



SURFACE VEHICLE RECOMMENDED PRACTICE

J2530™

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Aftermarket Wheels - Passenger Cars and Light Truck - Performance Requirements and Test Procedures

RATIONALE

Editorial changes made to improve grammar and SAE procedure. Added reference to new composite wheel testing: SAE J3204. Revised stamping specification to allow other permanent markings without having to either emboss or stamp into the wheel. Changed the special restriction wheel use stamping example to "limited use spare only". Added to radial test criteria/test termination the statement that all bolts must be replaced if lug bolts are replaced to match the cornering test criteria.

1. SCOPE

This SAE Recommended Practice provides performance, sampling, certifying requirements, test procedures, and marking requirements for aftermarket wheels intended for normal highway use on passenger cars, light trucks, and multipurpose passenger vehicles. For aftermarket wheels on trailers drawn by passenger cars, light trucks, or multipurpose vehicles, refer to SAE J1204. These performance requirements apply only to wheels made of materials included in Tables 1 and 2. For wheels using composite material, refer to SAE J3204. New nomenclature and terms are added to clarify wheel constructions typically not used in OEM applications. The testing procedures and requirements are based on SAE standards listed in the references.

2. REFERENCES

2.1 Applicable Documents

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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J175	Wheels - Lateral Impact Test Procedure - Road Vehicles
SAE J179	Labeling - Disc Wheels and Demountable Rims - Trucks
SAE J328	Wheels - Passenger Car and Light Truck Performance Requirements and Test Procedures
SAE J1204	Wheels - Recreational and Utility Trailer Fatigue Test Procedure and Performance Requirements
SAE J1982	Nomenclature - Wheels for Passenger Cars, Light Trucks, and Multipurpose Vehicles

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SAE WEB ADDRESS:

For more information on this standard, visit
https://www.sae.org/standards/content/J2530_202109/

SAE J3204 Aftermarket Composite Wheels Made of Matrix Material and Fiber Reinforcement Intended for Normal Highway Use - Test Procedures and Performance Requirements

Kinstler, J., "The Science and Methodology of SAE Wheel Fatigue Test Specifications," SAE Technical Paper 2005-01-1826, 2005, <https://doi.org/10.4271/2005-01-1826>.

2.1.2 Tire and Rim Association Publications

Available from The Tire and Rim Association, Inc., 175 Montrose West Avenue, Suite 150, Copley, OH 44321, Tel: 330-666-8121, www.us-tra.org.

Yearbook, The Tire and Rim Association, Inc.

2.2 Relationship of SAE Standard to ISO Standards

The following ISO standards provide test specifications for wheels which are comparable to this standard. Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 3006:1995 Road Vehicles - Passenger Car Wheels for Road Use - Test Methods

ISO 7141:1995 Passenger Cars - Light Alloy Wheels - Impact Test

ISO 3894:1995 Commercial Vehicles - Wheels/Rims - Test Methods

3. DEFINITIONS

3.1 AFTERMARKET WHEEL

The classification used for wheels generally designed for fitment to multiple vehicle applications that may be sold to the general public subsequent to the initial purchase of such vehicles. Aftermarket wheels are sold as an intended replacement of OEM wheels provided for said vehicles.

3.2 FUNCTIONAL FASTENER

A connection device such as a bolt, rivet, or wire spoke used to join together the individual components of the wheel assembly.

3.3 LUG BOLT/NUT

Hardware designed for securing the wheel to the vehicle.

3.4 OFFSET

The inset, zerset, or outset of the wheel as defined in SAE J1982, Figure 3 (noted in millimeters).

3.5 WHEEL LOAD

The maximum load rating of the wheel as specified by the wheel manufacturer and shall be no less than one-half of the vehicle static load of the heaviest axle (as specified by the vehicle manufacturer) of any vehicle for which the wheel is intended (as determined by the wheel manufacturer).

3.6 IMPORTER OF RECORD

U.S. [Customs](#) term for the [entity](#) responsible for (1) ensuring the imported [goods comply](#) with [local laws](#) and [regulations](#), (2) [filing](#) a [completed duty entry](#) and [associated documents](#), and (3) [paying](#) the assessed [import duties](#) and other [taxes](#) on those goods.

3.7 REMANUFACTURER

An identifiable and unique company that reworks or modifies an existing wheel including (1) refinishing, (2) subassembly, or (3) repairing to install back on a vehicle.

