(R) WHEELS—PASSENGER CARS—PERFORMANCE REQUIREMENTS AND TEST PROCEDURES—SAE J328 MAR90

SAE Recommended Practice

Report of Wheel Committee approved March 1968 and last revised May 1970. Completely revised by the Wheel Standards Committee March 1990.

1. Scope—This SAE Recommended Practice provides minimum performance requirements and uniform procedures for fatigue testing of ferrous disc wheels intended for normal highway use on passenger cars, light trucks, and multipurpose passenger vehicles. For procedures and minimum performance requirements for wheels used on medium and heavy trucks, see SAE J267. For wheels used on trailers drawn by passenger cars, light trucks, or multipurpose vehicles, see SAE J1204. Wheels intended for temporary use and nonferrous road wheels are not included in this document.

2. References

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

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

SAE J1204, Wheels-Recreational and Utility Trailer Test Procedures

SAE J1982, Under development

ISO 3911, Wheels/Rims-Nomenclature, Designation, Marking, and its of Measurement

3. Definitions—See Figure 1.

4. Performance Requirements—The test wheels, when subjected to the test procedures described in Section 5 shall meet the following minimum performance requirements:

4.1 Dynamic Cornering Fatigue

4.1.1 MINIMUM CYCLES—After being subjected to 18 000 test cycles, there shall be no evidence of failure, as indicated by propagation of a crack existing prior to test, new visible cracks penetrating through a section, or the inability of the wheel to sustain load.

4.1.2 BENDING MOMENT—The bending moment (force × moment arm) to be applied to the test wheel shall be determined as follows:

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

where:

M = bending moment lbf ft (N.m)
W = 1/2 of the maximum vertical static load on the front or rear axle as specified by the vehicle manufacturer or the load rating of the wheel as specified by the wheel manufacturer lbf (N)
R = Static loaded radius of the largest tire to be used on the wheel as specified by the vehicle manufacturer and/or wheel manufacturer ft (m)
μ = coefficient of friction developed between the tire and the road ~~0.7~~ $\mu = 0.7$
d = the inset or outset of the wheel ft (m); use positive sign for inset and negative sign for outset
S = load factor S = 1.6

4.2 Dynamic Radial Fatigue

4.2.1 MINIMUM CYCLES—After being subjected to 400 000 cycles, there shall be no evidence of failure, as indicated by propagation of a crack existing prior to test, new visible cracks penetrating through a section, or the inability of the wheel to sustain load.

4.2.2 RADIAL LOAD—The radial load to be applied to the wheel shall be determined as follows:

$$F_r = Wk \qquad \text{(Eq.2)}$$

where:

F_r = radial load: use F_{r1} or F_{r2} whichever is greater as determined by the following formulas:

$$F_{r1} = W_1 k_1 \qquad \text{(Eq.3)}$$

where:

W_1 = 1/2 of the maximum static load on the front axle
K_1 = load factor = 2.25
$F_{r2} = W_2 k_2$

where:

