Bridge Safety Questioned As Search Goes On

Divers Continue To Look For Victims Of Horrific Minnesota Bridge Collapse

(CBS/AP) Divers searched the Mississippi River on Thursday for bodies still trapped beneath the twisted debris of a collapsed freeway bridge, as finger-pointing began over a federal report two years ago that found the bridge was "structurally deficient."

Speculation is already beginning into what may have caused the eight-lane Interstate 35W bridge to **buckle and collapse** during the evening rush hour Wednesday.

"It's hard to be conclusive so early, but it looks like the main support, the main steel arch, may have given way or something right near it," Richard Stehly, an expert in bridge engineering and co-founder of St. Paul, Minn.-based American Engineering Testing, told **CBS Evening News anchor Katie Couric**.

"Also, the things that support the main arch, the foundations on either bank, perhaps they did. But investigators will look at everything. They will look at the materials. They will look at all the pieces of debris. And they'll find out the cause, because we need to learn the reason for its failure."

Inspections as far back as 2000 on the bridge identified both corrosion in the steel and a lot of cracking, says Stehly.

Questions are also being raised about a 2005 report in the U.S. Department of Transportation's National Bridge Inventory that rated the bridge as "structurally deficient" and possibly in need of replacement.

The report said there were fatigued details on the main truss and floor truss system. Yet it concluded there was no need to prematurely replace the bridge because of fatigue cracking, avoiding the high cost associated with such a large project.

When the bridge was built 40 years ago, it was state of the art, a massive steel arch spanning the Mississippi. But the bridge was designed without the extra support common to later designs, which meant that if one component failed, the whole bridge was likely to fall, reports **CBS affiliate WCCO's Ben Tracy** in Minneapolis.

The official death count from Wednesday evening's collapse stood at four, but Police Chief Tim Dolan said more bodies were in the water. As many as 30 people were reported missing, and the rescue effort had shifted to recovery. Hospital officials said 79 people were injured.

Federal officials alerted states Thursday to immediately inspect all bridges similar to the Minneapolis bridge that collapsed. President Bush, who will travel to the scene of the disaster on Saturday, said the federal government would help rebuild the bridge in the city that will host next year's Republican National Convention.

"We in the federal government must respond, and respond robustly, to help the people there not only recover, but to make sure that lifeline of activity — that bridge — gets rebuilt as quickly as possible," Bush said.

Still stung by harsh criticism of the government's sluggish response to Hurricane Katrina, Bush talked with

state and local officials in Minnesota, and the administration dispatched officials to the scene.

First lady Laura Bush will visit Minneapolis on Friday to console victims of the disaster.

The House Transportation Committee quickly approved legislation Thursday that would direct $250 million to Minnesota to help it replace the bridge.

The White House said a U.S. inspection of the 40-year-old bridge in 2005 found problems. The Interstate 35W span rated 50 on a scale of 100 for structural stability and was classified as "structurally deficient," transportation officials said.

The designation means some portions of the bridge needed to be scheduled for repair or replacement, and it was on a schedule for inspection every two years. "It didn't mean that the bridge is unsafe," Transportation Secretary Mary Peters said.

Earlier, at the White House, press secretary Tony Snow said while the inspection did not indicate the bridge was at risk of failing, "If an inspection report identifies deficiencies, the state is responsible for taking corrective actions."

Minnesota Gov. Tim Pawlenty on Thursday ordered an immediate inspection of all bridges in the state with similar designs, but said the state was never warned that the bridge needed to be closed or immediately repaired.

"There was no call by anyone that we're aware of that said it should be immediately closed or immediately replaced," Pawlenty said. "It was more of a monitor, inspect, maintain, and potentially replace it in the future."

The eight-lane Interstate 35W bridge, a major Minneapolis artery, was in the midst of repairs when it buckled during the evening rush hour. Dozens of cars **plummeted 60 feet**into the Mississippi River, some falling on top one of another. A school bus sat on the angled concrete.

A strong current and low visibility hampered the search for bodies, but at least four submerged vehicles had been located with sonar, officials said.

The divers face extreme danger — they have to avoid mountains of twisted steel, concrete and cars. The massive debris field has created pockets of fast-moving water, small whirlpools that could pull a diver to his death, reports **CBS News correspondent Byron Pitts**.

"We have a number of vehicles that are underneath big pieces of concrete, and we do know we have some people in those vehicles," Dolan said. "We know we do have more casualties at the scene."

Speaking with **Couric** on Thursday, Pawlenty said there were 80,000 bridges designated as "structurally deficient," adding that inspectors of the I-35W bridge "indicated there was no need for dramatic intervention."

As 2007 began, at least 73,694 of the nation's 596,808 bridges, or about 12 percent, were classified as "structurally deficient," Federal Highway Administration figures show. They include 816 built as recently as

the early 1990s and 3,871 that are nearly a century old,

In the Mississippi River, divers took down license plate numbers for authorities to track down the vehicles' owners. Getting the vehicles out is expected to take several days and involve moving around very large, heavy pieces of bridge.

Relatives who could not find their loved ones at hospitals gathered in a hotel ballroom Thursday for any news, hoping for the best.

As many as 50 vehicles tumbled into the river when the bridge collapsed, leaving those who could escape to scramble to shore. Some survivors carried the injured up the river bank, while emergency workers tended to others on the ground and some jumped into the water to look for survivors. Fire and black smoke rose from the wreckage.

"People who were pinned or partly crushed told emergency workers to say 'hello' or say 'goodbye' to their loved ones," Dolan said.

The first step of the federal investigation will be to recover pieces of the bridge and reassemble them, much like a jigsaw puzzle, to try and determine what happened, NTSB Chairman Mark Rosenker said.

Investigators also want to review video of the collapse, and were setting up a phone number for witnesses to call with information.

"It is clearly much too early in the initial stages of this investigation to have any idea what happened," Rosenker said.

This week, road crews had been working on the bridge's joints, guard rails and lights, with lane closures overnight on Tuesday and Wednesday.

The steel-arched bridge, built in 1967, rose 64 feet above the river and stretched 1,900 feet across the water. It was built with a single 458-foot-long steel arch to avoid the need for piers that might interfere with river navigation.

INTERSTATE HIGHWAY SYSTEM

Collapse Spotlights Weaknesses in U.S. Infrastructure

By Nick Miroff
Washington Post Staff Writer
Friday, August 3, 2007; Page A08

The bridge that lies crumpled in the Mississippi River is the latest link to fail in a national highway system rapidly deteriorating under the strain of ever-increasing traffic volume and inadequate upkeep, transportation experts said yesterday.

Once the sturdy pride of post-war America, the federal interstate system is now a vast network of aging roads and bridges, including many -- such as the span that collapsed in Minneapolis -- that engineers consider deficient or obsolete.

Despite record spending on highways, experts and engineers said federal funds aren't enough to save the interstate system's half-century old bridges and 47,000 miles of highway from further decay, as a network designed to connect the nation teeters under a crush of commuter traffic.

"We're falling further and further behind," said Robert Poole, director of transportation studies at Reason Foundation and an adviser to the Federal Highway Administration. "We're prospering as a nation, driving more as commuters and shipping more goods, and that's pounding the highways and wearing them out."

According to a 2005 Highway Administration report, more than 75,000 of the nation's roughly 600,000 bridges -- 13.1 percent -- were rated "structurally deficient," meaning some components of the bridges' decks or support structures were rated poor or worse. While not necessarily unsafe, the structurally deficient designation often requires speed and weight restrictions to lessen the risk of collapse.

Concerns about bridge reliability pushed the state of the country's infrastructure into the political arena yesterday, as Senate Majority Leader Harry M. Reid (D-Nev.) called the Minneapolis bridge collapse a "wake-up call."

"We have all over the country crumbling infrastructure -- highways, bridges, dams -- and we really need to take a hard look at this," Reid said in a television interview.

Congress approved a six-year, $286 billion transportation funding package in 2005 that boosted highway and mass transit projects. But the government will need to spend $188 billion in the next 20 years just to fix the nation's flawed bridges, according to a 2005 study by the American Society of Civil Engineers.

Bridges in the Washington region are, on average, in better condition than elsewhere in the country, although hundreds of area spans are in substandard shape. Of the 245 bridges in the District, 9 percent were graded structurally deficient in the Highway Administration survey, along with 9 percent of Virginia bridges and 8 percent of Maryland bridges.

Engineers on the $2.4 billion Woodrow Wilson Bridge Project, one of several bridge projects underway in the region, said the new bridge is designed to avert the kind of catastrophe that occurred in Minneapolis.

"A majority of the interstate bridges in this country are [at the end of] service life," said Ronaldo T. "Nick" Nicholson, the Virginia Department of Transportation's manager for the Woodrow Wilson Bridge project. "In Minnesota, they were trying to extend the life rather than replace it."

Though engineers have not yet determined why the Minneapolis bridge failed, bridge experts said its collapse was not necessarily the result of a physical breakdown. Of the 1,502 recorded bridge failures between 1966 and 2005, almost 60 percent were caused by soil erosion around the underwater bridge supports, according to Jean-Louis Briaud, a civil engineer with the Texas Transportation Institute.

It's the number one killer of bridges," he said. "If you create a hole around the bridge support, then the foundation cannot carry the load of the deck."

Vigilant inspections can prevent failures, and the Minnesota collapse was particularly shocking to those who say safety has been improving.

"By and large, things are positive, and states have been spending more on bridges and making progress," said Alan E. Pisarski, author of "Commuting in America," who noted that the number of structurally deficient bridges in the country has declined in the past decade. "But there are still a lot of them that are structurally deficient."

Nevertheless, the overall national infrastructure is stuck in a "death spiral," as states repeatedly fail to maintain the status quo condition of their transportation networks, Pisarski said. Maintenance standards slip further as the money is spread thin.

Diminishing tax revenue and surging costs have put a double squeeze on state transportation departments, transportation experts said. While federal gas tax rates have remained at 18.4 cents a gallon since 1993, construction costs have been increasing 20 percent a year in some areas. The price of steel, oil and concrete are all up, partly driven by demand for raw materials in China, where the government is busy laying out a national highway system of its own.

"We're going to run out of capacity pretty quick, and that is going to put a grinding halt on productivity, profitability and our way of life," said Janet Kavinoky, director of transportation infrastructure at the U.S. Chamber of Commerce.

Last year marked the 50th anniversary of the Interstate Highway System, a legacy of President Dwight D. Eisenhower and his grand vision for a road system that would shrink the continent and "meet the demands of catastrophe or defense, should an atomic war come."

The missiles never came, but the cars did. State transportation departments, which took control of the interstate system in exchange for federal funds, are confronted with an even costlier mission: satisfying commuter demand for lane-widening projects in urban areas where land is most expensive.

One result, said the Reason Foundation's Poole, is that states are turning to the private sector to maintain existing roads and build the next generation of highways, a change encouraged by the Bush administration.

Jerome F. Hajjar, professor of structural engineering at the University of Illinois at Urbana-Champaign, said the American Society of Civil Engineers has been warning for years that the nation needs to devote more attention to its aging bridges.

"Each bridge is different, and each bridge needs to stand up," he said. "Collapsing is not an option."

Staff writers Brigid Schulte and Amy Goldstein contributed to this report

A Reassuring Sound Above Traffic's Din

Bridge Inspectors Rely on Senses

By Brigid Schulte
Washington Post Staff Writer
Friday, August 3, 2007; Page B01

With all the advanced technology available in the world, a proper bridge inspection comes down to a pick hammer and a "ping."

Not a "thud." A thud is bad.

A nice, high-pitched ping means the bridge's steel hexagon bolts are tight. And tight bolts mean the intricate lattice of steel diaphragms, cross braces, bearings and splice plates -- in short, the entire superstructure of the bridge -- will hold up as thousands of vehicles pound across it everyday.

A "thud" means the bolts have started to come loose. If all they need is a little tightening, most bridge inspectors carry a yard-long wrench for the job. Oh, there is the occasional need for ground-penetrating radar to check for potholes on the concrete deck above and red dye penetrant or magnetic powder to look for cracks in the steel below. But by and large, bridge inspection is not rocket science.

Ronaldo T. "Nick" Nicholson, a former Virginia Department of Transportation bridge inspector who is manager of the Woodrow Wilson Bridge project, pointed to his eyes. "In bridge inspection, your best tools are these," he said. And, of course, the ears. "It's all visual or audio."

Nicholson explained the intricacies of pings and thuds yesterday under Bridge B609, one of 50 ramps and bridges in the Springfield Mixing Bowl. High above, strapped into an orange lift on the back of a VDOT pickup, Ray Tudge, a bridge inspector of 17 years, wielded his little hammer. From the ground, 35 feet below, Tudge's hammering sounded like a dull "thwack," with an occasional hollow "blang." But Tudge later affirmed that from up high, the noises were indeed pings, just what one would expect from a brand-new, state-of-the-art bridge built to last 100 years.

Nicholson was leading a gaggle of TV cameras and reporters to observe the inspection to reassure motorists that Virginia's bridges were indeed safe after the catastrophic failure of a bridge in Minneapolis. The Maryland Department of Transportation called a news conference to provide the same reassurance. Nicholson said Virginia, Maryland and other surrounding states follow the federal government's rigorous National Bridge Inspection program standards.

Inspectors are trained to make small fixes, such as minor bolt tightening, Tudge explained. To be certified, inspectors must complete a two-week federal program. If he finds a small crack, he drills a hole at one end to keep it from spreading. But if he sees anything that merits watching, he notes it in a report. Cracks are measured. Digital photographs are taken. If he finds something more serious -- say, rust building up in such a way that bolts and rivets are in danger of popping -- he calls in a bridge repair team.

But if he finds a crack, signs of wear or fracturing so serious as to warrant emergency action, he and every other bridge inspector in Virginia has the authority to immediately shut down the bridge. That, Nicholson said, has happened only two or three times in the past decade in Northern Virginia that he can recall.

In Virginia, inspectors such as Tudge are responsible for inspecting 20,000 bridges, about 2,200 of which are in Northern Virginia. They inspect each bridge every two years, more often if the bridges are older or show signs of stress. Parts of the old Wilson Bridge that was demolished last year were of such concern for potential catastrophic failure that bridge inspectors increased some inspections to every six months.

For the most part, inspecting a bridge is tedious, painstaking and not for the faint of heart. For Tudge to eyeball every bolt on this quarter-mile-long bridge in Springfield will take about three weeks, he said -- a month and a half if it were in bad shape. And when he gets to the section that arcs over the pounding interstate traffic, he'll have to use the state's only "bridge snooper," a machine that will lower him over the side of the top deck so he can clamber around the bridge's underside.

Nicholson said he watched with horror as the Interstate 35W bridge in Minneapolis collapsed. The bridge had been inspected in 2005 and 2006. One consolation, he said, is that VDOT has replaced all the similarly styled deck truss bridges in his Northern Virginia district, most recently turning one on Route 7 over Goose Creek in Loudoun County into a pedestrian-only historic byway.

But he does have pressing worries, such as the Washington Street Bridge over Columbia Pike in Arlington County that was built in the 1940s and was not designed to handle the volume of traffic it gets everyday. "That one needs to be replaced," he said, "before something happens."

Area Bridges Need Pricey Repair Work

Hundreds of Spans Cited in Report

By Michael Laris and Virgil Dickson
Washington Post Staff Writers
Friday, August 3, 2007; Page B01

More than a dozen bridges in the District, hundreds more in Maryland, and nearly 1,200 in Virginia have deteriorated sharply since they were built and need increasingly expensive fixes to remain safe, according to federal and local statistics and interviews.

Like the span that collapsed in Minneapolis, those bridges are listed as "structurally deficient" by federal standards, a transportation term of art that indicates "major deterioration, cracks, or other deficiencies in their decks, structure, or foundations," according to a 2006 U.S. Department of Transportation report.

Local transportation engineers emphasized yesterday that despite being tagged as "deficient," the bridges are safe to travel on. "If we feel a bridge is not safe, we would close it without delay," said Ardeshir Nafici, acting chief engineer for the District's Department of Transportation.

But the District, which maintains many of the Washington region's vital Potomac River bridges, will not have the resources to keep its structures safe during the next decade or two without a major infusion of funds, according to Kathleen Penney, deputy chief engineer for the city's Transportation Department.

"A lot of bridges were built in the late '50s and '60s. We're dealing with a time issue," Penney said. "Nationally, there are a massive number of bridges that are coming to the end of their useful lives. . . . We have some major bridges that are going to need work over the next 10 or 20 years. The District is a very small government, and our normal apportionment [of federal funds] is not enough to address the deficiencies we know we are going to have to deal with."

Penney cited the Theodore Roosevelt Memorial Bridge as one example of an aging structure that will need an overhaul in coming years.

Several other Washington area bridges are being rebuilt or rehabilitated. The first span of a new Woodrow Wilson Bridge opened last year, and the second is slated to open next year; maintenance work is being done on the underside of the American Legion Bridge; the Frederick Douglass Bridge is being overhauled this month; and repairs are ongoing on the William Preston Lane Jr. Memorial (Chesapeake Bay) Bridge.

Federal rules require bridge inspections every two years or less, local officials said.

D.C. officials said 15 of its bridges, or just over 6 percent, were listed as "structurally deficient," according to the latest statistics from the city.

District officials said two bridges have not been inspected within the past two years. They are both over Amtrak lines and were last inspected in 2004 because the Transportation Department had trouble gaining access to the sites, the officials said.

Some on the District's deficient list are set for expensive fixes. For instance, there are plans for a major overhaul and redesign of the 11th Street Bridge beginning in 2009, according to spokesman Erik Linden.

Officials in Virginia, where 1,197 bridges -- 9 percent -- were federally classified as "structurally deficient," and Maryland, where 410 -- 8 percent -- received the designation, repeatedly noted that their bridges are safe for travel.

"This is an opportunity to realize that these bridges were not built by themselves and require all of us to invest in our infrastructure . . . to make sure tragedies like this don't happen," Gov. Martin O'Malley (D) said at a news conference yesterday. State Transportation Secretary John D. Porcari added that no Marylander "should be concerned about the safety of our bridges."

Porcari said that in April, the Federal Highway Administration gave the state an "excellent rating" for inspections. He said Maryland is responsible for the maintenance of more than half of the state's 5,000-plus bridges. Local governments are responsible for the rest.

Virginia has an "aggressive bridge inspection and safety program which goes beyond federal requirements," said Joan Morris, a spokeswoman for the state's Department of Transportation.

"We conduct about 12,000 bridge inspections each year. We have no reason to believe that any bridge in Virginia is in danger of collapse. If we find a safety or structural concern, we immediately post a weight limit, detour traffic and repair the bridge," Morris said.

VDOT staff members yesterday began a review of records of the state's 20,000 bridges and large culverts -- boxlike structures through which traffic passes. Officials said the analysis will identify Virginia bridges consisting of a "long, open span" similar to the Minneapolis bridge as well as bridges of similar age. Officials did not know how long the review would take.

In Arlington County, designs are being drawn up to replace a bridge at Route 27 and Columbia Pike, Virginia officials said.

Advocacy groups said the collapse in Minneapolis, coupled with federal statistics showing substantial numbers of bridges in the District, Maryland and Virginia needing repair, is a wake-up call for local officials.

"It doesn't mean that the bridge is likely to collapse or fall down tomorrow. It doesn't mean they are unsafe," said John B. Townsend II, a spokesman for AAA Mid-Atlantic. Still, he said, "It's a red flag; it's an early warning."

Local officials would not speculate on the cause of the bridge collapse in Minneapolis. "However, we will be relentless in our efforts to improve our practices where we can and learn whatever lessons the tragedy in Minneapolis may offer," Porcari said.

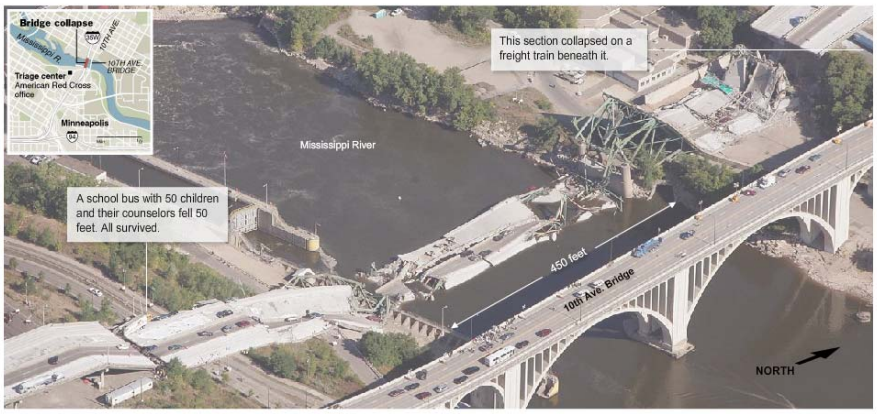
AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

1 2 3 4 5 6 7 8 NEXT



Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

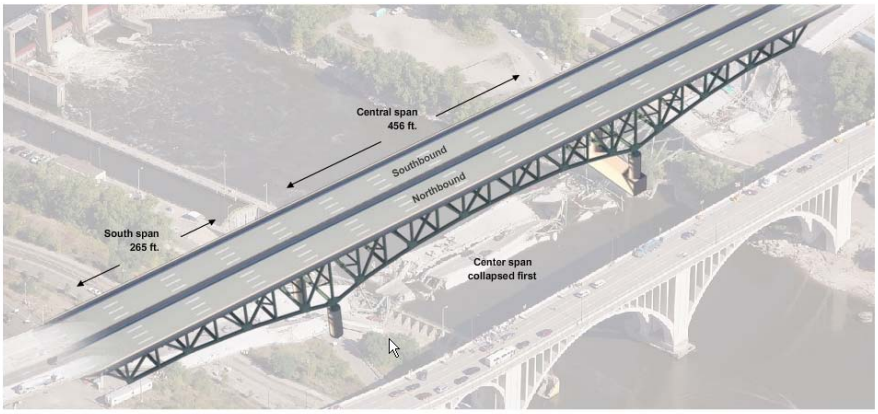
AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

1 2 3 4 5 6 7 8 NEXT



Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

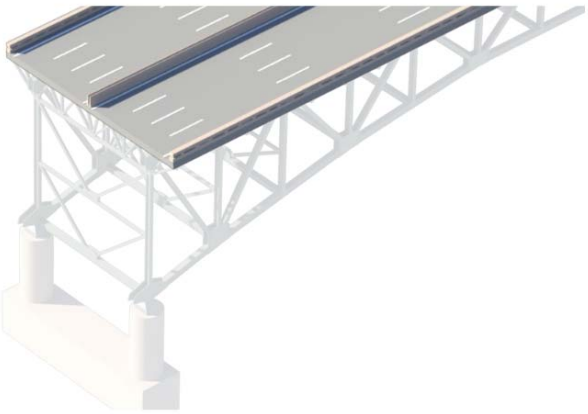
AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

1 2 3 4 5 6 7 8 NEXT



Concrete Road

The concrete road adds stiffness to the truss system.

Potential Problems

Workers had been replacing sections of the road's top layer. State officials say it is unlikely that this contributed to the collapse.

Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

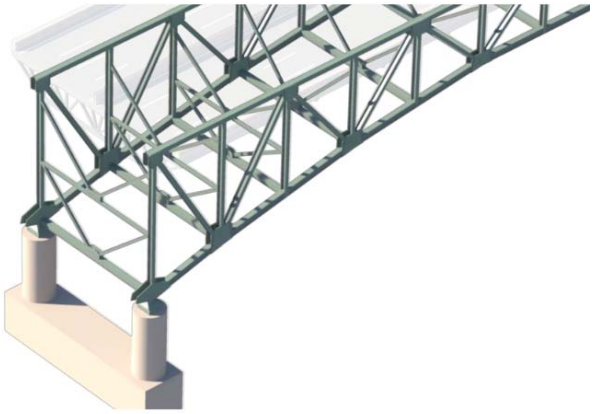
AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

1 2 3 4 5 6 7 8 NEXT



Trusses

Vertical and diagonal members attached to chords provide the main support for the bridge.

Potential Problems

Heavy trucks can cause cracks in the top chords. Inspectors have been concerned about metal fatigue, which can cause cracking within the steel members and connections. Repairs had been made, but finding all cracks is difficult without special imaging equipment.

Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

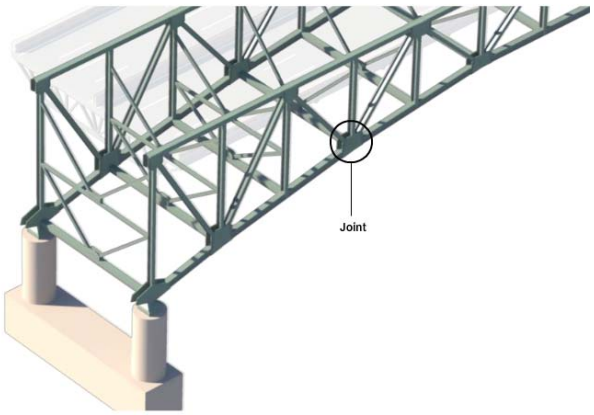
1 2 3 4 5 6 7 8 NEXT

Joints

Steel plates cover connections where beams and chords are welded or bolted together.

Potential Problems

Inspection reports noted numerous welding problems in the truss. Bridge collapse experts say that most steel truss bridge failures are related to welding at joints.



Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

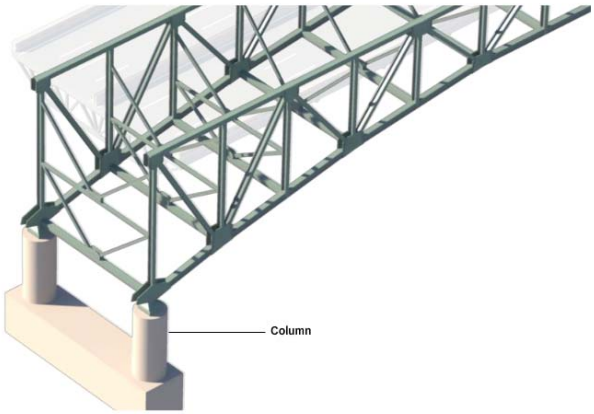
1 2 3 4 5 6 7 8 NEXT

Columns

The truss system rests on these concrete supports that are driven into the ground.

Potential Problems

A recent underwater inspection showed that the piers were in good condition.



Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

AUGUST 3, 2007

E-MAIL | FEEDBACK

Critical Parts of the Structure

A look at the Minneapolis bridge's structural components and where similar kinds of bridges are vulnerable.

1 2 3 4 5 6 7 8 NEXT

Building With Redundancy

Bridges are generally built with a high level of redundancy, so that if one part fails the load is redistributed through the structure. The I-35W bridge did not have a high level of redundancy, and the failure of a single significant component could have led to the collapse of the entire structure.

Interstate 35W Bridge

Three span truss bridge, opened 1967.

1,000 Feet

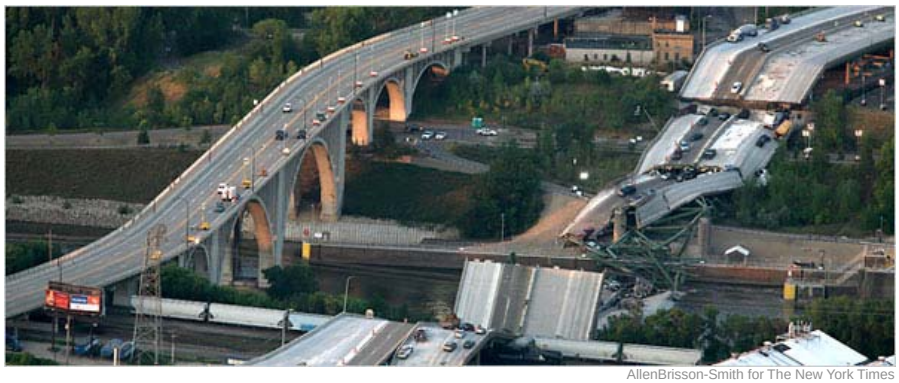
With redundancy: Brooklyn Bridge

Suspension bridge, opened in 1883. Each of the four main cables is made of 19 strands of 280 wires each. A reinforced deck provides additional support.

Source: Minnesota Transportation Department; Kenneth L. Carper, Washington State University; The Lawrence Group; Henry Petroski, Duke University; Terry Shike, Oregon Transportation Department,; Progressive Contractors; New York City Transportation Department; "The Works: Anatomy of a City" by Kate Ascher; nycroads.com

The New York Times; photograph by Scott Olson/Getty Images

Minneapolis Bridge Had Passed Inspections



AllenBrisson-Smith for The New York Times

The entire span of the Interstate 35W bridge collapsed in Minneapolis.

It did not, however, get stellar grades for its condition.

Additionally, officials said the bridge's design had been considered outmoded for decades because a single failure of a structural part could bring down the whole bridge. About 11 percent of the nation's steel bridges, mostly from the 1950s and 1960s, lack the redundant protection to reduce these failures, federal officials said.

Over all, the bridge was rated 4 on a scale of zero to 9, with 9 being perfect and zero requiring a shutdown. An inspection report last year said the supporting structure was in "poor condition," far from the lowest category. Hundreds of other working bridges are in similar shape, but the report did indicate that the bridge had possible issues that needed to be regularly inspected.

The bridge has been inspected annually since 1993, but independent engineers acknowledged yesterday that there are well-known limits to how useful an inspection can be. Bridges, they said, are prone to a variety of problems, and some are hard to spot. At the Minnesota Department of Transportation, shaken engineers made it clear that they knew something crucial had somehow been overlooked.

"We thought we had done all we could," said Daniel L. Dorgan, bridge engineer at the department's bridges division. "Obviously something went terribly wrong."

On Thursday, the United States Department of Transportation said it had told all states to inspect bridges similar in design and construction to the one that collapsed, or to review inspection reports. The department said there were 756 such bridges.

In 1982, a bridge inspector looked at the Mianus River Bridge in Greenwich, Conn., and did not see the metal-fatigued pin that would break nine months later, collapsing three lanes of Interstate 95 and killing three.

In 1987, a New York Thruway bridge near Amsterdam, N.Y., also had a clean bill of health, but inspectors had never gone underwater into the Schoharie Creek to look at the bridge's footings, where flood waters had scoured the concrete base. When the footings slipped, the bridge fell. Ten people died.

Today, inspectors use ultrasound to check the pins in bridges similar to the Mianus one, and bridge footings receive much more attention.

"I think bridge inspections are the best they've ever been," said David Schulz, director of the Infrastructure Technology Institute at Northwestern University in Chicago.

The cause of the Interstate 35W bridge failure on Wednesday will probably become clear through metallurgical examinations of the wreckage, experts said, but recovering the metal parts will be delayed by the search for human remains and the need to keep investigators safe in the swirling waters of the Mississippi.

The bridge was undergoing repair work this summer, and Mr. Schulz said he would be stunned if the work did not play a major role in the collapse. "It's too much of a coincidence," he said.

But Mr. Dorgan said he saw no connection between the repair work, which was taking place mostly on the roadway, and the collapse of the steel support structure far below.

Mr. Dorgan said the bridge was believed to be in good enough shape until 2020, when it was due for either a major overhaul or replacement.

Parts of the bridge were considered structurally deficient because of corroded bearings and tiny metal cracks that had been spotted years ago but were considered stable. The rating of "deficient" is a common one that indicates the need for regular inspection and does not mean the bridge is dangerous, said Thomas D. Everett, a top bridge official with the Federal Highway Administration.

The most visible threat to a bridge is usually corrosion. But metal fatigue — the weakening of steel by the repeated weight of heavy trucks bouncing across the bridge surface — is harder to see. Bridges in northern climates are particularly vulnerable to metal fatigue because steel becomes more brittle and prone to cracking when it is cold.

“A crack is very difficult to observe visually,” said Steven J. Fenves, a guest researcher at the National Institute of Standards and Technology, part of the Commerce Department, and a professor emeritus of civil engineering at Carnegie Mellon University. “There may be paint over it, or maybe many layers of corrosion over it. It may be in an invisible place, in the second plate, not the outermost plate.”

The possibility that metal fatigue could cause a bridge to fail was not even considered by bridge engineers in the 1950s and 1960s, when the Minneapolis bridge was designed and built, Mr. Dorgan said. Research at Lehigh University in the 1970s showed that stresses could be much larger than had been thought. The I-35W bridge, which had been designed according to less rigid standards devised by the American Association of State Highway Officials in 1961, had components that would not be included in a bridge built today.

Fatigue cracks appeared in the approaches to the bridge, but no significant problems were detected in the center span. A study in 2001 by University of Minnesota researchers concluded: “The bridge should not have any problems with fatigue cracking in the foreseeable future.”

In a study completed in 2001 by the Federal Highway Administration, 49 working inspectors from around the country visually examined test bridges in Pennsylvania and West Virginia. The inspectors correctly identified fatigue cracks only 4 percent of the time.

Additional techniques like X-rays, ultrasound, magnetic particles or dye can help identify cracks.

