TP-P572-U-00

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U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

Part 572, SUBPART U
PERFORMANCE CALIBRATION REQUIREMENTS

ENFORCEMENT
Office of Vehicle Safety Compliance
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1. PURPOSE AND APPLICATION

The purpose of this laboratory procedure is to provide dummy users (independent testing laboratories under contract with the Office of Vehicle Safety Compliance) with standard test procedures for performing receiving-inspection and performance calibration tests on the Part 572, Subpart U dummy so that repetitive and correlative test results can be obtained. The following tests have been developed to establish a uniform calibration procedure for all users as the means of verifying the performance of the dummy.

A. EXTERNAL MEASUREMENTS

B. HEAD DROP TEST (572.182)

C. NECK FLEXION TEST (572.183)

D. SHOULDER IMPACT TEST (572.184)

E. THORAX – RIB DROP TEST (572.185(b))

F. THORAX – FULL BODY IMPACT TEST (572.185(c))

G. ABDOMEN IMPACT TEST (572.186)

H. LUMBAR SPINE FLEXION TEST (572.187)

I. PELVIS IMPACT TEST (572.188)

2. GENERAL REQUIREMENTS

A properly configured Part 572, Subpart U EuroSID (ES-2re), 50th percentile male side impact dummy must be tested to the calibration requirements stated herein prior to and after being used in a compliance crash test. Contractors may use “passing” post test calibration data to indicate the pre-test condition of a test dummy used in consecutive crash tests occurring less than 90 days apart. Otherwise, a full pretest calibration must be performed.

3. SECURITY

All NHTSA test dummies delivered to the contract laboratory as Government Furnished Property (GFP) will be stored in a safe and secure area such as the dummy calibration laboratory. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of GFP. Any security problems shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours.

The contractor is responsible for inspecting and reporting to NHTSA the condition of test dummies. Contractors shall protect and segregate the data that evolves from conducting dummy calibration tests before and after each vehicle crash usage.

No information concerning the dummy calibration data shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Branch or Division Chief.

NOTE: No individuals, other than contractor personnel directly involved in the dummy calibration test program, shall be allowed to witness dummy calibration tests unless specifically authorized by the COTR.

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire dummy calibration laboratory, test fixtures, and instrumentation in a neat, clean, and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

5. TEST SCHEDULING AND MONITORING

The Part 572, Subpart U dummies are being calibrated as test tools to be used in a vehicle test to determine compliance with the requirements of FMVSS 214. The schedule for these performance calibration tests must be correlated with that of the vehicle tests. Upon request, all testing shall be coordinated to allow monitoring by the COTR.

6. TEST DATA DISPOSITION

The contractor shall make all dummy calibration data available to the COTR for review and analysis as required. Calibration test data for each dummy will be sent to the COTR with each test report in the format indicated in this test procedure.

All backup data sheets, strip charts, recordings, plots, technician's notes, etc. shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

Part 572 test dummies will be furnished to the contract laboratory by the OVSC. The dummies shall be stored in an upright sitting position with the weight supported by the internal structure of the pelvis. The dummies head shall be held upright without supporting the weight of the dummy by using an eyebolt that can be secured in the top of the head. These dummies shall be stored in a secured room that is kept between 55ºF and 85ºF. The contractor will check dummy components for damage after each crash test and complete a dummy damage checklist that will be included with the posttest dummy calibration. The COTR will be kept informed of the dummies condition in order that replacement parts can be provided. The contractor shall calibrate the dummies before and verify the calibration after every crash test.

8. CALIBRATION AND TEST INSTRUMENTATION

Before the contractor initiates the dummy performance calibration test program, a test instrumentation calibration system must be implemented and maintained in accordance with established calibration practices. The calibration system shall be set up and maintained as follows:

A. Standards for calibrating the measuring and test equipment shall be stored and used under appropriate environmental conditions to assure their accuracy and stability.

B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals not exceeding 12 months for instruments and 12 months for calibration standards. Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.

8. CALIBRATION AND TEST INSTRUMENTATION…Continued

C. All measuring and test equipment and measuring standards shall be labeled with the following information:

(1) Date of calibration

(2) Date of next scheduled calibration

(3) Name of the technician who calibrated the equipment

D. The contractor shall provide a written calibration procedure that includes, as a minimum, the following information for all measurement and test equipment.

(1) Type of equipment, manufacturer, model number, etc.

(2) Measurement range

(3) Accuracy

(4) Calibration interval

(5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)

(6) The actual procedures and forms used to perform calibrations.

E. The contractor shall keep records of calibrations for all test instrumentation in a manner that assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the written acceptance of the COTR before testing begins.

F. Test equipment shall receive a calibration check immediately prior to and after each test. This check shall be recorded by the test technician(s) and submitted with the final report.

G. Anthropomorphic test devices shall be calibrated before and after each test. These calibrations shall be submitted with the final report.

9. PHOTOGRAPHIC DOCUMENTATION

Provide digital still photographs showing any damage that occurred to the test dummy as a result of the crash test. Provide copies of the photographs in the draft test report.

10. PRETEST REQUIREMENTS

The following equipment and instrumentation are necessary to conduct the calibration tests in accordance with Part 572;

10.1 HEAD DROP TEST FIXTURE (572.182(a) & 572.112(a))
A test fixture configured in accordance with the specifications contained in the figure below shall be used to conduct the head drop tests.

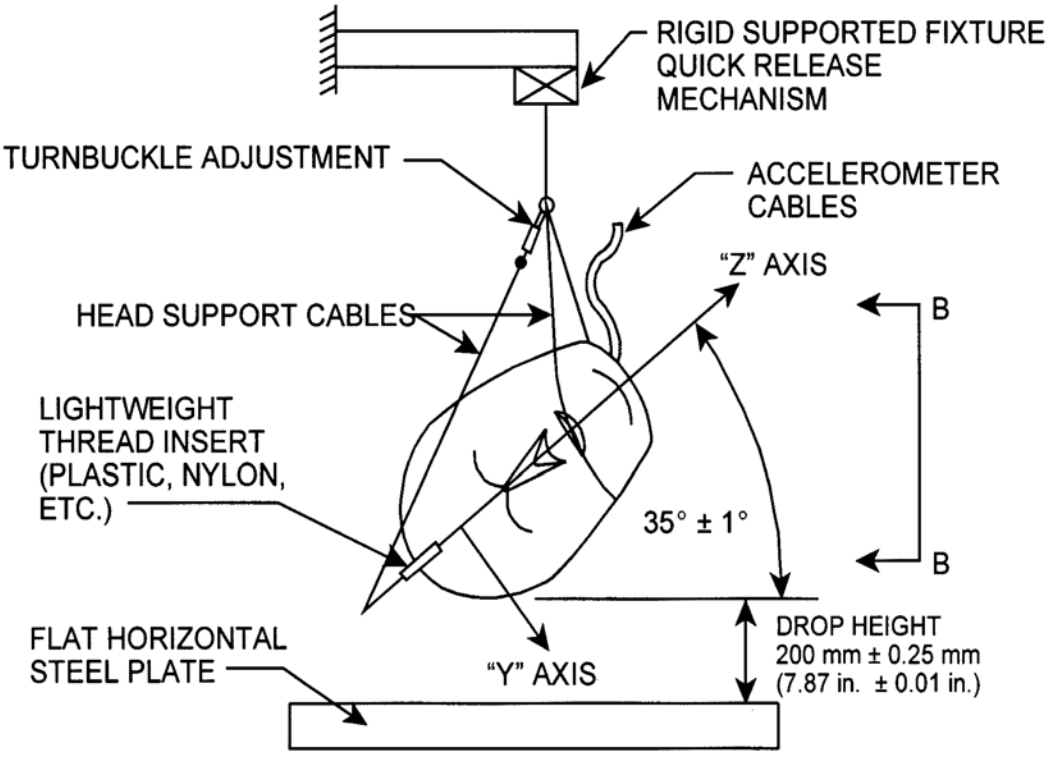
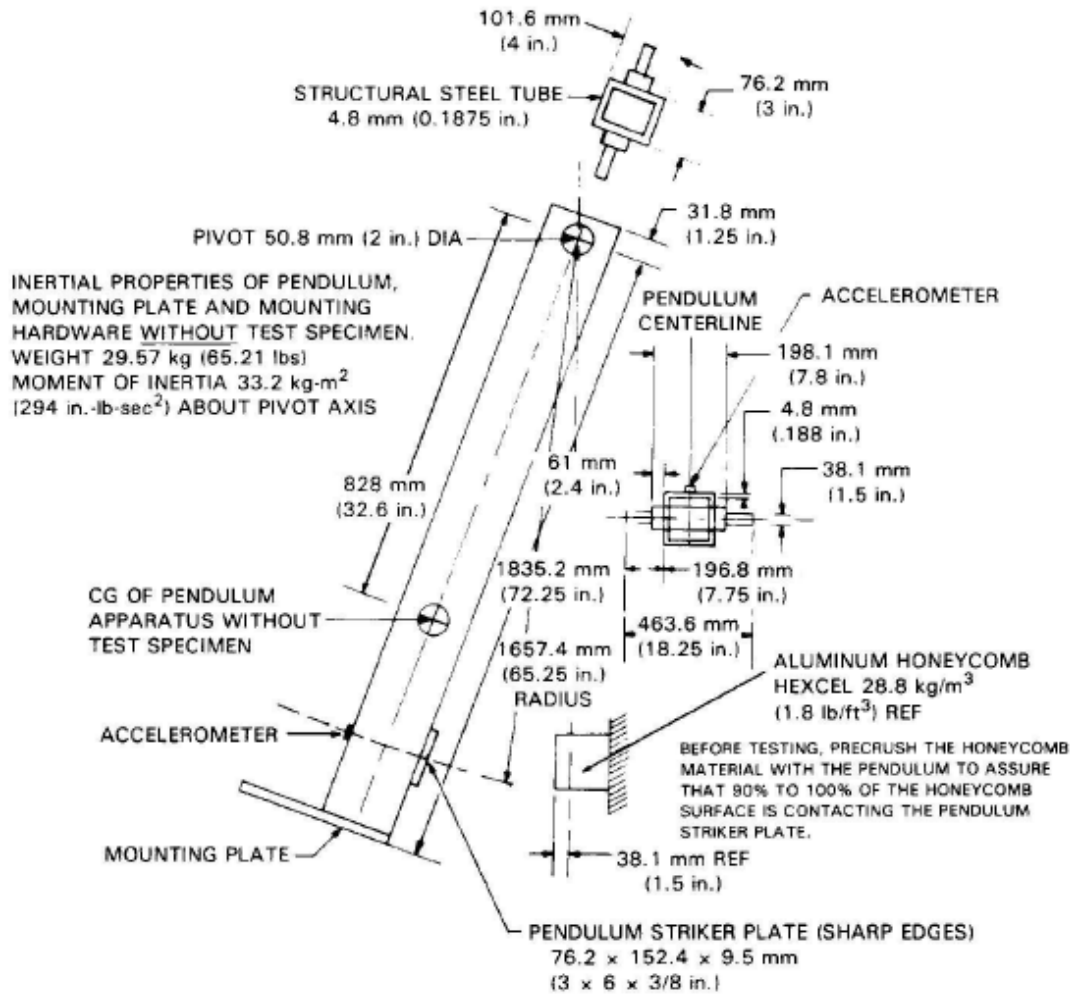


Plate is 51 mm x 610 mm x 610 mm (2 x 24 x 24 in.) with SURFACE FINISH 0.2 microns (8 microinches) to 2.0 microns (80 microinches). IMPACT SURFACE to be clean and dry.

10. PRETEST REQUIREMENTS…Continued

10.2 PART 572 PENDULUM TEST FIXTURE (572.183(2), 572.33)

A pendulum configured in accordance with the specifications contained in the figure below shall be used to conduct the neck and lumbar flexion tests.



