

281 Toll Site Roadway

281.1 Roadway Layout

This chapter establishes roadway design requirements within toll site limits. See **FDM 280** for toll program governance and **FDM 947** for toll facility plans requirements.

281.1.1 General Requirements

- (1) Each toll site must be designed to prevent toll avoidance maneuvers as described in **FDM 280.10.3** and the final TSTM.
- (2) Roadway cross sections must be provided at the beginning and end of the toll loop pavement area and at the centerline of the gantry.

281.1.2 Roadway Requirements for Toll Sites

- (1) The preferred location of the toll gantry is on a tangent segment of roadway. If a tangent roadway section is not feasible, then the toll gantry can be located on a curve with a radius greater than or equal to 3,000 feet as measured from edge of toll loop pavement area closest to center of curve.
- (2) The centerline of the gantry must be perpendicular to the final striping of the toll loop pavement area for tangent alignments.
- (3) The centerline of the gantry must be radial to the final striping of the toll loop pavement area for curved alignments.
- (4) Toll loop pavement area may be located within sag and crest vertical curves only when the vertical grade is at least 0.3% at any point within the toll loop pavement area.
- (5) The lane, shoulder, and buffer widths must be constant in the toll loop pavement area.
- (6) At the toll loop pavement area, a minimum 10-foot separation is required between equipped lanes/shoulders and any adjacent non-tolled lanes as shown in Schemes 3 and 4 of **Exhibit 281-1**, except where express lane buffers are used.
- (7) The toll loop pavement is prohibited from being located within super-elevation transitions or any cross-slope transition areas, except for shoulder rocking.
- (8) Toll sites must not be located within queuing areas as identified by the design year traffic analysis.

- (9) Toll sites must not be located within areas where weaving, merging or diverging traffic is likely.
- (10) In a merge area, the gantry centerline must be located a minimum of 200 feet upstream of the first lane drop sign or 50 feet beyond the end of the merge area.
- (11) The gantry centerline must be located a minimum of 200 feet from nearby sign structures, bridges, or toll plaza canopies. Considerations that would increase this minimum distance include the following:
 - (a) The taper of the maintenance pull-off area must tie into the shoulder a minimum of 25' before bridges or similar roadside features.
 - (b) TTC for bridge/sign structure inspection and maintenance that may extend into the toll site.
 - (c) TTC for bridge widening and/or replacements that may extend into the toll site.
- (12) The difference between elevations used to calculate the APE must not exceed 26 inches.
- (13) Express lane toll facilities require the following:
 - (a) Gantries must be located within one (1) mile downstream from the express lane ingress.
 - (b) Gantries must be located within one (1) mile of the last Toll Amount Sign within the EL segment before continuing to the next set of destinations.
 - (c) Ingress to each EL segment must be designed without the need for "data" gantries.
 - (d) The toll site must be coordinated with all existing, interim, and ultimate express lane ingress and egress locations.
- (14) Toll gantries must not block an overhead sign. Minimum distance should be 800 feet for static panels and 1000 feet for dynamic message signs.

Exhibit: 281-1 Toll Loop Pavement Area Separation Layouts

281.1.3 Existing Toll Site Requirements

When milling and resurfacing at an existing toll site, for any cross-slope corrections, barrier replacement and/or changes to the roadway surface within the toll loop pavement area, the following is required:

- (a) The toll loop pavement must be analyzed to determine that all roadway criteria and vertical clearance criteria over the roadway is not impacted.
- (b) Changes to lane striping or non-conformance to vertical clearance criteria and roadway criteria within the toll loop pavement area will require a redesign of the toll site plans which meets all criteria.
- (c) Evaluate if paving operations would damage existing toll loop conduits which would result in the need for installing toll header curb.

Toll sites adjacent to a roadway improvement project must be analyzed to determine if the impacts to the existing sites can be mitigated or if new toll sites are required.

281.2 Toll Loop Pavement Area Dimensions

281.2.1 Pavement Length

The length of the Toll Loop Pavement Area is 100 feet with the gantry located at the midpoint, splitting the 100-foot length into equal 50-foot segments. When the Toll Loop Pavement Area is located in a horizontal curve, the 100-foot minimum length is measured along the outside edge of shoulder pavement closest to the center of curvature.

A 12-inch-wide toll header curb must extend the full length of the toll loop pavement, adjacent to the concrete barrier with loop conduit stub-ups. The toll header curb must be poured after installation of loop conduit stub-ups. See **Exhibit 282-35** and **Exhibit 282-37**.

281.2.2 Pavement Width

The width of the Toll Loop Pavement Area encompasses Toll Lanes, Express Lanes, and all adjacent shoulders and buffers. Where the buffer is less than 10 feet wide, the General Use Lane adjacent to the Express Lane buffer must be designed as a toll lane and be provided with toll equipment and toll loop pavement as shown in Schemes 1 and 2 of **Exhibit 281-1**.

