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4.8 OTHER STRUCTURES OVER ROADWAYS

4.8.1 Introduction

This chapter deals with structures that have not already been discussed but require review since their condition may affect the traveling public on the roadway underneath the structure. These structures include railway bridges, pedestrian bridges, and pipeline bridges (utility cable structures, high voltage towers, and telecommunication towers are not covered in this Manual). Although the Wisconsin Department of Transportation (WisDOT) or local government agencies may not own these structures, their safety must be assessed if they encroach the travelled right of way. Many WisDOT-owned structures will have an Identification Plaque mounted to the structure. However, private owners may also have identification plaques attached to their structures. The inspector should be familiar with the standard WisDOT ID plaque format and be able to differentiate these from private owner ID Plaques. Refer to Part 1, Chapter 5, for an explanation of the WisDOT numbering system.

The structures discussed in this chapter are an additional safety check for the traveling public, and do not limit the ultimate responsibility of the structure owner to ensure a safe structure. WisDOT may perform the inspection of the structures through cooperative inspection efforts with the owning agency or through independent inspections. The level of inspection effort for these structures may vary, and will typically be owner-specific and site-specific. Cursory inspections from the underside of the structure in conjunction with reviewing the owner's latest inspection report may be sufficient to confirm the safety of the structure. However, the inspector should never enter private property without the owner's consent.

4.8.2 Railway Bridges

The inspection of the materials for a railway bridge is similar to that of a highway bridge. Refer to Part 2 of this Manual for a discussion on bridge inspection. Additionally, this Section will focus on the inspection of elements and evaluation of problems which are unique to a railway bridge. Refer to Figure 4.8.2-1 and Figure 4.8.2-2 for views of a typical railway bridge.

Figure 4.8.2-1: Railroad Bridge Top View.

Figure 4.8.2-2: Railroad Bridge Elevation View.

4.8.2.1 Railway Bridge Loads

All bridges, whether railway or vehicular incur many of the same types of loading. Of course, the magnitude of these loads will differ for a railway bridge due to its specific type of usage. The greatest difference between railway and roadway bridges is the increased vertical live, impact, centrifugal, and longitudinal (braking) load. Furthermore, railway bridges often experience larger thermal forces and vibration.

4.8.2.2 Railway Bridge Inspection Reporting

Although WisDOT owns several railway bridges, private railroad companies own most of the railway bridges in Wisconsin. The American Railway Engineering and Maintenance-Of-Way Association (AREMA) recommend a 12-month annual inspection program be completed by the owners of railway bridges. At times, because of poor condition or low rating capacity, inspections may be scheduled at 3, 4, or 6-month intervals. Railway owners may provide only cursory inspections, instead of detailed inspections. Additionally, these inspection reports vary in format and content from one company to another company. The owner of the railway structure is responsible for the safety associated with the bridge. Any additional inspections by others related to the safety of the traveling public under the bridge should be considered a supplemental bridge inspection. This supplemental bridge inspection data should be forwarded to the bridge owner if a serious safety condition exists.

During a supplemental inspection, the inspector should report indications of failure in any portion of the structure and any conditions that could contribute to a future failure. Likewise, any loose or corroded elements in danger of falling onto traffic lanes below should be noted. Most frequently, the Wisconsin Department of Transportation (WisDOT) became involved in private railway bridge inspections after receiving complaints from passing motorists about falling rivets, bolts, and/or nuts. If possible, structures should be observed during passage of a train, so that the effects of vibrations, sideways, and deflections may be noted. All pertinent

defects should be noted and recorded, and reference points established for notification of the railway bridge owner.

4.8.2.3 Railway Bridge Inspections

The railway track approach immediately adjacent to the abutment and back wall is one of the most important areas of a railway bridge and is probably one that receives the least attention. On bridges having inner guardrails, the track bed is never tamped because the tamper blades will not fit within the guardrails. Typically this area never receives the attention that it should and the track surface remains low. If there is no inner guardrail and the bridge is located within the limits of a surfacing program there is a tendency to raise the track to the back wall and leave the bridge in a "hole". When surfacing is properly performed, the tamper is turned and the approach is raised away from the bridge, providing a smooth transition from the level bridge to the newly surfaced track.

