Chapter 7

Rail-Highway Crossings

Figures

Tables

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7 Rail-Highway Crossings

7.1 ~~A~~ Introduction

The basic design for grade crossings should be similar to that given for highway intersections in **Chapter 3 – Geometric Design**. Rail-highway grade crossings should be limited in number and should, where feasible, be accomplished by grade separations. Where at-grade crossings are necessary, adequate traffic control devices and proper crossing design are required to limit the probability of crashes.

7.2 ~~B~~ Objective and Priorities

The primary objective in the design, construction, maintenance, and reconstruction of rail-highway crossings is to provide safety for both rail and roadway vehicles in a feasible and efficient manner. The achievement of this objective may be realized by utilizing the following techniques in the listed sequence of priority.

7.2.1 ~~B.1~~ Conflict Elimination

The elimination of at grade rail-highway conflicts is the most desirable procedure for promoting safe and efficient traffic operations. This may be accomplished by the closing of a crossing or by utilizing a grade separation structure.

7.2.2 ~~B.2~~ Hazard Reduction

The design of new at-grade crossings should consider the objective of hazard reduction. In addition, an effective program of reconstruction should be directed towards reducing crash potential at existing crossings.

The regulation of intersections between railroads and all public streets and highways in Florida is vested in the ***Florida Administrative Code, (Rule Chapter 14-57: Railroad Safety and Clearance Standards, and Public Railroad-Highway Grade Crossings***. This rule contains minimum requirements for all new grade crossings.

The FDOT 's rail office has other documents available that contain additional guidance for the design, reconstruction, and upgrading of existing rail-highway grade crossings, and may be contacted for further information.

7.3 ~~C~~ Rail-Highway Grade Crossing Near or Within Project Limits

Federal-aid projects must be reviewed to determine if a rail-highway grade crossing is within the limits of or near the terminus of the project. If such rail-highway grade crossing exists, the project must be upgraded to meet the requirements of the ***Manual on Uniform Traffic Control Devices*** ~~***(2009 Edition with Revision Numbers 1 and 2, May 2012)***~~ ***(MUTCD)*** in accordance with **Title 23, United States Code (U.S.C.), Chapter 1, Section 109(e)** and ***23 C.F.R. 646.214(b)***.

These requirements are located in **Part** ~~**Chapter**~~ **8** of the **MUTCD**. "Near the terminus" is defined as being either of the following:

- If the project begins or ends between the crossing and the MUTCD-mandated advanced placement distance for the advanced (railroad) warning sign. See **MUTCD, Table 2C-3** ~~**Table 2C-4**~~ **(Condition B, Column "0" mph)** for this distance.
- An intersection traffic signal within the project is linked to the crossing's flashing light signal and gate.

7.4 ~~D~~ Design of Rail-Highway Crossings

The primary requirement for the geometric design of a grade crossing is that it provides adequate sight distance for the motorist to make an appropriate decision as to stop or proceed at the crossing.

7.4.1 ~~D.1~~ Sight Distance

The minimum sight distance requirements for streets and highways at rail-highway grade crossings are like those required for highway intersections (**Chapter 3 – Geometric Design**).

7.4.1.1 ~~D.1.a~~ Stopping Sight Distance

The approach roadways at all rail-highway grade crossings should consider stopping sight distance no less than the values given in **Chapter 3, Table 3 – 3 Minimum Stopping Sight Distances** for the approach to stop signs. This distance shall be measured to a stopping point prior to gates or stop bars at the crossing, but not less than 15 feet from the nearest track. All traffic control devices shall be visible from the driver eye height of 3.50 feet.

7.4.1.2 ~~D.1.b~~ Sight Triangle

At grade crossings without train activated signal devices, a sight triangle should be provided.

The provision of the capability for defensive driving is an important aspect of the design of rail-highway grade crossings. An early view of an approaching train is necessary to allow the driver time to decide to stop or to proceed through the crossing.

The size of this sight triangle, which is shown in **Figure 7 – 1 Visibility Triangle at Rail-Highway Grade Crossings**, is dependent upon the train speed limit, the highway design speed, and the highway approach grade. The minimum distance along the highway (d_H), includes the requirements for stopping sight distance, the offset distance (D) from the edge of track to the stopped position (15 feet), and the eye offset (de) from the front of vehicles (8 feet); (**Figure 7 – 1, Case A**). The required distance (d_T) along the track, given in **Table 7 – 1 Sight Distance at Rail-Highway Grade Crossings**, is necessary to allow a vehicle to stop or proceed across the track safely. Where the roadway is on a grade, the lateral sight distance (d_T) along the track should be increased as noted (**Table 7 – 1**). This lateral sight distance is desirable at all crossings. In other than flat terrain it may be necessary to rely on speed control signs and devices and to predicate sight distance on a reduced speed of operation. This reduced speed should never be less than 15 mph and preferably 20 mph.

7.4.1.3 ~~D.1.c~~ Crossing Maneuvers

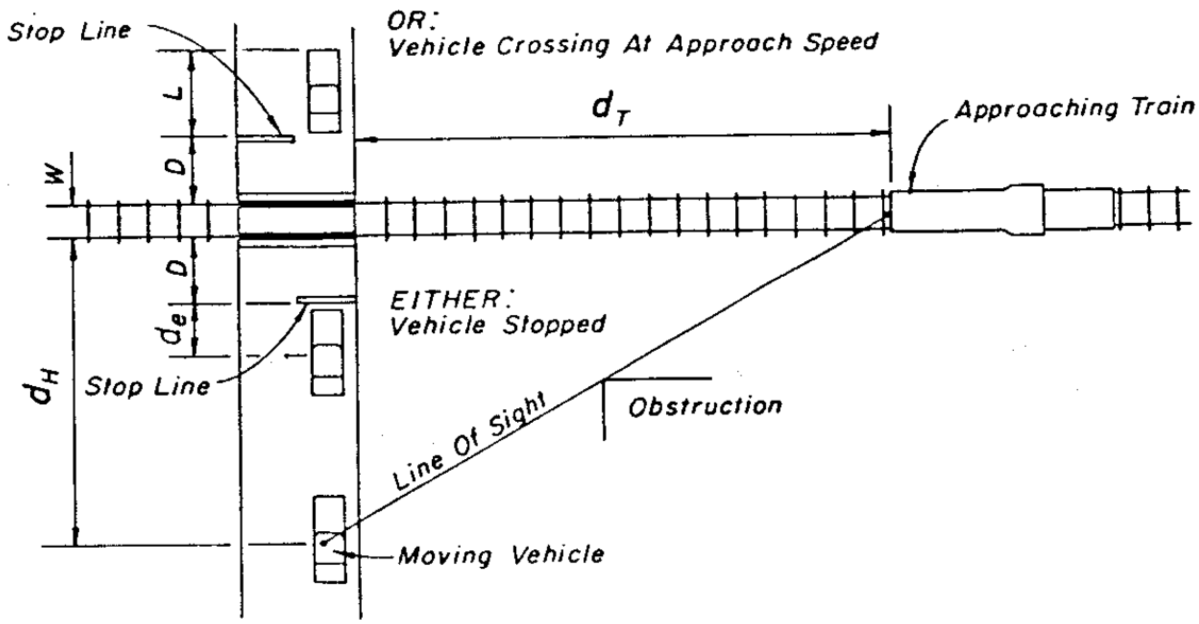
The sight distance required for a vehicle to cross a railroad from a stop is essentially the same as that required to cross a highway intersection as given in **Chapter 3 – Geometric Design**.

An adequate clear distance along the track in both directions should be provided at all crossings. This distance, when used, shall be no less than the values obtained from **Figure 7 – 1 Visibility Triangle at Rail-Highway Grade Crossings** and **Table 7 – 1 (Case B), Sight Distance at Rail-Highway Grade Crossings**. Due to the greater stopping distance required for trains, this distance should be increased wherever possible.

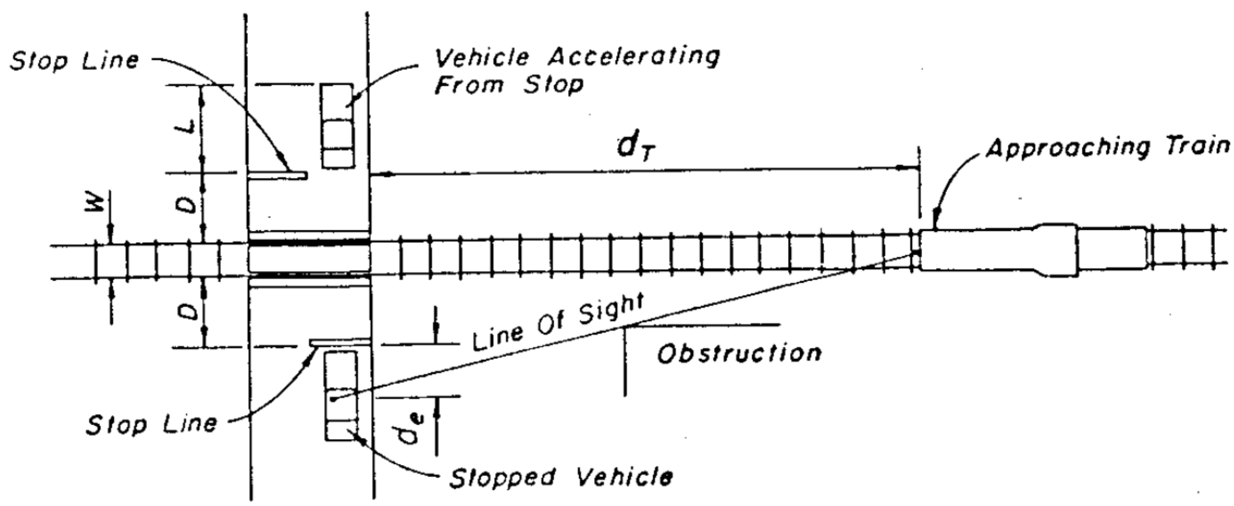
The crossing distance to be used shall include the total width of the tracks, the length of the vehicle, and an initial vehicle offset. This offset shall be at least 10 feet back from any gates or flashing lights, but not less than 15 feet from the nearest track. The train speed used shall be equal to or greater than the established train speed limit.

