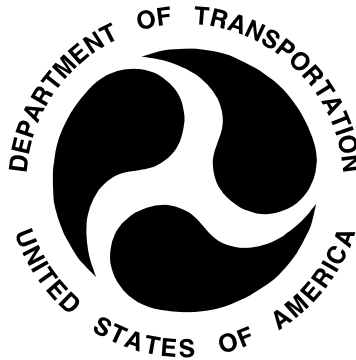


REPORT NO. 208-MGA-2004-DC011

DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208

**Volkswagen of America, Inc.
2004 Volkswagen Beetle Passenger Car
NHTSA No.:C45802**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Dates: March 18- August 20, 2004

Final Report Date: August 27, 2004

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAIL CODE: NVS-220
400 SEVENTH STREET, S.W., ROOM 6115
WASHINGTON, D.C. 20590**

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EXTERNAL DIMENSIONS

SN505, 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.	774.7-800.1	783.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	438.0
C	H-POINT HEIGHT	Reference	81.3-86.3	84.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.4
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	124.3
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.3
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	46.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	283.4
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	532.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	405.2
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	421.6

SN505, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	182.4
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	473.7
S	HEAD BREADTH	The widest part of the head	137.1-147.3	144.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	305.7
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	362.4
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	84.3
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	533.7
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	863.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	773.6
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 505 Test Date 8/16/04

Technician Joe Fleck

☒ Pretest calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. 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. (572.132(c)(1))

Record the maximum temperature	<u>22.0</u>
Record the minimum temperature	<u>21.1</u>
Record the maximum humidity	<u>50%</u>
Record the minimum humidity	<u>40%</u>
- ☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 500mm

Record the left side distance 501mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	270
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	10

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

Joe Flores
Signature

8/16/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test ID: D041921

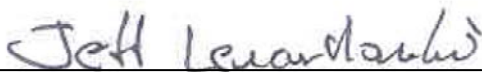
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Peak Resultant Acceleration	G's	250 - 300	270	Pass
Peak Lateral Acceleration	G's	+/- 15	9.5	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

08/16/2004

Test Date



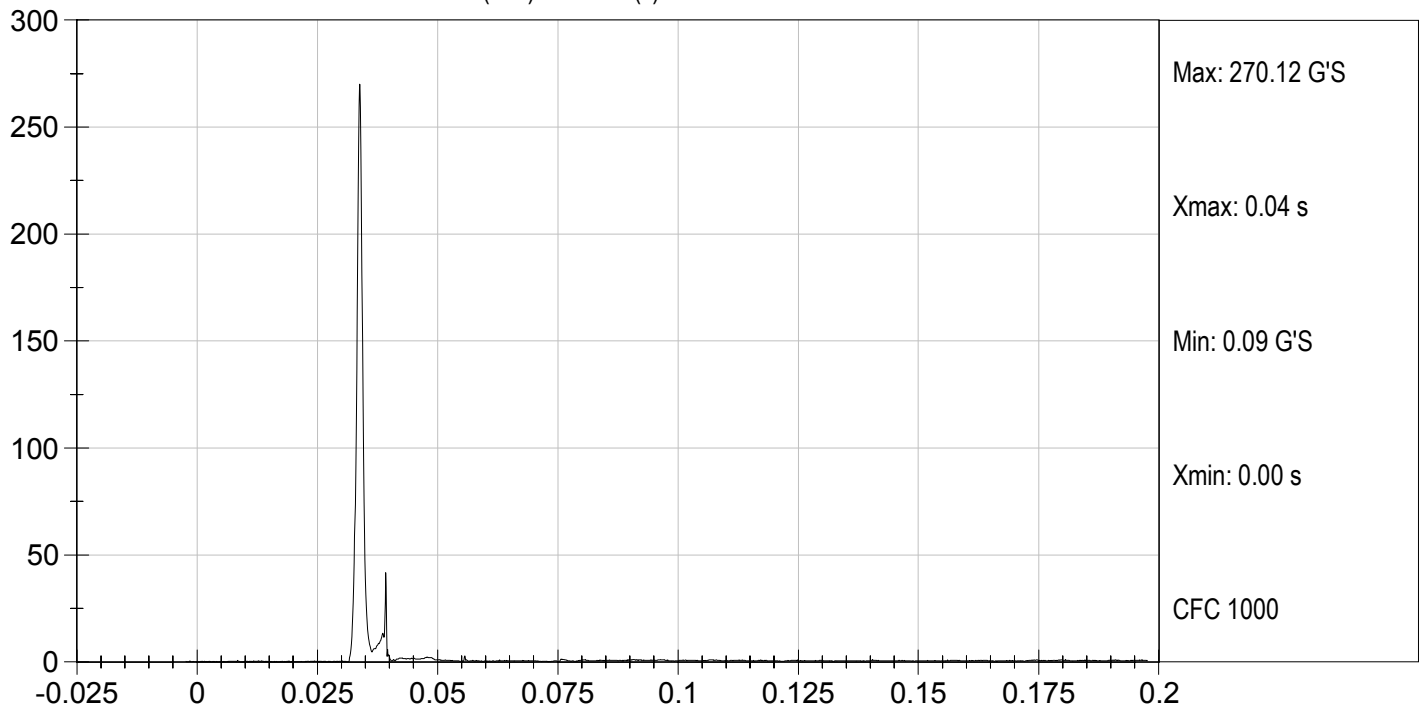
Approved By



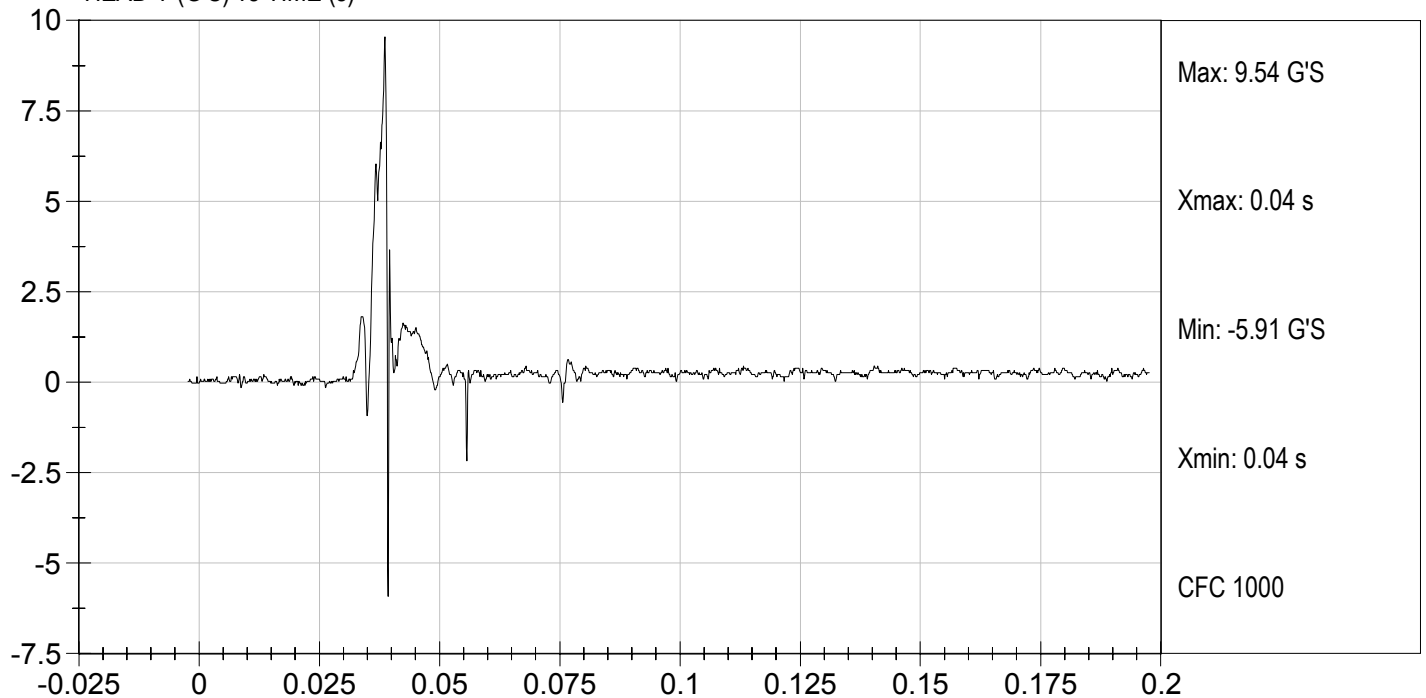
Test Desc: Head Drop
Componet ID: D041921

Test Date: 08/16/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 505 Test Date 8/16/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.1</u> |
| Record the maximum humidity | <u>50%</u> |
| Record the minimum humidity | <u>40%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
 Record findings and actions: No Deterioration. Hardness: Front 85; Back 88.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.10 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.4 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.8 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.7 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>73</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	86 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Fleck
Signature

8/16/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041922

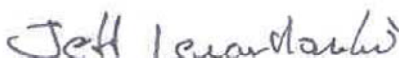
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.10	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	73	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	86	Pass
Overall Results				Pass	



Laboratory Technician

08/16/2004

Test Date



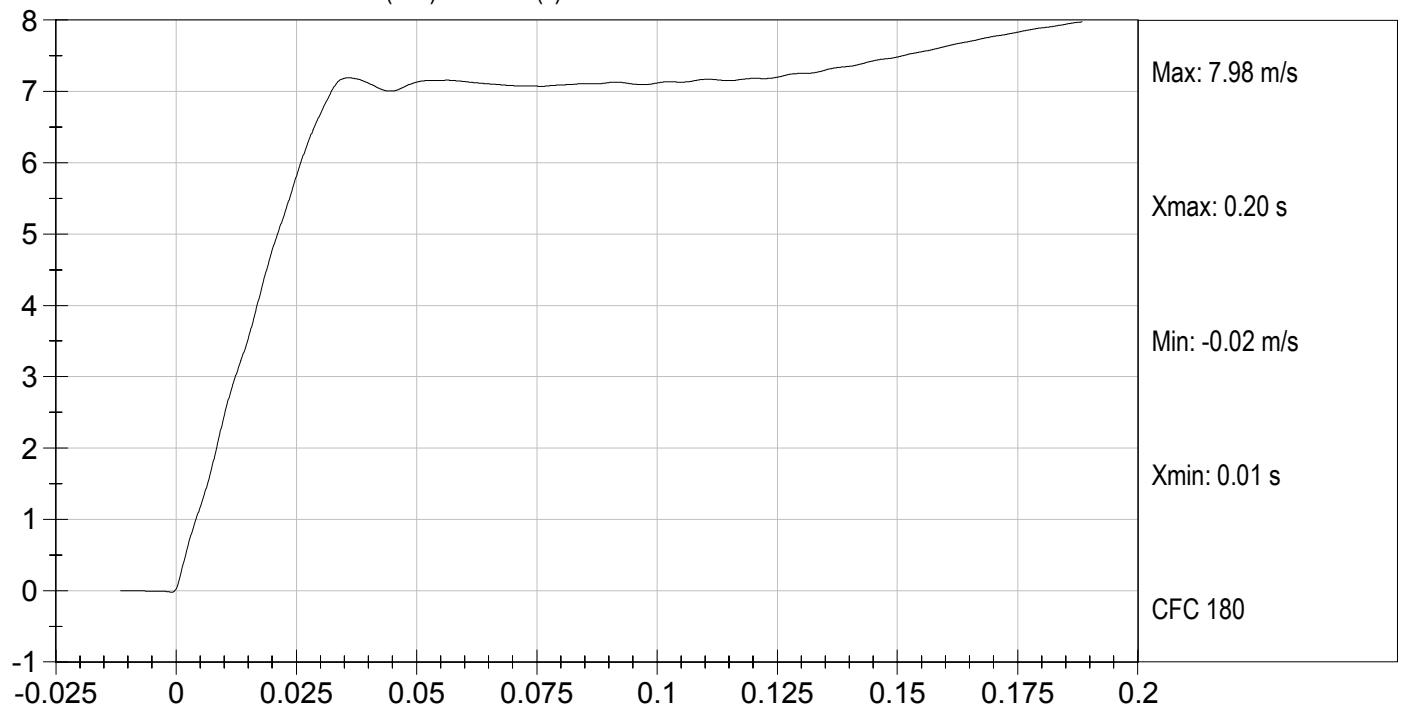
Approved By



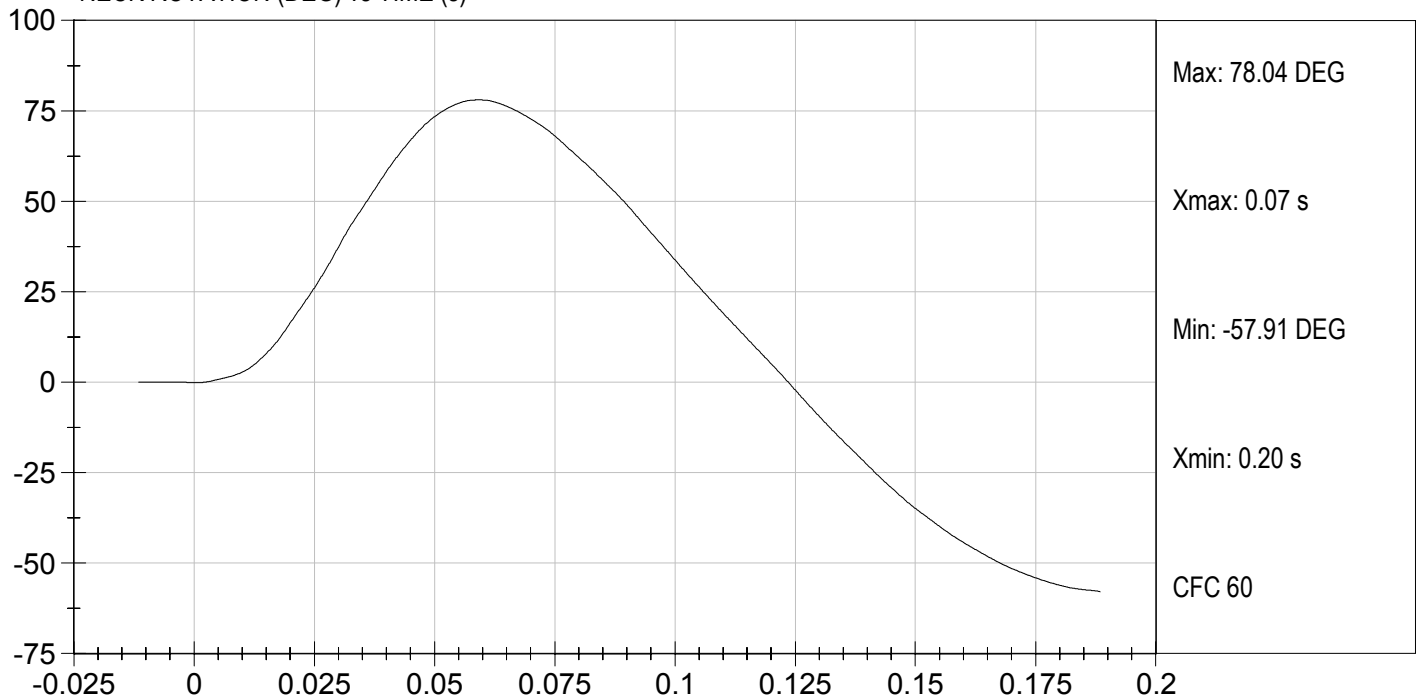
Test Desc: Neck Flexion
Componet ID: D041922

Test Date: 08/16/2004
Velocity: 23.3 ft/s, 7.10 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



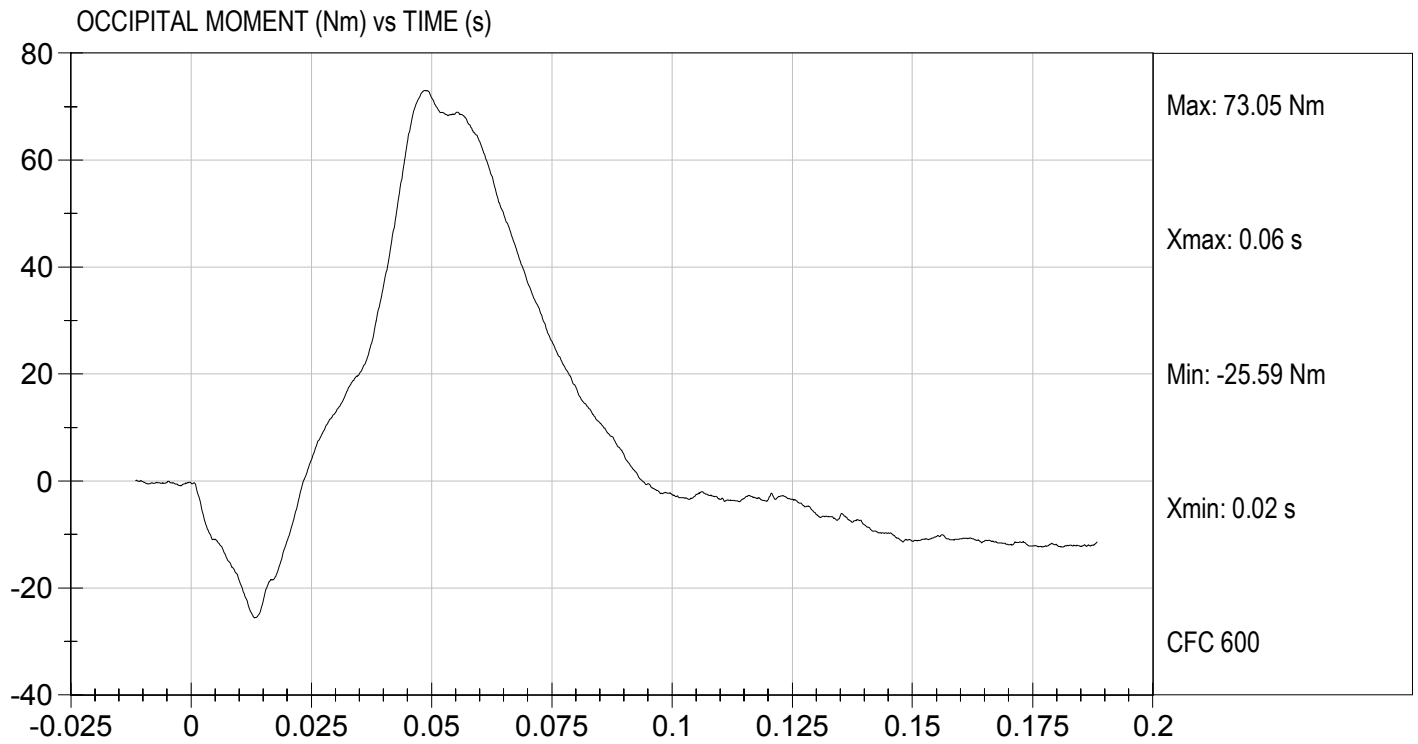
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D041922

Test Date: 08/16/2004
Velocity: 23.3 ft/s, 7.10 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 505

Test Date 8/16/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.1

Record the maximum humidity 50%

Record the minimum humidity 40%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 85; Back 88.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.13 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.8 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.4 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-61</u> Nm @ <u>106</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	95 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Joe Fleck
Signature

8/16/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041923

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.8	Pass
	30 msec	m/sec	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-61	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	95	Pass
Overall Results					Pass



Laboratory Technician

08/16/2004

Test Date

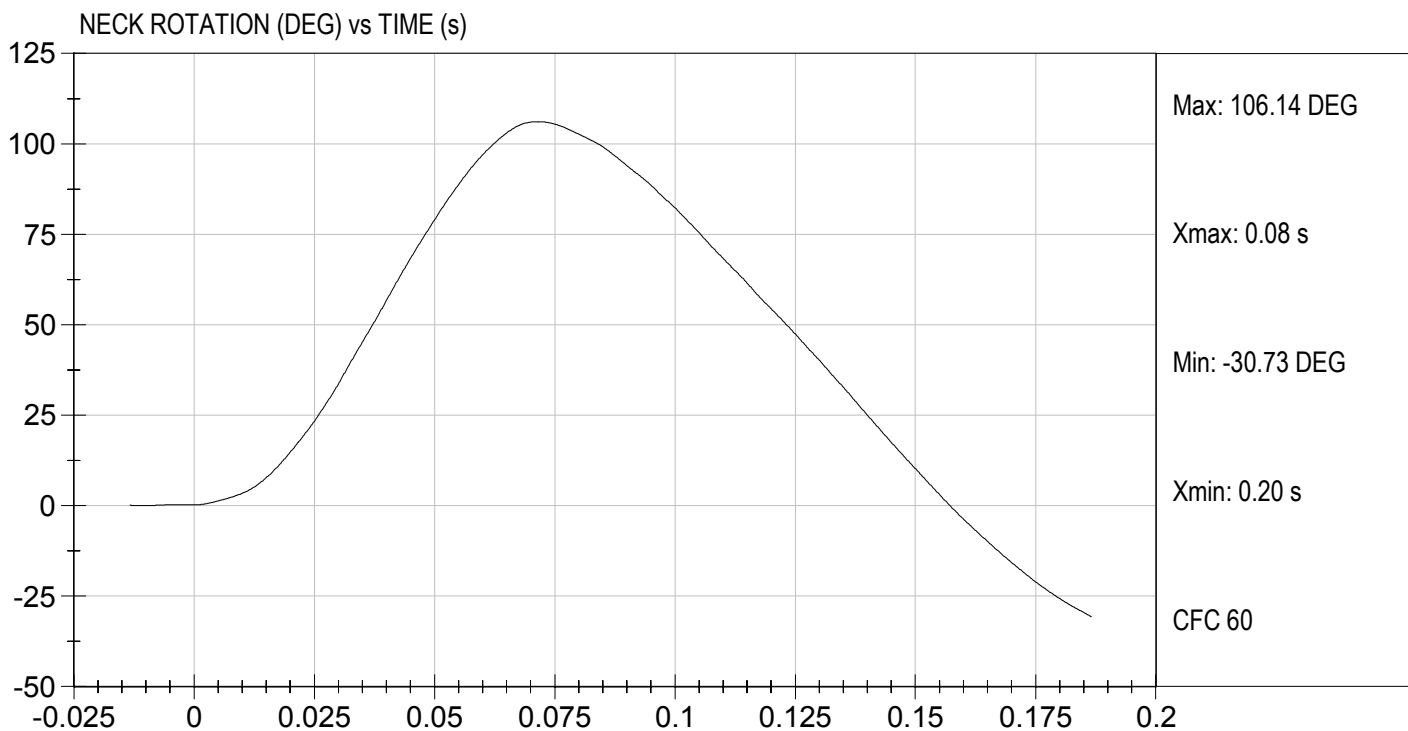
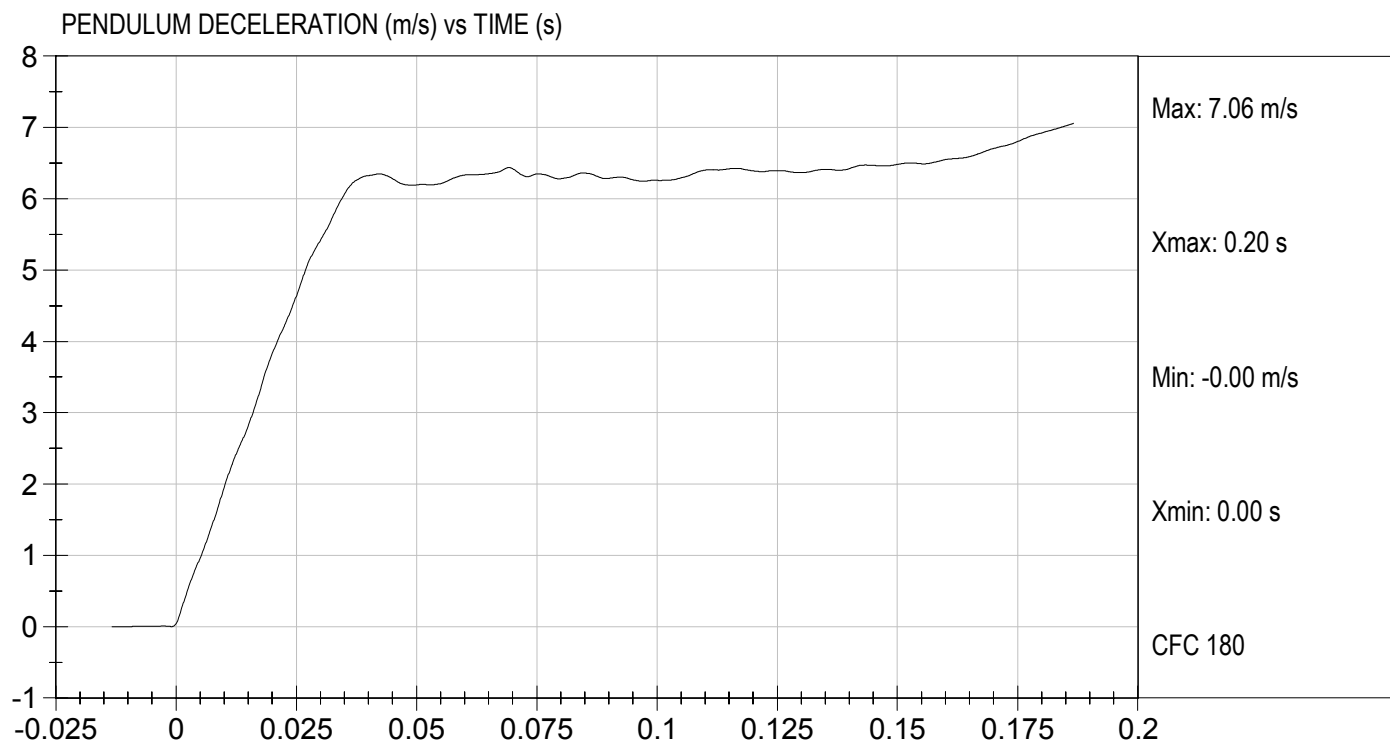


Approved By



Test Desc: Neck Extension
Componet ID: D041923

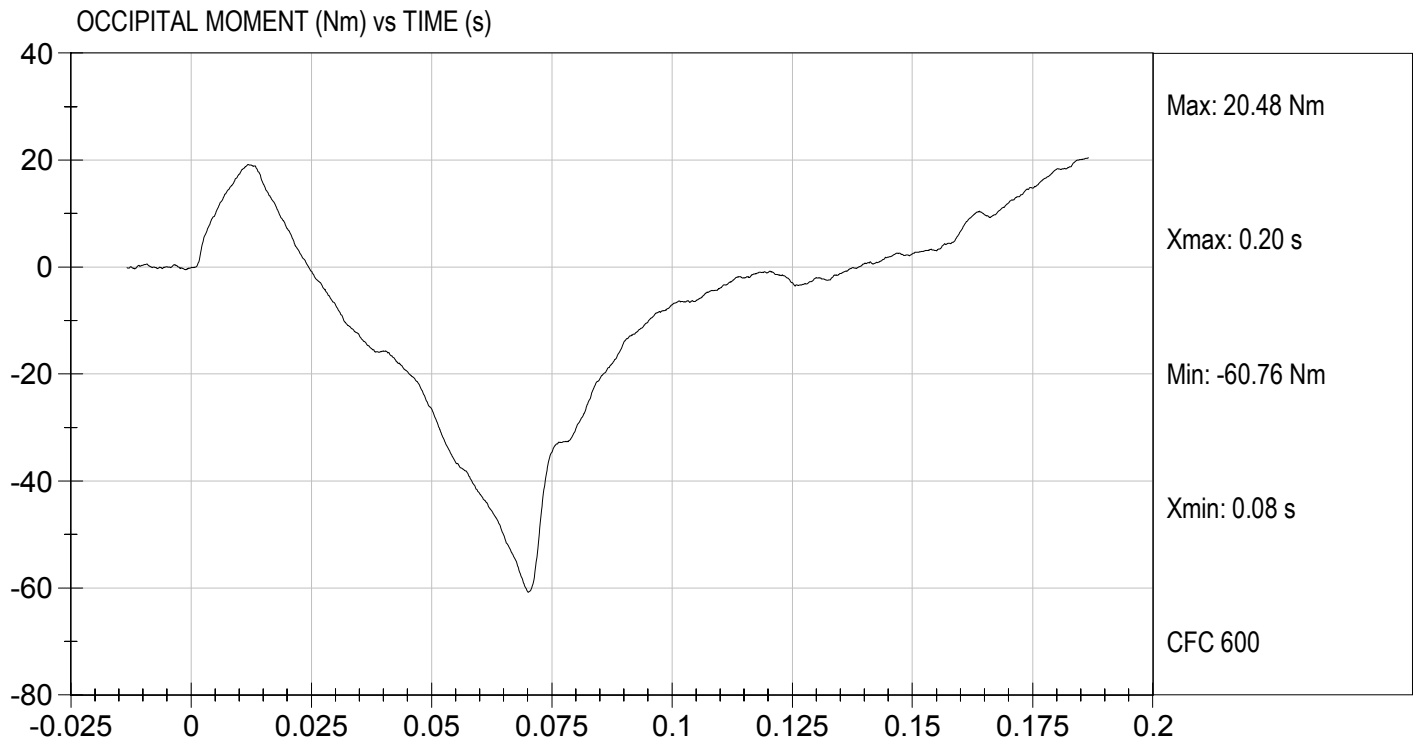
Test Date: 08/16/2004
Velocity: 20.11 ft/s, 6.13 m/s





Test Desc: Neck Extension
Componet ID: D041923

Test Date: 08/16/2004
Velocity: 20.11 ft/s, 6.13 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 505

Test Date 8/16/04

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 22.0

Record the minimum temperature 21.1

Record the maximum humidity 50%

Record the minimum humidity 40%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.79 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	54 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4210 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4210 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Signature James Carney

8/16/04
Date

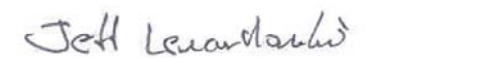
MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041924

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	6.59 to 6.83	6.79	Pass
Peak Deflection	mm	50 to 58	55.4	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4210	Pass
			Overall Test Results	Pass


Laboratory Technician


Approved By

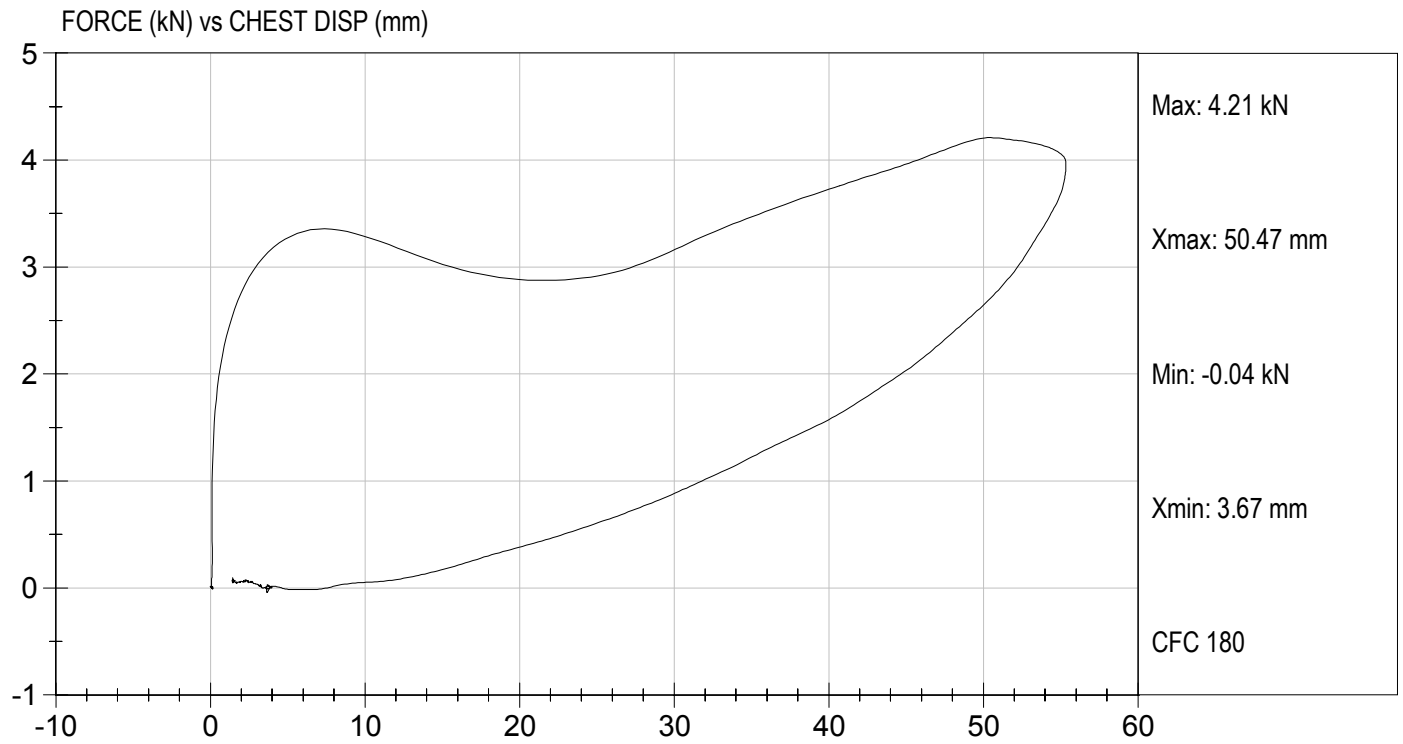
08/16/2004

Test Date



Test Desc: Thorax Impact
Componet ID: D041924

Test Date: 08/16/2004
Velocity: 22.27 ft/s, 6.79 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 505

Test Date 8/16/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.1

Record the maximum humidity 50%

Record the minimum humidity 40%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 19°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	19°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	364 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	23°

Joe Fleck
Signature

8/16/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041927

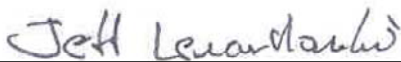
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	23	Pass
Force at 45 deg	N	320 to 390	364	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result			Pass	



Laboratory Technician

08/16/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 8/16/04

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.1

Record the maximum humidity 50%

Record the minimum humidity 40%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

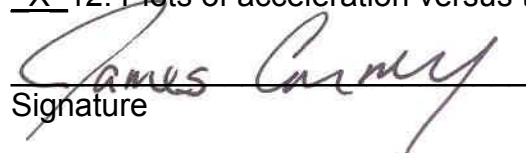
X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3700 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.


Signature

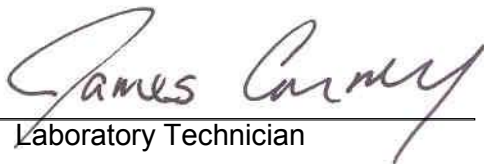
8/16/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041926

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	3.45 to 4.06	3.70	Pass
Overall Test Results				Pass


Laboratory Technician

08/16/2004

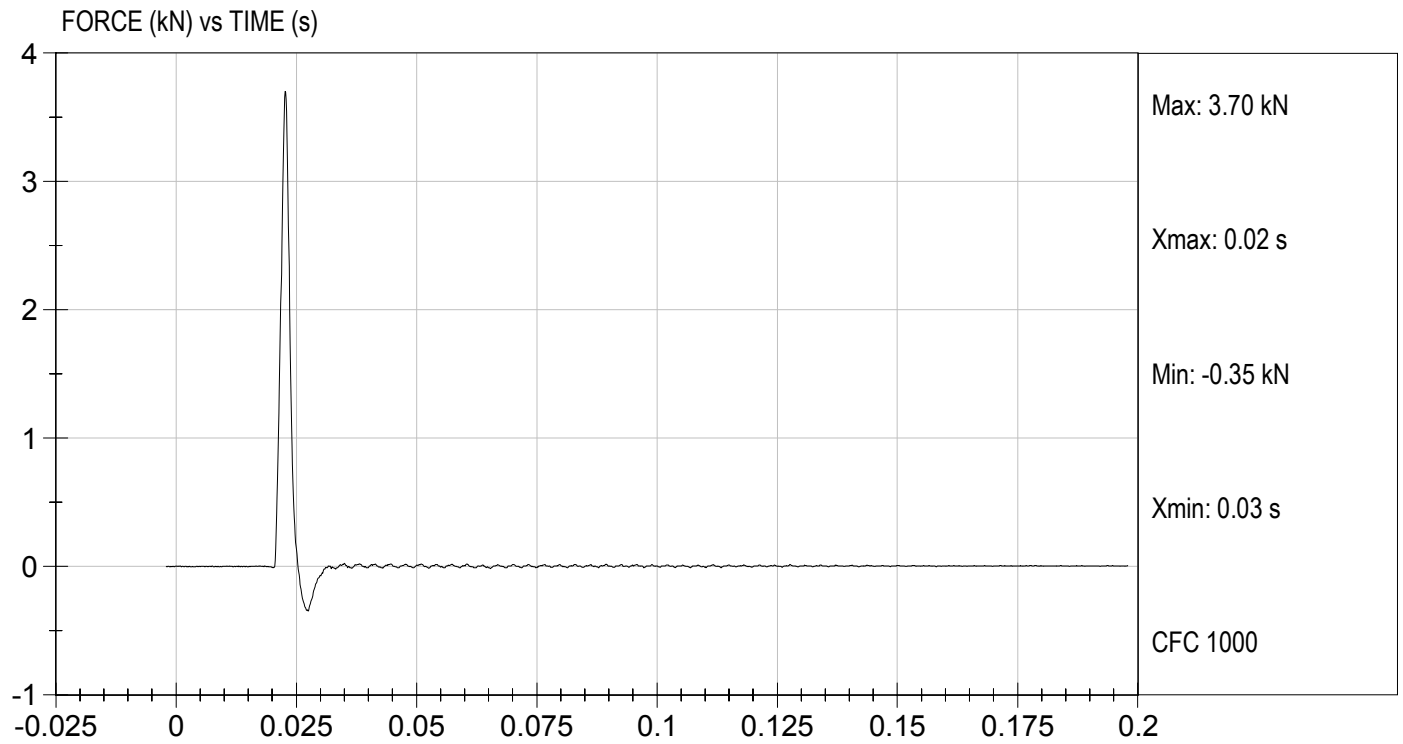
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D041926

Test Date: 08/16/2004
Velocity: 6.82 ft/s, 2.08 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 8/16/04

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.1

Record the maximum humidity 50 %

Record the minimum humidity 40 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

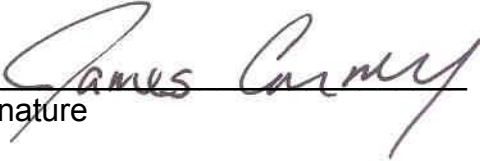
☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3670 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.


Signature

8/16/04
Date

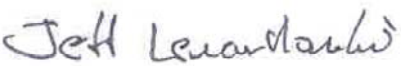
MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041925

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.67	Pass
Overall Test Results				Pass


Laboratory Technician

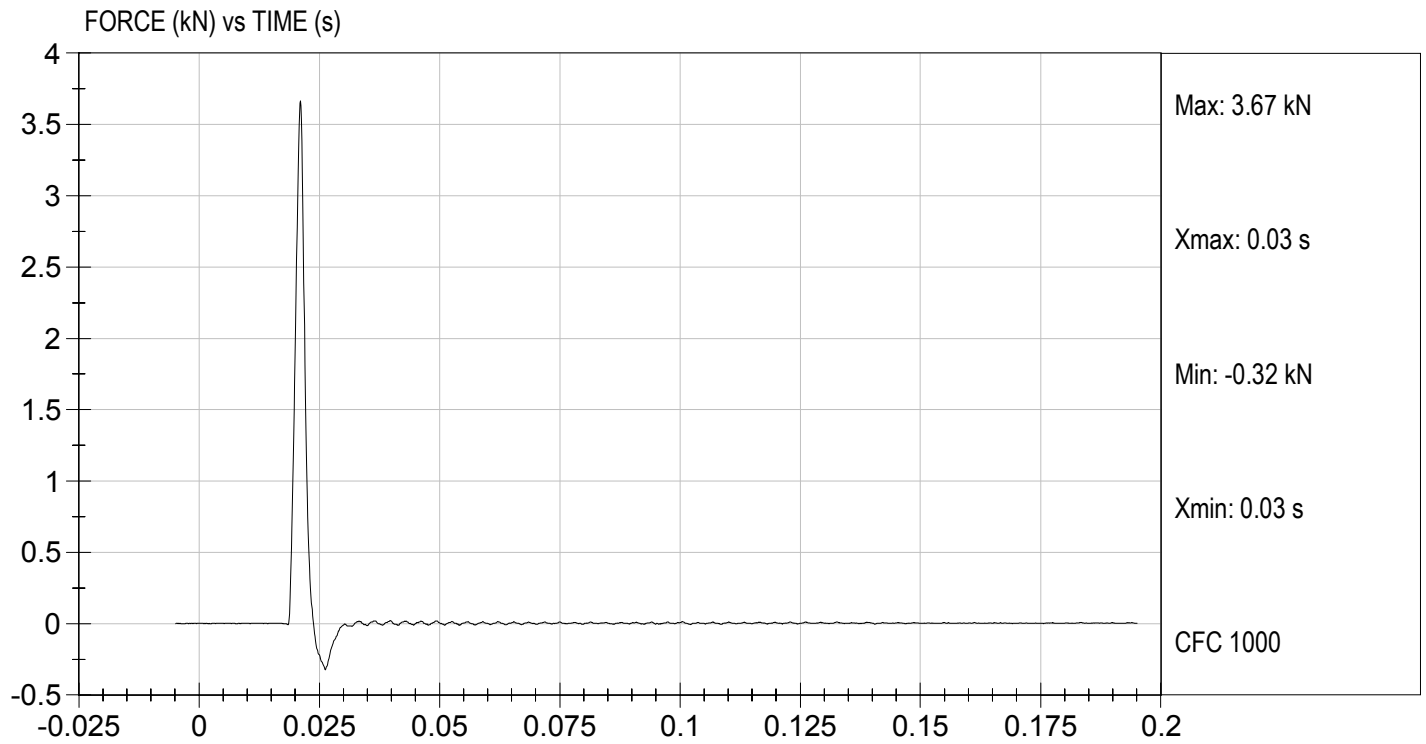

Approved By

08/16/2004
Test Date



Test Desc: Right Knee
Componet ID: D041925

Test Date: 08/16/2004
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 505 Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. 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. (572.132(c)(1))

Record the maximum temperature	<u>21.8</u>
Record the minimum temperature	<u>21.2</u>
Record the maximum humidity	<u>56%</u>
Record the minimum humidity	<u>48%</u>
- ☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 500mm

Record the left side distance 500mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	272
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	12

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

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test ID: D041991

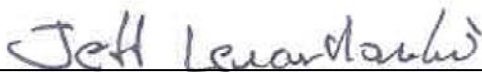
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	250 - 300	272	Pass
Peak Lateral Acceleration	G's	+/- 15	11.7	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

08/23/2004

Test Date



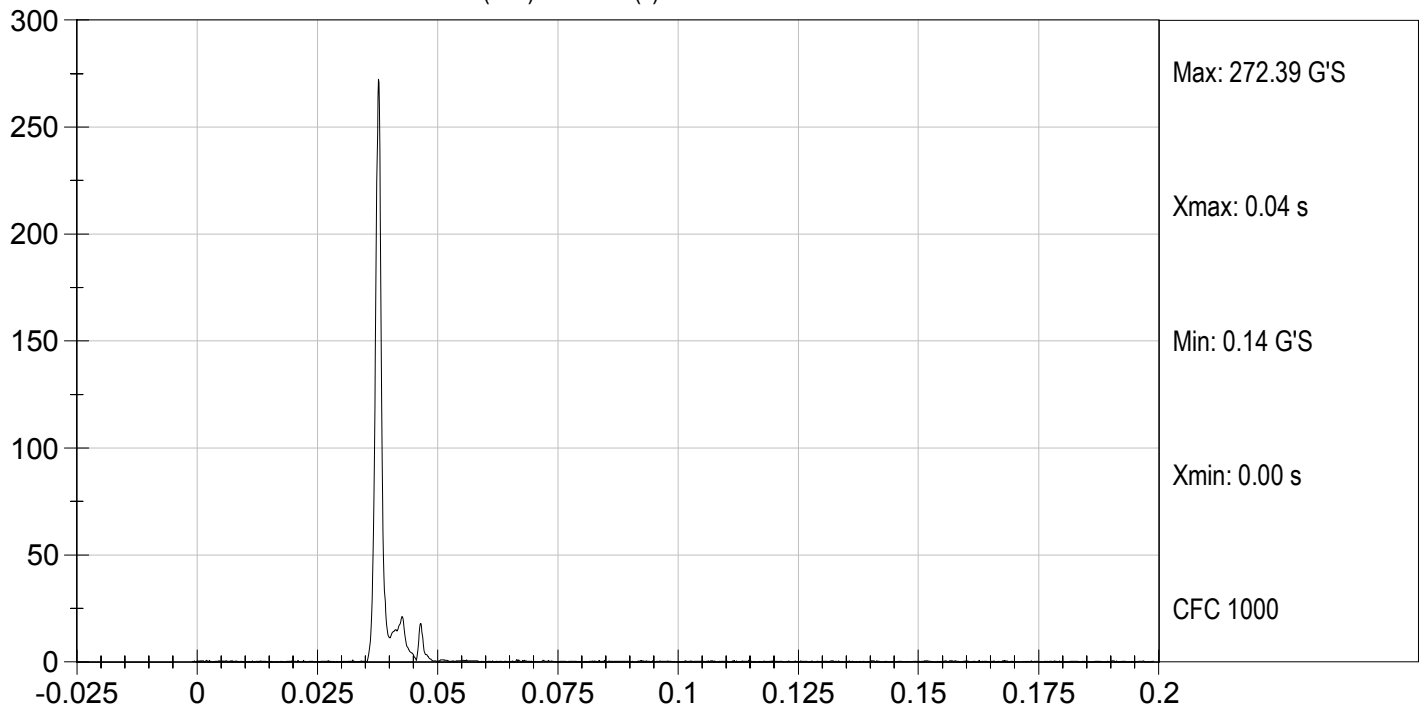
Approved By



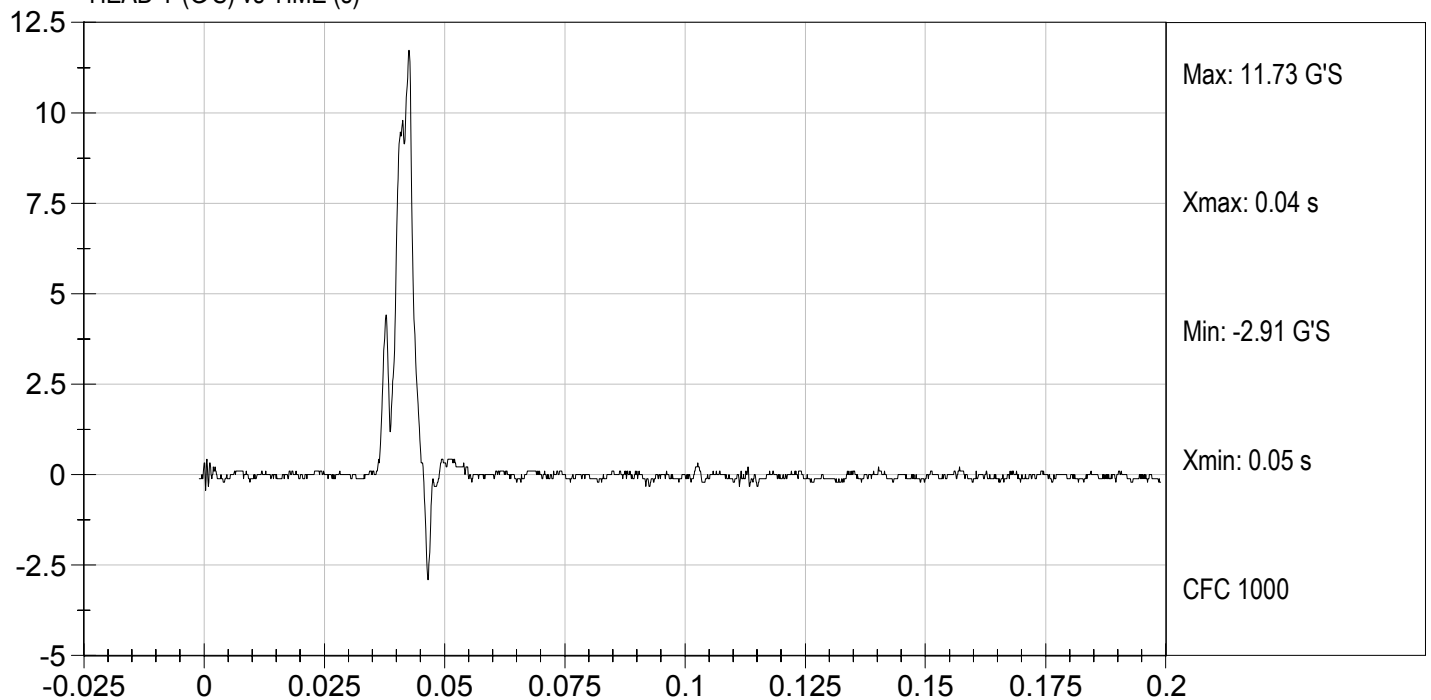
Test Desc: Head Drop
Componet ID: D041991

Test Date: 08/23/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 505 Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>56%</u> |
| Record the minimum humidity | <u>48%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness: Front 85; Back 88.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.5 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.9 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.8 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>78</u> Nm @ <u>79</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	86 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041992

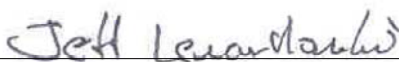
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.9	Pass
	30 msec	m/sec	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	78	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	86	Pass
Overall Results				Pass	



Laboratory Technician

08/23/2004

Test Date



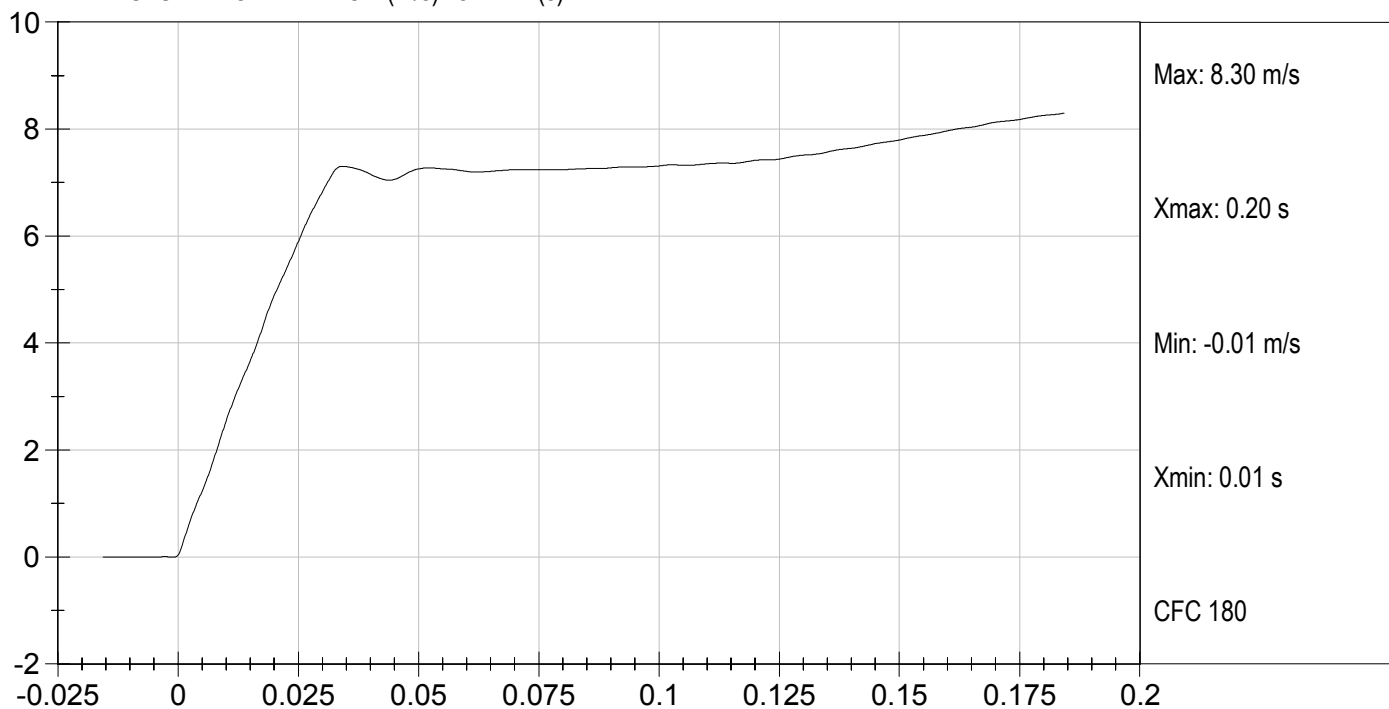
Approved By



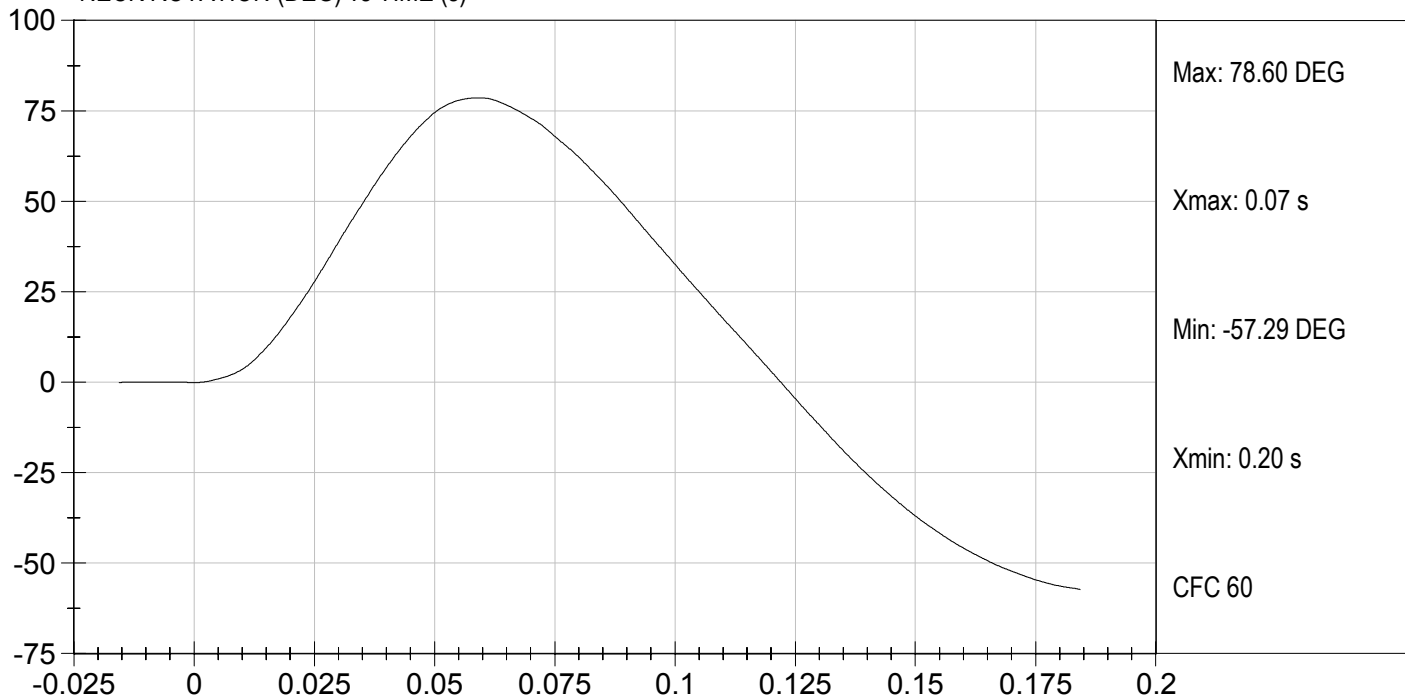
Test Desc: Neck Flexion
Componet ID: D041992

Test Date: 08/23/2004
Velocity: 23.18 ft/s, 7.07 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



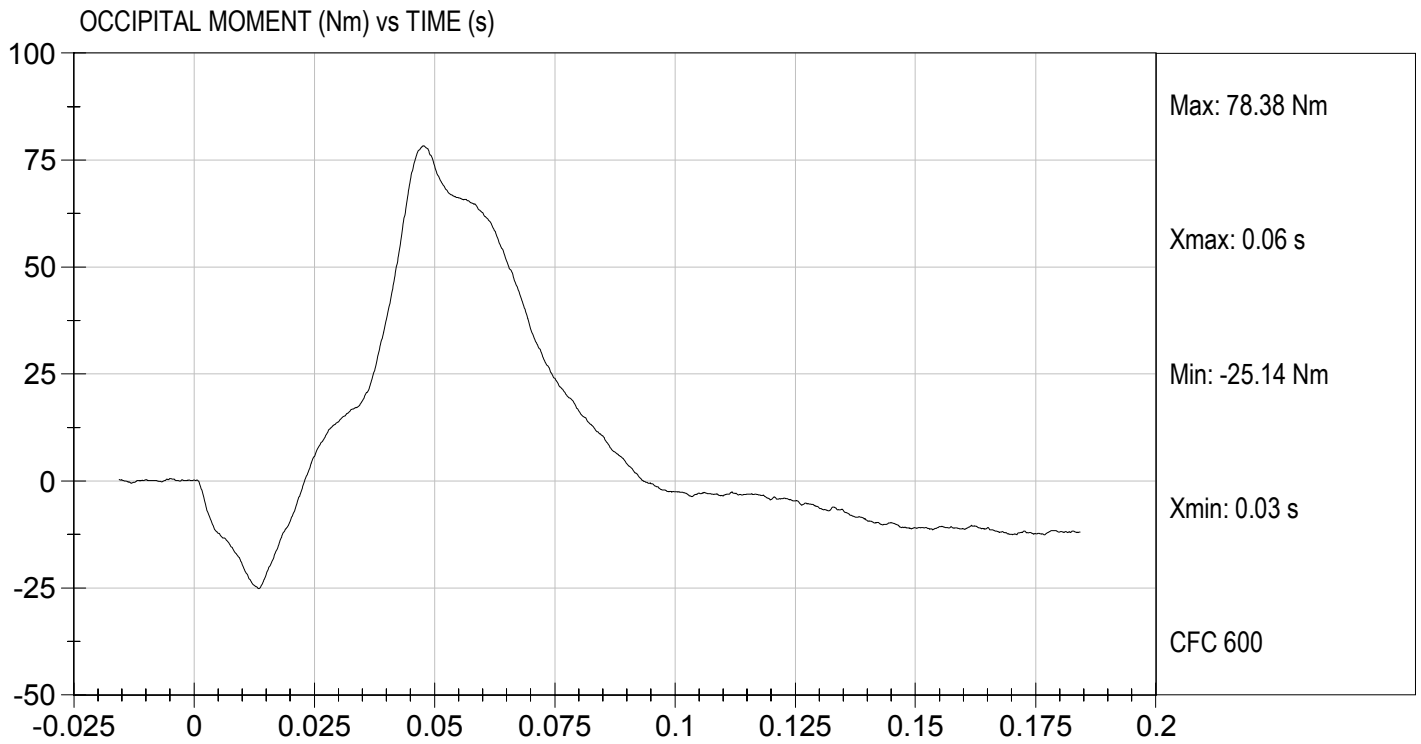
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D041992

Test Date: 08/23/2004
Velocity: 23.18 ft/s, 7.07 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 505 Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one extension test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>56%</u> |
| Record the minimum humidity | <u>48%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness: Front 85; Back 88.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.11 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.7 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.2 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-55</u> Nm @ <u>105</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	101 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041993

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.11	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	105	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	101	Pass
Overall Results					Pass



Laboratory Technician

08/23/2004

Test Date

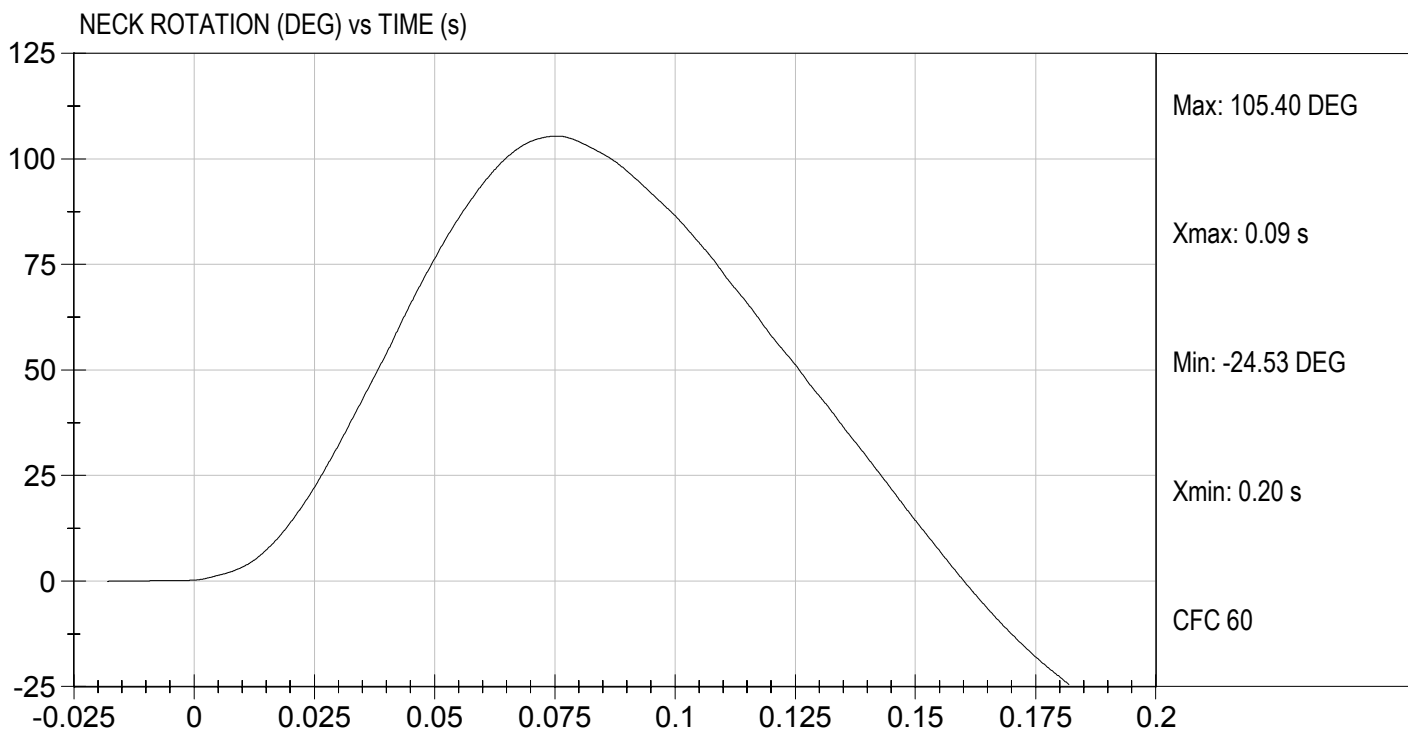
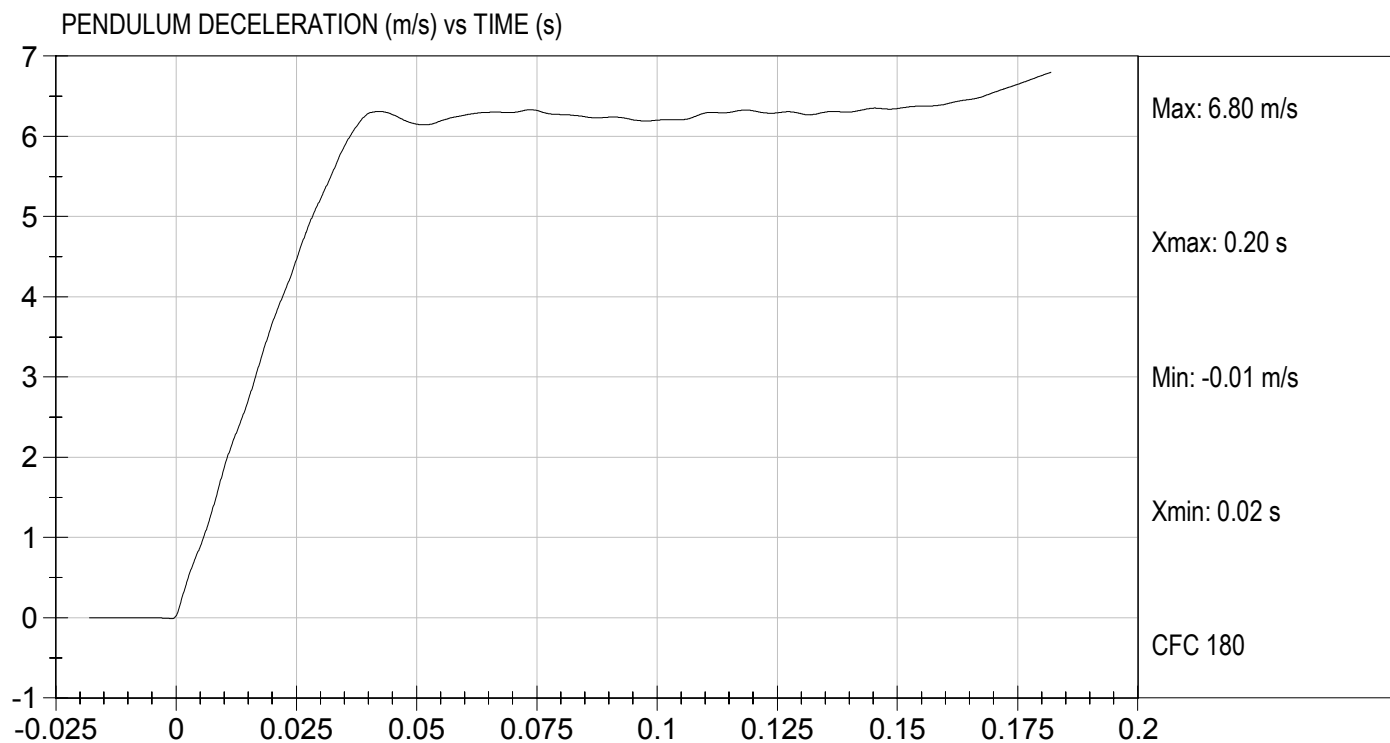


Approved By



Test Desc: Neck Extension
Componet ID: D041993

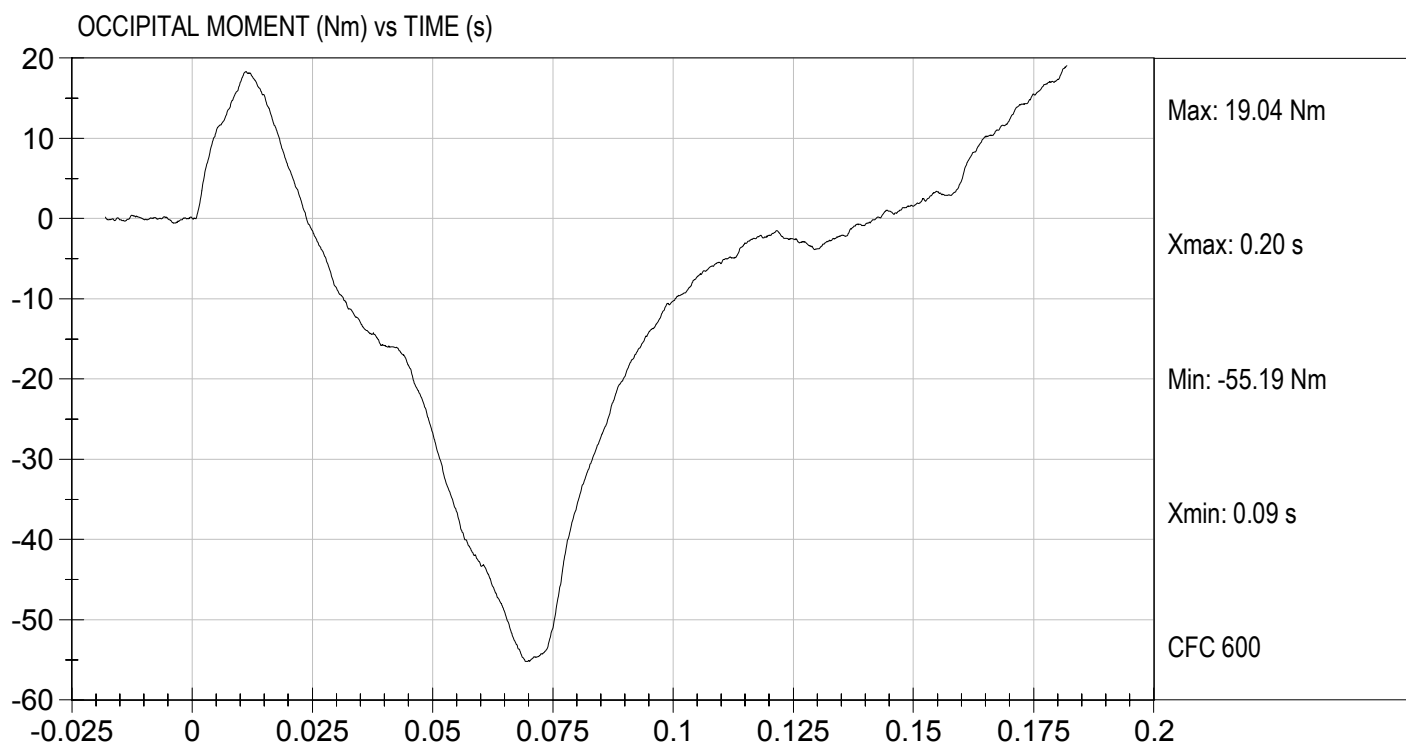
Test Date: 08/23/2004
Velocity: 20.05 ft/s, 6.11 m/s





