Turnpike Design Website

Change/Update Request

To (Assistant Design Engineer): Thomas Pridgen To (Design Manager): Michael Davis

Date: 08/20/07 **Request By:** William Cook - Turnpike Re

Type of Update	Media
☐ New Criteria	☑ Website
☑ Addendum	☑ TPPPH*
☐ Lessons Learned	Attachments: ☑ Yes ☐ No

* **TPPPH Volume:** 1 **TPPPH Chapter:** 2 **TPPPH Section:** 2.14.4

Description of Change/Update

The following should be added to the Design website as an addendum to the Turnpike Plans Preparation and Practices Handbook, Chapter 2, Design Geometrics and Criteria, for median u-turn design requirements on the Turnpike system. The attached document is a signed document by FDOT Central Office that shall serve as concurrence to the spacing criteria used for median emergency, maintenance, and patrolling openings on Turnpike system roadways.

Concurrence

Date: 8/22/07 Design Manager: [signature]

Date: 8/22/2007 Assistant Design Engineer: [signature]

Florida Department of Transportation

CHARLIE CRIST
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

STEPHANIE C. KOPELOUSOS
SECRETARY

MEMORANDUM

DATE: August 15, 2007

TO: Lora Hollingsworth, P.E. Director, Office of Design

FROM: David C. O'Hagan, P.E., State Roadway Design Engineer

COPIES: Jim Mills

SUBJECT: Median U-Turn Design Criteria

The Median U-Turn Design Criteria proposed by Florida's Turnpike Enterprise, in my opinion, should be approved without exception.

Last year, the State Roadway Design Office (SRDO) was asked by FHWA to review our current policies on median crossovers/U-Turns locations on our Interstate Highway System (FIHS). This review consisted of two parts:

1. Develop state design criteria for the location and design of median crossovers/U-Turns. The AASHTO publication "A Policy on the Geometric Design of Highways and Streets" (the AASHTO "Greenbook") contains criteria for the spacing of median crossovers and this criteria formed the basis of our design criteria now found in the Plans Preparation Manual 2.14.4.

2. Study the existing crossover inventory and provide recommendations on their redesign, relocation or removal. The study was initially completed late last year and the attached draft report was delivered to senior management for their review. This report concluded that, although most of our median crossover inventory does not meet the newly published design criteria, a review of accident history from 2005 did not show they were a significant safety concern (only 0.06% of accidents on the IHS occur at crossovers). The draft report recommends that we do not modify our current inventory as the cost of such modifications could be better spent on elements that can improve safety. Unfortunately, the report has not been finalized as the inventory in several districts was not completely accurate and the final report must be.

The Turnpike also submitted their inventory of median crossovers/U-Turns locations for our review. They are not included in the draft report to the FHWA because this route is not on the FIHS. Nonetheless, we reviewed the Turnpike's criteria and discovered that very few of their crossovers meet our design criteria. At the request of the Florida Highway Patrol (FHP) and other emergency service providers, the Turnpike's crossovers are spaced much more closely. Our review of the accident history in crossover locations did show that the turnpike has nearly doubled the rate of accidents at crossovers than on the FIHS. But again, their rate is still very low.

My recommendation to approve the Turnpike's Median U-Turn Design Criteria is based on the following major facts:

- The AASHTO Greenbook crossover spacing criteria (3 to 4 miles minimum) is based solely on old statistics that estimated interchanges were spaced on average every 8 miles or so. It is not based on any research on the safety of such a spacing. This issue was discussed at the AASHTO Technical Committee on Geometric Design Meeting in June 2007. The Technical Committee agreed to recommend revising the next edition of the Greenbook to allow more flexibility in the spacing of crossovers.

- It is well known that lives can be saved if accident victims are treated within "the golden hour" of the accident and if highway speeds are lower. By spacing the crossovers on the Turnpike more closely, we permit emergency service providers quicker access to accidents between crossovers, and we provide the FHP more effective access for enforcement of speed limits.

Oftentimes we also permit the Turnpike to serve as our "laboratory for innovation and change." The accident monitoring program the attached policy commits to provides us with an ideal opportunity to better scrutinize the safety aspects of the AASHTO Greenbook criteria. Nationally, we need to better understand whether closer crossover spacing saves more lives than it potentially costs.

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DRAFT SUMMARY OF FINDINGS
FLORIDA INTERSTATE MEDIAN CROSSOVERS

Introduction

At the request of the Federal Highway Administration (FHWA), the Florida Department of Transportation reviewed its current inventory of median crossovers locations on the state's interstate system. The FDOT conducted this review to:

- Determine if each crossovers met the AASHTO's "A Policy on Geometric Design of Highways and Streets" (Greenbook) and/or the FDOT criteria stated in the Plans Preparation Manual (PPM), Section 2.14.4:
- Study whether the crossovers had safety concerns; and
- Propose potential schemes to redesign, relocate or remove those crossovers that have verified or potential safety concerns.

Following this review, the FDOT will discuss the findings herein with FHWA and develop a strategy for addressing the existing crossover inventory.

