

CHAPTER

4

Markings

SECTION 4.1

CROSSWALKS IN AREAS WITH HEAVY PEDESTRIAN TRAFFIC

4.1.1 PURPOSE

This section provides guidelines for applying pavement markings and signing near marked crosswalks.

Engineers may consider adding crosswalks at locations other than intersections to provide a defined pedestrian crossing path near busy destinations along the State Highway System, such as beaches or hotels. When locating marked crosswalks, consider nearby sidewalks, paths, guardrails, retaining walls, or shrubbery.

4.1.2 MARKINGS

Design crosswalks as two parallel 1-foot-wide white lines. Place these lines no less than 6 feet apart at intersections and no less than 10 feet apart at midblock locations. Locate the crosswalk where it provides the shortest crossing distance whenever practical. Use special emphasis markings to make the crosswalk more visible to pedestrians and motorists. See ***Standard Plans, Index 522-002*** for sidewalk curb ramp design, and ***Standard Plans, Index 711-001*** for crosswalk pavement marking details.

4.1.3 SIGNING

Install a *PEDESTRIAN CROSSING* sign (***W11-2***) with a downward diagonal arrow plaque (***W16-7p***) immediately adjacent to each marked pedestrian crossing. This sign can be ground-mounted or mounted overhead on a mast arm or span wire.

Install a *PEDESTRIAN CROSSING* sign (***W11-2***) with an *AHEAD* plaque (***W16-9P***) before a marked crosswalk. Engineers may install these in advance of each crosswalk in areas with heavy pedestrian activity. Use engineering judgment to determine if advance crossing sign assemblies are needed. Consider crosswalk spacing, roadside development, and other factors. Consult ***FDOT Design Manual (FDM) Exhibit 230-9*** for the suggested sign placement distance based on approach speeds.

Engineers may install an *END PEDESTRIAN CROSSING* sign to notify motorists that the pedestrian zone has ended. Use 8-inch letters on an 8 x 4-foot sign panel for overhead-mounted signs. Use 4-inch letters on a 3 x 2.5-foot sign panel for ground-mounted signs. Install the sign approximately 200 to 300 feet downstream of the last marked crosswalk.

SECTION 4.2

PAVEMENT WORD, SYMBOL, AND ARROW MARKINGS

4.2.1 PURPOSE

This section provides guidelines on applying roadway pavement word, symbol, and arrow markings to supplement existing highway signing and emphasize regulatory, warning, or guidance messages (***Figure 4.2-1*** and ***Figure 4.2-2***).

Figure 4.2-1. Pavement Word Markings



Consult ***MUTCD Section 3B.20*** for the minimum requirements for roadway pavement word, symbol, and arrow markings. For additional requirements, consult the ***Manual on Speed Zoning for Highways, Roads, and Streets in Florida*** and ***Standard Plans, Indexes 711-001*** and ***711-002***.

Design route shields in accordance with ***Standard Plans, Index 711-001***.

Roadway pavement word, symbol, and arrow markings can substitute vertical signs when overhead signing is impractical or impossible to install, such as when it would impose on navigable airspace.

To apply non-standard word or symbol pavement markings, complete the following:

1. Conduct an engineering study documenting how these markings would improve safety or operations efficiency and submit it to the ***District Traffic Operations Engineer (DTOE)*** for concurrence.
2. Once the ***DTOE*** has concurred, the ***District Traffic Operations Office*** will submit the study to the ***State Traffic Operations Engineer (STOE)*** for concurrence.
    - Once the STOE has concurred, the ***State Traffic Engineering and Operations Office*** will submit an FHWA Request to Experiment (RTE) for approval.
    - If the RTE is approved by FHWA, the ***District Traffic Operations Office*** recommending the design will be responsible for submitting the required interim and final reports to the ***State Traffic Engineering and Operations Office*** for review and submission to FHWA.

Figure 4.2-2. Pavement Symbol and Arrow Markings



4.2.2 LANE USE ARROW AND 'ONLY' PAVEMENT MARKINGS ON INTERSECTION APPROACHES

Use lane use arrow symbols only in through lanes at intersections with overhead lane use control signs, or where unusual geometrics or through lane alignment may confuse motorists. In the latter case, use a straight arrow symbol in through lanes as additional guidance.

