

AGENDA

FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

Thursday, March 27, 2014, 8:00 AM – 5:00 PM

Friday, March 28, 2014, 8:00 AM – 12:00 PM

FDOT's Turnpike Headquarters, Auditorium A
Turkey Lake Service Plaza
Ocoee, Florida 34761

Thursday, March 27, 2014

8:00 – 8:30 **Introductions and General Information**

- Welcome and Introductions (Michael Shepard)
- Committee and Associate Member Changes (Mary Anne Koos)
- March 2013 Meeting Minutes & Vote to Approve (Mary Anne Koos)
- Contact Information and Subcommittee Assignments (Mary Anne Koos)

8:30 – 9:00 **Rulemaking and Sunshine Law**

- Rulemaking Process (Larry Ringers, General Counsel's Office)
- Sunshine Law (Larry Ringers, General Counsel's Office)
- Status of 2013 Greenbook (Frank Sullivan)

9:00 – 9:30 **Presentations**

- MUTCD Typical Applications not Contained within the FDOT Series 600 Indexes (David Kuhlman)

9:30 – 9:45 *Morning Break*

9:45 – 11:30 **Presentation of Proposed Revisions for 2014 Greenbook**

- Introduction and Definition of Terms and Chapter 1 – Planning (Rick Hall)
- Chapter 3 – Geometric Design (Howard Webb)
- Chapter 4 – Roadside Design (Charles Ramdatt)
- Chapter 13 – Public Transit (Charles Ramdatt)
- Chapter 16 – Residential Street Design (Scott Cottrell)
- Chapter 17 – Bridges and Other Structures (Jimmy Pittman)
- Chapter 18 – Signing and Marking (Gail Woods)

11:30 – 1:00 *Lunch*

1:00 – 1:30 **Presentation**

- Bike-Pedestrian Safety Initiative and Complete Streets (Billy Hattaway)

1:30 – 1:40 **Orientation for Subcommittee Meetings** (Michael Shepard)

- 1:50 – 2:25 Subcommittee Meetings for Final Drafting of Proposed 2014 Revisions**
- Introduction and Definition of Terms and Chapter 1 – Planning (Rick Hall, Room 2130)
 - Chapter 3 – Geometric Design (Howard Webb, Room 2167)
 - Chapter 4 – Roadside Design (Charles Ramdatt, Room 2131)
- 2:35 – 3:15 Subcommittee Meetings for Final Drafting of Proposed 2014 Revisions**
- Chapter 13 – Public Transit (Charles Ramdatt, Room 2130)
 - Chapter 16 – Residential Street Design (Scott Cottrell, Room 2131)
 - Chapter 17 – Bridges and Other Structures (Jimmy Pittman, Auditorium)
 - Chapter 18 – Signing and Marking (Gail Woods, Room 2167)
- 3:15 – 3:30 *Afternoon Break***
- 3:30 – 5:00 Chapter Report and Vote on 2014 Chapter Revisions**
- Introduction and Definition of Terms and Chapter 1 – Planning (Rick Hall)
 - Chapter 3 – Geometric Design (Howard Webb)
 - Chapter 4 – Roadside Design (Charles Ramdatt)
 - Chapter 13 – Public Transit (Charles Ramdatt)
 - Chapter 16 – Residential Street Design (Scott Cottrell)
 - Chapter 17 – Bridges and Other Structures (Jimmy Pittman)
 - Chapter 18 – Signing and Marking (Gail Woods)
- 5:00 *Adjourn***

Friday, March 28, 2014

- 8:00 – 9:15 Future Greenbook Revisions**
- Goals (Michael Shepard)
 - Review of AASHTO Criteria (Frank Sullivan)
 - Parking Lot Topic Discussion (Michael Shepard)
 - Selection of Chapters for Future Work (Michael Shepard)
- 9:15 – 9:30 *Morning Break***
- 9:30 – 10:20 Breakout Sessions for Future Greenbook Revisions**
- Chapter _____ (Room 1054)
 - Chapter _____ (Room 1123)
 - Chapter _____ (Room 2130)
 - Chapter _____ (Room 3001)
- 10:30 – 11:45 Chapter Chair Reports for Future Greenbook Revisions and Discussion**
- 11:45 – 12:00 Closing Remarks (Michael Shepard)**
- 12:00 *Adjourn***

Minutes

2014 FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

Thursday, March 27, 2014, 8:00 AM – 5:00 PM

Friday, March 28, 2014, 8:00 AM – 12:00 PM

FDOT's Turnpike Headquarters, Auditorium A
Turkey Lake Service Plaza
Ocoee, Florida 34761

Thursday, March 27, 2014

Members in Attendance

Bernie Masing, Ramon D. Gavarrete, Andy Tilton, Steven M. Neff, Jimmy Pitman, Kenneth Dudley, David Cerlanek, Rick Hall, Keith Bryant, Howard Webb, Robert Behar, Christopher R. Mora, George T. Webb, Annette Brennan, Gail Woods, Charles Ramdatt, Scott Cottrell, Chris Tavella, Andres Garganta, Juvenal Santana, Ron Chin, Peter R. Brett

Other FDOT Staff and Public in Attendance

Duane Brautigam, Michael Shepard, Mary Anne Koos, Frank Sullivan, Billy Hattaway, Joy Puerta, Mark V. Massaro, David F. Kuhlman, Frederick J. Schneider, Andre Pavlov, Chester Henson, Fred Heery, Gabrielle (Gabe) Matthews, Miranda Glass, Gevin McDaniel, Alan Hart, Chad Swails

General Information

- Welcome and Introductions (Michael Shepard)
Florida Greenbook Committee and Associate Member Changes - Changes in membership for the Greenbook Committee were reviewed and new members, Peter Brett (City of Tampa) and Juvenal Santana (City of Miami) were introduced. Ben Money (City of Tampa) and Elyrosa Estevez (City of Miami) were thanked for their service on the Greenbook Committee.
- Review March 2013 Meeting Minutes & Vote to Approve (Mary Anne Koos)
The minutes were approved by the Committee with no edits.
- 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. Subcommittees that are in need of additional members are the Maintenance of Traffic, Bridges, and Local Specifications.

Rulemaking and Sunshine Law

- Rulemaking Process (Susan Schwartz, General Counsel's Office)
The Rule for the Florida Greenbook is [14-15.002, Florida Administrative Code \(F.A.C.\)](#),
- "Rulemaking" is defined as the adoption, amendment or repeal of a rule and is the process used to adopt the Greenbook. 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.

- A review by the Office of Financial and Regulatory Responsibility (OFAR), located in the Governor's Office is also required to evaluate the regulatory costs to business. Since the Greenbook applies to public agencies, there is considered to be no impact. The 2013 Greenbook is in rule development and has been published in the Florida Administrative Register. An opportunity for public comment has been provided, however no public workshop was requested and no comments have been received.
- The Greenbook is published first in Rule Development, then in Rule Making. If there are no comments, or if all comments are addressed, it then goes to the Department of State (DOS) for Rule Adoption. Twenty days after it is posted by DOS, the manual becomes effective.
- Sunshine Law (Susan Schwartz, General Counsel's Office)

To comply with Florida's Sunshine law, Susan explained that members cannot discuss with each other the action they intend to take at a later meeting of the Greenbook Committee. Subcommittee meetings don't need to be noticed if the meeting is just for fact finding and the final recommendations come before the full committee for approval.

Presentations

- **MUTCD Typical Applications Not Contained Within the FDOT Series 600 Indexes** (David Kuhlman)

This presentation included an overview of requirements for Maintenance of Traffic (MOT) provided in the MUTCD, the 2010 Utility Accommodation Manual and the Design Standards 600 Series. Modifications of the Index 600 Series, developed by the Florida Power and Light Company, were also presented. These modifications were developed to minimize the requirements for short duration Maintenance of Traffic on low volume, low speed roadways. The request was to include the revised standards in the Florida Greenbook.

- The Committee decided to refer the issue to the Chapter 11 - Work Zone Safety Subcommittee for further investigation and recommendation. The Committee cited the current option of following the MUTCD as the minimum standard, or preparing a local Standard/Design signed and sealed by a Florida registered engineer. The Subcommittee will address the request during the Chapter 11 workshop.

Presentation of Proposed Revisions for 2015 Greenbook

- **Introduction and Definition of Terms** (Mary Anne Koos)

Ms. Koos presented the proposed changes for the Introduction and Definition of Terms. These updates include adding definitions for Boarding and Alighting Areas, Para Transit, Urban Area and Urbanized Areas.

- **Chapter 1 – Planning** (Mary Anne Koos)

Ms. Koos presented the chapter edits. The edits included enhancing the language addressing multi-modal transportation systems, reorganization of the language addressing function and safety of the roadway, and updates to the Reference's Section, including a reference to the *2010 Highway Capacity Manual*.

- **Chapter 3 – Geometric Design** (Howard Webb)

Mr. Webb and Mr. Sullivan presented the changes proposed for Chapter 3 regarding passing sight distance. FDOT's Traffic Engineering and Operations Office has recently adopted the values for passing sight distance found in the MUTCD in their MUTS Manual. The current criterion in the Florida Greenbook is based upon language in the PPM, and not consistent with the guidance found in the MUTCD and MUTS. The subcommittee proposes to delete the passing sight distance criteria in the Florida Greenbook and refer to the MUTCD.

- **Chapter 4 – Roadside Design** (Charles Ramdatt) - Mr. Ramdatt and Mr. Sullivan presented an overview of the proposed changes for the Roadside Design chapter. These include revised guidance on addressing roadside hazards, vertical curves, roadside canals, culverts, poles and support structures, and bus shelters. A reference to AASHTO's Roadside Design Guide was added.

- **Chapter 13 – Public Transit** (Charles Ramdatt) - Mr. Ramdatt explained the goal for the proposed revision was to provide new or updated information on bus bays, shelters, and boarding and alighting areas. New and updated references were also provided.

- **Chapter 16 – Residential Street Design** (Scott Cottrell) - Mr. Cottrell explained the goal for the proposed revision was to improve the connectivity of the local street system, address intersection sight distance and design speed, and improve the guidance provided for pedestrians and cyclists. New and updated references were also provided.

- **Chapter 17 – Bridges** (Jimmy Pittman) – Mr. Pittman gave an overview of the updated chapter. The general goals were to provide additional information on the design of retaining walls and sound barriers and update the LRFD reference to include the applicable Interims.

- **Chapter 18 – Signing and Marking** (Gail Woods) – Ms. Woods gave an overview of the changes proposed. The general goals were to update the guidance for the design and placement of street name signs and provide information on community wayfinding, dynamic message signs, and audible vibratory pavement markings.

Presentation

- **Bike-Pedestrian Safety Initiative and Complete Streets** (Billy Hattaway) - Secretary Hattaway gave an overview of the Secretary's Initiative to improve traffic safety in Florida. FDOT is offering training in Designing for Pedestrian Safety, Road Safety Audit Training, Roundabout Design, and developing a Pedestrian Safety Action Plan. FDOT is also developing targeted engineering solutions, and focused media campaigns and law enforcement and education training. Policy initiatives include complete streets policy and implementation, promotion of modern roundabouts, guidance for road diets on the state system, context based bicycle and pedestrian facilities, US Bike Routes US 90 and US 1, and update of traffic laws.

Subcommittee Meetings for Final Drafting of Proposed 2015 Revisions

- The Committee broke out into subcommittee groups to discuss in more detail the revisions proposed in the meeting package and to follow up on the comments from the morning's chapter presentations. The following subcommittees met: Introduction and Definition of Terms, Chapter 3 – Geometric Design, Chapter 4 – Roadside Design, Chapter 13 – Public Transit, Chapter 16 – Residential Street Design, Chapter 17 – Bridges and Other Structures, and Chapter 18 – Signing and Marking.

Chapter Reports and Approval of Updates for 2015 Greenbook

Proposed Updates for 2015 Greenbook

- **Introduction and Definition of Terms** (Mary Anne Koos) – Ms. Koos presented an overview of the proposed changes for the Introduction and Definition of Terms. These updates include:
 - Revise the definition for Bus Stop Pad to Boarding and Alighting Area as shown in the meeting package.
 - Retain the current language defining public transit and add the definition for Para Transit included in the meeting package.
 - Add definitions for urban area and urbanized area included in the meeting package, which were based upon FHWA's language and consistent with the Plans Preparation Manual (PPM) definitions.

Moved by Andy Tilton to approve the changes, seconded by Steve Neff. The changes were approved unanimously.

- **Chapter 1 – Planning** (Mary Anne Koos) – Ms. Koos gave an overview of the development of the updated chapter. The general goals were to recognize a more multi-modal transportation system, address function and safety of the roadway earlier in the organization of the chapter, update the References section, including a reference to the *2010 Highway Capacity Manual*. The proposed updates are those presented in the meeting package with the following edits:
 - Use “street” rather than “transportation” to describe the “system” in the fourth paragraph.
 - Revise Section B.1.c to read “Unless prohibited by law, a variety of travelers should be expected on all public roads. These could include pedestrians, bicyclists, and motor vehicle operators and passengers. Types and relative volumes of people expected to use the street or highway influence trip characteristics and design features.”

Moved by Andy Tilton to approve the changes, seconded by Robert Behar. The changes were approved unanimously.

- **Chapter 3 – Geometric Design** (Howard Webb) – Mr. Webb and Mr. Sullivan explained the goal for the proposed revision was to harmonize the Florida Greenbook with the 2011 AASHTO Greenbook related to stopping and passing sight distance.
 - Revise the object height for stopping sight distance to 2.0 from 0.5 feet in Section C.3.a - Stopping Sight Distance.

- Revise Section C.3.b - Passing Sight Distance to be consistent with the language presented in the meeting materials.
- Update Table 3-3 - Sight Distances and Lengths of Vertical Curves with the corrected values for stopping sight distance using the 2.0 foot object height. Rounded K Values for Minimum Lengths of Vertical Curves will be updated to be consistent with AASHTO. Remove the section from the Table entitled Minimum Passing Sight Distances (Feet).

Moved by Charles Ramdatt to approve the changes, seconded by Keith Bryant. The changes were approved unanimously.

- **Chapter 4 – Roadside Design** (Charles Ramdatt) – Mr. Ramdatt and Mr. Sullivan presented an overview of the proposed changes for the Roadside Design chapter. The proposed updates are those presented in the meeting package with the following edits:
 - Revise Section C - Objectives as shown in the meeting materials except for the 4th bullet which was revised to read “Roadsides that accommodate necessary maintenance vehicles, emergency maneuvers and emergency parking.”
 - Revise Section D - Roadside Design as shown in the meeting materials. Add a sentence to the end of the section which reads “The AASHTO Roadside Safety Analysis Program (RSAP) is the recommended tool for evaluating the cost effectiveness of shielding roadside hazards.”
 - Revise Section D.1.a - Horizontal Curves as shown in the meeting package except delete the reference to “Chapter 18, Signing and Marking.”
 - Revise Section D.1.b - Vertical Curves as shown in the meeting package except revise the last sentence to read “Vertical curves with inadequate stopping sight distance may be mitigated with appropriate advanced signage and other warning devices, or can be reconstructed.”
 - Section D.4 – Roadside Canals was deferred to a separate presentation on the next day.
 - Revise Section D.13 - Bus Shelters to read as follows “Bus shelters should be moved back as far as practical from the roadside with pedestrian access to the bus stop boarding and alighting area at the roadside.”
 - Revise Section E - Protective Devices as shown in the meeting package except replace the term “guardrail and crash cushions” with “longitudinal barriers”.
 - Revise the second paragraph in Section E.1.c - Location to read “Barriers shall be offset from obstacles or other hazards a sufficient distance so the barrier may deflect without interference. The location of the barrier should be selected in close coordination with the design of its deflection characteristics.”

Moved by Andy Tilton to approve the changes, seconded by Howard Webb. The changes were approved unanimously.

- **Chapter 13 – Public Transit** (Charles Ramdatt) - Mr. Ramdatt explained the goal for the proposed revision was to provide new or updated information on bus bays, shelters, and boarding and alighting areas. New and updated references were also provided. The changes proposed in the meeting package were approved, except for the following:
 - Revise the second paragraph in Section C.1 - Boarding and Alighting (B&A) Areas to read “The slope of the B&A 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. Benches and other site amenities shall 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.”
 - Revise the draft figures 13-1 and 13-2 to show two cross sections for each figure. Cross section AA through the boarding and alighting area and cross section BB through the connection to the roadway.
 - Revise last sentence in Section D.3 - Bus Stop Lighting to read “The use of solar panel lighting for bus bays is another option that should be considered.” Direction was also given to work to harmonize this section with Chapter 6 and 8 of the Greenbook in future revisions.
 - In addition to the updated references in Section E - References for Informational Purposes, a suggestion was made to add a reference and link to Chapter 14-20, Florida Administrative Code.

Moved by David Cerlanek to approve the changes, seconded by Gail Woods. The changes were approved unanimously.

- **Chapter 16 – Residential Street Design** (Scott Cottrell) - Mr. Cottrell explained the goal for the proposed revision was to improve the connectivity of the local street system, address intersection sight distance and design speed, and improve the guidance provided for pedestrians and cyclists. New and updated references were also provided. The changes proposed in the meeting package were approved, except for the following:
 - Revise the first sentence in Section C.5.a - Width of Roadway to read “The minimum width of a two-way residential roadway should be 20 feet from edge-of-pavement to edge-of-pavement (excluding curbs and gutters).”
 - Revise Section C.5.b - Medians to read “When used in residential areas, medians or traffic separators should conform to Chapter 3 or Chapter 19.”
 - Revise Section C.8.a - Bicycle Facilities to add the sentence “For bike lane transitions, see Chapter 9” to the end of the paragraph.
 - Revise the last sentence in Section C.9.b - Shared Use Paths to read “Shared use paths may be used by golf carts in certain areas, under certain circumstances in accordance with Sections 316.212, 316.2125 and 316.2126, F.S.

Moved by Andy Tilton to approve the changes, seconded by Annette Brennan. The changes were approved unanimously.

- **Chapter 17 – Bridges and Other Structures** (Jimmy Pittman) – Mr. Pittman gave an overview of the updated chapter. The general goals were to provide additional information on the design of retaining walls and sound barriers and update the LRFD reference to include the applicable Interims. The changes proposed in the meeting package were approved, except for the following:
 - Revise Section C.1 - Bridges to read “At a minimum, the AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 6th Edition (2012) with applicable Interims shall be used. Any bridge reconstruction (i.e., lengthening, widening, and/or major component replacement) shall be designed as specified in this section. Record of such reconstruction shall be maintained as specified in Section D of this chapter. The remaining design life should be considered in the design.
 - A direct link to the Structures Design Guidelines was added to Section H, References for Informational Purposes

Moved by Howard Webb to approve the changes, seconded by Ron Chin. The changes were approved unanimously.

- **Chapter 18 – Signing and Marking** (Gail Woods) – Ms. Woods gave an overview of the changes proposed. The general goals were to update the guidance for the design and placement of street name signs and provide information on community wayfinding, dynamic message signs, and audible vibratory pavement markings. The language adopted was based upon the materials presented in the meeting package, except for the following:
 - Retain the Chapter title “Signing and Marking “until the chapter is updated to include traffic signals.
 - Revise the last sentence of the first paragraph in Section C.2 - Advance Traffic Control Signs to read “The visibility criteria for traffic signals shall be based on having a continuous view of at least two signal faces for the distance specified in **Table 4D-2. Minimum Sight Distance for Signal Visibility of the MUTCD.**”
 - Revise the guidance for when two sign panels are used in Section C.3.a Standards to read “when two sign panels are used, install one sign panel on the left and the other sign panel on the right side of the signal heads; or”
 - Revise Section C.4 - Community Wayfinding Guidance to read “Community wayfinding guide signs should be developed and approved through local resolution with criteria for the destinations shown on the community wayfinding guide sign system plan. Any wayfinding guide sign should be used in accordance with Rule 14-51.030, F.A.C. The intent is to provide guidance and navigation information to local cultural, historical, recreational, and tourist activities. No destination should be displayed for the purpose of advertising.”
 - Revise Section D.1- 6-inch Pavement Markings to read “6-inch pavement markings should be used for all pavement center line, lane separation line and edge line markings”.
 - Revise Section D.2 - Reflective Pavement Markers to read "To provide greater emphasis and increase visibility, reflective (raised) pavement markers (RPM) may be placed at 40-foot spacing along the centerline markings of roadways.”

Florida Greenbook Advisory Committee Meeting Minutes March 27-28, 2014

- Revise the title of Section D.3 to read “Audible Vibratory Pavement Markings.” The proposed language was revised to read “For high speed roadways, audible, vibratory markings should be considered.”

Moved by Andy Tilton to approve the changes, seconded by Robert Behar. The changes were approved unanimously.

Adjourn

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

Friday, March 28, 2014

Members in Attendance

Bernie Masing, Ramon D. Gavarrete, Andy Tilton, Steven M. Neff, Jimmy Pitman, Kenneth Dudley, David Cerlanek, Keith Bryant, Howard Webb, Robert Behar, George T. Webb, Annette Brennan, Gail Woods, Charles Ramdatt, Scott Cottrell, Chris Tavella, Andres Garganta, Ron Chin, Peter R. Brett

Other FDOT Staff and Public in Attendance

Duane Brautigam, Michael Shepard, Mary Anne Koos, Frank Sullivan, Miranda Glass, Billy Hattaway, Joy Puerta, Mark V. Massaro, David F. Kuhlman, Frederick J. Schneider, Andre Pavlov, Chester Henson, Fred Heery, Gabrielle (Gabe) Matthews, Gevin McDaniel, Alan Hart, Chad Swails

Future Greenbook Revisions

- **Goals** (Michael Shepard) – Mr. Shepard thanked the committee for all the work that was accomplished on Thursday and explained that following a presentation on AASHTO Greenbook criteria, the committee would be asked to identify the chapters that need revisions. Also, later this morning there would be further discussion on the guidance on Chapter 4 and roadside canals. Breakout sessions for those selected chapters would then follow. Similar to the process that was used to develop the new Drainage Chapter, technical experts from FDOT’s Central or District Offices will be assigned to each chapter. Technical experts from local governments and consultants are also welcome to serve on Chapter Subcommittees.
- **Review of 2011 AASHTO “Greenbook” Criteria** (Frank Sullivan) – The presentation included an overview of the general changes between the 2011 and 2004 Greenbooks. The major differences are:
 - Emphasis on designer consideration of the “context” of the project area and multi-modal design
 - New design vehicles were added including the SU-40 and tandem axle trucks, and the WB-50 was replaced with WB-62
 - Clarifies that the roadway width includes the shoulder to be consistent with the Roadside Design Guide

Florida Greenbook Advisory Committee Meeting Minutes March 27-28, 2014

- Passing sight distance for two lane rural highways was revised based upon NCHRP Report 605 and is now consistent with the MUTCD
- Superelevation values were updated
- Added information on Rumble Strips
- Added vertical clearance criteria for pedestrian overpasses and structures on collectors
- Allows the use of 10' lanes on urban arterials with low bus and truck traffic and design speeds < than 35 mph
- Updated the pedestrian crossing criteria at intersections to be consistent with the Highway Capacity Manual
- Added information on double and triple lefts based upon NCHRP 505
- Updated exhibits for grade separations and interchanges, including roundabout ramp terminals, ramp metering, and left side ramp terminals

FHWA has not adopted the 2011 Greenbook; however, they do allow states to adopt the portions they felt were appropriate. The 2004 AASHTO Greenbook is referenced in the PPM. It was decided the 2004 AASHTO Greenbook will be the used as the basis for the 2013 Florida Greenbook.

