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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 P 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 DIMENSIONS (PADI)

B. HEAD DROP TEST (572.142)

C. NECK FLEXION TEST (572.143(b)(1))

D. NECK EXTENSION TEST 572.143(b)(2)

E. THORAX IMPACT TEST ((572.144)

F. TORSO FLEXION (572.145)

National Highway Traffic Safety Administration (NHTSA) contract laboratories performing FMVSS 213 testing for the Office of Vehicle Safety Compliance (OVSC) must use this laboratory procedure for the calibration of Part 572, Subpart P dummies.

2. GENERAL REQUIREMENTS

The Code of Federal Regulations (49CFR), Parts 571 and 572, was amended to adopt the Hybrid III, 3-Year-Old Child Dummy as the means of determining a Child Restraint System’s (CRS’s) conformance to the performance requirements of FMVSS 213. Each Part 572, Subpart P dummy used in a compliance test must meet the specifications and performance criteria of Part 572 before and after each CRS test in order to be an acceptable compliance test tool.

The Part 572, Subpart P Hybrid III, 3-Year-Old Child Dummy consists of components and assemblies specified in the drawing and specifications package which is available from Reprographics Technologies, 9000 Virginia Manor, Beltsville, MD 20705, telephone - (301) 419-5070.

3. SECURITY

All NHTSA Part 572, Subpart P 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 that 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 maintaining the NHTSA test dummies in good working order, and shall protect and segregate the data that evolves from conducting Part 572, Subpart P dummy calibration tests before and after each low risk deployment usage.

No Information concerning the Part 572, Subpart P 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 P dummies are being calibrated as test tools to be used in a CRS test to determine compliance with the requirements of FMVSS 213. The schedule for these performance calibration tests must be correlated with that of the CRS tests. 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. All calibration test data for each particular Part 572, Subpart P dummy will be sent to the COTR with each test report.

All backup data sheets, strip charts, recordings, plots, technicians 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, Subpart P test dummies will be furnished to the contract laboratory by the OVSC. The dummies shall be stored in a hanging position using the bracket and positioning shown in the following drawings.
NOTES:
1. 4.50" IS THE MINIMUM DIMENSION REQUIRED TO CLEAR THE DUMMIES SHOULDER AND ARM.

FIGURE 1D
FIGURE 2D
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 low risk deployment 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.

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 6 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.

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.

9. RESERVED

10. DEFINITIONS

PADI: Procedures for Assembly, Disassembly, and Inspection

11. PRETEST REQUIREMENTS

11.1 TRANSDUCER REQUIREMENTS

The contractor shall provide and install the following instrumentation to the GFP dummies (excluding the chest deflection transducer).

A. HEAD – The head accelerometers shall have dimensions, response characteristics and sensitive mass locations specified in drawing SA572-S4 and be mounted in the head as shown in drawing 210-0000. (572.146(b))

Three accelerometers shall be mounted in the head cavity to measure orthogonal accelerations (Ax, Ay, Az) at the center of gravity (CG) of the head assembly.

B. NECK – The upper neck force transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S19 and shall be mounted at the upper neck transducer location as shown in drawing 210-0000. (572.146(c))

C. CHEST – The chest accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the torso assembly in traxial configuration at the T4 location as shown drawing 210-0000. The chest accelerometers are not
required for dummy calibration testing but are required for FMVSS 208 low risk deployment testing. (572.146(e))

The chest deflection potentiometer shall have the dimensions and response characteristics specified in drawing SA572-S50 and be mounted in the torso assembly as shown in drawing 210-0000. (572.146(f))

D. TEST FIXTURE – The neck pendulum, thorax and knee probe accelerometers shall have the dimensions and characteristics of drawing SA572-S4.

11.2 OTHER TRANSDUCER CONDITIONS

A. TRANSDUCER MOUNTS – The mountings for sensing devices shall have no resonance frequency less than 3 times the frequency range of the applicable channel class. (572.146(n))

B. TRANSDUCER SIGN CONVENTION - The sign convention for outputs of transducers mounted within the dummy that measure head and chest accelerations, chest deflection and neck loads are located in Figure 3D and Table 1D. For other transducers see SAE J1733DEC94. (572.146(m))

C. TRANSDUCER OUTPUTS and 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 will be comprised of a sensor, signal conditioner, data acquisition device, and all interconnecting cables, and must conform to the requirements of SAE Recommended Practice J211/1 MAR95, "Instrumentation for Impact Test," with channel classes as follows: (572.146(l))

(1) Head acceleration Class 1000 (572.146(l)(1))
(2) Neck force Class 1000 (572.146(l)(2)(i))
(3) Neck pendulum acceleration Class 180 (572.146(l)(2)(iii))
(4) Neck moment Class 600 (572.146(l)(2)(ii))
(5) Neck potentiometer Class 60 (572.146(l)(2)(iv))
(6) Thorax spine acceleration Class 180 (572.146(l)(3)(ii))
(7) Thorax pendulum acceleration Class 180 (572.146(l)(3)(iii))
(8) Sternum deflection Class 600 (572.146(l)(3)(iii))
(9) Lumbar torso flexion Class 60 (572.146(l)(4)(iii))

All filter classes should be of the "phaseless" type to be compatible with the "time" dependent test parameters.
11.3 THORAX IMPACTOR PROBE (572.146(a))

A. The test probe for thoracic impacts shall be of rigid metallic construction, concentric in shape and symmetric about its longitudinal axis.

