2009 INFRASTRUCTURE FACT SHEET

ASCE American Society of Civil Engineers

More than 26%, or one in four, of the nation's bridges are either structurally deficient or functionally obsolete. While some progress has been made in recent years to reduce the number of deficient and obsolete bridges in rural areas, the number in urban areas is rising. A $17 billion annual investment is needed to substantially improve current bridge conditions. Currently, only $10.5 billion is spent annually on the construction and maintenance of bridges.

TRANSPORTATION

FACTS ABOUT

BRIDGES

TRANSPORTATION

BRIDGES

2009 GRADE **C**

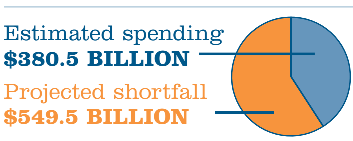
RAISING THE GRADES SOLUTIONS THAT WILL WORK NOW

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **BRIDGES AND ROADS**

Total investment needs
$930 BILLION



★ **SET** a national goal that less than 15% of the nation's bridges be classified as structurally deficient or functionally obsolete by 2013;

★ **INCREASE** transportation investment significantly at all levels of government to fund the needed repair, renovation, or reconstruction of the nation's deficient bridges;

★ **IMPLEMENT** an asset-management approach to maintaining bridges to achieve an appropriate balance between correcting immediate problems, conducting preventive maintenance, rehabilitating deficient bridges, and periodically replacing older bridges;

★ **UPDATE** bridge-inspection standards and implement risk-based prioritization for the repair or reconstruction of the nation's bridges;

★ **INCREASE** funding for long-term transportation research at the national level to ensure better performing and more resilient bridges.

CONDITION

Usually built to last 50 years, the average bridge in our country is now 43 years old.[1] According to the U.S. Department of Transportation, of the 600,905 bridges across the country as of December 2008, 72,868 (12.1%) were categorized as structurally deficient and 89,024 (14.8%) were categorized as functionally obsolete. From 2005–2008, the number of deficient (structurally deficient plus functionally obsolete) bridges in rural areas declined by 8,596. However, in urban areas during the same time frame, there was an increase of 2,817 deficient bridges.[2] Put another way, in 2008 approximately one in four rural bridges were deficient, while one in three urban bridges were deficient. The urban impact is quite significant given the higher level of passenger and freight traffic.

A structurally deficient bridge may be closed or restrict traffic in accordance with weight limits because of limited structural capacity. These bridges are not unsafe, but must post limits for speed and weight. A functionally obsolete bridge has older design features and geometrics, and though not unsafe, cannot accommodate current traffic volumes, vehicle sizes, and weights. These restrictions not only contribute to traffic congestion, they also cause such major inconveniences as forcing emergency vehicles to take lengthy detours and lengthening the routes of school buses.

With truck miles nearly doubling over the past 20 years and many trucks carrying heavier loads, the spike in traffic is a significant factor in the deterioration of America's bridges. Of the more than 3 trillion vehicle miles of travel over bridges each year, 223 billion miles come from trucks.[1]

To address bridge needs, states use federal as well as state and local funds. According to the American Association of State Highway and Transportation Officials (AASHTO), a total of $10.5 billion was spent on bridge improvements by all levels of government in 2004. Nearly half, or $5.1 billion, was funded by the Federal Highway Bridge Program—$3.9 billion from state and local budgets and an additional $1.5 billion in other federal highway aid.[1] AASHTO estimated in 2008 that it would cost roughly $140 billion to repair every deficient bridge in the country—about $48 billion to repair structurally deficient bridges and $91 billion to improve functionally obsolete bridges.[1]

Simply maintaining the current overall level of bridge conditions—that is, not allowing the backlog of deficient bridges to grow—would require a combined investment from the public and private sectors of $650 billion over 50 years, according to

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TABLE 8.1 ★ U.S. Bridge Statistics

