

ISSUE BRIEF



KENTUCKY BRIDGES

2011 Kentucky Grade: D

Date: February 1, 2011

Whether bridges are used in the daily commute or to increase commercial development, over the long term, maintaining bridges affects all Kentuckians.

CURRENT CONDITIONS

Kentucky's bridges were last evaluated by the ASCE Kentucky Section in 2003. At that time, a grade of C- was assigned. This grade was based in large measure on progress that had been made over the preceding seven years – from 1996 to 2003 – addressing the backlog of deficient bridges that existed in the Kentucky inventory. Unfortunately, the improvements made prior to 2003 have been lost between 2003 to 2010. At the beginning of 2003, 29.7% of Kentucky bridges were deficient. The national combined deficiency average at that point was approximately 27.6%. Data available in 2010 indicates that the national combined average had fallen to 24.8% while the deficiency rate in Kentucky had risen to 32.2%. Kentucky's bridge inventory is trending in the wrong direction when compared to the national average.

The current grade reflects the ability of Kentucky's bridges to support the current demands of inter- and intra-state commerce and the personal travel demands of residents and visitors. The grade is not a reflection of the safety of individual bridges or the bridge system. All bridges included are deemed safe.

The cost to repair or replace all deficient bridges in Kentucky is estimated to be more than \$1.2 billion and the cost to raise Kentucky's grade from a D to the national average is estimated to be more than \$283 million. Currently, \$98,099,379 in combined state and federal funds is available in the FY2010 budget to upgrade the status of deficient Kentucky bridges.



Figure 1 – Signs of deterioration in the aging U.S. transportation infrastructure system (Dr. John J. Myers)

There are many definitions of the term “bridge.” This report utilizes the National Bridge Inspection Standards (NBIS) definition, which generally identifies bridges as spans of greater than 20 feet. Using this definition, there are currently 13,729 highway bridges in Kentucky; 8,860 are owned and maintained by the state, and 4,604 are owned and maintained by one of Kentucky’s 120 counties. The remaining 265 bridges are owned by other entities, including municipalities and the federal government

All Kentucky bridges are inventoried and inspected every two years and the results of the inspections are reported by the state to the Federal Highway Administration (FHWA) as part of the National Bridge Inventory (NBI). A bridge is determined to be structurally deficient if significant load-bearing elements are found to be inadequate or the waterway adequacy, which is the ability of the bridge to remain open to traffic during varying levels of flooding, is insufficient. A bridge is determined to be functionally obsolete if it does not meet current design standards such as lane width, vertical clearance or approach conditions. Neither condition implies that the bridge is unsafe, rather that it is in need of repair or upgrade. Bridges determined to be unsafe are taken out of service. Deficient bridges, for the purposes of this report, are the sum of the bridges that have been found to be either structurally deficient or functionally obsolete.

The expected life of a highway bridge is approximately 50 years. In Kentucky, nearly 63 percent of bridges are more than 30 years old and 31 percent are more than 50 years old. The average age of highway bridges in the United States is approximately 40 years.

To provide a better assessment of bridge performance, the FHWA has developed a sufficiency rating system. Bridges with a sufficiency rating of less than 80 percent are eligible for rehabilitation using federal matching funds. Nearly 56 percent of Kentucky’s bridges fall into this category and the average age of these bridges is 49 years. Bridges with a sufficiency rating of less than 50 percent are eligible to be replaced using federal matching funds. More than 12 percent of Kentucky’s bridges fall into this category and the average age of these bridges is 54 years. A comparison of Kentucky’s state and county bridge sufficiency ratings is shown in *Table 1*.

Table 1 – Comparison of sufficiency ratings for state and county bridges

Owner	Number of Bridges	Number of Bridges with Sufficiency Less Than 80% (inclusive)	Percentage of Bridges with Sufficiency Less Than 80% (inclusive)	Number of Bridges with Sufficiency Less Than 50%	Percentage of Bridges with Sufficiency Less Than 50%
State	8,860	4,649	52.50%	715	8.10%
County	4,604	2,841	61.70%	1,006	21.80%
Totals	13,464	7,490	55.60%	1,721	12.90%

Status of Bridges in Kentucky and the Nation

In the 2003 Kentucky Infrastructure Report Card, bridge data indicated that over the preceding 10 years, the percentage of deficient bridges in Kentucky had steadily declined and, based largely on that decline, assigned a grade of C- to bridges.

NBI data available from 2002 indicates that deficient bridges amounted to 29.7 percent of the total Kentucky bridge inventory at that time, while the national combined average was 27.6 percent. The difference between the percentage of deficient bridges in Kentucky and the U.S. as a whole was more than 2 percent at that time.

