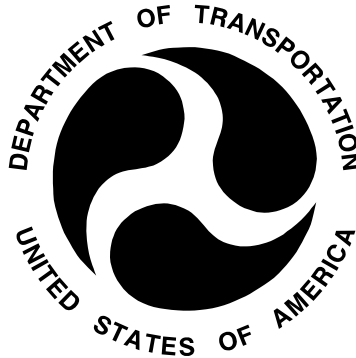


REPORT NO. 208-MGA-2006-DC015

DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208

**DAIMLERCHRYSLER CORPORATION
2006 DODGE RAM TRUCK
NHTSA NO.: C60304**

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



TEST DATES: MARCH 22, 2006 – APRIL 26, 2007

FINAL REPORT DATE: AUGUST 27, 2007

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVE. S.E., NVS-220
WASHINGTON, D.C. 20590**

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HYBRID III 50 th SN #403, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.9
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.5
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.9
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.4
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.6
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.	13.0-13.6	13.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	8.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.5
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.6
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".	17.8-18.8	18.5

HYBRID III 50th SN #403, PART 572, SUBPART E EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.2
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.8
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	3.9
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.8
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 403

Test Date 4/13/07

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 3 hours since the last head drop. (572.32(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))
3. Torque the skull cap screws to 160 lbf-in.
4. Accelerometers and their respective mounts are smooth and clean.
5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))
6. 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. (572.32(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>26%</u> |
| Record the minimum humidity | <u>25%</u> |
7. 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.
8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, 1,1,1 trichloroethane or equivalent prior to the test. (572.32(c)(2))

X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(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 10. The 1.6 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 7A.
Record the right side distance 469mm
Record the left side distance 469mm

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is rigidly supported. (572.32(c)(4))

X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm

X 14. 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. (572.32(b) & (572.32(c)(4))

X 15. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	241
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 $\leq 15 \text{ g}$	7

X 16. Plots of the x, y, z, and resultant acceleration data follow this sheet.



Signature

4/13/07

Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test ID: D071011

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	225 - 275	241	Pass
Peak Lateral Acceleration	G's	≤ +/- 15.0	6.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

4/13/07

Test Date



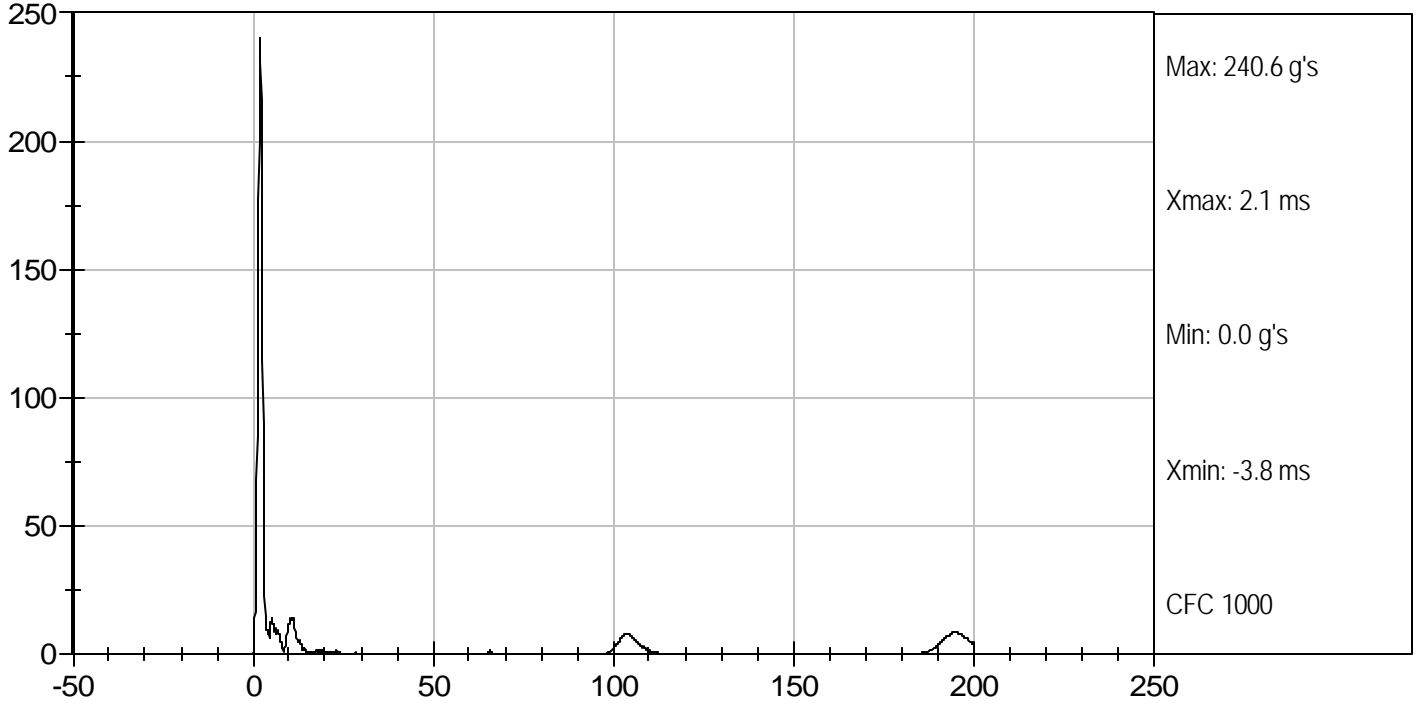
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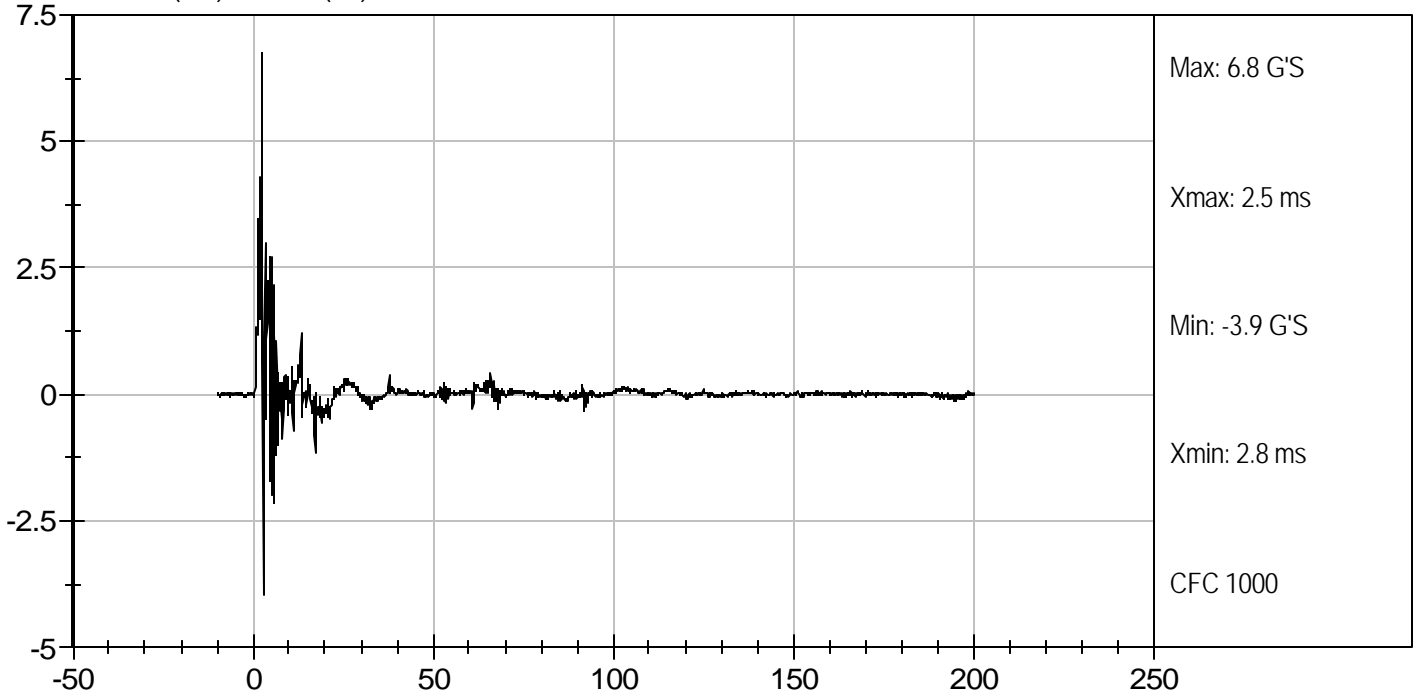
Test Desc: Head Drop
Component ID: D071011

Test Date: 4/13/07
Velocity: 0 ft/s, 0.00 m/s

HEAD RESULTANT ACCELERATION (g's) vs TIME (ms)



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



DATA SHEET A4
NECK FLEXION TEST (572.33)

Dummy Serial Number 403

Test Date 4/13/07

Technician Justino Diaz

- 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. (572.36(m))
 N/A, ONLY one flexion test performed
- 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(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. (572.33(c)(1))

Record the maximum temperature	<u>20.8</u>
Record the minimum temperature	<u>20.7</u>
Record the maximum humidity	<u>26%</u>
Record the minimum humidity	<u>25%</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. (78051-90). Record findings and actions: No Deterioration Hardness Front 88; Rear 85
- 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 9A for the flexion test. (572.33(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 11A.
- 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 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Flexion Test Results (572.33(b)(1) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	22.6 ft/sec ≤ speed ≤ 23.4 ft/sec	22.8
Pendulum Deceleration Versus Time Pulse	@ 10ms	22.5 ≤ g ≤ 27.5
	@ 20 ms	17.6 ≤ g ≤ 22.6
	@30ms	12.5 ≤ g ≤ 18.5
	Above 30 ms	29 g maximum
First Pendulum Decay to 5g	34 ms ≤ time ≤ 42 ms	38
Plane D Rotation	64° ≤ max. rotation ≤ 78°	70
	57 ms ≤ time of max. rotation ≤ 64 ms	59
Time for Plane D Rotation to Cross 0° During First Rebound	113 ms ≤ time ≤ 128 ms	114
Maximum Moment	65 lbf-ft ≤ moment ≤ 80 lbf-ft	75
	47 ms ≤ time of max. moment ≤ 58 ms	52
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)	97 ms ≤ time ≤ 107ms	99

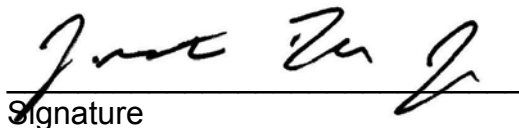
*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$
(572.33(b)(1)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf 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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature

4/13/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D.: D071012

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.19	Pass
	20 msec	G's	17.60 to 22.60	18.28	Pass
	30 msec	G's	12.50 to 18.50	12.65	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	12.61	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.2	Pass
	Time	msec	57.0 to 64.0	58.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	101.2	Pass
	Time	msec	47.0 to 58.0	51.6	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.5	Pass
Overall Test Results					Pass

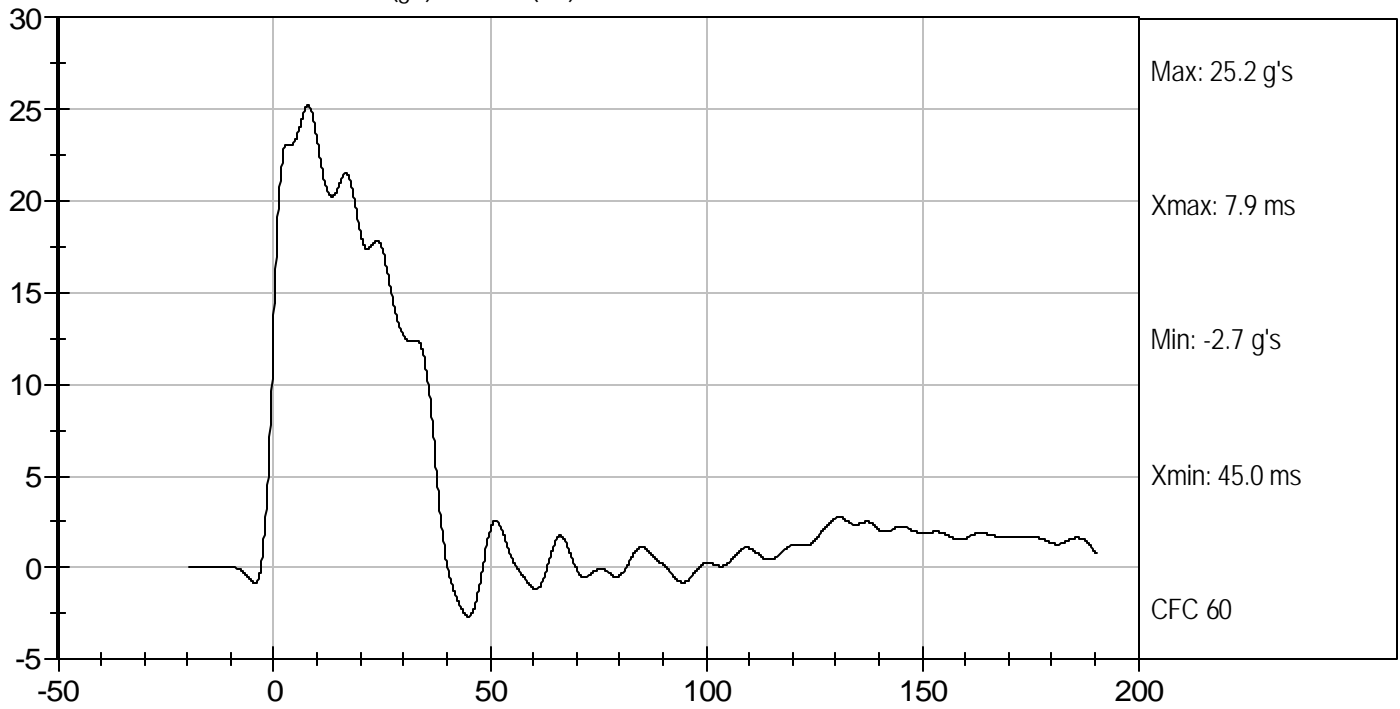

 Laboratory Technician

4/13/07
 Test Date

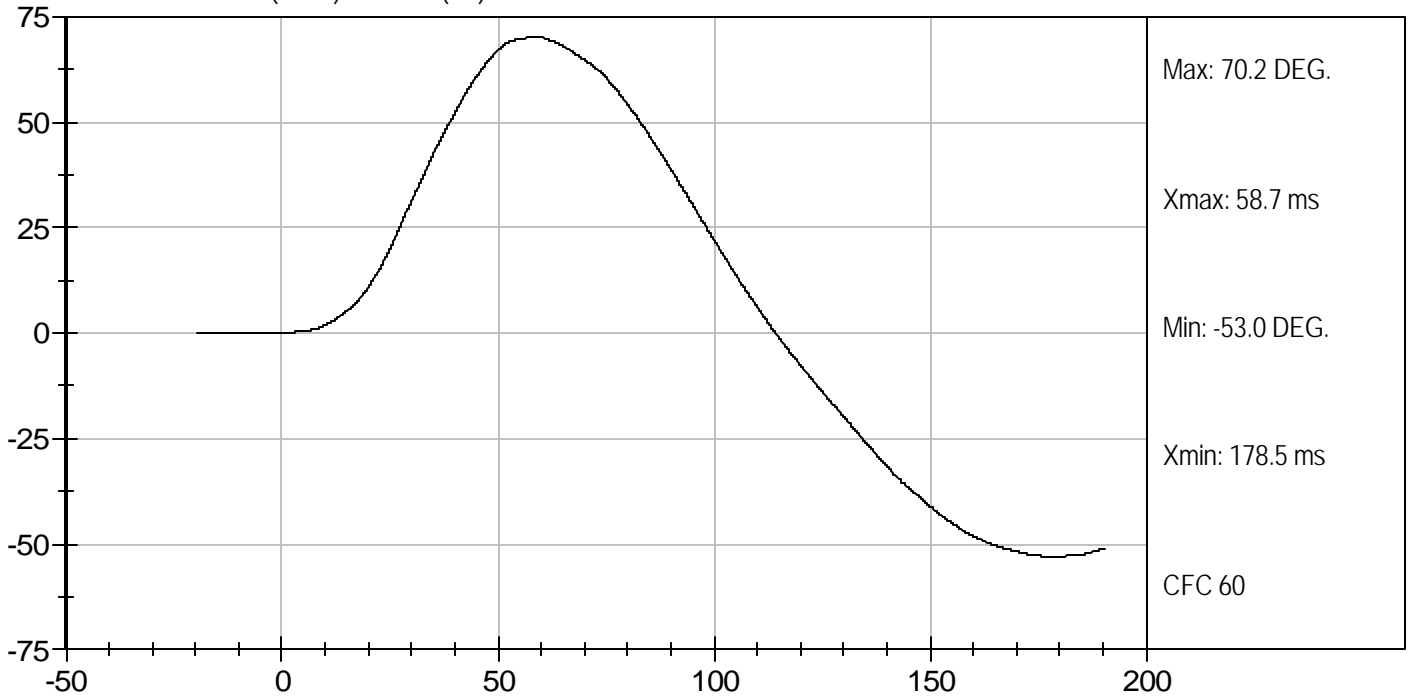

 Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



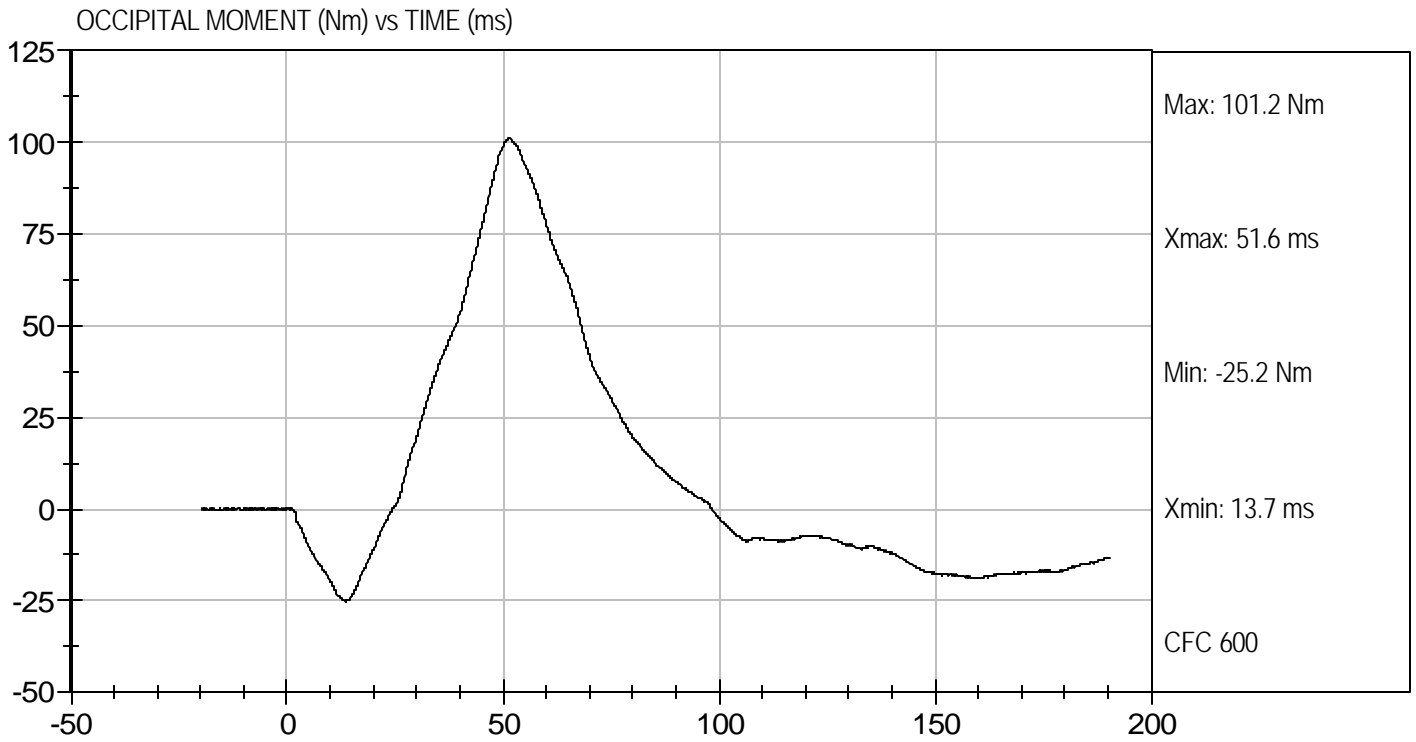
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D071012

