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Federal-aid Program Overview

Bridge Load Rating and Posting

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Keeping structurally deficient bridges in service.



As a matter of public safety and as a way of safeguarding vital transportation infrastructure, State and local law enforcement agencies enforce weight restrictions on trucks and heavy vehicles travelling public roads. Under normal conditions, vehicles over 40 tons are not permitted on interstate highways. Additional restrictions apply based on the legal load combination, a function of vehicle weight and axle spacing. For example, 25 tons is the weight limit for a typical three-axle truck on an interstate highway, while a typical semi-trailer's limit is 36 tons, and a 4 axle dump truck's is 27 tons. State and local laws may address the legal load combinations allowed on State and county roads by farm vehicles and other types of commercial trucks.



When the drivers of trucks operating within the legal weight limits cross a bridge, they are relying on the bridge owner—whether a federal agency, the State Department of

Transportation, counties, or municipalities—to keep the bridge safe and available for their use. All of these bridge owners have critical tasks in common. They need to:

- Inspect the bridge for deterioration or damage;
- Determine if changes in condition have reduced the bridge's structural capacity to safely carry legally permissible loads, measured by its load rating; and
- Notify the public of any weight restrictions.

The responsibility for restricting loads on local bridges may fall on State or local agencies depending on agreements between each State and local governments it serves.



Here we will review how load ratings are determined and the best practices for posting truck weight restrictions.

Before a bridge or culvert is constructed, an engineer designs its structural elements to have capacity to meet anticipated use. After construction and as part of every bridge owner's responsibility according to the National Bridge Inspection Standards, a bridge is inspected once every two years. The inspection report documents any deterioration or damage that might reduce capacity and may recommend an updated load rating analysis.



By considering various loading patterns, and associated uncertainties, a rating analysis is developed to determine the truck loads that the bridge can carry safely on a regular basis, called the inventory level, and the maximum permissible loads on the bridge, called the operating level. Both ratings can be expressed in terms of gross vehicle weight and as a ratio of gross vehicle to legal weight, or rating factor. For example, for semi use, a county bridge may have an inventory level rating of 38 tons and an operating rating of 64 tons. As the legal weight for a semi is 36 tons – the rating factors are 1.06 and 1.78 respectively.

When the operating level rating factor is less than 1 for a given legal load combination, it no longer has the capacity to carry that full legal load. As this puts the safety of drivers at risk, the bridge owner must restrict truck weights, often through a load posting, until such time that structural capacity of the bridge is restored or the bridge is no longer able to carry traffic.

When the operating or inventory rating of a bridge is less than 3 tons for any vehicle, the bridge must be closed to all traffic.

Like other black and white roadway signs, the weight restrictions posted at a bridge are legally enforceable. Coordinating a posting with law enforcement is an effective method for ensuring appropriate use of the bridge and safeguarding public safety.

Strategies:

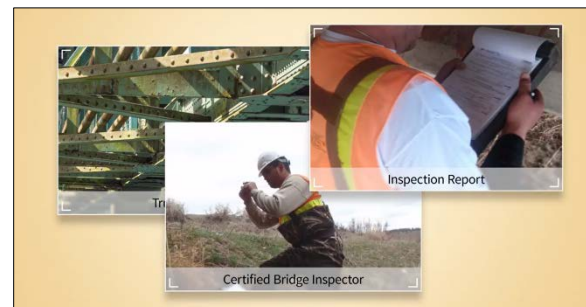
- Coordinate with law enforcement
- Alternate routes
- Advance posting
- Public communication



The loss of access to a bridge or culvert may disrupt farming or commercial activities, so agencies responsible for posting restrictions may wish to adopt additional strategies for reducing negative impacts and barriers to enforcement. For example, agencies can:

- Identify and share alternate routes available to heavy vehicles;
- Use an advance posting so commercial vehicles can take an alternate route without backtracking; and
- Communicate the new posting and risk of overloading the bridge to the public.

Let's see how one bridge owner fulfilled their load rating and posting responsibility.



During the inspection of a county owned truss bridge, a certified bridge inspector found a truss member had corroded and lost 15 percent of its cross-sectional area in a critical location. The inspection report recommended a load rating analysis.

The county manager hired an engineering consultant to perform the analysis. During the initial meeting, he explained that the bridge was used by farm tractors with loaded grain carts during harvest time and that their gross weight often exceeded 40 tons which is allowed by the county. The engineer incorporated this scenario into her model and found the rating factor for the tractor and loaded grain carts to be 0.85. She recommended restricting maximum weights for this special vehicle type. Use by typical over-the-road trucks was not affected by the load rating.



The county manager met with the county magistrate to get a posting order. Once they could legally post the bridge, the county manager provided a copy of the court order for the county sheriff to encourage enforcement action and directed the installation of a weight restriction sign at the bridge and advance warning signs at the intersections nearest the bridge. As harvest time was approaching, he also identified an alternate route for those farmers affected and posted the route on a popular community poster board at the local farm supply store.

Exceeding the posted weight limit on a bridge greatly increases the likelihood of permanent bridge damage and bridge collapse. A bridge that fails under the load of a heavy vehicle poses a serious risk to the driver and the traveling public. In addition to the loss of equipment, the loss of a bridge, and the access that it provides, can negatively affect the local economy.

Effectively manage risk:

- Have load rating for all bridges 
- Post weight restrictions 
- Work with law enforcement 

To effectively manage the risk of a bridge failure due to overload, a bridge owner must:

- Have a load rating for all bridges in their inventory that considers the current condition of the bridge and all legal load combinations;
- Post weight restrictions at any bridge that cannot safely carry legal loads; and
- Work with law enforcement to ensure weight restrictions are enforced.

As a bridge owner, verify that the load ratings for the bridges in your inventory are both current and complete and ensure that bridges that can't carry legal loads are appropriately posted. If they are not, contact your State Department of Transportation for assistance.

Additional Resources

- FHWA Operations website for truck size and weight as a ready source of information on Federal standards and guidelines, state enforcement activities, and reporting requirements.
<https://ops.fhwa.dot.gov/freight/sw/index.htm>
- This FHWA Policy Guidance Center page has technical information for load rating provides guidelines for rating calculations and policy implementation
<https://www.fhwa.dot.gov/pgc/index.cfm?ddisc=110&dsub=1148>
- An FHWA brochure on Understanding Bridge Weight Limits
<https://ops.fhwa.dot.gov/publications/fhwahop16068/fhwahop16068.pdf>
- FHWA's load rating webpage with information and links to the NBIS webpage for load rating information
<https://www.fhwa.dot.gov/bridge/loadrating/>
- The National Bridge Inspection Standards, 23 CFR 650 Subpart C
<https://www.ecfr.gov/cgi-bin/text-idx?node=sp23.1.650.c>

The content of this document is not a substitute for information obtained from State departments of transportation, appropriate FHWA Division Offices, and applicable laws. Scenarios have been simplified for emphasis and do not necessarily reflect the actual range of requirements applicable to the scenario or this topic. This document was created under contract number DTFH61-13-A-00001 by the Federal Highway Administration, U.S. Department of Transportation, and is offered to the public to heighten and focus awareness of Federal-aid requirements within the local public agencies community and reinforces the importance of these necessary policies, procedures, and practices.

This Companion Resource is the script content for the video production of the same name.