

# Minutes (Approved)

## FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

Wednesday, March 27, 2013, 8:00 AM – 5:00 PM

Thursday, March 28, 8:00 AM – 12:00 PM

FDOT's Deland Operations Center, Sailfish Meeting Room

1650 N. Kepler Road

Deland, Florida 32724

Phone: 386-740-3400

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### Wednesday, March 27, 2013

#### General Information (8:30 – 9:00 AM)

- Introductions (Frank Sullivan)
- Discuss Florida Greenbook Committee and Associate Member Changes - Changes in membership for the Greenbook Committee were reviewed and new members, Scott Cottrell (Sumter County), Jim Widman (Pasco County), and Ben Money (City of Tampa) were introduced. Jim Harrison (Orange County) was thanked for his service on the Greenbook Committee.
- Review March 2012 Meeting Minutes & Vote to Approve (Frank Sullivan) - Jimmy Pittman moved to approve minutes, Richard Diaz seconded, approved as presented.
- Review Contact Information (Mary Anne Koos) – A sheet was circulated for everyone to update their contact information.
- Update Subcommittee Assignments (Mary Anne Koos) – A listing of current subcommittee assignments was circulated. Members updated their committee membership preferences. It was agreed that rather than having chapter authors, the title would be chapter chair.

#### Presentations (9:00 – 10:15 AM)

- **Rulemaking Process** (Bruce Conroy) – "Rulemaking" is defined as the adoption, amendment or repeal of a rule. In its simplest form, rulemaking consists of drafting the rule text, providing notice to the public, accepting public comment and filing the rule for adoption. Revisions to the Florida Greenbook begin with drafting proposed changes and review by the Committee. The proposed changes are then reviewed by FDOT's General Counsel Office and approved by FDOT's Secretary. An opportunity for public comment is provided and if needed or requested a public workshop held. FDOT will disclose the intent to update the Greenbook in an annual report to the Governor's Office by June 30th, with a summary of proposed changes. FDOT will then formally begin rulemaking after June 30<sup>th</sup>. Generally takes about 6 months to become effective. The Rule for the Florida Greenbook is [14-15.002, Florida Administrative Code \(F.A.C.\)](#).

- **Sunshine Law** (Bruce Conroy) - Florida's Sunshine Law is found in Article I, Section 24, Florida Constitution and Chapter 286, Florida Statutes (F.S.), and applies to state agencies. FDOT's process for complying with the Sunshine law was discussed. FDOT posts information for public meetings on the Department's website, including the meeting agenda and materials. Minutes of the meeting are also posted. Only summary minutes required, and should include the date, time, who was present, whether a quorum was met, if there were attendees by phone, and a summary of decisions made. If the meeting occurs without proper notice, the results of meeting may be overturned.

Legislation proposed last session requires every board or meeting to allow public input. Currently we allow the public to attend, but do not have to provide an opportunity for public input. Committee members should remember that notice and minutes apply to all meetings if they include more than one member. Phone calls, personal conversations, texts, or meetings through an intermediary are not authorized under the Sunshine Law. Subcommittees, if they are coming back to make recommendations for decisions by the full committee, are required to meet Sunshine Law. Normally information gathering meetings would not have to follow Sunshine requirements. However, if the Greenbook forms a committee for the purpose of fact finding, since they are already a Sunshine committee, Sunshine will extend to the fact finding committee also. Non-compliance, once it's found, breaks the action of the committee, and renders their work void.

- **Status of 2013 Greenbook** (Benjamin Gerrell) - The changes the Committee approved in 2012 have been included in the draft 2013 Florida Greenbook that is in the rulemaking process now. The proposed revisions to Chapters 3, 5, 8, 13 and 17 were summarized and are included in the meeting package.

Fred Schneider asked how constructible the small wedge to the right of the lime rock is in the safety edge detail. Mr. Pitman, Annette Brennan and Miranda Glass provided examples of projects where the design has been used or is proposed: Nassau County, Marion County, and US 231 in Bay/Jackson County. Ms. Brennan mentioned that FHWA has many resource materials that we can use as part of their Every Day Count's initiative.

- **Bus Rapid Transit** (Diane Quigley, Jack Freeman, Kelly Blume) - Kittleson and Associates provided an overview of their research project for FDOT's Transit Office to develop design criteria for exclusive Bus Rapid Transit (BRT) lanes. Once internal review is completed, it will be made available to Greenbook members for their review. The study is focused on curb side bus lanes, median bus lanes, separated bus lanes, and use of the shoulder by buses. Mr. Freeman explained the typical sections and charts that will be included in the study, and how the dimensions included will refer back to the PPM and Florida Greenbook. A Bus-On-Shoulder Option is included since Florida passed legislation last year to allow this. FDOT's Traffic Ops and Transit Offices are working together to develop a policy.

Bernie Masing asked how exclusive right turn lanes would be addressed. Where bike lanes should be placed was also discussed. Rick Hall suggested they use a 4 lane roadway (rather than 6 lane) as their typical section, and should include speed and

context references. Ms. Blume clarified that the designs shown were for 45 mph or less. Richard Diaz asked about the relative crash frequency of these types of transit facilities, especially related to cyclists.

Ms. Koos summarized a recent study completed by FDOT on shared bicycle/bus lanes that found there was very little performance data on safety that had been collected on these facilities. The research report can be found on FDOT's Research office web site. "The title is **BDK 85 977-32** A Summary of Design, Policies, and Operational Characteristics for Shared Bicycle/Bus Lanes, [Summary](#) or [Final Report](#)."

Chris Mora asked whether bus stops should be near or far side, and was referred to [Accessing Transit](#) for guidance but far side is recommended. It was asked whether left side buses could be built with lock out doors, which they can be. The Transit Office plans to hold a statewide webinar once the document has been completed.

### **Proposed Updates for 2014 Greenbook (10:30 AM– 12:00 PM, 1:15 – 1:30 PM)**

- **Chapter 10 – Maintenance and Resurfacing** (Miranda Glass) – Ms. Glass presented an overview of the proposed changes for Chapter 10. These changes include a revision to the title to include "Resurfacing", a description and examples of maintenance activities, and addition of third section of the chapter that provides guidance on how ADA requirements, railroad—highway grade crossings, and safety improvements such as the safety edge should be included in projects. Information was also added on the minimum scope requirements for projects that receive federal aid.

Mr. Schneider asked for clarification on when projects should include provisions to meet federal ADA requirements. Dean Perkins, FDOT's ADA Coordinator, participating by telephone, indicated that in a maintenance operation, there are no requirements to upgrade pedestrian facilities. However, anything beyond a maintenance activity is a resurfacing project and would be considered "an alteration". This triggers the need to upgrade existing pedestrian facilities so that they are accessible. The Florida Division of FHWA has determined that curb ramps and detectable warnings should be a priority.

For assistance in determining when a project is maintenance versus resurfacing, members were referred to the following Q & A memo from FHWA on how ADA should be applied to public rights of way. [http://www.fhwa.dot.gov/civilrights/programs/ada\\_sect504qa.cfm](http://www.fhwa.dot.gov/civilrights/programs/ada_sect504qa.cfm)

Further discussion included:

- the threshold for structural resurfacing and whether to remove the 1.5" thickness guidance,
- whether installation of a safety edge be written as a "shall" or "should" condition,
- if the reference to railway crossings should be discussed in both sections,
- if FDOT's Safety Office will be providing the crash data for rail crossings,
- suggesting the reference to the MUTCD in KM/hour should be converted to mph, and
- how the requirements for gates at RR crossings should be met and who would fund those.

Andy Garganta asked whether the reference to the Local Agency Program (LAP) was needed in Chapter 10. It was explained the reference to LAP is so the design criteria in the Greenbook could be used in their federally funded projects.

- **Chapter 20 – Drainage** (Jennifer Green) – Ms. Green recognized the technical advisors who worked together to draft the drainage chapter, including Alex Barrios (Miami-Dade County), Omelio Fernandez (Palm Beach County), Jim Hunt (City of Orlando), and Ken Todd (Palm Beach County). She then gave an overview of the development of the new drainage chapter for the Greenbook. The chapter as developed based upon the table that was discussed at the March 2012 Greenbook comparing current criteria within the Greenbook to FDOT’s and AASHTO’s Drainage Manuals.

The original intent was to reference FDOT’s Drainage Manual for Manning’s values. A major change was adjusting the amount of the spread to allow for more flexibility for local roads. FDOT will retain the responsibility of looking at optional pipe materials, however the direction in the Greenbook will be to explore various materials but there is no need to use alternate materials.

- **Chapter 19 - Traditional Neighborhood Development (TND)** (Mary Anne Koos) - Ms. Koos explained the goal for the proposed revisions was to better define traditional neighborhood development; and allow the approval of an area in a community, in addition to a specific roadway, to be approved as a TND project and use TND criteria. References in the Chapter were also updated.
- **Goals of 2014 Updates** (Benjamin Gerrell) - Mr. Gerrell reviewed the goals to be accomplished for this meeting, including adoption of criteria for Safety Edge in resurfacing projects, clarify design of transit facilities for accessibility, improve utilization of TND criteria and handbook, and establish minimum standards for designing roadway drainage systems.

#### **Subcommittee Meetings for Final Drafting of Proposed 2014 Updates (1:30 – 3:00 PM)**

- The Committee broke out into smaller groups to discuss in more detail the Introduction and Definition of Terms and Chapters 10 – Maintenance and Resurfacing, 13 – Transit, 19 - Traditional Neighborhood Development, and 20 – Drainage.

#### **Chapter Reports and Approval of Updates for 2014 Greenbook (3:15 – 5:00 PM)**

- **Introduction and Definition of Terms –**

The fourth paragraph on Page ii of the Introduction was modified to reflect the changes proposed for Chapter 10:

“Standards established by this Manual are intended for use on all new and resurfacing construction projects off the state highway and federal aid systems. Unless specified otherwise herein, it is understood that the standards herein cannot be applied completely to all reconstruction and maintenance type projects. However, the standards shall be

applied to reconstruction and maintenance projects to the extent state or federal statute requires and that economic and environmental considerations and existing development will allow.”

The following changes were approved to the Definitions of Terms. Add definitions for crosswalk and resurfacing as proposed in the meeting package. Add definitions for maintenance and TND drafted in the package and then revised by the Committee. Revise the existing definitions for bicycle lane, shared use path, traffic lane and travelled way as shown in the meeting package. Delete the definition for undesignated bike lanes since bike lanes must be marked with a bicycle symbol or word per the MUTCD. Do not add a definition for sidewalk since it’s already addressed in Florida Statutes. Wait to adopt revised definitions for bus stop pad and paratransit until a revised Chapter 13 is adopted.

The definitions revised in the meeting are:

**Maintenance** - A strategy of treatments to an existing roadway system that preserves it, retards future deterioration, and maintains or improves the functional condition.

**Shared Use Path** - Paved facilities physically separated from motorized vehicular traffic by an open space or barrier. May be within the highway right of way or an independent right of way, with minimal cross flow by motor vehicles. Users are non-motorized and may include: pedestrians, bicyclists, skaters, people with disabilities, runners and others

**Traditional Neighborhood Development (TND)** - TND refers to the development or redevelopment of a neighborhood or town using traditional town planning principles. Projects should include a range of housing types and commercial establishments, a network of well-connected streets and blocks, civic buildings and public spaces, and other uses such as stores, schools, and places of worship within walking distances of residences.

**Traffic Lane/Travelled Way**– These two terms were split into separate definitions. Traffic Lane is now defined as Traffic - Pedestrians, bicyclists, motor vehicles, street cars and other conveyances either singularly or together while using for purposes of travel any highway or private road open to public travel. Traveled Way is defined as the portion of the roadway for the movement of vehicles, exclusive of shoulders, berms, sidewalks and parking lanes.

The changes were approved unanimously.

- **Chapter 10 – Maintenance and Resurfacing.** The Maintenance Subcommittee suggested the following changes be made to the draft chapter:

Struck the first paragraph under B Maintenance., preferring to refer to definition for maintenance in the introduction. Revised the 12<sup>th</sup> bullet in Section B.5.4 by striking the language “...but does not increase the pavement’s structural capacity.” Revised the paragraph beginning with “pavement maintenance...” by deleting the sentence “A

smooth riding skid resistant surface must be provided at all times to allow for safe vehicle maneuvers.”

Revised the first paragraph under C Resurfacing to read “Resurfacing projects must be designed and constructed in a manner that will comply with the accessibility standards and requirements set forth in the *Americans with Disabilities Act of 1990 (ADA)*, Revised the first paragraph under Section C.1 ADA Requirements to read “If new sidewalk and driveway construction or reconstruction are included on resurfacing projects they shall be designed in accordance with ADA requirements. Project design should include an evaluation of existing driveways to determine if it is feasible to upgrade nonconforming driveways.”

Revised the third paragraph under Section C.1 ADA Requirements to read “Where existing right of way is inadequate or conflicts occur with existing features that cannot be practicably relocated or adjusted (e.g. driveways, drainage inlets, signal poles, pull boxes, utility poles, etc.), pedestrian accessibility shall be provided to the maximum extent feasible, with appropriate documentation signed and sealed by a Professional Engineer (EOR). Other than meeting detectable warning and curb ramp requirements, existing sidewalks and driveways are not required to be upgraded for the sole purpose of meeting ADA requirements unless included in the project scope.”

Revised Section C.2 Railroad-Highway Grade Crossing Near or Within Project Limits to include a reference to Chapter 7 Rail-Highway Grade Crossings and move the language on defining “near the terminus” to Chapter 7. Suggested that mph, rather than km, be used in reference to speed. Amended the language in the first paragraph under Section C.3 Safety Improvements to read “...crosswalks and bicycle facilities...” In Section C.3.1 Pavement Safety Edge revised the last paragraph to reference Figures 10-1 and 10-2, and amend the requirements for safety edge from a “shall” to “should” condition. The changes were approved unanimously.

- **Chapter 13 – Transit.** During the breakout session, the Transit subcommittee discussed the need for additional revisions to the text and figures before proceeding with adoption. Following is a summary of their suggestions:

Add a clarification to Boarding and Alighting Areas for coordination with transit providers to determine compatibility of the B&A design with the transit equipment to board passengers. Revise Figure 12-1 and 2 to read “Boarding and Alighting Area for Flush Shoulder Roadways with Connection to the Roadway When a Raised Platform is Needed. Add labels to both the plan and section view for the landing, platform, and indicate that dimensions vary. Add an example of a shelter to the Shelters section. Clarify that if a bench is provided, it shall be on an accessible route. Revise “high speed traffic to” traffic volume and speed” in the Bus Bays or Pull Outs section. Delete the section Promote Public Transit. Add language to the Street Side facilities section that far side bus stops and bays are preferred and reference to Accessing Transit for more detailed discussion of the location of bus stops or bays. Revise the section entitled Bus Bay Lighting to “Bus Stop Lighting”. Revise Figure 13-3 to Bus Bay Locations, delete the text “After Stop” and show leaders from labels to locations along roadway. Add the



AASHTO Transit Guide to the References section. It was agreed that this Chapter would be refined through later subcommittee meetings.

- **Chapter 19 - Traditional Neighborhood Development** Revise the Introduction, Design Elements, and Transit sections as shown in the meeting package, except substitute “include other uses” for “amenities” in the Introduction. Approved unanimously.
- **Chapter 20 – Drainage** A new Chapter addressing drainage is proposed for inclusion in the Greenbook. The Drainage Subcommittee suggested the following changes be made to the draft chapter:

Revise the table in the Design Frequency section to have two types: “major roadway” and “all other road types”. Section C.5 Safety was revised to read “The design and location of open channels shall comply with roadside safety and clear zone requirements. See *Chapter 3 Geometric Design* for clear zone requirements, including special clearance criteria for canals.” Section C.6 Documentation was revised to read “For new construction, design documentation for open channels shall include the hydrologic and the hydraulic analyses, including analysis of channel lining requirements.” Revised the minimum pipe diameter from 24” to 18” for exfiltration trench pipes/french drains in Section D.8.a Pipe Size and Length, Section D.10 was revised to read “For new construction, supporting calculations for storm sewer system design shall be documented and provided to facility owner.” Table 20-4 Recommended Minimum Design Flood Frequency was revised to include the criteria for Local Road System within the Local Road and Streets,  $ADT \leq 3,000$  VPD. Section E.5 Clearances was revised by deleting “ice and” from the paragraph. Approved unanimously.

**Adjourn** The meeting adjourned for the day at 5:00 PM.

## **Thursday, March 28, 2013**

### **Goals, Workshops for Updates (post-2014 Greenbook) (8:00 – 10:30 AM)**

The committee reconvened at 8:00 AM. District 1 Secretary Hattaway joined the meeting by phone. Mr. Gerrell explained that we would break out into small groups to work on the following Greenbook chapters: Chapter 3 – Geometric Design, Chapter 9 – Bicycle Facilities and Chapter 13 – Transit. Mr. Schneider suggested Chapter 2 – Land Development should also be discussed. Mr. Brautigam suggested that it may be in conflict with local ordinances. Ms. Quigley added that with all the changes in comprehensive planning, the Land Development Chapter may not be needed. Mr. Cottrell suggested it would be good to keep Chapter 2 due the need to have guidance for access management.

Mr. Brautigam thanked everyone for their commitment to the Greenbook, and emphasized the need to make progress throughout the document. He suggested we wait on the bicycle and pedestrian chapters since they were recently updated and the chapter on Lighting until FDOT sorts out where we are with all the new technology. Mr. Pittman mentioned the need to include the LAP guidance regarding RR crossings from Chapter 10 into Chapter 7 of the Greenbook.

Discussion continued on the value of the Construction, Design Exceptions and Traffic Calming Chapters. Mr. Brautigam asked the committee about the importance of the Residential Street Design Chapter. A suggestion was made to combine it with the Land Development Chapter, however the group felt it important to retain as its own chapter so that residential street design not be confused with geometric design. The Structures chapter was just updated recently. However, the Signing and Marking chapter should be updated.

The Committee was asked to update their interest in serving as either the chair or member of chapter subcommittees on the Signup sheet. The following people agreed to serve as Chapter Chairs: Mr. Bryant, Chapter 12 - Construction, Mr. Ramdatt, Chapter 13 - Transit, Mr. Cottrell, Chapter 16 - Residential Street Design, Mr. Pittman, Chapter 17 – Bridges and Other Structures. Ms. Mathews asked to be added to the subcommittee for Chapter 1 - Planning, and Mr. Widman agreed to be a member of the subcommittee for Chapter 12 – Construction (Bob Shepard will assist him as a technical expert.)

The Committee agreed to work on Chapters 1 – Planning, 3 – Geometric Design, 4 – Roadside Design, 13 – Public Transit, and 18 – Signing and Marking for the morning subcommittee meetings.

#### **Chapter Author Reports, Commitments for post-2014 Greenbook (10:30 – 12:00 PM)**

- Chapter 7 - Rail-Highway Grade Crossings: To be consistent with revisions to Chapter 10 that were adopted earlier for federal aid projects in proximity to railroad crossings, a motion was made to also revise Chapter 7 to include similar guidance with a reference to the MUTCD. Approved unanimously.
- Chapter 1 – Planning: The subcommittee would like to focus on updating the Chapter to include information on funding sources and ensure all transportation modes are included consistently throughout the document. Plans should identify and look at the impacts to other organizations.
  - Funding – sources, processes, schedules
  - Modes – Diversity, context, coordination
  - Plans – Coordination w/ upstream activity, MPO, ETDM, NEPA, FDOT, FHWA
- Chapter 3 – Geometric Design: A review of the chapter criteria in comparison to the currently adopted and newer versions of AASHTO’s “Policy on Geometric Design of Highways and Streets” criteria is needed. The subcommittee also would like to review the criteria for stopping and passing sight distance and the design of median and roadside barriers (using cable or guardrail),
- Chapter 4 - Roadside Design: Future review of the UAM, Roadside Design Guide, and research underway by FDOT was suggested to allow for greater flexibility in the Greenbook. Coordination with Chapter 13 – Transit to address the locations for bus shelters was also suggested. Possibly include references to standards, but amend for low volume roads and lower speed roadways, taking into account capital cost and ongoing maintenance requirements.



**Florida Greenbook Advisory Committee Meeting Minutes (Approved)**  
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- Chapter 13 – Transit: The subcommittee is considering a rewrite of Chapter 13 for a future edition of the Greenbook.
- Chapter 18 – Signing and Marking: The subcommittee’s suggestions were to, update the references to statutes, ensure all references are correct, and add in guidance on the use of the audible vibratory pavement markings and special emphasis crosswalks. Guidance on Dynamic Message Signs, and special markings, signing, signals, and ITS technology should also be added. The Greenbook Committee agreed to revise the chapter name to Traffic Control Devices when the Chapter is revised, and include a reference to wayfinding signage and having a hierarchy of signage.
- General Promotion of Greenbook - When the Greenbook is adopted, FDOT should send a e-blast to ITE, APWA, and FACERS.
- The meeting adjourned at 12:00 PM.