Test Desc: Neck Extension
Componet ID: D041993

Test Date: 08/23/2004
Velocity: 20.05 ft/s, 6.11 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 505

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 22.0

Record the minimum temperature 21.2

Record the maximum humidity 60%

Record the minimum humidity 51%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.65 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4260 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4256 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Flack
Signature

8/24/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

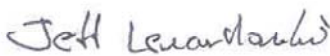
ATD Serial No: 505

Test I.D: D041994

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	55	Pass
Probe Speed	m/s	6.59 to 6.83	6.65	Pass
Peak Deflection	mm	50 to 58	52.5	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.3	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4256	Pass
			Overall Test Results	Pass


 Laboratory Technician

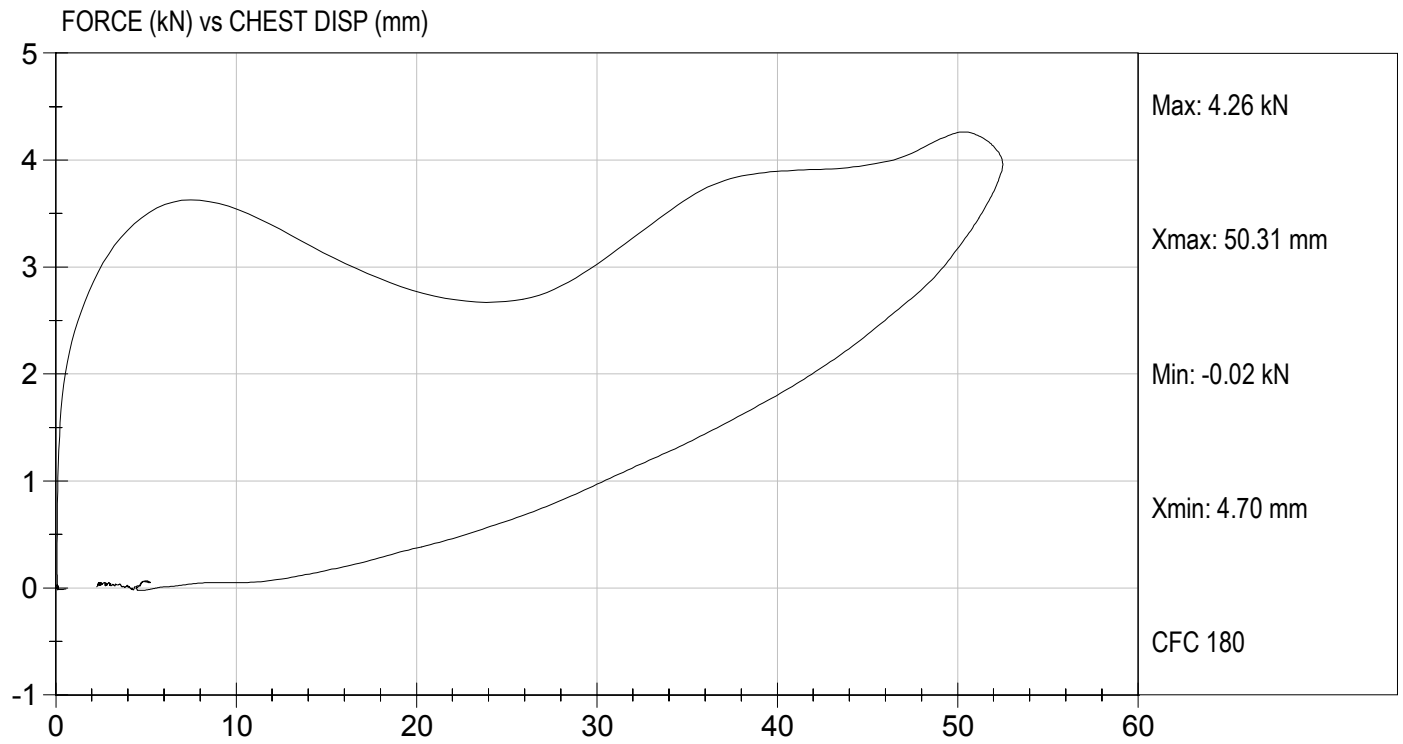
08/24/2004
 Test Date


 Approved By



Test Desc: Thorax Impact
Componet ID: D041994

Test Date: 08/24/2004
Velocity: 21.81 ft/s, 6.65 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 505

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 20.2

Record the maximum humidity 56%

Record the minimum humidity 49%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 19°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	19°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	352 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	23°

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041997

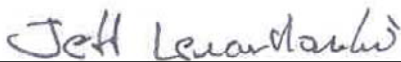
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	23	Pass
Force at 45 deg	N	320 to 390	352	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result				Pass



Laboratory Technician

08/23/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 56%

Record the minimum humidity 48%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3770 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041996

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.77	Pass
Overall Test Results				Pass



Laboratory Technician

08/23/2004

Test Date

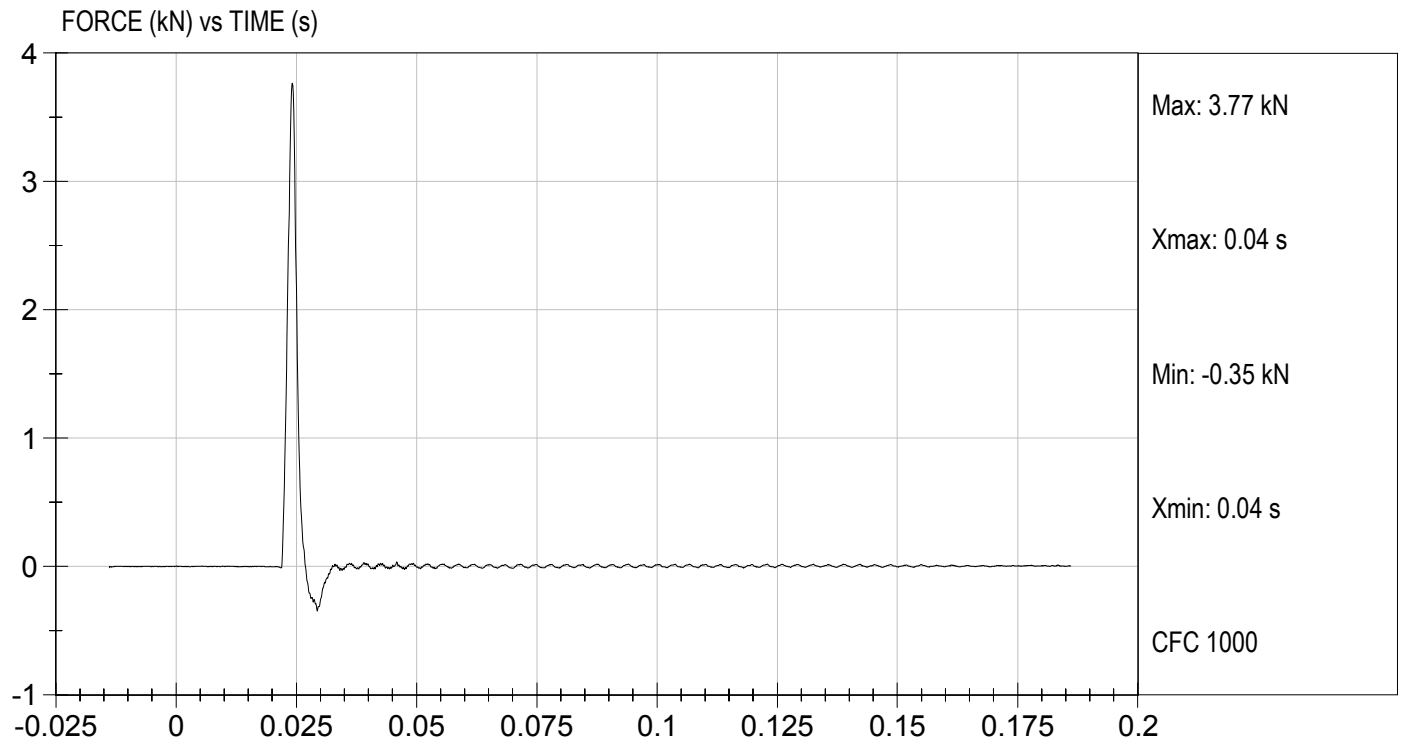


Approved By



Test Desc: Left Knee
Componet ID: D041996

Test Date: 08/23/2004
Velocity: 6.94 ft/s, 2.12 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 2 (when successive knee impact tests are necessary)

☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☐ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 56 %

Record the minimum humidity 48 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3620 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D041995

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.62	Pass
Overall Test Results				Pass



Laboratory Technician

08/23/2004

Test Date

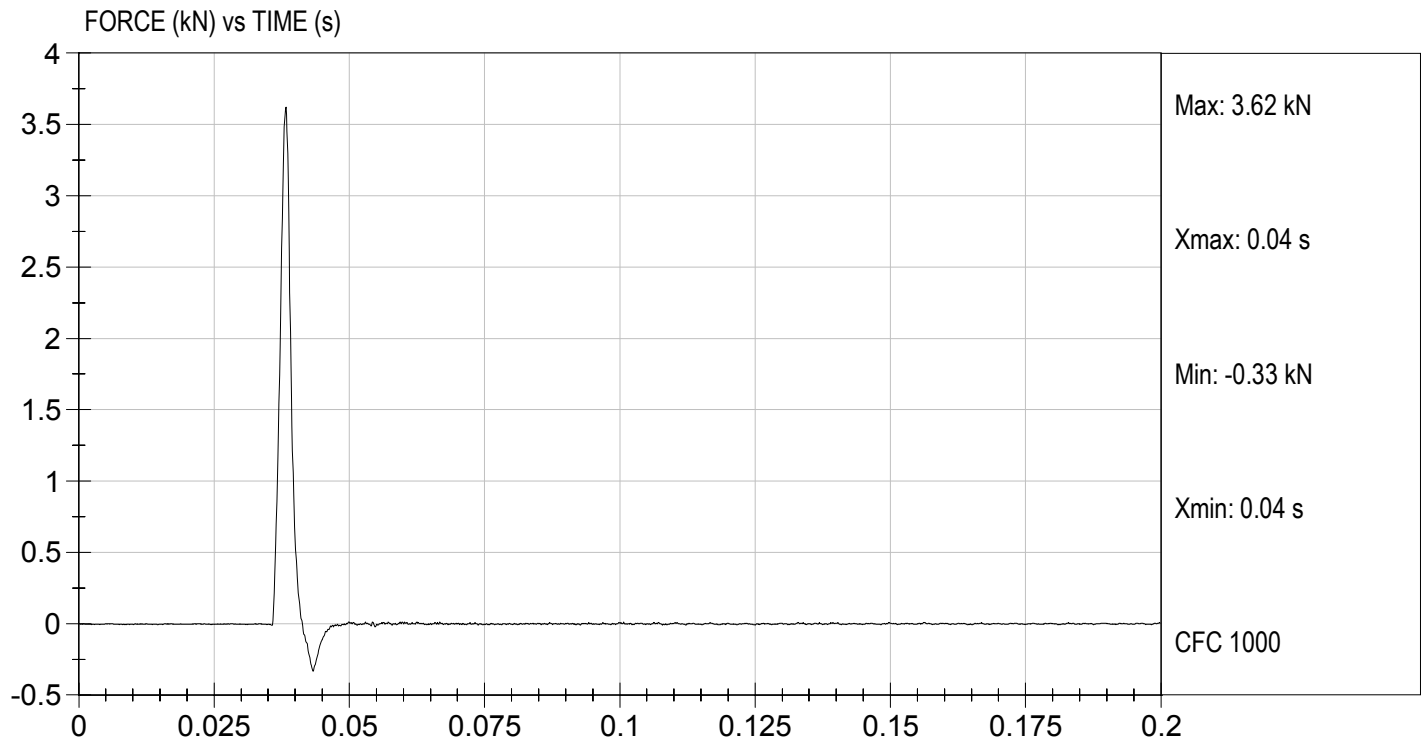


Approved By



Test Desc: Right Knee
Componet ID: D041995

Test Date: 08/23/2004
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 505

Test Date 8/23/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

8/23/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

8/23/04
Date

EXTERNAL DIMENSIONS

SN505, 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.	774.7-800.1	783.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	438.0
C	H-POINT HEIGHT	Reference	81.3-86.3	84.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.4
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	124.3
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.3
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	46.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	283.4
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	532.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	405.2
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	421.6

SN505, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	182.4
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	473.7
S	HEAD BREADTH	The widest part of the head	137.1-147.3	144.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	305.7
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	362.4
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	84.3
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	533.7
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	863.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	773.6
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

EXTERNAL DIMENSIONS

SN516, 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.	774.7-800.1	785.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	454.9
C	H-POINT HEIGHT	Reference	81.3-86.3	83.5
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	81.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	252.0
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.5
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	282.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.1
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	525.9
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	357.7
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	396.0
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	421.2

SN516, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	176.8
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	472.1
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.7
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	180.1
U	HIP BREADTH	The widest part of the hip	299.7-314.9	310.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	357.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.5
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	539.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	863.2
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	784.4
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	342.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	163.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 516 Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. 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. (572.132(c)(1))

Record the maximum temperature	<u>21.7</u>
Record the minimum temperature	<u>20.6</u>
Record the maximum humidity	<u>54%</u>
Record the minimum humidity	<u>48%</u>
- ☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 502mm

Record the left side distance 501mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	269
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	8

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


Signature

8/18/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test ID: D041961

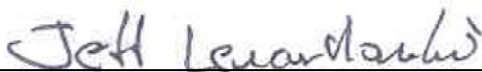
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	250 - 300	269	Pass
Peak Lateral Acceleration	G's	+/- 15	7.6	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

08/18/2004

Test Date



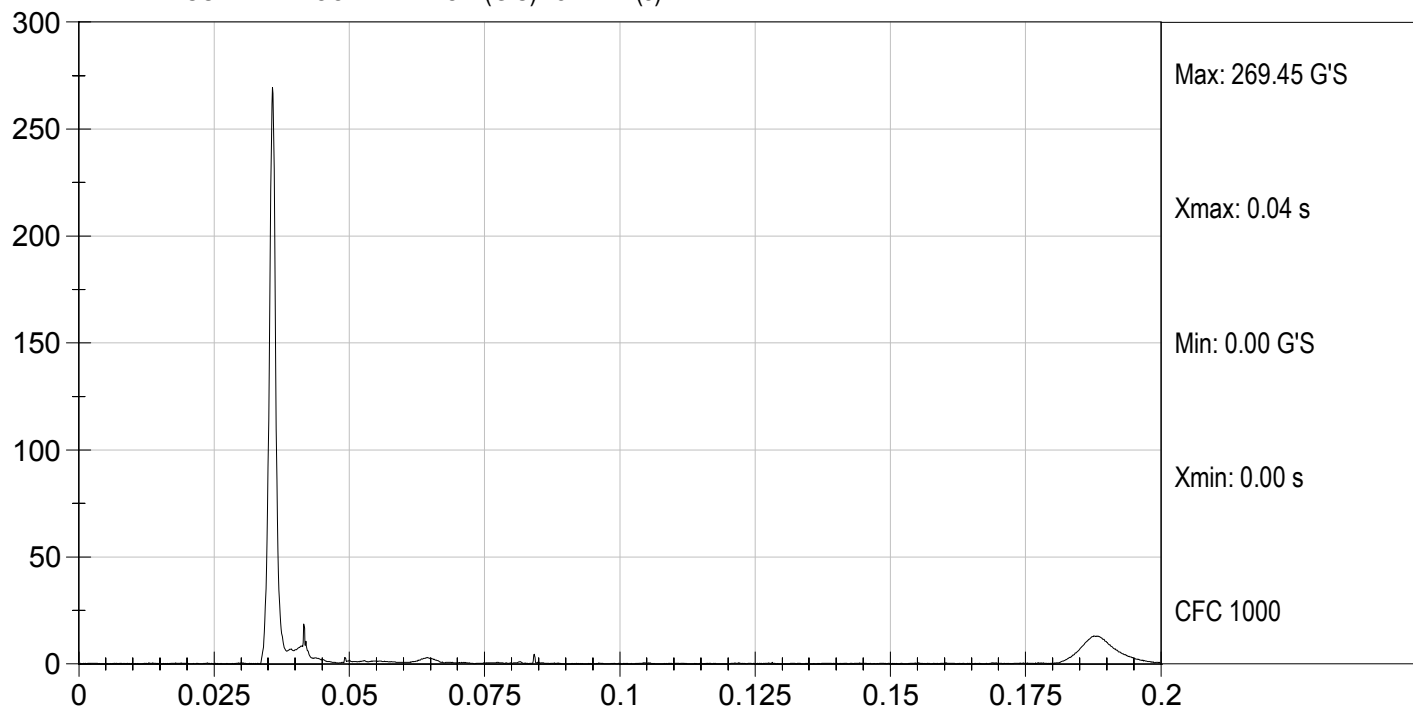
Approved By



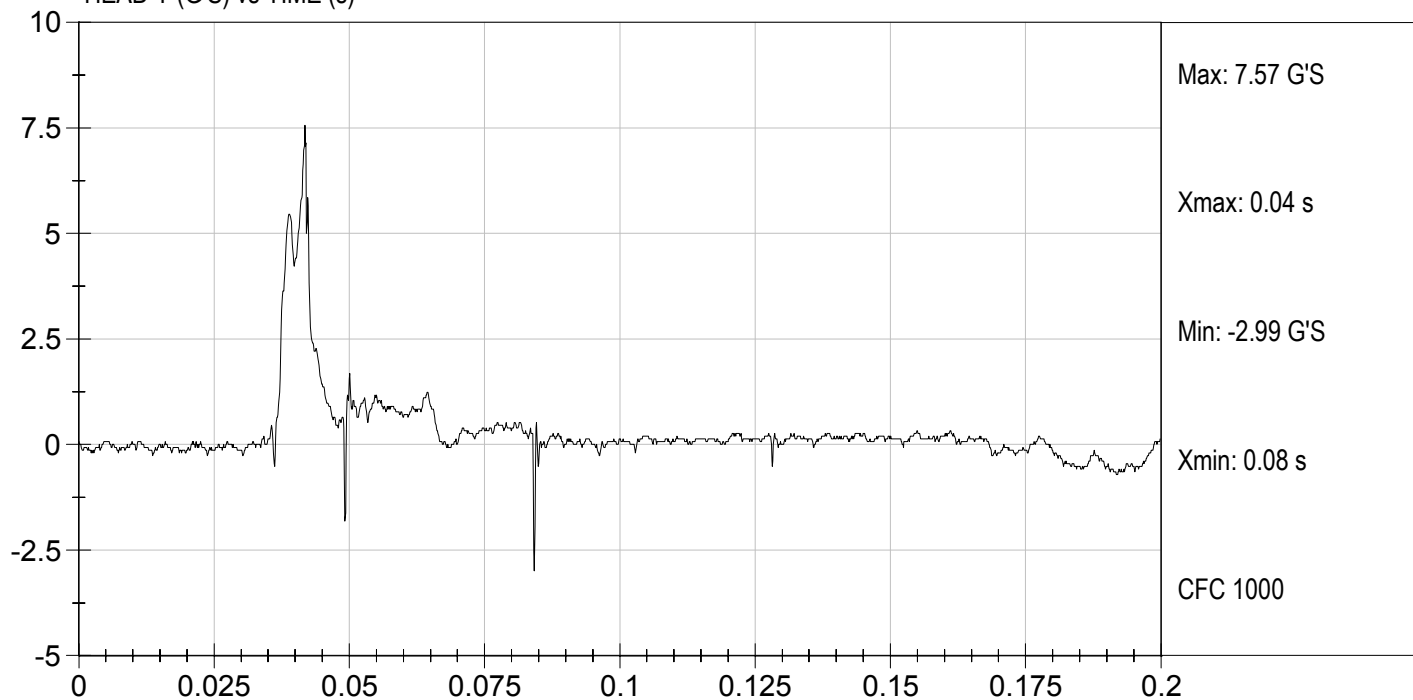
Test Desc: Head Drop
Componet ID: D041961

Test Date: 08/18/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 516

Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))

☒ N/A, ONLY one flexion test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.6

Record the maximum humidity 54%

Record the minimum humidity 48%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 89; Back 89.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	6.95 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.5 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.8 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.6 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>80</u> Nm @ <u>80</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	84 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Flores
Signature

8/18/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D041962

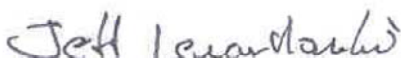
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Speed		m/sec	6.89 to 7.13	6.95	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	80	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	84	Pass
Overall Results					Pass



Laboratory Technician

08/18/2004

Test Date

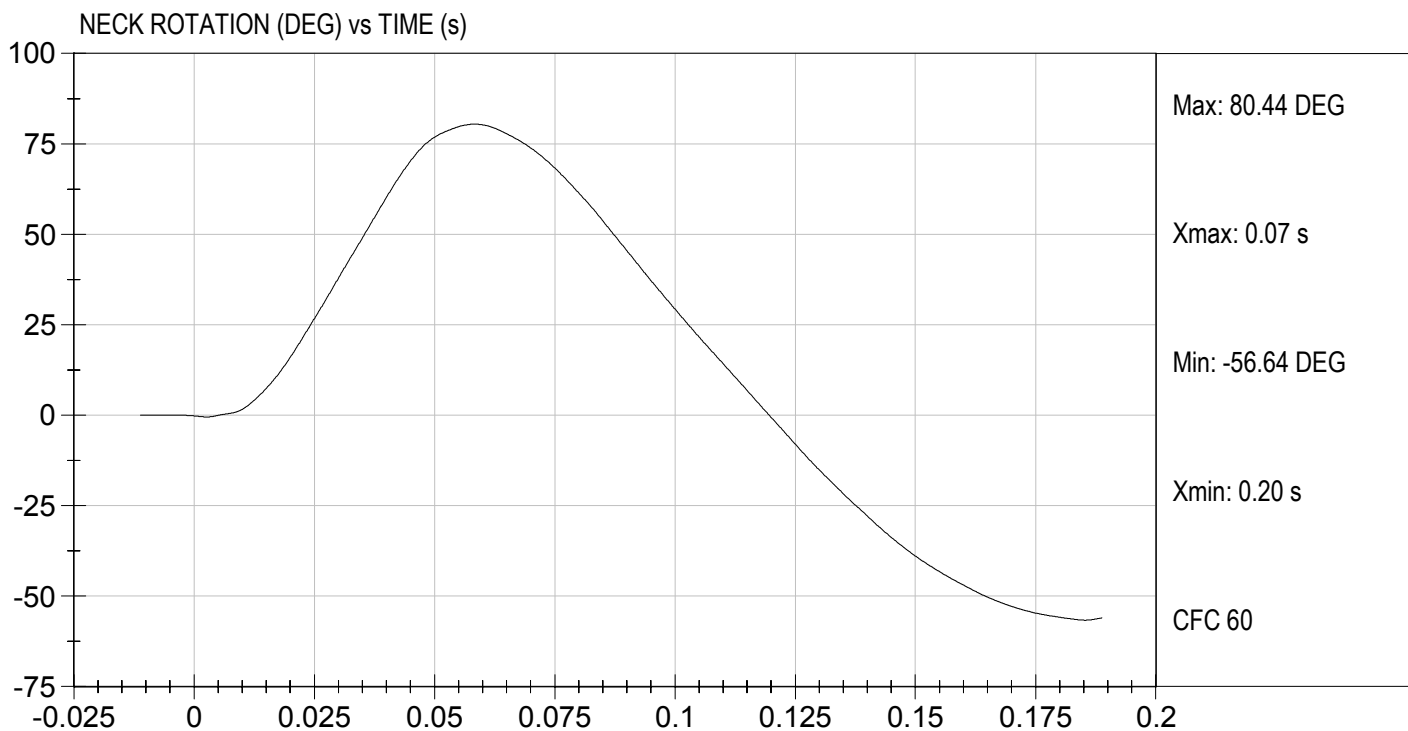
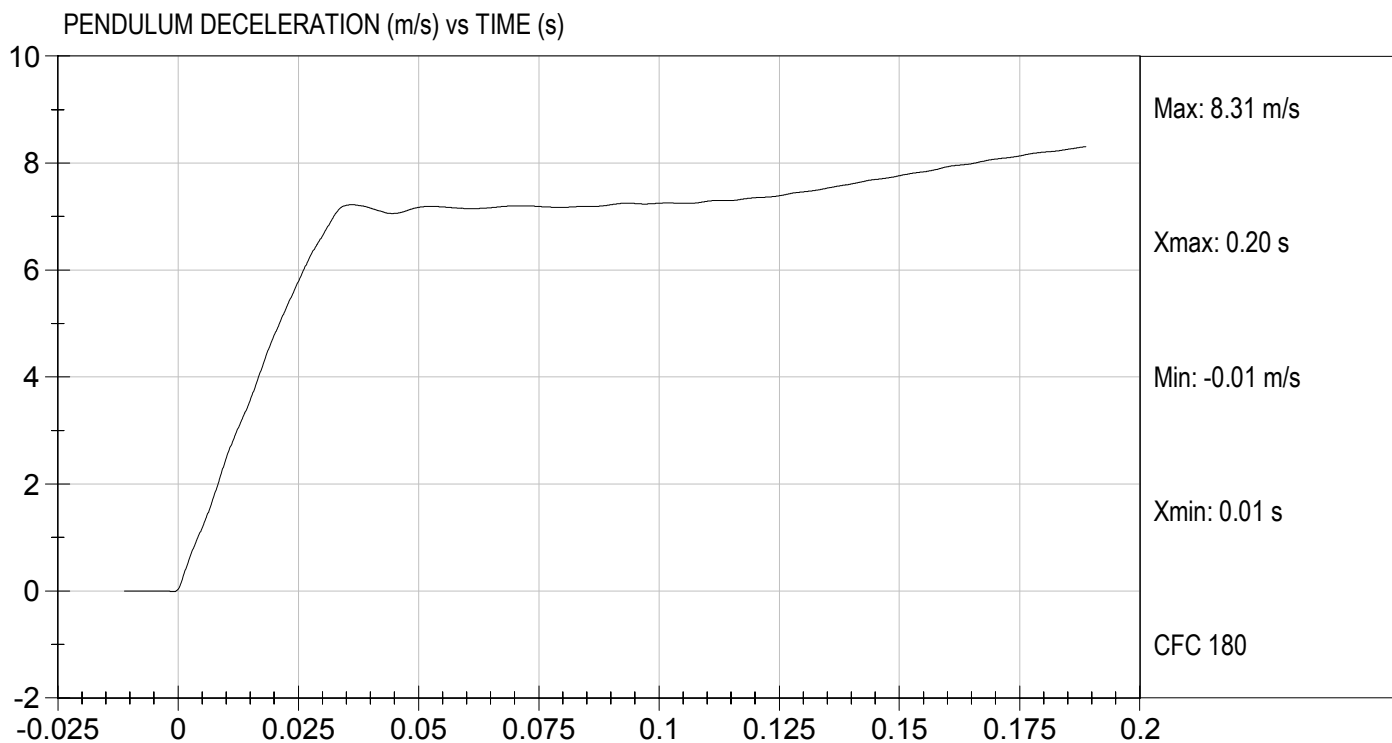


Approved By



Test Desc: Neck Flexion
Componet ID: D041962

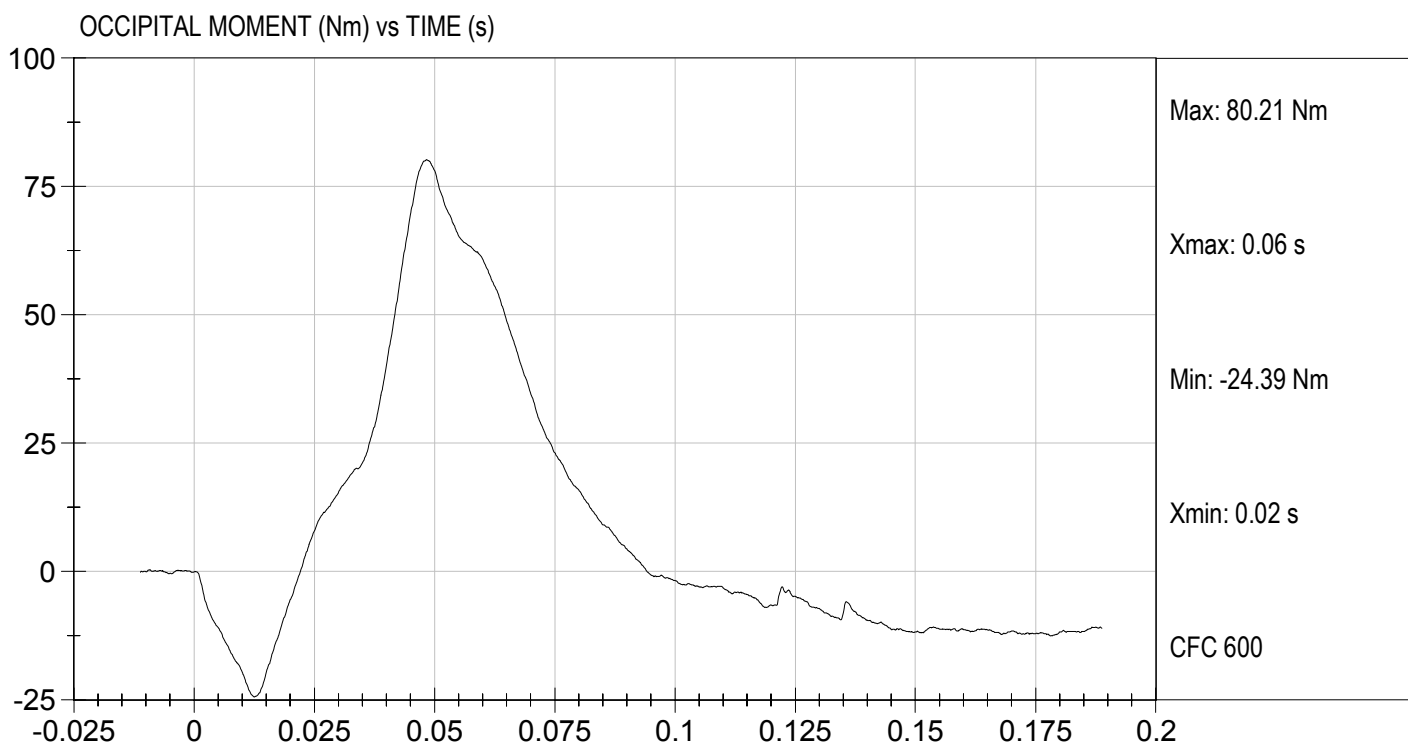
Test Date: 08/18/2004
Velocity: 22.8 ft/s, 6.95 m/s





Test Desc: Neck Flexion
Componet ID: D041962

Test Date: 08/18/2004
Velocity: 22.8 ft/s, 6.95 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 516

Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.6

Record the maximum humidity 54%

Record the minimum humidity 48%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 89; Back 89.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.09 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.8 m/s
	@ 30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.5 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-61</u> Nm @ <u>110</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	96 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

8/18/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D041963

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.09	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.8	Pass
	30 msec	m/sec	4.6 to 5.6	5.5	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-61	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	96	Pass
Overall Results					Pass



Laboratory Technician

08/18/2004

Test Date

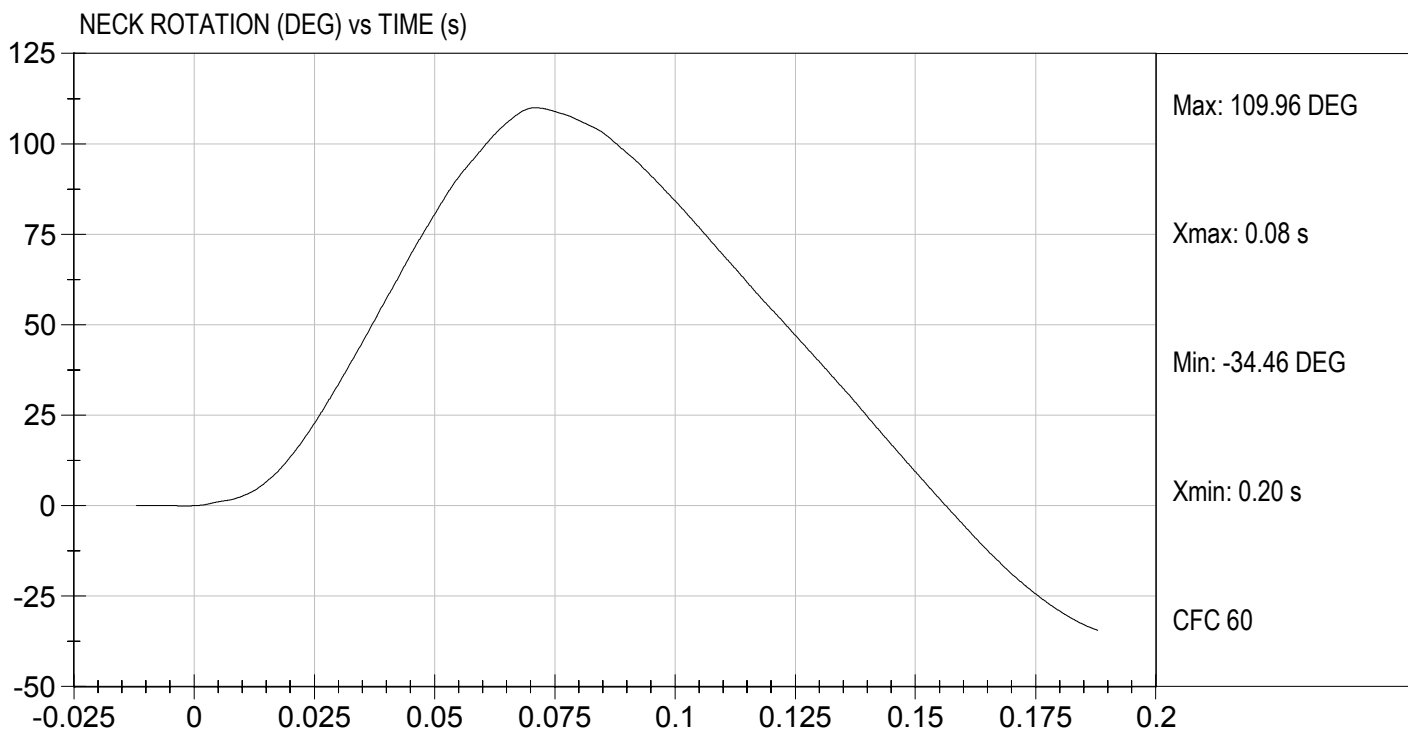
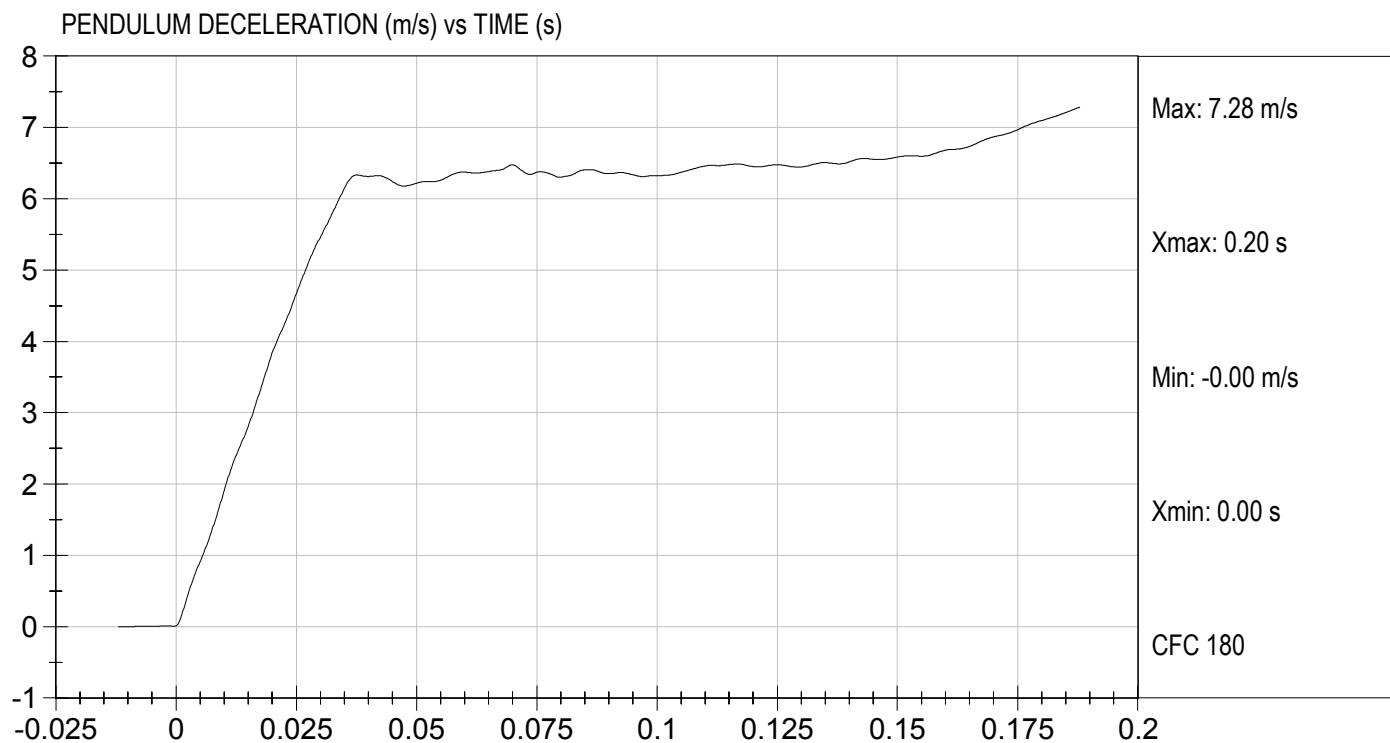


Approved By



Test Desc: Neck Extension
Componet ID: D041963

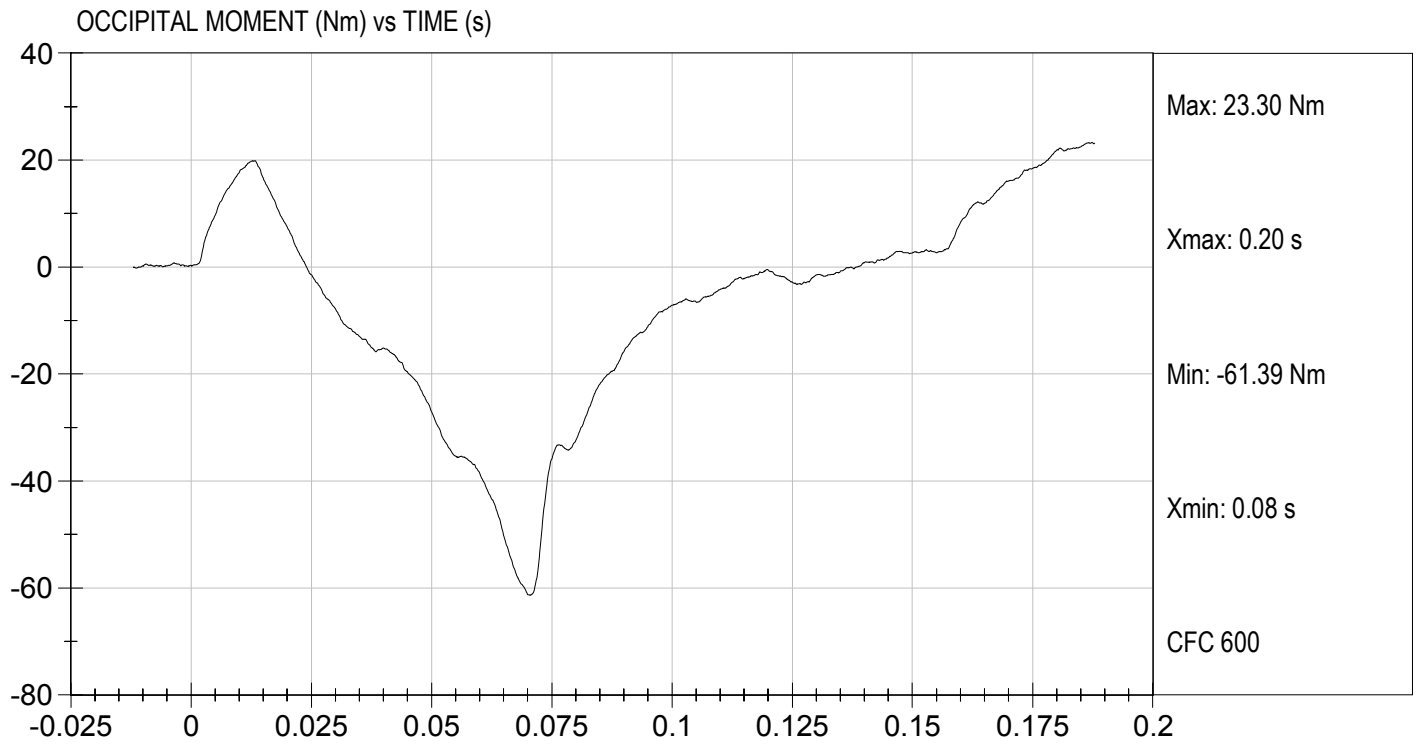
Test Date: 08/18/2004
Velocity: 19.98 ft/s, 6.09 m/s





Test Desc: Neck Extension
Componet ID: D041963

Test Date: 08/18/2004
Velocity: 19.98 ft/s, 6.09 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 516

Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 21.7

Record the minimum temperature 20.6

Record the maximum humidity 54%

Record the minimum humidity 48%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.82 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	51 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4120 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4120 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Flores
Signature

8/18/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D041964

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.6	Pass
Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	6.59 to 6.83	6.82	Pass
Peak Deflection	mm	50 to 58	51.1	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.1	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4120	Pass
Overall Test Results				Pass



Laboratory Technician

08/18/2004

Test Date

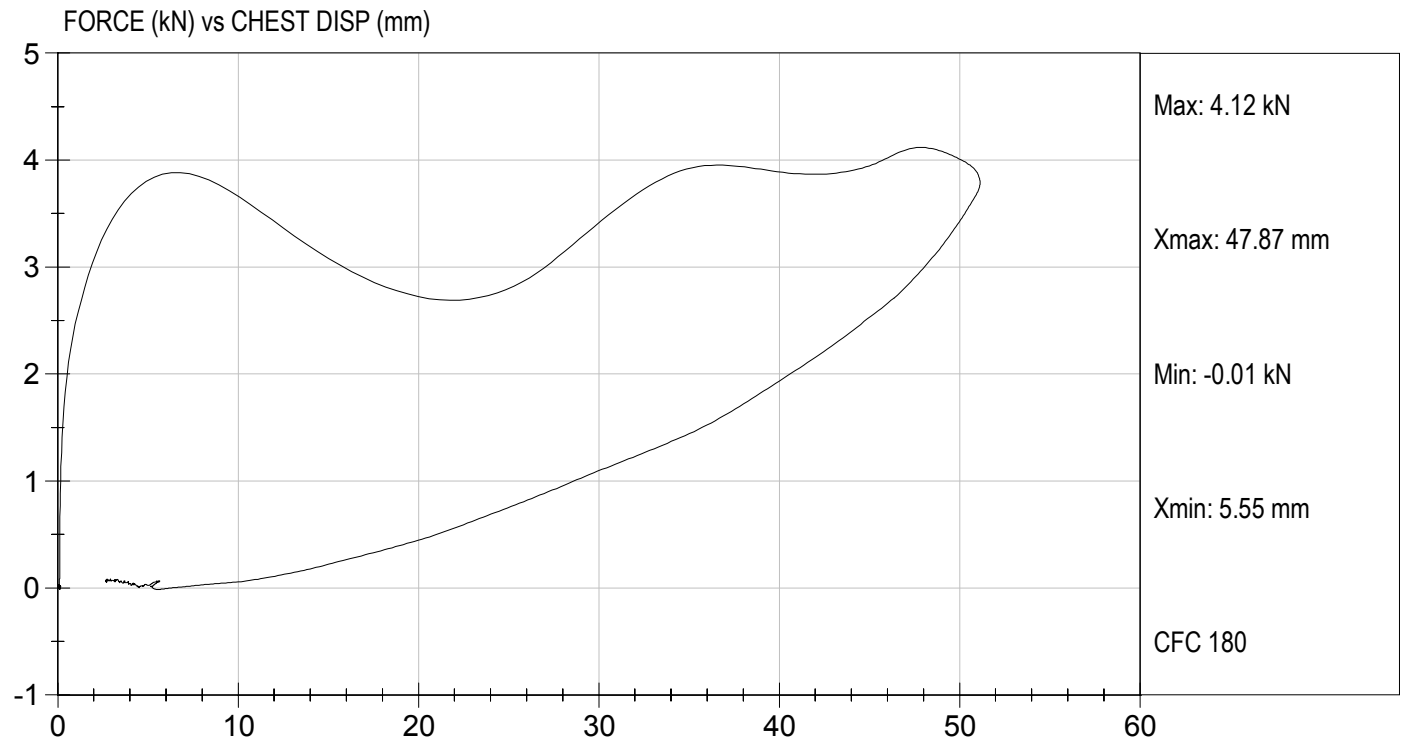


Approved By



Test Desc: Thorax Impact
Componet ID: D041964

Test Date: 08/18/2004
Velocity: 22.38 ft/s, 6.82 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 516

Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.6

Record the maximum humidity 54%

Record the minimum humidity 48%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 19°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	19°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	341 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	21°

Joe Fleck
Signature

8/18/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D041967

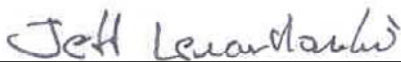
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	21	Pass
Force at 45 deg	N	320 to 390	341	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result			Pass	



Laboratory Technician

08/18/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.6

Record the maximum humidity 54%

Record the minimum humidity 48%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3820 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

8/18/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D041966

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.82	Pass
Overall Test Results				Pass



Laboratory Technician

08/18/2004

Test Date

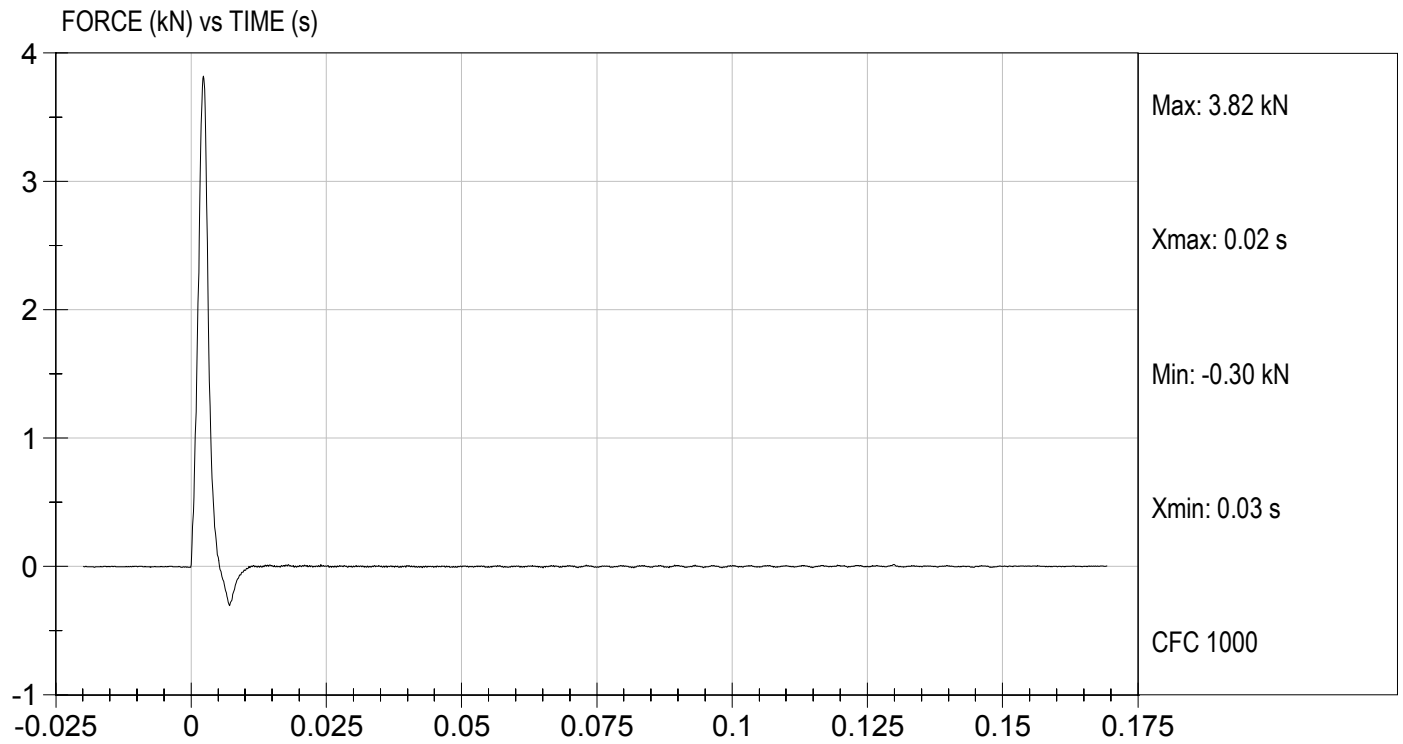


Approved By



Test Desc: Left Knee
Componet ID: D041966

Test Date: 08/18/2004
Velocity: 6.94 ft/s, 2.12 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 8/18/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.6

Record the maximum humidity 54 %

Record the minimum humidity 48 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3880 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

8/18/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D041965

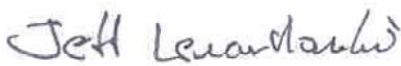
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.88	Pass
Overall Test Results				Pass



Laboratory Technician

08/18/2004

Test Date

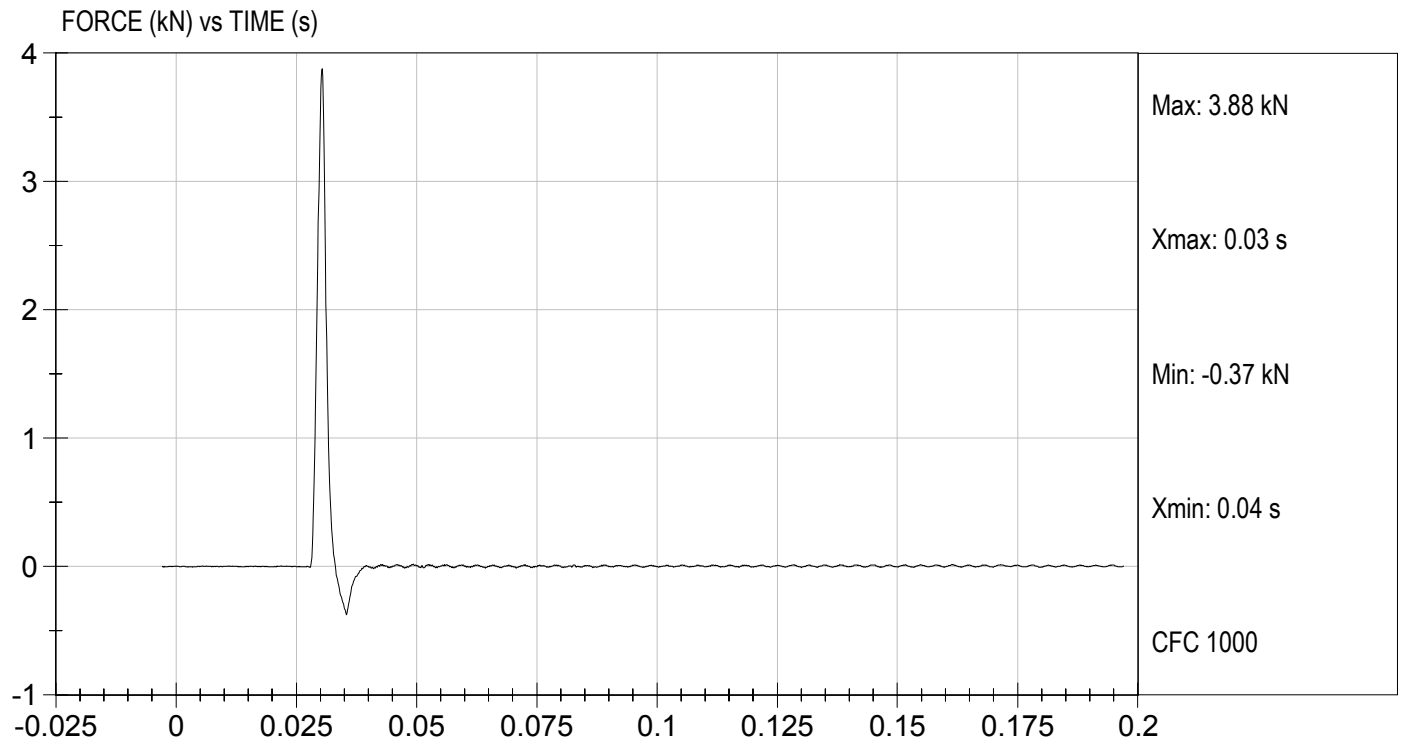


Approved By



Test Desc: Right Knee
Componet ID: D041965

Test Date: 08/18/2004
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 516

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))

☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

☒ 4. Accelerometers and their respective mounts are smooth and clean.

☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))

☒ 7. 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. (572.132(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 54%

Record the minimum humidity 50%

☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 500mm

Record the left side distance 501mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	281
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	11

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

Joe Flores
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test ID: D042001

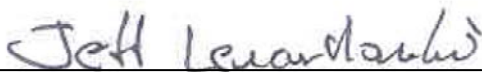
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	250 - 300	281	Pass
Peak Lateral Acceleration	G's	+/- 15	11.1	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

08/23/2004

Test Date



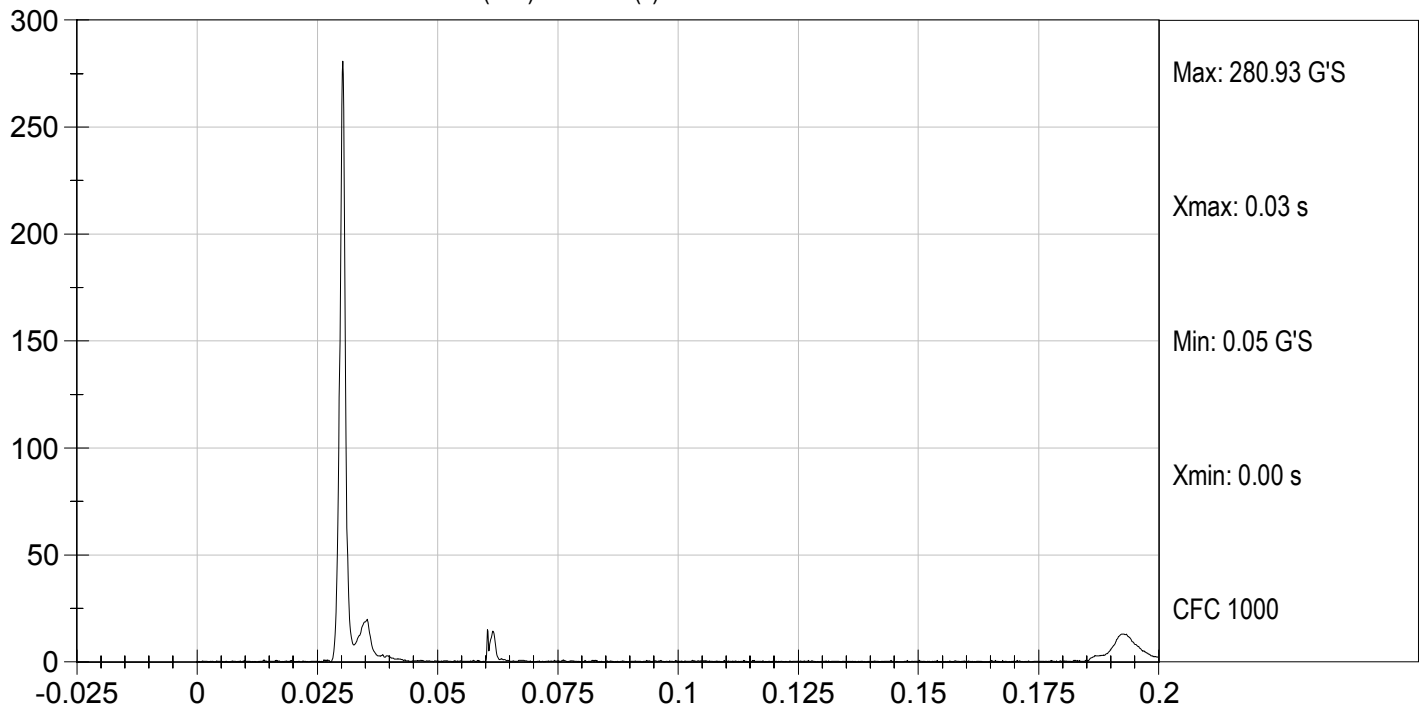
Approved By



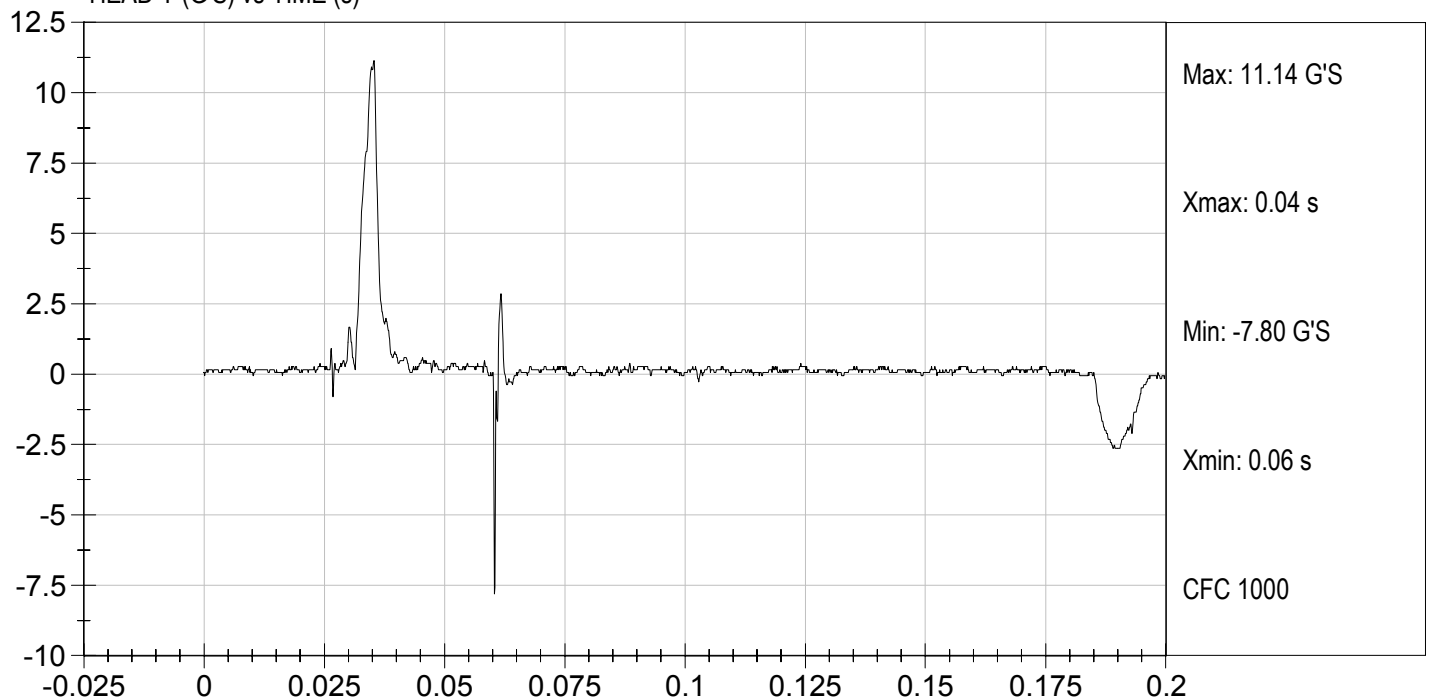
Test Desc: Head Drop
Componet ID: D042001

Test Date: 08/23/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 516

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))

☒ N/A, ONLY one flexion test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 54%

Record the minimum humidity 50%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 89; Back 89.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.12 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.5 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.8 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.8 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>78</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	84 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042002

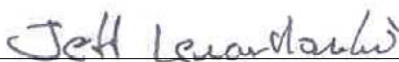
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.12	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	78	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	84	Pass
Overall Results				Pass	



Laboratory Technician

08/23/2004

Test Date

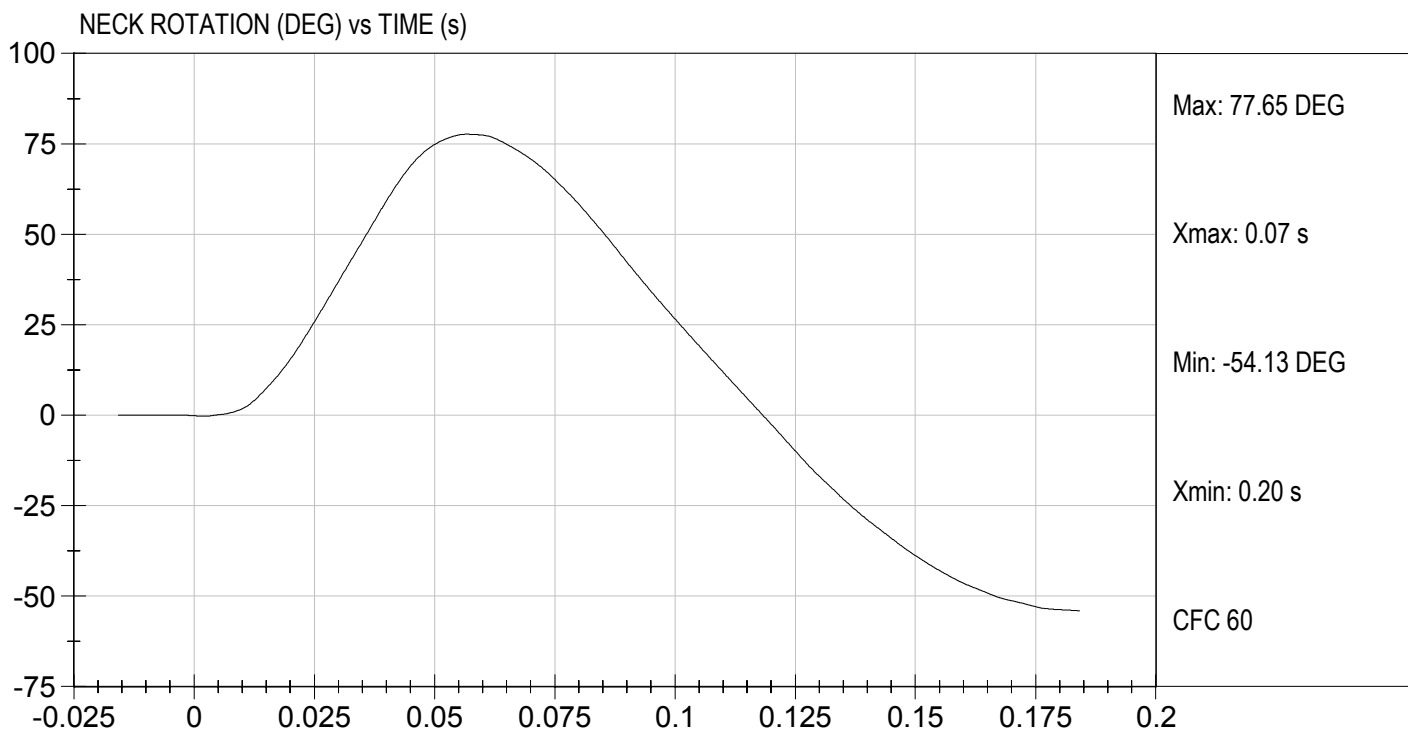
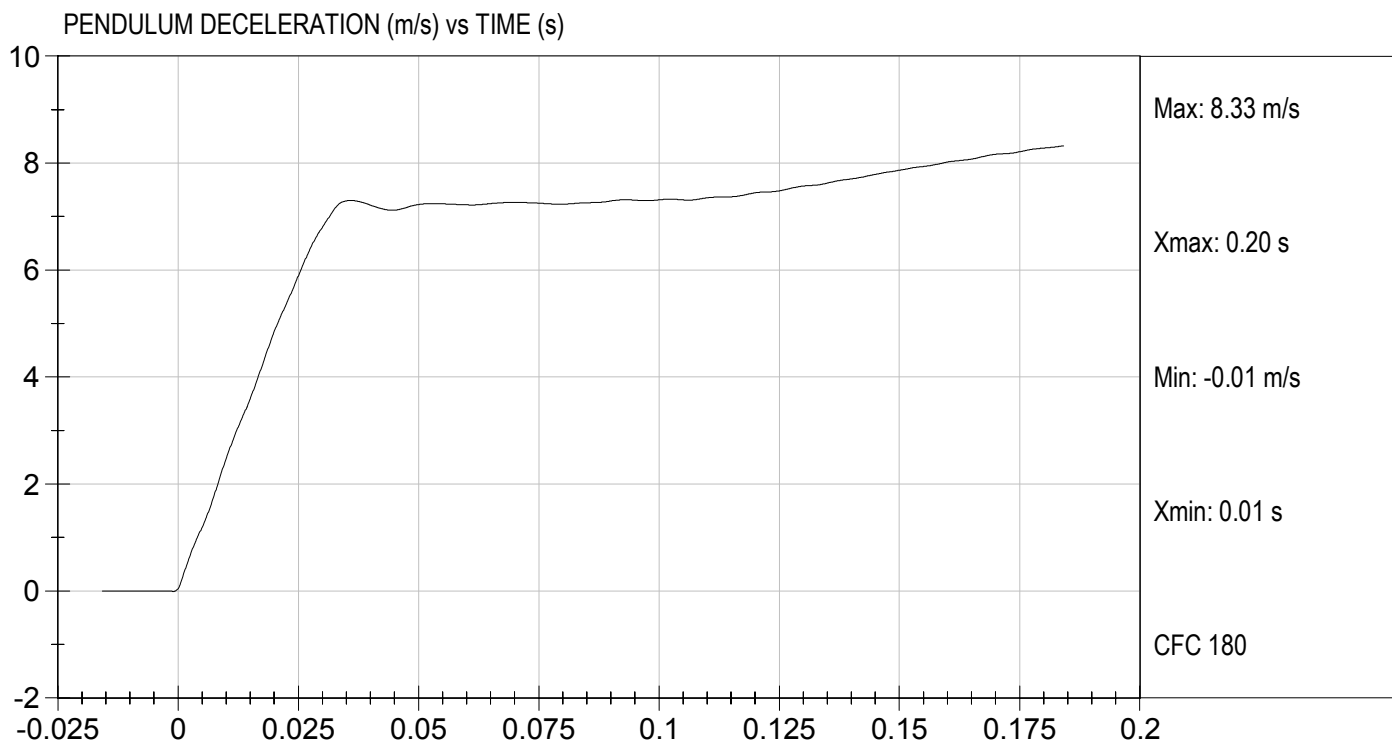


Approved By



Test Desc: Neck Flexion
Componet ID: D042002

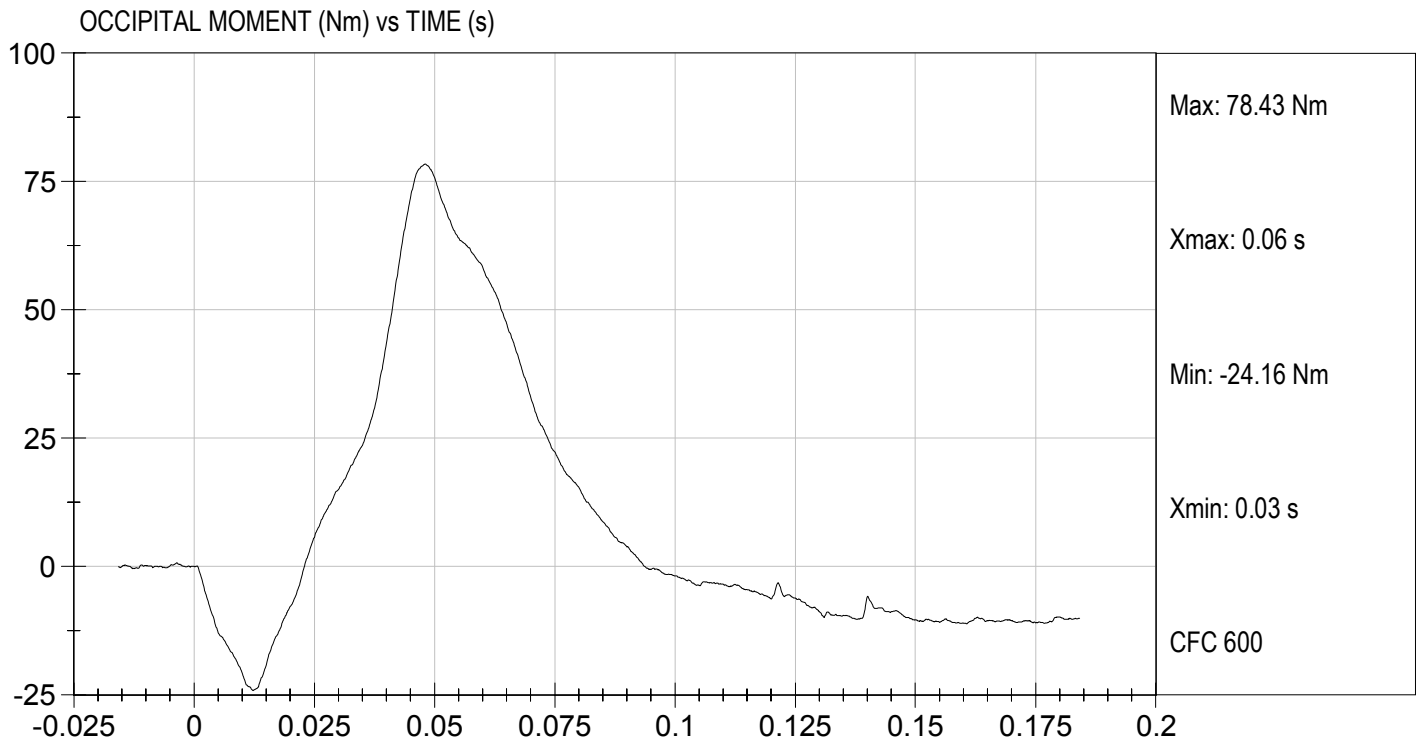
Test Date: 08/23/2004
Velocity: 23.35 ft/s, 7.12 m/s