NBI data available at the end of 2009 indicates that Kentucky has 13,729 publicly maintained bridges, of which 1,362, or 9.9 percent, are structurally deficient and 3,064, or 22.3 percent, are functionally obsolete. A total of 4,426, or 32.2 percent of Kentucky’s bridges are rated deficient. Nationally, the 2009 NBI lists 603,245 bridges, of which 71,179, or 11.8 percent are structurally deficient and 78,468, or 13 percent, are functionally obsolete, amounting to a total of 149,647, or 24.8 percent, deficient bridges. Thus, the difference between the percentage of deficient bridges in Kentucky and the U.S. as a whole has increased steadily since 2002 and now stands at more than 7 percent – an all-time high. (See *Figure 2*)

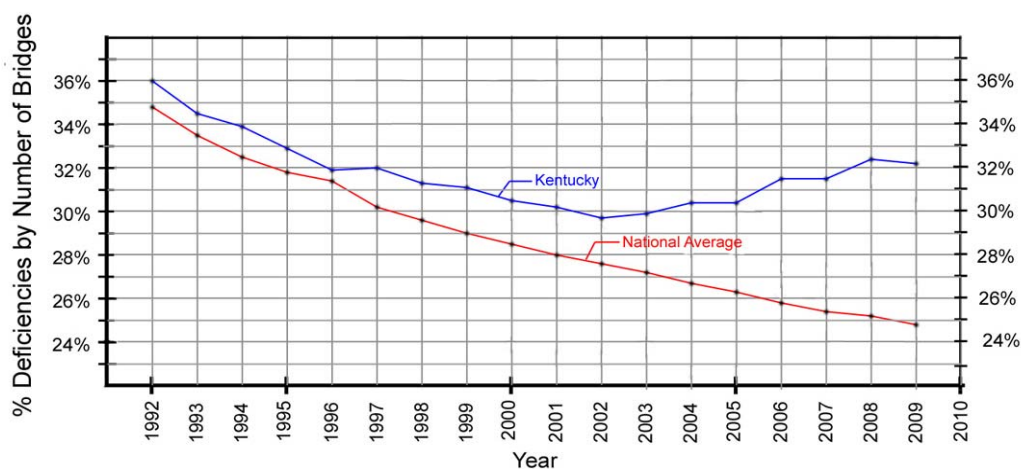


Figure 2 – Bridge deficiencies – Kentucky vs. national average

Figure 3 shows the percentage of deficient bridges by county. *Figure 4* shows the percentage of deficient bridges by deck area in each county. Rural counties in Kentucky have many bridges over back roads and waterways that do not carry the same volume or density of traffic as bridges in more urban counties. The per-bridge cost to remedy deficiencies will not be the same in both circumstances. Analysis of deficiencies by both the gross number of bridges and the gross deck area of bridges helps to bring the relative magnitude of the deficiencies into focus.

See *Appendix Table 2* and *Table 3* for more detail.

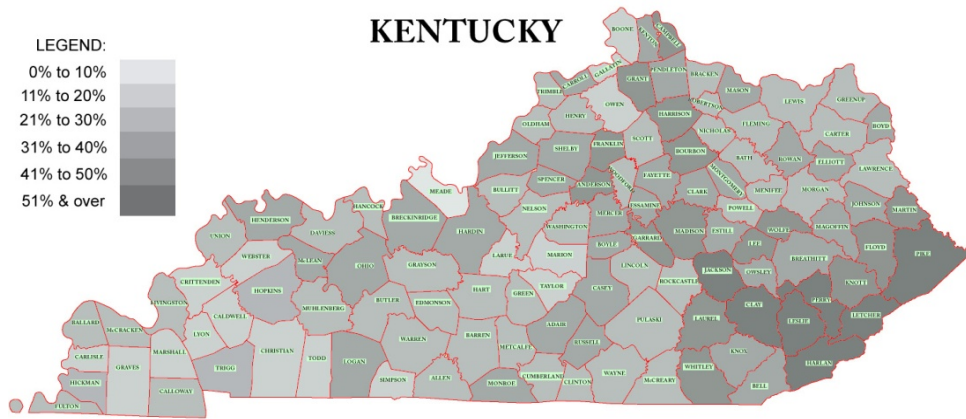


Figure 3 – Map showing percentage of deficiencies of bridges in counties by number of bridges

