

TURNPIKE DESIGN HANDBOOK (TDH)

DESIGN CRITERIA – PART 2



FLORIDA'S TURNPIKE ENTERPRISE PRODUCTION DESIGN DEPARTMENT

OCOE, FL

January 2022

Introduction

As part of the Florida's Turnpike Enterprise (Turnpike) continuing quality enhancement efforts, the ***Turnpike Design Handbook (TDH)*** has been developed to provide consultants, reviewers and management with a single source of additional Turnpike-specific requirements that modify or add to the requirements included in the ***Florida Department of Transportation (FDOT) Design Manual (FDM)***.

The ***FDM*** and the ***TDH*** are both four-part documents:

- Development and Processes – Part 1
- Design Criteria – Part 2
- Plans Production – Part 3
- NexGen Plans Production – Part 9

The ***TDH*** also includes the [Turnpike Guide Drawings](#), which are available electronically on the Turnpike Design website. Review and become familiar with the [Turnpike Guide Drawings](#), including the Guide Drawings Introduction document which provides a general description and overview of the Guide Drawings development and their use.

For Turnpike requirements related to tolling, please see the [General Tolling Requirements \(GTR\)](#) which is a separate document.

The ***TDH*** is updated on an annual basis, following the official revision of the ***FDM***. Interim updates to the ***TDH*** will be issued as Addenda to the annual revision.

Should you have any comments or suggestions for this ***TDH*** document, please contact the Turnpike Design Engineer.

200 Context Based Design

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

201 Design Controls

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

201.5 Design Speed

201.5.1 Design Speed Selection

Add the following paragraph

All Turnpike facilities must have a design speed of 70 mph, with the following exceptions.

- (1) Turnpike (SR 821) from Milepost 0 to Milepost 27.5 has a design speed of 65 mph in accordance to **AASHTO** design criteria, for horizontal and vertical curve length and stopping sight distance, with the exception of K-Values for crest vertical curves that must meet or exceed the more stringent Department 60 mph design speed criteria. All other design elements must conform to Department criteria.
- (2) Veteran's Expressway (SR 589) from Milepost 1.54 to Milepost 13.57 must have a design speed of 60 mph.
- (3) Polk Parkway (SR 570) from Milepost 0 to Milepost 12.7 must have a design speed of 65 mph.

201.5.3 RRR Projects

Add the following subsection

201.5.3.1 Turnpike RRR Design

Resurfacing design criteria must follow the modifications shown in **TDH 114**.

Add the following section

201.7 Turnpike Design Controls

The Turnpike system must be designed to "Interstate" standards, except for the Veteran's Expressway from Milepost 1.54 to Milepost 13.57 which is classified as an Urbanized Freeway.

202 Speed Management

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

210 Arterials and Collectors

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

211 Limited Access Facilities

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

211.1 General

211.1.1 Interstate Resurfacing Projects

Add the following paragraph

A Design Memorandum must be included within the Design Documentation for utilizing the AASHTO interstate standards that were in effect at the time of original construction.

211.2 Travel Lanes and Auxiliary Lanes

211.2.2 Pavement Cross Slopes

Add the following sentence to the end of the fourth paragraph

Both shoulder and travel lane transition(s) must be detailed in the roadway plans and all calculations documented in the roadway design documentation.

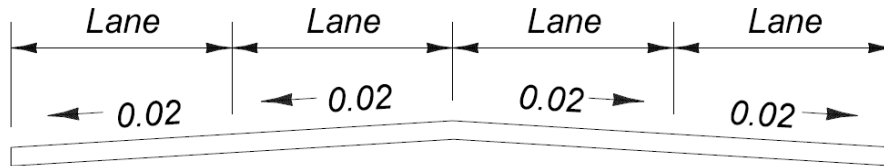
Add the following paragraphs

New two-lane ramps must be designed with 0.03 cross slope for both lanes through the gore area. It is understood that **FDM Figure 211.2.1** depicts through lanes, and that auxiliary lanes can be applied with a cross slope in the same direction as the adjacent through lane even if this causes more than three lanes to be sloped in the same direction. This approach does not require a new construction and widening projects Design Variation.

For the Turnpike's typical section with a 70 MPH design speed and eight (8) or more lanes is to have the two inside travel lanes sloped towards the median as shown in **Figure 211.2.1** below.

Figure 211.2.1 Standard Pavement Cross Slopes

Replace the fourth typical section with the following section



211.2.2.1 Existing Pavement Cross Slopes

Add the following paragraph

Median through lane widening, turn lanes, tapered or parallel single lane ramps adjacent to two through lanes do not automatically warrant a 0.03 cross slope. Surface drainage will be reviewed and used as the deciding factor.

211.2.3 Hydroplaning Risk Analysis

Add the following paragraph

A hydroplaning analysis is required whenever any additional contributing pavement (ex: managed lane buffer, paved shoulder, paved gore, auxiliary lane, etc.) is added to the standard pavement cross slope sections shown in **FDM Figure 211.2.1**. Superelevated sections must be analyzed for hydroplaning as outlined in **Table 211.2.4** below. For bridges with ungrooved decks that exceed the requirements outlined above, a hydroplaning analysis is required. A grooved bridge deck does not require an analysis. Hydroplaning analyses will apply to all conventional and non-conventional projects; (widening, reconstruction, and new construction projects). The hydroplaning analysis will include hydroplaning calculations and where a risk is identified, a risk evaluation will be provided in report format to include identifying mitigating strategies to reduce or eliminate the risk. The report will also include a benefit-cost analysis for the mitigating strategies. The preliminary analysis is required to be submitted with the 15% line and grade or Draft Typical Section Package (whichever one is submitted first). A final recommendation will be prepared and provided to the Turnpike Project Manager in conjunction with the Final Typical Section Package.

*Add the following table***Table 211.2.4 Hydroplaning Analysis Requirements in Superelevated Sections**

Project Type	Number of Lanes Draining in One Direction		
	Less Than 3 Lanes	3 Lanes	More Than 3 Lanes
Capacity Improvements & New Alignments	Not required	Only when superelevation of lowest lane is less than 3% or when there have been 2 or more wet weather crashes ⁽¹⁾ within the available 5-year crash data	Always required
RRR	Not required	Only required when there have been 2 or more wet weather crashes ⁽¹⁾ within the available 5-year crash data	

Notes: (1) Wet weather crashes attributable to hydroplaning conditions.

For bridge transitions, evaluate mitigating strategies such as shortening transitions and staggering the cross slope transitions prior to evaluating more costly solutions (i.e. bridge replacement and pavement type changes). More costly solutions require additional design details and a benefit-cost analysis.

211.2.4 Roadway Transitions

Add the following paragraph

At bridge approach slabs, for a 150-foot length before or after the concrete approach slab, the ultimate pavement design asphalt thickness must be placed flush with the concrete at the ultimate profile grade. The initial pavement section must transition to the ultimate thickness at a maximum rate of 0.08 percent (1 inch/100 feet).

211.3 Medians

211.3.2 Median Crossovers

Add the following subsection

211.3.2.2 Crossovers on Turnpike Facilities

Median u-turns are used to accommodate turnarounds between interchanges for maintenance, service, and law enforcement personnel. The primary purpose of the u-turns is to alleviate adverse travel time for emergency vehicles by providing strategic u-turn locations.

Coordination efforts between the Turnpike Roadway Design Engineer, Turnpike Traffic Operations Engineer, FHP Troop Commander, and Turnpike Maintenance Engineer helped provide the direction needed to identify and develop Turnpike specific criteria for the design and locations (sometimes relocation) of the official use u-turns on the system. Design guidelines from **AASHTO's A Policy of Highway and Streets**, along with outcome of the internal coordination efforts, were used to develop Turnpike specific criteria during the time when the state was developing standards for crossovers on Limited Access Facilities.

The following is a summary of crossover spacing criteria:

Criteria	Turnpike Requirement
Median width opening	≥ 20 feet (concrete barrier wall separated)

All crossovers within a project's limit must be evaluated for the spacing criteria and for sight distance deficiency. Findings and recommendations for crossovers to remain or be relocated must be documented and submitted in a Project Design Variation Memorandum. In the special case of managed lanes with buffers separating the managed lanes from general use lanes, crossovers will be prohibited. Evaluate alternative crossing locations.

Median openings on Turnpike Facilities must follow **FDM Exhibit 211-1** and **Exhibit 211-2**; however, the opening between both attenuators must be a maximum of 40 feet.

211.4 Shoulders

Add the following paragraphs

On ramps, the left and right shoulder widths may be reversed or adjusted if needed to provide additional sight distance on the inside of a curve. However, the sum of the right and left shoulder widths must be greater than or equal to the sum of the standard shoulder widths and in no instance will the shoulder width on the outside of the curve be less than 4 feet. Even though this is an acceptable practice for mitigating sight distance per **AASHTO Chapter 10.9.6**, a Formal Design Variation for shoulder width will be required.

Where single lane ramps meet cross roads, additional ramp lanes are usually added for acceleration/deceleration of right or left turns. Unless these additional lanes are more than 500 feet long measured along the ramp baseline, single lane six-foot wide ramp shoulders must be used throughout. A similar 500 feet length would apply to ramp toll facility approaches and departures. Frequent, short changes in ramp width do not warrant corresponding short changes in ramp shoulder width. The shoulder transitions may be longer than the multi-lane ramp segment.

Other shoulder requirements:

- (1) Four-foot paved inside shoulders on one-lane ramps and profiled edge lines on both sides of the travel way for all ramps must be evaluated at each ramp location within a project before implementation. The evaluation must consider horizontal and vertical geometry, sight distance, crash data, and other site-specific factors to compare safety benefits to constructability and cost considerations.
- (2) “Two Lane Ramp Interstate” within **FDM Table 211.4.1** must also be applied to ramps with more than two lanes, and thus have a four-foot paved inside shoulder and a ten-foot paved outside shoulder.
- (3) Though **FDM 260.1.1** only shows “two lanes” for multi-lane ramps, the shoulder configuration (six-foot inside shoulder and ten-foot outside shoulder) must also be applied when more than two ramp lanes occur.
- (4) Twelve-foot inside and outside paved shoulders must be provided for mainline sections that are three lanes or more in one direction, and that have greater than 250 DDHV trucks. Additional stabilization and continuation of the shoulder cross slope beyond the twelve feet of paved width are not required. This shoulder width requirement must be applied to roadway on retaining wall and bridge when the above conditions occur. When twelve-foot shoulder is required for sections with shoulder gutter use ten-foot paved shoulder with shoulder gutter and follow the Managed Lanes shoulder criteria outlined in **FDM Table 211.4.1**.
- (5) Shoulder requirements for 100 feet of pavement centered on the toll gantry, are listed in the [GTR](#).

211.4.2 Shoulder Cross Slopes

Add the following subsections

211.4.2.1 Shoulder Rocking

When a minimum 0.3% longitudinal gutter grade cannot be maintained using uniform shoulder cross slopes then shoulder rocking may be used to achieve positive drainage.

The cross slope for shoulders may be varied from minimum 0.03 to a maximum 0.06 in tangent sections. The design must maintain balance between inlet spacing and flat shoulder cross slopes. A 0.24% minimum longitudinal gutter grade may be used to achieve a minimum distance of 100 feet between the low point and the high point of the shoulder rocking should be maintained to the greatest extent practical.

Designs adjacent to a single slope barrier wall must include provisions to maintain the minimum height required by the [*FDOT Standard Plans*](#). Designs adjacent to an F-Shape concrete barrier wall must include provisions to maintain the gutter profile within the 3-inch vertical face of the wall and maintain a minimum height required by the [*FDOT Standard Plans*](#).

For outside shoulder rocking, use one of the three options below to meet minimum spread criteria. Options 1 and 2 are preferred and must be shown as not feasible, as determined by the Turnpike Roadway and Drainage Engineers, before Option 3 can be considered.

- (1) Use concrete barrier wall with inlets to collect storm water. The varying shoulder cross slope must be designed to meet then the above criteria for shoulder cross slope and longitudinal gutter grade.
- (2) Use guardrail with shoulder gutter and inlets to collect storm water. The varying shoulder cross slope must be designed to meet the above criteria for shoulder cross slope and longitudinal gutter grade.
- (3) Use guardrail in conjunction with a permanent turf reinforcement mat in fill sections with a front slope steeper than 1:4 (maximum slope of 1:2) and maximum height of 10 feet. Shear stress calculations are required to be submitted for the design/selection of the permanent turf reinforcement mat.

211.4.2.2 Shoulder Rocking Gutter Line Profiles

A gutter profile must be provided within the roadway plan set for all areas with shoulder rocking. Provide the profile in either table format or in graphical profile format. The profiles can be depicted on the roadway profile sheet or on a separate sheet at the EOR's discretion. A special detail must be provided that details the barrier wall reveal in all areas of shoulder rocking.

Provide a profile of both gutter lines (each side of the barrier wall) and a top of the wall profile. The top of concrete barrier wall profile must be designed to follow the roadway profile grade; not the 'sawtooth' shoulder profile grade. The height of the proposed concrete barrier wall will vary (minimum height per [*FDOT Standard Plans*](#)) between the high and low points of the shoulder rocking profile to allow the top of the barrier wall profile to follow the grade of the roadway profile grade. The intent is to avoid an undulating top of barrier wall profile.

