MINUTES – Florida Greenbook Advisory Committee Meeting
Holiday Inn - Oceanfront, Cocoa Beach, March 9, 2005

1. Rob Quigley opened the meeting by introducing himself and going over the **agenda** and handouts that included a **Meeting Package** and a **Final Draft 2005 Florida Greenbook** (dated 3/5/2005) **(*Committee Member Access Only*)**.

2. Meeting **attendees** introduced themselves.

3. Rob discussed Committee Member changes (since last meeting): Andres Garganta (replaced Eugene Bechamps) and Richard McCubbin (replaced John Pappas).

4. Rob asked the committee to review their **member information** and provide any updates prior to publication the Final version of the 2005 Florida Greenbook. (***Updated Member Information is posted on the Florida Greenbook web page***).

5. Rob briefly reviewed the **March 2004 meeting minutes**. No comments.

6. Rob discussed Florida Greenbook ownership, DOT's role and the Committee's role and responsibilities. Rob also noted that active Committee participation is essential. Joy Puerta asked if the Chapter Authors could get electronic versions of each of their respective chapters. (***This will be done once the 2005 edition is finalized***).

7. Rob gave a status of the 2005 Florida Greenbook. It will be sent to FDOT's Legal Office for review after any final comments from this meeting have been incorporated (***this Version dated 3/29/2005* (*Committee Member Access Only*) was submitted on 3/30/2005***). Once the Legal Office's comments have been addressed, the Florida Greenbook will be sent to the Joint Administrative Procedures Committee (JAPC) for review. After all review comments have been addressed, the **Rulemaking Process** will begin (Rob also gave a brief overview of this process).

8. Rob mentioned the Travel Packages that were handed out and the information required for reimbursement.

9. Rob discussed with the committee **Duane Brautigam's presentation** from the 2003 meeting regarding Local Agency Specifications. Many of the same questions were asked this time that were asked in 2003. Several members discussed how they are handling specifications that FDOT no longer maintains. Most members agreed that something needs to be done to address the issues that keep coming up regarding these specifications used by local agencies. The Committee decided to form a "Local Agency Specifications" subcommittee to define the problems and recommend solutions. (***Updated Subcommittee Membership information is posted on the Florida Greenbook web page***).

10. Rob discussed an issue that had recently come up regarding horizontal clearance requirements for canals. The Meeting Package included a **summary** of crash reports involving run off the road into canals that resulted in fatalities as well as some **draft language** on canal hazards proposed for Chapter 4. Also provided in the Meeting Package were the current Plans Preparation Manual **(PPM) sections on Canal Hazards**. The committee evaluated the crash summary and determined that the canal horizontal clearance was not a contributing factor in any of the cases. Because of this, the committee elected to make no changes the current section on Horizontal Clearance for Roadside Canals.

11. Rob discussed with the committee **Tom Bane's presentation** from the 2003 meeting regarding Horizontal Clearance & Clear Zone. Also provided in the Meeting Package were the current PPM sections on **Horizontal Clearance** and **Clear Zone** (which differ slightly from the presentation) and **Index 700** of the Design Standards. Rob covered the

changes made to the PPM in 2003 and how they differ from the way the Florida Greenbook addresses horizontal clearance. The committee agreed that some proposed language should be drafted for the next meeting for the committee to consider for the 2007 edition of the Florida Greenbook. The proposed language should also address deep standing water in clear zone, bus bench requirements, and minimum clearance measured from bike lanes.

12. Amy Datz (FDOT Transit Office), Rick Sparer (Earth Tech), and Lynn Kendrick (Earth Tech) handed out a **summary** of the Transit Safety Study and an **Outline** for the Chapter 13 changes. They then discussed the proposed changes to **Chapter 13** (addressing bus stops and bus bays) as well as **additional edits** that were not in the original meeting package. The committee had some good comments and was in favor of the additions. The committee agreed that the chapter needs to be fine-tuned by the Chapter Subcommittee and presented at the next meeting. Any further comments may be submitted to **Amy Datz**.

13. Technology Transfer Center (T^2) representative Nina Barker and consultant Allen Schrumpf (DRMP) handed out **Draft Review Material** for their planned Florida Greenbook Seminar Series. They discussed the program and asked the committee to review the draft material for the planned training series and send comments to **Nina and Allen.**

14. David O'Hagan of the State Structures office gave a **Presentation** on the effects of last year's hurricanes on Florida structures. This included discussions on the Escambia Bay Bridge, as well as sign, signal, and lighting support structures. David also discussed some changes that are being worked on regarding wind maps, costal structures, and wind loading.

15. Jim Mills gave a **Presentation** on current FDOT design issues These issues included information on cable barrier systems, low profile barriers, Type K barriers, truncated domes, patterned/textured pavement, pavement markings/nighttime visibility, and the 2006 Design Standards.

16. Workshop on changes presented in the **Draft 2005 Florida Greenbook** (***Committee Member Access Only***) that were new since the last meeting. Items discussed at the previous meeting that had been incorporated were the changes in intersection sight distance based on the 2001 AASHTO Greenbook, changes to the figures in Chapter 9 based on the 2003 MUTCD, and other changes to Chapter 9 regarding railroad crossings and rumble strips. The Committee had several comments which will be addressed for the final version.

17. Open discussion / Committee Member issues.

18. **Subcommittee membership** was briefly reviewed and updated as well. (***Updated Subcommittee Membership information is posted on the Florida Greenbook web page***).

19. Rick Renna discussed High Density Polyethylene Pipe.

20. Rob discussed the **tentative schedule** for the 2007 Florida Greenbook.

21. Travel Form Reminder. Contact **Felicia Bush** if you have any questions.

22. Discussed improvements for the next meeting: Suggestions included meeting in a larger, "squarer" room with a bit more table space and finding out if future meetings could qualify for Continuing Education Credits.

23. Meeting adjourned.

Florida Greenbook Advisory Committee Meeting

March 9, 2005

Attendee Sign In

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19	Annette Brennan	FDOT D5	386-943-5543
20	Audees Gargantz	Consul-Tech	305 599-3141

Florida Greenbook Advisory Committee Meeting

March 9, 2005

Attendee Sign In - Continued

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44			
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March 9, 2005

Florida Greenbook Advisory Committee Meeting

Holiday Inn – Oceanfront
Cocoa Beach, Florida

Contents

General Information

AGENDA

FLORIDA GREENBOOK ADVISORY COMMITTEE MEETING

Wednesday, March 9, 2005 8:00am – 5:00pm

Holiday Inn Cocoa Beach Oceanfront Resort
1300 North Atlantic Avenue
Cocoa Beach, FL 32931

(321)783-2271

8:00 – 8:15	General Information • Introductions • Committee Member Changes • Review March 2004 Meeting Minutes • Discuss Florida Greenbook Ownership • 2005 FGB Status / Rulemaking Process
8:15 – 9:00	Greenbook QPL / Specifications Issues
9:00 – 9:45	Horizontal Clearance issues (Rob Quigley) • Canal Hazard Section • Horizontal Clearance / Clear Zone Definitions
9:45 – 10:00	Morning Break
10:00 – 11:00	Transit - Bus Bay and Bus Bulb Design (Amy Datz / Richard Sparer)
11:00 – 11:45	T^2 Training Discussion (Nina Barker & Allen Schrumpf)
11: 45 – 1:15	Lunch
1:15 – 2:00	Hurricane Structural Damage Presentation (David O'Hagan)
2:00 – 3:00	Current FDOT Issues (Jim Mills / Brian Blanchard) • Cable Guardrail • Low Profile Barriers / Type K Barriers • Truncated Domes • Patterned/Textured Pavement • Pavement Markings / Nighttime Visibility • 2006 Design Standards
3:00 – 3:15	Afternoon Break
3:15 – 4:40	Roundtable discussion / Committee Member Issues
4:40 – 4:50	Review / Update Subcommittee Assignments
4:50 – 5:00	Closing items • Tentative Schedule for 2007 Manual • Travel Form Reminder / Reimbursement Info • Meeting Critique

Time slots for the agenda are tentative and could change slightly due to individual schedules of guests.

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Minutes – Florida Greenbook Advisory Committee Meeting
Crowne Plaza - Westshore, Tampa, March 17, 2004

1. Brian Blanchard opened the meeting by introducing himself and going over the **agenda**.
2. Meeting **attendees** introduced themselves.
3. Brian discussed Committee Member changes (since last meeting): Bernie Masing (replaced Mike Peterson), Harold Desdunes (replaced Felix Blanco), and Jimmy Pitman is looking for a replacement for Fred Kyle (possibly John Pappas, or other engineer from the City of Jacksonville). New Associate Members include Amy Datz and Billy Hattaway.
4. Rob Quigley asked the committee to review their **member information** and provide any updates.
5. Rob briefly reviewed the **March 2003 meeting minutes**. No comments.
6. Brian discussed Florida Greenbook ownership, DOT's role and the Committee's role. Brian also noted that active Committee participation is essential, and we may have to evaluate members who have not shown participation in recent years. Brian also mentioned that we might need to define in the Greenbook the roles of the Chapter Subcommittee Authors and Co-Authors.
7. Rob discussed the new **schedule** for the 2004 Florida Greenbook needed to incorporate the new Chapter 17 and the intersection sight distance changes. He also pointed out that the 2004 Florida Greenbook (and future editions) would only be available electronically. Notification of future updates will be provided to registered users via email or postcard. (Hardcopies will still be sent to Committee Members)
8. Rob gave a brief overview of the **Rulemaking Process**.
9. William Nickas, and David O'Hagan (Central Office Structures Design) and Rick Renna (Central Office Drainage Design) discussed the new **Chapter 17** and the background issues that lead to the development of this chapter. The previous requirements in the Florida Greenbook were very minimal, and some of the issues discussed stemmed form lack of specific requirements in certain areas. Some of these issues stemmed from the fact that all public bridges get turned over to the DOT for inspection, and there have not been specific requirements for local bridges. The problems encountered with non-state bridges include improper or lack of pile records, scour calculations, load rating information, and traffic railings.

   Since this was the first opportunity the Committee had to discuss this chapter, the Committee agreed to send the chapter for review again (by 4/17/04), after the comments from the meeting are incorporated.

10. Workshop on submitted comments and other changes presented in the **Draft 2004 Florida Greenbook** that were new since the last meeting. One item discussed at the previous meeting that had not been completed yet was the changes in intersection sight distance based on the 2001 AASHTO Greenbook. These will be sent out for the Committee to review (by 4/17/04) prior to finalization of the 2004 Florida Greenbook.

11. Ed Rice (State Safety Office) was unable to attend, but he had wanted to discuss things that came out of a recent Florida At-Risk Driver Council meeting, specifically to find out whether any local agencies had adopted the FDOT design standards for older drivers, and whether the Committee would like to include those standards in the Florida Greenbook. Rob Quigley discussed this information and handed out a copy of the FDOT Traffic Operations web page on the DOT's **Elder Road User Program.** Several counties had adopted some of the standards for elder road users, but not necessarily all of it. The consensus was that the local agencies are aware of the improved criteria for elder road users, but they did not want to standardize them in the Florida Greenbook.

12. Open discussion / Committee Member issues.

13. Rob briefly discussed the **Florida Greenbook web page**, its content, and recent changes.

14. Subcommittee membership was briefly reviewed and updated as well. This included enrollment for the new Chapter 17 Subcommittee. Also, there had been some discussion in the past regarding a Product Review Subcommittee, but the Committee decided to put this on hold until the next meeting.

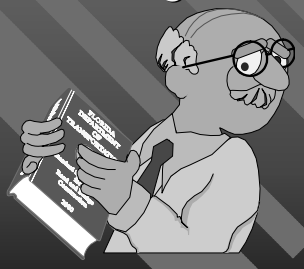
15. Travel Form Reminder. Contact **Felicia Bush** if you have any questions. Brian also mentioned that since the number of Associate Members continues to grow, his office will no longer be able to reimburse travel expenses for them.

16. Discussed improvements for the next meeting: Suggestions for a larger room with a bit more "elbow room."

17. Meeting adjourned.

Specs & Products for Local Agencies

Specifications & Products for Local Agencies



Duane F. Brautigam, P.E.
State Specifications Engineer

Specifications & Products for Local Agencies

- New Directions for FDOT Specifications: What Does This Mean for Local Agencies?
- The Qualified Product List (QPL): The New Look of the QPL and Looking at New Options for Local Agencies

The Restaurant Analogy

- What Do We Want?
- How Do We Order It?
- How Do We Know If We Got What We Ordered?
- What Happens If We Didn't Get What We Ordered?
- How Do We Pay For What We Got?

New Directions for FDOT Specifications

- CQC - Contractor Quality Control Specifications
- Developed as "QC 2000"
- Contractor Performs all QC Testing
- Verification & Resolution Testing Levels
- Training & Certification
- Laboratory & Field

New Directions for FDOT Specifications

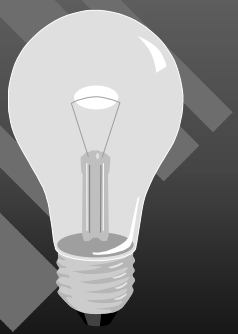
- Using the State Specs Office Website
- Electronic Specifications Packages
- Planned Publication of the 2004 Standard Specifications for Road & Bridge Construction Book

New Options for Local Agency Specifications

- Where Does That Leave Local Agencies?
- Specs Deleted from the 2004 Book
- Base Specs
- Concrete
- Earthwork
- Asphalt
- Superpave – Pre CQC
- What Else??

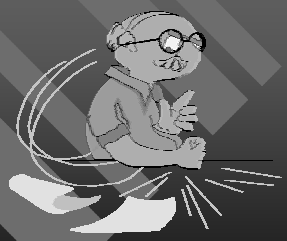
New Options for Local Agency Specifications

- The Greenbook Repository
- A Library for Local Agency Specs from a Link on the FDOT State Specs Office Web Site
- Available for Agencies, Designers & Contractors
- Flexibility in Format
- No Longer FDOT Specs for Coordination & Updating



New Options for Local Agency Specifications

- What DOT Can Do:
- "Outreach" Workshops
- Training Sessions, including Hands-On Computer Training in Spec Package Preparation
- Use of the FDOT Macro for Spec Package Preparation



The Qualified Products List The New Look QPL

- THE QPL IS (In 25 Words or Less):
- "A List of Pre-Approved Products That May Be Relied Upon as Meeting FDOT Specifications, Standards or Other Specified Criteria"
- The Most Important Thing You Should Remember About the QPL:
- It All Starts with Defining the Standard
- "Show Me the Spec"

The Qualified Products List
The New Look QPL

Common QPL Misconceptions:

- A List of "Favorite Things"
- If a Product is Not on the QPL, It Cannot be Used
- All Manufactured Products are Covered by the QPL
- QPL is a Way to Specify a Proprietary Product
- QPL is an Endorsement of Products by FDOT

How about New Widgets ????

Looking at New Products
The Historic Perspective

Arbitrary QPL listings

Provisional Approvals

Evaluation - a Part Time Job

A Long and Frustrating Process

Inconsistent Results

Try on Existing Jobs by Supplemental Agreement

Work Plan on New Jobs

Looking at New Products
A New Perspective for DOT

Separate the Processes (QPL; New)

Education and Training

Committee for Product Review (CPR) to Oversee

Evaluation of New Products for Potential Use on DOT system

How About Other Uses?

Looking at New Products New Options for Local Agencies

- How About Local Agency Use?
- Evaluating Potential Use on the Local System?
- The “Greenbook QPL”??
- The “Greenbook CPR”??

Two New Concepts for the Greenbook Committee

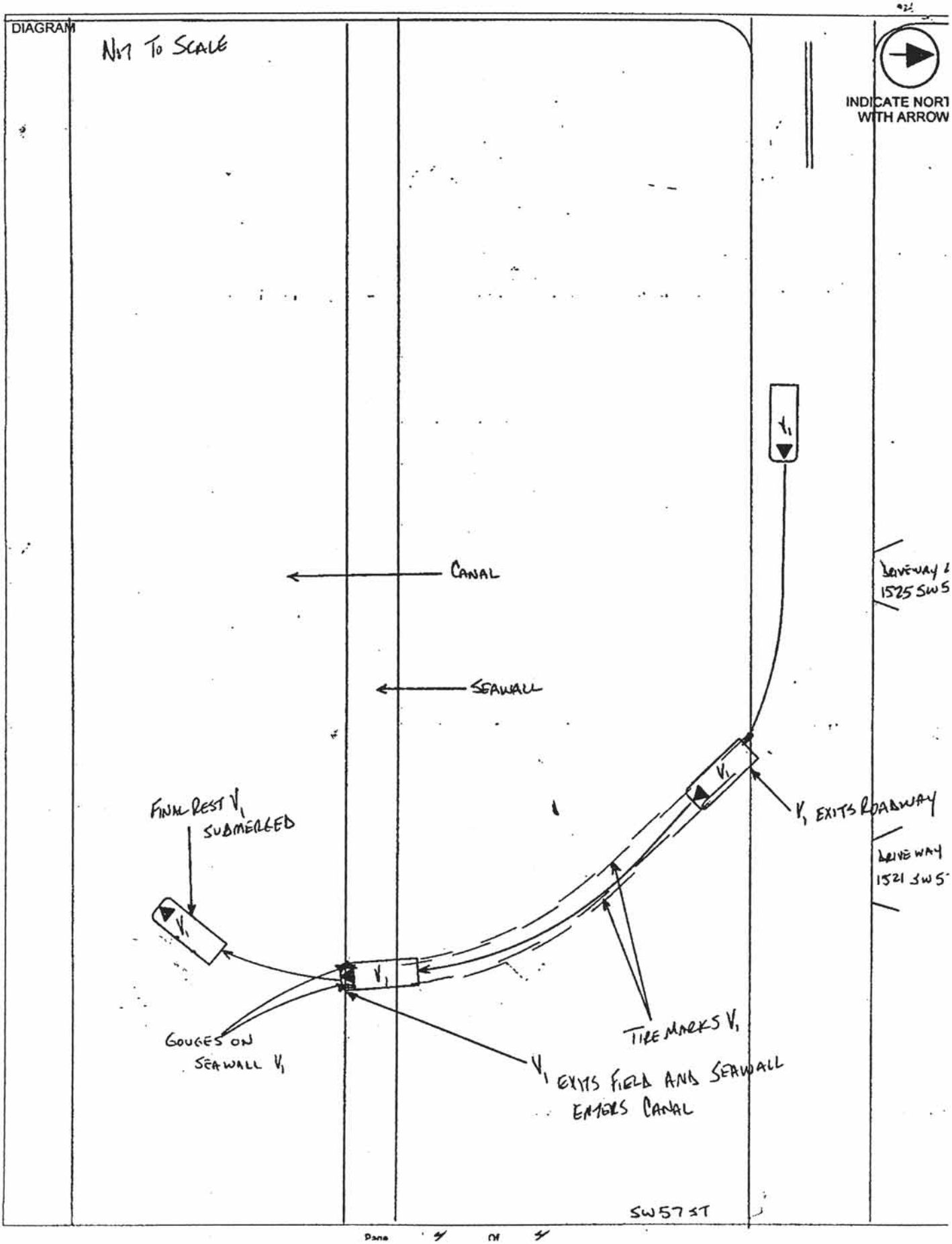
- Back to the Restaurant Analogy:
- Is There Somehow We Can Help You with YOUR Order??
- Where Do We Go From Here??

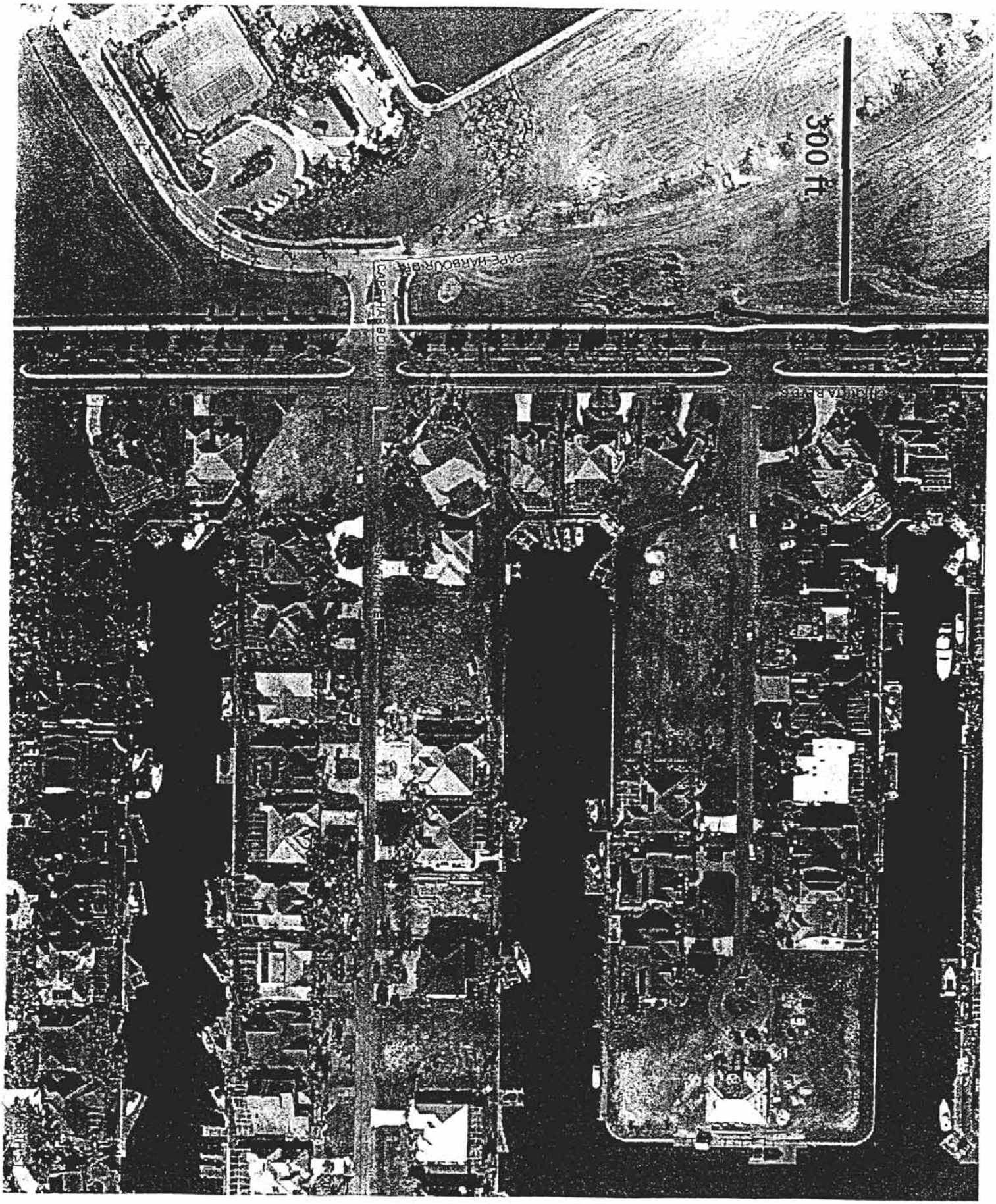
Roadside Canals / Horizontal Clearance & Clear Zone

16 "OFF SYSTEM" FATAL CRAHSES INVOLVING RUN-OFF-ROAD INTO CANAL														
CRASH #	COUNTY	DATE	TIME	ROAD	POSTED SPEED	EST. SPEED	DESIGN SPEED	OFFSET RDWY	WEATHER	ROAD SURFACE	CONTRIBUTING FACTOR	Alcohol/ Drugs	Comments	
70473453	Palm Bch	1/15/2003	6:50 AM	Miami Canal Rd	45	35		14 ft	Cloudy	Dry	Careless driving	pend.		
70473455	Palm Bch	2/4/2003	5:45 AM	Dirt Road	na	5	uk	uk	Fog	Dry	Careless driving	no		
70493335	Palm Bch	2/11/2003	4:45 AM	Hatton Hgwy	55	0			Clear	Dry	Obstructing traffic	no		
72964787	Palm Bch	9/22/2003	1:32 PM	Lake Worth Rd	45	45			other	other	other	pend.		
72970413	Palm Bch	10/3/2003	3:30 PM	Miami Canal Rd	35	pen			Clear	Dry	Exceeding speed	pend.		
70318870	Palm Bch	11/9/2003	9:30 AM	Community Dr	35	30			Clear	Dry	Careless driving	pend.	"T" inters.	
72684210	Lee	1/28/2003	12:18 PM	SW 57th St	na	uk	uk	130 ft.	Clear	Dry	medical	uk		photo
71024882	Lee	2/8/2003	4:27 AM	CR 865 (Bonita Bch Rd)	45	48	55		Cloudy	Dry	Careless driving	yes	"T" inters.	photo
75216890	Lee	11/26/2003	11:45 PM	NW 13 St	30	na	uk	100 ft.	Clear	Dry	Disregard Stop Sign	yes	"T" inters.	photo
75303822	Lee	12/21/2003	3:00 AM	Bass Road	55	65	60	50 ft.	Clear	Dry	Careless driving	yes	curve	photo
70986708	Collier	3/7/2003	1:29 PM	CR 31	45	45		33 ft.	Clear	Dry	medical	no		photo
70987701	Collier	12/13/2003	4:30 AM	CR 846 (Immokalee Rd)	55	55		50 ft.	Clear	Dry	uk	yes		photo
72433507	Miami-Dade	4/20/2003	11:00 PM	SE 24 St	40	uk			Clear	Dry	uk	pend.	curve	
70408940	Miami-Dade	9/2/2003	8:10 PM	NW 138 St	na	uk	30 (Res)	38 ft.	Cloudy	other	uk	uk		
70805952	Indian Rv	10/22/2003	5:40 PM	4th St (Dirt road)	35	45	uk	uk	Cloudy	Dry	Careless driving	pend.		
70445129	St. Lucie	12/12/2003	9:00 PM	Emerson Ave (Dirt Road)	55	55	uk	uk	Clear	Dry	Exceeding speed	pend.		

