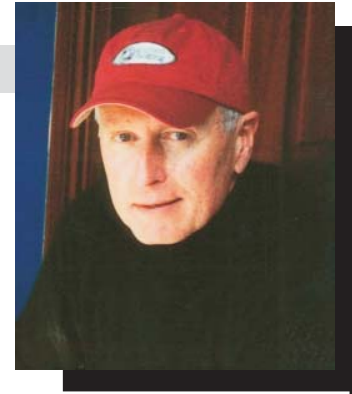


About the Author/WAYNE WALLACE

Wayne Wallace is the president of Applied Bolting Technology Products. The company provides bolting consulting services and manufactures direct tension indicating washers from its base in Rockingham, Vermont. Wallace is a member of the Research Council on Structural Connections, owner of several patents, and author of numerous papers on the practical aspects of quality assurance in structural bolting. He can be reached by phone at 800-552-1999, by fax at 802-460-3104, or e-mail at wwllace@sover.net.



Squirters — Technology For a Modern World

“**T**he times they are a-changin’” — Bob Dylan. There was a day when, if you wanted a steel erector to “snug” a connection, mark it, then hold the bolt head and rotate the nut either 1/3rd, 1/2, or 2/3rd turn, it would happen. Today, it probably won’t.

So we adjust to new times. Terrorism makes us tolerate TSA. High fuel costs force more efficient heating and transportation. We think Green in response to global warming. Every construction method is reassessed as new projects begin. Remember rivets?

Some types of steelwork need 25 or 35 bolts per ton, especially in severe earthquake zones. Installing and inspecting all these bolts can consume 20% of the field labor.

Around the world, the bolting workforce is becoming more and more “variable”. For “variable,” read less skilled. Not just the crews doing the tightening, the inspectors too. Contractors like Bechtel, Fluor, PCL, TIC, Cleveland Bridge, Shurtleff & Andrews, Cimolai, Foster Wheeler, etc., knowing they cannot get well trained experienced skilled labor for all projects, and yet knowing they MUST become more efficient to stay competitive, choose Sqrter DTI’s to help with the bolting.

Yes, Squirters work technically well, making the bolting crews do a good job regardless of torque. Yes, they work better than standard DTI’s which can look compressed when they’re on the wrong sized hole or when they’re installed using the wrong flat washer or when they’re installed upside down. Yes, you can see

Squirters from twenty feet away and know that ALL the bolts have been tightened, and none have been missed. And after initial calibration, with Squirters you don’t need to use a feeler gage either very much, or sometimes not at all.



Can you tell how much turn was put on this bolt?



What turn was put on these bolts?

But mainly, their popularity is because you can tell visually when the bolt is tight enough. Tight is when the squirted silicone looks just like it did in the pre-job Sqrter calibration test. Less silicone is less tight. More silicone is more tight.

Show a craft worker of any skill level the appearance of a finished Sqrter, with about 3-5mm of silicone squirted out from under all the bumps, and tell him or her to just keep on doing that on every bolt. You don’t have to speak English to understand a picture.

Says Bill Cooper, 30 year veteran Site Manager on dozens of 10,000 to 30,000 ton projects around the world, “Squirters are a great product. They make it possible for us to get good results from all our bolting craft, no matter what their background, ethnicity, native language, education.” In labor starved Alberta, Canada, contractor PCL tells us that they were skept-

ical a year ago, but not any longer. It’s Squirters all the way.

Like all DTI’s, Squirters make it possible to get the bolt up to the right tension. And that’s important. But, equally important, is the way that Squirters help the erection go faster, with fewer problems uncovered in

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inspection. We're told that in many types of steelwork, like power plants, bridges, refineries, LNG plants, etc, where ALL bolts MUST get TENSIONED correctly, and where the QA inspection is intended to verify that, Squirters can save 20% of the field man-hours, or more. This savings amounts to more than the Squirter DTI's cost to purchase.

Here are the other bolting methods:

1. Calibrated Wrench – The process whereby a torque value is decided by field testing representative samples of the bolt assembly lots in a tension calibrator (Skidmore), and

then using that torque to apply to all the bolts from that lot. VERY labor intensive and therefore costly when executed right. Must be repeated daily and for

every lot of bolts. One power contractor has told us, after trying to enforce these procedures on a power plant, "It's like going back to a previous century. It's dark ages stuff. And it doesn't work!" This procedure usually degenerates into using one torque value for all bolts for the entire project. In Canada, the calibrated wrench method is not allowed, and it is severely conditioned in the RCSC Specification in an attempt to remedy the known shortfalls of the method. This same power contractor doesn't allow calibrated wrench any longer, and even suggested this method be deleted from the RCSC SA specification.

2. Turn-of-Nut – After snugging the plies firmly together, the process of installing a prescribed part turn on every bolt. Marking the nut position at snug, holding the bolt head from rotating, and marking a finished position must be done. Sometimes inspected with a torque wrench. When correctly done, this procedure will work well in some situations. The snug point must have been reached accurately, and the amount of

turn must be known in advance for the length of bolt being installed, that is, 1/3, 1/2, or 2/3rd turn. Bolting professionals using this method must tell the craft worker what turn to apply on every bolt. Faced with problems it is possible for the crew to mark the connection as finished without actually doing the right turn – hence the torque wrench inspection in some cases. One large boiler manufacturer, after a subcontractor erector had in-

stalled tens of thousands of bolts by turn-of-nut, decided to audit the tensions produced by ultrasonic tests, and found "an unacceptably high failure rate." That boiler contractor no longer allows their subcontractors to select the bolting method, and drives them to Squirter DTI's.

3. TC Bolts (Sometimes called Tension Control Bolts) – Bolt/nut/flat washer sets which are made with a splined extension on the shank which is designed to shear off when the torque resistance reaches a threshold level, calibrated at break-off to produce a tension equal to or greater than the minimum specified by the

RCSC. Again, these bolt sets will produce the right tension, but only if they have been made sufficiently stronger than the minimum, and only if their original condition is

maintained through removal from protected storage, insertion into the hole, snugging, and then finally tightening by breaking off the splined end. Because TC bolts are torque-based and affected by weather while stored, they are required by the RCSC to be checked AT THE TIME OF BREAK-OFF in a Skidmore to see if the correct tension is still obtained. Experience on many projects shows this break-off relationship does not always hold up after several days of exposure. Galvanized TC and Type III TC bolts are particularly problematical, and bolts larger than 1 1/8" diameter are not made as a TC set.

4. Standard (non-Squirter) DTI's – Compared to the above three methods of tightening bolts, standard DTI's work

pretty well, but they require checking with a feeler gage to see that the bumps have been sufficiently compressed, and the little feeler gage gap is pretty small to see, so erectors like to just flatten the heck out of them just to be sure.

Here's the Squirter DTI method:

Calibrate the Squirters once at the start of the job, snug the connection, then just make all the Squirters look like they did when calibrated. Or, as we say on our tee-shirts, just "Drive 'Em 'Till they Squirt." Our Tee-Shirts exaggerate the squirt, but they get across the point. They're technology for a modern world. ⚙️



You can see: loose, snug, just right, too tight.



All the bolts get Squirted.

