

STEEL INTERCHANGE

Steel Interchange is an open forum for *Modern Steel Construction* readers to exchange useful and practical professional ideas and information on all phases of steel building and bridge construction. Opinions and suggestions are welcome on any subject covered in this magazine. If you have a question or problem that your fellow readers might help you to solve, please forward it to *Modern Steel Construction*. At the same time, feel free to respond to any of the questions that you have read here. Please send them to:

Steel Interchange
Modern Steel Construction
One East Wacker Dr., Suite 3100
Chicago, IL 60601-2001

Answers and/or questions should be typewritten and double-spaced.

Listed below are questions that we would like the readers to answer or discuss.

What is the upper limit on installed tension for A325 or A490 bolts?

There is no specified upper limit on the installed tension for a high-strength bolt that needs to be fully tightened. The Research Council on Structural Connections Specification for Structural Joints Using A325 or A490 Bolts gives a minimum tension requirement. One only has to make sure the installation method achieves the minimum tension.

The specification lists the acceptable installation methods to get the appropriate tension. There is no torque installation method for fully-tightened bolts. The differences between two people installing the bolt and starting at the snug tight condition will not have a great effect on the final preload.

The installed tension in a bolt will not effect the applied load on the bolt. Many people will state that since the fully tensioned bolt is installed to 70% of the minimum tensile strength, the applied load on the bolt can only be such that it causes a stress of 30% of the minimum tensile strength, but the installation subjects the bolt to a combined torque and tension. Once installed, the torque is removed and the bolt is subject to only a tensile stress which is always less than the combined stress.

What tension should be used when installing A307 bolts?

An A307 bolt is a soft bolt and can not take much tension, therefore there is no specified tension requirement for A307 bolts. These are installed only to the snug tight condition, that is to the point where the plies of the connected elements are brought together. This is defined in the Research Council on Structural Connections Specification for Structural Joints Using A325 or A490 Bolts.

This is also why A307 bolts can only be used in bearing type connections. Most bearing type connections need only be installed to the snug tight condition, slip-critical connections require fully-tightened bolts.

Submittals that have been prepared by word-processing are appreciated on computer diskette (either as a Wordperfect file or in ASCII format).

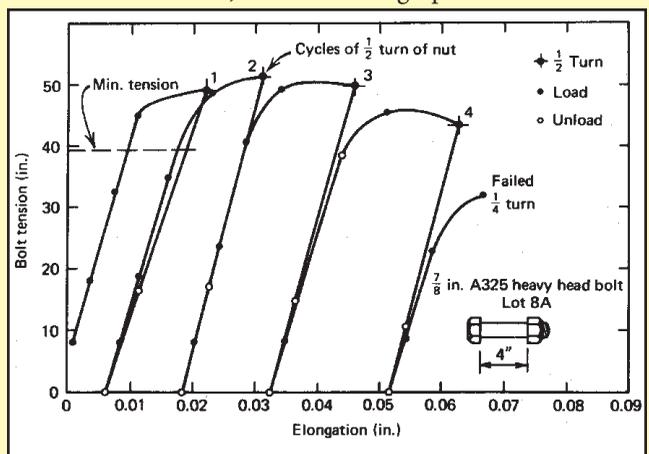
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Information on ordering AISC publications mentioned in this article can be obtained by calling AISC at 800/644-2400.

Obviously this will allow less involved inspection as well as easier installation. But because of strength you will need more bolts than if you used A325 bolts, therefore, it would be less expensive to use the higher strength A325 bolts.

Why are there limitations on reusing high-strength bolts?

An A325 bolt that is tightened multiple times exceeds the elastic limit and it can not achieve the same tension after repeated tightening. An A325 bolt will be able to reach the proper tension 3 or four times before the applied tension can not be reached the specified minimum. Therefore we allow A325 bolts to be reused at the discretion of the engineer. The figure from the Guide to Design Criteria for Bolted and Riveted Joints shows a graph of an A325 bolt



that is tightened, loosened and retightened.

An A490 bolt drops off much quicker so it should not be reused after it has been fully tightened.

What is the minimum stick through needed for a bolt?

The Research Council on Structural Connections Specification for Structural Joints Using A325 or A490 Bolts defines full thread engagement as when the bolt is flush with or outside the face of the nut. A stick-through requirement is not necessary because it will do nothing to

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improve the performance. Therefore, as long as the end of the bolt is at least flush with the outside face of the nut the bolt can be considered to be fully engaged.

What are the permissible variations in surface condition for structural shapes?

ASTM A6/A6M defines the permissible variations in the surface condition of structural steel plates and shapes as they are produced at the rolling mill. Since structural steel is usually furnished in the as-rolled condition, it should be recognized that surface imperfections (e.g., seams, scabs, etc.) Within the limits specified in ASTM A6/A6M may be present on the material received at the fabrication shop. Any special surface condition requirements, when needed in the as-rolled product, must be specified on the contract documents.

It should be remembered that material purchased to meet the requirements of ASTM A6/A6M is subject to acceptance or rejection based upon visual inspection both at the rolling mill and at the time of receipt by the fabricator. Occasional surface imperfections will appear that were not visible before fabrication and blast cleaning. Furthermore, because of the high temperatures and special problems associated with producing heavyweight cross-sections, and the inherent surface finish problems associated with certain steel chemistries (e.g., ASTM A588-weathering steel), the finish of these materials cannot be expected to be as fine as thinner lighter-weight cross sections and materials of other properties.

Surface variations that are discovered or occur after receipt of the material from the rolling mill or after blast cleaning and which are determined to be non-detrimental to the strength of the member need not be repaired or removed for cosmetic reasons, unless otherwise specifically stated in the contract documents. The responsibility for such repairs should be a contractual agreement, clearly understood by all parties involved, including the general contractor (owner), fabricator, erector, and painter.

Surface imperfections in heavyweight sections or weathering steel that are parallel to the line of stress and not detrimental to the end use of the member should be acceptable. The surface may appear mottled, pock-marked, pitted, alligatored, as having washboard ridges, etc. However, if these imperfections are detrimental to the intended service, they may be repaired by the fabricator by grinding or welding.

Steel Interchange Editor, Modern Steel Construction, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001.

Questions and responses will be printed in future editions of Steel Interchange. Also, if you have a question or problem that readers might help solve, send these to the Steel Interchange Editor.

One of the primary concerns in flexural design is the use of lateral bracing to control lateral-torsional buckling. What constitutes lateral bracing? Does the bracing member need to be a particular stiffness compared to the member being braced? Does it need to be a particular stiffness compared to the member being braced? Does it need to brace the compression flange, or will it serve its purpose if it braces the web? If the load is applied uniformly by a plate resting across the top flange of the beam, does the plate laterally brace the beam? What if the plate is welded to the beam?

James M. Gleason
George Koch Sons Inc.
Evansville, IN

What are coating requirements for steel that is going to be placed underground or in contact with the soil?

How does one figure out the K-factor for a column that is part of a frame braced with knee braces?

New Questions

Listed below are questions that we would like the readers to answer or discuss.

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