*March 30, 2011*

# *Florida Greenbook Advisory Committee Meeting*

# *Meeting Review Package*

# *Agenda*

# AGENDA

## FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

**Wednesday, March 30, 2011 8:00am – 5:00pm**

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

| | | (Duration – minutes) |
|---|---|---|
| **8:00 – 8:30** | General Information | 30 |
| | • Introductions (David O'Hagan) | |
| | • Committee Member Changes (David O'Hagan) | |
| | • Review March & April 2010 Meeting Minutes & VOTE (David O'Hagan) | |
| | • Discuss Florida Greenbook Committee (Rob Quigley) | |
| | • Rulemaking Process and Status (Rob Quigley) | |
| | • Sunshine Law (Rob Quigley) | |
| | • Review Contact Information / Update Subcommittee (Rob Quigley) | |
| **8:30 – 9:30** | Design Issues | |
| | • Highway Safety Manual (Frank Sullivan) | 15 |
| | • Safety Edge | 15 |
| | • Low Volume and Unpaved Local Roads & Bridges | 15 |
| | • Overweight/Oversize Truck Permitting | 15 |
| **9:30 – 9:45** | MUTCD Update (Mark Wilson) | 15 |
| **9:45 – 10:00** | ***Morning Break*** | ***15*** |
| **10:00 – 11:30** | Review Major Chapter Edits & Vote (Ch. 5, 9) | 90 |
| **11:30 – 12:00** | Review Minor Chapter Edits (Ch. 3, 10, 17) | 30 |
| **12:00 – 1:00** | ***Lunch - On Your Own*** | ***60*** |
| **1:00 – 1:30** | Review of TND Handbook and Committee Vote (Billy Hattaway) | 30 |
| **1:30 – 1:50** | LAP Community of Practice (Duane Brautigam) | 20 |
| **1:50 – 2:15** | Drainage (New Chapter vs. FDOT Drainage Manual Reference) (Rob Quigley) | 25 |
| **2:15 – 3:00** | Other Chapter Subcommittee Reports (Chapter Authors) | 45 |
| **3:00 – 3:15** | ***Afternoon Break*** | ***15*** |
| **3:15 – 3:45** | Public Comment Period | 30 |
| **3:45 – 4:45** | Committee Member Issues | 60 |
| **4:45 – 5:00** | Closing Items (Rob Quigley) | 15 |
| | • Action Items | |
| | • Future Subcommittee Meetings | |
| | • Meeting Critique | |

***Note: Time slots are tentative. Any other information provided at the meeting will be posted with the Minutes at:*** **http://www.dot.state.fl.us/rddesign/FloridaGreenbook/FGB.shtm**

# *Committee Member Changes*

# FLORIDA GREENBOOK ADVISORY COMMITTEE

# 2010/2011 MEMBERSHIP CHANGES

## MEMBERS

**DISTRICT 7**

The year before last, **Charles Mixson** left his position as the County Engineer for Hernando County. The D-7 Rural Area Member position has been filled by **Charles Balut**, the Citrus County Department of Public Works Engineering Services Director.

**ASSOCIATE MEMBERS**

This year, **Jim Mills** retired from the Department of Transportation. Jim has been listed as an Associate member since 2001, but had been involved before that.

# *March 2010 Meeting Minutes*

# MEETING MINUTES

1. David O'Hagan (Committee Chairperson / Florida Department of Transportation (FDOT) State Roadway Design Engineer) opened the meeting at 8:00am. David stated this meeting was being held under the Sunshine Law and minutes were being taken. David asked to make sure all in attendance had received a **Meeting Review Package** and he briefly discussed the **Agenda**.

2. The **Sign-In Sheet** was passed around and meeting attendees introduced themselves. The attendance roster is attached as an amendment to these minutes.

3. David O'Hagan discussed the **Committee Member Changes** (since last meeting). Replacing Chuck Meister as the District 3 Urban Area Member, is Keith Bryant, the Traffic Engineering Manager for Bay County. Replacing Jim Davis as the District 4 Rural Area Member, is Chris Mora, the Public Works Director for Indian River County. Replacing Charles Mixson as the District 7 Rural Area Member, is Charles Balut, the Engineering Services Director for Citrus County.

4. Rob Quigley reviewed the **2009 Meeting Minutes**. The minutes were reviewed with one correction was made regarding the Highway Safety Manual in item 17. All were in favor to accept the minutes as amended.

5. Rob Quigley discussed ownership of the Florida Greenbook. The objective is to have the members to take ownership of the individual chapters so that changes can be better managed. One of the goals for the FDOT Central Office Roadway Design staff is to better define the role of the Associate Members for the next year's meeting. Associate Members are currently involved as technical advisors and participate in chapter development, but they do not participate in voting. The Committee Chairperson is also an Associate Member and does not participate in voting.

6. Rob Quigley stated that the **Rule Making Process** will begin after comments from this meeting are resolved. The Rule Making Process generally takes about 6 months to complete.

7. Rob Quigley said that according to the **Sunshine Law** all meetings, including subcommittee meetings, are open to the public and must be advertised. Therefore, the subcommittees need to work with Rob by giving him at least a one-week notice on any meetings so he can post the meeting information. Meeting minutes must be sent to Rob following the meetings so they can be posted.

8. The following issues were presented:

   Issue #1: Strategic Highway Safety Plan (SHSP) Update

   Marianne Trussell made a **Presentation on the SHSP** started in 2006. The plan is being updated by the Leadership Group to include teen drivers, elderly drivers, distracted driving, work zones and impaired driving. The SHSP is located at: http://www.dot.state.fl.us/safety/SHSP/StrategicHwySafetyPlan.shtm

   Marianne noted that there is a web site for tracking roadway safety improvements as part of implementation of the SHSP. Local Agencies can enter information directly

into the system. Upgrades related to pedestrian facilities and guardrail should be entered into the system. Such upgrades have been included in resurfacing projects paid for with stimulus money. The program tracking web site is located at: http://www2.dot.state.fl.us/safetyprogramtracking. For further information, please contact **Marianne Trussell** or **Joe Santos**.

Issue #2: Design Issues / AASHTO Update

Jim Mills gave an update on the American Association of State Highway and Transportation Officials (AASHTO) publication of three manuals: the Highway Safety Manual (HSM), the Roadside Design Guide (RSDG) and the AASHTO Policy on Geometric Design of Highways and Streets (AASHTO Green Book). The HSM is at the printer and will be sold for a cost of around $350-$400. The RSDG updated version should be published this year, but we do not have a target date. The AASHTO Green Book is in the balloting process now and will be published this year. There are several changes; however, none that will affect the Florida Greenbook significantly. There will be some modifications to the design vehicles and to the passing sight distance values. Also, the term 'horizontal clearance' will be changed to 'lateral offset' which will make the RSDG and the AASHTO Green Book in agreement. More information on these documents may be found on the AASHTO website: http://www.transportation.org/.

The question was asked as to the relationship of the Florida Greenbook to these three AASHTO documents. Jim said that there was no mandate for the Florida Greenbook Committee to adopt these manuals; however, any roadway improvements to a National Highway System roadway will require the use of these manuals. If the Florida Greenbook refers to any of these manuals, we should refer to a particular publication year since the Rule-Making process requires it.

Issue #3: Signing, Marking & Signalization

Chester Henson provided an update on the 2009 Manual on Uniform Traffic Control Devices (MUTCD), vibratory markings, mast arm policy area and new specifications for mast arm finishes.

Table 2B-1 titled "Regulatory Sign and Plaque Sizes" was revised so that conventional roadways are separated into multi-lane and single-lane. In general, the sign sizes are larger for multi-lane roadways. The Department intends to adopt the 2009 MUTCD effective January 1, 2011with specific implementation dates for some components. These implementation dates are covered in Mark Wilson's presentation.

The Department has updated their Plans Preparation Manual (PPM) to include the use of audible and vibratory markings. The following language is included in Section 7.2.8.2 of the PPM:

> "Audible and vibratory markings shall be installed on all flush shoulder rural projects excluding limited access facilities. These markings are a countermeasure for lane departure crashes. These markings shall be installed on the outside edge lines for all two lane and multi-lane undivided rural roadways; and on the inside and outside edge lines of all multi-lane divided rural roadways."

There is new standard for mast arm poles within 10 miles of the coast. The FDOT also selected a standard galvanized finish. If paint is to be used, the contractor must put up a bond to maintain the finish for five years after installation, afterwards the local government must maintain the finish. A policy has been instituted to inspect the structural aspects of mast arms on the State Highway System; however, no official inspection cycle has been implemented yet.

For further information, please contact **Chester Henson**.

Issue #4: MUTCD Update

Mark Wilson gave a **Presentation on the 2009 MUTCD** covering several of the updates. Some of the issues covered included:

1. Although sign sizes have increased, 30" signs can remain in place until the useful life is reached.
2. A 'wireless internet' access sign is now included as a General Service Sign.
3. A motorcycle plaque is included in Section 6F.54 for use in work zones and may be mounted below a LOOSE GRAVEL (W8-7) sign, a GROOVED PAVEMENT (W8-15) sign, a METAL BRIDGE DECK (W8-16) sign, or a STEEL PLATE AHEAD (W8-24) sign if the warning is intended to be directed primarily to motorcyclists.
4. The dotted line pavement marking applies to intersections to separate a through lane that continues beyond the intersection from a turn lane.
5. A major revision to Signal Warrant #4 (pedestrian volume) was made in Section 4C.05. The former warrant's two criteria to meet in order to satisfy Warrant 4 are replaced with two new criteria that are based on a combination of vehicular and pedestrian volumes for either 4-hours or a single peak hour, and only one of the criteria needs to be met. This is based on an extensive National Cooperative Highway Research Program (NCHRP) research study conducted by the Texas Transportation Institute (TTI).
6. The optional use of flashing yellow arrows for permissive turns has been incorporated in Chapter 4D. This is an alternative for circular green and has a high level of understanding and correct response by left-turn drivers and a lower fail-critical rate than the circular green.

The following is a link to MUTCD training: http://mutcd.fhwa.dot.gov/ser-Training.htm

For further information, please contact **Mark Wilson**.

Issue #5: Review and Vote of the Edits for 2010 (Chapters 3, 6, 11, 18 and 19)

The **Previously Discussed Edits** for 2010 are contained in the Meeting Review Package dated March 24, 2010 except as noted below.

Chapter 3 – revisions approved by vote with no changes

Chapter 6 – revisions approved by vote with proposed changes

Chapter 11 – revisions approved by vote with no changes

Chapter 18 – reference on page 18-4 to 'Table 4D-1 of the MUTCD' should read 'Table 4D-2 of the MUTCD' to correspond with the 2009 MUTCD. Rob Quigley said that he would review the chapter for references to the MUTCD and change the table references to so that they are more generic where appropriate. Revisions approved by vote with proposed changes.

Chapter 19 – the issue of referencing coordination with local services appears only in Section E.1.c. Discussion ensued as to whether coordination should be referenced in other sections of the chapter. Specifically, a motion was made to add a note under Table 19-1 requiring 12' wide outside lanes on transit routes. This motion failed by vote.

A change was proposed to E.5.b so that the second sentence reads "that would interfere with vehicle access" instead of "to allow for vehicles to negotiate access". The language change approved by vote.

A Traditional Neighborhood Development (TND) handbook will be developed within the next 3 to 6 months.

Revisions to Chapter 19 were approved by vote with proposed changes.

Issue #6: Updating Committee Membership Information

Rob Quigley asked the committee to review their **Member Information** and provide updates. **Subcommittee Membership** was also briefly reviewed and updated. Updated Member and Subcommittee Membership information is posted on the Florida Greenbook Web Page: **http://www.dot.state.fl.us/rddesign/FloridaGreenbook/FGB.shtm**.

Issue #7: Updating the Florida Greenbook

David O'Hagan gave a short **Presentation on the "Florida Greenbook Update 2010"** that included the need for a general revision to the Florida Greenbook to address things like American Recovery and Reinvestment Act (ARRA) Projects, Multimodal Transportation (Chapters 8, 9 and 13), ADA Requirements and Safety issues. One of the safety issues discussed was the "Safety Edge", which is on the FHWA web page: http://safety.fhwa.dot.gov/roadway_dept/pavement/safedge/.

Issue # 8: Workshops for 2010 Updates

David O'Hagan discussed the **Comments made by Department Technical Reviewers** on each chapter of the Florida Greenbook. The comments were based on indentifying issues for the subcommittees to consider for future updates to the Florida Greenbook.

The Chapter Subcommittees worked in groups to discuss the comments made through the Department technical review, and any other needed changes. Then the Subcommittees were asked to develop and report back plans for needed updates to each chapter.

Issue # 9: Chapter Author Reports

Introduction

Although there is no subcommittee for the Introduction, the terms defined here will need to be updated in coordination with the other chapter updates. All existing definitions will need to be reviewed and updated as necessary.

Chapter 1: Planning

A. Move 1A (INTRODUCTION) and 1D (OPERATION) into Guidebook
B. Move 1B and 1C into Chapter 2

Chapter 2: Land Development

A. Chapter 2 will be reviewed by the chapter subcommittee.
B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 3: Geometric Design

A. Chapter 3 will be reviewed by the chapter subcommittee.
B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.
C. Coordinate and integrate changes from other chapters like TND, Residential Street Design, Maintenance, Pedestrian Facilities, etc., and check for any conflicts.
D. Revisit definition of "Reconstruction".
E. Update section on Roadside clear zone.
F. Evaluate intersection sight distance criteria as it applies to driveways.

Chapter 4: Roadside Design

A. Chapter 4 will be reviewed by the chapter subcommittee.
B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

C. A "Chapter Author" will need to be identified.

D. Evaluate the inclusion of new or updated references or studies relating to roadside design.

Chapter 5: Pavement Design and Construction

A. Safety edge will be added as a treatment to mitigate pavement edge drop-offs.

B. Further discussion may be needed to address guidance for unpaved roads. ***{****To follow up, this issue may need to be addressed in other chapters. Perhaps AASHTO's* ***"Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT <= 400) 2001"*** *could be considered as a reference since it addresses the design of unpaved roads. The US EPA also has a document available titled* ***"Recommended Practices Manual: A Guideline for Maintenance and Service of Unpaved Roads"*** *and is available online at:* ***http://water.epa.gov/polwaste/nps/unpavedroads.cfm*** ***}***

Chapter 6: Roadway Lighting

A. Section E – Uniformity of Illumination: change the first sentence of the second paragraph that reads "uniformity ratio of 10:1 should not be exceeded." to "uniformity ratio of 10:1 shall not be exceeded."

B. Section H – Light Poles: paragraph two will be reworded will be reworded as most conventional lighting is mounted on breakaway poles.

Chapter 7: Rail Highway Grade Crossings

A. Add a new "Section E" that will describe the need to address railroad crossing upgrades, as per Title 23 U.S.C. on Federal-aid projects.

B. Add language that describes the 2009 MUTCD requirements for passive crossings.

C. Evaluate language in Chapter 5 of the 2009 MUTCD for requirements at railroad crossings on low volume roads.

D. Section B2 – Update some Rule references and references to the Design Standards, Indexes 600 and 280.

E. Section B2 - Modify language in the 3rd line of the top paragraph.

F. Incorporate 2009 MUTCD requirements into Figure 7-2 "Grade Crossing Configuration".

Chapter 8: Pedestrian Facilities

A number of changes had already been discussed at previous Committee Meetings, and the subcommittee felt these changes were close to being ready for voting. An additional Committee Meeting will be scheduled to review and vote on these changes. ***{To follow up, this meeting was held on April 29, 2010 and the revisions to Chapter 8 were approved by vote as amended.}***

Chapter 9: Bicycle Facilities

A. Chapter 9 will be reviewed by the chapter subcommittee.

B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 10: Maintenance

A. Add federal-aid (Allen and Scott)

B. Maintenance Resurfacing (Allen)

C. Rename chapter to “Maintenance and Resurfacing”

D. ADA and Curb-cut Ramps

Chapter 11: Work Zone Safety - no changes proposed since this chapter has just been updated for 2010.

Chapter 12: Construction – Chapter author, Tanzer Kalayci, will review and offer comments.

Chapter 13: Public Transit:

A. Chapter 13 will be reviewed by the chapter subcommittee.

B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 14: Design Exceptions

A. Chapter 14 will be reviewed by the chapter subcommittee.

B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 15: Traffic Calming

A. Move 15A (INTRODUCTION) and 15B (PLANNING CRITERIA) into Guidebook

B. Move 15C (INAPPROPRIATE TRAFFIC CALMING TECHNIQUES), 15D (APPROPRIATE TRAFFIC CALMING TECHNIQUES) and 15E (OTHER SOURCES) into Chapter 16.

Chapter 16: Residential Street Design – Chapter 16 will be reviewed by the chapter subcommittee.

Chapter 17: Bridges and Other Structures

A. Chapter 17 will be reviewed by the chapter subcommittee.

B. Improve guidance in the following sections:

   a. C.4.a: Pier Locations - add reference to FDOT fender design standard.

   b. C.4.b: Vessel Impact - add reference to FDOT vessel traffic data for ships and barges.

   c. H.2: Sign, Lighting and Traffic Signal Supports – add guidance for Dynamic Message Signs.

   d. Add guidance for hurricane susceptibility to storm surge.

C. Add information on policy for inspecting pedestrian bridges

D. These updates will be submitted for ballot next year along with the revision already proposed.

Chapter 18: Signing and Marking

A. Table 4D-1 in old manual is now Table 4D-2 in 2009 MUTCD

B. Revise wording of C.5 to change “should” to “shall”

C. These revisions can be ready for balloting next year.

Chapter 19: Traditional Neighborhood Development (TND) Subcommittee – complete the new guidebook.

9. The chapter workshop discussions varied in duration, and were permitted to continue past the allotted time slot so their progress would not be interrupted. As each group finished, the Chapter Authors were asked to hand their reports in to David O’Hagan (or submit by email). The workshop groups that had finished were then permitted to leave.

# *April 2010 Meeting Minutes*

# DRAFT MINUTES

## FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

**Thursday, April 29, 2010 2:30pm – 5:00pm**

**Florida Department of Transportation**
**Room 315 – Haydon Burns Building, 3rd Floor**
**605 Suwannee Street**
**Tallahassee, Florida 32399**

**And by Teleconference via Member Invitation**

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**1.** Introductions

The meeting began at 2:30pm. Meeting and teleconference participants introduced themselves. The Florida Greenbook Advisory Committee members were identified, and since more than 14 of the 28 members were in attendance, there was a quorum and the meeting continued. Attendees are listed on the following page.

**2.** Meeting Format

Rob Quigley gave a brief presentation outlining the meeting format. Information on the GoToWebinar format was contained in the Meeting Review Package.

**3.** Chapter 8 (Pedestrian Facilities) –

The draft changes to Chapter 8 were discussed. The comments that were brought up were addressed and the corresponding changes were made to the chapter during the meeting. The discussion lasted longer than the planned duration, but the group decided to continue in order to finish the discussion and vote. There were still enough voting members present to make a quorum, so they cast their votes either in favor of or against adoption of Chapter 8 as modified at the meeting. This was done electronically and the results were 15 In Favor of Adoption and 1 Against Adoption. With the majority committee vote for adoption (15 of 28 members), the Chapter 8 draft was approved.

**4.** Additional Recommended Changes (Intro. & Ch. 17)

Due to the extended discussion on Chapter 8, the draft changes to the Introduction (Definitions) and Chapter 17 (Bridges and Other Structures) were not discussed and will be addressed at another time.

**5.** The meeting was adjourned at 5:00pm

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# FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

**Thursday, April 29, 2010**

**2:30pm – 5:00pm**

## MEETING ATTENDEES

| # | NAME | MEMBER | OFFICE |
|---|---|---|---|
| 1 | Robert Quigley | | FDOT Central Office Design |
| 2 | Jim Mills | | FDOT Central Office Design |
| 3 | Dean Perkins | | FDOT Central Office Design |
| 4 | Jeremy Fletcher | | FDOT Central Office Design |
| 5 | David O'Hagan | | FDOT Central Office Design |
| 6 | Chester Henson | | FDOT Central Office Design |
| 7 | Mary Anne Koos | | FDOT Central Office Design |
| 8 | Frank Sullivan | | FDOT Central Office Design |
| 9 | Todd Powell | | FDOT Central Office Design |
| 10 | Bruce Dietrich | | FDOT Central Office Design |
| 11 | Charles Balut | * | Citrus County Engineering |
| 12 | Alissa Torres | | Orange County |
| 13 | Bernie Masing | * | FDOT District 1 |
| 14 | Harold Desdunes | * | FDOT District 6 |
| 15 | George Webb | * | Palm Beach County |
| 16 | Jim Burnside | * | City of Tampa |
| 17 | Scott Golden | * | FDOT District 3 |
| 18 | Billy Hattaway | | Vanasse Hangen Brustlin |
| 19 | Annette Brennan | * | FDOT District 5 |
| 20 | Mark Robinson | | FDOT District 5 |
| 21 | Jim Pitman | * | FDOT District 2 |
| 22 | Steve Neff | * | City of Cape Coral |
| 23 | Elyrosa Estevez | * | City of Miami Public Works |
| 24 | G. Britton Hardy | * | Attending for Ron Chin of FDOT District 7 |
| 25 | Gene Howerton | * | Arcadis |
| 26 | Kenneth Dudley | * | Taylor County |
| 27 | Chris Mora | * | Indian River County |
| 28 | Elius Nortelus | * | Attending for Ramon Gavarrete of Highlands County Engineering |
| 29 | Gail Holley | | FDOT Traffic Engineering and Operations |
| 30 | Keith Bryant | * | Bay County Traffic Engineering |
| 31 | Andres Garganta | * | Consul0Tech |
| 32 | Richard Diaz, Jr. | * | Diaz Pearson & Associates |

* Florida Greenbook Advisory Committee Member

# *Florida Greenbook Committee Statute*

Select Year: 2010 Go

# The 2010 Florida Statutes(including Special Session A)

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.

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# *Rulemaking Process and Status*

## Rulemaking for the 2010 Florida Greenbook

On January 4, 2011, Governor Scott issued Executive Order No. 11-01. This order freezes all new regulations and establishes the Office of Fiscal Accountability and Regulatory Reform, which will review all rules prior to promulgation as well as agency practices and contracts. The Florida Greenbook was in FDOT's Office of General Counsel, being prepared for Rulemaking when the order was issued. At that time, Rulemaking on the Florida Greenbook was put on hold.

The following describes the next steps in proceeding with Rulemaking:

1) The Office of General Counsel is writing a report for the Governor's office on all the existing Department Rules, including the existing Florida Greenbook Rule (14-15.002).
2) Once this is done, the Department must request authorization from the Governor's Office to begin Rule Development.
    a) When we request authorization, it is submitted on a standard form the Governor's Office has prepared. It is just a short summary of why the rule is being update.
    b) Also, it must be determined if a Statement of Estimated Regulatory Costs (SERC) must be prepared. If a SERC is required, a SERC will need to be prepared before the Governor's Office will authorize rulemaking.
3) When they approve the rule to go forward with Rule Development, we will publish the Notice of Development of Proposed Rules., we will begin the Rulemaking process with JAPC by filing "Notice of Rule Development" (published in Florida Administrative Weekly).
    a) This is an opportunity for a Rule Development Workshop to take place. At this point a workshop can be announced or wait to see if one is requested. There is no time frame at this point, but the general practice is to wait around 30 days.
    b) If comments are received, we have 90 days to respond.
4) The next step is to publish a Notice of Proposed Rule.
    a) The notice and copy of the rule is sent to the Joint Administrative Procedures Committee (JAPC) at this time.
    b) At this stage a hearing can be announced or a hearing may be requested within 21 days.
5) If no hearing is requested and JAPC has no comments to be addressed we may file the rule for adoption after 28 days from the publication of the notice. We have up to 90 days to adopt the rule.

**At this point, it sounds like we are still in #1…**and we will likely rename it the 2011 Florida Greenbook

# *Sunshine Law*

# A Summary of Florida's Government in the Sunshine Law

**September 22, 2005**

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## 1. Scope of the Sunshine Law

The Sunshine Law provides public access to governmental proceedings, including meetings of public boards or commissions. § 286.011, Fla. Stat. (2004)

Section 286.011, Florida Statutes, provides that 1) meetings of public boards or commissions must be open to the public, 2) reasonable notice of such meetings must be given; and 3) minutes of the meeting must be taken.

## 2. Definition of a Meeting

The Sunshine Law does not only apply to formal proceedings by boards and commissions. It applies to any gathering, casual or not, concerning matters upon which *foreseeable action* may be taken by the applicable agency or organization. *See Hough v. Stembridge*, 278 So. 2d 288 (Fla. 3d DCA 1973). Meetings in defiance of the Sunshine Law are those that are "violative of the statute's spirit, intent and purpose." *Id.*

Because the Sunshine Law applies to *any* gathering, formal or casual, concerning matters upon which action may be taken, the statute also applies to discussions over the telephone or communications via computer.

## 3. Individuals/Organizations Subject to the Sunshine Law

The Sunshine Law applies to any meeting between two or more members of "any board or commission of any state agency or authority or of any agency or authority of any county, municipal corporation, or political subdivision." *See* § 286.011, Fla. Stat. (2004). The courts have stated that it was the Legislature's intent to bind "every board or commission of the state, or of any county or political subdivision over which it has domain and control." *Times Publishing Company v. Williams*, 222 So. 2d 470 (Fla. 2d DCA 1969). All public agencies, including elected and appointed boards or commissions and even collegial bodies, are subject to the statute. The Florida Department of Transportation (the Department) is a public agency and thus falls under the authority of the Sunshine Law.

## 3(a). Advisory Boards or Committees

Advisory boards or committees appointed by public agencies are subject to the Sunshine Law, even if their recommendations are not acted upon. *See* AGO 82-35, *Town of Palm Beach v. Gradison*, 296 So. 2d 473 (Fla. 1974). A limited exception applies to committees established strictly for fact-finding such as information gathering and reporting.

### 3(b). Staff Members

The meetings of staff members of a board or commission covered by the Sunshine Law are generally not subject to the Sunshine law. This exception also applies to staff members of advisory boards or committees. *See* § 286.011, Fla. Stat., *Occidental Chemical Co. v. Mayo*, 351 So. 2d 336 (Fla. 1977). However, when a staff member ceases to function in a staff capacity and is appointed to a committee which is delegated authority to make recommendations to a board or official, the staff member loses his or her identity as staff while working on the committee and the Sunshine Law applies to the committee. Thus, it is the nature of the act performed, not the makeup of the committee or the proximity of the act to the final decision which determines whether a committee composed of staff is subject to the Sunshine Law.

### 3(c). Purchasing or Bid Evaluation Committees

Generally committees appointed by agencies subject to Sunshine Law to consider purchases or bids by contractors are themselves subject to the Sunshine Law. However, meetings involving confidential bid estimates are not subject to the Sunshine Law because the Department's contract award process has been adopted in recognition of Sunshine Law requirements.

### 4. Notice Requirements

As previously mentioned, meetings covered by the Sunshine Law require that "reasonable notice" be given beforehand. The Attorney General's Office has suggested notice guidelines, which include: 1) the notice should contain the time and place of the meeting and, if available, an agenda, 2) the notice should be prominently displayed in the area in the agency's office set aside for that purpose, 3) emergency sessions should be afforded the most effective notice under the circumstances and 4) effective methods include press releases, phone calls to wire services, and advertising in local newspapers of general circulation.

### 5. Consequences for Failure to Comply

The consequences for violation of the Sunshine Law vary. There can be criminal penalties if any board or commission member *knowingly* violates the Sunshine Law, including the possibility of a second degree misdemeanor charge (which can include imprisonment and/or a fine). Additional consequences include removal from office, non-criminal penalties such as fines, attorney's fees, and civil actions for injunctive or declaratory relief.

Violation of the Sunshine Law also renders actions taken by boards or commissions invalid. Section 286.011, Florida Statute provides that no resolution, rule, regulation or formal action shall be considered binding except as taken or made at an open meeting.

## 6. Conclusion

It is advisable to be well acquainted with Florida's Government-in-the-Sunshine Law. The overarching policy behind the law is very simple. Actions should be analyzed in light of the Sunshine Law's spirit and intent to provide the public a right of access to government proceedings.

# FLORIDA DEPARTMENT OF TRANSPORTATION
# GOVERNMENT IN THE SUNSHINE
## September 2005

**Caveat:** This briefing paper is intended as an overview of the complex legal issues involving Florida's Government in the Sunshine Law, Public Record Law, and Ethics Laws. Readers are cautioned that these laws contain traps for the unwary, which can cause seemingly innocent activities to become a crime. The advice of an attorney should he sought for their application to particular circumstances.

## OPEN MEETINGS

All meetings at which public business is discussed or transacted shall be duly noticed and open to the public.[1]

**YOU CANNOT:**

- Discuss with any other member any item that is under consideration by the authority, except at a duly noticed public meeting

**YOU CAN:**

- Discuss other matters with other members at any time.
- Discuss authority business with any person who is not a member, except that the person cannot act as a liaison between or among members.

A continuing concern is the sending of e-mail by a member to other members. An e-mail that states factual background material is permissible[2] so long as there is no interaction between or among members. E-mails that solicit comments from other members or that circulate responses from members are prohibited. [3]

Minutes of each meeting must be taken, which must include a record of all voting.[4]

## PUBLIC RECORDS

Records of "any board or commission of any state agency or authority of any agency or authority of any county, municipal corporation, or political subdivision," except those that are specifically exempted by statute, are public records and must be available for inspection and copying by any person at a reasonable place and time.[5]

A public record is defined very broadly and includes tape recordings, hand written notes, and information in a computer.[6] All materials made or received in connection with official business regardless of form are to be open for public review unless exempted by the legislature. This includes notes that are intended to be kept as a record or that are circulated or communicated to another.[7] However, notes prepared for personal use are not public records.[8]

Electronic mail comes within the public records law, and any e-mail sent or received relating to official business must be made available to the public if requested. As noted above, the Public Meeting Law prohibits interactive e-mail between or among members relating to official business of the authority.

## ETHICS

Certain provisions of the Florida Code of Ethics for Public Officers and Employees, Sections 112.311-112.326, Florida Statutes, apply. It is not the intent of this summary to cover the multifarious aspects of governmental ethics. For more information, visit the Commission of Ethics Website: http://ww.ethics.state.fl.us/ Certain key provisions are summarized below.

- Prohibited actions or conduct:[9] Solicitation or acceptance of gifts or unlawful compensation to influence official action; misuse of public position; or use of information not available to the public generally for personal pecuniary gain for themselves or anyone else. Note: For the gifts that are allowed by the statute,[10] the Governor's Code of Ethics places further restrictions.[11]

- Restricted business and contractual relationships:[12] Certain restrictions and prohibitions apply to members or their relatives.

- Voting Conflicts of Interest:[13] Persons present at a meeting are required to vote, unless the member has a voting conflict of interest, in which case the member may abstain from voting.[14] A voting conflict occurs when the measure being voted on inures to the private gain or loss of the member, a relative, the member's employer, or a client of the member. The member must disclose the conflict prior to participating in discussion or voting on the matter, or if unknown at the time, as soon as possible. The member must file Commission on Ethic's Form 8A[15] with the recording secretary within fifteen days of the vote.

**Reference Materials:**

Attorney General's Website: http://myfloridalegal.com/sunshine
*Government-in-the-Sunshine Manual,* First Amendment Foundation, Tallahassee, FL
First Amendment's Website: http://www.floridafaf.org/

ENDNOTES:

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[1] Article 1, Section 24(b), Florida Constitution, and Section 286.011, Florida Statutes (Florida Government in the Sunshine Law), apply to agencies of the state. Sections 343.80-343.89, Florida Statutes, created the Northwest Florida Transportation Corridor Authority as an agency of the state.
[2] Attorney General Opinion 2001-20, March 20, 2001.

[3] Attorney General Informal Opinion, October 31, 2000.
[4] Sections 286.011(2) and 286.012, Florida Statutes.

[5] Article I, Section 24(a), Florida Constitution; Section 119.07, Florida Statutes.
[6] Section 119.011(1), Florida Statutes; Orange County v. Florida Land Co., 450 So. 2d 341 (Fla. 5th DCA 1984).
[7] Shevin v. Byron, Harless, Schaffer, Reid & Assoc., Inc., 379 So. 2d 633 (Fla. 1980).
[8] Times Publishing Co. v. City of St. Petersburg, 558 So. 2d 487 (Fla. 2d DCA 1990).
[9] Section 112.313(7), Florida Statutes.
[10] Sections 112.312(12) and 112.313(2), Florida Statutes.
[11] Governor Bush's Code of Ethics, available at:
http://www.myflorida.com/myflorida/government/policies/ethicscode.html
[12] Sections 112.313(3), (7), and (12), Florida Statutes.
[13] Section 112.3143, Florida Statutes.
[14] Section 286.012, Florida Statutes.
[15] http://www.ethics.state.fl.us/forms/Form8a_2000.PDF.

