# BRIDGE DESIGN MANUAL

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# CHAPTER 11 • RAILROAD CROSSINGS

## 11.00 RAILROAD CROSSINGS

While there is an occasional at-grade railroad crossing on a freeway, it can be assumed that a structure will be built to separate the rail traffic from the highway traffic. For a discussion of at-grade railroad crossings, refer to RDM Chapter 12. Grade separations will be discussed in this chapter.

For grade separations on a free access road, the Economic Analysis Unit, Program Planning Division, Bureau of Transportation Planning will calculate the cost/benefit ratio based on a given time period (usually 50 years). The cost/benefit ratio must equal at least 1.0 for the grade separation to be economically justified.

For Projects involving railroad crossings, begin coordination with Railroad Coordination Unit - Office of Rail (and Railroad) as early as possible after project assignment to the design unit.

Due to coordination being an involved process and response times from Railroads often being unpredictable, innovative contracts, such as Design-Build, are not advisable for projects involving Railroads.

## 11.01 IDENTIFICATION OF GRADE SEPARATIONS

When a railroad is carried over the highway, the structure identification will be by X (i.e., X09 of 82022); and when a highway is carried over the railroad, the identification will be by R (i.e., R01 of 63041).

## 11.02 STRUCTURE AGREEMENT PREPARATION

All work performed on either existing or new grade separations is subject to approval by the Railroad that has jurisdiction over the tracks. An agreement, if required, covering the work is prepared by the Infrastructure Section of the Office of Rail, the railroad, and Office of Attorney General.

### 11.02.01 Railroad Contacts

(revised 1-14-2000)

The Railroad Grade Separations Engineer of the Infrastructure Section Unit – Office of Rail will contact the Railroad when the programming letter for the project is issued and marked scoping plans are received. They will request the Railroad to submit an estimate for preliminary engineering. This estimate includes the cost of reviewing agreements, special provisions, preliminary and final plans, preparation of force account plans and estimates, and cost of attendance at meetings. After a letter of agreement or other arrangements for preliminary engineering has been made and FHWA approval has been received, the Railroad is authorized to start preliminary engineering work. No plans should be sent to the Railroad until after the Railroad is authorized to start preliminary engineering.

It is important to note that Railroads require anywhere from eight months to one-and-a-half years (or longer, depending on project complexity and the particular Railroad) after receipt of preliminary plans to complete their reviews, prepare force account estimates, and sign the agreement. Fully executed Railroad agreements are needed before advertising, letting, and awarding a project, sufficient time must be allowed for the Railroad to complete its process.

### 11.02.02 Agreement Plans

(revised 8-20-2009)

The agreement with the Railroad contains exhibits showing the general features of the proposed work. The Bridge Design Engineer shall prepare appropriate plan sheets. Normally the General Plan of Site and General Plan of Structure will suffice but special details such as runarounds, drainage plans, and right-of-way must be included. These exhibits (generally in “PDF” format) shall be submitted to the Railroad Grade Separations Engineer. All work must be 100% complete.

### 11.02.03 Force Accounts

(revised 1-14-2000)

The Railroad Grade Separations Engineer of the Railroad Coordination Unit – Office of Rail will request the Railroad to submit an estimate of the Force Account work to be performed by the Railroad. This Force Account work will normally be paid through a separate job number programmed by the Region Bridge Engineer, and obligated by the Railroad Grade Separations Engineer; however there may be some projects for which the cost of the Force Account work will be included in the estimated cost of the bridge project number. The Railroad Grade Separations Engineer will notify the Bridge Design Engineer if the Force Account work is to be included in the bridge project job number.

### 11.02.04 Easements

The Bridge Design Engineer will indicate on the General Plan of Site sheet the desired highway easement across Railroad Right-of-Way for highway purposes. The Railroad Grade Separations Engineer will obtain Railroad approval and then forward the Railroad approved easement plan to the Bridge Design Engineer for transmittal to the Development Services Division, Real Estate Section as part of the final Right-of-Way requirements.

