Testimony of
The American Society of Civil Engineers
Before the
House Committee on Transportation and Infrastructure
on
Structurally Deficient Bridges in the United States

September 5, 2007

Chairman Oberstar, Congressman Mica and Members of the Committee:

Good morning. I am Andrew Herrmann, a Board Member of the American Society of Civil Engineers (ASCE)[*], and the Managing Partner of Hardesty & Hanover, LLP, a transportation consulting engineering firm headquartered in New York. I am a licensed Professional Engineer in 26 states. During my 34 year career I have been responsible for many of the firm's major fixed and movable bridge projects. My experience covers inspection, rating, design, rehabilitation, and construction of bridges.

Let me start by thanking you for holding this hearing. As someone who has worked in this field for many years, I can say that there are few infrastructure issues of greater importance to Americans today than bridge safety.

I am pleased to appear today to be able to lend ASCE's expertise to the problem of the nation's crumbling infrastructure that was highlighted by the tragic events of August 1, 2007 when the I35W Bridge in Minneapolis collapsed into the Mississippi River.

I am also pleased to voice ASCE's strong support of the **National Highway System Bridge Reconstruction Initiative**, which would provide dedicated funding to States to repair, rehabilitate, and replace structurally deficient bridges on the National Highway System (NHS).

I. Bridge Conditions

More than 4 billion vehicles cross bridges in the United States everyday and, like all man-made structures, bridges deteriorate. Deferred maintenance accelerates deterioration and causes bridges to be more susceptible to failure. As with other critical infrastructure, a significant investment is essential to maintain the benefits and to assure the safety that society demands.

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[*] ASCE, founded in 1852, is the country's oldest national civil engineering organization. It represents more than 140,000 civil engineers in private practice, government, industry, and academia who are dedicated to the advancement of the science and profession of civil engineering. ASCE is a 501(c) (3) non-profit educational and professional society.

In 2005, ASCE issued the latest in a series of assessments of the nation's infrastructure. Our *2005 Report Card for America's Infrastructure* found that as of 2003, 27.1% or 160,570 of the nation's 590,753 bridges were structurally deficient or functionally obsolete, an improvement from 28.5% in 2000. In fact, over the past 12 years, the number of deficient bridges (both structurally deficient and functionally obsolete categories) has steadily declined from 34.6% in 1992 to 25.8% in 2006.

However, this improvement is contrasted with the fact that one in three urban bridges (31.2% or 43,189) were classified as structurally deficient or functionally obsolete, much higher than the national average.

In 2005, the FHWA estimated that it would cost $9.4 billion a year for 20 years to eliminate all bridge deficiencies. In 2007, FHWA estimated that $65 billion could be invested immediately in a cost beneficial manner to address existing bridge deficiencies.

The ten year improvement rate from 1994 to 2004 was 5.8% (32.5% - 26.7%) less deficient bridges. Projecting this rate forward from 2004 would require 46 years to remove all deficient bridges. Unfortunately the rate of deficient bridge reduction from 1998 on to 2006 is actually decreasing with the current projection from 2006 requiring 57 years for the elimination of all deficient bridges. Progress has been made in the past in removing deficient bridges, but our progress is now slipping or leveling off.

There is clearly a demonstrated need to invest additional resources in our nation's bridges. However, deficient bridges are not the sole problem with our nation's infrastructure. The U.S. has significant infrastructure needs throughout the transportation sector including roads, public transportation, airports, ports, and waterways. As a nation, we must begin to address the larger issues surrounding our infrastructure so that public safety and the economy will not suffer.

II. Bridge Inspection Program

The National Bridge Inspection Standards (NBIS), in place since the early 1970s, require biennial safety inspections for bridges in excess of 20 feet in total length located on public roads. These inspections are to be performed by qualified inspectors. Structures with advanced deterioration or other conditions warranting closer monitoring are to be inspected more frequently. Certain types of structures in very good condition may receive an exemption from the 2-year inspection cycle. These structures may be inspected once every 4 years. Qualification for this extended inspection cycle is reevaluated depending on the conditions of the bridge. Approximately 83 percent of bridges are inspected once every 2 years, 12 percent are inspected annually, and 5 percent are inspected on a 4-year cycle.

Information is collected documenting the conditions and composition of the structures. Baseline composition information is collected describing the functional characteristics,

descriptions and location information, geometric data, ownership and maintenance responsibilities, and other information. This information permits characterization of the system of bridges on a national level and permits classification of the bridges. Safety, the primary purpose of the program, is ensured through periodic hands-on inspections and ratings of the primary components of the bridge, such as the deck, superstructure, and substructure. This classification and condition information is maintained in the National Bridge Inventory (NBI) database maintained by FHWA. This database represents the most comprehensive source of information on bridges throughout the United States.

