The Engineering Society For Advancing Mobility Land Sea Air and Space®
SAE INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J328

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Superseding J328 MAR90

Submitted for recognition as an American National Standard

(R) WHEELS—PASSENGER CAR AND LIGHT TRUCK PERFORMANCE REQUIREMENTS AND TEST PROCEDURES

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. Scope—This SAE Recommended Practice provides minimum performance requirements and uniform procedures for fatigue testing of wheels intended for normal highway use and temporary use on passenger cars, light trucks, and multipurpose vehicles. For heavy truck wheels and wheels intended to be used as duals, see SAE J267. For wheels used on trailers drawn by passenger cars, light trucks, or multipurpose vehicles, see SAE J1204. These minimum performance requirements apply only to wheels made of materials included in Tables 1 to 4.

2. References

2.1 Applicable Publications—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 J267—Wheels/Rims-Trucks—Test Procedures and Performance Requirements
SAE J1204—Wheels-Recreational and Utility Trailer Test Procedures

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

ISO 3006—Road vehicles—Passenger car road wheels—Test methods
ISO 3911—Wheels/rims—Nomenclature, designation, marking, and units of measurement

2.1.3 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 & Rim Association Inc.

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2.2 Related Publication—The following publication is provide for informational purposes only and is not a required part of this document.

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

SAE J393—Nomenclature-Wheels, Hubs, and Rims for Commercial Vehicles

TABLE 1—TEST FACTORS AND MINIMUM CYCLE REQUIREMENTS FOR WHEELS IN NORMAL HIGHWAY SERVICE—DYNAMIC CORNERING FATIGUE

Wheel Type (Material)	"S" Front	"S" Rear	Minimum Cycles
Ferrous All	1.6	1.45	18 000
Cold Formed Aluminum 5000 Series(1)	1.8	1.55	50 000
Aluminum Cast and Forged	2.0	1.75	50 000

1. With 3% or less magnesium content.

TABLE 2—TEST FACTORS AND MINIMUM CYCLE REQUIREMENTS FOR WHEELS IN NORMAL HIGHWAY SERVICE—DYNAMIC RADIAL FATIGUE

Wheel Type (Material)	"K" Front	"K" Rear	Minimum Cycles
Ferrous All	2.25	2.0	400 000
Aluminum All	2.5	2.25	600 000

TABLE 3—FACTORS AND MINIMUM CYCLE REQUIREMENTS FOR TEMPORARY USE WHEELS—DYNAMIC CORNERING FATIGUE

Wheel Type (Material)	"S" Front	"S" Rear	Minimum Cycles
Ferrous All	1.6	1.45	9 000
Cold Formed Aluminum 5000 Series(1)	1.8	1.55	25 000
Aluminum Cast and Forged	2.0	1.75	25 000

1. With 3% or less magnesium content.

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TABLE 4—FACTORS AND MINIMUM CYCLE REQUIREMENTS FOR TEMPORARY USE WHEELS—DYNAMIC RADIAL FATIGUE

Wheel Type (Material)	"K" Front	"K" Rear	Minimum Cycles
Ferrous All	1.65	1.45	400 000
Aluminum All	1.80	1.60	600 000

3. ***Definitions—***See Figure 1.

3.1 **Normal Highway Use—**A wheel intended for sustained, all position, use on a motor vehicle on improved surfaces with no special restrictions as to speed or distance traveled.

3.2 **Temporary Use—**A wheel intended for "temporary use" only as a spare on only one vehicle position at a time and only for the life of an original tire. Special speed restrictions may also apply.

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

4.1 **Equipment—**Use a test machine that:

a. Imparts a constant rotating bending moment to the wheel (see Figure 2.)
b. Maintains the test load within ±2.5%.
c. Monitors and measures the deflection of the system at the point of load application during the test.

4.2 **Procedure**

a. Use a test adapter, studs, and nuts representative of those specified for the wheel.
b. Verify the mating surfaces of the wheel and adapter are free of foreign material or excessive wear.
c. Attach a rigid load arm shaft and test adaptor to the wheel mounting surface.
d. Tighten the nuts to 115 N·m ± 7 N·m (85 ft-lb ± 5 ft-lb) or as specified by the wheel or vehicle manufacturer.
e. Clamp the rim securely to the test device.
f. Adjust the system to be within 0.25 mm (0.010 in) total indicator reading normal to the load arm shaft at the point of load application.
g. Apply the test load parallel to the plane of the rim.

