Chapter 2

Design Geometrics and Criteria

The following are changes, additions or deletions to the January 2014, Topic #625-000-007, Plans Preparation Manual (PPM), for use on Turnpike projects only.

2.0 General

Add the following paragraph

The width of all bridges shall equal the paved width of the approach roadway including the paved width of shoulders. Section 2.3 of this volume provides criteria for design of shoulders.

2.1.5 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 3 percent cross slope. Surface drainage will be reviewed and used as the deciding factor. New two lane ramps, however, will be designed with 3 percent for both lanes through the gore area. It is understood that Figure 2.1.1 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 Design Variation, but shall meet lane spread requirements for storm water runoff. However, a hydroplaning analysis will be required if number of lanes sloped in one direction is greater than the maximum allowed of 3 lanes.

2.1.6 Roadway Pavement

Add the following paragraph

TPPPH Section 16.2.7.1 contains the minimum standards for pavement designs on the Turnpike System.

Add the following section

2.1.6.3 Longitudinal Pavement

Whenever new pavement is proposed to be joined to existing pavement such as widening, auxiliary lanes, ramps, etc., a minimum 6” wide shelf will be created by milling to receive the final lift(s) of structural course(s) in the new pavement structure.

For plan detail guidance, refer to Turnpike Design website, under TPPPH manual, Roadway guide drawings:

http://design.floridasturnpike.com/prod_design/roadway/roadwayguidedrawings.html

2.1.7 Transitions of Pavement Widths

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 shall be placed flush with the concrete at the ultimate profile grade. The initial pavement section shall transition to the ultimate thickness at a rate of 0.08 percent (1 inch/100 feet).

2.3 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 shall 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 ft. Even though this is an acceptable practice for mitigating sight distance per AASHTO Chapter 10.9.6, a 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 feet ramp shoulders should be used throughout. A similar 500 feet length would apply to ramp plaza approaches and departures. Frequent short changes in ramp width should 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 feet paved inside shoulders on one lane ramps and audible edge lines on both sides of the travel way for all ramps shall be evaluated at each ramp location within a project before implementation. The evaluation should 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 PPM Table 2.3.1 shall also be applied to ramps with more than two lanes, and thus have a four feet paved inside shoulder and a ten feet paved outside shoulder.
3. Though PPM Figure 2.0.1 only shows "two lanes" for multi-lane ramps, the shoulder configuration (six feet inside shoulder and ten feet outside shoulder) shall also be applied when more than two ramp lanes occur.
4. Twelve feet inside and outside paved shoulders shall 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 paved width are not required. This shoulder width requirement also needs to be applied to bridges when the above conditions occur.
5. A minimum median paved shoulder width of twelve feet is required for delineator separated Express Lanes.

Deviations to the above requirements will require an approved technical memorandum, similar in effort to preparing and processing a standard Design Variation.

2.3.1 Limits of Friction Course on Paved Shoulders

Add the following paragraph

Shoulder pavement on the high side where the shoulder slopes toward the travel lanes, the shoulder pavement will be flush with the adjacent travel way friction course to avoid trapping water on the shoulder.

http://design.floridasturnpike.com/prod_design/roadway/roadwayguidedrawings.html

2.3.2 Shoulder Warning Devices (Rumble Strips)

Add the following paragraph

The minimum thickness of structural asphalt on shoulders where ground-in rumbles strips are to 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 shall be no less than 1.5 inches.

Add the following section

2.3.4 Shoulder Rocking

Cross slope for full width shoulders in a tangent section may be varied from 3% to a maximum of 6%. A minimum longitudinal gutter grade of 0.24% shall be met. The minimum distance between the low point and high point is 100 feet. This criterion applies to sections of the mainline where the profile grade line will require varying the inside or outside shoulder slope as a means of maintaining minimum spread criteria. Design shall include provisions to assure that the reveal of the concrete barrier is not compromised.

For the outside shoulder the Turnpike will allow one of three types of treatment in areas where the outside shoulder slope must be varied in order to meet minimum spread criteria. Options 1 and 2 must be shown as not feasible or workable before Option 3 can be considered.

1. Use concrete barrier wall with inlets. If the shoulder slope must be varied then the above criteria for varying the shoulder slope and longitudinal gutter grade must be met.
2. Use guardrail with shoulder gutter and inlets to collect storm water. If the shoulder slope must be varied then the above criteria for varying the shoulder slope and longitudinal gutter grade must be met.
3. Use guardrail in conjunction with a permanent turf reinforcement mat in fill sections with a front slope steeper than 1:4 and embankment height less than or equal to 10 feet. Storm water will be allowed to flow over the shoulder and the miscellaneous asphalt onto the sodded front slope. Shear stress calculations will be required for the design/selection of the permanent turf reinforcement mat.

