

Got Fastener Training?

Structural Bolting Can Be Risky Business – What Suppliers Need To Know

by:

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Every experienced structural bolting supplier has war stories about things that have gone horribly wrong with structural bolt transactions or installations. Those fastener suppliers who only dabble in the structural bolting niche soon find out about the inherent risks associated with supplying structural bolting. Not only are there more risks, they are different than those found in other fastener product categories.

One aspect that can make structural bolt supply a particularly risky endeavor is that the supplier, whether a distributor or a manufacturer, is at the mercy of many different entities throughout the supply chain. Everyone from the raw material supplier to the job-site bolting installers and special inspectors can create a special kind of hell for the unaware structural bolting supplier. But it doesn't have to be that way. A well-informed and educated supplier with a well-developed risk management system can learn to avoid these pitfalls. In doing so, they become superior suppliers because as they protect themselves, they also protect their customers and the projects their customers erect.

So what are these pitfalls, booby traps and unexpected nightmares that can befall a bolting supplier, and what are the resources suppliers need to avoid them? Let's examine this through a few real-life examples. In the process we will highlight some of the specifications and resources you must know about to be a safe supplier.

In one recent structural steel building application, the job was almost shut down because the project special bolting inspectors believed nine different lots of tension control bolt (TC bolt) assemblies did not meet the required tension specifications. The bolts were various sizes and from two different manufacturers. The special inspectors insisted the bolts could not be used on the job, and those bolts already installed had to be removed and replaced. To make matters worse, this was on Thursday and concrete was scheduled to be poured on the floors with the suspect bolts on Monday.

Suppliers aware of facts about structural bolts know the mere description of this problem shows the issue could not possibly be with the bolts themselves. Suffice it to say, the supplier's awareness made it possible to bring a quick, decisive solution to the problem and keep all of the bolt lots on the job.

A key element of bringing a positive outcome to this situation was that the supplier was able to go to the job site with the expertise and equipment necessary to analyze the problem and make a case for his customer, the structural steel erector, to keep the bolts in place. One of the challenges was that there was already an adversarial relationship between the erector and the special inspector.

The supplier's technical expert quickly was able to discern that the problem had to do with the special inspector's tests, not with the bolts. Using their Skidmore Wilhelm Bolt Tension Calibrator, the supplier proved that the special inspector's bolt tension calibrator was being, and had been, used improperly. This caused their test to produce the erroneous results. The stop-work order was rescinded and the job continued on schedule.

In another situation, the contract test laboratory responsible for construction materials testing on a state regulated construc-

tion project rejected a lot of 7/8" x 2-1/4" ASTM A325 structural bolts. The reason for the rejection was failure of the bolts to pass the required wedge tensile test. These bolts already had been installed and tensioned on the job. Removing them would be very costly in both labor and job delays. Upon examining the laboratory's test report and comparing it to the original manufacturer's test report, the supplier's technical expert noticed the laboratory used an incorrect wedge angle in its test. However, the laboratory would not concede it had used an incorrect wedge for the test. Using the IFI Technology Connection and the *IFI Inch Fastener Standards Book*, 8th Edition, the supplier was able to present this information decisively to the laboratory manager and to the job-site special inspector. The bolts then were successfully tested with the proper wedge, and the job proceeded without delay.

OTHER AREAS INSIDE THE TECHNOLOGY CONNECTION					
ITC Home	Search Results				
Fastener Specification	You have entered the following criteria:				
Chemical Requirements	STANDARD ASTM A325-2010e1, Type 1				
Raw Material Conversion	Fastener Test Requirements				
Fastener Weights	Standard	Core Hardness	De-carburization	Proof Load	Wedge Tensile
Inspection Sample Size	ASTM A325-2010e1, Type 1	Yes	Yes	Yes	3D and Longer
Fastener Test Requirements	Wedge Angle, when Nom. Dia. ≤ 1.00	Wedge Angle, when Nom. Dia. > 1.00	Wedge Angle, when bolt or screw is threaded within 1D of head	Rotational Capacity	Surface Discontinuities
Locking Performance	Flange bolts and studs - 6°; all other 10°	Flange bolts and studs - 4°; all other 6°	6° for 1/4 - 3/4; 4° over 3/4"	Yes	ASTM F788
Tapping Hole Application Sizes					
Thread Depth Calculator					
Fastener Finishes					
Q&A Blog					
Technical Bulletins					
Technical Assistance					

An example of output from the IFI Technology Connection, Fastener Test Requirements Utility.