Test Desc: Neck Flexion
Componet ID: D042002

Test Date: 08/23/2004
Velocity: 23.35 ft/s, 7.12 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 516 Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one extension test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))

Record the maximum temperature	<u>21.8</u>
Record the minimum temperature	<u>21.2</u>
Record the maximum humidity	<u>54%</u>
Record the minimum humidity	<u>50%</u>
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness: Front 89; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.13 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.8 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.6 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.2 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-54</u> Nm @ <u>109</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	101 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

8/23/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042003

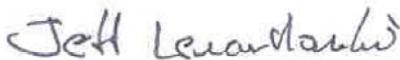
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	53	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	101	Pass
Overall Results					Pass



Laboratory Technician

08/23/2004

Test Date

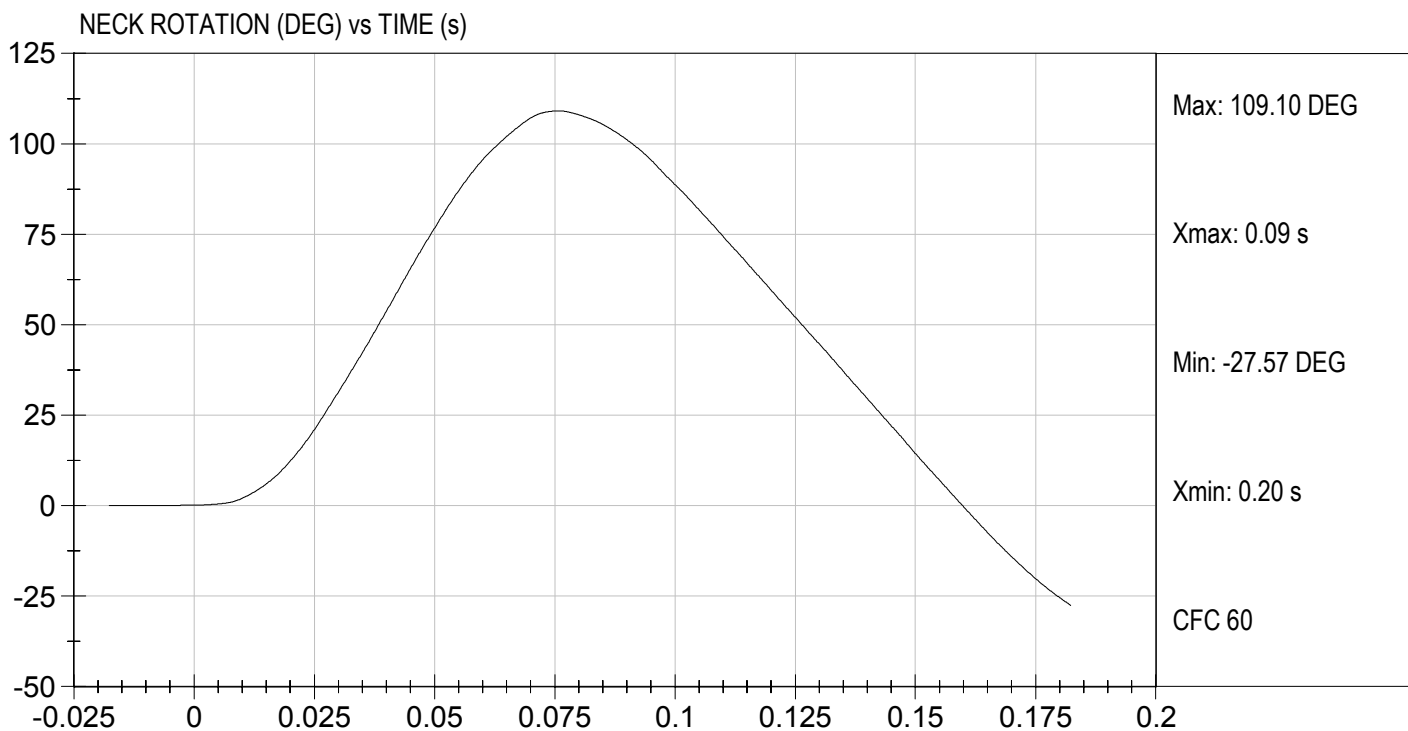
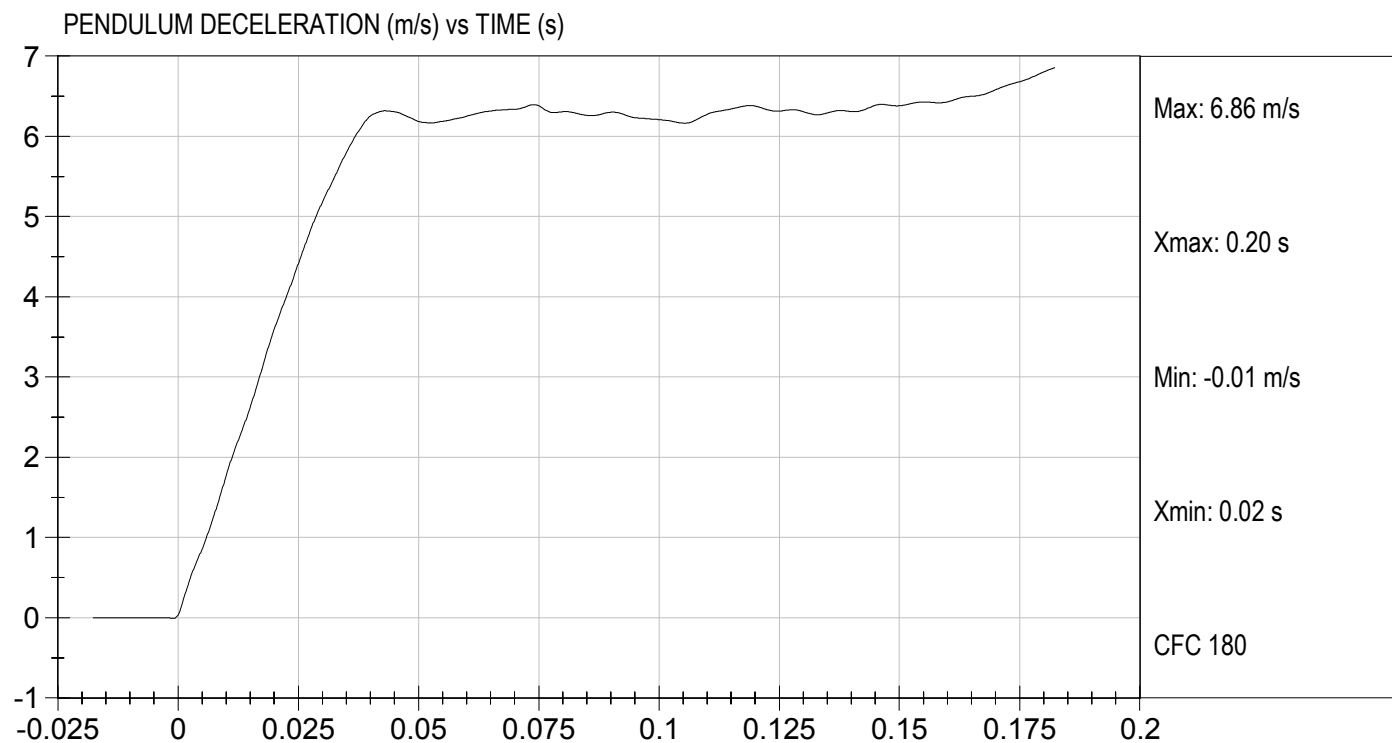


Approved By



Test Desc: Neck Extension
Componet ID: D042003

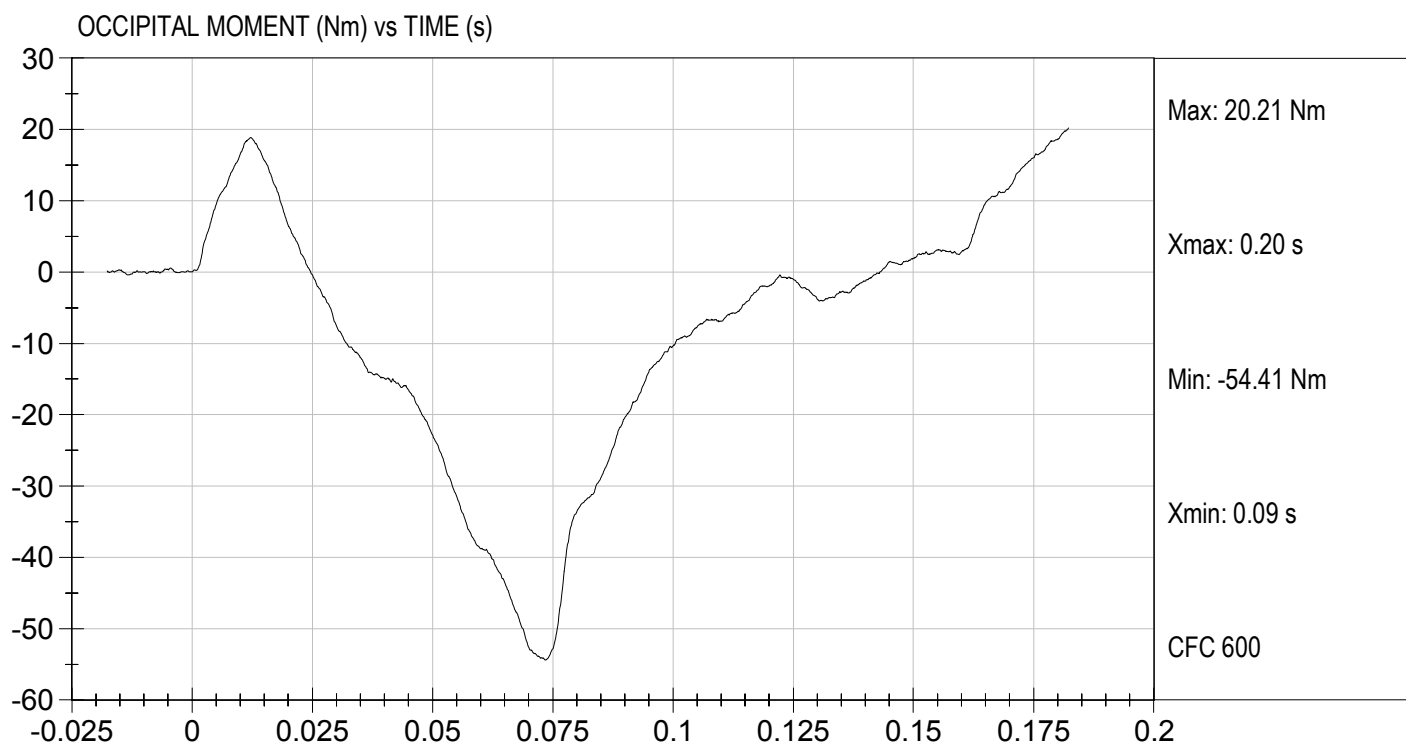
Test Date: 08/23/2004
Velocity: 20.12 ft/s, 6.13 m/s





Test Desc: Neck Extension
Componet ID: D042003

Test Date: 08/23/2004
Velocity: 20.12 ft/s, 6.13 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 516

Test Date 8/24/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 21.7

Record the minimum temperature 20.7

Record the maximum humidity 54%

Record the minimum humidity 49%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.75 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4200 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4190 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	70%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Fleck
Signature

8/24/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

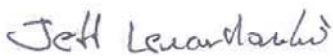
ATD Serial No: 667

Test I.D: D042004

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	52	Pass
Probe Speed	m/s	6.59 to 6.83	6.75	Pass
Peak Deflection	mm	50 to 58	52.4	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4190	Pass
			Overall Test Results	Pass


 Laboratory Technician

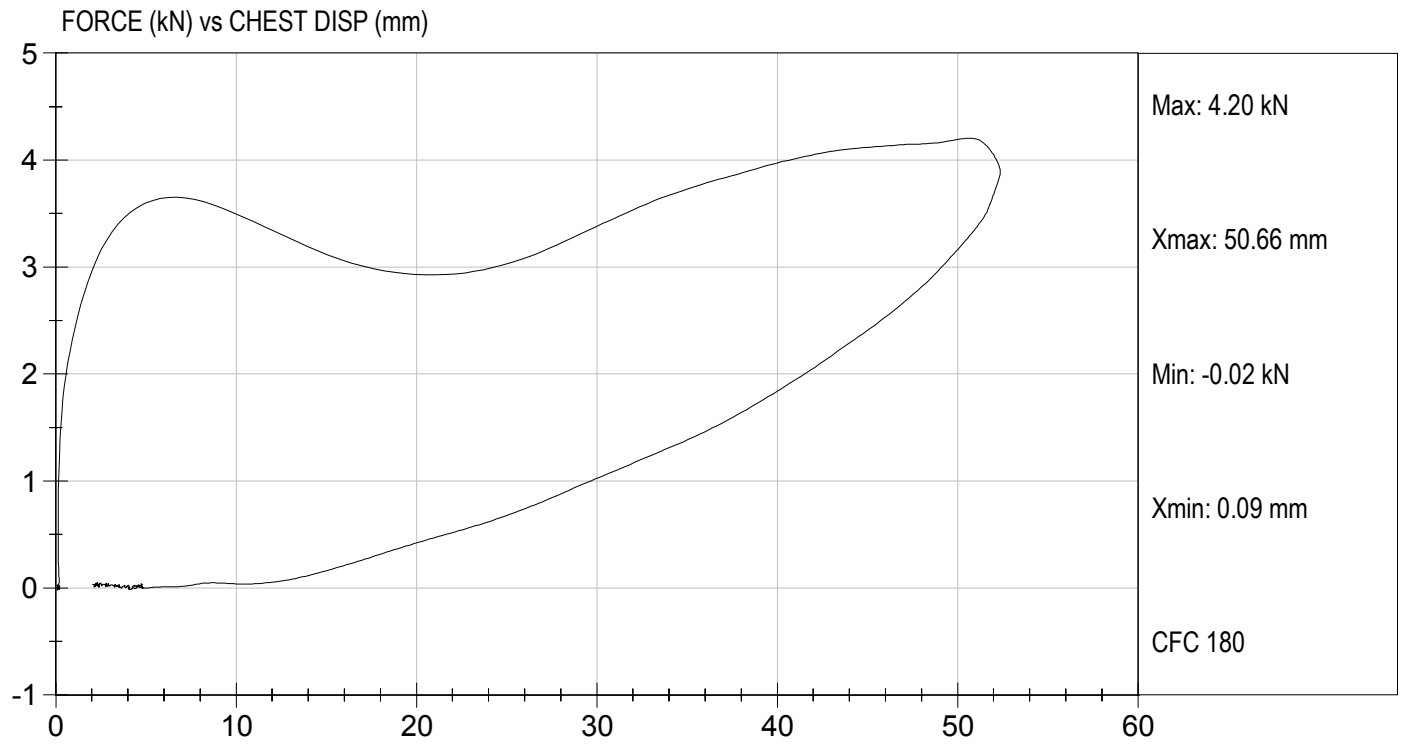
08/24/2004
 Test Date


 Approved By



Test Desc: Thorax Impact
Componet ID: D042004

Test Date: 08/24/2004
Velocity: 22.14 ft/s, 6.75 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 516

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 54%

Record the minimum humidity 50%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 17.5°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	17.5°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	357 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	22°

Joe Flores
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042007

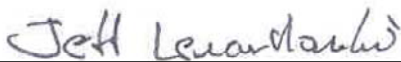
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Initial Angle	deg	0 to 20	17.5	Pass
Return Angle	deg	+/- 8	22	Pass
Force at 45 deg	N	320 to 390	357	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result				Pass



Laboratory Technician

08/23/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 54%

Record the minimum humidity 50%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3800 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Flores
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042006

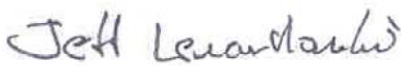
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.8	Pass
Overall Test Results				Pass



Laboratory Technician

08/23/2004

Test Date

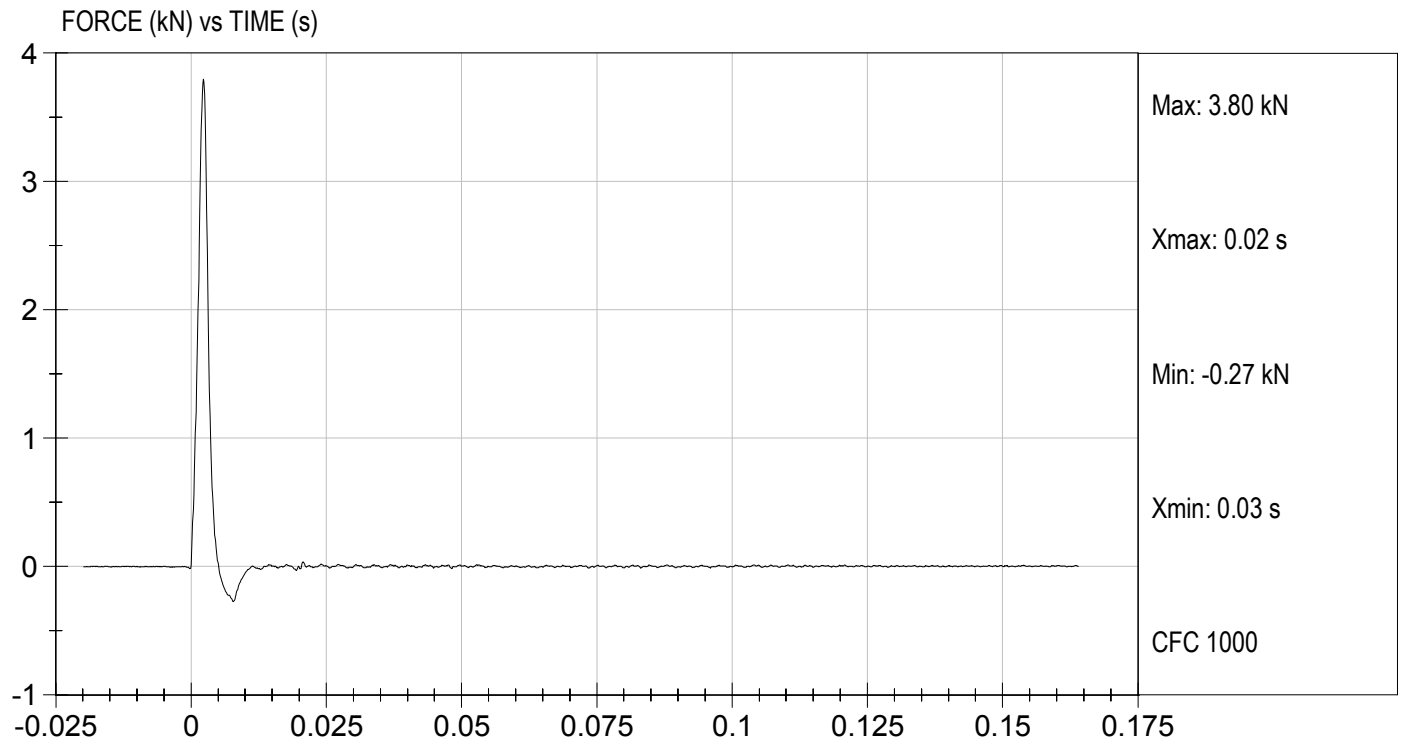


Approved By



Test Desc: Left Knee
Componet ID: D042006

Test Date: 08/23/2004
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 8/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 2 (when successive knee impact tests are necessary)

☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☐ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.1

Record the maximum humidity 54 %

Record the minimum humidity 50 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3790 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

8/23/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042005

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.79	Pass
Overall Test Results				Pass



Laboratory Technician

08/23/2004

Test Date

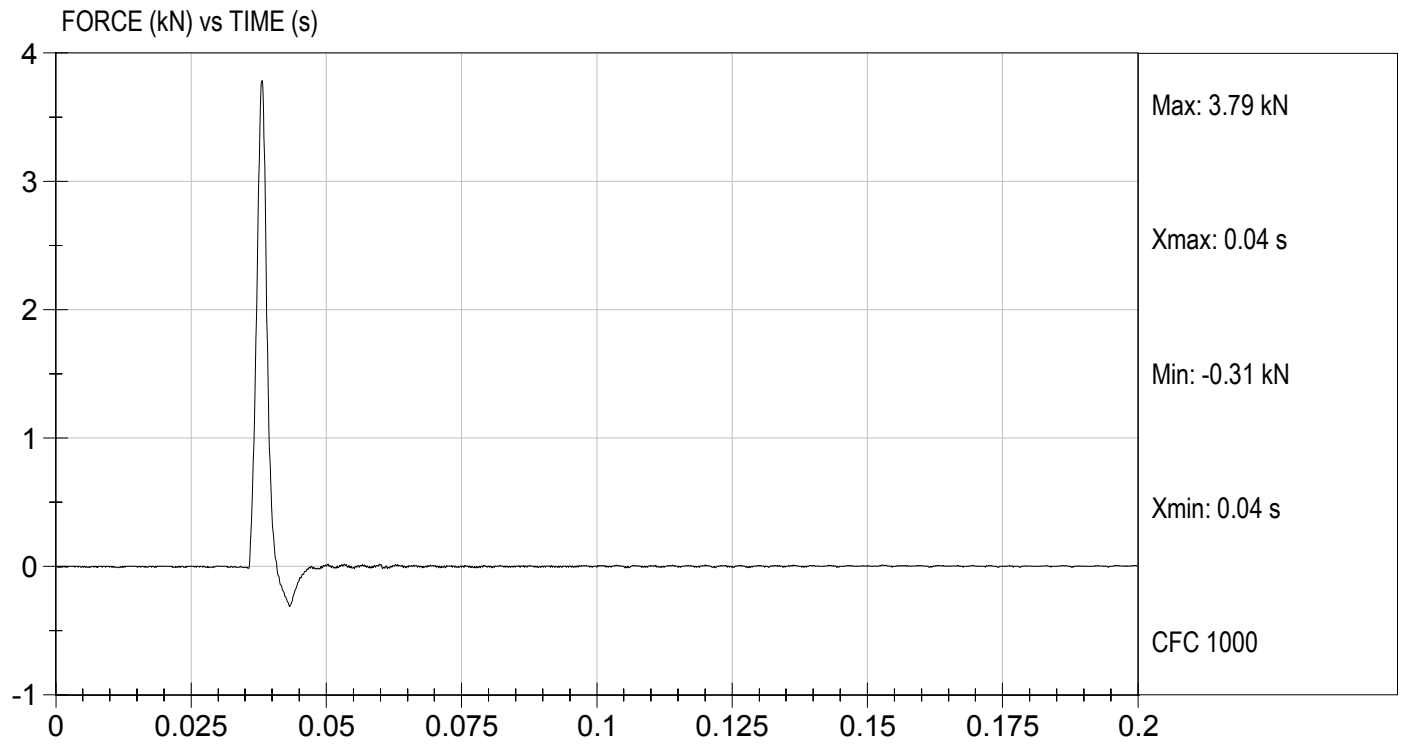


Approved By



Test Desc: Right Knee
Componet ID: D042005

Test Date: 08/23/2004
Velocity: 6.92 ft/s, 2.11 m/s



DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 516

Test Date 8/20/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

8/23/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

8/23/04
Date

EXTERNAL DIMENSIONS

SN516, 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.	774.7-800.1	785.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	454.9
C	H-POINT HEIGHT	Reference	81.3-86.3	83.5
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	81.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	252.0
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.5
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	282.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.1
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	525.9
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	357.7
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	396.0
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	421.2

SN516, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	176.8
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	472.1
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.7
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	180.1
U	HIP BREADTH	The widest part of the hip	299.7-314.9	310.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	357.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.5
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	539.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	863.2
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	784.4
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	342.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	163.0

EXTERNAL DIMENSIONS

SN506, 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.	774.7-800.1	780.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	443.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.1
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.4
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	255.8
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	193.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	545.0
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	365.2
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	438.0

SN506, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	183.0
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	226.2
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	475.8
S	HEAD BREADTH	The widest part of the head	137.1-147.3	142.0
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	180.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	305.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	359.0
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.5
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	538.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	857.6
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	789.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 506

Test Date 5/14/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))

☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

☒ 4. Accelerometers and their respective mounts are smooth and clean.

☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))

☒ 7. 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. (572.132(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.6

Record the maximum humidity 48%

Record the minimum humidity 45%

☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 501mm

Record the left side distance 501mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	276
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	9

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

Joe Fleck
Signature

5/14/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test ID: D041151

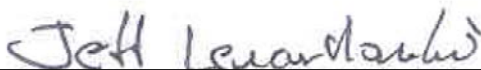
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	250 - 300	276	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.1	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

05/14/2004

Test Date



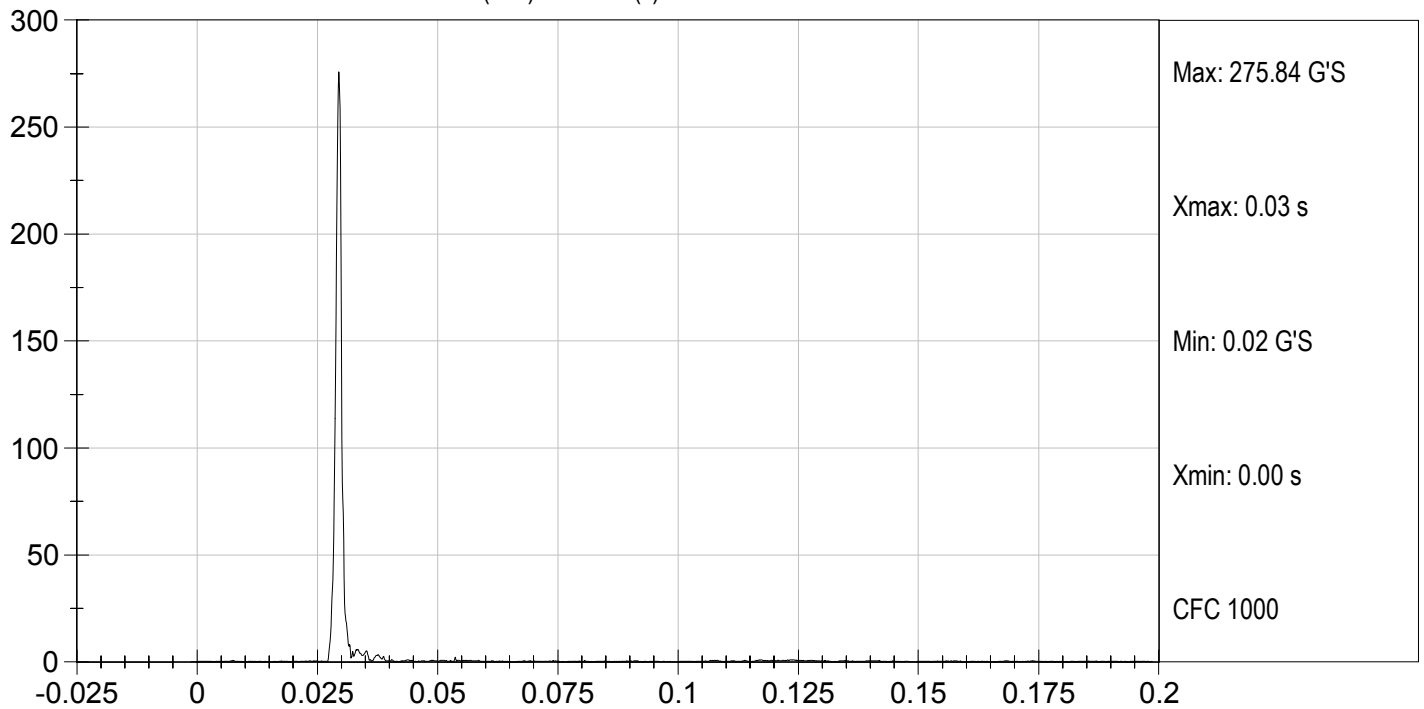
Approved By



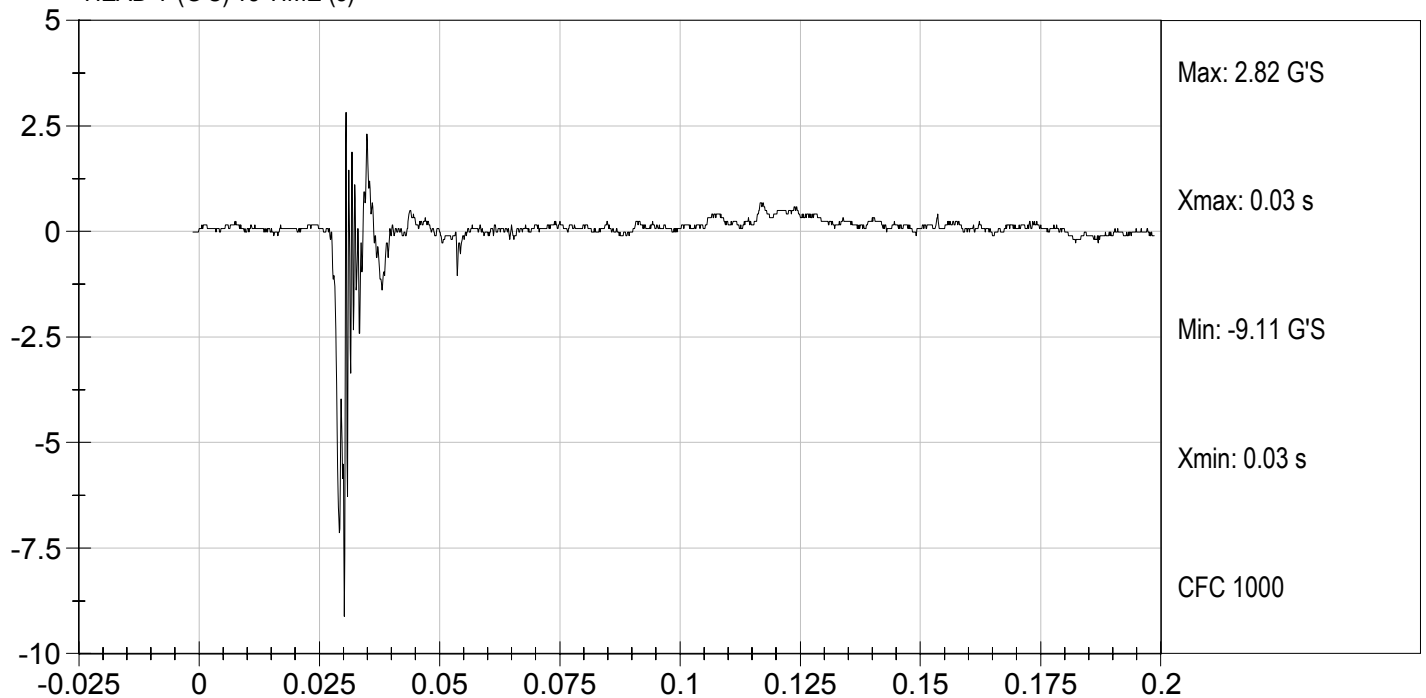
Test Desc: Head Drop
Componet ID: D041151

Test Date: 05/14/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 506 Test Date 5/14/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.1</u> |
| Record the minimum temperature | <u>21.6</u> |
| Record the maximum humidity | <u>48%</u> |
| Record the minimum humidity | <u>45%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
 Record findings and actions: No Deterioration. Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.04 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.5 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.9 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.9 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>75</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	83 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Flack
Signature

5/14/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041152

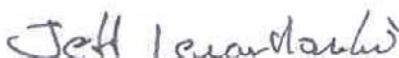
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.2	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.9	Pass
	30 msec	m/sec	5.8 to 7.0	6.9	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	75	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	83	Pass
Overall Results				Pass	



Laboratory Technician

05/14/2004

Test Date



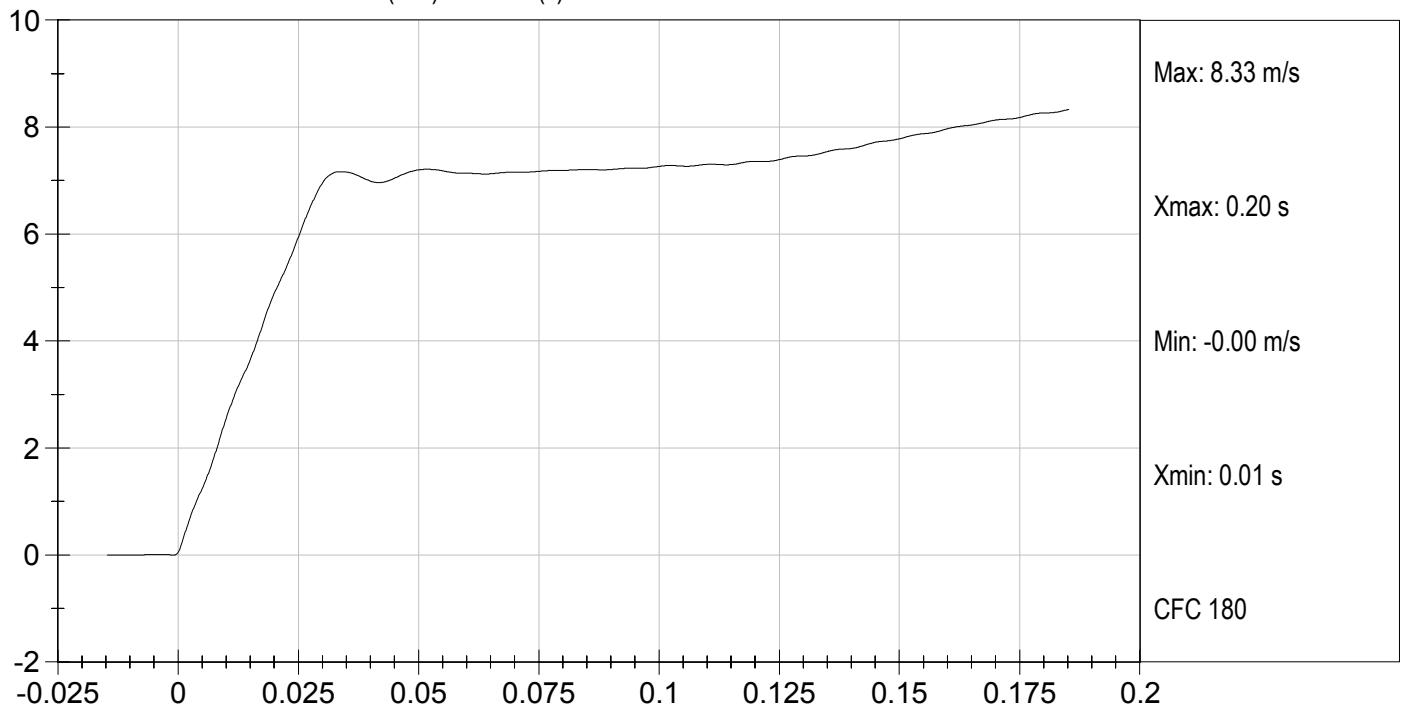
Approved By



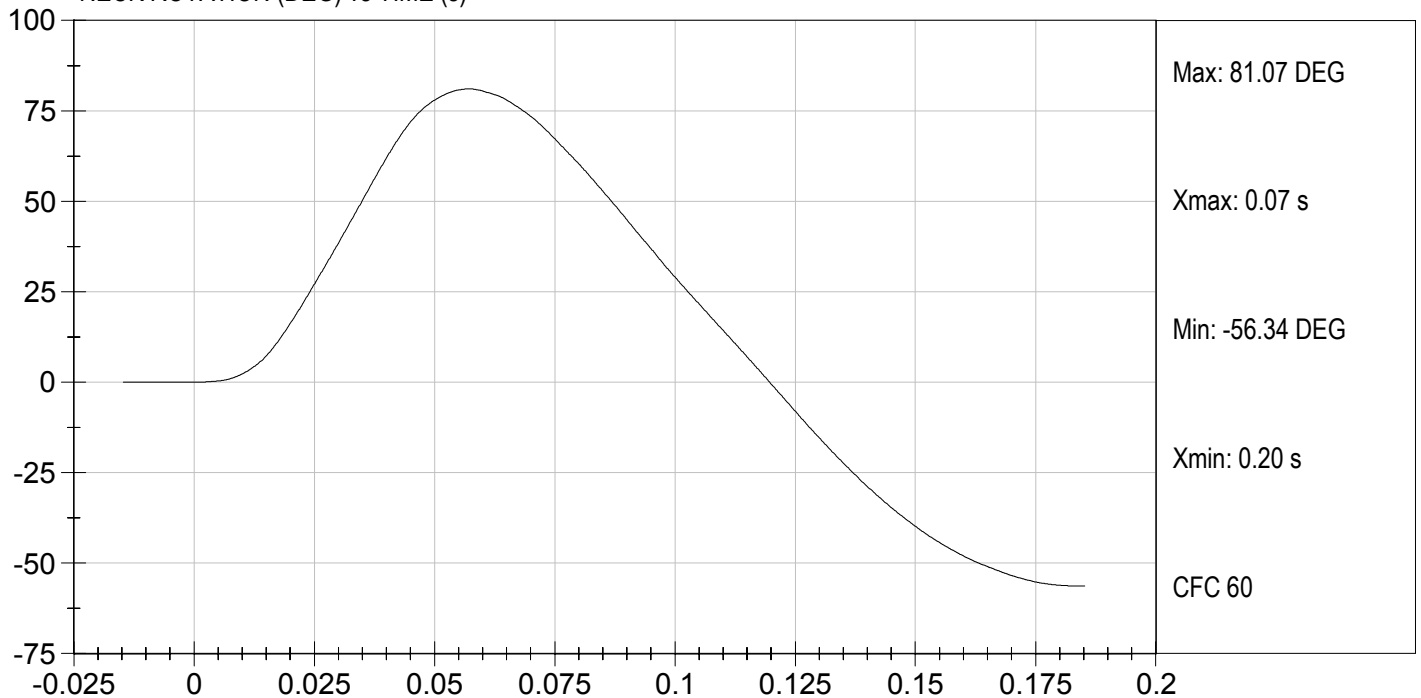
Test Desc: Neck Flexion
Componet ID: D041152

Test Date: 05/14/2004
Velocity: 23.1 ft/s, 7.04 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



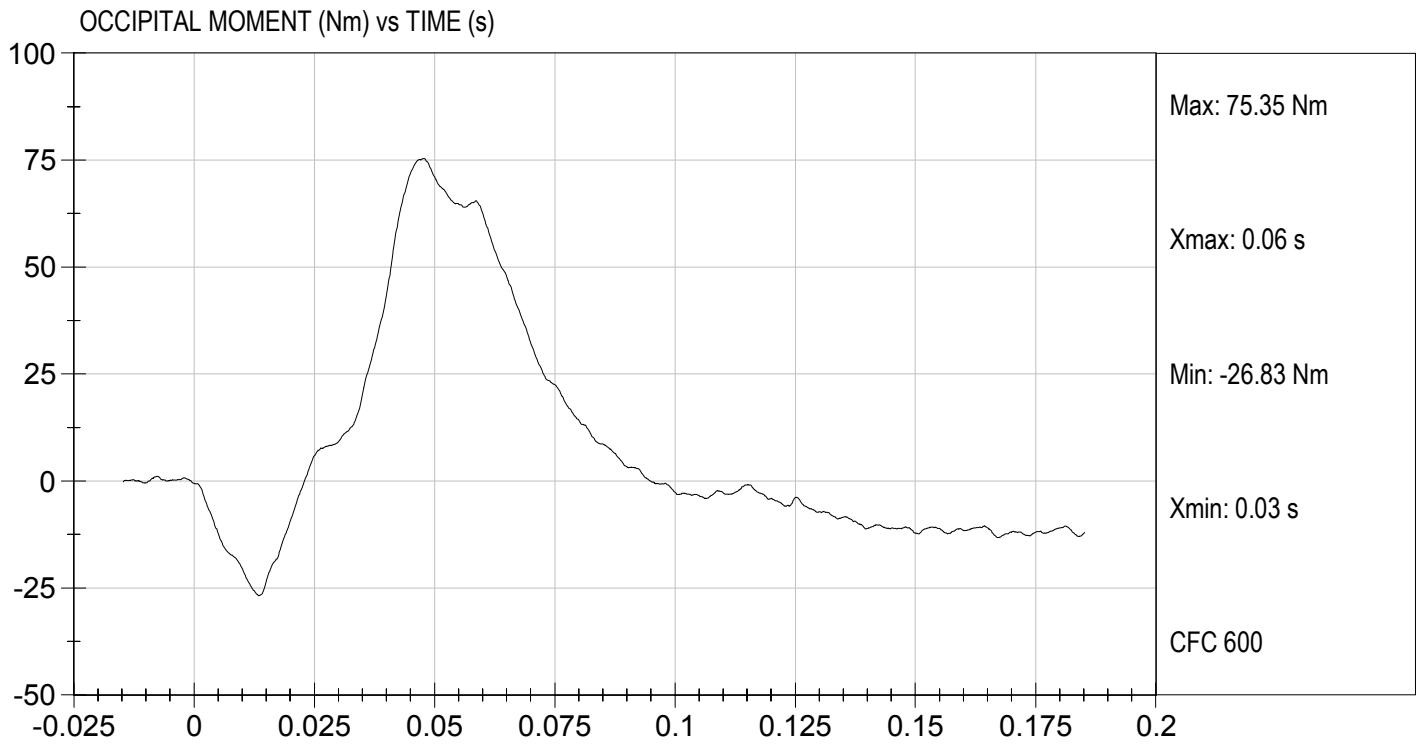
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D041152

Test Date: 05/14/2004
Velocity: 23.1 ft/s, 7.04 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 506

Test Date 5/14/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.6

Record the maximum humidity 48%

Record the minimum humidity 45%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 89; Back 90.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.10 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.7 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.2 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-57</u> Nm @ <u>108</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	99 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Joe Fleck
Signature

5/14/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041153

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.2	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.10	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	99	Pass
Overall Results					Pass



Laboratory Technician

05/14/2004

Test Date

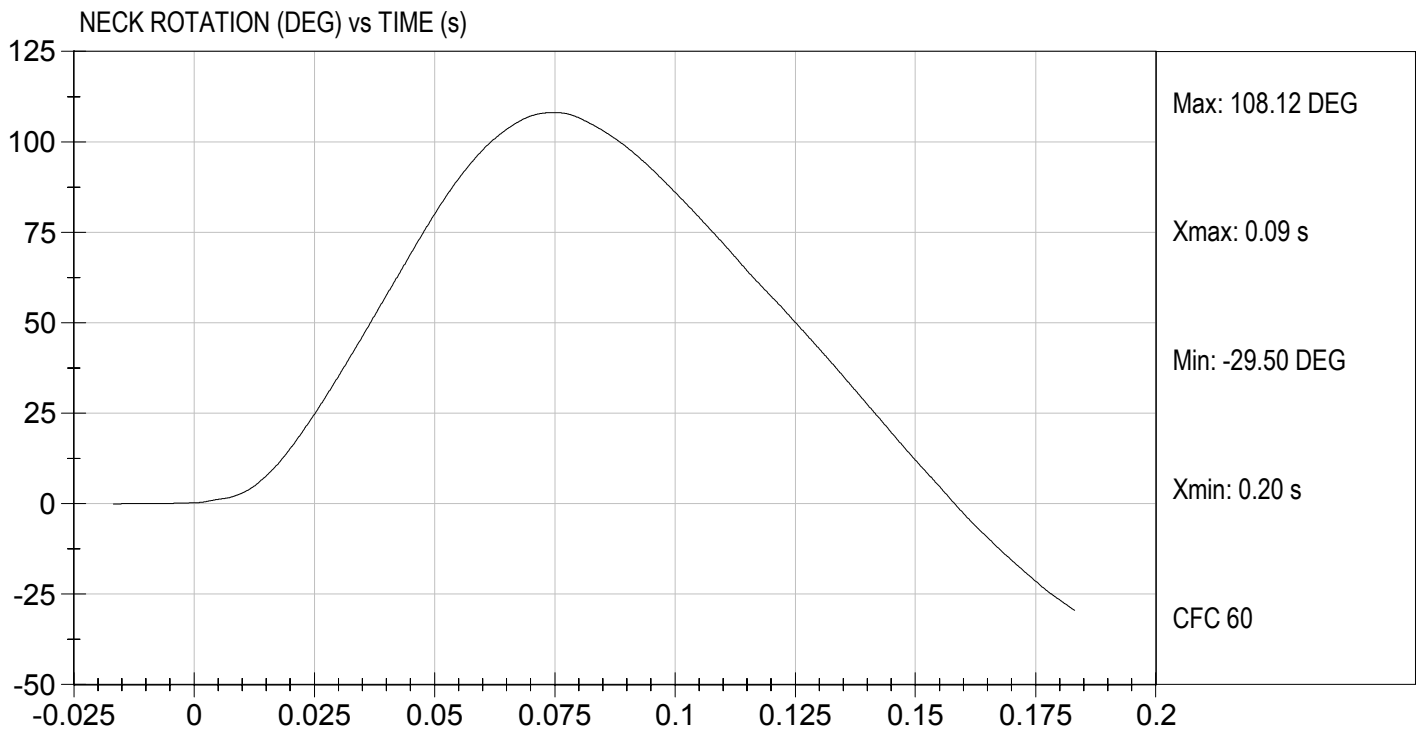
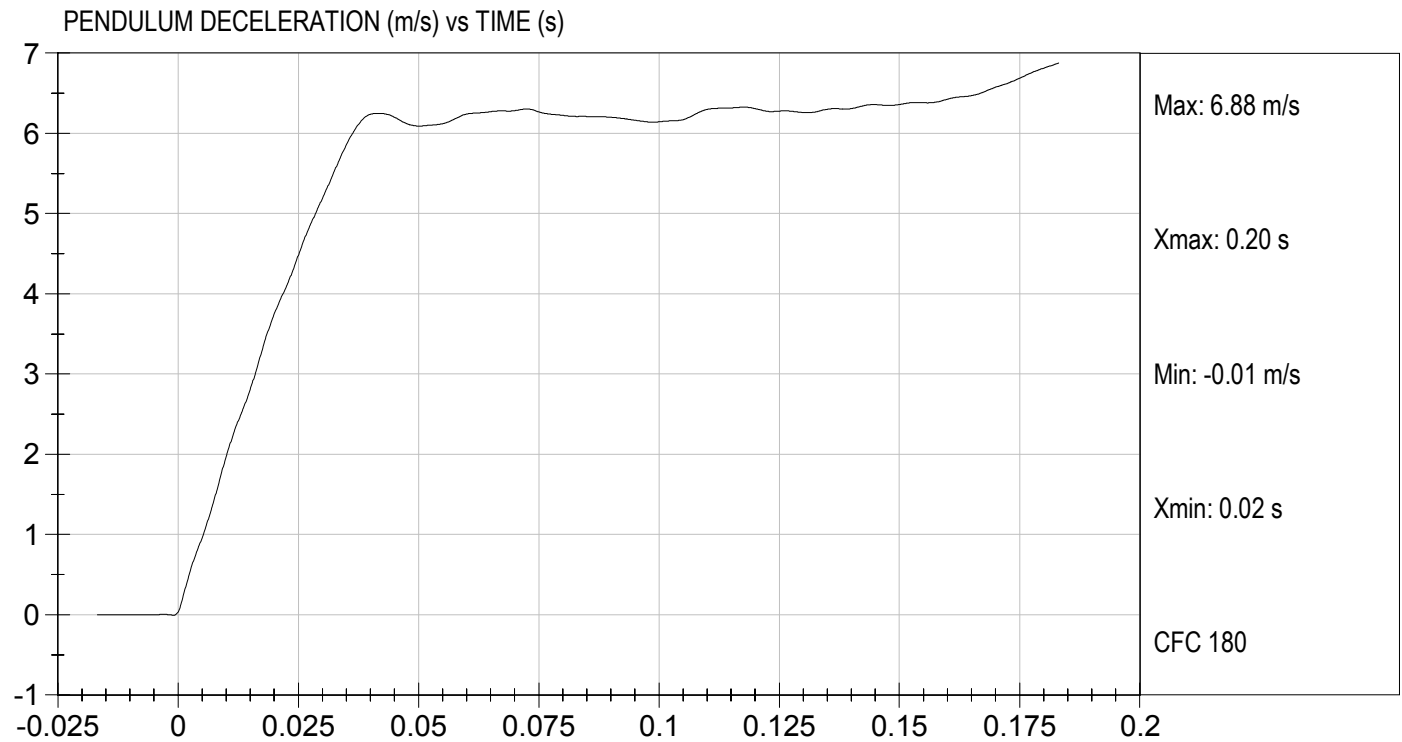


Approved By



Test Desc: Neck Flexion
Componet ID: D041153

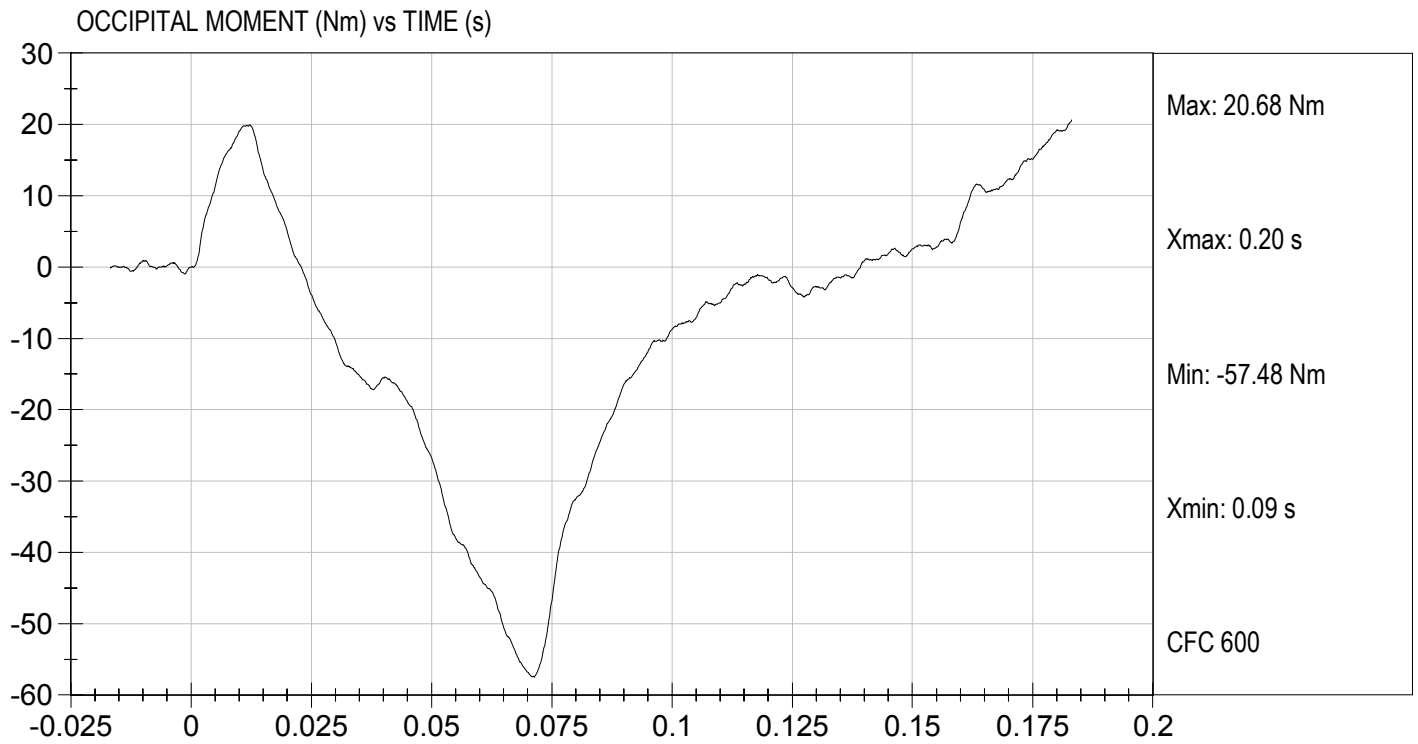
Test Date: 05/14/2004
Velocity: 20 ft/s, 6.10 m/s





Test Desc: Neck Flexion
Componet ID: D041153

Test Date: 05/14/2004
Velocity: 20 ft/s, 6.10 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 506

Test Date 5/17/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 22.1

Record the minimum temperature 21.8

Record the maximum humidity 51%

Record the minimum humidity 45%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.79 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	51 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	3920 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	3923 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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


Signature

5/17/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

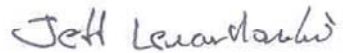
ATD Serial No: 506

Test I.D: D041154

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.2	Pass
Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	6.59 to 6.83	6.79	Pass
Peak Deflection	mm	50 to 58	50.9	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	3.9	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	3923	Pass
			Overall Test Results	Pass


 Laboratory Technician

05/17/2004
 Test Date


 Approved By

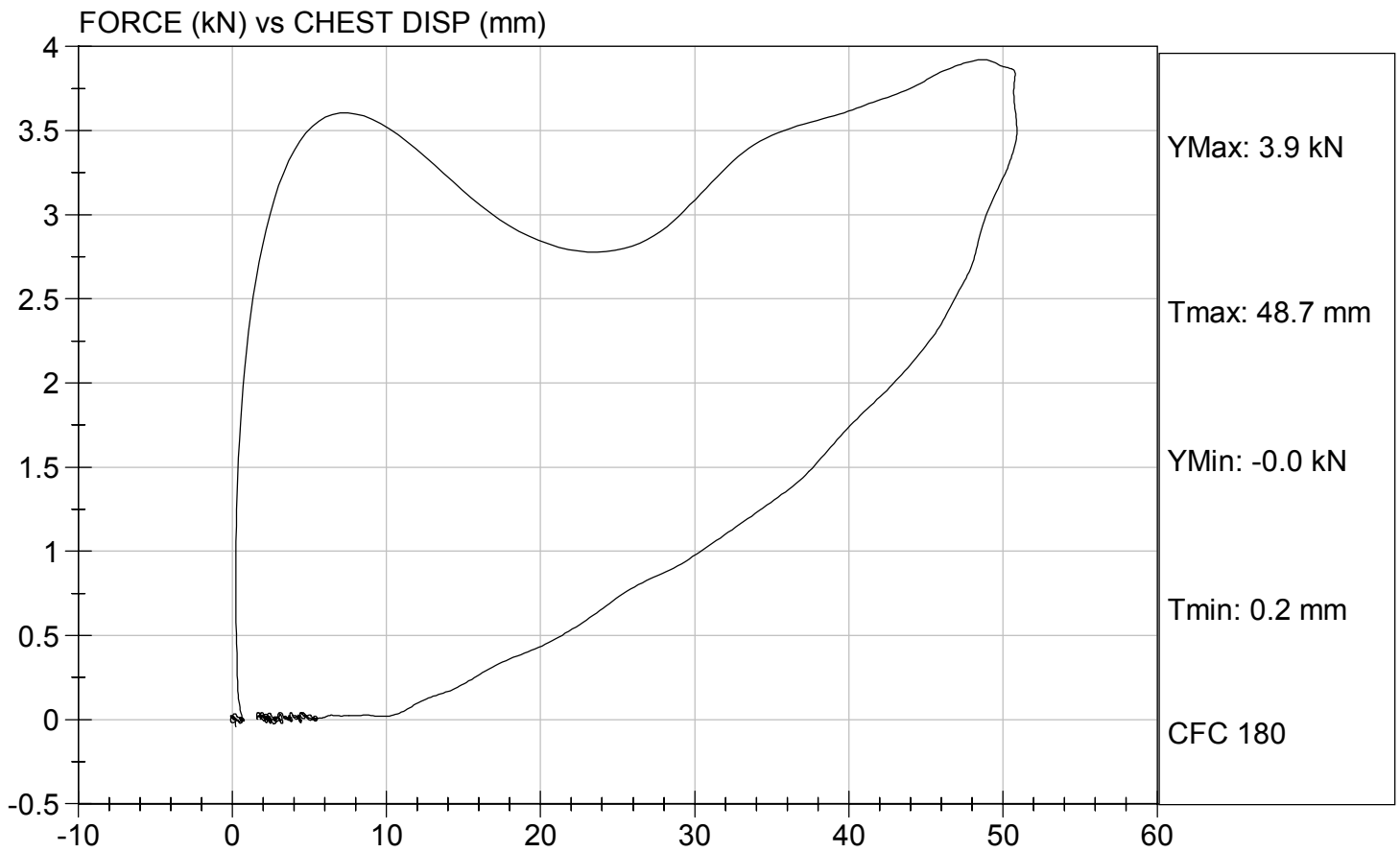


Test Description: Thorax Impact

Test Date: 05/17/2004

Component: D041154

Speed: 22.28 ft/sec, 6.79 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 506

Test Date 5/14/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.6

Record the maximum humidity 48%

Record the minimum humidity 45%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 15°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	15°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	328 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	17°

Joe Fleck
Signature

5/14/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041157

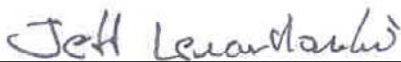
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Initial Angle	deg	0 to 20	15	Pass
Return Angle	deg	+/- 8	17	Pass
Force at 45 deg	N	320 to 390	328	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result				Pass



Laboratory Technician

05/14/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 506

Test Date 5/14/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 22.4

Record the minimum temperature 21.6

Record the maximum humidity 48%

Record the minimum humidity 45%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3610 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

5/14/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041156

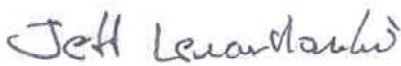
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.4	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.61	Pass
Overall Test Results				Pass



Laboratory Technician

05/14/2004

Test Date

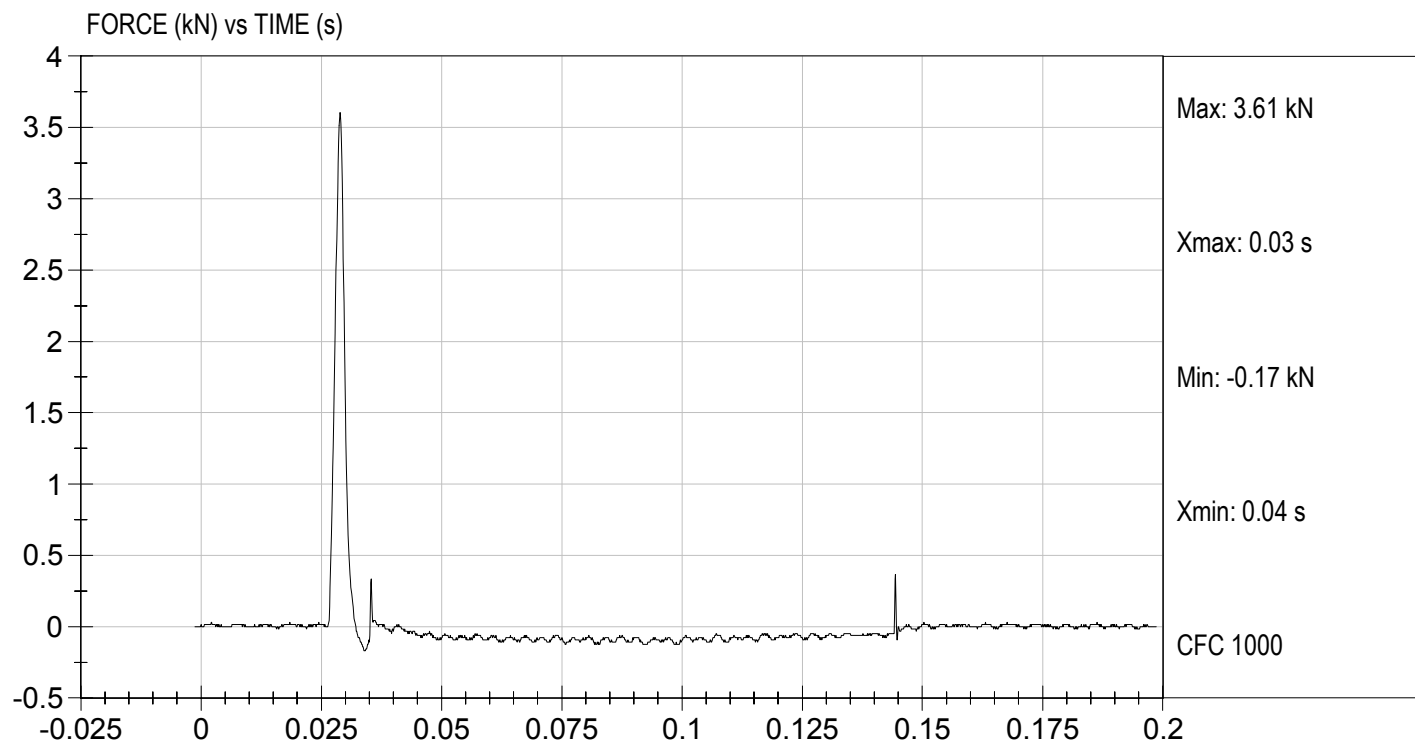


Approved By



Test Desc: Left Knee
Componet ID: D041156

Test Date: 05/14/2004
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 506

Test Date 5/14/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 22.4

Record the minimum temperature 21.6

Record the maximum humidity 48 %

Record the minimum humidity 45 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3570 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.


Signature

5/14/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041155

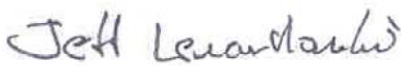
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.4	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.57	Pass
Overall Test Results				Pass



Laboratory Technician

05/14/2004

Test Date

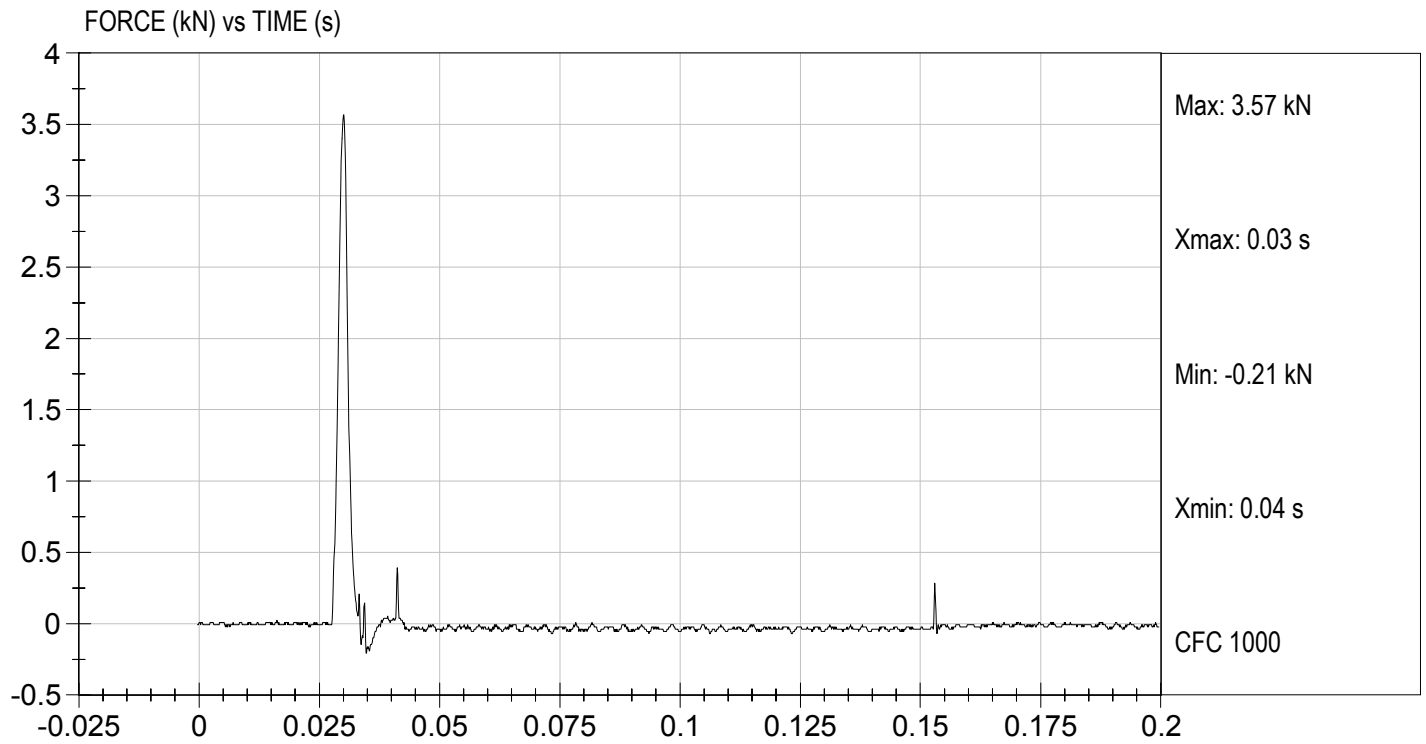


Approved By



Test Desc: Right Knee
Componet ID: D041155

Test Date: 05/14/2004
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 506 Test Date 6/1/04

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. 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. (572.132(c)(1))

Record the maximum temperature	<u>21.3</u>
Record the minimum temperature	<u>20.7</u>
Record the maximum humidity	<u>54%</u>
Record the minimum humidity	<u>49%</u>
- ☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 501mm

Record the left side distance 501mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	275
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	12

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

Joe Fleck
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test ID: D041271

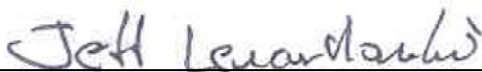
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	250 - 300	275	Pass
Peak Lateral Acceleration	G's	+/- 15	12	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

06/01/2004

Test Date



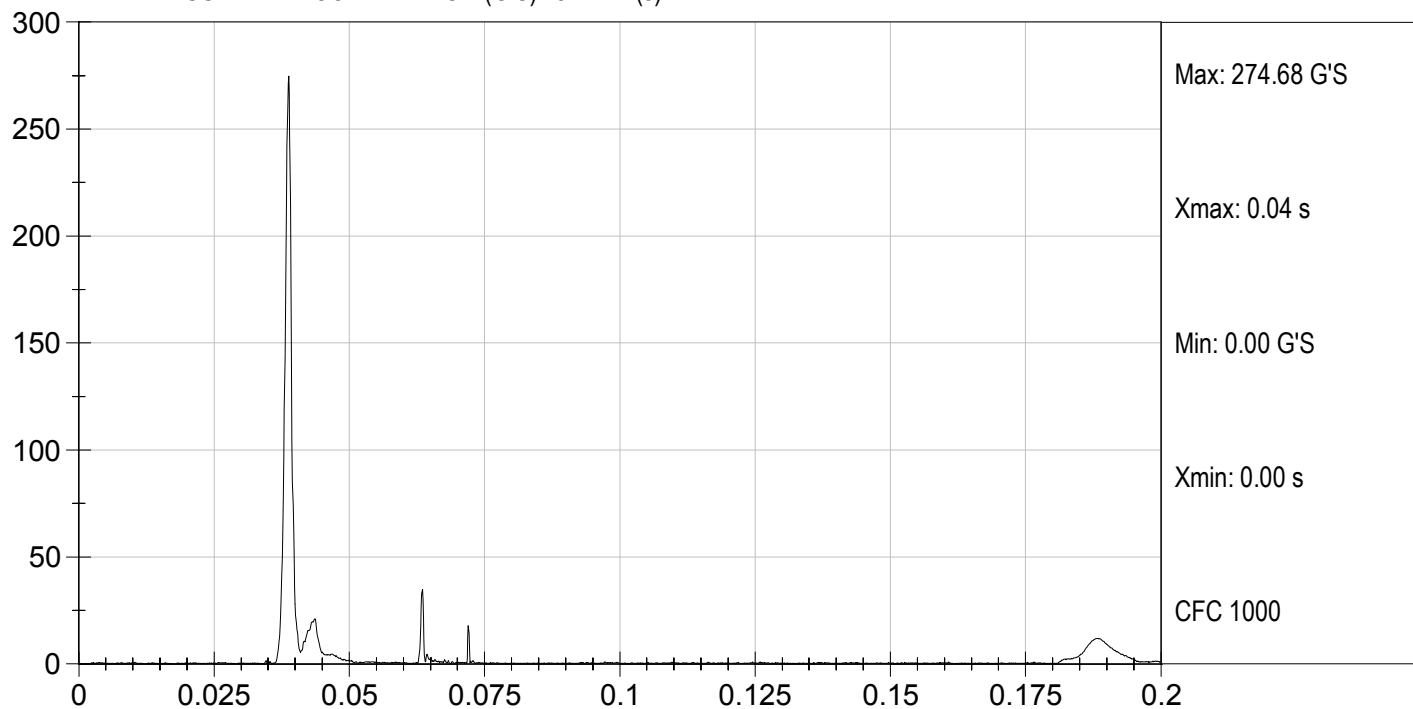
Approved By



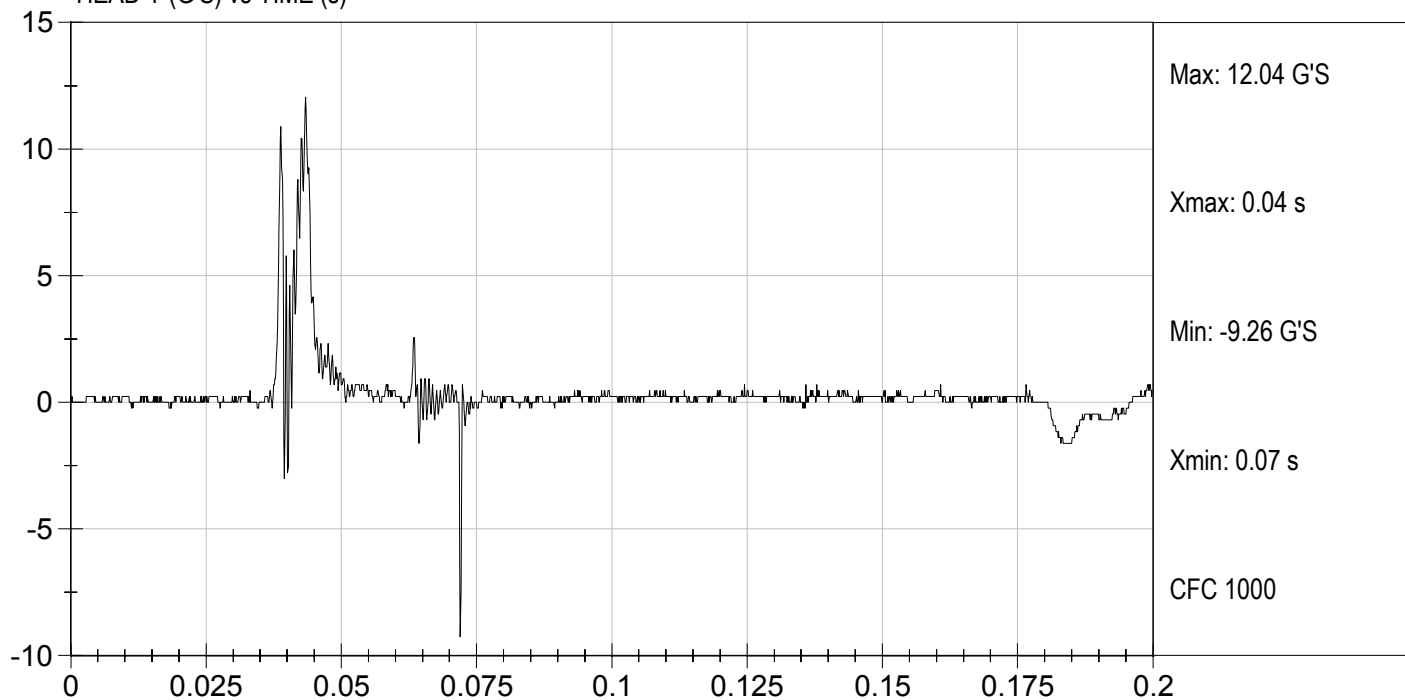
Test Desc: Head Drop
Componet ID: D041271

Test Date: 06/01/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 506

Test Date 6/1/04

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

 1. It has been at least 30 minutes since the last flexion test. (572.137(q))

X N/A, ONLY one flexion test performed

X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

X 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. (572.133(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.7

Record the maximum humidity 54%

Record the minimum humidity 49%

X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 89; Back 90.

