way or easement.

c. A right-of-way use permit is required for any construction in, utility usage of or access to a County right-of-way. Such construction must meet all County standards and permitting procedures can be found at the Seminole County website. Permit fees are established by the Board of County Commissioners.

9. Access Limitations require that no new residential development may create any parcels zoned for single-family or duplex residential uses having access on an arterial or collector roadway.

1.2.4. Intersections

A. General

1. The design and location of urban or suburban intersections should be consistent with the requirements of the latest edition of the Florida Greenbook and "A Policy on Geometric Design of Highways and Streets."

2. Intersections must be designed to:

a. Intersect at right angles;

b. Avoid the connection of more than two streets;

c. Mirror the opposing leg whenever possible (for example, a 4-lane roadway should meet a 4-lane roadway);

d. Address safe pedestrian crossing in accordance with current ADA and FDOT requirements;

e. Provide sight visibility in accordance with the FDOT Design Standards; and

f. Accommodate County Trail crossing standards.

B. Spacing for Street Intersections

1. A local street may intersect a collector if spaced at a minimum distance of 660 feet from any other intersection or, in the case of a "T" type intersection, at a minimum distance of 660 feet from any other street intersection.

2. A residential street functions only to service a local residential community and does not connect any higher classified roadways.

C. Spacing for Signalized Intersections

The need for signals must be based upon one or more of the warrants included in the MUTCD being satisfied. Minimum spacing must meet current State Highway System Access Management Standards. Access class #, based on FAC Rule 14-97, will be determined by the County Engineer.

D. Pavement (or Curb) Radii at Intersections

The minimum intersection radii of pavement edge, or back of curb, where used, at all typical intersections approximating a right angle are as follows:

Connection From	To	Minimum Radius
Collector or Local	Arterial	50 feet
Any Roadway	2-Lane Access	50 feet
Local	Collector	50 feet
Subdivision	Local	35 feet
Subdivision	Subdivision	25 feet

1.2.5. Median Access Provisions

To assure traffic safety and protect roadway capacity, median openings located within a roadway must be spaced the maximum distance apart that allows safe and adequate traffic condition.

A. Median Width and Design

1. Medians should be of sufficient width to shadow left turn or crossing vehicles and should meet the current FDOT Design Standards and Access Management Standards.

2. The "bullet nose" design with a control radius of 50 feet is preferred over the circular end treatment as the more natural path facilitates the maneuver at a higher speed with less or no encroachment on the adjacent lane.

3. Refer to Florida Greenbook for required median widths based upon speed limit, number of lanes, and whether the location is rural or urban.

B. Median Spacing and Location

1. Median openings for collectors and above should be in accordance with FDOT Access Management Standards per Florida Administrative Code Rule 14-97, as this rule may be amended from time to time.

2. Dedicated public streets are given priority consideration for median openings.

3. All median designs and provisions must be consistent with FDOT standards.

1.2.6. Marginal Access Provisions

Marginal access provisions are designed to assist in assuring that ingress and egress movements to and from the roadway are handled with a minimum of impact to the public facility. The basis for assessing the need for particular marginal access provisions lies in the following criteria:

A. Current or projected future functional classification of the road accessed;

B. Projected average daily traffic (ADT) of the accessing development;

C. Projected peak hour traffic on the accessing development;

D. Trip characteristics, i.e., vehicle type, hours of operation;

E. Site and roadway characteristics and design;

F. Speed of accessed roadway; and

G. Urban versus rural roadway facilities.

1.2.7. Number and Spacing of Driveways

In general, the minimum number of driveways necessary to adequately accommodate access to and from the site must be permitted in accordance with the current FDOT Driveway Information Guide, unless otherwise directed by the County Engineer or his or her designee.

A. Spacing between driveways must conform to the Table below based on functional classification. Distance is measured from nearest edge of pavement to edge of pavement. (Detail T-1)

Facility	Minimum Separation
Arterial	330 feet
Collector, Major or Minor	330 feet
Local	200 feet

B. Driveways on opposite sides of any undivided street classified collector or arterial must either be aligned on the same centerline or be offset by adequate distance to assure that left turn lanes maintain proper storage and that no conflicts are created by opposing left turns.

C. Driveways on opposite sides of any undivided street classified local must either be aligned on the same centerline or be offset a minimum of 200 feet measured from edge of pavement to edge of pavement.

D. For developments that request more than one two-way driveway, based upon parcel size, projected trip generation of the site, amount of roadway frontage, and other appropriate design considerations, additional driveways may be permitted if all other requirements are met, as approved by the County Engineer.

1.2.8. Corner Clearance

A. Parcels located in the corner of two or more roadways where at least one of the roads is a public facility must locate access drives no closer than 330 feet from the intersection. Access may be provided at 200 feet from the intersection, where approved by the County Engineer. (Detail T-1)

B. If the corner parcel accesses one or more arterial or collector roadways, full access is limited to 660 feet from the intersection on the arterial or collector. A right-in/right-out is permitted at 330 feet from the intersection. (Detail T-1)

Sec. 1.3. Auxiliary Lanes (Right and Left Turn Lanes)

The purpose for the development of marginal access standards is to reduce conflict between driveway entrances and through traffic. One method of reducing conflict is to provide a refuge area where vehicles can leave the through traffic lanes, slow down and accomplish the turn. Auxiliary lanes, as defined below, provide that capability and consequently may be required. The following specifications should be regarded as minimal. Longer lanes may be required based upon the speed of the accessed roadway, the development's projected right and left turn volumes, or construction conflicts with existing drives, streets or roads.

1.3.1. Requirements

A. The length of turn lanes must comply with FDOT standards.

B. On 2-lane roadways a **right turn** lane section is required for developments with a daily trip rate of 3,000 ADT or greater. On 2-lane roadways with posted speeds of 40 mph, or greater, a **right turn** lane may be required as determined by the County Engineer. On 4- and 6-lane roadways, a right turn lane section is required for developments with a daily trip rate of 4,000 ADT and greater. In all cases, an inbound radius of 50 feet at development access is required. See Detail T-16 for design and markings specifications, unless otherwise directed by the County Engineer.

C. A **left turn** lane section is required for any development that accesses a road classified Collector and above or has a posted speed of 35 mph or higher. When a left turn lane falls within 300 feet from an existing left turn lane terminus, then a total 36-foot section is required to eliminate weaving or "hour glass" sections. See Detail T-16 for design and markings specifications, unless otherwise directed by the County Engineer.

Sec. 1.4. Driveway Design

The FDOT Design Standards must be used for all driveway designs, unless otherwise directed by the County. (Detail T-3)

Sec. 1.5. Cross-Access and Joint Use Driveways

1.5.1. During the review of a project or as a condition of approval, an agreement between the property owner and the Board of County Commissioners for a joint-use drive or cross-access easement may be required. The intent is to connect adjacent properties in order to limit the number of access points and to constitute a joint and common means of access to adjacent properties. The

owner or the owner's agent shall submit to the County Engineer the following information upon request:

A. Owners legal name and address;

B. Legal description for the total site; and

C. Legal description for the joint-use drive or cross-access easement, to include a survey drawing.

1.5.2. The legal form of any such agreement is subject to the approval of the County Attorney's Office.

Sec. 1.6. Signing and Marking Specifications (supplement to MUTCD)

1.6.1. All private roadway striping must meet County public roadway striping standards.

1.6.2. All private or public development must comply with Chapter 316, Florida Statutes, the latest edition of MUTCD, and Chapter 250, Seminole County Code, for signing and markings. Signing and markings must be depicted on all development plans and require approval from the County Traffic Engineer.

1.6.3. If at any time prior to final acceptance, an unforeseen need becomes apparent for signing or pavement markings that were not shown on the approved plans, the County reserves the right to require the additional signs or markings in the interest of public safety and as a condition of County acceptance.

1.6.4. Thirty (30) inch high intensity "STOP" signs are required at every street intersection for acceptance of public infrastructure improvements. All signs must be in place prior to issuance of the first building permit. The developer shall furnish and install regulatory signs as required by the County Traffic Engineer. Regulatory signs must conform to the specifications in the MUTCD. All materials must be 3M Scotchlite, high intensity. All signs must be mounted on twelve (12) channel posts (hot dipped galvanized, two (2) pounds per foot).

1.6.5. When required, speed limit signs must reflect the standard stated within the MUTCD. The County Traffic Engineer shall determine posted speed limits in compliance with Chapter 316, Florida Statutes and the Board of County Commissioners.

1.6.6. All pavement markings and field installation must be approved prior to final acceptance by the County Traffic Engineer in accordance with the latest editions of the FDOT Standard Specifications for Road and Bridge Construction and the FDOT Design Standards.

1.6.7. All traffic control devices for private developments shown on final approved or as-built plans are the responsibility of the property owner to maintain in perpetuity. Personal or property damage as a result of missing signs, worn and ineffective traffic control devices and markings, or other site plan or code requirements are the individual liability of the property owner, any other legally responsible entity, or both.

1.6.8. All markings must conform to the Seminole County Details and the latest edition of the FDOT Standard Specifications for Road and Bridge Construction along with the most current issue of FDOT's Design Standards. In addition, this document conforms to the latest editions of a Policy of Geometric Design of Highway and Street (AASHTO) Standards, and the MUTCD.

A. Temporary tape must be installed prior to darkness of day of existing markings removal. No conflicting markings are permitted.

B. No markings may be installed prior to layout approval by the County Traffic Engineer.

C. Centerline and edge line must extend 20 feet beyond transition point downstream and 20 feet prior to transition point upstream.

D. Striping must be based on the FDOT Index 17346.

E. Gore bullnose must have a minimum 50-foot radius.

F. All striping plans require the approval of the County Traffic Engineer.

G. During auxiliary lane construction and installation of markings, signs must be placed in the work zone in accordance with the latest edition of the MUTCD and as approved on the Maintenance of Traffic (MOT) Plan.

H. Two-way blue reflective markers must be installed in the center of the driving lane nearest each fire hydrant. Further specifications can be found in Chapter 3, Public Safety Standards, of this manual.

I. Parking stalls must be marked with white paint.

J. When a lane closure is permitted on a road with a classification of collector or above, hours of closure will be limited between 9:00 a.m. and 4:00 p.m. unless prior consent is obtained from the County Traffic Engineer. These hours may be further limited by Public School hours, if applicable.

K. Additional paving, marking and signage may be required for safety and traffic control as determined by the County Traffic Engineer.

1.6.9. Signing and Marking Details

A. Street Name Signs

Street name signs must be nine inches tall with six inch "C" letters on 0.080" anodized aluminum with high intensity white letters and border with green translucent background and must include the Seminole County logo in reflective materials. Street signs must be double blade bolted on both ends and mounted on a standard vandal resistant twist bracket between the sign and U channel. The street sign assembly (four nine -inch blades with twist bracket) must be installed on top of the stop sign post.

B. Street Name Signs Specifications

The style of the Street Name sign must reflect the governing agency responsible for the maintenance of that entire assembly. When the entrance road to a subdivision or development is located within City jurisdiction and it intersects a County roadway, the City is responsible for maintenance of both Street Name signs on the assembly. Therefore, both signs would exhibit identical design criteria, and neither sign may carry a Seminole County Logo.

Seminole County Logos are exclusive to County maintained Street I.D. Assemblies and must not be provided for or installed on any assembly that is not maintained by Seminole County.

1. Ground Mount Street I.D.:

a. White Legend/Translucent Green Background with County logo

b. 0.5 inches White Border 0.75 inches Radius

c. High Intensity Materials

d. Font 6 inches Highway Gothic Upper Case

e. Sizes:

i. 24 inch length x 9 inch height

ii. 30 inch length x 9 inch height

iii. 36 inch length x 9 inch height

iv. 42 inch length x 9 inch height

f. Mount on Twist Bracket, on 12-foot u-channel, above stop sign

2. **Overhead Street I.D.:**

a. Overhead Illuminated Street I.D.

b. White Legend/ Translucent Green Background

c. 1.25 inches White Border No Radius

d. Materials White Translucent Lexan

e. Font Helvetica/Medium (act.ak rev.r) 8 inch Upper/Lower Case

f. Sizes: Length 94.5 inch x Height 15.5 inch Or 70.5 inch x 15.75 inch

3. **Overhead Aluminum I.D.:**

a. White Legend/Translucent Green Background

b. 1 inch Border 1.5 inches Radius

c. High Intensity Materials

d. Font 8 inch Helvetica/Medium (act. ak rev r) Upper /Lower Case

e. Sizes:

i. Length 48 inch x Height 18 inch

ii. Length 60 inch x Height 18 inch

iii. Length 72 inch x Height 18 inch

4. **Dead End Signs:**

a. Black Legend/Yellow Background

b. 5 inch Black Border 0.75 inch Radius

c. High Intensity Materials

d. Font 6 inch Highway Gothic Upper Case

e. Size: 24 inch Length x 9 inch Height

f. Mount on cantilever, on top of 12-foot U-channel behind stop sign below twist bracket if applicable

5. **Regulatory Signs:**

Regulatory signs must conform to the specifications in the MUTCD and FDOT Standards.

Sec. 1.7. Signal Specifications

1.7.1. All signal design and installation must comply with the latest edition of the FDOT Design Standards and any applicable Seminole County Standards.

1.7.2. Any and all signal installations and signal modifications require a signal plan. These plans are subject to review and approval by the Seminole County Traffic Engineer at all stages of development. Prior to construction, final plans must be signed and sealed by a State of Florida Registered Professional Engineer and submitted to the Seminole County Traffic Engineer. Upon completion of all signal work, as-built drawings, with the corresponding digital files, must be provided to the County Traffic Engineer.

1.7.3. Seminole County is standardized on mast arm type signal installations. Mast arms in accordance with the latest Seminole County Mast Arm Standards are required on all County and City roadways and preferred on State highways.

1.7.4. Modifications to existing signals are treated the same way as new signal installations in that they require professionally designed plans reviewed by the County and adherence to all FDOT and Seminole County Standards. For modifications to existing signals, temporary detection is required during construction to maintain actuation of all approaches to the signal.

1.7.5. All wiring, materials and equipment must meet Seminole County standards and must be submitted to the County for review and approval. Signals must be installed by County-approved contractors. Once the signal is accepted, it will become the maintenance responsibility of the County.

1.7.6. The contractor shall notify the County Traffic Engineer prior to beginning any work at an intersection.

1.7.7. Annual power and maintenance costs of a traffic signal located at a privately maintained road, street or drive is the sole responsibility of the owners of the private road, unless arrangements are made to share the expense with cross-street or adjacent owners.

1.7.8. Depending on location or signal spacing, the County may require fiber optic cable interconnection between adjacent signals.

1.7.9. All new signals require illuminated streets signs.

Sec. 1.8. Utility Work in the Right-of-Way:

All work within a County right-of-way, easement or County property requires a County Right-of-Way Use Permit.

1.8.1. Utility Boring

Open cuts on County-maintained roadways are not permitted unless there is clear evidence that there is no physical alternative to an open cut in which case the County Engineer may then consider an open cut. All pressurized pipes under pavement within County right-of-way must be installed inside a casing pipe.

1.8.2. Sediment and Erosion Control

A sediment and erosion control plan is required for all work within the County rights-of-way. The plan must specify both the installation and removal of any temporary measures required.

1.8.3. Right-Of-Way Restoration

A right-of-way restoration plan consistent with County standards is required. The site must be restored to its original or better condition, as approved by the County Engineer. Utilities within County rights-of-way that are no longer needed must be “taken out of service” as directed by the County Engineer. AC pipe to be “taken out of service” must be removed. Pipe bursting is <u>not</u> permitted for asbestos cement (AC) pipe.

1.8.4. Submittal Requirements:

A Construction Application/Permit is available from the Engineering Division for all work within County right-of-way.

Sec. 1.9. Maintenance of Traffic Requirements

Maintenance of Traffic Requirements

The purpose of this Section is to provide standards and procedures for establishing and permitting Maintenance of Traffic (MOT) Work Zone within County right-of-way.

1.9.1. Applicability

Seminole County approved MOT plans are required for any construction or work within the County right-of-way, easements or on County property including the installation or maintenance of any public or private utility, structure, driveway, culvert, pavement or other object.

1.9.2. Exemptions

No MOT plan is required for Seminole County Public Works projects. Construction Zones within State Road right-of-way are the responsibility of the FDOT

1.9.3. Application Procedures

Applications for MOT approval, accompanied by the appropriate fee, must be submitted to the Engineering Division. Work Zones must comply with the MUTCD and the FDOT Design Standards. The proposed zone must be reviewed and approved prior to field application. Once approved, the Engineering Division shall field-inspect the zone for compliance and traffic safety. It is the responsibility of the applicant to assure the maintenance of the zone to include, but not limited to, darkness provisions and covering or removing those signs that are not applicable not only daily, but immediately as the need arises. The fee and application form must be as approved by resolution and updated as needed.

1.9.4. Insurance

The insurance required for the right-of-way plan must satisfy the requirements for the MOT plan, thus no additional coverage is required.

1.9.5. Submittals

The following information must be provided either in electronic format or non-electronically by applicants for all County permits:

A. Name, local address, email address and phone and fax number (including emergency contact number) of applicant;

B. Date, precise description of the work proposed;

C. Two sketches or drawings showing the location of the work;

D. Special conditions;

E. A maintenance of traffic plan; and

F. The expected starting and completion dates.

1.9.6. Special Conditions for a Total Roadway Closure

In the event a total roadway closure is permitted by the County Traffic Engineer, it is the responsibility of the contractor to notify the public and County Engineer a minimum of 10 days

prior to the actual roadway closure. Upon request, the County Traffic Engineer shall provide a notification list to assist the contractor in the notification process.

1.9.7. Applications and Field Installations

The County Engineer or County Traffic Engineer has the authority to approve or deny applications and field installations.

1.9.8. Time Limit

If work does not commence by the 60th day after date of issuance, the permit will be considered void and reapplication will be necessary. Work must be completed by the completion date indicated on the application. Work not completed by the completion date is subject to stop work order, re-application, additional fees or other remedies as may be required by the Board of County Commissioners.

1.9.9. Restoration

No person may use County right-of-way, easement or County property for any purpose for which a permit is required by this Section without first obtaining a permit. In the event County right-of-way, easement or County property is used or construction takes place without a permit, the person(s) shall remove any construction facility, make the area safe for traffic and pedestrians and cease any further use until a permit is obtained. Upon completion of construction or work within the permitted zone, the applicant shall remove all signs, barricades, and other temporary devices immediately. In the event that the County removes such devices, the County is not obligated to return the devices to the applicant.

Sec. 1.10. Road and Street Standards

The following standards apply to public and private roadways.

1.10.1. Grade

A. Minimum centerline grade for all roads with curb and gutter is 0.30 percent.

B. Maximum centerline grades for all roads may not exceed values delineated in Table 3-4 (Flat Terrain) of the Florida Greenbook.

1.10.2. Curve Radius

A. No curve on a residential street or road may have a centerline radius of less than 100 feet unless approved by the County Engineer or his or her designee. Curves with less than a 180-foot center-line radius require pavement widening from point of curvature (P.C.) to point of tangency (P.T.) unless the County Engineer, based upon the application of sound and generally accepted engineering practices and principles, permits signage to provide appropriate warnings and notices to drivers.

B. This requirement must be accomplished by widening the pavement 3 feet each side from P.C. to P.T. and taper (100-foot minimum) on both ends.

C. Curve signs may be required as directed by the County Traffic Engineer.

1.10.3. Subgrade, Base Course, Surface Course and Friction Course

All construction must conform to FDOT standards entitled "Flexible Pavement Design Manual" and to Details T-7 and T-8 unless otherwise directed by the County.

1.10.4. Curb and Gutter

A. All subdivision streets must be paved and drained utilizing curb-and-gutter construction except in the following circumstances:

1. Where right-of-way width is 70 feet or greater with a rural pavement section without a sidewalk; or

2. "Most-effective" recharge areas.

B. The width of curb and gutter must be a minimum of 24 inches and either FDOT Type F or Miami curb (subdivisions only). Approved mountable median curb may be used around median dividers. All curb designed to handle water must incorporate an approved gutter design. A stabilized subgrade must be established beneath all curbs and one foot beyond the back of curb.

C. No water valve boxes, meters, portions of manholes, or other appurtenances of any kind relating to any underground utilities may be located in any portion of a curb and gutter section.

D. The minimum allowable flow line grade for roadways with curbing is 0.30%. The tolerance for ponded water in curb construction is one-fourth inch (1/4") maximum; if exceeded, the section of curb must be removed and reconstructed to the line and grade of the adjacent curb.

E. Plastering is not permitted. Saw-cut all joints (unless an alternate method is approved) at intervals no greater than 10 feet, except where shorter intervals are required for closures, but, in no case, less than six feet.

F. No raised portion of any type of curb may be constructed beyond the radius of the driveway return.

G. After concrete has set sufficiently, but in no case later than three days after construction, the curbs must be backfilled and compacted, as required.

H. All cross-street valley gutters must be three feet in width and constructed of concrete.

I. Where curbing is removed and replaced, removal must be to the nearest joint and replaced in-kind, to existing line and grade.

1.10.5. Sidewalks

A. Construction of sidewalks is required on:

1. All roadways providing access to a development; and

2. All other roadways adjacent and contiguous to a proposed development.

B. Concrete sidewalks must be constructed on both sides of all streets with 3,000 psi concrete. Sidewalk must be a minimum of five (5) feet in width (six feet on arterials & collectors) and four inches thick (six inches thick in driveways and in front of common areas).

C. If alternative path systems or Trail connection alternatives are approved instead of sidewalks, specifications for materials and design must be approved by the County Engineer. All Trail connections must be approved by the County Engineer.

D. On sidewalks and alternative path systems, all sidewalk ramps must be constructed in compliance with current ADA requirements and must include detectable warning device (truncated domes).

E. Dead end sidewalks must have signage to indicate the end of the sidewalk.

1.10.6. Cul-De-Sac Design

A. General

1. Permanent dead-end streets may not exceed 1,200 feet in length. Where unusual circumstances arise, a greater length may be approved by the County Engineer.

2. A cul-de-sac must be provided with a minimum turnaround having a pavement radius of 42 feet for Residential Uses and 54 feet for Commercial Uses. However, on a case by case basis the Building Fire Official may require a larger radius. However, any application of a center island must permit the required emergency vehicle to safely negotiate a complete turnaround without encroaching on the island or outside curbing.

B. Unpaved Island

An unpaved island may be provided in the center of the turnaround as long as the following conditions are met:

1. An unpaved island requires a right-of-way use permit for construction or alteration.

2. The island must be surrounded by a median curb or standard curb.

3. The surface of the island must be improved with landscaping (grass, trees and shrubs).

4. Any landscaping or other elements located in the island may not interfere with sight distance.

5. The island must have a minimum diameter of 20 feet measured to the back of the curb.

6. The developer shall provide for perpetual maintenance of the island through homeowners associations or other acceptable organizations or legally assign the maintenance responsibilities to a lot or lots fronting on the cul-de-sac. A signed and approved agreement with the County is required for any such agreement or arrangement.

7. Islands within turnarounds on a cul-de-sac or in other approved locations must retain existing vegetation and improve the visual qualities of the turnaround through the addition of landscaping or decorative pavement, where possible.

8. Pavers, stamped concrete or other decorative surface may be permitted if acceptable to the County Engineer.

9. Landscaping within islands must conform to the County's landscaping requirements section.

Sec. 1.11. Right-of-Way and Pavement Widths

1.11.1. Right-of-Way and Pavement Widths by Classification

A. Required Right-of-Way and Pavement Widths

Curb And Street Type	ROW In Feet		Pavement In Feet	
	Urban	Rural	Urban	Rural
Local	60	80	20 (min.)	20 (min.)
Residential 50 lots and above	50	70	20 (min.)	20 (min.)

Less than 50 lots*	46	66	20	20
Cul-de-sac (radius)(1)	53	50	42 (min.)	42 (min.)
Service Drive	50	70	20	20
Townhomes	40	--	22	--

*46 foot ROW and 20 foot pavement applicable on any roadway with 50 lots or less, at any point within the development

(1) See Sec. 1.10.6(A)2

– All internal roadways must be private and built to County Standards; all public roadways must be designed and constructed to County standards

Note: Pavement widths exclude curbing.

B. Reduced Right-of-Way

With the approval of the County Engineer, narrower existing rights-of-way may be accepted provided that drainage, utilities, sidewalk, etc. are accommodated.

1.11.2. Additional Right-of-Way

A. Section 35.100(a) of the LDC specifies how the need for required dedication or conveyance of right-of-way is determined.

B. Section 35.100(b) of the LDC specifies the instruments to be used for the dedication or conveyance of right-of-way.

C. Section 35.100(c) of the LDC specifies additional requirements for the dedication or conveyance of right-of-way.

D. Section 35.100(d) of the LDC specifies the requirements for additional right-of-way at intersections.

E. Section 35.100(e) of the LDC specified the requirements for right-of-way at corner clip radius.

1.11.3. Additional Pavement Requirements

A. Divided Roads

On divided two-lane roads (boulevards), minimum pavement width for each lane is 20 feet, exclusive of curbs, if any. On undivided or divided four-lane roads, minimum inside lane widths must be 12 feet each while minimum outside lane widths must be 14 feet, with provisions for auxiliary lanes as may be required by the County Engineer.

B. Rural Road Paved Shoulders

On rural roadways where paved shoulders are present, any improvements to the roadway necessitate construction of paved shoulders throughout the improvement project whenever feasible.

Paved shoulders must be consistent with Seminole County and FDOT standards.

C. Bicycle Facilities

To the fullest extent possible, all rural arterial and collector sections must have shoulders eight feet in width (five feet paved & three feet stabilized), and all urban arterial and collector sections must have either a curb lane 14 feet in width or an undesignated lane four feet in width.

Sec. 1.12. Bicycle, Pedestrian and Trail Facilities

1.12.1. General

Unless otherwise provided for in this manual, all design, construction and maintenance of bicycle, pedestrian and Trail facilities must conform to the provisions of the County's Trail Design Standards, the latest editions of the Florida Greenbook, FDOT Bicycle Facilities Planning and Design Manual, Pedestrian Handbook and Trail Intersection Design Handbook.

1.12.2. Roadway Improvements

All new highways, except those where bicycles are legally prohibited, such as controlled access highways, should be designed and constructed assuming bicycle uses. Bicycle-safe design practices should be followed including safe drainage grates and railroad crossings, smooth pavements and signals responsive to bicycles. In addition, the desirability of adding facilities such as bicycle lanes, bicycle routes, shoulder improvements and wide curb lanes must be considered.

Sec. 1.13. Trail Facilities and Design Standards

1.13.1. Trail Design Standards

Trail design standards must comply with Details T-22 Thru T-31.