The setback for determining the required clear area for sight distance should be at least 10 feet more than the vehicle offset. Care should be exercised to ensure signal supports and other structures at the crossing do not block the view of drivers preparing to cross the tracks.

Figure 7-1 Visibility Triangle at Rail-Highway Grade Crossings



Case A
Approaching vehicle to safely cross or stop at railroad crossing



Case B
Vehicle departing from stopped position to safety cross railroad track

Notes:

1. For d_H and d_T values and crossing conditions, see **Table 7-1**.

Table 7-1 Sight Distance at Rail-Highway Grade Crossings

Design Sight Distances for Combinations of Train and Highway Vehicle Speeds Conditions:								
Single Track 90° Crossing Design Vehicle WB-62FL and WB-67 (L=73.5' d_e=8') Flat Highway Grades			Track Width (W) = 5' Vehicle Stop Position (D) = 15' No Train Activated Warning Devices					
Train Speed (mph)	Case B Vehicle Departure From Stop	Case A Moving Vehicle						
	Vehicle Speed (mph)							
	0	10	20	30	40	50	60	70
	d_t (feet) Sight Distance Along Railroad Track							
10	255	155	110	102	102	106	112	119
20	509	310	220	203	205	213	225	239
30	764	465	331	305	307	319	337	358
40	1019	619	441	407	409	426	450	478
50	1274	774	551	509	511	532	562	597
60	1528	929	661	610	614	639	675	717
70	1783	1084	771	712	716	745	787	836
80	2038	1239	882	814	818	852	899	956
90	2292	1394	992	915	920	958	1012	1075
100	2547	1548	1102	1017	1023	1064	1124	1194
110	2802	1703	1212	1119	1125	1171	1237	1314
120	3057	1858	1322	1221	1227	1277	1349	1433
130	3311	2013	1433	1322	1329	1384	1461	1553
d_H (feet) Sight Distance Along Highway								
	69	135	220	324	447	589	751	69

Notes:

1. Sight distances are required in all quadrants of the crossing.
2. Corrections must be made for conditions other than shown in the table, such as, multiple rails, skewed angle crossings, ascending and descending grades, and curvature of highways and rails. For condition adjustments and additional information refer to Railroad-Highway Grade Crossings under **Chapter 9** of **"A Policy on Geometric Design of Highways and Streets", AASHTO (2018 ~~2011~~)**. Additional information is available on FHWA's website for ***Highway-***

Rail Grade Crossing Surfaces and ***NCHRP Synthesis 250 Highway – Rail Grade Crossing Surfaces, TRB, (1998)***."

Source: Developed from Table 9 – 29 ~~Table 9 – 32~~, A Policy on Geometric Design of Highway and Streets, AASHTO (2018 ~~2011~~).

7.4.2 ~~D.2~~ Approach Alignment

The alignment of the approach roadways is a critical factor in developing a safe grade crossing. The horizontal and vertical alignment, and particularly any combination thereof, should be as gentle as possible.

7.4.2.1 ~~D.2.a~~ Horizontal Alignment

The intersection of a highway and railroad should be made as near to the right angle (90 degrees) as possible. Intersection angles less than 70 degrees should be avoided. The highway approach should, if feasible, be on a tangent, because the use of a horizontal curve tends to distract the driver from a careful observation of the crossing. The use of superelevation at a crossing is normally not possible since this would prevent the proper grade intersection with the railroad.

7.4.2.2 ~~D.2.b~~ Vertical Alignment

The vertical alignment of the roadway on a crossing is an important factor in safe vehicle operation. The intersection of the tracks and the roadway should constitute an even plane. All tracks should, preferably, be at the same elevation, thus allowing a smooth roadway through the crossing. Where the railroad is on a curve with superelevation, the vertical alignment of the roadway shall coincide with the grade established by the tracks.

Vertical curvature on the crossing should be avoided. This is necessary to limit vertical motion of the vehicle.

The vertical alignment of the approach roadway should be adjusted when rail elevations are raised to prevent abrupt changes in grade and entrapment of low clearance vehicles.

The roadway approach to crossing should also coincide with the grade established by the tracks. This profile grade, preferably zero, should be extended a reasonable distance (at least two times the design speed in feet) on each side of the crossing. Where vertical curves are required to approach this section, they should be as gentle as possible. The length of these vertical curves shall be of sufficient length to provide the required sight distance.

7.4.3 ~~D.3~~ Highway Cross Section

Preserving the continuity of the highway cross section through a grade crossing is important to prevent distractions and to avoid hazards at an already dangerous location.

7.4.3.1 ~~D.3.a~~ Pavement

The full width of all travel lanes shall be continued through grade crossings. The crown of the pavement shall be transitioned gradually to meet the cross-sectional grade of the tracks. This pavement cross slope transition shall be in conformance with the requirements for superelevation runoff. The lateral and longitudinal pavement slopes should be designed to direct drainage away from the tracks.

7.4.3.2 ~~D.3.b~~ Shoulders

All shoulders shall be carried through rail-highway grade crossings without interruption.

The use of full-width paved shoulders is required at all new crossings to maintain a stable surface for emergency maneuvers. The shoulders should be paved a minimum distance of 50 feet on each side of the crossing, measured from the outside rail. It is desirable to pave 100 feet on either side to permit bicycles to exit the travel lane, slow for their crossing, and then make an adequate search before selecting a gap for a return to the travel lane. See **Chapter 3, Table 3 – 22 Minimum Shoulder Widths for Flush Shoulder Highways** ~~**Table 3 – 11 Shoulder Widths for Rural Highways**~~ for further information on shoulder width.

7.4.3.3 ~~D.3.c~~ Medians

It is recommended that the full median width on divided highways should be continued through the crossing. The median should be contoured to provide a smooth transition on the tracks.

A raised median is the ideal deterrent to discourage motorists from driving around the gates to cross the tracks or making a U-turn prior to the tracks. Flush medians should have channelization devices as a deterrent. Railroad signals and gate assemblies should be installed in the median only when gate arms of 36 feet will not adequately span the approach roadway.

Figure 7-2 Flush Median Channelization Devices

Alexander Street, SR 39A, Plant City, FL 1

7.4.3.4 ~~D.3.d~~ Sidewalks and Shared Use Paths

To provide an accessible route for pedestrians at grade rail-highway crossings, new or existing sidewalks and shared use paths shall be continued across the rail crossing. The surface of the crossing shall be:

- firm, stable and slip resistant,
- level and flush with the top of rail at the outer edges of the rails, and
- area between the rails align with the top of rail.