10.3 TEST PROBE (572.189(a), 572.36(a))

A. The test probe for the lateral shoulder, thorax without arm, abdomen and pelvis impact tests is a 6 inch diameter cylinder weighing 51.5 pounds. (572.36(a))

B. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It has an edge radius of 0.5 inches. (572.36(a))

C. The probe's end opposite to the impact face must have provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal centerline of the cylinder. (572.36(a))

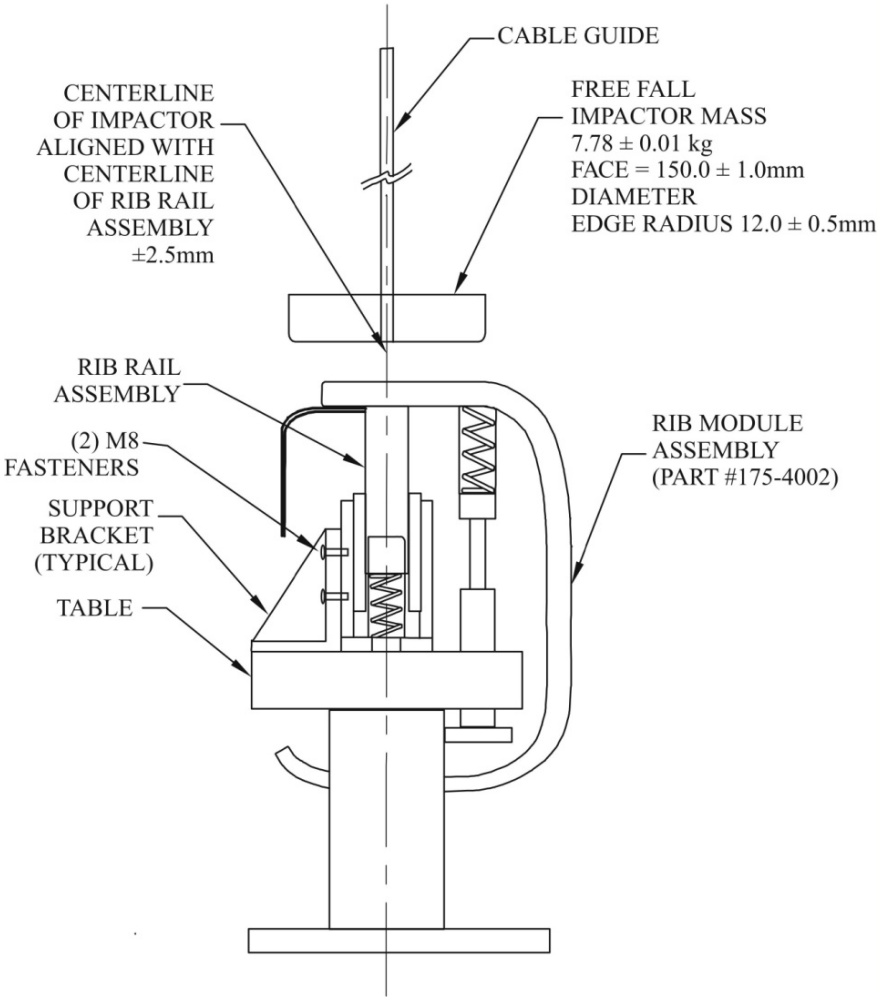
D. The test probe has a minimum mass moment of inertia in yaw of 9,000 kg-cm^2, a free air resonant frequency not less than 1,000 Hz (572.189(a)).

10. PRETEST REQUIREMENTS…Continued

E. All hardware attached directly to the impactor and one-third (1/3) of the mass of the suspension cables must be included in the calculations of the total impactor mass. The sum mass of the attachments and1/3cable mass must not exceed 5 percent of the total pendulum mass. No suspension hardware, suspension cables, or any other attachments to the test probe, including velocity vane, shall make contact with the dummy during the test (572.189(a)).

10.4 RIB DROP TEST FIXTURE (572.185(b)(1)(iii))

A test fixture configured in accordance with the specifications contained in the figure below shall be used to conduct the rib drop tests.



10. PRETEST REQUIREMENTS….Continued

10.5 TRANSDUCER REQUIREMENTS

The contractor shall provide and install the following instrumentation;

A. ACCELEROMETERS
Accelerometers for the head, the thoracic spine, and the pelvis conform to specifications of SA572–S4.(572.189(b)).

B. ROTARY POTENTIOMETER
Rotary potentiometers for the neck and lumbar spine certification tests conform to SA572–53. (572.189 (c))

10.6 OTHER TRANSDUCER CONDITIONS

A. TRANSDUCER MOUNTS
The mountings for sensing devices shall have no resonance frequency within range of 3 times the frequency range of the applicable channel class. (572.189(l)).

B. TRANSDUCER SIGN CONVENTION
The sign convention for outputs of transducers mounted within the Hybrid III that measure head and chest accelerations, chest deflection and femur loads are located in Figure 2A. For other transducers see SAE J1733DEC94 (Appendix F). (572.36(j) & (572.31(a)(5))

C. TRANSDUCER OUTPUT FILTERING
The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part are recorded with individual data channels. Each data channel is comprised of a sensor, signal conditioner, data acquisition device and all interconnecting cables. Instrumentation and sensors conform to the Recommended Practice SAE J–211 (Mar. 1995)—Instrumentation for Impact Test unless noted otherwise.

All instrumented response signal measurements shall be treated to the following specifications:

(1) Head acceleration—Digitally filtered CFC 1000;
(2) Neck and lumbar spine rotations—Digitally filtered CFC 180;
(3) Neck and lumbar spine pendulum accelerations—Digitally filtered CFC 60;
(4) Pelvis, shoulder, thorax without arm, and abdomen impactor accelerations—Digitally filtered CFC 180;
(5) Abdominal and pubic symphysis force—Digitally filtered at CFC 600;
(6) Thorax deflection—Digitally filtered CFC 180.
(7) Filter the pendulum acceleration data using a SAE J211 CFC 60 filter.

All filter classes should be of the "phaseless" type to be compatible with the "time" dependent test parameters.

D. TEST FIXTURE
The neck pendulum and thorax probe accelerometers shall have the dimensions and characteristics of Endevco Model 7231C. (572.36(g))channels.

11. CALIBRATION TEST EXECUTION

See Check Sheets in Section 14.

12. POST TEST REQUIREMENTS

The contractor shall verify all instrumentation and check data sheets and photographs. Make sure data is recorded in all data blocks on every peformance calibration test data sheet.

13. REPORTS

13.1 APPARENT NONCONFORMANCE

During the post test calibration, any indication of apparent nonconformance to the requirements of Regulation P572 shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). Written notification shall be submitted with a copy of the particular test data sheet(s) and preliminary data plot(s).

In the event of an apparent nonconformance, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

13.2 FINAL PERFORMANCE CALIBRATION REPORTS

The pre-test calibration and post test calibration verification data for each Part 572, Subpart U dummy used in the vehicle compliance test shall be submitted with the FMVSS 214 final test report for the vehicle tested.

14. CHECK SHEETS

CHECK SHEET NO. U1
EXTERNAL MEASUREMENTS

Dummy Serial No._____ Test Date_____
Technician_____

__1 Remove the dummy's chest jacket and foam shoulder pad.
__2 Seat the dummy on a flat, rigid, smooth, clean, horizontal surface. The seating surface must be at least 610 mm (24 in.) wide and 406 – 508 mm (16-20 in.) deep, with a vertical section at least 610 mm (24 in.) wide and 914 mm (36 in.) high attached to the rear of the seating surface. The dummy's midsagittal plane should be vertical and centered on the horizontal surface (Figure 1).

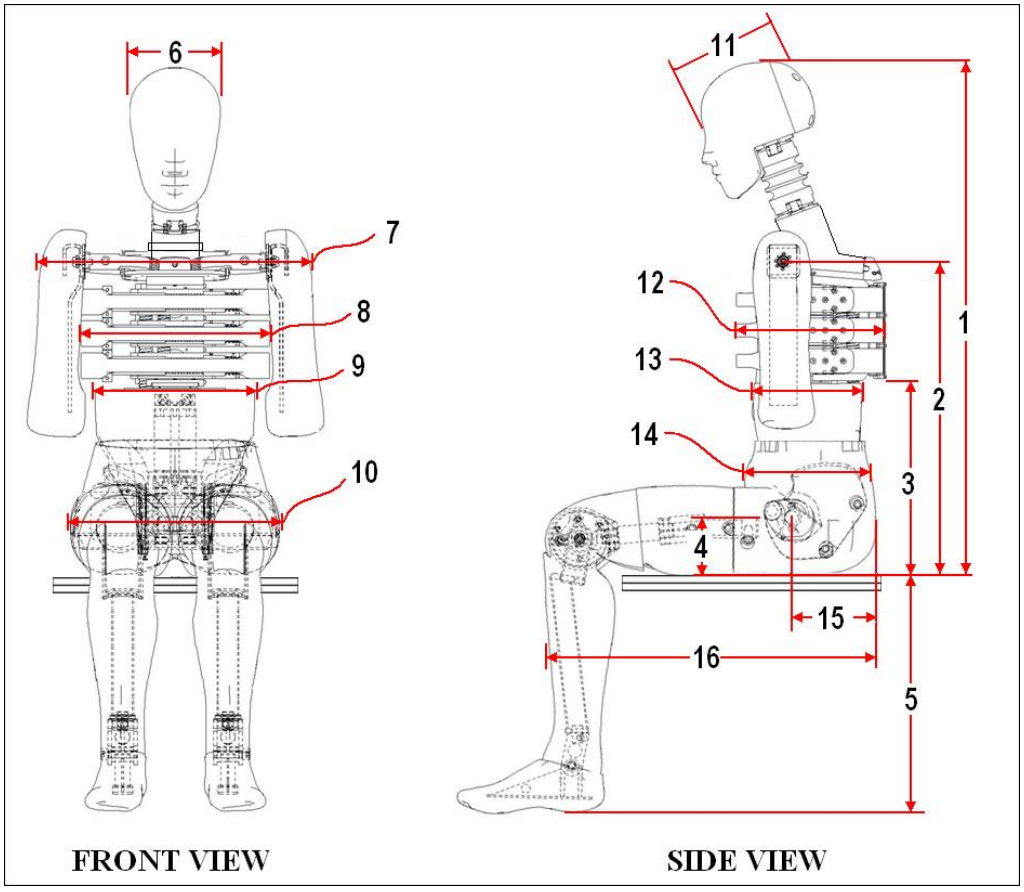


Figure 1. Seated Position of ES-2re for taking external measurements

__3 Place the dummy's upper torso vertical as measured at the torso back plate by setting the rib extension cover button head screws flush against the vertical measurement surface. The torso back plate and the back of the buttocks are not in the same vertical plane; therefore the buttocks will not be in contact with the vertical measurement surface. A strap or bungee cord may be placed around the neck bracket to secure the dummy in position.
__4 Position the upper and lower legs parallel to the dummy's midsagittal plane. The centerline between the knee pivot and the screw attaching the ankle to the lower tibia shall be vertical.
__5 Position the feet parallel to the dummy's midsagittal plane with the bottoms horizontal and parallel to the seating surface.

CHECK SHEET NO. U1 (Continued)
EXTERNAL MEASUREMENTS

__6 Before measuring the dummy's sitting height, lift the head to obtain a straight neck, with parallel end plates. This can be checked using a straight edge placed on the neck end plates as shown in Figure 2. A strap or bungee cord may be placed around the head to secure it in this position.

