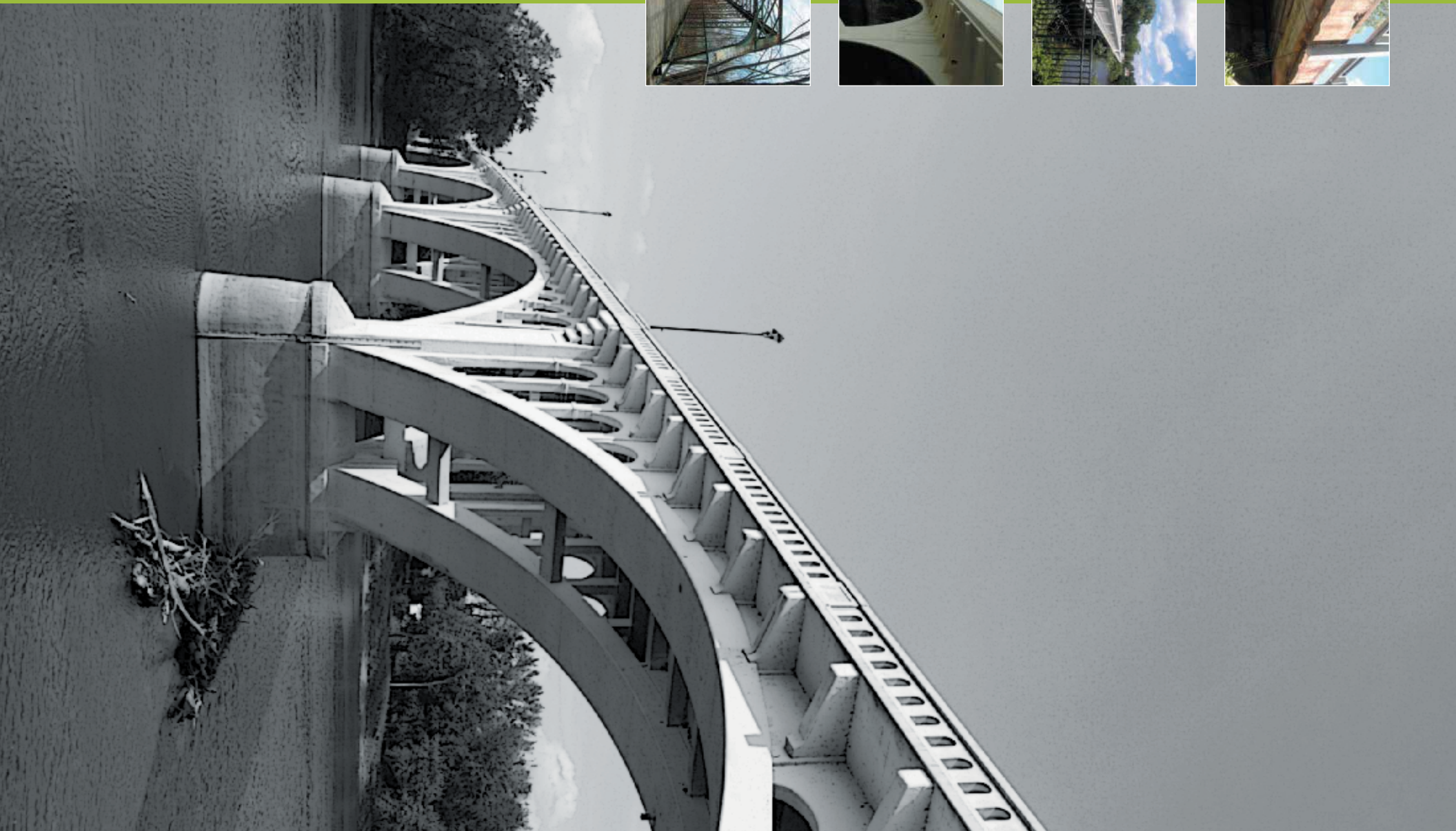
BRIDGES

GRADE: C+



Conditions

In recent years, a string of bridge closings, collapses, and near-misses have made headlines in our nation—Indiana included—leaving deaths, lawsuits, and financial hardships in their wake. These failures result from a growing backlog of bridge deterioration, much like what we have here in Indiana.

