

Supplemental Specification for implementing DuraSquirt DTIs in accordance with RCSC 2.6.2:
Alternative Washer Type Indicating Devices

DuraSquirt DTIs, are enhanced versions of ASTM F959¹ DTIs that render feeler gages unnecessary. DuraSquirt DTIs are to be installed in accordance with the following as per the AISC/RCSC.

Verification Testing

The DuraSquirt DTI with the nut, bolt and washer (forming an assembly) shall be verified to achieve at least the minimum design tension by the bolting crew and inspector; employing the following procedure:

1. Tighten 3 assemblies in a tension calibrator until the DuraSquirt DTI displays squirt indication beyond the outer diameter in all bump locations, known as complete indication.
2. Record the achieved tensions, compared to RCSC Table 7.1 or AISC 360-16, Table J3.1.

A tension that is greater than the values in RCSC/AISC tables, is not cause for rejection when using ASTM, and similar hardware. The ultimate shear strength of a bolt is not affected by the pretension in a bolt (Guide to Design Criteria for Bolted and Riveted Joints 2nd ed; Kulak et al., 1987, pp 47).

Installation

Assemblies shall be installed (per connection) by the following procedure and referenced RCSC sections:

1. Insert and snug assemblies in accordance with the requirements of RCSC Section 8.1, with the DuraSquirt DTI positioned per Figures C-8.1, figures b & c and washers per RCSC table 6.1 (if necessary). If complete indications of the DuraSquirt DTIs are achieved while snugging, the identified assemblies shall be replaced.
2. Assemblies are then to be fully tensioned from the most rigid part of the joint onward until complete indications are achieved.

Inspection

Routinely inspect DuraSquirt DTIs assemblies by the following procedure:

1. Observe the verification testing and adherence to the snug step of installation.
2. After tensioning, confirm complete indication of inspected assemblies. No further evidence or investigation is required in these cases.
3. Less than 100% complete indication may be accepted by the site, as long as the DTI bumps are flattened to zero gap, and Arbitration determines the percentage of completed indication, results in acceptable tension values.²

Arbitration

Assembly installation and inspection may be arbitrated by the bolting crew and inspector by:

1. Tightening 3 assemblies in a tension calibrator until the tension calibrator indicates the minimum value specified in the applicable minimum bolt tension table.
2. Recording the number of locations where indication media appears beyond the outer diameter of the DuraSquirt DTI. The count of indications then forms the minimum for the arbitrated installation and inspection criteria.²

¹ ASTM F959 3.1.1 *compressible-washer-type direct tension indicator*, *n*—washer-type element inserted under the bolt head or hardened washer, having the capability of indicating the achievement of a required minimum bolt tension by the degree of direct tension indicator plastic deformation. Hereafter referred to as *direct tension indicator*.

² Lack of indication may be caused by oversized holes, poor quality hardware, uncured or excessively thick steel coatings, etc. Contact Applied Bolting Technology at (802) 460-3100 or info@appliedbolting.com for assistance.