Mark V. Rosenker, chairman of the National Transportation Safety Board, said yesterday that his agency would determine whether the criteria for inspections were adequate. “They may well not be enough,” he said. Or the procedures may be adequate but may not have been followed, he said.

Safety board investigators will use computer modeling to study the failure, Mr. Rosenker said, and will also reconstruct parts of the bridge from the wreckage to determine the cause. The board’s final report could be many months away, he said.

An all-or-nothing design

The span's truss system had no redundancy, say experts; failure of any one part would have triggered a collapse.

By Ralph Vartabedian and Nicholas Riccardi, Times Staff Writers
August 3, 2007

MINNEAPOLIS — A house of cards is how some engineers describe the steel truss system used on the Interstate 35W bridge that collapsed into the Mississippi River, saying that almost any piece of the complex design that failed would have brought down the entire span.

Experts said Thursday that it was far too early to speculate about the specific causes of Wednesday's bridge collapse, but in the past most bridges over rivers have failed for a handful of known reasons: weak foundations, corrosion, metal fatigue, ship collision or design error.

The bridge, leading into and out of downtown Minneapolis, was being closely watched by transportation officials after studies warned about its deteriorating condition. Six years ago, significant corrosion and cracking were discovered under the roadway, but a top expert in metal fatigue concluded that they did not pose a safety hazard.

The I-35W collapse also occurred during a program to resurface the roadway, another red flag to many experts who theorized that vibrations or unintended disruptions to the truss structure under the roadway could have weakened the bridge so much that it could not bear the load of evening rush-hour traffic.

Catastrophic engineering failures — whether the crash of a space shuttle or the breach of a levee — usually result from a large set of problems that become an accepted risk over time and then reach a crucial point that escapes attention.

"We thought we had done all we could," Dan Dorgan, an engineer for the Minnesota Department of Transportation, said Thursday. "Obviously, something went terribly wrong."

Thousands of steel truss bridges were built in the interstate highway construction boom of the 1950s and '60s because they could support large traffic loads with minimal amounts of steel. Engineers stopped designing them long ago because they require so much labor to build, require a lot of maintenance and were eclipsed by newer technologies.

The I-35W bridge was entirely supported by two main trusses, composed of many small pieces of steel bolted or welded together like a child's Erector Set. Though it is possible to design a steel truss bridge with redundancy, the I-35W bridge was supported only by those main trusses.

"A truss arch bridge is like a chain — if you try to take out one link, you lose the whole system," said Abolhassan Astaneh-Asl, a UC Berkeley professor who is an expert in such bridges. "They are very vulnerable to instability."

Astaneh compared a steel truss system to a house of cards, which will quickly collapse if one card is pulled out.

The risk was demonstrated in 1967, when a steel truss bridge over the Ohio River collapsed, killing 46 people, said Kent Harries, a civil engineer at the University of Pittsburgh. Not long afterward, an association of highway engineers banned any new bridges that could collapse if a single element failed, so-called nonredundant structures.

The I-35W bridge was completed in 1967, placing it in the last generation before safety rules were upgraded.

The bridge collapse was caught on a surveillance video. It shows the bridge's 390-foot center span dropping straight down and within seconds the west and east sections buckling and collapsing.

"The real notable thing is the speed and completeness of the collapse," Harries said.

The collapse most likely was caused by a series of problems that cumulatively weakened the bridge and reduced its ability to carry a heavy load, according to interviews with many engineers.

In 2001, the state's Department of Transportation grew so worried about the bridge, which carries more traffic than any other span in the state, that it commissioned an extensive engineering study by experts at the University of Minnesota.

The 82-page report discovered cracking and corrosion, but ultimately recommended only that the state step up inspections to every six months, compared with the federal requirement of every two years.

Although the report may have badly missed the mark, it demonstrates the difficulty of assessing cumulative metal fatigue and corrosion, according to Harries. The lead author of the report was one of the nation's top experts on metal fatigue, he said.

As the nation's highway system ages, a growing number of bridges are being classified as deficient. A recent U.S. Department of Transportation survey found that 27% of the nation's bridges are structurally deficient — the I-35W bridge carried that designation for 17 years.

A number of bridges collapse each year in the United States, though seldom as dramatically as occurred Wednesday.

Of the roughly 500,000 bridges in the nation that span water, about 1,500 collapsed between 1966 and 2005, according to Jean-Louis Briaud, a Texas A&M University civil engineer and expert in bridge failure. The largest portion of those collapses, about 900, occurred when rivers scoured the foundations of support piers, he said. A few dozen deaths occur each year when bridges collapse.

Briaud would not rule out scour in the I-35W collapse, even though the piers rest on the river banks and the center span covered the entire width of the river. Scour could still have occurred on the banks and caused the piers to slowly tilt over time, he said. The collapse will most likely trigger a renewed examination of the deteriorating U.S. highway system.

The nation's deficient bridges are part of an estimated $200 billion worth of infrastructure improvements needed across the nation, according to Priscilla Nelson, a civil engineer at the New Jersey Institute of Technology.

"Engineers everywhere feel very sad this happened, but we know in our hearts that it will happen again," Nelson said. "We need to bite the bullet and make the investments."

Caltrans to inspect bridges
Many of those bridges are among thousands in the state that need to be repaired or replaced, the federal government found.

By Sharon Bernstein and Catherine Saillant, Times Staff Writers
August 3, 2007

Caltrans officials on Thursday began emergency structural inspections of 69 bridges across California in the wake of the collapse of a span in Minnesota.

Many of those bridges are among nearly 3,000 in the state that the federal government found to be structurally deficient, with inspectors concluding that they must be repaired or replaced.

State transportation officials said Thursday that the federal findings don't mean the bridges are unsafe for vehicle use. Routine inspections have found all spans to be structurally sound, they said.

"If we felt that a bridge was unsafe, we would close it immediately," said Doug Failing, director of the California Department of Transportation's Los Angeles and Ventura County operations.

Caltrans Director Will Kempton said the state plans to inspect the 69 bridges built with steel trusses similar to those that failed in the Minnesota accident. The state owns 22 of those, and city and county governments own the rest.

The failure of the Minnesota bridge — which was also classified by the federal government as "structurally deficient" — has sparked concerns about whether other bridges are in danger of collapsing.

The U.S. Bureau of Transportation Statistics, which catalogs federal highway and bridge data provided by the states annually, reported problems with about 6,700 bridges in California. Those include steel-truss bridges as well as other types of spans. Of those, 2,994 were considered structurally deficient, needing "significant maintenance attention, rehabilitation or replacement."

The others were found to be "functionally obsolete," because the spans weren't built to handle today's traffic loads. Federal officials found these bridges in many cases were too narrow or didn't have proper vertical clearance.

About half of the roughly 24,000 bridges in California are owned by the state, and the rest are owned by city and county governments. Of the bridges found to be deficient, about half are

owned by the state.

Most of the bridges owned by the state had problems with their surfaces, which officials insisted late Thursday were not critical flaws.

But 63 of those state-owned spans, including 27 in Southern California, had more significant structural problems, according to state records. Detailed data were not available on bridges owned by county and local governments.

State-owned spans in Los Angeles County with structural problems include the Commodore Schuyler L. Heim Bridge in Long Beach, a stretch of Kanan Road at the 101 Freeway, and the 405 Freeway at Temple Avenue.

In Riverside County, several spans were also structurally vulnerable, including Indian Street at the 15 Freeway and Warm Springs Creek at the 15. Structural problems in Santa Barbara County included Santa Monica Canyon at Highway 192, and the 101 Freeway at Oak Creek.

The state's bridges are relatively old — half were built before 1967. And many are carrying trucks and other vehicles that are much heavier than the ones for which they were designed, causing stresses and crumbling concrete. The Gerald Desmond Bridge in Long Beach — which has become an important route for port truck traffic — is wrapped in wire nets that keep chunks of concrete from falling into the water and onto the streets below.

Failing and other Caltrans officials argued that bridges in California are safer than those in other states because most are built to withstand earthquakes.

And unlike bridges in other states, he and others said, bridges in California are built to withstand stresses in several places throughout their structure, so that if one support or joint is damaged by a quake, the others would continue to hold up the span.

But some other engineers said the state should be doing more — not just inspecting bridges but also moving to fix the thousands that the federal government said are deficient.

"They're taking a whack-a-mole response to these things," said Richard Little, who heads USC's Keston Institute for Public Finance and Infrastructure Policy.

Little said the state should be concerned about the federal findings. "The public isn't interested in whether we have good bureaucratic procedures in place," he said. "The public is concerned whether we have public agencies that are on top of things."

Chia-Ming Uang, a structural engineering professor at UC San Diego, said that inspections are particularly important in assessing the safety of older bridges.

Many older bridges — including several hundred in California — are made of steel, Uang said, and can fail as the metal becomes fatigued. Prompt inspection of such bridges, which are more common in the eastern part of the country, is required to determine if there are cracks in the structure.

In addition to the issue of structural integrity, California has had to grapple with the danger posed to bridges by earthquakes.

After the Loma Prieta and Northridge earthquakes, California spent $2.4 billion repairing and reinforcing more than 2,000 freeway bridges. But cities and counties have been slower to make fixes, leaving more than 500 bridges that state engineers believe are at risk of damage or failure in the event of a major temblor. They include such landmark spans as the Hyperion Bridge in Silver Lake, the 6th Street bridge in downtown Los Angeles and the heavily traveled La Cienega Boulevard bridge over Ballona Creek, a key route to and from Los Angeles International Airport.

In Los Angeles County, 53 bridges still require seismic upgrading, and nearly 300 were recently handed a grade of "D" or below by a major civil engineering organization.

In San Diego County, 160 spans need to be retrofitted.

Local governments have said that it is difficult to fix the bridges because of the high cost. Some funding is slowly becoming available, thanks to last year's passage of a major state bond for infrastructure repair, but it will be years before the work is done.

Securing funding and permits to repair bridges can be costly and time-consuming, public works officials say. The historic 6th Street bridge, for example, will cost $140 million to retrofit.

William Higley, deputy director of public works for Los Angeles County, said an anticipated infusion of funds from last year's public infrastructure bond would enable engineers to repair all of the county's 53 bridges that need to be retrofitted.

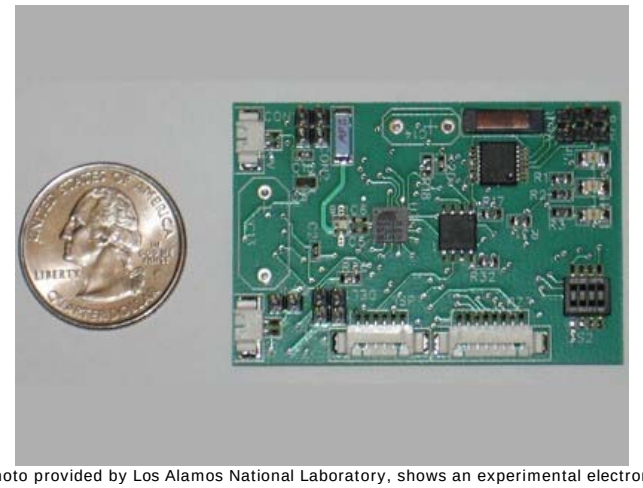
But he said that it would be about 10 years before seismic work on the spans would be completed.

Higley said he was "concerned" about the number of bridges in the state that do not meet federal standards, but cautioned against overreacting.

"I am concerned but not alarmed," Higley said, because the bridges are inspected regularly and are closed if they are believed to be unsafe.

Could Tiny Sensors Detect Bridge Crises?

Researchers Hope Tiny Sensors Placed on Bridges Can Offer Warning Before Disaster



This undated photo provided by Los Alamos National Laboratory, shows an experimental electronic sensor that could possibly be used to detect electrical charges emitted by stress on material, such as steel-reinforced concrete. LANL scientists are working on the technology that could provide early warnings of potential failures in highway bridges, according to officials. (Courtesy of Los Alamos National Laboratory)

Researchers here are hoping small sensors put on bridges about the size of a credit card and costing only $1 apiece could provide an early warning to potential failures like the one in Minneapolis.

Los Alamos National Laboratory scientists, in collaboration with the University of California at San Diego, say such a system would provide enough lead time to either shut down a bridge or perform preventive maintenance to avert serious failures.

"The idea is to put arrays of sensors on structures, such as bridges, and look for the changes of patterns of signals coming out of those sensors that would give an indication of damage forming and if it is propagating," said Chuck Farrar, a civil engineer at the lab.

The electronic sensors would be powered by microwaves or the sun and would send data via radiotelemetry to a computer for analysis. The sensors detect electrical charges emitted by stress on material, such as steel-reinforced concrete.

Researchers are in the second year of the four-year project funded at $400,000 a year and it probably will be years before the sensors are commercially available, Farrar said.

Researchers are trying to incorporate the sensors with microprocessors and wireless telemetry systems so they can work as stand-alone monitoring devices, Farrar said.

Research on wireless sensors for structures also is being conducted at the University of Michigan and Stanford University, and research on bridge monitoring is being conducted at Drexel University, he said.

One hitch is how to power the sensors. Researchers are looking at small, remote-control helicopters to do the job. They would send a pulse to provide power to the sensor, help take a reading and broadcast it back to the chopper.

The helicopter also could carry a light source that would be focused through a lens to a small solar array on the sensor node.

Researchers will be testing the helicopter power delivery and wireless sensor next month on a bridge about 10 miles north of Truth or Consequences.

Much work still remains to be done. Civil engineers must work with electrical engineers and computer scientists to bring the technology together.

"The hard part is getting data from damaged structures to use in the study. Nobody wants to give you a very expensive bridge to just test a data integration algorithm," Farrar said.

Fatigue, Lack of Backup Supports Eyed in Collapse

Minnesota Bridge Lacked Backup Support System, Engineering Experts Told ABC News

A portion of the Interstate 35-West bridge over the Mississippi River collapsed during the evening rush hour in Minneapolis Wednesday. (Minneapolis Star Tribune/MCT/Landov)

ABCNEWS

By RUSSELL GOLDMAN
August 2, 2007

Structural fatigue, and the lack of a backup system in the event of a failure, may have been factors in the collapse of the Interstate 35-West bridge in Minnesota last night, experts told ABC NEWS.com.

National transportation officials said it's too early to know exactly what caused the bridge to give way in Minneapolis last night. But state reports from 2001 and 2005 indicated there were fatigue cracks in the bridge's trusses, and that the bridge had no secondary system to bear the weight of traffic in the event of an unexpected failure.

The bridge "exhibited several fatigue problems, primarily due to unanticipated out-of-plane distortion of the girders. Concern about fatigue cracking in the deck truss is heightened by a lack of redundancy in the main truss system," a 2001 report by the Minnesota transportation department found.

"Structural fatigue and fatigue cracks" could have contributed to the collapse, Roberto Ballarini, a structural engineer and head of the civil engineering department at the University of Minnesota, said.

"Degradations in the materials or structural overload could also lead to collapse," Ballarini added.

The 1,900 foot bridge is supported by two arching superstructures called trusses.

The bridge had been classified as "structurally deficient," but that determination meant only that it needed to be maintained and not torn down, Minnesota Gov. Tim Pawlenty said in a press conference.

10 Pins

If one of the 10 pins connecting each truss to the roadbed, or deck, failed, the entire bridge would collapse, said David Billington, a professor of structural engineering at Princeton University. "The pins carry vertical loads down. … If one pin fails, the whole structure fails," Billington said. "There are two trusses. If one truss goes there is no way the bridge can stand up. The deck cannot be supported on only one side."

Billington said the design of the bridge was "not generically bad but susceptible" to total failure if one part fails. There is, however, "no history of this kind of structure failing," he said.

Corrosion too could be a factor, said John M Hooks, director of the Bridge Management Information Systems Laboratory at the Department of Transportation Turner-Fairbank Highway Research Center.

"In a metal structure, [collapse] could be caused by fatigue and multiple occurrences of stress or corrosion," Hooks said. "Most bridges are built with a lot of redundancy in them and the members are pretty thick."

White House Press Secretary Tony Snow said the bridge, part of Interstate 35-West spanning the Mississippi River, rated 50 on a scale of 120 for structural stability.

"This doesn't mean there was a risk of failure, but if an inspection report identifies deficiencies, the state is responsible for taking corrective actions," he said.

Some 70,000 to 80,000 bridges nationwide are also rated "structurally deficient," Pawlenty said.

Billington said many bridges across the United States need regular maintenance, and he compared the "structurally deficient" rating to a grade of "C- or D."

Mark Rosenker, chairman of the National Transportation Safety Board, said it was "clearly much too early to know what happened."

The federal government's investigation would entail reassembling parts of the bridge, he said.

Four people have been confirmed dead as a result of Wednesday evening's rush-hour collapse. As many as 30 more people are missing.

Experts: Leadership, money keys to building bridges

http://edition.cnn.com/2007/US/08/02/bridge.infrastructure/index.html#cnnSTCText

- **STORY HIGHLIGHTS**
- About 25 percent of nation's bridges not as good as they should be, data shows
- Experts say infrastructure problems due to lack of funding, leadership
- $188 billion over the next two decades needed for nation's bridges, report says
- Interstate 35W bridge was deemed structurally deficient two years ago

(CNN) -- Nearly a quarter of the nation's roughly 600,000 major bridges carry more traffic than they were designed to bear, according to reports based on federal government data.

Experts said Thursday that the problem stems from a lack of money and leadership.

Federal Highway Administration data from 2006 shows that 24.5 percent of the nation's bridges longer than 20 feet were categorized as "structurally deficient" or "functionally obsolete" (data from Utah and New Mexico was from 2005).

"Our bridges are not in very good condition in this country," said Ruth Stidger, editor in chief of the trade publication Better Roads, which compiled the data. Some states are worse than others. Arizona and Rhode Island have a similar number of structurally deficient or functionally obsolete bridges -- 384 and 405 respectively. In Arizona, however, that's 5 percent of its total bridges, while in Rhode Island, it's more than half.

While the "structurally deficient" and "functionally obsolete" monikers don't indicate the crossings are treacherous, they do imply serious problems, Stidger said.

The Interstate 35W bridge that collapsed into the **Mississippi River** during Wednesday rush hour was deemed structurally deficient two years ago.

Recent inspections did show "concerns about stress and fatigue" in aspects of the bridge but did not result in calls for immediate restrictions on the bridge, Minnesota Gov. Tim Pawlenty said Thursday.

Structurally deficient, Stidger said, generally means the bridge can't carry the traffic it was designed to accommodate. Usually, restricting traffic to light vehicles can alleviate any dangers.

Functionally obsolete is a different story, Stidger said, explaining that bridges carrying this tag also carry major design problems, diminishing their load-carrying capacity. Functionally obsolete bridges "probably should be replaced," she said.

In its most recent report card on the nation's infrastructure, the American Society of Civil Engineers gave the nation's bridges a grade of "C" and said that in 2003 27.1 percent of them were deficient.

--

Casey Dinges, a staff leader on the report card, said "structurally deficient" and "functionally obsolete" are technical terms used by the federal government.

"Neither one means failure is imminent or that your life is in danger or that you should be afraid to get in your car," he said. "That said, we still have pretty serious concerns about the overall state of the nation's infrastructure."

The report also said bringing all the nation's bridges up to snuff would cost $188 billion over the next two decades.

While the number might sound staggering to some, Dinges says it's "doable."

"That's simply maintaining what we are doing right now," he said.

"New technology, money -- there are resources involved, but I think the big thing is really political leadership, and that has to come at all levels of government," he said.

"There has to be an honest discussion about the financial resources it takes to maintain these systems," he said, adding that infrastructure needs to be a priority.

"There are no Republican bridges. There are no Democratic drinking water purification facilities. We all use these systems," he said.

But Stidger said states aren't getting the money they need to repair their roads and bridges. They're forced to resort to a process of "patch, patch, patch and nothing ever gets repaired," she said.

She likened the process to putting a Band-Aid on a broken elbow and said, "There's only so much you can do with inadequate funding."

The bulk of Highway Trust Fund revenue comes from an 18.4-cents-a-gallon federal gasoline tax. The fund is the primary source of federal money for transportation infrastructure and the interstate highway system.

That tax has not been adjusted since 1993, despite inflation and sharp increases in construction costs, according to the fund's Web site.

"In the eyes of many, political resistance to raising the tax, or indexing it to inflation, remains almost insurmountable in the current climate," the Web site states.

The fund suggests exploring alternative sources of revenue, including tolls, public-private partnerships or a mileage-based tax.

But even if all the money Congress has approved from transportation improvements was doled out to the states, it still would not be enough, Stidger said.

The latest numbers show that of the nation's 595,185 bridges longer than 20 feet, 145,996 have some sort of problem.

메모 포함[l1]: national bridge number: 595,185

So, should the state of the nation's roads and bridges strike fear into the heart of the American commuter?

"Normally, I would say no," Stidger said, "but if I lived in Minnesota and drove over that bridge every day, I would not be a happy camper."

Overall, city, state and county engineers do a fine job inspecting bridges, reporting deficiencies and addressing those deficiencies with the resources they have, Stidger said.

But as Wednesday's tragedy demonstrated, sometimes those efforts are insufficient.

The Interstate 35W bridge was under repair when it suddenly collapsed in a manner that left engineers familiar with the bridge baffled. "I am totally puzzled as to why both ends of the bridge would come down all at once," said Ted Galambos, a University of Minnesota engineering professor. "I don't think it was overload, so it could have been either some fatigue, failure or some sudden buckling that would cause the failure."

The Federal Highway Administration says this would be only the second bridge to fail for structural reasons in 20 years. The agency said most bridges are safe and those that should be closed will be.

Additionally, the House on Friday voted to direct $250 million in emergency spending for the Interstate 35W bridge. States are usually limited to $100 million for such emergencies, which is why the legislation is needed. A similar bill is pending in the Senate.

"You can't not deal with it. Bridges have to perform," Dinges said. "We're seeing this as a wake-up call. It's time to stop hitting the snooze button."

States warned to inspect bridges

http://edition.cnn.com/2007/US/08/02/bridge.structure/index.html

- **STORY HIGHLIGHTS**
- A 2001 state report noted problems with the bridge's load-carrying elements
- A 2005 federal assessment determined the bridge was "structurally deficient"
- Neither report indicated that the bridge was unsafe to use
- Expert says he's "puzzled" both sides of bridge collapsed at once

MINNEAPOLIS, Minnesota (CNN) -- U.S. Transportation Secretary Mary Peters notified state transportation departments Thursday to immediately inspect all bridges of the same design as the one that collapsed Wednesday in Minnesota.

Brian Turmail, spokesman for the Transportation Department, said there are about 750 bridges across the country that have similiar steel deck truss designs.

Turmail said the meaure is being taken "out of extreme caution."

Two reports published since 2001 have pointed to structural problems with the Interstate 35W bridge that collapsed Wednesday into the Mississippi River, but both reports determined the bridge was safe despite deficiencies.

메모 포함[W2]: final conclusion of the inspection reports

"The bridge's deck truss system has not experienced fatigue cracking, but it has many poor fatigue details on the main truss and the floor truss system," said a report conducted for the Minnesota Department of Transportation in 2001.

The 40-year-old bridge is of a type known as deck steel truss. It has three parts: a deck, superstructure and substructure.

The deck is made of concrete and rebar, the superstructure is made of steel and the substructure is made of steel and concrete footing, according to Mark Rosenker, chairman of the **National Transportation Safety Board**, which is investigating the collapse that killed at least four people and injured dozens Wednesday.

Rosenker is leading a 19-member team charged with determining the cause of the accident. He asked that anyone with still pictures or video contact NTSB investigators at 866-328-6347.

The executive summary of the 2001 Minnesota Department of Transportation report -- undertaken by the University of Minnesota's Department of Civil Engineering -- points to fatigue problems with the bridge's approach span, the segments that connect the main span of the bridge to land.

However, the report said, "Fatigue cracking is not expected during the remaining useful life of the bridge."

In 2005, the U.S. Department of Transportation's National Bridge Inventory database concluded the bridge was "structurally deficient."

Minnesota Department of Transportation bridge engineer Dan Dorgan said the term "structurally deficient" is a Federal Highway Administration rating.

Inspectors rate sections of the bridge on a 1 to 9 scale, with 9 being in excellent condition, he said.

"A structurally deficient condition is a bridge that would have a rating of 4 either in the deck, the superstructure or the substructure," he said. "Any one of those in condition 4 or less is considered structurally deficient."

메모 포함[W3]: definition of structurally deficient

But, he noted, out of 13,000 state and local bridges in Minnesota that are 20 feet and more in span, 1,160 of them -- 8 percent of the state's bridges -- are considered structurally deficient.

Tom Everett of the Federal Highway Administration's National Bridge Inspection Program said the structurally deficient rating was a "programatic classification rather than an indication of safety."

"It does not indicate a bridge is dangerous or that that bridge must be replaced," he said.

The Minnesota bridge was deemed structurally deficient in 1990, Dorgan said, "due to corrosion of the bearings, so they were not able to move as freely as designed."

Later, inspectors found corrosion of steel around joints in the bridge and fatigue cracks in the approach spans. Those problems were repaired in the 1990s.

"Recent inspections in 2005 and 2006 found no evidence of cracking or growth in the existing cracks in the tab well that have been there since the day the bridge was built," he said.

메모 포함[W4]: what is tab well

Dorgan also cited an in-depth study of the bridge's fatigue potential conducted from 2004 to 2007 that recommended two alternatives for the bridge's future -- to add steel plates to reinforce critical parts of the bridge or to conduct thorough inspections of the wells inside the box to determine whether there were cracks.

"We chose the inspection route, and began in May," he said, adding that officials intended to replace the bridge about 2020.

"We had the bridge partially inspected and were going to complete that this fall after construction was done."

During a Wednesday news conference, Minnesota Gov. Tim Pawlenty described the bridge deficiencies as "minor" and said the state was told that the bridge's deck might need to be rehabilitated or replaced in 2020 or later.

"It was last inspected both in 2005 and 2006. There were no structural deficiencies identified according to [the Minnesota Department of Transportation]," Pawlenty said.

메모 포함[W5]: excuse of the governor: not reported

Vital clues about what caused the bridge to crumble may be lying in the Mississippi River.

One expert said it was baffling how the bridge collapsed.

"I am totally puzzled as to why both ends of the bridge would come down all at once. When my colleague tested it, it was very low stress," said Ted Galambos, a University of Minnesota engineering professor.

"I don't think it was overload, so it could have been either some fatigue, failure or some sudden buckling that would cause the failure."

Senate Majority Leader Harry Reid, D-Nevada, said the collapse should trigger action.

"I think we should look at this tragedy that occurred as a wake-up call for us. We have -- all over the country -- crumbling infrastructure, highways, bridges, dams, and we really need to take a hard look at this," Reid said Thursday.

He said it was "the right thing to do" for the infrastructure and the economy. "For every billion dollars we spend in our crumbling infrastructure, 47,000 high-paying jobs are created," Reid said.

Most bridges are inspected every two years and receive ratings based on the conditions of various components, according to the U.S. Department of Transportation.

In addition to "structurally deficient," another bridge classification is "functionally obsolete," according to the Federal Highway Administration.

A bridge is tagged structurally deficient when significant bridge elements have deteriorated and the bridge's load-carrying capacity is reduced, according to the highway administration.

A bridge is dubbed functionally obsolete when the bridge does not meet current design standards.

Neither label indicates a bridge is unsafe for travel, the highway administration said.

As of 2003, there were about 160,570 bridges deemed structurally deficient or functionally obsolete, according to the American Society of Civil Engineers. The number represented 27.1 percent of the nation's bridges.

The American Society of Civil Engineers also reported that the number of bridge deficiencies had steadily declined from 34.6 percent in 1992 to 27.1 percent in 2003.

메모 포함[W6]: reduction of structurally deficient structures

Bridge collapse probe focuses on unexplained shift

- **STORY HIGHLIGHTS**
- **NEW**: NTSB says one section of bridge shifted 50 feet as it fell
- The rest of the bridge appears to have fallen in place
- Investigators to examine video that may show another view of the collapse

MINNEAPOLIS, Minnesota (CNN) -- Investigators trying to figure out what caused Wednesday's massive bridge collapse are focusing on the southern end of the span, which "behaved differently" as it fell, the National Transportation Safety Board said Friday.

The NTSB, which is investigating the disaster that killed at least five people and injured dozens, is also hoping another video provided by the Army Corps of Engineers will provide new images of the collapse.

What's getting investigators' attention is the way the southern part of the bridge fell in a video they've already examined -- recorded by a security camera near the bridge's north end -- and the way the section settled after the collapse.

"It appears that it has shifted approximately 50 feet to the east and when we compare that to what we've seen in the rest of the bridge -- the rest of the bridge appears to have collapsed in place, " said **NTSB** Chairman Mark Rosenker, who is leading a 19-member team charged with determining the cause of the accident.

"We're going to take a look at any unique design factors that could have created that shift...for whatever reason."

It's not the answer to the mystery of why the bridge fell, but a step forward, Rosenker said.

The NTSB will also examine three more videos provided by the Army Corps of Engineers, one of which may show another view of the bridge falling, Rosenker said. Investigators aren't optimistic the other two will show anything because they weren't pointed at the bridge.

On Thursday, U.S. Transportation Secretary Mary Peters notified state transportation departments to immediately inspect all bridges of the same design as the one that collapsed Wednesday on Interstate 35W into the Mississippi River in Minneapolis.

Brian Turmail, spokesman for the Transportation Department, said there are about 750 bridges across the country that have similar steel deck truss designs.

Turmail said the measure is being taken "out of extreme caution."

Two reports published since 2001 have pointed to structural problems with the Interstate 35W bridge, but both reports determined the bridge was safe despite deficiencies.

"The bridge's deck truss system has not experienced fatigue cracking, but it has many poor fatigue details on the main truss and the floor truss system," said a report conducted for the Minnesota Department of Transportation in 2001.

The 40-year-old bridge is of a type known as deck steel truss. It has three parts: a deck, superstructure and substructure.

The deck is made of concrete and rebar, the superstructure is made of steel and the substructure is made of steel and concrete footing, according to Rosenker.

The executive summary of the 2001 Minnesota Department of Transportation report -- undertaken by the University of Minnesota's Department of Civil Engineering -- points to fatigue problems with the bridge's approach span, the segments that connect the main span of the bridge to land.

However, the report said, "Fatigue cracking is not expected during the remaining useful life of the bridge."

In 2005, the U.S. Department of Transportation's National Bridge Inventory database concluded the bridge was "structurally deficient."

Minnesota Department of Transportation bridge engineer Dan Dorgan said the term "structurally deficient" is a Federal Highway Administration rating.

Inspectors rate sections of the bridge on a 1 to 9 scale, with 9 being in excellent condition, he said.

"A structurally deficient condition is a bridge that would have a rating of 4 either in the deck, the superstructure or the substructure," he said. "Any one of those in condition 4 or less is considered structurally deficient."

But, he noted, out of 13,000 state and local bridges in Minnesota that are 20 feet and more in span, 1,160 of them -- 8 percent of the state's bridges -- are considered structurally deficient.

Tom Everett of the Federal Highway Administration's National Bridge Inspection Program said the structurally deficient rating was a "programatic classification rather than an indication of safety."

"It does not indicate a bridge is dangerous or that that bridge must be replaced," he said.

The Minnesota bridge was deemed structurally deficient in 1990, Dorgan said, "due to corrosion of the bearings, so they were not able to move as freely as designed."

Later, inspectors found corrosion of steel around joints in the bridge and fatigue cracks in the approach spans. Those problems were repaired in the 1990s.

"Recent inspections in 2005 and 2006 found no evidence of cracking or growth in the existing cracks in the tab well that have been there since the day the bridge was built," he said.

Dorgan also cited an in-depth study of the bridge's fatigue potential conducted from 2004 to 2007 that recommended two alternatives for the bridge's future -- to add steel plates to reinforce critical parts of the bridge or to conduct thorough inspections of the wells inside the box to determine whether there were cracks.

"We chose the inspection route, and began in May," he said, adding that officials intended to replace the bridge about 2020.

"We had the bridge partially inspected and were going to complete that this fall after construction was done."

During a Wednesday news conference, Minnesota Gov. Tim Pawlenty described the bridge deficiencies as "minor" and said the state was told that the bridge's deck might need to be rehabilitated or replaced in 2020 or later.

"It was last inspected both in 2005 and 2006. There were no structural deficiencies identified according to [the Minnesota Department of Transportation]," Pawlenty said.

Most bridges are inspected every two years and receive ratings based on the conditions of various components, according to the U.S. Department of Transportation.

In addition to "structurally deficient," another bridge classification is "functionally obsolete," according to the Federal Highway Administration.

A bridge is tagged structurally deficient when significant bridge elements have deteriorated and the bridge's load-carrying capacity is reduced, according to the highway administration.

A bridge is dubbed functionally obsolete when the bridge does not meet current design standards.

Neither label indicates a bridge is unsafe for travel, the highway administration said.

As of 2003, there were about 160,570 bridges deemed structurally deficient or functionally obsolete, according to the American Society of Civil Engineers. The number represented 27.1 percent of the nation's bridges.

