FLORIDA DEPARTMENT OF TRANSPORTATION
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Florida Method of Test for verification of DIRECT TENSION INDICATOR DEVICE PERFORMANCE

Designation FM 5-583

1. SCOPE

1.1 This method covers the procedure for verifying that Direct Tension Indicator Devices (DTIs) provide a gap when the test tension is 1.05 times greater than the job installation tension requirements. This method applies to fastener assemblies of sufficient length to fit into a bolt tension measuring device. When the bolt is too short to permit testing of the fastener assembly in the bolt tension measuring device, the DTI shall be tested in accordance with 3.1 through 3.4 below, using a longer bolt to verify the DTI performance.

2. EQUIPMENT REQUIRED:

2.1 A calibrated bolt tension measuring device of size required for bolt used and fitted with a flat insert in place of the normal bolt head holding insert. The special insert is required to allow access to measure the DTI gap. Use the calibrated bolt measuring device that has been calibrated within the last 12 months.

2.2 A 0.005 inch tapered leaf thickness (feeler) gauge used to inspect the bolts after installation.

2.3 Bolts, nuts and standard washers used in the work with the DTIs.

2.4 Impact and manual wrenches to tighten the bolts. Equipment must be the same as that used in the final work of installing the DTIs.

3. PROCEDURE:

3.1 Install bolt, nut, DTI and standard washer into the bolt tension measuring device. Assembly must match that to be used in the final work.

3.2 As necessary, use another wrench on the bolt head to prevent rotation of the bolt head against the DTI if the DTI is against the turned element.

3.3 Tighten the bolt to the tension listed below (1.05 times the minimum installation tension). If an impact wrench is used, tighten the bolt to a load slightly below the required load and use a manual wrench to attain the

required tension. The load indicating needle of the tension measuring device cannot be read accurately when only an impact wrench is used.

Bolt Diameter (inch)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
ASTM A 325 Bolt – Tension (kips)	13	20	29	41	54	59	75	89	108

3.4 Determine and record the number of spaces between the protrusions on the DTI that a 0.005 inch feeler gage is refused. The total number of spaces in the various sizes and usage of DTIs is shown below.

Bolt Diameter (inch)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Number of Spaces on DTI for ASTM A 325 Bolts	4	4	5	5	6	6	7	7	8

3.5 If the 0.005-inch feeler gage is refused in no more than the maximum number of spaces shown below, continue the test (Note also, that this is the 'snug-tight' condition referred to in 460-5.4.9.1.). If the 0.005-inch feeler gage is refused in more gaps than shown, the DTI fails the test.

Bolt Diameter (inch)	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Maximum Number of Spaces Gage is Refused	1	1	2	2	2	2	3	3	3

3.6 Further tighten the bolt to the smallest gap allowed, defined as follows: as the smallest gap condition achieved when the gaps at all of the spaces are each less than 0.005 inch (or of a gap size approved by the Engineer) and at least one gap is visually open. Note the load in the bolt at the smallest gap. Do not tighten to a no visible gap condition: at this point the load in the bolt becomes indeterminate. The bolt load at this smallest gap is not to have caused

excessive permanent deformation of the fastener. Evaluate the degree of inelastic deformation in DTI step 3.7, below.

3.7 Remove the bolt from the calibrator and turn the nut on the threads of the bolt by hand. The nut should be able to be turned on the complete length of the threads, excluding the thread run-out for acceptance. Alternately, if the nut is unable to go the full length, but the load at the minimum DTI gap (measured in DTI step 3.6 above) is less than 95% of the bolt tension recorded at the nut rotation required in FM 5-581 or FM 5-582, the assembly, including the DTI, is deem to have passed the test.
If the nut cannot be run the full thread length, and the load at the smallest gap condition is greater than the 95% of bolt tension recorded at the nut rotation required for the Rotational-Capacity test, the load required for the smallest game in step 3.6., is too large. Therefore, the DTI Lot may be rejected. If the test equipment is a coated DTI under the turned element, the maximum number of spaces the gage is refused is the number of the spaces on the washer minus one.

3.8 Test DTI/bolt Lots that are too short to fit in the tension measuring device in accordance with FM 5-582 by tightening to the minimum DTI gap (as measured in DTI step 3.6 above) and checked in accordance with DTI step 3.7 above; excluding the 95% acceptance alternative since the short bolt RC test was not conducted in the tension measuring device. Alternately, if approved by the Engineer, the DTI device used with the short bolt can be checked in accordance with DTI steps 3.1 through 3.5 above using longer bolt assemblies from a Lot previously passing the required RC tests in tension measuring device.