211.4.3 Limits of Friction Course on Paved Shoulders

Replace the second paragraph with the following paragraph

For locations where median barrier wall is continuous and shoulder slopes toward the travel lane, the inside shoulder pavement must be flush with the friction course placed on the adjacent travel lane. This will address any concerns for trapping water on the shoulder as demonstrated in **FDM Figure 211.4.3**. For locations such as at toll sites detail the FC-5 to FC-12.5 transition such that trapping water in the transition areas are avoided.

211.4.4 Audible and Vibratory Treatment

211.4.4.1 Ground-in Rumble Strips

Add the following paragraph

The minimum thickness of structural asphalt on shoulders where ground-in rumble strips must be used is 1.5 inches. On existing shoulders without rumble strips that call for new rumble strips to be placed, the minimum thickness of existing structural asphalt and proposed asphalt must be no less than 1.5 inches.

211.8 Superelevation

Add the following paragraph

For ramp design speeds less than 35 mph see **AASHTO Exhibit 3-30 Maximum Relative Gradient** for superelevation transition rates.

211.9 Vertical Alignment

211.9.1 Grades

Add the following paragraph

The desired minimum profile grade is 0.5%; 0.3% is the minimum to the greatest extent practical. Roadway profiles will be designed to avoid the need for shoulder rocking to the greatest extent practical. Use of flatter grades can be justified in special cases but consideration to future widening and resurfacing must be given.

211.9.2 Vertical Curves

Add the following paragraph

The minimum K values and minimum vertical curve lengths found in **FDM Tables 211.9.2** and **211.9.3** require some clarifications and restrictions:

Service Interchanges: Per **AASHTO**, it is intended that a "platform" about 200 feet in length be provided on the ramp in advance of the gore using the K values provided in **FDM Table 211.9.2**.

System Interchanges: K values for the higher system ramp design speeds must be used except for the "platform" area.

211.11 Structures

Add the following paragraph

The width of all Turnpike-owned roadways on retaining wall and bridge must equal the paved width of the approach roadway and shoulder. The unpaved width of shoulder is not included in the width. **TDH 211.4** provides criteria for design of shoulders.

211.13 Ramp Terminals

Add the following paragraph

According to **AASHTO**, parallel designs are preferred over tapered design. To optimize safety and operations within interchanges on Turnpike facilities, all new construction, widening, and capacity improvement projects must provide parallel entrance and exits unless project specific circumstances warrant the need for tapered designs. The project specific circumstances must be coordinated with the Turnpike Roadway Design Engineer and the justification documented in the Design Decisions Journal.

211.16 Maintenance Access

Add the following paragraphs

On projects that add roadside barrier to existing facilities (e.g. canal protection, spot/systemwide safety improvement projects), locate maintenance and operations access points to existing facilities that are outside the clear zone and would not be accessible from the shoulder.

The maximum continuous length of a guardrail run along the outside of the roadway is 2,500 feet between end terminals. An access opening must be provided when long guardrail runs are broken up. Coordinate with the Turnpike Maintenance Engineer and Turnpike ITS Design Engineer on the final access location points to meet the needs of maintenance and operations.

The preferred typical detail for roadside guardrail access openings is depicted in the [Maintenance Access Detail Guide Drawings](#), found on the Turnpike Design website.

Add the following sections

211.17 Sodding

On resurfacing projects where there is more than 12 feet of travel lane pavement draining to the edge, the minimum sod dimension is 2 feet 8 inches. Where there is less than 12 feet of travel lane pavement draining to the edge, the minimum sod dimension is 1 foot 4 inches. Typically, the 2 feet 8 inches occurs on the outside shoulder and the 1 foot 4 inches on the inside shoulder.

For all slopes adjacent to new construction or widening, sodding must be used throughout the entire limits of the project.

211.18 Interchange Fence

On all projects involving interchanges between a Turnpike system facility and any roadway classified as “Urban”, use Type B fence along the limited access right of way within the limits of the interchange.

Limits of Type B fence within the interchange begin at the theoretical gore point of each ramp and terminate at the end of the limited access right of way adjoining the urban roadway being crossed. Quadrants that do not contain a theoretical gore point will extend Type B fence to the point where the typical mainline right of way is resumed.

211.19 Roadway and Bridge Approach Slab Evaluation

RRR Projects – The ERCAR must evaluate the profile, cross slope, and rideability of all roadway and bridge approach slab locations throughout the limits of the project. When deficiencies are identified, summarize the potential underlying causes and provide a recommendation for correcting the deficiencies along with an estimated cost of construction.

Capacity Improvement Projects – Perform the same evaluation as required for the RRR Projects and provide evaluation in the design documentation submitted with the 15% line and grade submittal. Existing bridges and approach slabs that are scheduled for complete reconstruction do not need to be evaluated for corrective measures.

211.20 Flexible Pavement Design

Flexible pavement designs must be done to the following minimum standards.

- (1) The Pavement Design Package must document what the existing friction course is and compare that to the existing crash patterns in determining the friction course when resurfacing ramps. Determine the location where speeds on the ramp are expected to drop below or exceed approximately 50 mph and make a recommendation for the logical transition between FC-5 and FC-12.5. Follow the coordination requirements as specified within **TDH 120.2.7.1** bullet point (2).
- (2) If new pavement is proposed to be joined to existing pavement such as widening, auxiliary lanes, ramps, and turn lanes, a minimum 6-inch wide shelf must be created at the longitudinal joint by milling the existing pavement structure. The minimum depth of the milling equals the thickness of the final lift of structural course in the new pavement structure. This creates a milled offset in the longitudinal pavement joint from preceding lifts of structural asphalt. Tack coat is used in the shelf to aid in adhesion and imperviousness. A detail of the longitudinal joint must be developed and placed in the project typical section details. The traffic control plan must accommodate the space necessary for this work in the phasing sequence. Plan notes or a table of dimensions must describe the limits of the milled shelf width and depth.
- (3) All pavement designs through toll loop pavement area must meet the minimum pavement designs listed in the [GTR](#). If necessary, the pavement thickness must be increased from the [GTR](#) minimums in order to provide the required pavement structural number.

212 Intersections

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

213 Modern Roundabouts

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

214 Driveways

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

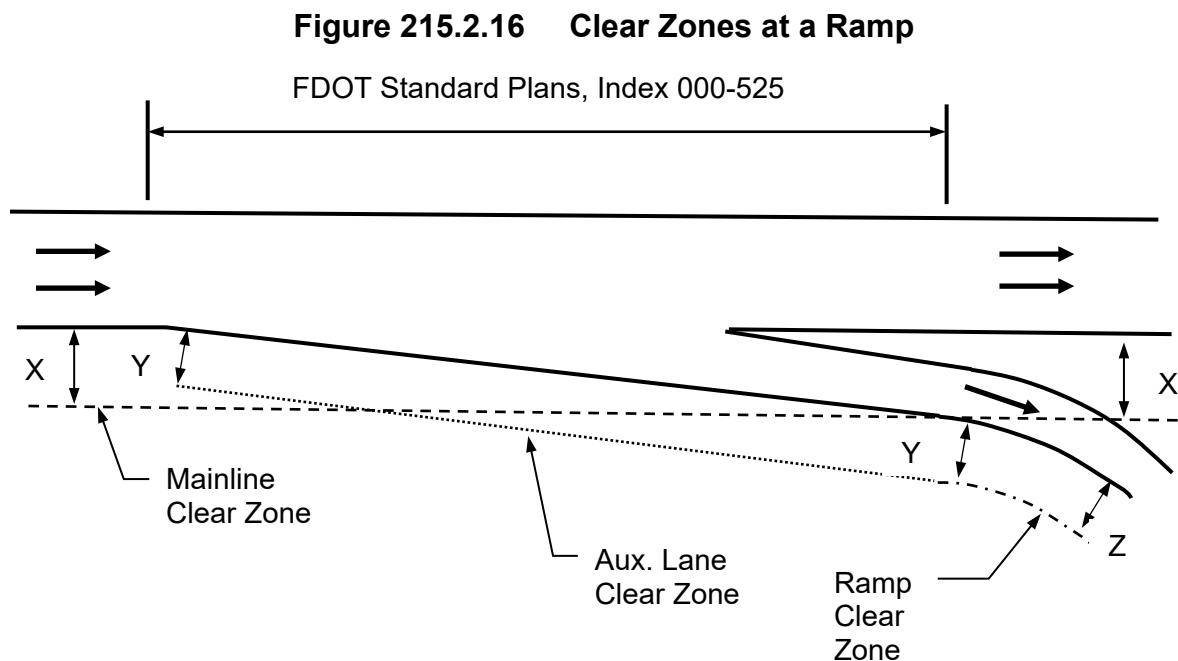
215 Roadside Safety

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

215.2 Roadside Features

215.2.3 Clear Zone Concept

Add the following figure



215.2.4 Lateral Offset

Add the following paragraph

For side streets owned and maintained by local agencies where the minimum lateral offset criteria required by **FDM Table 215.2.2** cannot be achieved then provide the greatest achievable lateral offset. Any deviations from FDOT clear zone must be included in the Project Design Variation Memorandum and is subject to approval by the Turnpike Design Engineer and local agency.

215.2.6 Roadside Slope Criteria

Replace the second paragraph with the following

New permanent slopes steeper than 1:2 are not allowed.

Add the following paragraphs

A 1:2 front slope rate with guardrail can be applied regardless of fill height when constrained conditions exist. Written documentation (email or meeting notes documentation is acceptable) of concurrence from the Turnpike Roadway Design Engineer and the Turnpike Maintenance Engineer must be obtained prior to incorporating this approach into design plans.

Provide 5 feet from face of guardrail to the beginning of the 1:2 cut slope on all guardrail and 1:2 cut slope applications to allow for a 5 feet guardrail deflection. If a concrete barrier is used instead of guardrail and shoulder gutter, then a 4 feet wide level bench must be constructed within the fill behind the barrier before proceeding with a 1:2 slope.

215.3 Roadside Hazards

215.3.2 Canal Hazards

Add the following paragraphs

A water body is defined as a natural or manmade feature, such as a pond, lake, ditch or canal that has a depth of water of 3 feet or more for an extended period of time (24 hours or more), as measured from the seasonal high water level or control elevation, to the water feature's bottom elevation.

Provide shielding for all water bodies within the interchange areas.

Evaluate for the need to shield all water bodies within Turnpike right of way and those that run along and may fall slightly outside of Turnpike right of way. Evaluation must include the review of traffic data, facility characteristics, 5-year crash history, and a cost estimate of recommended improvements.

Modification for Non-Conventional Projects:
Delete the above paragraph and see RFP for specific shielding requirements.

215.4 Longitudinal Barriers, Barrier Transitions, End Treatments & Crash Cushions

215.4.1 Longitudinal Barriers

215.4.1.1 Flexible Barrier

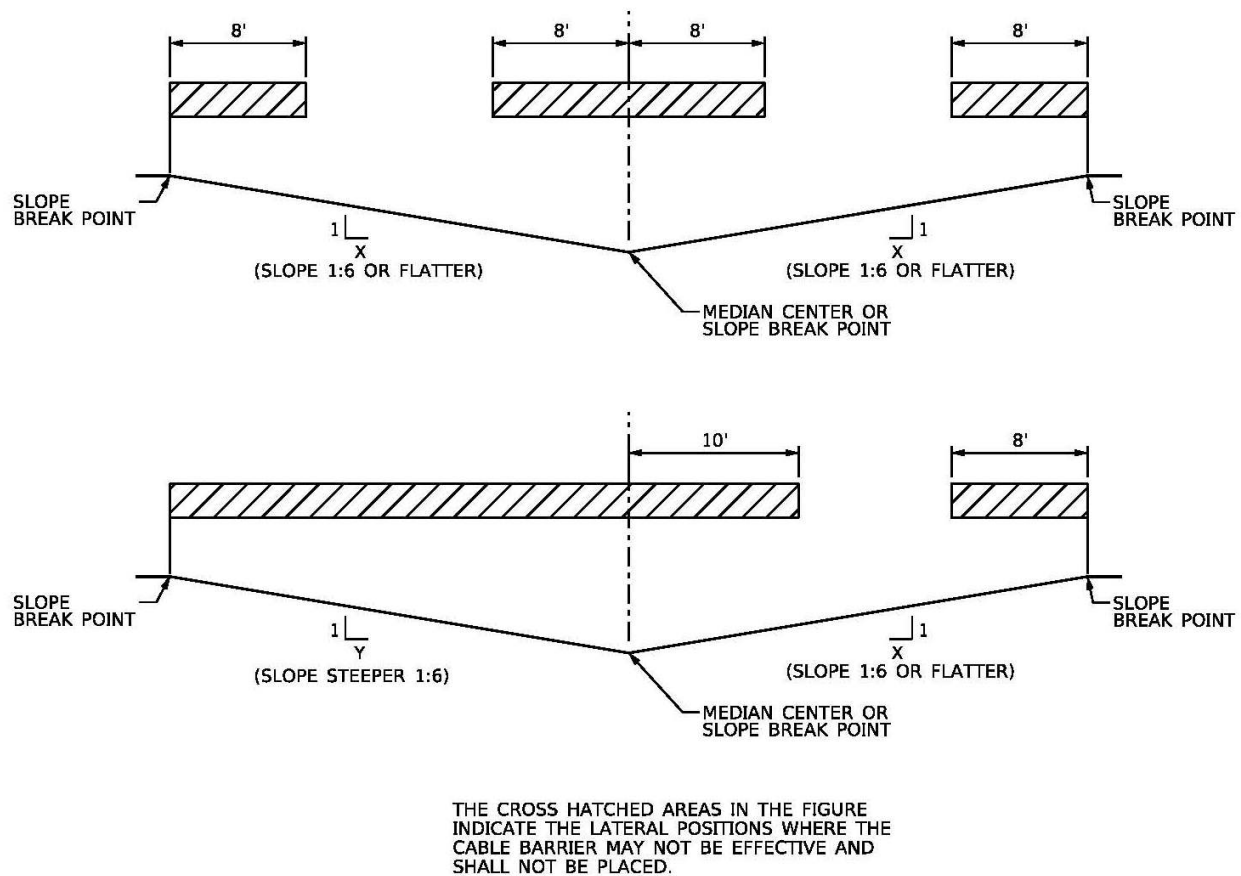
Add the following paragraphs

The following criteria apply to the placement of high tension cable barrier (HTCB) and supplement the [**FDOT Developmental Standard Plans**](#).