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| 4. Roadside Design | **VACANT** |
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| 6. Roadway Lighting | Bernie Masing |
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# *Highway Safety Manual*

An Overview of the

# HIGHWAY SAFETY MANUAL

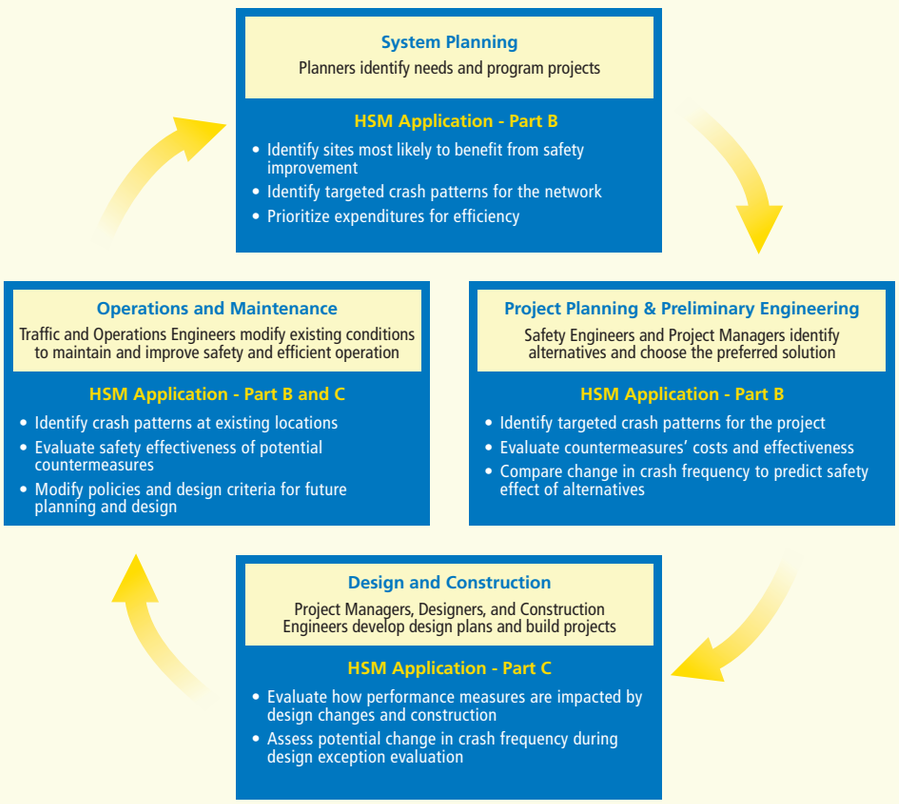
## What is its purpose?

The purpose of the Highway Safety Manual (HSM) is to provide the best factual information and proven analysis tools for crash frequency prediction. The HSM will facilitate integrating quantitative crash frequency and severity performance measures into roadway planning, design, operations, and maintenance decisions. The primary focus of the HSM is the increased application of analytical tools for assessing the safety impacts of transportation project and program decisions.

## What are its uses?

- Identify sites with the most potential for crash frequency or severity reduction.
- Identify factors contributing to crashes and associated potential countermeasures to address these issues.
- Evaluate the crash reduction benefits of implemented treatments.
- Conduct economic appraisals of improvements to prioritize projects.
- Calculate the effect of various design alternatives on crash frequency and severity.
- Estimate potential crash frequency and severity on highway networks, and the potential effects of transportation decisions on crashes.

## How does the HSM apply to the Project Development Process?




## Overview of HSM chapters

### Part A - Introduction, Human Factors, and Fundamentals

Chapter 1 – Introduction and Overview
Chapter 2 – Human Factors
Chapter 3 - Fundamentals

### Part B - Roadway Safety Management Process

Chapter 4 – Network Screening
Chapter 5 – Diagnosis
Chapter 6 – Select Countermeasures
Chapter 7 – Economic Appraisal
Chapter 8 – Prioritize Projects
Chapter 9 – Safety Effectiveness Evaluation

### Part C - Predictive Method

Chapter 10 – Rural Two-Lane Roads
Chapter 11 – Rural Multilane Highways
Chapter 12 – Urban and Suburban Arterials

### Part D - Crash Modification Factors

Chapter 13 – Roadway Segments
Chapter 14 – Intersections
Chapter 15 – Interchanges
Chapter 16 – Special Facilities
Chapter 17 – Road Networks

An Overview of the

# HIGHWAY SAFETY MANUAL

## HOT TOPICS OF THE HSM

### What about tort liability and risk management?

The HSM is designed to support practitioners in managing risk. The quantitative analysis of safety data provides protection to public agencies concerned about risk. The HSM is neither intended to be, nor does it establish, a legal standard of care for users or professionals. No standard of conduct or any duty toward the public or any person shall be created or imposed by the publication and use or nonuse of the HSM. Documentation used, developed, compiled or collected for analyses conducted in connection with the HSM may be protected under Federal law (23 USC 409).

### What training is available to assist me in using the HSM?

Step by step procedures with examples are included in the HSM to assist practitioners. Additionally, training courses are available through the National Highway Institute at **http://nhi.fhwa.dot.gov**.

- New Approaches to Highway Safety Analysis (NHI-380075)
- HSM Practitioners Guide to Two-Lane Rural Roads (NHI-380070A)
- HSM Practitioners Guide to Multilane Urban/Suburban Highways (NHI-380070B)
- HSM Application to Intersections (NHI-380105*)
- HSM Workshop (NHI-380106*)
- Application of Crash Reduction Factors (NHI-380093)
- Science of Crash Reduction Factors (NHI-380094)
- Interactive Highway Safety Design Model (IHSDM) (NHI-380071, NHI-380100* web-based)

**Course under development*

### How much does it cost? Can I buy it online?

The HSM is currently available for purchase from AASHTO for $325 for AASHTO members and $390 for non-members. Discounts are available for those states taking HSM training. Both hard copy and electronic versions are available. To purchase, visit **http://bookstore.transportation.org** and search under code HSM-1.

### What data are needed?

Three types of data are needed to apply the HSM safety prediction methodologies: site characteristics data, traffic volume data, and crash data. Details are available in the Highway Safety Manual Data Needs Guide, available here: **www.trb.org/Publications/Blurbs/Highway_Safety_Manual_Data_Needs_Guide_159984.aspx**

### Is software support available?

**Yes.** HSM methodologies will be supported by the following software programs:

- **SafetyAnalyst** is a suite of analytical tools for guiding the decision-making process to identify safety improvement needs and develop a system-wide program of site-specific improvement projects. SafetyAnalyst supports Part B of the HSM. **www.safetyanalyst.org**
- The **Interactive Highway Safety Design Model (IHSDM)** is a suite of software analysis tools for evaluating safety and operational effects of geometric design decisions. It performs the predictive method for the facilities in Part C of the HSM. **www.tfhrc.gov/safety/ihsdm/ihsdm.htm**
- The **Crash Modification Factors Clearinghouse** houses a web-based database of CMFs along with supporting documentation to help transportation engineers identify the most appropriate countermeasure for their safety needs. The CMF Clearinghouse supports Part D of the HSM. **www.cmfclearinghouse.org**

### Where can I find more information?

The most up-to-date information on the HSM can be found here: **www.highwaysafetymanual.org**

# *Safety Edge*

# The Safety Edge

## A Pavement Edge Drop-Off Treatment

## What is the Safety Edge?

The Safety Edge is a simple but effective solution that can help save lives by allowing drivers who drift off highways to return to the road safely. Instead of a vertical drop-off, the Safety Edge shapes the edge of the pavement to 30 degrees. Research has shown this is the optimal angle to allow drivers to re-enter the roadway safely. The asphalt Safety Edge provides a strong, durable transition for all vehicles. Even at higher speeds, vehicles can return to the paved road smoothly and easily. The FHWA's goal is to accelerate the use of the Safety Edge technology, working with States to develop specifications and adopt this pavement edge treatment as a standard practice on all new paving and resurfacing projects.

*The Safety Edge is shown here in the main photo during construction. Upon project completion, the adjacent unpaved material should be graded flush with the top of the pavement (inset photo). The Safety Edge creates a more durable pavement edge and makes recovery from any future drop-off much easier and safer.*

U.S. Department of Transportation

**Federal Highway Administration**

## How Does It Work?

Drivers leave the paved road for many reasons. When steering the tires back onto the pavement, a vertical edge can make it difficult for a driver to safely re-enter the travel lane. Drivers may over-steer and lose control of the vehicle, leading to severe crashes. The challenge is that a drop-off is created during most paving projects. Even when the unpaved shoulder is regraded to eliminate the drop-off, the edge often becomes exposed within a few months. The edge also may deteriorate.

The Safety Edge is an effective solution to reduce pavement edge-related crashes, by shaping the edge of the pavement to 30 degrees using a commercially available device (called a shoe) that can be attached to the paver. The asphalt is extruded under the shoe, resulting in a durable edge that resists edge raveling. Research has shown this 30-degree shape allows drivers to re-enter the roadway safely.

After paving with the Safety Edge, the adjacent material should be regraded flush with the top of the pavement. This is considered the best practice, and provides the safest pavement edge. The difference is that when the edge becomes exposed, this shape can be more safely traversed than a vertical edge.

*The shoe that creates the Safety Edge is a special edging device that asphalt paving contractors can install on new or existing resurfacing equipment.*

## Quick Facts

*Sharp, steep pavement edge drop-offs can contribute to crashes.*

- The Safety Edge can help decrease highway fatalities and serious injuries on our Nation's highways.
- Because the Safety Edge provides an additional level of consolidation on the edge, edge raveling is decreased. This contributes to longer pavement life.
- The Safety Edge involves minimal time and cost to implement. Typically, less than 1 percent additional asphalt is needed. The Safety Edge shoe, which creates the edge, can be installed on existing equipment.
- The Safety Edge also can be installed on Portland Cement concrete pavements. (Several differences should be considered. For more information, visit the Safety Edge Web site for details.)
- Best practice is to maintain a flush edge, so that no drop-off exists. The Safety Edge reduces the risk of drop-offs when maintenance forces cannot keep up with erosion or tire wear.
- Vertical and near vertical pavement edge drop-offs have been a factor in a substantial percentage of severe crashes in which vehicles leave the road, particularly on rural roads with unpaved shoulders. The Safety Edge reduces this problem, providing a safer transition back to the road.
- The Safety Edge is a safer design for motorcyclists and bicyclists, as well as motorists.

# Case Study: Iowa Adopts Safety Edge Policy

*Safety Edge treatment being applied during an asphalt overlay.*

The Iowa FHWA Division and the Iowa Department of Transportation (IDOT) recently began working with counties to install the Safety Edge on projects with a history of roadway departure crashes. The Safety Edge was included at the county level on project plans or incorporated as change orders on already-let projects. During one of these county projects, the contractor's safety officer felt positive about the results because the Safety Edge potentially reduced the contractor's liability by providing immediate elimination of the vertical drop-off.

After seeing how easily even large vehicles could traverse the pavement edge without loss of control or damaging the edge, the county decided its typical practice of bringing in a gravel wedge before nightfall was not necessary when the Safety Edge was present. The results were so positive that IDOT decided to use the Safety Edge on one of its State paving projects on a narrow road. Since then, IDOT has decided to adopt the Safety Edge as standard practice across the entire State.

# Pavement Edge Drop-Offs Can Contribute to Crashes

Roadway departures account for 53 percent of fatal crashes. State-level studies point to the life-saving potential of the Safety Edge. For example, researchers studying crashes in Missouri during 2002-2004 reported that pavement edges may have been a contributing factor in as many as 24 percent of rural run-off-road crashes on paved roadways with unpaved shoulders. This type of crash was twice as likely to include a fatality than rural crashes overall on similar roads.[1]

When a driver drifts off the roadway and tries to steer back onto the pavement, a vertical pavement edge can create a "tire scrubbing" condition that may result in over-steering. If drivers over-steer to return to the roadway without reducing speed, they are prone to lose control of the vehicle. The resulting crashes tend to be more severe than other crash types. The vehicle may veer into the adjacent lane, where it may collide with oncoming cars; overturn; or run off the opposite side of the roadway and strike a fixed object or overturn on a slope.

*This is a typical diagram for a crash caused by tire scrubbing. The vehicle at left scrubbed the edge of the pavement, and when it returned, the driver overcorrected, lost control, crossed into the adjacent lane, and struck an oncoming vehicle.*
*(Graphic source: AAA Foundation for Highway Safety)*

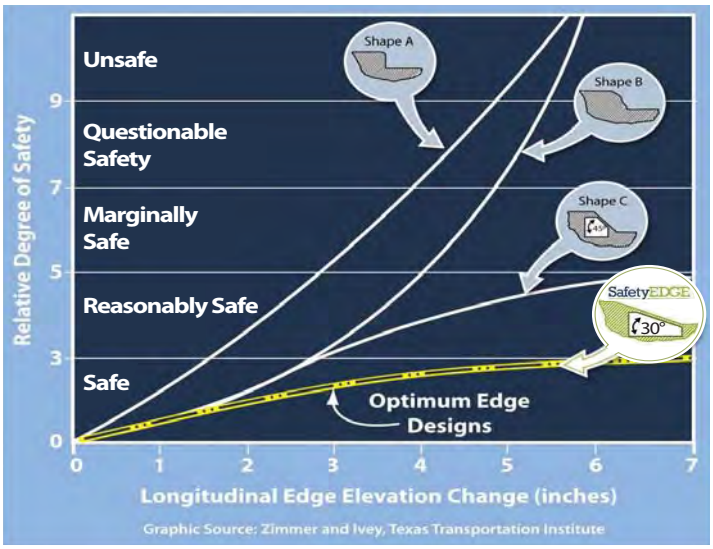
Inexperienced drivers are not the only victims of tire scrubbing. Smaller, lighter vehicles have a harder time climbing a steep pavement edge. At high speeds, the climb is particularly dangerous. According to in-service evaluations, a vertical or near vertical drop-off of 2.5 inches or greater has been shown to pose a significant risk, while pavements built with the Safety Edge showed reductions of more than 5 percent of total crashes .

[1]Hallmark et. al: Safety Impacts of Pavement Edge Drop-Offs, AAA Foundation for Highway Safety, Washington, DC, September 2006.

# FAQs

### *Why should I change my current process to include the Safety Edge?*

The Safety Edge improves the short- and long-term safety of the roadway. Studies show that severe crashes may occur when a vehicle drops a tire over the edge of a nearly vertical pavement. The research shows that virtually all drivers can recover, even at high speeds, when the pavement edge is a 30-degree wedge. Using the Safety Edge also improves the durability of the pavement edge.

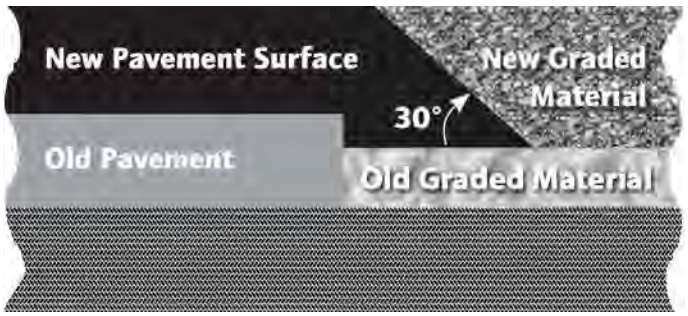



### *Do I need to modify my paving process to install the Safety Edge on asphalt?*

Very few changes are needed. The key item is to add a specially designed shoe, per manufacturer's instructions, to the paver to create the Safety Edge. While paving, the shoe should be monitored and adjusted to keep the bottom edge of the device in contact with the road shoulder surface. Using the Safety Edge should not affect the rate of production.

### *How much will the addition of the Safety Edge cost per mile?*

It will be almost negligible for hot-mix asphalt. It does depend somewhat on the specific design and construction parameters, but typically the process compacts asphalt that often otherwise would break off because it was loose. When measured, it has been calculated to be less than 1 percent additional asphaltic material.




*This diagram shows how the Safety Edge is created during a repaving project. As the new graded material begins to settle or erode, the angled and more durable Safety Edge prevents a vertical edge from forming, making the pavement edge safer for drivers and cyclists.*

# Contact Information

***For training or more information on this Every Day Counts Initiative, please contact your local FHWA Division Office.***

**To learn more about EDC, visit:**
*http://www.fhwa.dot.gov/everydaycounts*

# About Every Day Counts

Every Day Counts is designed to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadways, and protecting the environment.


Publication Number: FHWA-SA-10-034

# *Low Volume Local Roads*

# Low Volume Local Roads

Here are some excerpts from AASHTO's **Guidelines for Geometric Design of Very Low-Volume Local Roads (ADTs <= 400) – 2001** that could be added to the geometric policies contained in the Greenbook**.** The Greenbook Chapter 3, Section A defines "low volume rural roads" while the criteria below is for "very low volume rural roads". A thorough review of AASHTO's guidelines (95 pages) will probably include many more provisions. If specific criteria for "very low volume rural roads" cannot be included, a general reference {Should we just reference the entire document?} may be appropriate in Chapter 3.

**CHAPTER 2 FRAMEWORK FOR DESIGN GUIDELINES - TRAFFIC VOLUMES** *(ref. page 10)*
Traffic volumes on very low-volume roads are stratified into three levels for purposes of the design guidelines in Chapter 4. The volume ranges are:

- 100 vehicles per day or less
- 100 to 250 vehicles per day
- 250 to 400 vehicles per day

**CHAPTER 4 DESIGN GUIDELINES - BRIDGE WIDTH - New Construction***(ref. pages 20- 21)* **-** for bridges on local roads with ADT of 400 veh/day or less, the bridge width should be equal to the width of the traveled way plus 0.6 m [2 ft]. However, when the entire roadway width (traveled way plus shoulders) is paved, the bridge width should be equal to the total roadway width. Bridge width should be measured between the inside faces of the bridge rail or guardrail. Bridges greater than 30 m [lo0 ft] in length should be evaluated individually to determine the appropriate bridge width. Bridge usage by trucks and recreational vehicles should also be considered in determining the appropriate width.

One-lane bridges may be provided on single-lane roads and on two-lane roads with ADT less than 100 veh/day where the designer finds that a one-lane bridge can operate effectively. The minimum width of a one-lane bridge should be 4.5 m [ 15 ft] unless the designer concludes that a narrower bridge can function effectively (e.g., based on the safety performance of similar bridges maintained by the same agency). Caution should be exercised in design of one-lane bridges wider
than **4.9** m **[I6** ft] to assure that drivers will not use them as two-lane structures. Simultaneous arrival of two or more opposing vehicles at a one-lane bridge should be rare, given the low traffic volumes, but one-lane bridges should have intervisible pull-Offs at each end where drivers can wait for traffic on the bridge to clear.

**CHAPTER 4 DESIGN GUIDELINES - ROADSIDE DESIGN - New Construction – Traffic Barriers** *(ref. page 49)*
The use of guardrail or other traffic barriers to shield or protect drivers from roadside obstructions is not generally cost-effective for very low-volume local roads.

**CHAPTER 4 DESIGN GUIDELINES - UNPAVED ROADS** *(ref. page 50)*
NCHRP Report 362 *(5)* found crash rates for unpaved roads to be lower for narrower roadway widths. Therefore, existing unpaved roads should not generally be widened as a safety measure unless there is evidence of a site-specific safety problem that may be corrected by widening.

Provision of roadside clear zones, flatter slopes, or traffic barriers is generally inconsistent with the economic decision to build and maintain an unpaved surface and is not generally necessary for the low-speed environment of an unpaved road.

# *Major Chapter Edits*
# *(Chapters 5 & 9)*

# CHAPTER 5

# PAVEMENT DESIGN AND CONSTRUCTION

## 5.1~~A~~ INTRODUCTION

The function of the pavement or roadway surface is to provide a safe and efficient travel path for vehicles using the street or highway. The pavement should provide a good riding surface with a minimum amount of distraction to the driver. The pavement friction characteristics should be such that adequate longitudinal and lateral forces between the vehicle tires and the pavement can be developed to allow a margin of safety for required vehicle maneuvers. These characteristics should be provided at the highest reasonable level for the expected pavement surface, weather conditions, and the anticipated operational characteristics of the facility. Resurfacing Rehabilitation and Restoration of existing pavements are discussed and included under Chapter 10 (Maintenace) of the manual.

In order for the pavement to perform its function properly, the following objectives shall be used to guide the design and construction of the pavement:

- Provide sufficient pavement structure and the proper pavement material strength to prevent pavement distress prior to the end of the design period.
- Develop and maintain adequate skid resistance qualities to allow for safe execution of braking, cornering, accelerating, and other vehicle maneuvers.
- Provide drainage to promote quick drying and to reduce the likelihood of hydroplaning and splashing.
- Provide adequate edge support or a “safety-edge” to resist vertical drop-offs and provide a safe roadside.

# 5.2~~B~~ PAVEMENT DESIGN

## 5.2.1~~B.1~~ Pavement Type Selection

For new construction and major reconstruction projects, the designer should determine the type of pavement to be constructed utilizing formal analysis of existing and anticipated conditions. Heavily trafficked roadways where there is a significant amount of to much traffic (>10% traffic) may warrant considerable for special asphalting pavement designs and for rigid pavement designs. ~~—~~The Department has a documented procedure patterned after the ~~1986~~ 1993 AASHTO Guide for Design of Pavement Structures, Appendix B. This procedure may be found in Department's ~~Flexible~~ Pavement Type Selection ~~Design~~ Manual.

## 5.2.2~~B.2~~ Structural Design

The pavement shall be designed and constructed so the required surface texture is maintained and its structure retains an adequate level of serviceability for the design period. The strength of the pavement materials shall be sufficient to maintain the desired roadway cross section without the formation of ruts or other depressions which would impede drainage. Subgrade strength and subgrade drainage are major factors to be considered in pavement design.

The Department's pavement design manuals are recommended as a guide for both flexible and rigid pavement design. Other design procedures are available including the AASHTO Guide for Design of Pavement Structures, ~~1986~~1993; ~~the AASHTO Interim Guide for Design of Pavement Structures, 1972;~~ and procedures which have been developed by the Portland Cement Association, the American Concrete Pavement Association, and the Asphalt Institute. The selection of the design procedure and the development of the design data must be managed by professional personnel competent to make these evaluations.

## 5.2.3~~B.3~~ Skid Resistance

Pavements shall be designed and constructed so as to maintain adequate skid resistance for as long a period as the available materials, technology, and economic restraints will permit, thus eliminating cost and hazardous maintenance operations.

The results of relevant experience and testing (i.e., tests conducted by the Department's Materials Office) should be used in the selection of aggregate and

other materials, the pavement mix design, the method of placement, and the techniques used for finishing the pavement surface. The design mixes should be monitored by continuous field testing during construction. Changes to the design mix or construction procedures must be made by qualified pavement designers and laboratory personnel ONLY.

The use of grooving (across the roadway) in concrete pavements frequently improves the wet weather skid resistance and decreases the likelihood of hydroplaning. This technique should be considered for locations requiring frequent vehicle maneuvers (curves, intersections, etc.) or where heavy traffic volumes or high speeds will be encountered. The depth, width, and spacing of the grooves should be such that vehicle operations are not hindered.

## 5.2.4~~B.4~~ Drainage

Adequate drainage of the roadway and shoulder surfaces should be provided. Factors involved in the general pavement drainage pattern include: pavement longitudinal and cross slopes, shoulder slopes and surface texture, curb placement, and the location and design of collection structures. The selection of pavement cross slopes should receive particular attention to achieve the proper balance between drainage requirements and vehicle operating requirements. The use of curbs or other drainage controls adjacent to the roadway surface should be avoided, particularly on high speed facilities. Specific requirements for cross slopes and curb placement are given in CHAPTER 3 - GEOMETRIC DESIGN.

~~The use of grooving (across the roadway) in concrete pavements frequently improves the wet weather skid resistance and decreases the likelihood of hydroplaning. This technique should be considered for locations requiring frequent vehicle maneuvers (curves, intersections, etc.) or where heavy traffic volumes or high speeds will be encountered. The depth, width, and spacing of the grooves should be such that vehicle operations are not hindered.~~

## 5.2.5~~B.5~~ Shoulder Treatment

The primary function of the shoulder is to provide an alternate travel path for vehicles in an emergency situation and preferred path for bicyclists. Shoulders should be capable of providing a safe path for vehicles traveling at roadway speed, and should be designed and constructed to provide a firm and uniform surface capable of supporting vehicles in distress. Particular attention ~~should~~ shall be given

to providing a smooth transition from pavement to shoulder and avoiding hazardous "drop-offs." ~~*{Safety Edge?}*~~ Adequate edge support shall be provided to include shouldler stabilization and /or a safety edge must be constructed. Details for the Safety Edge included in Figure I with associated quality requirements.

~~Paved shoulders~~Shoulder pavement may be provided to improve drainage of the roadway, to serve bicycles and transit users, and to minimize shoulder maintenance.

FIGURE 3
SAFETY EDGE QUANTITIES

| SAFETY EDGE ASPHALT AND BASE QUANTITIES | | | | | |
|---|---|---|---|---|---|
| OVERLAY THICKNESS (INCHES) | AREA OF SAFETY EDGE WEDGE (SF) | QUANTITY OF ASPHALT FOR SAFETY EDGE - BOTH SIDES (TONS PER MILE) | QUANTITY OF OBG 1 FOR SAFETY EDGE - BOTH SIDES (SY PER MILE) | COST PER MILE | |
| | | | | SAFETY EDGE ONLY | SAFETY EDGE WITH OBG 1 |
| 1 | 0.006 | 4.65 | 2346.7 | $450.72 | $11,973.02 |
| 2 | 0.024 | 18.59 | 2346.7 | $1,801.93 | $13,324.23 |
| 3 | 0.054 | 41.82 | 2346.7 | $4,053.61 | $15,575.91 |
| 4 | 0.096 | 74.34 | 2346.7 | $7,205.78 | $18,728.07 |
| 5 | 0.150 | 116.16 | 2346.7 | $11,259.39 | $22,781.69 |
| 6 | 0.217 | 168.05 | 2346.7 | $16,289.09 | $27,811.38 |

NOTE:
QUANTIES FOR TREATMENT 11 PER FDOT STANDARD INDEX 105 WILL VARY DEPENDING ON SHOULDER WIDTH. SEE FDOT STANDARD INDEX 105 FOR DETAILS.

1

2

# 5.3~~C~~ PAVEMENT CONSTRUCTION

A regular program of inspection and evaluation should be conducted to ensure the pavement criteria are satisfied during the construction process. Any regular inspection program should include the following:

- The use of standard test procedures, such as AASHTO and the American Society for Testing and Materials (ASTM).
- The use of qualified personnel to perform testing and inspection.
- The use of an independent assurance procedure to validate the program.

After construction, the pavement surface shall be inspected to determine the required surface texture and smoothness was achieved and the surface has the specified slopes. Spot checking of skid resistance by approved methods should be considered. ~~Inspection of the roadway during wet weather conditions should be carried out as soon as possible to quickly locate drainage problems such as depressions in the pavement surface.~~ Periodic reinspection should be undertaken in conformance with the guidelines described in CHAPTER 10 – MAINTENANCE, Section 10.6.4~~F.4~~ Pavement Maintenance.

# CHAPTER 9

# BICYCLE FACILITIES

## 9.1~~A~~ Introduction

Bicycle facilities shall~~ould~~ be given full consideration in the planning and development of transportation facilities, including the incorporation of such ways into state, regional, and local transportation plans and programs under the assumption that transportation facilities will be used by cyclists. Bicycle ways should be established in conjunction with the construction, reconstruction, or other change of any transportation facility and special emphasis should be given to projects in or within 1 mile of an urban area.

Appropriately designed and located bicycle facilities play an important role in supporting bicycle travel. Bicyclists should be considered in all phases of transportation planning, design, construction and maintenance activities. Particular emphasis should be given to new construction, reconstruction, intersection ~~capacity~~ improvement~~,~~ ~~projects,~~ and transit projects. ~~All projects, particularly intersection modifications, should be designed to accommodate bicyclists. Bicycle-safe design practices, as described in this Manual, should be followed during initial roadway design to avoid costly subsequent improvements.~~ Bicycle facilities can include bicycle lanes, paved shoulders, wide curb lanes, shared lanes ~~(pending 2009 MUTCD)~~, shared use paths, traffic control devices[jtp1], and bicycle parking facilities. .

## 9.2~~B~~ On-Street Facilities

Provisions for bicycle traffic should be incorporated in the original roadway ~~highway~~ design. All ~~New~~ roadways~~highways~~, except where bicycle use is prohibited by law~~limited access highways~~, should be designed~~,~~ ~~and~~ constructed and maintained under the assumption they will be used by bicyclists. Roadway conditions should be favorable for bicycling, with smooth pavement, limited changes in elevation along edge lines, and ~~that~~ drainage inlets and utility covers ~~that~~ which cannot be moved out of the travel way ~~are~~should be designed flush with grade, well seated, and make use of bicycle-compatible grates and covers. ~~This requires special care in preparing the roadway surface to accommodate 1¼ inch tires. Attention needs to be given to include safe drainage grates and railroad crossings, smooth pavements, and signals responsive to bicycles.~~ [mak22]

Railroad grade crossings on a diagonal can cause steering difficulties for bicyclists.

Crossings for bicycle facilities should be perpendicular to the rail. This can be accomplished as a widened shoulder or bicycle lane, or~~.~~ separate path. Consideration should be given to improving the smoothness of the crossing and reducing the width and depth of the flangeway opening. Flangeway fillers can be used on heavy rail lines to minimize the size of the opening adjacent to the rail.

In addition~~, the desirability of adding facilities, such as~~ bicycle lanes, paved shoulders, wide curb lanes, or shared lanes ~~and shoulder improvements,~~ should be included to the fullest extent feasible. The appropriate selection of a bicycle facility depends on many factors, including motor vehicle and bicycle traffic characteristics, adjacent land use and expected growth patterns. ~~Specifically, a~~All new or reconstructed ~~rural~~ arterial and major collector roadways ~~sections~~ in and within one mile of an urban~~ized~~[mak33] area should include ~~be given consideration for the construction of 4 to 5 foot paved shoulders, and all urban arterial and collector sections should be given consideration for either undesignated 4 foot lanes or marked~~ bicyc~~k~~le lanes. The provision for bicycle facilities is also desirable for resurfacing, restoration & rehabilitation (RRR) projects.

Rumble strips used in a traffic lane to alert operators to conditions ahead (e.g. stop signs, traffic signals or curves) should provide clear space (free of rumble strips) for bicyclists. This clear space may be a paved shoulder or if no paved shoulder is present, a minimum of 1.5 feet of clear space at the outermost portion of the lane.

## ~~B.1 Paved Shoulders~~

~~In rural areas, or on sections without curb and gutter, adding or improving paved shoulders often can be the best way to accommodate bicyclists. Paved shoulders also benefit motor vehicle traffic.~~

~~Paved shoulders should be at least 4 feet wide to accommodate bicycle travel. The measurement of shoulder width does not include the width of any gutter pan. Paved shoulder width of 5 feet is recommended from the face of guardrail, curb, or other roadside barrier. Additional shoulder width is desirable if motor vehicle speeds exceed 50 mph, or the percentage of trucks, buses, or recreational vehicles is high.~~

~~If paved shoulders 4 feet wide cannot be provided, consider adding 3 foot shoulders. The only practical difference in the operation of a 3 foot shoulder and wider shoulders, as they relate to bicyclists, is a slight decrease in motorist-bicyclist separation distances. Other operational characteristics, such as motorist encroachment into adjacent lanes while passing and changes in the motorist~~

~~position within the lane while passing are not significantly impacted.~~

## 9.2.1~~2~~ Bicycle ~~(Bike~~ Lanes~~)~~

Bicycle lanes ~~should be considered when it is desirable to~~ delineate available roadway space for preferential use by bicyclists; providing more predictable movements by ~~and~~ motorists and bicyclists.~~, and to provide for more predictable movements by each~~. Bicycle lanes also help increase the total capacity of highways carrying mixed bicycle and motor vehicle traffic. Bicycle lanes shall have a minimum functional width of 4 feet. At least 1 foot additional width is needed when the bicycle lane is adjacent to a curb or other barrier, on-street parking is present, there is substantial truck traffic (>10%), or speeds exceed 50 mph. Bicycle lane widths are illustrated in Figure 9 - 1. The 4-foot bicycle lane shown in the flush shoulder typical section assumes the shoulder provides emergency maneuvering room.

~~Bicycle lane markings can increase bicyclists' confidence that motorists will not stray into their path of travel. Likewise, passing motorists are less likely to swerve to the left out of their lane to avoid bicyclists on the right.~~

Bicycle lanes are ~~should be~~ one-way facilities and carry bicycle~~ke~~ traffic in the same direction as the adjacent motor vehicle traffic~~lane~~. A bicycle lane should be delineated from the travel lanes with a 6-inch solid white line and be marked with the bicycle symbol and arrow as shown in Figure 9-2.~~.~~ Bicycle lane markings should be placed immediately after major intersections and driveways, with a maximum spacing of 600 feet in urban areas and 1,320 feet in rural areas.

A through bicycle lane shall not be positioned to the right of a right turn lane only lane or to the left of a left turn only lane. For new construction, reconstruction, and traffic operations projects, at locations with right turn lanes, bus bays or parking lanes, a 5-foot bicycle lane shall be provided between the through lane and right turn lane, bus bay or parking lane. For bicycle lanes adjacent to parking lanes, if the parking volume is substantial or the turnover is high an additional 1-2 feet of width should be provided for the bicycle lane where right of way is adequate.

~~In most cases, bike lanes will be through lanes and be located to the right of the right most through lane.~~

~~Two-way bike lanes on one side of the roadway are not recommended when they result in riding against the flow of motor vehicle traffic. Wrong-way riding is a major~~

~~cause of bicycle crashes and violates the Rules of the Road as stated in the Uniform Vehicle Code and Chapter 316, Florida Statutes. Bicycle specific wrong-way signing may be used to discourage wrong-way travel. There may be special situations where a two-way bike lane for a short distance can eliminate the need for bicyclists to make a double crossing of a busy street. This should be considered after a careful evaluation of the risks.~~

On one-way streets, ~~bike~~ bicycle lanes should generally be placed on the right side of the street. A bicycle lane on the left side of the street can be considered when a bicycle lane on the left ~~Bike lanes on the left side are unfamiliar and unexpected for most motorists. This should only be considered when a bicycle lane on the left~~ will substantially decrease the number of conflicts, such as those caused by frequent ~~heavy~~ bus traffic~~.~~, heavy right turning movements, high-turnover parking lanes~~or unusually heavy movements to the right~~, or if there are a significant number of ~~left-turning~~ left turning bicyclists.