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
All Bridges	**582,976**	**585,542**	**589,674**	**589,685**	**590,887**	**591,940**	**593,813**	**595,363**	**597,340**	**599,766**
Urban	128,312	130,339	133,384	133,401	135,339	135,415	137,598	142,408	146,041	151,171
Rural	454,664	455,203	456,290	456,284	455,548	456,525	456,215	452,955	451,299	448,595
Structurally Deficient Bridges, Total	**93,072**	**88,150**	**86,692**	**83,595**	**81,261**	**79,775**	**77,752**	**75,923**	**73,784**	**72,520**
Urban	14,073	12,967	NA	12,705	12,503	12,316	12,175	12,600	12,585	12,951
Rural	78,999	75,183	NA	70,890	68,758	67,459	65,577	63,323	61,199	59,569
Functionally Obsolete Bridges, Total	**79,500**	**81,900**	**81,510**	**81,439**	**81,537**	**80,990**	**80,567**	**80,412**	**80,317**	**79,804**
Urban	27,588	26,095	29,398	29,383	29,675	29,886	30,298	31,391	32,292	33,139
Rural	51,912	52,835	52,112	52,056	51,862	51,104	50,269	49,021	48,025	46,665

NA = Not Available

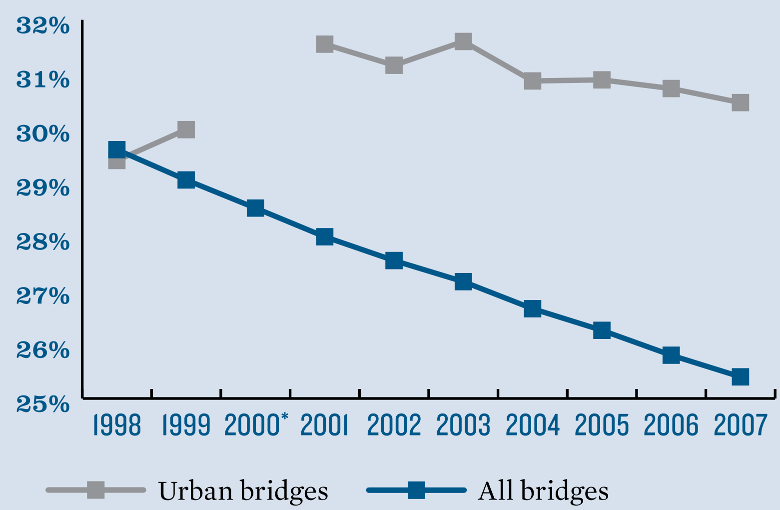
SOURCE *Transportation Statistics Annual Report*, U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

AASHTO, for an average annual investment level of $13 billion. The cost of eliminating all existing bridge deficiencies as they arise over the next 50 years is estimated at $850 billion in 2006 dollars, equating to an average annual investment of $17 billion.[3]

RESILIENCY

The reliable and efficient flow of people, commodities, and emergency services within our roadway system relies on the nation's bridge system, which overall is highly resilient. The keys involve three components: system redundancy and workarounds; recovery measures, including rapid restoration ability, security, and robustness against hazards—both natural and man-made; and individual bridges' structural redundancy. Interstate bridges are usually built in pairs so that if one is taken out of service, the companion bridge can carry traffic in both directions temporarily. Also, in most urban areas, there are a number of bridges that can provide suitable alternate routes for traffic. Those key bridges that lack redundancy make it extremely difficult to establish convenient workarounds should the bridge be closed. Increasing congestion means that any

FIGURE 8.1 ★ Percent of Deficient Bridges in the United States



* 2000 data not available

SOURCE *State Transportation Statistics: 2007,* U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

rerouting caused by a significant bridge closure could result in major traffic delays.

Bridges are designed to account for the likely loads and forces that the span could expect to encounter during its service life. Structurally, today's bridges are highly redundant, and incorporate multiple girder systems that can compensate for the failure of a single member. There are exceptions for example, fracture-critical bridges, which require more frequent monitoring to ensure that they remain capable of handling their designed traffic loads. Resiliency should be part of the evaluation criteria in a risk-analysis to justify and prioritize bridge investment. That investment includes activities that range from nonstructural measures to the structural and from the design of new bridges to the rehabilitation and replacement of old bridges.