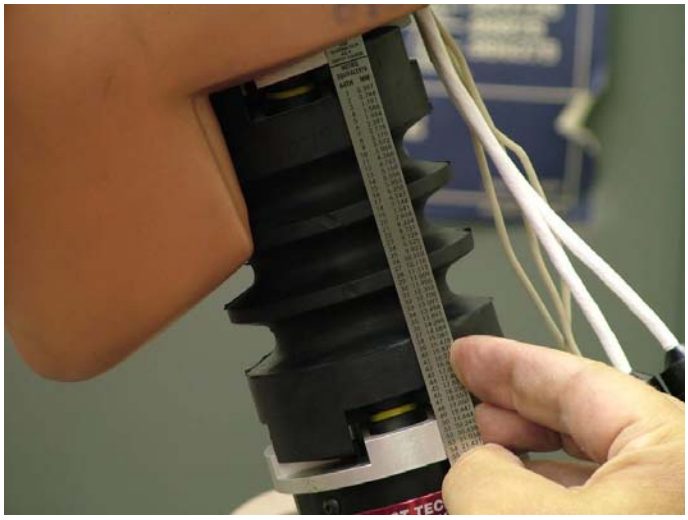


Figure 2. Checking for a straight neck before measuring sitting height

__7 Threaded cylindrical tools (Figure 3) are used to take measurements in recessed locations at the shoulder and pelvis (see Figure 3). To install the tool at the shoulder, remove the M10 BHCS that fastens the arm to the clavicle and replace the screw with the tool (Figure 4). To install the tool at the pelvis, remove the M6 SHCS from the center of the pelvis back plate and replace the screw with the tool.

Figure 3. Threaded cylindrical tools

CHECK SHEET NO. U1 (Continued)
EXTERNAL MEASUREMENTS

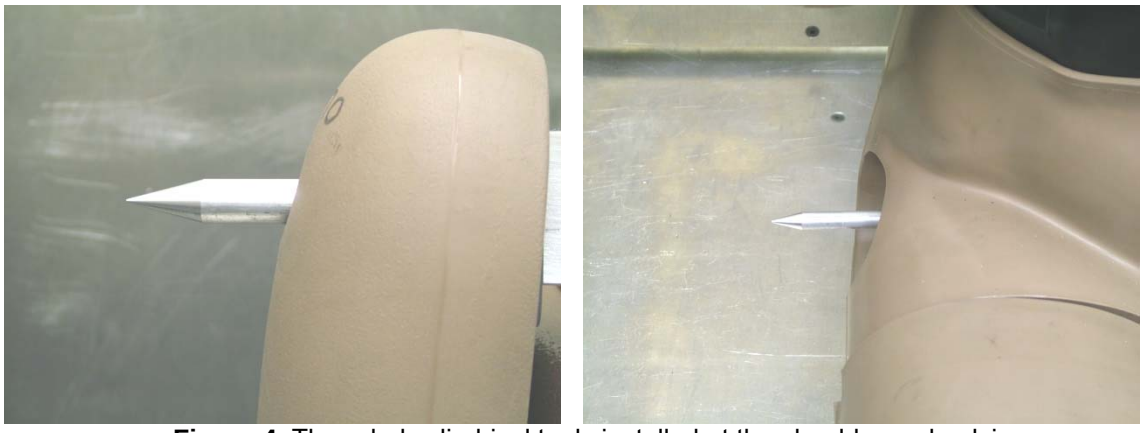


Figure 4. Threaded cylindrical tools installed at the shoulder and pelvis

__8 Take the following measurements and record on Table U1. Verify that each measurement meets the specification by indicating “Pass” or “Fail” in the far right column.

__8.1 **Sitting Height (1):** With the head positioned as indicated in step 6, measure the distance from the seat horizontal surface to a level placed on top of the head.

__8.2 **Seat to Shoulder Joint (2):** seat surface to center of shoulder attachment bolt.

__8.3 **Seat to the Lower Face of the Thoracic Spine Box (3):** Seat surface to bottom surface on Thoracic spine box.

__8.4 **Seat to the Hip Joint (4) (center of bolt):** Seat Surface to center of pelvis back plate attachment bolt.

__8.5 **Sole to Seat, Sitting (5):** Seat surface to bottom of foot

__8.6 **Head Width (6):** Measure the widest part of the head.

__8.7 **Shoulder/Arm Width (7):** Outside of arm to outside of arm at the shoulder attachment bolt level.

__8.8 **Thorax Width (8):** Outside Width of Thorax rib modules.

__8.9 **Abdomen Width (9):** Outside width of abdomen (black insert)

__8.10 **Pelvis Lap Width (10):** Outside maximum width of the pelvis flesh measured at the H-Point level.

__8.11 **Head Depth (11):** Measure from the back of the head to the forehead.

__8.12 **Thorax Depth (12):** Front of the thorax rib module to the back of the seat surface

__8.13 **Abdomen Depth (13):** Front side to the back side of the abdomen

__8.14 **Pelvis Depth (14):** Front side of the pelvis to the rear of the buttocks at the top of the thigh level.

__8.15 **Back of Buttocks to Hip Joint (15) (center of bolt):** Back of the buttocks to the center of the back plate attachment plate

__8.16 **Back of Buttocks to Front Knee (16):** Back of the buttocks to the most forward surface of the knee

CHECK SHEET NO. U1 (Continued)
EXTERNAL MEASUREMENTS

Table U1. External Measurements

No.	Description	Spec. (mm)	Result	Pass/ Fail
1	Sitting Height	900 - 918		
2	Seat to Shoulder Joint	558 - 572		
3	Seat to Lower Face of Thoracic Spine Box	346 - 356		
4	Seat to Hip Joint (center of bolt)	97 - 103		
5	Sole to Seat, Sitting	333 - 451		
6	Head Width	152 - 158		
7	Shoulder/Arm Width	461 – 479		
8	Thorax Width	322 – 332		
9	Abdomen Width	273 – 287		
10	Pelvis Lap Width	359 – 373		
11	Head Depth	196 – 206		
12	Thorax Depth	262 – 272		
13	Abdomen Depth	194 – 204		
14	Pelvis Depth	235 – 245		
15	Back of Buttocks to Hip Joint (center of bolt)	150 – 160		
16	Back of Buttocks to Front Knee	597 - 615		

_____ _____
Signature Completion Date

CHECK SHEET NO. U2
HEAD DROP TEST (S572.182)

Dummy Serial No._____ Test Date_____
Technician_____

__1 Inspect the head skin for cracks, tears or other damage. Replace the skin if necessary.
__2 Remove the skull cap by unscrewing the four M6 x 16 SHCS in the back of the head and inspect for defects (Figure 5). If defects are present, repair or replace.

> **Note:** If the damage results from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

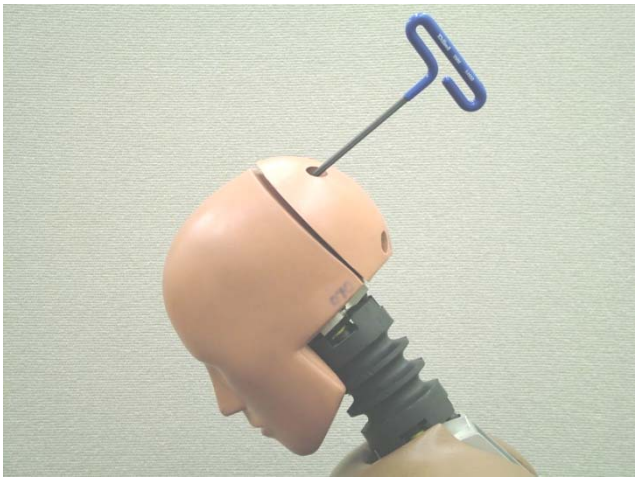


Figure 5. Removal of the skull cap

__3 Soak the head assembly in a controlled environment at a temperature and relative humidity indicated in Table U2 for at least four hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U2. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.
__4 Unscrew the four M6 x 12 SHCS in the upper neck load cell (or structural replacement) inside the head and separate the head/load cell assembly from the neck. If an accelerometer mount is installed on the upper neck load cell, remove it first for easier access to the four M6 x 12 SHCS (Figure 6).

Figure 6. Removal of head from neck

CHECK SHEET NO. U2 (Continued)
HEAD DROP TEST (S572.182)

__5 Remove the upper neck load cell (or structural replacement) from the head by unscrewing the four M6 x 22 SHCS in the base of the head. (Figure 7).

Figure 7. Removal of upper neck load cell structural replacement

__6 Fasten the accelerometers to the accelerometer mount, assuring that all axes are properly oriented using six M1.4 x 3 SHCS.

__7 Fasten the accelerometer mount to the upper neck load cell (or structural replacement) using two M5 x 10 SHCS and one M5 x 16 SHCS. Attach a self-adhesive cable tie mount to the upper surface at the rear of the upper neck load cell (or structural replacement). Cable tie the accelerometer cables to the cable tie mount to act as a cable strain relief to prevent damage to the accelerometers.

Figure 8. Accelerometer Mount

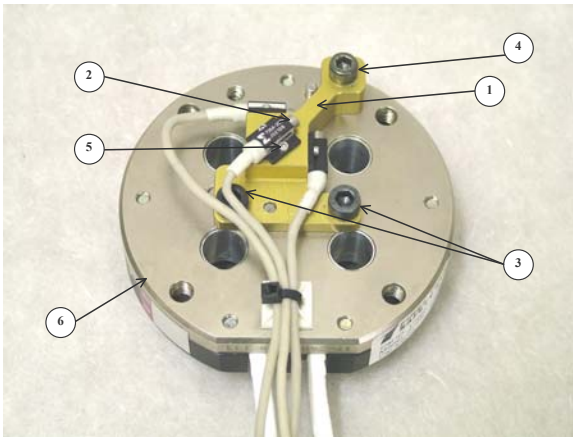


Table I - Head C.G Accelerometer Components

Part Description	Quantity	Part Number	Item No.
Accelerometer Mount, Head C.G.	1	SA572-S81	1
Uniaxial Accelerometer	3	SA572-S4	2
Screw, M5 x .8 x 10 SHCS	2	5000291	3
Screw, M5 x .8 x 16 SHCS	1	5000020	4
Screw, M1.4 x .3 x 3 SHCS	6	5000068	5

CHECK SHEET NO. U2 (Continued)
HEAD DROP TEST (S572.182)

__8 Re-install the upper neck load (or structural replacement) to the base of the head
__9 Replace the skullcap. To avoid pinching and damaging transducer cables when installing the skull cap, make sure that any transducer cables exiting the head are carefully located in the cable access cutout located at the base of the skull.
__10 When replacing the skullcap, use the standard skullcap bolts for all but the bottom left (for left side impacts) or bottom right (for right side impacts) bolts. Instead, insert a threaded 4.2 cm long (1.3 cm of the 4.2 cm is threaded) hex rod so that it protrudes from the skullcap. Tighten the rod into the threaded hole with a wrench. This rod will be used to route the cabling which holds the head assembly for test.
__11 Clean the headskin with isopropyl alcohol and allow it to dry thoroughly.
__12 Suspend the head assembly using the head suspension cables (Figure 9). Route the suspension cable around the protruding hex bolt, and between the lips.

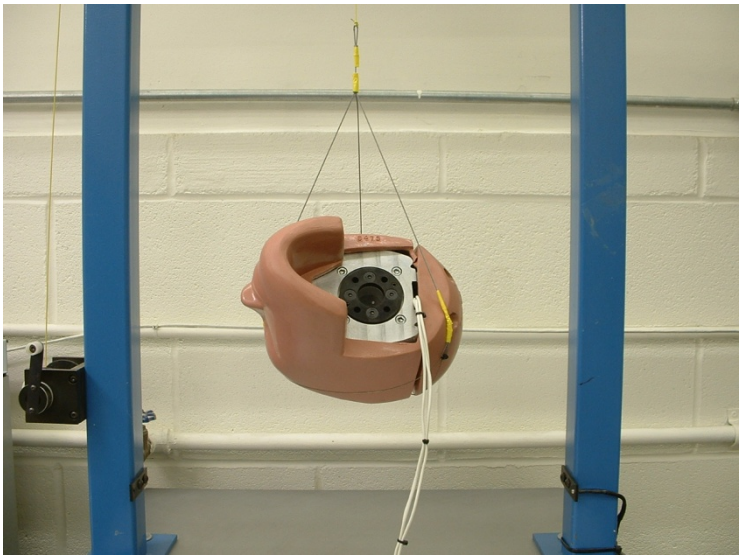


Figure 9. Threaded cylindrical tools

__13 Adjust the head so that the skull base/D-plane is 35°± 1º from the vertical (see Figure 10).

Figure 10. Adjusting the D-plane to 35°± 1º

CHECK SHEET NO. U2 (Continued)
HEAD DROP TEST (S572.182)

__14 Level the head so that it is horizontal (± 1°) in the fore-aft direction (Figure11).

Figure 11. Leveling the Head in the fore-aft direction

__15 Prepare an impact surface that is constructed of a rigidly supported, flat horizontal steel plate which is 51 (± 2 mm) thick and 610 mm (± 10 mm) square with a micro-finish of 0.2 microns (8 microinches) to 2.0 microns (80 microinches).