The American Society of Civil Engineers also reported that the number of bridge deficiencies had steadily declined from 34.6 percent in 1992 to 27.1 percent in 2003.

Unstable Bridges, Underfunded Facilities

Inspection Of Nation's Decrepit Bridges, Investment In Infrastructure Under Scrutiny

Aug. 3, 2007

CBS) After the catastrophe in Minneapolis, decrepit bridges are getting a closer look and coming up short, reports **CBS News correspondent Nancy Cordes**.

From California to Connecticut on Friday, inspectors could be seen hanging off bridges, floating below them, and peering at them with binoculars.

"You never know when you're gonna find a crack," one inspector says.

What they're seeing are spans that appear to be held together by little more than hope—like one propped up by two by fours in New Jersey. Inspectors also found rusted metal in Maryland and decaying concrete in California.

Coming under the greatest scrutiny are the 750 bridges in the U.S. that are similar in design to the one that collapsed. A third of those steel deck-truss bridges are rated structurally deficient—just like the Minneapolis bridge was before its structure failed.

"It's like when you bend a paper clip," Ohio structural engineer Chuck Cvitkovich says. "If you keep bending that paper clip, eventually it's going to break."

Today and every day, the most sophisticated piece of equipment that's typically used to inspect bridges is the naked eye.

"I clean the weld with a brush and wipe the dirt off to make a visual inspection to make sure there's not a crack," and inspector in Arkansas said.

But visual inspections don't mean much if they're wrong. The Federal Highway Administration estimates that 56 percent of the time, bridges are rated as better or worse than they actually are.

메모 포함[W7]: wrong inspection result: 56%

There is new technology that uses electric currents to look for cracks inside metal beams—kind of like an EKG for a bridge. Only a couple of states use it.

At Los Alamos National Laboratories in New Mexico, they've developed a tiny helicopter that could send signals to and get readings from sensors embedded in bridges. But it's not ready, and it's expensive.

메모 포함[W8]: new monitorting technology in LA

Nick Roper is the chief bridge engineer for Northern Virginia, where 30 bridges have been deemed structurally deficient.

"If you had enough funding, what would you do that you can't do now?" **Cordes** asks.

I would replace every deficient bridge that's in my district," Roper says.

And that's the real dilemma facing transportation officials from coast to coast. Even if all those inspections do uncover structural problems, where will the money come to fix them?

메모 포함[W9]: shortage of money

As **CBS News correspondent Sharyl Attkisson** reports, funding the nation's infrastructure is all a matter of priorities.

Out of the $2.7 trillion dollar federal budget, it's estimated only around $50 billion dollars a year goes for infrastructure – just a tiny slice of the pie. Experts say what's needed is $210 billion dollars a year for five years just for upkeep.

And the need is felt in all 50 states. Coast-to-coast there have been sewage leaks, killer chunks of falling concrete, broken pipes in the Midwest, and contaminated water in Washington D.C. New Jersey loses an astonishing 20 million gallons of drinking water a day from leaky pipes.

But when it comes to spending federal dollars, sometimes priorities seem out of whack.

In Alaska, a third of the bridges are awaiting repair. But Alaska's members of Congress wanted to put $450 million toward pet projects for two new bridges that would only serve a combined population of about a hundred.

메모 포함[W10]: priority out of whack

In Colorado, the highways are corroded and rusting. But the state's members of Congress still saw fit to put a half million dollars toward a future wildlife overpass. That's right, a bridge for wild animals to cross the highway.

But Congress only funds about 25 percent of the nation's infrastructure. States and local governments pick up the rest of the tab and they're cash-starved too.

Congressman Jim Oberstar from Minnesota heads the House Transportation Committee and is Congress' leading authority on infrastructure.

"We need to do far better and we all know that," Oberstar says. He says both Congress and the White House have traditionally had trouble making the tough decision to collect and spend more tax dollars on infrastructure.

"We have to make those investments and they don't come like manna from the sky. You have to pay for it. And you either pay now or pay a whole lot later," he says.

The Minnesota bridge collapse may be the catalyst that pushes Congress to make better plans and a bigger investment in the upkeep of the critical facilities that keep the nation running.

Nation's Infrastructure Is Showing Its Age

From Water Mains To Pipelines To Highways, America's Foundations Are Falling Apart

Aug. 2, 2007

CBS) The bridges built in the boom years of the Eisenhower Era have entered middle age, and thanks to neglect, they're not aging gracefully: 150,000 U.S. bridges are **rated structurally deficient or obsolete**. That's more than a quarter of the nation's bridges that are in need of major repairs or replacement. One of them is in Dillsburg, Pa. It's been shut down — but it won't get fixed for five years. State Transportation Secretary Allen Biehler says he has 6,000 other bridges in line for repairs.

"Those bridges are an average age of 50 years old, and that's about what a bridge's life is, in using older designs," says Biehler. New York's Tappan Zee Bridge is over that age limit. Engineers say the major Hudson River crossing leading to New York City desperately needs a $1.3 billion overhaul.

"It's unbelievable the amount of traffic we experience in this country," says Robert Bernstein, CEO of Material Technologies, whose company specializes in technologies that monitor metal fatigue in real time. "It's much more than 50 years ago. Plus, what's going over them is 10, 20, 30 times heavier."

And it's not just bridges, reports **CBS News correspondent Nancy Cordes**. From steam pipes to the power grid to water mains, much of the nation's infrastructure has not been adequately maintained, much less modernized. experts say. Demand has surged in the past few decades, experts say, but the will and money to fund upkeep have not.

"When you throw the switch and the power doesn't come on; when you turn your faucet and clean water doesn't come out, then you pay attention to it. That's too late," says Patrick Natale of the American Society of Civil Engineers. The society put out an **infrastructure report card** in 2005. The nation's aviation system got a D+; wastewater management got a D- and dams got a D.

More than 3,500 dams are currently considered unsafe, including the largest dam east of the Mississippi — the Wolf Creek Dam in Tennessee.

"If you live downstream from a dam, it doesn't matter whether the dam was attacked by terrorists or whether it failed because of fatigue and age and lack of repair," says Natale. "The people downstream are all impacted the same."

It's estimated that the cost of updating the nation's infrastructure would be $1.6 trillion. That's about $5,300 for every American. The cost of not updating, engineers warn, might be measured in more human lives.

The average life span of a bridge is about 50 years. More than 150,000 U.S. bridges are rated as structurally deficient or obsolete. **(CBS)**

메모 포함[W11]: Eisehhower Era

메모 포함[W12]: other facilities

메모 포함[W13]: the cost of updating the nation's infrastructure

메모 포함[W14]: average life span of a bridge in USA

Search For Answers In Bridge Collapse

2005 Report Called Minnesota Bridge "Structurally Deficient" And Possibly In Need Of Replacement

(CBS/AP) Federal transportation officials arrived in Minneapolis on Thursday to begin investigating the deadly collapse of an interstate bridge into the Mississippi River.

The Homeland Security Department said the collapse did not appear to be terrorism-related, but Hennepin County Sheriff Richard Stanek said the cause was still unknown.

"All indications are that it was a collapse, not an act of someone doing it," Stanek said.

The first step of the federal investigation will be to recover pieces of the bridge and reassemble them, kind of like a jigsaw puzzle, to try and determine what happened, NTSB Chairman Mark Rosenker said.

Investigators also want to review video of the collapse, and were setting up a phone number for witnesses to call with information.

"It is clearly much too early in the initial stages of this investigation to have any idea what happened," Rosenker said.

But speculation was already beginning into what may have caused the eight-lane Interstate 35W bridge to buckle and collapse during the evening rush hour Wednesday

"It's hard to be conclusive so early, but it looks like the main support, the main steel arch, may have given way or something right near it," Richard Stehly, an expert in bridge engineering and co-founder of St. Paul, Minn.-based American Engineering Testing, told **CBS News Anchor Katie Couric**. "Also, the things that support the main arch, the foundations on either bank, perhaps they did. But investigators will look at everything. They will look at the materials. They will look at all the pieces of debris. And they'll find out the cause, because we need to learn the reason for its failure."

Inspections as far back as 2000 on the bridge identified both corrosion in the steel and a lot of cracking, says Stehly.

Questions are also being raised about a 2005 report in the U.S. Department of Transportation's National Bridge Inventory which rated the bridge as "structurally deficient" and possibly in need of replacement.

The report said there were fatigued details on the main truss and floor truss system. Yet it concluded there was no need to prematurely replace the bridge because of fatigue cracking, avoiding the high cost associated with such a large project.

Minnesota Gov. Tim Pawlenty said Thursday that there was no indication from that and other reviews that the bridge should be shut down.

"There are 80,000 bridges in the United States with that designation," Pawlenty told **Couric**. "Neither the federal officials nor the state officials who did the inspection indicated the bridge needed to be replaced immediately. It was something they foresaw in approximately 2020.

"Clearly, there was fatigue, but it wasn't uncommon and not unlike many bridges," Pawlenty said. "And the inspectors who looked at the bridge, actually looked at the bridge, indicated there was no need for dramatic intervention. In other words it could be monitored and dealt with. They did not call for the closure of the bridge. Had they done that the bridge would have been closed immediately."

메모 포함[W15]: an excuse of the gov.

Pawlenty ordered an immediate inspection of all bridges in the state with similar designs.

Former NTSB chairman James Burnett was in Minneapolis when the tragedy happened. He told **CBS *Early Show* co-anchor Hannah Storm** the 2005 report "does not necessarily mean there was safety inadequacy of the bridge. There are other types of structural deficiency that may not necessarily mean there's an immediate safety problem."

The I-35W bridge, a major Minneapolis artery, was in the midst of being repaired and two lanes in each direction were closed when the bridge collapsed.

Burnett said NTSB inspectors will be looking at the inspection reports of the bridge and "examining the bridge itself and particularly the metal portions to see if reports of fatigue cracking were, in fact, accurate, and whether there was any factor that might have caused those cracks to promulgate more quickly than had been projected. They'll be looking to see if there had been any external damage to the bridge, and also whether or not the construction process may have contributed, even by vibration, to the bridge failure."

Burnett said that in the 25 years he's been following transportation safety, there have been about five interstate bridge collapses.

"Bridge collapses averaging once every five years would be not as frequent, or more frequent, than we're having plane crashes," he said.

메모 포함[W16]: frequency of a bridge collapse in USA?

Investigators eye bridge's mid-collapse shift

By Judy Keen, USA TODAY

MINNEAPOLIS — Investigators want to know why the southern span of Minneapolis' I-35W bridge shifted sideways as much as 50 feet as it collapsed, the head of the National Transportation Safety Board said Friday as the investigation into the bridge failure continued.

NTSB Chairman Mark Rosenker said investigators "will be making a very thorough examination of that southern end" as well as "any unique design factors" that may have caused the bridge to shift. The southern end was the only portion of the bridge that shifted during the Wednesday collapse, he said.

"I don't want to leave the impression that we have the answer. What we have is a step forward," Rosenker said at a Friday afternoon news conference. He returned to that point repeatedly, later saying, "We have not ruled out anything."

The comments came on a day when a fifth body was recovered from the collapsed bridge. Divers continued to search the Mississippi River near the bridge, but officials said the final death toll may be lower than originally feared.

The fifth victim, the driver of a tractor-trailer rig that was engulfed in flames immediately after the structure collapsed Wednesday during rush hour, was found late Thursday on the bridge decking, fire department spokeswoman Kristi Rollwagen said. The name of the latest victim has not been released.

Hennepin County Sheriff Richard Stanek said the number of people unaccounted for in the disaster has dropped to eight. About 60 vehicles are visible in the wreckage; more are submerged, he said. Seventeen divers are working in the river in 30-minute shifts, he said.

But Stanek cautioned it was difficult to predict a final death toll until all of the wreckage can be surveyed.

"It's a terrible mess, quite honestly," Stanek told reporters. "We don't know how many were on the bridge when it collapsed, or how many victims were in the vehicles themselves."

Capt. Bill Chandler, of the sheriff's department, said conditions were better for divers on Friday because the U.S. Corps of Engineers, which controls the flow of water into the river, had lowered the water level by about two feet.

"As divers are diving, they don't have the strong current they would normally have in the area," Chandler said.

The officials also said some of those unaccounted for have been found. He said the occupant of one of the submerged cars turned up safe at work on Friday and two others were found in the hospital.

Chandler noted that the windows in some of the cars were rolled down, but cautioned this did not necessarily mean the occupants got out.

"We are going under the assumption that there are still people in the water," Chandler said.

Four victims were identified Thursday: Sherry Engebretsen, 60, of Shoreview; Julia Blackhawk, 32, of Savage; Patrick Holmes, 36, of Moundsview; and Artemio Trinidad-Mena, 29, of Minneapolis.

Crews planned to focus on 13 areas on the upstream side of the collapse, including four vehicles that were partially submerged and had been checked briefly Wednesday or Thursday, he said.

Fourteen people were still at Hennepin County Medical Center, where most of the victims were taken, with five of them still in critical condition, spokeswoman Kathy Roberts said Friday.

Among the missing is Sadiya Sahal, 23, and her 2-year-old daughter, Hanah Mohamed. Sahal, who is five months pregnant, left home at 5:15 p.m. with the toddler in the back seat. She called her family at 5:30 p.m. saying she was stuck in traffic on the bridge, according to Omar Jamal, a spokesman for the family. That was her last phone call.

"Her husband is destroyed. He's in shock," Jamal said.

The cause of the collapse is under investigation, but National Transportation Safety Board chairman Mark Rosenker said his team got two big breaks Thursday with a surveillance video showing the collapse and a computer program that would analyze how the bridge failed. Those two developments will speed their work and allow them to do a smaller reconstruction of part of the bridge span,Rosenker said.

As Congress moved to approve $250 million in emergency spending to replace the bridge, Minnesota Gov. Tim Pawlenty said he is considering calling a special session of the Legislature to deal with transportation issues.

The bridge had been designated "structurally deficient" as early as 1990, but Pawlenty said the state was never warned that the I-35W bridge needed to be closed or immediately repaired.

"There was a view that the bridge was ultimately and eventually going to need to be replaced," he said.

More than 70,000 bridges across the country are rated structurally deficient, and engineers estimate repairing them all would take at least a generation and cost more than $188 billion.

"I think anybody who looks at the national picture, the national statistics and says that we don't have a problem, would be naive or misleading the situation," Pawlenty said. "We have a major problem."

Although the recovery operation may last for several more days, life was returning to normal Friday in the Twin Cities area. Commutes were lighter than usual, as they were Thursday. Interstate 35W, which 141,000 vehicles used each day in crossing the Mississippi on the bridge, is a major artery for the city.

One local highway that usually has traffic lights has been converted to a freeway by switching all the lights permanently to green.

The Uptown Art Fair and the Minnesota Fringe Festival, a film and performance showcase, were set to begin Friday. The Minnesota Twins, who canceled a Thursday game, planned to play a weekend series against the Cleveland Indians.

First Lady Laura Bush met dozens of volunteers and rescue workers Friday, including Shanna Hanson, a volunteer firefighter who was one of the first responders on the scene. She had been waterskiing on the river when the bridge fell.

Deputy Police Chief Rob Allen stood on a hill with Bush overlooking the flattened freeway bridge and described a school bus tangled in the wreckage.

"If you ever need proof of the hand of God, just look where that bus is," Allen said. "Two seconds later, there's a massive fire right where the cab of that truck is, and those kids would have been killed in a fire. Two seconds earlier, and it's in the river."

The 60 youngsters all made it safely out of the debris.

"The whole country has seen the strength of the Minneapolis-St. Paul community, and because we've seen that strength, we all are confident that the bridge will be rebuilt and that your city will heal," Bush said.

Coincidentally, Bush had already been scheduled to come to the Twin Cities Friday to deliver remarks at a youth conference in St. Paul.

Minneapolis had sunny weather with temperatures in the 80s today, but conditions Saturday could worsen, complicating recovery efforts. The forecast calls for rain with a chance of storms.

Officials see new urgency to improve USA's bridges

By Rick Hampson, Dennis Cauchon and Paul Overberg, USA TODAY

Against the shock of a mighty span's inexplicable fall — at rush hour, into the nation's greatest river — bridge experts offer this reassurance: The same federally mandated inspections that show one-quarter of U.S. bridges to be "structurally deficient" or "functionally obsolete" also indicate they're in very little danger of collapsing.

Of course, that's what the same experts would have said about the Interstate 35W bridge in Minneapolis before it crashed down Wednesday.

As rescue crews searched the Mississippi River on Thursday for what could be up to 30 more victims beyond the four confirmed dead, it was clear that the bridge's sudden failure — like a similar one 40 years ago in West Virginia that inspired the inspection system — could put a new focus on the nation's decaying bridges.

ACROSS THE U.S.: Busy bridges that need work

Across the nation Thursday, there was a fresh urgency on improving infrastructure — the roads, bridges, utilities and other basics of modern life that aren't always the most popular spending priorities for governments.

U.S. Transportation Secretary Mary Peters and several governors ordered safety reviews for thousands of bridges, especially those similar to the steel-deck truss span that collapsed in Minneapolis. There are about 700 such bridges in the USA. New Jersey Gov. Jon Corzine went further, promising evaluations of all 6,400 local, state and federal bridges in his state, regardless of owner.

In Minneapolis, there was grief, outrage and questions over whether government officials could have done more to prevent the disaster. "A bridge in the middle of America shouldn't fall into a river," said Sen. Amy Klobuchar, D-Minn., whose home is near the span.

The disaster on Minnesota's busiest bridge — which carries 141,000 cars a day — raised hopes of more money for infrastructure in general. The bridge collapse came two weeks after an 83-year-old steam pipe exploded under a street in Midtown Manhattan, sending a geyser of gases and debris hundreds of feet into the air.The American Society of Civil Engineers estimates that the USA needs to spend $1.6 trillion over five years to put its infrastructure — which includes some 590,000 bridges — in good condition.

"Unfortunately, it takes a catastrophe to get us busy on some things," said Sam Maggard, head of the Bridge Inspection Program at New Mexico State University.

He was thinking of another rush-hour bridge collapse four decades ago.

On Dec. 15, 1967, the Silver Bridge between Point Pleasant W.Va., and Gallipolis, Ohio, suddenly buckled and collapsed. All but six of the 37 vehicles on the bridge fell into the Ohio River or onto its banks; 46 people were killed.

The disaster led to the creation of the National Bridge Inspection Standards in the early 1970s. Now, a bridge is supposed to be inspected at least every two years.

Other disasters also expanded the store of knowledge about bridge failure:

•The 1987 collapse of a New York State Thruway bridge, in which 10 people died, alerted officials to the problem of scouring on underwater bridge supports. That's when swirling water erodes sediment in which the supports are sunk.

•The fall of the Sunshine Skyway Bridge in Tampa Bay in 1980, after it was rammed by a ship, focused attention on the threat to bridges from water traffic.

"Sometimes it takes a tragedy to get decision-makers to pay attention," said Andrzej Nowak, who teaches civil engineering at the University of Nebraska. "I think the biggest thing to come of this will be that, as a nation, we'll spend more money replacing and maintaining these older bridges."

A call for spending

Such spending is long overdue, in the view of many who study the issue.

"Let's face it: It's not a popular thing to throw money at maintaining something as dull as a bridge," says Terry Wipf, director for bridges at Iowa State University's Center for Transportation Research and Education.

"Infrastructure is such a geeky, wonky topic that it's difficult to get the attention of the public or elected officials," says Robert Dunphy of the Urban Land Institute in Washington, D.C.

"You can increase a bridge's life by washing it once a year, but we don't even have the money to do that," says Nowak.

They and other experts agreed that U.S. bridges — inspected regularly and designed for loads far greater than they should ever have to bear — generally are safe.

"I don't take (the Minneapolis disaster) as a warning sign that we have to be scared about driving over bridges," said Tripp Shenton, a University of Delaware civil engineer. "The rate of failure is so small we don't have to be worried."

Excluding those caused by obvious external forces — earthquakes, floods, vessel or vehicle collisions — the collapse of the I-35W bridge marked only the third time since the Silver Bridge disaster that the fall of an American bridge had caused the loss of multiple lives.

The others were the 1983 collapse of the I-95 bridge over the Mianus River in Greenwich, Conn., which killed three, and the 1987 Thruway bridge collapse near Amsterdam, N.Y.

"Everything isn't perfect, we know that, and it's hard to find the right word for what it is," Maggard says. "Reasonably safe? Yeah. Generally safe? Yeah. Not every inspector catches every flaw on every bridge, but at least we've got someone out there looking."

메모 포함[W17]: alert of scouring: 1987 New York State Thruway bridge

메모 포함[W18]: threat of water traffic: 1980 Sunshine Skyway Bridge

메모 포함[W19]: only third collapse since 1967 Mianus Bridge???

Neglect of aging bridges is less a safety issue than an economic one, Wipf says. "Bridges don't last as long as they should because they're not maintained. We lose money by not investing in our infrastructure."

Generations of decaying bridges

Thousands of the USA's most heavily traveled bridges are 30 to 60 years old. They were built, beginning in the 1950s, as part of the interstate highway system. Others bridges are much older. The George Washington Bridge connecting New Jersey and New York City last year observed its 75th birthday, and got a $62 million makeover.

The ill-fated I-35W bridge seems to have been a prime example of the age and neglect that plagues many U.S. spans.

In 1990, the U.S. government rated the bridge as "structurally deficient," citing corrosion in its bearings. The designation means some portions of the bridge need to be scheduled for repair or replacement. Inspectors did not believe the corrosion was a major problem. Inspectors later found cracks and corrosion in the steel around the bridge's joints; those were repaired by the state, which is responsible for maintenance of the bridge.

In a 2005 inspection, the 40-year-old bridge rated 50 on a scale of 100 for structural stability and was classified as "structurally deficient." That "didn't mean that the bridge is unsafe," Transportation Secretary Peters says.

"We thought we had done all we could," Minnesota state bridge engineer Dan Dorgan said near the mangled remains of the span. "Obviously something went terribly wrong."

According to federal data based on a June 2005, inspection, the bridge compared poorly with others:

•Among bridges in the urban interstate system, only about 6% had a structure with a rating as bad or worse than the I-35W span.

•Among all urban highway bridges with six or more lanes, only about 15% were rated as bad or worse.

•Among all kinds of urban highway bridges, only about 6% were described, like the I-35W bridge, as structurally deficient, based on factors such as the condition of its superstructure or clearance over ater.

The relatively poor rating doesn't mean the bridge was unsafe because modern spans are designed with large safety margins to reduce the chance of failure, says Shenton, the Delaware engineer.

Designers calculate the strength necessary to carry a deck full of vehicles and add at least 70% more strength to the bridge, he says. "When we actually go out and do field tests of bridges, they are more over designed than we think they are."

메모 포함[W20]: safety margin

Some bridges considered structurally deficient aren't up to the weight standards of today's traffic, says Finn Hubbard, state bridge engineer for the Wisconsin Department of Transportation.

"The ones that are 50 to 60 years old are the ones we get worried about because trucks were considerably lighter then," he says. Those bridges are posted with weight limits.

Although the American Society of Civil Engineers gave the condition of the nation's infrastructure a "D" grade, bridges got a "C." In the penny-pinching world of infrastructure, says Dunphy of the Urban Land Institute, "bridges are about as good as it gets."

If even low-rated bridges are supposed to be safe, how could Wednesday's disaster have happened?

Shenton says the federally mandated inspections on the bridge should have caught any problems. Visual inspections are far from perfect, however, and small cracks or other problems are easy to miss.

"When you are inspecting a bridge like that, it's a huge structure," he says. "That's a lot of area to cover. You get down in there; there's a lot of dirt and debris and pigeon crap."

Better inspection methods

The U.S. government is pushing more sophisticated inspection techniques. "Today, a typical bridge inspection is like going to a doctor and having him ask how you feel, but not checking your blood pressure or using a stethoscope," Shenton says.

Inspectors can use ultrasound to look inside a bridge or apply a dye that can reveal cracks not visible to the eye. Eventually, many major bridges also will get computerized warning systems that will automatically detect problems, much as they do in cars or the space shuttle.

That costs as much as hundreds of thousands of dollars per bridge, Wipf says.

In 2005 the Federal Highway Administration started a major effort to preserve bridges. The program includes a 20-year research effort to better understand how bridges deteriorate and how to spot the symptoms.

Also, a 10-year national effort to overhaul the design and safety code that engineers use to build bridges will culminate Oct. 31, when the new specifications become mandatory for new federally funded bridges.

The rules — which cover specifics such as beam sizes and concrete strength — won't make bridges look markedly different. They're designed to make new bridges last 75 years (as opposed to 50) and cost less.

메모 포함[W21]: new design life of bridges in USA 75yrs

Now, "we understand better why bridges fall down," said Kelley Rehm, a structural engineer at the American Association of State Highway and Transportation Officials.

How to pay for these and other infrastructure improvements? Governments need to tap private investors, says Chris Lawton, a partner in Ernst & Young, a firm that designs such deals. The United Kingdom finances 10% to 15% of its infrastructure needs through private investment, he says. That could mean more toll bridges and roads, or transferring long-term maintenance of a bridge to a private firm, he says.

Maggard, the New Mexico State bridge inspection director, says the problem goes back to the beginning of the interstate highway system.

"We did not realize it would take all the freight off the rails, and put a car in every garage," he says. "We increased the traffic and the weight so much we reduced the life span of our bridges."

READERS: The condition of the nation's bridges brings two common reactions: political and personal. How do you feel about the bridges in your area? As you travel, are you concerned or comfortable? Read our Community Center blog for more on readers' bridge fears, or tell us your feelings below.

Contributing: Alan Levin; Matt Kelley, Andrea Stone; Dan Wilson of the Appleton, Wis., Post-Crescent, the Associated Press

Official calls Minneapolis bridge collapse 'anomaly'

WASHINGTON (AP) — The head of the National Transportation Safety Board said Friday people shouldn't fret about general bridge safety across the country, notwithstanding figures showing more than 70,000 are rated structurally deficient.

"I don't believe that they should be worried at all," NTSB Chairman Mark Rosenker said from the scene of the collapse this week of an interstate highway bridge in Minneapolis.

"Rules that have been put into place as a result of a recommendation that we made some 30 years ago have improved the conditions and the standards that in fact these things are being inspected on," he said. ""But with that said, as a result of this catastrophic disaster, we're going to be looking at the rules and finding out in fact if they should be tightened, made more stringent."

Concern about bridge safety has increased in the wake of that bridge span collapse in Minnesota, and figures show that repairing all bridges considered structurally deficient would take at least a generation and cost more than $188 billion. That works out to at least $9.4 billion a year over 20 years, according to the American Society of Civil Engineers.

The bridges carry an average of more than 300 million vehicles a day. "We actually have the collapse itself in total video for us, lasting approximately three seconds. We'll be able to use that as an investigative tool to give us an idea where the structural failure began," Rosenker said.

He said it's too early for officials to know if the accident could have been avoided. "They are built not to fall down. This is an anomaly and we're going to try to find out why this is an anomaly and prevent that anomaly from ever happening again" he said in an appearance on ABC's *Good Morning America* Friday.

It is unclear how many of the spans across America pose actual safety risks. Federal officials alerted the states late Thursday to immediately inspect all bridges similar to the Mississippi River span that collapsed.

In a separate cost estimate, the Federal Highway Administration has said addressing the backlog of needed bridge repairs would take at least $55 billion. That was five years ago, with expectations of more deficiencies to come.

It is money that Congress, the federal government and the states have so far been unable or unwilling to spend.

"We're not doing what the engineers are saying we need to be doing," said Gregory Cohen, president of the American Highway Users Alliance, an advocacy group representing a wide range of motorists.

"Unfortunately when you consistently underinvest in roads and bridges ... this is the dangerous consequence," Cohen said of Wednesday's deadly Mississippi River bridge collapse in Minneapolis. He said engineers have estimated $75 billion a year is needed just to keep highways and bridges from further deterioration, but that only around $60 billion a year is being provided.

At least 73,533 of 607,363 bridges in the nation, or about 12%, were classified as "structurally deficient," including some built as recently as the early 1990s, according to 2006 statistics from the Federal Highway Administration.

The federal government provides 80% of the money for construction, repair and maintenance of the so-called federal-aid highway system including Interstate highways and bridges. But states set priorities and handle construction and maintenance contracts.

A bridge is typically judged structurally deficient if heavy trucks are banned from it or there are other weight restrictions, if it needs immediate work to stay open or if it is closed. In any case, such a bridge is considered in need of considerable maintenance, rehabilitation or even replacement.

Congressional leaders say the number of bridges in need of repair is too high and the funding too low.

There is crumbling infrastructure all over the country, said Senate Majority Leader Harry Reid, D-Nev. Sen. Patty Murray, D-Wash., who heads the Senate panel that controls transportation spending, said the Bush administration has threatened vetoes when Democrats try to increase such spending.

White House deputy press secretary Scott Stanzel, accusing the Democrats of using the bridge collapse for partisan purposes, said Bush had increased funding for federal highways by about 30% during his administration. The president had threatened to veto legislation not over highway funding but because of billions of dollars in excess funding in other areas, Stanzel said.

Democrats were not alone in calling for more bridge funding.

"People think they're saving money by not investing in infrastructure, and the result is you have catastrophes like this," said Rep. Tom Petri, R-Wis., a member of the House transportation committee.

The federal government is now providing about $40 billion a year to improve and expand the nation's highways and bridges.

The main source of revenue for roads and bridges, the federal highway trust fund, is failing to keep up with spending demand. The 18.3 cents a gallon in federal taxes hasn't changed since 1993, and the demand for more fuel-efficient vehicles could affect fuel consumption.

Funding isn't the only issue getting attention after the Minnesota collapse.

Transportation Secretary Mary Peters said in an interview with The Associated Press that she had asked her department's inspector general to evaluate the agency's overall bridge inspections.

According to the Federal Highway Administration, most bridges in the U.S. Highway Bridge Inventory — 83% — are inspected every two years. About 12%, those in bad shape, are inspected annually, and 5%, those in very good shape, every four years.

The Department of Transportation's inspector general last year criticized the Highway Administration's oversight of interstate bridges. The March 2006 report said investigators found incorrect or outdated maximum weight calculations and weight limit postings in the National Bridge Inventory and in states'

메모 포함[l22]: number of structurally deficient bridges in the nation

메모 포함[W23]: frequency of inspection in USA

bridge databases and said the problems could pose safety hazards. The Highway Administration agreed that improvements in its oversight of state bridge inspections and data were needed.

Incorrect load ratings could endanger bridges by allowing heavier vehicles to cross than should, and could affect whether a bridge is properly identified as structurally deficient in the first place, the inspector general said.

The audit didn't identify any Minnesota bridges or mention the state beyond noting that 3% of its bridges were structurally deficient, placing it at the low end among states. It said those bridges were crossed by an average of 30,000 to 40,000 vehicles a day, putting it 13th among the states.

An analysis of 2006 Federal Highway Administration data found that Minnesota bridges were generally in better shape than those in other states. Only about 6% of the state's 20,000 bridges were listed as being structurally deficient. In Oklahoma, nearly 27% of bridges were cited by the federal government as being structurally deficient, the highest percentage among the states.

Among counties with more than 100 bridges, the problem appears to be most significant in the Midwest. In Nemaha County in southeastern Nebraska, about 58% of 194 bridges are structurally deficient. More than 55% of neighboring Pawnee County's 188 bridges are in the same shape. Of the 10 worst-off counties with significant numbers of bridges, seven are in Oklahoma or Nebraska.

On the other end of the scale, at least 10 counties with a significant number of bridges have none that are structurally deficient, according to the latest government statistics. A half-dozen of those are in Texas.

Several governors on Wednesday ordered state transportation officials to inspect particular bridges or review their inspection procedures.

Beyond Minnesota, North Dakota Gov. John Hoeven said his state doesn't have any bridges similar to the Minneapolis bridge but he had asked state officials to review inspection procedures. Presidential hopeful and New Mexico Gov. Bill Richardson ordered an inspection of several steel-truss bridges in the state. Arizona Gov. Janet Napolitano directed state transportation officials to conduct a statewide review, starting with highly traveled bridges in urban areas.

The New York Times
nytimes.com

August 4, 2007

Hundreds of Inspectors Check Nation's Old Steel Bridges

By MATTHEW L. WALD and KENNETH CHANG

On the old bridge that carries Missouri Route 5 over the Lake of the Ozarks, near a place called Hurricane Deck, men with hammers spent yesterday whacking the girders and plates on the underside and listening to the voice of the steel. A subtle whisper could indicate a crack that could cause a collapse like the one in Minneapolis on Wednesday.

But these inspectors, like hundreds of others who were ordered out to old steel bridges around the country yesterday in the wake of the collapse, had no real idea of what they were trying to find.

