The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
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SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J1965

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ROAD VEHICLES—WHEELS FOR COMMERCIAL VEHICLES & MULTIPURPOSE PASSENGER VEHICLES—FIXING NUTS—TEST METHODS

1. *Scope*—This SAE Recommended Practice applies to nuts as specified in SAE J694 and J1835 used for wheel and demountable rim attachment.

   Only the test methods necessary to assure proper wheel or rim assembly are specified. Fasteners for less common and special applications are not included.

1.1 **Purpose**—This document, to insure proper assemblies, specifies test methods for Metric or English, 1 or 2 piece flange nuts, single ball seat nuts, inner and outer ball seat nuts, and rim clamp nuts.

2. *References*

2.1 **Applicable Documents**—The following publications form a part of this specification to the extent specified herein. 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 (Ref. ISO 6157/2)
SAE J267—Wheels/Rims—Trucks—Test Procedures and Performance Requirements (Ref. ISO 3894)
SAE J694—Disc Wheel/Hub or Drum Interface Dimensions—Commercial Vehicles (Ref. ISO 4107) (Ref. ISO 7575)
SAE J1835—Fastener Hardware for Wheels for Demountable Rims

2.2 **Related Publications**—The following publications are provided for information purposes only and are not a required part of this document.

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

SAE J393—Nomenclature—Wheels, Hubs, and Rims for Commercial Vehicles (Ref. ISO 3911)
SAE J995—Mechanical and Material Requirements for Steel Nuts (Ref. ISO 898/2)
SAE J1992—Wheels/Rims—Military Vehicles—Test Procedures and Performance Requirements

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3. *Test Methods for Nut Body and Ball Seat Nuts*

3.1 Proof Load/Compression Test Procedures—Use only fully processed nut/nut assemblies, which are production parts intended for the vehicle. For inner dual ball seat nuts, the test method recommended can be seen in Figure 1. For two piece nuts, the initial height of the nut (H) must be measured before beginning the proof load/compression test. The nut shall be loaded on a threaded fixture or bolt as shown in Figure 2. For outer ball seat nuts and rim clamp nuts the recommended test method can be seen in Figure 3. The complete nut/nut assembly shall be loaded axially through the threads three times to a load of 0.6 x proof load value (F). After three loadings, a fourth loading of 1.0 x F shall be applied.

The load shall be maintained for 15 s. The nut shall resist the load without failure by stripping or rupture and shall be removable by hand after the load is released. If the threads on the bolt or test fixture are damaged during the test, the test should be discarded. (It may be necessary to use a manual wrench to start the nut in motion. Such wrenching is permissible provided that it is restricted to one-half turn and that the nut is then removable by hand.) The test fixture or bolt used shall be threaded to a tolerance class that is representative of the parts to be used in production.

3.2 Proof Load Values—See Table 1.

TABLE 1—PROOF LOAD VALUES

	F (kN)	F (lb)
Inner Dual Ball Seat Nuts		
3/4-16 Class 10.9 (Grade 8) mechanical properties	249.1	56 000
3/4-16 Class 8.8 (Grade 5) mechanical properties	164.6	37 000
15/16-12	278.9	62 700
One Piece Flange Nuts		
9/16-18	98.3	22 100
5/8-18	124.1	27 900
11/16-16	149.0	33 500
Two Piece Flange Nuts		
9/16-18	108.5	24 400
5/8-18	136.6	30 700
7/8-14	271.3	61 000
M14x1.5	103.2	23 200
M18x1.5	179.3	40 300
M20x1.5	225.1	50 600
M22x1.5	276.2	62 100
Single or Outer Ball Seat Nuts		
3/4-16	164.6	37 000
1 1/8-16	222.4	50 000
15/16-12	278.9	62 700
1 5/16-12	378.1	85 000
Rim Clamp Nut		
3/4-10	197.5	44 400