Test Date: 4/13/07
Velocity: 22.83 ft/s, 6.96 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 403 Test Date 4/13/07

Technician Justino Diaz

- 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. (572.36(m))
 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. (572.33(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. (572.33(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>26%</u> |
| Record the minimum humidity | <u>25%</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 88; Rear 85

- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 10A for the extension test. (572.33(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 11A.
- 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 19.5 ft/s to 20.3 ft/s as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Extension Test Results (572.33(b)(2) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	19.5 ft/sec ≤ speed ≤ 20.3 ft/sec	19.6
Pendulum Deceleration versus time pulse	@ 10ms	17.2 ≤ g ≤ 21.2
	@ 20 ms	14 ≤ g ≤ 19
	@30ms	11.0 ≤ g ≤ 16.0
	Above 30 ms	22 g maximum
First Pendulum Decay to 5g	38 ms ≤ time ≤ 46 ms	40
Plane D Rotation	81° ≤ max. rotation ≤ 106°	98
	72 ms ≤ time of max. rotation ≤ 82 ms	80
Time for Plane D Rotation to Cross 0° During First Rebound	147 ms ≤ time ≤ 174 ms	165
Maximum Moment	-59 lbf-ft ≤ moment ≤ -39 lbf-ft	-45
	65 ms ≤ time ≤ 79 ms	75
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)	120 ms ≤ time ≤ 148 ms	147

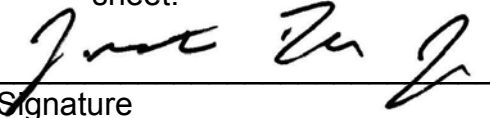
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$
(572.133(b)(1)(ii))

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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature

4/13/07
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE**

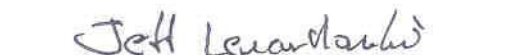
ATD Serial No: 403

Test I.D.: D071013

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.24	Pass
	20 msec	G's	14.00 to 19.00	14.38	Pass
	30 msec	G's	11.00 to 16.00	12.06	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	12.02	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	40.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.6	Pass
	Time	msec	72.0 to 82.0	80.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	165.0	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-61.1	Pass
	Time	msec	65.0 to 79.0	74.9	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	146.5	Pass
Overall Test Results					Pass

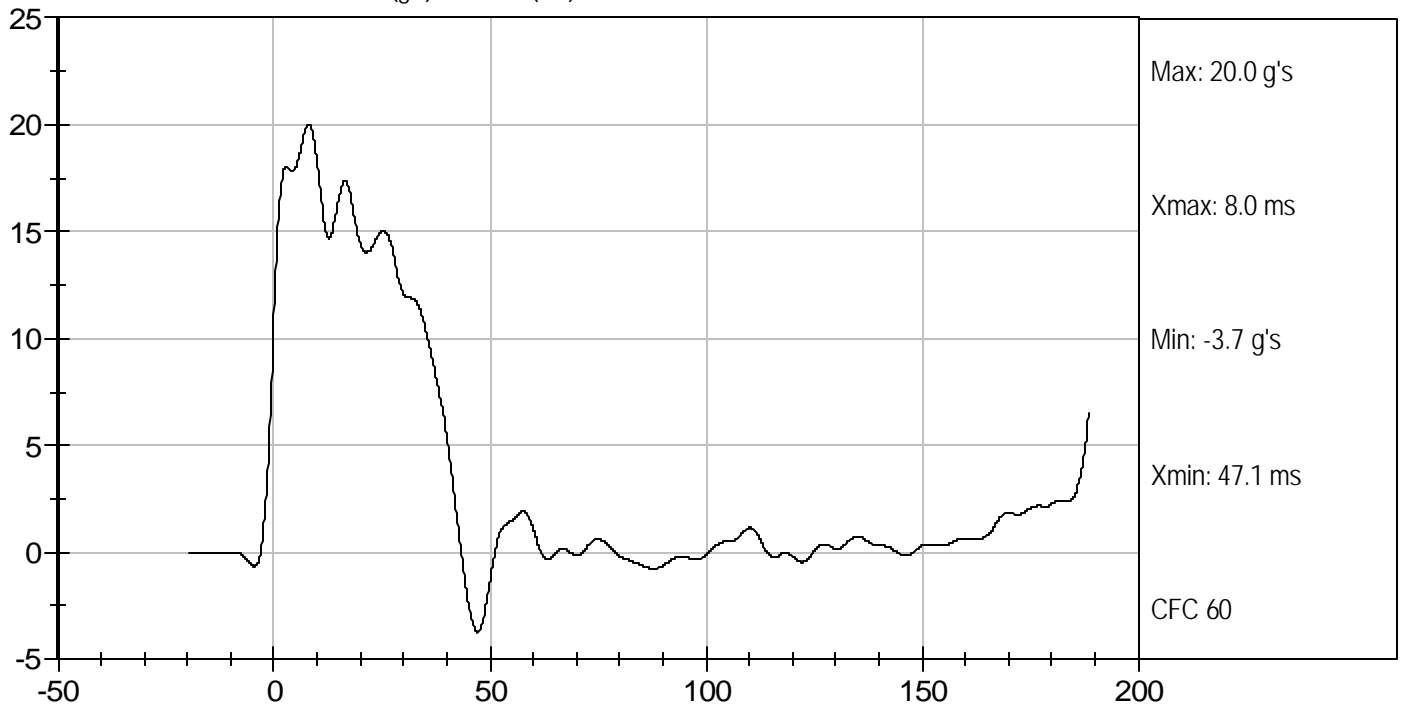

Laboratory Technician

4/13/07
Test Date

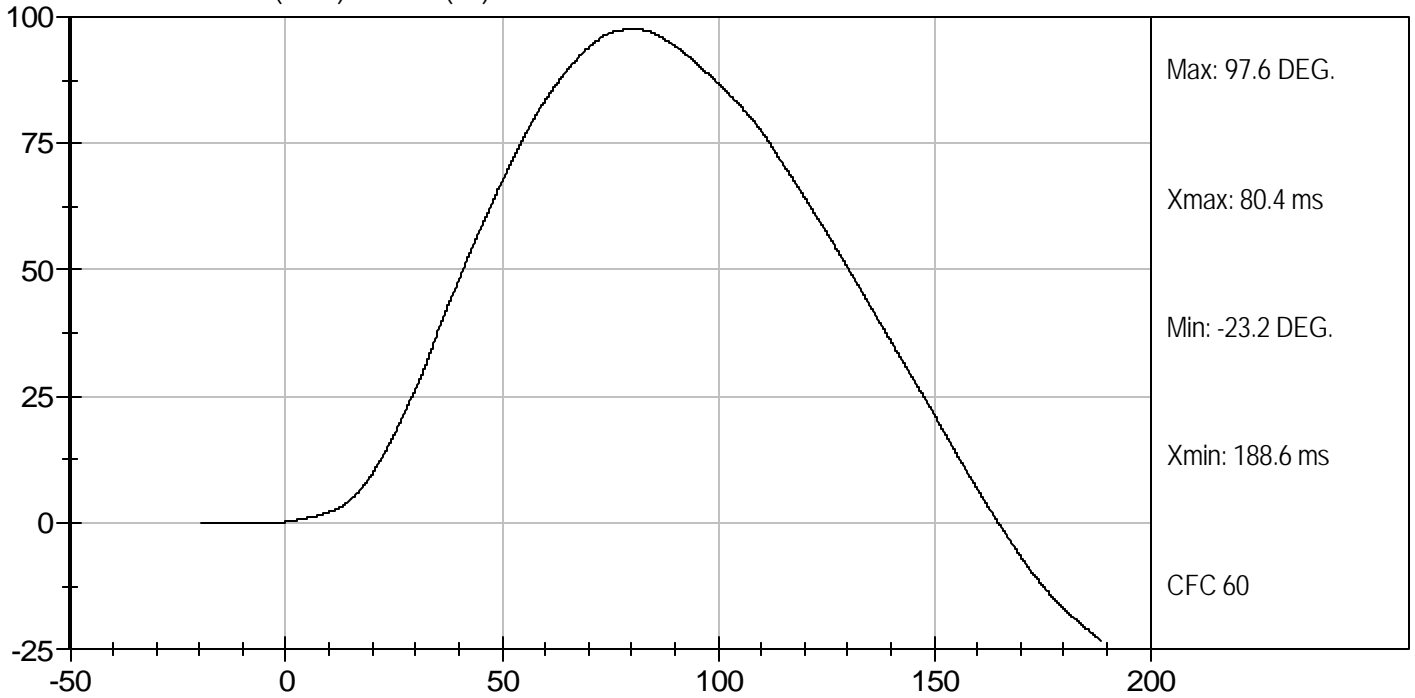

Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



NECK ROTATION (DEG.) vs TIME (ms)

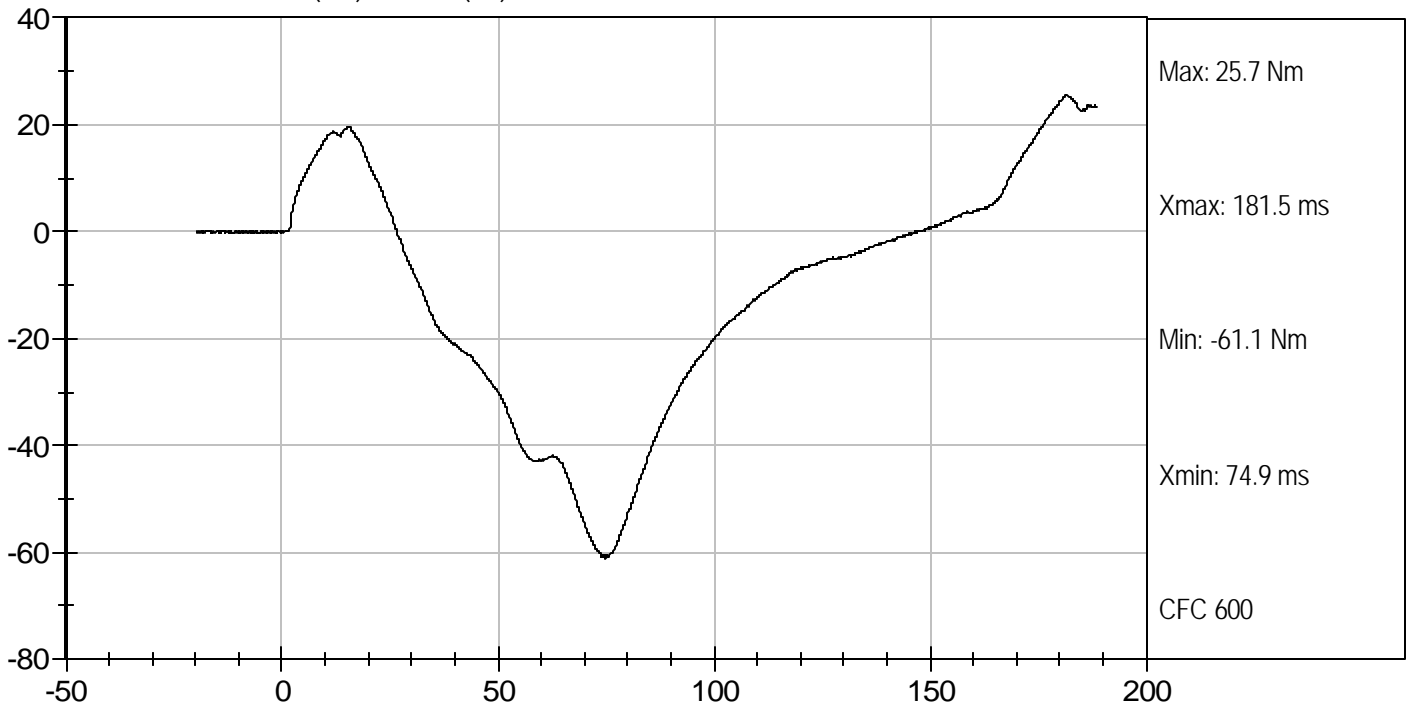




Test Desc: Neck Extension
Component ID: D071013

Test Date: 4/13/07
Velocity: 19.61 ft/s, 5.98 m/s

OCCIPITAL MOMENT (Nm) vs TIME (ms)



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 403 Test Date 4/16/07

Technician Tim Bratz

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 12A.
3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(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. (572.34(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.9</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>27%</u> |
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 (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). 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

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- 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. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- 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. 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 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. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s \leq speed \leq 22.4 f/s	22.2
Chest Compression	2.50 in. \leq compression \leq 2.86 in.	2.52
Peak resistance force**	1160 lb \leq peak force \leq 1325 lb	1260
Internal Hysteresis***	69% \leq 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 (572.34(b))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve.

X 17. Plots of chest compression, pendulum acceleration, pendulum speed, and force, follow this sheet.


Signature

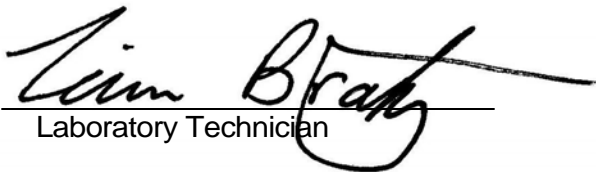
4/16/07
Date

**MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE**


ATD Serial No: 403

Test I.D: D071014

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	28	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,604	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.41	Pass
Internal Hysteresis	%	69 to 85	70	Pass
			Overall Test Results	Pass


Laboratory Technician

4/16/07
Test Date

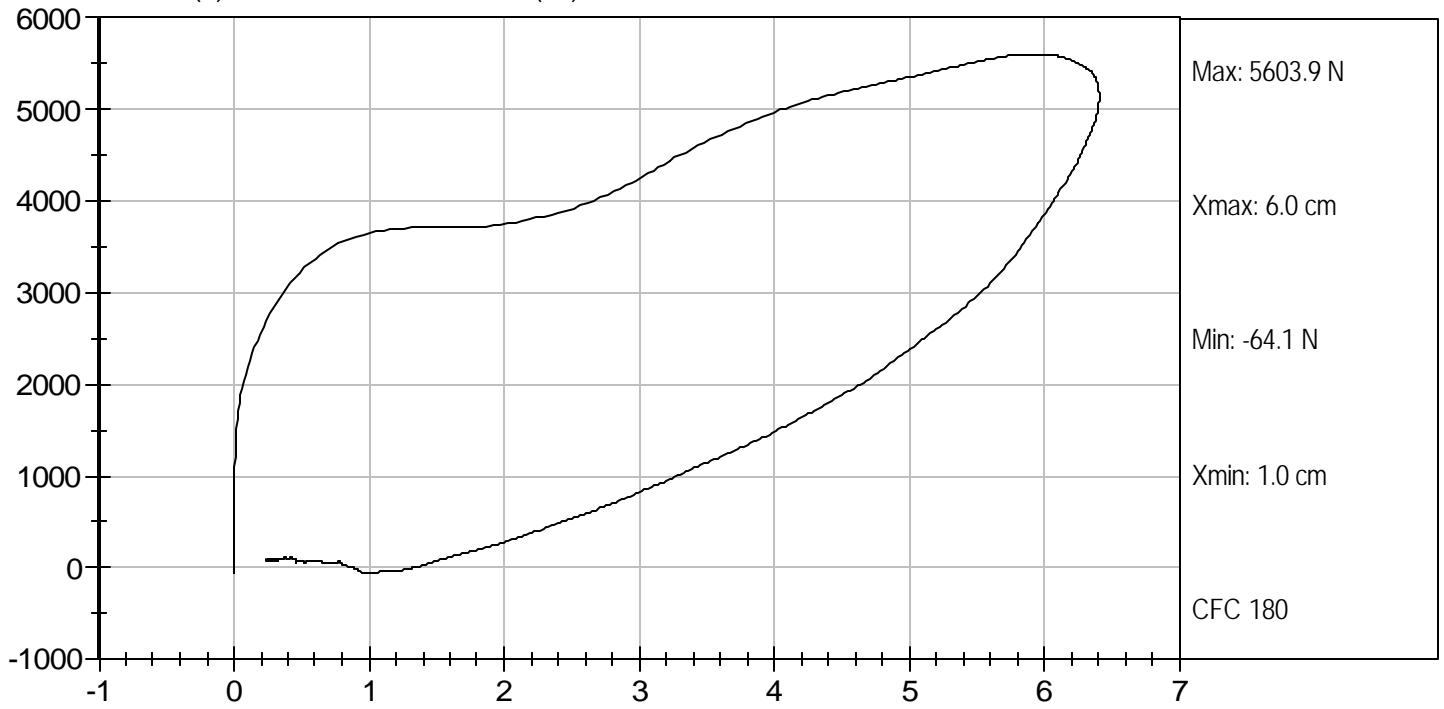

Approved By



Test Desc: Thorax Impact
Component ID: D071014

Test Date: 4/16/07
Velocity: 22.22 ft/s, 6.77 m/s

FORCE (N) vs CHEST DISPLACEMENT (cm)



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403 Test Date 4/13/07

Technician Justino Diaz

- Pretest calibration
 Post test calibration verification

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

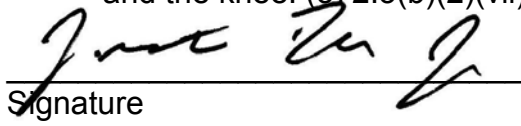
1. It has been at least 30 minutes since the last knee impact test. (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
 Record the maximum temperature 20.8
 Record the minimum temperature 20.7
 Record the maximum humidity 26%
 Record the minimum humidity 25%
5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1061

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))


Signature

4/13/07
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE


ATD Serial No: 403

Test I.D: D071016

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	25	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,721	Pass
Overall Test Results				Pass


