

**Wheels—Recreational and Utility Trailer Test Procedure**

- 1. Scope**—This SAE Recommended Practice provides uniform procedures and minimum performance requirements for fatigue testing ferrous and aluminum wheels intended for normal highway use on travel, camping, and boat and light utility trailers drawn by passenger cars, light trucks, and multipurpose vehicles. (See Figures 1 and 2.) For procedures and minimum performance requirements for wheels used on trucks, see SAE J267, and for wheels used on passenger cars, see SAE J328. For the application of passenger car and light truck wheels [inset less than 0.10 m (0.33 ft)] to this trailer service, use this procedure. For the application of heavier truck wheels [inset 0.10 m (0.33 ft) or more] use SAE J267. Mobile home service is outside the scope of this document.

There are two basic test procedures described, a cornering fatigue test and radial fatigue test. The cornering test is directed at the wheel disc; whereas the radial test also examines the rim and attachment portion of the wheel. Both test procedures are required to obtain a thorough examination of the wheel.

- 1.1 Rationale**—This document has been reaffirmed to comply with the SAE 5-Year Review policy.

**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, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

SAE J267—Wheels/Rims—Trucks—Test Procedures and Performance Requirements  
SAE J328—Wheels—Passenger Cars—Performance Requirements and Test Procedures

- 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 PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

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

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2.2.2 ISO PUBLICATION—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 3911—Wheels/rims—Nomenclature, designation, marking and units of measurement

