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

SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J1204 | REV. DEC89

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(R) WHEELS - RECREATIONAL AND UTILITY TRAILER TEST PROCEDURE

1. SCOPE:

This document provides uniform procedures and minimum performance requirements for fatigue testing pressed steel wheels intended for normal highway use on travel, camping, and boat and light utility trailers drawn by passenger cars and light trucks. 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 0.33 ft (0.10 m)] to this trailer service, use this procedure. For the application of heavier truck wheels [inset 0.33 ft (0.10 m) 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.

2. DEFINITIONS: (Pressed Steel Wheels)

SAE J393 (Reference ISO 3911). See Figures 1 and 2.

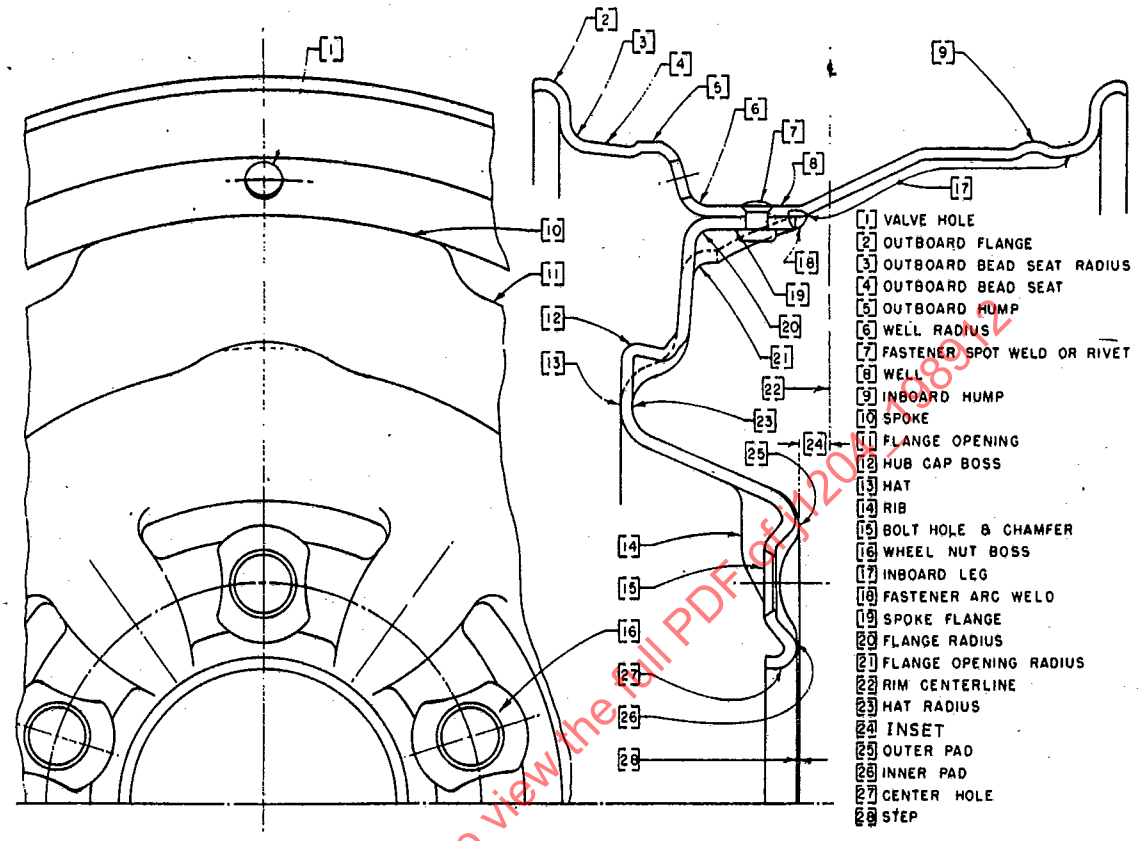

FIGURE 1

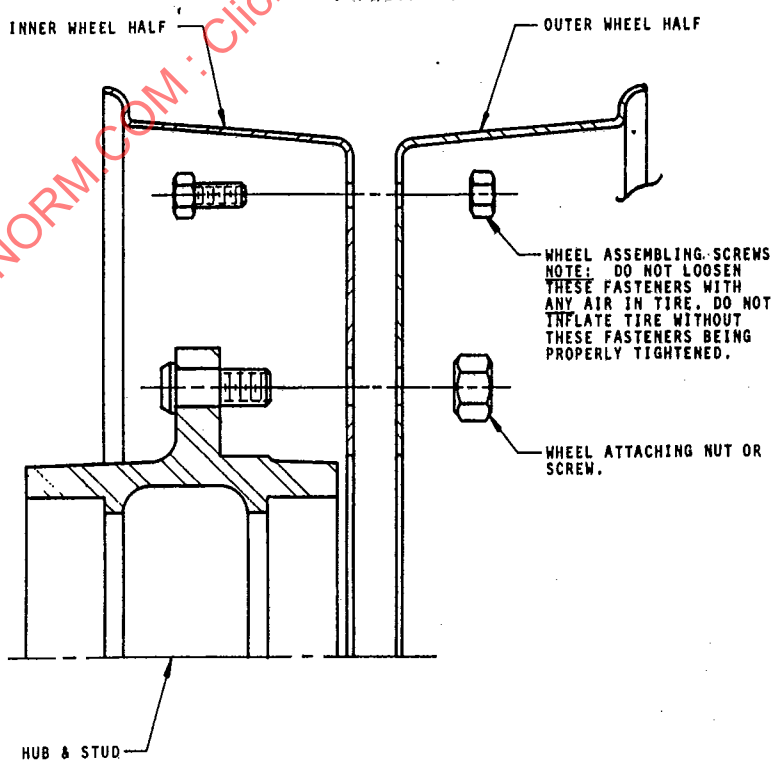

FIGURE 2

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 torqued 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 0.010 in (0.25 mm) 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 ±3%.

TABLE 1 - Mounting Nut Torques[a] for Laboratory Wheel/Tests

Application	Thread Size	Torque (dry) lbf·ft	Torque (dry) N·m
Disc Wheels	7/16 - 20	85 ± 5	115 ± 7
	12 x 1.5 mm	90 ± 10	125 ± 15
	1/2 - 20	85 ± 5	115 ± 7
	14 x 1.5 mm	115 ± 5	158 ± 7
	9/16 - 18	115 ± 5	158 ± 7
	5/8 - 18	130 ± 5	178 ± 7

[a]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.