 Laboratory Technician

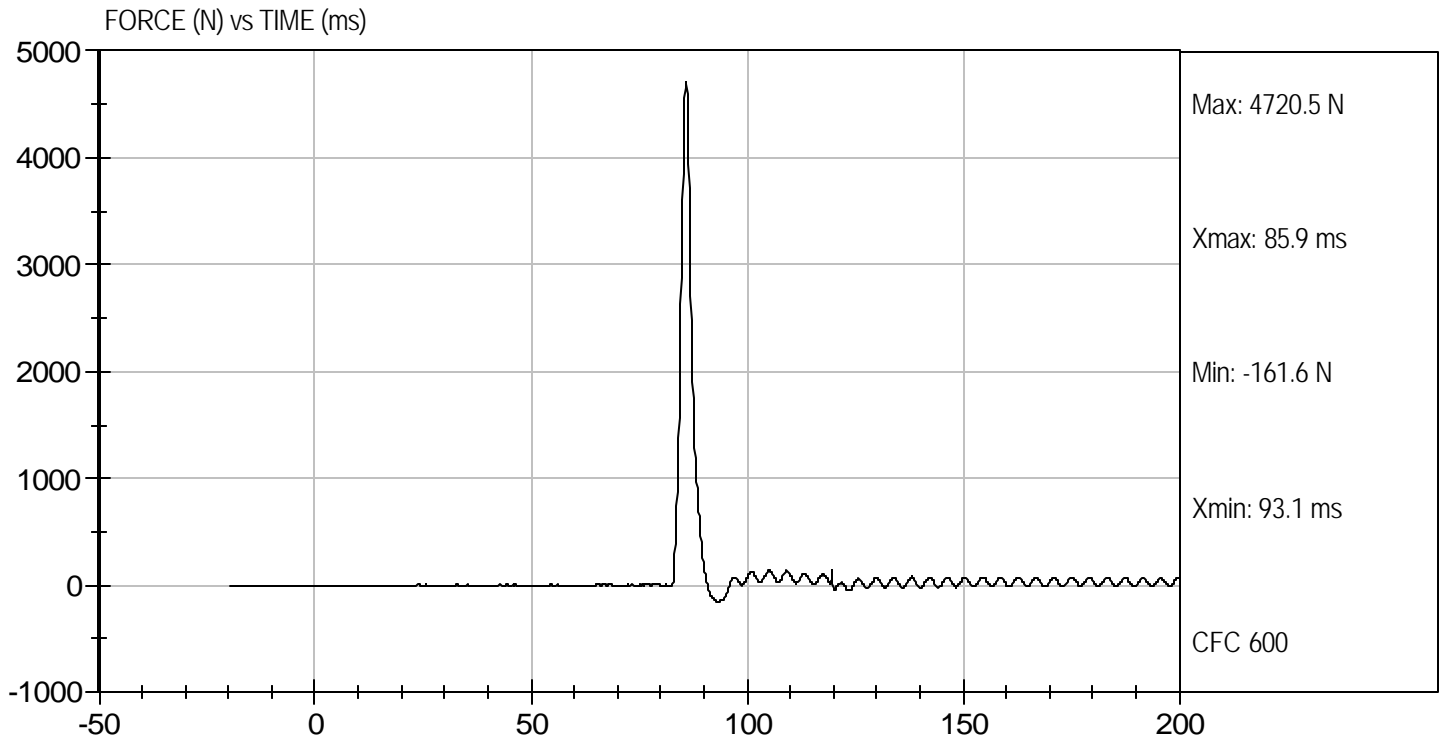
4/13/07
 Test Date


 Approved By



Test Desc: Left Knee
Component ID: D071016

Test Date: 4/13/07
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 4/13/07

Technician Justino Diaz

- 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.
 (572.36(m))

N/A, ONLY one knee impact test performed

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

3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))

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. (572.35(b)(2)(ii))

Record the maximum temperature 20.8

Record the minimum temperature 20.7

Record the maximum humidity 26%

Record the minimum humidity 25%

5. Mount the test specimen and secure it to the rigid test fixture.
 (572.35(b)(2)(iii)) (Figure 14A)

6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))

7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally.
 (572.35(b)(2)(iv)&(vi))

8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))

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 6.8 ft/s and 7.0 ft/s. (572.35(b))

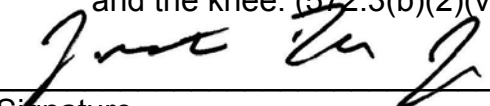
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	6.9
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1084

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))



Signature

4/13/07

Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE


ATD Serial No: 403

Test I.D: D071015

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	25	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,822	Pass
Overall Test Results				Pass


 Laboratory Technician

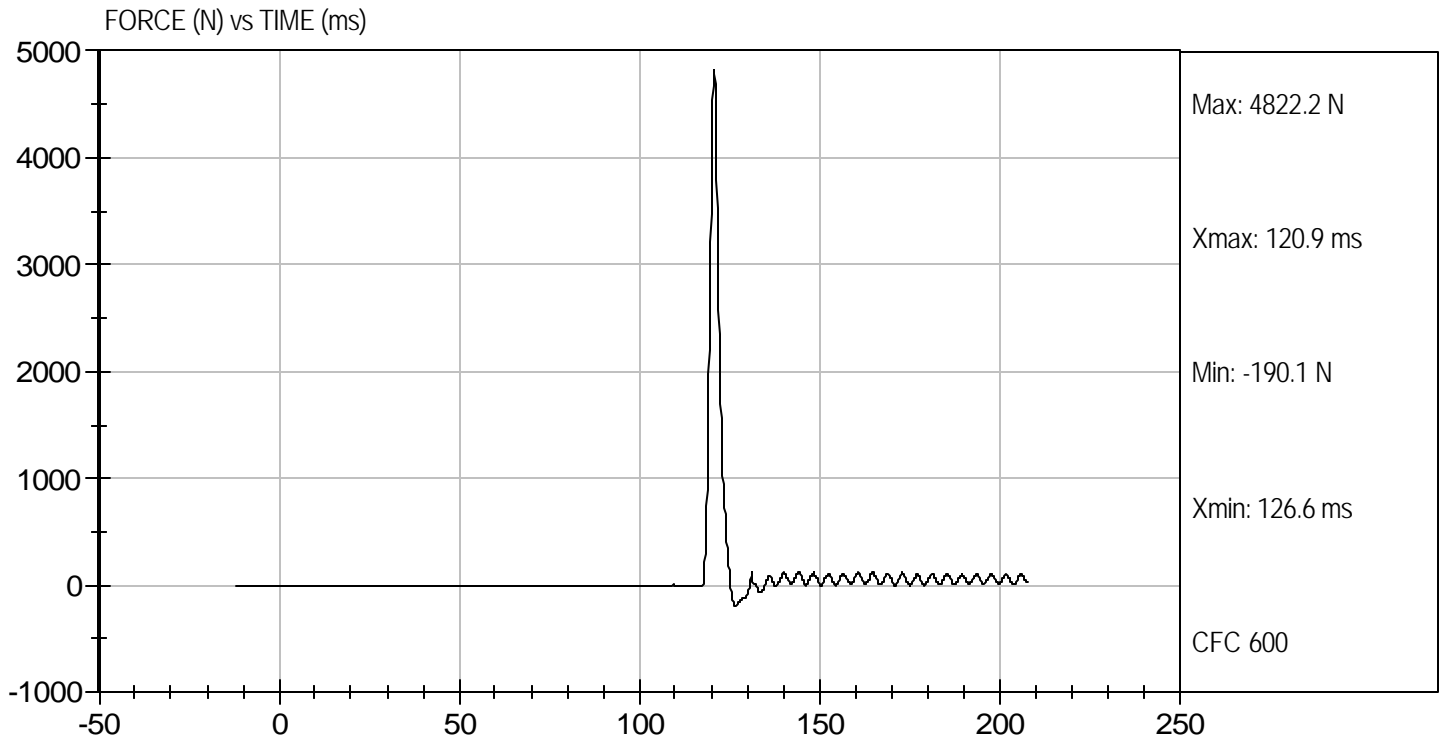
4/13/07
 Test Date


 Approved By



Test Desc: Right Knee
Component ID: D071015

Test Date: 4/13/07
Velocity: 6.94 ft/s, 2.12 m/s



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c))

Dummy Serial Number 403

Test Date 4/13/07

Technician Dave Wilcox

- Pretest calibration
 Post test calibration verification

Test attempt no. 1 (when successive hip joint-femur flexion tests are necessary)

1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
 N/A, ONLY one hip joint-femur flexion test performed
2. The test fixture conforms to the specifications in Figure 17A.
3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 3.2 remove the abdominal insert (78051-52)
 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
4. The 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. (572.35(c)(v))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>26%</u> |
| Record the minimum humidity | <u>25%</u> |
5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
7. Adjust the threaded rods until plane B is horizontal.
8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

X 10. Complete the following table:

Left Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	42
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	45

X 11. Secure the lever arm into the right femur shaft opening of the upper leg structure assembly (78051-44) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))

X 12. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the $\frac{1}{2}$ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19). (572.35(c)(2)(iv))

X 13. Complete the following table:

Right Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	60
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41



Signature

4/13/07

Date

MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D071010


Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	26	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	81.6	57.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	45	Pass
Overall Test Results					Pass



 Laboratory Technician

4/13/07

 Test Date

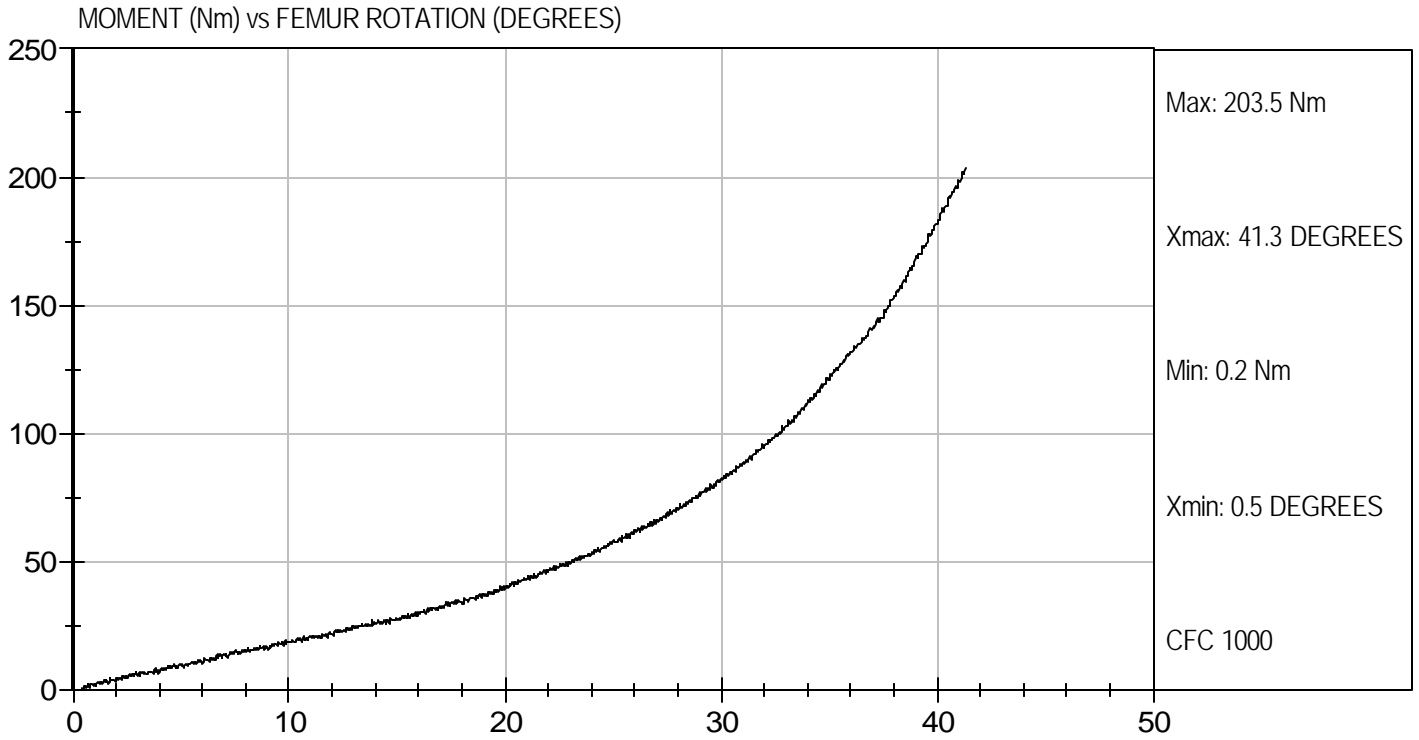


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D071019

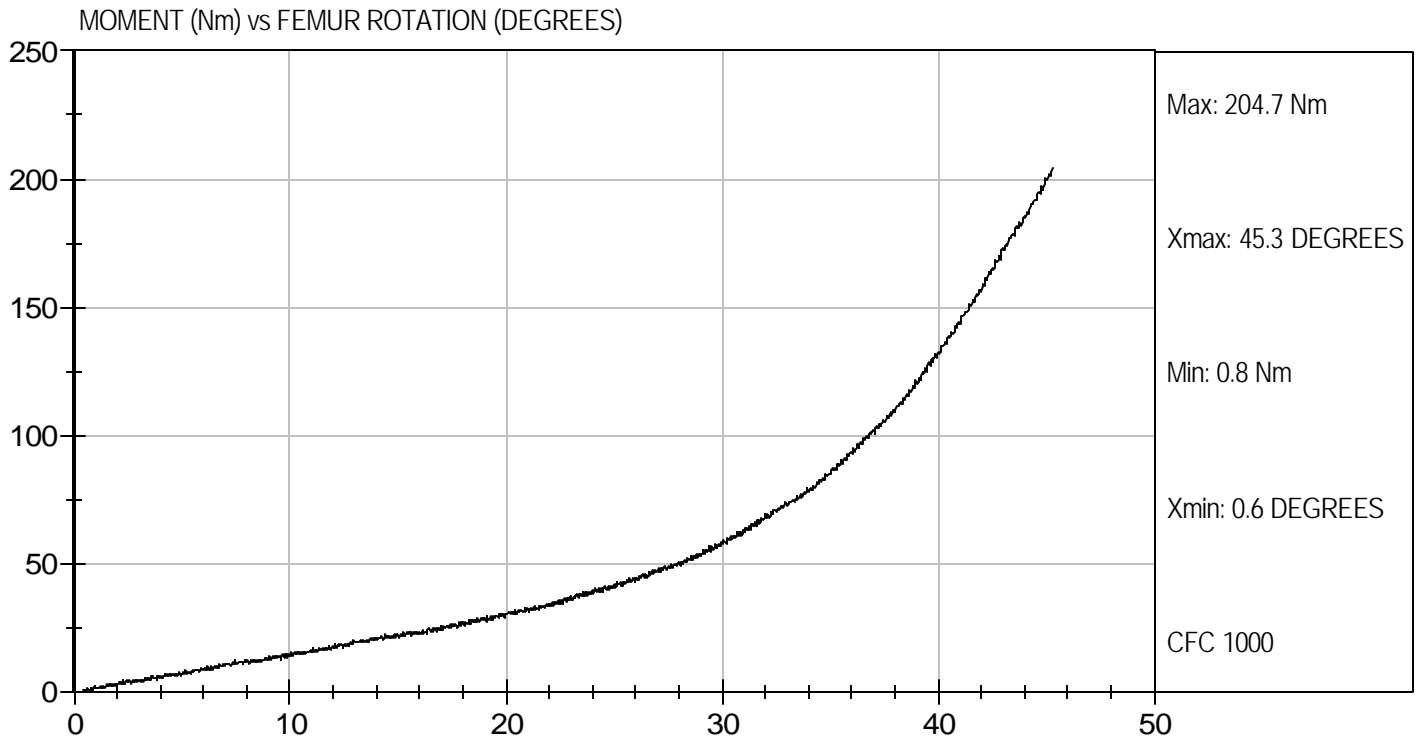
Test Date: 4/13/07
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D071010

Test Date: 4/13/07
Velocity: 0 ft/s, 0.00 m/s



DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 403

Test Date 4/27/07

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 3 hours since the last head drop. (572.32(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))

3. Torque the skull cap screws to 160 lbf-in.

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

5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))

6. 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. (572.32(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.3

Record the maximum humidity 38%

Record the minimum humidity 37%

7. 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.

8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, 1,1,1 trichloroethane or equivalent prior to the test. (572.32(c)(2))

X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(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 10. The 1.6 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 7A.
Record the right side distance 469mm
Record the left side distance 469mm

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is rigidly supported. (572.32(c)(4))

X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm

X 14. 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. (572.32(b) & (572.32(c)(4))

X 15. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	260
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 16. Plots of the x, y, z, and resultant acceleration data follow this sheet.



