OFFICE OF DESIGN BULLETIN 21-02
TRAFFIC ENGINEERING AND OPERATIONS BULLETIN 21-01
FREIGHT AND MULTIMODAL OPERATIONS BULLETIN 21-01

DATE: February 12, 2021


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SUBJECT: Railroad At-Grade Crossings: Signing and Pavement Markings

This Bulletin introduces revisions to the FDOT Design Manual (FDM) and the FDOT Standard Plans for Road and Bridge Construction (Standard Plans) to further enhance safety at highway-railroad at-grade crossings.

REQUIREMENTS

1. Delete FDM 220.2.1.1 and replace it with Attachment ‘A’.

2. Standard Plans, Index 509-070 (Railroad Grade Crossing Traffic Control Devices) has been updated to remove signing and pavement marking details and is released as an Interim Revision (IR509-070-1) to the FY 2020-21 Standard Plans. See Attachment ‘B’. An Interim Revision
will also replace the original version of the Index published on October 30, 2020 with the FY 2021-22 Standard Plans.

3. Standard Plans, Index 711-001 (Pavement Markings) has been updated to include a ‘Railroad Dynamic Envelope (RDE) Pavement Marking Detail’ and ‘Railroad Crossing Pavement Message’ details. This update is released as an Interim Revision (IR711-001-1) to the FY 2020-21 Standard Plans. See Attachment ‘C’. An Interim Revision will also replace the original version of the Index published on October 30, 2020 with the FY 2021-22 Standard Plans.

IMPLEMENTATION

These requirements are effective immediately for all projects where the Railroad Dynamic Envelope Safety Countermeasures (per Traffic Engineering and Operations Bulletin 20-01, Roadway Design Bulletin 20-02, Program Management Bulletin 20-01, Construction Bulletin 20-02, and Freight and Multimodal Operations Bulletin 20-01) have not been installed. For projects where Railroad Dynamic Envelope Safety Countermeasures have already been installed, this new criteria may be used if the District determines that it will enhance the safety of the railroad crossing.

CONTACT

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TL/TT/RF/gjm
Attachment ‘A’
220.2.1.1 Signing and Pavement Markings

Exhibits 220-1 through 220-4 provide typical signing and pavement markings for Active Grade Crossings. Refer to the MUTCD for definitions and signing and pavement markings at Passive Grade Crossings.

Do not place turning movement lane-use pavement markings on the upstream approach between the railroad crossing pavement message and the tracks.

Where intersections occur between the W10-1 sign shown in Exhibits 220-1 through 220-4 and the tracks, place an additional W10-1 sign between the intersection and the railroad gate.

Include Railroad Dynamic Envelope (RDE) pavement markings at Active and Passive Grade Crossings on:

- State Roads,
- State-owned rails, and
- State-owned property.

Any Variations to not install an RDE are to be approved by the Chief Engineer.

The determination of slightly or significantly skewed is at the discretion of the EOR.

Detail RDE pavement markings in the Plans in accordance with Standard Plans, Index 711-001 and the details shown in Exhibits 220-1 through 220-4. Ensure the details in the plans include the following:

1. Orient RDE pavement markings:

   (a) In the direction of the travel lanes at all approaches upstream of the crossing (i.e., transverse to the travel lanes).

      i. For slightly skewed railroads extend the RDE markings transverse across all lanes, as shown in Exhibits 220-2 and 220-3.

      ii. For significantly skewed railroads, step the RDE markings transverse across each lane, as shown in Exhibit 220-4.

   (b) Along the railroad (i.e., parallel to the railroad tracks) for areas between tracks and downstream of the crossing.
(c) To maximize the visibility of the RDE pattern for both the upstream and downstream sides of the track. Locate markings in a manner to ensure the “X” pattern is identifiable to the motorists and bicyclists and centered in the lanes to the extent practicable.

(2) Place RDE markings through the foul area as shown in Exhibits 220-3 and 220-4. If the railroad owner will not allow the RDE markings through the foul area, or the substrate material will not provide an appropriate bonding surface for the markings, keep the RDE markings outside of the railroad’s foul area as shown in Exhibits 220-1 and 220-2.

(3) Replace all skip lane lines with solid lines for the following distance: From stop bar to stop bar of each approach, then upstream and downstream for a Distance “A” plus 15 feet. For Distance “A”, see table in Exhibit 220-1.

(4) Continue solid longitudinal edge line, lane line, and centerline markings through the RDE pattern, maintaining a 9-inch clear space between the RDE pattern and the longitudinal lane lines or gore areas.

(5) Refurbish all existing longitudinal lane lines, edge lines, and centerlines to remain in-place for the following minimum distance: From stop bar to stop bar of each approach, then upstream and downstream for a Distance “A” plus 15 feet. For Distance “A”, see table in Exhibit 220-1.