1.13.2. Trail Crossing Treatments

A. Trail Crossing Treatments must comply with the Trails Protection Ordinance #2002-3. Trail Connection/Crossing Permit contact is Engineering Division Permit Coordinator.

B. Typical Crossing Treatments

1. The trail corridor intersects many roadway facilities with varying typical sections, volumes and speeds. Minimum design and crossing treatments are based on the type and function of the roadway. There are typically three types of crossings, as follows:

a. Mid-block, at-grade crossing;

b. Intersection at-grade crossing; and

c. Grade-separated crossing.

2. Mid-block at-grade crossings within 600 feet of an intersection on any arterial or collector roadway must be avoided where practical. Where less than 600 feet of spacing exists, crossings should be moved to the nearest intersection.

3. The following table summarizes mid-block crossing characteristics and recommended treatments.

Typical Section	Function	Traffic Conditions	Recommended Treatment (minimum)
2-Lane	Arterial Collector Driveway to commercial facility Residential roadway	Site distance not restricted Actual speeds less than 45 MPH ADT less than 6,000	At-grade crossing with trail signing/marking No other advance warning required
2-Lane	Arterial Collector Residential roadway	Site distance restricted Actual speeds over 45 MPH ADT over 6,000	At-grade crossing with trail signing/marking Advance flashers on W11 A-1

Typical Section	Function	Traffic Conditions	Recommended Treatment (minimum)
4-Lane	Arterial Collector	ADT less than 7,500 Actual speeds less than 45 MPH	Crossing with nearest signalized intersection is desirable At-grade crossing with advance overhead flashers Regulatory speed reduction if actual speeds over 45 MPH Other advance features and safety devices as determined by the County Traffic Engineer
4- or 6-Lane	Arterial Collector	ADT over 7,500	Grade separation or crossing with nearest signalized intersection is desirable Consider mid-block signalization if 1,320 feet or more from an existing signal Other advance features and safety devices as determined by the County Traffic Engineer

4. Mid-Block Crossing

Typical treatment and design features are illustrated in Details T-26 and T-27. Other advanced features and safety devices may be required by the County Traffic Engineer, including, but not limited to:

a. Additional traffic control devices;

b. Rumble strips;

c. Loop sensors for activation of warning devices;

d. Raised crossings; and

e. Signalization.

5. Existing Un-signalized Intersection

Typical treatment and design features are illustrated in T-28. Advanced features and safety devices may be required by the County Traffic Engineer, including, but not limited to:

a. Pedestrian features (international symbol);

b. Audible pedestrian features;

c. Exclusive pedestrian phasing;

d. Modification of existing phasing or overhead display;

e. Fiber optic multi-message signs in conflicting turn lanes ("No Right Turn" and "Yield to Pedestrian in Crosswalk"); and

f. Additional traffic control signs, markings and signal displays.

6. Grade-separated crossings must be designed to accommodate all users and must adhere to all applicable federal, state and county standards.

7. The County Traffic Engineer shall evaluate all conditions that do not conform to the normal application of these standards and determine the design parameters for these conditions.

1.13.3. Maintenance of Trail Traffic Requirements

Maintenance of trail traffic requirements must comply with the MOT/Work Zones within County right-of-way with review and approval by the County Engineer.

1.13.4. Sight Distance Requirements

All appropriate design measures must be taken to ensure the corner sight triangle is clear of all obstructions (signs, trees, fencing, railing, landscaping, etc.) The sight distance measurements must comply with FDOT requirements for the approach speed of the transportation facility. Vertical and horizontal sight distance for the trail alignment must be designed to ensure safe stopping distance by bicyclists and skaters.

References:

American Association of State Highway and Transportation Officials (AASHTO), 1999

FDOT Plans Preparation Manual, January 2000

FDOT Bicycle Facilities Planning and Design Handbook, July 1999

FDOT Trail Intersection Design Handbook, August 1996

FDOT Pedestrian Planning and Design Handbook, April 1999

FDOT Designing Trail Termini, June 1998

Sec. 1.14. Transit Service and Facilities

1.14.1. General

Unless otherwise provided for in this manual and authorized by State law, all design, construction and maintenance of transit facilities within the road right-of-way must conform to ADA requirements, the latest edition of the FDOT Greenbook, the FDOT Public Transit Office design guidelines and the Orange-Seminole-Osceola Transportation Authority (LYNX).

1.14.2. Roadway Improvements

All new arterial and collector highways should be designed and constructed under the assumption that they will be used by transit vehicles.

1.14.3. Sight Distance Requirements

All appropriate design measures must be taken to ensure the corner sight triangle is clear of all obstructions (shelters, signs, trees, fencing, railing, landscaping, etc.) The sight distance measurements must comply with FDOT requirements for the approach speed of the transportation facility.

SEMINOLE COUNTY PUBLIC WORKS ENGINEERING MANUAL

Chapter 2

Surface Water Management Standards

July 24, 2013

2.1 INTRODUCTION

The purpose of these Standards is to establish the minimum criteria for the design, construction and maintenance for all Land Development projects within Seminole County. All design, construction and maintenance for public and private Surface Water Management Systems used for the conveyance of storm water must conform to requirements of the St. Johns River Water Management District (SJRWMD), the Florida Department of Environmental Protection (FDEP), and the Florida Department of Transportation (FDOT). The County Engineer or his or her designee shall review any variance to the minimum criteria of the Drainage Standards.

2.1.1 Relationship to Florida Statutes

The Surface Water Management Standards must be consistent with Florida law. Consequently, all standards must be consistent with the latest rules of the SJRWMD set forth in Rules 40C-4, 40C-40, 40C-41, 40C-42, 40C-44, and 40C-400, Florida Administrative Code, FDOT's rules set forth in Rule 14-86, Florida Administrative Code (if FDOT Drainage Permit required), and FDEP's rules set forth in Rule 62-25, Florida Administrative Code. Chapter 373, Florida Statutes, must be met as applicable. These State standards are set as minimum requirements and do not supersede Seminole County requirements if these State standards are less stringent. If not covered in these standards all Federal, State and local regulations are applicable. Any reduction in the minimum criteria of the Seminole County Surface Water Management Standards must be reviewed and approved by the County Engineer or his or her designee.

2.1.2 Relationship to the Land Development Code

The Land Development Code (LDC) is oriented toward the development of individual sites and the process for receiving development approvals. The LDC does not provide detailed specifications for infrastructure design. These standards provide guidelines that meet accepted standards of engineering practice and are mutually supportive and consistent with the LDC.

2.1.3 GENERAL

Protection of the water resources in Seminole County is critical to public health, safety and welfare and the control of erosion, sedimentation and flooding is mandatory. The following general criteria apply:

A. The drainage system for each phase of a development must be capable of standing on its own if subsequent areas planned for development are not developed.

B. The drainage system for each development must be sized to accommodate or bypass existing upstream runoff.

C. The general criteria, outlined herein, are in no way to be construed as prohibiting new and innovative techniques. However, all such new and innovative techniques are

subject to the approval of the County Engineer or his or her designee at a pre-design conference prior to their use in the design of any development.

D. The storage and controlled release of retention on-site and infiltration into the ground of excess stormwater runoff from any commercial, industrial, and residential developments are required to prevent runoff that is greater than it was prior to such development.

E. The procedure for disposing of excess stormwater runoff is dependent on the Hydrologic Soil Classification of the soils within the proposed development boundaries, which Hydrologic Soil Classification must be as used and defined by the Soil Conservation Service of the U. S. Department of Agriculture (A, B, C, or D and A/D, B/D, and C/D) in the publication, Seminole County, Florida - Soils, and in other publications of the Soil Conservation Services. However, the location and designation of the various Soil Types as depicted therein must be fully substantiated by soils analysis.

F. All major stormwater conveyance systems must be of the shallow, flat, slow-velocity, open-channel, "floodway" type which must be designed to delay or retard runoff from any development. The side slopes of such conveyance systems must be kept as flat as possible (maximum of four (4) horizontal to one (1) vertical). The construction of any deep artificial canals, ditches, channels, etc., or the construction of major storm sewer systems, which will rapidly convey runoff to any receiving waters or substantially reduce the level of the ground water table, is expressly prohibited. Lowering of the ground water table must be minimized and determined on a site specific basis.

G. Should the proposed development area contain an existing natural watercourse the natural watercourse and the vegetation inherent within it must be maintained and the proposed development designed so as to preserve same. However, the use of such natural watercourse to carry off runoff from any development will be permitted if provision for control of sediment in the excess runoff is made prior to entrance of the runoff to the natural watercourse. This does not preclude the use of wetlands for storage and treatment of stormwater runoff as long as the designed drainage system does not measurably degrade the affected area.

H. All detention and retention basins must be readily accessible from streets or public right-of-way and must be situated so that maintenance can be easily performed.

I. No site alteration may adversely affect the existing surface water flow pattern.

J. No site alteration may cause siltation of wetlands, pollution of downstream wetlands, or reduce the natural retention or filtering capabilities of wetlands.

K. No site alteration may allow water to become a health hazard.

2.1.4 Water Quantity

A. All site alteration activities must provide for water retention, settling structures and flow-attenuation devices as necessary to ensure that the post-development runoff is not greater than the pre-development runoff.

B. No site alteration may adversely affect the existing surface water flow pattern. Watershed boundaries must be maintained in order to conform to existing conditions.

C. No open drainage ditches may be created within the boundaries of any subdivision or abutting any blocks or tiers of lots within any subdivision in Seminole County. Open drainage ditches, where permitted, must flow in a direction away from the subdivision, commencing at an outer boundary, or a corner, of the subdivision.

2.1.5 Water Quality

A. Permitted rates and volumes of stormwater runoff, whether discharged into natural or artificial watercourses, must meet existing water quality standards or ensure that the receiving water body is not degraded, whichever is greater.

B. No site alteration may cause siltation of wetlands, pollution of downstream wetlands, or reduce the natural retention or filtering capabilities of wetlands

C. No site alteration may allow surface water to become a health hazard.

D. At minimum, all re-development must provide water quality for any new or redeveloped impervious area.

2.1.6 Recharge

A. The parcel must be developed to maximize the infiltration of natural rainfall into the soil and to minimize direct overland runoff into adjoining streets and watercourses. Stormwater runoff from roofs and other impervious surfaces should be diverted into swales or terraces on the lot when possible.

B. Runoff from driveways, roofs, or other impervious areas should be diverted so as to flow over grassed areas prior to flowing into any drainage system wherever possible.

2.1.7 Easements

A. Where necessary, based upon sound engineering practices, easements for drainage facilities must be provided to the County through instruments of conveyance acceptable to the County.

B. Any off-site easements needed to ensure a functioning drainage system must be included in the proposal for development and made a criterion for site plan approval.

C. Easements for all facilities must be shown on construction drawings. The easements and rights-of-way must be executed and accepted by the Board of County Commissioners and recorded in the Public Records prior to issuance of a building permit.

2.1.8 Multiple Use/Amendment to Surface Water Management Standard

A. As part of a Master Plan, Preliminary Subdivision Plan or Site Plan submittal, one (1) or more wetlands and retention or detention areas may be designated as a development amenity area. Development amenity areas which comply with the following standards will be credited up to a maximum of fifty percent (50%) of the total open space otherwise required by this Code:

1. No more than fifty percent (50%) of each proposed development amenity area may be comprised of retained wetlands or wet detention facilities not required to be fenced.

2. The non-wetland detention facility portion of each area must be designated as an active or passive recreational use as the Planning Manager determines appropriate.

3. Where practicable, existing natural vegetation for the non-wetland detention facility portion of each area must be retained and maintained. All proposed development amenity areas must be fully integrated with other planned uses within the development site though the provision of pedestrian, bicycle or vehicular access.

B. Consistent with the general intent and purposes of LDC Chapter 30, Part 52 and other provisions of this Code, the Planning & Development Manager will permit development that utilizes wetlands and stormwater retention or detention facilities as development amenity areas as an incentive, to encroach upon no more than fifty percent (50%) of the required buffer area; provided, however, that existing natural vegetation must not be destroyed.

C. Any stormwater management system incorporating wetlands for stormwater treatment must comply with Rule 40C-42, Florida Administrative Code, Design and Performance Criteria for Wetlands Stormwater Management Systems, as amended, or its successor provisions.

2.2 DEVELOPMENT WITHIN FLOOD PRONE AREAS

2.2.1 General

A. Protection of flood prone areas is vital to surface water management. Unrestricted development in the floodplain can cause an increase in the risk to life and property. Floodplain encroachment can cause an increase in flood height, flow velocity, rate of

rise and duration of flooding. It can also pose a potential hazard by contributing to the sediment and building materials which may be swept downstream by flood waters. Therefore, the protection and preservation of flood prone areas have become important criteria for development.

B. Developments which contain flood prone lands must not cause an impact on the existing flooding characteristics. Floodplains must be maintained hydrologically in their natural state and protected with a conservation easement.

C. Flood prone areas often contain wetlands. In such cases, any proposed development within the area must be compatible with both allowable uses within flood prone areas and allowable uses within wetlands.

D. A small area study by a professional engineer to determine the Base Flood Elevation is required to be performed for all development on parcels greater than 5 acres or 50 lots within an undesignated FEMA "A" flood zone.

E. Development activities within flood prone areas must be limited in scope. A study must be provided for any change in the flood prone elevations and must be approved by the County Engineer or his or her designee. For residential lots within flood prone areas, the study must be submitted to the Federal Emergency Management Agency (FEMA) and the Letter of Map Revision (LOMR) submitted to the county prior to the Final Inspection.

2.2.2 Flood Prone Development Requirements

A. Retention-Detention Facilities

Retention-detention ponds are allowed within the floodplain providing they can meet the following criteria:

1. Soil Suitability. The soils characteristics of the floodplain must be able to support a retention-detention pond. Soils which have been identified by the Soil Conservation Service as having a very low potential for septic tank absorption fields must be considered as questionable for retention-detention ponds. A determination of soil suitability may be submitted by a qualified geotechnical engineer, but it is subject to approval by the County Engineer or his or her designee.

2. Floodway Hazard. The basin must in no way create a negative impact on the existing flooding conditions. Construction of the retention-detention pond must not constitute a net reduction in floodplain storage or limit the flow capacity of the floodway.

3. Retention or detention within the floodplain may not be utilized for compensating storage unless no floodplain impacts can be demonstrated.

B. Traversing Works

Traversing works are allowed provided that they do not create a net reduction in either flood flow or flood storage capabilities immediately upstream or downstream of the structure. Traversing works must be reviewed and approved by the County Engineer or his or her designee on an individual basis.

C. Reshaping

Some reshaping of the floodplain is permissible. Any fill placed within the flood prone area must be balanced by providing an equal volume of compensating storage. Compensation is to be accomplished between the ordinary high water elevation and the 100-year elevation. Reshaping the floodplain must not create a rise in flood elevations, increase flood flow velocities, or reduce flood flow capacity. Any impacts to the floodplain must be permitted by FEMA prior to the Final Inspection.

D. Utilities

All utilities must be placed outside of flood prone areas wherever possible. When it is impossible to avoid placing utilities within a floodplain, they must comply with the following provisions.

1. Materials - All utilities must be constructed with materials and equipment resistant to flood damage.
2. Construction Methods - All utility improvements must be constructed by methods and practices that minimize flood damage.
3. Water Supply Systems - All water supply systems must be designed and constructed to eliminate infiltration of flood waters into the system.
4. Sanitary Sewage Systems - Sanitary sewage systems must be designed and constructed to eliminate infiltration of flood waters in the systems and discharges from the systems must be located to avoid impairment to them or contamination from them during flooding.

E. Other

All proposed uses within the flood prone area not otherwise indicated in these standards are subject to review and recommendation by the County Engineer or his or her designee on an individual basis.

2.3. EASEMENTS

2.3 EASEMENTS

2.3.1. Conservation Easements

Section 35.101(a) of the Land Development Code specifies the criteria for required conveyance or dedication of conservation easements related to surface water management.

2.3.2. Drainage Easements

Section 35.101(b) of the Land Development Code specifies the criteria for required conveyance or dedication of drainage easements related to surface water management.

The minimum allowable width of drainage easements are as follows:

Drainage System	Minimum Easement Width
Closed Drainage System	(outside diameter + 4 feet + 2xD) where D = depth from finished grade to pipe invert 15 feet minimum
Open Drainage System	
Bottom width 20' or less	15 feet + BW + 2xSxD
Bottom width 20' to 40'	30 feet + BW + 2xSxD
Bottom width greater than 40'	40 feet + BW + 2xSxD
	where BW = bottom width, S = side slope, and D = depth

As specified in Section 35.101(b) of the Land Development Code, the minimum allowable width of drainage easements may be increased if deemed necessary by the County Engineer or his or her designee.

2.3.3. Access Easements

Section 35.101(c) of the Land Development Code specifies the criteria for required conveyance or dedication of access easements related to surface water management.

2.4. DESIGN CRITERIA

2.4.1 Design Storm (Minimum)

The minimum design criteria for drainage facilities are as follows:

Facility	Design Storm	Design Rainfall
Retention or Detention Facilities		**SCS Type II FLMod**
With Positive Outfall	Meet Pre-development Rate of Discharge for the 25-Year, 24-Hour Storm event.	8.6 inches
Landlocked, No Positive Outfall (SJRWMD Criteria)	100-Year, 24-Hour Total Retention (25-Year, 96-Hour Pre/Post Volumetric Discharge with appropriate receiving system with County Engineer approval)	10.6 inches 11.6 inches
Sites with no viable outfall and/or defined conveyance system or with a restricted outfall system*	25-year, 24-hour total retention	8.6 inches
Collection or Conveyance Systems		
Internal to Development	10-Year, 24-Hour 0.5 feet below gutter line	7.5 inches
Arterial and Collector Streets	10-Year, Hydraulic Gradient Line 1.0 feet below gutter line	7.5 inches
Local Streets	10-Year, Hydraulic Gradient Line 0.5 feet below gutter line	7.5 inches
Roadside Swale	10-Year, 3-Hour (FDOT Std)	4.5 inches
Canal / Major Crossings*	25-Year or 50-Year, 24 Hour	8.6 or 9.5 inches
Bridge	100-Year, 24 Hour	10.6 inches

Design frequency may be increased if deemed necessary by the County Engineer or his or her designee to protect upstream or downstream properties.
*As determined by the County Engineer or his or her designee.

Landlocked is defined as a drainage system that does not currently discharge its basin or sub-basin in the 10-year, 24-hour storm event.

2.4.2 Retention/Detention Facilities Design Criteria

A. New Developments

1. Peak Attenuation

The peak discharge resulting from the design storm, as computed for the development must not exceed the peak discharge resulting from the design storm for existing conditions in the area.

2. Total Retention

   Developments which are deemed landlocked or that discharge to a County right-of-way (ROW) that does not have a defined conveyance system for discharge must retain all runoff resulting from the design storm as computed for the developed condition, unless approved by the County Engineer or his or her designee.

B. Redeveloped Sites

Redevelopments which have no increase or a net decrease in impervious area yet lack evidence of a functioning retention or retention-detention facility may be required to retrofit the site to current County standards.

C. Design Based on Soils

The design of stormwater management facilities must be based upon soil conditions. In areas where soils have been classified under the SCS Hydrologic Soil Classification System as Types A or B (pervious), the overall stormwater management strategy must be that of on-site retention and infiltration into the ground. The overall stormwater management system must provide detention basins to attenuate peak from the contributory drainage area and to settle solids washed off or eroded from the areas where the soils have been classified under the SCS Hydrologic Soils Classification as types C and D (impervious) or A/D, B/D and C/D (high ground water table areas).

1. Detention with Filtration
   Detention with filtration ponds must be designed to attenuate peak outflows to pre-development rates and to provide filtration for the pollution abatement volume for systems not required to hold total retention.

2. Retention/Detention
   Retention or detention ponds must be designed to attenuate peak outflows to pre-development rates and to provide retention of the pollution abatement volume for systems not required to hold total retention.

3. Retention
   Retention ponds must be designed to retain the entire volume of stormwater routed for the design storm onsite for systems required to hold total retention.

4. Exfiltration
   Exfiltration systems must be designed to store and exfiltrate the required volume based on the design criteria. Exfiltration systems must be designed with a safety factor of 2.0

D. Outfall

Outfall structures must be as simple as possible and must employ fixed control elevations.

1. Detention with Filtration Ponds and Retention or Retention-Detention Ponds

   Detention with filtration ponds and retention or retention-detention ponds are required to have an outfall structure. The location of the structure and the shape of the pond must be designed such that no "short-circuiting" of flow occurs and that maximum retention of suspended solids is achieved. The outfall structure is required to limit peak off-site discharges to pre-development rates. The filtration system should be designed to drawdown 50% of the water quality treatment volume within 24-30 hours or the entire pond volume within 14 days.

2. Retention Ponds

   An outfall structure may be required for retention ponds where deemed necessary. In all cases retention ponds must be designed considering the event of a possible overflow. A path for such overflow must be determined and structures in the development so situated that no flood damage occurs either on-site or off-site.

3. Exfiltration Systems

   A direct connection to an outfall system may be required for exfiltration systems where deemed necessary. In all cases, exfiltration systems must be designed considering the event of a system surcharge. A path for excess runoff must be determined and structures in the development so situated that no flood damage occurs either on-site or off-site.

2.4.3 Open Drainage Ways and Retention/Detention Ponds

Access Easements

A. See Section 2.3.3

B. Maintenance Berms

The minimum requirement for maintenance berms is as follows:

Ditch or Canal Width	Minimum Unobstructed Maintenance Berm Required	
	Public	Private
20 Feet or Less	15 Feet One Side	15 Feet One Side
20 Feet to 40 Feet	15 Feet Both Sides	15 Feet Both Sides
Greater than 40 Feet	20 Feet Both Sides	20 Feet Both Sides
Ponds With Fencing	20 Feet around pond perimeter	15 Feet around pond perimeter
Without Fencing	15 Feet around pond perimeter	10 Feet around pond perimeter

The cross slopes of the maintenance berm must be 10:1 or flatter.

C. Grading

Areas adjacent to open drainage ways and ponds must be graded to preclude the entrance of stormwater except at planned locations. Where retention or detention areas are located on the project periphery, the developer may be required to provide additional landscaping or screening to adequately protect abutting properties. Size, depth and right-of-way are variables that may affect the design criteria and variations may be used with the approval of the County Engineer or his or her designee.

D. Side Slopes (Minimum)

Open Drainage Ways	Side Slopes
Swale, ditch or canal	4:1
Ponds Dry Bottom	
Residential	4:1
Commercial	2.5:1
Ponds Wet Bottom	
(Not Fenced)	4:1 (to 2 feet below the normal water level and 2:1 to pond bottom)
Wet Bottom (Fenced)	Vertical, with retaining wall not over 50 percent of pond perimeter, otherwise no steeper than 3:1 (to 2 feet below the normal water level and 2:1 to pond bottom)

E. Minimum Bottom Width
The minimum bottom width for open drainage ways is 4 feet.

F. Slope Protection
The disturbed areas in and around the pond side slopes and berms must be sodded. The bottom of ponds must be seeded or sand grown sod used.

G. Fencing
A 6-foot chain link fence must be placed along canal easements or rights-of-way including maintenance berms. Ponds must have a 6-foot chain link fence to prevent entry to facilities that present a hazard. A fence is required for retention or detention areas where one or more of the following conditions exist:

1. Rapid stage changes that would make escape practically impossible for small children.

2. Dry bottom ponds for residential and commercial developments where side slopes are steeper than 4:1 and the design high water exceeds 2 feet of depth.

3. Wet Bottom: Where side slopes are steeper than 4:1.

H. Freeboard

One-foot freeboard is required above design high water elevation for open drainage ways and ponds. In the 25-year, 24-hour storm event, the freeboard may be reduced to 6 inches if the 100-year, 24-hour storm event is routed without infiltration during the storm event and without breach of the pond and with County Engineer or his or her designee's approval.

I. Berms Constructed in Fill

Where berms in fill are proposed, calculations supporting the stability of the berms must be submitted by the Geotechnical Engineer. Where excess seepage may be expected through the berm, a clay core or approved equal liner may be required.

J. Utilities in a Retention Pond

Utility lines of all kinds, including but not limited to, those of franchised utilities, electric power, telephone, cable television, water, wastewater and gas must not be placed in retention ponds.

2.4.4 Hydraulic Design Criteria

A. Roadway (Pavement) Drainage Design

1. General

Good pavement drainage design consists of the proper selection of grades, cross slopes, curb types and inlet location to remove the design storm rainfall from the pavement in a cost effective manner while preserving the safety, traffic capacity and integrity of the highway and street system. These factors are generally considered to be satisfied, provided that excessive spreads of the water are removed from the vehicular traveled way and that siltation at pavement low points is not allowed to occur. The standards included herein will accomplish these objectives.

a. Roadway Grade - The minimum allowable centerline grade for all streets with curb and gutter is 0.30%.
b. Cross-Slope - The minimum allowable cross-slope for all streets is 1/4 inch per foot.
c. Drainage Structures - All drainage structures, unless specifically detailed in these guidelines, must conform to the latest edition of the FDOT Roadway and Traffic Design Standards.
   Any drainage structure not detailed in the FDOT Design Standards must all be designed in conformance with good engineering practices and will require approval by the County Engineer or his or her designee.

2. Criteria for the use of Roadway Underdrains

Where the seasonal high water table cannot reasonably be maintained one foot from the base of the roadway, underdrains may be considered for approval by the County Engineer or his or her designee.

All streets approved with an underdrain system must be designed to provide a minimum clearance of one (1) foot between the bottom of the base and the estimated seasonal highwater table, or the artificial water table induced by an underdrain system. The use of underdrain systems which control the seasonal high water table to provide these minimum clearances is permitted, but such systems must meet the following requirements and are subject to the following limitations.

a. The use of a limerock base in conjunction with underdrain systems is prohibited.
b. Underdrain systems are permitted if it is anticipated that they will flow no more than six (6) months in an average rainfall year.

c. Each underdrain system's trench bottom may be placed below the seasonal low water table elevation only if a Hydrologist or Soils Engineer demonstrates, utilizing sound and generally acceptable engineering practices and scientifically reliable data, that the lowering will not adversely impact adjacent property or surface water.
d. The distance between the bottom of each underdrain system trench and the bottom of the roadway base must not be less than 24 inches.
e. The geotechnical engineer responsible for the development shall provide the following design certification, which must be imprinted with the engineer's seal:
   "The undersigned professional engineer certifies that the underdrain design for _____ road, extending from station _____ to station _____ has been designed such that the separation between the bottom of the base and the artificially induced wet season water table is no less than one (1) foot for the entire width of pavement."
f. Each underdrain system must, after installation, be inspected by the project geotechnical engineer who shall certify that the underdrain installation procedures and materials have been accomplished and are in accordance with the approved plans.
g. The development's stormwater facilities must be designed to accommodate expected flow contributed by the underdrain system.
h. The underdrain system must pass County inspection for compliance prior to the issuance of final approval.
i. Use of underdrain systems are prohibited in areas designated as high recharge areas.
j. Underdrain systems may be permitted within a zone of influence of jurisdictional wetlands only if it is demonstrated by the applicant, providing competent substantial evidence and sound engineering techniques and data, that the use of an underdrain system will not create negative impacts to wetlands.
k. Use of road underdrain system in conjunction with excessive or inordinate cutting (excavation) of road grade is prohibited.
l. Excavation for road construction must be minimized to limit the magnitude of the underdrain system required.
m. No trees are permitted to be planted within the right-of-way or within twenty feet (20') of an underdrain system without the installation of root guards.
n. Six inch (6") pipe is required for all underdrains.
o. Clean-outs must be located every one hundred feet (100’) and at directional changes.