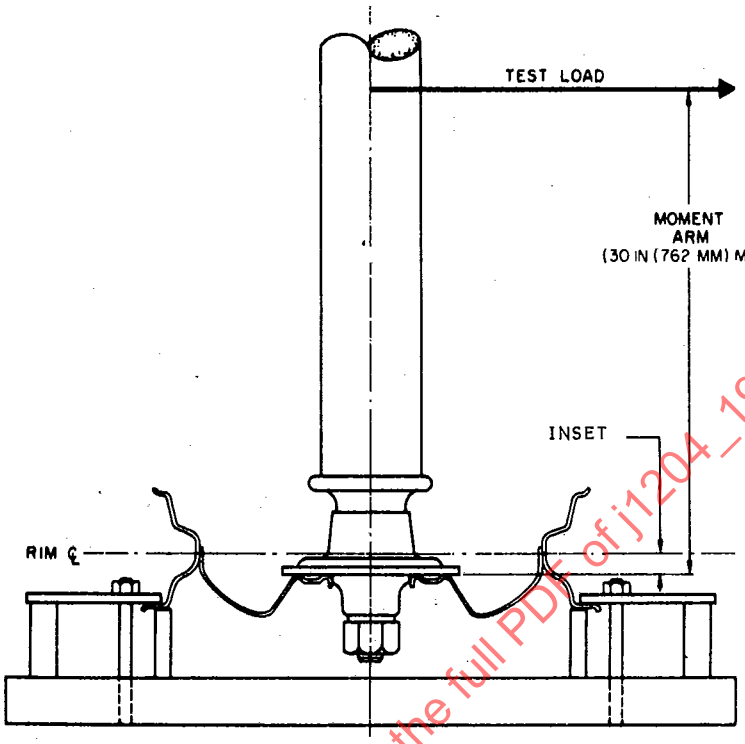

FIGURE 3

3.2.3 Bending Moment: Bending moment is determined by:

$$M = W(R\mu + d)S$$

where

M = Bending moment lbf·ft (N·m)

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

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

μ = Coefficient of friction between the tire and the road; use μ - 0.7

d = The inset or outset of the wheel ft (m). Use positive sign for inset and negative sign for outset.

S = Load Factor 1.45

The test load is determined from the following relation:

$$F = \frac{M}{D} \text{ (see Figure 3)}$$

3.2.3 (Continued):

where

F = Test load; lbf (N)

D = Moment arm; ft (m)

M = Bending moment lbf·ft (N·m)

3.2.4 Minimum Cycle Requirement = 18 000.

3.2.5 Test Termination Definitions:

a. Inability of wheel to sustain load.
b. A visually detected fatigue crack penetrating through a section.

3.3 Dynamic Radial Fatigue Test:

3.3.1 Equipment: The test machine shall be one with a driven rotatable drum, which presents a smooth surface wider than the loaded test tire section width. The suggested diameter of the drum is 67.23 in (1707.6 mm) 300 rev/mile (187.5 rev/km). The test wheel and tire must provide loading normal to the surface of the drum and in line radially with the center of the test wheel and the drum. The axes of the test wheel and the drum must be parallel. Equipment must hold test load to within ±3%.

3.3.2 Procedure: Tires selected for this test shall be representative of the maximum size and type approved by the trailer or the wheel manufacturer for the wheel under test. The test adaptor, studs, and nuts shall be representative of those specified for the wheel. The wheel nuts shall be torqued to the torque limits specified in Table 1 for stud size and type of nut used. Test inflation pressures shall be selected in accordance with Table 2.

3.3.3 Radial Load Determination: The radial load is determined as follows:

$$F_r = WK$$

where

F_r = Radial load; lbf (N)

W = The maximum static wheel load as specified by the wheel or trailer manufacturer; lbf (N)

K = Load factor = 2.00

3.3.4 Minimum cycle requirement = 400 000.

3.3.5 Test Termination Definition:

a. Inability of wheel to sustain load or contain air, or
b. A visually detected fatigue crack penetrating through a section.

TABLE 2

Usage Tire Pressure of Load		Test Pressure (Maintain within +5%)	
psi	kPa	psi	kPa
Up to 40	Up to 280	65	450
41 - 60	280 - 410	80	550
61 - 80	420 - 550	100	690
81 - 100	560 - 690	130	900

The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

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RATIONALE:

This document was last updated in November 1977. It contains the sentence "For Performance Requirements, See SAE JXXXX." SAE JXXXX was never written.

At the time this procedure was written, it was understood by the committee that such requirements had to be separate and that performance requirements were less well accepted. At this time, however, the committee is proposing to incorporate the performance requirements into the body of SAE J1204 and to make the changes necessary as a result. SAE J1204 is also being updated in line with current SAE practice.

The performance requirements are those originally intended to be used and are consistent with those for nonsteering, trailing axles of motor vehicles.

The dissemination of this information is considered to be particularly important in view of the diverse and widespread nature of the recreational vehicle manufacturing industry.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

SAE J267 DEC83, Wheels/Rims - Trucks - Test Procedures and Performance Requirements

SAE J328 MAY70, Wheel - Passenger Cars - Performance Requirements and Test Procedures

SAE J393 JAN84, Nomenclature - Wheels, Hubs, and Rims for Commercial Vehicles

ISO 3911

APPLICATION:

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