- (1) The preferred slope for HTCB placement is 1V:10H. The maximum allowable slope is 1V:6H.
- (2) Areas where HTCB must not be placed are shown in **Figure 215.4.8** below.
- (3) Post spacing must be installed such that the dynamic deflection is no more than a maximum of 8 feet.
- (4) End anchors must be protected from vehicle impact with rigid barrier, guardrail, or overlapping cable barrier.

For median applications retro-reflective sheeting must be specified on both sides of the posts.

Add the following figure

Figure 215.4.8 Flexible Barrier Placement

215.4.6 Barrier Placement

215.4.6.4 Continuous Median Barriers

Add the following subsection

215.4.6.4.1 Median Barrier Grading Requirements

The preferred median slope is 1V:10H. This is flatter than the standard 1V:6H median typical section slopes. The slopes ahead and in front of guardrail installation are particularly critical on the older and narrow medians of 40 feet wide (see **AASHTO Roadside Design Guide**). In most cases, regrading requires the median ditch profile to be realigned horizontally and vertically. Therefore, drainage and earthwork in these areas need special attention in developing the typical sections and drainage profiles.

215.4.7 Warrants for Roadside Barriers

Add the following paragraph

Light pole foundations are not considered a hazard if built in accordance to [FDOT Standard Plans, Index 715-001 Conventional Lighting](#), though the roadway slope may cause a portion of the foundations to protrude more than 4 inches in height.

215.7 Existing Barrier Systems

Add the following paragraphs

For added capacity and reconstruction projects, existing guardrail sections that do not meet current mounting height design standards must be replaced or upgraded to meet current standards. If a run of guardrail extends beyond the project limits, then a 25-foot transition detail will be used to connect to the existing guardrail and a special detail shall be included in the roadway plans.

For resurfacing and spot or system wide safety improvement projects, existing guardrail sections that do not meet current mounting height design standards and are impacted by project improvements must be replaced or upgraded such that the entire run of guardrail meets current standards. Guardrail that does not meet the mounting height requirements at the time it was installed and the condition of the miscellaneous pavement under the guardrail must also be considered when making the determination. It is the intention of the Turnpike to bring guardrail up to current standards, however if extenuating circumstances exist and if the impacted length is less than 50 percent of the total length of guardrail then only the impacted length may be replaced or upgraded. Written documentation (email or meeting notes documentation is acceptable) of concurrence from the Turnpike Roadway Design Engineer must be obtained prior to incorporating this approach into design plans or ERCAR Reports. A Project Design Variation Memorandum is required to be submitted showing justification for the modified replacement or upgrade. Existing guardrail within the limits of the project not impacted by the project improvements is not required to be upgraded or replaced but should be considered where practical.

Add the following section

215.9 Miscellaneous Asphalt Pavement

Evaluate the condition of all locations with miscellaneous asphalt pavement under guardrail to remain. Locations that are in poor condition must be repaired and may necessitate the resetting or replacement of guardrail. Locations that are in good condition must be documented in the Design Documentation with recent field visit photos.

216 Earthwork

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

216.1 General

Add the following sentence to end of the third paragraph

Landscape work may require excavation to remove and replace soils unsuitable for plant growth and finish grading for drainage and aesthetic purposes.

216.4 Earthwork Pay Items

216.4.5 Borrow Excavation (Truck Measure)

Replace the second paragraph with the following paragraph

Evaluate the availability of borrow material within the project right of way during design, prior to Phase III. The evaluation must include an assessment of earthwork balance for the project and must also evaluate whether there are any restrictions from a Drainage, Geotechnical, Environmental, or future Turnpike Program Need perspective. Obtaining material from the project right of way must not create an unsafe condition or unprotected hazard. Any borrow excavation occurring within the Turnpike right of way must meet the pond dimensional criteria depicted in **Figure 5-1** of the [FDOT Drainage Manual](#). The control elevation must be determined if a slope steeper than 1:4 is proposed in order to confirm compliance with **Figure 5-1** of the [FDOT Drainage Manual](#).

216.6 Summary of Earthwork

Add the following sentence to the end of the first paragraph

Specify and quantify material necessary to meet the drainage design requirements, such as select material beneath swales, on fill, and ponds designed to percolate runoff.

220 Railroads

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No changes to this chapter

221 Utilities

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

221.1 General

Add the following sentence to end of the third paragraph

For stand-alone landscape projects, it may not be necessary or cost effective to do full utility coordination. Utilize best available information, Level “D” – Existing Records as defined in the [FDOT Surveying and Mapping Handbook 3.6.1](#), to show utilities on landscape plans and add plan notes stating utilities will not be relocated as a result of planting. Notes will be included requiring the contractor to provide utility designates and locates for Department-owned and private utilities.

222 Pedestrian Facilities

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

222.4 Pedestrian Drop-off Hazards and Railings

222.4.1 Bridge Pedestrian Railings and Fences

Add the following paragraphs

All pedestrian facilities (sidewalk or shared use paths) on bridges over Florida's Turnpike limited access right of way must provide a fully enclosed fence per **FDM Figure 222.4.8** and [**FDOT Standard Plans, Index 550-012**](#). For roads crossing over Florida's Turnpike limited access right of way with bike lanes or shoulders with expected bike traffic, use curved bridge fencing per **FDM Figure 222.4.7** and [**FDOT Standard Plans, Index 550-11 & 550-13**](#).

Conditions where either of the two cases above are not feasible or practical alternative designs (equestrian, very low pedestrian volumes, etc.) can be utilized require approval from the Turnpike Maintenance and Turnpike Design Engineers. Written documentation (email or meeting notes documentation is acceptable) of concurrence from the Turnpike Maintenance Engineer and the Turnpike Design Engineer must be obtained prior to incorporating this approach into design plans.

223 Bicycle Facilities

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

224 Shared Use Paths

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

225 Public Transit Facilities

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

226 Patterned Pavement and Architectural Pavers

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No changes to this chapter

228 Landscape Design

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

228.1 General

Add the following paragraph

The use of resilient, low maintenance shrubs is encouraged to provide slope stabilization and as an underplanting for palms and trees to protect from mower damage.

228.2 Landscape Design Requirements

Add the following item to the list in the first paragraph

- [Turnpike Landscape Program Master Plan](#)

Add the following item to the list in the second paragraph under item (2)

- (q) Address listed wildlife and plant species within the project. Address listed species permits if needed.

Add the following sentence to item (3)(d) on the list in the second paragraph

Address water use permits if needed.

Add the following paragraphs

Setback guidelines from roadway and other related features to proposed landscape materials are identified in a summary table in the [Turnpike Landscape Program Master Plan](#).

Address the following design requirements:

- (1) Landscaping must be located such that drainage pipes, ditches and swales are not blocked or flows impeded. When available, the design high water (DHW) of ditches, swales and ponds must be shown on landscaping plans. If DHW elevations are not available, approximate pond breaks (top and bottom of mainstream berm at side slope breaks) and top and bottom of swales/ditches must be shown within the plans. Landscaping location must consider maintenance access along and across ditches and around stormwater management facilities.

Maintenance access must be provided so that maintenance forces can access the facility.

- (2) All planting details for beds on a 1:2 slopes or greater must include the use of weed control and erosion control fabric. Fabrics must be anchored or toed so that storm water cannot run underneath the mat. Weed control fabric and erosion control fabric must be biodegradable within 3 years.
- (3) The planting plans and maintenance plans must clearly indicate the limits of the installation, Contractor's mowing limits, and maintenance limits. Mowing limits must be a minimum of 6 feet outside the outermost plant when plants are "bedded" or 6 feet around a tree which is in a turfgrass area.
- (4) Maintenance plans must quantify maintenance activities consistent with the FTE Landscape Master Plan.

228.3 Landscape Opportunity Plan

Replace the first paragraph with the following

Prepare a Landscape Opportunity Plan (LOP) early in the design process, during PD&E preliminary plans development, or prior to the Phase I submittal in the final engineering design phase to ensure conservation and landscape improvements are considered in all phases of planning and design development. The LOP must provide an inventory and analysis of existing on-site and off-site elements which will guide the design.

Add the following subsection

228.3.3 Purpose, Need and Feasibility Study

Depending on the project size and complexity, there may be the need for the development of a Purpose, Need and Feasibility Study which includes a comprehensive inventory and analysis of the existing conditions and preparation of a Concept Level or Landscape Opportunities Plan. The Purpose, Need and Feasibility Study is submitted for full ERC review.

229 Selective Clearing and Grubbing Design

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

230 Signing and Pavement Marking

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

230.1 General

Add the following to the end of the third paragraph

TDH [Traffic Guide Drawings](#)

Add the following paragraphs

[Traffic Guide Drawings](#), available on the Turnpike Design website, establish guidelines for traffic design and traffic engineering plan development. The Guide Drawings show layouts and details of an example condition.

Ancillary structures must not be placed in drainage features. If project geometry or other constraints require the placement of an ancillary structure in a drainage feature, coordinate with the Turnpike Drainage Design Engineer to confirm these structures and their associated components are placed above the appropriate elevation as follows:

- Treatment Swales – Weir Elevation
- Conveyance Ditches – Normal Depth
- Stormwater Ponds – Design Storm Peak Stage
- Floodplain Compensation or Other Systems – Seasonal High Water Level

Provide the applicable elevation in the component specific cross sections and typical cross sections.

230.1.1 Structural Supports

Replace the second paragraph with the following paragraph

Refer to **TDH 261** for information regarding structural support requirements. Refer to **TDH 325** for information regarding plan requirements.

230.1.3 Vertical Clearance

Replace this subsection with the following sentence

Refer to **TDH 210.10.3** for vertical clearance requirements for sign structures.

230.2 Signing

230.2.1 Sign Placement

Add the following paragraphs

The minimum sign spacing between a Dynamic Message Sign (DMS) and guide signs or directional signs should be 1000 feet, when the guide sign is upstream of the DMS sign.

All advance guide signs should use the physical gore as the point of reference for distance messages. The only time this should not be done is if the physical gore and theoretical gore are separated by more than 500 feet.

Follow the [Typical Off-Ramp Signing Diagrams](#), located on Turnpike Design website, for Advisory Speed Warning Signing at all Turnpike exit ramps.

For size of signs, lettering, and plaques, follow the Freeway Classification in **MUTCD Tables 2B-1, 2C-2, 2E-4, and 2E-5**. The minimum sizes for regulatory and warning signs on exit or entrance ramps to/from Turnpike facilities must be Freeway Classification.

230.2.2 Overhead Signs on Limited Access Facilities

Add the following sentence to end of the fifth paragraph

Align the far edge of the sign panel, furthest from the upright, flush with the end of the horizontal chord of the cantilever structure.

230.2.4 External Lighting of Overhead Signs

Add the following paragraphs

If a sign panel on an existing structure is being replaced, all sign panels on the structure should be consistent. For example, if a structure has three existing signs with lights, one panel is being replaced, the plans should call for either A) lights on the new panel or B) the other two panels replaced with Type XI sheeting and removal of the lights.

Add the following subsections**230.2.12 Toll Route Markers**

The Turnpike mainline must use the Turnpike route marker sign panel shown in the most current [Traffic Guide Drawings](#).

On side streets, leading to the Turnpike mainline, use the Toll Auxiliary Sign (M4-15) in combination with the Turnpike route marker. On numbered routes, use the Toll Route Shield (FTP-79-06, FTP-80-06, or FTP-81-06) without the additional Toll Auxiliary Sign.

The width of the attached cardinal direction sign, directional arrow auxiliary sign, or other auxiliary sign must match the width of the parent route marker sign.

