

# Florida Greenbook

Manual of Uniform Minimum Standards for Design,  
Construction and Maintenance for Streets and Highways

## Sub-committee Meeting

Chapter 4 – Roadside Design

# Agenda

**June 16, 2025**  
2:00 PM – 3:00 PM

**Virtual on Microsoft Teams**  
***MS Teams Link***

2:00 PM	Welcome and Introductions	Chapter 4 Sub-Committee and FDOT Staff
2:10 PM	Chapter 4 Review (17 <sup>th</sup> Edition)	Jacqui Morris, Kittelson Staff
2:30 PM	Sub-Committee Discussion	Chapter 4 Sub-Committee
2:40 PM	Action Items and Next Steps	Jacqui Morris, Kittelson Staff
2:50 PM	Closing remarks <ul style="list-style-type: none"><li>Public Comment</li></ul>	Jacqui Morris

# Florida Greenbook Subcommittee Meeting

## Chapter 4 – Roadside Design

*Virtual – Microsoft Teams*

**June 16, 2025**

*Public Meeting*



*17<sup>th</sup> Edition*

*Welcome*

**Derwood Sheppard, PE**

State Roadway Design Engineer

*Florida Greenbook Chair*

# Agenda

## June 16, 2025

2:00 PM	Welcome and Meeting Overview	Derwood Sheppard
2:05 PM	Introductions	Chapter 4 Subcommittee and FDOT Staff
2:10 PM	Chapter 4 Outline Review – 17th Edition	Morgan Dean, Kittelson
2:30 PM	Committee Discussion & Next Steps	Chapter 4 Subcommittee
2:45 PM	Closing remarks <ul style="list-style-type: none"><li>• Public Comment</li></ul>	Derwood Sheppard

## Online Attendees *Meeting Logistics*

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The chat feature can be used to ask questions to the presenters or share resources.



Be sure to mute your microphone unless you are asking a question.



You may turn on or off your video camera accordingly.



Raise your virtual hand to ask a live question.

# Introductions

- ✓ Name
- ✓ Role
- ✓ Company

## Online Attendees:



### Chapter Subcommittee Members & Technical Advisors

Please turn on your camera and unmute your microphone to introduce yourself.



### Guests and Members of the Public

Type your name and e-mail address in the chat.

# Chapter 4 Outline Review – 17<sup>th</sup> Edition



This is a working document  
that has not been adopted.

## Chapter 4

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# Committee Discussion & Next Steps



*Open for public comment*



## Online Attendees

*Microsoft Teams Meeting Logistics*



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You may turn on or off your video camera accordingly.



Raise your virtual hand to ask a live question.

Thank you for attending!

## Contact

If you have any questions, comments or suggestions regarding the **Florida Greenbook**, please contact:

**Derwood Sheppard, P.E.**

State Roadway Design Engineer

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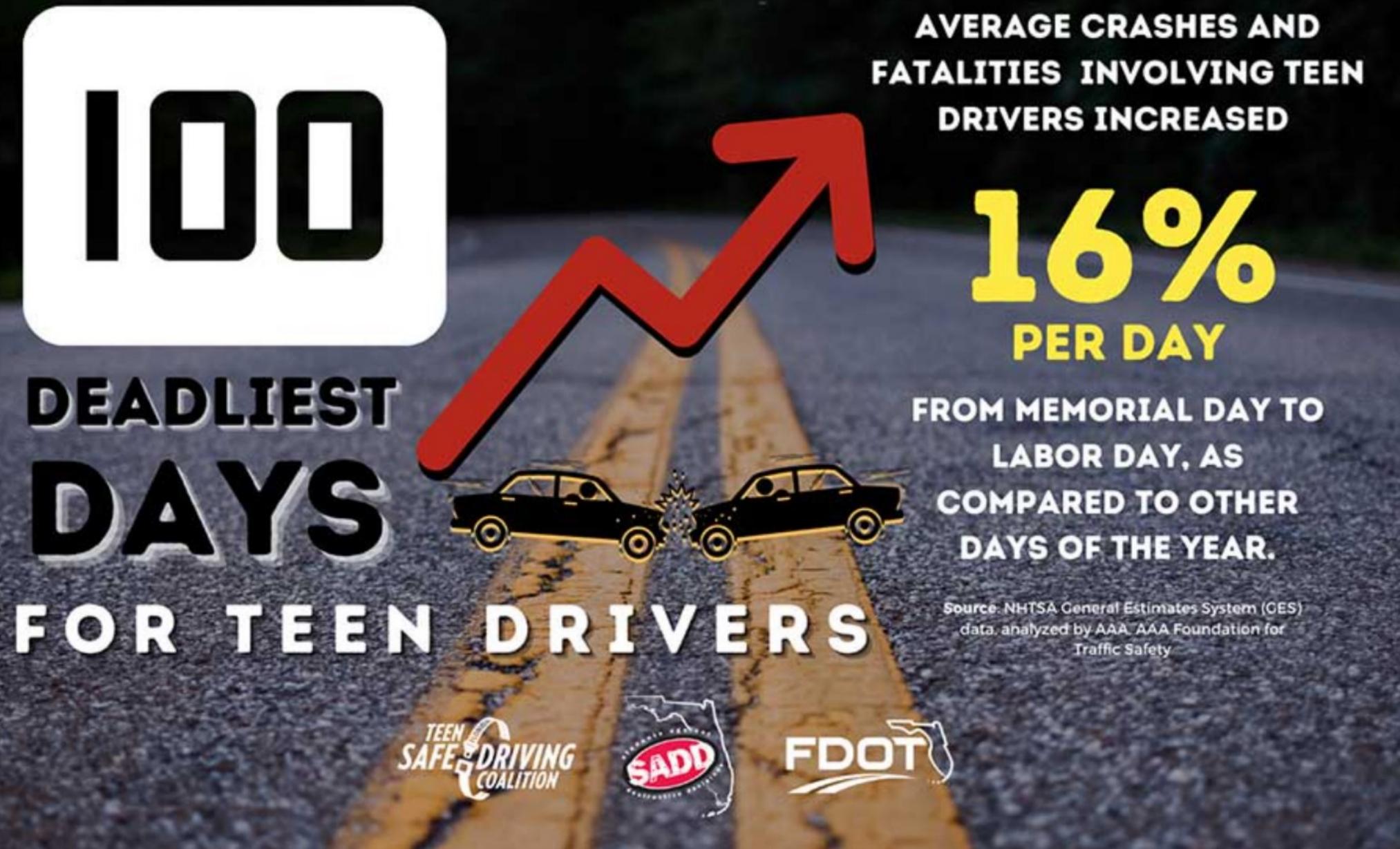
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# Florida Greenbook

Manual of Uniform Minimum Standards for Design,  
Construction and Maintenance for Streets and Highways

## *Subcommittee Meeting*

### Chapter 4 – Roadside Design

**Monday, June 16, 2025**  
2:00 PM – 3:00 PM

**Virtual Meeting** via *Microsoft Teams*

#### Attendees

Raul Alessandri  
Mo Ansari  
Nick Benedico  
DeWayne Carver  
Morgan Dean  
Martha Edenfield  
Karina Fuentes  
Andy Garganta  
Benjamin Gerrell  
Bharathi Gundurao  
Gene Howerton  
Kevin Ingle  
John MacDonald  
James McGinnis  
Jacqueline Morris  
Jennifer Musselman  
Mark Musselman  
John Olson  
Gail Woods

