Chapter 6

Railroad Crossing

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Railroad Crossing

6.1 General

A railroad-highway crossing, like any highway-highway intersection, involves either a crossing at-grade or a separation of grades. This chapter provides standard requirements for crossings at other than high-speed railways. Crossing requirements for high-speed railways must be coordinated with the Department's Rail Office on a project-specific basis.

The following three major railroad companies currently operate in the State of Florida:

1. CSX Transportation, Incorporated
2. Florida East Coast Railway Company
3. Norfolk Southern Corporation

Ten shortline railroad companies and three terminal switching companies also operate in the State of Florida.

6.2 At-Grade Crossings

Selection of the warning devices to be used is a function of the geometrics of railroad-highway grade crossing, including the alignment, profile, sight distance and cross section of both the roadway and the railroad. Railroad grade crossing angles should be as near 90 degrees as practical.

Design Criteria and Standards are given in the ***Florida Greenbook*** and the Department's ***Railroad Procedures Manual***. Design considerations are discussed in ***Chapter IX*** of the ***AASHTO Policy on Geometric Design***.

6.2.1 Devices

Traffic control devices for railroad-highway grade crossings consist primarily of signs, pavement markings, flashing light signals and automatic gates. A large number of significant variables must be considered in determining the types of warning device to be installed at a railroad grade crossing. The type of highway, volume of vehicular traffic, volume of railroad traffic, speed of vehicular traffic, volume of pedestrian traffic, accident record, and geometrics of the crossing are some of the factors influencing the choice of warning devices to be provided at the railroad crossing.

Standards and criteria for design, placement, installment and operation of these devices are covered in the ***Manual on Uniform Traffic Control Devices (MUTCD)*** and the Department's ***Railroad Procedure Manual***. The Department's ***Design Standards*** should also be consulted in the design of railroad crossings.

6.2.2 Surfaces

The highway traveled way at a railroad crossing should be constructed for a suitable length with all-weather surfacing. A roadway section equal to the current or proposed cross section of the approach roadway should be carried across the crossing. The crossing surface itself should have a riding quality equivalent to that of the approach roadway. When selecting the type of crossing and the material to be used in its construction, consideration should be given to the character and volume of traffic using the highway. The District Rail Coordinator should be consulted in selecting the material.

The ***Design Standards***, ***Index 560*** contains details for the construction of crossings.

6.2.3 Railroad-Highway Grade Crossing Near or Within Project Limits

Federal-aid projects must be reviewed to determine if a railroad-highway grade crossing is within the limits of or near the terminus of the project. If such railroad-highway grade crossing exists, the project must be upgraded to meet the latest ***MUTCD*** requirements in accordance ***Title 23 United States Code (U.S.C.), Chapter 1, Section 109(e)*** and ***CFR 646.214(b)***. These requirements are located in ***Chapter 8*** of the ***MUTCD***. "Near the terminus" is defined as being either of the following:

1. 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-4*** (on page 2C-6, Condition B, column "0" mph) for this distance.
2. An intersection traffic signal within the project is linked to the crossing's flashing light signal and gate.

6.3 Grade Separations

For underpasses, the bridge carries the railway and must be designed and constructed to carry railway loadings in conformance with the ***American Railway Engineering and Maintenance Association (AREMA) Manual for Railway Engineering***, latest edition. For overpasses, the bridge carries highway traffic and must be designed and constructed to carry highway loadings. In either case, adequate clearances between the facilities must be provided.

Clearances, geometrics, utilities, provisions for future tracks, and maintenance road requirements for off-track equipment will involve negotiations with the governing railroad company. The railroad's review and approval, including need for and location of crash walls, shall be based on the completed BDR/30% Structures Plans prepared by the SDO, District Structures Design Engineer, or their consultant.

6.3.1 Criteria

The Structures Plans shall be prepared in accordance with the criteria obtained from the governing railroad company, the ***Plans Preparation Manual***, and the ***Structures Detailing Manual***.

See ***Figure 6.1*** for dimensions, which must be obtained from the railroad company before preparing the BDR/30% Structures Plans.