__16 Raise the head assembly so that it is 200 mm (7.87”) from the impact point to the lowest point on the head (Figure 12).

__17 Clean the impact surface with isopropyl alcohol.

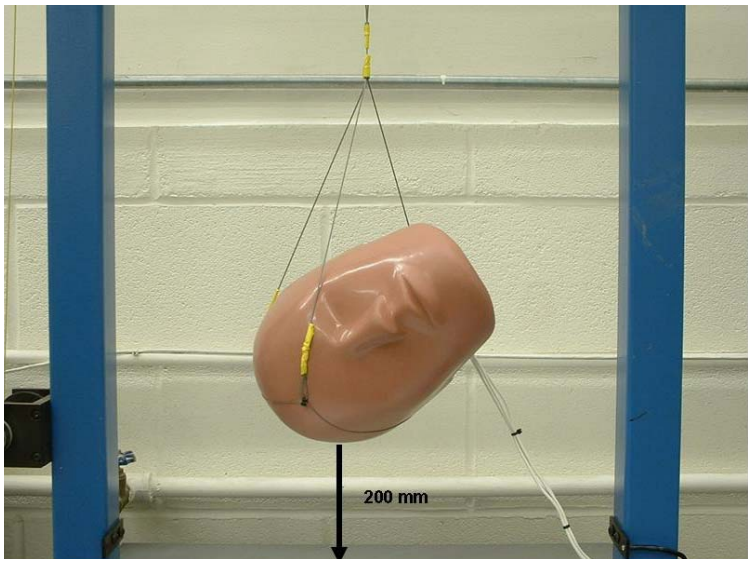


Figure 12. Raise the head to the proper drop height

CHECK SHEET NO. U2 (Continued)
HEAD DROP TEST (S572.182)

__18 Record the room temperature and humidity on Table U2. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column.
__19 Release the head assembly so that it falls freely to the impact surface.
__20 Collect the head acceleration data and filter using a Channel Class 1000 phaseless filter in accordance with SAE J211.
__21 Time zero is defined as the time of contact between the head and the impact surface. All channels should be at a zero level at this point.
__22 Plot the x, y, z and resultant acceleration curves.
__23 Record the peak head resultant acceleration and peak head X acceleration. Verify that these accelerations lie within the specifications indicated in Table U2.
__24 Calculate 15% of the peak head resultant acceleration.
__25 Calculate the maximum oscillation that occurs after the peak resultant acceleration. Verify that the maximum oscillation is less than 15% of the peak head resultant acceleration.
__26 Wait at least 2 hours between successive head certification tests on the same side of the head.

Table U2. Head Drop Test

Tested Parameter		Units	Specification	Result	Pass/ Fail
Head Assembly Soak Time		Minutes	≥240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity – During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
Peak Head Resultant Acceleration		g’s	125 to155		
Peak Head X Acceleration		g’s	<15		
Unimodal (Oscillation)			<15%		

_____ _____
Signature Completion Date

CHECK SHEET NO. U3
NECK FLEXION TEST (S572.183)

Dummy Serial No._____ Test Date_____
Technician_____

__1 Unscrew the four M6 x 30 SHCS connecting the neck bracket to the shoulder assembly and separate the neck bracket from the shoulder. (Figure 13)

__2 Remove the neck assembly (Part No. 175-2000) from the neck bracket by unscrewing the four M6 x 1 x 16 SHCS at the base of the neck assembly. (Figure 14)

__3 Visually inspect the neck assembly for deformation, tears or breaks in the rubber or if the neck is permanently bent or twisted.

> **Note:** If the damage results from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Figure 13. Removal of the neck bracket from the shoulder assembly

Figure 14. Removal of the neck from neck bracket

> **Note:** When a lower neck load cell is installed, a different neck bracket and different fasteners than shown are required.

CHECK SHEET NO. U3 (Continued)
NECK FLEXION TEST (S572.183)

__4 Soak the neck assembly in a controlled environment at a temperature and relative humidity indicated in Table U4 for at least four hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U4. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.

__5 Torque the half-spherical screws (175-2004) located at either end of the neck assembly to 88 ± 5 in-lbs. using the neck compression tool (175-9500) or equivalent.

__6 Prepare the headform (Part No. 175-9000) for the test (Figure 15).

__7 Attach the top of the neck assembly to the headform interface plate (Part No. 175-9029) with four M6x12 SHCS.

__8 Attach the base of the neck assembly to the headform interface plate (Part No. 175-9027) with four M6x40 SHCS.

__9 Attach the mounting base of the headform onto the pendulum with four M6x12 SHCS. Mount the headform with its rotational potentiometers on the left-hand side (Figure 16).

__10 Attach carbon fiber rods (i.e, Arrow Shafts) to each pivot assembly.

__11 Carefully insert a carbon fiber rod through the potentiometer assembly that is farthest from the honeycomb impact surface (i.e. Arrow Shaft – Pivot Assembly B).

__12 Slide the pivot assembly onto the central carbon fiber rod (i.e., Arrow Shaft). Then, place the spacer onto the central carbon fiber rod.

__13 Insert a second carbon fiber rod through the potentiometer assembly housing that is closest to the honeycomb impact surface (i.e., Arrow Shaft – Pivot Assembly A).

__14 Lightly tighten the set screw at the base of Pivot Assembly A to firmly attach it to the central carbon fiber rod being careful not to damage the rod.

__15 Attach the potentiometers to the neck mounting plate in their correct orientation with Pivot Assembly A closest to the honeycomb.

__16 Prepare the pendulum for the test.
Mount a uni-axial accelerometer on the pendulum with its sensitive axis 1657.4 mm from the pendulum pivot in accordance with Standard Part 572 subpart E.

CHECK SHEET NO. U3 (Continued)
NECK FLEXION TEST (S572.183)

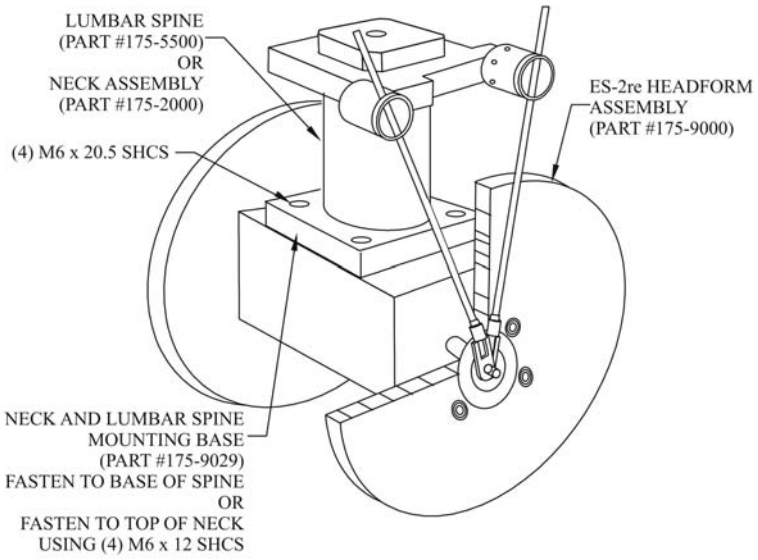


Figure 15. Neck/Lumbar spine attached to the headform

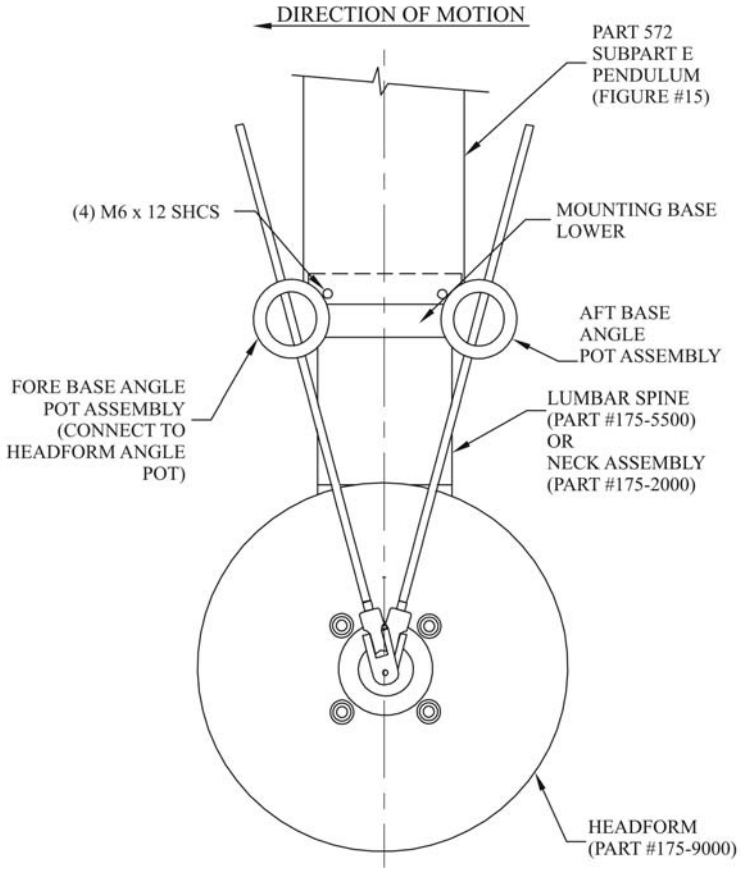


Figure 16. Headform attached to the pendulum

CHECK SHEET NO. U3 (Continued)
NECK FLEXION TEST (S572.183)

__17 Record the room temperature and humidity in Table U4. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column

__18 Raise the pendulum and allow it to fall freely such that it achieves an impact velocity of 3.4 ± 0.1 m/s. The pendulum must be vertical ± 0.5° when its speed is reduced to 0 m/s.

__19 Allow the neck to flex without the neck-headform assembly making contact with any object.

__20 Time zero is defined as the time of contact between the pendulum and the honeycomb. All channels should be at zero level at this point.

__21 Determine the velocity time history by integrating the pendulum acceleration beginning at time zero. Filter the pendulum acceleration using CFC 60.

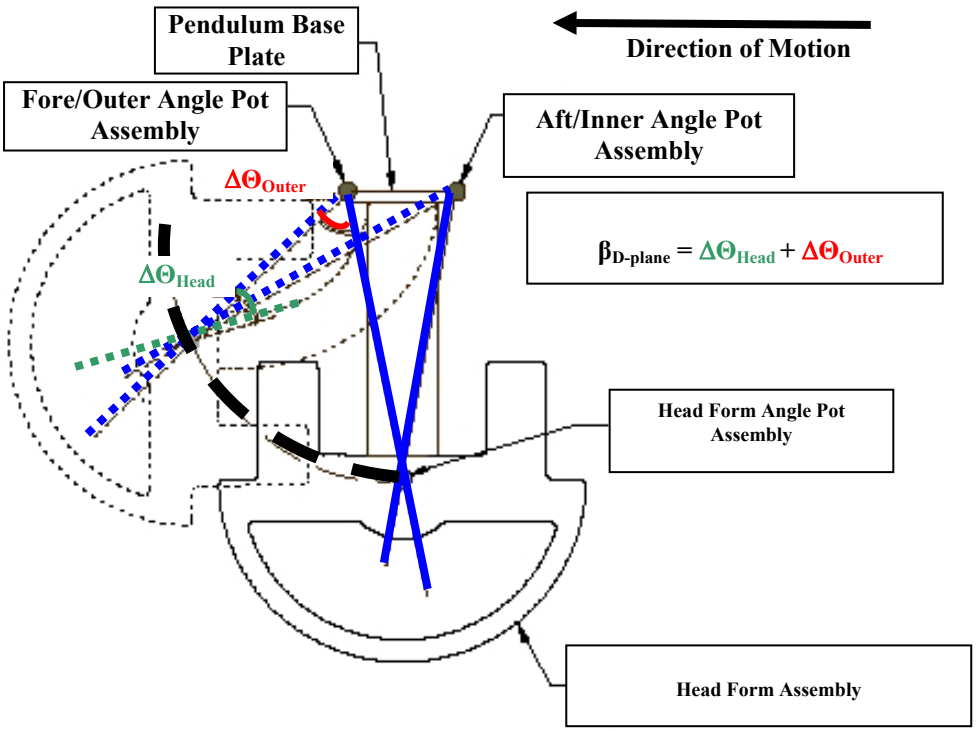
__22 Verify that the velocity time history of the pendulum falls within the corridor determined by the upper and lower boundaries specified in Table U3.

