APPENDIX E

PART 572, SUBPART R (12-MONTH-OLD) DUMMY PERFORMANCE CALIBRATION TEST PROCEDURE

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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 R 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 (572.152)

C. NECK FLEXION TEST (572.153(b)(1))

D. NECK EXTENSION TEST 572.153(b)(2)

E. THORAX IMPACT TEST ((572.154)

National Highway Traffic Safety Administration (NHTSA) contract laboratories performing FMVSS 208 testing for the Office of Vehicle Safety Compliance (OVSC) must use this laboratory procedure for the calibration of Part 572, Subpart R dummies.

2. GENERAL REQUIREMENTS

The Code of Federal Regulations (49CFR), Parts 571 and 572, was amended to adopt the Hybrid III, CRABI 12-Month-Old Dummy as the means of determining a vehicle's conformance to the performance requirements of FMVSS 208. Each Part 572, Subpart R dummy used in a compliance test must meet the specifications and performance criteria of Part 572 before and after each low risk deployment test in order to be an acceptable compliance test tool.

The Part 572, Subpart R Hybrid III, CRABI 12-Month-Old 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 R 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 Acquisition Management, 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 R dummy calibration tests before and after each low risk deployment usage. No Information concerning the Part 572, Subpart R dummy calibration data shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's 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 R dummies are being calibrated as test tools to be used in a low risk deployment test to determine compliance with the requirements of FMVSS 208. The schedule for these performance calibration tests must be correlated with that of the vehicle 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 R 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 R 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 drawings 1E and 2E.

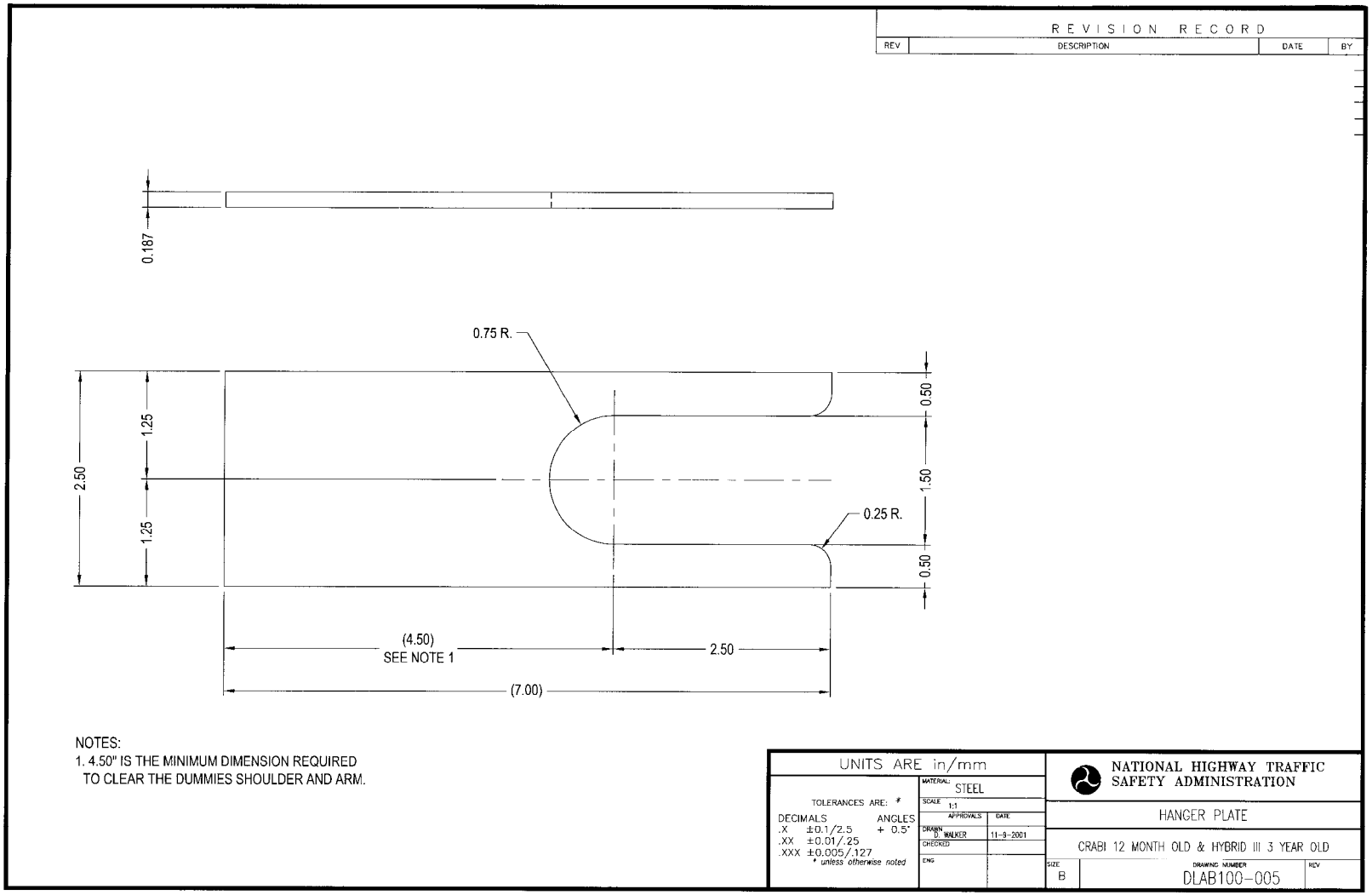

REVISION RECORD
REV
DESCRIPTION
DATE
BY
0.187
0.75 R.
0.50
1.25
2.50
1.50
1.25
0.25 R.
0.50
(4.50)
SEE NOTE 1
2.50
(7.00)
NOTES:
1. 4.50" IS THE MINIMUM DIMENSION REQUIRED
TO CLEAR THE DUMMIES SHOULDER AND ARM.
UNITS ARE in/mm
TOLERANCES ARE: *
DECIMALS
.X ±0.1/2.5
.XX ±0.01/.25
.XXX ±0.005/.127
* unless otherwise noted
ANGLES
± 0.5°
MATERIAL: STEEL
SCALE 1:1
APPROVALS
DATE
DRAWN D. WALKER 11-5-2001
CHECKED
ENG
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
HANGER PLATE
CRABI 12 MONTH OLD & HYBRID III 3 YEAR OLD
SIZE B
DRAWING NUMBER DLAB100-005
REV