The District Rail Coordinator is an additional reference source available to the designer.

6.3.2 Bridge Width

For overpasses, the highway bridge width is determined from the approved typical section for the proposed bridge. Details for underpasses will depend on the specific project.

6.3.3 Horizontal Clearances to Face of Structures

Horizontal clearances shall be measured in accordance with ***Figure 6.1***. 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's Rail Office should be consulted if such action is being considered.

The minimum horizontal clearances measured from the centerline of outside track to the face of pier cap, bent cap, or any other adjacent structure are shown in ***Table 6.3.3***, but must be adjusted for certain physical features and obstructions as described hereinafter.

Table 6.3.3 Horizontal Clearances for Railroads

Minimum Clearance Requirements	Normal Section	With 8 ft. Required Clearance for Off-Track Equip.	Temporary Falsework Opening
With Crash Walls*	18 ft.	22 ft.	10 ft.
Without Crash Walls	25 ft.	25 ft.	N/A

* See the ***Structures Design Guidelines, Section 2.6.7*** for crash wall requirements.

The additional 8 ft. horizontal clearance for off-track equipment shall be provided only when specifically requested in writing by the railroad. In the event there is any doubt, the FDOT's Rail Office should be consulted.

6.3.3.1 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.

6.3.3.2 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 6.1 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.

6.3.3.3 Required Foundation Clearances

Edges of footings shall not be closer than 11 ft. from centerline of the track to provide adequate room for sheeting.

6.3.4 Crash Walls

See the ***Structures Design Guidelines*** for crash wall requirements.

6.3.5 Vertical Clearance

Minimum vertical clearances for overpasses are given in ***Table 2.10.1, Chapter 2*** of this manual. 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 determined by ***Section 6.3.3*** and ***Table 6.3.3***. If a track is identified as an electrified railroad, the minimum vertical clearance shall be 24 feet 3 inches. This provision is based on the FDOT's ***South Florida Rail Corridor Clearance Policy for 25 KV service (Topic No. 000-725-003***). In addition to existing electrified railroads, this provision applies to tracks identified as candidates for future electrification.

6.3.6 Special Considerations

1. Shoring and Cribbing requirements during construction should be accounted for in the preparation of the preliminary plans to assure compliance with the clearance criteria set forth herein. See ***Figure 6.2***.

   NOTE: Anything (e.g., cofferdams, footings, excavation, etc.) encroaching within 10 ft. of centerline of the track requires approval of the governing railroad.

2. Overpasses for electrified railroads may require protection screens.

3. Sometimes the substructure supports may be located between tracks or an outside track and the off-track equipment road.

4. Drainage from the section of the bridge above railroad right of way shall be drained away from the railroad right of way. When open scuppers are provided on the bridge, none shall be closer than 25 ft. from the centerline of the nearest track.

6.3.7 Widening of Existing Overpasses

The requirements for widening existing overpasses are as follows:

1. If existing horizontal or vertical clearances are less than those required for a new structure, it is required that the new portion of the structure be designed so as not to encroach into the existing clearances.

2. Permanent vertical clearances will have to take into account the track grade and the cross slope of the bridge superstructure. Therefore, it is generally more desirable to widen on the ascending side of the bridge cross slope.

3. Permanent horizontal clearances will have to take into account horizontal curves and substructures that are not presently parallel to the track.

4. Temporary construction clearances are particularly critical where existing clearances are already substandard. If vertical and horizontal clearances less than 22 ft. and 10 ft., respectively, are necessary, they will have to be approved on an individual basis. On high volume main lines, it may not be possible to reduce already restricted vertical clearances.

5. If widening requires construction of new widened approach fills, it is required that the same consideration be given to drainage design as required on new bridges. If new substructures provide less than 25 ft. horizontal clearance from center line of track, they must be designed with crash wall protection except as stated above.

The BDR/30% Structures Plans shall show a cross section at right angles to the centerline of the track where the centerline of bridge intersects the centerline of track. In situations where the substructure is not parallel to the track, or the track is curved, sections perpendicular to the centerline of the tracks shall be furnished at each substructure end.