Criteria

The AASHTO Greenbook criteria on crossover location, located on pages 510 through 513 of that document, can be summarized as follows:

1. On rural freeways, crossovers are
    a. Normally provided where interchange spacing exceeds 5 miles.
    b. Spaced at 3 to 4 mile intervals between interchanges.
    c. Not located closer than 1,500 ft. to the end of a speed-change taper of a ramp or to any structure.
    d. Not located where below-minimum stopping sight distance exists or on superelevated curves.
2. On urban freeways, crossovers for emergency or maintenance purposes are not generally warranted due to the close spacing of interchange facilities and the extensive development of the abutting street network.

AASHTO intends that the rural criteria be used to "avoid extreme adverse travel for emergency and law-enforcement vehicles." Other criteria are listed in the AASHTO Greenbook regarding the actual geometry of the crossover. This includes not allowing them when the median width is less than 25 ft. These criteria have been in the Greenbook since at least 1984.

The FDOT's PPM specifies that approval by the State Roadway Design Engineer (An "Exception") and FHWA is necessary when the above Greenbook criteria for rural freeways cannot be met anywhere (rural or urban) on the system's Limited Access Facilities. These approvals are also required if the median width is less than 25 ft.

The FDOT's PPM also specifies that approval by the District Design Engineer is necessary (a "Variation") when the following crossover criteria are not met:

1. Located within 1.5 miles of any interchange.
2. Located in Urban areas.
3. Located where the median width is less than 40 ft.

DRAFT SUMMARY OF FINDINGS
FLORIDA INTERSTATE MEDIAN CROSSOVERS

In areas where median barriers are present, the PPM also requires that openings for crossovers should not be greater than five miles apart between interchanges.

Inventory

Each district surveyed the location of each crossover on their interstate system. Once the District completed the location survey, the Roadway Design Office reviewed each location to determine if it would require an Exception and/or Variation if constructed according to new requirements of PPM 2.14.4. The results of this survey and analysis are summarized in the table below.

Florida Interstate Highway System Crossover Inventory Summary

District	Facility	No. Crossovers	"Exceptions"[1]	"Variations"[2]	Acceptable[3]
One	I-75	25	11	1	14
	I-4	2	2	0	0
Two	I-75	33	22	12	10
	I-10	9	8	5	0
	I-95	16	10	6	3
	I-295	3	3	3	0
Three	I-10	28	20	7	7
Four	I-75	23	22	18	1
	I-95	12	3	3	8
	I-595	6	6	6	0
Five	I-75	8	2	0	6
	I-95	11	5	3	5
	I-4	7	4	5	1
Six	I-95	0	N/A	N/A	N/A
	I-75	0	N/A	N/A	N/A
Seven	I-75	2	0	1	1
	I-275	1	1	1	0
	I-4	3	3	3	0
TOTAL		189	122	79	56 (30%)

1. Number of crossovers that would require SRDE & FHWA approvals if constructed according to PPM.
2. Number of crossovers that would require DDE approval, sometimes also with SRDE/FHWA approval, if constructed according to PPM.
3. Number of crossovers that meet the requirements specified in the PPM.

Safety

With an inventory of all crossovers completed, the FDOT's Safety Office next reviewed the potential accident history for each crossover. This review was thorough. Consequently, only accidents in 2005 were reviewed. The results of this review are summarized in the table below.

DRAFT SUMMARY OF FINDINGS
FLORIDA INTERSTATE MEDIAN CROSSOVERS

Florida Interstate Highway System Crossover Accident Summary (2005)

District	Facility	No. Accidents[1]	Accidents @ "Questionable"[2] Crossovers (Injuries)	Accidents @ "Good"[3] Crossovers (Injuries)
One	I-75	1	0	1
	I-4	1	1	0
Two	I-75	1	0	1 (3)
	I-10	1	1 (1)	0
	I-95	2	2 (1)	0
	I-295	2	2	0
Three	I-10	1	1	0
Four	I-75	1	1 (1)	0
	I-95	3	0	3 (2)
	I-595	0	0	0
Five	I-75	0	0	0
	I-95	0	0	0
	I-4	0	0	0
Six	I-95	0	0	0
	I-75	0	0	0
Seven	I-75	0	0	0
	I-275	2	2 (1)	0
	I-4	0	0	0
TOTAL		15	10 (4)	5 (5)

1. Accidents include only those wherein motorists were using the facility.
2. "Questionable" meaning the crossovers do not meet some of the criteria in the PPM.
3. "Good" meaning the crossover meets all criteria in the PPM.

Of the fifteen accidents reported at crossovers in 2005, there were three possible injuries, five non-incapacitating injuries and one incapacitating injury. There were no fatalities. The two accidents on I-295 were at the same location as were two accidents on I-95 in Indian River County (District 4). The overall cross-over accident rate on Florida's Interstates is therefore 0.079 accidents per crossover in 2005.

Analysis

The Department recognizes that there could be a perceived problem with the location of many of our emergency and maintenance use crossovers on the Interstate System. About 70% are not located in accordance with the PPM. During the calendar year 2005, fifteen accidents occurred as a result of motorists using these facilities illegally. This represents approximately 0.06% of the 23,646 documented accidents on Florida's Interstate System in 2005. Of these fifteen accidents, ten (67%) occurred at crossovers that do not meet the PPM criteria (0.04% of accidents on Florida's interstate

system). Therefore, the accident rate does not appear to be readily attributable to whether or not the crossover location meets the PPM criteria. From the fifteen accidents, nine possible or confirmed injuries resulted, but only four (44%) of these occurred at non-compliant crossovers. Therefore, there does not appear to be a correlation between the compliance status of a crossover and the severity of an accident either. However, all five of the injuries at compliant crossovers occurred in two accidents which statistically skew these results.

