§ 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 mid sagittal plane, the mid sagittal 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 mid sagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the mid sagittal 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 mid sagittal plane.

(5) Impact the thorax with the test probe so that at the moment of contact the probe’s longitudinal centerline falls within 2 degrees of a horizontal line in the dummy’s mid sagittal 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.

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§ 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
translate in angular motion relative to
the vertical transverse plane 45 ±0.5 de-
degrees at which time the force applied
must be not less than 320 N (71.5 lbf) and
not more than 390 N (87.4 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 upper/lower torso assembly is as
follows:
(1) Soak the dummy in a controlled
environment at any temperature be-
tween 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) Assemble the complete dummy
(with or without the legs below the fe-
murs) and attach to the fixture in a
seated posture as shown in Figure O4.
(3) Secure the pelvis to the fixture at
the pelvis instrument cavity rear face
by threading four ¼ inch 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) Attach the loading adapter brack-
et to the spine of the dummy as shown
in Figure O4.
(5) Inspect and adjust, if necessary,
the seating of the abdominal insert
within the pelvis cavity and with re-
spect to the torso flesh, assuring that
the torso flesh provides uniform fit and
overlap with respect to the outside sur-
face of the pelvis flesh.
(6) Flex the dummy’s upper torso
three times between the vertical and
until the torso reference plane, as
shown in Figure O4, reaches 30 degrees
from the vertical transverse plane. Bring
the torso to vertical orientation and wait for 30 minutes before con-
doing the test. During the 30 minute
waiting period, the dummy’s upper
Torso shall be externally supported at
or near its vertical orientation to pre-
vent it from drooping.
(7) Remove all external support and
wait two minutes. Measure the initial
orientation angle of the torso reference
plane of the seated, unsupported
dummy as shown in Figure O4. The ini-
tial orientation angle may not exceed
20 degrees.
(8) Attach the pull cable and the load
cell as shown in Figure O4.
(9) Apply a tension force in the
midsagittal plane to the pull cable as
shown in Figure O4 at any upper torso
deflection rate between 0.5 and 1.5 de-
gres per second, until the angle ref-
ence plane is at 45 ±0.5 degrees of
flexion relative to the vertical trans-
verse plane.
(10) Release all force at the attach-
ment bracket as rapidly as possible,
and measure the return angle with re-
spect to the initial angle reference
plane as defined in paragraph (6) 3 min-
utes after the release.
§ 572.136 Knees and knee impact test
procedure.
(a) Knee assembly. The knee assembly
(refer to §§ 572.130(a)(1)(v) and (vi)) for
the purpose of this test is the part of
the leg assembly shown in drawing
880105–560.
(b)(1) When the knee assembly, con-
sisting of sliding knee assembly (draw-
ing 880105–528R or –528L), lower leg
structural replacement (drawing 880105–603), lower leg flesh (drawing
880105–601), ankle assembly (drawing
880105–660), foot assembly (drawing
880105–651 or 650), and femur load trans-
ducer (drawing SA572–S14) or its struc-
tural replacement (drawing 78051–319) is
tested according to the test procedure in
subsection (c), the peak resistance
force as measured with the test probe-
mounted accelerometer must be not
less than 3450 N (776 lbf) and not more
than 4060 N (913 lbf).
(2) The force shall be calculated by
the product of the impactor mass and
its deceleration.
(c) Test procedure. The test procedure
for the knee assembly is as follows:
(1) Soak the knee assembly in a con-
trolled environment at any tempera-
ture 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 se-
cure it to a rigid test fixture as shown