DIAGRAM

NOT TO SCALE

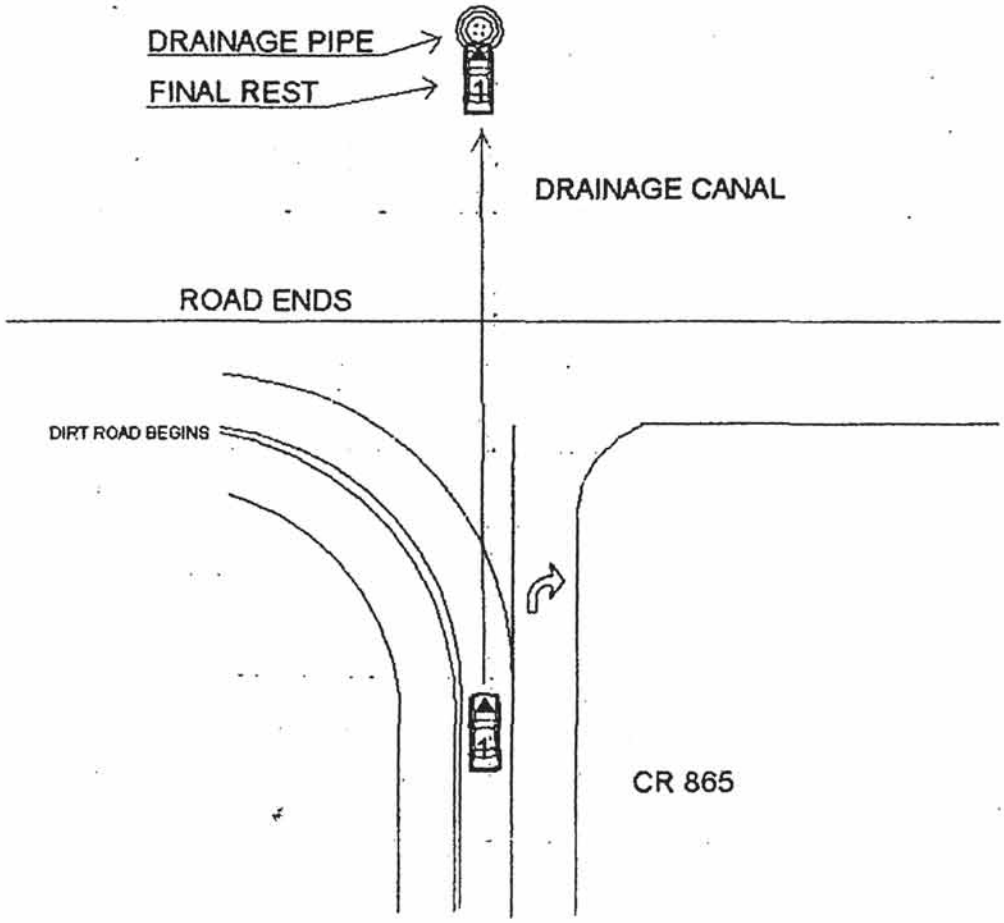


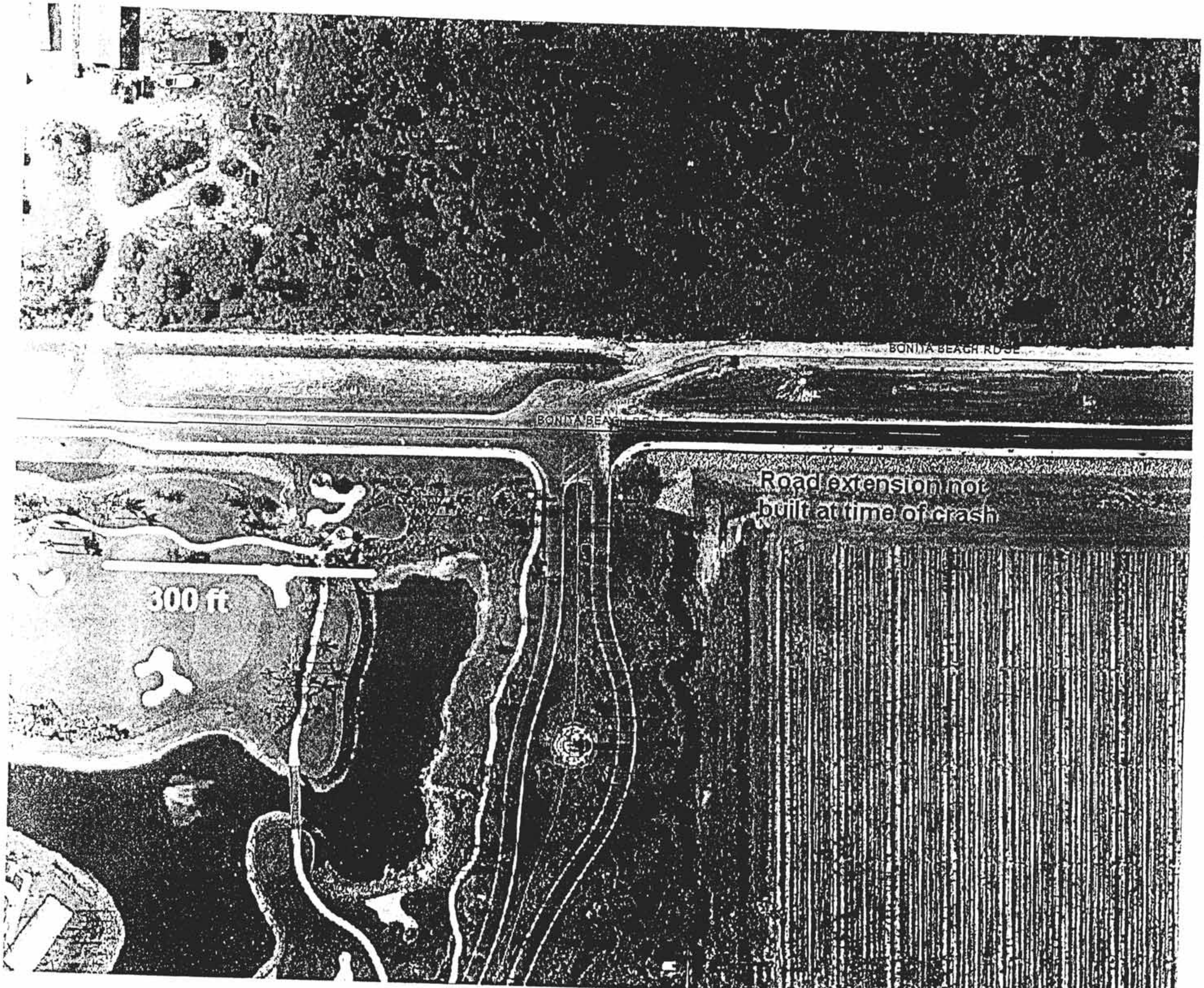


SW 57th Street

DIAGRAM

INDICATE NORTH WITH ARROW

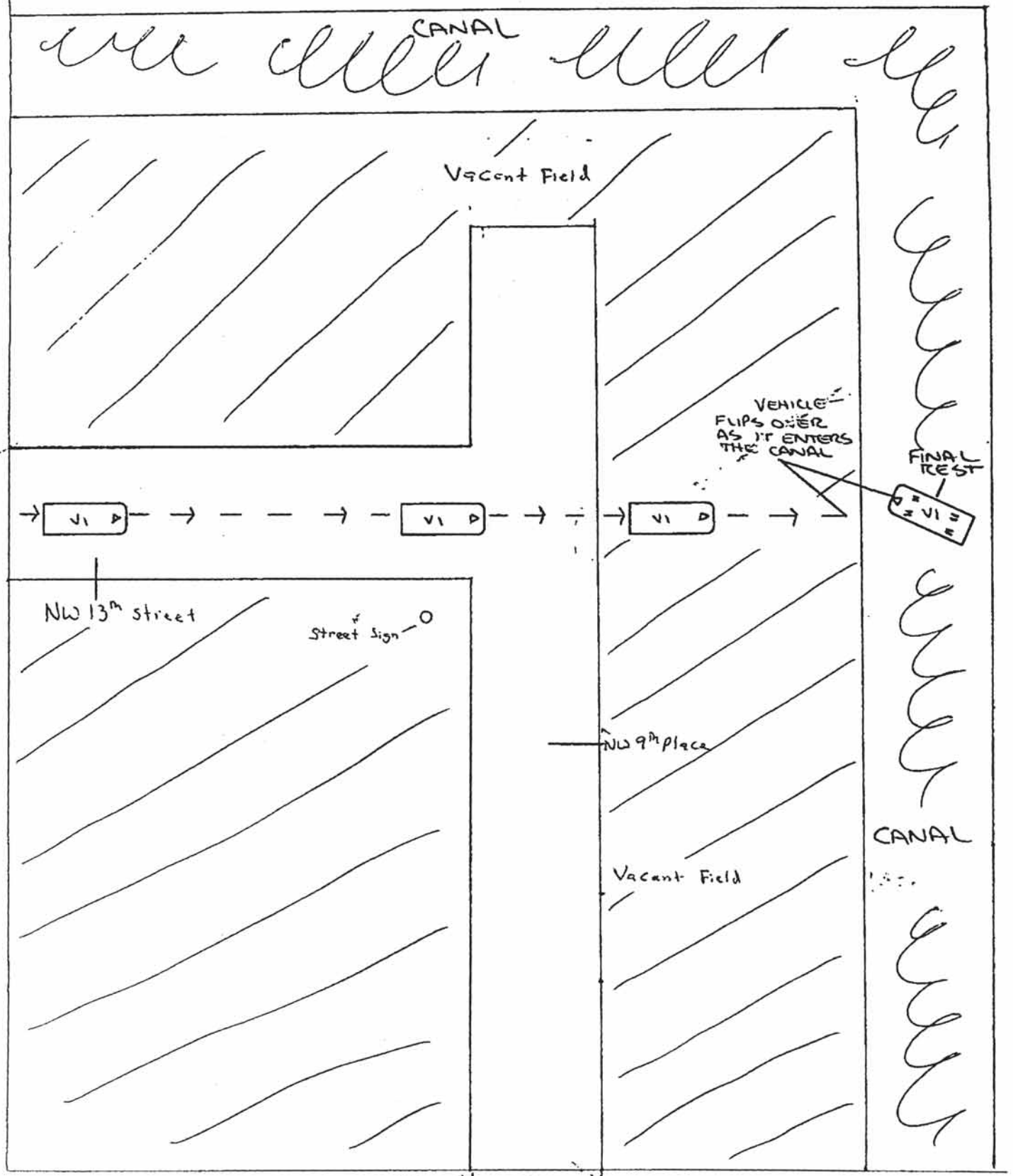


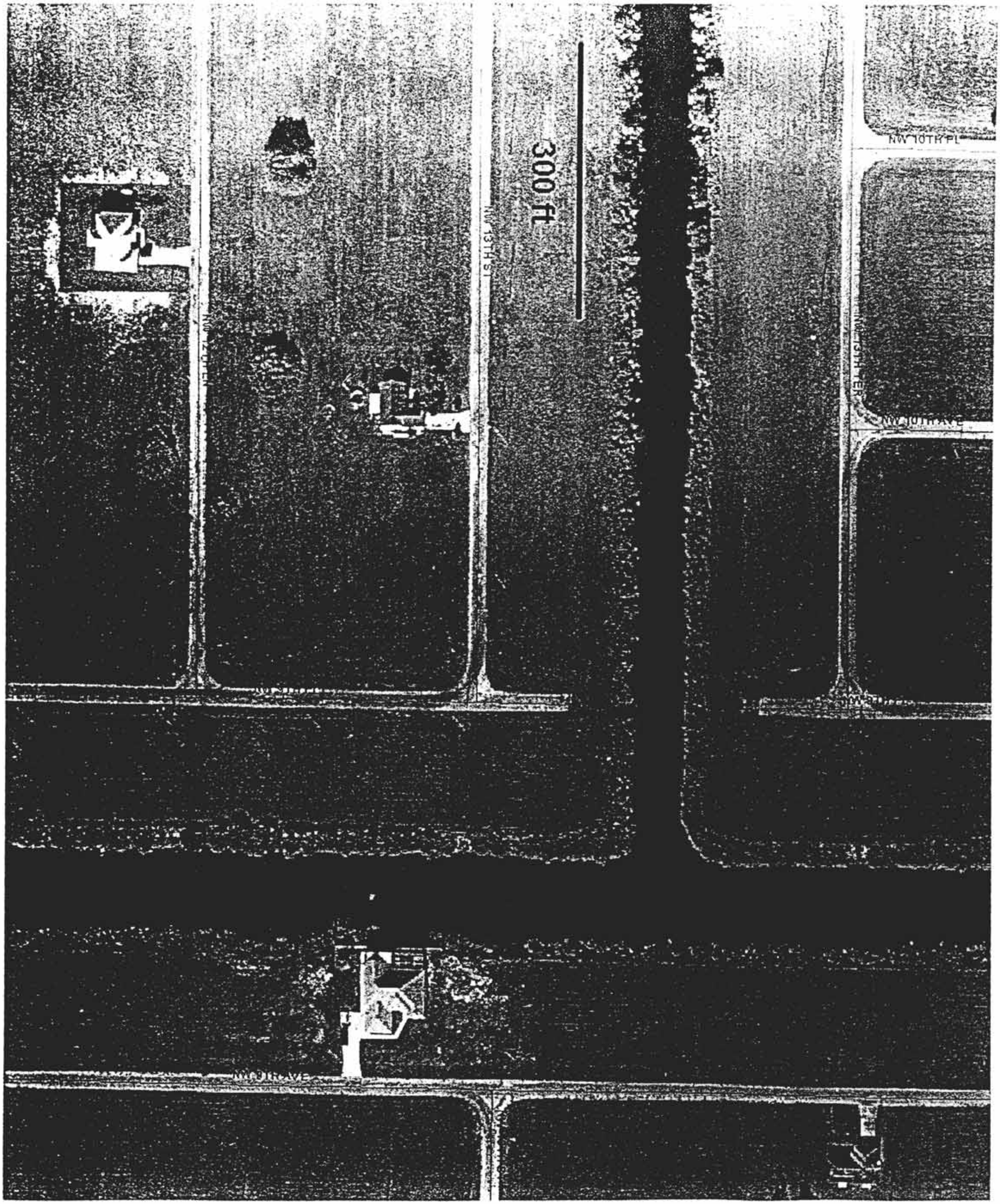


BONITA BEACH RD SE
BONITA BEA
Road extension not
built at time of crash
300 ft

DIAGRAM Not to scale

INDICATE NOR
WITH ARROW

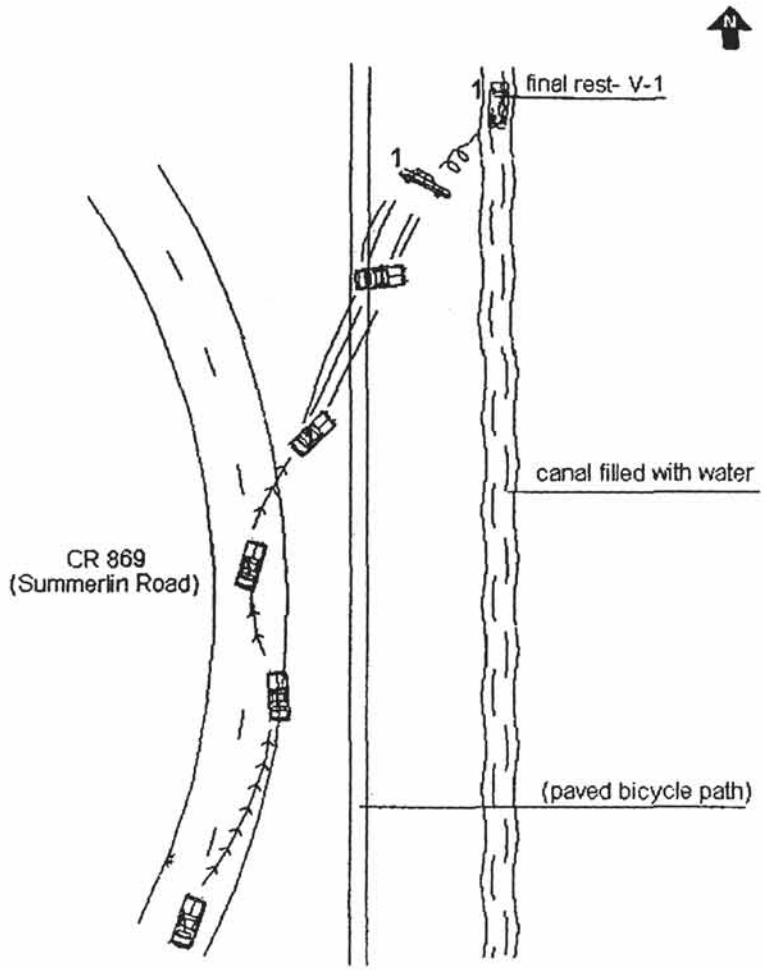


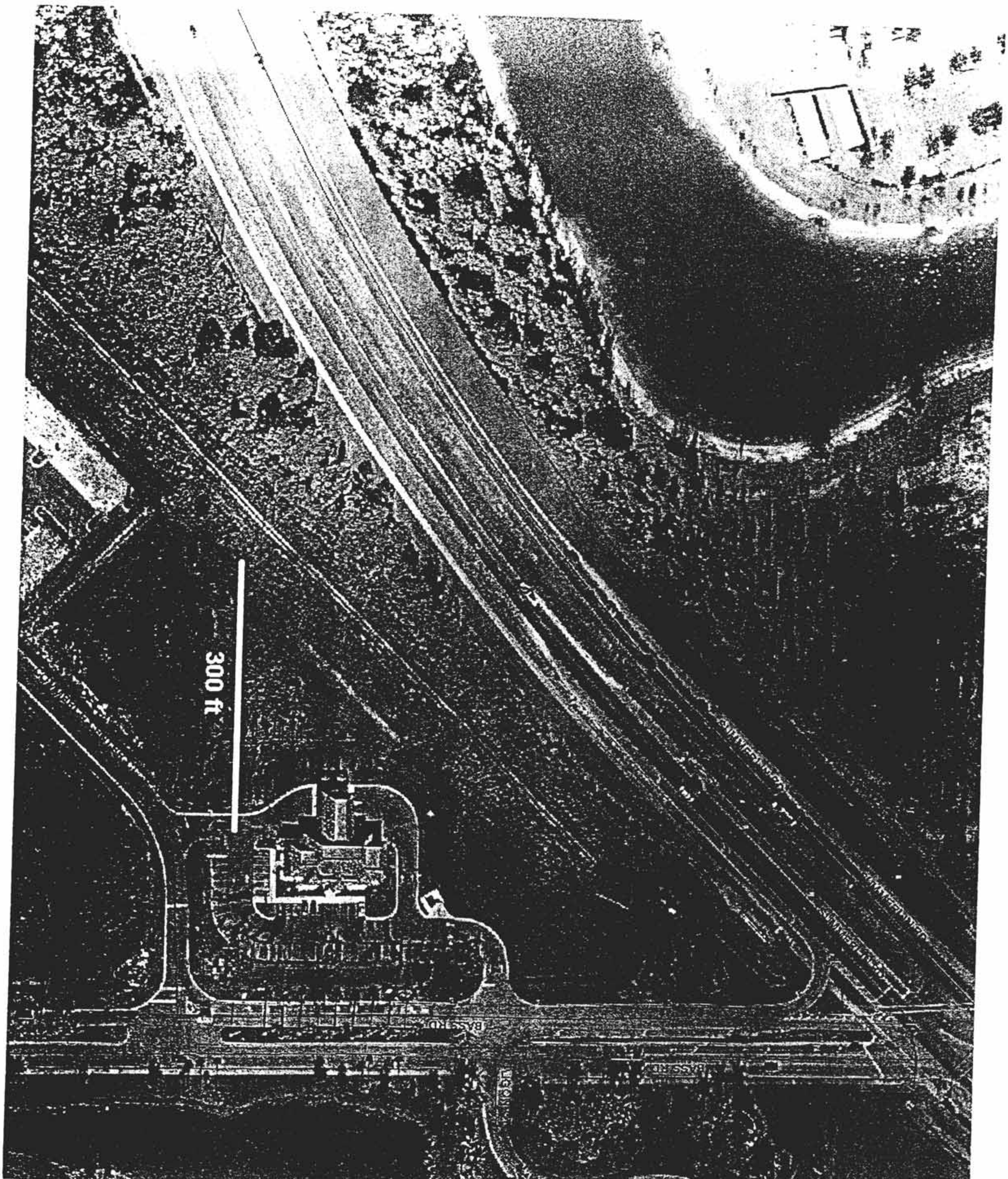


NW 13th ST

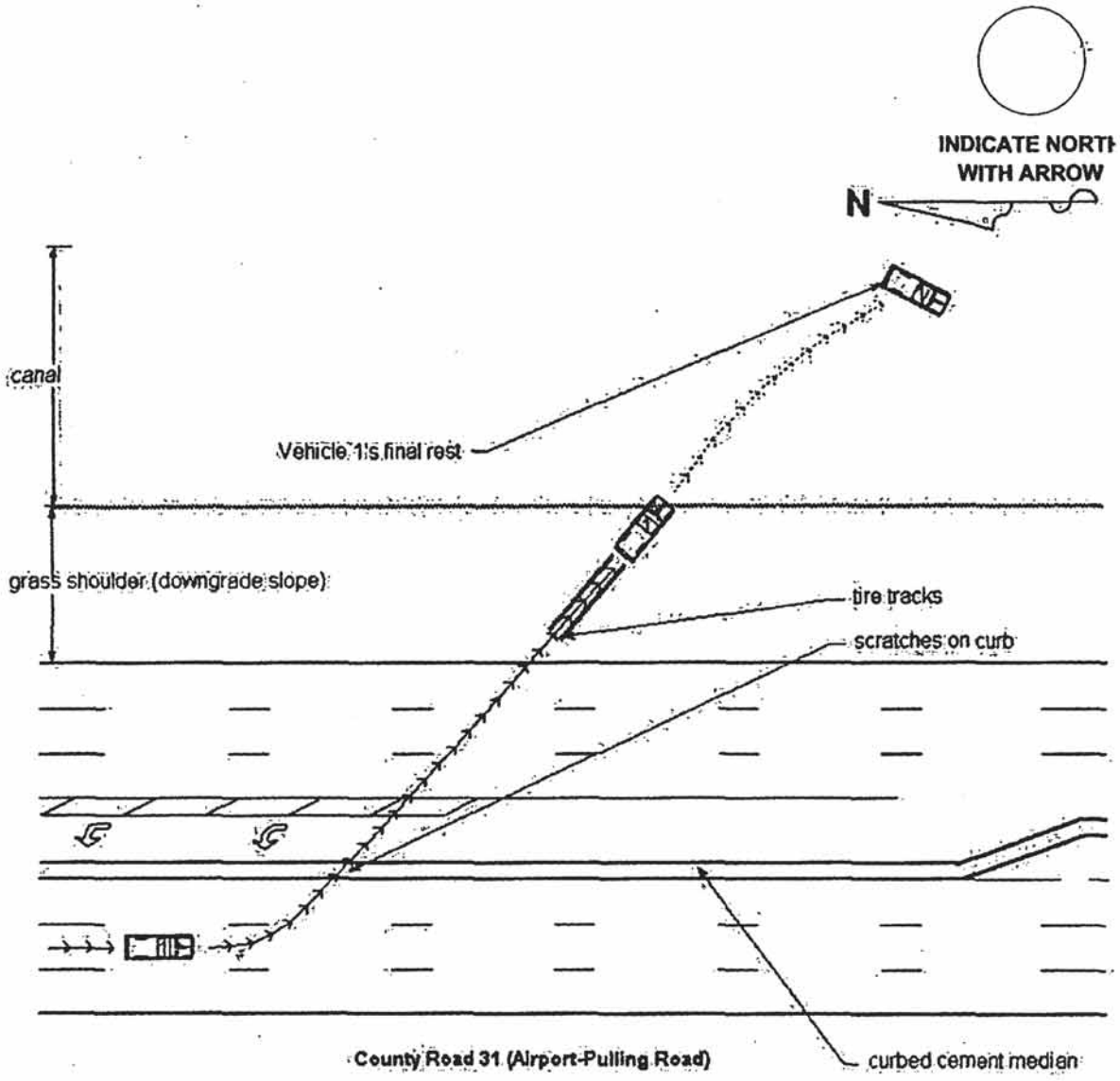
DIAGRAM

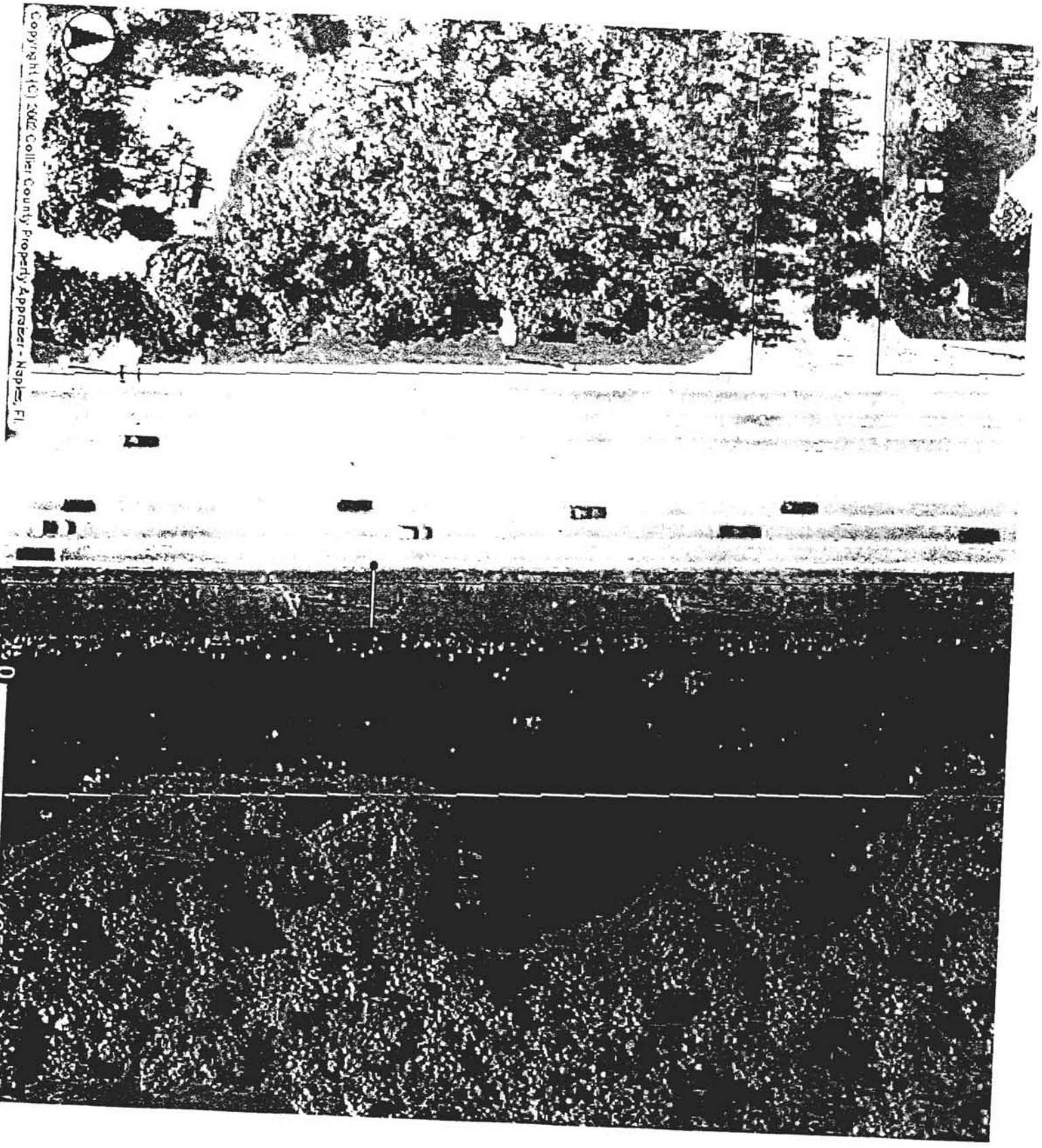
INDICATE NOR
WITH ARROW




300 ft

DIAGRAM

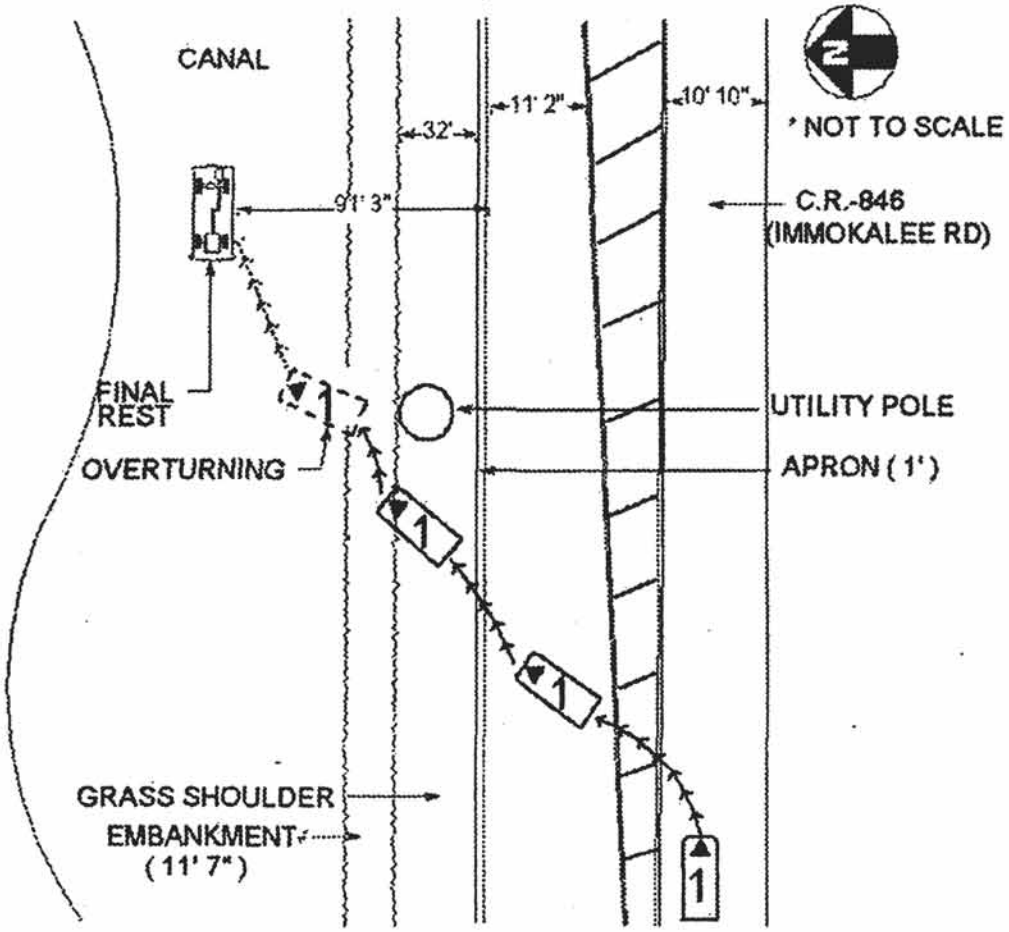

INDICATE NORTH
WITH ARROW
N
canal
Vehicle 1's final rest
grass shoulder (downgrade slope)
tire tracks
scratches on curb
County Road 31 (Airport-Pulling Road)
curbed cement median



County Road 31 (Airport - Pulling Rd)

DIAGRAM

INDICATE NORT WITH ARROW



CR 846 (Immokalee Rd.)

CHAPTER 4

D.4. Roadside Canals

A canal is defined as an open ditch parallel to the roadway for a minimum distance of 1000 ft. and with a seasonal water depth in excess of 3 ft. for extended periods of time (24 hours or more).

Roadside canals or other bodies of water close to the roadway should be eliminated wherever feasible. Where roadside bodies of water ~~(with seasonal water depth in excess of 3 feet for 24 hours or longer)~~ **lie within the roadside clear zone, they shall be** ~~guarded~~shielded.

For rural and urban flush shoulder roadways, the distance from the outside edge of the through travel lane to the top of the canal side slope nearest the road will be no less than 60 ft. for roadways with design speeds of 50 mph or greater and with design speeds less than 50 mph this distance may be reduced to 50 ft. for flush shoulders and 40 ft. for curb or curb and gutter roadways.

Where it is not possible to meet the above minimum criteria, guardrail or other protective devices should be installed 5 ft. from the canal front slope.

When new canal or roadway alignment is required, distances greater than those above should be provided, if possible, to accommodate possible future improvements to the roadway (widening, etc.).

4.2 Hazard Standards

4.2.1 Canal Hazards

A canal is defined as an open ditch parallel to the roadway for a minimum distance of 1000 ft. and with a seasonal water depth in excess of 3 ft. for extended periods of time (24 hours or more).

For rural and urban flush shoulder highways, the distance from the outside edge of the through travel lane to the top of the canal side slope nearest the road will be no less than 60 ft. for highways with design speeds of 50 mph or greater. For highways with design speeds less than 50 mph this minimum distance may be reduced to 50 ft. for rural and urban flush shoulder highways or 40 ft. for urban curb or curb and gutter highways. When new canal or roadway alignment is required, distances greater than those above should be provided, if possible, to accommodate possible future improvements to the roadway (widening, etc.).

On fill sections, a flat berm (maximum 1:10 slope) of width no less than 20 ft. will be provided between the toe of the roadway front slope and the top of the canal side slope nearest the roadway. This minimum berm width applies to all types of highways, both rural and urban construction. (See ***Exhibits 4-A & 4-B***)

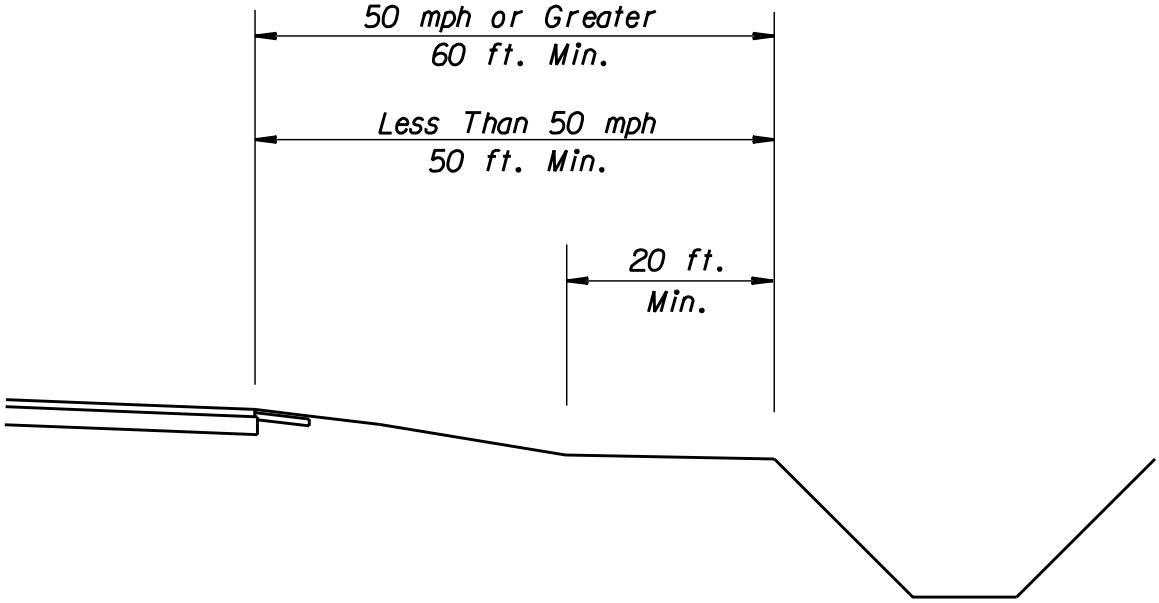
When the slope between the roadway and the "extended period of time" water surface is 1:6 or flatter, the minimum distance can be measured from the edge of the through lane to the "extended period of time" water surface and a berm is not required.

In sections with ditch cuts, 20 ft. will be provided between the toe of the front slope and the top of the canal.

Guardrail or other protective devices shall be installed 5 ft. from the canal front slope where it is not possible to meet the above minimum criteria. The design is complicated when clear zone and slope criteria are combined with canal hazard criteria. Extreme caution must be taken to ensure that all criteria are met.

If the minimum standards for canal hazards cannot be met, then the standard guardrail treatments as provided in the ***Design Standards*** should be used.

Exhibit 4-A Minimum Standards for Canal Hazards (Rural and Urban Flush Shoulders)



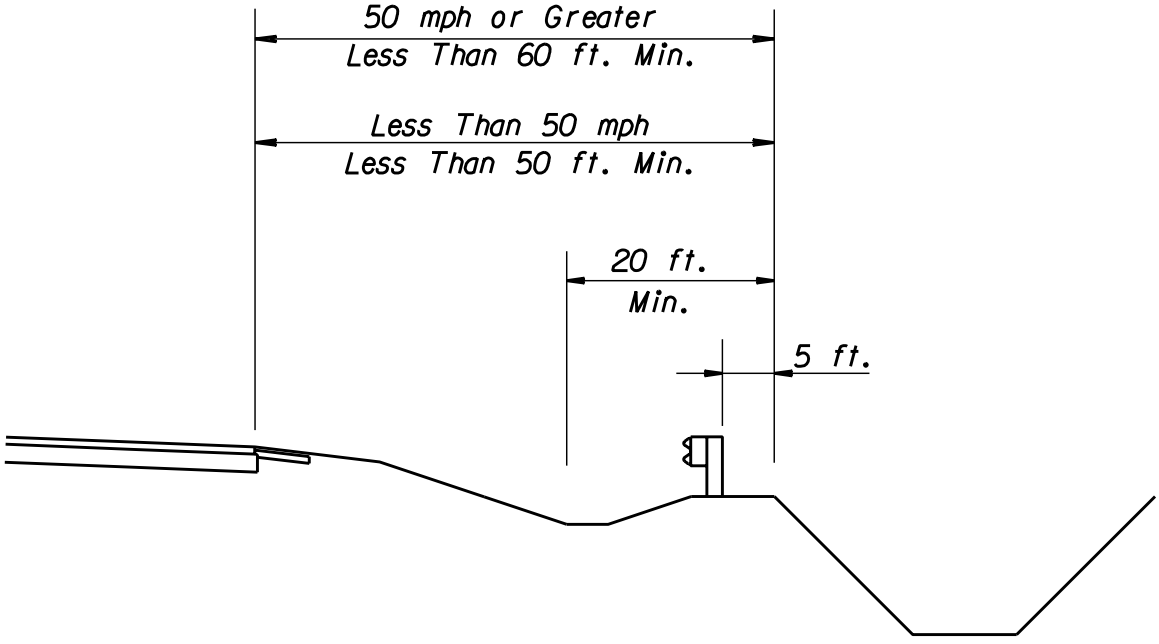
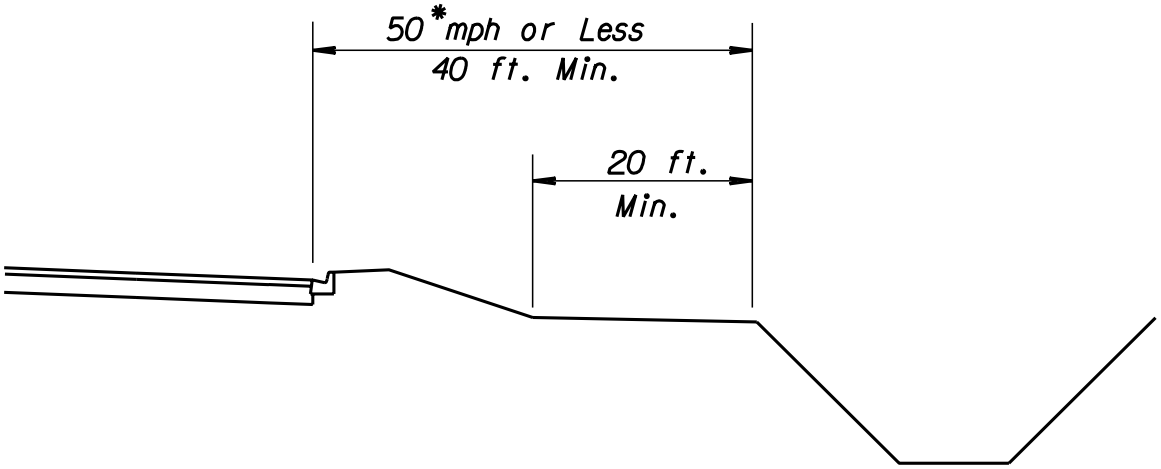
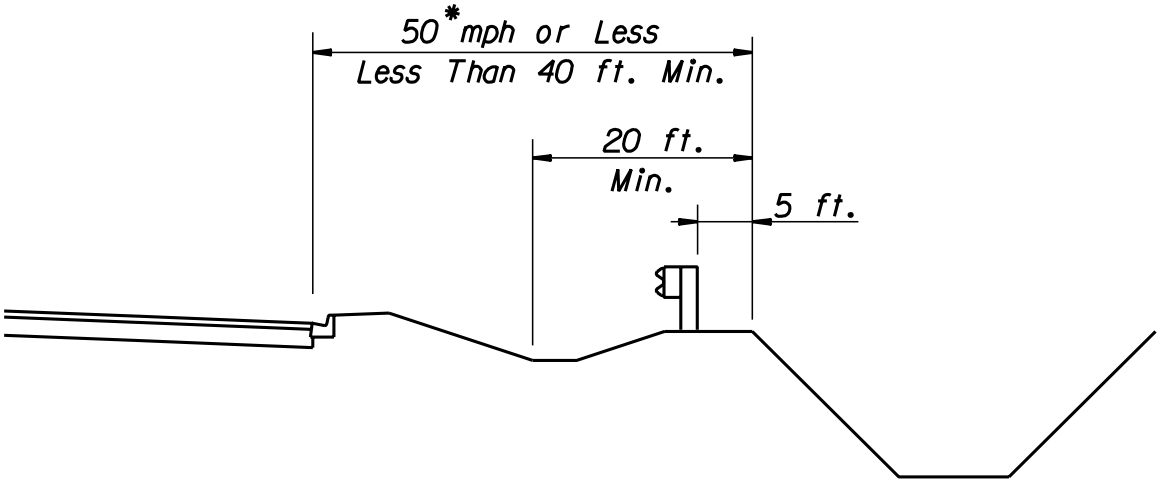


Exhibit 4-B Minimum Standards for Canal Hazards (Urban Curb or Curb and Gutter)





* Posted speeds not to be greater than 45 mph.

Table 2.11.7 Horizontal Clearance to Railroad Grade Crossing Traffic Control Devices

Placement shall be in accordance with the ***Design Standards***.

Table 2.11.8 Horizontal Clearance to Drop-off and Canal Hazards

Canals: (See also ***Chapter 4*** of this Volume.)

Rural and Urban Flush Shoulders:

Design Speeds ≥ 50 mph: 60 ft. from the travel lane.
Design Speeds < 50 mph: 50 ft. from the travel lane.

Urban Curb or Curb and Gutter:

40 ft. from the edge of the travel lane.

Drop-offs: (See also ***Chapter 4*** of this Volume.)

Rural and Urban Flush Shoulders:

Treat as roadside slopes in accordance with ***Design Standards, Index 700.***

Urban Curb or Curb and Gutter:

22 ft. from traveled way to the point that is 6 ft. below the hinge point.

Table 2.11.9 Horizontal Clearance to Other Roadside Obstacles

Minimum Horizontal Clearance to other roadside obstacles:

Rural and Urban Flush Shoulders:

Outside the clear zone.

Urban Curb or Curb and Gutter:

4 ft. back of face of curb. May be 2.5 ft. back of face of curb when all other alternatives are deemed impractical.

Note: Horizontal Clearance to mailboxes is specified in the construction details contained in the ***Design Standards, Index No. 532.***

FDOT's "new" approach to urban/suburban design & clear zone

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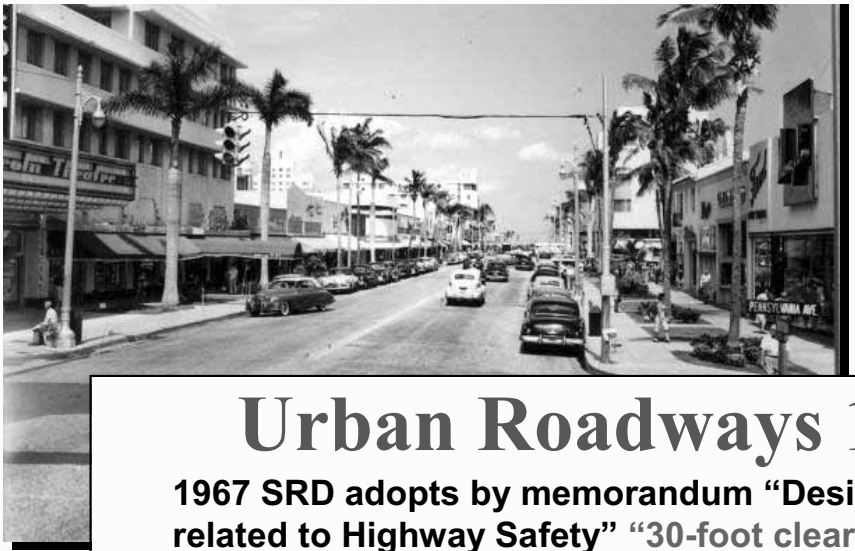
Mail-station 32
Tallahassee Florida 32399
(850) 414-4379
thomas.bane@dot.state.fl.us

Urban Roadways 1937-1954

1937 AASHO guidance "use common sense"

Urban Roadways 1967

1954 AASHO "A Policy on Geometric Design of Rural Highways" no guidance for urban areas usually 2' to 4' was being provided.

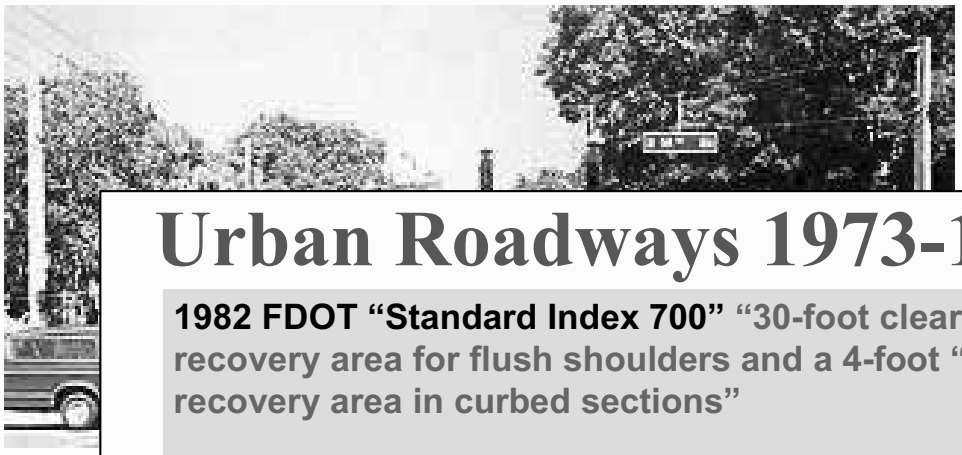


Urban Roadways 1967

1967 SRD adopts by memorandum "Design Criteria related to Highway Safety" "30-foot clear recovery area for flush shoulders and a 4-foot "clear recovery area in curbed sections"

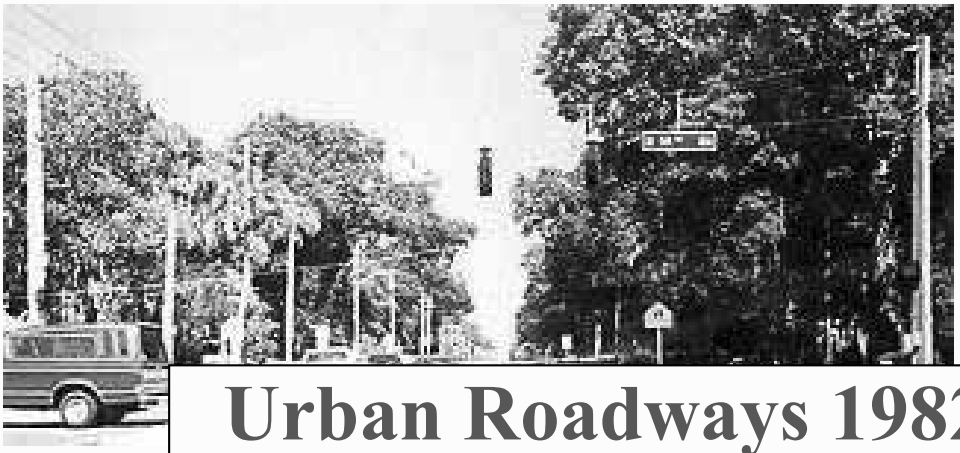
Urban Roadways 1973

1973 AASHO "A Policy on Geometric Design of Urban Highways and Arterial Streets" "30-foot clear area to be provided in urban and suburban sections but made exceptions to residential areas.



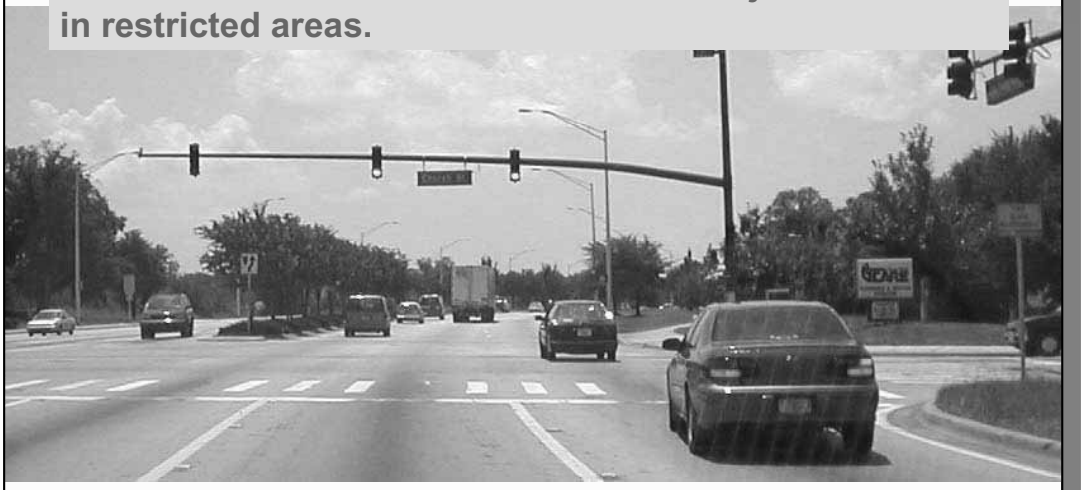
Urban Roadways 1973-1982

1982 FDOT "Standard Index 700" "30-foot clear recovery area for flush shoulders and a 4-foot "clear recovery area in curbed sections"



Urban Roadways 1982-2003

2003 FDOT reissues Standard Index 700 and bases horizontal clearances on restricted and non-restricted conditions. Horizontal clearances for all objects on all highway. Clearances based on providing clear zones in non-restricted areas and based on the objects function in restricted areas.



Suburban Highways
1973 - 2003

Notes:

Greenbook Meeting 3/5/03 – Thomas Bane P.E

Safety Concerns

Safety Concerns

We are #2 in Tree Crash Fatalities:

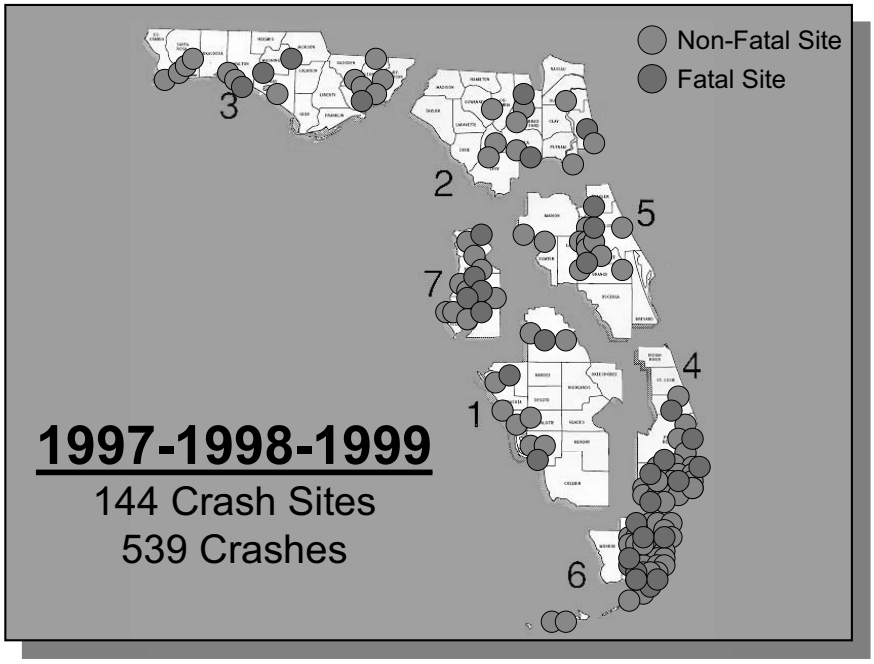
In 1999, FDOT was ranked number two in the nation for the most tree crash fatalities

Urban Medians are High Crash Areas:

In 2002 FDOT as part of an AASHTO project studied tree crashes on Florida's roadways and found that from 1997 to 1999 the highest number of fatal crashes and non-fatal crashes on urban roadways occurred within the medians of 6-lane facilities

Notes:

Notes:



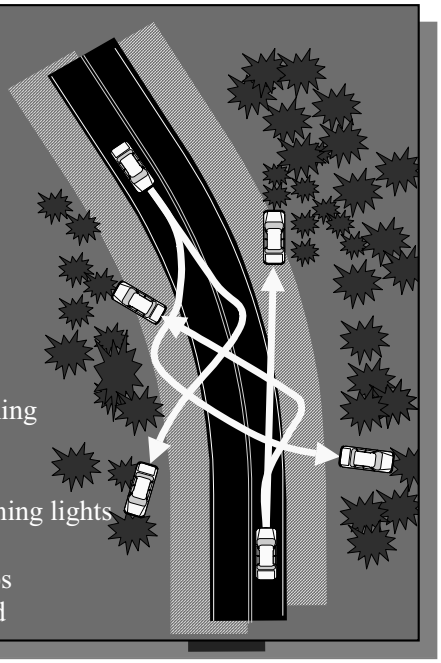
Rural Tree Crashes

Horizontal Curves

Review crash histories of curves that are below standard

Add extra clear zone width to the outside of the curves/crashes.

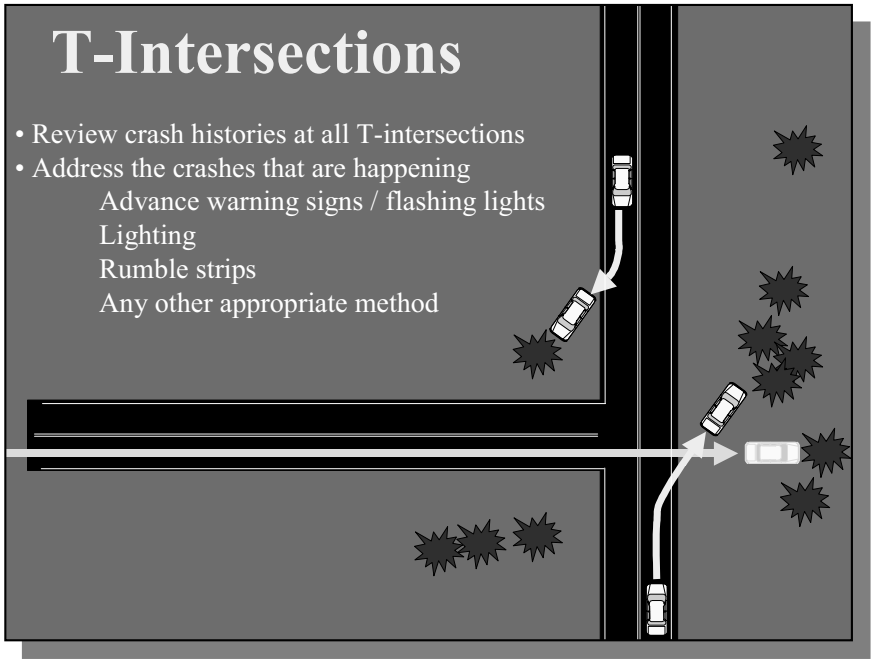
- Review crash histories of all curves
- Address the crashes that are happening
  - Increasing the radius
  - Improve superelevation
  - Advance warning signs / flashing lights
  - Lighting
  - Advisory speed / rumble strips
  - Any other appropriate method



Notes:

T-Intersections

- Review crash histories at all T-intersections
- Address the crashes that are happening
  - Advance warning signs / flashing lights
  - Lighting
  - Rumble strips
  - Any other appropriate method

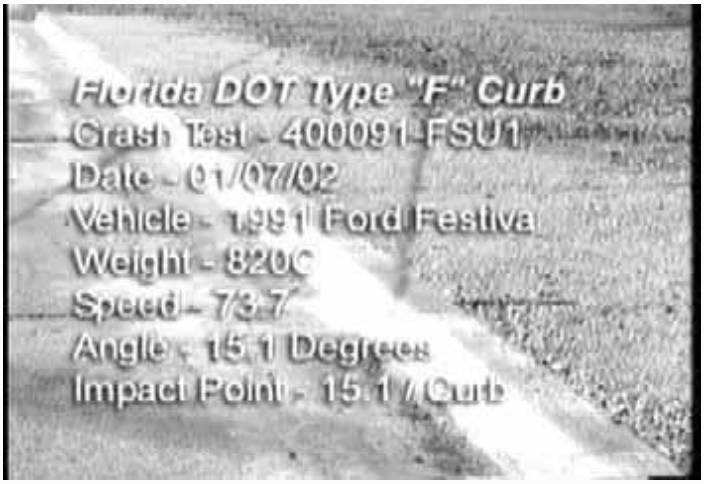


Correcting Some Misconceptions

Notes:

Correcting Some Misconceptions

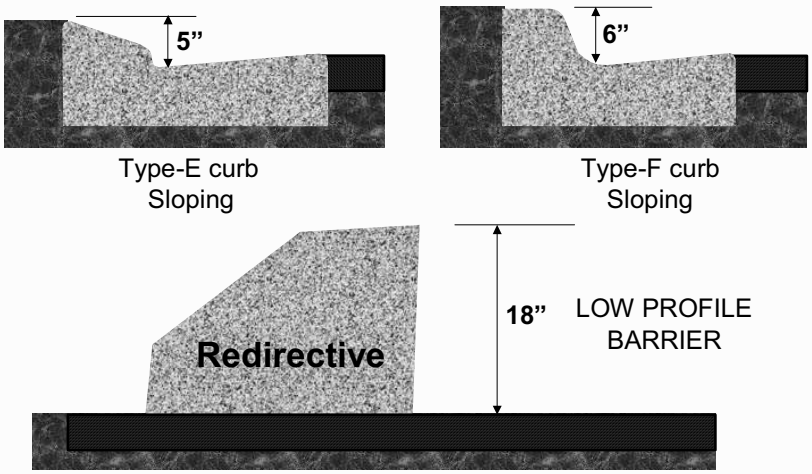
Testing Old Assumptions



Notes:

Notes:

Correcting Some Misconceptions



Correcting Some Misconceptions

Correcting Some Misconceptions

FDOT Type E&F Curb Misconceptions:

Do : Channel water
Provide delineation.

