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SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J267

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Submitted for recognition as an American National Standard

(R) Wheels/Rims—Trucks—Performance Requirements and Test Procedures

1. ***Scope—***This SAE Recommended Practice provides minimum performance requirements and uniform laboratory procedures for fatigue testing of wheels and demountable rims intended for normal highway use on trucks, buses, truck-trailers, and multipurpose vehicles. For other wheels intended for normal highway use and temporary use on passenger cars, light trucks, and multipurpose vehicles, see SAE J328. For wheels used on trailers drawn by passenger cars, light trucks, or multipurpose vehicles, see SAE J1204. For bolt together military wheels, see SAE J1992. This document does not cover other special application wheels and rims.

2. ***References***

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

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

SAE J328—Wheels—Passenger Cars and Light Truck Performance Requirements and Test Procedures
SAE J393—Nomenclature—Wheels, Hubs, and Rims for Commercial Vehicles
SAE J1204—Wheels—Recreational and Utility Trailer Test Procedure
SAE J1992—Wheels/Rims—Military Vehicles—Test Procedures and Performance Requirements
SAE HS 3300—Wheels Standards Supplement

2.1.2 TIRE AND RIM ASSOCIATION PUBLICATION—Available from The Tire and Rim Association, Inc., 175 Montrose West Avenue, Suite 150, Copley, OH 44321.

Yearbook, The Tire and Rim Association Inc.

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

ISO 3006—Road Vehicles—Passenger Car Wheels—Test Methods
ISO 3894—Road vehicles—Truck—Wheels/rims—Test methods
ISO 3911—Wheel/rims—Nomenclature, designation, marking, and units of measurement

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SAE WEB ADDRESS http://www.sae.org

2.2.2 OSHA PUBLICATION—OSHA Publication Office, Room S-4203, 200 Constitution Avenue NW, Washington, DC 20210.

OSHA Standard 29 CFR Part 1910.177—Servicing of Multi-Piece and Single-Piece Rim Wheels

3. Dynamic Cornering Fatigue—The test wheels, when subject to the following test procedures, shall meet the minimum performance requirement specified in Table 1.

TABLE 1—CORNERING FATIGUE TEST
TEST LOAD FACTORS AND CYCLE REQUIREMENTS

Disc Wheel/Rim Description (All Mountings) Material	Disc Wheel/Rim Description (All Mountings) Rim Diameter Code	Disc Wheel/Rim Description (All Mountings) Inset/Outset mm	Disc Wheel/Rim Description (All Mountings) Inset/Outset in	Performance Requirements Accelerated Test Factor	Performance Requirements Minimum Cycle Life
Ferrous	13, 14, 15	Less than 101.6	Less than 4	1.60	18 000
Ferrous	16 and larger(1)	Less than 101.6	Less than 4	1.45	30 000
Ferrous	All	101.6 or more	4 or more	1.10	60 000
				1.30	40 000
Aluminum	16	127 or more	5 or more	1.35	250 000
				1.63	80 000
Aluminum	17.5 and larger(1)	All	All	1.35	250 000

1. Exclude 17.5 and larger with rim width of 266.7 mm (10.50 in) and wider (wide base tire wheels).

3.1 Equipment—Use a test machine that:

a. Imparts a constant rotating bending moment to the wheel. See Figure 1A or 1B.
b. Maintains the test load within ±3%.
c. Monitors and measures the deflection of the system.
d. Has a rigid load arm shaft.

3.2 Procedure

a. Use a test adapter, studs, and nuts representative of those specified for the wheel.
b. Verify the mating surfaces of the adapter are free of foreign material or excessive wear.
c. Attach the wheel to a rigid load arm shaft and test adapter.
d. Tighten the nuts to the torque specified in Appendix A for the stud size and type of nut. Torque shall be checked and reset periodically during the course of a test in order to compensate for the "wearing in" of mating surfaces.
e. Clamp the rim securely to the test device.
f. Adjust the system so that shaft runout is not more than 0.25 mm (0.010 in) total indicator reading at the point of loading.