Conclusions

In general, this limited study of the inventory of median crossovers on Florida's Interstate System concludes that the safety of the public is not compromised by their existing locations. Furthermore, the data suggests immediate statewide closure of non-compliant crossovers would not reduce the number of accidents on the system. Non-compliant crossovers have only been responsible for a fraction of 1% of the accidents on the system. The cost to remove the 122 non-compliant crossovers would better be spent on other more proven safety enhancements on the Interstates.

Local agencies in concert with emergency providers or law enforcement have requested median crossovers in response to a need to provide essential safety services. To simply remove them without a comprehensive plan to relocate them for the convenience of these responsible users may degrade their response times.

However, two crossovers appear to have an unusual accident rate of two in 2005 alone. The crossovers are located at:

- Milepost 5.48, Duval County, on I-295 in District Two, and
- Milepost 19.13, Indian River County on I-95 in District Four.

These Districts will review the multi-year accident history for these locations and determine if they should be relocated, redesigned or removed. We will also direct the districts to include in their resurfacing programs funds for consultants to review the location of crossovers in each project and make recommendations on whether they should be relocated, redesigned or removed. Those that are recommended to remain would follow an Exception or Variation approval process as outlined in Chapter 23 of the Plans Preparation Manual.

The Florida Department of Transportation's Roadway Design Office will make the AASHTO median crossover criteria a topic of discussion at this summer's AASHTO Subcommittee of Design Meeting. The analysis just concluded revealed to us the potential over-conservatism in the location criteria. According to our research, this criteria has been in the AASHTO Greenbook since 1984. In the twenty-two years since, the ability of passenger vehicles to accelerate and stop probably increased significantly. Our emergency responders improved survivability of accident victims by treating injuries within the "golden hour" of the incident. Our police, sheriffs and troopers are constantly being challenged by Highway Safety Plans to increase enforcement. We believe that these concerns also exist in other states, particularly North Carolina.

Finally, the FDOT will begin a long-term study of the safety of median crossovers on the Florida Turnpike System. These non-Federal highways has 238 crossovers along there ??? mile routes. During 2005, we determined that there were 35 accidents at these crossovers (accident rate of 0.147 accidents per crossover). In response to vehicular crossover accidents, the Turnpike installed guardrail, concrete railing or cable-barrier down the median. The Florida Highway Patrol requested that emergency-use crossovers be installed at very close spacings to aid in law enforcement and emergency response. The Turnpike has agreed to report to the Central Office annually on accident locations, severity, and fatalities at their crossovers. This data will be used to scrutinize the crossover policies of both AASHTO and the FDOT.

FLORIDA'S TURNPIKE ENTERPRISE

Operates the statewide Turnpike System as part of the Florida Department of Transportation

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MEMORANDUM

To: Lora Hollingsworth, P.E., Director, Office of Design
Florida Department of Transportation

From: William F. Sloup, P.E., Turnpike Design Engineer WFS

Copies: David O'Hagan, P.E., State Roadway Design Engineer
John Easterling P.E., Turnpike Traffic Operations Engineer

Subject: **Request for Approval of Median U-turns Design Criteria on Florida's Turnpike System**

Date: July 26, 2007

Purpose: The purpose of this memorandum is to request approval on design criteria used for median u-turns on Florida's Turnpike Enterprise systems.

History: 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.

Florida's Turnpike mainline consists of two median configurations. One, a concrete barrier wall separated median, 20 feet to 26 feet wide. The other, a grassed median, 40+ feet wide with double faced median guardrail located at the left or right shoulder line. The concrete barrier wall separated median is located predominantly in South Florida from MP 0.86x just north of the Golden Glades toll plaza (Broward County) to MP 153 (St Lucie County). This section of Florida's Turnpike was closed to crossover traffic with the installation of concrete barrier wall in the 1980's and 1990's. The grass median section is located from MP 153 (St Lucie County) to MP 309 (Sumter County), the terminus of Florida's Turnpike. This section was closed to cross over traffic in 2005 as part of Florida's Turnpike median protection program.

In addition to the Turnpike Mainline, other Turnpike owned and operated facilities, HEFT (SR 821), Sawgrass Expressway (SR 869), Seminole County Expressway (SR 417), Veterans Expressway/Suncoast Parkway (SR 589), Polk County Parkway (SR 470), and Beachline (SR 528), follow one of the previously mentioned median closure configurations. All facilities provide "official use only" openings for policing, service, emergency response, and maintenance vehicles.

Attachment one provides the current locations of median openings along all of these facilities.