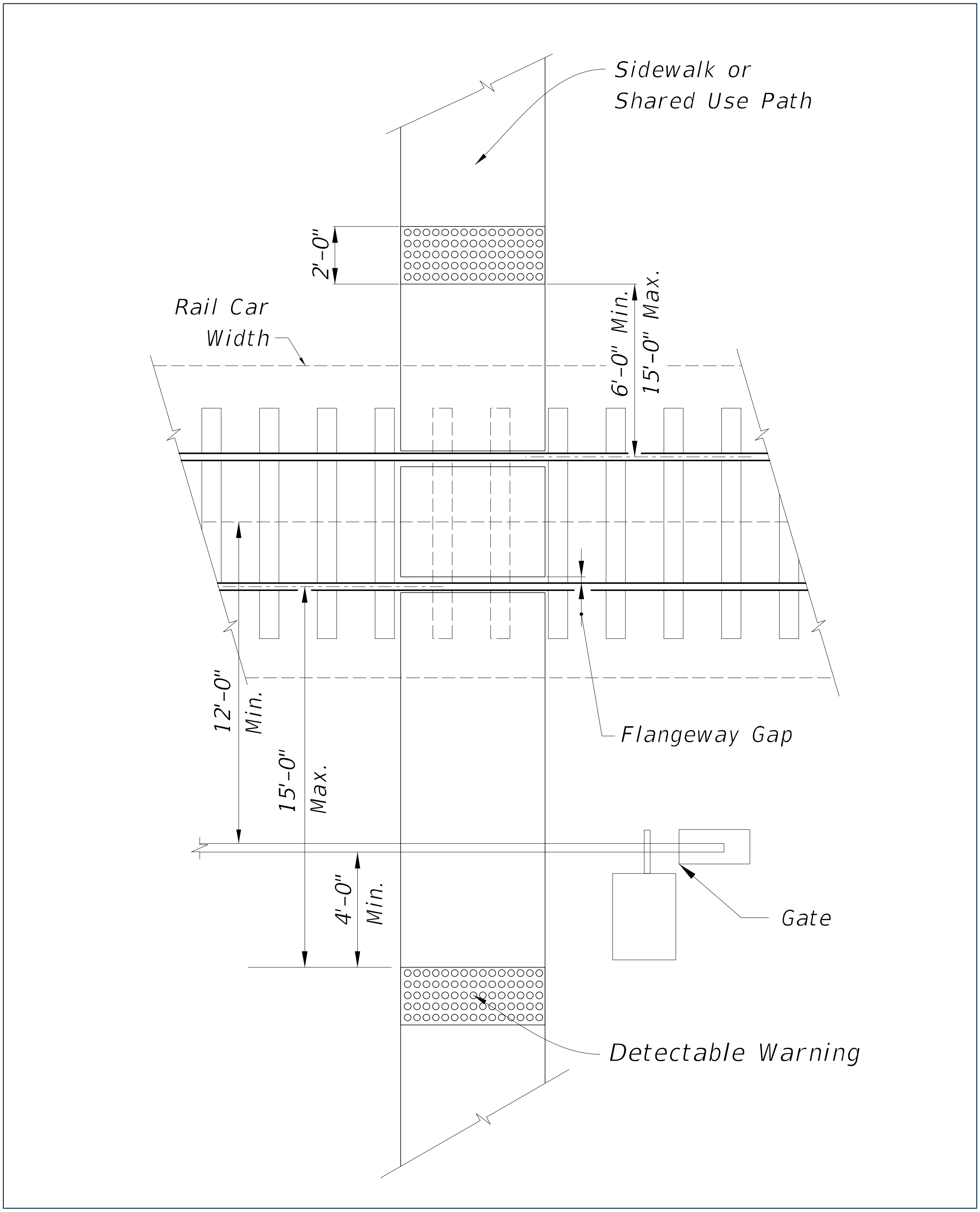
Detectable warnings shall be placed on each side of the rail-highway crossing, extend 2.0 feet in the direction of pedestrian travel and the full width across the sidewalk or shared use path, as shown in **Figure 7 – 3 Pedestrian Crossings**.

The edge of the detectable warning nearest the rail crossing shall be 6.0 to 15.0 feet from the centerline of the nearest rail. Where pedestrian gates are provided, detectable warnings shall be placed a minimum of 4.0 feet from the side of the gates opposite the rail, and within 15.0 feet of the centerline of the nearest rail.

If traffic control signals are in operation at a crossing that is used by pedestrians or bicyclists, an audible device such as a bell shall also be provided and operated in conjunction with the traffic control signals. See ***MUTCD, Chapters 8B, 8C and 8D*** ~~***MUTCD, Chapters 8B and 8C***~~

for further information and to determine if additional signals, signs, or pedestrian gates should be included. See ***MUTCD, Chapter 8E*** ~~***MUTCD, Chapter 8D***~~ for additional information on designing crossings for shared use paths.

Figure 7-3 Pedestrian Crossings



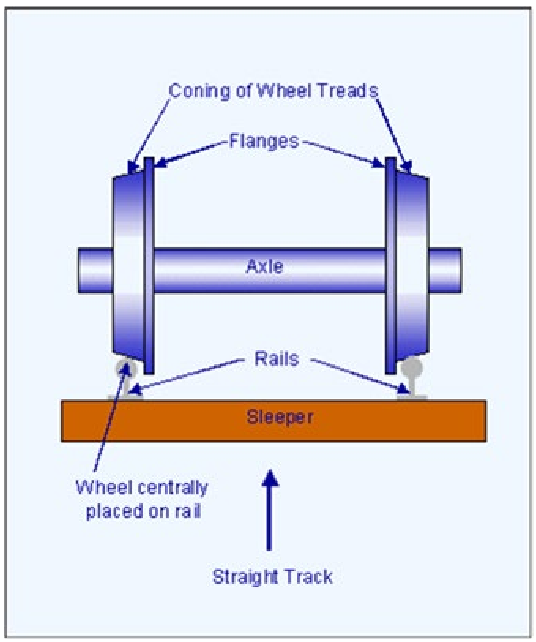
Notes:

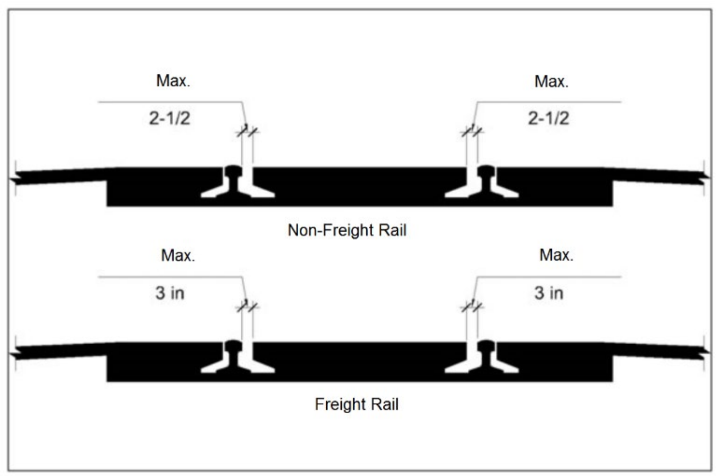
1. Pedestrian gates may be installed on the outside of the sidewalk/shared use path or in the utility strip.

Flangeway gaps are necessary to allow the passage of train wheel flanges; however, they pose a potential hazard to pedestrians who use wheelchairs because the gaps can entrap the wheelchair casters. Flangeway gaps at pedestrian at-grade rail crossings shall be 2 ½” maximum on non-freight rail track and 3” maximum on freight rail track.

Figure 7 – 4 Flangeways and Flangeway Gaps illustrates where the flanges are located on the wheel, how they interact with the rails, and the maximum gap allowed.

Figure 7-4 Flangeways and Flangeway Gaps





See **Chapter 8 – Pedestrian Facilities** and **Chapter 9 – Bicycle Facilities** for further information on designing sidewalks and shared use paths. The ***2006 Americans with Disabilities Act – Standards for Transportation Facilities*** and the ***2020 Florida Building Code, Accessibility 7th Edition*** impose additional requirements for the design and construction of pedestrian facilities.

7.4.3.5 ~~D.4.e~~ Roadside Clear Zone

Although it is often not practical to maintain the full width of the roadside clear zone, the maximum clear area feasible should be provided. This clear zone shall conform to the requirements for slope and change in grade for roadside clear zones.

7.4.3.6 ~~D.3.f~~ Auxiliary Lanes

Auxiliary lanes are permitted but not encouraged at signalized rail-highway grade crossings that have a large volume of bus or truck traffic required to always stop. These additional lanes should be restricted for the use of these stopping vehicles. The approaches to these auxiliary lanes shall be designed as storage for deceleration lanes. The exits shall be designed as acceleration lanes.

7.4.4 ~~D.4~~ Roadside Design

The general requirements for roadside design given in **Chapter 3 – Geometric Design** and **Chapter 4 – Roadside Design**, should be followed at rail-highway grade crossings. Supports for traffic control devices may be required within the roadside recovery area. Due to the structural requirements and the necessity for continuous operation, the use of a breakaway design is not recommended. The use of a guardrail or other longitudinal barrier is also not recommended, because an out of control vehicle would tend to be directed into the crossing.

To reduce the hazard to errant vehicles, all support structures should be placed as far from the traveled way as practicable.

7.4.5 ~~D.5~~ Vertical Clearance

Minimum vertical clearances for grade separated rail-highway crossings are shown in **Table 7 – 2 Minimum Vertical Clearances for New Bridges**. Minimum vertical clearance is the least distance between the bottom of the superstructure and the top of the highest rail utilized anywhere within the horizontal clearance zone.

Table 7-2 Minimum Vertical Clearances for New Bridges

Facility Type	Clearance
Railroad over Roadway	16'-6"
Roadway over Railroad[1]	23’-6”
Pedestrian over Railroad[1]	23'-6"
Note:	

1. Over High Speed Rail Systems, see the latest version of ***American Railway Engineering and Maintenance-of-Way Association (AREMA)*** guidelines, or the design office of the high-speed rail line of interest for specific guidelines and specifications. Over Electrified Railroad, the minimum vertical clearance shall be 24 feet 3 inches. (See ***Department Topic No. 000-725-003: South Florida Rail Corridor Clearance***.)

For any construction affecting existing bridge clearances (e.g., bridge widenings or resurfacing) vertical clearances less than 16' - 0" shall be maintained or increased. If reducing the design vertical bridge clearance to a value between 16’ - 0” and 16' - 2", the design vertical clearance dimension in the plans shall be stated as a minimum.

7.4.6 ~~D.6~~ Horizontal Clearance

Horizontal clearances shall be measured in accordance with **Figure 7 – 5 Track Section**. The governing railroad company occasionally may accept a waiver from normal clearance requirements if justified, i.e., for designs involving widening or replacement of existing overpasses. The ***FDOT District Rail Coordinator*** should be consulted if such action is being considered for FDOT owned rail corridors. For other rail crossings, coordinate with the owner of the rail corridor.

