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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE STANDARD

SAE J2283

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Submitted for recognition as an American National Standard

MECHANICAL AND MATERIAL REQUIREMENTS FOR ONE PIECE WHEEL NUTS

1. ***Scope—***This SAE Standard covers the chemical, metallurgical, and mechanical requirements for one piece passenger car and truck ferrous wheel nuts with conical or spherical nut seats for the following sizes:

a.	M10 x 1.25	M14 x 1.5	9/16-18
b.	M12 x 1.25	M12 x 1.5	1/2-20

This test is for ordinary wheel nuts. Special applications (nut material and/or configurations) may require special conditions which must meet load values in 3.4.1.

2. ***References***

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

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

SAE J122—Surface Discontinuities on Nuts
SAE J995—Mechanical and Material Requirements for Steel Nuts
SAE J1102—Mechanical and Material Requirements for Wheel Bolts

2.1.2 ANSI PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI B1.1—Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B1.13M—Metric Screw Thread—M Profile

3. ***Test Procedures***

3.1 **Nut Proof Load Test Procedures—**Use only fully processed nuts which are representative of production parts intended for the vehicle. The nut shall be assembled on a wheel bolt or on a hardened threaded mandrel at the specified thread length engagement (L) specified in Table 1. The proof load (F) for the nut as specified in Table 1 shall be applied against the nut in an axial direction in tension as shown in Figure 1. The load shall be maintained for 15 s. The nut shall resist the load without failure by stripping or rupture and shall be removed by finger turning after the load is released. It may be necessary to start the nut rotating by using a manual wrench. Such wrenching is permissible provided it is restricted to one-half turn and that the nut is then removable by finger turning. Special materials and configurations may require different test methods to meet these load values.

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TABLE 1—PROOF LOAD VALUES, THREAD ENGAGEMENT, AND BOLT HOLE REQUIREMENTS

Thread Size	Proof Load (F)(1) kN	Proof Load (F)(1) lb	85% Thread Engagement (L)(2) mm	85% Thread Engagement (L)(2) Turns(3)	Bolt Hole Dia (D) mm	Bolt Hole Dia (D) in
M10x1.25	50.8	11 420	8.8/8.1	7 to 6-1/2	10.22/10.38	0.409/0.402
M12x1.25	76.4	17 180	10.6/10.0	8-1/2 to 8	12.22/12.38	0.488/0.481
M12x1.5	73.1	16 450	10.5/9.8	7 to 6-1/2	12.22/12.38	0.488/0.481
M14x1.5	103.4	23 240	12.4/11.6	8-1/4 to 7-3/4	14.21/14.38	0.566/0.560
1/2-20	85.4	19 200	11.1/10.5	8-3/4 to 8-1/4	12.92/13.08	0.515/0.508
9/16-18	108.3	24 360	12.7/12.0	9 to 8-1/2	14.52/14.68	0.578/0.571

1. For sizes not included in Table 1:
   Inch series based on 120 ksi material tensile strength. Metric series based on 830 MPa material tensile strength from SAE J1102.
   Metric Stress Areas = $0.7854\ (D-0.9382P)^{(2)}$
   Inch Stress Areas = $0.7854\ (D-0.9743/n)^{(2)}$
   where:
   D = Nominal size
   P = Thread pitch
   n = Number of threads per inch
2. Length of thread engagement does not include nut and bolt thread chamfer. For nuts shorter than 85% thread engagement, use full thread engagement of nut.
3. One turn equals 360 degree rotation of the nut on the test bolt. Nut and bolt thread chamfer can be eliminated by counting turns from the point of initial engagement of bolt and nut threads.

3.1.1 If the threads on the bolt or mandrel are damaged during the test, the test should be discarded. For referee test purposes, the hardened mandrel shall be used.

3.1.2 The test bolts shall have threads conforming to 6g tolerances for metric and 2A tolerances for unified inch series. The test bolt shall have a yield strength in excess of specified proof load of nut being tested.

3.1.3 The mandrels shall have a hardness of Rockwell C45 minimum. The hardened mandrel shall have threads conforming to Class 3A tolerances as specified in ANSI B1.1, except that the major diameter shall be the minimum major diameter with a plus tolerance of 0.002 in. The metric mandrels shall have threads conforming to the threads as specified in ANSI B1.13M except minimum major diameter shall be the minimum major diameter plus 0.25 times major diameter tolerance.

3.1.4 For referee purposes, the proof load test shall be conducted using a hardened mandrel.

3.2 Nut Cone Seat Concentricity

3.2.1 The nut shall be assembled on a threaded mandrel and rotated using a dial indicator gage to measure the runout of the cone (nut seal) to the threads as shown in Figure 2. Special configurations may require a different measurement method to test nut seat concentricity.

3.2.2 The total runout shall not exceed 2% of the nominal thread size.

3.3 Surface Discontinuities—The nut shall meet SAE J122 for surface discontinuities.

3.4 Mechanical and Material Requirements—The nut shall meet SAE J995 for mechanical and material requirements not specified in this document.