Signature

4/27/07

Date

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 403

Test ID: D071191

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	225 to 275	260	Pass
Peak Lateral Acceleration	G's	≤ +/- 15.0	-12.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

4/27/07

Test Date

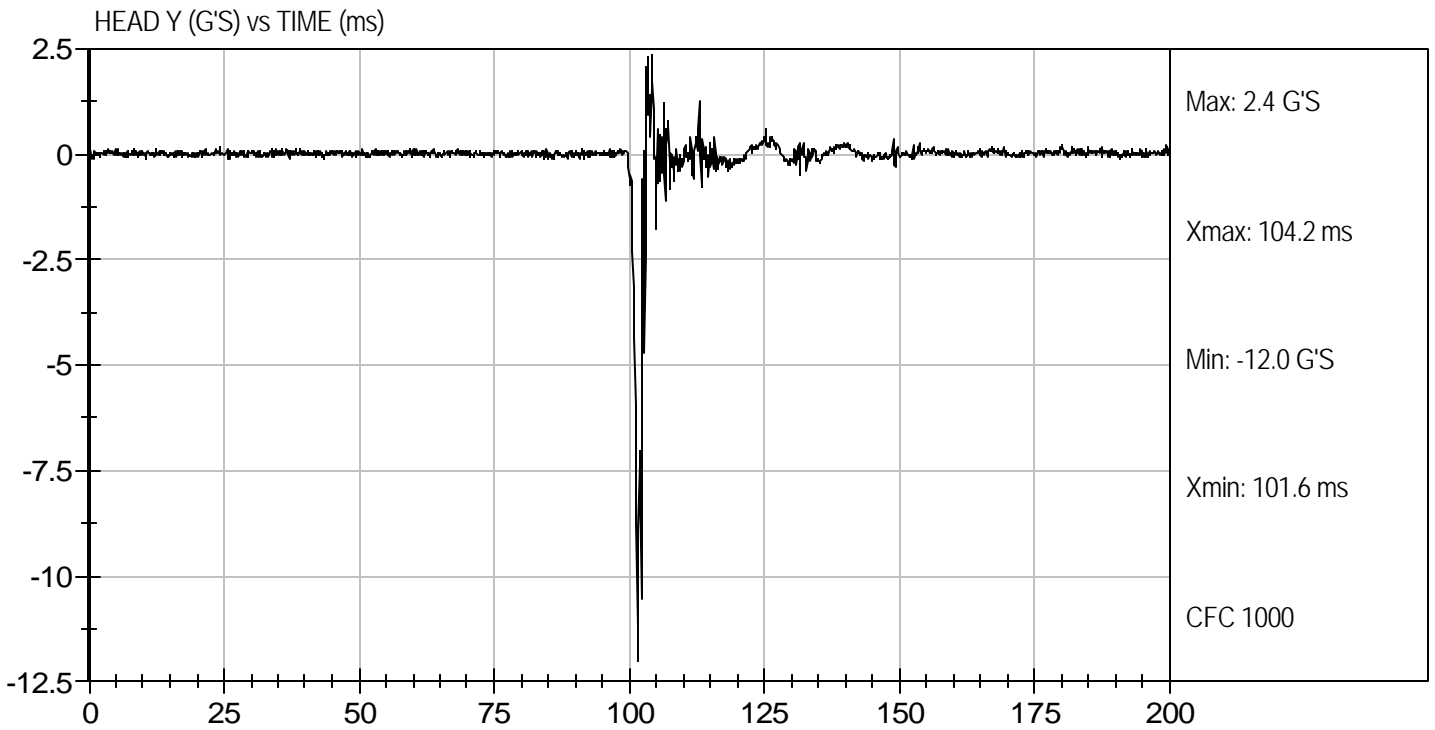
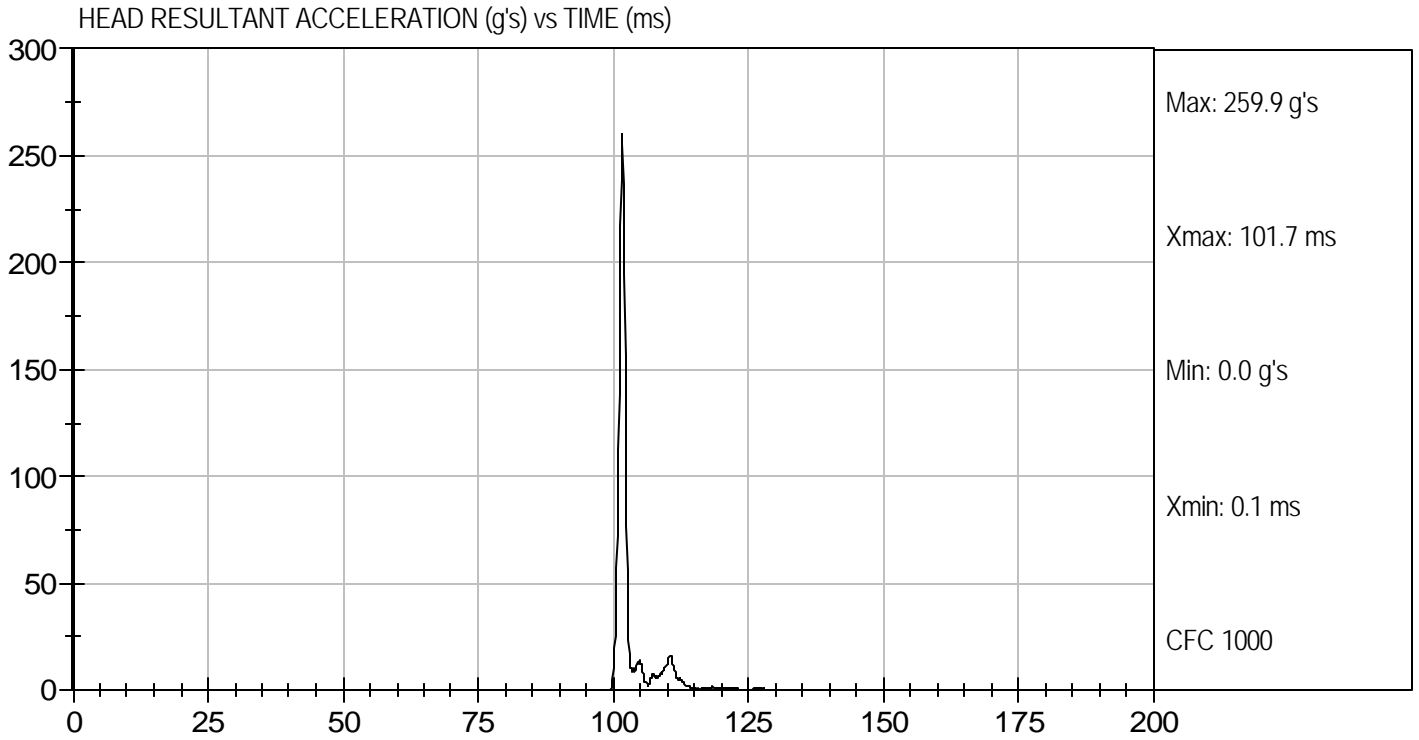


Approved By



Test Desc: Head Drop
Component ID: D071191

Test Date: 4/27/07
Velocity: 0 ft/s, 0.00 m/s



DATA SHEET A4
NECK FLEXION TEST (572.33)

Dummy Serial Number 403

Test Date 4/30/07

Technician Tim Bratz

- 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. (572.36(m))
 N/A, ONLY one flexion test performed
2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(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. (572.33(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.2</u> |
| Record the minimum temperature | <u>20.5</u> |
| Record the maximum humidity | <u>40%</u> |
| Record the minimum humidity | <u>33%</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. (78051-90). Record findings and actions: No Deterioration Hardness Front 88; Rear 85
6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 9A for the flexion test. (572.33(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 11A.
- 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 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Flexion Test Results (572.33(b)(1) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	22.6 ft/sec ≤ speed ≤ 23.4 ft/sec	22.8
Pendulum Deceleration Versus Time Pulse	@ 10ms	22.5 ≤ g ≤ 27.5
	@ 20 ms	17.6 ≤ g ≤ 22.6
	@30ms	12.5 ≤ g ≤ 18.5
	Above 30 ms	29 g maximum
First Pendulum Decay to 5g	34 ms ≤ time ≤ 42 ms	37
Plane D Rotation	64° ≤ max. rotation ≤ 78°	71
	57 ms ≤ time of max. rotation ≤ 64 ms	58
Time for Plane D Rotation to Cross 0° During First Rebound	113 ms ≤ time ≤ 128 ms	114
Maximum Moment	65 lbf-ft ≤ moment ≤ 80 lbf-ft	67
	47 ms ≤ time of max. moment ≤ 58 ms	50
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)	97 ms ≤ time ≤ 107ms	98

*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$
(572.33(b)(1)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf 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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature

4/30/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE


ATD Serial No: 403

Test I.D.: D071192

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	33	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.25	Pass
	20 msec	G's	17.60 to 22.60	18.02	Pass
	30 msec	G's	12.50 to 18.50	14.37	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	14.33	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.6	Pass
	Time	msec	57.0 to 64.0	57.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.8	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	90.5	Pass
	Time	msec	47.0 to 58.0	50.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.2	Pass
Overall Test Results					Pass

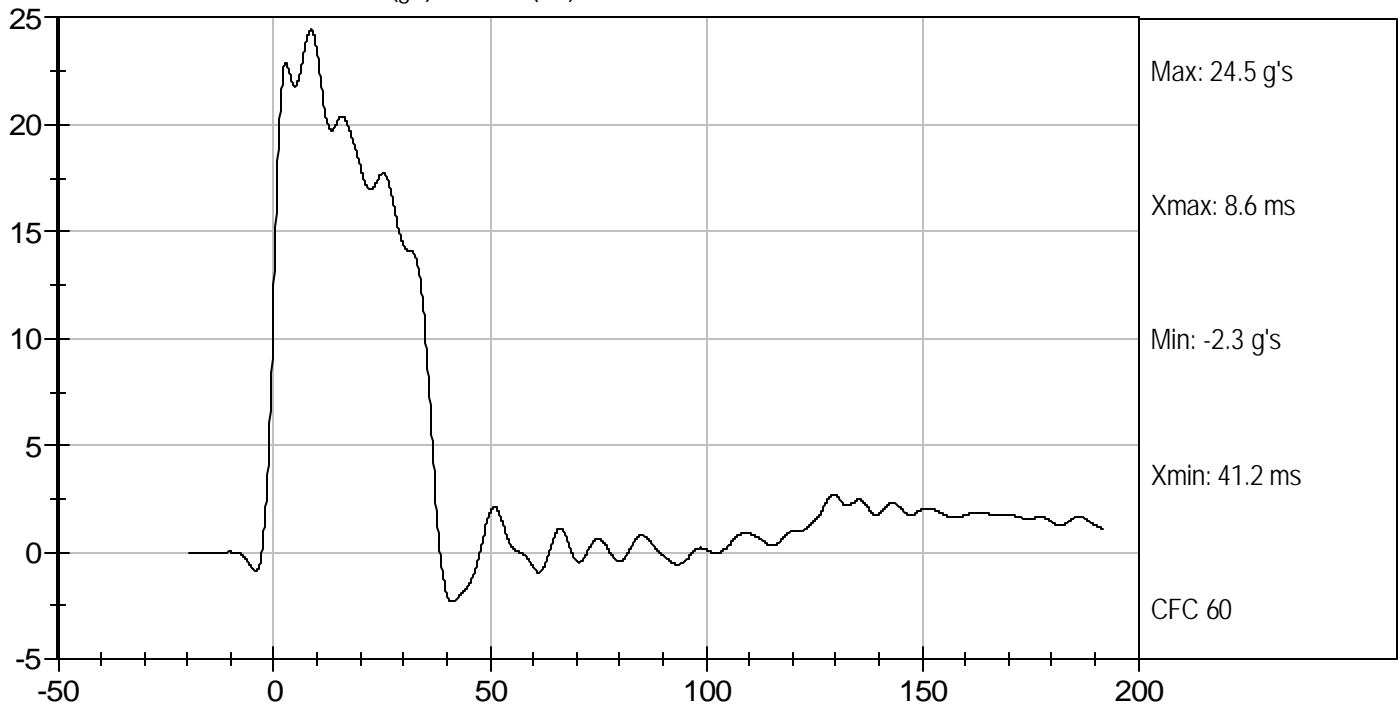

 Laboratory Technician

4/30/07
 Test Date

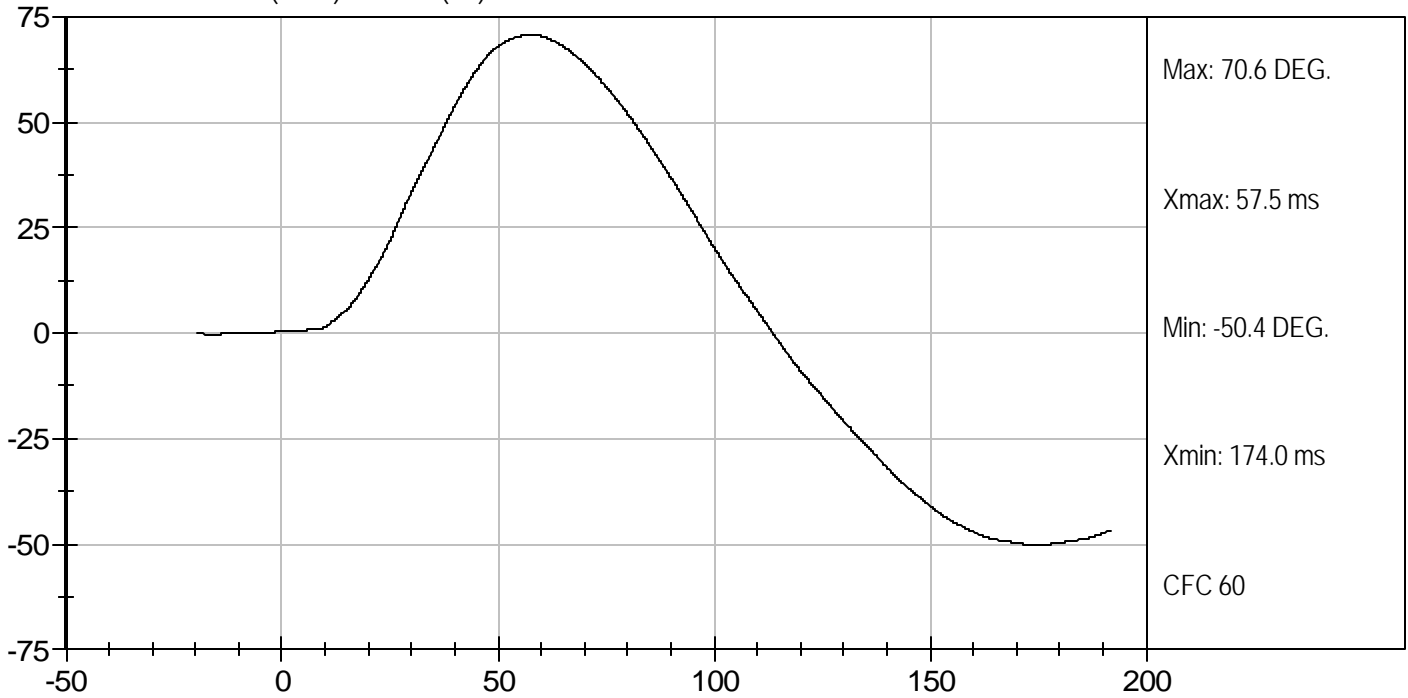

 Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



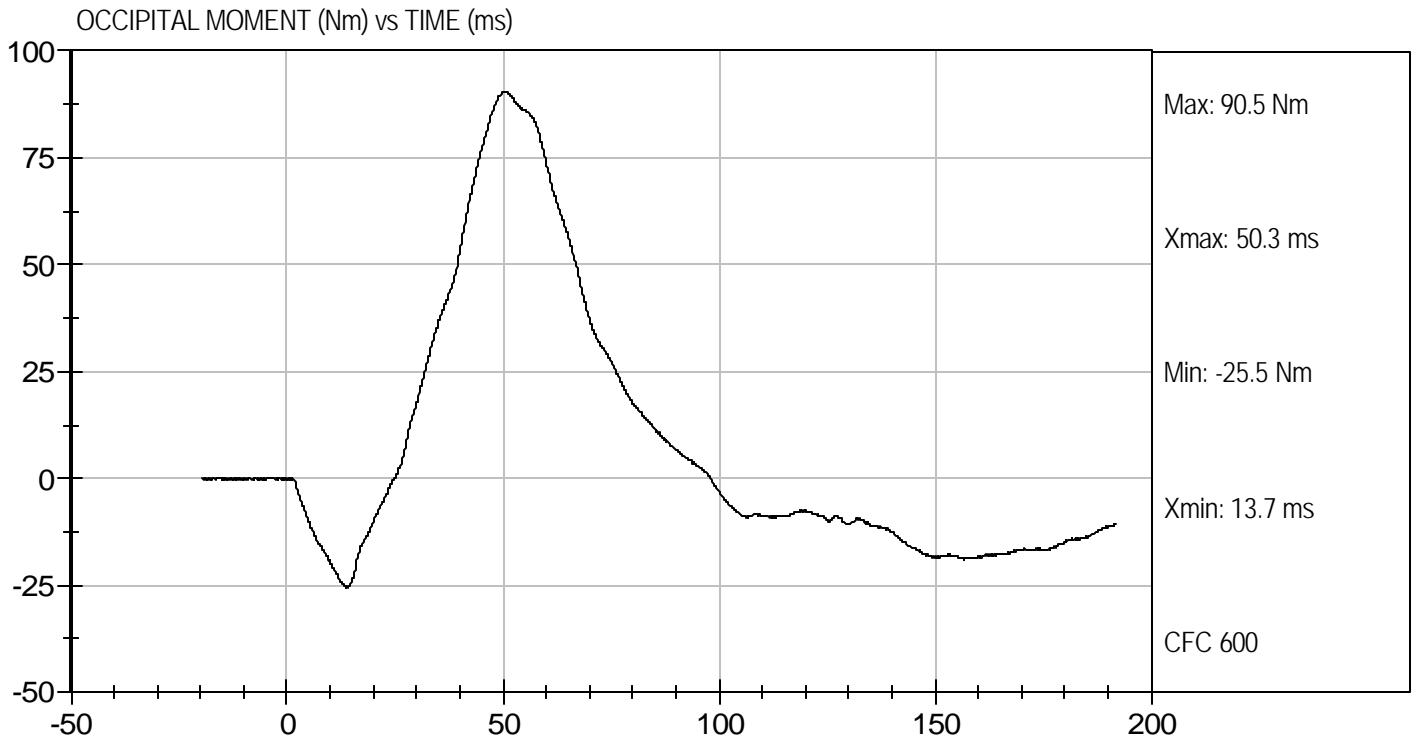
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D071192

Test Date: 4/30/07
Velocity: 22.83 ft/s, 6.96 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 403

Test Date 4/30/07

Technician Tim Bratz

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. (572.36(m))

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. (572.33(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. (572.33(c)(1))

Record the maximum temperature 21.2

Record the minimum temperature 20.5

Record the maximum humidity 40%

Record the minimum humidity 33%

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 88; Rear 85

- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 10A for the extension test. (572.33(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 11A.
- 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 19.5 ft/s to 20.3 ft/s as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Extension Test Results (572.33(b)(2) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	19.5 ft/sec ≤ speed ≤ 20.3 ft/sec	19.8
Pendulum Deceleration versus time pulse	@ 10ms	17.2 ≤ g ≤ 21.2
	@ 20 ms	14 ≤ g ≤ 19
	@30ms	11.0 ≤ g ≤ 16.0
	Above 30 ms	22 g maximum
First Pendulum Decay to 5g	38 ms ≤ time ≤ 46 ms	41
Plane D Rotation	81° ≤ max. rotation ≤ 106°	97
	72 ms ≤ time of max. rotation ≤ 82 ms	77
Time for Plane D Rotation to Cross 0° During First Rebound	147 ms ≤ time ≤ 174 ms	160
Maximum Moment	-59 lbf-ft ≤ moment ≤ -39 lbf-ft	-42
	65 ms ≤ time ≤ 79 ms	73
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)	120 ms ≤ time ≤ 148 ms	141

*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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature


4/30/07
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE**

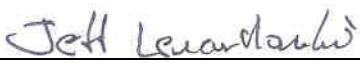
ATD Serial No: 403

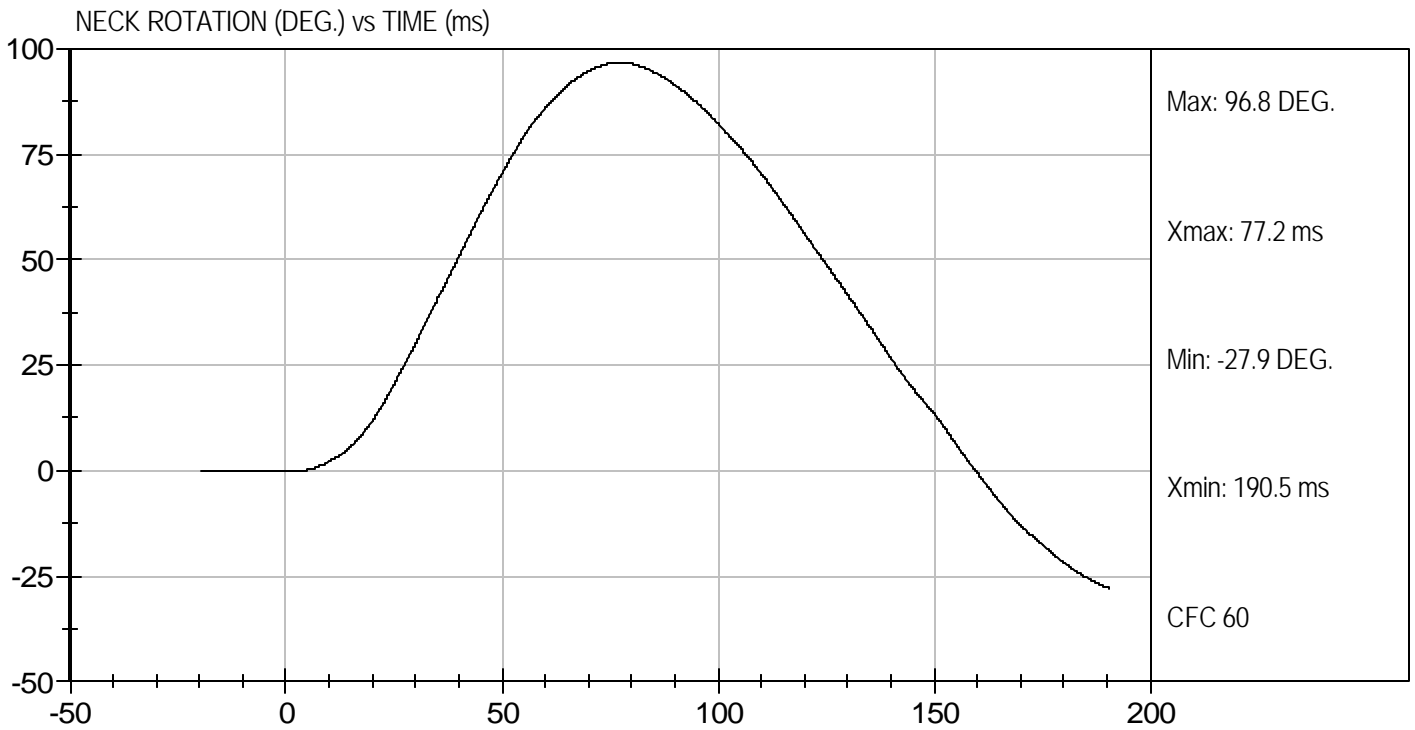
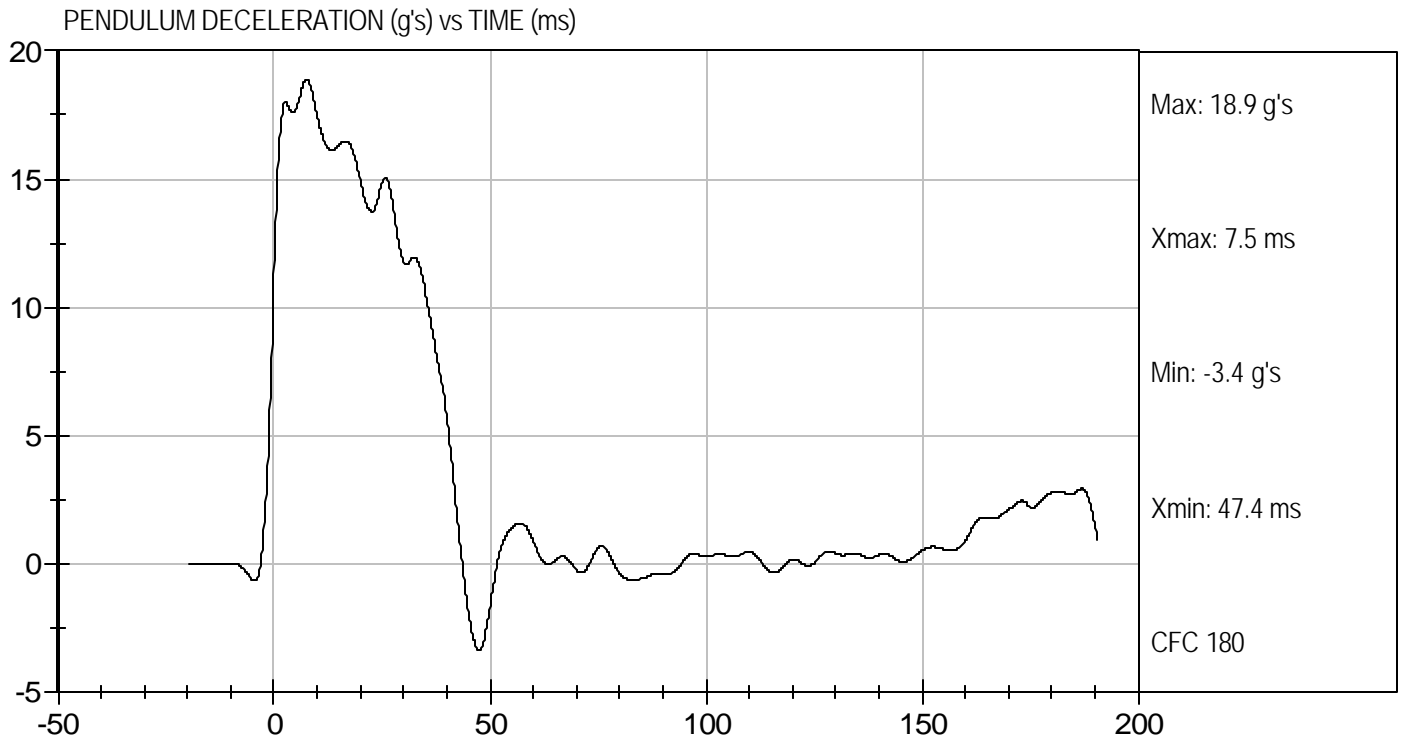
Test I.D.: D071193

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	33	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	17.46	Pass
	20 msec	G's	14.00 to 19.00	14.94	Pass
	30 msec	G's	11.00 to 16.00	11.73	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	11.96	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	40.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.8	Pass
	Time	msec	72.0 to 82.0	77.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	159.7	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-56.7	Pass
	Time	msec	65.0 to 79.0	72.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	140.6	Pass
Overall Test Results					Pass


Laboratory Technician

4/30/07
Test Date


Approved By

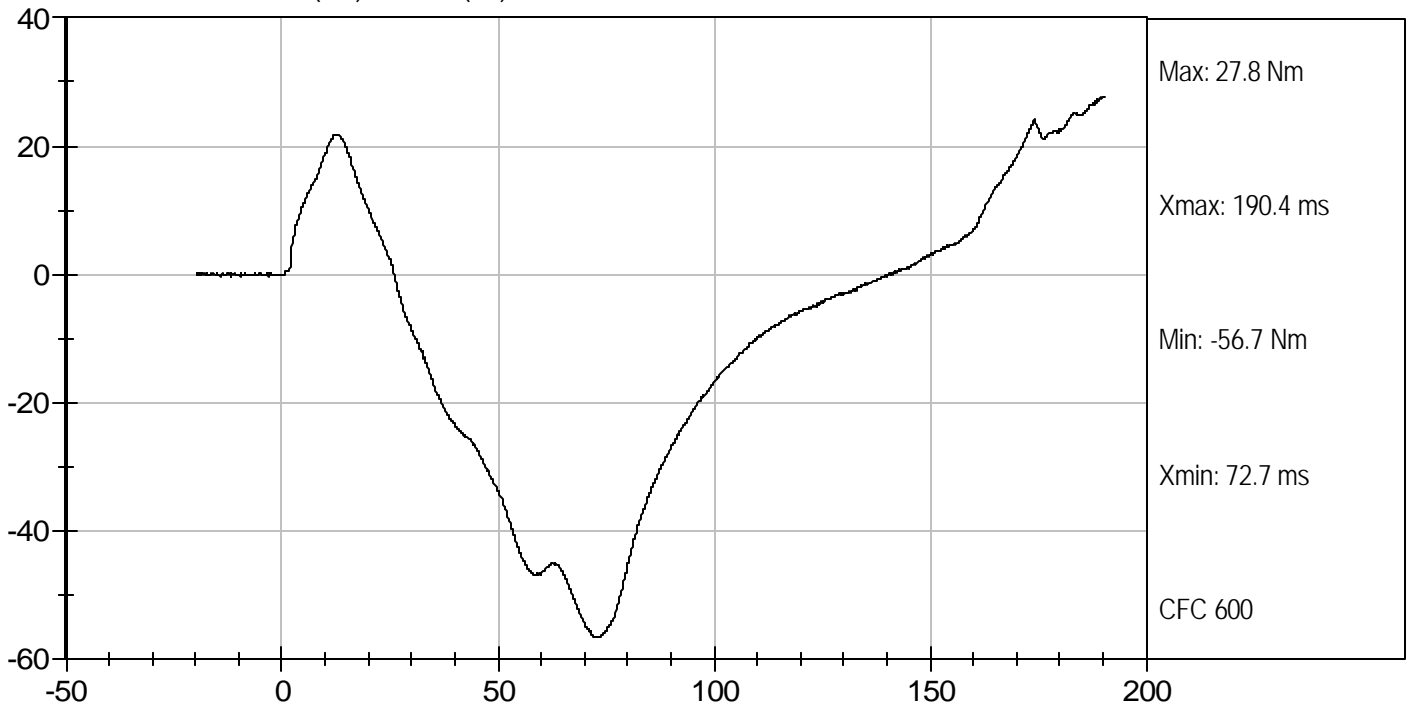




Test Desc: Neck Extension
Component ID: D071193

Test Date: 4/30/07
Velocity: 19.84 ft/s, 6.05 m/s

OCCIPITAL MOMENT (Nm) vs TIME (ms)



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 403

Test Date 5/1/07

Technician Tim Bratz

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 12A.

3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(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. (572.34(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.6

Record the maximum humidity 43%

Record the minimum humidity 41%

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 (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). 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

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- 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. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- 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. 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 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. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s \leq speed \leq 22.4 f/s	22.2
Chest Compression	2.50 in. \leq compression \leq 2.86 in.	2.52
Peak resistance force**	1160 lb \leq peak force \leq 1325 lb	1258
Internal Hysteresis***	69% \leq 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 (572.34(b))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve.

X 17. Plots of chest compression, pendulum acceleration, pendulum speed, and force, follow this sheet.


Signature


5/1/07
Date

**MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE**


ATD Serial No: 403

Test I.D: D071194

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,596	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.39	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

05/01/07
Test Date

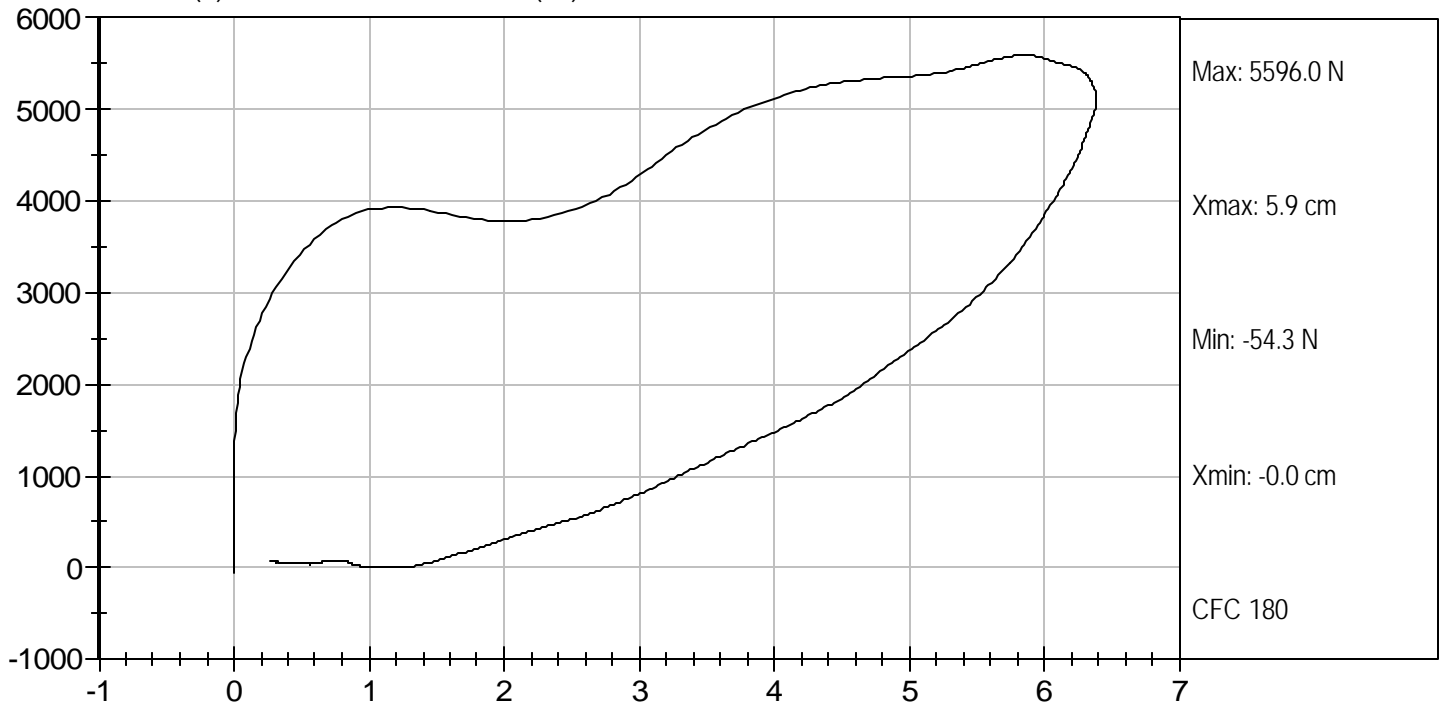

Approved By



Test Desc: Thorax Impact
Component ID: D071194

Test Date: 05/01/07
Velocity: 22.22 ft/s, 6.77 m/s

FORCE (N) vs CHEST DISPLACEMENT (cm)



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 4/27/07

Technician Jessica Gall

- Pretest calibration
 Post test calibration verification

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

1. It has been at least 30 minutes since the last knee impact test. (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
Record the maximum temperature 21.5
Record the minimum temperature 21.3
Record the maximum humidity 38%
Record the minimum humidity 37%
5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	6.9
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1079

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))

Jessica Hall
Signature

4/27/07
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D071196a

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,798	Pass
Overall Test Results				Pass

Jessica Gall

 Laboratory Technician

4/27/07

 Test Date

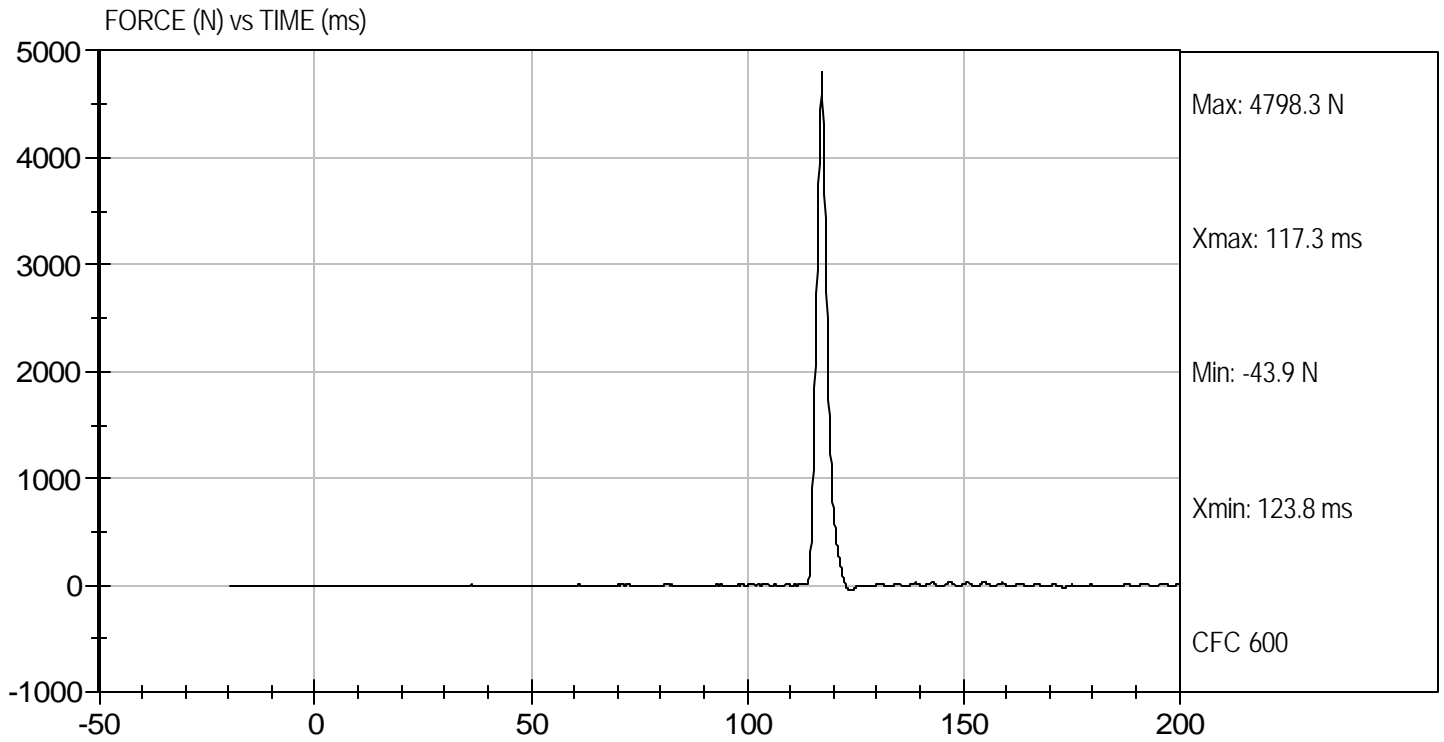
David Winkelbauer

 Approved By



Test Desc: Left Knee
Component ID: D071196a

Test Date: 4/27/07
Velocity: 6.92 ft/s, 2.11 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 4/27/07

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. (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
Record the maximum temperature 21.5
Record the minimum temperature 21.3
Record the maximum humidity 38%
Record the minimum humidity 37%
5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1111

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))

Jessica Hall
Signature

4/27/07
Date

**MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 403

Test I.D: D071195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.13	Pass
Peak Probe Force	Newtons	4715 to 5782	4,940	Pass
Overall Test Results				Pass