Turnpike Criteria:

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. Since the state had not yet developed a policy on crossovers on Limited Access facilities, the Turnpike used the AASHTO (2004) design criteria as the guide for design with the below-mentioned changes applying to Turnpike projects. Therefore, Florida's Turnpike spacing criteria does not adhere to the State's draft policy and the Roadway Design Bulletin 06-09 for Crossovers on Limited Access Facilities. The following is a summary of Florida's Turnpike spacing criteria:

Median Guardrail projects criteria (northern section):

- Mainline Grassed median typically 40 feet in width. HEFT grassed median from 64 feet to 80 feet in width (MP 0 to MP 17).
- Reduced spacing (1 to 2 miles) between u-turns was strongly recommended and agreed upon by Turnpike maintenance and FHP Troop K, the primary users of official use u-turns.
- All existing locations were evaluated for horizontal and vertical geometry. U-turns were installed only at locations where these elements were not restricted and where safety concerns were met.
- Existing locations that did not meet geometric or sight distance criteria were closed and sometimes relocated.
- U-turns are not located within one mile of an interchange.

Concrete Barrier Wall projects criteria (southern section):

- MP 0.86x to MP 153
- As barrier wall locations could not be offset, openings were to be protected with quadguard end terminals on each end of a +/- 20 foot opening.
- Spacing of median concrete barrier wall openings are in dense urban areas between interchanges. These openings were located at a minimum spacing of 1 to 1.5 miles minimum.
- Future barrier wall openings will adhere to Florida's Turnpike 1 to 2 mile spacing criteria.

Summary of Criteria:

Criteria	Turnpike Current	AASHTO (2004)	Proposed FHOT
U-turn spacing	1 to 2 miles apart	3 to 4 miles apart	3 miles apart
Interchange Location	Not within 1 mile	Not within 1500 ft of ramp taper or bridge	Not within 1.5 miles
Median width	≥ 20 feet (cbw separated)	≥ 25 feet	≥ 40 feet

Crash History:

Crash data for the Turnpike Mainline was reviewed for the 2004 and 2005 calendar years. This crash data represents the year before the Turnpike's Median Protection projects and the year of completion, which occurred in 2005. Crashes that involved vehicles making a u-turn, as recorded by the Florida Highway Patrol, were included in the results below. Overall, there was an increase of 5 crashes between 2004 and 2005, with no fatalities. Three of these crashes took place at one location in Broward County where concrete barrier wall separates traffic. This u-turn location is scheduled to be closed with FPID 406195-1 (Broward County Widening) currently in design. The other two crashes occurred at independent locations.

Florida's Turnpike experienced an overall increase in traffic crashes of 27% along the mainline and HEFT from 2004 to 2005. The five additional crashes at u-turn locations is a 23% increase. This is less than the total crash rate increase from 2004 to 2005.

With official use u-turn locations doubling during the median protection program and traffic growth trends of 7% to 11.5% in the concrete barrier wall section and 5.7% to 9.7% in the median guardrail section, the increase of 5 crashes from 2004 to 2005 is not a significant increase in relation to overall crashes for the mainline and HEFT.

State Road 91	20	24
State Road 821	2	3
Total	22	27

Each year, the crash data will be monitored to observe trends and number of crashes for different locations along the Turnpike Mainline and our other facilities. In the future, individual u-turn locations that exhibit a high number of crashes or a substantial increase in crashes involving u-turns will be reanalyzed and, if required, recommended for removal.

Emergency Response:

Florida's Turnpike production design group coordinated extensively with Turnpike's maintenance group and Florida Highway Patrol (FHP) Troop K during the Median Protection Program in 2004. Both groups repeatedly requested additional median u-turn locations. The following outlines comments by FHP Troop K:

- The unfortunate perception of victims in an emergency. Seconds feel like minutes and minutes feel like hours. The ability to quickly u-turn within sight of the victim of a crash or other emergency incident is very reassuring to victims and person who may be rendering aid. A person that is injured has a better chance of survival if they are transported from the incident to the hospital within 60 minutes. "The Golden Hour." This is especially critical in rural areas since flight conditions are often limited.
- By having the ability to U-turn within close proximity to an incident you do not need to park your cruiser in the opposite lane, and jump the guardrail. The crossing of the guardrail can also lead to injury to individual responder. The unattended cruiser may become a hazard in the unaffected lane that can result in secondary crashes, and traffic slowdowns in the lanes that are not affected by the primary incident.
- The officer's ability to place his cruiser in the area of the incident assists in preserving the scene and protecting those involved. It also makes emergency gear more accessible. The emergency lighting on the cruiser helps to assist to move the traffic through the affected scene in a safer more orderly fashion.
- The evenly spaced crossovers also assist to safely evacuate the traffic that has found itself trapped because of a major incident.
- The motoring public also knows that an officer enforcing traffic laws can easily cross-over and overtake a violator, thereby making traffic enforcement more effective and efficient.
- We can all agree that the Guardrails have significantly increased the lives saved on Florida's Turnpike. The

ability to quickly crossover to the scene of major and minor incident has also saved lives.