"What do you really look for?" said David E. Buck, a spokesman for the Maryland highway administration. "Nothing has specifically come out of the Minnesota situation that says, 'look for this.' "

There are more than 750 bridges with steel deck trusses, roughly similar to the one that now lies in the Mississippi River, and the federal government told the states Thursday evening to quickly inspect about 470 of them that are particularly vulnerable to flaws. All were regularly inspected anyway, some more frequently than the two-year interval the federal government requires. With investigators in Minneapolis only beginning the painstaking task of determining the cause of the collapse, it is not clear what the states should be doing that they are not doing now.

Yesterday, however, federal transportation officials said they would begin a thorough examination of the National Bridge Inspection Program, to ensure that Washington is being rigorous in monitoring state inspections.

"What happened in Minnesota is simply unacceptable," said Mary E. Peters, the secretary of transportation, who ordered the department's inspector general to conduct the review. "We must have a top-to-bottom review of the bridge inspection program to make sure that everything is being done to keep this kind of tragedy from occurring again."

Around the country, engineers inside and outside government said they were eagerly awaiting some clue about what had happened in Minnesota. They noted, though, that bridges that can be brought down by a single failure — similar to the now-obsolete design used in the 40-year-old Minneapolis bridge — were an integral part of the American landscape and were certain to persist for decades.

Missouri has only 11 bridges with a design similar to the one in Minneapolis, but Pennsylvania has about 55, and inspectors there are beginning with the 17 or so that are rated as "structurally deficient," hoping to get through them by the end of August.

Allen Biehler, the secretary of transportation in Pennsylvania, said his department's attention has now been raised "sky high," but also said the inspections would be like those in the past.

"We don't know of any reason that these structures are not safe, but when the U.S. Department of

Transportation asks us to re-inspect, we're sure going to do that," he said.

In Maryland, engineers are planning to bring a "snooper truck" — the kind that parks on the bridge deck and uses an arm to bring the inspector down under the structure — to look at a bridge on the north side of the Washington Beltway that carries more than 200,000 vehicles a day. The bridge was most recently inspected last summer and was not scheduled for another look until next year, but will get the standard inspection this summer too.

At the federal level, there is also uncertainty. "Everything we know today does indicate we were doing it correctly, but clearly something happened here," said Frederick G. Wright Jr., executive director of the Federal Highway Administration. Mr. Wright spoke to reporters by conference call from Minneapolis.

In Missouri, Dennis W. Heckman, the state bridge engineer, said it was possible that the collapse would bring a shift in inspection procedures. The last such change, he said, was after the bridge carrying Interstate 90 over Schoharie Creek in upstate New York collapsed, on April 5, 1987, killing 10 people, because water had undermined a support. That led to new procedures to look for "scouring" of stream beds and rivers, he said.

"We really are anxious to know what the problem was," he said. Referring to the bridge in Minneapolis, he said, "We've all seen bridges that look worse than this one. This seems like some kind of new failure mechanism." Experts speculated on all kinds of ideas, including subtle earthquake damage.

One known vulnerability of the Minneapolis bridge and other steel bridges built in the 1960s has been welded joints. Steel bridges of an earlier vintage were bolted together, but construction shifted to welding, because it is usually cheaper and easier and also provides more flexibility in how the pieces can be assembled. At the time, though, engineers had only limited information about how welded joints held up over time and stress.

Research in the 1970s revealed that certain welded components were particularly vulnerable to metal fatigue. The I-35W bridge included these types of welded components in locations that were "fracture-critical," meaning that a break in that spot would probably lead to a collapse.

Engineers can design "redundant" bridges that are not vulnerable to the failure of a single part, but that adds weight and cost. Fracture-critical bridges are still being designed and built today, and old bridges with fracture-critical components can be rehabilitated instead of replaced, civil engineers say.

"As long as you put in place the proper design to virtually eliminate the risk of fracture," said Edward P. Wasserman, director of the structures division at the Tennessee Department of Transportation, "and as long as you have a reasonable plan to inspect and maintain it."

Mr. Wasserman said that his department had recently finished rebuilding a bridge with characteristics similar to the one in Minneapolis, the Gay Street bridge in Knoxville, because it was historic and the city did not want it replaced.

메모 포함[W24]: new failure mechanism

메모 포함[W25]: cost lives

메모 포함[W26]: fracuture critical bridges

The New York Times
nytimes.com

August 4, 2007

Federal Rules to Improve Design of Highway Bridges Will Go Into Effect in October

By WILLIAM J. BROAD

In October, the federal government will begin enforcing new rules for highway bridge design meant to make new structures more efficient, more reliable, safer and longer lived — and implicitly better than hundreds of thousands of existing spans across the nation.

The new rules have been in the works for two decades, and their enforcement by the Federal Highway Administration is unrelated to the Minneapolis bridge collapse, officials said. The rules will act like housing codes and not be retroactive. Many old bridges will suddenly be out of date but will be grandfathered in, as is the case with many old homes as community standards rise.

States have been slowly applying the new rules for years, some better than others. Minnesota is at the forefront, with 100 percent enforcement on new bridges as of last year. New York has been slower, and California slower still.

States that fail to follow the new rules after October could jeopardize their federal financing.

The rules, highly complex, call for major improvements in the design of bridge steel, concrete and foundations. They are more conservative, for instance, in their assessment of the sturdiness of driven pilings, and in some cases will raise the cost of bridge foundations.

Officials called the rules the biggest change in federal regulations for bridge design since 1931. Behind the change, they said, are such factors as more realistic assessments of highway traffic as well as advances in the statistical analysis of past bridge failures and their causes.

메모 포함[W27]: new rules

Among other things, the rules will produce bridges better able to withstand peak traffic stresses and severe weather, as well as "extreme events" like ship collisions and earthquakes.

"It's going to increase reliability, which translates into bridges that are safer, more cost efficient, and have longer design lives," said Kelley C. Rehm, program manager for bridges and structures at the American Association of State Highway and Transportation Officials, which wrote the new rules.

"It doesn't mean existing bridges are going to fall down," Ms. Rehm added. "In the past, some were overdesigned, and some didn't have as much of a safety factor as we'd like to see. Today, we know a lot more about how loads are doing to affect the bridges, and why they fail."

Surprisingly, experts say most bridge failures involve not structural failure of the span itself but of its foundations. For instance, churning water can undermine driven pilings, causing the whole bridge to

collapse suddenly.

The rules were actually written seven years ago, during the Clinton administration. In June 2000, David H. Densmore, director of bridge technology at the highway administration, ordered them applied to all bridges built after Oct. 1, 2007.

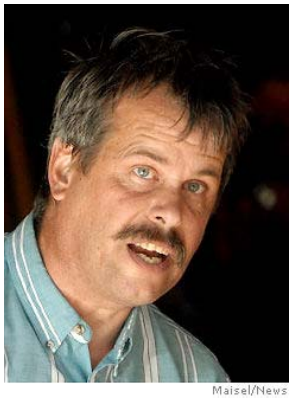
In theory, the rules affect just federally financed bridges, but experts said the effects would eventually include all state and local bridges because the old rules are no longer updated and adhering to them could hurt bridge trustworthiness.

washingtonpost.com

Hey, don't blame me for collapse

'Go after the designer,' says Minneapolis bridge checker

BY MIKE JACCARINO and KERRY BURKE *in Minneapolis* and TRACY CONNOR *in New York*
DAILY NEWS STAFF WRITERS



Maisel/News

Inspector Kurt Fhurman says he's not to blame for the collapse, and that the designer of the bridge should be.

The inspector who signed off on Minneapolis' Interstate 35W bridge almost every year since 1994 refused to accept blame yesterday for the collapse that killed at least five people.

"Go after the designer. Go ask him why he did what he did," Kurt Fhurman angrily told the Daily News at his home. "Go after the designer."

Fhurman and another inspector from the Minnesota Department of Transportation conducted inspections of the bridge every year but one since 1994, state records show.

Yearly inspections were ordered after the feds deemed the bridge "structurally deficient," but the state found there was no reason to close it down.

Minnesota Gov. Tim Pawlenty suggested it was a catastrophic error.

"Experts that we rely on, technical experts and engineers, made some decisions about what needed to be done...and now those decisions will have to be reviewed," Pawlenty said.

"The bridge was declared fit for service," he said. "There will be tough questions asked, including by me, and we will get to the bottom of this."

Fhurman, who was hostile and refused to elaborate on his comments, implied the cause of Wednesday's disaster was the design of the bridge - a roadbed sitting atop a metal truss.

The bridge, built in 1967, was designed by Sverdrup & Parcel, a prominent firm that also designed Busch Stadium in St. Louis, the Superdome in New Orleans and the Chesapeake Bay Bridge-Tunnel.

The founder of the firm, Leif Sverdrup, is dead. The company is part of Jacobs Engineering Group in Pasadena, Calif., which did not return calls.

The two companies that built the bridge were Industrial Construction Co. and HurCon Inc. Both are out of business.

Ultimately, the cause of the collapse will be determined by the National Transportation Safety Board. A video that shows the bridge collapsing Wednesday has provided crucial early clues, federal officials said.

NTSB Chairman Mark Rosenker said investigators are particularly interested in learning why a part of the bridge's southern span shifted as it collapsed.

"I don't want to leave the impression that we have the answer. What we have is a step forward," Rosenker said. "We will be making a very thorough examination of that southern end."

While NTSB probers collect and assemble debris, emergency workers were trying to recover bodies from the rubble and Mississippi River. At least eight people were still missing.

Firefighters recovered the body of a fifth victim, Paul Eickstadt, 51, of Mounds View, Minn., the driver of a tractor-trailer that was engulfed in flames in the collapse, from the wreckage late Thursday.

Among those feared dead were a pregnant woman, Sadiya Sahal, 23, and her 2-year-old daughter, Hanah Mohamed.

Sahal left home at 5:15 p.m. and called her family at 5:30 p.m. saying she was stuck in traffic on the bridge, family spokesman Omar Jamal said. They didn't hear from her again.

"Her husband is destroyed. He's in shock," Jamal said.

First Lady Laura Bush visited the scene yesterday, ahead of President Bush's scheduled trip today. At an American Red Cross chapter, Laura Bush shook hands with Jay Reeves, who helped evacuate children from a school bus on the bridge.

"She believes it was lucky someone like me was right there on the spot," Reeves, 39, said, his voice breaking. "You'll have to excuse me, but that was pretty cool."

washingtonpost.com

Collapse Spotlights Weaknesses in U.S. Infrastructure

By Nick Miroff
Washington Post Staff Writer
Friday, August 3, 2007; A08

The bridge that lies crumpled in the Mississippi River is the latest link to fail in a national highway system rapidly deteriorating under the strain of ever-increasing traffic volume and inadequate upkeep, transportation experts said yesterday.

Once the sturdy pride of post-war America, the federal interstate system is now a vast network of aging roads and bridges, including many -- such as the span that collapsed in Minneapolis -- that engineers consider deficient or obsolete.

Despite record spending on highways, experts and engineers said federal funds aren't enough to save the interstate system's half-century old bridges and 47,000 miles of highway from further decay, as a network designed to connect the nation teeters under a crush of commuter traffic.

"We're falling further and further behind," said Robert Poole, director of transportation studies at Reason Foundation and an adviser to the Federal Highway Administration. "We're prospering as a nation, driving more as commuters and shipping more goods, and that's pounding the highways and wearing them out."

According to a 2005 Highway Administration report, more than 75,000 of the nation's roughly 600,000 bridges -- 13.1 percent -- were rated "structurally deficient," meaning some components of the bridges' decks or support structures were rated poor or worse. While not necessarily unsafe, the structurally deficient designation often requires speed and weight restrictions to lessen the risk of collapse.

Concerns about bridge reliability pushed the state of the country's infrastructure into the political arena yesterday, as Senate Majority Leader Harry M. Reid (D-Nev.) called the Minneapolis bridge collapse a "wake-up call."

"We have all over the country crumbling infrastructure -- highways, bridges, dams -- and we really need to take a hard look at this," Reid said in a television interview.

Congress approved a six-year, $286 billion transportation funding package in 2005 that boosted highway and mass transit projects. But the government will need to spend $188 billion in the next 20 years just to fix the nation's flawed bridges, according to a 2005 study by the American Society of Civil Engineers.

Bridges in the Washington region are, on average, in better condition than elsewhere in the country, although hundreds of area spans are in substandard shape. Of the 245 bridges in the District, 9 percent were graded structurally deficient in the Highway Administration survey, along with 9 percent of Virginia bridges and 8 percent of Maryland bridges.

Engineers on the $2.4 billion Woodrow Wilson Bridge Project, one of several bridge projects underway in the region, said the new bridge is designed to avert the kind of catastrophe that occurred in Minneapolis.

"A majority of the interstate bridges in this country are [at the end of] service life," said Ronaldo T. "Nick" Nicholson, the Virginia Department of Transportation's manager for the Woodrow Wilson Bridge project. "In Minnesota, they were trying to extend the life rather than replace it."

메모 포함[W28]: extend life span

Though engineers have not yet determined why the Minneapolis bridge failed, bridge experts said its collapse was not necessarily the result of a physical breakdown. Of the 1,502 recorded bridge failures between 1966 and 2005, almost 60 percent were caused by soil erosion around the underwater bridge supports, according to Jean-Louis Briaud, a civil engineer with the Texas Transportation Institute.

"It's the number one killer of bridges," he said. "If you create a hole around the bridge support, then the foundation cannot carry the load of the deck."

Vigilant inspections can prevent failures, and the Minnesota collapse was particularly shocking to those who say safety has been improving.

"By and large, things are positive, and states have been spending more on bridges and making progress," said Alan E. Pisarski, author of "Commuting in America," who noted that the number of structurally deficient bridges in the country has declined in the past decade. "But there are still a lot of them that are structurally deficient."

Nevertheless, the overall national infrastructure is stuck in a "death spiral," as states repeatedly fail to maintain the status quo condition of their transportation networks, Pisarski said. Maintenance standards slip further as the money is spread thin.

Diminishing tax revenue and surging costs have put a double squeeze on state transportation departments, transportation experts said. While federal gas tax rates have remained at 18.4 cents a gallon since 1993, construction costs have been increasing 20 percent a year in some areas. The price of steel, oil and concrete are all up, partly driven by demand for raw materials in China, where the government is busy laying out a national highway system of its own.

"We're going to run out of capacity pretty quick, and that is going to put a grinding halt on productivity, profitability and our way of life," said Janet Kavinoky, director of transportation infrastructure at the U.S. Chamber of Commerce.

Last year marked the 50th anniversary of the Interstate Highway System, a legacy of President Dwight D. Eisenhower and his grand vision for a road system that would shrink the continent and "meet the demands of catastrophe or defense, should an atomic war come."

The missiles never came, but the cars did. State transportation departments, which took control of the interstate system in exchange for federal funds, are confronted with an even costlier mission: satisfying commuter demand for lane-widening projects in urban areas where land is most expensive.

One result, said the Reason Foundation's Poole, is that states are turning to the private sector to maintain existing roads and build the next generation of highways, a change encouraged by the Bush administration.

Jerome F. Hajjar, professor of structural engineering at the University of Illinois at Urbana-Champaign, said the American Society of Civil Engineers has been warning for years that the nation needs to devote more attention to its aging bridges.

"Each bridge is different, and each bridge needs to stand up," he said. "Collapsing is not an option."

Bush begins tour of bridge collapse in Minneapolis

President Bush has arrived in Minneapolis and will soon begin a tour of the area where a busy highway bridge collapsed Wednesday over the Mississippi River. At least five people died and dozens were injured.

White House officials say the president will view the scene from above, and then head over to the broken span to meet with rescuers and local officials.

Back in Washington, the House is expected to approve spending $250 million to rebuild the highway bridge. This would be in addition to the $5 million that the federal government gave the state right after the collapse to pay for debris removal and recovery operations.

Transportation Secretary Mary Peters told reporters traveling with the president this morning that she didn't want to speculate about the cause of the collapse until the NTSB has had a chance to complete its investigation. (As we reported last night, experts are trying to figure out why the south end of the bridge shifted as it fell.)

"But clearly this was not something that we expected to happen, given the history of this bridge, the inspection process, and how this bridge was rated," she said. "But something happened, and it is clearly very, very important that we get not only to the bottom of what happened there, but also really look at the processes and the procedures by which we inspect and rate bridges, to make sure that we are doing everything we can to ensure America's infrastructure is safe."

Peters says she has asked the Transportation Department's inspector general to review the nation's bridge inspection programs.

Bush devoted his weekly radio address to the disaster. "This is a difficult time for the community in Minneapolis, but the people there are decent and resilient, and they will get through these painful hours. As they do, they know that all of America stands with them, and that we will do all we can to help them recover and rebuild," he said in the speech.

This afternoon, Bush heads to the presidential retreat at Camp David, Md., for a scheduled meeting with Afghan President Hamid Kharzai.

Update at 10:37 a.m. ET: The *Star Tribune* has a report on first lady Laura Bush's tour of the site yesterday. The paper says five people are confirmed dead and 98 injured in the collapse. Officials say seven to nine people are still missing, according to the paper.

The *Star Tribune* looks at the potential for lawsuits against those who built or maintained the bridge. It says the government's total liability is limited to $1 million. The builders are thought to be exempt from claims because the bridge was finished more than six years ago.

"Given those limitations, attorneys likely will focus on the private entities involved in the bridge's maintenance, particularly if state and federal investigators find that private firms bear any of the blame for the collapse," the paper reports.

Lawyers are said to be hunting for potential litigants.

Update at 11:52 a.m. ET: USA TODAY's David Jackson says Bush pledged that his administration will help rebuild the bridge.

"Our message to the Twin Cities is we want to get this bridge rebuilt as quick as possible," Bush said.

"I make no promises on the timetable," he added, but said Transportation Secretary Mary Peters will work to eliminate any bureaucratic roadblocks.

Bush praised various government officials and rescue workers for the "coordinated way" in which they are trying "to save life and to find life." He said rescue and clean-up efforts are "going to take a while."

(Photo by Morry Gash, AP)

The New York Times
nytimes.com

August 4, 2007

States Across the Country Race to Inspect Bridges

By MONICA DAVEY

MINNEAPOLIS, Aug. 3 — As recovery divers moved from car to car in the murky waters of the Mississippi River on Friday, state officials across the country raced to inspect bridges that are similar to the steel-deck truss bridge that collapsed here, killing at least five people.

One bridge, in Missouri, was closed indefinitely as a precaution. Elsewhere, bridge inspectors were told to cancel their vacations to conduct the emergency inspections and, in some cases, also re-examine bridges with designs unlike the fallen Interstate 35W bridge.

In Washington, the inspector general for the federal Transportation Department was ordered to review the National Bridge Inspection Program, which oversees bridges across the country, including more than 70,000 that have been found to be structurally deficient. Among other things, investigators are to examine whether the necessary repairs are being made to the deficient bridges.

In addition to those confirmed dead in the bridge collapse here on Wednesday, an uncertain number of people — some authorities say the number would most likely be close to eight — were still considered missing and presumed dead beneath the waters. An additional 100 people were injured, more than 20 of them arriving at hospitals a day or two after the collapse, having only then felt the physical effects of their ordeals.

As devastating as the deaths and injuries have been for the city, some officials credited the much-criticized design of the bridge, at least in part, for preventing the likely death toll from being even worse on the crammed I-35W, a crucial downtown thoroughfare.

Because the bridge had structural supports beneath the road surface, vehicles were not pummeled by steel from above them when the bridge fell, as happens in some bridge collapses, said Jim Clack, this city's fire chief.

Other factors, Chief Clack said, may have helped too: the bridge was so crowded during that evening's rush hour that cars were barely moving, leading many of the cars to "almost ride the bridge down" as it suddenly dropped 60 feet, apparently preventing them from actually landing in the waters below.

"In a way, we were lucky," Chief Clack said.

Still, many people, including some family members of those killed in the collapse, were questioning state officials' handling of potential flaws in the bridge and said signs of trouble had been ignored. The bridge had been deemed "structurally deficient" in 1990, but it was not expected to be replaced until 2020.

As recently as this year, the safety of the bridge had clearly been a point of concern within the Minnesota Department of Transportation. A consulting company hired by the state to examine "fatigue cracking" in the deck truss suggested extra metal plating might be added in some areas; at the time of the collapse, the state had not installed such reinforcements.

The company, URS, had also offered other alternatives, including more examinations of the troubled areas, which the state pursued.

In an interview here, Gov. Tim Pawlenty, a Republican, said the state had relied on the engineers and the experts as it made maintenance choices.

“They made a decision in this case that they thought was appropriate at the time, but now we have to ask the tough questions about whether that was a reasonable decision,” Mr. Pawlenty said. “I can assure you that we will get to the bottom of it.”

Few words, though, could bring comfort to the families of those still missing, who had begun to wonder when, if ever, their loved ones might be found, or to the families of those who died.

Somebody should be charged with murder,” said Khaffak Ansari, ex-husband of Julia Blackhawk, who died in the bridge collapse. “We live in this superpower, and they tell us things are safe.”

메모 포함[W29]: blame as a murder

President Bush was expected to fly to Minneapolis on Saturday. Laura Bush, the first lady, toured the area on Friday, meeting with volunteers and emergency workers.

National Transportation Safety Board officials continued their investigation into the cause of the collapse, focusing their attention on the southern part of the bridge which, they said, “seemed to behave differently” than the bridge’s other sections. While much of the bridge essentially fell in place, the southern section seemed to shift in an eastward direction about 50 feet, said Mark V. Rosenker, chairman of the safety board.

By Friday, divers had managed to locate at least a dozen submerged cars, despite treacherous conditions in the rushing waters, steeped with muck, metal and electrical wires. By nightfall, no bodies had been found inside cars; the body of the fifth victim, reported by the authorities on Friday, was recovered on the river’s edge on Thursday. The search was expected to continue for days.

From the wreckage, stories of misery — a victim imploring rescue workers to pass along final words to relatives — continued to emerge along with moments of impossible good fortune: a man in a wheelchair crashing his van against the bridge wall to avoid the waters and escaping alive; a woman with a 3-month-old baby in tow.

The car of one woman who was believed by friends to be missing was, indeed, found in the river, the authorities said Friday; then law enforcement authorities found her safe and unhurt, at her workplace.

Situations like hers, the authorities said, helped explain why the estimate of those missing had fluctuated, and still seemed to be changing Friday. Some 1,200 people had contacted the authorities since Wednesday evening in search of family members and friends, many of whom had later turned up safe — far from the bridge, some in hospitals. Determining the precise number of those who were not missing any longer, though, has been difficult.

With multiple federal, county and city agencies involved in the investigation, even they offered conflicting numbers of those missing. While Rich Stanek, the Hennepin County sheriff, estimated that eight people were still missing early Friday, Tim Dolan, the Minneapolis police chief, said “several” were unaccounted for but said no one was sure what the divers might find. Meanwhile, the response in other states to the

collapse here took on urgency.

The California Department of Transportation canceled the vacations of bridge inspectors so that all 69 of that state's steel-deck truss bridges could be checked immediately.

In Missouri, local officials indefinitely closed a 90-year-old steel-truss bridge serving the suburbs of St. Louis County. County officials had planned to close Old Gravois Bridge later this summer, after inspections showed continuing deterioration. But this city's experience sped the closing.

"The horrors of that disaster obviously weren't something we wanted to experience on a firsthand basis," said Garry Earls, director of the St. Louis County Department of Highways and Traffic.

Here, Governor Pawlenty has ordered inspections of all bridges in the state, starting Friday, including more than 1,000 deemed "structurally deficient." Officials say the designation "deficient" does not necessarily mean a bridge is dangerous or needs immediate replacement, but Mr. Pawlenty said the entire national system of "ratings and definitions" for bridges must now be reviewed from top to bottom.

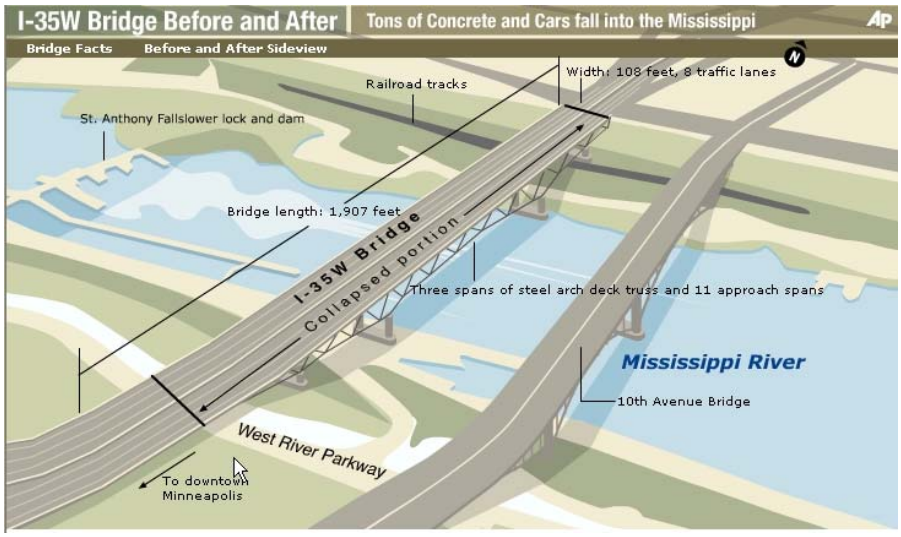
In an interview, R. T. Rybak, the mayor of Minneapolis, said he was "deeply troubled" by the "warning signs" expressed in various inspections of the bridge here over the years.

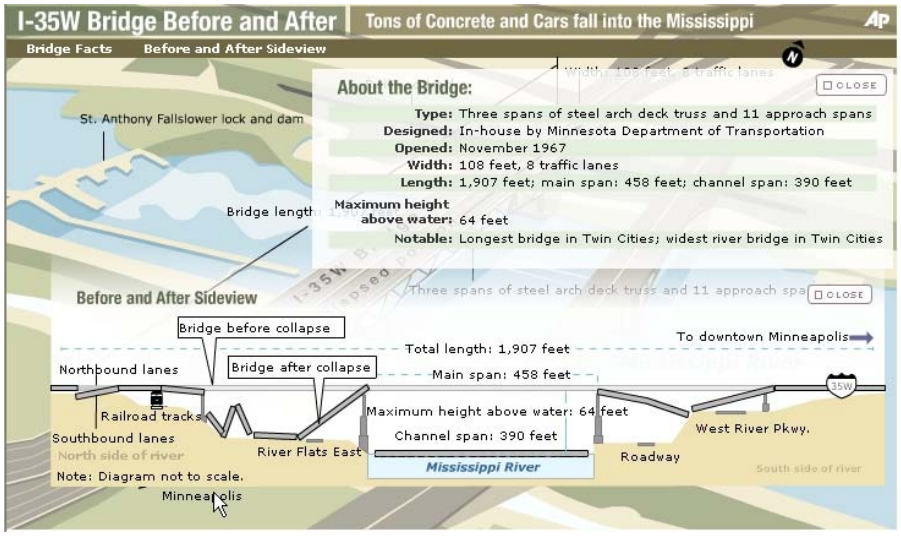
메모 포함[W30]: confusing inspection system: warning signs

"It's too late for the victims in Minneapolis," Mr. Rybak said. "It will be too late for others unless we finally get serious about some of this crumbling infrastructure that many of us have been talking about for some time."

Many in this city said they were looking at bridges with a wary eye now. "And they should," the mayor said. "It is inexcusable that people driving their cars in a major American city should have to think twice about whether that bridge will collapse."

Reporting for these articles was contributed by Brenda Goodman, Jim Orso, Griff Palmer, Julia Preston and Libby Sander.


I-35W Bridge Before and After
Tons of Concrete and Cars fall into the Mississippi
Bridge Facts
Before and After Sideview
Width: 108 feet, 8 traffic lanes
Railroad tracks
St. Anthony Fallslower lock and dam
Bridge length: 1,907 feet
I-35W Bridge
Collapsed portion
Three spans of steel arch deck truss and 11 approach spans
Mississippi River
10th Avenue Bridge
West River Parkway
To downtown
Minneapolis


I-35W Bridge Before and After
Tons of Concrete and Cars fall into the Mississippi
Bridge Facts
Before and After Sideview
About the Bridge:
CLOSE
Type: Three spans of steel arch deck truss and 11 approach spans
Designed: In-house by Minnesota Department of Transportation
Opened: November 1967
Width: 108 feet, 8 traffic lanes
Length: 1,907 feet; main span: 458 feet; channel span: 390 feet
Maximum height above water: 64 feet
Notable: Longest bridge in Twin Cities; widest river bridge in Twin Cities
St. Anthony Fallslower lock and dam
Before and After Sideview
Bridge before collapse
Bridge after collapse
Total length: 1,907 feet
Main span: 458 feet
To downtown Minneapolis
Northbound lanes
Railroad tracks
Southbound lanes
North side of river
River Flats East
Maximum height above water: 64 feet
Channel span: 390 feet
Mississippi River
Roadway
West River Pkwy.
South side of river
Note: Diagram not to scale.
Minneapolis

Deadly Bridge Collapses Through the Decades

The Minneapolis Collapse Is One of Many Fatal Bridge Breakdowns

Aug. 2. 2007 —

They are marvels of steel and concrete, engineering feats that millions of drivers speed across everyday.

But Wednesday's collapse of a Minneapolis bridge that left at least four people dead and many moremissing is a grim reminder of how fragile these seemingly secure structures can be. More than adozen major bridges, overpasses and highways have collapsed in the United States and around theworld in the last 40 years, killing dozens of motorists.

Earlier this week, a highway overpass under construction in Oroville, Calif., collapsed, crushing a delivery truck and seriously injuring a construction worker who fell 50 feet. In April, a section of freeway that funnels traffic off the San Francisco-Oakland Bay Bridge melted and collapsed after a gasoline tanker truck overturned and burst into flames, injuring the truck driver.

Fourteen people, including a 3-year-old girl, were killed in May 2002, when a 500-foot section of a bridge spanning the Arkansas River in Webbers Falls, Okla., collapsed after a barge ran into one of its supports.

In September 2001, Texas' Queen Isabella Causeway gave way after a string of barges driven off course by currents crashed into a bridge support. Eight motorists died when their vehicles plunged 85 feet into the channel. Because the causeway is the only bridge connecting the popular beach destination South Padre Island with the mainland, the disaster had a huge economic impact on the area.

In April 1987, 10 people were killed when a bridge on the New York State Thruway near
Amsterdam, N.Y., gave way. One of America's most deadly bridge breakdowns occurred in 1980, when a 1,000-foot section of the Sunshine Skyway Bridge in Florida collapsed after a freighter struck it during a storm. A Greyhound bus and several cars plunged 150 feet into Tampa Bay, killing 35 people.

While the Sunshine Skyway Bridge tragedy may be the worst U.S. bridge accident in recent memory, it was not as deadly as the 1967 Silver Bridge collapse. In December of that year, the eyebar chain suspension bridge collapsed into the Ohio River at the height of rush hour, carrying 31 vehicles and 46 people with it.

Collapses Around the World

Several bridge collapses outside of the United States have been even more deadly. In March 2001, a pillar on a 116-year-old bridge in Lisbon, Portugal, gave way, causing a tour bus and two cars to plunge into the Douro River and killing more than 50 people.

Eleven people died in October 2001, when two trucks collided in the 10-mile-long Gotthard tunnel, which cuts through the Swiss Alps. Fire spewing thick black smoke delayed rescue attempts and an explosion caused a 100-yard stretch of ceiling to collapse on trapped cars.

After a high-speed train derailed in Hanover, Germany, in June 1998, cars flipped off the tracks, causing an overpass to collapse and killing 101 people. Bodies were pulled from the wreckage and found near the tracks among shredded seats and luggage.

In Quebec in September 2006, five people died and six were injured when a more than 60-foot stretch of an overpass collapsed, sending cars tumbling and crushing the vehicles below. It took workers more than 24 hours to reach two trapped cars in the debris; they were flattened to knee height.

In 1995, an estimated 50 people were killed when a bridge collapsed under heavy rain near Aflou, Algeria, and in the fall of 2005, six people were killed when a section of a highway bridge collapsed and plunged into a ravine in southern Spain.

'Bridges in America Should Not Fall Down'

According to the Center for International and Strategic Studies, more than a quarter of the country's 600,000 bridges are structurally unstable. A 2005 federal report stated that Minneapolis' Interstate 35W bridge, built in 1967 and supported by a single steel arch, was structurally deficient and may need to be repaired.

The fact that 27 percent of U.S. bridges are unstable "does not necessarily mean that any is near imminent failure," Casey Dinges, the managing director of external affairs for the American Society of Civil Engineers, said on "Good Morning America" today.

"Once a bridge has been designated to have problems, we keep a close eye on it," Dinges said. Dinges said that despite this long history of bridge breakdowns and the ongoing tragedy in Minneapolis, nervous commuters "should not be overly concerned" about their local bridges collapsing. "People getting in their cars this morning should not be fearing for their lives," he said.

In a news conference today, U.S. Secretary of Transportation Mary Peters emphasized that bridge collapses like the one in Minneapolis are a relative rarity and she pledged to make sure bridges across the country stay safe.

"Bridges in America should not fall down," she said. "We need to get down to the bottom of this and that is absolutely my top priority."