*March 27-28, 2013*

*Florida Greenbook Advisory Committee Meeting*

*Meeting Review Package*



# *Agenda*



# AGENDA

## FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

Wednesday, March 27, 2013, 8:00 AM – 5:00 PM

Thursday, March 28, 8:00 AM – 12:00 PM

FDOT's Deland Operations Center, Sailfish Meeting Room

1650 N. Kepler Road

Deland, Florida 32724

Phone: 386-740-3400

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### Wednesday, March 27, 2013

**8:00 – 8:30**     **Welcome**

**8:30 – 9:00**     **General Information**

- Introductions (Frank Sullivan)
- Discuss Florida Greenbook Committee (Benjamin Gerrell)
- Committee and Associate Member Changes (Benjamin Gerrell)
- Review March 2012 Meeting Minutes & Vote to Approve (Frank Sullivan)
- Review Contact Information (Mary Anne Koos)
- Update Subcommittee Assignments (Mary Anne Koos)

**9:00 – 9:30**     **Presentations**

- Rulemaking Process (Bruce Conroy)
- Sunshine Law (Bruce Conroy)

**9:30 – 9:45**     **Status of 2013 Greenbook** (Benjamin Gerrell)

**9:45 – 10:15**   **Presentations**

- Bus Rapid Transit (Diane Quigley and Jack Freeman)

**10:15 – 10:30**   *Morning Break*

**10:30 – 12:00**   **Presentation of Proposed Updates for 2014 Greenbook**

- Chapter 10 – Maintenance and Resurfacing (Miranda Glass)
- Chapter 19 - Traditional Neighborhood Development (Mary Anne Koos)
- Chapter 20 – Drainage (Jennifer Green)

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**12:00 – 1:15**     *Lunch*

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- 1:15 – 1:30 Goals of 2014 Updates** (Benjamin Gerrell)
- Adopt criteria for use of Safety Edge in resurfacing projects
  - Clarify design of transit facilities for accessibility
  - Improve utilization of TND criteria and handbook
  - Establish minimum standards for designing roadway drainage
- 1:30 – 3:00 Subcommittee Meetings for Final Drafting of Proposed 2014 Updates**
- Introduction and Definition of Terms
  - Chapter 10 – Maintenance and Resurfacing
  - Chapter 13 - Transit
  - Chapter 19 - Traditional Neighborhood Development
  - Chapter 20 – Drainage
- 3:00 – 3:15 Break**
- 3:15 – 5:00 Chapter Report and Vote on 2014 Chapter Updates**
- Introduction and Definition of Terms
  - Chapter 10 – Maintenance and Resurfacing
  - Chapter 13 - Transit
  - Chapter 19 - Traditional Neighborhood Development
  - Chapter 20 – Drainage
- 5:00 Adjourn (Dinner)**

## **Thursday, March 28, 2013**

- 8:00 – 8:15 Goals for post-2014 Greenbook Updates**
- 8:15 – 10:30 Workshops for Updates (post-2014 Greenbook)**
- Chapter 3 – Geometric Design
  - Chapter 9 – Bicycle Facilities
  - Chapter 13 - Transit
  - Others?
- 10:30 – 10:45 Morning Break**
- 10:45 – 11:45 Chapter Author Reports, Commitments for post-2014 Greenbook Chapter Updates**
- 11:45 – 12:00 Closing Items** (Benjamin Gerrell)
- FDOT Chapter Work Group Assistants
  - Meeting Critique

*Florida Greenbook Committee Statute*



## The 2012 Florida Statutes

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[Title XXVI](#)

PUBLIC TRANSPORTATION

[Chapter 336](#)

COUNTY ROAD SYSTEM

[View Entire Chapter](#)

**336.045** Uniform minimum standards for design, construction, and maintenance; advisory committees.—

(1) The department shall develop and adopt uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, where feasible, bicycle ways, underpasses, and overpasses used by the public for vehicular and pedestrian traffic. In developing such standards and criteria, the department shall consider design approaches which provide for the compatibility of such facilities with the surrounding natural or manmade environment; the safety and security of public spaces; and the appropriate aesthetics based upon scale, color, architectural style, materials used to construct the facilities, and the landscape design and landscape materials around the facilities. The department shall annually provide funds in its tentative work program to implement the provisions of this subsection relating to aesthetic design standards. The minimum standards adopted must include a requirement that permanent curb ramps be provided at crosswalks at all intersections where curbs and sidewalks are constructed in order to give handicapped persons and persons in wheelchairs safe access to crosswalks.

(2) An advisory committee of professional engineers employed by any city or any county in each transportation district to aid in the development of such standards shall be appointed by the head of the department. Such committee shall be composed of: one member representing an urban center within each district; one member representing a rural area within each district; one member within each district who is a professional engineer and who is not employed by any governmental agency; and one member employed by the department for each district.

(3) Notwithstanding the provisions of any general or special law to the contrary, all plans and specifications for the construction of public streets and roads by any municipality or county shall provide for permanent curb ramps at crosswalks at all intersections where curbs and sidewalks are constructed in order to give handicapped persons and persons in wheelchairs safe access to crosswalks.

(4) All design and construction plans for projects that are to become part of the county road system and are required to conform with the design and construction standards established pursuant to subsection (1) must be certified to be in substantial conformance with the standards established pursuant to subsection (1) that are then in effect by a professional engineer who is registered in this state.

(5) Curb ramps which are required by subsections (1) and (3) to be provided at all intersections of curbs and sidewalks on public streets and roads shall be constructed to be in substantial conformance with the Uniform Federal Accessibility Standards published by the General Services Administration, Department of Housing and Urban Development, Department of Defense, and United States Postal Service. The provisions of this subsection apply to curb ramps let to contract on or after July 1, 1986.

(6) If the governing body of a county or municipality has adopted a design element as part of its comprehensive plan pursuant to part II of chapter 163, the department shall consider such element during project development of transportation facilities. The design of transportation facilities constructed by the department within the boundaries of that county or municipality must be consistent with that element to the maximum extent feasible.

**History.**—s. 1, ch. 72-328; ss. 2, 3, ch. 73-58; ss. 1, 2, ch. 74-242; s. 8, ch. 77-165; s. 1, ch. 78-398; ss. 5, 6, ch. 83-52; ss. 1, 2, 3, ch. 84-151; s. 69, ch. 84-309; s. 16, ch. 85-180; s. 31, ch. 86-243; s. 5, ch. 91-429; s. 5, ch. 92-152.

**Note.**—Former s. 335.075.

## *Committee Member Changes*





# **FLORIDA GREENBOOK ADVISORY COMMITTEE**

## **2013/2014 MEMBERSHIP CHANGES**

### **MEMBERS**

#### **DISTRICT 5**

Scott Cottrell from Sumter County replaced James Harrison in District 5 as a rural area representative. James Harrison is now an associate member.

#### **DISTRICT 7**

Ben Money is the new urban area representative from the City of Tampa in District 7.

James Widman is the new rural area representative from Pasco County in District 7.

#### **ASSOCIATE MEMBERS**

Michael Shepard replaced David O'Hagan as the State Roadway Design Engineer and the Chairperson for the Greenbook Advisory Committee.

Billy Hattaway, District One Secretary, has rejoined as an associate member.

Gabrielle Matthews replaced Amy Datz from the FDOT Transit Office in Central Office.



## ***March 2012 Meeting Minutes***



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# Minutes (Draft)

## FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

Thursday, March 29, 2012 8:00 AM – 5:35 PM

Florida Turnpike Headquarters  
Turkey Lake Service Plaza  
Building 5315, Auditorium B  
Mile Marker 263 on Florida Turnpike  
Ocoee, Florida 34761

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### General Information

- Introductions - David O'Hagan introduced Ben Gerrell and Frank Sullivan, and emphasized the meeting will focus on improving safety for all highways in Florida. Members introduced themselves.
- Discussed Florida Greenbook Committee - Ben Gerrell discussed the statute, 336.045 F.S. which established the Greenbook Committee.
- Rulemaking Process - Ben Gerrell gave an update on the status of adoption of the 2011 Florida Greenbook. Upon completion of the rulemaking process, it will be adopted by FDOT and posted to FDOT's web site.
- Sunshine Law - Ben Gerrell advised members the meeting was being held in accordance with Florida's Sunshine Law. Meetings of public boards and commissions must be open to the public. Notice was posted on FDOT's web site of the meeting and meeting materials. He reviewed the requirements of the sunshine law for the committee and chapter subcommittees.
- Committee Member Changes - David O'Hagan reviewed committee member changes. The following member changes have occurred.
  - **District 4** - Robert Behar replaced Tanzer Kalayci in District 4 as a non-government member.
  - **District 5** - Gail Woods replaced Craig Batterson in District 5 as a non-government member.
  - **District 7** - Jim Burnside retired from the City of Tampa, leaving a vacancy. He was a member of the Florida Greenbook Advisory Committee for over 20 years. There is also a vacancy for the rural area representative in District 7.
  - **Associate Members** - David O'Hagan briefed members on changes in FDOT. Rob Quigley has moved to FDOT's Production Support Office, and serves as the State Project Management Engineer. Ben Gerrell has replaced Rob Quigley in the Roadway Design Office, and is responsible for the Plans Preparation Manual and Florida Greenbook. Billy Hattaway has also resigned from the Committee, as he is now the Secretary for FDOT District One.
- Review and Approval of March 2011 Meeting Minutes - David O'Hagan asked for a motion to adopt the minutes from the March 30, 2011 Greenbook meeting. Richard Diez moved to adopt the minutes; Andy Tilton seconded the motion, approved unanimously.



**Status of 2011 Greenbook/Updates** - Ben Gerrell gave an update on the status of rulemaking process and 2011 Greenbook. The Greenbook could be ready for adoption by mid-April. The chapters updated included two new chapters, Chapter 18 Signing and Markings and Chapter 19 Traditional Neighborhood Development. Chapter 8 Pedestrian Facilities and Chapter 9 Bicycle Facilities both had substantial revisions. Chapter 3 Geometric Design, Chapter 6 Roadway Lighting, Chapter 11 Work Zone Safety, Chapter 17 Bridges and other Structures had minor changes. The 2011 Greenbook that is proceeding with rule making is posted on FDOT's web site under "May 2011 Draft Florida Greenbook".

**LAP Community of Practice** - Duane Brautigam gave an update on FDOT's LAP Community of Practice Task Team, which several members of the Greenbook Committee serve on. The goal is achieving commitment for delivery of FDOT and Local Agency Program (LAP) projects in a timely way. The Local Agency Program Info Tool (LAPIT) provides information about project documentation and the Plans, Specifications and Estimates Package (PSE), and analyzes proposals, award and selection, invoicing, construction, and contract closeout. Their next meeting is in April 2012.

Ramon Gavarrete and George Webb discussed the LAP process from the local's perspective on the variety of ways that District's implement the LAP process and the time needed to manage LAP projects. The process is complex, partly because of the oversight brought by federal funding. Hopefully the manual will help to clarify the process. The Florida Association of County Engineers and Road Superintendents (FACERS) has been instrumental in representing not just their own counties but all local governments statewide.

It was asked if the LAP manual can be revised. Mr. Brautigam's response was the LAP Manual is mostly administrative guidance, while the LAP Community of Practice's goal is to go beyond the purpose and content of the LAP Manual. His goal is to give simplification, stability and predictability to how projects are implemented. Charles Ramdatt asked if he could meet with the LAP Team since he has extensive experience with LAP projects. Mr. Brautigam welcomed his thoughts and invited him to work with group.

Monica Gourdine explained FHWA is ultimately responsible for the LAP projects, and working with FDOT to develop a consistent message in which requirements apply to projects based upon where the project is located (Status on FHS). Concerns from the Greenbook members were that FHWA policy may change and projects may not be reimbursed or FDOT Districts may be perceived as requiring extra paperwork to ensure funding is secure.

**8:50 – 11:00 Quantitative Safety of Local Roads and Proven Safety Counter Measures**  
(Rickey Fitzgerald and Monica Gourdine)

Rickey Fitzgerald, FDOT Safety Office, gave a presentation on crash data collected by FDOT/DHSMV on local and state highways. There are a few similarities between counties across both SHS and Local Road crashes. The majority of crashes occur during daylight hours (55%), followed by crashes in the dark on lit roadways (27%). On local roads, 29% of the pedestrian crashes occur at intersections. He explained that the Safety Office collects crash

forms from DHSMV, uploads them into the CAR system, and can conduct queries and shape files in response to requests from local governments.

Monica Gourdine presented FHWA's 2012 Proven Safety Countermeasures. These include roundabouts, safety edge, medians and pedestrian crossing islands, longitudinal rumble strips, corridor access management, back plates and reflective borders on traffic signals, enhanced delineation and friction on horizontal curves, pedestrian hybrid beacon, and road diets/roadway reconfiguration.

**9:45 – 10:00 *Morning Break***

**11:00 – 12:00 *Proposed Updates for 2013 Greenbook***

Dean Perkins provided a brief update on the US Dept. of Justice's adoption of new ADA Standards and the change in criteria proposed under the Public Right of Way Accessibility Guidelines. Proposed changes include a min. pedestrian access route width of 48", inclusion of Accessible Pedestrian Signals (APS) at signalized intersections, and allowing sidewalk grades to follow the grade of the adjacent roadway.

Jennifer Green gave an overview of the new Drainage Chapter proposed for the Greenbook. The revisions are based upon a survey of many different types of roadways. It is consistent with FDOT's Drainage Manual, which most people are using today for their criteria. Members appreciated the work that was done to draft the chapter, and felt it was an excellent resource.

In response to member concerns about the "shall" conditions, Ms. Green responded that the "shalls" are really limited to the minimum criteria (e.g. 18" pipe size, 15" hub caps). Discussion continued as to whether the chapter should contain requirements (shall) or guidance. Mr. O'Hagan spoke to the fact that in the entire Greenbook, there are only ~100 shall conditions and it's much easier to enforce if we limit the Greenbook to the minimum of what must be done.

Mr. O'Hagan asked for a motion as to whether a chapter should be added. Mr. Gavarrate moved to include a drainage chapter in the Greenbook, seconded by Mr. Ramdatt. All were in favor, none opposed. Mr. G. Webb agreed to serve as chair, supported by his staff. Others who volunteered to help on committee are Fred Schneider, Andy Tilton, Andres Garganta, and Gaspar Miranda. They asked that Ms. Green continue to support the work of the committee and retain a format similar to the FDOT Drainage Manual. It was agreed to set the end of the summer as the goal for having the finalized chapter.

Mr. O'Hagan discussed whether a chapter on federal aid projects was needed. Mr. Gavarrate asked Mr. O'Hagan to discuss the requirements related to stimulus projects that were being implemented by local governments. The constraints of the Greenbook were that it only applies to new construction, and some of the guidance needed for the stimulus projects is not included. The group suggested that the LAP Manual might be an area to include some criteria for federally funded projects, or possibly in Chapter 10 Maintenance. David Cerlanek suggested a link in Chapter 10 to the LAP Manual. A motion was made to add a federal aid chapter to the Greenbook, by Howard Webb. The motion died for lack of a second. Adjourned for lunch.

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**Lunch**

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**1:00 – 5:30 PM Chapter Author Reports, Vote and Commitments for 2012 Revision Process**

Mr. Brautigam and Mr. O'Hagan discussed the need for progress on the chapter updates and enforceable criteria. FDOT is committed to addressing the needs in the Greenbook for updating of chapters and we need everyone to step up. Since we only meet once a year it's hard to accomplish our work just at this meeting. The Drainage committee's work is an excellent example we can all follow.

Mr. O'Hagan identified chapters that need lead authors. The group felt that Mr. H. Webb would be well qualified to lead the Geometric Design chapter, Mr. Webb accepted the responsibility.

- Chapter and Section Numbering – The entire Greenbook is being reformatted to revise the alphabetical identification of chapters and sections to numerical sequences. The following revisions will be based upon the current (alphabetical) sequence. *(Following a review of past minutes, it's been decided to retain the current (alphabetical) system of partitioning the chapter. This allows a distinction between the PPM and Greenbook language.)*
- Chapter 3 – Geometric Design: Sidewalk, Roundabouts and Bridges on Very-Low Volume Local Roads ( $ADT \leq 400$ ), the group accepted the work of the committee with the following minor edits:
  - Page 3-29, lines 17-20; page 3-64, lines 8-11, 24-27, page 3-65, lines 7-10: update reference to 2006 ADA Standards for Transportation Facilities and 2012 Florida Accessibility Code.
  - Page 3-68, lines 10-11: revise criteria to require an accessible space for a wheel chair user adjacent to a bench at a bus top, and provide a minimum dimension of 30" wide by 48" deep.
  - Page 3-43, lines 19-29, page 3-44, lines 1-3, 11-23: updated the Roundabout section to include a reference to NCHRP Report 672: Roundabouts: An Informational Guide, added guidance on the conditions in which roundabouts should be considered. Added all conditions in the proposed language except for bullet 6 referencing traffic calming.
  - Very Low Volume Local Roads ( $ADT \leq 400$ ): two options for the proposed language were considered, the shorter, one page option was selected and approved without changes. The use of this chapter was clarified in that it is not meant to be applied to bridges in subdivisions or developments; rather that the local governments' subdivision criteria would determine the bridge criteria.
  - The above changes to Chapter 3 were moved by Jimmy Pittman, seconded by Mr. Ramdatt, approved unanimously.

- Chapter 5 - Pavement Design and Construction: Safety Edge – Ron Chin presented on the committee’s work to address safety edge in the Greenbook.
  - Page 5-1, last sentence of the introduction, modified proposed language to read “Resurfacing of the existing pavements is discussed and included under Chapter 10 (Maintenance and Resurfacing) of the manual.” Use of the objectives was revised to read “shall be considered in the design and construction of the pavement”. The fourth bullet was revised during the committee meeting to read “Provide a Safety Edge treatment adjacent to the travel lane on roadways without curb or paved shoulders and with posted speed 45 mph or greater.”
  - Page 5-2, revisions to B.1 and B.2 were adopted during the 2011 Greenbook meeting.
  - Page 5-3, language regarding “grooved pavement” was moved from Section B.4 to B.3 and revised to read “The use of transverse grooving in concrete pavement frequently improves the wet weather skid resistance and decreases the likelihood of hydroplaning.” The remainder of the paragraph remained as proposed in the meeting package. Section B.5 was revised to delete the reference to “preferred path for bicyclists.”
  - Page 5-4, the proposed language in the first paragraph was revised to read “Particular attention shall be given to provide a smooth transition from pavement to shoulder.” The proposed language discussing Safety Edge technology was accepted, with a recommendation to show Figures 5-1 Two Lane Road with Safety Edge and 5-2 Safety Edge Detail (No Paved Shoulders) for “proposed pavement”, not “existing pavement”.
  - Page 5-5, following Figure 5-2, the first paragraph in the proposed language beginning with “Safety Edge shall...” was deleted. The language in the second paragraph was accepted as proposed, “Shoulder pavement may be provided to improve...”
  - Page 5-6, the last paragraph was revised to read “After construction the pavement surface shall be inspected to determine the required surface texture was achieved and the surface has the specified slopes. Spot checking skid resistance by approved methods should be considered. Periodic reinspection should be undertaken in conformance with the guidelines described in Chapter 10 - MAINTENANCE ~~AND RESURFACING.~~” *(Resurfacing will be added to the title for Chapter 10 in conjunction with the update of the entire Chapter.)*
  - There was discussion of whether the language in this chapter should more closely align with the PPM, since the PPM does not require the safety edge if shoulders are at least 2’ wide.
  - Page 5-3, Section B. 3 Skid Resistance, the direction of grooved concrete pavement and language was revised to use transverse grooving.
  - Mr. O’Hagan asked how do the local agencies mean to use the guidance in Section 5-1 and whether or not the Safety Edge will increase the cost of projects. Fred Schneider felt it may cost a bit more in a RRR project due to redesign of the shoulder; however cost in new construction should be insignificant.

- Miranda Glass noted Chapter 10 will likely be revised to be called Maintenance and Resurfacing and delete the language related to Section F4.
- Mr. O'Hagan asked for a motion to approve the above changes in Chapter 5, moved by Ron Chin, including the reference to Safety Edge for RRR projects. Seconded by Gail Woods, approved unanimously.
  
- Chapter 8 – Pedestrian Facilities
  - Page 8-9, 8-10, Mr. Schneider discussed the changes made to update the references to 2006 ADA Standards for Transportation Facilities and 2012 Florida Accessibility Code.
  - Andy Tilton moved to adopt the proposed changes, seconded by Annette Brennan, approved unanimously.
  
- Chapter 10 - Maintenance and Resurfacing
  - Miranda Glass discussed how maintenance is different than resurfacing, and how they can be differentiated. As currently drafted, Resurfacing (RRR) is listed under Maintenance. Ms. Glass asked if Resurfacing should be placed in its own section under Chapter 10 and defined differently so that ADA responsibilities can be clarified. The Chapter needed additional language to define how maintenance projects differed from a RRR/alteration.
  - Discussion followed that Resurfacing should be Section 10.7 (G) if it becomes its own section, 10.6.5 (F.5) if kept under maintenance activities. Ms. Brennan asked whether the guidance that was used in ARRA might be included in the Greenbook. Mr. O'Hagan felt that material added to the Greenbook should be limited to criteria; other information should be placed in the LAP Manual or LAP Community of Practice materials. Mr. Gavarrete preferred to leave under Maintenance.
  - FHWA defines maintenance vs. alterations. Reconstruction, widening, mill and fill, and signal installations is considered to be an alteration by FHWA due to affecting the structural capacity of the pavement. Maintenance is defined by FHWA as inspection, overhaul, repair, preservation, and the replacement of parts, but excludes preventive maintenance.
  - Ms. Glass recommended the chapter be edited further, and that both maintenance and resurfacing be addressed in the same chapter.
  
- Chapter 13 – Public Transit
  - Ms. Brennan suggested adding a description for boarding and alighting areas to the chapter, and note that when projects include a new bus stop or impact existing bus stops they should comply with FAC 14-20. Mr. Tilton moved to accept the changes made in the submitted draft plus the language proposed to add FAC 14-20. Seconded by Steve Neff, unanimously passed.
  
- Mr. O'Hagan asked the group as it approached 5:00 whether they would agree to continue in an extended session, which they agreed to.



- Chapter 17 – Bridges and Other Structures
  - Mr. O’Hagan discussed the changes, primarily editorial to Chapter 17 and the notional loads in the LRFD, requirement for a FL 120 permit load rating greater than 1, and new guidance on girder transportation. Revisions were also made to Section 17.3.3.3 (C.3.b) that pedestrian and bicycle railings comply with the LRFD. Pedestrian/bicycle railings and 2-pipe guide railings and details may be mounted on walls or other structures where the drop-off is 5’ or less. Concrete, aluminum or steel railings shall be used where drop off hazards are greater than 5’.
  - Mr. Ramdatt asked about where the referenced IBF design standards were located. Mr. O’Hagan agreed to include a web link to the instructions.
  - Mr. O’Hagan discussed the need for a consistent process for inspection of local pedestrian bridges and permitting of larger loads. It was agreed that further discussion with FDOT’s maintenance office is needed and no changes to the chapter would be made at this time regarding these issues. There was agreement on revising titles, document references and editorial changes that didn’t change document requirements.
  - Revisions to Section 17.3.4 (C.4) Bridge Substructure were discussed with a suggestion to spell out SDG (Structures Design Guide) and provide a web link.
  - Mr. G. Webb asked about Section 17.7 (G) Bridge Load Rating, Permitting, and Posting and remove the language “If Necessary” in regards to posting in the National Bridge Inventory. Joy Puerta also mentioned that the LRFD language needs to be maintained. Following discussion, the decision was made to leave this section as is.
  - Mr. Ramdatt moved to adopt the drafted changes to Chapter 17, except for the changes in Section 17.7 (G). Steve Neff seconded, approved unanimously.
- Introduction –
  - Mr. O’Hagan proposed a revision to be made to address the Greenbook Advisory Committee and work groups. Chapter work groups are considered to be doing pen and ink changes which they will provide to the chair of each chapter. The chair will then take the chapter work group’s revisions to the whole Greenbook Advisory Committee.- This change in structure will require each work group be chaired by an Advisory Committee member.
  - Following several questions from members on how the Sunshine Law would apply to the work groups, Mr. Ramdatt asked whether FDOT could have a follow up discussion with our general council to confirm what the sunshine requirements would be of both the advisory committee members and the Greenbook workgroups. Mr. O’Hagan agreed to provide the draft language to legal for their review. Mr. Ramdatt’s concern was that if more than one Advisory Committee member participated on a work group, that sunshine requirements might still apply. Mr. O’Hagan indicated sunshine rules would

still apply to the Advisory Committee and Work Groups until new language is adopted in the Greenbook.