B. It shall have a mass of $1.70 \pm 0.01 \text{ kg (3.75 \pm 0.02 lbs)}$. $1/3$ of the weight of the suspension cables and their attachments to the impact probe must be included in the calculation of mass, and such components may not exceed 5 percent of the total weight of the test probe.

C. It shall have a minimum mass moment of inertia of $283 \text{ kg-cm}^2$ ($0.25 \text{ lbs-in-sec}^2$) in yaw and pitch about the center of gravity.

D. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It must have a flat, continuous, and non-deformable face with a diameter of $50.8 \pm 0.2 \text{ mm (2.00 \pm 0.01 in)}$ and a maximum edge radius of $12.7 \text{ mm (0.5 in)}$.

E. The impactor is a cylinder with a diameter of $53.3 \text{ mm (2.1 in)}$ and it is at least $25.4 \text{ mm (1.0 in)}$ long.

F. 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 axis of the probe.

G. The impact probe shall have a free air resonant frequency of not less than $1000 \text{ Hz}$ in the direction of the longitudinal direction of the impactor.
SIGN CONVENTION FOR PART 572 TEST DUMMIES

POSSIBLE $A_R$ = $\sqrt{A_X^2 + A_Y^2 + A_Z^2}$ Gs

3 UNIAXIAL ACCELEROMETERS LOCATED AT THE C.G. OF THE HEAD ASSEMBLY

3 UNIAXIAL ACCELEROMETERS LOCATED AT THE C.G. OF THE CHEST ASSEMBLY

RIGHT FEMUR LOAD CELL ($F_R$)

LEFT FEMUR LOAD CELL ($F_L$)

FIGURE 3D
<table>
<thead>
<tr>
<th>BODY SEGMENT — MEASURED FORCE</th>
<th>POSITIVE OUTPUT DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NECK FX SHEAR</td>
<td>HEAD REARWARD OR CHEST FORWARD</td>
</tr>
<tr>
<td>FY SHEAR</td>
<td>HEAD LEFTWARD, CHEST RIGHTWARD</td>
</tr>
<tr>
<td>FZ AXIAL</td>
<td>HEAD UPWARD, CHEST DOWNWARD</td>
</tr>
<tr>
<td>MX MOMENT (ROLL)</td>
<td>LEFT EAR TOWARD LEFT SHOULDER</td>
</tr>
<tr>
<td>MY MOMENT (PITCH)</td>
<td>CHIN TOWARD STERNUM</td>
</tr>
<tr>
<td>MZ MOMENT (YAW)</td>
<td>CHIN TOWARD LEFT SHOULDER</td>
</tr>
<tr>
<td>FEMUR FX SHEAR</td>
<td>KNEE UPWARD, UPPER FEMUR DOWNWARD</td>
</tr>
<tr>
<td>FY SHEAR</td>
<td>KNEE RIGHTWARD, UPPER FEMUR LEFTWARD</td>
</tr>
<tr>
<td>FZ AXIAL</td>
<td>KNEE FORWARD (TENSION), PELVIS REARWARD</td>
</tr>
<tr>
<td>MX MOMENT (ROLL)</td>
<td>KNEE LEFTWARD, HOLD UPPER FEMUR IN PLACE</td>
</tr>
<tr>
<td>MY MOMENT (PITCH)</td>
<td>KNEE UPWARD, HOLD UPPER FEMUR IN PLACE</td>
</tr>
<tr>
<td>MZ MOMENT (YAW)</td>
<td>KNEE ROTATED CCW WHEN FACING FRONT OF DUMMY</td>
</tr>
<tr>
<td>KNEE CLEVIS - FZ AXIAL</td>
<td>TIBIA DOWNWARD (TENSION), FEMUR UPWARD</td>
</tr>
<tr>
<td>UPPER TIBIA MX MOMENT</td>
<td>ANKLE LEFTWARD, HOLD KNEE IN PLACE</td>
</tr>
<tr>
<td>MY MOMENT</td>
<td>ANKLE FORWARD, BOTTOM OF KNEE CLEVIS</td>
</tr>
<tr>
<td>LOWER TIBIA MX MOMENT</td>
<td>ANKLE FORWARD, KNEE REARWARD</td>
</tr>
<tr>
<td>MY MOMENT</td>
<td>ANKLE RIGHTWARD, KNEE LEFTWARD</td>
</tr>
<tr>
<td>CHEST DISPLACEMENT</td>
<td>CHEST COMPRESSED - NEGATIVE</td>
</tr>
<tr>
<td>KNEE SHEAR DISPLACEMENT</td>
<td>PUSH ON FRONT OF TIBIA - NEGATIVE</td>
</tr>
</tbody>
</table>