3. Criteria for the use of Pond Underdrains

    a. Use of pond underdrain systems are prohibited in areas designated as high recharge areas.
    b. Pond underdrain systems may be permitted within a zone of influence of jurisdictional wetlands only if it is demonstrated by the applicant, providing competent substantial evidence and utilizing sound and generally accepted engineering techniques and data, that the use of a pond underdrain system will not create negative impacts to wetlands.
    c. Underdrains used solely to control high groundwater table should be located in the sideslope; however, underdrains in the pond bottom are acceptable for private non-residential uses. Mound-type underdrain is prohibited.
    d. Three inches (3") of #57 stone is required for final cover over a pond underdrain system's trenches.
    e. Clean-outs must be located every one hundred feet (100') and at all directional changes.
    f. The developer shall provide verification of capacity required prior to connection to existing County drainage collection system.
    g. A pond underdrain system is prohibited unless it can be demonstrated that it will not have an adverse impact to surface waters or groundwater.
    h. No trees may be planted within twenty feet (20') of a pond underdrain system without installation of root guards.
    i. Six inch (6") pipe is required for all pond underdrain systems. (Four inch (4”) piping may be allowed if pvc.)

4. Swales

    a. Swale drainage is permitted only if the wet season water table is a minimum of two (2) feet below the invert of the swale.
    b. Where roadside swales are required, a positive outfall for the drainage may be required depending on the soil classification and topography.
    c. All swales must be sodded to prevent erosion.

5. Curbs and Gutters

    Subdivisions must have all streets paved and drained utilizing curb-and-gutter construction. Where lot widths of at least one hundred twenty feet (120’) can be assured, roadside drainage swales may be utilized.

    All roadway drainage not considered suitable for swale type drainage must be designed as one of the following:

Any Miami Curb and Gutter Section	Maximum 600 Feet Run Between Inlets
Standard Curb and Gutter Section	Maximum 1200 Run Between Inlets

Variance to the above runs must be substantiated with calculations.

The width of curb and gutter must be a minimum of twenty-four (24) inches and must be either FDOT type F or Miami curb (subdivisions only) and gutter, depending upon flow to be handled. Simple vertical curbing will not be acceptable. Approved mountable median curb may be used around median dividers on the high side of pavement.

A stabilized subgrade is required beneath all curbs and one (1) foot beyond the back and front of curb.

No water valve boxes, meters, portions of manholes, or other appurtenances of any kind relating to any underground utilities may be located in any portion of a curb and gutter section.

The minimum allowable flow line grade of curbs and gutters is 0.30%, except in intersections where a flatter grade is allowable. The tolerance for ponded water in curb construction is one-fourth inch (1/4") maximum; if exceeded, the section of curb must be removed and reconstructed to grade.

Plastering is not permitted on the face of the curb. Joints must be saw-cut at intervals of ten (10) feet, except where shorter intervals are required for closures, but, in no case, less than four (4) feet.

All cross-street valley gutters must be constructed of concrete.

6. Runoff Determination
   The peak rates of runoff for which the pavement drainage system must be designed, must be determined by the Rational Method. The time of concentration, individual drainage areas and rainfall intensity amounts must be submitted as part of the drainage plans.

   A separate Rational Runoff Coefficient (C) must be determined for the specific contributing area to each inlet/catch basin within the proposed storm sewer system. A composite C value must be computed for each contributing area based on an individual C value of 0.9 for the estimated impervious portion of the actual area and an individual C value of 0.2 for the remaining pervious (grassed) portion of the actual area.

7. Stormwater Spread Into Traveled Lane
   Inlets must be spaced at all low points, intersections and along continuous grades so as to prevent the spread of water from exceeding tolerable limits. The acceptable tolerable limits for arterial and collector roadways is defined as approximately one half the traveled lane width. Acceptable tolerable limits for interior subdivision roadways are defined as a maximum of one (1") inch above the crown of the road.

8. Inlet Types
   Curb inlet types to be used must be of the latest version of the Florida Department of Transportation Design Standards. Ditch bottom inlets must be Florida Department of Transportation inlet types C, D, E and H.

9. Low Point Inlets
   All inlets at low points (sumps) must be designed to intercept 100 percent of the design flow without exceeding the allowable spread of water onto the traveled lanes as defined above. On arterial roadways, in order to prevent siltation and to provide for a safety factor against clogging of single inlet in a sump location, multiple inlets are required to be constructed at all sump locations. Preferably three (3) inlets should be constructed on each side of the roadway, one (1) at the low point and one (1) each side at a point 0.2 feet higher than the low point. Open bottom inlets are encouraged in effective recharge areas.

B. Storm Sewer Design

1. Design Discharges

   Storm sewer system design is to be based upon a 10-year frequency event. The system must be designed to handle the flows from the contributory area within the proposed subdivision. Then, the system must be analyzed a second time to ensure that any off-site flows can also be accommodated. This second analysis must consider the relative timing of the on-site and off-site flows in determining the adequacy of the designed system.

2. Minimum Pipe Size

   The minimum size of pipe to be used in storm sewer systems is 15 inches or equivalent elliptical. The minimum size of pipe to be used in storm sewer systems associated with a collector or arterial roadway is 18 inches or equivalent elliptical. Designs must be based upon six (6) inch increments in sizes above 18 inches.

3. Pipe Grade

   All storm sewers must be designed and constructed to produce a minimum velocity of 2.5 feet per second (fps) when flowing full. No storm sewer system or portion thereof may be designed to produce velocities in excess of 20 fps for reinforced concrete pipe or 10 fps for metal pipe. The maximum velocity at the outlet pipe must comply with FDOT requirements.

4. Pipe Clearance

   The minimum clearance for all storm pipes is as follows:

Description	Clearance
From bottom of roadway base to outside crown of pipe	1.0 Feet
Utility crossing, outside edge to outside edge	0.5 Feet

5. Conflict Manholes

   Conflict manholes may be used only when there is no reasonable alternative design. Where it is necessary to allow a sanitary line or other utility to pass through a manhole, inlet or junction box, the utility must be ductile iron with no joint permitted in the structure.

   Where utility lines pass through manholes, the utility must be placed in such a manner as to provide a minimum of one foot clearance between the bottom of the manhole and the bottom of the utility pipe.

   Conflict manholes must be over-sized to accommodate the decreased flow and maneuverability inside the structure.

6. Maximum Lengths of Pipe

   The following maximum runs of pipe must be used when spacing access structures of any types:

Pipe Size	Maximum
15 Inches	200 Feet
18 Inches	300 Feet
24 to 36 Inches	400 Feet
42 Inches and Larger	500 Feet

7. Design Tailwater

   All storm sewer systems must be designed taking into consideration the tailwater of the receiving facility. In the case where the detention pond is the receiving facility, the design tailwater level can be estimated from the information generated by routing through the pond the hydrograph resulting from a 10-year frequency storm of duration equal to that used in designing the pond. Then the design tailwater level can be assumed to be the 10-year pond level corresponding to the time at which peak inflow occurs from the storm sewer into the pond. In lieu of the above detailed analysis, however, a simpler design tailwater estimate can be obtained by averaging the established 25-year Design High Water elevation for the pond and the pond bottom elevation for "dry bottom" ponds or the normal water elevation for "wet bottom" ponds.

8. Hydraulic Gradient Line Computations

   The Hydraulic Gradient Line for the storm sewer system must be computed taking into consideration the design tailwater on the system and the energy losses associated with entrance into and exit from the system, friction through the system, and turbulence in all structures within the system.

   The energy losses associated with the turbulence in the individual manholes are minor for an open channel or gravity storm sewer system and can typically be overcome by adjusting (increasing) the upstream pipe invert elevations in a manhole by a small amount. However, the energy losses associated with the turbulence in the individual manholes can be significant for a pressure or surcharged storm sewer system and must be accounted for in establishing a reasonable hydraulic gradient line. Acceptable head loss coefficients (K) for various types of surcharged structures must be used.

C. Culvert Design

1. Minimum Size

   a. Pipe
      The minimum size pipe to be used for culvert installations under roadways and driveways must be 18 inches or equivalent elliptical.
   b. Box Culverts
      Box culverts must be 3' x 3' minimum. Increments of 1 foot in height or width should be used above this minimum.

2. Maximum Pipe Grade

   The maximum slope allowable is a slope that produces 10 fps velocity within the culvert barrel. Erosion protection and energy dissipation is required to properly control entrance and outlet velocities.

3. Maximum Lengths of Structure

   The maximum length of culvert conveyance structure without access is as allowed in Section 2.4.4 (B) (6).
   Note: For box culverts use 500 feet maximum.

4. Design Tailwater

   All culvert installation must be designed taking into consideration the tailwater of the receiving facility.

5. Allowable Headwater

   The designer should set the allowable headwater of a culvert installation for an economical installation. When end walls are used, the headwater should not exceed the top of the end wall at the entrance. If the top of the end wall is inundated, special protection of the roadway embankment, ditch slope or both may be necessary for erosion protection.

6. Design Procedure

   The determination of the required size of a culvert installation can be accomplished by mathematical analysis or by the use of design nomographs.

2.4.5 Plan Requirements

A. Drainage Plans

A master drainage map showing all existing and proposed features must be included in the construction plans. The map should be prepared preferably on a 24 inch by 36 inch sheet on a scale not to exceed 1" = 200'. Listed below are the features that must be included on the drainage map.

1. Drainage bounds, including all offsite areas draining to the proposed subdivision.
2. Sufficient topographical information with one foot contour intervals.
3. High water data on existing structures upstream and downstream of the subdivision.
4. Notes indicating sources of high water data.
5. Notes pertaining to existing standing water, area of heavy seepage, or springs.
6. Existing drainage features (ditches, roadways, ponds). Existing drainage features are to be shown a minimum of 1000 feet downstream of the proposed development unless the ultimate outfall system is a lesser distance.
7. Proposed drainage features including applicable access.
8. Delineation of drainage sub-basins.

9. General type of soils (obtain from soil survey of Seminole County).
10. Flood hazard classification.
11. Description of current ground cover, land use or both.
12. Drainage plans must also include the following:

    a. Cross-section of retention and detention facilities.
    b. Typical swale, ditch or canal sections.
    c. Drainage rights-of-way and easements.
    d. Typical fencing detail.
    e. Erosion control plan.
    f. Typical landscape or buffer wall showing flow through drainage, where necessary.

B. Subsoil Investigation

A subsoil report by a Geotechnical Engineer may be required by the County Engineer or his or her designee. A minimum of two (2) borings must be taken for each retention or detention area. Geotechnical analysis and recommendation are required if alternate materials are proposed.

C. Stormwater Calculations

Stormwater calculations for retention and detention areas, including design high water elevations for the 25-year and 100-year storm events must include the following:

Storm sewer tabulations including, but not limited to, the following:

1. Locations and types of structures.
2. Types and lengths of line.
3. Drainage sub-area tributary to each structure.
4. Runoff coefficient per sub-area.
5. Time of concentration to structure.
6. Hydraulic gradient for the 10 year frequency storm event.
7. Estimated receiving water (tailwater) elevation with sources of information, if available.
8. Diameters of pipe.
9. Outlet and other pipe velocities.

D. Off-Site Improvements

For all off-site improvements involving roadways, cross sections showing all existing and proposed topographic features within the right-of-way must be plotted at 50-foot intervals and at all locations where the roadway features change significantly. Plotted centerline profiles of the existing and proposed roadways are also required. Filling or cutting of public rights-of-way for a grade transition in conjunction with an adjacent

development is prohibited except to construct a perpendicular access for vehicular or pedestrian traffic.

E. Floodplain Impacts

Any project that proposes impacts to the FEMA floodplain requires that the appropriate completed FEMA application be submitted for acceptance and County signature prior to final engineering approval.

2.5. MATERIAL SPECIFICATIONS

Unless otherwise stated all materials used must conform to the latest editions of the FDOT Design Standards and the FDOT Standard Specifications for Road and Bridge Construction.

2.5.1 Pipe

A. The use of optional pipe materials may be considered in residential subdivisions and private commercial developments only. Installation of these pipes must follow Florida Department of Transportation (FDOT) requirements and specifications.

B. For all County-maintained roadways outside of subdivisions, optional pipe materials are not allowed and reinforced concrete pipe must be used (with the exception of residential driveways and open pond outfalls).

C. All joints, regardless of pipe material, must be wrapped with filter fabric.

2.5.2 Inlets, Manholes and Junction Boxes

All materials used in the construction of inlets, manholes and junction boxes must conform to the latest editions of the FDOT Design Standards and the FDOT Standard Specifications for Road and Bridge Construction.

2.5.3 Underdrains/Exfiltration Systems

All materials used in the construction of underdrains and exfiltration systems (French drains) must conform to the latest edition of the FDOT Design Standards Indices 285 & 286 and FDOT Standard Specifications for Road and Bridge Construction.

2.5.4 Drainage Structures

All materials used in the construction of drainage structures must conform to the latest editions of the FDOT Design Standards and the FDOT Standard Specifications for Road and Bridge Construction.

Rip-rap is not an acceptable material for drainage structures, but can be used for erosion control.

2.5.5 Fencing

All fencing must be black 6-foot chain link fence with a minimum 15-foot wide double gate opening conforming to the FDOT specifications.

2.5.6 Sod, Seed & Mulch

All sod, seed and mulch materials and installation must conform to the latest edition of the FDOT Standard Specifications for Road and Bridge Construction.

2.6. EROSION AND SEDIMENT CONTROL

Development activities can result in the generation of significant amounts of pollutants which may reach surface and ground waters. One of the primary pollutants of surface waters is sediment due to erosion. Excessive quantities of sediment that reach water bodies and floodplains have been shown to adversely affect the physical, biological and chemical properties of these receiving systems. The purpose of Section 2.6 is to minimize the deposition of sediments into the air, water or both in order to maintain compliance with erosion control laws and regulations.

2.6.1 Compliance

Erosion control measures are to be designed so that local, state and federal water quality standards are achieved prior to discharge from a site. Best management practices are to be incorporated during construction in accordance with Rule 62-25.025, Florida Administrative Code, and other applicable statutes or codes. All surface water discharge from a site, including dewatering discharge, must meet state water quality criteria (Rule 62-302, Florida Administrative Code) unless temporarily exempted by specific permit conditions.

2.6.2 Erosion Control Plan

An Erosion Control Plan must be submitted with all development plans. The Erosion Control Plan should detail clear and effective best management practices for the control of off-site sedimentation. The measures set forth in the Erosion Control Plan are intended to be the minimum standards. In the event that the erosion control methodologies detailed in the Erosion Control Plan are not effective, alternate methods for maintaining state water quality standards for discharge from the construction site will be required. Any additional erosion control measure that is required to comply with local, state and federal laws must be implemented.
The Erosion Control Plan must include, at a minimum, the following details:

A. Project description; location, including proximity to wetlands, lakes, streams and other environmentally sensitive areas; and limits of construction;
B. Construction sequence, including timelines for the installation of erosion control BMP's;
C. Location of construction entrance;
D. Erosion control devices;
E. Maintenance schedule for BMP's;
F. All necessary National Pollutant Discharge Elimination System (NPDES) permits must be obtained from the Florida Department of Environmental Protection (FDEP)

prior to any work activities and kept onsite throughout construction. Necessary permits may include, but are not limited to, Generic Permit for Stormwater Discharge from Large or Small Construction Activities (CGP).

2.6.3 Best Management Practices

The selection of best management practices (BMP's) is site-specific in nature because of the infinite variety of site characteristics such as topography, geology, physiography, climate and hydrology. Effective and efficient prevention of water quality degradation from development activities depends upon sound judgment in choosing the most effective system of control practices (i.e. treatment train of BMPs). In addition, proper installation and maintenance of BMPs is critical in preventing water quality degradation. Please refer to the following manuals and guidelines for specific BMP installation and maintenance requirements: Chapter 6, Florida Development Manual: Guide to Sound Land and Water Management, Florida Department of Environmental Regulation, June 1988; Florida Stormwater, Erosion and Sedimentation Control Inspectors Manual, Florida Department of Environmental Protection (latest edition); Florida Department of Transportation, Standard Specifications for Road and Bridge Construction (latest edition).

A. General

Best management practices (BMP's) must be used where applicable and are required to be shown or noted on submitted construction plans. The BMP's are performance based and must be changed if not effective at preventing off-site sedimentation.

2.6.4 Construction Practices

All construction activities requiring erosion and sediment control must conform to the following requirements:

A. Construction schedule: Erosion and sediment control measures must be placed prior to or as the first step in construction.

B. Perimeter Controls: Temporary erosion and sediment control measures must be installed prior to any on-site grading or clearing activities consistent with good construction practices. The first construction activity should be the placement of temporary erosion and sediment control measures around the perimeter of the project or the initial work area to protect the project, adjacent properties and water resources.

1. Double Row: A double row of trenched-in silt fence or other perimeter erosion or turbidity containment measure is required adjacent to natural water bodies including; lakes, streams and contiguous wetlands and sloughs in Seminole County. The double row of silt fence should be separated by at least three (3) feet to allow room for maintenance and reduce damage to the outer row during failures.

2. Installation of Fences: It is imperative that silt fences be properly installed in order to avoid compliance violations and costly delays. Proper installation consists of the following:

a. Trenching in the fabric edge four (4) inches wide by four (4) inches deep, incorporating eight (8) inches of silt fence into the trench;

b. Installing the stakes on the downstream side of the anticipated water flow;

c. Attaching two (2) silt fence sections by wrapping and rolling in order to provide a continuous seal of fabric;

d. Driving all posts 10-12 inches into the ground and pulling tight on each section; and

e. Backfilling and compacting trench fill over ground flap

3. Hay Bales: Hay bales are not allowed as a perimeter erosion control device within the County; however, synthetic alternatives are acceptable.

C. Inlet Protection Devices

All sediment must be prevented from entering any stormwater drainage system through the use of inlet protection devices (i.e. sandbags, boards, drainfield pipe or other protective devices). Hay bales are not recommended as an inlet protection BMP.

D. Ditch Blocks and Dams

No earthen ditch blocks, dams or other erodible material may be placed in live streams, canals or other natural water bodies. Ditch blocks or dams must be composed of non-erodible materials. Materials commonly used are sheet piling, portable cofferdams, inflatable water structures and other comparable devices. Construction materials such as piling, dikes or other obstructions in watercourses should be removed as soon as practicable after completion of the operation but not before water quality standards have been met. Construction operations in rivers, streams, lakes or other bodies of water should be restricted to:

1. Areas where channel changes occur are shown on the plans;
2. Areas which must be entered to construct structures or erosion and sediment control measures; and
3. Areas where waters must be forded occasionally during construction, as approved by the County. Frequent fording should not be permitted; temporary bridges or other structures should be constructed where frequent crossings are necessary.

E. Materials on Roadways

All mud, dirt or other materials tracked or spilled on to existing state, county, city or other public or private roads and facilities from a construction site must be removed promptly by the landowner or designee. Sediment must not be washed or swept into any existing stormwater inlets. A designated equipment and vehicle wash area is suggested on construction sites in order to prevent tracking of materials off-site.

F. Seeding

During site construction, the landowner or designee must provide temporary seeding, sodding, mulching or equivalent soil protection for all areas that have been cleared but do not have ongoing construction.

Temporary erosion and sediment control measures must be coordinated with permanent measures to assure effective and continuous control throughout the construction phase. Temporary measures must not be constructed for expediency in lieu of permanent measures.

2.6.5 Maintenance

All features of the temporary BMPs must be maintained during the life of the construction so as to function as they were originally designed and constructed.

2.6.6 Permanent Erosion Control

The permanent erosion control facilities of the project must be designed to minimize the impact on off-site facilities. All permanent soil erosion control measures for slopes, channels and any disturbed land areas must be sodded, seeded, mulched or equivalently protected within seven (7) calendar days after final grading.

2.7 Special Area Design Criteria

2.7.1 Aquifer Recharge Overlay Zone

Special design criteria applicable in the Aquifer Recharge Overlay Zone may be found in Chapter 30, Part 54 of the LDC.

2.7.2 Econlockhatchee River Protection Overlay

Special design criteria applicable in the Econlockhatchee Overlay may be found in Chapter 30, Part 57 of the LDC.

2.7.3 Wekiva River Protection-Seminole Estates Overlay

Special design criteria applicable in the Wekiva River Protection-Seminole Estates Overlay may be found in Chapter 30, Part 58 of the LDC.

2.7.4 Urban Conservation Village

Special design criteria applicable in Urban Conservation Village Design may be found in Chapter 30, Part 27 of the LDC.

ATTACHMENT
GLOSSARY

AERIAL SUPPORT - Structural supports used to suspend utility lines above the ground.

ARTERIAL STREETS - Streets and highways which are used primarily for arterial traffic and defined as such by Florida Statutes.

AS-BUILT SURVEY - A post-construction survey identifying the actual lengths and elevations of the stormwater management system by a certified land surveyor.

BRIDGE - A traversing work for vehicular traffic which maintains the basic cross-section of the waterway.

CLOSED DRAINAGE SYSTEM - A stormwater collection and transmission system consisting primarily of inlets and storm sewers.

CONSTRUCTION - Any activity including land clearing, earthmoving or the erection of structures which will result in the creation of a stormwater management system.

DESIGN HIGH WATER - The elevation of the water surface as determined by the flow conditions of the design storm.

DESIGN STORM - A selected rainfall pattern of specified amount, intensity, duration and frequency that is used as a basis for design.

DETENTION - The collection and temporary storage of stormwater with subsequent release, at a specified rate, into a downstream system.

DRAWDOWN - Lowering the water surface, water table or piezometric surface resulting from a withdrawal of water.

EFFECTIVE GRAIN SIZE - The diameter of filter sand or other aggregate that corresponds to the 10 percentile finer by dry weight on the grain size distribution curve.

ENGINEER - A Professional Engineer registered in Florida, or other person exempted pursuant to the provisions of Chapter 471, Florida Statutes.

EROSION AND SEDIMENT CONTROL PLAN - A formal plan which outlines a system of management practices to control soil erosion, reduce sediment loss or protect the water quality.

EXFILTRATION - A stormwater management procedure which stores runoff in a subsurface collection system and disposes of it by percolation into the surrounding soil.

FILTRATION - The selective removal of suspended matter from stormwater by passing the water through at least 2 feet of suitable fine textured granular media such as porous soil, uniformly graded sand and gravel or other natural or artificial aggregate, which may be used in conjunction with filter fabric and underdrain pipe.

FLOOD PRONE - That land lying within a "flood-prone area," as designated by the most recent United States Geological Survey Map series entitled "Map of Flood-Prone Areas" delineated on 7.5 minute series topographic Maps, or lands lying within flood-hazard areas, as delineated on Federal Emergency Management Agency, Federal Insurance Administration (FEMA/FIA) Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps, when such maps have been adopted by the Seminole County Board of County Commissioners or other land as may be identified by the Seminole County Engineer that lies within the flood boundary according to the data available at the time; provided, however, that an applicant may challenge this designation by securing competent expert evaluation, at the applicant's own expense, demonstrating that the property does not fall within the designated flood delineation. If this expert determines that the property in question is not within a flood-prone area and the County Engineer concurs with this determination, this property must be designated as non flood-prone for the purposes of this Code. Based upon this determination of this property as non flood-prone, Federal Emergency

Management Agency, Federal Insurance Administration Maps must be amended according to the established procedure.

FLOODWAY - The permanent channel of a stream or other water course, plus any adjacent floodplain areas that must be kept free of any encroachment in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than a designated amount.

FREEBOARD - A vertical distance between the elevation of the design highwater and the lowest elevation of the top of the bank, levee or berm.

HIGH WATER TABLE - The highest free surface of the groundwater table based upon SCS investigation or field verification by soils analysis.

IMPERVIOUS - Land surfaces which do not allow, or minimally allow, the penetration of water; included as examples are building roofs, normal concrete and asphalt pavements and some fine grained soils such as clays.

MAINTENANCE - Routine custodial maintenance needed to ensure the functioning of a stormwater management system to meet design criteria.

NONSTRUCTURAL - A method or methods of stormwater management which attempts, to the greatest degree possible, to employ natural and selfmaintaining systems and limit the use of man-made, maintenance intensive structures.

OPEN DRAINAGE SYSTEM - A stormwater collection and transmission system consisting primarily of swales, ditches and canals.

OUTFALL - The point, location or structure where stormwater runoff discharges from a surface water management system to a receiving body of water or other system.

OUTFALL STRUCTURE - The structure or structures which control the discharge of a water management system into another system or receiving water body.

PEAK DISCHARGE - The maximum instantaneous flow from a given storm condition at a specific location.

PROJECT AREA - The area being modified or altered in conjunction with a proposed activity.

RECHARGE - Replenishment of ground water reservoirs by infiltration and transmission from permeable soils.

RETENTION - The prevention of discharge of a given volume of stormwater runoff by complete on-site storage with subsequent release by percolation into the surrounding soils.

RIPRAP - Man-made or natural materials placed against an embankment or other work for protection against the action of water. Materials may include sand-cement bags, concrete block, rubble, etc.

ROADWAY - A designated travel pathway, either public or private, which is designed for vehicular traffic and is not used primarily as a driveway access to a property.

SHORT-CIRCUITING - Flow characteristics of a detention pond in which a direct flow path exists between the inflow and outflow points, thus diminishing the velocity reduction and settling capability of the pond.

STABILIZED MAINTENANCE BERM - A maintenance pathway stabilized to a depth of ten (10) inches to fifty (50) pounds per square inch, Florida Bearing valve.

STORMWATER - The flow of water which results from, and which occurs immediately following, a rainfall event.

STORMWATER MANAGEMENT SYSTEM - The designed features of the property which collect, convey, channel, hold, inhibit or divert the movement of stormwater.