FIGURE 1E

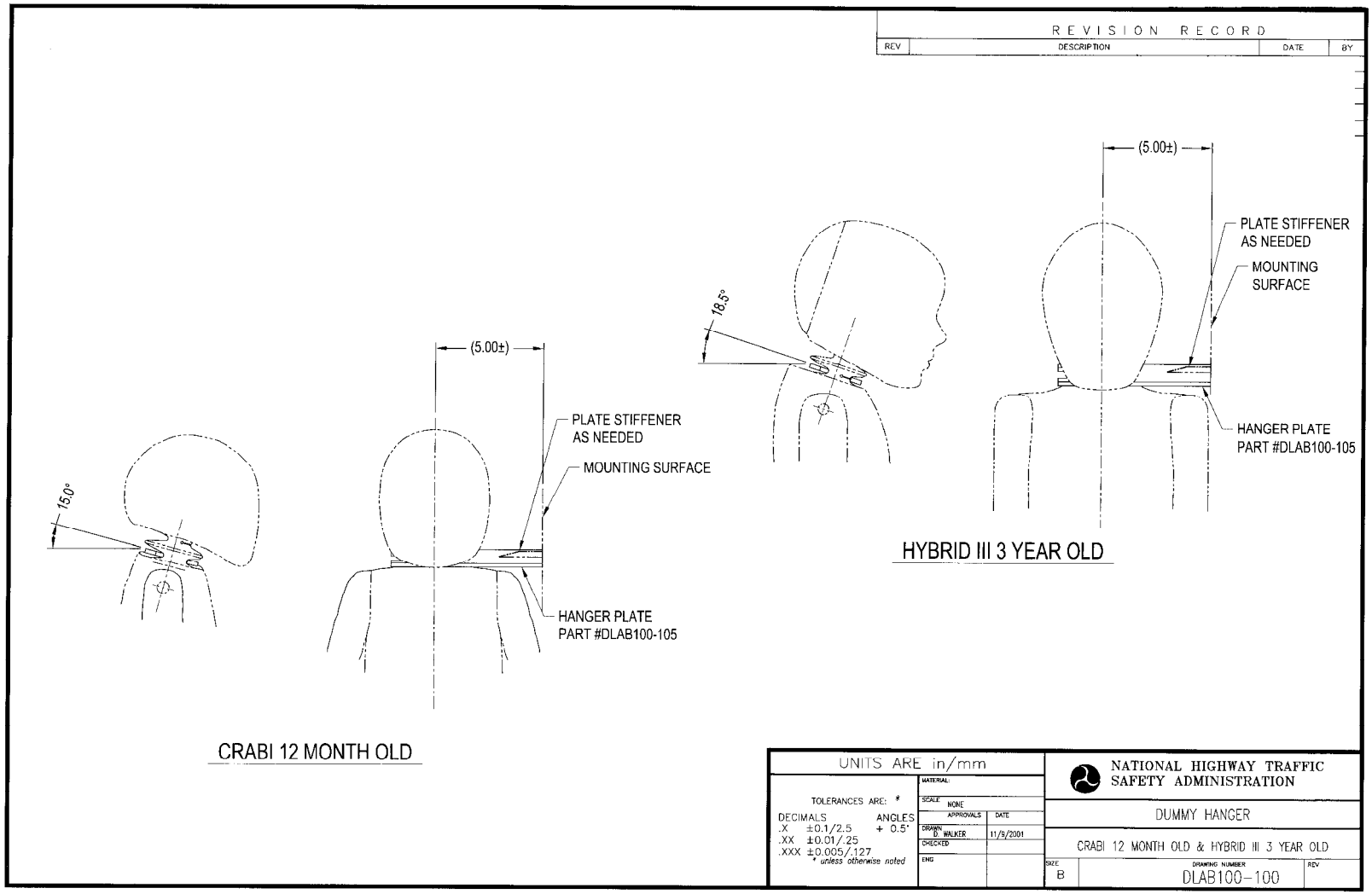

REVISION RECORD
REV
DESCRIPTION
DATE
BY
(5.00±)
PLATE STIFFENER AS NEEDED
MOUNTING SURFACE
18.5°
HANGER PLATE PART #DLAB100-105
HYBRID III 3 YEAR OLD
15.0°
(5.00±)
PLATE STIFFENER AS NEEDED
MOUNTING SURFACE
HANGER PLATE PART #DLAB100-105
CRABI 12 MONTH OLD
UNITS ARE in/mm
TOLERANCES ARE: *
DECIMALS
.X ±0.1/2.5
.XX ±0.01/.25
.XXX ±0.005/.127
* unless otherwise noted
ANGLES + 0.5°
MATERIAL:
SCALE NONE
APPROVALS
DATE
DRAWN D. WALKER
11/9/2001
CHECKED
ENG
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
DUMMY HANGER
CRABI 12 MONTH OLD & HYBRID III 3 YEAR OLD
SIZE B
DRAWING NUMBER DLAB100-100
REV

FIGURE 2E

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. The contractor shall calibrate the dummies before and verify the calibration after every low risk deployment test. If the posttest verification is within the calibration specifications, it may be used as the pretest calibration for the next crash test or low risk deployment 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.

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 shall 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 verify the calibration after each low risk deployment test. These calibrations shall be submitted with the final report.

9. PHOTOGRAPHIC DOCUMENTATION

Provide still digital photographs (8 x 10 inch glossy color prints properly focused for clear images) of posttest damage resulting from the low risk deployment test.

A tag, label or placard identifying the item and date shall appear in each photograph and must be legible. Each photograph shall be labeled as to the subject matter. The required resolution for digital photographs is a minimum of 1,600 x 1,200 pixels. Digital photographs are required to be in color and in a JPG format.

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 921022-000. (572.155(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 neck force-moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S23 and shall be mounted as shown in drawing 921022-000. (572.155(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 921022-000. The chest accelerometers are not required for dummy calibration testing but are required for FMVSS 208 low risk deployment testing. (572.155(e))

D. TEST FIXTURE – The neck pendulum, and thorax 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. (572.155(k))

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 3E. For other transducers see SAE J1733DEC94. (572.155(i))

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 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: (572.155(i))

(1) Head acceleration	Class 1000	(572.155(i)(1))
(2) Neck force	Class 1000	(572.155(i)(2)(i))

(3) Neck moment	Class 600	(572.155(i)(2)(ii))
(4) Neck pendulum acceleration	Class 180	(572.155(i)(2)(iii))
(5) Neck rotation transducers	Class 60	(572.155(i)(2)(iv))
(6) Thorax spine acceleration	Class 180	(572.155(i)(3)(ii))
(7) Thorax pendulum acceleration	Class 180	(572.155(i)(3)(ii))

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

11.3 THORAX IMPACTOR PROBE (572.155(a))

A. The test probe for thoracic impacts shall be of rigid metallic construction, concentric about its longitudinal axis.
B. It shall have a mass of 2.86 ± 0.02 kg (6.3 ± 0.05 lbs). 1/3 of the weight of the suspension cables and any 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 164 kg-cm^2 (0.145 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. The face has a diameter of 101.6 ± 0.25 mm (4.00 ± 0.01 in), a maximum edge radius of 7.6 to 12.7 mm (0.3 to 0.5 in) and is flat, continuous and non-deformable.
E. A 101-103 mm diameter cylinder surface extends at least 12.5 mm to the rear of the impact face.
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 Hz measured in line with the longitudinal axis of the impactor.