230.2.13 Truck Lane Restrictions

Include truck lane restriction signs on corridors that have three or more lanes in each direction of travel.

Sample panel designs for the restriction are included in the [Traffic Guide Drawings](#). Locate the signs similar to a post-interchange sign so that drivers entering the system are informed at each entry point. If installation of the truck lane restriction sign is not possible on the mainline due to sign clutter, the truck lane restriction sign can be located on the entrance ramp after the toll facility, when necessary, to maintain proper sign spacing.

231 Lighting

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

231.1 General

Add the following paragraphs

Lighting Guide Drawings establish guidelines for lighting design and plan development. The Lighting Guide Drawings are available on the Turnpike Design website

In addition to the **FDOT Specifications**, the following standards should be consulted:

Roadway Lighting Design Guide, AASHTO - This is the basic guide for highway lighting. It includes information on warranting conditions and design criteria.

Recommended Practice for Roadway Lighting IES RP-8-00 (R2005), ANSI/IESNA.

American National Standard Practice for Tunnel Lighting IES RP-22-11, ANSI/IESNA.

The IESNA Lighting Handbook Reference & Application, IESNA.

Federal Aviation Regulation, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, USDOT/FAA. This regulation sets the requirements to follow on projects near airports.

Federal Aviation Administration Advisory Circular AC 70/7460-1, Obstruction Marking and Lighting, FAA. This advisory circular defines the requirements identify objects that require special lighting near airports.

Federal Aviation Administration Advisory Circular AC 150/5345-43, Specification for Obstruction Lighting Equipment, FAA. This advisory circular contains the FAA specification for obstruction lighting equipment.

Manual on Uniform Traffic Studies (January 2000) Chapter 15 Highway Lighting Justification Procedure, FDOT.

231.1.4 Voltage Drop Criteria

Replace this subsection with the following paragraph

The maximum allowable voltage drop for determining the conductor sizes for lighting branch circuits is 6 percent. Voltage drop calculations must include a combination of both branch circuits and feeder circuit runs from the power company service point to the last luminaire within a circuit.

231.2 Design Criteria

Add the following paragraphs

Light pole layout and design must employ practices, where possible, to reduce the risk of light poles in high crash and high-risk locations. Some of these design considerations are, but may not be limited to: lane drop and intersection locations, sections of roadway where the paved shoulder narrows, and curve/vehicle departure directions.

Conventional roadway lighting, employing shoulder mounted light poles, must be used for Turnpike owned and maintained lighting systems. Conventional lighting must be mounted within the right of way beyond the outside shoulders of the roadway along the mainline. For ramps and auxiliary lanes separated from the mainline, outside shoulder mounting is preferred. Conventional roadway lighting luminaires must be pole top style, for Turnpike owned roadways.

The lighting design must include mainline transition lighting to allow a reasonable reduction in lighting levels from a lighted roadway to an unlighted road. The mainline transition lighting must extend the lighting limits by approximately four-to six-pole spacing. The mainline transition illumination levels must be 1.0 foot candle average initial intensity (horizontal foot candles) with uniformity ratios as specified in **Table 231.2.1**.

Evaluation of the use of luminaire shielding will be required for all areas of the roadway adjacent to residential, highly urbanized, or environmentally sensitive locations where potential light pollution may be perceived. Photometric analysis using luminaires with the manufacturer's shield option must be included in the LDAR. Coordination with other disciplines for review of areas of concern is required.

If the length of the mainline between any two lighted areas (roadway sections, interchanges, service plazas, and/ or tolls facility) is 0.5 mile or less, then that section of the mainline must be lighted.

All widening and resurfacing projects must be reviewed for compliance with current lighting criteria. Project begin and end limits must include the full lighting scope regardless of the limits of roadway work, unless otherwise noted by the Turnpike Project Manager.

Where roadside lighting exists or is proposed near tolling facilities, the roadway lighting must be reviewed for compliance with current lighting criteria and [GTR](#). All deficiencies within the project scope must be identified and corrected. The Turnpike Electrical Design Engineer and the Turnpike Project Manager must be notified regarding all lighting deficiencies found outside the project limits.

Where new poles and luminaires are being proposed, all poles, luminaires, foundations, and infrastructure within the project scope must be new.

Modification for Non-Conventional Projects:
Replace the above paragraph with the following: All poles, luminaires, foundations and infrastructure must be new.

Table 231.2.1 Lighting Initial Values***Replace the following table items and add the following notes***

Roadway Classification	Illumination Level Average Initial Foot Candle		Illumination Uniformity Ratios		Veiling Luminance Ratio
Or Project Type	Horizontal (H.F.C.)	Vertical (V.F.C.)	Avg./Min.	Max./Min.	L _{V(MAX)} /L _{AVG}
Conventional Roadway Lighting and Signalized Intersections					
Limited Access Facilities, Major Arterials & Highway Speed Tolling Gantries	1.7	N/A	4:1 or Less	10:1 or Less	0.3:1 or Less
All Other Roadways	1.0				
Pedestrian Ways and Bicycle Lanes ⁽¹⁾	2.5				
Sign Lighting					
Low Ambient Luminance ⁽²⁾	5.0 to 10.0	N/A	N/A	6:1	N/A
Medium Ambient Luminance ⁽²⁾	10.0 to 20.0				
High Ambient Luminance ⁽²⁾	20.0 to 40.0				
Rest Area Lighting					
Entrance and Exit	1.7	N/A	4:1 or Less	10:1 or Less	N/A
Interior Roadways	1.5				
Parking Areas	1.5				

Notes:

- (1) This assumes a separate facility. Facilities adjacent to a vehicular roadway should use the levels for that roadway.
- (2) Ambient luminance classifications are defined in the **AASHTO Roadway Lighting Design Guide, Section 10.3**. Refer to the [Traffic Guide Drawings](#) for information on sign panel sheeting.

For conventional lighting: These average illumination values should be considered standard, but should be increased, if necessary, to maintain a uniform ratio. The maximum illumination level average initial horizontal foot-candle value must be 2.25 FC for interstate, expressway, freeway, major arterials, and highway speed tolling gantries. The maximum illumination level average initial horizontal foot-candle values must be one and one-half values for all other roadways, pedestrian ways, and bicycle lanes.

For rest area and service plaza lighting: These average illumination values should be considered standard, but should be increased if necessary, to maintain a uniform ratio. The maximum illumination level average initial horizontal foot-candle values must be one and one-half values.

Add the following subsections**231.2.2 Box Girder Maintenance Lighting and Power**

Welding or burning of the structure is not allowed. The electrical work associated with the box girders involves working in confined space areas. All precautions and rules according to "confined spaces" of the ***Code of Federal Regulations, 29 CFR 1910.146*** apply. Emergency lighting must be provided within each box girder per ***NFPA 101***.

The minimum conductor size must be #10 AWG. A green insulated conductor must be installed in each conduit run. The minimum conduit size must be 1 inch.

The six-hour timers must control the lighting contactors. Timers must be provided at each hatch entrance and mid span.

The light fixtures must be connected to branch circuit breakers separate from the receptacle branch circuit breakers.

The service voltage for the box girders must be 240/480 volts, single-phase, three-wires and then step down to the 120/240 volts through the mini power centers. A main disconnect switch must be provided immediately adjacent to the hatch door of each girder. The 240/480 volt-feeder must terminate in a distribution panelboard. The distribution panelboard must provide 480 volt power to each mini power center.

The number of mini power centers within each box girder must be determined based on the number of lights and receptacles. The maximum number of lights and receptacles within a mini power center must be as indicated on ***[FDOT Standard Plans, Index 715-240 Maintenance Lighting for Box Girders](#)***.

231.2.3 Lighting Load Center and Wiring Criteria

The standard service voltage for roadway lighting load centers must be 240/480 volts, single-phase, three-wires.

Roadway lighting load centers must be coordinated with the utility service provider prior to Phase III Plan Submittal. Utility service transformers must be coordinated for connected and spare loads. Design consideration must be given regarding utility standard service transformer sizes and limitations. Where a lighting load exceeds typical utility service transformer sizes, the lighting load must be split and multiple load centers provided to serve the load. Coordinate with the utility service provider to determine utility service provider project specific service requirements. Provide notes and details in the plans, as needed, to address utility service provider's requirements.

FDOT Standard Plans, **Index 639-001 Service Point Details** and **Lighting Guide Drawings** must be coordinated with the utility service provider's requirements for electrical service (or electrical service standards). The electrical service point must be designed to meet all utility service provider's requirements.

Load center locations and surrounding areas must have a minimum of 1 foot between the load centers and the design high water elevations of the locations.

Lighting load center enclosure and maintenance pad minimum dimensions must be as shown in the **Lighting Guide Drawings**.

Where a lighting load center is being replaced and existing poles, equipment, etc. are being re-fed, all equipment and identification labels must be replaced to identify new load center and circuit designations. Coordinate with the Turnpike Maintenance Engineer to properly update identification of equipment.

The voltage rating for Turnpike owned and maintained roadway luminaires must be 480 Volts (AC), for use on standard 240/480 Volts (AC), single-phase, three-wire systems.

Roadway lighting circuit conductors must not be larger than #1 AWG. Circuits requiring conductors larger than #1 AWG must be coordinated with the Turnpike Electrical Design Engineer and Turnpike Maintenance Engineer.

Where existing conductors within a circuit are being replaced, the size of the new conductors must not be smaller than the existing conductors.

Dedicated circuits must be provided for daytime supplemental underdeck lighting. Daytime dedicated circuits must be in separate conduits from roadway lighting circuits. Where conduits are run in the same trench with roadway lighting conduits, the conduits must be separated in the pull boxes. Dedicated daytime lighting circuit conduits must be wrapped with electrical hazard tape in the pull boxes. Dedicated daytime lighting circuit conductors must be identified with an additional tag that states that daytime conductors are energized during the day.

Underdeck light fixture mounting details must be provided in the plans. Attachment of lighting equipment/associated conduit to mechanically stabilized earth (MSE) wall panels is not allowed. Attachment of lighting equipment/associated conduit to MSE copings is acceptable. Attachment to other bridge elements must conform to the **FDOT Structures Design Guidelines Appendix 1A**.

Roadway lighting must be connected to alternate circuits to prevent a total blackout of any section of the highway in the event that a circuit is out of service. Existing lighting replacements must be evaluated on a case-by-case basis, regarding alternate circuits.

Modification for Non-Conventional Projects:
Replace the above paragraph with the following:
Roadway lighting must be connected to alternate circuits.

The maximum distance between pull boxes and/or splice boxes in long conduit runs is 300 feet.

A special power distribution design is required when new poles and luminaires are being proposed behind noise walls. Conduit, junction boxes, and pull boxes must be installed in front of noise walls on the roadside.

There must be no more than three circuits in a single conduit. Show multiple conduits as needed in the plans to meet this circuit requirement.

All roadway crossings by directional bore must be provided with a spare conduit and a dedicated pull box at each end of the road crossing. Use of light pole pull boxes for directional bore runs is not allowed, where space is sufficient for providing dedicated pull boxes.

231.2.4 Temporary Lighting Criteria

The design of temporary lighting must meet the criteria shown in **TDH 231.2**. Temporary lighting design may require Department review for the purposes of opening a project specific pay item. Photometrics, details, quantities, and layout in the roadway temporary traffic control plan for specific construction phases will be required. See FDOT Basis of Estimates for additional information regarding temporary lighting requirements.

231.2.5 Pole Design Criteria

Bridge mounted light poles (bridges and approach slabs) are not desirable and should be avoided where possible. This can be done by adjusting the pole spacing before and after bridge approaches. If bridge mounted light poles are unavoidable, their location must be coordinated with the Engineer of Record for Structures Design (see Standard Plan Instructions for Index 521-660). Bridge-mounted poles must have pull boxes as specified in [FDOT Standard Plans, Index 630-010 Conduit Details-Embedded](#).

Nominal mounting heights for conventional poles must be between 40 and 50 feet as specified in [FDOT Standard Plans, Index 715-002 Standard Aluminum Lighting](#). Nominal mounting heights for high mast poles must be between 80 and 120 feet as specified in [FDOT Standard Plans, Index 715-010 High Mast Lighting](#). Technical

special provisions (TSP) and details must be provided in those cases where special pole designs are required.

Conventional roadway light poles must be aluminum and must not be painted.

A concrete slab is not required in those instances when the poles are located behind sidewalks. The pull box must be located flush with the sidewalk in front of the light pole. Plan details will be required for light poles located behind sidewalks to show layout of pull box, conduits, pole foundation, etc., especially for sites where limited Department-owned right of way exists.

A combination pole and pull box concrete slab is not required where the grade is 1:2 or greater and protected by guardrail.

All foundations and pull boxes must be coordinated with current and future grading to ensure that the top of the foundations and the pull boxes are not below grade. In addition, foundations, boxes (pull, splice, junction or similar), and lighting equipment must not be located within the limits of any drainage systems or other locations where water may intrude, or debris may accumulate.

All components of the pole cable distribution system must be listed by a nationally recognized testing laboratory.