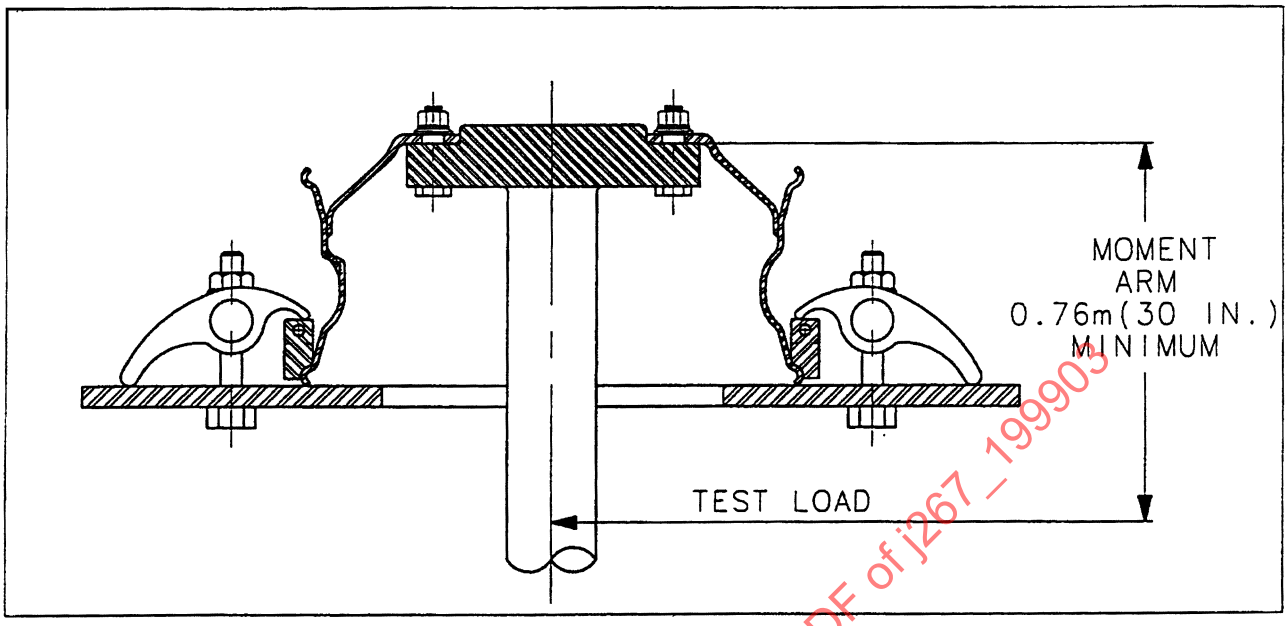

FIGURE 1A—

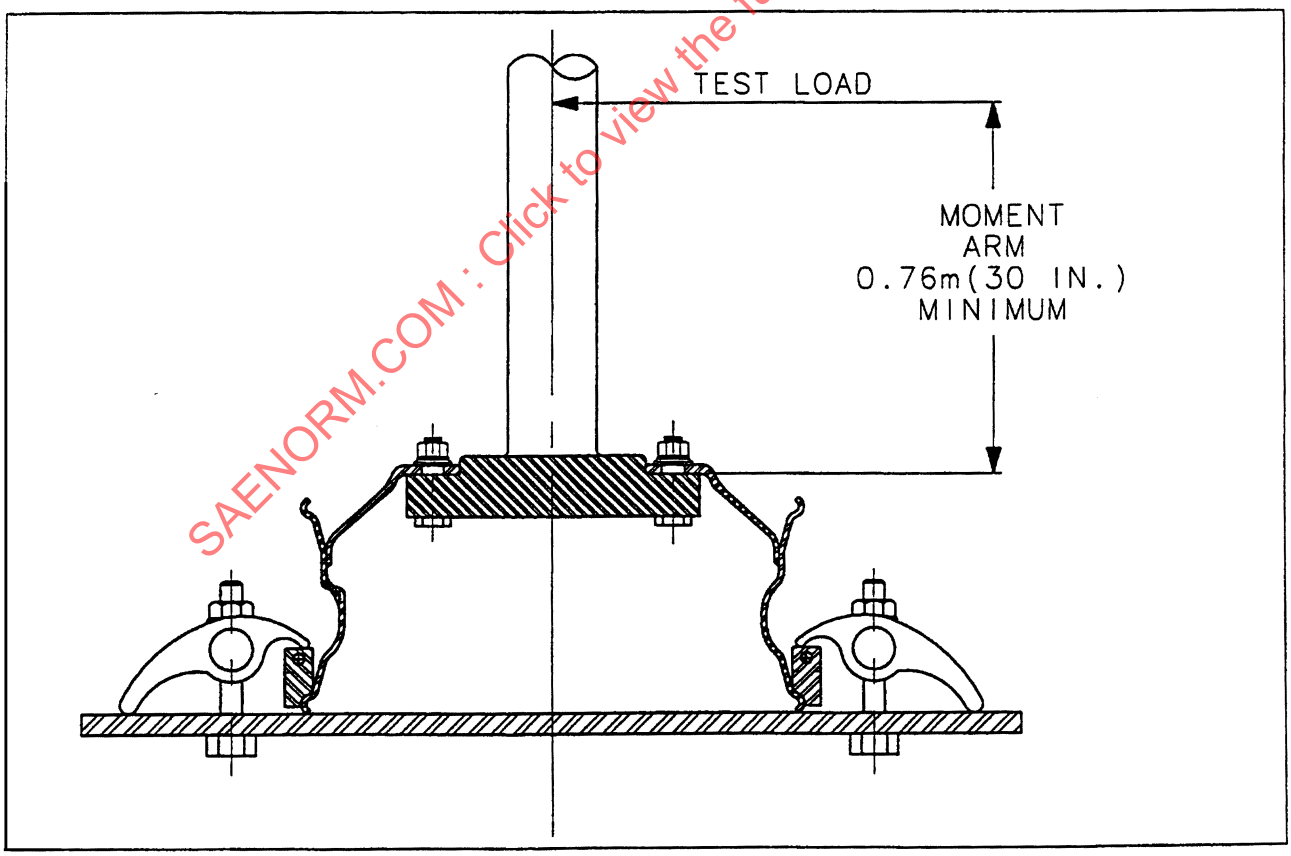

FIGURE 1B—

FIGURE 1—CORNERING FATIGUE—90 DEGREE LOADING METHOD (TYPICAL SETUP)

3.3 Test Loading

a. Test Load and Bending Moment Determination—The test load is determined by Equation 1:

$$\text{Test Load} = \frac{M}{\text{Moment arm}} \text{ (see Figure 1A or 1B)} \qquad \text{(Eq. 1)}$$

M is determined by Equation 2:

$$M = (L)[u(slr) + d](S) \qquad \text{(Eq. 2)}$$

where:

M = Bending moment, N-m (lbf-in)
u = Coefficient of friction developed between tire and road, use 0.7 for u.
slr = Largest static loaded radius of the tires to be used on the wheel as specified by the current Tire and Rim Association Yearbook or the vehicle/wheel manufacturer, mm x 10^{-3} (in). Use the values of slr found in Appendix B.
d = Inset or outset, mm x 10^{-3} (in). (Positive for inset, negative for outset) of the wheel. If wheel may be used as inset or outset, use inset. See SAE J393.
S = Accelerated test factor. See Table 1.
L = Load rating of the wheel as specified by the wheel manufacturer, N (lbf).

b. For minimum cycle life, see Table 1.
c. Apply the test load parallel to a plane through the center of the rim as shown in Figure 1A or 1B. Load may push against shaft or pull the shaft.

3.4 Test Wheels—Use only fully processed new wheels, which are representative of wheels intended for the vehicle and ready for road use. New wheels/rims and new related components of multi-piece rims will be used for each test.

3.5 Test Criteria/Test Termination—The wheel under test must complete the minimum number of test cycles prior to test termination. The test shall be terminated by the inability of the wheel to sustain load and/or a visually detected fatigue crack penetrating through a section. Broken studs or other parts of the test fixture do not require test termination but may result in damage to the wheel and test invalidation.

4. Dynamic Radial Fatigue Test, Disc Wheels, and Demountable Rims—The test wheels, when subject to the following test procedures, shall meet the minimum performance requirement specified in Table 2.

4.1 Equipment—Use a test machine that:

a. Has a driven rotatable drum which presents a smooth surface wider than the loaded test tire section width.
b. Has a suggested drum diameter of 1707.06 mm (67.23 in), giving 187.5 revolutions per kilometer (300 revolutions per mile).
c. Imparts a constant load to the wheel. This load must be perpendicular to the surface of the drum and in line radially with the center of the test wheel and the center of the drum.
d. Can maintain the test load and inflation within ±3%.
e. Holds the axis of the test wheel and the drum parallel.