X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.00 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.5 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.8 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.7 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>80</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	84 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Fleck
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041272

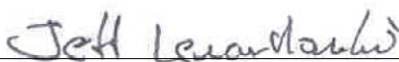
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	54	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.00	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	80	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	84	Pass
Overall Results					Pass



Laboratory Technician

06/01/2004

Test Date



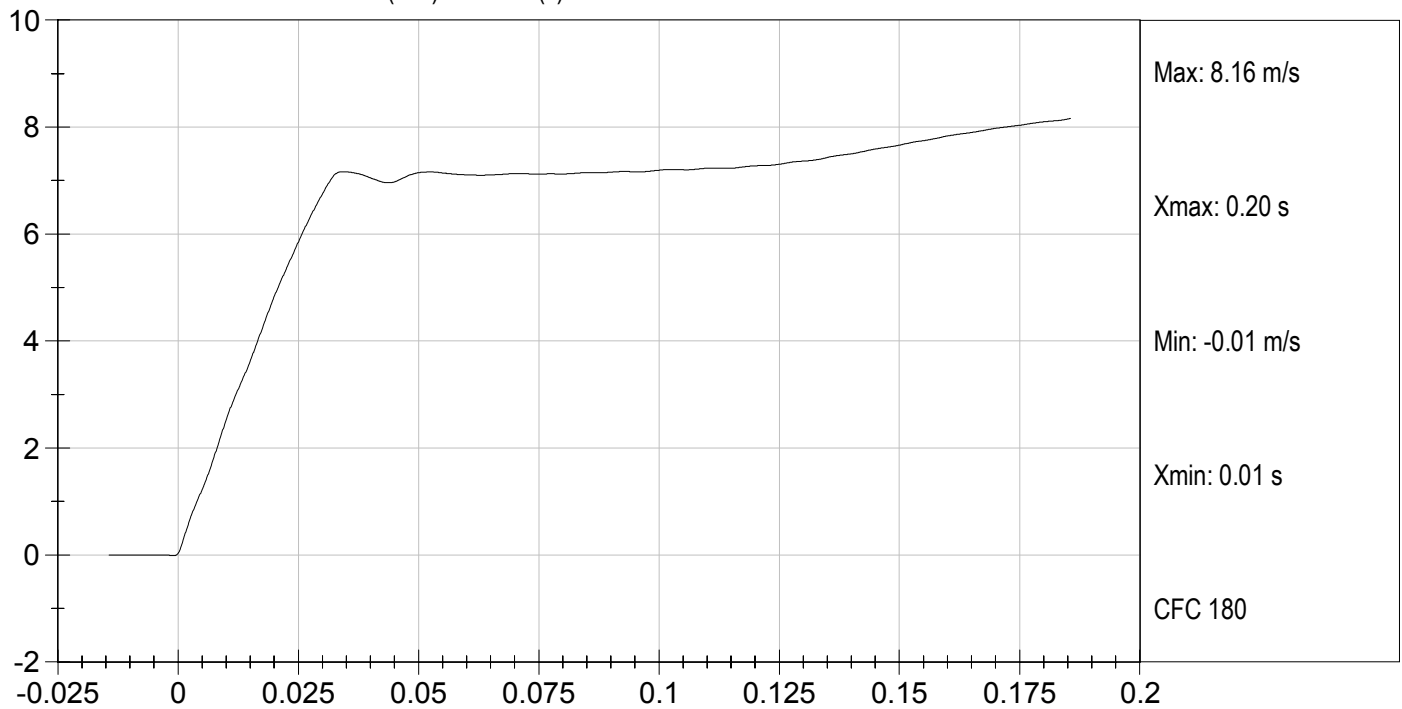
Approved By



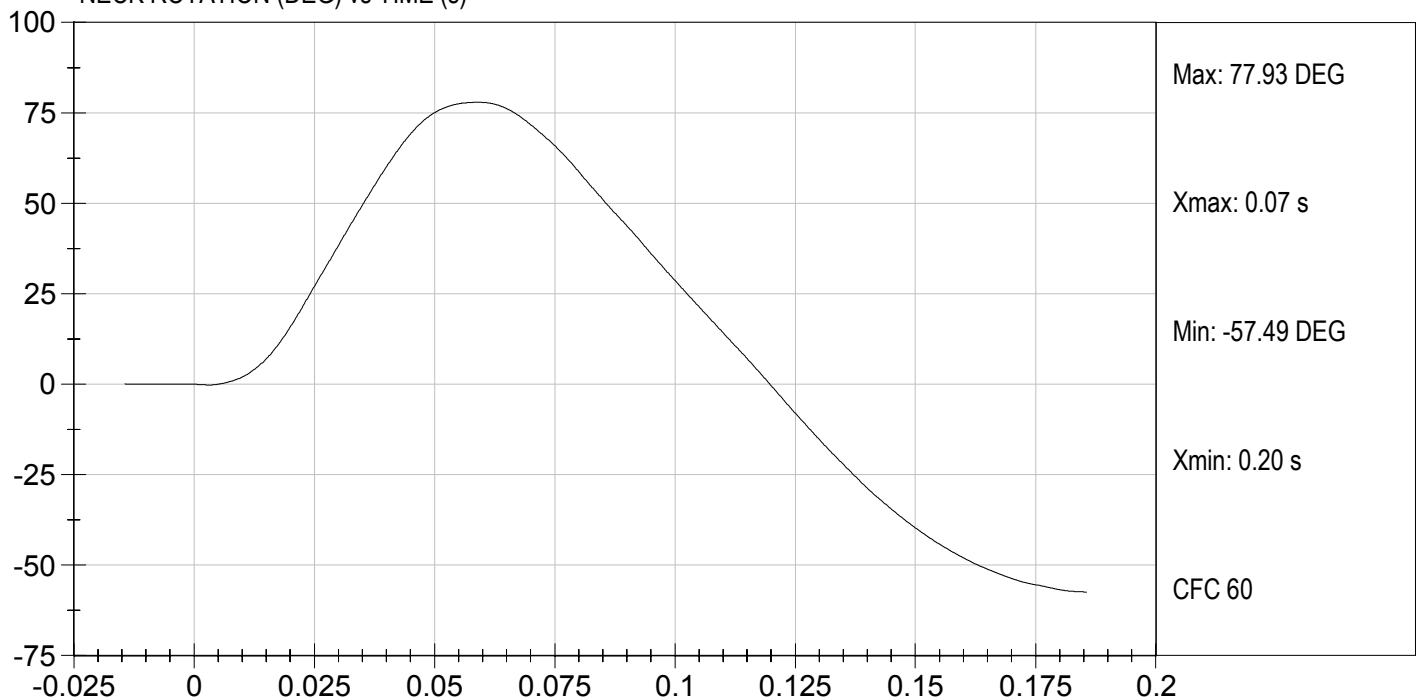
Test Desc: Neck Flexion
Componet ID: D041272

Test Date: 06/01/2004
Velocity: 22.97 ft/s, 7.00 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



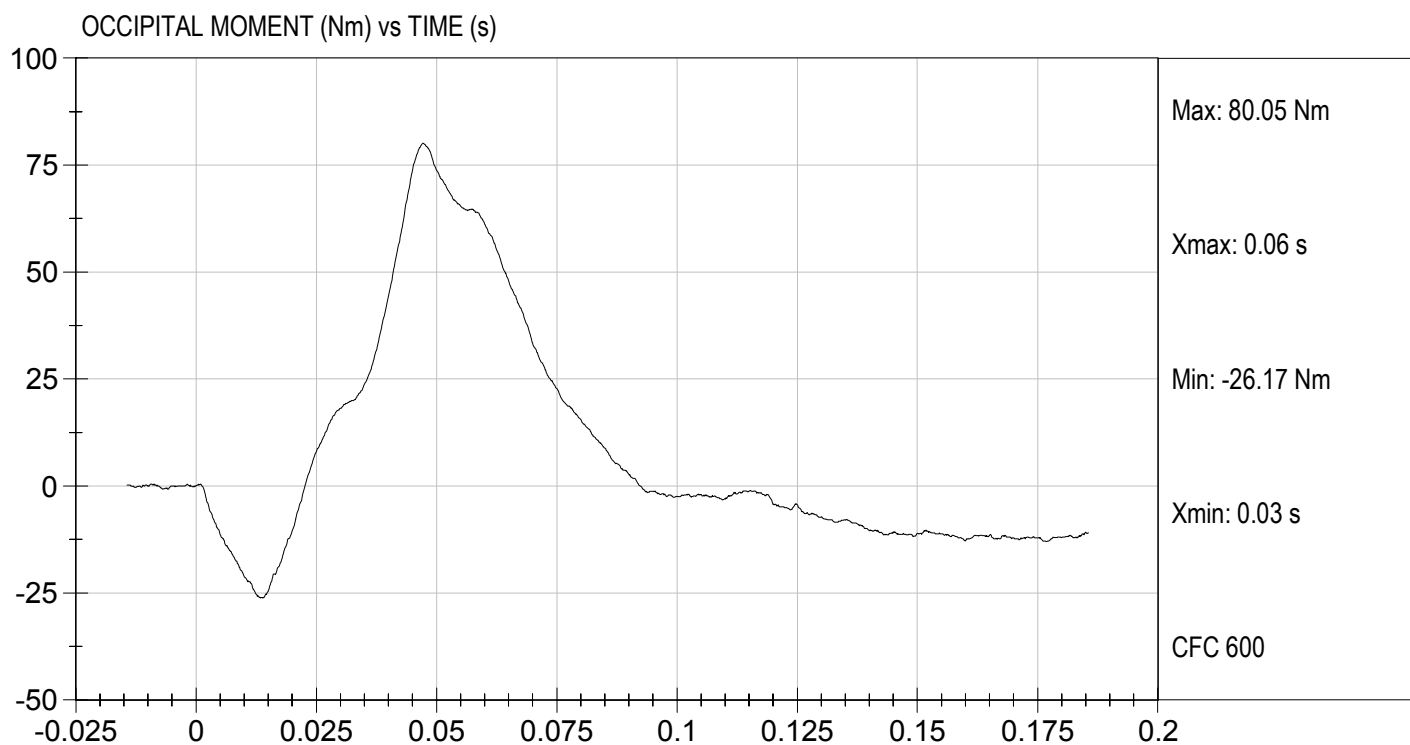
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D041272

Test Date: 06/01/2004
Velocity: 22.97 ft/s, 7.00 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 506

Test Date 4/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.7

Record the maximum humidity 54%

Record the minimum humidity 49%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 89; Back 90.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.8 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.7 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.3 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-56</u> Nm @ <u>110</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	100 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Joe Fleck
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041273

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	54	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.07	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	100	Pass
Overall Results					Pass



Laboratory Technician

06/01/2004

Test Date

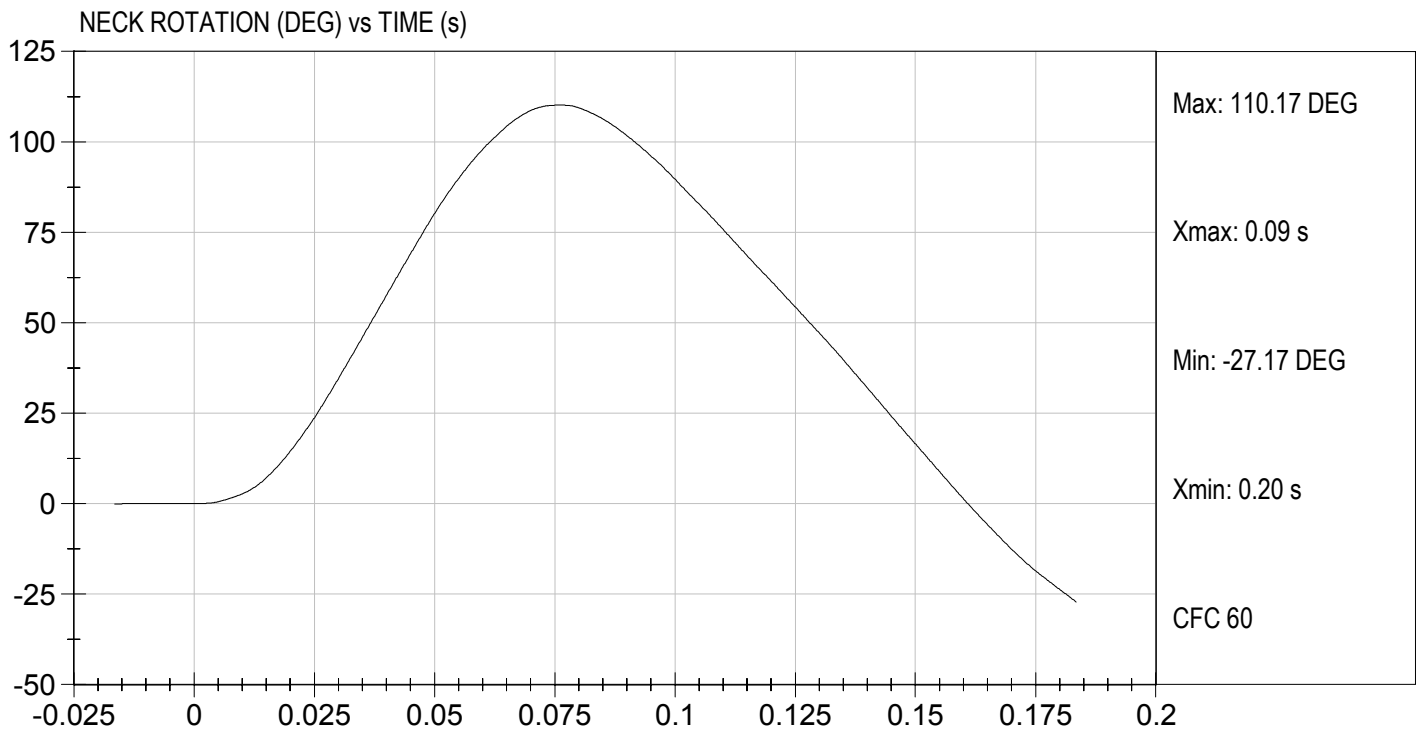
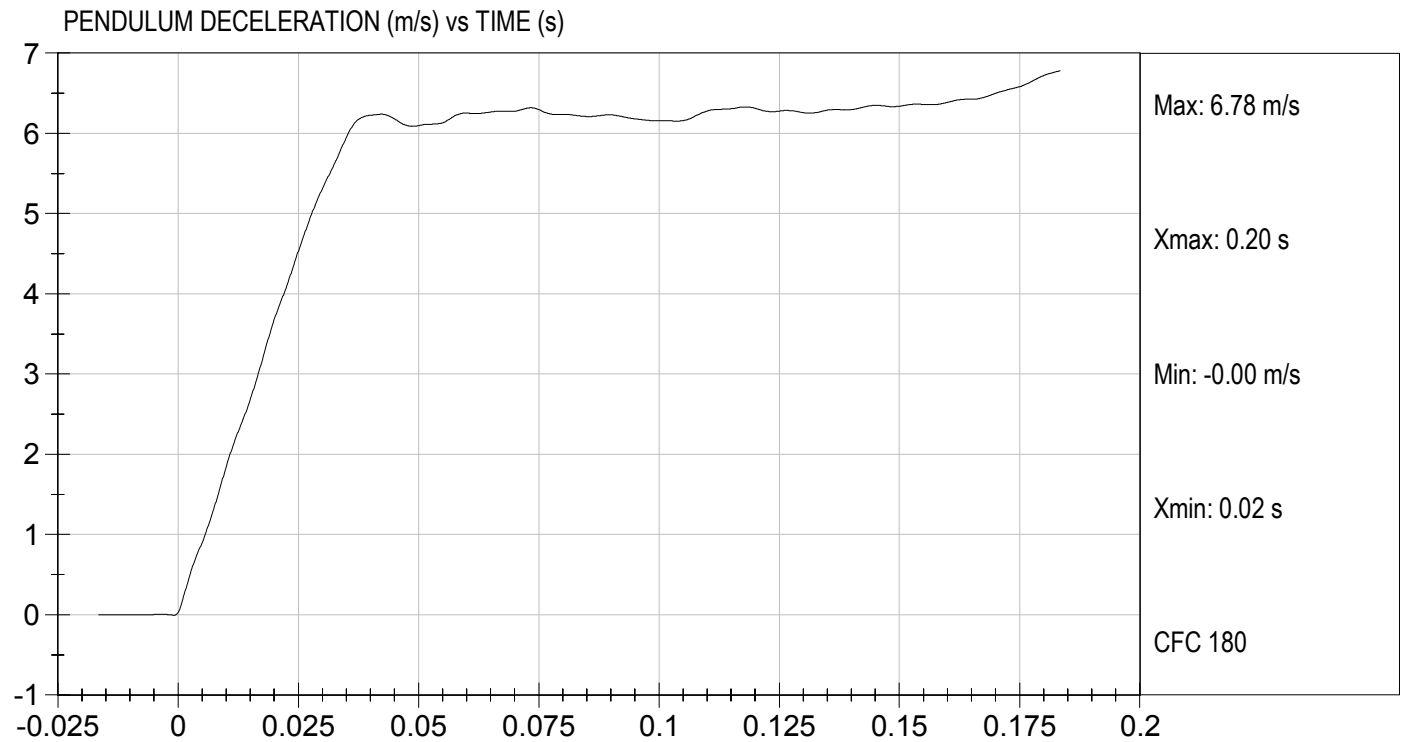


Approved By



Test Desc: Neck Extension
Componet ID: D041273

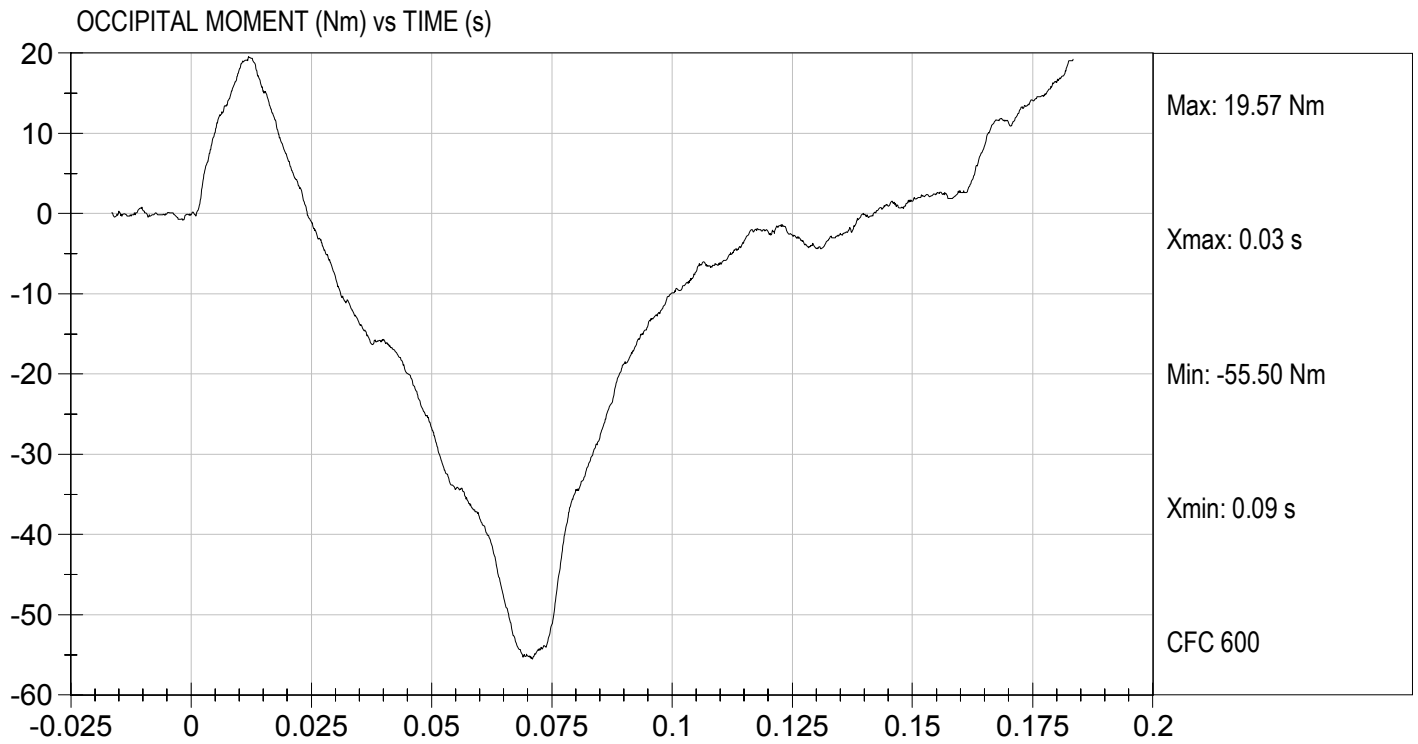
Test Date: 06/01/2004
Velocity: 19.91 ft/s, 6.07 m/s





Test Desc: Neck Extension
Componet ID: D041273

Test Date: 06/01/2004
Velocity: 19.91 ft/s, 6.07 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 506

Test Date 6/1/04

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 21.7

Record the minimum temperature 20.7

Record the maximum humidity 54%

Record the minimum humidity 49%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	56 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4030 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4032 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Jessica Hall
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

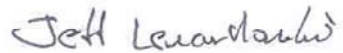
ATD Serial No: 506

Test I.D: D041274

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	49	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	55.6	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.0	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4032	Pass
			Overall Test Results	Pass


 Laboratory Technician

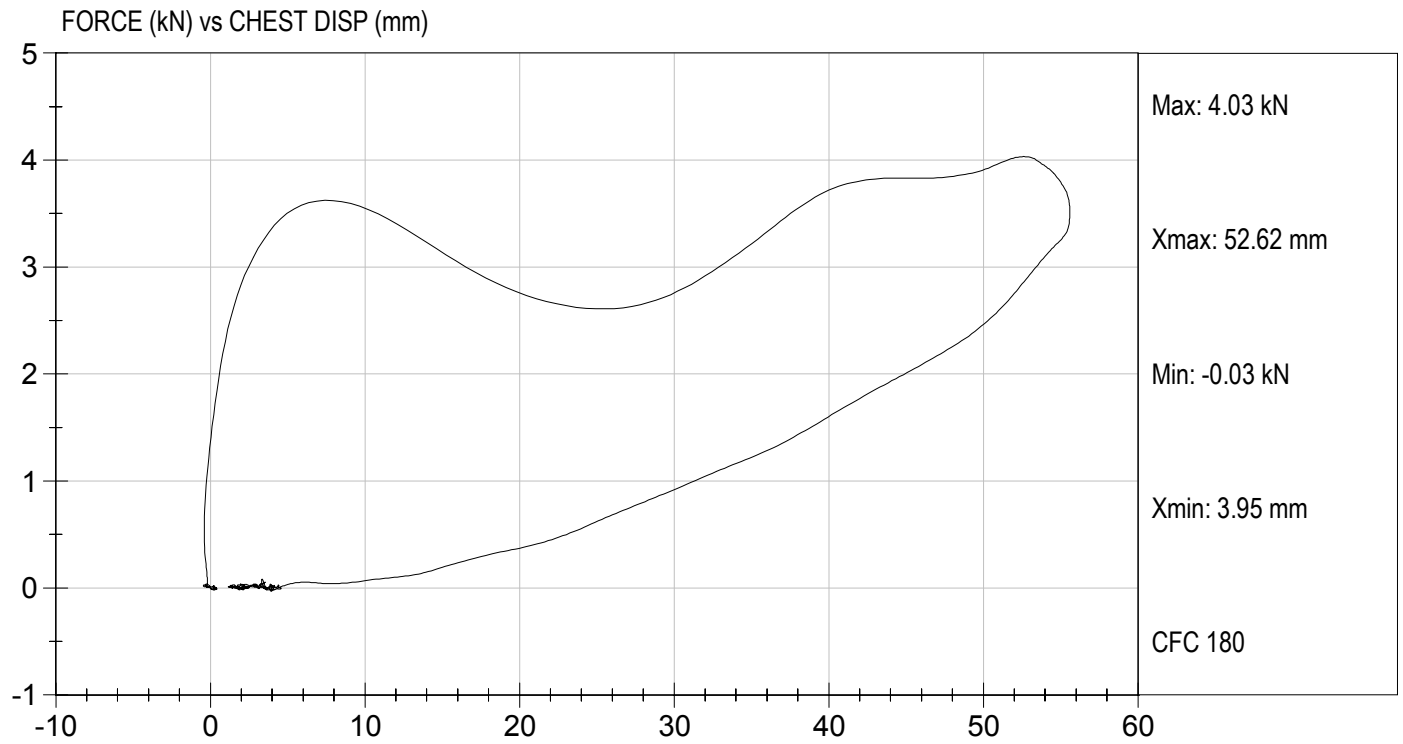
06/01/2004
 Test Date


 Approved By



Test Desc: Thorax Impact
Componet ID: D041274

Test Date: 06/01/2004
Velocity: 22.2 ft/s, 6.77 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 506

Test Date 4/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.7

Record the maximum humidity 54%

Record the minimum humidity 49%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 14°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	14°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	336 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	15°

Joe Fleck
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041277

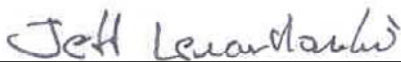
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Initial Angle	deg	0 to 20	14	Pass
Return Angle	deg	+/- 8	15	Pass
Force at 45 deg	N	320 to 390	336	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result				Pass



Laboratory Technician

06/01/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 506

Test Date 4/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.7

Record the maximum humidity 54%

Record the minimum humidity 49%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3770 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041276

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.77	Pass
Overall Test Results				Pass



Laboratory Technician

06/01/2004

Test Date

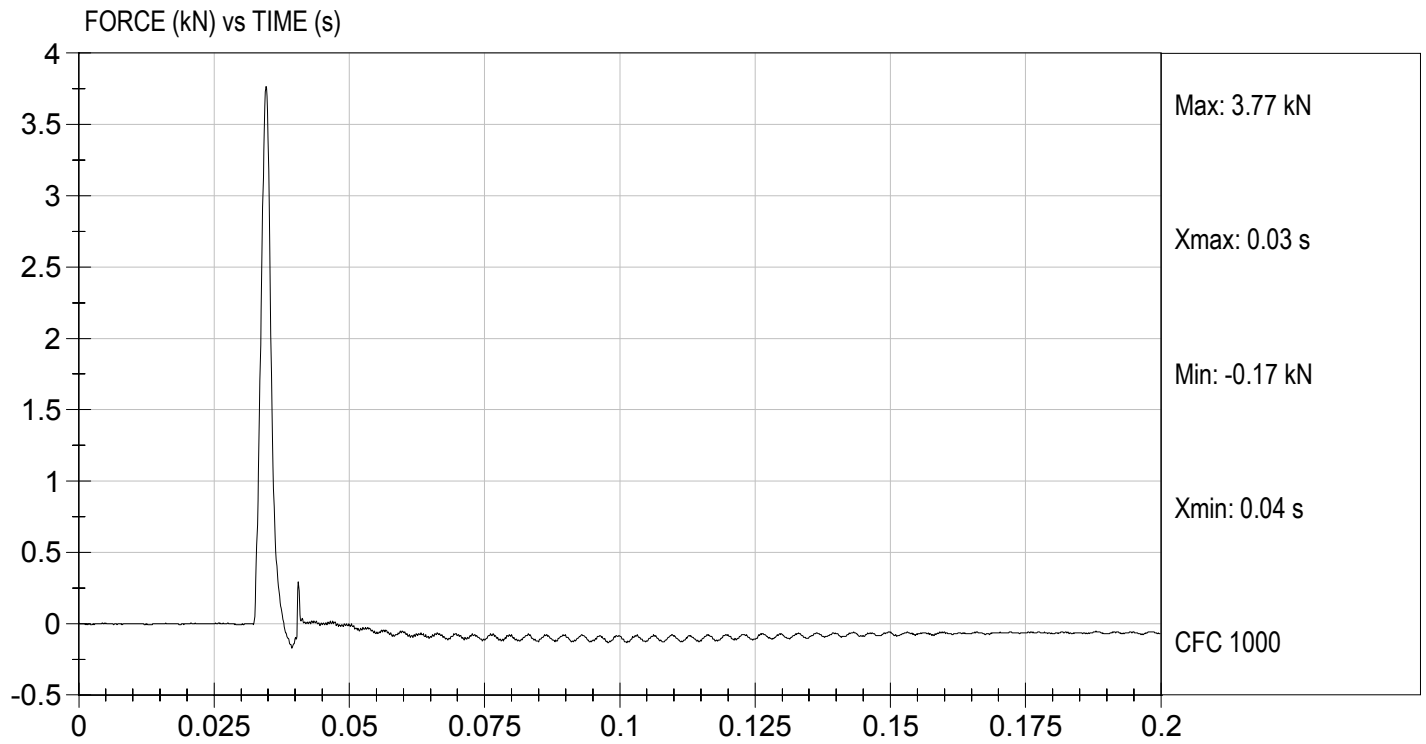


Approved By



Test Desc: Left Knee
Componet ID: D041276

Test Date: 06/01/2004
Velocity: 6.95 ft/s, 2.12 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 506

Test Date 6/1/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 2 (when successive knee impact tests are necessary)

☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☐ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 20.4

Record the maximum humidity 54 %

Record the minimum humidity 49 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.09 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3690 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

6/1/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 506

Test I.D: D041275

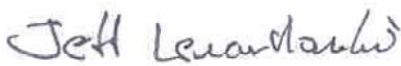
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Speed	m/sec	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.69	Pass
Overall Test Results				Pass



Laboratory Technician

06/01/2004

Test Date

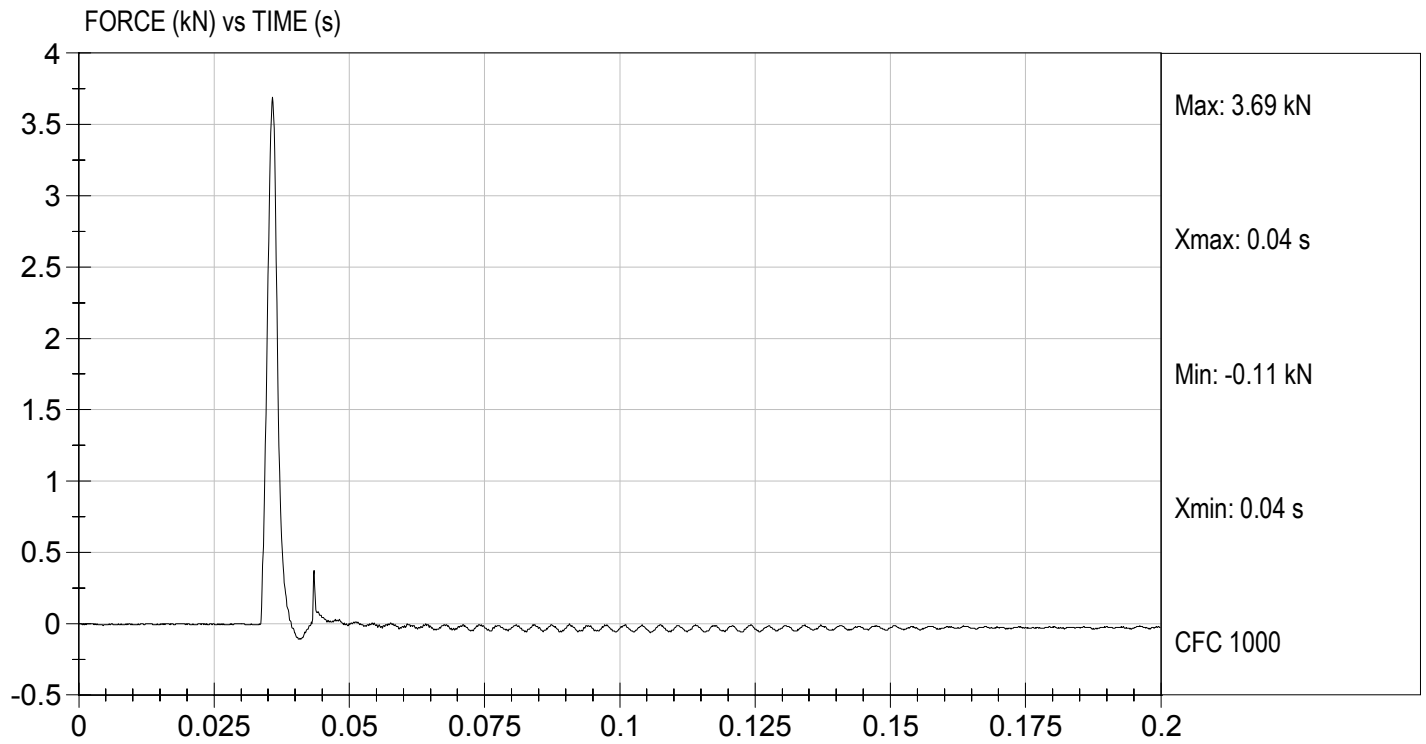


Approved By



Test Desc: Right Knee
Componet ID: D041275

Test Date: 06/01/2004
Velocity: 6.86 ft/s, 2.09 m/s



DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 506 Test Date 5/28/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

6/1/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

6/1/04
Date

EXTERNAL DIMENSIONS

SN506, 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.	774.7-800.1	780.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	443.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.1
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.4
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	255.8
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	193.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	545.0
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	365.2
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	438.0

SN506, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 $\pm$ 5.1 mm above seat surface	175.3-190.5	183.0
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	226.2
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	475.8
S	HEAD BREADTH	The widest part of the head	137.1-147.3	142.0
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	180.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	305.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	359.0
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.5
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	538.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 $\pm$ 12.7 mm above seat surface	850.9-881.3	857.6
Z	WAIST CIRCUMFERENCE	Measured 165.1 $\pm$ 5.1 mm above seat surface	759.5-789.9	789.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

EXTERNAL DIMENSIONS

SN511, 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.	774.7-800.1	794.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.5
C	H-POINT HEIGHT	Reference	81.3-86.3	82.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	148.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	82.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	131.3
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.4
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	43.5
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	278.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	195.2
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	545.0
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	361.7
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	399.0
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	415.1

SN511, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	180.2
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	225.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	465.2
S	HEAD BREADTH	The widest part of the head	137.1-147.3	143.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	180.0
U	HIP BREADTH	The widest part of the hip	299.7-314.9	309.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	363.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	87.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	545.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	873.8
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	788.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 511

Test Date 6/11/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))

☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

☒ 4. Accelerometers and their respective mounts are smooth and clean.

☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))

☒ 7. 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. (572.132(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.5

Record the maximum humidity 51%

Record the minimum humidity 48%

☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 502mm

Record the left side distance 502mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	280
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	9

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

Jessica Hall
Signature

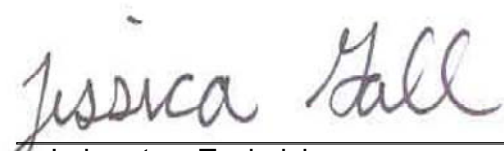
6/11/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

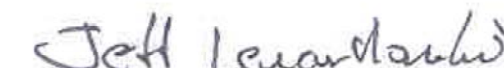
ATD Serial No: 511

Test ID: D041371

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	250 - 300	280	Pass
Peak Lateral Acceleration	G's	+/- 15	-8.7	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/11/2004
Test Date

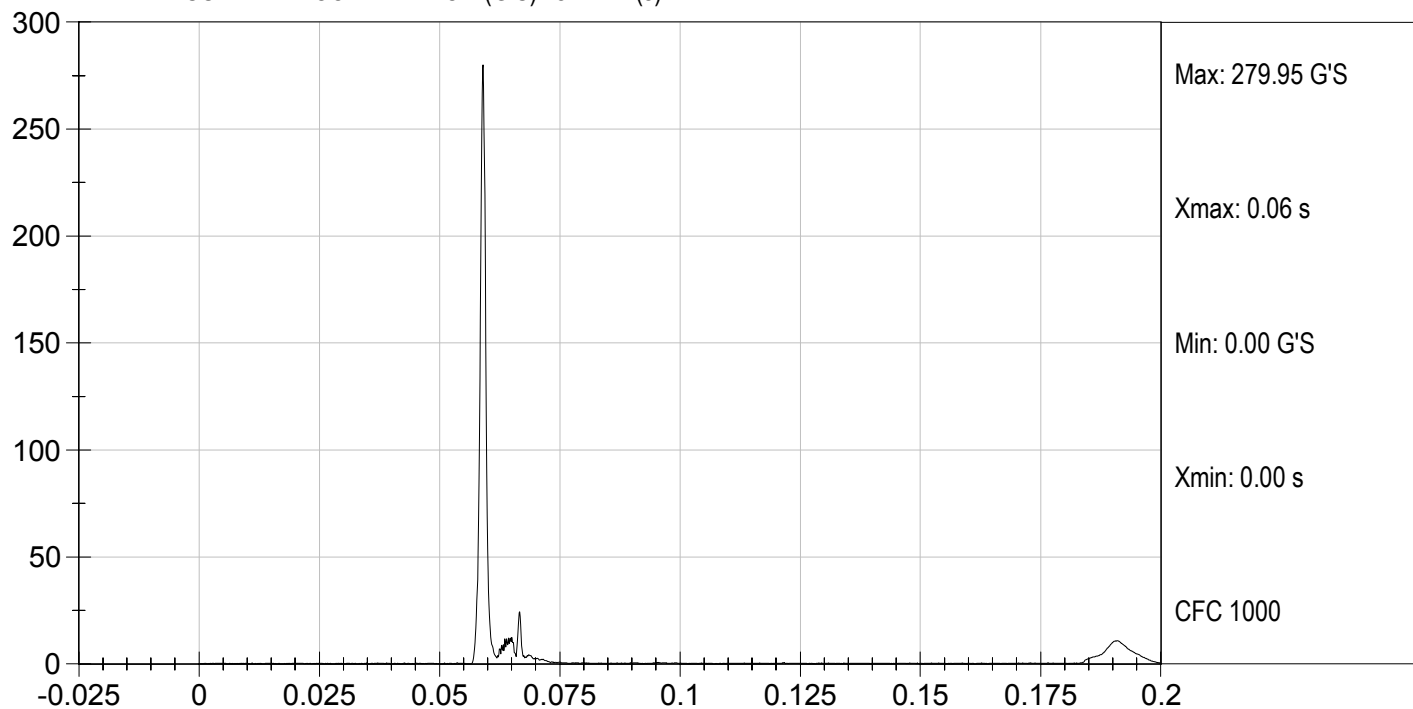

Approved By



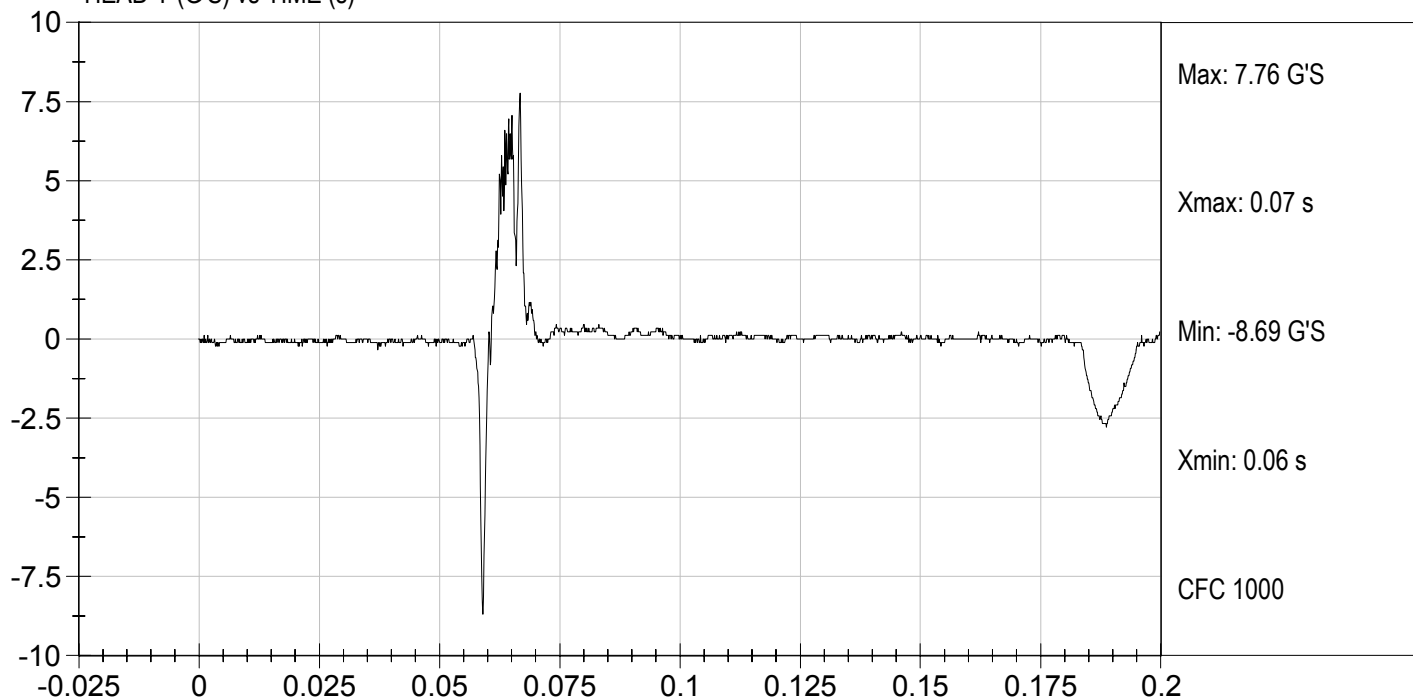
Test Desc: Head Drop
Componet ID: D041371

Test Date: 06/11/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 511

Test Date 6/15/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))

☒ N/A, ONLY one flexion test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.0

Record the maximum humidity 48%

Record the minimum humidity 43%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 81; Back 89.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.05 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.4 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.6 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.7 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>83</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	87 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

Joe Fleck
Signature

6/15/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041372

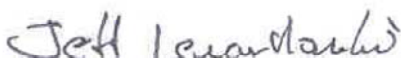
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.6	Pass
	30 msec	m/sec	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	83	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	87	Pass
Overall Results				Pass	



Laboratory Technician

06/15/2004

Test Date



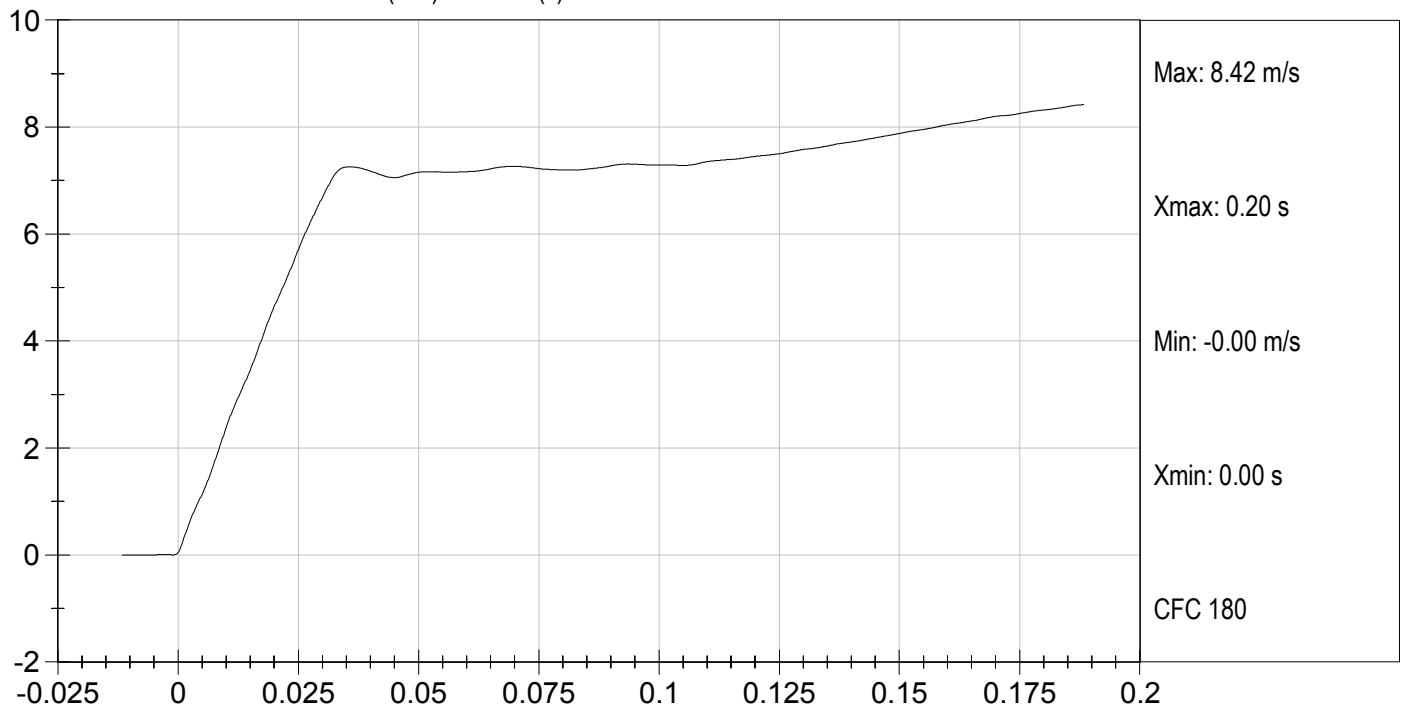
Approved By



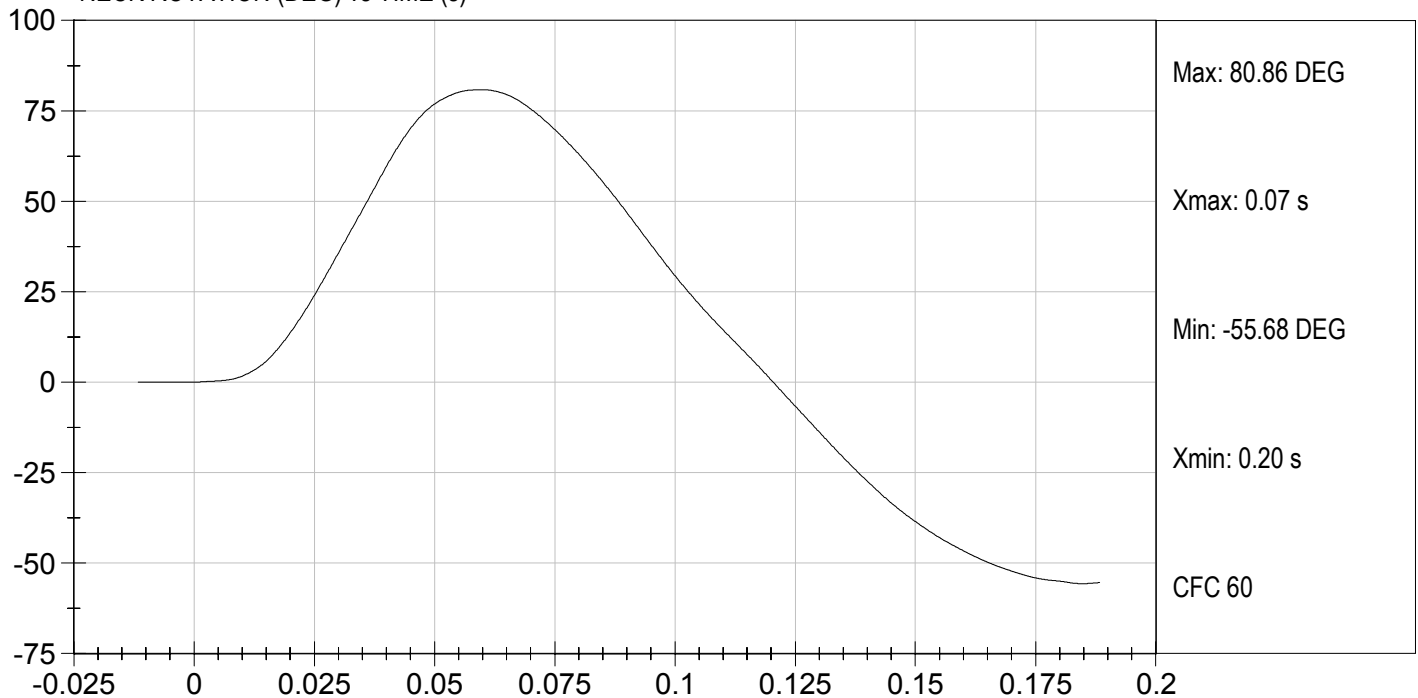
Test Desc: Neck Flexion
Componet ID: D041372

Test Date: 06/15/2004
Velocity: 23.14 ft/s, 7.05 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



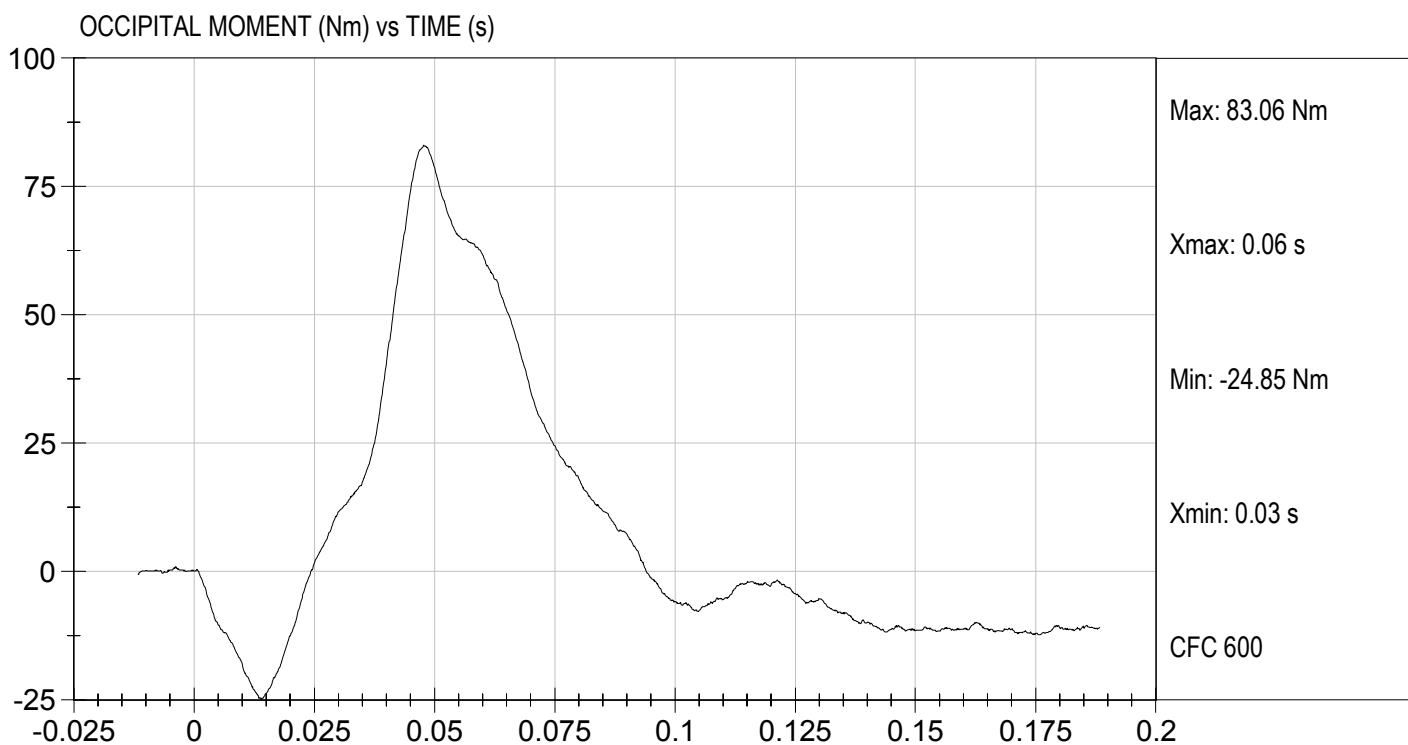
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D041372

Test Date: 06/15/2004
Velocity: 23.14 ft/s, 7.05 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 511 Test Date 6/15/04

Technician Joe Fleck

☒ Pretest calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one extension test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.0</u> |
| Record the maximum humidity | <u>48%</u> |
| Record the minimum humidity | <u>43%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness: Front 81; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.08 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.7 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.4 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-56</u> Nm @ <u>110</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	99 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

6/15/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041373

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	99	Pass
Overall Results					Pass



Laboratory Technician

06/15/2004

Test Date

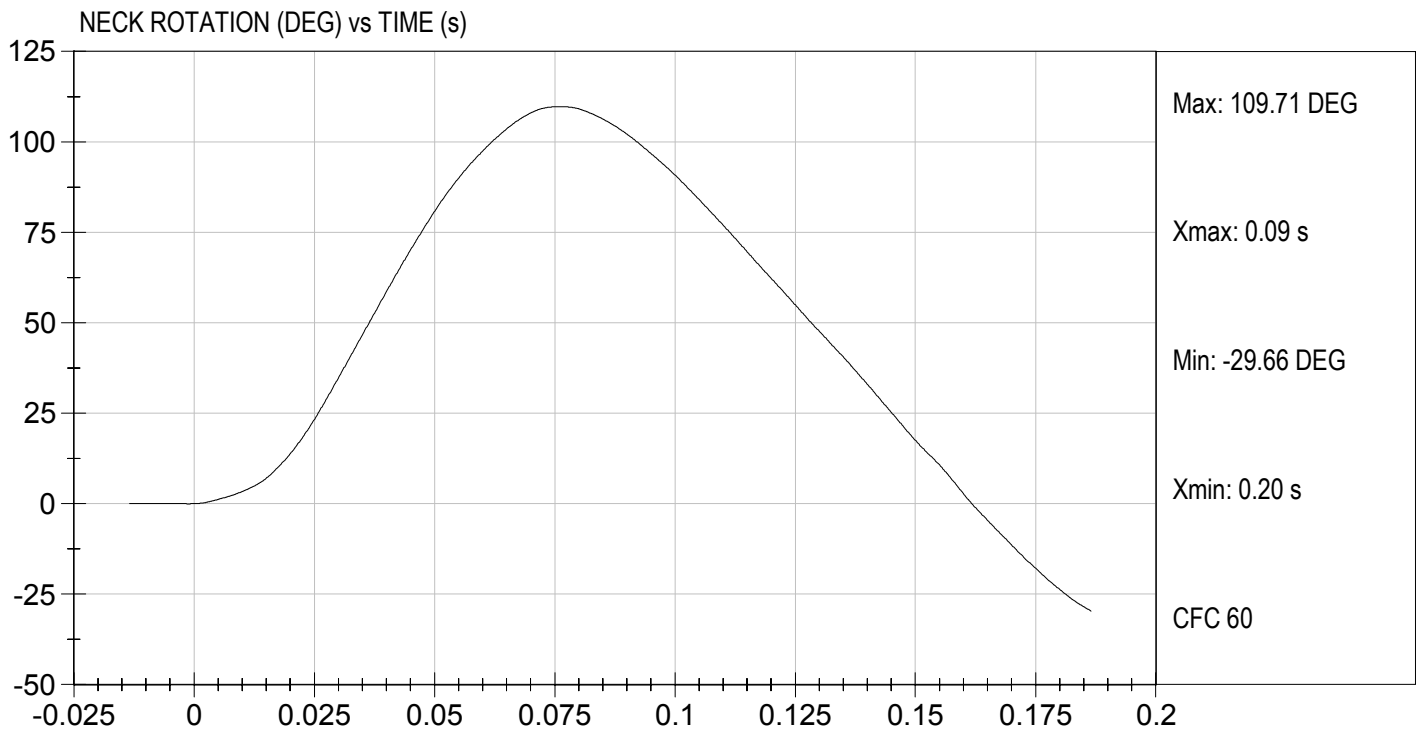
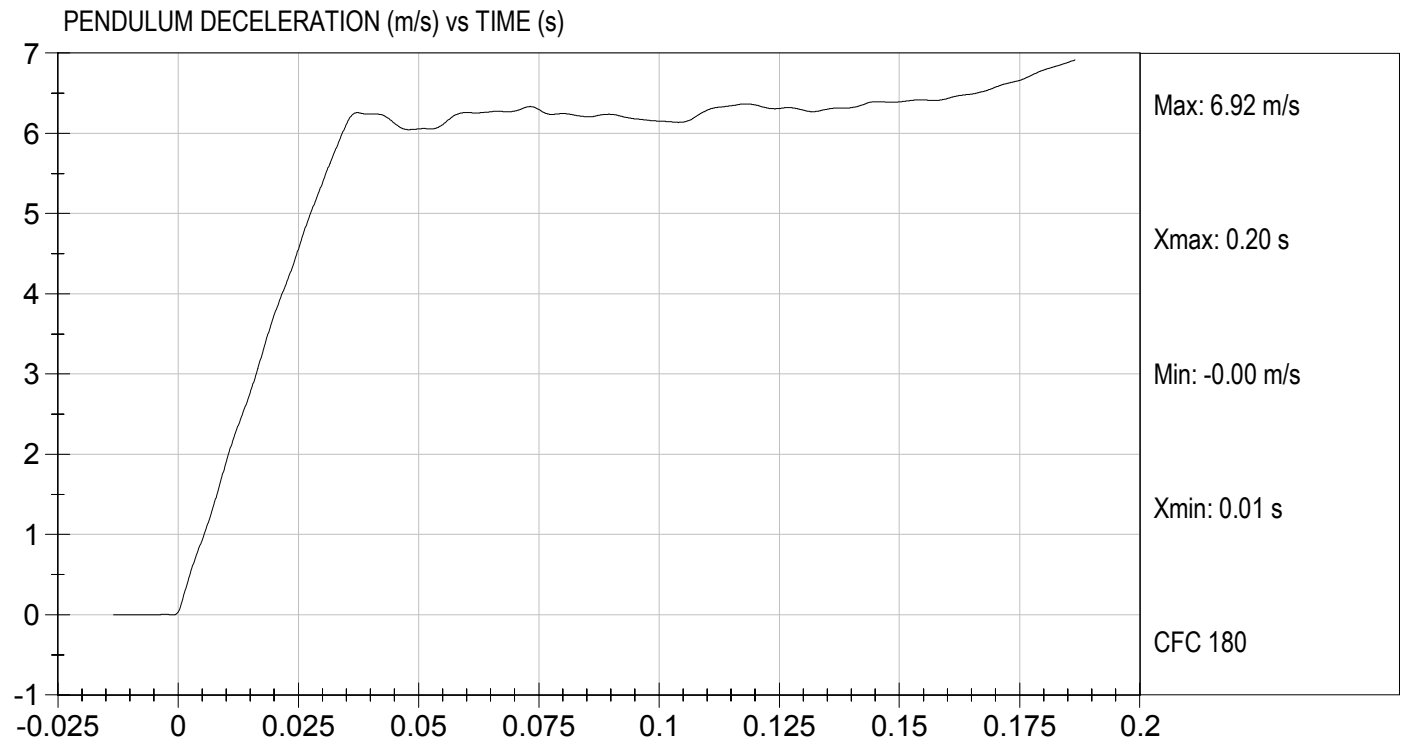


Approved By



Test Desc: Neck Extension
Componet ID: D041373

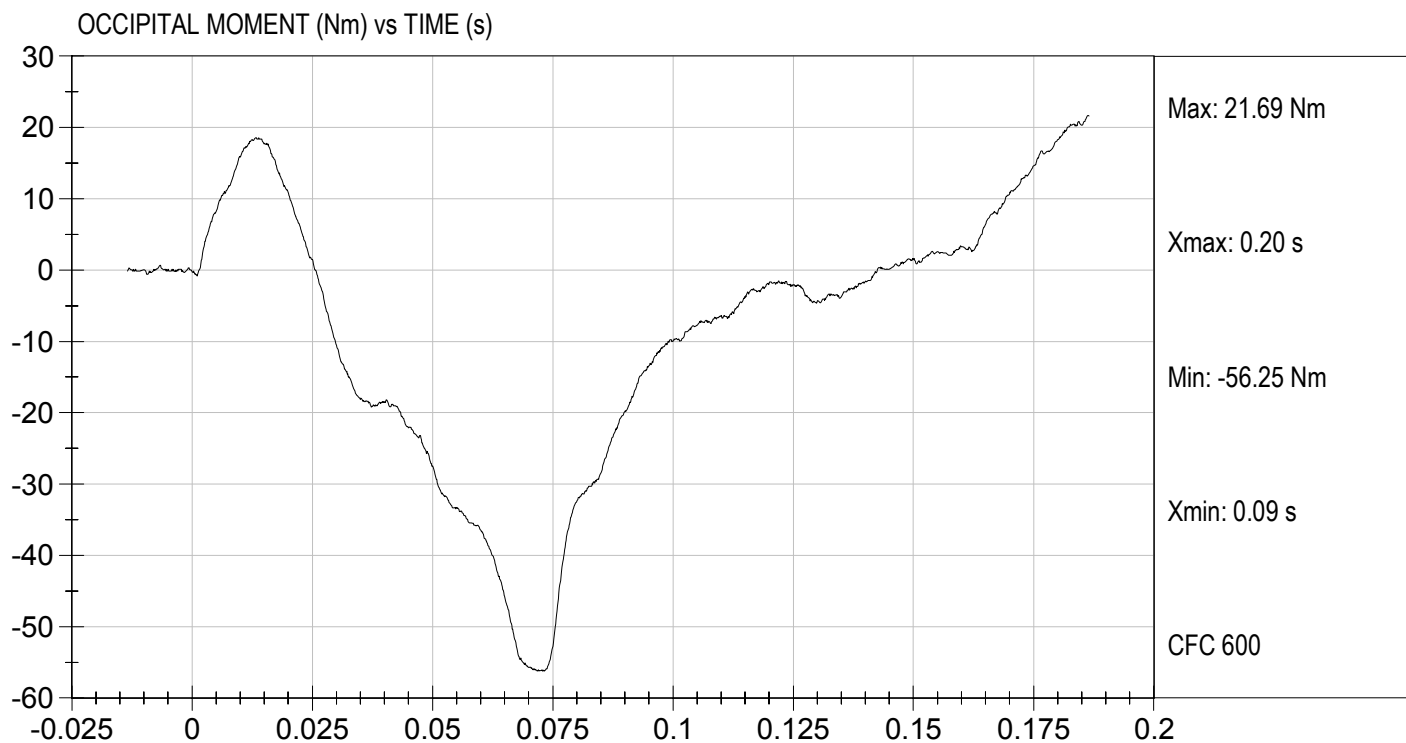
Test Date: 06/15/2004
Velocity: 19.96 ft/s, 6.08 m/s





Test Desc: Neck Extension
Componet ID: D041373

Test Date: 06/15/2004
Velocity: 19.96 ft/s, 6.08 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 511

Test Date 6/15/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 21.8

Record the minimum temperature 21.0

Record the maximum humidity 48%

Record the minimum humidity 43%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.78 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	54 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4220 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4216 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Flack
Signature

6/15/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041374

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	6.59 to 6.83	6.78	Pass
Peak Deflection	mm	50 to 58	54.0	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4216	Pass
			Overall Test Results	Pass



Laboratory Technician

06/15/2004

Test Date

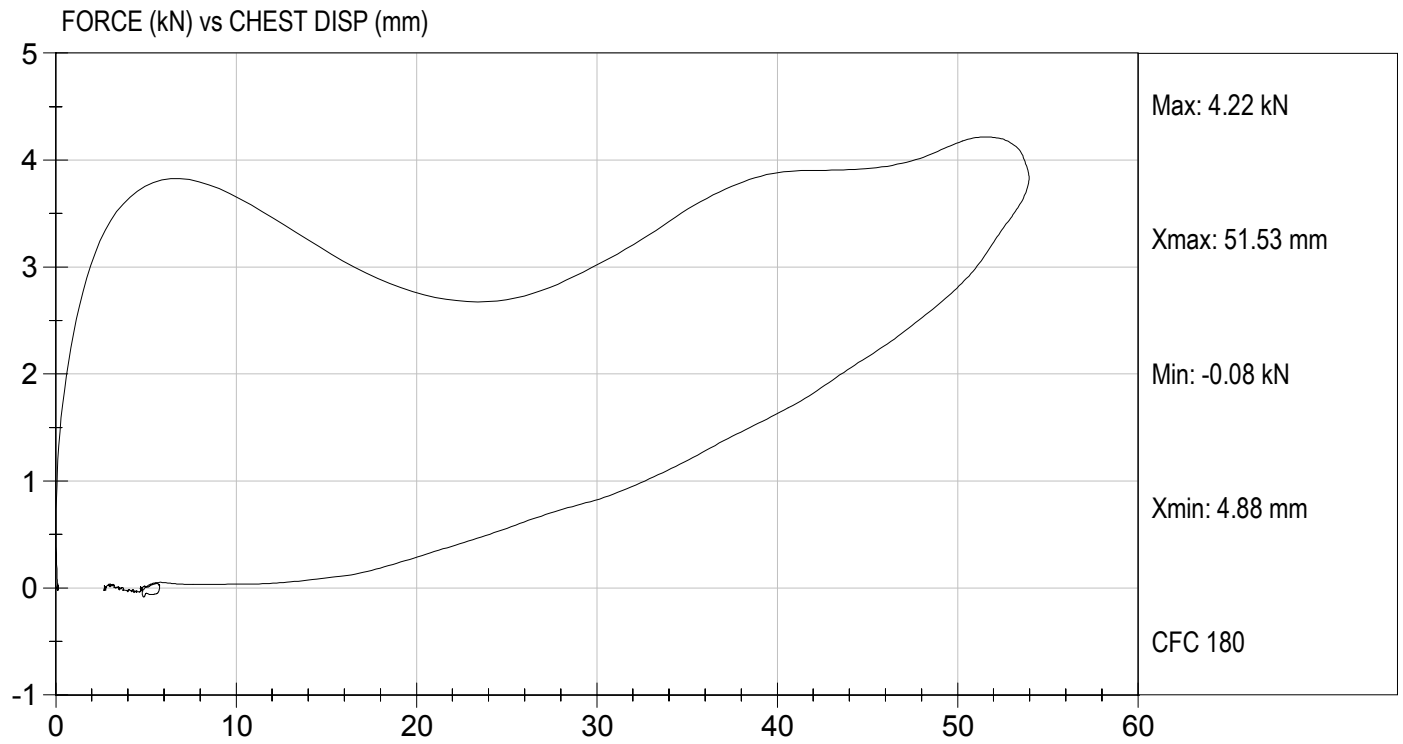


Approved By



Test Desc: Thorax Impact
Componet ID: D041374

Test Date: 06/15/2004
Velocity: 22.23 ft/s, 6.78 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 511

Test Date 6/15/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 13B.

☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.0

Record the maximum humidity 48%

Record the minimum humidity 43%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))

☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))

☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))

☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))

Record reference plane angle (max. allowed 20°) 17°

☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	17°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	349 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	19°

Joe Fleck
Signature

6/15/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041377

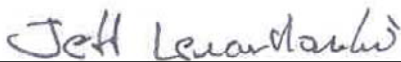
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	19	Pass
Force at 45 deg	N	320 to 390	349	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	Yes	Pass
Overall Result				Pass



Laboratory Technician

06/15/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 511

Test Date 6/15/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☐ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.1

Record the maximum humidity 48%

Record the minimum humidity 43%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3530 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Flores
Signature

6/15/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041376

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	3.45 to 4.06	3.53	Pass
Overall Test Results				Pass



Laboratory Technician

06/15/2004

Test Date

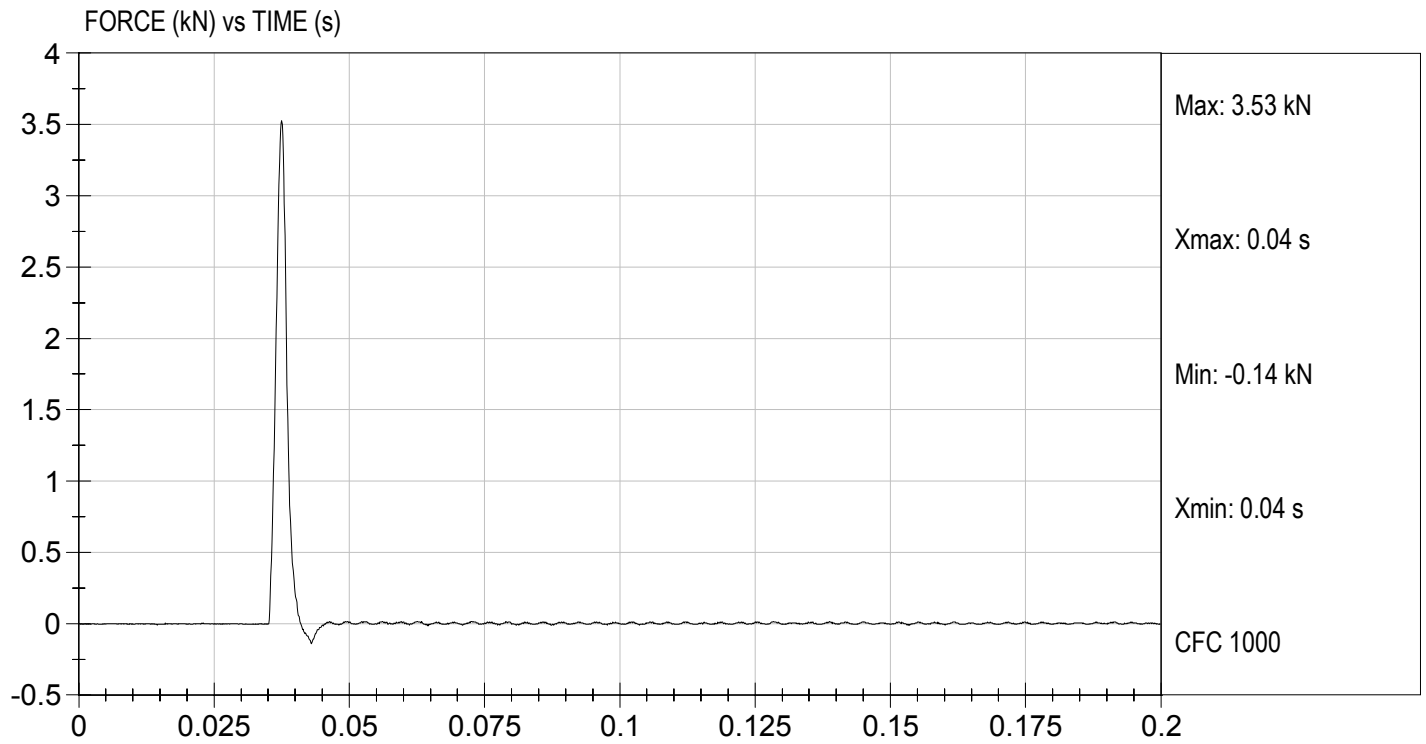


Approved By



Test Desc: Left Knee
Componet ID: D041376

Test Date: 06/15/2004
Velocity: 6.83 ft/s, 2.08 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 511

Test Date 6/15/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.1

Record the maximum humidity 48 %

Record the minimum humidity 43 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3600 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

6/15/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041375

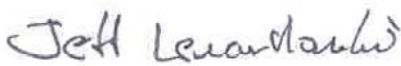
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	3.45 to 4.06	3.60	Pass
Overall Test Results				Pass



Laboratory Technician

06/15/2004

Test Date

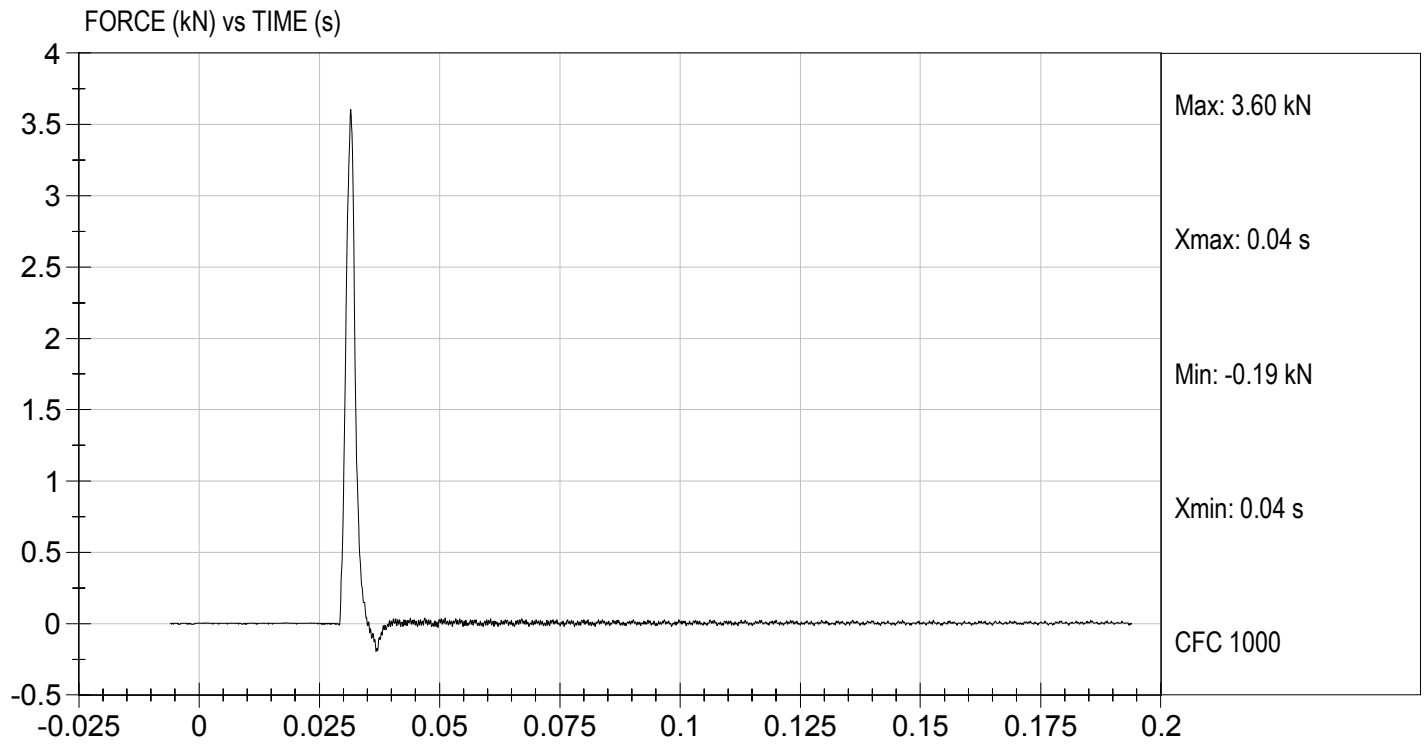


Approved By



Test Desc: Right Knee
Componet ID: D041375

Test Date: 06/15/2004
Velocity: 6.84 ft/s, 2.08 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 511

Test Date 6/22/04

Technician Jessica Gall

 Pretest calibration

X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))

X N/A, ONLY one head drop performed

X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))

X 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

X 4. Accelerometers and their respective mounts are smooth and clean.

X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))

X 7. 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. (572.132(c)(1))

Record the maximum temperature 21.8

Record the minimum temperature 21.2

Record the maximum humidity 47%

Record the minimum humidity 42%

X 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 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. (572.132(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))

Record the actual distance 376 mm

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance 502mm

Record the left side distance 502mm

- X 12. 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). (572.132(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.132(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	290
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	12

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

Jessica Hall
Signature

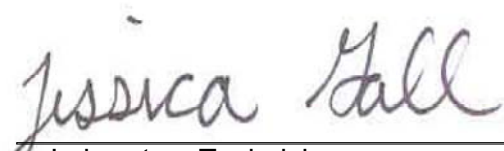
6/22/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

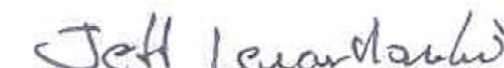
ATD Serial No: 511

Test ID: D041391

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	250 - 300	290	Pass
Peak Lateral Acceleration	G's	+/- 15	-11.5	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/22/2004
Test Date

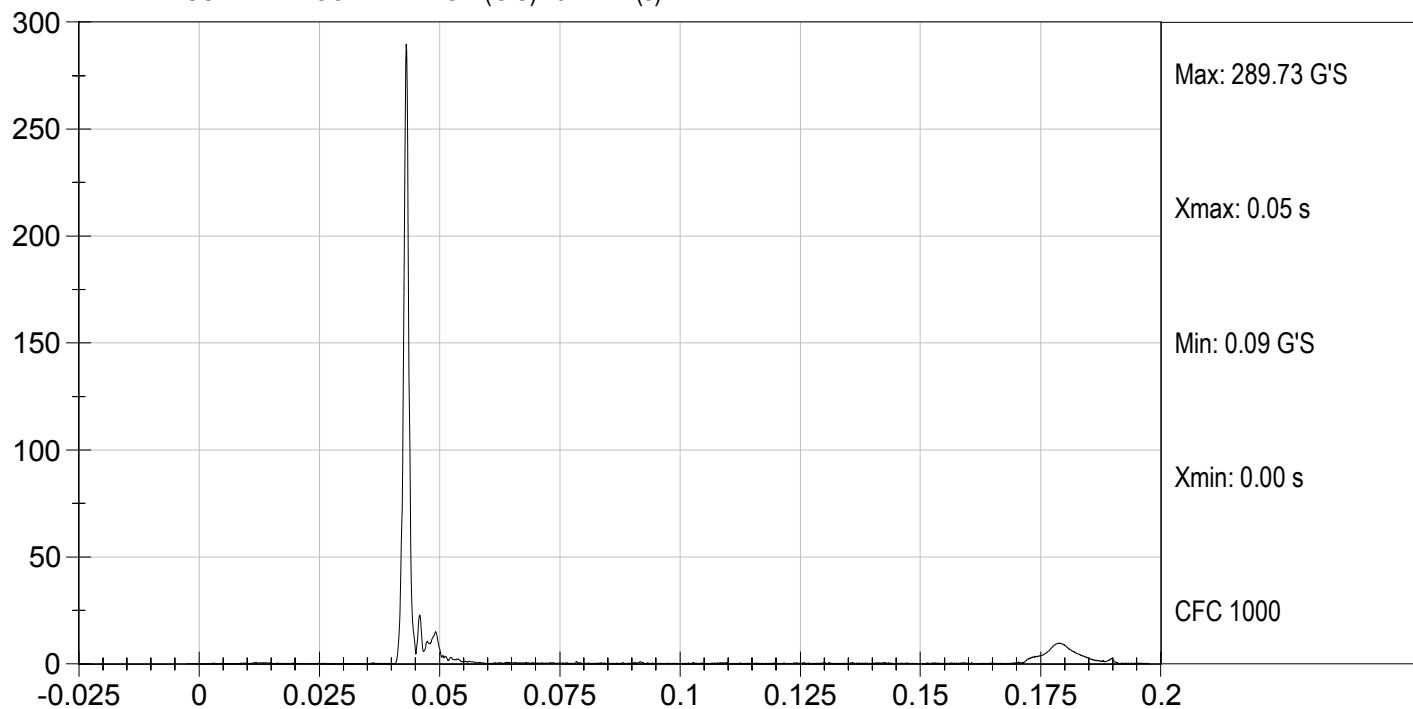

Approved By



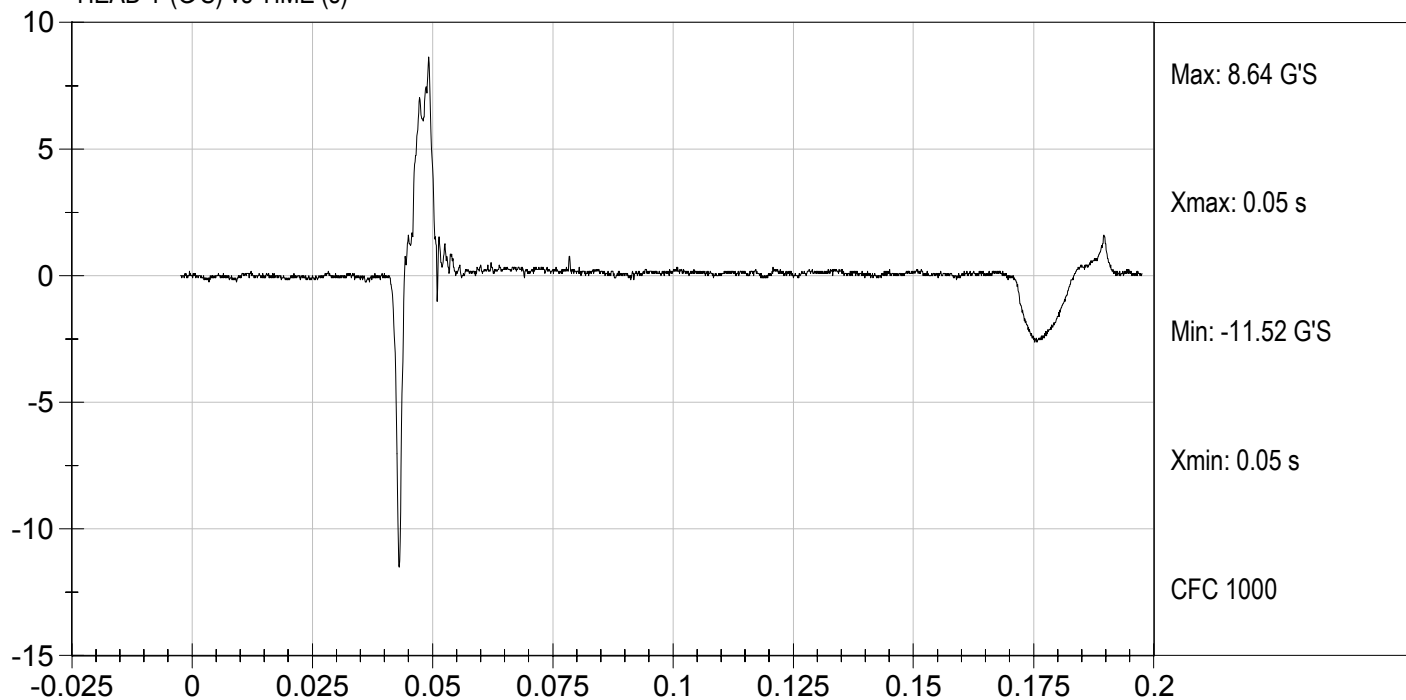
Test Desc: Head Drop
Componet ID: D041391

Test Date: 08/31/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (s)



HEAD Y (G'S) vs TIME (s)



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 511

Test Date 6/22/04

Technician Jim Carney

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 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. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>47%</u> |
| Record the minimum humidity | <u>42%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
 Record findings and actions: No Deterioration. Hardness: Front 81; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.12 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.2 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.3 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.1 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>78</u> Nm @ <u>89</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	90 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

James Carney
Signature

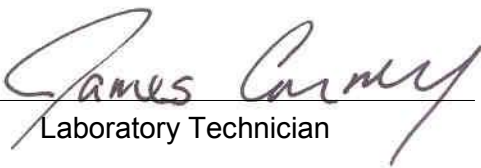
6/22/04
Date

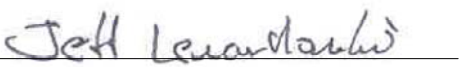
MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041392

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.12	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.2	Pass
	20 msec	m/sec	4.0 to 5.0	4.3	Pass
	30 msec	m/sec	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	89	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	78	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	90	Pass
Overall Results				Pass	


Laboratory Technician

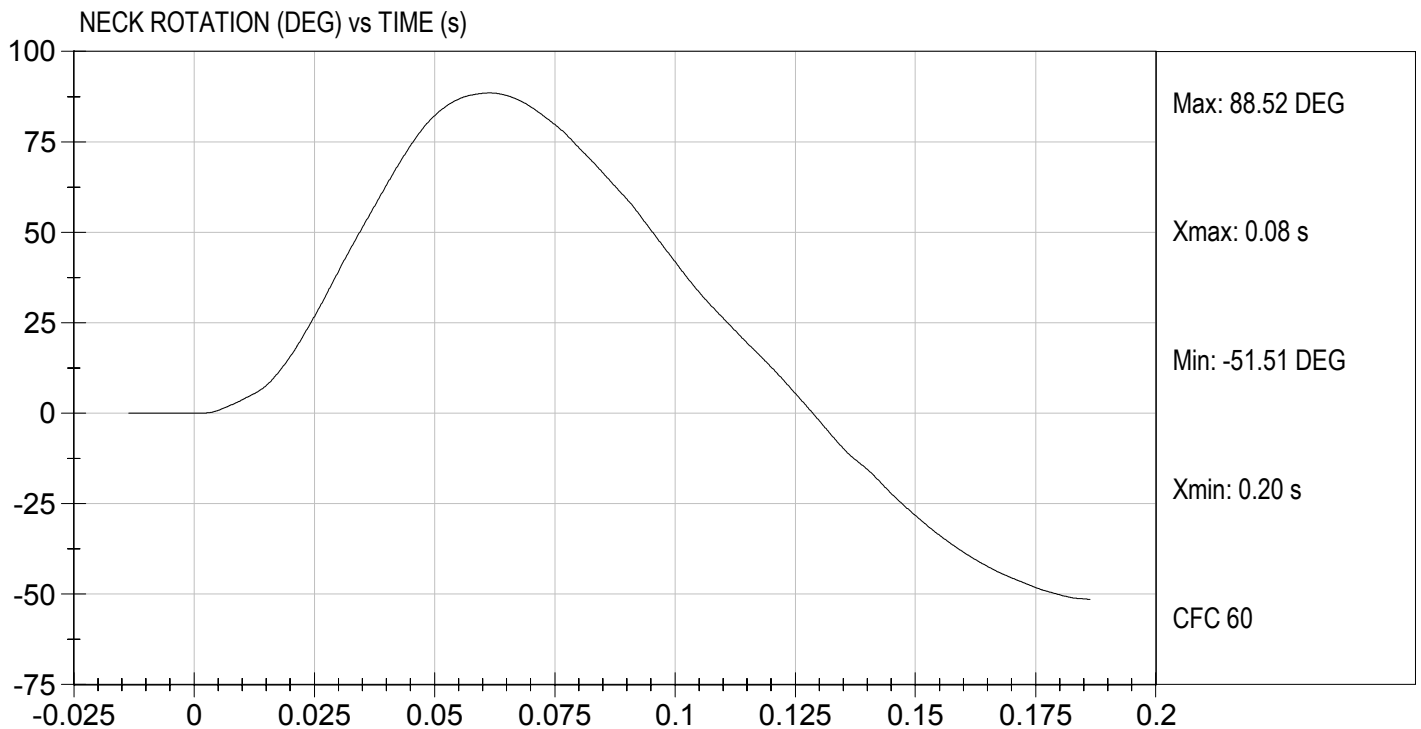
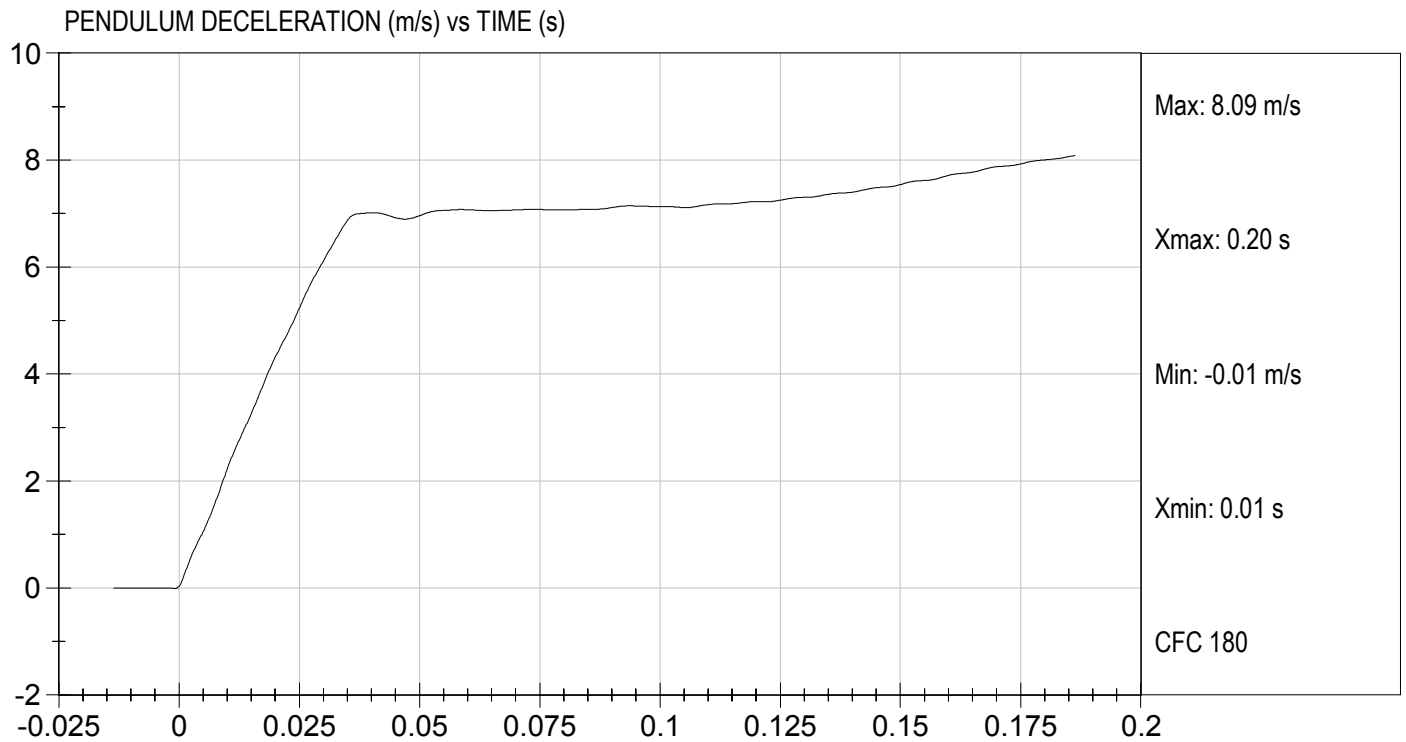

Approved By

06/22/2004
Test Date



Test Desc: Neck Flexion
Componet ID: D041392

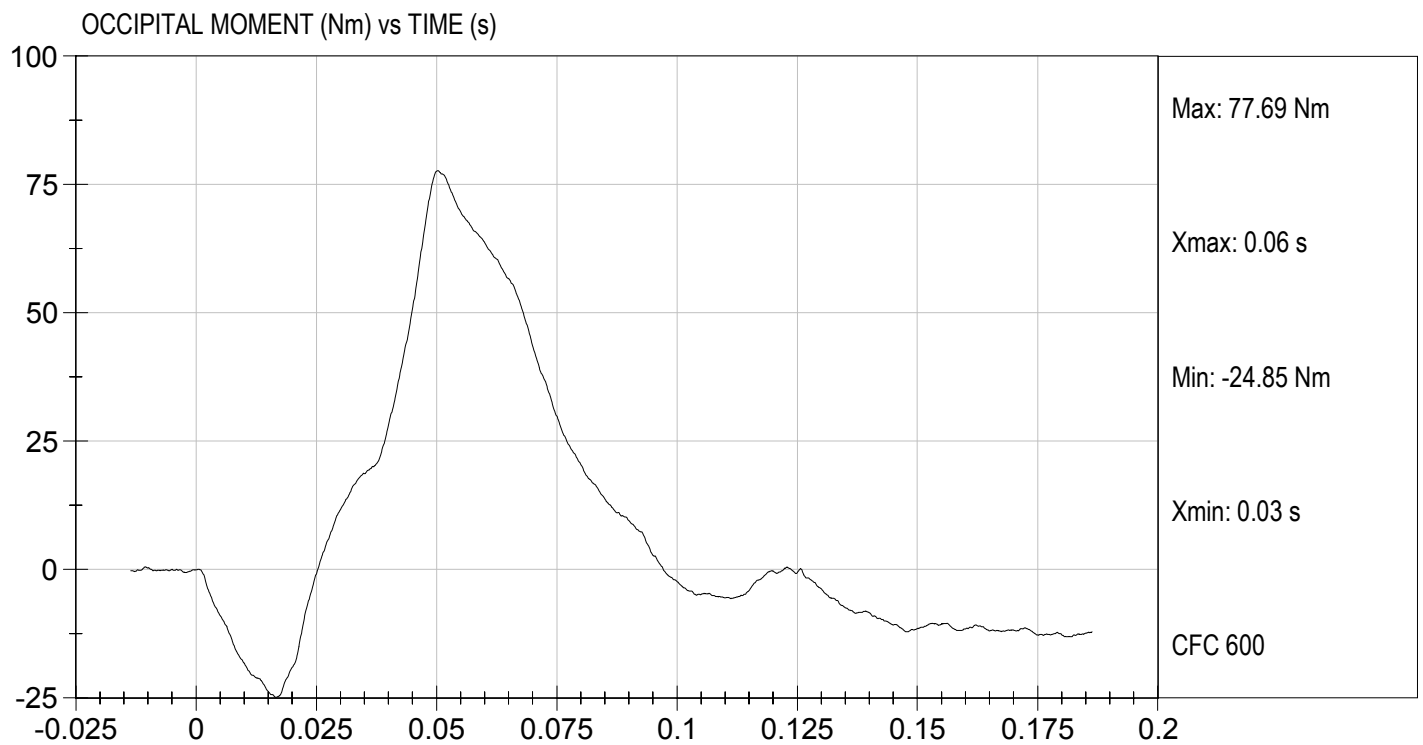
Test Date: 06/22/2004
Velocity: 23.36 ft/s, 7.12 m/s





Test Desc: Neck Flexion
Componet ID: D041392

Test Date: 06/22/2004
Velocity: 23.36 ft/s, 7.12 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 506

Test Date 6/23/04

Technician Jim Carney

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

☒ 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. (572.133(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.2

Record the maximum humidity 46%

Record the minimum humidity 42%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration. Hardness: Front 81; Back 89.

☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 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 bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Extension Test Results (572.133(b)(2) & (572.133(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.15 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.8 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.5 m/s
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.1 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	<u>-58</u> Nm @ <u>111</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	104 ms

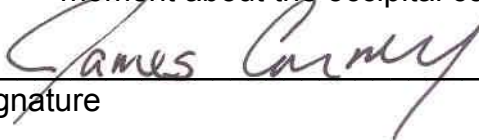
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

6/23/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

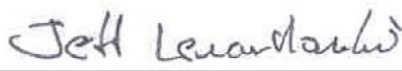
Test I.D: D041393

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.15	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.5	Pass
	30 msec	m/sec	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	111	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-58	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	104	Pass
Overall Results					Pass


Laboratory Technician

06/23/2004

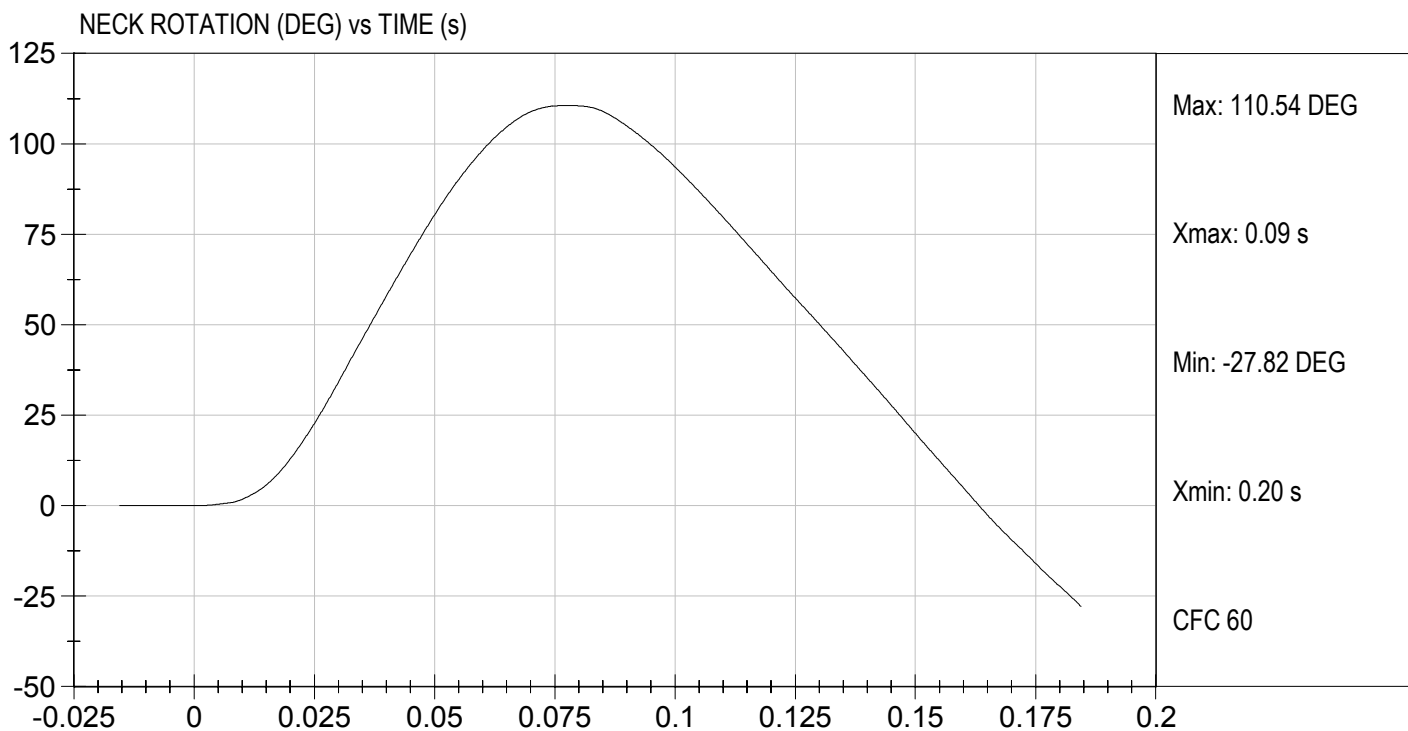
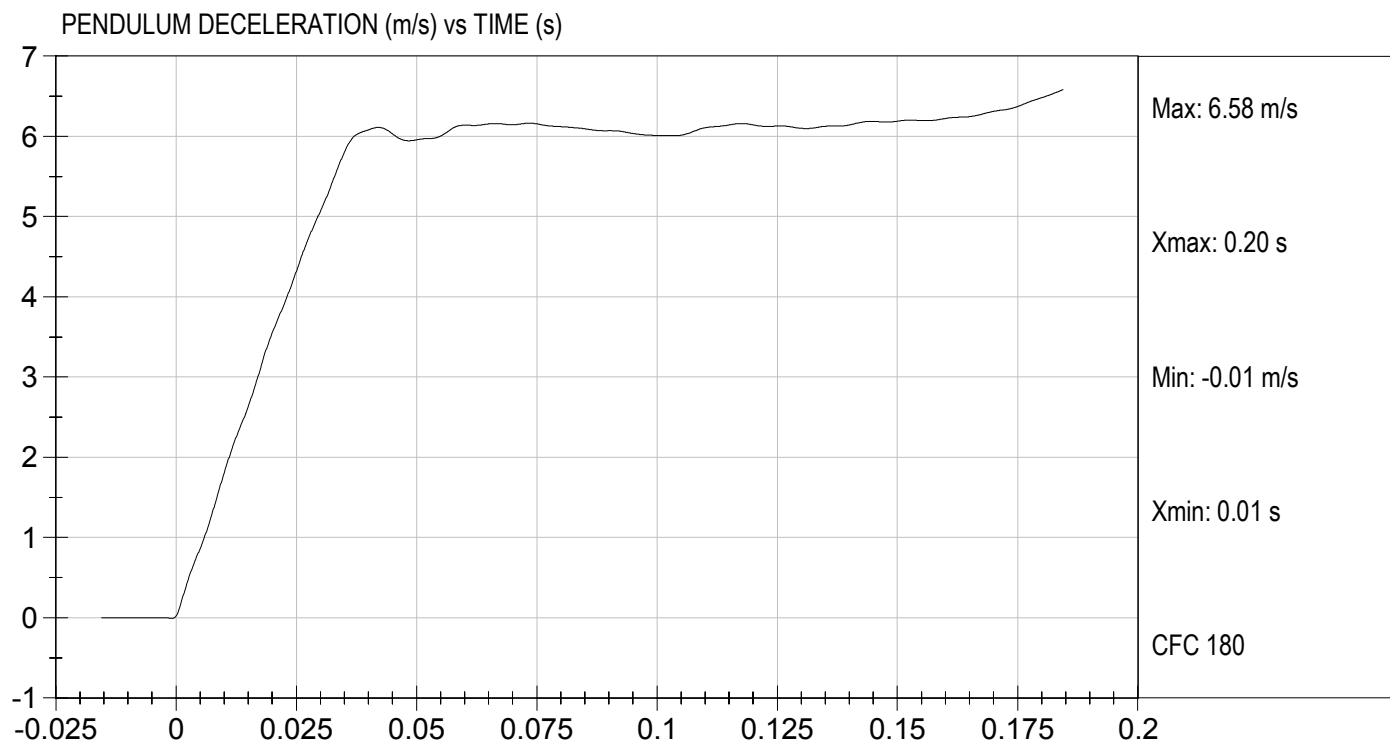
Test Date


Approved By



Test Desc: Neck Extension
Componet ID: D041393

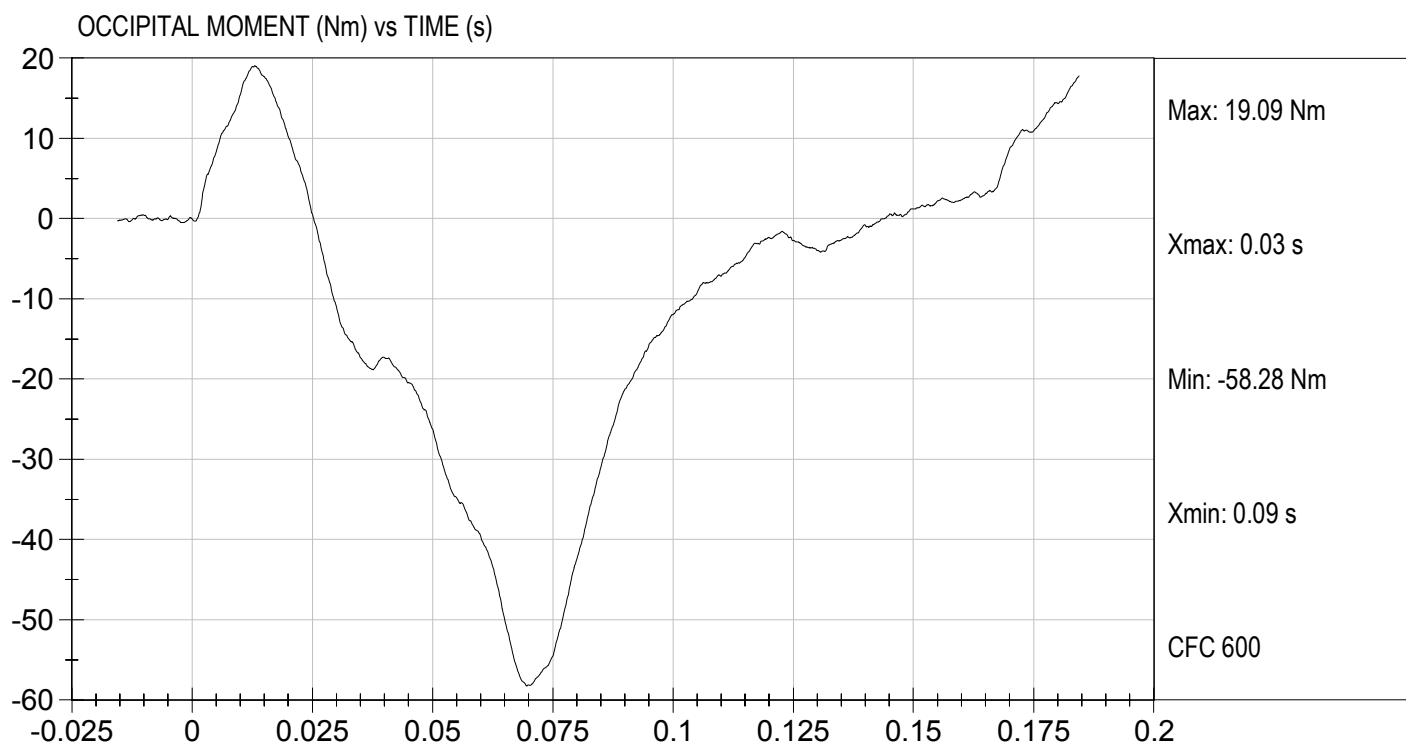
Test Date: 06/23/2004
Velocity: 20.18 ft/s, 6.15 m/s





Test Desc: Neck Extension
Componet ID: D041393

Test Date: 06/23/2004
Velocity: 20.18 ft/s, 6.15 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 511

Test Date 6/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11B.

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(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. (572.134(c)(2))

Record the maximum temperature 22.0

Record the minimum temperature 21.2

Record the maximum humidity 46%

Record the minimum humidity 42%

☒ 5. Remove the chest skin and 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 _____

☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

☒ 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504)

that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 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 installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 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. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.78 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	55 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4170 N
Peak force** between 18.0 and 50.0 mm chest compression	$\text{peak force} \leq 4600 \text{ N}$	4170 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Flores
Signature

6/23/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

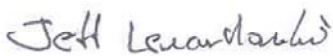
ATD Serial No: 511

Test I.D: D041394

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	6.59 to 6.83	6.78	Pass
Peak Deflection	mm	50 to 58	55.2	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	Yes/No	< 4600 N	4170	Pass
Overall Test Results			Pass	


 Laboratory Technician

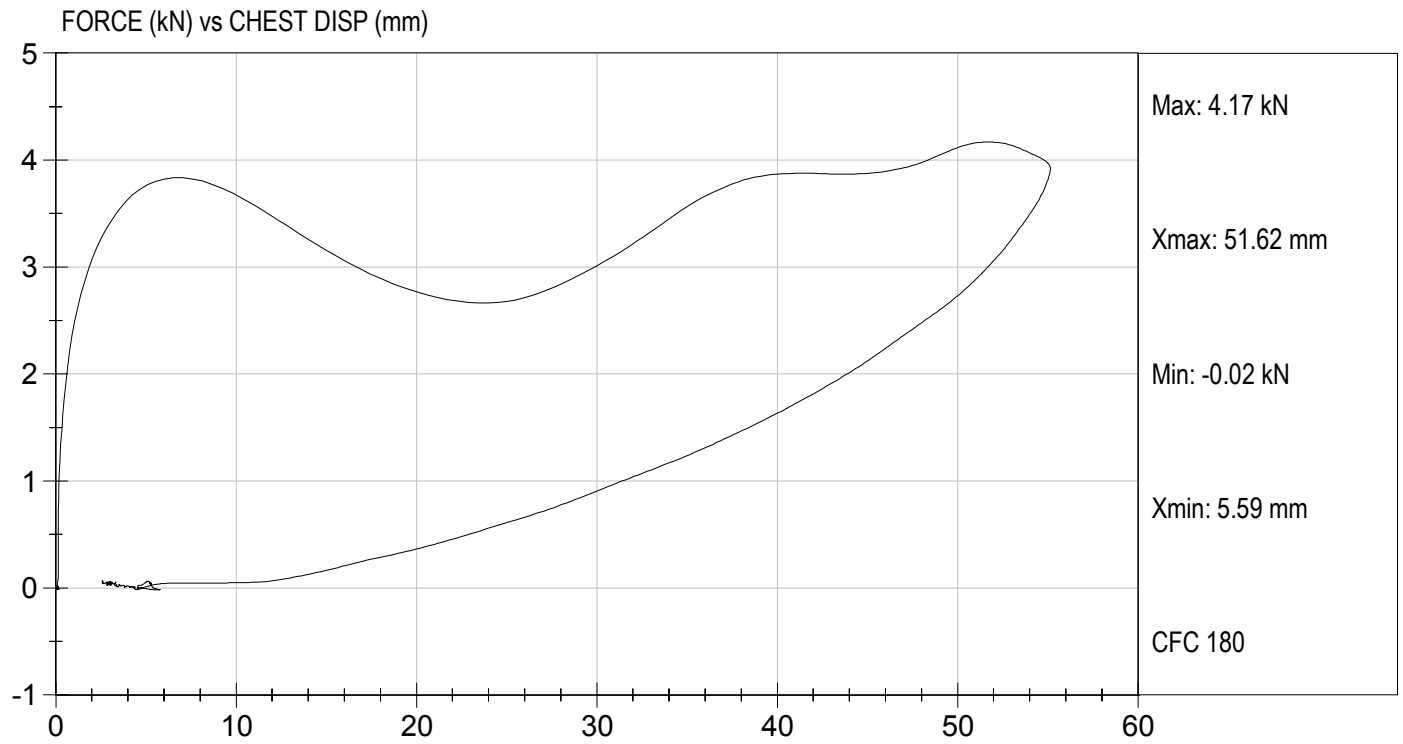
06/23/2004
 Test Date


 Approved By



Test Desc: Thorax Impact
Componet ID: D041394

Test Date: 06/23/2004
Velocity: 22.23 ft/s, 6.78 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 511 Test Date 6/22/04

Technician Dave Wilcox

- ☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.135(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. (572.135(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>47%</u> |
| Record the minimum humidity | <u>42%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- ☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- ☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))
- ☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- ☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- ☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
- | | |
|---|------------|
| Record reference plane angle (max. allowed 20°) | <u>16°</u> |
|---|------------|
- ☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 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 angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

Torso Flexion Results (572.135(b), 572.135(c)(7), (572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	16°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	363 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	21°



 Signature

6/22/04

 Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041397

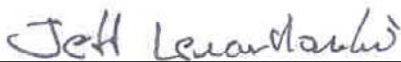
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	21	Pass
Force at 45 deg	N	320 to 390	363	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result				Pass



Laboratory Technician

05/27/2004

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 511

Test Date 6/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B

☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.2

Record the maximum humidity 46%

Record the minimum humidity 42%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3550 N

*Force = impactor mass x deceleration (572.136(b)(2))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Flores
Signature

6/23/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041396

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.55	Pass
Overall Test Results				Pass



Laboratory Technician

06/23/2004

Test Date

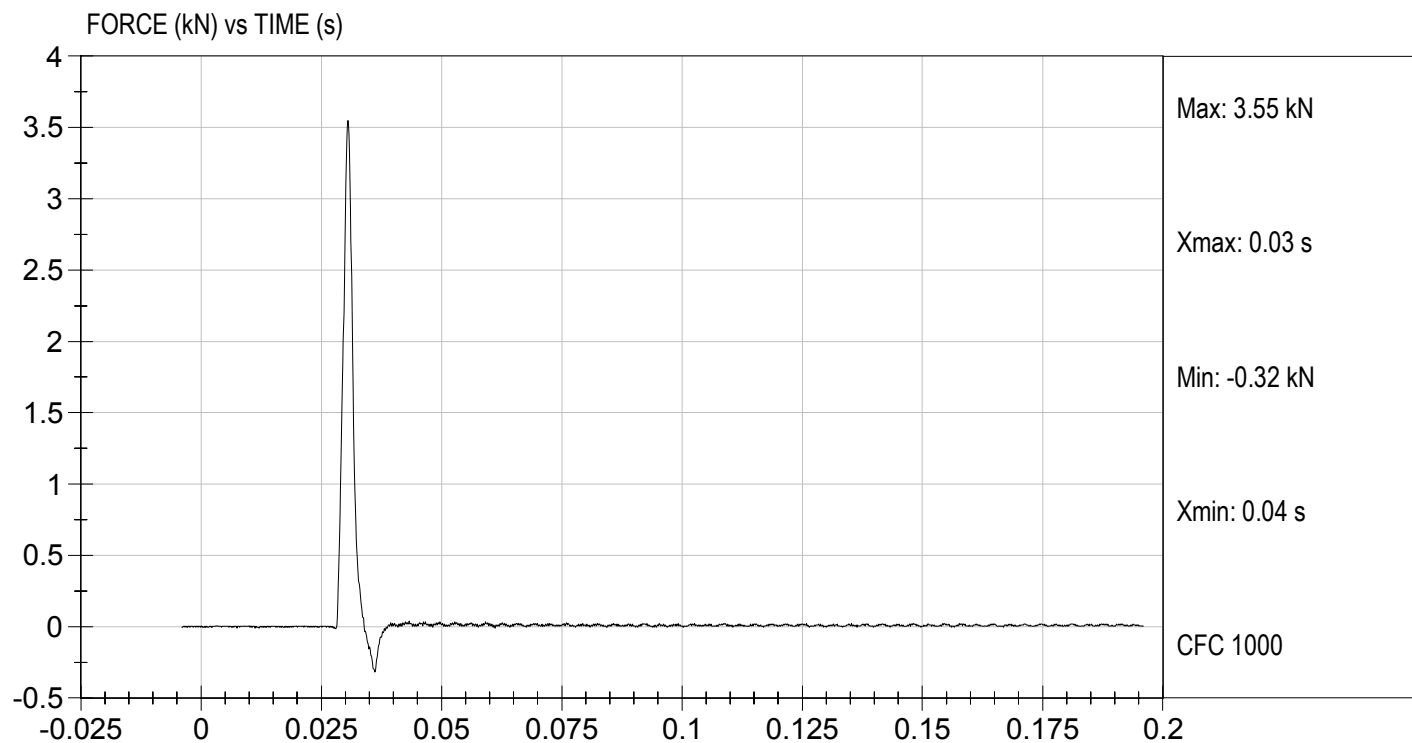


Approved By



Test Desc: Left Knee
Componet ID: D041396

Test Date: 06/23/2004
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 511

Test Date 6/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 14B.

☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))

☒ 4. The knee 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. (572.136(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.2

Record the maximum humidity 46 %

Record the minimum humidity 42 %

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5))

☒ 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3520 N

*Force = impactor mass x deceleration (572.136(b)(2))

☒ 12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck
Signature

6/23/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 511

Test I.D: D041395

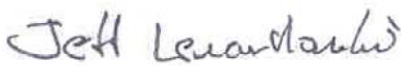
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.52	Pass
Overall Test Results				Pass



Laboratory Technician

06/23/2004

Test Date

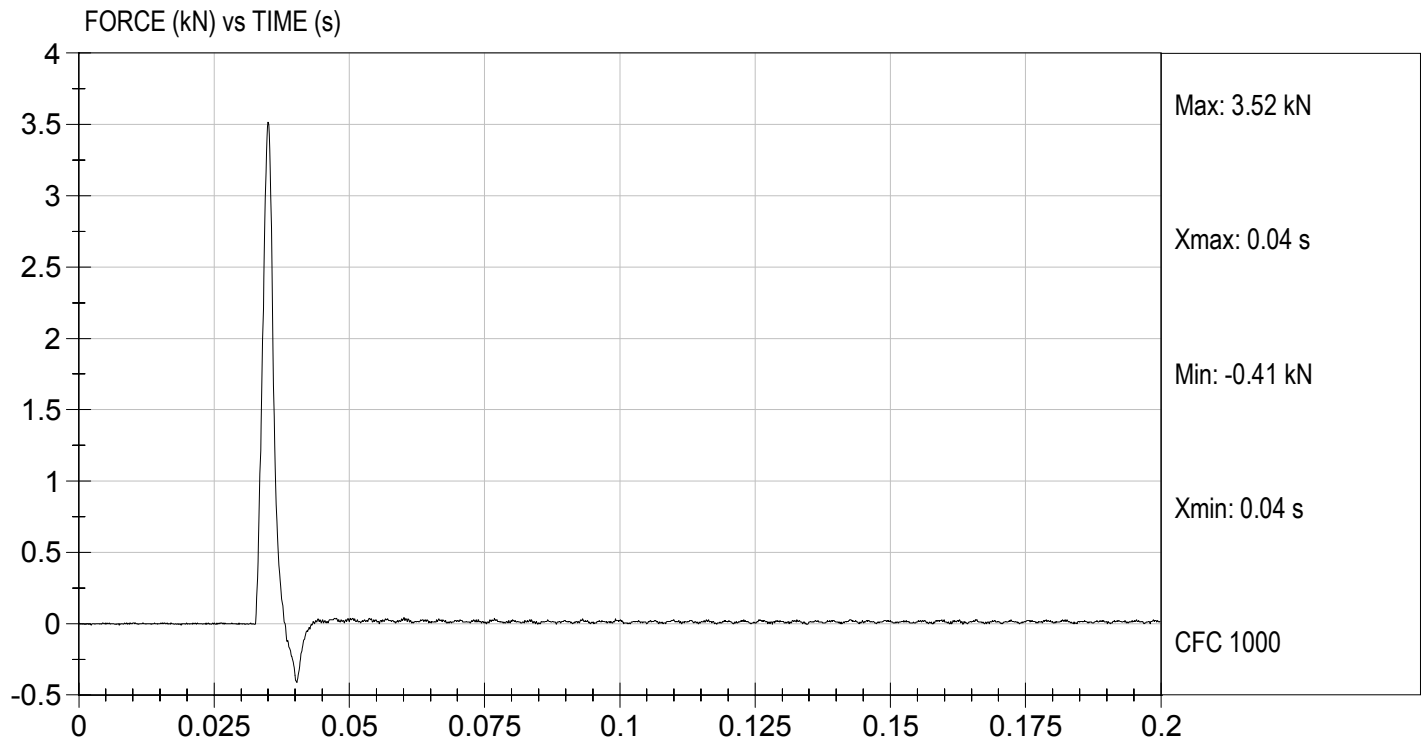


Approved By



Test Desc: Right Knee
Componet ID: D041395

Test Date: 06/23/2004
Velocity: 6.89 ft/s, 2.10 m/s



DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 511

Test Date 6/18/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

6/21/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

6/21/04
Date

EXTERNAL DIMENSIONS

SN511, 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.	774.7-800.1	794.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.5
C	H-POINT HEIGHT	Reference	81.3-86.3	82.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	148.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	82.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	131.3
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.4
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	43.5
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	278.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	195.2
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	545.0
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	361.7
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	399.0
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	415.1

SN511, HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	180.2
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	225.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	465.2
S	HEAD BREADTH	The widest part of the head	137.1-147.3	143.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	180.0
U	HIP BREADTH	The widest part of the hip	299.7-314.9	309.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	363.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	87.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	545.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	873.8
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	788.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

EXTERNAL DIMENSIONS

SN153, HYBRID III, PART 572, SUBPART N EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	638.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	358.2
C	H-POINT HEIGHT	Reference	63.5 - 73.7	64.0
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	89.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	62.3
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	96.7
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	190.4
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	18.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	220.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	160.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	373.2
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	289.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	315.0

SN153, HYBRID III, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	326.2
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	138.4
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	171.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	343.0
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.8
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	175.4
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	218.6
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	268.0
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	65.2
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	523.5
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 330.2 ± 5.1 mm above seat surface	596.9 - 622.3	620.0
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	563.7
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.5
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	158.0

DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 153

Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

☐ 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))

☒ 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.

☒ 4. Accelerometers and their respective mounts are smooth and clean.

☒ 5. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))

☒ 7. 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. (572.122(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 44%

Record the minimum humidity 43%

☒ 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 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. (572.122(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5C. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.122(c)(3))

Record the actual distance 14.8"

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 5C. (572.122(c)(3))

Record the right side distance 488mm

Record the left side distance 487mm

- X 12. 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). (572.122(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	288
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	15

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

Jessica Hall
Signature

7/08/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041531

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	245 - 300	288	Pass
Peak Lateral Acceleration	G's	+/- 15	15	Pass
Unimodal above 50 G's	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

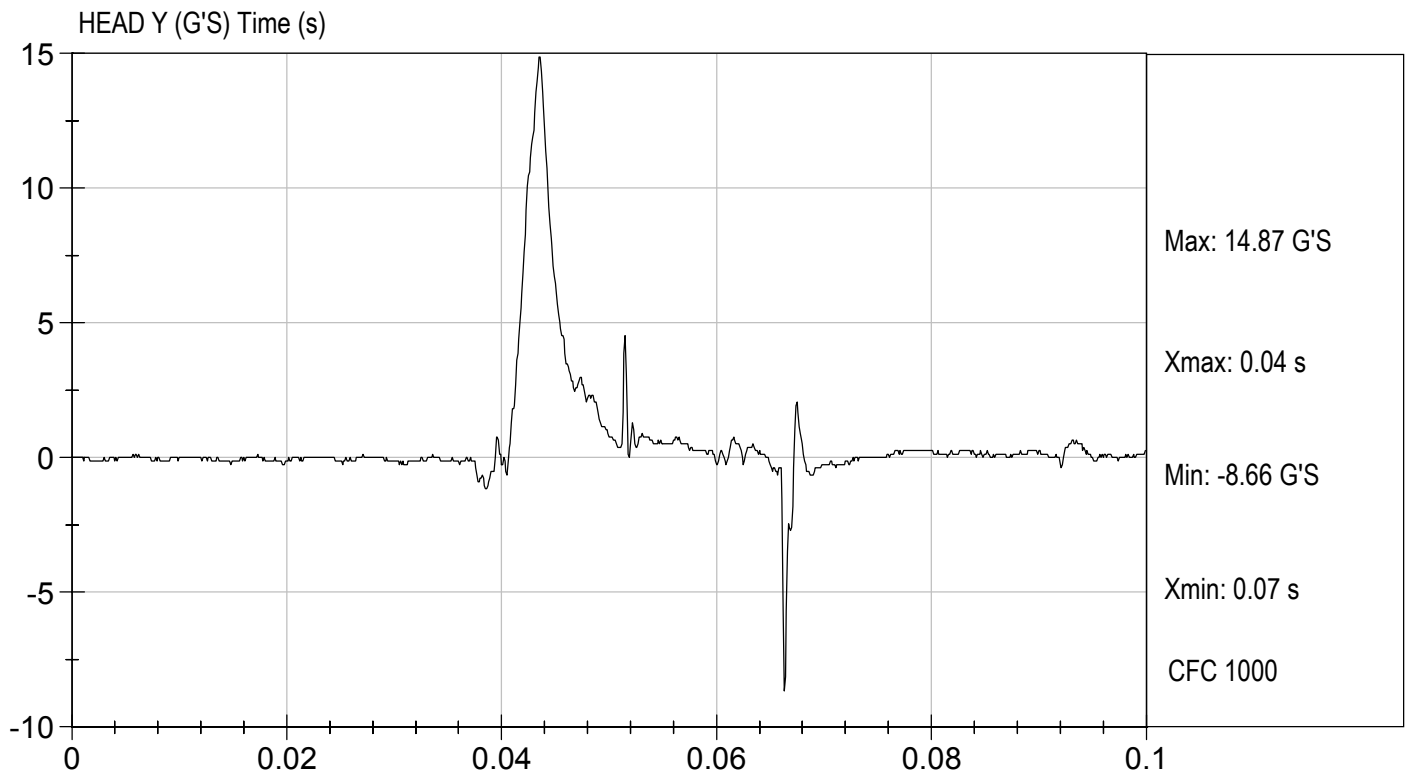
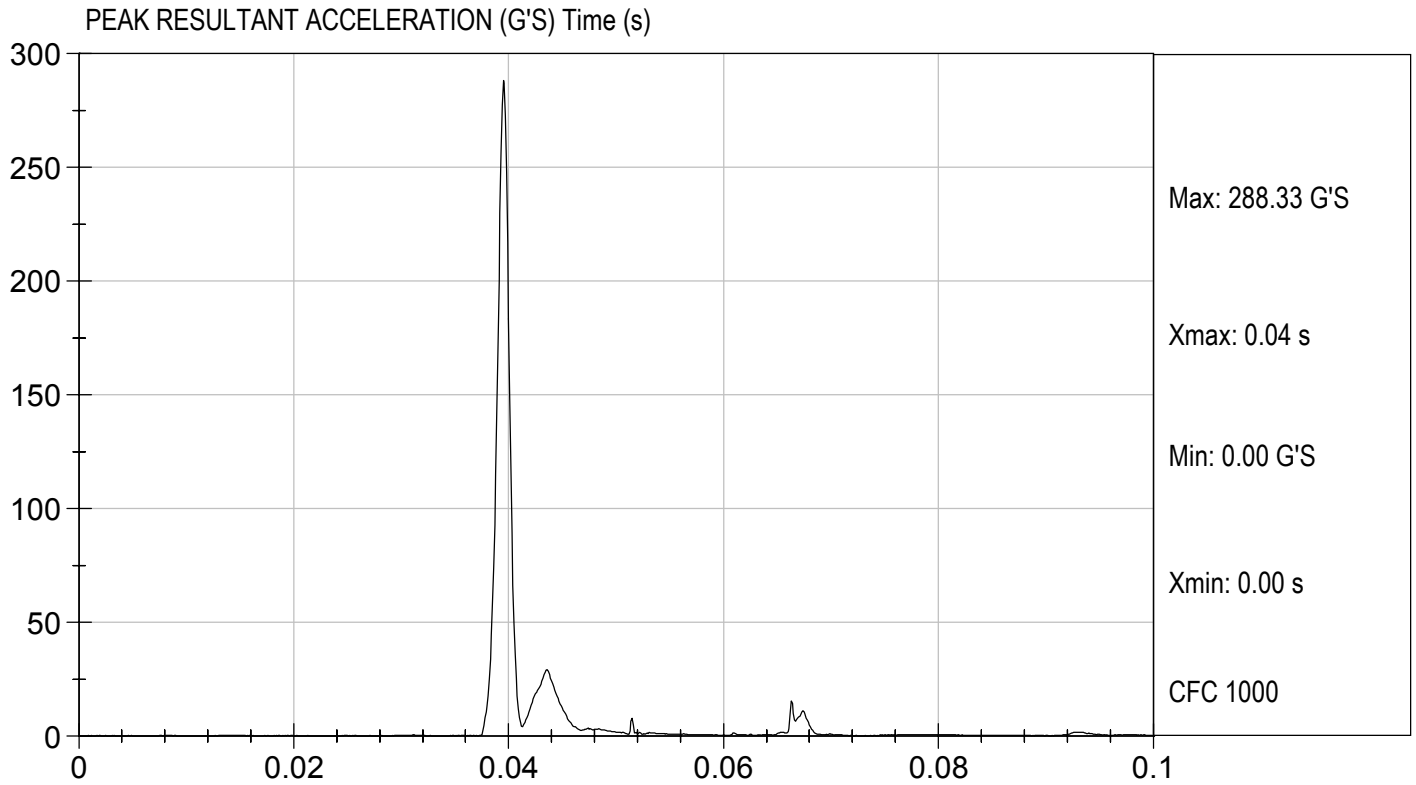
07/08/2004
Test Date


Approved By



Test Desc: Head Drop
Componet ID: D041531

Test Date: 07/08/2004
Velocity: 0 ft/s, 0 m/s



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 153 Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- ☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- ☒ 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. (572.123(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>44%</u> |
| Record the minimum humidity | <u>43%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.
Record findings and actions: No Damage.
- ☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.90 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.6 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	3.0 m/s
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.3 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	<u>33</u> Nm @ <u>75</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	105 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.123(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Jessica Hall
Signature

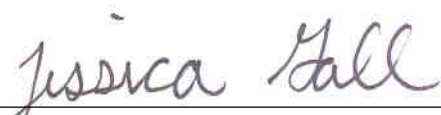
7/08/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041532

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.90	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	3.0	Pass
	30 msec	msec	3.8 to 5.0	4.3	Pass
D Plane Rotation	Max	deg	74 to 92	75	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	33	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 - 123	105	Pass
Overall Results				Pass	


 Laboratory Technician

07/08/2004

Test Date

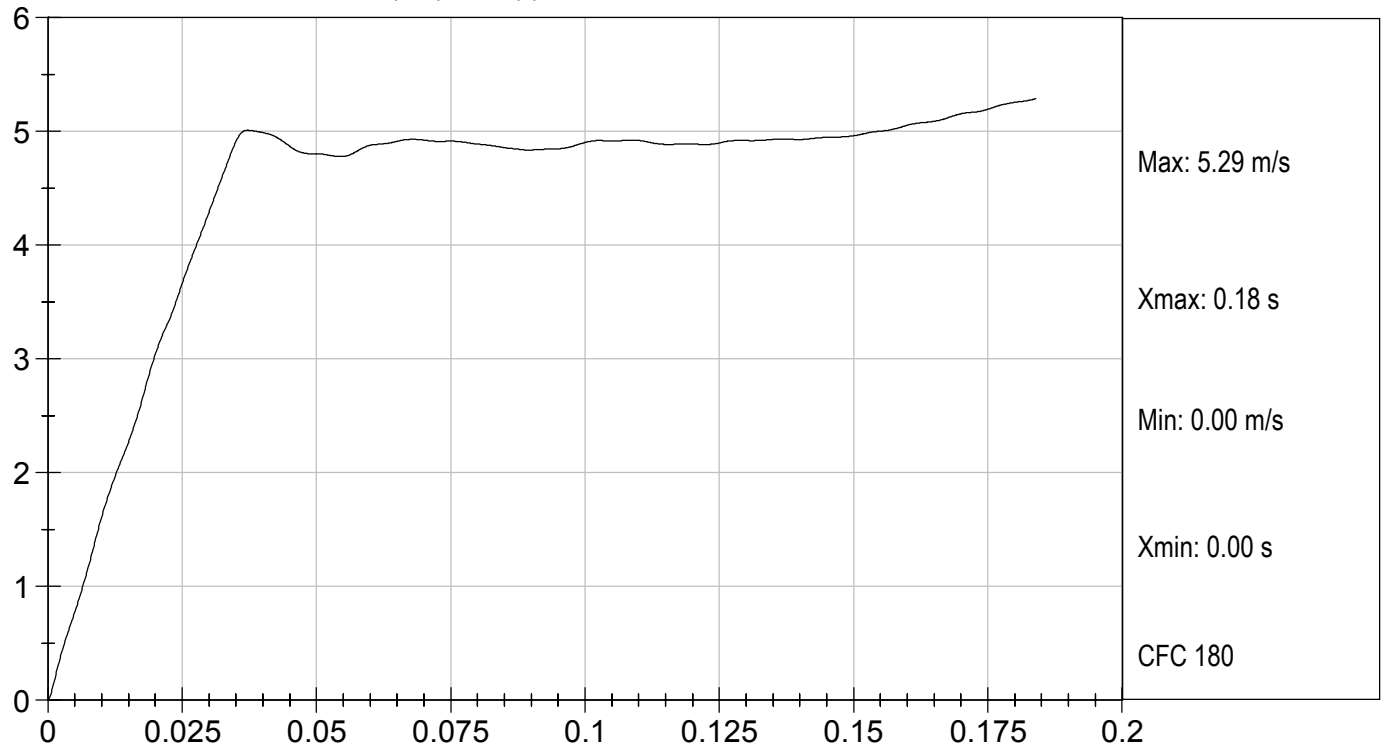

 Approved By



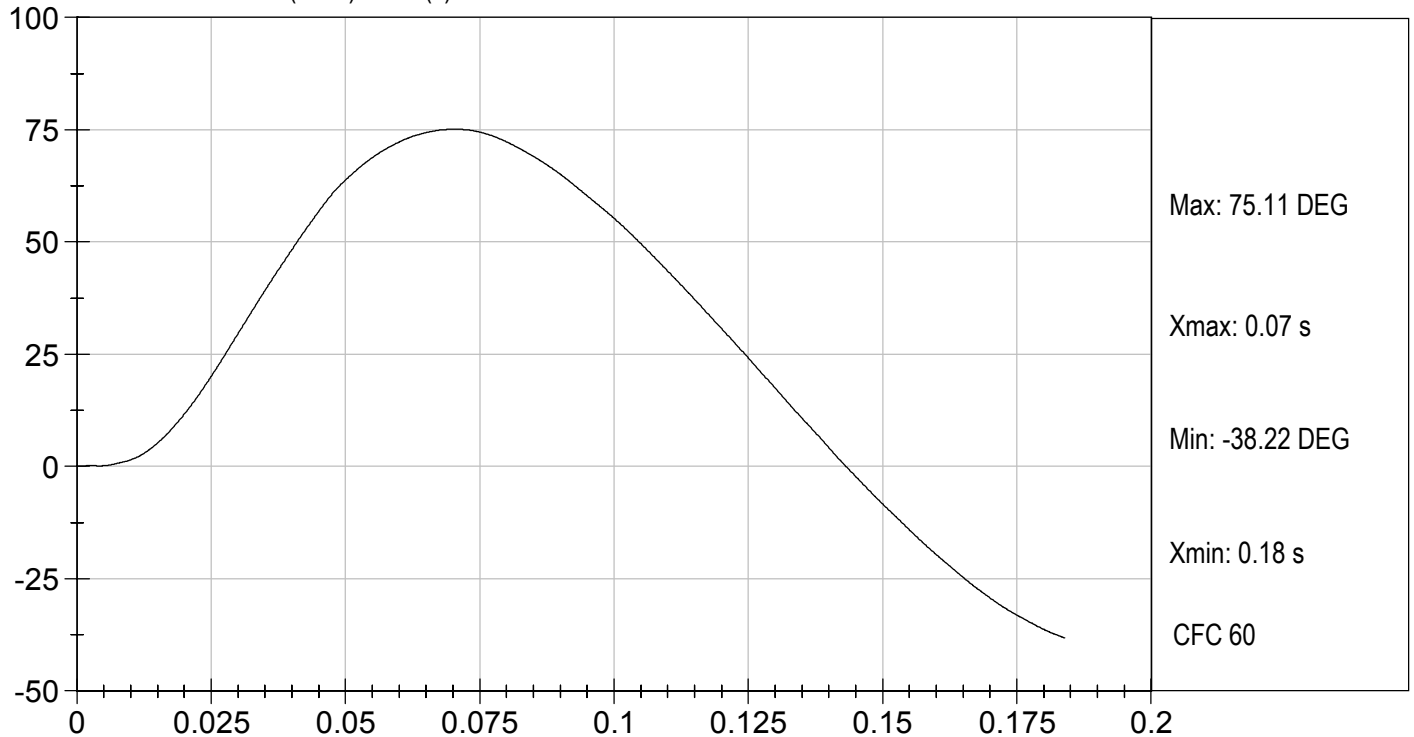
Test Desc: Neck Flexion
Componet ID: D041532

Test Date: 07/08/2004
Velocity: 16.09 ft/s, 4.90 m/s

PENDULUM DECELERATION (m/s) Time (s)



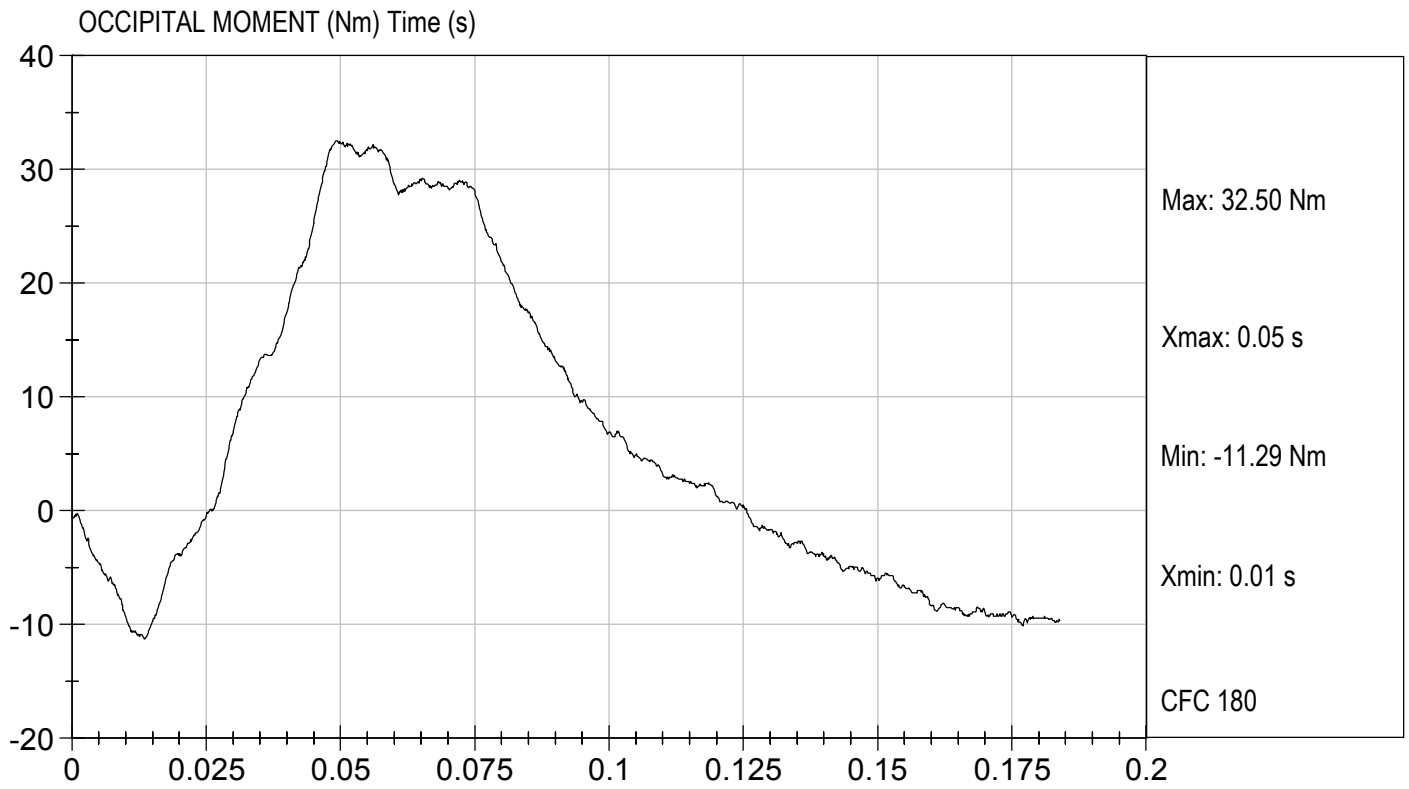
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Flexion
Componet ID: D041532

