SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

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Low Speed Thorax Impact Test Procedure for the HIII 50th Male Dummy

RATIONALE

Not applicable.

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1. SCOPE AND PURPOSE

This procedure establishes a recommended practice for performing a Low Speed Thorax Impact Test to the Hybrid III 50th Male Anthropomorphic Test Device (ATD or crash dummy). This test was created to satisfy the demand by the industry to have a calibration test which resulted in similar results to an actual low energy automotive impact test. An inherent problem exists with the current calibration procedure because the normal (6.7 m/s) thorax impact test has test corridors that are not representative to these low energy impact tests. The normal test corridors specify a displacement range of around 68 mm and the low speed displacement corridor needs to be around 25 mm.

The intent of this recommended practice is to develop a low speed thorax calibration procedure for the H-III50M dummy in 25 to 30 mm deflection range.

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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 version of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE, 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 EA-23 User's Manual for the 50th Percentile Male Hybrid III Test Dummy

SAE J2517 Hybrid III Family Chest Potentiometer Calibration Procedure

SAE J211/1 Instrumentation for Impact Test—Part 1—Electronic Instrumentation

2.2 Related Publication

The following publications are provided for information purposes and are not a required part of this document.

2.2.1 Federal Publication

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

Motor Vehicle Regulation No. 572 Test Dummies Specifications—Anthropomorphic Test Dummy for Applicable Test Procedures

3. CALIBRATION PROCEDURE

3.1 Preparation

a. The complete dummy assembly (78051-218) is required, including the clothing [vest and panty], but without the shoes (78051-294 left and 78051-295 right).

b. The fixture consists of a smooth, clean, dry, steel seating surface and a test probe. The test probe is a 152.4 ± 0.25 mm (6.0 ± 0.01 in) diameter rigid cylinder with a mass of 23.36 ± 0.02 kg (51.5 ± 0.05 lb), including instrumentation, rigid attachments, and the lower 1/3 of the suspension cable mass. The impacting surface has a flat, right angle face with an edge radius of 12.7 ± 0.3 mm (0.5 ± 0.01 in). Mount an accelerometer to the probe with its sensitive axis in line with the longitudinal centerline of the test probe.

c. The data acquisition system, including transducers, must conform to the specifications of the latest revision of SAE J211. Filter all data channels using Channel Class 180 phaseless filters. Calibrate chest deflection transducer using SAE J2517 Revision September 2006.

3.2 Test Procedure

a. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Pay particular attention to the rib damping material, chest displacement transducer assembly, and the rear rib supports. Torque the spine cables to 1.2-1.4 N·m (10-12 in-lbf).

b. Soak the test dummy in a controlled environment with a temperature of 20.6 to 22.2 °C (69 to 72 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to the test, until the rib temperature has reached the soak temperature. The test environment should have the same temperature and humidity requirements as the soak environment.

c. Check that all transducers are properly installed, oriented, and calibrated.

d. Seat the dummy (without the chest skin but with the panty) on the test fixture surface. The surface must be long enough to support the pelvis and outstretched legs.

e. Align the upper and lower neck bracket index marks to the zero position.

f. Place the arm assemblies horizontal (± 2°) and parallel to the midsagittal plane. Secure the arms by tightening the adjustment nut which holds the arm yoke to the clavicle assembly. If necessary, prop the arms up with a rod that will fall away during the test.

Level the ribs both longitudinally and laterally ± 0.5° and adjust the pelvis angle to 13 ± 2°. (Use the special tool which inserts into the pelvic structure and extends outward beyond the pelvic skin surface. The tool permits the use of an angle measurement device to determine the pelvis angle.)

The midsagittal plane of the dummy is vertical ± 1° and within 2° of being parallel to the centerline of the test probe. The longitudinal centerline of the test probe is centered on the midsagittal plane of the dummy within 3 ± 0.25 mm. Align the test probe so its longitudinal centerline is 12.7 ± 1 mm below the horizontal centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane.