The roadway pavement word *ONLY* is not required for an exclusive turn lane if the arrow symbol is used under the following conditions:

- Lane is developed at a midblock location
- Lane is clearly delineated by appropriate channelization
- Lane requires lateral vehicle movement from an established lane for proper positioning to execute the turn

Use the roadway pavement word *ONLY* with the roadway pavement arrow symbol where unusual geometrics or exclusive turn lane alignment may confuse motorists.

Where an established through lane becomes an exclusive turn lane, use the roadway pavement word *ONLY* with the roadway pavement arrow symbol indicating the allowed turning movement.

When using the roadway pavement word *ONLY* with an arrow symbol, pair the pavement markings with the appropriate signs specified in ***MUTCD Section 2B.26***, ***Section 2B.27***, ***Section 2B.28***, ***Section 3B.20***, and ***TEM Sections 2.3.2*** and ***2.3.3***.

Design and placement details for roadway pavement arrows and the *ONLY* message are available in the ***Standard Plans, Index 711-001***.

4.2.3 ROUTE SHIELD PAVEMENT MARKINGS

Install route shield pavement markings as follows:

- Use pre-formed thermoplastic.
- Use 20-foot-long shields for limited access roadways and 15-foot-long shields for arterials and collectors, according to ***Standard Plans, Index 711-001***.
- Align a route shield in the center of the lane.
- Install the route shields horizontally across the roadway; do not stagger them. See ***Figure 4.2-3***.
- If arrows or messages are included to supplement a route shield (*TO*, *LEFT*, *RIGHT*, *NORTH*, *SOUTH*), place them downstream of the route shield. See ***Figure 4.2-4***.

- Leave an 80-foot gap between markings, including sequential route markings for multiple destinations. Reduce this spacing to 20 feet for lower-speed applications, such as left-turn lanes at diamond interchanges, as shown in ***Figure 4.2-6***. Cardinal directions may be 40 feet from a route shield marking.

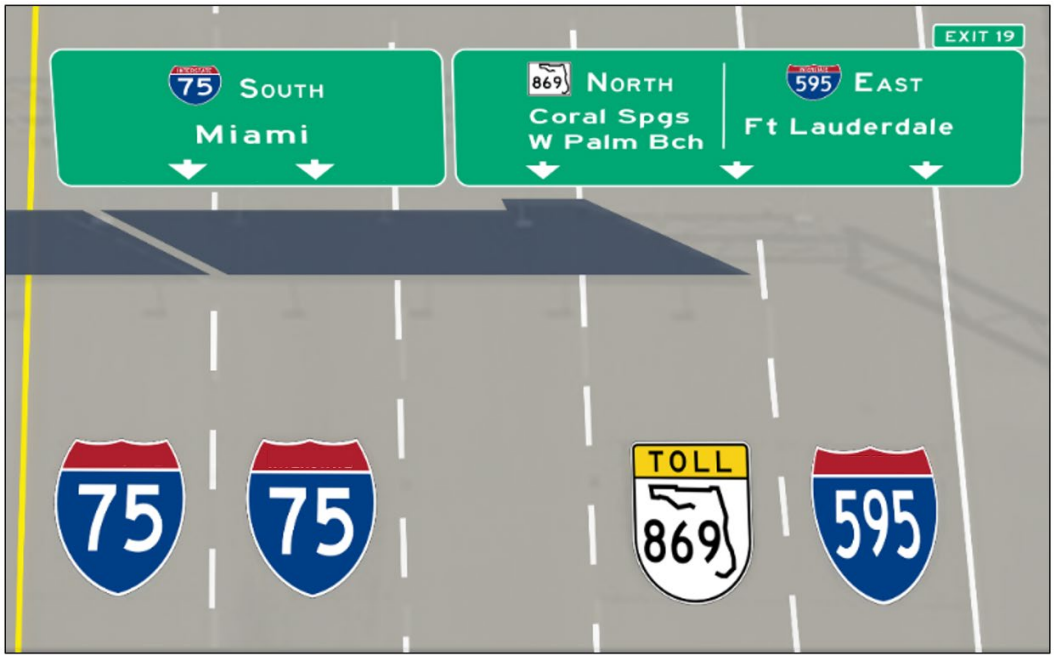
4.2.3.1 Mainline

Coordinate with the ***District Maintenance Office*** before requesting ***DTOE*** approval to install route shield pavement markings on mainlines (***Figure 4.2-3***).