C = clearance of hole, (see Table 2)
D = diameter of bolt or screw,
R = radius or chamfer, (see Table 2)
T = thickness of wedge at thin side of hole, equals one half diameter of bolt or screw
W = wedge angle, (see Table 2)

FIG. 3 Wedge Test Details—Bolts

Table 2 Tension Test Wedge Angles

Nominal Product Size, in.	Degrees	
	Bolts ^A	Studs and Flange Bolts
1/4 through 1	10	6
Over 1	6	4

^AHeat-treated bolts that are threaded one diameter or closer to the underside of the head, shall use a wedge angle of 6° for sizes 1/4 through 3/4 in. and 4° for sizes over 3/4 in.

The *IFI Inch Fastener Standards Book*, 8th edition, shows details of ASTM F606 Wedge Tensile Test Requirements.

One more war story. A special bolting inspector had arrived on the job site to witness the final tensioning of pre-installed ASTM



F2280 TC bolts. The bolting had been installed snug-tight some weeks ago. Since then, there had been two rain storms and the bolting was totally exposed, resulting in significant corrosion to the bolting. In order for TC bolts to perform to specification it is essential the manufacturer's applied lubrication is not compromised in any way up through the time of final tensioning. One of the special bolting inspector's most important responsibilities when inspecting TC bolt installations is to ensure the lubrication in the bolt assemblies has not been compromised. This was clearly a case where this requirement had been violated and the bolting would need to be replaced. Fortunately, the bolting supplier had provided a technical resource that allowed the erector and the inspector an option. Referring to the RCSC's *Specification for Structural Joints Using High-Strength Bolts*, the supplier's technical expert was able to offer a solution that could keep the bolts in place.

These are just a few examples of the many structural bolting problems that can occur when supplying this product. Often times these problems do not have the kinds of positive outcomes illustrated here. The reasons include lack of training, lack of technical expertise and/or lack of the equipment necessary to solve the problem quickly by the bolting supplier. Time is always critical in these potential job-stopping situations.

At the **Fastener Training Institute® (FTI)**, we recognize that making the right training and resources available can be a life saver for the structural bolting supplier, whether a distributor or a manufacturer. To that end, we have developed a special one-day training program, *Structural Bolting Technology*. This hands-on training will cover the basics of structural bolting and related terminology along with advanced concepts including the difference between X and N structural bolts, and under-

standing types of structural connections (snug tight, slip critical, pre-tensioned).

Hands-on demonstrations will include use of the Skidmore Wilhelm Bolt Tension Calibrator and the Rotational Capacity Test, and how to access and use the specifications and standards that cover the manufacture and installation of structural bolts. Features of the three scenarios described above will be presented including exact details on how they were resolved along with many more real-life examples.

Structural Bolting Technology will be presented for the first time in La Mirada, CA, USA, on September 23, 2014.

Please contact the Fastener Training Institute to register for *Structural Bolting Technology* or to be placed on a mailing list for any fastener training courses at info@FastenerTraining.org.

And, check the website below for the other course offerings.

www.FastenerTraining.org

FTI

The **Fastener Training Institute®**'s core purpose is to enhance fastener use, reliability and safety.

Carmen Vertullo, CFS, is a manufacturing engineer and fastener consultant based in San Diego, CA, USA. His company, **CarVer Consulting**, works with fastener suppliers and end users to solve fastener problems, develop quality management systems and provide custom fastener solutions. He has been instrumental in the development of fastener training programs for associations, end users and suppliers. He is also one of the lead instructors for the Fastener Training Institute's Certified Fastener Specialist™ training program. Carmen Vertullo can be reached at carver316@gmail.com. To receive additional information, visit the website: www.FastenerTraining.org