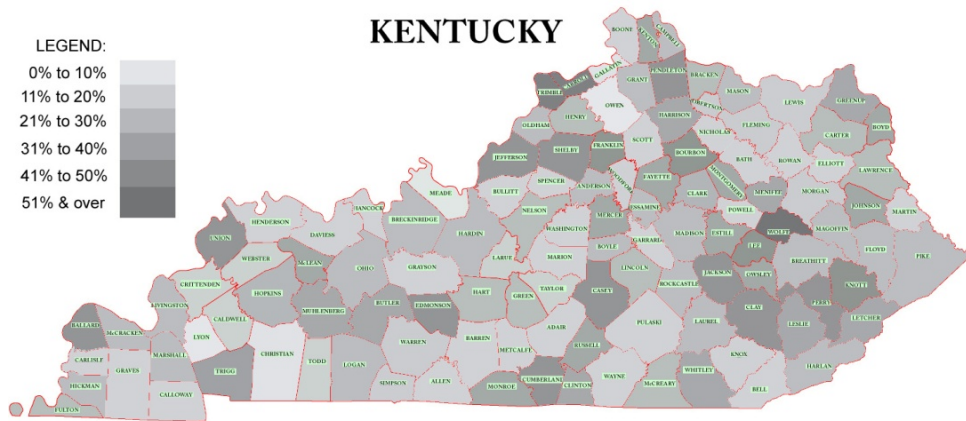


Figure 4 – Map showing percent deficiencies of bridges in counties by deck area

Cost to Upgrade the Kentucky Bridge Inventory

Costs were estimated for the purpose of this issue brief by dividing the most recent Kentucky Bridge Office cost data, which is the information publicly available from the Kentucky Department of Transportation from which the current unit cost to repair and replace bridges can be determined, by the deck area of bridges rehabilitated or replaced for the costs expended. The result is an average cost of \$110 per square foot for projects that involve total bridge replacement or bridge widening, including additional lanes and structure. This figure does not include the cost of purchasing the land where a bridge may sit, designing or engineering – only the cost of construction. For projects that involve only bridge deck overlay, meaning no additional lanes or structure were constructed, the Kentucky Bridge Office estimates a cost of \$40 per square foot.

This issue brief provides a reasonable professional assumption that half of the projects undertaken for the costs expended involved \$110 per square foot bridge replacement or addition of lanes and structure and that the other half involved \$40 per square foot bridge deck overlay. On that premise, the average composite cost to upgrade deficient Kentucky highway bridges would be \$75 per square foot of bridge deck. The total, estimated cost to repair all deficient

highway bridges in Kentucky, calculated by deck area as described, is more than **\$1.2 billion**. *Figure 5* includes a map comparing costs for each county.

It may be unrealistic to assume that funding can be provided to correct all deficiencies and bring all of Kentucky’s highway bridges up to 21st century standards in the short term. No state has been able to reduce its deficiency rating below 11 percent – Kentucky currently stands at 32.2 percent. Therefore, an alternative cost analysis was performed to estimate the cost of bringing Kentucky highway bridges up from their current status to that of the national average, which would cost more than \$283 million. Data available from the Kentucky Transportation Cabinet indicates that \$98,099,379 is budgeted for repair and replacement of Kentucky highway bridges in the current fiscal year.



Figure 5 – Estimated cost of bridge repairs by county

RECOMMENDATIONS SUPPORTED BY ASCE

It is recommended that a Bridge Committee partnership be established among ASCE Kentucky Section, FHWA, KYTC (Maintenance Division) and one or more public interest representatives outside of state government and the engineering community. The committee should be comprised of at least one representative from each group. The goal would be to increase the efficiency of gathering and analyzing data and formulating conclusions based on that data. It could be a source of ready, reliable data, a motivating factor, and of great assistance to the agencies that provide the funds and perform the corrective rehabilitation and maintenance of bridges.

Functions of the Bridge Committee would include:

- Working in unison with state government to set a reasonable goal and timetable for reducing bridge deficiencies in Kentucky to a level below the combined national average.
- Working in unison with state government and the legislature to develop a sustainable source of funding to support the bridge rehabilitation and replacement program.

Any program that is developed should be evaluated on a yearly basis to assure that the overall condition of Kentucky bridges is making progress toward meeting, and exceeding, the national average within a reasonable time period and that Kentucky bridges are maintained at or above the national average thereafter.

GRADE

The condition of highway bridges in Kentucky has deteriorated since the 2003 Kentucky Infrastructure Report Card. As in 2003, Kentucky lags the national average, but the gap between Kentucky and the national average has widened significantly. The sufficiency ratings of highway bridges place Kentucky in the lowest quartile of the nation.

Accordingly, an overall D grade has been assigned to Kentucky's bridges.

ACKNOWLEDGEMENTS

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KENTUCKY BRIDGE SUB-COMMITTEE

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