The Development Services Division, Real Estate Section will prepare all legal documents of easement granted by the Railroad to MDOT.

### 11.02.05 Final Agreement

(revised 1-14-2000)

The Final Agreement, if required, will be processed through the Railroad Coordination Unit – Office of Rail in the normal manner. Final approval of the agreement by the Railroad, and MDOT, will give the Railroad the right to approve the plans as prepared by MDOT. Before a project may be advertised, let, and awarded, MDOT must have obtained the Railroad’s approval of the plans and Final Agreement.

## 11.03 SPECIAL PROVISIONS

(revised 1-14-2000)

Plans for railroad grade separations require Special Provisions for work on Railroad Property. The information to be included will be obtained by the Railroad Grade Separations Engineer from the Railroad. The Railroad Grade Separations Engineer will prepare Special Provisions and forward them to the Railroad for review and approval. Special Provisions may cover such items as temporary roads, railroad runarounds, flagging, and utility relocation. After receiving Railroad approval, he/she will forward the special provisions to the Bridge Design Engineer for inclusion in the proposal.

The pay item, “Railroad Inspection and Flagging,” is included in the Special Provisions. The Bridge Design Engineer will estimate a pre-established, budgeted dollar amount for this pay item which will appear in the bid document so that all bidders use the same dollar amount. Railroad flagging can be assumed to be required any and all times the contractor is working on, above, or below Railroad property. Assume 8 hours straight time and anything beyond 8 hours (including nights/weekends) is figured as double time. Contact the Railroad Grade Separations Engineer for the current daily dollar amount to use in estimating the flagging.

The pay item “Work on Railroad Property” is included in the Special Provisions. The Bridge Design Engineer will estimate a pre-established, budgeted dollar amount for this pay item which will appear in the bid document so that all bidders use the same dollar amount. Information regarding the speed and frequency of Railroad movements at the proposed project will be forwarded by the Railroad Grade Separations Engineer to the Bridge Design Engineer for inclusion in the Proposal as a "Coordination Clause."

The Special Provision for Railroad Insurance Requirements’ will often be required. This will include notes for the contractor to obtain Right-of-Entry permits and associated costs. The "Progress Clause", included in the Proposal, shall place a time limit restriction on the contractor to complete work on Railroad property. This will ensure a timely completion of work on the Railroad and alleviate the need for flagging regardless of total project completion time.

## 11.04 PLAN PREPARATION

(revised 1-14-2000)

Plans for Railroad Grade Separations must show several items that are specifically required for Railroad plans. Special attention must be given to drainage, Railroad cross-section, underclearance, side clearance temporary steel sheet piling, crash walls, and false decking clearances. MDOT may be required to provide details and calculations to the Railroad to facilitate the approval of the plans.

### 11.04.01 Design Criteria

(revised 1-14-2000)

Structures carrying the Railroad over the highway shall be designed according to the current American Railway Engineering and Maintenance of Way Association (AREMA) specifications, and the contract plans shall so note. In addition, any structures influencing the track or its support (such as retaining walls and culverts) shall satisfy AREMA specifications. Some Railroads may have design requirements supplemental to AREMA specifications. The Railroad Grade Separations Engineer should be contacted on all jobs involving Railroads and shall inform designers of these requirements.

### 11.04.02 Drainage

Adequate provisions must be made to handle existing track drainage and meet with the Railroad’s approval. Do not locate deck drains over railroad roadbed, from back of ditch to back of ditch.

### 11.04.03 Railroad Cross-Section

(revised 1-14-2000)

A cross section with a horizontal distance of 25 ft.- 0 in., measured at right angles from the centerline of track at the top of rails, to the face of the embankment slope, may be approved. The 25 ft.- 0 in. distance may be increased at individual structure locations as appropriated to

provide for drainage if justified by a hydraulic analysis or to allow adequate room to accommodate special conditions, such as where heavy and drifting snow is a problem. The railroad must demonstrate that this is its normal practice to address these special conditions in the manner proposed.