SIGN CONVENTION FOR PART 572 TEST DUMMIES

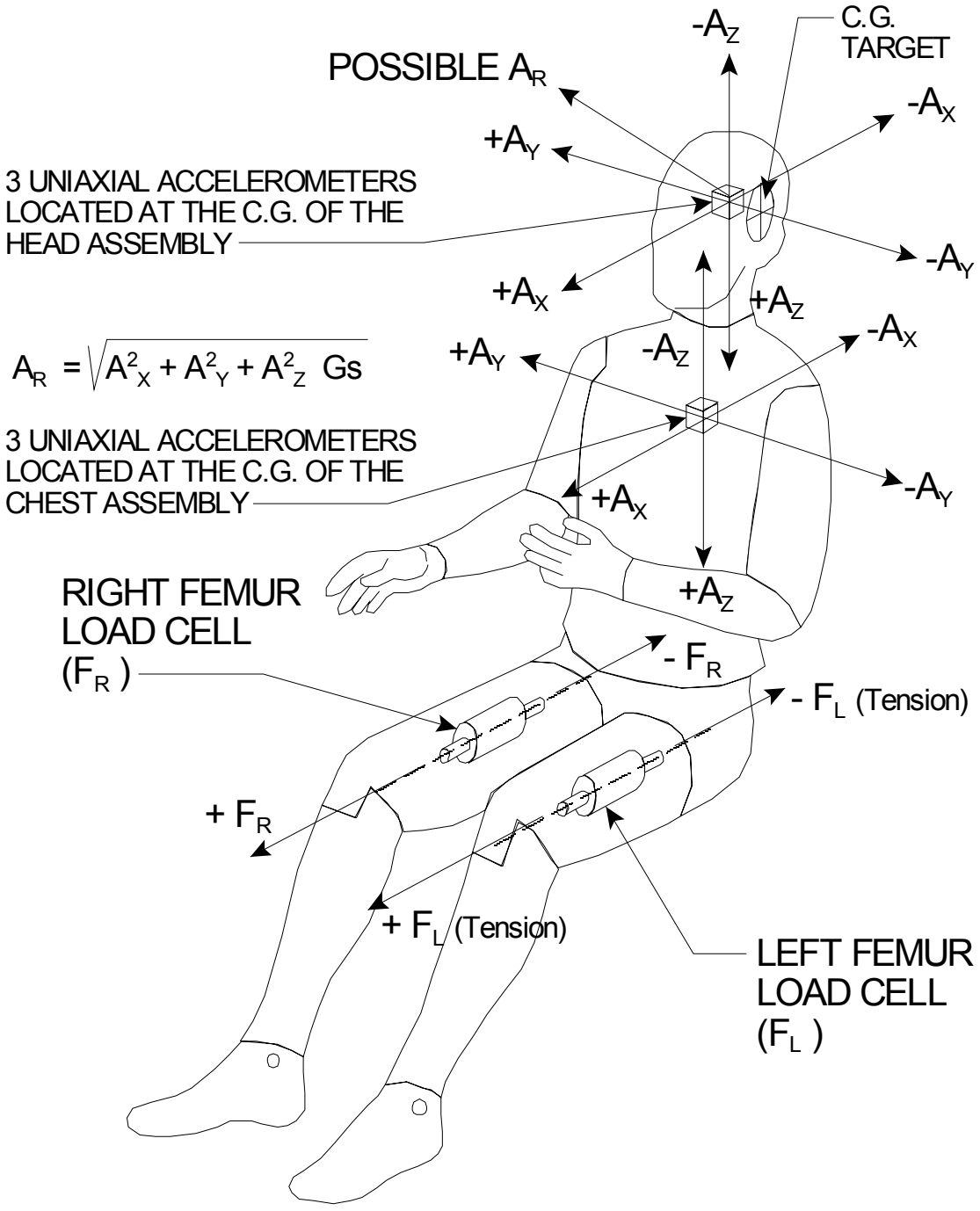


FIGURE 3E

TABLE 1E

SIGN CONVENTION FOR HYBRID III TRANSDUCER OUTPUTS	
BODY SEGMENT — MEASURED FORCE	**POSITIVE OUTPUT DIRECTION**
NECK	
FX SHEAR	HEAD REARWARD OR CHEST FORWARD
FY SHEAR	HEAD LEFTWARD, CHEST RIGHTWARD
FZ AXIAL	HEAD UPWARD, CHEST DOWNWARD
MX MOMENT (ROLL)	LEFT EAR TOWARD LEFT SHOULDER
MY MOMENT (PITCH)	CHIN TOWARD STERNUM
MZ MOMENT (YAW)	CHIN TOWARD LEFT SHOULDER
LEFT SHOULDER	
FX	LEFT ARM/SHOULDER FORWARD, CHEST REARWARD
FZ	LEFT ARM/SHOULDER DOWNWARD, CHEST UPWARD
RIGHT SHOULDER	
FX	RIGHT ARM/SHOULDER FORWARD, CHEST REARWARD
FZ	RIGHT ARM/SHOULDER DOWNWARD, CHEST UPWARD
LUMBAR SPINE	
FX	CHEST REARWARD, PELVIS FORWARD
FY	CHEST LEFTWARD, PELVIS RIGHTWARD
FZ	CHEST UPWARD, PELVIS DOWNWARD
MX MOMENT	LEFT SHOULDER TOWARD LEFT HIP
MY MOMENT	STERNUM TOWARD FRONT OF LEGS
MZ MOMENT	RIGHT SHOULDER FORWARD, LEFT SHOULDER REARWARD
PUBIC	
FX SHEAR	PUBIC REARWARD, CHEST FORWARD
FZ AXIAL	PUBIC UPWARD, CHEST DOWNWARD

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. (572.155(n))

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. (572.155(m))

C. The dummy head performance tests are conducted at any temperature from 18.9°C (66ºF) to 25.6°C (78ºF) 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-headform assembly and thorax assembly, the temperature range is 20.6°C (69ºF) to 22.2°C (72ºF) 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.

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. (572.155(l))

E. Dummies will be clothed for the thorax calibration tests with a form fitting cotton-polyester-based tight-fitting sweat shirt with long sleeves and ankle length pants. The total weight of the shirt and pants shall not exceed 0.25 kg (0.55 lb). (572.154(c)(2))

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 R dummy used in the low risk deployment test shall be submitted with FMVSS 208 final test report for the vehicle tested.

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 the 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
VEHICLE SAFETY COMPLIANCE TESTING
FOR OCCUPANT CRASH PROTECTION

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
Mail Code: NVS-220
1200 New Jersey Ave., SE)
Washington, DC 20590

15. Data Sheets

DATA SHEET E1
DUMMY DAMAGE CHECKLIST (12-MONTH-OLD)

Dummy Serial Number _____ Test Date _____

Technician _____

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

Indicate NA in the OK column for any components not applicable to this size dummy.