4.3 **Bending Moment—**Calculate the bending moment (Force x Load Arm Length) to be applied to the test wheel as follows in Equation 1:

$$M = W(Ru + d)S \quad \text{(Eq. 1)}$$

where:

M = bending moment N·m (lbf-ft): Use M_1 or M_2 whichever is greater as determined by Equations 2 and 3:

$$M_1 = W_1(Ru + d)S_1 \quad \text{(Eq. 2)}$$

and

$$M_2 = W_2(Ru + d)S_2 \quad \text{(Eq. 3)}$$

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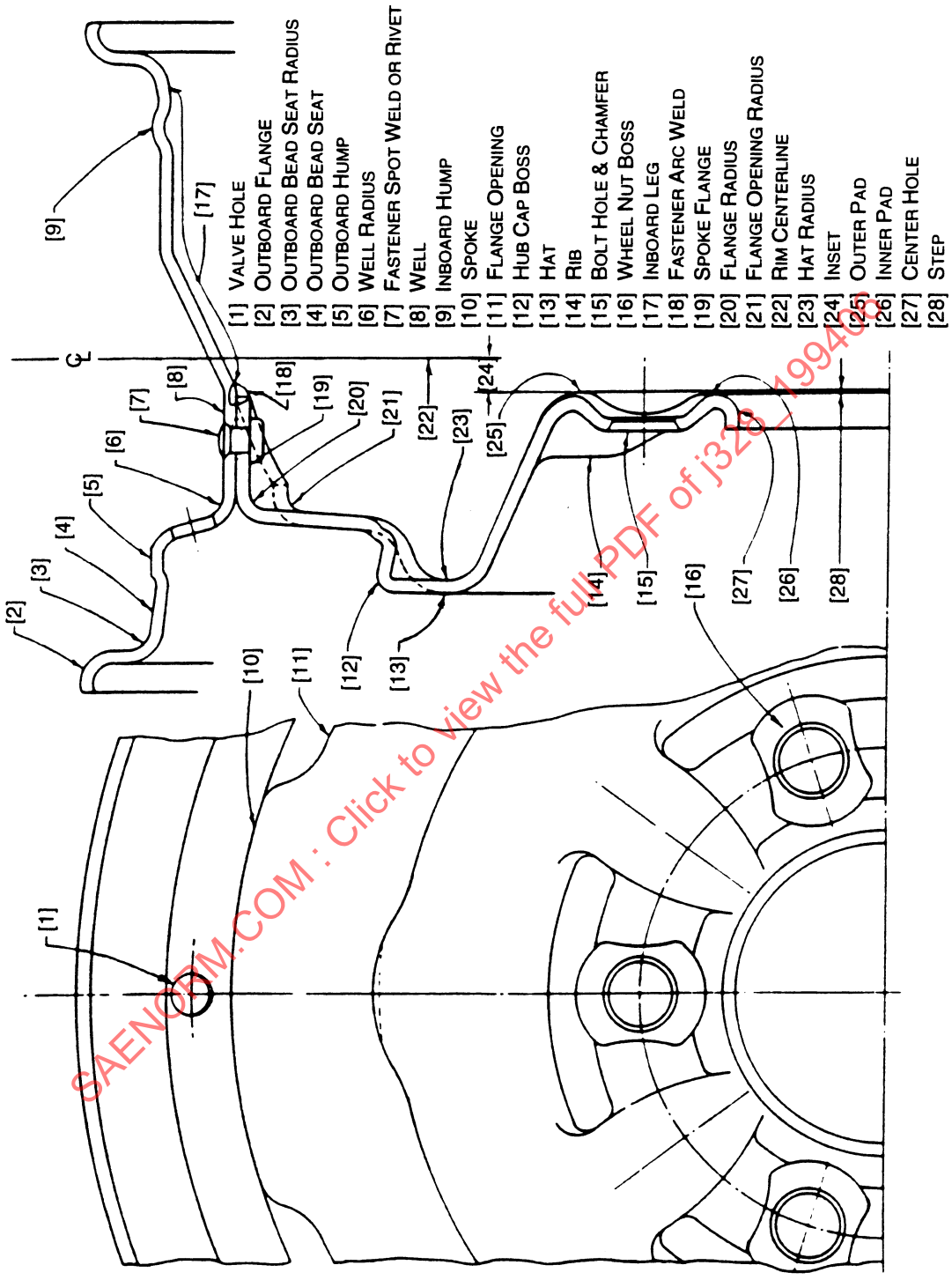