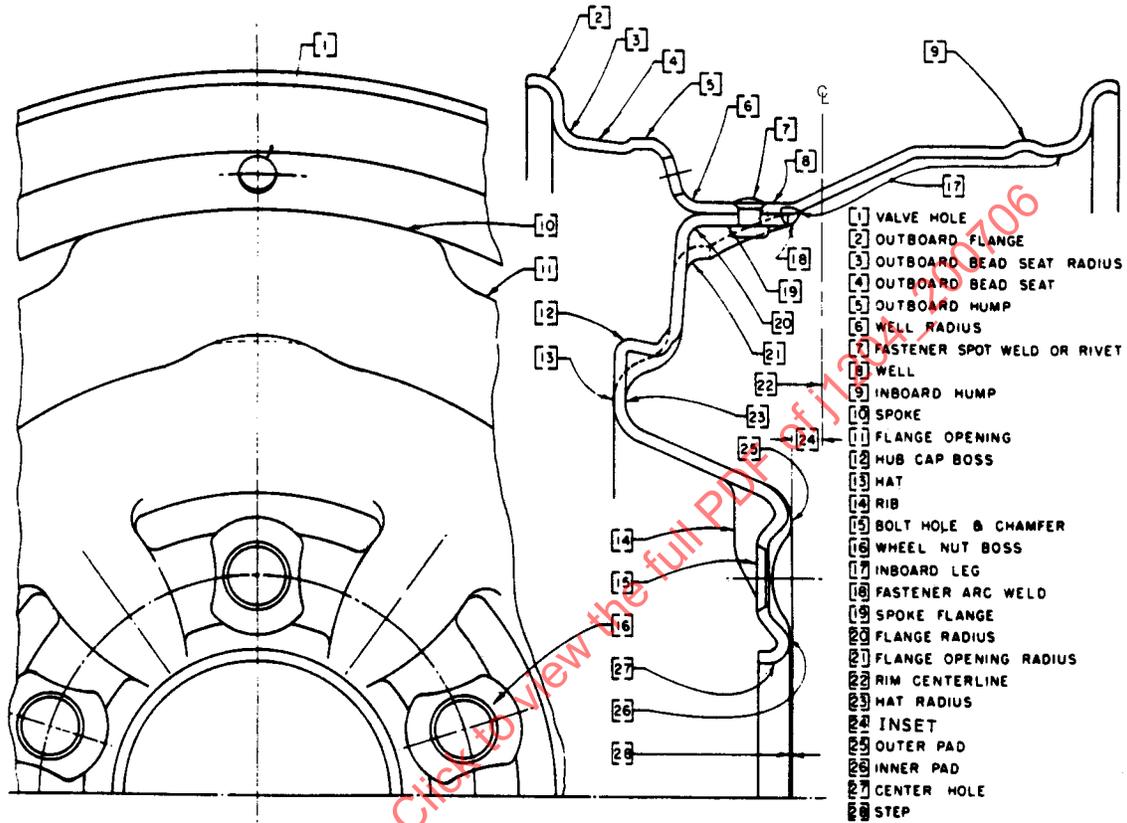


FIGURE 1—NOMENCLATURE FOR DROP CENTER WHEEL

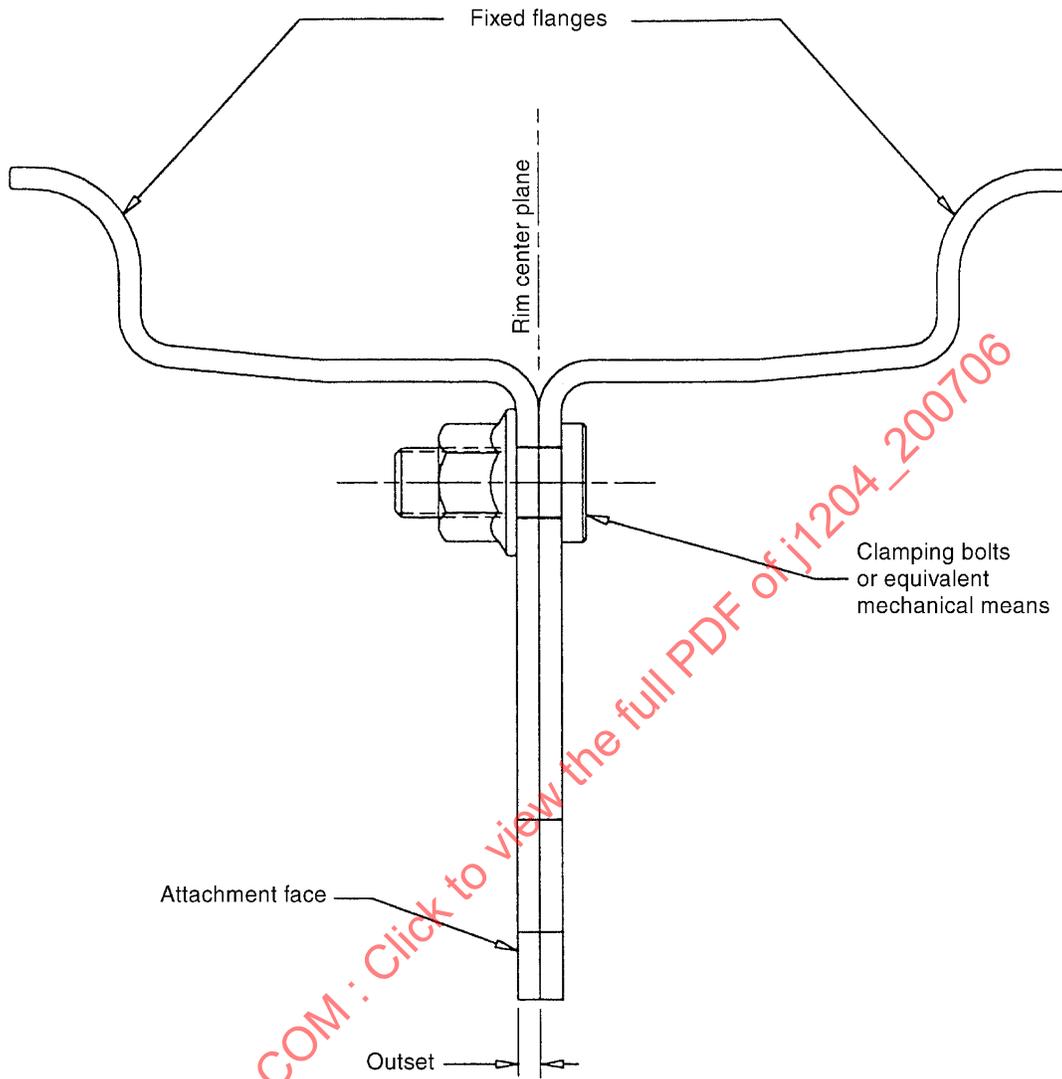


FIGURE 2—NOMENCLATURE FOR DIVIDED WHEEL

### 3. Test Procedures

**3.1 Wheels for Test**—Use only fully processed new wheels that are representative of production parts intended for the vehicle and ready for road use. Separate wheels are to be used for each test.