**NOTE:** DIRECTIONS ARE DEFINED IN RELATION TO A SEATED DUMMY
11.4 GENERAL TEST CONDITIONS

A. Surfaces of dummy components are not painted unless otherwise specified. (572.146(q))

B. Dummy performance tests of the same component, segment, assembly, or fully assembled dummy are separated in time by a period of not less than 30 minutes unless otherwise specified. (572.146(p))

C. Except for neck assembly and thorax assembly testing, the dummy performance tests are conducted at any temperature from 18.9°C (66°F) to 25.6°C (78°F) and at any relative humidity from 10% to 70% after exposure of the dummy to these conditions for a period of not less than 4 hours. For the neck assembly and thorax assembly, the temperature range is 20.6°C (69°F) to 22.2°C (72°F)

D. Dummy limb joints are set at 1 G, barely restraining the weight of the limb when it is extended horizontally. The force required to move a limb segment does not exceed 2 Gs throughout the range of limb motion. (572.146(o))

E. Dummies will be clothed for the thorax calibration tests with a form fitting cotton-polyester-based tight-fitting long-sleeved shirt and ankle length pants. The total weight of the shirt and pants shall not exceed 0.25 kg (0.55 lb). (572.144(c)(1))

12. CALIBRATION TEST EXECUTION

Complete the Data Sheets in section 15.

13. 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 performance calibration test data sheet.

14. REPORTS

14.1 APPARENT NONCONFORMANCE

During the posttest calibration verification, 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 posttest 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.

14.2 FINAL PERFORMANCE CALIBRATION REPORTS

14.2.1 COPIES

A report containing the pre-test calibration and post test calibration verification data for each Part 572, Subpart P dummy used in the CRS test shall be submitted with FMVSS 213 final test reports.

Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

14.2.2 REQUIREMENTS

Performance calibration report Table of Contents shall include the following:

A. Section 1 — Purpose of Calibration Test
B. Section 2 — Calibration Data Summary
C. Section 3 — Test Data
D. Section 4 — Test Equipment List and Calibration Information
E. Section 5 — Photographs (if applicable)

The test data for each dummy will be presented in separate sections. Each section shall contain a title page, test results summary and the test data. The title page shall include the dummy's serial number and he manufacturer's name. It will also indicate whether the calibration data is pre or posttest. The test results sheets will provide a summary of each test and describe any damage, failures and/or corrective action taken. The test data shall include the pass/fail data sheets, the time histories for each data channel used to determine the pass or fail status, and instrumentation calibration data sheets.
14.2.3 FIRST PAGE

FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

A. Final Report Title And Subtitle such as

DUMMY PERFORMANCE CALIBRATION
IN SUPPORT OF
CHILD RESTRAINT SYSTEM TESTING
FMVSS No. 213

B. Contractor's Name and Address such as

ABC TESTING LABORATORIES, INC.
405 Main Street
Detroit, Michigan 48070

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS B AND C

C. Date of Final Performance Calibration Report completion

D. The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
400 Seventh Street, SW
Room 6111 (NVS-222)
Washington, DC 20590
DATA SHEET D1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number _____________  Test Date _____________

Technician ___________________________

This check sheet is completed as part of the posttest calibration verification.

__Perform general cleaning.

<table>
<thead>
<tr>
<th>Dummy Item</th>
<th>Inspect for</th>
<th>Comments</th>
<th>Damaged</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer skin</td>
<td>Gashes, rips, cracks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>Ballast secure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General appearance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neck</td>
<td>Broken or cracked rubber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper neck bracket firmly attached to the lower neck bracket</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Looseness at the condyle joint</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Nodding blocks cracked or out of position</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Spine</td>
<td>Broken or cracks in rubber.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ribs</td>
<td>Broken or bent ribs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Broken or bent rib supports</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Damping material separated or cracked</td>
<td></td>
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<tr>
<td></td>
<td>Rubber bumpers in place</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest Displacement Assembly</td>
<td>Bent shaft</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Transducer leads</td>
<td>Torn cables</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Dummy Item</td>
<td>Inspect for</td>
<td>Comments</td>
<td>Damaged</td>
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<tr>
<td>Accelerometer</td>
<td>Head mounting secure</td>
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<td>Mountings</td>
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<td>Knees</td>
<td>Skin condition</td>
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<tr>
<td></td>
<td>Insert (do not remove)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Casting</td>
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<tr>
<td>Limbs</td>
<td>Normal movement and adjustment</td>
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<tr>
<td>Knee Sliders</td>
<td>Wires intact</td>
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<td></td>
<td>Rubber returned to “at rest” position</td>
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</tr>
<tr>
<td>Pelvis</td>
<td>Broken</td>
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<tr>
<td>Other</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

