



STEERING WHEEL RIM FACEFORM IMPACT TEST PROCEDURE—SAE J52

SAE Recommended Practice

Report of Body Engineering Committee and Automotive Safety Committee approved April 1973.

1. Scope—This SAE Recommended Practice describes a laboratory test procedure for comparative evaluation of the dynamic load-deflection characteristics of steering wheel rims during simulated driver facial impact situations.

2. Rationale—Highway accident data show that striking the steering wheel rim with the head/face is a significant cause of driver injury. Such contact can occur even with harnessed drivers and with involuntary restraint systems. Although this recommended practice does not measure human injury potential, its use is as an aid for evaluating steering wheel design.

3. Items To Be Measured

3.1 Faceform Velocity—The velocity of the faceform immediately prior to impact, and immediately after breaking contact with the rim.

3.2 Displacement-Time History of the Faceform—The displacement-time history of the faceform during the period of contact with the rim.

3.3 Force-Time History of the Faceform—The force-time history of the faceform during the period of contact with the rim. The force is calculated from mass and acceleration data.

3.4 Start of Impact—A means shall be employed to indicate initial contact of the faceform.

4. Faceform—The faceform shall consist of a half-cylindrical form, 6.00 in (152.4 mm) in diameter, and 5.50 in (139.7 mm) long. The form should be made from hard oak wood, with the grain in the direction of impact. This 6.00 in (152.4 mm) diameter faceform shall be covered with a 0.25 in (6.4 mm) layer of simulated subcutaneous tissue, made according to the specifications shown in the Appendix. (Also see SAE J984.) This tissue, in turn, is held in place by a suitable pliable covering such as chamois. (See SAE J202.) These tissue layers shall be replaced when damaged. The use of these "tissues" and "skin" layers is not intended to imply the measurement of facial laceration, but is simply a convenient and consistent means to remove the "shock" of a hard rim striking a faceform, and, at the same time, better simulate the conditions of human facial impact, since the face does have tissue layers over its bony structure. The effective weight of the faceform shall be 15 lb (7 kg).

5. Direction and Location of Test

5.1 At impact, the long axis of the impacting surface of the faceform shall lie both in a vertical plane through the axis of the steering assembly upper column, and within the plane of the steering wheel rim (Fig. 1). The impacting surface is symmetrical with respect to its long axis. The plane of the steering wheel rim is defined as that plane which continuously contacts that portion of the rim which faces the driver.

5.2 The initial contact with the rim shall take place at the midpoint of the long axis of the faceform.

5.3 The direction of impact at initial contact shall be normal to the plane of the steering wheel rim. After faceform contact with the rim, the forward resultant faceform velocity vector shall remain perpendicular to the original plane of the steering wheel rim or shall be inclined toward the axis of the steering column, to preclude unrealistic stretching of the rim.

5.4 The steering wheel rim may be tested in any rotational position (on spoke, off spoke, etc.).

6. Test Equipment—The test equipment shall:

6.1 Consist of a steering wheel mount that is at least as rigid as the actual mount in a vehicle.

6.2 Provide a means to propel the impacting device to the desired impact velocity. The faceform shall be rigidly mounted to its propelling device. This propelling device shall allow the impacting mass to rebound freely along the direction or arc of impact for a sufficient distance to allow the measurement of rebound velocity.

6.3 Include any system of instrumentation that will measure the items in paragraph 3 and meet the performance requirements of SAE J211, except the channel class of the accelerometer shall be 180 Hz.

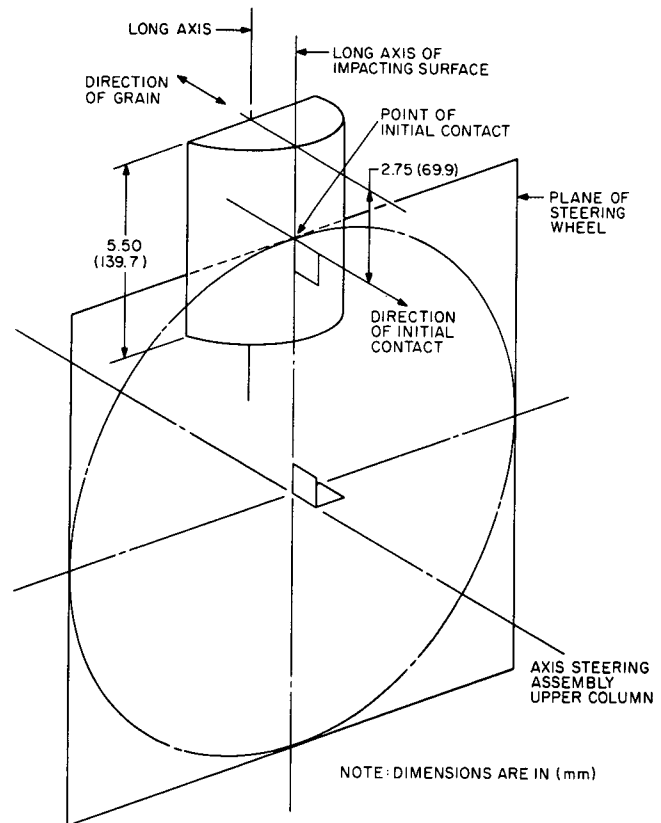


FIG. 1—DIRECTION OF IMPACT

6.4 Force may be determined by an accelerometer mounted on the impacting device, with its sensitive axis along a line extending in the direction of impact through the faceform c.g.

7. Test Procedure

7.1 Mount the sample to the test fixture and impact at the desired test velocity in accordance with paragraph 5.

7.2 For rim materials that may be affected by normal temperature variations, maintain the desired test temperature within $\pm 5^\circ\text{F}$ ($\pm 3^\circ\text{C}$) for 12 h prior to and during test.

APPENDIX

The following is a list of components for the subcutaneous tissue.

Material for Subcutaneous Tissue

1. Flex-able liquid rubber. Source: Shramm Fiberglas Products, Inc., Chicago, Illinois.

2. Hardener. Source: Shramm Fiberglas Products, Inc., Chicago, Illinois.

3. Amyl Zimate (antioxidant). Source: DuPont.

A dry fluoride mold release is used.

Material usage: 200 g Flex-able, 6 g hardener, 2 g Amyl Zimate.

Molding Instructions

1. Aluminum mold, cold.

2. Cure 7 h at 200°F (93°C) for 0.25 in (6.4 mm) thick sections for 1 in (25 mm) thickness.

3. Shelf life—Six months maximum at room temperature, less at higher temperatures.

SAE Technical Board Rules and Regulations

All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE Standard or SAE Recommended Practice, and no commitment to conform to or be guided by any technical report.

In formulating and approving technical reports, the Technical Board, its Councils and Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents.

Printed in U.S.A.