Reuters and The Associated Press contributed to this report.

Report: 34 Percent of Major Roads Are in Poor, Mediocre Condition

46,000 Miles of Highway Are Half a Century Old

Aug. 2, 2007 —

The fallen I-35 West bridge that connected the east neighborhood of Minneapolis with the University of Minnesota's west neighborhood was investigated in 2005 and 2006 and had no structural defects, according to Minnesota Gov. Tim Pawlenty.

However, construction that was reportedly in progress restricted traffic to one lane. The I-35 West bridge was built in 1967 it has eight lanes of traffic, sits 64 feet above the water and has the highest daily traffic flow in the state.

The bridge was built with a single 458-foot-long steel arch to avoid putting any piers in the water that might impede river navigation. So, how did this catastrophe, which has since left seven people dead and dozens more injured, happen?

Infrastructure Woes

Highway engineers say the neglect of America's infrastructure costs lives every day. More than 40,000 people die in highway accidents each year. Road conditions, the engineers say, are a factor in almost one-third of those deaths.

메모 포함[W31]: cost lives

America's most important road system 46,000 miles of interstate highway is now half a century old. A report card two years ago from the American Society of Civil Engineers said that 34 percent of major roads are in poor or mediocre condition. And that's not all.

The civil engineers say the number of unsafe dams has risen by more than 33 percent in the past two years, and in that time, there have been 29 dam failures. Power capacity isn't keeping pace with demand, and the power grid needs $10 billion a year invested over the next five years. And, according to civil engineers, 27 percent of U.S. bridges are structurally deficient.

Pete Ruane, of the American Road Builders' Association, said, "Many of these bridges their life cycle, their life expectancy, and depending on the state many of them are in very, very bad shape, and need major maintenance or replacement."

The Department of Transportation National Bridge Inventory Web site reported the I-35 West bridge's condition as fair. Its overall bridge rating "meets currently acceptable standards." But, according to a technical report evaluated by the University of Minnesota civil engineering department, in March 2001, the bridge's deck truss experienced "fatigued cracking" and has many "poor fatigue details" on the main truss and floor truss system.

"But that will cost an estimated $10 billion each year over the next two decades," Ruane said, "but that's small compared to the estimated $54 billion poor roads cost motorists in repairs and extra operating costs." Some argue the real problem is congestion that the road system is strained beyond its capacity.

메모 포함[W32]: road repair: 54billion dollars

With Americans already losing $3.5 billion a year, the situation threatens to go from slow to slower. Just a few months ago, in Oakland, Calif., a tanker truck carrying 8,600 gallons of gasoline crashed into a

highway support on the highway interchange known as "the maze." Flames from the accident burned with such intensity, they melted the steel supporting the roadway above, causing it to collapse.

That collapse is expected to disrupt traffic for months, as nearly 300,000 commuters rely on the damaged stretch of road each week. Traffic is an increasing source of stress to commuters in this country, and highway reconstruction is a major cause of it. But knowing that the construction could save lives should ease the pain at the wheel

.

ABC's Bob Jamieson contributed to this report.

메모 포함[W33]: traffic congestion due to repair

Learning from bridge failure

Collapses such as the I-35W in Minneapolis give engineers the best clues about what not to do. Let's hope the lessons are remembered.

By By Henry Petroski
August 4, 2007

The collapse of an interstate highway bridge over the Mississippi River in Minneapolis took everyone, including engineers, by surprise.

We do not expect our bridges to drop out from beneath us, and their designers take great pains to ensure that they do not. Among the surest ways to obviate the failure of any structure is to anticipate all the different ways in which it can fail. Thus, in designing the Minneapolis bridge, engineers had to consider the consequence of a single steel member breaking, buckling or otherwise failing to carry its intended load.

The intended load on a bridge consists of two distinct parts. The so-called dead load is the weight of the steel and concrete that makes up the structure itself. This can be on the order of 80% or more of the total weight that a bridge is expected to bear.

The remainder of the load consists of the weight of the traffic, which in theory can be controlled, and the less controllable forces produced by ice, snow, wind and possibly an earthquake. All expected combinations of these loads -- and how the structure responds to them -- must be taken into account when a bridge is designed. The size and configuration of structural elements, like beams and girders, are chosen to give the bridge more strength than it needs under a worst-case scenario, a concept known as a "factor of safety."

Engineers often look to examples of success and failure to guide their designs. Paradoxically, it is the failures that are the more reliable teachers. As the case of the Minneapolis bridge so clearly shows, a structure that stands successfully for decades is not necessarily a sound design. However, when a bridge fails, it provides invaluable lessons in what not to do.

There are many historical examples of major bridge failures, but one that comes fast to mind today is the 1967 collapse of the 41-year-old Silver Bridge across the Ohio River at Point Pleasant, W.Va. Silver Bridge -- which took its name from the color of its paint -- was a chain suspension structure that collapsed suddenly in rush-hour traffic, sending 75 vehicles into the water and killing 46 people.

It was a year and a half before the Federal Highway Administration issued a definitive report, which attributed the collapse to the growth of an undetected crack in one of the enormous chain links. Aided by corrosion and the repetition of traffic loads over the years, the fatigue crack had grown to such a size that it weakened the link until it could no longer hold up the load it was designed to take.

Because the connection details of the Silver Bridge suspension chains made it difficult, if not impossible, for such a crack to be detected, a twin bridge upriver was dismantled before it suffered the same fate. A more far-reaching immediate consequence was a new requirement that all bridges in the nation be inspected according to federal guidelines. Many bridges throughout the country were closed or had speed limits and traffic loads imposed on them. The Silver Bridge, which had been so vital to the life of the area, was replaced within two years by one of a cantilever design -- the type that failed at Minneapolis.

메모 포함[W34]: reconstruction of silver bridge

In the decades since the collapse of the Silver Bridge, there have been other sudden highway bridge

failures, most notably the Mianus River Bridge on Interstate 95 in Connecticut in 1983 and the Schoharie Creek Bridge carrying the New York Thruway over its namesake stream in 1987. In both cases, lax inspection and maintenance procedures were found to be at fault.

The Mianus failure was traced to excessive corrosion that resulted when roadway drains were paved over and missing gutters were not replaced. At Schoharie, severe, undetected scour under one of the bridge's piers led to its sudden collapse.

No matter how carefully bridge designers anticipate failure on the drawing board (or computer screen), their structures will only be as reliable as how carefully built, maintained and inspected they are. Just because a bridge has given decades of successful service under adverse conditions of increasingly heavy traffic and neglect does not mean that it will continue to do so. It is the function of regular and careful inspections to catch what designers might not have anticipated.

In the wake of Minneapolis, there will no doubt be renewed vigilance. More careful inspections and more conservative interpretations of their findings may cause some immediate inconveniences, but they will also likely prevent some imminent failures.

메모 포함[W35]: more conservative interpretation

In bridge design, as in all structural engineering, success can breed hubris and catastrophe, while failure nurtures humility and caution. Unfortunately, it does seem to take a collapse to re-sensitize inspectors and operators to the real dangers that lurk among rusting steel and cracking concrete. Let us hope that the lessons learned in Minneapolis are not forgotten once more.

Henry Petroski *is a professor of civil engineering and history at Duke University. He is the author, most recently, of "Success Through Failure: The Paradox of Design*

Police ID 8 still missing after Minnesota bridge collapse

- **STORY HIGHLIGHTS**
- **NEW:** Police: Eight "reliably placed in the area," but list isn't definitive
- **NEW:** Investigation shifts to span's north side; high-quality images to help
- State transportation spokesman says bridge may be rebuilt by late 2008
- Construction timetable will depend on pace of debris removal

MINNEAPOLIS, Minnesota (CNN) -- As investigators probed what caused an interstate bridge packed with rush-hour traffic to collapse into the Mississippi River this week, Minneapolis police Saturday night issued a statement naming the eight people -- including a 2-year-old girl -- still missing in the murky waters.

Our thoughts and prayers are with the families of Richard Chit, Peter Hausmann, Greg Jolstad, Vera Peck, Christina Sacorafas, Sadia Adam Sahal, Hannah Sahal and Scott Sathers as they anxiously await any news," the police statement said. Hannah Sahal, 2, was riding in a car with her mother, Sadia Adam Sahal, police said.

Authorities said only those eight had been "reliably placed in the area of the bridge collapse" on Interstate 35W, but said the list should not be considered definitive. "A larger list of those reported missing, but not yet definitively connected to the bridge remains with investigators," the statement said.

"As we move through the recovery operation and investigation, we want to remain focused on the unique stories of the people involved," police said. Chit, 21, was in the car with his mother, Peck; Hausmann was driving to pick up a friend; Jolstad was working on the bridge construction project; and Sacorafas was on her way to dance class, but had left a voice mail message saying she was delayed by traffic and running late.

Meanwhile, the head of the National Transportation Safety Board said Saturday that federal investigators finished inspecting the south side of the collapsed bridge, helping to clear the way for the state of Minnesota to begin moving damaged cars and debris to secure areas.

In addition, said Mark Rosenker, NTSB chairman, a camera aboard an FBI helicopter produced a high-definition, three-dimensional image Saturday of the center portion of the bridge and other areas impossible to reach on the ground.

Rosenker said nothing significant was discovered on the south side of the bridge, and attention was now shifting to the north, which buckled vertically. The FBI images will be a great aid, he said.
Investigators say the south side probably didn't contribute to the collapse, he added. The bridge's southern end shifted and fell on the ground.

The vehicles, some of which remain on the bridge deck, will be examined for clues to how people may have died or been injured, Rosenker said.
"That will be an important part of the final report" on the cause of the disaster, he said. In addition, state workers can begin removing the deck of the bridge.

"As they begin to take the deck away, the superstructure will remain in the water. And then they will begin bringing up the superstructure. We have to do that in a way that preserves anything that gives us a good

indication of what happened in the center portion of the bridge span," Rosenker said. The superstructure will be examined under water, he said.

Rosenker said that he planned to return to Washington on Sunday but that his investigators will remain, partly to supervise the removal of debris. Evidence will be shipped back to the **NTSB** lab in Washington for analysis, he said.

Teams will move debris of interest to a staging area a few hundred yards from the bridge, where it can be studied further, the director said.

"Overall, we continue to make progress ... but small measures of progress," Rosenker said. He said it will be a few days before the superstructure is removed.

Earlier Saturday, a spokesman for the Minnesota Department of Transportation predicted a contract for rebuilding the span would be signed by mid-September. The new structure could open late next year, said Bob McFarlin.

Construction will start as soon as possible after the contract is awarded, he told reporters, but the timetable will depend on how quickly debris can be removed.

The Senate passed a bill Friday night that would authorize up to $250 million for rebuilding, and the measure was in the House on Saturday. If approved, it will go to President Bush for his signature.

McFarlin said Congress would appropriate the money in September or October. Five people were killed in the disaster, and at least eight are missing -- thought to be trapped in submerged cars or under debris.

Divers continued their grim search at the site Saturday but were being brought up from time to time so debris could be cleared, said Sgt. Tracey Martin of the Hennepin County Sheriff's Office. Diving operations were to continue until nightfall, she said.

President Bush surveyed the huge chunks of concrete and twisted metal Saturday and pledged the federal government would "eliminate roadblocks" and "cut through paperwork" to rebuild the bridge as quickly as possible.

"I bring prayers from the American people to those who have suffered loss of life as a result of the collapse of the 35W bridge in the Twin Cities. I bring prayers to those who wonder whether they'll ever see a loved one again," Bush said.

"I have met with the chief of police and the sheriff and rescue workers -- people who represent men and women working as hard as they possibly can to save life and to find life -- to go under these murky waters to find the facts. And it's going to take a while.

"I have been impressed not only by their determination but by their compassion," the president added.

Feds to probe agency overseeing bridge inspection program

- Story Highlights
- Department of Transportation: Minneapolis bridge collapse raises questions
- Inquiry to examine whether states are efficiently repairing deficient bridges
- Also under review: Federal funding provided to states
- Repairing all spans rated structurally deficient would cost more than $188 billion

WASHINGTON (AP) -- The collapse of an Interstate highway bridge in Minneapolis, Minnesota, is prompting an investigation of the agency responsible for inspecting highway bridges, federal transportation officials announced Friday.

The inspector general for the Department of Transportation said the inquiry would focus on the Federal Highway Administration's inspection program.

It would also look at ways to improve the agency's oversight of more than 70,000 bridges that have been found structurally deficient.

"The Interstate 35W bridge collapse raises questions" about the highway administration oversight of bridge inspections, said Calvin L. Scovel III, the transportation department's inspector general.

Scovel said his inquiry will examine whether highway administration officials followed recommendations in 2006 to improve oversight of structurally deficient bridges and to work more closely with state transportation officials to "address the most serious deficiencies found during bridge inspections."

Also under review, Scovel said, is the federal funding provided to states and whether they are making efficient repairs to deficient bridges.

The Minneapolis bridge was found structurally deficient in 1990.

Transportation Secretary Mary Peters, asked Friday whether she could be sure none of the other structurally deficient bridges are unsound, said there are no indications, but substantive changes in bridge inspections are needed.

Peters said changes could come, however, depending on the results of inspections ordered Thursday of 756 steel-deck truss bridges similar to the Minneapolis bridge and on findings from the investigation into the collapse.

"Obviously something happened here that none of us expected," Peters said.

Repairing all spans rated structurally deficient would take at least a generation and cost more than $188 billion -- at least $9.4 billion a year over 20 years.

Those bridges carry an average of more than 300 million vehicles a day.

At least 73,533 of roughly 607,363 bridges in the nation, or about 12 percent, were classified as "structurally deficient," including some built as recently as the early 1990s, according to 2006 statistics from the Federal Highway Administration.

A bridge is typically judged structurally deficient if heavy trucks are banned or there are other weight restrictions, if it needs immediate work to stay open or if it is closed. In any case, such a bridge is considered in need of substantial maintenance, rehabilitation or even replacement.

The Federal Highway Administration has said addressing the backlog of needed bridge repairs would take at least $55 billion. That was five years ago, with expectations of more deficiencies to come.

It is money that Congress, the federal government and the states have so far been unable or unwilling to spend.

The federal government provides 80 percent of the money for construction, repair and maintenance of the so-called federal-aid highway system including Interstate highways and bridges. But states set priorities and handle construction and maintenance contracts.

The federal government is now providing about $40 billion a year to improve and expand the nation's highways and bridges.

An analysis of 2006 Federal Highway Administration data found that Minnesota bridges were generally in better shape than those in other states. Only about 6 percent of the state's 20,000 bridges were listed as being structurally deficient. In Oklahoma, nearly 27 percent of bridges were cited by the federal government as being structurally deficient, the highest percentage among the states.

Bridge collapse probe focuses on unexplained shift

- Story Highlights
- **NEW**: NTSB says one section of bridge shifted 50 feet as it fell
- The rest of the bridge appears to have fallen in place
- Investigators to examine video that may show another view of the collapse

MINNEAPOLIS, Minnesota (CNN) -- Investigators trying to figure out what caused Wednesday's massive bridge collapse are focusing on the southern end of the span, which "behaved differently" as it fell, the National Transportation Safety Board said Friday.

The NTSB, which is investigating the disaster that killed at least five people and injured dozens, is also hoping another video provided by the Army Corps of Engineers will provide new images of the collapse.

What's getting investigators' attention is the way the southern part of the bridge fell in a video they've already examined -- recorded by a security camera near the bridge's north end -- and the way the section settled after the collapse.

"It appears that it has shifted approximately 50 feet to the east and when we compare that to what we've seen in the rest of the bridge -- the rest of the bridge appears to have collapsed in place, " said NTSB Chairman Mark Rosenker, who is leading a 19-member team charged with determining the cause of the accident.

"We're going to take a look at any unique design factors that could have created that shift...for whatever reason." It's not the answer to the mystery of why the bridge fell, but a step forward, Rosenker said.

The NTSB will also examine three more videos provided by the Army Corps of Engineers, one of which may show another view of the bridge falling, Rosenker said. Investigators aren't optimistic the other two will show anything because they weren't pointed at the bridge.

On Thursday, U.S. Transportation Secretary Mary Peters notified state transportation departments to immediately inspect all bridges of the same design as the one that collapsed Wednesday on Interstate 35W into the Mississippi River in Minneapolis.

Brian Turmail, spokesman for the Transportation Department, said there are about 750 bridges across the country that have similar steel deck truss designs.

Turmail said the measure is being taken "out of extreme caution."
Two reports published since 2001 have pointed to structural problems with the Interstate 35W bridge, but both reports determined the bridge was safe despite deficiencies.

"The bridge's deck truss system has not experienced fatigue cracking, but it has many poor fatigue details on the main truss and the floor truss system," said a report conducted for the Minnesota Department of Transportation in 2001.

The 40-year-old bridge is of a type known as deck steel truss. It has three parts: a deck, superstructure and substructure. The deck is made of concrete and rebar, the superstructure is made of steel and the substructure is made of steel and concrete footing, according to Rosenker.

The executive summary of the 2001 Minnesota Department of Transportation report -- undertaken by the University of Minnesota's Department of Civil Engineering -- points to fatigue problems with the bridge's approach span, the segments that connect the main span of the bridge to land.

However, the report said, "Fatigue cracking is not expected during the remaining useful life of the bridge." In 2005, the U.S. Department of Transportation's National Bridge Inventory database concluded the bridge was "structurally deficient."

Minnesota Department of Transportation bridge engineer Dan Dorgan said the term "structurally deficient" is a Federal Highway Administration rating.

Inspectors rate sections of the bridge on a 1 to 9 scale, with 9 being in excellent condition, he said.
"A structurally deficient condition is a bridge that would have a rating of 4 either in the deck, the superstructure or the substructure," he said. "Any one of those in condition 4 or less is considered structurally deficient."

But, he noted, out of 13,000 state and local bridges in Minnesota that are 20 feet and more in span, 1,160 of them -- 8 percent of the state's bridges -- are considered structurally deficient.

Tom Everett of the Federal Highway Administration's National Bridge Inspection Program said the structurally deficient rating was a "programatic classification rather than an indication of safety."

"It does not indicate a bridge is dangerous or that that bridge must be replaced," he said.
The Minnesota bridge was deemed structurally deficient in 1990, Dorgan said, "due to corrosion of the bearings, so they were not able to move as freely as designed."

Later, inspectors found corrosion of steel around joints in the bridge and fatigue cracks in the approach spans. Those problems were repaired in the 1990s.

"Recent inspections in 2005 and 2006 found no evidence of cracking or growth in the existing cracks in the tab well that have been there since the day the bridge was built," he said.

Dorgan also cited an in-depth study of the bridge's fatigue potential conducted from 2004 to 2007 that recommended two alternatives for the bridge's future -- to add steel plates to reinforce critical parts of the bridge or to conduct thorough inspections of the wells inside the box to determine whether there were cracks.

"We chose the inspection route, and began in May," he said, adding that officials intended to replace the bridge about 2020.

"We had the bridge partially inspected and were going to complete that this fall after construction was done." During a Wednesday news conference, Minnesota Gov. Tim Pawlenty described the bridge deficiencies as "minor" and said the state was told that the bridge's deck might need to be rehabilitated or replaced in 2020 or later.

"It was last inspected both in 2005 and 2006. There were no structural deficiencies identified according to [the Minnesota Department of Transportation]," Pawlenty said.
Most bridges are inspected every two years and receive ratings based on the conditions of various components, according to the U.S. Department of Transportation.

In addition to "structurally deficient," another bridge classification is "functionally obsolete," according to the Federal Highway Administration.
A bridge is tagged structurally deficient when significant bridge elements have deteriorated and the bridge's load-carrying capacity is reduced, according to the highway administration.

A bridge is dubbed functionally obsolete when the bridge does not meet current design standards.
Neither label indicates a bridge is unsafe for travel, the highway administration said.

As of 2003, there were about 160,570 bridges deemed structurally deficient or functionally obsolete, according to the American Society of Civil Engineers. The number represented 27.1 percent of the nation's bridges.

The American Society of Civil Engineers also reported that the number of bridge deficiencies had steadily declined from 34.6 percent in 1992 to 27.1 percent in 2003.

New Technology To Aid Bridge Investigation

Officials Will Reconstruct I35-W Bridge With Lasers, Computers And Cameras

MINNEAPOLIS, Aug. 5, 2007

A helicopter with a camera similar to those used in Hollywood movies will soon peer into the wreckage of last week's Minneapolis bridge collapse.

Laser-guided surveying equipment has helped produce an in-depth map of the debris. Software re-creating the disaster on a computer screen may even be able to pinpoint the exact piece of bridge that gave way.

Investigators trying to determine the cause of the disaster are armed with a powerful technological arsenal that will enable them to get answers much quicker than in previous eras, when crews had to literally put the pieces of fallen bridge back together.

"Computers and modeling techniques are just light years from what was available 40 years ago," said Ted Galambos, a professor emeritus of structural engineering at the University of Minnesota and an expert in the stability of structural steel. "Now we can have an idea and we can test that on a computer in a few hours."

Investigators caution, however, that it could take up to 18 months to complete their exhaustive probe into why Minnesota's busiest bridge collapsed and fell into the Mississippi River on Wednesday, killing at least five people and injuring dozens.

메모 포함[l36]: time required for investigation: 18months

Eight people remained missing Sunday, and divers are spending long days in the debris-filled water searching for bodies. But investigators already have begun zeroing in on clues.

On Friday, they were focusing on the south section of the bridge, where they quickly found that the span shifted 81 feet during the collapse.

On Saturday, the north side became the focus. That's where they plan to use a helicopter equipped with a high-resolution camera that can examine the debris in precise detail for any troublesome signs. The camera is kept steady by a gyroscope — which is how Hollywood crews get smooth footage while filming from a vibrating helicopter.

Investigators also plan to watch frame-by-frame enhancements of video of the collapsing bridge. In addition, the FBI used laser-guided surveying equipment to complete a detailed 3-D map of the wreckage, and quickly provided the data to the lead investigation agency, the National Transportation Safety Board.

Nineteen NTSB investigators from around the country are in Minneapolis, working out of trailers, hotels and command posts. They will be working with investigators in Washington who will be putting in long hours in front of computers.

That will include re-creating various bridge collapse scenarios with high-tech software in what is called a "finite element analysis." In this analysis, investigators can simulate removing a key support structure from the bridge and see how the bridge reacts.

"If they remove a piece and it falls down the way they saw it, that's a pretty good indication they found the right piece and there's all sorts of ways of doing that," said W. Gene Corley, senior vice president of CTL Group, an engineering firm.

Corley, who has helped investigate bridge collapses, as well as disasters such as the attacks on the World Trade Center and the Oklahoma City federal building, predicted that the NTSB should have a pretty good idea within a few weeks of the cause.

During his weekend news conferences, NTSB Chairman Mark Rosenker repeatedly stressed the value of the computer modeling program. He said a range of data goes into the analysis, including weather, the number of cars, the speed of the vehicles, and the weight of construction equipment that had been on the bridge when it collapsed.

"This is a very accurate and a very complex model. This isn't something that most of us at least deal with on our computers," Rosenker said Sunday.

So far, investigators haven't been able to pinpoint a cause, but they've also managed to rule out a variety of scenarios.

"Every day we make progress in understanding at least where the failures are not. Where they are is where we're going to have to work a lot harder," Rosenker said.

The early clues and advances in technology could make for a far speedier investigation than after past bridge collapses.

The investigation into the 1967 collapse of a bridge linking Gallipolis, Ohio, and Point Pleasant, W. Va., took more than four years. It found that the cause "was a crack no bigger than a fingernail," said Galambos, the engineering professor.

"It was a very long and involved process. It reads like a detective story," he said.

After a portion of a bridge on I-95 in Greenwich, Conn., collapsed in 1983, investigators hauled much of the debris to a nearby state maintenance yard, recreating the scene and trying to decipher the clues, said Jim Loersch, retired as the state's manager of bridge safety and evaluation.

Investigators cut out samples of suspect steel, placing them under electron microscopes to study the grain, he said.

"If you have absolutely no idea (what happened), you'll just have to pull out every piece and reassemble the bridge just like you would in an aircraft disaster," Galambos said.

In the end, NTSB investigators determined that the Connecticut collapse was caused by loosening in the pins and hangers holding the slab of bridge in place. That was due to inadequate inspection and maintenance by the state Department of Transportation, federal investigators said. The state came up with its own findings, and the whole process took several years.

The NTSB says the Minneapolis bridge will not have to be fully reassembled, largely because of all the technology they have.

Investigators can instead focus on the part of the bridge that failed and not the entire 1,900-foot span. They also will inspect the destroyed cars to better understand how people died — or escaped.

Diagnosing a deficient bridge

The unexplained failure in Minneapolis has some inspectors jumpy, too quick to see potential catastrophe at every weld.

By Stephanie Simon, Times Staff Writer
5:33 PM PDT, August 5, 2007

PUEBLO, Colo. -- There are holes in the steel girders supporting state bridge K-18-R.

Not big holes. The size of a deck of cards, maybe. But the corrosion so alarmed state inspectors on a routine visit last week that they asked their supervisor to take a look.
Which is why he's now perched 40 feet above the Arkansas River, bracing his back against the concrete deck of the bridge and his feet against the rust-scarred steel trusses that keep the structure up. Jeff Anderson is tapping the girders with a geologist's pick, listening to each ping and clank for clues about how K-18-R is bearing up. He's waiting for the bridge to talk to him.

"Watch out below!"

A very sizeable chunk of corroded steel gives way under Anderson's probing and tumbles down, shattering on the bike path that runs along the river.

Built in 1924 in this modest farm town in south-central Colorado, the bridge is one of about 75,000 nationwide deemed "structurally deficient." Its sufficiency rating stands at 47 on a scale of 100 — lower, by a few points, than the interstate bridge that collapsed into the Mississippi River last week in Minneapolis. Anderson's inspection could bump Pueblo's bridge down into the low 20s on that scale.

A heavy truck passes overhead, and K-18-R wheezes like an asthmatic patient: Eeeeh-huh. Eeeeh-huh. The girders tremble under the stress. Just like they're supposed to, Anderson says.

An engineer trained at the University of Colorado at Boulder, he designed bridges for 15 years before joining the state inspection team seven years ago. On this afternoon, he's sweating, filthy and just a bit freaked out by all the spiders — "I hate spiders," he says, more often than he realizes — but Anderson is in his element.

The air down here smells of must from the mud-drab river below. Birds flit past, whirling in shafts of sunlight. Dirty white crystals hang like icicles from the underbelly of the bridge deck; they're almost pretty, until Anderson explains that they're formed from mortar leaching out of the concrete, weakening the roadway.

A mid-weight vehicle rumbles overhead, and K-18-R squeaks insistently, a rusty-tricycle-wheel sound. Then there's a steady, calming whir as a succession of lighter cars whiz by.

Governors in state after state have ordered emergency inspections of thousands of bridges in the wake of the Minnesota collapse. Some teams will use high-tech equipment: ultrasound to check for cracked bolts or a special dye that can point out stress fractures. Computer modeling helps determine how much weight the bridge can bear. Magnetic particle testing evaluates the strength of welding.

Anderson, 51, prefers to use nothing more sophisticated than binoculars. He brings wading boots and climbing gear to each job (though he shimmied up this bridge with just his bare hands and his Nikes). He likes to get up close to his patients, crawl on and in and under the bridge; he makes his diagnosis by sight and sound.

Or as he puts it: "There's a lot of intuition."

Just now, he's studying the report his inspectors filed the day before. They haven't had time to type it up, so it's just a dust-streaked page scribbled over in red ink. "Section loss W Web. R3 corrosion at abutment plate bearing. R3 R4 Stringer H." Anderson checks each spot. There's corrosion all right, but it's all on the periphery of the steel truss; none of it has even begun to affect the main load-bearing girders.

He can't understand why his inspection team flagged this bridge as critical. An overreaction to the Minneapolis tragedy, he thinks. The unexplained failure there has made some inspectors jumpy, too quick to see potential catastrophe at every weld.

Not that Anderson doesn't recognize the potential for catastrophe.

Colorado's more than 8,000 bridges get visual inspections every two years. Every five years, teams use ultrasound to examine key bolts and pins for cracking and divers inspect underwater pilings.

That regimen is up to federal code. But Anderson knows how much could happen between inspections. A truck could slam into a key support pillar. Joints could freeze up, stiffening girders that are supposed to sway as they absorb stress.

Once, on a late Friday night, he was called out to a bridge — a major artery through Denver — because a construction crew working nearby reported an odd slapping noise. It turned out that a connector piece had snapped and one of the two main girders supporting the bridge had broken free. The bridge was closed immediately.

So when he's asked whether the Minneapolis collapse makes him more anxious, Anderson smiles wryly.

Navy And FBI Join Bridge Collapse Search

More Divers Search The Mississippi River To Locate Bodies Buried Under Wreckage

MINNEAPOLIS, Aug. 7, 2007

A helicopter with a camera mounted in its nose made slow sweeps above the wreckage of last week's bridge collapse in Minneapolis to take detailed pictures of the debris, Aug. 6, 2007. **(AP Photo/M. Spencer Green)**

(CBS/AP) An elite team of Navy divers joined the search Tuesday for victims of the collapse of a Minnesota bridge that killed at least five people, bringing greater experience and more sophisticated technology to the search for bodies in the murky Mississippi River.

The team of 15 divers and a five-member command crew arrived hours before dawn Tuesday, and several divers immediately entered the water even though local officials encouraged them to wait until daybreak.

"Two in the morning, they dove into the water," Minneapolis Police Capt. Mike Martin said, calling them "the best divers in the world."

Martin says it's so dangerous, at this point Navy divers are the only ones skilled enough to handle the search, reports **CBS News correspondent Bianca Solarzano**.

"The divers are facing extremely swift currents, experiencing very dark and deep places where lights aren't going to be able to help them see what they're doing," EMT Adam Wojciekhowski told **Solarzano**.

Navy Senior Chief David Nagle said the divers wanted to get a feel for the area, and were in the water for about two hours. Divers were back in the river by late morning, removing concrete rebar and other debris. Local crews have complained they have been hampered by dangerously unstable wreckage and a rapid current.

One of the cars that did tumble into the river was pulled out. No bodies were inside, but it's another step closer to getting searchers to the missing, reports **Solarzano**.

Hennepin County Sheriff's Capt. Bill Chandler said the vehicle was removed to make room for the Navy dive operation.

The team's arrival raised hopes of speeding up the recovery operation. At least eight people are missing and presumed dead in last week's collapse, with perhaps more still in the river. Five people are confirmed dead.

Joining the Navy team was an FBI dive crew, doing forensic work for the investigation. Their tools included a small unmanned submarine equipped with a robotic arm. "It's basically crime-lab-underwater kind of work," Martin said.

The Navy divers will be tethered to above-ground oxygen tanks, so they can stay in the water much longer than local divers, who had been using scuba tanks. Heavy-duty equipment will allow divers to cut through steel

wreckage. The Navy also has sophisticated sonar to scan for bodies.

Navy divers assisted in the reclamation of historic sunken ships including the ironclad Civil War ship the Monitor. After the 1996 crash of TWA Flight 800 off Long Island near New York City, they made more than 700 dives to recover bodies and reclaim wreckage to help the government investigation. Navy divers recovered both the flight data recorder and the cockpit voice recorder.

Also Tuesday, four people still hospitalized with injuries from the collapse improved to serious condition, leaving only one person in critical condition. About 100 people were hurt in the disaster.

Separately, teams of designers and builders are racing to meet a dawn Wednesday deadline to show they are qualified to bid on a fast-track bridge replacement project.

State transportation officials hope to award contracts next month, with the goal of having a new bridge standing at the end of 2008.

Erecting such a bridge would ordinarily take about three years, even if the design and building phases were overlapped to save time, said Bill Cox, owner of Corman Construction Inc. in Annapolis Junction, Md., a road and bridge construction firm.

Teams of designers and builders are racing to meet a dawn Wednesday deadline for showing they are qualified to bid on the bridge replacement project, which the state has put on a fast track.

Minnesota Gov. Tim Pawlenty is reconsidering a proposed increase in the states gas tax to fund roads, something he's vetoed twice, reports **Solarzano**

State transportation officials hope to award contracts next month, with the goal of having a new bridge standing at the end of 2008.

A severe winter in a state known for its cold weather could throw off the reconstruction schedule. But other conditions are favorable — including a construction industry with plenty of available resources to take on such a daunting challenge.

"It is doable. It is a bit fast, but this is an emergency," said Khaled Mahmoud with the Bridge Engineering Association in New York. "And if we are ever good at anything, it's responding to emergencies."

The goal of awarding contracts in mid-September is highly ambitious given the array of questions to be answered, including whether to mimic the former bridge's alignment, how much traffic to accommodate, how much to spend and what it will look like.

The state intends to write financial incentives into the contract to make the compressed schedule more likely to be met.

The bridge's design will largely determine the cost, and although the federal government has pledged $250 million, Mahmoud said $300 million to $350 million "sounds about right."

