

# **IX. BRIDGES, TRESTLES, BOX CULVERTS AND UNLOADING PITS**

## **9.01 GENERAL**

All proposed bridges, trestles, box culverts, unloading pits and structures over which the Company's equipment will operate shall be designed in accordance with American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, Chapters 7 (Timber), 8 (Concrete), and 15 (Steel Structures), for E-80 Live Loading and appropriate Impact. Prior to the beginning of construction, the proposed design must be approved by the Company's Chief Engineer - Bridges and Structures. Sufficient time should be allowed for proper review and approval.

Drawings covering temporary sheeting and bulkheads to protect railroad tracks during adjacent structure construction shall be approved by Chief Engineer - Bridges and Structures.

Clearances and drainage requirements will be furnished upon request to the Chief Engineer - Bridges and Structures.

## **9.02 UNLOADING PITS**

The following guidelines shall be used when designing all unloading pits.

There shall be no rail joints in the running rail over the pit. Welding or torch cutting of running rail shall not be permitted.

The top of the pit shall be equipped with a removable cover which will be kept in place when the pit is not in use and which shall be designed in accordance with AREMA Chapter 15, Section 8.5.3.2.

Minimum distance from centerline of any adjacent track to nearest edge of pit walls is to be 15 feet. Closer clearances require special approval and indemnity if permitted.

Minimum horizontal distance from centerline of pit track to adjacent obstructions above the top of the pit is to be 9 feet (see Plan 7-1).

Pit cover and top of pit are to extend a minimum of 10 feet from the centerline of pit track on open side of pit. Embankment side slopes should not be steeper than 2 to 1.

Applicant is to furnish the distance and direction from centerline of pit to nearest switchpoint and to the switchpoint at the mainline. Application, plans, and details of each pit are to be submitted to the Division Superintendent and are to be approved before construction may begin.

## **9.03 SINGLE SPAN UNLOADING PITS WITH A SPAN LENGTH OF 15 FEET OR LESS**

Live Load: Cooper's E-80 with 28 percent impact.

Design specifications and workmanship shall be in accordance with current AREMA Specification, Chapters 7 (Timber), 8 (Concrete) and 15 (Steel Structures).

General pit details can be referenced from Figures 8-5, 8-6, and 8-7 in the AREMA Manual Chapter 15, Section 8. However, Norfolk Southern requires that the top of pit to extend a minimum of 10 feet from the centerline of the pit track, not the eight feet shown by AREMA in Figure 8-5.

#### **9.04 SINGLE SPAN UNLOADING PITS WITH A SPAN LENGTH GREATER THAN 15 FEET OR MULTI-SPAN PITS**

##### **9.04.01 General**

All portions of the unloading structure that are subjected to train or equipment loading shall be designed as a bridge in accordance with the AREMA Manual (current edition). All plan submittals for proposed unloading structures must include design calculations stamped by a registered professional engineer certifying that the design is in accordance with AREMA requirements. If computer programs are utilized in the design, the submittal shall include a complete summary of the input data used and all design assumptions. Additional manual calculations may be required to document compliance with AREMA requirements. Thirty days should be allowed in scheduling for the Railroad Company's review of unloading structure plans and calculations.

##### **9.04.02 Steel Superstructure**

**Span Type:** All spans shall be designed as simple spans. The use of side plates, bolted to beam webs, will be permitted as a means to stabilize or maintain alignment between adjacent spans. All beam ends shall have bearing stiffeners and shall bear directly on pit walls, floorbeams or columns. Attachment of ends of floorbeams to vertical steel plates, embedded in pit wall, is prohibited.

**Loadings:** All steel superstructure shall be designed for Cooper's E-80 live loading and appropriate impact. All loads outlined in Section 1.3 of AREMA Chapter 15 must be considered in the design. A reduction in wind load (Section 1.3.7) may be considered where justified by local conditions. To the extent possible, hoppers and mechanical features of the unloading structure should be supported independent of the superstructure carrying train loading.

**Fatigue:** By AREMA definition, all rail support beams and floorbeams are fracture critical members and must be so designated on the plans. The steel superstructure shall be designed to include fatigue consideration for 2,000,000 cycles and allowable stresses reduced, based on the fabrication and connection details used. All material specifications, including notch toughness requirements, must be shown on plans. All non-destructive testing requirements shall be shown on the plans. When requested to do so, the Industry or its designated representative will furnish the Company with copies of material certifications and test results, as well as copies of results of testing required during fabrication.

**Erection:** The steel superstructure supporting train loading shall be shipped, handled and erected in such manner as to avoid injurious bends, nicks or gouges to the steel. Field welding may be used only for minor connections, not subject to train live load force, as outlined in Section 1.5.10 of AREMA Chapter 15.

**Concrete Substructure:** All concrete portions of undertrack unloading structures that are subjected to train loading shall be designed in accordance with Chapter 8 of the AREMA Manual. Pit end walls shall be designed for the effects of vertical load from rail support beams and live load surcharge from train on ground track adjacent to the pit. Surcharge from adjacent parallel

tracks, roadways and buildings shall be considered in the design of pit side walls. Calculation and application of train surcharge loadings shall be as outlined in AREMA Chapter 8.

**Foundations:** Submittal of unloading structure plans shall include a geotechnical report defining the characteristics of the soils at the site and their suitability for supporting the design loads. All foundations for unloading structures shall be designed in accordance with the requirements in AREMA Chapter 8.

**Approach Walls:** If approaches to the main pit span, or spans, are to be constructed of parallel reinforced concrete walls, with the rails attached directly to the top of the walls, the approach walls shall be designed in accord with AREMA Chapter 8, Concrete Structures and Foundations. The two parallel walls shall have a single footing supporting both walls. Where necessary to obtain safe bearing capacity, the approach walls shall extend to the same depth as the pit walls. The rails shall be attached to the walls using standard Pandrol plates and clips, unless other attachment is approved by the Chief Engineer - Bridges and Structures. Pandrol plates and clips shall be spaced at 2'-0" maximum.