Jessica Gall

Laboratory Technician

4/27/07

Test Date

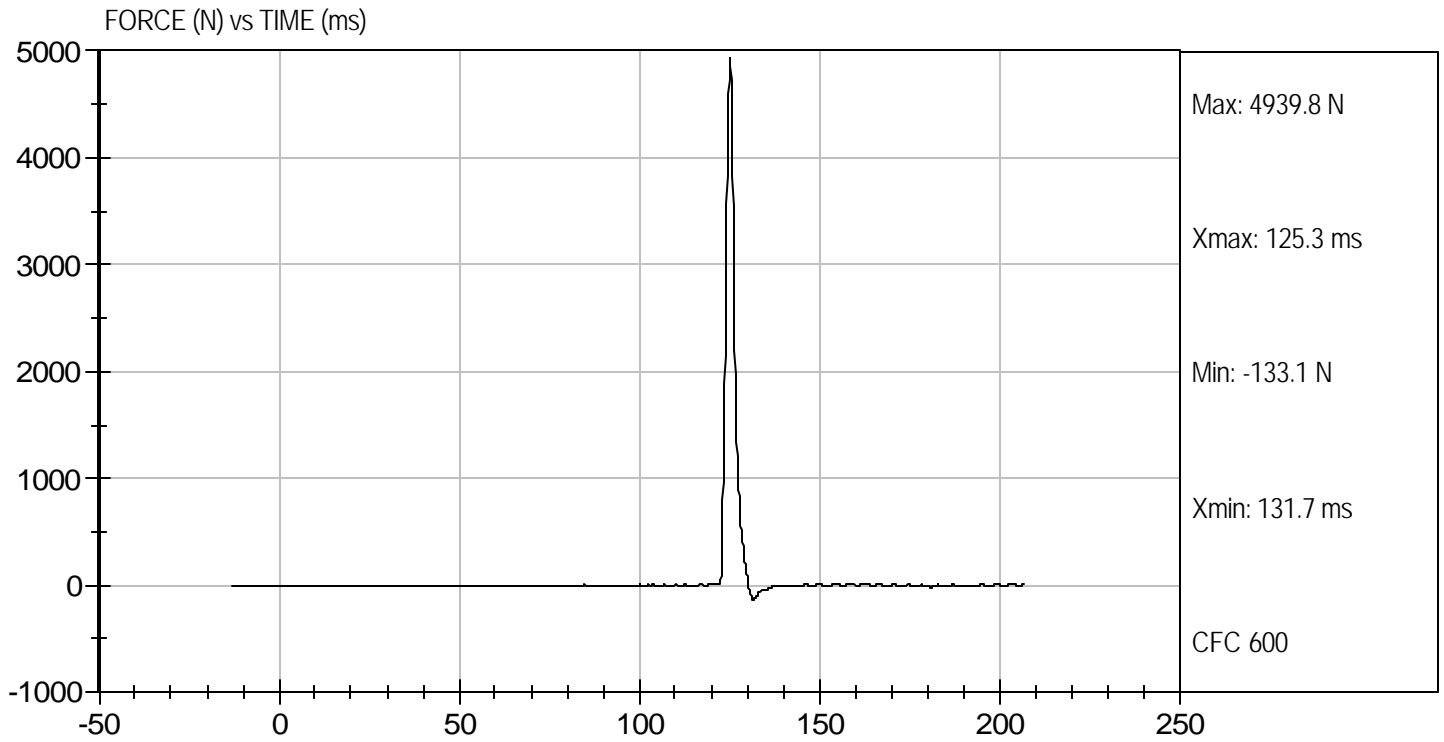
David Winkelbauer

Approved By



Test Desc: Right Knee
Component ID: D0711955

Test Date: 4/27/07
Velocity: 6.99 ft/s, 2.13 m/s



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c))

Dummy Serial Number 403

Test Date 4/30/07

Technician Dave Wilcox

- Pretest calibration
 Post test calibration verification

Test attempt no. 1 (when successive hip joint-femur flexion tests are necessary)

1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
 N/A, ONLY one hip joint-femur flexion test performed
2. The test fixture conforms to the specifications in Figure 17A.
3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 3.2 remove the abdominal insert (78051-52)
 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
4. The 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. (572.35(c)(v))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.2</u> |
| Record the minimum temperature | <u>20.5</u> |
| Record the maximum humidity | <u>40%</u> |
| Record the minimum humidity | <u>33%</u> |
5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
7. Adjust the threaded rods until plane B is horizontal.
8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

X 10. Complete the following table:

Left Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	41
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	45

X 11. Secure the lever arm into the right femur shaft opening of the upper leg structure assembly (78051-44) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))

X 12. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the $\frac{1}{2}$ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19). (572.35(c)(2)(iv))

X 13. Complete the following table:

Right Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	64
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41



Signature

4/30/07

Date

MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D071199


Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	32	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	86.8	55.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	45	Pass
Overall Test Results					Pass



 Laboratory Technician

4/30/07

 Test Date



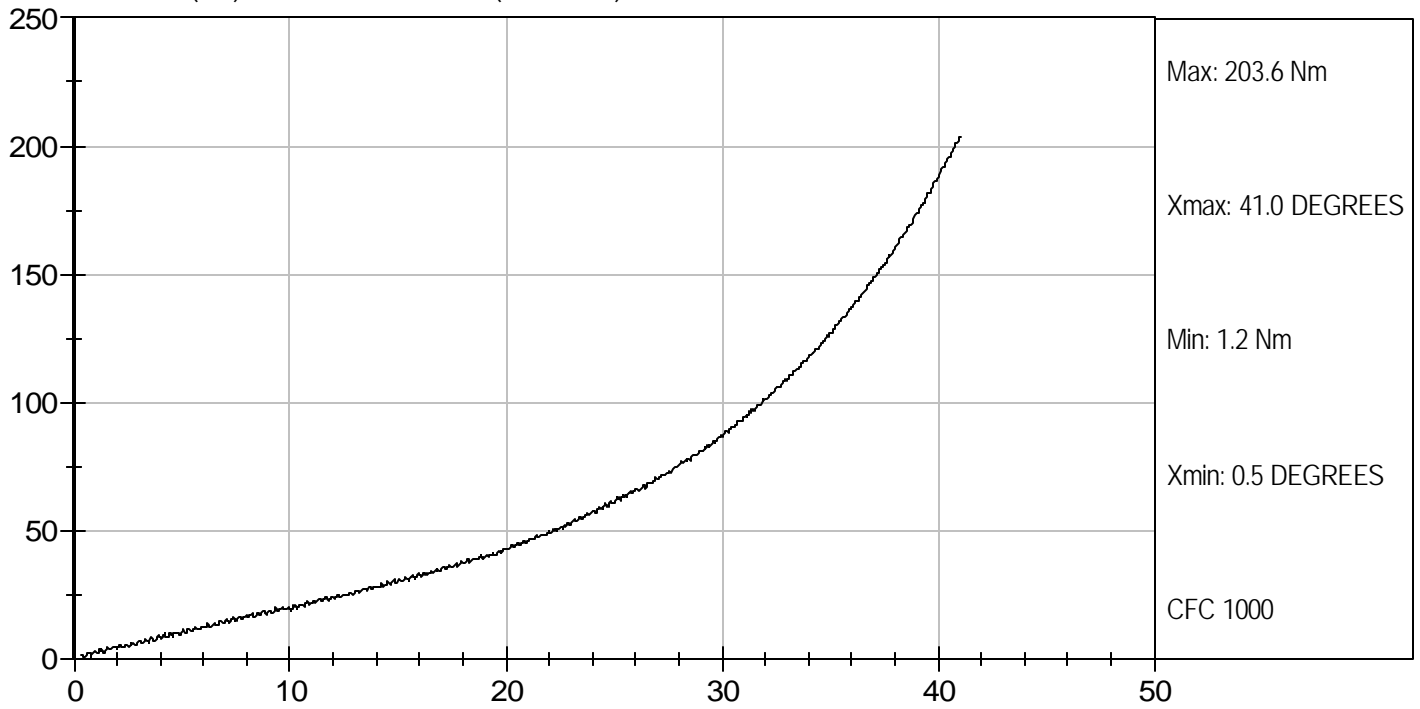
 Approved By



Test Desc: Hip Femur Flexion
Component ID: D071199

Test Date: 4/30/07
Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)

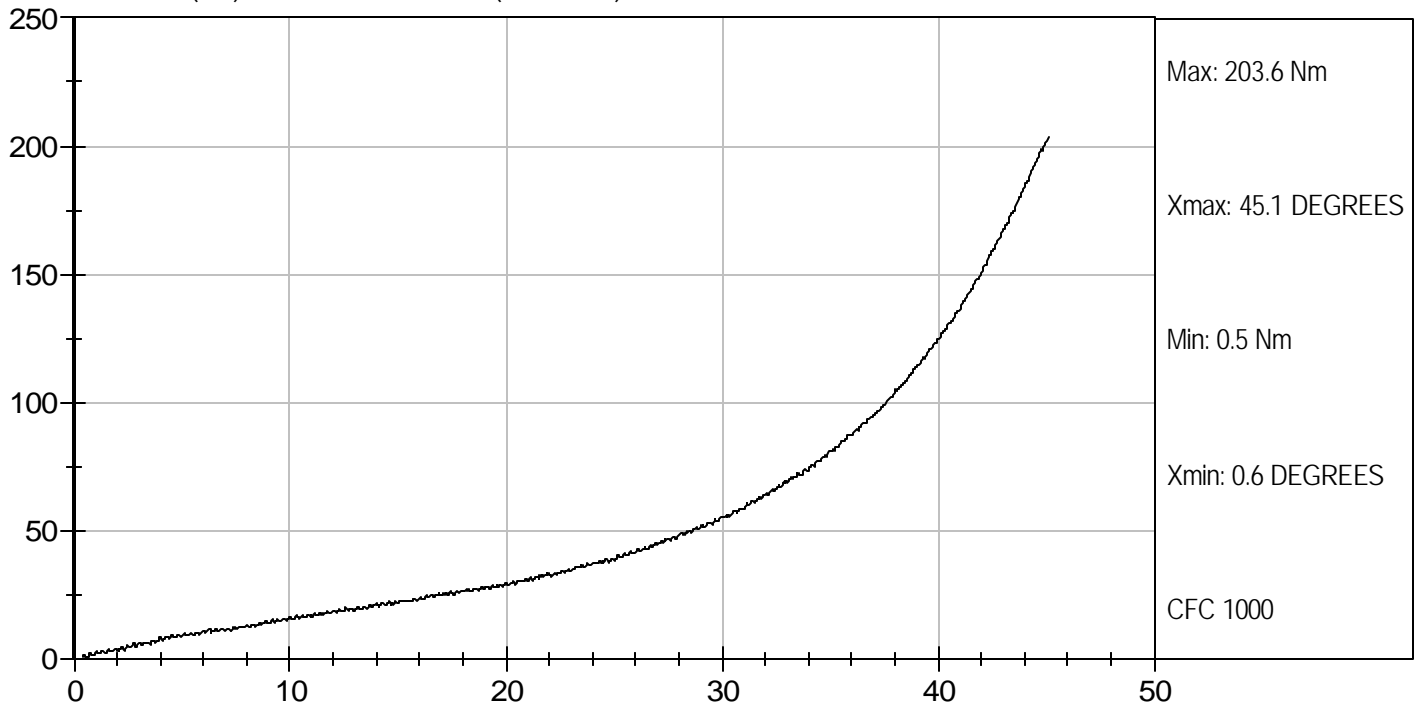




Test Desc: Hip Femur Flexion
Component ID: D071190

Test Date: 4/30/07
Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



HYBRID III 50 th SN #403, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.9
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.5
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.9
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.4
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.6
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.	13.0-13.6	13.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	8.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.5
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.6
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".	17.8-18.8	18.5

HYBRID III 50th SN #403, PART 572, SUBPART E EXTERNAL DIMENSIONS , continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.2
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.8
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	3.9
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.8
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

DATA SHEET A1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 403

Test Date 4/26/07

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
Spine	Nodding blocks cracked or out of position			X
	Broken or cracks in rubber.			X
	Broken or bent ribs			X
Ribs	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			
	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

5/1/07
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

5/1/07
Date

HYBRID III 50 th SN #401, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.7
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.2
C	H-POINT HEIGHT	Reference	3.3-3.5	3.5
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.8
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.	13.0-13.6	13.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
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".	17.8-18.8	18.5

HYBRID III 50th SN #401, PART 572, SUBPART E EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.2
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.7
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.5
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 401

Test Date 4/13/07

Technician Tim Bratz

Pretest calibration

Post test calibration verification

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

1. It has been at least 3 hours since the last head drop. (572.32(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))

3. Torque the skull cap screws to 160 lbf-in.

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

5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))

6. 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. (572.32(c)(1))

Record the maximum temperature 20.8

Record the minimum temperature 20.7

Record the maximum humidity 26%

Record the minimum humidity 25%

7. 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.

8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, 1,1,1 trichloroethane or equivalent prior to the test. (572.32(c)(2))

X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(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 10. The 1.6 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 7A.
Record the right side distance 469mm
Record the left side distance 469mm

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is rigidly supported. (572.32(c)(4))

X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm

X 14. 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. (572.32(b) & (572.32(c)(4))

X 15. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	226
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 $\leq 15 \text{ g}$	4

X 16. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Tim Brab
Signature

4/13/07
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE


ATD Serial No: 401

Test ID: D071001

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	225 to 275	226	Pass
Peak Lateral Acceleration	G's	≤ +/- 15.0	4.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


 Laboratory Technician

4/13/07
 Test Date

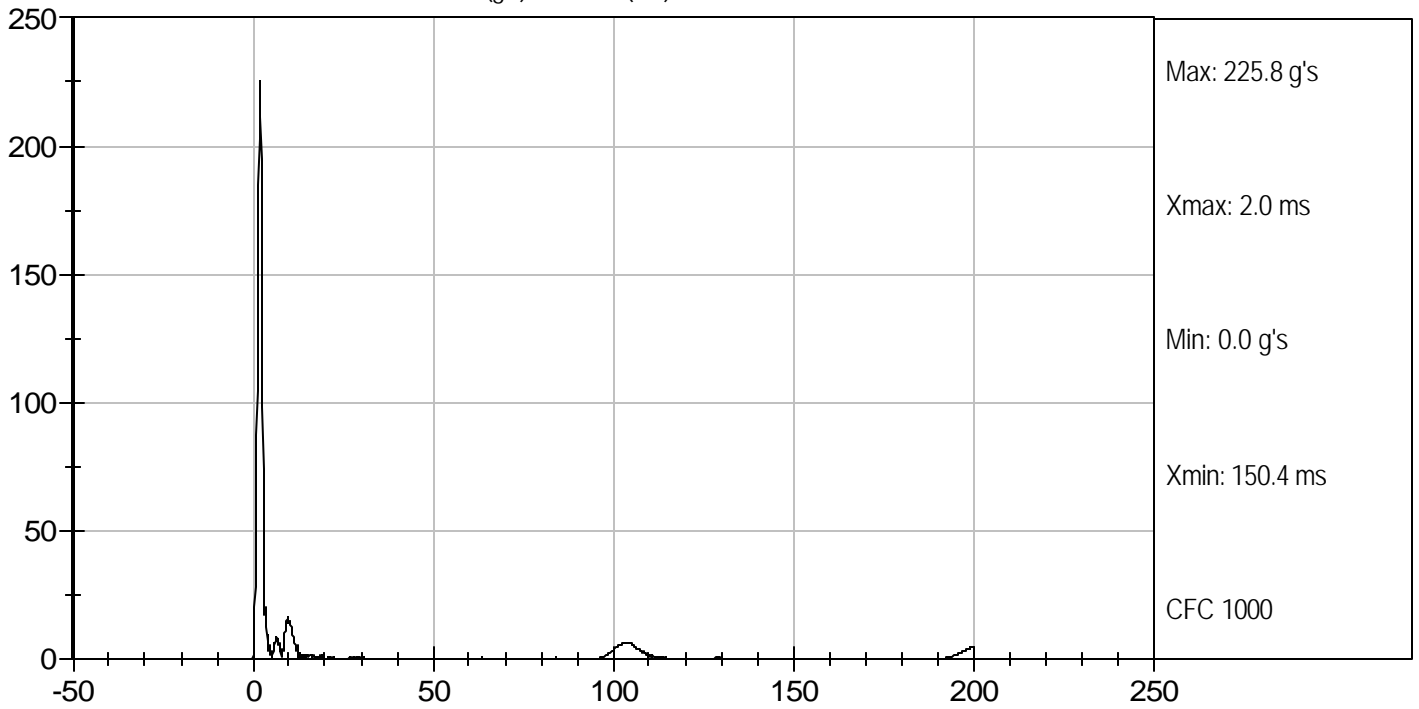

 Approved By



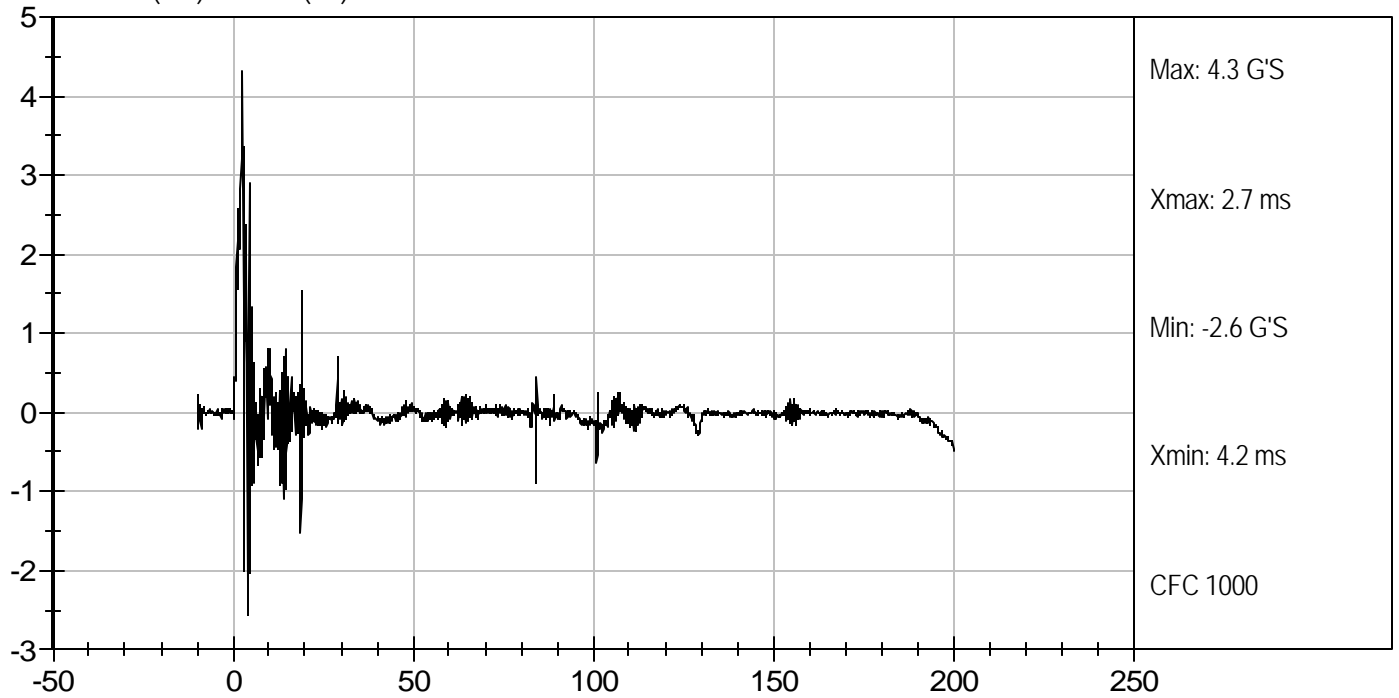
Test Desc: Head Drop
Component ID: D071001