Two documents, the American Association of State Highway and Transportation Officals' (AASHTO) *Manual for Condition Evaluation of Bridges* and the Federal Highway Administration's (FHWA) *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*, provide guidelines for rating and documenting the condition and general attributes of bridges and define the scope of bridge inspections. Standard condition evaluations are documented for individual bridge components as well as ratings for the functional aspects of the bridge. These ratings are weighted and combined into an overall Sufficiency Rating for the bridge on a 0-100 scale. These ratings can be used to make general observations on the condition of a bridge or an inventory of bridges.

The factors considered in determining a sufficiency rating are: S1- Structural Adequacy and Safety (55% maximum), S2- Serviceability and Functional Obsolescence (30% maximum), S3- Essentiality for Public Use (15% maximum), and S4- Special Reductions (detour length, traffic safety features, and structure type--13% maximum).

In addition to the sufficiency rating, these documents provide the following criteria to define a bridge as structurally deficient or functionally obsolete, which triggers the need for remedial action.

Structurally Deficient – A structurally deficient (SD) bridge may be restricted to light vehicles because of its deteriorated structural components. While not necessarily unsafe, these bridges must have limits for speed and weight, and are approaching the condition where replacement or rehabilitation will be necessary. A bridge is structurally deficient if its deck, superstructure, or substructure is rated less than or equal to 4 (poor) or if the overall structure evaluation for load capacity or waterway adequacy is less than or equal to 2 (critical). Note a bridge's structural condition is given a rating between 9 (excellent) and 0 (representing a failed condition). In a worse case scenario, a structurally deficient bridge may be closed to all traffic.

Functionally Obsolete – A bridge that is functionally obsolete (FO) is safe to carry traffic but has less than the desirable geometric conditions required by current standards. A bridge is functionally obsolete if the deck geometry, underclearances, approach roadway alignment, overall structural evaluation for load capacity, or waterway adequacy is rated less than or equal to 3 (serious). A functionally obsolete bridge has older design features and may not safely accommodate current traffic volumes, vehicle sizes, and

vehicle weights. These restrictions not only contribute to traffic congestion, but also pose such major inconveniences as lengthy detours for school buses or emergency vehicles.

Structural Capacity –Components of bridges are structurally load rated at inventory and operating levels of capacity. The inventory rating level generally corresponds to the design level of stresses but reflects the present bridge and material conditions with regard to deterioration and loss of section. Load ratings based on the inventory level allow comparisons with the capacities for new structures. The inventory level results in a live load which can safely utilize an existing structure for an indefinite period of time. The operating rating level generally describes the maximum permissible live load to which the bridge may be subjected. This is intended to tie into permits for infrequent passage of overweight vehicles. Allowing unlimited numbers of vehicles to use a bridge at the operating level may shorten the life of the bridge.

Bridge Engineers and Bridge Inspectors:

Bridge inspection services should not be considered a commodity. Currently, NBIS regulations do not require bridge inspectors to be Professional Engineers, but do require individuals responsible for load rating the bridges to be Professional Engineers. ASCE believes that non-licensed bridge inspectors and technicians may be used for routine inspection procedures and records, but the pre-inspection evaluation, the actual inspection, ratings, and condition evaluations should be performed by licensed Professional Engineers experienced in bridge design and inspection. They should have the expertise to know the load paths, critical members, fatigue prone details, and past potential areas of distress in the particular type of structure being inspected. They must evaluate not only the condition of individual bridge components, but how the components fit into and affect the load paths of the entire structure. The bridge engineer may have to make immediate decisions to close a lane, close an entire bridge, or to take trucks off a bridge to protect the public safety.

III. National Highway System Bridge Reconstruction Initiative

ASCE applauds the quick action by Chairman Oberstar to announce legislation that would address the public safety issues posed by the National Highway System's structurally deficient bridges. This is a promising display of support that has often been lacking for the problem of our nation's crumbling infrastructure. However, it is essential to remember that this legislation, while a good first step, is not the sole solution.

ASCE strongly supports quick action to enact the NHS Bridge Reconstruction Initiative which would create a dedicated fund to repair, rehabilitate, and replace structurally deficient bridges on the NHS. This is accomplished through four components:

- Improving bridge inspection requirements;
- Providing dedicated funding for structurally deficient NHS bridges;
- Distributing funds based on public safety and need; and
- Establishing a bridge reconstruction trust fund.

A thorough review of the current bridge inspection requirement seems appropriate and there must be greater emphasis on the steps needed to address a structurally deficient bridge once it has been classified. ASCE strongly supports a requirement that bridge inspections be performed by licensed professional engineers who are certified bridge inspectors. The initiative's compliance reviews of state bridge inspection programs and increased emphasis are good steps to improving the states bridge programs. These efforts, however, must emphasize bridge safety not bureaucracy.

A dedicated funding source to repair, rehabilitate, and replace structurally deficient bridges on the NHS would be a good complement to the current FHWA bridge program because of the emphasis on NHS bridges. NHS bridges carry a large percentage --more that 70 percent --of all traffic on bridges. Of the 116,172 bridges on the NHS, 6,175 are structurally deficient of which 2,830 are part of the Interstate System. The investment backlog for these deficient bridges is estimated to be $32.1 billion.

