

# MBMA

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## New Bolt Specification *That's Right, Snug Tight!*

by

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### Introduction

The new edition of the *Specification for Structural Joints Using ASTM A325 or A490 Bolts* [1], was recently released by the Research Council on Structural Connections (RCSC) and will have a significant impact on the installation of bolts in most metal building systems. Connections using A325 high strength bolts will be permitted to be snug-tightened in most applications. This bulletin outlines the new provisions and how it will affect metal buildings.

### What is a Snug-Tightened Bolt?

RCSC defines the snug-tightened condition as "the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench to bring the plies into firm contact." Firm contact is further defined as "the condition when the planes of contact between two plies are solidly seated against each other, but not necessarily in continuous contact."

Since snug-tightened bolts do not require a specified pre-tension, the installation and inspection requirements are much less demanding. Snug-tightened bolts are not a new idea. They have been permitted in connections since 1985, but only where the load is transferred by shear in the bolts and bearing stress

in the connected material. The recent change, discussed in this bulletin, extends snug-tightened A325 bolts to connections where they are in tension or combined shear and tension, such as bolted end-plates, as long as the application involves static loading. It is important to note that static loading includes environmental loads such as wind and snow.

### Installation and Inspection

The bolt holes of snug-tightened joints are required to be aligned to permit insertion of the bolts without undue damage to the threads. Tightening of the bolts needs to progress systematically starting at the most rigid part of the joint. More than one cycle through the bolt pattern may be required to

achieve the required snug-tight condition.

The only inspection required for snug-tightened bolts is to verify that the proper fastener components have been used including washers where required, the connected plies are clean steel, the bolt holes meet the diameter and quality requirements, and the plies of the connected elements have been brought into firm contact.

### Building Code Acceptance

RCSC's adoption of these changes, that permit more widespread use of snug-tightened bolts, is the first step in the building code process. AISC has made the same revisions to their

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latest Specification, *Load and Resistance Factor Design for Structural Steel Buildings* [2], to permit greater use of snug-tightened bolts. These two organizations work in concert to make parallel revisions where there is mutual agreement. This further validates the technical merits of the revisions.

The model code groups, BOCA, SBCCI, and ICBO will not be releasing new editions of their respective codes in preparation for the transition to the International Building Code (IBC). Therefore, they will not be updated to officially adopt the new AISC Specification. It will however, be recognized in the 2003 edition of the IBC. While it must be the decision of the local authority having jurisdiction, it is anticipated that they would accept the latest AISC and RCSC recommendation on matters affecting bolting even before the eventual adoption of IBC 2003.

## Metal Building Applications

RCSC provides general guidelines for applications where bolts are permitted to be snug-tightened and when they need to be pretensioned or have slip in the joint prevented. AISC goes further in defining appropriate snug-tight applications for buildings.

According to both AISC and RCSC, as long as the bolt holes are not oversized or slotted, snug-tightened bolts are permitted in all low-rise buildings except for the supporting structure for cranes over 5-ton capacity or other machinery or equipment where live loads produce impact or reversal of stresses. However, this only applies to A325 bolts, which are most common in metal buildings. If A490 bolts are used, they must be fully tightened unless they are in shear/bearing with no tension present.

The use of snug-tightened bolts in seismic regions will require the judgment of the metal building manufacturer, taking into account the seismic design category of the particular application, or any specific requirements of the local authority having jurisdiction.

## What Led to This Change?

Research sponsored by MBMA, RCSC, and AISC over the past 15 years provided the basis for these changes. Dr. Thomas Murray of Virginia Tech was the principal researcher. He tested bolted end-plate connections using A325 high strength bolts to show that they had the same ultimate strength after being subjected to cyclic loading simulating the wind load that the building would be subjected to over the design life [3].

## Summary

The new RCSC and AISC provisions permitting wider use of snug-tightened A325 bolts in metal building applications will make installation and inspection much easier, without affecting the performance of the connections. This should be utilized where applicable to take full advantage of this change.

## References

- [1] Specification for Structural Joints Using ASTM A325 or A490 Bolts, Research Council on Structural Connections, Chicago, IL, June 23, 2000.
- [2] Load and Resistance Factor Design Specification for Structural Steel Buildings, American Institute of Steel Construction, Chicago, IL, December 27, 1999.
- [3] Murray, T. M., Kline, D. P., and Rojiani, K. B., "Use of Snug-Tight Bolts in End-Plate Connections," *Connections in Steel Structures II: Behavior, Strength and Design*, American Institute of Steel Construction, Chicago, IL, 1991, pp. 27-34.

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