The pole cable distribution system must be installed in the pull box adjacent to each light pole.

For poles with two luminaires, a single TC cable must be run from the adjacent pull box to the pole's handhole. From the pole's handhole, a pole cable distribution system is required for each luminaire.

231.3 Design Methodology

Add the following item to the list in the first paragraph

- (3) For Roadway Segments beneath Bridge Underdecks: 5 feet longitudinally and 5 feet transversely along the roadway, including pedestrian travel ways.

Add the following paragraphs

A point-by-point, computerized photometric analysis must be performed for all roadway areas being illuminated throughout the project. Photometric data points must be legible. A copy of the results of this analysis must be included in the LDAR. Results must indicate foot-candle values displayed on plan view on 11" x 17" pages with 1/100th accuracy (0.XX foot-candles). Where solid objects, such as bridges, block light fixture contributions, a 3D

graphic representation must be included to ascertain that solids were accounted for. Typical section photometric analyses are not considered a complete or thorough photometric analysis.

A point-by-point, computerized photometric analysis must be performed for all signs being illuminated throughout the project. A 1 foot by 1 foot maximum point spacing must be used for the point by point photometric for the entire area of the sign panel(s). A copy of the results of this analysis must be included in the LDAR. Results must indicate foot-candle values displayed on each sign panel with 1/100th accuracy (0.XX) foot-candles).

A photometric analysis is required for projects where the relocation of light poles is included in the scope of work.

Provide an angle convention detail, if any tilting is required, to clearly depict fixture tilt orientation. A detail is required for each type of fixture being used (fixture on pole, sign luminaire, etc.). The detail(s) must be provided in the LDAR and the plan sheets.

231.3.1 Analysis Zones

Replace the first paragraph under the header “Limited Access Facilities” with the following paragraph

Limited Access Facilities:

Establish independent analysis zones for the mainline roadway segments, ramp segments, underdeck segments, and crossroad segments at interchanges.

Add the following item to the list under the header “Limited Access Facilities”

- (5) Analyze underdeck divided roadway segments using two analysis zones, one for each direction of travel. Include pedestrian travel ways (i.e. bike lanes and sidewalks). Each zone will be bounded by the back edge of the pedestrian travel ways or travel lane (where no pedestrian travel ways are provided).

231.3.6 Underdeck Bridge Lighting

Add the following sentence to the end of the first paragraph

In addition to piers and pier caps, underdeck lighting can also be mounted to other substructure elements such as end bents and wall copings.

Add the following subsections

231.3.6.1 Nighttime Underdeck Lighting

Where there is continuous roadway lighting during the night, roadways under bridge structures must be lighted to the same level (or criteria) of the adjacent roadway. If the adjacent roadway is not lighted, lighting under bridge structures is still required where frequent nighttime pedestrian traffic exists, or where unusual/critical roadway geometry occurs adjacent to or underneath the bridge structure.

231.3.6.2 Daytime Supplemental Underdeck Lighting

Daytime lighting may be required when the bridge structure limits natural sunlight penetration and limits a driver's visibility under the structure. Evaluation of existing/proposed roadway design regarding the need for daytime lighting must be included in the Lighting Design Analysis Report (LDAR). Daytime supplemental lighting must be provided as warranted by evaluation or as required by the Turnpike Electrical Design Engineer. These requirements include not only Turnpike facilities, but any roadway crossing under a Turnpike facility.

Methodology from the **ANSI/IES RP-22-11 Tunnel Lighting Guide** must be used to determine the need for daytime supplemental lighting for underpasses. **ANSI/IES RP-22-11** provides **Table 2** and **Table 3** for determining the need for daytime lighting of tunnels/underpasses and for preliminary determination of the target luminance value for threshold zone lighting.

When the adjustment factor per **ANSI/IES RP-22-11 Table 2** is zero, no daytime lighting is recommended.

No daytime lighting is recommended for underpasses of 80 feet or less.

No daytime lighting is recommended for underpasses between 80 feet and 250 feet long with traffic volume below 15,000 AADT, if there is good daylight penetration and good wall reflectance. However, where skewed roadway geometry, pedestrian/bike facilities, or local jurisdictional request(s) are present, perform a daylight study (per Turnpike Design Handbook procedure and with consideration of applicable factors) to verify the need for daytime lighting.

- (1) Consider several factors when determining the proper adjustment factor from **ANSI/IES RP-22-11 Table 2**:
 - (a) Exit Visibility - Where the exit is completely visible from the site safe stopping distance, the silhouette of objects beneath the underpass against the bright aperture at the exit may provide better detection by contrast for a driver. Make an assessment to determine if the roadway beneath the

underpass is straight and allows contrast detection from the driver's viewpoint at the site safe stopping distance. This is considered "good" exit visibility. Otherwise where curved roadways (horizontal curve with radii of 880 feet or less in rural areas, 2,500 feet or less in urban areas) are present beneath the underpass, the exit must not be considered visible.

- (b) **Daylight Penetration** - The overall luminance level is assisted by natural light entering the underpass. Assess daylighting through openings such as entrance/exit portal, columns, wall embankments beneath the underpass, and median separations (10 feet or greater) between the bridges. 3-D modeling lighting simulation software with daylighting features (i.e. AGi32) is the recommended method for determining daylight penetration for proposed/existing conditions. For existing bridge daylighting retrofits, results from software simulation may be field verified using photometric meters at the site prior to completion of design.
 - (c) **Reflectance of Underpass Walls** - For narrow underpasses, retaining walls help to improve the luminance on the pavement due to the amount of light that will be reflected. For wide underpasses with three or more lanes and those with embankments, the reflectance has much less effect due to the inter-reflection between the bridge deck and embankment surfaces. Assess the reflectance based upon the material reflectivity (i.e. concrete reflectivity varies between 20-30%, see recommended reflectivity in **Table 231.3.6**) of the underpass' surfaces.
- (2) Determine the pavement luminance value from **ANSI/IES RP-22-11, Table 3** and apply the adjustment factor from **Table 2**.
 - (3) Perform a daylight study using lighting simulation software capable of 3-D modeling of proposed underpasses and with features required to account for contribution of sunlight per weather station data. The study must be performed at 9 AM, 12 noon, & 3 PM at proposed underpass locations.

The average luminance value in the threshold zone of the underpass must be determined per **Tables 2** and **3** of the **ANSI/IES RP-22-11** guide.

A daylight study (to be included in the LDAR) must be performed by software simulation and field investigation to account for sunlight that may contribute to achieving the overall luminance value at the roadway beneath the underpass. See recommended surface material reflectivity percentages for use in software modules following the recommended procedure below.

The procedure for design of photometrics for daytime lighting is as follows (**ANSI/IES RP-22-11** and **AGi32** or equivalent software will be needed to implement this procedure):

- (1) Determine the **AASHTO** Safe Stopping Sight Distance (SSSD) per **ANSI/IES RP-22-11 Table 1**. Typical underpass will likely be evaluated for threshold zone only lighting. Perform calculations to confirm this assumption.
- (2) Determine threshold zone luminance value.
 - (a) Per **ANSI/IES RP-22-11 Table 2**, evaluate table parameters to determine adjustment factor.
 - (b) Evaluate proposed roadway “scene” and select scene per **ANSI/IES RP-22-11 Figure 3**.
 - (c) Evaluate and determine the “Suggested Maintained Average Pavement Luminance Levels in the Threshold Zone of Vehicular Tunnels”, per **ANSI/IES RP-22-11 Table 3**.
 - (d) Apply adjustment factor from (2)(a).
- (3) Perform daylight study for proposed underpass. **AGi 32** lighting software is recommended. Other equivalent software/field methods may also be used. Considerations include but may not be limited to: luminance contributions from the sun, material reflectance, underpass orientation, etc. per **ANSI/IES RP-22-11**.
 - (a) Create a proposed underpass model. The model must include, but not be limited to: all surfaces that reflect light, any openings, roadway layout below underpass, bridge structures beneath underpass, as well as other contributors.
 - (b) Apply surface reflectivity characteristics. The recommended material reflectivity characteristics may be obtained from **Table 231.3.6**.
 - (c) Create calculation zones for the roadway(s) beneath the proposed underpass. Data points near the edges of the underpass may artificially inflate the luminance average. It is recommended that those data points not be considered in the overall average luminance. Points within the first 23 feet of the entrance and exit portals must not be included in the overall average.
 - (d) Run daylighting module and calculate average luminance values within calculation zones established in (3)(c). Site location coordinates are required for weather station data (if available, the Perez All Weather module). Luminance value determined in previous step 2 must be used. As a worst-case scenario, daylight module study must be run assuming the orientation of the sun at 9am, 3pm, and 12 noon.
 - (e) If average luminance value cannot be met using daylight, then layout supplemental wall mount luminaires beneath underpass as needed to meet the calculated average luminance value. Use of nighttime luminaires in conjunction with the daytime supplemental luminaires may be required. The

goal will be to meet the average luminance value using the least number of fixtures.

- (f) Adjust and re-run daylight module and re-calculate as needed to meet the average luminance value as determined in step (2) above.

Deliverables from the daylighting study must include, but may not be limited to:

- Snapshots of all 3-D views of underpass models
- Summary of luminance value achieved with point to point photometrics layout that shows the calculation zones
- All assumptions/judgements made to support the study

Coordination with the Turnpike Structures Design Engineer, power utility service provider, and electrical design sub-consultant (if separate from lighting designer) may be required. Coordinate as needed to achieve a daytime lighting design that meets department requirements.

Add the following table

Table 231.3.6 Material Reflectivity

Material (Surface)	Recommended Reflectivity
Concrete	0.25
Steel	0.20
Asphalt	0.38

231.6 Lighting Design Coordination

Replace the last paragraph with the following paragraphs

Per **FDM 110.5.1**, all projects must be reviewed and coordinated to determine if notification and/or permitting are required by the Federal Aviation Administration (FAA), (FDOT), and any local jurisdictions.

The designer must provide copies of all lighting related notifications and permits for review in the LDAR. If none are required, written notification must be given to that effect in the LDAR. For FAA accounts, designate the “Sponsor” as Florida’s Turnpike Enterprise (FTE) with the Turnpike Project Manager identified as the “Attention of.”

Coordination with the manager of any affected airport and/or heliport may be required to fully address the airspace aspects of the project.

Add the following paragraph

Once the light pole locations are established, they should be checked with the ITS layout and the toll equipment layouts for any conflicts with the light poles, the light pole pull boxes, and the roadway lighting circuits.

231.7 Lighting Design Analysis Report

Add the following paragraphs

A Lighting Design Analysis Report (LDAR) must be provided. A [Turnpike LDAR Template](#) can be found on the Turnpike Design website. LDAR guidelines must be modified as necessary to be project specific and to describe any special considerations.

All design considerations must be documented in the LDAR. Design Variations, Design Exceptions, and deviations from Turnpike criteria must be identified separately in the table of contents and fully clarified under the “Design Methodology” section of the LDAR. See the [Turnpike LDAR Template](#) for additional information. Correspondence regarding deviations from criteria should be included as an appendix to the report and referenced as needed for clarification. A summary of deviations from criteria described in the design methodology shall be documented in the “Conclusions” section of the LDAR. Coordinate with maintaining agencies, as well as other Department stakeholders as applicable, to ascertain their preferences and obtain all other pertinent information required to provide an acceptable design.

Add the following section and subsections

231.8 Electrical Systems Design and Analysis

The design of all electrical systems (Lighting, Traffic Signals, ITS, etc.) must comply with **FAC 61G15-33, Responsibility Rules of Professional Engineers Concerning the Design of Electrical Systems**. These responsibilities are applicable for all new projects and any major modifications or renovations.

The following analyses are required, yet not limited to: voltage drop calculations, load analysis and calculations, arc flash hazard analysis, and short circuit analysis and device coordination. These designs and analyses must be prepared, reviewed, signed and sealed by a Professional Engineer licensed in the State of Florida. The Professional Engineer must be competent in electrical engineering through training and/or experience. The design analyses must be submitted with each plan submittal as part of the LDAR for lighting projects and the Power Design Analysis Report (PDAR) for ITS projects.

Electrical system design analysis should be completed using accepted industry power system analysis software (i.e. ETAP, SKM, etc.). If calculations by hand are used, engineering judgment, assumptions and methods must be clearly explained in the report. All supplemental information used or referenced in the power design analysis must also be provided in the report.

231.8.1 Voltage Drop

Voltage drop calculations must be submitted for all branch circuits and service feeders. Voltage drop calculations must be limited to the percentages shown in **TDH 231.1.3**. If no Department criteria exist, use the guidelines set forth in the **NEC**. Voltage drop calculations must be performed when additional loads are added to existing infrastructure to ensure the proposed conductors are sized appropriately for the total voltage drop resulting from the addition of new loads further from the existing circuits. Formulas, description of variables, and any other supplemental information required to evaluate design results must be included in the report.

231.8.2 Load Analysis

A complete load analysis must be submitted. This analysis must include but is not limited to: calculation of cabinet loads, circuit loads, and total loads for each service to determine and evaluate the appropriate capacity and rating for all components of the electrical system.