If upon visual examination, damage is apparent in any of these areas, the appropriate engineer or engineering technician is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement approved by:

_____________________________  ______________
Signature      Date

Describe the repair or replacement of parts:

Checked by

_____________________________  ______________
Signature      Date
DATA SHEET D2
EXTERNAL MEASUREMENTS
(See the PADI, pages 65-68)

Dummy Serial Number _______________  Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

__1. Seat the dummy on a flat, rigid, smooth, clean, dry, horizontal surface as shown in Figure 5D and 6D. The seating surface is at least 406 mm (16 in) wide and 221 mm (8 11/16 in) in depth with a vertical section at least 406 mm (16 in) wide and 610 mm (24 in) high attached to the rear of the seating fixture. The dummy's midsagittal plane is vertical and centered on the test surface.

__2. Secure the dummy to the test fixture so that the upper torso and buttocks are against the rear surface.

__3. Position the dummy’s H-point so it is 39.4 ± 5.1 mm (1.55 ± 0.2 in) above the horizontal seating surface and 62.0 ± 5.1 mm (2.44 ± 0.2 in) forward of the rear vertical surface of the fixture.

__4. Extend the dummy’s neck so that the base of the skull is level both fore-and-aft and side-to-side, within 0.5 degrees. The rearmost surface of the head should be 53.3 ± 5.1 mm (2.1 ± 0.2 in) from the vertical surface of the test fixture. A strap or bungee cord may be placed around the forehead of the dummy to stabilize the head in this position.

__5. Position the upper and lower legs parallel to the midsagittal plane so the centerline between the knee pivot and the ankle pivot is parallel to the rear vertical surface of the fixture.

__6. Position the feet parallel to the dummy’s midsagittal plane with the bottoms horizontal and parallel to the seating surface.

__7. Position the upper arms downward vertically so the centerline between the shoulders and elbow pivots is parallel to the rear vertical surface of the fixture.

__8. Position the lower arms horizontally so the centerline of the lower arm-hand is parallel to the seat surface.

__9. Record the dimensions listed in following table, except for dimension Q, X, Y and Z (reference figure 4D).

__10. Mark the locations AA, and BB, and record the dimensions Y, Z, as specified in the following table and figure 4D. Measure and record dimensions Q and X.

_____________________________  ______________
Signature            Date
# EXTERNAL DIMENSIONS

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>DESCRIPTION</th>
<th>DETAILS</th>
<th>ASSEMBLY DIMENSION (mm)</th>
<th>ACTUAL MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TOTAL SITTING HEIGHT</td>
<td>Seat surface to highest point on top of the head.</td>
<td>538.5-553.7</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>SHOULDER PIVOT HEIGHT</td>
<td>Centerline of shoulder pivot bolt to the seat surface.</td>
<td>307.4-322.6</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>H-POINT HEIGHT</td>
<td>Reference</td>
<td>34.3-44.5</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>H-POINT LOCATION FROM BACKLINE</td>
<td>Center of the shoulder pivot bolt to the fixture’s rear vertical surface.</td>
<td>56.9-67.1</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>SHOULDER PIVOT FROM BACKLINE</td>
<td>Centerline of shoulder pivot bolt to the seat surface.</td>
<td>60.9-71.1</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>THIGH CLEARANCE</td>
<td>Fixture’s seat surface to highest point on the upper leg segment</td>
<td>81.0-91.2</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>BACK OF ELBOW TO WRIST PIVOT</td>
<td>Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines</td>
<td>247.4-262.6</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>HEAD BACK TO BACKLINE</td>
<td>Rearmost surface of the head to the fixture’s rear vertical surface (Reference)</td>
<td>48.2-58.4</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>SHOULDER TO- ELBOW LENGTH</td>
<td>Measure from the highest point on top of the shoulder to the lowest part of the flesh on the elbow in line with the shoulder and elbow pivot bolts.</td>
<td>185.4-200.6</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>ELBOW REST HEIGHT</td>
<td>Measure from the flesh below the elbow pivot bolt to the seat surface.</td>
<td>133.6-148.8</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>BUTTOCK TO KNEE LENGTH</td>
<td>The forward most part of the knee flesh to the fixture’s rear vertical surface, in line with the knee and hip pivots.</td>
<td>284.8-300</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>POPLITEAL HEIGHT</td>
<td>Seat surface to the horizontal plane of the bottom of the feet.</td>
<td>218.5-233.7</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>KNEE PIVOT HEIGHT</td>
<td>Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.</td>
<td>241.6-256.8</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>BUTTOCK POPLITEAL LENGTH</td>
<td>The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture’s rear vertical surface.</td>
<td>218.0-233.2</td>
<td></td>
</tr>
</tbody>
</table>
## HYBRID III, SUBPART P EXTERNAL DIMENSIONS, continued