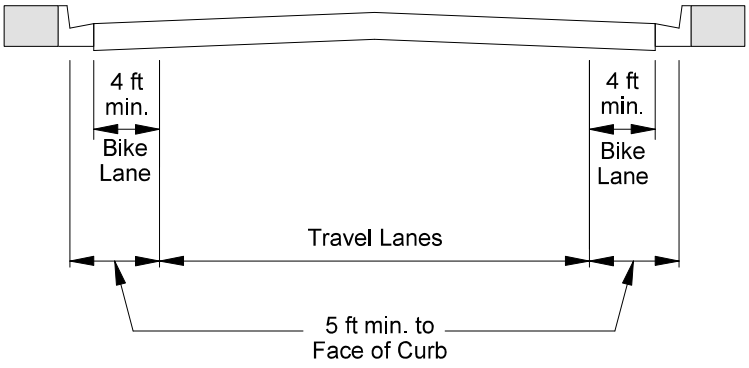
~~Thus, left side bike lanes should only be considered after careful evaluation. Similarly, two-way bike lanes on the left side of a one-way street with a suitable separation from the motor vehicle should only be considered after a complete engineering study of other alternatives and relative risks.~~

Bicycle lanes should provide bicycle-safe drainage inlet grates, pavement surfaces should be smooth, and traffic signal should be responsive to bicyclists. Regular maintenance of bicycle lanes should be a top priority, since bicyclists are unable to use a lane with potholes, debris or broken glass. The overall minimum width of a travel lane and a bicycle lane is 14 feet. Bicycle lanes shall not be provided on the circular roadway of a roundabout and shall be transitioned prior to the roundabout in accordance with the MUTCD.

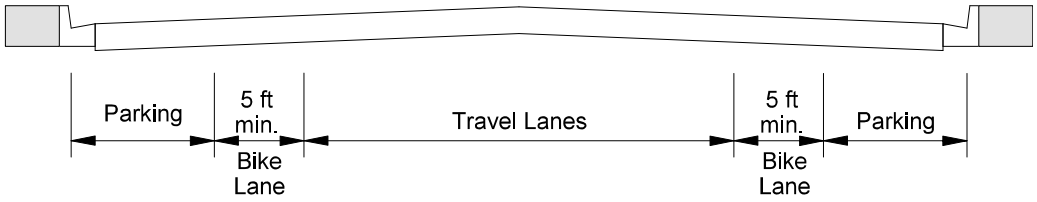
~~One-way~~ Various configurations of bicycle lanes on curb and gutter and flush shoulder typical sections are ~~are~~ illustrated ~~should be designed with the minimum width given~~ in Figure 9~~-~~-~~1~~6 – 9-14~~.~~ ~~The 4 foot bike lane shown assumes the shoulder provides emergency maneuvering room.~~

**Figure 9–1**
**Minimum Widths for Bicycle Lanes**

a) Curbed Street without Parking




b) Curbed Street with Parking




c) Roadway without Curb and Gutter

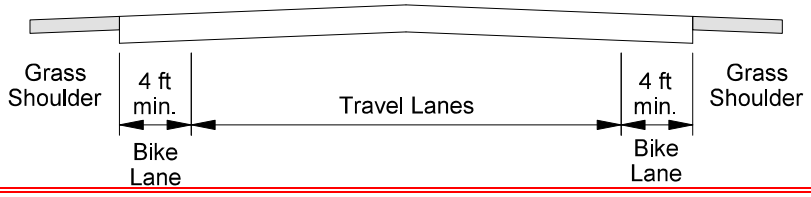
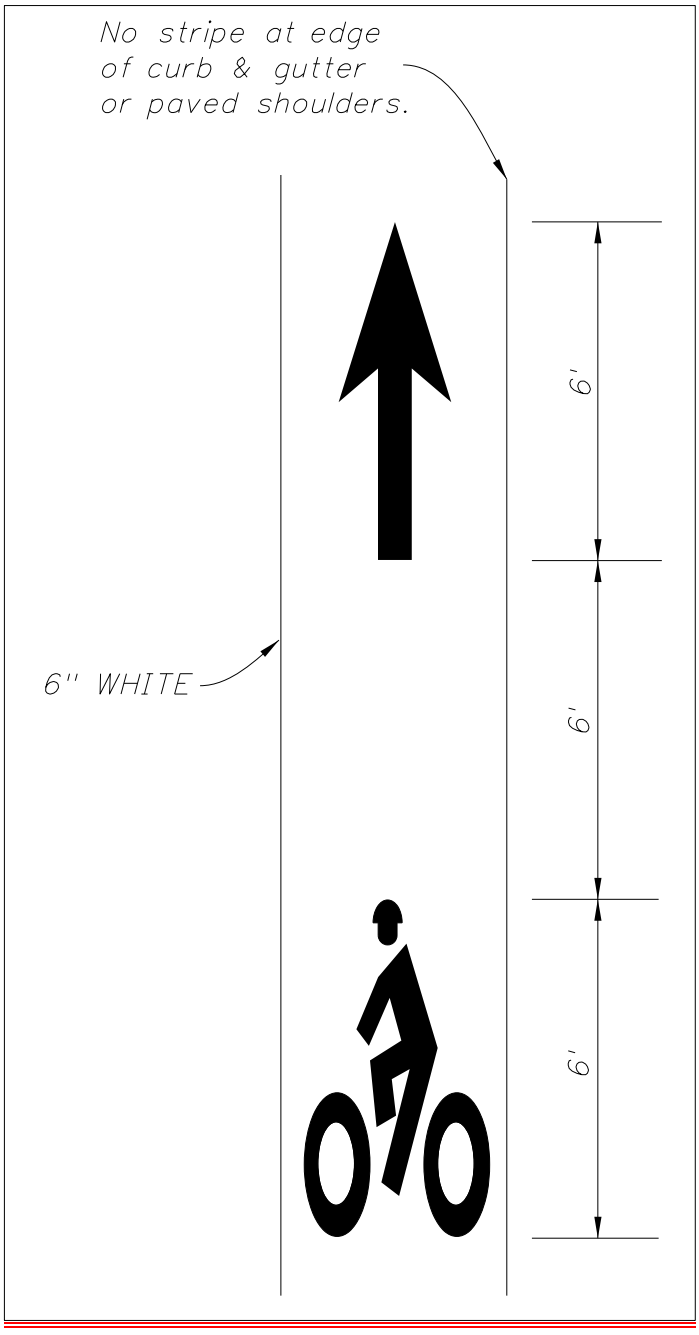


**Figure 9-2**
**Detail of Bicycle Markings**



## 9.2.2 Paved Shoulders

A paved shoulder is a portion of the roadway which has been delineated by edge line striping, but generally does not include special pavement markings for the preferential use by bicyclists. In some areas, adding or improving paved shoulders often can be an acceptable way to accommodate bicyclists. Paved shoulders ~~-~~may be marked as bicycle lanes.

A paved shoulder at least 4 feet in width is considered to be a bicycle facility. Additional shoulder width is desirable if the posted speed exceed 50 mph, or the percentage of trucks, buses, or recreational vehicles is high (>10%). A minimum 5-foot clear width between the traveled way and the face of curb, guardrail or other roadside barrier is also required.

## 9.2.3~~B.3~~ Wide ~~Curb~~ Outside Lanes

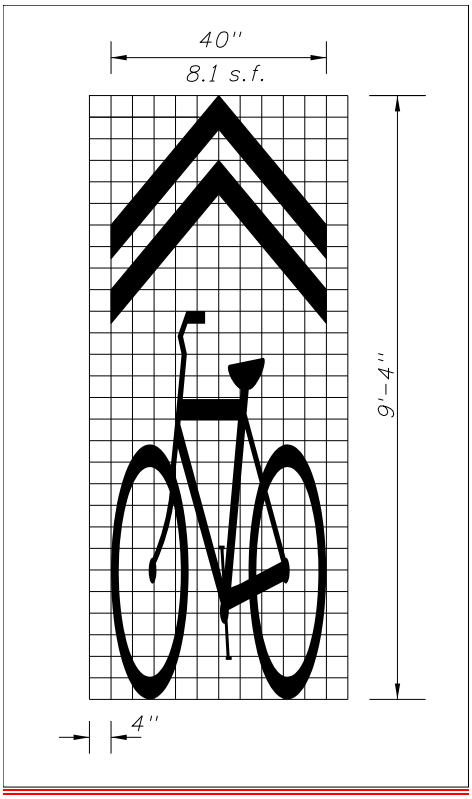
Wide outside lanes are through lanes which provide a minimum of fourteen feet in width. This width allows most motor vehicles to pass cyclists within the travel lane, which is not possible on more typical 10-foot to 12-foot wide lanes. On stretches of roadway with steep grades where bicyclists need more maneuvering space, the wide curb lane should be slightly wider where practical. In restricted urban conditions, where it is not possible to include ~~bike~~ bicycle lanes or paved shoulders or on minor~~lower volume~~ collector streets, a wide curb lane may be a practical option for a bicycle facility. However, in situations where more than 15 feet of pavement width exists, bicycle lanes or paved shoulders should be provided. ~~An outside lane wider than 12 feet can help accommodate both bicycles and motor vehicles in the same lane. Fourteen feet is the recommended lane width for shared use in a wide curb lane, and is the minimum width that will allow passenger cars to safely pass bicyclists within a single lane.~~[jp24]

## 9.2.4 Shared Lane Markings

Shared lane markings, as shown in Figure 9-2 may be used in travel lanes to indicate the optimum alignment for a bicyclist within the lane and to inform road users that bicyclists might occupy the travel lane. Shared Lane Markings shall not be placed in bicycle lanes or on paved shoulders. Shared Lane Markings should not be placed on roadways that have a posted speed limit above 35 mph. The Shared Lane Markings may be used to:

- Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle,
- Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same travel lane,
- Alert road users of the lateral location bicyclists are likely to occupy within the traveled way,
- Encourage safe passing of bicyclists by motorists, and
- Reduce the incidence of wrong-way bicycling.

**Figure 9-3 Shared Lane Marking**



Shared lane markings shall be placed in accordance with the guidance established in MUTCD[mak5].

- If used in a shared lane with on-street parallel parking, Shared Lane Markings should be placed so that the centers of the markings are at least 11 feet from the face of the curb, or from the edge of the pavement where there is no curb. (Figure 9-4)
- If used on a street without on-street parking that has an outside travel lane that is less than 14 feet wide, the centers of Shared Lane Markings should be a least 4 feet from the face of the curb, or from the edge of the pavement where there is no curb. (Figure 9-5)
- If used, the Shared Lane Markings should be placed immediately after an intersection and spaced at intervals not greater than 250 feet thereafter.

**Figure 9-4 Shared Lane Marking Placement (With On-Street Parking[mak6])**

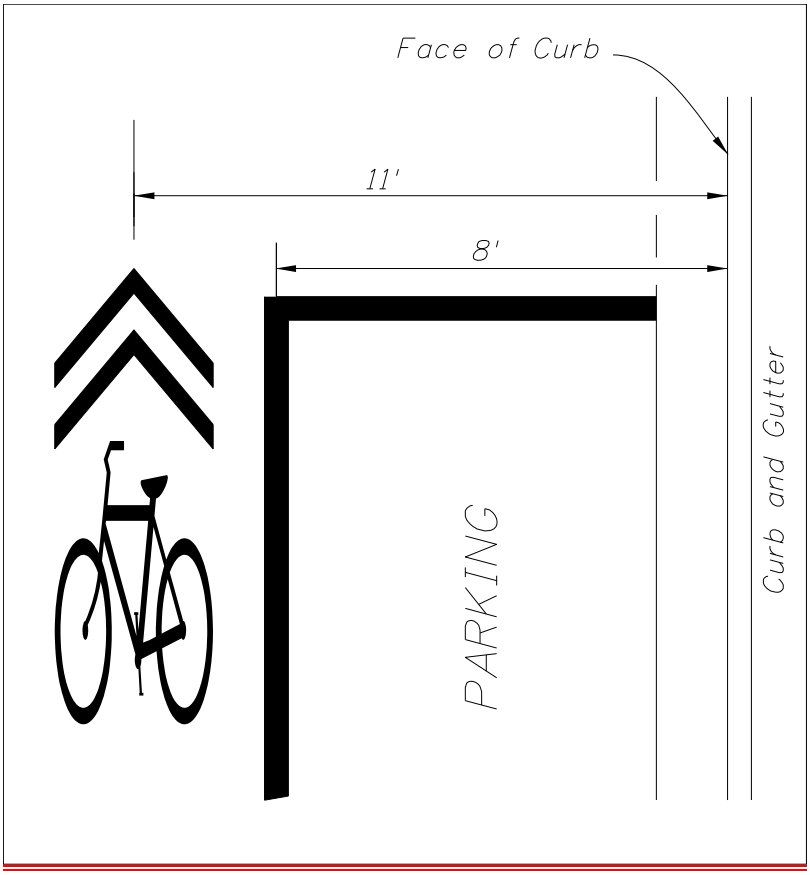
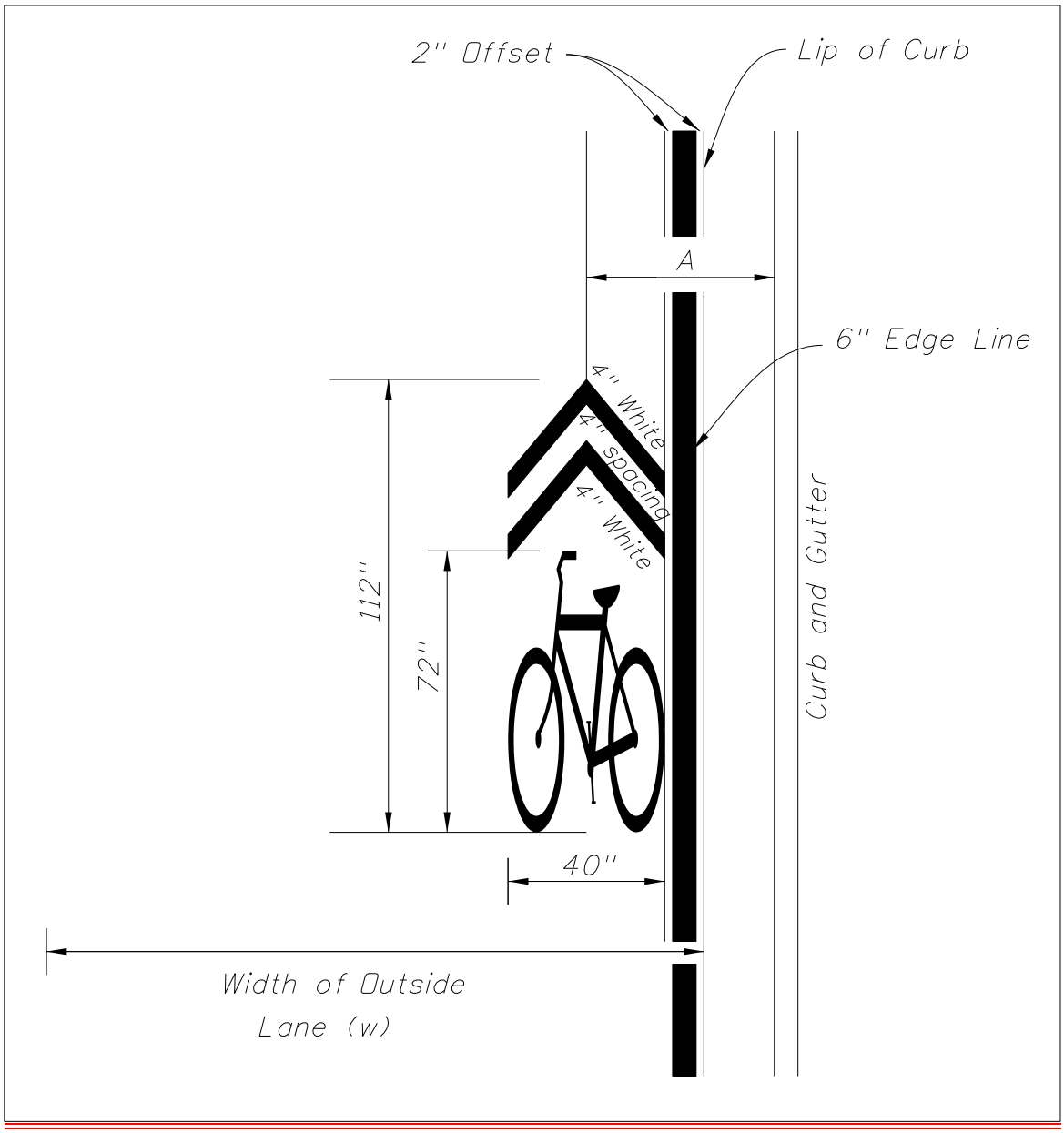


**Figure 9-5 Shared Lane Marking Placement (No Designated Parking)**



## 9.3~~C~~ Shared Use Paths

Shared use paths are facilities usually on an exclusive right of way~~.~~; with minimal cross flow by motor vehicles. They are almost always used by pedestrian, joggers, in-line skaters, bicyclists, and in some cases equestrians. ~~Users are non-motorized and may include, but are not limited to, the following[jtp7]:~~

- ~~Bicyclists~~
- ~~In-line skaters~~
- ~~Roller skaters~~
- ~~Skateboarders~~
- ~~Wheelchair users~~
- ~~Pedestrians (walkers, runners, people with baby strollers, people walking dogs, etc.)~~

Shared use paths ~~can~~ serve a variety of purposes. They can provide a school age child, a recreational cyclist, or a person with a disability an alternative to busy roadways. Shared use paths can be located along former rail corridors, the banks of rivers or canals, and through parks and forests.~~users with a shortcut through a residential neighborhood.~~ Shared use paths can also provide access to areas otherwise served only by limited access highways. For transportation purposes, they should be thought of as an extension of the roadway network for non-motorized users. The inclusion of a shared use path should not be considered as an alternative to providing ~~in~~on-street facilities, but, rather, as a supplement.

For a discussion of shared path design beyond what is in this chapter, refer to the AASHTO Guide for the Development of Bicycle Facilities~~Florida Bicycle Facilities Planning and Design Handbook~~.

### 9.3.1~~C.1~~ Separation ~~Between~~between Shared Use Paths and Roadways

Shared use paths should be separated from the roadway. In some cases, paths along highways for short sections are permissible, given an appropriate level of separation between facilities. Some problems with paths located immediately adjacent to the roadways are as follows:

- Unless separated, they require one direction of bicycle traffic to ride against motor vehicle traffic, contrary to normal rules of the road.

- When paths end, bicyclists going against traffic will tend to continue to travel on the wrong side of the street. Likewise, bicyclists approaching a path often travel on the wrong side of the street to get to the path. Wrong-way travel by bicyclists is a major cause of bicycle/automobile crashes and should be discouraged at every opportunity.

- At intersections, motorists entering or crossing the roadway often will not notice bicyclists coming from the right, as they are not expecting or looking for contra-flow vehicles. Motorists turning to exit the roadway may likewise fail to notice the bicyclists. Even bicyclists coming from the left (the expected direction) often go unnoticed, especially when sight distances are limited.

- When constructing a two-way path within a narrow right of way, sacrificing the shoulder on the adjacent roadway would be a detriment to both the motorist and the bicyclists and should be avoided if at all possible.

- Many bicyclists will use the roadway instead of the shared use path because they have found the roadway to be safer, less congested, more convenient, or better maintained. Bicyclists using the roadway are often subjected to harassment by motorists who feel that, in all cases, bicyclists should be on the path instead.

- Although the shared use path should be given the same priority through intersections as the parallel highway, motorists falsely expect bicyclists to stop or yield at all cross streets and driveways. Efforts to require or encourage bicyclists to yield or stop at each cross street and driveway are inappropriate and frequently ignored by bicyclists.

- Stopped cross street motor vehicle traffic or vehicles exiting side streets or driveways may block the path crossing.

- Because of the proximity of motor vehicle traffic to opposing bicycle traffic, barriers are often necessary to keep motor vehicles out of shared use paths and bicyclists out of traffic lanes. These barriers can represent an obstruction to bicyclists and motorists, can complicate maintenance of the facility, and cause other problems.

When it is decided to construct a shared use path adjacent to a roadway, the following should be considered.

- Conflict points should be limited to as few as possible.
- Conflicts should occur at as low a speed as possible. Consider reducing turning radii to reduce the speeds of motorists turning toward the shared use path. Kinks in the path alignment can reduce the speed of path users approaching the conflict.
- Maintain adequate sight distances for both motorists and path users to perceive and react to potential conflicts.

When the distance between the shared use path and the highway shoulder is less than 5 feet, a physical barrier is recommended. Where used, the barrier should be a minimum of 42 inches high, to prevent cyclists from toppling over it. A barrier between a shared use path and an adjacent highway should not impair sight distance at intersections, and should be designed to not be a hazard to errant motorists.

### 9.3.2~~C.2~~ Width

The paved width and operating width required for a shared use path are primary design considerations. The minimum recommended width for a paved two-way path is 10 feet. In many cases, it is desirable to increase the minimum width to 12 feet. The width should be increased if there is expected substantial use by bicyclists, probable shared use with joggers and in-line skaters, steep grades, and locations where bicyclists are likely to ride two abreast.

In a few cases, it may be acceptable to decrease the trail width to 8 feet. This width should only be used where the following conditions prevail:

- Bicycle traffic is expected to be low, even on peak days or during peak hours.
- Pedestrian use of the facility is not expected to be more than occasional.
- There will be good horizontal and vertical alignment, providing safe and frequent passing opportunities.
- During normal maintenance activities, the path will not be subjected to maintenance vehicles causing pavement edge damage.

For further discussion of shared use path design, refer to the Florida Bicycle Facilities Planning and Design Handbook.

## 9.3.3~~C.3~~ Horizontal Clearance

A minimum 2 foot wide graded area with a maximum 1:6 slope should be maintained adjacent to both sides of the path; however, 3 feet or more is desirable to provide clearance from trees, poles, walls, fences, guardrails or other lateral obstructions. Where the path is adjacent to canals, ditches, or slopes steeper than 1:3, a wider separation should be considered. A minimum 5 foot separation from the edge of the path pavement to the top of the slope is desirable. Depending on the height of embankment and condition at the bottom, a physical barrier, such as dense shrubbery, railing or chain link fence, may need to be provided. If a railing or barrier must be placed closer than 2 feet from the path, flare the end of the railing or barrier so that the end treatment of the barrier does not constitute a hazard.

## 9.3.4~~C.4~~ Vertical Clearance

Vertical clearance to obstructions should be a minimum of 8 feet. However, vertical clearance may need to be greater to permit passage of maintenance and emergency vehicles. In undercrossings and tunnels, 10 feet[jtp8] is desirable.

## 9.3.5~~C.5~~ Design Speed

A design speed of 20 mph should be used for shared use paths.

## 9.3.6~~C.6~~ Structures

The minimum clear width on structures should be the same as the approach shared use path, plus the minimum 2 foot wide clear areas.

Grades on structures to be used by pedestrians shall comply with the requirements of the ADA Accessibility Guidelines (as described in the Federal Register) and the Florida Accessibility Code For Building Construction as given in CHAPTER 3 – GEOMETRIC DESIGN.

## 9.3.7~~C.7~~ Ramp Widths

Ramps for curbs at intersections should be at least the same width as the shared use path. Curb cuts and ramps should provide a smooth transition between the shared use path and the roadway. A 5 foot radius or flare may be considered to

facilitate right turns for bicyclists.

## 9.4~~D~~ Railroad Crossings

Railroad-highway grade crossings should ideally be at a right angle to the rails. This can be accomplished either as a separate path or a widened shoulder. The greater the crossing deviated from this ideal crossing angle, the greater is the potential for a bicyclist's front wheel to be trapped in the flangeway, causing loss of steering control. If the crossing angle is less than approximately 45 degrees, an additional paved shoulder of sufficient width should be provided to permit the bicyclist to cross the track at a safer angle, preferable perpendicularly. Where this is not possible, and where train speeds are low, commercially available compressible flangeway fillers may enhance bicyclist operation. It is also important that the roadway approach be at the same elevation as the rails. For more information, see Figure 27 in the AASHTO Guide for the Development of Bicycle Facilities ~~(1999)~~.

## 9.5 Structures

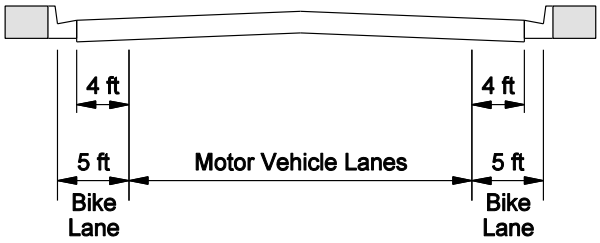
All new bridges over roadways and shared use paths shall be designed to meet the vertical clearance standards specified in Chapter 3, Section 3.3.7.10.4.2, and Chapter 17, Section 17.3.3.2.

All bridges that include provisions for pedestrians shall provide pedestrian accommodations and design considerations that meet the provisions of the ADA.

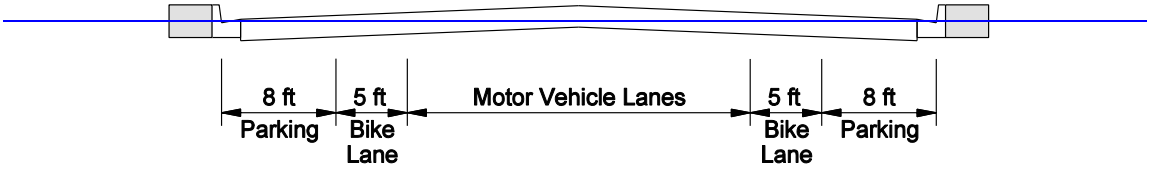
The minimum clear width of a shared use bridge should be the same as the approach paved shared use path, plus the minimum 2 foot wide clear areas. Bridges over roadways should be covered or screened to reduce the likelihood of objects being dropped or thrown below. If the bridge is enclosed, the visual tunnel effect may require widening the bridge to provide a feeling of security of all bridge users. The area adjacent to overpasses may be fenced to prevent unsafe crossings and to channel pedestrians to the vertical separation structure. Access by emergency, patrol and maintenance vehicles should be considered in establishing the design clearances of structures on shared use paths. Where practical, a path vertical clearance of 10 feet (on the structure) is desirable for adequate vertical shy distance.

## ~~FIGURE 9 – 1~~
## ~~MINIMUM WIDTHS FOR BIKE LANES~~

### a) Curbed Street without Parking




### b) Curbed Street with Parking




### c) Roadway without Curb and Gutter

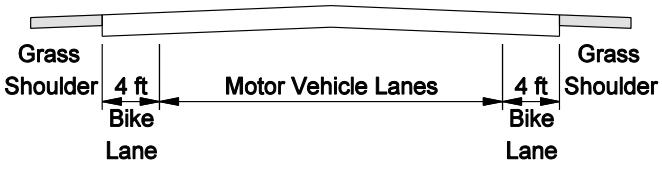
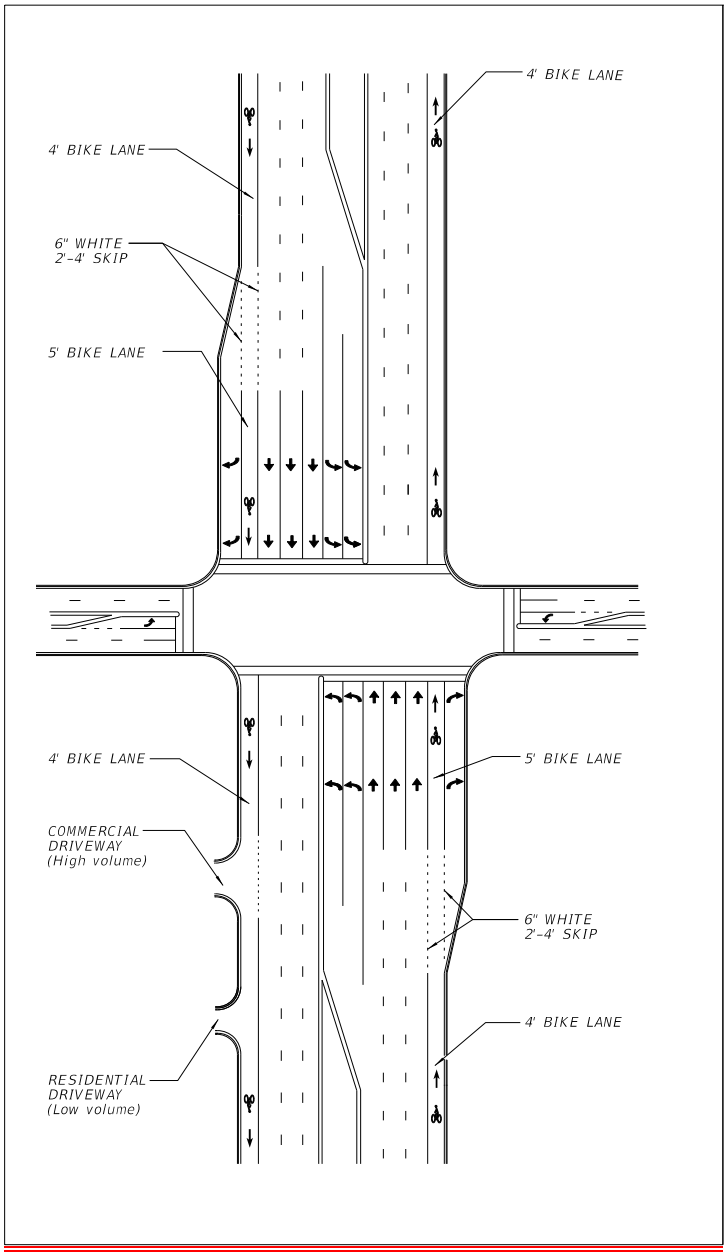
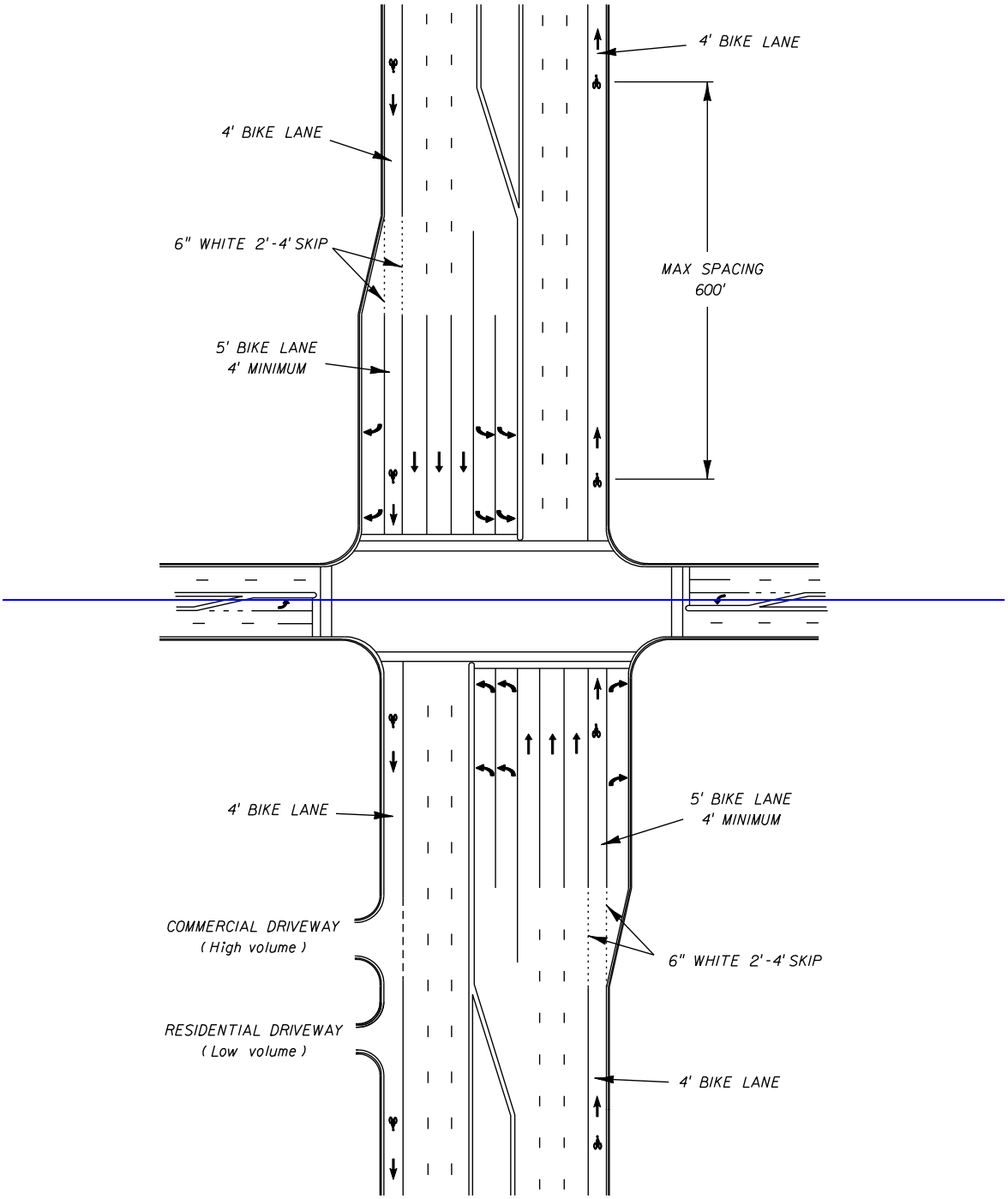