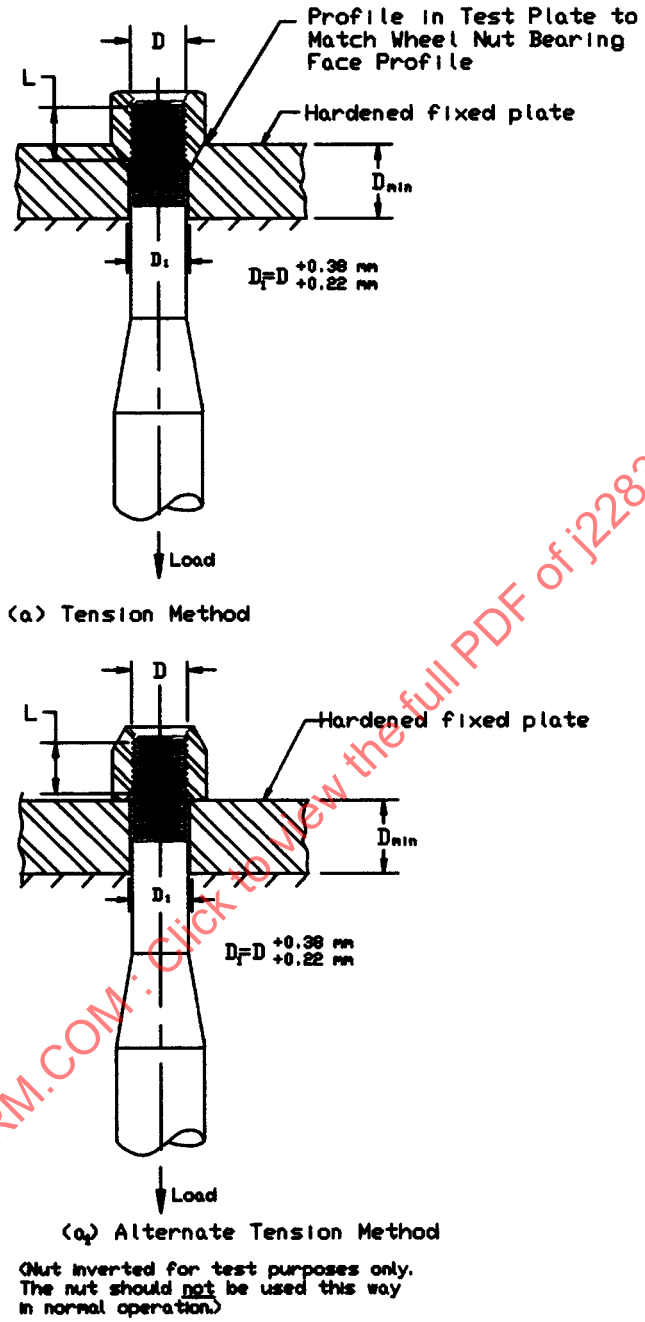

FIGURE 1—ONE-PIECE FERROUS WHEEL NUTS PROOF LOAD TESTING ARRANGEMENTS

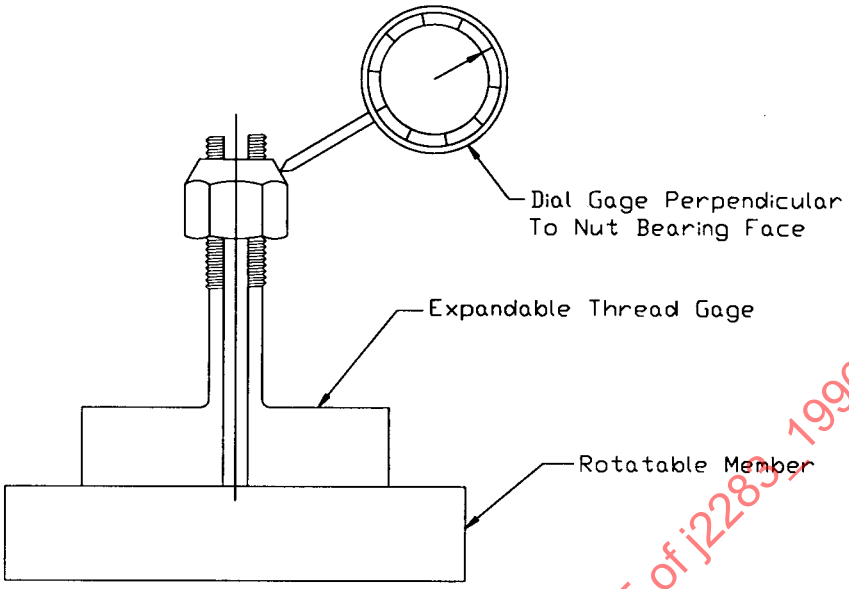

FIGURE 2—NUT CONE CONCENTRICITY TEST

PREPARED BY THE SAE NUT SEAT TEST TASK FORCE
OF THE SAE WHEEL STANDARDS COMMITTEE