SUB-BASIN - A physical division of a larger watershed associated with one reach of the storm drainage system.
SWALE - A vegetated man-made trench approximately one-foot deep or less and having side slopes equal to or greater than 4 feet horizontal to 1 foot vertical.
TAILWATER DEPTH - The depth of flow immediately downstream from the discharge structure, or at the point of discharge.
TOTAL LAND AREA - Land holdings under common ownership which are contiguous or land holdings which are served by common surface water management facilities.
TRAVERSING WORK - Any artificial structure or construction that is placed in or across a stream, or other watercourse, or an impoundment.
UNIFORM COEFFICIENT - The number representing the degree of homogeneity in the distribution of particle sizes of filter sand or other granular material. The coefficient is calculated by determining the D60/D10 ratio where D10 and D60 refer to the particle diameter corresponding to the 10 and 60 percentile of the material which is finer by dry weight.
WATERSHED - A geographical area or region that is so sloped either by man or nature that surface runoff is carried away by a single drainage system by gravity to a common outlet or outlets. Also referred to as a drainage basin or drainage area.
WATER TABLE - The upper surface of the free ground water in a zone of saturation; locus of points in the soil water at which hydraulic pressure is equal to atmospheric pressure.
WETLANDS - Hydraulically sensitive areas which are identified by being inundated or saturated by surface or ground water with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.
(Att, App B, LDC, through Supp 16).

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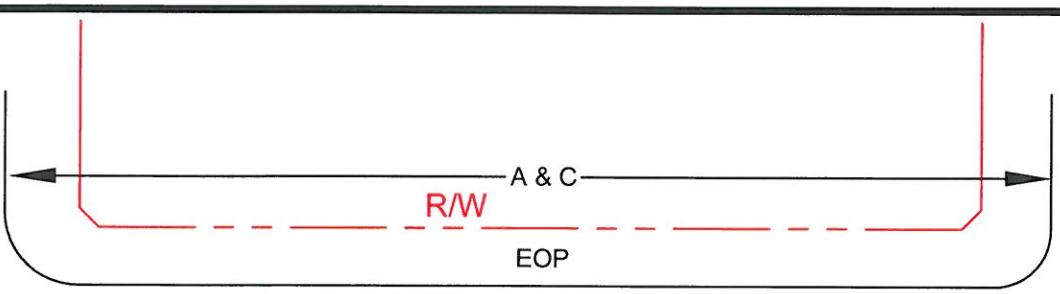
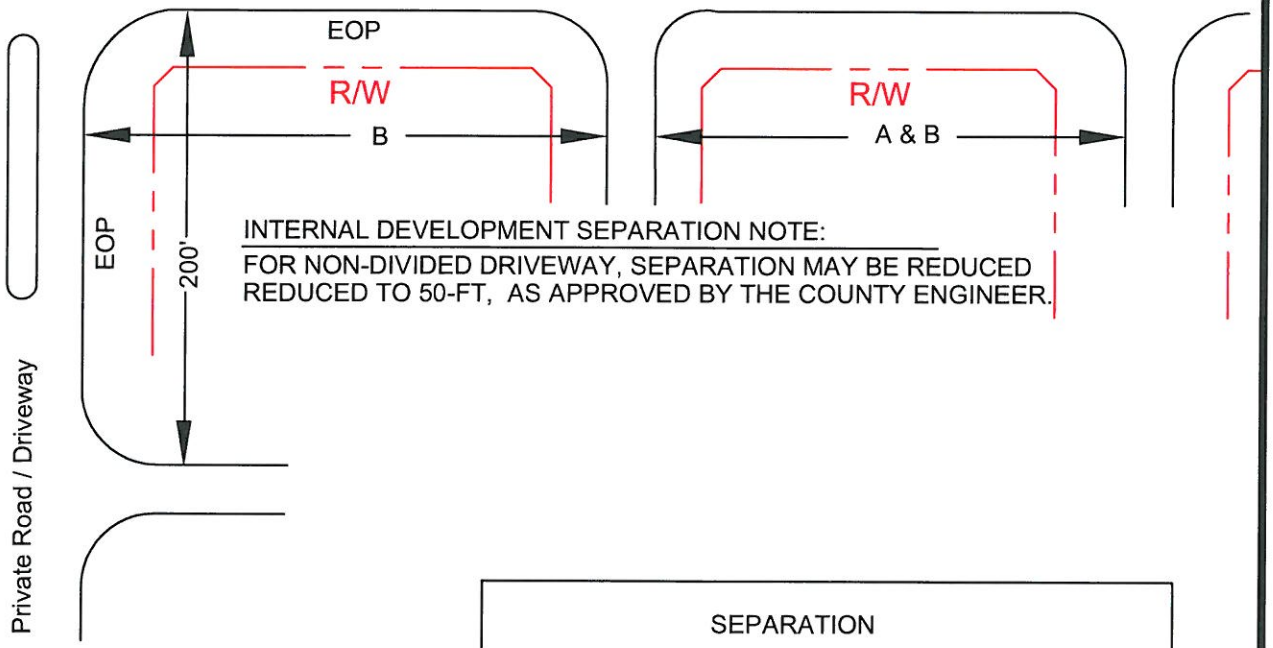
Engineering Design Standards

DRIVEWAY SEPARATION FOR ARTERIAL / COLLECTOR / LOCAL



ARTERIAL / COLLECTOR / LOCAL



INTERNAL DEVELOPMENT SEPARATION NOTE:
FOR NON-DIVIDED DRIVEWAY, SEPARATION MAY BE REDUCED REDUCED TO 50-FT, AS APPROVED BY THE COUNTY ENGINEER.

		SEPARATION		
	TYPE OF ACCESS	ARTERIAL	COLLECTOR	LOCAL
A	INTERSECTION	1320'	1320' / 660' *	660'
B	PRIVATE ROAD / DRIVEWAY	330'	330'	200'
C	CORNER CLEARANCE	**330'	330'	200'

NOTES:

1. DISTANCES ARE MEASURED FROM NEAREST EDGE OF PAVEMENT (EOP) TO NEAREST EDGE OF PAVEMENT. THIS ALSO APPLIES TO DIVIDED ROADWAYS.
2. POSTED SPEED ON PUBLIC ROADWAY > or = 35MPH.

* BASED ON ACCESS CLASS PER FAC RULE 14-97
** 330' FOR RIGHT IN / RIGHT OUT, 660' FOR FULL ACCESS.

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SEMINOLE COUNTY

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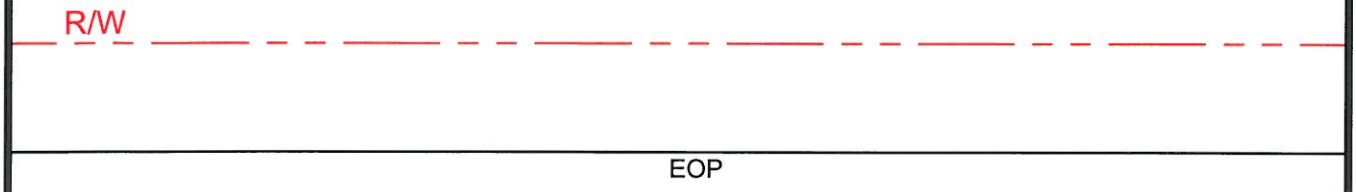
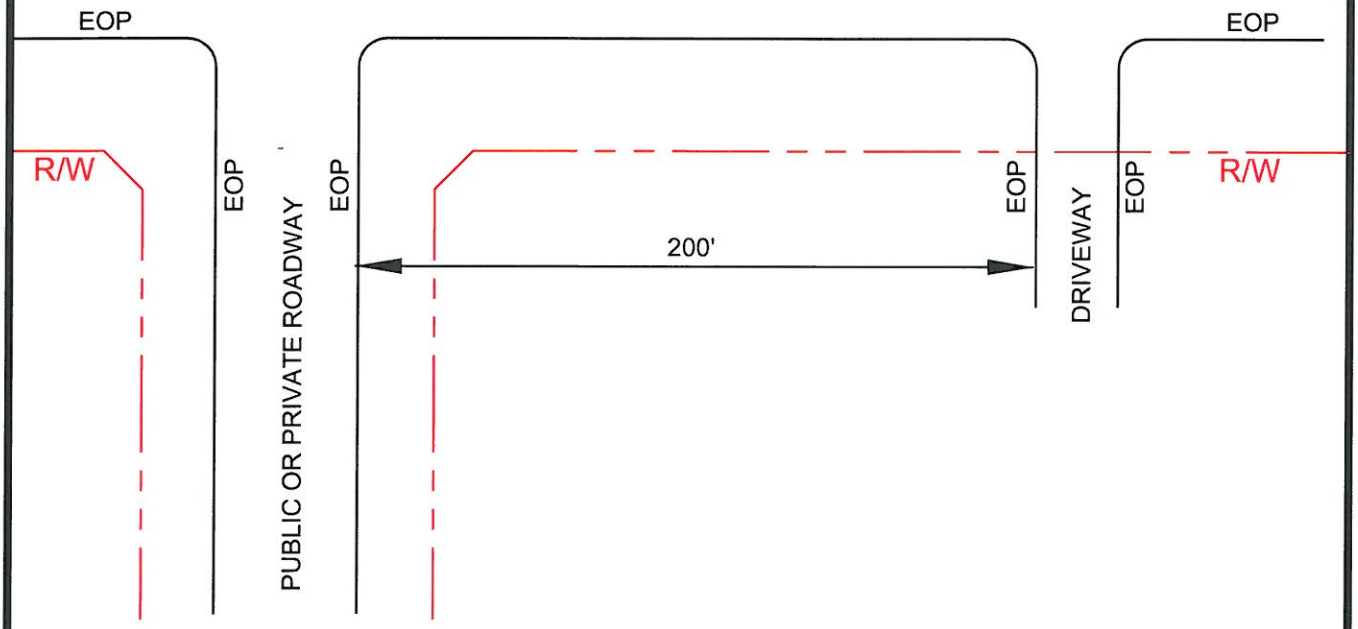
T-1
TRANSPORTATION DETAIL

Engineering Design Standards

CORNER CLEARANCE



CONNECTION TO LOCAL ROAD OR ROADWAY WITH POSTED SPEED < 35MPH



NOTE:

1. DISTANCES ARE MEASURED FROM THE NEAREST EDGE OF PAVEMENT TO THE NEAREST EDGE OF PAVEMENT (EOP). THIS ALSO APPLIES TO DIVIDED ROADWAYS.
2. JOINT-USE DRIVEWAYS AND CROSS-ACCESS EASEMENTS ARE RECOMMENDED AND ENCOURAGED.

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T-2
TRANSPORTATION DETAIL

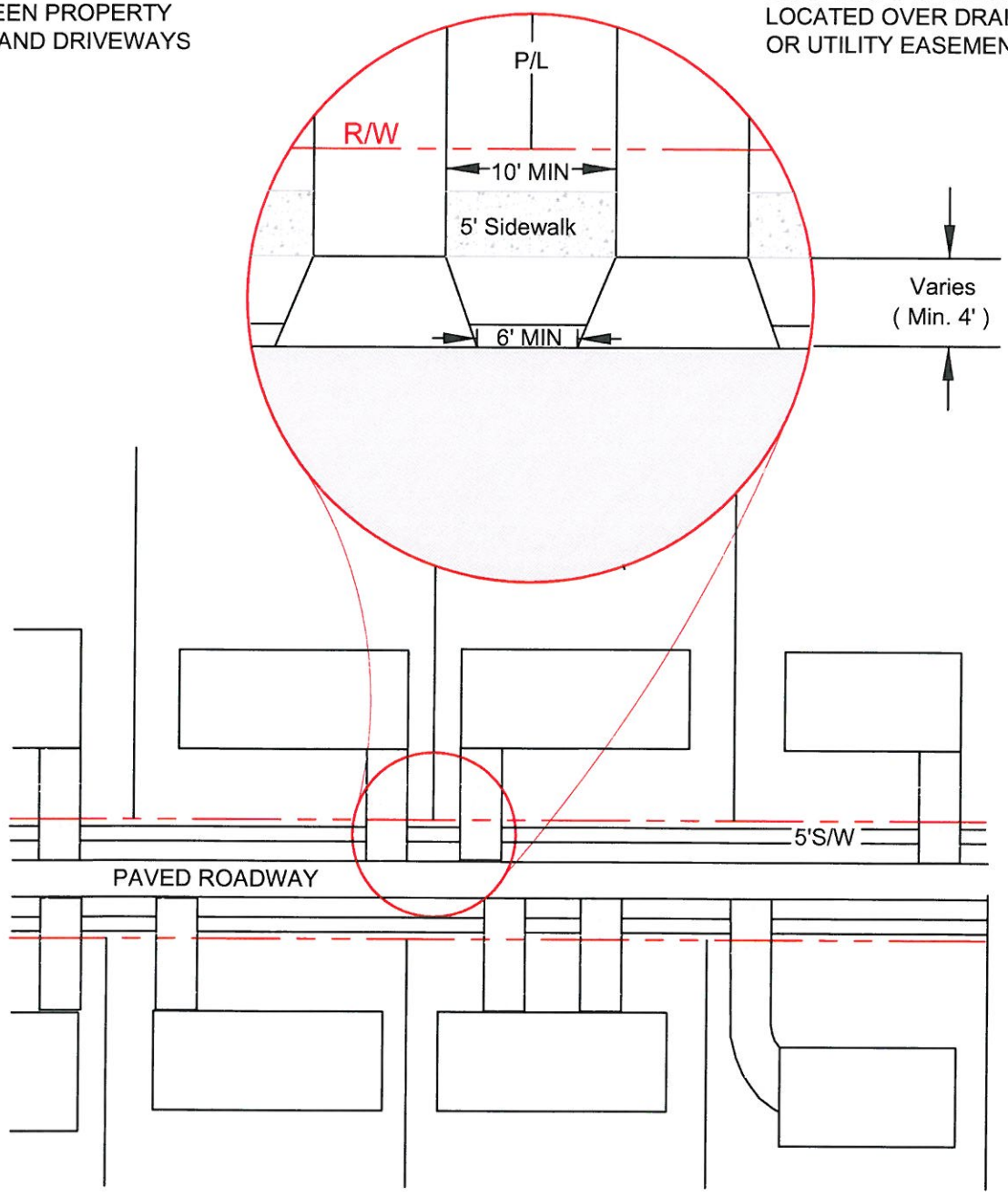
Engineering Design Standards

DRIVEWAY SEPARATION FOR RESIDENTIAL

SINGLE FAMILY RESIDENTIAL

5' MINIMUM SEPARATION BETWEEN PROPERTY LINES AND DRIVEWAYS

DRIVEWAYS SHALL NOT BE LOCATED OVER DRAINAGE OR UTILITY EASEMENTS



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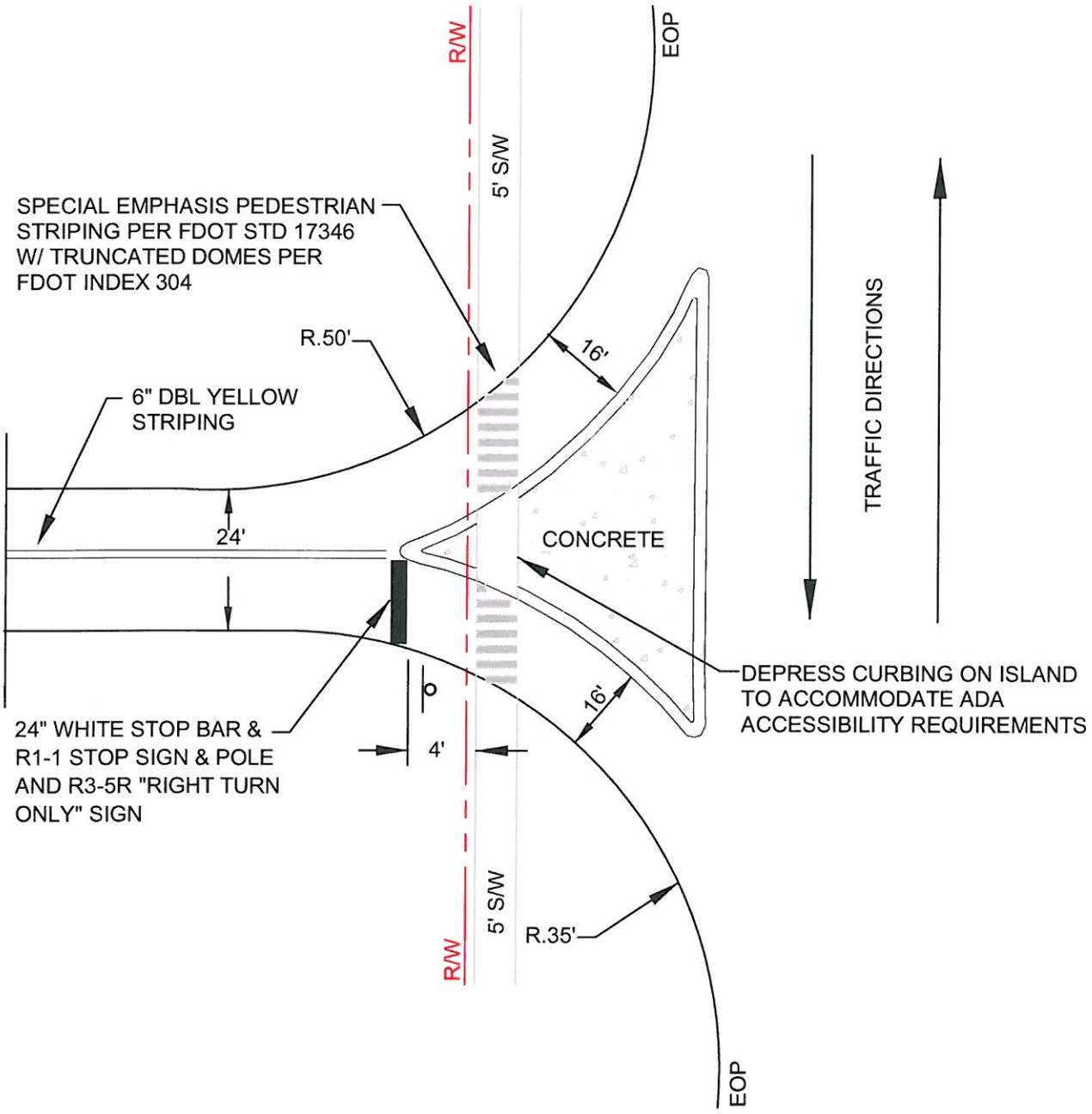
T-3
TRANSPORTATION DETAIL

Engineering Design Standards

RAISED TRAFFIC SEPARATOR FOR DRIVEWAYS (Right-In / Right-Out)

PRIMARILY APPLICABLE TO NON-DIVIDED ROADWAYS
WHERE REQUIRED BY THE COUNTY ENGINEER



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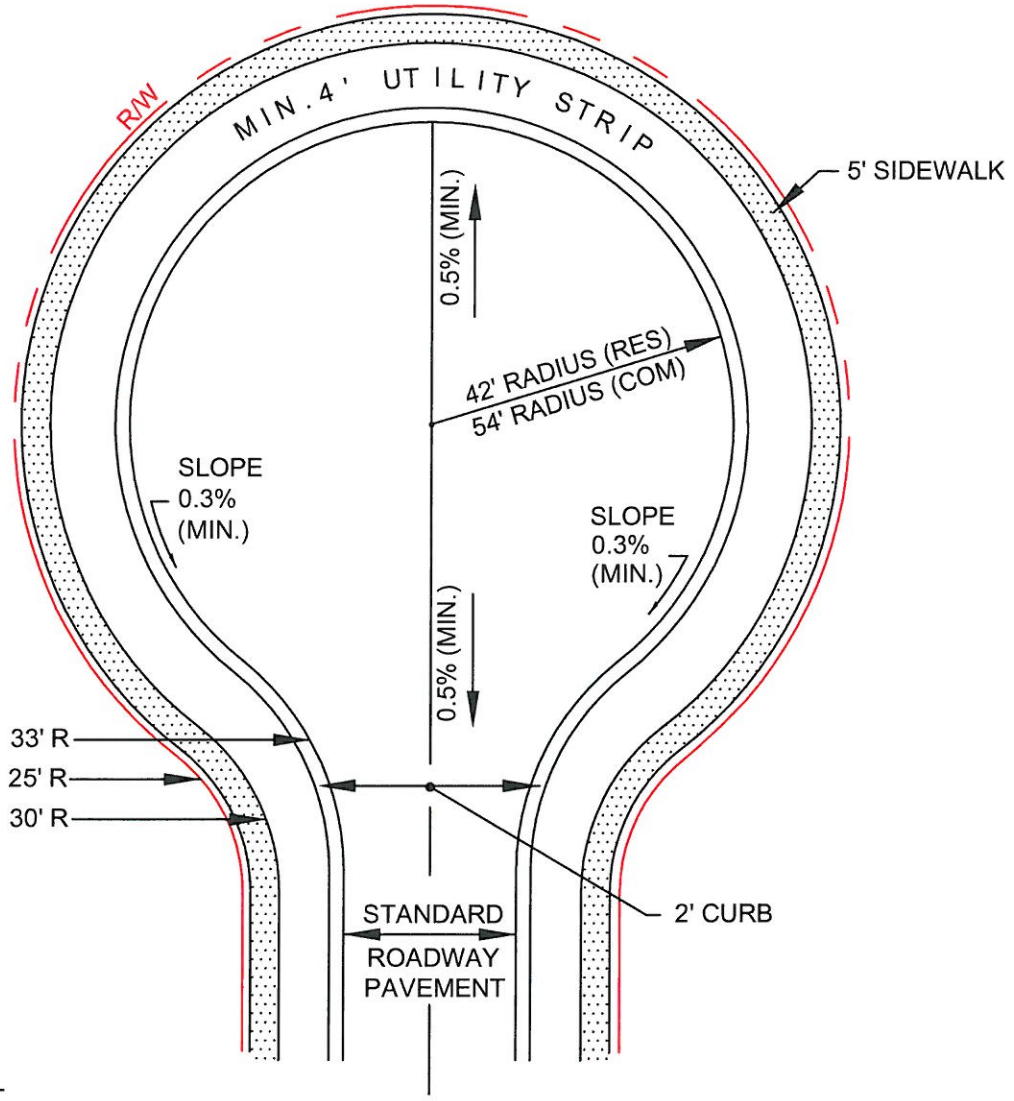
T-4
TRANSPORTATION DETAIL

Engineering Design Standards

RESIDENTIAL CUL-DE-SAC



NOTES:

1. PAVEMENT WIDTH: MEASURED TO EDGE OF CURB
2. SIDEWALK SHALL BE LOCATED IN RW OR SIDEWALK EASEMENT, AS PERMITTED
3. MAINTAIN A MINIMUM 4' SEPARATION BETWEEN BACK OF CURB AND SIDEWALK.
4. VERTICAL CURVE DESIGN MAY BE REQUIRED TO ACHIEVE LOW-POINTS AT PROPERTY LINES FOR DRAINAGE STRUCTURES AND PIPES.
5. THE SIDEWALK MAY NOT BE CONSTRUCTED ADJACENT TO THE PAVEMENT.
6. ALL VEHICLE MOVEMENTS MUST BE DESIGNED FOR CONTAINMENT WITHIN THE PAVEMENT AREA.