Test Date: 07/08/2004
Velocity: 16.09 ft/s, 4.90 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 153

Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

☒ 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. (572.123(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 44%

Record the minimum humidity 43%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C.
(572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test.
(572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 12. Complete the following table:

Neck Extension Test Results (572.123(b)(2) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.29 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.7 m/s
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	4.0 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	<u>-23</u> Nm @ <u>89</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	128 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.123(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Jessica Hall
Signature

7/08/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041533

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.29	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.7	Pass
	30 msec	msec	3.2 to 4.2	4.0	Pass
D Plane Rotation	Max	deg	85 to 103	89	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-23	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	128	Pass
Overall Results				Pass	

Jessica Hall
Laboratory Technician

07/08/2004
Test Date

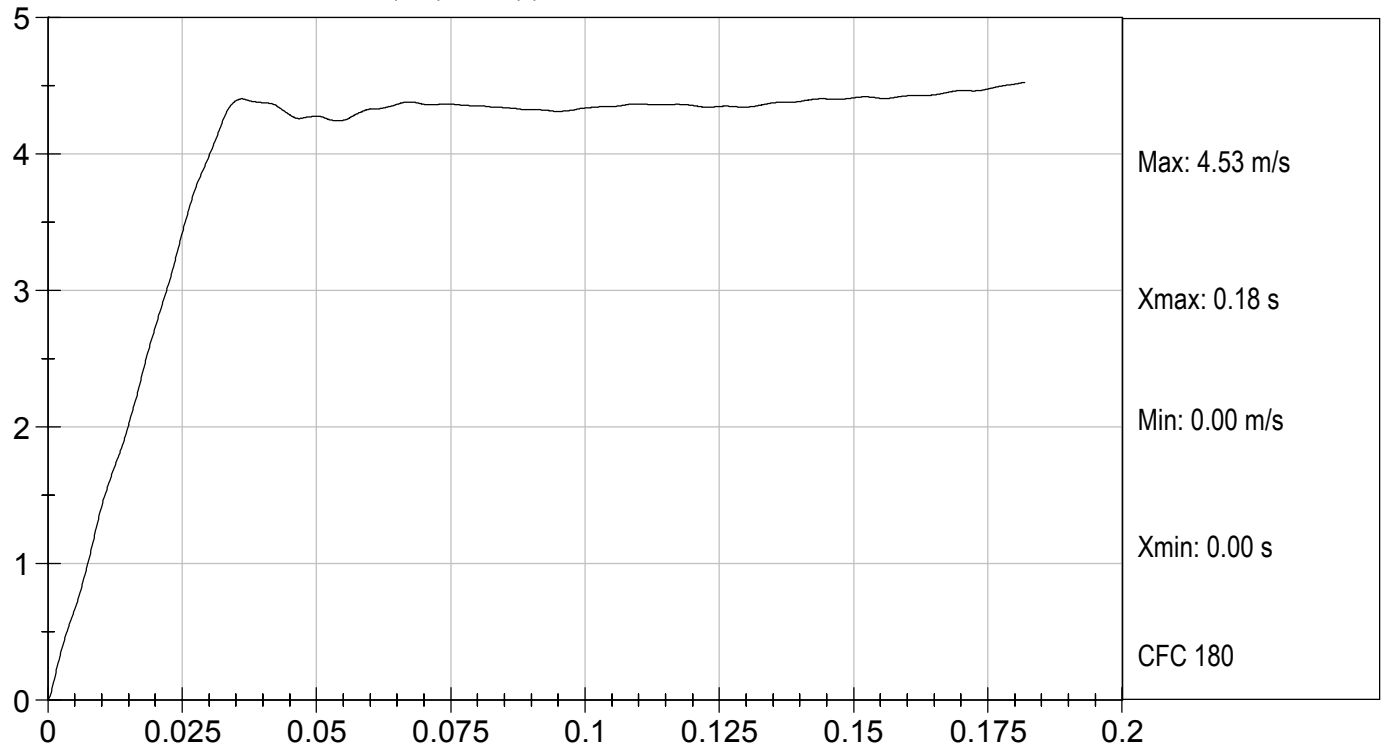
Jeff Leonard
Approved By



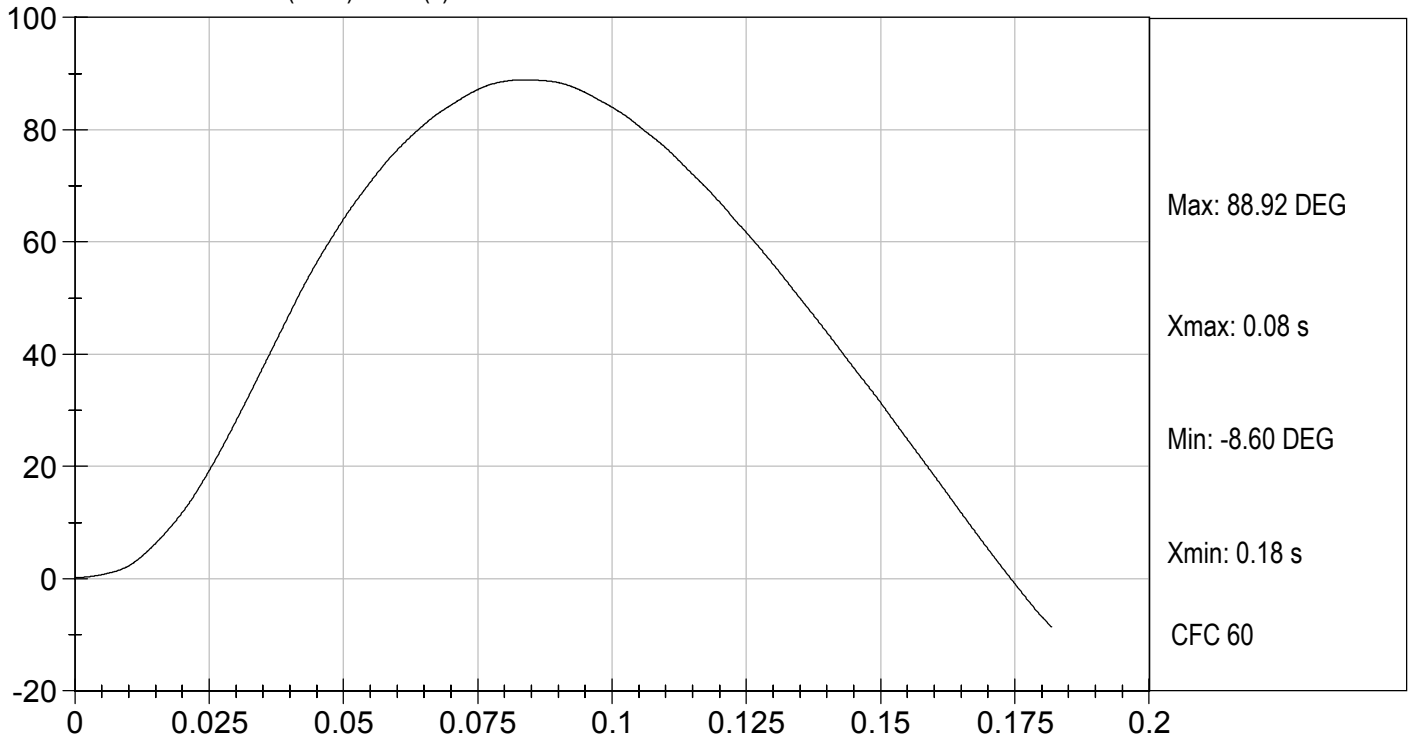
Test Desc: Neck Extension
Componet ID: D041533

Test Date: 07/08/2004
Velocity: 14.08 ft/s, 4.29 m/s

PENDULUM DECELERATION (m/s) Time (s)



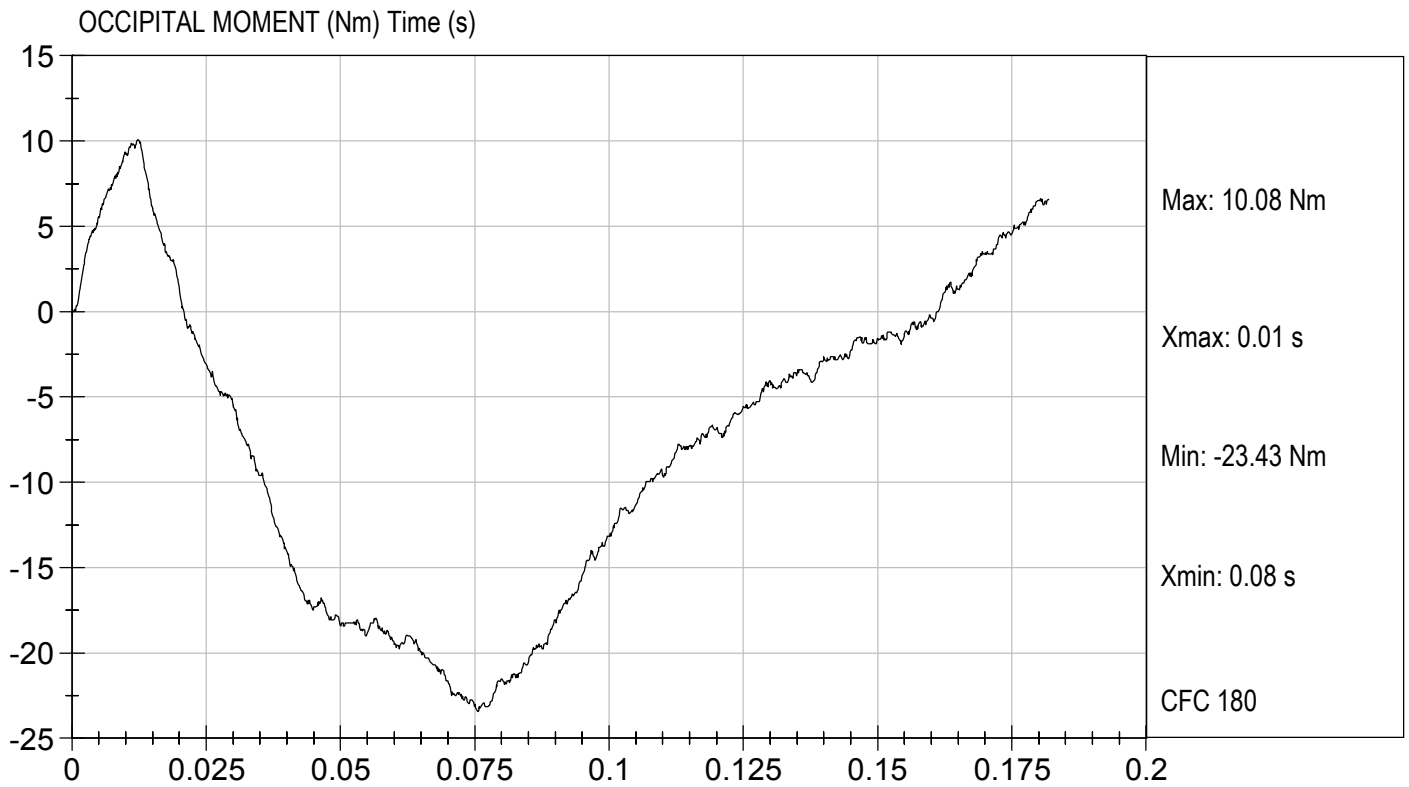
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Extension
Componet ID: D041533

Test Date: 07/08/2004
Velocity: 14.08 ft/s, 4.29 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 153

Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11C.

☒ 3. The complete assembled dummy (127-0000) is used (572.124(b)).

☒ 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. (572.134(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 44%

Record the minimum humidity 43%

☒ 5. Remove the chest skin and 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 _____

☒ 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))

☒ 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))

- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. 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. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

Thorax Impact Results (572.124(b) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.69 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	46 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1280 N
Peak force** between 12.5 and 38.0 mm chest compression	Peak force $\leq 1500 \text{ N}$	1275 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	76 %

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Jessica Hall
Signature

7/08/04
Date

Hybrid III Calibration Data Sheet

THORAX IMPACT HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041534

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	6.59 to 6.83	6.69	Pass
Peak Deflection	mm	38 to 46	46	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.28	Pass
Internal Hysteresis	%	65 to 85	76	Pass
Peak Force 12.5 mm - 38 mm	N	≤ 1500 N	1275	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

07/08/2004
Test Date

Jeff Leonard
Approved By

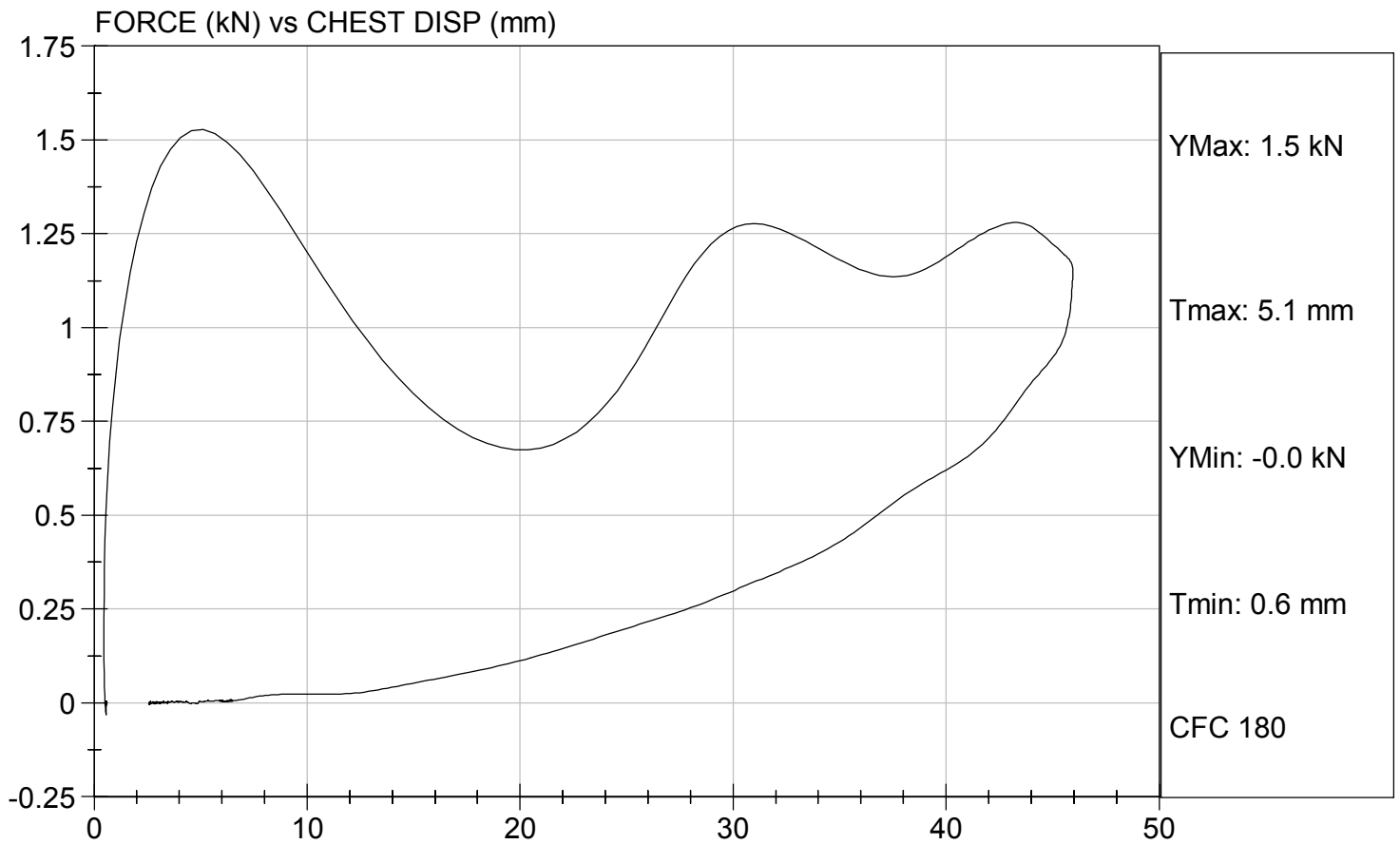


Test Description: Thorax Impact

Test Date: 07/08/2004

Component: D041534

Speed: 21.96 ft/sec, 6.69 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 153

Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))

☒ N/A, ONLY one torso flexion test performed

☒ 2. The test fixture conforms to the specifications in Figure 11C.

☒ 3. The complete assembled dummy (127-0000) is used (572.125(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. (572.135(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 44%

Record the minimum humidity 43%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x½ inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))

☒ 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))

☒ 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))

☒ 10. Remove all external support that was implemented in 9 above. (572.125(c)(5))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))

Record reference plane angle (max. allowed 22°) 12°

☒ 12. Attach the pull cable and the load cell. (572.125(c)(6))

☒ 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 angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))

- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds.
(572.125(c)(8))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 17. Complete the following table:

Torso Flexion Results (572.125(b), 572.125(c)(7), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 22^\circ$	12°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	191 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	15°

Jessica Hall
Signature

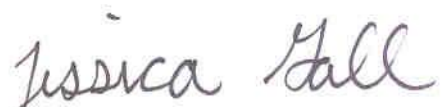
7/08/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

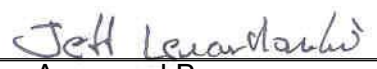
Test I.D: D041537

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Initial Angle	deg	0 to 22	12	Pass
Return Angle	deg	0 to 8	15	Pass
Force at 45 deg	N	147 to 200	191	Pass
Overall Test Results				Pass



Laboratory Technician

07/08/2004
Test Date



Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 153

Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee 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. (572.126(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 44%

Record the minimum humidity 43%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2080 N

*Force = impactor mass x deceleration (572.126(b))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Jessica Hall
Signature

7/08/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041536

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	2.0 to 3.0	2.1	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

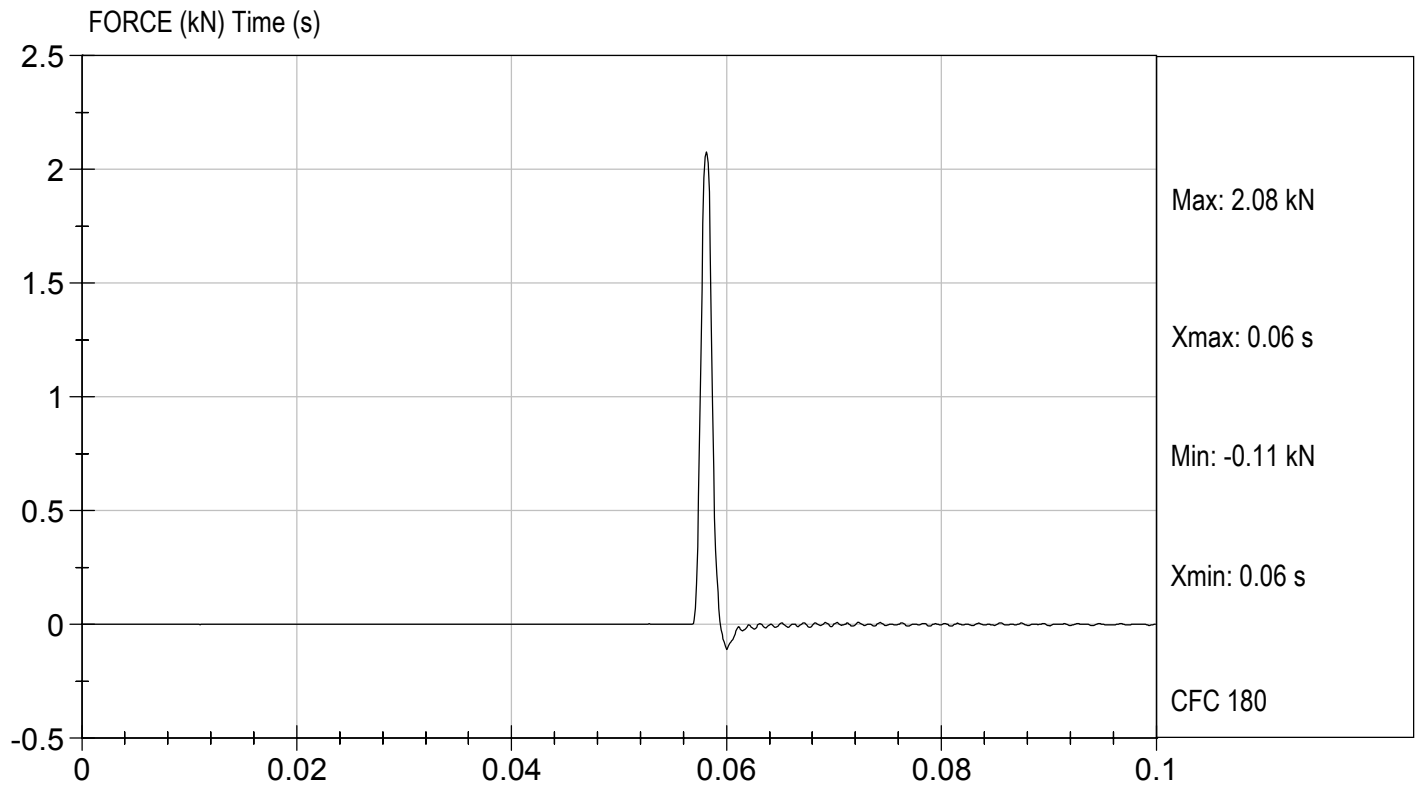
07/08/2004
Test Date

Jeff Leonard
Approved By



Test Desc: Left Knee
Componet ID: D041536

Test Date: 07/08/2004
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 153

Test Date 7/08/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee 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. (572.126(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 44%

Record the minimum humidity 43%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2100 N

*Force = impactor mass x deceleration (572.126(b))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Jessica Hall
Signature

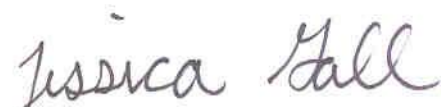
7/08/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041535

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	2.0 to 3.0	2.1	Pass
Overall Test Results				Pass


Laboratory Technician

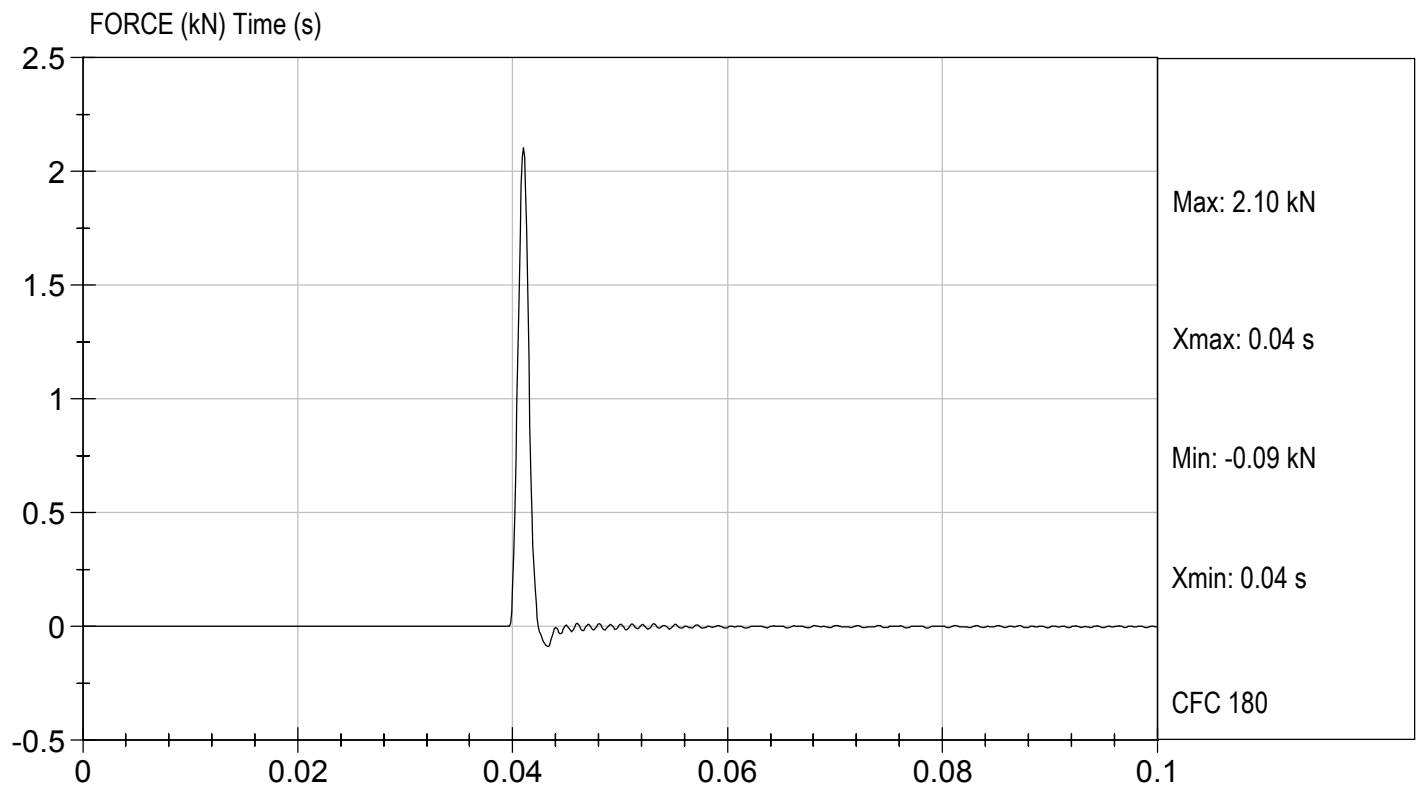
07/08/2004
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D041535

Test Date: 07/08/2004
Velocity: 6.83 ft/s, 2.08 m/s



DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 153

Test Date 7/13/04

Technician Jessica Gall

 Pretest calibration

X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))

X N/A, ONLY one head drop performed

X 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))

X 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.

X 4. Accelerometers and their respective mounts are smooth and clean.

X 5. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))

X 7. 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. (572.122(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.6

Record the maximum humidity 58%

Record the minimum humidity 50%

X 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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 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. (572.122(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5C. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.122(c)(3))

Record the actual distance 14.8"

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.

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 5C. (572.122(c)(3))

Record the right side distance 487mm

Record the left side distance 488mm

- X 12. 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). (572.122(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	290
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	12

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

Jessica Hall
Signature

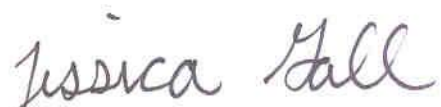
7/13/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

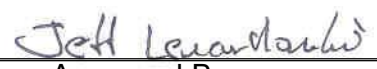
Test I.D: D041581

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	245 - 300	290	Pass
Peak Lateral Acceleration	G's	+/- 15	12	Pass
Unimodal above 50 G's	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

07/13/2004
Test Date



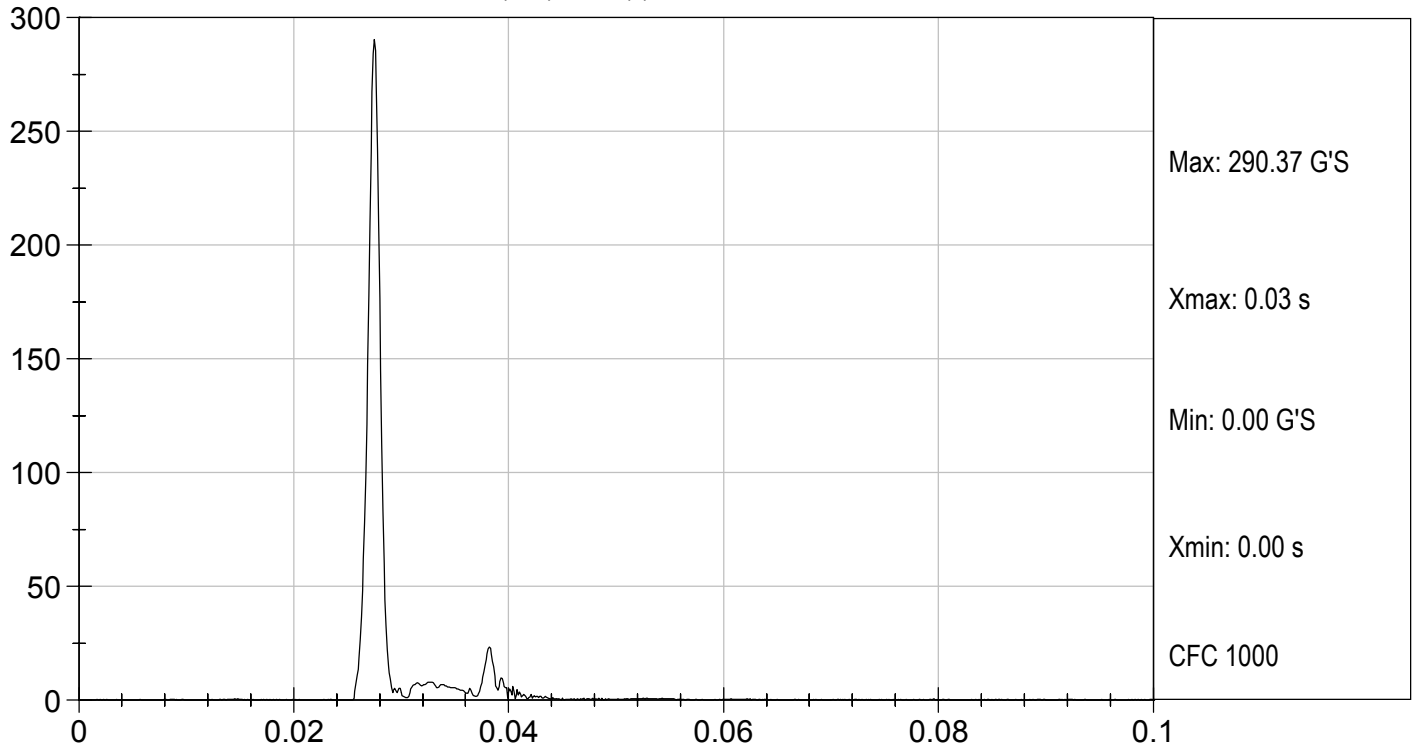
Approved By



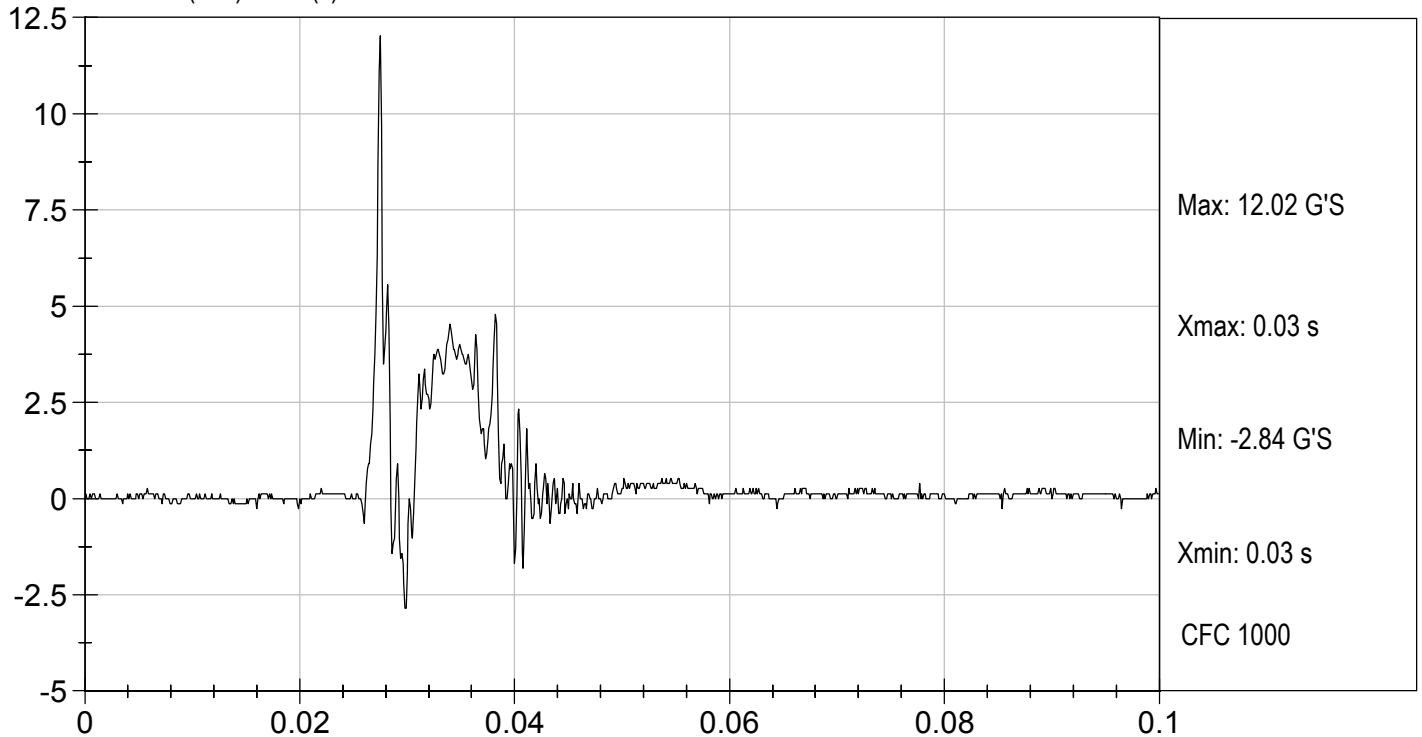
Test Desc: Head Drop
Componet ID: D041581

Test Date: 07/13/2004
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) Time (s)



HEAD Y (G'S) Time (s)



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 153

Test Date 7/13/04

Technician Dave Wilcox

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))

☒ N/A, ONLY one flexion test performed

☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

☒ 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. (572.123(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.6

Record the maximum humidity 58%

Record the minimum humidity 50%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.92 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.5 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	2.9 m/s
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.2 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	<u>32</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	108 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.123(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

7/13/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041582

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	54	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.92	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.5	Pass
	20 msec	msec	2.4 to 3.4	2.9	Pass
	30 msec	msec	3.8 to 5.0	4.2	Pass
D Plane Rotation	Max	deg	74 to 92	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	32	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 - 123	108	Pass
Overall Results				Pass	



Laboratory Technician

07/13/2004

Test Date



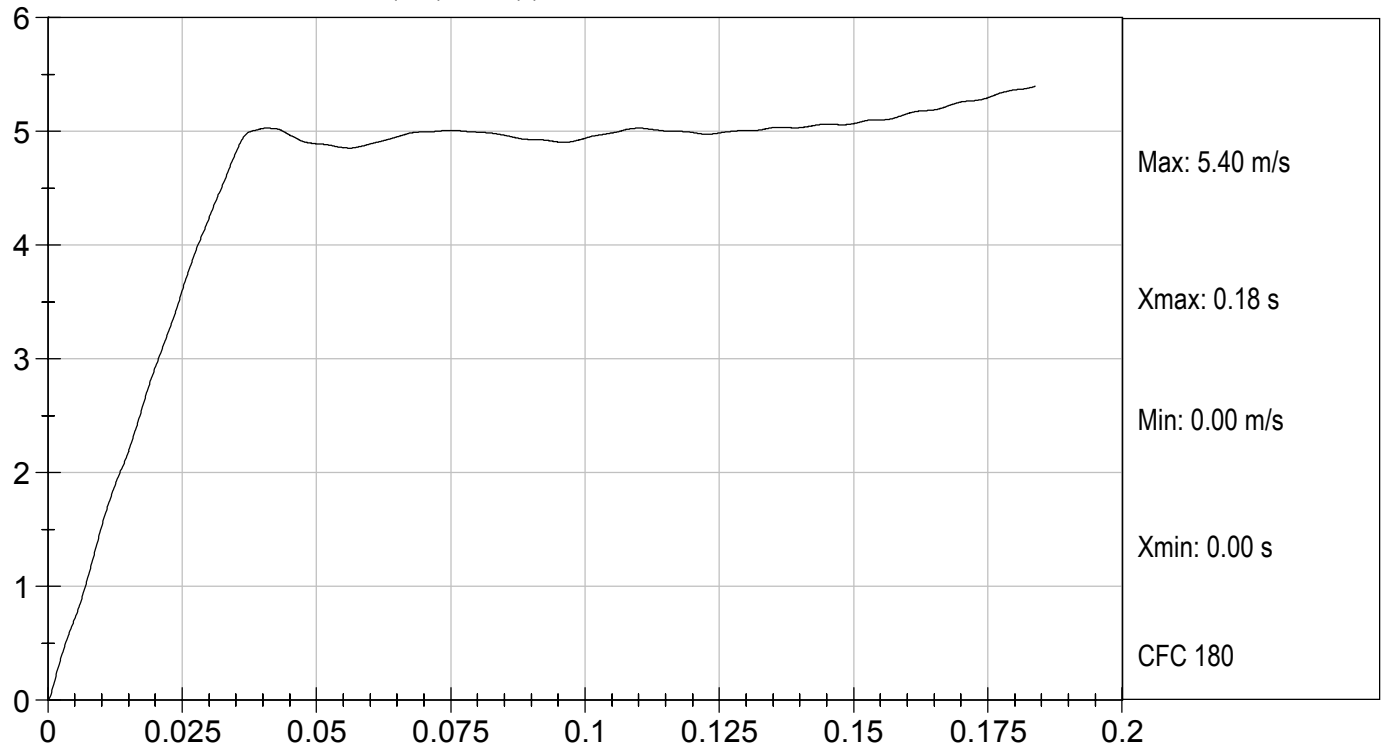
Approved By



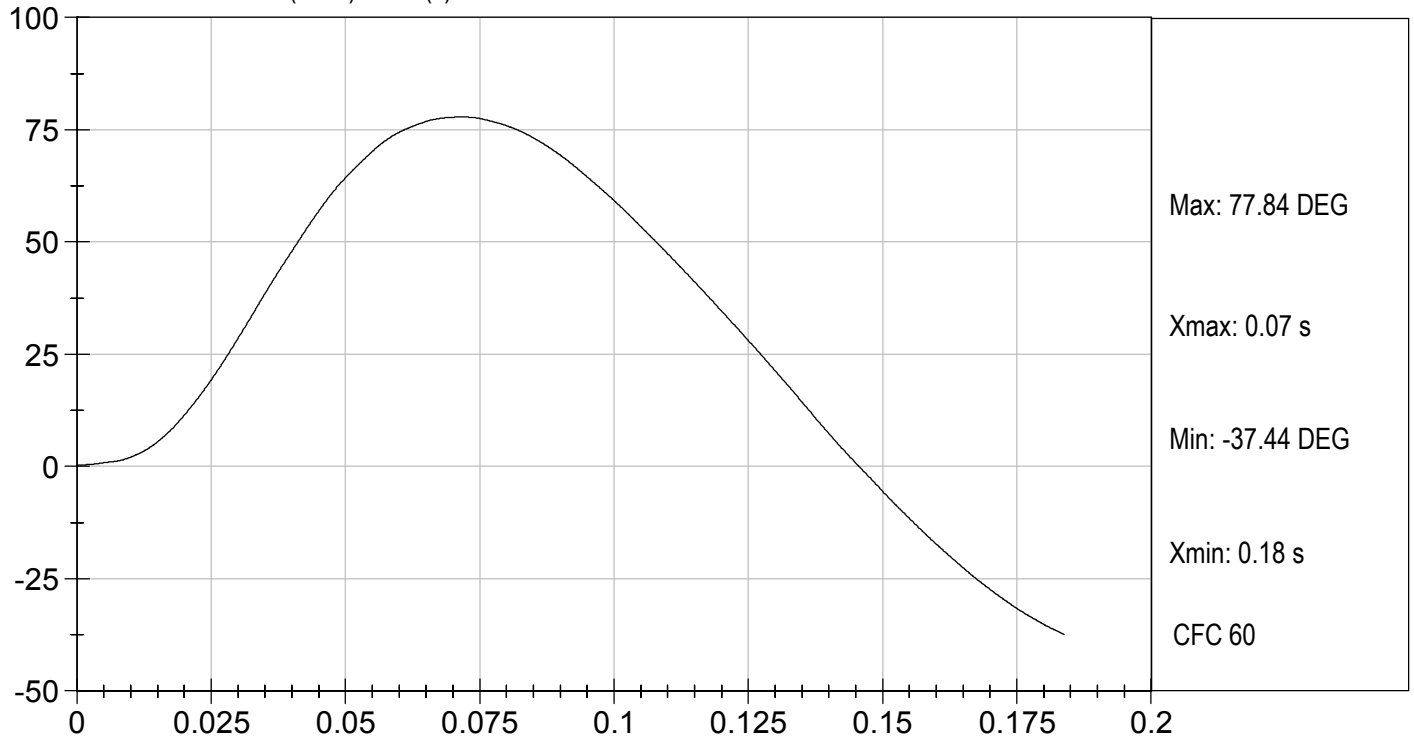
Test Desc: Neck Flexion
Componet ID: D041582

Test Date: 07/13/2004
Velocity: 16.15 ft/s, 4.92 m/s

PENDULUM DECELERATION (m/s) Time (s)



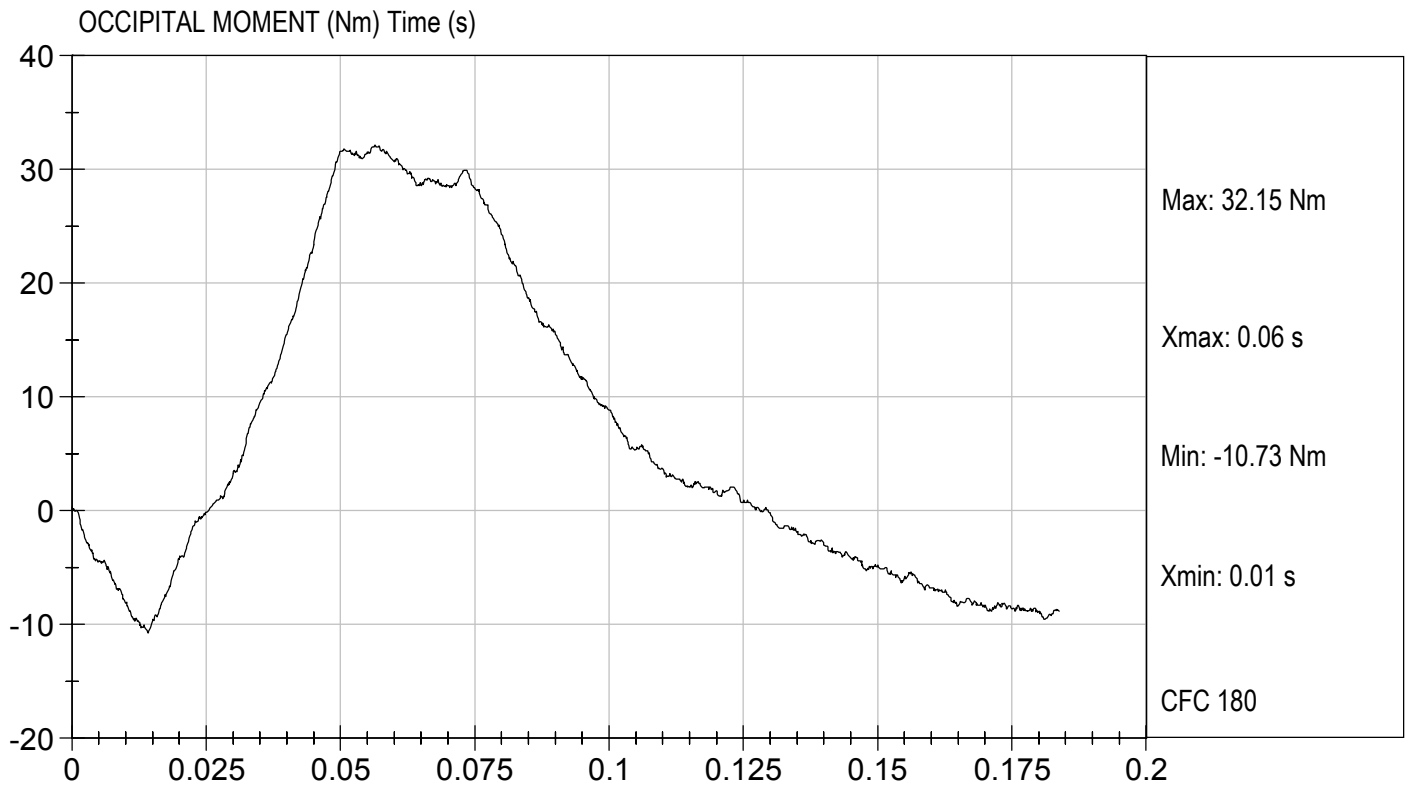
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Flexion
Componet ID: D041582

Test Date: 07/13/2004
Velocity: 16.15 ft/s, 4.92 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 153

Test Date 7/13/04

Technician Dave Wilcox

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

☒ 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. (572.123(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.6

Record the maximum humidity 58%

Record the minimum humidity 50%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C.
(572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test.
(572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 12. Complete the following table:

Neck Extension Test Results (572.123(b)(2) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.36 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.7 m/s
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.9 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	<u>-24</u> Nm @ <u>91</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	130 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = 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. (572.123(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

7/13/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041583

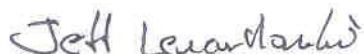
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	55	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.36	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.7	Pass
	30 msec	msec	3.2 to 4.2	3.9	Pass
D Plane Rotation	Max	deg	85 to 103	91	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-24	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	130	Pass
Overall Results				Pass	



Laboratory Technician

07/13/2004

Test Date



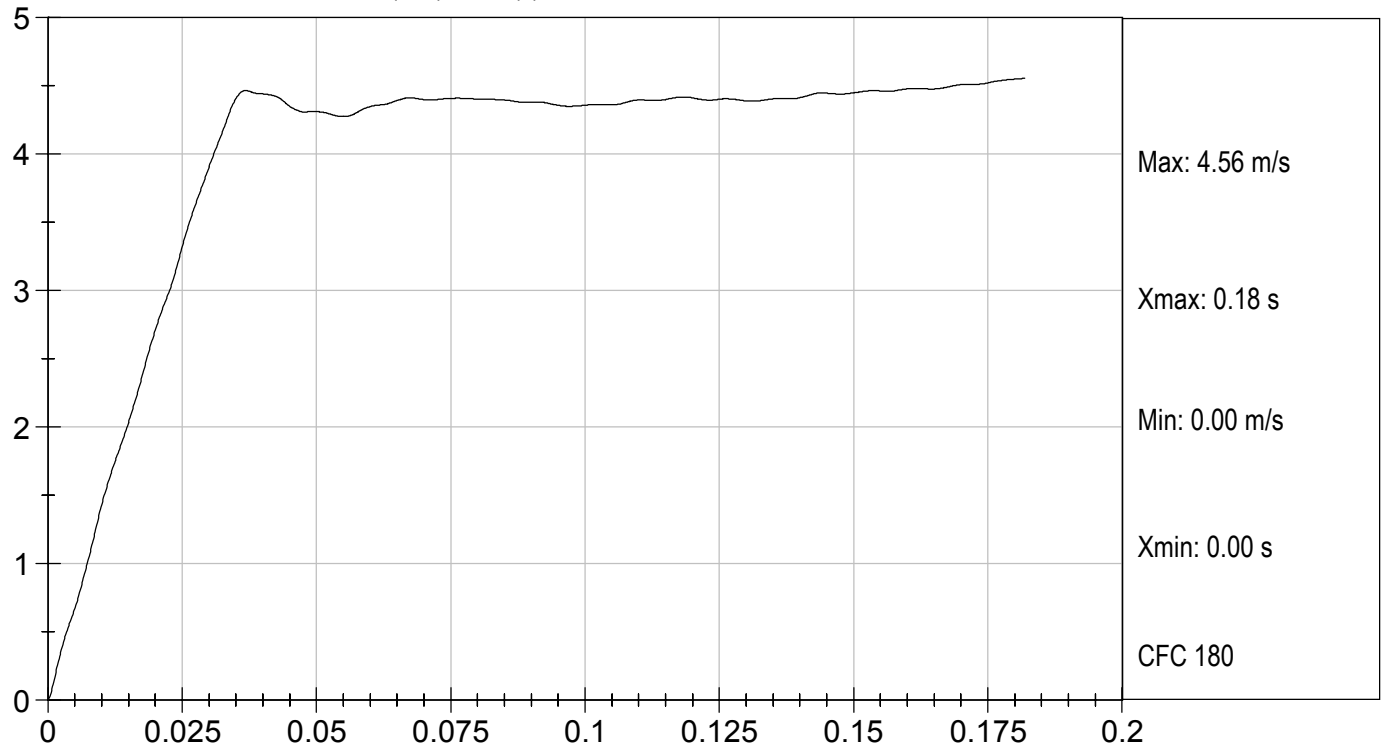
Approved By



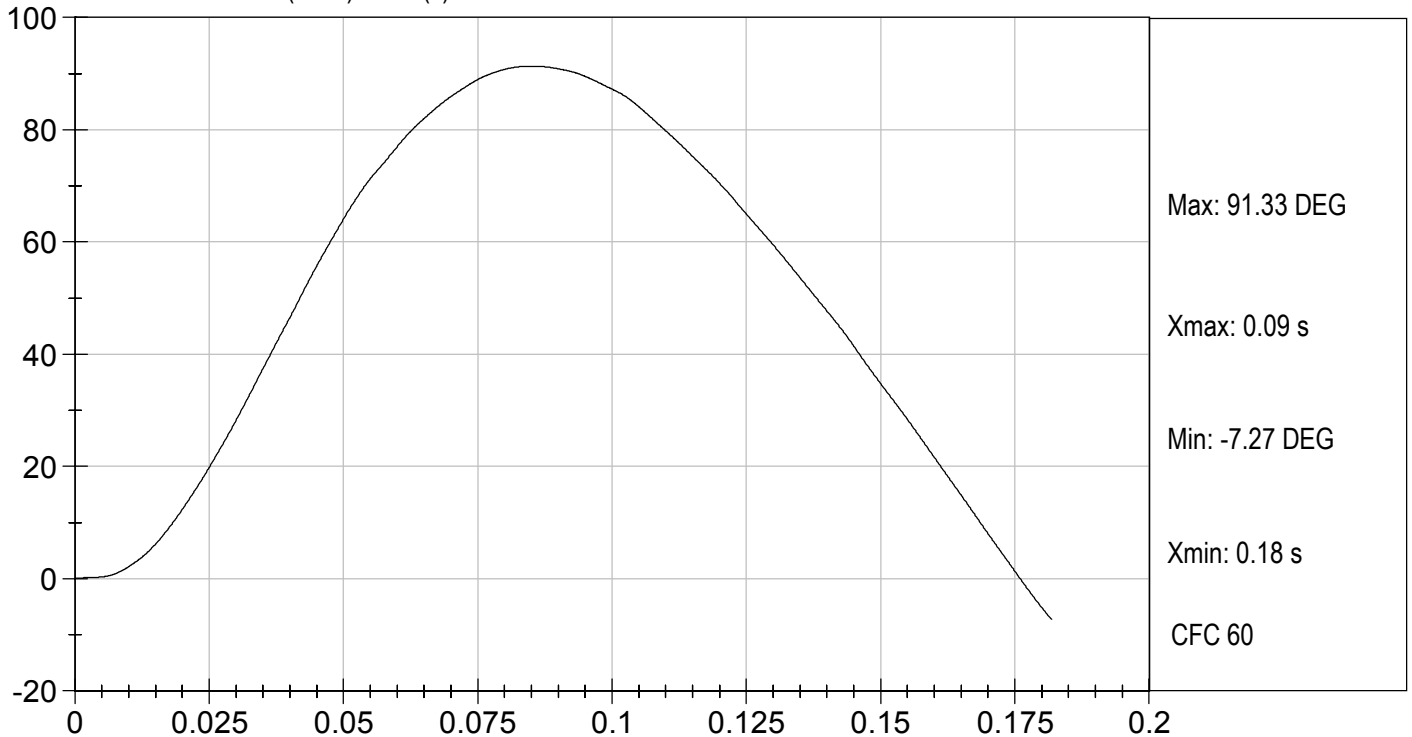
Test Desc: Neck Extension
Componet ID: D041583

Test Date: 07/13/2004
Velocity: 14.29 ft/s, 4.36 m/s

PENDULUM DECELERATION (m/s) Time (s)



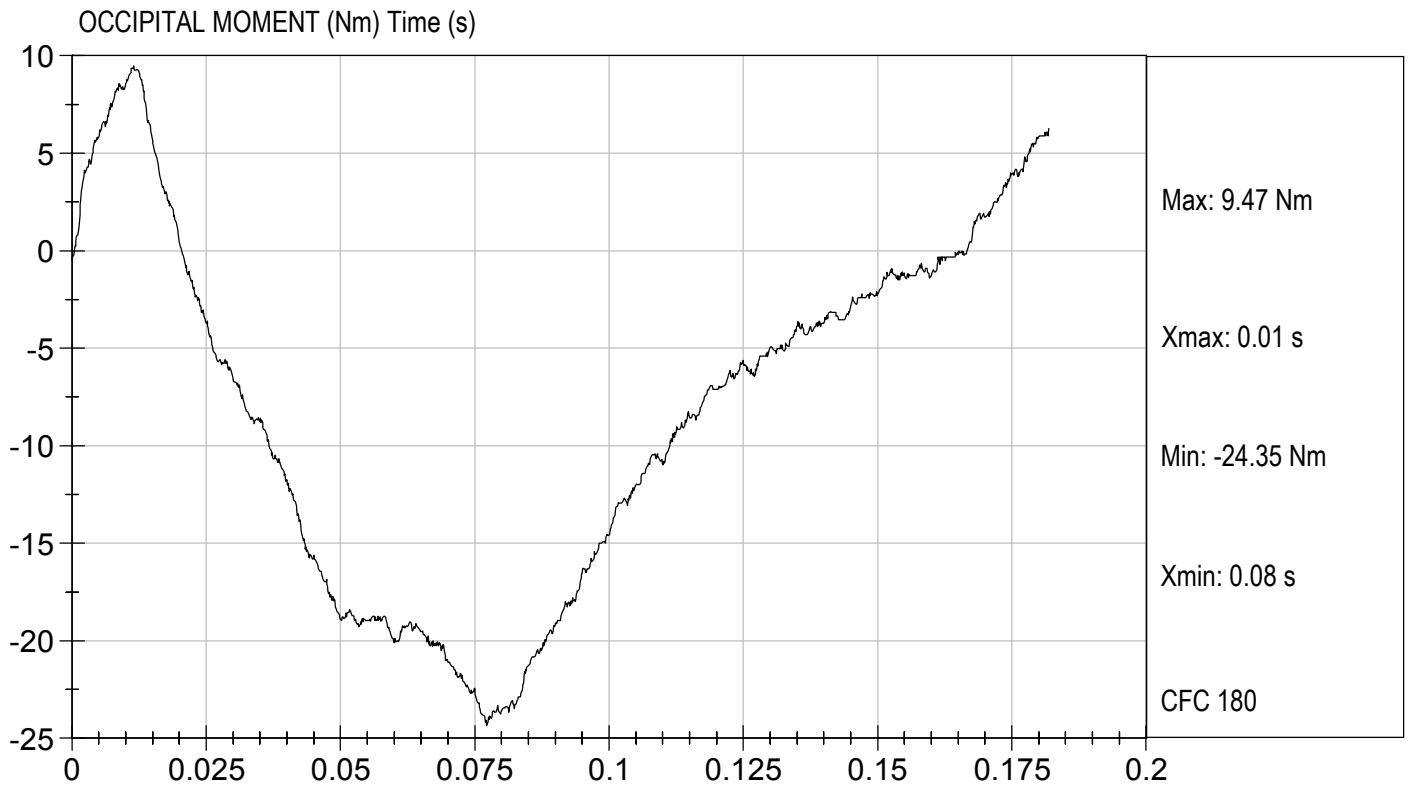
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Extension
Componet ID: D041583

Test Date: 07/13/2004
Velocity: 14.29 ft/s, 4.36 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 153

Test Date 7/14/04

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 11C.

☒ 3. The complete assembled dummy (127-0000) is used (572.124(b)).

☒ 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. (572.134(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 20.9

Record the maximum humidity 48%

Record the minimum humidity 42%

☒ 5. Remove the chest skin and 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 _____

☒ 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))

☒ 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))

- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. 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. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

Thorax Impact Results (572.124(b) and 572.124(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.73 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	46 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1310 N
Peak force** between 12.5 and 38.0 mm chest compression	Peak force $\leq 1500 \text{ N}$	1380 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	77 %

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Jessica Hall
Signature

7/14/04
Date

Hybrid III Calibration Data Sheet

THORAX IMPACT HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D.: D041584

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	6.59 to 6.83	6.73	Pass
Peak Deflection	mm	38 to 46	46	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.31	Pass
Internal Hysteresis	%	65 to 85	77	Pass
Peak Force 12.5 mm - 38 mm	N	≤ 1500 N	1380	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

07/14/2004
Test Date

Jeff Leonard
Approved By

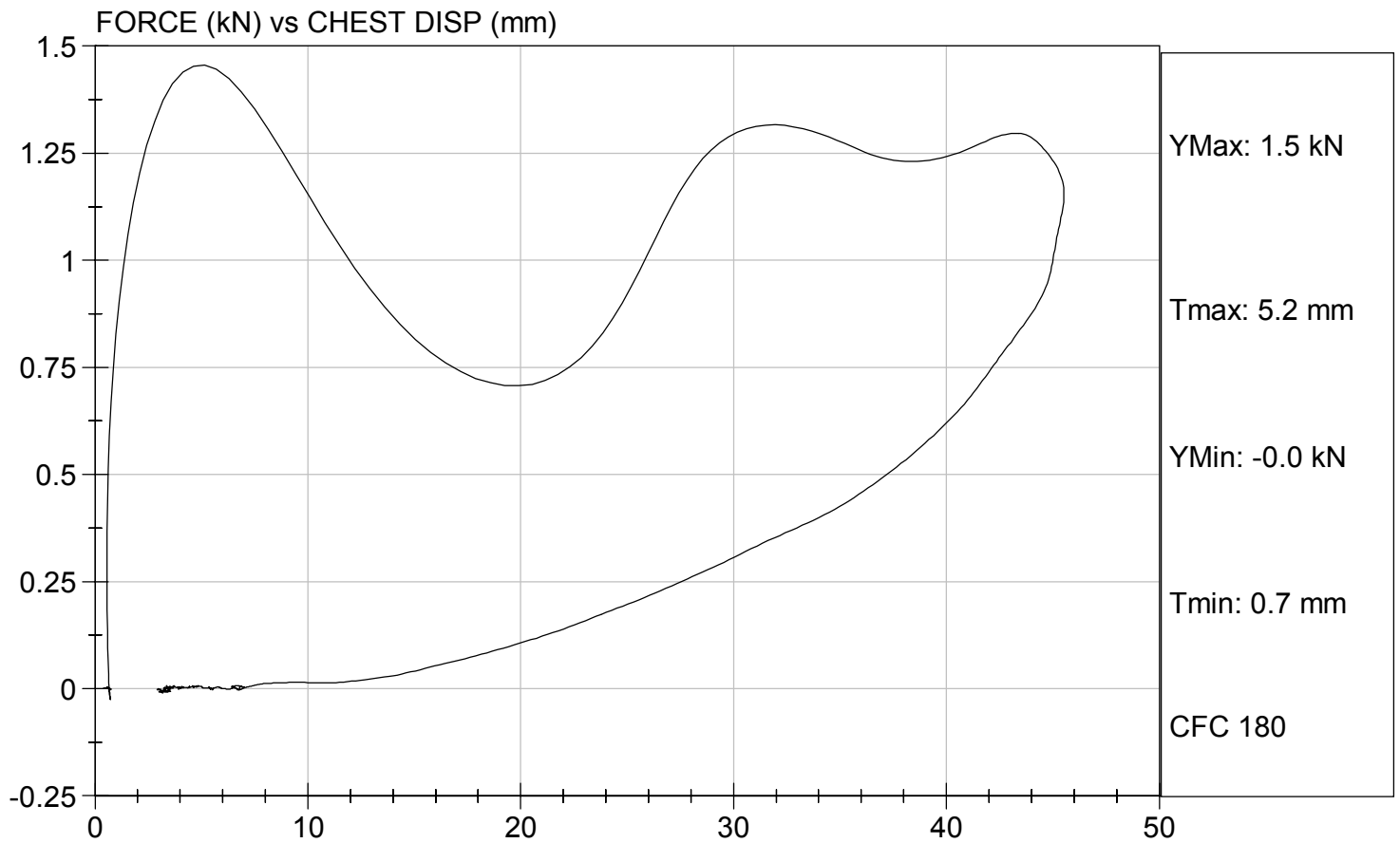


Test Description: Thorax Impact

Test Date: 07/14/2004

Component: D041584

Speed: 22.07 ft/sec, 6.73 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 153

Test Date 7/13/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))

☒ N/A, ONLY one torso flexion test performed

☒ 2. The test fixture conforms to the specifications in Figure 11C.

☒ 3. The complete assembled dummy (127-0000) is used (572.125(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. (572.135(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.6

Record the maximum humidity 58%

Record the minimum humidity 50%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x½ inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))

☒ 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))

☒ 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))

☒ 10. Remove all external support that was implemented in 9 above. (572.125(c)(5))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))

Record reference plane angle (max. allowed 22°) 10°

☒ 12. Attach the pull cable and the load cell. (572.125(c)(6))

☒ 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 angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))

- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds.
(572.125(c)(8))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 17. Complete the following table:

Torso Flexion Results (572.125(b), 572.125(c)(7), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 22^\circ$	10°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	184 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	13°

Joe Fleck
Signature

7/13/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041587

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Initial Angle	deg	0 to 22	10	Pass
Return Angle	deg	0 to 8	13	Pass
Force at 45 deg	N	147 to 200	184	Pass
Overall Test Results				Pass



Laboratory Technician

07/13/2004

Test Date



Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 153

Test Date 7/13/04

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee 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. (572.126(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.6

Record the maximum humidity 58%

Record the minimum humidity 50%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2330 N

*Force = impactor mass x deceleration (572.126(b))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Jessica Hall
Signature

7/13/04
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041586

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	2.0 to 3.0	2.3	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

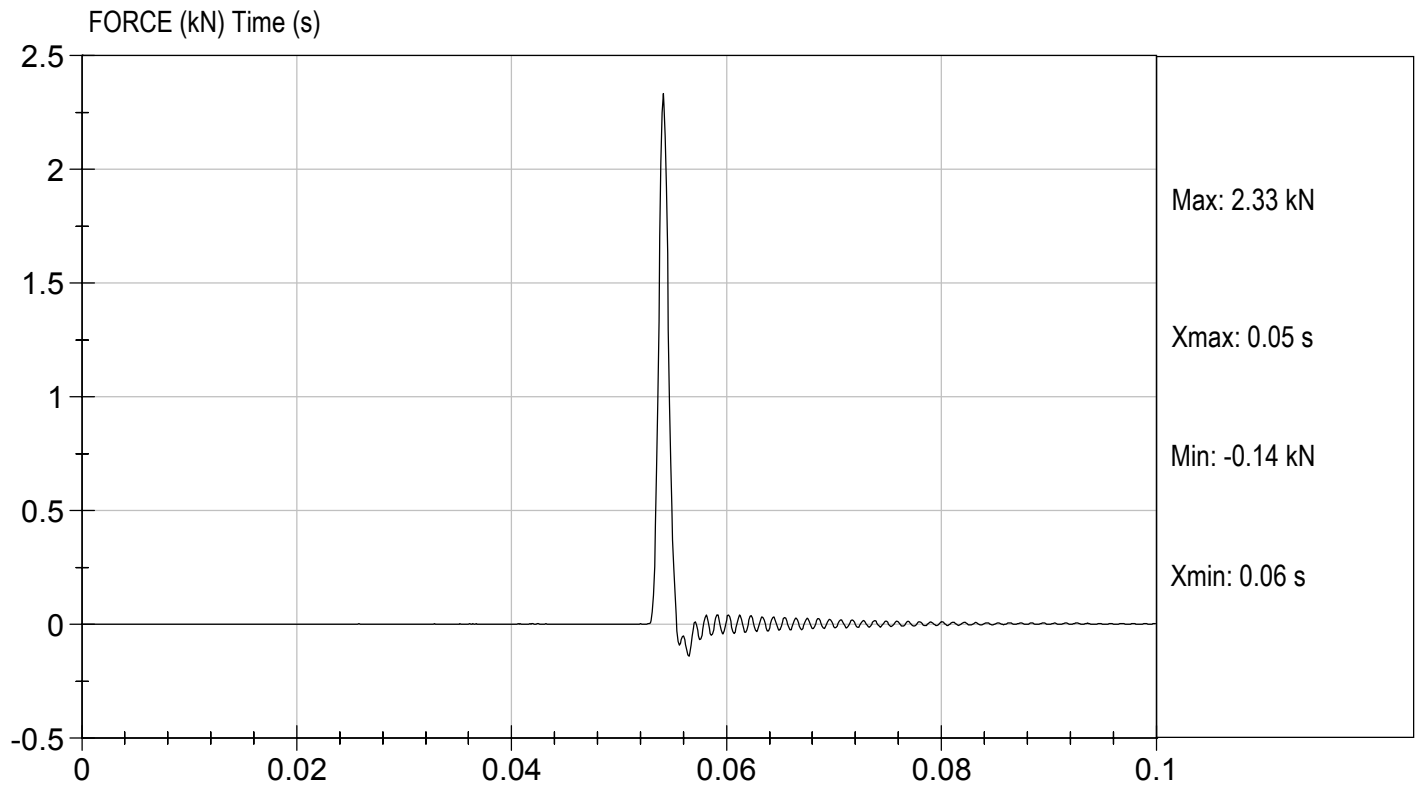
07/13/2004
Test Date

Jeff Levanthaler
Approved By



Test Desc: Left Knee
Componet ID: D041586

Test Date: 07/13/2004
Velocity: 6.84 ft/s, 2.08 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 153

Test Date 7/13/04

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee 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. (572.126(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 20.6

Record the maximum humidity 58%

Record the minimum humidity 50%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))

☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2430 N

*Force = impactor mass x deceleration (572.126(b))

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Jessica Hall
Signature

7/13/04
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 153

Test I.D: D041585

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	2.0 to 3.0	2.4	Pass
Overall Test Results				Pass


Laboratory Technician

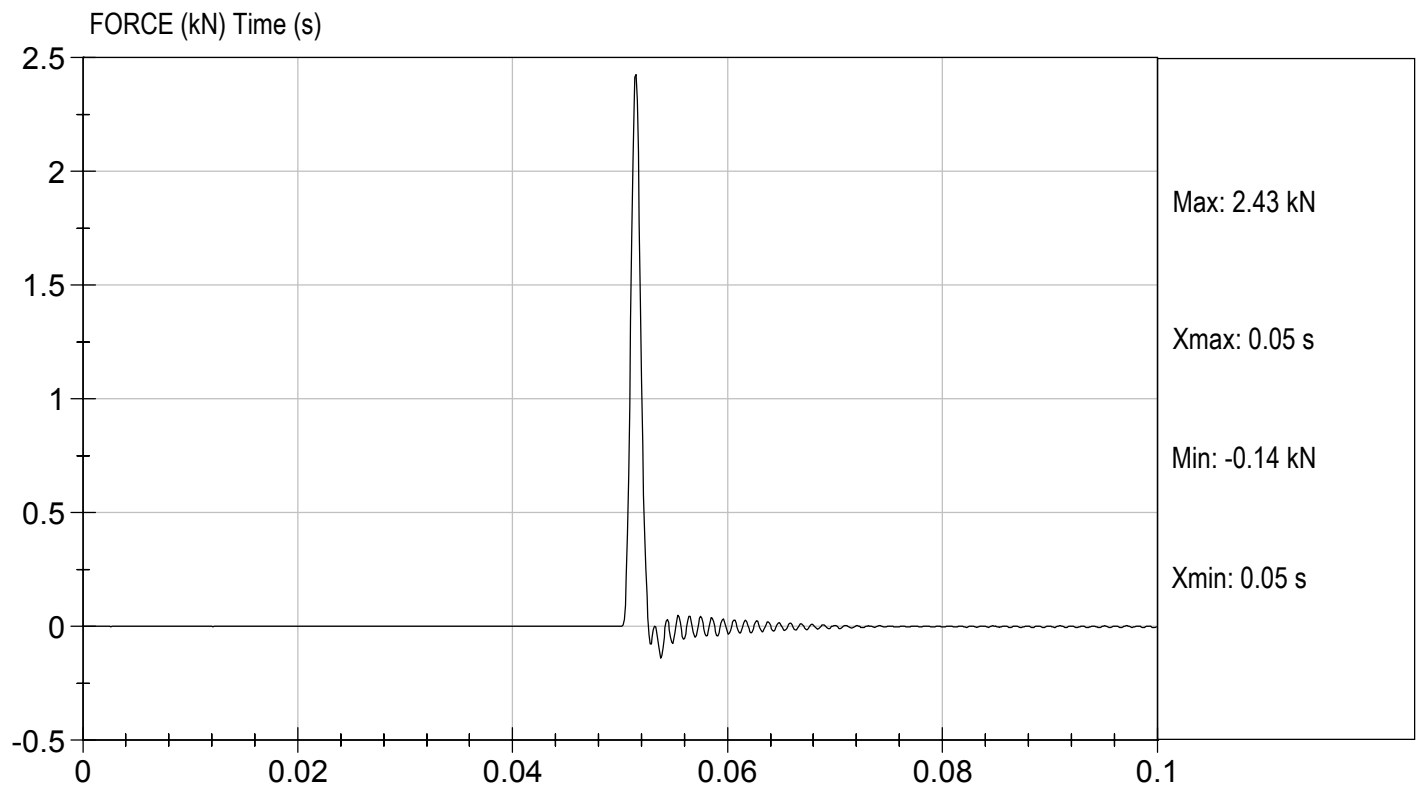
07/13/2004
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D041585

Test Date: 07/13/2004
Velocity: 6.96 ft/s, 2.12 m/s



DATA SHEET C1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 153

Test Date 7/9/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

7/12/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

7/12/04
Date

EXTERNAL DIMENSIONS

SN153, HYBRID III, PART 572, SUBPART N EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	638.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	358.2
C	H-POINT HEIGHT	Reference	63.5 - 73.7	64.0
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	89.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	62.3
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	96.7
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	190.4
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	18.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	220.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	160.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	373.2
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	289.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	315.0

SN153, HYBRID III, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	326.2
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	138.4
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	171.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	343.0
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.8
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	175.4
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	218.6
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	268.0
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	65.2
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	523.5
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 330.2 ± 5.1 mm above seat surface	596.9 - 622.3	620.0
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	563.7
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.5
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	158.0

SN031, 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.	538.5-553.7	545.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	320.4
C	H-POINT HEIGHT	Reference	34.3-44.5	42.3
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	66.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	70.2
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	85.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	249.8
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	54.3
I	SHOULDER TO- ELBOW LENGTH	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.	185.4-200.6	196.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	142.2
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300	290.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	228.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	246.4
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	227.0

SN031, HYBRID III, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	145.2
P	FOOT LENGTH	Tip of toe to rear of heal	137.6-147.8	143.9
Q	STATURE	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.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	259.0
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	134.4
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	174.0
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	202.4
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	248.0
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	58.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	506.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	545.0
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	551.6
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	245.2
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.7

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 031

Test Date 2/18/04

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 (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. (572.142(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.3

Record the maximum humidity 23%

Record the minimum humidity 19%

☒ 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: No Damage.