**Figure 9-6~~25~~**
**Major ~~Bicycle Lanes w~~Intersection ~~W~~ith Separate**
**Right Turn Lane, Curb and Gutter ~~Urban~~ Typical Section ~~(Curb And Gutter)~~**



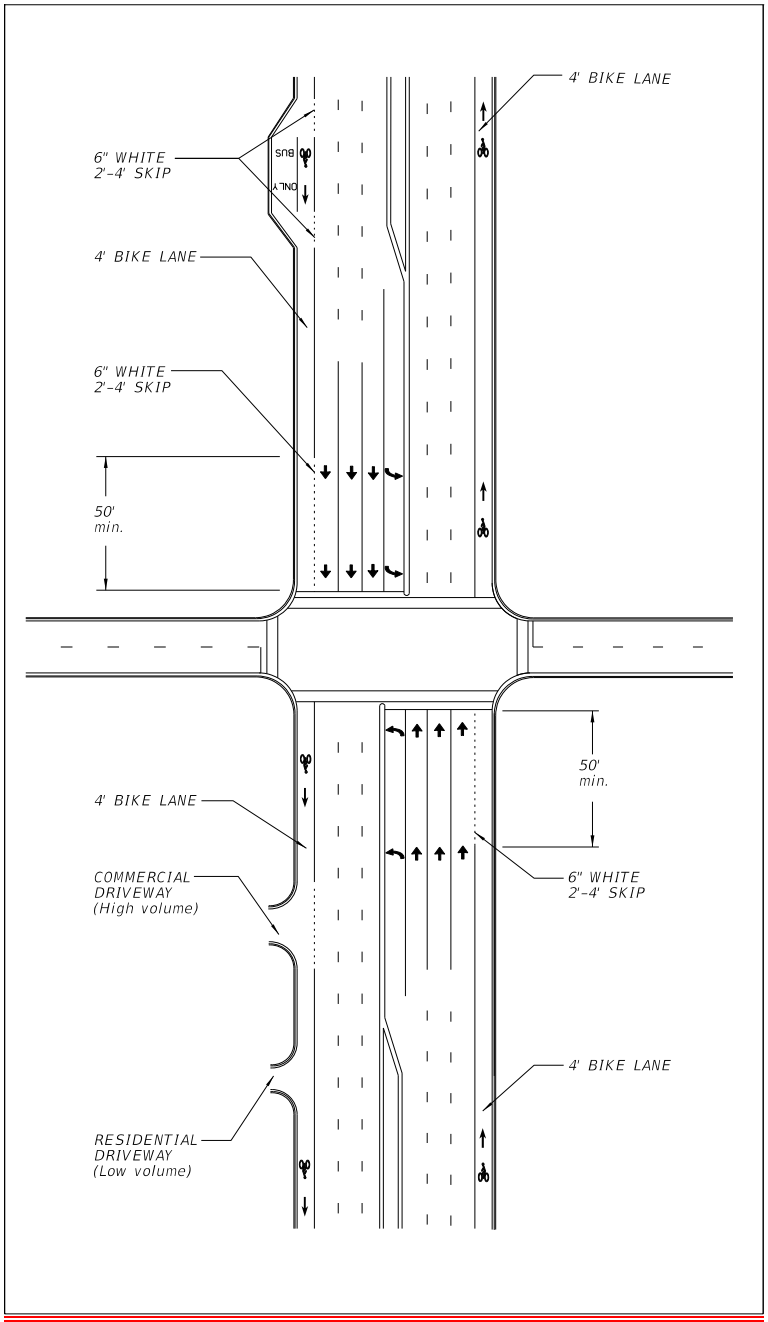

4' BIKE LANE
4' BIKE LANE
6" WHITE 2'-4' SKIP
MAX SPACING
600'
5' BIKE LANE
4' MINIMUM
4' BIKE LANE
5' BIKE LANE
4' MINIMUM
COMMERCIAL DRIVEWAY
( High volume )
6" WHITE 2'-4' SKIP
RESIDENTIAL DRIVEWAY
( Low volume )
4' BIKE LANE

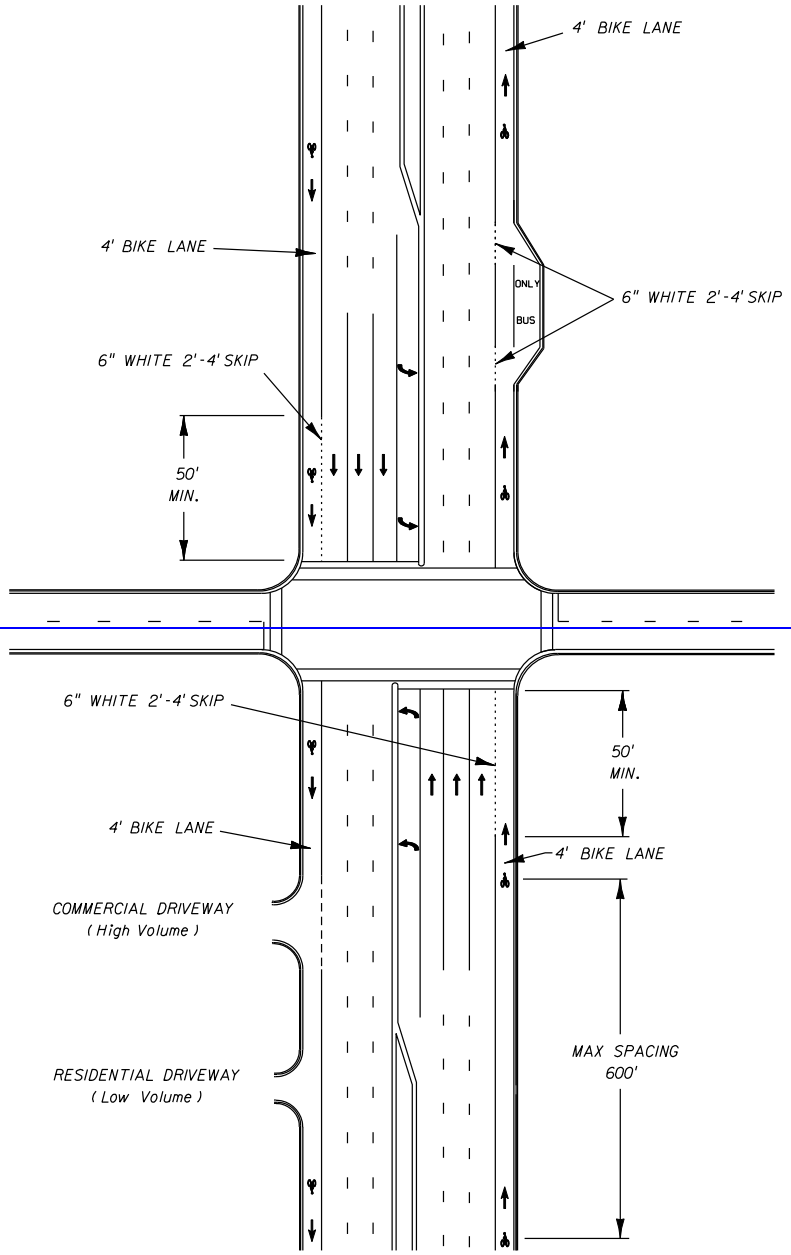
1
2

**Figure 9-7~~63~~**

**~~Major Intersection~~Bicycle Lanes ~~No Right Turn Lane Plus~~plus Busbay, Curb and Gutter Typical Section**

**~~Urban Typical Section (Curb And Gutter)~~**




4' BIKE LANE
4' BIKE LANE
ONLY
BUS
6" WHITE 2'-4' SKIP
6" WHITE 2'-4' SKIP
50'
MIN.
6" WHITE 2'-4' SKIP
50'
MIN.
4' BIKE LANE
4' BIKE LANE
COMMERCIAL DRIVEWAY
( High Volume )
RESIDENTIAL DRIVEWAY
( Low Volume )
MAX SPACING
600'

1
2

## ~~FIGURE 9 – 4~~
## ~~MAJOR WITH LOCAL STREET INTERSECTION NO RIGHT TURN LANE~~
## ~~URBAN TYPICAL SECTION (CURB AND GUTTER)~~

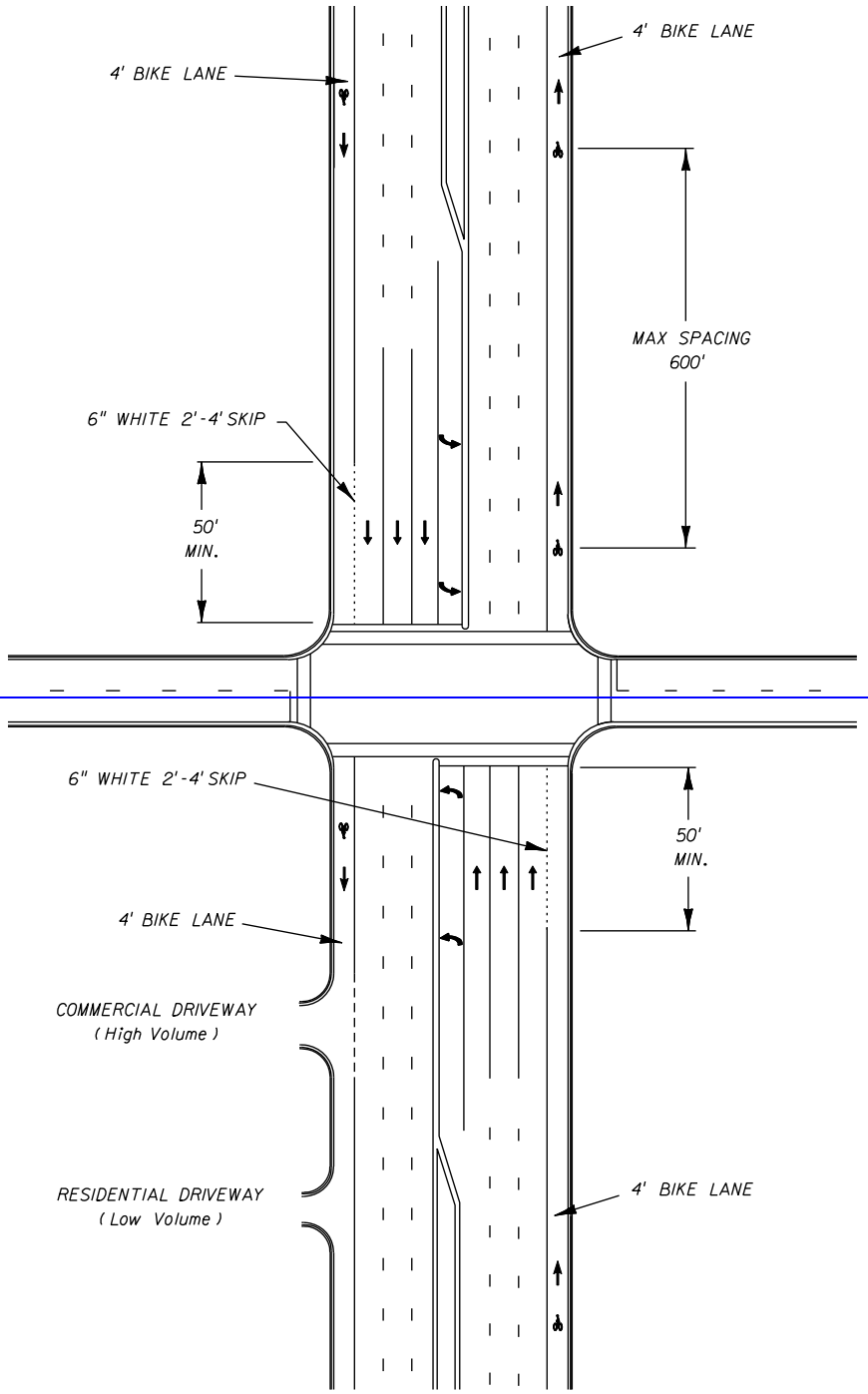
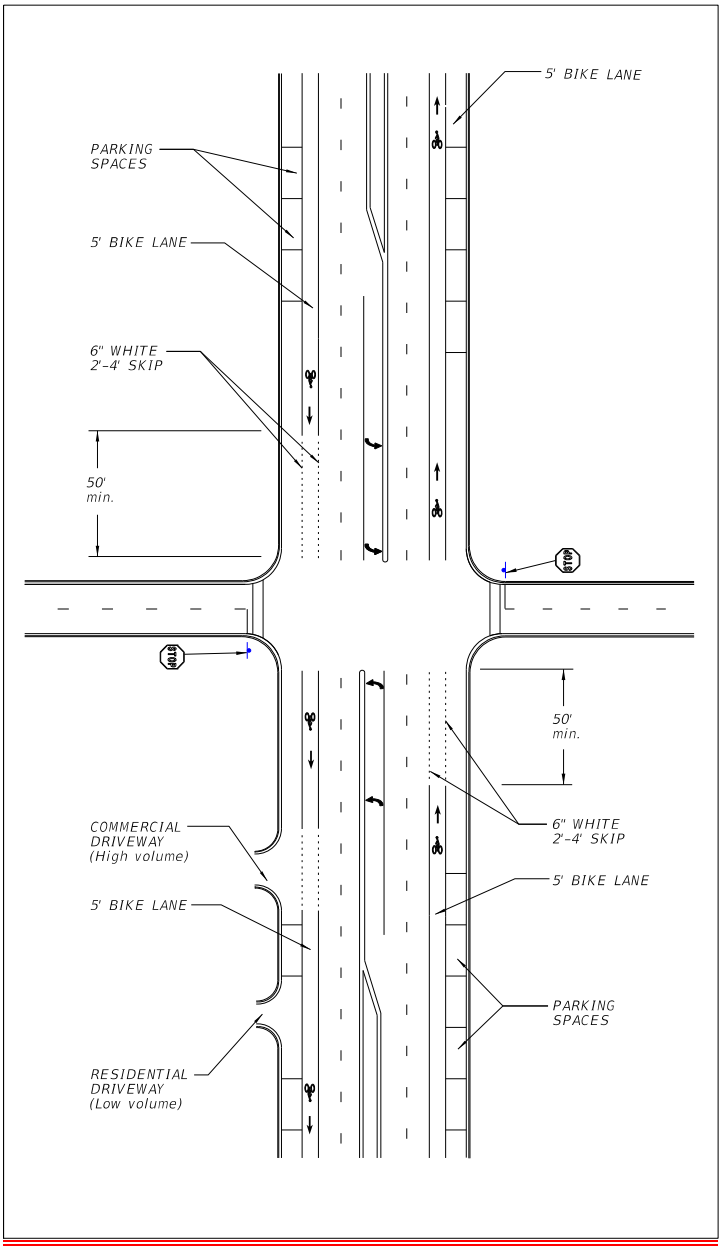
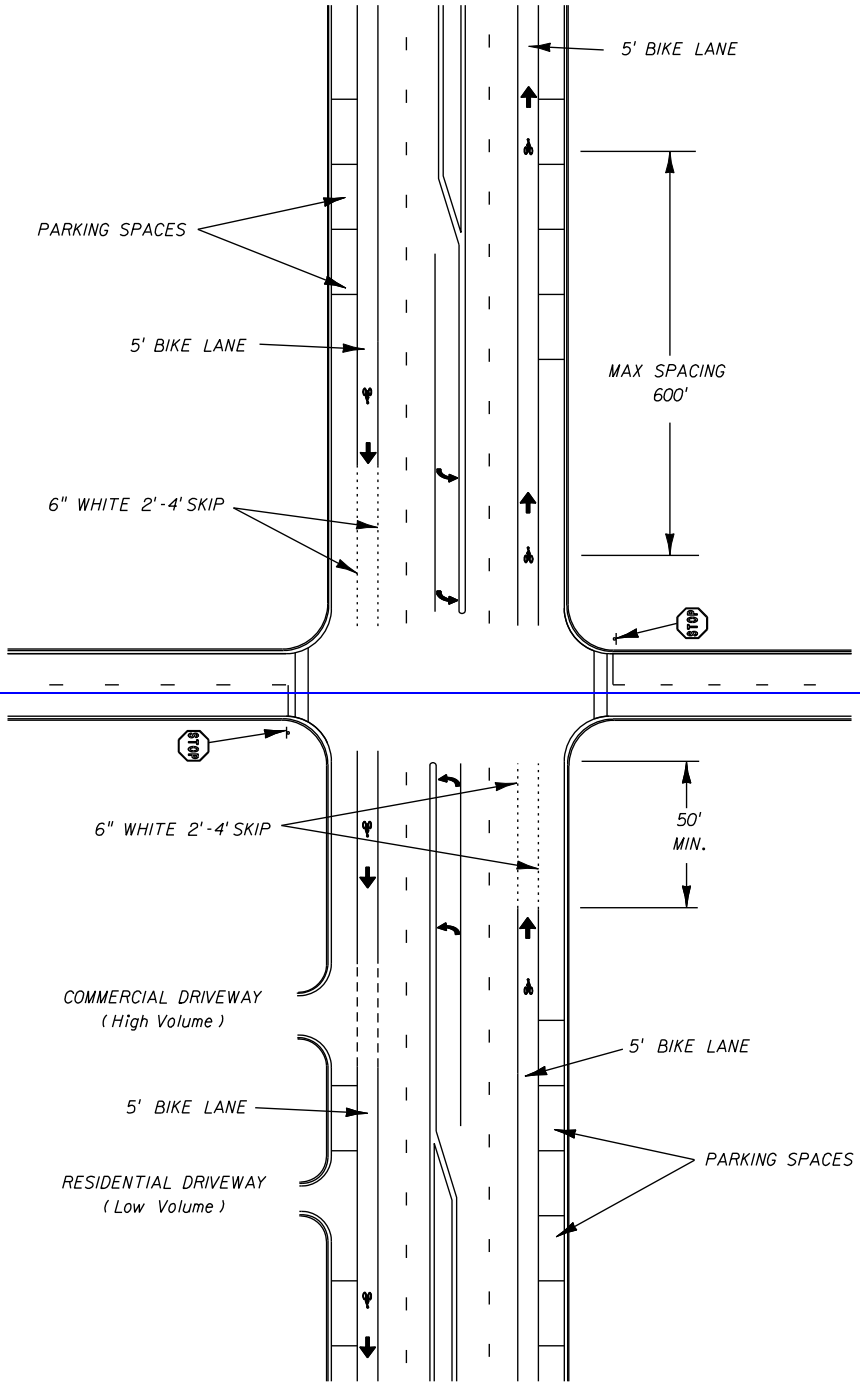


**Figure 9-8~~75~~**

**~~Major With Local Street Intersection~~Bicycle Lanes with ~~No Right Turn Lane~~**

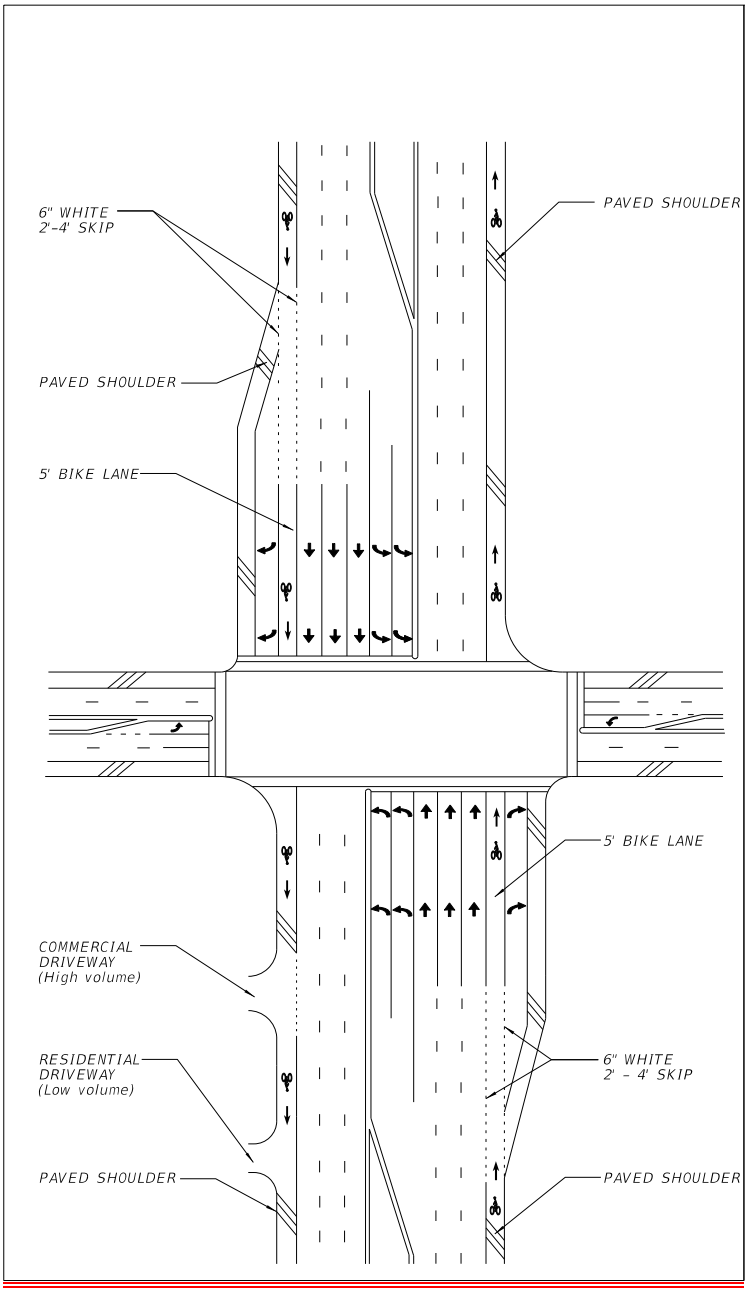
**On Street Parking, Curb and Gutter ~~Urban~~ Typical Section ~~(Curb And Gutter)~~**

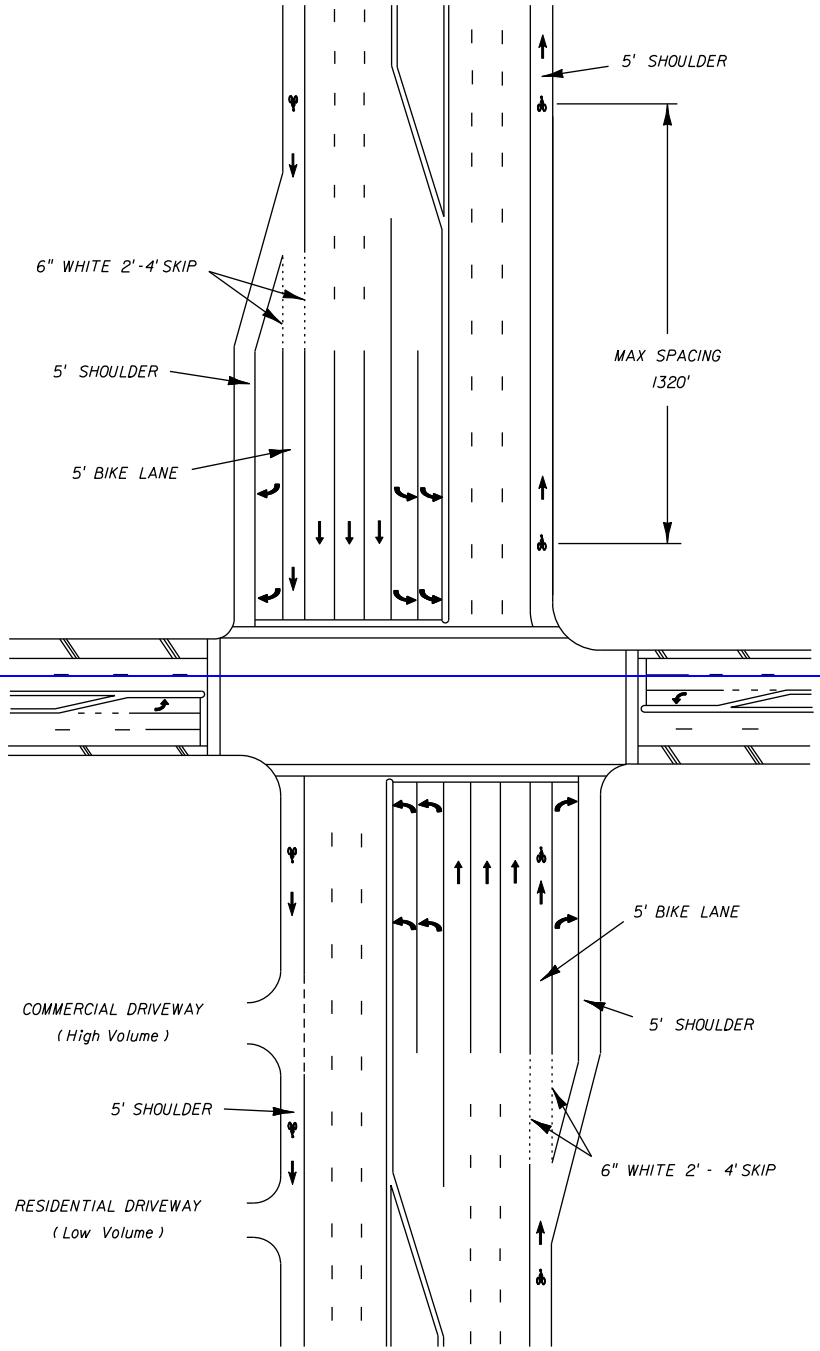



5' BIKE LANE
PARKING SPACES
5' BIKE LANE
MAX SPACING
600'
6" WHITE 2'-4' SKIP
STOP
STOP
6" WHITE 2'-4' SKIP
50'
MIN.
COMMERCIAL DRIVEWAY
( High Volume )
5' BIKE LANE
5' BIKE LANE
PARKING SPACES
RESIDENTIAL DRIVEWAY
( Low Volume )

1
2

**Figure 9-9~~86~~**
**~~Major Intersection~~ Bicycle Lanes ~~w~~With ~~Designated Shoulder~~ Separate Right Turn Lane, Flush Shoulder ~~Rural~~ Typical Section ~~(Paved Shoulder)~~**

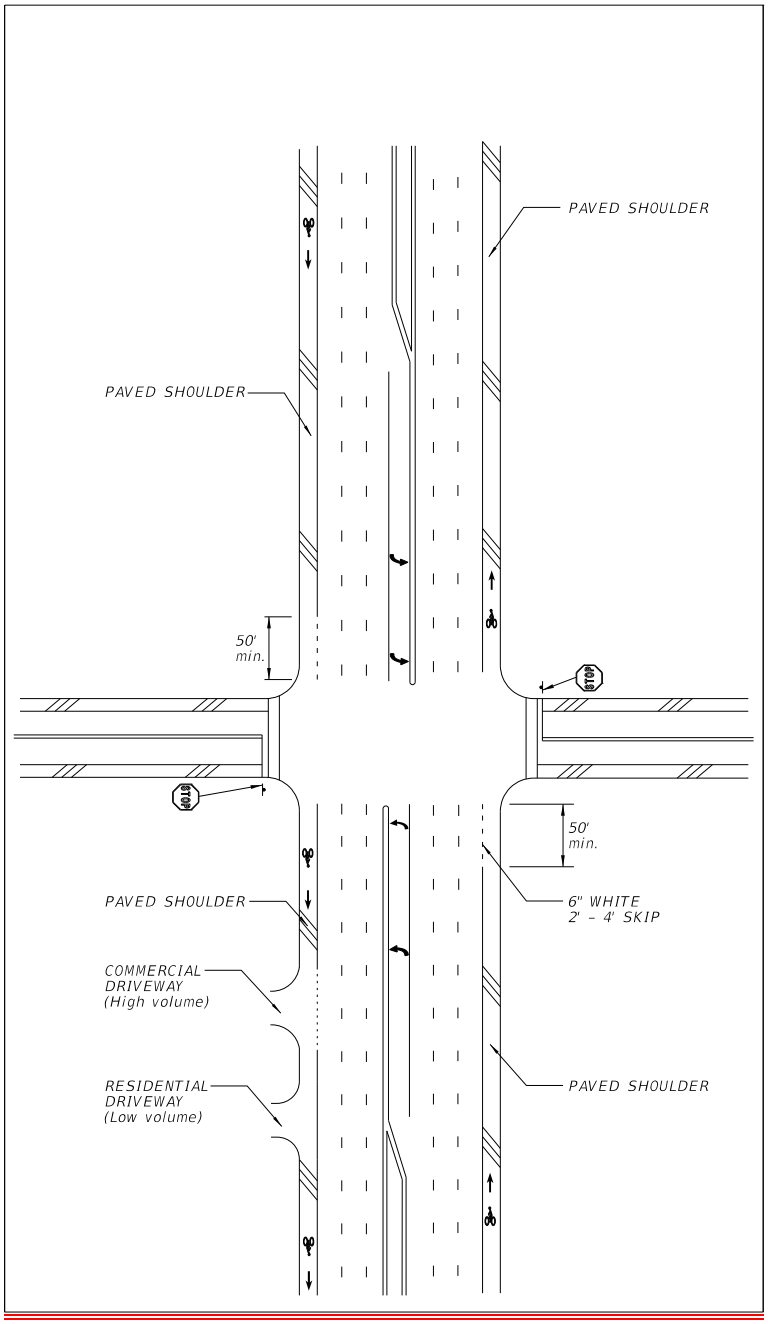


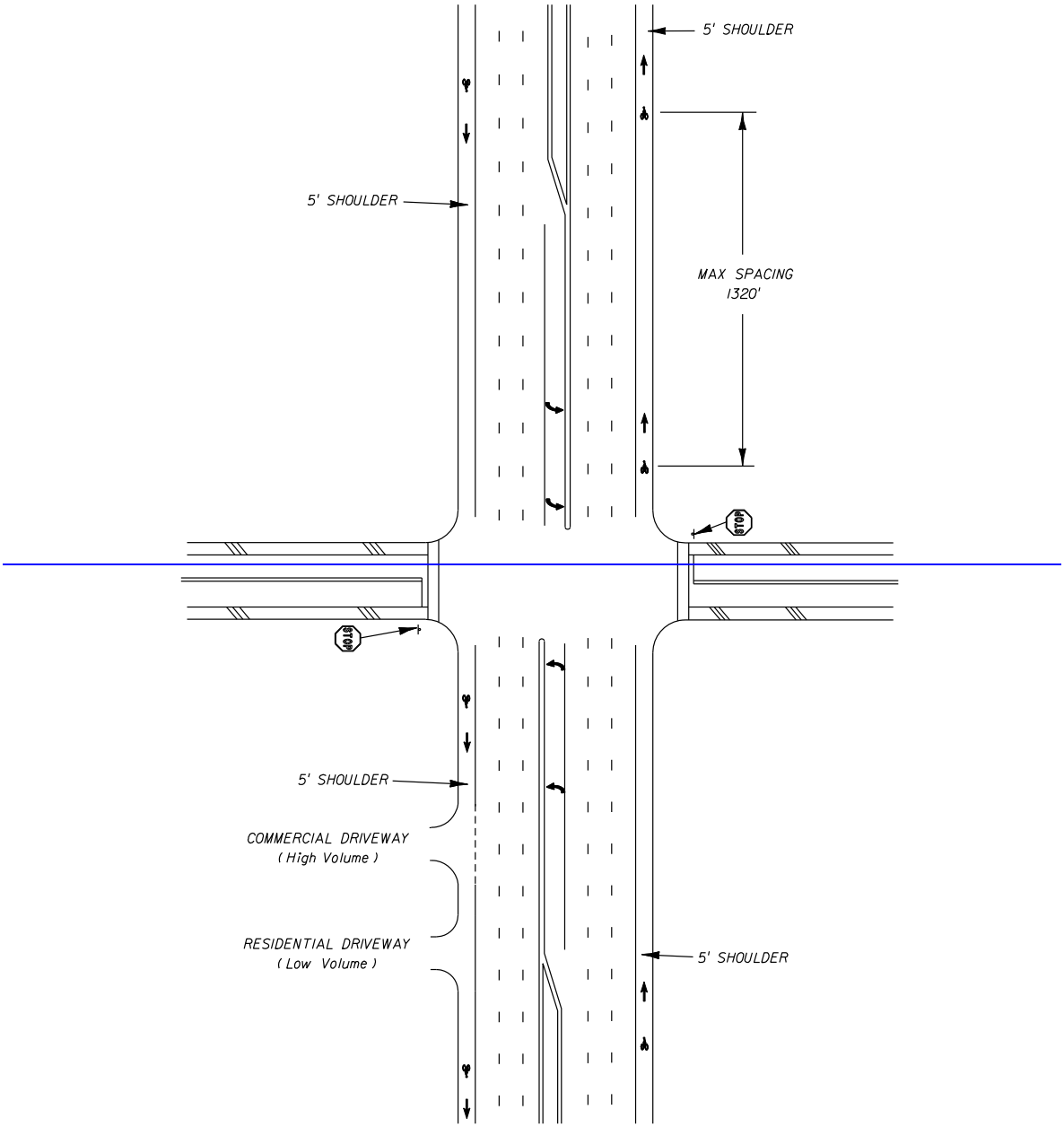

5' SHOULDER
6" WHITE 2'-4' SKIP
5' SHOULDER
MAX SPACING
1320'
5' BIKE LANE
5' BIKE LANE
COMMERCIAL DRIVEWAY
( High Volume )
5' SHOULDER
5' SHOULDER
6" WHITE 2' - 4' SKIP
RESIDENTIAL DRIVEWAY
( Low Volume )