For any major modifications or renovations, calculations must consist of providing the existing load (prior to modification), the load being removed, the load being added, and new total load. A load analysis must be provided any time electrical load is added to existing infrastructure. All existing loads must be field verified by metering or calculated based on existing conditions.

New service points and load centers must be provided with a minimum of 20 percent spare capacity.

Manufacturer's product data cut sheets containing equipment power requirements must be provided in the report. Generator sizing calculations, UPS sizing calculations, and any other calculations affected by power loads for the project must be provided in the report.

231.8.3 Arc Flash Hazard Analysis

Provide an arc flash hazard analysis for new electrical distribution equipment (panelboards, transformers, load centers, disconnects, etc.), per the latest version of the ***Standard for Electrical Safety in the Workplace, NFPA 70E***. An arc flash hazard analysis must determine the arc flash protection boundary and the personal protective equipment (PPE) that personnel within the arc flash boundary must use. The arc flash hazard analysis must be updated when a major modification or renovation takes place. Arc flash and shock warning labels must be field installed on each piece of new electrical distribution equipment. The labels must indicate the flash hazard boundary, the flash hazard at 18 inches, the PPE level requirements, and the approach restrictions. All labels proposed for use on electrical equipment must be provided (in .pdf format) as part of the report and in the plans.

231.8.4 Short Circuit Analysis and Device Coordination

A short circuit analysis must determine maximum fault current on each piece of new electrical distribution equipment and proper fault current interrupting capacity. Provide documentation from the utility provider on the maximum available fault current at the utility transformer. This value must be used in the short circuit analysis. Software programs or hand methods used must be capable of calculating the maximum short circuits at all electrical equipment locations to ensure equipment ratings are adequate. The short circuit analysis must be updated when a major modification or renovation takes place or if electrical load is added to existing infrastructure. The AIC ratings for all equipment must be provided as part of the contract documents to meet or exceed the short circuit analysis results.

Electrical distribution equipment must be designed as fully rated and selectively coordinated systems. The protective features of the electrical distribution system must automatically and selectively isolate a faulted or overloaded circuit from the remainder of the electrical system. Only the closest protective device to the fault must operate to isolate the fault without affecting other parts of the system.

232 Signalization

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

232.1 General

Add the following paragraph

Make every reasonable effort to incorporate the design preferences of the local maintaining agency. These preferences may include but are not limited to pole types, detector loop strategies, conduit routing, specific equipment, signal timing methods, etc. Meet with the maintaining agency to ascertain their preferences and obtain all other pertinent information. Report all findings to the Turnpike Project Manager before proceeding with design.

232.1.1 Structural Supports

Replace the second paragraph with the following paragraph

Refer to **TDH 261** for information regarding structural support requirements. Refer to **TDH 327** for information regarding plan requirements.

232.1.3 Certification and Specialty Items

Add the following paragraph

The design of traffic signals compatible with local signal systems may require the use of materials for which there are no approved [FDOT Specifications](#). In those cases, Develop project specific TSPs for inclusion in the contract document.

232.10 Traffic Signal Project Coordination

Add the following paragraphs

Verify that documentation exists that the signal is warranted. If documentation does not exist, contact the Turnpike Traffic Operations Office.

In general, the Turnpike will actively work with the local maintaining agencies and the geographic District Traffic Operations office for coordination of design and maintenance issues.

At the request of the local maintaining agency any signals designed by the Turnpike will include features and equipment typically used for their signals and signal systems. This will include time base, closed loop, UTCS or other technologies. The communications medium must match those already in place.

Maintenance agreements exist between the geographic district and local agency. New traffic signal locations must be discussed with the Turnpike Traffic Operations Engineer so the new traffic signals can be included in the existing agreement. The Turnpike Traffic Operations Office is responsible for communicating and coordinating directly with each District Traffic Operations Office (District Traffic Operations Engineer and Traffic Signals Engineer (or equivalent)) on new or modified traffic signals, signal systems and/or intersection beacons. The Traffic Signal Maintenance and Compensation Agreement (TSMCA) shall be included in the 90% submittal for new signals. Refer to the TSMCA Procedure for details.

Add the following note to the Signal General Notes sheet:

Coordination must be made with the Turnpike Traffic Operations Engineer and Assistant Traffic Operations Engineer to prepare a traffic regulation for a warranted signal a minimum of 30 days prior to the signal going active.

233 Intelligent Transportation Systems (ITS)

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

233.1 General

Add the following paragraph

Refer to **FDM 228** and Standard Scope of Services for information regarding landscaping and landscape design. Coordinate with the Turnpike Landscape Architect to avoid potential conflicts with existing or proposed landscape improvements.

233.1.3 ITS Device Approval and Compatibility

Add the following paragraph

Equipment requirements must be coordinated at the time of final RFP or specification development with the Turnpike Traffic Operations Engineer to ensure the most appropriate manufacturers and models at the time.

Coordinate with maintaining agencies, as well as other Department stakeholders as applicable, to ascertain their preferences in equipment not owned and maintained by the Turnpike.

233.3 ITS Power Design

Add the following paragraphs

Refer to **TDH 231.8** for electrical design requirements.

600V step-up electrical systems are prohibited.

Include a Remote Power Management Unit (RPMU) within each device cabinet. Ensure the RPMU provides a minimum of six NEMA 5-15R receptacles, nominal 120 VAC.

233.3.2 Local Backup and Alternative Power Sources

Add the following paragraph

If any DMS has secondary backup power through a permanent generator, then the corresponding UPS for the sign must be able to operate on battery power and display messages for a minimum of 15 minutes.

233.3.4 Power Design Requirements

Add the following to the third item in the first paragraph

Step-up and step-down transformers must include a minimum of two 2.5% full capacity below normal taps and two 2.5% above normal taps on the primary side.

233.3.5 Power Load Requirements

Add the following paragraph

Include 20% spare load capacity in every cabinet (excluding DMS loads) and in addition, include a 15A load at 120V, at the end of every circuit.

233.3.6 Voltage Drop

Add the following paragraphs

See **TDH 233.3.7** for additional information.

For the calculation of the voltage drop and the size of conductors from the ITS cabinet UPS to the ITS devices (and for DMS DC circuits), use the allowable voltage drop recommended by the manufacturer of the ITS equipment.

233.3.7 Installation of Power Cable

Add the following paragraphs

Maximum conductor size for ITS power circuits shall be #1/0 AWG. Larger Conductor sizes may be permitted from the utility service transformer to the service disconnect and from the service disconnect to the main distribution panel (load center, if applicable) to accommodate the total demand load calculated for all of the circuits. Coordinate with the

utility company to provide service transformers at suitable locations to meet the maximum conductor size requirements.

Provide requirement to use gel-cap splices to splice electrical wires. Wire nut or electrical tape splicing is not acceptable.

233.3.9 Emergency Generator Power Systems (Generators)

233.3.9.1 Generator Design Requirements

Replace the second paragraph with the following paragraph

Use Diesel as the fuel type for permanent generator designs. The fuel tank shall be sized to provide 48 hours of run time at full (rated) load.

Add the following paragraphs

If permanent generators are included on a project, then the generator must include an Automatic Transfer Switch (ATS), Communications cabinet, fuel tank, and SCADA module. Coordinate with Turnpike ITS for requirements. Refer to the ITS Permanent Generator Installation Guide Drawings included as part of the [ITS Guide Drawings](#), which can be found on the Turnpike Design website, for guidance.

Provide a generator pad with a minimum clearance of 30 inches around the generator and fuel tank. Include pad design details with adequate information such as reinforcing, concrete class type/strength and installation notes.

233.4 ITS Support Infrastructure

Add the following paragraphs

All foundations and cabinets must be coordinated with current and future grading to ensure that the top of the foundations and cabinets are not below grade.

Provide callouts/notes in the plans to indicate that existing infrastructure including but not limited to concrete poles, support structures, pull and splice boxes, foundations, conduit, fiber, and wiring that are no longer used as part of the permanent ITS system must be removed and legally disposed.

233.4.1 Conduit Infrastructure

Add the following paragraphs

The fiber optic conduit system must consist of a minimum of four 1 1/4-inch conduits. One of the conduits must contain the fiber optic cable backbone. One of the conduits must contain tone wire and the other two remaining conduits are spares. The conduits must utilize the colors as described below. In addition, for conduits that require stripes, include three equally spaced longitudinal stripes of sufficient width and color intensity to be easily distinguished:

- Orange without stripes (fiber optic cable backbone)
- Orange with white stripes (tone wire)
- Orange with green stripes (spare)
- Orange with black stripes (spare)

The electrical conduit system must consist of a minimum of one 2-inch conduit and must utilize red colored (without stripes) conduit.

Lateral fiber conduit requirements for ITS must include two 1 1/4-inch conduits, one of which one is a spare. The lateral conduits must utilize the following colors:

- Orange without stripes (lateral); and
- Orange with white stripe (spare).

Include conduit casing (outerduct) of adequate size when conduits are installed under large water bodies such as canals etc.

Neither bridge-mount conduit nor barrier wall embedded fiber/electrical service wires is permitted.

Each conduit shall include only one fiber cable; collocation of fiber cables inside the same conduit is not permitted.

233.4.2 Pull, Splice, and Junction Boxes

Add the following paragraphs

Provide requirements for splice vault wire management such as non-metallic cable supports to allow the slack cable to be positioned without resting on the ground. The railing system must provide at least 3 inches of separation from the cabling to the bottom

of vault. Provide concrete apron as indicated in the standard index, ensuring appropriate compaction to reduce the possibility of washouts.

The top of pull, splice and junction boxes should be placed a minimum of 2 feet above the appropriate drainage feature elevation described in **TDH 230.1**.

All splice boxes must be H-20 or HS-20 load rated with a minimum dimension of 54 inches (length) x 54 inches (width) x 48 inches (depth).

Any pull box proposed in shoulders or in roadways must be H-20 or HS-20 load rated and include a solid bottom with provisions for weep holes and conduit entry. Pull boxes that are proposed outside of shoulder or roadway must be Tier 22 load rated.

Pull boxes and splice boxes for fiber optic cable must be labeled and include the words "TPK FIBER OPTIC" permanently cast into their top surface.

Electrical pull boxes must be spaced at a maximum distance of 500 feet for the entire length of new projects.

Electrical pull box covers and Locate pull box covers for ITS must include the words "TPK ITS Electric" and "TPK ITS Locate" permanently cast into their top surface.

Pull boxes with low voltage (50V or less) ITS cables must include the words "TPK ITS Composite" permanently cast into their top surface.

233.4.3 Fiber Optic Cable Designating System

Add the following paragraph

The labeling on the Fiber Route Marker must be:

BEFORE DIGGING IN THIS AREA CALL
Florida's Turnpike Enterprise
954-934-1400
AND
SUNSHINE ONE CALL
1-800-432-4770

233.5 Fiber Optics and Network Design

233.5.1 Fiber Optic Cable

Add the following paragraphs

For new systems, the fiber optic cable backbone should utilize 144 single-mode fibers as a minimum.

Lateral connections for ITS drops to the backbone must utilize 24 fibers as a minimum. Terminate all 24 fibers in the patch panel at the local hub. See **TDH 233.5.1.1** for additional details.

The wording on the warning tape shall include “CAUTION: TURNPIKE FIBER OPTIC CABLE BURIED BELOW”.

Ensure labeling on splice enclosures, exiting conduits, and fiber optic cable entering the boot with weatherproof laser printed tags. Ensure labeling on patch panels inside of building installations. Use a permanent laser printed tag, waterproof labels, with a printout indicating the department, number of strands, stations upstream and downstream to the next hub. For example:

Department: TPK-ITS Strands: 144
Install Date: 07/07/2013 Project: 420735-1-A
Current MP: 152.6
Upstream MP: 153.4
Downstream MP: 151.9

233.5.1.1 Splices, Terminations, and Connection Hardware

Add the following paragraphs

For new patch panels at the local hubs, use preloaded SC duplex single mode, 12-port splice cassette(s) with pre-routed factory polished fiber pigtails and integral splice tray. Ensure the pigtailed splice cassette module(s) matches the appropriate patch panel housing.

Terminate all fibers that enter a structure inside the rack.

Bring the entire backbone fiber and terminate all fibers inside a hub building. Do not bring any laterals into the hub building.

When the project work necessitates a break in the fiber cable, include provisions regarding allowable downtime. Provide any temporary splice drawings required during construction.

Permanent fiber optic cable must include replacement of the entire cable from the nearest existing termination point (butt end splice) to the next existing termination point (butt end splice) removing all temporary splices.

Add the following subsection

233.5.1.2 Fiber Optic Cable Assignment and Allocation Scheme

Assign the backbone fiber optic cable buffers based on the following functionalities:

- Blue and Green buffers → ITS Layer 3 Communications
- Orange buffer → ITS Distribution
- Red and Black buffers → Tolls
- Rest of the buffers → Reserved for other functionalities

Allocate Orange buffer fibers to respective ITS device(s) based on the following:

ITS Device Fiber Allocation			
Orange Buffer Fibers		ITS Device Type	Fiber Allocation Spacing
1	2	CCTV and Collocated Devices	Stagger between fiber pairs for each adjacent CCTV
3	4		
5	6	DMS and Collocated Devices	Stagger between fiber pairs for each adjacent DMS
7	8		
9	10	MVDS Generator Bluetooth AVI Wrong Way Detection	Alternate Between Fiber Pair
11	12		

Coordinate with the Turnpike ITS Network Administrator prior to the Phase III submittal.