As recently as November of 2009, the Indiana Department of Transportation (INDOT) closed the Cline Avenue Bridge over the Indiana Harbor Canal in northwestern Indiana when severe corrosion around the piers crippled the structure beyond repair. INDOT's 2009 Bridge Inventory, delivered to the Federal Highway Administration (FHWA), rated 4,091 Indiana bridges as **structurally deficient** or **functionally obsolete**.

While imminent collapse of any of these bridges is unlikely, the data points to serious problems with our state's bridge network, requiring preventive and corrective actions to be taken now.

Rating Definitions/Implications

Structural deficiency refers to identified bridge weaknesses that must be monitored or repaired. Specifically, the structure's functionality and adequacy are compared to current demands, exposing any defects that demand closer attention. Factors considered include the bridge's load-carrying capacity, clearances, waterway adequacy, and approach roadway alignment.

A deficient rating doesn't necessarily imply an impending collapse. Rather, a deficient bridge requires significant maintenance and repair, as well as eventual rehabilitation or replacement. Vehicles navigating those bridges must submit to gross weight restrictions below standard weight levels allowed by statute, or there may be lane closures if the bridge is allowed to remain in service.

Condition ratings are the primary criteria for the classification of structural deficiencies: 80 percent of structurally deficient bridges have deficiencies in their decks, superstructures, substructures, or culvert ratings. The remaining 20 percent of deficient bridges suffer from other structural and/or waterway inadequacies.

Functional obsolescence refers to bridges built to outdated design standards. Functional adequacy is assessed by measuring existing functional and geometric configurations—including deck geometry, clearance, and/or approach roadway alignment—against current standards and demands.

Bridges have been designed according to standards in place at the time they were constructed. Over time, design and safety requirements evolve and upgrade. A bridge designed in the 1930s no longer reflects the standards of today's environment. The magnitude of those disparities determines the classification of the bridge's functionality today.

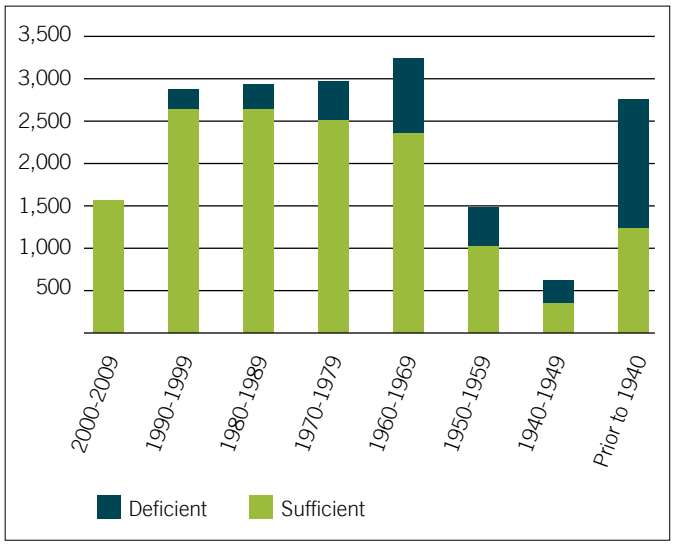
In short, structural deficiencies stem from decaying bridge components, while functional obsolescence results from changed safety standards or traffic demands on that structure.

The two ratings are not mutually exclusive. A bridge may suffer from both types of deficiencies. Its deficiency percentages ultimately place that bridge in one of three categories: structurally deficient, functionally obsolete, or non-deficient. Structural deficiencies are considered more critical, owing to their safety implications. Hence, a bridge that is both structurally deficient and functionally obsolete is identified only as structurally deficient.

The **Sufficiency Rating** is a numerical score of a bridge's structural adequacy, safety, essentiality for public use, serviceability, and functionality. The rating is based on a zero-to-100 scale, with 100 percent representing a fully sufficient bridge.