When the approach surface is allowed to remain low, large forces are applied to the back wall and bridge seat by passing trains. The results are broken back wall ties, cracked and failed back walls, damaged bridge seats, etc. The secondary batter from the mechanical equipment tends to damage bridge ties and cause additional impact to the bridge seat. It is vitally important that the approaches to the bridge be kept level and smooth.

When inspecting bridges, the approaches should be observed for the following serious conditions:

1. The approach is excessively low or out of cross level or both.
2. Broken track and back wall ties in the approach area.
3. Severe muddy condition in the track at the approach and back wall (suggesting approach settlement).
4. Bent or broken rails.
5. Missing or broken track components, angle bars, bolts, spikes, etc.

4.8.3 Pedestrian Bridges

While this section is located under Chapter 8 (Other Structures over Roadways), it is also applicable for pedestrian bridges over other obstacles (e.g., a waterway) and can be implemented by the maintaining agency/owner as deemed appropriate. The inspection and evaluation of a pedestrian bridge is similar to that of the bridges discussed in Part 2 of this Manual. Pedestrian bridges over roadways should be inspected at a 48-month maximum interval with special inspections for problem areas. Often times fencing is provided on the sides of the bridge. This makes it difficult or impossible for the inspector to look over the side. Therefore, additional access equipment may be necessary to properly inspect the underside of the bridge. Traffic control is often necessary when additional access equipment is used. Refer to Figure 4.8.3-1 through Figure 4.8.3-2 for an overall view of a pedestrian bridge and the bridge's approach ramp.

Figure 4.8.3-1: Overall View of Pedestrian Bridge.

Figure 4.8.3-2: Pedestrian Bridge Entrance/Exit Ramp.

Since the pedestrian bridge will not encounter the same loadings that vehicle or railway bridges encounter, some pedestrian bridges are constructed with a non-redundant girder system. A non-redundant system will only have a one or two girder superstructure, thus making the bridge a nonredundant steel tension member (NSTM). Since some pedestrian bridges are non-redundant, the inspector should pay extra attention to the bridge girder system to ensure excessive corrosion or cracking is not occurring. Refer to Figure 4.8.3-3 and Figure 4.8.3-4 for examples of NSTM pedestrian bridges.

Figure 4.8.3-3: Non-Redundant Steel Girder Pedestrian Bridge.

Figure 4.8.3-4: Steel Thru Truss Pedestrian Bridge.

4.8.4 Pipelines

Non-Wisconsin Department of Transportation (WisDOT) pipelines are typically owned by either a transport company that moves a bulk product, or a distribution company that sells the product. Both of these types of owners operate pipelines in the State. Their product normally consists of a fuel, such as gasoline, fuel oils, propane, or natural gas.

The inspector should familiarize himself with the products carried in these pipelines and be aware of the signs of a leak. Not all these products will have a tell-tale style “natural gas smell”, especially bulk natural gas which does not have this odor added until it is processed by the

distribution company. If a leak is detected the inspector should immediately leave the site by foot, and then contact the owner. It is important to leave the site without introducing an ignition source, such as sparks created by starting a vehicle or using a cell phone. The inspector should also be familiar with safety procedures with respect to leaks involving these fuels. The inspection should not continue until the owner has contained the leak and given notice to proceed.

The inspection of a pipeline bridge is similar to that of the bridges discussed in Part 2 of this Manual. Pipelines should be inspected at 24-month intervals with special inspections for problem areas.

Pipelines should be inspected for material deterioration and any loose bolts or pieces of material that could fall on to the roadway below. In addition, the inspector should look for sags in the pipe and inspect the structure's cables (for cable supported pipes) and foundations. Refer to Figure 4.8.4-1 for an end view of a pipeline bridge.

Figure 4.8.4-1: End View of a Pipeline Bridge.

Pipelines are most often connected to a bridge using a saddle/clamping system. Refer to Figure 4.8.4-2 for a view of a typical pipeline-to-bridge connection. This bridge uses U-bolts to hold the pipeline to the bridge. All connections should be inspected to ensure the pipeline is securely fastened. Any loose or missing connections should be noted in the inspection report.

Figure 4.8.4-2: Pipeline to Bridge Connection.