

## CONDITION OF LOCALLY OWNED BRIDGES

by Ronald J. Ladyka, PE, and Benjamin T. Wigton, EIT

Bridges provide essential links in an efficient roadway system, whether on a national or a local scale. Our nation is home to more than 600,000 bridges on public roads, and slightly more than 40 percent are locally owned by counties and municipalities. In Pennsylvania, approximately 25,000 bridges are located on state-owned routes, and about 6,400 are found on locally owned roads.

As with other components of the infrastructure, bridges deteriorate over time. This is due to several factors, including overstress caused by increasing traffic volumes and material breakdown caused by environmental and manmade influences, such as rain or the extensive use of road salts. To maintain our roadway system, we must provide regular maintenance to our bridges. Neglecting this maintenance could accelerate the structures' deterioration to the point where either extensive bridge rehabilitation or replacement becomes the only option.

This tech sheet is the first of a three-part series on locally owned bridges. It is intended to serve as a "call to action" for local bridge owners to reevaluate their approach to bridge ownership. Parts 2 and 3 in this series will explain in further detail inspection and maintenance practices for locally owned bridges.

### Deficient Bridges

The National Bridge Inspection Standards (NBIS) were created as a result of passage of the Federal Aid Highway Act (1968), the Surface Transportation Assistance Act (1978), and the Surface Transportation and Uniform Relocation Assistance Act (1987). The NBIS regulations apply to all publicly owned bridges greater than 20 feet in length located on public roadways. The current version of the NBIS regulations has been in effect since January 2005 with a minor regulatory modification made in January 2010.

The Federal Highway Administration (FHWA) uses three indicators to evaluate the condition of the nation's bridges:

- 1) the bridge condition ratings,
- 2) the number of structurally deficient bridges, and
- 3) the percentage of deficient deck area on the bridges.

The classifications and number of deficient bridges are widely used by policymakers and will be discussed here.

According to PennDOT's website (March 2016), 2,141 of the 6,487 locally owned bridges in Pennsylvania are structurally deficient (SD) and 911 are functionally obsolete (FO). This brings the total number of deficient bridges to 3,052, or 47 percent of the total.

With the third largest number of state-owned bridges in the nation, Pennsylvania has the second highest number of bridges classified as structurally deficient. The average age of a bridge on PennDOT's system is more than 50 years old. Table 1 compares the percentages of SD and FO bridges in Pennsylvania with those percentages nationwide.

**Table 1. Percentage of Deficient Bridges\***

BRIDGE TYPE	% SD	% FO	% SD or FO
Publicly owned bridges in U.S.*	10	14	24
PennDOT-owned bridges*	15	16	31
Locally owned bridges in Pa.*	33	14	47

\* Bridges greater than 20 feet in length on public roadways

## Structurally Deficient Bridges

Structurally deficient, or SD, means that deterioration has occurred to one or more of the bridge's major components (deck, superstructure, or substructure). Although deterioration is present, a structurally deficient bridge is not unsafe. SD bridges often feature weight limit postings less than the legal limit because of material losses from the original structural components.

Weight limit postings help to preserve the bridge by moving overweight vehicles to other roadways. However, forcing vehicles such as emergency vehicles, commercial trucks, school buses, and farm equipment to use alternative routes can cause other problems. Alternative routes typically involve longer distances, which increase travel time and fuel consumption and can reduce the efficiency of the local economy.



The bridge site near approach load posting sign (at right) is visually obstructed by vegetation growth.

## Functionally Obsolete Bridges

Functionally obsolete, or FO, means that the bridge has older features, such as narrower road widths and lower weight limits, compared to more recently built bridges. FO bridges often feature restrictive lateral or vertical clearances, low weight limit capacity, or poor approach alignment. In some cases, bridges may become functionally obsolete simply because the approaches are widened to accommodate an additional lane or wider shoulder without modifying the bridge at the same time.

Additionally, historic bridges such as timber-covered bridges or steel trusses may exhibit only minor deterioration, but because they were designed and constructed at a time when lighter traffic loads were required to be carried, they cannot handle today's loads. Functionally obsolete bridges provide a reduced level of service to the transportation network since they do not satisfy current design standards or structural capacity.

## Sufficiency Rating for Bridges

The sufficiency rating is a calculated score indicating a bridge's ability to meet the traffic demands and safety needs for the route it carries. The rating number is based upon the bridge's structural adequacy and safety, how essential it is for public use, and its serviceability and functional obsolescence.

Factors included in sufficiency rating calculation are:

- Bridge adequacy and safety based on inspection data (55 percent).
- Bridge serviceability and functional obsolescence based on ability of the bridge to meet current traffic conditions (30 percent).
- How essential the bridge is for public use (15 percent).

Local bridge owners must be able to recognize the importance of their bridges, understand their overall condition designation, including SD and FO, and know what to do with the information.

### Sources:

- PennDOT. Bridge Safety Inspection FAQ. 2011.
- PennDOT. [www.penndot.gov](http://www.penndot.gov). 2016.
- Federal Highway Administration. [www.fhwa.dot.gov/bridge/nbi/no10/owner15.cfm](http://www.fhwa.dot.gov/bridge/nbi/no10/owner15.cfm).



The bridge width here is substandard compared to the approaching roadway. Note the hazardous clearance markers at the bridge.