☒ 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))

- X 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 14.8"

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.

- X 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 460mm

Record the left side distance 459mm

- X 12. 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). (572.142(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 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 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	265
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	10

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


Signature

2/18/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 031

Test I.D: D04351

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	265.4	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	10.1	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/18/2004

Test Date



Approved By



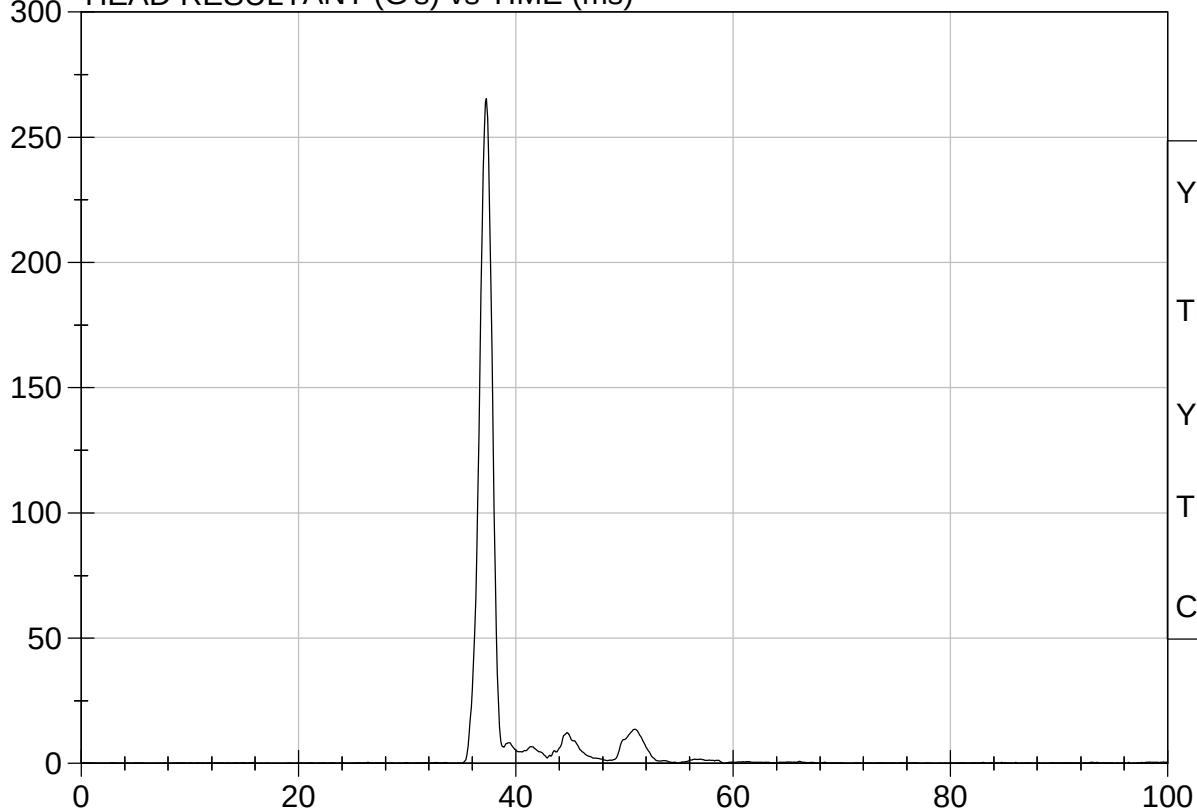
Test Description: Head Drop

Test Date: 02/18/2004

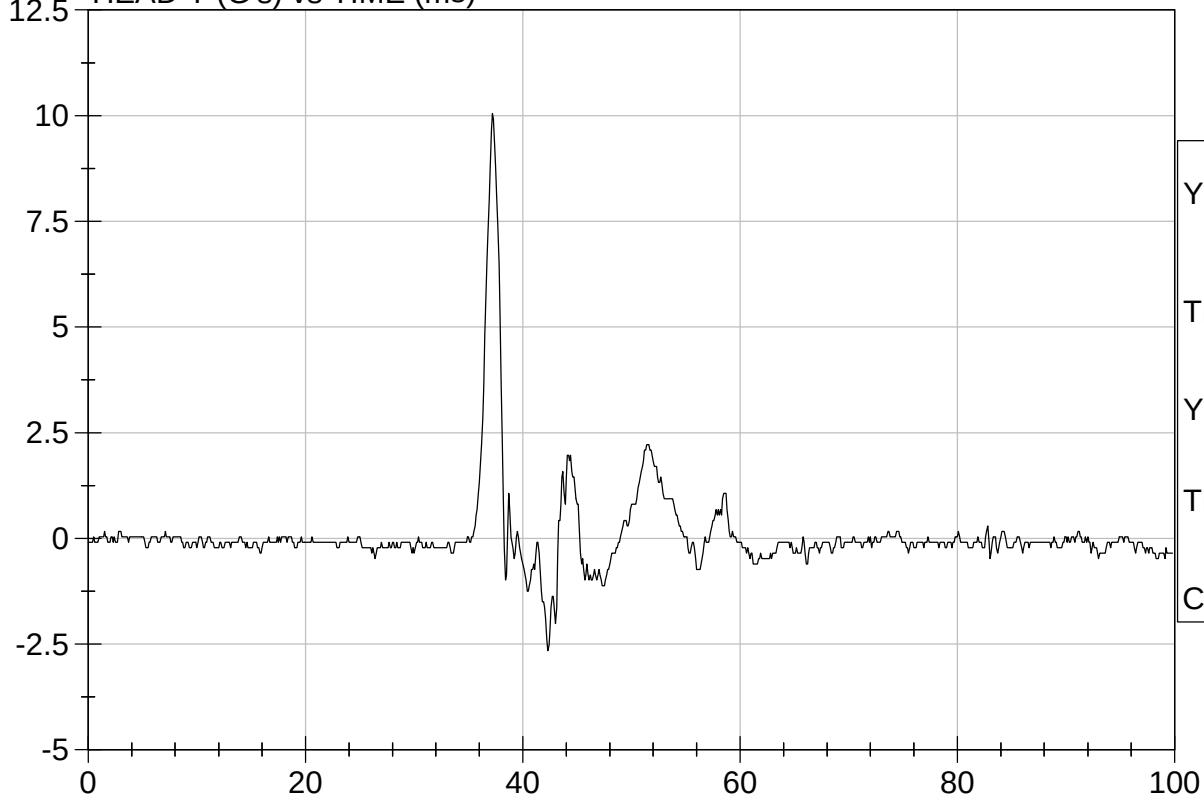
Component: D04351

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 031

Test Date 2/19/04

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.8

Record the maximum humidity 28%

Record the minimum humidity 22%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.6 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.3 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.3 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.5 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>45</u> Nm @ <u>76</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	71 ms

*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))

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


Signature

2/19/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 031

Test I.D: D04352

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.56	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.3	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	76.3	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	45.0	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	70.6	Pass
Overall Test Results					Pass



Laboratory Technician

02/19/2004

Test Date



Approved By

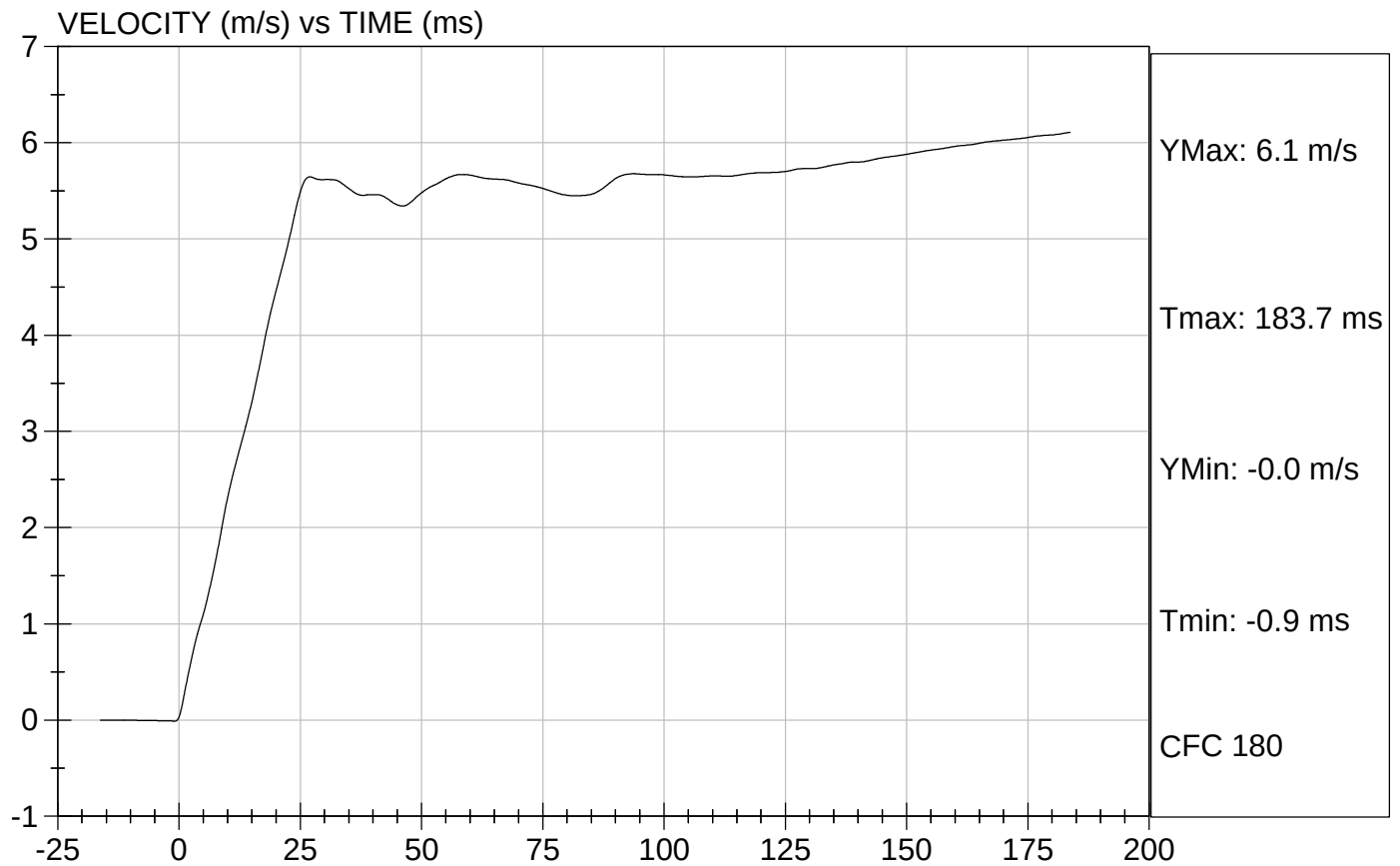


Test Description: Neck Flexion

Test Date: 02/19/2004

Component: D04352

Speed: 18.25 ft/sec, 5.56 m/sec





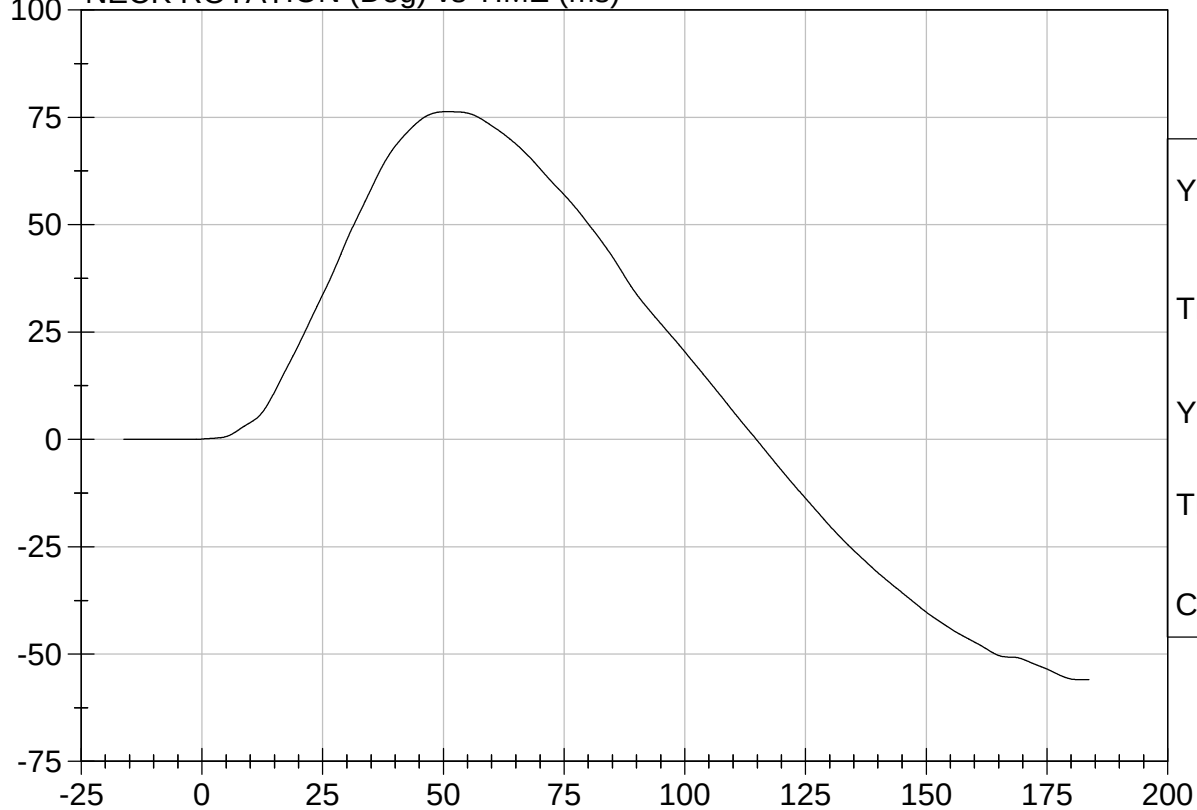
Test Description: Neck Flexion

Test Date: 02/19/2004

Component: D04352

Speed: 18.25 ft/s, 5.56 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 76.3 Deg

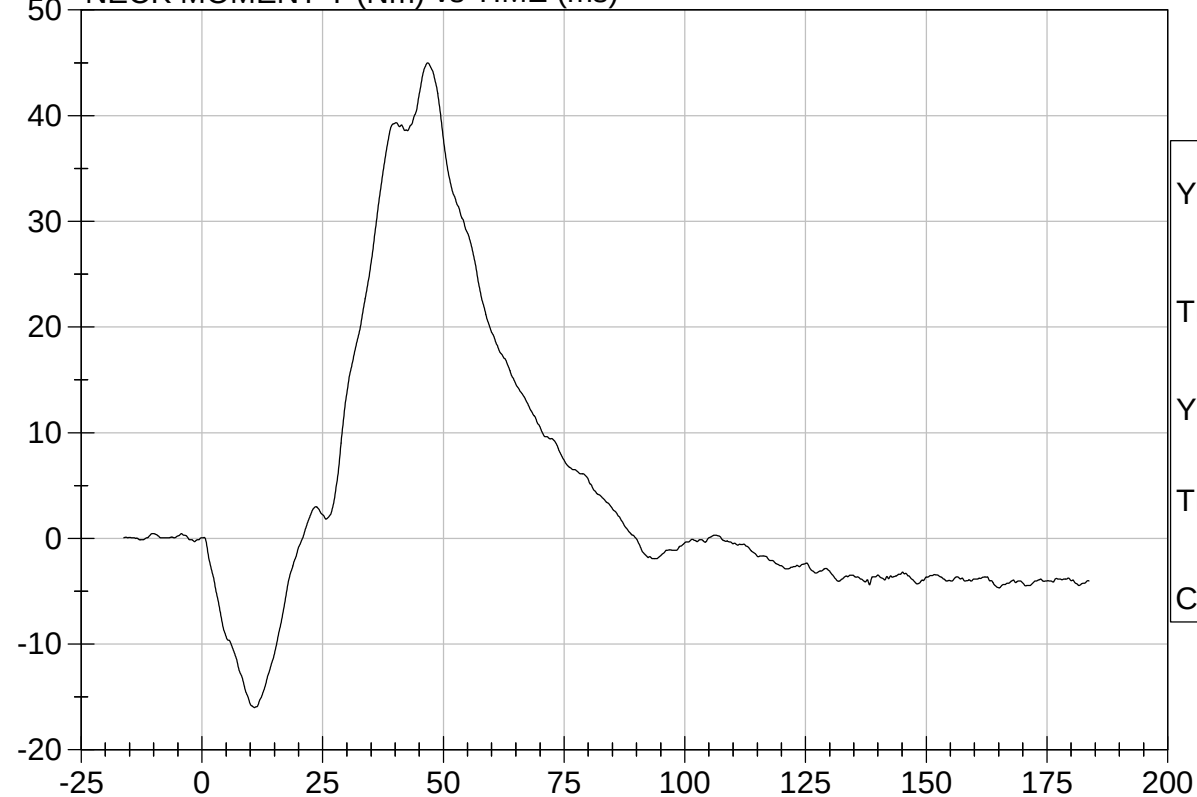
Tmax: 50.7 ms

YMin: -56.0 Deg

Tmin: 183.7 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 45.0 Nm

Tmax: 46.8 ms

YMin: -16.0 Nm

Tmin: 10.9 ms

CFC 600

DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 031

Test Date 2/19/04

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.8

Record the maximum humidity 28%

Record the minimum humidity 22%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.72 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.3 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.3 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	3.1 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-44.6</u> Nm @ <u>84</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	68 ms

*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))

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


Signature

2/19/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 031

Test I.D: D04353

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.72	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.3	Pass
	10 msec	m/s	1.9 - 2.5	2.3	Pass
	14 msec	m/s	2.8 - 3.5	3.1	Pass
D Plane Rotation		deg	83 - 93	83.5	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-44.6	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	67.5	Pass
Overall Test Results					Pass


 Laboratory Technician

02/19/2004

Test Date

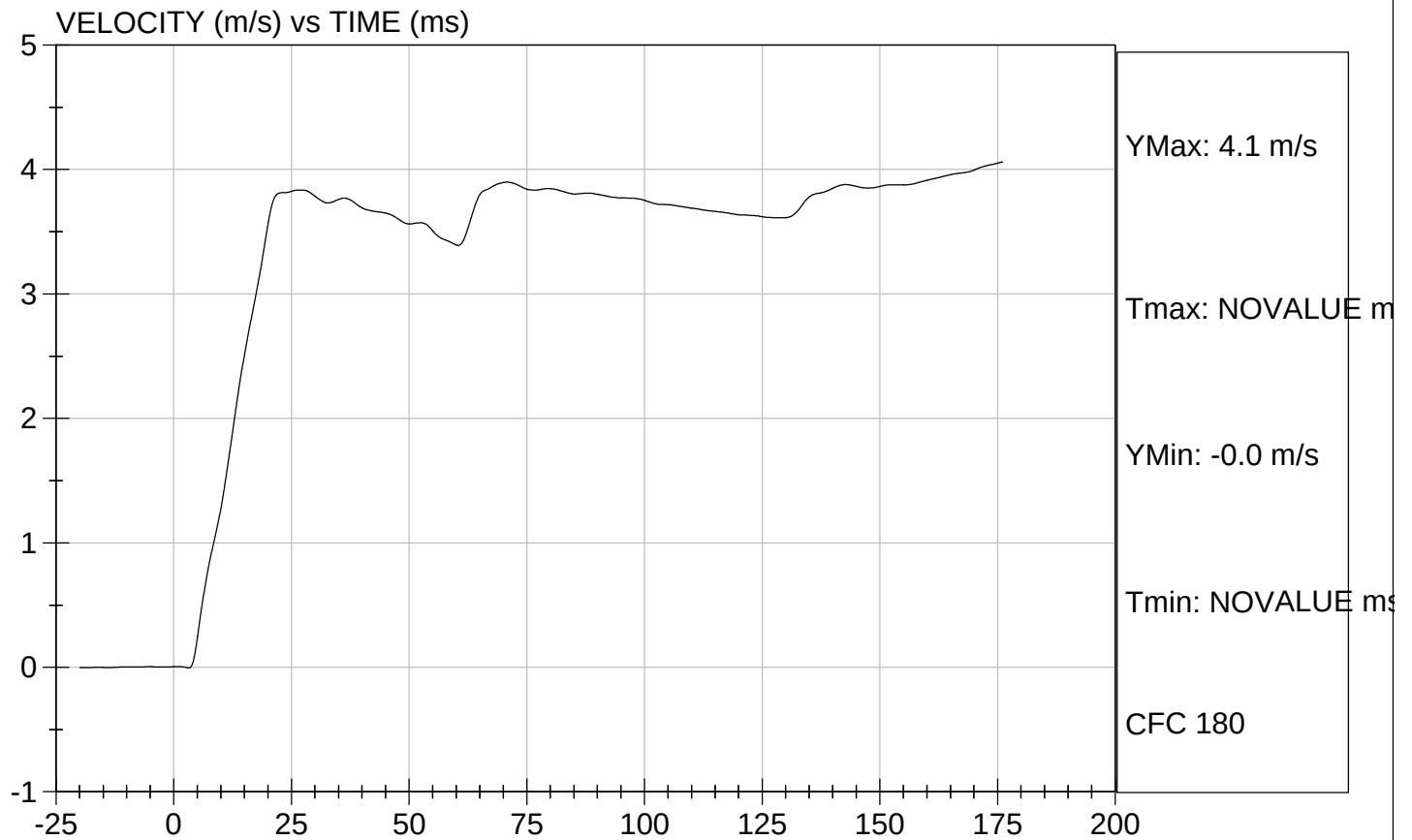

 Approved By



Test Description: Neck Extension Test Date: 02/19/2004

Component: D04353

Speed: 12.2 ft/sec, 3.72 m/sec





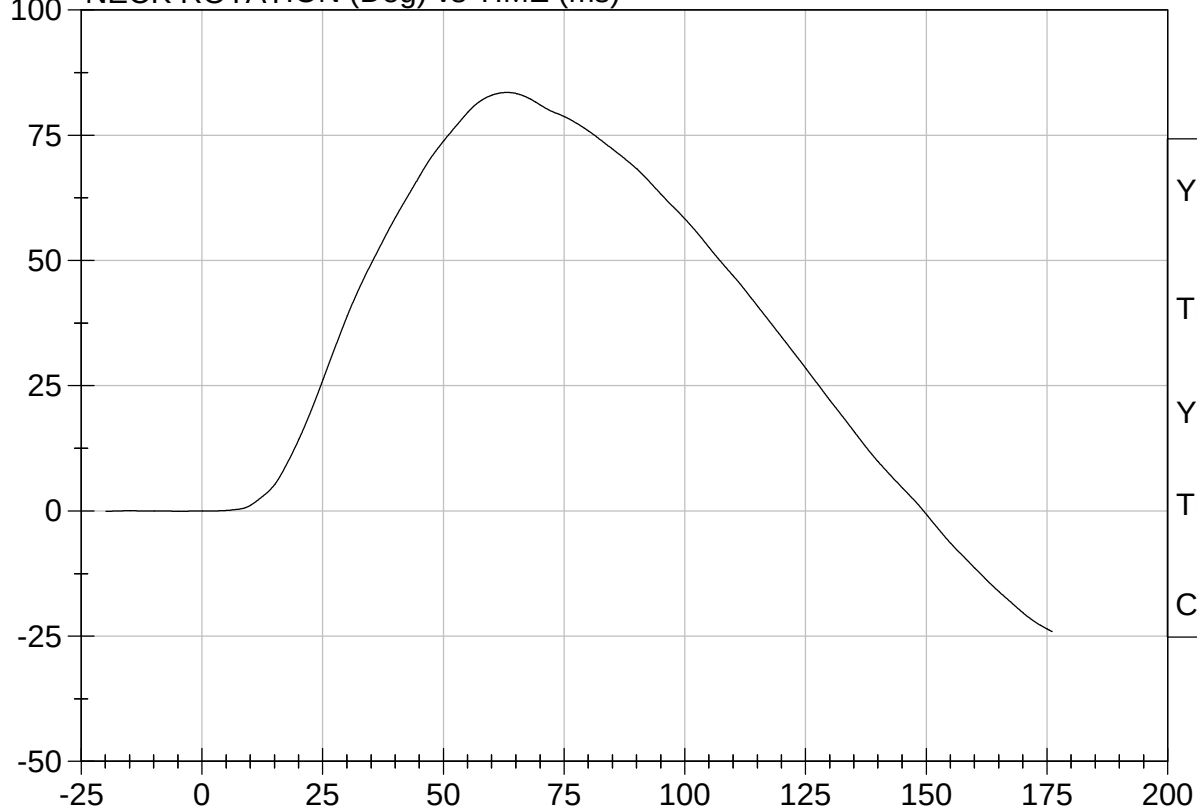
Test Description: Neck Extension

Test Date: 02/19/2004

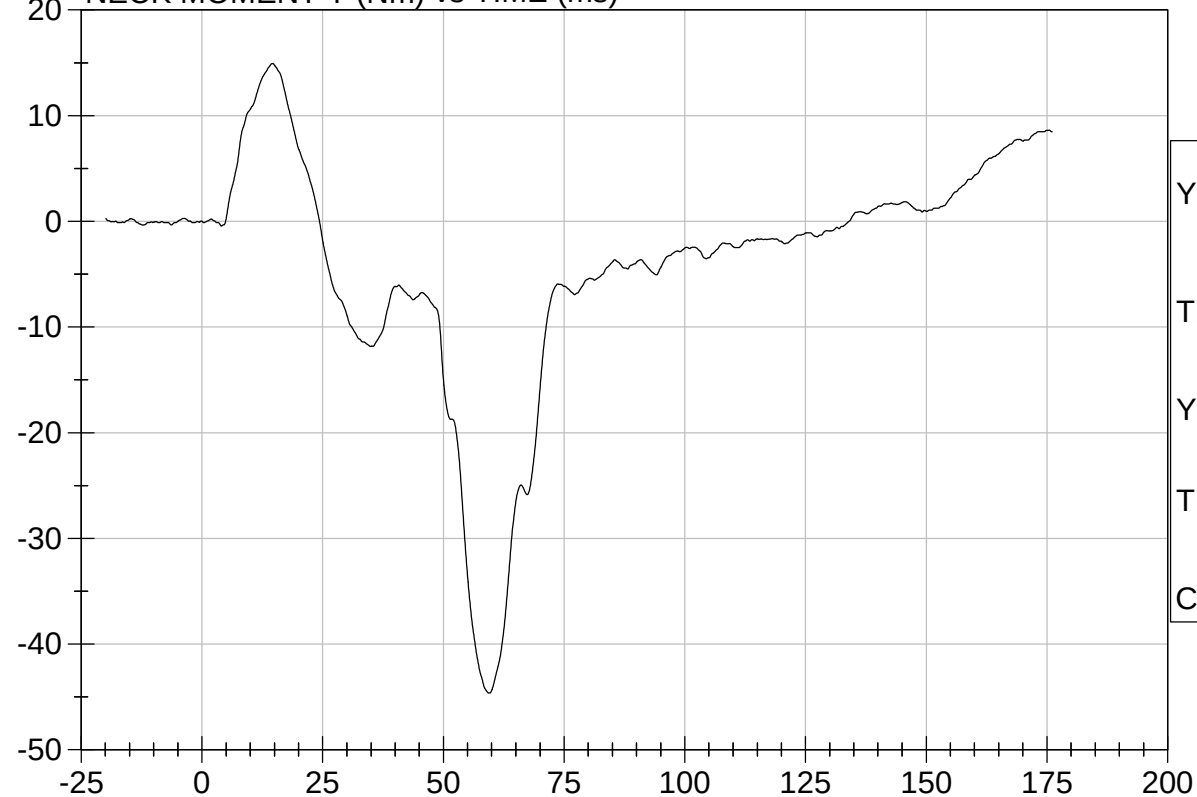
Component: D04353

Speed: 12.2 ft/s, 3.72 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 031 Test Date 2/19/04

Technician Jessica Gall

☒ Pretest calibration
☐ Post test calibration verification

Test attempt no. 1 (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 | <u>22.1</u> |
| Record the minimum temperature | <u>21.8</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>22%</u> |
- ☒ 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 $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 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 $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 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.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 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))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 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. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.1 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	34mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	740 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	770 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	69%

*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)

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

Jessica Hall
Signature

2/19/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

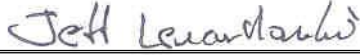
ATD Serial No: 031

Test I.D: D04354

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	5.9 to 6.1	6.07	Pass
Peak Deflection	mm	32 - 38	34	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.74	Pass
Internal Hysteresis	%	65 to 85	69	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.77	Pass
Overall Test Results				Pass


Laboratory Technician

02/19/2004
Test Date


Approved By

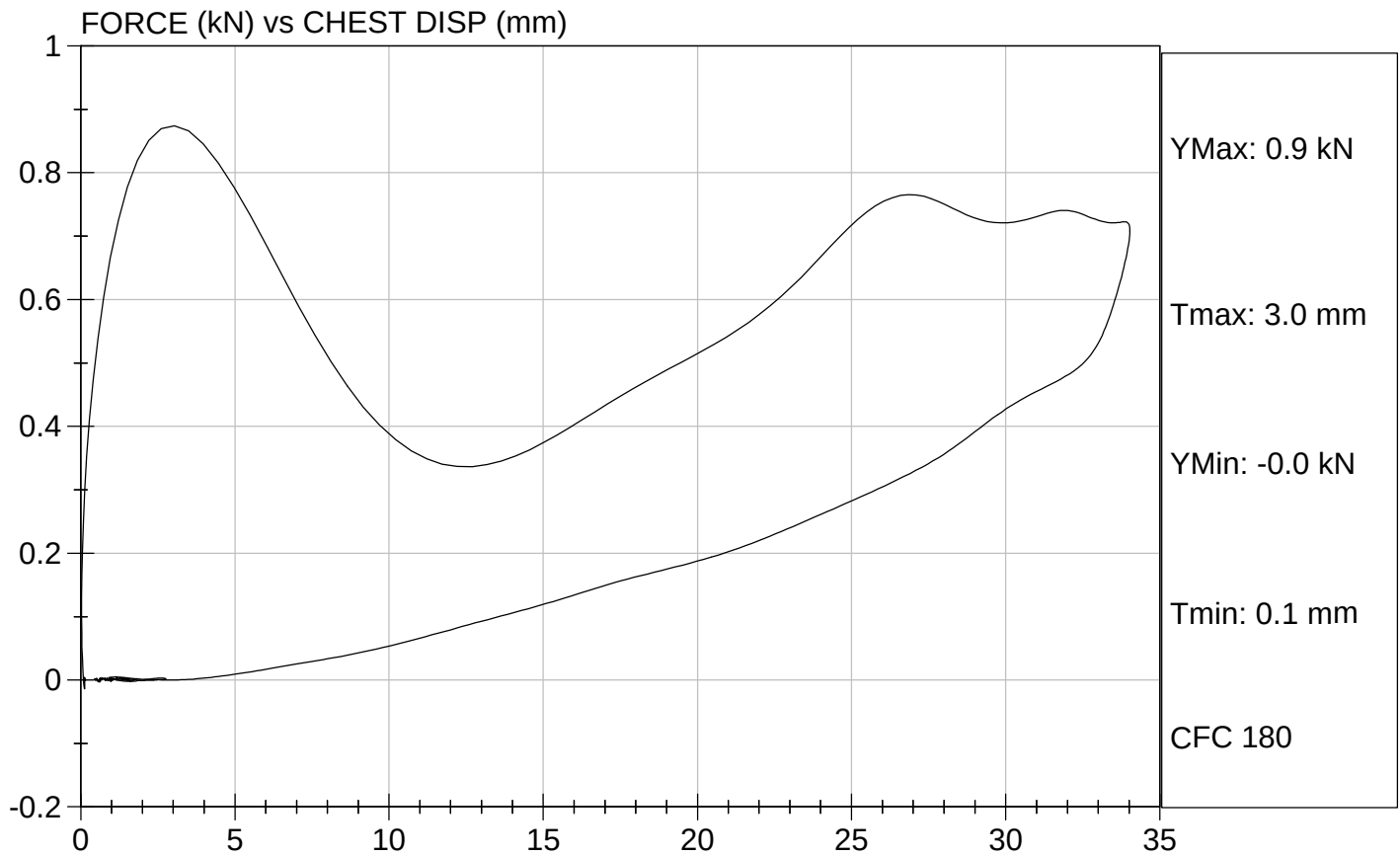


Test Description: Thorax Impact

Test Date: 02/19/2004

Component: D04354

Speed: 19.9 ft/sec, 6.07 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 031

Test Date 2/19/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 22.1

Record the minimum temperature 21.8

Record the maximum humidity 28%

Record the minimum humidity 22%

☒ 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 $\pm 1^\circ$ 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 $30^\circ \pm 2^\circ$. 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))

- X 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°) 6°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 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 $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 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 $\leq 15^\circ$	6°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	177 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	9°

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

Jessica Hall
Signature

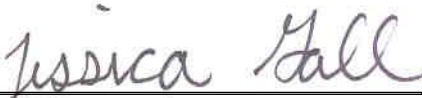
2/19/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 031

Test I.D: D04357

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force At 45 deg.	N	130 - 180	177	Pass
Initial Angle	deg	0 - 15	6	Pass
Return Angle	deg	0 - 10	9	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

02/19/2004
Test Date

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 031

Test Date 6/01/04

Technician Jessica Gall

 Pretest calibration

X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))

X N/A, ONLY one head drop performed

X 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))

X 4. Accelerometers and their respective mounts are smooth and clean.

X 5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 7. 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. (572.142(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.0

Record the maximum humidity 53%

Record the minimum humidity 45%

X 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: No Damage.

X 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))

- X 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 14.8"

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.

- X 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 459mm

Record the left side distance 459mm

- X 12. 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). (572.142(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 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 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	275
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	8

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

Jessica Hall
Signature

6/01/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 031

Test I.D: D041301

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	275.2	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.3	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

06/01/2004
Test Date

Jeff Leonard
Approved By



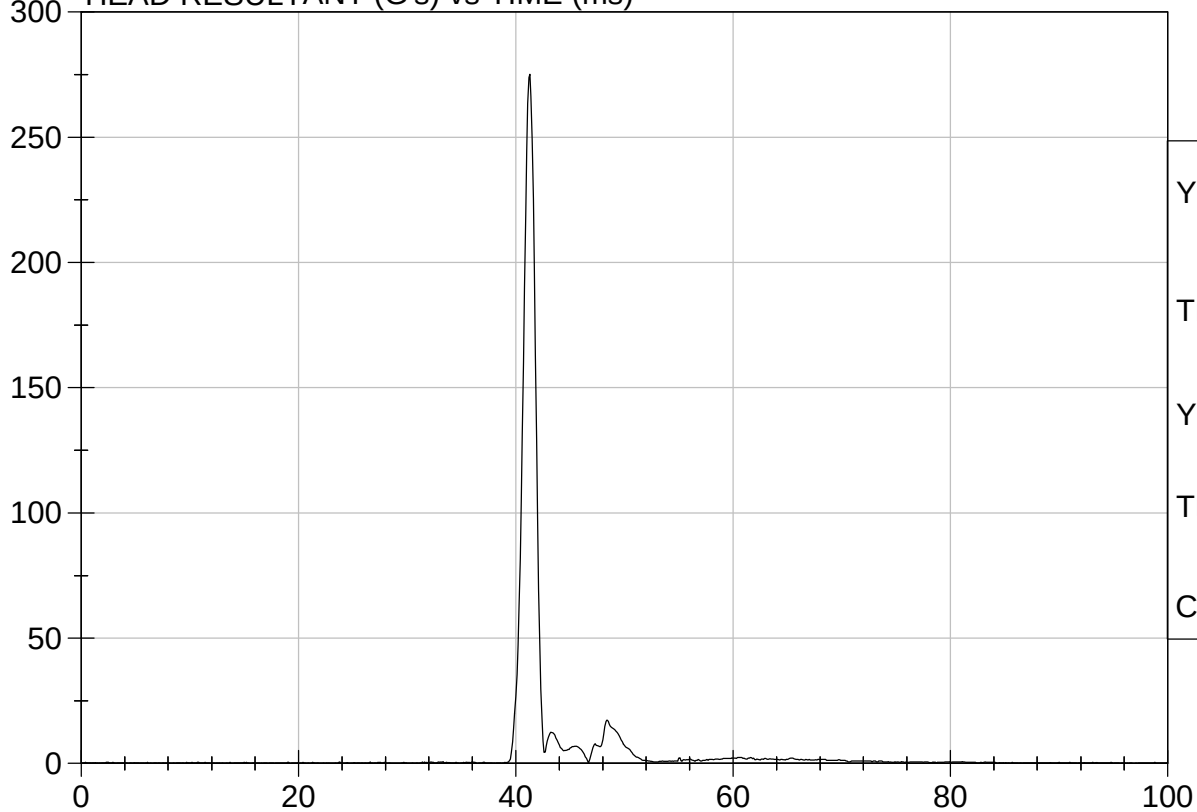
Test Description: Head Drop

Test Date: 06/01/2004

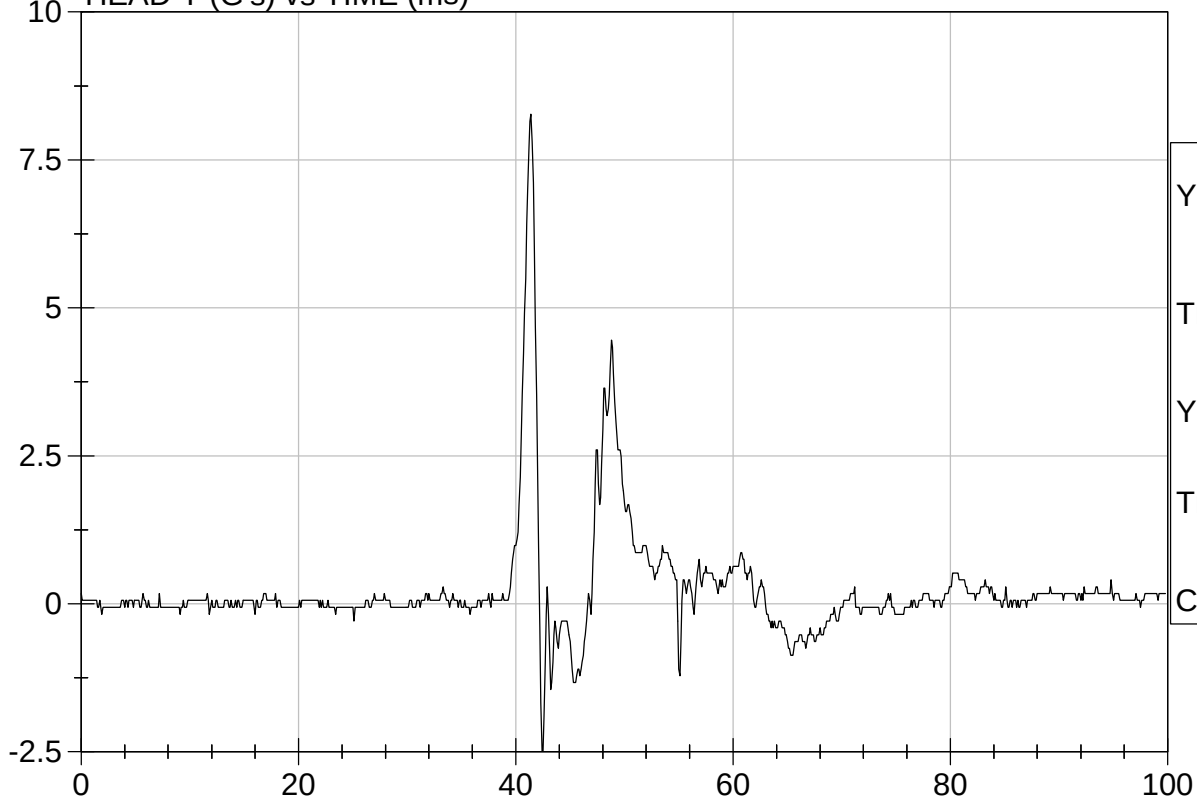
Component: D041301

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 031

Test Date 6/01/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.0

Record the maximum humidity 53%

Record the minimum humidity 45%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.5 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.6 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.8 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>46</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	69 ms

*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))

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

Joe Fleck
Signature

6/01/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

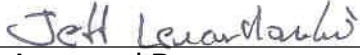
ATD Serial No: 031

Test I.D: D041302

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.49	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.5	Pass
	15 msec	m/s	3.0 - 4.0	3.6	Pass
	20 msec	m/s	4.0 - 5.1	4.8	Pass
D Plane Rotation		deg	70 - 82	81.4	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	46.1	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	69.4	Pass
Overall Test Results					Pass


 Laboratory Technician

06/01/2004
 Test Date


 Approved By

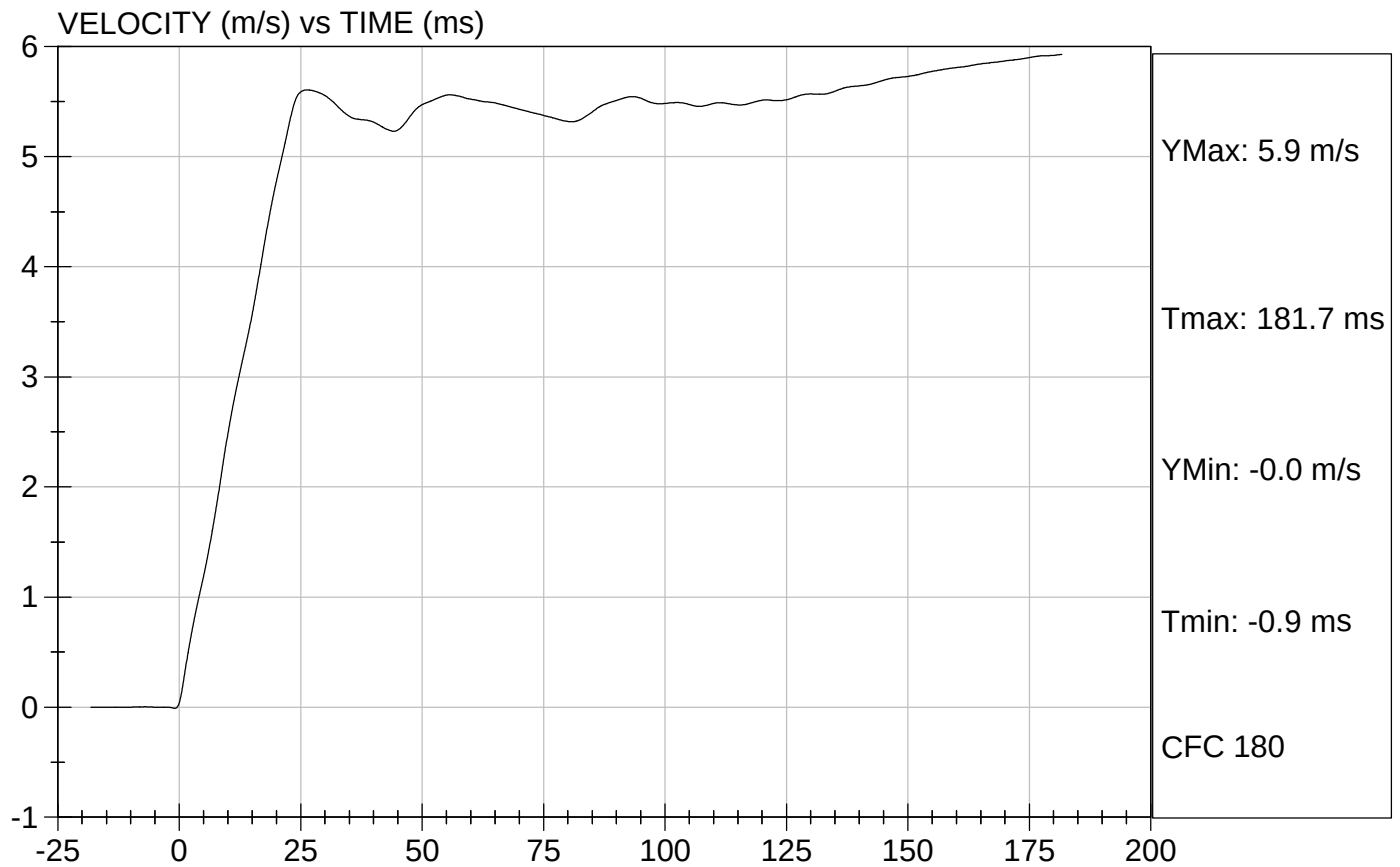


Test Description: Neck Flexion

Test Date: 06/01/2004

Component: D041302

Speed: 18.01 ft/sec, 5.49 m/sec





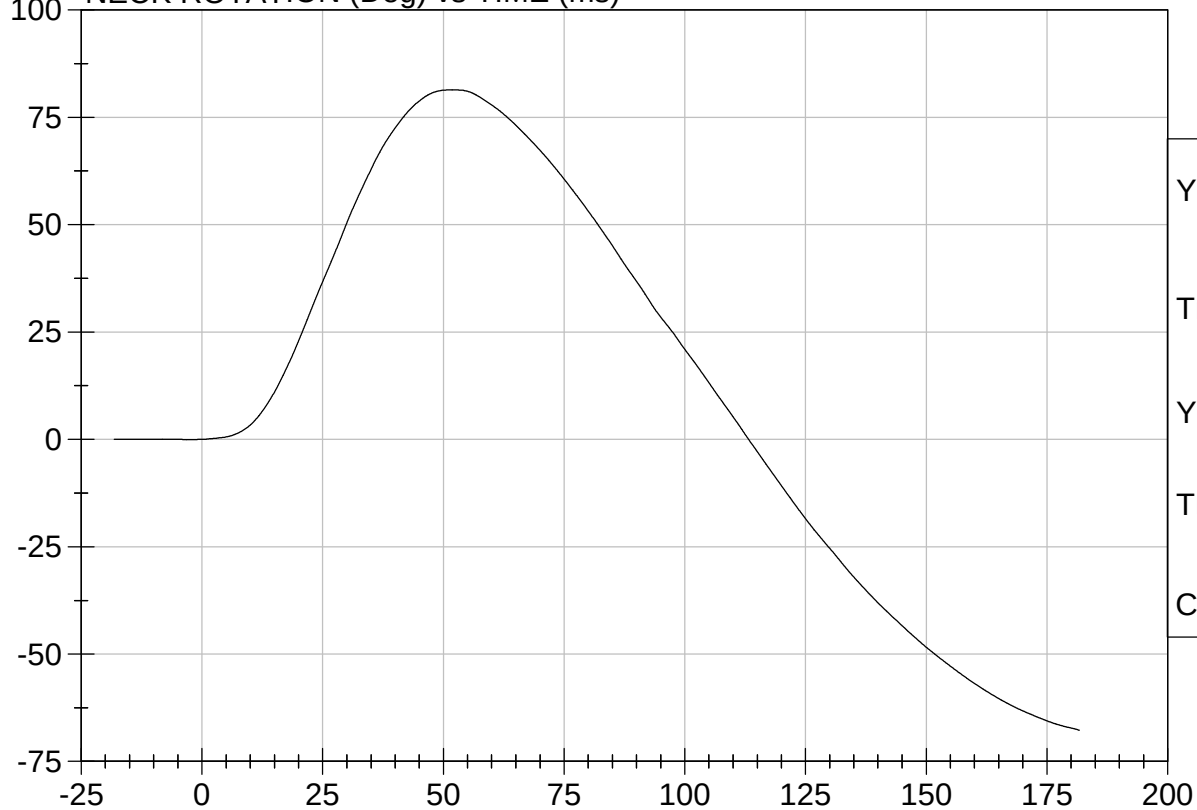
Test Description: Neck Flexion

Test Date: 06/01/2004

Component: D041302

Speed: 18.01 ft/s, 5.49 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 81.4 Deg

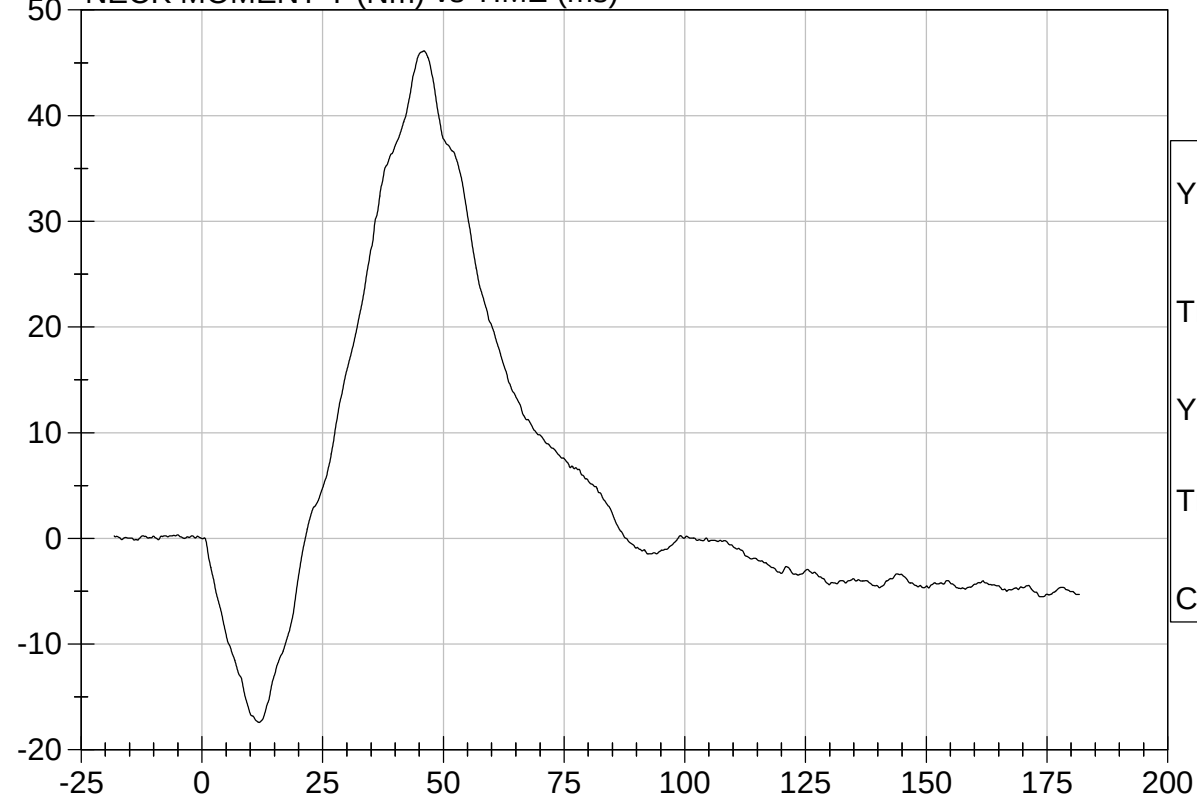
Tmax: 51.6 ms

YMin: -67.8 Deg

Tmin: 181.7 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 46.1 Nm

Tmax: 46.0 ms

YMin: -17.4 Nm

Tmin: 11.8 ms

CFC 600

DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 031

Test Date 6/01/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.0

Record the maximum humidity 53%

Record the minimum humidity 45%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.70 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.3 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.3 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	3.1 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-43.2</u> Nm @ <u>86</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	68 ms

*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))

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

Joe Fleck
Signature

6/01/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

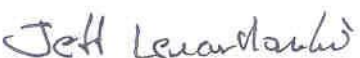
ATD Serial No: 031

Test I.D: D041303

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.70	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.3	Pass
	10 msec	m/s	1.9 - 2.5	2.3	Pass
	14 msec	m/s	2.8 - 3.5	3.1	Pass
D Plane Rotation		deg	83 - 93	85.5	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-43.2	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	68.2	Pass
Overall Test Results					Pass


 Laboratory Technician

06/01/2004
 Test Date

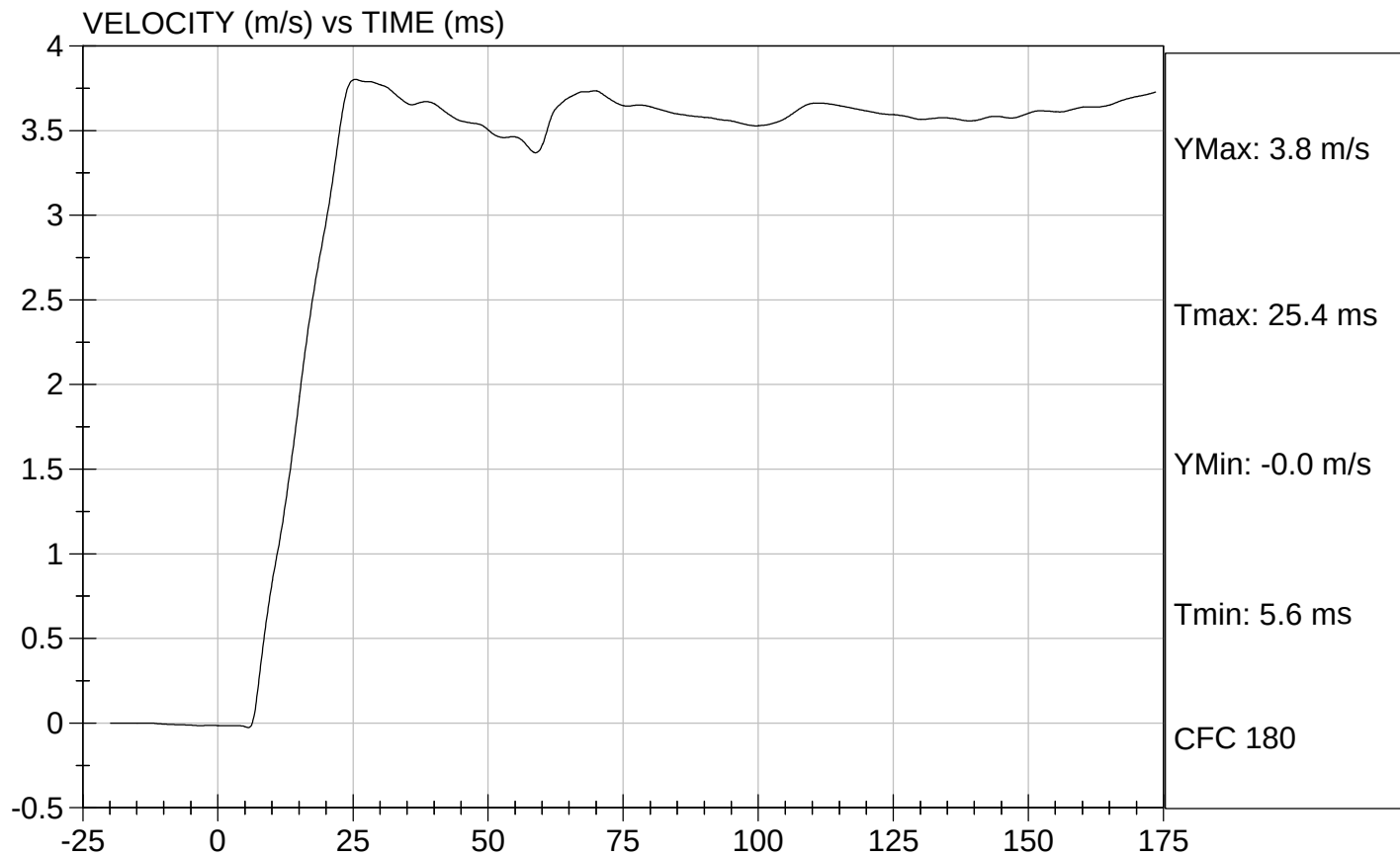

 Approved By



Test Description: Neck Extension Test Date: 06/01/2004

Component: D041303

Speed: 12.13 ft/sec, 3.70 m/sec





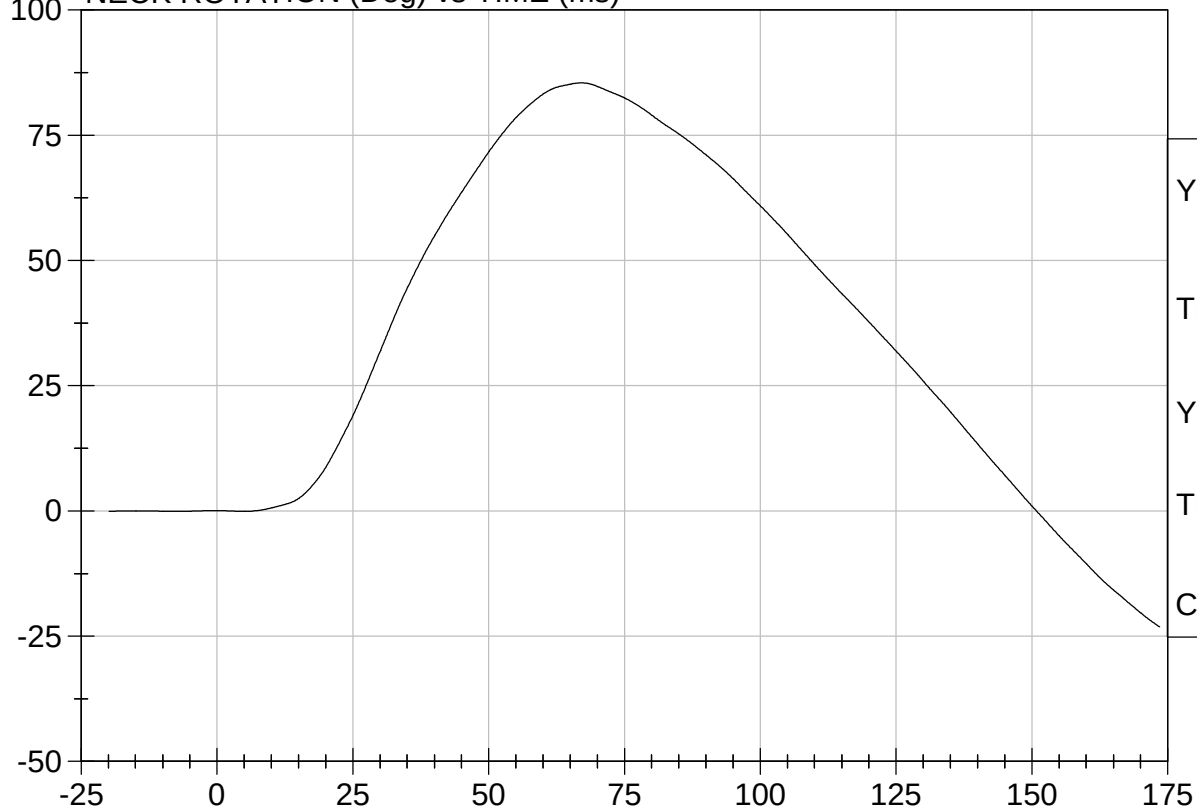
Test Description: Neck Extension

Test Date: 06/01/2004

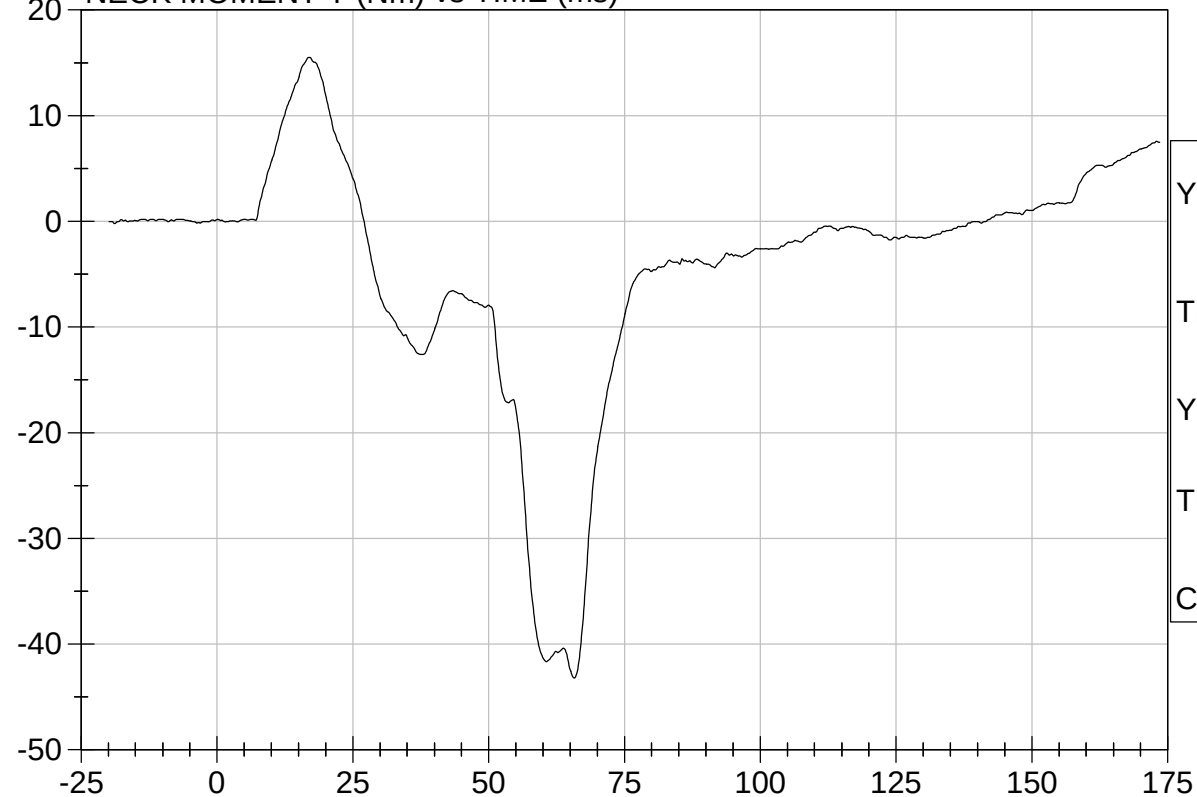
Component: D041303

Speed: 12.13 ft/s, 3.70 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 031 Test Date 6/03/04

Technician Jessica Gall

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (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 | <u>22.0</u> |
| Record the minimum temperature | <u>21.0</u> |
| Record the maximum humidity | <u>43%</u> |
| Record the minimum humidity | <u>38%</u> |
- ☒ 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 $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 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 $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 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.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 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))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 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. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	33mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	700 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	700 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

*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)

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

Jessica Hall
Signature

6/03/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

ATD Serial No: 031

Test I.D: D041304

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Velocity	m/s	5.9 to 6.1	6.04	Pass
Peak Deflection	mm	32 - 38	33.4	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.70	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.70	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

06/03/2004
Test Date

Jeff Leonard
Approved By

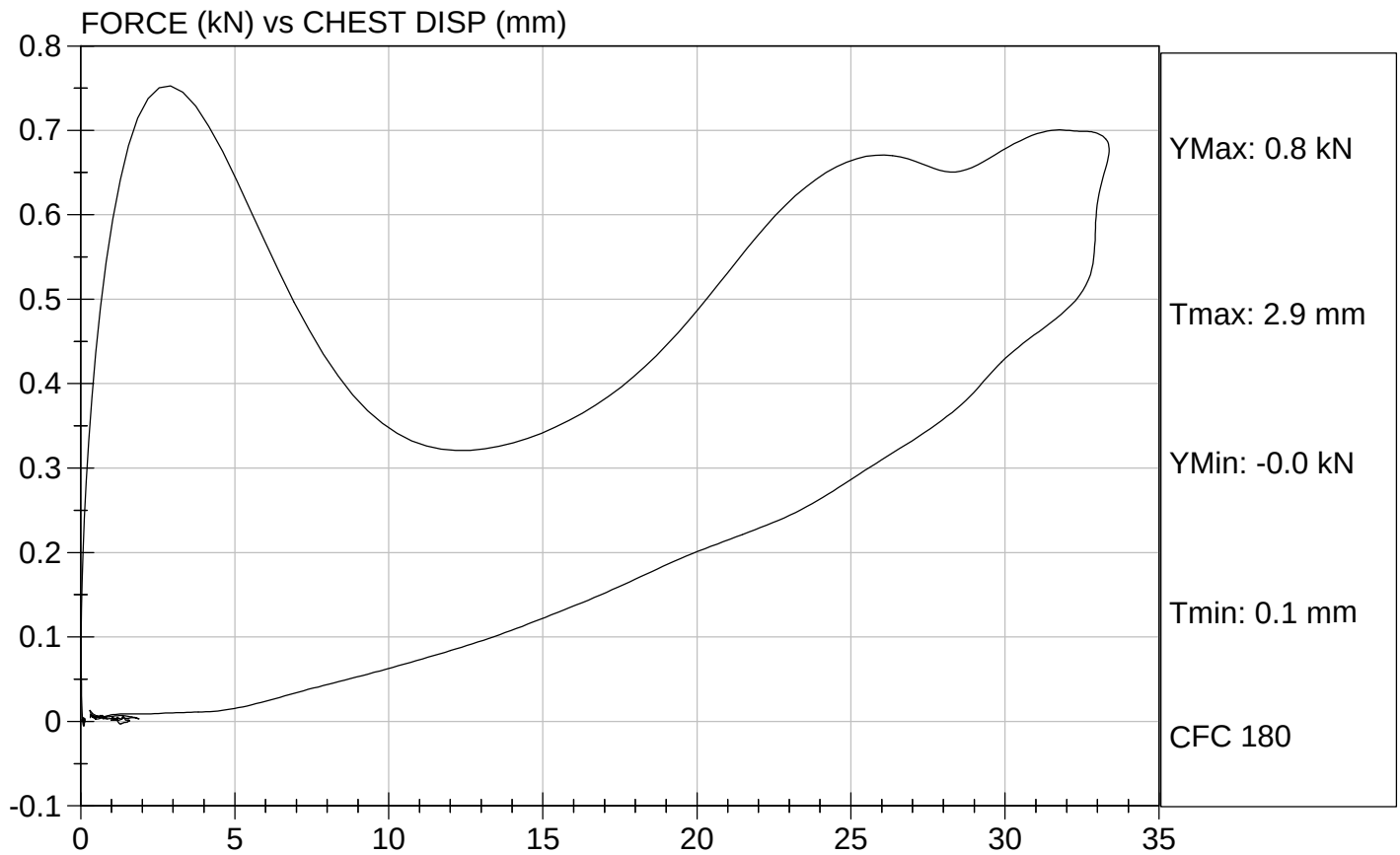


Test Description: Thorax Impact

Test Date: 06/03/2004

Component: D041304

Speed: 19.82 ft/sec, 6.04 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 031

Test Date 6/02/04

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (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 22.1

Record the minimum temperature 21.8

Record the maximum humidity 54%

Record the minimum humidity 46%

☒ 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 $\pm 1^\circ$ 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 $30^\circ \pm 2^\circ$. 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))

- X 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°) 6°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 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 $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 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 $\leq 15^\circ$	6°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	176 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	8°

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

Jessica Hall
Signature

6/02/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 031

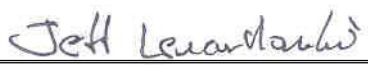
Test I.D: D041307

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Force At 45 deg.	N	130 - 180	176	Pass
Initial Angle	deg	0 - 15	6	Pass
Return Angle	deg	0 - 10	8	Pass
Overall Test Results				Pass



Laboratory Technician

06/02/2004
Test Date



Approved By

DATA SHEET D1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 031

Test Date 5/28/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

6/1/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Levanthaler
Signature

6/1/04
Date

SN031, 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.	538.5-553.7	545.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	320.4
C	H-POINT HEIGHT	Reference	34.3-44.5	42.3
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	66.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	70.2
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	85.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	249.8
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	54.3
I	SHOULDER TO- ELBOW LENGTH	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.	185.4-200.6	196.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	142.2
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300	290.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	228.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	246.4
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	227.0

SN031, HYBRID III, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	145.2
P	FOOT LENGTH	Tip of toe to rear of heal	137.6-147.8	143.9
Q	STATURE	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.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	259.0
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	134.4
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	174.0
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	202.4
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	248.0
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	58.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	506.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	545.0
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	551.6
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	245.2
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.7

SN032, 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.	538.5-553.7	544.8
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	316.4
C	H-POINT HEIGHT	Reference	34.3-44.5	35.0
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	65.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	67.7
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	87.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	248.3
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	51.1
I	SHOULDER TO- ELBOW LENGTH	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.	185.4-200.6	198.6
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	140.4
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300	291.5
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	225.0
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	253.8
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	229.1
SN032, HYBRID III, SUBPART P EXTERNAL DIMENSIONS, continued				

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	140.2
P	FOOT LENGTH	Tip of toe to rear of heal.	137.6-147.8	145.3
Q	STATURE	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.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	261.0
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	134.4
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	174.6
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.3
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	244.7
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	58.4
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	505.2
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	546.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	550.0
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.7
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032

Test Date 6/08/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 (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. (572.142(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.1

Record the maximum humidity 58%

Record the minimum humidity 52%

☒ 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: No Damage.