233.6 ITS Poles and Structures

233.6.1 Camera Lowering Device

Add the following paragraph

The closed-circuit television (CCTV) camera must be mounted at a minimum of 45 feet above the highest crown elevation of the mainline roadway, and in some cases may need to be higher to maintain 100 percent coverage of the roadway.

233.7 ITS Enclosures

Add the following subsection

233.7.4 Maintenance Service Pads

Maintenance service pads are required at each new ITS component support pole location to provide adequate clear space and stable footing for maintenance access. Ensure the design and placement of pads prevent soil erosion underneath and accumulation of silt on the pad.

Provide a service pad at new cabinet locations or existing cabinet locations with documented safety concerns. Service pads must allow access to the cabinet equipment from each door.

233.8 Communication and Networking Devices

Add the following paragraph

Coordinate with the Turnpike Traffic Operations Engineer to ensure the most appropriate ITS device and equipment manufacturers and models are included in the plans.

233.9 Traffic Data and Vehicle Detection Systems

233.9.3 Microwave Vehicle Detection Systems (MVDS)

Add the following paragraphs

In rural areas, MVDS devices must be spaced at 1-mile intervals and co-located with other ITS equipment, like CCTV. For urban areas, the MVDS devices must be spaced at half-mile intervals.

The MVDS should be installed at CCTV camera locations to minimize costs, and where conflicts between the MVDS and CCTV lowering device can be avoided. The use of roadway lighting poles or sign structures for the installation of CCTV cameras and MVDS sites is not allowed.

233.9.5 Automatic Vehicle Identification (AVI) Systems

Add the following paragraph

For travel time data collection, provide VDS-AVI equipment based on Bluetooth technology. VDS-AVI equipment must be installed at each walk-in DMS and every interchange, with a maximum spacing of approximately 3 to 5 miles, and in accordance with the manufacturer's requirements.

233.10 Closed-Circuit Television Systems

Add the following paragraph

Provide 100 percent video coverage of the project corridor general toll lanes, and managed lanes (as applicable) including shoulders, entrance and exit ramps, master hubs, ITS cabinets, generators, and walk-in DMS. Show cone of vision guidelines to ensure the CCTVs can view corresponding DMS clearly.

233.11 Motorist Information Systems

233.11.1 Dynamic Message Sign (DMS)

Add the following paragraphs

Any walk-in DMS proposed on structures collocated with static signage in the same direction requires a signed approval from the Turnpike Traffic Operations Engineer and local agency, if applicable. Submit a Design Memorandum prior to the Phase II submittal detailing background information, proposed sign structure location, reasons for collocation, any disadvantages to collocation, illustration of the sign structure with proposed DMS and collocated sign(s), adjacent guide signs, and any additional details to support the recommendation. Include signature and date entries for the EOR and the Turnpike Traffic Operations Engineer.

New walk-in DMS installed on the mainline must be capable of displaying 21 characters per line, full color, full matrix messages with 20mm pixel pitch (resolution).

Arterial DMS (also known as "ADMS" or "Front Access DMS") must be capable of displaying 15 characters per line, three lines, full color, and full matrix messages with 20mm pixel pitch (resolution).

For all types of DMS, provide a ground accessible cabinet to install UPS head units and associated battery equipment to meet backup power requirements. Transfer switch, auxiliary power, and generator connection must be installed. Coordinate with the Turnpike Traffic Operations Engineer to see if a separate generator is required.

233.11.2 Highway Advisory Radio (HAR)

Add the following paragraphs

Existing HAR Transmitter (HART) and HAR Beacon (HARB) locations impacted by project work must be relocated to maintain system effectiveness, in accordance with FCC licensing requirements.

A typical HAR deployment consists of one HART and two HARB signs. One HARB is installed in each direction approaching the HART. Ideal locations provide adequate signal strength and minimal potential interference of the radio signal between HARB and HART locations. A practical spacing of 3 miles is recommended between the HART and HARB location to ensure adequate signal strength at the beacon locations.

Coordinate HAR relocations with FDOT State Traffic Engineering and Operations, who maintains FCC licensing information for each HART. The Radio Frequency (RF) output is power adjustable up to the FCC maximum of 10 watts. The maximum power level must be in accordance with the requirements of the FCC License.

The existing and desired radio frequency is established at 1640 AM (1640 KHz), as licensed by the FCC.

240 Transportation Management Plan

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

240.1 General

Replace the second sentence in the second paragraph with the following

Depending on the project logistics, the team composition may include FHWA, local government, business representatives, Florida Highway Patrol, and Emergency Responders.

240.1.1 TMP Reference Documents

Add the following items to the list in the first paragraph

- (9) [FDOT Drainage Manual](#)
- (10) [Turnpike Supplement to the FDOT Drainage Manual](#)
- (11) [General Tolling Requirements \(GTR\)](#)

240.2 Temporary Traffic Control Plan

240.2.1 TTCP Details

240.2.1.2 Work Zone Speed

Add the following paragraph

For any locations incorporating speed reductions, speed limit signs must be installed departing the work zone to "restore" the speed limit to the existing posted speed. During non-construction periods the speed limits must be restored to the existing posted speed limits.

240.2.1.3 Tapers

Add the following paragraph

All transitions and tapers for work zones must be based on the existing posted speed.

240.2.1.4 Superelevation

Add the following paragraphs

The transition from existing to temporary pavements is a critical area. These areas are prone to flooding since all the permanent construction features do not exist. These incomplete features include final pavement elevations and drainage facilities. Frequently, these temporary pavement transitions are superelevated with almost flat profiles. Elevations and grades with all superelevation data are required to be shown to ensure the intended design is constructed.

Diversions with construction speeds of 50 mph or greater are considered high speed facilities. Curvature and superelevation criteria for open highway conditions apply and must meet superelevation criteria described in the **FDM 210.9** and **211.8**.

240.2.1.5 Lane Widths

Add the following paragraphs

The minimum lane width for work zone travel lanes is 11 feet on Turnpike facilities, except at least one 12-foot lane located on the outside in each direction must be provided. Auxiliary, turning, acceleration or deceleration lanes are not to be considered as the outside lane.

The lane width for work zone travel lanes on single lane ramps shall be no less than 12 feet. For single lane ramps the lane width provided for turning movements must accommodate WB-62FL trucks entirely within the pavement markings of the travel lane. Ramps that service tandem trucks must accommodate the WB-109D truck entirely within the pavement markings of the travel lane. Truck turning templates and AutoTurn Analysis must be provided in the TTCP design documentation.

Shoulder widths associated with the travel lanes must be designed to achieve a minimum of two feet in width (paved). Spread must be checked to verify that the provided shoulder width complies with the criteria in **Chapter 3.9.1** of the [***FDOT Drainage Manual***](#).

Milling and resurfacing must utilize a minimum offset of four feet from Turnpike traffic and the milling operation or the resurfacing operation.

Consideration should also be given to maintain the maximum shoulder width up to 12 feet whenever possible to benefit motorists and for use by law enforcement and emergency responders for incident management.

240.2.1.6 Lane Closure Analysis

Add the following to the end of the fourth paragraph

Approval must be obtained prior to Phase II plans being submitted for review.

Add the following paragraphs

The staging of a particular construction project must permit the roadway to be restored to its original number of lanes within 24 hours. If necessary, the use of temporary bridges must be included in the traffic control plans to avoid prolonged lane closures due to work on the bridge.

Lane closure traffic data must be obtained from Turnpike Traffic and Planning Office including a growth rate factor and peak seasonal factor for all production design projects. See [Turnpike Lane Closure Guidelines](#), which can be found on the Turnpike Design website, for additional information and guidance.

Develop analysis for both the begin construction year and the end construction year for projects twenty-four months and longer. Lane closure analyses are to be submitted for review in electronic format and include traffic data as attachment for reference. If a detour and/or a prolonged closure is proposed on a project, the lane closure analysis must also include traffic analysis of the affected ramps. In terms of prolonged closure, include analysis and effect of closure(s) on the capacity and operations at the interchange.

Daytime and weekend lane closures are prohibited; however, deviations from this requirement will be evaluated if a closure is more beneficial to the Turnpike, its customers and adjacent property owners. For example, driving guardrail posts at night adjacent to homes is not as desirable as daytime closures which would support the work during the day and minimize the noise pollution and complaints from the adjacent property owners. Provide all supporting documentation including, but not limited to, lane closure analysis and the specific reasons why the request is being made. On certain projects, daytime lane closures may not be applicable throughout the entire project. This aspect must be considered for the design when making a recommendation. Evaluate adjacent project closure hours and include analysis and recommendation.

Refer to the [Turnpike Lane Closure Policy](#) for more information.

Add the following subsections**240.2.1.6.1 Requesting Deviations from the Turnpike Lane Closure Policy**

Deviations from the [Turnpike Lane Closure Policy](#) are highly discouraged and should only be considered when all other alternatives are deemed impossible, impractical, or unsafe. Deviations must be requested with the necessary justification in accordance with the [Turnpike Lane Closure Policy](#). A Lane Closure Policy Deviation Memorandum must be prepared and approved by the Turnpike Director of Transportation Operations or designee(s) as soon as possible in the design and no later than Phase III Plans Submittal. In addition to the requirements of **FDM 122**, the Lane Closure Policy Deviation Memorandum must contain justification that includes:

- (1) Summarization of the Lane Closure Analysis
- (2) Evaluation of the 5-year crash data (including time of day analysis)
- (3) Alternatives Considered
 - Explain why these alternatives are impractical, impossible, or unsafe.
 - Include rough cost, impacts to right of way, environment, community, operations, etc.

The Design Lane Closure Policy Deviation Memorandum must also include a summary, conclusions, and appendices of the supporting documentation.

A coordination meeting with Turnpike Traffic Operations Engineer, Turnpike Roadway Design Engineer, and Turnpike Construction Engineer is required prior to requesting the deviation which is done as part of the 45% traffic control plan workshop and no later than Phase II Plans Submittal.

240.2.1.7 Traffic Pacing***Add the following paragraphs***

[FDOT Standard Plans, 102 Series Traffic Pacing](#) includes a design table applicable to most work times of 20 minutes or less. The table is based on a pacing speed of 20 mph. Slower pacing speeds are not recommended but can be selected when necessary to shorten the pacing distance. See [Turnpike Lane Closure Policy](#) for additional guidelines on traffic pacing.

Site specific conditions will dictate whether a pacing operation can be implemented; therefore, coordination is required at the time the TTCP is being developed. The type of work will determine the construction equipment and required staging areas the contractor will need, particularly for placing bridge beams. Review of these issues will determine if lane closures will need to be used along with the pacing operation, or if the traffic will have to be detoured instead of paced.

Refer to **TDH 242.5** for Traffic Pacing Restrictions.

240.2.1.8 Detours, Diversions, and Lane Shifts

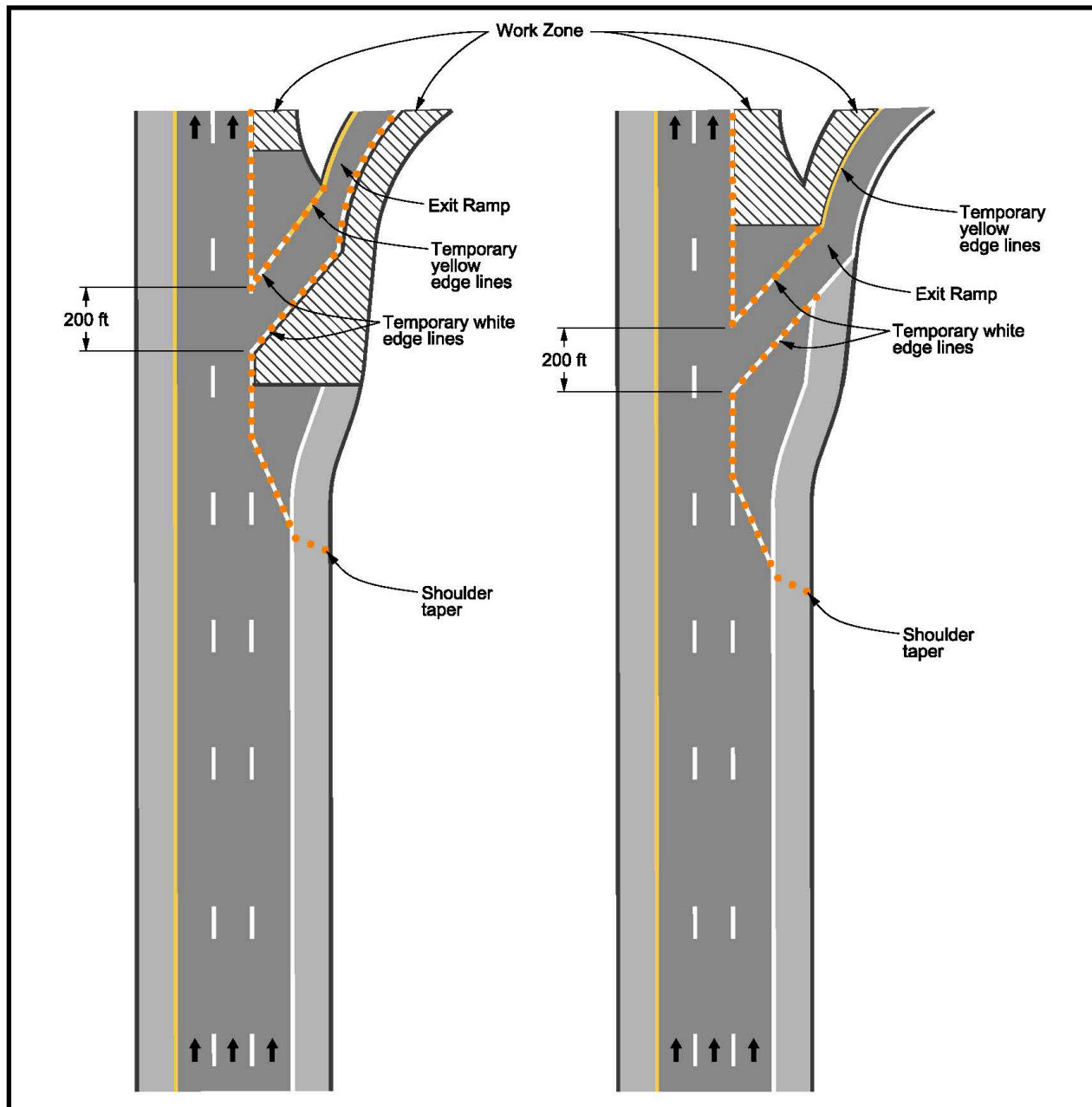
Add the following items to the list in the fourth paragraph