__Perform general cleaning.

Dummy Item	Inspect for	Comments	Damaged	OK
Outer skin	Gashes, rips, cracks			
Head	Ballast secure			
	General appearance			
Neck	Broken or cracked rubber			
	Upper neck bracket firmly attached to the lower neck bracket			
	Looseness at the condyle joint			
	Nodding blocks cracked or out of position			
Spine	Broken or cracks in rubber.			
Ribs	Broken or bent ribs			
	Broken or bent rib supports			
	Damping material separated or cracked			
	Rubber bumpers in place			
Chest Displacement Assembly	Bent shaft			
	Slider arm riding in track			
Transducer leads	Torn cables			

Dummy Item	Inspect for	Comments	Damaged	OK
Accelerometer Mountings	Head mounting secure			
	Chest mounting secure			
Knees	Skin condition			
	Insert (do not remove)			
	Casting			
Limbs	Normal movement and adjustment			
Knee Sliders	Wires intact			
	Rubber returned to “at rest” position			
Pelvis	Broken			
Other				

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 E2
EXTERNAL MEASUREMENTS (12-MONTH-OLD)
(See the PADI, pages 52-55)

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. 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 tangent to the rear vertical surface of the fixture (as tangent as possible).
__3. Push the dummy's forehead rearward and secure the head (at the forehead) against the seat back surface.
__4. Place the centerlines of the upper arms vertical.
__5. Place the centerlines of the lower arms horizontal.
__6. Position the upper legs so that they are parallel to one another.
__7. Position the lower legs so that they are perpendicular to the upper legs and the bottom of the foot is horizontal.
__8. Record the dimensions listed in following table, except for dimension Q (reference figure 4E).
__9. Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsaggital plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks for Q.

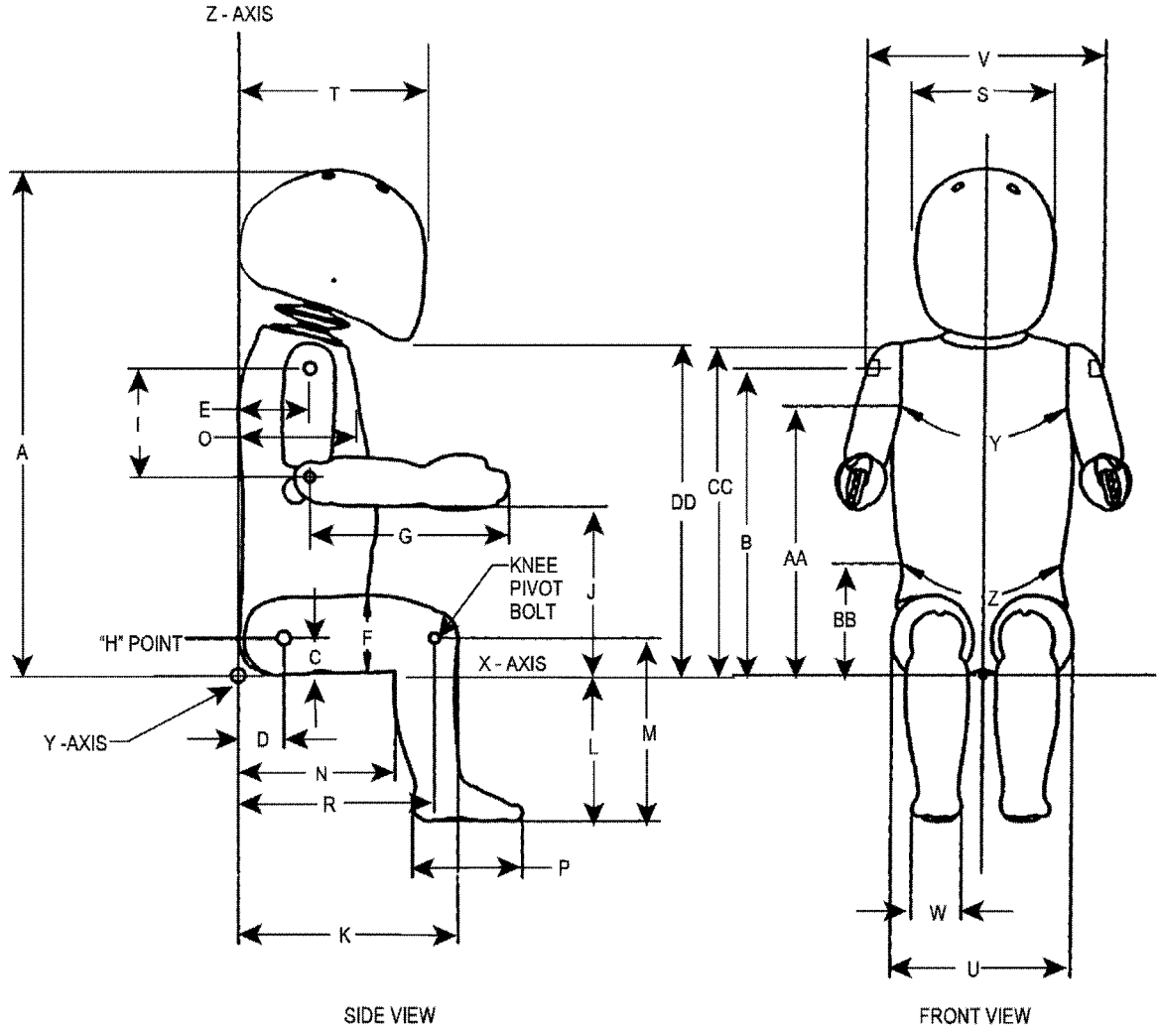
_____ _____
Signature Date

EXTERNAL DIMENSIONS

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456-471.2	
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	

HYBRID III, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	
P	FOOT LENGTH	Tip of toe to rear of heal	92.4-102.6	
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsaggital plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsgittal plane.	149.9-165.1	
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447-472.4	
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	

HYBRID III, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	



EXTERNAL DIMENSIONS

FIGURE 4E

DATA SHEET E3
FRONTAL HEAD DROP TEST (572.152) (12-MONTH-OLD)

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))
__ N/A, ONLY one head drop performed
__2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
__3. Accelerometers and their respective mounts are smooth and clean.
__4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
__5. The head 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 a test. (572.152(c)(1))
Record the maximum temperature _____
Record the minimum temperature _____
Record the maximum humidity _____
Record the minimum humidity _____
__6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head 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: _____
_____
_____
_____
_____
__7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

__8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8±0.04 inch) from the impact surface. (572.152(c)(3)(i))
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.