(6) Place RPMs at 10’ maximum on center for the following distance: From stop bar to stop bar of each approach excluding the foul area, then upstream and downstream for a Distance “A” plus 15 feet. For Distance “A”, see table in Exhibit 220-1.

(7) For conditions where multiple tracks are configured non-parallel to each other, maintain the typical RDE pattern and fill the gap between the tracks, as necessary.

(8) RDE markings must not interfere with any pedestrian crosswalk.

Consider the following additional provisions for Active and Passive Grade Crossings:

- For significantly skewed angles, corridor highway lighting for the following minimum distance: From stop bar to stop bar of each approach, then upstream and downstream for a Distance “A” plus 15 feet. For Distance “A”, see table in Exhibit 220-1.

- For significantly skewed angles, curves, and intersections directly adjacent to crossings, consider using additional channelization techniques for the roadway alignment. Some channelization techniques include Internally Illuminated RPMs.
and Tubular Markers. When crest vertical curves impede the visibility of RPMs, Tubular Markers should be used. Consider excluding downstream RDE pattern when traffic queuing is not expected.

- Consider the use of through lane-use arrows. For turn lanes, a route shield may be used in conjunction with the through lane-use arrow.

- Remove all existing traffic control signs and pavement markings (e.g., turning signs and turning arrow lane-use pavement markings) from the upstream approach that may lead to driver confusion on the correct turning point for downstream turning movements.

For pavement marking material selection, see *FDM 230*.

For side roads with Active and Passive Grade Crossings within 100 feet of the edge of traveled way, include W10-2, W10-3 or W10-4 signs on the mainline state road in accordance with the *MUTCD*. 
Dimensions not shown for clarity, see Exhibit 220-1.
RAILROAD CROSSING AT URBAN MULTILANE ROADWAY WITH TURN LANE

Dimensions not shown for clarity, see Exhibit 220-1.

EXHIBIT 220-3
02/05/2021
RAILROAD CROSSING WITH SIGNIFICANT SKEW TO THE ROADWAY

Dimensions not shown for clarity, see Exhibit 220-1.

EXHIBIT 220-4
02/05/2021
Attachment ‘B’
TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY

SECTION

1. Signal Unit

2. Flasher Units

3. Bell

4. Automatic Gates

5. Railroad Grade Crossing

NOTES:

1. The location of flashing warning devices and stop lines shall be established based on future (or present) installation of gate with appropriate track clearances.

2. Where plans call for railroad traffic control devices to be installed in curbed medians, the minimum median width shall be 12'-6".

3. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk.  0'-6" - Locate device outside sidewalk. Over 6' - Locate device between face of curb & sidewalk.

4. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail, or 8' from and parallel to gate when present.

5. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 17'-6" from above the Crown of Roadway to the Lowest Point of the Overhead Signal Unit.

6. Where plans call for railroad traffic control devices to be installed in curbed medians, the minimum median width shall be 12'-6".

7. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk.  0'-6" - Locate device outside sidewalk. Over 6' - Locate device between face of curb & sidewalk.

8. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail, or 8' from and parallel to gate when present.

9. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 17'-6" from above the Crown of Roadway to the Lowest Point of the Overhead Signal Unit.

10. Flasher units shall be installed in curbed medians, the minimum median width shall be 12'-6".

11. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk.  0'-6" - Locate device outside sidewalk. Over 6' - Locate device between face of curb & sidewalk.

12. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail, or 8' from and parallel to gate when present.

13. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 17'-6" from above the Crown of Roadway to the Lowest Point of the Overhead Signal Unit.

14. Flasher units shall be installed in curbed medians, the minimum median width shall be 12'-6".

15. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk.  0'-6" - Locate device outside sidewalk. Over 6' - Locate device between face of curb & sidewalk.

16. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail, or 8' from and parallel to gate when present.

17. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 17'-6" from above the Crown of Roadway to the Lowest Point of the Overhead Signal Unit.

18. Flasher units shall be installed in curbed medians, the minimum median width shall be 12'-6".

19. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk.  0'-6" - Locate device outside sidewalk. Over 6' - Locate device between face of curb & sidewalk.

20. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail, or 8' from and parallel to gate when present.

21. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 17'-6" from above the Crown of Roadway to the Lowest Point of the Overhead Signal Unit.

22. Flasher units shall be installed in curbed medians, the minimum median width shall be 12'-6".

23. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk.  0'-6" - Locate device outside sidewalk. Over 6' - Locate device between face of curb & sidewalk.

24. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail, or 8' from and parallel to gate when present.

25. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 17'-6" from above the Crown of Roadway to the Lowest Point of the Overhead Signal Unit.