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>DESCRIPTION</th>
<th>DETAILS</th>
<th>ASSEMBLY DIMENSION (mm)</th>
<th>ACTUAL MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>CHEST DEPTH WITH JACKET</td>
<td>Measured 254.0 ± 5.1 mm above seat surface</td>
<td>138.5-153.7</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>FOOT LENGTH</td>
<td>Tip of toe to rear of heal</td>
<td>137.6-147.8</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>STATURE</td>
<td>Lay the dummy out on a flat surface with the rear surfaces of the head, upper torso, buttocks and heels touching the surface and with the bottom of the feet perpendicular to that surface. Measure the distance from the bottom of the feet to the top of the head.</td>
<td>932.2-957.6</td>
<td>N/A</td>
</tr>
<tr>
<td>R</td>
<td>BUTTOCK TO KNEE PIVOT LENGTH</td>
<td>Knee pivot bolt to the fixture’s rear vertical surface.</td>
<td>251.4-261.6</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>HEAD BREADTH</td>
<td>Distance across the widest of the head at its widest point</td>
<td>128.3-143.5</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>HEAD DEPTH</td>
<td>Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsgittal plane.</td>
<td>167.4-182.6</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>HIP BREADTH</td>
<td>Distance across the width of the hip at the widest point of the jacket</td>
<td>200.7-215.9</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>SHOULDER BREADTH</td>
<td>Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts</td>
<td>236.5-251.7</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>FOOT BREADTH</td>
<td>The widest part of the foot</td>
<td>53.6-63.8</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>HEAD CIRCUMFERENCE</td>
<td>At the largest location</td>
<td>500.4-515.6</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>CHEST CIRCUMFERENCE WITH JACKET</td>
<td>Distance around chest at reference location AA, with jacket on.</td>
<td>527.1-552.5</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>WAIST CIRCUMFERENCE</td>
<td>Distance around chest at reference location BB, with jacket on.</td>
<td>527.1-552.5</td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>REFERENCE LOCATION FOR DIMENSION Y</td>
<td>Reference: 254.0 ± 5.1 MM above the seat surface</td>
<td>248.9-259.1</td>
<td></td>
</tr>
<tr>
<td>BB</td>
<td>REFERENCE LOCATION FOR DIMENSION Z</td>
<td>Reference: 165.1 ± 5.1 MM above seat surface</td>
<td>160.0-170.2</td>
<td></td>
</tr>
</tbody>
</table>
EXTERNAL DIMENSION MEASUREMENT DESIGNATIONS

FIGURE 4D
EXTERNAL DIMENSIONS TEST SETUP

FIGURE 5B
DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number _______________ Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive head drops are necessary)

__1. It has been at least 2 hours since the last head drop. (572.142(c)(5))
   __ N/A, ONLY one head drop performed
__2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259),
   accelerometer mounting block (SA572-S80) structural replacement of ½ mass of
   the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one
   ½–20x1” flat head cap screw (9000150), and three (3) accelerometers (SA572-
   S4). (572.142(a))
__4. Accelerometers and their respective mounts are smooth and clean.
__5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued
   to 10.2 Nm.
__6. The data acquisition system, including transducers, conforms to the requirements
   of SAE Recommended Practice J211/1 MAR95. (572.146(l))
__7. The head assembly soaked at a temperature between 18.9°C (66ºF) and 25.6°C
   (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4)
   hours prior to a test. (572.142(c)(1))
   Record the maximum temperature ______
   Record the minimum temperature ______
   Record the maximum humidity ______
   Record the minimum humidity ______
__8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace
   the head skin if the damaged area is more than superficial. Note: If the damage
   resulted from the low risk deployment 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.
   Record findings and actions: _________________________________________
   _________________________________________
   _________________________________________
   _________________________________________
__9. Clean the impact surface of the skin and the impact surface of the fixture with
   isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))
10. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8±0.04 inch) from the impact surface. (572.142(c)(3))
   Record the actual distance

   **NOTE:** The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.

11. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.142(c)(3))
   Record the right side distance
   Record the left side distance

12. The impact surface is clean and dry and has a micro finish in the range of 203.2x10^-6 mm (8 micro inches) to 2032.0x10^-6 mm (80 micro inches) (RMS). (572.142(c)(4))
   Record actual micro finish

14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.142(c)(4))
   Record thickness
   Record width
   Record length

15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches ± 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.142(b) & (572.142(c)(4))

16. Complete the following table. (572.142(b)):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak resultant acceleration</td>
<td>250 g ≤ x ≤ 280 g</td>
<td></td>
</tr>
<tr>
<td>Resultant versus time history curve</td>
<td>Unimodal</td>
<td></td>
</tr>
<tr>
<td>Oscillations after the main pulse</td>
<td>Less than 10% of the peak resultant acceleration</td>
<td></td>
</tr>
<tr>
<td>Lateral acceleration</td>
<td>y-axis acceleration ≤ 15 g</td>
<td></td>
</tr>
</tbody>
</table>

17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

_____________________________  ______________
Signature      Date
HEAD DROP TEST SET-UP SPECIFICATIONS

HEAD SUSPENSION CABLES

QUICK RELEASE

HEAD ASSEMBLY (210-1000 REF.) WITH HEAD ACCELEROMETERS (210-0000 SHT. 3 OF 7 REF.)