- Mr. OHagan asked for volunteers to chair the work groups. It was agreed the chairs would be:

Howard Webb, Chapter 3, Geometric Design

Annette Brennan, Chapter 8, Pedestrian Facilities

Annette Brennan, Chapter 9, Bicycle Facilities

Chris Tavella, Chapter 11, Work Zone Safety

Steve Neff, Chapter 15, Traffic Calming

Keith Bryant, Chapter 17, Bridges and Other Structures

Gail Woods, Chapter 18, Signing and Marking

Rick Hall, Chapter 19, will be approached on TND chapter (*Rick Hall has agreed to serve as the Chair*)

George Webb, Chapter 20, Drainage

Andy Garganta moved to adjourn the meeting, Jimmy Pittman seconded. Approved unanimously. Meeting adjourned at 5:35 pm.

*Committee Member Information  
And  
Chapter Subcommittee Assignments*





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3. Geometric Design .....	Howard Webb
4. Roadside Design .....	Charles Ramdatt
5. Pavement Design and Construction.....	Ron Chin
6. Roadway Lighting.....	Bernie Masing
7. Rail-Highway Grade Crossings .....	Jimmy Pitman
8. Pedestrian Facilities .....	Annette Brennan
9. Bicycle Facilities.....	Annette Brennan
10. Maintenance.....	Scott Golden
11. Work Zone Safety .....	Chris Tavella
12. Construction.....	<b>VACANT</b>
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18. Signing and Marking.....	Gail Woods
19. Traditional Neighborhood Development .....	Rick Hall
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## *Rulemaking Process and Status*





## **Rulemaking for the 2013 Florida Greenbook**

- 1) After the program area has developed a draft rule or amendment, the Notice of Development of Proposed Rules is published. Then the Rulemaking process begins with JAPC by filing “Notice of Rule Development” (published in Florida Administrative Register).
  - a) This is an opportunity for a Rule Development Workshop to take place. At this point a workshop can be announced or wait to see if one is requested. There is no time frame at this point, but the general practice is to wait around 30 days.
  - b) Also, it must be determined if a Statement of Estimated Regulatory Costs (SERC) must be prepared. If a SERC is required, a SERC will need to be prepared before the Governor’s Office will authorize rulemaking.
  - c) If comments are received, we have 90 days to respond.
- 2) The next step is to publish a Notice of Proposed Rule.
  - a) The notice and copy of the rule is sent to the Joint Administrative Procedures Committee (JAPC) at this time.
  - b) At this stage a hearing can be announced or a hearing may be requested within 21 days.
- 3) If no hearing is requested and JAPC has no comments to be addressed we may file the rule for adoption after 28 days from the publication of the notice. We have up to 90 days to adopt the rule.

**The 2013 Florida Greenbook is in the early stages of rulemaking, #1.**



## *Sunshine Law*



## FLORIDA'S GOVERNMENT-IN-THE SUNSHINE LAW

### 1. THE LAW

Florida's Sunshine Law is found in Article I, Section 24, Florida Constitution and Chapter 286, Florida Statutes (F.S.), and applies to state agencies. The Sunshine Law is to be liberally construed; its exemptions are to be narrowly construed. Two or more people who are tasked with making a decision or recommendation constitute a "Board or Commission" under the Sunshine Law and are subject to its provisions. Section 286.011(1), F.S., states:

All meetings of any board or commission of any state agency . . . at which official acts are to be taken are declared to be public meetings open to the public at all times, and no resolution, rule, or formal action shall be considered binding except as taken or made at such meeting. Members may discuss such business matters only at a public meeting. . . .

The use of third persons or other means to evade the Sunshine Law is prohibited. The Sunshine Law does not generally apply to individual decision makers, fact finding, or general staff meetings.

### 2. BASIC PUBLIC MEETING REQUIREMENTS

#### A. Open, Accessible, Non-Discriminatory, Technology.

- 1) Pursuant to Section 286.26, F.S., public meetings must be open to the public, made accessible to individuals with physical handicaps, and held at locations that are easy to reach.
- 2) Pursuant to Section 286.011(6), F.S., public meetings are prohibited from being held at any location that discriminates on the basis of sex, race, age, creed, color, origin, or economic status, or operates in a manner as to unreasonably restrict public access.
- 3) Public meetings may include the use of teleconference, video, webinar, or other technology, but the public must be provided points of access. See Rule Chapter 28-109, F.A.C., regarding conducting proceedings by communications media technology.

B. Reasonable Notice. Pursuant to Section 286.011(1), F.S., reasonable notice of public meetings must be provided. A minimum of 24 hours is considered reasonable notice. Pursuant to Section 286.0105, F.S., notices of meetings must advise the public that a record of the meeting is required for an appeal of any decision made at the meeting, and that the person who wants to appeal a decision may need to ensure there is a verbatim record of

the meeting. Public meeting notices are published on the Department's website. Meetings subject to Chapter 120, F.S., the Administrative Procedures Act, must also be published in the Florida Administrative Weekly. Generally, an agenda is advisable, but not required. An agenda is required when a meeting, hearing, or workshop is held pursuant to Section 120.525, F.S., and must be published on the agency's website no less than 7 days prior to the event.

C. Minutes. Pursuant to Section 286.011(2), F.S., minutes of public meetings must be taken, promptly recorded, and available for public inspection. The minutes may be posted or provided upon request. Recordings or transcripts are not required, but persons attending are permitted to record or videotape the meeting.

### 3. EXEMPTIONS

There are a limited number of exemptions to public meetings requirements under Section 286.0113, F.S.:

A. Meetings in which all or part of a security system plan would be revealed.

B. Procurements under Section 287.057, F.S., in which there are negotiations with a vendor or there are oral questions and answers of a vendor. As required by Section 286.0113(2), F.S., a complete recording of the negotiations or oral presentations must be made and no portion may be off the record. The recordings will be exempt from the public records requirement of Section 119.071(3)(a), F.S., until a notice of decision or intended decision is provided or 30 days after the bids, proposals, or final replies are opened.

### 4. CONSEQUENCES OF SUNSHINE LAW VIOLATIONS

There are a number of consequences for failure to comply with the Sunshine Law:

A. Noncriminal penalties. A violation constitutes a noncriminal infraction and violators are subject to the imposition of a fine not to exceed \$500. Section 286.011(3)(a), F.S.

B. Criminal penalties. A knowing violation, occurring either within or outside the state, is a second degree misdemeanor, punishable under Section 775.082 or 775.083, F.S., which provide for up to 60 days in jail or a fine of \$500. Sections 286.011(3)(b) and (c), F.S.

C. Attorney's fees. In an action to enforce the Sunshine Law or to invalidate actions taken in violation of the Sunshine Law, attorney's fees will be assessed against the agency and may be assessed against individual members of the board or commission, including attorney's fees on appeal. Anyone filing such an action found to have done so in bad faith may also be assessed with attorney's fees. Section 286.011(4), F.S.

D. Injunctions. Circuit courts have jurisdiction to issue injunctions to enforce the Sunshine Law. Section 286.011(2), F.S.

E. Action Void. Actions taken at a meeting where the Sunshine Law was violated are void. Section 286.011(1), F.S. Only a full open hearing, meeting, or workshop can cure a Sunshine Law violation; a perfunctory ratification of actions taken will not suffice.

F. Removal from office. Section 112.52, F.S.

G. Loss of public confidence.

##### 5. FURTHER INFORMATION

Please contact Bruce Conroy or Bob Burdick at the Office of the General Counsel at (850) 414-5265 with any questions or for more information.





## *Status of 2013 Greenbook/ Updates*



## Summary of Proposed Changes for 2013 Greenbook

- Chapter 3 – Geometric Design: Sidewalk, Roundabouts and Bridges on Very-Low Volume Local Roads:
  - Update reference to 2006 ADA Standards for Transportation Facilities and 2012 Florida Accessibility Code.
  - Revise criteria to require an accessible space for a wheel chair user adjacent to a bench at a bus top, with a minimum dimension of 30” wide by 48” deep.
  - Included a reference to NCHRP Report 672: Roundabouts: An Informational Guide, added guidance on the conditions in which roundabouts should be considered. Established a minimum width for new two lane bridges on Low Volume Local Roads ( $ADT \leq 400$ ) at 22 feet, 15 feet for a one lane bridge.
  
- Chapter 5 - Pavement Design and Construction: Safety Edge.
  - Included a requirement to provide a Safety Edge treatment adjacent to the travel lane on roadways without curb or paved shoulders and with posted speed 45 mph or greater.
  - To improve skid resistance, expanded the guidance on transverse grooving of concrete pavements in locations with frequent vehicle maneuvers. Emphasized the need to provide a smooth transition from pavement to shoulder, and that shoulder pavement may be provided to improve drainage, serve bicyclists and pedestrians, and to minimize maintenance.
  - Added new sections for unpaved roads to give guidance for material selection and drainage.
  - Added language that after construction the pavement surface shall be inspected to determine the required surface texture was achieved and the surface has the specified slopes.
  
- Chapter 8 – Pedestrian Facilities
  - Update the references to 2006 ADA Standards for Transportation Facilities and 2012 Florida Accessibility Code.
  
- Chapter 13 – Public Transit
  - Added a description for boarding and alighting areas, and note that when projects include a new bus stop or impact existing bus stops they should comply with FAC 14-20.
  
- Chapter 17 – Bridges and Other Structures
  - Clarified that bridges should meet the notional design load specified in the LRFD and also meet the requirement for a FL 120 permit load rating greater than 1. Revisions were also made that pedestrian and bicycle railings comply with the LRFD. Added a new section for Girder Transportation.



## ***Bus Rapid Transit***



Florida Department of Transportation, Transit Office

# TYPICAL SECTIONS FOR EXCLUSIVE TRANSIT RUNNING WAYS

Presentation to Florida  
Greenbook Committee

March 27, 2013



## Project Purpose

- Provide typical sections and design guidance for exclusive transit running ways in Florida
  - Level of interest from Florida transit planners and operators
    - Bus rapid transit (BRT)
    - Transit preferential treatments
  - Lack of existing standards and guidance
- Reinforce/revise/inform FDOT policies and procedures related to transit facility design



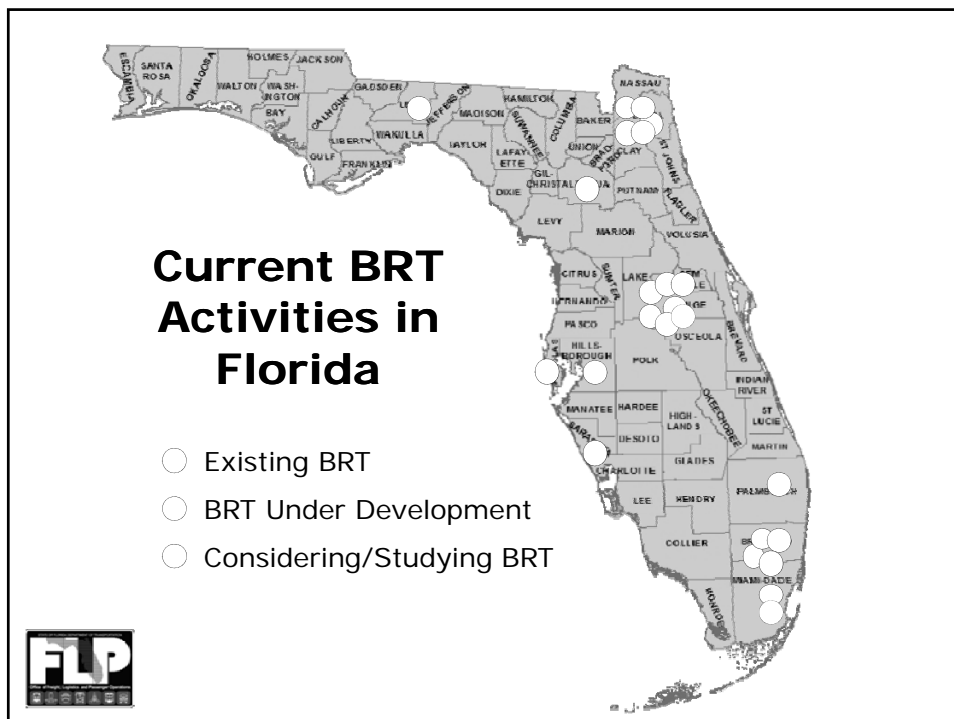
Los Angeles





## Key Policies and Procedures

- Florida Statutes Section 335.02
  - Allows exclusive lanes on the State Highway System
    - FDOT "may establish standards for lanes on the State Highway System"
    - FDOT "shall seek to achieve the highest degree of efficient mobility for corridor users"
    - FDOT "must give consideration to ... multimodal alternatives [and] addition of special use lanes [and] the most effective use of existing rights-of-way"
  - FDOT is working on procedural guidance for dedicating general use lanes to transit
- Florida Administrative Code Rule 14-20.003
  - Prohibits transit shelters in medians
  - Result: limits transit running way options in Florida



## Project Team

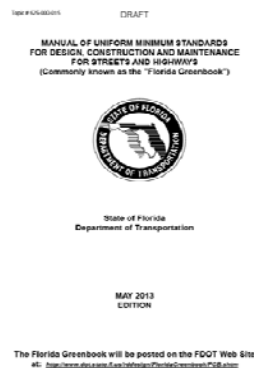
- FDOT Transit Office – Gabrielle Matthews, Project Manager
- Kittelson & Associates, Inc. – Karl Passeti, Project Manager
- Project Review Committee



## Florida Greenbook Context

- Potential to include typical sections and/or design guidance in future edition
- Potential to reference report in next edition and/or continuing Greenbook Committee member activities
- Feedback from Committee members highly desired!

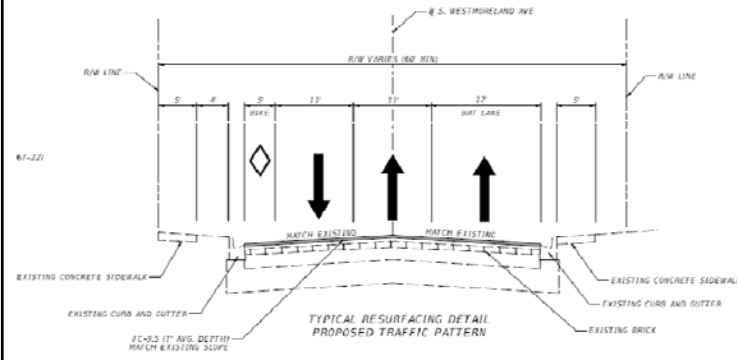
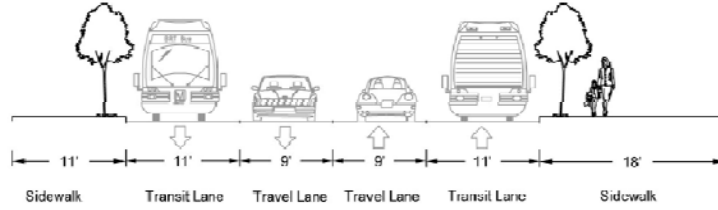
FDOT will be considering revisions to the *Plans Preparation Manual* as well



# Florida Greenbook Context

Jacksonville Downtown BRT: A. Philip Randolph Boulevard

Source: JTA



Orlando  
East-West  
Lymmo:  
Westmoreland  
Drive  
Source: LYNX

## Exclusive Transit Running Ways



Curbside Bus Lanes

Sources: Kittelson & Associates, maps.google.com



## Exclusive Transit Running Ways



### Median Bus Lanes and Busways

Sources: Lane Transit District, maps.google.com



## Exclusive Transit Running Ways



### Separate Busways, Bus Streets, and Bus-on-Shoulder

Sources: Kittelson & Associates, maps.google.com



## Foundation for Typical Sections

- 2003 report by FDOT District 4
- National case studies of transit agencies with experience designing and operating exclusive transit facilities
- Review of recent literature
- Review of Florida exclusive transit facility projects
- Consistency with current *Plans Preparation Manual*, Florida Greenbook, and FDOT rules/procedures to the extent possible



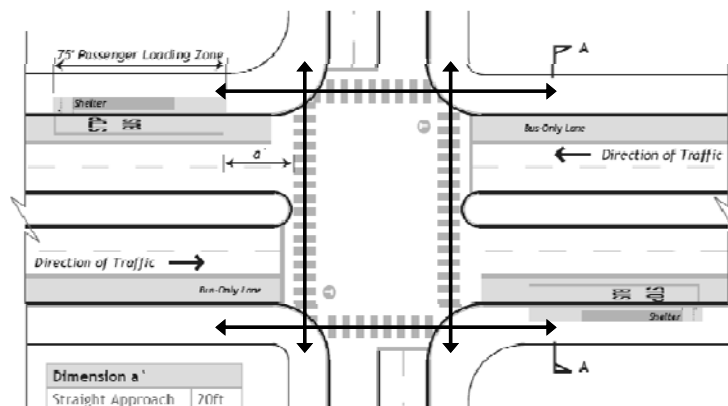
Pittsburgh



## 1. Concurrent Flow Curb Bus Lanes

Example Plan View

Source: Santa Clara Valley Transportation Authority



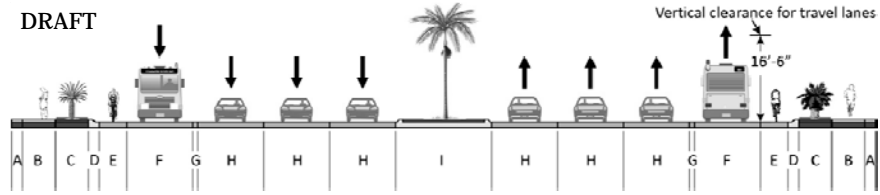
Dimension a'	
Straight Approach	70ft
After Right Turn	75ft
After Left Turn	50ft

↔ PEDESTRIAN CONNECTIONS



# 1. Concurrent Flow Curb Bus Lanes

DRAFT

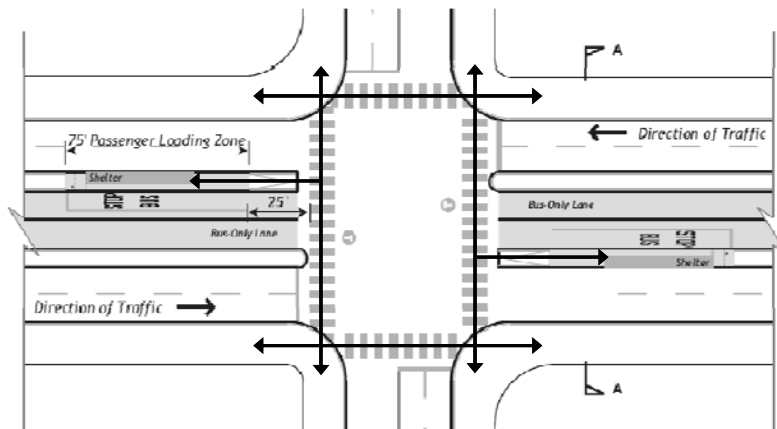


DESIGNATION	DESCRIPTION	DIMENSION (FEET)		NOTES
		PREFERRED	CONSTRAINED	
A	UTILITY/TIE BACK AREA	2'	1'	2' utility area should be accounted for behind sidewalk per all FDOT typical sections from PPM, Volume 2, Chapter 6 that show sidewalks.
B	SIDEWALK	6'	5'	Minimum 5' wide sidewalk shall be separated by 2' buffer strip. 6' wide can be used when sidewalk constructed adjacent to curb. (PPM, Volume 1, Chapter 8.3.1) 5' minimum sidewalk with complies with ADA standards.
C	BUFFER/PLANTING STRIP	6'	0' to 6'	0' wide strip allowed when sidewalk is minimum 6' wide. Minimum of 2' can be used when sidewalk is 5' wide. Buffer width tied to sidewalk width per PPM. (PPM, Volume 1, Chapter 8.3.1) Should be 6' wide where practical to eliminate need to narrow or re-route sidewalks around driveways. This wider strip places the sidewalk far enough back to not be affected by the driveway cross slope. (Florida Greenbook, Chapter 8, Section C.3.b, Page 4)
D	CURB AND GUTTER	2'	2'	Outside curb to be Type F curb and gutter (2' width). (FDOT Design Standards, Index 300 and shown in PPM, Volume 2, Chapter 6 Typical Sections, Exhibit TYP-6) Curbs are not to be used on facilities w/design speed >45 mph. (Florida Greenbook, Chapter 3, Section C.7.g, Page 25)
E	BIKE LANE	5'	4' to 5'	4' width if curb and gutter is present. 5' minimum if adjacent to barrier. 5' minimum if the bike lane is between bus lane (F) and travel lanes (H). (PPM Section 8.4.1 and Section 8.4.2.1) Note that the bike lane (E) can be placed between the bus lane (F) and general travel lane (G) instead, which would eliminate the need for the separator (G). Designers should consider safety, volumes, etc. when placing bike lane.
F	BUS LANE	12'	11'	Preferred and constrained widths reflect 2012 interviews with and case studies of bus rapid transit systems in the U.S. and Integrating Transit into Traditional Neighborhood Design Policies - The Influence of Lane Width on Bus Safety.
G	SEPARATOR	1'	6"	1' minimum preferred and 6" constrained based on the case studies. Wider separators (e.g., concrete mountable medians) may be warranted based on site-specific conditions and needs. If concrete median is to be used, refer to FDOT Standard Index 302, Sheet Number 1, Type I or II Concrete Traffic Separator. These mountable separators can have widths of 4', 6' or 8'6".
H	TRAVEL LANE	12'	11'	From PPM, Volume 1, Chapter 2, Table 2.1.1, lanes for arterials should be 12' but can be 11' if the facility is a non-FHHS/SIS road and meets one of the conditions listed in the footnotes on the table. Streets and highways with significant truck/bus traffic should have 12' wide traffic lanes. (Florida Greenbook, Chapter 3, Section C.7.b.1, Page 16)
I	MEDIAN	22'	15'6"	From PPM Table 2.2.1, median can be 10-12' if flush (painted) only on 5-lane sections where left turns need to be accommodated and speeds are $\leq$ 40 mph. If speeds are $\leq$ 45 mph and the median is raised, minimum width is 22' from Table 2.2.1. This 22' median includes the 2" Type E curb and gutter on both sides. Minimum width on Urban Streets with speed limit of 45 mph or less is 15'6" from Table 3-11 in Chapter 3 on page 68 in Florida Greenbook.