Where required by the Railroad, side clearance shall be provided for off-track maintenance equipment. The Railroad Grade Separations Engineer will determine from the Railroad the extent and location of this clearance.

Federal funds are eligible to participate in costs to provide space for more tracks than are in place when the Railroad establishes to the satisfaction of MDOT and the FHWA that it has a definite demand and plans for installation of the additional tracks within a reasonable time.

## 11.04.04 Coordination

(revised 8-20-2009)

In general, a vertical underclearance of 23 ft.- 0 in. is required for highway grade separations over Railroads when constructing a new bridge or removing the existing superstructure. For preventative maintenance, rehabilitation and deck replacement projects the existing railroad vertical underclearance does not need to be increased unless requested by the Railroad.

## 11.04.05 Temporary Steel Sheet Piling

Except where required for jacking pits, approval of temporary sheeting and bracing details must be obtained from the Railroad prior to letting of the contract. Details are to be prepared by the Bridge Design Engineer, submitted to the Railroad for approval, and shown on the contract plans. Details of sheeting for jacking pits are normally to be submitted by the contractor to the Railroad for approval. Proposed temporary sheet piling to be cut off will require Railroad's approval. Sheet pile cut off is typically required to be a minimum of 2' below existing grade.

## 11.04.06 Railroad-Owned Materials

When the plans call for removal of Railroad-owned materials (rails, ties, and hardware), the proposed disposition of these materials must be noted on the plans so that the contractor will not assume that the salvaged material will become his/her property. The Railroad may wish to salvage these materials for future use. Note the location to stockpile railroad materials on the plans.

## 11.04.07 Hazard Cost

The Bridge Estimating Engineer will calculate the percentage of the construction cost representing a hazard to train operations. The hazard cost includes the cost of the portion of superstructure over, and the substructure units adjacent to the tracks, and will be calculated to the nearest one (1) percent.

## 11.04.08 Temporary Runaround

In constructing Railroad bridges over highways, a temporary runaround for the Railroad will be required. The details of this by-pass will be provided by the Railroad through the Railroad Grade Separations Engineer and will be included in the project plans. In general, the contractor will be responsible for all earthwork up to the subgrade. The Railroad will place the ballast and tracks, with the cost of this work borne by MDOT.

## 11.04.09 Crash Walls

Faces of piers or pier columns located closer than 25 ft.- 0 in. from the centerline of the nearest track shall be protected by a crash wall according to AREMA Specifications.

## 11.04.10 Barrier, Splashboards and Safety Fences

(revised 9-28-2026)

Designers of overhead railroad structures may be required to provide a means of protecting Railroad facilities and to maintain the safety of trains and employees below the structure from snow removal activities and errant vehicles.

Where snow removal is anticipated, splashboards or fencing may be required by the Railroad. A solid barrier railing of 3’-6” minimum height and splashboard on top for a total height of 5 feet may be required, but criteria vary and must satisfy the requirements of the Railroad.

The limits of railing and splashboard must meet the requirement of the railroad.

Barrier railing is acceptable on structures where snow removal is not anticipated.

Barrier railing or combination of barrier railing and splashboards and their limits on the structure shall be clearly shown on the plans.

During construction of structures, safety fencing may be required to protect workers on the structure and below the structure, follow the requirements (limits and height) of the Railroad.

Ornamental fencing meeting the strength, limit and height requirements of the Railroad may be an acceptable alternative to splashboards and conventional fencing.

# 11.05 PLAN DISTRIBUTION

(revised 6-24-2019)

The Bridge Design Engineer shall compile a plan set that includes:

- title sheet
- applicable note sheet
- structure sheets
- roadway sheets
- Right-of-Way sheets

Due to the variability of review and approval processes by the railroads, the plan set along with applicable proposal documents are sent to the Railroad Grade Separation Engineer, for distribution to the Railroad.

If needed, distribution procedures for specific Railroads can be obtained through the Railroad Coordination Unit – Office of Rail.