INDEX

TYPE I

TYPE II

TYPE III

TYPE IV

TYPE V
RAILROAD GATE ARM LIGHT SPACING

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>Dimension &quot;A&quot;</th>
<th>Dimension &quot;B&quot;</th>
<th>Dimension &quot;C&quot;</th>
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<tr>
<td>14 Ft.</td>
<td>6'</td>
<td>36&quot;</td>
<td>5'</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5'</td>
</tr>
<tr>
<td>16-17 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5'</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>28&quot;</td>
<td>41&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>28&quot;</td>
<td>41&quot;</td>
<td>9'</td>
</tr>
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<td>24-28 Ft.</td>
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<td>41&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>29-31 Ft.</td>
<td>36&quot;</td>
<td>41&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>32-34 Ft.</td>
<td>36&quot;</td>
<td>41&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>36&quot;</td>
<td>41&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>41&quot;</td>
<td>9'</td>
</tr>
</tbody>
</table>

NOTE:

MEDIAN SIGNAL GATES FOR MULTILANE UNDIVIDED URBAN SECTIONS
(Three or More Driving Lanes in one direction, 45 mph or less)

RELATIVE LOCATION OF CROSSING TRAFFIC CONTROL DEVICES
Attachment ‘C’
NOTES FOR PAVEMENT MESSAGES:
1. When an arrow or another pavement message is used with a pavement message, maintain a minimum distance of 5' between items. Deduct 6 inches from the base of each item. See the Pavement Message Spacing Table for "S" value.
2. Place all pavement messages 25' back from the stop line.
3. Dimensions are within 1" ±.
4. All grids are 4" x 4".
5. All pavement messages must be white except route shields.
6. Increase width of route shield for routes with three digits.

GENERAL NOTE:
1. See Index 509-070 for pavement markings at railroad crossings.

PAVEMENT MESSAGE SPACING TABLE

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Distance &quot;S&quot; (feet)</th>
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<tbody>
<tr>
<td>20</td>
<td>25</td>
</tr>
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<td>30 - 35</td>
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</tbody>
</table>

FOR INFORMATION ONLY
FOR INTERIM SEE: https://www.fdot.gov/design/standardplans/current/rev.shtm

REVISION

DESCRIPTION:

LAST REVISION: 02/05/21

ADDED RAILROAD PAVEMENT MARKING DETAILS.

FY 2020-21
STANDARD PLANS

PAVEMENT MARKINGS

INDEX 711-001-1

SHEET 1 of 14
YIELD LINES

Yield Lines consist of five 18" X 27" white triangles which face traffic. Equally space triangles within traffic lane. When a bike lane is present, add one additional triangle in the center of the bike lane.
CURB AND GUTTER

FLUSH SHOULDER

**STRIPING FOR BUFFERED BIKE LANE**

**STRIPING WITH NO SHOULDER OR BIKE LANE**

**STRIPING WITH SHOULDER OR NON-BUFFERED BIKE LANE**

NOTES:

1. Lane widths (X) may not be same for each lane in the section.
2. For placement of RPMs, see Index 706-001.
INTERSECTION APPROACH STRIPING WITH TURN LANE AND BUFFERED BIKE LANE KEY HOLE

NOTES:

1. Lane widths (X) may not be same for each lane in the section.
2. For placement of Express Lane markers and associated RPMs, see the Plans.
3. For placement of RPMs, see Index 706-001.
4. For placement of Express Lane markers and associated RPMs, see the Plans.

BUFFERED EXPRESS LANE STRIPING

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

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https://www.fdot.gov/design/standardplans/current/rev.shtm

DocuSign Envelope ID: 28670F11-A8C2-4908-A636-3391EB06F1AF
DESCRIPTION:

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

CURB AND GUTTER SHOWN

PAVEMENT MARKINGS

INDEX

FY 2020-21

STANDARD PLANS

FOR INFORMATION ONLY
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PAVEMENT MARKINGS AND DELINEATORS FOR MEDIAN CROSSES

**DETAIL "B"**

- **Non-Paved Surface Foundation**
- **Tubular Marker (Yellow)**

**DETAIL "C"**

- **Tubular Marker (Yellow)**
- **Delineator Post**

**NOTE:**

1. Apply yellow reflective paint to the noses of curbed medians, traffic separators, and raised islands. When applying yellow reflective paint in conjunction with Raised Pavement Markers, refer to Index 706-001.

2. Options for grassed medians:
   A. Option 1: Tubular Marker (Yellow). Attach Tubular Marker according to manufacturer’s instructions. Non-Paved Surface Foundation (See Detail “F”) is provided as an option if no other suitable surface is provided. Install Non-Paved Surface Foundation flush with the surrounding ground surface.
   B. Option 2: Delineator Post. Use yellow retro-reflective sheeting on both sides of the delineator. Mount the post so that the top is 4'-0" above the grade at the edge of the pavement.

