U.S. Department of Transportation
Federal Highway Administration

Technical Advisory

Inspection of Fracture Critical Bridges Fabricated from AASHTO M270 Grade 100 (ASTM A514/A517) Steel

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PURPOSE

The purpose of this Technical Advisory is to provide recommendations regarding the in-service inspection of, and the treatment of critical findings identified on, fracture critical bridges fabricated from AASHTO M270 Grade 100 (ASTM A514/A517) steel, more commonly known as "T-1" steel.

BACKGROUND

1. The I-64 Sherman Minton Bridge is a fracture critical bridge which consists of two 800-foot tied arch truss main spans that carry six lanes across the Ohio River between Louisville, Kentucky and New Albany, Indiana that was constructed between 1960-1961, before the material and fabrication requirements of the AASHTO/AWS Fracture Control Plan for this type of bridge were adopted.
2. As the result of in-service inspection, several cracks were found in the butt welds or their associated heat-affected zones of the tension ties of both spans. It was subsequently determined that the cracking was very likely caused by hydrogen that was introduced into the weld as the result of improper fabrication procedures. T-1 steel is known to be very susceptible to this type of cracking.
3. Earlier this year, retrofit and repair work to address those cracks and additional inspection work to verify the soundness of the remaining butt welds in the tie began.
4. On September 8, 2011, inspectors discovered an additional critical crack in the tension tie that previously could not be seen through visual inspection because of the removal of a connection plate detail as part of the ongoing retrofit process.
5. After study and analysis of this newly found crack, it was determined that an unacceptable level of risk to the traveling public was associated with the continued operation of the bridge. As a result, on September 9, 2011 the bridge was closed.

RECOMMENDATIONS

1. This Technical Advisory strongly recommends that State Departments of Transportation and other bridge owners review the inspection records of their inventory of fracture critical bridges to ensure any components fabricated with T-1 steel have been regularly and appropriately inspected and that any critical

findings have been properly identified and addressed. As defined in the National Bridge Inspection Standards, a fracture critical member inspection involves a hands-on inspection that may include visual and other nondestructive evaluation.

2. If deficiencies are found, follow up with those structures placing priority on inspection or remediation of components primarily in tension such as arch ties, hangers or truss members that contain butt welds.

3. It is also recommended that on fracture critical bridges fabricated using T-1 steel prior to the adoption of the Fracture Control Plan of the AASHTO/AWS D1.5-88 Bridge Welding Code, where cracks due to a lack of hydrogen control during welding have previously been found, that the soundness of all butt welds in those tension components be verified through visual and non-destructive testing unless this verification has been previously conducted.

King W. Gee
Associate Administrator for Infrastructure