Don't : ~~Act as barriers.~~
~~Slow vehicles~~
~~Redirect vehicles.~~

Horizontal Clearances Practices:

~~Flush Shoulder = Clear Zone~~
~~Curb and Gutter = 4-foot~~

Restricted Areas = Offsets based on function
Non-restricted Areas = Offsets based on Clear Zone

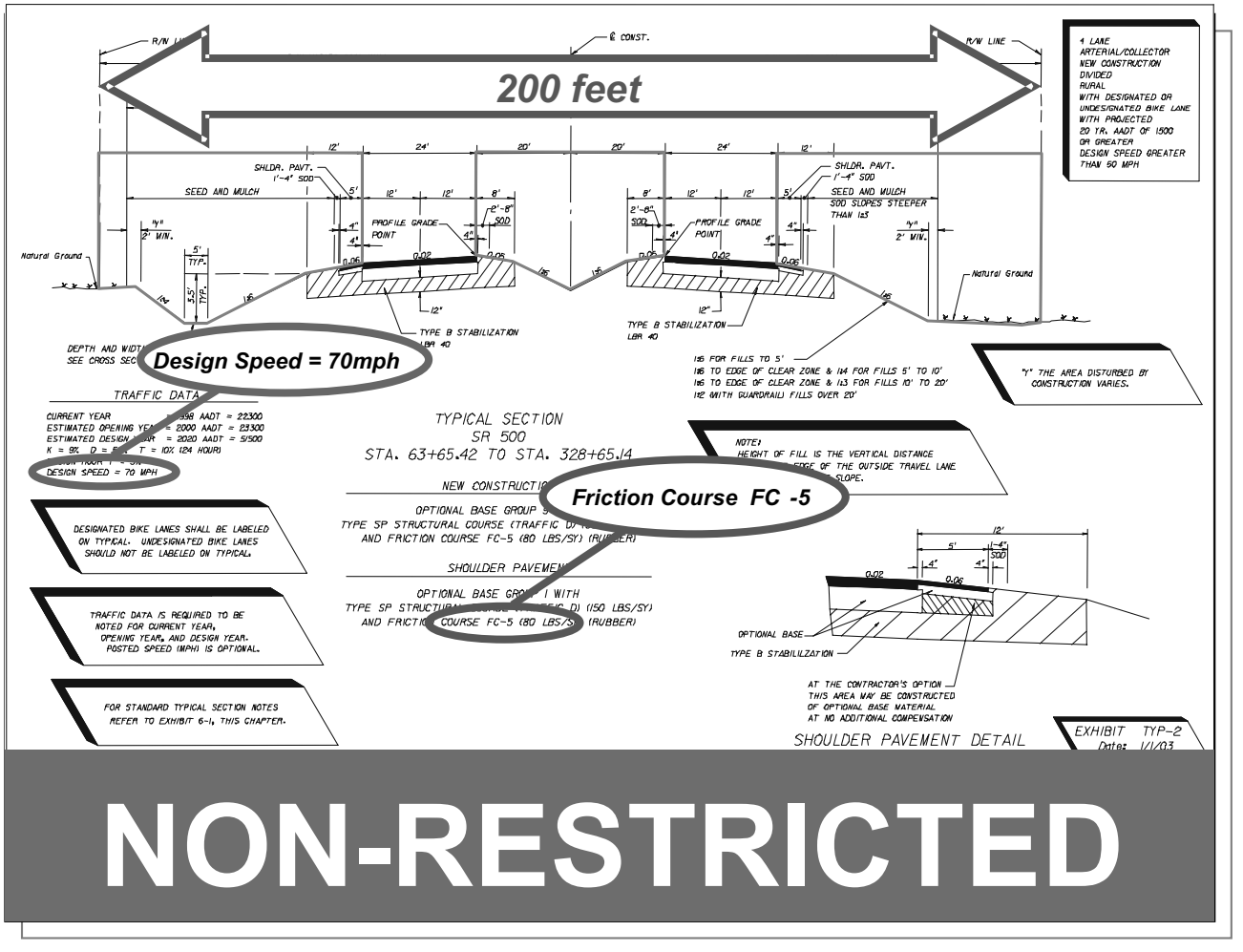
Notes:

Notes:

Changes to FDOT Policies

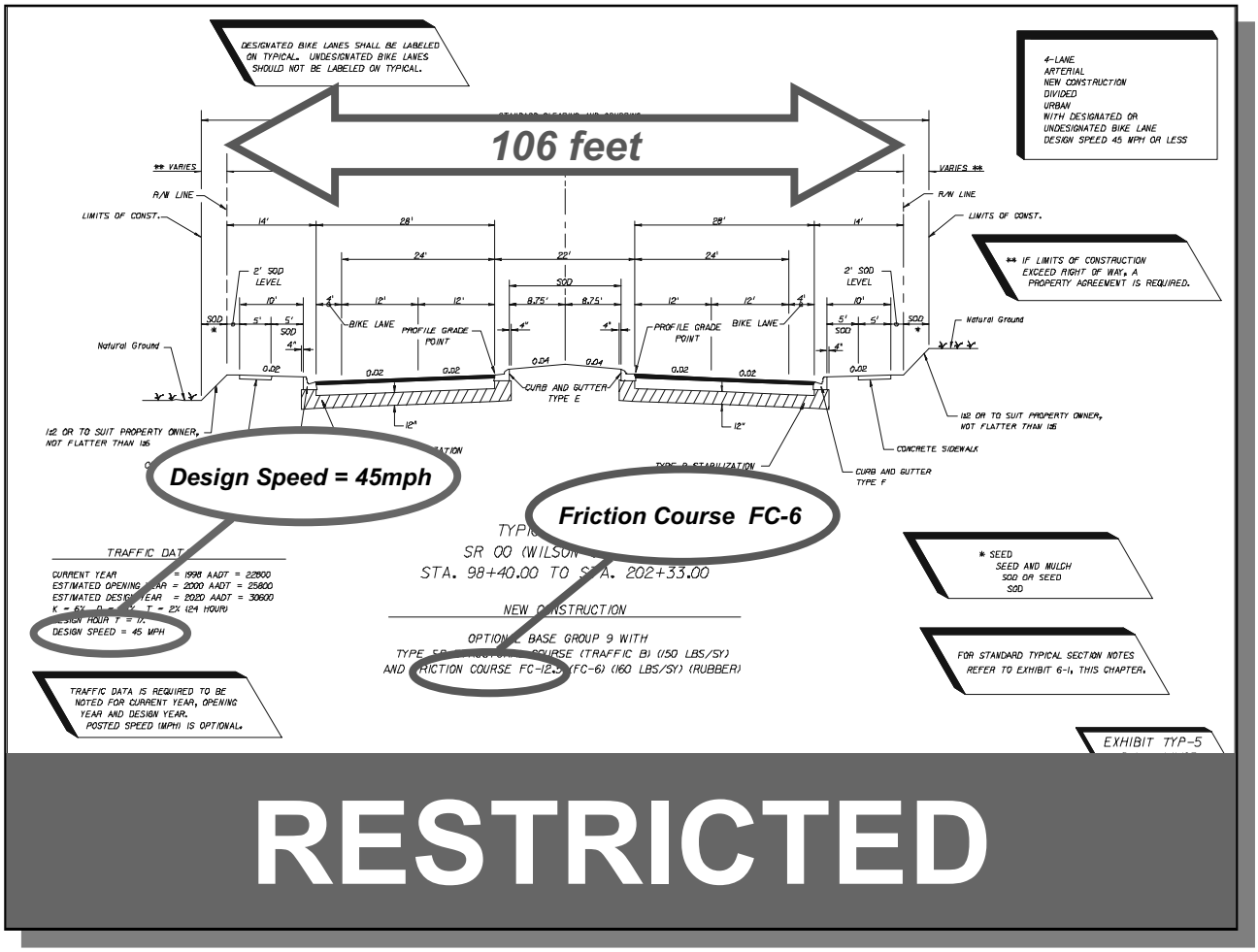
1. Introduced a New Typical Section for Suburban Area in Chapter 2, Section 16 of the PPM Vol-I.
2. Introduced new terminology – Restricted and Non-restricted.
3. Reintroduced Standard Index 700 consistent with the new suburban typical sections and the new terminology.
4. Revised Chapter 4 of the PPM to be consistent with Index 700.
5. Revising the PPM and other manuals to be consistent with the new Index 700, the new suburban typical sections and the new terminology.

Rural Typical



Notes:

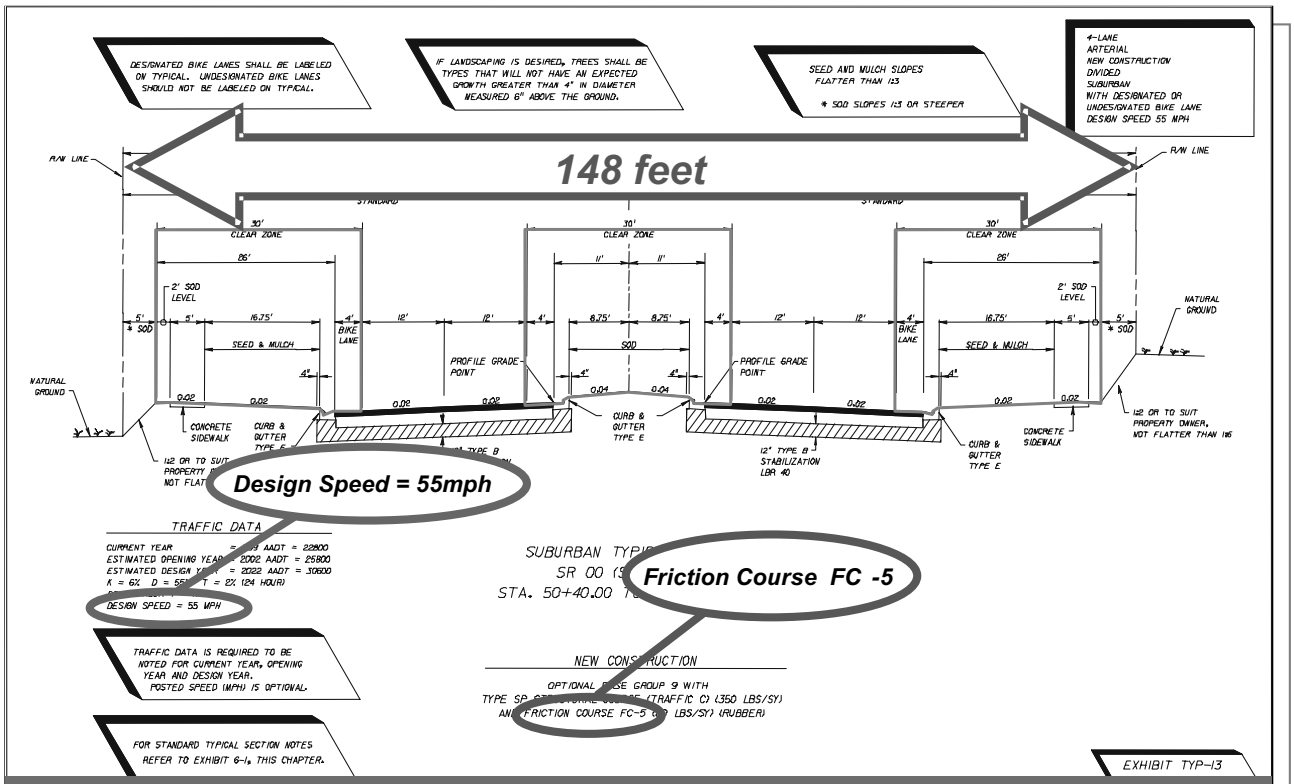
Urban Typical



RESTRICTED

Notes:

Suburban Typical



NON-RESTRICTED

Notes:

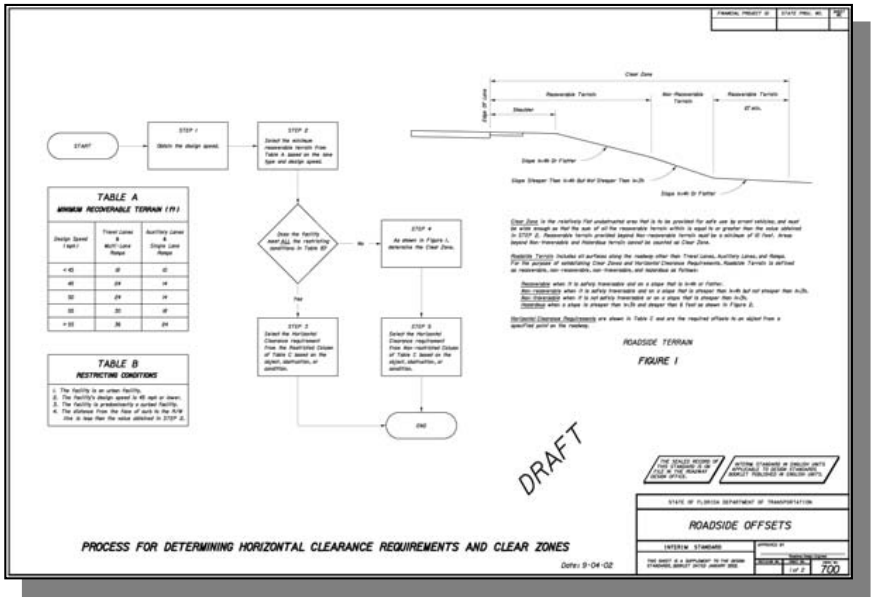
Standard Index 700

Past Practice

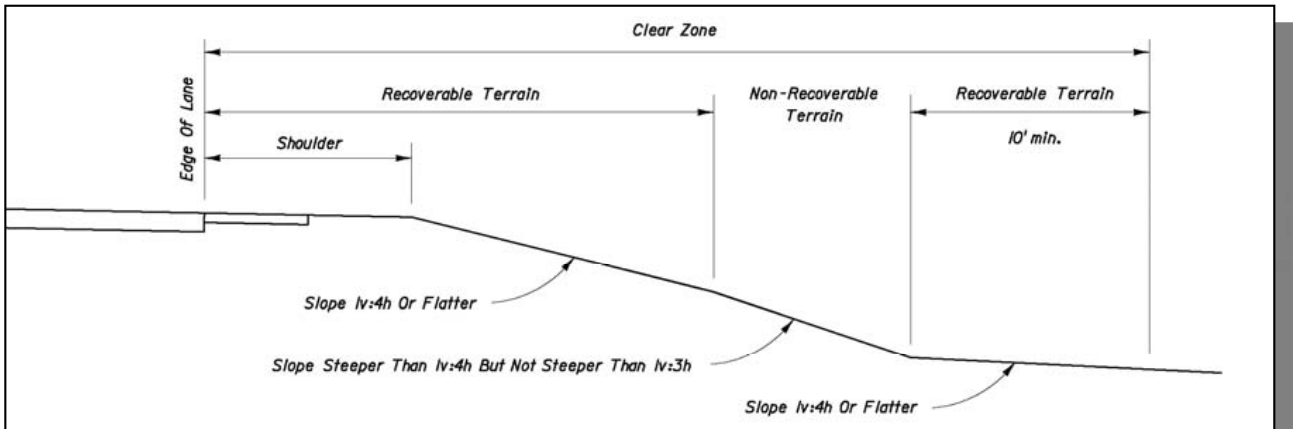
- **70%** of Maintenance, Construction, and Utilities used the Old Standard Index 700 that was discontinued in 1996.
- **30%** of Design used the Old Standard Index 700.
- **92%** of the Old Standard Index 700 users made none of the required adjustments for curvature and terrain.

Notes:

Notes:



Standard Index 700



Clear Zone is the relatively flat unobstructed area that is to be provided for safe use by errant vehicles, and must be wide enough so that the sum of all the recoverable terrain within is equal to or greater than the value obtained in STEP 2. Recoverable terrain provided beyond Non-recoverable terrain must be a minimum of 10 feet. Areas beyond Non-traversable and Hazardous terrain cannot be counted as Clear Zone.

Roadside Terrain includes all surfaces along the roadway other than Travel Lanes, Auxiliary Lanes, and Ramps. For the purpose of establishing Clear Zones and Horizontal Clearance Requirements, Roadside Terrain is defined as recoverable, non-recoverable, non-traversable, and hazardous as follows:

Recoverable when it is safely traversable and on a slope that is 1v:4h or flatter.
Non-recoverable when it is safely traversable and on a slope that is steeper than 1v:4h but not steeper than 1v:3h.
Non-traversable when it is not safely traversable or on a slope that is steeper than 1v:3h.
Hazardous when a slope is steeper than 1v:3h and deeper than 6 feet as shown in Figure 2.

Horizontal Clearance Requirements are shown in Table C and are the required offsets to an object from a specified point on the roadway.

ROADSIDE TERRAIN

FIGURE 1

Notes:

Standard Index 700

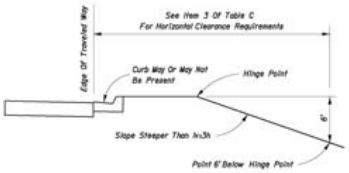
FINANCIAL PROJECT ID	STATE PROJ. NO.	SHEET NO.

TABLE C

	Item No.	OBJECTS, OBSTRUCTIONS OR CONDITIONS	HORIZONTAL CLEARANCE REQUIREMENTS	
			Restricted	Non-Restricted
GENERAL	1	Above Ground Fixed Hazards: all roadside objects, obstructions or conditions other than those listed below that exceed 4 inches in height and pose a hazard to errant vehicles and vehicle occupants.	Locate as close to the Right Of Way as practical and not less than 4 feet from face of curb.	Locate outside the Clear Zone as close to the Right Of Way as practical.
ROADWAY	2	All FDOT approved guardrails, crash cushions, permanent or temporary concrete barriers, and guardrail end terminals.	Locate as shown in the Design Standards.	Locate as shown in the Design Standards.
	3	Drop-off Hazards: any point along a roadside slope steeper than 1v:3h that is deeper than 6 feet below the hinge point. See Figure 2.	Locate the point that is 6 feet below the hinge point no less than 22 feet from the edge of lane.	Treat as roadside slopes in accordance with Design Standard 400.
	4	Mailboxes not shown in Design Standard 532.	Not to be used.	Not to be used.
	5	Mailboxes shown in Design Standard 532.	Locate in accordance with Design Standard 532.	Locate in accordance with Design Standard 532.
	6	Trees expected to become greater than 4 inches in diameter measured 6 inches above the ground.	Outside Roadways: Locate no less than 4 feet from face of curb in accordance with Design Standard 546. Inside Medians: Locate no less than 6 feet from the edge of traffic lane and in accordance with Design Standard 546.	Locate outside the Clear Zone as close to the Right Of Way as practical and in accordance with Design Standard 546.
	7	Trees not expected to become greater than 4 inches in diameter measured 6 inches above the ground.	Locate in accordance with Design Standard 546.	Locate in accordance with Design Standard 546.
	8	Canals behind guardrail.	Locate no less than 5 feet from the back of the guardrail post.	Locate no less than 5 feet from the back of the guardrail post.
	9	Canals without guardrail.	Locate as close to the Right Of Way as practical and not less than 40 feet from the traveled way.	Design speeds of 50 mph and greater: Locate as close to the Right Of Way as practical and not less than 60 feet from the traveled way. Design speeds less that 50 mph: Locate as close to the Right Of Way as practical and not less than 50 feet from the traveled way.
DRAINAGE	10	Culvert wing wall, endwall, retaining walls and flared end sections less than 6 feet deep.	Locate no less than 4 feet from face of curb.	Locate outside the Clear Zone.
	11	Culvert wing wall, endwall, retaining walls and flared end sections 6 feet and greater in depth.	Treat as drop-off hazard; See Item No. 3.	Treat as drop-off hazard; See Item No. 3.
	12	Mitered End Sections.	Locate as shown in Design Standards 272 and 273.	Locate as shown in Design Standards.
TRAFFIC CONTROL DEVICES	13	Frangible Sign Supports.	Locate no less than 4 feet from face of curb and in accordance with Design Standard 17302.	Locate in accordance with Design Standard 17302.
	14	Overhead sign supports and other non-frangible signs.	Locate no less than 4 feet from face of curb.	Locate outside the Clear Zone.
	15	Signal Controller Cabinets, Signal Poles, Strain Poles and Mast Arms.	Locate no less than 4 feet from face of curb and not in medians.	Locate outside the Clear Zone and not in medians.
LIGHTING	16	Conventional Lighting (Frangible and Non-frangible).	Locate no less than 4 feet from face of curb and not in medians.	Locate 20 feet from travel lanes or 14 feet from auxiliary lanes. Not in medians. May be Clear Zone width when the Clear Zone is less than 20 feet.
	17	Highmast Lighting.	Not applicable.	Locate outside the Clear Zone.
STRUCTURES	18	Bridge Piers and Abutments: Above ground vertical structures.	Locate not less than 16 feet from edge of travel lane.	Locate outside the Clear Zone.
UTILITIES	19	Fire Hydrants with bases no higher than 4 inches above the ground.	Locate not less than 2 feet from face of curb.	Locate as close to the Right Of Way as practical.
	20	Utility Installations: all above ground fixed objects.	Locate as close to the Right Of Way as practical and not less than 4 feet from face of curb and not in medians.	Locate outside the Clear Zone as close to the Right Of Way as practical and not in medians and not within limited access facilities. May be placed 4 feet behind the back of shields that have been justified for other reasons.
RAILROADS	21	Railroad Crossing Traffic Control Devices.	Locate in accordance with Design Standard 17882.	Locate in accordance with Design Standard 17882.

GENERAL NOTES

1. When sidewalks are present, an unobstructed sidewalk width of at least 4 feet must be provided.
2. When site specific conditions prohibit meeting the horizontal requirements in TABLE C, the object, obstruction or condition must be mitigated, possibly by shielding. Otherwise, the Plans Preparation Manual, Volume 1, Chapters 2, 4, 21 and 25, or Chapters 5 and 9 of the Utility Accommodation Manual must be researched to determine viable alternatives. The minimum requirements in these manuals can only be reduced when a Design Variation or Design Exception has been approved in accordance with Chapter 23 of the Plans Preparation Manual, Volume 1 or a Utility Exception has been approved in accordance with Chapter 13 of the Utility Accommodation Manual.



DROP-OFF HAZARDS

FIGURE 2

DRAFT

THE SEALED RECORD OF THIS STANDARD IS ON FILE IN THE ROADWAY DESIGN OFFICE.

INTERIM STANDARD IN ENGLISH UNITS APPLICABLE TO DESIGN STANDARDS BOOKLET PUBLISHED IN ENGLISH UNITS.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

ROADSIDE OFFSETS

INTERIM STANDARD

THIS SHEET IS A SUPPLEMENT TO THE DESIGN STANDARDS, BOOKLET DATED JANUARY 2002.

APPROVED BY

Roadway Design Engineer

REVISION NO.	SHEET NO.	INDEX NO.
	2 of 2	700

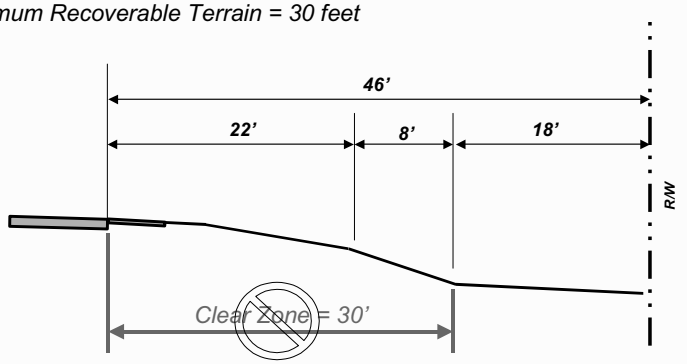
Date: 9-04-02

Notes:

Clear Zone

Design Speed = 55 mph
Lane Type =Travel Lane

Therefore from Table A:
Minimum Recoverable Terrain = 30 feet



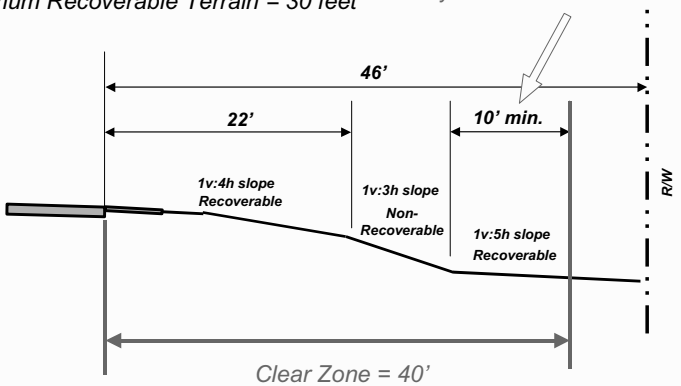
Notes:

Notes:

Design Speed = 55 mph
Lane Type =Travel Lane

Therefore from Table A:
Minimum Recoverable Terrain = 30 feet

Only 8' is needed to provide the 30' of recoverable terrain; however, a minimum or 10' is to be provided beyond non-recoverable terrain.

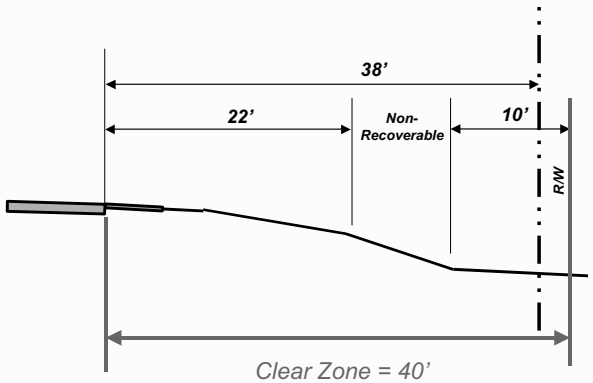


A 40' clear zone was required so that the recoverable terrain within would be equal to or greater than the 30' minimum recoverable terrain obtained from Table A.

Clear Zone

What do I do when I don't have the R/W?

DO:

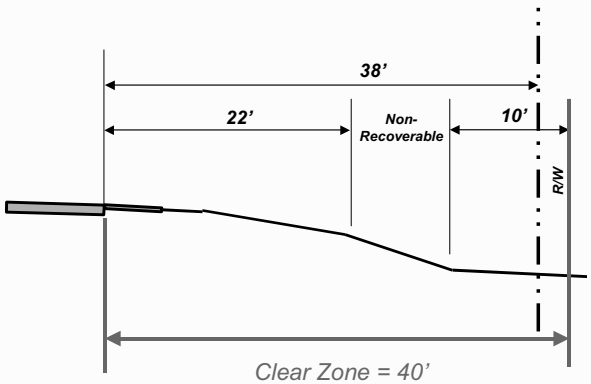


1. Eliminate the non-recoverable slope so the needed recoverable terrain falls within the Clear Zone.
2. Buy additional R/W so the needed recoverable terrain falls within the R/W.
3. Shield objects within the R/W.
4. Get a Design Exception for objects within the R/W.

Notes:

Notes:

DO NOT:

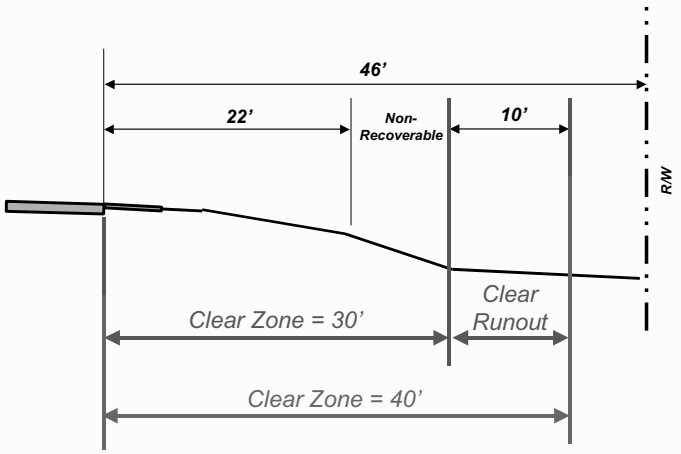


1. Ignore the non-recoverable slope within the Clear Zone.
2. Suggest placing curbs to reduce the Horizontal Clearance.
3. Make agreements to place trees within these areas.
4. Ignore the Clear Zone in medians.
5. Forget that Clear Zone applies to Urban areas as well as Rural areas.

Clear Zone

Minimum Clear Zone = 30 feet ***(Old Method)***

Minimum Recoverable Terrain = 30 feet ***(New Method)***



Notes:

Notes:

Recap

THEN	*NOW*
Rural and Urban Typicals	Rural, Urban and Suburban Typicals
Flush Shoulder & Curbed Roadways	Restricted & Non-restricted Roadways
Old 700 => "Design Criteria" PPM => "Design Criteria"	New 700 => Standard Roadside Offsets PPM => "Minimum Design Criteria"
Unobstructed Recovery Areas Clear Recovery Areas Clear Zones Clear Runout Four foot offsets	Horizontal Clearance Requirements

2.11 Horizontal Clearance

Horizontal clearance is the lateral distance from a specified point on the roadway such as the edge of travel lane or face of curb, to a roadside feature or object. Horizontal clearance applies to all highways. Horizontal clearance requirements vary depending on design speed, whether rural or urban with curb, traffic volumes, lane type, and the object or feature.

Rural highways with flush shoulders and highways with curb or curb and gutter where right of way is not restricted have roadsides of sufficient widths to provide clear zones; therefore, horizontal clearance requirements for certain features and objects are based on maintaining a clear zone wide enough to provide the recoverable terrain in ***Table 2.11.10***. The procedure for determining required clear zone widths is described in ***Chapter 4*** of this volume.

In urban areas, horizontal clearance based on clear zone requirements for rural highways should be provided wherever practical. However, urban areas are typically characterized with lower speed, more dense abutting development, closer spaced intersections and accesses to property, higher traffic volumes, more bicyclists and pedestrians, and restricted right of way. In these areas, curb with closed drainage systems are often used to minimize the amount of right of way needed. Highways with curb or curb and gutter in urban areas where right of way is restricted do not have roadsides of sufficient widths to provide clear zones; therefore, while there are specific horizontal clearance requirements for these highways, they are based on clearances for normal operation and not based on maintaining a clear roadside for errant vehicles. It should be noted that curb has no redirectional capabilities except at speeds less than the lowest design speeds used on the State Highway System. Therefore curb should not be considered effective in shielding a hazard. Curb is not to be used to reduce horizontal clearance requirements.

Crashworthy objects shall meet or exceed the offset listed in ***Tables 2.11.1*** through ***2.11.9*** and objects that are not crashworthy are to be as close to the right of way as practical and no closer than the requirements listed in ***Tables 2.11.1*** through ***2.11.9.***

For horizontal clearances where roadways overpass railroads refer to ***Chapter 6*** of this volume.

Table 2.11.1 Horizontal Clearance for Traffic Control Signs

PLACEMENT	Placement shall be in accordance with the ***Design Standards***. Placement within sidewalks shall be such that an unobstructed sidewalk width of 4 ft. or more (not including the width of curb) is provided.
SUPPORTS	Supports, except overhead sign supports, shall be frangible or breakaway. When practicable, sign supports should be located behind barriers that are justified for other reasons. Overhead sign supports shall be located outside the clear zone unless shielded.

Table 2.11.2 Horizontal Clearance for Light Poles

CONVENTIONAL LIGHTING	Not in the median except in conjunction with barriers that are justified for other reasons. Rural and Urban Flush Shoulders: 20 ft. from the travel lane, 14 ft. from auxiliary lane (may be clear zone width when clear zone is less than 20 ft.). Urban Curb or Curb and Gutter: From right of way line to 4 ft. back of face of curb (may be 2.5 ft. back of face of curb when all other alternatives are deemed impractical). Placement within sidewalks shall be such that an unobstructed sidewalk width of 4 ft. or more (not including the width of curb) is provided.
HIGHMAST LIGHTING	Outside of the clear zone unless shielded.

Table 2.11.3 Horizontal Clearance for Utility Installations

ABOVE GROUND FIXED OBJECTS (Such as Poles)	Shall not be located within the limited access right of way, except as allowed by the ***Policy No. 000-625-025, Telecommunications Facilities on Limited Access Rights of Way***. Shall not be located in the median. Rural and Urban Flush Shoulders: Not within the clear zone. Install as close as practical to the right of way without aerial encroachments onto private property. Urban Curb or Curb and Gutter: At the R/W line or as close to the R/W line as practical. Must maintain 4 ft. clear from face of curb. Placement within sidewalks shall be such that an unobstructed sidewalk width of 4 ft. or more (not including the width of the curb) is provided. See the ***Utility Accommodation Manual, (Topic No. 710-020-001)*** for additional information. Note: may be located behind barriers that are justified for other reasons.
FRANGIBLE AND BREAKAWAY OBJECTS (Such as Fire Hydrants)	Rural and Urban Flush Shoulders: Locate as close to the right of way as practical. Urban Curb or Curb and Gutter: Locate no less than 1.5 feet from face of curb.

Table 2.11.4 Horizontal Clearance to Signal Poles and Controller Cabinets for Signals

Shall not be located in medians

Rural and Urban Flush Shoulders:
Outside the clear zone.

Urban Curb or Curb and Gutter:
4 ft. from face of outside curbs and outside the sidewalk. However, when necessary, the Signal Poles may be located within sidewalks such that an unobstructed sidewalk width of 4 ft. or more (not including the width of curb) is provided.

Table 2.11.5 Horizontal Clearance to Trees

Minimum Horizontal Clearance to trees where the diameter is or is expected to be greater than 4 inches measured 6 inches above the ground shall be:

Rural and Urban Flush Shoulders:
Outside the clear zone.

Urban Curb or Curb and Gutter:
4 ft. from face of outside curbs.
6 ft. from edge of inside traffic lane.

Table 2.11.6 Horizontal Clearance to Bridge Piers and Abutments

Minimum Horizontal Clearance to Bridge Piers and Abutments:

Rural and Urban Flush Shoulders:
Outside the clear zone.

Urban Curb or Curb and Gutter:
16 ft. from the edge of the travel lane.

Table 2.11.7 Horizontal Clearance to Railroad Grade Crossing Traffic Control Devices

Placement shall be in accordance with the ***Design Standards***.

Table 2.11.8 Horizontal Clearance to Drop-off and Canal Hazards

Canals: (See also ***Chapter 4*** of this Volume.)

Rural and Urban Flush Shoulders:

Design Speeds ≥ 50 mph: 60 ft. from the travel lane.
Design Speeds < 50 mph: 50 ft. from the travel lane.

Urban Curb or Curb and Gutter:

40 ft. from the edge of the travel lane.

Drop-offs: (See also ***Chapter 4*** of this Volume.)

Rural and Urban Flush Shoulders:

Treat as roadside slopes in accordance with ***Design Standards, Index 700.***

Urban Curb or Curb and Gutter:

22 ft. from traveled way to the point that is 6 ft. below the hinge point.

Table 2.11.9 Horizontal Clearance to Other Roadside Obstacles

Minimum Horizontal Clearance to other roadside obstacles:

Rural and Urban Flush Shoulders:

Outside the clear zone.

Urban Curb or Curb and Gutter:

4 ft. back of face of curb. May be 2.5 ft. back of face of curb when all other alternatives are deemed impractical.

Note: Horizontal Clearance to mailboxes is specified in the construction details contained in the ***Design Standards, Index No. 532.***

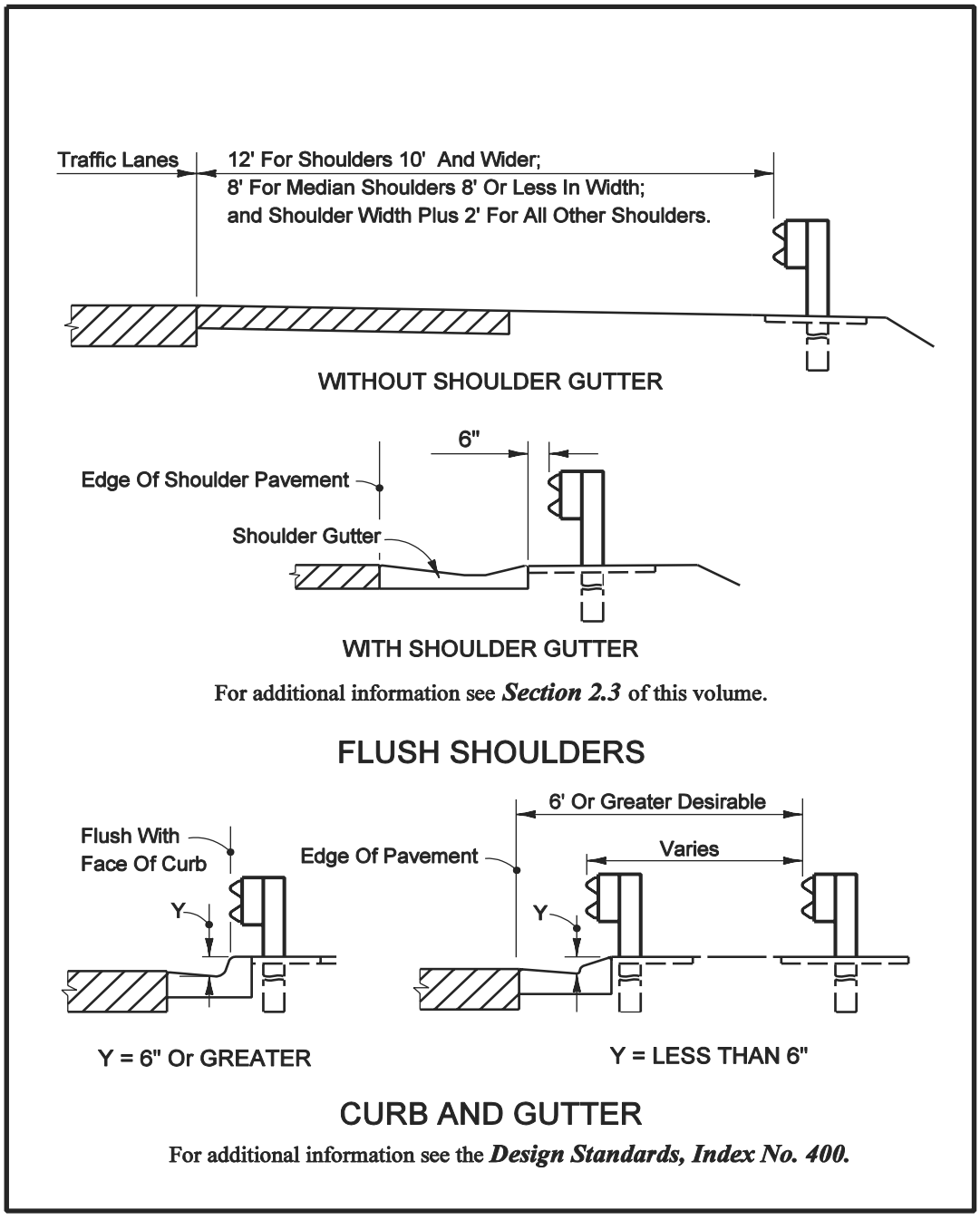
Table 2.11.10 Recoverable Terrain

DESIGN SPEED (mph)	≥ 1500 AADT(1)		< 1500 AADT(1)	
	TRAVEL LANES & MULTILANE RAMPS (feet)	AUXILIARY LANES & SINGLE LANE RAMPS (feet)	TRAVEL LANES & MULTILANE RAMPS (feet)	AUXILIARY LANES & SINGLE LANE RAMPS (feet)
< 45	18	10	16	10
45	24	14	20	14
50	24	14	20	14
55	30	18	24	14
> 55	36	24	30	18

(1) AADT=Mainline 20 years projected annual average daily traffic.

The above values are to be used in the process for determining the clear zone width as described in ***Chapter 4*** of this volume.

Figure 2.11.1 Horizontal Clearance to Guardrail



Chapter 4

Roadside Safety

4.1 Clear Zone

4.1.1 Clear Zone Concept

A roadside that is traversable and unobstructed by fixed objects will allow vehicles that leave the roadway to recover safely. The clear zone is the relatively flat unobstructed area that is to be provided for safe use by errant vehicles. The designer should provide as much clear zone as practical.

If natural or man-made hazards, including slopes steeper than 1:3, occur within the clear zone, the designer should attempt the following treatments, in order of priority:

1. Eliminate the hazard.
    a. Remove the hazard.
    b. Relocate the hazard outside the clear zone.
    c. Make the hazard traversable or crashworthy.
2. Shield the hazard with a longitudinal barrier or crash cushion. This treatment should only be taken if the barrier or crash cushion presents a lesser hazard.
3. Leave the hazard unshielded. This treatment should be taken only if a barrier or crash cushion is more hazardous than the hazard, if the likelihood of striking the hazard is very small or if the expense of treatment outweighs the benefits in terms of crash reduction.

If crash data or safety reports indicate that early treatment of the hazards will result in fewer or less severe crashes, designers should consider directing that those treatments be accomplished as the first order of work, if feasible and practical.

4.1.2 Clear Zone Criteria

The clear zone must be wide enough so that the sum of all the recoverable terrain within is equal to or greater than the recoverable terrain value obtained in the appropriate ***Table 2.11.10, Table 21.5*** or ***Table 25.4.14.1***. The process for determining the clear zone width is to extend the clear zone width as shown in ***Figure 4.1.2.1*** and ***4.1.2.2*** until the recoverable terrain is obtained. If non-recoverable terrain is encountered before obtaining the full amount of recoverable terrain, then the remaining amount must be provided beyond the non-recoverable terrain. Where right of way permits, the portion of recoverable terrain provided beyond the non-recoverable terrain must be a minimum of 10 feet. The clear zone is to be free of hazardous objects, hazardous terrain, and non-traversable terrain. Also, clear zones may be widened based on crash history.

Figure 4.1.2.1 Clear Zone Plan View

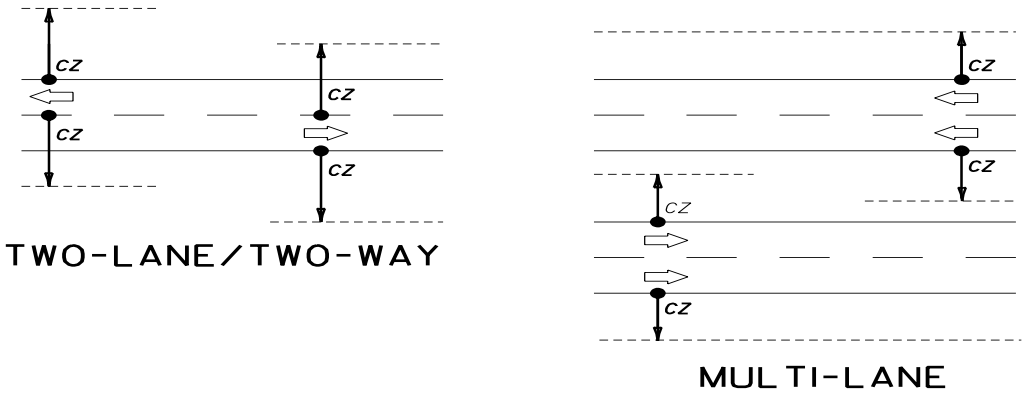
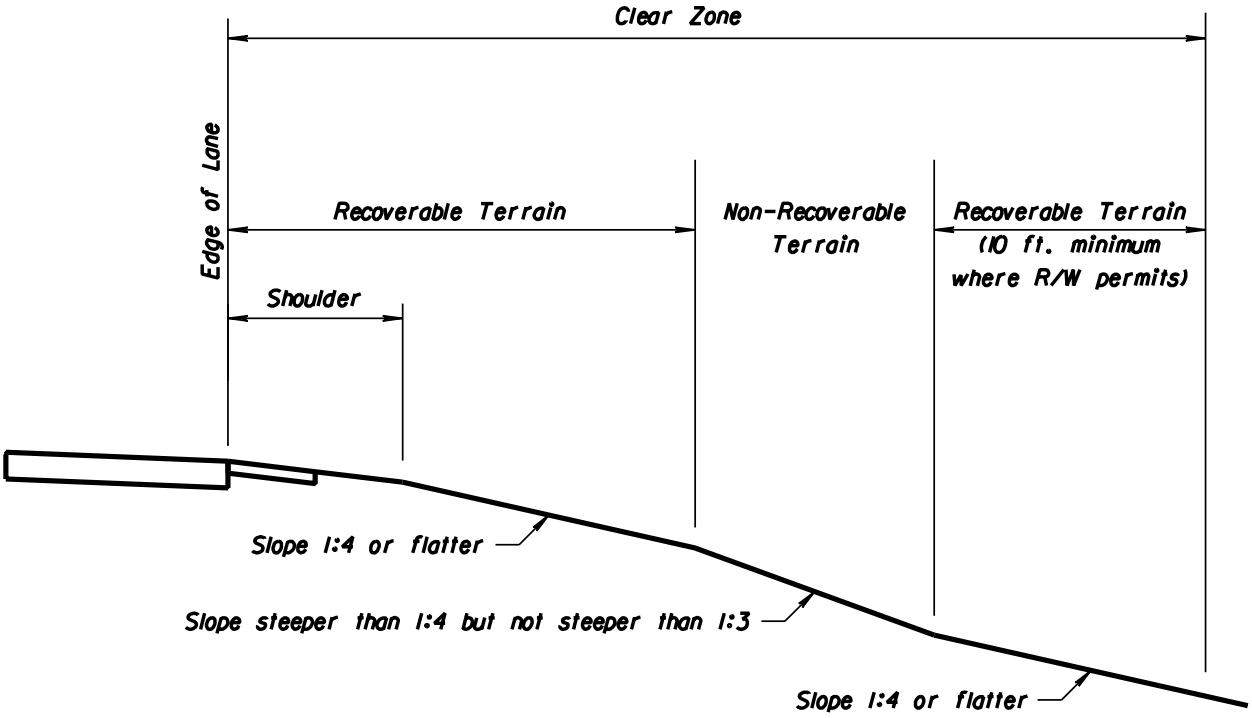


Figure 4.1.2.2 Clear Zone Cross Section



Roadside Terrain includes all surfaces along the roadway other than Travel Lanes, Auxiliary Lanes, and Ramps. For the purpose of establishing Clear Zones, Roadside Terrain is defined as recoverable, non-recoverable, non-traversable, and hazardous as follows:

1. Recoverable when it is safely traversable and on a slope that is 1:4 or flatter.
2. Non-recoverable when it is safely traversable and on a slope that is steeper than 1:4 but not steeper than 1:3.
3. Non-traversable when it is not safely traversable or on a slope that is steeper than 1:3.
4. Hazardous when a slope is steeper than 1:3 and deeper than 6 feet.