Shoulder widths in the Toll Loop Pavement Area must match the approach and departure roadway shoulder widths (paved and unpaved) except for the following conditions:

- (1) When the median barrier is widened to accommodate toll gantry supports and/or median toll loop pull boxes.
- (2) Single lane ramps must have at least one shoulder with a minimum width of 10 feet. This is to provide adequate space for maintenance vehicle access. Design approach and departure shoulders to support using the widened shoulder under the gantry as a travel lane during maintenance activities to avoid closing the entire ramp.
- (3) When the maintenance pull-off area is located adjacent to the shoulder, shoulder width must be a minimum of 10 feet. This shoulder requirement ends at the trailing edge of the maintenance pull-off area and must be of sufficient length to allow deceleration to a stop condition of maintenance vehicles.

Where guardrail is present, the paved shoulder width must extend to the face of the adjacent guardrail.

The maximum lane width within the toll loop pavement area is 15 feet.

The maximum shoulder width within the toll loop pavement area is 15 feet.

281.2.3 Pavement Thickness

See the ***FDOT Flexible and Rigid Pavement Design Manuals*** for information on the structural design of the pavement within the Toll Loop Pavement Area.

Rigid pavement must be poured after installation of loop conduit stub-ups as identified in ***Exhibit 282-34*** and ***Exhibit 282-36***. Loop conduits and loop conduit stub-ups must be positionally secured and protected from physical damage during concrete pavement installation including the concrete pouring operation.

281.2.4 Toll Loop Pavement Area Restrictions

Do not place rumble strips within the Toll Loop Pavement Area.

The Toll Loop Pavement Area must be free of metal objects at or below grade.

Do not place curb and gutter or shoulder gutter as shown in ***Standard Plans, Index 520-001*** within the Toll Loop Pavement Area except:

- When the toll header curb is required.
- When toll loop infrastructure does not cross the curb and gutter and/or shoulder gutter.

See ***FDM 281*** and ***FDM 282*** for additional requirements for the Toll Loop Pavement Area.

281.2.5 Grading and Drainage of Shoulders

At the shoulder transitions approaching and departing the toll loop pavement area:

- (1) Avoid abrupt elevation and cross slope changes.
- (2) Provide positive drainage to prevent ponding.
- (3) See **Exhibit 281-2** for typical ponding issues to avoid.

Exhibit: 281-2 Approach and Departure Should Transition Drainage Concerns

281.3 Toll Site Signs and Pavement Markings

See **FDM 230.2.8** for Toll Site Signs and Pavement Markings criteria.

281.4 Toll Site Construction Phasing Requirements

The plans and specifications must be prepared to account for the following construction phase requirements.

281.4.1 General Requirements

- (1) Demolition at existing toll site can only begin after the new toll system on the replacement toll site is installed, commissioned, tested and activated such that it is collecting tolls.
- (2) Include in the contract documents schedules for notification and salvage time frames at existing toll sites to be demolished and/or renovated.
- (3) See **FDM 284.1** for gantry types. Lane closure requirements for gantries are as follows:
 - (a) Non-Accessible – Lane closures are required at the toll loop pavement area to perform tolling equipment installation and must be included in the TTCP.
 - (b) Accessible – While some of the activities associated with toll equipment installation can be performed from the gantry, lane closures are required for other activities and must be included in the TTCP. Coordinate with Turnpike Tolls Design for project specific activities requiring lane closure.
- (4) The construction stage phasing must be designed to accommodate the following:
 - (a) Utility relocations, removal of piping, metal objects, etc. within the toll site must be complete and the final riding surface of the pavement with final striping in its final alignment must be constructed at all equipped lanes and shoulders and the site turned over to the Department before the TEC begins toll equipment installation.
 - (b) The TEC must have 21 consecutive TEC working days of exclusive and uninterrupted access per movement, at each toll site for their installation commissioning and testing work.
 - (c) The Department must have 35 consecutive TEC working days of access to the project for End-to-End testing for express lanes.
 - (d) The TEC working days must not include weekends, holidays, special events, and work period shutdowns.

- (e) See the **Toll Facility TSP Library** for additional requirements on the Primary Walk-throughs and Operational Testing Walk-throughs:
 - i. TEB Sites: TEB Package, TSP Section for Project Closeout for TEB Sites.
 - ii. RTC Sites: RTC Package for TSP Acceptance Procedures for Toll Facilities at RTC Toll Sites.
- (5) See **FDM 285.7** for communications criteria during construction phasing.
- (6) Maintain all existing toll operations with no interruption to toll collection during construction.
- (7) Maintain toll operations during construction for express lanes, including dynamic rate setting systems, consistent with the existing tolling plan and operations.

281.4.2 Temporary Traffic Control (TTC)

The traffic control plans and specifications must detail the TTC required for work associated with constructing a toll site including lane and roadway closures and detours to facilitate the following:

- (1) Construction of the gantry.
- (2) TEC's installation, commissioning, and testing for each movement at each toll site.
- (3) Department's End-to-End testing for express lanes.