3.8 VEHICLE MANUFACTURER

An identifiable and unique company which manufactures and retails on-road vehicles (fitted with original wheel and tire assemblies) under the company's brand name(s).

3.9 WHEEL MANUFACTURER, PRODUCER, OR FABRICATOR

An identifiable and unique company producing a vehicle wheel from raw material into a final product with a unique part number and ready to be installed on a vehicle.

3.10 WHEEL SUPPLIER

An identifiable and unique company selling wheels to the market using a specific design with a unique code, marking, and under a proprietary brand. Wheel supplier also applies as a general term to reference companies fulfilling any definitions per 3.6 to 3.9.

3.11 MINIMUM PERFORMANCE REQUIREMENT

A wheel design that meets or exceeds the pairing of test factor and cycle requirements in Tables 1 and 2 should have acceptable field performance in its intended service. The cycle requirements associated with seven samples in Tables 1 and 2 represent historical, non-statistical, minimum performance requirements. Pairings of test factor and cycle requirements for sample sizes less than seven represent equivalent confidence and reliability.

4. WHEEL MARKINGS

Wheels that comply with this specification must be permanently marked with the following information. The characters shall be legible as a fully processed wheel and the character size shall not be less than 3.0 mm high. If the characters are stamped onto the surface, they should be impressed to a depth from the wheel surface or, at the option of the wheel manufacturer, embossed to a height from the wheel surface of not less than 0.125 mm.

- 4.1 Wheel supplier's name, trademark, symbol, or brand.
- 4.2 Date of manufacture of the wheel, indicating the month and year, which may be either coded or specifically indicated.
- 4.3 Wheel supplier's part number or code.
- 4.4 Country of manufacture.
- 4.5 Rim size designation – Rim diameter, width, offset, and rim profile (e.g., 16 x 7J IS44 for a 16 diameter, 7 wide, J profile, and 44 inset wheel).
- 4.6 The manufacturer's wheel load rating as established by design validation testing to this specification expressed in pounds or kilograms.
- 4.7 The symbol "DOT," constituting a certification by the manufacturer that the rim complies with all applicable motor vehicle safety standards.

Following the symbol, "DOT," a designation which indicates the source of rim's published nominal dimensions as follows:

"T" indicates The Tire and Rim Association, Inc.

"E" indicates The European Tyre and Rim Technical Organisation.

"J" indicates Japan Automobile Tyre Manufacturers Association, Inc.

“D” indicates Deutsche Industrie Norm.

“B” indicates British Standards Institution.

“S” indicates Scandinavian Tire and Rim Organization.

“A” indicates Tyre and Rim Association of Australia.

4.8 “SAE J2530” may be cast in, stamped on, or labeled on wheels that conform to this specification.

4.9 If the wheel manufacturer recommends restricting wheel use, the special usage shall be permanently marked with the restriction, for example “Limited Use Spare Only.”

5. WHEEL QUALIFICATION

When possible, test samples must pass through all of the processes to duplicate the effects and/or characteristics of the final product.

5.1 Test Sample Selection

Test samples shall be representative of wheels produced or to be produced.

5.2 Sample Size for Tests

The sample size for the dynamic cornering fatigue test (Section 6) is shown in Table 1 and for the dynamic radial fatigue test (Section 7) are shown in Table 2. The sample size shown is between two and seven wheels with the appropriate minimum cycles requirements for that sample size. The cycles are based on the material fatigue curves and use Weibull statistics with a reliability of 90%, a confidence level of 50%, and a beta (slope) of two. Any combination is acceptable as long as the minimum cycles for all sample wheels are reached.

The sample size for the impact test (Section 8) is two wheels.

5.3 Retest and Additional Model Variation Requirements

Changes in style, diameter, material, increase in wheel load rating, cross sectional dimensions, maximum tire diameter, offset, functional fasteners, or production processes which could affect wheel's life will require retesting.

For wheels that vary only in finish, it is required to test the wheel with the greatest potential for non-compliance.

For wheels that vary only in width and offset, it is required to test the model variations with the mathematically highest bending moment and include test samples per Section 5 with the largest bolt circle and test samples per Section 5 with the smallest bolt circle and least number of lug holes.

5.4 Inspection of Test Samples

Visual inspection for crack identification shall be executed via corrected 20/20 vision without optical assistance. Dye penetrant inspection for crack verification is recommended; however, it is not mandatory.