# Florida Greenbook

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Topic		
1	Welcome and Meeting Overview [Slide #1 – 3]	Jacqui Morris
	<p>Jacqui Morris shared instructions for participating in the meeting through Microsoft Teams.</p> <p>Jacqui shared an overview of the meeting agenda.</p>	
2	Introductions [Slide #4]	Chapter 4 Subcommittee and FDOT Staff
	<p>Jacqui asked meeting attendees to introduce themselves. Each of the committee members and FDOT staff introduced themselves. Guests included their contact information in the chat.</p>	
3	Chapter 4 Outline Review – 17 <sup>th</sup> Edition [Slide #6]	Morgan Dean, Kittelson
	<p>Morgan walked through the draft outline, covering the following sections:</p> <ul style="list-style-type: none"><li>• Introduction</li><li>• Keeping Vehicles on the Roadway (this section is new)</li><li>• Designing for a Forgiving Roadway</li><li>• Design Requirements for Appurtenances and Other Roadside Features</li><li>• Longitudinal Barrier Evaluation, Selection, and Design</li><li>• Semi-Rigid (Metal Guardrail) Barriers</li><li>• Rigid (Concrete) Barriers</li><li>• Flexible (High Tension Cable) Barriers</li><li>• End Treatments and Crash Cushions</li><li>• Bridge Barriers (Rails)</li><li>• Roadside Safety in Work Zones (Portable Barriers)</li><li>• References for Information Purposes</li></ul> <p>Morgan asked if there were any appurtenances not currently covered in the outline that committee members would like to see included. Bob Behar requested that retaining walls and noise walls be included. Andy Garganta requested including intelligent transportation systems (ITS) poles (especially those for dynamic message signs).</p>	

# Florida Greenbook

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Bob Behar requested to consider bridge piers and abutments in lateral offset criteria.

Bob Behar asked if there would be a table similar to the FDM table on guardrail deflection at different impact speeds. Morgan said the team would consider the FDM criteria and national research.

Andy Garganta asked where context would be addressed. Morgan mentioned that it will be integrated throughout the chapter.

Bob Behar asked if the chapter would include or refer to the clear zone and lateral offset tables in FDM. Morgan said versions of the tables would be directly included and will differ slightly from the FDM tables due to a difference in context.

Morgan stated that the next step will be developing an annotated outline for the chapter, which will include the information covered today.

4	Committee Discussion & Next Steps [Slide #5]	Chapter 4 Subcommittee
	Jacqui mentioned that we would regroup with the committee when the team has a more detailed, annotated outline to share.	
4	Closing remarks [Slide #7-8] <ul style="list-style-type: none"><li>Public Comment</li></ul>	Jacqui Morris
	There was no public comment. Jacqui adjourned the meeting.	

# Chapter 4

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## 4 Roadside Design

### 4.1 Introduction

- Description of roadside safety
- Road departure crash statistics (US, Florida)
- Relation to FDOT Target Zero and NRSS
- State of Florida roadside safety principles (to supplement discussion of USDOT approach).
- Hierarchy for addressing hazards
- A statement on context
- A statement on how this document fits in with the AASHTO RDG, FDOT FDM, and other key documentation.
- Organization and navigating Ch. 4

### 4.2 Keeping Vehicles on the Roadway

- Introduction on keeping vehicles on the roadway.
- Countermeasures to reduce the likelihood of roadway departures.
  - Rumble strips/stripes
  - Wider edge lines
  - Pavement friction
  - Horizontal curve safety
  - Nighttime visibility
  - Infrastructure to support in-vehicle lane support systems
- State policies and standards related to rumble strips, edge lines, etc.
  - Standard Plan 546-001: Raised rumble strips
  - Standard Plan 546-010: Ground-in rumble strips – limited access
  - Standard Plan 546-020: Ground-in rumble strips – arterials and collectors
  - Standard Plan 706-001: Typical placement of raised pavement markers
  - Standard Plan 711-001: Pavement markings

## 4.3 Designing for a Forgiving Roadside

- Introduction on designing a forgiving roadside.

### 4.3.1 Design Option Hierarchy and Preferred Treatments for Hazards

- Provide the design hierarchy (removal, redesign, relocate, reduce impact severity, redirect by shielding, and delineate) [reference to RDG].
- Provide guidance on preferred treatments for different hazards [reference to RDG].
- Introduction to trees and the trade-offs of placing them on the roadside (will reference to 4.4.2 for further information).