One study estimates that more than 80 percent of the nation's roads and bridges are not capable of meeting the country's needs over the next decade. Rather than spending on needed repairs, much of the money spent goes to politically popular new projects, reports **Solarzano**.

메모 포함[l37]: politically popular new projects

Just last month, North Carolina opened this $102 million stretch of roadway, yet one in three bridges in the state is listed as substandard.

The city asked residents to observe a moment of silence Tuesday evening at the minute the bridge fell, and bells at churches and City Hall were to toll immediately after.

Should Bridges Come With Warning Labels?

Weight Limit Signs Indicate a Bridge Is in Trouble, But They Are Widely Ignored
By RUSSELL GOLDMAN
Aug. 4, 2007

As questions about how the I-35W bridge collapsed Wednesday in Minneapolis remain unanswered, people across the U.S. are wondering how to tell if the bridges they travel everyday are safe.

States and municipalities have a responsibility to inform motorists about a span's potential problems, Nick Coleman wrote in a column in the Minneapolis-St. Paul Star Tribune. Noting that the collapsed bridge was classified "structurally deficient" and received a 50 percent rating on a state report, Coleman asked: "Would you drive your kids or let your spouse drive over a bridge that had a sign saying, "CAUTION: Fifty-Percent Bridge Ahead"?

Warnings are everywhere these days, from hot cups of coffee to neighborhood sex-offender alerts. Why not bridges? Authorities contacted by ABC News.com dismissed such an idea as ineffective. "I think the idea of signs is absurd," said John Hooks, director of the Bridge Management Information Systems Laboratory at the U.S. Department of Transportation's Turner-Fairbank Highway Research Center.

"The average driver wouldn't understand anything that was meaningful, that would really indicate if the bridge was safe. Even saying 'structurally deficient' wouldn't help much. Structurally deficient very infrequently means the bridge is in danger of any collapse. It is an administrative tool to determine if federal funds should be used for repairs.

It indicates a level of condition, but doesn't directly reflect the risk of collapse," he said.
Furthermore, he said, there already are signs that indicate whether a bridge is in poor condition.

"Bridges that can't handle the legal load limit have signs. Load limits mean a bridge has a condition problem or was designed a long time ago, before the legal load limit was increased. Load limits are easily understood by laymen and engineers," he said.

Enforcement of the current load limit signs, and not new signs are the answer to keeping bridges safe, said Robert Sinclair, a spokesman for the American Automobile Association.
"It makes sense to indicate weight limit, but the problem comes with enforcement. Unless you have a guy with scales at the bridge, overweight trucks create wear and tear and do the most serious damage," Sinclair said.

Tear This Bridge Down

Bridges that are unsafe don't need signs warning drivers -- they need to be torn down, said Jeffrey Denner, who sued the Massachusetts Turnpike Authority on behalf of the family of a woman killed when roof tiles fell in a tunnel in Boston.
"If something is unsafe, it shouldn't be used," Denner told ABC News.com.

"This is the greatest and wealthiest country on earth. We shouldn't need to classify bridges into those

that are in 'A'shape or 'D' shape. … We should be able to safely travel through every bridge and tunnel without having to decipher the meaning of signs," he said.

"It shouldn't be up to motorists to assume risk, people are not experts. It would be like going to the doctor and in the middle of surgery he asked if I wanted him to remove my liver, I'm not trained enough to know."

For now, information on the safety of bridges nationwide is difficult to come by. Some state transportation departments will release reports on request for specific bridges, but most information remains off limits to the public.

Federal reports listing the country's least safe bridges that have been reported on frequently since the Minnesota collapse needed to be purchased.

Bridge Inspectors Battle Small Cracks, Big Bureaucracy

Bridge Inspectors Say Federal Standards Are Minimal, May Lead to Lax Reports

Bridge inspector Jody Ferris, with the bridge department of the Maryland Highway Administration, examines the I-70 bridge that crosses over state road 97, in Cooksville, Md., Friday, Aug. 3, 2007. This was a regularly scheduled inspection that occurs every two years. (Jacquelyn Martin/ AP Photo)

In his 41 years inspecting bridges, Ken Whelton has seen just about everything, but even he was unprepared for footage of the Minnesota bridge collapsing without warning into the Mississippi River.

"That totally shocked me that the bridge would fall straight down," Whelton said. "That is very, very unusual and difficult for me to comprehend."

Everyone now wants to know who was inspecting that bridge, and how the inspectors might have missed a crucial flaw in its structure -- or worse, identified the flaw but let it go unfixed.

The answer to this question is not so simple in the byzantine world of bridge inspection. Inspections are conducted by a mix of state and local government agencies, many of which subcontract the jobs out to private bridge inspection agencies.

메모 포함[l38]: inspection system in USA

Often armed with high-tech equipment but sometimes using nothing more than their eyes and a camera, inspectors are the front line of bridge safety. They dive under water, stand underneath and sometimes scale the sides of bridges to inspect beams of steel, sometimes hidden by layers of paint or rust, and roadbeds of concrete.

Some of the things inspectors dread the most characterized the collapsed Minnesota bridge, including nonredundant design, cold climates and heavy traffic loads, Whelton said.

But in conversations with state transportation officials, it became clear that much as they fight bridge deterioration, they also must contend with the tension of trying to go beyond the minimum federal inspection requirements, which some say are insufficient and lead to potentially vague and unhelpful inspection reports.

Sleuthing for Clues

Whelton and his team of inspectors examine not only at a bridge's overall structure but throughout the bridge's nooks and crannies, looking for water and ice leaking into corroding joints, and steel beams rusting away.

These small things -- weaknesses in small joints or the destruction caused by ice water running through cracks in the bridges -- are often key to the integrity of a bridge, and can have destructive consequences if they are not maintained, Whelton said.

Whelton, who is now semi-retired, most recently worked for the Non-Destructive Testing Group, a private contractor that worked for the Michigan Department of Transportation.

Indeed, state departments of transportation inspect only a fraction of bridges themselves. They often subcontract to inspectors like Whelan, or they do not control the bridges altogether: Local towns and cities often assume full inspection responsibilities.

Having worked in Michigan throughout his career, Whelton knows the harm that the freeze and thaw cycle can have on bridges in cold climates like Minnesota. Ice is used to clear those roads, particularly when they are used as much as I-35W was, eventually creating ice water runoff that causes steel to rust.

Then "the corrosion is accelerated by the warm temperatures" of the summertime, often requiring repair and repainting.

Whelton said nonredundant bridges like the one that collapsed in Minnesota don't often pose serious problems. Though they lack ancillary support systems, in his study of bridges he found that they are usually some of the strongest bridges because their structures cannot break.

But if there are weaknesses, they could spell disaster, he said, as may have been the case in Minnesota this week.

States and Standards

Inspectors' jobs require close attention to detail, and some states have responded by ramping up their regulations to ensure more expertise and a more-detailed rating measure for their inspectors.

The basic standards for bridge inspection, including the training required of inspectors and the grading system for bridges, are all set at the national level by the Federal Highway Administration, and were last updated in 2005.

Those inspecting bridges must be either professional engineers or have a certain number of years' experience working with bridges, using the federal code, which was last updated in 2005.

Three parts of bridges -- the substructure, superstructure and roadway -- are graded on a 10-point scale and then labeled if necessary as structurally deficient or functionally obsolete.

But some state departments of transportation are increasingly finding these minimum requirements insufficient, and are ramping up their regulations at the local level.

In Texas, the state with the most bridges in the country but also one of the strongest safety records, bridge managers must specifically be bridge engineers - any other type of engineering degree won't do, according to Randy Cox of Texas' Department of Transportation.

메모 포함[l39]: Texas only bridge eng. allowed

"There are many kinds of professional engineers, and we want to make sure that they have the proper engineering training," Cox said.

And in Oklahoma, the department of transportation has joined other states in following a more rigorous grading system for bridges that go beyond the three numerical grades required by the government with upward of 15 ratings, said Bob Rusch, the chief bridge engineer for the Oklahoma Department of Transportation.

Rusch said that the basic federal guidelines are too vague and may cause inspectors and bridge managers to overlook certain critical flaws in a bridge. A blanket grade of 5 on a bridge's superstructure, for example, might occlude a more serious flaw in its beams or welds.

While this decentralized system that has states and even cities and towns overseeing bridge inspection does have the benefit of allowing ambitious regions to impose stricter regulations, it can leave behind poorer or less-ambitious regions with only the minimum minimal standards.

Perhaps one of the most persistent problems caused by this highly decentralized system is inconsistency in the grading of bridges, Rusch said, particularly if it is done on a simple 10-point scale. Because they rest on the assessment of individuals with different levels of training and experience, maintaining the integrity of the ratings can be a challenge, he said.

"The inspections are a little too varied. They're subjective and different inspectors will rate the same bridges differently," said Rusch.

But Oklahoma has devised another solution to this problem, one that once again goes beyond the federal regulations. The state has begun to require refresher courses for inspectors to help maintain quality across the state's bridge ratings, with the aim of helping standardize grading procedures.

메모 포함[l40]: Problems of USA's inspection system: solution devised by Oklahoma state

Gephyrophobia: A Fear Of Crossing Bridges

Even Before The Minnesota Collapse, Many Have Severe Phobia About Bridges

SANDY POINT, Md., Aug. 10,2007

(CBS) Elise Ayers, who works for the State Department, isn't afraid of overseas adventure. What scares her is the "Monster."

The monster she fears is the **Chesapeake Bay Bridge** in Maryland. At four miles long and 185 feet high, Ayers says the thought of driving the bridge — with the way it rises straight in the air — raises a sense of panic in her.

"My temperature changes and then all of a sudden I think I'm getting over the bridge and I realize I'm not thinking clearly," she tells **CBS News correspondent Wyatt Andrews**.

That same sense of doom comes over a construction worker, who asked not to be identified.

"Oh yeah, [my] heart races, you can't grip the steering wheel tight enough. It's horrible," he said.

The Minneapolis bridge collapse last week might naturally make any driver approach a bridge with at least a second thought. But for drivers with a true bridge phobia, it's a lot more than a second thought: It's an overwhelming fear.

Jerilyn Ross, a therapist who treats drivers with bridge phobia, describes it as a loss of control — a fear of fear itself.

"It's not so much a fear of the bridge," she says. "It's a fear of being on the bridge, being halfway across the bridge and suddenly panicking and thinking 'I want to get off. What if I pass out? What if I die?'"

To get over the Bay Bridge, Ayers called a bridge-crossing service. Ken Medell arrives to drive her and her car across. Last year, 4,000 drivers asked for the service — 11 every day.

In other states, fearful drivers can be driven across the **Tappan Zee** in New York, the **Mackinaw Straits** in Michigan and the **Delaware Memorial Bridge**.

The service exists because bridge panic is a safety concern.

"You try to cross the bridge where something happens and you panic. Now you've got either the bridge backing up or someone running into you," Medell says.

At the end of the crossing, Ayers is safe and she's off for vacation. It may be a while before she's over the fear — but today she's over the monster.

Detecting Bridge Problems Goes High-Tech

Precision Technology Used In Europe Is Available In U.S., But The Money For It Often Isn't

MANNO, Switzerland, Aug. 9, 2007

CBS) Using hammers and binoculars, engineers listen for the sound of corroded steel, looking for evidence of cracking. This is the way America inspects its bridges.

If inspectors can't see a problem, they can't know something's wrong.

But in Europe, with some of the most spectacular new bridges and some of the most beautiful old ones, bridge owners are turning to new technology to check on the health of their bridges around the clock.

"Inspection is a very useful tool, but it's restricted to the surface of the bridge — and not all the deficiencies can be found," says Daniel Inaudi of Smartec. "You'd like to make the analogy to your doctor."

Only On The Web: More Than Meets The Eye

Like your doctor's tests, high-tech bridge sensing gets to the heart of the matter, reports **CBS News correspondent Sheila MacVicar**.

Fiber-optic sensors are embedded into the concrete, "and by measuring the time the light takes to travel through the fiber, we can measure the deformation of the bridge," Inaudi explained.

For older bridges, there's a special tape that's embedded with a fiber-optic filament. It will be glued to a 40-year-old bridge in Sweden.

"We can install a tape like this that can be several kilometers long and then pinpoint to one-meter precision where the problem is happening," says Inaudi.

The technology isn't restricted to Europe; it's also made in America.

"We're able to capture data that is less than one-tenth the width of a human hair," says Atlanta's Peter Vanderzee, who markets a similar kind of remote sensing for bridge managers in the U.S.

"Every time we go to them and present our technology, we generally hear a big 'Wow. That's a very interesting piece of technology. We'd like to use it, but we don't have the money," says Vanderzee.

Across America, transportation authorities say they are financially strapped. Some say they have a hard time even finding the money to buy paint.

메모 포함[W41]: no money to buy paint

Until they know exactly what caused the catastrophic collapse in Minneapolis, advocates of remote bridge sensing say they won't know for sure if the new technology would have given a warning. But they do say inspectors and engineers would have had a much better idea of what shape the bridge was in.

Possible Minneapolis Bridge Flaw Found

Discovery Prompts Warning About Strain On Bridges During Construction Projects

MINNEAPOLIS, Aug. 9, 2007

CBS/AP) The National Transportation Safety Board said it found issues with the collapsed Minnesota bridge's design, specifically its gusset plates — the steel plates that tie steel beams together — and said they would look into reports of wobbling.

The finding preceded a warning by the head of the U.S. transportation system, who cautioned that states consider the additional stress placed on bridges during construction projects.

"Given the questions being raised by the NTSB, it is vital that states remain mindful of the extra weight construction projects place on bridges," Transportation Secretary Mary Peters said Wednesday.

A construction crew was repairing the surface of the eight-lane Interstate 35W bridge over the Mississippi River when it collapsed on Aug. 1.

The NTSB said helicopter observations had found several "tensile fractures" in the superstructure on the north side of the bridge, but nothing that appeared to show where the collapse began. Investigators were verifying loads and stresses on the beams, as well as materials in the plates.

The specter of wobbling was raised by a worker who claimed to have noticed unusual swaying of the bridge in the days before its collapse. The company that was doing the work, Progressive Contractors Inc., rejected that report Wednesday. The company had said it didn't believe any of its work contributed to the bridge failure but hadn't responded directly to claims of wobbling.

"We have now met with every single worker who was on the bridge when it collapsed," Tom Sloan, vice president of the company's bridge division, said in a statement. "None of them observed or reported any unusual swaying."

메모 포함[W42]: dispute about the cause

Officials of the Minnesota Department of Transportation wouldn't comment to the Associated Press on the significance of the gussets in the bridge's collapse.

Gary Peterson, Minnesota's assistant bridge engineer, told The New York Times "I don't know what this could be," Mr. Peterson said. "I'm frankly surprised at this point. I can't even begin to speculate."

Meanwhile, Navy divers continued probing the wreckage of the collapsed bridge for bodies, and officials said they expected removal of heavy debris to begin later than expected to give the divers more time.

Five people are confirmed dead in the collapse, with at least eight others missing and presumed dead. At least eight people were still hospitalized Wednesday, one in critical condition.

Divers were carrying out "a very meticulous, hand-over-hand search of the scene," said their spokesman, Senior Chief Dave Nagle.

Navy and FBI dive teams are trying to go deeper into the debris of the bridge than the local dive teams that have been working since the collapse, police Capt. Mike Martin said. He expects it to be at least a week before cranes start regularly hauling out large pieces of debris.

Martin told reporters the recovery operation was a "very dangerous, very tenuous situation down there. The current is constantly changing," reported **CBS News reporter Jim Krasula**.

The FBI team had to abandon using the larger of its two unmanned submarines. The remote-controlled vehicle — equipped with a camera, sonar, lights and a grabbing arm — was too big to maneuver amid the unstable, twisted bridge wreckage and vehicles in the cloudy water, agent Paul McCabe said Wednesday.

Instead, FBI divers will try their smaller sub, a shoe-box-size vehicle equipped only with lights and a camera. It is more difficult for the sub to navigate the Mississippi River's stiff river currents because of the sub's smaller thrusters. The water where the divers are working ranges from 2 to 14 feet deep.

Debris removal had been expected to begin this week. The State Patrol said 88 vehicles have been located at the collapse site, including those in the Mississippi River.

Flags flew at half-staff at the Minnesota Capitol on Wednesday in **honor of the victims**, a week after the bridge collapse.

Thousands of people continued to flock to the site Wednesday. Police report a handful of arrests of people who have crossed security cordons around the bridge. But officials said most people are keeping a respectful distance.

Flying flags at half-staff at the Capitol in St. Paul followed observances Tuesday in which church bells tolled in downtown Minneapolis as residents observed a moment of silence for victims of the Interstate 35W bridge collapse.

DOT 79-07
Wednesday, August 8, 2007
Contact: Sarah Echols
Phone: (202) 366-4570

U.S. Secretary of Transportation Mary E. Peters Cautions States to Carefully Consider Extra Weight Caused by Construction Projects on Bridges

WASHINGTON, D.C. - U.S. Secretary of Transportation Mary E. Peters today cautioned states to carefully consider the additional weight placed on bridges during construction or repair projects. Though it has not yet indicated any definitive cause of the Minneapolis I-35W collapse, the National Transportation Safety Board (NTSB) has indicated that the stress on the gusset plates may have been a factor, and that one possible stress may be the weight of construction equipment and materials on the bridge.

"Given the questions being raised by the NTSB, it is vital that states remain mindful of the extra weight construction projects place on bridges," Secretary Peters said.

The Secretary has pledged to quickly share with states any information learned from the NTSB investigation. Secretary Peters added that she has directed the Federal Highway Administration to continue to work closely with the NTSB investigators to identify any broader design issues that need to be addressed relating to gusset plates on the I-35W bridge.

The Secretary directed the Federal Highway Administration to issue guidance to all state transportation agencies and bridge owners strongly advising they ensure that the weight of construction equipment and stockpiled raw materials in place for current or future construction work not exceed the load limit for the bridge.

메모 포함[W43]: possbility that construction load may exceed the load limit

DOT 75-07
Contact: Brian Turmail, Phone: (202) 366-4570
Thursday, August 2, 2007

Secretary Peters Asks Inspector General to Review the National Bridge Inspection Program

In response to the tragic bridge collapse in Minneapolis, Minnesota last night, U.S. Transportation Secretary Mary E. Peters has requested the Department of Transportation's Inspector General to conduct a rigorous assessment of the National Bridge Inspection Program.

"What happened in Minnesota is simply unacceptable. We must have a top-to-bottom review of the bridge inspection program to make sure that everything is being done to keep this kind of tragedy from occurring again," Secretary Peters said.

The Secretary called for the Inspector General to determine if the current federal program delivers the highest level of bridge safety. And, if needed, the Inspector General will make recommendations for future changes to the program.

U.S. Department of Transportation
Federal Highway Administration

MEMORANDUM

Subject:	Technical Advisory 5140.28 - Construction Loads on Bridges	Date:	August 8, 2007
From:	Frederick G. Wright (Bud) Executive Director (HOA-3)		
To:	Division Administrators Directors of Field Services Federal Land Highway Division Engineers		

PURPOSE

In the ongoing investigation of the collapse of the I-35W Bridge in Minneapolis, the National Transportation Safety Board has identified construction equipment and materials loading on the bridge as part of their review. While no conclusions have been reached, in an abundance of caution, we strongly advise the State Transportation Agencies and other bridge owners who are engaged in or contemplating any construction operation on their bridges to ensure that any construction loading and stockpiled raw materials placed on a structure do not overload its members.

For more discussion on this issue, please refer to the AASHTO Standard Specifications for Highway Bridges, 17th Edition, Division II, Section 8.15 or the AASHTO Load Resistance and Factor Design Bridge Design Specifications, 4th Edition, Section 3.

Please refer any questions to Benjamin Tang at 202-366-4592 or benjamin.tang@dot.gov.

PDF Version (32 kb)

Source: Miners concerned about safety where collapse occurred

HUNTINGTON, Utah (CNN) -- Some of the miners at Utah's Crandall Canyon mine -- including one of the men trapped by Monday's cave-in -- apparently were concerned about working in the area of the collapse, a source told CNN.

A truck delivers fencing Friday to be used in the effort to find six men trapped in a Utah coal mine.

1 of 2

more photos »

The source, who requested anonymity, said the six trapped miners were working in an area called 7 Belt -- the deepest part of the mine.

A large hole being drilled in an effort to reach the men had bored through 1,644 feet of earth as of Friday night, officials said. A total depth of 1,886 feet is anticipated, said Richard Stickler, assistant secretary of the Department of Labor for mine safety and health.

In recent weeks, the floors in that part of the mine had been "heaving," or buckling up, from intense pressure, said the source, who has intimate knowledge of the conditions in the mine.

Supervisors at the mine knew of the problem, he said.

Several miners -- reportedly including Manuel Sanchez, who is among the trapped men -- were becoming apprehensive, the source said.

A member of Sanchez's family told a Utah newspaper that he had expressed concern about safety in one part of the mine.

The mine's operator said he was not aware of the safety concerns.

Don't Miss

- **Three dead in accident at Indiana mine**
- I-Report: **Send your mine collapse information**
- **Tuchman: Trip into collapsed mine nerve-racking**
- **In depth: Miners trapped**

"I've never heard that," Bob Murray, president and CEO of Murray Energy, told CNN's Ted Rowlands when asked why someone would have been worried about that section of the mine. "I have no idea. It's probably a rumor, and I'm not going to respond to rumors."

Sanchez has been trapped since early Monday, along with five other miners. The mining company has not released the miners' names, but family and friends have confirmed to CNN the identities of Sanchez, Kerry Allred, Carlos Payan, Brandon Phillips, Alonso Hernandez and Don Erikson. **Watch a report on miner safety concerns »**

Asked why they did not complain about their safety concerns, several miners said complaining means the loss of a job.

Murray denied that. "If you're getting that from the community, then those miners must work for another mining company. I don't operate that way," he said.

Not so, said Paul Riddle, who used to work in one of Murray's mines. "Always profits before safety, that's my opinion, my feeling, my experience," he said.

Miners who work for Murray are sometimes forced to push the envelope when it comes to safety, he said, and are afraid to speak up for fear of being fired.

"I'm not the only one," he said. "There are many, many people that feel this way and are afraid to speak up."

An attempt to make contact with the trapped miners was unsuccessful Friday, when a microphone lowered into a narrow hole drilled into a mine cavity detected no sounds. Murray said that technical difficulties prevented the microphone from picking up sound, the drill steel was blocking the microphone, and a line broke.

Survey equipment showed that the drill drifted 87 feet during the drilling but ended up in an active area of the mine, where the miners could be, Stickler said. There has been no communication with the miners since the collapse.

Air tests overnight suggested there may be oxygen levels of about 20 percent in the area where the miners are thought to be, Stickler said. Later tests found oxygen levels at about 7 percent -- too little to survive -- but that

may be because the drill hole drifted as it was being bored, Stickler said. **See where the miners are thought to be trapped »**

The 2.5-inch bore hole reached the cavity in the central Utah mine more than 1,800 feet below the surface about 10 p.m. MT Thursday (midnight ET), Stickler said.

"The fact that we have not picked up any sound I believe should not be interpreted as bad news," Murray said.

"There could be a number of factors as to why sounds in there might not be picked up, and I wouldn't look at it as good or bad news," he said.

A second, larger hole being drilled into the mine has a better chance of accuracy, Stickler said. That drill -- more than 8 inches in diameter -- should reach the cavity late Friday or early Saturday, he said.

As of Friday evening, the larger drill was about 240 feet away from the miners' presumed location, Stickler said.

"We feel that we will have a better chance of maintaining that hole [the larger one] and put a TV camera down it," Murray said.

Murray said Thursday that if the miners survived the collapse, they could continue to live on fresh air, food and water supplied through the holes until crews can remove tons of coal and rock that clogged a collapsed tunnel.

That process could take four or five more days, he said early Friday.

Between what they had packed with their lunches and what was stored in the mine, the men had about a week's worth of water, Murray said. **See the rescue efforts at the mine »**

Murray has insisted a magnitude-3.9 **earthquake** caused the mine collapse, and has said at least 10 "aftershocks" have been recorded, with seismic activity earlier wiping out more than 300 feet of progress and halting rescue efforts temporarily.

Seismologists and geophysicists have not been as sure, saying the seismic activity they measured appeared to stem from the mine's collapse.

On Thursday, University of California-Berkeley seismologist Douglas Dreger said the data show the shaking detected bore the signature of a collapse and "not a tectonic earthquake."

Experts have said the "aftershocks" could be the rock adjusting after the collapse.

About 50 representatives of the **Mine Safety and Health Administration** are on the site, Stickler said. He said the mine is in compliance with federal laws.

Inspectors cited it for 30 violations this year, MSHA records show. Recommended fines in the 10 cases involving penalties ranged from $60 to $524.

The mine employs about 65 people and last year yielded nearly 605,000 tons of coal, according to the MSHA. **E-mail to a friend**

CNN's Vivienne Foley, Ed Lavandera and Gary Tuchman contributed to this report.

Remains of mother and child recovered from bridge collapse site

MINNEAPOLIS, Minnesota (CNN) -- The bodies of a 22-month-old girl and her mother have been recovered from the rubble of the I-35W bridge collapse, the Hennepin County Medical Examiner's Office said Friday.

Sadiya Sahal and her daughter are among the victims of the bridge collapse in Minneapolis, Minnesota.

The remains were found Thursday.

Hana Sahal was in a car with her mother, Sadiya Sahal, 22 -- a nursing student from Somalia -- when it plunged into the Mississippi River, said Omar Jamal, a spokesman for the family. **See photos of victims of the collapse »**

Sadiya Sahal died of blunt-force and penetrating abdominal injuries. Hana, the only child believed to be a casualty of the disaster, died of blunt-force head injuries, according to the county medical examiner's Web site.

Authorities informed Sahal's family Thursday that the child had died, said Jamal, director of the Somali Justice Advocacy Center. The family was told Friday that Sadiya Sahal's body was identified.

Funerals for both are planned for Saturday, Jamal said Friday night. Sadiya Sahal was five months pregnant, he said.

Divers on Friday pulled more human remains from the river, but the Hennepin County sheriff's office did not specify whether the remains represented one body or more.

The discovery of another victim would mean at least nine people were killed when the bridge fell six stories into the Mississippi during the evening rush hour on August 1. The medical examiner's office still listed eight victims on its Web site, however, and said that as of Friday evening, all remains found had been identified. Other victims may still be trapped in the rubble. **Watch 'traffic cam' video of the chaos moments after the bridge collapse »**

Federal officials investigating the disaster said Friday an aerial photo made before the bridge collapsed shows where construction equipment was placed on the structure and could help investigators determine why the bridge fell.

"This gives us an outstanding depiction of what, in fact, was on the bridge as it relates to the loads that were provided by the construction company: the equipment, the positioning of the equipment, where the loads were. All of that data will be put into our ... computer model," Mark Rosenker, chairman of the National Transportation Safety Board, said Friday.

Part of the investigation is focusing on construction work on the bridge before it fell. Crews were using heavy equipment to resurface parts of the deck and make other repairs. The eight-lane bridge was down to two lanes to accommodate the work. **See a diagram of the bridge's structure »**

The I-35W bridge was classified as "structurally deficient" by state bridge inspectors for at least 17 years.

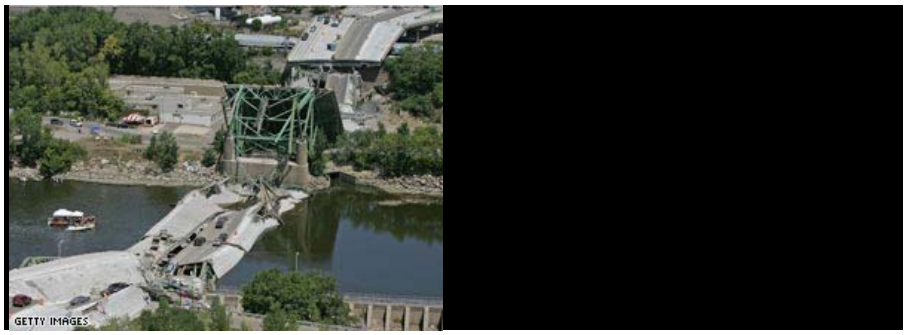
U.S. Transportation Secretary **Mary Peters** said Friday that Minnesota will receive an advance of $50 million in federal emergency relief for debris removal and other operations in preparation for reconstruction.

The money is an advance on the $250 million Congress authorized before its August recess began. Congress must pass legislation to appropriate the $250 million before it can be released, Peters said.

The state also received $5 million in emergency aid the morning after the disaster, and $5 million was secured by Minnesota's congressional delegation to set up alternative transportation options for motorists. **E-mail to a friend**

Poll: Americans worried but reject higher taxes to fix bridges

WASHINGTON (CNN) -- Nearly half of all Americans are worried about the collapse of a bridge somewhere in the United States, yet nearly two-thirds reject higher taxes to inspect and fix them, according to a new CNN/Opinion Research Corp. poll released Thursday.



The collapse of a bridge in Minnesota has put America's infrastructure on the political agenda.

In the poll, 52 percent were either "very worried" or "somewhat worried" about a bridge collapsing. Forty-seven percent were either "not too worried" or "not worried at all." One percent had no opinion.

But only one in three Americans are concerned that a bridge that they drive across regularly will collapse, while 69 percent are not worried.

In an effect called BIMBY -- "Better In My Back Yard" -- that is common in polling, CNN Polling Director Keating Holland said people often feel that situations locally are better than the national averages.

The new numbers come eight days after an interstate highway bridge in Minneapolis, Minnesota, collapsed into the Mississippi River. At least five people were killed in the collapse.

Don't Miss

- **Complete poll results (PDF)**
- **Probe focuses on joint plates**
- **Bush dismisses higher gas taxes**

Despite the concerns, only one-third of those polled favor increasing the **tax** on gas to pay for bridge inspections and repairs. The federal program to inspect and repair bridges is funded mostly by the federal tax on gasoline. Sixty-five percent of those questioned were against raising that tax.

"Polls sometimes show that the public is willing to accept higher taxes to pay for popular projects, but not in this case," Holland said. "With the price of gasoline hovering around $3, it may not be surprising that Americans don't want to pay any more at the pump, even though they worry about bridge safety."

Several members of the House Transportation Committee are calling for the tax hike in the wake of the Interstate 35W bridge collapse in Minneapolis last week. Congressman James Oberstar, D-Minnesota, on Wednesday said he would introduce legislation for bridge repair funding and increased inspections. He says a 5-cent increase in the gas tax would pay for the proposed three-year program by generating $8.5 billion a year.

Citing 74,000 bridges rated by the federal government as "structurally deficient," Oberstar told reporters "we cannot wait for another tragedy. We must, and we will, act decisively."

At a news conference Thursday morning at the White House, President Bush dismissed raising the federal gasoline tax, at least until Congress changes the way it spends highway money.

"It's an interesting question, about how Congress spends and prioritizes highway money," the president said. "My suggestion would be that they revisit the process by which they spend gasoline money in the first place."

"If bridges are a priority, let's make sure we set that priority first and foremost, before we raise taxes," Bush said.

The poll involved telephone interviews with 1,029 American adults conducted August 6-8, 2007. The poll's margin of error was plus-or-minus 3 percentage points **E-mail to a friend**

CNN's Steve Brusk contributed to this report.

Bridge collapse death toll likely to reach eight

MINNEAPOLIS, Minnesota (AP) -- Remains pulled from the wreckage of a collapsed bridge on Thursday may include another victim along with the two earlier announced, which would bring the confirmed death toll to eight, authorities said.

Investigators stand on the collapsed Interstate 35W bridge wreckage Thursday.

more photos »

Navy divers had recovered human remains at first believed to be those of two bodies.

At a news conference, Hennepin County Chief Medical Examiner Andrew Baker said what was thought to be one set of remains is now believed to be from more than one person.

The first victim recovered Thursday was identified as Peter Joseph Hausmann, 47, of Rosemount.

Baker said that authorities believe they know the identities of the other two people, and that they were on the list of missing in the August 1 collapse. They were not immediately identified.

Crews have been searching for at least eight people missing and presumed killed in the collapse, including a mother and her young daughter and another woman and her adult son. **Watch 'traffic cam' video of the chaos moments after the bridge collapse »**

As searchers combed the river for victims, federal officials looking into the cause of the collapse issued an advisory for states to inspect the metal plates, or gussets, that hold girders together on bridges nationwide.

메모 포함[W44]: metal plates

Investigators said the gussets on the failed Minneapolis bridge were originally attached with rivets -- old technology more likely to slip than the bolts used in bridges today.

Some of the gussets also may have been weakened by welding work over the years, and some may have been too thin, engineering experts said Thursday.

Questions about the gussets prompted Transportation Secretary Mary Peters to caution states about stress placed on bridges during construction projects.

Don't Miss

- **Police arrest intruders near bridge**
- MSP: **Supervisor says crew's work was safe**
- MSP: **Crews jackhammered concrete before collapse**
- **In Depth: Deadly bridge collapse**

Investigators are also looking at whether extra weight from construction work could have affected the bridge. An 18-person crew had been working on the Interstate 35W span when it collapsed during the evening rush hour.