__9. 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. (572.152(c)(3)(i))
Record the right side distance _____
Record the left side distance _____

__10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))
Record the angle _____

__11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish _____

__12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness _____
Record width _____
Record length _____

__13. 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. (572.152(b) & (572.152(c)(4))

__14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	100 g ≤ x ≤ 120 g	
Resultant versus time history curve	Unimodal	
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	
Lateral acceleration	y-axis acceleration ≤ ±15 g	

__15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

_____ _____
Signature Date

FRONTAL HEAD DROP TEST SET-UP SPECIFICATIONS

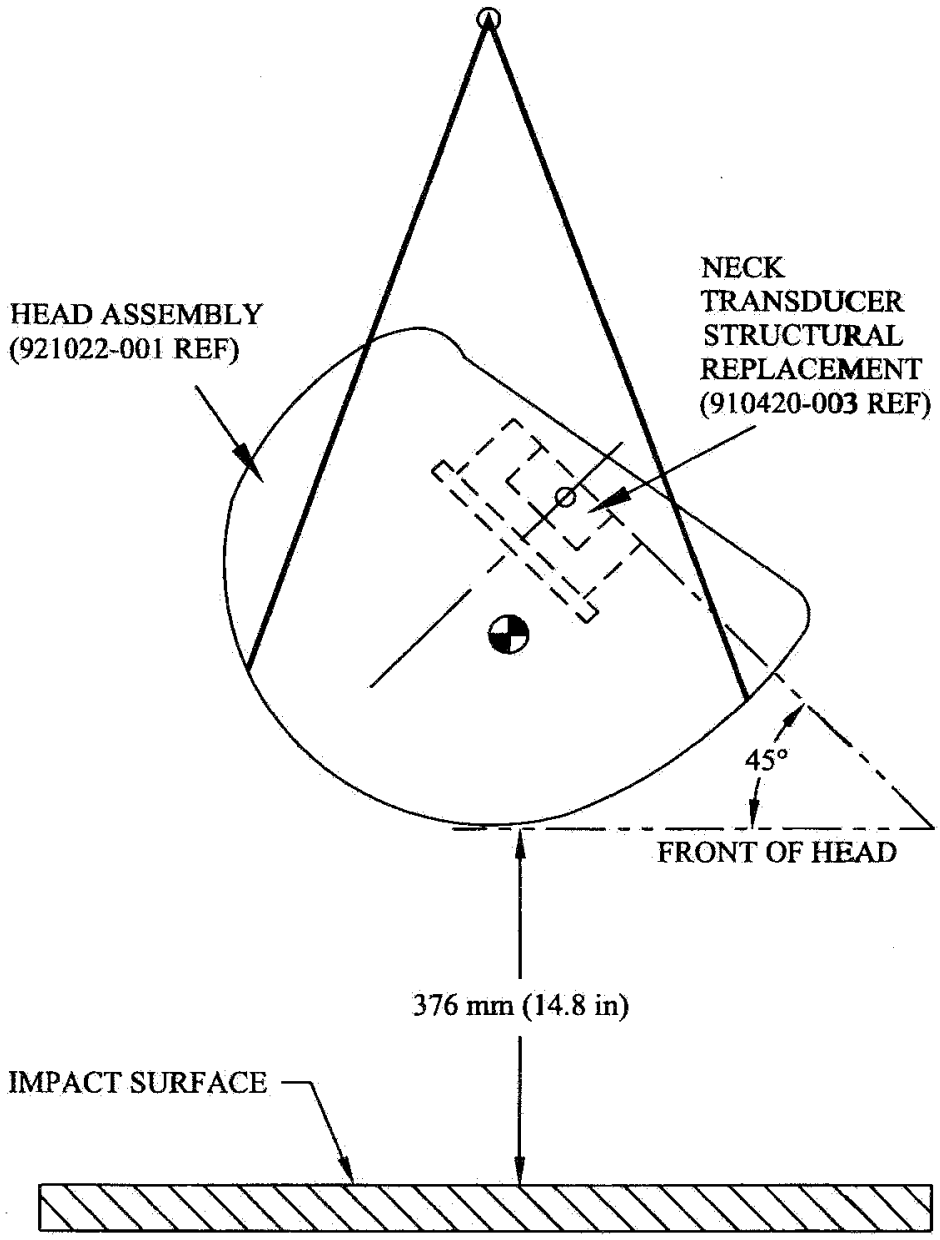


FIGURE 5E

DATA SHEET E4
REAR HEAD DROP TEST (572.152) (12-MONTH-OLD)

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))
__ N/A, ONLY one head drop performed
__2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
__3. Accelerometers and their respective mounts are smooth and clean.
__4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
__5. The head 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 a test. (572.152(c)(1))
Record the maximum temperature _____
Record the minimum temperature _____
Record the maximum humidity _____
Record the minimum humidity _____
__6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head 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: _____
_____
_____
_____
_____
__7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

__8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8±0.04 inch) from the impact surface. (572.152(c)(3)(ii))
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.

__9. 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. (572.152(c)(3)(ii))
Record the right side distance _____
Record the left side distance _____

__10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
Record the angle _____

__11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish _____

__12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness _____
Record width _____
Record length _____

__13. 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. (572.152(b) & (572.152(c)(4))

__14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	55 g ≤ x ≤ 71 g	
Resultant versus time history curve	Unimodal	
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	
Lateral acceleration	y-axis acceleration ≤ ±15 g	