- **Selection of Chapters for Future Work** (Michael Shepard) - The Committee agreed to work on Chapter 6 – Roadway Lighting, Chapter 8 – Pedestrian Facilities, Chapter 9 – Bicycle Facilities, Chapter 11 – Work Zone Safety and Chapter 15 – Traffic Calming in the subcommittee workshops. There was agreement to not address traffic signals at this time in Chapter 18.
- **Chapter 4 –Roadside Design and Canals** (Charles Ramdatt) – Mr. Ramdatt suggested the language in Chapter 4 addressing canals be written to be no more restrictive than that found in other FDOT criteria. The following changes were approved:
 - Add the following sentence to the first paragraph in Section D.4 - Roadside Canals, “A canal is defined as an open ditch parallel to the roadway for a minimum distance of 1000 ft. and with a seasonal water depth in excess of 3 ft. for extended periods of time (24 hours or more)”.
 - Add the following to form the third paragraph in the Section D: “For rural and urban flush shoulder highways, the distance from the outside edge of the through travel lane to the top of the canal side slope nearest the road will be no less than 60 ft. for highways with design speeds of 50 mph or greater. For highways with design speeds less than 50 mph this minimum distance shall not be less than 50 ft. for rural and urban flush shoulder highways or 40 ft. for urban curb or curb and gutter highways. When new canal or roadway alignment is required, distances greater than those above should be provided, if possible, to accommodate possible future improvements to the roadway (widening, etc.). If the minimum standards for canal hazards cannot be met, then shielding should be considered.”
 - Add a third paragraph that reads “The RSAP is the recommended tool for evaluating the cost effectiveness of shielding roadside hazards.”

Minutes (Draft)

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

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 30th. 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

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 12th 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.

- 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.

FLORIDA GREENBOOK ADVISORY COMMITTEE MEMBERS

DISTRICT 1

Bernie Masing, P.E.
District Design Engineer
FDOT - District 1
801 North Broadway Street
Bartow, Florida 33830-1249
(863) 519-2543 FAX (863) 519-2892
bernie.masing@dot.state.fl.us

Ramon D. Gavarrete, P.E.
County Engineer/Utilities Director
Highlands County
Board of County Commissioners
505 South Commerce Avenue
Sebring, Florida 33870-3869
(863) 402-6877 FAX (863) 402-6548
rgavarre@hcbcc.org

Andy Tilton, P.E.
Water Resource Director
Johnson Engineering, Inc.
251 West Hickpochee Avenue
LaBelle, Florida 33935
(863) 612-0594 Fax (863) 612-0341
atilton@johnsoneng.com

Steven M. Neff, P.E.
Transportation Manager
City of Cape Coral
Public Works / Transportation Division
P.O. Box 150027
Cape Coral, Florida 33915-0027
(239)574-0702 x1219 FAX(239)573-3087
sneff@capecoral.net

DISTRICT 2

Jimmy Pitman, P.E.
District Design Engineer
FDOT - District 2
1901 South Marion Street
Lake City, Florida 32025-5814
(386) 961-7583 FAX (386) 961-7809
jimmy.pitman@dot.state.fl.us

Kenneth Dudley, P.E.
County Engineer
Taylor County
Board of County Commissioners
201 East Green Street
Perry, Florida 32347
(850)838-3500x104 FAX (850)838-3501
county.engineer@taylorcountygov.com

Gene Howerton, P.E.
Vice President
Arcadis U.S., Inc.
1650 Prudential Drive, Suite 400
Jacksonville, Florida 32207
(904) 721-2991 FAX (904) 861-2840
Gene.Howerton@arcadis-us.com

David Cerlanek, P.E., P.T.O.E., C.P.M.
Asst. Public Works Director / Co. Engineer
Alachua County Public Works Department
P.O. Box 1188
Gainesville, FL 32602
(352) 374-5245x214 FAX (352) 337-6243
dcerlanek@alachuacounty.us

DISTRICT 3

Scott Golden, P.E.
District Design Engineer
FDOT - District 3
Post Office Box 607
Chipley, Florida 32428
(850) 330-1492 FAX (850) 330-1148
scott.golden@dot.state.fl.us

Rick Hall, P.E.
Hall Planning and Engineering, Inc.
322 Beard Street
Tallahassee, Florida 32303
(850) 222-2277 FAX (850) 222-6555
rickhall@hpe-inc.com

Roger A. Blaylock, P.E.
County Engineer
Santa Rosa County
6051 Old Bagdad Highway, Suite 300
Milton, Florida 32583
(850) 981-7100 FAX (850) 983-2161
RogerB@santarosa.fl.gov

Keith Bryant, P.E.
Traffic Engineering Manager
Bay County
840 West 11th Street
Panama City, Florida 32401
(850) 248-8740 FAX (850) 248-8749,
kbryant@baycountyfl.gov

DISTRICT 4

Howard Webb, P.E.
District Design Engineer
FDOT - District 4
3400 West Commercial Blvd
Ft. Lauderdale, Florida 33309
(954) 777-4439 FAX (954) 777-4482
howard.webb@dot.state.fl.us

Robert Behar, P.E.
President
R.J. Behar and Company, Inc.
6861 SW 196 Avenue, Suite 302
Pembroke Pines, Florida 33332
(954) 680-7771
bbehar@rjbehar.com

Christopher R. Mora, P.E.
Public Works Director
Indian River County
1801 27th Street
Vero Beach, Florida 32960
(772) 226-1379 FAX (772) 778-9391
cmora@ircgov.com

George T. Webb, P.E.
County Engineer
Palm Beach County
Post Office Box 21229
West Palm Beach, Florida 33416-1229
(561) 355-2006 FAX (561) 355-2090
GWebb@pbcgov.org

DISTRICT 5

Annette Brennan, P.E.
District Design Engineer
FDOT - District 5
719 South Woodland Boulevard
Deland, Florida 32720
(386) 943-5543 FAX (386) 736-5302
annette.brennan@dot.state.fl.us

Gail Woods, P.E.
Transportation Manager
WBQ Design and Engineering, Inc.
201 N. Magnolia Avenue, Suite 200
Orlando, Florida 32801 (407) 839-
4300 FAX (407) 839-1839
Gwoods@wbq.com

Charles Ramdatt, P.E., P.T.O.E.
Transportation Engineering Div. Manager
City of Orlando
400 South Orange Avenue
P.O. Box 4990
Orlando, Florida 32802
(407) 246-3186 FAX (407) 246-3392
Charles.Ramdatt@cityoforlando.net

Scott Cottrell, P.E.
Public Works Director
Sumter County
319 East Anderson Avenue
Bushnell, Florida 33513
(352) 569-6700 FAX 352-569-6701
scott.cottrell@sumtercountyfl.gov

DISTRICT 6

Chris Tavella, P.E.
District Design Engineer
FDOT - District 6
1000 NW 111th Avenue
Miami, Florida 33172
(305) 470-5103 FAX (305) 470 5338
chris.tavella@dot.state.fl.us

Andres Garganta, P.E.
Vice President
CSA Group, Inc..
6100 Blue Lagoon Drive, Suite 300
Miami, Florida 33126
(305) 461-5484x7304 FAX (305) 461-5494
agarganta@csagroup.com

Gaspar Miranda, P.E.
Assistant Director, Highway Engineering
Miami-Dade County
Public Works Department
111 N.W. 1st Street, Suite 1510
Miami, Florida 33128
(305) 375-2130 FAX (305) 679-7738
GXM@miamidade.gov

Juvenal Santana, P.E.
Assistant Director
City of Miami Public Works Department
444 S.W. 2nd Avenue, 8th Floor
Miami, Florida 33130
(305) 416-1218 FAX (305) 416-1278
jsantana@miamigov.com

DISTRICT 7

Ronald A. Chin, P.E.
District Design Engineer
FDOT - District 7
11201 N. McKinley Drive
Tampa, Florida 33612
(813) 975-6030 FAX (813) 975-6150
ronald.chin@dot.state.fl.us

Richard Diaz, Jr., P.E.
President
Diaz Pearson & Associates, Inc.
4202 El Prado Blvd.
Tampa, Florida 33629
(813) 258-0444 FAX (813) 258-4440
richard@diazpearson.com

Peter R. Brett, P.E.
Chief Engineer Transportation Division
City of Tampa
306 E. Jackson Street, 4E
Tampa, Florida 33602
(813) 274-8054
pete.Brett@tampagov.net

Jim Widman, P.E.
Engineering Services Director
County Engineer
Pasco County
7536 State Street, Suite 140
New Port Richey, Florida 34654
jwidman@pascocountyfl.net

ASSOCIATE MEMBERS

Michael Shepard, P.E., Chairperson
State Roadway Design Engineer
FDOT - Central Office
605 Suwannee St., MS 32
Tallahassee, Florida 32399-0450
(850) 414-4283 FAX (850) 414-5261
michael.shepard@dot.state.fl.us

Mary Anne Koos
Special Projects Coordinator
FDOT - Central Office
605 Suwannee St., MS 32
Tallahassee, Florida 32399-0450
(850) 414-4321 FAX (850) 414-5261
maryanne.koos@dot.state.fl.us

Vacant
Roadway Design Engineer
FDOT - Central Office
605 Suwannee St., MS 32
Tallahassee, Florida 32399-0450
(850) 414-4318 FAX (850) 414-5261

Frank Sullivan, P.E.
Criteria & Standards Section Leader
FDOT - Central Office
605 Suwannee St., MS 32
Tallahassee, Florida 32399-0450
(850) 414-4324 FAX (850) 414-5261
frank.sullivan@dot.state.fl.us

Billy Hattaway, P.E.
District Secretary
FDOT - District 1
801 North Broadway Street
Bartow, Florida 33830-1249
(863) 519-2201 FAX (863) 519-2892
billy.hattaway@dot.state.fl.us

ASSOCIATE MEMBERS (Continued)

Robert Robertson, P.E.
State Structures Design Engineer
FDOT - Central Office
605 Suwannee St., MS 33
Tallahassee, Florida 32399-0450
(850) 414-4267 FAX (850) 414-4955
robert.robertson2@dot.state.fl.us

Joy Puerta
City Transportation Analyst
City of Boca Raton,
Municipal Services Dept.
201 West Palmetto Park Road
Boca Raton, Florida 33432
(561) 416-3410 FAX (561) 416-3418
jpuerta@ci.boca-raton.fl.us

Mark V. Massaro, P.E.
Director, Public Works Dept.
Orange County
4200 South John Young Parkway
Orlando, Florida 32839
(407) 836-7970 FAX (407) 836-7716
mark.massaro@ocfl.net

David F. Kuhlman
Florida Power & Light Company
Post Office Box 029100
Miami, Florida 33102-9100
(305) 552-2995 FAX (305) 228-5695
David.F.Kuhlman@fpl.com

Lora Hollingsworth, P.E.
Chief Safety Officer
FDOT - Central Office
605 Suwannee St., MS 53
Tallahassee, Florida 32399-0450
(850) 245-1504 FAX (850) 245-1554
lora.hollingsworth@dot.state.fl.us

Joseph Santos, P.E.
Transportation Safety Engineer
FDOT - Central Office
605 Suwannee Street, MS 53
Tallahassee, Florida 32399-0450
(850) 245-1502 FAX (850) 245-1554
joseph.santos@dot.state.fl.us

Frederick J. Schneider, P.E.
FACERS Representative
Lake County Public Works
437 Ardice Avenue
Eustis, Florida 33726
(352) 483-9040 FAX (352) 483-9015
fschneider@lakecountyfl.gov

Andre Pavlov, P.E.
Assistant State Structures Design
Engineer
FDOT - Central Office
605 Suwannee St., MS 33
Tallahassee, Florida 32399-0450
(850) 414-4293 FAX (850) 414-4955
andre.pavlov@dot.state.fl.us

Chester Henson, P.E.
State Traffic Standards Engineer
FDOT - Central Office
605 Suwannee St., MS 32
Tallahassee, Florida 32399-0450
(850) 414-4117 FAX (850) 414-5261
chester.henson@dot.state.fl.us

Duane Brautigam, P.E.
Director, Office of Design
FDOT - Central Office
605 Suwannee St., MS 38
Tallahassee, FL 32399-0450
(850) 414-4175 FAX (850) 414-4791
duane.brautigam@dot.state.fl.us

ASSOCIATE MEMBERS (Continued)

Allen W. Schrupf, P.E.
Senior Associate
DRMP, Inc.
941 Lake Baldwin Lane
Orlando, Florida 32814
(407) 897-0594 FAX (407) 896-4836
aschrumpf@drmp.com

Fred Heery
Deputy State Traffic Operations Engineer
FDOT - Central Office
State Traffic Engineering and
Operations Office
605 Suwannee St., MS 36
Tallahassee, Florida 32399-0450
(850) 410-5416 FAX (850) 410-5503
fred.heery@dot.state.fl.us

Gabrielle (Gabe) Matthews
State Transit Planner
FDOT – Central Office
605 Suwannee Street, MS 26
Tallahassee, Florida 32399-0450
(850-414-4532
gabrielle.matthews@dot.state.fl.us

Florida Greenbook Chapter Subcommittees - 2014

<u>Chapter</u>	<u>Chapter Chair</u>
1. Planning	Rick Hall
2. Land Development.....	Vacant
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 and Resurfacing.....	Scott Golden
11. Work Zone Safety	Chris Tavella
12. Construction.....	Keith Bryant
13. Public Transit.....	Charles Ramdatt
14. Design Exceptions	Ramon Gavarrete
15. Traffic Calming.....	Steve Neff
16. Residential Street Design.....	Scott Cottrell
17. Bridges and Other Structures	Jimmy Pittman
18. Signing and Marking.....	Gail Woods
19. Traditional Neighborhood Development	Rick Hall
20. Drainage.....	George Webb

OTHER SUBCOMMITTEES

Local Specifications Subcommittee	Vacant
---	--------

Chapter 1 - Planning

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Rick Hall	Chair	rickhall@hpe-inc.com
Andy Tilton	Member	atilton@johnsoneng.com
Chris Mora	Member	cmora@ircgov.com
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Gabe Matthews	Member	gabrielle.Matthews@dot.state.fl.us

Chapter 2 - Land Development

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Vacant	Chair	Vacant
Rick Hall	Member	rickhall@hpe-inc.com
George Webb	Member	GWebb@pbcgov.org
Roger Blaylock	Member	RogerB@santarosa.fl.gov
Richard Diaz	Member	richard@diazpearson.com
Joseph Santos	Member	joseph.santos@dot.state.fl.us
Mark Massaro	Member	mark.massaro@ocfl.net

Chapter 3 - Geometric Design

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Howard Webb	Chair	howard.webb@dot.state.fl.us
Ken Dudley	Member	county.engineer@taylorcountygov.com
David Cerlanek	Member	dcerlanek@alachuacounty.us
Ramon Gavarrete	Member	rgavarre@hcbcc.org
Gaspar Miranda	Member	GXM@miamidade.gov
Rick Hall	Member	rickhall@hpe-inc.com
Andres Garganta	Member	agarganta@csagroup.com
Robert Behar	Member	bbeharr@rjbehar.com
Keith Bryant	Member	kbryant@baycountyfl.gov
David Kuhlman	Member	david.f.kuhlman@fpl.com
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us

Allen Schrumpf	Member	aschrumpf@drmp.com
Joseph Santos	Member	joseph.santos@dot.state.fl.us
Fred Schneider	Member	fschneider@co.lake.fl.us

Chapter 4 - Roadside Design

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Charles Ramdatt	Chair	Charles.Ramdatt@cityoforlando.net
Roger Blaylock	Member	RogerB@santarosa.fl.gov
Ramon Gavarrete	Member	rgavarre@hcbcc.org
Andres Garganta	Member	agarganta@csagroup.com
Keith Bryant	Member	kbryant@baycountyfl.gov
Gaspar Miranda	Member	GXM@miamidade.gov
Scott Cottrell	Member	scott.cottrell@sumtercountyfl.gov
David Kuhlman	Member	david.f.kuhlman@fpl.com
Joseph Santos	Member	joseph.santos@dot.state.fl.us
Allen Schrumpf	Member	aschrumpf@drmp.com

Chapter 5 - Pavement Design and Construction

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Ron Chin	Chair	ronald.chin@dot.state.fl.us
Andres Garganta	Member	agarganta@csagroup.com
Chris Mora	Member	cmora@ircgov.com
Gail Woods	Member	Gwoods@wbq.com
Chris Tavella	Member	Chris.Tavella@dot.state.fl.us
Robert Behar	Member	bbeharr@rjbehar.com
Jim Widman	Member	jwidman@pascocountyfl.net
Chris Wert	Technical Advisor	chris.wert@sumtercountyfl.gov

Chapter 6 - Roadway Lighting

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Bernie Masing	Chair	bernie.masing@dot.state.fl.us
George Webb	Member	GWebb@pbcgov.org
Keith Bryant	Member	kbryant@baycountyfl.gov
Chester Henson	Member	chester.henson@dot.state.fl.us
Allen Schrumpf	Member	aschrumpf@drmp.com

Chapter 7 - Rail Highway Grade Crossings

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Jimmy Pitman	Chair	jimmy.pitman@dot.state.fl.us
Charles Ramdatt	Member	Charles.Ramdatt@cityoforlando.net
Chris Mora	Member	cmora@ircgov.com

Chapter 8 - Pedestrian Facilities

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Annette Brennan	Chair	annette.brennan@dot.state.fl.us
Rick Hall	Member	rickhall@hpe-inc.com
Richard Diaz	Member	richard@diazpearson.com
Andy Tilton	Member	atilton@johnsoneng.com
Gene Howerton	Member	Gene.Howerton@arcadis-us.com
Chris Tavella	Member	chris.tavella@dot.state.fl.us
Ron Chin	Member	ronald.chin@dot.state.fl.us
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Mark Massaro	Technical Advisor	mark.massaro@ocfl.net

Chapter 9 - Bicycle Facilities

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Annette Brennan	Chair	annette.brennan@dot.state.fl.us
Gene Howerton	Member	Gene.Howerton@arcadis-us.com
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Chris Tavella	Member	chris.tavella@dot.state.fl.us
Ron Chin	Member	ronald.chin@dot.state.fl.us
Keith Bryant	Member	kbryant@baycountyfl.gov

Chapter 10 - Maintenance

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Scott Golden	Chair	john.golden@dot.state.fl.us
David Cerlanek	Member	dcerlanek@alachuacounty.us
Keith Bryant	Member	kbryant@baycountyfl.gov
Ramon Gavarrete	Member	rgavarre@hcbcc.org
Scott Cottrell	Member	scott.cottrell@sumtercountyfl.gov
Chris Mora	Member	cmora@ircgov.com
Allen Schrupf	Member	aschrumpf@drmp.com

Chapter 11 - Work Zone Safety

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Chris Tavella	Chair	Chris.Tavella@dot.state.fl.us
Andres Garganta	Member	agarganta@csagroup.com
Gail Woods	Member	Gwoods@wbq.com

Chapter 12 - Construction

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Keith Bryant	Chair	kbryant@baycountyfl.gov
Andy Tilton	Member	atilton@johnsoneng.com
Steve Neff	Member	sneff@capecoral.net
Bernie Masing	Member	bernie.masing@dot.state.fl.us
Jim Widman	Member	jwidman@pascocountyfl.net
Joseph Santos	Member	joseph.santos@dot.state.fl.us
Fred Schneider	Member	fschneider@co.lake.fl.us
Bob Shepard	Technical Advisor	

Chapter 13 - Public Transit

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Charles Ramdatt	Chair	Charles.Ramdatt@cityoforlando.net
Annette Brennan	Member	Annette.Brennan@dot.state.fl.us
Richard Diaz	Member	richard@diazpearson.com
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Gabe Mathews	Member	gabrielle.matthews@dot.state.fl.us
Fred Schneider	Member	fschneider@co.lake.fl.us

Chapter 14 - Design Exceptions

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Ramon Gavarrete	Chair	rgavarre@hcbcc.org
Roger Blaylock	Member	RogerB@santarosa.fl.gov
Andres Garganta	Member	agarganta@csagroup.com
Howard Webb	Member	howard.webb@dot.state.fl.us
Scott Golden	Member	john.golden@dot.state.fl.us
Bernie Masing	Member	bernie.masing@dot.state.fl.us
Robert Behar	Member	bbeharr@rjbehar.com

Chapter 15 - Traffic Calming

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Steve Neff	Chair	sneff@capecoral.net
Ramon Gavarrete	Member	rgavarre@hcbcc.org
Gaspar Miranda	Member	GXM@miamidade.gov
Andres Garganta	Member	agarganta@csagroup.com
Jim Widman	Member	jwidman@pascocountyfl.net
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Mark Massaro	Member	mark.massaro@ocfl.net

Chapter 16 - Residential Street Design

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Scott Cottrell	Chair	scott.cottrell@sumtercountyfl.gov
Ramon Gavarrete	Member	rgavarre@hcbcc.org
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Andy Tilton	Member	atilton@johnsoneng.com
Bernie Masing	Member	bernie.masing@dot.state.fl.us
Mark Massaro	Member	mark.massaro@ocfl.net
Annette Brennan	Member	Annette.Brennan@dot.state.fl.us

Chapter 17 - Bridges and Other Structures

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Jimmy Pitman	Chair	jimmy.pitman@dot.state.fl.us
Andre Pavlov	Member	andre.pavlov@dot.state.fl.us
Mark Massaro	Member	mark.massaro@ocfl.net

Chapter 18 – Signing and Marking

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Gail Woods	Chair	Gwoods@wbq.com
Gaspar Miranda	Member	GXM@miamidade.gov
Steve Neff	Member	sneff@capecoral.net
George Webb	Member	GWebb@pbcgov.org
Chris Mora	Member	cmora@ircgov.com
Scott Cottrell	Member	scott.cottrell@sumtercountyfl.gov
Joy Puerta	Member	jpuerta@ci.boca-raton.fl.us
Chester Henson	Member	chester.henson@dot.state.fl.us
Fred Heery	Member	fred.heery@dot.state.fl.us
Gail Holley	Technical Advisor	gail.holley@dot.state.fl.us

Chapter 19 - Traditional Neighborhood Development (TND) Subcommittee

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
Rick Hall	Chair	rickhall@hpe-inc.com
Richard Diaz	Member	richard@diazpearson.com
Andres Garganta	Member	agarganta@csagroup.com
David Cerlanek	Member	dcerlanek@alachuacounty.us
Andy Tilton	Member	atilton@johnsoneng.com
Billy Hattaway	Member	Billy.Hattaway@dot.state.fl.us
Mark Massaro	Member	mark.massaro@ocfl.net

Chapter 20 - Drainage

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
George Webb	Chair	GWebb@pbcgov.org
Andy Tilton	Member	atilton@johnsoneng.com
Andres Garganta	Member	agarganta@csagroup.com
Gaspar Miranda	Member	GXM@miamidade.gov
Scott Golden	Member	john.golden@dot.state.fl.us
Robert Behar	Member	bbeh@rjbehar.com
Katey Breland	Technical Advisor	catherine.breland@dot.state.fl.us
Chris Wert	Technical Advisor	chris.wert@sumtercountyfl.gov
Jim Hunt	Technical Advisor	Jim.Hunt@Cityoforlando.net
Alex Barrios	Technical Advisor	barria@miamidade.gov
Ken Todd	Technical Advisor	Ktodd@pbcgov.org
Omelio Fernandez	Technical Advisor	OFernand@pbcgov.org

Local Specifications Subcommittee

<i>Name</i>	<i>Involvement</i>	<i>Email</i>
VACANT	Chair	VACANT
Duane Brautigam	Member	duane.brautigam@dot.state.fl.us
Robert Robertson	Member	robert.robertson2@dot.state.fl.us
Charles Ramdatt	Member	Charles.Ramdatt@cityoforlando.net

Select Year:

2013

Go

The 2013 Florida Statutes

[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.

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 Bob Burdick or Larry Ringers at the Office of the General Counsel at (850) 414-5265 with any questions or for more information.

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.

THIS PAGE INTENTIONALLY LEFT BLANK

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.

ADT	Average daily two-way volume of traffic.
AUXILIARY LANE	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.
AVERAGE RUNNING SPEED	For all traffic, or component thereof, the summation of distances divided by the summation of running times.
BICYCLE LANE (BIKE LANE)	A portion of a roadway (typically 4-5 ft) which has been designated for preferential use by bicyclists by pavement markings, and if used, signs. They are one-way facilities that typically carry traffic in the same direction as adjacent motor vehicle traffic.
<u>BOARDING AND ALIGHTING US STOP PAD (B&A) AREA</u>	A firm, stable, <u>slip resistant surface that</u> accommodates passenger movement on or off a bus.
CLEAR ZONE	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.

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.

PARAPUBLIC TRANSIT

A comparable transportation service required by the ADA for individuals with disabilities who are unable to use fixed route transportation systems. ~~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.