4.2.2 Drop-off Hazards

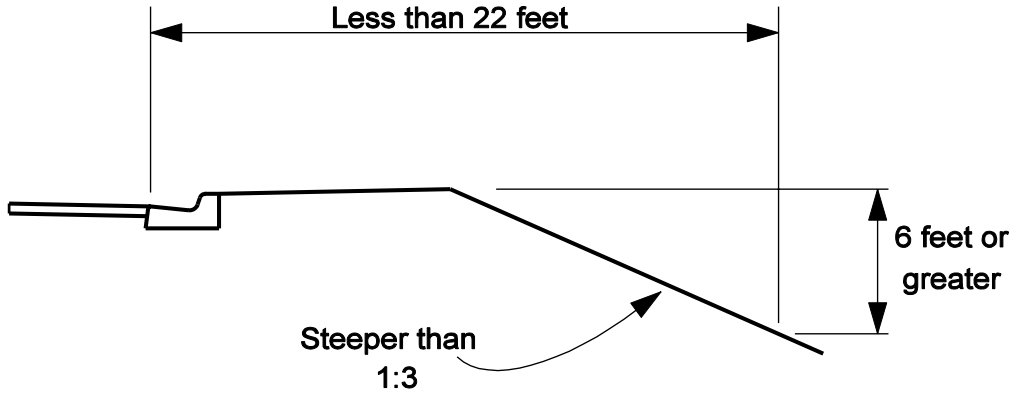
Drop-off hazards are defined as steep or abrupt downward slopes that can be perilous to vehicle occupants and/or pedestrians and cyclists. The Engineer should consider shielding any drop-off determined to be a hazard. The following guidelines will be useful in standardizing the identification and treatment of drop-off hazards.

Drop-off hazards for vehicle occupants:

1 A drop-off of 6 feet or more with a slope steeper than 1:3 should be considered a hazard and shielded when it is within the Clear Zone.

2 In urban sections with curb or curb and gutter, a drop-off of 6 feet or greater with a slope steeper than 1:3 located within 22 feet of the traveled way, should be evaluated for shielding.

Figure 4.2.2 Drop-off Hazards in Urban Sections



In determining if shielding a drop-off hazard would be feasible for protecting vehicle occupants, the following should be considered:

1. When a drop-off is shielded, a guardrail or barrier is usually set closer to the road, which increases the probability of impacting the guardrail or barrier. Also, these shields generally require the ends to be treated, which also needs to be taken into consideration. The ***Roadside Design Guide*** and its ***ROADSIDE 5.0*** program should be used to evaluate the benefits of shielding a drop-off. The global parameters needed to run the ***ROADSIDE 5.0*** program are listed in ***Section 23.2.2*** of this volume.

2. When a drop-off is to be shielded with guardrail, a minimum of 62.5 feet of guardrail is required to develop proper ribbon strength. A minimum clear area 4 feet wide is to be provided behind the guardrail to allow the guardrail to deflect when impacted. Proper slope and soil bearing for the posts is to be provided.

3. Another consideration is whether the drop-off has a significant crash history. Drop-offs that have had 3 crashes within three consecutive years over a five-year period are considered to have a significant crash history and should be shielded. Five years of crash data for a particular site can be obtained from the Safety Office.

For drop-off criteria in work zones see ***Chapter 10*** of this volume and ***Index 600*** of the ***Design Standards.***

Generally, pedestrians and bicyclists will be adequately protected from a drop-off hazard if a guardrail or barrier has been installed between the path or sidewalk and the drop-off. However, circumstances do exist that will ultimately dictate when a handrail is needed. For guidance, see ***Section 8.8 Drop-off Hazards for Pedestrians and Bicyclists*** of this volume.

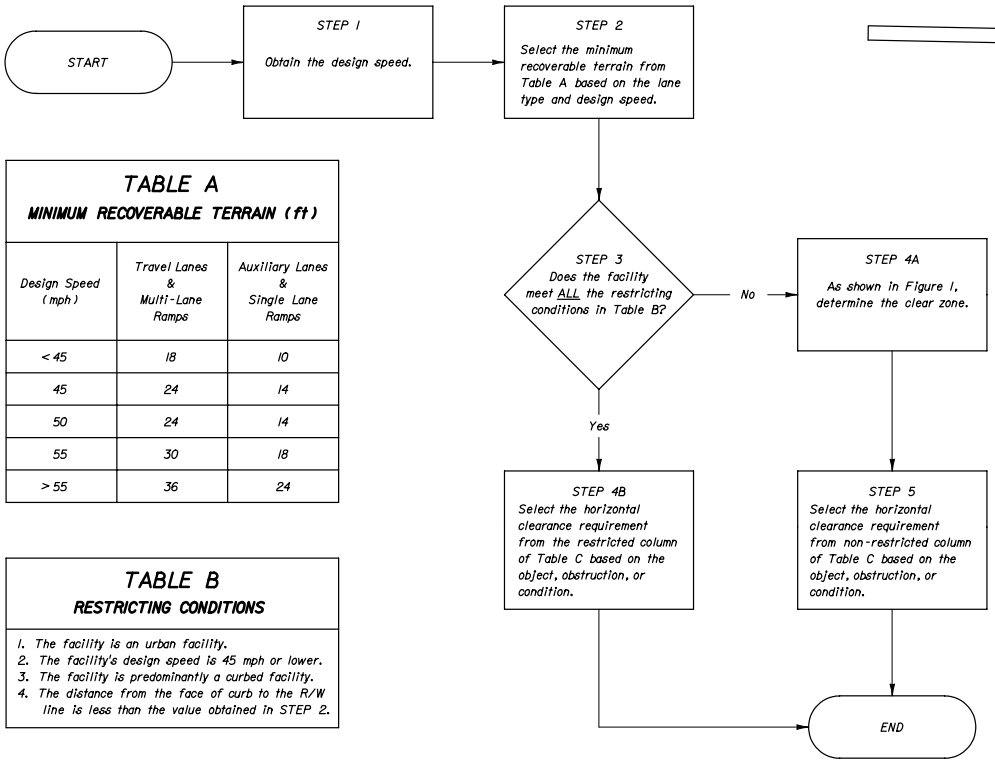
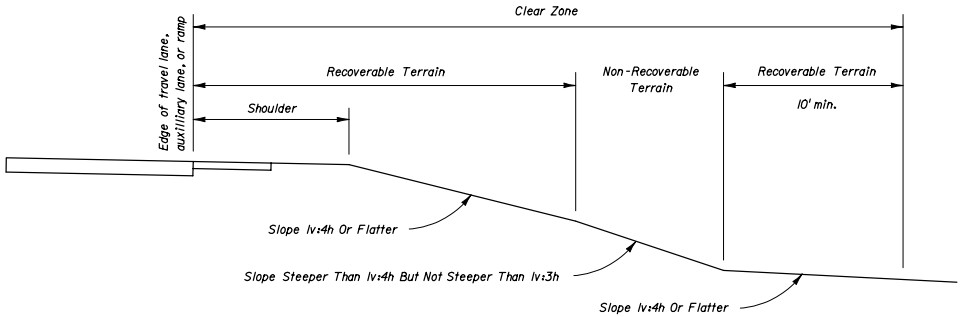


TABLE A
MINIMUM RECOVERABLE TERRAIN (ft)

Design Speed (mph)	Travel Lanes & Multi-Lane Ramps	Auxiliary Lanes & Single Lane Ramps
< 45	18	10
45	24	14
50	24	14
55	30	18
> 55	36	24

TABLE B
RESTRICTING CONDITIONS

1. The facility is an urban facility.
2. The facility's design speed is 45 mph or lower.
3. The facility is predominantly a curbed facility.
4. The distance from the face of curb to the R/W line is less than the value obtained in STEP 2.



Clear Zone is the relatively flat unobstructed area that is to be provided for safe use by errant vehicles, and must be wide enough so that the sum of all the recoverable terrain within is equal to or greater than the value obtained in STEP 2. Recoverable terrain provided beyond non-recoverable terrain must be a minimum of 10 feet. Areas beyond non-traversable and hazardous terrain cannot be used as recoverable or non-recoverable terrain.

Roadside Terrain includes all surfaces along the roadway other than travel lanes, auxiliary lanes, and ramps. For the purpose of establishing clear zones and horizontal clearance requirements, roadside terrain is defined as recoverable, non-recoverable, non-traversable, and hazardous as follows:

- Recoverable when it is safely traversable and on a slope that is 1v:4h or flatter.
- Non-recoverable when it is safely traversable and on a slope that is steeper than 1v:4h but not steeper than 1v:3h.
- Non-traversable when it is not safely traversable or on a slope that is steeper than 1v:3h.
- Hazardous when a slope is steeper than 1v:3h and deeper than 6 feet as shown in Figure 2.

Horizontal Clearance Requirements are shown in Table C and are the required offsets to an object from a specified point on the roadway.

ROADSIDE TERRAIN

FIGURE 1

PROCESS FOR DETERMINING HORIZONTAL CLEARANCE REQUIREMENTS AND CLEAR ZONES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

ROADSIDE OFFSETS

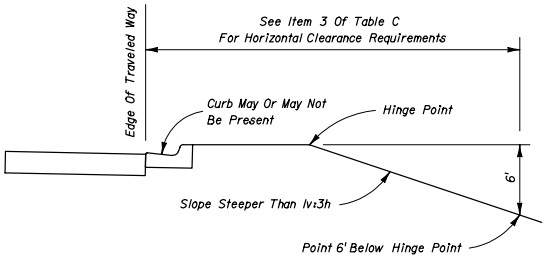
	Names	Dates
Designed By	TRB	12/02
Drawn By	SBC	12/02
Checked By		

Approved By _____
Roadway Design Engineer

Revision	Sheet No.	Index No.
04	1 of 2	700

TABLE C

	Item No.	OBJECTS, OBSTRUCTIONS OR CONDITIONS	HORIZONTAL CLEARANCE REQUIREMENTS	
			Restricted	Non-Restricted
GENERAL	1	Above ground fixed hazards: All roadside objects, obstructions or conditions other than those listed below that exceed 4 inches in height and pose a hazard to errant vehicles and vehicle occupants.	Locate as close to the Right Of Way as practical and not less than 4 feet from face of curb.	Locate outside the clear zone as close to the Right Of Way as practical.
ROADWAY	2	All FDOT approved guardrails, crash cushions, permanent or temporary concrete barriers, and guardrail end terminals.	Locate as shown in the Design Standards.	Locate as shown in the Design Standards.
	3	Drop-off hazards: Any point along a roadside slope steeper than 1v:3h that is deeper than 6 feet below the hinge point. See Figure 2.	Locate the point that is 6 feet below the hinge point no less than 22 feet from the traveled way.	Treat as roadside slopes in accordance with Design Standard 400.
	4	Mailboxes not shown in Design Standard 532.	Not to be used.	Not to be used.
	5	Mailboxes shown in Design Standard 532.	Locate in accordance with Design Standard 532.	Locate in accordance with Design Standard 532.
	6	Trees expected to become greater than 4 inches in diameter measured 6 inches above the ground.	Outside roadways: Locate no less than 4 feet from face of curb in accordance with Design Standard 546. Inside medians: Locate no less than 6 feet from the edge of traffic lane and in accordance with Design Standard 546.	Locate outside the clear zone as close to the Right Of Way as practical and in accordance with Design Standard 546.
	7	Trees not expected to become greater than 4 inches in diameter measured 6 inches above the ground.	Locate in accordance with Design Standard 546.	Locate in accordance with Design Standard 546.
	8	Canals behind guardrail.	Locate no less than 5 feet from the back of the guardrail post.	Locate no less than 5 feet from the back of the guardrail post.
	9	Canals without guardrail.	Locate as close to the Right Of Way as practical and not less than 40 feet from the traveled way.	Design speeds of 50 mph and greater: Locate as close to the Right Of Way as practical and not less than 60 feet from the traveled way. Design speeds less that 50 mph: Locate as close to the Right Of Way as practical and not less than 50 feet from the traveled way.
DRAINAGE	10	Culvert wing wall, endwall, retaining walls and flared end sections less than 6 feet deep.	Locate no less than 4 feet from face of curb.	Locate outside the clear zone.
	11	Culvert wing wall, endwall, retaining walls and flared end sections 6 feet and greater in depth.	Treat as drop-off hazard; See Item No. 3.	Treat as drop-off hazard; See Item No. 3.
	12	Mitered end sections.	Locate as shown in Design Standards 272 and 273.	Locate as shown in Design Standards.
TRAFFIC CONTROL DEVICES	13	Frangible sign supports.	Locate no less than 4 feet from face of curb and in accordance with Design Standard 17302.	Locate in accordance with Design Standard 17302.
	14	Overhead sign supports and other non-frangible signs.	Locate no less than 4 feet from face of curb.	Locate outside the clear zone.
	15	Signal controller cabinets, signal poles, strain poles and mast arms.	Locate no less than 4 feet from face of curb and not in medians.	Locate outside the clear zone and not in medians.
LIGHTING	16	Conventional lighting (frangible and non-frangible).	Locate no less than 4 feet from face of curb and not in medians.	Locate 20 feet from travel lanes or 14 feet from auxiliary lanes. Not in medians. May be clear zone width when the clear zone is less than 20 feet.
	17	Highmast lighting.	Not applicable.	Locate outside the clear zone.
STRUCTURES	18	Bridge piers and abutments: Above ground vertical structures.	Locate not less than 16 feet from edge of travel lane.	Locate outside the clear zone.
UTILITIES	19	Fire hydrants with bases no higher than 4 inches above the ground.	Locate not less than 2 feet from face of curb.	Locate as close to the Right Of Way as practical.
	20	Utility installations: All above ground fixed objects.	Locate as close to the Right Of Way as practical and not less than 4 feet from face of curb and not in medians.	Locate outside the clear zone as close to the Right Of Way as practical and not in medians and not within limited access facilities. May be placed 4 feet behind the back of shields that have been justified for other reasons.
RAILROADS	21	Railroad crossing traffic control devices.	Locate in accordance with Design Standard 17882.	Locate in accordance with Design Standard 17882.



DROP-OFF HAZARDS

FIGURE 2

GENERAL NOTES

1. When sidewalks are present, an unobstructed sidewalk width of at least 4 feet must be provided.

2. When site specific conditions prohibit meeting the horizontal clearance requirements in TABLE C, the object, obstruction or condition must be mitigated, possibly by shielding. Otherwise, the Plans Preparation Manual, Volume 1, Chapters 2, 4, 21 and 25, or Chapters 5 and 9 of the Utility Accommodation Manual must be researched to determine viable alternatives. The minimum requirements in these manuals can only be reduced when a Design Variation or Design Exception has been approved in accordance with Chapter 23 of the Plans Preparation Manual, Volume 1 or a Utility Exception has been approved in accordance with Chapter 13 of the Utility Accommodation Manual.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

ROADSIDE OFFSETS

	Names	Dates
Designed By	TRB	12/02
Drawn By	SBC	12/02
Checked By		

Approved By _____
Roadway Design Engineer

Revision	Sheet No.	Index No.
04	2 of 2	700

March 9, 2005- Green Book Committee Meeting

Analysis of Transit Route Accidents on the State and Federal Highway System and Implementation of Safety Related Strategies and Improvements (Transit Safety Project)

- Phase 1 of the Transit Safety Project involved extensive research of transit (bus) crashes that have occurred on the State Highway System (SHS) from 1998 to 2002.

- After review of the identified highest-crash locations, we found no specific roadway design issues that significantly contributed to the crash occurrences. Consequently, the recommendations developed focused on addressing the vehicle/driver behavioral and operational problems that helped serve to cause most of the crashes.

- As a result of the Phase 1 research, the following recommendations were developed to address the transit safety problems identified and reduce transit-related crashes.

  A. Install more bus pull-out bays on state roads. The presence of more pull-out bays is expected to improve the safety of bus operations on the SHS.

  B. Undertake and complete a study to improve and standardize the lighting configurations on buses, to increase auto driver awareness of the presence and operation of the buses.

  C. Develop and implement an on-going public awareness effort to better inform motorists of the Florida law that requires drivers to yield to buses entering the travel lane from a bus stop or station.

- While no locations were found to experience statistically high crash rates involving buses, a significant number of the crashes that did occur involved autos striking the rear area of the buses.

- For all crashes with an injury or fatality at the identified high-frequency locations, involving buses anywhere on the SHS, it was determined that the auto struck the rear area of the bus in 20% of the crashes. For the crashes of this type that occurred in the immediate vicinity of a bus stop, the auto struck the rear area of the bus in 47% of the crashes.

- It was also found the locations that experienced the highest frequencies of crashes involving buses, with an injury or fatality, were generally in transit systems that did not have many bus pull-out bays. Most of these crash locations near bus stops identified in the Phase 1 study (which were located in the Orlando area) study did not have pull-out bays.

- This result from the Phase 1 report, along with other data and information collected, suggested that the presence of pull-out bays would reduce bus crashes that occur, given the proper operations of traffic as buses enter the roadway lane from the pull-out bay.

March 9, 2005- Green Book Committee Meeting Outline for Chapter 13 Proposed Changes

As part of the Phase 2 the Transit Safety Study we were to identify standards used relating to the locations of pull-out bays for the transit agencies throughout the state. This research will build upon the design standards used by various agencies. Potential opportunities to include these design guidelines during the roadway widening programming and design process and incorporating these guidelines into the Green Book is the first step toward development of a FDOT standard.

This discussion will include the **Street Side Bus Stop Facilities** primarily situations, were turnout (pull out) bays for transit vehicles are appropriate (i.e., consistent slow boarding, layover needs, safety reasons, high speed traffic, etc.).

There are three general bus stop design types: curb-side, nubs and bus bays.

- **Curb-side** the most common, simplest and convenient form of bus stops. Curb-side bus stops are located adjacent to the travel lane requiring only a sign to designate a stop.
- **Nubs/Curb Extensions/Bulbs** consist of a section of sidewalk that extends up to the through travel lane from the curb of a parking lane and may be constructed along streets with on-street parking. The bus will stop within the travel lane instead of weaving into the parking lane.
- **Bus Bays (Pullouts, Turnouts)** where passengers board or alight in an area outside of the travel lane. This design feature allows traffic to flow freely without the obstruction of stopped buses.
- As a subsection of this **Florida law (F.S. 316.0815)** identifies that the driver of a vehicle shall yield to the right-of-way to a publicly owned transit bus traveling in the same direction which has signaled and is reentering the traffic flow for a specifically designated pull-out bay.

The following are guidelines for locating bus bay (Figures that detail each type are included in the proposed revisions):

- **Far side bus bays** should be placed at signalized intersections so the signal can create gaps in traffic for the bus to re-enter the traffic stream.
- **Near side bus bays** should be avoided because of conflicts with right turning vehicles, delays to transit service as buses attempt to reenter the travel lane, and obstruction of traffic control devices and pedestrian activity.
- **Mid-block bus bay** locations may be associated with key pedestrian access to major transit-oriented activity centers.

Other guideline for Bus Bays include:

- **Bus Bay Signing & Pavement Markings** Signing and pavement markings near bus bays should differentiate bus bays from travel lanes.
- **Grading and Drainage Bus bays** should not be located on profile low points to avoid placing passengers in areas of potential ponding.
- **Pavement Section Bus bays** are to be constructed with a flexible (asphalt) or rigid (concrete) pavement section that covers the entire turnout area.
- **Bus Bay Lighting bus bay** pavement areas should meet the same criteria for minimum illumination levels, uniformity ratios and max-to-min ratios that are being applied to the adjoining roadway based on Chapter 6-Roadway Lighting.

CHAPTER 13

PUBLIC TRANSIT

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CHAPTER 13

PUBLIC TRANSIT

A INTRODUCTION

All usual modes of transportation (autos, trucks, transit vehicles, rails, aircraft, water craft, bikes, pedestrian) should be considered when planning, designing, and constructing the surface transportation system. Where there is a demand for highways to serve vehicles, there could also be a demand for public transit or public transportation. Public transit should be considered in all phases of a project, including planning, preliminary design and engineering, design, construction, etc. With the recent passing of various legislation, multimodalism is the ultimate goal.

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

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

Federal and State legislation provide the stimulus for planning, designing, and constructing a fully integrated transportation system benefiting the traveling public and the environment. Examples of legislation include The Federal Transportation Equity Act for the 21st Century (TEA-21), The Americans with Disabilities Act of 1990 (ADA), and The Clean Air Act

Amendment of 1990 (CAAA). In response to this legislation, the surface transportation system should provide for concurrent use by automobiles, public transit and rail, and to the extent possible, bicycles and pedestrians.

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

B OBJECTIVE

There are a number of methods to efficiently develop a coordinated surface transportation system. Coordination among agencies is necessary during the planning and design stages to incorporate transit needs and during the construction phase for re-routing bus (and complementary pedestrian) movements and for actual transit agency specific requirements (e.g., bus stop sign replacement, shelter installations, etc.). For planning purposes, the State and Local Transportation Improvement Program (TIP) should be referenced. Additionally, individual transit authorities have five year Transit Development Plans (TDPs) that are updated annually. The TDP can be used as a guide for planned transit needs along existing and new transportation corridors so transit consideration and transit enhancements can be incorporated where appropriate.

C CURBSIDE TRANSIT COMPONENTS AND FACILITIES

C.1 Stops and Station Areas

Where new bus stop pads are constructed at bus stops, bays, or other areas where a lift or ramp is to be deployed, they shall have a firm, stable surface, minimum clear length of 96 inches (measured from the curb or vehicle roadway edge), minimum clear width of 60 inches (measured parallel to the vehicle roadway) to the maximum extent allowed by legal site restraints, and shall be connected to streets, sidewalks, or pedestrian paths by an accessible route. The slope of the pad parallel to the roadway shall, to the extent practicable, be the same as the roadway. For water drainage, a maximum slope of 1:50 (2%) perpendicular to the roadway is allowed. In cases where there are no sidewalks or curbs, bus stop pads may be necessary to allow the wheelchair passengers to board or alight from a transit vehicle. Coordination with the Public Transportation Office and/or local public transit provider(s) is necessary.

C.2 Shelters

Every public transit system has different needs with regards to shelters and corresponding amenities (e.g., benches, information kiosks, leaning posts, trash receptacles, etc.). Shelter foundation and associated pad size vary from stop to stop based on right of way availability, line of sight, facility usage, etc. Where provided, new or replaced bus shelters shall be installed or positioned as to permit a wheelchair or mobility aid user to enter from the public way and to reach a location therein having a minimum clear floor area of 30 inches by 48 inches, entirely within the perimeter of the shelter. Such shelters shall be connected by an accessible route to the boarding area provided under C.1 Stops and Station Areas, this Chapter. Coordination with the Public Transportation Office and local transit provider(s) is necessary. All shelters should provide a location for a bicycle rack. Shelters should be installed at locations where demand warrants their installation.

C.3 Benches

Bench placement should be in an accessible location (i.e., not on the far side of a drainage ditch from the actual bus stop), but appropriately out of the path of travel on a sidewalk. Connection between the sidewalk and/or bus stop pad should be provided. Coordination with the Public Transportation Office and the local public transit provider(s) is necessary.

C.4 Concrete Bus Stop Pads

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

C.5 Promote Public Transit

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

~~C.5 Bus Bays (Pullout or Turnout Bays)~~

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

D STREET SIDE BUS STOP FACILITIES

In some situations, turnout bays for transit vehicles are appropriate (i.e., consistent slow boarding, layover needs, safety reasons, high speed traffic, etc.). Bus bays can be designed for one or more buses. Coordination with the Public Transportation Office and/or the local public transit provider(s) will help determine the need for and justification of bus bays. Additional details are provided in the FDOT District 4 Transit Facilities Guidelines date April 2004.

There are three general bus stop design types: curb-side, nubs and bus bays. All three design types are linear configurations and discussed in greater detail below.

D1. Curb-Side

Curb-side, particularly right lane curb-side stops, are the most common, simplest and convenient form of bus stops. Curb-side bus stops are located adjacent to the travel lane requiring only a sign to designate a stop. Only a single stopping position at the head of the stop is defined; if multiple buses approach, they simply line-up behind the preceding bus. Due to its simple design, curb-side stops are easy and inexpensive to install, easy to relocate, and provide easy access for bus drivers causing minimal delays to buses. Disadvantages include potential queues behind buses causing congestion as well as encouraging drivers to make unsafe lane maneuvers to avoid delay behind stopped buses. (1)

D 2. Nubs/Curb Extensions/Bulbs

Nubs, also called curb extensions or bus bulbs, consist of a section of sidewalk that extends up to the through travel lane from the curb of a parking lane. Nubs are a form of a curbside stop. In areas with high pedestrian use such as Central Business Districts (CBD), curb extensions may be constructed along streets with on-street parking. When the bus stop is located at a nub, the bus will stop within the travel lane instead of weaving into the parking lane. This allows nubs to operate similar to curbside stops. Nubs offer additional area for pedestrians to wait for a bus and space to provide additional transit infrastructure such as shelters, benches, and bicycle facilities. Nubs also create opportunities for additional on-street parking. Nubs have particular application along streets with lower traffic speeds and/or low traffic volumes, where it would be acceptable to stop buses in the travel lane.

Common reasons for installing nubs include:

- High transit ridership in corridor;
- Re-entry problems for buses, particularly during peak travel times;
- Need to separate transit and pedestrian activity on crowded sidewalks; and
- Need to provide additional transit infrastructure.

According to an article published in the Institute of Transportation Engineers (ITE) Journal (2), nubs are not appropriate on facilities with:

- High operating speeds, generally 45 MPH or greater;
- High traffic volumes;
- Transit corridors that serve a large wheelchair dependent population;
- Less than 24-hour on-street parking available;
- Low transit ridership or pedestrian activity; or
- Transit layover stations.

Figures 13-1 through 13-6 identify typical nub design for near side, far side and mid-block stops respectively.

D.3 *Bus Bays (Pullouts, Turnouts)*

Bus stops may be designed with a bus bay or pullout to allow buses to pick up and discharge passengers in an area outside of the travel lane. This design feature allows traffic to flow freely without the obstruction of stopped buses. The greater distance placed between waiting passengers and the travel lane increases safety at a stop. Bus bays are encouraged on roadways with high operating speeds, such as roads that are part of the Urban Principal Arterial System. For a particular bus stop, a high frequency of crashes involving buses is a good indicator for the need of a bus bay.(3) Additionally, bus bays may be constructed in downtown or shopping areas where many passengers may board and alight at the same time. The following factors should be considered when deciding to incorporate bus bays in a design:

- Buses are expected to layover at the end of a route or bus routes intersect and buses have extended stops to allow for transfers.
- Traffic in the curb lane exceeds 250 vehicles during the peak hour.
- Actual traffic speed is greater than 40 MPH.
- Bus volumes are 10 or more per peak hour on the roadway.
- Passenger volumes exceed 20 to 40 boardings an hour.
- Average peak-period dwell time exceeds 30 seconds per bus.
- History of repeated traffic and/or pedestrian crashes at stop location.
- Right-of-way width is adequate to construct the bay without adversely affecting sidewalk pedestrian movement.
- Improvements, such as widening or 3R projects, are planned for a major roadway such that the expansion provides an opportunity to include the bus bay as part of the improvement, reducing the cost of the bus bay.

At a specific location, the factors may be conflicting and a balance must be obtained based on the designer's judgment and input from the applicable transit agencies. In locations where the traffic volumes exceed 1,000 vehicles per hour per lane, it is difficult to maneuver the bus into the bay and back into the travel lane. Even though Florida law (F.S. 316.0815) identifies that right-of-way is afforded to exiting buses, incorporating an acceleration distance, signal priority, or a far side (versus near side or mid-block) placement, are potential solutions when traffic volumes exceed 1,000 vehicles per hour (1)

The decision of whether or not to provide a bus bay depends on the priorities that are established for the transit facility and available right-of-way. Even though standards for bus bays have been developed and incorporated in many locations, some agencies are opposed to their construction because they prioritize vehicular traffic contradicting the concepts to build livable communities. In high-density commercial locations with on- street parking, nubs are a potential alternative to bus bays. The following summarizes the advantages and disadvantages of bus bays.

The advantages of bus bays over nubs are:

- Allows vehicles to proceed around the bus, reducing delay for other roadway traffic and minimizing the probability of a crash.
- Assists in maximizing the vehicle capacity of the roadway.

- Clearly defines the bus stop.
- Passenger loading and unloading may be conducted in a safer manner.
- Less potential for rear-end crashes.

The disadvantages of bus bays over nubs are:

- On streets with high traffic volumes, it is difficult for buses to re-enter traffic, increasing delays and average travel time. In high volume locations, bus operators may not utilize bus bays once constructed.
- Creates additional paving and may require additional right-of-way.
- May increase rates of sideswipe crashes as buses re-enter the traffic stream.

In addition to the standard or closed bus bay design, there are two general variations of bus bays: open bus bays and partial open bus bays. These variations can be used in certain locations based on specific conditions. The use of partial open bus bays is not recommended for use in these guidelines since it requires a partial sidewalk extension into the through lane at the intersection. The following section summarizes the differences between closed and open bus bays. In addition, combination right turn lane and bus bay option is discussed.

The total length of the bus bay should allow room for an entrance taper, a deceleration lane, a stopping area, an acceleration lane, and exit taper. TCRP 19 provides detailed bus bay dimensions that are applicable when right-of-way is unlimited and accesses points are limited. However, in some cases it may be acceptable to use the through lane as the acceleration and deceleration lane and provide only the tapers and the stopping area. (1) The actual design of a bus bay/turnout will depend on local site conditions and the volume of service and passenger transfer needs. Space constraints may limit the size of bus bays while service volumes may necessitate their expansion to accommodate additional buses (4)

The dimensions for mid-block bus bays are highly variable and depend on the design speed and classification of the roadway in order to afford buses sufficient distance for deceleration and acceleration. The physical location of the roadway, local characteristics, level of transit service and the type of bus (regular or articulated) will dictate the type and design of mid-block bus bay appropriate for a particular location. The level of transit service may require a larger bus bay to accommodate multiple buses; likewise, the length of the bus will ultimately depict the length of the bus bay.

The following are guidelines for locating bus bays:

- Far side bus bays should be placed at signalized intersections so the signal can create gaps in traffic for the bus to re-enter the traffic stream.
- Near side bus bays should be avoided because of conflicts with right turning vehicles, delays to transit service as buses attempt to reenter the travel lane, and obstruction of traffic control devices and pedestrian activity. In addition, near side bus bays may cause operational conflicts, as transit drivers may not pull completely into the bus bay due to the difficulty of re-entering the mixed-travel lane.
- Mid-block bus bay locations may be associated with key pedestrian access to major transit-oriented activity centers.

D.3.a. Closed Bus Bays

A closed bus bay may be located either near side, far side or mid-block and consists of a physical entrance taper, a stopping area and a physical exit taper. The closed bus bay is also referred to as a turnout since it is a specially constructed area separated from the travel lanes and off the normal section of the roadway.

Design for bus bays along urban versus rural street configurations are depicted in Figures 13-7 through 13-10. Near side bus bays preceding lane drop in a right turn lane and with on-street parking are depicted in Figures 13-13.

D.3.b. Open Bus Bays

The open bus bay is always located on the far side of the intersection. The open bus bay does not have a physical entrance taper and is thus open to the upstream intersection. On facilities of four-lanes or less, open bus bays facilitate U-turns from the opposing direction. Open bus bays are not recommended on six or more lane facilities. With the open bus bay design, the pavement width of the upstream cross street is utilized for deceleration and to move the bus from the travel lane. The major advantages of the open bus bay are; 1) the ease with which the bus can exit the traffic stream and stop out of the travel lane and 2) the shorter overall length of the bay (compared to a closed bus bay). The most significant disadvantage of this design is the increased distance a pedestrian must walk to cross the street

and traverse the length of the bay. Re-entry difficulties remain the same as a closed bus bay. At a signalized intersection the re-entry difficulty is overcome as the signal permits the bus operator to exit the bay during the gaps created by the traffic signal. Figures 13-14 and 13-15 depict locational criteria for open bus bays with and without on-street parking for far side stops.

D.3.c. Combination Bus Bay / Right Turn Lane

In addition to the alternative designs described above, designers may want to consider a bus bay / right turn lane combination. In many instances conflict between buses and right turning vehicles exists. To address this conflict, it may be appropriate to develop a combined bus bay / right turn lane which can accommodate both transit and right turning vehicles. Figures 13-16 through 13-18 depict combined bus bay-right turn lane configurations for near and far side locations respectively. These combinations can be applied to either near side bus bays with an intersection auxiliary right turn lane or far side bus bays with an auxiliary right turn lane for a succeeding turnout connection. The various bus bay and right turn configurations include three basic options:

- Most desirable design: the bus bay is placed entirely upstream from the right turn lane;
- Second most desirable design: the bus bay is placed partially upstream from the right turn lane since the bus bay and right turn lane share the bus exit and right turn entry taper; and
- Minimum design: the bus bay and right turn lane share space but with the bus bay located as far upstream as feasible.

D.4. Bus Bay Signing & Pavement Markings

Signing and pavement markings near bus bays should differentiate bus bays from travel lanes. Sample striping is provided in all applicable figures in this chapter. Generally, a broken 6-inch white stripe, 2-feet by 4-feet skip, should be used in the areas where buses will be entering and leaving the bus bay (acceleration and deceleration tapers). A solid 6-inch white stripe should be used between the dashed areas to delineate the travel lane for through vehicles.

D.5. Grading and Drainage

Bus bays should not be located on profile low points to avoid placing passengers in areas of potential ponding. In curb and gutter locations, bus bay pavement should slope into the roadway at a 2% cross slope that directs run-off to a drainage structure located outside of the bus bay area. When possible, runoff should be directed to adjacent native landscaping areas. In the absence of curb and gutter, bus bay pavement or landing pads should be sloped away from the roadway (2% cross slope minimum or matching the adjoining roadway pavement slope) to direct runoff to roadway drainage ditches.

D.6 Pavement Section

Bus bays are to be constructed with a flexible (asphalt) or rigid (concrete) pavement section that covers the entire turnout area. The bus bays shall be designed and constructed in accordance with the requirements set forth in CHAPTER 5 – PAVEMENT DESIGN AND CONSTRUCTION.

The designer should consider a concrete pavement section to decrease long-term maintenance costs since asphalt pavement will deteriorate when in frequent contact with petroleum distillate deposits from buses and may become deteriorated due to the loads and shear forces applied to the pavement surface during bus starting and stopping movements. Projections for the number of buses to use a bus bay and expected layover times at the stop should be taken into account to determine a pavement design. Additional design criteria are provided in the AASHTO Guide for Design of Pavement Structures (1993) for a standard bus arriving every 15 minutes for a design period of 20 years.

The width of the bus bays should be designed with the minimum width given in Figures 13-7 through 13-10 depending upon the type of bus bay and the rural or urban condition.

~~D.6 Pavement Section~~

~~Bus bays are to be constructed with a flexible (asphalt) or rigid (concrete) pavement section that covers the entire turnout area. To decrease long-term maintenance costs, the use of a concrete pavement section is recommended. Asphalt pavement will deteriorate when in frequent contact with petroleum distillate deposits from buses and may become deteriorated due to the loads and shear forces applied to~~

~~the pavement surface during bus starting and stopping movements. In addition to soil conditions, projections for the number of buses to use a bus bay and expected layover times at the stop should be taken into account to determine a concrete pavement design. (4) The recommended pavement design is a 9-inch concrete slab with a 12-inch sub-base (LBR 40). This design is based on the criteria provided in the AASHTO Guide for Design of Pavement Structures (1993) for a standard bus arriving every 15 minutes for a design period of 20 years. Refer to the FDOT Pavement Design Manuals for additional pavement design criteria.~~

D.7 Bus Bay Lighting

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

~~D.7 Bus Bay Lighting~~

~~Lighting design for bus bay pavement areas should meet the same criteria for minimum illumination levels, uniformity ratios and max-to-min ratios that are being applied to the adjoining roadway based on FDOT Lighting Design Criteria (5). If lighting is not provided for the adjoining roadway, coordination with the transit agency may be considered to determine if lighting is to be provided for the bus stop area. A decision to install lighting for the adjoining bus stop area may include illumination of the bus bay pavement area. The use of solar panel lighting for bus bays is another option that should be considered.~~

~~C.6 Promote Public Transit~~

~~All citizens and businesses in the State of Florida are encouraged to promote public transit. This can be done in many ways from providing employees reduced fares, to providing route maps and schedules. Work with your local transit agency to provide service to large employment areas and major attractions. Assist local transit~~

~~agencies in providing such things as bus lanes, park and ride lots and easements for bus shelters and bicycle parking. Encourage businesses or neighborhoods to hold a "Commuter Choices Week" and invite your transit agencies to provide information on the advantages of using transit. "Commuter Choices Week" is a state sponsored event that promotes alternative transportation in the work place (walk, bike, bus, transit, telecommuting).~~

FIGURE 13 -1
NEAR SIDE NUB/BULB WITH ON-STREET PARKING PRECEDING RIGHT TURN LANE

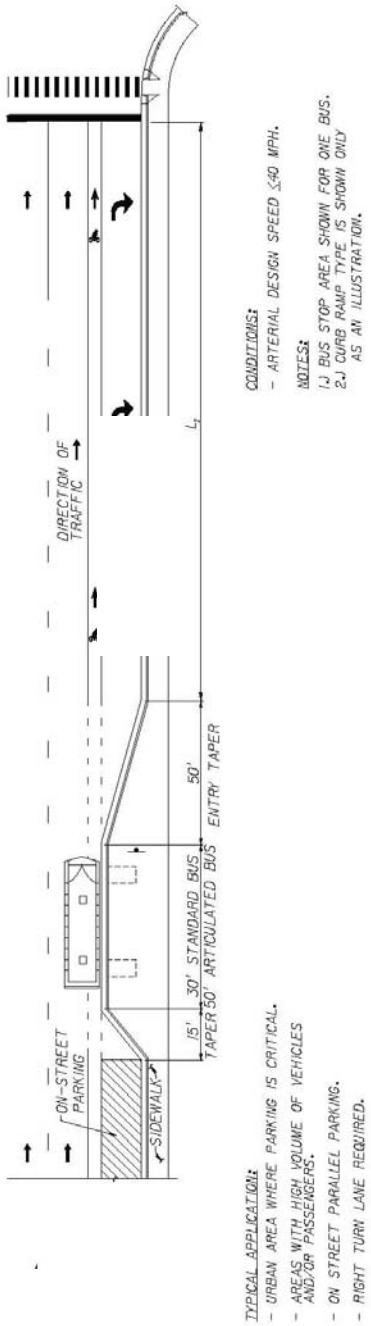


FIGURE 13 -2

NEAR SIDE NUB/BULB WITH ON STREET PARKING

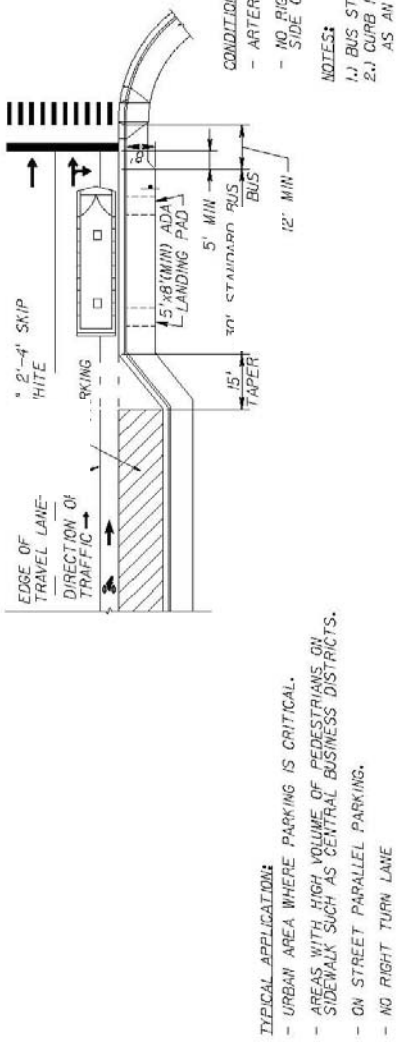
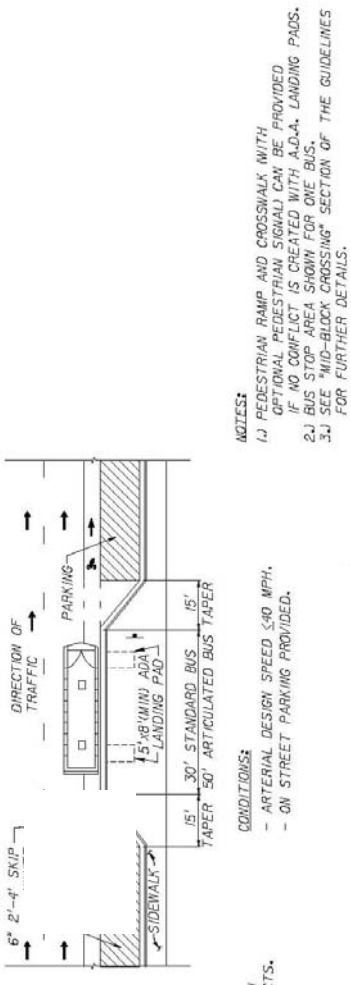


FIGURE 13 - 3
MID-BLOCK NUB/BULB WITH ON- STREET PARKING



NOTES:
1.) PEDESTRIAN RAMP AND CROSSWALK WITH OPTIONAL PEDESTRIAN SIGNAL CAN BE PROVIDED IF NO CONFLICT IS CREATED WITH A.D.A. LANDING PADS.
2.) BUS STOP AREA SHOWN FOR ONE BUS.
3.) SEE "MID-BLOCK CROSSING" SECTION OF THE GUIDELINES FOR FURTHER DETAILS.