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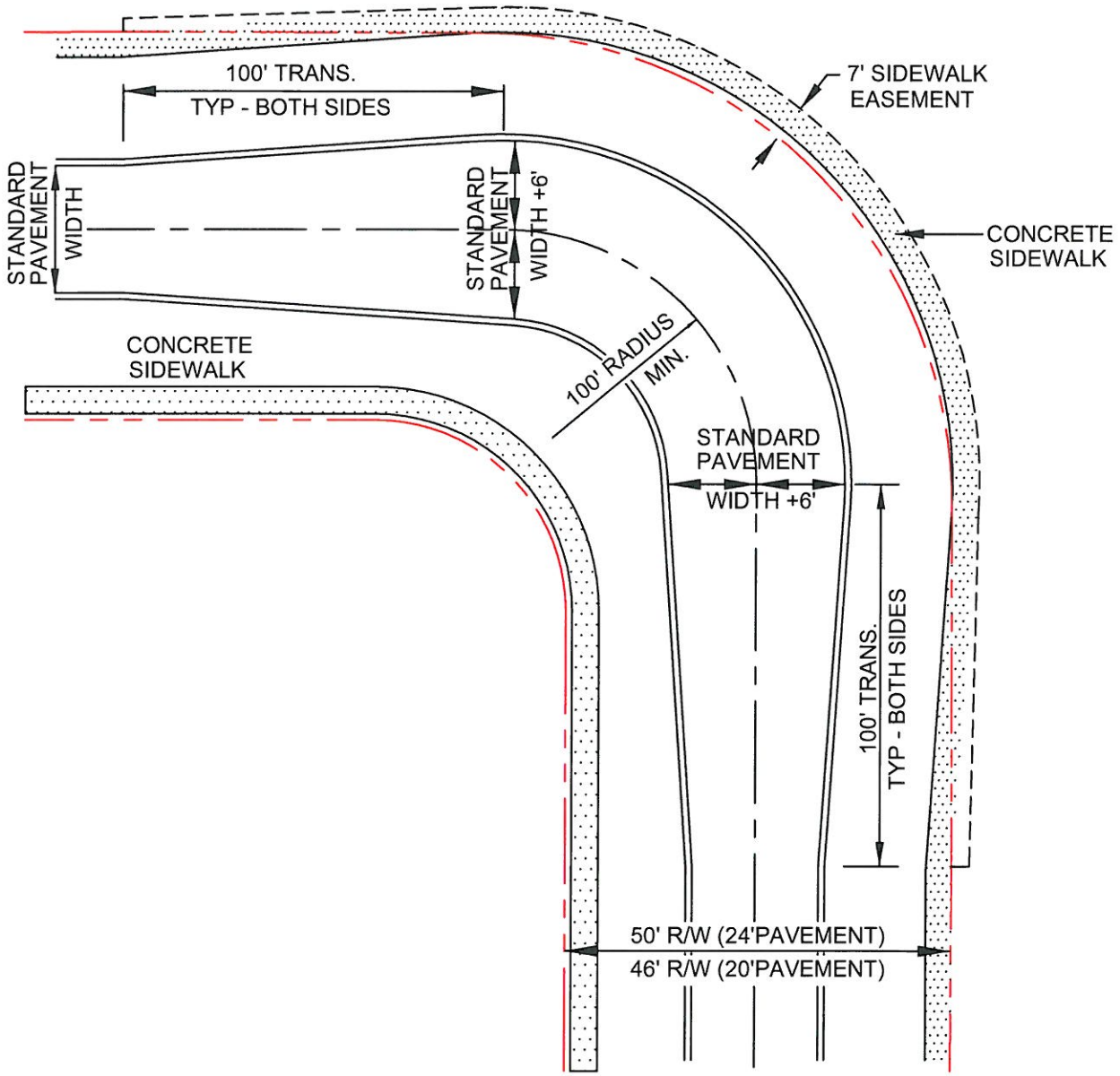
Engineering Design Standards

SUBDIVISION PAVEMENT CURVE @ 90° TURN

ALTERNATE DESIGN FOR RESIDENTIAL 90° TURNS



NOTE:

1. TO BE USED ON ROADWAYS WITH A CENTERLINE RADIUS OF LESS THAN 180'.

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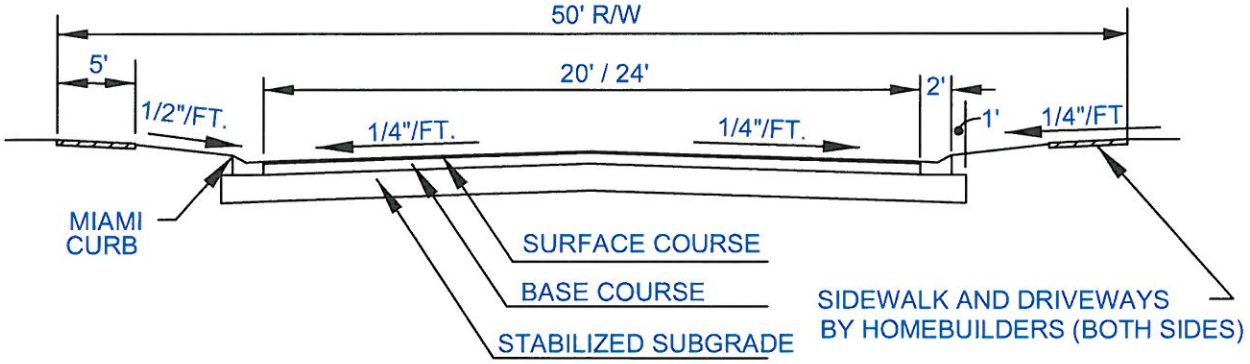
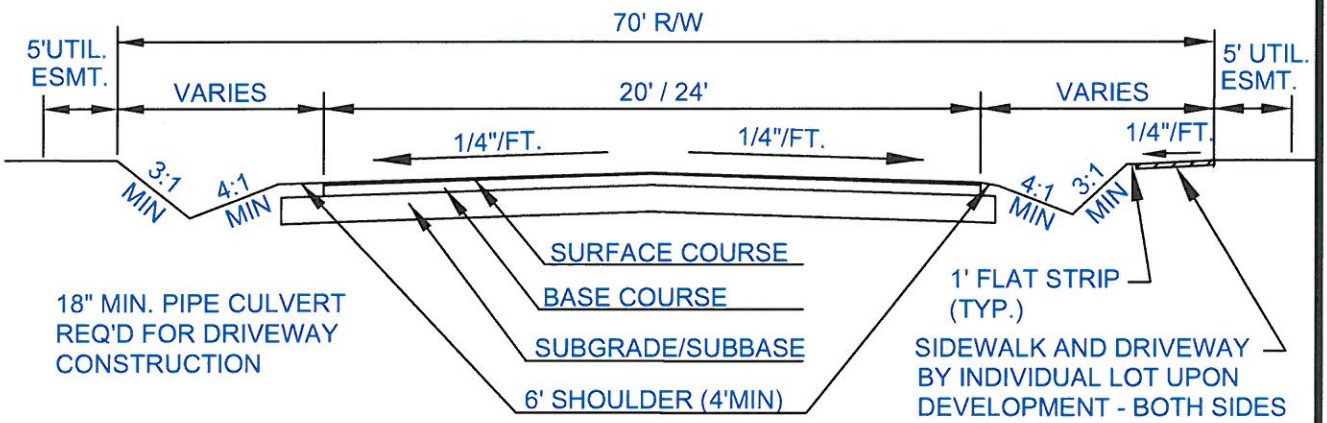
TRANSPORTATION DETAIL

Engineering Design Standards

TYPICAL SECTION SUBDIVISION ROADWAY (URBAN / RURAL)



(URBAN)



(RURAL)

1. PRIOR TO COMMENCING CONSTRUCTION WITHIN THE RW, THE CONTRACTOR SHALL CONTACT SEMINOLE COUNTY TRAFFIC ENGINEERING AT (407) 665-5677 AND SUBMIT A MAINTENANCE-OF-TRAFFIC PLAN FOR USE IN THE REQ'D. PRE-CONSTRUCTION CONFERENCE.
2. ALL DISTURBED AREAS WITHIN THE SEMINOLE COUNTY RW SHALL BE RESTORED TO EXISTING OR BETTER CONDTIONS.
3. ALL CURB AT INTERSECTIONS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE ADA ACCESSIBILITY REQ'MTS, AS APPLICABLE.
4. SITE CONTRACTOR SHALL INSTALL ALL SIDEWALK THAT IS ADJACENT TO INDIVIDUAL LOTS AS REQ'D BY THE APPROVED ROADWAY TYPICAL SECTION.
5. REFER TO THE SEMINOLE COUNTY LAND DEVELOPMENT CODE FOR SIDEWALK REQUIREMENTS.
6. ALL SIDEWALK AT DRIVEWAYS SHALL BE 6" THICK (NON REINFORCED)
7. ALL CONSTRUCTION PER FDOT STANDARDS UNLESS OTHERWISE DIRECTED BY THE COUNTY ENGINEER.
8. REFERENCE TRANSPORTATION DETAIL T-8 FOR PAVEMENT REQUIREMENTS.

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TRANSPORTATION DETAIL

TABLE OF PAVEMENTS

	ROADWAYS (PUBLIC & PRIVATE)				ONSITE (PRIVATE)
PAVEMENTS	ARTERIAL - MAJOR / MINOR COLLECTOR	COMMERCIAL INDUSTRIAL	LOCAL	RESIDENTIAL	PARKING
FRICTION COURSE * (1" FC-12.5 / 9.5 / RUBBER) **	1"	N/A	N/A	N/A	N/A
STRUCTURAL COURSE (TYPE SP-9.5 OR SP-12.5)	3" / 2"	2"	1½"	1½"	1½"
BASE COURSE *** LIMEROCK / SOIL CEMENT	10" 98% T-180	8" 98% T-180	6" 98% T-180	6" 98% T-180	6" 98% T-180
SUGBRADE STABILIZED / COMPACTED	12" 98% T-180	12" 98% T-180	12" 98% T-180	10" 98% T-180	8" 98% T-180
SIDEWALK / DRIVEWAY CONCRETE (3000 PSI)	4" / 6" 95% T-180	4" / 6" 95% T-180	4" / 6" 95% T-180	4" / 6" 95% T-180	4" / 6" 95% T-180
		SEE NOTE #10			

NOTES:

1. ROADWAY TESTING FOR PUBLIC & PRIVATE ROADS @ 250-FT INTERVALS (MINIMUM), STARTING @ 0+50 WITH NO LESS THAN 2-SAMPLES PER ROADWAY, AS DIRECTED BY THE COUNTY ENGINEER
2. * FRICTION COURSE ON ALL ROADWAYS WITH SPEED LIMIT OF 35 MPH OR GREATER
3. ** FOR ARTERIALS FC-12.5 SHAL BE USED. FOR COLLECTORS EITHER FC-9.5 OR 12.5 MAY BE USED UNLESS % TRUCKS >10%, THEN FC-12.5 SHALL BE USED.
4. *** SOIL CEMENT (180 PSI MIN, 300 PSI MAX) OVER COMPACTED SUBGRADE - 98% AASHTO T-180, METHOD D
5. LIMEROCK BASE OVER STABILIZED SUBGRADE, LBR 40 OR FBV 75 PSI
6. FOR STATE ROADS -- AS DIRECTED BY FDOT PERMIT
7. ALTERNATIVE BASE GROUP 9 PERMITTED BY APPROVAL OF THE COUNTY ENGINEER
8. FIBERMESH CONCRETE PERMITTED
9. REFER TO FDOT STANDARDS & SPECIFICATIONS FOR DETAILS & SPECIFICATIONS NOT PROVIDED HEREIN.
10. THE COUNTY ENGINEER MAY DETERMINE THAT A SUPPLEMENTAL PAVEMENT SECTION IS WARRANTED FOR PROPOSED COMMERCIAL / INDUSTRIAL USES. IF SO, THE COUNTY ENGINEER WILL ESTABLISH THE DESIGN CRITERIA AT TIME OF FINAL DEVELOPMENT PLAN SUBMITTAL.

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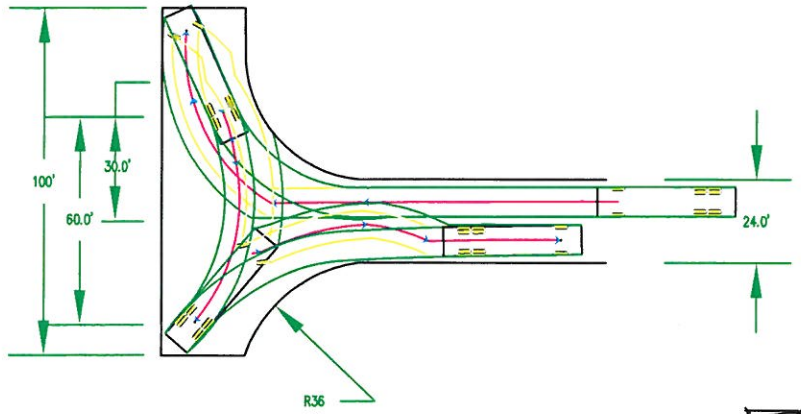
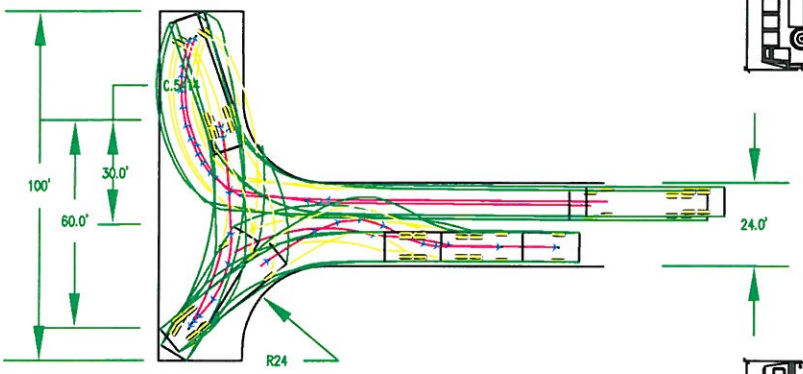
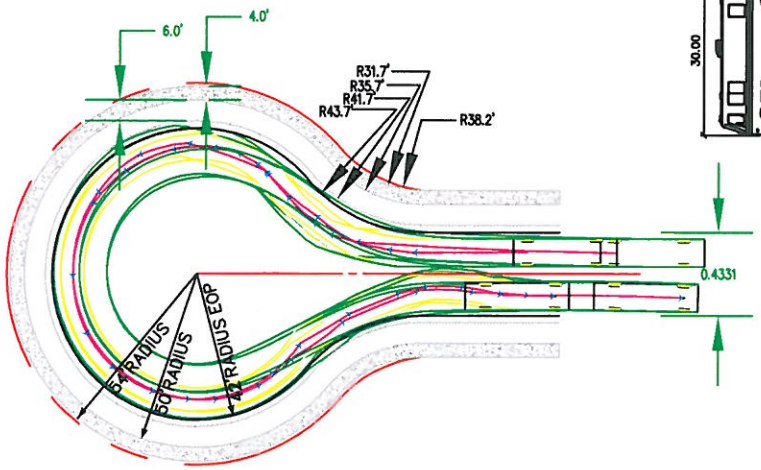
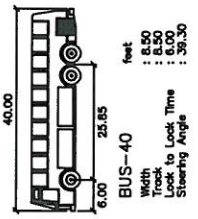
TURNING RADII



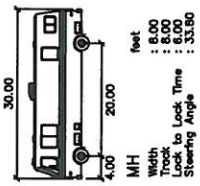






BUS-40 OK

MAX SIZE EQUIVALENT TO
ENGINES WITH 40' TURNING RADII
Simulation works with B. and E.



MH

EQUIVALENT TO
SQUAD 3 VEHICLE
This simulation works
with B. and E.

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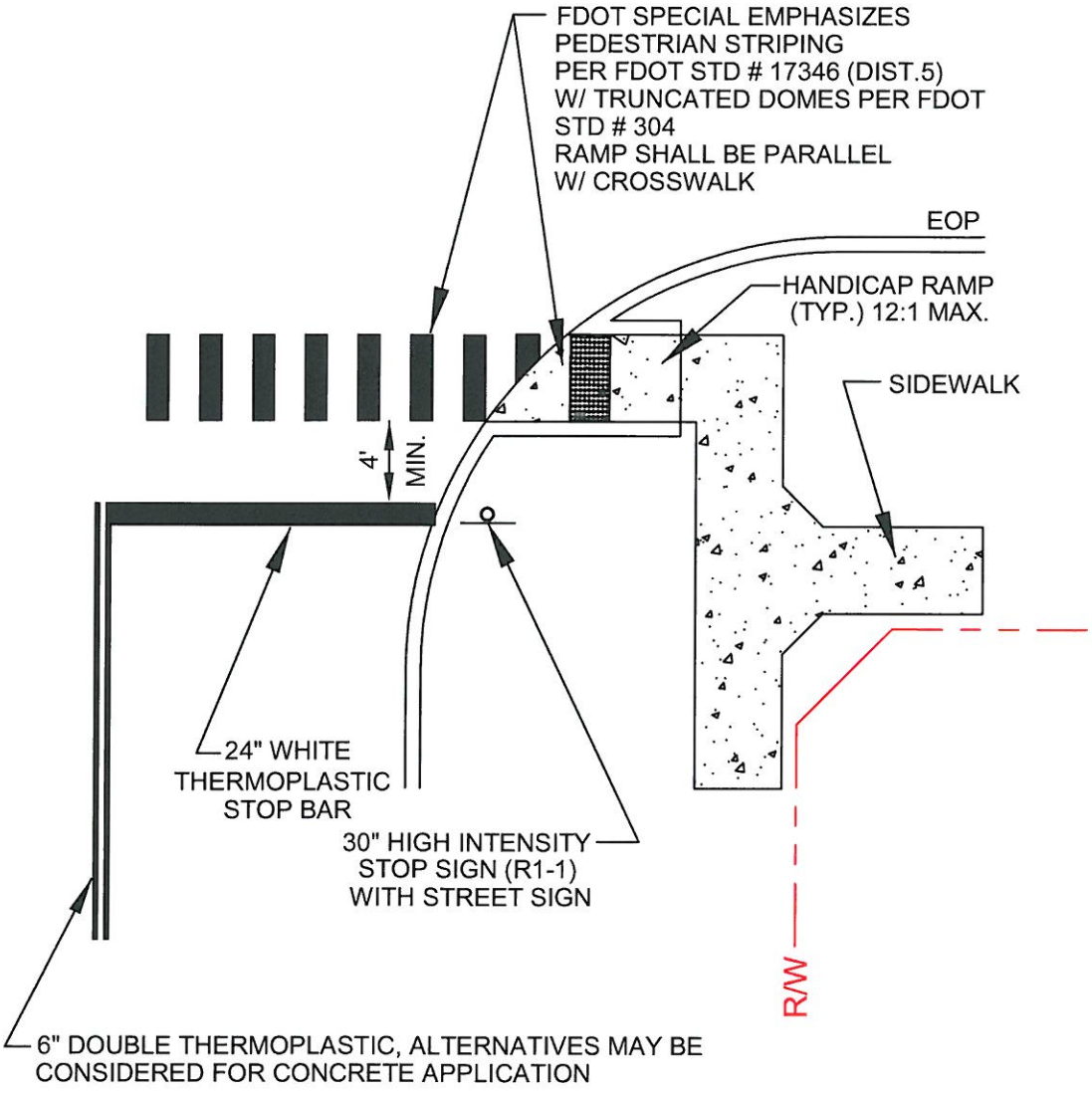
TRANSPORTATION
DETAIL

ADA SIDEWALK RAMPS - SUBDIVISIONS



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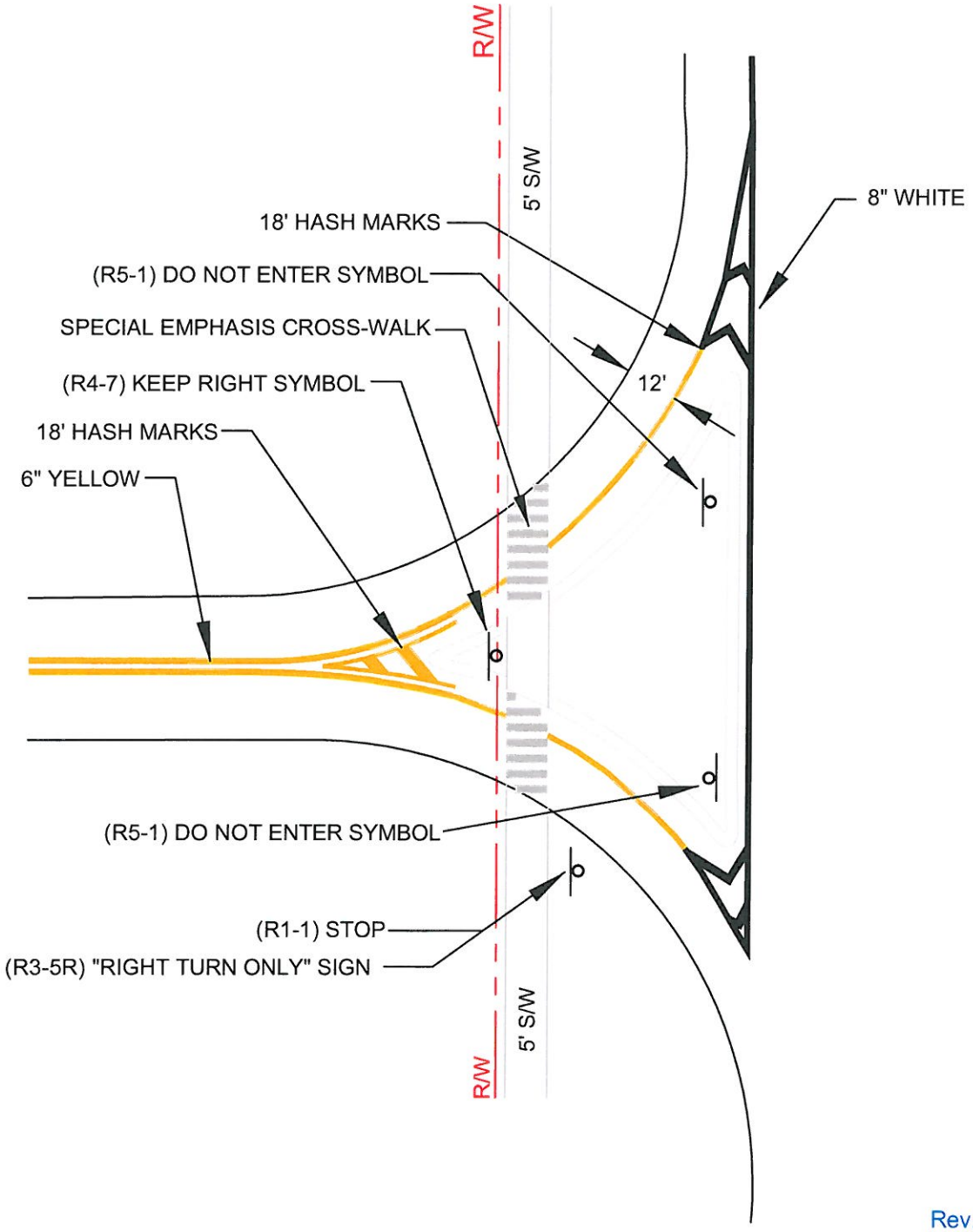
STRIPING : RIGHT-IN / RIGHT-OUT WITH RAISED TRAFFIC SEPARATOR



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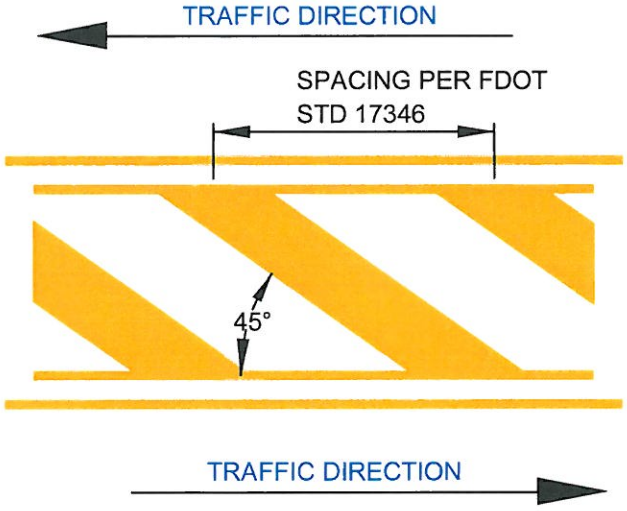
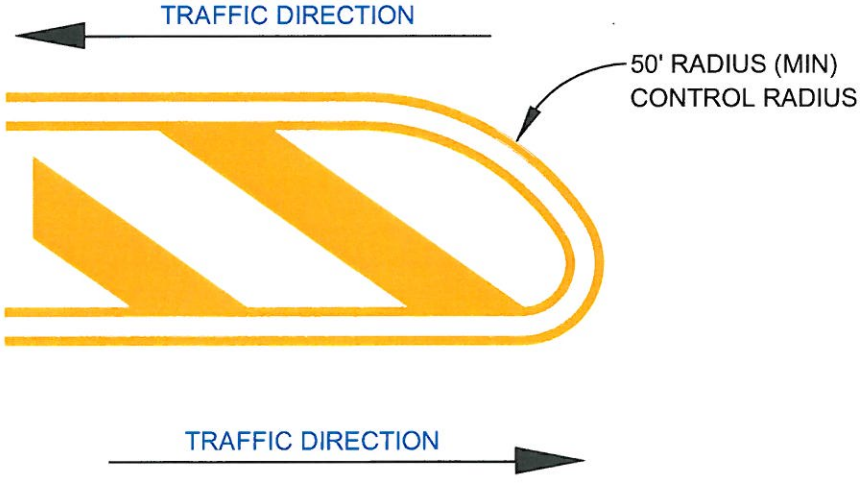
STRIPING : CHEVRON & BULLNOSE

CHEVRON



BULLNOSE



NOTE:
FOR DETAIL NOT SHOWN, PLEASE REFER TO FDOT DESIGN STANDARD, LATEST EDITION.

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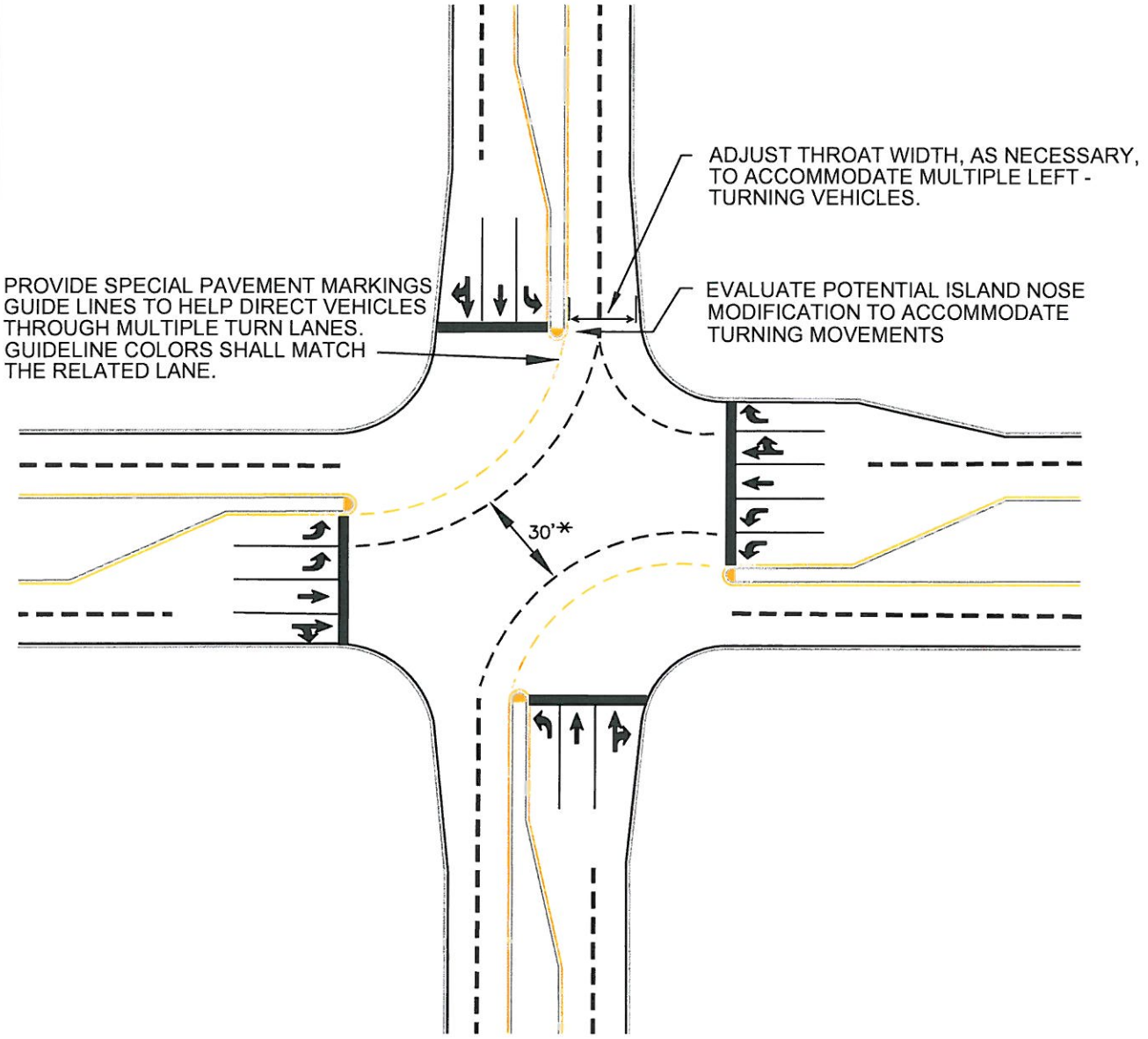
T-12
TRANSPORTATION DETAIL

Engineering Design Standards

STRIPING : DUAL TURN LANES



* THIS DIMENSION APPLIES TO THE SEPARATION OF OPPOSING MULTIPLE LEFT-TURN LANES TURNING SIMULTANEOUSLY. MINIMUM DISTANCE BETWEEN OUTSIDE VEHICLE PATH OR OPPOSING VEHCILES IS 6'.