1
2

**Figure 9-10~~97~~**

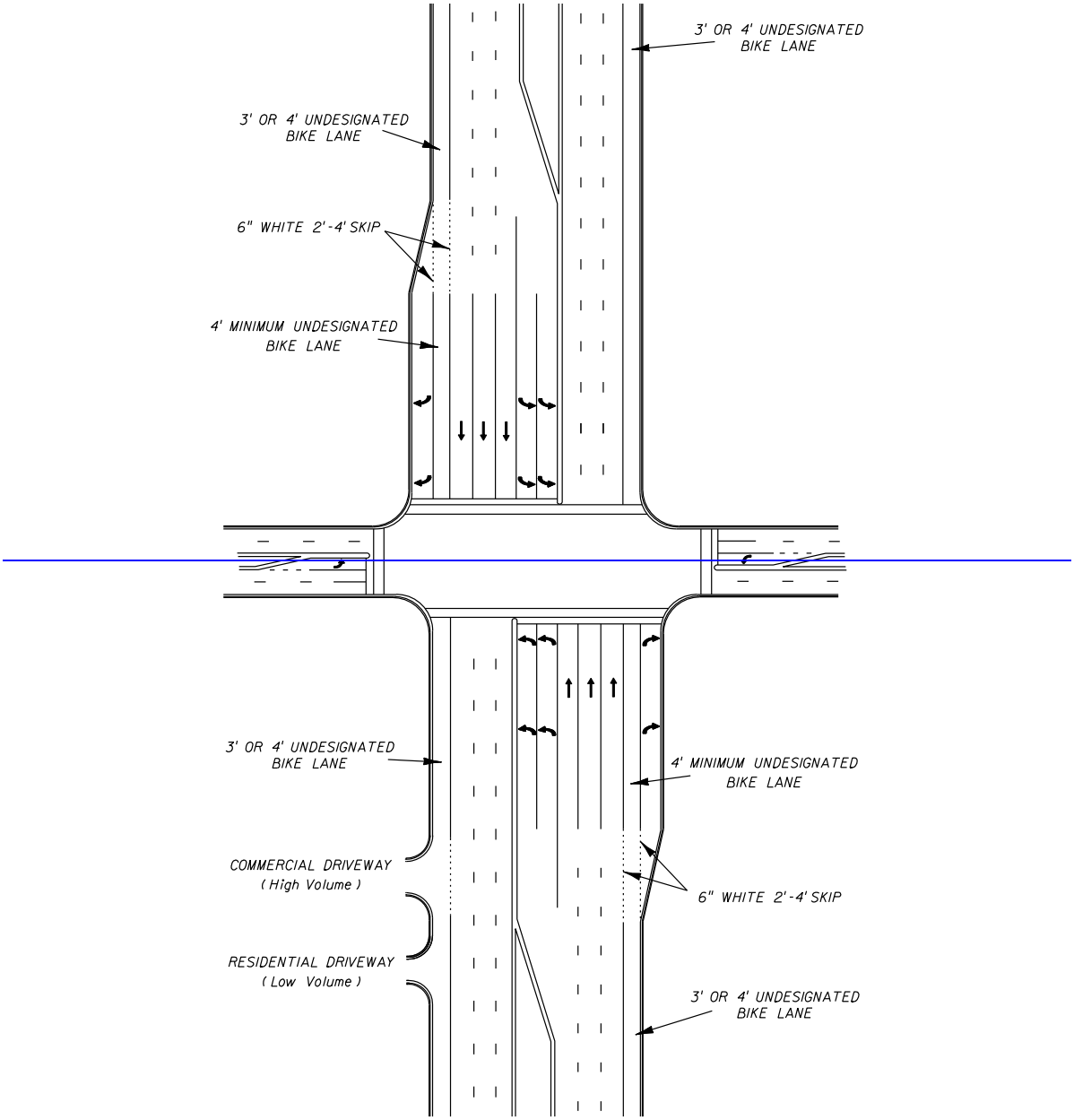
**~~Major With Local Street Intersection Designated~~Bicycle Lanes ~~Shoulder~~ with No Right Turn Lane, Flush Shoulder~~Rural~~ Typical Section ~~(Paved Shoulder)~~**




5' SHOULDER
5' SHOULDER
MAX SPACING
1320'
STOP
STOP
5' SHOULDER
COMMERCIAL DRIVEWAY
( High Volume )
RESIDENTIAL DRIVEWAY
( Low Volume )
5' SHOULDER

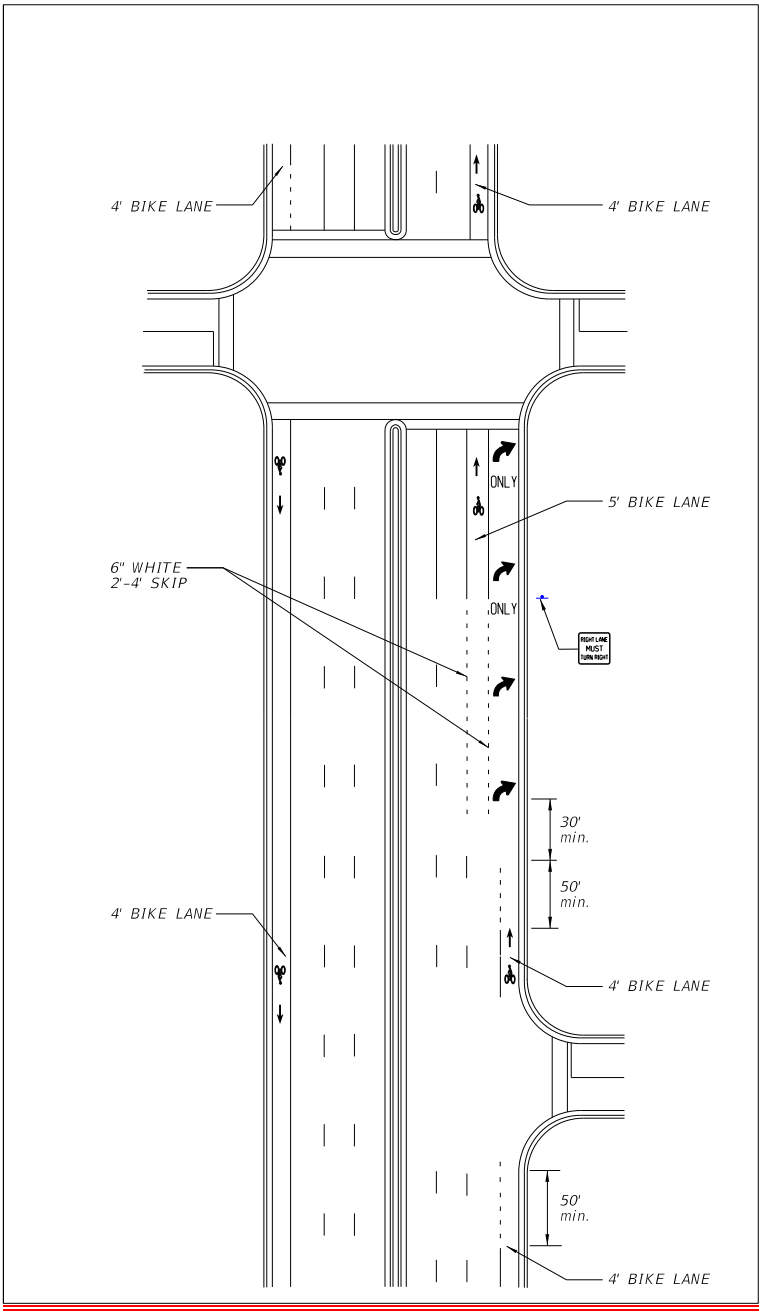
1
2

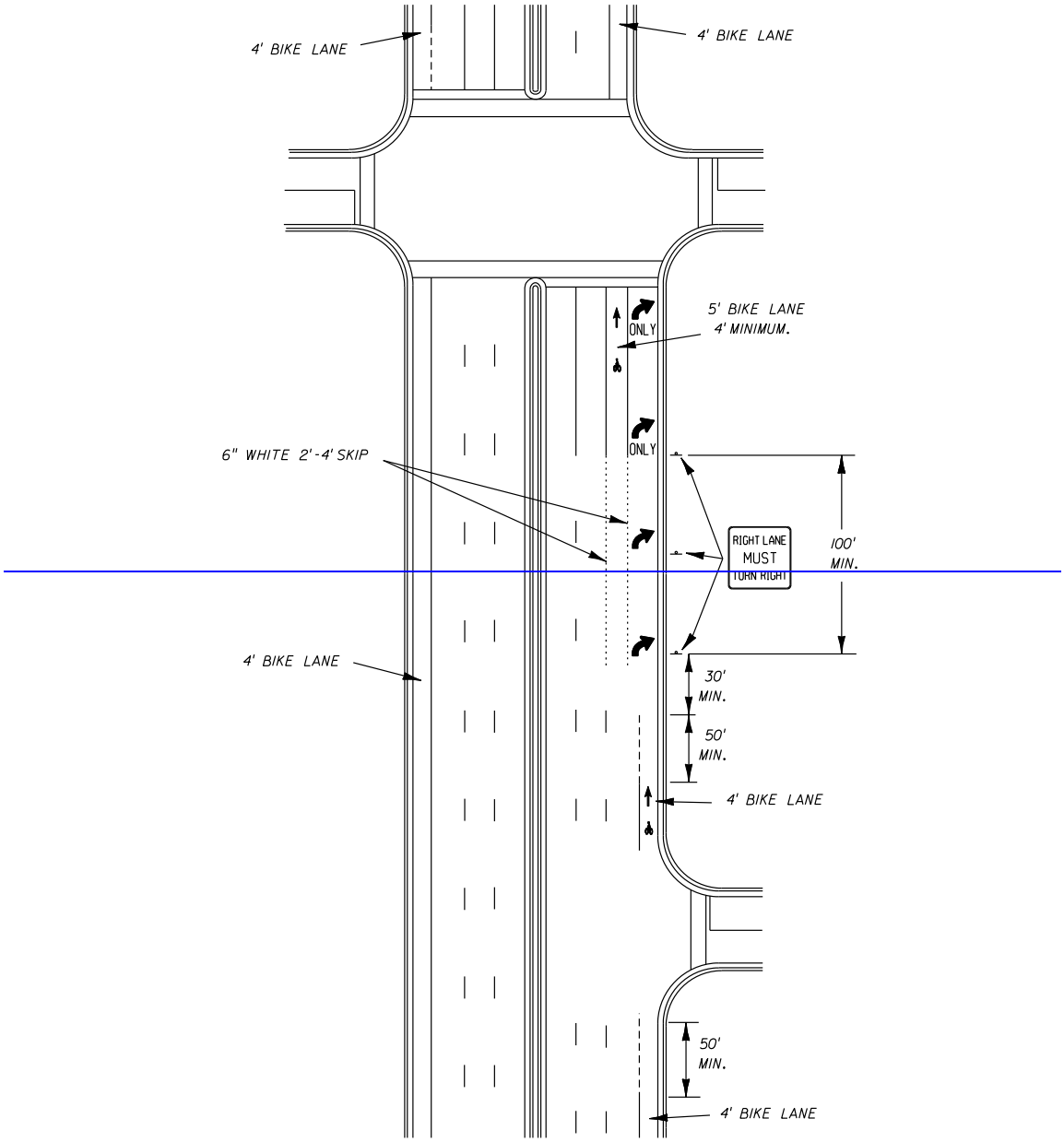
## ~~FIGURE 9 – 8~~
## ~~MAJOR INTERSECTION SEPARATE RIGHT TURN LANE 3' OR 4' UNDESIGNATED BIKE LANE URBAN TYPICAL SECTION (CURB AND GUTTER)~~



## Figure 9-11~~09~~

## Bicycle Lane ~~Major Intersection~~ with Right Turn Drop Lane~~,~~ ~~Designated Or Undesignated Bike Lane~~ Curb and Gutter ~~Urban~~ Typical Section ~~(Curb And Gutter)~~



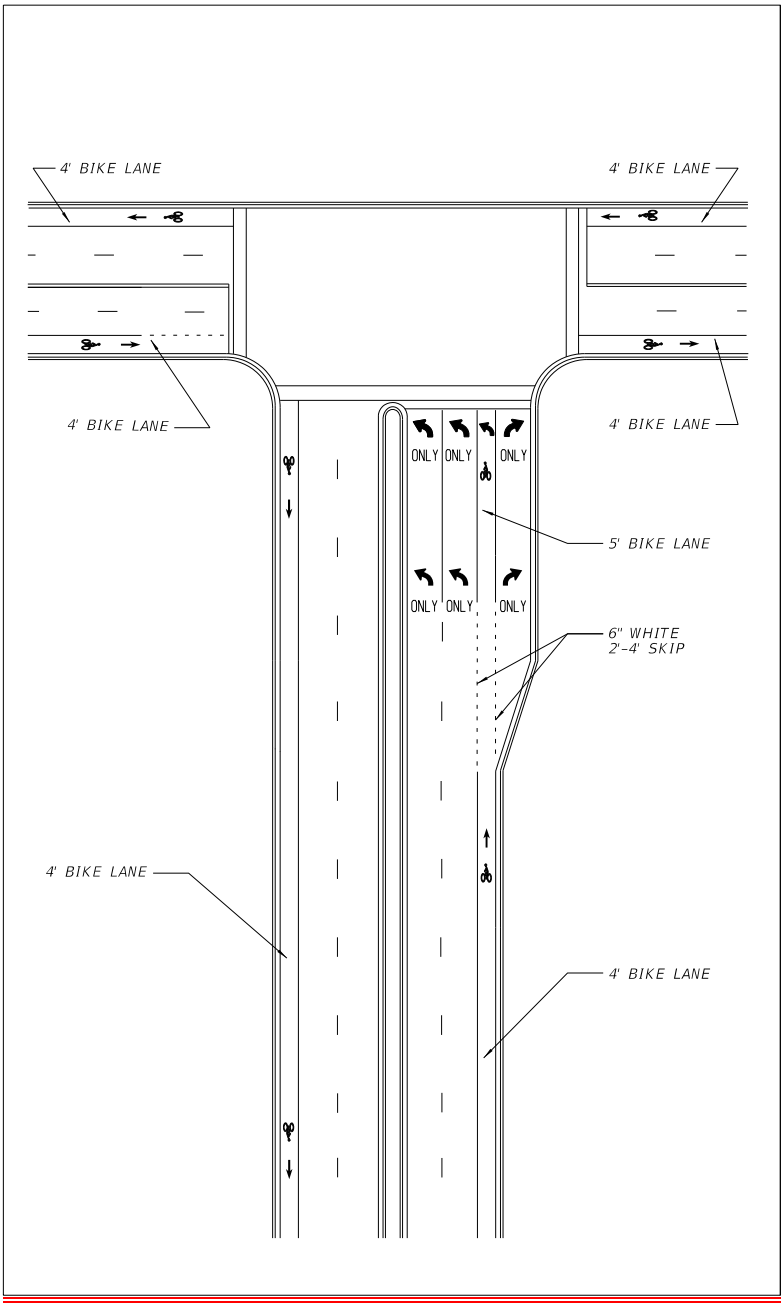

4' BIKE LANE
4' BIKE LANE
5' BIKE LANE
4' MINIMUM.
ONLY
ONLY
6" WHITE 2'-4' SKIP
RIGHT LANE
MUST
TURN RIGHT
100'
MIN.
4' BIKE LANE
30'
MIN.
50'
MIN.
4' BIKE LANE
50'
MIN.
4' BIKE LANE

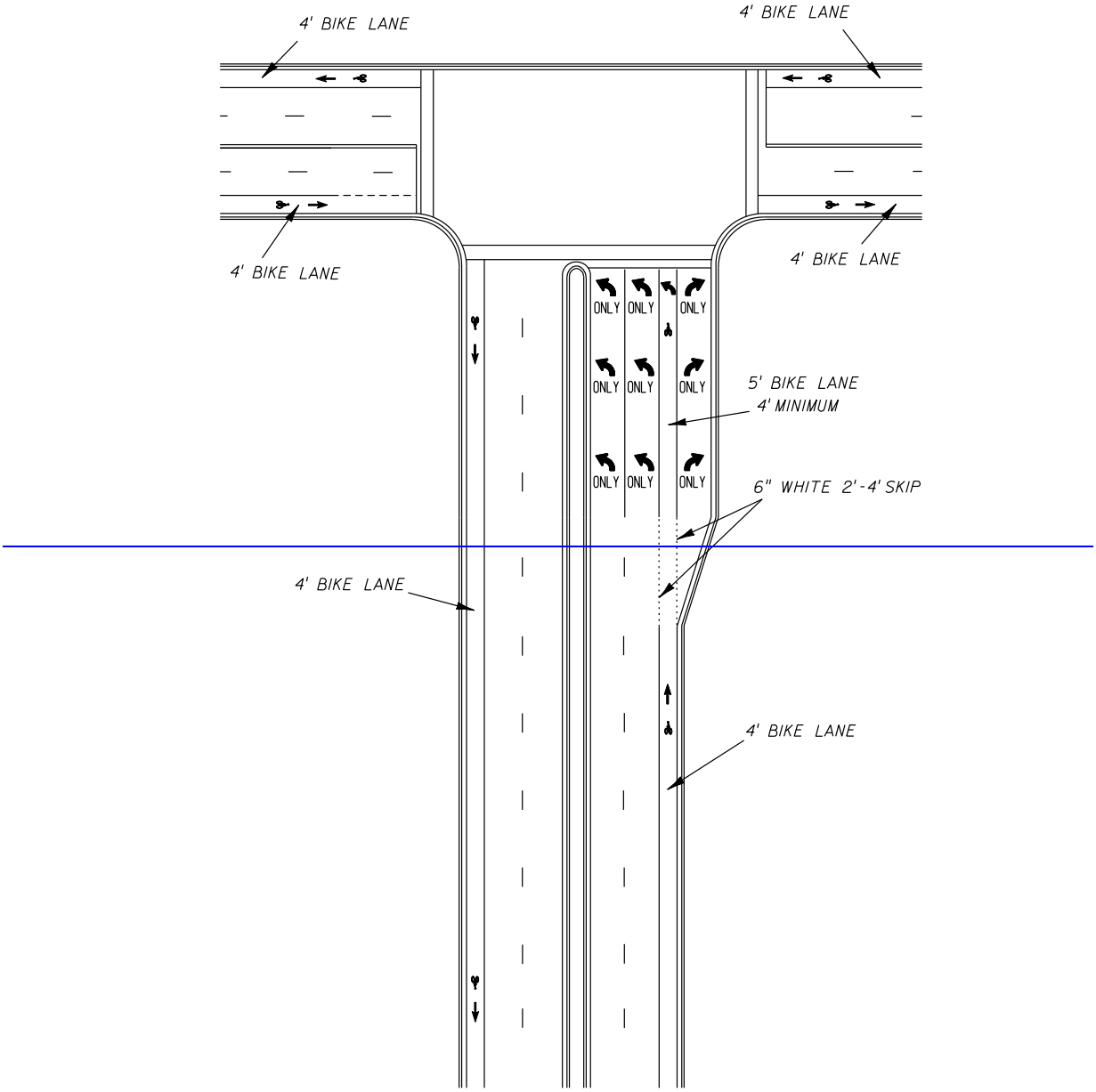
1

2

**Figure 9-12~~110~~**

**"Tee" Intersection with Bicycle Lane, Separate Right and Left Turn Lanes, Curb and Gutter~~Urban~~ Typical Section ~~(Curb And Gutter)~~**



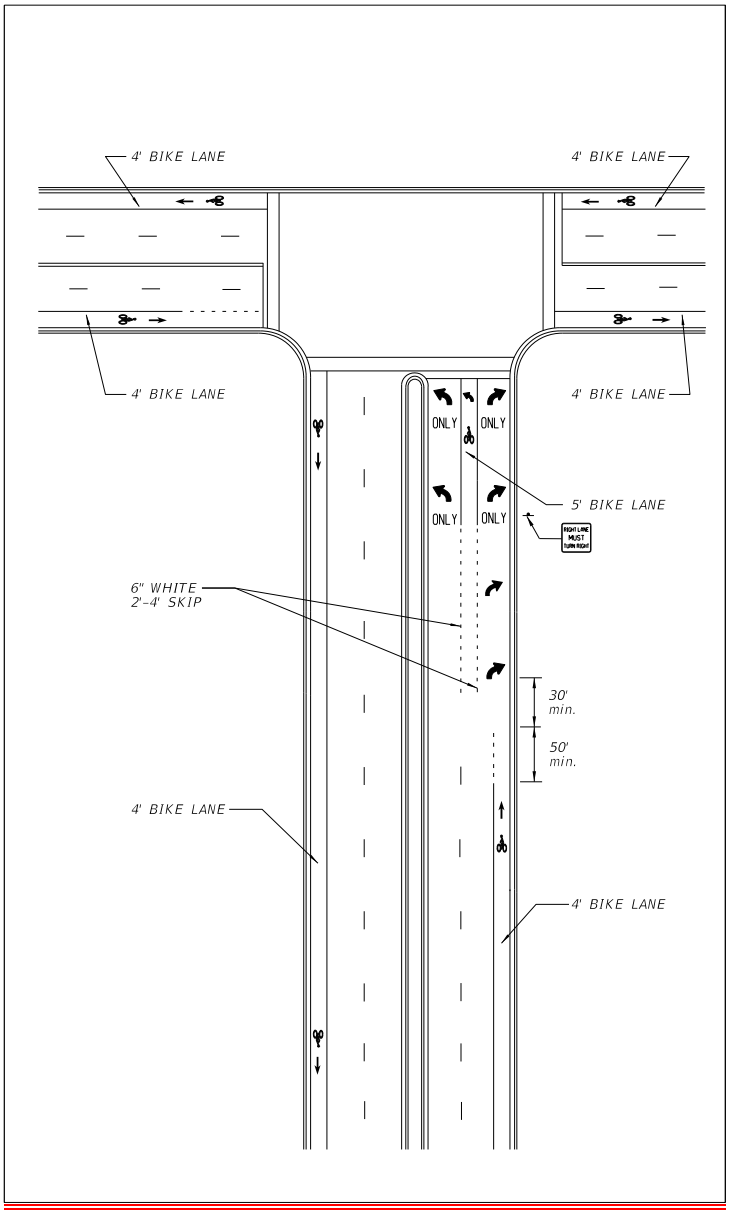

4' BIKE LANE
4' BIKE LANE
4' BIKE LANE
4' BIKE LANE
ONLY
ONLY
ONLY
ONLY
ONLY
ONLY
ONLY
ONLY
ONLY
5' BIKE LANE
4' MINIMUM
6" WHITE 2'-4' SKIP
4' BIKE LANE
4' BIKE LANE

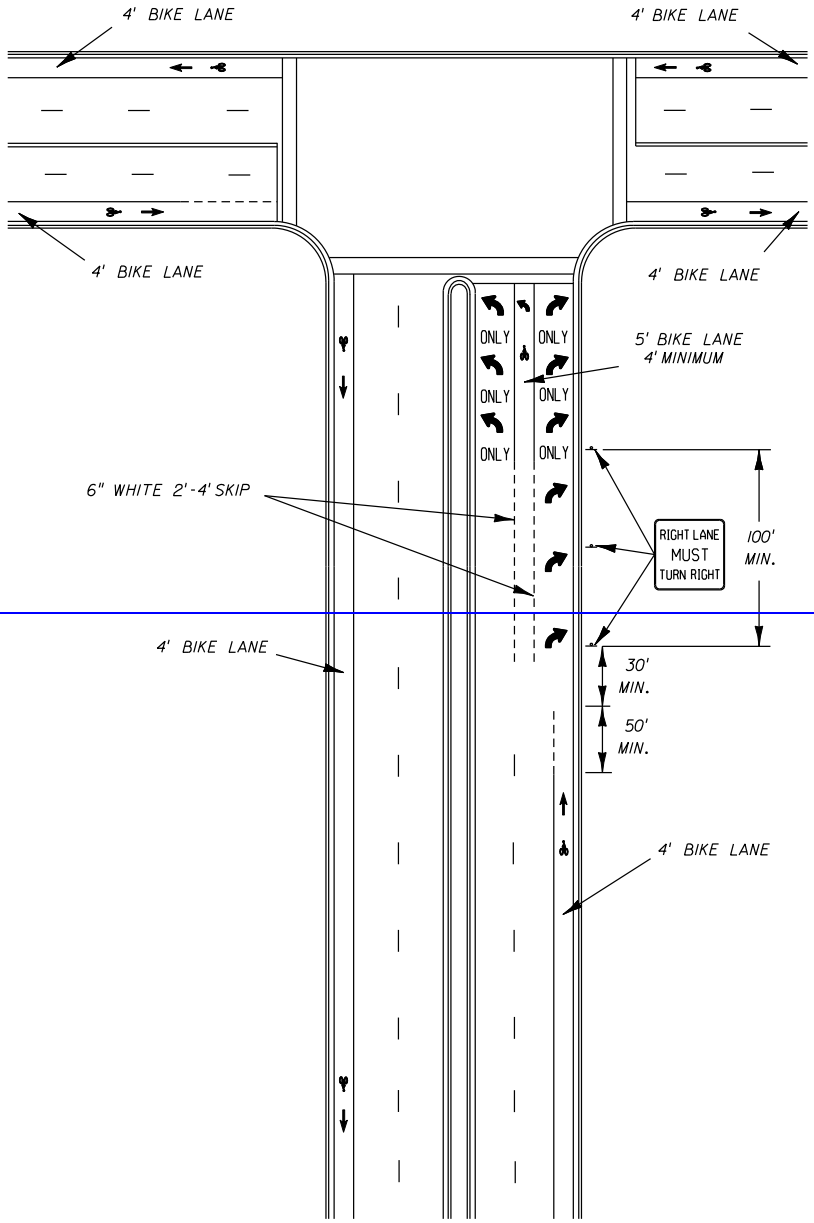
1

2

**Figure 9-13~~2~~11**

**"Tee" Intersection with Bicycle Lanes, Left Turn Lane and Right Turn Drop Lane, Curb and Gutter~~Urban~~ Typical Section ~~(Curb And Gutter)~~**



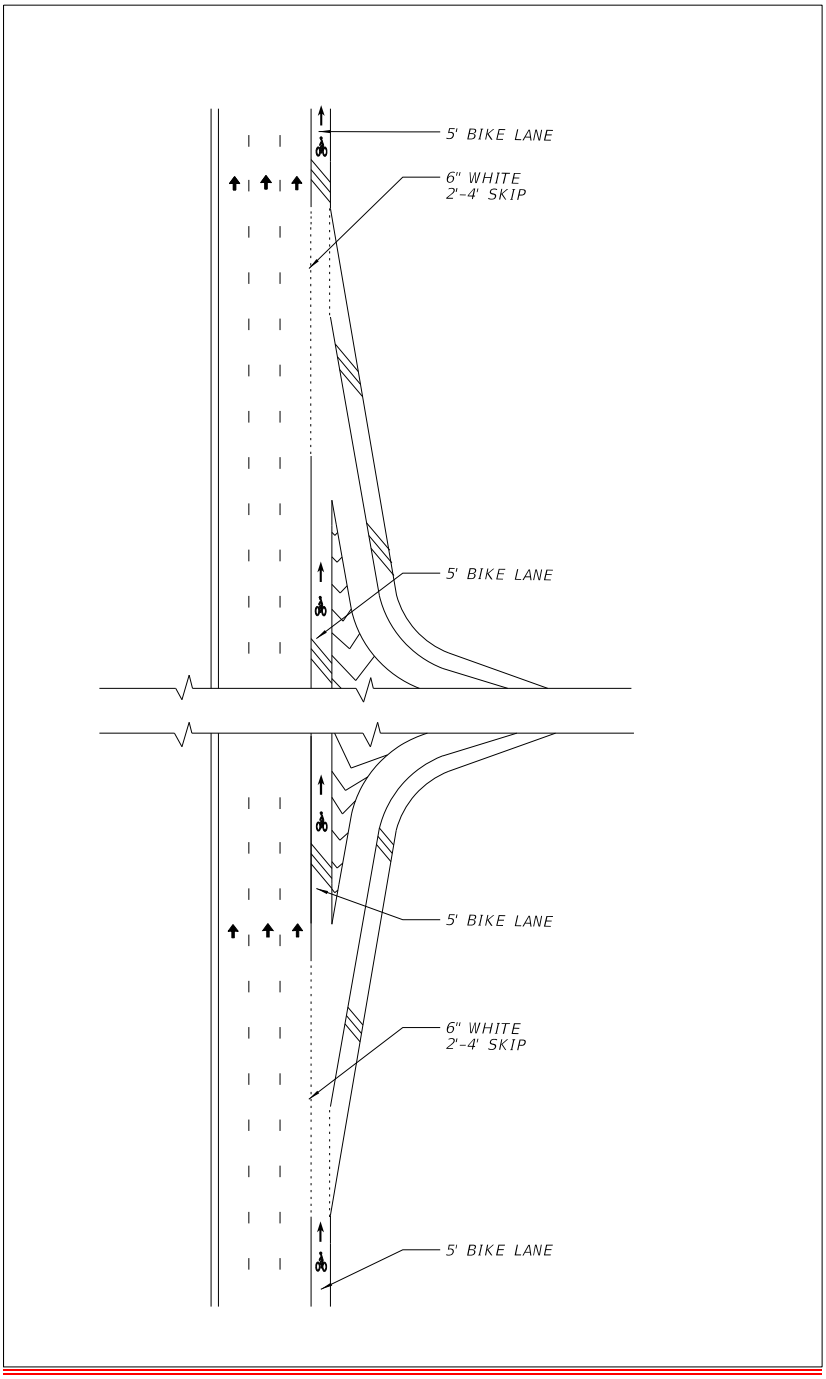

4' BIKE LANE
4' BIKE LANE
4' BIKE LANE
4' BIKE LANE
ONLY
ONLY
ONLY
ONLY
ONLY
ONLY
5' BIKE LANE
4' MINIMUM
6" WHITE 2'-4' SKIP
RIGHT LANE
MUST
TURN RIGHT
100'
MIN.
4' BIKE LANE
30'
MIN.
50'
MIN.
4' BIKE LANE

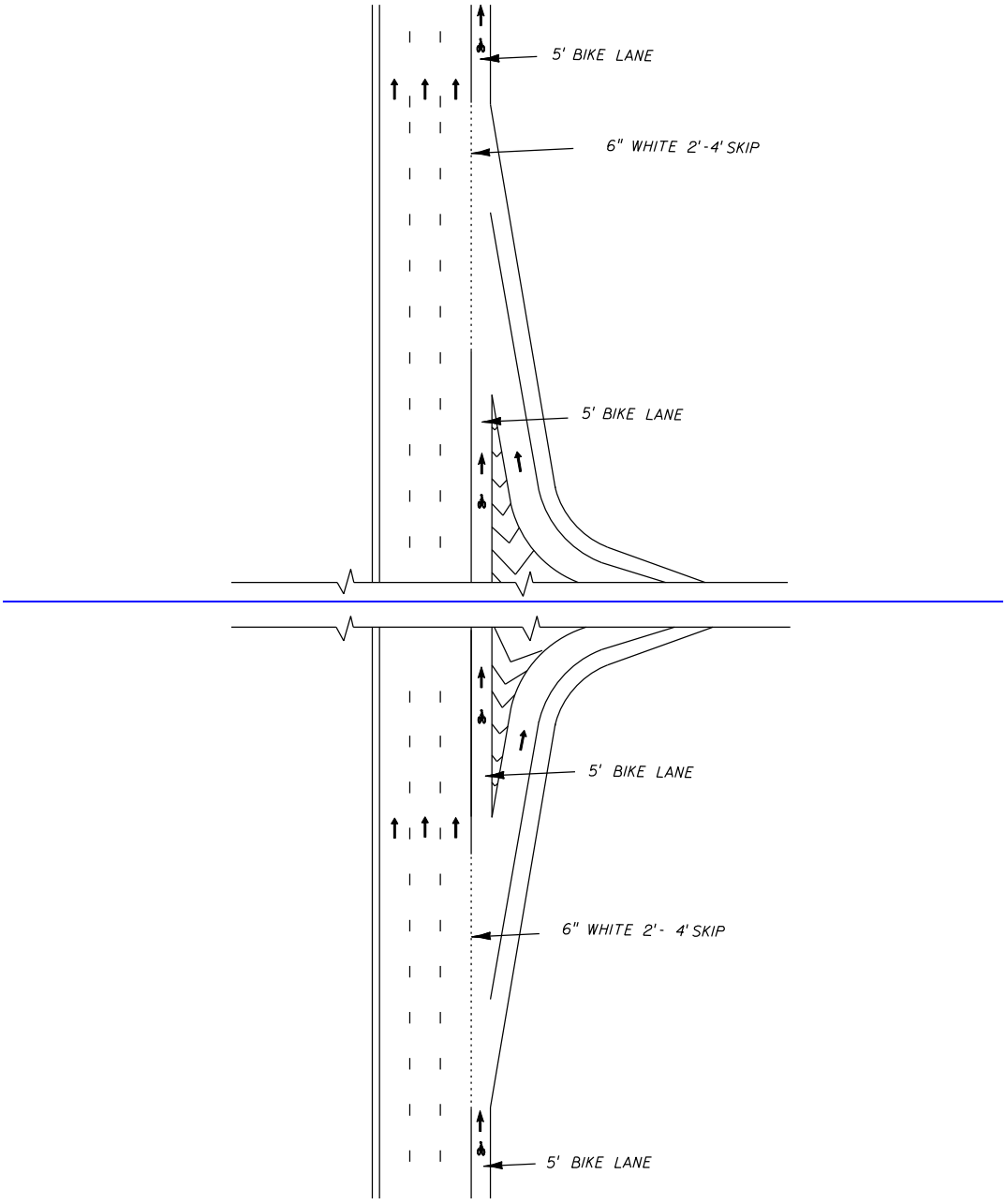
1

2

3

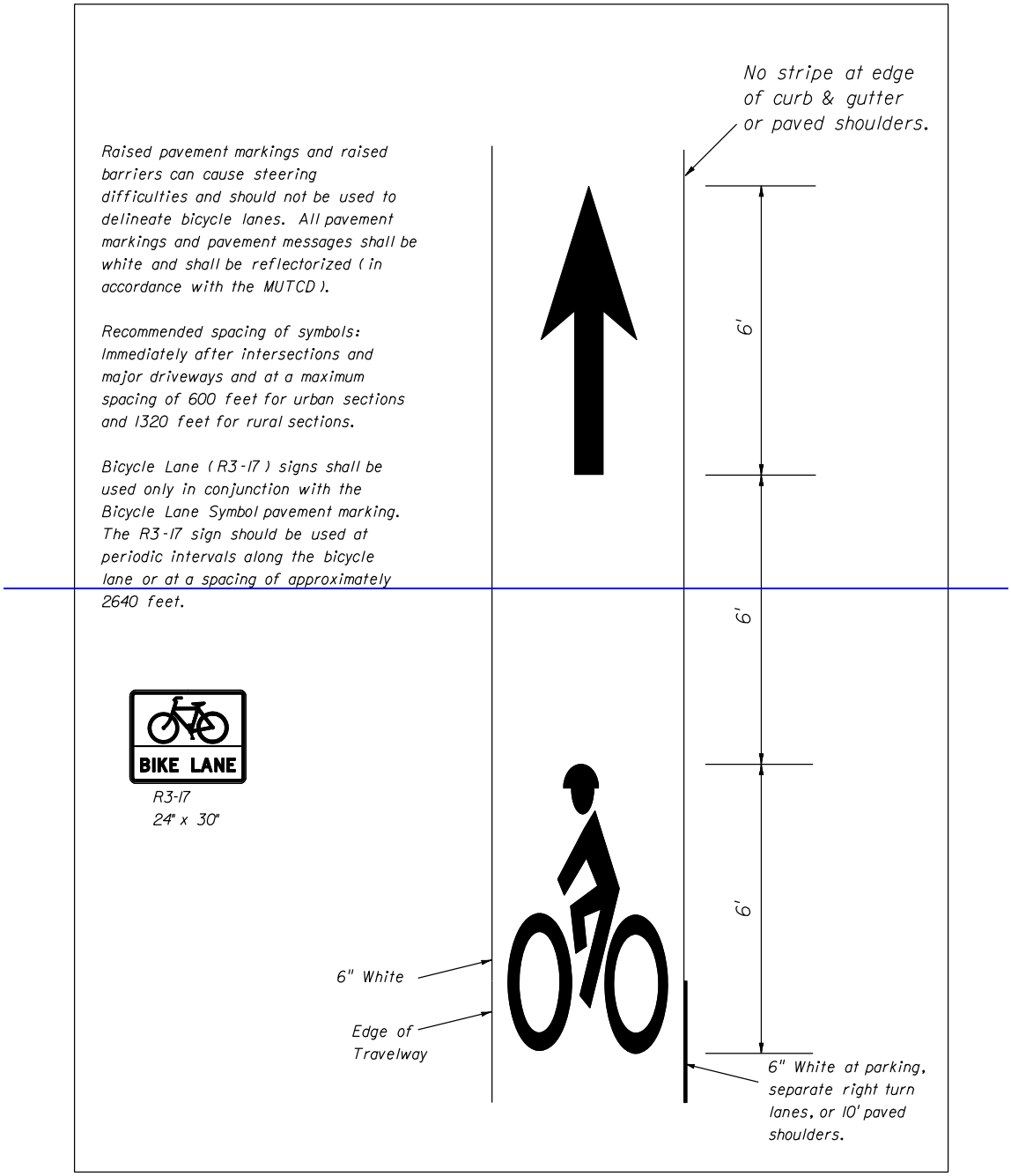
**Figure 9-14~~3~~12**
**Bicycle Lanes on Interchange Ramps**
**Flush Shoulder~~Rural~~ Typical Section ~~(Paved Shoulder)~~**




5' BIKE LANE
6" WHITE 2'-4' SKIP
5' BIKE LANE
5' BIKE LANE
6" WHITE 2'- 4' SKIP
5' BIKE LANE

1
2

## ~~Figure 9-1413~~
## ~~Detail Of Designated Bike Lane And Bike Shoulder Markings~~



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# *Minor/In-Progress Chapter Edits (Chapters 3, 10 & 17)*

# CHAPTER 3

# GEOMETRIC DESIGN

## 3.1~~A~~ INTRODUCTION

Geometric design is defined as the design or proportioning of the visible elements of the street or highway. The geometry of the roadway is of central importance since it provides the framework for the design of other highway elements. In addition, the geometric design establishes the basic nature and quality of the vehicle path, which has a primary effect upon the overall safety characteristics of the street or highway.