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 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, and others.

SHOULD

An advisory condition. Where the word "should" is used, it is considered to denote advisable usage, recommended but not mandatory.

SLOPES

Slopes in this manual are expressed as a ratio of vertical to horizontal (V:H).

SURFACE TRANSPORTATION

Network of highways, streets, and/or roads.
SYSTEM Term can be applied to local system or expanded to desired limits of influence.

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 include other uses such as stores, schools, and places of worship within walking distances of residences.

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

The portion of the roadway for the movement of vehicles, exclusive of shoulders, berms, sidewalks and parking lanes.

TRAVEL LANE

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.

URBAN AREA

A geographic region comprising as a minimum the area inside the United States Bureau of the

Census boundary of an urban place with a population of 5,000 or more persons, expanded to include adjacent developed areas as provided for by Federal Highway Administration regulations.

URBANIZED AREA

A geographic region comprising as a minimum the area inside an urban place of 50,000 or more persons, as designated by the United States Bureau of the Census, expanded to include adjacent developed areas as provided for by Federal Highway Administration regulations. Urban areas with a population of fewer than 50,000 persons which are located within the expanded boundary of an urbanized area are not separately recognized.

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.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER 1

PLANNING

<u>A</u>	<u>INTRODUCTION</u>	<u>1-1</u>
<u>B</u>	<u>FUNCTIONAL CLASSIFICATION</u>	<u>1-2</u>
<u>B.1</u>	<u>Function</u>	<u>1-2</u>
<u>B.1.a</u>	<u>Volume</u>	<u>1-2</u>
<u>B.1.b</u>	<u>Speed</u>	<u>1-2</u>
<u>B.1.c</u>	<u>Traveler Characteristics</u>	<u>1-2</u>
<u>B.1.d</u>	<u>Trip Characteristics</u>	<u>1-3</u>
<u>B.1.e</u>	<u>Safety</u>	<u>1-3</u>
<u>B.1.f</u>	<u>Measures of Level of Service</u>	<u>1-3</u>
<u>B.1.g</u>	<u>Access Requirements</u>	<u>1-3</u>
<u>B.1.h</u>	<u>Public Transit Use</u>	<u>1-4</u>
<u>B.2</u>	<u>Classification</u>	<u>1-4</u>
<u>B.2.a</u>	<u>Basic Classification</u>	<u>1-4</u>
<u>B.2.a.1</u>	<u>Local Road</u>	<u>1-5</u>
<u>B.2.a.2</u>	<u>Collector Road</u>	<u>1-5</u>
<u>B.2.a.3</u>	<u>Arterial Road</u>	<u>1-5</u>
<u>B.2.b</u>	<u>Classification Modifications</u>	<u>1-5</u>
<u>B.2.b.1</u>	<u>Urban</u>	<u>1-5</u>
<u>B.2.b.2</u>	<u>Major/Minor</u>	<u>1-6</u>
<u>C</u>	<u>CONSIDERATIONS for ROADSIDE DESIGN</u>	<u>1-7</u>
<u>C.1</u>	<u>Safety</u>	<u>1-7</u>
<u>C.2</u>	<u>Economic Constraints</u>	<u>1-7</u>
<u>C.3</u>	<u>Access</u>	<u>1-8</u>
<u>C.4</u>	<u>Maintenance Capabilities</u>	<u>1-8</u>
<u>C.5</u>	<u>Utility and Transit Operations</u>	<u>1-8</u>
<u>C.6</u>	<u>Emergency Response</u>	<u>1-8</u>
<u>C.7</u>	<u>Environmental Impact</u>	<u>1-9</u>
<u>C.8</u>	<u>Community and Social Impact</u>	<u>1-9</u>
<u>C.9</u>	<u>Modes of Transportation</u>	<u>1-10</u>

D	OPERATION	1-15
D.1	Policy	1-15
D.2	Objectives	1-15
D.3	Activities	1-15
	D.3.a Maintenance and Reconstruction	1-16
	D.3.b Work Zone Safety	1-16
	D.3.c Traffic Control	1-16
	D.3.d Emergency Response	1-17
	D.3.e Coordination and Supervision	1-17
	D.3.f Inspection and Evaluation	1-17
E	References	1-19
A	INTRODUCTION	1-1
B	CONFLICTING CRITERIA	1-2
	B.1 Economic Constraints	1-2
	B.2 Access	1-2
	B.3 Maintenance Capabilities	1-3
	B.4 Utility and Transit Operations	1-3
	B.5 Emergency Response for Fire, Police, etc.	1-3
	B.6 Environmental Impact	1-3
	B.7 Community and Social Impact	1-4
	B.8 Modes of Transportation	1-4
C	HIGHWAY FUNCTION AND CLASSIFICATION	1-5
	C.1 Function	1-5
	C.1.a Volume	1-5
	C.1.b Highway User Types	1-5
	C.1.c Trip Characteristics	1-5
	C.1.d Speed	1-5
	C.1.e Safety	1-5
	C.1.f Level of Service	1-6
	C.1.g Access Requirements	1-6
	C.1.h Public Transit Use	1-6
	C.2 Classification	1-6

C.2.a	Basic Classification.....	1-6
C.2.a.1	Local.....	1-7
C.2.a.2	Collector.....	1-7
C.2.a.3	Arterial.....	1-7
C.2.b	Classification Modifications.....	1-7
C.2.b.1	Urban.....	1-7
C.2.b.2	Major/Minor.....	1-8
D	OPERATION.....	1-9
D.1	Policy.....	1-9
D.2	Objectives.....	1-9
D.3	Activities.....	1-9
D.3.a	Maintenance and Reconstruction.....	1-10
D.3.b	Work Zone Safety.....	1-10
D.3.c	Traffic Control.....	1-10
D.3.d	Emergency Response.....	1-11
D.3.e	Coordination and Supervision.....	1-11
D.3.f	Inspection and Evaluation.....	1-11

CHAPTER 1

PLANNING

A INTRODUCTION

~~Planning, as discussed in this section, is not to be confused with the broader transportation system's planning and project programming which normally precedes the design, construction, and maintenance of highways.~~

Developing and maintaining an efficient multi-modal ~~highway~~ system requires careful planning by each unit in a transportation ~~highway~~ agency. This includes both planning for the design and construction of streets and highways and planning for operating the facilities. Overall planning would include a consideration for all aspects of design, construction, and operations (including maintenance) affecting the resulting characteristics of streets and highways. These characteristics will be significantly affected by the degree to which the various demands and requirements on the highway system are satisfied in the initial planning and design.

Successful highway design requires that the role of each new facility in the overall highway system be clearly delineated. The determination and clear definition of the function and classification of each street and highway is also required. Safety and efficiency of new facilities is predicated, to a large extent, on corridor selection and provisions for adequate right of way, alignment, and access control. Initial planning and design should also consider provisions for future modifications and upgrading required by changes in speed, volume, or standards.

Plans for actually operating a new street or highway should be considered in the initial planning and should be closely coordinated with the design of the facility. Development of plans and procedures for successfully operating an existing highway system must include a consideration of all activities affecting the operating characteristics of each street and highway.

Planning, designing, operating, and maintaining a transportation ~~highway~~ system has become more complex in recent years. These disciplines must ~~now~~ address the relationship to land use and the desire for access to ~~needs of increased~~ public transit, and pedestrian and bicycle traffic, ~~increasing bicyclist use~~ the growing number of elder road users, and the mobility needs of persons with disabilities ~~the disabled~~. This begins

in planning and continues throughout the design and operational process.

BC HIGHWAY FUNCTIONAL AND CLASSIFICATION

A determination of the function and operational requirements, and a clear definition of the classification of each new facility are required prior to the actual design.

C.1 Function

B.1 Function

Design of each new street or highway is based upon its function in the highway system. Operational requirements that must be satisfied to fulfill this function are dependent upon the following factors:

BC.14.a Volume

Volume of traffic that must be carried by the facility is a primary factor governing the design. Variations in volume with respect to direction and time should also be evaluated to determine the expected requirements for peak capacities.

B.1.b Speed

Operating speed (to be maintained) should meet reasonable expectations of the users.

BC.14.cb Traveler Characteristics Highway User Types

Unless prohibited by law, a variety of travelers should be expected on all public roads. These include pedestrians, bicyclists, transit users and motor vehicles. Types and relative volumes of people highway users expected to use the street or highway influence trip characteristics and design features.

BC.14.d Trip Characteristics

Functions of a new facility are, to a large extent, determined by the length and purpose of vehicle trips. Trip characteristics are influenced by land use characteristics and the highway network layout.

C.1.d Speed

Operating speed (to be maintained) should meet reasonable expectations of the users.

BC.14.e Safety

Functional classification plays an important role in setting expectations and measuring outcomes for safety. Since agencies consider the type of roadway in evaluating the significance of crash rates, functional classification can be used to evaluate the relative safety of roadways and implement safety improvements and programs.

Provisions of streets and highways with safe operating characteristics shall be considered a primary requirement.

BC.14.f Measures of Level of Service

Level of service (LOS) is essentially a measure of the quality of the overall operating characteristics of a street or highway. Factors involved in determining the level of service include speed and safety, as well as travel time; traffic conflicts and interruptions; freedom to maneuver; driving convenience and comfort; and operating costs. Level of service is also dependent upon actual traffic volume and composition of traffic (motor vehicles, trucks, transit, bicyclists, and pedestrians).

The *Highway Capacity Manual 2010* provides further information on assessing the traffic and environmental effects of highway projects.

BC.14.g Access Requirements

Degree and type of access permitted on a given facility is dependent upon

its intended function and should conform to the guidelines in CHAPTER 3 - GEOMETRIC DESIGN. Reasonable access control must be exercised to allow a street or highway to fulfill its function.

BC.14.h Public Transit Use

Both current and planned use by public transit influence design features. Transit vehicles increase capacity on a roadway. There must be the ability to safely stop along the roadway to board and discharge passengers.

B.C.2.2 Classification

Classification

Road classifications are defined in Section 334.03 F.S.. Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network.

Road classifications are defined in Section 334.03, Florida Statutes. Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network.

B.C.2.2.a a Basic Classification

Basic Classification

Basic functional categories include arterial, collector, and local roads which may be subdivided into principal, major, or minor levels. These levels may be additionally divided into rural and urban categories. This basic classification system is utilized throughout this Manual.

Basic functional categories include arterial, collector, and local roads which may be subdivided into principal, major, or minor levels. These levels may be additionally divided into rural and urban categories. This basic classification system is utilized throughout this Manual.

BC.2.a.1 Local Road

A route providing service which is of relatively low average traffic volume, short average trip length or minimal through-traffic movements, and high land access for abutting property.

BC.2.a.2 Collector Road

A route providing service which is of relatively moderate average traffic volume, moderately average trip length, and moderately average operating speed. These routes also collect and distribute traffic between local roads or arterial roads and serve as a linkage between land access and mobility needs.

BC.2.a.3 Arterial Road

A route providing service which is relatively continuous and of relatively high traffic volume, long average trip length, generally higher operating speed, and high mobility importance. In addition, ~~every~~ United States numbered highways ~~is an~~ shall be arterial roads.

BC.2.b Classification Modifications

Design and classification of streets and highways should also be based upon a consideration of highway user expectations. The function of any facility, as perceived by the user, essentially determines the driver's willingness to accept restrictions upon speed, capacity, access, or level of service. Basic classification systems may also be modified by the following variables:

BC.2.b.1 Urban

Urban area highway users will generally accept lower speeds and levels of service. Economic constraints in urban areas are also generally more severe. Minor modifications in design criteria are, therefore, appropriate for urban streets. **CHAPTER 19 – TRADITIONAL NEIGHBORHOOD DEVELOPMENT** provides additional information for the design of urban streets.

BC.2.b.2 Major/Minor

Streets and highways may be classified as major or minor depending upon traffic volume, trip length, and mobility.

Additional information on the functional classification of roadways may be found in ***Highway Functional Classification Concepts, Criteria and Procedures, 2013 Edition (FHWA)***.

CB CONSIDERATIONS for ROADSIDE DESIGN CONFLICTING CRITERIA

~~Development of safe streets and highways for all modes of surface transportation (autos, trucks, bicycles, pedestrians, transit vehicles, etc.) should receive the highest priority in the design process. This objective may tend to be compromised by other conflicting requirements and demands upon the highway system. The following criteria should be considered and resolved in the initial planning and design of streets and highways to avoid a sacrifice of required safety characteristics. The criteria are not listed in order of priority, and the weighting of each criterion should be based on the context of a project, the available resources, and the users.~~

C.1 Safety

Development of safe streets and highways for all modes of surface transportation (autos, trucks, bicycles, pedestrians, transit vehicles, etc.) should be given a high priority in the design process. Good roadway design is key to safe and efficient operation and should be sensitive to the surrounding environment. The safety performance of roadway elements should be considered in planning, design, construction, maintenance, and operation phases to be truly comprehensive.

CB.21 Economic Constraints

In determining the benefit/cost ratio for any proposed facility, the economic evaluation should go beyond the actual expenditure of highway funds and the capacity and efficiency of the facility. Overall costs and benefits of various alternatives should include an evaluation of all the known ~~probable~~ environmental, community, and social impact and their effect upon highway quality and cost.

Allocation of sufficient funds for obtaining the proper corridor and adequate right of way and alignment should receive the initial priority. Future acquisition of additional right of way and major changes in alignment are often economically prohibitive. This can result in substandard streets and highways with permanent hazards. Reconstruction or modification under traffic is expensive, inconvenient, and hazardous to the highway user. This increase in costs, hazards, and inconvenience can be limited by initial development of quality facilities.

CB.32 Access

~~Demand for access to streets and highways by adjacent property owners can produce problems.~~ Although the public must have reasonable access to the highway network, it is necessary to have certain controls and restrictions. Allowing indiscriminate access can seriously compromise the safety capacity and level of service of a street or highway, consequently reducing its utility and general economic value. The level and type of access should be tied to the functional class of the roadway.

The proper layout of the highway network and the utilization of effective land use controls (CHAPTER 2 - LAND DEVELOPMENT) can provide the basis for regulating access. The actual access controls should conform to the guidelines given in CHAPTER 3 - GEOMETRIC DESIGN.

CB.43 Maintenance Capabilities

Planning and design of streets and highways should include provisions for the performance of required maintenance. The planning of the expected maintenance program should be coordinated with the initial highway design to ensure maintenance activities may be conducted without excessive traffic conflicts or hazards.

CB.54 Utility and Transit Operations

Utility accommodation within rights of way is generally considered to be in the public's best interest, since rights of way frequently offer the most practical engineering, construction, and maintenance solutions for utility service to businesses and residences. Utility and transit facility locations should be carefully chosen to ~~optimize~~minimize interference with the operations and safety of the transportation facility. Additional information on the design of transit facilities can be found in CHAPTER 13 TRANSIT.

CB.65 Emergency Response ~~for Fire, Police, etc.~~

Development of an effective emergency response program is dependent upon the nature of the highway network and the effectiveness of the operation of the system. Provisions for emergency access and communication should be considered in the initial planning and design of all streets and highways. Local

emergency response personnel should be included in primary activities.

CB.76 Environmental Impact

Construction and operation of streets and highways frequently produces an adverse effect upon the environment. Early consideration and resolution of environmental ~~issues~~ ~~problems~~ can avoid costly delays and modifications that may compromise the quality and efficiency of operation. Specific ~~topics~~ ~~problems~~ often encountered include the following:

- ~~Air Quality~~ ~~Noise pollution~~
- ~~Coastal Zone Resources~~ ~~Air and water pollution~~
- ~~Farmland~~ ~~Interruption of the hydrological system~~
- ~~Floodplains~~ ~~Degradation of the biological system~~
- ~~Hazardous Waste and Brownfields~~
- ~~Noise~~
- ~~Roadside vegetation~~
- ~~Safe Drinking Water Act~~
- ~~Water Quality~~
- ~~Watersheds Management~~
- ~~Wetlands~~
- ~~Wild and Scenic Rivers and Wilderness~~ Areas
- ~~Wildlife and~~ ~~Threatened~~ ~~and Endangered Species~~
- ~~Wildlife, Habitat and Ecosystems~~

CB.87 Community and Social Impact

Quality and value of a community is directly influenced by the layout and design of streets and highways. Quality of the network determines the freedom and efficiency of movement. Inadequate design of the network and poor land use practices can lead to undesirable community separation and deterioration. Specific design of streets and highways has a large effect upon the overall aesthetic value which is important to the motorist and resident.

- Bicycle and Pedestrian Issues
- Corridor Preservation
- Historical and Archaeological Preservation
- Scenic Byways
- Section 4(f) and 5(f)
- Visual Impacts

Conflicting criteria should be resolved through early coordination. It is the responsibility of the planner and designer to consider, and where possible, select alternatives alleviating conflicts and promoting positive solutions to interrelated problems.

CB.98 Modes of Transportation

Planning processes should analyze/evaluate other modes of transportation and their relationship to the highway system. Recommendations for incorporation into the design process should be made. This will involve coordination with local, city, county, special interest groups, etc., in developing such recommendations.

C HIGHWAY FUNCTION AND CLASSIFICATION

A determination of the function and operational requirements, and a clear definition of the classification of each new facility are required prior to the actual design.

C.1 Function

Design of each new street or highway is based upon its function in the highway system. Operational requirements that must be satisfied to fulfill this function are dependent upon the following factors:

C.1.a Volume

Volume of traffic that must be carried by the facility is a primary factor governing the design. Variations in volume with respect to direction and time should also be evaluated to determine the expected requirements for peak capacities.

C.1.b Highway User Types

Types and relative volumes of highway users expected to use the street or highway influence trip characteristics and design features.

C.1.c Trip Characteristics

Functions of a new facility are, to a large extent, determined by the length and purpose of vehicle trips. Trip characteristics are influenced by land use characteristics and the highway network layout.

C.1.d Speed

Operating speed (to be maintained) should meet reasonable expectations of the users.

C.1.e Safety

Provisions of streets and highways with safe operating characteristics shall be considered a primary requirement.

C.1.f — Level of Service

~~Level of service is essentially a measure of the quality of the overall operating characteristics of a street or highway. Factors involved in determining the level of service include speed and safety, as well as travel time; traffic conflicts and interruptions; freedom to maneuver; driving convenience and comfort; and operating costs. Level of service is also dependent upon actual traffic volume and composition of traffic.~~

C.1.g — Access Requirements

~~Degree and type of access permitted on a given facility is dependent upon its intended function and should conform to the guidelines in CHAPTER 3 – GEOMETRIC DESIGN. Reasonable access control must be exercised to allow a street or highway to fulfill its function.~~

C.1.h — Public Transit Use

~~Both current and planned use by public transit influence design features. Transit vehicles increase capacity on a roadway. There must be the ability to safely stop along the roadway to board and discharge passengers.~~

C.2 — Classification

~~Road classifications are defined in Section 334.03, Florida Statutes. Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network.~~

C.2.a — Basic Classification

~~Basic functional categories include arterial, collector, and local roads which may be subdivided into principal, major, or minor levels. These levels may be additionally divided into rural and urban categories. This basic classification system is utilized throughout this Manual.~~

C.2.a.1 — Local

A route providing service which is of relatively low average traffic volume, short average trip length or minimal through-traffic movements, and high land access for abutting property.

C.2.a.2 — Collector

A route providing service which is of relatively moderate average traffic volume, moderately average trip length, and moderately average operating speed. These routes also collect and distribute traffic between local roads or arterial roads and serve as a linkage between land access and mobility needs.

C.2.a.3 — Arterial

A route providing service which is relatively continuous and of relatively high traffic volume, long average trip length, generally higher operating speed, and high mobility importance. In addition, all United States numbered highways shall be arterial roads.

C.2.b — Classification Modifications

Design and classification of streets and highways should also be based upon a consideration of highway user expectations. The function of any facility, as perceived by the user, essentially determines the driver's willingness to accept restrictions upon speed, capacity, access, or level of service. Basic classification systems may also be modified by the following variables:

C.2.b.1 — Urban

Urban area highway users will generally accept lower speeds and levels of service. Economic constraints in urban areas are also generally more severe. Minor modifications in design criteria are, therefore, appropriate for urban streets.

C.2.b.2 Major/Minor

~~Streets and highways may be classified as major or minor depending upon traffic volume, trip length, and mobility.~~

D OPERATION

The concept of operating the existing highway network as a system is essential to promote safety, efficiency, mobility, and economy. This requires comprehensive planning and coordination of all activities on each street and highway. These activities would include maintenance, construction, utility operations, public transit operations, traffic control, and emergency response operations. ~~Although the behavior of the individual road users~~ motorist is somewhat independent, driver actions and response should ~~also~~ be considered as an integral part of the operation of streets and highways. Coordination of the planning and supervision of each activity on each facility is necessary to achieve safety and efficient operation of the total highway system.

D.1 Policy

Each highway agency with general responsibility for existing streets and highways should establish and maintain an operations department. Each existing street or highway should be assigned to the jurisdiction of the operations department. The operations department shall be responsible for planning, supervising, and coordinating all activities affecting the operating characteristics of the highway system under its jurisdiction.

D.2 Objectives

The primary objective of an operations department shall be to maintain or improve the operating characteristics of the highway system under its jurisdiction. These characteristics include safety, capacity, and level of service. The preservation of the function of each facility, which would include access control, is necessary to maintain these characteristics and the overall general value of a street or highway.

D.3 Activities

The achievement of these objectives requires the performance of a variety of coordinated activities by the operations department. The following activities should be considered as minimal for promoting the safe and efficient operation of a highway system.

D.3.a Maintenance and Reconstruction

Maintaining or upgrading the quality of existing facilities is an essential factor in preserving desirable operating characteristics. The planning and execution of maintenance and reconstruction activity on existing facilities must be closely coordinated with all other operational activities and, therefore, should be under the general supervision of the operations department.

All maintenance work should be conducted in accordance with the requirements of CHAPTER 10 - MAINTENANCE. The priorities and procedures utilized should be directed toward improvement of the existing system. The standards set forth in this Manual should be used as guidelines for establishing maintenance and reconstruction objectives. All maintenance and reconstruction projects should be planned to minimize traffic control conflicts and hazards.

D.3.b Work Zone Safety

An important responsibility of the operations department is the promotion of work zone safety on the existing highway system. The planning and execution of maintenance, construction, and other activities shall include provisions for the safety of motorists, bicyclists, pedestrians, and workers. All work shall be conducted in accordance with the requirements presented in CHAPTER 11 - WORK ZONE SAFETY.

D.3.c Traffic Control

Traffic engineering is a vital component of highway operations. The planning and design of traffic control devices should be carried out in conjunction with the overall design of the street or highway and highway user. The devices and procedures utilized for traffic control should be predicated upon developing uniformity throughout the system and compatibility with adjacent jurisdictions.

A primary objective to be followed in establishing traffic control procedures is the promotion of safe, orderly traffic flow. The cooperation of police agencies and coordination with local transit providers is essential for the achievement of this objective. Traffic control during maintenance,

construction, utility, or emergency response operations should receive special consideration.

D.3.d Emergency Response

The emergency response activities (i.e., emergency maintenance and traffic control) of the operations department should be closely coordinated with the work of police, fire, ambulance, medical, and other emergency response agencies. The provisions for emergency access and communications should be included in the initial planning for these activities.

D.3.e Coordination and Supervision

Coordination and supervision of activities on the highway system should include the following:

- Supervision and/or coordination of all activities of the operations department and other agencies to promote safe and efficient operation
- Coordination of all activities to provide consistency within a given jurisdiction
- Coordination with adjacent jurisdictions to develop compatible highway systems
- Coordination with other transportation modes to promote overall transportation efficiency

D.3.f Inspection and Evaluation

The actual operation of streets and highways provides valuable experience and information regarding the effectiveness of various activities. Each operations department should maintain a complete inventory of its highway system and continuously inspect and evaluate the priorities, procedures, and techniques utilized in all activities on the existing system under its jurisdiction. Activities by other agencies, as well as any highway agency, should be subjected to this supervision.

Promotion of highway safety should be aided by including a safety office (or officer) as an integral part of the operations department. Functions of this office would include the identification and inventory of hazardous locations and procedures for improving the safety characteristics of highway operations.

