



# Iowa Department of Transportation

ROTATIONAL—CAPACITY TEST  
 Short Bolt Procedure 1-5-95  
 (For bolts too short to be tested in a Skidmore.)

Test Number \_\_\_\_\_  
 Date \_\_\_\_\_  
 Inspector \_\_\_\_\_

County \_\_\_\_\_ Project # \_\_\_\_\_ Design # \_\_\_\_\_

Fastener Type BLACK GALVANIZED  
 Field Relubricated for this test Yes \_\_\_\_\_ No \_\_\_\_\_

Calculations	
Bolt diameter *D* = _____ inches	
4D = _____ in. 8D= _____ in.	
Bolt Length = _____ inches	

## Misc. Information

R – C PROCEDURE (I.M. 453.06 B)
Measured Torque at Snug Tight = _____ ft-lbs Range given in TABLE 1
Measured Torque after Initial Rotation = _____ ft-lbs Rotation given in TABLE 2
Is Torque < TABLE 3? _____ Yes, Continue test _____ No, R – C Lot Fails
Complete R – C Test Rotation. Total rotation required by R – C test given in TABLE 4.
Condition of Fastener: Nut OK? _____, Bolt OK? _____, PASS? _____

TABLE 1

Bolt Dia.	Initial Tension Range (ft-lbs)
3/4"	50 to 100
7/8"	80 to 160
1"	120 to 240
1-1/8"	150 to 300

TABLE 2

Bolt Length	Initial R – C (Turns)
L ≤ 4D	1/3
4D < L ≤ 8D	1/2
8D < L ≤ 12D	2/3

TABLE 3

Bolt Dia.	Max. Torque (ft-lbs)
5/8"	290
3/4"	500
7/8"	820
1"	1230
1-1/8"	1500

TABLE 4

Bolt Length	Total R – C Turns
L ≤ 4D	2/3
4D < L ≤ 8D	1
8D < L ≤ 12D	1-1/3

Production Lot# \_\_\_\_\_  
 Bolts \_\_\_\_\_  
 Nuts \_\_\_\_\_  
 Washers \_\_\_\_\_  
 R – C Lot # \_\_\_\_\_

## NOTES:

R – C Procedure from I.M. 453.06 B, Appendix A
1. Place fastener into an appropriate size hole in any available splice. Use washer/shims under "turned" element. Need a minimum 3 to 5 exposed threads behind the nut. (NOTE: May use a maximum of 3 washers &/or shim plates.)
2. Initially tension fastener to values listed in TABLE 1.
3. Match mark bolt tip, nut corner, washer/shims, and the base steel. (Mark shall be a straight line.)
4. Tighten fastener to rotation specified in TABLE 2. NOTE: Same rotation required for Turn-of-Nut.
5. Record torque when rotation in Step 4 is achieved. (Torque is read with nut in motion.)
6. Torque shall not exceed values in TABLE 3. If Step 5's torque is LESS THAN "Maximum" allowable, fastener lot passes first phase of R – C testing. If torque is GREATER, fastener lot fails. Entire lot may be relubricated and retested or else lot is replaced and tested.
7. Complete nut rotation to total rotation required by TABLE 4. NOTE: Rotation is measured from initial reference marked in Step 3 and is 2 times the rotation required for Turn-of-Nut.
8. Loosen nut, remove bolt, and inspect bolt and nut for visible signs of damage. Damage could be thread stripping, nut does not run freely to location of test shims, nut is cracked, bolt is Cracked in the threads, etc. If there is evidence of damage, the bolt lot is rejected. Entire lot may be Relubricated and retested or else replaced and tested.
9. Conduct test on two randomly selected fasteners for each lot to be incorporated into the structure. Both tested fasteners must pass the R – C test to accept that lot.

Bolt Diameters	
Fraction	Decimal
5/8"	0.625"
3/4"	0.750"
7/8"	0.875"
1-1/8"	1.125"

ASTM GRADES FOR	
Blk & Galv	Bolt A 325
Black	Nut A 194
Galvanized	Nut A 563
Blk & Galv	Washer F 436

