SURFACE VEHICLE RECOMMENDED PRACTICE

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Wheels - Lateral Impact Test Procedure - Road Vehicles

RATIONALE

This document has been updated to add a reference to SAE J3204.

1. SCOPE

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

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

SAE J1982 Nomenclature - Wheels for Passenger Cars, Light Trucks, and Multipurpose Vehicles

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 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 J2530 Aftermarket Wheels - Passenger Cars and Light Truck - Performance Requirements and Test Procedures

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

2.2.2 ISO Publications

Copies of these documents are available online at http://webstore.ansi.org/.

ISO 3911 Wheels and Rims for Pneumatic Tyres - Vocabulary, Designation and Marking

ISO 7141:1981 Road Vehicles - Wheels - Impact Test Procedure

3. DEFINITIONS

The terminology used herein follows the standard definitions found in SAE J393 with the following addition:

3.1 ADJUSTED DROP HEIGHT (ADH)

The height, in millimeters (mm), that a mass must be dropped from to replicate free fall from 230 mm, as measured by time of 12.31 ms +0.3/-0 ms to pass through a distance of 25.4 mm prior to tire contact. Tests are to be conducted at adjusted drop height. See Appendix D for a recommended procedure for measuring mass velocity and adjusting drop height.

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. Tires and wheels used for test should not be used subsequently on a vehicle.

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 degrees ± 1 degree 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 Figure 1).

The width of the support beam is 200 mm minimum, to prevent permanent deformation, and is recommended to be made of 400 MPa minimum yield material. All pivot joints in the wheel mount fixture should be free to rotate. The lateral spacing of the rubber mounts must be a minimum of 200 mm on center. Shoulder bolts are recommended to prevent binding. The wheel mount fixture dimensions are shown in Figure 1.

4.2.1 An alternate construction includes a rotating adapter that allows circumferential alignment. Rubber mounts are recommended to be constrained perpendicular to direction of drop, as seen in Figure 3. Jounce travel is limited per alternate construction defined in Figure 4.

4.2.2 Each piece of equipment has friction unique to that machine. Friction is compensated for by calibrating to determine the ADH at which 230 mm of freefall is accomplished on that machine.

4.3 Test Setup and Procedure

a. Adjust the striker mass.

$$D = 0.6W + 180 \quad \text{(Eq. 1)}$$

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

b. Rigidly constrain any weights added to the striker mass so that it acts as one mass.

c. Mount wheel to the hub adapter through the bolt circle using representative fasteners.

d. Torque lugnuts to 115 N·m ± 7 N·m, or the torque recommended by the vehicle or wheel manufacturer.

e. Select tubeless tire of the smallest nominal section width tire intended for use with the wheel by the vehicle or wheel manufacturers.

f. Inflate tire pressure, as specified by the vehicle manufacturer. In the absence of such specification, use 200 kPa for all passenger car applications. Tire pressure is to be 380 kPa for light truck applications at and above 1120 kg load rating and temporary spare applications.

g. Align the front edge of the striker to be 25 mm ± 1 mm overlapping the rim flange of the wheel. The tire section must not overlap the striker plate in both radial and lateral directions during the impact.

h. Raise mass to the adjusted drop height as found at last calibration.

i. Conduct the tests at temperatures between 10 °C and 38 °C.

j. Drop mass on wheel tire assembly.

k. Measure tire pressure (kPa) within 1 minute of impact.

l. Inspect wheels for cracks, take digital image if cracks are present.

m. Fill out test datasheet (see Appendix A for example).

4.3.1 Repeat impacts to ensure that the integrity of the wheel is evaluated in the presence of varying design features. One impact location to be at the valve hole. A separate wheel shall be used for each test.