☒ 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))

- X 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 14.8"

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.

- X 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 463mm

Record the left side distance 462mm

- X 12. 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). (572.142(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 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 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	263
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	12

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

Joe Fleck
Signature

6/08/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

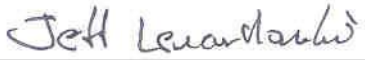
ATD Serial No: 032

Test I.D: D041351

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	262.9	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	11.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/08/2004
Test Date


Approved By



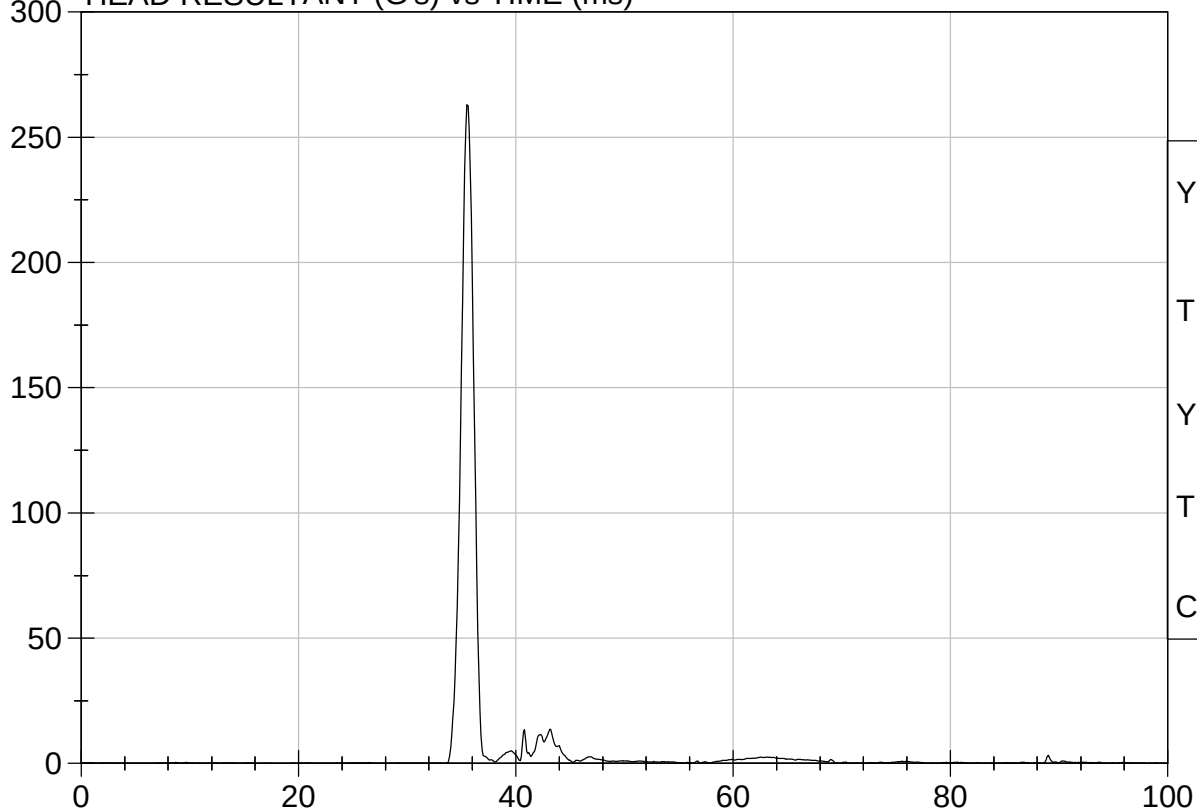
Test Description: Head Drop

Test Date: 06/08/2004

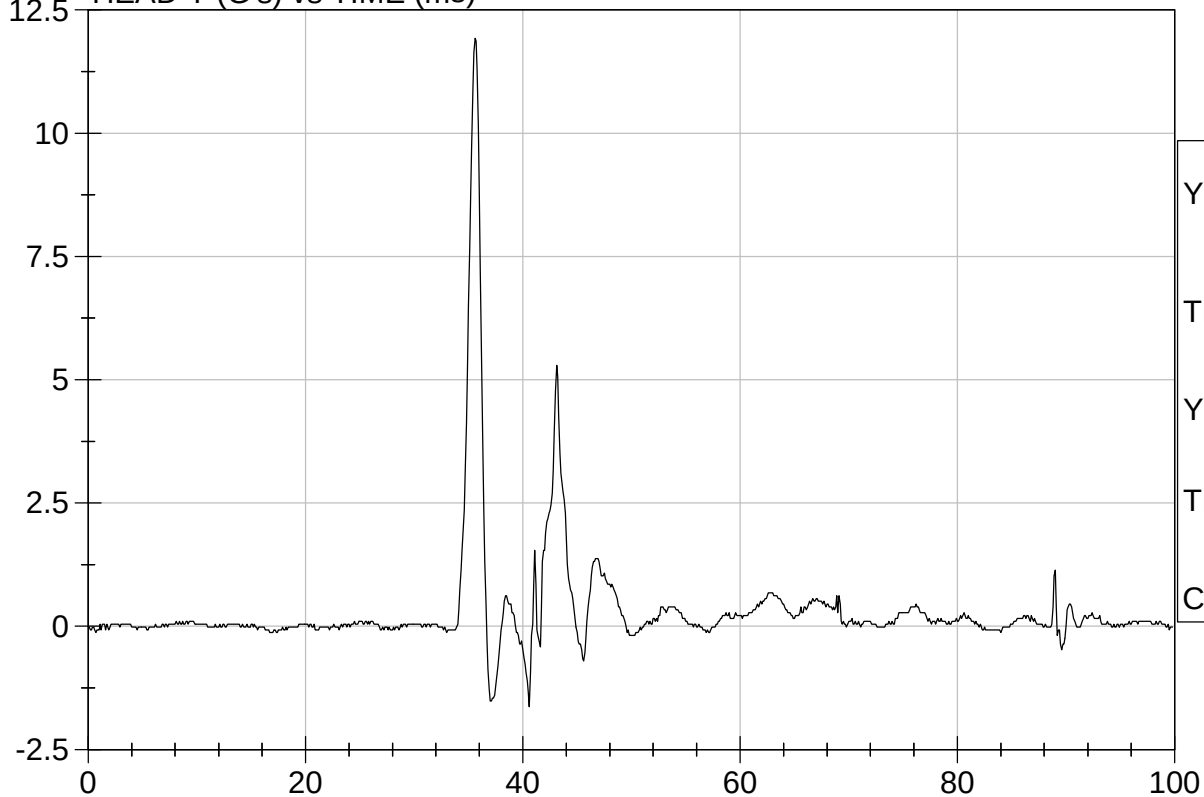
Component: D041351

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032

Test Date 6/08/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.1

Record the maximum humidity 54%

Record the minimum humidity 51%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.3 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.3 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.5 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>43</u> Nm @ <u>80</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	71 ms

*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))

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

Joe Fleck
Signature

6/08/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 032

Test I.D: D041352

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	53	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.52	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.3	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	80.1	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	43.4	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.1	Pass
Overall Test Results					Pass



Laboratory Technician

06/08/2004

Test Date



Approved By

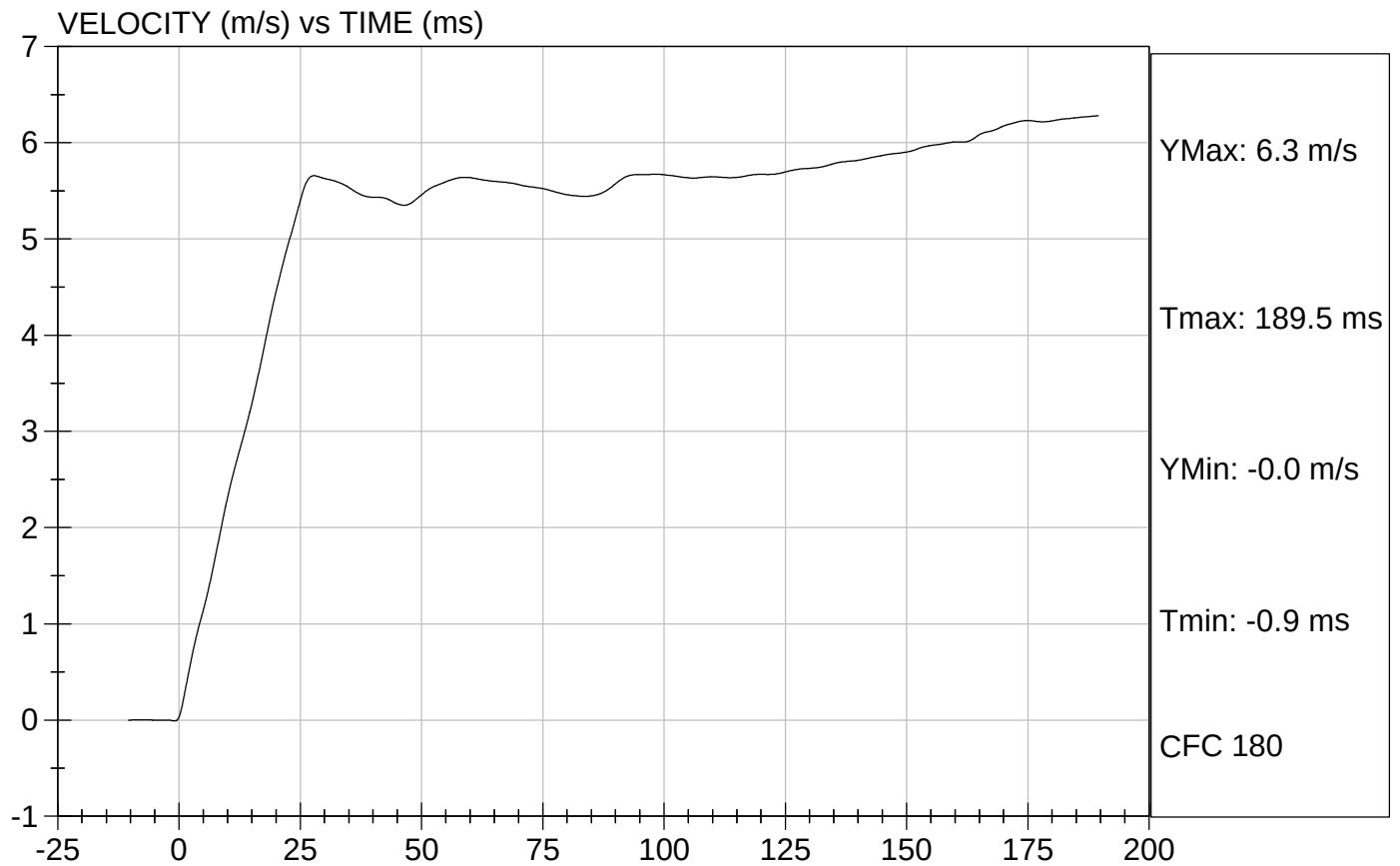


Test Description: Neck Flexion

Test Date: 06/08/2004

Component: D041352

Speed: 18.1 ft/sec, 5.52 m/sec





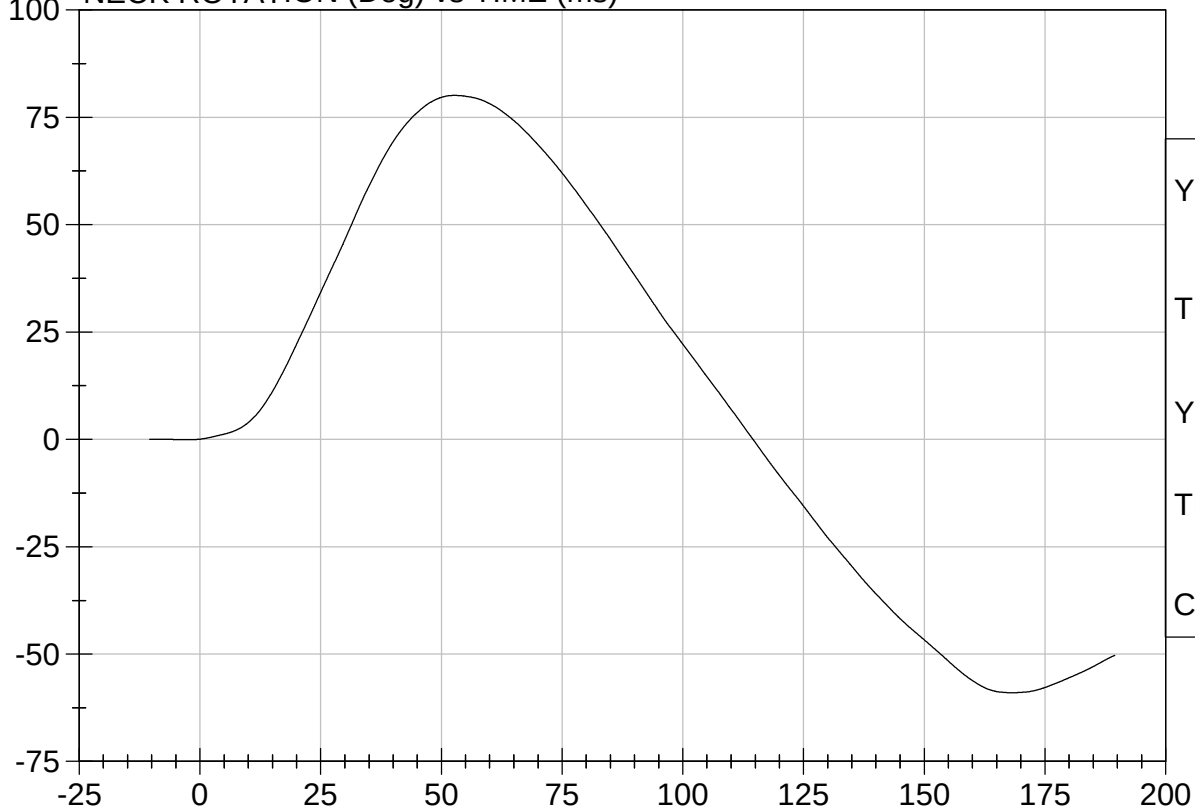
Test Description: Neck Flexion

Test Date: 06/08/2004

Component: D041352

Speed: 18.1 ft/s, 5.52 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 80.1 Deg

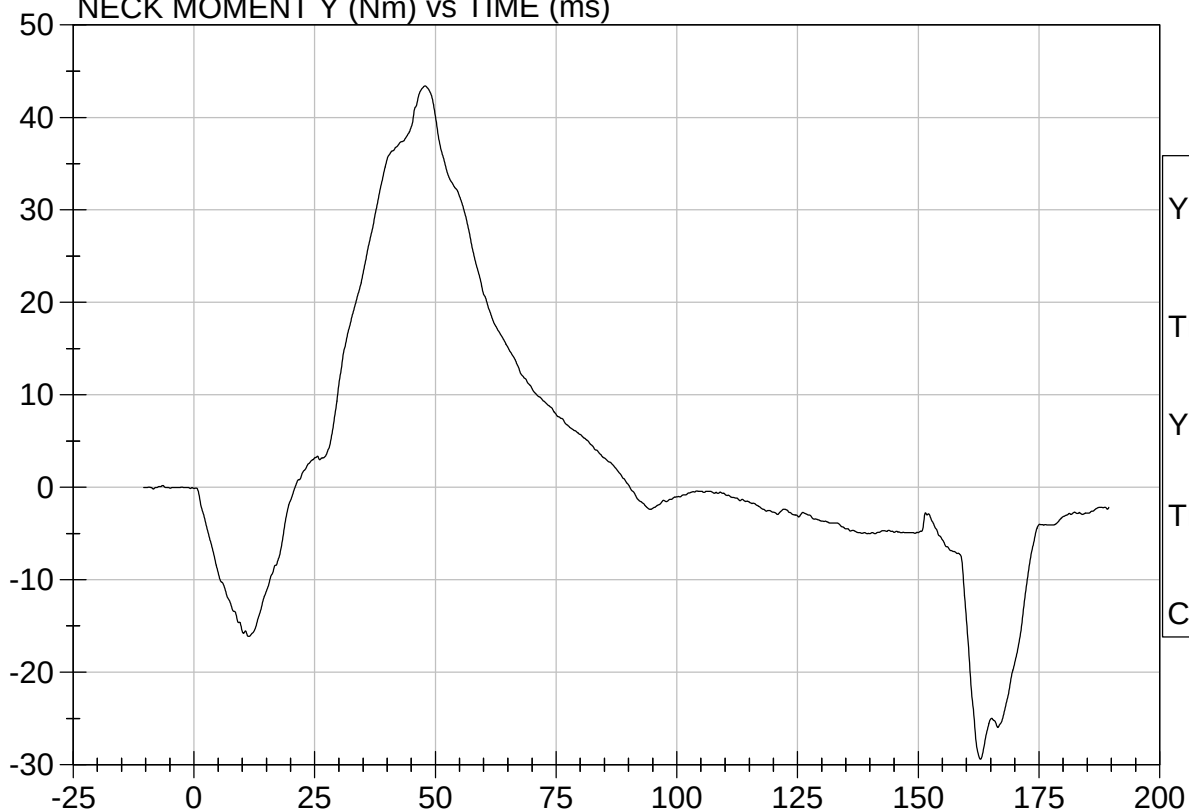
Tmax: 52.7 ms

YMin: -59.0 Deg

Tmin: 168.1 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 43.4 Nm

Tmax: 47.8 ms

YMin: -29.4 Nm

Tmin: 162.9 ms

CFC 600

DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032

Test Date 6/08/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.1

Record the maximum humidity 54%

Record the minimum humidity 51%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.73 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.3 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.3 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	3.1 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-46.6</u> Nm @ <u>85</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	68 ms

*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))

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

Joe Fleck
Signature

6/08/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 032

Test I.D: D041353

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.73	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.3	Pass
	10 msec	m/s	1.9 - 2.5	2.3	Pass
	14 msec	m/s	2.8 - 3.5	3.1	Pass
D Plane Rotation		deg	83 - 93	85.4	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-46.6	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	68.2	Pass
Overall Test Results					Pass


 Laboratory Technician

06/08/2004
 Test Date

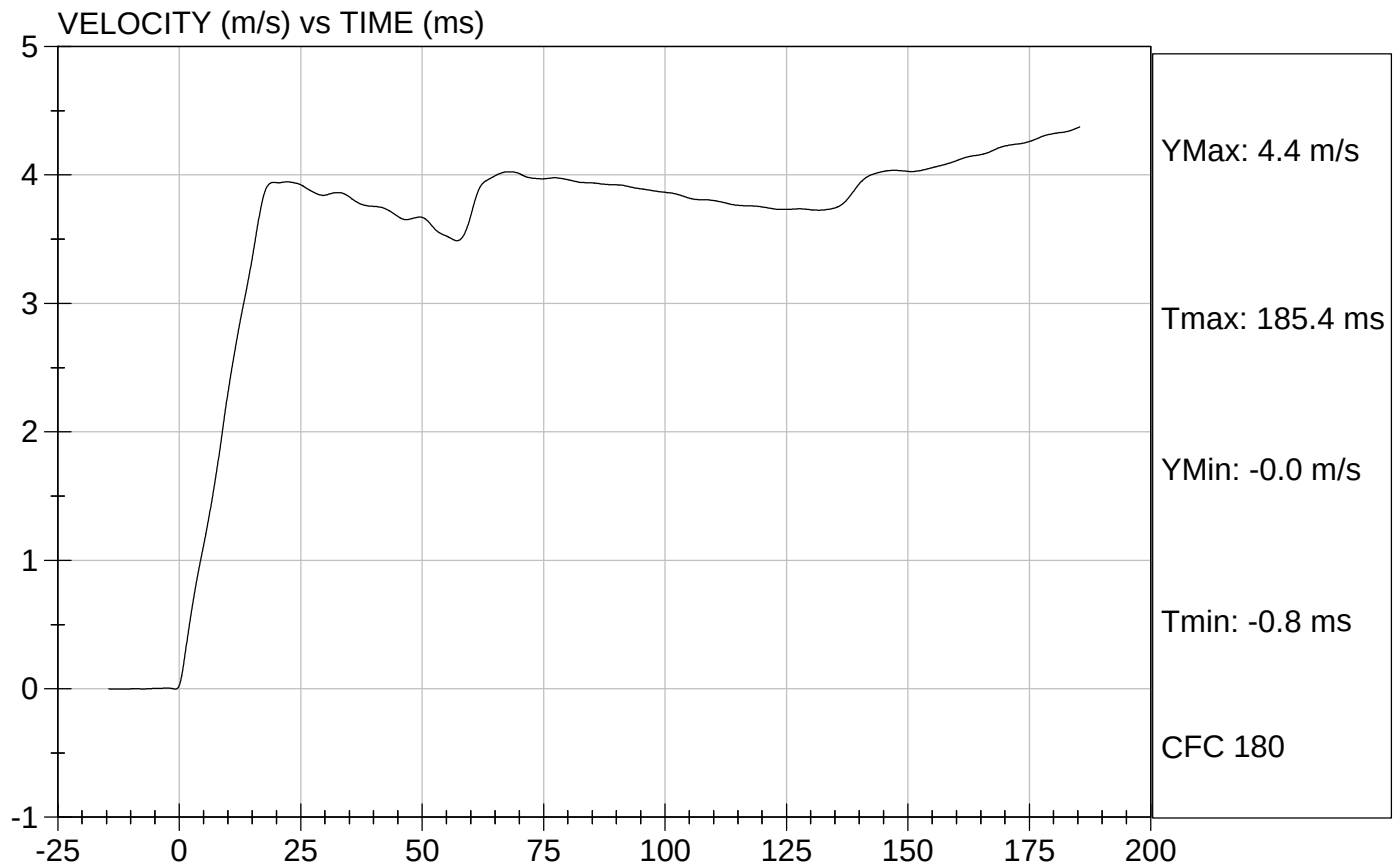

 Approved By



Test Description: Neck Extension Test Date: 06/08/2004

Component: D041353

Speed: 12.23 ft/sec, 3.73 m/sec





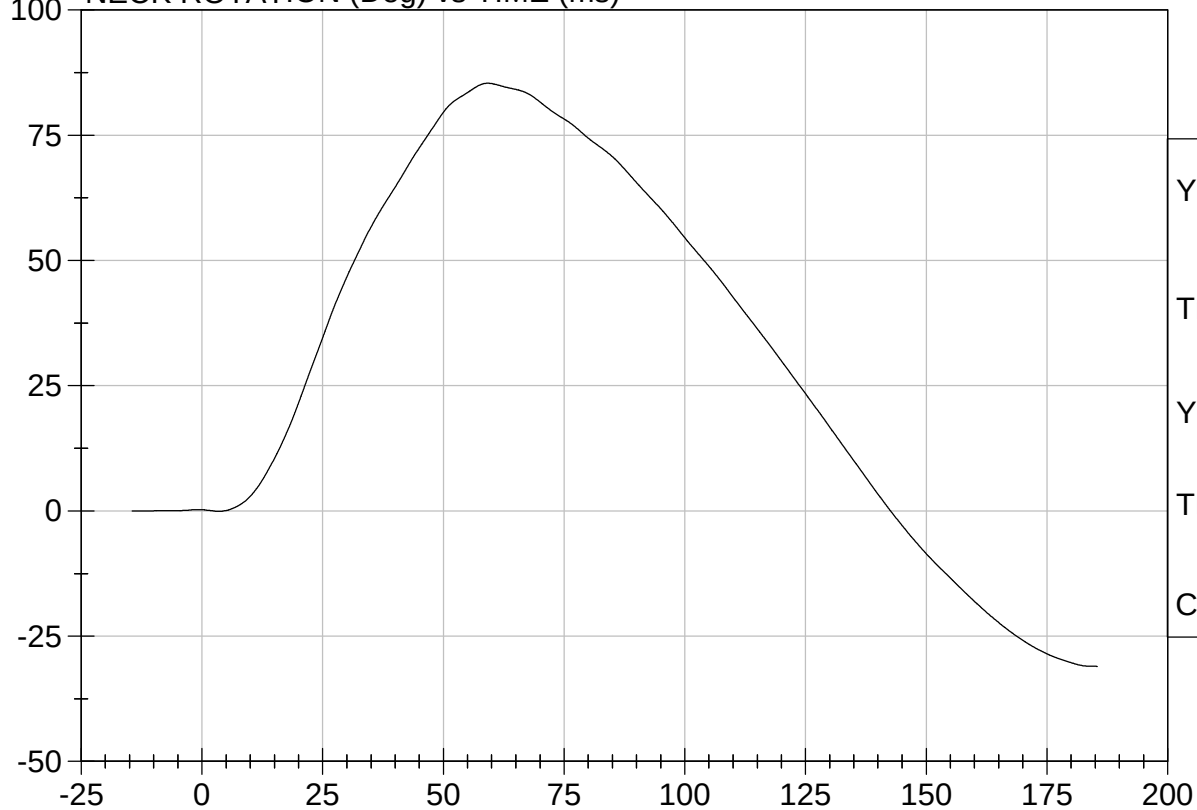
Test Description: Neck Extension

Test Date: 06/08/2004

Component: D041353

Speed: 12.23 ft/s, 3.73 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 85.4 Deg

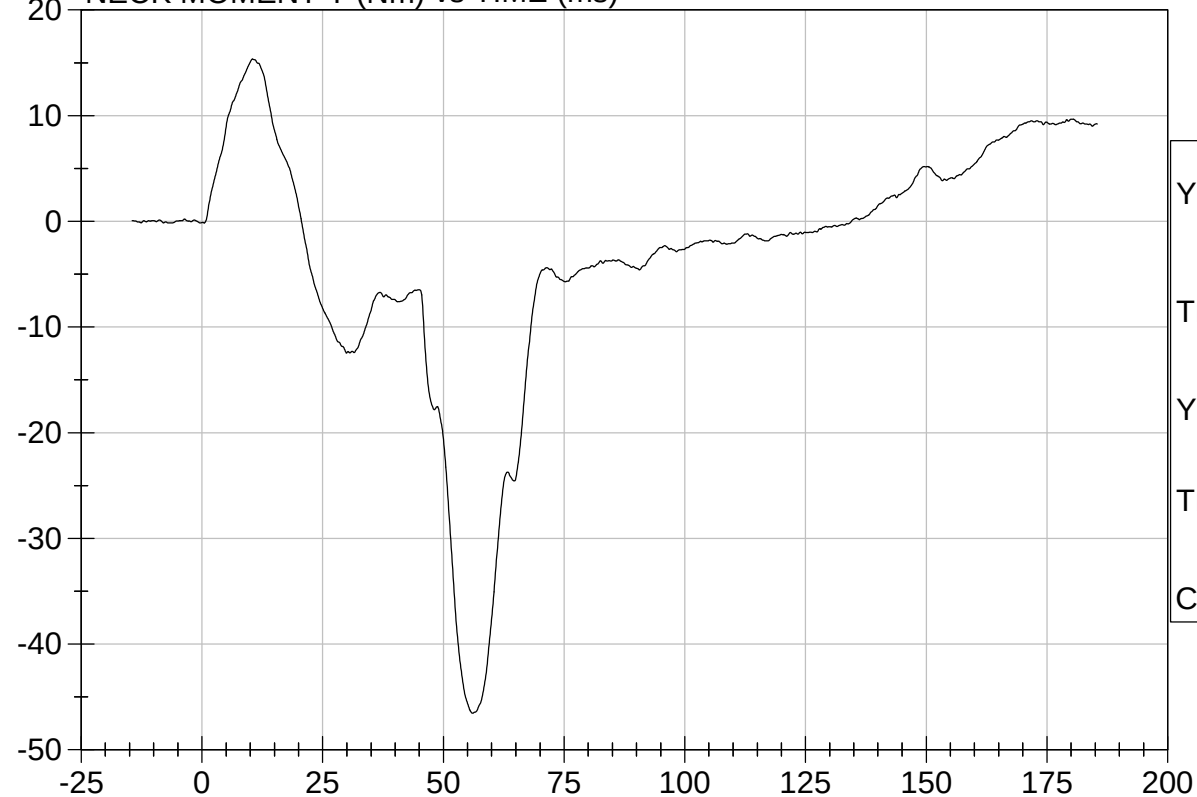
Tmax: 59.2 ms

YMin: -31.0 Deg

Tmin: 185.4 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 15.4 Nm

Tmax: 10.5 ms

YMin: -46.6 Nm

Tmin: 56.0 ms

CFC 600

DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 6/09/04

Technician Joe Fleck

☒ Pretest calibration
☐ Post test calibration verification

Test attempt no. 1 (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 | <u>21.9</u> |
| Record the minimum temperature | <u>20.5</u> |
| Record the maximum humidity | <u>58%</u> |
| Record the minimum humidity | <u>52%</u> |
- ☒ 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 $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 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 $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 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.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 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))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 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. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	38mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	720 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	750 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

*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)

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

Joe Fleck
Signature

6/09/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

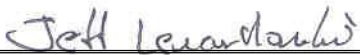
ATD Serial No: 032

Test I.D: D041354

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Velocity	m/s	5.9 to 6.1	6.04	Pass
Peak Deflection	mm	32 - 38	37.7	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.72	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.75	Pass
Overall Test Results				Pass


 Laboratory Technician

06/09/2004
 Test Date


 Approved By

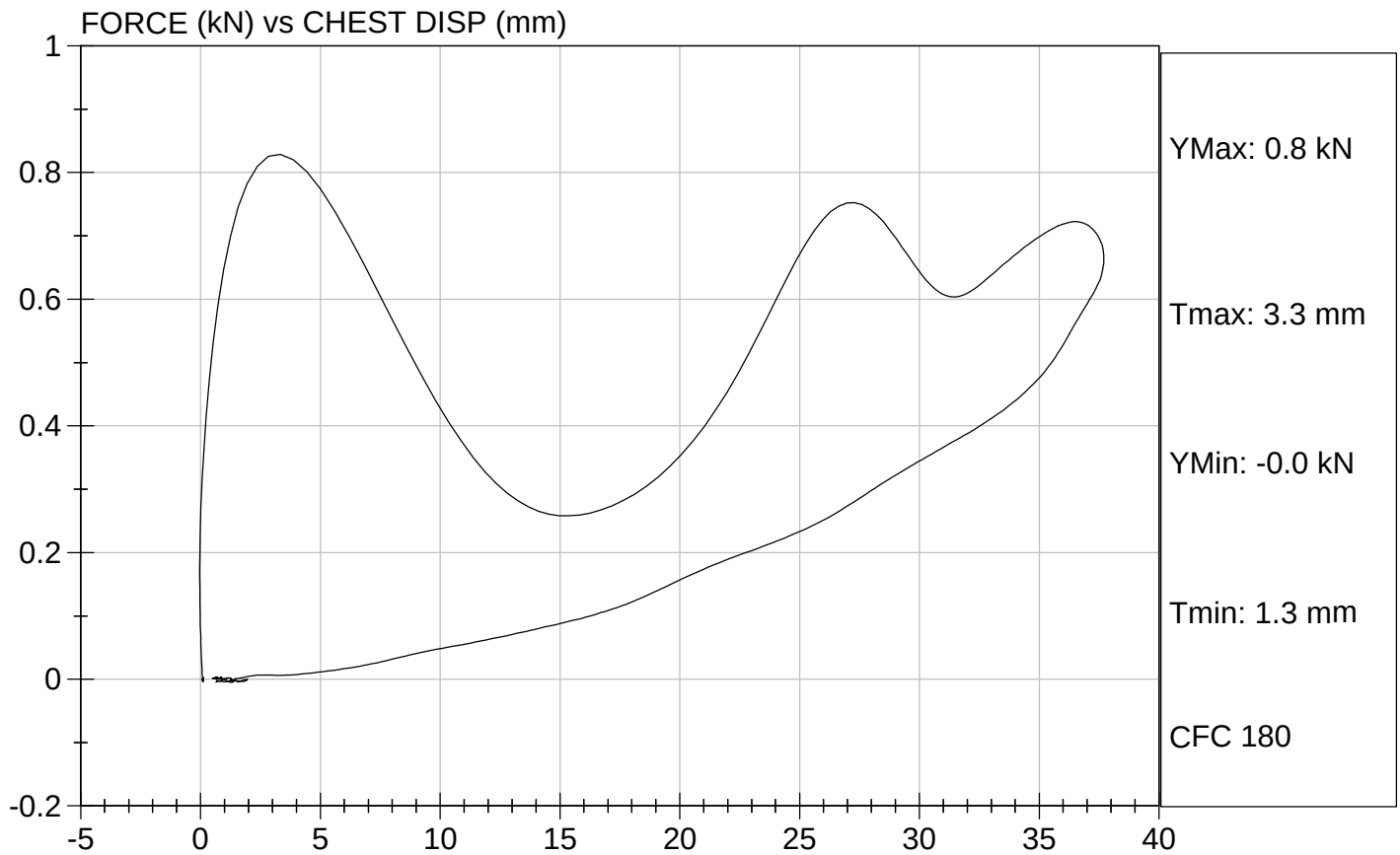


Test Description: Thorax Impact

Test Date: 06/09/2004

Component: D041354

Speed: 19.82 ft/sec, 6.04 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 6/09/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

Test attempt no. 1 (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 21.9

Record the minimum temperature 20.5

Record the maximum humidity 58%

Record the minimum humidity 52%

☒ 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 $\pm 1^\circ$ 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 $30^\circ \pm 2^\circ$. 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))

- X 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°) 0°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 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 $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 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 $\leq 15^\circ$	0°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	176 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	3°

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

Joe Fleck
Signature

6/09/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

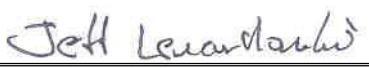
ATD Serial No: 032

Test I.D: D041357

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Force At 45 deg.	N	130 - 180	176	Pass
Initial Angle	deg	0 - 15	0	Pass
Return Angle	deg	0 - 10	3	Pass
Overall Test Results				Pass


Laboratory Technician

06/09/2004
Test Date


Approved By

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032

Test Date 6/23/04

Technician Jessica Gall

 Pretest calibration

X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))

X N/A, ONLY one head drop performed

X 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))

X 4. Accelerometers and their respective mounts are smooth and clean.

X 5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 7. 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. (572.142(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 20.7

Record the maximum humidity 45%

Record the minimum humidity 40%

X 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: No Damage.

X 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))

- X 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 14.8"

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.

- X 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 466mm

Record the left side distance 466mm

- X 12. 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). (572.142(c)(4))

Record actual micro finish 656×10^{-6} mm

- X 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 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	275
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	6

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

Jessica Hall
Signature

6/23/04
Date

Hybrid III Calibration Data Sheet

3 Year Old

Head Drop Calibration

ATD Serial No: 032

Test I.D: D041401

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	275.1	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.0	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

06/23/2004
Test Date

Jeff Leonard
Approved By



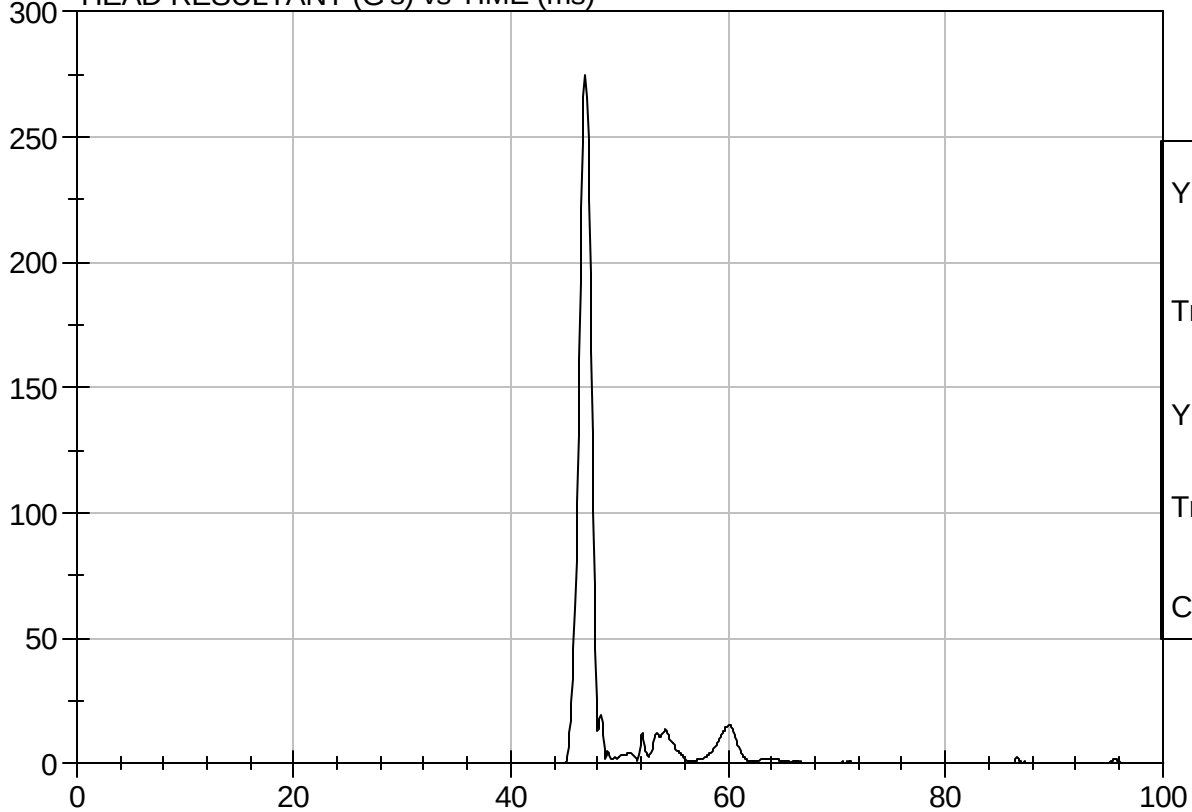
Test Description: Head Drop

Test Date: 06/23/2004

Component: D041401

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 275.1 G

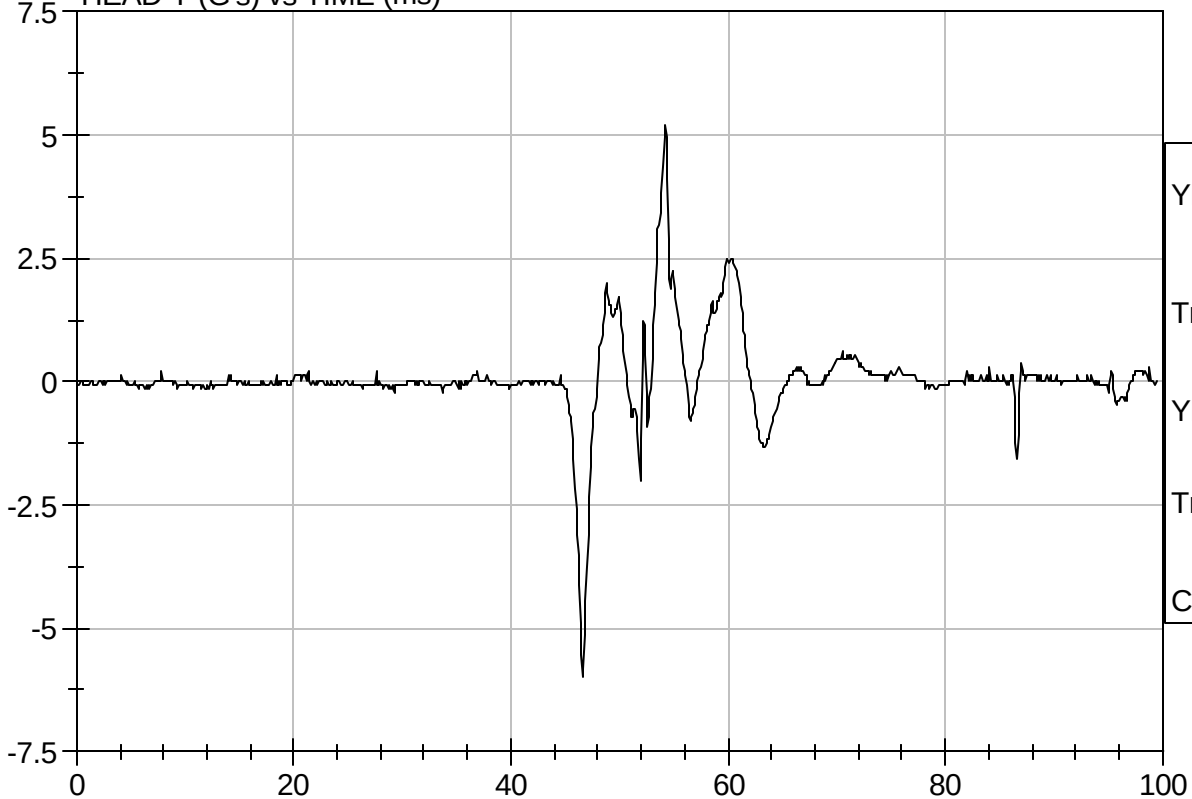
Tmax: 46.8 ms

YMin: 0.1 G

Tmin: 0.5 ms

CFC 1000

HEAD Y (G's) vs TIME (ms)



YMax: 5.2 G

Tmax: 54.2 ms

YMin: -6.0 G

Tmin: 46.6 ms

CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032

Test Date 6/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 20.7

Record the maximum humidity 45%

Record the minimum humidity 40%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.3 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.3 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.5 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>44</u> Nm @ <u>80</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	71 ms

*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))

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

Joe Fleck
Signature

6/23/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 032

Test I.D: D041402

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.45	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.3	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	79.8	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	44.3	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.2	Pass
Overall Test Results					Pass


 Laboratory Technician


 Approved By

06/23/2004
 Test Date

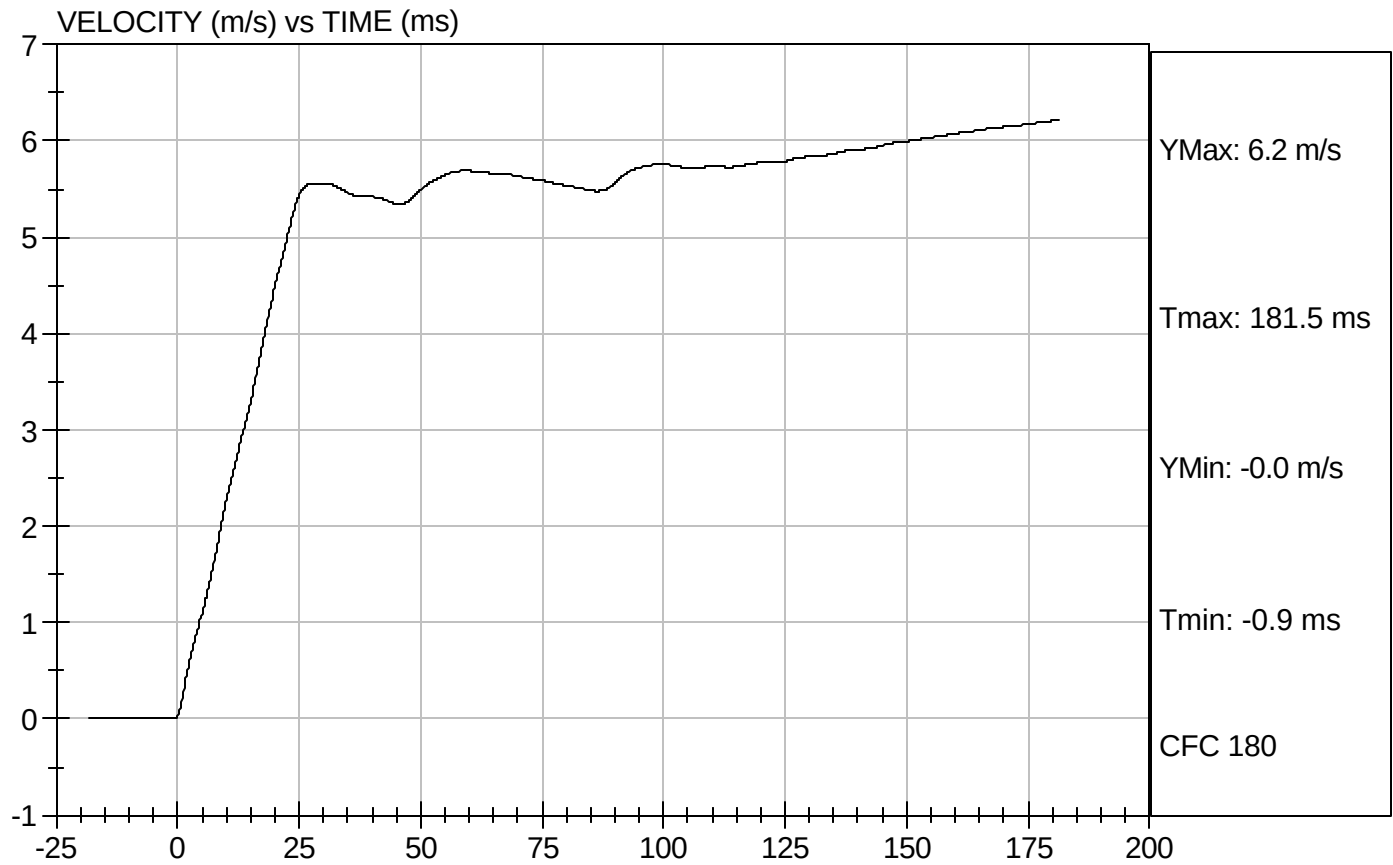


Test Description: Neck Flexion

Test Date: 06/23/2004

Component: D041402

Speed: 17.896 ft/sec, 5.45 m/sec





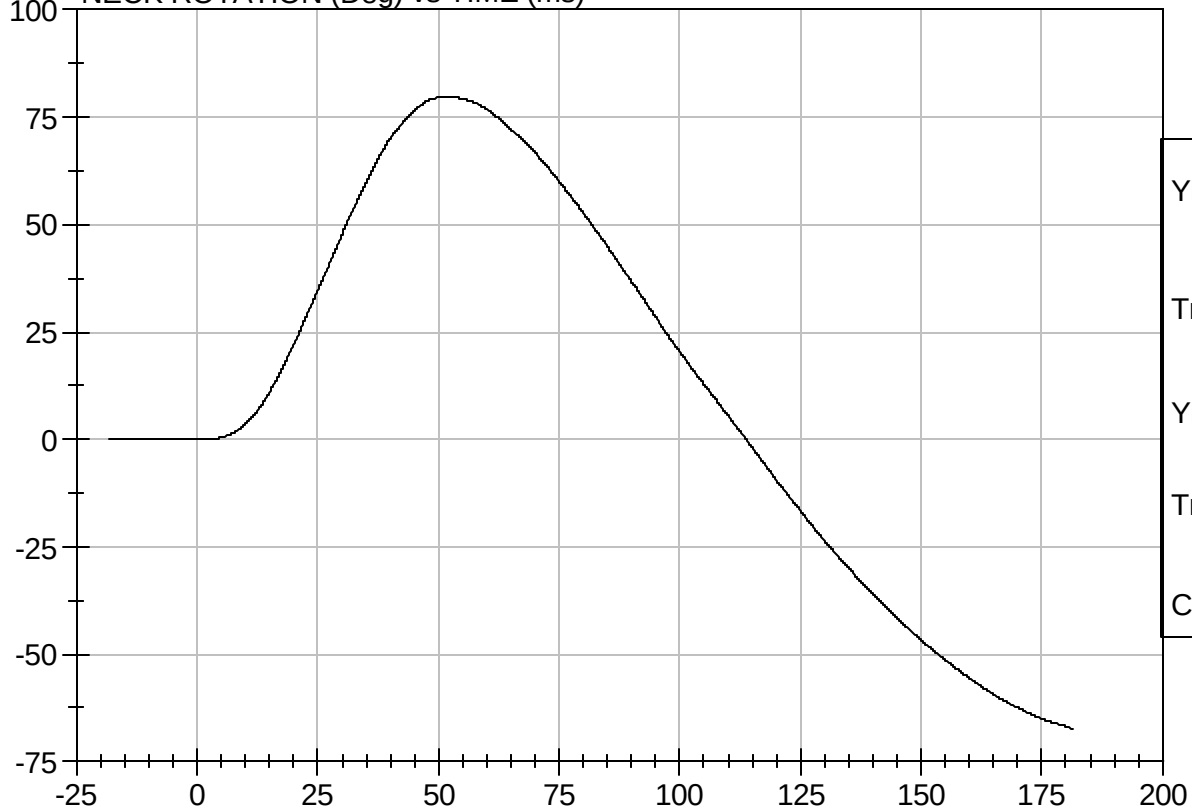
Test Description: Neck Flexion

Test Date: 06/23/2004

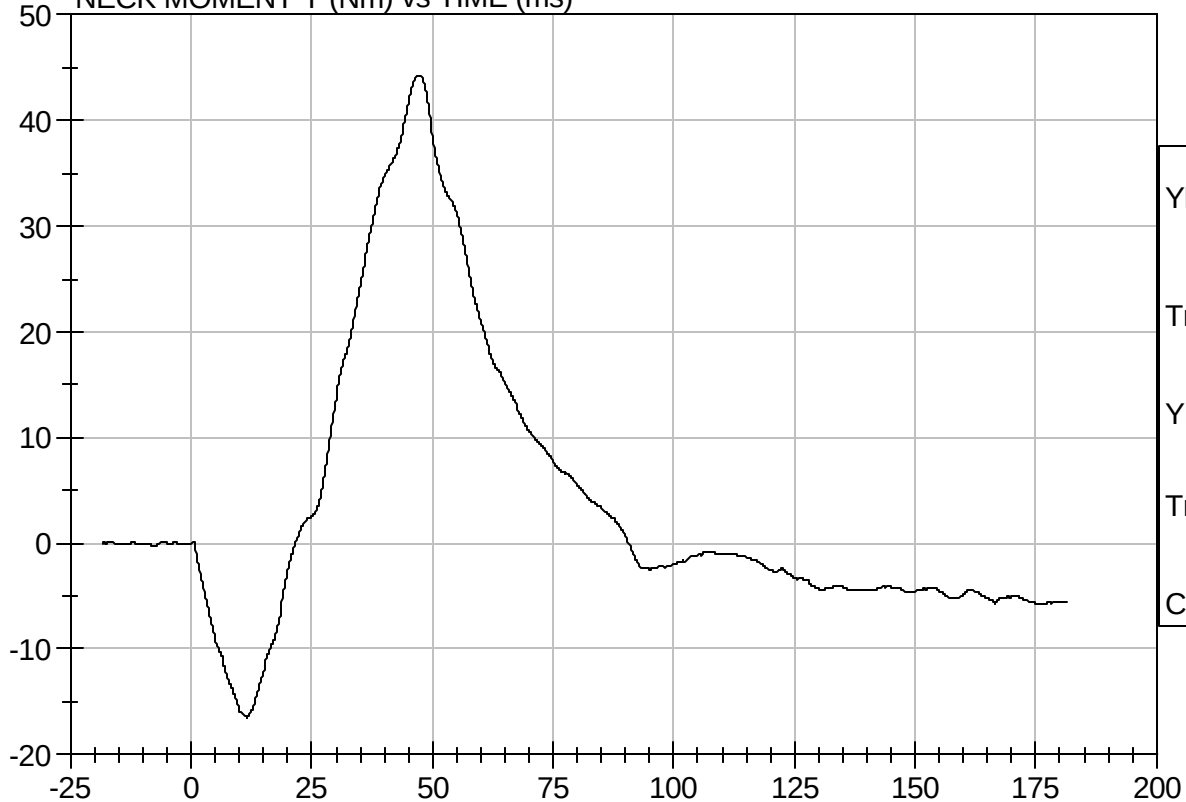
Component: D041402

Speed: 17.896 ft/s, 5.45 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032

Test Date 6/23/04

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (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 (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. (572.143(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 20.7

Record the maximum humidity 45%

Record the minimum humidity 40%

☒ 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: No Damage.

☒ 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.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 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))
- X 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))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.74 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.2 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.1 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	2.9 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-46.8</u> Nm @ <u>85</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	68 ms

*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))

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

Joe Fleck
Signature

6/23/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

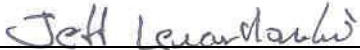
ATD Serial No: 032

Test I.D: D041403

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.74	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.2	Pass
	10 msec	m/s	1.9 - 2.5	2.1	Pass
	14 msec	m/s	2.8 - 3.5	2.9	Pass
D Plane Rotation		deg	83 - 93	85.2	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-46.8	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	68.4	Pass
Overall Test Results					Pass


 Laboratory Technician

06/23/2004
 Test Date


 Approved By

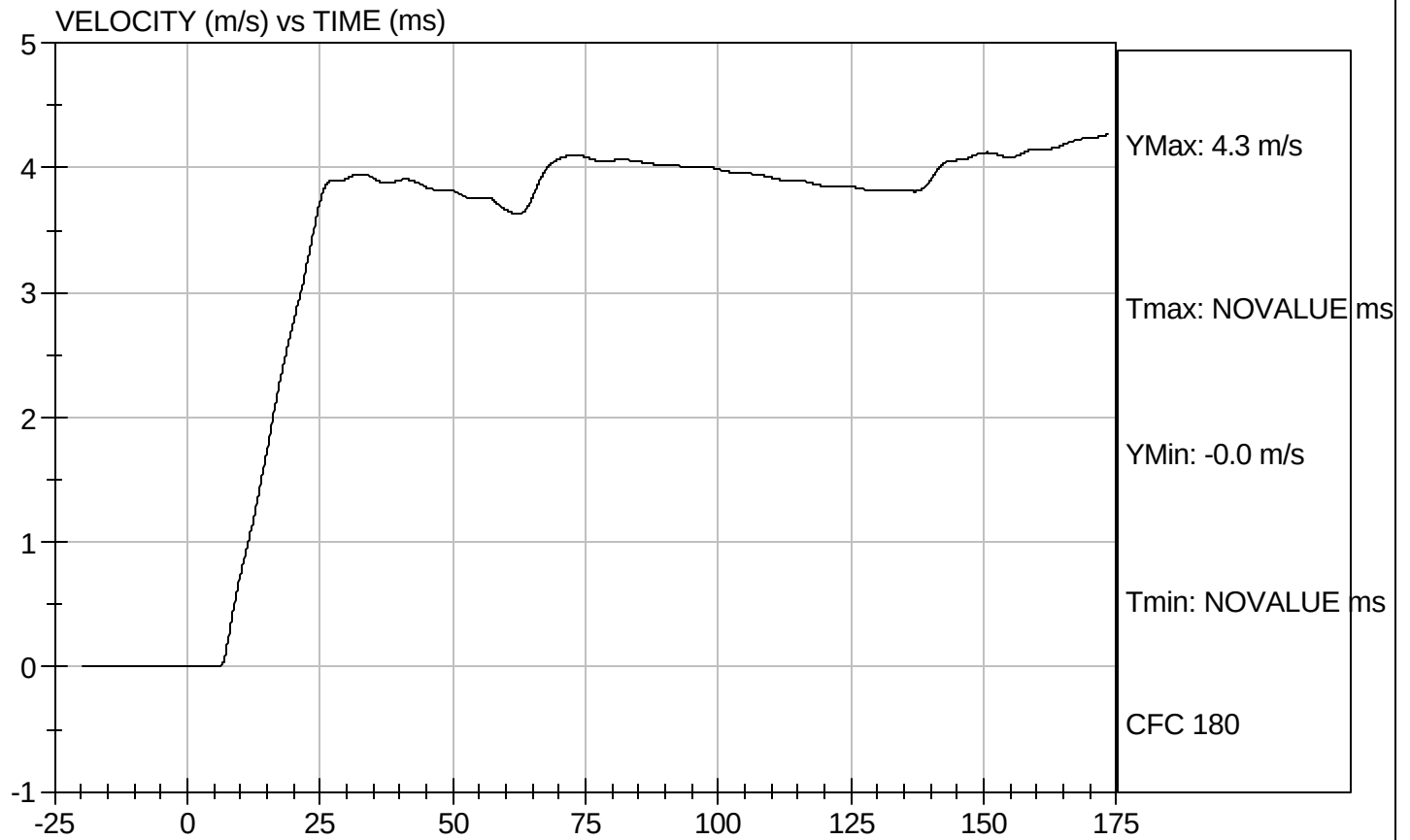


Test Description: Neck Extension

Test Date: 06/23/2004

Component: D041403

Speed: 12.26 ft/sec, 3.74 m/sec





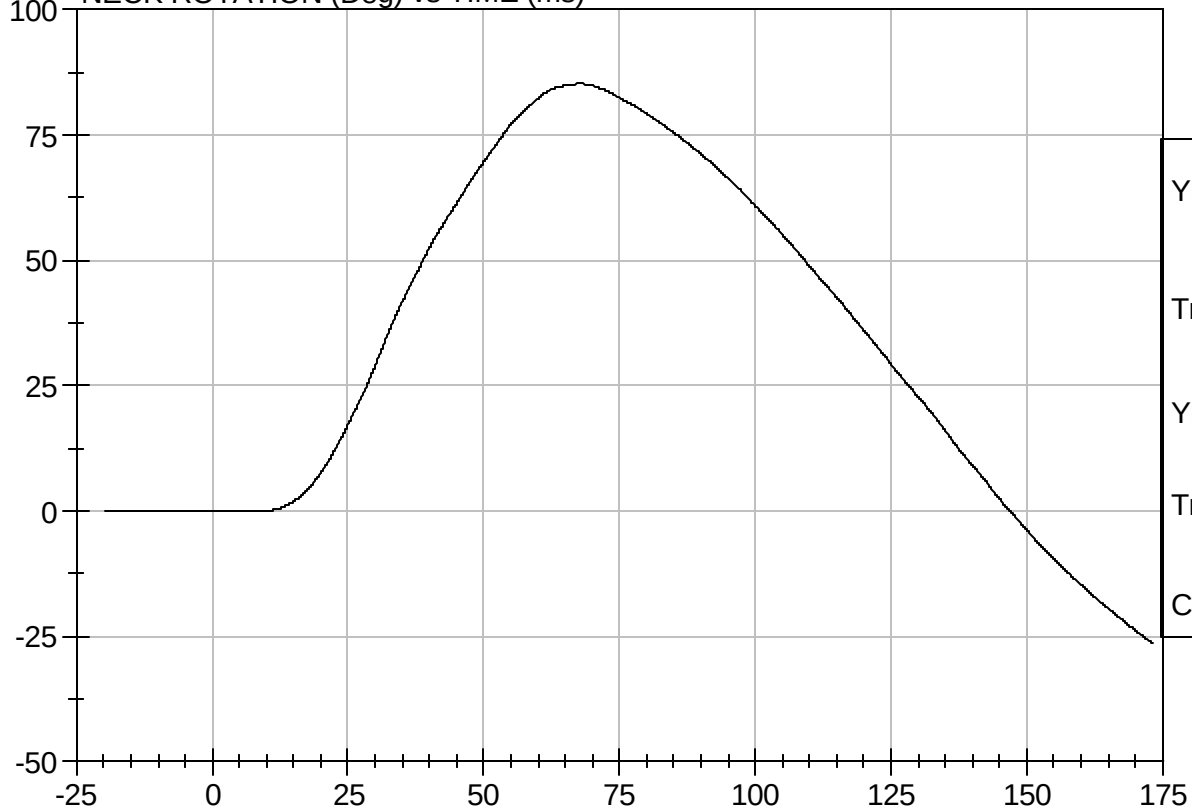
Test Description: Neck Extension

Test Date: 06/23/2004

Component: D041403

Speed: 12.26 ft/s, 3.74 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 85.2 Deg

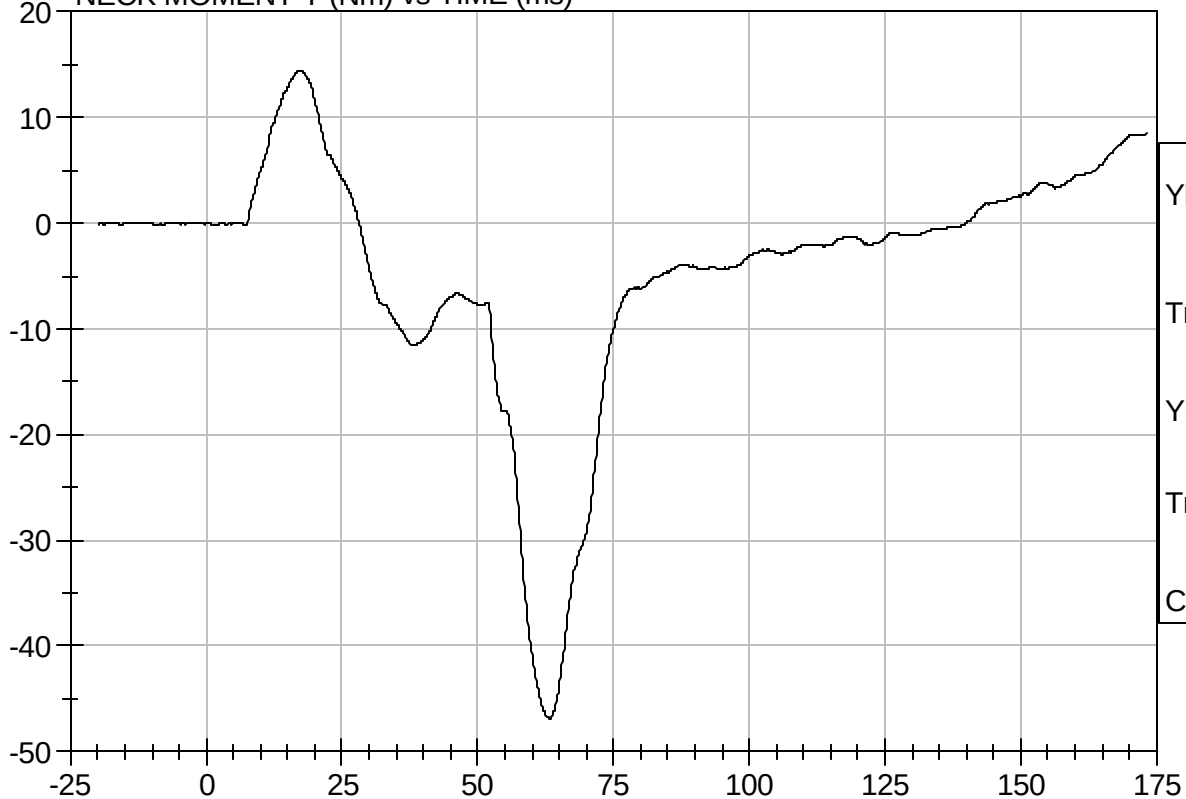
Tmax: NOVALUE

YMin: -30.2 Deg

Tmin: NOVALUE

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 14.5 Nm

Tmax: 17.0 ms

YMin: -46.8 Nm

Tmin: 63.2 ms

CFC 600

DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 6/24/04

Technician Jim Carney

☐ Pretest calibration
☒ Post test calibration verification

Test attempt no. 1 (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 | <u>21.2</u> |
| Record the minimum temperature | <u>20.9</u> |
| Record the maximum humidity | <u>48%</u> |
| Record the minimum humidity | <u>44%</u> |
- ☒ 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 $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 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 $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 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.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 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))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 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. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

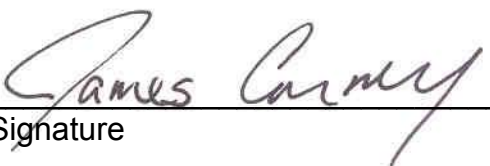
Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	37mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	730N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	790N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

*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)

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


Signature

6/24/04
Date

Hybrid III Calibration Data Sheet

3 Year Old

Thorax Impact Test

ATD Serial No: 032

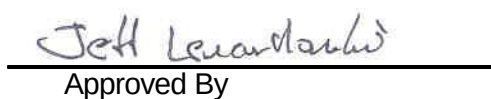
Test I.D: D041404

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Velocity	m/s	5.9 to 6.1	6.00	Pass
Peak Deflection	mm	32 - 38	37.1	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.73	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.79	Pass
Overall Test Results				Pass


Laboratory Technician

06/24/2004

Test Date


Approved By

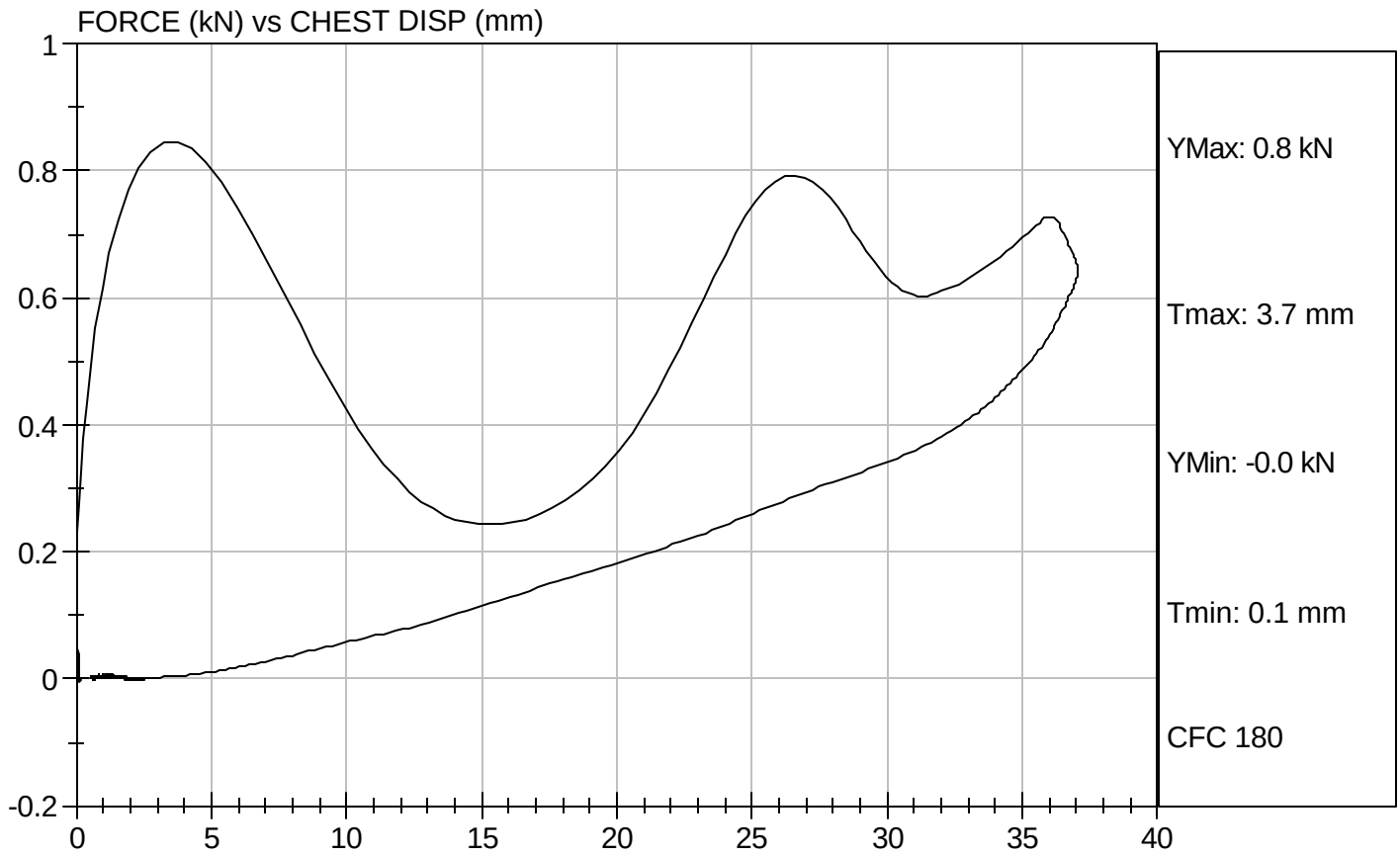


Test Description: Thorax Impact

Test Date: 06/24/2004

Component: D041404

Speed: 19.685 ft/sec, 6.00 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 6/23/04

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

Test attempt no. 1 (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 21.6

Record the minimum temperature 20.7

Record the maximum humidity 45%

Record the minimum humidity 40%

☒ 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 $\pm 1^\circ$ 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 $30^\circ \pm 2^\circ$. 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))

- X 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°) 5°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 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 $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 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 $\leq 15^\circ$	5°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	171 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	6°

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

Jessica Hall
Signature

6/23/04
Date

Hybrid III Calibration Data Sheet

3 Year Old

Torso Lumbar Flexion

ATD Serial No: 032

Test I.D: D041407

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Force At 45 deg.	N	130 - 180	171	Pass
Initial Angle	deg	0 - 15	5	Pass
Return Angle	deg	0 - 10	6	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

06/23/2004
Test Date

Jeff Leonard
Approved By

DATA SHEET D1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 032

Test Date 6/18/04

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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:

Jessica Hall
Signature

6/21/04
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

6/21/04
Date

SN032, 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.	538.5-553.7	544.8
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	316.4
C	H-POINT HEIGHT	Reference	34.3-44.5	35.0
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	65.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	67.7
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	87.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	248.3
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	51.1
I	SHOULDER TO - ELBOW LENGTH	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.	185.4-200.6	198.6
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	140.4
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300	291.5
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	225.0
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	253.8
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	229.1

SN032, HYBRID III, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	140.2
P	FOOT LENGTH	Tip of toe to rear of heal.	137.6-147.8	145.3
Q	STATURE	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.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	261.0
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	134.4
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	174.6
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.3
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	244.7
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	58.4
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	505.2
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	546.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	550.0
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.7
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0