CONDITIONS:
- ARTERIAL DESIGN SPEED ≤40 MPH.
- ON STREET PARKING PROVIDED.

TYPICAL APPLICATION:
- AREAS WITH HIGH VOLUME OF PEDESTRIANS ON SIDEWALK SUCH AS CENTRAL BUSINESS DISTRICTS.
- MID-BLOCK BUS STOP NEEDED TO ACCESS A TRANSIT DEMAND GENERATOR.
- ON-STREET PARALLEL PARKING.

FIGURE 13 - 4
MID-BLOCK NUB/BULB ON DIVIDED ROADWAY WITH ON-STREET PARKING

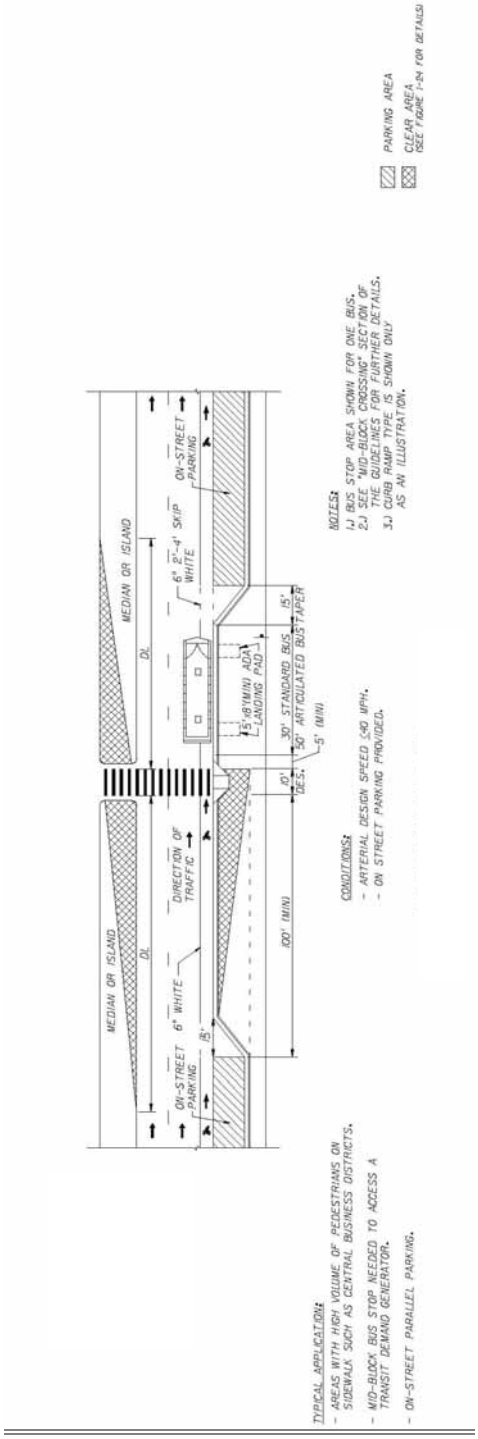


FIGURE 13 -5
MID-BLOCK ON AN UNDIVIDED ROADWAY WITHOUT ON-STREET PARKING

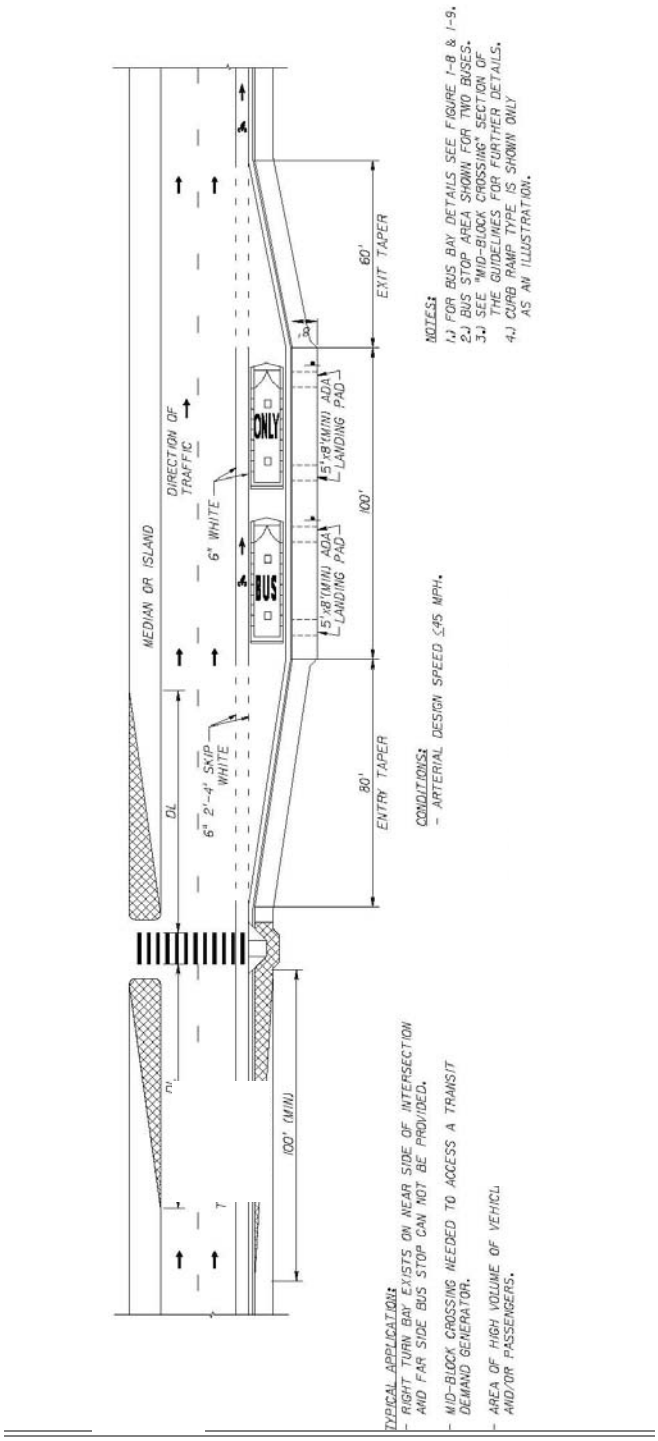


FIGURE 13 -6
MID-BLOCK NUB/BULB WITH TWO-WAY-LEFT-TURN-LANE MEDIAN AND- ON-STREET PARKING

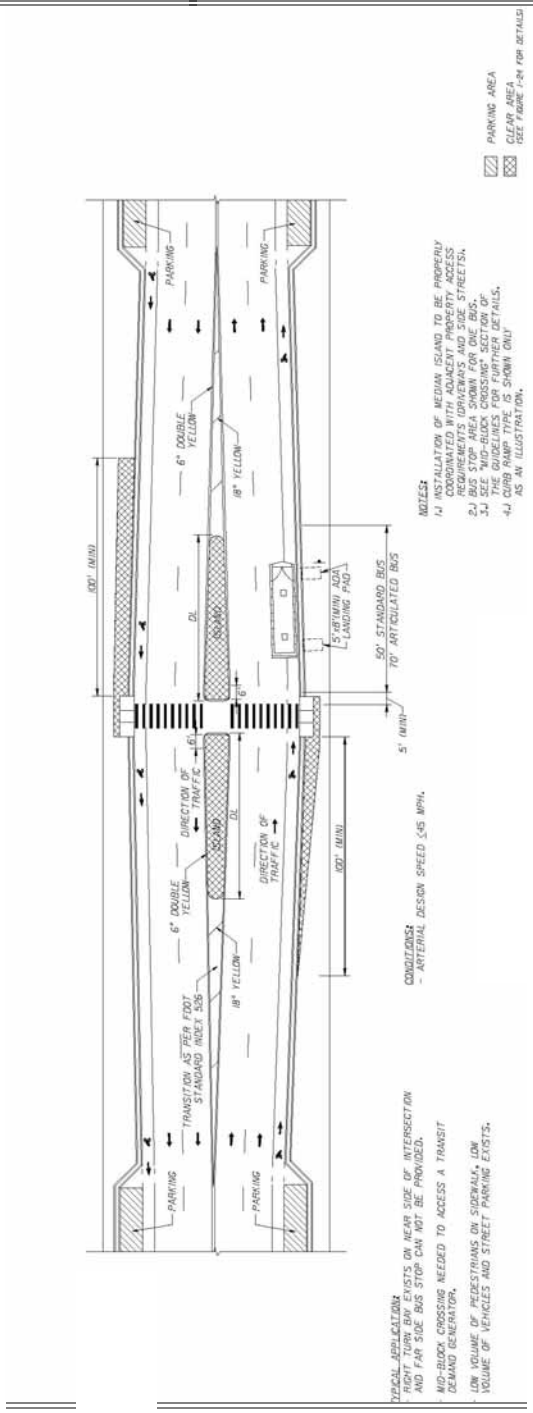


FIGURE 13 - 7
CLOSED BUS BAY LAYOUT WITH CONCRETE PAVEMENT AND URBAN CURB AND GUTTER

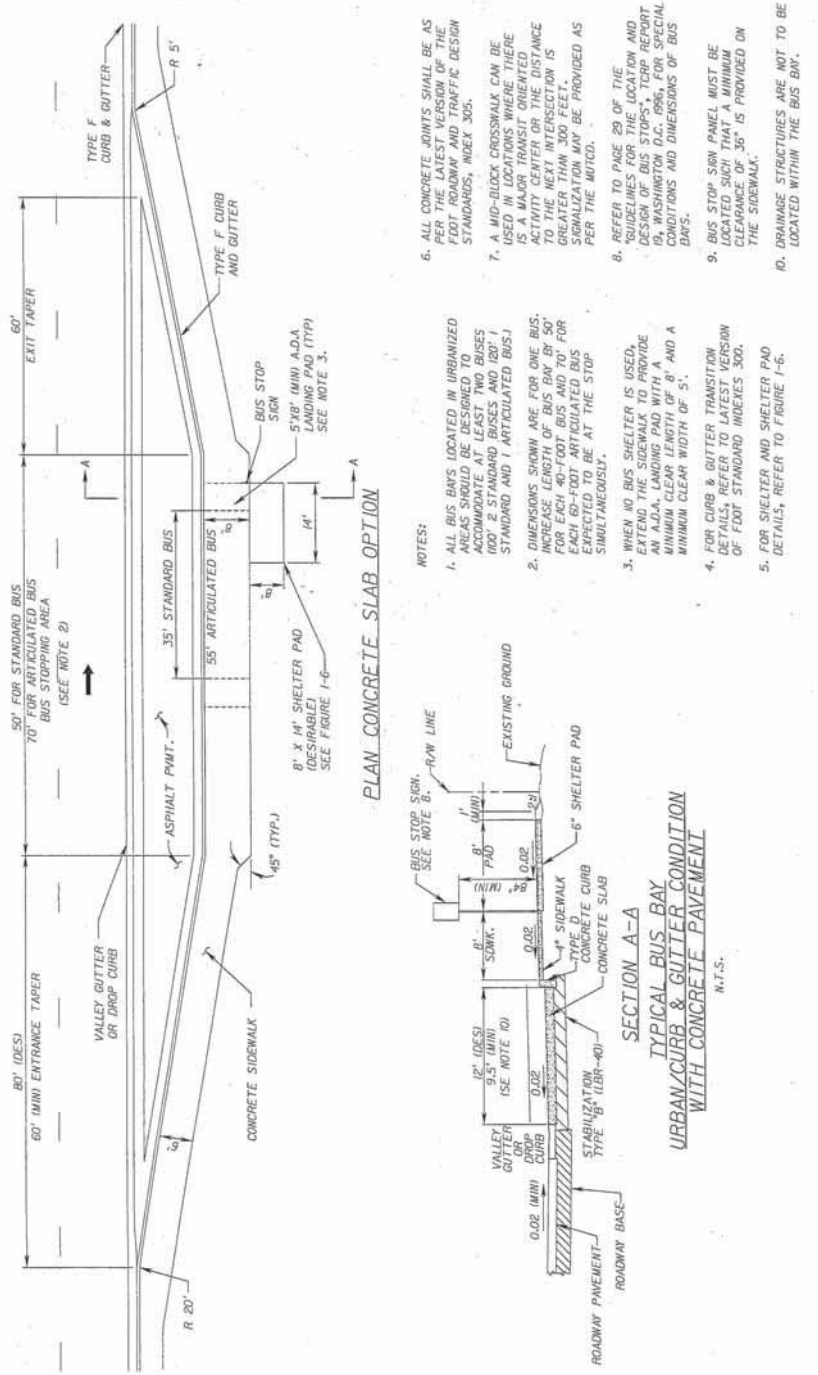


FIGURE 13 - 8
CLOSED BUS BAY LAYOUT WITH ASPHALT PAVEMENT AND URBAN CURB AND GUTTER

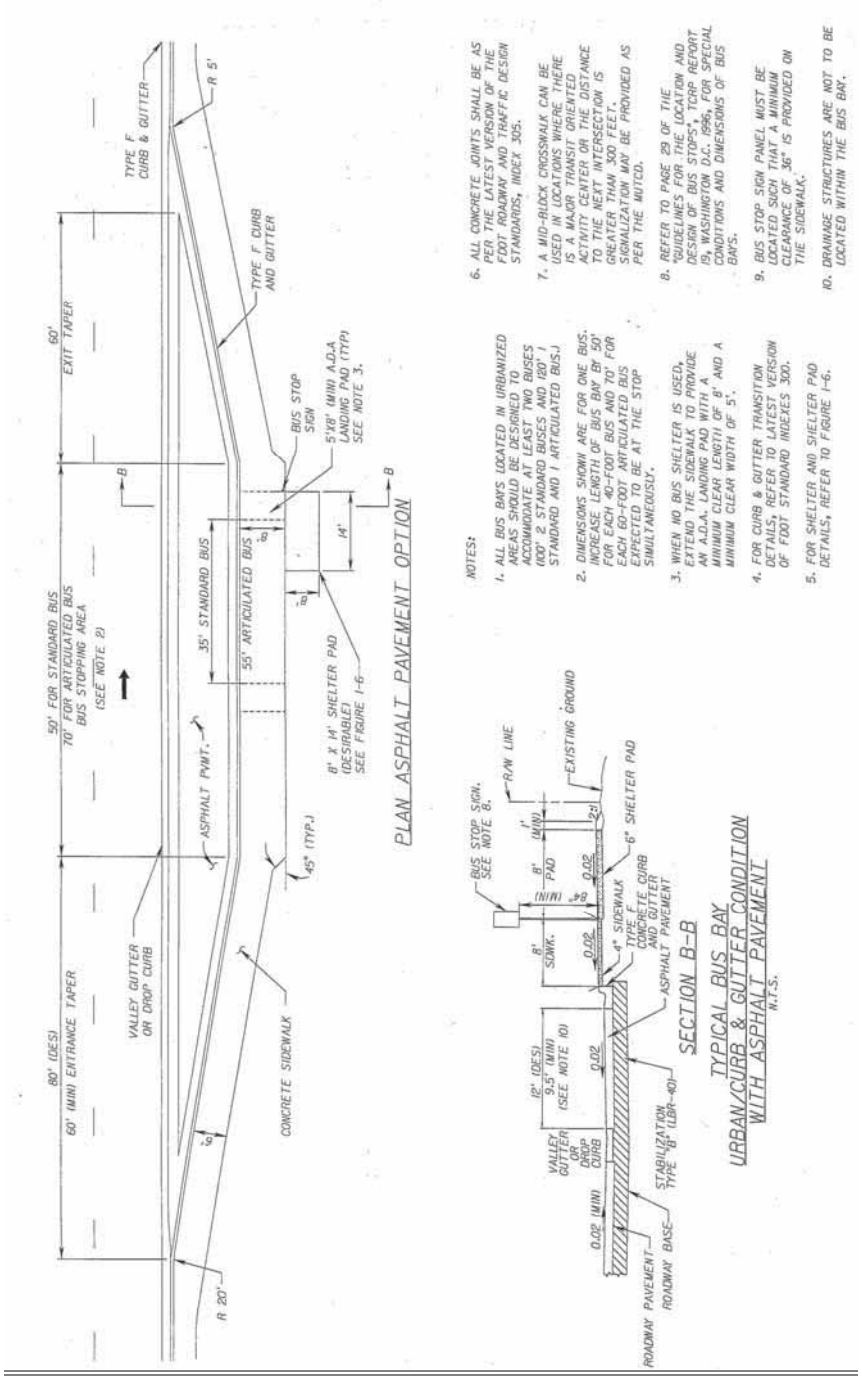


FIGURE 13 - 9
CLOSED BUS BAY LAYOUT WITH CONCRETE PAVEMENT AND RURAL SHOULDER

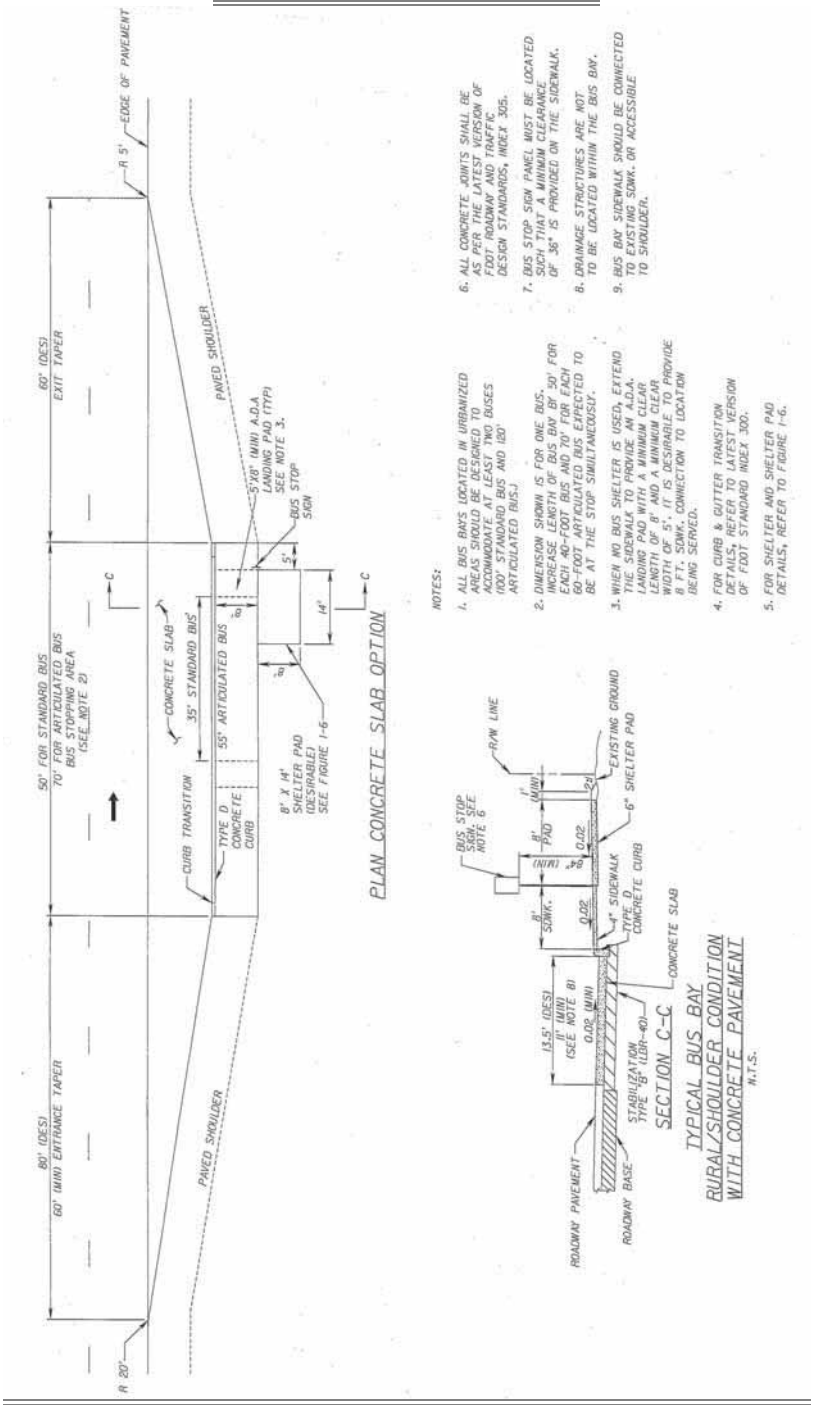


FIGURE 13 - 10
CLOSED BUS BAY LAYOUT WITH ASPHALT PAVEMENT AND RURAL SHOULDER

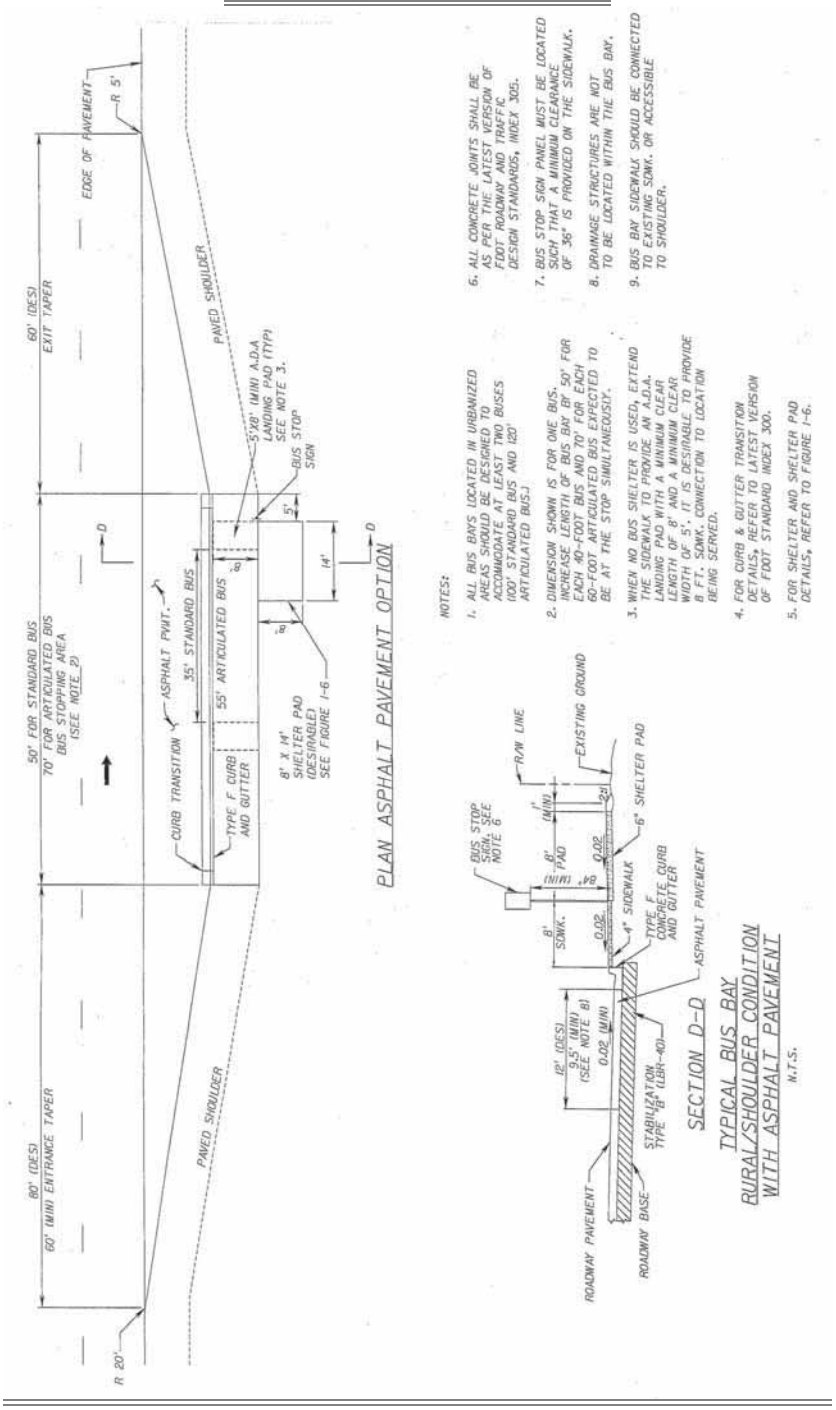


FIGURE 13 - 11
NEAR SIDE BUS BAY / STOPS IN PRECEDING RIGHT TURN LANE

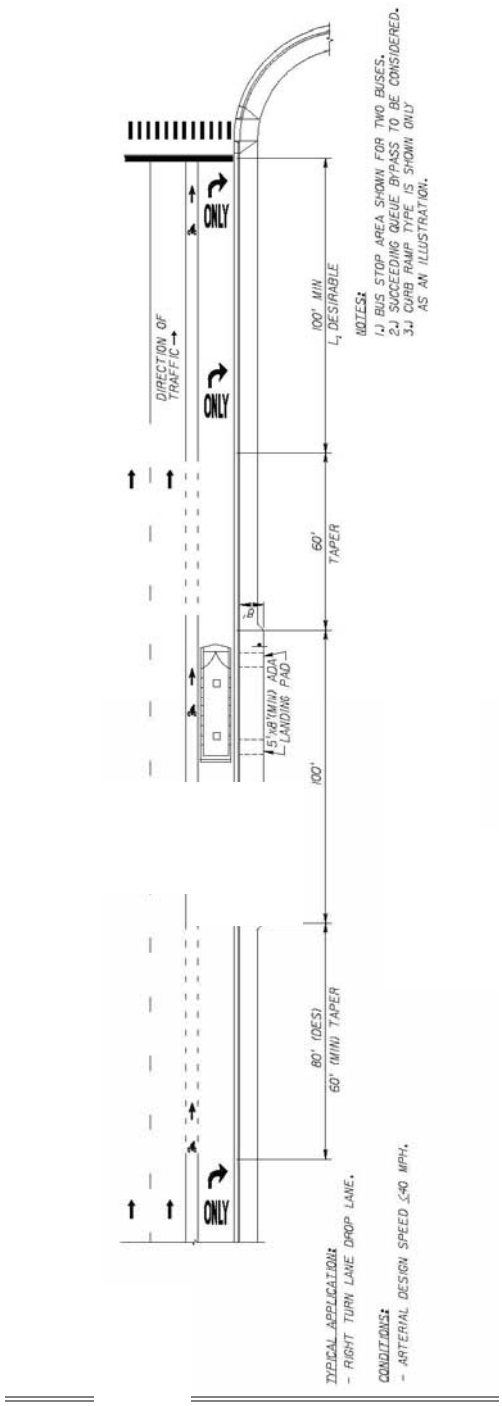
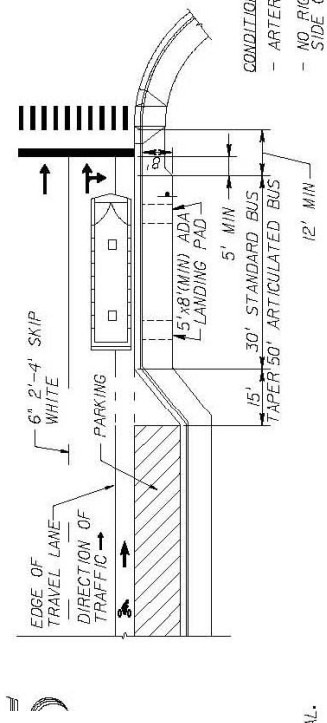


FIGURE 13 - 12
NEAR SIDE BUS BAY / STOPS IN NUB/BULB WITH ON-STREET PARKING

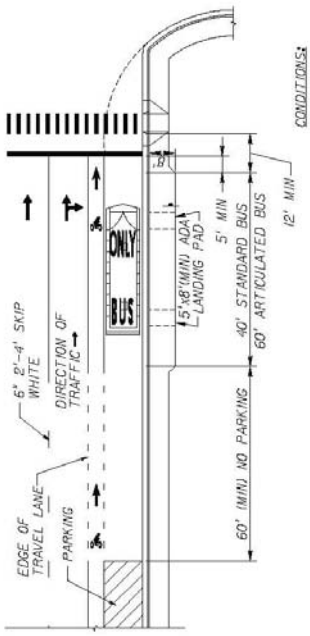


CONDITIONS:
- ARTERIAL DESIGN SPEED ≤40 MPH.
- NO RIGHT TURN BAY ON NEAR SIDE OF INTERSECTION.

NOTES:
1.) BUS STOP AREA SHOWN FOR ONE BUS.
2.) CURB RAMP TYPE IS SHOWN ONLY AS AN ILLUSTRATION.

TYPICAL APPLICATION:
- URBAN AREA WHERE PARKING IS CRITICAL.
- AREAS WITH HIGH VOLUME OF PEDESTRIANS ON SIDEWALK SUCH AS CENTRAL BUSINESS DISTRICTS.
- ON STREET PARALLEL PARKING.
- NO RIGHT TURN LANE

FIGURE 13 - 13
NEAR SIDE BUS BAY / STOPS WITH ON-STREET PARKING



NOTES:
1.) BUS STOP AREA SHOWN FOR ONE BUS.
2.) CURB RAMP TYPE IS SHOWN ONLY AS AN ILLUSTRATION.

CONDITIONS:
- ARTERIAL DESIGN SPEED ≤40 MPH.

TYPICAL APPLICATION:
- AREAS WITH HIGH VOLUME OF VEHICLES AND/OR PASSENGERS.
- NO RIGHT TURN LANE
- ON STREET PARALLEL PARKING.

FIGURE 13 - 14
FAR SIDE OPEN BUS BAY PRECEDING A RIGHT TURN LANE

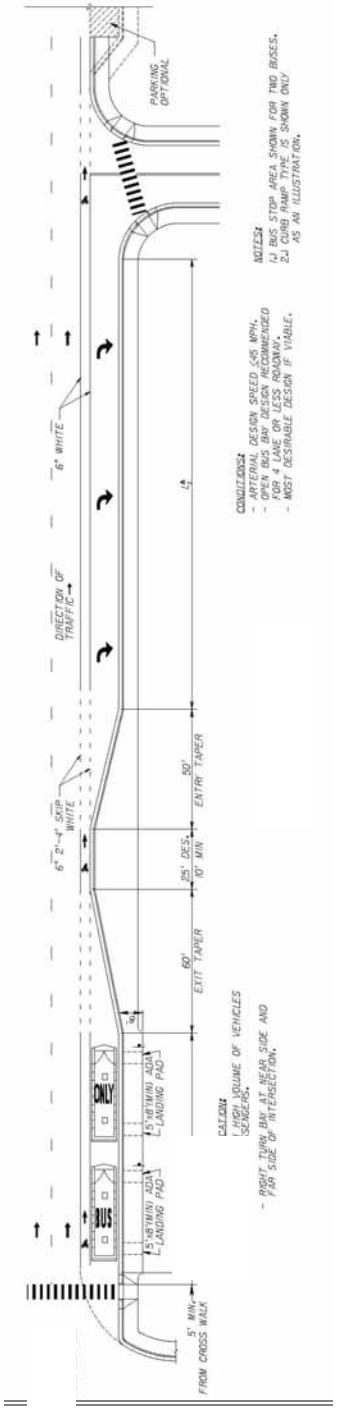


FIGURE 13 - 15
FAR SIDE OPEN BUS BAY PRECEDING A RIGHT TURN LANE WITH SHARED TAPER

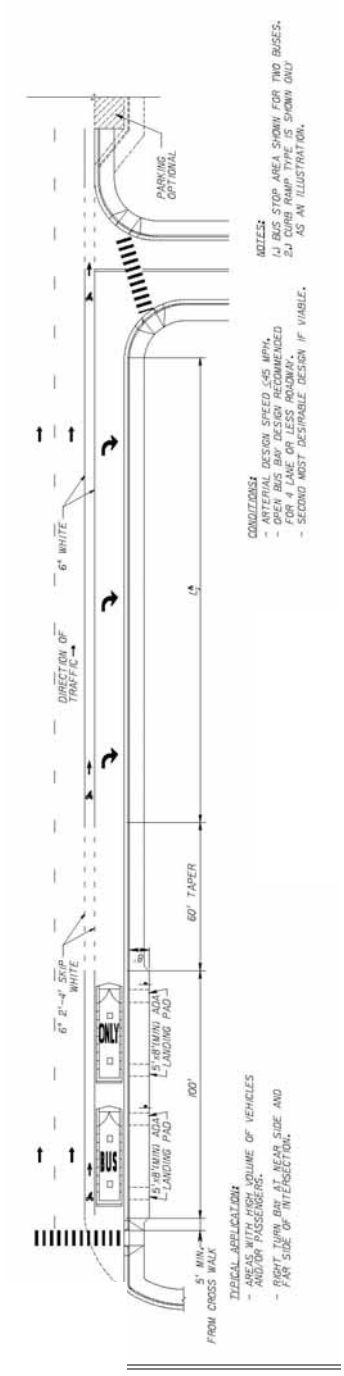


FIGURE 13 - 16
FAR SIDE OPEN BUS BAY WITH SHARED RIGHT TURN LANE

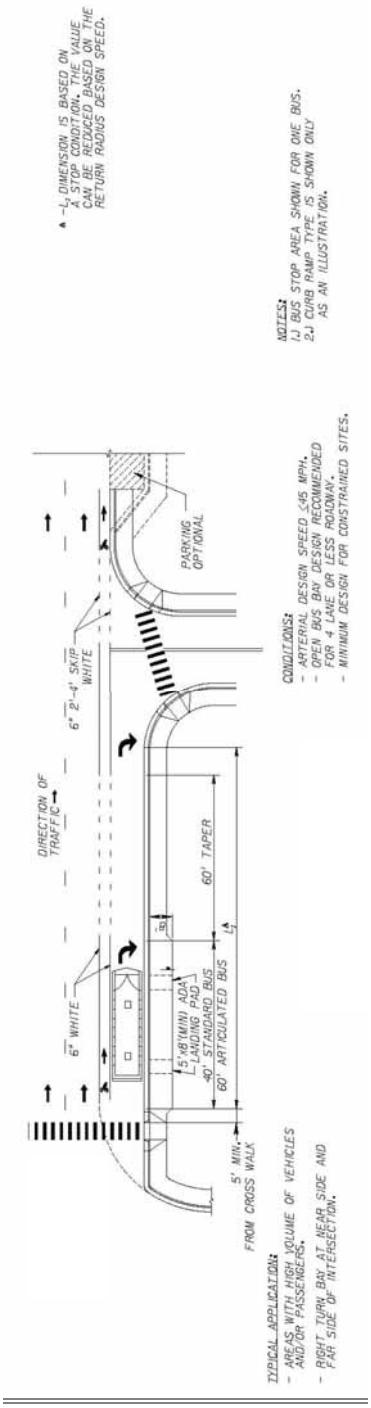


FIGURE 13 -17
FAR SIDE OPEN BUS BAY WITH ON STREET PARKING

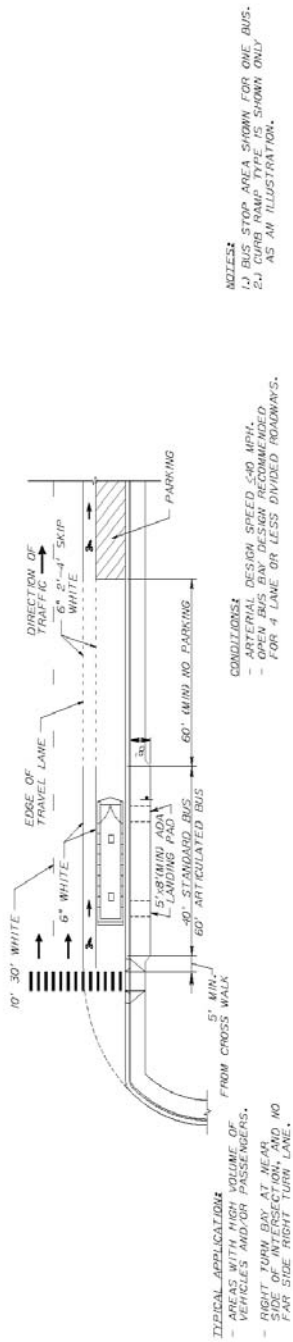
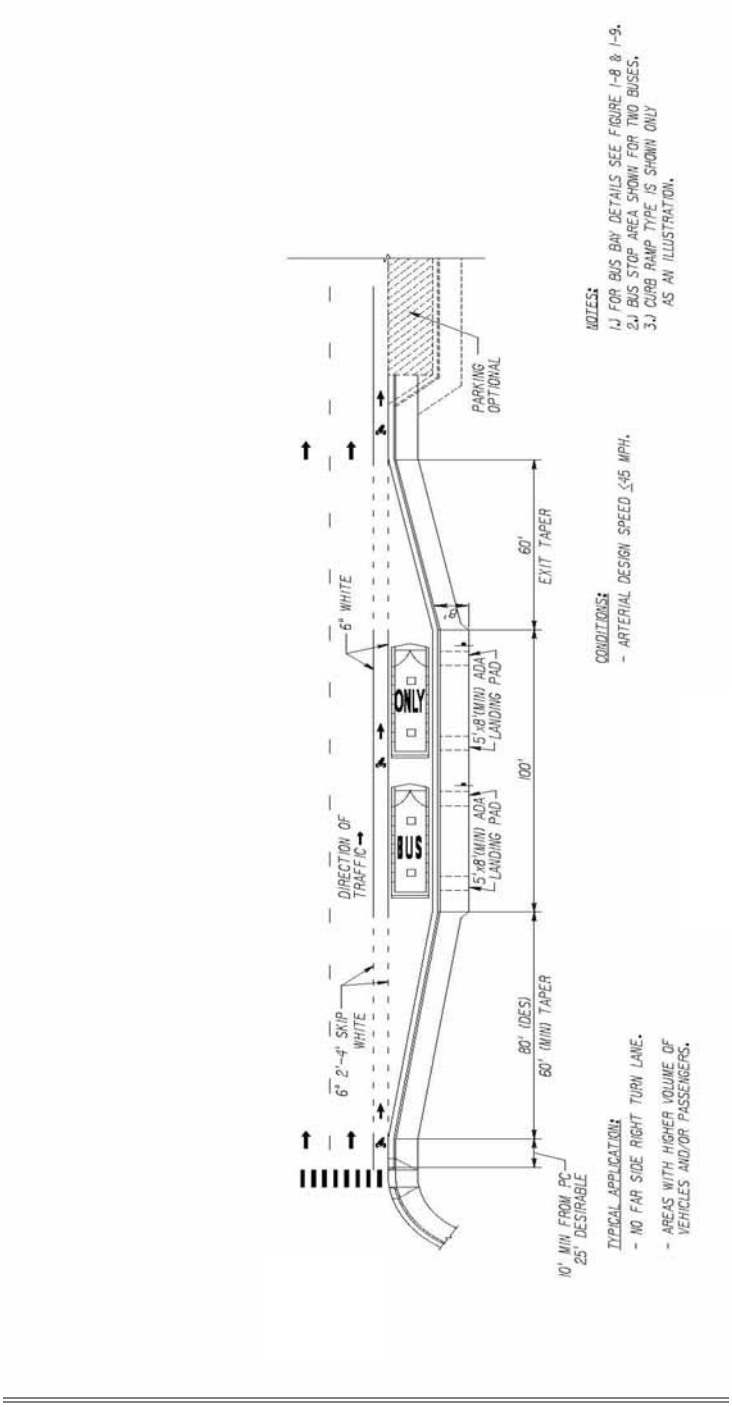


FIGURE 13 - 18
FAR SIDE CLOSED BUS BAY



REFERENCES

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

1. Transportation Research Board (TRB). Guidelines for the Location and Design of Bus Stops. adapted from TCRP Report 19. Washington D.C.: National Academy Press, 1996: pages 23, 27-29.
2 Fitzpatrick, Kay, Kevin Hall, Melisa Finley and Stephen Farnsworth. Guidelines for the Use of Bus ~ ITE Journal. May 2002.
3 Hillsborough Area Regional Transit. Transit Friendly Planning and Design Handbook and Technical Manual. Hillsborough County, October 1995: 18.
4 Pace News Page. Chicago Illinois. 12 December 2000. <www.pacebus.com/subguidelines/default.asp>.
5. Florida Department of Transportation (FDOT). Plans Preparation Manual: Chapter 2. January 2004.
6. Florida Department of Transportation (FDOT). District 4 Transit Facilities Guidelines Version 2 April 2004.
7. Interim Geometric Design Guidelines for Transit Facilities on Highways and Streets, American Association of State and Highway and Transportation Officials (AASHTO), July 2002

DRAFT PUBLIC TRANSIT CHAPTER REVISIONS TO GREEN BOOK CHANGES

3/9/05 CHANGES FROM DRAFT SENT 2/13/05

Page 13i Revised Table of Contents

Page 13-6 Section D.2 Nubs/Curb Extension/Bulbs

Add the following under common reason for installing nubs include:

- Eliminates the need for riders to walk between parked cars to access the bus

Page 13-7 Section D.3. Bus Bays (Pullout, Turnouts)
3R is defined as (Resurfacing, Restoration and Rehabilitation) projects

Change to the following paragraph:

> At a specific location, the factors may be conflicting and a balance must be obtained based on the designer's judgment and input from the applicable transit agencies. In locations where the traffic volumes exceed 1,000 vehicles per hour per lane, it is difficult to maneuver the bus into the bay and back into the travel lane, even though Florida law (F.S. 316.0815) identifies that right-of-way is afforded to exiting buses. Incorporating an acceleration distance, signal priority, or a far side (versus near side or mid-block) placement, are potential solutions when traffic volumes exceed 1,000 vehicles per hour (1)

Page 13-8: Define - Transit Cooperative Research Program (TCRP)

Page 13-9: Figures 13-13 is changed to Figures 13-11 and 13-12

Pages 13-14 through 13-31: Replace Figures 1-19 in the document

Figure 13-1 Sheet correction – section of drawing missing
Figure 13-2 Sheet correction – section of drawing missing
Figure 13-4 Mid Block on a Divided Roadway Without On-Street Parking Reference to Figure 1-24 is changes to new Figure 13-19 Transit Facility Mid Block Bus details
Figure 13-5 Sheet correction – Mid Block on a Divided Roadway With On-Street Parking and reference to Figure 1-9 and 1-10 is change to Figures 13-7 to 13-10 and section of drawing missing
Figure 13-7 Sheet correction – Delete Note 5 for shelter and pad details, and exit taper line should be moved to exit taper gutter terminus
Figure 13-8 Sheet correction – Delete Note 5 for shelter and pad details, and exit taper line should be moved to exit taper gutter terminus
Figure 13-9 Sheet correction – Delete Note 5 for shelter and pad details, and add note to Slope along curb line to assure positive drainage.
Figure 13-10 Sheet correction – Delete Note 5 for shelter and pad details, and add note to Slope along curb line to assure positive drainage.

Figure 13-11 Sheet correction – Near Side Bus Bay/Stops with Preceding Lane Drop Right Turn Lane and correct section of drawing missing
Figure 13-12 Sheet correction – Delete
Figure 13-13 is re-numbered to 13-12
Figure 13-14 is re-numbered to 13-13 and correct missing text
Figure 13-15 is re-numbered to 13-14
Figure 13-16 is re-numbered to 13-15
Figure 13-17 is re-numbered to 13-16
Figure 13-18 is re-numbered to 13-17 references to Figure 1-9 and 1-10 is change to Figures 13-7 to 13-10
New Figure 13-18 Table for L_1 Right Turn Values
New Figure 13-19 Transit Facility Mid Block Bus details

Page 13-32: Correct reference title: Fitzpatrick, Kay, Kevin Hall, Melissa Finley and Stephen Farnsworth. Guidelines for the Use of Bus Bulbs ~ ITE Journal. May 2002.