Bruce Magladry, director of the National Transportation Safety Board's Office of Highway Safety, said the agency will use a computer to simulate how the bridge might have behaved with different loads, and with different parts of the bridge failing. He said there are infinite combinations to test, so the simulation may have to be run 50 times or 5,000 times.

"Then we compare what the (simulated) collapse looks like to what we actually see out there on the ground," Magladry said, and repeat the simulation until it matches what happened. **See a diagram of the bridge's structure »**

NTSB investigators have been trying to pinpoint where on the bridge the collapse began. Observations from a helicopter camera this week found several "tensile fractures" in the superstructure on the north side of the bridge, but nothing that appeared to show where the collapse began, the NTSB said.

Also Thursday, President Bush dismissed a proposal to raise the federal gasoline tax to repair the nation's bridges at least until Congress changes the way it spends highway money and considers the economic impact of a tax increase.

At the bridge site, recovery crews have removed several vehicles from the river in the past two days. In all, 88 vehicles have been located, both in the river and amid the broken concrete wreckage of the bridge.

The list of people -- all from Minnesota -- confirmed missing and feared dead in the bridge collapse include a woman and her young daughter. The eight have been identified as Christine Sacorafas, 45, of White Bear Lake; Vera Peck, 50, and her son Richard Chit, 20, both of Bloomington; Greg Jolstad, 45, of Mora; Peter Hausmann, 47, of Rosemount; Sadiya Sahal, 23, of St. Paul, and her 2-year-old daughter, Hanah; and Scott Sathers, 29, of Maple Grove. **See photos of bridge memorials » E-mail to a friend**

Crews Had Jackhammered Concrete Before Collapse

Details of repair work revealed

Robert Ingrassia, Staff Reporter

MINNEAPOLIS -- Road crews used jackhammers to remove concrete from the Interstate 35W bridge the day the span collapsed, but state officials declined to say Wednesday whether they believe the work contributed to the disaster.

For the first time Wednesday, the Minnesota Department of Transportation detailed the bridge deck repairs that were under way when the structure suddenly plummeted into the Mississippi River.

“We’re not going to speculate about the cause,” said Bob McFarlin, assistant to the state transportation commissioner. “We’ll leave that to the NTSB (National Transportation Safety Board).” The road work has been a focus of discussion among the public and engineering experts since the Aug. 1 collapse. State officials have repeatedly said the maintenance work was routine.

“The deck has nothing to do with the structure,” McFarlin said. “It’s just the deck.”
The $9 million repair began in July. Progressive Contractors, an experienced road construction company based in St. Michael, Minn., was resurfacing the bridge’s concrete deck and completing repairs to lighting and guard rails.

The project was about 70 percent complete, said Liz Benjamin, a state construction engineer overseeing the work. The job mainly entailed grinding off the top 2 inches of the road’s surface and repaving with new concrete.

Crews also replaced a series of expansion joints, which are narrow breaks between slabs that allow concrete to expand and contract with the weather.

In addition, workers searched for areas where the concrete was eroded below the surface. When they found such spots, they used jackhammers to remove all 9 inches of the concrete deck.
By July 31, the contractor had completed work on two lanes in each direction and begun working on two of the four remaining lanes. On Aug. 1, the day of the collapse, crews spent much of their time using 45-pound jackhammers to remove concrete from various weak spots, Benjamin said.

Plans for that evening had called for workers to begin resurfacing two lanes. They had heavy equipment and tons of material used to make the concrete staged on the bridge.
About 20 workers were on the span when it collapsed. Greg Jolstad, a Progressive Contractors employee, remains missing.

Some experts have speculated the repair work somehow triggered the collapse.
“At first, I thought that would be the focus,” said Michael Oliva, an engineering professor at the University of Wisconsin-Madison.

Oliva said he speculated that crews may have affected the tension and compression needed to hold the bridge together when they removed decking material. But Oliva said he later reviewed the bridge's design – which features a system of trusses and support beams – and concluded the deck played no role in holding up the bridge.

Still, Oliva said the project may have indirectly affected the span by shifting traffic loads. At the time of the collapse, four of the eight lanes were open – two in each direction. The two lanes on the downstream side of the bridge were closed, meaning the remaining three-quarters of the deck was bearing all the traffic.

Road crew members told a rescue worker they'd felt the span "wobbling" in the days prior to the collapse, according to the Minneapolis Star Tribune. State officials have declined to address that issue and referred questions on that matter to the NTSB.

Road Crew Supervisor Says Bridge Work Was Safe

Worker who fell with bridge said he noticed no wobbling

Robert Ingrassia, Staff Reporter

MINNEAPOLIS -- A road crew supervisor who survived the Interstate 35W bridge collapse in Minneapolis insists none of his workers felt any unusual wobbling or swaying before the span plunged into the Mississippi River.

"During all of my time on the I-35W bridge, I did not notice any unusual or unexpected swaying or rumbling," said Steve Weston, a project manager with Progressive Contractors of St. Michael, Minn. "No one in my crew made any such report to me. Right up to the collapse, I had no reason to believe that my crew and I were in danger."

The firm also stated it has completed its own "intensive review" of the work.
"There's nothing we did during our work that should have contributed to the collapse," Weston said. "We're as shaken and baffled by the collapse as the motorists on the bridge that day."

Weston was part of an 18-member crew on the bridge when it crumbled Aug. 1. He said he was lucky to survive. One worker, Greg "Jolly" Jolstad, 45, is one of eight people who remain missing.
The firm's work has become one focus on the National Transportation Safety Board's investigation into the collapse. U.S. Transportation Secretary Mary Peters warned states Wednesday to take precautions about added stress placed on bridges during repair work.

Progressive Contractors was resurfacing the bridge deck as part of a $9 million state contract. The project was about 70 percent complete, said Liz Benjamin, a state construction engineer overseeing the work. The job mainly entailed grinding off the top 2 inches of the road's surface and repaving with new concrete.
Crews also replaced a series of expansion joints, which are narrow breaks between slabs that allow concrete to expand and contract with the weather.

In addition, workers searched for areas where the concrete was eroded below the surface. When they found such spots, they used jackhammers to remove all 9 inches of the concrete deck.

By July 31, the contractor had completed work on two lanes in each direction and had begun working on two of the four remaining lanes. On Aug. 1, the day of the collapse, crews spent much of their time using 45-pound jackhammers to remove concrete from various weak spots, Benjamin said.
Plans for that evening had called for workers to begin resurfacing two lanes. They had heavy equipment and roughly 100 tons of sand and other material used to make the concrete staged on the bridge.

The Minneapolis Star Tribune reported this week that road crew workers told a rescuer shortly after the collapse they had felt "wobbling" on the bridge. Progressive Contractors officials said none of the surviving crew members stated they had noticed such unusual movement.

Weston said many drivers “may not realize that every steel bridge sways to some extent.”
Progressive Contractors, founded in 1971, has done extensive work for the Minnesota Department of Transportation and other public agencies.

“We continue to believe that our concrete repair work was routine, that it was done well, and that there was nothing about it that should have caused a bridge to collapse,” said Tom Sloan, a Progressive Contractors vice president.

Bridge collapse death toll likely to reach eight

MINNEAPOLIS, Minnesota (AP) -- Remains pulled from the wreckage of a collapsed bridge on Thursday may include another victim along with the two earlier announced, which would bring the confirmed death toll to eight, authorities said.

Investigators stand on the collapsed Interstate 35W bridge wreckage Thursday.

more photos »

Navy divers had recovered human remains at first believed to be those of two bodies.

At a news conference, Hennepin County Chief Medical Examiner Andrew Baker said what was thought to be one set of remains is now believed to be from more than one person.

The first victim recovered Thursday was identified as Peter Joseph Hausmann, 47, of Rosemount.

Baker said that authorities believe they know the identities of the other two people, and that they were on the list of missing in the August 1 collapse. They were not immediately identified.

Crews have been searching for at least eight people missing and presumed killed in the collapse, including a mother and her young daughter and another woman and her adult son. **Watch 'traffic cam' video of the chaos moments after the bridge collapse »**

As searchers combed the river for victims, federal officials looking into the cause of the collapse issued an advisory for states to inspect the metal plates, or gussets, that hold girders together on bridges nationwide.

Investigators said the gussets on the failed Minneapolis bridge were originally attached with rivets -- old technology more likely to slip than the bolts used in bridges today.

Some of the gussets also may have been weakened by welding work over the years, and some may have been too thin, engineering experts said Thursday.

Questions about the gussets prompted Transportation Secretary Mary Peters to caution states about stress placed on bridges during construction projects.

Investigators are also looking at whether extra weight from construction work could have affected the bridge. An 18-person crew had been working on the Interstate 35W span when it collapsed during the evening rush hour.

Bruce Magladry, director of the National Transportation Safety Board's Office of Highway Safety, said the agency will use a computer to simulate how the bridge might have behaved with different loads, and with different parts of the bridge failing. He said there are infinite combinations to test, so the simulation may have to be run 50 times or 5,000 times.

"Then we compare what the (simulated) collapse looks like to what we actually see out there on the ground," Magladry said, and repeat the simulation until it matches what happened. **See a diagram of the bridge's structure »**

NTSB investigators have been trying to pinpoint where on the bridge the collapse began. Observations from a helicopter camera this week found several "tensile fractures" in the superstructure on the north side of the bridge, but nothing that appeared to show where the collapse began, the NTSB said.

Also Thursday, President Bush dismissed a proposal to raise the federal gasoline tax to repair the nation's bridges at least until Congress changes the way it spends highway money and considers the economic impact of a tax increase.

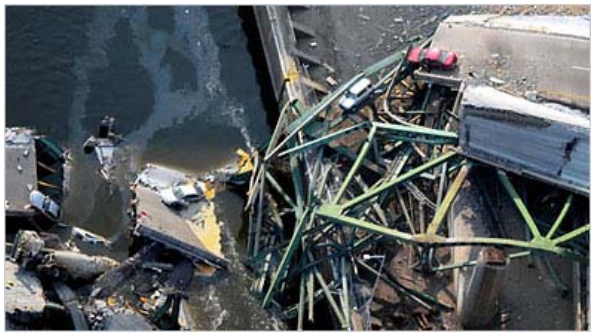
At the bridge site, recovery crews have removed several vehicles from the river in the past two days. In all, 88 vehicles have been located, both in the river and amid the broken concrete wreckage of the bridge.

The list of people -- all from Minnesota -- confirmed missing and feared dead in the bridge collapse include a woman and her young daughter. The eight have been identified as Christine Sacorafas, 45, of White Bear Lake; Vera Peck, 50, and her son Richard Chit, 20, both of Bloomington; Greg Jolstad, 45, of Mora; Peter Hausmann, 47, of Rosemount; Sadiya Sahal, 23, of St. Paul, and her 2-year-old daughter, Hanah; and Scott Sathers, 29, of Maple Grove. **See photos of bridge memorials » E-mail to a friend**

Search

The New York Times
Sunday, August 12, 2007

Bridge Disasters



Ben Garvin/Associated Press

Bridges are some of mankind's grandest engineering works, but sometimes they fall down. A 2003 study in the Journal of Performance of Constructed Facilities, which is published by the American Society of Civil Engineers, examined over 500 bridge collapses in the United States, and found that the average age of the failed structure was 52.5 years, and that the most common causes were flood and scour, which accounted for almost 53 percent of the incidents. Other factors were bridge overload; collisions with trucks, trains or ships or barges or deficiencies in design, material , construction or maintenance. The society's web site carries a report that says that eliminating all bridge deficiencies would take more than $9 billion a year for 20 years.

The most recent large-scale disaster came on Aug. 1, 2007, when the I-35W bridge over the Mississippi River in Minneapolis collapsed. - *Aug. 2, 2007*

Related: Bridges and Tunnels

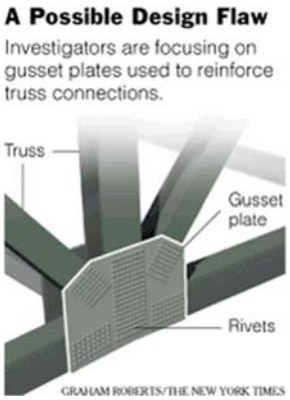
Potential Flaw Seen in Design of Fallen Bridge

Ruth Fremson/The New York Times

National Transportation Safety Board inspectors examined some of the bridge parts on Wednesday.

MINNEAPOLIS, Aug. 8 — Investigators have found what may be a design flaw in the bridge that collapsed here a week ago, in the steel parts that connect girders, raising safety concerns for other bridges around the country, federal officials said on Wednesday.

National Transportation Safety Board Report (www.ntsb.gov)
Times Topics: Bridge Disasters



Ruth Fremson/The New York Times
Work continued on Wednesday in removing wreckage from the collapsed Minneapolis bridge.

The Federal Highway Administration swiftly responded by urging all states to take extra care with how much weight they place on bridges of any design when sending construction crews to work on them. Crews were doing work on the deck of the Interstate 35W bridge here when it gave way, hurling rush-

hour traffic into the Mississippi River and killing at least five people.
The National Transportation Safety Board's investigation is months from completion, and officials in Washington said they were still working to confirm the design flaw in the so-called gusset plates and what, if any, role they had in the collapse.

Still, in making public their suspicion about a flaw, the investigators were signaling they considered it a potentially crucial discovery and also a safety concern for other bridges. Gusset plates are used in the construction of many bridges, not just those with a similar design to the one here.

"Given the questions being raised by the N.T.S.B., it is vital that states remain mindful of the extra weight construction projects place on bridges," Secretary of Transportation Mary E. Peters said in a statement issued late Wednesday.

Since the collapse, the concern among investigators has focused on "fracture critical" bridges, which can collapse if even a single part fails. But neither the safety board nor the federal Department of Transportation on Wednesday singled out any particular design of bridge in raising its new concerns about gusset plates and the weight of construction equipment.

Concerns about the plates emerged not from the waters of the Mississippi River here, where workers have only begun to remove cars and the wreckage with cranes, but from scrutiny of the vast design records related to the steel truss bridge.

In Minneapolis, state transportation department officials seemed surprised by the sudden focus on the bridge's gusset plates, which are the steel connectors used to hold together the girders on the truss of a bridge. On this bridge, completed in 1967, there would have been hundreds of them, officials here said.

Gary Peterson, the state's assistant bridge engineer, said he knew of no questions that had ever been raised about the gusset plates, no unique qualities to distinguish them from those on other bridges, no inkling of any problem during decades of inspections of the bridge.
"I don't know what this could be," Mr. Peterson said. "I'm frankly surprised at this point. I can't even begin to speculate."

If those who designed the bridge in 1964 miscalculated the loads and used metal parts that were too weak for the job, it would recast the national debate that has emerged since the collapse a week ago, about whether enough attention has been paid to maintenance, and raises the possibility that the bridge was structurally deficient from the day it opened. It does not explain, however, why the bridge stood for 40 years before collapsing.

In an announcement, the safety board said its investigators were "verifying the loads and stresses" on the plates as well as checking what they were made of and how strong they were.

State authorities here said the plates were made of steel, and were, in most such bridges, shaped like squares, five feet by five feet, and a half inch thick. Such plates are common in bridges as a way to attach several girders together, said Jan Achenbach, an expert in testing metals at the Northwestern

University Center for Quality Engineering and Failure Prevention.

A consultant hired by the State of Minnesota in the days after the collapse to conduct an investigation of what had gone wrong, even as the national safety board did its work, first discovered the potential flaw, the board said. Representatives at Wiss, Janney, Elstner Associates Inc., the consulting firm, could not be reached late Wednesday.

Federal authorities said one added stress on the gusset plates may have been the weight of construction equipment and nearly 100 tons of gravel on the bridge, where maintenance work was proceeding when the collapse occurred. A construction crew had removed part of the deck with 45-pound jackhammers, in preparation for replacing the two-inch top layer, and that may also have altered the stresses on the bridge, some experts said.

The chairman of the National Transportation Safety Board, Mark V. Rosenker, said on Sunday that investigators were calculating the stresses generated on each girder and other bridge components from the construction equipment and materials.

While cautioning states on Wednesday about the weight of construction equipment and materials, the federal transportation department did not immediately issue any broader warnings about gusset plates. Brian Turmail, a spokesman for the Transportation Department, said on Wednesday evening that his agency was “conducting additional analysis to determine whether we need to ask the states to do checks of their designs.”

If there was a design error in the 1960s, failure to identify it before the bridge collapse indicates a problem with the federal inspection program, said Thomas M. Downs, who was the associate administrator of the Federal Highway Administration from 1978 to 1980
.
Here, state officials were racing to respond to the new concerns about a design flaw, but said they had no details. “We’re going to leave that to the N.T.S.B.,” said Bob McFarlin, assistant to the commissioner of the Minnesota Department of Transportation.

Of a potential design flaw, Brian McClung, the spokesman for Gov. Tim Pawlenty, said the state’s transportation department “will be looking into every single issue and possibility raised by the N.T.S.B. or the parallel investigation ordered by Governor Pawlenty, including this one.”

Mr. Peterson said that concerns about gusset plates might normally focus on questions of corrosion over time, but that he had never heard of a question over the original design or metal make up of a plate here. Had ultrasonic testing of the plates shown signs of corrosion or cracking, that would be a concern, he said. But in the case of the I-35W bridge, Mr. Peterson said he recalled “no gusset plate issues at all.”
When the bridge was built, in the 1960s, its hundreds of gusset plates were attached with rivets, though bridge designers here switched to bolts, a stronger option, in the 1970s.
“Bolts are better,” Mr. Peterson said, “but we wouldn’t consider anything wrong with rivets.”

Monica Davey reported from Minneapolis, and Matthew L. Wald from Washington

The New York Times
nytimes.com

August 7, 2007

Bridge Collapse Revives Issue of Road Spending

By SUSAN SAULNY and JENNIFER STEINHAUER

MINNEAPOLIS, Aug. 6 — In the past two years, Gov. Tim Pawlenty of Minnesota twice vetoed legislation to raise the state's gas tax to pay for transportation needs.
Now, with at least five people dead in the collapse of the Interstate 35W bridge here, Mr. Pawlenty, a Republican, appears to have had a change of heart.

"He's open to that," Brian McClung, a spokesman for the governor, said Monday of a higher gas tax. "He believes we need to do everything we can to address this situation and the extraordinary costs."
Even as the cause of the bridge disaster here remains under investigation, the collapse is changing a lot of minds about spending priorities. It has focused national attention on the crumbling condition of America's roadways and bridges — and on the financial and political neglect they have received in Washington and many state capitals.

Despite historic highs in transportation spending, the political muscle of lawmakers, rather than dire need, has typically driven where much of the money goes. That has often meant construction of new, politically popular roads and transit projects rather than the mundane work of maintaining the worn-out ones.

Further, transportation and engineering experts said, lawmakers have financed a boom in rail construction that, while politically popular, has resulted in expensive transit systems that are not used by a vast majority of American commuters.

Representative James L. Oberstar, Democrat of Minnesota and the chairman of the Committee on Transportation and Infrastructure, sent out a news release last month boasting about Minnesota's share of a recent transportation and housing appropriations bill.

Of the $12 million secured for the state, $10 million is slated for a new 40-mile commuter rail line to Minneapolis, called the Northstar. The remaining $2 million is divided among a new bike and walking path and a few other projects, including highway work and interchange reconstruction.

The $286 billion federal transportation legislation passed by Congress in 2005 included more than 6,000 earmarks, which amounted to blatant gifts to chosen districts, including the so-called Bridge to Nowhere in rural Alaska (that earmark was later removed after a political uproar).

Senator Charles E. Schumer, Democrat of New York, said in a telephone interview Monday that earmarks for transportation in federal legislation were "almost always new construction and not maintenance." Earlier, Mr. Schumer said that he would introduce legislation next month to double a proposed federal transportation bill appropriation, with a focus on upkeep to $10 billion.

“The bottom line,” Mr. Schumer said, “is that routine but important things like maintenance always get shortchanged because it’s nice for somebody to cut a ribbon for a new structure.”

Last week, Representative John L. Mica of Florida, the ranking Republican on the Transportation and Infrastructure Committee, met with advisers to the Bush administration to urge a nationwide plan to address transportation needs. Rebuilding the I-35W bridge would be only “a Band-Aid” Mr. Mica said, “to a much more serious problem.”

“We don’t have any kind of strategic plan to deal with infrastructure, and we’re falling behind,” he said. In statehouses across the country, legislators tried this past session to fill some of the void by passing bond acts or allocating money to improve roads, bridges and other pieces of the transportation system.

In Arkansas, lawmakers set aside $80 million, 15 percent of which will be used to repair county roads, 15 percent for city byways and the rest for its highways. New Mexico approved a $200 million plan for local and tribal road projects, and in Texas, $700 million was allotted for state transportation projects over the next two years.

메모 포함[W45]: Arkansas: 15% set aside to repair county roads

Voters in California this year authorized nearly $20 billion in transportation bonds to pay for repairs and make other improvements to its taxed system.

“We still barely scratched the surface,” said Adam Mendelsohn, the communications director for Gov. Arnold Schwarzenegger, a Republican. “The governor is very concerned about the lack of attention that the federal government has given to infrastructure. It is probably no more acute than in California because of the tremendous strains from population growth.”

The federal budget for transportation comes largely from excise taxes, particularly on gasoline, set by Congress at 18.4 cents in 1993 and eroded over time by inflation and fuel efficiency. As such, over the last decade, state legislatures in 14 states have voted to raise the state gas tax 19 times. And several states are looking at toll roads and congestion pricing initiatives to help shore up the roads.

The National Conference of State Legislatures, a group with members from all 50 states, is calling for a 3-cents per gallon increase in the federal gas tax.

C. Michael Walton, a professor of civil engineering at the University of Texas, Austin, helped write a series of reports issued by the American Society of Civil Engineers that have repeatedly found the nation’s highway system with insufficient money. “Continually falling short of the actual needs,” Professor Walton said, results largely from “our backlash to increases in taxes.”

Professor Walton said states had been looking to the federal government for leadership. “I am not sure transportation falls to the top of the priorities as it should barring a catastrophic failure,” he said in reference to state government spending.

A study released in May by the Urban Land Institute and Ernst & Young found that 83 percent of the

nation's transportation infrastructure was not capable of meeting the country's needs over the next 10 years. The American Society of Civil Engineers, in its latest national report card, gave transportation infrastructure a D.

Meanwhile, there are urgent needs. The Interstate highway system turned 50 last year and is showing signs of age and inadequate upkeep. Around St. Louis, for instance, old bridges, rocky roads and tight ramp loops have led to a shutdown of parts of Interstate 64/Highway 40 — one of the most important corridors in the state — until late 2009.

"It's so easy to let this stuff slip," said Robert Dunphy, a senior resident fellow at the Urban Land Institute.

The national highway system, originally called the National System of Interstate and Defense Highways, came into being under the Eisenhower administration. (The country's population was 169 million then, and there were about 54 million registered vehicles on the roads.) It was spurred by fears that Americans would have a mobility crisis if the country were attacked in a nuclear war. By the 1970s much of the system was completed.

But since then, the nation's highways have eroded with age and use, especially in areas like the Southwest where population booms have far outweighed the ability of roads to carry the new drivers.
Typically financing for capital transportation projects comes from the federal government matched with funds from states, which are then charged with maintaining the roads and bridges. But the federal government and states operate trust funds, filled with revenues from various excise taxes, which have been unable to maintain existing roadways adequately or finance capital expenditures.

But it may often be less the amount allocated for transportation than how it is doled out that leads to eroding highways, some critics say.

"Highway funding is supposed to be on the basis of need," said Raymond Helmer, a transportation consultant in Houston who has worked on transportation projects for over 50 years. "There is supposed to be cost-benefit analysis, and every state does a study as required by federal government and comes up with needs, but then politicians say, 'I don't want that road here, I want it here.' "

Some transportation experts also said that though light rail and other public transportation projects made sense in cities, investing in them in sprawling suburban regions might not, even if the systems were supported, in theory, by the public.

"Too many American cities are spending far too much money on expensive rail transit projects, which are used for only 1 to 2 percent of local travel, and far too little on highway projects which are used for 95 to 99 percent of local travel," Randal O'Toole, a senior fellow with the Cato Institute, said in an e-mail interview.

There has also been more emphasis nationwide on building new roads than on the maintenance and upkeep of old ones. Steve Ellis, the vice president of Taxpayers for Common Sense, a group that monitors federal spending, said that might help move traffic in some places, but it left many others

with the equivalent of a leaky roof.

“It would be irresponsible of me to go out to dinner if I couldn’t fix a leak in my roof,” Mr. Ellis said. “But that’s essentially what we do. We don’t take care of what we’ve got, but we talk a lot about building more and new.”

Susan Saulny reported from Minneapolis, and Jennifer Steinhauer from Los Angeles.

Divers recover more human remains from bridge collapse site

- **STORY HIGHLIGHTS**
- **NEW:** Divers found body of Richard Chit, 20; his mother is still missing
- Cranes removed a school bus, other vehicles from ends of fallen span
- 100 people were injured; eight remain hospitalized
- Bridge collapsed August 1; at least nine people died

MINNEAPOLIS, Minnesota (AP) -- Divers on Sunday found another body at the site of the Mississippi River bridge collapse, raising the official death toll to nine.

Workers remove a school bus from the Interstate 35W bridge collapse site on Sunday.

more photos »

The Hennepin County Medical Examiner's Office identified the body as 20-year-old Richard Chit of St. Anthony. His mother, 50-year-old Vera Peck of Bloomington, is still missing.

The other three people known to be missing are Christine Sacorafas, 45, of White Bear Lake; Greg Jolstad, 45, of Mora; and Scott Sathers, 29, of Maple Grove.

As divers resumed their search Sunday, a crane working removed a school bus and other vehicles from one end of the ruined span.

The yellow school bus became a symbol of a disaster that could have been worse. Everyone on board -- 52 children and several adults -- escaped alive.

One of the bus survivors, Julie Graves, had been accompanying children from a neighborhood center in Minneapolis on a trip to a water park the day the bridge collapsed.

On Sunday, her feet were in casts and tight wraps on her arms locked her elbows. She has been in a back brace after surgery to repair two broken lumbar vertebrae last week, but is expected to make a full recovery.

"I'm doing good," Graves said by phone Sunday from Hennepin County Medical Center. "Some pain here and there definitely. But I'm so grateful to be alive."

In all, 44 vehicles have been removed from the bridge since its collapse. About 100 vehicles had been on the structure when it fell on August 1, said Minnesota Department of Transportation spokesman Kevin Gutknecht.

See a diagram of the bridge »

Most vehicles on the bridge's north end were gone; Gutknecht said work would focus on the south end for the next day or two.

Broken glass remained on a slanted section on the bridge's north end as pedestrians and cyclists peered through a mesh fence put up to keep them from getting too close.

So far, crews have cleared cars from parts of the bridge that fell onto land. Equipment is positioned to start major debris removal once the recovery efforts are finished.

About 100 people were injured in the collapse, but only eight remained hospitalized, their conditions ranging from serious to good. Hennepin County Medical Center released one patient and upgraded another from serious to satisfactory condition, a spokeswoman said Sunday.

See the victims of the collapse »

Graves, who celebrated her 28th birthday at the hospital Friday, expects to remain at the hospital for up to two weeks.

She had planned to get married at the end of the month and she said she still may exchange vows, but the wedding celebration has been pushed back to May "so I can be in full dancing condition."

E-mail to a friend

Bridge Failure Can't Fend Off Usual Politics

(New York Times)

MINNEAPOLIS, Aug. 15 — It took all of two weeks for the political unity brought on by a deadly bridge collapse here to fall apart.

Even as divers continued searching the Mississippi River on Wednesday for four people missing since the busy Interstate 35W bridge fell on Aug. 1, political leaders were dueling over plans for a replacement span.

The battle lines extended from disputed plans for light rail to suggestions that Gov. Tim Pawlenty, a Republican, was unnecessarily rushing reconstruction to impress Republican Party leaders, who will hold their presidential convention in the Twin Cities in September 2008. Mr. Pawlenty says such talk is nonsense.

"There's a deep sense of loss for people all over Minnesota," said Lawrence R. Jacobs, the director of the Center for the Study of Politics and Governance at the University of Minnesota. "And for them, to see kind of this new — and old — politics flare up like this is unseemly."

Mr. Pawlenty and his State Department of Transportation have already unveiled broad plans for the new bridge, announcing the names of five possible contractors, and urging that it be open in record time, by the end of next year.

But R. T. Rybak, a Democrat who is mayor of Minneapolis; some Democratic leaders in the State Legislature; and members of the Minneapolis City Council have been loudly critical, questioning the need — and safety, given everything — of rushing to build a bridge.

Some called for provisions to allow light rail along the new span. Some called for a memorial for the victims. Mostly, they demanded: Why the hurry?

In a place where politics is usually more civil than in many other big cities, everyone involved seems to wish to play down a rift.

Still, Mr. Pawlenty's fiercest critics said they wondered whether the governor was hoping to turn attention toward a new bridge in the coming months and away from an investigation into why the old bridge failed and whether there were signs missed. Some suggested that Mr. Pawlenty hoped to show progress on a new bridge when the Republicans arrive for the convention.

Minnesota is considered a swing state in presidential elections, and some Republicans here have speculated that Mr. Pawlenty might be running-mate material.

"Politics isn't rocket science, you know," said Steve Murphy, a state senator and Democratic leader of the Transportation Committee. "Quite frankly, there's no reason to rush headlong into building this bridge."

Mr. Pawlenty sharply denied any notion that he was racing to build a bridge to enhance his image when he plays host to his party in 2008. "That's silly," he said Wednesday, noting that even with an expedited construction schedule, the bridge would not be complete until after the convention.

"That is no factor in how and when this will be built," Mr. Pawlenty said.
Instead, he said, state officials are hurrying to start work on the bridge, expected to cost as much as $250 million and to span 10 lanes (two more than the old bridge had), because of the economic damage happening each day without the bridge in this city's downtown. He said his economic experts have pegged the damage at $400,000 a day in lost work, extra fuel used and other costs.

"The bridge being out is a major economic and traffic disruption for our region and for our state," the governor said. Building a bridge "correctly and quickly" are not mutually exclusive, he said.

The days immediately after the bridge collapse brought political harmony here. Republicans and Democrats toured the wreckage together; they met with grieving families. And Mr. Pawlenty, who vetoed a proposed increase in the gasoline tax as recently as May, said he would reconsider such an increase if a special legislative session was called.

But as the state's bridge rebuilding plans began filtering out this week, some officials began voicing doubt. Lawmakers in St. Paul held a special hearing on Wednesday, quizzing Department of Transportation officials on the plans. The Minneapolis City Council began drawing up a "statement of principles" about the new bridge and what it did — and did not — want.

“This is too fast,” Mayor Rybak said, despite his agreement with the governor’s concern about the traffic snarl that has come with the loss of a bridge that carried 140,000 drivers to and from this city’s center each day.

“There’s a significant problem in not having a bridge, but there will be a more significant problem if we don’t do this bridge right,” Mr. Rybak said. “If we rush to judgment and put up a bridge without asking the right questions, we will be regretting this decision for decades.”

The ringing and clanging of this city’s one light rail line can be heard through the open window in Mr. Rybak’s third-floor office at City Hall. (“Music to my ears,” he says.) One of Mr. Rybak’s main wishes is that the bridge be built with enough reinforcement to accommodate the possibility of such a rail line someday.

The financial tug between road projects and mass transit projects has long played out in Minnesota, often pitting the state’s biggest cities against the outlying counties. State officials initially said that federal financing for the bridge could not be spent to build a significantly different, larger or changed bridge, with a rail line, for instance.

But on Wednesday, Mr. Pawlenty said he was “working on all” of the concerns brought forward, including looking at the possibility of a bridge that might someday carry a light rail.

There was consensus, he said, that there should be a memorial, either on the bridge or somewhere else. “I’ve already slowed things down,” Mr. Pawlenty said, adding that much of the talk of discord over the bridge had been overblown.

For some here, nonetheless, debate of any sort over a future bridge comes impossibly soon.
Divers, sometimes fighting strong currents and other times pounding rain, were working around the clock in the Mississippi in search of four people still missing. Nine bodies have been found so far. The divers were to enter their third week of searching on Thursday, while families waited on.

Libby Sander contributed reporting from Chicago.

How to pay for US road and bridge repair?

Some lawmakers put a hike in the gas tax on the table, but Bush dismissed the idea on Thursday.

By Ben Arnoldy | *Staff writer of The Christian Science Monitor*
from the August 10, 2007 edition

Minneapolis - The Minneapolis bridge collapse has put the nation's decaying roads and bridges front and center, and politicians are suddenly in a fix-it mood.

In Congress, Rep. James Oberstar (D) of Minnesota proposed Wednesday a national bridge plan that would create dedicated funding for the fixing of the nation's 73,784 bridges rated "structurally deficient" by the Department of Transportation.