5.5 Acceptance Criteria

Wheels conform to the specification if they meet the acceptance criteria for the testing specified in Sections 4, 6, 7, and 8.

6. DYNAMIC CORNERING FATIGUE

6.1 Performance Requirements

The test wheels, when submitted to the following test procedures, shall meet or exceed the minimum performance requirement as specified in Table 1.

6.2 Equipment

Refer to SAE J328.

6.3 Procedure

Refer to SAE J328.

6.4 Bending Moment

Calculate the bending moment (Force x Load Arm Length) to be applied to the test wheel as follows.

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

where:

W = load rating of the wheel as specified by the wheel manufacturer

R = one half of the largest overall diameter of the tires to be used on the wheel as specified by the current Tire and Rim Association yearbook or the vehicle/wheel manufacturer

μ = coefficient of friction developed between the tire and the road; use $\mu = 0.7$

d = the inset or outset of the wheel (offset); use positive sign for inset and negative sign for outset

S = load factor – see Table 1; use one of the factors for the type of wheel being tested

NOTE: When calculating the bending moment, all units of measurement must be of the same system.

6.5 Test Criteria/Test Termination

6.5.1 Acceptance Criteria

The wheel conforms to this test if all the elements of wheel qualification in Section 5 are used and the samples under test must complete the minimum number of test cycles for the sample size used without termination.

6.5.2 Test Termination

Terminate the test when any of the following conditions occur.

- a. Wheel exceeds the initial deflection at point of load application by 20%.
- b. A visually detected crack penetrating through a section of the wheel in the base metal or propagation of any existing fracture/crack resulting in a fatigue crack penetrating through any section of the wheel at the minimum cycles for the sample size used specified as in Table 1. Inspection should be done at the minimum cycles for the sample size used in Table 1. Cracking in the wheel finish alone shall not be the basis for finding a test termination.
- c. One or more lug nuts loosening to less than 60% of the initial torque at the minimum cycles for the sample size used as specified in Table 1. If loosening is due to broken wheel bolts, studs, or nuts, see 6.5.2 e. Inspection should be done at the minimum cycles for the sample size used as specified in Table 1.
- d. Break or crack of a functional fastener.
- e. First instance of broken lug bolts or other parts of the test fixture do not require test termination but may result in damage to the wheel and test invalidation. Broken lug bolts shall not be replaced more than once per test. All bolts should be replaced if lug bolts are replaced. If necessary, the test shall be terminated and the wheel retested or replaced and retested.

7. DYNAMIC RADIAL FATIGUE

7.1 Performance Requirements

The test wheels, when submitted to the following test procedures, shall meet or exceed the minimum performance requirement as specified in Table 2.

7.2 Equipment

Refer to SAE J328.

7.3 Procedure

Refer to SAE J328.

7.4 Radial Load

The radial load to be applied to the wheel shall be determined as follows.

$$F = WK \quad (\text{Eq. 2})$$

where:

F = radial load

W = load rating of the wheel as specified by the wheel manufacturer

K = load factor – see Table 2; use one of the factors for the type of wheel being tested

NOTE: When calculating the radial load, all units of measurement must be of the same system.

7.5 Test Criteria/Test Termination

7.5.1 Acceptance Criteria

The wheel conforms to this test if all the elements of wheel qualification in Section 5 are used and the samples under test must complete the minimum number of test cycles without termination.

7.5.2 Test Termination

Terminate the test when any of the following conditions occur.

- a. Inability of the wheel to sustain the test load.
- b. A visually detected crack penetrating through a section of the wheel in the base metal or propagation of any existing fracture/crack resulting in a fatigue crack penetrating through any section of the wheel at minimum cycles for the sample size used as specified in Table 2. Inspection should be done at the minimum cycles for the sample size used in Table 2. Cracking in the wheel coating alone shall not be the basis for finding a test termination.
- c. Loss of air pressure through a fatigue crack in the rim.
- d. Break or crack of a functional fastener
- e. Failure of the test tire, broken lug bolts or studs, or other parts of the test fixture do not require test termination but may result in damage to the wheel and test invalidation. Broken lug bolts shall not be replaced more than once per test. All bolts should be replaced if lug bolts are replaced. If necessary, the test shall be terminated and the wheel retested or replaced and retested.