If the Railroad is in an existing cut section, plan approvals will be considered by the governing railroad on an individual location basis. Factors to be considered will be the length, depth, and type material of the existing cut section, in addition to all of the previously mentioned factors.

Figure 6.1 Track Section

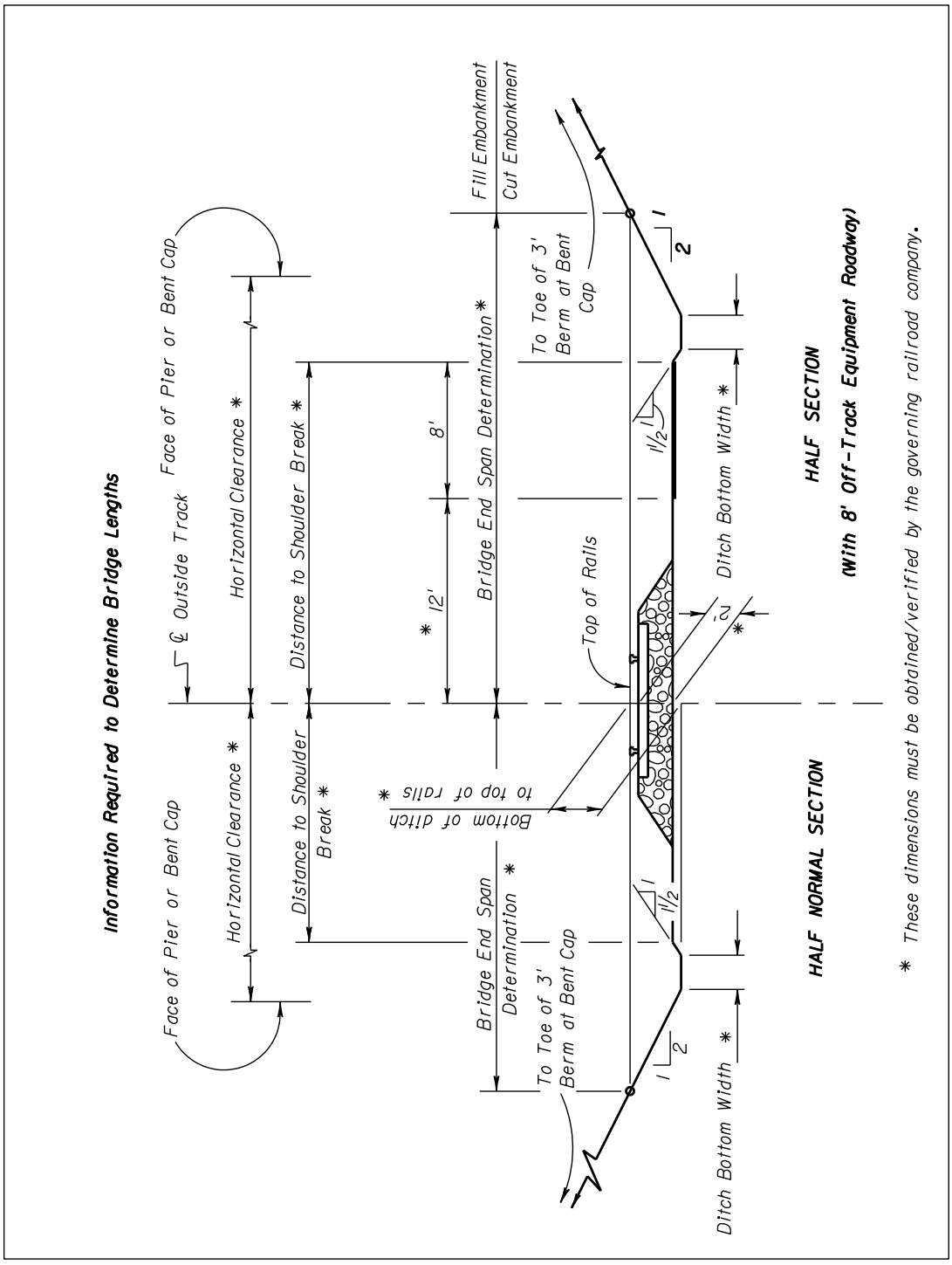
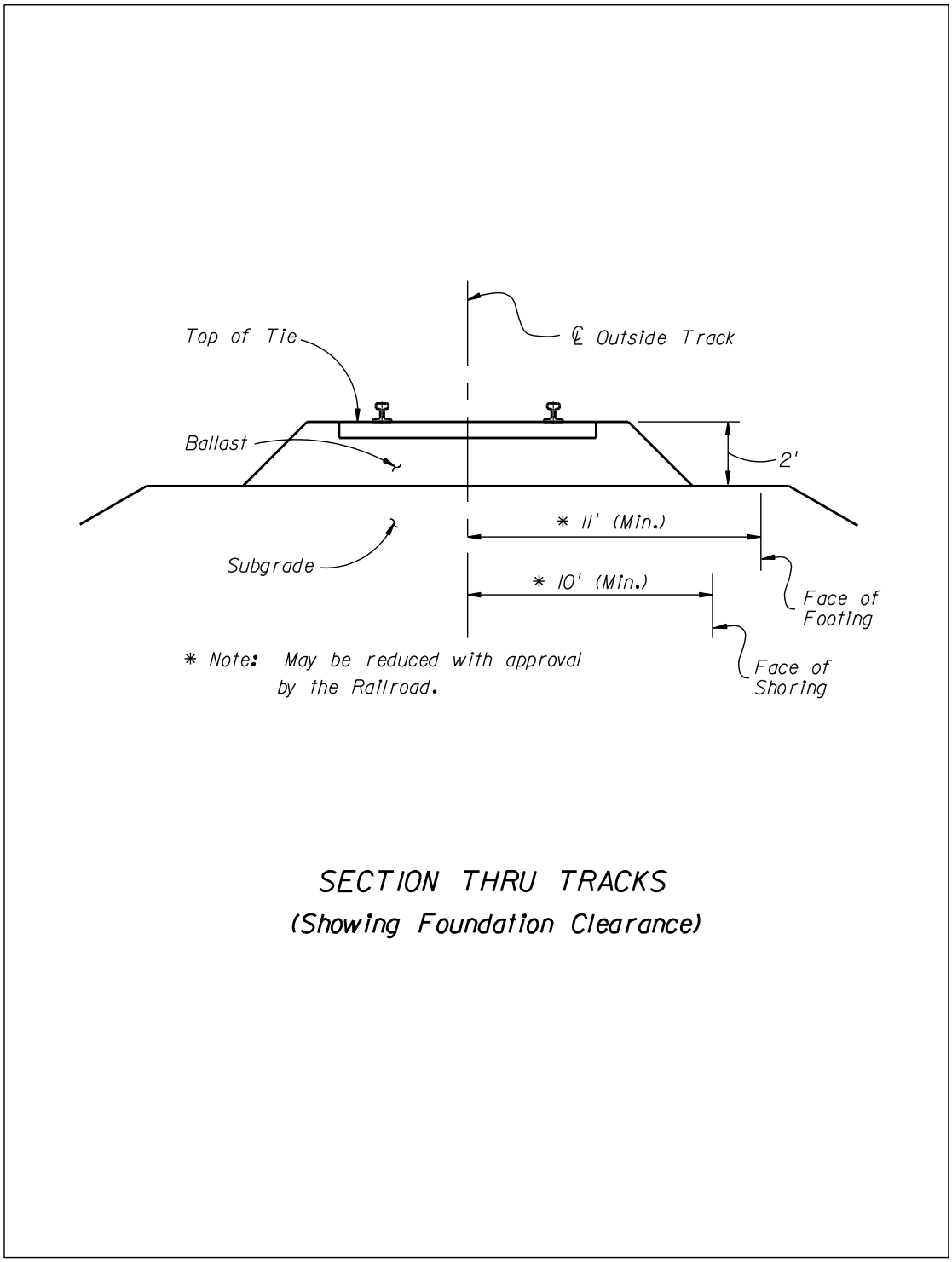


Figure 6.2 Section Thru Tracks



SECTION THRU TRACKS
(Showing Foundation Clearance)