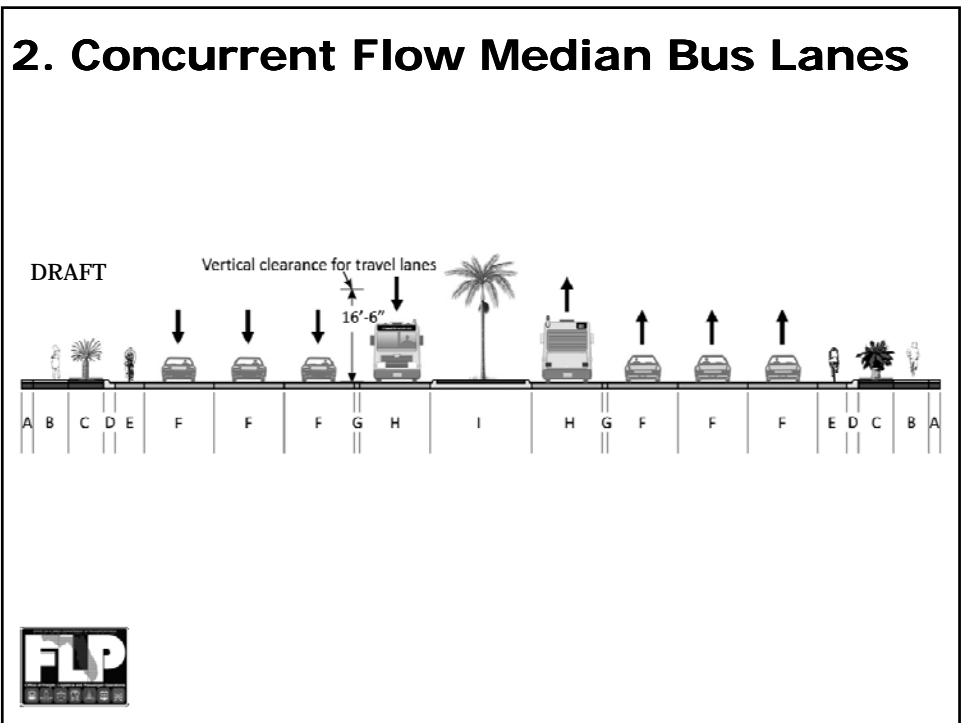
# 2. Concurrent Flow Median Bus Lanes

Example Plan View

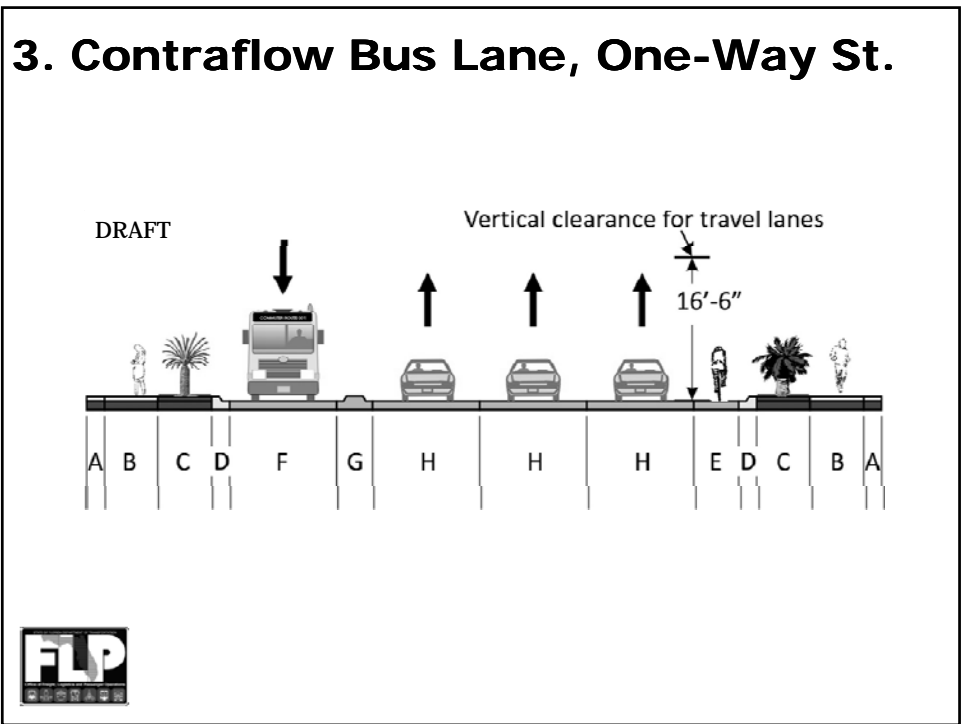
Source: Santa Clara Valley Transportation Authority



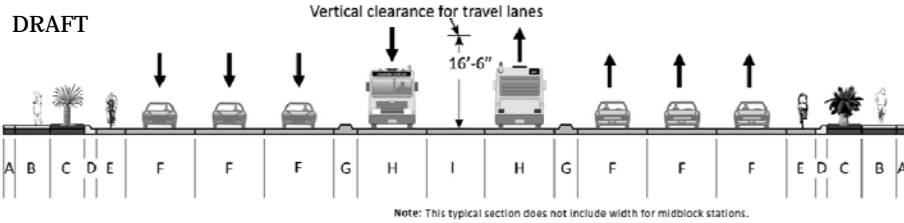
## 2. Concurrent Flow Median Bus Lanes



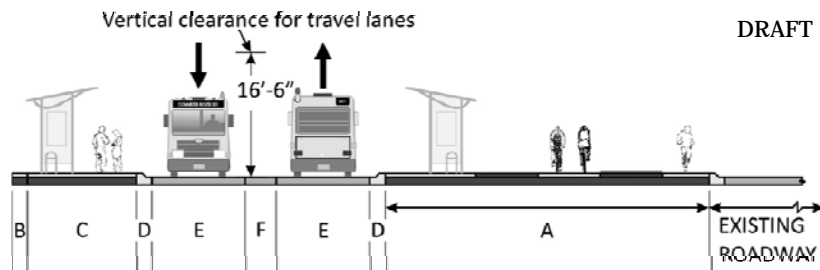
## 3. Contraflow Bus Lane, One-Way St.



## 4. Two-Way Busway in Shared ROW

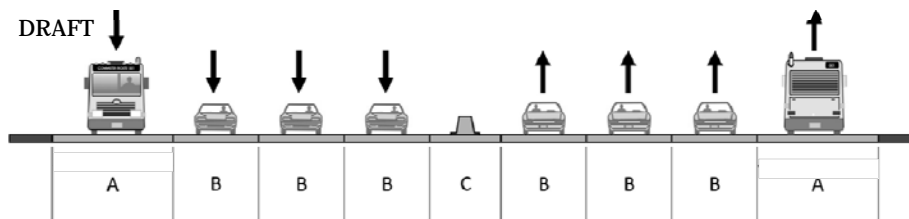


## 5. Two-Way Busway in Separate ROW





## 6. Bus-on-Shoulder Operation



## Next Steps

1. Project Review Committee and Greenbook Committee review of draft report – through month of April
2. Project Review Committee webinar – late April/early May
3. Completion of final draft report – mid-May
  - Incorporate Greenbook Committee feedback
  - Incorporate webinar feedback
4. Completion of final report - early June



## Future Efforts

- Webinar
  - Intended to share findings and solicit feedback
  - Statewide audience of planners, designers, and operators
- Coordination with PPM





## ***Chapter 10 – Maintenance and Resurfacing***



See Chapter 10 Maintenance and Resurfacing for proposed changes.



## ***Chapter19 – Traditional Neighborhood Development***





See Chapter 19 Traditional Neighborhood Development for proposed changes.



## *Chapter 20 - Drainage*



# Chapter 20 - Drainage

What's changed

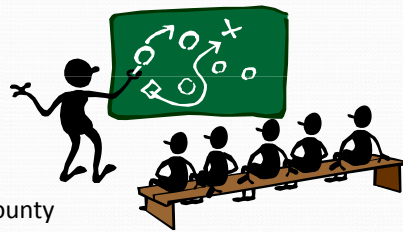
## Last Year's Meeting

- Presented Task Team Summary Table
  - Established minimum standards
    - AASHTO, FDOT Drainage Manual, Current Greenbook
- Voted to write Drainage Chapter
  - Based on recommendations in summary table

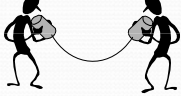


## Chapter Team

- Chairperson
  - George Webb – Palm Beach County
- Members
  - Andres Garganta – CSA Group
  - Gaspar Miranda – Miami Dade County
  - Fred Schneider – Lake County
  - Andy Tilton – Johnson Engineering
- Supporting Staff
  - Jennifer Green – FDOT
  - Ken Todd – Palm Beach County
  - Alex Barrios – Miami Dade County
  - Jim Hunt – City of Orlando
  - Omelio Fernandez – Palm Beach County



## Work Process

- Teleconferences 
- Chapter Reviews & Comments
  - Chapter compiled by FDOT with input from chapter committee
- Changes
  - Agreed to by Chapter Committee members



## Changes

- Open Channel & Storm Sewer design frequency
  - Added disclaimer from FDOT Drainage Manual

TYPE CHANNEL	FREQUENCY
Roadside, Median, and Interceptor ditches or swales for major roadway facilities	10-year
All other road types	5-year

Site-specific factors may warrant the use of an atypical design frequency. Any increase over pre-development stages shall not significantly change land use values, unless flood rights are acquired.

## Changes

- Reference to AASHTO manning's n value table
  - Issue: AASHTO publication cost
  - Referenced the Department's Drainage Manual tables which are available online

### 20.3.C.1 Manning's "n" Values

Recommended Manning's n values for channels with bare soil, vegetative linings, and rigid linings are presented in the Department's *Drainage Manual*, Table 2.1 and 2.2. <http://www.dot.state.fl.us/rddesign/dri/Manualsandhandbooks.shtm>

The probable condition of the channel when the design event is anticipated shall be considered when a Manning's n value is selected.



## Changes

- Spread Standards
  - Added criteria for design speed  $\leq 30$  mph

Design Speed (mph)	Spread Criteria*
Design Speed $\leq 30$	Crown of Road
$30 < \text{Design speed} \leq 45$	Keep $\frac{1}{2}$ of lane clear
$45 < \text{Design Speed} \leq 55$	Keep 8' of lane clear
Design Speed $> 55$	No encroachment

## Changes

- Optional Pipe Material requirement
  - MAP-21 removed optional material requirements
  - All references to FHWA letter removed
- Provided minimum design requirements for pipe
  - Durability
  - Hydraulic Capacity
  - Structural Capacity



Questions?





## ***Goals of 2014 Updates***



## *Workshops for Updates*



## *Introduction*





## INTRODUCTION

The purpose of this Manual is to provide uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks (where feasible), bicycle facilities, underpasses, and overpasses used by the public for vehicular and pedestrian traffic as directed by Sections 20.23(4)(a), 334.044(10)(a), 334.048(3) and 336.045, F.S.

In the following statutory excerpts, the term "Department" refers to the Florida Department of Transportation.

**Section 20.23, F.S. Department of Transportation.** There is created a Department of Transportation which shall be a decentralized agency.

**(4)(a)** The central office shall establish departmental policies, rules, procedures, and standards and shall monitor the implementation of such policies, rules, procedures, and standards in order to ensure uniform compliance and quality performance by the districts and central office units that implement transportation programs. Major transportation policy initiatives or revisions shall be submitted to the commission for review.

**Section 334.044, F.S. Department; powers and duties.** The department shall have the following general powers and duties:

**(10)(a)** To develop and adopt uniform minimum standards and criteria for the design, construction, maintenance, and operation of public roads pursuant to the provisions of Section, 336.045, F.S.

**Section 334.048, F.S. Legislative intent with respect to department management accountability and monitoring systems.** The department shall implement the following accountability and monitoring systems to evaluate whether the department's goals are being accomplished efficiently and cost-effectively, and ensure compliance with all laws, rules, policies, and procedures related to the department's operations:

**(3)** The central office shall adopt policies, rules, procedures, and standards which are necessary for the department to function properly, including establishing accountability for all aspects of the department's operations.

**Section 336.045, F.S. Uniform minimum standards for design, construction, and maintenance; advisory committees.**

(1) The department shall develop and adopt uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, where feasible, bicycle ways, underpasses and overpasses used by the public for vehicular and pedestrian traffic. In developing such standards and criteria, the department shall consider design approaches which provide for the compatibility of such facilities with the surrounding natural or manmade environment; the safety and security of public spaces; and the appropriate aesthetics based upon scale, color, architectural style, materials used to construct the facilities, and the landscape design and landscape materials around the facilities.

(4) All design and construction plans for projects that are to become part of the county road system and are required to conform with the design and construction standards established pursuant to subsection (1) must be certified to be in substantial conformance with the standards established pursuant to subsection (1) that are then in effect by a professional engineer who is registered in this state.

These standards are intended to provide basic guidance for developing and maintaining a highway system with reasonable operating characteristics and a minimum number of hazards.

Standards established by this Manual are intended for use on all new and resurfacing construction projects off the state highway and federal aid systems. Unless specified otherwise herein, It is understood that the standards herein cannot be applied completely to all reconstruction and maintenance type projects. However, the standards shall be applied to reconstruction and maintenance projects to the extent state or federal statute requires and that economic and environmental considerations and existing development will allow.

When this Manual refers to guidelines and design standards given by current American Association of State Highway and Transportation Officials (AASHTO) publications, these guidelines and standards shall generally be considered as minimum criteria. The Department may have standards and criteria that differ from the minimum presented in this Manual or by AASHTO for streets and highways under its jurisdiction. A county or municipality may substitute standards and criteria adopted by the Department for some or all portions of design, construction, and maintenance of their facilities. Department standards, criteria, and manuals must be used when preparing projects on the state highway system or the national highway system.

Criteria and standards set forth in other manuals, which have been incorporated by reference, shall be considered as requirements within the authority of this Manual.

This Manual is intended for use by qualified engineering practitioners for the communication of standards and criteria (including various numerical design values and use conditions). The design, construction, and maintenance references for the infrastructure features contained in this Manual recognize many variable and often complex process considerations. The engineering design process, and associated use of this Manual, incorporates aspects of engineering judgment, design principles, science, and recognized standards towards matters involving roadway infrastructure.

Users of this Manual are cautioned that the strict application of exact numerical values, conditions or use information taken from portions of the text may not be appropriate for all circumstances. Individual references to design values or concepts should not be used out of context or without supporting engineering judgment.

The contents of this Manual are reviewed annually by the Florida "Greenbook" Advisory Committee. Membership of this committee is established by the above referenced Section 336.045(2), F.S. Comments, suggestions, or questions may be directed to any committee member.

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## POLICY

Specific policies governing the activities of planning, design, construction, reconstruction, maintenance, or operation of streets and highways are listed throughout this Manual. All agencies and individuals involved in these activities shall be governed by the following general policies:

- Each public street and highway, and all activates thereon, shall be assigned to the jurisdiction of some highway agency. Each highway agency should establish and maintain a program to promote safety in all activities on streets and highways under its jurisdiction.
- Highway safety shall be considered and given a high priority in order to promote the achievement of the maximum safety benefits for given expenditures and efforts.
- The provision for safe, high-quality streets and highways, and maximum transit opportunities should take priority over the provision for the maximum highway mileage obtainable for the available funds.

## OBJECTIVES

The planning, design, construction, reconstruction, maintenance, and operation of streets and highways should be predicated upon meeting the following objectives:

- Develop and maintain a highway system that provides the safest practicable environment for motorists, cyclists, pedestrians, and workers.
- Establish and maintain procedures for construction, maintenance, utility, and emergency operations that provide for safe highway and transit operating conditions during these activities.
- Provide streets and highways with operating characteristics that allow for reasonable limitations upon the capabilities of vehicles, drivers, cyclists, pedestrians, and workers.
- Provide uniformity and consistency in the design and operation of streets and highways.

- Provide for satisfactory resolution of conflicts between the surface transportation system and social and environmental considerations to aid neighborhood integrity.
- Reconstruct or modify existing facilities to reduce the hazard to the highway users.
- Reduce the deaths, injuries, and damage due to highway crashes.

Additional general and specific objectives related to various topics and activities are listed throughout this Manual. Where specific standards or recommendations are not available or applicable, the related objectives shall be utilized as general guidelines.

## DEFINITIONS OF TERMS

The following terms shall, for the purpose of this Manual, have the meanings respectively ascribed to them, except instances where the context clearly indicates a different meaning.

<b>ADT</b>	Average daily two-way volume of traffic.
<b>AUXILIARY LANE</b>	A designated width of roadway pavement marked to separate speed change, turning, passing, and climbing maneuvers from through traffic. It may provide short capacity segment.
<b>AVERAGE RUNNING SPEED</b>	For all traffic, or component thereof, the summation of distances divided by the summation of running times.
<b>BICYCLE LANE (BIKE LANE)</b>	A portion of a roadway (typically 4-5 ft) which has been designated <del>by signing and pavement markings for the preferential or exclusive</del> use by bicyclists <u>by pavement markings and, if used, signs.</u> <u>They are one-way facilities that typically carry traffic in the same direction as adjacent motor vehicle traffic.</u>
<b><u>BUS STOP BOARDING AND ALIGHTING AREA (B&amp;A)</u></b>	A <u>raised platform with a</u> firm stable <u>surface that</u> accommodates passenger movement on or off a bus.
<b>CLEAR ZONE</b>	The total roadside border area starting at the edge of the motor vehicle travel lane, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear runout area. The desired width is dependent upon the traffic volumes and speeds, and on the roadside geometry. Note: The aforementioned "border area" is not the same as "border width". Also, see Horizontal Clearance.



**CROSSWALK**

Portion of the roadway at an intersection included within the connections of lateral lines of the sidewalks on opposite sides of the highway, measured from the curbs or in the absence of curbs from the traversable roadway. Crosswalks may also occur at an intersection or elsewhere distinctly indicated for pedestrian crossing.

**DHV**

Design hourly two-way volume of traffic.

**DESIGN SPEED**

A selected rate of travel used to determine the various geometric features of the roadway.

**EXPRESSWAY**

A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at major intersections.

**FREEWAY**

An expressway with full control of access.

**FRONTAGE ROAD**

A street or highway constructed adjacent to a higher classification street or other roadway network for the purpose of serving adjacent property or control access.

**GRADE SEPARATION**

A crossing of two roadways or a roadway and a railroad or pedestrian pathway at different levels.

**HIGH SPEED**

Speeds of 50 mph or greater.

**HIGHWAY, STREET, OR ROAD**

General terms, denoting a public way for purposes of traffic, both vehicular and pedestrian, including the entire area within the right of way. The term street is generally used for urban or suburban areas.

**HORIZONTAL CLEARANCE**

Lateral distance from edge of motor vehicle travel lane to a roadside object or feature.

**INTERSECTION**

The general area where two or more streets or highways join or cross.

**MAY**

A permissive condition. Where "may" is used, it is considered to denote permissive usage.

**MAINTENANCE**

A strategy of treatments to an existing roadway system that preserves it, retards future deterioration, and maintains or improves the functional condition (without significantly increasing the structural capacity).

**NEW CONSTRUCTION**

The construction of any public road facility (paved or unpaved) where none previously existed, or the act of paving any previously unpaved road, except as provided in Chapter 3, Section A of these standards.

**OPERATING SPEED**

The rate of travel at which vehicles are observed traveling during free-flow conditions.

**PUBLIC TRANSIT**

Passenger transportation service, local or regional in nature, that is available to any person. Public transit includes bus, light rail, and rapid transit.

**RECONSTRUCTION**

Any road construction other than new construction.

**RECOVERY AREA**

Generally synonymous with clear zone.

**RESIDENTIAL STREETS**

Streets primarily serving residential access to the commercial, social, and recreational needs of the community. These are generally lower volume and lower speed facilities than the primary arterial and collector routes of the local

system "or as adopted by local government ordinance".

## **RESURFACING**

Work to place additional layers of surfacing on highway pavement, shoulders, and bridge decks, and necessary incidental work to extend the structural integrity of these features for a substantial time period.

## **RIGHT OF WAY**

A general term denoting land, property or interest therein, usually in a strip, acquired or donated for transportation purposes. More specifically, land in which the State, the Department, a county, a transit authority, or a municipality owns the fee or has an easement devoted to or required for use as a public road.

## **ROADWAY**

The portion of a street or highway, including shoulders, for vehicular use.

## **SIDEWALK**

That portion of a street between the curb line, or the lateral line, of a roadway and adjacent property lines, intended for use by pedestrians.

## **SHALL**

A mandatory condition. (When certain requirements are described with the "shall" stipulation, it is mandatory these requirements be met.)

## **SHARED USE PATH**

Paved facilities physically separated from motorized vehicular traffic by an open space or barrier. May be ~~on~~ within the highway right of way or an independent ~~exclusive~~ right of way, with minimal cross flow by motor vehicles. Users are non-motorized and may include ~~but are not limited to~~: pedestrians, bicyclists, in-line skaters, runners and others ~~wheelchair users (both non-motorized and motorized), and pedestrians.~~

<b>SHOULD</b>	An advisory condition. Where the word "should" is used, it is considered to denote advisable usage, recommended but not mandatory.
<b>SLOPES</b>	Slopes in this manual are expressed as a ratio of vertical to horizontal (V:H).
<b>SURFACE TRANSPORTATION SYSTEM</b>	Network of highways, streets, and/or roads. Term can be applied to local system or expanded to desired limits of influence.
<b><u>TRADITIONAL NEIGHBORHOOD DEVELOPMENT (TND)</u></b>	<u>TND refers to the development or redevelopment of a neighborhood or town using traditional town planning principles. Projects should include a range of housing types and commercial establishments, a network of well-connected streets and blocks, civic buildings and public spaces, and have amenities such as stores, schools, and worship within walking distances of residences.</u>
<b><u>TRAFFIC LANE/</u></b>	<u>Pedestrians, bicyclists, motor vehicles, street cars and other conveyances either singularly or together while using for purposes of travel any highway or private road open to public travel.</u>
<b>TRAVELED WAY</b>	<u>The portion of the roadway for the movement of vehicles. A designated width of the roadway exclusive of shoulders, berms, sidewalks and parking lanes and bicycle lanes for the movement of vehicles. This includes auxiliary lanes.</u>
<b>TRAVEL LANE</b>	A designated width of roadway pavement marked to carry through traffic and to separate it from opposing traffic or traffic occupying other traffic lanes. Generally, travel lanes equate to the basic number of lanes for a

facility.

## **TURNING ROADWAY**

A connecting roadway for traffic turning between two intersection legs.

## **UNDESIGNATED BIKE LANE**

~~A bike lane which is not designated with the bike and arrow pavement markings. It is striped as a regular bike lane on approaches to intersections.~~

## **VEHICLE**

Every device upon, or by which any person or property is or may be transported or drawn upon a traveled way, excepting devices used exclusively upon stationary rails or tracks. Bicycles are defined as vehicles per Section 315.003, Florida Statutes.

## **WIDE CURB LANE**

A portion of the roadway which can be used by bicycles and motorized traffic, characterized by a curb lane, which is of such width that bicycle and motorized traffic can be accomplished in the same lane. This lane should always be the through lane closest to the curb (when a curb is provided) or the shoulder edge of the road when a curb is not provided.

