

Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46413, July 15, 2002]

§ 572.131 General description.

(a) The Hybrid III fifth percentile adult female crash test dummy is defined by drawings and specifications containing the following materials:

(1) Technical drawings and specifications package P/N 880105-000 (refer to § 572.130(a)(1)), the titles of which are listed in Table A;

(2) Parts List and Drawings, Part 572 Subpart O Hybrid III Fifth Percentile Small Adult Female Crash Test Dummy (HIII-5F, Alpha Version) (June 2002) (refer to § 572.130(a)(1)(ix)).

TABLE A

Component assembly	Drawing No.
Head Assembly	880105-100X
Neck Assembly	880105-250
Upper Torso Assembly	880105-300
Lower Torso Assembly	880105-450
Complete Leg Assembly—left	880105-560-1
Complete Leg Assembly—right	880105-560-2
Complete Arm Assembly—left	880105-728-1
Complete Arm Assembly—right	880105-728-2

(b) Adjacent segments are joined in a manner such that, except for contacts existing under static conditions, there is no contact between metallic elements throughout the range of motion or under simulated crash impact conditions.

(c) The structural properties of the dummy are such that the dummy conforms to this Subpart in every respect before use in any test similar to those specified in Standard 208, Occupant Crash Protection.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46414, July 15, 2002]

§ 572.132 Head assembly and test procedure.

(a) The head assembly (refer to § 572.130(a)(1)(i)) for this test consists of the complete head (drawing 880105-100X), a six-axis neck transducer (drawing SA572-S11) or its structural replacement (drawing 78051-383X), and 3 accelerometers (drawing SA572-S4).

(b) When the head assembly is dropped from a height of 376.0 ±1.0 mm

(14.8 ±0.04 in) in accordance with subsection (c) of this section, the peak resultant acceleration at the location of the accelerometers at the head CG may not be less than 250 G or more than 300 G. The resultant acceleration vs. time history curve shall be unimodal; oscillations occurring after the main pulse must be less than 10 percent of the peak resultant acceleration. The lateral acceleration shall not exceed 15 G (zero to peak).

(c) *Head test procedure.* The test procedure for the head is as follows:

(1) Soak the head assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to a test.

(2) Prior to the test, clean the impact surface of the skin and the impact plate surface with isopropyl alcohol, trichloroethane, or an equivalent. The skin of the head must be clean and dry for testing.

(3) Suspend and orient the head assembly as shown in Figure 19 of 49 CFR 572. The lowest point on the forehead must be 376.0 ±1.0 mm (14.8 ±0.04 in) from the impact surface. The 1.57 mm (0.062 in) diameter holes located on either side of the dummy's head shall be used to ensure that the head is level with respect to the impact surface.

(4) Drop the head assembly from the specified height by means that ensure a smooth, instant release onto a rigidly supported flat horizontal steel plate which is 50.8 mm (2.0 in) thick and 610 mm (24.0 in) square. The impact surface shall be clean, dry and have a micro finish of not less than 203.2×10⁻⁶ mm (8 micro inches) (RMS) and not more than 2032.0×10⁻⁶ mm (80 micro inches) (RMS).

(5) Allow at least 2 hours between successive tests on the same head.

§ 572.133 Neck assembly and test procedure.

(a) The neck assembly (refer to § 572.130(a)(1)(ii)) for the purposes of this test consists of the assembly of components shown in drawing 880105-250.

(b) When the head-neck assembly consisting of the head (drawing 880105-100X), neck (drawing 880105-250), bib

simulator (drawing 880105–371), upper neck adjusting bracket (drawing 880105–207), lower neck adjusting bracket (drawing 880105–208), six-axis neck transducer (drawing SA572–S11), and either three accelerometers (drawing SA572–S4) or their mass equivalent installed in the head assembly as specified in drawing 880105–100X, is tested according to the test procedure in subsection (c) of this section, it shall have the following characteristics:

(1) *Flexion.* (i) Plane D, referenced in Figure O1, shall rotate in the direction of preimpact flight with respect to the pendulum’s longitudinal centerline between 77 degrees and 91 degrees. During the time interval while the rotation is within the specified corridor, the peak moment, measured by the neck transducer (drawing SA5572–311), about the occipital condyles may not be less than 69 N-m (51 ft-lbf) and not more than 83 N-m (61 ft-lbf). The positive moment shall decay for the first time to 10 N-m (7.4 ft-lbf) between 80 ms and 100 ms after time zero.

(ii) The moment shall be calculated by the following formula: Moment (N-m) = $M_y - (0.01778m) \times (F_x)$.

(iii) M_y is the moment about the y-axis, F_x is the shear force measured by the neck transducer (drawing SA572–S11), and 0.01778m is the distance from force to occipital condyle.