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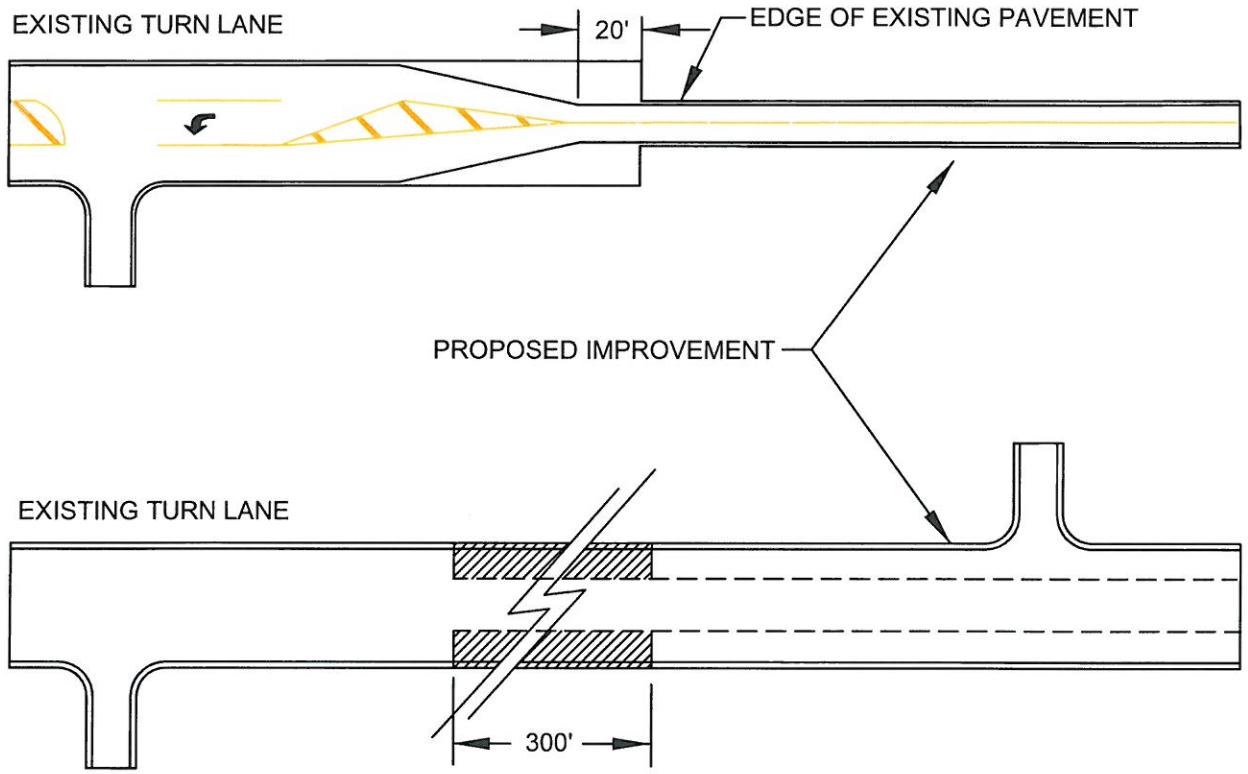
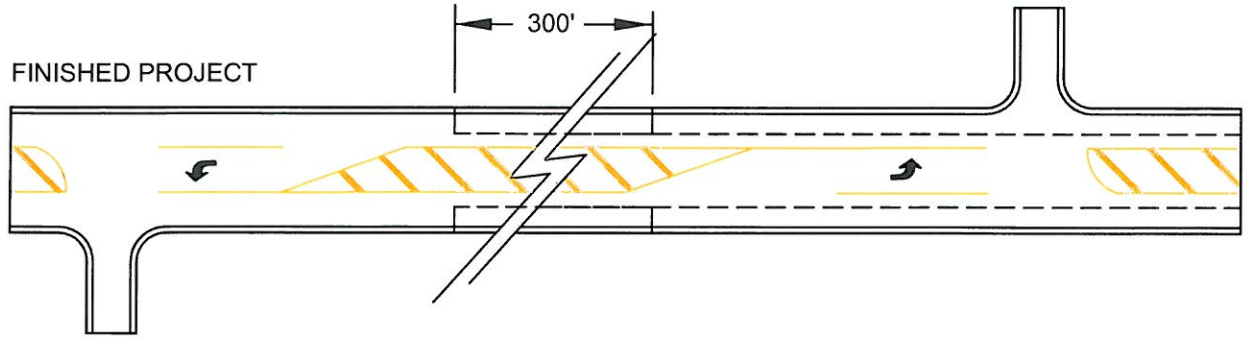
T-13
TRANSPORTATION DETAIL

STRIPING : AUXILIARY LANES



WHEN PROPOSED LANE MODIFICATIONS FALL WITHIN 300' OF EXISTING IMPROVEMENTS, THE TWO SECTIONS SHALL BE CONNECTED CREATING A 36' WIDE SECTION THROUGHOUT.



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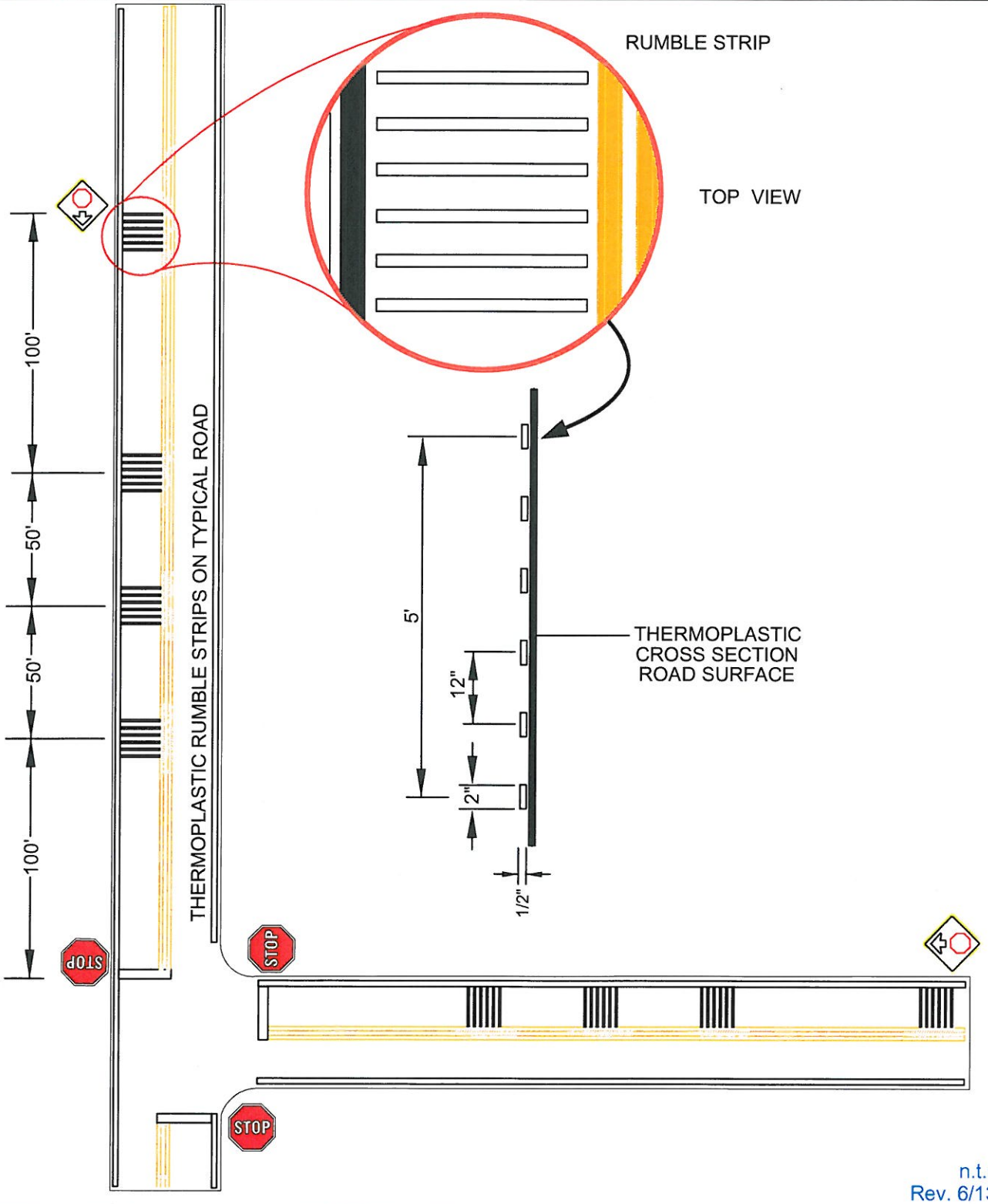
Engineering Design Standards

STRIPING : RUMBLE STRIPS



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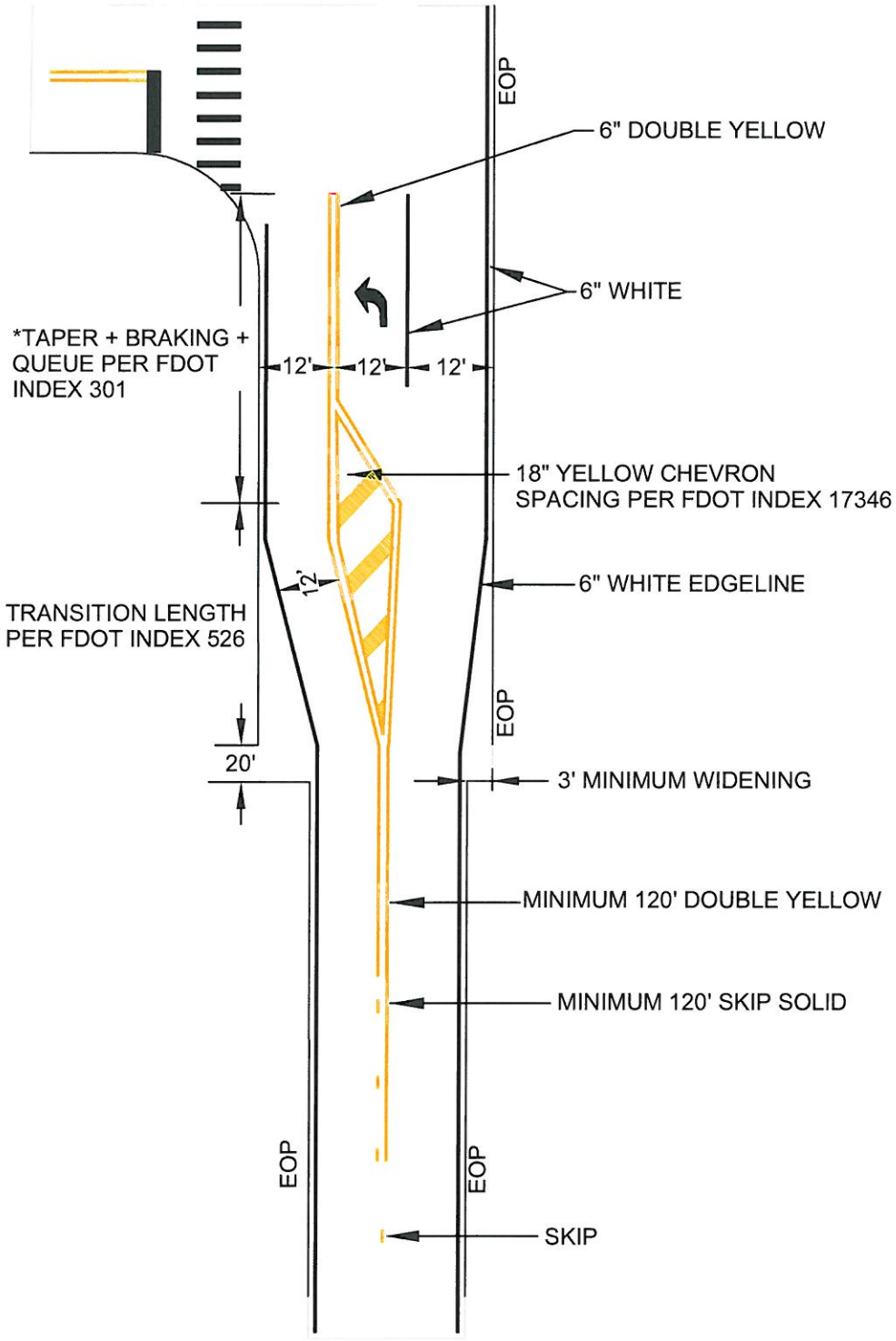
TRANSPORTATION
DETAIL

Engineering Design Standards

AUXILIARY LANES



*STANDARD SEMINOLE COUNTY QUEUE 100'

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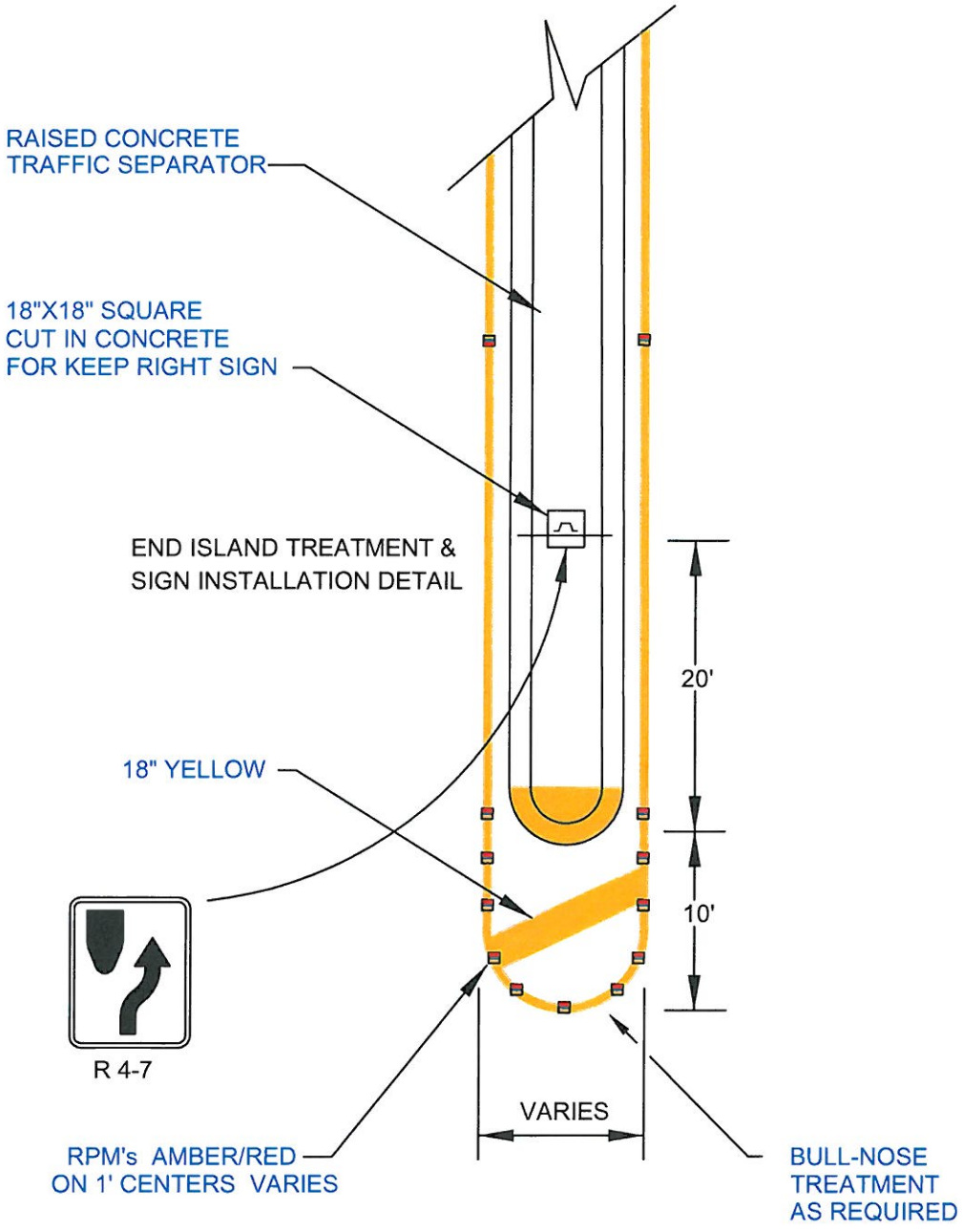
TRANSPORTATION DETAIL

RPM's & MEDIAN SIGN



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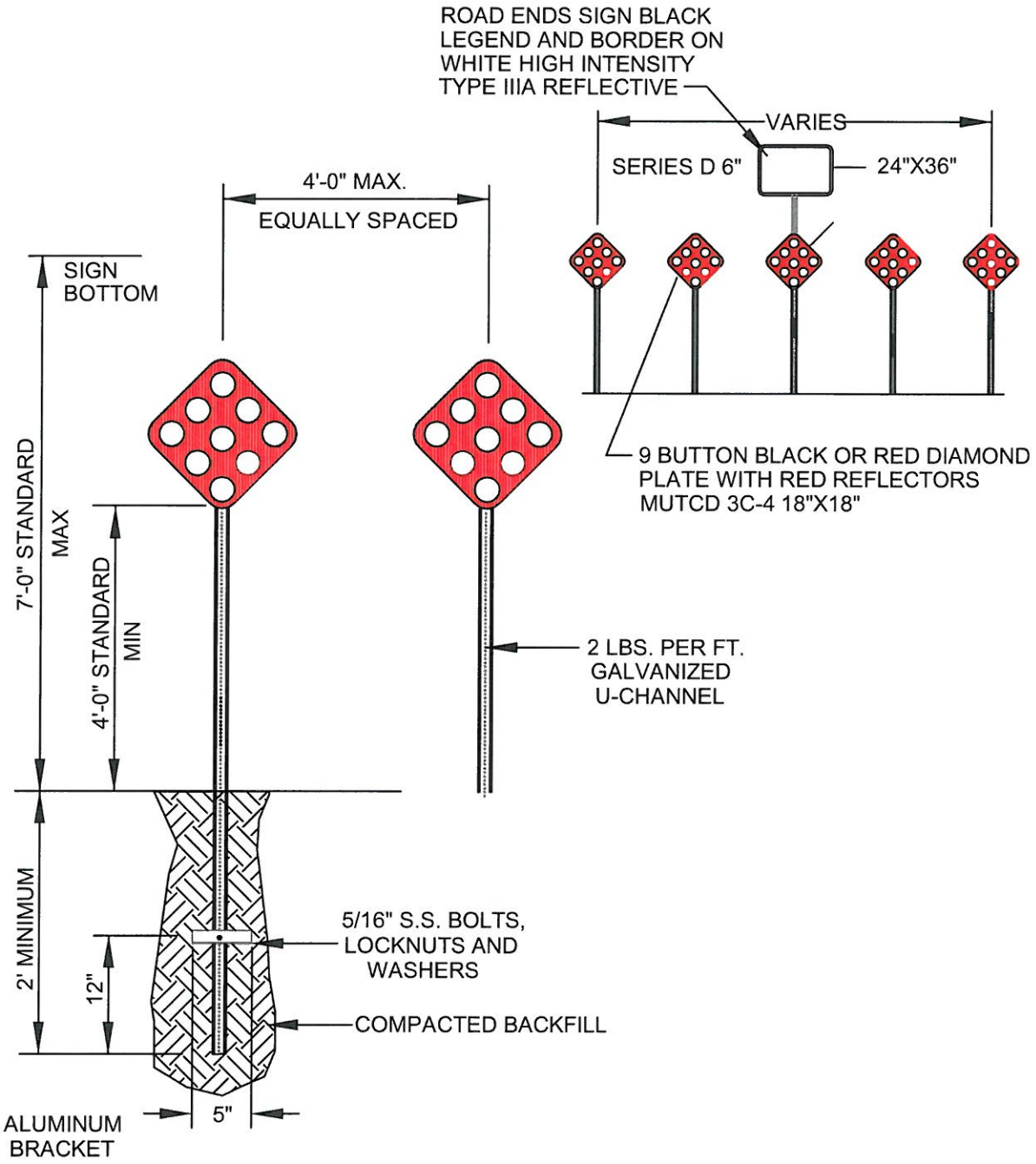
Engineering Design Standards

ROADWAY TERMINATION



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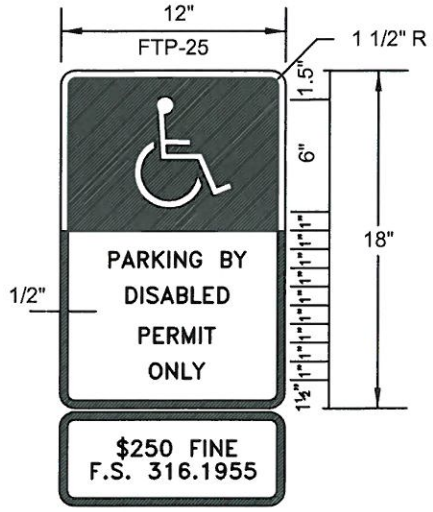
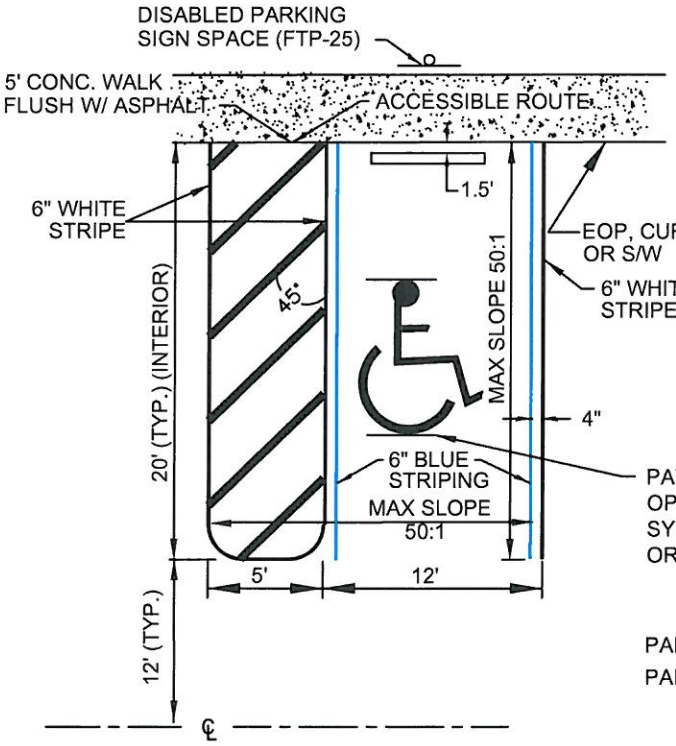
TRANSPORTATION DETAIL

SIGNAGE : ADA - PARKING & SIGNAGE



NOTE: (DISABLED SIGN ONLY)

1. ALL LETTERS SHALL BE BLACK AND SHALL CONFORM TO FDOT "ROADWAY AND TRAFFIC DESIGN STANDARDS" .
2. TOP PORTION OF SIGN SHALL HAVE REFLECTORIZED (ENGINEERING GRADE) BLUE BACKGROUND WITH WHITE REFLECTORIZED LEGEND AND BORDER.
3. BOTTOM PORTION OF SIGN SHALL HAVE A REFLECTORIZED (ENGINEERING GRADE) WHITE BACKROUND w/BLACK BORDER.
4. ONE SIGN REQUIRED FOR EACH PARKING SPACE.
5. HEIGHT OF SIGN SHALL BE 7' ABOVE GROUND IN ACCORDANCE WITH FDOT "ROADWAY AND TRAFFIC DESIGN STANDARDS" .
6. ALL RAMPS NOT TO EXCEED 12:1 SLOPE, 8 1/3% GRADE.



ACCESSIBILITY:

A) IN ACCORDANCE WITH THE FLORIDA ACCESSIBILITY CODE FOR BUILDING CONSTRUCTION, 4.1.3 SECTION (1), DATED OCT. 1996, (or latest revision) AT LEAST ONE ACCESSIBLE ROUTE COMPLYING WITH 4.3 SHALL CONNECT ACCESSIBLE BUILDING OR FACILITY ENTRANCES WITH ALL ACCESSIBLE SPACES AND ELEMENTS WITHIN THE BUILDING OR FACILITY. DETAILS WITH SLOPE INFORMATION MUST BE DEPICTED ON SITE PLAN.

B) THE LOCATION OF HANDICAPPED PARKING STALL, LOADING ZONES, SIDEWALKS AND RAMPS ON SITE SHALL MEET CHAPTER 316.1955 OF THE FLORIDA STATUES AND SECTION 4.1.3 OF THE FLORIDA ACCESSIBILITY CODE. CURB RAMPS SHALL NOT EXCEED 12:1 SLOPES. PARKING SPACE AND AISLE SHALL NOT EXCEED 50:1 CROSS-SLOPE.

PARKING STALLS SHALL BE MARKED WITH WHITE & BLUE PAINT PER FLORIDA ACCESSIBILITY CODE SECTION 4.6.1.