Route shield pavement markings are justified under any of the following conditions:

- There is a reported increase in crash frequency as a result of complex lane assignments such as lane drops, double lane exits with optional lanes, gores where crash cushions are frequently hit, or unusual geometries.
- The optional or excess lane is underutilized, and weaving maneuvers may cause unexpected congestion identified by volume/capacity analyses.
- Lane assignments are complex, or alignment shifts are present.
- An overhead sign structure is not practical, and the turn lane from an arterial to a limited-access on-ramp may appear to provide access to other destinations.

Figure 4.2-3. Route Shield Pavement Markings for Mainline

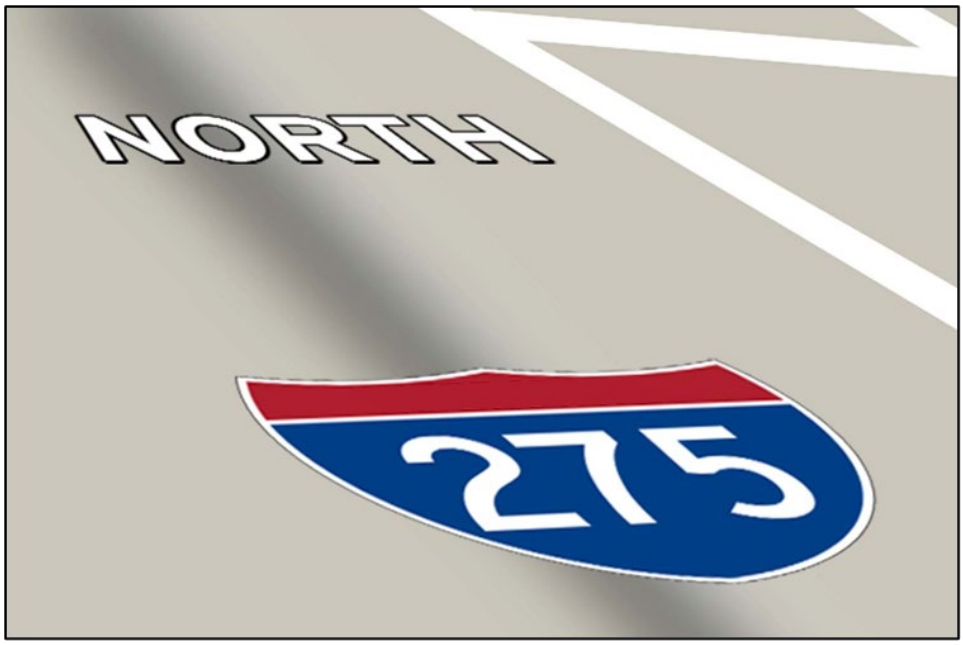


Consider the following when deciding where to install route shield pavement markings:

- Install route shield pavement markings where they will be most visible to motorists.

- Place the markings after at least one interchange overhead guide sign.
- Install the markings within 1 mile upstream of the decision point to allow motorists to safely change lanes, considering existing signs and other traffic control devices.
- Limit installations to two sets of markings (shield with arrow or message) before the gore or decision point.
- Avoid placing the markings under or immediately adjacent to overpasses, as these can cast shadows on the shields. Placing markings on downhill slopes may reduce their effectiveness.

