



U.S. Department  
of Transportation

Federal Highway  
Administration

# Memorandum

Subject: **ACTION:** Use of High Strength  
Fasteners in Highway Bridges

Date: December 1, 2017

From: /s/ Joseph L. Hartmann, Ph.D., P.E.  
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Structures

In Reply Refer To: HIBS-10

To: Directors of Field Services  
Division Administrators  
Federal Lands Highway Division  
Engineers

## **PURPOSE**

The purpose of this memorandum is to provide updated guidance on the specification and use of high-strength fasteners in highway bridges.

## **SUPERSEDED DOCUMENTS**

This memorandum supersedes and cancels the following FHWA documents that are no longer relevant:

- April 26, 1978, Technical Advisory T 5140.3
- December 24, 1986, Memorandum “*A325 Bolts Possibly Not Meeting Specification*”
- July 18, 1988, Memorandum “*High-Strength Bolts*”

## **BACKGROUND**

In the 1970s and 1980s there were noted issues with high-strength bolts used in bridge construction. This was first addressed by FHWA in Technical Advisory T 5140.3 (Chg. 1) *A325 Galvanized Bolts – Quality Assurance* (April 26, 1978).<sup>1</sup> While that advisory seems to be a response to a particular failure investigation,<sup>2</sup> another memo published eight years later titled *A325 Bolts Possibly Not Meeting Specification* (December 24, 1986) included a specific alert that bolts not conforming to the appropriate ASTM standards had penetrated the market at that

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<sup>1</sup> This Technical Advisory was first published on March 24, 1978, though amended one month later to fix a grammatical error.

<sup>2</sup> The failure study was conducted by the FHWA Office of Research for the National Forest Service in support of their construction of a bridge over the Cathedral Falls Creek in the Tongass National Forest.

time. Because of these issues, FHWA conducted an extensive research project to evaluate the performance of both black and galvanized high-strength fasteners for highway bridges.<sup>3</sup> This research project revealed the need for national technical guidance and education in the areas of fastener specification, installation, and inspection. As a result, a memorandum titled *High Strength Bolts* (July 18, 1988) was published providing supplemental performance requirements for owners to consider on projects that used high-strength fasteners. In addition, FHWA developed training that contained a comprehensive treatment of known problems associated with high-strength bolts during this period.<sup>4</sup>

The concerns and recommendations expressed in the aforementioned FHWA documents are no longer relevant in current practice. The legacy recommendations from the 1985-1987 FHWA high-strength fastener research have since been incorporated into the current AASHTO and ASTM specifications, and there is no need for additional FHWA requirements. The FHWA has full confidence in the use of high-strength fasteners on highway bridge projects that comply and are installed with the appropriate AASHTO and ASTM standards, including the newly adopted ASTM F3125 *Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions*.

### **FHWA POLICY ON HIGH-STRENGTH FASTENERS**

At a minimum, Federal-aid bridge projects must use the high-strength fastener requirements included in the AASHTO *LRFD Bridge Design Specifications* 7<sup>th</sup> edition and AASHTO *LRFD Bridge Construction Specifications* 3<sup>rd</sup> edition as per 23 CFR 625.4.<sup>5</sup> The FHWA's only role is to ensure that high-strength fasteners are specified and installed to meet the intent of the Engineer, and the requirements of these specifications.

The AASHTO has decided that the new editions of their specifications will adopt ASTM F3125, reflecting the state of engineering practice. Some ASTM F3125 grades, and alternative fastener types as well, provide simplified installation procedures that may lead to cost-savings. All FHWA Division Office bridge engineers and Federal Lands Division bridge engineers should encourage the use of ASTM F3125 specifications on Federal-Aid and Federal Lands projects, and work with their partners to revise State DOT or Federal Agency and project specifications that currently reference withdrawn ASTM specifications.

The FHWA does not maintain a preference for or preclude any bolt grade under ASTM F3125, and is supportive of alternative fasteners that perform equally or better than ASTM F3125 fasteners.

The FHWA does not maintain a preference for installation method to be carried out by fabricators and construction contractors. Most bolts in bridges require pre-tensioning and the

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<sup>3</sup> Yura, J., K. Frank, and D. Polyzois, *High Strength Bolts for Bridges*, Report No. FHWA-RD-87-088, FHWA, Washington D.C. (1987).

<sup>4</sup> *High Strength Bolts for Bridges*, Report No. FHWA-SA-91-031, FHWA, Washington D.C. (1991).

<sup>5</sup> The FHWA updates 23 CFR part 625 periodically to incorporate revisions and interim editions of these and other specifications. Check the regulation to ensure that you are using the most recent editions that have been incorporated by reference.

*AASHTO LRFD Bridge Construction Specifications* outline four methods of pre-tensioning. In addition, FHWA no longer has any modification or additional requirements to the installation procedures in standard ASTM F3125. Owners have the flexibility to specify their own installation methods, inspection requirements, and quality control measures above and beyond those prescribed in the *AASHTO LRFD Bridge Construction Specifications*, provided that the final installed fasteners meet the function intended.

Please share this memorandum with appropriate staff and with all State DOT, Federal agency, and tribal government officials. Questions on the guidance can be directed to Dayi Wang at (202) 366-5604 or e-mail at [Dayi.Wang@dot.gov](mailto:Dayi.Wang@dot.gov), or to Brian Kozy at (202) 493-0341 or e-mail at [Brian.Kozy@dot.gov](mailto:Brian.Kozy@dot.gov).