FIGURE 13 -1
NEAR SIDE NUB/BULB WITH ON-STREET PARKING
PRECEDING RIGHT TURN LANE

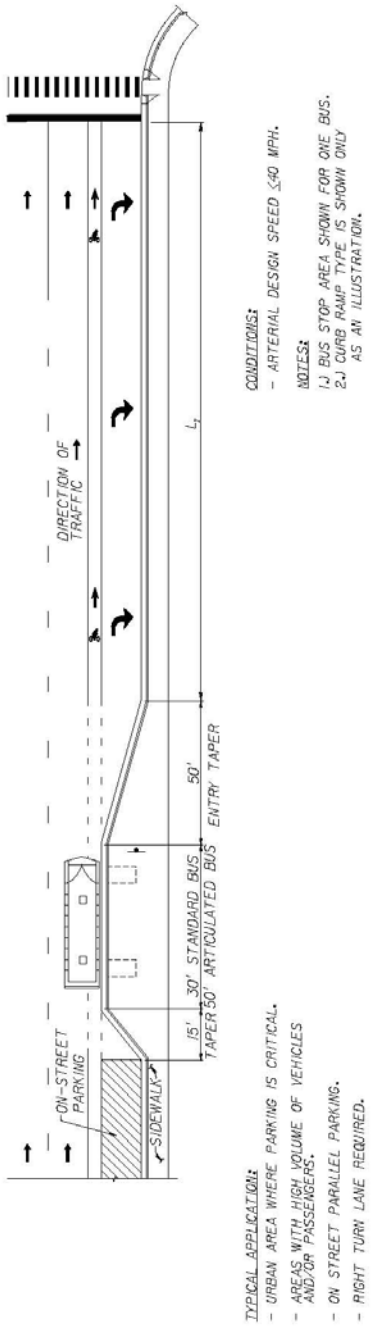


FIGURE 13 -2

NEAR SIDE NUB/BULB WITH ON STREET PARKING

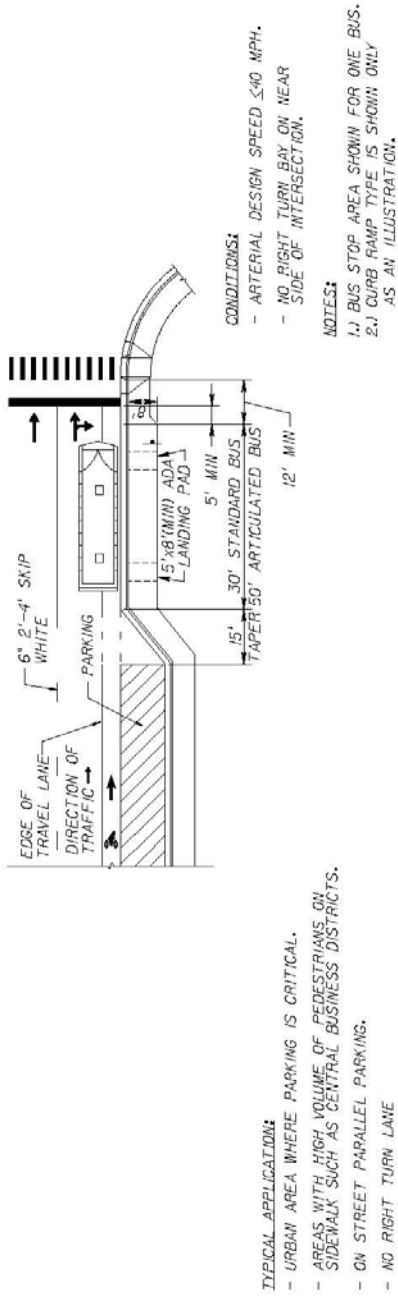
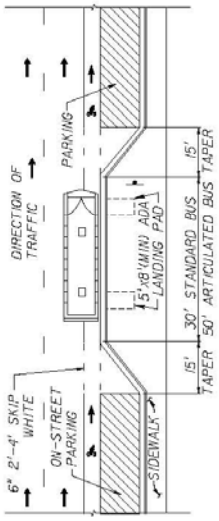


FIGURE 13 - 3
MID-BLOCK NUB/BULB WITH ON- STREET PARKING



NOTES:
1.) PEDESTRIAN RAMP AND CROSSWALK WITH OPTIONAL PEDESTRIAN SIGNAL CAN BE PROVIDED IF NO CONFLICT IS CREATED WITH A.D.A. LANDING PADS.
2.) BUS STOP AREA SHOWN FOR ONE BUS.
3.) SEE "MID-BLOCK CROSSING" SECTION OF THE GUIDELINES FOR FURTHER DETAILS.

CONDITIONS:
- ARTERIAL DESIGN SPEED ≤40 MPH.
- ON STREET PARKING PROVIDED.

TYPICAL APPLICATION:
- AREAS WITH HIGH VOLUME OF PEDESTRIANS ON SIDEWALK SUCH AS CENTRAL BUSINESS DISTRICTS.
- MID-BLOCK BUS STOP NEEDED TO ACCESS A TRANSIT DEMAND GENERATOR.
- ON-STREET PARALLEL PARKING.

FIGURE 13 - 4
MID-BLOCK NUB/BULB ON DIVIDED ROADWAY WITH ON-STREET PARKING

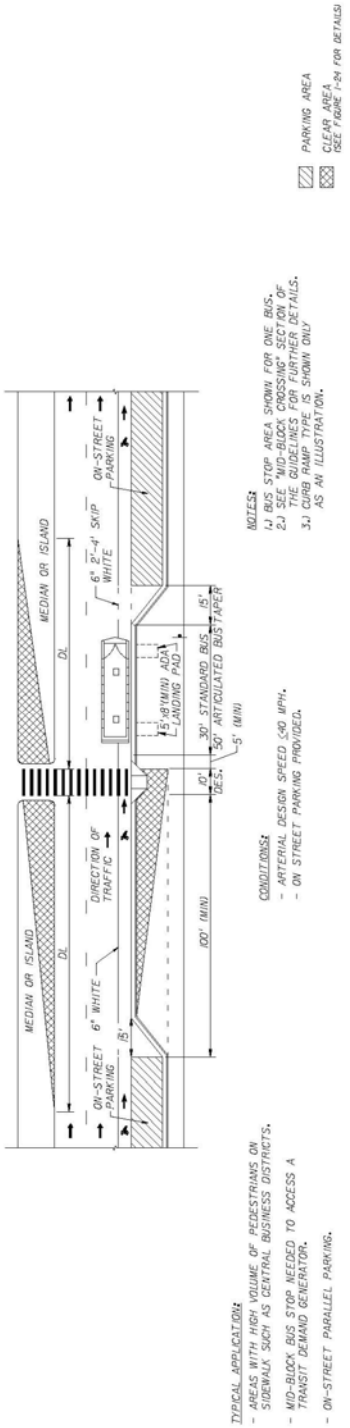


FIGURE 13 -5
MID-BLOCK ON AN UNDIVIDED ROADWAY WITHOUT ON-STREET PARKING

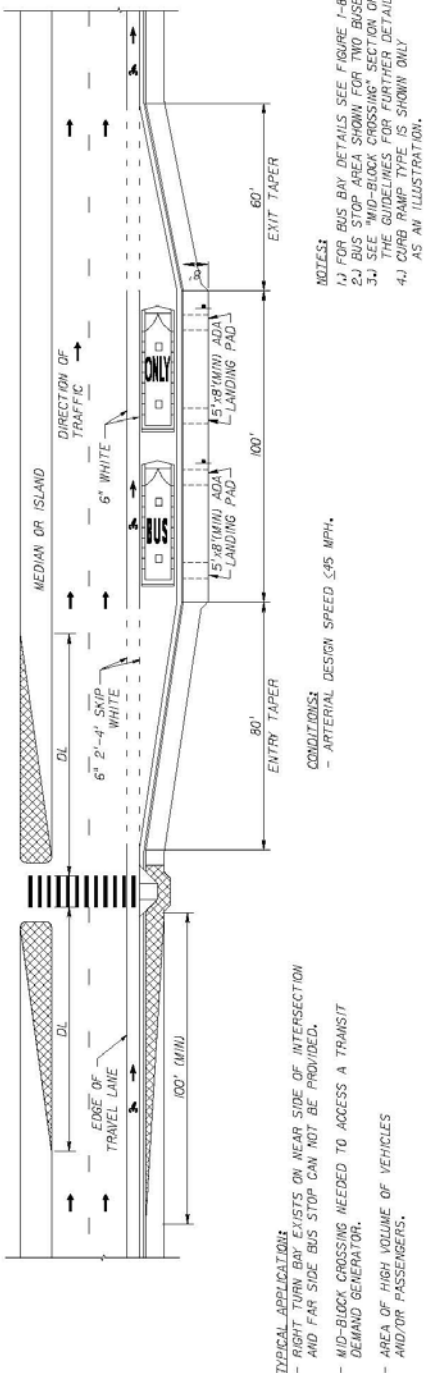


FIGURE 13 -6
MID-BLOCK NUB/BULB WITH TWO-WAY-LEFT-TURN-LANE MEDIAN AND ON-STREET PARKING

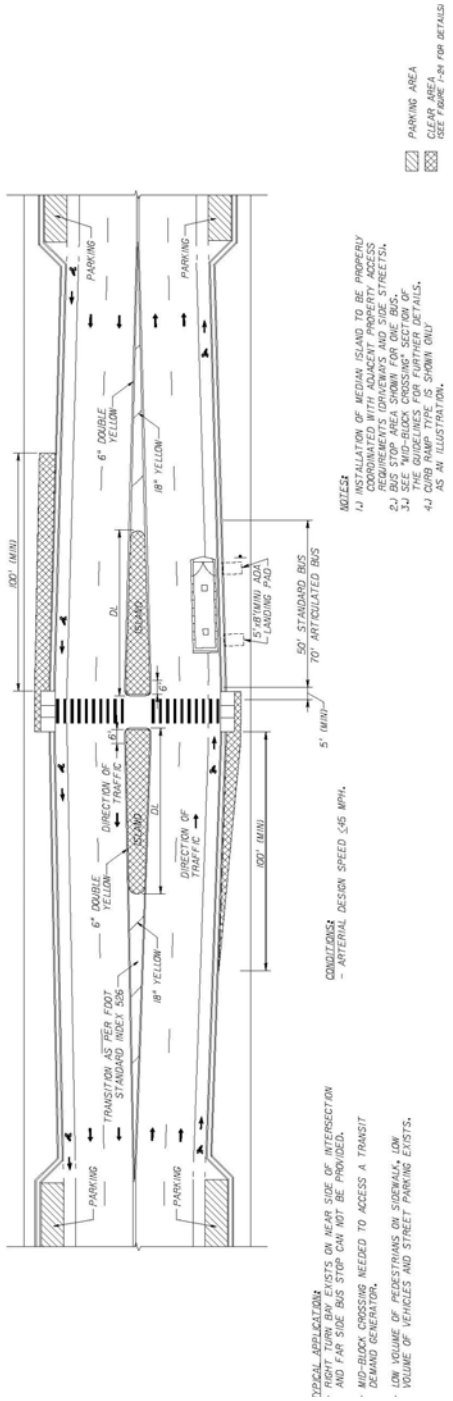


FIGURE 13 - 7
CLOSED BUS BAY LAYOUT WITH CONCRETE PAVEMENT AND URBAN CURB AND GUTTER

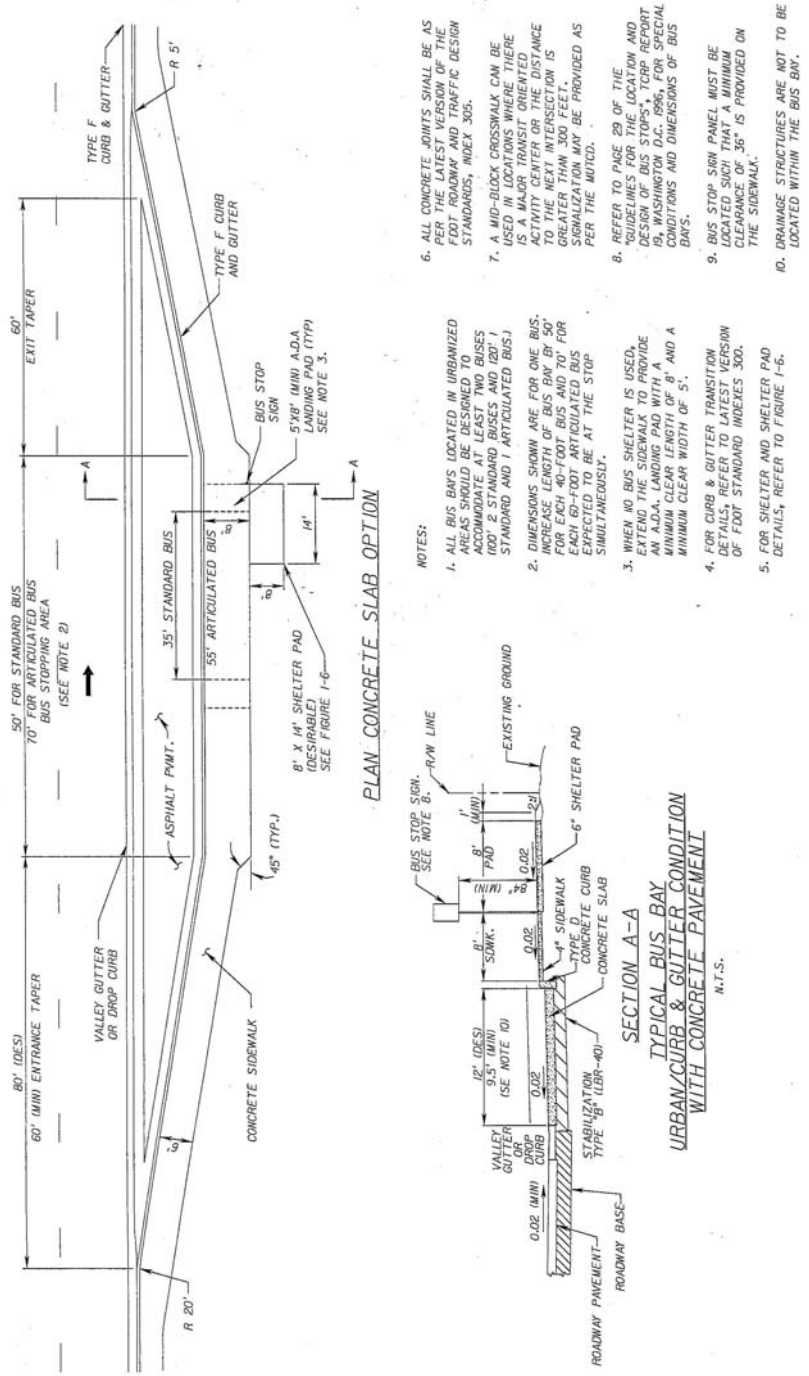


FIGURE 13 - 8
CLOSED BUS BAY LAYOUT WITH ASPHALT PAVEMENT AND URBAN CURB AND GUTTER

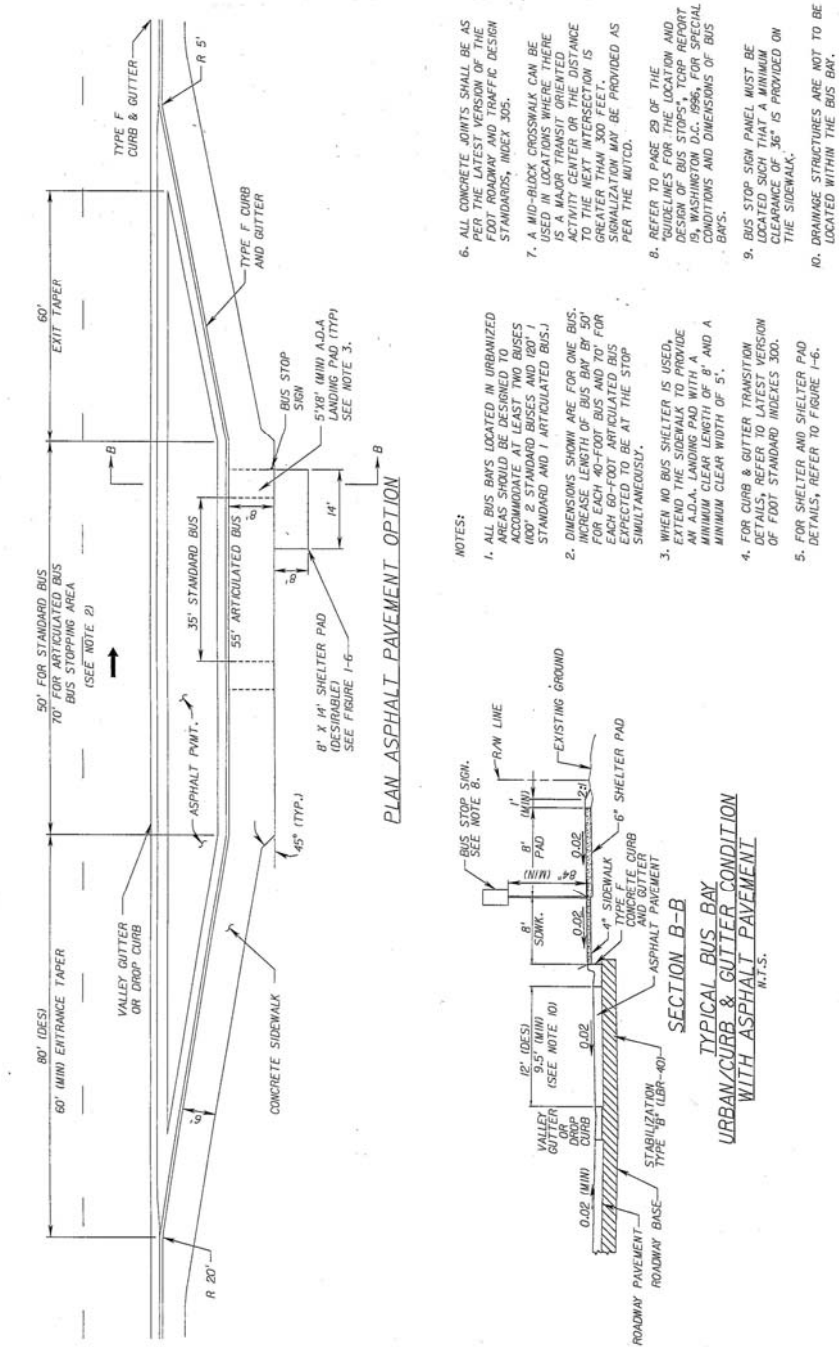


FIGURE 13 - 9
CLOSED BUS BAY LAYOUT WITH CONCRETE PAVEMENT AND RURAL SHOULDER

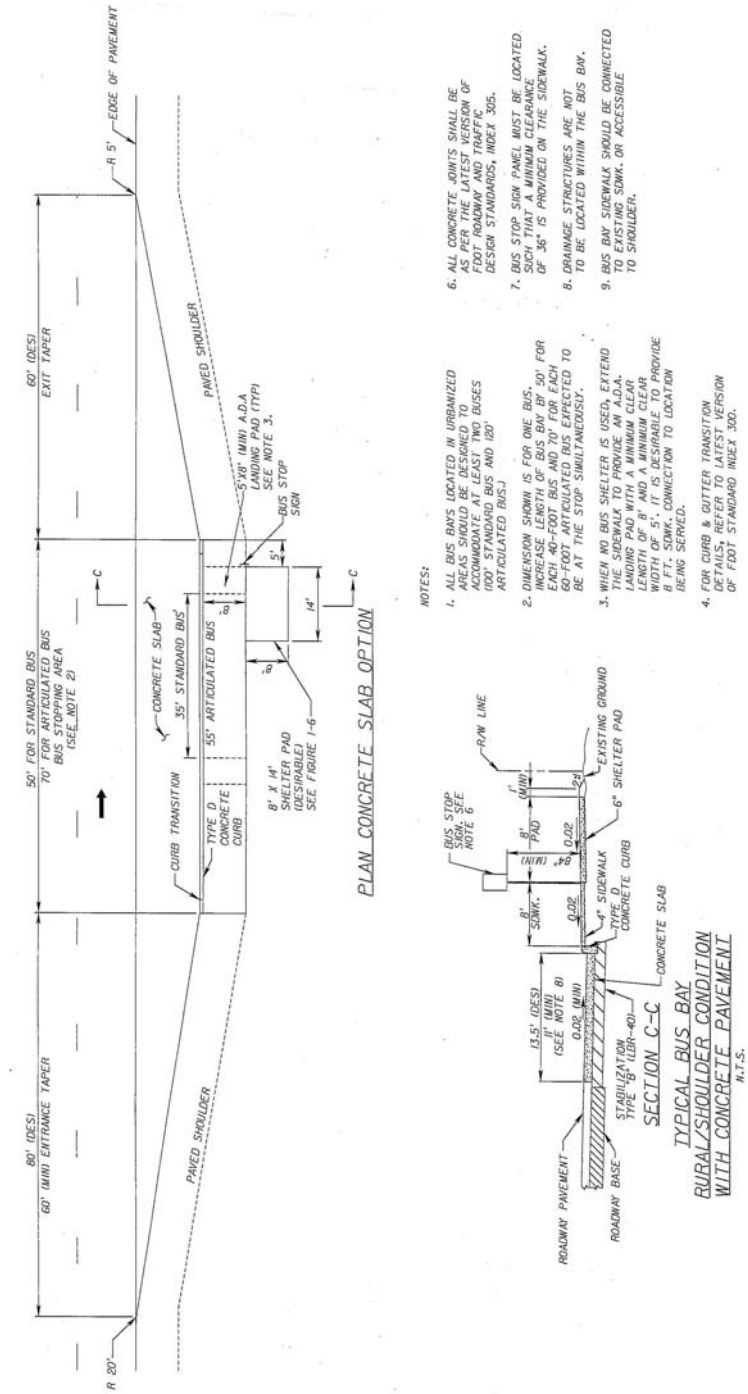


FIGURE 13 - 10
CLOSED BUS BAY LAYOUT WITH ASPHALT PAVEMENT AND RURAL SHOULDER

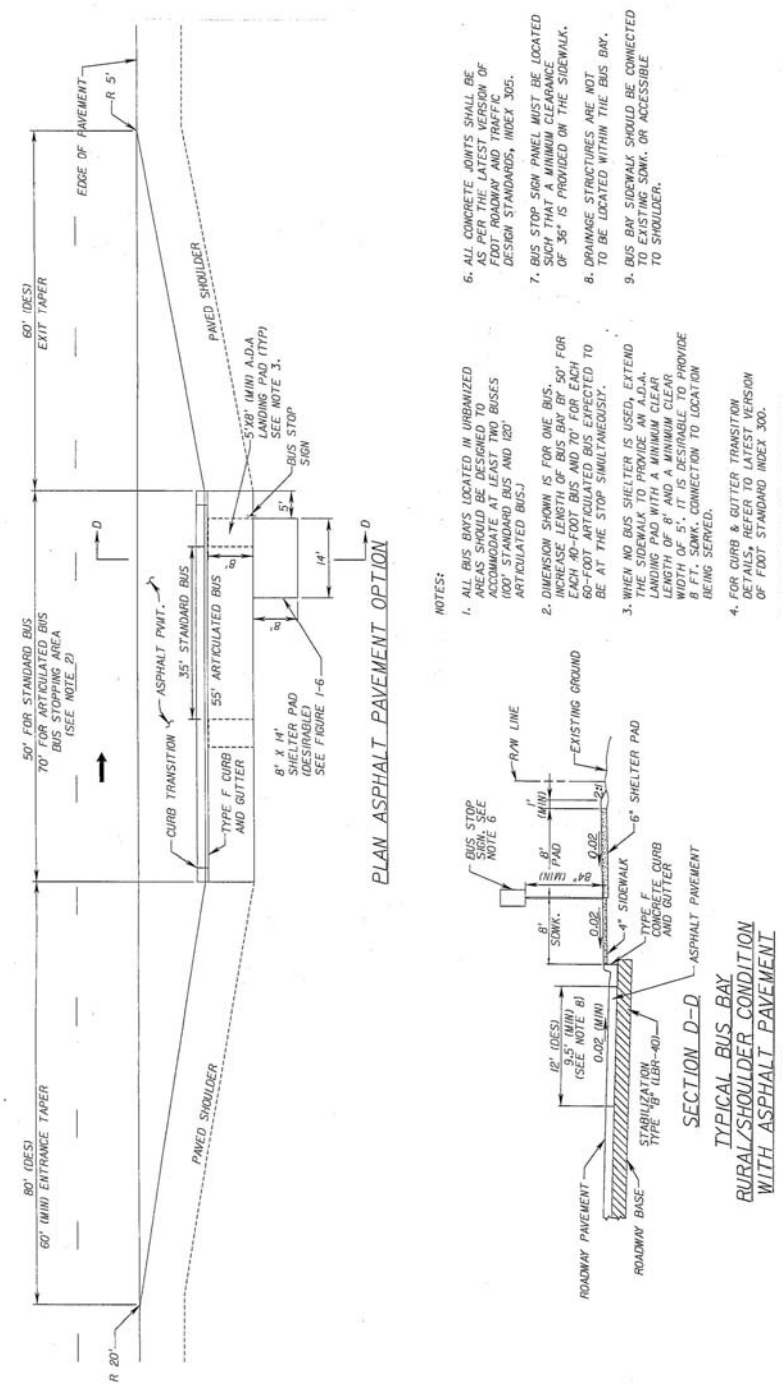


FIGURE 13 - 11
NEAR SIDE BUS BAY/STOP WITH PRECEDING LANE DROP RIGHT TURN LANE

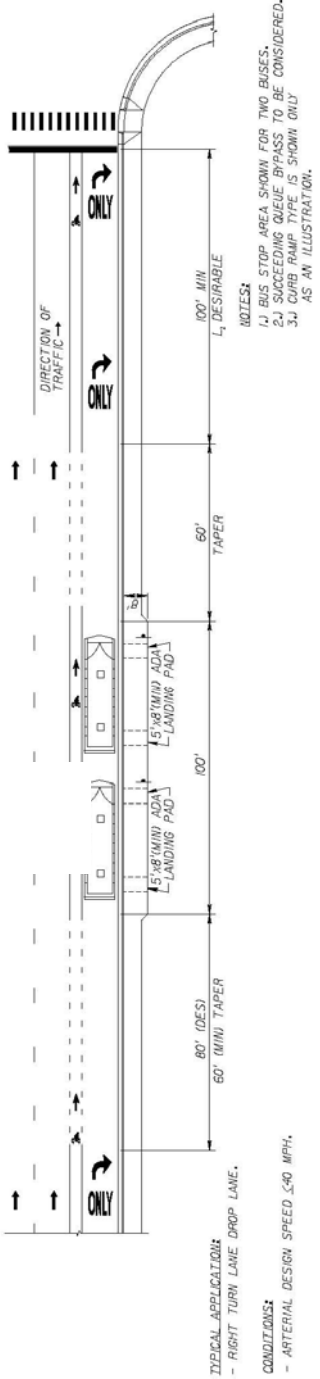
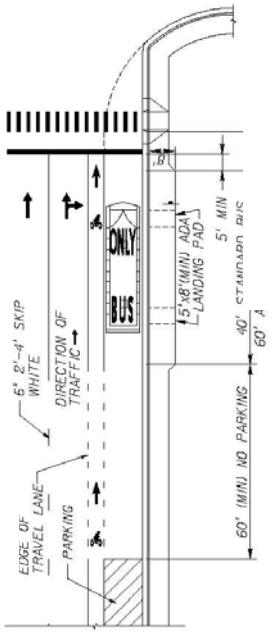


FIGURE 13 - 12
NEAR SIDE BUS BAY/STOP WITH ON-STREET PARKING



NOTES:
1.) BUS STOP AREA SHOWN FOR ONE BUS.
2.) CURB RAMP TYPE IS SHOWN ONLY AS AN ILLUSTRATION.

SPEED ≤40 MPH.

TYPICAL APPLICATION:
- AREAS WITH HIGH VOLUME OF VEHICLES AND/OR PASSENGERS.
- NO RIGHT TURN LANE
- ON STREET PARALLEL PARKING.

FIGURE 13 - 13
FAR SIDE OPEN BUS BAY PRECEDING A RIGHT TURN LANE

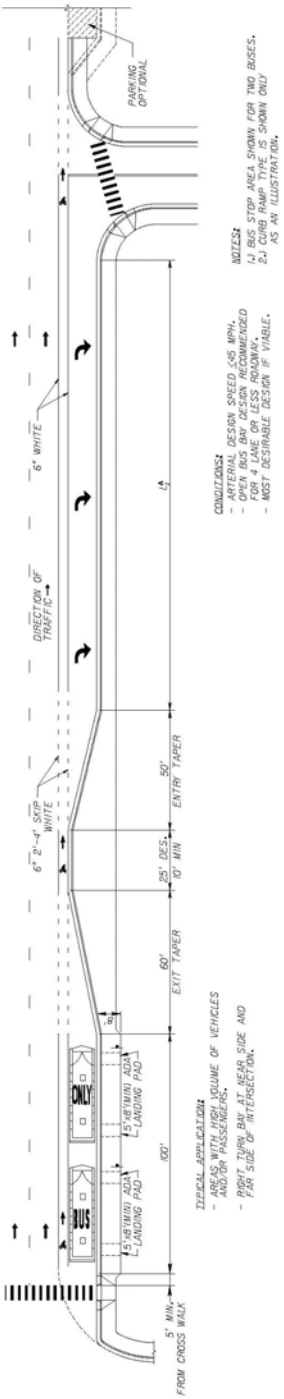


FIGURE 13 - 14
FAR SIDE OPEN BUS BAY PRECEDING A RIGHT TURN LANE WITH SHARED TAPER

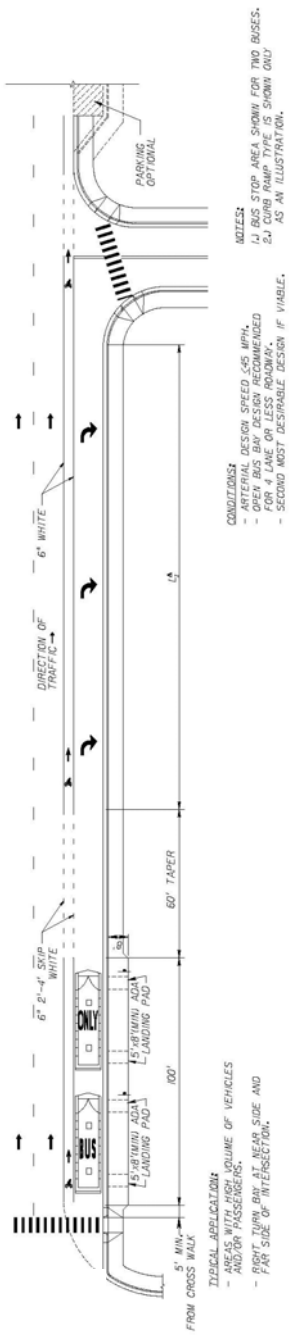


FIGURE 13 - 15
FAR SIDE OPEN BUS BAY WITH SHARED RIGHT TURN LANE

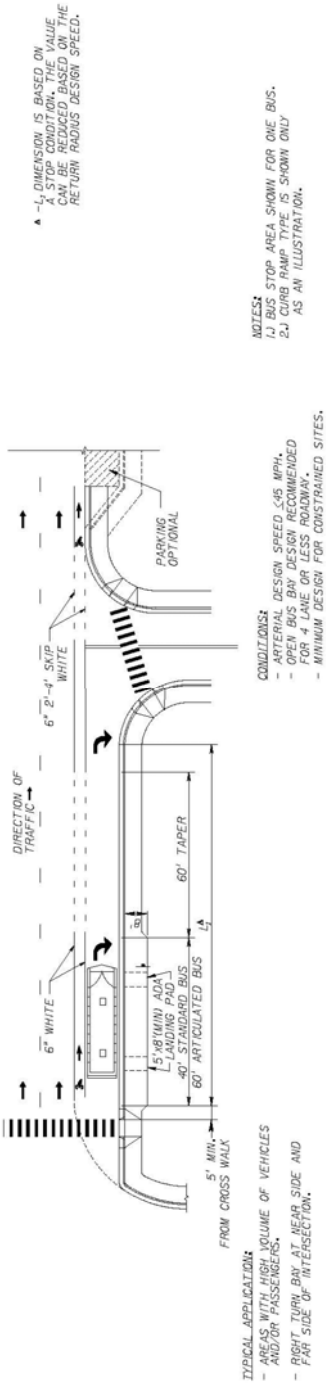


FIGURE 13 -16
FAR SIDE OPEN BUS BAY WITH ON STREET PARKING

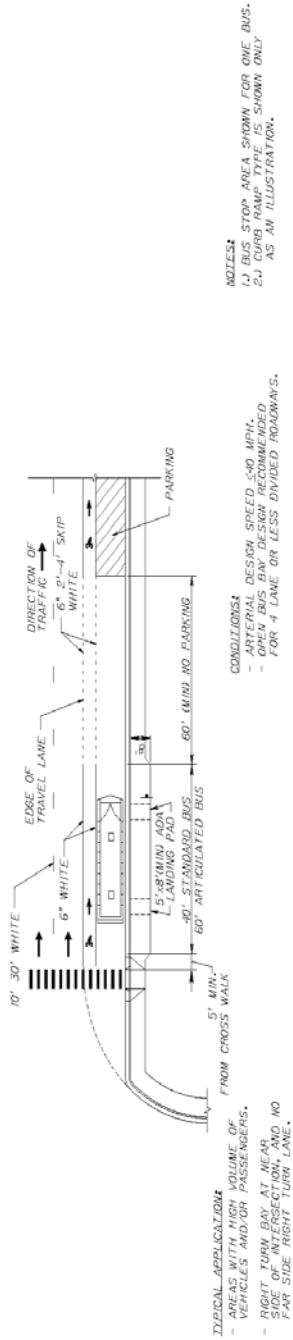


FIGURE 13 - 17
FAR SIDE CLOSED BUS BAY

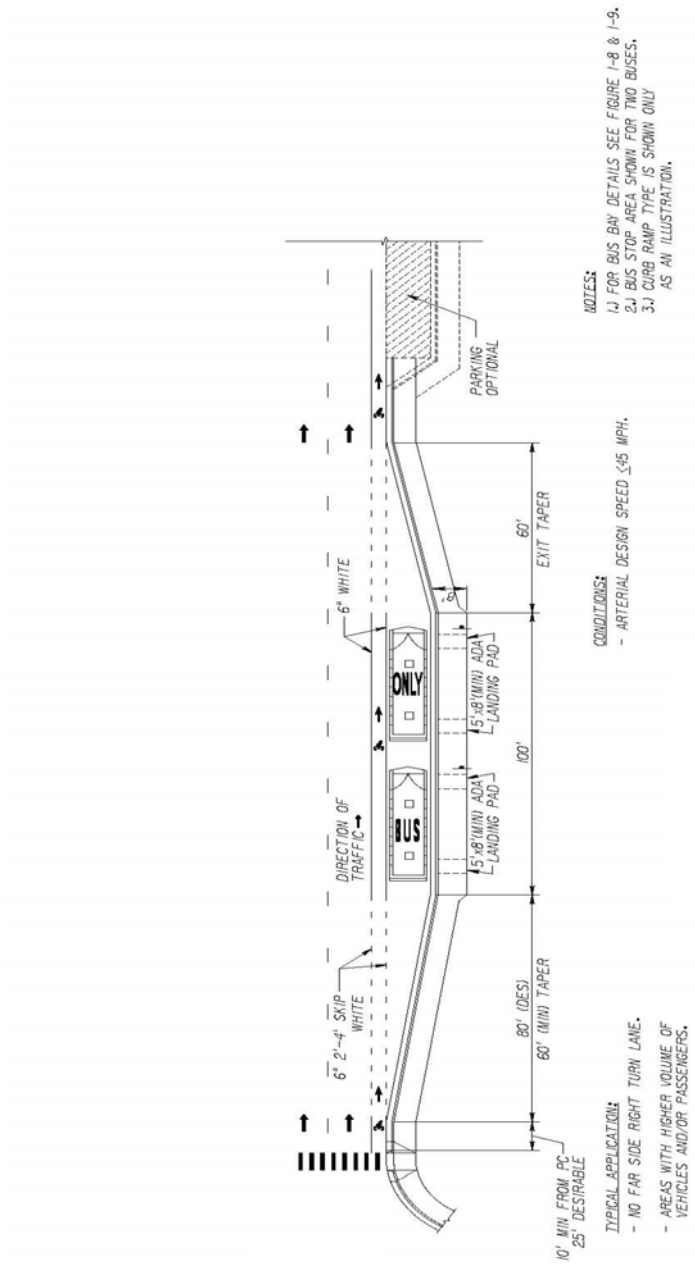


FIGURE 13 - 18
TABLE OF L_1 RIGHT TURN LANE DESIGN LENGTHS

RIGHT TURN LANE DESIGN LENGTH		
DESIGN SPEED (MPH)	* L_1 (FT)	
	RIGHT TURN VALUE	THROUGH LANE VALUE
35	95'+QRT	20'+QT
40	105'+QRT	30'+QT
45	135'+QRT	35'+QT
50	190'+QRT	55'+QT

SOURCE: FDOT STANDARD INDEX 301

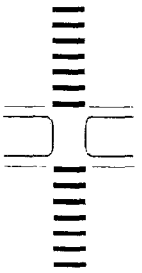
NOTE: THIS TABLE APPLIES TO ALL NEAR SIDE AND FAR SIDE BUS FACILITIES IN COMBINATION WITH RIGHT TURN LANES.

* L_1 = UTILIZE LARGER OF TWO VALUES FOR NEAR SIDE STOPS AND RIGHT TURN VALUE FOR FAR SIDE STOPS.
QRT = QUEUE STORAGE VALUE FOR THE RIGHT TURN MOVEMENT (FT).
QT = QUEUE STORAGE VALUE FOR THE THROUGH MOVEMENT (FT).

NOTES FOR QUEUE STORAGE VALUES: (QRT OR QT)

1. UTILIZE A 90% SUCCESS RATE VALUE FOR ALL NON-FIHS FACILITIES AND A 95% SUCCESS RATE FOR ALL FIHS FACILITIE ALL QUEUE VALUES ARE TO BE OBTAINED FROM THE PEAK HOUR FOR THE DESIGN YEAR, AND SHALL BE BASED ON THE ADJUSTED MAXIMUM QUEUE REACH (AMQR).
2. WHEN POSSIBLE AND DESIRABLE, PROVIDE MORE STORAGE WHERE THE PROJECTED VALUES APPEAR "LIGHT".
3. UTILIZE A VALUE OF 25FT AVERAGE VEHICLE DISTANCE UP TO A VALUE OF 2% TRUCKS. FOR GREATER TRUCK PERCENTAGES, INCREASE THE AVERAGE VEHICLE DISTANCE BY 2 TO 3FT FOR EVERY 5% INCREASE IN TRUCK PERCENTAGE.
4. A FORMAL QUEUE STUDY SHOULD BE PERFORMED AT EACH LOCATION. AT LOCATIONS WHERE A SPECIFIC QUEUE STUDY DOES NOT EXIST, UTILIZE A MINIMUM QUEUE STORAGE VALUE OF 100FT IN URBAN/SUBURBAN AREAS AND 50FT IN RURAL AREAS.
5. THE QUEUE LENGTH IS TO BE MEASURED FROM THE RADIAL POINT OR, WHEN A STOP BAR IS REQUIRED, FROM THE STOP BAR.

FIGURE 13 - 19
TRANSIT FACILITY MID-BLOCK BUS DETAILS – CROSSWALK CLEAR ZONE REQUIREMENTS – DIMENSION DL



MEDIAN OPTION 1
(STRAIGHT MEDIAN WITH STRAIGHT CROSSWALK)

NOTE: FOR 3 OR MORE LANE ROADWAY SECTIONS MIDBLOCK CROSSINGS MUST BE SIGNALIZED AND APPROVED BY FDOT'S TRAFFIC OPERATIONS DEPARTMENT.

CROSSWALK CLEAR ZONE REQUIREMENTS

DESIGN SPEED (MPH)	**S.S.D. (FT)	DIMENSION DL (FT) MEDIAN/SIDEWALK WIDTH 2'	4'	6'	8'	10'	≥ 12'
30	200	100	135	150	160	165	170
35	250	125	165	190	200	210	215
40	300	150	200	225	240	250	260
45	350	175	235	265	280	290	300

** S.S.D. - STOPPING SIGHT DISTANCE

MID-BLOCK CROSSING NOTES:

1. USE THE SAME PARAMETERS FOR ROADWAYS WITH MORE THAN FOUR LANES.
2. INSTALL ADVANCE WARNING SIGNS AS PER THE MUTCD AND FDOT STANDARDS TO WARN MOTORISTS OF ONCOMING CROSSWALK.
3. CLEAR AREA SHOULD BE FREE OF ALL FIXED OBJECTS SUCH AS LIGHT/UTILITY POLES, SIGNAL EQUIPMENT, TREES, VEGETATION, STREET FURNITURE, ETC. THAT WOULD OBSTRUCT THE VIEW OF PEDESTRIANS. CROSSING WARNING SIGNS ARE EXCLUDED FROM THE CLEAR AREA REQUIREMENTS.

FDOT INDEX 17346 OF THE LATEST EDITION OF ROADWAY AND TRAFFIC DESIGN STANDARDS TO SIGN AND CROSSING SIGNAL LOCATION.

PROHIBITED FOR 100' IN ADVANCE OF THE

WILL BE DEPRESSED AT CROSSING LOCATION EVEN WALKING SURFACE RATHER THAN RAMPS.

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Final Course Goals, Objectives, and Course Outline

Based upon the statement of work provided by Florida Transportation Safety Training Program and the Florida Transportation Technology Transfer (T2) Center at the University of Florida, the following Final Course Goals and Objectives are proposed:

I. Course Goals and Objectives – plus any supplemental information
II. Course Outline – in Narrative and Tabular form

The goals and objectives are presented in *Italics*, and the regular font serves as further explanation of the Course Goal and Learning Objectives.

The Narrative Overview of the Course Outline explains the course and identifies the connection between the learning objectives for each lesson and the Course Objectives. Many of the learning objectives are based upon the different chapters in the Florida Greenbook. The Course Outline will follow the sequence of that document closely. Subsequent modifications by the Florida Transportation Technology Center staff will be incorporated into the final documents. Worked out examples will be important aspects to teaching materials provided to the participants.

I. Course Goal

At the end of the Greenbook Seminar Series, the participants will be able to develop and / or evaluate designs that conform to the Greenbook standards, and hence offer a safer, more consistent roadway network throughout the state.

The primary target audience for this course is young engineers, engineering interns or deign technicians that are charged with developing roadway designs in Florida that are not located on the State Highway System. In addition, staff from agencies charged with reviewing designs prepared by others to determine conformance with FDOT Greenbook Criteria will also be included as prospective participants.