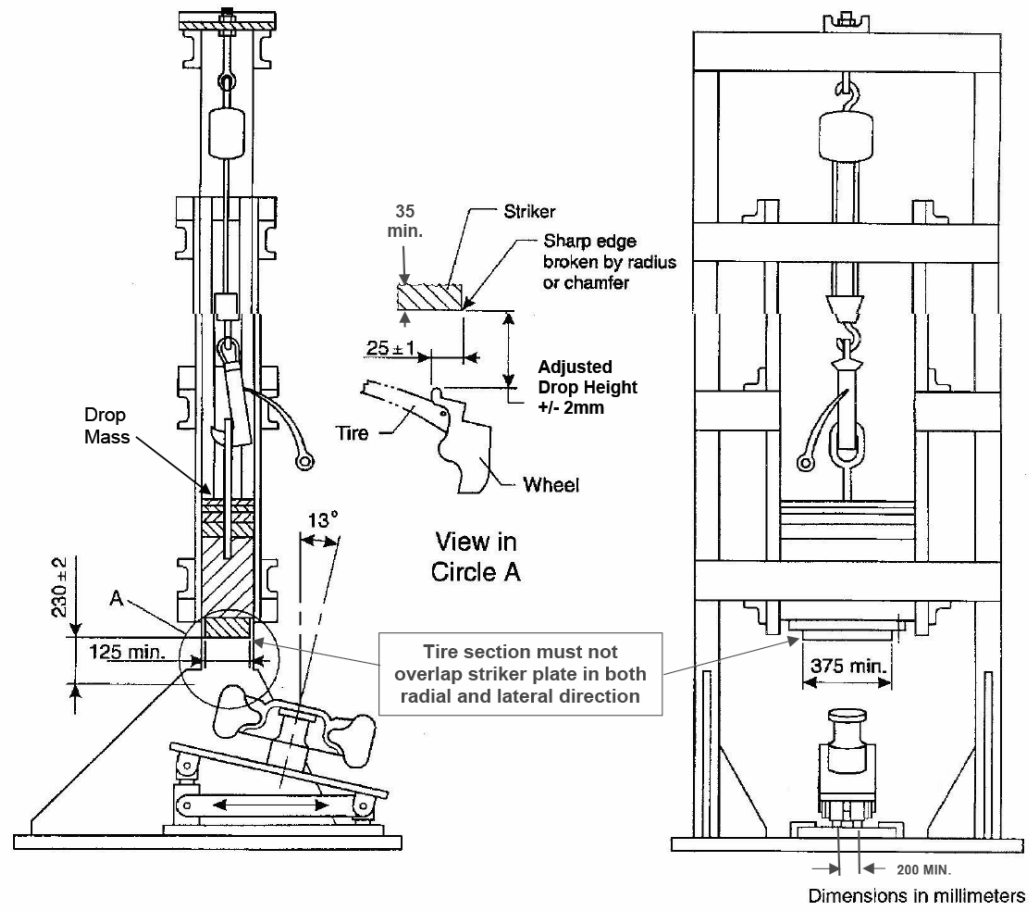

Figure 1 - Impact loading test machine

4.4 Calibration of Rubber Mounts

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

4.4.2 As an alternative to the calibration procedure noted in Figure 2, rubber mounts can be calibrated in a traceable load versus deflection device. Load all four rubber mounts in parallel to 1000 kg with an added 70 kg to replicate the weight of the pedestal. Deflection criteria of 4.4.1 is applicable.

4.5 Calibration of Drop Height

4.5.1 Friction in the slides can be compensated for by adjusting the drop height (ADH) until a velocity is measured that replicates 230 mm of free fall. A velocimeter and a light curtain are used in combination to measure the velocity of the drop mass just prior to striking the tire. The calibrator is to start at 230 mm and increment in 2 mm increases of drop height until the time it takes to go through a 25 mm light curtain is 12.31 ms +0.3/-0 ms. As an example: the ADH to be noted on the calibration certificate and sticker as ADH equal to 234 mm. All tests on specific machine to be dropped at the ADH until the next calibration. ADH to be displayed on calibration certificate and calibration sticker on the mass.

Calibration should include all the fields found in Calibration Data Sheet noted in Appendix B.