

§572.124 Thorax assembly and test procedure.

(a) *Thorax (upper torso) assembly.* The thorax consists of the part of the torso assembly shown in drawing 127–2000.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 127–0000) is impacted by a test probe conforming to section 572.127(a) at 6.71 ± 0.12 m/s (22.0 ± 0.4 ft/s) according to the test procedure in paragraph (c) of this section:

(1) The maximum sternum displacement (compression) relative to the spine, measured with chest deflection transducer (drawing SA572–S50), must be not less than 38.0 mm (1.50 in) and not more than 46.0 mm (1.80 in). Within this specified compression corridor, the peak force, measured by the probe in accordance with section 572.127, shall not be less than 1150 N (259 lbf) and not more than 1380 N (310 lbf). The peak force after 12.5 mm (0.5 in) of sternum displacement but before reaching the minimum required 38.0 mm (1.5 in) sternum displacement limit shall not exceed by more than 5% the value of the peak force measured within the required displacement limit.

(2) The internal hysteresis of the ribcage in each impact as determined by the plot of force vs. deflection in paragraph (b)(1) of this section shall be not less than 65 percent but not more than 85 percent.

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

(1) 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.

(2) Seat and orient the dummy, wearing a light-weight cotton stretch short-sleeve shirt and above-the-knee pants, on a seating surface without back support as shown in Figure N4, 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.

(3) 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.

(4) 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.

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

§572.125 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 127–3002), including cable (drawing 127–8095), mounting plate insert (drawing 910420–048), nylon shoulder bushing (drawing 9001373), nut (drawing 9001336), and abdominal insert (drawing 127–8210), on resistance to articulation between upper torso assembly (drawing 127–2000) and lower torso assembly (drawing 127–3000).

(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 N5 according to 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 torso assembly to translate in angular motion until the machined rear surface of the instrument cavity at the back of the thoracic spine box is at 45 ± 0.5 degrees relative to the vertical transverse plane, at which time the force applied as shown in Figure N5 must be not less than 147 N (33 lbf) and not more than 200 N (45 lbf), and

(2) Upon removal of the force, the torso assembly must return to within 8 degrees of its initial position.

(c) *Test procedure.* The test procedure for the torso assemblies 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 a relative humidity between 10 and 70

percent for at least four hours prior to a test.

(2) Attach the dummy (with or without the legs below the femurs) to the fixture in a seated posture as shown in Figure N5.

(3) Secure the pelvis at the pelvis instrument cavity rear face by threading four ¼ in cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic-lumbar joining surface is horizontal.

(4) Flex the thorax forward three times between vertical and until the torso reference plane, as shown in figure N5, reaches 30 ± 2 degrees from vertical. Bring the torso to vertical orientation, remove all externally applied flexion forces, and wait 30 minutes before conducting the test. During the 30-minute waiting period, the dummy's upper torso shall be externally supported at or near its vertical orientation to prevent sagging.

(5) Remove the external support and wait two minutes. Measure the initial orientation of the torso reference plane of the seated, unsupported dummy as shown in Figure N5. This initial torso orientation angle may not exceed 22 degrees.

(6) Attach the loading adapter bracket to the spine of the dummy, the pull cable, and the load cell as shown in Figure N5.

(7) Apply a tension force in the midsagittal plane to the pull cable as shown in Figure N5 at any upper torso deflection rate between 0.5 and 1.5 degrees per second, until the torso reference plane is at 45 ± 0.5 degrees of flexion relative to the vertical transverse plane as shown in Figure N5.

(8) Continue to apply a force sufficient to maintain 45 ± 0.5 degrees of flexion for 10 seconds, and record the highest applied force during the 10-second period.

(9) Release all force as rapidly as possible, and measure the return angle at 3 minutes or any time thereafter after the release.

§ 572.126 Knees and knee impact test procedure.

(a) *Knee assembly.* The knee assembly is part of the leg assembly (drawing 127-4000-1 and -2).

(b) When the knee assembly, consisting of knee machined (drawing 127-4013), knee flesh (drawing 127-4011), lower leg (drawing 127-4014), the foot assembly (drawing 127-4030-1 (left) and -2 (right)) and femur load transducer (drawing SA572-S10) or its structural replacement (drawing 127-4007) is tested according to the test procedure in section 572.127(c), the peak resistance force as measured with the test probe mounted accelerometer must be not less than 2.0 kN (450 lbf) and not more than 3.0 kN (625 lbf).

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

(1) Soak the knee 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) Mount the test material and secure it to a rigid test fixture as shown in Figure N6. No contact is permitted between any part of the foot or tibia and any exterior surface.

(3) Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur.

(4) Guide the pendulum so that there is no significant lateral vertical or rotational movement at time-zero.

(5) The test probe velocity at the time of contact shall be 2.1 ± 0.03 m/s (6.9 # 0.1 ft/s).

§ 572.127 Test conditions and instrumentation.

(a) The test probe for thoracic impacts shall be of rigid metallic construction, concentric in shape, and symmetric about its longitudinal axis. It shall have a mass of 2.86 ± 0.02 kg (6.3 # 0.05 lbs) and a minimum mass moment of inertia of 622 kg-cm² (0.55 lbs-in-sec²) in yaw and pitch about the CG.