(2) *Extension.* (i) Plane D, referenced in Figure O2, shall rotate in the direction of preimpact flight with respect to the pendulum’s longitudinal centerline between 99 degrees and 114 degrees. During the time interval while the rotation is within the specified corridor, the peak moment, measured by the neck transducer (drawing SA5572–S11), about the occipital condyles shall be not more than –53 N-m (–39 ft-lbf) and not less than –65 N-m (–48 ft-lbf). The negative moment shall decay for the first time to –10 N-m (–7.4 ft-lbf) between 94 ms and 114 ms after time zero.

(ii) The moment shall be calculated by the following formula: Moment (N-m) = $M_y - (0.01778m) \times (F_x)$.

(iii) M_y is the moment about the y-axis, F_x is the shear force measured by the neck transducer (drawing SA572–S11), and 0.01778 m is the distance from force to occipital condyle.

(3) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. All data channels shall be at the zero level at this time.

(c) *Test Procedure.* The test procedure for the neck assembly is as follows:

(1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Torque the jam nut (drawing 9000018) on the neck cable (drawing 880105–206) to 1.4 ±0.2 N-m (12.0 ±2.0 in-lb).

(3) Mount the head-neck assembly, defined in subsection (b) of this section, on the pendulum described in Figure 22 of 49 CFR 572 so that the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum as shown in Figure O1 for flexion tests and Figure O2 for extension tests.

(4)(i) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of 7.01 ±0.12 m/s (23.0 ±0.4 ft/s) for flexion tests and 6.07 ±0.12 m/s (19.9 ±0.40 ft/s) for extension tests, measured by an accelerometer mounted on the pendulum as shown in Figure 22 of 49 CFR 572 at the instant of contact with the honeycomb.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified below. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve:

TABLE B—PENDULUM PULSE

Time ms	Flexion		Extension	
	m/s	ft/s	m/s	ft/s
10	2.1–2.5	6.9–8.2	1.5–1.9	4.9–6.2
20	4.0–5.0	13.1–16.4	3.1–3.9	10.2–12.8
30	5.8–7.0	19.5–23.0	4.6–5.6	15.1–18.4

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46414, July 15, 2002]

§ 572.134 Thorax assembly and test procedure.

(a) Thorax (Upper Torso) Assembly (refer to § 572.130(a)(1)(iii)). The thorax consists of the part of the torso assembly shown in drawing 880105-300.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 880105-000) is impacted by a test probe conforming to section 572.137(a) at 6.71 ± 0.12 m/s (22.0 ± 0.4 ft/s) according to the test procedure in subsection (c) of this section:

(1) Maximum sternum displacement (compression) relative to the spine, measured with chest deflection transducer (drawing SA572-S5), must be not less than 50.0 mm (1.97 in) and not more than 58.0 mm (2.30 in). Within this specified compression corridor, the peak force, measured by the impact probe as defined in section 572.137 and calculated in accordance with paragraph (b)(3) of this section, shall not be less than 3900 N (876 lbf) and not more than 4400 N (989 lbf). The peak force after 18.0 mm (0.71 in) of sternum displacement but before reaching the minimum required 50.0 mm (1.97 in) sternum displacement limit shall not exceed 4600 N.

(2) The internal hysteresis of the ribcage in each impact as determined by the plot of force vs. deflection in paragraph (1) of this section shall be not less than 69 percent but not more than 85 percent. The hysteresis shall be calculated by determining the ratio of the area between the loading and unloading portions of the force deflection curve to the area under the loading portion of the curve.

(3) The force shall be calculated by the product of the impactor mass and its deceleration.

(c) *Test procedure.* The test procedure for the thorax assembly is as follows:

(1) The dummy is clothed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg (0.30 lb) each.

(2) Soak the dummy in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70

percent for at least four hours prior to a test.

(3) Seat and orient the dummy on a seating surface without back support as shown in Figure O3, with the limbs extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane vertical within ± 1 degree and the ribs level in the anterior-posterior and lateral directions within ± 0.5 degrees.

(4) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the midsagittal plane of the dummy within ± 2.5 mm (0.1 in) and is 12.7 ± 1.1 mm (0.5 ± 0.04 in) below the horizontal-peripheral centerline of the No. 3 rib and is within 0.5 degrees of a horizontal line in the dummy's midsagittal plane.

(5) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

(6) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(7) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46415, July 15, 2002]

§ 572.135 Upper and lower torso assemblies and torso flexion test procedure.

(a) *Upper/lower torso assembly.* The test objective is to determine the stiffness effects of the lumbar spine (drawing 880105-1096), and abdominal insert (drawing 880105-434), on resistance to articulation between the upper torso assembly (drawing 880105-300) and the lower torso assembly (drawing 880105-450) (refer to § 572.130(a)(1)(iv)).

(b)(1) When the upper torso assembly of a seated dummy is subjected to a force continuously applied at the head to neck pivot pin level through a rigidly attached adaptor bracket as shown in Figure O4 according to the test procedure set out in subsection (c) of this section, the lumbar spine-abdomen assembly shall flex by an amount that permits the upper torso assembly to