Results of this inspection and evaluation program should be utilized to make the modification necessary to promote safe and efficient operation. Feedback for modifying design criteria should be generated by this program. Experience and data obtained from operating the system should be utilized as a basis for recommending regulatory changes. Cooperation of legislative, law enforcement, and regulatory agencies is essential to develop the regulation of vehicles, driver behavior, utility, emergency response activities, and the access land use practices necessary for the safe and efficient operation of the highway system.

E References

Design criteria are established for transportation projects to ensure that they provide safe, economical, and fully-functional multimodal transportation facilities. Various FDOT publications contain information on procedures, criteria, and standards for guiding and controlling design and construction activities. There are many local, state, and federal laws and rules that may impact the design of a project. These laws and rules are referenced in the publications when the Department is aware of them.

For situations where specific design standards or criteria cannot be found in the FDOT publications, current approved technical publications such as AASHTO's *Policy on Geometric Design of Highways and Streets* should be used as design guidelines. Local agencies must ensure that project designs meet or exceed the referenced design criteria and that the standards developed from acceptable guidelines are appropriate for the proposed facility.

The following publications establish guidance and criteria for the critical areas of Roadway and Bridge/Structure designs:

- Plans Preparation Manual, Volume I (Topic No. 625-000-007) and Volume II (Topic No. 625-000-008)
<http://www.dot.state.fl.us/rddesign/PPMManual/PPM.shtm>
- Design Standards (Standard Indexes) (Topic No. 625-010-003)
<http://www.dot.state.fl.us/rddesign/DesignStandards/Standards.shtm>
- Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook) (Topic No. 625-000-015)
<http://www.dot.state.fl.us/rddesign/FloridaGreenbook/FGB.shtm>
- A Policy on Geometric Design of Highways and Streets, 6th Edition (AASHTO Green Book) (AASHTO Bookstore GDHS-6)
https://bookstore.transportation.org/collection_detail.aspx?ID=110
- FDOT Standard Specifications for Road and Bridge Construction
<http://www.dot.state.fl.us/specificationsoffice/Implemented/SpecBooks/default.shtm>

- [AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 6th Edition \(AASHTO Bookstore LRFDUS-6-M\)](https://bookstore.transportation.org/item_details.aspx?id=1924)
https://bookstore.transportation.org/item_details.aspx?id=1924
- [FDOT Structures Manual \(Topic No. 625-020-018\)](http://www.dot.state.fl.us/structures/StructuresManual/CurrentRelease/StructuresManual.shtm)
<http://www.dot.state.fl.us/structures/StructuresManual/CurrentRelease/StructuresManual.shtm>
- [FDOT Facilities Design Manual \(Topic No. 625-020-016\)](http://www.dot.state.fl.us/projectmanagementoffice/Publications/default.shtm)
<http://www.dot.state.fl.us/projectmanagementoffice/Publications/default.shtm>
- [Florida Intersection Design Guide](http://www.dot.state.fl.us/rddesign/FIDG-Manual/FIDG.shtm)
<http://www.dot.state.fl.us/rddesign/FIDG-Manual/FIDG.shtm>
- [NCHRP Report 672 – Roundabouts: An Informational Guide, 2nd Edition](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf)
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf
- [AASHTO Highway Safety Manual, 1st Edition \(AASHTO Bookstore HSM-1\)](https://bookstore.transportation.org/collection_detail.aspx?ID=33)
https://bookstore.transportation.org/collection_detail.aspx?ID=33
- [Local Agency Program Manual \(Topic No. 525-010-300\)](http://www.dot.state.fl.us/projectmanagementoffice/lap/LAP_TOC.shtm)
http://www.dot.state.fl.us/projectmanagementoffice/lap/LAP_TOC.shtm
- [Project Development and Environmental Manual Part 1 and Part 2 \(Topic No. 650-000-001\)](http://www.dot.state.fl.us/emo/pubs/pdeman/pdeman1.shtm)
<http://www.dot.state.fl.us/emo/pubs/pdeman/pdeman1.shtm>
- [Rigid Pavement Design Manual \(Topic No. 625-010-006\)](http://www.dot.state.fl.us/rddesign/PM/Publications.shtm)
<http://www.dot.state.fl.us/rddesign/PM/Publications.shtm>
- [Flexible Pavement Design Manual \(Topic No. 625-010-002\)](http://www.dot.state.fl.us/rddesign/PM/publicationS.shtm)
<http://www.dot.state.fl.us/rddesign/PM/publicationS.shtm>
- [FDOT Drainage Manual \(Topic No. 625-040-002\)](http://www.dot.state.fl.us/rddesign/Hydraulics/ManualsandHandbooks.shtm)
<http://www.dot.state.fl.us/rddesign/Hydraulics/ManualsandHandbooks.shtm>
- [Soils and Foundations Handbook](http://www.dot.state.fl.us/structures/DocsandPubs.shtm)
<http://www.dot.state.fl.us/structures/DocsandPubs.shtm>
- [Standard Highway Signs \(FHWA\)](http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm)
http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

- [Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition](http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm)
http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm
- [Roadway Lighting Design Guide \(AASHTO Bookstore GL-6\)](https://bookstore.transportation.org/item_details.aspx?id=320)
https://bookstore.transportation.org/item_details.aspx?id=320
- [AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition \(AASHTO Bookstore LTS-6\)](https://bookstore.transportation.org/collection_detail.aspx?ID=126)
https://bookstore.transportation.org/collection_detail.aspx?ID=126
- [Highway Functional Classification: Concepts, Criteria and Procedures, 2013 Edition \(FHWA\)](http://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section00.cfm)
http://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section00.cfm
- [Highway Capacity Manual 2010 \(Transportation Research Board\) \(TRB Bookstore HCM10\)](http://books.trbbookstore.org/hcm10.aspx)
<http://books.trbbookstore.org/hcm10.aspx>
- [Quality/Level of Service Handbook](http://www.dot.state.fl.us/planning/systems/programs/sm/los/default.shtm)
<http://www.dot.state.fl.us/planning/systems/programs/sm/los/default.shtm>
- [Manual on Uniform Traffic Studies \(Topic No. 750-020-007\)](http://www.dot.state.fl.us/trafficoperations/Operations/Studies/MUTS/muts.shtm)
<http://www.dot.state.fl.us/trafficoperations/Operations/Studies/MUTS/muts.shtm>
- [Surveying Procedure \(Topic No. 550-030-101\)](http://www.dot.state.fl.us/surveyingandmapping/doc_pubs.shtm)
http://www.dot.state.fl.us/surveyingandmapping/doc_pubs.shtm
- [Right of Way Mapping Procedure \(Topic No. 550-030-015\)](http://www.dot.state.fl.us/surveyingandmapping/doc_pubs.shtm)
http://www.dot.state.fl.us/surveyingandmapping/doc_pubs.shtm
- [Guide for the Development of Bicycle Facilities, 4th Edition \(AASHTO Bookstore GBF-4\)](https://bookstore.transportation.org/collection_detail.aspx?ID=116)
https://bookstore.transportation.org/collection_detail.aspx?ID=116
- [Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition \(AASHTO Bookstore GPF-1\)](https://bookstore.transportation.org/collection_detail.aspx?ID=39)
https://bookstore.transportation.org/collection_detail.aspx?ID=39
- [Accessing Transit Design Handbook for Florida Bus Passenger Facilities](http://www.dot.state.fl.us/transit/Pages/NewTransitFacilitiesDesign.shtm)
<http://www.dot.state.fl.us/transit/Pages/NewTransitFacilitiesDesign.shtm>

NCHRP 15-52 [Anticipated]

Developing a More Flexible and Context-Sensitive Functional Classification System for Geometric Design

Project Data

Source:	AASHTO Highway Subcommittee on Design
Funds:	\$250,000
Staff Responsibility:	B. Ray Derr
Fiscal Year:	2014

*This project has been tentatively selected and a project statement (request for proposals) is expected in **April 2014**. The project statement will be available on the world wide web site. The problem statement below will be the starting point for a panel of experts to develop the project statement.*

Since 1984, the AASHTO "Green Book" (*A Policy on the Geometric Design of Highways and Streets*) and other roadway design criteria have been based on a functional classification system of a hierarchical roadway network composed of arterials, collector roads, and local roads. This classification is further broken out by an urban or rural designation. This system, though traditional, is rigid. Definitions of arterials and collectors are fairly well defined, and the determination of urban or rural is based on the census. Once a roadway is classified, the designer uses this information to determine design criteria. It is at this point that the designer, through a context-sensitive approach, determines the appropriate design criteria for the project. This rigid system is also used by planners in distributing funding and establishing project priorities. While this is the accepted method, the so-called flexibility in design is initially constrained by the classification. If a more flexible system could be developed for the initial classification, this would enable the designer to address context at a much earlier stage. This would also aid in the public perception of a more flexible and context-sensitive approach to community needs.

The Federal-Aid Highway Act of 1973 required the use of functional highway classification to update and modify the federal-aid highway systems. This legislative requirement is still effective today. Further, procedures for functional classification in urbanized areas are required to be developed within the framework of the continuing, comprehensive, and cooperative planning process carried out pursuant to Section 134 of Title 23, U.S. Code. The Federal Highway Administration's *2008 Updated Guidance for the Functional Classification of Highways* and the Green Book are the principal sources of guidance to transportation planners and designers on the function of the highway system, including the concept of functional classification, hierarchies of movements and components, functional relationships, access needs/controls, and functional system characteristics.

However, over the past three decades or so this system of highway classification has been under increasing scrutiny and discussion due to its inability to flexibly respond to variances in many factors influencing highway design. These factors primarily address context sensitivity and items such as accommodation of bicycles and pedestrians, transit service, aesthetics, livability, on-street parking, and other relationships to a highway's surrounding environment. Limited research and guidance is available regarding how these factors are impacted by current functional classification guidelines. Very little technical analysis has been done to correlate and balance the elements of traditional functional classification concepts with the range of "contextual" issues noted above. As a result, many technical papers, presentations, and new guidance documents have been developed by a wide range of interests to offer expanded and sometimes new definitions and characteristics of functional classification beyond those provided by FHWA and AASHTO.

The objectives of this research are: (1) develop a more flexible, context-sensitive methodology for classifying roadways; (2) review the traditional methods of classifying roadways based on function; (3) identify historical problems and perceptions with this method; (4) research alternative methods for classifying roadways; (5) develop alternative methods for classifying roadways; (6) develop alternative methods for determining "urban" and "rural" context; and (7) encourage flexibility in the choice of functional classification. The research will build upon related FHWA efforts and NCHRP Project 15-47, "Developing an Improved Highway Geometric Design Process."

The research study would first review the traditional method(s) for roadway classifications and identify the advantages and disadvantages to this approach. This would be based on the designer's use of this method for classifying roadways which would subsequently determine controlling design criteria. This would also be based on planners' use of the classification system as a method to determine priorities and availability of funds. Public perception of transportation departments' use of this classification system will also be reviewed.

The research would investigate alternative methods for classifying roadways. This would include alternatives considered or used by state DOTs and other agencies as well as the "new urbanism" approaches. This would include alternative methods for determining density other than the traditional census definition of urban and rural. This would also include a broader classification of the urban and rural environments such as: town centers, central business districts, suburbs, densely or sparsely populated areas, and developed or natural regions, etc.

The research would develop new methods or combinations of methods that might be used to classify roadways with consideration for geographical context. This would be based on the research of innovative methods to classify roadways and may develop from a combination of various ideas. Emphasis would be placed on expanding on the flexibility approach in the Green Book.

The research would consider how the new method(s) might be used in conjunction with the AASHTO Green Book or other design criteria. This would include consideration of context in the initial selection of the functional classification. [Note, this might be similar to the way design speed is now determined in the Green Book by selecting an appropriate design speed for the facility based on context. An agency could similarly be selecting the "appropriate" classification for the roadway based on context and then use this classification system to subsequently utilize design criteria.]

The research would then conclude with how this new method(s) of classification addressed the goals of this research study. How might designers and planners benefit from this system? How might the public and communities be better served?

To create a link to this page, use this URL: <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3656>

CHAPTER 3

GEOMETRIC DESIGN

A	INTRODUCTION	3-1
B	OBJECTIVES	3-3
C	DESIGN ELEMENTS	3-4
C.1	Design Speed	3-4
C.2	Design Vehicles	3-6
C.3	Sight Distance.....	3-9
C.3.a	Stopping Sight Distance.....	3-9
C.3.b	Passing Sight Distance	3-12
C.3.c	Sight Distance at Decision Points	3-12
C.3.d	Intersection Sight Distance	3-13
C.4	Horizontal Alignment.....	3-13
C.4.a	General Criteria.....	3-13
C.4.b	Superelevation.....	3-14
C.4.c	Curvature	3-19
C.4.d	Superelevation Transition (superelevation runoffs plus tangent runoff)	3-22
C.4.e	Lane Widening on Curves.....	3-22
C.5	Vertical Alignment.....	3-25
C.5.a	General Criteria.....	3-25
C.5.b	Grades	3-25
C.5.c	Vertical Curves.....	3-27
C.6	Alignment Coordination.....	3-32
C.7	Cross Section Elements.....	3-34
C.7.a	Number of Lanes	3-34
C.7.b	Pavement.....	3-34
C.7.b.1	Pavement Width.....	3-34
C.7.b.2	Pavement Cross Slope (not in superelevation)	3-35
C.7.c	Shoulders.....	3-36
C.7.c.1	Shoulder Width.....	3-36

	C.7.c.2	Shoulder Cross Slope	3-37
C.7.d		Sidewalks.....	3-38
C.7.e		Medians	3-39
	C.7.e.1	Type of Median.....	3-40
	C.7.e.2	Median Width	3-40
	C.7.e.3	Median Slopes.....	3-43
	C.7.e.4	Median Barriers	3-43
C.7.f		Roadside Clear Zone	3-44
	C.7.f.1	Roadside Clear Zone Width	3-44
	C.7.f.2	Roadside Slopes	3-46
	C.7.f.3	Criteria for Guardrail.....	3-46
C.7.g		Curbs	3-47
C.7.h		Parking.....	3-47
C.7.i		Right of Way	3-47
C.7.j		Changes in Typical Section.....	3-49
	C.7.j.1	General Criteria	3-49
	C.7.j.2	Lane Deletions and Additions.....	3-49
	C.7.j.3	Special Use Lanes	3-49
	C.7.j.4	Structures	3-49
		C.7.j.4.(a) Horizontal Clearance.....	3-50
		C.7.j.4.(b) Vertical Clearance	3-50
		C.7.j.4.(c) End Treatment.....	3-50
C.8		Access Control.....	3-51
	C.8.a	Justification	3-51
	C.8.b	General Criteria.....	3-51
		C.8.b.1 Location of Access Points	3-51
		C.8.b.2 Spacing of Access Points.....	3-51
		C.8.b.3 Restrictions of Maneuvers.....	3-52
		C.8.b.4 Turn Lanes	3-52
		C.8.b.5 Grade Separation	3-53
		C.8.b.6 Roundabouts.....	3-53
	C.8.c	Control for All Limited Access Highways.....	3-54
	C.8.d	Control of Urban Streets	3-55
	C.8.e	Control for Rural Highways	3-56

	C.8.f	Land Development.....	3-56
C.9		Intersection Design	3-57
	C.9.a	General Criteria.....	3-57
	C.9.b	Sight Distance.....	3-58
		C.9.b.1 General Criteria	3-59
		C.9.b.2 Obstructions to Sight Distance	3-62
		C.9.b.3 Stopping Sight Distance	3-63
		C.9.b.3.(a) Approach to Stops.....	3-63
		C.9.b.3.(b) On Turning Roads.....	3-63
	C.9.b.4	Sight Distance for Intersection Maneuvers	3-66
		C.9.b.4.(a) Driver's Eye Position and Vehicle Stopping Position	3-67
		C.9.b.4.(b) Design Vehicle	3-68
		C.9.b.4.(c) Case B1 - Left Turns From the Minor Road	3-68
		C.9.b.4.(d) Case B2 - Right Turns From the Minor Road and Case B3 – Crossing Maneuver From the Minor Road	3-69
		C.9.b.4.(e) Intersections with Traffic Signal Control (AASHTO Case D)	3-70
		C.9.b.4.(f) Intersections with All-Way Stop Control (AASHTO Case E).....	3-70
		C.9.b.4.(g) Left Turns from the Major Road (AASHTO Case F)	3-70
		C.9.b.4.(h) Intersection Sight Distance References.....	3-71
	C.9.c	Auxiliary Lanes.....	3-73
		C.9.c.1 Merging Maneuvers.....	3-73
		C.9.c.2 Acceleration Lanes.....	3-75
		C.9.c.3 Exit Lanes	3-79
	C.9.d	Turning Roadways at Intersections.....	3-84
		C.9.d.1 Design Speed.....	3-84
		C.9.d.2 Horizontal Alignment	3-84
		C.9.d.3 Vertical Alignment	3-85
		C.9.d.4 Cross Section Elements	3-86

C.9.e	At Grade Intersections	3-88	
	C.9.e.1 Turning Radii	3-88	
	C.9.e.2 Cross Section Correlation	3-88	
	C.9.e.3 Median Openings	3-89	
	C.9.e.4 Channelization.....	3-89	
C.9.f	Driveways	3-90	
C.9.g	Interchanges	3-90	
C.9.h	Clear Zone	3-91	
C.10	Other Design Factors	3-92	
	C.10.a Pedestrian Facilities.....	3-92	
		C.10.a.1 Policy and Objectives - New Facilities.....	3-92
		C.10.a.2 Accessibility Requirements	3-92
		C.10.a.3 Sidewalks	3-93
		C.10.a.4 Curb Ramps	3-93
		C.10.a.5 Additional Considerations.....	3-94
	C.10.b Bicycle Facilities.....	3-94	
	C.10.c Bridge Design Loadings.....	3-95	
	C.10.d Dead End Streets and Cul-de-sacs.....	3-95	
	C.10.e Bus Benches and Transit Shelters.....	3-95	
	C.10.f Traffic Calming.....	3-96	
C.11	Reconstruction	3-96	
	C.11.a Introduction	3-96	
	C.11.b Evaluation of Streets and Highways	3-96	
	C.11.c Priorities	3-97	
C.12	Design Exceptions	3-99	
C.13	Very Low-Volume Local Roads (ADT \leq 400)	3-100	
	C.13.a Bridge Width	3-100	
	C.13.b Roadside Design.....	3-100	

TABLES

TABLE 3 – 1	RECOMMENDED MINIMUM DESIGN SPEED (MPH)	3-6
TABLE 3 - 2	DESIGN VEHICLES	3-8
TABLE 3 – 3	SIGHT DISTANCES AND LENGTHS OF VERTICAL CURVES	3-11
TABLE 3 – 4	HORIZONTAL CURVATURE	3-20
TABLE 3 – 5A	CALCULATED AND DESIGN VALUES FOR TRAVELED WAY WIDENING ON OPEN HIGHWAY CURVES (TWO-LANE HIGHWAYS, ONE-WAY OR TWO-WAY)	3-23
TABLE 3 – 5B	ADJUSTMENTS FOR TRAVELED WAY WIDENING VALUES ON OPEN HIGHWAY CURVES (TWO-LANE HIGHWAYS, ONE-WAY OR TWO-WAY)	3-24
TABLE 3 – 6	RECOMMENDED MAXIMUM GRADES IN PERCENT.....	3-26
TABLE 3 – 7	MAXIMUM CHANGE IN GRADE WITHOUT USING VERTICAL CURVE.....	3-28
TABLE 3 – 8	MINIMUM LANE WIDTHS.....	3-35
TABLE 3 – 9	MINIMUM WIDTHS OF PAVEMENT AND SHOULDERS FOR TWO (2) LANE RURAL HIGHWAYS	3-35
TABLE 3 – 10	SHOULDER WIDTHS FOR MULTILANE RURAL DIVIDED HIGHWAYS.....	3-37
TABLE 3 – 11	MEDIAN WIDTH FOR FREEWAYS (URBAN AND RURAL).....	3-42
TABLE 3 – 12	MEDIAN WIDTH FOR RURAL HIGHWAYS (MULTILANE FACILITIES).....	3-42
TABLE 3 – 13	MINIMUM WIDTH OF CLEAR ZONE.....	3-45
TABLE 3 – 14	ACCESS CONTROL FOR ALL LIMITED ACCESS HIGHWAYS	3-55
TABLE 3 – 15	SIGHT DISTANCE FOR APPROACH TO STOPS.....	3-64
TABLE 3 – 16	LENGTH OF TAPER FOR USE IN CONDITIONS WITH FULL WIDTH SPEED CHANGE LANES.....	3-73
TABLE 3 – 17	DESIGN LENGTHS OF SPEED CHANGE LANES FLAT GRADES - 2 PERCENT OR LESS.....	3-76
TABLE 3 – 18	RATIO OF LENGTH OF SPEED CHANGE LANE ON GRADE TO LENGTH ON LEVEL	3-77
TABLE 3 – 19	MINIMUM ACCELERATION LENGTHS FOR ENTRANCE TERMINALS.....	3-78
TABLE 3 – 20	MINIMUM DECELERATION LENGTHS FOR EXIT TERMINALS...	3-81
TABLE 3 – 21	SUPERELEVATION RATES FOR CURVES AT INTERSECTIONS	3-84

C.3 Sight Distance

The provision for adequate horizontal and vertical sight distance is an essential factor in the development of a safe street or highway. An unobstructed view of the upcoming roadway is necessary to allow time and space for the safe execution of passing, stopping, intersection movements, and other normal and emergency maneuvers. It is also important to provide as great a sight distance as possible to allow the driver time to plan for future actions. The driver is continuously required to execute normal slowing, turning, and acceleration maneuvers. If he can plan in advance for these actions, traffic flow will be smoother and less hazardous. Unexpected emergency maneuvers will also be less hazardous if they are not combined with uncertainty regarding the required normal maneuvers. The appropriate use of lighting (CHAPTER 6 - ROADWAY LIGHTING) may be required to provide adequate sight distances for night driving.

Future obstruction to sight distance that may develop (e.g., vegetation) or be constructed should be taken into consideration in the initial design. Areas outside of the highway right of way that are not under the highway agency's jurisdiction should be considered as points of obstruction. Planned future construction of median barriers, guardrails, grade separations, or other structures should also be considered as possible sight obstructions.

C.3.a Stopping Sight Distance

Safe stopping sight distances shall be provided continuously on all streets and highways. The factors, which determine the minimum distance required to stop, include:

- Vehicle speed
- Driver's total reaction time
- Characteristics and conditions of the vehicle
- Friction capabilities between the tires and the roadway surface
- Vertical and horizontal alignment of the roadway

It is desirable that the driver be given sufficient sight distance to avoid an object or slow moving vehicle with a natural, smooth maneuver rather than an extreme or panic reaction.

The determination of available stopping sight distance shall be based on a height of the driver's eye equal to 3.50 feet and a height of obstruction to be avoided equal to 0.50 feet. It would, of course, be desirable to use a height of obstruction equal to zero (coincident with the roadway surface) to provide the driver with a more positive sight condition. Where horizontal sight distance may be obstructed on curves, the driver's eye and the obstruction shall be assumed to be located at the centerline of the travel lane on the inside of the curve.

The stopping sight distance shall be no less than the values given in [Table 3-3](#).