Supporting reference:

The above concerns have been documented by other states such as North Carolina. In the Report # FHWA/NC 2003-05 published in November 2003, emergency responders in North Carolina provided similar input on North Carolina's median protection program. Response times to emergencies along North Carolina highways prompted some emergency operators to 'dispatch emergency vehicles to both sides of the highway simultaneously to assure adequate patient access and transport. This leads them to tie-up two units for every call'. This report can be viewed on the internet at:
http://www.ncdot.org/doh/preconstruct/tpb/research/download/2002-06FinalReport.pdf

Conclusion:

In summary, Florida's Turnpike Enterprise requests concurrence of official use u-turn spacing, as outlined above, on Florida's Turnpike systems. It is Florida's Turnpike Enterprise objective to provide quick response times for FHP, emergency response teams and maintenance, without sacrificing safety of patrons or personnel. The above criteria represent one of our methods of obtaining this standard. Please indicate FDOT concurrence with Florida's Turnpike criteria by signing this memorandum in the space provided below.

Concurrence by: Lora Hollingsworth Date: 8/16/07

Lora Hollingsworth, P.E., Director, Office of Design
Florida Department of Transportation

Attachments (3):

AASHTO guidelines
FDOT Roadway Design Bulletin 06-09
Median U-turns inventory

Florida Department of Transportation

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SECRETARY

Mail Station 32

ROADWAY DESIGN BULLETIN 06-09

DATE: August 25, 2006

TO: District Design Engineers, Plans Preparation Manual Holders

FROM: David C. O'Hagan, PE, State Roadway Design Engineer

COPIES: Robert Greer, Brian Blanchard, Tim Lattner, William Nickas, Duane Brautigam, Marianne Trussell, Chris Richter, FHWA

SUBJECT: Crossovers on Limited Access Facilities

REQUIREMENTS

The following section addressing the installation of permanent crossovers on Limited Access facilities is added to the Plans Preparation Manual, Volume I, Chapter 2.

2.14.4 Crossovers on Limited Access Facilities

Permanent crossovers on rural freeways are sometimes necessary to avoid excessive travel distances for emergency vehicles, law-enforcement vehicles, and maintenance vehicles. Median crossings shall be allowed only when there is a clear documented request and need for such a feature; however they shall be limited in number and very carefully located. The location of crossovers used for maintenance purposes should consider the needs of emergency and law enforcement vehicles and vice versa. Permanent crossovers should conform to the recommendations of AASHTO's "Geometric Design of Highways and Streets" (see Rural Freeway Medians). The location of all crossovers requires approval of the District Design Engineer. Note, this criteria does not apply to contra flow crossovers placed for facilitating hurricane evacuation, nor does it apply to temporary construction crossovers. For temporary construction crossovers, please see Design Standards Index Numbers 630 and 631.

The following AASHTO crossover recommendations are requirements on FDOT's Limited Access Facilities:

median is also suitable when stage construction will involve the future addition of two 3.6-m [12-ft] traffic lanes.

Exhibit 8-2. Typical Ground-Level Rural Freeway

Where the terrain is extremely rolling, or the land is not suitable for cultivation or grazing, a wide variable median with an average width of 45 m [150 ft] or more, as shown in Exhibit 8-3C, may be attainable. Such a width permits the use of independent roadway alignment, both horizontally and vertically, to its best advantage in blending the freeway into the natural topography. Foreslopes and backslopes used within the clear zone should provide for vehicle recovery. The remaining median width may be left in its natural state of vegetation, trees, and rock outcroppings to reduce maintenance costs and add scenic interest to passing motorists. The combination of independent alignment and a natural park-like median is pleasing to motorists. For driver reassurance, the opposing roadway should be in view at frequent intervals.

Median widths in the range of 3.0 to 9.0 m [10 to 30 ft], as shown in Exhibit 8-3D, may be needed where right-of-way restrictions dictate or in mountainous terrain. These medians are usually paved, and where roadways are crowned, underground drainage should be provided. Considering the usual developing-area traffic volumes as well as operational characteristics in mountainous areas, a median barrier is usually warranted as a safety measure.

To avoid extreme adverse travel for emergency and law-enforcement vehicles, emergency crossovers on rural freeways are normally provided where interchange spacing exceeds 8 km [5 mi]. Between interchanges, emergency crossovers are spaced at 5- to 6.5-km [3- to 4-mi] intervals. Maintenance crossovers may be needed at one or both ends of interchange facilities,

depending on interchange type, for the purpose of snow removal and at other locations to facilitate maintenance operations. Maintenance or emergency crossovers generally should not be located closer than 450 m [1,500 ft] to the end of a speed-change taper of a ramp or to any structure. Crossovers should be located only where above-minimum stopping sight distance is provided and preferably should not be located on superelevated curves.