The design of roadway geometry must be conducted in close coordination with other design elements. These other elements include: pavement design, roadway lighting, traffic control devices, transit, drainage, and structural design. The design should consider safe roadside clear zones, bicycle and pedestrian ~~safety~~accommodation, emergency response, and maintenance capabilities.

The safety characteristics of the design should be given primary consideration. The initial establishment of sufficient right of way and adequate horizontal and vertical alignment is not only essential from a safety standpoint, but also necessary to allow future upgrading and expansion without exorbitant expenditure of highway funds.

The design elements selected should be reasonably uniform but should not be inflexible. Different minimum standards apply for Traditional Neighborhood Developments in Chapter 19 and Residential Street Design in Chapter 16.

The minimum standards presented in this chapter should not automatically become the standards for geometric design. The designer should consider use of a higher level, when practical, and consider cost-benefits as well as consistency with adjacent facilities. Reconstruction and maintenance of facilities should, where practical, include upgrading to these minimum standards.[RQ1]

In restricted or unusual conditions, it may not be possible to meet the minimum standards. In such cases, the designer must obtain an exception in accordance with CHAPTER 14 – DESIGN EXCEPTIONS from the reviewing or permitting organization. However, every effort should be made to obtain the best possible alignment, grade, sight distance, and proper drainage consistent with the terrain, the development, safety, and fund availability. ~~The concept of highway users has expanded in recent years creating additional concerns for the designer.~~

## 3.3.7.5~~C.7.e~~ Medians

Median separation of opposing traffic lanes provides a beneficial safety feature and should be used wherever feasible. Separation of the opposing traffic also reduces the problem of headlight glare, thus improving safety and comfort for night driving. When sufficient width of medians is available, some landscaping is also possible.

The use of medians often aids in the provision of drainage for the roadway surface, particularly for highways with six or more traffic lanes. The median also provides a vehicle refuge area, improves the safety of pedestrian crossings, provides a logical location for left turn storage lanes, and provides the means for future addition of traffic lanes and mass transit. In many situations, the median strip aids in roadway delineation and the overall highway aesthetics.

Median separation is required on the following streets and highways:

- Freeways
- All streets and highways, rural and urban, with 4 or more travel lanes and with a design speed of 45~~40~~ mph or greater

Median separation is desirable on all other multi-lane roadways to enhance pedestrian crossings.

The nature and degree of median separation required is dependent upon the design speed, traffic volume, adjacent land use, and the frequency of access. There are basically two approaches to median separation. The first is the use of horizontal separation of opposing lanes to reduce the probability of vehicles crossing the median into incoming traffic. The second method is to attempt to limit crossovers by introducing a positive median barrier structure.

In rural areas, the use of wide medians is not only aesthetically pleasing, but is often more economical than barriers. In urban areas where space and/or economic constraints are severe, the use of barriers is permitted to fulfill the requirements for median separation.

Uncurbed medians should be free of abrupt changes in slope,

### 3.3.7.6~~C.7.f~~ Roadside Clear Zone

The roadside clear zone is that area outside the traveled way available for use by errant vehicles. Vehicles frequently leave the traveled way during avoidance maneuvers, due to loss of control by the driver (e.g., falling asleep) or due to collisions with other vehicles. The primary function of the clear zone is to allow space and time for the driver to retain control of his vehicle and avoid or reduce the consequences of collision with roadside objects. This area also serves as an emergency refuge location for disabled vehicles.

The design of the roadway must also provide for adequate drainage of the roadway. Drainage swales within the clear zone should be gently rounded and free of discontinuities. Where large volumes of water must be carried, the approach should be to provide wide, rather than deep drainage channels. Side slopes and drainage swales that lie within the clear zone should be free of protruding drainage structures (CHAPTER 4 - ROADSIDE DESIGN, 4.4.6.3~~D.6.c.~~ Culverts).

In the design of the roadside, the designer should consider the consequences of a vehicle leaving the traveled way at any location. It should always be the policy that protection of vehicles and occupants shall take priority over the protection of roadside objects. Further criteria and requirements for safe roadside design are given in CHAPTER 4 - ROADSIDE DESIGN. ***{Address Border Width?}***

#### 3.3.7.6.1~~C.7.f.1~~ Roadside Clear Zone Width

The clear zone width is defined as follows:

- Rural sections - measured from the edge of the outside motor vehicular travel way

Urban sections - measured from the face of the curb

The minimum permitted widths are provided in Table 3-~~-~~12. These are minimum values only and should be increased wherever practical.

In rural areas, it is desirable, and frequently economically feasible, to increase the width of the clear zone. Where traffic volumes and

### ~~C.7.j.4~~3.3.7.10.4 Structures

The pavement, median, and shoulder width, and sidewalks should be carried across structures such as bridges and box culverts. Shoulder widths for multi-lane rural divided highway bridges may be reduced as shown in Table 3-~~-~~9. The designer should evaluate the economic practicality of utilizing dual versus single bridges for roadway sections incorporating wide medians.

The minimum roadway width for bridges on urban streets with curb and gutter shall be the same as the curb-to-curb width of the approach roadway. Sidewalks on the approaches should be carried across all structures. Curbed sidewalks should not be used adjacent to traffic lanes when design speeds exceed 45 mph. When the bridge rail (barrier wall) is placed between the traffic and sidewalk, it should be offset a minimum distance of 2½ feet from the edge of the travel lane, wide curb lane or bicycle lane. For long (500 feet or greater), and/or high level bridges, it is desirable to provide an offset distance that will accommodate a disabled vehicle. The transition from the bridge to the adjacent roadway section may be made by dropping the curb at the first intersection or well in advance of the traffic barrier, or reducing the curb in front of the barrier to a low mountable curb with a gently sloped traffic face. See CHAPTER 17 – BRIDGES AND OTHER STRUCTURES for additional requirements.

#### 3.3.7.10.4.1~~C.7.j.4.(a)~~ Horizontal Clearance

Supports for bridges, barriers, or other structures should be placed at or beyond the required shoulder. Where possible, these structures should be located outside of the required clear zone.

#### 3.3.7.10.4.2~~C.7.j.4.(b)~~ Vertical Clearance

Vertical clearance should be adequate for the type of expected traffic. Freeways and major arterials shall have a vertical clearance of at least 16 feet. Other streets and highways should have a clearance of 16 feet unless the provision of a reduced clearance is fully justified by a specific analysis of the situation (14 feet minimum). Provision for additional clearance (3 inches to 6 inches) is recommended to allow for future resurfacing. The minimum vertical clearance for a pedestrian or shared use bridge over a roadway is 17 feet. The minimum vertical clearance for a bridge over a railroad is 23 feet; however additional clearance may be required by the rail owner.

### 3.3.10.1.4~~C.10.a.4~~ Curb Ramps

In areas with sidewalks, curb ramps must be incorporated at locations where crosswalks adjoin the sidewalks. The basic curb ramp type and design application depends on the geometric characteristics of the intersection or other crossing location.

Typical curb ramp width shall be a minimum of 3 feet with 1:12 curb transitions on each side when pedestrians must walk across the ramp. Ramp slopes shall not exceed 1:12 and shall have a slip resistant surface texture. Ramp widths equal to crosswalk widths are encouraged.

Curb ramps at marked crossings shall be wholly contained within the crosswalk markings excluding any flared sides.

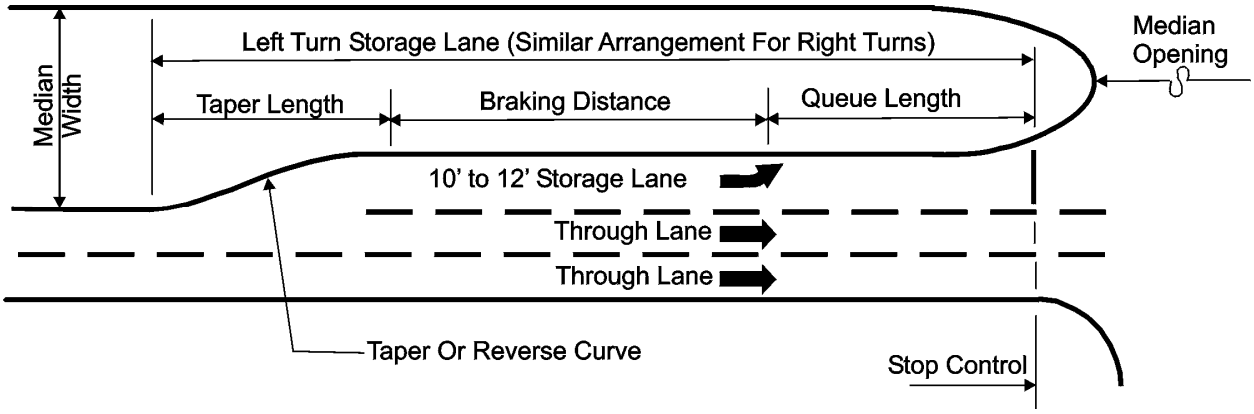
If diagonal ramps must be used, any returned curbs or other well-defined edges shall be parallel to the pedestrian flow. The bottom of diagonal curb ramps shall have 48-inch minimum clear space within the crosswalk. If diagonal curb ramps have flared sides, they shall also have at least a 24-inch long segment of straight curb located on each side of the curb ramp and within the marked crossing.

It is important to visually impaired persons using the sidewalk that the location of the ramps be as uniform as possible. A contrasting surface texture should be used. On sections without curb and gutter, a contrasting surface texture should be used on the approach to crosswalks.

The Department's Design Standards, Index 304, which addresses the design of curb ramps, may be considered. ~~Designers should keep in mind there are many variables involved making each street intersection a special problem. For this reason, s~~Standard guidelines will not fit all situations and cannot replace the need for the use of sound engineering judgment in the design of curb ramps.

Two ramps per corner are preferred to minimize the problems with entry angle and to decrease the delay to people in wheel chairs or visually impaired pedestrians entering and exiting the roadway.[RQ3]

## FIGURE 3-~~-~~13
## TYPICAL STORAGE LANE




**Storage Queue Length - Unsignalized Intersections**

| | | | | | |
|---|---|---|---|---|---|
| Turning Vehicles Per Hour | 30 | 60 | 100 | 200 | 300 |
| Required Storage Length (FEET) | 25 | 50 | 100 | 175 | 250 |
| At signalized intersections, the required queue length depends on the signal cycle length, the signal phasing arrangement, and rate of arrivals and departures of turning vehicles.<br><br>In absence of a turning movement study, it is recommended that 100 ft. of queue length be provided in urban/suburban areas and 50 ft. of queue length be provided in rural/town areas as a minimum. | | | | | |

| Taper Length And Braking Distance (FEET) | | | | |
|---|---|---|---|---|
| **Highway Design Speed (MPH)** | **Storage Entry Speed* (MPH)** | **Taper Length**[RQ5] | **Brake To Stop** | |
| | | | **Urban**** | **Rural***** |
| 35 | 25 | ~~70~~ | 75 | --- |
| 40 | 30 | ~~80~~ | 75 | --- |
| 45 | 35 | ~~85~~ | 100 | --- |
| 50 | 40/44 | ~~105~~ | 135 | 215 |
| 55 | 48 | ~~125~~ | --- | 260 |
| 60 | 52 | ~~145~~ | --- | 310 |
| 65 | 55 | ~~170~~ | --- | 350 |
| * Reaction Precedes Entry<br>** Minimum Braking Distance, Wet Conditions<br>*** Customary Braking Distance, Wet Conditions | | | | |

The storage lane may be in place of or in addition to deceleration length (See Section 3.3.9.3.3~~C.9.c.3~~).

# CHAPTER 10

# MAINTENANCE AND RESURFACING

*Some issues to address in Chapter 10:*

- *ADA requirements on Maintenance projects*
- *RRR and Maintenance resurfacing*
- *LAP Projects?*
- *Unpaved road maintenance*
- *Federal aid project requirements / ARRA (including Rail requirements)*
- *Non FA job requirements (upgrading shoulder treatments, roadside hardware, curb ramps, crash history investigation/mitigation)*
- *Permitting loads on bridges*
- *Pavement maintenance / safety edge consistency with Chapter 5 changes (or references between the chapters as appropriate)*

## 10.1~~A~~ INTRODUCTION

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

## 10.2~~B~~ OBJECTIVES

The major objectives of a maintenance program include the following:

- Maintain all highway features and components in the best possible condition
- Improve sub-standard features, with the ultimate goal to at least meet minimum standards

- Provide for minimum disruptions and hazards to traffic during maintenance operations
- Location and reporting of inadequate safety features

## 10.3C POLICY

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

- Identify needs
- Establish priorities
- Establish procedures
- Establish and maintain a regular program of maintenance for all aspects

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

# 10.4~~D~~ IDENTIFICATION OF NEEDS

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

## 10.4.1~~D.1~~ Inspection

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

## 10.4.2~~D.2~~ Crash Records

A regular program of crash investigations, record keeping, and analysis should be established to provide information for recommended highway modification and corrective maintenance requirements. Cooperation among maintenance, traffic operations, and police agencies is required, and activities of these agencies should be coordinated in accordance with the guidelines set forth in Highway Safety Program Guideline 21 (II)~~9~~ Identification and Surveillance of Accident Locations. Inspection of the highway network and analysis of crash records should be utilized to provide feedback for modification of design and construction procedures.

# 10.5~~E~~ ESTABLISHMENT OF PRIORITIES

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

# 10.6FESTABLISHMENT OF PROCEDURES

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

## 10.6.1F.1 Emergency Maintenance

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

- The removal of debris from crashes, cargo spillage, or other causes. This activity should be conducted in accordance with the guidelines set forth in Highway Safety Program Guideline 16, Debris Hazard Control and Cleanup.
- Replacement of inoperative traffic control devices
- Repair or replacement of damaged highway safety components such as lighting, traffic control devices, redirection, and energy absorbing devices
- Repair or correction of any situation that provides an immediate or unexpected hazard to the public
- Assistance in any activity during emergency response operations

## 10.6.2F.2 Routine Maintenance

Routine maintenance operations are those that may be predicted and planned in advance. These operations, which may be preventive or corrective in nature, should be conducted on a regularly scheduled basis using standard procedures. Proper scheduling of these operations should be utilized to provide minimum

disruptions and hazards to the driving public. Routine maintenance would include operations such as:

- Cleaning and debris removal from the pavement, shoulders, and roadside clear zones
- Mowing and other vegetation control operations to provide a smooth recovery area and to maintain proper sight distance
- Cleaning and inspection of gutters, ditches, and other drainage structures
- Structural inspection and preventive maintenance on bridges and other structures
- Cleaning, replacement, and maintenance of roadway lighting fixtures
- Replacement and maintenance of traffic control devices
- Inspection and maintenance of redirection and energy absorbing devices (CHAPTER 4 - ROADSIDE DESIGN)
- Inspection and maintenance of emergency response communication systems and access facilities
- Inspection and maintenance of pavement and shoulders, with particular emphasis on maintaining shoulders flush with the pavement (CHAPTER 5 - PAVEMENT DESIGN, CONSTRUCTION AND MAINTENANCE)
- Inspection and maintenance of all highway components and safety features
- Inspection and maintenance of pedestrian pavements, crossings, etc., with particular emphasis on meeting the intent of ADA

## 10.6.3~~F.3~~ Special Maintenance

Special maintenance operations are defined as those projects that are neither urgent or routine in nature, but are occasionally required to improve or maintain a street or highway in a quality condition. Since these projects can be planned in advance of the initiation of any work, procedures that provide for efficient, rapid, and safe operations can be developed. To avoid continuing disruptions of traffic, the quality and durability of these improvements, corrections, and repairs should be maintained at the highest practicable level. Special maintenance should include the

upgrading of the highway safety features, as well as the repair or replacement of damaged or deteriorated highway components. These operations should be designed to upgrade or maintain the street or highway in accordance with the Standards presented in this Manual.

## 10.6.4~~F.4~~ Pavement Maintenance

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

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

Pavement maintenance requires a substantial portion of the total maintenance budget for streets and highways. It is necessary to ensure highway safety. A smooth-riding, skid-resistant surface must be provided at all times to allow for safe vehicle maneuvers. The reduction of hydroplaning and splashing is essential for promoting safe and efficient operation during wet weather conditions. The elimination of driving discomfort, and vehicle damage caused by deteriorated pavements, provides additional economic justification for maintaining the pavement in a fully serviceable condition.

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

### 10.6.4.1 Resurfacing

Resurfacing work is defined as work undertaken to extend the pavement service life and/or enhance highway safety. This includes the placement of additional surface materials and/or other work necessary to return an existing roadway pavement to a condition of structural and functional adequacy.

## 10.6.5 ADA Requirements

On resurfacing projects, detectable warnings and curb ramps shall be brought into compliance with ADA requirements. This includes installing new detectable warnings for both flush shoulder and curbed roadway connections and signalized driveways where none exist or do not meet current requirements. New curb ramps shall be provided on curbed roadways where none exist; existing substandard curb ramps shall be replaced. Existing ramps not meeting detectable warning requirements which otherwise comply with ADA, shall be retrofitted with detectable warnings. (See Index 304 & 310 of the Design Standards, for guidance on detectable warnings.)

When compliance with ADA curb ramp requirements is determined to be technically infeasible documentation as a Design Exception is required. This may occur where existing right of way is inadequate and where conflicts occur with existing features that cannot be feasibly relocated or adjusted, e.g., drainage inlets, signal poles, pull boxes, etc...

Other than meeting detectable warning and curb ramp requirements, existing sidewalks and flared driveway turnouts are not required to be upgraded for the sole purpose of meeting ADA requirements, unless included in the project scope. All new sidewalk and driveway construction or reconstruction included on resurfacing projects shall be designed in accordance with ADA requirements. However, even if new sidewalk is to be constructed, non-conforming driveways are not required to be upgraded.

## 10.6.6 Railroad-Highway Grade Crossing Near or Within Project Limits

Federal-aid projects must be reviewed to determine if a railroad-highway grade crossing is within the limits of or near the terminus of the project. If such railroad-highway grade crossing exists, the project must be upgraded to meet the latest ***MUTCD*** requirements in accordance ***Title 23 United States Code (U.S.C.), Chapter 1, Section 109(e)*** and ***CFR 646.214(b)***. These requirements are located in ***Chapter 8*** of the ***MUTCD***. "Near the terminus" is defined as being either of the following:

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

# CHAPTER 17

# BRIDGES AND OTHER STRUCTURES

## 17.1~~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 ~~constructed~~ that will be maintained by the Department ~~will maintain~~, must comply with all Department policies, procedures, standards and specifications, and this Manual does not apply.

## 17.2~~B~~ OBJECTIVES

The objectives of this chapter are as follows:

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

# 17.3C DESIGN

The design of bridges and other structures shall be led by a licensed professional engineer who shall assume responsible charge of the work. The standards and criteria included herein are directed only toward specific considerations that shall be followed. Other considerations are necessary to create a comprehensive bridge design allowing owners and their engineers flexibility in design.

## 17.3.1C.1 General

All bridges and other structures shall be designed in accordance with specifications (including guide specifications) published by the American Association of State Highway and Transportation Officials (AASHTO). At a minimum, the AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 5th Edition (2010) shall be used.

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

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

## 17.3.2C.2 Bridge Live Loads

~~All elements of the bridge should be designed for the vehicular and pedestrian live loads specified in AASHTO LRFD Specifications Sections 3.6.1 and 3.6.2.~~

In addition to the notional design loadvehicles specified in LRFDthe code, design for a FL 120 permit vehicles as define in the FDOT Structures Manual – Structures Design Guidelines. This vehicle allows for a more consistent load rating process considering the current bridge inventory.~~with different characteristics are legal on the Department's system. These vehicles are illustrated in the Department's "Bridge Load Rating, Permitting and Posting Manual" and should be considered.~~

## 17.3.3C.3 Bridge Superstructure

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

### 17.3.3.1 Girder Transportation

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

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

### 17.3.3.2 C.3.a Vertical Clearance

All new bridges over roadways and shared use paths shall be designed to meet the vertical clearance standards specified in Chapter 3, Section 3.3.7.10.4.2C.7.j.4.(b), and Chapter 9, Section 9.3.4C.4.

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

- To allow debris to pass without causing damage, the clearance between the design flood stage and the low member of bridges shall be a minimum of two feet. This standard does not apply to culverts and bridge-culverts.

- For crossings subject to boat traffic, the minimum vertical 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 |

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

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

### 17.3.3.3~~2~~ ~~C.3.b~~ Railings

All traffic, pedestrian, and bicycle railings shall comply with the requirements in Section 13 of AASHTO's LRFD Bridge Design Specifications, 5th Edition (2010). Traffic railings shall meet the crash requirements of at least Test Level 3 (TL-3) for bridges with design speeds greater than 45 mph and at least TL-2 for design speeds less than or equal to 45 mph.

For pedestrian/bicycle railings, two-pipe guiderails and details (similar to the Department's Design Standards, Indexes 870 or 880) shall not be mounted on walls or other structures where drop-off hazards exceed ~~2'-6"~~5 feet. Instead, concrete, aluminum~~,~~ or steel~~, or composite picket~~ railing and details (similar in strength and geometry to the Department's Design Standards, Indexes 820 thru 862~~, 850 or 860~~) should be used (or modified to suit environmental runoff concerns).

### 17.3.3.4~~3~~ ~~C.3.c~~ Expansion Joints

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

### 17.3.3.5~~4~~ ~~C.3.d~~ Drainage

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

### 17.3.3.6~~5~~ ~~C.3.e~~ ADA

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

### 17.3.3.76C.3.f End Treatments

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

## 17.3.4C.4 Bridge Substructure

The substructure of a bridge consists of all elements below the superstructure including its bearings, piers, and foundations. Considerations that shall be incorporated into the design of all substructures include the following:

### 17.3.4.1C.4.a Scour

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

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

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

***{Add reference to FDOT fender design standard}***
***{Add guidance for hurricane susceptibility to storm surge}***

### 17.3.4.2~~C.4.b~~ Vessel Impact

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

(Permanent Dead Loads) + WA+FR+CV

With all load factors equal to 1.0 where WA are water loads, FR are friction forces and CV are the vessel collision loads. Nonlinear structural effects must be included and can be significant. It is anticipated that the entire substructure (including piles) may have to be replaced and the superstructure repaired if a bridge is subjected to this design impact load; however, the superstructure must not collapse.

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

Further guidance and training may be obtained from the SDG, Section 2.11 and AASHTO's LRFD Bridge Design Specifications, Section 3.14.

***{add reference to FDOT vessel traffic data for ships and barges}***

### 17.3.4.3~~C.4.c~~ Pier Locations

All bridges over roadways shall have substructures supports set back from vehicular traffic lanes in accordance with Chapter 3, Section 3.3.7.10.4.1~~C.7.j.4.(a)~~.

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

- For crossings subject to boat traffic a minimum horizontal clearance of 10 feet shall be provided.

- Where no boat traffic is anticipated, horizontal clearance shall be provided consistent with debris conveyance needs and structure economy.

~~**C.4.d Bearings**~~

~~The bridge superstructure and substructure should be designed for the complete replacement of the interfacing bearings.~~

## 17.4~~D~~ CONSTRUCTION

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

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

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

# 17.5E ROUTINE INSPECTION AND MAINTENANCE

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

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

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

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

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

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

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

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

***{Add information on policy for inspecting pedestrian bridges}***

## 17.6~~F~~ RECONSTRUCTION

Any reconstruction (i.e., lengthening, widening, and/or major component replacement) shall be designed as specified in Section 17.3~~C~~ of this chapter. Record of such reconstruction shall be maintained as specified in Section 17.4~~D~~ of this chapter. The remaining design life should be considered in the design of a repair on the project.

# ~~G~~17.7 BRIDGE LOAD RATING, PERMITTING, AND POSTING

Section 335.07, F.S., mandates a sufficiency rating system for roads on the State Highway System. This statute also applies to bridges. This rating system considers the structural adequacy, safety, and serviceability of the road/bridge. The Department provides the posting information, if required, to the local agency owner and requires the owner to provide the appropriate signage to be promptly installed in accordance with the MUTCD. Bridge load ratings~~For bridges, the determination of this rating~~ shall be accomplished using procedures in the Department's ~~2006~~ "Bridge Load Rating, Permitting and Posting Manual" and Department's Structures Manual Volume 8 - FDOT Modifications to Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges. If necessary, the bridge owner shall post all bridges in the National Bridge Inventory (NBI) within 90 or 180 days of ~~opening or~~ a change in load rating for on-system or off-system bridges, respectively.

For new construction or reconstruction, the bridge owner shall perform a load rating and provide the Department with a completed Bridge Load Rating Summary Form (see Structures Manual Volume 8) within 90 or 180 days of opening for on-system or off-system bridges, respectively. The bridge owner should consider requiring the engineer of record to perform the load rating.

# 17.8~~H~~ OTHER STRUCTURES

## 17.8.1~~H.1~~ Walls (Retaining and Sound)

The design of conventional, anchored, mechanically stabilized, and prefabricated modular retaining wall structures shall meet the requirements of AASHTO's LRFD Bridge Design Specifications, 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 walls shall meet the requirements of AASHTO's Guide Specifications for Structural Design of Sound Barriers (1989) with the 2002 Interims. For sound walls within the clear zone, their design and/or protection shall comply with the following:

- ~~Do not attach~~ For sound barriers attached to the top of traffic railings ~~unless the system has been~~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 17.3.3.32C.3.b.

## 17.8.2H.2 Sign, Lighting, and Traffic Signal Supports

The design of sign, lighting, and traffic signal support these structures shall meet the requirements of AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals Fifth Edition (2009) 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).

The Department maintains a Qualified Products List (QPL) for the supply of single column ground signs, aluminum light poles, high mast light poles, strain poles, and mast arm assemblies for use on the State Highway System.

***{add guidance for Dynamic Message Signs}***

## 17.9~~1~~ RECOMMENDATIONS

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

## 17.10~~J~~ REFERENCES FOR INFORMATIONAL PURPOSES

The following is a list of publications used in the preparation of this chapter.

- AASHTO, all publications may be ordered from:
  bookstore.transportation.org
- FDOT "Bridge Load Rating, Permitting and Posting Manual" may be ordered from:
  http://www2.dot.state.fl.us/proceduraldocuments/procedures/bin/850010035.pdf
- FDOT "Bridge Maintenance and Repair Manual" contact the State Maintenance Office - 2740 Centerview Drive, Tallahassee, Florida 32399; 850-410-5757
- FDOT "Bridge Operations and Maintenance" may be ordered from:
  https://www.fldotmpubs.com/pls/orbit/orbit.show_page?version=FLDOT
- FDOT "Design Standards":
  http://www.dot.state.fl.us/rddesign/DesignStandards/Standards.shtm
- FDOT "Drainage Manual":
  http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm
- FDOT "Plans Preparation Manual":
  www.dot.state.fl.us/rddesign/PPMManual/PPM.shtm
- FDOT "Qualified Products List":
  http://www2.dot.state.fl.us/SpecificationsEstimates/ProductEvaluation/QPL/QPLIndex.aspx
- FDOT "Standard Specifications for Road and Bridge Construction"
  www.dot.state.fl.us/specificationsoffice/
- FDOT Structures Manual Volume 1 – "Structures Design Guidelines":
  www.dot.state.fl.us/structures/StructuresManual/CurrentRelease/StructuresManual.shtm
- FHWA "HEC-18" and "HEC-20" may be ordered from:
  http://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm

# *Traditional Neighborhood Development Handbook*

# TRADITIONAL NEIGHBORHOOD DEVELOPMENT HANDBOOK


A INTRODUCTION ..... 1

B APPLICATION ..... 4

C PLANNING CRITERIA ..... 7

D NETWORK ..... 11

E THOROUGHFARE TYPES ..... 16

F DESIGN PRINCIPLES ..... 24
Introduction ..... 24
Design Process ..... 24

G CROSS SECTION ELEMENTS ..... 25
Introduction ..... 25

H TRAVELED WAY ..... 26
Introduction ..... 26
On Street Parking ..... 27
Mid-Block Crossings ..... 28

I Access Management ..... 29

J INTERSECTIONS ..... 29
Introduction ..... 29

K DEFINITIONS ..... 30

# TABLES

# FIGURES

# TRADITIONAL NEIGHBORHOOD DEVELOPMENT HANDBOOK

## A INTRODUCTION

This Traditional Neighborhood Development Handbook (TND) is intended to supplement Chapter 19 Traditional Neighborhood Development of the Florida Greenbook and to provide best practices to facilitate proper design of TND communities. While Chapter 19 of the Florida Greenbook has regulatory authority for use in design of TND's, this Handbook is intended to be more instructional to those who have not designed these types of developments. A fundamental principle in designing TND is to be guided by the context of the built environment established or desired for a portion of the communities, as TND communities rely on a stronger integration of land use and transportation than seen in Conventional Suburban Development (CSD) communities. TND has clearly defined characteristics and design features necessary to achieve the goals for compact and livable development patterns reinforced by a context-sensitive transportation network.

This Handbook provides guidance for planning and designing greenfield (new), brownfield or urban infill, and redevelopment projects within the compact urban context. It also clearly differentiates between CSD and TND communities to maximize the possibility that proper design criteria are used to create well executed TND communities. This is important, as the street geometry, adjacent land use, and other elements must support a higher level of transit, pedestrian, and bicycle activity than seen in a CSD.