1/2 NECK TRANSDUCER MASS SIMULATOR (TE-107-001 REF.)

D - PLANE PERPENDICULAR TO SKULL CAP/SKULL INTERFACE

DROP HEIGHT
376 mm ± 1 mm (14.76 in ± .04 in)

62° ±1°

IMPACT SURFACE

FIGURE 7D
DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number _______________ Test Date _______________

Technician ___________________________ 

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive flexion tests are necessary)

__1. It has been at least 30 minutes since the last neck test. (572.146(p))
   __N/A, this is the first neck test performed
__2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))
__3. The assembly soaked at a temperature between 20.6°C (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))
   Record the maximum temperature ______
   Record the minimum temperature ______
   Record the maximum humidity ______
   Record the minimum humidity ______
__4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
   Record findings and actions: _________________________________________ 
   _______________________________________
   _______________________________________
   _______________________________________
   _______________________________________
__6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2)
__7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
__8. The test fixture pendulum conforms to the specifications in Figure 8D.
__9. The head-neck assembly is mounted 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 9D for the flexion test. (572.143(c)(3))
__10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top
horizontal surface of the neck load cell. These measurement devices should be
designed to minimize their influence upon the performance of the head-neck
assembly.

11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
12. Set the instrumentation so that the moment and rotation are defined to be zero
when the longitudinal centerline of the neck and pendulum are parallel.

(572.143(b)(1)(iii))

13. Release the pendulum and allow it to fall freely from a height to achieve an
impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum
accelerometer. (572.143(c)(4))

14. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendulum impact speed</td>
<td>5.4 m/s ≤ speed ≤ 5.6 m/s</td>
<td></td>
</tr>
<tr>
<td>Pendulum ΔV with respect to impact speed</td>
<td>@ 10ms 2.0 m/s ≤ ΔV ≤ 2.7 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@ 15 ms 3.0 m/s ≤ ΔV ≤ 4.0 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@ 20ms 4.0 m/s ≤ ΔV ≤ 5.1 m/s</td>
<td></td>
</tr>
<tr>
<td>Plane D Rotation</td>
<td>Peak moment* 42 Nm ≤ moment ≤ 53 Nm during the following rotation range 70° ≤ angle ≤ 82°</td>
<td>____Nm @ ____degrees</td>
</tr>
<tr>
<td>Positive Moment Decay** (Flexion)</td>
<td>Time to decay to 10 Nm 60 ms ≤ time ≤ 80ms</td>
<td></td>
</tr>
</tbody>
</table>

*The moment is a direct reading from the load cell
**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

15. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and
neck rotation about the y-axis follow this sheet.

_____________________________  ______________
Signature      Date

D-26
DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number _____________  Test Date _____________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive extension tests are necessary)

__1.  It has been at least 30 minutes since the last neck test. (572.146(p))
    __ N/A, this is the first neck test performed
__2.  The components required for the neck tests include the neck molding assembly
    (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper
    mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer
    (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load
    moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))
__3.  The assembly soaked at a temperature between 20.6°C (69ºF) and 22.2°C
    (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4)
    hours prior to a test. (572.143(c)(1))
    Record the maximum temperature ______
    Record the minimum temperature ______
    Record the maximum humidity ______
    Record the minimum humidity ______
__4.  Visually inspect neck assembly for cracks, cuts and separation of the rubber from
    the metal segments.  Note:  If the damage resulted from the low risk deployment
    test, the damaged area is to be documented with photography and the post test
    calibration verification testing completed before any replacement or repairs are
    made.
    Record findings and actions: _________________________________________
    __________________________________________
    __________________________________________
    __________________________________________
    __________________________________________
__6.  Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm
    and 0.3 Nm. (572.143(c)(2)
__7.  The data acquisition system, including transducers, conforms to the requirements
    of SAE Recommended Practice J211/1 MAR95. (572.146(l))
__8.  The test fixture pendulum conforms to the specifications in Figure 8D.
__9.  The head-neck assembly is mounted 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 10D for the extension test. (572.143(c)(3))
__10. Install the transducers or other devices for measuring the "D" plane rotation with
    respect to the pendulum longitudinal centerline.  Note: Plane "D" is the top
horizontal surface of the neck load cell. These measurement devices should be
designed to minimize their influence upon the performance of the head-neck
assembly.