Figure 4.2-4. Cardinal Direction Markings

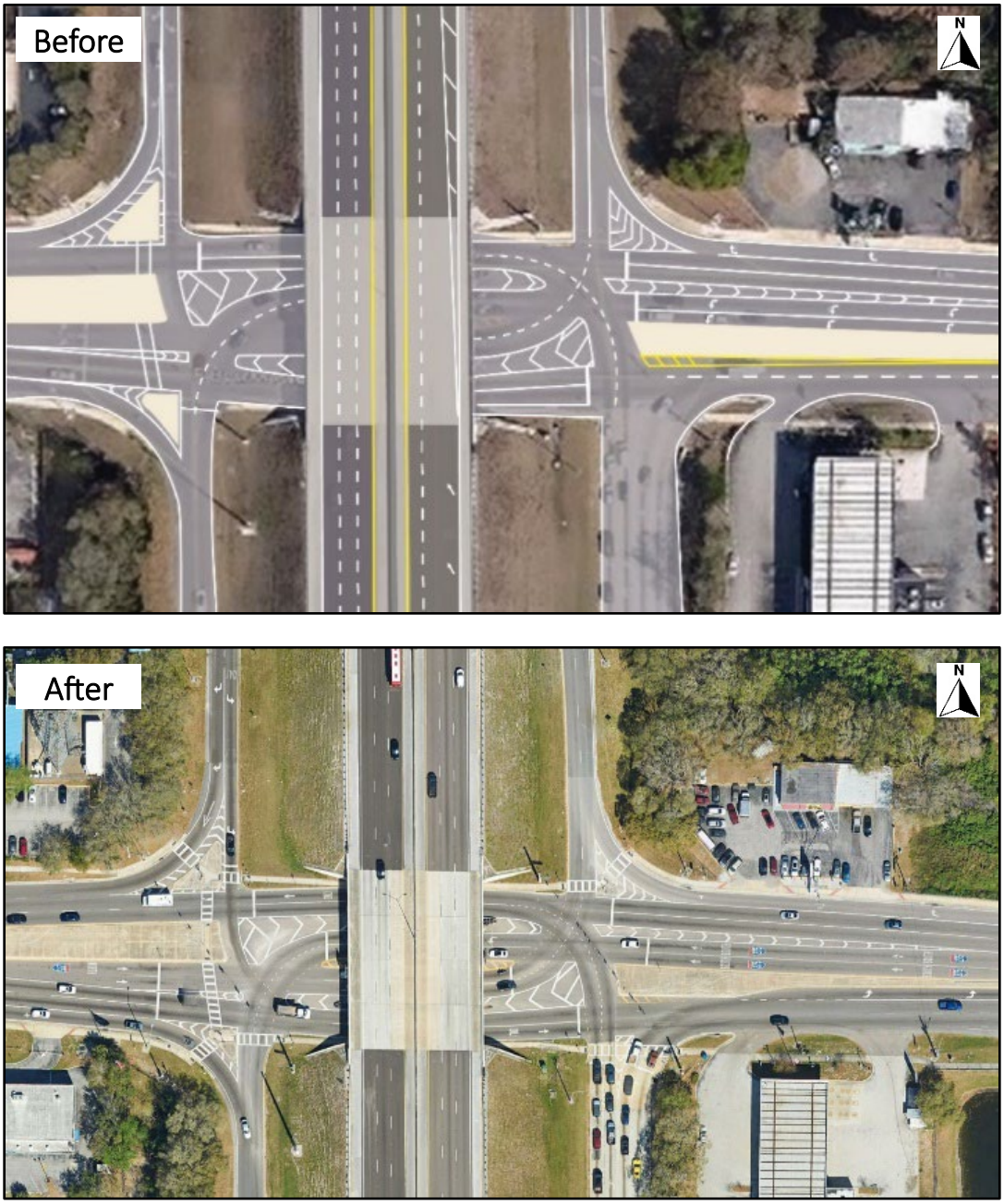


4.2.3.2 Interchange Access

Route shield pavement markings can help prevent wrong-way driving as motorists navigate arterials connected to limited-access facilities. A common example is diamond interchanges, or where turn lane(s) are developed at signals and the actual turning movement occurs at a downstream signal. Apply these treatments in conjunction with appropriate geometric design (e.g., signing, lighting, supplemental channelization) to prevent potential wrong-way driving.

Figure 4.2-5 shows before-and-after plan views at the E Bearss Avenue and I-275 interchange. The “before” image shows the conditions with dual westbound left-turn arrow markings east of the northbound off-ramp. The “after” image shows an interstate shield, cardinal direction, and straight-arrow pavement markings on the eastbound and westbound left-turn lanes. These pavement marking improvements inform motorists that the limited-access on-ramp entrance is available at the downstream signal.

Figure 4.2-5. Before and After Plan View of E Bearss Avenue and I-275 Interchange



Arterial left-turn lane(s) feeding into an interchange on-ramp may have a median opening to allow turning movements from conflicting approaches. When a median opening is present along the arterial left-turn lane(s), install one set of pavement markings per lane (including the interstate shield, cardinal direction, and straight arrow). An example is shown in ***Figure 4.2-6***. Pavement markings for interchange access do not require ***DTOE*** approval.

Figure 4.2-6. Pavement Markings for Interchange Access



SECTION 4.3

SPECIAL RAISED PAVEMENT MARKERS

4.3.1 PURPOSE

This section describes how to uniformly apply blue and internally-illuminated raised pavement markers (IIRPMs) on the State Highway System.