__23 The fore (A), aft (B) and headform (C) angles are directly measured during the test and filtered using CFC180 (Figure 18).

__24 The maximum headform flexion angle is calculated by summing the fore (A) and headform (C) angles (i.e., $\beta max = \Delta\Theta_{Head} + \Delta\Theta_{Outer}$).

__25 Verify that the maximum headform flexion angle and the time it occurs meet specifications listed in Table U4.

__26 Verify that the decaying headform rotation vs. time curve crosses the 0 degree angle with respect to its initial position at time of impact relative to the pendulum centerline between 53 and 88 ms after the time of peak translation rotation value is reached.



where $\Delta\Theta_{Head}$ and $\Delta\Theta_{Outer}$ are the deviations of the angles Θ_{Head} and Θ_{Outer}

Figure 17. Angle measurements with the head form setup

CHECK SHEET NO. U3 (Continued)
NECK FLEXION TEST (S572.183)

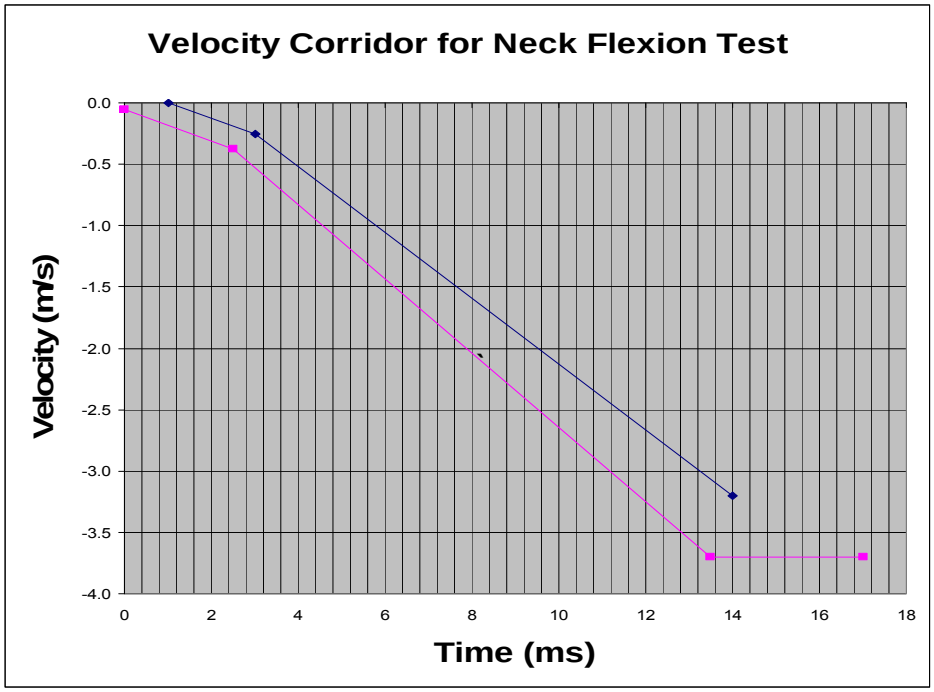


Table U3. Neck Flexion Test Pendulum Velocity Corridors

Upper Boundary		Lower Boundary	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (ms)
1.00	0.00	0	-0.05
3.00	-0.25	2.5	-0.375
14.00	-3.20	13.5	-3.7
		17	-3.7

Table U4. Neck Flexion Test

Tested Parameter		Units	Specification	Result	Pass/ Fail
Head Assembly Soak Time		Minutes	≥240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Pendulum Velocity		m/s	3.3 to 3.5		
Maximum headform flexion angle		Deg	49 to 59		
Time at Maximum flexion angle		ms	54 to 66		
Headform Flexion Decay (Peak to zero)		ms	53 to 88		

_____ _____

Signature Completion Date

CHECK SHEET NO. U4
SHOULDER IMPACT TEST (S572.184)

Dummy Serial No._____ Test Date_____
Technician_____

Pretest Preparation

__1 Soak the dummy in a controlled environment at the temperature and relative humidity shown in Table U5 for at least four hours prior to a test. Record the length of time for the soak and maximum and minimum temperature and humidity in Table U5. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.

__2 Remove the arm that will be located on the impact side and the M10x30 button head screw in the shoulder cam.

__3 Remove the shoulder foam pad.

__4 Adjust the elastic bungee cord tension such that the force required to move the shoulder cam forward 1 to 5 mm, when applied at 4 mm (± 1 mm) from the outer edge of the clavicle and applied in the same plane as the clavicle movement is between and including 27.5N and 32.5N. To set the elastic bungee cord tension, the length of the elastic bungee cord is adjusted at the elastic cord holder.

__5 After setting the elastic bungee cord tension, check that the clavicles can travel the full range of motion and come to a stop on the cam stop blocks inside the shoulder box. If the shoulder range of motion is limited by the maximum extension of the elastic bungee cord, replace the bungee cord with a new one.

__6 Reattach the arm and sit the dummy without jacket on a flat, horizontal, rigid surface without back support covered by two PTFE Teflon sheets 2 mm thick.

__7 Set both arms at the middle pivot stop in the shoulder joint. Verify that the arms are set at a position of 50°±2° forward with respect to the horizontal, pointing downward.

__8 Adjust the dummy such that the anterior-posterior axis of the dummy is perpendicular to the direction of impact.

__9 Place the dummy legs horizontal with the distance between the ankles at 100 ± 5 mm.

__10 Align the thorax vertically ±2° as measured at the rib extension cover. Do not support the dummy to maintain this position (see Figure 18).

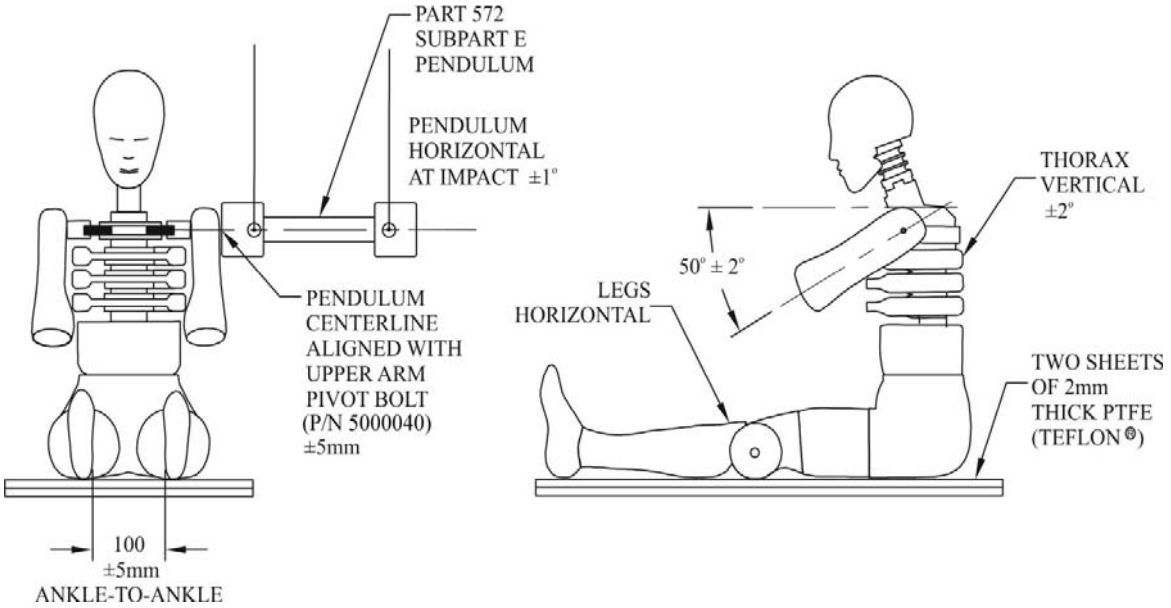


Figure 18. Shoulder Impact Test Condition

CHECK SHEET NO. U4 (Continued)
SHOULDER IMPACT TEST (S572.184)

Conduct Test, Collect Data and Verify Performance

__11 Record the room temperature and humidity in Table U5. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column.
__12 The pendulum meets Part 572 subpart E (572.36 (a)) and is equipped with an accelerometer with its sensitive axis collinear with the longitudinal axis of the pendulum.
__13 Align the pendulum so that at contact with the shoulder, its longitudinal axis is perpendicular ±1° to the midsagittal plane of the thorax and centered on the upper arm pivot bolt ± 5 mm (Figure 18).
__14 Release the pendulum such that it strikes the shoulder with an impact speed of 4.3 ± 0.1 m/s.
__15 Record the pendulum acceleration and digitally filter at SAE J211 CFC180.
__16 Verify that the peak impactor acceleration meets specifications in Table U5.

Table U5. Shoulder Impact Test

Tested Parameter		Units	Specification	Result	Pass/ Fail
Dummy Soak Time		Minutes	≥240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
Pendulum Speed		m/s	4.2 to 4.4		
Peak Impactor Acceleration		G’s	7.5 to 10.5		

Note – 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.

_____ _____
Signature Completion Date

CHECK SHEET NO. U5
RIB DROP TEST (S572.185(b))

Dummy Serial No._____ Test Date_____
Technician_____

__1 To release the rib modules, remove the Teflon cover from the back plate by unscrewing the eight M3 x 6 BHCS (Figure 19).

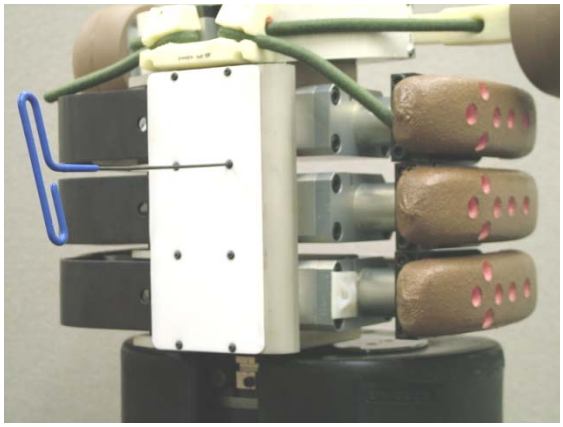


Figure 19. Removal of Teflon back plate cover

__2 Remove the rib extension guide/back plate load cell (or load cell structural replacement) assembly by unscrewing the six M6 x 22 SHCS that fasten the back plate load cell to the spine box (Figure 20). If further disassembly is desired, the rib extension guide can then be separated from the back plate load cell by unscrewing the five M6 x 18 FHCS (Figure 21).