__15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

_____ _____
Signature Date

REAR HEAD DROP TEST SET-UP SPECIFICATIONS

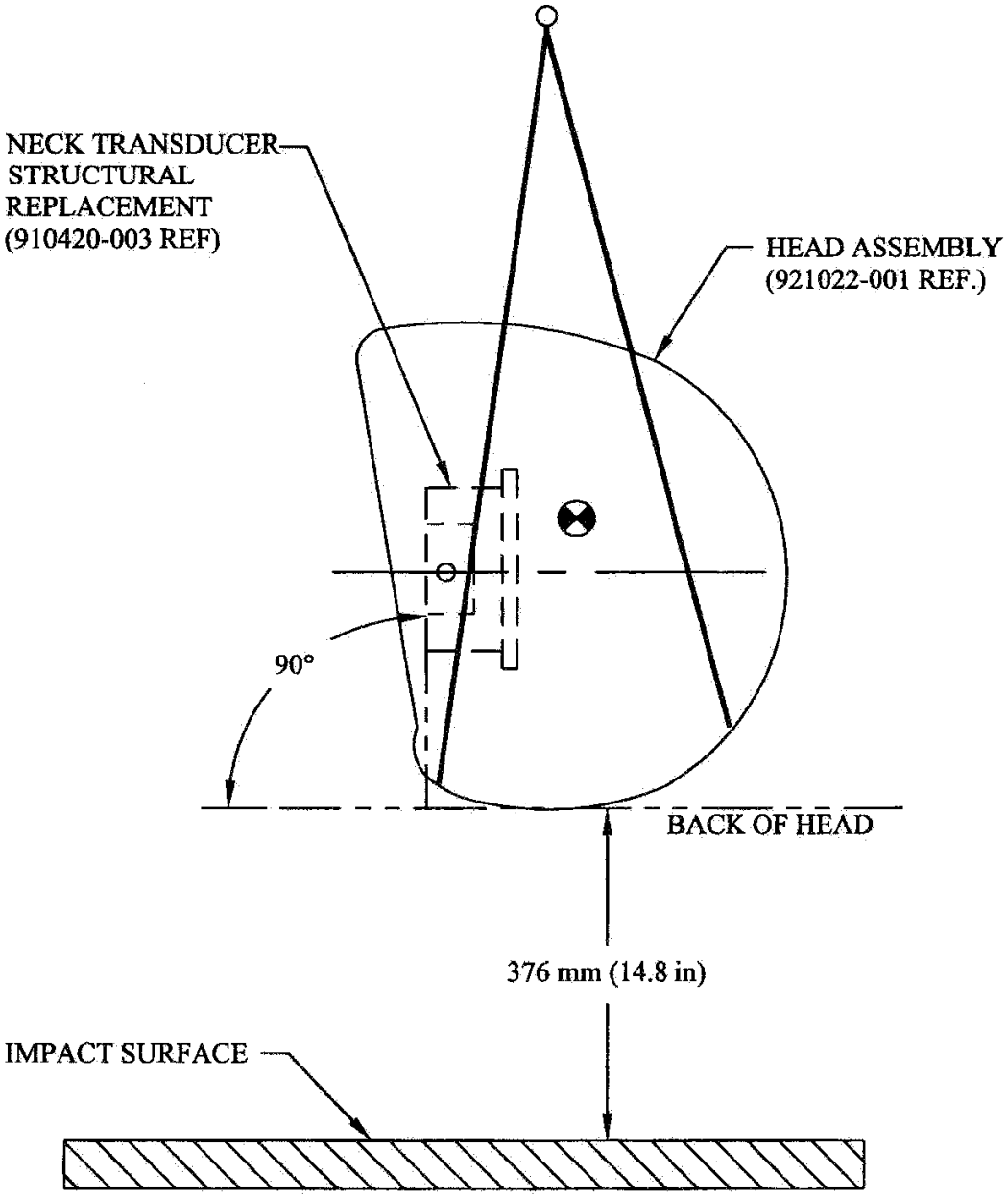


FIGURE 6E

DATA SHEET E5
NECK FLEXION TEST (572.153) (12-MONTH-OLD)

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. (572.155(m))
__ N/A, this is the first neck test performed
__2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
__3. The 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 a test. (572.153(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 (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2)
__7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
__8. The test fixture pendulum conforms to the specifications in Figure 7E.
__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 8E for the flexion test. (572.153(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 and not induce neck torsion. (572.153(c)(3)(ii))

__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. (572.153(c)(3)(i))
__13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
__14. Complete the following table:

Neck Flexion Test Results (572.143(b)(1) & (572.153(c)(4)(ii)

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75^{o} ≤ angle ≤ 86^{o}	____Nm @ ___degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	

*Moment about the occipital condyle = M_y – (0.005842 m x F_x) (572.153(b)(1)(iii)
My = Moment in Nm measured by the transducer
Fx = Force, in N measured by the transducer
**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.153(c)(4)(i))

__15. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

_____ _____
Signature Date

DATA SHEET E6
NECK EXTENSION TEST (572.153) (12-MONTH-OLD)

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. (572.155(m))
__ N/A, this is the first neck test performed
__2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
__3. The 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 a test. (572.153(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 (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2)
__7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
__8. The test fixture pendulum conforms to the specifications in Figure 7E.
__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 9E for the flexion test. (572.153(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 and not induce neck torsion. (572.153(c)(3)(ii))

__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. (572.153(c)(3)(i))
__13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
__14. Complete the following table:

Neck Extension Results (572.143(b)(1) & (572.153(c)(4)(ii)

Parameter		Specification	Result
Pendulum impact speed		2.4 m/s ≤ speed ≤ 2.6 m/s	
Pendulum ΔV with respect to impact speed	@ 6 ms	0.8 m/s ≤ ΔV ≤ 1.2 m/s	
	@ 10 ms	1.5 m/s ≤ ΔV ≤ 2.1 m/s	
	@ 14 ms	2.2 m/s ≤ ΔV ≤ 2.9 m/s	
Plane D Rotation		Peak moment* -12 Nm ≤ moment ≤ -23 Nm during the following rotation range 80^o ≤ angle ≤ 92^o	____Nm @ ___degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm 76 ms ≤ time ≤ 90ms	

*Moment about the occipital condyle = M_y – (0.005842 m x F_x) (572.153(b)(2)(iii)
My = Moment in Nm measured by the transducer
Fx = Force, in N measured by the transducer
**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.153(c)(4)(i))