Test Date: 4/13/07
Velocity: 0 ft/s, 0.00 m/s

HEAD RESULTANT ACCELERATION (g's) vs TIME (ms)



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



DATA SHEET A4
NECK FLEXION TEST (572.33)

Dummy Serial Number 401

Test Date 4/13/07

Technician Justino Diaz

- 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. (572.36(m))
 N/A, ONLY one flexion test performed
2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(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. (572.33(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>26%</u> |
| Record the minimum humidity | <u>25%</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. (78051-90). Record findings and actions: No Deterioration Hardness Front 88; Rear 85
6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 9A for the flexion test. (572.33(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 11A.
- 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 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Flexion Test Results (572.33(b)(1) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	22.6 ft/sec ≤ speed ≤ 23.4 ft/sec	23.2
Pendulum Deceleration Versus Time Pulse	@ 10ms	22.5 ≤ g ≤ 27.5
	@ 20 ms	17.6 ≤ g ≤ 22.6
	@30ms	12.5 ≤ g ≤ 18.5
	Above 30 ms	29 g maximum
First Pendulum Decay to 5g	34 ms ≤ time ≤ 42 ms	38
Plane D Rotation	64° ≤ max. rotation ≤ 78°	72
	57 ms ≤ time of max. rotation ≤ 64 ms	60
Time for Plane D Rotation to Cross 0° During First Rebound	113 ms ≤ time ≤ 128 ms	115
Maximum Moment	65 lbf-ft ≤ moment ≤ 80 lbf-ft	67
	47 ms ≤ time of max. moment ≤ 58 ms	51
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)	97 ms ≤ time ≤ 107ms	98

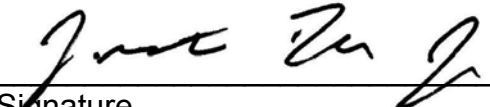
*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$
(572.33(b)(1)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf 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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature

4/13/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE


ATD Serial No: 401

Test I.D.: D071002

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.72	Pass
	20 msec	G's	17.60 to 22.60	18.41	Pass
	30 msec	G's	12.50 to 18.50	14.40	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	14.38	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.6	Pass
	Time	msec	57.0 to 64.0	60.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.9	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	91.0	Pass
	Time	msec	47.0 to 58.0	51.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.3	Pass
Overall Test Results					Pass

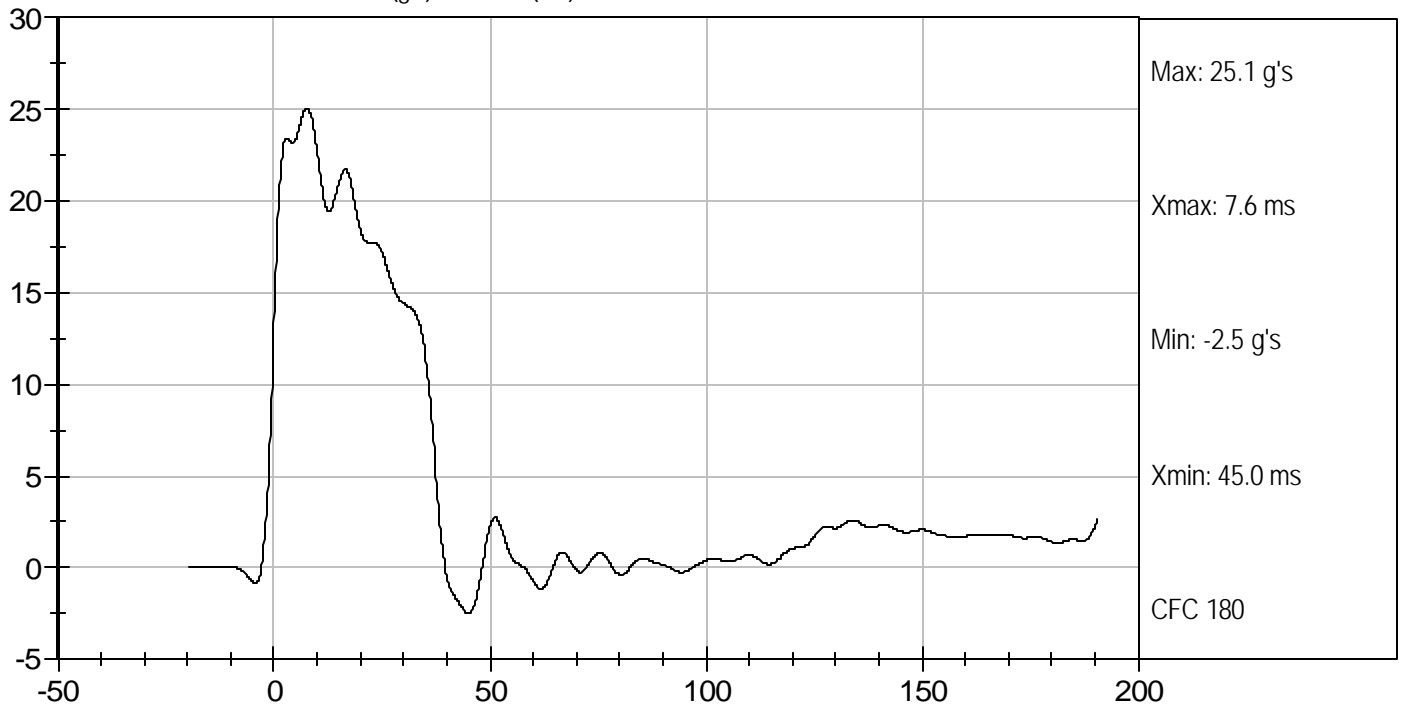

 Laboratory Technician

4/13/07
 Test Date

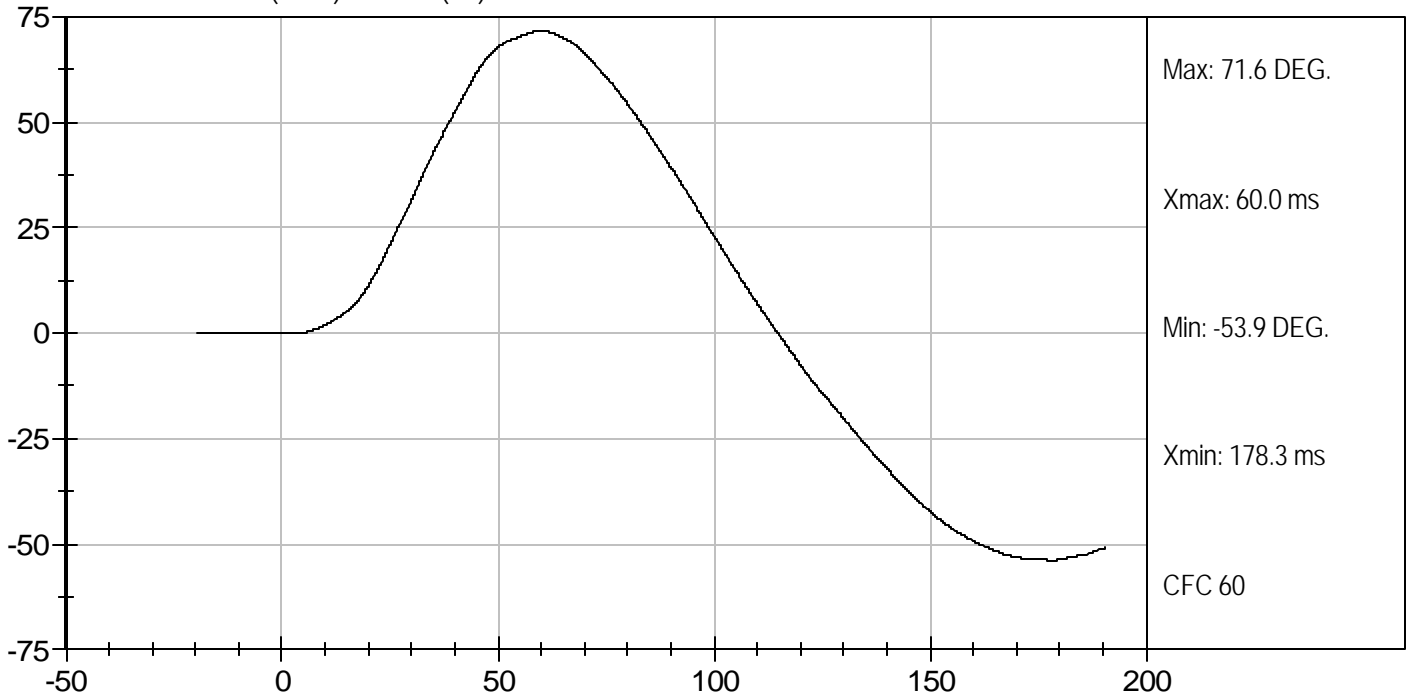

 Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



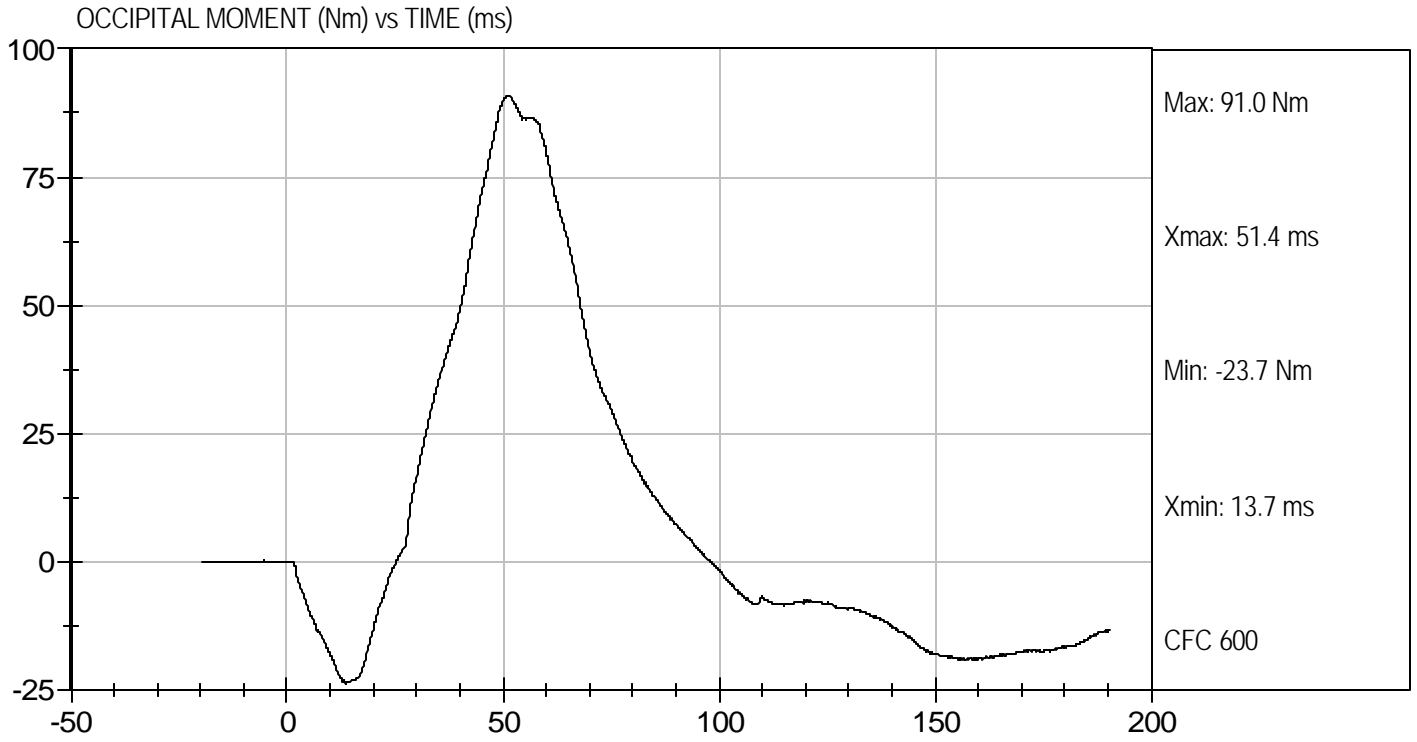
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D071002

Test Date: 4/13/07
Velocity: 23.15 ft/s, 7.06 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 401 Test Date 4/13/07

Technician Justino Diaz

- 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. (572.36(m))
 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. (572.33(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. (572.33(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>26%</u> |
| Record the minimum humidity | <u>25%</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 88; Rear 85

- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 10A for the extension test. (572.33(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 11A.
- 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 19.5 ft/s to 20.3 ft/s as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Extension Test Results (572.33(b)(2) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	19.5 ft/sec ≤ speed ≤ 20.3 ft/sec	19.6
Pendulum Deceleration versus time pulse	@ 10ms	17.2 ≤ g ≤ 21.2
	@ 20 ms	14 ≤ g ≤ 19
	@30ms	11.0 ≤ g ≤ 16.0
	Above 30 ms	22 g maximum
First Pendulum Decay to 5g	38 ms ≤ time ≤ 46 ms	40
Plane D Rotation	81° ≤ max. rotation ≤ 106°	97
	72 ms ≤ time of max. rotation ≤ 82 ms	78
Time for Plane D Rotation to Cross 0° During First Rebound	147 ms ≤ time ≤ 174 ms	162
Maximum Moment	-59 lbf-ft ≤ moment ≤ -39 lbf-ft	-40
	65 ms ≤ time ≤ 79 ms	73
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)	120 ms ≤ time ≤ 148 ms	144

*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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


 Signature

4/13/07
 Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE**

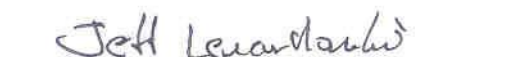
ATD Serial No: 401

Test I.D.: D071003

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.85	Pass
	20 msec	G's	14.00 to 19.00	15.82	Pass
	30 msec	G's	11.00 to 16.00	11.24	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	11.60	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.8	Pass
	Time	msec	72.0 to 82.0	77.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	162.3	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-54.2	Pass
	Time	msec	65.0 to 79.0	73.2	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	144.1	Pass
Overall Test Results					Pass

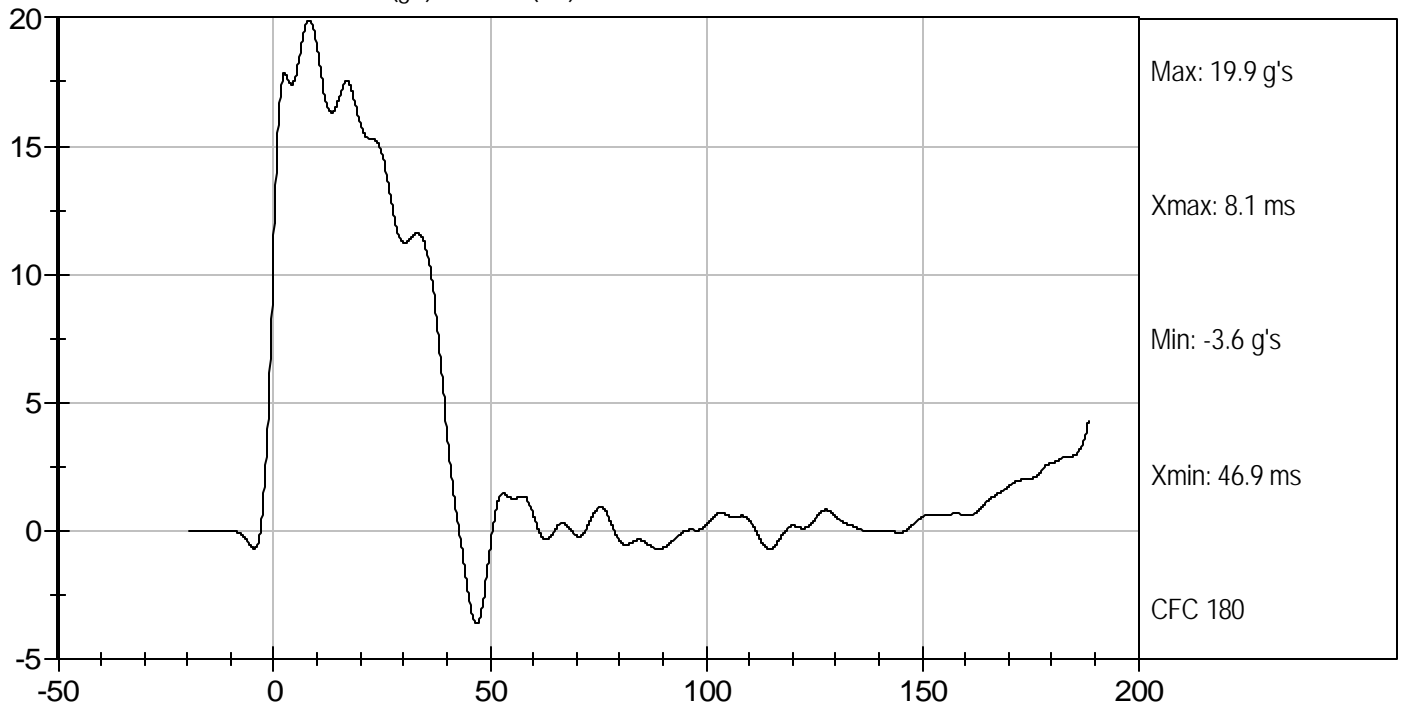

Laboratory Technician

4/13/07
Test Date

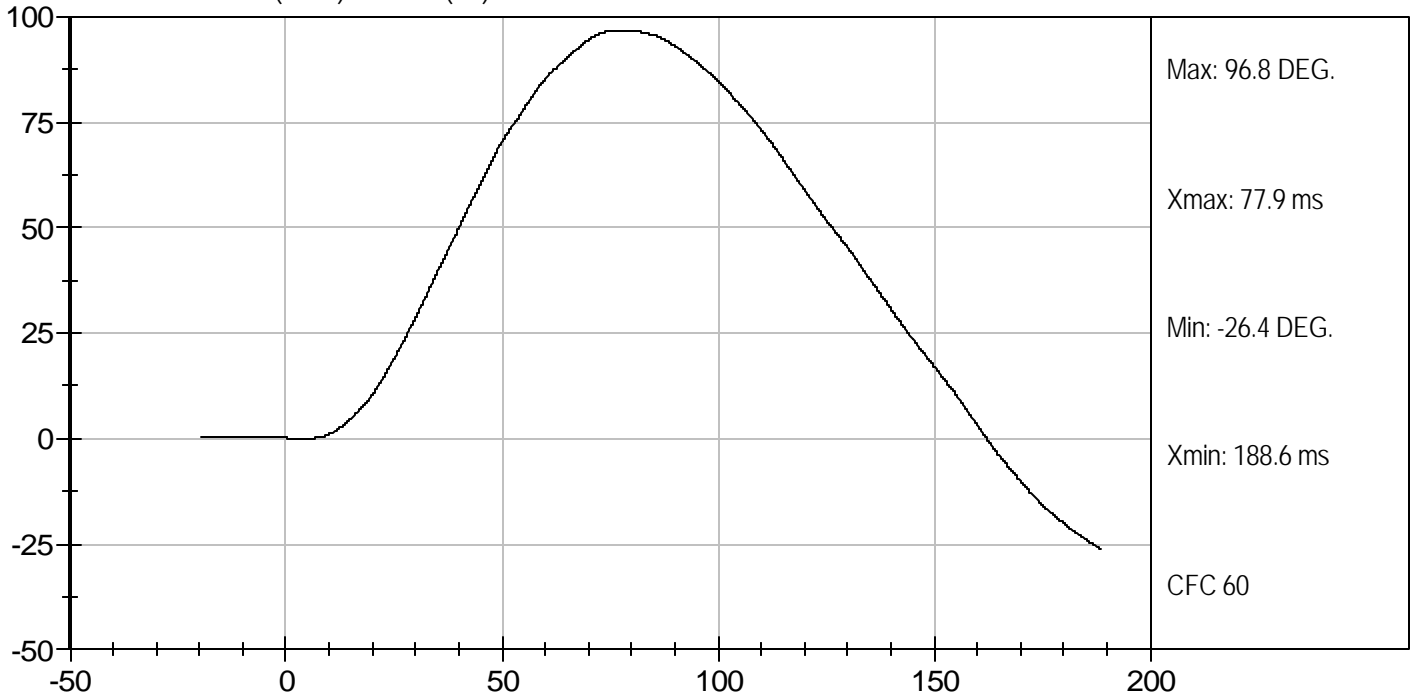

Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



NECK ROTATION (DEG.) vs TIME (ms)