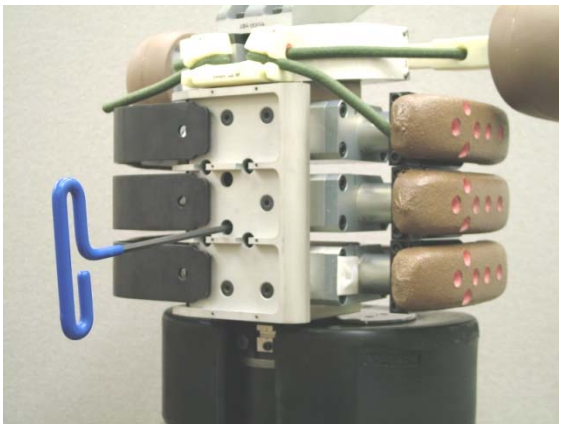


Figure 20. Removal of rib extension guide

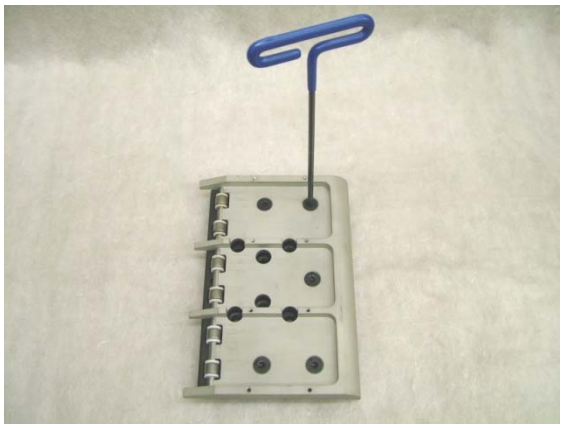


Figure 21. Disassembly of the rib guide

CHECK SHEET NO. A5 (Continued)
THORAX - RIB DROP TEST (S572.185(b))

__3 Remove each rib module by unscrewing the two M8 x 20 SHCS that fasten each of the three rib modules to the spine box (Figure 22).

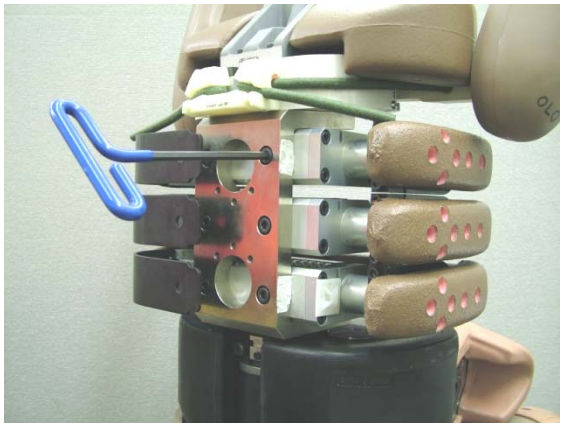


Figure 22. Removal of rib module

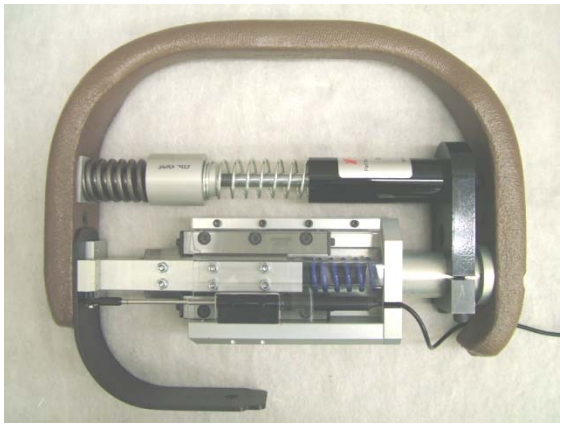


Figure 23. Inspection of the rib module

__4 Visually inspect the rib modules for damage, play in the linear bearing, non-symmetry in the rib, loss of oil from the damper, etc (Figure 23). Check that the rib easily expands to the rib stop without assistance. Make adjustments or replace as necessary.

> **Note:** If the damage results from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

__5 Soak the rib modules in a controlled environment at a temperature and relative humidity indicated in Table U6 for at least four hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U6. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.

__6 Prepare the drop test fixture and data acquisition system. The guided mass must weigh 7.78±0.01 kg and have a flat impact face 150 ± 1.0 mm in diameter.

__7 Mount a rib module rigidly in the drop test fixture with the impacted side of the rib facing up.

__8 Align the rib module and guided mass so that at impact, the center point of the guided mass impact face contacts the centerline of the rib rail guide system within ± 2.5 mm.

__9 Record the room temperature and humidity in Table U6. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column.

__10 Release the impact mass from a height of 815 ± 8mm. Measure and record rib deflection.

__11 Plot rib deflection v. time. Record the maximum rib deflection on Table U6 and verify that it meets specification by indicating “Pass” or “Fail.”

__12 In a time period not less than 5 minutes, subject the same rib module to second rib drop test with the guided mass released at a height of 459 ± 5mm.

__13 Plot rib deflection v. time. Record the maximum rib deflection on Table U6 and verify that it meets specification by indicating “Pass” or “Fail.”

__14 Record the time period between rib drop tests on Table U6.

__15 If the test results are not within specification, allow a period of not more than 30 minutes, conduct a repeat test.

__16 Repeat the above sequence for the other rib modules

CHECK SHEET NO. U5 (Continued)
THORAX - RIB DROP TEST (S572.185(b))

Table U6. Thorax **-** Rib Drop Tests

Tested Parameter		Units	Specification	Result	Pass/ Fail
Upr Rib Drop Module Soak Time		Minutes	≥ 240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
1st Test - Drop Height 459 ± 5 mm		mm	36 – 40		
2nd Test - Drop Height 815 ± 8 mm		mm	46 – 51		

Tested Parameter		Units	Specification	Result	Pass/ Fail
Middle Rib Drop Module Soak Time		Minutes	≥ 240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
1st Test - Drop Height 459 ± 5 mm		mm	36 – 40		
2nd Test - Drop Height 815 ± 8 mm		mm	46 – 51		

Tested Parameter		Units	Specification	Result	Pass/ Fail
Lower Rib Drop Module Soak Time		Minutes	≥ 240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
1st Test - Drop Height 459 ± 5 mm		mm	36 – 40		
2nd Test - Drop Height 815 ± 8 mm		mm	46 – 51		

_____ _____

Signature Completion Date

CHECK SHEET NO. U6
THORAX – FULL BODY IMPACT TEST (S572.185(c))

Dummy Serial No._____ Test Date_____
Technician_____

Pretest Preparation

__1 Soak the dummy in a controlled environment at a temperature and relative humidity indicated in Table U7 for at least four hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U7. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.
__2 Remove the jacket and shoulder foam pad.
__3 Remove the arm that will be located on the impact side and the M10x30 button head screw in the shoulder cam. Set the other arm in the vertically downward position.
__4 Sit the dummy on a flat, horizontal, rigid surface without back support covered by two PTFE Teflon sheets 2 mm thick.
__5 Adjust the dummy such that the anterior-posterior axis of the dummy is perpendicular to the direction of impact.
__6 Place the dummy legs horizontal with the distance between the ankles at 100 ± 5 mm.
__7 Align the thorax vertically ±2° as measured at the rib extension cover plate. Do not support the dummy to maintain this position (Figure 24).

Conduct Test, Collect Data and Verify Performance

__8 Record the room temperature and humidity in Table U7. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column.
__9 The pendulum meets Part 572 Subpart E (572.36 (a)) and is equipped with an accelerometer with its sensitive axis collinear with the longitudinal axis of the pendulum.
__10 The pendulum is aligned so that at contact with the thorax, its longitudinal axis is within ±0.5º (horizontal and perpendicular) to the midsagittal plane of the dummy and centered on the middle rib access hole ± 5 mm (Figures 24 & 25).
__11 Release the pendulum such that it strikes the dummy’s thorax with an impact speed of 5.5 ± 0.1 m/s.
__12 Record the pendulum acceleration and digitally filter at SAE J211 CFC180.
__13 Compute and record the impactor force as the product of the impact probe acceleration and its’ mass.
__14 Verify that at any time after 6ms from time zero, the peak impactor force lies within the specified force levels in Table U7.
__15 Verify that upper, middle and lower rib deflections meet specification by indicating “pass” or “Fail” in the far right column of Table U7.
__16 If the results do not meet specification, wait at least 30 minutes, conduct another test.
__17 Record results of additional tests in separate tables.

CHECK SHEET NO. U6 (Continued)
THORAX – FULL BODY IMPACT TEST (S572.185(c))

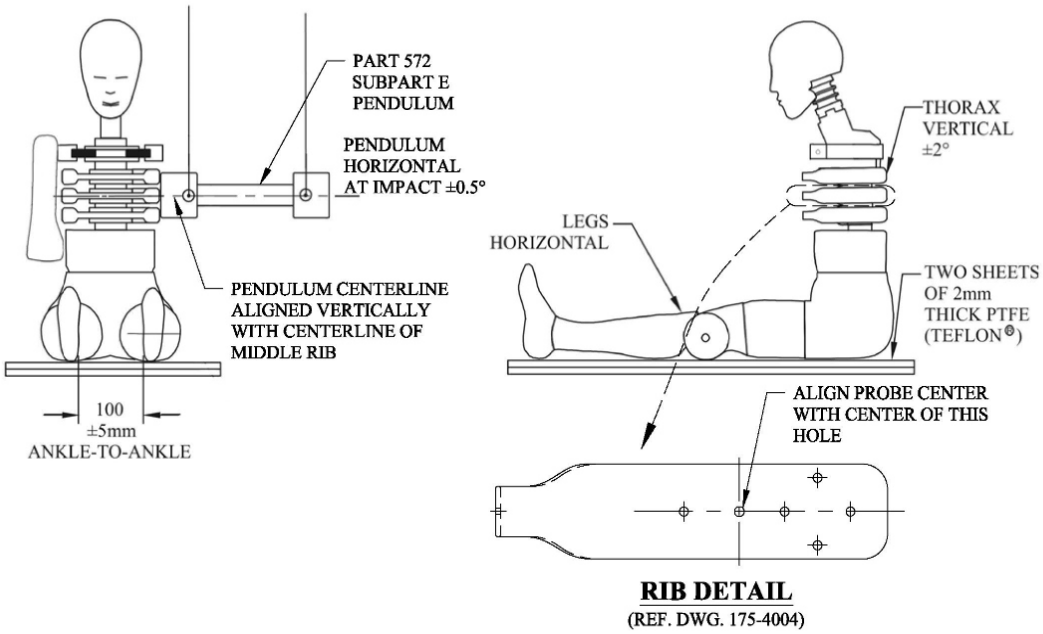


Figure 24. Full Body Thorax Impact Test Condition

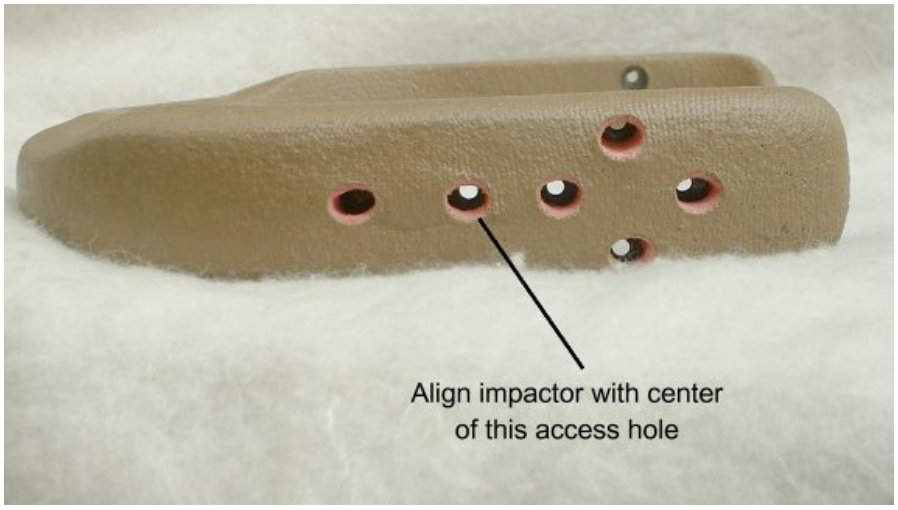


Figure 25. Rib Detail

CHECK SHEET NO. U6 (Continued)
THORAX – FULL BODY IMPACT TEST (S572.185(c))

Table U7. Thorax - Full Body Impact Test

Tested Parameter		Units	Specification	Result	Pass/ Fail
Head Assembly Soak Time		Minutes	≥240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
Peak Impactor Velocity		m/s	5.4 to 5.6		
Peak Upr Rib Deflection		mm	34 to 41		
Peak Middle Rib Deflection		mm	37 to 45		
Peak Lwr Rib Deflection		mm	37 to 44		
Peak Impactor Force (> 6ms)		kN	51 to 62		

_____ _____

Signature Completion Date

CHECK SHEET NO. U7
ABDOMEN IMPACT TEST (S572.186)

Dummy Serial No._____ Test Date_____
Technician_____

Pretest Preparation

__1 Soak the dummy in a controlled environment at a temperature and relative humidity indicated in Table U8 for at least three hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U8. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.
__2 Remove the jacket and shoulder foam pad.
__3 Sit the dummy on a flat, horizontal, rigid surface without back support covered by two PTFE Teflon sheets 2 mm thick.
__4 Adjust the dummy such that the anterior-posterior axis of the dummy is perpendicular to the direction of impact.
__5 Place the legs horizontal with the distance between the ankles at 100 ± 5 mm.
__6 Align the thorax vertically ± 2° as measured at the torso back plate. Do not support the dummy to maintain this position (Figure 26).