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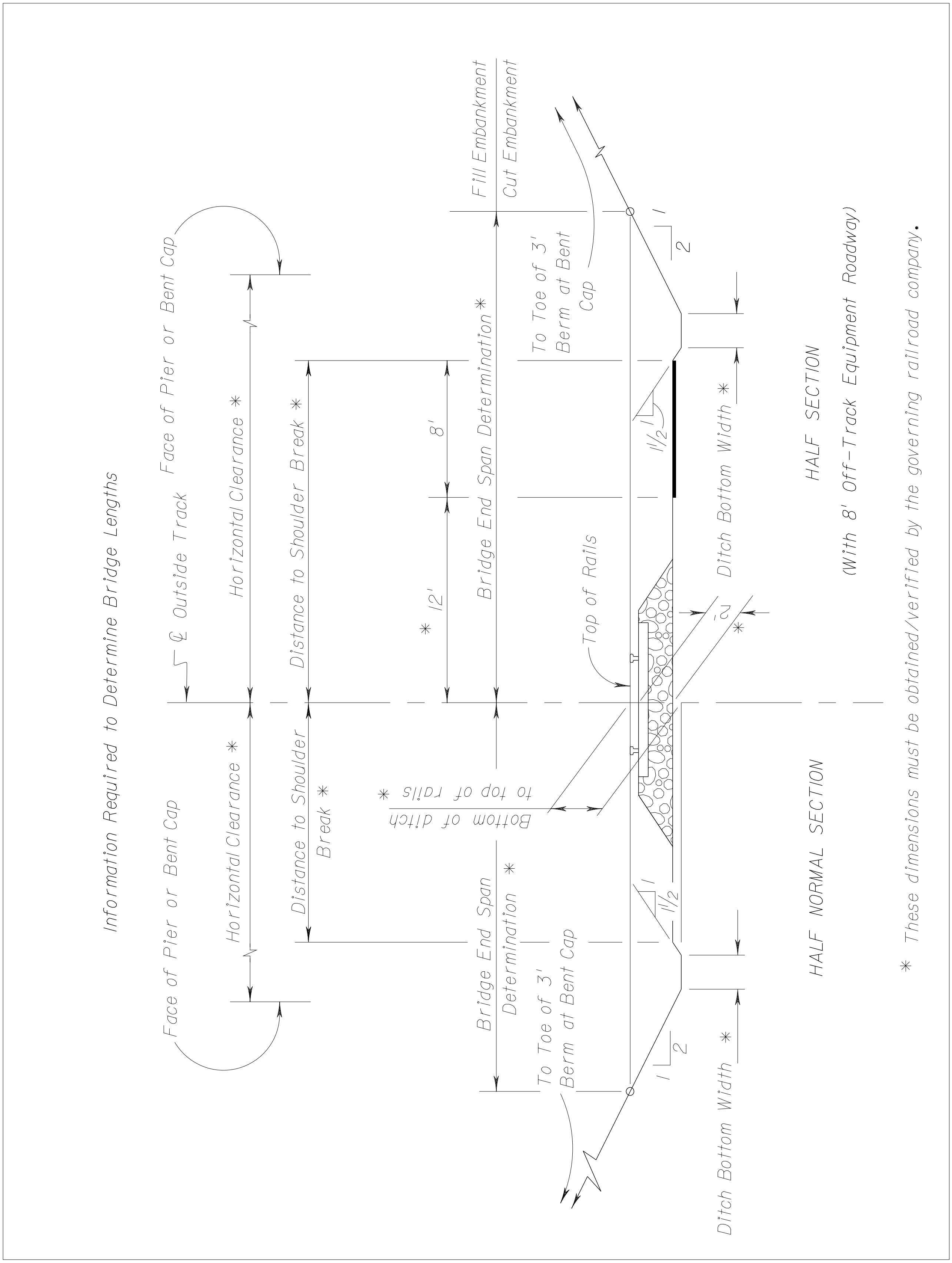
Figure 7-5 Track Section



The minimum horizontal clearances measured from the centerline of outermost existing or proposed tracks to the face of pier cap, bent cap, or any other adjacent structure are shown in **Table 7 – 3 Horizontal Clearances for Railroads** but must be adjusted for certain physical features and obstructions such as track geometry and physical obstructions.

Table 7-3 Horizontal clearances for Railroads

Minimum Clearance Requirements	Normal Section[1]	With 8' Required Clearance for Off-Track[2]	Temporary Falsework Opening
With Crash Walls	18 ft.	22 ft.	10 ft.
Without Crash Walls	25 ft.	25 ft.	N/A

Notes:

1. Any proposed structure over the South Florida Rail Corridor shall be designed and constructed to provide a horizontal clear span of a minimum of 100 feet but not less than 25 feet from the center line of the outermost existing or proposed tracks. (See ***Department Topic No. 000-725-003: South Florida Rail Corridor Clearance***.)

2. The additional 8 ft. horizontal clearance for off-track equipment shall be provided only when specifically requested in writing by the railroad.

7.4.6.1 ~~D.6.a~~ Adjustments for Track Geometry

When the track is on a curve, the minimum horizontal clearance shall be increased at a rate of 1.5 inches for each degree of curvature. When the track is superelevated, clearances on the inside of the curve will be increased by 3.5 inches horizontally per inch of superelevation. For extremely short radius curves, the ***AREMA*** requirements shall be consulted to assure proper clearance.

7.4.6.2 ~~D.6.b~~ Adjustments for Physical Obstructions

Columns or piles should be kept out of the ditch to prevent obstruction of drainage. Horizontal clearance should be provided to avoid the need for crash walls unless extenuating circumstances dictate otherwise.

Figure 7 – 5 Track Sections shows horizontal dimensions from the centerline of track to the points of intersection of a horizontal plane at the rail elevation with the embankment slope. These criteria may be used to establish the preliminary bridge length, which normally is also the length of bridge eligible for FHWA participation; however, surrounding topography, hydraulic conditions, and economic or structural considerations may warrant a decrease or an

increase of these dimensions. These dimensions must be coordinated with the governing railroad company.

The ***FDOT Structures Design Guidelines, Section 2.6.7*** provide additional information on the design of structures over or adjacent to railroad and light rail tracks.

7.4.7 ~~D.7~~ Access Control

The general criteria for access control in **Chapter 3 – Geometric Design** for streets and highways should be maintained in the vicinity of rail-highway grade crossings. Private driveways should not be permitted within 150 feet, nor intersections within 300 feet, of any grade crossing.

7.4.8 ~~D.8~~ Parking

No parking shall be permitted within the required clear area for the sight distance visibility triangle.

7.4.9 ~~D.9~~ Traffic Control Devices

The proper use of adequate advance warning and traffic control devices is essential for all grade crossings. Advance warning should include pavement markings and two or more signs on each approach. Each new crossing should be equipped with train-activated flashing signals.

Automatic gates, when used, should ideally extend across all lanes, but shall at least block one-half of the inside travel lane. It is desirable to include crossing arms across sidewalks and shared use paths.

Traffic control devices shall meet the requirements of the ***MUTCD***. See Section E of this chapter for additional requirements for traffic control devices in Quiet Zones. **Figure 7 – 6 Median Signal Gates for Multilane Curbed Sections** provides an example of gate installation when a median is present.

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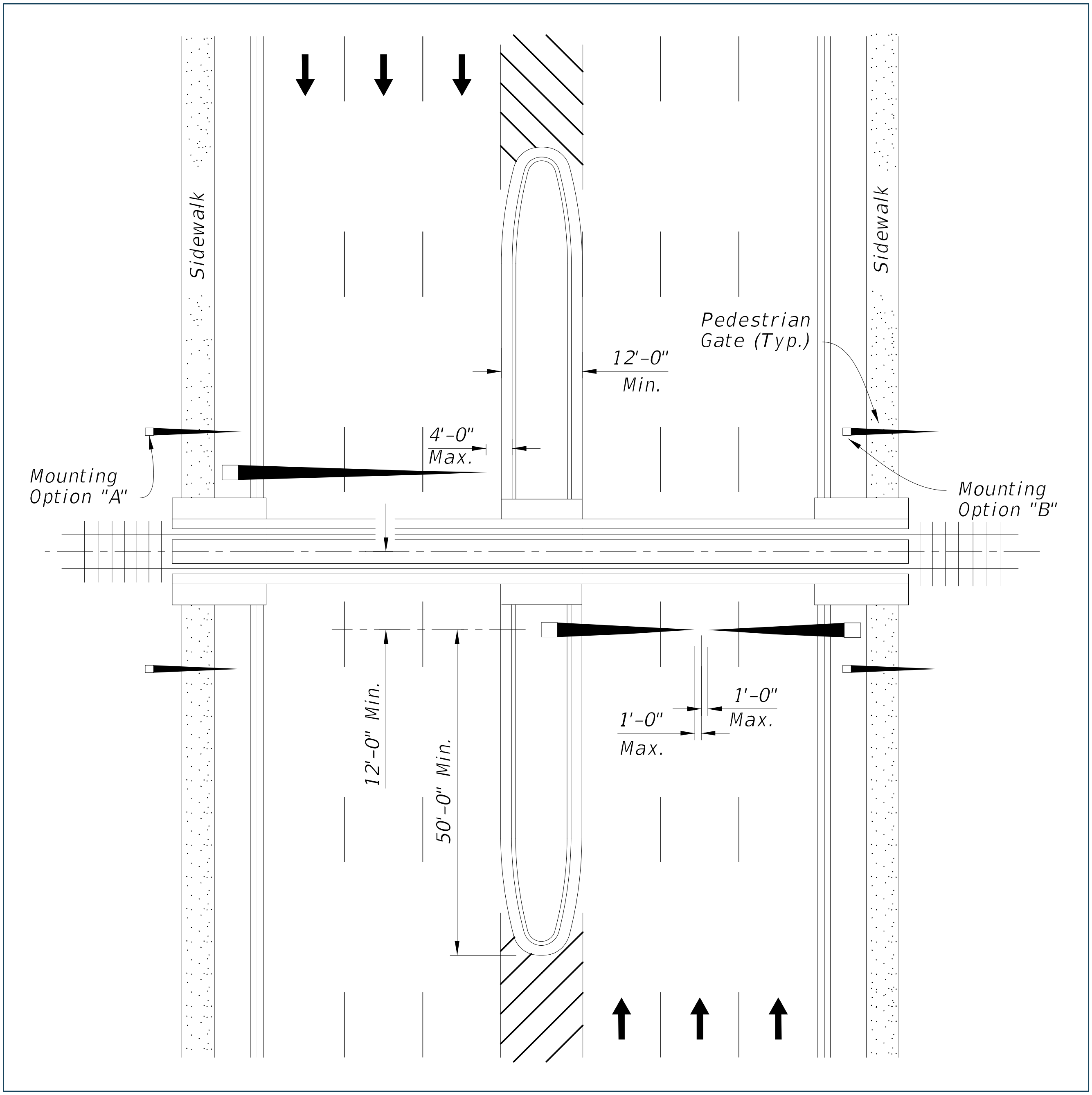
Figure 7-6 Median Signal Gates for Multilane Curbed Sections