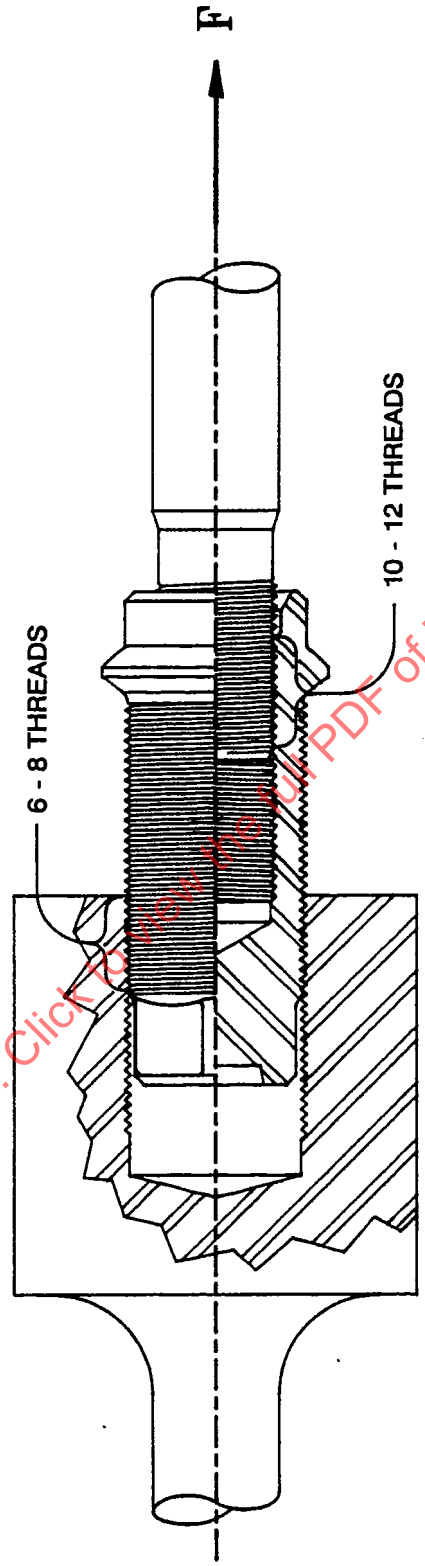

FIGURE 1—INNER DUAL BALL SEAT NUT PROOF LOAD TEST ARRANGEMENT

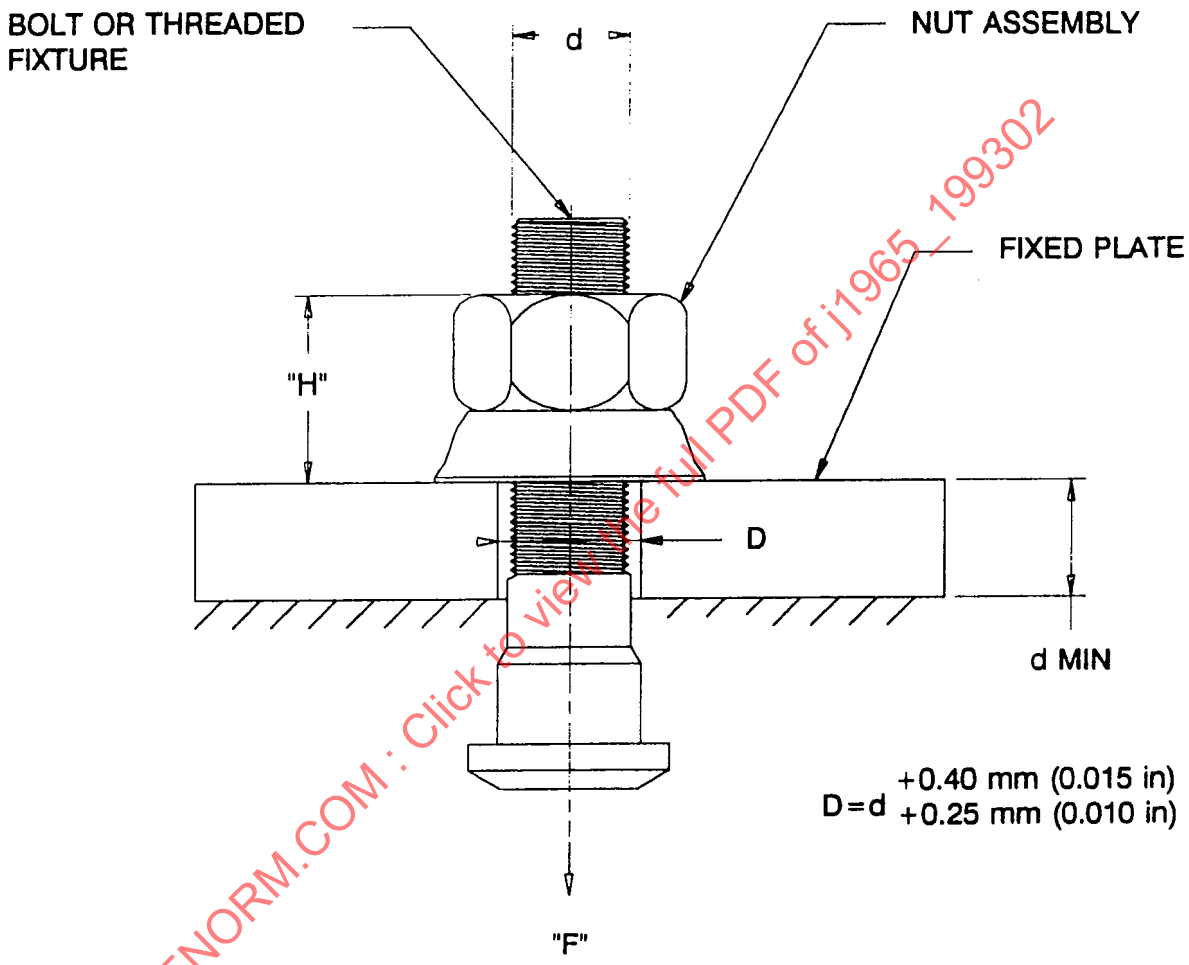

FIGURE 2—TWO PIECE FLANGE NUT PROOF LOAD/COMPRESSION TEST ARRANGEMENT

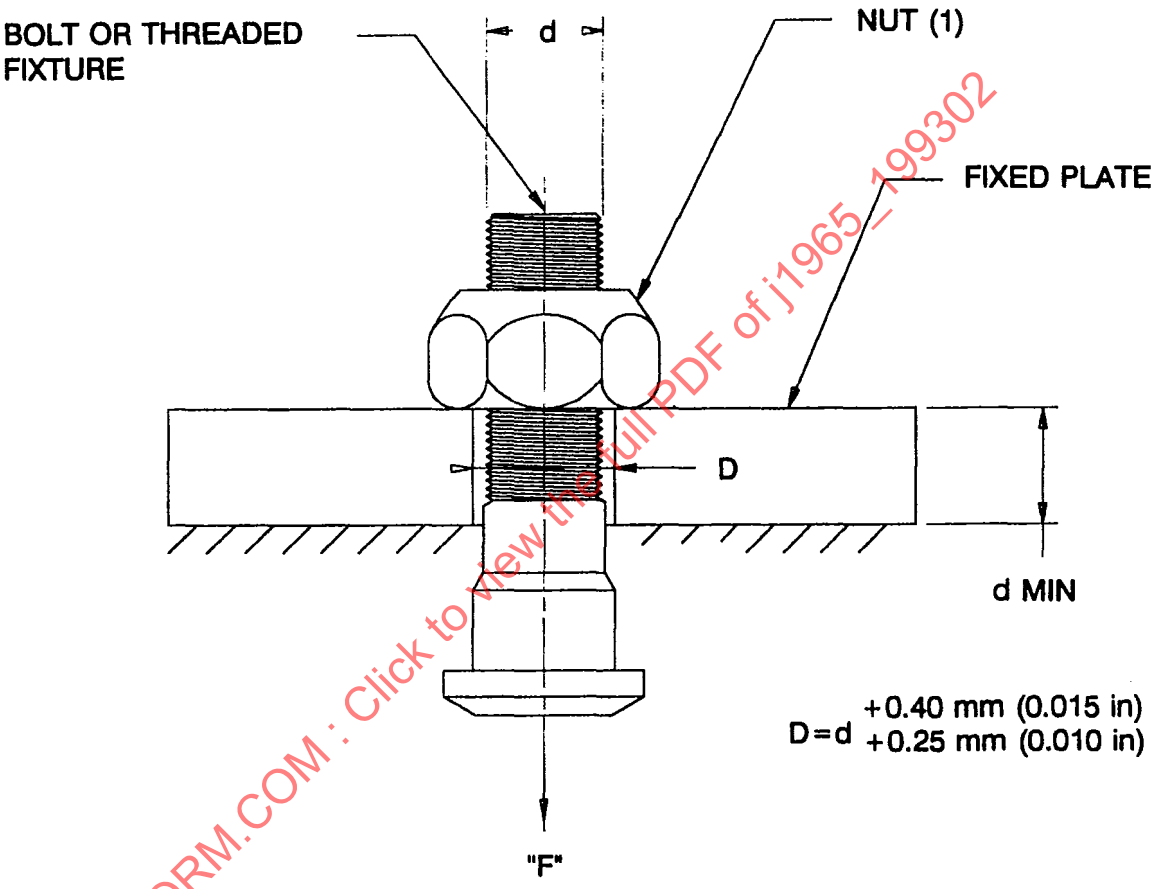

FIGURE 3—OUTER BALL SEAT NUT PROOF LOAD TEST ARRANGEMENT

3.3 Failure Criteria and Surface Discontinuities

a. The criteria for rejection due to cracks or other surface discontinuities is shown in Section 5.

b. For two piece flange nuts, the permanent deformation in nut height (H) after unloading must not exceed 0.13 mm (0.005 in).

4. Nut Assembly Test Methods (Two Piece Flange Nut Only)

4.1 Torque/Tension—Clamping Force—The purpose of this test is to insure the ability of the nut assembly to provide proper clamping force. The coefficient of friction should be representative of the production parts.

