

§ 572.194

Time(ms)	Peak pendulum delta-V(m/s)
20.0	-4.40 to -5.40
25.0	-5.40 to -6.10
>25.0 < 100	-5.50 to -6.20

(2) The maximum translation-rotation of the midsagittal plane of the headform disk (180-9061 or 9062) in the lateral direction measured, with the rotation transducers specified in 49 CFR 572.200(e) shall be 71 to 81 degrees with respect to the longitudinal axis of the pendulum (see Figure V2-C in appendix A to this subpart) occurring between 50 and 70 ms from time zero;

(3) Peak occipital condyle moment shall not be higher than -36 Nm and not lower than -44 Nm. The moment measured by the upper neck load cell (Mx) shall be adjusted by the following formula: $Mx(oc)^1 = Mx + 0.01778F_y$;

(4) The decaying moment shall cross the 0 Nm line after peak moment between 102 ms-126 ms after time zero.

[71 FR 75370, Dec. 14, 2006, as amended at 74 FR 29895, June 23, 2009]

§ 572.194 Shoulder.

(a) The shoulder structure is part of the upper torso assembly shown in drawing 180-3000. For the shoulder impact test, the dummy is tested as a complete assembly (drawing 180-0000). The dummy is equipped with T1 laterally oriented accelerometer as specified in 49 CFR 572.200(d), and deflection potentiometer as specified in 180-3881 configured for shoulder and installed as shown in drawing 180-0000 sheet 2 of 5. When subjected to the test procedure as specified in paragraph (b) of this section, the shoulder shall meet the performance requirements of paragraph (c) of this section.

(b) *Test procedure.* (1) Soak the dummy assembly (180-0000) in a test environment as specified in 49 CFR 572.200(j).

(2) Seat the dummy, outfitted with the torso jacket (180-3450) and cotton underwear pants on a certification bench, specified in Figure V3 in appendix A to this subpart, the seat pan and the seatback surfaces of which are covered

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with a 2 mm thick PTFE (Teflon) sheet;

(3) Align the outermost portion of the pelvis flesh of the impacted side of the seated dummy tangent to a vertical plane located within 10 mm of the side edge of the bench as shown in Figure V4-A in appendix A to this subpart, while the midsagittal plane of the dummy is in vertical orientation.

(4) Push the dummy at the knees and at mid-sternum of the upper torso with just sufficient horizontally oriented force towards the seat back until the back of the upper torso is in contact with the seat back.

(5) While maintaining the dummy's position as specified in paragraphs (b)(3) and (4) of this section, the top of the shoulder rib mount (drawing 180-3352) orientation in the fore-and-aft direction is 24.6 ± 2.0 degrees relative to horizontal, as shown in Figure V4-B in appendix A to this subpart.

(6) Adjust orientation of the legs such that they are symmetrical about the mid-sagittal plane, the thighs touch the seat pan, the inner part of the right and left legs at the knees are as close as possible to each other, the heels touch the designated foot support surface and the feet are vertical and as close together as possible.

(7) Orient the arm to point forward at 90 ± 2 degrees relative to the inferior-superior orientation of the upper torso spine box incline.

(8) The impactor is specified in 49 CFR 572.200(a).

(9) The impactor is guided, if needed, so that at contact with the dummy's arm rotation centerline (ref. item 23 in drawing 180-3000) the impactor's longitudinal axis is within ± 1 degree of a horizontal plane and perpendicular to the midsagittal plane of the dummy. The centerpoint of the impactor face at contact is within 2 mm of the shoulder yoke assembly rotation centerline (drawing 180-3327), as shown in Figure V4-A in appendix A to this subpart.

(10) The dummy's arm-shoulder is impacted at 4.3 ± 0.1 m/s with the impactor meeting the alignment and contact point requirements of paragraph (b)(9) of this section.

(11) Allow a period of at least thirty (30) minutes between successive tests of the same shoulder assembly.