7.4.10 D.10 Rail-Highway Grade Crossing Surface

Each crossing surface should be compatible with highway user requirements and railroad operations at the site. When installing a new rail-highway crossing or reworking an existing at-grade crossing, welded rail should be placed the entire width from shoulder point to shoulder point. Surfaces should be selected to be as maintenance free as possible.

7.4.11 ~~D.11~~ Roadway Lighting

The use of roadway lighting at grade crossings should be considered to provide additional awareness to the driver. Illumination of the tracks can also be a beneficial safety aid.

7.4.12 ~~D.12~~ Crossing Configuration

Recommended layouts for grade crossings are shown in **Figures 7 – 7 Passive Rail-Highway Grade Crossing Configuration** and **7 – 8 Active Rail-Highway Grade Crossing Configuration**. The distance “A” in the Figures is determined by speed and shown in the ***MUTCD, Table 2C – 3*** ~~***MUTCD, Table 2C – 4. Guidelines for the Advance Placement of Warning Signs***~~. Although the design of each grade crossing must be "tailored" to fit the existing situation, the principles given in this section should be followed in the design of all crossings. Additional information on the design of rail-highway crossings can be found in the FDOT’s ***Standard Plans***.

Passive rail-highway grade crossings include traffic control devices that provide static messages of warning, guidance, and, in some instances, mandatory action for the driver.

*Source: **FHWA Railroad-Highway Grade Crossing Handbook***

Active rail-highway grade crossings include traffic control devices that give advance notice of the approach of a train.

*Source: **FHWA Railroad-Highway Grade Crossing Handbook***

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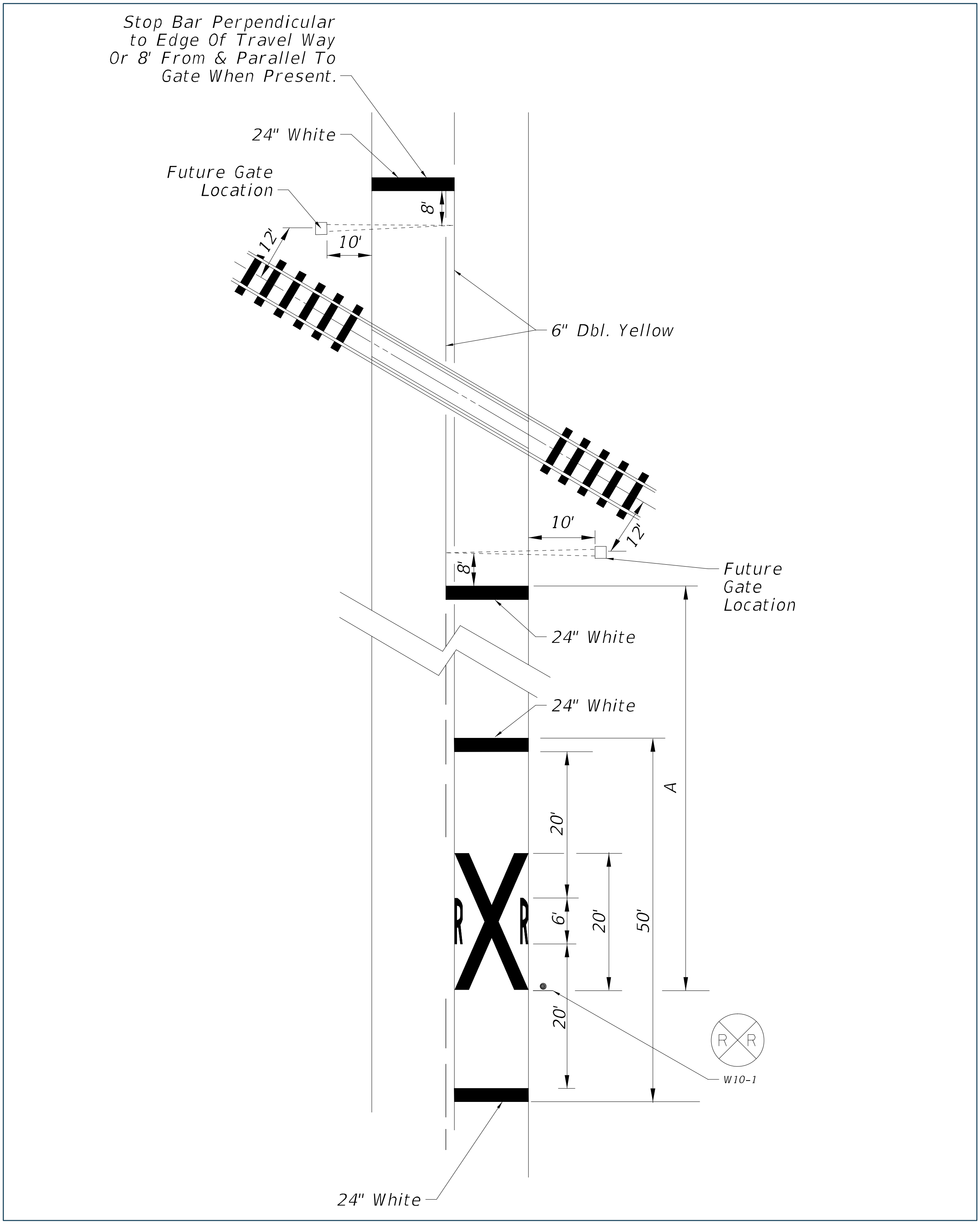
Figure 7-7 Passive Rail-Highway Grade Crossing Configuration



Notes:

1. The distance "A" is determined by speed and shown in the ~~***MUTCD, Table 2C – 3***~~ ***MUTCD, Table 2C – 4. Guidelines for the Advance Placement of Warning Signs***.

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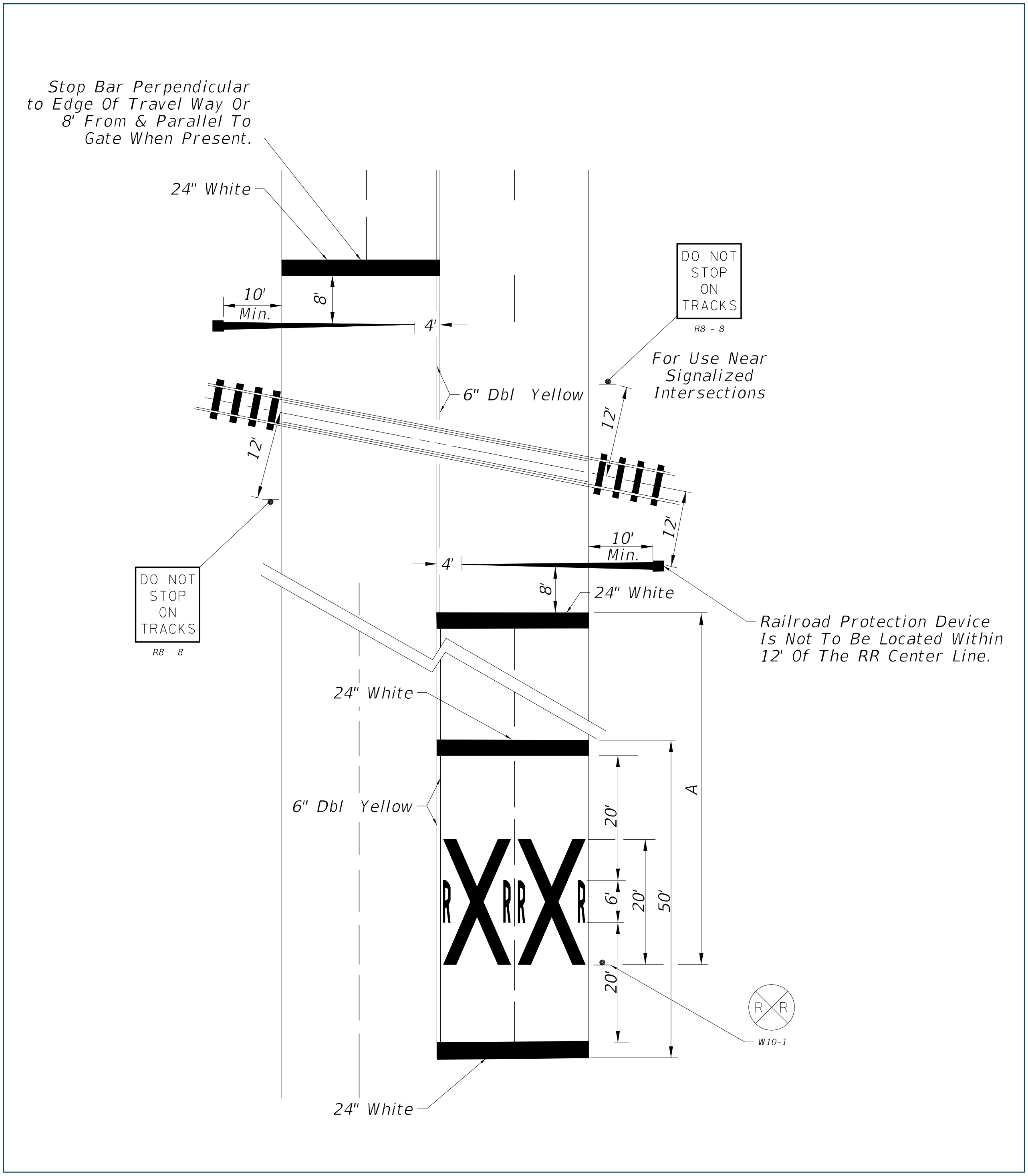
Figure 7-8 Active Rail-Highway Grade Crossing Configuration



