

Bridge Inspection Definitions

Which bridges are included in the National Bridge Inventory (NBI)?

Bridges or culverts that carry vehicular traffic and are longer than 20 feet are part of the National Bridge Inventory system.

What bridges are not considered part of the NBI?

Bridges or culverts that do not carry vehicular traffic or are equal to or less than 20 feet are not part of the National Bridge Inventory System. In Minnesota, bridges 10 feet or longer are inspected and inventoried.

What are “general condition ratings?”

According to the National Bridge Inspection Standards (NBIS), general condition ratings describe the current condition of a bridge or culvert. The general condition ratings are an overall assessment of the physical condition of the deck (riding surface), the superstructure (load carrying members such as beams or trusses that support the driving surface), substructures (abutments and piers) or culvert. General condition ratings range from 0 (failed condition) to 9 (excellent).

What is a “structurally deficient” bridge?

The classification “Structurally Deficient” is used to determine eligibility for federal bridge replacement and rehabilitation funding. Bridges are classified as “structurally deficient” if they have a general condition rating for the deck, superstructure, substructure or culvert as 4 or less or if the road approaches regularly overtop due to flooding. A general condition rating of 4 means that the component rating is described as poor. Examples of poor condition include corrosion that has caused significant section loss of steel support members, movement of substructures, or advanced cracking and deterioration in concrete bridge decks. For bridge owners, the classification structurally deficient is a reminder that the bridge may need further analysis that may result in load posting, maintenance, rehabilitation, replacement or closure.

The fact that a bridge is structurally deficient does not imply that it is unsafe. A structurally deficient bridge typically needs maintenance and repair and eventual rehabilitation or replacement to address deficiencies. To remain open to traffic, structurally deficient bridges are often posted with reduced weight limits that restrict the gross weight of vehicles using the bridges. If unsafe conditions are identified during a physical inspection, the structure will be closed.

What is a “functionally obsolete” bridge?

A functionally obsolete bridge is one that was built to standards that do not meet the minimum federal clearance requirements for a new bridge. These bridges are not automatically rated as structurally deficient, nor are they inherently unsafe. Functionally obsolete bridges include those that have sub-standard geometric features such as narrow lanes, narrow shoulders, poor approach alignment or inadequate vertical under clearance. The classification functionally obsolete is also term used as a priority status for federal bridge replacement and rehabilitation funding eligibility.

What is a “fracture-critical” bridge?

A fracture-critical bridge typically has a steel superstructure with load (tension) carrying members arranged in a manner in which if one fails, the bridge could collapse. Examples of fracture critical bridges are two girder bridges or truss bridges. The classification of fracture critical *does not* mean the bridge is inherently unsafe.

What is a bridge’s “sufficiency rating?”

Sufficiency rating is a computed numerical value that is used to determine eligibility of a bridge for Federal funding. The sufficiency rating formula result varies from 0 to 100. The formula includes factors for structural condition, bridge geometry, and traffic considerations. The sufficiency rating formula is contained in the December 1995 Edition of the “Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges”. A bridge with a sufficiency rating of 80 or less is eligible for Federal bridge rehabilitation funding. A bridge with a sufficiency rating of 50 or less is eligible for Federal bridge replacement funding.

What is “fatigue”?

Fatigue is a material response that describes the tendency of a material to break when subjected to repeated loading. Fatigue failure occurs after a certain number and magnitude of stress cycles have been applied. Each material has a hypothetical maximum stress level to which it can be loaded and unloaded an infinite number of times.

Fatigue in bridges is a concern when steel bridge components are subjected to localized cyclic loading. The fact that bridge components may be susceptible or have fatigue concerns *does not* mean the bridge is inherently unsafe. Fatigue damage occurs over long periods of time at specific locations. Signs of fatigue can be identified and the problem arrested prior to failure of the component.

An illustration of fatigue can be made by bending a paper clip and allowing it to return to its original position. After a few cycles of bending, the paper clip retains its original properties. Eventually, repeated bending will cause the paper clip to crack and then break. This is an illustration of fatigue leading to failure.

History of Federal Bridge Inspection Program

The Federal bridge inspection program regulations were developed as a result of the Federal-Aid Highway Act of 1968 following the collapse of the Silver Bridge in Point Pleasant, West Virginia. The United States Secretary of Transportation established the National Bridge Inspection Standards (NBIS) to locate and evaluate existing bridge condition to ensure the safety of the traveling public.

The 1968 Federal-Aid Highway Act directed the states to maintain an inventory of federal-aid highway system bridges. This was amended over time to establish criteria for NBIS bridges including:

- Defining the NBIS to bridges to those on the federal-aid highway system.
- Requiring inspections of bridges longer than 20 feet on all public roads.
- Expanding bridge inspection programs to include special inspection procedures for fracture-critical members and underwater inspection.
- Establishing minimum training and experience requirements for bridge inspectors.
- Setting maximum inspection intervals for bridges