11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

12. Set the instrumentation so that the moment and rotation are defined to be zero
when the longitudinal centerline of the neck and pendulum are parallel.
   (572.143(b)(2)(iii))

13. Release the pendulum and allow it to fall freely from a height to achieve an
impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum
accelerometer. (572.143(c)(4))

14. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendulum impact speed</td>
<td>3.55 m/s ≤ speed ≤ 3.75 m/s</td>
<td></td>
</tr>
<tr>
<td>Pendulum ∆V with respect</td>
<td>@ 6 ms 1.0 m/s ≤ ∆V ≤ 1.4 m/s</td>
<td></td>
</tr>
<tr>
<td>to impact speed</td>
<td>@ 10 ms 1.9 m/s ≤ ∆V ≤ 2.5 m/s</td>
<td></td>
</tr>
<tr>
<td>@ 14 ms 2.8 m/s ≤ ∆V ≤ 3.5 m/s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Plane D Rotation           | Peak moment*
   -53.3 Nm ≤ moment ≤ -43.7 Nm during the following rotation range 83≤ angle ≤ 93
| Negative Moment Decay**    | Time to decay to -10 Nm
   60 ms ≤ time ≤ 80ms

*The moment is a direct reading from the load cell
**Time zero is defined as the time of initial contact between the pendulum striker
plate and the honeycomb material. (572.143(c)(4)(iii))

15. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and
neck rotation about the y-axis follow this sheet.

________________________________________  ______________
Signature      Date
PENDULUM SPECIFICATIONS

FIGURE 8D
NECK FLEXION TEST SET-UP SPECIFICATIONS

NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE WITH HEADFORM MOTION. PENDULUM SHOWN IN VERTICAL ORIENTATION.

FIGURE 9D
NECK EXTENSION TEST SET-UP SPECIFICATIONS

NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE WITH HEADFORM MOTION. PENDULUM SHOWN IN VERTICAL ORIENTATION.

FIGURE 10D
DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number ________________  Test Date ________________

Technician __________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive thorax impact tests are necessary)

__1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))
   __ N/A, ONLY one thorax impact test performed
__2. The test fixture conforms to the specifications in Figure 11D.
__3. The complete assembled dummy (210-0000) is used (572.144(b)) and is dressed in cotton-polyester-based tight-fitting long sleeved shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.144(c)(1))
__4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.144(c)(2))
   Record the maximum temperature ______
   Record the minimum temperature ______
   Record the maximum humidity ______
   Record the minimum humidity ______
__5. Remove the arms.
__6. Unzip the 3 zippers and fold down the chest jacket. Visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
   __ - No damage
   __ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____________________________
   __ - The following repairs or replacement was performed. Record _____________________________
__7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))
__8. Level the middle rib both longitudinally and laterally ± 0.5°. (572.144(c)(3))
9. The midsagittal plane of the dummy is vertical within ± 1°. (572.144(c)(3))

10. The longitudinal centerline of the test probe is centered within ±2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within ±0.5° of a horizontal line in the dummy’s midsagittal plane. (572.144(c)(4))

11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.

12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.

13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))

14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).

15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy during the test. (572.144(c)(7))
16. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter*</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Probe Speed</td>
<td>5.9 m/s ≤ speed ≤ 6.1 m/s</td>
<td></td>
</tr>
<tr>
<td>Chest Compression</td>
<td>32 mm ≤ compression ≤ 38 mm</td>
<td></td>
</tr>
<tr>
<td>Peak force** between 32 and 38 mm chest compression</td>
<td>680 N ≤ peak force ≤ 810 N</td>
<td></td>
</tr>
<tr>
<td>Peak force** between 12.5 and 32.0 mm chest compression</td>
<td>Peak force ≤ 910 N</td>
<td></td>
</tr>
<tr>
<td>Internal Hysteresis***</td>
<td>65% ≤ hysteresis ≤ 85%</td>
<td></td>
</tr>
</tbody>
</table>

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.144(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12D)

17. Plots of chest compression, pendulum acceleration, pendulum force, and force versus deflection follow this sheet.

_____________________________  ______________
Signature      Date
Probe specifications:

1. Rigid metallic construction, concentric its longitudinal axis.
2. A mass of $1.7 \pm 0.02$ kg ($3.75 \pm 0.05$ lbs). $1/3$ of the weight of the suspension cables and their attachments to the impact probe are included in the calculation of mass, and such components may not exceed 5 percent of the total weight of the test probe.
3. Minimum mass moment of inertia of 164 kg-cm$^2$ (0.145 lbs-in-sec$^2$) in yaw and pitch about the center of gravity.
4. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It has a flat, continuous, and non-deformable face with diameter of $50.8 \pm 0.2$ mm (2.00 ± 0.01 in) and a maximum edge radius of 7.6-12.7 mm (0.3-0.5 in).
5. The impactor is a cylinder with a diameter of 53.3 mm (2.1 in) and it is at least 25.4 mm (1.0 in) long.
6. 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 axis of the probe.
7. The impact probe shall have a free air resonant frequency of not less than 1000 Hz in the direction of the longitudinal direction of the impactor.