- Cross-slope break overs must be located on stripe lines except when the lane is actively transitioning.
- Lane cross slopes are required to be per **FDM 211.2.2**.
- TTCP will provide provisions that pavement drop offs must be on lane lines.

Add the following subsection

240.2.1.16 Exit Ramp Opening

Work in the vicinity of an exit ramp shall adhere to the requirements shown in the **Figure 240.2.1** below. All other elements not specified herein shall meet the requirements shown on the **MUTCD** latest edition Figure 6H-42.

Figure 240.2.1 Work in the Vicinity of an Exit Ramp

240.2.2 Temporary Traffic Control Devices

240.2.2.1 Signs

Add the following paragraph

Prepare details for nonstandard TTC signs that do not have a standard **MUTCD** or FTP number. Provide the details on guide sign worksheets in the plans.

240.2.2.2 Work Zone Pavement Markings

Add the following paragraphs

All proposed, temporary, or existing pavement markings to be removed must be detailed completely in the plans for a proper layout. This includes either dimensions to physical features or stations and offsets.

Overlays or milling with overlays is the only acceptable method(s) to achieve a positive means for the obliteration of existing pavement markings in areas such as long-term crossovers, diversions and in some cases tangent sections that provide a rough riding pavement.

High pressure water blasting is the only acceptable method for the removal of conflicting pavement markings in those areas not mentioned above. When removing pavement messages via water blasting, the entire area within the pavement message, including the interior of the message that is not painted or have thermoplastic, must be water blasted so that the message outline is completely obliterated and drivers are not able to read or see the scar outlining the former message.

240.2.2.3 Temporary Raised Pavement Markers

Add the following paragraph

RPMs used to delineate traffic control lane lines must be installed in conjunction with lane stripes.

240.2.2.7 Portable Changeable Message Signs

Add the following paragraphs

Use of remotely programmable PCMS should be considered as needed. These PCMS could be activated and changed in real-time by Turnpike TMC for better work zone management.

For planned lane closures and detours, a PCMS must be placed and must display an advanced notification message one week prior to a lane closure or detour. Time may be extended if deemed necessary but should not extend beyond 14 calendar days. The message must include the month and day(s) of the implementation of the closure or detour. Prior to closure, the message must read location "TO CLOSE" with the date. During the closure, the message must read the location is "CLOSED".

240.2.2.11 Law Enforcement Officers

Add the following paragraphs

All lane and ramp closures require the use of traffic control officers for the duration of the closure. Coordinate the use of additional traffic control officers with the Turnpike Traffic Operations Engineer at the preliminary TTCP submittal, or at a minimum, prior to the Phase II submittal. This must be an item of discussion at the 45% traffic control plan workshop.

The locations and/or need for additional traffic control outside of the conditions called out in the [**FDOT Specifications, Section 102**](#) must be documented in a Project Design Variation Memorandum identifying the additional locations and the corresponding considerations of a safety issue to the motorist and workers.

A matrix indicating the estimated hours for traffic control must be developed and provided to the Turnpike Construction Engineer during coordination with law enforcement personnel. Coordination with the Turnpike Construction Engineer must include discussion on placement of the matrix within the plans and/or the design documentation.

Traffic Control Officer Estimate				
Direction/Phase	Number Work Periods	Hours/Work Period	No. Officers Required	Total Hours
NB Phase I	2	8	1	16
NB Phase II	2	8	1	16
SB Phase I	2	8	1	16
SB Phase II	2	8	1	16
Total Hours				64

This matrix is an example and must be modified as required for each project.

240.2.2.15 Temporary Highway Lighting

Replace the first paragraph with the following paragraph

When practical, existing highway lighting is to remain in service during all phases of construction or until new lighting is installed and placed in service. Temporary lighting systems are required for all roadways where existing lighting is being replaced or new lighting is being constructed. Prepare a temporary lighting design that completely describes all temporary lighting work proposed during all phases of construction. Give detailed information on luminaires, poles, conduit, conductors, and any existing lighting equipment to be used for temporary lighting purposes. A field survey must be conducted to establish the condition of any existing system(s) and the responsibilities of the contractor for returning existing to remain lighting system(s) back to an acceptable condition.

Add the following subsections

240.2.2.20 Emergency Pull Off Area

All capacity improvement or interchange projects that are greater than one mile in length along the mainline, and reduce the outside mainline shoulder width to less than eight feet wide, must include provisions for an emergency pull off area. The emergency pull off area must be located to the right of the outside travel lane for use by patrons and emergency management personnel. The emergency pull off area must be a minimum of twelve feet wide and 500 feet long located every one-half to one mile and no closer than one-half mile from an interchange. The emergency pull off area must maintain the adjacent lane or paved shoulder cross slope and be paved with chevron pavement markings at 60-foot spacing. The emergency pull off area must not be designated as an ingress/egress location for the contractor.

240.2.2.21 Temporary Drainage

Design the temporary drainage facilities necessary during all construction phases. This includes but is not limited to designing temporary ditches, the size and length of pipes, placement of inlets, and where necessary, calculating inlet hydraulics and spread where water may pool along temporary barrier wall or curbing adjacent to an inside lane. All temporary drainage items must be shown in the plans and quantified.

240.2.2.22 Friction Course on Temporary Pavement

New structural asphalt has similar friction factors as friction course. The use of friction course asphalt on temporary pavement during construction will be used on a case by case basis and consider the duration of the construction phase, drainage, cross slope, operating speed, and horizontal curvature.

240.2.2.23 Standard MOT General Notes

See the [Roadway Guide Drawings](#), located on the Turnpike Design website, for standard **MOT General Notes** that must be shown on traffic control plans as applicable.

240.3 Transportation Operations Plan

Table 240.3.1 Transportation Operation Strategies

Add the following items under the column “Safety Management and Enforcement”

Safety Management and Enforcement
Specialty tow or flatbed wreckers, incident response trucks (IRT)
Emergency Access, Emergency Stopping Sites, Glare Screens

241 Lane Closure Analysis

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

242 Traffic Pacing Design

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

242.4 Traffic Pacing Calculations Example

Replace this section with the following paragraph

See [Turnpike Lane Closure Policy](#) for allowable hours of traffic pacing.

Add the following section

242.5 Traffic Pacing Restrictions

Beam placement, overhead demolition, and the construction of span sign structures or span toll gantry structures shall be performed utilizing detours where practical. Project specific needs may warrant the use of traffic pacing for these activities. If traffic pacing is determined to be necessary, provide sufficient justification and obtain written concurrence (email or meeting notes documentation is acceptable) from the Turnpike Traffic Operations Engineer prior to designing traffic pacing for these construction activities.

All pacing operations must also include a “Safe Route” plan in the event that the construction activities last longer than the allowable pacing timeframe. This plan must note that it will only be used at the direction of the Construction Project Manager. An example [“Safe Route” plan](#) is available on the Turnpike Design website.

The number of allowable detours, durations, and restrictions must be defined in the plans.

Modification for Non-Conventional Projects:

Delete **TDH 242.5** and refer to the RFP for traffic pacing restrictions.

243 Portable Changeable Message Signs

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

250 Hydraulic Data and Agency Permits

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

250.1 General

Add the following paragraph

For projects with bridges over water bodies, the Preliminary (15%) Line and Grade Submittal should depict the existing and proposed bridge pile alignments (substructures) to indicate any impact or change to the hydraulics.

251 Stormwater Pollution Prevention Plan (SWPPP) Development

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

260 Bridge Structures

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

261 Structural Supports for Signs, Signals, Lighting, and ITS

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

261.1 General

Add the following sentence to the end of the first paragraph

Use of a custom design sign structure requires written (email) approval of the Turnpike Structures Design Engineer.

Add the following item to the list in the third paragraph

- [FDOT Standard Plans](#), **Indexes 700-040** and **700-041**, Cantilever & Span Sign Structures: avoid truss depths greater than 8 feet due to inspection issues.

Add the following paragraph

Ancillary structures (highway signs, luminaires, traffic signals, ITS and tolling) must not be painted or otherwise coated without written (email) approval of the Turnpike Structures Design Engineer. Steel elements must use a galvanized coating per the [FDOT Standard Plans](#).

261.5 ITS Support Structures

Add the following paragraph

Every effort should be made to use ITS support structures from the [FDOT Standard Plans](#). Confirm that the [FDOT Standard Plans](#) are applicable by comparing project-specific attachments and site conditions versus the assumptions in the [FDOT SPI](#). Provide design and details based on the proposed attachments to ITS poles. Symmetrically placed prestressing should be considered where applicable.

262 Retaining Walls

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

262.2 Retaining Wall Plans Submittal Procedures

Add the following paragraph

If any wall system is proposed to be connected to an existing MSE wall, and the existing soil reinforcement provides resistance for the new wall, the design life of the existing wall system must be analyzed to confirm that it has the same design life as the new wall. This analysis must be submitted for review with the Phase III submittal (or 90% Plans). Internal and external wall stability analyses must use the lowest soil friction angle, as determined by direct shear tests following [*Florida Sampling and Testing Methods FM 3-D3080*](#) to model existing MSE wall backfill.

263 Geosynthetic Design

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

263.1 General

Add the following sentences to the end of the second paragraph

The use of Reinforced soil slopes will most likely preclude the installation of large plant material and relegate the use of sod which necessitates expensive and dangerous mowing operations. Prior to deciding to use reinforced soil slopes, coordinate with the Turnpike Landscape Architect to assure that geosynthetic reinforcement is compatible with beautification goals and programmed or planned landscape projects.

264 Noise Walls and Perimeter Walls

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

264.2 Noise Walls

264.2.2 Noise Abatement Criteria

264.2.2.2 Reasonableness

Add the following paragraphs

Maintenance access points must be provided for noise walls constructed along the Turnpike system. The spacing between openings or the ends of the noise wall must be no greater than one-half mile. Coordinate all maintenance openings with the Turnpike Project Manager and the Turnpike Maintenance Department. Refer to the **Noise Wall Maintenance Access Detail** included as part of the [Structures Guide Drawings](#), which can be found on the Turnpike Design website, for acceptable access opening types and example details of maintenance doors. Prepare the final Control Drawings and all details required for the proposed openings.

Ensure that the noise wall study station limits, for concrete barrier/noise walls, are extended to account for any tapers, attenuators or guardrail required during final design as required by the [FDOT Standard Plans](#). This also applies to overlapping noise wall installations. These changes may require reanalysis in an updated Noise Study Report Addendum document due to site specific geometry.

Show the location and limits (stations and offsets), including any tapers, for the traffic railing/noise walls in the contract plans. Provide dimensions “D” and “L” depicted in the **Noise Wall Maintenance Access Detail** for any proposed access points.

265 Reinforced Concrete Box and Three-Sided Culverts

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

No changes to this chapter

266 Bicycle and Pedestrian Bridges

The following are changes, additions or deletions to the January 2022 FDOT Design Manual (FDM), Topic #625-000-002, for use on Turnpike projects only.

266.2 Design Criteria

Add the following sentences to item (7)(b) on the list in the first paragraph

- (b) Use full screening on pedestrian bridges crossing Turnpike right of way. When fencing is required, the limits of fencing is from the beginning of the approach slab at Begin Bridge to the end of the approach slab at End Bridge.