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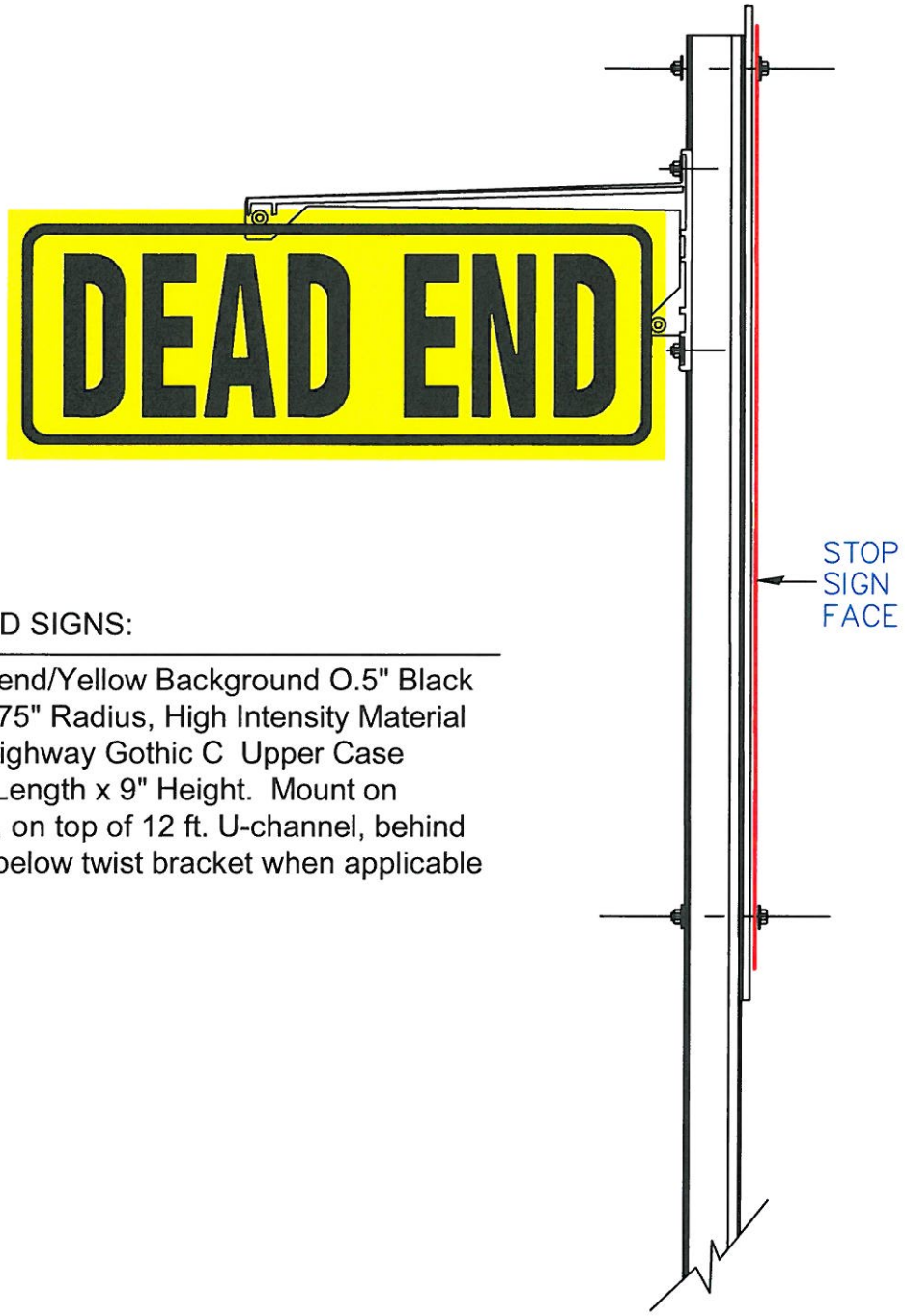
SIGNAGE : DEAD END

APPLICATION: WHEN NO VEHICLE TURNAROUND ROADWAY IS AVAILABLE



DEAD END SIGNS:

Black Legend/Yellow Background O.5" Black Border 0.75" Radius, High Intensity Material
Font: 6" Highway Gothic C Upper Case
Size: 24" Length x 9" Height. Mount on cantilever, on top of 12 ft. U-channel, behind stop sign below twist bracket when applicable

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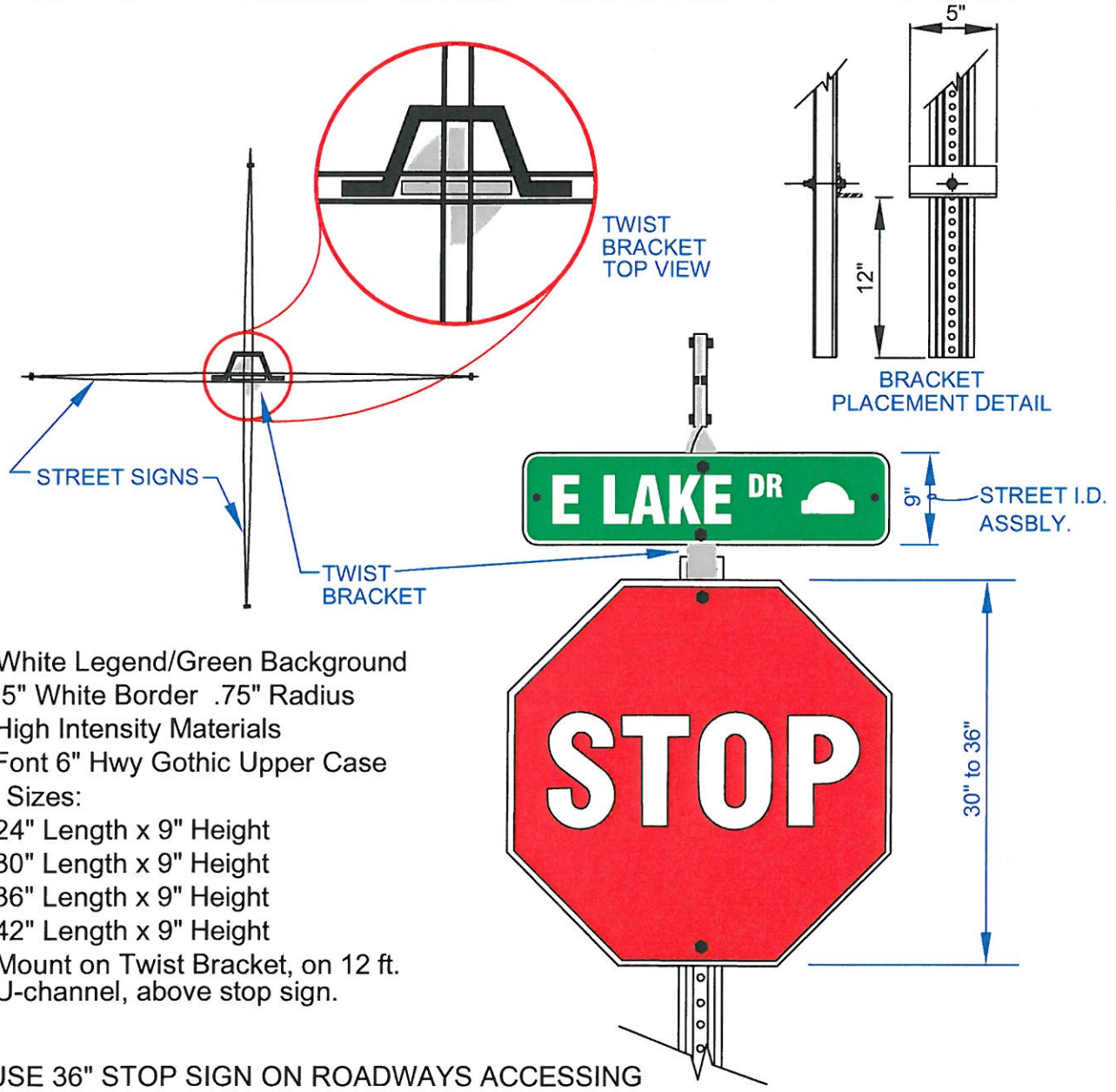
Engineering Design Standards

SIGNAGE : STOP SIGN & STREET NAME



White Legend/Green Background
.5" White Border .75" Radius
High Intensity Materials
Font 6" Hwy Gothic Upper Case
Sizes:
24" Length x 9" Height
30" Length x 9" Height
36" Length x 9" Height
42" Length x 9" Height
Mount on Twist Bracket, on 12 ft. U-channel, above stop sign.

USE 36" STOP SIGN ON ROADWAYS ACCESSING ARTERIAL OR HIGHER CLASSIFICATION
INTERNAL STOP SIGN = 30"
MAIN ENTRANCE STOP SIGN = 36"

(In compliance with Traffic Ordinance #82-39 Florida Statue Chapter 316)

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TRANSPORTATION DETAIL

SIGNAGE : ILLUMINATED & STANDARD STREET SIGN

Overhead Illuminated Street I.D.
White Legend/Green Background
1.25" White Border No Radius
Materials White Translucent Lexan
Font: Helvetica/Medium (act.ak rev.r) 8" Upper/Lower Case
Sizes: Length 94.5" x Height 15.5" Or 70.5" x 15.75"

Overhead Aluminum Street I.D.
White Legend/Green Background
1" Border 1.5" Radius
High Intensity Materials
Font: 8" Highway Gothic C Upper/Lower Case
Sizes: Length 48" x Height 18"
Length 60" x Height 18"
Length 72" x Height 18"

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TRAIL DESIGN STANDARDS

Multi Use Trail (Paved Facility)

Pavement Design

Wearing Surface (Trail Width) ..... 1¼" Type S-III Asphaltic Concrete
Base Course (Trail Width + 0.5') ..... 6" Optional Material**
Subgrade (Trail width + 2.0') ..... 8" Type "B" Stabilization***

* Optional Base Course Materials include Limerock, shell, crushed concrete** or asphalt.
** Use sub grade above or have geotechnical engineer development sub grade specifications.
*** Type "B" Stabilization to be compacted to LBR 40 with 98% Compaction.

Multi Use Path (Unpaved Facility)

Path shall be smooth, firm, and unyielding. Installation of mulch is optional: 6' - 8' wide

General Standards

Curb cuts and ramps* for all Paved Trail Crossings: Concrete = 6" thick
* Shall meet FDOT Index No. 304** tactile surface requirements
** Dome pattern shall be in-line with direction of travel

Cross slope of pavement (Sloping in one direction instead of crowning is preferred)
Recommended ..... 1 %
Maximum ..... 2 %

Longitudinal Grades

Preferred Maximum (Design shall adhere to ADA Standards) 5%

Shoulder adjacent to paved trail (Graded area free of hazards adjacent to both sides of trail)

Preferrable ..... 3.0'
Minimum ..... 2.0'
Cross slope min 2%
Cross slope max 5%

Design speed

Bicycle facilities (Paved/Unpaved) : 20 mph/ 15 mph

Radius / Horizontal Curvature

Min Centerline Radius ..... 100'

Separation between paved trail and unpaved path (where possible)

Recommended..... 5'
With equestrian use ..... 10'

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TRAIL DESIGN STANDARDS

Clearances:

Clear Zone/Horizontal Clearances for paved trails

Lateral clearance from obstruction (trees, poles, walls, guardrails etc.)
- Minimum without barrier ..... 4.0'
- Minimum for Cross Seminole Trail ..... 5.0'

Lateral separation from grade change (steeper than or equal to a 3:1 H:V slope)
- Minimum without barrier ..... 6.0'
- Distance between roadway & trail should be ..... 5.0'
- When less, continuous barrier/divider minimum height ..... 4.5'

Vertical Clearances
- Vertical clearance to obstruction for pedestrian use ..... 8.0'
- Vertical clearance to obstruction for bicycle use .....10.0'
- Vertical clearance to obstruction for equestrian use ..... 12.0'

References - Refer to the latest editions of the following:

- Manual of Uniform Traffic Control Devices
- FDOT Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways (Florida Green Book)
- American Association of State Highway and Transportation Officials (AASHTO)
- FDOT Plans Preparation Manual
- FDOT Bicycle Facilities Planning and Design Handbook
- FDOT Pedestrian Planning and Design Handbook
- FDOT Trail Intersection Design Handbook
- FDOT Designing Trail Termini
- Seminole County Land Development Code

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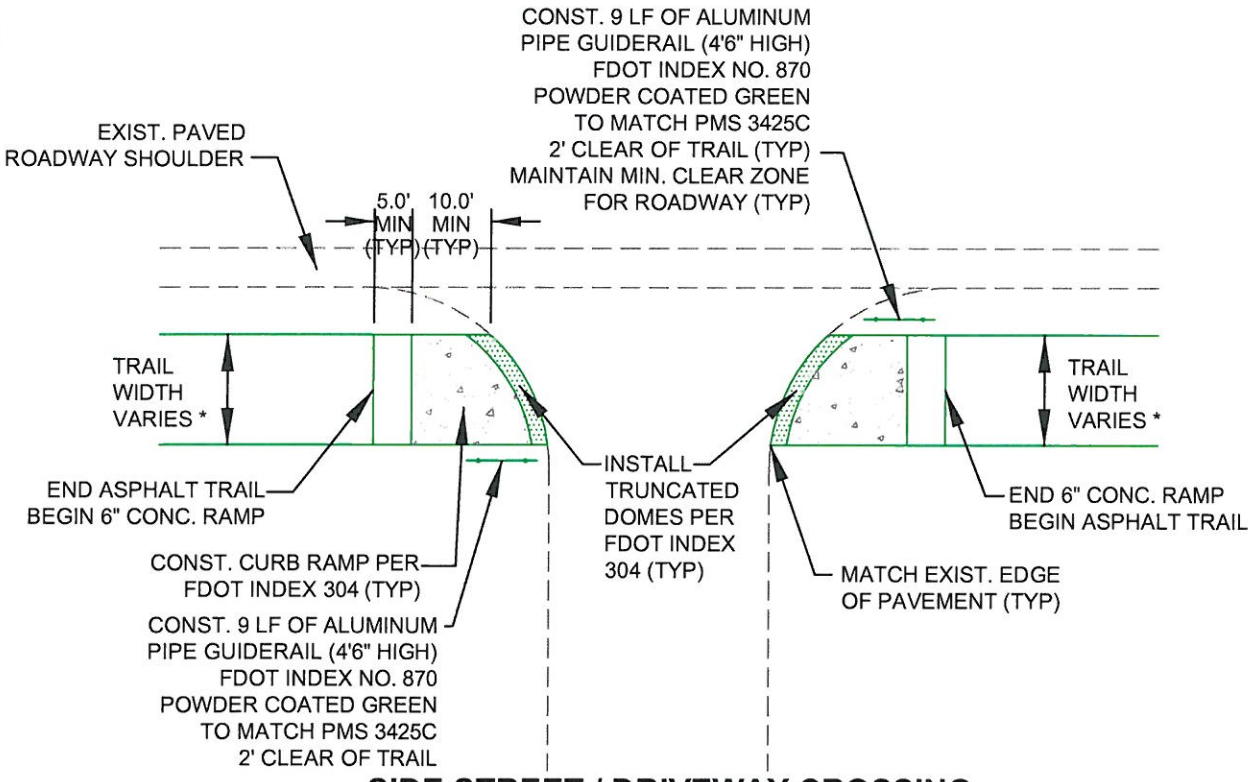
TRAIL DESIGN STANDARDS

Rural Crossing Detail



SIDE STREET / DRIVEWAY CROSSING
TRAIL WITHOUT MEDIAN DETAIL
RURAL TYPICAL SECTION

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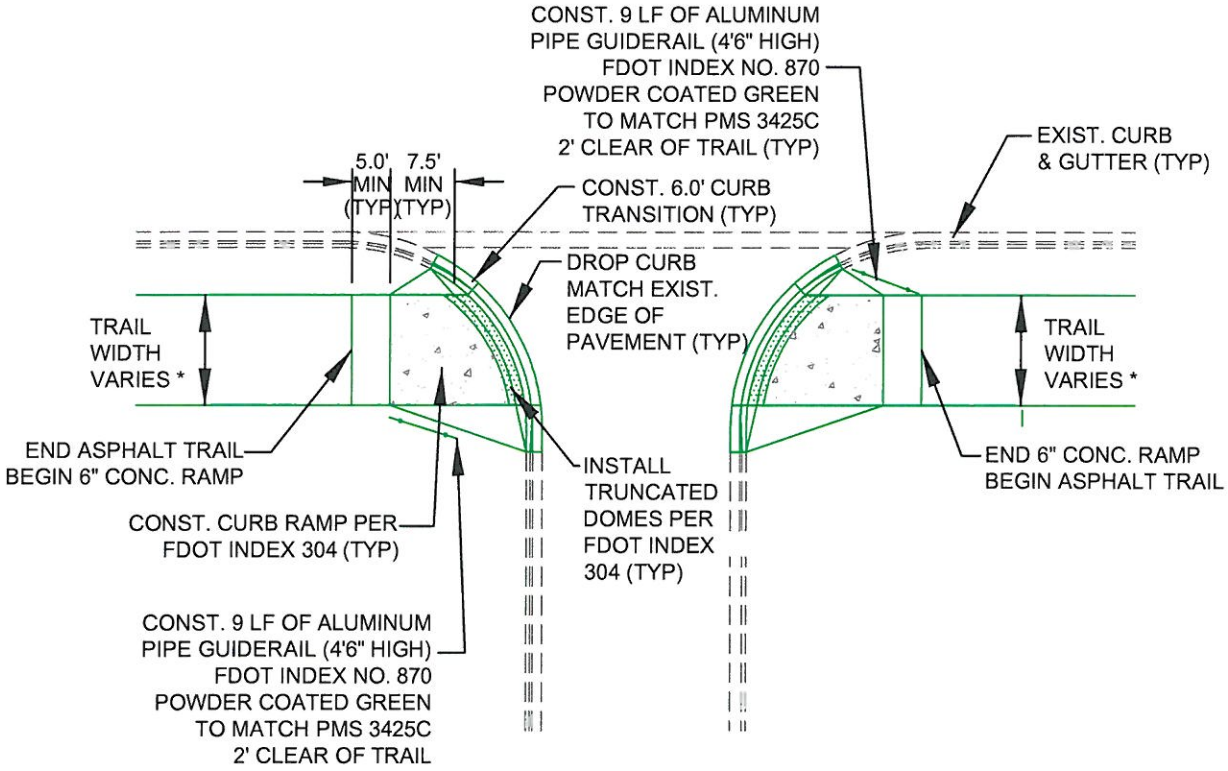
TRAIL DESIGN STANDARDS

Urban Crossing Detail



SIDE STREET/DRIVEWAY CROSSING
TRAIL WITHOUT MEDIAN DETAIL
URBAN TYPICAL SECTION

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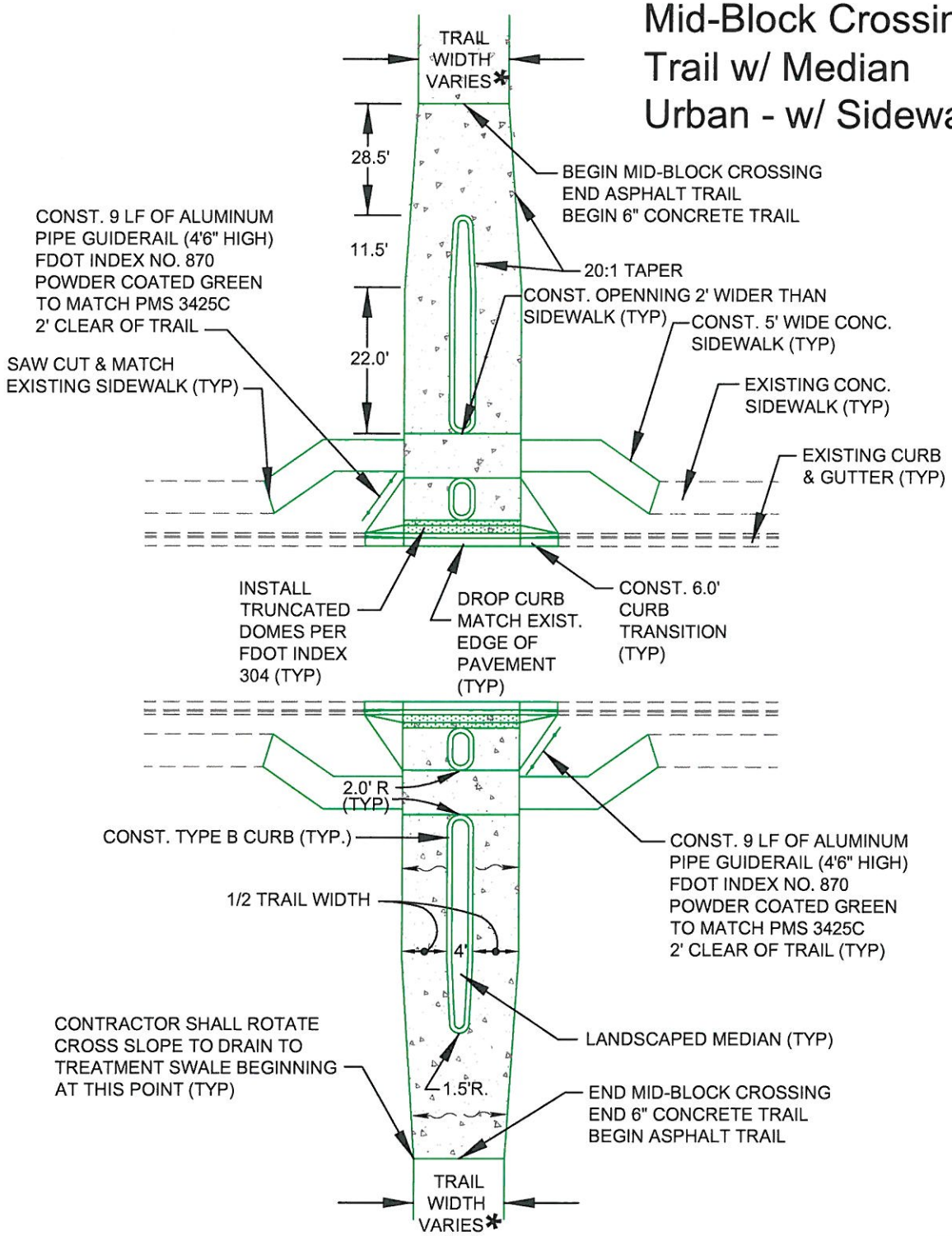
TRAIL DESIGN STANDARDS

Mid-Block Crossing
Trail w/ Median
Urban - w/ Sidewalk



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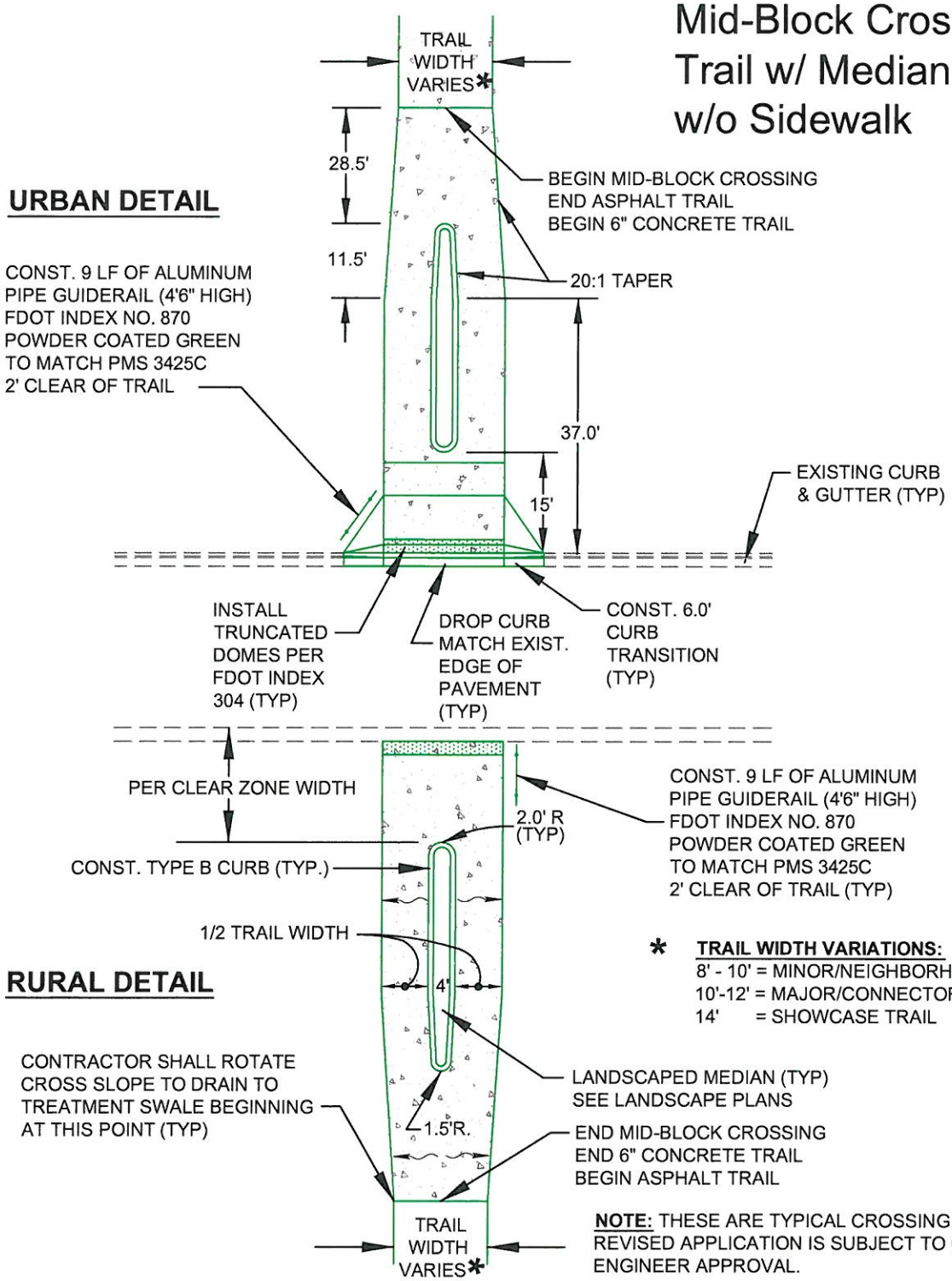
T-27
TRANSPORTATION DETAIL

TRAIL DESIGN STANDARDS

Mid-Block Crossing Trail w/ Median w/o Sidewalk

URBAN DETAIL



* **TRAIL WIDTH VARIATIONS:**
8' - 10' = MINOR/NEIGHBORHOOD TRAIL
10'-12' = MAJOR/CONNECTOR TRAIL
14' = SHOWCASE TRAIL

NOTE: THESE ARE TYPICAL CROSSING DETAILS. REVISED APPLICATION IS SUBJECT TO COUNTY ENGINEER APPROVAL.