To facilitate clearer discussion, this document establishes a series of definitions for transportation facilities with the overall category name of thoroughfares. Specifically, the term thoroughfare includes streets, which should be reserved for the more urban context and the term road, which should be reserved for the more rural context. Other facilities such as highways (higher volume, higher speed facilities in more rural settings) and drives (streets with a natural setting on one side) are also categorized as thoroughfares. Greater precision in naming thoroughfare types will greatly facilitate planning and engineering communication regarding transportation facilities and their appropriate context.

**Differences between Conventional and Traditional Neighborhood Development:**

The characteristics of CSD typically include separated land uses, where housing, retail, office and industrial uses are isolated from one another in separate buildings, areas of a development or areas of a community. Housing is usually further separated into neighborhoods, such that apartments, condominiums and other higher density housing are separate from single family housing. Parks, schools, post offices, health facilities, and other community resources are at a large scale and separated from other uses to

the degree that they can only be reached by motor vehicle.

In CSD, the scale of big box retail, office parks and other commerce can only be sustained in an auto-dominant environment, since they must have a regional market to succeed. Their site design includes land parcels so large that walking to a building from the adjacent thoroughfare or other buildings is not likely.

Finally, the CSD thoroughfare system is hierarchal and very much like a plumbing system, where "local" streets with lower traffic volumes feed into "collector" streets with higher levels of traffic, then finally onto the "arterial", where speeds and volumes are typically much higher. Block sizes in CSD are large to minimize the number of intersections. This type of thoroughfare network puts essentially all trips onto the arterial with few to no alternate routes for travelers.

In CSD, design speeds for thoroughfares outside subdivisions are rarely less than 35 mph and may be as high as 50 mph. Thus, longer distance through traffic is mixed with shorter trip traffic accessing local services. Higher volume, high speed streets fronted by the walls of subdivisions or surface parking lots of commercial developments result in a built environment that impedes pedestrian, transit and bicycle due to long distances between signals, difficulty crossing wide roadways, lack of shade, and other accommodations for bicyclists and pedestrians.. See the top of Figure 1 for an illustration of CSD.


**Figure 1 Comparison of CSD and TND**
***(Source: DPZ/Treasure Coast Regional Planning Council)***

TND, illustrated in the bottom of Figure 1, in contrast, is very supportive of pedestrian, bicycle and transit modes. Land uses are mixed, with retail, office, civic buildings, and residential interwoven throughout the community, often located in the same buildings. Block sizes are a smaller scale to improve walkability and to create a fine network of streets that accommodate bicyclists and pedestrians, providing a variety of routes for all users. Multi-family and single family residential is located in close proximity or adjacent to each other, and residential of various sizes and price points are mixed into neighborhoods.

Due to the differences in the desired context of the community and the desired goal to

create appropriate speeds for pedestrian and bicyclists, there are differences in the design practice for TND thoroughfares and CSD thoroughfares. In an infill or redevelopment TND site, designers have to be more flexible in the application of design criteria since existing conditions such as building placement create limited space to accommodate all modes. This is because constrained environments (limited right-of-way, buildings close to the street) are often the best design envelope for creating great walkability. Most observed pedestrian activity occurs in compact, "constrained" development patterns. Constrained spaces occurring in CSD usually limit the opportunity to meet motor vehicle based "minimum standards." Within the TND context, the focus of the designer should be to ensure that speeds are managed for pedestrian comfort and safety rather than purely on the movement of motor vehicles.

Likewise, designers should recognize that where TND streets transition into CSD streets, the design criteria such as intersection sight distance, use of on-street parking, and other features should be evaluated to ensure they provide safety for users. This is due to the higher speeds on most CSD streets.

# B APPLICATION

Context is the environment in which the thoroughfare is built and includes the placement and frontage of buildings, adjacent land uses and open space, historic, cultural, and other characteristics that form the built and natural environments of a given place. ITE's **Designing Walkable Urban Thoroughfares: A Context Sensitive Approach** is one of the documents included in the listing of reference material at the end of this chapter. The ITE Guide uses the term Context Zone in lieu of the term Transect Zone to describe the same characteristics of community. Transect Zones are used in this document due to their widespread use in the planning and urban design profession.

It is essential for the urban context to inform transportation design, and transportation planners and designers should understand the form and scale of urban development to best serve its traveling population. As noted in the Planning Criteria section below, a broader perspective is needed to move beyond the planning and zoning classification of land by use and the transportation classification of travel mode as motor vehicle dominant. There is an inherent need to create a walkable environment which cannot be adequately dealt with by traditional engineering or planning tools.

For application in walkable communities, the context through which the thoroughfare passes must be identified. For this document, context can defined at three levels as described in the Planning Criteria section:

- The Region
- The Community
- The Block

Regional planning identifies an area's existing and desired patterns of development, conserving some lands and encouraging development in other areas. Community planning occurs within areas encouraged for development by the local vision plans. Regional and community elements are defined in **Section C. Planning Criteria**, below.

Each block within the compact urban communities can be quantified by its mix of land uses, finer grained thoroughfare networks and development intensity. Transect Zones have been clearly defined to quantify the context of each community, block by block. To demonstrate the three planning levels; one can ride between regional sectors, bicycle between communities and walk between transect zones. Block by block transect zones, within community types provide designers the most direct guidance for thoroughfare design.

### Rural-Urban Transect

The transect zones (T-Zones) within each community type define the human habitats, ranging from the very rural (T1) to the very urban (T6). All T-Zones allow some mix of

uses, from home occupations and civic spaces/buildings allowed in otherwise residential T3, to the most intense mixed use in T5 and T6. The mix of T-Zones in a community offers a greater diversity of building types, thoroughfare types, and civic space types than conventional zoning allows, providing greater walkability.

In the least-intensive T-Zones of a community, T1 and T2, a rural road or highway is appropriate. Open space outside the community types, whether preserved or reserved, is guided by its regional sector designation, not by a T-Zones. All T-Zone designations occur inside community types.

By definition, the urban T-Zones T3 through T6 do not exist as "stand alone" zones, but rather are organized in relationship to each other within a community. Each T-Zone is highly walkable and assumes the pedestrian mode as a viable and often preferred travel mode, especially for the ¼ mile, five minute walk.

The T3 Sub-urban zone defines the urban to rural edge. Of all the T-Zones, T3 appears most like conventional sprawl. It has single-family dwellings, a limited mix of uses and housing types, and tends to be more automobile-oriented than T4, T5 or T6. To be a walkable transect zone, it must be located within the same pedestrian shed as T4, T5 and/or T6. The 5-minute test of walkable distance (¼ mile radius) limits the overall size of a T3 transect zone. The T3 zone often defines the edge of the more developed urban condition, so is sometimes called "neighborhood edge".

Transect zones T4 through T6 are relatively simple to recognize and assign properly.

For example, knowing that a particular area is a T5, Town Center, defines the context for the built environment including the street design criteria and elements such as the , width of sidewalks, the presence of on-street parking and use of tree wells instead of planting strips. Buildings built to the sidewalk with parking on street and behind, for instance, are appropriate in T5 and T6. Referring to a set of tables and design recommendations correlated to the transect helps the designer determine how a thoroughfare should function in each T-Zones.

To further define the T-Zones used throughout the document, the T-Zones and their related characteristics are listed in Figure 2 below.

## Figure 2 Transect Zone Descriptions

*(Source SmartCode 9.2)*


**T-1 NATURAL**

T-1 Natural Zone consists of lands approximating or reverting to a wilderness condition, including lands unsuitable for settlement due to topography, hydrology or vegetation.

| | |
|---|---|
| **General Character:** | Natural landscape with some agricultural use |
| **Building Placement:** | Not applicable |
| **Frontage Types:** | Not applicable |
| **Typical Building Height:** | Not applicable |
| **Type of Civic Space:** | Parks, Greenways |


**T-2 RURAL**

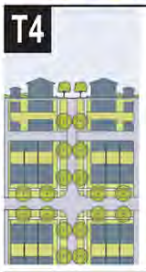
T-2 Rural Zone consists of sparsely settled lands in open or cultivated states. These include woodland, agricultural land, grassland, and irrigable desert. Typical buildings are farmhouses, agricultural buildings, cabins, and villas.

| | |
|---|---|
| **General Character:** | Primarily agricultural with woodland & wetland and scattered buildings |
| **Building Placement:** | Variable Setbacks |
| **Frontage Types:** | Not applicable |
| **Typical Building Height:** | 1- to 2-Story |
| **Type of Civic Space:** | Parks, Greenways |


**T-3 SUB-URBAN**

T-3 Sub-Urban Zone consists of low density residential areas, adjacent to higher zones that some mixed use. Home occupations and outbuildings are allowed. Planting is naturalistic and setbacks are relatively deep. Blocks may be large and the roads irregular to accommodate natural conditions.

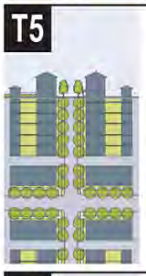
| | |
|---|---|
| **General Character:** | Lawns, and landscaped yards surrounding detached single-family houses; pedestrians occasionally |
| **Building Placement:** | Large and variable front and side yard Setbacks |
| **Frontage Types:** | Porches, fences, naturalistic tree planting |
| **Typical Building Height:** | 1- to 2-Story with some 3-Story |
| Type of Civic Space: | Parks, Greenways |




**T-4 GENERAL URBAN**

T-4 General Urban Zone consists of a mixed use but primarily residential urban fabric. It may have a wide range of building types: single, sideyard, and rowhouses. Setbacks and landscaping are variable. Streets with curbs and sidewalks define medium-sized blocks.

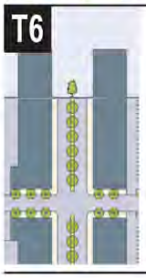
| | |
|---|---|
| **General Character:** | Mix of Houses, Townhouses & small Apartment buildings, with scattered Commercial activity; balance between landscape and buildings; presence of pedestrians |
| **Building Placement:** | Shallow to medium front and side yard Setbacks |
| **Frontage Types:** | Porches, fences, Dooryards |
| **Typical Building Height:** | 2- to 3-Story with a few taller Mixed Use buildings |
| **Type of Civic Space:** | Squares, Greens |




**T-5 URBAN CENTER**

T-5 Urban Center Zone consists of higher density mixed use building that accommodate etail, offices, rowhouses and apartments. It has a tight network of streets, with wide sidewalks, steady street tree planting and buildings set close to the sidewalks.

| | |
|---|---|
| **General Character:** | Shops mixed with Townhouses, larger Apartment houses, Offices, workplace, and Civic buildings; predominantly attached buildings; trees within the public right-of-way; substantial pedestrian activit |
| **Building Placement:** | Shallow Setbacks or none; buildings oriented to street defining a street wall |
| **Frontage Types:** | Stoops, Shopfronts, Galleries |
| **Typical Building Height:** | 3- to 5-Story with some variation |
| **Type of Civic Space:** | Parks, Plazas and Squares, median landscaping |




**T-6 URBAN CORE**

T-6 Urban Core Zone consists of the highest density and height, with the greatest variety of uses, and civic buildings of regional importance. It may have larger blocks; streets have steady street tree planting and buildings are set close to wide sidewalks. Typically only large towns and cities have an Urban Core Zone.

| | |
|---|---|
| **General Character:** | Medium to high-Density Mixed Use buildings, entertainment, Civic and cultural uses. Attached buildings forming a continuous street wall; trees within the public right-of-way; highest pedestrian and transit activity |
| **Building Placement:** | Shallow Setbacks or none; buildings oriented to street, defining a street wall |
| **Frontage Types:** | Stoops, Dooryards, Forecourts, Shopfronts, Galleries, and Arcades |
| **Typical Building Height:** | 4-plus Story with a few shorter buildings |
| **Type of Civic Space:** | Parks, Plazas and Squares; median landscaping |

# C PLANNING CRITERIA

Planning for TND communities occurs at several levels, including the region, the community, the block and finally, the street and building. Planning should consider the context of development patterns, looking carefully at the relationship between land use, buildings and transportation modes in an integrated fashion. As noted by Chris Leinberger in his book, *Option of Urbanism,* context in urbanized areas generally falls into two major categories; walkable urban and drivable suburban. This context based approach and the use of form based zoning codes can create development patterns that balance pedestrian, transit and bicycling with motor vehicle modes of transportation. The following sections help to define considerations for developing communities at different scales to increase the potential for creating TND patterns.

Planners should determine the applicable regional plans that guide their area. Plans can be generated for or coordinated with the Metropolitan Planning Organization planning process for urbanized areas. Sector planning and comprehensive planning at the city, county and regional level, i.e., any level above that of the individual community, also yield documented regional plans.

Regional planning practice varies by jurisdiction. Clear definitions of regional sectors or districts will identify where development is encouraged and discouraged by local and state policy. Only then can regional sectors guide the development and location of community types. Existing comprehensive plans should be reviewed to determine areas for planned future growth.

One example of regional sector definitions can be found in the SmartCode, a model form based code available for use in any region. SmartCode documents define the following regional sectors; also shown in the center of **Figure 3.**

**O-1 Preserved Open Sector -** Permanently set-aside open space, such as park or wilderness area, or lands set aside via easements or land grants. Communities are not located in O-1.

**O-2 Reserved Open Sector** - Comprised of lands that are currently open, but may be expected to develop at some point in the future, such as land for agriculture or silviculture. Communities are not located in O-2. O-2 is a temporary designation.

**G-1 Restricted Growth Sector** and **G2 Controlled Growth Sector** - These are undeveloped areas with little existing development at the beginning of the planning period, thus, any development will be new development. The less-intensive G1 Sector is intended for hamlets only, and the more-intensive G2 sector, anticipates more intense development. These Sectors might be farmland, forests, or fields at the edge of existing urban development.

**G-3 Intended Growth Sector** and **G-4 Infill Growth Sector** - G-4 is developed, G-3 is not. Locations for G-1, G-2, and G-3 depend on terrain, thoroughfares and rail lines.

Regardless of the regional comprehensive plan terms and definitions, once the regional sectors/areas are mapped, then refined planning is possible at the community level with the designation of community types.

Each community type is made up of transect zones to further define its character. The jurisdiction's existing comprehensive plan should again be reviewed to identify available community type definitions. If none are adopted, the SmartCode offers a set of definitions. As an example, **Figure 3** describes the community types, in order from least to most intensive:

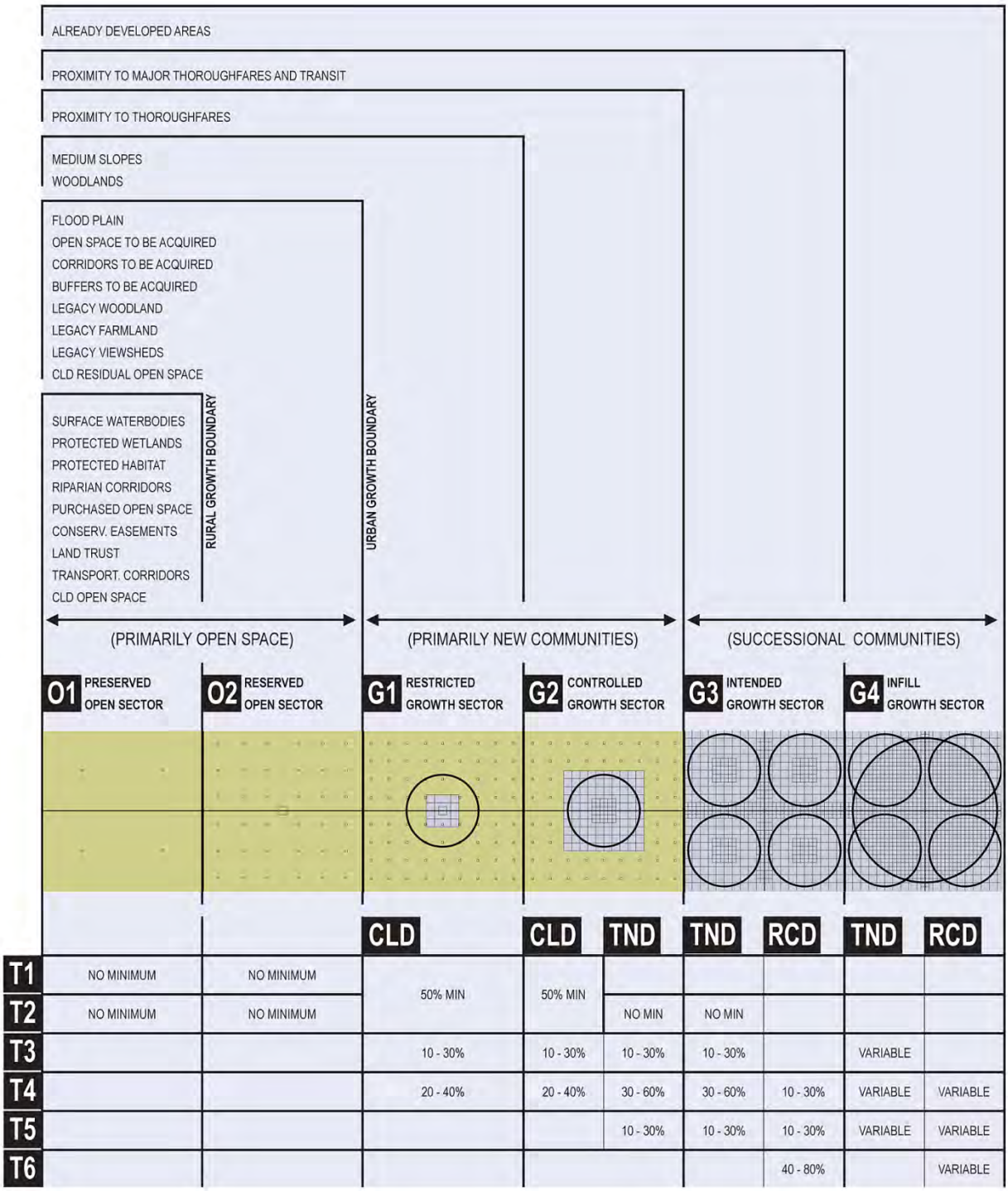
**CLD – Clustered Land Development** – an incomplete neighborhood standing alone in the countryside. (Syn: hamlet)

**TND – Traditional Neighborhood Development** –a village or small town composed of one or more neighborhoods (Infill TND occurs in the G-4 Sector.)

**RCD – Regional Center Development** – a large town or part of a city with regionally significant development. (Infill RCD occurs in the G-4 Sector.)

**Figure 3 Context Levels – Region, Community & Transect Zone**

*(Source SmartCode 9.2)*



As noted in the following Community Guiding Principles section, planning for a specific community type focuses the scale of land pattern and the transportation facilities.

The principles for defining or creating the context should be considered based on the scale of the area that is being evaluated, developed, or redeveloped. Regional scale considerations yield the recommended locations of cities and towns in areas where growth is encouraged. Then, cities and towns can be planned.

**The City/Town – Guiding Principles**

- The city should retain its natural infrastructure and visual character derived from its location and climate, including topography, landscape and coastline.
- Growth strategies should encourage infill and redevelopment.
- New development should be structured to reinforce a pattern of neighborhoods and urban centers, with growth and higher density focused at transit nodes rather than along corridors.
- Transportation corridors should be planned and reserved in coordination with land use.
- Green corridors should be encouraged to enhance and connect the urbanized areas.
- The city should include a framework of transit, pedestrian, and bicycle systems that provide alternatives to automobile use.
- A diversity of land use should be distributed throughout the city to enable a variety of economic activity, workplace, residence, recreation and civic activity.
- Affordable and workforce housing should be distributed throughout the city to match job opportunities and to avoid concentrations of poverty.

**The Community - Guiding Principles**

- Neighborhoods and urban centers with a mix of uses should be the preferred pattern of development; single-use area should be the exception.
- Neighborhoods and urban centers should be compact, bicycle and pedestrian-oriented and mixed-use. Density and intensity of use should relate to the degree of existing or planned transit service.
- The ordinary activities of daily living should occur within walking or bicycling distance within a half mile of most dwellings, allowing independence to those who do not drive.
- Interconnected networks of thoroughfares should be designed to disperse and reduce the length of automobile trips and to encourage transit use, walking and bicycling. A range of open space, including parks, squares and playgrounds, should be distributed within neighborhoods and urban centers.

- Appropriate building densities and land uses should occur within walking or bicycling distance of transit stops.
- Civic, institutional and commercial activity should be embedded in mixed-use urban centers, not isolated in remote single-use complexes.
- Schools should be located to enable children to walk or bicycle to them. Programs such as Florida's Safe Routes to Schools may be referenced for additional information. Note that this program is intended for retrofitting CSD communities and many of the recommendations may not apply to properly designed TND communities.
- Within neighborhoods, a range of housing types and price levels should accommodate diverse ages and incomes.

**The Block and the Building - Guiding Principles**

- Buildings and landscaping should contribute to the physical definition of thoroughfares as civic places.
- Development should adequately accommodate automobiles, while respecting the pedestrian, bicyclist and transit user in the spatial form of public space.
- The design of streets and buildings should reinforce safe environments, while ensuring access is provided in a way that walking and bicycling are encouraged and that neighborhoods have multiple access points either through streets or pathways.
- Architecture and landscape design should grow from local climate, topography, history, culture and building practice.
- Civic buildings and public gathering places should be located to reinforce community identity and support self-government.

## D NETWORK

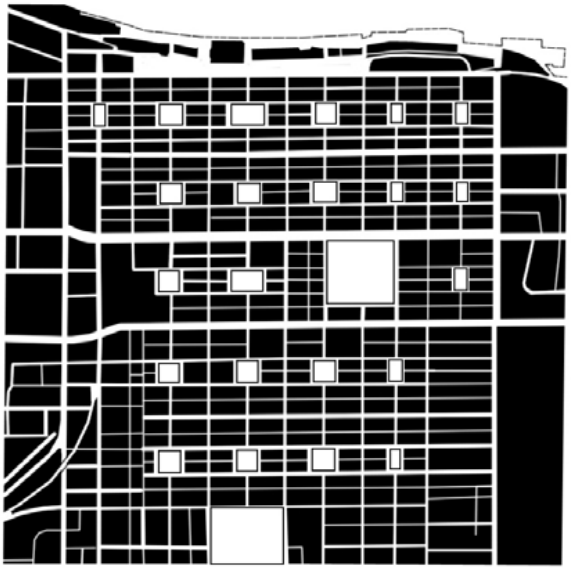
Urban network types are frequently characterized as either traditional or conventional. Traditional networks are typically characterized by a relatively non hierarchical pattern of short blocks and straight streets with a high density of intersections that support all modes of travel in a balanced fashion.

**Figure 4 Traditional Network**

*(Source: VHB)*

**New York, NY**

**Savannah, GA**



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

**Figure 5 Conventional Network**

*(Source: VHB)*

**Walnut Creek, CA**

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

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

It is important in TND networks to have a highly interconnected network of streets with smaller block sizes than in conventional networks. There are various ways to ensure these goals are achieved. Two approaches for evaluation of effective network are included below. One consideration in the evaluation process is the size of the area being evaluated. The primary criterion is the need to create an area of high walkability since the intent of these evaluation tools is to assist in providing a means for evaluating the connectivity of a given network.

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

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

There are various ways to evaluate the density of networks which provide an indicator of walkability. Two approaches for evaluation of effective network are included below.

First, a simple method of determining the number of intersections per square mile yields an indication of walkability. This indicator informs the LEED-ND system (Leadership in Energy and Environmental Design – Neighborhood Design) of the degree of walkability and compactness in community design projects. Fundamentally, smaller block size is a vital component of walkable communities. It encourages walking through greater land use mix, managed traffic speeds, richer pedestrian route selection and other features. Greater than 100 intersections per square mile indicates an area has potential for walking as a viable travel mode, especially if finer design details are applied, such as bridges crossing barriers such as canals and rail lines. Through empirical observation, block sizes of 400 to 600 feet on edge experience easy walking environments. Chicago

has many 660 foot block edges and community life is sustained by walking, transit and motor vehicle mobility.

A theoretical 100 intersection square mile would have ten blocks per mile at its edge, which yields block edges of 528 feet between centerlines. LEED-ND uses 120 intersections per square mile as one of its indicators which equals roughly 440 feet per block edge. A rigid grid is not required and is, in fact, discouraged as it encourages fast vehicle speed and creates less interest for the traveler. Less than a full square mile can be easily prorated to achieve the necessary measured values. Several Florida examples of intersections per square mile include Key West at 212, Miami Lakes at 141, Seaside at 393 and Celebration at 366 (parts of Rome, Italy have 800).

Another network walkability measure is called the Connectivity Index (Reid Ewing, 1996) which can be used to quantify how well a thoroughfare network connects destinations. Links are the segments between intersections, and intersections are the nodes. Cul-de-sac heads are treated as a node. A higher index means that travelers have increased route choice, providing more connections available for travel between any two locations. The Connectivity Index is calculated by dividing the number of links by the number of nodes. A score of 1.4 is the minimum needed for a walkable community.

An example illustrating how to calculate a Connectivity Index is included below:

To establish a Connectivity Index, using a map of the network under consideration, first establish the area to be evaluated. Identify and count the number of intersections, cul-de-sacs and street segments between intersections/cul-de-sacs within the study area.

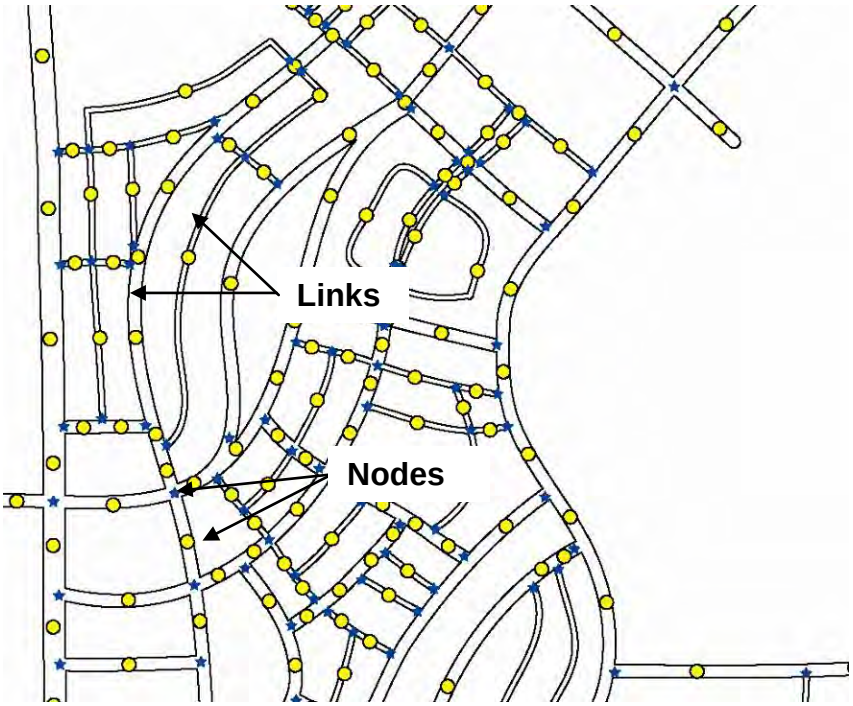
The Starkey Ranch project, a portion of which is shown in Figure 6, illustrates the identification of nodes and links. For the entire community, there were a total of 242 road segments, or links, and 146 intersections/cul-de-sacs or nodes identified. The calculation for this community yielded a Connectivity Index of 1.66, which is greater than 1.4, therefore, based on the Connectifity Index, the Starkey Ranch should be considered walkable.

Connectivity Index = 242 Links/146 Nodes = 1.66

**Figure 5**

**Connectivity Index, Odessa, FL**

*(Source: AECOM, Project: Starkey Ranch)*



# E THOROUGHFARE TYPES

Section C, Highway Function and Classification in CHAPTER 1 PLANNING contains the conventional classification system that is commonly accepted to define the function and operational requirements for thoroughfares. These classifications are also used as the primary basis for geometric design criteria.

Traffic volume, trip characteristics, speed and level of service, and other factors in the functional classification system relate to the mobility of motor vehicles, not bicyclists or pedestrians, and do not consider the context or land use of the surrounding environment. This approach, while appropriate for high speed rural and suburban roadways, does not provide designers with guidance on how to design for a Traditional Neighborhood Development or in a context sensitive manner.

The thoroughfare types described here provide mobility for all modes of transportation with a greater focus on the pedestrian. The functional classification system can be generally applied to the thoroughfare types in this chapter. Designers should recognize the need for greater flexibility in applying design criteria, based more heavily on context and the need to create a safe environment for pedestrians, rather than strictly following the conventional application of functional classification in determining geometric criteria.

**General Principles**

- The thoroughfares are intended for use by motor vehicle, transit, bicycle, and pedestrian traffic and to provide access to lots and open spaces.
- The thoroughfares consist of travel lanes and public frontages. The lanes provide the traffic and parking capacity. Thoroughfares consist of travel lanes in a variety of widths for parked and for moving vehicles. The public frontages contribute to the character of the transect zone. They may include swales, sidewalks, curbing, planters, shared use paths and street trees.
- Thoroughfares should be designed in context with the urban form and desired design speed of the transect zones through which they pass. The public frontages that pass from one transect zone to another should be adjusted accordingly.

The terms for thoroughfare types that are used in Traditional Neighborhood Development include:

**RD-Road**

A road is a local, slow-movement thoroughfare suitable for more rural transect zones. Roads provide frontage for low-density buildings with a substantial setback. Roads have narrow pavement and open swales drained by percolation, with or without sidewalks. The landscaping may be informal with multiple species arrayed in naturalistic clusters.

**Olson Road, Tallahassee, FL**

*(Photo - Billy Hattaway)*

Since roads are located in more rural transect zones where larger setbacks are created, there is normally no provision for on-street parking. Lot size and driveways should be designed to provide for parking on-site so that parking will not occur on sidewalks.

## ST-Street

A street is a local, multi-movement thoroughfare suitable for all urbanized transect zones and all frontages and uses. A street is urban in character, with raised curbs, drainage inlets, wide sidewalks, parallel parking, and trees in individual or continuous planters aligned in an allee. Character may vary in response to the commercial or residential uses lining the street.

It is important to note that, for entirely different purposes than the definitions in this handbook, many municipalities use the terms “avenue” and “street” in combination with the thoroughfare name as a way to differentiate streets running north and south from those running east and west (e.g. 1st Street, 1st Avenue).


**East 1st Street, Sanford, FL**

*(Source: AECOM Project, Photo - Billy Hattaway)*

**DR-Drive**

A drive is located along the boundary between an urbanized and a natural condition, usually along a waterfront or park. One side has the urban character of a thoroughfare, with sidewalk and buildings, while the other has the qualities of a road or parkway, with naturalistic planting and rural details.

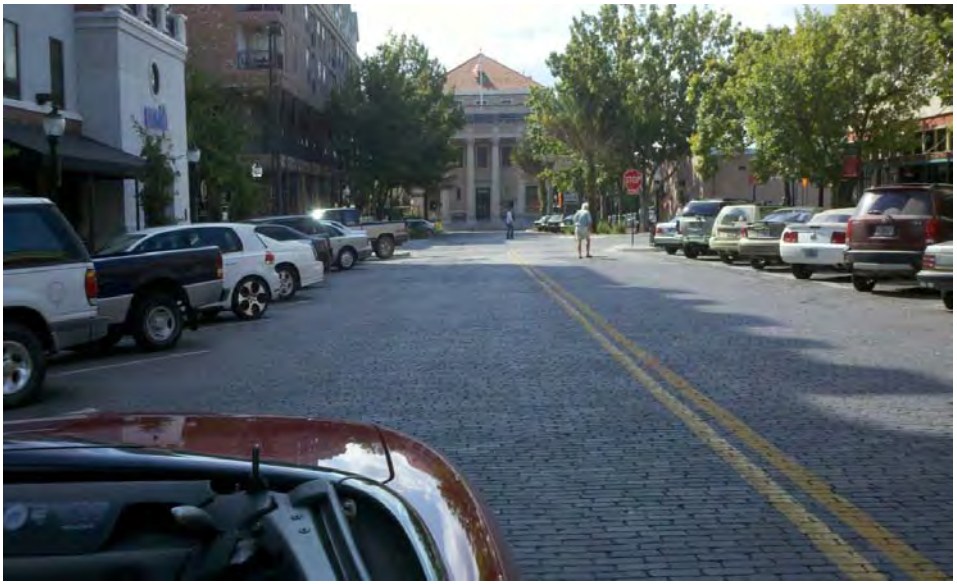
**Drive, Franklin, TN**

*(Source: DPZ Project: Westhaven, Photo - Billy Hattaway*

**AV-Avenue**

An avenue is a thoroughfare of high vehicular capacity and low to moderate speed, acting as a short distance connector between urban centers and usually equipped with a landscaped median.

It is important to note that many municipalities use the terms, “avenue” and “street” in combination with the thoroughfare name as a way to differentiate streets running north and south from those running east and west. (e.g. 1st Street, 1st Avenue)



**SE 1st Street, Gainesville, FL**

*(Source: Photo – Rick Hall)*

**BV-Boulevard**

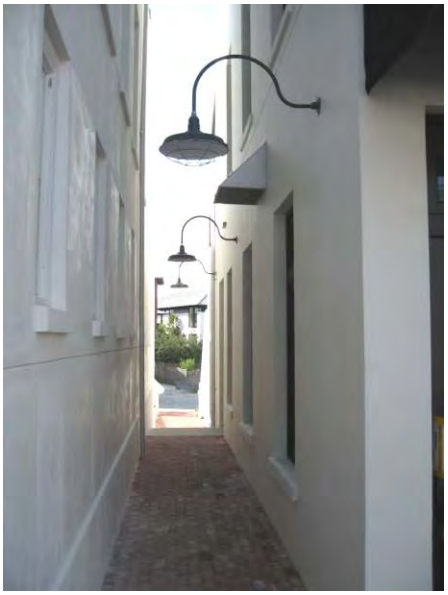
A boulevard is a thoroughfare designed for high vehicular capacity and moderate speed, traversing an urbanized area. Boulevards are usually equipped with side access lanes buffering sidewalks and buildings.