TABLE 2—RADIAL FATIGUE TEST
TEST LOAD FACTORS AND CYCLE REQUIREMENTS

Disc Wheel/Rim Description (All Mountings) Material	Disc Wheel/Rim Description (All Mountings) Rim Diameter Code	Disc Wheel/Rim Description (All Mountings) Inset/Outset[1] mm	Disc Wheel/Rim Description (All Mountings) Inset/Outset[1] in	Performance Requirements Accelerated Test Factor	Performance Requirements Minimum Cycle Life
Ferrous	13, 14, 15, 16, 17 5 degrees Drop Center	All	All	2.2 1.8	500 000 1 000 000
Ferrous	15, 17, 18, 20, 22, 24 5 degrees Flat Base	All	All	2.0 1.9 1.8 1.7	500 000 600 000 700 000 850 000
	17.5HC, 19.5, 22.5, 24.5 15 degrees Drop Center			1.6	1 000 000
Aluminum	16	127 or more	5 or more	2.8 2.0	100 000 1 000 000
Aluminum	17.5 and larger	All	All	2.8 2.0	100 000 1 000 000

1. Offset for demountable rims.

4.2 Procedure

a. Select test tires that are representative of the maximum size and type approved by the vehicle or wheel manufacturer for the wheel under test.
b. Use a test adapter, studs, and nuts (and clamps for demountable rims) that are representative of those specified for the wheel/rim.
c. Mount and inflate the tire to 448 kPa ± 14 kPa (65 psi ± 2 psi) for tires with usage pressure of 310 kPa (45 psi) or less. For wheels and tires intended for use at higher pressures, use 1.2 times the usage pressure, but not less than 448 kPa ± 14 kPa (65 psi ± 2 psi).
d. Tighten the nuts to the torque specified in Appendix A for the stud size and type of nut. Torque shall be checked and reset periodically during the course of a test in order to compensate for the "wearing in" of mating surfaces.
e. There may be an increase in inflation pressure during the test. This is normal, but it is permissible to adjust back to the test pressure.

4.3 Radial Test Loading

a. Radial Load Determination—The radial load is determined as follows in Equation 3:

$$R = (S)L \qquad \text{(Eq. 3)}$$

where:

R = Radial load, N (lbf)
S = Accelerated test factor. See Table 2.
L = Load rating of the wheel/rim as specified by the wheel/rim manufacturer, N (lbf)

b. For minimum cycle life, see Table 2.

4.4 **Test Wheels—**Use only fully processed new wheels/rims which are representative of wheels/rims intended for the vehicle and ready for road use. New wheels/rims and new related components of multi-piece rims will be used for each test.

4.5 **Test Criteria/Test Termination—**The wheel under test must complete the minimum number of test cycles prior to test termination. The test shall be terminated by the inability of the wheel to sustain load and/or a visually detected fatigue crack penetrating through a section. Failure of the test tire, broken studs, or other parts of the test fixture do not require test termination but may result in damage to the wheel and test invalidation.

5. Notes

5.1 **Marginal Indicia—**The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE TRUCK AND BUS WHEEL SUBCOMMITTEE
OF THE SAE TRUCK AND BUS CHASSIS COMMITTEE

APPENDIX A

TABLE A1—TEST TORQUES

Application[1]	Thread Size	Dry Torque[2] +10%, −0% N-m	Dry Torque[2] +10%, −0% lbf-ft
Disc Wheels	M12 × 1.5	110	80
Light Truck	7/16 – 20	110	80
60 degree Cone Nuts	1/2 – 20	110	80
	9/16 – 18	170	125
	5/8 – 18	170	125
Hub Piloted Mounting	9/16 – 18	160	120
1-piece Nut	11/16 – 16	410	300
Hub Piloted Mounting	9/16 – 18	170	125
2-piece nut	5/8 – 18	180	130
	3/4 – 16	410	300
	7/8 – 14[3]	480	350
	7/8 – 14	610	450
	M12 x 1.75	115	85
	M14 x 1.75	180	130
	M14 x 1.5	150	110
	M18 x 1.5	260	190
	M20 x 1.5	380	280
	M22 x 1.5	610	450
Hub Piloted Mounting	9/16 – 18	150	110
with Clamp Plate and	M14 x 1.5	150	110
90 degree Cone Nuts	5/8 –18	180	130
Ball Seat Mounting	3/4 – 16	610	450
	1- 1/8 – 16	610	450
Heavy-Duty Ball	15/16 – 12	1020	750
Seat Mounting	1- 5/16 – 12	1020	750
Demountable Rims Studs and Nuts	3/4 – 10	270	200

1. For applications and sizes not shown, use torque recommendations prescribed by the wheel/rim or vehicle manufacturer.
2. Dry torque means no additional lubricants are applied.
3. Bus Front.