(i) Plane D, referenced in Figure P2 of this subpart, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 70 degrees and 82 degrees. Within this specified rotation corridor, the peak moment about the occipital condyle may not be less than 42 N-m and not more than 53 N-m.

(ii) The positive moment shall decay for the first time to 10 N-m between 60 ms and 80 ms after time zero.

(iii) The moment and rotation data channels are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel.

(2) Extension.

(i) Plane D referenced in Figure P3 of this subpart shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 83 degrees and 93 degrees. Within this specified rotation corridor, the peak moment about the occipital condyle may be not more than −43.7 N-m and not less than −53.3 N-m.

(ii) The negative moment shall decay for the first time to −10 N-m between 60 and 80 ms after time zero.

(iii) The moment and rotation data channels are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel.

(c) *Test procedure.* (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 9001336) on the neck cable (drawing 210–2040) between 0.2 N-m and 0.3 N-m.

(3) Mount the neck-headform assembly, defined in paragraph (a) of this section, on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure P2 of this subpart for flexion and Figure P3 of this subpart for extension tests.

(4) Release the pendulum and allow it to fall freely to achieve an impact velocity of 5.50 ±0.10 m/s (18.05 + 0.40 ft/s) for flexion and 3.65 ±0.1 m/s (11.98 ±0.40 ft/s) for extension tests, measured by an accelerometer mounted on the pendulum as shown in Figure 22 of this part 572 at time zero.

(i) The test shall be conducted without inducing any torsion twisting of the neck.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified in Table B of this section. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve as indicated in Table B of this section.

(iii) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. The pendulum data channel shall be zero at this time.

TABLE B—PENDULUM PULSE

Time	Flexion		Time	Extension	
ms	m/s	ft/s	ms	m/s	ft/s
10	2.0–2.7	6.6–8.9	6	1.0–1.4	3.3–4.6
15	3.0–4.0	9.8–13.1	10	1.9–2.5	6.2–8.2
20	4.0–5.1	13.1–16.7	14	2.8–3.5	9.2–11.5

§572.144 Thorax assembly and test procedure.

(a) *Thorax (upper torso) assembly (refer to §572.140(a)(1)(iv)).* The thorax consists of the upper part of the torso assembly shown in drawing 210–3000.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 210–0000) is impacted by a test probe conforming to §572.146(a) at 6.0 ±0.1 m/s (19.7 ±0.3 ft/s) according to the test procedure in paragraph (c) of this section.

(1) Maximum sternum displacement (compression) relative to the spine, measured with the chest deflection transducer (SA–572–S50), must not be less than 32mm (1.3 in) and not more than 38mm (1.5 in). Within this specified compression corridor, the peak force, measured by the probe-mounted

accelerometer as defined in § 572.146(a) and calculated in accordance with paragraph (b)(3) of this section, shall be not less than 680 N and not more than 810 N. The peak force after 12.5 mm of sternum compression but before reaching the minimum required 32.0 mm sternum compression shall not exceed 910 N.

(2) The internal hysteresis of the ribcage in each impact, as determined from the force vs. deflection curve, shall be not less than 65 percent and 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 test dummy is clothed in cotton-polyester-based tight-fitting shirt with long sleeves and ankle-length pants whose combined weight is not more than 0.25 kg (0.55 lbs).

(2) Soak the dummy in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and at any 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 P4, with the lower limbs extended horizontally and forward, the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane being 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 dummy's mid-sagittal plane and is centered on the center of No. 2 rib within ±2.5 mm (0.1 in.) and 0.5 degrees of a horizontal plane.

(5) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line is 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 15262, Mar. 22, 2000, as amended at 66 FR 64376, Dec. 13, 2001]

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

(a) The test objective is to determine the resistance of the lumbar spine and abdomen of a fully assembled dummy (drawing 210–0000) to flexion articulation between upper and lower halves of the torso assembly (refer to § 572.140(a)(1)(iv)).

(b)(1) When the upper half of the torso assembly of a seated dummy is subjected to a force continuously applied at the occipital condyle level through the rigidly attached adaptor bracket in accordance with the test procedure set out in paragraph (c) of this section, the lumbar spine-abdomen assembly shall flex by an amount that permits the upper half of the torso, as measured at the posterior surface of the torso reference plane shown in Figure P5 of this subpart, to translate in angular motion in the midsagittal plane 45 ±0.5 degrees relative to the vertical transverse plane, at which time the pulling force applied must not be less than 130 N (28.8 lbf) and not more than 180 N (41.2 lbf), and

(2) Upon removal of the force, the upper torso assembly returns to within 10 degrees of its initial position.

(c) *Test procedure.* The test procedure is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 18.9° and 25.6 °C (66 and 78 °F) and at any relative humidity between 10 and 70 percent for at least 4 hours prior to a test.

(2) Assemble the complete dummy (with or without the lower legs) and seat it on a rigid flat-surface table, as shown in Figure P5 of this subpart.

(i) Unzip the torso jacket and remove the four ¼–20×¾″ bolts which attach