**TABLE 3 – 3
 SIGHT DISTANCES AND LENGTHS OF VERTICAL CURVES**

MINIMUM STOPPING SIGHT DISTANCES (FEET) (For application of stopping sight distance, use an eye height of 3.50 feet and an object height of 6 inches above the road surface)												
Design Speed (MPH)	15	20	25	30	35	40	45	50	55	60	65	70
Stopping Sight Distance (FEET)	80	115	155	200	250	305	360	425	495	570	645	730

ROUNDED K VALUES FOR MINIMUM LENGTHS VERTICAL CURVES												
$L = KA$												
L = LENGTH OF VERTICAL CURVE				A = ALGEBRAIC DIFFERENCE OF GRADES IN PERCENT								
Design Speed (MPH)	15	20	25	30	35	40	45	50	55	60	65	70
K Values for Crest Vertical Curves	5	10	19	31	47	70	98	136	185	245	313	401
K Values for Sag Vertical Curves	10	17	26	37	49	64	79	96	115	136	157	181
<ul style="list-style-type: none"> The length of vertical curve must never be less than three times the design speed of the highway Curve lengths computed from the formula $L = KA$ should be rounded upward when feasible The minimum lengths of vertical curves to be used on major highways are shown in the table below 												

MINIMUM LENGTHS FOR VERTICAL CURVES ON MAJOR HIGHWAYS (FEET)			
Design Speed (MPH)	50	60	70
Crest Vertical Curves (FEET)	300	400	500
Sag Vertical Curves (FEET)	200	300	400

MINIMUM PASSING SIGHT DISTANCES (FEET) (For application of passing sight distance, use an eye height of 3.50 feet and an object height of 3.50 feet above the road surface)												
Design Speed (MPH)	20	25	30	35	40	45	50	55	60	65	70	
Minimum Passing Sight Distance (FEET)	710	900	1090	1280	1470	1625	1835	1985	2135	2285	2480	

C.3.b Passing Sight Distance

~~The passing maneuver, which requires occupation of the opposing travel lane, is inherently dangerous. The driver is required to make simultaneous estimates of time, distance, relative speeds, and vehicle capabilities. Errors in these estimates result in frequent and serious crashes.~~

~~Highways with two or more travel lanes in a given direction are not subject to requirements for safe passing sight distance.~~ Two-lane, two-way highways should be provided with safe passing sight distance for as much of the highway as feasible. The driver demand for passing opportunity is high and serious limitations on the opportunity for passing reduces the capacity and safe characteristics of the highway.

The distance traveled after the driver's final decision to pass (while encroaching into the opposite travel path) is that which is required to pass and return to the original travel lane in front of the overtaken vehicle. In addition to this distance, the safe passing sight distance must include the distance traveled by an opposing vehicle during this time period, as well as a reasonable margin of safety. ~~Due to the many variables in vehicle characteristics and driver behavior, the passing sight distance should be as long as is practicable.~~

~~The determination of passing sight distance shall be based on a height of eye equal to 3.50 feet and a height of object passing equal to 3.50 feet.~~ Where passing is permitted, the passing sight distance shall be no less than the values given in [Table 3-3, the MUTCD, Part 3.](#)

C.3.c Sight Distance at Decision Points

It is desirable to provide sight distances exceeding the minimum at changes in geometry, approaches to intersections, entrances and exits, and other potential decision points or hazards. The sight distance should be adequate to allow the driver sufficient time to observe the upcoming situation, make the proper decision, and take the appropriate action in a normal manner.

Minimum stopping distance does not provide sufficient space or time for the driver to make decisions regarding complex situations requiring more than simple perception-reaction process. In many cases, rapid stopping or lane changing may be extremely undesirable and cause hazardous maneuvers (i.e., in heavy traffic conditions); therefore, it would be preferable to provide sufficient sight distance to allow for a more gradual reaction.

The sight distance on a freeway preceding the approach nose of an exit ramp should exceed the minimum by 25 percent or more. A minimum sight distance of 1000 feet, measured from the driver's eye to the road surface is a desirable goal. There should be a clear view of the exit terminal including the exit nose.

C.3.d Intersection Sight Distance

Sight distances for intersection movements are given in the general intersection requirements ([C.9 Intersection Design](#), this chapter).

C.4 Horizontal Alignment

C.4.a General Criteria

The standard of alignment selected for a particular section of highway should extend throughout the section with no sudden changes from easy to sharp curvature. Where sharper curvature is unavoidable, a sequence of curves of increasing degree should be utilized.

Winding alignment consisting of sharp curves is hazardous, reduces capacity, and should be avoided. The use of as flat a curve as possible is recommended. Flatter curves are not only less hazardous, but also frequently less costly due to the shortened roadway.

Maximum curvature should not be used in the following locations:

- High fills or elevated structures. The lack of surrounding objects reduces the driver's perception of the roadway alignment.
- At or near a crest in grade

CHAPTER 4

ROADSIDE DESIGN

A	INTRODUCTION	4-1
B	POLICY	4-1
C	OBJECTIVES	4-2
D	ROADSIDE DESIGN	4-3
D.1	Geometric Changes	4-3
D.1.a	Horizontal Curves	4-3
D.1.b	Vertical Curves.....	4-4
D.1.c	Changes in Cross Section.....	4-4
D.1.d	Decision or Conflict Points	4-4
D.2	Fills.....	4-4
D.3	Cuts.....	4-4
D.4	Roadside Canals.....	4-5
D.5	Vegetation.....	4-5
D.5.a	Stability	4-5
D.5.b	Drainage	4-6
D.5.c	Environmental and Aesthetic Considerations.....	4-6
D.5.d	Landscaping - Design Considerations	4-6
D.6	Drainage	4-7
D.6.a	Inlets	4-7
D.6.b	Ditches.....	4-7
D.6.c	Culverts.....	4-8
D.7	Curbs	4-8
D.8	Poles and Support Structures	4-9
D.9	Intersections.....	4-10
D.10	Underpasses.....	4-10
D.11	Bridges and Overpasses.....	4-10
D.12	Mailboxes.....	4-11
D.13	Bus Shelters.....	4-11

E	PROTECTIVE DEVICES	4-12
E.1	Redirection Devices	4-12
E.1.a	Function	4-12
E.1.b	Warranting Conditions	4-12
E.1.c	Location	4-13
E.1.d	Length	4-13
E.1.e	Vehicle Containment.....	4-13
E.1.f	Barrier Types	4-13
E.1.g	Transitions	4-14
E.1.h	Terminations	4-14
E.2	Energy Absorbing Devices.....	4-15
E.2.a	Function	4-15
E.2.b	Warranting Conditions	4-15
E.2.c	Design Criteria	4-15
E.2.d	Design Details.....	4-16
E	REFERENCES FOR INFORMATIONAL PURPOSES	4-17

CHAPTER 4

ROADSIDE DESIGN

A INTRODUCTION

This chapter presents guidelines and standards for roadside designs intended to reduce the likelihood and/or consequences of roadside crashes. Construction and maintenance of safe medians and roadsides are of vital importance in the development of safe streets and highways.

Many of the standards presented in CHAPTER 3 - GEOMETRIC DESIGN are predicated to a large extent upon reducing the probability of vehicles leaving the proper travel path. Other standards in that chapter are directed toward a reduction in the likelihood and/or consequences of crashes by vehicles leaving the roadway. These standards contain requirements for the design of shoulders, medians, and roadsides including requirements for the use of ~~guardrail and~~ longitudinal barriers. Design of the roadside should be considered and conducted as an integral part of the total highway design.

Due to the variety of causative factors, the designer should consider a vehicle leaving the traveled way at any location. Design of the roadside should be based upon reducing the consequences to errant vehicles and their occupants.

B POLICY

The roadside, which includes the median, shall be considered as the total environment adjacent to the roadway. The design of the roadside shall be considered as an integral part of the total highway design.

C OBJECTIVES

General objectives to be followed in roadside design are to provide an environment that will reduce the likelihood and/or consequences of crashes by vehicles that have left the traveled way. The achievement of this general objective will be aided by the following:

- Roadside areas adequate to allow reasonable space and time for a driver to regain or retain control of the vehicle and stop or return to the traveled way safely.
- Shoulders, medians, and roadsides that may be traversed safely without vehicle vaulting or overturning.
- Location of roadside fixed objects and hazards as far from the travel lane as is economically feasible.
- Roadsides that, ~~in addition to being safe, appears safe to the driver to encourage use of the roadside for~~ accommodate necessary emergency maneuvers and ~~for~~ emergency parking.
- Protection of pedestrians, workers, or other persons subjected to the hazard of ~~out-of-control~~ errant vehicles.
- Adequate protective devices (where hazards are unavoidable) compatible with vehicle speeds and other design variables.

D ROADSIDE DESIGN

The basic requirements and standards for the design of shoulders, medians, and roadsides are given in CHAPTER 3 - GEOMETRIC DESIGN. This includes specific requirements regarding widths, slopes, and changes in grade. General requirements for drainage facilities, utilities, transit, and pedestrian facilities are also included.

This chapter contains general guidelines for particular situations encountered in roadside design due to the variety and complexity of possible situations encountered. The designer should utilize the following as basic guidelines to develop a safe roadside design.

Prior to any other consideration, the designer should attempt to:

1. Eliminate the hazard:
 - a. Remove the hazard.
 - b. Relocate the hazard outside of the clear zone.
 - c. Make the hazard traversable or crashworthy.
2. Shield the hazard with a longitudinal barrier or crash cushion.
3. Leave the hazard unshielded. This treatment is taken only when the barrier or crash cushion is more hazardous than the hazard.

D.1 Geometric Changes

D.1.a Horizontal Curves

On horizontal curves, consideration should be given to increasing the clear zone above the minimum requirements due to the increased likelihood of vehicles leaving the traveled way. Increasing clear zone widths and decreasing roadside slopes on curves is also important since a vehicle will probably leave the traveled way at a steeper exit angle. Increasing clear zone widths on curves is also beneficial in improving the available sight distance. Proper signage should be part of every roadside design. For proper signage to inform drivers of approaching curves, refer to Chapter 18, "Signing and Marking", MUTCD.

D.1.b Vertical Curves

As a vehicle comes over ~~at the~~ crest of a vertical curve, the driver may suddenly be presented with a situation requiring an emergency maneuver. The provision of adequate clear zones is particularly important where available stopping sight distance may not be adequate or where driver expectancy may be violated. High traffic volumes ~~are high~~ (i.e., urban areas) may result in rapidly forming ~~since~~ traffic queues ~~may form rapidly~~, thus tending to cause rear-end collisions. Vertical curves with inadequate stopping sight distance can be mitigated with appropriate advanced signage and other warning devices.

D.1.c Changes in Cross Section

The provision of adequate clear zone is very important at exits, entrances, lane drops, or other changes in the roadway cross section. The exterior boundaries of the clear zone should extend well beyond any reductions in roadway width and then gradually reduce to provide design width for the new roadway cross section.

D.1.d Decision or Conflict Points

Adequate clear zones should be provided at any point of traffic merging or conflicts, and at locations where the driver is confronted with making a decision regarding vehicle maneuvers.

D.2 Fills

Many roadways, for drainage purposes, are elevated somewhat above the surrounding terrain. Where feasible, the side slopes should not exceed a ratio of 1:4. On flatter slopes (1:6 or greater), care should be exercised to eliminate sharp changes in grade or other discontinuities.

If the side slope is steeper than 1:3, ~~guardrail or another~~ longitudinal barriers s should be considered.

D.3 Cuts

A primary objective of roadside design in cut sections is to prevent conditions

tending to cause rollovers or serious collisions with the cut slopes. When the material (soils) in the cut is smooth and stable, the use of an increasing backslope is a reasonable solution. The technique is also acceptable in stable rock cuts, provided that smooth fill material is utilized to affect the backslope.

The use of a rigid barrier incorporated into the cut slope is also satisfactory for rock slopes. Where the material in the cut is irregular or unstable, a ~~guardrail or other~~ longitudinal barrier ~~offset out~~ from the cut face should be utilized. ~~Placing the barrier away from the slope is necessary to prevent rocks or other materials from falling onto the roadsides.~~

D.4 Roadside Canals

Roadside canals or other bodies of water close to the roadway should be eliminated wherever feasible.

Where roadside bodies of water (with seasonal water depth in excess of 3 feet for 24 hours or longer) lie within the roadside clear zone, they shall be shielded using ~~guardrail or another~~ the appropriate longitudinal barrier.

Due to the nature of the hazard, even if the canal is outside of the clear zone, consideration may be given to ~~protection~~ shielding. The decision to shield a canal should include an objective assessment of risk of shielding the canal to the unshielded condition. This is due to the fact that barriers are also hazards and, thus, have associated long term crash costs in addition to construction and maintenance costs. The Roadside Safety Assessment Program is the recommended tool for evaluating the cost effectiveness of shielding roadside hazards.

D.5 Vegetation

The proper use of natural vegetation can provide valuable and economical assistance in developing aesthetic and safe traversable roadsides.

D.5.a Stability

The use of grass or other easily maintained, low-growing vegetation may be used on medians and roadsides. This vegetation should be carefully maintained so vehicles can safely traverse those areas.

D.5.b Drainage

Drainage swales may be protected from hazardous scouring (alteration of safe ditch contour) by the appropriate vegetation. Grass, vines, or other plants can be beneficial in stabilizing embankments to prevent erosion of material onto adjacent roadways. The appropriate use of grass or shrubbery can also aid in retarding runoff in the vicinity of the roadway, thus benefiting the overall drainage pattern.

D.5.c ~~Crash Cushions~~

~~Native shrubbery may also be used as an effective natural barrier or crash cushion at the outer edge of the clear roadsides. Care should be taken to use shrubbery or other vegetation that would slow an out-of-control vehicle without excessive deceleration. Vegetation that would develop large trunks or branches should be avoided.~~

D.5.cd Environmental and Aesthetic Considerations

The use of natural grass and shrubbery for borders along roadways provides an important environmental asset. This border serves as a preserved green belt that minimizes the adverse impact (dirt, noise, etc.) of a street or highway. The use of a wide, gently flowing grassed roadside of varying width is generally an aesthetically pleasing ~~solution to safe roadside~~ design.

D.5.de Landscaping - Design Considerations

The Department's ***Design Standards (Index Numbers 544 - Landscape Installations, and 546 - Sight Distance at Intersections)***, contain information on landscaping, that may be considered. ***Index 544*** provides landscape installation details. The Department also produces the "Florida Highway Landscaping Guide" which is an excellent landscaping information source and

Standard Index 546 provides information on landscaping in vicinities of conventional intersections. For roundabout landscape guidelines and related sight line requirements, refer to ***NCHRP 672 "Roundabouts: An Informational Guide"***. The Department also produces the "Florida Highway

~~Landscaping Guide" which is an excellent landscaping information source.~~

D.6 Drainage

Proper drainage of the pavement, shoulders, median, and roadsides is important for maintaining a safe street or highway. Techniques utilized for providing drainage should result in safe vehicle operation on or off the roadway.

D.6.a Inlets

Drainage inlets should not be placed in a bus bay, travel, or bike lane and should not be placed in a shoulder, except at the exterior edge, when drainage restrictions are severe. Drainage inlets within the median or roadside(s) shall be traversable. A small area around the inlet should be paved to improve drainage and to prevent localized erosion. Corner radii inlets should be avoided as they hinder pedestrians, create ponding, create maintenance problems, and complicate intersection design.

D.6.b Ditches

Drainage ditches perpendicular to the roadway should not be used within the median or roadsides. All drainage ditches within the median or roadsides shall meet the requirements for slopes and changes in grade given in CHAPTER 3 - GEOMETRIC DESIGN.

D.6.c Culverts

Where culverts are unavoidable at intersections, the entrance and exit should be flush with the adjacent ground or located beyond the clear zone. The slope and changes in grade at the structure should conform to minimum requirements for roadsides. Culvert terminations at median crossovers should be constructed in a similar fashion.

Where culverts are required perpendicular to the roadway, they should be extended to the roadsides as a minimum. Headwalls at the culvert terminations (within the clear zone) should not protrude above the ground surface in excess of 4 inches. Sloping entrances and exits generally flush with side slopes should be used wherever possible (even outside the clear zone). Proper ground contouring of the roadside approach can provide a relatively smooth surface that can be traversed with reasonable safety by an out-of-control errant vehicle.

Cross drains and side drains within the clear zone should be equipped with mitered end sections. FDOT Standard Index Series 200 provides requirements for the proper use of flared and mitered end sections.

D.7 Curbs

The basic criteria for prohibiting or permitting the use of curbs are given in CHAPTER 3 - GEOMETRIC DESIGN. Curbs serve any or all of the following purposes: drainage control, roadway edge delineation, right of way reduction, aesthetics, delineation of pedestrian walkways, reduction of maintenance operations, and assistance in orderly roadside development.

Curbs should not be used along freeways or other high-speed arterials, but if a curb is needed, it should not be located closer to the traveled way than the outer edge of the shoulder. In addition, sloping end treatments should be provided.

D.8 Poles and Support Structures

The location and design of poles or support structures for signs, signals, lighting, or other purposes is an important aspect of safe roadside design. All poles and support structures should be located outside the required clear zone when practical unless their supports are of the frangible or breakaway type. Non-breakaway poles and sign support structures may be located behind a barrier that is present for another reason. For proper offset from rigid obstacles to barriers, see section "E" of this chapter. ~~When practical, poles and sign supports should be located behind existing barriers.~~

The function of a breakaway support is to minimize the vehicle deceleration and the probability of injury to vehicle occupants. The design of the support should also be adequate to prevent portions of the structure from penetrating the vehicle interior.

Small signs should be designed to bend over flush with the ground upon impact. Larger signs should be designed with multiple posts with slip joints at the base and a weakened section and fuse plate intended to act as a hinge at the bottom of the sign.

Utility poles and structures not related to highway operations, should be located outside the clear zone and as close as practical to the edge of right of way, without aerial encroachment, and without violating National Electric Safety Code (NESC) clearances. New utility poles not placed at the edge of the right of way, and falling within the limits of the clear zone dimensions defined in Table 3-12 should be approved through the exception process prescribed in CHAPTER 14 - DESIGN EXCEPTIONS. Placement within sidewalk shall be such that a minimum unobstructed sidewalk width of 32" is provided.

In accordance with Section 337.403, Florida Statutes, existing utility poles must be relocated when **unreasonably** interfering with the "convenient, safe, or continuous use, or the maintenance, improvement, extension, or expansion" of public roads. Utility poles adjacent to road improvement projects, but not directly interfering with construction, ~~within the limits of the Control Zones depicted in The Department's January 1999 Utility Accommodation Manual (Rule 14-46.001), Exhibit H~~ should be considered for relocation, to the extent they can be relocated, to achieve the clear zone requirements of Table 3-12. Utility poles that cannot be relocated and will remain within the ~~limits of a Control Zone~~ clear zone, should be approved through the exception process prescribed in

CHAPTER 14 - DESIGN EXCEPTIONS.

D.9 Intersections

All poles or other structures not absolutely essential should not be located in the vicinity of the intersection. When joint use agreements can be arranged, the various governmental agencies, transit authorities, and utilities should consider the use of joint purpose single poles as a replacement for all poles or structures serving a single purpose. Light poles, traffic signal supports and boxes, transit stop signs, and all other street furniture should be moved back as far as is practical from the boundary of the roadsides.

Energy absorbing devices should be considered for protection of lighting and traffic signal supports located within the roadsides.

D.10 Underpasses

The full median and roadside should be carried through underpasses without interruption. Where it is not feasible to eliminate the supports, guardrail or another longitudinal barrier should be used. The barrier may be a rigid barrier incorporated into the support columns or a guardrail set out from the supports. The barrier should be extended well beyond the supports.

D.11 Bridges and Overpasses

The required ~~horizontal clearance~~ lateral offset (CHAPTER 3 - GEOMETRIC DESIGN) should be maintained on all bridges, overpasses, or other elevated roadways. The full roadway cross section, including shoulders, should be carried across without interruption. Bridge railings should be designed and constructed in compliance with the requirements for redirection barriers. Particular emphasis should be placed on the prevention of structural failure and vaulting of the railing by errant vehicles.

On all high speed roadways (design speed 50 mph or greater), the bridge railing or other barriers should be extended sufficiently (and properly terminated) to prevent vehicles from passing behind the barrier and entering the hazardous location. The transition between the bridge railing and the approach barrier should be smooth and continuous. Barrier curbs should not be placed in front of bridge railings or other barriers. Pedestrian facilities should be placed outside

of the bridge railing or longitudinal barrier on all high speed roadways.

It is desirable that twin bridges for nominal width median divided highways be filled in the dividing area, carrying the median across the bridge without interruption. The gore area between diverging elevated roadways should be bridged over for a sufficient distance to allow for the placement of any energy absorbing devices. If twin bridges are used, the median layout should conform to CHAPTER 3 - GEOMETRIC DESIGN.

See CHAPTER 17 – BRIDGES AND OTHER STRUCTURES for additional requirements for bridges and bridge railings.

D.12 Mailboxes

Guidelines for the location of mailboxes, type of support and turnout construction, given in the Department's Design Standards, Index 532 - Mailboxes or AASHTO - "A Guide for Erecting Mailboxes on Highways", should be considered.

D.13 Bus Shelters

Bus shelters should be moved back as far as practical from the roadside with pedestrian access to the bus stop pad at the roadside. Proper marking by color and surface texture is essential for convenience and safety of pedestrians.

E PROTECTIVE DEVICES

Protective devices for roadside design may be considered as highway ~~appurtenances~~ safety features intended to reduce the severity of run-off-the-road crashes. In those situations where the minimum safety standards for median and roadside are not feasible, protective devices should be considered. Guardrail and crash cushions should not be used indiscriminately, for at least two reasons: they are expensive to install and maintain, and they are closer to the road than the ~~objects~~ obstacles they are shielding. ~~They are involved in more crashes than unshielded objects.~~ They should be used ~~only~~ when they are warranted by the reduction in crash severity.

Refer to the Florida DOT Plans Preparation Manual, Chapter 4 "Roadside Safety" for additional information on roadside and median barriers and crash cushions.

E.1 Redirection Devices

Redirection devices are longitudinal barriers, ~~(rigid or flexible)~~ such as guardrails, median barriers, and bridge railings placed parallel to the roadway to contain and redirect ~~out-of-control~~ errant vehicles.

E.1.a Function

The primary function of a longitudinal barrier is to redirect an errant vehicle away from hazardous roadside ~~situations~~ obstacles. The barrier should be designed to produce a minimum of ~~deceleration~~ adverse impacts (lateral and longitudinal) to a vehicle.

E.1.b Warranting Conditions

Warranting conditions for the use of longitudinal barriers are essentially those conditions in which the overall probability of injuries and fatalities would be reduced by the use of these redirection devices. AASHTO's Roadside Design Guide contains warrants related to roadside barrier selection and placement.

E.1.c Location

Ideally, the barrier should be located to minimize the likelihood of being struck by an errant vehicle. The barrier should be located outside the normal shoulder width. The location and orientation of the barrier should also be selected to minimize the angle of impact and the resulting vehicle deceleration.

~~Flexible barriers should be set out~~ Barriers must be offset from ~~rigid objects/obstacles~~ or other hazards a sufficient distance so the barrier may deflect without interference. Reasonable deflections for guardrails with strong posts are approximately 2 to 45 feet. ~~Weak-post/strong-post~~ rail barriers and cable systems may deflect considerably more. The location of the barrier should be selected in close coordination with the design of its deflection characteristics.

E.1.d Length

The length of a longitudinal barrier should be sufficient to prevent a vehicle, traveling in either direction, from passing behind the barrier and striking the hazard being ~~guarded~~ shielded.

E.1.e Vehicle Containment

Longitudinal barriers should have sufficient strength to prevent a vehicle from ~~breaking through~~ penetrating the barrier. Structural continuity and smoothness is also required to prevent rapid deceleration or penetration of the vehicle by any of the barrier components. The shape and height of the barrier should be adequate to deter overturning or vaulting of the vehicle. The surface in front of the barrier should be approximately perpendicular to the barrier and should be free from barrier curbs or other discontinuities.

E.1.f Barrier Types

Longitudinal Barriers may be generally classified as rigid or flexible. The recommended barriers in the following sections are intended as general guidelines only. As new types of barriers are developed and tested successfully, they may be incorporated into roadside design. They should, however, conform with the requirements previously established.

- Rigid Barrier - Rigid barriers are generally less effective in controlling lateral vehicle deceleration at locations subject to high-angle impacts. The use of this barrier is recommended for bridge railings and for use at retaining walls, rock cuts, or other rigid hazards where space limitations are severe constrained.
- Flexible Barrier - Barriers which yield somewhat on impact are often more useful in limiting the rate of vehicle deceleration. Special care should be exercised to ensure they are structurally adequate and they maintain a smooth continuous surface.

This type of barrier can be expected to deflect 2 to 45 feet under impact. The post spacing may be increased when a stiffer rail is utilized. The weak post barrier and the cable barrier can be expected to deflect 8 to 12 feet or more and should be limited to locations with adequate clear space.