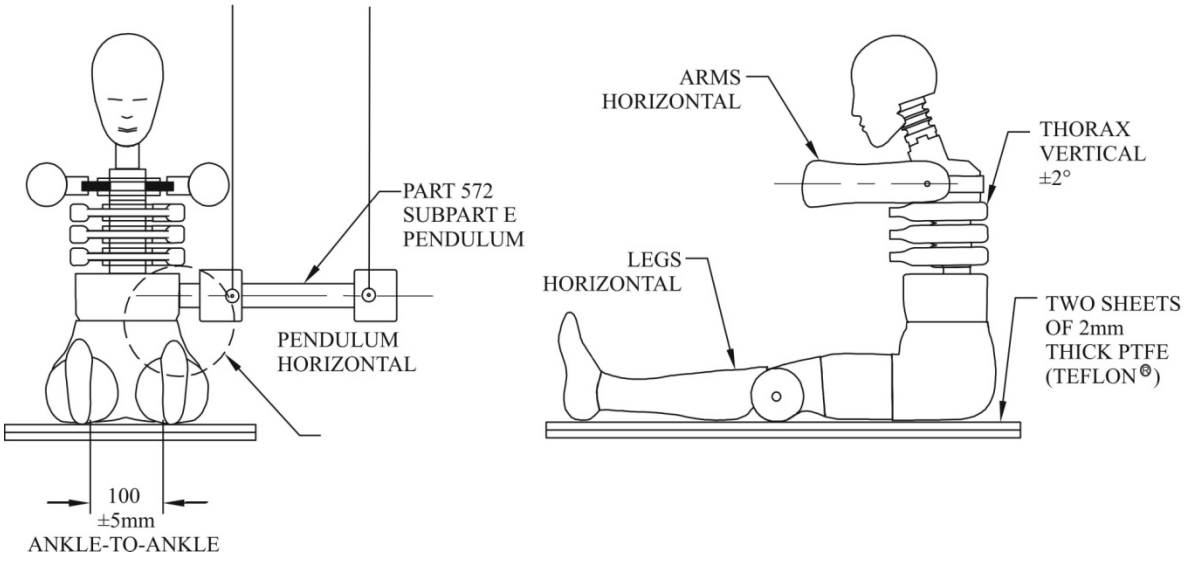


Figure 26. Abdomen impact test condition

__7 Affix an abdomen impactor face whose weight is 1.0 kg ±0.01 kg., height is 70 mm ± 1 mm, width is 150 mm and depth is 60 to 80 mm to the Part 572 Subpart E pendulum (Figure 27).
__8 The flat impact surface, with an edge radius of 4 to 5 mm and a minimum Rockwell Hardness of M85, is aligned such that at its widest part is horizontal and centered on the longitudinal axis of the pendulum.
__9 Affix an accelerometer with its sensitive axis collinear with the longitudinal axis of the pendulum.

CHECK SHEET NO. U7 (Continued)
ABDOMEN IMPACT TEST (S572.186)

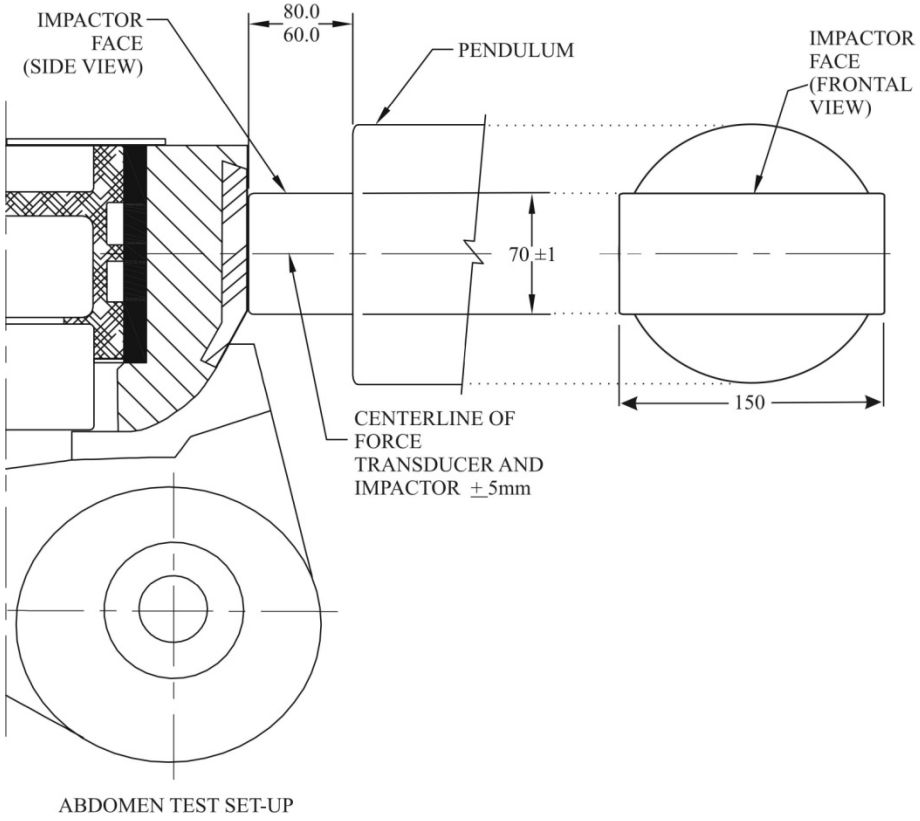


Figure 27. Abdomen Impact Face

Conduct Test, Collect Data and Verify Performance

__10 Record the room temperature and humidity in Table U8. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column.

__11 The pendulum is aligned so that at contact with the abdomen, its longitudinal axis is perpendicular ±0.5º to the midsagittal plane of the dummy and the impact face is centered on the abdomen’s middle load measuring sensor within 5 mm.

__12 Release the pendulum such that it strikes the dummy’s thorax with an impact speed of 4.0 ± 0.1 m/s.

__13 Record the impactor acceleration and digitally filter at SAE J211 CFC180.

__14. Record the abdomen forces from the three load cells and digitally filter at SAE J211 CFC 60.

__15. Verify that the maximum of the sum of the forces of the three abdominal load sensors is not less than 2200 N and not more than 2700 N occurring between 10 ms and 12.3 ms. The calculated sum of the three load cell forces must be concurrent in time.

__16. Verify that the maximum impactor force (e.g., impactor acceleration multiplied by its mass) is not less than 4000 N and not more than 4800 N occurring between 10.6 ms and 13.0 ms.

CHECK SHEET NO. U7 (Continued)
ABDOMEN IMPACT TEST (S572.186)

Table U8. Abdomen Impact Test

Tested Parameter		Units	Specification	Result	Pass/ Fail
Head Assembly Soak Time		Minutes	≥240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
Peak Impactor Force		kN	4.0 to 4.8		
Time of Peak Impactor Force		ms	10.6 to 13.0		
Sum of Abdomen forces		kN	2.2 to 2.7		
Time		ms	10 to 12.3		

_____ _____

Signature Completion Date

CHECK SHEET NO. U8
LUMBAR SPINE FLEXION TEST (S572.187)

Dummy Serial No._____ Test Date_____
Technician_____

Pretest Preparation

__1 Remove the lumbar spine assembly (Part No. 175-9000) from the dummy's torso.
__2 Soak the lumbar spine assembly in a controlled environment at a temperature and relative humidity indicated in Table U10 for at least four hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U10. Verify that each measurement meets specification by indicating "Pass" or "Fail" in the far right column.
__3 Attach the top of the lumbar spine assembly to the headform lower mounting base (Part No. 175-9027) with two ¼-20 x 1 SHCS.
__4 Attach the base of the lumbar spine assembly to the headform mounting base (Part No. 175-9029) with four M6x12 SHCS (Figure 16).
__5 Attach the lower mounting base of the headform with lumbar spine assembly onto the pendulum with four M6x12 SHCS. Attach the headform with its rotational potentiometers on the left-hand side for left side impacts and on the right-hand side for right side impacts (Figure 17)
__6 Torque the lumbar hex nut (Part No. 9000057) on to the lumbar cable assembly (Part No. 175-5506) to 50 ± 5 in-lb. If the lumbar will not pass certification testing at this pretension, the nut can be tightened or loosened as necessary.
__7 Attach carbon fiber rods (i.e, Arrow Shafts) to each pivot assembly.
__8 Carefully insert a carbon fiber rod through the potentiometer assembly that is farthest from the honeycomb impact surface (i.e. Arrow Shaft – Pivot Assembly B).
__9 Slide the pivot assembly onto the central carbon fiber rod (i.e., Arrow Shaft). Then, place the spacer onto the central carbon fiber rod.
__10 Insert a second carbon fiber rod through the potentiometer assembly housing that is closest to the honeycomb impact surface (i.e., Arrow Shaft – Pivot Assembly A).
__11 Lightly tighten the two set screws at the base of Pivot Assembly A to firmly attach it to the central carbon fiber rod being careful not to damage the rod.
__12 Attach the potentiometers to the neck mounting plate in their correct orientation with Pivot Assembly A closest to the honeycomb.
__13 Prepare the pendulum for the test.
__14 Mount a uni-axial accelerometer on the pendulum with its sensitive axis 1657.4 mm from the pendulum pivot in accordance with Standard Part 572 Subpart E.

Conduct the Test, Collect Data and Verify Performance

__15 Record the room temperature and humidity in Table U10. Verify that the temperature and relative humidity meets specification by indicating "Pass" or "Fail" in the far right column. The data acquisition system conforms to SAE J211.
__16 Raise the pendulum and allow it to fall freely such that it achieves an impact velocity of 6.05 ± 0.1 m/s.
__17 Allow the lumbar spine to flex without the lumbar spine/headform assembly making contact with any object.
__18 Time zero is defined as the time of contact between the pendulum and the honeycomb. All channels should be at zero level at this point.
__19 Determine the velocity time history by integrating the pendulum acceleration beginning at time zero. Filter the pendulum acceleration using CFC 60.
__20 Verify that the velocity time history of the pendulum falls within the corridor determined by the upper and lower boundaries specified in Table U9.
__21 The fore (A), aft (B) and headform (C) angles are directly measured during the test and filtered using CFC180.

