

Torque-Tension Test Procedure for Steel Threaded Fasteners - Inch Series

RATIONALE

J174 has been reaffirmed to comply with the SAE five-year review policy.

Foreword—On some applications of threaded fasteners, it is desirable to control the amount of developed tension when a specific range of torque has been applied or the torque required to develop a specific range of tension. Accurate torque-tension relationships can be achieved only by uniquely defining and controlling the many related test parameters, such as: materials, their hardness and finish coatings, mating part interference fit, lubrication between both mated parts, the presence of foreign materials as rust, dust, and burrs, temperature and humidity, and whether the tightening is by hand or power tool turn nut or bolting wrenching.

1. Scope—This test procedure is intended to provide a quality control method for checking torque-tension characteristics of non-prevailing torque-type threaded steel fasteners 1/4 through 1 in nominal diameters. Realistically, torque-tension relationships for specific individual fastener assembly joints will vary due to the different joint parameters. Tests using actual joint components will be required to determine accurate torque-tension values for those conditions. For the metric version, see SAE J174M.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J174M—Torque-Tension Test Procedure for Steel Threaded Fasteners—Metric Series
 SAE J429—Mechanical and Material Requirements for Externally Threaded Fasteners
 SAE J995—Mechanical and Material Requirements for Steel Nuts

2.1.2 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 117—Method of Salt Spray (Fog) Testing
 ASTM B 487—Method for Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section

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3. Test Material

- 3.1 Test Bolt**—When evaluating nuts, test bolts conforming to SAE J429, grade 8 requirements shall be used. Threads shall gage to the same class of fit as the nuts. Threads on all bolts shall be produced by rolling.

Bolts shall be free from burrs, loose scale, and contamination. This test procedure can be applied to test bolts with different finish coatings. But to compare torque-tension bolt quality results, various lots, and/or manufacturers, the finish shall be zinc phosphate and oil, meeting a 72-h salt spray life when tested in accordance with ASTM B 117.

NOTE—The lubricant shall neither be added or removed from the test material. It shall be dry to the touch as determined by Waterman #41 filter blot test.

- 3.2 Test Washer**—Washer shall conform to the dimensional, metallurgical, and finish requirements given in Table 1. (See also Figure 1.) Optionally, clipped washers or multihole plates or strips may be used providing they conform to the previous requirements.

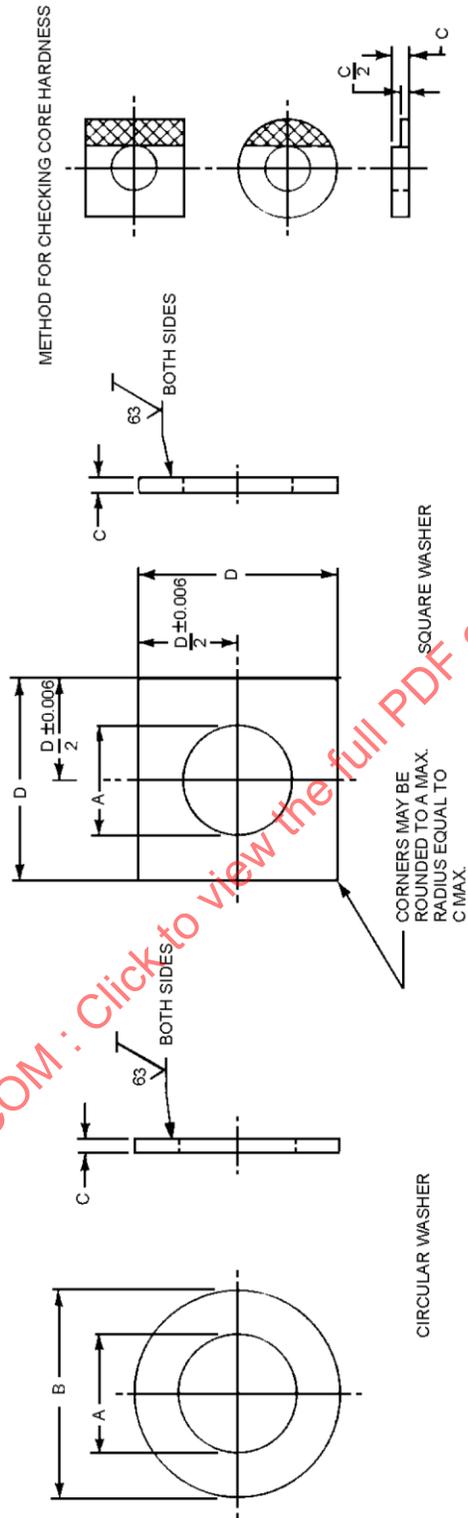
TABLE 1—TEST WASHERS—WASHER DIMENSIONS—INCHES

Nominal Fastener Size	Inside Dia A ⁽¹⁾ ±0.005	Outside Dia B ±0.010	Width D ±0.012	Thickness C Max	Thickness C Min
1/4	0.281	0.750	0.656	0.080	0.073
5/16	0.344	0.875	0.776	0.080	0.073
3/8	0.406	1.000	0.892	0.080	0.073
7/16	0.469	1.125	1.018	0.080	0.073
1/2	0.531	1.312	1.152	0.121	0.114
9/16	0.625	1.500	1.274	0.121	0.114
5/8	0.688	1.625	1.422	0.121	0.114
11/16	0.750	1.687	1.500	0.121	0.114
3/4	0.812	1.750	1.678	0.160	0.153
7/8	0.969	1.875	1.916	0.160	0.153
1	1.025	2.000	2.184	0.160	0.153

1. The washer ID is intended for use with hex bolts and all nuts. To accommodate other bolts with larger under head fillet radii, washer hole diameter shall be increased proportionally to allow bearing surface of bolt head to seat.

NOTES:

- All dimensions are in inches.
- Square washers are preferred. Use of round washers is acceptable during a transition period to exclusive use of square washers.
- Material shall be carbon steel with a chemical composition of C, 0.48-0.60%; Mn, 0.60-1.50%; P, 0.035% max; and S, 0.045% max; quenched and tempered, with a surface hardness of 85-88, and a core hardness of 73-78 HR A.
- Washers shall be electrodeposited zinc plated to a coating thickness of 0.0002 to 0.0004 in and shall be subjected to no additional surface treatment. As soon as practicable following plating, washers shall be baked for 1 h at 375 °F ± 25 °F. Plating thickness shall be checked in accordance with ASTM B 487 (Microscopic Test).
- Washers shall be free from burrs and sharp edges.



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FIGURE 1—TEST WASHERS