**Minnesota Department of Transportation**
**Interstate 35W Mississippi River Bridge, Minneapolis**
**Fact Sheet - Oct. 16, 2007**

## Background on the I-35W bridge over the Mississippi

- Federal identification number 9340
- Designed by Sverdrup & Parcel
- Built in 1964 by Hurcon Inc. and Industrial Construction Company
- Industrial Construction Company constructed steel trusses and deck in the summer of 1965
- Bridge opened to traffic in 1967
- Original cost for the bridge was $440,740 to construct the piers and $4,828,262 to construct the bridge
- Carried about 140,000 vehicles daily, including 5,700 commercial vehicles
- Scheduled for reconstruction in 2020-25

## Design

- Deck steel truss was made up of three parts: the deck, superstructure and substructure
- The average life span of a deck steel truss bridge is about 50 years, compared to a 75-100 year life span of a typical bridge.
- 1,907 feet long, 14 spans
- Carried four lanes of traffic in each direction north and south. Three of those lanes were general lanes. The far right lane on each side is an acceleration/deceleration lane.
- In 1967, the bridge opened with striping that provided for three lanes of through traffic and the acceleration/deceleration lane.
- The bridge had a split deck (longitudinally parallel to traffic) and was 113 feet, 4 inches wide.
- The approach span superstructures were supported by 14 continuous 48-inch deep welded plated girders (five approach spans were at the south and six approach spans were at the north). Spans 6, 7 and 8 were the main river spans

and the traffic loads were supported by two steel deck trusses parallel with traffic. The truss was symmetrical with spans 6 and 8 each having a length of 266 feet.

- The center river span 7 was 456 feet in length. The truss was constructed of welded components and was approximately 60 feet deep at the landside river piers (piers 6 and 7). The two trusses were connected by welded floor beam trusses (running transverse to traffic) with 27-inch rolled steel beam roadway stringers running parallel carrying the deck and traffic loads to the floor beam trusses. The floor beam trusses were 12 feet in depth.

Similar bridges in Minnesota include:

1. Highway 23 bridge over the Mississippi River in St. Cloud
2. Highway 123 over the Kettle River in Sandstone
3. Highway 243 over the St. Croix River to Osceola, Wisconsin
4. and the First Street South bridge in Sauk Rapids.
5. There is also a bridge of somewhat similar design on Highway 61 near Gooseberry Falls State Park.

**Bridge capacity**

- The capacity of the bridge was rated safe for legal truck loads (up to 80,000 pounds per truck), which is the standard use for bridge design today. The bridge was rated to be safe to carry permitted (overweight) loads of up to 159,000 pounds.

**Inspection history**

- Had been inspected annually since 1993; before that, was inspected every two years.

- Last fracture critical inspection was in 2006. A special inspection of the weld details began in the spring of 2007. Mn/DOT intended to complete the inspection of all weld details and all remaining members in the fall of 2007. (See inspection reports on I-35W Bridge online at www.dot.state.mn.us/i35wbridge/history.html.)

- The 2006 Fracture Critical Bridge Inspection Report, prepared by a Mn/DOT bridge inspection team, describes specific problems that caused the superstructure to receive a poor rating. The poor rating can be attributed to corrosion at some areas where the paint system has deteriorated, poor weld details in the steel truss members and floor beams, bearings that are not moving as they were designed to move, and existing fatigue crack repairs to the truss cross beam and approach spans.

- Deficiencies were acknowledged in inspection reports dating back to 1997. Mn/DOT had taken several steps to address these deficiencies. Some cracking in the approach spans was repaired or was being monitored.

- The Bridge Office had contracted with the University of Minnesota in 2001 to evaluate the fatigue stresses within the truss. Field tests were conducted. Measured and calculated stress ranges were less than the fatigue threshold, therefore, it was concluded that fatigue cracking was not expected in the deck truss. The following actions were recommended:
  - Structural components of the main truss with the highest stress ranges should be inspected thoroughly, every two years.
  - Critical locations of the floor trusses had high stress ranges, and should be inspected every six months.

- Although the report concluded that fatigue cracking was not expected to be a problem for the weld details used on the truss, Mn/DOT contracted with URS in 2006 to do a more in-depth fatigue and fracture analysis, and to determine whether the fracture of any single truss member would result in collapse of the bridge or whether the traffic load would be safely carried by other members of the bridge. URS made three recommendations in January 2007:
  1) Add redundant plating over the most critical 52 truss members
  2) Conduct a visual examination of all suspected weld details and remove measurable defects at suspected weld details of all 52 fracture critical truss members, or
  3) Do a combination of both 1) and 2).

  Mn/DOT had begun inspection of the weld details and no weld cracks were detected. Therefore, Mn/DOT did not proceed with option 1 at that time. Mn/DOT intended to complete the inspection of the weld details on all of the remaining members after the completion of the current construction project.

**Structurally deficient bridges**

- A bridge is rated as “structurally deficient” when part of the bridge is found to be in poor condition. Many bridges in poor condition are still safe for use. As deterioration continues, engineering analysis is sometimes necessary to re-compute the safe load capacity of the bridge. If the safe load capacity is less than today’s legal truck load (80,000 pounds per truck), the bridge is posted at the newly computed safe load capacity. The bridge was not under any restrictions.

- The condition of different parts of a bridge is rated on a scale of 1 to 9 (7, 8, or 9 are good condition ratings, 6 is satisfactory, 5 is fair, 4 is poor, 3 is serious, 2 is critical and 1 is closed). A structurally deficient bridge is one for which the deck, the superstructure or the substructures are rated in condition 4 or less. For this bridge, the superstructure was rated 4.

- In Minnesota, there are 1,097 bridges that are considered structurally deficient and that have a sufficiency rating less than or equal to 80. Of these bridges, 106 are on the state trunk highway system and 991 are on the local system.

**Federal report on bridges (NBIS database)**

- The National Bridge Inspection Standards require states to annually report condition ratings for all bridges in their states to the Federal Highway Administration. Each Mn/DOT district has inspectors who are trained to inspect and rate bridge condition. That information is forwarded to Mn/DOT's Bridge Office where it is compiled and forwarded to the FHWA. The FHWA uses that data to determine which bridges are structurally deficient and functionally obsolete.

**Recent work on the bridge**

- Work involved concrete and joint repair, lighting and guardrail installation
- Work was scheduled to be complete Sept. 30
- Cost for the work is $9 million
- The bridge roadway slab was nine inches thick. As part of the concrete work, the contractor milled (ground) off the top two inches of concrete and replaced it with new concrete.
- The outside two lanes in both directions had been completed so the overlay work was half done.
- Other concrete removal work was done using 45-pound jackhammers. Nothing larger was used to remove the concrete.
- In eight different spots, the concrete was completely replaced. Those spots were for expansion joint replacement and some full-depth repairs.
- The average size of a section that was entirely replaced was 26 feet by 3.5 feet

**Current traffic impacts**

- Visit www.511mn.org and www.mndot.gov for the latest traffic information