### 4.3.2 Roadside Slopes

- Define foreslopes (fill slopes) and backslopes (cut slopes).
- Define the slope categories: recoverable, non-recoverable, and critical.

### 4.3.3 Clear Zone

- Definition, description, and significance of clear zone.
- A description of how clear zones relate to roadside slopes.
- Minimum clear zone tables [updated to reflect conversations with Derwood and committee].

### 4.3.4 Lateral Offset

- Definition of lateral offset and a description of how it relates to clear zone.
- Description of when it is appropriate to use the minimum lateral offset table.
- Minimum lateral offset tables [updated to reflect conversations with Derwood and committee].
- Include a clear description of what “above ground hazards” are (this is a hazard type listed in the lateral offset table). This description will be informed by the RDG definition.

### 4.3.5 Border Width (Area)

- Definition of border width.
- A description of how it relates to clear zone and lateral offset.
- Reference to Chapter 3 to see more details on border width.

## **4.4 Design Requirements for Appurtenances and Other Roadside Features**

- Introduction to design requirements for appurtenances.
- Define appurtenances (sign, signal, and lighting supports; utility poles; trees; etc.) and describe why specific design guidance is needed (these features often must be located within the clear zone).
- This chapter will reference standard plans for the specific devices discussed as relevant.
- This chapter will reference other Greenbook chapters as relevant (e.g., the lighting supports section will reference the Lighting chapter).

### **4.4.1 Performance Requirements for Breakaway Devices**

- Definition and description of breakaway devices. This will include dialogue clarifying the difference between a device that breaks away and a crashworthy breakaway device.
- Summary of performance requirements.

### **4.4.2 Trees**

- Statistics on road departure crashes with trees.
- Significance of tree diameter on safety.
- Guidance on existing guidance related to roadside trees (see RDG) including general guidance on where (generally speaking) it is appropriate to place trees and what the trade-offs are.
- Discuss relationship among safety related to tree presence, design speed, and context.

### **4.4.3 Sign Supports**

- Reference the MUTCD, Chapter 18 (Signing and Marking), and Standard Plans.

### **4.4.4 Traffic Signal Supports**

- Provide the guidance currently provided in the Greenbook (fixed base, shall meet lateral offset and clear zone criteria, and should not be located within medians).
- Reference Standard Plans.

### **4.4.5 Lighting Supports**

- Define conventional lighting and high mast lighting.
- Reference Chapter 6 (Lighting).

#### **4.4.5.1 Conventional Lighting**

- Provide the guidance currently provided in the Greenbook (supports shall be breakaway).
- Reference Standard Plans and RDG.

#### **4.4.5.2 High Mast Lighting**

- Provide the guidance currently provided in the Greenbook (should be located outside clear zone and, in most cases, not in medians).
- Reference Standard Plans.

#### **4.4.6 Utility Poles**

- Provide the guidance currently provided in the Greenbook (meet lateral offset and clear zone requirements and be relocated in accordance with Section 337.403, F.S.).
- Reference RDG and Chapter 14 (Design Exceptions and Variations).
- Reference Utility Accommodation Manual.

#### **4.4.7 Fire Hydrants**

- Provide the guidance currently provided in the Greenbook (fire hydrants should preferably meet the lateral offset and clear zone minimums previously provided).

#### **4.4.8 Railroad Crossing Warning Devices**

- Refer Greenbook users to Chapter 7 (Rail-Highway Crossings).

#### **4.4.9 Mailbox Supports**

- Provide the guidance currently provided in the Greenbook (specific guidance for curbed roadways and flushed shoulders).
- Reference the RDG.

#### **4.4.10 Bus Benches and Shelters**

- Refer Greenbook users to Chapter 3 (Geometric Design) and Chapter 13 (Public Transit).