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## ***Chapter 10 – Maintenance and Resurfacing***





## CHAPTER 10

### MAINTENANCE AND RESURFACING

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## CHAPTER 10

### MAINTENANCE AND RESURFACING

#### A INTRODUCTION

In order to provide for the safe and efficient movement of all modes of traffic, it is essential to maintain all aspects of the road and right of way at the highest reasonable level of safety. Improvements consistent with upgrading safety standards or accommodating changes in traffic are also required to maintain the facility in a quality condition. Maintenance and resurfacing are~~is a~~ costly operations, therefore, every effort should be made to provide the maximum safety benefit from each maintenance operation. The fact that a major portion of the maintenance effort is necessary to merely preserve the economic investment in a facility should not be considered as justification for sacrificing the requirements for maintaining or improving the safety characteristics of a street or highway.

#### B MAINTENANCE OBJECTIVES

Maintenance is typically applied to pavements in good condition having significant remaining service life. As a major component of pavement preservation, maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface or near-surface of structurally sound pavements. Examples of preventive treatments include asphalt crack sealing, chip sealing, slurry or micro-surfacing, thin and ultra-thin hot-mix asphalt overlay, concrete joint sealing, diamond grinding, dowel-bar retrofit, and isolated, partial and/or full-depth concrete repairs to restore functionality of the slab (e.g., edge spalls, or corner breaks).

##### B.1 Objectives

The major objectives of a maintenance program include the following:

- Maintain all highway features and components in the best possible condition
- Improve sub-standard features, with the ultimate goal to at least meet minimum standards
- Provide for minimum disruptions and hazards to traffic during maintenance

1 operations

- 2
- Location and reporting of inadequate safety features

3 **B.2C Policy**

4 Each highway agency responsible for maintenance shall develop and maintain a  
5 program of highway maintenance for the entire highway network under its  
6 jurisdiction. This program should include the following activities:

- 7
- Identify needs

8

  - Establish priorities

9

  - Establish procedures

10

  - Establish and maintain a regular program of maintenance for all aspects

11 The program should be regularly evaluated and suitably modified to promote the  
12 maintenance of streets and highways that result in the best practicable condition.

13 **B.3D Identification of Needs**

14 The identification of maintenance needs is the first stage in the development of a  
15 successful maintenance program, and is required when any portion of the  
16 highway system is in a sub-standard condition. Action is also required to correct  
17 any situation which is hazardous or may become hazardous in the near future.  
18 This may be accomplished by both regular inspection of the highway network  
19 and proper analysis of crash records.

20 **B.3.1D.1 Inspection**

21 Periodic and systematic inspection of the entire highway network under  
22 each agency's jurisdiction is required to identify situations requiring  
23 improvements, and corrections or repairs. These inspections should be  
24 conducted by maintenance or traffic operations personnel, or other  
25 qualified personnel who are trained in the aspects of highway  
26 maintenance requirements.

1                    **B.3.2D-2 Crash Records**

2                    A regular program of crash investigations, record keeping, and analysis  
3                    should be established to provide information for recommended highway  
4                    modification and corrective maintenance requirements. Cooperation  
5                    among maintenance, traffic operations, and police agencies is required,  
6                    and activities of these agencies should be coordinated in accordance with  
7                    the guidelines set forth in the National Highway Traffic Safety  
8                    Administration (NHTSA) Program Guideline No. 21 (II)-9. Identification and  
9                    Surveillance of Crash-Accident Locations. Inspection of the highway  
10                    network and analysis of crash records should be utilized to provide  
11                    feedback for modification of design and construction procedures.

12                   **B.4E Establishment of Priorities**

13                   The maintenance activities determined to be necessary by the identification  
14                   program should be carried out on a priority basis. The establishment of priorities  
15                   should be based, to a large extent, upon the objective of promoting highway  
16                   safety. A high priority should be given to the improvement or correction of  
17                   situations that may result in fatal or serious crashes. Preservation of highway  
18                   investment and promotion of efficient traffic operations are important  
19                   maintenance objectives. Every effort should be made to ensure the highest  
20                   safety payoff from the maintenance dollar.

21



## 1 **B.5F Establishment of Procedures**

2 Standard procedures and methods for maintenance operations should be  
3 established for efficient, rapid, and safe completion of the required work. All  
4 maintenance work shall be conducted in accordance with the Standards set forth  
5 in CHAPTER 11 - WORK ZONE SAFETY. Each maintenance agency should  
6 develop its own Maintenance Manual or utilize the Maintenance Manuals of the  
7 Department. Such manuals should specify the methods, procedures, equipment,  
8 personnel qualifications, and other aspects of the work necessary to ensure  
9 successful completion of maintenance operations. Procedures should be  
10 developed for emergency, routine, and special operations.

### 11 **B.5.1F.4 Emergency Maintenance**

12 Emergency maintenance operations are those required to immediately  
13 restore the highway to a safe condition. Emergency maintenance work  
14 should be carried out by personnel who are specially trained and qualified.  
15 Work units, which should be available on a twenty-four hour basis, should  
16 be connected with the emergency response communications system.  
17 Emergency operations would include the following:

- 18 • The removal of debris from crashes, cargo spillage, or other causes.  
19 This activity should be conducted in accordance with the guidelines set  
20 forth in [the NHTSA Highway Safety Program Guideline No. 16](#), Debris  
21 Hazard Control and Cleanup.
- 22 • Replacement of inoperative traffic control devices
- 23 • Repair or replacement of damaged highway safety components such  
24 as lighting, traffic control devices, redirection devices, and energy  
25 absorbing devices
- 26 • Repair or correction of any situation that provides an immediate or  
27 unexpected hazard to the public
- 28 • Assistance in any activity during emergency response operations

### 29 **B.5.2F.2 Routine Maintenance**

30 Routine maintenance operations are those that may be predicted and  
31 planned in advance. These operations, which may be preventive or

- 1 corrective in nature, should be conducted on a regularly scheduled basis  
2 using standard procedures. Proper scheduling of these operations should  
3 be utilized to provide minimum disruptions and hazards to the driving  
4 public. Routine maintenance ~~may~~would include operations such as:
- 5 • Cleaning and debris removal from the pavement, shoulders, and  
6 roadside clear zones
  - 7 • Mowing and other vegetation control operations to provide a smooth  
8 recovery area and to maintain proper sight distance
  - 9 • Cleaning and inspection of gutters, ditches, and other drainage  
10 structures
  - 11 • Structural inspection and preventive maintenance on bridges and other  
12 structures
  - 13 • Cleaning, replacement, and maintenance of roadway lighting fixtures
  - 14 • Replacement and maintenance of traffic control devices
  - 15 • Inspection and maintenance of redirection and energy absorbing  
16 devices (CHAPTER 4 - ROADSIDE DESIGN)
  - 17 • Inspection and maintenance of emergency response communication  
18 systems and access facilities
  - 19 • Inspection and maintenance of pavement and shoulders, with  
20 particular emphasis on maintaining shoulders flush with the pavement  
21 (CHAPTER 5 - PAVEMENT DESIGN; AND CONSTRUCTION-~~AND~~  
22 MAINTENANCE)
  - 23 • Inspection and maintenance of all highway components and safety  
24 features
  - 25 • Inspection and maintenance of pedestrian pavements, crossings, etc.,  
26 with particular emphasis on meeting the intent of ADA (especially  
27 sidewalk cracks, joint separations, accumulated debris, adjacent  
28 landscape materials, etc.)
  - 29 • Thin pavement milling and resurfacing (<1.5" thickness maximum) that  
30 is intended to preserve the pavement, retard its future deterioration

1 and maintain its functional condition but does not increase the  
2 pavement's structural capacity.

### 3 **B.5.3F.3 Special Maintenance**

4 Special maintenance operations are defined as those projects that are  
5 neither urgent nor routine in nature, but are occasionally required to  
6 improve or maintain a street or highway in a quality condition. Since these  
7 projects can be planned in advance of the initiation of any work,  
8 procedures that provide for efficient, rapid, and safe operations can be  
9 developed. To avoid continuing disruptions of traffic, the quality and  
10 durability of these improvements, corrections, and repairs should be  
11 maintained at the highest practicable level. Special maintenance should  
12 include the upgrading of the highway safety features, as well as the repair  
13 or replacement of damaged or deteriorated highway components. These  
14 operations should be designed to upgrade or maintain the street or  
15 highway in accordance with the Standards presented in this Manual.

### 16 **B.5.4F.4 Pavement Maintenance**

17 The primary purpose of pavement maintenance is to ensure the pavement  
18 characteristics prescribed in CHAPTER 5 – PAVEMENT DESIGN AND  
19 CONSTRUCTION, are reasonably maintained. Each agency with  
20 responsibility for maintenance of streets and highways shall establish a  
21 meaningful pavement maintenance system (including shoulders and  
22 drainage structures) for the entire system under its jurisdiction. This  
23 program should include:

- 24 • A process that monitors the serviceability of the existing streets and  
25 highways and identifies the pavement sections that are inadequate
- 26 • A systematic plan of maintenance activities designed to correct  
27 structural deficiencies and to prevent rapid deterioration
- 28 • A preservation program, with assigned priorities, designed to  
29 resurface, reconstruct, or replace pavements when they are no longer  
30 structurally serviceable

31 Pavement maintenance requires a substantial portion of the total  
32 maintenance budget for streets and highways. It is necessary to ensure  
33 highway safety. A smooth-riding, skid-resistant surface must be provided  
34 at all times to allow for safe vehicle maneuvers. The reduction of

1 hydroplaning and splashing is essential for promoting safe and efficient  
2 operation during wet weather conditions. The elimination of driving  
3 discomfort, and vehicle damage caused by deteriorated pavements,  
4 provides additional economic justification for maintaining the pavement in  
5 a fully serviceable condition.

6 It is recognized that a comprehensive preservation program is expensive. |  
7 Adequate financing is required to successfully carry out these activities.  
8 The establishment of appropriate budget priorities and careful planning  
9 can assist in developing and conducting a pavement maintenance and  
10 preservation program that will, within a reasonable number of years, bring  
11 substandard pavements up to the required level of serviceability and will  
12 maintain the adequacy of the entire system.

13 |

## **C    RESURFACING**

Resurfacing is defined as work undertaken to extend the pavement service life and/or enhance highway safety. This includes the placement of additional surface materials and/or other work necessary to return an existing roadway pavement to a condition of structural and functional adequacy. Resurfacing projects must be designed and constructed in a manner that will comply with the accessibility standards and requirements set forth in the *Americans with Disabilities Act of 1990 (ADA)*.

### **C.1    ADA Requirements**

All new sidewalk and driveway construction or reconstruction included on resurfacing projects shall be designed in accordance with ADA requirements. Project design shall include an evaluation of existing driveways to determine if it is feasible to upgrade nonconforming driveways. Where existing right of way is inadequate or conflicts occur with existing features that cannot be practicably relocated or adjusted (e.g. driveways, drainage inlets, signal poles, pull boxes, utility poles, etc.), accessibility shall be provided to the maximum extent feasible.

Existing detectable warnings and curb ramps shall be brought into compliance with ADA requirements. This includes installing new detectable warnings for both flush shoulder and curbed roadway connections and signalized driveways where none exist or do not meet current requirements. New curb ramps shall be provided on curbed roadways where none exist and existing substandard curb ramps shall be replaced. Existing ramps not meeting detectable warning requirements which otherwise comply with ADA shall be retrofitted with detectable warnings.

Other than meeting detectable warning and curb ramp requirements, existing sidewalks and driveways are not required to be upgraded for the sole purpose of meeting ADA requirements unless included in the project scope.

### **C.2    Railroad-Highway Grade Crossing Near or Within Project Limits**

Federal-aid projects must be reviewed to determine if a railroad-highway grade crossing is within the limits of or near the terminus of the project. If such railroad-highway grade crossing exists, the project must be upgraded to meet the latest **MUTCD** requirements in accordance with **Title 23 United States Code (U.S.C), Chapter 1, Section 109(e)** and **CFR 646.214(b)**.

1 These requirements are located in Chapter 8 of the MUTCD. “Near the  
2 terminus” is defined as being either of the following:

- 3 • If the project begins or ends between the crossing and the MUTCD-  
4 mandated advanced placement distance for the advanced (railroad)  
5 warning sign. See MUTCD, Table 2C-4 (on page 2C-6, Condition B,  
6 column “0” mph) for this distance.
  
- 7 • An intersection traffic signal within the project is linked to the crossing’s  
8 flashing light signal and gate.

### 9 C.3 Safety Improvements

10 Local agencies should strive to upgrade the safety of their facilities during  
11 scheduled maintenance intervals especially during pavement resurfacing  
12 projects. Particular attention should be paid to improving pedestrian and bicyclist  
13 safety using strategies such as crosswalk and bicycle lane delineations. Meeting  
14 the latest ADA requirements for curb cuts and curb ramps is a requirement under  
15 federal law. Investments should also be made in improved guardrail end  
16 treatments and bridge-end transitions on high speed facilities.

#### 17 C.3.1 Pavement Safety Edge

18 Many low-cost strategies exist to improve the long-term safety of streets  
19 and highways. One such strategy is the pavement Safety Edge. The  
20 Safety Edge provides a higher probability of a vehicle returning safely to  
21 the travel lane when it drifts off the pavement. The Safety Edge is a  
22 wedge-shaped transition of the structural pavement to the unpaved  
23 shoulder. The wedge shape eliminates tire scrubbing against the  
24 pavement edge and improves vehicle stability as it crosses a drop-off.

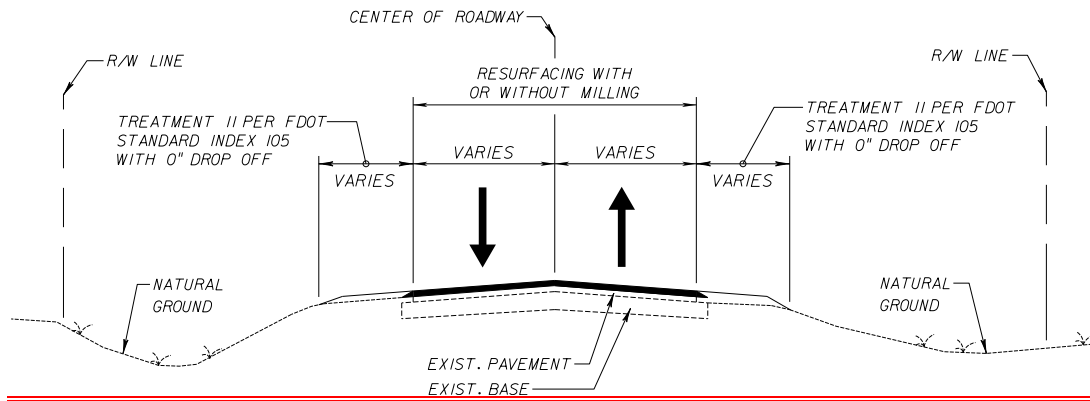
25 The Safety Edge is particularly effective when providing a smooth  
26 transition from pavement to shoulder when vertical drop-offs exceed 2  
27 inches. Construction of the Safety Edge typically includes initially pulling  
28 the unpaved shoulder for pavement structural course, and then backfilling  
29 onto the Safety Edge with installation of sod or turf. The Safety Edge is  
30 very effective in mitigating the severity of road-departure crashes even  
31 should the unpaved shoulder erode away from it between maintenance  
32 intervals.

1  
2  
3  
4

Details for the Safety Edge are included in Figures 5 - 1 and 5 - 2. Safety Edge shall be constructed adjacent to the pavement edge on rural roadways with no paved shoulder and posted speeds 45 mph and above.

1  
2  
3

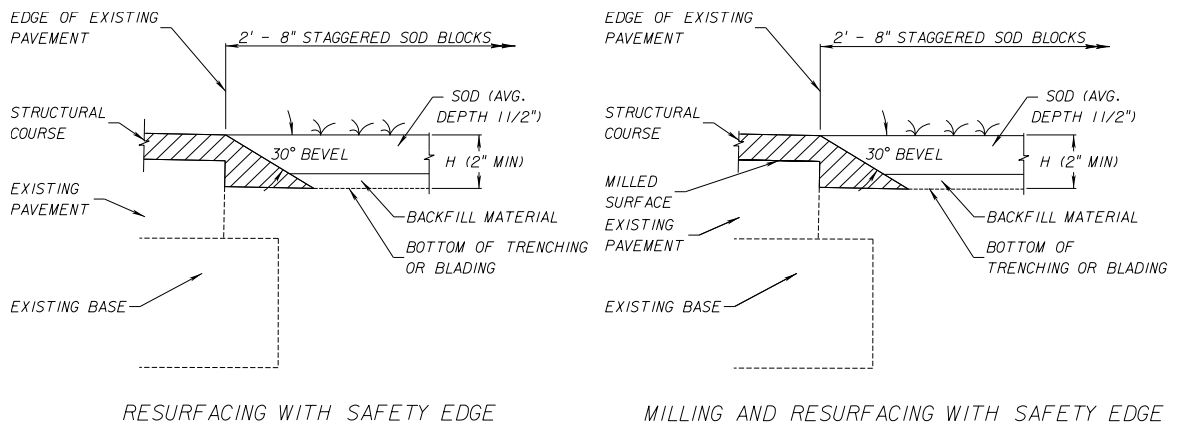
**FIGURE 5 - 1**  
**TWO LANE ROAD WITH SAFETY EDGE**



4

5  
6  
7

**FIGURE 5 - 2**  
**SAFETY EDGE DETAIL (NO PAVED SHOULDERS)**



FOR  $2'' \leq H \leq 5''$   
 SINGLE LIFT  
 SAFETY EDGE DETAIL

8

9



## C.4 Federal Aid Project Requirements

The following is the minimum scope that a local highway resurfacing project must contain for federal-aid assistance including projects in the Local Agency Program (LAP):

- Rework shoulders to be flush with the pavement and establish turf along the pavement edge.
- Upgrade or Replace existing roadside hardware (guardrail) as necessary for compliance with Federal criteria for 3R projects (as summarized in the Florida Department of Transportation's Plans Preparation Manual, Section 25.4.26).
- Meet the latest MUTCD standards for signing and pavement marking.
- Construct or reconstruct, as appropriate, curb cuts and ramps to comply with current ADA requirements.
- Upgrade the safety of the project by mitigating the impact of crashes involving vehicles, bicycles and pedestrians.

Note: The local agency may contact the FDOT District Safety Office and determine locations within the project with crash rates higher than average for similar facility type. The local agency may then identify the causes of the crashes from a review of crash report data provided by the FDOT District Safety Office. Based on this analysis, the local agency may then specify the appropriate crash mitigation measures (additional guardrail, signing, vibratory/audible pavement marking, designated crosswalks or other prudent safety-enhancing strategies).

- Upgrade railroad crossings requirements upgraded to meet the latest MUTCD requirements in accordance USC Title 23, Chapter 1, Section 109e) and CFR 646.214(b), when the railroad-highway grade crossing is located within the limits of or near the terminus of the project. These requirements are located in Chapter 8 of the MUTCD. "Near the terminus" shall be defined as either or the following:

1. If the project ends after the MUTCD-mandated advanced placement distance for the advanced (railroad) warning sign. See MUTCD Table 2C-4 on page 2C-5, Condition B, column "0" km/h for this distance.

2. An intersection traffic signal within the project is linked to the crossing's flashing light signal and gate.

1 **D REFERENCES FOR INFORMATIONAL PURPOSES**

2 The following is a list of publications that may be referenced for further guidance:

3 • Source: AASHTO Standing Committee on Highways, 1997

4 • FHWA Pavement Preservation Definitions, HIAM-20, September 12, 2005,  
5 <http://www.fhwa.dot.gov/pavement/preservation/091205.cfm>

6 • NCHRP Synthesis 417: Geometric Design Practices for Resurfacing, Restoration,  
7 and Rehabilitation, <http://www.nap.edu/>  
8



## *Chapter 13 – Public Transit*



## CHAPTER 13

### PUBLIC TRANSIT

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## CHAPTER 13

### PUBLIC TRANSIT

#### A INTRODUCTION

All ~~usual~~ modes of transportation (autos, trucks, transit vehicles, rails, aircraft, water craft, ~~bicyclist~~bikes, and pedestrians) should be considered when planning, designing, and constructing the surface transportation system. Where there is a demand for highways to serve vehicles, there could also be a demand for public transit or public transportation. Public transit should be considered in all phases of a project, including planning, preliminary design and engineering, design, construction, and maintenance etc. Coordination with the appropriate public transit provider(s) will help determine the need for transit related infrastructure ~~and justification of bus bays~~ on a project-by-project basis. ~~With the recent passing of various legislation, multimodalism is the ultimate goal.~~ The integration of public transit street side facilities along with pedestrian and bicycle facilities furthers the implementation of this goal.

Planning and designing for public transit is important because it is an integral part of the overall surface transportation system. Public transit is defined as passenger transportation service, local or regional in nature, that is available to any person. It operates on established schedules along designated routes or lines with specific stops and is designed to move relatively large numbers of people at one time. Public transit includes bus, light rail, trolleys and bus rapid transit and paratransit. ~~Public transportation is similar in definition because it serves the general public, it also includes non-fixed route services that are door-to-door or paratransit services~~ [mak1].

With rising levels of congestion resulting in the use of new strategies to effectively and efficiently manage mobility, there is an increased demand for accessible and user friendly public transit. New strategies include increased emphasis on public transit and new emphasis on Transportation System Management (TSM), as well as Transportation Demand Management (TDM). TSM is the use of low cost capital improvements to increase the efficiency of roadways and transit services such as; retiming traffic signals or predesignating traffic flow. TDM focuses on people reducing the number of personal vehicle trips, especially during peak periods. TDM includes the promotion of alternatives to the single occupant vehicle, including public transportation, carpooling, vanpooling, bicycling, walking, and telecommuting, as well as other methods for reducing peak hour travel.

Federal and State legislation provide the stimulus for planning, designing, and constructing a fully integrated transportation system benefiting the traveling public and the environment. Examples of legislation include the ~~Moving Ahead for Progress in the 21st Century Act~~ ~~Safe, Accountable, Flexible, and Efficient Transportation Equity Act—A Legacy for Users~~ (MAP-21/SAFETEA-LU), The Americans with Disabilities Act of 1990 (ADA), and The Clean Air Act Amendment of 1990 (CAAA). In response to this legislation, the surface transportation system should provide for concurrent use by automobiles, public transit and rail, ~~and, to the extent possible,~~ bicycles and pedestrians.

~~Throughout the entire process, coordination with transit as if it were a utility is essential.~~

## B OBJECTIVE

There are a number of methods to efficiently develop a coordinated surface transportation system. Coordination among agencies is necessary during the planning and design stages to:

- ~~incorporate transit needs and during the construction phase for re-routing bus (and complementary pedestrian) movements,~~ and
- ~~for actual transit agency specific requirements (e.g., bus stop sign replacement, shelter installations, etc.).~~

For planning purposes, the state and local Transportation Improvement Program (TIP) should be referenced. Additionally, individual transit authorities have ~~five-ten~~ year Transit Development Plans (TDPs) that are updated annually. The TDP can be used as a guide for planned transit needs along existing and new transportation corridors so transit consideration and transit enhancements can be incorporated where appropriate.