__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

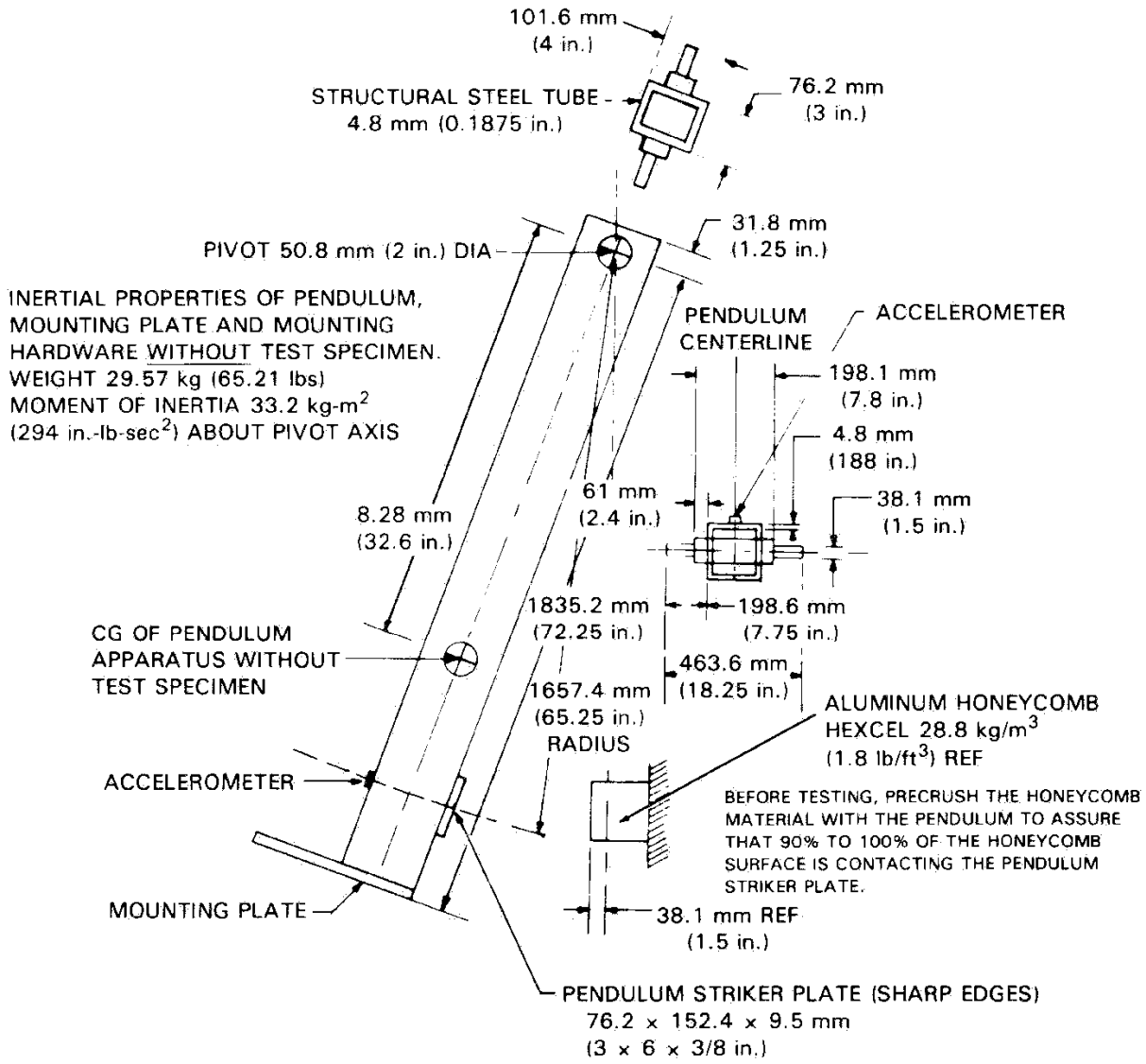
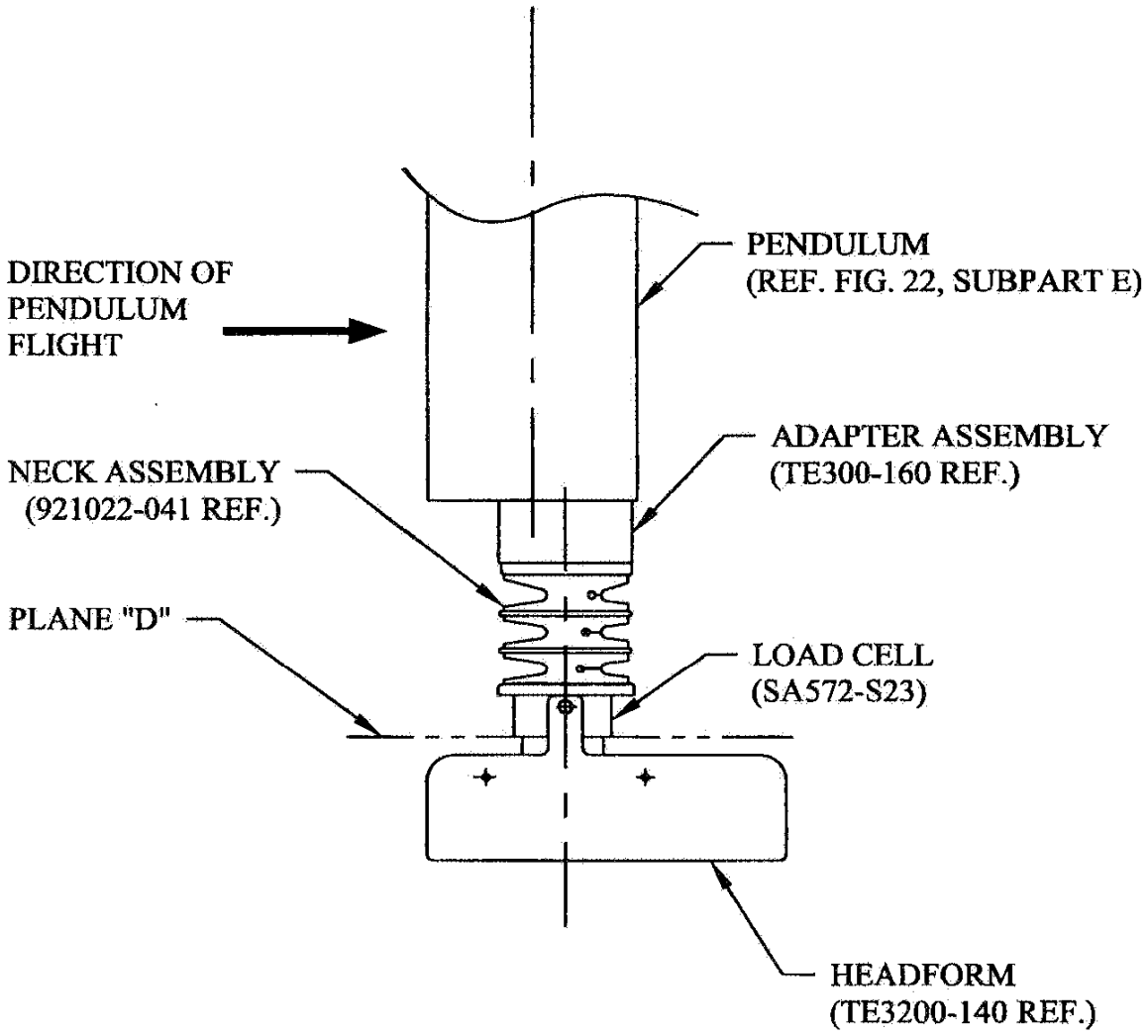