4.1.1 SELECTION—Use only fully processed nut assemblies which are representative of production parts intended for the vehicle. New nuts and studs or bolts should be used for each test.

4.1.2 TEST PROCEDURE—The nut shall be tested on a bolt test stand which can display all necessary data. The following are to be recorded:

a. Overall tightening torque
b. Bolt tension
c. Head friction torque/thread friction torque (optional)

The force is applied using a tightening device using rotational speed of 6 to 10 rpm. Test bolts must be representative of those used in production. To reduce variations the test bolts should be oiled with an SAE 10W30 oil. Nuts shall be tested as supplied with no additional oil added.

The test method is to torque to the initial value shown in Table 2 and take measurements on the force of the bolt and then to continue to torque to the final value as shown in Table 2 and again measure the force on the bolt.

Table 2 gives minimum and maximum test torques and tensions.

TABLE 2—TEST TORQUES AND TENSIONS

Thread	A Initial Torque (N-m)	A Initial Torque (ft-lb)	B Initial Tension (Min) (kg)	B Initial Tension (Min) (lb)	C Final Torque (N-m)	C Final Torque (ft-lb)	D Final Tension (Max) (kg)	D Final Tension (Max) (lb)
M14 x 1.5	149	110	4 525	10 000	190	140	10 498	23 200
M18 x 1.5	249	184	8 145	18 000	430	317	18 235	40 300
M20 x 1.5	339	250	10 181	22 500	610	450	22 896	50 600
M22 x 1.5	502	370	13 575	30 000	678	500	28 100	62 100
9/16 - 18	169	125	5 339	11 800	190	140	11 041	24 400
5/8 - 18	176	130	5 520	12 200	244	180	13 891	30 700
7/8 - 14	475	350	9 050	20 000	678	500	27 647	61 100

NOTE—The final tension values (D) are the calculated bolt proof load values for each thread size in material Class 10.9 (Grade 8).