#### **4.4.11 Curb**

- This section will include a statement on not using curb for redirection capabilities or to achieve minimum lateral offset criteria (this language can mimic the language Derwood used to address this in the Florida Design Manual).

#### **4.4.12 Drainage Structures**

- Provide the guidance currently provided in the Greenbook (designs should be traversable or outside the clear zone).
- Reference RDG, Standard Plans, and Drainage Manual.

#### **4.4.13 Canals and Water Bodies**

- Provide the guidance currently provided in the Greenbook (they should be eliminated or located outside the clear zone).
- Currently, the lateral offset table refers to this section in the “Canal Hazards” row. The quantitative guidance related to offset provided in this section will be brought into the lateral offset table so users do not have to be redirected to obtain the proper guidance.

### **4.5 Longitudinal Barrier Evaluation, Selection, and Design**

#### **4.5.1 Overview of Roadside Barriers**

- Purpose of roadside (longitudinal) barriers.
- Barrier performance assessments.
- Types of barriers (rigid, semi-rigid, flexible); median barriers; temporary barriers.
- Factors influencing barrier type selection.
- Components of roadside barriers – end treatments, crash cushions, attachments.
- FDOT QPL.
- Organization of following chapters, including a statement on all work zone information being provided in the Roadside Safety in Work Zones (Portable Barriers) section, rather than being worked into the other chapters.

#### **4.5.2 Crash Test Criteria and Performance Requirements**

- Brief overview of NCHRP 230 and NCHRP 350.
- AASHTO Manual for Assessing Safety Hardware (MASH) test matrix summary.
- Vehicle trajectory and occupant risk performance requirements.

#### **4.5.3 Safety Hardware Upgrades**

- FDOT practice for barrier repair and installation (MASH versus NCHRP 350 approved devices).

#### **4.5.4 Warrants**

- Tie in warrants with design option hierarchy and preferred treatment of hazards guidance.
- The sub-sections in this section will align with the types of features presented in the clear zone and lateral offset tables. As those tables emerge, so may these sub-sections.

##### **4.5.4.1 Median Barriers**

- Discuss the role of and appropriate use cases for barriers placed in the median.
- This section will reference the minimum median width topic covered in Chapter 3.

#### **4.5.5 Barrier Selection Guidelines**

- A list of the factors and characteristics that should be considered to select the most appropriate barrier.

#### **4.5.6 Barrier Placement Considerations and Guidelines**

- A brief description of the combination of barrier characteristics and roadway/roadside characteristics that drive the placement of barriers.

##### **4.5.6.1 Length of Need**

- Define length of need.
- Discuss the importance of implementing an appropriate length of need and guidance for determining what the appropriate length of need is.

##### **4.5.6.2 Barrier Offsets**

- Provide guidance on placing barriers with respect to the traveled way.
- Refer to Standard Plans and FDOT Design Manual.

##### **4.5.6.3 Flare Rate**

- Define flare rate.
- Discuss the role and appropriate use case(s) of a flared barrier.

##### **4.5.6.4 Deflection Space and Zone of Intrusion**

- Define and describe the zone of intrusion and how it affects placement of flexible and semi-rigid barriers.

- Refer to RDG and Standard Plans.

#### **4.5.6.5 Barriers on Slopes**

- Describe the effect of sloped terrain on barrier performance.

#### **4.5.6.6 Barriers Near and on Curbs**

- If desired, this section can reference NCHRP Research Report 1089: Development of Installation Guidelines for Midwest Guardrail System in Combination with Roadside Curbs for MASH TL-3 Applications. This report, published in 2024, provides guidance for lateral offset of the 31" tall Midwest Guardrail System (MGS) behind curbs. This guidance is  $\leq 0.5$  feet when the MGS installation height is 31" tall relative to the roadway surface and 1 to 6 feet when the MGS installation height is 31" tall relative to the top of curb/soil backfill.

#### **4.5.7 Attachments to Barriers**

- List examples of barrier attachments (signs, light poles, etc.).
- Describe the requirements attachments must meet and refer to MASH crash test criteria.
- Refer to FDOT Design Manual.