## C TRANSIT COMPONENTS

### C.1 Boarding and Alighting (B&A) Areas ~~Stops and Station Areas~~

Boarding and Alighting (B&A) areas help to create an accessible bus stop by providing a raised platform that is compatible with a bus that kneels or extends a ramp. ~~Where new bus stops are located with bus bays, or other areas where a lift or ramp is to be deployed, they shall have a B&A boarding and alighting area~~ has consisting of a firm, stable and slip-resistant surface with a minimum clear length of 8.0 feet96 inches (measured perpendicular from to the curb or vehicle roadway edge), and a minimum clear width of 5.0 feet60 inches (measured parallel to the vehicle roadway). Firm, stable, and slip resistant B&A areas are required if amenities such as benches or shelters are added to a bus stop. ~~to the maximum extent allowed by legal or site restraints, and shall be connected to streets, sidewalks, or pedestrian paths by an accessible route. B&A areas are not required at bus stops on flush shoulder roadways where only a bus stop sign is provided. Coordinate with the appropriate public transit provider(s).~~

The slope of the B&A boarding and alighting area parallel to the roadway shall to the extent practicable, be the same as the roadway. For water drainage, a maximum slope of 1:50 (2%) perpendicular to the roadway is allowed. ~~In cases where there are no sidewalks or curbs, bus stop boarding and alighting areas may be necessary to allow the wheelchair passengers to board or alight from a transit vehicle. Benches and other site amenities must not be placed on the B&A area. The B&A area can be located either within or outside the shelter, and shall be connected to streets, sidewalks, or pedestrian circulation paths by an accessible route.~~

On flush shoulder roadways, a B&A area may be constructed at the shoulder point (or edge of shoulder pavement on roadways with a design speed of 45 mph or less) as shown in Figures 3-1 and 3-2. A Type "E" curb (5" curb height) should be used.

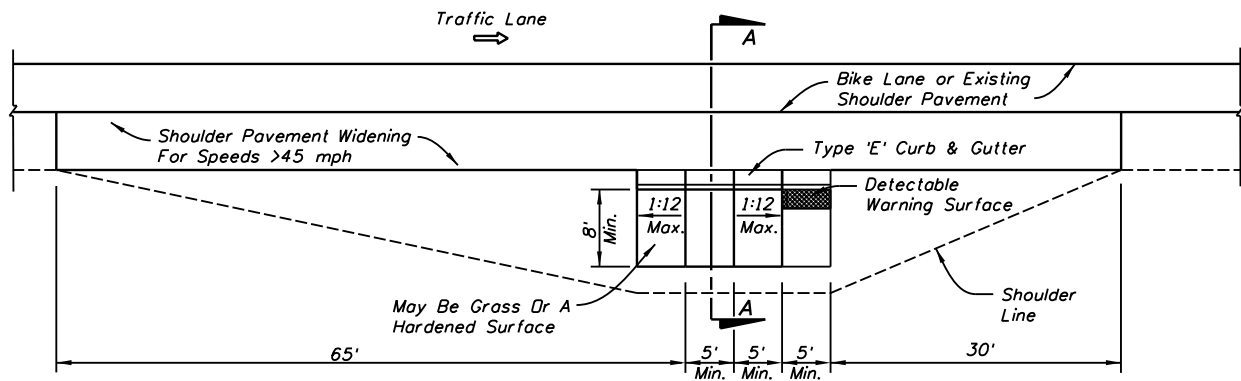
A sidewalk and/or ramp provided with the B&A area shall be a minimum of 5 feet in width, and the ramp shall not exceed a slope of 1:12. A detectable warning is required where a sidewalk associated with a B&A area connects to the roadway at grade. Except for the area adjacent to the 5" curb, the areas surrounding the B&A area shall be flush with the adjacent shoulder and side slopes and designed to be traversable by errant vehicles. On the upstream side of the platform, a

maximum slope of 1:12 should be provided, and may be grass or a hardened surface. The B&A area (and ramp and level landing if needed) should be constructed with 6" thick concrete.

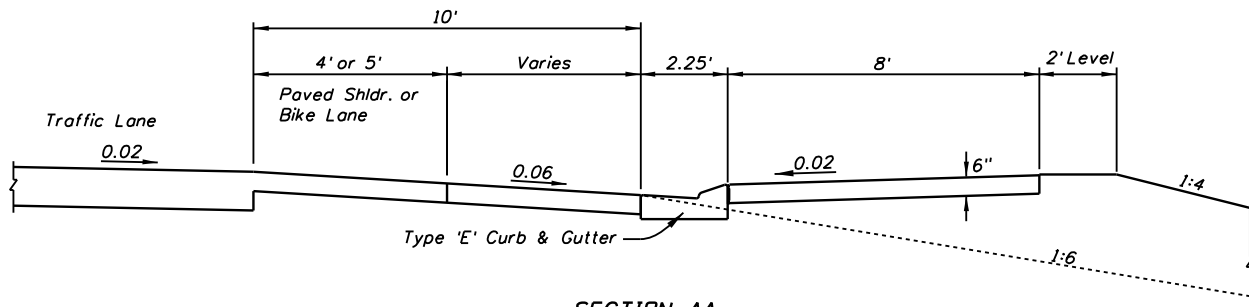
~~Coordinateion with the appropriate public transit provider(s) is necessary.~~

**Figure 13 – 1**

**Boarding and Alighting Area for Flush Shoulder Roadways  
 with Connection to the Roadway**



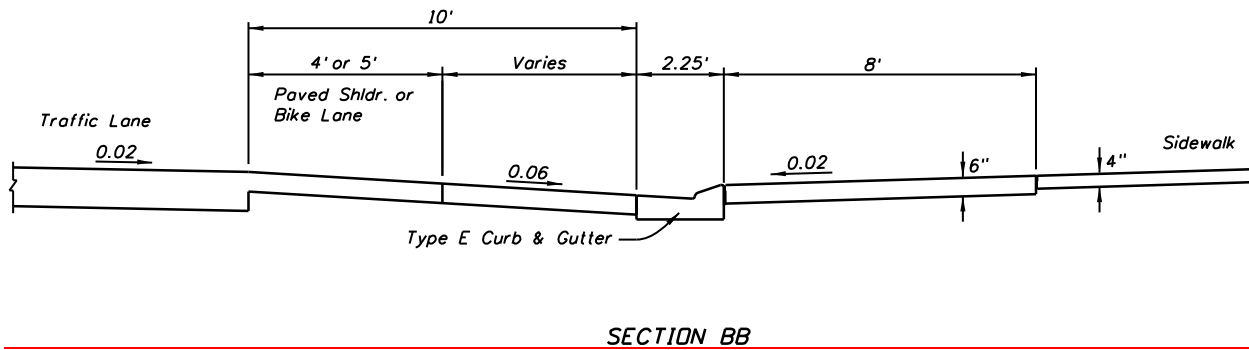
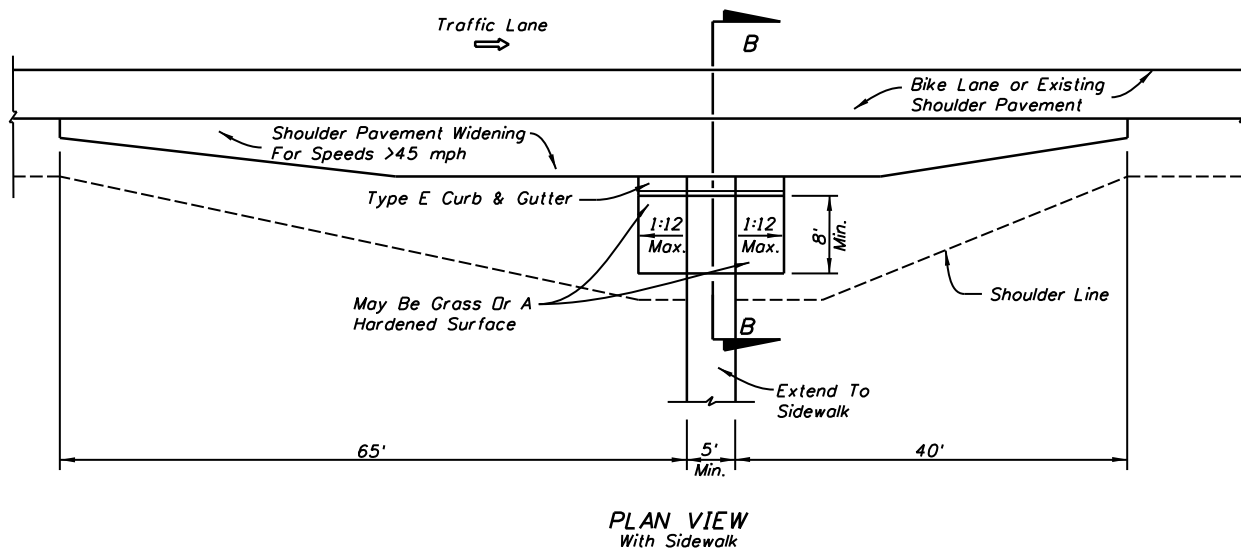
PLAN VIEW  
 Without Sidewalk



SECTION AA

**Figure 13 – 2**

**Boarding and Alighting Area for Flush Shoulder Roadways  
 with Connection to the Sidewalk**



## C.2 Shelters

Every public transit system has different needs with regards to shelters and corresponding amenities (e.g., benches, information kiosks, leaning posts, trash receptacles, etc.). Shelter foundation and associated pad size vary from stop to stop based on right of way availability, line of sight, and facility usage, etc. New or replaced bus shelters shall be installed or positioned as to permit a wheelchair or mobility aid user to enter to provide an accessible route from the public way (sidewalk or roadway) and to reach a location therein that has having a minimum clear floor area of 30 inches by 48 inches, entirely within the perimeter of the shelter.

Such Sshelters shall be connected by an accessible route to a B&A the boarding and alighting area, provided under C.1 Stops and Station Areas, this Chapter. Coordination with the appropriate public transit provider(s) is necessary. Where feasible, All Sshelters should provide a location for a bicycle rack. Shelters should be installed at locations where demand warrants installation and in accordance with clear zone criteria in CHAPTER 3 – GEOMETRIC DESIGN (C.10.e and Table 3-13) of this Manual.

## C.3 Benches

Bench placement shall be in an accessible location (i.e., not on the far side of a drainage ditch from the actual bus stop), on an accessible route appropriately out of the path of travel on a sidewalk. Benches They and shall have an adjacent firm, stable and slip-resistant surface at least 30 inches wide and 48 inches deep to allow a user of a wheelchair user to sit next to the bench, permitting the user shoulder-to-shoulder seating with a companion. Connection between the bench, the sidewalk and/or bus stop B&A boarding and alighting area shall be provided. Coordination with the Public Transportation Office and the local public transit provider(s) is necessary.

## C.4 Stops and Station Areas

Transit stops should be located so that there is a level and stable surface for boarding vehicles. Locating transit stops at signalized intersections increases the usability for pedestrians with disabilities.

### Concrete Bus Stop Boarding and Alighting Areas



~~Although not always practical, there are situations where concrete bus stop boarding and alighting areas should be incorporated into the pavement design of a project. Frequent stopping transit vehicles in a particular location is an example where concrete pads may be warranted.~~

### **C.5 Bus Bays (Pullout or Turnout Bays)**

~~In some situations~~ turnout bus bays for transit vehicles ~~are appropriate~~ may be necessary (e.g., extended dwell time, ~~consistent slow boarding~~ layover needs, safety reasons, high speed traffic, etc.). Bus bays can be designed for one or more buses. ~~Coordination~~ ion with the ~~Public Transportation Office and/or the~~ local public transit provider(s) ~~will to help~~ determine the need for ~~and justification of~~ bus bays. When possible, bus bays should be located on the far side of a signalized intersection. The traffic signal will create the critical gap needed for bus re-entry into traffic. There are several publications available which provide additional design information for transit system applications. The Department District Public Transportation Office(s) maintains a library of these publications.

### **C.6 Promote Public Transit**

All citizens and businesses in the State of Florida are encouraged to promote public transit. This can be done in many ways, such as ~~from~~ providing employees reduced fares, ~~to providing~~ route maps and schedules. Work with your local transit agency to provide service to large employment areas and major attractions. Assist local transit agencies in providing such things as bus lanes, park and ride lots and easements for bus shelters and bicycle parking. Encourage businesses or neighborhoods to hold a "Commuter Choices Week" and invite your transit agencies to provide information on the advantages of using transit. "Commuter Choices Week" is a state sponsored event that promotes alternative transportation in the work place (walk, bike, bus, transit, telecommuting).

## D PUBLIC TRANSIT FACILITIES

When a project includes a public transit route, curb-side and street-side transit facilities for bus stops should be considered in the roadway design process. Transit facilities shall comply with Chapter 14-20, Florida Administrative Code, Following is a link to the code:

<https://www.flrules.org/gateway/ChapterHome.asp?Chapter=14-20>

The “Accessing Transit: Design Handbook for Florida Bus Passenger Facilities” and “~~Transit Vehicles and Facilities on Streets and Highways~~” provide s guidance relating to provisions for curb-side and street-side facilities.

### D.1. Curb-Side Facilities

Curb-side facilities are the most common, simple and convenient form of facilities at a bus stop. These include bus stop signs, passenger waiting shelters, bus stop wheelchair access pad B&A areas, benches, bike racks, leaning rails, and shelter lighting. ~~Chapter 1 of “Accessing Transit” provides additional details and guidelines for each type of transit facility that may be considered as guidelines.~~ Chapter 1 of “Accessing Transit” provides additional details and guidelines for each type of transit facility that may be considered as guidelines. Coordination with the appropriate public transit provider(s) may be necessary into determine the appropriate type and placement of amenities developing the bus stop plans.

### D.2 Street-Side Facilities

Bus stop locations can be categorized as far side, near side and mid block stops. Bus stops may be designed with a bus bay or pullout to allow buses to pick up and discharge passengers in an area outside of the travel lane. This design feature allows traffic to flow freely without the obstruction of stopped buses. See Figure 13 - 31 for typical detail for the bus stop and bus bay categories. Chapter 2 of “Accessing Transit” provides additional details that may be considered as guidelines.

Bus bays can be closed-ended, open-ended, or nubs/bulbs, and can be positioned near-side, far-side, or mid-block in relation to an intersection, as illustrated in Figure 13 - 3. The greater distance placed between waiting passengers and the travel lane increases safety at a stop. Bus bays are classified as 'closed', 'open' or 'bulbs'. Detailed standard drawings that may be considered for various bus bay configurations are provided in “Transit Facilities

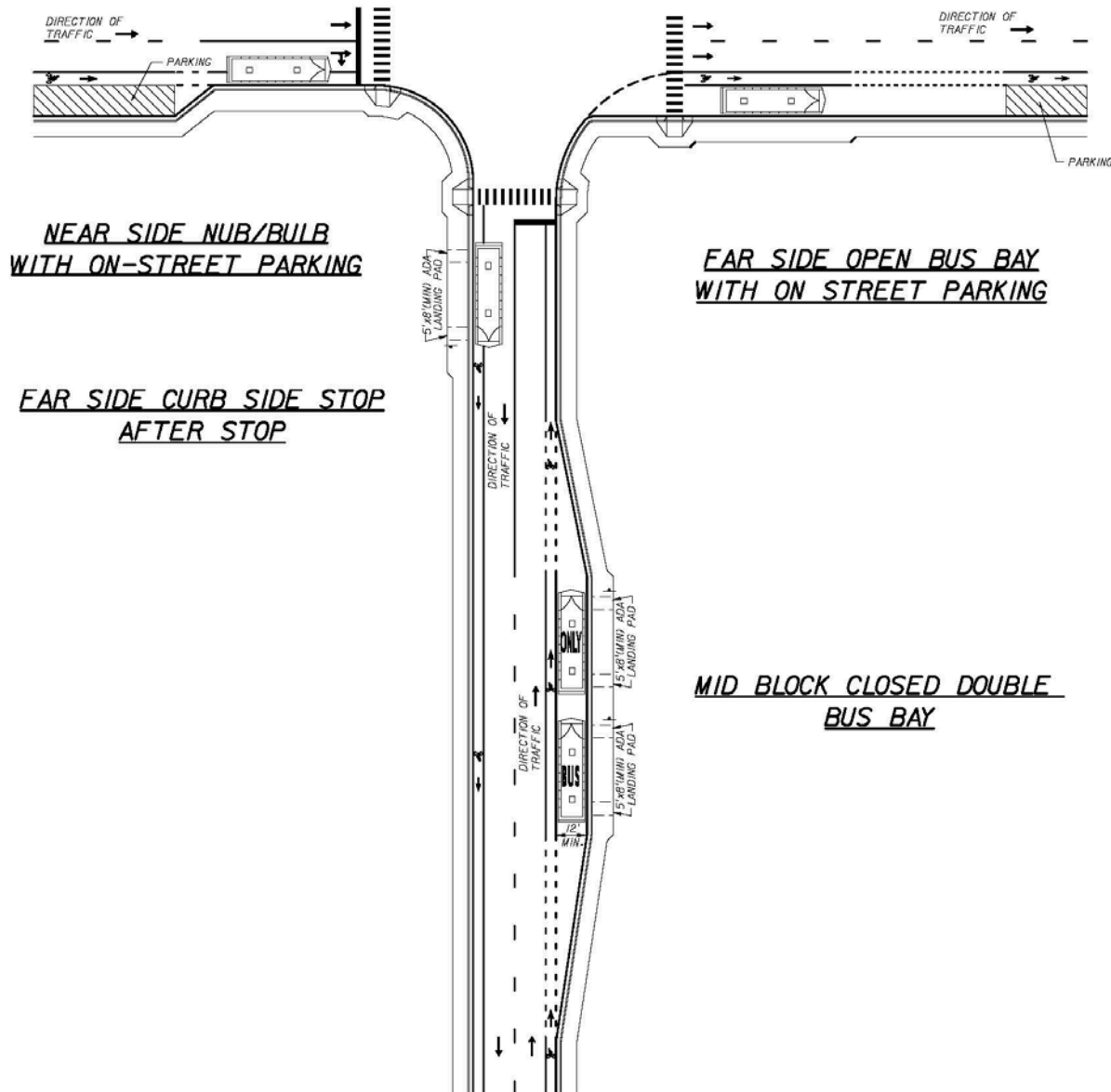
~~Guidelines” provide detailed standard drawings that may be considered for various bus bay configurations on the Department’s Public Transportation Office website: <http://www.dot.state.fl.us/transit/>.~~

The total length of the bus bay should allow room for an entrance taper, a stopping area, and an exit taper as a minimum. However, in some cases it may be appropriate to consider providing acceleration and deceleration lanes depending on the volume and speed of the through traffic. This decision should be based upon site specific conditions. “Accessing Transit” provides detailed bus bay dimensions for consideration with various right of way and access conditions. ~~when right of way is unlimited and access points are limited.~~

### D.3 Bus Bay Lighting

Lighting design for bus bay ~~pavement area~~s should meet the same criteria for minimum illumination levels, uniformity ratios and max-to-min ratios that are being applied to the adjoining roadway based on CHAPTER 6 – ROADWAY LIGHTING of this Manual. If lighting is not provided for the adjoining roadway, ~~coordination~~ with the transit agency ~~may be considered~~ to determine if lighting ~~is to~~should be provided for the bus stop area, particularly when night transit services are provided. A decision to install lighting for the adjoining bus stop area may include illumination of the bus bay pavement area. The use of solar panel lighting for bus bays is another option that should be considered.

**Figure 13 – 34**  
**Bus Bay Categories**



## E REFERENCES FOR INFORMATIONAL PURPOSES

The following is a list of publications that may be referenced for further guidance:

- FDOT “Accessing Transit Design Handbook for Florida Bus Passenger Facilities” on the Public Transportation Office web site:  
<http://www.dot.state.fl.us/transit/NewTransitPlanning.shtm>
- **FDOT** “Transit Facilities Guidelines” on the Public Transportation Office web site:  
<http://www.dot.state.fl.us/transit/NewTransitPlanning.shtm>
- ~~“Transit Vehicles and Facilities on Streets and Highways”, from Transit Cooperative Research Program (TCRP) of the Transportation Research Board of the National Research Council January 2007~~

## *Chapter19 – Traditional Neighborhood Development*



## CHAPTER 19

### TRADITIONAL NEIGHBORHOOD DEVELOPMENT

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## CHAPTER 19

### TRADITIONAL NEIGHBORHOOD DEVELOPMENT

#### A INTRODUCTION

Florida is a national leader in planning, design and construction of Traditional Neighborhood Development (TND) communities, and in the renovation of downtown neighborhoods and business districts. TND refers to the development or redevelopment of a neighborhood or town using traditional town planning principles. Projects should include a range of housing types and commercial establishments, a network of well-connected streets and blocks, civic buildings and public spaces, and have amenities such as stores, schools, and worship within walking distances of residences.

They represent patterns of development aligned with the state's growth management, smart growth and sprawl containment goals. This approach, with its greater focus on pedestrian, bicycle and transit mobility; is distinct from Conventional Suburban Development (CSD). CSDs are comprised largely of subdivision and commercial strip development.

TND communities rely on a strong integration of land use and transportation. A TND has clearly defined characteristics and design features that are necessary to achieve the goals for compact and livable development patterns reinforced by a context-sensitive transportation network. The treatment of land use, development patterns and transportation networks necessary for successful TND communities is a major departure from those same elements currently utilized in other Greenbook chapters.

To provide a design that accomplishes the goals set out in this chapter, designers will be guided by the context of the built environment, established or desired, for a portion of the communities because TND communities rely on a stronger integration of land use and transportation than CSD communities. This chapter provides criteria that may be used for the design of streets within a TND when such features are desired, appropriate and feasible. This involves providing a balance between mobility and livability. This chapter may be used in planning and designing new construction, urban infill, and redevelopment projects.

Section B of this chapter discusses the primary objectives of TND in more detail to aid the designer in the selection of proper criteria. Section C sets forth specific design criteria for the transportation system within TND.