2.4 Roadside Slopes

Add the following paragraphs

Though a 1:4 front slope rate can be applied without restrictions per PPM Chapter 4, a 1:6 rate to the edge of a clear zone is required on widening and reconstruction projects. In addition, a 1:2 front slope rate with guardrail can be applied regardless of fill height when constrained conditions exist, which requires approval from FTE Roadway, Drainage and Maintenance.

Sufficient space from face of guardrail to the beginning of the 1:2 slope shall be provided on all guardrail and 1:2 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 shall be constructed within the fill behind the barrier before proceeding with a 1:2 slope.

2.5.1 Limited Access Facilities

Add the following paragraphs

On Turnpike resurfacing and widening projects where additional R/W will not be acquired, the minimum border width will be based on the following criteria:

1. The border width accommodates (1) roadside design components such as signing, drainage features, guardrail, fencing and clear zone, (2) the construction and maintenance of the facility and (3) permitted public utilities.
2. Along ramps and mainline lanes where roadside barriers are used and thus clear zone is not applicable, the minimum border width from the back of a barrier or retaining wall shall be 10’ if maintenance vehicles have sufficient access from public right-of-way that is contiguous and unimpeded to the Turnpike facility.
3. If the maintenance access is not continuous along a barrier or wall, and thus maintenance vehicles and equipment would need to turn around, then a sufficient turnaround area shall be provided that is acceptable and approved by FTE Maintenance.
4. Maintenance accessibility includes the ability for equipment and vehicles to maneuver around obstacles including fences, lights, signs, side slopes and ponds.

This approach does not require a Design Variation.

2.6 Grades

Table 2.6.2 Maximum Change in Grade Without Vertical Curves

Add following note

The minimum distance required between VPI’s used to develop the Profile Grade Line (PGL) is 3 * Design Speed.

2.8.1 Horizontal Curves

Add the following section

2.8.1.4 Express Lane Separation in Horizontal Curves

On Turnpike facilities, Express Lanes will be either barrier separated or buffer separated with delineators. Minimum stopping sight distances requirements per PPM Table 2.7.1 and AASHTO apply. If barrier or delineators impede required sightlines around horizontal curves, then a formal Design Exception or Variation is required.

2.8.2 Vertical Curves

Add the following paragraphs

The minimum vertical curve lengths and minimum K values listed in the notes in PPM Tables 2.8.5 and 2.8.6 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 Freeway K values.

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

2.9 Superelevation

Replace paragraph 2 with the following

The standard superelevation transition places 80% of the transition on the tangent and 20% on the curve. In transition sections where the cross slope is less than 1.5%, a minimum longitudinal grade of 0.5% shall be maintained for new and reconstructed alignments. For widening projects where MOT is shown to be cost prohibitive, the inside and outside edge of pavement shall maintain a minimum grade of 0.3%.

Add the following paragraph

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

2.10 Vertical Clearance

Replace the first sentence of paragraph 2 with the following

For any construction affecting existing bridge clearances (e.g., bridge widenings or resurfacing), vertical clearances less than 16'-6" shall be maintained or increased, unless otherwise approved by the Turnpike Structures Design Engineer.

Table 2.10.2 Minimum Vertical Clearances for Signs

Change the following table

ELEMENTS	CLEARANCE

Overhead Sign Structures	18'-0"

2.11 Horizontal Clearance

Figure 2.11.1 Horizontal Clearance to Guardrail

Replace title with the following

Figure 2.11.1 Horizontal Clearance to Flexible Barriers

2.14 Interchanges and Medians Openings/Crossovers

Add the following section

2.14.5 Crossovers on Turnpike Facilities

Median u-turns throughout the Turnpike 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 along Florida's Turnpike.

Coordination efforts between Turnpike Production Design, Traffic Operations, FHP Troop K, and Service/Maintenance departments, 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 (2004), 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 Florida's Turnpike crossover spacing criteria:

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

All crossovers within a project's limit are to be evaluated by the design consultant for the spacing criteria and for sight distance deficiency. Findings are to be documented and submitted to the Department for review and an internal decision will be made as to relocate or close the location. In the special case of managed lanes with buffers separating the managed lanes from general purpose lanes, crossovers will be prohibited. The design consultant will evaluate alternative crossing locations such as bridge abutments or emergency routes through interchanges.

Emergency Crossover Design Guide Drawings can be found at the following link:

http://design.floridasturnpike.com/prod_design/roadway/roadwayguidedrawings.html

Additional guide drawings are available within the PPM, Chapter 2.

Add the following section

2.17 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 shall be used throughout the entire limits of the project.