W_2 = 1/2 of the maximum static load on the rear axle
K_2 = load factor = 2.0

5. Test Procedures

5.1 Wheels for Test—Use only fully processed new wheels, which

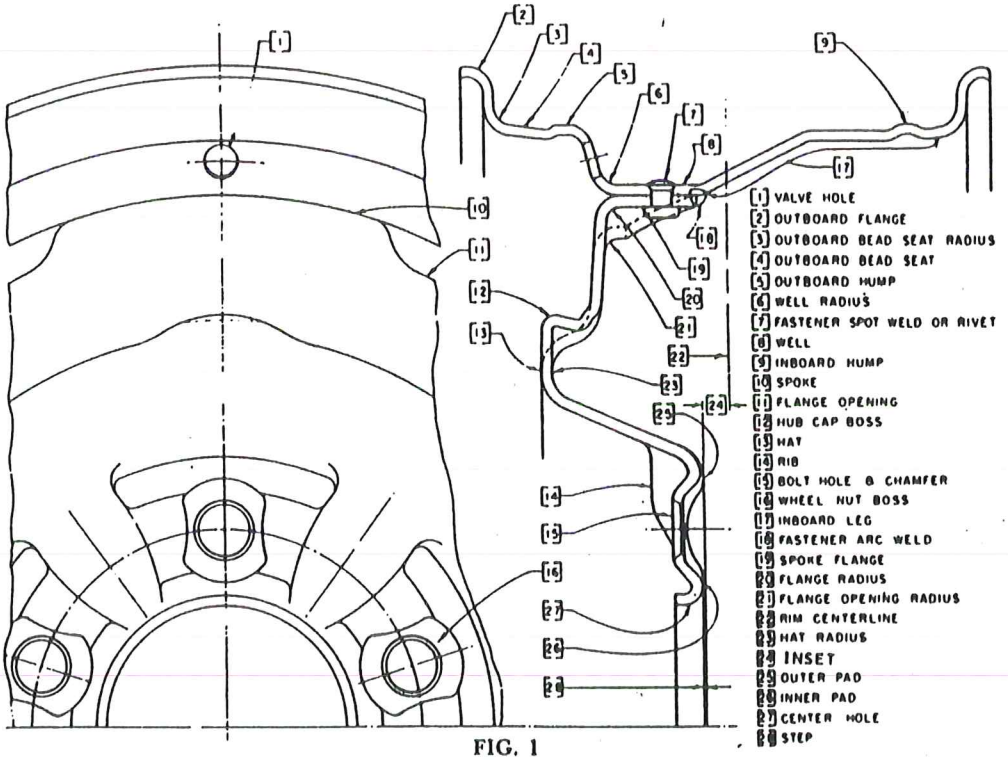

FIG. 1

are representative of wheels intended for the vehicle and ready for road use. Separate wheels are to be used for each test.

5.2 Dynamic Cornering Fatigue Test

5.2.1 EQUIPMENT—The test machine shall be one with a driven rotatable device and a means to impart a constant bending moment to a wheel.

5.2.2 PROCEDURE—The rim shall be clamped securely to the rotatable 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 at the beginning of the test to 85 lbf ft ± 5 (115 N.m ± 7). The mating surface of the test adaptor and wheel shall be free of buildup of paint, dirt, wear, or foreign matter. The final clamped position of the wheel to the rotating device 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. The loading system should maintain the bending moment within ± 2.5%.

5.3 Dynamic Radial Fatigue Test

5.3.1 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 (300 rev/mile) [1707.6 mm (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 axis of the test wheel and the drum must be parallel. Equipment should maintain the test load within ±2.5%.

5.3.2 PROCEDURE—Tires selected for this test must be representative of the maximum size and type of tire approved by the vehicle or 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 at the beginning of test to 85 lb ft ± 5 (115 N.m ± 7). The recommended cold inflation pressure of the test tire is 65 psi ± 2 (448 kPa ± 14). There may be an increase in pressure during test operation. This increase is normal.

φWHEELS —IMPACT TEST PROCEDURES— R(D VEHICLES—SAE J175 JUN88

SAE Recommended Practice

Report of Wheel Committee approved September 1970 and completely revised June 1988. This standard is equivalent to ISO 7141-1981 with the exception of "Definitions" where SAE J393 is cited.

1. Scope—The SAE Recommended Practice establishes minimum performance requirements and related uniform laboratory test procedures for evaluating axial (lateral) curb impact collision properties of all wheels intended for use on passenger cars and light trucks.

2. Reference—This standard is equivalent to ISO 7141-1981 with the exception of "Definitions" where SAE J393 is cited.

ISO 7141, Road Vehicles—Wheels—Impact Test Procedures.

ISO 3911, Wheels/Rims—Nomenclature, Designation, Marking and Units of Measurement.

3. Definitions—See SAE J393, Nomenclature—Wheels, Hubs, and Rims for Commercial Vehicles.

4. Test Procedures

4.1 Wheels for Test—Only fully-processed new wheels which are representative of wheels intended for passenger car and light truck applications shall be used for each test.[1]

4.2 Equipment—The test machine shall be one in which an impact loading is applied to the rim flange of a wheel complete with tire. The wheel shall be mounted with its axis at an angle of 13 ± 1 deg to the vertical so that its highest point is presented to the vertically-acting striker. The impacting face of the striker system shall be at least 125 mm wide and at least 375 mm long. (See Fig. 1.)