Notes:

1. The distance "A" is determined by speed and shown in the ***MUTCD, Table 2C – 4. Guidelines for the Advance Placement of Warning Signs***.

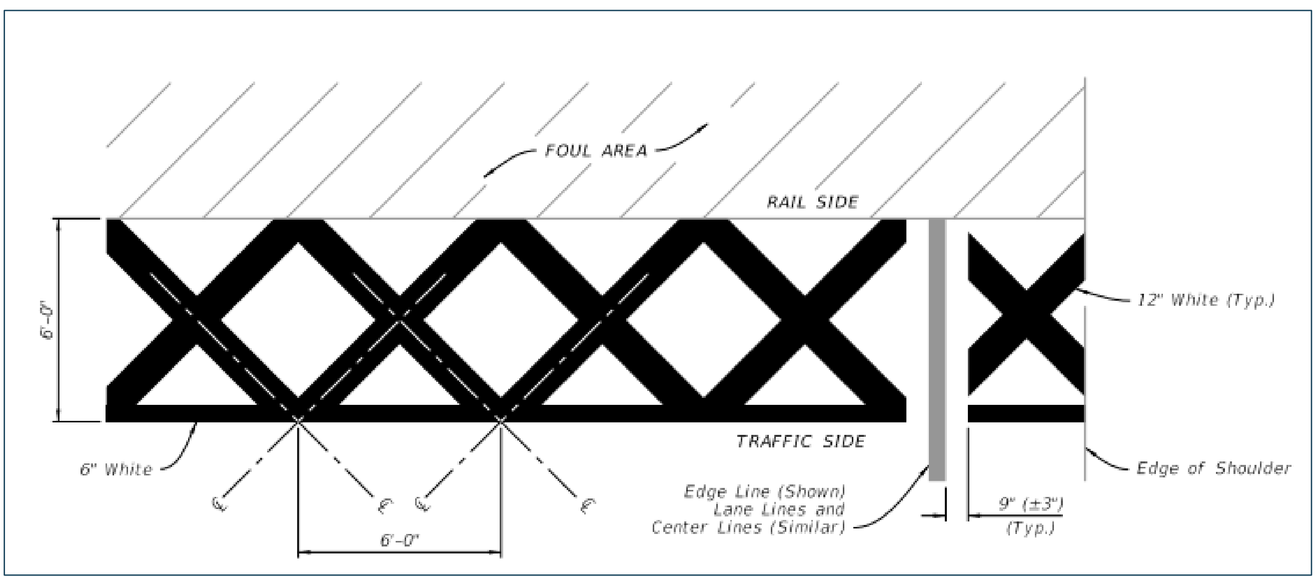
7.4.13 ~~D.13~~ Railroad Dynamic Envelope Pavement Marking and Signage

Railroad Dynamic Envelope pavement markings should be used to delineate the area around at-grade railroad crossings where vehicles should not stop. The U. S. Department of Transportation's (U.S. DOT) Volpe Center found that the addition of the dynamic envelope pavement markings and modified signage reduced the number of vehicles that stopped within the dynamic envelope zone and increased the number of vehicles that stopped behind the stop line. The research was published as a presentation and called ***Evaluation of Pavement Markings within the Dynamic Envelope***. Coordination with the railroad is necessary. See **Part 8 of the MUTCD** for additional requirements for signage.

Where local roads cross state owned rail corridors, the railroad dynamic envelope pavement marking is required.

Figure 7 – 9 Railroad Dynamic Envelope Pavement Marking Detail, Figure 7 – 10 Railroad Crossing at 2-Lane Roadway, **Figure 7 – 11 Railroad Crossing at Multilane Roadway**, and **Figure 7 – 12 Railroad Crossing at Multilane Roadway with Right Turn Lane** provide examples of how rail dynamic envelopes can be signed and marked for at-grade rail crossings. **Table 7 – 4 Location of "Do Not Stop on Tracks" Signage for Railroad Crossings Using the Rail Dynamic Envelope** shows the distance between the RR Warning Sign (W10-1) and the Do Not Stop on Tracks (R8-8) sign. For additional information see the FDOT's ***Standard Plans***.

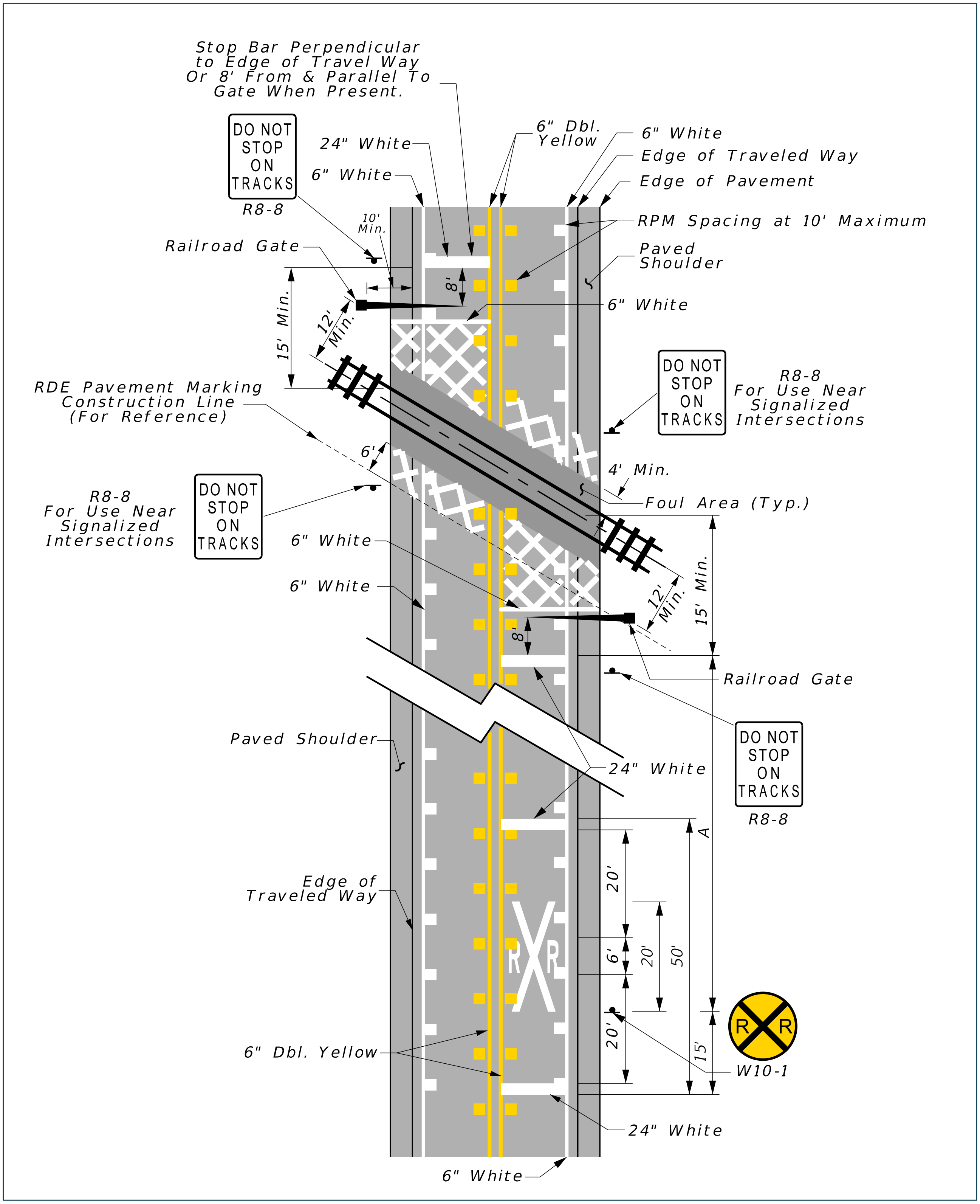
Figure 7-9 Railroad Dynamic Envelope Pavement Marking Detail



Notes:

1. The pavement markings shall begin a minimum of 4' from the edge of the nearest rail or outside the foul area, as determined by the railroad owner.