E.1.g Transitions

Changes in barrier types should be kept to a minimum. Transitions between two types of barriers should be smooth and continuous with no protruding components that could snag or penetrate a vehicle striking the barrier from either direction of travel. The transition from a flexible to a rigid barrier should be stiffened gradually to prevent "pocketing" of an errant vehicle.

E.1.h Terminations

Barrier terminations or interruptions should be kept to a minimum. The barrier termination should be designed to allow for a reasonably safe traversal by a vehicle traveling in either direction.

Roadside guardrails should be flared away from the roadway. The use of energy absorbing devices as the termination of the longitudinal barrier is an effective and acceptable procedure for both roadsides and medians.

E.2 Energy Absorbing Devices

E.2.a Function

The primary function of an energy absorbing device or crash cushion is to ~~limit the deceleration rate of a vehicle~~ is to reduce the severity of impacts with fixed objects. These are utilized at locations where impact with the roadside ~~object-obstacle~~ would produce a greater deceleration rate. The deceleration rate is controlled by providing a cushion which deforms ~~over a large distance~~ and absorbs energy while bringing the vehicle gradually to a stop.

E.2.b Warranting Conditions

Crash cushions ~~(or other protective devices)~~ are used for the protection of occupants of an ~~out-of-control errant~~ vehicle which might strike ~~objects obstacles~~ within the median or roadside that would produce ~~serious excessive~~ vehicle deceleration.

Other locations or situations that should be considered for crash cushions include:

- Gore areas on elevated roadways
- Intersections
- Barrier terminations
- Bridge abutments and supports
- Retaining walls
- Any other roadside object subject to impact by an errant vehicle

E.2.c Design Criteria

The primary design criteria are the limitation of vehicle deceleration which is a function of the vehicle speed and the total crash cushion deformation.

The crash cushion should be located as far from the roadway as is practicable to reduce the likelihood of impact. Special care should be exercised in the design to reduce the probability of a vehicle overturning or vaulting the crash cushion.

E.2.d Design Details

The development and testing of crash cushions are both recent and rapid. The rapidly expanding technology in this field requires the most recent research and experience be utilized in selecting a particular type of crash cushion. [AASHTO's Roadside Design Guide provides guidance for the selection of sacrificial, re-useable and low maintenance crash cushion types.](#)

E REFERENCES FOR INFORMATIONAL PURPOSES

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

- **AASHTO Roadside Design Guide**
<https://bookstore.transportation.org/>
- **NCHRP Report 672 – Roundabouts: An Informational Guide, Second Edition**
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf
- **Section 401, Florida Statutes**
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0337/Sections/0337.401.html
- **FDOT Drainage Manual, January 2014**
<http://www.dot.state.fl.us/rddesign/Hydraulics/ManualsandHandbooks.shtm>

CHAPTER 13

PUBLIC TRANSIT

<u>A</u>	<u>INTRODUCTION</u>	13-1
<u>B</u>	<u>OBJECTIVE</u>	13-2
<u>C</u>	<u>TRANSIT COMPONENTS</u>	13-3
	<u>C.1 Boarding and Alighting (B&A) Areas</u>	13-3
	<u>C.2 Shelters</u>	13-7
	<u>C.3 Benches</u>	13-8
	<u>C.4 Stops and Station Areas</u>	13-8
	<u>C.5 Bus Bays (Pullout or Turnout Bays)</u>	13-8
<u>D</u>	<u>PUBLIC TRANSIT FACILITIES</u>	13-10
	<u>D.1. Curb-Side Facilities</u>	13-10
	<u>D.2 Street-Side Facilities</u>	13-10
	<u>D.3 Bus Stop Lighting</u>	13-11
<u>E</u>	<u>REFERENCES FOR INFORMATIONAL PURPOSES</u>	13-13
A	INTRODUCTION	13-1
B	OBJECTIVE	13-2
C	TRANSIT COMPONENTS	13-3
	C.1 Stops and Station Areas	13-3
	C.2 Shelters	13-3
	C.3 Benches	13-3
	C.4 Concrete Bus Stop Boarding and Alighting Areas	13-4
	C.5 Bus Bays (Pullout or Turnout Bays)	13-4
	C.6 Promote Public Transit	13-4
D	PUBLIC TRANSIT FACILITIES	13-6
	D.1. Curb Side Facilities	13-6
	D.2 Street Side Facilities	13-6
	D.3 Bus Bay Lighting	13-7

E REFERENCES FOR INFORMATIONAL PURPOSES 13-9

FIGURES

<u>Figure 13 – 1</u>	<u>Boarding and Alighting Area for Flush Shoulder Roadways with Connection to the Roadway</u>	<u>13-5</u>
<u>Figure 13 – 2</u>	<u>Boarding and Alighting Area for Flush Shoulder Roadways with Connection to the Sidewalk</u>	<u>13-6</u>
<u>Figure 13 – 3</u>	<u>Bus Shelter Location</u>	<u>13-7</u>
<u>Figure 13 – 4</u>	<u>Bus Bay Locations.....</u>	<u>13-12</u>
Figure 13 – 1	Boarding and Alighting Area for Flush Shoulder Roadways with Connection to the Roadway	13-5
Figure 13 – 2	Boarding and Alighting Area for Flush Shoulder Roadways with Connection to the Sidewalk.....	13-6
Figure 13 – 3	Bus Shelter Location	13-7
Figure 13 – 4	Bus Bay Locations.....	13-11

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~~nature, which 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, ~~street car~~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~~predestinating 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) to determine compatibility with equipment and transit vehicles.~~

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 13-1 and 13-2. 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

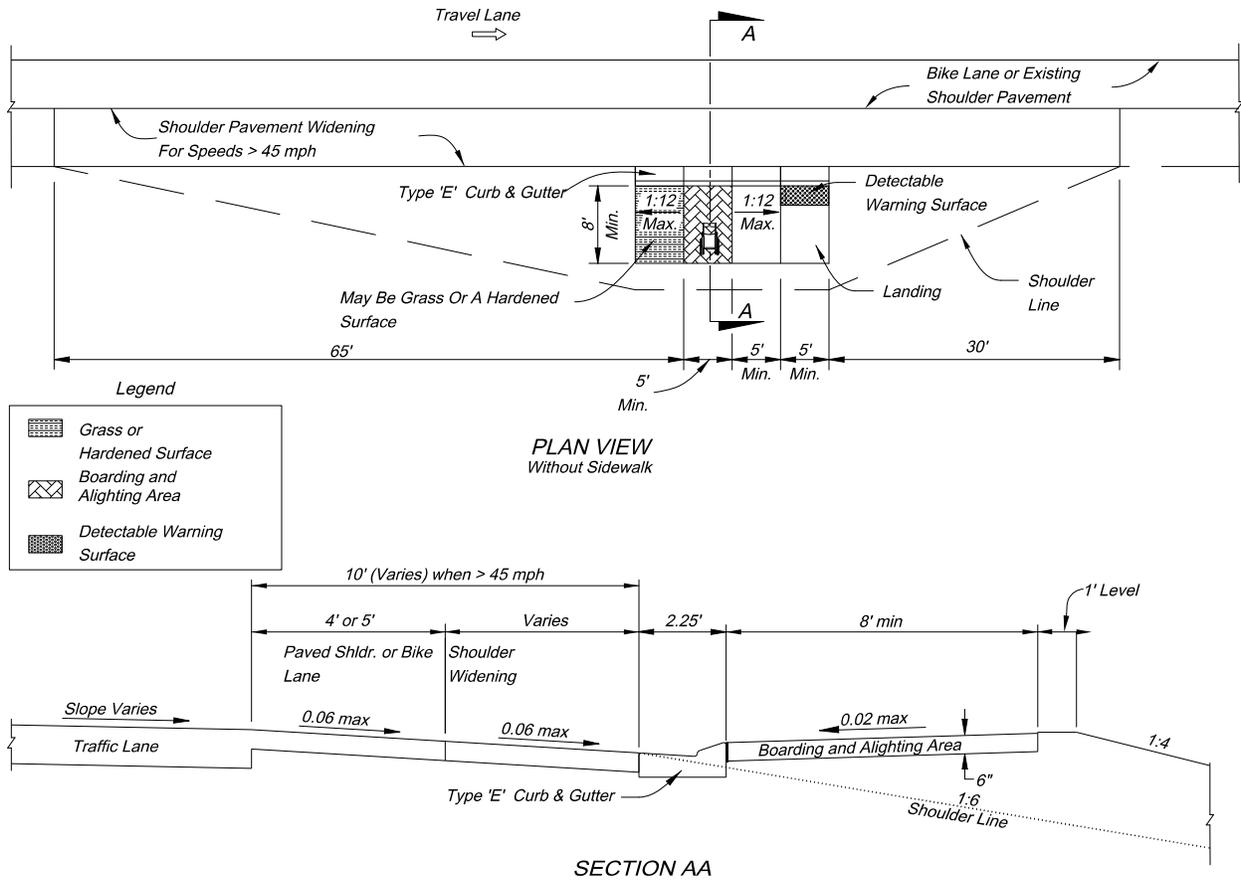
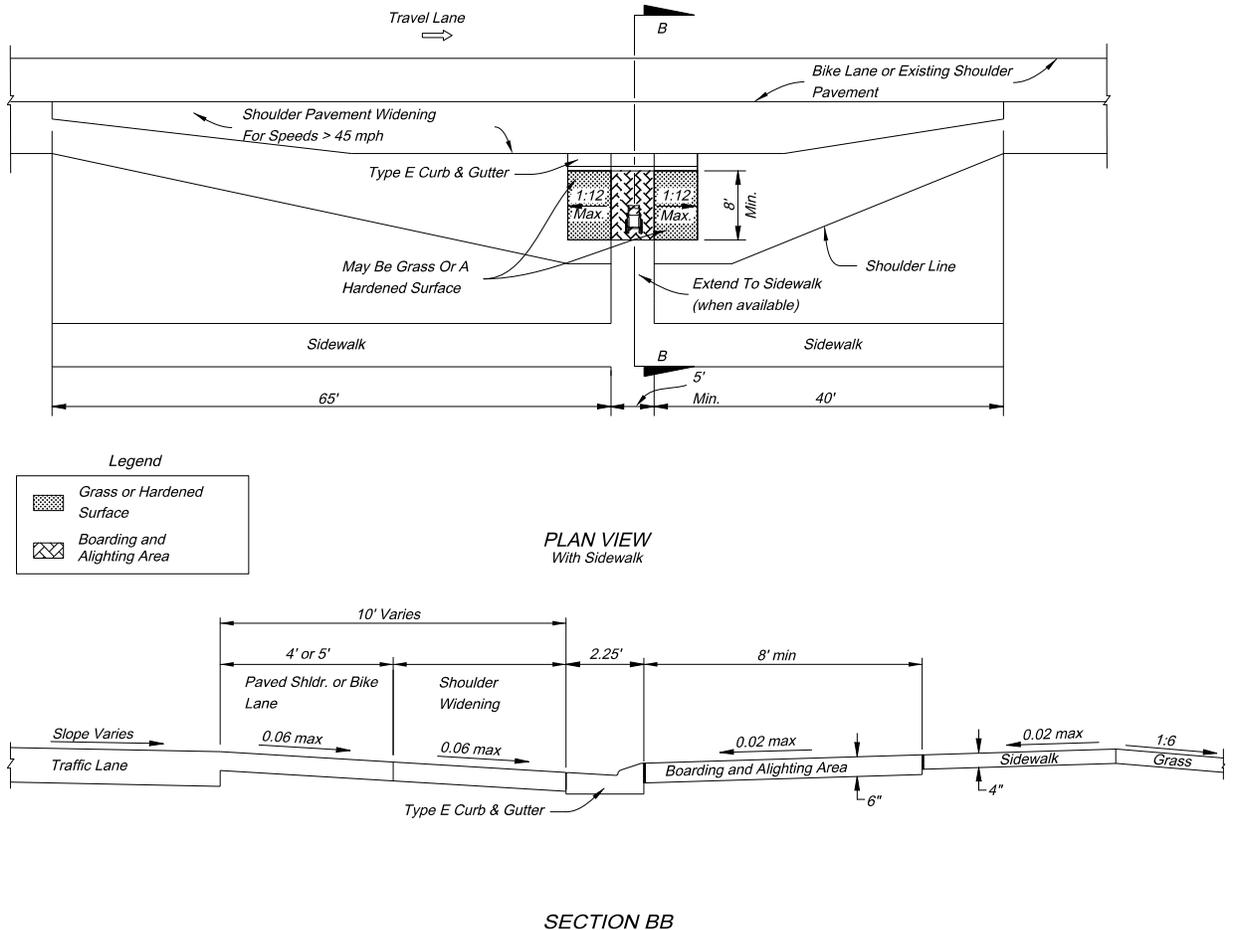


Figure 13 – 2
Boarding and Alighting Area for Flush Shoulder Roadways
with Connection to the Sidewalk

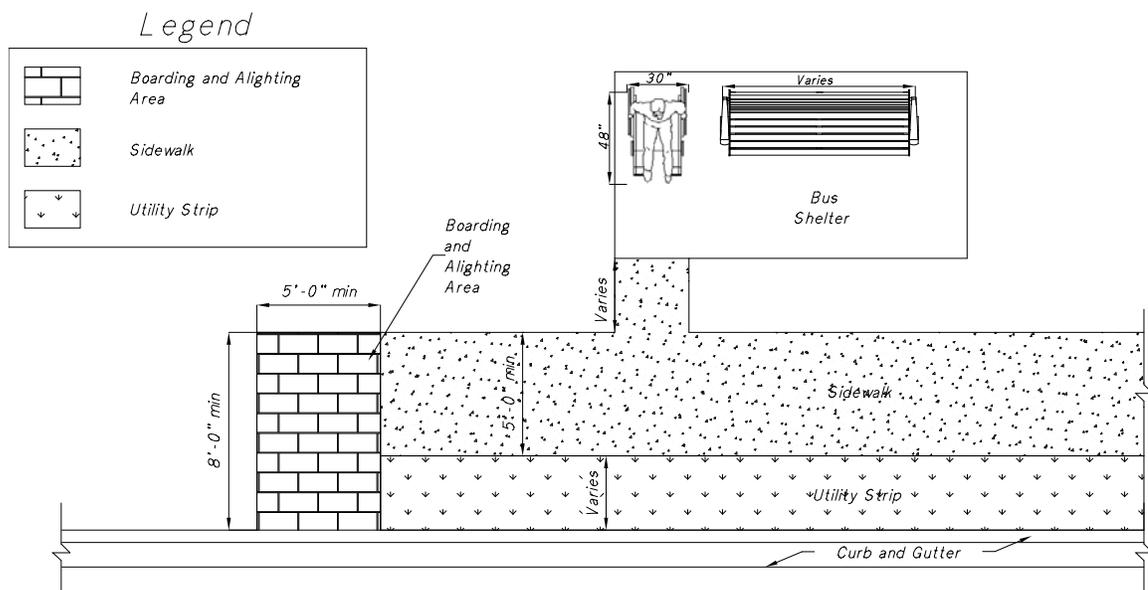


C.2 Shelters

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 a minimum clear floor area of 30 inches by 48 inches, entirely within the perimeter of the shelter.

Such shelters 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 shelters 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.

Figure 13 – 3
Bus Shelter Location



C.3 Benches

~~If a bench is provided, it should be on an accessible route. 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 volumes or speed of traffic, etc.). Bus bays can be designed for one or more buses. Coordination with the ~~Public Transportation Office and/or the~~ local public transit provider(s) will to help determine the need ~~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, 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. 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. Far side bus stops and bays are preferred. See Accessing Transit 2013 for a more detailed discussion of the location of the bus stop or bay.

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

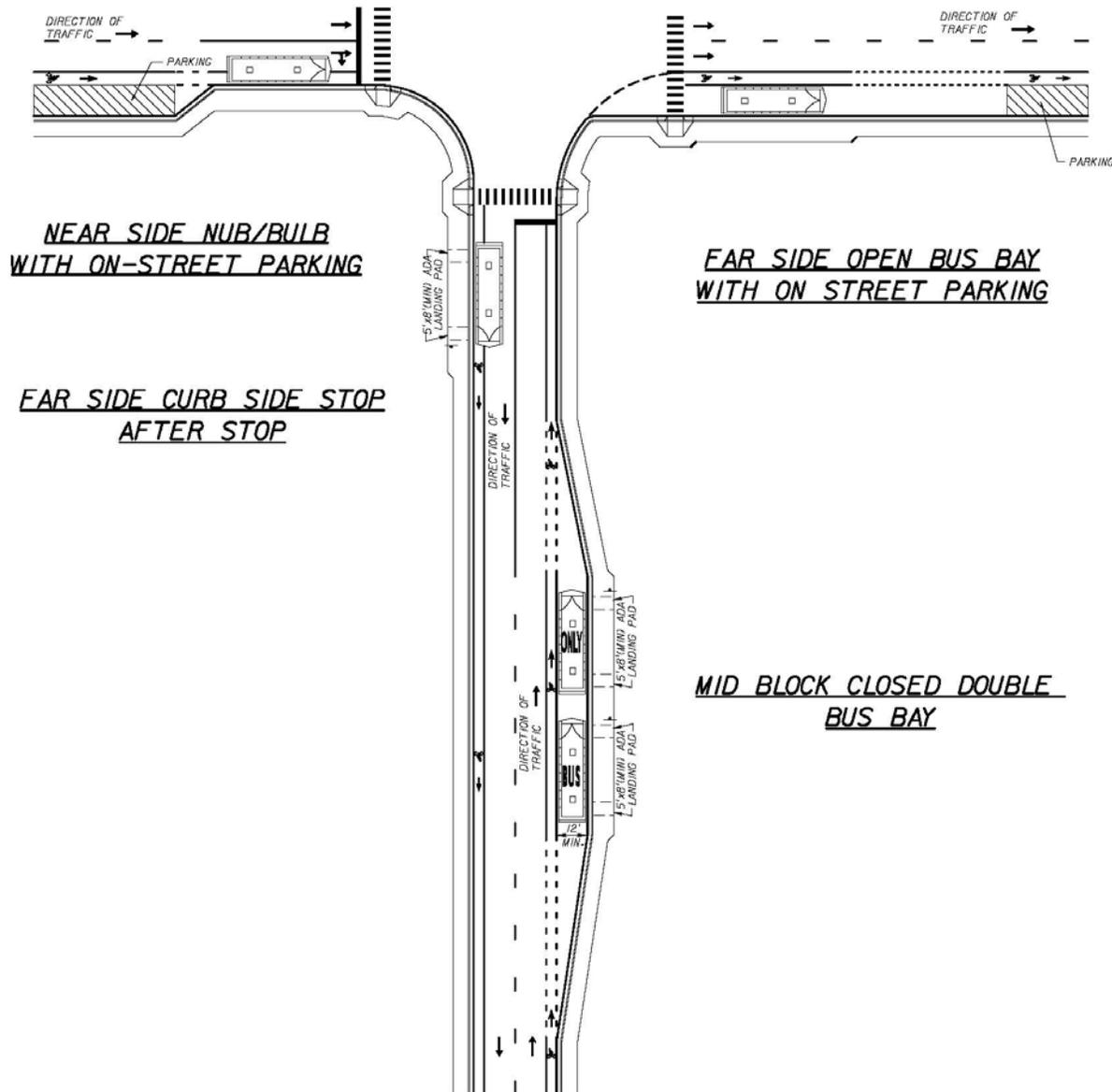
~~considered for various bus bay configurations are provided in “Transit Facilities Guidelines” provide detailed standard drawings that may be considered for various bus bay configurations on the Department’s Public Transportation Office website: <http://www.dot.state.fl.us/transit/>.~~

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 ~~Stop~~ Bay Lighting

Lighting design for bus ~~bay pavement areas~~ stops 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~~ **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 – 41
Bus Bay Locations Categories



E REFERENCES FOR INFORMATIONAL PURPOSES

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

- ~~FDOT's "2013 Accessing Transit Design Handbook for Florida Bus Passenger Facilities" on the Public Transportation Office web site:~~ <http://www.dot.state.fl.us/transit/Pages/NewTransitFacilitiesDesign.shtm>
- ~~FDOT "Transit Facilities Guidelines" on the Public Transportation Office web site:~~ <http://www.dot.state.fl.us/transit/NewTransitPlanning.shtm>
- ~~TCRP Report 155 – Track Design Handbook for Light Rail Transit, Second Edition~~ http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_155.pdf
- ~~Commuter Rail Authority/SunRail design guidance~~^[mak2]
- ~~"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~~

CHAPTER 16

RESIDENTIAL STREET DESIGN

<u>A</u>	<u>INTRODUCTION</u>	<u>16-1</u>
<u>B</u>	<u>OBJECTIVES</u>	<u>16-2</u>
<u>C</u>	<u>DESIGN ELEMENTS</u>	<u>16-4</u>
	<u>C.1</u> <u>Design Speed</u>	<u>16-4</u>
	<u>C.2</u> <u>Sight Distance</u>	<u>16-4</u>
	<u>C.2.a</u> <u>Stopping Sight Distance</u>	<u>16-4</u>
	<u>C.2.b</u> <u>Passing Sight Distance</u>	<u>16-4</u>
	<u>C.2.c</u> <u>Intersection Sight Distance</u>	<u>16-5</u>
	<u>C.3</u> <u>Horizontal Alignment</u>	<u>16-6</u>
	<u>C.3.a</u> <u>Minimum Centerline Radius</u>	<u>16-6</u>
	<u>C.3.b</u> <u>Minimum Curb Return Radius</u>	<u>16-6</u>
	<u>C.4</u> <u>Vertical Alignment</u>	<u>16-7</u>
	<u>C.4.a</u> <u>Vertical Curves</u>	<u>16-7</u>
	<u>C.5</u> <u>Cross Section Elements</u>	<u>16-7</u>
	<u>C.5.a</u> <u>Width of Roadway</u>	<u>16-7</u>
	<u>C.5.b</u> <u>Medians</u>	<u>16-7</u>
	<u>C.6</u> <u>Cul-de-sacs and Turnarounds</u>	<u>16-8</u>
	<u>C.6.a</u> <u>Turning Area</u>	<u>16-8</u>
	<u>C.7</u> <u>Pedestrian Considerations</u>	<u>16-8</u>
	<u>C.7.a</u> <u>Sidewalks</u>	<u>16-8</u>
	<u>C.8</u> <u>Bicyclist Considerations</u>	<u>16-9</u>
	<u>C.8.a</u> <u>Bicycle Facilities</u>	<u>16-9</u>
	<u>C.9</u> <u>Shared Use Paths</u>	<u>16-9</u>
	<u>C.10</u> <u>Clear Zone</u>	<u>16-9</u>
<u>D</u>	<u>REFERENCES FOR INFORMATIONAL PURPOSES</u>	<u>16-10</u>
<u>A</u>	<u>INTRODUCTION</u>	<u>16-1</u>
<u>B</u>	<u>OBJECTIVES</u>	<u>16-2</u>

C	DESIGN ELEMENTS	16-4
C.1	Design Speed	16-4
C.2	Sight Distance	16-4
C.2.a	Stopping Sight Distance	16-4
C.2.b	Passing Sight Distance	16-4
C.2.c	Intersection Sight Distance	16-5
C.3	Horizontal Alignment	16-6
C.3.a	Minimum Centerline Radius	16-6
C.3.b	Minimum Curb Return Radius	16-6
C.4	Vertical Alignment	16-6
C.4.a	Vertical Curves	16-6
C.5	Cross Section Elements	16-7
C.5.a	Width of Roadway	16-7
C.5.b	Medians	16-7
C.6	Cul-de-sacs and Turnarounds	16-7
C.6.a	Turning Area	16-7
C.7	Pedestrian Considerations	16-8
C.7.a	Sidewalks	16-8
C.8	Bicyclist Considerations	16-8
C.8.a	Bicycle Facilities	16-8
C.8.b	Shared Use Paths	16-8
C.9	Clear Zone	16-9

TABLES

TABLE 16 - 1	MINIMUM STOPPING SIGHT DISTANCE FOR RESIDENTIAL STREETS.....	16-4
TABLE 16 - 2	MINIMUM CORNER INTERSECTION SIGHT DISTANCE FOR RESIDENTIAL STREETS	16-5
TABLE 16 - 3	MINIMUM CENTERLINE RADII FOR RESIDENTIAL STREETS	16-6

CHAPTER 16

RESIDENTIAL STREET DESIGN

A INTRODUCTION

The street is a public way designed for the purposes of serving motor vehicles, bicycles, pedestrians, and transit vehicles. The primary function of residential streets is to provide access to homes that front those streets. The primary consideration, therefore, of residential street design should be to foster a safe and pleasant environment for the residents that live along the street, and safe traveling conditions for motorists, bicyclists and pedestrians. The convenience of motorists is a secondary consideration.