FDOT has an established process to keep designers informed of FDOT criteria and plans preparation preferences. This effort consists of a fully established set of design criteria, manuals with the criteria defined, as well as documentation requirements to modify them as needed. The process also has the benefit of an established program of training supported by FDOT management. Training includes periodic Project Management Training series, annual Update training (in Roadway Design, Project Development & Environmental (PD&E) Studies, Structural Deign, Drainage Design, Construction Project Administration Manual (CPAM) and Computer Aided Design Drafting (CADD)), and intermittent training (as new procedures, such as Maintenance of Traffic, Specifications, Electronic Letting, and Load Rating Factor Design (LRFD) are adopted by FDOT).

On roads off of the State Highway System, the Florida Greenbook provides a reasonable range of design criteria, but training in how to utilize this document is not currently available to agency staff (that reviews the designs on behalf of the jurisdictional agency) or to design firms. The only means for staff to learn how to utilize the Greenbook would be mentoring from senior staff members. The intent of these seminars is to provide this much needed training in a workshop format.

II. Course Objectives

At the end of the course, participants will be able to:

A. *Define the different elements of a roadway design project.*

In order to develop the most appropriate design, the designer must understand the definitions that are to be used, and also the impacts on the driver of these design elements (i.e. Level of Service, Design Speed, Class of Facility, Sight Distance, and Capacity).

B. *Recognize the importance to the driver and interaction of the elements in the overall design.*

Design elements and their criteria are based on the principles of trying to provide a roadway that has consistent design elements for the driver, and also that suits the expected types and volume of traffic on the facility.

C. *Determine the appropriate FDOT Greenbook design criteria.*

Once an understanding of design elements, human factors, and performance is obtained, the organization of the Florida Greenbook will be reviewed, and the various design criteria contained within it, and how to extract the appropriate data for the example project(s). For this objective, more specific results will be obtained. Calculations will be worked out in detail.

D. *Properly document design exceptions.*

Design exceptions are instances where the generally accepted criteria are not met, for justifiable reasons, but are often necessary to the development of a completed design. The consistent methodology for development of them and associated documentation is vital, because design exceptions must stand up to scrutiny at a later date.

E. *Design and / or evaluate the roadway designs prepared by others for conformance with the FDOT Greenbook criteria.*

Once design criteria are selected for a project, the design elements must be combined to suit the needs of the project. Understanding how to select design criteria that yield a design achieving an appropriate balance between design criteria (i.e. safety and design economy – including Construction Costs, Property Costs, Maintenance Costs, and User Costs/Benefits) will be covered. For this objective, review a project for conformance with Greenbook criteria, compare results, and justify concessions that are a necessary component of the design process.

End of Final Course Goals & Objectives

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Final Course Outline - Tabulation

Seminar # A – Overview

Session A1	Introduction	45 Minutes
Session A2	Definitions	50 Minutes
Break		
Session A3	Planning	45 Minutes
Session A4	Land Development	45 Minutes
Lunch		
Session A5	Design Speeds and Design Vehicles	50 Minutes
Session A6	Reference Material	50 Minutes
Break		
Session A7	Critique of Sample Projects Workshop	75 Minutes
		6 contact hours

Seminar # B – Geometric Criteria

Session B1	Geometric Design – Horizontal Alignment	55 Minutes
Session B2	Geometric Design – Vertical Alignment	50 Minutes
Break		
Session B3	Geometric Design – Cross Section	50 Minutes
Session B4	Design Criteria Matrix	30 Minutes
Lunch		
Session B5	Roadside Design	70 Minutes
Session B6	Design Exceptions	30 Minutes
Break		
Session B7	Design Criteria Matrix Workshop	75 Minutes
		6 contact hours

Seminar # C – Additional Design Issues

Session C1	Pavement Design	50 Minutes
Session C2	Roadway Lighting	40 Minutes
Break		
Session C3	Railroad Grade Crossings and Transit	40 Minutes
Session C4	Pedestrian and Americans with Disabilities Act (ADA)	50 Minutes
Lunch		
Session C5	Bicycle Facilities	50 Minutes
Session C6	Maintenance Issues	50 Minutes
Break		
Session C7	Worksite Safety	40 Minutes
Session C8	Site Condition Assessment	40 Minutes
		6 contact hours

End of Final Course Outline - Tabulation

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Final Course Outline - Narrative

Seminar # A – Overview

Session A1 Introduction 45 Minutes

This session will inform participants of how the course is organized, the reasons why the Florida Greenbook is important, what to expect during later sessions, and when. It will also familiarize the instructor with the range of participant experience.

Session A2 Definitions 50 Minutes

The first step in the course is to establish the definition of terms that will be used during later sessions. Every participant needs to be on the "same page". As part of this effort, acronyms will be listed and defined.

Session A3 Planning 45 Minutes

This session will identify the competing factors in highway design (i.e. economy, safety, environmental impacts, and emergency services). It will also stress the importance of the classification of the facility, what each classification does, and how to determine it. The session will give the participants a sense of how you can never "please everyone" – concessions are a necessity.

Session A4 Land Development 45 Minutes

Development is the primary reason that highway improvements are needed. The highway system must evolve to accommodate the new development, but the concept must adhere to a concept of hierarchy of roadways – arterials, collectors, and local streets. Concepts of access control will also be introduced, as well as allowing space for all components in the border area (utilities, transit, pedestrians, bicyclists, lighting, green space are also studied).

Session A5 Design Speeds and Design Vehicles 50 Minutes

The design speed controls a vast array of highway design criteria. Selection of an appropriate design speed for the project is the most important safety issue in the design process. Design vehicles are nearly as important, as the vehicles that are expected to use a facility must have enough room to maneuver safely.

Session A6 Reference Materials 50 Minutes

Florida Department of Transportation (FDOT), Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO) offer a vast array of resource materials that can be utilized in the design process. For example, FDOT's website has a significant variety of information to draw upon, when the material can be used, and when it should be used (and when it should not be used). Participants will be provided with comprehensive lists of reference materials, including web addresses.

Session A7 Critique of Sample Projects Workshop 75 Minutes

Participants will be divided into groups of 4-6, and asked to review a project, and offer comments on the project, including recommending design speed, facility classification, design vehicle, and identifying the issues and relative importance that would be considered. The result would be similar to a marketing presentation.

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Seminar # B – Geometric Criteria

Session B1 Geometric Design – Horizontal Alignment 55 Minutes

This session will discuss the different components of horizontal design – sight distances, curves, superelevation (including transitions), and intersections.

Session B2 Geometric Design – Vertical Alignment 50 Minutes

This session will discuss the different components of vertical design – minimum and maximum grades, crest and sag vertical curves (K values), intersection grading. Coordination of horizontal and vertical alignment will also be discussed.

Session B3 Geometric Design – Cross Section 50 Minutes

This session will discuss right-of-way, median, pavement, shoulders, and borders and the widths and slopes that are allowed for each. Advantages and disadvantages of rural and urban typical sections will be discussed. Clear zones will also be introduced.

Session B4 Design Criteria Matrix 30 Minutes

Developing a comprehensive matrix of design criteria is an invaluable tool to document the design process. It documents the source of the design decisions that are made during development, and provides a single, short, justifiable record. A design criteria matrix for a sample project will be developed with the participants. The Instructor will provide the matrix format, but the individual criteria will be researched by participants as a group.

Session B5 Roadside Design 70 Minutes

Evaluation of roadside hazards will be discussed, along with the possible treatments that can be considered. The hazards include slopes, canals, and isolated hazards. Possible treatments and uses are discussed, including breakaway features, shifting the hazard outside the clear zone, guardrail, barrier wall, and curbs.

Session B6 Design Exceptions 30 Minutes

Design exceptions are a necessary part of many projects. There are constraints that do not have a feasible solution given the design criteria for the project. Design exceptions are a means for the designer to compromise the design standards to an extreme degree. This is not recommended as a normal practice, but it must be an available option. The importance of making a systematic, orderly document to record the process provides the owner and the designer with a more defendable design.

Session B7 Design Criteria Matrix Workshop 75 Minutes

As a practical exercise, participants will again be divided into groups of 4-6 people, and asked to develop a design criteria matrix for a sample project, along with a list of potential design exceptions. The format would again be similar to a short marketing presentation.

Seminar # C – Additional Design Issues

Session C1 Pavement Design 50 Minutes

In this session, the different components of the pavement section and the basic method of designing a pavement section will be discussed. We will discuss what different types of materials are available, when and where friction course is appropriate, uses of black base, rigid concrete pavement, etc. What to look for during construction is also discussed.

Session C2 Roadway Lighting 40 Minutes

The normal locations where lighting is warranted and general criteria (illumination levels, uniformity) are discussed. In addition, we need to discuss appropriate locations relative to the roadway section. The primary focus will be FDOT style poles (except high mast systems, since they are less likely to be proposed on non-FDOT facilities. Aesthetic pole options will also be briefly described.

Session C3 Railroad Grade Crossings & Transit 40 Minutes

The general operation sequence of railroad crossing (signal preemption, lights, and gates) and sight triangles at unsignalized crossings will be discussed. We will discuss the importance of a good geometric layout, smooth vertical profile of the roadway, good drainage design, appropriate clearance from intersections, and how the crossing is designed to accommodate the bicyclist. Options for crossing pavement surfaces will be reviewed.

Session C4 Pedestrian and Americans with Disabilities Act (ADA) 50 Minutes

Needs of normal and Americans with Disabilities Act (ADA) pedestrian will be reviewed, including minimum ADA criteria for profile grades, cross slopes, sidewalk widths, pedestrian clear zones, separation from vehicular traffic, and multi use paths needs. We will also review dropoff requirements for pedestrians, pedestrian signals, and options of grade separations, and their related issues.

Session C5 Bicycle Facilities 50 Minutes

Different locations for the bicyclist within the roadway section will be discussed (paved shoulders, wide curb lanes, marked bike lanes, and separate bikeways), along with width and surface requirements, clear zones, signing, markings, etc.

Session C6 Maintenance Issues 50 Minutes

Maintenance needs for the various elements of the roadway network are discussed, and how maintenance activities are done. Characteristics of a facility that is cost-effective to maintain will be reviewed. Maintenance issues such as landscaping, drainage, utilities, pavement, sidewalks, lighting, signals, and structures will be covered.

Session C7 Worksite Safety 40 Minutes

The basic principles of Work Zone Traffic Control (WZTC), and available FDOT materials (primarily the Design Standards), and the Manual on Uniform Traffic Control Devices (MUTCD) will be reviewed. A short discussion will occur on the appropriateness of FDOT training at minimal cost.

Session C8 Site Condition Assessment 40 Minutes

End of Final Course Outline – Narrative

Preliminary Lesson Plan

Florida Greenbook Seminar Series
Seminar A - Overview

Prepared by:
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FINAL DRAFT

FLORIDA GREENBOOK SEMINAR SERIES
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Summary of Sessions
Florida Green Book Seminar
Seminar A - OVERVIEW

Course Sessions and Time Allocations

Session #	Session Title	Time Allocation
A1	Introduction	45 Minutes
A2	Definitions	50 Minutes
A3	Planning	45 Minutes
A4	Land Development	45 Minutes
A5	Design Speeds and Design Vehicles	50 Minutes
A6	Reference Material	50 Minutes
A7	Critique of Sample Projects Workshop	75 Minutes
	TOTAL CONTACT TIME	6.0 Hours

Preliminary Agenda

Session #	Session Title	Start Time	End Time
	Registration	8:00 am	8:30 am
A1	Introduction	8:30 am	9:15 am
A2	Definitions	9:15 am	10:05 am
	BREAK	10:05 am	10:25 am
A3	Planning	10:25 am	11:10 am
A4	Land Development	11:10 am	11:55 am
	LUNCH	11:55 am	1:00 pm
A5	Design Speeds and Design Vehicles	1:00 pm	1:50 pm
A6	Reference Material	1:50 pm	2:40 pm
	BREAK	2:40 pm	3:00 pm
A7	Critique of Sample Projects Workshop	3:00 pm	4:15 pm

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Session No: A1
Session Title: Introduction

Performance-Based Learning Objectives
Participants will be able to:
- State their backgrounds and reasons for attending.
- Recognize FDOT requirements for PE certification of conformance with the Florida Greenbook.
- Recognize the flexibility provided by the FDOT Greenbook for the designer.

Instructional Method
During this session, the discussion will focus on the history and reasons the Florida Greenbook was developed, any supporting statutes, plus how and why it differs from the FDOT Plans Preparation Manual. Proper application of FDOT Greenbook standards will also be discussed (a new road design project would require more careful adherence to the FDOT standards, but a reconstruction or minor widening project would not permit full application of standards while still being feasible). FDOT standards need to be applied to all FDOT maintained roadways.

FDOT policy states that every public street or roadway must be under some agency's jurisdiction. Each agency must establish and maintain its own program to assure safety. Highway Safety must be a high priority – higher than building more road miles using the funds available (SAFETY > COSTS).

The primary objective is to build a design that:

1. Is a safe environment for all users. The definition or criteria of what is "safe" varies according to several factors: road purpose, traffic mix, volume, and speed influence conditions.
2. Is uniform and consistent, so the user has reasonable expectations ("no surprises = safer environment").
3. Effectively blends into the environment by mitigating impacts to the social and natural surroundings.

In essence, the objective is to provide the participant with a "file cabinet", containing empty file folders. Each folder is labeled with the session titles, representing the contents of a single folder. Each following session will provide the contents of a single folder. Reference to Florida Statutes and the Florida Greenbook as being available resources.

Time Allocation: Orientation – 5 minutes
Introductions – 15 minutes
Lecture – 25 minutes
Total: 45 minutes

Evaluation Plan: Not Applicable

Reference Sources:
FDOT - Manual of Uniform Minimum Standards for Design, Construction & Maintenance for Streets & Highways, commonly known as the Florida Greenbook
Section 334.044, Florida Statutes. Department (FDOT); powers and duties.
Section 336.045, Florida Statutes. Uniform minimum standards for design, construction & maintenance; advisory committees.

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Session No: A2
Session Title: Definitions

Performance-Based Learning Objectives
Participants will be able to:
- Identify the key phrases and definitions to be utilized during the course.

Instructional Method
Definitions will be presented in groups, with terms explained utilizing examples shown in photographs or graphics. Definitions discussed relate to:

- Degrees of requirement in FDOT manuals (define the shall, should, & may).
- Facility classification / types of roadways (define the meaning of freeway, expressway, arterial, collector, local street, and frontage road).
- Speed and volume (define the meaning of average running speed, design speed, operating speed, high speed, low speed, Annual Average Daily Traffic (AADT), Design Hourly Volume (DHV), and design vehicle).
- Typical Section conditions (define the meaning of clear zone, traveled way, shoulder, right-of-way, raised and flush median, urban and rural sections, side slopes, recoverable and non-recoverable slopes).
- Bicycles and pedestrians (define the meaning of wide vehicle lane, undesignated bike lane, bike lane, bikeway, sidewalk, passenger pad, and curb ramp).

Time Allocation: Lecture – 40 minutes
Quiz/Game - 10 minutes
Total: 50 minutes

Evaluation Plan:
A short quiz or game will be used to compare definitions to terms utilized during in subsequent sessions in the series.

Reference Sources: Florida Greenbook, 2002 Edition, page v-x

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Session No: A3
Session Title: Planning

Performance-Based Learning Objectives
Participants will be able to:
- Recognize conflicting issues that the designer is required to assess.
- Measure the importance of project issues.
- Assess issues relating to selecting a classification of a facility.
- Identify each facility's classification.

Instructional Method
During the first part of the session, the instructor will present the idea that there are a wide range of competing issues involved with every design project. Each of the issues will be discussed briefly, and visual examples of the issues offered as feasible. With each issue, participants will be asked to rate the level of importance they place on each issue. Key aspects of discussion are:

- Overall Project Costs: economics of a project are nearly as important as safety. The government entities needing the project must constantly evaluate cost/benefit ratios.
- Property Access: must be maintained, but managed effectively.
- Maintenance: every facility must be maintained, and by designing a facility with maintenance in mind, manpower needs can be reduced,
- Utilities within the Right-of-Way: utilities need to be located within Right-of-Way because the facility can be constructed and maintained economically.
- Transit Operations: present different problems relating to usefulness, accessibility and level of service, all of which are key to keeping ridership.
- Emergency Services Operations: mandate very short response times to reach sites. Their activities will be affected by congestion, by changing travel patterns, or by constructing Traffic Calming measures.
- Social/Economic Impacts: new projects must effectively blend into the environment they occupy, limiting impacts to social and natural surroundings.

The second part of the discussion will focus on the different characteristics of the traffic on a new or existing facility that must be evaluated. Each characteristic (volume, trip length, speed and level of service) will be described, as well as different classifications (local, collector, arterial, or freeway), and sub-classifications (urban & rural facilities), (major & minor facilities).

A final portion of the session will present the idea that facilities must be monitored regularly; traffic volumes and conditions evolve, and the facility must be evaluated for possible modifications. This will result in an inventory of facilities and an orderly program of improvements based on needs.

Time Allocation: Discussion of design issues – 15 minutes Total: 45 minutes
Discussion of roadway and traffic characteristics – 15 minutes
Discussion of ongoing monitoring – 15 minutes

Evaluation Plan: Evaluate participant learning through interaction (i.e. offering photos of different facilities and asking for their classification, or asking for examples of different issues discussed during the session). Participants will identify facility types by the characteristics in the photos. This is of particular importance as most often, the designer will be required to extend or modify an existing facility, hence the need to identify the type of facility that exists now.

Reference Sources: Florida Greenbook, Chapter 1 – Planning.

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Session No: A4
Session Title: Land Development

Performance-Based Learning Objectives
Participants will be able to:

- List issues relating to transportation that are important to a developer - achieving property access, maximizing property value, keeping through traffic speeds and safety high.
- List the functional and FDOT requirements for access control.
- List requirements for each type of user (cars, transit, pedestrians, bicyclists, trucks, etc.).
- Identify methods to allow for future expansion (of the roadway network or the development).

Instructional Method
Through interactive discussion (including graphics and photos of representative examples, both good and bad), show the importance of each of these topics and offer possible solutions to address the needs of the transportation network relating to the issues listed below:

Issue	Possible Solution
Network development -	New streets created for a development should not compromise the intended street network (i.e. local streets feed to collector streets, etc.) and conform to the FDOT's, County's or Metropolitan Planning Organization's (MPO's) comprehensive plan.
Capacity improvements –	Provide additional through lanes, or alter signal timing in order to gain additional capacity at signals or on roadway segments.
Auxiliary turn lanes –	Separate turning traffic from existing through traffic reduces congestion on the adjacent roadway, and improves safety.
Median openings –	Full or directional median openings, signalized vs. unsignalized are means to reduce conflict points in the traffic stream, discussing FDOT access management regulations.
Driveway location -	Provide adequate corner clearance and separation of driveways that make sense for the highway, not just to maximize the developer's use of the property.
Driveway design criteria -	Width, return radius and throat length for design traffic are all elements that must be considered when developing access connections to the roadway network, particularly with heavy truck movements in larger shopping centers, etc.

Also discuss how a facility may ultimately evolve. Considering the ultimate conditions early in an area's development offers great economies to agencies by decreasing future construction costs.

Time Allocation: Discussion – 45 minutes Total: 45 minutes

Evaluation Plan: Evaluate participant learning through interaction (i.e. open-ended questions), particularly by soliciting participant comments on examples and photos of features on existing or previous projects.

Reference Sources: Transportation and Land Development – Frank Koepke and Virgil Stover, published by ITE

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Session No: A5
Session Title: Design Speeds and Design Vehicles

Performance-Based Learning Objectives
Participants will be able to:
- Define design speed, average running speed and posted speed limit.
- Explain the differences in performance and maneuvering ability of different types of vehicles.
- Select appropriate design speeds and design vehicles for a project

Instructional Method
During an interactive discussion, the instructor will explain or illustrate the two principal issues that determine most roadway design criteria – design speed and design vehicle.

First, review the definition of design speed, and where normal design speeds are shown in the Florida Greenbook. Show how it related to average running speed and speed limit signing. Emphasize the importance of giving the driver characteristics in providing a safe roadway. Also define the meanings of "unrestricted" and "restricted" conditions, and where the "restricted" conditions might be applicable.

Second, review the definition of design vehicle, and where "swept-path" diagrams can be found in the American Association of State Highway and Transportation Officials (AASHTO) Green Book. Present the graphics of different design vehicles in AASHTO (primarily car, single unit truck, small and large semi-trailers, and small and large bus –other types of design vehicles will be reviewed briefly), pointing out the similarities and differences of each.

Ask the class to develop a list of criteria matrix in a roadway design, and have the class identify which is the primary control issue: design speed or design vehicle or something else. This list will be utilized in the workshop later in the day, and in later sessions from the Florida Greenbook Seminar Series (selecting individual criteria). Once the class has developed their own criteria matrix, the instructor will review his/her version, and the reasoning used to create it.

Time Allocation: Discussion – 30 minutes
Participant design criteria matrix – 10 minutes
Instructor design criteria matrix – 10 minutes
Total: 50 minutes

Evaluation Plan: Comparison of the design matrix created by participants with the one developed by the instructor. The intention is to make this matrix format consistent, gradually completing it.

Reference Sources: Florida Greenbook, and 2001 AASHTO Green Book, pages 15-46 (regarding design vehicles), and 2001 AASHTO Green Book, pages 67-72 (regarding design speeds)

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Session No: A6
Session Title: Reference Materials

Performance-Based Learning Objectives
Participants will be able to:
- Locate on the internet FDOT's website and follow the website's (site map) organization.
- Identify the organizations which are potential sources of information.
- Identify the location of other agencies' reference materials on the internet.
- Select appropriate reference manuals (hardcopies) that participants may want to have in-house.

Instructional Method
Through interactive discussion, learn what resources are available from different agencies, including FDOT, Federal Highway Administration (FHWA), AASHTO, and Institute of Transportation Engineers (ITE). Review which types of information each entity may have, and how the information may be accessed. Particular attention will be placed on internet-based access, which give participants the opportunity to utilize the latest version of materials.

- Review contact information and available resources from FDOT – as FDOT is becoming increasingly "Web-Based," the majority of information is best viewed online. Discuss the contents of each FDOT office's website. The websites provide the most current information on those resources anticipated to be of more frequent use – i.e. maps and publications, training, Plans Preparation Manual (PPM), Design Standards (DS), traffic, structures, bicycle & pedestrian, access management, Basis of Estimates manual (BOE), specifications, Construction Project Administration Manual (CPAM).
- Review Contact Information for FHWA - Access to the Manual on Uniform Traffic Control Devices (MUTCD) and Standard Highway Signs manuals.
- Review resources of the Florida Transportation Technology Transfer (T^2) Media Center.
- Review AASHTO resources (primarily seminars and publications for sale).
- Review ITE resources (primarily seminars and publications for sale).

Time Allocation: Discussion of FDOT Website – 15 minutes — Total: 50 minutes
Discussion of FHWA Website – 10 minutes
Discussion of (T^2) Media Center – 10 minutes
Discussion of AASHTO Website – 5 minutes
Discussion of ITE Website – 5 minutes
Short quiz – 5 minutes

Evaluation Plan: Short verbal quiz asking participants to identify where to find documents

Reference Sources:
1. Current site maps of FDOT, FHWA, AASHTO and ITE websites.
2. Listings of materials available from each entity.

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Session No: A7
Session Title: Workshop A – Critique of Sample Projects

Performance-Based Learning Objectives
Participants will be able to:
- Examine a proposed project and make an initial assessment conceptual imporvements developed for a project.
- Select the appropriate design speed, design vehicle, facility classification and traffic characteristics for the area.
- Identify issues important to consider during the design process.

Instructional Method
Participants will be divided into groups of about 6 people each, and asked to review a project. As with an engineering firm that is shortlisted, they will review the available material, make a determination of the appropriate basic criteria (design speed, design vehicle, facility classification for the project), and list the issues that they consider the most important ones for this project.

Each group will have a different project, and will give the presentation (5 minutes) to the class, and other team participants will be encouraged to ask the presenters to answer questions about their presentation.

The instructor should allow the participants contribute all they can to the session, as classroom participation. Instructors would contribute at the end of the presentation about each group, offering further comment, and make sure participation is encouraged.

Once all presentations are completed, thank participants for attending, summarize the day's activities and offer a description of subsequent seminars, both of which will build upon material in Seminar A:

Seminar B - Geometric Criteria
Seminar C - Additional Design Issues

Time Allocation: Group Exercise – 40 minutes
Presentations - 20 minutes
Evaluations Wrap-up – 15 minutes
Total: 75 minutes

Evaluation Plan: Classroom interactive discussions, and presentations developed by participants.

Since both of these seminars (B and C above) will build on this first seminar, a key element in the evaluation of this seminar (wrap-up portion) would be to ask participants to state - via written evaluations or verbal comments - their expectations of the next two seminars.

Reference Sources: Not Applicable.

End of Preliminary Lesson Plan
Florida Greenbook Seminar Series
Seminar A – Overview

Preliminary Lesson Plan

Florida Greenbook Seminar Series
Seminar B – Geometric Criteria

Prepared by:
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FINAL DRAFT

FLORIDA GREENBOOK SEMINAR SERIES
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Summary of Sessions
Florida Green Book Seminar
Seminar B – GEOMETRIC CRITERIA

Course Sessions and Time Allocations

Session #	Session Title	Time Allocation
B1	Geometric Design – Horizontal Alignment	55 Minutes
B2	Geometric Design – Vertical Alignment	50 Minutes
B3	Geometric Design – Cross Sections	50 Minutes
B4	Design Criteria Matrix	30 Minutes
B5	Roadside Design	70 Minutes
B6	Design Exceptions	30 Minutes
B7	Design Criteria Matrix Workshop	75 Minutes
	TOTAL CONTACT TIME	6.0 Hours

Preliminary Agenda

Session #	Session Title	Start Time	End Time
	Registration	8:00 am	8:30 am
B1	Geometric Design – Horizontal Alignment	8:30 am	9:25 am
B2	Geometric Design – Vertical Alignment	9:25 am	10:15 am
	BREAK	10:15 am	10:30 am
B3	Geometric Design – Cross Section	10:30 am	11:20 am
B4	Design Criteria Matrix	11:20 am	11:50 am
	LUNCH	11:50 am	1:00 pm
B5	Roadside Design	1:00 pm	2:10 pm
B6	Design Exceptions	2:10 pm	2:40 pm
	BREAK	2:40 pm	3:00 pm
B7	Design Criteria Matrix Workshop	3:00 pm	4:15 pm

FLORIDA GREENBOOK SEMINAR SERIES
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Session No: B1
Session Title: Geometric Design – Horizontal Alignment

Performance-Based Learning Objectives
Participants will be able to:
- Choose appropriate locations for horizontal curves.
- Choose appropriate deflection angles, where curves are not needed.
- Choose suitable compound curves.
- Calculate superelevation transition (runoff) lengths and locations relative to curve endpoints.
- Determine proper increases to lane widths on turning roadways.

Instructional Method
During this first part of the session, the discussion will cover the initial purpose for curves (to connect a series of tangents that begin and end at predetermined points), and the data associated with a horizontal curve.

Next, show examples of good and bad locations (of horizontal curves), using photographs of existing locations, plan sheets, or sketches, and explain the reasons why they are good or bad choices. Points of discussion include horizontal curve locations at or near intersections, crests or sags, on high fills, or near other decision points.

Show examples of centerlines that change direction without curves and of compound curves. Discuss their limitations.

Discuss superelevation rates (urban values, rural values, and intersection curves), showing Tables 3-3 and 3-22, Figures 3-1 and 3-2. Also show how runoff lengths are calculated. Explain that superelevation should be carefully considered, because several pitfalls exist. Superelevation means that areas of zero (0) cross slope are needed, and profile grade line (PGL) must be monitored to make sure no flat spots are created. Show how superelevation and runouts affect adjoining properties and intersections.

Discuss what happens on large radii curves and turning roadways (smaller radii curves). Pavement widths need to increase slightly as the radius decreases. Show Tables 3-20 and 3-21, and explain how they should be used.

Time Allocation: General horizontal design – 25 minutes
Superelevation – 15 minutes
Roadway widths – 25 minutes
Total: 55 minutes

Evaluation Plan:
Through interactive discussion, solicit participant input in solving example problems by looking up charts, performing superelevation calculations, and commenting on examples provided.

Reference Sources:
Florida Greenbook, 2002 Edition, page 3-8 through 3-11

FLORIDA GREENBOOK SEMINAR SERIES
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Session No: B2
Session Title: Geometric Design – Vertical Alignment

Performance-Based Learning Objectives

Participants will be able to:

- Identify controls of vertical alignment.
- Select appropriate vertical curve length based on design speed. Calculate the various elements of a vertical curve.
- Measure stopping sight distance and passing sight distance.
- Recognize characteristics of good coordination of horizontal and vertical alignment.
- Develop grading concepts of intersections that will be smooth for the driver.

Instructional Method

During the first part of the discussion, use a white board or flip chart to list discuss what the participants think are controlling issues for the vertical alignment of a project. Examples of criteria are minimum and maximum grades, base clearance, flooding criteria, high points at intersections, and reasoning for each.

The next part of the discussion involves vertical curves. Show the vertical curve formula, and work through an example of a vertical curve problem, where a vertical curve needs to pass through a specific point. Show a diagram of the solution, and a completed profile sheet.

Discuss stopping and passing sight distance criteria, and how it can be measured. Use this information in a discussion of the ways horizontal and vertical alignment needs to be coordinated (i.e. designs where drivers have better visibility approaching decision points, avoiding "flat spots" where cross slopes are at 0% near vertical curve low points – meaning drainage problems will result).

Discuss the subtleties of intersection grading. Each roadway profile may work by itself, but when two of them intersect, the condition creates special problems. Show an example of an intersection that has two profiles that intersect at the center of the intersection. When grading is extended toward curblines, the surfaces must be warped to keep reasonable cross slopes of pavement, keep runoff flowing along the curbline, or provide additional inlets. Present a completed intersection grading sheet as an illustration.

At the end of the session, participants will be given a handout containing sentences with blanks relating to key issues discussed during the session. They will choose the correct term from a list of terms to fill in each blank in these sentences. The instructor will go over each sentence and ask participants for the correct term.

Time Allocation: Basic vertical criteria – 10 minutes — Total: 50 minutes
Vertical curves – 10 minutes
Coordination of horizontal and vertical alignment – 15 minutes
Intersection grading - 10 minutes
Quiz – 5 minutes

Evaluation Plan:

The instructor will evaluate participant learning by listening to the answers given by participants and by asking participants (show of hands) how many blanks they filled in correctly.

Reference Sources:

Florida Greenbook, 2002 Edition, pages 3-6 through 3-8 (for stopping and passing sight distance issues) and pages 3-12 through 3-14.

FLORIDA GREENBOOK SEMINAR SERIES
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Session No: B3
Session Title: Geometric Design – Cross Sections

Performance-Based Learning Objectives
Participants will be able to:
- Select appropriate widths and cross slopes for medians, lanes, shoulders, and right-of-way.
- Determine proper border widths to accommodate drainage needs and sidewalks.
- Select appropriate locations and lengths of auxiliary lanes.
- Develop proper transitions between roads and bridges (widths and cross slopes).
- Select appropriate horizontal and vertical clearances for structures.

Instructional Method
Show graphics of different types of typical sections (divided urban, divided rural, undivided urban and undivided rural), and discuss the differences between them. Discuss appropriate ranges of width and pavement cross slope for different components of the typical, drainage features, sidewalks, and right-of -way, and the reasons for them.

Discuss when auxiliary lanes (i.e. speed-change/turn lanes, parking lanes, or climbing lanes) can be useful, and when they should be considered. Show photo examples of each type of lane.

Discuss the special requirements that structures place on cross sections. Structures must have adequate horizontal and vertical clearances, and the roadway cross section must often be transitioned to meet the proposed structure shape. For examples, cross slopes on roadways must rotate to meet the single slope on the bridge deck.

Time Allocation: Discussion of basic cross section issues – 25 minutes Total: 50 minutes
Discussion of transitions – 25 minutes

Evaluation Plan:
Evaluate participant learning through interaction (i.e. offering photos of different conditions and asking participants for their assessment and opinions on resolving issues discussed during the session).

Reference Sources:
Florida Greenbook, 2002 Edition, pages 3-14 through 3-26

FLORIDA GREENBOOK SEMINAR SERIES
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Session No: B4
Session Title: Design Criteria Matrix

Performance-Based Learning Objectives
Participants will be able to:
- Recognize the value of having the design criteria consolidated in a single short document.
- List the criteria that should be included in a design criteria matrix.
- Select appropriate design criteria values for the matrix (matrices) for a project.

Instructional Method
Present a blank design criteria matrix, showing three basic columns, stating:
(1) The design element
(2) The design criteria for the project
(3) A reference to show which source document it came from.

Show the various categories of criteria that should be considered. In general, develop a blank design criteria matrix that will be utilized by participants during the workshop session. Also, work through a matrix for an example project.

By having a design criteria in place, the design is more consistent and effective. All members of the design team can reference the matrix, and it can be easily presented to a prospective or reviewing agency for approval.

Time Allocation: Discussion – 30 minutes Total: 30 minutes

Evaluation Plan:
Evaluate participant learning through interaction (i.e. participants identifying design criteria of the example projects).

Reference Sources:
Blank and completed examples of design criteria matrices
Florida Greenbook, 2002 edition.

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: B5
Session Title: Roadside Design

Performance-Based Learning Objectives

Participants will be able to:

- Define the clear zone, and hazard (as it applies to the clear zone issue).
- Select appropriate clear zone widths.
- List common roadside features that constitute a clear zone hazard.
- Identify instances where curbing should or should not be used.
- Define the purpose of a traffic barrier.
- Choose effective end treatments for barriers.
- Choose effective landscaping treatments meeting FDOT standard layouts.

Instructional Method

During the first part of the discussion, review the definition of the roadside clear zone and hazard (as related to it). Explain that as policy, FDOT considers the entire median and the roadside adjacent to the roadway part of the project limits. Roadside clear zone evaluation applies to this entire area. Show where the clear zone is measured from, and where to find the required values (Table 3-12). Also ask participants to identify locations where clear zone is of particular importance (i.e. changes in alignment, decision points).

Next, include a discussion of when feature characteristics that determine whether or not a feature is a hazard:

- Canal hazards have at least 3 feet of water depths for 24 hours or more, and at least 1000 feet of frontage and within 40 to 60 feet of the lane, depending on design speeds.
- Fill slopes are hazards when they exceed certain limits, but cut slopes can be steeper, as long as they are smooth and stable. Review the differences between recoverable (1:4 or flatter) and non-recoverable (steeper than 1:4, but with a runout area at the bottom of the slope) slopes.
- Appurtenances (trees, utility poles, signal poles and sign supports) need to be outside the clear zone if possible, or meet breakaway criteria.
- Bridges are formidable hazards and should be located outside the clear zone is, or protected.

Explain the limitations of vertical curb. Explain that it can reduce overall right of way requirements because of the reduced clear zone width. Clarify that it can only be used where design speeds are 45 mph or less. It also required profile grade to have slope.

Next, discuss the issue of barriers and end treatments. Explain length of need calculations and show photos of how they are used to protect a hazard within the clear zone. Be sure to explain that a barrier is itself a hazard, and the feature it protects must be a greater hazard. Show photos of each type of installation - concrete barrier wall, guardrail, and connections to bridges. Discuss advantages and disadvantages of each.

Discuss approach and trailing guardrail end treatments and impact attenuators (particularly ground surface's cross slope requirements, and other aspects of proper installation). Show the FDOT Roadway and Traffic Design Standards and the design data shown on them.

Session B5 – Roadside Design (continued)

Discuss characteristics of good landscaping of roadsides, presenting photographs of various different installations. Issues should include:

- Selecting low-maintenance vegetation.
- Providing a grass strip behind the curb.
- Selecting vegetation that will not grow into a hazard later.
- Satisfy FDOT Roadway and Traffic Design Standard 544 (Landscape Installations) and 546 (Sight Distance at Intersections).

At the end of the session, administer a short verbal quiz, asking participants to select appropriate design decisions on all of the issues discussed.

Time Allocation: Define **c**lear zone & hazard, measuring them – 10 min. Total: 70 minutes
Different types of hazards – 10 minutes
Different types of barrier protection – 10 minutes
Different types of transitions – 10 minutes
Different types of barrier and guardrail end treatment – 10 minutes
Different types of landscaping – 10 minutes
Quiz – 10 minutes

Evaluation Plan:
Participants will give input on the different methods of evaluating and mitigating hazards, followed by a short quiz at the end of the session reviewing the material presented.

Reference Sources:
Florida Greenbook, 2002 Edition, Chapter 4
FDOT Roadway and Traffic Design Standards (400 Series, 544 and 546)
Current AASHTO Roadside Design Guide.

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: B6
Session Title: Design Exceptions

Performance-Based Learning Objectives
Participants will be able to:

- Recognize that documentation of design exceptions are required by the Florida Greenbook when design criteria are less than AASHTO, just like FDOT practice.
- Recognize the 13 controlling design elements that must be met or require design exceptions.
- Recognize the five components that are needed in the documentation, so format is consistent.

Instructional Method:
Discuss the FDOT requirement that design exceptions be prepared when design elements cannot be met. Identify the 13 controlling design elements, where to find AASHTO criteria for them, and why they are important.

Review a completed design exception document, briefly discussing the information included in each component and why it is needed.

Time Allocation: Discussion on FDOT requirements – 5 minutes Total: 30 minutes
13 AASHTO controlling design elements – 10 minutes
Review completed design exception document – 10 minutes
Short quiz – 5 minutes

Evaluation Plan: Short verbal quiz asking participants to:

- Recognize the 13 controlling design elements.
- Recognize the five components of a design exception documentation.

Reference Sources:
Florida Greenbook, 2002 Edition, Chapter 14,
FDOT Plans Preparation Manual (PPM), Chapter 23
AASHTO design criteria for the 13 controlling design elements (included in the PPM).

FLORIDA GREENBOOK SEMINAR SERIES
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Session No: B7
Session Title: Design Criteria Matrix Workshop

Performance-Based Learning Objectives
Participants will be able to:
- Examine a proposed project to assess the proposed criteria that should be developed for a project.
- Develop appropriate design criteria matrices.
- Identify potential design exceptions.

Instructional Method
Participants will be divided into groups of about 6 people each, and asked to review a project. As with an engineering firm shortlisted, they will review the available material, and given the appropriate basic criteria (design speed, design vehicle, facility classification for the project), and develop appropriate design criteria matrix (matrices). In addition, develop a list of design exceptions.

Each group will have a different project, and will give the presentation (5-10 minutes) to the class, and other team participants will be encouraged to ask questions of the presenters about their presentation.

The instructor should let the participants contribute first, then follow with their own contributions an comments at the end of the presentation from each group. Make sure participation is encouraged.

Once all presentations are completed, thank participants for attending and summarize the day's activities.

Time Allocation: Group Exercise – 45 minutes
Presentations - 20 minutes
Evaluations wrap-up – 10 minutes
Total: 75 minutes

Evaluation Plan:
Classroom interactive discussions, and presentations developed by participants.

Reference Sources:
Not applicable.

End of Preliminary Lesson Plan
Florida Greenbook Seminar Series
Seminar B – Geometric Criteria

Preliminary Lesson Plan

Florida Greenbook Seminar Series
Seminar C – Additional Design Issues

Prepared by:
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FINAL DRAFT

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Summary of Sessions
Florida Green Book Seminar
Seminar C – Additional Design Issues

Course Sessions and Time Allocations

Session #	Session Title	Time Allocation
C1	Pavement Design	50 minutes
C2	Roadway Lighting	40 minutes
C3	Railroad Grade Crossings and Transit	40 minutes
C4	Pedestrian and Americans with Disabilities Act (ADA)	50 minutes
C5	Bicycle Facilities	50 minutes
C6	Maintenance Issues	50 minutes
C7	Worksite Safety	40 minutes
C8	Site Condition Assessment	40 minutes
	TOTAL CONTACT TIME	6.0 Hours

Preliminary Agenda

Session #	Session Title	Start Time	End Time
	Registration	8:00 am	8:30 am
C1	Pavement Design	8:30 am	9:20 am
C2	Roadway Lighting	9:20 am	10:00 am
	BREAK	10:00 am	10:15 am
C3	Railroad Grade Crossings & Transit	10:15 am	10:55 am
C4	Pedestrian and Americans with Disabilities	10:55 am	11:45 am
	LUNCH	11:45 am	1:00 pm
C5	Bicycle Facilities	1:00 pm	1:50 pm
C6	Maintenance Issues	1:50 pm	2:40 pm
	BREAK	2:40 pm	3:00 pm
C7	Worksite Safety	3:00 pm	3:40 pm
C8	Site Condition Assessment	3:40 pm	4:20 pm

FLORIDA GREENBOOK SEMINAR SERIES
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Session No: C1
Session Title: Pavement Design

Performance-Based Learning Objectives
Participants will be able to:
- Explain the three basic purposes of pavement.
- Identify the layers in common flexible pavement sections.
- Select appropriate uses of friction course, asphalt rubber membrane interlayer (ARMI), grinding pavement.
- Identify pavement problems and select appropriate solutions.

Instructional Method
During this first part of the session, ask the participants to identify the purposes of pavement:
- Supporting wheel loads for the design life of the pavement.
- Providing adequate skid resistance.
- Providing adequate drainage.

During the next part of the session, explain the components of a pavement section. Describe the composition of each layer (stabilization, base course, structural course, and friction course). Introduce the FDOT Flexible Pavement Design Manual, and review its content briefly (show the table of contents), explain the purpose, and the information provided within it.

Show an example pavement design problem, discussing items like pavement layer coefficients, and also factors such as FDOT policy on friction course (where it should and should not be used).

Show photographs of different types of pavement distress (shoving, raveling, alligator cracking, potholes, deterioration of the edge of the pavement, etc.), asking the participants to determine the cause. Upon receiving the participant's input, the instructor should offer an opinion and possible resolution methods.

Time Allocation: General pavement issues – 15 minutes Total: 50 minutes
FDOT Flexible Pavement Design Manual – 15 minutes
Pavement distress issues – 15 minutes
Verbal quiz – 5 minutes

Evaluation Plan:
Provide a short verbal quiz at the end of the session asking for definitions or minimum criteria for different layers, or asking participants to identify the type of distress shown in photographs.

Reference Sources:
Florida Greenbook, Chapter 5
FDOT Flexible Pavement Design Manual, 2002 Edition

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C2
Session Title: Roadway Lighting

Performance-Based Learning Objectives
Participants will be able to:
- Explain the way lighting is measured for luminaires.
- Identify different elements of cost for lighting systems.
- Identify the most appropriate locations for lighting.

Instructional Method
During the first part of the discussion, explain the basic principles of roadway lighting. Explain a graphic that shows how illumination is measured (both average illumination (1 foot-candle), as well as uniformity rations (average to min. = 4:1 and max. to min. = 10:1) uniformity. Next, use an interactive discussion to ask the participants how illumination levels can be modified by changing any of the following:
- fixture type (filament and lens)
- size (wattage)
- height and length of supports
- location relative to the pavement

During the next part of the discussion, introduce the principle of economy. Ask the participants to identify the various issues of cost (construction, electricity, and maintenance). Once the participants understand these cost issues, ask the participants to identify the types of locations that are most often WARRANTED for roadway lighting.

Show photographs of different applications - transit stops, interchanges, intersections, pedestrian or bicycle traffic areas and locations where ration of nighttime to daytime crashes are high. Also discuss underpasses and suitable options in other places where daytime and nighttime lighting needs exist.