Figure 7-10 Railroad Crossing at 2-Lane Roadway



Notes:

1. For distance "A", see **Table 7 – 4 Location of "Do Not Stop on Tracks" Signage for Railroad Crossings Using the Rail Dynamic Envelope**.

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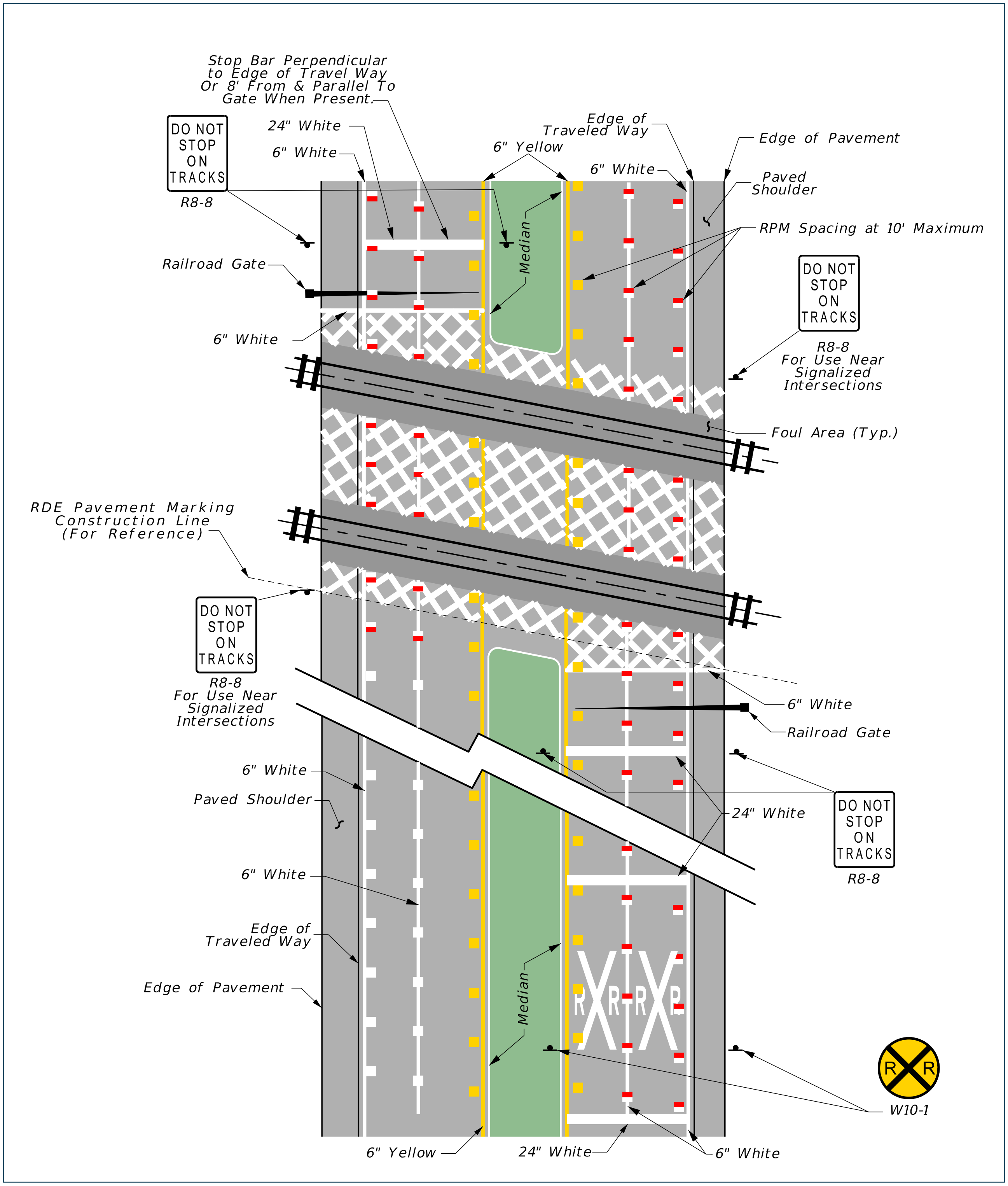
Figure 7-11 Railroad Crossing at Multilane Roadway



Notes:

1. Dimensions not shown for clarity, see **Figure 7 – 10 Railroad Crossing at 2 Lane Roadway**.

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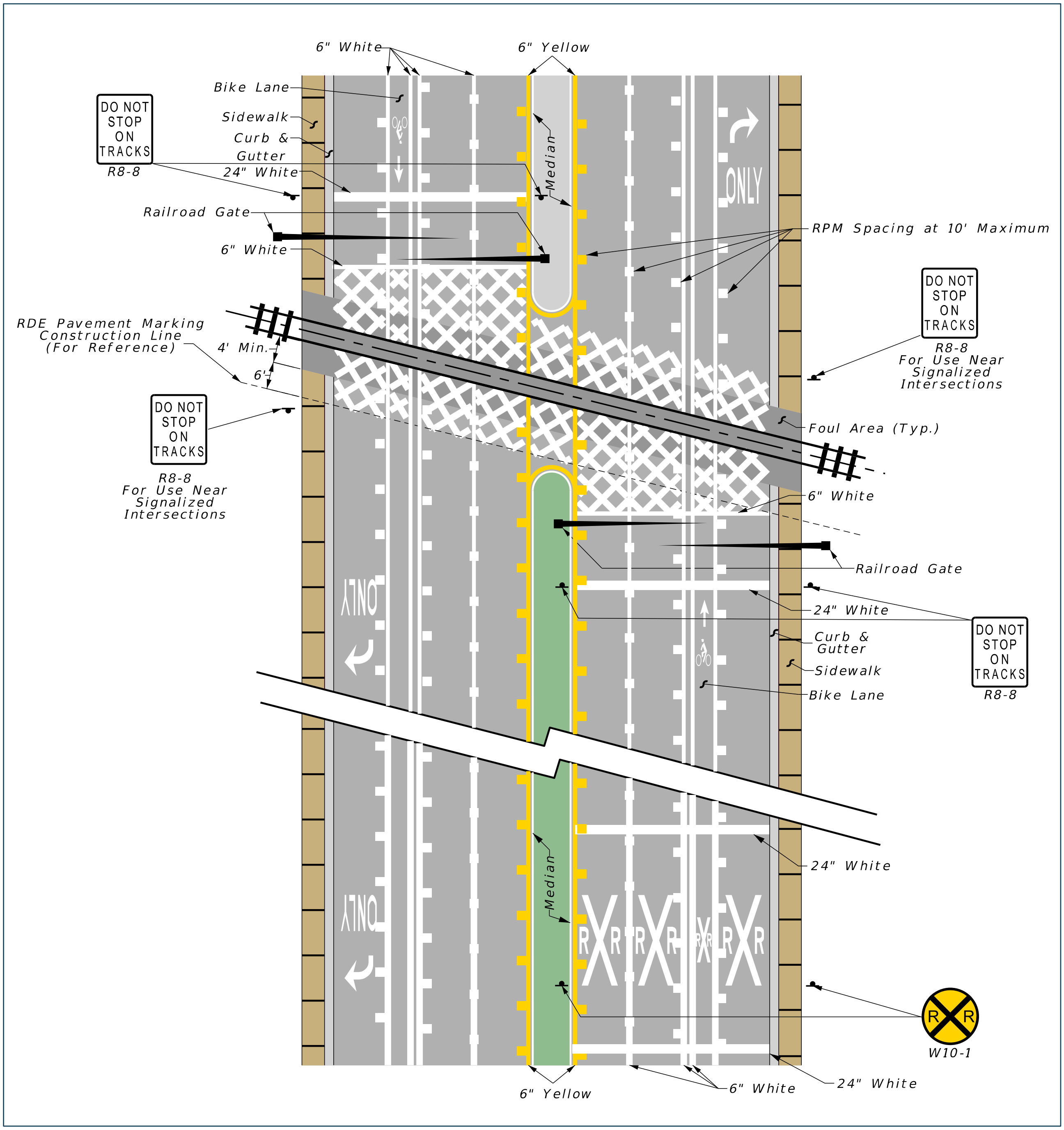
Figure 7-12 Railroad Crossing at Multilane Roadway with Right Turn Lane



Notes:

1. Dimensions not shown for clarity, see **Figure 7 – 10 Railroad Crossing at 2 Lane Roadway**.

Table 7-4 Location of "Do Not Stop on Tracks" Signage for Railroad Crossings Using the Rail Dynamic Envelope

Design Speed (mph)	Distance A (feet)
60	400
55	325
50	250
45	175
40	125
35	100
Curbed	85 in.