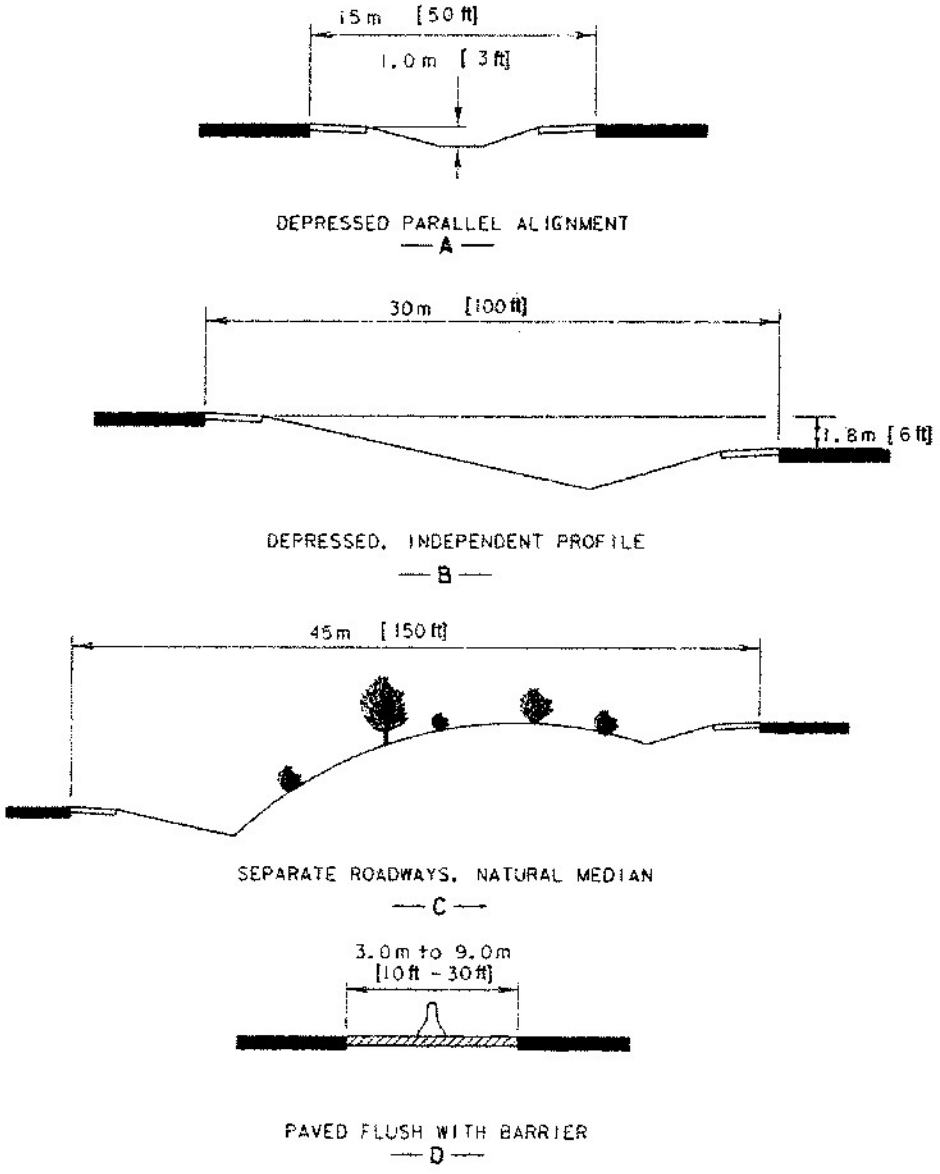

Exhibit 8-3. Typical Rural Medians

The width of the crossover should be sufficient to provide safe turning movements and should have a surface capable of supporting maintenance equipment used on it. The crossover should be depressed below shoulder level to be inconspicuous to traffic and should have 1V:10H or flatter sideslopes to minimize its effect as an obstacle to uncontrolled vehicles. Crossovers should not be placed in restricted-width medians unless the median width is sufficient to accommodate the vehicle length (i.e., 7.5 m [25 ft] or more). Where median barriers are employed, each end of the barrier at the median opening may need a crashworthy terminal. For further information, refer to the AASHTO *Roadside Design Guide* (4).

Sideslopes

Flat, rounded sideslopes, fitting with the topography and consistent with available right-of-way, should be provided on rural freeways. Foreslopes of 1V:6H or flatter are recommended in cut sections and for fills of moderate height, as discussed in Chapter 4. Where fill heights are intermediate, a combination of recoverable and non-recoverable slopes may be used to provide the acceptable vehicle recovery area, (see the AASHTO *Roadside Design Guide* [4] for further information). For high fills, steeper slopes protected by guardrail may be needed. In addition, backslopes of 1V:3H or flatter permit normal landscaping and erosion control practices and ease maintenance operations. In highly productive agricultural areas, steeper slopes may be used, but the combination of foreslope, backslope, and ditch configuration should permit vehicle recovery. Where rock or loess deposits are encountered, backslopes may be nearly vertical, but, where practical, should be located to provide an adequate recovery area for errant vehicles.

Frontage Roads

The need for local service across and along rural freeway corridors is usually considerably less than that along highly developed urban freeways. Therefore, along rural freeways, frontage roads are usually intermittent and relatively short. They either provide access to one or more severed properties or provide continuity of a local road by connecting it with a grade-separated crossroad.

Where a rural freeway is located parallel to and in close proximity to a major highway, the major highway is often converted to a continuous two-way frontage road and serves as a collector facility.

Because of the lack of continuity and the type of service being provided, newly constructed frontage roads are normally two-way facilities in rural areas. Since traffic operations at two-way frontage road intersections with grade-separated crossroads are more complex, such intersections are generally located as far as practical from grade-separation structures and interchange ramp terminals.

Rural frontage roads are generally outside the control-of-access line but within the right-of-way limits. Design details for rural frontage roads are similar to those used for local roads, as discussed in Chapters 3 and 5.