### 3.2 Dynamic Cornering Fatigue

**3.2.1 EQUIPMENT**—The test machine shall be one with a means to impart a constant rotating bending moment of the wheel.

**3.2.2 PROCEDURE**—The rim shall be clamped securely to the test device. A rigid load arm shaft with a test adaptor shall be attached to the mounting surface of the wheel, using studs and nuts representative of those specified for the wheel.

These wheel nuts shall be tightened to the torque limits specified in Table 1 for the stud size and the type of nut. The mating surface of the test adaptor and wheel shall be free of build-up of paint, dirt, wear, or foreign matter. The final clamped position of the wheel without load shall not exceed an eccentricity of 0.25 mm (0.010 in) total indicator reading normal to the shaft axis at the point of loading. The application of the test load will be parallel to a plane through the center of the rim as shown in Figure 3. The loading system should maintain the bending moment within  $\pm 3\%$ .

**TABLE 1—MOUNTING NUT TORQUES<sup>(1)</sup> FOR LABORATORY WHEEL/TESTS**

Application	Thread Size	Torque (dry) N·m	Torque (dry) lbf·ft
Disc Wheels	7/16 – 20	115 ± 7	85 ± 5
	12 x 1.5 mm	115 ± 7	85 ± 5
	1/2 – 20	115 ± 7	85 ± 5
	14 x 1.5 mm	158 ± 7	115 ± 5
	9/16 – 18	158 ± 7	115 ± 5
	5/8 – 18	178 ± 7	130 ± 5

1. Nut torque values may be checked and reset during the course of a wheel test in order to compensate for the "wearing in" of mating surfaces of nuts and bolt holes. This shall be done at 1000 cycles and it may be done again at 5000 cycles.

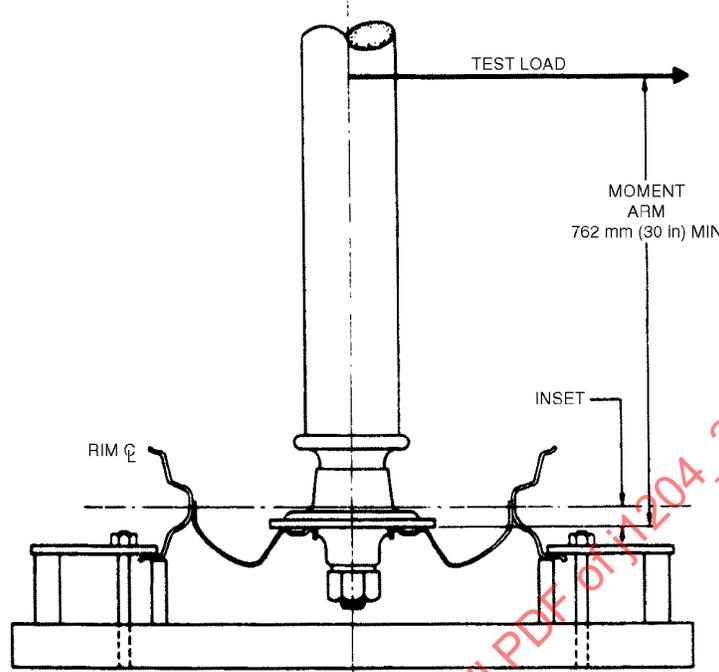


FIGURE 3—ROTARY TEST

3.2.3 BENDING MOMENT—Bending moment is determined by Equation 1:

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

where:

M = Bending moment N·m (lbf·ft)

W = The maximum static wheel load as specified by vehicle manufacturer and/or wheel manufacturer; N (lbf)

R = Static loaded radius of the largest tire to be used on the wheel as specified by the vehicle and/or wheel manufacturer; m (ft)

$\mu$  = Coefficient of friction between the tire and the road; use  $\mu = 0.7$

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 2)

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

Wheel Type (Material)	“S”	Minimum Cycles
Ferrous All	1.45	18 000
Cold Formed Aluminum	1.55	50 000
5000 Series’ Aluminum Cast and Forged	1.75	50 000
With 3% or less magnesium content.		