The following link provides a handbook containing essential information to provide

designers guidance in the successful application of this Chapter:

<http://www.dot.state.fl.us/rddesign/FloridaGreenbook/TND-Handbook.pdf>

## B APPLICATION

A project or community plan may be considered a TND when at least the first seven of the following principles are included:

1. Has a compact, pedestrian-oriented scale that can be traversed in a five to ten-minute walk from center to edge.
2. Is designed with low speed, low volume, interconnected streets with short block lengths, 150 to 500 feet, and cul-de-sacs only where no alternatives exist. Cul-de-sacs, if necessary, should have walkway and bicycle connections to other sidewalks and streets to provide connectivity within and to adjacent neighborhoods.
3. Orients buildings at the back of sidewalk, or close to the street with off-street parking located to the side or back of buildings, as not to interfere with pedestrian activity.
4. Has building designs that emphasize higher intensities, narrow street frontages, connectivity of sidewalks and paths, and transit stops to promote pedestrian activity and accessibility.
5. Incorporates a continuous bike and pedestrian network with wider sidewalks in commercial, civic, and core areas, but at a minimum has sidewalks at least five feet wide on both sides of the street. Accommodates pedestrians with short street crossings, which may include mid-block crossings, bulb-outs, raised crosswalks, specialty pavers, or pavement markings.
6. Uses on-street parking adjacent to the sidewalk to calm traffic, and offers diverse parking options, but planned so that it does not obstruct access to transit stops.
7. Varies residential densities, lot sizes, and housing types, while maintaining an average net density of at least eight dwelling units per acre, and higher density in the center.
8. Integrates at least ten percent of the developed area for nonresidential and civic uses, as well as open spaces.
9. Has only the minimum right of way necessary for the street, median, planting strips, sidewalks, utilities, and maintenance that are appropriate to the adjacent land uses and building types.
10. Locates arterial highways, major collector roads, and other high-volume corridors at the edge of the TND and not through the TND.

The design criteria in this chapter shall only be applicable within the area defined as TND.

## **C PLANNING CRITERIA**

Planning for TND communities occurs at several levels, including the region, the city/town, the community, the block, and, finally, the street and building. Planning should be holistic, looking carefully at the relationship between land use, buildings, and transportation in an integrated fashion. This approach, and the use of form based codes, can create development patterns that balance pedestrian, bicycling, and transit with motor vehicle transportation.

### **C.1 LAND USE**

In addition to its importance in calculating trip generation, the Institute of Transportation Engineers (ITE) recognizes land use as fundamental to establishing context, design criteria, cross-section elements, and right of way allocation. The pedestrian travel that is generated by the land uses is also important to the design process for various facilities.

A well-integrated, or “fine grained”, land use mix within buildings and blocks is essential. These buildings and blocks aggregate into neighborhoods, which should be designed with a mix of uses to form a comprehensive planning unit that aggregates into larger villages, towns, and regions. Except at the regional scale, each of these requires land uses to be designed at a pedestrian scale and to be served by “complete streets” that safely and attractively accommodate many modes of travel.

The proposed land uses, residential densities, building size and placement, proposed parking (on-street and off-street) and circulation, the location and use of open space, and the development phasing are all considerations in facility design for TNDs. ITE recommends a high level of connectivity, short blocks that provide many choices of routes to destinations, and a fine-grained urban land use and lot pattern. Higher residential density and nonresidential intensity, as measured by floor area ratios of building area to site area, are required for well-designed TNDs.

### **C.2 NETWORKS**

Urban networks are frequently characterized as either traditional or conventional. Traditional networks are typically characterized by a relatively non-hierarchical pattern of short blocks and straight streets with a high density of intersections that support all modes of travel in a balanced fashion.

**Figure 19-1 Traditional Network**



**New York, NY**

**Savannah, GA**

(Source: VHB)

The typical conventional street network, in contrast, often includes a framework of widely-spaced arterial roads with limited connectivity provided by a system of large blocks, curving streets and a branching hierarchical pattern, often terminating in cul-de-sacs.

**Figure 19-2 Conventional Network**



**Walnut Creek, CA**

(Source: VHB)



Traditional and conventional networks differ in three easily measurable respects: (1) block size, (2) degree of connectivity and (3) degree of curvature. While the last does not significantly impact network performance, block size and connectivity create very different performance characteristics.

Advantages of traditional networks include:

1. Distribution of traffic over a network of streets, reducing the need to widen roads;
2. A highly interconnected network providing a choice of multiple routes of travel for all modes, including emergency services;
3. More direct routes between origin and destination points, which generate fewer vehicle miles of travel (VMT) than conventional suburban networks;
4. Smaller block sizes in a network that is highly supportive to pedestrian, bicycle, and transit modes of travel;
5. A block structure that provides greater flexibility for land use to evolve over time.

It is important in TND networks to have a highly interconnected network of streets with smaller block sizes than in conventional networks. There are several ways to ensure that these goals are achieved.

One method is based upon the physical dimensions used to layout streets and blocks. The following list identifies those parameters:

1. Limit block size to an average perimeter of approximately 1,320 feet.
2. Encourage an average intersection spacing for local streets of 300-400 feet.
3. Limit maximum intersection spacing for local streets to approximately 600 feet.
4. Limit maximum spacing between pedestrian/bicycle connections to approximately 300 feet (that is, it creates mid-block paths and pedestrian shortcuts).

## D OBJECTIVES

The basic objectives of a Traditional Neighborhood Development are:

1. Safety
2. Mobility of all users (vehicles, pedestrians, bicyclists and transit)
3. Compact and livable development patterns
4. Context-sensitive transportation network

TND features are based upon the consideration of the following concepts. These concepts are not intended as absolute criteria since certain concepts may conflict. The concepts should therefore be used for the layout of proper street systems.

1. Strong integration of land use and transportation.
2. Very supportive of pedestrian, bicycle, and transit modes.
3. Smaller block sizes to improve walkability, and to create a fine network of streets accommodating bicyclists and pedestrians, and providing a variety of routes for all users.
4. On-street parking is favored over surface parking lots.
5. Limited use of one way streets.
6. Speeds for motor vehicles are ideally kept in the range of 20-35 mph through the design of the street, curb extensions, use of on-street parking, the creation of enclosure through building and tree placement.
7. Street geometry (narrow streets and compact intersections), adjacent land use, and other elements within a TND must support a high level of transit, pedestrian and bicycle activity.
8. Provide access to emergency services, transit, waste management, and delivery trucks.
9. Provide access to property.

This approach to street design requires close attention to the operational needs of transit, fire and rescue, waste collection, and delivery trucks. For this reason, early coordination with transit, fire and rescue, waste collection, and other stakeholder groups is essential. For fire and rescue, determination of the importance of that corridor for community access should be determined, e.g. primary or secondary access.

More regular encroachment of turning vehicles into opposing lanes will occur at intersections. Therefore, frequency of transit service, traffic volumes, and the speeds at those intersections must be considered when designing intersections.

When designing features and streets for TND communities, creativity and careful attention to safety for pedestrians and bicyclists must be balanced with the operational needs of motor vehicles.

Finally, it is very important when designing in TND communities to ensure that a continuous network is created for pedestrians, bicyclists, and transit throughout the community to create higher levels of mobility that are less dependent on automobile travel.

## E DESIGN ELEMENTS

The criteria provided in this chapter shall require the approval of the maintaining authority's designated Professional Engineer representative with project oversight or general compliance responsibilities. Approval may be given based upon a roadway segment or specific area.

The criteria provided in this chapter are generally in agreement with AASHTO guidelines with a special emphasis on urban, low-speed environments. Design elements within TND projects not meeting the requirements of this chapter are subject to the requirements for Design Exceptions found in Chapter 14 of this manual.

### E.1 Design Controls

#### E.1.a Design Speed

The application of design speed for TND communities is philosophically different than for conventional transportation and CSD communities. Traditionally, the approach for setting design speed was to use as high a design speed as practical.

In contrast to this approach, the goal for TND communities is to establish a design speed that creates a safer and more comfortable environment for pedestrians and bicyclists, and is appropriate for the surrounding context.

Design speeds of 20 to 35 mph are desirable for TND streets. Alleys and narrow roadways intended to function as shared spaces may have design speeds as low as 10 mph.

#### E.1.b Movement Types

Movement types are used to describe the expected driver experience on a given thoroughfare, and the design speed for pedestrian safety and mobility established for each of these movement types. They are also used to establish the components and criteria for design of streets in TND communities.

**Yield:** Has a design speed of less than 20 mph. Drivers must proceed slowly with extreme care, and must yield to pass a parked car or approaching vehicle. This is the functional equivalent of traffic calming. This type should accommodate bicycle routes through the use of shared lanes.

**Slow:** Has a design speed of 20-25 mph. Drivers can proceed carefully, with an occasional stop to allow a pedestrian to cross or another car to park. Drivers should feel uncomfortable exceeding design speed due to the presence of parked cars, enclosure, tight turn radii, and other design elements. This type should accommodate bicycle routes through the use of shared lanes.

**Low:** Has a design speed of 30-35 mph. Drivers can expect to travel generally without delay at the design speed, and street design supports safe pedestrian movement at the higher design speed. This type is appropriate for thoroughfares designed to traverse longer distances, or that connect to higher intensity locations. This type should accommodate bicycle routes through the use of bike lanes.

Design speeds higher than 35 mph should not normally be used in TND communities due to the concerns for pedestrian and bicyclist safety and comfort. There may be locations where planned TND communities border, or are divided by, existing corridors with posted/design speeds higher than 35 mph. In those locations, coordination with the regulating agency should occur with a goal to re-design the corridor and reduce the speed to 35 mph or less. The increase in motorist travel time due to the speed reduction is usually insignificant because TND communities are generally compact.

When the speed reduction cannot be achieved, measures to improve pedestrian safety for those crossing the corridor should be evaluated and installed when appropriate.

### **E.1.c Design Vehicles**

There is a need to understand that street design with narrow streets and compact intersections requires designers to pay close attention to the operational needs of transit, fire and rescue, waste collection, and delivery trucks. For this reason, early coordination with transit, fire and rescue, waste collection, and other stakeholder groups is essential.

Regular encroachment of turning vehicles into opposing lanes will occur at intersections. Therefore, frequency of transit service, traffic volumes, and the speeds at those intersections must be considered when designing intersections. For fire and rescue, determination of the importance of the street for community access should be determined, e.g. primary or secondary access.

The designer should evaluate intersections using turning templates or turning movement analysis software to ensure that adequate operation of vehicles can occur. Treatment of on-street parking around intersections should be evaluated during this analysis to identify potential conflicts between turning vehicles and on-street parking.

## **E.2 Sight Distance**

See CHAPTER 3 GEOMETRIC DESIGN, C.3 Sight Distance

### **E.2.a Stopping Sight Distance**

See CHAPTER 3 GEOMETRIC DESIGN, C.3.a Stopping Sight Distance.

### **E.2.b Passing Sight Distance**

Due to the importance of low speeds and concerns for pedestrian comfort and safety, passing should be discouraged or prohibited.

### **E.2.c Intersection Sight Distance**

Sight distance should be calculated in accordance with CHAPTER 3, Section C.9.b, using the appropriate design speeds for the street being evaluated. When executing a crossing or turning maneuver after stopping at a stop sign, stop bar, or crosswalk, as required in Section 316.123, F.S., it is assumed that the vehicle will move slowly forward to obtain sight distance (without intruding into the crossing travel lane) stopping a second time as necessary.

Therefore, when curb extensions are used, or on-street parking is in place, the vehicle can be assumed to move forward on the second step movement, stopping just shy of the travel lane, increasing the driver's potential to see further than when stopped at the stop bar. The resulting increased sight distance provided by the two step movement allows parking to be located closer to the intersection.

The MUTCD requires that on-street parking be located at least 20 feet from crosswalks. The minimum stopping sight distance is 60 feet for low volume (< 400 ADT) streets. Even on slow speed, low volume urban streets, the combination of curb return, crosswalk width and 20-foot setback to the first parking space may not meet the minimum stopping distance. Justification for locating parking spaces 20 feet from crosswalks may be achieved based on community history with existing installations.

## **E.3 Horizontal Alignment**

### **E.3.a Minimum Centerline Radius**

See CHAPTER 3 GEOMETRIC DESIGN, C.4 Horizontal Alignment and Table 3-3 Horizontal Curvature, Low-Speed Urban Streets.

### **E.3.b Minimum Curb Return Radius**

Curb return radii should be kept small to keep intersections compact. The use of on-street parking and/or bike lanes increases the effective size of the curb radii, further improving the ability of design vehicles to negotiate turns without running over the curb return.

**Table 19-1 Curb Return Radii**

<b>Movement Type</b>	<b>Design Speed</b>	<b>Curb Radius w/Parallel Parking*</b>
Yield	Less than 20 mph	5-10 feet
Slow	20-25 mph	10-15 feet
Low	30-35 mph	15-20 feet

\* Dimensions with parking on each leg of the intersection. Both tangent sections adjacent to the curb return must provide for on-street parking or else curb radii must be evaluated using “design vehicle” and either software or turning templates.

## **E.4 Vertical Alignment**

See CHAPTER 3 GEOMETRIC DESIGN, C.5 Vertical Alignment.

## **E.5 Cross Section Elements**

### **E.5.a Introduction**

As discussed earlier in this chapter, TND street design places importance on how the streets are treated since they are part of the public realm. The street portion of the public realm is shaped by the features and cross section elements used in creating the street. For this reason, it is necessary the designer pay more attention to what features are included, where they are placed, and how the cross section elements are assembled.

### E.5.b Lane Width

Travel lane widths should be based on the context and desired speed for the area where the street is located. Table 19-2 shows travel lane widths and associated appropriate speeds. It is important to note that in low speed urban environments, lane widths are typically measured to the curb face instead of the edge of the gutter pan. Consequently, when curb sections with gutter pans are used, the motor vehicle and parking lanes include the width of the gutter pan.

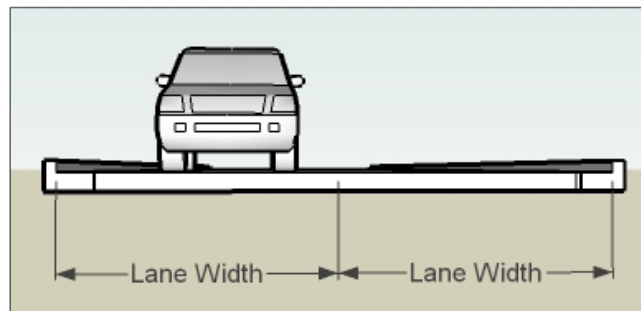
**Table 19-2 Minimum Lane Width**

Movement Type	Design Speed	Travel Lane Width
Yield*	Less than 20 mph	N/A
Slow	20-25 mph	9-10 feet
Low	30-35 mph	10-11 feet

\* Yield streets are typically residential two-way streets with parking on one or both sides. When the street is parked both sides, the remaining space between parked vehicles (10 feet minimum) is adequate for one vehicle to pass through. Minimum width for a yield street with parking on both sides should be 24 feet curb face to curb face. Minimum width for a yield street with parking on one side should be 20 feet curb face to curb face, allowing for two 10-foot lanes when the street is not parked.

Figure 19-3 shows a typical measurement.

**Figure 19-3 Lane Width**



(Source: VHB)

In order for drivers to understand the appropriate driving speeds, lane widths should create some level of discomfort when driving too fast. The presence of on-street parking is important in achieving the speeds shown in Table 19-2. When bicycle lanes or multi-lane configurations are used, there is more room for vehicles, such as buses, to operate. However car drivers may feel more comfortable driving faster than desired.



Alleys and narrow roadways that act as shared spaces can have design speeds as low as 10 mph, as noted in CHAPTER 16 RESIDENTIAL STREET DESIGN.

Alleys can be designed as either one way or two way. Right of way width should be a minimum of 20 feet with no permanent structures within the right of way that would interfere with vehicle access to garages or parking spaces, access for trash collection, and other operational needs. Pavement width should be a minimum of 12 feet. Coordination with local municipalities on operational requirements is essential to ensure that trash collection and fire protection services can be completed.

### E.5.c Medians

Medians used in low-speed urban thoroughfares provide for access management, turning traffic, safety, pedestrian refuge, landscaping, lighting, and utilities. These medians are usually raised with raised curb.

Landscaped medians can enhance the street or help create a gateway entrance into a community. Medians can be used to create tree canopies over travel lanes for multi-lane roadways contributing to a sense of enclosure.

Medians vary in width depending on available right of way and function. Because medians require a wider right of way, the designer must weigh the benefits of a median with the issues of pedestrian crossing distance, speed, context, and available roadside width.

**Table 19-3 Recommended Median Width**

<b>Median Type</b>	<b>Minimum Width</b>	<b>Recommended Width</b>
Median for access control	4 feet	6 feet
Median for pedestrian refuge	6 feet	8 feet
Median for trees and lighting	6 feet [1]	10 feet [2]
Median for single left turn lane	10 feet [3]	14 feet [4]

Table Notes:

- [1] Six feet measured curb face to curb face is generally considered the minimum width for the proper growth of small caliper trees (less than 4 inches),
- [2] Wider medians provide room for larger caliper trees and more extensive landscaping,
- [3] A ten foot lane provides for a turn lane without a concrete traffic separator,
- [4] Fourteen feet provides for a turn lane with a concrete traffic separator.

### E.5.d Turn Lanes

The need for turn lanes for vehicle mobility should be balanced with the need to manage vehicle speeds and the potential impact on the border width, such as sidewalk width. Turn lanes tend to allow through vehicles to maintain higher speeds through intersections, since turning vehicles can move over and slow in the turn lane.

Left turn lanes are considered to be acceptable in an urban environment since there are negative impacts to roadway capacity when left turns block the through movement of vehicles. The installation of a left turn lane can be beneficial when used to perform a road diet such as reducing a four lane section to three lanes with the center lane providing for turning movements. In urban areas, no more than one left turn lane should be provided.

Right turns from through lanes do not block through movements, but do create a reduction in speed due to the slowing of turning vehicles. Right turn lanes are used to maintain speed through intersections, and to reduce the potential for rear end crashes. However, the installation of right turn lanes increases the crossing distance for pedestrians and the speed of vehicles, therefore the use of exclusive right turn lanes are rarely used except at "T" intersections.

### E.5.e Parking

On-street parking is important in the urban environment for the success of those retail businesses that line the street, to provide a buffer for the pedestrian, and to help calm traffic speeds. When angle parking is proposed for on-street parking, designers should consider the use of back in angle parking in lieu of front in angle parking.

**Table 19-4 Parking Lane Width**

<b>Movement Type</b>	<b>Design Speed</b>	<b>Parking Lane Width</b>
Slow	20-25 mph	(Angle) 17-18 feet
Slow	20-25 mph	(Parallel) 7 feet
Low	30-35 mph	(Parallel) 7-8 feet

### E.6 Cul-de-sacs and Turnarounds

Cul-de-sacs should only be used where no other alternatives exist. Cul-de-sacs should have walkway or bicycle connections to other sidewalks and streets to provide connectivity within and to adjacent neighborhoods.

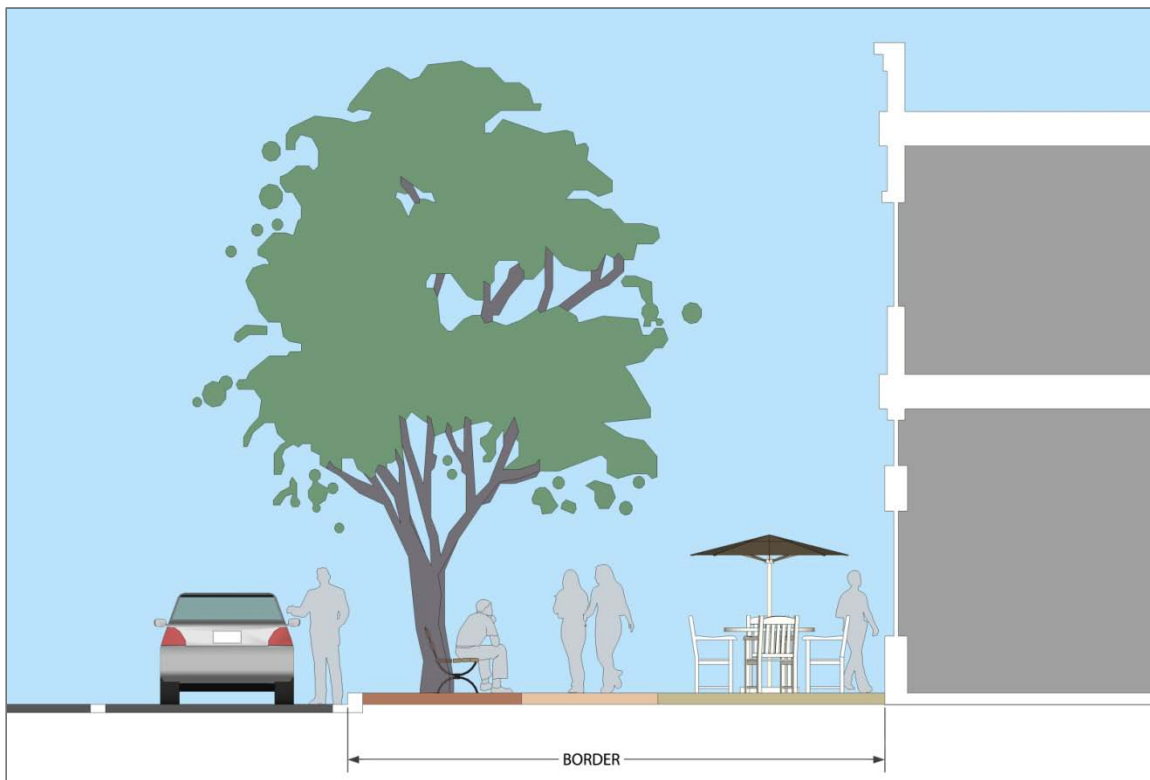
### E.6.a Turning Area

A residential street open at one end only should have a special turning area at the closed end. A residential street more than 100 feet long and open at one end only shall have a special turning area at the closed end. This turning area should be circular and have a radius appropriate to the types of vehicle expected. The minimum outside radius of a cul-de-sac shall be 30 feet. In constrained circumstances, other turning configurations such as a “hammerhead” may be considered.

### E.7 Pedestrian Considerations

In urban environments, the “border,” or area between the face of a building or right of way line and the curb face, serves as the pedestrian realm because it is the place for which pedestrian activity is provided, including space to walk, socialize, places for street furniture, landscaping, and outdoor cafes. In an urban environment, the border consists of the furniture, walking and shy zones.

Figure 19-4 Border



(Source: VHB)

### **E.7.a Furniture Zone**

The furniture zone can be located adjacent to the building face, but more commonly is adjacent to the curb face. The furniture zone contains parking meters, lighting, tree planters, benches, trash receptacles, magazine and newspaper racks, and other street furniture. The furniture zone is separate from the walking/pedestrian and shy zones to keep the walking area clear for pedestrians, including proper access to transit stops.

### **E.7.b Walking/Pedestrian Zone**

Chapter 8 addresses considerations for pedestrians. In a properly designed urban environment, where buildings are at the back of the sidewalk and vehicle speeds are low, the separation from traffic is normally provided by on-street parking, which also helps to calm traffic. The width of the walking/pedestrian zone should be at least four feet and should be increased based on expected pedestrian activity.

### **E.7.c Shy Zone**

The shy zone is the area adjacent to buildings and fences that pedestrians generally “shy” away from. A minimum of one foot is provided as part of the sidewalk width. This space should not be included in the normal walking zone of the sidewalk.

### **E.7.d Mid-Block Crossings**

Properly designed TND communities will not normally require mid-block crossings due to the use of shorter block size. When mid-block crossings are necessary, the use of curb extensions or bulbouts should be considered to reduce the crossing distance for pedestrians.