3. Extend double yellow centerlines 100' back from intersection on all approaches or 50' for unmarked cross roads.

PAVEMENT MARKINGS FOR INTERSECTIONS WITH MAJOR AND MINOR ROADS

**INDEX 711-001-1**

**FOR INFORMATION ONLY**

**FOR INTERIM SEE:**

https://www.fdot.gov/design/standardplans/current/rev.shtm

- Added railroad pavement marking details.
- FY 2020-21
- STANDARD PLANS
- 7 of 14
**REVISED DESCRIPTION:**

**STANDARD PLANS FY 2020-21 SHEET INDEX**

**PAVEMENT MARKINGS**

**NOTE:** See Sheet 1 for "S" value.

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**TWO WAY LEFT TURN LANE**

*(With Single Lane Left Turn Channelization)*

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**RIGHT TURN LANE DROP AND ISLAND DETAILS**

*LEFT TURN LANE DROP IS MIRROR IMAGE*

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**TRAFFIC CHANNELIZATION AT GORE**

**NOTE:** See Sheet 1 for "S" value.
**NOTE:**

Make pavement markings yellow for left roadway centered on existing roadway. Right roadway centered on existing roadway is similar with white pavement markings.

### Left Roadway Centered on Existing Roadway

**Design Speeds**

<table>
<thead>
<tr>
<th>Design Speed (MPH)</th>
<th>Post Speed Limit (MPH)</th>
<th>&quot;L&quot; (FT)</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>40</td>
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</tbody>
</table>

**Length "L"**

White Delineators Shall Be Used Throughout The Transition Where Design Speeds Are Greater Than 50 mph.

### Right Roadway Centered on Existing Roadway

**Design Speeds**

<table>
<thead>
<tr>
<th>Design Speed (MPH)</th>
<th>Post Speed Limit (MPH)</th>
<th>&quot;L&quot; (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
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<tr>
<td>40</td>
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<td>20</td>
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</tbody>
</table>

**Length "L"**

White Delineators Shall Be Used Throughout The Transition Where Design Speeds Are Greater Than 50 mph.

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**Markings for Traffic Separation**

**Detail "D"**

**Detail "E"**

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**FOR INTERIM SEE:**

https://www.fdot.gov/design/standardplans/current/rev.shtm

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**Pavement Markings**

**FY 2020-21**

**Standard Plans**

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**Added railroad pavement marking details.**
STANDARD CROSSWALK DETAILS

NOTES:
1. For crosswalk width, exceed width of the adjacent sidewalk, but do not make width less than 6' for intersection crosswalks and 10' for midblock crosswalks. Measure width from the inside of the transverse crosswalk markings.
2. When the Special Emphasis Crosswalk is not perpendicular to the lane lines, make the longitudinal markings parallel to the lane lines.
3. Refer to Index 322-002 when Curb Ramps are present.

SPECIAL EMPHASIS CROSSWALK DETAILS
NOTES:
1. This Index also applies to right turn lanes.
2. Make pavement marking yellow for left-turn lanes and white for right-turn lanes.
3. See Sheet 1 for "S" value.
4. Space arrows evenly between the first and last arrow with a minimum spacing of "S" between arrows.
5. For turn lanes greater than 225' in length, use a minimum of three arrows. Use additional arrows in accordance with the Plans or as directed by the Engineer. Space arrows evenly throughout the available length with a minimum spacing of "S" between arrows.

DESCRIPTION:

FOR INFORMATION ONLY
FOR INTERIM SEE:
https://www.fdot.gov/design/standardplans/current/rev.shtm

TURN LANE MARKINGS

SINGLE LEFT TURNS

DOUBLE LEFT TURNS
DESCRIPTION:

1. Dimensions are to the centerline of markings.

2. An Access Aisle is required for each accessible space when angle parking is used.

3. Criteria for pavement markings only, not public sidewalk curb ramp locations. For ramp locations refer to plans.

4. Tint blue pavement markings to match color 15180 of Federal Standards SRSA.

5. Mount FTP-22-06 sign below the FTP-21-06 sign.

6. Use of the pavement symbol in accessible parking spaces is optional. When pavement symbol is used, the symbol is either 3'-0" or 5'-0" high and white in color.
NOTES:
1. All grids are 4" x 4".
2. Pavement Marking Should Not Extend Into Opposing Lane.
3. Center School Pavement Marking In lane.
NOTE:
Orient Railroad Dynamic Envelope Marking as shown in the Plans.

RAILROAD DYNAMIC ENVELOPE (RDE) PAVEMENT MARKING DETAIL

Area = 89 S.F.

RAILROAD CROSSING PAVEMENT MESSAGE

Added railroad pavement marking details.

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