FIGURE 1—NOMENCLATURE

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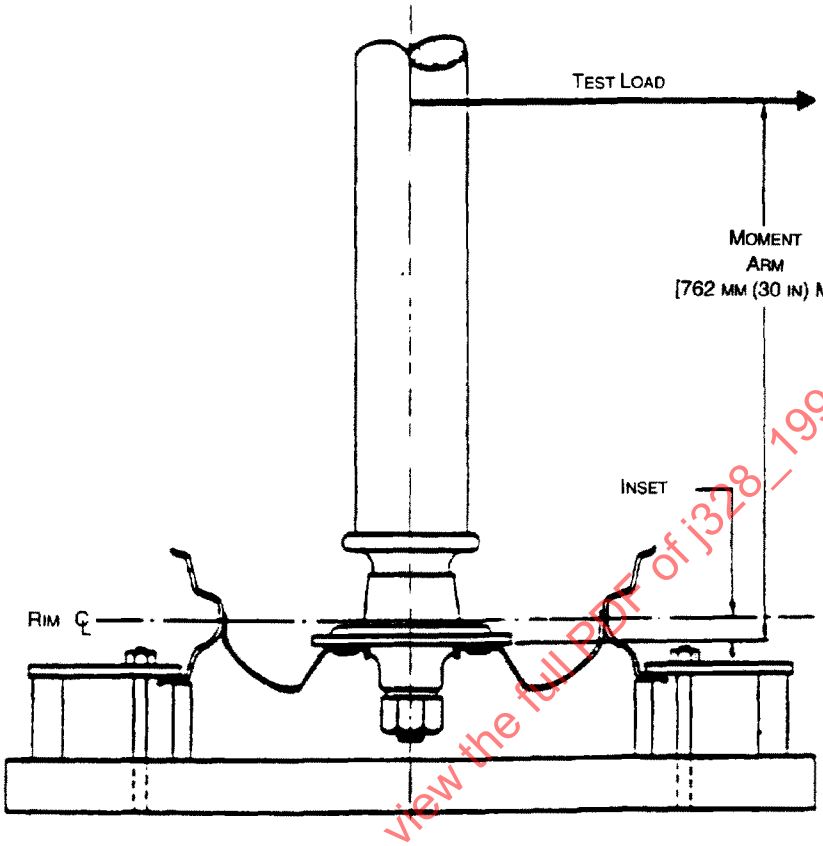

FIGURE 2—DYNAMIC CORNERING FATIGUE MACHINE

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where:

W = 1/2 of the maximum vertical static load on the axle as specified by the vehicle manufacturer or the load rating of the wheel as specified by the wheel manufacturer N (lbf): W_1 (Front) W_2 (Rear)
R = Static-loaded radius of the largest tire specified by the vehicle manufacturer and/or wheel manufacturer m (ft)
u = coefficient of friction developed between the tire and the road: use u = 0.7
d = the inset or outset of the wheel m (ft): use positive sign for inset and negative sign for outset
S = load factor—see Table 1 or 3. S_1 (Front), S_2 (Rear)

4.4 Test Criteria/Test Termination

a. Use only fully processed new wheels, which are representative of wheels intended for the vehicle and ready for road use. Separate wheels are to be used for each test.
b. The wheel under test must complete the minimum number of test cycles Table 1 or 3 prior to test termination. The test shall be terminated when the operating deflection exceeds the initial deflection at point of load application by 20%. 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. Dynamic Radial Fatigue

5.1 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 - 187.5 revolutions per kilometer (67.23 in - 300 revolutions per mile).
c. Imparts a constant load to the test wheel and tire normal to the surface of the drum and in line radially with the center of the test wheel and drum.
d. Can maintain the test load within ±2.5%.
e. The axis of the test wheel and drum are parallel.

5.2 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 adaptor, studs, and nuts that are representative of those specified for the wheel.
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 wheel nuts to 115 N·m ± 7 N·m (85 ft-lb ± 5 ft-lb) or as specified by the vehicle or wheel manufacturer.
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.
f. Use caution as the test tires are severely overloaded and may fail.

5.3 Radial Load—The radial load to be applied to the wheel shall be determined as follows in Equation 4:

$$F_r = WK \quad \text{(Eq. 4)}$$

where:

F_r = radial load: use F_{r1} or F_{r2} whichever is greater as determined by Equations 5 and 6:

$$F_{r1} = W_1 K_1 \quad \text{(Eq. 5)}$$

where:

W_1 = 1/2 of the maximum static load on the front axle
K_1 = load factor (rear). See Table 2 or 4.

$$F_{r2} = W_2 K_2 \quad \text{(Eq. 6)}$$

where:

W_2 = 1/2 of the maximum static load on the rear axle
K_2 = load factor (front). See Table 2 or 4

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