

**Standard Method of Test for
Verification of Direct Tension Indicators (DTI) Performance**
SCDOT Designation: SC-T-152 (9/08)

1. SCOPE

- 1.1. This method covers the procedure for determining the DTI performance before installation in a working application.

2. REFERENCED DOCUMENT

ASTM F 959
ASTM A 325

3. SIGNIFICANCE AND USE

- 3.1. The purpose of this procedure is to verify that the DTI being tested is capable of indicating the achievement of a specified minimum bolt tension in an ASTM A 325 structural bolt.

4. APPARATUS

- 4.1. Calibrated bolt Tension Measuring Device (TMD) with a special flat insert in place of a normal bolt head holding insert.
- 4.2. ASTM A325 bolt assembly.
- 4.3. 0.005-inch thick tapered leaf (feeler) gauge.
- 4.4. Impact wrench or manual wrench.

5. PROCEDURE

- 5.1. Install bolt, nut, washer and DTI in the Tension Measuring Device with the DTI at the front face of the TMD. Test the fastener assembly with the DTI in the same position on the fastener assembly as it is during erection installation.
- 5.2. Use a second wrench on the bolt head during testing to prevent rotation of the head against the DTI.
- 5.3. Tighten the bolt to tension listed in the table below. If an impact wrench is used, tighten to a load slightly below the required load and use a manual wrench to attain the required tension because the load-indicating needle of the TMD cannot be read accurately when an impact wrench is used.

*Bolt Tension									
Bolt Diameter (inch)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Tension, kips	13	20	29	41	54	59	75	89	108
*Bolt Tension equals 1.05 x Min. Installation Tension									

- 5.4. Determine and record the number of spaces between the protrusion on the DTI that a 0.005 inch feeler gauge is refused. The total number of spaces in the various sizes and grade of DTI is shown in the table below.

Number of Spaces on DTI									
Bolt Diameter (inches)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
No. of Spaces	4	4	5	5	6	6	7	7	8

- 5.5. The 0.005 inch feeler gauge should be refused in less than one half of the gaps. If the feeler gauge is refused in one half or more of the gaps, the DTI fails the verification test and no further testing is required.
- 5.6. If less than one half of the gaps refuse the 0.005 inch feeler gauge, continue with further tightening the bolt to the smallest gap allowed in the working application. Normally, this smallest gap condition is achieved when the gaps at all the spaces are less than 0.005 inch (or a gap size as approved by the BCE), and not all gaps are completely closed. When such a condition is achieved, the 0.005 inch thick feeler gauge is refused at all spaces, but a visible gap exists in at least one space. Record the load in the bolt at the smallest gap. Do not tighten the bolts in this installation verification test nor in the actual installation to a no visible gap condition. The load in the bolt becomes indeterminate when no gap exists.
- 5.7. Ensure that the bolt load at this smallest gap does not cause excessive permanent inelastic deformation of the fastener. The degree of inelastic deformation is judged by removing the fastener from the test apparatus and turning the nut by hand the full length of the threads on the bolt after the test.
- 5.8. Remove the bolt from the TMD and turn the nut on the threads of the bolt by hand. Make note of the nut's ability to be turned on the complete length of the threads excluding the thread run-out.

Note the pretension load, the number of required spaces, the maximum spaces the gauge is refused, the bolt tension, the compression strength of the DTI, and the results of whether the DTI compression meets required specifications or not.

6. REPORT

- 6.1. None