#### **4.5.8 Barriers at Intersections and in Low-Speed Environments**

- Description of TL-1 and TL-2 barriers that are more cost-effective and appropriate at lower speeds than TL-3 barriers.

### **4.6 Semi-Rigid (Metal Guardrail) Barriers**

- Description of metal guardrails and their mechanism(s) for reducing crash severity (energy absorption).
- Types of metal guardrails (strong post and weak post; w-beam and thrie-beam).
- Guidance on site conditions and placement to promote effective performance.
- Guidance on system durability, cost, and maintenance.
- Statement on end treatments for metal guardrails and reference to end treatments section.

### **4.7 Rigid (Concrete) Barriers**

- Description of concrete barriers and their mechanism(s) for reducing crash severity (redirection).
- Types of concrete barriers (Jersey, F-shape, and single slope).

- Guidance on site conditions and placement to promote effective performance.
- Guidance on system durability, cost, and maintenance.
- Statement on end treatments for concrete barriers (crash cushion or transition) and reference to crash cushion and transition sections.

## **4.8 Flexible (High Tension Cable) Barriers**

- Description of high-tension cable barrier (HTCB) systems and their mechanism(s) for reducing crash severity (energy absorption and redirection).
- Types of HTCB systems (three-strand and four-strand).
- Guidance on site conditions and placement to promote effective performance.
- Guidance on system durability, cost, and maintenance.
- Statement on end treatments and reference to end treatments section.

## **4.9 End Treatments and Crash Cushions**

- This section will describe the different types of end treatments (e.g., buried in back slope and end terminals), including crash cushions. This will also include barrier transition guidance, as transitioning between barriers of different heights and different stiffnesses requires specific care.

### **4.9.1 End Treatments for Guardrail**

- Approach terminals.
- Trailing anchorages.

### **4.9.2 End Treatments for Rigid Barrier (Crash Cushions)**

- Crash cushions.
- Reference Barrier Transitions.

### **4.9.3 End Treatments for High Tension Cable Barrier (HTCB)**

- Refer to FDOT developmental design standards.

### **4.9.4 Barrier Transitions**

- Description of what a barrier transition is and when it is necessary.
- Describe the design considerations for implementing an effective transition.

#### **4.9.4.1 Height Transitions**

#### **4.9.4.2 Stiffness Transitions**

### **4.10 Bridge Barriers (Rails)**

- Reference to Chapter 17 and FDOT Design Manual Chapter 215.

### **4.11 Roadside Safety in Work Zones (Portable Barriers)**

- Introduction to work zone safety and positive protection.

#### **4.11.1 Clear Zone Width in Work Zones**

- A table for minimum clear zone width will be provided (this guidance is separate from the previously presented clear zone guidance for outside of work zones).

#### **4.11.2 Above Ground Hazards in Work Zones**

- Define above ground hazards for the work zone context.
- Provide guidance on treating above ground hazards in work zones.

#### **4.11.3 Non-Traversable Edge Drop-Offs, Critical Slopes, and Roadside Excavations**

- Reference Drop-Off Condition Detail.
- Reference Standard Plans and Standard Specifications.

#### **4.11.4 Temporary Barriers in Work Zones**

- Description of temporary barriers and their mechanism(s) for reducing crash severity.
- Types of temporary barriers (concrete barriers, crash cushions, Type I, II, and III barricades, plastic and water-filled barriers).
- Guidance on selecting the right type of temporary barrier.
- Guidance on site conditions and placement to promote effective performance.
- Guidance on system durability, cost, and maintenance.

#### **4.11.5 End Treatments for Temporary Barriers**

- Statement on end treatments (and crash cushions) and reference to previous end treatments (and crash cushions) section(s).
- Attachments
- Transitions

## 4.12 References for Informational Purposes

- Reference to roadside safety related organizations, programs, and research (e.g., AASHTO, FHWA, Task Force 13, NCHRP, etc.).