281.4.3 Toll Site Temporary Traffic Control

281.4.3.1 Temporary Traffic Control Plan (TTCP)

- (1) Develop a TTCP (in accordance with **FDM 240** through **FDM 243**) for all work associated with the toll site construction, TEC activities, and express lanes commissioning and testing activities.
- (2) The installation of the toll gantry foundations must be identified in the construction phasing as early as possible to allow sufficient time for foundation surveys to be included in the toll gantry shop drawings. Additional subphases may be required to accommodate the construction of the toll gantry foundations prior to the construction of the remainder of the toll site.
- (3) TTCP for installation of toll gantry foundations cannot be changed without written approval from the Turnpike Design Engineer.

- (4) TTCP must develop detailed phasing for all activities associated with toll equipment installation, commissioning, and testing which typically requires partial or full closures at all ramp and mainline tolling movements as follows:
 - (a) Separate phasing must be provided in the TTCPs for each tolling movement along with the details and quantities for the TTC at each tolling point.
 - (b) Typical sections for all traffic control sub-phases must be shown for each toll site.
 - (c) The phasing must be coordinated with the Turnpike to determine whether toll equipment installation can be scheduled during off-peak hours, weekends or only at night.
 - (d) Maintain existing toll sites in operation as identified in **FDM 281.4.3** and **FDM 281.4.4** and while construction of new toll sites is undertaken.
- (5) Lane closure analysis must be provided to determine if the toll site or tolling movements require one TTC setup for the duration of the toll equipment installation, commissioning, and testing period or if nightly TTC setups are required during the toll equipment installation, commissioning, and testing period.
- (6) Proposed detours that avoid increased tolling through the detour are preferred. Where such increases cannot be avoided, a Detour Toll Analysis Memorandum (DTAM) with options to address the impact to customers is required. The following scenarios would require an analysis and memorandum to be submitted:
 - (a) The detour sends users to a toll site with a higher toll or through multiple toll sites.
 - (b) The detour sends users away from a toll site to a non-tolled route.
 - (c) The detour reduces the number of tolled lanes.
- (7) During toll equipment installation, commissioning, and testing, approach and departure roadway segments must be available to allow testing vehicles to accelerate to the final roadway condition posted speed prior to entering the tolling loop pavement area and decelerate upon departure. Approach and departure pavement limits are as follows:
 - (a) 3,500 feet of roadway at each mainline tolling gantry (2,000 feet of approach and 1,500 feet of departure).
 - (b) 2,500 feet of roadway at each ramp tolling gantry (1,500 feet of approach and 1,000 feet of departure) or as length of ramp permits for the TEC testing activities' posted speed.

281.4.3.2 Tolling Sub-Phase Requirements

- (1) Partial closures must be designed to allow a full lane or full shoulder in a single sub-phase for TEC installation activities.
- (2) Full closures are required to allow the TEC to test and commission the equipment at each ramp tolling movement.
- (3) Express Lane End-to-End Testing:
 - (a) The phase at which the express lane End-to-End testing takes place must be clearly identified.
 - (b) If existing express lanes are extended or are being concurrently constructed, the End-to-End testing may require full closures of the express lanes beyond the limits of the project. Coordination with the Turnpike must take place to determine the need for closing express lanes beyond the project limits.

281.4.3.3 AET Toll Sites in Production

Traffic control at toll sites that are collecting revenue must comply with the following:

- (1) Lane and shoulder widths must not be modified.
- (2) Shoulders must not be used as travel lanes.
- (3) Vehicle straddling between two lanes or between a lane and a shoulder is not permitted.
- (4) Do not pin temporary barriers within the limits of the toll loop pavement area.

281.4.4 Existing Toll Site Traffic Control

The traffic control at toll sites must accommodate the current lane operation schedule. Consult with the Turnpike for the latest toll site lane operation schedules for all toll sites that are impacted by the project.

Comply with the requirements of **FDM 281.4** for Projects where no work is anticipated at existing tolls sites.

281.4.4.1 General Requirements

- (1) Coordinate with Turnpike Tolls Design prior to Phase II submission for any traffic control phase that includes lane closures at a toll site.

Modification for Non-Conventional Projects:

Replace Item (1) above with the following:

- (1) Coordinate with Turnpike Tolls Design prior to the 90% submission for any traffic control phase that includes lane closures at a toll site.
- (2) Traffic control plans must include specific measures to prevent tolling loops and tolling pavement from being damaged when paving equipment or other heavy equipment is at any toll site.
- (3) When milling and resurfacing the toll loop pavement area, the TTCP phasing and schedule must include the TEC installation, commissioning, and testing periods for the affected toll site.
- (4) When any lane at an existing toll plaza is scheduled to be converted from cash/violations operational mode to "Toll by Plate" operational mode (also known as AET-Lite), the TTCPs must include the traffic control (phasing notes, plans, and details) required during and after AET-Lite conversion.

281.4.4.2 Non-AET Facilities

Traffic control must comply with the following for all lanes at non-AET toll sites:

- (1) The toll collection type (cash or electronic toll collection) must not be changed.
- (2) Electronic toll collection lanes and cash toll lanes must be available in all phases; however, the number of each type of toll lanes needed must be submitted to Turnpike Toll Systems Project Manager for approval by Toll Systems Program Manager with enough total tolled lanes to process current traffic volumes. Written documentation (email or meeting notes documentation) of concurrence from the Toll Systems Program Manager or designee is acceptable.