After completing the initial setup, record reference measurements from locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure that the dummy remains in the same position after installing the chest skin. When using a cable-supported test probe, the dummy must be moved rearward from the test probe to account for the thickness of the chest skin, so the probe will impact at the lowest point on its arc of travel. The test setup appears in Figure 1.

g. Install the chest skin and shirt and reposition the dummy as described in the preceding paragraph using the recorded reference measurements. The reference locations must be accessible after installation of the chest skin, so it may be necessary to leave the chest skin unzipped until the references are checked, and then fasten it just prior to the test.

h. Impact the thorax with the test probe so the probe's longitudinal centerline is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact.

Guide the probe so no significant lateral, vertical or rotational motion takes place during the impact.

The test probe velocity at the time of impact is 3.00 m/s ± 0.06 m/s.

Time-zero is defined as the time of initial contact between the test probe and the chest skin. All data channels should be at the zero level at this time (after processing to Engineering Units).

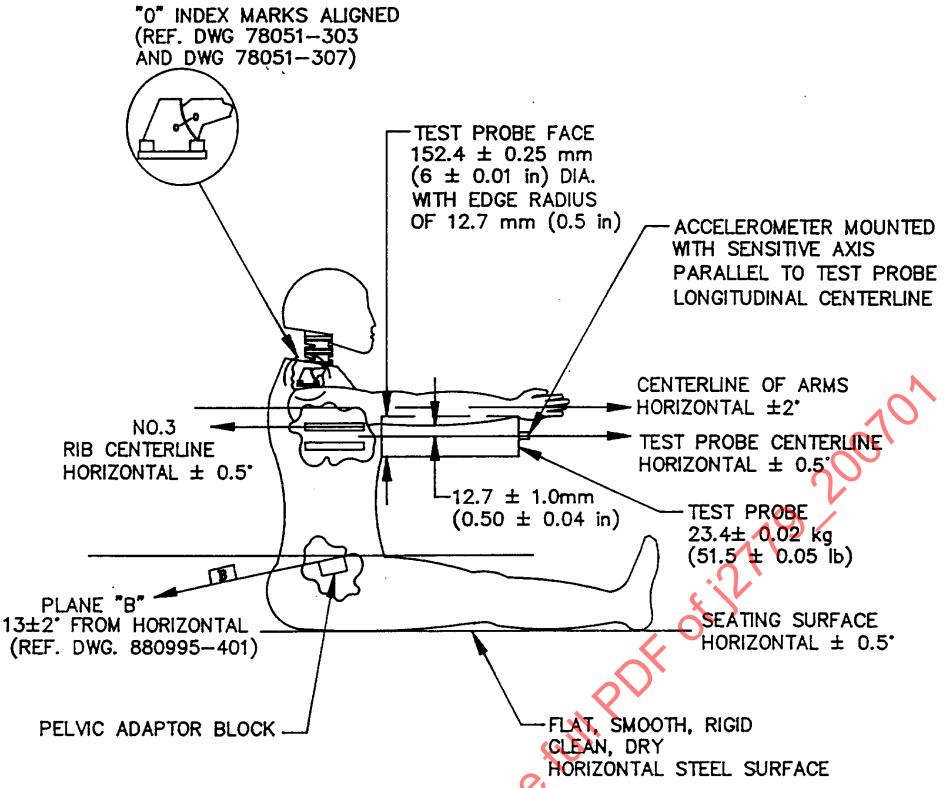
Wait at least 30 minutes between successive tests on the same thorax.

3.3 Performance Specifications

The maximum sternum-to-spine deflection, as measured by the chest displacement transducer should lie between 21.5 and 26.5 mm.

The maximum force applied to the thorax by the test probe should measure between 2.38 and 2.73 kN.

The internal hysteresis ratio should be greater than 60 percent but less than 75 percent. The hysteresis ratio, determined from the force vs. deflection curve, is the ratio of the area between the loading and unloading portions of the curve to the area under the loading portion of the curve. See Figure 2 for details.



NOTE:

A) NO EXTERNAL SUPPORT IS REQUIRED ON THE DUMMY TO MEET SETUP SPECIFICATIONS

B) THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL (± 1°) AND WITHIN 2° OF THE CENTERLINE OF THE TEST PROBE

C) THE MIDSAGITTAL PLANE OF THE DUMMY IS CENTERED ON THE CENTERLINE OF THE PENDULUM WITHIN 3 mm (0.12 in)

FIGURE 1 - TEST SET-UP SPECIFICATIONS