¹ $Mx(oc)$ is the moment at occipital condyle (Newton-meters) and F_y is the lateral shear force (Newtons) measured by the load cell.

(c) *Performance criteria.*

(1) While the impactor is in contact with the dummy's arm, the shoulder shall compress not less than 28 mm and not more than 37 mm measured by the potentiometer specified in (a);

(2) Peak lateral acceleration of the upper spine (T1) shall not be less than 17 g and not more than 22 g;

(3) Peak impactor acceleration shall be not less than 13 g and not more than 18 g.

[71 FR 75370, Dec. 14, 2006, as amended at 74 FR 29895, June 23, 2009]

§572.195 Thorax with arm.

(a) The thorax is part of the upper torso assembly shown in drawing 180-3000. For the thorax with arm impact test, the dummy is tested as a complete assembly (drawing 180-0000). The dummy's thorax is equipped with T1 and T12 laterally oriented accelerometers as specified in 49 CFR 572.200(d), and deflection potentiometers for the thorax and shoulder as specified in 180-3881, installed as shown in drawing 180-0000 sheet 2 of 5. When subjected to the test procedure as specified in paragraph (b) of this section, the thorax shall meet performance requirements of paragraph (c) of this section.

(b) *Test procedure.* (1) Soak the dummy assembly (180-0000) in a test environment as specified in 49 CFR 572.200(j).

(2) Seat the dummy, outfitted with the torso jacket (180-3450) and cotton underwear pants on a certification bench, specified in Figure V3, the seat pan and the seatback surfaces of which are covered with a 2-mm-thick PTFE (Teflon) sheet.

(3) Align the outermost portion of the pelvis flesh of the impacted side of the seated dummy tangent to a vertical plane located within 10 mm of the side edge of the bench as shown in Figure V5-A, while the midsagittal plane of the dummy is in vertical orientation.

(4) Push the dummy at the knees and at mid-sternum of the upper torso with just sufficient horizontally oriented force towards the seat back until the back of the upper torso is in contact with the seat back.

(5) While maintaining the dummy's position as specified in paragraphs (b)(3) and (4) of this section, the top of the shoulder rib mount (drawing 180-3352) orientation in the fore-and-aft direction is 24.6 ± 2.0 degrees relative to horizontal as shown in Figure V5-B in appendix A to this subpart.

(6) Adjust orientation of the legs such that they are symmetrical about the mid-sagittal plane, the thighs touch the seat pan, the inner part of the right and left legs at the knees are as close as possible to each other, the heels touch the designated foot support surface and the feet are vertical and as close together as possible.

(7) Orient the arm downward to the lowest detent such that the longitudinal centerline of the arm is parallel to the inferior-superior orientation of the spine box.

(8) The impactor is specified in 49 CFR 572.200(a).

(9) The impactor is guided, if needed, so that at contact with the dummy's arm, its longitudinal axis is within ± 1 degree of a horizontal plane and perpendicular to the midsagittal plane of the dummy. The centerpoint of the impactor face is within 2 mm of the vertical midpoint of the second thoracic rib and coincident with a line parallel to the seat back incline passing through the center of the shoulder yoke assembly arm rotation pivot (drawing 180-3327), as shown in Figure V5-A in appendix A to this subpart.

(10) The dummy's arm is impacted at 6.7 ± 0.1 m/s.

(11) Time zero is defined as the time of contact between the impact probe and the arm.

(12) Allow a period of at least thirty (30) minutes between successive tests of the same thorax assembly.

(c) *Performance criteria.*

(1) While the impactor is in contact with the dummy's arm, the thoracic ribs and the shoulder shall conform to the following range of deflections:

(i) Shoulder not less than 31 mm and not more than 40 mm;

(ii) Upper thorax rib not less than 25 mm and not more than 32 mm;

(iii) Middle thorax rib not less than 30 mm and not more than 36 mm;

(iv) Lower thorax rib not less than 32 mm and not more than 38 mm;