The street design should create an environment that cautions drivers that they are in a residential area where they must safely share the traveling space with pedestrians and bicyclists, both child and adult. Visual cues such as meandering streets, sidewalks, landscaping, signage, narrowed streets, changes in pavement texture (such as brick, stamped, or textured surfaces), and raised crosswalks all serve to heighten drivers' awareness for the need to maintain lower speeds. Incorporating such features into residential street design at inception will reduce or eliminate the need for traffic calming retrofits.

Section B of this chapter discusses the primary objectives of Residential Street Design in more detail, to aid the designer in the selection of proper criteria. **Section C** sets forth specific design criteria for residential streets.

B OBJECTIVES

The basic principles of residential street design are based on four factors:

1. SAFETY
2. EFFICIENCY OF SERVICE
3. LIVABILITY AND AMENITIES
4. ECONOMY OF LAND USE, CONSTRUCTION, AND MAINTENANCE

The following 17 principles incorporate these factors. These principles are not intended as absolute criteria, since instances may occur where certain principles conflict. The principles should therefore be used as concepts for layout of proper street systems.

1. Adequate vehicular and pedestrian access should be provided to all parcels.
2. Local street systems should be designed to minimize through traffic movements unless it is specifically desired by the County or municipality to connect residential developments.
3. Street patterns should minimize excessive vehicular travel through connectivity between adjacent residential developments, and to larger street networks.
4. Local street systems should be logical and comprehensible, and systems of street names and house numbers should be simple, consistent, and understandable.
5. Local circulation systems and land-development patterns should not detract from the efficiency of adjacent ~~bordering~~ major streets due to lack of connectivity.
6. Elements in the local circulation system should not have to rely on extensive traffic regulations and enforcement in order to function efficiently and safety.
7. Traffic generators within residential areas should be considered in the local circulation pattern.

8. The planning and construction of residential streets should clearly indicate their local function. The street's residential nature should be obvious to those driving on them.
9. The street system should be designed for a relatively uniform low volume of traffic.
10. Local streets should be designed to discourage excessive speeds.
11. Pedestrian-vehicular conflict points should be minimized.
12. The amount of space in the land development devoted to motor vehicle uses should be minimized.
13. ~~There should be a limited number of intersections.~~ Smaller block sizes may be used to encourage walking or bicycling. See **Chapter 19 – Traditional Neighborhood Development** for more information.
14. The arrangement of local streets should permit economical and practical patterns, shapes, and sizes of development parcels and provide interconnectivity without using arterials or collectors.
15. Local streets should consider and utilize topography from the standpoint of both economics and amenities.
16. Appropriate provisions for transit service within residential areas should be included.
17. Street design should consider horizontal and vertical compatibility and connectivity with sidewalks, bicycle lanes, and pedestrian walkways.

C DESIGN ELEMENTS

C.1 Design Speed

For local residential streets, design speeds of ~~15~~20 to 30 mph are appropriate, depending on the adjacent development, terrain, available right of way, and other area controls. Alleys and narrow roadways intended to function as shared spaces (that is, could be used to access driveways, for garbage pickup, and travel by walking or bicycling) may have design speeds as low as 10 mph. Design speeds greater than 30 mph in residential areas require increased sight distances and radii which are contrary to the function of a local residential street.

C.2 Sight Distance

C.2.a Stopping Sight Distance

The minimum stopping sight distance is shown in [Table 16 - 1](#).

**TABLE 16 - 1
MINIMUM STOPPING SIGHT DISTANCE FOR RESIDENTIAL STREETS**

Design Speed (MPH)	Stopping Sight Distance (FEET)
10	45
15	75
20	125
25	150
30	200

C.2.b Passing Sight Distance

Passing should not be encouraged on local residential streets, and design for passing sight distance is seldom applicable on these streets. If longer straight sections and higher design and posted speeds support passing,

the street shall be designed under the design criteria established in **Chapter HAPTER 3 – Geometric EOMETRIC Design ESIGN.**

C.2.c Intersection Sight Distance

Intersections shall be designed with adequate corner sight distance as set forth in Table 16 - 2. Intersection design should take into consideration growth of landscaping and other amenities. Where a local residential street intersects a higher-order street, the design criteria of the higher-order street shall control within the right of way of the higher-order street. ~~Where the right of way of the higher order street is indistinguishable from that of the lower street, the right of way for this purpose may be determined by connecting the points where the two rights of way intersect.~~

**TABLE 16 - 2
MINIMUM CORNER INTERSECTION SIGHT DISTANCE
FOR RESIDENTIAL STREETS**

Design Speed (MPH)	Corner Intersection Sight Distance * (FEET)
10	110
15	160
20	210
25	260
30	310

* Corner sight distance measured from a point on the minor road at least 14.5 feet from the edge of the major road pavement and measured from a height of eye at 3.5 feet on the minor road to a height of object at 3.5 feet on the major road.

Where stop or yield control is not used, the corner sight distance should be a minimum of ~~3200 feet~~. ~~If restrictions are unavoidable, a minimum of, and desirably 2300 feet is allowed with proper warning signage found in the Manual on Uniform Traffic Control Devices (MUTCD) such as an intersection warning sign (W2 series) or cross traffic does not stop here plaque (W4-4P) or more.~~ To maintain the minimum sight distance, restrictions on height of embankments, locations of buildings, and screening fences may be necessary. Any landscaping in the sight

distance triangle should be low growing, and should not be higher than 3 feet above the level of the intersecting street pavements. Tree overhangs should be trimmed to at least 8 feet above the level of the intersections.

Intersecting streets should meet at approximately right angles. Angles of less than 60 degrees should be avoided.

C.3 Horizontal Alignment

C.3.a Minimum Centerline Radius

The minimum radii for horizontal curves are given in Table 16 - 3. Typically, superelevation should not be utilized on local residential streets. Where superelevation is appropriate or required, the street shall be designed under the design criteria established in **Chapter HAPTER 3 – Geometric EOMETRIC DDesign ESIGN.**

**TABLE 16 - 3
MINIMUM CENTERLINE RADII FOR RESIDENTIAL STREETS**

Design Speed (MPH)	Min. Centerline Radius (FEET)
10	25
15	50
20	89
25	166
30	275

C.3.b Minimum Curb Return Radius

Where there are substantial pedestrian movements, the minimum radius of curb return where curbs are used, or the outside edge of pavement where curbs are not used shall be 15 feet. A minimum radius of 25 feet is desirable to accommodate turning movements of service vehicles.

C.4 Vertical Alignment

C.4.a Vertical Curves

Vertical curves shall be designed for a minimum stopping sight distance using the design criteria of 30 mph established in **Chapter 3 – Geometric Design**.

C.5 Cross Section Elements

C.5.a Width of Roadway

The minimum width of a two-way residential roadway shall be 2018 feet from edge-of-pavement to edge-of-pavement (excluding curbs and gutters). Travel lanes should be a minimum of 10 feet wide, and wider where practicable. Under constrained conditions or in some very rural areas, lanes 9 feet or narrower may be used. Refer to Chapter 4 of the AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400). Lanes narrower than 9 feet are prohibited in the absence of a Design Exception as provided for in **Chapter 14 – Design Exceptions**.

When parking lanes are provided on one or both sides of the roadway, they shall be at least 7 feet wide including the gutter section where applicable.

Where curb and gutter sections are used, the roadway may be narrowed to the travel lane width (plus bike lane if present) at intersections. This will prevent parking close to the intersection, reduce crossing distances for pedestrians, provide space for curb ramps, and reduce turning speeds. By providing ~~occasional midblock curb extensions, as well as~~ intersection curb extensions, the visual width of the roadway can be reduced.

C.5.b Medians

The minimum width for a median is 4 feet (6 feet if it is to serve as a pedestrian refuge). When median openings are provided to allow turns across the roadway, median opening length shall be adequate to accommodate the design vehicle's turning radius requirements.

C.6 Cul-de-sacs and Turnarounds

C.6.a Turning Area

~~A residential street open at one end only should have a special turning area at the closed end, and~~ 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. Cul-de-sacs can detract from connectivity if used excessively or inappropriately.

C.7 Pedestrian Considerations

C.7.a Sidewalks

In residential areas, sidewalks should be provided on both sides of the street. The sidewalks should be located as far as practicable from the ~~travel~~ lanes and usually close to the right of way line. In certain circumstances, such as where ~~the adjacent~~ lots are very large or there are environmental limitations, sidewalk on only one side may be considered. Along collector roadways shared use paths may be provided in lieu of sidewalks. Connectivity to and between existing public sidewalk or shared use path facilities is desired.

Pedestrian access should be provided to schools, day care facilities, parks, churches, shopping areas, and transit stops within or adjacent to the residential development. Pedestrian access to these destinations and throughout the neighborhood shall be designed for safe and convenient pedestrian circulation. ~~from each house in the development should be as direct as practicable. With careful design, direct pedestrian access can be provided to these destinations without requiring pedestrians to walk along high volume, high speed roadways. Mid-block crossings between houses, for~~ S sidewalks or shared use paths between houses or to connect cul-de-sacs, may be used where necessary to provide direct access.

Sidewalks, crosswalks and mid-block crossings shall be constructed under the criteria set forth in **Section C.7.d** of **Chapter HAPTER 3** –

Geometric Design, and Chapter 8 – Pedestrian Facilities.

C.8 Bicyclist Considerations

C.8.a Bicycle Facilities

Residential roadways are generally sufficient to accommodate bicycle traffic. ~~;~~ ~~however,~~ ~~When~~ ~~specific~~ ~~bicycle~~ facilities are desired, they should connect to existing facilities and be designed in accordance with **Chapter 3 – Geometric Design** and **Chapter 9 – Bicycle Facilities**.

C.98.b Shared Use Paths

~~Connections to schools, parks, shopping areas, and transit stops within or adjacent to the residential development should be provided. Bike lanes along collector and arterial roadways may be used to provide these connections. However, when designated bike lanes are not available, shared use paths may be utilized to provide direct access. A shared use path is a hard surfaced pathway physically separated from motorized vehicular traffic by an open space or barrier. Shared use paths may be used by bicyclists, pedestrians, skaters, wheelchair users, and joggers.~~

Shared use paths may be provided in lieu of sidewalks along collector roads in accordance with **Section C.7.a**. When shared use paths are desired, they should connect to other pedestrian and bicycle facilities within or adjacent to the residential area, and connect to schools, day care facilities, parks, churches, shopping areas, and transit stops. Shared use paths shall be designed in accordance with **Section C** of **Chapter 9 – Bicycle Facilities**. Shared use paths may be used by golf carts in certain areas, in accordance with Sections 316.212, 316.2125 and 316.2126, F.S.

C.109 Clear Zone

Clear zone requirements for residential streets shall be based on Chapter 3 – Geometric Design, Table 3 – 13.

D REFERENCES FOR INFORMATIONAL PURPOSES

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

- **AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400):**
<https://bookstore.transportation.org/>
- **Manual on Uniform Traffic Control Devices (MUTCD)**
http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm

~~THIS PAGE INTENTIONALLY LEFT BLANK~~

CHAPTER 17

BRIDGES AND OTHER STRUCTURES

1		
2		
3	<u>A</u>	<u>INTRODUCTION..... 17-1</u>
4	<u>B</u>	<u>OBJECTIVES 17-1</u>
5	<u>C</u>	<u>DESIGN..... 17-2</u>
6	<u>C.1</u>	<u>Bridges - General 17-2</u>
7	<u>C.2</u>	<u>Bridge Live Loads 17-2</u>
8	<u>C.3</u>	<u>Bridge Superstructure 17-3</u>
9	<u>C.3.a</u>	<u>Girder Transportation 17-3</u>
10	<u>C.3.b</u>	<u>Vertical Clearance..... 17-3</u>
11	<u>C.3.c</u>	<u>Railings 17-4</u>
12	<u>C.3.d</u>	<u>Expansion Joints..... 17-5</u>
13	<u>C.3.e</u>	<u>Drainage 17-5</u>
14	<u>C.3.f</u>	<u>ADA 17-5</u>
15	<u>C.3.g</u>	<u>End Treatments 17-5</u>
16	<u>C.4</u>	<u>Bridge Substructure 17-5</u>
17	<u>C.4.a</u>	<u>Scour 17-6</u>
18	<u>C.4.b</u>	<u>Vessel Impact 17-6</u>
19	<u>C.4.c</u>	<u>Pier Locations 17-7</u>
20	<u>C.5</u>	<u>Retaining Walls and Sound Barriers 17-8</u>
21	<u>C.6</u>	<u>Sign, Lighting, and Traffic Signal Supports 17-8</u>
22	<u>C.7</u>	<u>Pedestrian Bridges..... 17-8</u>
23	<u>D</u>	<u>CONSTRUCTION..... 17-9</u>
24	<u>E</u>	<u>ROUTINE INSPECTION AND MAINTENANCE 17-10</u>
25	<u>F</u>	<u>BRIDGE LOAD RATING, PERMITTING, AND POSTING 17-12</u>
26	<u>G</u>	<u>RECOMMENDATIONS 17-14</u>
27	<u>H</u>	<u>REFERENCES FOR INFORMATIONAL PURPOSES 17-15</u>
28	<u>A</u>	<u>INTRODUCTION..... 17-1</u>

1	B	OBJECTIVES	17-1
2	C	DESIGN	17-2
3		C.1 General	17-2
4		C.2 Bridge Live Loads	17-2
5		C.3 Bridge Superstructure	17-3
6		C.3.a Girder Transportation	17-3
7		C.3.b Vertical Clearance	17-3
8		C.3.c Railings	17-4
9		C.3.d Expansion Joints	17-5
10		C.3.e Drainage	17-5
11		C.3.f ADA	17-5
12		C.3.g End Treatments	17-5
13		C.4 Bridge Substructure	17-5
14		C.4.a Scour	17-6
15		C.4.b Vessel Impact	17-6
16		C.4.c Pier Locations	17-7
17	D	CONSTRUCTION	17-8
18	E	ROUTINE INSPECTION AND MAINTENANCE	17-9
19	F	RECONSTRUCTION	17-10
20	G	BRIDGE LOAD RATING, PERMITTING, AND POSTING	17-11
21	H	OTHER STRUCTURES	17-12
22		H.1 Retaining Walls and Sound Barriers	17-12
23		H.2 Sign, Lighting, and Traffic Signal Supports	17-12
24		H.3 Pedestrian Bridges	17-12
25	I	RECOMMENDATIONS	17-13
26	J	REFERENCES FOR INFORMATIONAL PURPOSES	17-14
27			

CHAPTER 17

BRIDGES AND OTHER STRUCTURES

A INTRODUCTION

Bridges provide safe passage for multimodal traffic over various obstacles along a road or path. This chapter presents guidelines and standards for designing, constructing, inspecting, and maintaining bridges as well as other structures such as walls and supports for signs, lights, and traffic signals. These standards and criteria are necessary due to the critical function these structures serve to communities throughout their lifespan. This chapter establishes uniform minimum standards and criteria for all bridges used by the public for vehicular and/or pedestrian traffic as well as other structures such as walls and supports for signs, lights, and traffic signals. The geometry of structures shall follow the standards and criteria set forth in Chapters 3, 8, 9, and 13. Exceptions to these standards and criteria must be processed in accordance with the procedures described in Chapter 14.

All bridges constructed on and over the Department's system, as well as all bridges that will be maintained by the Department, must comply with all Department policies, procedures, standards and specifications, and this Manual does not apply.

B OBJECTIVES

The objectives of this chapter are as follows:

- To prescribe uniform criteria with respect to bridge and miscellaneous structures design ~~loads, design methodology,~~ and geometric layout.
- To alert owners to the various federal and state requirements to be included in the design, construction, maintenance, and inspection of their bridges and other structures.
- To provide practical suggestions specific to Florida on prudent ~~bridge structural~~ engineering based on past experience with statutes, standards, and criteria.

1 C DESIGN

2 The design of bridges and other structures shall be led by a licensed professional
3 engineer who shall assume responsible charge of the work. The standards and criteria
4 included here are directed only toward specific considerations that shall be followed.
5 Other considerations are necessary to create a comprehensive bridge design allowing
6 owners and their engineer's flexibility in design. All bridges and other structures shall
7 be designed in accordance with specifications (including guide specifications) published
8 by the American Association of State Highway and Transportation Officials (AASHTO).

9 C.1 Bridges - General

10 ~~All bridges and other structures shall be designed in accordance with~~
11 ~~specifications (including guide specifications) published by the American~~
12 ~~Association of State Highway and Transportation Officials (AASHTO). At a~~
13 ~~minimum, the AASHTO Load and Resistance Factor Design (LRFD) Bridge~~
14 ~~Design Specifications, 6ⁿ Edition (2012) with 2013 Interims shall be used. Any~~
15 ~~bridge reconstruction (i.e., lengthening, widening, and/or major component~~
16 ~~replacement) shall be designed as specified in this Section C of this chapter.~~
17 ~~Record of such reconstruction shall be maintained as specified in Section D of~~
18 ~~this chapter. The remaining design life should be considered in the design of a~~
19 ~~repair on the project.~~

20 ~~The design of all bridge facilities shall consider both the economic use of~~
21 ~~materials and the sound application of aesthetic principles. According to Section~~
22 ~~336.045, Florida Statutes:~~

23 ~~*"In developing such standards and criteria, the department shall consider*~~
24 ~~*design approaches which provide for the compatibility of such facilities*~~
25 ~~*with the surrounding natural and manmade environment; ...and the*~~
26 ~~*appropriate aesthetics based upon scale, color, and architectural style,*~~
27 ~~*materials used to construct the facility, and the landscape design and*~~
28 ~~*landscape materials around the facility..."*~~

29 C.2 Bridge Live Loads

30 In addition to the notional design load specified in LRFD, bridges shall also
31 require a FL 120 permit load rating greater than 1 as defined in the FDOT
32 Structures Manual Volume 1– Structures Design Guidelines (SDG). This vehicle
33 allows for a more consistent load rating comparison considering the current
34 bridge inventory.

35

1 **C.3 Bridge Superstructure**

2 The superstructure of a bridge is that portion of the structure that spans between
3 its supports or piers. Considerations that shall be incorporated into the design of
4 all superstructures will include the following:

5 **C.3.a Girder Transportation**

6 The EOR is responsible for investigating the feasibility of transportation for
7 heavy, long and/or deep girder field sections. In general, the EOR should
8 consider the following during the design phase:

- 9 • Whether or not multiple routes exist between the bridge site and a
10 major transportation facility.
- 11 • The transportation of field sections longer than 130 ft or weighing
12 more than 160,000 pounds requires coordination through the
13 Department's Permit Office during the design phase of the project.
14 Shorter and/or lighter field sections may be required if access to the
15 bridge site is limited by roadway(s) with sharp horizontal curvature
16 or weight restrictions.
- 17 • On steel superstructures, where field splice locations required by
18 design result in lengths greater than 130 feet, design and detail
19 "Optional Field Splices" in the plans.
- 20 • For curved steel box girders, prefabricated trusses, and integral
21 pier cap elements, size field pieces such that the total hauling width
22 does not exceed 16 feet.

23 **C.3.b Vertical Clearance**

24 All new bridges over roadways and shared use paths shall be designed to
25 meet the vertical clearance standards specified in Chapter 3, Section
26 C.7.j.4.(b), and Chapter 9, Section C.4.

27 All new bridges over water shall be designed to meet the following vertical
28 clearance standards:

- 29 • To allow debris to pass without causing damage, the clearance
30 between the design flood stage and the low member of bridges

1 shall be a minimum of two feet. This standard does not apply to
2 culverts and bridge-culverts.

- 3 • For crossings subject to boat traffic, the minimum vertical
4 navigation clearance should be:

Tidewater bays and streams	6 feet above Mean High Water *
Freshwater rivers, streams, non-regulated/controlled canals, and lakes	6 feet above Normal High Water
Regulated/controlled lakes and canals	6 feet above control elevation

5 * For locations subject to tidal salt / brackish water splashing, a
6 12 foot vertical clearance above Mean High Water should be
7 considered for bridge durability reasons.

8 Higher clearances apply for crossings over legislated channels under the
9 control of the U.S. Coast Guard (USCG). Designers should also consider
10 future navigation demands and future shared use path demands in setting
11 the vertical clearance of a bridge.

12 **C.3.c Railings**

13 All traffic, pedestrian, and bicycle railings shall comply with the requirements
14 in Section 13 of LRFD. Traffic railings shall meet the crash requirements of
15 at least Test Level 3 (TL-3) for bridges with design speeds greater than 45
16 mph and at least TL-2 for design speeds less than or equal to 45 mph.

17 For pedestrian/bicycle railings, two-pipe guiderails and details (similar to the
18 Department's Design Standards, Indexes 870 or 880) may be mounted on
19 walls or other structures where drop-off hazards are 5 feet or less.
20 Concrete, aluminum or steel railing and details (similar in strength and
21 geometry to the Department's Design Standards, Indexes 820 thru 862)
22 shall be used (or modified to suit environmental runoff concerns) where
23 drop-off hazards are greater than 5 feet. See appropriate Instructions for
24 Design Standards (IDS) for more information.

25

1 **C.3.d Expansion Joints**

2 The number of joints should be minimized to reduce the inspection and
3 maintenance needs of the bridge.

4 **C.3.e Drainage**

5 All bridge designs shall include a drainage design that is specific to its site.
6 Conveyance of drainage off the bridge roadway should be designed to
7 meet spread standards contained in the Department's ***Drainage Manual***,
8 Chapter 3 and may include open systems (i.e., scuppers) or closed
9 systems (i.e., inlets and pipes) based on environmental permitting
10 restrictions. Drainage from the bridge should not drop onto traffic below.
11 Longitudinal conveyance piping attached to bridges is expensive and
12 maintenance-intensive, and should be avoided whenever possible.
13 Conveyance of drainage off pedestrian facilities shall meet the provisions
14 of the Americans with Disabilities Act (ADA). Further guidance on the
15 design of bridge deck drainage may be found in the current version of
16 FHWA Publication HEC-21, "Bridge Deck Drainage Systems."

17 **C.3.f ADA**

18 All bridges that include provisions for pedestrians shall provide pedestrian
19 accommodations and design considerations that meet the provisions of
20 the ADA. Significant ADA design considerations exist for all facilities with
21 grades that exceed 5%.

22 **C.3.g End Treatments**

23 Requirements for end treatments of structures are given in CHAPTER 4 –
24 ROADSIDE DESIGN. Bridge barriers shall be designed to accommodate
25 connection of a guardrail transition or energy absorbing system.

26 **C.4 Bridge Substructure**

27 The substructure of a bridge consists of all elements below the superstructure
28 including its bearings, piers, and foundations. For guidance on bridges
29 vulnerable to coastal storms, see SDG Section 2.5. Considerations that shall be
30 incorporated into the design of all substructures include the following:

1 **C.4.a Scour**

2 A hydrologic/hydraulic analysis shall be performed to quantify expected
3 stages and flows at the bridge site. Anticipated substructure scour shall
4 be developed for the following:

- 5 • Worst case scour condition up through the 100-year frequency flood
6 event (Scour Design Flood Event).
- 7 • Worst case scour condition up through the 500-year frequency flood
8 event (Scour Check Flood Event).