**Octavia Boulevard, San Francisco, CA**

*(Source: Alan Jacobs & Elizabeth McDonald Project, Photo – sfcityscape)*

**PP-Pedestrian Passage**

A pedestrian passage is a narrow connector restricted to pedestrian use and limited vehicular use that passes between buildings or between a building and a public open space. Passages provide shortcuts through long blocks and connect rear parking areas with frontages. In T3, Pedestrian Passages may be unpaved and informally landscaped. In T4, T5 and T6, they should be paved and landscaped and may provide limited vehicular access. When in civic zones, passages should correspond with their context and abutting transect zones.



**Pedestrian Passage, Rosemary Beach, FL**

*(Source: DPZ Project: Rosemary Beach, Photo – Billy Hattaway)*

**Pedestrian Passage, Franklin, TN**

*(Source: DPZ Project: Westhaven, Photo – Billy Hattaway)*

**AL-Alley**

An Alley is a narrow vehicular access-way at the rear or side of buildings providing service and parking access, and utility easements. Alleys have no sidewalks, landscaping, or building frontage requirements. They accommodate trucks and dumpsters and may be paved from building face to building face, with drainage by an inverted crown using impervious or pervious pavement. In older residential neighborhoods, alleys may be unpaved.

**Alley, Franklin, TN**

*(Source: DPZ Project: Westhaven, Photo – Billy Hattaway)*

# F DESIGN PRINCIPLES

## Introduction

The principles for designing streets in TND communities are similar in many respects to designing streets for conventional transportation.

- Providing mobility for users
- Creating a safe street for users
- Accommodating movement of goods
- Providing access for emergency services, transit, waste management, and delivery trucks
- Providing access to property

TND street design principles have a different emphasis in the following manner:

- The basis for selecting criteria and features used in designing TND communities is the transect zone.
- Streets should be created in context with the desired public realm or other contextual elements
- Focused on reducing speed to create a safer and more comfortable environment for pedestrians and bicyclists

When designing features and streets for TND communities in an infill or redevelopment site, designers need to understand that they will have to "do the best they can." Flexibility is required in the approach to design in what is a constrained environment. Creativity and careful attention to safety for pedestrians and bicyclists must be balanced with the operational needs of motor vehicles.

Likewise, designers should recognize that where TND streets transition into CSD streets, the design criteria such as intersection sight distance, use of on street parking, and other features should be evaluated to ensure that safety for users is provided. This is due to the higher speeds on most CSD streets.

## Design Process

The design process for TND communities treats streets as an important part of the public realm, which is the totality of spaces used by the general public, such as streets, plazas, parks and other public infrastructure. TND balances the mobility of all users and pays a great deal of attention to the context or transect

zone in which the street is located. The process also pays attention to creating a high degree of connectivity and an extensive network of streets.

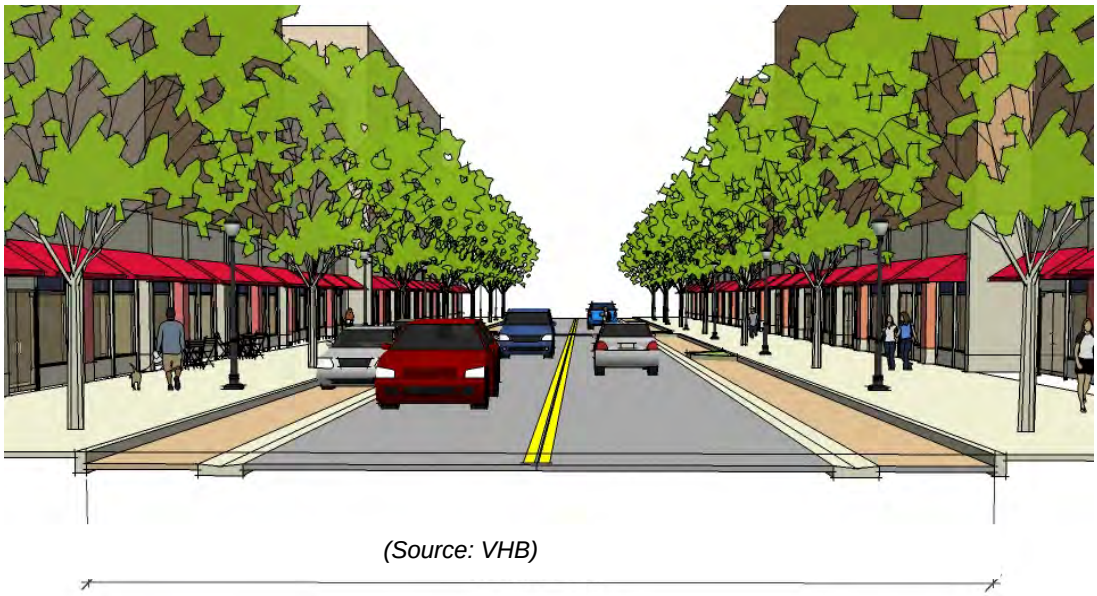
# G CROSS SECTION ELEMENTS

## Introduction

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

# H TRAVELED WAY

The traveled way is the central part of the thoroughfare between the curb faces where vehicle movement and on street parking occurs.



*(Source: VHB)*

## Introduction

Every community has different equipment in service for transit, waste collection and emergency services, and coordination with operators should occur early in the planning process to ensure that those service providers can operate their equipment on the streets. The frequency of access by these vehicles should be considered when setting lane widths. The use of narrower lane widths requires that designers recognize the impacts on turning at intersections and u-turns for multi-lane roads.

## On Street Parking

When angle parking is proposed for on street parking, designers should consider the use of back-in angle parking, also called head-out angle parking, in lieu of front-in angle parking. Back in angle parking has the following advantages:

- Loading and unloading of passengers naturally encourages passenger movement towards the sidewalk.
- Loading and unloading from the trunk or tailgate occurs at the sidewalk.

**Back in Angle Parking, Columbus, OH**

*(Source: Photo - Dan Burden)*

- When the vehicle leaves, the driver has a better view of oncoming traffic, reducing the risk of crashes.

**Back in Angle Parking, Seattle, WA**

*(Source: Photo - Dan Burden)*

When designated bike lanes are needed in conjunction with on street parking (for speeds greater than 25 mph), designers should consider increasing the bike lane to 6 feet, in lieu of increasing parallel parking width from 7 to 8 feet. This helps encourage vehicles to park closer to the curb and provides more room for door swing, potentially reducing conflict with cyclists.

When streets are located in Transect Zones 1 and 2, where larger setbacks are created, on street parking is not normally provided for. Lot sizes and driveways should be designed to provide for parking on site so that parking will not occur on sidewalks.

## Mid-Block Crossings

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

**Mid-Block Crossing, Sanford, FL**

*(Source: AECOM project, Photo - Billy Hattaway)*

## I Access Management

The philosophy of short block lengths in TND communities is intended to reduce travel speeds, increase access to property, and improve circulation for all users. This is in contrast to the use of access management in CSD, which has the goal of keeping vehicles moving at higher speeds.

As parking is usually located within blocks in mixed use blocks and in alleys in residential neighborhoods, access along streets is provided primarily through side streets and alleys. This greatly reduces driveway access along corridors, improving safety for bicyclists, pedestrians and vehicles, due to the reduction in conflict points.

# J INTERSECTIONS

### Introduction

The proper design of intersections is very important to the safety of all users. Research reveals that intersections are disproportionately responsible for crashes and injuries, especially for pedestrians. This is due to the number of conflict points that occur.

The goal should be to keep intersections compact to keep vehicle speeds down and to reduce pedestrian crossing distance. The benefits of compact intersections are reduced exposure of pedestrians to vehicles and shorter cycle times for the pedestrian phase of signals.

The TND approach to street design with more narrow streets and compact intersections requires designers to pay close attention to the operational needs of transit, fire and rescue, waste collection, and delivery trucks. For this reason, early coordination with transit, fire and rescue services, waste collection, and other stakeholder groups is essential.

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

# K DEFINITIONS

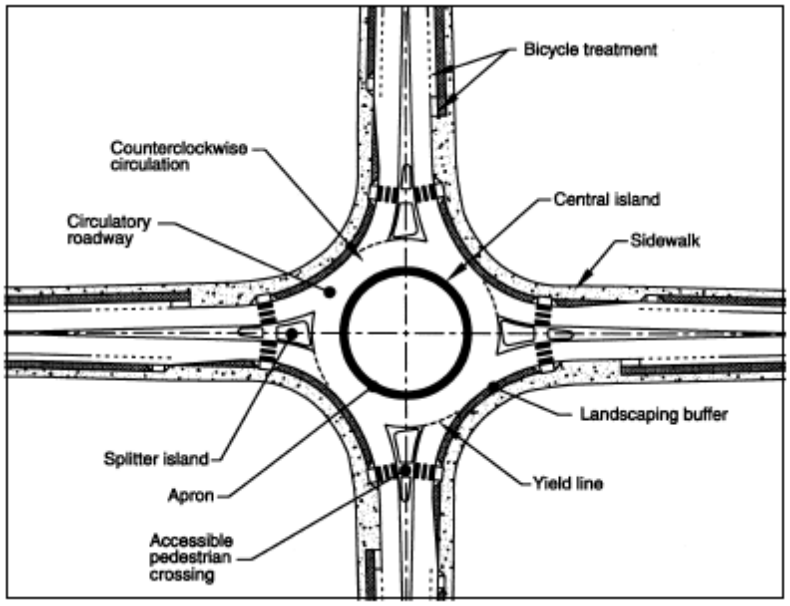
- **Allee** – a walkway or street lined with trees or tall shrubs
- **Alley** - a narrow street, especially one through the middle of a block, giving access to the rear of lots or buildings.
- **Avenue** (AV) – an avenue is a thoroughfare of high vehicular capacity and low to moderate speed, acting as a short distance connector between urban centers, and usually equipped with a landscaped median.

  It is important to note that many municipalities use the terms, “avenue” and “street” in combination with the thoroughfare name as a way to differentiate streets running north and south from those running east and west. (e.g., 1st Street, 1st Avenue). These are street names, not to be confused with thoroughfare types.

- **Border** - the area between the curb of the thoroughfare and the right of way line. Elements of the public frontage include the type of curb, sidewalk, planter, street tree and streetlights.
- **Boulevard** – a boulevard is a thoroughfare designed for high vehicular capacity and moderate speed, traversing an urbanized area. Boulevards are usually equipped with slip roads buffering sidewalks and buildings.
- **Context** – the financial, environmental, historical, cultural, land use types, activities and built environment that help to establish the configuration of thoroughfares.
- **Context sensitive solutions** (CSS) - a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist.
- **Design speed** - A selected rate of travel used to determine the various geometric features of the street.
- **Drive -** A drive is located along the boundary between an urbanized and a natural condition, usually along a waterfront or park. One side has the urban character of a thoroughfare, with sidewalk and buildings, while the other has the qualities of a road or parkway, with naturalistic planting and rural details.
- **Human scale** - describes buildings, block structure and other aspects of the built environment that are designed in consideration for pedestrians and bicyclists, their rate of travel and other physical needs
- **Liner building** - a building specifically designed to mask a parking lot or a parking garage from the frontage.
- **Live-work** - a dwelling unit that contains a commercial component in the unit.
- **Mixed use development** - the practice of allowing more than one type of land

use in a building or set of buildings. This can mean some combination of residential, commercial, industrial, office, institutional, or other land uses.

- **Modern roundabout** - a circular intersection with specific design and traffic control features. These features include yield control of all entering traffic, channelized approaches, and appropriate geometric curvature to ensure that travel speeds on the circulatory roadway are typically less than 30 mph.




**Modern Roundabout**

*(Source: FHWA Roundabouts: An Informational Guide)*

- **Neighborhood** - an urbanized area at least 40 acres in size that is primarily residential. A neighborhood should be based upon a partial or entire standard pedestrian shed.
- **New Urbanism** - a development philosophy based on the principles of Traditional Neighborhood Development designed for the pedestrian, bicyclist and transit, as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice. See the Charter of the New Urbanism for more information (http://www.cnu.org/charter).
- **Passage** - a pedestrian connector passing between buildings, providing shortcuts through long blocks and connecting rear parking areas to frontages.
- **Path** - a pedestrian way traversing a park or rural area.
- **Pedestrian shed** - an area, approximately circular, that is centered on a common destination. A pedestrian shed is applied to determine the approximate

size of a neighborhood. A standard pedestrian shed is 1/4 mile radius, or 1320 feet, about the distance of a five-minute walk at a leisurely pace.

**Pedestrian Shed**
*(Source: AECOM)*

- **Rear alley/Lane** - a vehicular way located to the rear of lots providing access to service areas, parking, and outbuildings and containing utility easements. Rear Lanes may be paved lightly to driveway standards. The streetscape consists of gravel or landscaped edges, has no raised curb, and is drained by percolation.
- **Retail** - premises available for the sale of merchandise and food service.
- **Smart Growth** - an urban planning and transportation theory that concentrates growth in the center of a city to avoid urban sprawl and advocates compact, transit-oriented, walkable, bicycle friendly land use, including mixed use development with a range of housing choices.
- **Road** - a local, slow-movement thoroughfare suitable for more rural transect zones. Roads provide frontage for low-density buildings with a substantial setback. Roads have narrow pavement and open swales drained by percolation, with or without sidewalks. The landscaping may be informal with multiple species arrayed in naturalistic clusters.
- **Setback** - the area of a lot measured from the right of way line to a building facade or elevation.
- **Street** – a local, multi-movement thoroughfare suitable for all urbanized transect zones and all frontages and uses. A street is urban in character, with raised curbs, drainage inlets, wide sidewalks, parallel parking, and trees in individual or continuous planters aligned in an allee. Character may vary in response to the commercial or residential uses lining the street.

It is important to note that many municipalities use the terms “avenue” and “street” in combination with the thoroughfare name as a way to differentiate streets running north and south from those running east and west (e.g. 1st Street, 1st Avenue).

These are street names, not to be confused with thoroughfare types.

- **Terminated vista** - a building or feature located at the end of a thoroughfare in a position of prominence.

**Terminated Vista, Monticello, FL**

*(Source: Billy Hattaway)*

- **Thoroughfare** - a corridor incorporating sidewalks, travel lanes, bike lanes and parking lanes within a right of way.
- **Traditional Neighborhood Development** (TND) - a community unit type structured by a standard Pedestrian Shed oriented towards a common destination consisting of a mixed use center or corridor.
- **Transit-Oriented Development** (TOD) - a regional center development with transit available or proposed. TODs are developments that are moderate to high density, mixed-use, and walkable development designed to facilitate transit and accommodate multiple modes of transportation. TODs generally encompass a radius of ¼ or ½ miles of a transit station, a distance most pedestrians are willing to walk. It incorporates features such as interconnected street networks, bicycle and pedestrian facilities, and street-oriented site design, to encourage transit ridership. This form of development optimizes use of the transit network and maximizes pedestrian accessibility. Successful TOD provides a mix of land uses and densities that create a convenient, interesting and vibrant community.
- **Town center** - the mixed-use center or main commercial corridor of a community. A Town Center in a hamlet or small TND may consist of little more than a meeting hall, corner store, and main civic space.
- **Transect** - a system of ordering human habitats in a range from the most natural to the most urban. The SmartCode is based upon six Transect Zones that

describe the physical character of place at any scale, according to the density and intensity of land use and urbanism.

- **Transect Zone (T-Zone)** - Transect Zones are administratively similar to the land use zones in conventional codes, except that in addition to the usual building use, density, height, and setback requirements, other design elements are integrated, including those of the private lot and building and the adjacent public streetscape. The elements are determined by their location on the Transect scale. The T-Zones are T1 Natural, T2 Rural, T3 Sub-Urban, T4 General Urban, T5 Urban Center, and T6 Urban Core.

- **Yield street -** a thoroughfare that has two-way traffic but only one effective travel lane because of parked cars, necessitating slow movement and driver negotiation.

# *Drainage*

# Florida Greenbook Drainage Chapter Considerations

**Greenbook –** Provides generic considerations for Drainage and does not include references to the Departments Optional Pipe requirements.
**Drainage Manual** – Provides return period/risk based criteria for design, as well as technical and documentation standards.

FDOT requested other state DOTs advise if they provided separate design criteria for off-system roadways. Of the responses received, no other state DOT provides separate design criteria for off-system roads.

**The following is the general note in Section 1 of the Drainage Manual.**
**GENERAL NOTE**
***Chapter 334, F.S.***, known as the ***Florida Transportation Code***, establishes the responsibilities of the State, counties, and municipalities for the planning and development of the transportation systems serving the people of Florida, with the objective of assuring development of an integrated, balanced statewide system. The Code's purpose is to protect the safety and general welfare of the people of the State and to preserve and improve all transportation facilities in Florida. Under ***Section 334.044, F.S.***, the ***Code*** sets forth the powers and duties of the Department of Transportation to develop and adopt uniform minimum standards and criteria for the design, construction, maintenance, and operation of public roads.

The standards in this ***Manual*** provide a basis for uniform design practice for typical roadway drainage design situations. Realizing that drainage design is primarily a matter of sound application of good engineering judgment, it is impossible to give precise rules which would apply to all possible situations that may arise. Situations will exist where these standards will not apply. THE INAPPROPRIATE USE OF AND ADHERENCE TO THESE STANDARDS DOES NOT EXEMPT THE ENGINEER FROM THE PROFESSIONAL RESPONSIBILITY OF DEVELOPING AN APPROPRIATE DESIGN. The engineer is responsible for identifying those standards that do not apply to a particular design, and to obtain approval to deviate from those standards. Deviation from a standard in this ***Manual*** must be approved the District Drainage Engineer.

| Greenbook | FDOT Drainage Manual | AASHTO |
|---|---|---|
| Chapter 3 Geometric Design<br>Page 3-1<br>*Every effort should be made to obtain the best possible…and proper drainage consistent with the terrain…* | The Drainage Manual provides a basis for uniform design practice which aides in the provision of the best possible drainage system. | States same basic principle of proper drainage for the terrain. |
| Chapter 3 Geometric Design<br>Page 3-11<br>Consider surface drainage in superelevation sections. | Curb inlets shall also be placed at the critical section prior to the level section in superelevation transitions, to avoid concentrated flows across the pavement. | Ch 9 AASHTO Highway Drainage Guidelines |

<table>
<tr><th>Greenbook</th><th>FDOT Drainage Manual</th><th>AASHTO</th></tr>
<tr><td>Chapter 3 Geometric Design<br>Page 3-17<br>Shoulders should be provided on all streets and highways incorporating open drainage.</td><td>Open channels shall be designed to convey, without damage, and to confine within the ditch, stormwater flow with standard design frequencies as follows:<br><table><tr><td>TYPE CHANNEL</td><td>FREQUENCY</td></tr><tr><td>Roadside, Median, and Interceptor ditches or swales</td><td>10-year</td></tr><tr><td>Outfall ditches</td><td>25-year</td></tr><tr><td>Canals</td><td>25-year</td></tr><tr><td>Temporary roadside and median ditches or swales</td><td>2-year</td></tr><tr><td>Temporary Outfalls and Canals</td><td>5-year</td></tr></table><br>Site-specific factors may warrant the use of an atypical design frequency</td><td>Ch 4 & 6 AASHTO Highway Drainage guidelines</td></tr>
<tr><td>Chapter 3 Geometric Design<br>Page 3-23<br>The design of the roadway must also provide for adequate drainage of the roadway. Drainage swales within the clear zone should be gently rounded and free of protruding drainage discontinuities. Where large volumes of water must be carried, the approach should be to provide wide, rather than deep drainage channels. Side slopes and drainage swales that lie within the clear zone should be free of protruding drainage structures.</td><td>Criteria for clear zone and side slopes are provided in Greenbook.<br><br>Inlets, and other hydraulic structures shall be selected/designed to satisfy hydraulic capacity, structural capacity, safety (vehicular, pedestrian, cyclist) and durability requirements.</td><td>Ch 9 AASHTO Highway Drainage Guidelines</td></tr>
<tr><td>Chapter 3 Geometric Design<br>Page 3-25<br>Curbs may be used to provide drainage control and improve the delineation of the roadway.</td><td>Standard design storm frequencies for the design of storm drain systems are as follows:<br><table><tr><td>TYPE STORM DRAIN</td><td>FREQUENCY</td></tr><tr><td>General design</td><td>3-year</td></tr><tr><td>General design work that involves replacement of a roadside ditch with a pipe system by extending side drain pipes.</td><td>10-year</td></tr><tr><td>General design on work to Interstate Facilities</td><td>10-year</td></tr><tr><td>Interstate Facilities for sag vertical curves which have no outlet other than a storm drain system, and for the outlet of systems requiring pumping stations</td><td>50-year</td></tr></table><br>Site-specific factors may warrant the use of an atypical design frequency</td><td>Ch 9 AASHTO Highway Drainage Guidelines</td></tr>
</table>

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<tr><th>Greenbook</th><th>FDOT Drainage Manual</th><th>AASHTO</th></tr>
<tr><td>Chapter 3<br>Page 3-55<br>Roadway conditions should be favorable for bicycling. This includes safe drainage grates…</td><td>Inlet type, location, and spacing shall consider pedestrian and bicycle safety. (Page 18)<br><br>Inlets, and other hydraulic structures shall be selected/designed to satisfy hydraulic capacity, structural capacity, safety (vehicular, pedestrian, cyclist) and durability requirements.</td><td>Ch 9 AASHTO Highway Drainage Guidelines</td></tr>
<tr><td>Chapter 4 Roadside Design<br>Page 4-5<br>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</td><td>The design of open channels shall consider the need for channel linings. Standard lining types are shown in Standard Indexes 199 and 281. Maximum velocities for the various forms of channel lining are given in Tables 2.3 and 2.4. When design flow velocities do not exceed the maximum permissible for bare earth as given in Table 2.3, standard treatment of ditches consists of grassing and mulching. For higher design velocities, sodding, ditch paving, or other form of lining consistent with Tables 2.3 and 2.4 shall be provided.</td><td>CH 3 AASHTO Highway Drainage Guidelines</td></tr>
<tr><td>Chapter 4 Roadside Design<br>Page 4-6<br>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.</td><td>Pipe material selection shall be in accordance with Chapter 6 of this manual.<br><br><table><tr><th>TYPE STORM DRAIN</th><th>FREQUENCY</th></tr><tr><td>General design</td><td>3-year</td></tr><tr><td>General design work that involves replacement of a roadside ditch with a pipe system by extending side drain pipes.</td><td>10-year</td></tr><tr><td>General design on work to Interstate Facilities</td><td>10-year</td></tr><tr><td>Interstate Facilities for sag vertical curves which have no outlet other than a storm drain system, and for the outlet of systems requiring pumping stations</td><td>50-year</td></tr></table><br>Site-specific factors may warrant the use of an atypical design frequency</td><td>Ch 9 AASHTO Highway Drainage Guidelines</td></tr>
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<tr><th>Greenbook</th><th>FDOT Drainage Manual</th><th>AASHTO</th></tr>
<tr><td>Chapter 4 Roadside Design<br>Page 4-6<br>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 roadsides shall be traversable. A small area around the inlet should be paved to improve drainage and to prevent local erosion. Corner radii inlets should be avoided as they hinder pedestrians, create ponding, create maintenance problems, and complicate intersection design.</td><td>Inlet type, location and spacing shall consider the following:<br>1. Inlet capacity and width of spread.<br>2. Movement of vehicles to and from adjacent property on turnouts.<br>3. Pedestrian and Bicycle Safety<br>4. Maximum pipe length without maintenance access (section 3.10.1)<br>5. Roadway Geometry<br>6. Hydraulic efficiency of the system<br>7. Potential for flooding of off-site property<br>Inlets shall be placed at all low points in the gutter grade, and as appropriate at intersections, median breaks, and on side streets where drainage would adversely flow onto the highway pavement.<br>For curb inlets on a continuous grade, a maximum spacing of 300 feet shall be used unless spread calculations indicate greater spacing is acceptable. Spread standards are provided below in Section 3.9.<br>Curb inlets shall also be placed at the critical section prior to the level section in superelevation transitions, to avoid concentrated flows across the pavement. Curb inlets shall not be located within handicap drop curb locations. The use of inlets on returns shall be justified and documented. Inlets in sag vertical curves that have no outlet other than the storm drain system and do not have open throats, should have flanking inlets on one or both sides. These flanking inlets should be located to satisfy spread criteria when the sag inlet is blocked. Even with an open throat inlet, flanking inlets should be considered when the minimum gutter grade cannot be met.<br><br>(Additional maintenance considerations are provided in the drainage manual)</td><td>Ch 9 AASHTO Highway Drainage Guidelines</td></tr>
<tr><td>Chapter 5 Pavement Design<br>Page 5-1<br>Provide drainage to promote quick drying and to reduce the likelihood of hydroplaning and splashing.</td><td>The spread resulting from a rainfall intensity of 4.0 inches per hour shall be limited as follows.
<table>
<tr><th>Typical Section Condition</th><th>Design Speed (mph)</th><th>Spread Criteria*</th></tr>
<tr><td>Parking Lane or Full Width Shoulders</td><td>All</td><td>No encroachment</td></tr>
<tr><td rowspan="3">All Other</td><td>Design speed ≤ 45</td><td>Keep ½ of lane clear</td></tr>
<tr><td>45 < Design Speed ≤ 55</td><td>Keep 8‟ of lane clear</td></tr>
<tr><td>Design Speed > 55</td><td>No encroachment</td></tr>
</table>
* The criteria in this column applies to travel, turn, or auxiliary lanes adjacent to barrier wall or curb, in normal or super elevated sections.</td><td>Ch 9 AASHTO Highway Drainage Guidelines</td></tr>
</table>

| Greenbook | FDOT Drainage Manual | AASHTO |
|---|---|---|
| Chapter 17 Bridges and Other Structures<br>Page 17-4<br>*All bridge designs shall include a drainage design that is specific to its site. Conveyance of drainage off the bridge roadway should be designed to meet spread standards contained in the Department's Drainage Manual, Chapter 3 and may include open systems (i.e., scuppers) or closed systems (i.e., inlets and pipes) based on environmental permitting restrictions. Drainage from the bridge should not drop onto traffic below.* | Greenbook refers to the Drainage Manual | Ch 7 AASHTO Highway Drainage |
| Chapter 17 Bridges and Other Structures<br>Page 17-5<br>*A hydrologic/hydraulic analysis shall be performed to quantify expected stages and flows at the bridge site. Anticipated substructure scour shall be developed for the following:*<br>*• Worst case scour condition up through the 100-year frequency flood event (Scour Design Flood Event).*<br>*• Worst case scour condition up through the 500-year frequency flood event (Scour Check Flood Event).*<br>*Any exceptions to the standards above hydrologic/hydraulic and scour analysis requirements shall be approved in writing by the local Department District Structures and Facilities Engineer. Methodology for computing bridge hydrology/hydraulics and bridge scour should follow the guidelines set forth in the most recent versions of the Department's "Drainage Manual."* | Greenbook refers to the Drainage Manual | Ch 7 AASHTO Highway Drainage |
| Optional Materials not covered in Greenbook. | Chapter 6 of Drainage Manual – Optional Culvert Materials<br>The Department also provides a service life estimator tool on the Drainage website. | |

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# *Other Subcommittee Reports*

Link to Technical Reviewer Comments

Issue # 8: Workshops for 2010 Updates

David O'Hagan discussed the **Comments made by Department Technical Reviewers** on each chapter of the Florida Greenbook. The comments were based on indentifying issues for the subcommittees to consider for future updates to the Florida Greenbook.

The Chapter Subcommittees worked in groups to discuss the comments made through the Department technical review, and any other needed changes. Then the Subcommittees were asked to develop and report back plans for needed updates to each chapter.

Issue # 9: Chapter Author Reports

Introduction

Although there is no subcommittee for the Introduction, the terms defined here will need to be updated in coordination with the other chapter updates. All existing definitions will need to be reviewed and updated as necessary.

Chapter 1: Planning

A. Move 1A (INTRODUCTION) and 1D (OPERATION) into Guidebook
B. Move 1B and 1C into Chapter 2

Chapter 2: Land Development

A. Chapter 2 will be reviewed by the chapter subcommittee.
B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 3: Geometric Design

A. Chapter 3 will be reviewed by the chapter subcommittee.
B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.
C. Coordinate and integrate changes from other chapters like TND, Residential Street Design, Maintenance, Pedestrian Facilities, etc., and check for any conflicts.
D. Revisit definition of "Reconstruction".
E. Update section on Roadside clear zone.
F. Evaluate intersection sight distance criteria as it applies to driveways.

Chapter 4: Roadside Design

A. Chapter 4 will be reviewed by the chapter subcommittee.
B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

C. A "Chapter Author" will need to be identified.

D. Evaluate the inclusion of new or updated references or studies relating to roadside design.

Chapter 5: Pavement Design and Construction

A. Safety edge will be added as a treatment to mitigate pavement edge drop-offs.

B. Further discussion may be needed to address guidance for unpaved roads. ***{****To follow up, this issue may need to be addressed in other chapters. Perhaps AASHTO's* ***"Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT <= 400) 2001"*** *could be considered as a reference since it addresses the design of unpaved roads. The US EPA also has a document available titled* ***"Recommended Practices Manual: A Guideline for Maintenance and Service of Unpaved Roads"*** *and is available online at:* ***http://water.epa.gov/polwaste/nps/unpavedroads.cfm*** ***}***

Chapter 6: Roadway Lighting

A. Section E – Uniformity of Illumination: change the first sentence of the second paragraph that reads "uniformity ratio of 10:1 should not be exceeded." to "uniformity ratio of 10:1 shall not be exceeded."

B. Section H – Light Poles: paragraph two will be reworded will be reworded as most conventional lighting is mounted on breakaway poles.

Chapter 7: Rail Highway Grade Crossings

A. Add a new "Section E" that will describe the need to address railroad crossing upgrades, as per Title 23 U.S.C. on Federal-aid projects.

B. Add language that describes the 2009 MUTCD requirements for passive crossings.

C. Evaluate language in Chapter 5 of the 2009 MUTCD for requirements at railroad crossings on low volume roads.

D. Section B2 – Update some Rule references and references to the Design Standards, Indexes 600 and 280.

E. Section B2 - Modify language in the 3rd line of the top paragraph.

F. Incorporate 2009 MUTCD requirements into Figure 7-2 "Grade Crossing Configuration".

Chapter 8: Pedestrian Facilities

A number of changes had already been discussed at previous Committee Meetings, and the subcommittee felt these changes were close to being ready for voting. An additional Committee Meeting will be scheduled to review and vote on these changes. ***{To follow up, this meeting was held on April 29, 2010 and the revisions to Chapter 8 were approved by vote as amended.}***

Chapter 9: Bicycle Facilities

A. Chapter 9 will be reviewed by the chapter subcommittee.

B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 10: Maintenance

A. Add federal-aid (Allen and Scott)

B. Maintenance Resurfacing (Allen)

C. Rename chapter to "Maintenance and Resurfacing"

D. ADA and Curb-cut Ramps

Chapter 11: Work Zone Safety - no changes proposed since this chapter has just been updated for 2010.

Chapter 12: Construction – Chapter author, Tanzer Kalayci, will review and offer comments.

Chapter 13: Public Transit:

A. Chapter 13 will be reviewed by the chapter subcommittee.

B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 14: Design Exceptions

A. Chapter 14 will be reviewed by the chapter subcommittee.

B. The comments from the technical reviewers will be reviewed by the committee and addressed in the next update.

Chapter 15: Traffic Calming

A. Move 15A (INTRODUCTION) and 15B (PLANNING CRITERIA) into Guidebook

B. Move 15C (INAPPROPRIATE TRAFFIC CALMING TECHNIQUES), 15D (APPROPRIATE TRAFFIC CALMING TECHNIQUES) and 15E (OTHER SOURCES) into Chapter 16.

Chapter 16: Residential Street Design – Chapter 16 will be reviewed by the chapter subcommittee.

Chapter 17: Bridges and Other Structures

A. Chapter 17 will be reviewed by the chapter subcommittee.

B. Improve guidance in the following sections:

   a. C.4.a: Pier Locations - add reference to FDOT fender design standard.

   b. C.4.b: Vessel Impact - add reference to FDOT vessel traffic data for ships and barges.

   c. H.2: Sign, Lighting and Traffic Signal Supports – add guidance for Dynamic Message Signs.

   d. Add guidance for hurricane susceptibility to storm surge.

C. Add information on policy for inspecting pedestrian bridges

D. These updates will be submitted for ballot next year along with the revision already proposed.

Chapter 18: Signing and Marking

A. Table 4D-1 in old manual is now Table 4D-2 in 2009 MUTCD

B. Revise wording of C.5 to change “should” to “shall”

C. These revisions can be ready for balloting next year.

Chapter 19: Traditional Neighborhood Development (TND) Subcommittee – complete the new guidebook.

9. The chapter workshop discussions varied in duration, and were permitted to continue past the allotted time slot so their progress would not be interrupted. Although many of the technical reviewer comments were discussed briefly, these will serve as a basis for further subcommittee meetings and will not be incorporated into the Florida Greenbook until the next cycle (post-2010). As each group finished, the Chapter Authors were asked to hand their reports in to David O’Hagan (or submit by email). The workshop groups that had finished were then permitted to leave.