### **E.7.e Curb Extensions**

Curb extensions are helpful tools for reducing the crossing distance for pedestrians, providing a location for transit stops, managing the location of parking, providing unobstructed access to fire and rescue, and increasing space for landscaping and street furniture.

Designers should coordinate with public works staff to ensure that street cleaning can be achieved with their equipment, and adequate drainage can be provided to avoid ponding at curb extensions.

## **E.8 Bicyclist Considerations**

### **E.8.a Bicycle Facilities**

Chapter 9 contains information on bicycle facilities. This section is directed to designing bike facilities in TND communities. Designing for bicycles on thoroughfares in TND communities should be as follows: bicycles and motor vehicles should share lanes on thoroughfares with design speeds of twenty five mph or less. It is important to recognize that the addition of bike lanes does increase roadway widths and can increase the tendency for drivers to speed.

When bicycle lanes are used in TND communities, they should be a minimum of 5 feet wide and designated as bike lanes. On curb and gutter roadways, a minimum 4-foot width measured from the lip of the gutter is required. The gutter width should not be considered part of the rideable surface area, but this width provides useable clearance to the curb face. Drainage inlets, grates, and utility covers are potential problems for bicyclists. When a roadway is designed, all such grates and covers should be kept out of the bicyclists' expected path. If drainage inlets are located in the expected path of bicyclists, they should be flush with the pavement, well seated, and have bicycle compatible grates.

Where parking is present, the bicycle lane should be placed between the parking lane and the travel lane, and have a minimum width of 5 feet. Designers should consider increasing the bicycle lane to 6 feet in lieu of increasing parallel parking width from 7 to 8 feet. This helps encourage vehicles to park closer to the curb, and provides more room for door swing, potentially reducing conflict with bicyclists.

Shared lane markings, or "sharrows," can be used instead of bicycle lanes adjacent to on-street parking. The sharrow allows the bicyclist to occupy the lane and therefore avoids placing bicyclists in the "door zone", and does not require an increase in lane width or ROW width for the thoroughfare. Guidance for use of the shared lane marking is included in Chapter 9, Bicycle Facilities and the 2009 MUTCD. See Figure 9-3 for a detailed drawing of a shared lane marking.

### **E.8.b Shared Use Paths**

Greenways, waterfront walks, and other civic spaces should include shared use paths, and provide for bicycle storage or parking. Bicycle storage or parking should also be included in areas near transit facilities to maximize connectivity between the modes.

### **E.9 Transit**

See “Accessing Transit, Design Handbook for Florida Bus Passenger Facilities, 2008” for information: <http://www.dot.state.fl.us/transit/NewTransitPlanning.shtm>  
[http://www.dot.state.fl.us/transit/Pages/2008\\_Transit\\_Handbook.pdf](http://www.dot.state.fl.us/transit/Pages/2008_Transit_Handbook.pdf)

### **E.10 Clear Zone**

In urban areas, horizontal clearances, based on clear zone requirements for rural highways, are not practical because urban areas are characterized by lower speed, more dense abutting development, closer spaced intersections and accesses to property, higher traffic volumes, more bicyclists and pedestrians, and restricted right of way. The minimum horizontal clearance shall be 1.5 feet measured from the face of curb.

Streets with curb, or curb and gutter, in urban areas where right of way is restricted do not have roadsides of sufficient widths to provide clear zones; therefore, while there are specific horizontal clearance requirements for these streets, they are based on clearances for normal operation and not based on maintaining a clear roadside for errant vehicles. It should be noted that curb has essentially no redirection capability; therefore, curb should not be considered effective in shielding a hazard.

## F REFERENCES FOR INFORMATIONAL PURPOSES

The following publications were either used in the preparation of this chapter, or may be helpful in designing TND Communities and understanding the flexibility in AASHTO design criteria:

1. ~~Designing Walkable Urban Thoroughfares~~ ~~Draft ITE Recommended Practice: A~~ ~~Context Sensitive Approach: An ITE Recommended Practice~~ ~~Solutions in~~ ~~Designing Major Urban Thoroughfares for Walkable Communities~~, 201~~0~~  
<http://www.ite.org/css/>
2. SmartCode 9.2 <http://www.smartcodecentral.org/>
3. A Guide for Achieving Flexibility in Highway Design, AASHTO, May, 2004  
<https://bookstore.transportation.org/>
4. Accessing Transit, Design Handbook for Florida Bus Passenger Facilities, 2008, FDOT Public Transit Office:  
<http://www.dot.state.fl.us/transit/NewTransitPlanning.shtm>  
[http://www.dot.state.fl.us/transit/Pages/2008\\_Transit\\_Handbook.pdf](http://www.dot.state.fl.us/transit/Pages/2008_Transit_Handbook.pdf)
5. Safe Routes to Schools Program, FDOT Safety Office:  
<http://www.dot.state.fl.us/safety/2A-Programs/Programs.shtm>  
[http://www.dot.state.fl.us/Safety/SRTS\\_files/SRTS.shtm](http://www.dot.state.fl.us/Safety/SRTS_files/SRTS.shtm)

## ***Chapter 20 - Drainage***





## CHAPTER 20 DRAINAGE

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## A INTRODUCTION

This chapter recognizes that Florida is regularly affected by adverse weather conditions. As such, the proper design of a roadway's drainage system is critical to its function and to the safety of the motoring public as well as pedestrians, bicyclists and other users of these facilities. Standing water on a roadway can not only create a hazard but could also impede the flow of traffic.

This chapter represents the minimum standards that should be used when designing roadway drainage. As is the case for all elements in a facility's design, the designer must consider site specific conditions and determine the proper level of service the facility's drainage system should provide. The design of drainage facilities should not only consider the system's ability to handle the design storm, but also consider the system's recovery time during an event which exceed the design storm.

## B OBJECTIVES

The objective of this chapter is to establish the minimum standards to which a roadway's drainage system is to be designed. In order for the drainage system to function properly, the below guidelines should be used in the design, construction and maintenance of these systems.

- Design and maintain drainage systems to quickly move water out of the travel lanes in order provide a safer environment for users of a facility during adverse weather conditions.
- Design drainage systems by taking into consideration the future maintenance of said system in order to avoid creating hazardous conditions to drivers and maintenance staff during routine servicing.

## C OPEN CHANNEL

This section presents minimum standards for the design of natural or manmade open channels, including roadside ditches, swales, median ditches, interceptor ditches, outfalls, and canals.

### C.1 Design Frequency

Open channels shall be designed to convey and to confine storm water within the ditch. Standard design frequencies for stormwater flow are as follows:

TYPE CHANNEL	FREQUENCY
Roadside, Median, and Interceptor ditches or swales for major roadway facilities	10-year
All other road types	5-year

Site-specific factors may warrant the use of an atypical design frequency. Any increase over pre-development stages shall not significantly change land use values, unless flood rights are acquired.

## C.2 Hydrologic Analysis

Hydrologic data used for the design of open channels shall be based on one of the following methods as appropriate for the particular site:

1. A frequency analysis of observed (gage) data shall be used when available. If insufficient or no observed data is available, one of the procedures below shall be used as appropriate. However, the procedures below shall be calibrated to the extent practical with available observed data for the drainage basin, or nearby similar drainage basins.
  1. Regional or local regression equation developed by the USGS.
  2. Rational Equation for drainage areas up to 600 acres.
  3. For outfalls from stormwater management facilities, the method used for the design of the stormwater management facility may be used.
2. For regulated or controlled canals, hydrologic data shall be requested from the controlling entity. Prior to use for design, this data shall be verified to the extent practical.

## C.3 Hydraulic Analysis

The Manning's Equation shall be used for the design of open channels.

### C.3.a Manning's "n" Values

Recommended Manning's n values for channels with bare soil, vegetative linings, and rigid linings are presented in the Department's *Drainage Manual*, Table 2.1 and 2.2.

<http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm>

The probable condition of the channel when the design event is anticipated shall be considered when a Manning's n value is selected.

### C.3.b Slope

Roadside channels should be designed to have self-cleaning velocities, where possible. Channels should also be designed to avoid standing water in the roadway right-of-way.

### C.3.c Channel Linings and Velocity

The design of open channels shall consider the need for channel linings. When design flow velocities do not exceed the maximum permissible for bare earth, the standard treatment of ditches may consist of grassing and mulching. For higher design velocities, sodding, ditch paving, or other form of lining shall be provided. Tables for maximum velocities for bare earth and the various forms of channel lining can be found in the Department's *Drainage Manual* Tables 2.3 and 2.4.

<http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm>

### C.3.d Limitations on Use of Linings

Grassing or sodding should not be used under the following conditions:

1. Continuous standing or flowing water
2. Areas that do not receive the regular maintenance necessary to prevent overgrowth by taller vegetation

3. Lack of nutrients
4. excessive soil drainage
5. Areas excessively shaded

To prevent cracking or failure, concrete lining must be placed on a firm, well-drained foundation. Concrete linings are not recommended where expansive clays are present.

When concrete linings are to be used where soils may become saturated, the potential for buoyancy shall be considered. Acceptable countermeasures may include:

1. Increasing the thickness of the lining to add additional weight.
2. For sub-critical flow conditions, specifying weep holes at appropriate intervals in the channel bottom to relieve the upward pressure on the channel.
3. For super-critical flow conditions, using subdrains in lieu of weep holes.

## **C.4 Construction and Maintenance Considerations**

The type and frequency of maintenance that may be required during the life of drainage channels should be considered during their design, and allowances should be made for the access of maintenance equipment.

## **C.5 Safety**

When possible, roadside channels should be located so that the peak water surface elevation during passage of the design flow is outside the clear zone, unless a roadside barrier is provided.

The safety and welfare of highway users (and of the owners and occupants of adjacent properties) should be an important consideration in the selection of cross-sectional geometry of drainage channels.

## C.6 Documentation

Design documentation for open channels shall include the hydrologic analysis and the hydraulic analysis, including analysis of channel lining requirements.

## D STORM DRAIN HYDROLOGY AND HYDRAULICS

This section presents minimum standards for the design of storm drain systems.

### D.1 Pipe Materials

See section G for pipe material requirements.

### D.2 Design Frequency

The minimum design storm frequency for the design of storm drain systems shall 3 years.

Site-specific factors may warrant the use of an atypical design frequency. Any increase over pre-development stages shall not significantly change land use values, unless flood rights are acquired.

### D.3 Design Tailwater

For most design applications where the flow is subcritical, the tailwater will either be above the crown of the outlet or can be considered to be between the crown and critical depth. To determine the EGL, begin with either the tailwater elevation or  $(d_c + D)/2$ , whichever is higher, add the velocity head for full flow and proceed upstream, adding appropriate losses (e.g., exit, friction, junction, bend, entrance).

An exception to the above procedure is an outfall with low tailwater. In this case, a water surface profile calculation would be appropriate to determine the location where the water surface will either intersect the top or end of the barrel and full-flow calculations can begin. In this case, the downstream water surface elevation would be based on critical depth or the tailwater, whichever is higher.



## **D.4 Hydrologic Analysis**

The Rational Method is the most common method in use for the design of storm drains when the momentary peak-flow rate is desired.

### **D.4.a Time of Concentration**

Minimum time of concentration shall be 10 minutes.

## **D.5 Hydraulic Analysis**

Hydraulic calculations for determining storm drain conduit sizes shall be based on open channel and pressure flow as appropriate. The Manning's equation shall be used.

### **D.5.a Pipe Slopes**

The minimum physical slope should be that which will produce a velocity of 2.5 feet per second (fps) when the storm drain is flowing full.

### **D.5.b Hydraulic Gradient**

If the hydraulic grade line does not rise above the top of any manhole or above an inlet entrance, the storm drainage system is satisfactory. Standard practice is to ensure that the HGL is below the top of the inlet for the design discharge (some local agencies may add an additional safety factor which can be up to 12 inches).

### **D.5.c Outlet Velocity**

When discharge exceeds 4 fps, consider special channel lining or energy dissipation. For computation of outlet velocity the lowest anticipated tailwater condition for the given storm event shall be assumed.

### **D.5.d Manning's Roughness Coefficients**

Standards Manning's Roughness Coefficients can be found in the

Department's **Drainage Manual** Section 3.6.4.

<http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm>

## D.6 Hydraulic Openings

If the hydraulic grade line does not rise above the top of any manhole or above an inlet entrance, the storm drainage system is satisfactory. Standard practice is to ensure that the HGL is below the top of the inlet for the design discharge.

### D.6.a Entrance Location and Spacing

Drainage inlets are sized and located to limit the spread of water on the roadway to allowable widths for the design storm.

Grate inlets and the depression of curb opening inlets should be located outside the through traffic lanes to minimize the shifting of vehicles attempting to avoid them. All grate inlets shall be bicycle safe where used on roadways that allow bicycle travel.

The Department's **Storm Drain Handbook** is available as a guide for inlet selection.

<http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm>

Inlet spacing shall consider the following:

- Regardless of the results of the hydraulic analysis, inlets on grade should be spaced at a maximum of 300 ft for 48 inches or smaller pipes.
- Inlets on grade should be spaced at a maximum of 600 ft for pipes larger than 48 inches.
- Inlets should be placed on the upstream side of bridge approaches.
- Inlets should be placed at all low points in the gutter grade.
- Inlets should be placed upstream of intersecting streets.
- Inlets should be placed on the upstream side of a driveway entrance, curb-cut ramp, or pedestrian crosswalk even if the hydraulic analysis places the inlet further down grade or within the feature.

- Inlets should be placed upstream of median breaks.
- Inlets should be placed to capture flow from intersecting streets before it reaches the major highway.
- Flanking inlets in sag vertical curves are standard practice.
- Inlets should be placed to prevent water from sheeting across the highway (i.e., place the inlet before the superelevation transition begins).
- Inlets should not be located in the path where pedestrians walk.

## D.6.b Grades

### D.6.b.1 Longitudinal Gutter Grade

The minimum longitudinal gutter grade shall be 0.3%. Minimum grades can be maintained in very flat terrain by use of a rolling profile.

## D.7 Spread Standards

The spread, in both temporary and permanent conditions, resulting from a rainfall intensity of 4.0 inches per hour shall be limited as follows:

Design Speed (mph)	Spread Criteria*
Design Speed $\leq$ 30	Crown of Road
30 < Design speed $\leq$ 45	Keep $\frac{1}{2}$ of lane clear
45 < Design Speed $\leq$ 55	Keep 8' of lane clear
Design Speed > 55	No encroachment

\* The criteria in this column apply to travel, turn, or auxiliary lanes adjacent to barrier wall or curb, in normal or super elevated sections.

In addition to the above standards, for sections with a shoulder gutter, the spread resulting from a 10-year frequency storm shall not exceed 1' 3" outside the gutter in the direction toward the front slope. This distance limits the spread to the face

of guardrail posts.

## D.8 Construction and Maintenance Considerations

Proper design shall also consider maintenance concerns of adequate physical access for cleaning and repair.

### D.8.a Pipe Size and Length

Consider using a minimum pipe size of 18" for trunk lines and laterals. 15" hubcaps commonly block smaller pipes resulting in roadway flooding. The minimum pipe diameter for all proposed exfiltration trench pipes (french drain systems) within a drainage system is 24".

The 18" minimum pipe size does not apply to connections from stormwater management facilities. The pipe size for these connections shall be the size required to convey the permitted discharge.

The maximum pipe lengths without maintenance access structures are as follows:

#### Pipes without French Drains:

18" - 42" pipe	300 feet
48" and larger and all box culverts	600 feet

#### French Drains that have access through only one end:

24" to 30" pipe	150 feet
36" and larger pipe	200 feet

#### French Drains that have access through both ends:

24" to 30" pipe	300 feet
36" and larger pipe	400 feet

### D.8.b Minimum Clearances

A minimum cover of 1 ft should be provided between the top of pipe and the top of subgrade. A minimum clearance of 1 ft should be provided between storm drainage pipes and other underground facilities (e.g., sanitary sewers). Check with local utility companies, as their clearance

requirements may vary from the 1' minimum.

## D.9 Protective Treatment

Drainage designs shall be reviewed to determine if some form of protective treatment will be required to prevent unauthorized entry to long or submerged storm drain systems, steep ditches, or water control facilities. If other modifications, such as landscaping or providing flat slopes, can eliminate the potential hazard and thus the need for protective treatment, they should be considered first. Areas provided for retention and detention, for example, can often be effectively integrated into parks or other green spaces.

Vehicular and pedestrian safety are attained by differing protective treatments, often requiring the designer to make a compromise in which one type of protection is more completely realized than the other. In such cases, an evaluation should be made of the relative risks and dangers involved to provide the design that gives the best balance. It must be remembered that the function of the drainage feature will be essentially in conflict with total safety, and that only a reduction rather than elimination of all risk is possible.

The three basic types of protective treatment are:

<u>Feature</u>	<u>Typical Use</u>
Grates	To prevent persons from being swept into long or submerged drainage systems.
Guards	To prevent entry into long sewer systems under no-storm conditions, to prevent persons from being trapped.
Fences	To prevent entry into areas of unexpected deep standing water or high velocity water flow, or in areas where grates or guards are warranted but are unsuitable for other reasons.

When determining the type and extent of protective treatment, the following considerations should be reviewed:

- The nature and frequency of the presence of children in the area, e.g., proximity to schools, school routes, and parks, should be established.
- Highway access status should be determined. Protective treatment is

usually not warranted within a limited access highway; however, drainage facilities located outside the limited access area or adjacent to a limited access highway should be considered unlimited access facilities.

- Adequate debris and access control would be required on all inlet points if guards or grates are used at outlet ends.
- Hydraulic determinations such as depth and velocity should be based on a 25-year rainfall event.
- The hydraulic function of the drainage facility should be checked and adjusted so the protective treatment will not cause a reduction in its effectiveness.
- Use of a grate may cause debris or persons to be trapped against the hydraulic opening. Grates for major structures should be designed in a manner that allows items to be carried up by increasing flood stages.
- Use of a guard may result in a person being pinned against it. A guard is usually used on outlet ends.
- A fence may capture excessive amounts of debris, which could possibly result in its destruction and subsequent obstruction of the culvert. The location and construction of a fence shall reflect the effect of debris-induced force.

## D.10 Documentation

Supporting calculations for storm sewer system design shall be documented and provided facility owner.

## E CROSS DRAIN HYDRAULICS

This section presents standards and procedures for the hydraulic design of cross drains including culverts, bridge-culverts<sup>1</sup>, and bridges.

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<sup>1</sup> A culvert qualifies as a bridge if it meets the requirements of Item 112 in the FDOT "[Bridge Management System Coding Guide](#)."

## E.1 General

Design shall be in accordance with **23 CFR 650** and the **National Flood Insurance Program**.

## E.2 Design Frequency

The recommended minimum design flood frequency for culverts is shown in Table E.2.a. The minimum flood frequency used to design the culvert can be adjusted based on:

- an analysis to justify the flood frequencies greater or lesser than the minimum flood frequencies listed below; and
- the culvert being located in a National Flood Insurance Program mapped floodplain.

**Table E.2.a Recommended Minimum Design Flood Frequency**

Roadway Classification	Exceedence Probability (%)	Return Period (Year)
Local Road and Streets, ADT >3,000 VPD	4%	25
Local Road and Streets, ADT =< 3,000 VPD	10%	10
Local Road System*	20%-10%	5-10

\*At the discretion of the designer

## E.3 Backwater

Allowable headwater is the depth of water that can be ponded at the upstream end of the culvert during the design flood. The allowable headwater for the design frequency should:

- have a level of inundation that is tolerable to upstream property and roadway for the design discharge;
- consider a duration or inundation that is tolerable to the upstream vegetation to avoid crop damage; and
- be lower than the upstream shoulder edge elevation at the lowest point of the roadway within the drainage basin.

If the allowable headwater depth to culvert height ratio (HW/D) is established to be greater than 1.5, the inlet of the culvert will be submerged. Under this condition, the hydraulics designer should provide an end treatment to mitigate buoyancy.

## E.4 Tailwater

For the sizing of cross drains and the determination of headwater and backwater elevations, the highest tailwater elevation which can be reasonably expected to occur coincident with the design storm event shall be used.

## E.5 Clearances

To permit the passage of ice and debris, a minimum clearance of 2 ft should be provided between the design approach water surface elevation and the low chord of the bridge where practical. Where this is not practicable, the clearance should be established by the hydraulics engineer based on the type of stream and level of protection desired. Additional vertical clearance information can be found in *Chapter 3*.

## E.6 Bridges and Other Structures

See *Chapter 17* Section C.3.d for Drainage Criteria.

# F STORMWATER MANAGEMENT

## F.1 Regulatory Requirements

### F.1.a Chapter 62-25, Florida Administrative Code

*Chapter 62-25, F.A.C.*, rules of the Florida Department of Environmental Protection specifies minimum water quality treatment standards for new development.

### F.1.b Chapter 62-40, Florida Administrative Code

*Chapter 62-40, F.A.C.*, rules of the Florida Department of Environmental Protection outlines basic goals and requirements for surface water protection and management to be implemented and enforced by the Florida Department of Environmental Protection and Water Management



Districts.

### **F.1.c National Pollutant Discharge Elimination System**

The National *Pollutant Discharge Elimination System* (NPDES) permit program is administered by the U. S. Environmental Protection Agency and delegated to the Florida Department of Environmental Protection in Florida. This program requires permits for stormwater discharges into waters of the United States from industrial activities; and from large and medium municipal separate storm sewer systems (MS4s). Construction projects are within the definition of an industrial activity.

## **G CULVERT MATERIALS**

The evaluation of culvert materials shall consider functionally equivalent performance in three areas: durability, structural capacity, hydraulic capacity.

### **G.1 Durability**

Culverts shall be designed for a design service life (DSL) appropriate for the culvert function and highway type. The design service life should be based on factors such as:

- Projected service life of the facility
- Importance of the facility
- Economics
- Potential inconvenience and difficulties associated with repair or replacement, and projected future demands on the facility.

In estimating the projected service life of a material, consideration shall be given to actual performance of the material in nearby similar environmental conditions, its theoretical corrosion rate, potential for abrasion, and other appropriate site factors. Theoretical corrosion rates shall be based on the environmental conditions of both the soil and water. At a minimum, the following corrosion indicators shall be considered:

1. pH
2. Resistivity

3. Sulfates
4. Chlorides

The Department of Transportation provides a free program for service life determination based on the above criteria. The program is available for download at <http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm>. To avoid unnecessary site specific testing, generalized soil maps may be used to delete unsuitable materials from consideration. The potential for future land use changes which may change soil and water corrosion indicators shall also be considered to the extent practical.

## **G.2 Structural Capacity**

Pipe material selection shall be based on AASHTO design guidelines and industry recommendations.

## **G.3 Hydraulic Capacity**

The hydraulic evaluation shall establish the hydraulic size for the particular culvert application. For storm drains and cross drains, the design shall use the Manning's roughness coefficient associated with the pipe material selected.