Representative Oberstar handled one of the hazmats of contemporary politics by suggesting a five-cent hike in the gas tax. Meanwhile, Minnesota's governor, a two-time opponent of gas-tax raises, says he's open to the idea. But President Bush dismissed the notion on Thursday, saying Congress first needs to change its priorities when spending highway money.

At the same time, Rep. John Mica (R) of Florida is calling for a new nationwide blueprint for the interstate highway system.

For infrastructure wonks, it's a rare moment of national focus on an unglamorous responsibility of government. Long neglect, however, has led to an expensive maintenance backlog, meaning lawmakers may look more seriously at newer financing models such as a mileage tax or privatization.

"Maintenance is just not sexy. It's the boring old stuff that goes on behind the scenes," says Robert Poole, director of transportation studies at the libertarian Reason Foundation in Los Angeles. "Because of [politicians'] bias toward new construction and ribbon cutting, and the competition for funds ... it's really hard to do annual maintenance."

The cost of improving the nation's roads and bridges to the levels needed is estimated to be $155.5 billion, according to the American Association of State Highway and Transportation Officials. And the backlog is increasing: The $75 billion in annual spending by federal, state, and local governments combined falls short of levels needed just to maintain the status quo.

Most of the available money comes from gasoline taxes.
The federal government hasn't raised the tax since 1993, while the cost of construction materials has jumped dramatically in recent years due to Chinese demand for materials like concrete and steel. The federal highway trust fund is expected to run dry by 2009.

During the debate in Washington over the last transportation appropriations bill in 2005, raising the gas tax was never on the table. Instead, lawmakers inserted 6,300 earmarks worth $24 billion to fund home-district projects, including the infamous "bridge to nowhere" in Alaska.

메모 포함[l46]: Bridge to nowhere in Alaska

"The bridge to nowhere and other ridiculous spending decisions have given a terrible name to the incredibly important work of fixing infrastructure," says Minneapolis Mayor R.T. Rybak.

Even before last week's disaster, 71 percent of motorists said they favored increasing spending on transportation, according to a American Automobile Association poll taken in November. But by a two-to-one margin they preferred tolls over gas tax raises. Mr. Poole interprets the preference for tolls as a desire for fundraising that is tied to specific and useful projects.

Some states are experimenting with new types of tolls. In California, Orange County and San Diego are charging tolls for single-occupant vehicles that want to travel in the high-occupancy vehicle lanes. The toll amount varies depending on traffic volume and can be as high as $9.

Chicago and Indiana have experimented with privatizing roads as a way out of the budget battles involved in road construction and maintenance. Under these deals, investors pay to lease a road or finance the construction of a new one in exchange for the ability to collect and keep toll money. The contracts bind investors to maintain the road and may set annual limits on toll raises.

The momentum of public-private partnerships has slowed as similar proposals have faced setbacks in New Jersey and Pennsylvania. But the idea might be revived given new pressure on politicians to undertake expensive infrastructure fixes. As the head of Minnesota's Department of Transportation pointed out, the state's gas tax would have to be raised more than 30 cents a gallon to fully rehabilitate the state's bridges.

"There's probably going to be no alternative but to turn to tolling and maybe public-private partnerships to fix the backlog of deficient bridges," says Poole, a leading advocate for highway privatization.

For now, most experts, however, suggest that the economics of the privatization model are too new to expect widespread adoption of it. There are also concerns about tolls making a patchwork quilt out of the Interstate system.

Many experts argue that what's needed is another national plan for the highway system now that the Eisenhower's Interstate project is finished.

"There is no clear vision," says Robert Dunphy, senior resident with the Urban Land Institute. "If you had this broader vision of what we're accomplishing with the money, it would be kind of a self-fulfilling prophecy in a way. Everyone would buy [in]."

Some question, though, whether the reaction to the Minneapolis disaster is spawning a rush to spend more money rather than spend it more wisely.

"We've got to look more critically at maintaining what we already have, and, secondly, look skeptically at new construction to make sure it's a good investment," says Steve Ellis, vice president of Taxpayers for Common Sense in Washington, DC.

But in Minnesota, longtime advocates for more state spending on roads and bridges say it's past time to bite the bullet and raise taxes and fees. After the governor vetoed a gas tax increase in May, State Sen. Steve Murphy (DFL) warned about the consequences for public safety – words he now regrets since he rejects insinuations that the veto caused the I35W bridge collapse. The National Transportation Safety Board is continuing its long-term investigation, focusing attention now on metal plates called gussets that join steel beams.

Senator Murphy, chairman of the Senate's transportation committee, says the state could raise sales and excise taxes, levy new vehicle transaction fees, or issue new bonds. Also possible is a model being tested in Oregon that taxes mileage rather than fuels. When motorists fill up, the pump takes a mileage reading and adds a per-mile fee to the gas purchase.

Last remains in bridge collapse recovered; toll is 13

MINNEAPOLIS (AP) — The remains of the last person missing after a bridge collapsed into the Mississippi River nearly three weeks ago have been found, authorities said Monday, bringing the official death toll to 13 and relief to the only family still awaiting word on a missing loved one.

Gregory Jolstad, nicknamed "Jolly," was on the construction crew that was resurfacing the bridge when it fell Aug. 1 during the evening rush hour. Jolstad, 45, was driving a skid loader, commonly known by the brand name Bobcat.

Divers had gone back in the water early Monday, and Jolstad's wife, Lisa Jolstad, had said officials vowed to continue until they found her husband.

The recovery, announced by the Hennepin County medical examiner, ends the search for bodies and allows construction crews to proceed with removing the collapsed pieces of the bridge.

"There aren't a lot of smiles here tonight," said Sheriff Rich Stanek, who was overseeing the search. "We all have very heavy hearts. It weighed on a lot of people, both personally and professionally."

FIND MORE STORIES IN: Mississippi River | Mora | Greg Jolstad

Stanek said that he spoke with Lisa Jolstad about the recovery and that "she appreciated very much both the dignity and respect we afforded those families."

Greg Jolstad, 45, was one of 18 construction workers on the bridge working for Progressive Contractors Inc. The other 17 survived the collapse. Seven suffered injuries, but none critical.

Also Monday, Gov. Tim Pawlenty asked President Bush to declare the collapse a major disaster, which would make the state eligible for more federal money. The governor said the emergency response costs alone would be more than $8 million.

Bush was scheduled to be in Minneapolis on Tuesday and to get a briefing on the bridge.

Jolstad had worked for PCI for 10 years, often commuting 90 miles one way to road jobs in the Twin Cities from his home in the central Minnesota town of Mora.

Lisa and Greg Jolstad were married in 1995 and lived with Lisa's three teenage children from a previous marriage in a 97-year-old farmhouse north of town where Greg Jolstad grew up.

"Greg never wanted to venture far from home," Lisa Jolstad said.

Her worst fear since the collapse was that her husband would still be missing after all the other victims of the disaster had been found — and that's exactly what happened.

A tax assessor currently between jobs, Lisa Jolstad is living for now on her husband's paycheck, which PCI continued to issue, as well as paying for grief counselors for family members.

"Everyone at the company is just heartsick for Greg's family," said David Lillehaug, PCI's attorney.

Lisa Jolstad said earlier that she was trying to keep occupied by getting the farmhouse ready for winter.

"I sit home every night, and I just can't believe he's not coming home," she said. "I look out the back door window and it's weird not to see his truck out there. I look out the bathroom window at the sky and know he's up there, and I say, you know, why did you have to leave, Greg?"

Experts tie pigeon dung to Minn. collapse

ST. PAUL (AP) — Pounded and strained by heavy traffic and weakened by missing bolts and cracking steel, the failed interstate bridge over the Mississippi River also faced a less obvious enemy: Birds, specifically pigeons.

Inspectors began documenting the buildup of pigeon dung on the span near downtown Minneapolis two decades ago.

Experts say the corrosive guano deposited all over the Interstate 35W span's framework helped the steel beams rust faster.

Although investigators have yet to identify the cause of the bridge's Aug. 1 collapse, which killed at least 13 people and injured about 100, the pigeon problem is one of many factors that dogged the structure.

"There is a coating of pigeon dung on steel with nest and heavy buildup on the inside hollow box sections," inspectors wrote in a 1987-1989 report.

FIND MORE STORIES IN: Minn | Department of Transportation

In 1996, screens were installed over openings in the bridge's beams to keep pigeons from nesting there, but that didn't prevent the building of droppings elsewhere.

Pigeon droppings contain ammonia and acids, said chemist Neal Langerman, an officer with the health and safety division of the American Chemical Society. If the dung isn't washed away, it dries out and turns into a concentrated salt. When water gets in and combines with the salt and ammonia, it creates small electrochemical reactions that rust the steel underneath.

"Every time you get a little bit of moisture there, you wind up having a little bit of electrochemistry occurring and you wind up with corrosion," said Langerman. "Over a long term, it might in fact cause structural weaknesses."

Langerman emphasized that he wasn't saying pigeon dung factored into the collapse of the 40-year-old bridge. "Let's let the highway transportation and safety people do their job," he said.

The problem is familiar to bridge inspectors everywhere.

The Colorado Department of Transportation spent so much time cleaning pigeon manure off bridges that it is embarking on a two-year research project looking for ways to keep pigeons away from its spans.

"It can be damaging to our structures because it's slightly acidic and it has other compounds in it that can dissolve especially things like concrete," said Patricia Martinek, the agency's environmental research manager.

Pigeon guano isn't just a danger to the bridges.

In the Denver area, the Colorado DOT pays outside environmental specialists to clean bridges wearing full biohazard suits with respirators because of heightened fears about bird flu and other diseases, said Rob Haines, who supervises maintenance there.

Keeping pigeons off bridges usually requires a multi-pronged strategy that can include netting to block holes and surfaces, spikes to keep them from landing, and sometimes poisoning, shooting or trapping the birds, said John Hart, a Grand Rapids, Minn.-based wildlife biologist with the U.S. Department of Agriculture.

The problem is that pigeons are naturally drawn to bridges and tall buildings since they're descended from cliff-dwellers, said Karen Purcell, who heads Project PigeonWatch at the Cornell Lab of Ornithology. Bridges offer shelter from predators and flat surfaces for nesting and roosting.

"It's a nice fit for them," Purcell said.

Meanwhile, the National Transportation Safety Board issued an update on its findings in the collapse Wednesday, saying investigators are looking at whether chemicals used in an automated de-icing system had any corrosive properties.

The state Transportation Department wasn't concerned about the system; in fact, the agency is planning to install a similar system on the replacement bridge, said Khani Sahebjam, a state transportation engineer.

The de-icing elements are inside the concrete deck, Sahebjam said, so he wouldn't expect them to pose a structural problem.

The automated system was triggered by weather conditions and kept the state from having to send crews to spread de-icing chemicals, Sahebjam said.

Scores of bridges 'deficient' since '80s

Enlarge By Joshua Adam Nuzzo, AFP/Getty Images

Navy divers survey the wreakage of the Interstate 35W bridge collapse in Minneapolis.

By Brad Heath, USA TODAY

Dozens of the nation's highway bridges that fell into disrepair 25 years ago still need overhauls to fix cracks, corrosion and other long-festering problems, a USA TODAY analysis of federal inspection records shows.

At least 96 interstate highway bridges rated "structurally deficient" by government inspectors in 1982 had the same rating last year, suggesting they weren't fixed or had lapsed and again require repair, according to the records. Those spans carry 3.8 million cars and trucks every day.

Such crossings face increased scrutiny after an interstate bridge in Minneapolis plummeted into the Mississippi River on Aug. 1, killing 13 people and triggering a wave of renewed safety inspections across the country. That collapse, still under investigation, also sparked calls from lawmakers to accelerate long-delayed — and costly — repairs.

"I think the challenge is that as these bridges continue to have their lives extended with maintenance, the states don't have the funds to go ahead with the types of replacements that some of the bridges will ultimately need," says Frank Moretti, director of policy and research for TRIP, a transportation advocacy group.

Some of the 96 bridges appear not to have undergone major overhauls since they were listed as deficient in 1982.

Many others have been fixed and since relapsed to being "structurally deficient" again. That rating means some parts of the bridge need to be scheduled for repair or replacement.

The Interstate 35W bridge that collapsed Aug. 1 was listed as deficient in 1990, though investigators did not judge it dangerous. About 2,800 interstate spans were listed as deficient last year, U.S. Transportation Department records show.

"We're confident these bridges are safe," says Charles Carrier, a spokesman for the Department of Transportation in New York, where 35 bridges made the list. "If we can't keep them safe, we close them."

Carrier and authorities in other states said some of the bridges have been patched this year, and

others are scheduled for repairs. Most will need to be replaced or overhauled, says Kazem Farhoumand of the Rhode Island Transportation Department.

"You need more than just maintenance," he says. "You have to spend a lot of money and a lot of time and a lot of effort."

The National Transportation Safety Board is investigating the Minneapolis bridge collapse. Investigators are checking the bridge's de-icing system and examining the weight of construction materials and vehicles that were on it before it fell.

Harp Road Detour Now In Place

Mon, 20 Aug 2007 7:59:00 PDT

Grays Harbor County Commissioners meet this afternoon. They will be drafting a resolution for a local declaration of emergency and will get an emergency road use agreement worked out with Weyerhaeuser Company following the Harp Road bridge collapse near Oakville last week.

Commissioner Al Carter says Weyerhaeuser was very cooperative with the county to get a short route on their land in place around the Harp Road bridge problem.

Anne Sullivan from the Grays Harbor County Emergency and Risk Management office says the four-mile detour runs from Harp Road to Garrard Creek Road to help give area residents a shorted route to and from their homes. The bypass road will be open to passenger cars and light trucks only. Before, residents were forced to use a 23-mile route on rural and logging roads to around the damaged bridge.

Carter says no word yet on when the Harp Road bridge will be replaced.

The detour was needed after the 68-foot bridge collapsed into Garrard Creek under the weight of a big rig truck hauling an excavator on Tuesday.

Toll in Pakistan collapse rises to 6

By ZARAR KHAN, Associated Press Writer Sun Sep 2, 6:05 AM ET

KARACHI, Pakistan - Rescue workers pulled out two more bodies Sunday from the rubble of collapsed overpass in Pakistan's largest city of Karachi, increasing the death toll to six, an official said.

Authorities also began a probe into why a section of the newly constructed bridge came crashing down Saturday. Thirteen others were injured.

At least two cars, a police van and a donkey cart were crushed under masonry when the 330-foot-long section of the bridge fell about 50 feet onto the road below.

Rescue workers pulled out the bodies of two men on Sunday before the rescue operation was called off, Mayor Mustafa Kamal said.

"There is no evidence any dead body or any survivor is trapped," he said.

Workers using heaving machinery were clearing the debris of twisted steel and concrete slabs, he said.

Authorities have suspended six officials from the state-run National Highway Authority, which is responsible for supervising highways in Pakistan, and the National Logistic Cell, a military-run construction company that built the Karachi bridge, said Shamim Siddiqi, minister for communications.

Those suspended include an NHA official who oversaw construction of the bridge, Siddiqi said. Investigators also have seized records relating to the project, he said, without specifying what may have caused the bridge to collapse.

The bridge was inaugurated by President Gen. Pervez Musharraf in August

Senate OKs $1B to repair U.S. bridges

WASHINGTON (AP) — The Senate approved $1 billion on Monday to speed repair and replacement of America's crumbling network of bridges, six weeks after the Interstate 35W span collapsed in Minneapolis.

The Senate approved the funds on a 60-33 vote as the Senate began debate on a $104.6 billion measure funding transportation and housing programs for the budget year beginning Oct. 1.

"Our bridges are deteriorating far faster than we can finance their replacement," said Sen. Patty Murray, D-Wash., lead sponsor of the bridge-repair funds. "More than one in every four bridges on U.S. highways is rated as deficient."

If approved, the Democratic plan would boost federal funding next year for bridge repair and replacement by 20%, but would barely make a dent in the $65 billion nationwide backlog of bridge repairs identified by the Department of Transportation.

The underlying bill faces a veto threat from President Bush, however, for exceeding his request by $4.4 billion.

"Fully 27% of our 600,000 bridges have aged so much that their physical condition or their ability to withstand current traffic levels is simply inadequate," Murray said. "Roughly half of these deficient bridges — or about 78,000 bridges across the nation — are structurally deficient."

The infusion of bridge repair funds would be paid for by tapping the dwindling reserves of the highway trust fund. Gasoline tax revenues are coming in below estimates and are unlikely to be able to fund highway programs at the levels set forth by the 2005 highway bill.

Sen. Christopher Bond, R-Mo., countered that lawmakers "should not overreact to the Minnesota bridge collapse by spending more money ... than is available."

White House budget office spokesman Sean Kevelighan said the Bush administration opposes the idea since it would speed up the depletion of the highway trust fund.

The money would not go to replacing the fallen Minneapolis bridge; rather, it would be delivered to state highway departments according to a funding formula set by Congress two years ago.

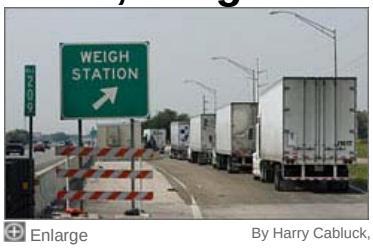
Congress moved immediately last month to pass a law approving a $250 million replacement bridge. But that legislation simply authorized the bridge, but did not provide actual funding.

Amy Klobuchar, D-Minn., said Monday she would offer an amendment to pay for the Minneapolis bridge replacement during debate on the transportation spending bill.

"It would be ironic if the Congress provided $1 billion for bridge repair across the country and didn't fix our bridge," Klobuchar said. "That won't happen and that can't happen."

Sen. Norm Coleman, a Republican facing re-election next year, said the White House has made a commitment "that the money will be there."

Thousands of overweight trucks punish roads, bridges



Enlarge By Harry Cabluck, AP

Drivers wait to enter a weigh station maintained by Texas Department of Public Safety troopers on Interstate 35, Aug. 31, in San Marcos, Texas. More than a half-million overweight trucks are allowed onto the nation's roads and bridges -- a practice that some officials say is dangerous for already weak infrastructure.

Texas Department of Public Safety Senior Trooper Randy King, right, motions a trucker off the scales at an Interstate 35 weigh station.

Enlarge By Harry Cabluck, AP

By April Castro, Associated Press

More than a half-million overweight trucks are allowed onto the nation's roads and bridges — an increasingly routine practice that some officials say is putting dangerous wear and tear on an already groaning infrastructure.

In interviews with The Associated Press, some experts warned that the practice of issuing state permits that allow trucks to exceed the usual weight limits can weaken steel and concrete, something that investigators say may have contributed to the Minneapolis bridge collapse Aug. 1 that killed 13 people.

"We talk about this all the time and the fear that we have is that we're going to have the same sort of disaster here that happened in Minnesota," said Don Lee, executive director of the Texas Conference of Urban Counties.

In 2000, Milwaukee's Hoan Bridge collapsed when steel girders cracked. Several factors were blamed for the collapse, including a significant number of heavy trucks, some over the normal weight limit, that routinely traveled over the bridge.

The weight limit for nearly all interstate highways is 40 tons. According to a government study, one 40-ton truck does as much damage to the road as 9,600 cars.

But permits frequently allow vehicles to exceed that amount by two tons in Texas and sometimes as much as 85 tons in Nevada. Some states grant one-time permits that allow trucks to be considerably heavier.

Around the country, many transportation officials dismiss such fears as overblown and say roads and bridges are safe, though some express concern that not enough is being spent to repair the damage done by extra-heavy trucks.

As for why they issue overweight-load permits, many state officials said they have no choice — they are simply carrying out the laws as passed by the legislature. Critics of those laws say they are often written to benefit powerful local industries, such as logging in the West, or oil and gas in Texas.

In the vast majority of cases, a single truck can safely pass over a sound bridge, even if the rig is way over the posted weight limit. But the cumulative effect of stress on the steel and concrete can eventually prove deadly.

Engineers liken the effect of heavy trucks on a bridge to bending a paper clip: It can bend again and again without breaking, but eventually it will snap.

Many states charge fees ranging from $12 to $1,000 for overweight-load permits, depending on the weight of the load. In theory, those fees are supposed to offset the damage done to the highways.

Texas, for example, granted nearly 39,000 such permits in the past year, generating $7.5 million, most of which was divided among the state's 254 counties for road maintenance.

"That in no way even comes close to covering the wear and tear on our roads and bridges in this state," said Chris Lippincott, a spokesman for the Texas Department of Transportation.

Darrin Roth, director of highway operations at the American Trucking Association, said it is not fair to put all the blame on trucks because permit loads are a tiny proportion of total traffic.

States allowed more than 500,000 overweight trucks to traverse the nation's bridges and highways at will in the past year, according to an AP review of figures in all 50 states. Those permits were good for an entire year. While 10 states do not issue year-long permits, all states hand out shorter-term permits good for a few days, weeks or months. Those add up to more than 1.8 million permits not included in the AP's count.

Many states, including Texas, have reported a modest increase in the number of overweight-load permits issued in recent years — a rise that Roth said can be attributed to a 2.5% to 3% annual increase in truck traffic because of the growing economy.

Eric Lockwood, who routinely carries 42 tons of hot oil all over Texas and has a state-issued overweight-load permit, said he doesn't worry much about bridges and weight limits.

"From what I understand, the way those bridges are engineered and built — even the ones that do have a weight limit on them — you can grossly exceed that weight limit without having a problem," Lockwood said, stopping to rest in New Braunfels after an early morning run from Houston. "That's what I've heard. I don't know what the truth is."

The permit does not allow him to travel on interstate highways, but he said he does so anyway about half of the time. When he gets ticketed, his company pays the fine, he said.

He recalled crossing an old wooden bridge with no guardrails recently to deliver fertilizer to an East Texas rancher. "I've never really given it a second thought," he said.

California is more cautious with its overweight permits. Truckers in California, where about 23,000 single-trip permits are issued annually, must request permission to travel on a specified route for each trip.

California transportation officials said they perform an extensive review to ensure the load can safely travel on the requested highways without damaging pavement and bridges. Often, truckers are required to reduce their loads.

But in Colorado, where almost 21,000 permits are issued annually, truckers are given a map with their overweight permits showing how much weight bridges around the state can handle. Drivers there operate on the honor system, and officials say they have no way of knowing if drivers are taking bridges appropriate for their loads.

"There's definitely room for improvement," said Colorado Transportation Department spokeswoman Stacey Stegman. "But by no means are we alarmed."

The danger is magnified by a recent federal finding that 18% of the nation's bridges either do not have weight limits posted or incorrectly calculated the weight limits that are posted. Also, a federal study last year classified 26% of the nation's bridges as either structurally deficient or functionally obsolete.

In the year before the Minneapolis disaster, the cause of which is still under investigation, the state Transportation Department granted permits for 48 overweight loads, including construction cranes and supplies weighing as much as 72½ tons.

The bridge had been categorized as structurally deficient, one of over 73,000 U.S. bridges with that designation last year.

Generally, trucks are not allowed to exceed the 40-ton weight limit on interstate highways. However, some stretches of interstate have higher weight limits because they were grandfathered in when the federal interstate system was created during the Eisenhower administration.

The numbers compiled by the AP do not include certain vehicles that states allow to operate without obtaining overweight-load permits. In Texas, for example, vehicles transporting ready-mix concrete, milk, solid waste, recyclable materials, seed cotton or chile pepper seedlings are not required to have an overweight permit on state roads, even if they are over the limit.

Similar exemptions exist in other states.

State policies vary greatly, with some much more lenient than others. Many states will not issue permits for loads that can be easily split up and carried at safer weights.

"It's one of the most befuddling policies we deal with, that we spend millions of dollars to build roads ... and the state comes along and for a pittance gives out a permit to allow trucks to destroy those roads in a matter of months or years," said Lee, the Texas official.

—

Associated Press writers Aaron Davis in Sacramento; Colleen Slevin in Denver; and Martiga Lohn in Minneapolis contributed to this report.

$8B in pork clogs U.S. infrastructure plans

By Ken Dilanian, USA TODAY

WASHINGTON — Six weeks after a fatal Minneapolis bridge collapse prompted criticism of federal spending priorities, the Senate approved a transportation and housing bill Wednesday containing at least $2 billion for pet projects that include a North Dakota peace garden, a Montana baseball stadium and a Las Vegas history museum.

That's not the half of it.

Total spending on transportation "earmarks" next year is likely to be about $8 billion, when legislative projects from a previously approved, five-year highway bill are factored in. A newly released report by the Department of Transportation's inspector general identified 8,056 earmarks totaling $8.5 billion in the fiscal year that ended in October, or 13.5% of the Transportation Department's $63 billion spending plan.

The inspector general's report found that the vast majority of earmarks — project-specific spending instructions written into bills, usually by lawmakers — were not evaluated on their merits, and that many "low-priority" earmarks often squeezed out more important projects.

The Federal Aviation Administration, for example, had to delay updating high-priority air-traffic control towers in favor of lower priority facilities requested by legislators, the inspector general found.

The report — requested by Sen. Tom Coburn, R-Okla., a vocal critic of earmarks — does not name the airports.

After the Minneapolis bridge collapse last month, Sen. John McCain, R-Ariz., and others pointed out that Congress for years failed to fund repairs on scores of "structurally deficient" bridges even as lawmakers earmarked money for projects such as the "bridge to nowhere" in Alaska.

Rep. Jim Oberstar, D-Minn., who chairs the House Transportation and Infrastructure Committee, has proposed a temporary 5-cent-per-gallon gas tax increase that he said would raise $25 billion over three years to help reduce the backlog of critical bridge repairs. Among Oberstar's earmarks in the House transportation bill is $250,000 for a bike trail in his district, which he has defended as legitimate. He did not respond to a request for comment.

Sen. Patty Murray, the Washington state Democrat who chairs the subcommittee that drafted the $106 billion transportation and housing bill, defended the bill and pointed to insertion this week of an additional $1 billion for bridge repairs.

Coburn's staff identified 500 earmarks in the bill, totaling $2 billion, that were publicly disclosed under new rules designed to shed some light on the practice.

"No one in America seriously believes that bike paths, peace gardens and baseball stadiums are more important national priorities than bridge and road repairs," Coburn said.

Coburn and a handful of other lawmakers routinely try to strip bills of earmarks, only to see colleagues crush them with bipartisan efficiency.

On Tuesday, Coburn offered an amendment prohibiting spending on earmarks until every structurally deficient bridge was fixed. It lost, 82 to 14.

The bill, which President Bush has threatened to veto, must now be reconciled with the House-approved version. That measure contains, among other earmarks, money for a California mule and packer museum.

since 2007. 12. 30 (sun)

MnDOT doubted a plan to bolster bridge

A consultant urged new plates for the aging I-35W bridge, the same plates that are now the focus of a federal inquiry, records show.

By Mike Kaszuba and Pat Doyle, Star Tribune
Last update: November 10, 2007 - 6:09 PM

In the year before the Interstate 35W bridge collapse, the engineering firm that studied the structural safety of the bridge found itself at odds with state transportation officials as it pushed a plan to reinforce the aging structure.

According to newly released documents from the Minnesota Department of Transportation, consultant URS Inc. played a diminishing role in decisions about the bridge even as it prepared its final report on its maintenance.

The records also show that URS was puzzled when MnDOT suddenly cast doubt on the consultant's $2 million plan to strengthen the bridge with steel plates.

The documents -- a mix of 13,500 e-mails and other communication from 2003 through 2007 -- offer the most complete look yet at the partnership between MnDOT and the San Francisco-based consultant, which had spent three years doing computer modeling and analysis on the 40-year-old bridge.

The Star Tribune obtained the documents through a state data practices act request.

In the days after the collapse, MnDOT said state officials and URS had mutually decided to explore other options instead of bolting steel plates to bridge sections at risk of cracking. But the documents indicate the two sides had a substantive disagreement over how to proceed.

메모 포함[W47]: bolting steel plates gives a risk of cracking

Last December, after pushing for months to replate the bridge, URS abruptly moved closer to MnDOT's position of finding a less intensive way to ensure the bridge's structural integrity. Three weeks after a top URS official had reiterated that the chance of a bridge truss failure "should be significantly reduced" by the replating, the same official suddenly e-mailed a colleague that he no longer thought the replating was necessary.

Even the agreed-upon solution -- closer inspections -- did not proceed as URS expected. On July 19, two weeks before the bridge collapsed, URS official Don Flemming was caught by surprise when MnDOT inspected the bridge without the firm. "I saw them on the bridge, and asked if we were not going to get involved," wrote Flemming, who for 14 years had been the state's bridge engineer before being hired by URS.

MnDOT spokesperson Lucy Kender said in an e-mail that it was "completely erroneous" to conclude that the relationship between the agency and its consultant had deteriorated. A spokesman for URS declined to comment.

Analysis 'very well done'

MnDOT has said it based its decision to postpone the replating because of URS' concerns that the work could actually weaken the bridge. According to the documents, however, URS did not raise this concern when it recommended the replating in the fall of 2006. Nor do the documents indicate that URS was focused on the integrity of the bridge's gusset plates.

Federal investigators have a "working theory" that the bridge collapsed in part because of the failure of gusset plates, which connected the bridge's girders.

"It is true that we don't have much safety margin for local stresses but on the other hand the overall stability of the structural system is not easily to be jeopardized," URS wrote as the company finished a draft report a year before the collapse. In handwritten notes from a September 2005 consultants' meeting, a URS official wrote that "gusset plate buckling -- if this occurs, it is not catastrophic."

From the start, URS executives were eager to do an exemplary job on their contract with MnDOT to evaluate the 35W bridge.

"I view this project as an important opportunity for us to get more work of this type from MnDOT in the future," Ed Zhou, a senior URS structural engineer, wrote in 2003. "This bridge will need deck replacement and rehabilitation."

For more than two years, URS consistently said that the bridge needed a major steel replating, according to the documents. That changed in a matter of weeks late last fall.

In the summer of 2006, URS formally recommended the replating project in its draft final report on the 35W bridge. MnDOT bridge design engineer Kevin Western told the consultant in an e-mail that "in general, the report and analysis was very well done."

At the same time, MnDOT raised concerns about the report's main recommendation.

"It's likely that retrofit of main members may be postponed for 15-20 years once an overlay is placed next year," MnDOT assistant bridge engineer Gary Peterson wrote in commenting on the draft report.

Instead of a major replating project, Peterson added, maybe MnDOT could simply "purchase plates and bolts for one or two member repairs ... should a short unrepairable crack be discovered."

Peterson added that in-depth weld inspections would continue every five years on critical members, and a "visual, arms-length" inspection would occur every year.

'Zero-probability' possible

In earlier interviews, state bridge engineer Dan Dorgan said the replating project lost steam only following a January 2007 conference call when URS acknowledged that drilling required for the retrofit could in fact weaken the bridge.

More recently, Kender, MnDOT's spokesperson, said there were more factors in the agency's decision, with URS telling state officials that if inspections and testing showed no measurable cracks then their confidence in the bridge's structural integrity would increase.

When Peterson appeared to reject the replating idea, Flemming for one was taken aback. "Gary's comments seem more difficult to handle," Flemming wrote in an August 2006 e-mail.

"If we really experienced major crack propagation in a critical member that it may be too late to make such a repair in a timely manner," Flemming wrote, and then added that "I am very concerned that they are suggesting relaxing inspections to a five year cycle and that retrofit be postponed for 15 to 20 years."

Although Dorgan at the time stated that he remained committed to the replating, other comments by Peterson drew a concerned response from Zhou. Asked by Peterson at one point asked whether the bridge's "absence of crack[s] ... indicate a low probability of future cracking?" Zhou replied: "No one can explain why some fractures [on other bridges] happened after so many years," but added that "as we learned from probability and statistics, a zero-probability event may still happen."

As URS worked to finalize its report last November, Zhou was still committed to the retrofit plan. But e-mail exchanges show that by mid-December -- without explanation -- he had changed. "Based on all the results we have obtained, I strongly believe that doing a 2-million-dollar plating retrofit is not necessary," he wrote to Flemming on Dec. 13. Zhou did not return a phone call for comment.

Zhou instead recommended a plan to use electronic sensors to detect cracks. "After that, we should have the peace of mind just as good as doing the plating," he wrote. The idea was later rejected by

MnDOT, which determined the technology was unproven.

In the end, URS recommended three options: the original replating plan; a plan to do some replating combined with inspections, and a plan to inspect the bridge and repair any cracks that were found. MnDOT chose the third option, which was described by URS as the "most cost efficient." And although they signed a contract to use URS in a May inspection of the bridge, state officials went ahead without the consultant.

Thirteen days before the collapse, MnDOT official Todd Niemann sent an e-mail to colleagues to tell them a meeting would be held in August "to determine if inspection can safely and adequately identify potential critical defects."

URS engineers continued to tinker with a final report on the bridge through e-mail exchanges on Aug. 1 -- just three hours before the 35W bridge collapsed.

Staff writer Dan Browning contributed to this report. mkaszuba@startribune.com • 612-673-4388 pdoyle@startribune.com • 651-222-1210

Find this article at:

http://www.startribune.com/local/11558136.html?pt=y