With the test calibration adapter located at the mid-span of the beam, a vertical mass of 1000 kg shall be applied to the center of the wheel mount as shown in Fig. 2. The vertical central deflection of the test fixture shall be 7.5 mm ± 0.75 when measured at the center of the beam.

4.3 Procedure—The wheel shall be mounted on the hub fixture by a means dimensionally representative of attachment used on the vehicle. The wheel attachment system shall be manually tightened to a value or by a method as recommended by the vehicle or wheel manufacturer.

The tubeless tire selected for the test wheel shall be the smallest nominal section width tire intended for use with the wheel, by the vehicle or wheel manufacturer. The inflation pressure shall be that specified by the vehicle manufacturer; in the absence of such specification, it shall be 200 kPa.

Because the design features of the wheel may vary, a sufficient number of locations on the circumference of the rim shall be tested to ensure that the integrity of the wheel is investigated. A separate wheel shall be used for each test.

The test should be conducted at room temperature (10 - 38°C).

4.3.1 DROPPING HEIGHT—The dropping height for the striker weight shall be 230 ± 2 mm above the highest part of the rim flange.

4.3.2 ALIGNMENT OF STRIKER—The striker shall be over the tire and the edge must overlap the rim flange by 25 ± 1 mm.

4.3.3. MAGNITUDE OF STRIKER MASS

$$D = 0.6\ W + 180$$

where

D = mass of striker ±2%, expressed in kilograms;
W = maximum static wheel loading as specified by wheel and/or vehicle manufacturer, expressed in kilograms.

5. Failure Criteria

5.1 The failure criteria are:

5.1.1 Visible fracture(s) penetrating through a section of the center member of the wheel assembly.

5.1.2 Separation of the center member from the rim.

5.1.3 Total loss of tire air pressure within one minute.

NOTE: Deformation of the wheel assembly, or fractures in the area of the rim section contacted by the face plate of the weight system, do not constitute a failure.

Dimensions in milimetres

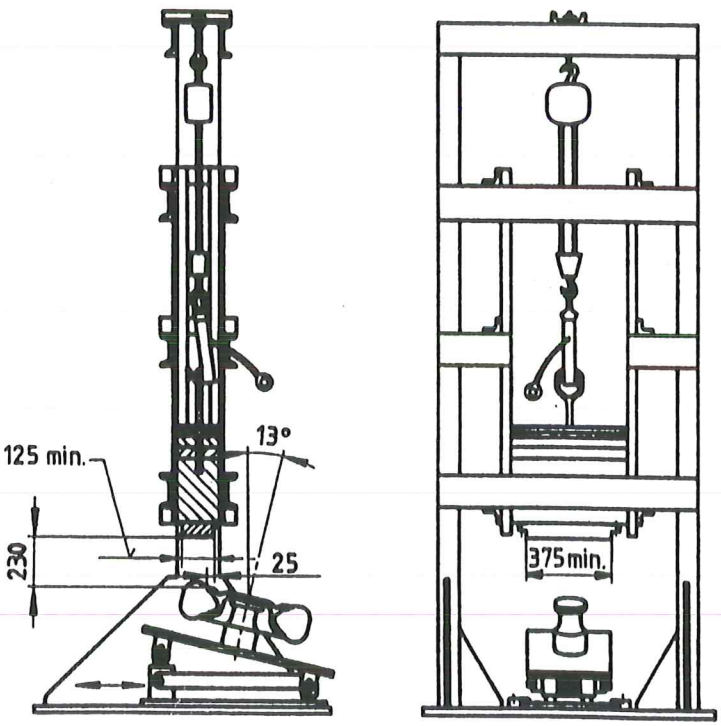

FIG. 1—IMPACT LOADING TEST MACHINE

[1] Tire and wheels used for test should not be used subsequently on a vehicle.