The National Bridge Inventory (NBI) is a compilation of bridge data supplied by the states to the Federal Highway Administration for bridges located on public roads. The NBI will be used for preparing the selected list of bridges both on and off federal-aid highways for federal funding. That list will include highway bridges with a sufficiency rating of 80 or less. Bridges with a sufficiency rating of 80 or less will be eligible for federal funds for rehabilitation, while those with a sufficiency rating of 50 or less will be eligible for replacement funds as well. To be considered for a deficient classification, a structure must be of bridge length and cannot have undergone construction or major reconstruction for the previous ten years.

As can be seen from the chart below, the older a bridge is, the more likely it is deficient. Most bridges in Indiana were designed for a 50-year lifespan. The chart shows a large number of bridges were built in the 1950s and 1960s. Many of these were connected with the massive investment made to construct the interstate highway system and supporting roadway system. As these bridges age, the maintenance needs can be expected to grow significantly.



Future Needs

Based on the projections included with the biannual bridge inspection reports, the total funding needed for repair and replacement of Indiana bridges is $3,550,400,000. Approximately half of those improvements are needed under the State system, with the other half under the county system.

Primary federal bridge funding programs include the National Bridge Inspection Program (NBIP) and the associated Highway Bridge Replacement and Rehabilitation Program (HBRRP).

On August 10, 2005, President Bush signed into law the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA_LU). With guaranteed funding for highways, highway safety, and public transportation totaling $244.1 billion nationwide over a six-year period from 2004-2009, SAFETEA-LU represents the largest surface transportation investment in our nation's history. Of this money, approximately $63 million per year is distributed to Indiana for work on bridges. This legislation has expired, but Congress continues to pass short-term extensions while working on the next version of a transportation funding bill.

Similarly, the Intermodal Surface Transportation Equity Act for the 21st Century redefined the highway program by including transit, intermodal projects, and technologies such as intelligent transportation systems. Meanwhile, the federal gasoline tax used for transportation funding gradually rose from 3¢ per gallon in 1956 to 18.4¢ in 1993. Improvements made possible by previous regulations are threatened, however, if the US Congress does not act quickly to replace the recently expired SAFETEA-LU.

Previously, the SAFETEA_LU bridge program was broadened to include systematic preventive maintenance, eliminating the requirement that bridges must be considered "significantly important." A total of $21.6 billion was authorized for this program through 2009 to enable states to improve eligible bridges over waterways, other topographical barriers, other highways, and railroads. The requirement that each state spend at least 15 percent of its bridge allocation for bridges on public roads that are not federal-aid highways (i.e., off-system bridges) still exist. Indiana has a long-standing agreement with the cities and counties to pass 25 percent of federal funds to them for road and bridge construction.

The State's ability to maintain current funding levels is far from certain. Currently, Indiana is near the end of an aggressive campaign to invest the funds from the Indiana Toll Road lease. Most of these funds went to projects such as the Hoosier Heartland and US 31 upgrades, increasing traffic capacity and connectivity throughout the state. Meanwhile, recent and projected shortfalls in gas tax receipts could trigger further reductions in federal highway funding. Gasoline taxes in Indiana are 18¢ per gallon and were last raised in 2003 when the national average price of gasoline was $1.72 per gallon.

The 2009 federal economic stimulus package did provide additional funds that state DOTs could use for bridge replacement projects. However, future bridge corrections hinge on lawmakers' ability to identify funding in the next transportation legislation.[8]

Most Indiana counties fund bridge maintenance, repair, and construction with money from their Cumulative Bridge Fund. Five counties in Indiana are allowed to form a Major Cumulative Bridge Fund, based on factors such as county population, bridge length, and need (Indiana State Code 8-16-3.1). According to the Indiana Local Technical Assistance Program, counties are also eligible to use additional funds such as the cumulative capital development, CEDIT (Community Economic Development Income Tax), or the county's general fund.[4] In 2008, 86 of Indiana's 92 counties utilized the Cumulative Bridge Fund as their primary funding source for bridge repair and replacement. Statewide Cumulative Bridge Funds generated approximately $53.4 million in 2007 but only $50.6 million in 2009.

