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## ROTATIONAL CAPACITY TESTS FOR BOLTS TOO SHORT TO FIT TENSION CALIBRATOR

### **ROTATIONAL CAPACITY (RC)**

Rotational Capacity (RC) Test for all high strength fasteners shall be performed in the shop and in the field as required by [Article 2408.39D](#) of the Standard Specifications.

There are two separate rotation capacity requirements:

1. Fasteners (bolts, nuts and washers) received at the project site shall have been RC tested by the supplier or manufacturer prior to shipment. Each combination of production lots must have a special RC lot number. This number must be readily identifiable on each container of fasteners.
2. Prior to installation, the contractor or the fabricator shall be required to test all RC lots as supplied. **NOTE:** Tests are not intended to match the values provided by the suppliers.

### **EQUIPMENT REQUIRED**

1. Calibrated torque wrench or equivalent (every six months)
2. Spacers and/or washers with hole sizes shall not be larger than 1/16 inch (2 mm) than the bolt being tested.
3. Steel section with an appropriately sized hole to install the bolt. Any available splice hole can be used with a plate thickness that will provide the number of threads under the nut required in Step 1 below.

### **PROCEDURE**

1. Install the bolt into the hole. Install the required number of shim plates and/or washers. One washer under the nut must always be used to cover three to five full threads. A combined total of no more than three shims and washers may be used.
2. Snug the bolt using a calibrated wrench. Snug tight torque shall be between 10% and 20% of the torque listed in Table B2.
3. Match mark the bolt tip, nut, and the plate in a straight line.

4. Tension the bolt by turning the nut using the torque wrench to the rotation listed below. A second wrench must be used to prevent rotation of the bolt head during tightening. Record the torque required when this rotation is achieved. (Torque must be measured with the nut in motion.)

Table B1

| Bolt Length<br>(measured in Step 1) | 4 x bolt diameter<br>or less | Greater than 4, but no<br>more than 8 x bolt<br>diameter | Greater than 8 x<br>bolt diameter |
|-------------------------------------|------------------------------|----------------------------------------------------------|-----------------------------------|
| Required Rotation                   | 1/3                          | 1/2                                                      | 2/3                               |

The measured torque should not exceed the values listed below. Assemblies that exceed the listed torque have failed the test.

Table B2

| Bolt Diameter<br>(in.) | 1/2 | 5/8 | 3/4 | 7/8 | 1    | 1 1/8 | 1 1/4 | 1 3/8 | 1 1/2 |
|------------------------|-----|-----|-----|-----|------|-------|-------|-------|-------|
| Torque (ft.-lb.)       | 150 | 290 | 500 | 820 | 1230 | 1500  | 2140  | 2810  | 3690  |

Table B2M

| Bolt Diameter<br>(mm) | 13  | 16  | 19  | 22   | 25   | 29   | 32   | 35   | 38   |
|-----------------------|-----|-----|-----|------|------|------|------|------|------|
| Torque (N-m)          | 203 | 393 | 678 | 1110 | 1670 | 2030 | 2900 | 3810 | 5000 |

5. Tighten the nut further to the rotation required below. The rotation is measured from the initial marking in Step 3. Assemblies fail the test if stripping or fracture occurs.

Table B3

| Bolt Length<br>(measured in Step 1) | 4 x bolt diameter<br>or less | Greater than 4, but no<br>more than 8 x bolt<br>diameter | Greater than 8 x<br>bolt diameter |
|-------------------------------------|------------------------------|----------------------------------------------------------|-----------------------------------|
| Required Rotation                   | 2/3                          | 1                                                        | 1 1/3                             |

6. Loosen and remove nut, and examine thread on the nut and bolt. No signs of thread shear failure, stripping, or torsional failure of the bolt should be evident. Assemblies, which have evidence of stripping, fail the test.

**NOTE:** When erecting steel beams, the beams shall be supported with drift pins and fitting-up bolts (temporary bolts).

**NOTE:** High strength bolts nuts and washers that have been torqued shall not be re-used. This includes both black and galvanized bolts and nuts.