



Technical Advisory

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Bolting Issues for Steel Bridges

Field Reports

The Bridge Division's Structural Steel field inspectors have reported two recent instances in which field-installed structural bolts for bridge members did not pass the job-site Rotational-Capacity (R-C) test as required by Item 447, Structural Bolting (Tex-452-A). The R-C test checks the bolt-nut assembly's performance in terms of ductility, lubrication, thread-stripping resistance, and strength. Two R-C tests are required: 1) one test is performed before the bolts are shipped and 2) another test is performed before installation at the job site. Failing job-site tests indicated the bolts were not sufficiently lubricated. In these cases, the bolt threads stripped in the R-C test device and bolts snapped in the structure during tightening.

Background on Bolted Connections for Bridges

Bolted connections for steel bridges are designed as friction connections. High-strength structural bolts develop a clamping force between the steel layers, and load is transferred by friction between the steel parts rather than bearing on the bolts. These bolts must be pretensioned to achieve this clamping force. The turn-of-the-nut tightening method described in Item 447 ensures proper bolt tension when the bolt or nut is turned the amount prescribed for the bolt length (refer to Table 5 in Item 447 in the 1993 Specifications). When a bolt is not sufficiently lubricated, it might not be adequately tensioned when turned the prescribed amount or might not turn the prescribed amount.

Field Lubrication

You can lubricate bolts in the field using stick wax or beeswax. The wax used for toilet bowl rings is also an effective and inexpensive alternative. **Note:* Lubricants such as soap and WD-40 have demonstrated little success. Apply the lubricant to the threads of the nut and to the nut face that will be in contact with the washer if the nut will be turned. If the bolt head will be turned, apply the lubricant to the underside of the bolt head as well. Perform a job-site R-C test on the re-lubricated bolts to ensure performance.



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Available Assistance

The Bridge Division's Construction and Maintenance Branch has 4 Structural Steel field inspectors who are available to serve as temporary inspectors for structural steel work on your projects. They are also available to train your staff on bolting and steel erection inspection if you wish to perform this work with your staff. Contact Brian D. Merrill, P.E., at 512-416-2232 or bmerrill@dot.state.tx.us to arrange such services.