9 Any exceptions to the standards above hydrologic/hydraulic and scour
10 analysis requirements shall be approved in writing by the Department's
11 local District Drainage Engineer. Methodology for computing bridge
12 hydrology/hydraulics and bridge scour should follow the guidelines set
13 forth in the most recent versions of the Department's "Drainage Manual."
14 Further guidance and training may be obtained through FHWA Hydraulic
15 Engineering Circulars (HEC) "HEC-18" and "HEC-20" and the
16 Department's training courses on these topics. Additionally, for larger
17 bridges (>120,000 sq. ft.), hydraulic designers may wish to consult with
18 the local Department District Drainage Engineer for case-specific
19 guidance. Scour load combinations with other loads shall be as per the
20 [FDOT Structures Manual Volume 1 - Structures Design Guidelines \(SDG\)](#),
21 Section 2.12 (and subsequently Section 2.11 of the SDG, the
22 Department's Drainage Manual, Chapter 4, and LRFD Sections 3.3.2,
23 3.14.1 and Table 3.4.1-1 as applicable).

24 **C.4.b Vessel Impact**

25 All bridges over USCG designated navigable waterways shall include
26 consideration for potential vessel collision. Such collisions generally occur
27 from barges or oceangoing ships. The engineer shall conduct a vessel
28 risk analysis to determine the most economical method for protecting the
29 bridge. This shall include either designing the bridge to withstand the
30 vessel collision, or protecting it with dolphin cells. Fender systems should
31 only be used to designate the channel width and not for pier protection.
32 ~~The above risk analysis may be conducted utilizing the Department's~~
33 ~~computer program "Vessel Impact Risk Analysis."~~ For load combinations,
34 use Load Combination "Extreme Event II" as follows:

35 (Permanent Dead Loads) + WA+FR+CV

36 With all load factors equal to 1.0 where WA are water loads, FR are
37 friction forces and CV are the vessel collision loads. Nonlinear structural

1 effects must be included and can be significant. It is anticipated that the
2 entire substructure (including piles) may have to be replaced and the
3 superstructure repaired if a bridge is subjected to this design impact load;
4 however, the superstructure must not collapse.

5 Note: Further refinement or complication of this load case is unwarranted.

6 Further guidance may be obtained from the SDG, Section 2.11 and LRFD
7 Section 3.14.

8 For guidance on bridge fender system design, see SDG Section 3.14 and
9 FDOT Design Standard Indexes 21900 and 21930.

10 **C.4.c Pier Locations**

11 All bridges over roadways shall have substructures supports set back from
12 vehicular traffic lanes in accordance with Chapter 3, Section C.7.j.4.(a).

13 All bridges over water shall have substructure supports located with
14 horizontal clearance requirements as listed below. In this case, horizontal
15 clearance is defined as the clear distance between piers, fender systems,
16 culvert walls, etc., projected by the bridge normal to the flow.

- 17 • For crossings subject to boat traffic a minimum horizontal clearance
18 of 10 feet shall be provided.
- 19 • Where no boat traffic is anticipated, horizontal clearance shall be
20 provided consistent with debris conveyance needs and structure
21 economy.

22

C.5H.1 Retaining Walls and Sound Barriers

The design of conventional, anchored, mechanically stabilized, and prefabricated modular retaining wall structures shall meet the requirements of LRFD Section 11. Local agencies should consider using only wall types approved by the Department. These are described in Section 3.12 of the SDG. Local agencies should also follow the design criteria for retaining walls found in Section 3.13 of the SDG.

The design of sound ~~barriers~~walls shall meet the requirements of the SDG and LRFD. For sound walls within the clear zone, their design and/or protection shall comply with the following:

- For sound barriers attached to the top of traffic railings only use crash tested systems consistent with the design speed of the facility. The Department has standards for TL-4 systems that meet the requirements of NCHRP Report 350.
- Non-crash tested sound barriers may be attached to structures if located behind an approved traffic railing and mounted at least five feet from the face of the traffic railing at deck level.

Potential existing off-site stormwater inflows through the proposed wall location should be verified in the field and considered in the wall design. Additional considerations for the design of sound barrier walls may be found in Volume 1, Chapter 32 of the Department's Plans Preparation Manual (PPM). For railings on top of walls, see Section C.3.b.

C.6H.2 Sign, Lighting, and Traffic Signal Supports

The design of sign, lighting, and traffic signal support -structures shall meet the requirements of AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals Fifth Edition (201309) with 2010 and 2011 Interims, and the Department's Structures Manual Volume 39 - FDOT Modifications to Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals (LTS-65).

C.7H.3 Pedestrian Bridges

For guidance on pedestrian bridges, see *SDG Chapter 10*.

1 **D CONSTRUCTION**

2 During the construction of a bridge or any structure at, over, or near a public facility,
3 safety awareness is necessary and precautions shall be taken to protect the public.
4 Provisions for protecting the public during construction shall be in accordance with the
5 MUTCD work zone traffic control procedures and the standards and criteria described in
6 Chapter 11. Worker safety is the responsibility of the contractor. Temporary barriers
7 shall be installed on all bridges being widened or whose new construction is phased.
8 Spread of stormwater on the bridge deck should be considered in planning temporary
9 traffic routing.

10 During the construction of a bridge or any structure, records to be kept and maintained
11 throughout its life shall include foundation construction records (pile driving records,
12 shaft tip elevations, borings) and as-built plans. These records provide critical
13 information necessary for future inspection, maintenance, emergency management,
14 enhancement, reconstruction, and/or demolition of these structures. These records
15 shall be delivered to the Department's local District Structures Maintenance Engineers.

16 Any proposed changes to the construction details or specifications shall be signed,
17 sealed, and dated by a professional engineer licensed in the State of Florida.

18

1 E ROUTINE INSPECTION AND MAINTENANCE

2 Title 23, Code of Federal Regulations, Part 650, Subpart C, sets forth the National
3 Bridge Inspection Standards (NBIS) for bridges on all public roads. Section 650.3
4 defines bridges, specifies inspection procedures and frequencies, and indicates
5 minimum qualifications for personnel. Each state is permitted to modify its bridge
6 inspection standards to deviate from the NBIS standards but only following approval
7 from the FHWA.

8 Section 335.074, F.S., mandates safety inspection of bridges as follows:

9 *“At regular intervals not to exceed 2 years, each bridge on a public transportation facility*
10 *shall be inspected for structural soundness and safety for the passage of traffic on such*
11 *bridge. The thoroughness with which bridges are to be inspected shall depend on such*
12 *factors as age, traffic characteristics, state of maintenance, and known deficiencies.*
13 *The governmental entity having maintenance responsibility for any such bridge shall be*
14 *responsible for having inspections performed and reports prepared in accordance with*
15 *the provisions contained herein.”*

16 This statute also defines the minimum dimensions of bridge structures that must be
17 inspected as follows:

18 *“Those bridges having an opening measured along the center of the roadway of more*
19 *than 20 feet between undercopings of abutments or spring lines of arches or extreme*
20 *ends of openings for multiple boxes and those bridges consisting of multiple pipes*
21 *where the clear distance between openings is less than half of the smaller contiguous*
22 *opening...”*

23 Bridge inspectors shall be certified in accordance with Chapter 14-48, F.A.C. Safety
24 inspection of bridges shall be conducted in accordance with Chapter 14-48, F.A.C.

25 The Department inspects all bridges in Florida, both on-system and off-system. The
26 Department provides each local government with copies of its inspection reports. Each
27 local government should maintain these reports to be responsive to Metropolitan
28 Planning Organization requests for bridge rehabilitation, replacement, or enhancement
29 designations.

30 All on-system and off-system bridges are assigned a Bridge Number by the
31 Department. For new bridges, local agencies shall contact the Department's local
32 District Structures Maintenance Engineers to have a number assigned.

1 **F RECONSTRUCTION**

2 ~~Any reconstruction (i.e., lengthening, widening, and/or major component replacement)~~
3 ~~shall be designed as specified in Section C of this chapter. Record of such~~
4 ~~reconstruction shall be maintained as specified in Section D of this chapter. The~~
5 ~~remaining design life should be considered in the design of a repair on the project.~~

6

1 **GF BRIDGE LOAD RATING, PERMITTING, AND POSTING**

2 Section 335.07, F.S., mandates a sufficiency rating system for roads on the State
3 Highway System. This statute also applies to bridges. This rating system considers the
4 structural adequacy, safety, and serviceability of the road/bridge. The Department
5 provides the posting information, if required, to the local agency owner and requires the
6 owner to provide the appropriate signage to be promptly installed in accordance with the
7 MUTCD. For bridges, the determination of this rating shall be accomplished using
8 procedures in the Department's "Bridge Load Rating Manual". If necessary, the bridge
9 owner shall post all bridges in the National Bridge Inventory (NBI) within 90 or 180 days
10 of opening or a change in load rating for on-system or off-system bridges, respectively.

11 For new construction or reconstruction, the bridge owner shall perform a load rating and
12 provide the Department with a completed Bridge Load Rating Summary Form (see
13 Bridge Load Rating Manual) within 90 or 180 days of opening for on-system or
14 off-system bridges, respectively. The bridge owner should consider requiring the
15 engineer of record to perform the load rating.
16

~~H — OTHER STRUCTURES~~

~~H.1 — Retaining Walls and Sound Barriers~~

~~The design of conventional, anchored, mechanically stabilized, and prefabricated modular retaining wall structures shall meet the requirements of LRFD Section 4.1. Local agencies should consider using only wall types approved by the Department. These are described in Section 3.12 of the SDG. Local agencies should also follow the design criteria for retaining walls found in Section 3.13 of the SDG.~~

~~The design of sound walls shall meet the requirements of the SDG and LRFD. For sound walls within the clear zone, their design and/or protection shall comply with the following:~~

- ~~• For sound barriers attached to the top of traffic railings only use crash tested systems consistent with the design speed of the facility. The Department has standards for TL-4 systems that meet the requirements of NCHRP Report 350.~~
- ~~• Non-crash tested sound barriers may be attached to structures if located behind an approved traffic railing and mounted at least five feet from the face of the traffic railing at deck level.~~

~~Potential existing off-site stormwater inflows through the proposed wall location should be verified in the field and considered in the wall design. Additional considerations for the design of sound barrier walls may be found in Volume 1, Chapter 32 of the Department's Plans Preparation Manual (PPM). For railings on top of walls, see Section C.3.b.~~

~~H.2 — Sign, Lighting, and Traffic Signal Supports~~

~~The design of sign, lighting, and traffic signal support structures shall meet the requirements of AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals Fifth Edition (2009) with 2010 and 2011 Interims, and the Department's Structures Manual Volume 9 - FDOT Modifications to Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals (LTS-5).~~

~~H.3 — Pedestrian Bridges~~

~~— For guidance on pedestrian bridges, see SDG Chapter 10.~~

1 **IG** RECOMMENDATIONS

- 2 • Involve the public in determining “*the appropriate aesthetics based upon scale,*
3 *color, and architectural style, materials used to construct the facility, and the*
4 *landscape design and landscape materials around the facility...*” (Section
5 336.045, F.S.).
- 6 • Resist the temptation to enhance the aesthetics of a bridge with non-structural
7 appurtenances and features that are novel and therefore may have safety
8 challenges (otherwise, consult with the Department on these safety issues).
- 9 • Consider the potential for future expansion of a bridge’s capacity (vehicular
10 transit and pedestrian) in its layout and bridge-type selection.
- 11 • Use the Department’s objective construction unit prices (contained in the
12 Structures Design Guidelines, Sections 9.2 and 9.3) to select bridge type(s) to
13 consider for final design.
- 14 • Consider the use of alternative designs (i.e., steel superstructures vs. concrete
15 superstructures) to increase bidding competition on very large bridge
16 construction projects.
- 17 • Consider factors other than economics in decisions on a bridge’s basic design
18 and its discretionary features.
- 19 • Invest in a comprehensive subsurface investigation of the site before any
20 significant design of the bridge occurs (which will also help avoid unforeseen
21 conditions during construction).
- 22 • Consult with other local officials on experiences relating to construction of other
23 bridges in the area.
- 24 • Consider using the Department’s Standard Specifications for Road and Bridge
25 Construction with notes on the plans referencing the Owner as the local
26 governmental agency and the Engineer as the owner’s engineer.
- 27 • Consider the constructability, inspectability, and maintainability of all bridge
28 components before they are incorporated into the project’s final design.
- 29 • Include drainage pass-throughs in wall designs.
- 30 • Preclude contractors without company or individual bridge experience from
31 bidding on a bridge construction project.
- 32 • Provide qualified construction inspection personnel for all phases of bridge
33 construction.
- 34 • Maintain all design and construction records in a safe, protected, and secure
35 location throughout the life of the bridge.

36

1 **JH** REFERENCES FOR INFORMATIONAL PURPOSES

2 The publications referenced in this chapter can be obtained from the following websites.

3 • AASHTO, all publications may be ordered from:

4 bookstore.transportation.org

5 • FDOT “Bridge Load Rating Manual” may be found at:

6 <http://www.dot.state.fl.us/statemaintenanceoffice/CBR/BridgeInformation.shtm>

7 • All other FDOT Publications may be found at:

8 <http://www.dot.state.fl.us/mapsandpublications/publications.shtm>

9 • FHWA “HEC-18” and “HEC-20” may be ~~found at~~ ordered from:

10 http://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm

11

12

CHAPTER 18

SIGNING AND MARKING

<u>A</u>	<u>INTRODUCTION</u>	<u>18-1</u>
<u>B</u>	<u>BACKGROUND</u>	<u>18-1</u>
<u>C</u>	<u>SIGNS</u>	
C.1	Advance Street Name Signs	18-1
C.1.a	Standards	18-2
C.1.b	Installation	18-2
C.1.c	Sign Design	18-2
C.2	Advance Traffic Control Signs	18-5
C.3	Overhead Street Name Signs	18-5
C.3.a	Standards	18-5
C.3.b	Installation	18-6
C.3.c	Sign Design	18-6
C.3.d	Internally Illuminated Overhead Street Name Signs	18-7
C.4	Community Wayfinding Guidance	18-8
C.5	DMS Overview	18-8
C.6	Design Details for Signs	18-8
<u>D</u>	<u>PAVEMENT MARKINGS</u>	<u>18-8</u>
D.1	6-inch Pavement Markings	18-8
D.2	Reflective Pavement Markers	18-8
D.3	Audible Vibratory Pavement Markings	18-9
A	INTRODUCTION	18-1
B	BACKGROUND	18-1
C	SIGNS	
C.1	Advance Street Name Signs	18-1
C.1.a	Standards	18-2
C.1.b	Installation	18-2
C.1.c	Sign Design	18-2

C.2	Advance Traffic Control Signs.....	18-3
C.3	Overhead Street Name Signs.....	18-3
C.3.a	Standards.....	18-3
C.3.b	Installation.....	18-4
C.3.c	Sign Design.....	18-4
C.4	Internally Illuminated Overhead Street Name Signs.....	18-4
C.5	Design Details for Signs.....	18-5
D	PAVEMENT MARKINGS.....	18-5
D.1	6 inch Pavement Markings.....	18-5
D.2	Reflective Pavement Markers.....	18-5

TABLES

Table 18-1 Design Guidelines for Advanced Street Name Signs..... 18-3

~~TABLE 18-1 DESIGN GUIDELINES FOR ADVANCE STREET NAME SIGNS.....18-2~~

FIGURES

Figure 18 – 1 Examples of Advanced Street Name Signs 18-4

CHAPTER 18

Traffic Control Devices ~~SIGNING AND MARKING~~

A INTRODUCTION

Signing and pavement markings help improve highway safety by providing guidance information to road users. Both signs and pavement markings should provide sufficient visibility to meet the user's needs. The design of signs and pavement markings should complement the basic highway design. Designers and engineers should also be aware of the capabilities and needs of seniors, and consider appropriate measures to better meet their needs and capabilities.

Sections C and D of this chapter specifically discuss traffic control devices for both signing and pavement marking that accommodate not only the needs of all types of road users, but also the special needs of seniors.

B BACKGROUND

Section 316.0745, F.S., ~~requires mandates that~~ the Department compile and publish a manual of uniform traffic control devices for use on the streets and highways of the state. To comply with this statute, the Federal Highway Administration's (FHWA) **Manual on Uniform Traffic Control Devices (MUTCD)** has been adopted for use in **Rule 14-15.010, Florida Administrative Code (F.A.C.):**

<https://www.flrules.org/gateway/ruleNo.asp?ID=14-15.010>

All references in this chapter are in conformance with the **MUTCD**:

<http://mutcd.fhwa.dot.gov/>

C SIGNS

C.1 Advance Street Name Signs

The use of advance street name signs provides advance notification to road users to assist them in making safe roadway decisions. Signs should be used for signalized or non-signalized intersections that are classified as a minor arterial or higher, or a cross street that provides access to a traffic generator or possesses other comparable physical or traffic characteristics deemed to be critical or significant.

C.1.a Standards

The words Street, Boulevard, Avenue, etc., may be abbreviated ~~or~~ deleted or reduced in size to conserve sign panel length. However, if confusion would result due to similar street names in the area, the deletion should not be made.

Use of the local name is preferred on advance street name signs.

When a cross street has a different name on each side of the intersection, both names shall be shown with an arrow beside each name to designate direction.

Additional legend such as NEXT SIGNAL or XX FEET may be added.

C.1.b Installation

Advance street name signs should be installed in advance of the intersection in accordance with the distances shown in “Condition A” of **Table 2C-4. Guidelines for Advance Placement of Warning Signs of the MUTCD**. These distances are to be considered the minimum for a single lane change maneuver, and should be measured from the begin taper point for the longest auxiliary lane designed for the intersection. The degree of traffic congestion and the potential number of lane change maneuvers that may be required should also be considered when determining the advance placement distance.

C.1.c Sign Design

Advance street name signs shall be designed in accordance with **Part 2 Signs** of the **MUTCD**. The lettering for the signs shall be composed of a combination of lower case letters with initial upper case letters.

Letter height should conform to Table 18-1, Design Guidelines for Advance Street Name Signs.

Table 18-1
Design Guidelines for Advanced Street Name Signs
Design Guidelines for Advance Street Name Signs

Posted Speed Limit (mph)	Letter Size (inches) Series E Modified	
	Upper	Lower
30—35	8	6
40 or Greater	10.67	8

<u>Posted Speed Limit</u>	<u>Street Name Legend</u>	<u>Next Signal or Intersection</u>
	<u>Letter Size (inches) Series E Modified (EM) Upper/Lower Case Letters</u>	<u>Letter Size (inches) Series D (D) Upper Case Letters</u>
<u>35 mph or less</u>	<u>8 EM</u>	<u>6 D</u>
<u>40 mph or greater</u>	<u>10.67 EM</u>	<u>8 D</u>

Figure 18 – 1
Examples of Advanced Street Name Signs



C.2 Advance Traffic Control Signs

Advance Traffic Control signs, i.e., Stop Ahead (W3-1), Yield Ahead (W3-2), and Signal Ahead (W3-3) signs, shall be installed on an approach to a primary traffic control device that is not visible for a sufficient distance to permit the driver to respond to the device. The visibility criteria for a traffic control device shall be based on having a continuous view of at least two signal faces for the distance specified in **Table 4D-2. Minimum Sight Distance for Signal Visibility of the MUTCD.**

An Advance Traffic Control sign may be used for additional emphasis of the primary traffic control device, even when the visibility distance to the device is satisfactory.

C.3 Overhead Street Name Signs

Overhead street name signs with mixed-case lettering should be used at major intersections (with multi-lane approaches) as a supplement to post mounted street name signs.

C.3.a Standards

Overhead street name signs shall only be used to identify cross streets, not destinations such as cities or facilities.

The words Street, Boulevard, Avenue, etc., may be abbreviated, ~~or~~ deleted or reduced in size to conserve sign panel length.

The border should be eliminated on overhead street name signs to minimize sign panel size.

When a cross street is known by both a route number and a local name, use of the local name is preferred.

~~When a cross street has dual local street name designations, both names may be used on the overhead street name sign.~~

When a cross street has a different name on each side of the intersection, two options are permitted:

- ~~when two sign panels are used, both names shall be shown on the overhead street name sign. When one sign panel is used, the names shall be separated with a border, with the left name displayed over the right. The display of block numbers is not required when two street names with arrows are provided on a single panel. When two signs are used, they should be installed with one sign panel on the left and the other sign panel on the right side of the intersection; or~~
- ~~when one sign panel is used, the left name should be displayed over the right name. Arrows should be provided to indicate which side of the intersection the street name applies.~~

~~Due to the possibility of hurricane strength winds, overhead street name signs should not be installed on span wire.~~

C.3.b Installation

~~Due to the possibility of hurricane strength winds, overhead street name signs should not be installed on span wire but should be mounted to the strain pole or mast arm.~~

The location of the overhead street name sign on a signal strain pole and/or mast arm may vary. However, it shall not interfere with the motorist's view of the signal heads. The preferred location is shown in the Department's [Design Standards, Index No. 17748](#). In the case of separate street names on each side of the street, ~~where separate signs are used,~~ one sign should be placed to the right of the ~~centerline and~~ signal heads and the other sign to the left ~~side~~ of the ~~centerline and~~ signal heads.

C.3.c Sign Design

On roadways with speeds of 40 mph or above, the sign panel should be at least 24 inches in height with the length determined by text. At a minimum, ~~use~~ 8-inch upper case and 6-inch lower case lettering for the street name. ~~If block numbering text is included, use and~~ 6-inch all upper case lettering ~~for the block numbering text~~ on the second line ~~shall be used~~. The preferred font is Series E-Modified; however, Series E may be used to accommodate the amount of legend so as not to exceed the 96-inch maximum length.

Where structurally possible, overhead street name signs should be designed in compliance with the FHWA recommendations for older drivers using a minimum lettering size of 10~~2~~-inch upper case with 9-inch lower case.

C.3.d4 Internally Illuminated Overhead Street Name Signs

~~An internally illuminated overhead street name sign~~ ~~may~~ ~~should~~ be used to improve night-time visibility ~~and benefits older drivers~~.

Internally illuminated overhead street name signs should have a standardized height of 24-inches and ~~a length not to exceed of 108~~72-inches ~~(nine feet)~~.

~~, with A either~~ Series E Modified or Series E font, which may vary to accommodate the amount of text on the panel ~~should be used~~. ~~In extreme cases, a 96-inch maximum length sign may be used.~~

The sign design shall be in accordance with the **MUTCD**. When possible the text should utilize the following text attributes in descending order to limit the maximum width:

- 10-inch upper case with 8-inch lower case, Type EM font
- 10-inch upper case with 8-inch lower case, Type E font
- 8-inch upper case with 6-inch lower case, Type EM font
- 8-inch upper case with 6-inch lower case, Type E font

Internally illuminated overhead street name signs shall be on the Department's [Approved Products List \(APL\)](#) ~~in accordance with Section 316.0745, F.S.~~

C.4 Community Wayfinding Guidance

Community wayfinding guide signs shall be developed and approved through local resolution with criteria for the destinations shown on the community wayfinding guide sign system plan. Any wayfinding guide sign should be used in accordance with Rule 14-51.030, F.A.C. The intent is to provide guidance and navigation information to local cultural, historical, recreational, and tourist activities. No destination should be displayed for the purpose of advertising.

C.5 DMS Overview

The main purpose of dynamic message signs (DMS) is to convey timely and important en-route and roadside information to motorists and travelers. Further information on how DMS signs may be used can be found in FDOT's policy on *Displaying Messages on Dynamic Message Signs Permanently Mounted on the State Highway System*.

<http://www2.dot.state.fl.us/proceduraldocuments/procedures/bin/000750015.pdf>

C.65 Design Details for Signs

The *MUTCD* shall govern the sign details for all signs. At a minimum, the "Conventional Road" size should be used on signs intended for motor vehicle operators. Signs intended for shared use path users should use the reduced "Shared-Use Path" sizing.

D PAVEMENT MARKINGS

D.1 6-inch Pavement Markings

6-inch pavement markings should be used for all ~~centerline~~ pavement center line, and lane separation line ~~edge~~ and edge line pavement markings.

D.2 Reflective Pavement Markers

~~In order to~~ To provide greater emphasis and increase visibility, reflective (raised) pavement markers (RPM) ~~may~~ should be placed at 40-foot spacings along the centerline markings of roadways with speeds ~~35~~ 40 mph or greater.

D.3 Audible Vibratory Pavement Markings

Audible, vibratory markings should be considered on the outside edge lines for all two lane and multi-lane undivided rural roadways. They should also be considered on the inside and outside edge lines for all multi-lane divided rural roadways. Audible and vibratory pavement markings may be used on centerline markings of two lane rural roadways.