7.5 E Quiet Zones

Quiet Zone means a segment of a rail line that includes public rail-highway crossings at which locomotive horns are not routinely sounded. The Federal Railroad Administration (FRA) has established guidelines the applying jurisdiction must follow for approval of quiet zones. Applying entities can go to the ***FRA's website*** and the ***Code of Federal Regulations (CFR), Title 49, Subtitle B, Chapter II, Part 222*** for further information on the process for approval of Quiet Zones.

Coordinate with the FDOT's District Rail Coordinator t o determine if crossings are located within designated Quiet Zones for State owned rail corridors or crossings of state highways. State owned rail corridors include the Central Florida Rail Corridor and the South Florida Rail Corridor. For other rail crossings, coordinate with the local government who maintains the crossing roadway, sidewalk, or shared use path to determine if the location has been approved by the FRA for a Quiet Zone.

For a crossing within a Quiet Zone that requires supplemental safety measures, approved supplemental safety measures include:

- Temporary closure of a public railroad-highway-rail grade crossing.
- Four-quadrant gate systems.

- Gates with medians or channelization devices.
- One way street with gate(s); and
- Permanent closure of a public highway-rail grade crossing.

The ***CFR, Title 49, Chapter II, Part 222, Appendix A, Approved Supplemental Safety Measures*** provides additional information on the design of Quiet Zones to meet federal approval. The **CFR** also requires that any traffic control device and its application where used as part of a Quiet Zone shall comply with all applicable provisions of the **MUTCD**. See ***Part 8 of the MUTCD*** ~~***MUTCD, Part 8, Traffic Control for Railroad and Light Rail Transit Grade Crossings***~~. for further information. Pedestrian gates, audible device, and detectable warnings are required when a sidewalk or shared use path is present or proposed.

For Quiet Zones that cross state owned rail corridors, the ***FDOT Design Manual, Chapter 220 Railroads*** provides additional information.

Figure 7 – 13 Gate Configurations for Quiet Zones illustrates the maximum gap allowed for gates at rail-highway crossings within Quiet Zones, based upon **CFR, Title 49, Chapter II, Part 222**.

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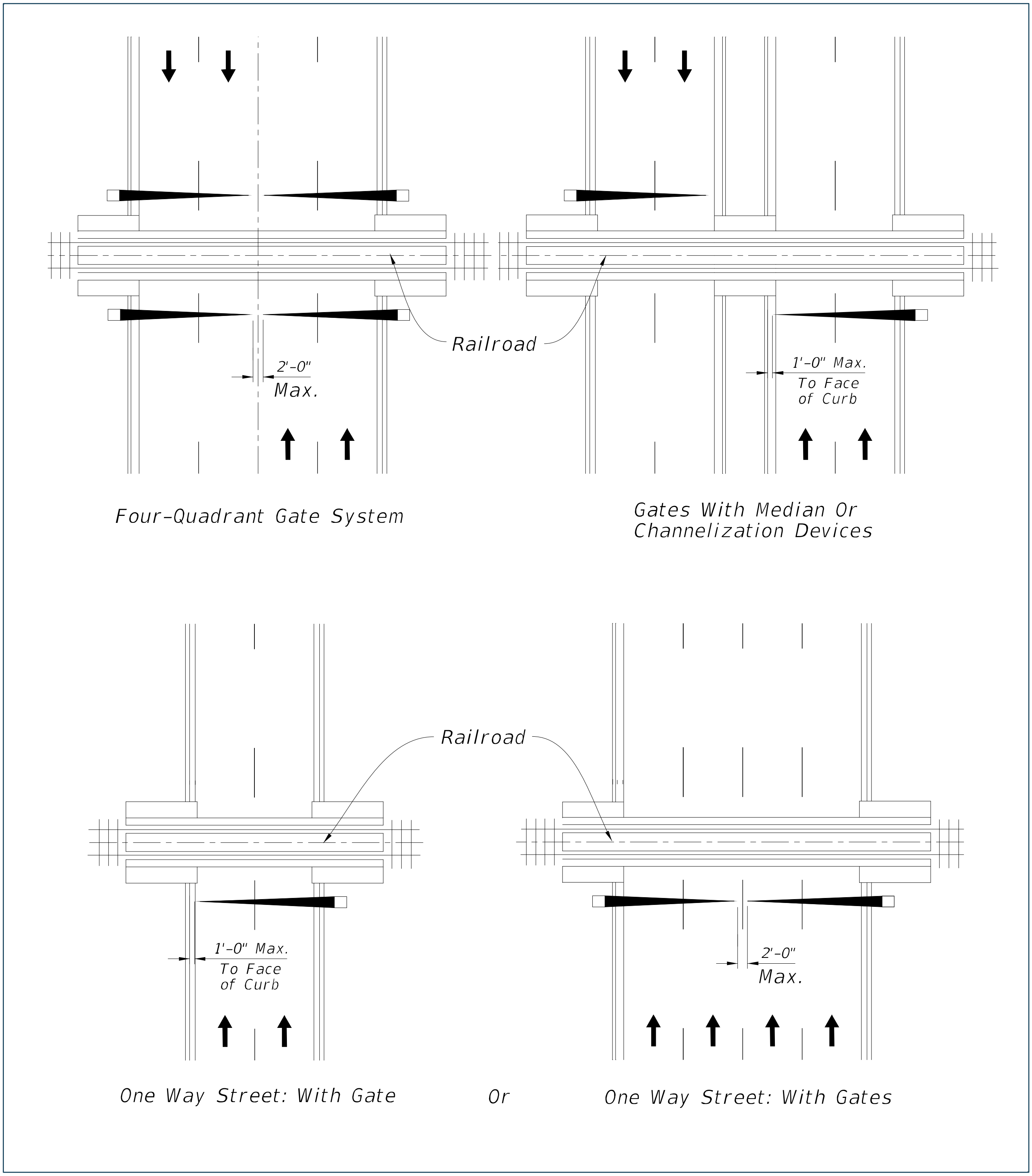
Figure 7-1 Gate Configuration for Quiet Zones



7.6 ~~F~~ High Speed Rail

The establishment of high-speed rail service is governed by **49 U.S. Code 26106 – High-Speed Rail Corridor Development**.

The ***High-Speed Rail (HSR) Strategic Plan*** divides potential operations into four categories or generic descriptions:

- HSR – Express. Frequent express service between major population centers 200 - 600 miles apart, with few intermediate stops. Top speeds of at least 150 mph on completely grade-separated, dedicated rights-of-way (with the possible exception of some shared track in terminal areas). Intended to relieve air and highway capacity constraints.
- HSR – Regional. Relatively frequent service between major and moderate population centers 100 - 500 miles apart, with some intermediate stops. Top speeds of 110 - 150 mph, grade-separated, with some dedicated and some shared track (using positive train control (PTC) technology). Intended to relieve highway and, to some extent, air capacity constraints.
- Emerging HSR. Developing corridors of 100 - 500 miles, with strong potential for future HSR Regional and/or Express service. Top speeds of up to 80 - 110 mph on primarily shared track (eventually using PTC technology), with advanced grade crossing protection or separation. Intended to develop the passenger rail market and provide some relief to other modes.
- Conventional Rail. Traditional intercity passenger rail services of more than 100 miles with as little as 1 to as many as 7 - 12 daily frequencies; may or may not have strong potential for future high-speed rail service. Top speeds of up to 79 mph generally on shared track. Intended to provide travel options and to develop the passenger rail market for further development in the future.

Further information on the implementation of high-speed rail service can be found on the Federal Railroad Administration's website ***High Speed Rail Overview***.

7.7 ~~G~~ Maintenance and Reconstruction

The inspection and maintenance of all features of rail-highway grade crossings shall be an integral part of each highway agency's and railroad company's regular maintenance program (**Chapter 10 – Maintenance and Resurfacing**). Items that should be given a high priority in this program include pavement stability and skid resistance, clear sight distance, and all traffic control and protective devices.

The improvement of all substandard or hazardous conditions at existing grade crossings is extremely important and should be incorporated into the regular highway reconstruction program. The objective of this reconstruction program should be to upgrade each crossing to meet these standards. The priorities for reconstruction should be based upon the guidelines set forth by the FDOT.

7.8 ~~H~~ References for Informational Purposes

The following is a list of publications that for further guidance:

- Federal Highway Administration Railroad-Highway Grade Crossing Handbook, Revised Second Edition, August 2007

  https://rosap.ntlhttps://rosap.ntl.bts.gov/view/dot

- Code of Federal Regulations (CFR), Title 49 Transportation, Part 222, Use of Locomotive Horns at Public Highway-Rail Grade Crossings

  http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title49/49cfr222_main_02.tpl

- The Train Horn Rule and Quiet Zones

  https://www.fra.dot.gov/Page/P0104

- Part 8 of the MUTCD ~~MUTCD, Part 8, Traffic Control for Railroad and Light Rail Transit Grade Crossings~~

  https://mutcd.fhwa.dot.gov/ ~~***http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part8.pdf***~~

- The American Railway Engineering and Maintenance-of-Way Association (AREMA)

  https://www.arema.org/

- Florida Administrative Code, (Rule 14-57: Railroad Safety and Clearance Standards, and Public Railroad-Highway Grade Crossings

  https://www.flrules.org/

- Florida Department of Transportation Rail Contacts

  https://www.fdot.gov/rail/contacts/staff.shtm