The requirement to distribute funds based on a formula which takes into account public safety and needs is an excellent step in creating a program that addresses public safety first. ASCE's Cannon of Ethics states clearly that public safety, health, and welfare should be the engineer's primary concern. Any bridge safety program should be based on providing for public safety first.

ASCE has long supported the creation of trust funds for infrastructure improvement. Unfortunately, the passage of SAFETEA-LU left a significant gap in funding the well-documented needs of our nation's surface transportation programs. During the SAFETEA-LU debate, it was estimated that $375 billion was needed for the surface transportation program, but only $286 billion was authorized in the law. This initiative would be a first step in addressing the long term needs of the nation. However, this effort should not detract from the investment needs debate during the reauthorization of SAFETEA-LU in 2009.

IV. ASCE's policies regarding bridges

Funding programs for transportation systems, i.e., federal aviation, highways, harbors, inland waterways, and mass transit as documented by the U.S. Department of Transportation, need to be increased, to provide orderly, predictable, and sufficient allocations to meet current and future demand. The Highway Trust Fund is in danger of insolvency (as other trust funds may be in the future) and must receive an immediate boost in revenue to ensure success of multi-modal transportation programs. In fact, the Office of Management and Budget estimates that in FY 2009 the Highway Account of the Highway Trust Fund will be in the red by as much as $4.3 billion.

The safety, functionality, and structural adequacy of bridges are key components necessary to support and ensure the safe, reliable, and efficient operation of transportation infrastructure and systems which provide mobility of people and the movement of goods

and services. Federal policy establishes the minimum bridge safety program components necessary for both public and private bridges to ensure an adequate and economical program for the inspection, evaluation, maintenance, rehabilitation, and replacement of our nation's bridges.

Continued neglect and lack of adequate maintenance will ultimately result in higher annual life-cycle costs of bridges due to shortened service life. Therefore, investment to improve the condition and functionality of the nation's bridges will reduce the required investment in the future.

Bridge Safety
For the continued safety of the nation's bridges, ASCE advocates that a bridge safety program for both public and private bridges be established, fully funded, and consistently operated to upgrade or replace deficient bridges and to properly maintain all others. This program should preserve full functionality of all bridges to support the operation of safe, reliable and efficient transportation systems, and to allow these systems to be utilized to their full capacity. Such programs should include as a minimum:

- Regular programs of inspection and evaluation that incorporate state-of-the-art investigative and analytical techniques, especially of older bridges which were not designed and constructed to current design loading and geometric standards;
- Posting of weight and speed limits on deficient structures;
- Implementing and adequately funding regular system-wide maintenance programs that are the most cost-effective means of ensuring the safety and adequacy of existing bridges;
- Establishing a comprehensive program for prioritizing and adequately funding the replacement of functionally obsolete and structurally deficient bridges;
- Setting a national goal that fewer than 15% of the nation's bridges be classified as structurally deficient or functionally obsolete by 2010; and

Transportation Funding
Adequate revenues must be collected and allocated to maintain and improve the nation's transportation systems and to be consistent with the nation's environmental and energy conservation goals. A sustained source of revenue is essential to achieve these goals.

ASCE recommends that funding for transportation system improvements, associated operations, and maintenance be provided by a comprehensive program including:

- User fees such as motor fuel sales tax;
- User fee indexing to the Consumer Price Index (CPI);
- Appropriations from general treasury funds, issuance of revenue bonds, and tax-exempt financing at state and local levels;
- Trust funds or alternative reliable funding sources established at the local, state, and regional levels, including use of sales tax, impact fees, vehicle registration fees, toll revenues, and mileage-based user fees developed to augment allocations from federal trust funds, general treasuries funds, and bonds;

- Refinement of the federal budget process to establish a separate capital budget mechanism, similar to many state budgets, to separate long-term investment decisions from day-to-day operational costs;
- Public-private partnerships, state infrastructure banks, bonding, and other innovative financing mechanisms as appropriate for the leveraging of available transportation program dollars, but not in excess of, or as a means to supplant user fee increases;
- The maintenance of budgetary firewalls to eliminate the diversion of user revenues for non-transportation purposes, and continuing strong effort to reduce fuel tax evasion.

V. Conclusion

Successfully and efficiently addressing the nation's infrastructure issues, bridges and highways included, will require a long-term, comprehensive nationwide strategy—including identifying potential financing methods and investment requirements. For the safety and security of our families, we, as a nation, can no longer afford to ignore this growing problem. We must demand leadership from our elected officials, because without action, aging infrastructure represents a growing threat to public health, safety, and welfare, as well as to the economic well-being of our nation.

Thank you, Mr. Chairman. That concludes my statement. I would be pleased to answer any questions that you may have.

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