1. Not spaced closer than 3.0 miles apart.
2. Located only in areas with above-minimum stopping sight distance and without superelevated curves.
3. Not located within 1,500 feet to the end of a speed-change taper (of a ramp or facility widening/narrowing) or any structure (bridge, overpassing facility or overhead sign).
4. Not located where the median width is less than 25 feet.

Crossover locations that do not meet the above criteria require approval by the State Roadway Design Engineer and FHWA (FHWA on Interstate facilities only).

The following additional criteria are also placed on crossovers designed for FDOT's Limited Access Facilities:

1. Not located within 1.5 miles of any interchange.
2. Not located where the median width is less than 40'.
3. Not located in urban areas
4. Where continuous median barrier is present, openings for crossovers should not be greater than 5.0 miles apart between Interchanges.

Crossovers that do not meet these additional criteria require approval by the District Design Engineer.

Typical layouts for the design of emergency use crossovers are provided in Figures 2.14.1, 2.14.2 and 2.14.3. These typical layouts will not cover all situations, but are provided as a guide for developing site-specific designs. Designs should accommodate the types of emergency vehicles expected to use the crossover. Law enforcement vehicles and typical ambulance sized vehicles can usually be easily accommodated. The typical layouts in Figures 2.14.1, 2.14.2 and 2.14.3 will accommodate an SU design vehicle. To the extent practical, designs should accommodate larger emergency response vehicles such as fire trucks. This will require acquiring information from local emergency responders on the size and configuration of vehicles used. Except where median widths are wider than normal, fire trucks and other larger vehicles will likely not be able to make u-turns without encroaching or crossing travel lanes. As a minimum, designs should provide for the necessary minimum radii and width to allow the largest design vehicle to enter the crossover and stop as close to perpendicular to traffic as practical. All designs should be tested by superimposing the turning path of the design vehicle to insure the crossover will operate as expected.

On Interstate facilities, the Federal Highway Administration directs that median shoulders approaching the crossover utilize the standard shoulder width, or existing shoulder width. The FHWA believes the safety benefits derived by making the crossovers appear less conspicuous outweigh the benefits obtained by providing paved

shoulders to accommodate acceleration and deceleration lanes for emergency vehicles, law enforcement, or other authorized vehicles.

The profile of the crossover shall conform as close as practical with travel way shoulder slopes and median side slopes so that the crossover is inconspicuous as possible to traffic. The paved width of the crossover should not be any wider than that necessary to provide for the largest design vehicle. Shoulder width for the crossover should be 8' minimum. Side slopes of the crossover (parallel with the mainline travel way) shall be 1V:10H or flatter. However, side slopes may be transitioned to match the slope of a pipe culvert safety end treatment where a culvert crossing underneath the crossover is necessary to provide for proper median drainage.

In locations where a median barrier is present, the length of the barrier opening should be minimized to the extent practical. As shown in Figure 2.14.3, the barrier ends on each side of the opening should be offset to the extent practical. Crashworthy end treatments or crash cushions to shield the barrier ends shall be provided when the ends are within the clear zone and fall within the departure angle used to set length of need. Crashworthy end treatments or crash cushions shall also be provided whenever the angle between barrier ends is less than 30 degrees measured from the direction of mainline travel (see Figure 2.14.3).

Drainage requirements must be determined for each location and appropriate provisions made. The drainage culvert shown in the figures are for example only. Either a mitered end section (1:4) or preferably a u-endwall with grate (1:6) should be used for culverts parallel with the mainline. Note that in some cases existing median ditches are shallow and there will be minimal clearances available for even small size culverts. This requires that site-specific vertical and horizontal geometry be developed for each location rather than use a typical drawing.

A pavement design equivalent to a Limited Access shoulder pavement should be provided (1-1/2" Structural Course, Base Group 1 with a 12" Stabilized Subgrade).

Signing for permanent crossovers shall consist of a "No U-turn" sign (R3-4) with an "Official Use Only" plaque (FTP-66-04). In accordance with MUTCD Section 3D.03, a double yellow delineator should be placed on the left side of the through roadway on the far side of the crossover for each roadway (see figures). To improve nighttime visibility for approaching emergency responders, install yellow RPM's placed outside the yellow edge line in advance of the crossover using the following pattern and spacing: 3 spaced 4" apart @ 1500', 2 spaced 4" apart @ 1000', and 1 @ 500' in advance of the crossover.

On reconstruction and RRR projects, the location of existing crossovers shall be evaluated for conformance to the above criteria. Those that do not meet this criterion must be removed as a part of the project unless approved by the State Roadway Design Engineer and FHWA (FHWA approval on Interstate only).

IMPLEMENTATION

The above requirements are effective immediately on all crossovers that have not been approved as of this date by the FHWA on Interstate Facilities, or the District Design Engineer on non-Interstate Limited Access facilities.