CHECK SHEET NO. U8 (Continued)
LUMBAR SPINE FLEXION TEST (S572.187)

__22 The maximum lumbar spine flexion angle is calculated by summing the fore (A) and headform (C) angles.

__23 Verify that the maximum lumbar spine flexion angle meets specifications listed in Table U10.

__24 Allow a period of at least thirty (30) minutes between successive tests on the same lumbar spine assembly.

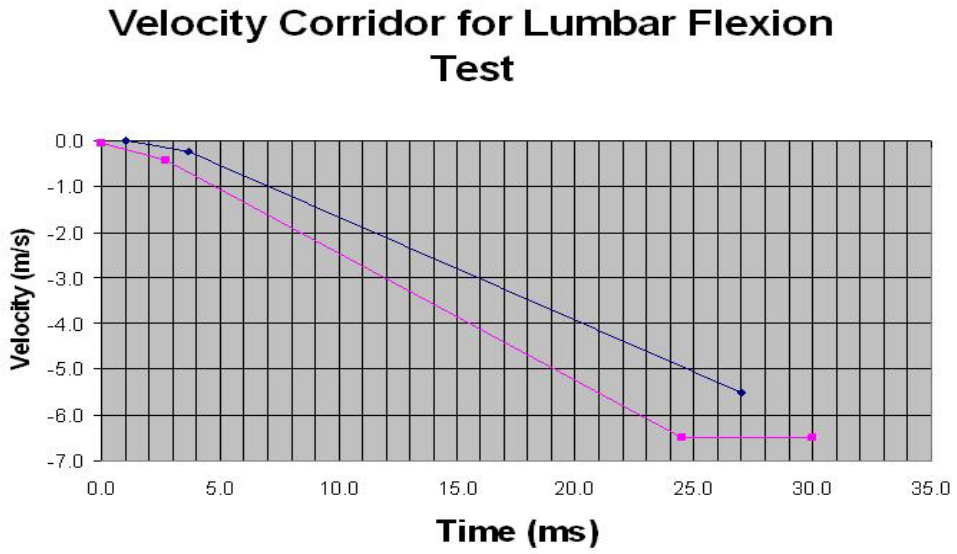


Table U9. Lumbar Spine Flexion Test Pendulum Velocity Corridors

Upper Boundary		Lower Boundary	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (ms)
1.0	0.0	0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.8	24.5	-6.50
		30.0	-6.50

Table U10. Lumbar Spine Flexion Test

Tested Parameter		Units	Specification	Result	Pass/ Fail
Lumbar Spine Assembly Soak Time		minutes	≥ 240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
Torque – Lumbar hex nut		In-lb	45 – 55		
Maximum headform flexion angle		deg	50±5°		
Time at Maximum flexion angle		ms	39 to 53		
Time of Decay to Zero Angle from Peak		ms	37 to 57		

_____ _____
Signature Completion Date

CHECK SHEET NO. U9
PELVIS IMPACT TEST (S572.188)

Dummy Serial No._____ Test Date_____
Technician_____

Pretest Preparation

__1 Soak the dummy in a controlled environment at a temperature and relative humidity indicated in Table U11 for at least four hours prior to a test. Record the length of time for the soak and the maximum and minimum temperature and humidity in Table U11. Verify that each measurement meets specification by indicating “Pass” or “Fail” in the far right column.

__2 Remove the shoulder foam pad and jacket.

__3 Sit the dummy on a flat, horizontal, rigid surface without back support covered by two PTFE Teflon sheets 2 mm thick.

__4 Adjust the dummy such that the anterior-posterior axis of the dummy is perpendicular to the direction of impact.

__5 Place the legs horizontal with the distance between the ankles at 100 ± 5 mm.

__6 Align the thorax vertically ± 2° as measured at the torso back plate. Do not support the dummy to maintain this position (Figure 28).

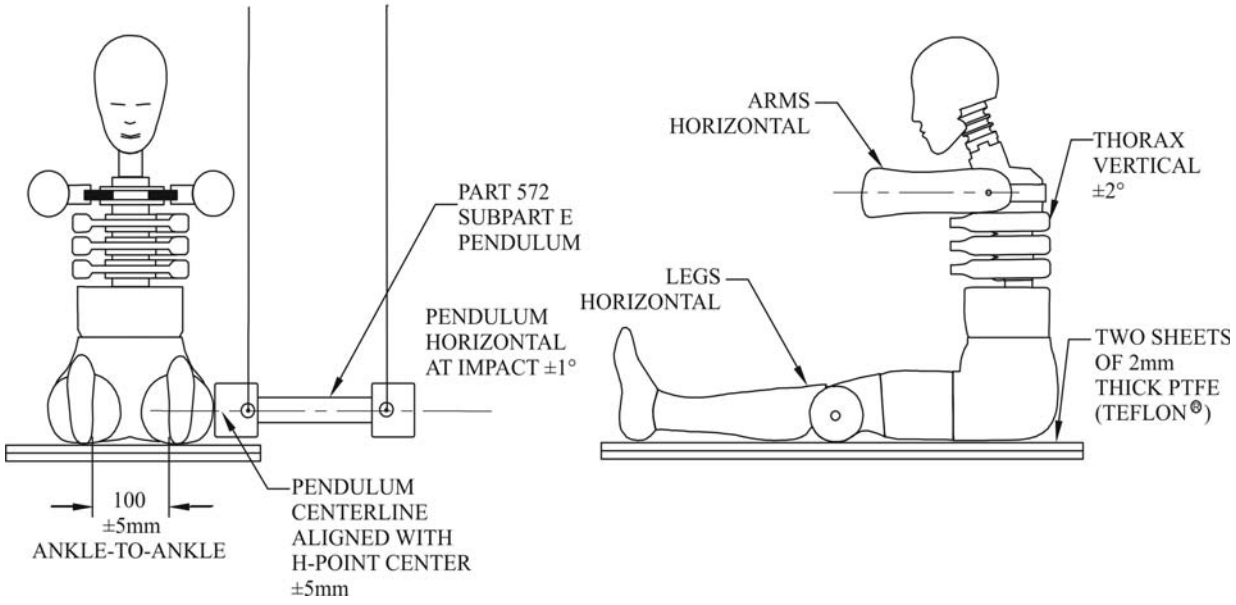


Figure 28. Pelvis impact test condition

CHECK SHEET NO. U9 (Continued)
PELVIS IMPACT TEST (S572.188)

Conduct the Test, Collect Data and Verify Performance

__1 Record the room temperature and humidity in Table U11. Verify that the temperature and relative humidity meets specification by indicating “Pass” or “Fail” in the far right column.
__2 The data acquisition system conforms to SAE J211.
__3 The pendulum meets Part 572 Subpart E (572.36 (a)) and is equipped with an accelerometer with its sensitive axis collinear with the longitudinal axis of the pendulum.
__4 The pendulum is aligned so that at contact, the center-point of the impactor face is within 5 mm of the center of the H-point.
__5 Release the pendulum such that it strikes the dummy’s pelvis with an impact speed of 4.3 ± 0.1 m/s.
__6 Record the pendulum acceleration and digitally filter at SAE J211 CFC180.
__7 Verify that
__8 Calculate the impactor force as the acceleration of the impactor times its mass and record in Table U11. Verify that the peak impactor force meets specification by indicating “Pass” or “Fail” in the far right column.
__9 Plot the pubic symphysis load vs. time. Verify that the peak response meets specification by indicating “Pass” or “Fail” in the far right column.
__10 If the test results do not meet specification, wait at least thirty (30) minutes, conduct a second test.
__11 Record results of additional tests in separate tables.

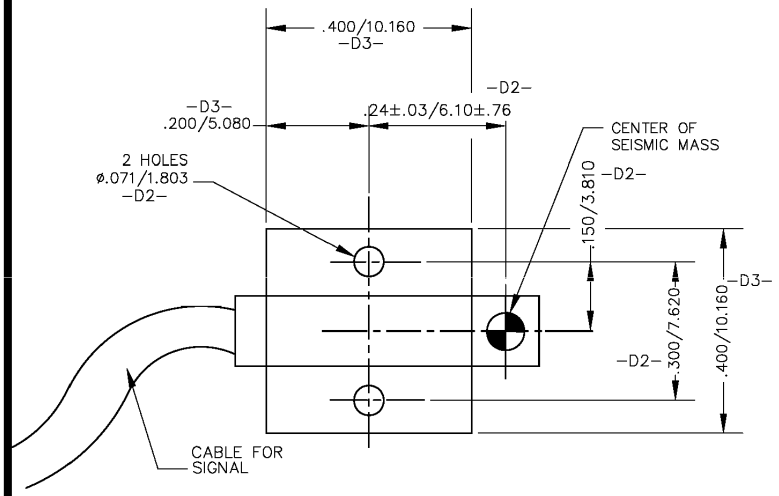
Table U11. Pelvis Impact Test

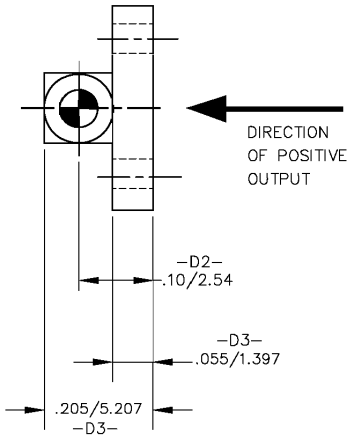
Tested Parameter		Units	Specification	Result	Pass/ Fail
Dummy Soak Time		minutes	≥ 240		
Temperature - During Soak	Max	°C	20.6 to 22.2		
	Min	°C			
Humidity - During Soak	Max	%	10.0 to 70.0		
	Min	%			
Temperature – During test		°C	20.6 to 22.2		
Humidity – During test		%	10.0 to 70.0		
Pendulum Velocity		m/s	4.2 to 4.4		
Peak Impactor Force		kN	4.7 to 5.4		
Time at Peak Force		ms	11.8 to 16.1		
Peak Pubic Symphysis Load		kN	1.23 to 1.59		
Time at Peak Load		ms	12.2 to 17.0		

_____ _____
Signature Completion Date

ATTACHMENT – Instrumentation Drawing

TP-P572-U-00





REVISION RECORD

ITEM NO.	BY	DATE	DESCRIPTION
–A–	HP	01/09/99	TOLERANCES
–B1–	DW	09/27/99	UPDATED NOTE
–B2–			CHANGE TRANSVERSE SENSITIVITY TO 1%
–B3–			REVISED FORMAT, ENLARGED TOLERANCES
–C1–	DW	02/8/00	REVISED TOLERANCE
–D1–	DW	08/15/01	CHANGED SINGLE DECIMAL PLACE TOLERANCE FROM ± 0.1/2.54 TO ± 0.1/2.5
–D2–	DW		CORRECTED METRIC EQUIVALENTS
–D3–	DW		ADDED DIMENSIONS

SPECIFICATIONS

	RANGE	±2000 g
	SENSITIVITY	.20 mV/g MIN
	MOUNTED RESONANCE FREQUENCY	22,000 Hz MIN

–B1– SIGNAL OUTPUT MUST BE COMPATIBLE WITH AND RECORDABLE IN A DATA CHANNEL AS DEFINED BY SAE J211

	DAMPING RATIO	UNDAMPED (.005)
–B2–	TRANSVERSE SENSITIVITY	±1% MAX
	NON–LINEARITY & HYSTERESIS	±2% MAX
	ZERO OFFSET	±25 mV
	EXCITATION	10V DC
	THERMAL SENSITIVITY	–5% Typ AT 0°F TO 150°F
	TEMPERATURE EXPOSURE LIMITS	0°/+200°F WITHOUT DAMAGE
	WEIGHT	1 gram (WITHOUT CABLE)
	HUMIDITY	SEALED

RELEASED

AUG. 15 2001

NHTSA

UNITS ARE in/mm

–D1–
–C1–
–B3–

TOLERANCES ARE: *

DECIMALS: .X ±0.1/2.5; .XX ±0.01/.25; .XXX ±0.005/.127

ANGLES ± 0.5°

* unless otherwise noted

MATERIAL:

SCALE NONE

APPROVALS / DATE

DRAWN GTE 3/5/98

CHECKED

ENG J McF H.P.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

UNIAXIAL PIEZORESISTIVE ACCELEROMETER

HYBRID III DUMMY FAMILY

SIZE A | DRAWING NUMBER SA572–S4 | REV D