FIGURE 11D
PART 572P HYBRID III-3C THORAX CALIBRATION - HYSTERESIS

THORAX RESISTIVE FORCE (N) vs. LOAD DISPLACEMENT (mm)

-200
-100
0
100
200
300
400
500
600
700
800
900
1000

0 10 20 30 40

12.5 mm 32.0 mm 38.0 mm

H-III 3C test

Deflection Corridor 32-38 mm

Force Corridor 680-810 N

Force Prior to Deflection Corridor 12.5-32 mm

Point A = Maximum Force in Deflection Corridor.
Point B = Max. Force between 12.5 mm - 32.0 mm shall not exceed 860 N.

FIGURE 12D
DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number _______________  Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive torso flexion tests are necessary)

__1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))
   __ N/A, ONLY one thorax impact test performed
__2. The test fixture conforms to the specifications in Figure 13D.
__3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).
   __ with legs below the femurs.
   __ without legs below the femurs.
__4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))
   Record the maximum temperature ______
   Record the minimum temperature ______
   Record the maximum humidity ______
   Record the minimum humidity ______
__5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))
__5. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within ±1° and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))
__6. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))
__7. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))
__8. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and 30° ± 2°. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))
__9. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0°. Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))
__10. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))
11. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
Record reference plane angle (max. allowed 15°)_____

12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))

13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.145(c)(5))

14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))

15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))

16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))

17. Complete the following table:

| Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5)) |
|-----------------------------------------------|-----------------|--------------|
| Parameter                                    | Specification   | Result       |
| Initial ref. plane angle                     | Angle ≤ 15°     |              |
| Torso rotation rate                          | 0.5°/s ≤ rate ≤ 1.5°/s |             |
| Force at 45° ±0.5°                           | 130 N ≤ force ≤ 180 N |             |
| Final ref. plane angle                       | Initial ref. plane angle ±10° | |

18. A plot of the force versus time follows this sheet.

_____________________________  ______________
Signature      Date

_____________________________  ______________
Signature      Date
FIGURE 13D

TORSO FLEXION TEST SET-UP SPECIFICATION

VERTICAL

INITIAL POSITION OF TORSO REFERENCE PLANE

15° MAX.

OCCIPITAL CONDYLE LOCATION

FINAL POSITION OF TORSO REF. PLANE 45°

CENTERLINE OF OCCIPITAL CONDYLE LOCATION. ALSO AXIS OF LOAD APPLICATION.

ATTACHED LOADING ADAPTER BRACKET TO MACHINED SPINE BOX WELDMENT (210-8020, DETAIL IN 210-3107) WITH (4) 8-32 SCREWS.

COMPLETE DUMMY ASSEMBLY (210-0000 REF.)

PELVIS-LUMBAR JOINING SURFACE HORIZONTAL ±1°

ATTACH PELVIS (REF. DWG 210-3000) TO TABLE MOUNTED FIXTURE WITH FOUR 1/4-20 BOLTS AT THE LUMBAR LOAD CELL STRUCT. REPLACEMENT (210-4510)

LOAD CELL

PULL CABLE

FLAT RIGID SURFACE

94.11mm (3.705in)

133.96mm (5.274in)

22.225mm (0.875in)

COMBINED WEIGHT OF LOAD CELL, LOADING ADAPTER BRACKET, PULL CABLE AND ATTACHMENT HARDWARE ≤ 0.70kg. (1.54 lb.)
<table>
<thead>
<tr>
<th>I.D. NO.</th>
<th>MANUFACTURER</th>
<th>MODEL NO.</th>
<th>SERIAL NO.</th>
<th>DATE OF LAST CALIBRATION</th>
<th>DATE OF NEXT CALIBRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DUMMY INSTRUMENTATION**

**HEAD ACCELEROMETERS**

(1) LONGITUDINAL

(2) LATERAL

(3) VERTICAL

NECK TRANSUDCER

**CHEST ACCELEROMETERS**

(1) LONGITUDINAL

(2) LATERAL

(3) VERTICAL

CHEST POTENTIOMETER

**FEMUR LOAD CELLS**

(1) RIGHT FEMUR

(2) LEFT FEMUR

**LABORATORY INSTRUMENTATION**

NECK PENDULUM ACCELEROMETER

THORAX PENDULUM ACCELEROMETER

KNEE PENDULUM ACCELEROMETER

NECK ROTATION TRANSDUCER 1 (OPTIONAL)

NECK ROTATION TRANSDUCER 2 (OPTIONAL)

**LABORATORY TECHNICIAN:** _________________________________