FIGURE 7E

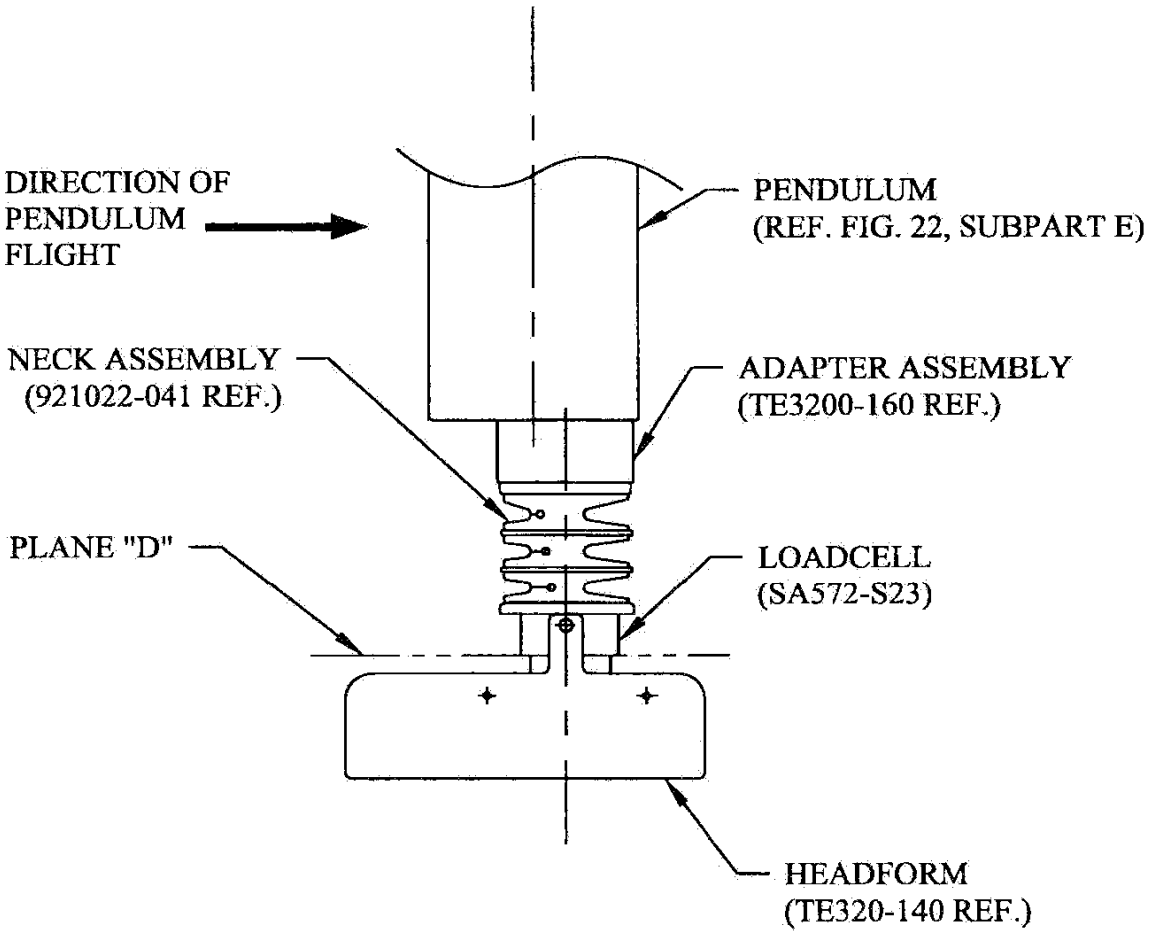
NECK FLEXION TEST SET-UP SPECIFICATIONS



NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE.

FIGURE 8E

NECK EXTENSION TEST SET-UP SPECIFICATIONS



NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE.

FIGURE 9E

DATA SHEET E7
THORAX IMPACT TEST (572.154) (12-MONTH-OLD)

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. (572.155(m))
__ N/A, ONLY one thorax impact test performed
__2. The test fixture conforms to the specifications in Figure 10E.
__3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))
__4. The dummy 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 this test. (572.154(c)(1))
Record the maximum temperature _____
Record the minimum temperature _____
Record the maximum humidity _____
Record the minimum humidity _____
__5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))
__6. The midsagittal plane of the dummy is vertical within ± 1º. (572.154(c)(3))
__7. The posterior surface of the upper spine box is 90° ± 1° from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))
__8. Place the upper arms parallel to the torso. Place the lower arms 0º to 5º forward of vertical. (572.154(c)(3))
__9. The longitudinal centerline of the test probe is centered within ±2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within ±0.5º of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))
__10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
__11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2º of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The velocity of the test probe at the time of impact is between 4.9 m/s and 5.1 m/s. (572.154(b)) The probe is

guided so there is no significant lateral, vertical or rotational movement during the impact. (572.154(c)(6) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.154(c)(7)

__12. Complete the following table:

Thorax Impact Results (572.154(b))

Parameter*	Specification	Result
Test Probe Speed	4.9 m/s ≤ speed ≤ 5.1 m/s	
Peak force**	1514 N ≤ peak force ≤ 1796 N	

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

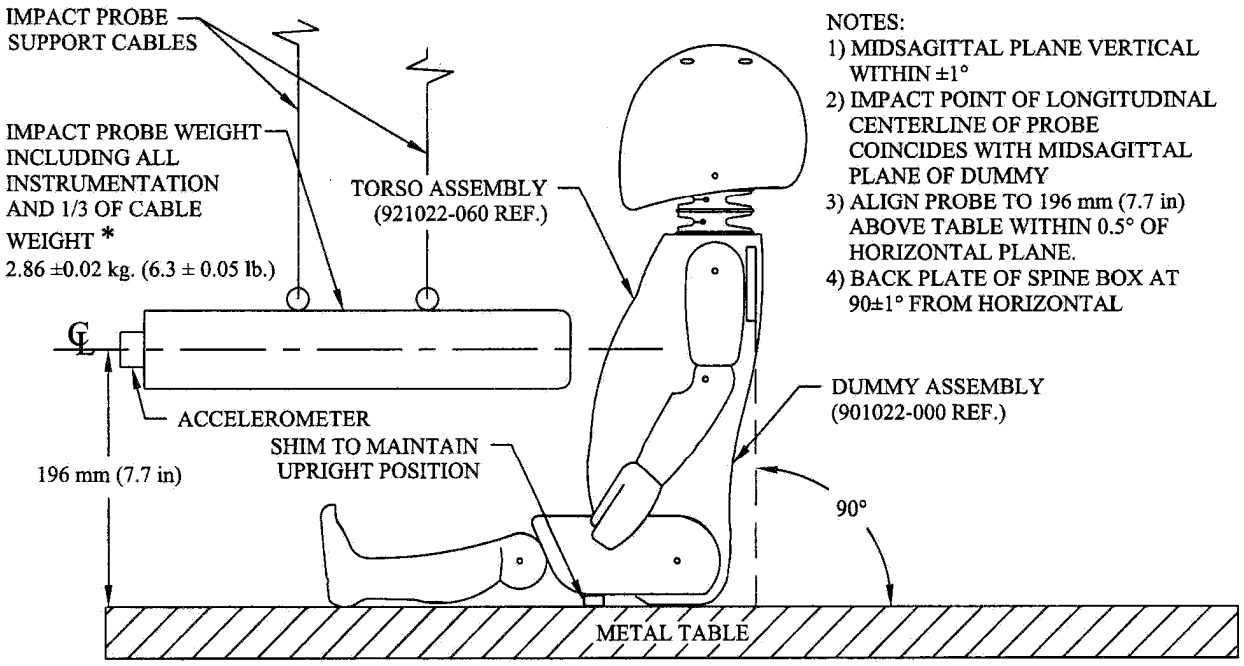
**Force = impactor mass x acceleration (572.144(b)(3))

__13. Plots of pendulum acceleration, and pendulum force, follow this sheet.

_____ _____

Signature Date

THORAX IMPACT TEST SET-UP SPECIFICATIONS



* 1/3 OF CABLE WEIGHT NOT TO EXCEED 5% OF THE TOTAL IMPACT PROBE WEIGHT.

Probe specifications:

1. Rigid metallic construction and concentric about its longitudinal axis.
2. A mass of 2.86 ± 0.02 kg (6.3 ± 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 101.6 ± 0.25 mm (4.00 ± 0.01 in) and a edge radius of 7.6 to 12.7 mm (0.3 to 0.5 in.).
5. A 101-103 mm (4.0-4.1 in) diameter cylinder surface extends at least 12.5 mm to the rear of the impact face.
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 line with the longitudinal axis of the impactor.

FIGURE 10E

DATA SHEET E8
PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL					
(2) LATERAL					
(3) VERTICAL					
NECK TRANSDUCER					
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: _____