SAE International

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J2424 MAR2013

Issued 1998-01
Revised 2013-03

Superseding J2424 APR2003

Free Motion Headform Impact Tests of Heavy Truck Cab Interiors

RATIONALE

This recommended practice is revised to update headform references to 49 CFR 572, include data processing according to SAE J1727, update the test speed range to agree with TP-201U and update formatting.

1. SCOPE

This SAE Recommended Practice describes the test procedures for conducting free motion headform testing of heavy truck cab interior surfaces and components. A description of the test set-up, instrumentation, impact configuration, target locations, and data reduction is included.

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 724-776-4970 (outside USA), www.sae.org.

SAE J211-1 Instrumentation for Impact Test - Part 1: Electronic Instrumentation

SAE J211-2 Instrumentation for Impact Test - Part 2: Photographic Instrumentation

SAE J1727 Injury Calculations Guidelines

SAE CRP-13 "Heavy Truck Crashworthiness – Phase III (Testing and Analysis for Recommended Practice Development", April 1997

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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2.1.2 Federal Publications

Available from the Superintendent of Documents, U. S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

Code of Federal Regulations, Title 49 part 571.201 Occupant Protection in Interior Impacts

Code of Federal Regulations, Title 49 part 572 Anthropomorphic Test Devices

TP-201U -00 Laboratory Test Procedure for FMVSS 201 - Occupant Protection in Interior Impact, Upper Interior Head Impact Protection

3. TEST SET-UP

3.1 Free Motion Headform

The free motion headform is a 4.54 kg modified Hybrid III dummy head with the nose removed that conforms to the specifications of 49 CFR 572 subpart L.

3.2 Impact Zone

The free motion headform is impacted with the interior components such that impact occurs within the forehead impact zone. This impact zone consists of a 100 mm (4 in) by 125 mm (5 in) rectangular area on the forehead of the free motion headform as described in the latest version of TP-201U.

3.3 Test Temperature Conditions

The free motion headform must be within the temperature range of 19 °C to 26 °C (66 °F to 78 °F) at any relative humidity between 10% and 70%. The free motion headform must be soaked in an ambient air environment in the specified range for a minimum of 4 h prior to the test.

4. INSTRUMENTATION

The instrumentation requires measurement of time, three accelerations, and the time when the headform contact occurs. All measurements should be recorded, filtered and processed according to the most recent version of SAE J211-1 and SAE J1727.

4.1 Accelerometers

Three accelerometers shall be installed in the head cavity to measure orthogonal accelerations (a_x, a_y, and a_z) at the center of gravity of the free motion headform. The three accelerometers shall be mounted in an orthogonal array, and the intersection of the planes containing the sensitive axis of the three sensors will be the origin of the array. Each data channel will be comprised of a sensor, signal conditioner, data acquisition device, and all interconnecting cables, and must conform to the requirements of the most recent version of SAE J211-1 with data Class 1000 for head acceleration data.

4.2 Event Time

A system that identifies the precise instant of headform contact will be incorporated with the time reference signal. The system should not affect the response of the free motion headform impact with the interior component.

5. IMPACT CONFIGURATION

Any means of propelling the headform can be used as long as the impactor design is capable of impacting the selected target at a velocity of 23.6 ±0.3 km/h The impactor must be able to launch the headform from inside the vehicle at the desired approach angle. At the time of launch, the midsagittal plane of the headform is vertical and the headform upright. The headform shall travel freely through the air, without rotation, along a velocity vector perpendicular to the headform's skull cap plate, not less than 25 mm (1 in) before making contact with the vehicle target. The free motion headform MUST travel in free flight at least 25 mm (1 in) prior to impact. The forehead impact zone must contact the target circle at the time of initial contact. A single test vehicle may be impacted multiple times subject to the following:

a. Impacts with 300 mm (12 in) of a prior impact may not occur less than 30 min apart.

b. No impacts may occur with 150 mm (6 in) of any other impact.

c. The distance between impacts is measured from the center of the target circles along the vehicle interior surface.

d. Allow at least 3 h between successive impacts on the same headform.

6. TARGET LOCATIONS

It is recommended that targets be chosen on the following interior components. Target locations that are covered by airbags during crash scenarios that would lead to head contact, may be evaluated with a deployed airbag in place.

a. Roof Side Rail

b. Front Header

c. Rear Header

d. Cab Roof

e. Dashboard or Instrument Panel

f. Steering Wheel Rim

g. Steering Wheel Hub

h. A - Pillar

i. B - Pillar

j. Upper Seat Belt Anchor for Torso Belt

k. Other cab dependent contact surfaces to which the head is exposed.