CONCLUSION

While some progress has been made recently in improving the condition of the nation's rural bridges, there has been an increase in the number of deficient urban bridges. At the same time, truck traffic over the nation's bridges is on the rise—a matter of great concern as trucks carry significantly heavier loads than automobiles and exact more wear and tear on bridges. The investment gap is accelerating and the failure to invest adequately in the nation's bridges will

RAISING THE GRADES CASE STUDIES

UTAH ★ Accelerated Bridge Construction

The Utah Department of Transportation (UDOT) has used some form of the accelerated bridge construction (ABC) method on 19 projects that have included 77 bridges. The majority of these projects entailed the use of precast decks cast off-site and lifted into place over a short period of time—often overnight. The benefits of the ABC method include not only reduced road closure time and a compressed schedule, but enhanced quality and increased safety for drivers and construction workers as well. The concept of fabricating entire bridge spans off-site and moving them into place with self-propelled modular transports (SPMTs) was used in four projects that replaced a total of 13 bridges. The use of off-site fabrication and SPMTs usually allows for the replacement of bridge spans over a weekend. In one case—the 4500 South crossing of I-215 in Salt Lake City—construction time was reduced by 120 days, saving drivers an estimated $4.2 million in terms of construction delays. *Photos courtesy of Utah Department of Transportation.*

RAISING THE GRADES
CASE STUDIES

I-495 / 95, NORTHERN VA / MD ★ Woodrow Wilson Bridge

Solving one of the worst bottlenecks on the East Coast, the $2.4 billion Woodrow Wilson Bridge Project in northern Virginia and Maryland replaced nearly 12% of the Capital Beltway (Interstate 495/95) and created four new interchanges. Opened in 1961, the original bridge was designed for 75,000 trips per day, but over the years traffic swelled to nearly 200,000 trips daily—11% of them by large trucks. With eight highway lanes squeezing into the original bridge's six lanes, the lack of shoulders and merge lanes resulted in accident rates twice those of other segments of the Beltway, and emergency crews were delayed in reaching those in need. Peak period stop-and-go conditions also contributed to decreased air quality. As one of nine bridges within the interstate highway system with a movable span, the 260 bridge openings per year created additional delays and congestion. These issues rendered the old bridge functionally obsolete.

The new drawbridges are 20 feet higher than the original, and the number of openings is expected to be reduced to about 65 per year, down about 75%. Shoulders on the new bridge will reduce the rate of accidents and improve accident management, and new merge lanes will increase safety. The new bridge has 12 lanes, including two express-type through lanes on each span to accommodate High Occupancy Vehicle (HOV) traffic. The new bridge was named the 2008 Outstanding Civil Engineering Achievement by ASCE. *Photo courtesy of the Wilson Bridge Project.*

RAISING THE GRADES CASE STUDIES

OAKLAND, CA ★ The MacArthur Maze Repairs

When a gasoline tanker rig flipped over on an elevated interstate highway connector ramp on April 29, 2007, the massive explosion and burning fuel warped and collapsed a critical section of the San Francisco Bay Area's MacArthur Maze. To allow traffic and commerce to flow through this vital artery quickly, the state undertook extreme measures to complete repairs in record-breaking time. The twisted steel and crumbled concrete that was the I-580 overpass also damaged the I-880 elevated ramp below. Such extensive damage could have been expected to take months to repair, but with the connectors so vital to commuters, the California Department of Transportation went to work around the clock under an emergency declaration. Only one week after the accident, the lower I-880 connector had been repaired and was reopened. The I-580 overpass was completed in just 26 days, due in part to a bonus of $200,000 paid for each day the work was completed sooner than two months after the accident. *Photo courtesy of California Department of Transportation, photographed by John Huseby.*

lead to increased congestion and delays for motorists, wasted fuel, the further deterioration of bridge conditions, and increased safety concerns. Once Congress works to address these problems in the 2009 authorization of the Surface Transportation Program, it should establish a goal that less than 15% of the nation's bridges be classified as structurally deficient or functionally obsolete by 2013 and should provide the funding needed to accomplish that. ★

SOURCES

1 American Association of State Highway and Transportation Officials (AASHTO). Bridging the Gap. July 2008

2 Data provided by Federal Highway Administration, U.S. Department of Transportation

3 Report of the National Surface Transportation Policy and Revenue Study Commission, Transportation for Tomorrow, December 2007 final report. Volume II, Chapter 4, p. 6