During the final discussion, briefly describe the different components of the lighting system (poles, junction boxes, conduit, wiring circuits, photoelectric controls and load centers).

At the end of the session, participants will be given a handout containing sentences with blanks relating to key issues discussed during the session. They will choose the correct term from a list of terms to fill in the blank for these sentences. The instructor will go over each sentence and ask participants for the correct term.

Time Allocation: Basic lighting design criteria – 5 minutes Total: 40 minutes
Lighting cost issues – 10 minutes
Lighting applications – 10 minutes
Lighting systems components and operation – 10 minutes
Quiz – 5 minutes

Evaluation Plan:
The instructor will evaluate participant learning by listening to the answers given by participants and by asking participants (show of hands) how many blanks were filled in correctly on their quiz.

Reference Sources:
An Informational Guide to Roadway Lighting – AASHTO
Florida Greenbook, Chapter 6

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C3
Session Title: Railroad Grade Crossings and Transit

Performance-Based Learning Objectives
Participants will be able to:
- Recognize the FDOT rule 14-46 requirement to eliminate grade crossings as often as possible. This means grade separations are often required.
- Determine sight distance requirements for at-grade crossings.
- Identify characteristics of good crossing alignments and cross sections.
- Identify the sequence of events that occur at crossing gates and adjacent traffic signals.

Instructional Method
During the first part of the discussion, show a copy of FDOT rule 14-46, highlighting the key passages to the rule, which require elimination of grade crossings whenever possible. Also clarify the legal power of railroads (having absolute control over their right-of-way) and the reasons for this control (they bear the liability of their system, and the system is the revenue source).

During an interactive discussion, ask participants to offer their opinions as to why a grade separation should be considered where an existing grade crossing is located. Ask them to identify safety issues (railroad, vehicle, emergency vehicle and pedestrian) and capacity issues (railroad and roadway). Show photographs of examples when possible.

During the next part of the session, define the sight distance requirements. Explain that for crossings with devices (lights and gates), stopping sight distance should be provided according to the Florida Greenbook Table 3-14 or Figure 3-7. Also explain that Table 7-1 and Figure 7-1 and 7-2 should be utilized for uncontrolled crossings.

During the next part of the discussion, show examples of photos of different crossings or features of them, asking the participants to identify a problem and a potential solution. Include these issues:
- Horizontal transitions (90 degree crossings shorten the length of crossings, and make bike crossing easier)
- Access management (eliminate driveways within 150 feet, intersections within 300 feet)
- Profile transitions (to meet rail elevations including the full width of crossing pavements)
- Cross section transitions (to meet rail profiles and drain runoff away from rails)

Next, discuss the operations of railroad protection devices and interconnection with adjacent traffic signals. Identify the sequence of operation: A) Clearance intervals of adjacent traffic signals,
B) Activating warning lights, and C) Activating crossing gates. Show photographs and explain how they operate.

Time Allocation: Railroad crossing regulations – 15 minutes
Railroad crossing geometric design – 15 minutes
Railroad crossing traffic design – 10 minutes
Total: 40 minutes

Evaluation Plan:
Evaluate participant learning through interaction (i.e. offering photos of different conditions and asking participants for their assessment and opinions on resolving issues discussed during the session).

Reference Sources:
Florida Greenbook, 2002 Edition, Chapters 7 and 13.

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C4
Session Title: Pedestrian and Americans with Disabilities Act (ADA)

Performance-Based Learning Objectives
Participants will be able to:
- List different locations for pedestrian pathways within a typical section in decreasing order of preference.
- List the criteria for sidewalks and curb ramps included in ADA regulations.
- Identify good design features of pedestrian pathway.

Instructional Method
During the first part of the discussion, emphasize the importance of separating the pedestrian from the vehicle. Show photographs of different locations for the pedestrian pathway. Ask participants to provide advantages and disadvantages of each option.

During the next part of the discussion, introduce the ADA principle; persons with disabilities deserve the same treatment as regular pedestrians, and need the same degree of access. Sidewalks and curb ramps are the only real issues civil engineers need to deal with (other than parking).

Discuss sidewalk criteria:
- Minimum width = 5 feet, 6 feet next to curb, with local minimums of 36 inches
- Border width = 2 feet to keep slopes intact, and for clear zone
- Sideslopes and dropoff criteria = steeper than 1:3 need protection
- Sidewalk cross slope = 2%
- Sidewalk profile grade = 5% without landings, 8% with landings
- Sidewalk paving = 4" concrete, with 6" concrete at driveways, or asphalt

Also review the different options for curb ramps. Review the FDOT Design Standards for curb ramps

Time Allocation: General location of pathways – 15 minutes Total: 50 minutes
ADA issues – 15 minutes
Design criteria for pathways and curb ramps – 20 minutes

Evaluation Plan:
Evaluate participant learning through interaction (i.e. participants identifying advantages and disadvantages of different concepts) during the discussion.

Reference Sources:
Florida Greenbook, 2002 Edition, Chapter 8
Florida Pedestrian Facilities Planning and Design Handbook, FDOT
Design Standards, Index 305 (Types of Curb Ramps)
Florida Accessibility Code for Building Construction

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C5
Session Title: Bicycle Facilities

Performance-Based Learning Objectives

Participants will be able to:

- Define different types of bicyclists.
- Identify appropriate design criteria and pavement marking for on-street bicycle facilities.
- Identify appropriate design criteria and pavement markings for off-street bicycle facilities.

Instructional Method

During the first part of an interactive discussion, present the idea that all ordinary roadways should provide for bicyclists in some fashion. Ask the participants to identify different types of bicyclists, and the best place for them:

- Proficient bicyclists who keep pace with traffic, riding for fitness and transportation. They do not belong on a sidewalk for their safety and the safety of pedestrians.
- Adult bicyclists who use the roadway for basic, low cost transportation.
- Youthful bicyclists who most commonly use the sidewalk (primarily they travel to and from schools and playgrounds), but have shorter trip lengths.

Discuss any special needs of a bicyclist over a motor vehicle. Bicyclists need a smooth surface, clear of debris or uneven pavement. Explain why roadway markings should be paint, not thermoplastic. Also discuss the other types of users of a multi-use trail (joggers, rollerbladers, and horseback riders).

Next, discuss the basic design criteria for on-street bicycle lanes. Ask for input by participants on their concepts, discuss these issues and show photographic examples of these issues:

- On arterials or collectors within 1 mile of an urbanized area.
- Width of paved shoulders for bicyclists (4’ normal width – not including gutter pan; more speeds or traffic volumes are high, near obstacles such as guardrail, curb or barrier wall).
- On curbed roadways, a 14’ curb lane, or 5’ next to a parking lane.
- On street bicycle lanes are similar in width to paved shoulders, but have more continuity.
- Markings for paved shoulders consist of a line delineating edge of vehicle travel, little else.
- Bike lanes should be on the right side of pavement, in one direction only. 2-way bike lanes are not as desirable because they are unexpected by drivers.

Next, discuss off street facilities, in a similar manner:

- They are not intended to replace on-street facilities, but supplement them.
- Paved widths need to be 10 feet minimum and 12 feet desirable, with 2 foot grass shoulders.
- Clear zone to trees is 3 feet, 5 feet to canals or 1:3 slopes (or protection).
- Vertical clearances are 8 feet for overpasses, and 10 feet for underpasses
- Profiles are limited to ADA restrictions.
- Design speed should be 20 mph on bikeways.
- Pay attention to drainage of the pathways, runoff across pathways may be a safety hazard.

At the end of the session, administer a short verbal quiz, asking participants to select appropriate design decisions on all of the issues discussed.

Time Allocation: Basic bicycle issues – 10 minutes Total: 50 minutes
On-street bicycle issues – 20 minutes
Off-street bicycle pathway issues – 15 minutes
Quiz – 5 minutes

Evaluation Plan:
Solicit participant input on the different issues, followed by a short quiz at the end of the session reviewing the material presented.

Reference Sources:
Florida Greenbook, 2002 Edition, Chapter 9
Florida Bicycle Facilities Planning and Design Handbook, FDOT

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C6
Session Title: Maintenance Issues

Performance-Based Learning Objectives
Participants will be able to:
- Identify the components of a maintenance plan.
- Recognize the routine maintenance activities.
- Select design features that provide for economical maintenance activity.

Instructional Method:
During the first part of the discussion, ask the participants to identify the items that contribute to maintenance activity's costs – personnel, equipment materials, etc. are all in the equation. Explain also that maintenance costs are ongoing, for the life of the facility.

Next, outline the components of a maintenance program, showing photographs of each activity.
- Routine inspection of facilities.
- Reviewing crash records.
- Establishing priorities of maintenance activities based on need.
- Routine maintenance activities (particularly clearing sight lines, mowing, and drainage etc.)
- Major maintenance activities (resurfacing, emergency repairs, etc.).

During the next part of the discussion, show photographs of design features with differing maintenance characteristics of maintenance. Ask the participants to put themselves in the role of a maintenance supervisor, and estimate how much effort will be required to get the maintenance tasks done. Much of the discussion will be centered on the photographs, as design plans rarely indicate the potential maintenance activities.

Time Allocation: Maintenance concept, policy, procedures – 25 minutes Total: 50 minutes
Economically maintainable facility design – 20 minutes
Short quiz – 5 minutes

Evaluation Plan:
Short verbal quiz asking participants to state:
- Components of a maintenance policy.
- Design features of a transportation facility that can be economically maintained.

Reference Sources:
Florida Greenbook, 2002 Edition, Chapter 10

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C7
Session Title: Worksite Safety

Performance-Based Learning Objectives

Participants will be able to:

- Define FDOT and Federal Policy relating to worksite safety.
- List the different segments of the work zone.
- Name appropriate FDOT devices to be used in each segment.

Instructional Method

During the first part of the discussion ask participants what is important about worksite safety:

- Spending as little as possible, since there is no "tangible product" when the project is built?
- Keeping traffic flowing as much as possible, even if the work takes longer?
- Building the project as fast as possible?
- Creating the safest worksite possible, at any cost – just to keep from getting sued?

Of course, the answer is "a combination of the above". Professional judgment is used in this area very often. Two documents - Florida Design Standard (DS) and the Manual on Uniform Traffic Control Devices (MUTCD) are regarded as the "Standard of Care." A design needs to conform to one of them.

Next, briefly describe each major part of the work zone (by name, location, purpose and what type of devices might be used):

1st part - Advance Warning Area – Grab attention, describe problem, prepare for action (warning signs, changeable message signs, flashing lights).

2nd part – Transition Area – Shift traffic to alternate position on roadway, or detour (channelizing devices, striping, reflective pavement markers (RPM's), flashing arrow boards, speed enforcement officers).

3rd part – Activity Area – Separate traffic from workers and activity; contains a buffer space and a work space (barriers, crash cushions, striping, channelizing devices, temporary lighting, traffic control officers).

4th part – Termination Area – Provides short distance for traffic to clear the work area and return to normal traffic lanes (channelizing devices, striping, RPM's, and warning signs).

The discussion will involve participant experiences, as well as the instructors, and photographs are an important part of the material.

Next, briefly review the organization of the DS, clarifying that the 600 Series Indexes define FDOT Policy, but 601 through 670 are typical layouts which can be changed. Also point out the MUTCD offers alternative layouts and slightly less strict requirements.

Briefly discuss other controlling issues, pedestrians, business access, maintaining drainage and utilities, etc. Show an example traffic control plan, where each phase provides space for workers and for traffic.

During the final portion of the discussion, give a short quiz, - show photos of different devices, and ask the participants to describe how they could be used.

Time Allocation: Concepts and FDOT policy – 10 minutes
Segments of the work zone – 5 minutes
Florida Design Standards - 15 minutes
Quiz – 10 minutes
Total: 40 minutes

Evaluation Plan:
Classroom interactive discussions with participants, sharing their experiences.

Reference Sources:
Florida Design Standards, Index 600 series
Manual on Uniform Traffic Control Devices, Part 6

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C8
Session Title: Site Condition Assessment

Performance-Based Learning Objectives
Participants will be able to:
- Examine a site condition and make an assessment of the issue's severity.
- Offer a potential method for resolution.

Instructional Method
Show a series of photographs of project site conditions; ask the participants to comment on the issue, and offer a resolution for the project. The instructor should encourage the participants to contribute all they can to the session as classroom participation. Instructor would contribute at the end of the presentation about each group, offering further comment, and assure participation.

Once reviews of all of the photographs are completed, complete evaluations, and thank participants for attending and summarize the day's activities.

Time Allocation: Review project site photos – 30 minutes
Evaluations and wrap-up – 10 minutes
Total: 40 minutes

Evaluation Plan:
Classroom interactive discussions by participants.

Reference Sources:
Not applicable.

End of Preliminary Lesson Plan
Florida Greenbook Seminar Series
Seminar C – Additional Design Issues

ALTERNATIVE

SESSION

C8 – BRIDGES AND OTHER STRUCTURES

TO BE ADDED

ONCE

FDOT 2004 GREENBOOK IS AUTHORIZED

This session should be positioned as Session 5, and Sessions C5 through C7 would become C6 through C8 (discarding the original Session C8).

Simply adjust time schedule accordingly, and revise Session Numbers.

FLORIDA GREENBOOK SEMINAR SERIES
DRAFT

Session No: C5
Session Title: Bridges and Other Structures

Performance-Based Learning Objectives
Participants will be able to:
- Identify appropriate criteria and methodology for design, based on FDOT and FHWA requirements.
- Select appropriate horizontal and vertical clearances.
- Select appropriate design details.

Instructional Method
During the first part of the discussion, present the concept that FDOT and FHWA have certain requirements that all designers must adhere to:
- All structures to be maintained by FDOT or which cross FDOT facilities must comply with all FDOT policies procedures and standards (not the Greenbook).
- AASHTO has two different forms of specifications (1) Standard Bridge Design Specifications and (2) and LRFD Bridge Design Specifications (Load & Resistance Factor Design). After January 1, 2007, all bridges must conform to LRFD.
- All structures need to have a regular program of inspection, (cycles of 2 years or less). Use national procedures.

The next part of the discussion should cover bridge clearances. Ask the participants to identify the different types of clearances that need to be observed:
- Clearances over roadways should be as provided in the Greenbook, Chapter 3.
- 2-foot drift clearance (to reduce possibilities for damage by flood debris); this doesn't apply for culverts/bridge culverts (i.e. less than 20-foot span).
- 1-foot clearance above tidal or brackish waters (to reduce corrosion potential).
- 6-foot navigation vertical clearances (above mean high water, normal high water or lake control elevation). Also provide 10-foot horizontal clearance.

Next, discuss railings. Identify the different types of railings and when they should be used. Show the participants photographs of each type, and ask the participants what is important about each alternative:
- Traffic barrier railings must meet Test Level TL-3 for design speeds over 45 mph.
- Traffic barrier railings must meet Test Level TL-2 for design speeds 45 mph and less.
- Picket style railings should be used for dropoffs of more than 30 inches.
- Aluminum pipe handrails should not be used for dropoffs of more than 30 inches.

Next briefly review the "Recommended do's and don'ts list" at the end of the chapter.

Time Allocation: Basic Criteria – 10 minutes
Clearances – 15 minutes
Details – 15 minutes
Total: 40 minutes

Evaluation Plan:
Classroom interactive discussions by participants.

Reference Sources:
2004 Edition Florida Greenbook, Chapter 17

Florida's 2004 Hurricane Season

Structural Impacts on the FDOT System

TAG Dec 6, 2004

Hurricane Wind Speed versus Design Wind Speed

(What's the Difference?)

TAG Dec 6, 2004

Wind Speeds

- Sustained Wind Speed
  - 60 second measurement duration
  - National Weather Service
- Fastest Mile Speed
  - Measurement duration varies
  - 1994 AASHTO
- Gust Wind Speed
  - 3 second measurement duration
  - National Weather Service and 2001 AASHTO

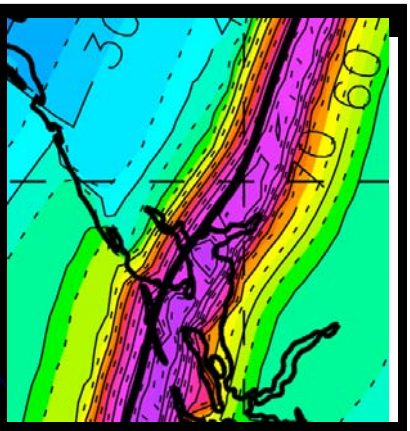
Florida Greenbook, 2005

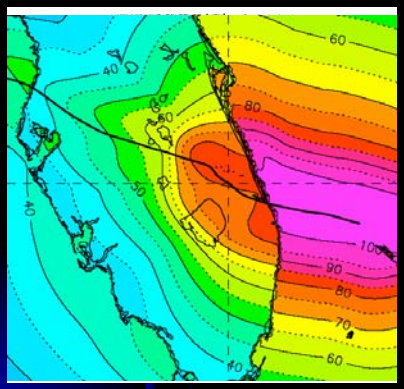
Maps from NOAA

www.aoml.noaa.gov/hrd/data_sub/wind.html

Charley

8/13/05
Sustained
Winds:
110/120
mph



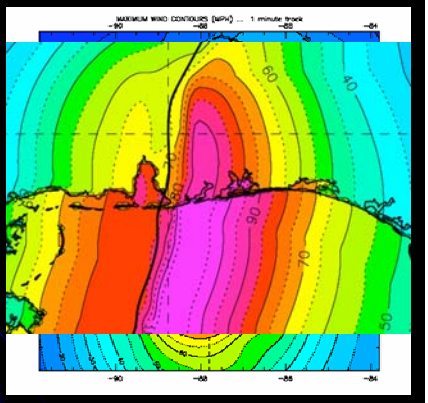


Frances

9/5/04
Sustained
Winds:
80 mph

Ivan

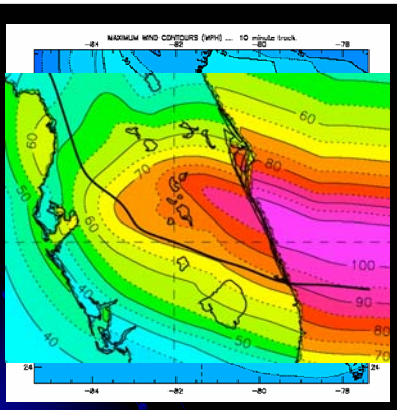
9/16/04
Sustained
Winds:
90 mph



Florida Greenbook, 2005

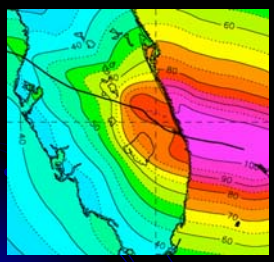
Jeanne

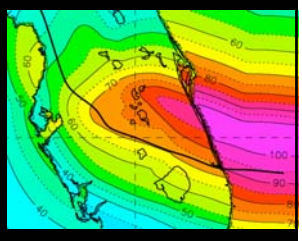
9/28/04
Sustained
Winds:
85 mph



Florida Greenbook, 2005

Frances / Jeanne

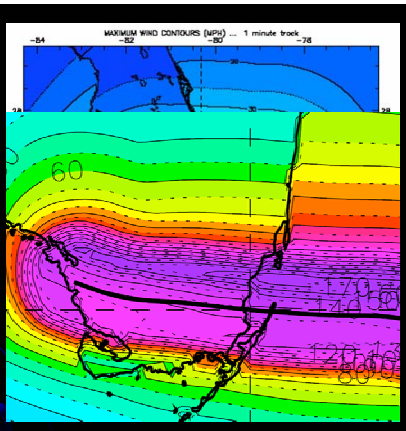




Florida Greenbook, 2005

Andrew

Sustained Winds: 150 mph



Sustanined Wind Speeds

Charley 120 mph
Frances 80 mph
Ivan 90 mph
Jeanne 85 mph

$$\text{fSustainedToFastestMile}\begin{pmatrix}120\\80\\90\\85\end{pmatrix} = \begin{pmatrix}128.5\\82.1\\93.5\\87.8\end{pmatrix}\text{mph}$$

$$\text{fSustainedTo3SecGust}\begin{pmatrix}120\\80\\90\\85\end{pmatrix} = \begin{pmatrix}145.9\\97.3\\109.4\\103.4\end{pmatrix}\text{mph}$$

Actual Winds vs. Design Winds

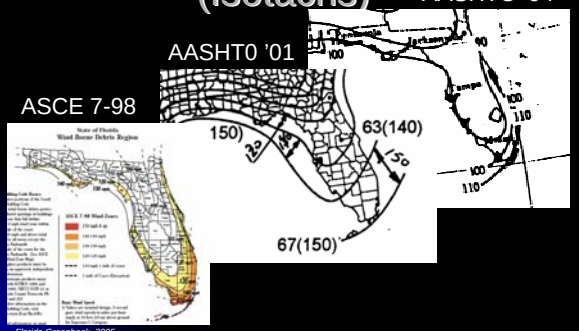
Hurricane	Wind	County	10 year	25 year
Charley	128 mph	Charlotte	80 mph	90 mph
Frances	84 mph	Brevard	80 mph	90 mph
Ivan	94 mph	Escambia	60 mph	90 mph
Jeanne	88 mph	Martin	80 mph	90 mph

Windspeed Contours (Isotachs)

AASHTO '94

AASHT0 '01

ASCE 7-98



Florida Greenbook, 2005

I-10 over Escambia Bay

The Destruction
The Cause
The Response
The Future

TAG Dec 6, 2004

I-10 over Escambia Bay

Escambia Bay on 9/16/2004

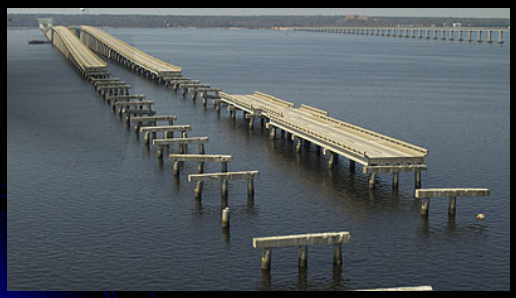
Florida Greenbook, 2005

I-10 over Escambia Bay

Escambia Bay on 9/16/2004

Florida Greenbook, 2005

I-10 over Escambia Bay



60' Trestle Spans Missing: 46 EB & 12 WB

Florida Greenbook, 2005

I-10 over Escambia Bay

One Known Fatality

Florida Greenbook, 2005

I-10 over Escambia Bay

Florida Greenbook, 2005

I-10 over Escambia Bay

East Abutment of EB Bridge

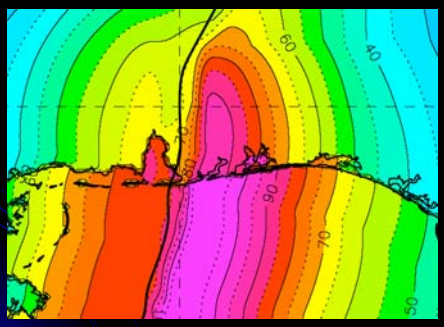
Florida Greenbook, 2005

I-10 over Escambia Bay

East Abutment of WB Bridge

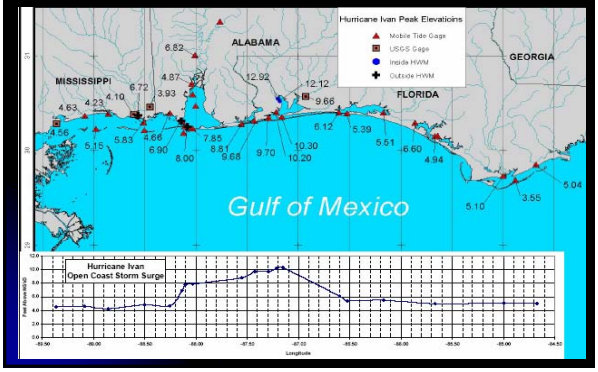
Florida Greenbook, 2005

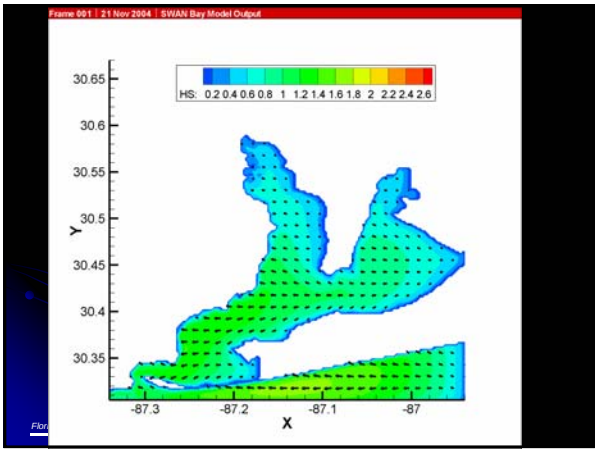
Ivan: The Perfectly Destructive Storm



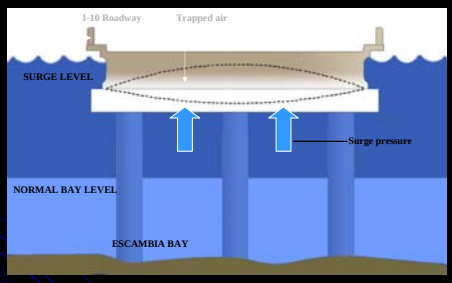
Florida Greenbook, 2005

Regional Peak Surge Elevations





What Happened?

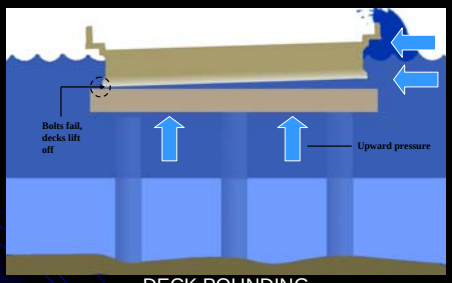


DECK LIFTING

Storm surge rose to 14 to 16 feet above sea level beneath the bridge decks, where beams captured air beneath them.

Florida Greenbook, 2005

What Happened?



DECK POUNDING

Waves of 13 feet atop the surge hit the sides of the bridge decks every 6.5 seconds at the height of the storm.

Florida Greenbook, 2005

What Happened?

DECK DESTRUCTION

Lifting and Pounding broke the connections between the bridge's piers and decks, allowing the deck sections to progressively slide sideways and fall into the water.

Florida Greenbook, 2005

I-10 over Escambia Bay

Misaligned Spans: 50 EB & 16 WB

Florida Greenbook, 2005

I-10 over Escambia Bay

Hold-Down Bolts Sheared

Florida Greenbook, 2005

I-10 over Escambia Bay

Hold-Down Bolts & Embedded Studs Sheared

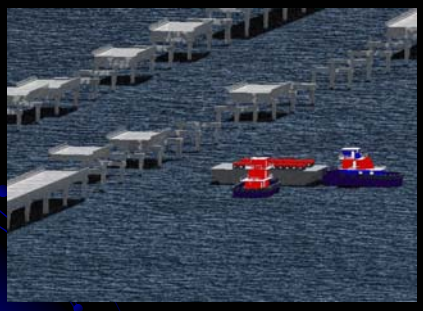
Florida Greenbook, 2005

Repair & Reconstruction

- Request for Proposals (9/17/04)
  - Pre-proposal Meeting (9:00 am)
    - Westbound open to traffic nlt 10/11/04
    - Contract Completion nlt 12/16/04
  - Question & Answer Meeting (1:00 pm)
  - Price Proposals Due & Opening (4:00 pm)
  - Execute Contract (by midnight)

Florida Greenbook, 2005

Repair & Reconstruction



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Repair & Reconstruction

- Westbound Bridge
  - 9/19 – 9/23: Mobilization
  - 9/24: Realignment of spans begins
  - 9/26: New bent pile driving begins
  - 9/29: Submerged span removal begins
  - 9/30: Span relocations begin
  - 10/4: Last span relocation completed
  - 10/5: Westbound bridge opens to two-way traffic.

Elapsed Time – 19 calendar days

(6 days ahead of schedule!).

Florida Greenbook, 2005

Repair & Reconstruction

- Eastbound Bridge
  - 10/6: Realignment of spans begins
  - 10/7: Submerged span removal begins
  - 10/15: New bent pile driving begins
  - 10/22: Span relocations begin
  - 11/1: "Acrow" bridge placing begins
  - 11/20: Eastbound bridge opens to one-way traffic.

Florida Greenbook, 2005

New Escambia Bay Bridge

- Request for Proposals
  - Design-build project
  - Maintenance & eventual demolition of current crossing
  - Stage construction to remove traffic from EB bridge ASAP (12/15/06 incentive/disincentive date)
  - Twin 56' wide roadways (3-12' lanes + 2-10' shoulders)
  - 250' min. main span, 130' min. spans elsewhere
  - Minimum Deck Elevation of 25' above mean high water
- Proposals Schedule
  - 3/04/05 Technical Proposal Due
  - 3/17/05 Price Proposal Due
  - 3/30/05 Anticipated Contract Award Date

Florida Greenbook, 2005

Other Bridges

Jensen Beach Causeway – Under Construction
Fishing Pier (under Main Bridge)

Hurricane Francis

Hurricane Jeanne

Two spans lost – 14" piles shattered

Florida Greenbook, 2005

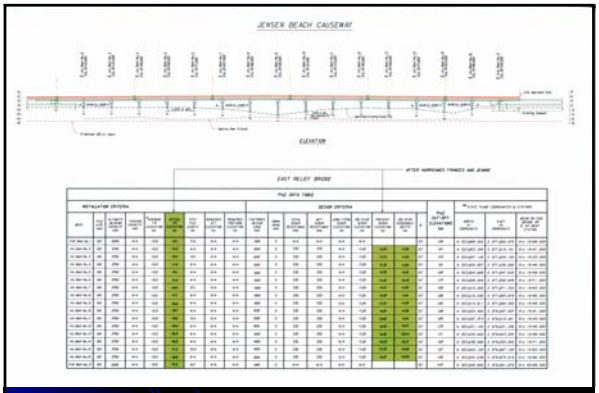
Other Bridges

Jensen Beach Causeway – Under Construction
East Relief Bridge

Hurricane Frances

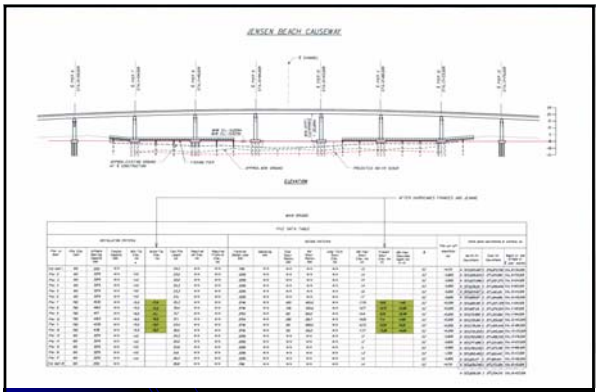
Hurricane Jeanne

Florida Greenbook, 2005



East Relief Bridge

Florida Greenbook, 2005



Main Bridge Scour

Florida Greenbook, 2005

Other Bridges

Typical Slope Failures Due to Wave Action

Florida Greenbook, 2005

Other Bridges

Typical Slope Failures Due to Abutment Scour

Florida Greenbook, 2005

Miscellaneous Structures

Traffic Signals, Signs & Lighting

TAG Dec 6, 2004

Traffic Signals & Supports

Considerable Damage to Traffic Signal Hangers, Disconnect Boxes, Clamps.

Some Damage to Strain Wires (connections).

Florida Greenbook, 2005

Mast Arm & Span Wire Inventory

District No.	No. Signals	No. Masts	Masts Damage	No. Wires	Other Damage
1	1,778	802	2	976	496
2	1,585	537	0	1,048	40
3	987	300	2	687	265
4	3,329	1,180	14	2,149	735
5	2,972	458	2	2,514	1,885
6	2,640	1,848	0	660*	0
7	2,151	518	0	1,633	102
Sum	15,442	5,643	20	9,667	3,523

Florida Greenbook, 2005

Component Failures: Hangers

Florida Greenbook, 2005

Component Failures: Disconnect Boxes

Florida Greenbook, 2005

Mast Arm Failures

14 Failures

- All pre-standard structures.
- 7 pole @ flange failures
- 3 base failures
- 4 anchor bolt failures

Florida Greenbook, 2005

Structural Successes

New Mast Arm - Punta Gorda

Strain Poles – Punta Gorda

Florida Greenbook, 2005

Multi-Post Ground Signs

Florida Greenbook, 2005

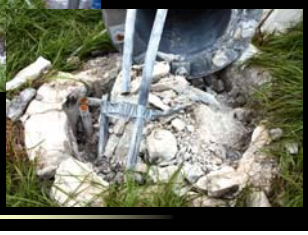
Multi-Post Ground Sign

Florida Greenbook, 2005

I-75 Cantilever Signs Structure

Florida Greenbook, 2005

I-75 Cantilever Sign Structure



Florida Greenbook, 2005

I-4 Cantilever Sign Structure

- Hurricane Jeanne
- Location I-4 near John Young Parkway
- Rush Hour 3:00 pm
- Damage to foundation identified by inspector and structure removed

Florida Greenbook, 2005

I-75 High Mast Lighting

19 High Mast Lights Failed in District 1

2 High Mast Lights Failed in District 4

Following Charley, Policy Issued to Lower Lights when Category 2 or Higher Threaten.

Florida Greenbook, 2005

Lighting Structures

164 of 1,559 (10%) Poles Damaged on 4 District 4 Projects.

Damage: Frangible aluminum bases, support arms, light fixtures (connections).

Florida Greenbook, 2005

Decorative Lighting Structures

PGA – West Palm Beach

55 failures out of 186 lights

Florida Greenbook, 2005

Lessons Learned

- Coastal Engineers for Coastal Bridges
- Traffic Signal Hangers & Connections
- Old vs. New Mast Arm Designs
- Sign Survivability Policy
- Sign Foundation Engineering, Specifications & CEI
- Lighting Structures Connections

Florida Greenbook, 2005


TAG Dec 6, 2004

Current FDOT Issues

Statewide Design Issues

Brian Blanchard, State Roadway Design Engineer

Statewide Design Issues

- Cable Barrier
- Low Profile Barriers/Type K Barriers
- Truncated Domes
- Patterned/Textured Pavement
- Pavement Markings/Nighttime Visibility
- 2006 Design Standards

Cable Barrier

Cable Barrier

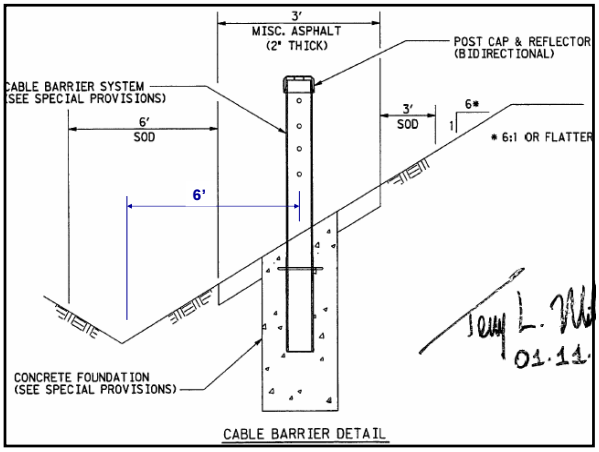
- Conventional Cable Barrier vs Pre-tensioned Cable Barrier
- Pre-tensioned Cable Barrier
  - Low maintenance (generally replace posts)
  - Low Initial Cost
  - Cables maintain height after hit
  - Can withstand multiple hits without replacing the cable
  - Relatively small deflection (less than 8 feet, depends on post spacing)
- Four NCHRP 350 Approved Pre-tensioned Proprietary Systems

Cable Barrier

- Not a One to One Substitution for Standard Guardrail
  - Requires More Deflection Space
  - Not Appropriate For Bridge Approaches or Transitions to Rigid Barrier
  - Not Appropriate for High Crash Locations (Use Concrete Barrier Wall)

Brifen Cable Barrier (4-Wire)

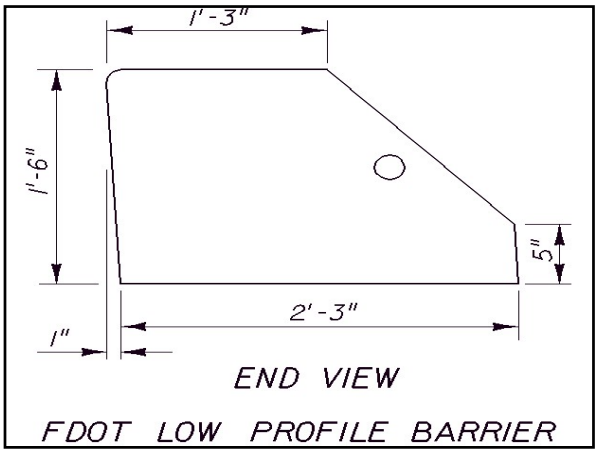

Trinity CASS (3 Wire)


3'
MISC. ASPHALT
(2" THICK)
POST CAP & REFLECTOR
(BIDIRECTIONAL)
CABLE BARRIER SYSTEM
(SEE SPECIAL PROVISIONS)
6'
SOD
3'
SOD
6*
1
* 6:1 OR FLATTER
6'
CONCRETE FOUNDATION
(SEE SPECIAL PROVISIONS)
01.11.
CABLE BARRIER DETAIL


BRIFEN
WIRE ROPE SAFETY FENCE
00:05
VERGE APPLICATION TEST


BRIFEN USA INC.
WIRE ROPE SAFETY FENCE
TL-4 Crash Testing


Low Profile Barrier (Index 412)

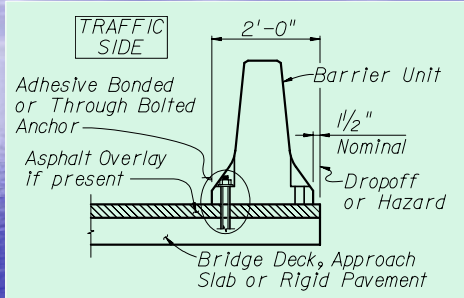


Type K Temporary Barrier

Type K Temporary Barrier

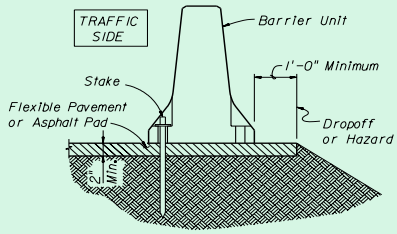
- Structures Standards Index 715
  - Fabrication and installation details and requirements
  - Transitions between freestanding and bolted or staked down Type K's
  - Transitions to rigid barriers to be added
- Index 715 will continue to grow

Type K Barrier – Bolted Down



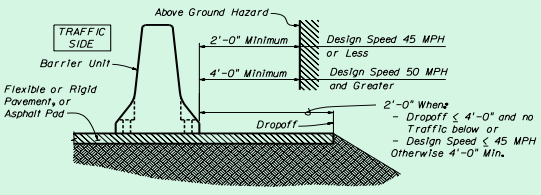
BOLTED DOWN BRIDGE OR ROADWAY INSTALLATION

Type K Barrier – Staked Down



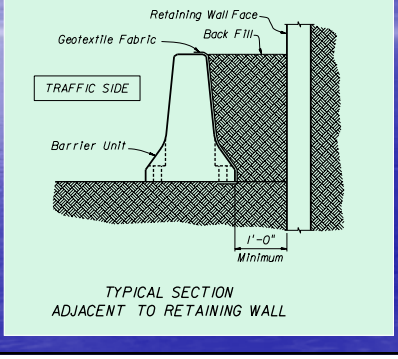
TYPICAL SECTION

Type K Barrier - Freestanding



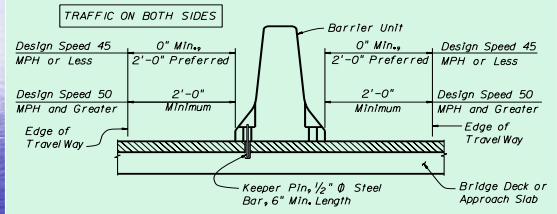
TYPICAL SECTION

Type K Barrier – Backfilled



TYPICAL SECTION
ADJACENT TO RETAINING WALL

Type K Barrier – Median



TYPICAL SECTION

Detectable Warning Surface

- New 527 Specification Effective July 2005
  - Cast In Concrete Method Discontinued
  - Allows for applied surfaces and mats, i.e., concrete, clay, ceramics, thermoplastics

PPM 1.11- Context Sensitive Solutions in Design

- In order to plan, design, construct, maintain and operate the State Transportation System, "Context Sensitive Solutions" should be considered in all projects, not only TDLC projects. This design philosophy seeks transportation solutions that improve mobility and safety while complementing and enhancing community values and objectives. Context sensitive solutions are reached through joint effort involving all stakeholders.
- CSD Training Planned for 2005

Patterned/Textured Pavement

- State Materials Office Test Track

Patterned/Textured Pavement

- Use Development Spec 523
  - Skid Resistance Requirements Included
  - Performance Measures for Wear and Skid
- Look for New 523 Spec January 2006
  - Similar to Current Developmental Spec
  - Will Require 3 Year Performance Measures
  - Expect this to be a QPL Item

2006 Design Standards

- Bridge Details Included In The Design Standards
- New Border and Title Block
- Proprietary Items Removed From The Booklet
  - Guardrail End Anchorages
  - Crash Cushions
  - Temporary Water Filled Barriers
  - Mechanically Stabilized Earth (MSE) Walls
- Proprietary Drawings Posted on the Qualified Products List (QPL)

Any Questions?

Brian Blanchard, State Roadway Design Engineer
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Chapter Subcommittee Assignments

CHAPTER SUBCOMMITTEES

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4.	Roadside Design	James Harrison
5.	Pavement Design and Construction	Dwayne Kile
6.	Roadway Lighting	Bernie Masing
7.	Rail-Highway Grade Crossings	Jimmy Pitman
8.	Pedestrian Facilities	Joy Puerta
9.	Bicycle Facilities	Joy Puerta
10.	Maintenance	James Sloane
11.	Work Zone Safety	Frederick Schneider
12.	Construction	Tanzer Kalayci
13.	Public Transit	Annette Brennan
14.	Design Exceptions	Ramon Gavarrete
15.	Traffic Calming	Henry Cook
16.	Residential Street Design	James Harrison
17.	Bridges and Other Structures	David O'Hagan

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Product Review?

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Tentative Key Dates

Tentative Key Dates for 2007 Florida Greenbook

2006

March 7-8 or 14-15, 2006	Tentative Greenbook Committee Meeting – Workshop on changes (2nd or 3rd week in March)
April 14 2006	Deadline for addressing comments from Committee meeting and submitting corrections for 2007 Greenbook
April 28, 2006	Deadline for compiling 2007 Draft for FDOT Legal office review
May 19, 2006	Deadline for addressing comments made by FDOT Legal office
June 2, 2006	Deadline for compiling the 2007 Draft Greenbook
June 16, 2006	Deadline for publishing a Change Notice/Addendum/Rulemaking for the changes
July 7, 2006	Deadline for submitting comments on the change notice (21 days)
August 29, 2006	Deadline for addressing comments due to original change notice
September 15, 2006	Deadline for publishing new Change Notice in response to comments
October 10, 2006	File rule amendment (Rule 14-15.002) 2007 Greenbook
November 1, 2006	Tentative effective date of the 2007 Florida Greenbook / Post on website
November 3, 2006	**Notification** sent to registered holders that 2007 Greenbook has been posted on FDOT website

All dates subject to change