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TURNPIKE U-TURN INVENTORY (HEFT & MAINLINE SYSTEMS)

System	MP	System	MP	System	MP	System	MP	System	MP
HEFT	0.60	Mainline	69.65	Mainline	119.20	Mainline	173.90	Mainline	235.70
HEFT	1.60	Mainline	70.52	Mainline	120.20	Mainline	174.80	Mainline	238.20
HEFT	4.00	Mainline	72.44	Mainline	121.20	Mainline	176.00	Mainline	239.20
HEFT	6.90	Mainline	74.00	Mainline	122.10	Mainline	177.50	Mainline	240.00
HEFT	7.60	Mainline	74.77	Mainline	123.00	Mainline	178.40	Mainline	241.00
HEFT	12.34	Mainline	75.36	Mainline	124.00	Mainline	179.50	Mainline	241.80
HEFT	13.69	Mainline	77.36	Mainline	125.60	Mainline	181.00	Mainline	243.10
HEFT	14.40	Mainline	79.28	Mainline	126.69	Mainline	181.80	Mainline	244.20
HEFT	15.33	Mainline	80.33	Mainline	127.47	Mainline	182.90	Mainline	245.50
HEFT	15.90	Mainline	81.11	Mainline	128.70	Mainline	183.90	Mainline	246.90
HEFT	17.68	Mainline	82.50	Mainline	131.82	Mainline	187.00	Mainline	252.65
HEFT	20.30	Mainline	83.03	Mainline	132.59	Mainline	188.15	Mainline	256.20
HEFT	21.30	Mainline	84.81	Mainline	133.57	Mainline	189.30	Mainline	257.66
HEFT	23.40	Mainline	85.80	Mainline	134.57	Mainline	190.10	Mainline	258.65
HEFT	25.20	Mainline	86.16	Mainline	137.43	Mainline	191.79	Mainline	260.43
HEFT	25.50	Mainline	88.75	Mainline	138.56	Mainline	197.40	Mainline	262.08
HEFT	25.70	Mainline	89.73	Mainline	139.80	Mainline	198.60	Mainline	264.93
HEFT	26.80	Mainline	90.70	Mainline	140.50	Mainline	199.50	Mainline	267.83
HEFT	28.90	Mainline	91.75	Mainline	141.51	Mainline	200.50	Mainline	269.39
HEFT	31.60	Mainline	92.72	Mainline	142.51	Mainline	201.50	Mainline	270.80
HEFT	33.40	Mainline	96.22	Mainline	144.48	Mainline	202.50	Mainline	272.30
HEFT	35.30	Mainline	97.92	Mainline	146.42	Mainline	203.40	Mainline	274.60
HEFT	37.10	Mainline	99.08	Mainline	147.40	Mainline	204.40	Mainline	276.20
HEFT	38.50	Mainline	99.56	Mainline	148.40	Mainline	205.40	Mainline	277.20
HEFT	40.00	Mainline	99.96	Mainline	149.35	Mainline	206.50	Mainline	278.10
HEFT	41.26	Mainline	100.95	Mainline	150.33	Mainline	207.30	Mainline	279.60
HEFT	42.98	Mainline	101.84	Mainline	152.34	Mainline	208.60	Mainline	281.10
HEFT	45.01	Mainline	102.82	Mainline	153.91	Mainline	209.70	Mainline	282.20
HEFT	46.70	Mainline	103.90	Mainline	154.16	Mainline	210.70	Mainline	284.30
Mainline	47.57	Mainline	104.83	Mainline	155.23	Mainline	211.70	Mainline	285.90
Mainline	48.21	Mainline	105.78	Mainline	155.98	Mainline	212.70	Mainline	287.00
Mainline	49.22	Mainline	106.72	Mainline	157.44	Mainline	213.70	Mainline	289.60
Mainline	50.19	Mainline	107.55	Mainline	159.90	Mainline	214.60	Mainline	290.70
Mainline	52.20	Mainline	108.54	Mainline	161.02	Mainline	218.50	Mainline	292.00
Mainline	53.11	Mainline	109.50	Mainline	161.90	Mainline	219.20	Mainline	293.00
Mainline	56.12	Mainline	110.47	Mainline	163.40	Mainline	220.50	Mainline	294.70
Mainline	57.10	Mainline	111.29	Mainline	163.99	Mainline	221.70	Mainline	299.00
Mainline	58.05	Mainline	112.45	Mainline	164.99	Mainline	222.60	Mainline	301.40
Mainline	59.03	Mainline	113.41	Mainline	166.54	Mainline	224.20	Mainline	302.30
Mainline	59.95	Mainline	114.30	Mainline	167.90	Mainline	228.40	Mainline	303.40
Mainline	61.92	Mainline	115.20	Mainline	169.22	Mainline	231.60	Mainline	306.50
Mainline	64.79	Mainline	116.20	Mainline	170.50	Mainline	232.60	Mainline	307.50
Mainline	66.68	Mainline	117.20	Mainline	171.86	Mainline	233.60		
Mainline	67.96	Mainline	118.20	Mainline	172.98	Mainline	234.60		

U-TURN INVENTORY (OTHER SYSTEMS)

System	MP
Polk Parkway	1.45
Polk Parkway	2.47
Polk Parkway	3.58
Polk Parkway	4.74
Polk Parkway	9.35
Polk Parkway	11.34
Polk Parkway	12.26
Polk Parkway	15.49
Polk Parkway	16.95

System	MP
Western Beltway	0.65
Western Beltway	1.87
Western Beltway	2.73
Western Beltway	3.92
Western Beltway	8.84

System	MP
Veterans Spur	1.34

System	MP
Seminole 91	44.51
Seminole 91	46.15

System	MP
Sawgrass	4.63
Sawgrass	12.55
Sawgrass	12.69