



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

October 31, 2011

CIRCULAR LETTER 2011-17

FHWA TECHNICAL ADVISORY 5140.32 – AASHTO M270 GR. 100 STEEL

COUNTY ENGINEERS/SUPERINTENDENTS OF HIGHWAYS
MUNICIPAL ENGINEERS/DIRECTORS OF PUBLIC WORKS
CONSULTING ENGINEERS

The purpose of this Circular Letter is to bring awareness regarding the recommendations included in a recently published Technical Advisory by the Federal Highway Administration. Technical Advisory 5140.32, *Inspection of Fracture Critical Bridges Fabricated from AASHTO M270 Grade 100 (ASTM A514/A517) Steel*, is located at <http://www.fhwa.dot.gov/bridge/t514032.cfm> and provides recommendations regarding the inspection and treatment of structures fabricated from AASHTO M270 Grade 100 (ASTM A514/A517) steel, also known as "T-1" steel. This Technical Advisory was prepared in response to cracks found in steel on the Sherman Minton Bridge carrying I-64 over the Ohio River between Louisville, Kentucky and New Albany, Indiana, which required closure of the structure on September 9, 2011.

The Technical Advisory addresses issues found with welds, particularly butt welds, connecting T-1 steel. Based on our research, the department is focusing review of our inventory on fracture critical structures constructed from 1959 to 1995 to determine if the T-1 steel was utilized during their fabrication. This is the timeframe in which we believe use of T-1 steel began, and before the material and fabrication requirements of the AASHTO/AWS Fracture Control Plan were adopted.

Although the "T-1 Steel" designation more accurately describes the U.S. Steel Corporation's product meeting the requirements of ASTM A514 specification and its predecessors, it has become synonymous with many other types of steel of the same grade. The Technical Advisory applies to all of these grades of steel, not just those produced by the U.S. Steel Corporation. It is very unlikely the T-1 designation will appear on the design plans. The following descriptors are a partial list of how this grade of steel was called out on the design plans and/or contract documents:

1. Grade 100 steel
2. Specified allowable stress range correlating to the 100 ksi steel, typically an f_s greater than 50 ksi
3. ASTM A514 or A517
4. Quenched & Tempered (Q&T) Steel
5. High-Strength Steel

6. Heat-Treated Steel
7. Combinations of the above

Additional information, recommendations and clarifications from the FHWA are included in Attachment A. Further guidance can be found using the "Questions and Answers" link located on the FHWA *Technical Advisory 5140.32* website (link provided above).

We have compiled a list of fracture critical structures on the local system based on information contained in the Illinois Structure Information System (ISIS) and will forward this list to the districts for their dissemination to the appropriate local agency. Local agencies will be notified by their district if they have any structures on the list of fracture critical structures.

The FHWA "Questions and Answers" indicates *"it is not the intent of this TA to recommend re-inspection of bridges that have been previously properly inspected and maintained."* However, the plans and shop drawings for these structures should be reviewed to determine if T-1 steel was utilized. All local agencies should review their inventory to ensure all fracture critical structures have been identified and review the plans of any fracture critical structure constructed during the specified date range to determine if T-1 steel was utilized. Please also refer to *Circular Letter 2010-09 Bridges with Gusset Plates, Fracture Critical Members or Hoan Details*, <http://www.dot.il.gov/blr/manuals/infocirculars/CL2010-09.pdf>, for additional guidance on identifying fracture critical structures.

Although we expect very few such structures were constructed on the local system, it is important to identify those structures containing T-1 steel. Local agencies should contact the Bureau of Bridges and Structure's Local Bridge Unit for further discussion and guidance if they find that any of their structures were constructed with T-1 steel.

If you have any questions regarding this Circular Letter, please contact Jack Elston at (217) 785-8748 or jack.elston@illinois.gov.

Sincerely,



Darrell W. Lewis, P.E.
Acting Engineer of Local Roads and Streets



D. Carl Puzey, P.E., S.E.
Acting Engineer of Bridges and Structures

Attachment

cc: Dan Brydl, FHWA - Illinois Division
Gary Iles, Illinois Department of Natural Resources
Elias Ajami, Illinois State Toll Highway Authority
Bryan Smith, Township Officials of Illinois
Robert Miller, Township Highway Commissioners of Illinois
(Algonquin, McHenry County)

ATTACHMENT A

FHWA RECOMMENDATIONS/CLARIFICATIONS – September 15, 2011

5140.32 Inspection of Fracture Critical Bridges with T-1 Steel

1. This Technical Advisory (TA) 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 identified have been properly 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.

Discussion: It is recognized that most owners will reference their bridge design plans and/or contract specifications to identify which structures incorporate T-1 steel. The designation T-1, which more accurately describes the U.S. Steel Corporation product that met the requirements of ASTM A514 specification and its predecessors, has become synonymous with many of the corporate twins of that grade of steel. The intent of this TA is to address all of these grades of steel, not just those formally produced by U.S. Steel Corporation. Also, it is very unlikely that the product name of the steel will appear on the design drawings. The following descriptors are a partial list of how this grade of steel was called out on design plans and/or contract documents:

- a. ASTM A514
- b. Grade 100 Steel
- c. Quenched & Tempered (Q&T) Steel
- d. High-Strength Steel
- e. Heat-Treated Steel
- f. Combinations of the above

The adjective "alloy" may also appear in the description with any of the above.

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.

Discussion: As used in this provision of the TA, deficiencies include those found during previous inspections and any gaps in the inspection process. Also, while the emphasis is on this grade of steel with butt welds, it is intended that findings related to all type of welding on this steel be reviewed for appropriate follow-up actions.

3. It is also recommended that on fracture critical bridges fabricated using T-1 steel prior to the adoption of the modern Fracture Control Plan of the AASHTO/AWS D1.5-95* 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. (**Note – Amended from AWS D1.5-88 by FHWA Q & A*)

Discussion: While it is likely that most bridge owners adopted the AASHTO Guide Specifications for Fracture Critical Non-Redundant Steel Bridge Members when it was originally published in 1978, the Fracture Control Plan that it contained was not a Standard Specification until the 1988 edition of the AASHTO/AWS D1.5-88 Bridge Welding Code. The intent of this TA is to recognize any version of the Fracture Control Plan. If the design plans call out the AASHTO Guide Specifications, the AASHTO/AWS D1.5 or an equivalent contract specification, that bridge would not be subject to the review recommended in this TA.