Each year, local county councils set the tax rate for the Cumulative (and Major Cumulative) Bridge Funds, which are financed solely through property tax levies based on assessments. Levy rates are capped at a statewide maximum of $0.10 per $100 of assessed value (Indiana State Code 8-16-3-3). State-wide Cumulative Bridge Funds generated approximately $53.4 million in 2007 but only $50.6 million in 2009.

State legislation enacted in 2008 began to cap property tax rates. Known as the "Circuit Breaker," this legislation (House Enrolled Act 1001) would take effect beginning with 2010 tax bills, capping property tax rates at one percent for homestead properties, two percent for agricultural properties, and three percent for commercial properties. In November 2010, Indiana voters will decide whether this legislation will become part of the State Constitution. The *Indiana Business Review* estimates that, based on the initial reading of House Bill 1001, property tax rates will decrease by approximately 31 percent. Any decrease in property tax collections will directly affect those counties that depend on the Cumulative Bridge Fund for bridge maintenance and replacement.

Conclusions and Recommendations

This report card assigns a grade of C+ to the bridge infrastructure in the state of Indiana, based on its 22.2 percentage of deficient bridges.

In all, Indiana maintains 18,483 bridges per the 2009 Federal Highway Administration report—an increase of 900 bridges since 1992[1]. Among these, 5,612 are maintained by the State, and 12,871 are maintained by the counties. An additional 63 bridges are on federal land such as Crane Naval Base.

During the period from 1992 to 2009, the percentage of deficient bridges dropped from 32.5 to 22.2 percent. While this is a significant improvement, that percentage reflects a staggering 4,091 deficient bridges. Of those, 16.5 percent are maintained by the State, and 24.6 percent are maintained by the counties.

Similarly, a grade of C was assigned to the nation's bridge infrastructure by ASCE in its *2009 Report Card on America's Infrastructure*. One in four US bridges is either structurally deficient or functionally obsolete, with that number rising in urban areas.

Based on the data and its implications outlined above, the Indiana Infrastructure Report Card Committee advises the following precaution and correction measures to enhance the safety of Indiana's bridges:

- Set a state goal to reduce the number of deficient bridges on State and county systems from 22.2 to 15 percent by 2020.
- Advocate additional federal, state and local funding for bridge rehabilitation and replacement programs.
- Establish a fully-funded, comprehensive program that operates consistently to upgrade or replace deficient bridges and maintain all others.[5,7]
- Encourage the use of Life-Cycle Cost Analysis (LCCA) principles in the design process to evaluate the total cost of projects (PS 451).
- Secure federal legislation supporting bridge repair and replacement needs.

The safety standards Hoosiers expect cannot be maintained without public support and the recognition of the need for significant investment. Progress has been made over the years, but still more than one in five bridges we use every day are deficient. With an aging bridge population, these needs will continue to grow. Possible losses of tax revenues to finance bridge improvements represent a serious challenge. With an estimated present cost of over $3.5 billion to solve this situation, the time to start working on it is now.

Sources

1. INDOT 2009 NBI Data as submitted to FHWA, http://www.fhwa.dot.gov/Bridge/britab.cfm
2. FHWA, 2006 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance report to Congress
3. FHWA, HIGHWAY BRIDGE REPLACEMENT AND REHABILITATION PROGRAM (23 CFR 650.409)
4. LTAP's "Needs Assessment for Local Roads and Streets," http://rebar.ecn.purdue.edu/LTAP/Resources/Publications.aspx
5. ASCE Policy Statement 382, "Transportation Funding," 20094, http://www.asce.org/Content.aspx?id=8603
6. ASCE Policy Statement 434, "Transportation Trust Funds," 20032009, http://www.asce.org/Content.aspx?id=8607
7. ASCE Policy Statement 208, "Bridge Safety," 20042009, http://www.asce.org/Content.aspx?id=8578
8. ASCE "Surface Transportation Authorization Policy," 2009, http://www.asce.org/uploadedFiles/Take_Action_-_New/Authorization_of_Surface_Transportation_Program-Revised.pdf