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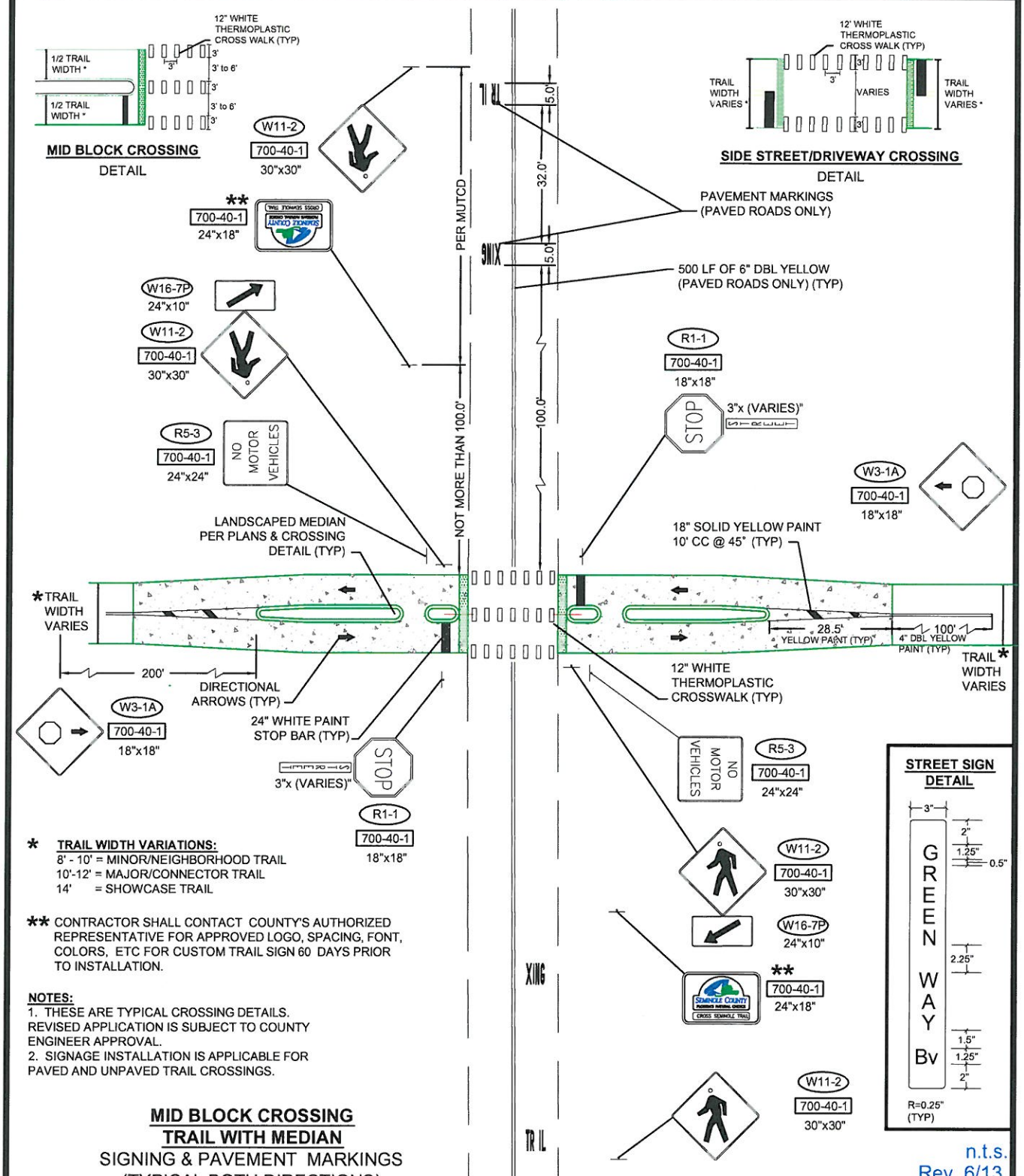
TRAIL DESIGN STANDARDS



* **TRAIL WIDTH VARIATIONS:**
8' - 10' = MINOR/NEIGHBORHOOD TRAIL
10'-12' = MAJOR/CONNECTOR TRAIL
14' = SHOWCASE TRAIL

** CONTRACTOR SHALL CONTACT COUNTY'S AUTHORIZED REPRESENTATIVE FOR APPROVED LOGO, SPACING, FONT, COLORS, ETC FOR CUSTOM TRAIL SIGN 60 DAYS PRIOR TO INSTALLATION.

NOTES:
1. THESE ARE TYPICAL CROSSING DETAILS. REVISED APPLICATION IS SUBJECT TO COUNTY ENGINEER APPROVAL.
2. SIGNAGE INSTALLATION IS APPLICABLE FOR PAVED AND UNPAVED TRAIL CROSSINGS.

MID BLOCK CROSSING
TRAIL WITH MEDIAN
SIGNING & PAVEMENT MARKINGS
(TYPICAL BOTH DIRECTIONS)

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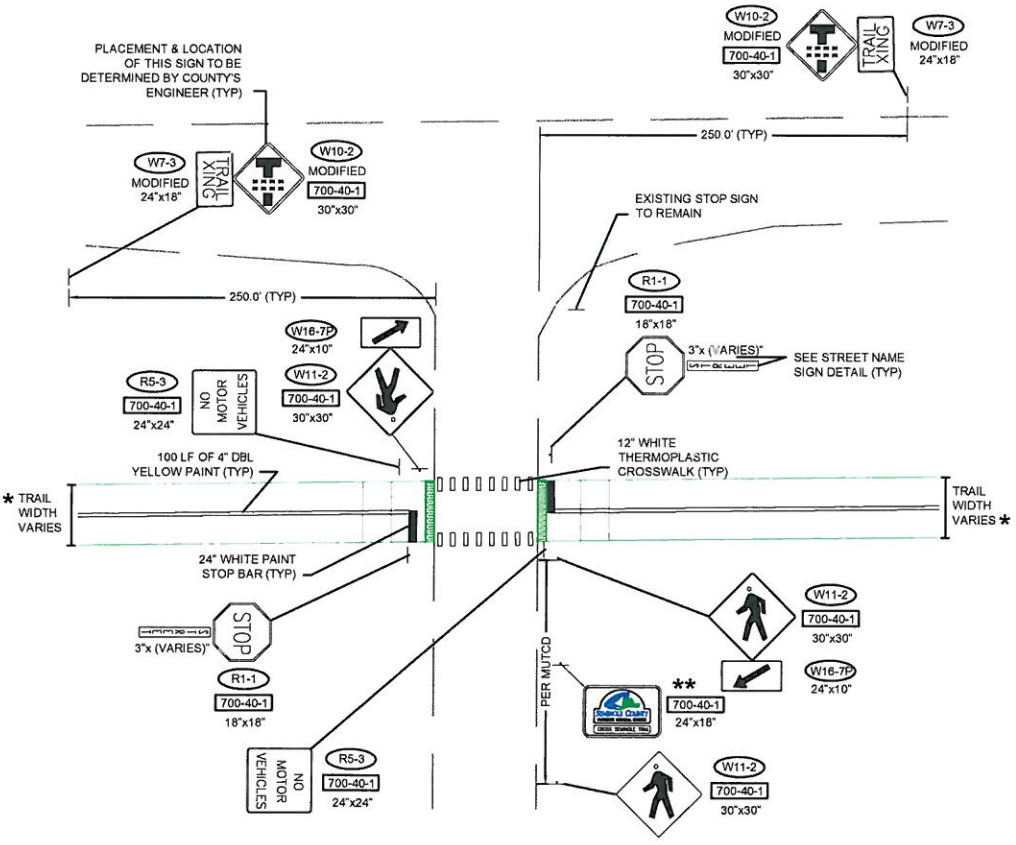
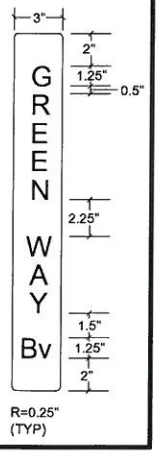
T-29
TRANSPORTATION DETAIL

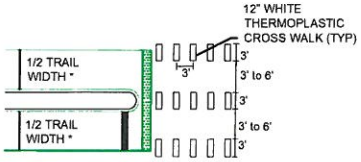
TRAIL DESIGN STANDARDS



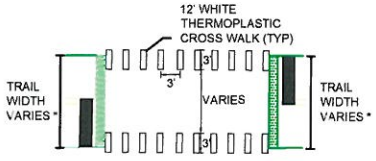
SIDE STREET/DRIVEWAY CROSSING
TRAIL WITHOUT MEDIAN
SIGNING & PAVEMENT MARKINGS

STREET SIGN DETAIL





MID BLOCK CROSSING
DETAIL



SIDE STREET/DRIVEWAY CROSSING
DETAIL

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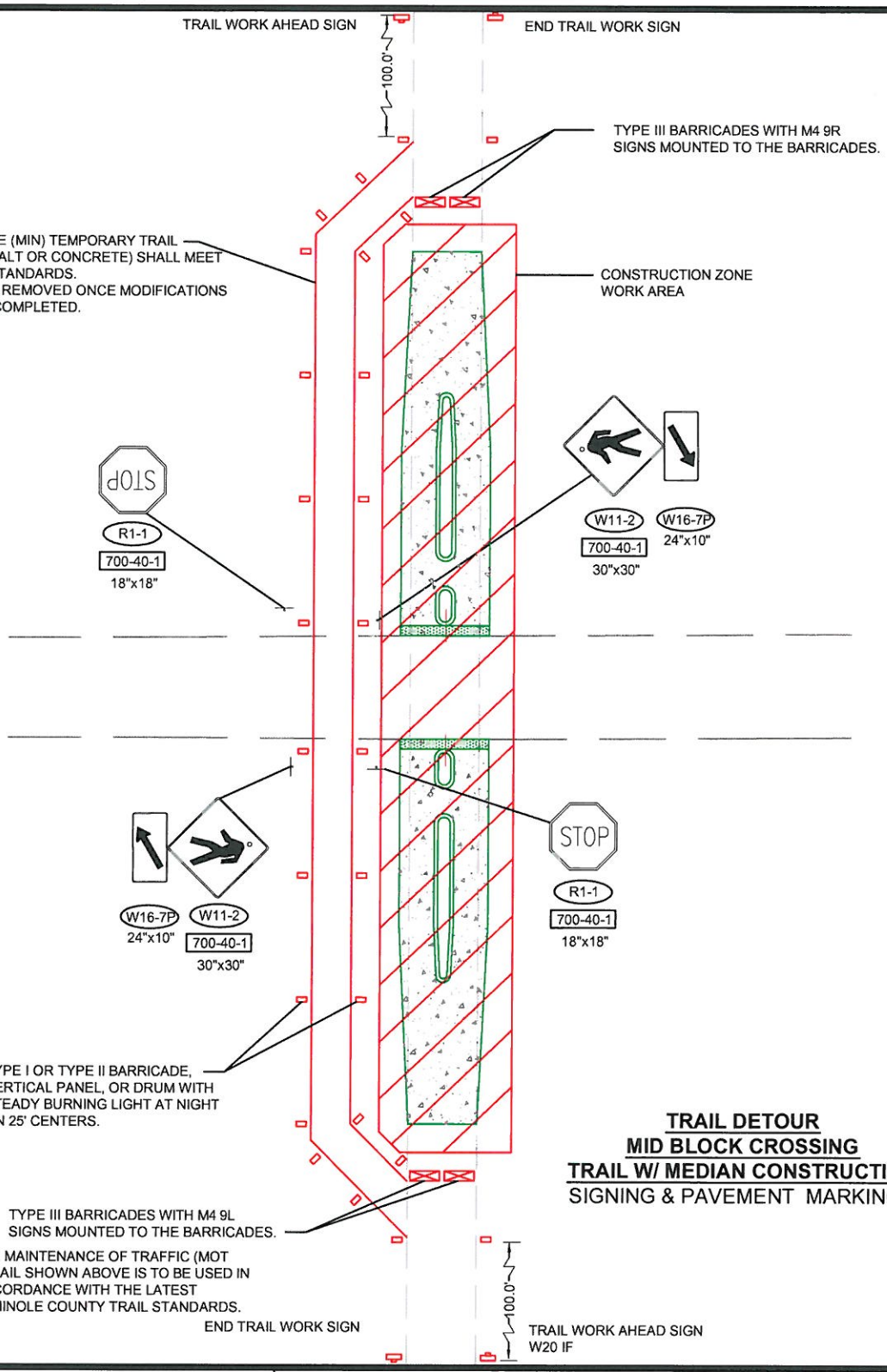
T-30
TRANSPORTATION DETAIL

Engineering Design Standards

TRAIL DESIGN STANDARDS



TRAIL DETOUR
MID BLOCK CROSSING
TRAIL W/ MEDIAN CONSTRUCTION
SIGNING & PAVEMENT MARKINGS

NOTE: THE MAINTENANCE OF TRAFFIC (MOT DETAIL SHOWN ABOVE IS TO BE USED IN ACCORDANCE WITH THE LATEST SEMINOLE COUNTY TRAIL STANDARDS.

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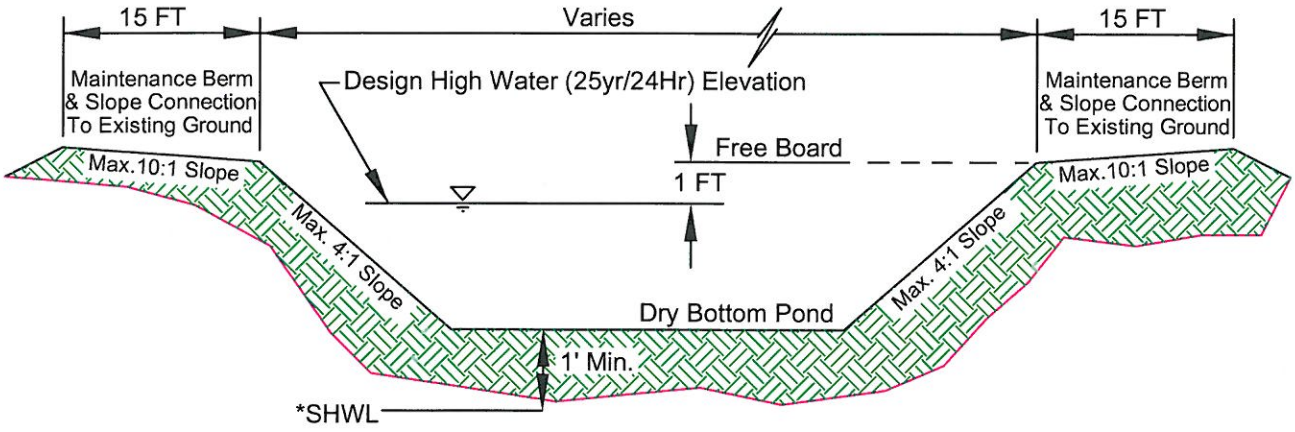
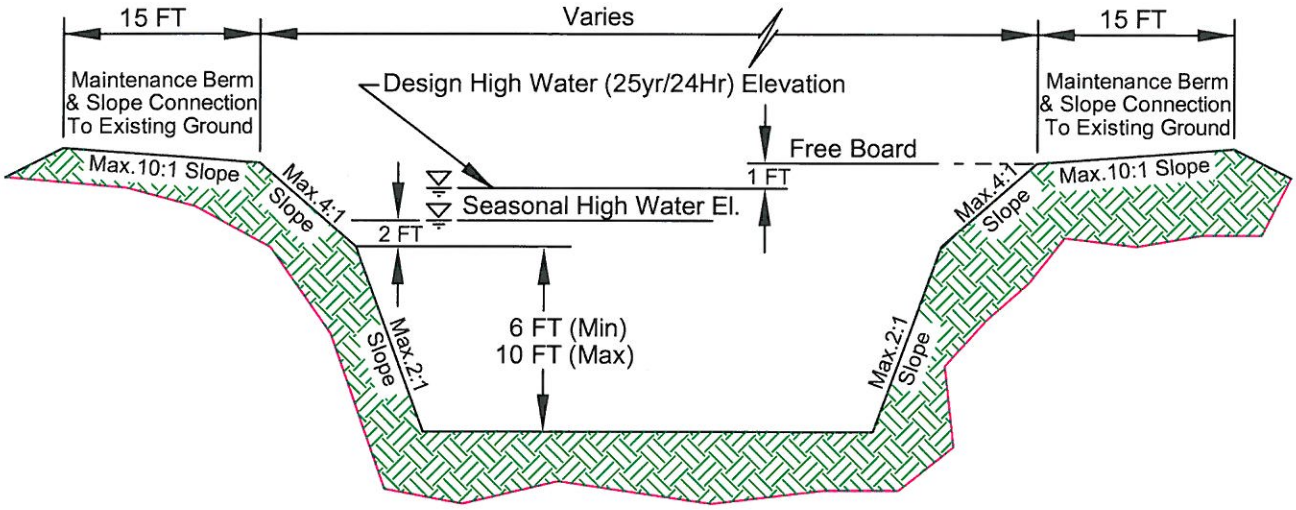
T-31
TRANSPORTATION DETAIL

Engineering Design Standards

STORMWATER MANAGEMENT POND



Typical Section
Dry Pond (w/o Fence)



Typical Section
Wet Pond (w/o Fence)

NOTE:

1. All pond designs must route the 100 year / 24 hour storm thru the facility to ensure that the storm event can flow thru the system w/o a breach, failure or over-flow.
2. See SCLDC Chapter 2.4 for additional design requirements.

*County Engineer or his designee may consider approval of an elevation based on an average of the seasonal high ground water level and the seasonal low ground water level as delineated by a licenced geotechnical engineer.

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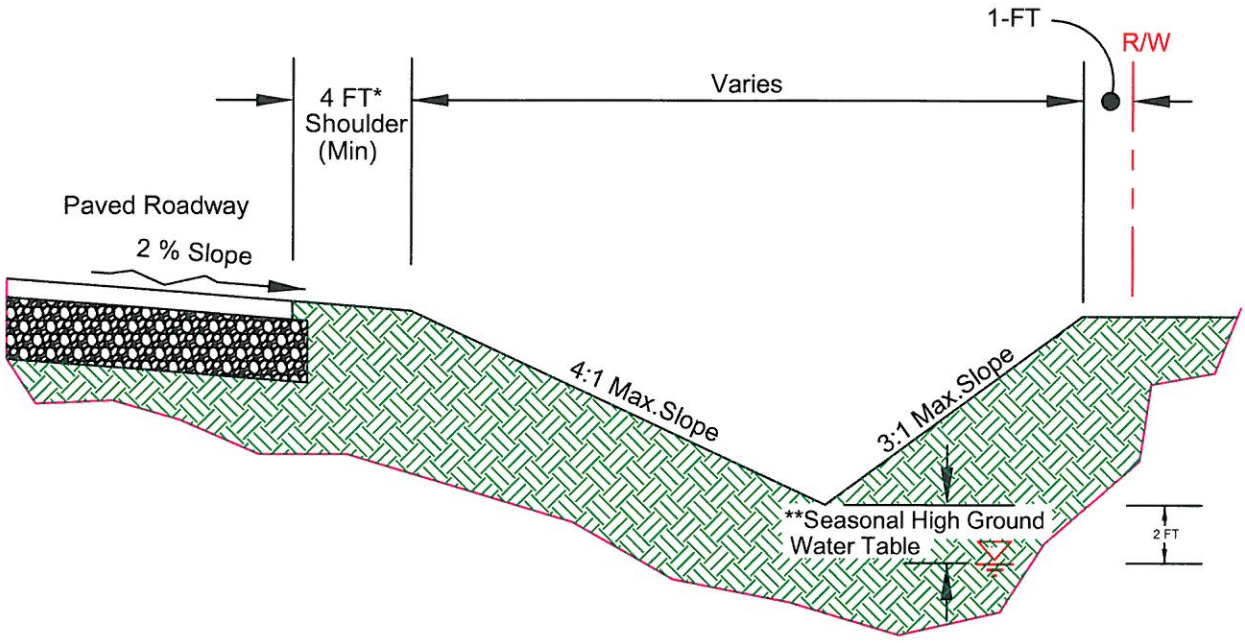
D-1
DRAINAGE DETAIL

Engineering Design Standards

ROADSIDE SWALE



NOTE:

1. Design storm flow within the swale system is not permitted to encroach onto the pavement.
2. If driveways are employed as swale check-dams, condition #1 (above) applies as well.
3. Swale systems within the public right-of-way are not permitted to overflow onto secondary sysems, outfalls or private property unles drainage easements are in place.
4. All non-paved areas within the right-of-way shall be sodded.
5. * Florida Green Book Standards shall govern.

**County Engineer or his designee may consider approval of an elevation based on an average of the seasonal high ground water level and the seasonal low ground water level as delineated by a licensed geotechnical engineer.

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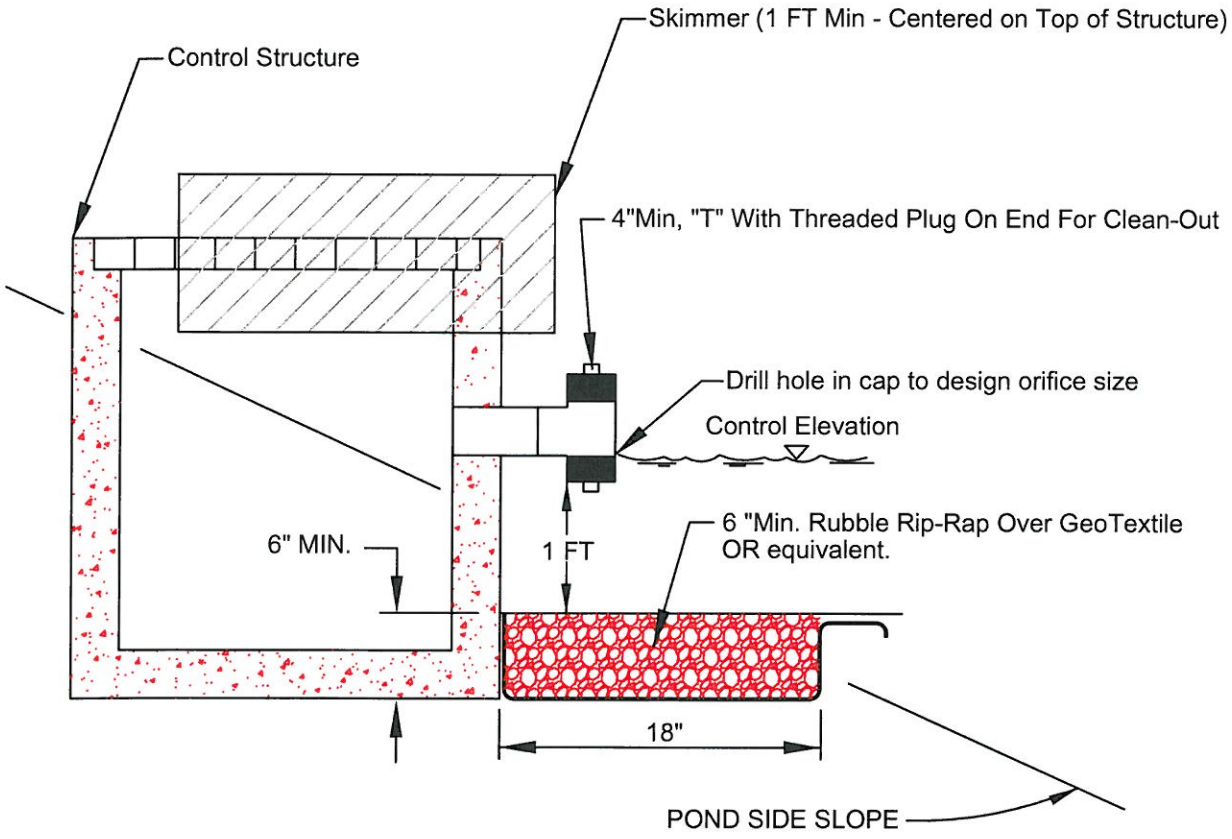
D-2
DRAINAGE
DETAIL

Engineering Design Standards

POND CONTROL STRUCTURE
DRAW - DOWN / BLEEDER



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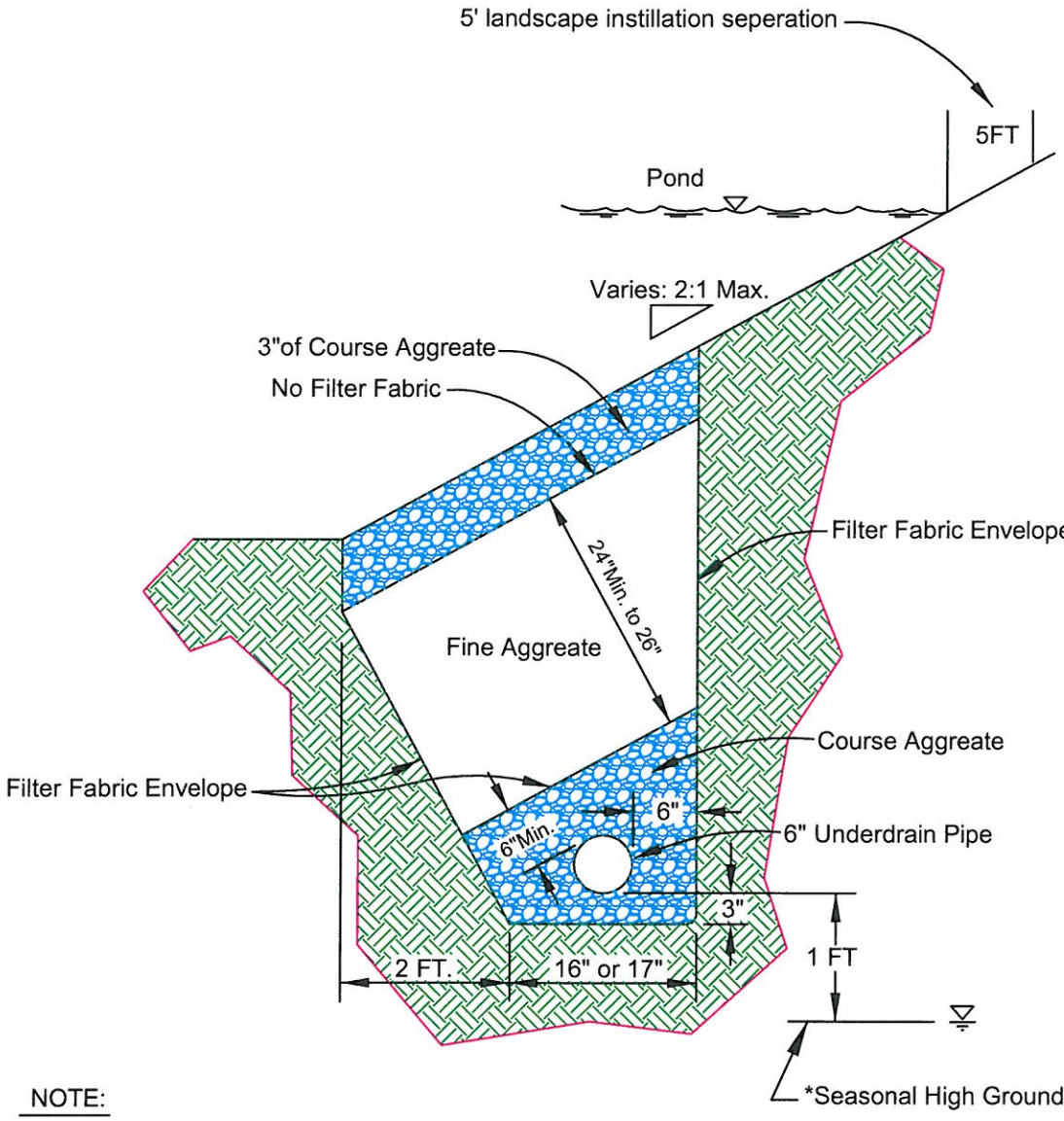
D-3
DRAINAGE
DETAIL

Engineering Design Standards

POND CONTROL STRUCTURE UNDERDRAIN



NOTE:

1. Underdrains are not permitted to artifically lower the existing water table.
2. For additional details not shown, refer To FDOT Standard Index #286, including cleanouts.
3. A licensed geotechnical engineer shall certify the proper instillation of the underdrain system.

*County Engineer or his designee may consider approval of an elevation based on an average of the seasonal high ground water level and the seasonal low ground water level as delineated by a licensed geotechnical engineer.

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D-4

DRAINAGE DETAIL