4.3.2 DEFINITIONS

Raised Pavement Marker (RPM): A traffic control device that enhances nighttime and wet weather visibility of roadway striping. RPMs are typically made of plastic, ceramic, or thermoplastic paint, which retroreflects automotive headlights.

Internally-Illuminated Raised Pavement Marker (IIRPM): A steady-burn internally-illuminated RPM. IIRPMs are permitted for use by ***MUTCD Chapter 3B*** as an equivalent alternative to RRPMs. The IIRPMs mentioned in this section are also known as Class F RPMs in ***Standard Specifications, Section 706***.

4.3.3 INTERNALLY-ILLUMINATED RAISED PAVEMENT MARKERS

The retroreflective RPM is FDOT's standard type of raised pavement marker. Limit IIRPM use to mitigation strategies for curves with any of the following:

- Substandard horizontal alignment or superelevation.
- Substandard lane widths.
- Substandard shoulder widths.

Space IIRPMs that supplement or substitute for longitudinal line markings as described in ***MUTCD Sections 3B.15 through 3B.17***. IIRPM installation on roadways within the State Highway System requires a signed and sealed traffic engineering and safety study. Submit the study to the District Traffic Operations Office for approval. ***DTOEs*** will coordinate with the District Maintenance Engineer to determine installation locations.

4.3.4 BLUE RAISED PAVEMENT MARKERS TO IDENTIFY FIRE HYDRANTS

Refer to ***Standard Plans, Index 706-001*** for placement applications.

SECTION 4.4
ROUNDABOUT MARKINGS

FDOT's standards for this section are shown in ***MUTCD Chapter 3C*** and ***FDM 213***.

SECTION 4.5

MANAGED LANES MARKINGS

4.5.1 PURPOSE

This section provides guidance on pavement markings for express or managed lanes. It supplements the standards defined in the ***FDM 211***, ***FDOT Managed Lanes Guidebook***, and ***MUTCD***.

4.5.2 DEFINITIONS

Contiguous Separation: The space between managed lane(s) and general-purpose lanes. Single 8-inch longitudinal pavement markings delineate this space.

Separation Width: The lateral gap between the managed lane(s) and the general-purpose lanes. This area includes the two single 8-inch longitudinal pavement markings and the space in between. The maximum contiguous separation width allowed is 36 inches.

Slip Ramp: An exclusive lane that connects managed lane(s) and general-purpose lanes by using breaks in the separation type.

Toll Gantry: Truss structure supporting toll equipment over the roadway.

Tolling Area: Section of roadway underneath the toll gantry.

Weave Lane: A lane accommodating weaving movements and speed changes as vehicles merge between managed lane(s) and general-purpose lanes.

Weave Zone: Provides simultaneous ingress and egress access between managed lane(s) and general-purpose lanes using a break in the separation type.

4.5.3 *EXPRESS* AND *ONLY* WORD PAVEMENT MARKINGS IN EXPRESS LANES

Install the *EXPRESS* and *ONLY* roadway pavement words before managed lane access points and co-locate them with overhead advance guide signs under the following conditions:

- When a general-purpose lane transitions directly into a managed lane(s).
- When a general-purpose lane directly connects from a surface street (see ***MUTCD Figure 2G-28***).

Install the *EXPRESS* roadway pavement word at the immediate point of entry under the following conditions:

- When the slip ramp transitions directly into a managed lane(s).
- When the slip ramp from a general-purpose lane merges directly into a managed lane(s).

Do NOT install the *ONLY* roadway pavement word under the following conditions:

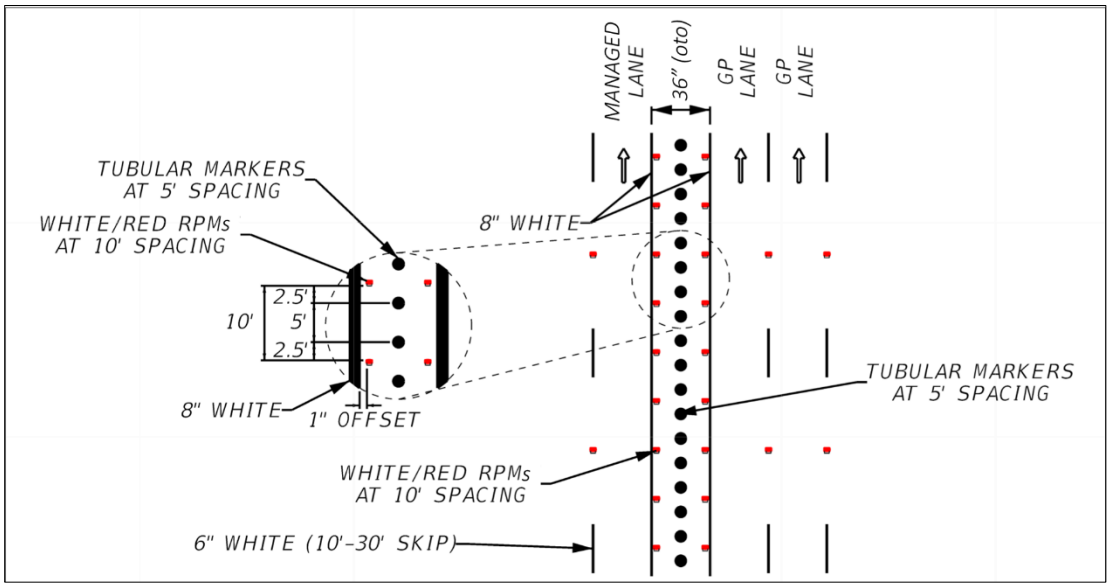
- When the managed lane is accessed by a weave zone.
- When the managed lane is accessed by a weave lane.
- At any point beyond the entry gore where there is no legal option to exit or enter a managed lane(s).

4.5.4 CHEVRONS AND MARKERS

Follow the ***FDM 211*** requirements for chevrons' and pavement markers' placement. Install chevron crosshatch markings with tubular markers (***Figure 4.5-1***) in buffers greater than 4 feet as follows:

- Place 18-inch white chevrons spaced 100 feet apart as follows in buffers 4 feet and wider:
  - **Slip Ramps:** within the slip ramp transition.
  - **Weave Lanes:** within the weave lane transition.
  - **Weave Zones:** extend 1,000 feet on both ends of the weave lane.

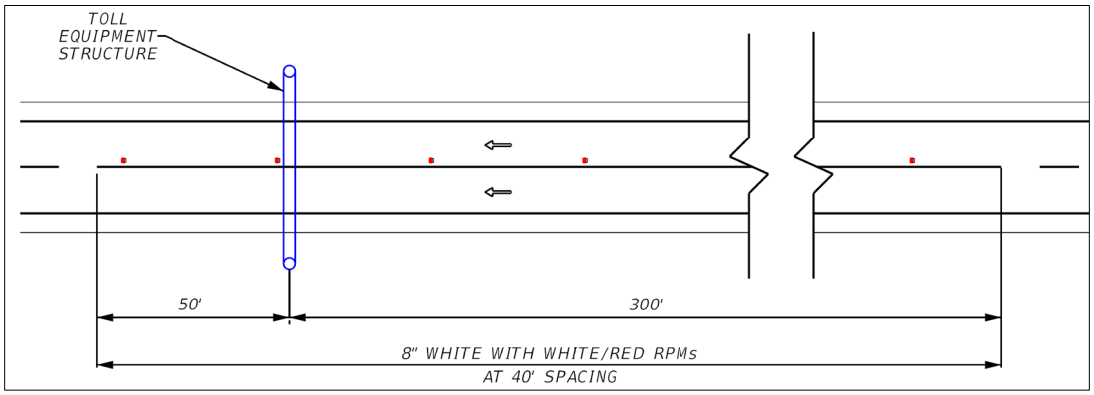
Figure 4.5-1. Separation Detail



4.5.5 PAVEMENT MARKINGS WITHIN THE TOLLING AREA

Where there is more than one managed lane, separate the lanes with a solid 8-inch white stripe 300 feet ahead of the toll gantry and 50 feet past it, as shown in ***Figure 4.5-2***.

Figure 4.5-2. Striping Under the Toll Gantry



Place tubular markers within the tolling area according to the ***FDM 211*** requirements:

- **Up to 8 feet:** Place one tubular marker, as shown in ***Figure 4.5-1***.
- **Between 8 and 12 feet:** Evenly space two tubular markers transversely, as shown in ***Figure 4.5-3***.
- **12 feet and greater:** Evenly space three tubular markers transversely.
- Do not install tubular markers or raised pavement markers on top of vehicle detection loops or their corresponding lead-in saw cut or sealant.

Figure 4.5-3. Tubular Marker Placement within the Tolling Area for Buffer Widths between 8 and 12 feet