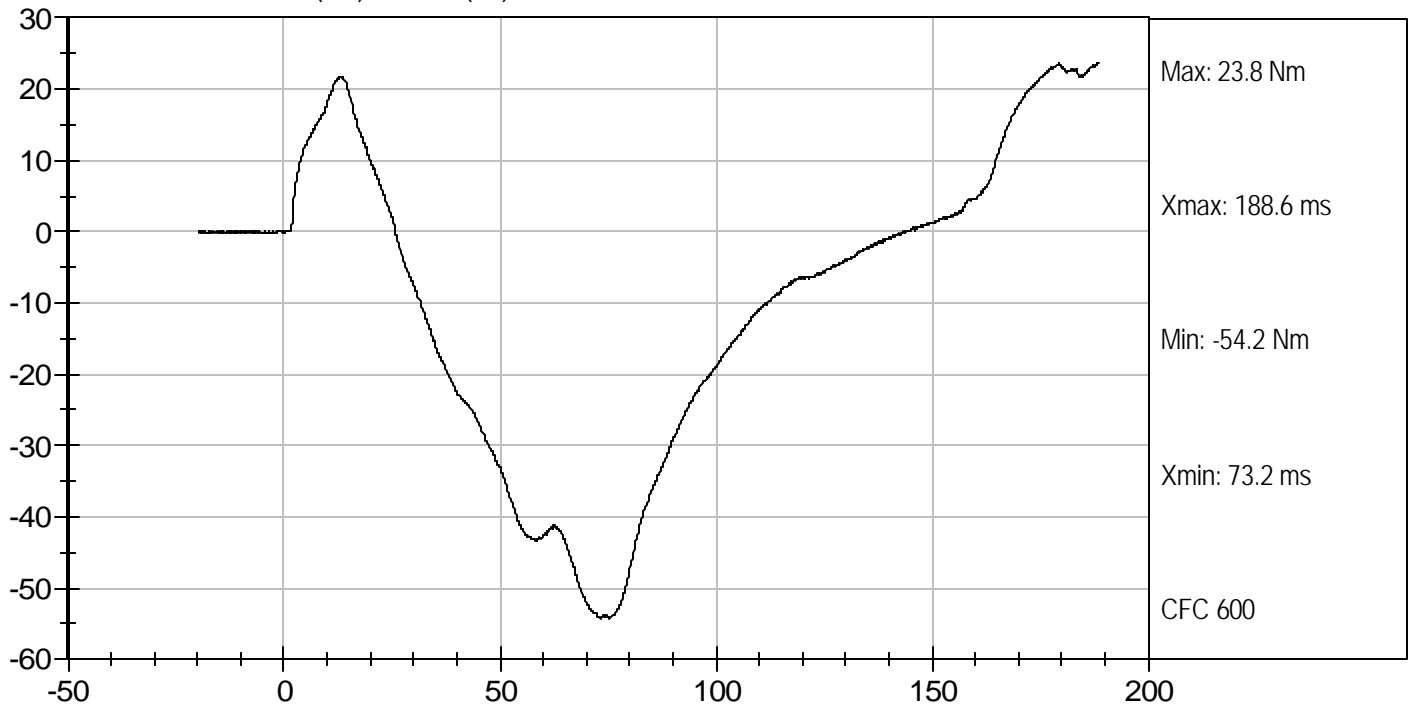




Test Desc: Neck Flexion
Component ID: D071003

Test Date: 4/13/07
Velocity: 19.61 ft/s, 5.98 m/s

OCCIPITAL MOMENT (Nm) vs TIME (ms)



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 401

Test Date 4/16/07

Technician Tim Bratz

- 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 12A.
3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(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. (572.34(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>20.9</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>27%</u> |
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 (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). 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

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- 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. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- 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. 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 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. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s \leq speed \leq 22.4 f/s	22.2
Chest Compression	2.50 in. \leq compression \leq 2.86 in.	2.63
Peak resistance force**	1160 lb \leq peak force \leq 1325 lb	1233
Internal Hysteresis***	69% \leq 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 (572.34(b))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve.

X 17. Plots of chest compression, pendulum acceleration, pendulum speed, and force, follow this sheet.


Signature


4/16/07
Date

**MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE**


ATD Serial No: 401

Test I.D: D071004

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,486	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.68	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

4/16/07
Test Date

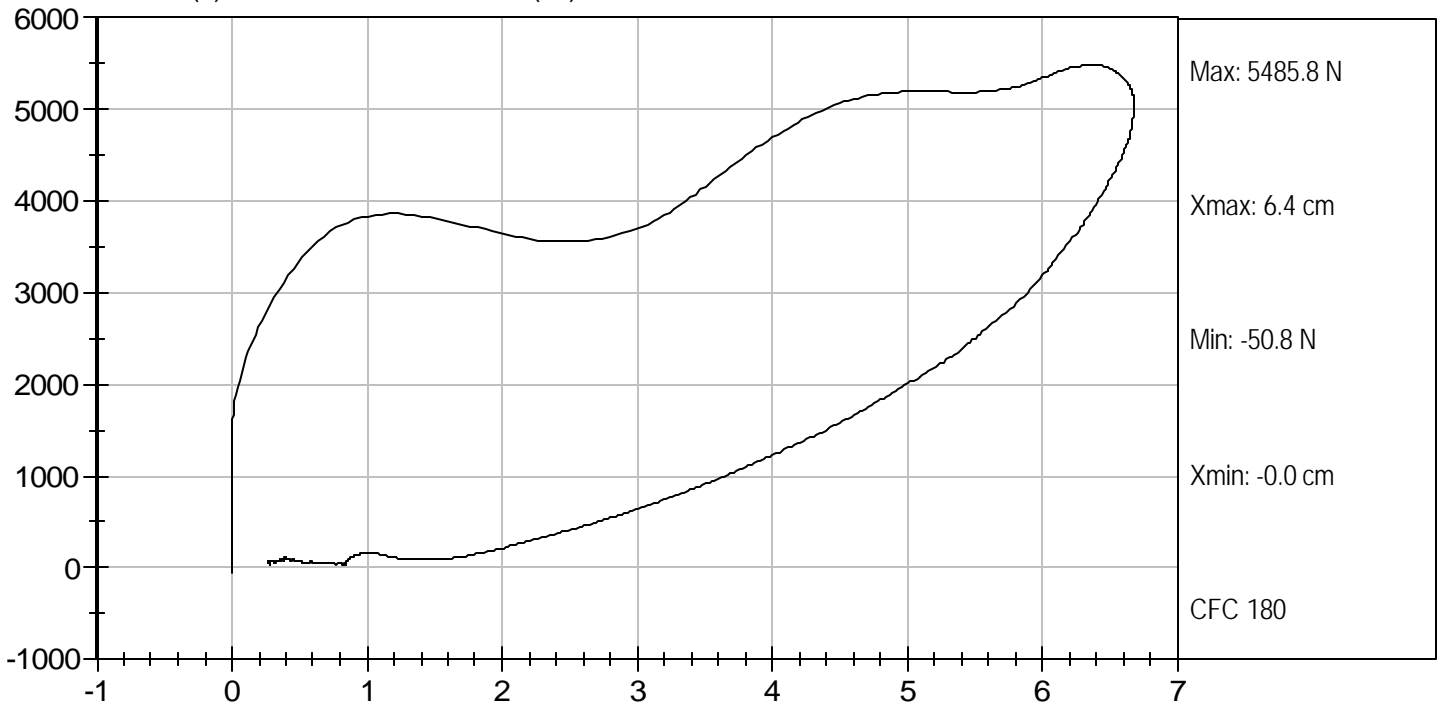

Approved By



Test Desc: Thorax Impact
Component ID: D071004

Test Date: 4/16/07
Velocity: 22.22 ft/s, 6.77 m/s

FORCE (N) vs CHEST DISPLACEMENT (cm)



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401 Test Date 4/13/07

Technician Justino Diaz

- Pretest calibration
 Post test calibration verification

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

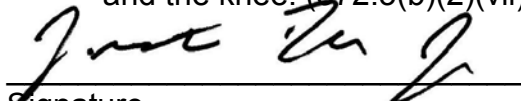
1. It has been at least 30 minutes since the last knee impact test.
 (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
 Record the maximum temperature 20.8
 Record the minimum temperature 20.7
 Record the maximum humidity 26%
 Record the minimum humidity 25%
5. Mount the test specimen and secure it to the rigid test fixture.
 (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally.
 (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1145

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))


Signature

4/13/07
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE


ATD Serial No: 401

Test I.D: D071006

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	25	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,095	Pass
Overall Test Results				Pass


 Laboratory Technician

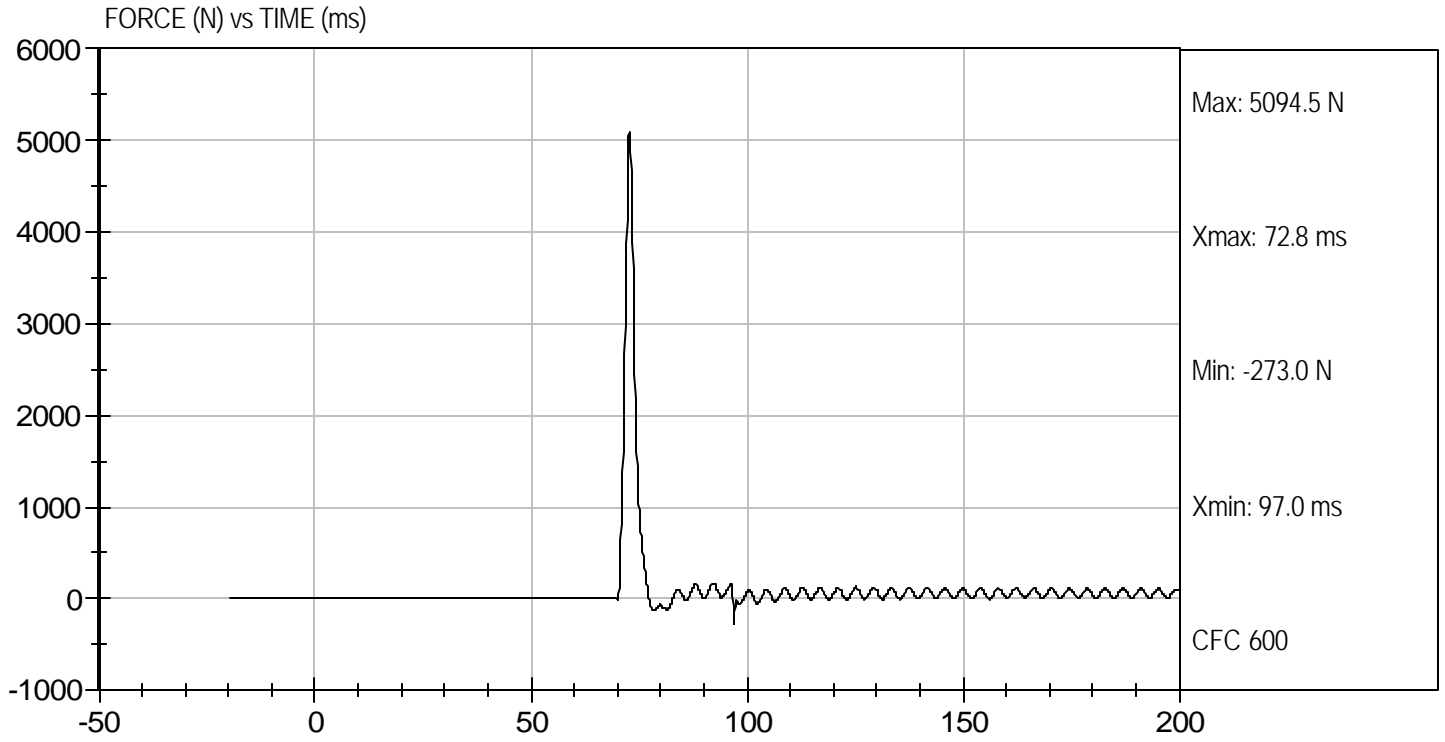
4/13/07
 Test Date


 Approved By



Test Desc: Left Knee
Component ID: D071006

Test Date: 4/13/07
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 4/13/07

Technician Justino Diaz

- Pretest calibration
 Post test calibration verification

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

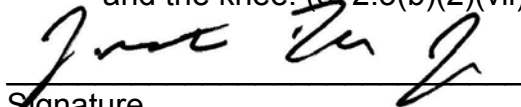
1. It has been at least 30 minutes since the last knee impact test. (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
 Record the maximum temperature 20.8
 Record the minimum temperature 20.7
 Record the maximum humidity 26%
 Record the minimum humidity 25%
5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1079

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))


Signature

4/13/07
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

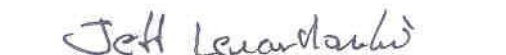
ATD Serial No: 401

Test I.D: D071005

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	25	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,800	Pass
Overall Test Results				Pass


 Laboratory Technician

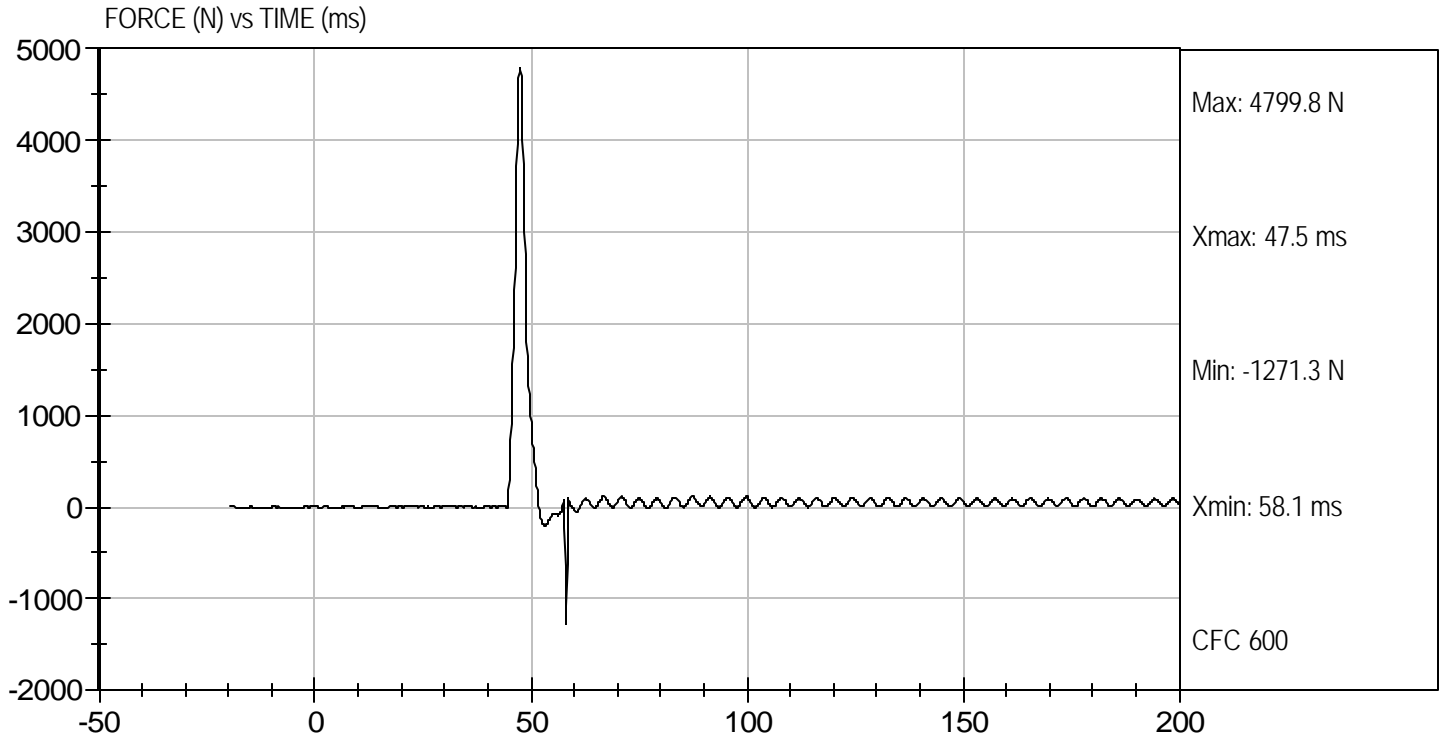
4/13/07
 Test Date


 Approved By



Test Desc: Right Knee
Component ID: D071005

Test Date: 4/13/07
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c))

Dummy Serial Number 401

Test Date 4/13/07

Technician Dave Wilcox

- Pretest calibration
- Post test calibration verification

Test attempt no. 1 (when successive hip joint-femur flexion tests are necessary)

- 1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
 - N/A, ONLY one hip joint-femur flexion test performed
- 2. The test fixture conforms to the specifications in Figure 17A.
- 3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
 - 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 - 3.2 remove the abdominal insert (78051-52)
 - 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
- 4. The 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. (572.35(c)(v))

Record the maximum temperature	<u>20.8</u>
Record the minimum temperature	<u>20.7</u>
Record the maximum humidity	<u>26%</u>
Record the minimum humidity	<u>25%</u>
- 5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
- 6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
- 7. Adjust the threaded rods until plane B is horizontal.
- 8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
- 9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

X 10. Complete the following table:

Left Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	44
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	43

X 11. Secure the lever arm into the right femur shaft opening of the upper leg structure assembly (78051-44) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))

X 12. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the $\frac{1}{2}$ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19). (572.35(c)(2)(iv))

X 13. Complete the following table:

Right Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	50
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42



Signature

4/13/07

Date

**MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 401

Test I.D: D071000

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.7	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	26	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	67.6	59.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	43	Pass
Overall Test Results					Pass



Laboratory Technician

4/13/07

Test Date

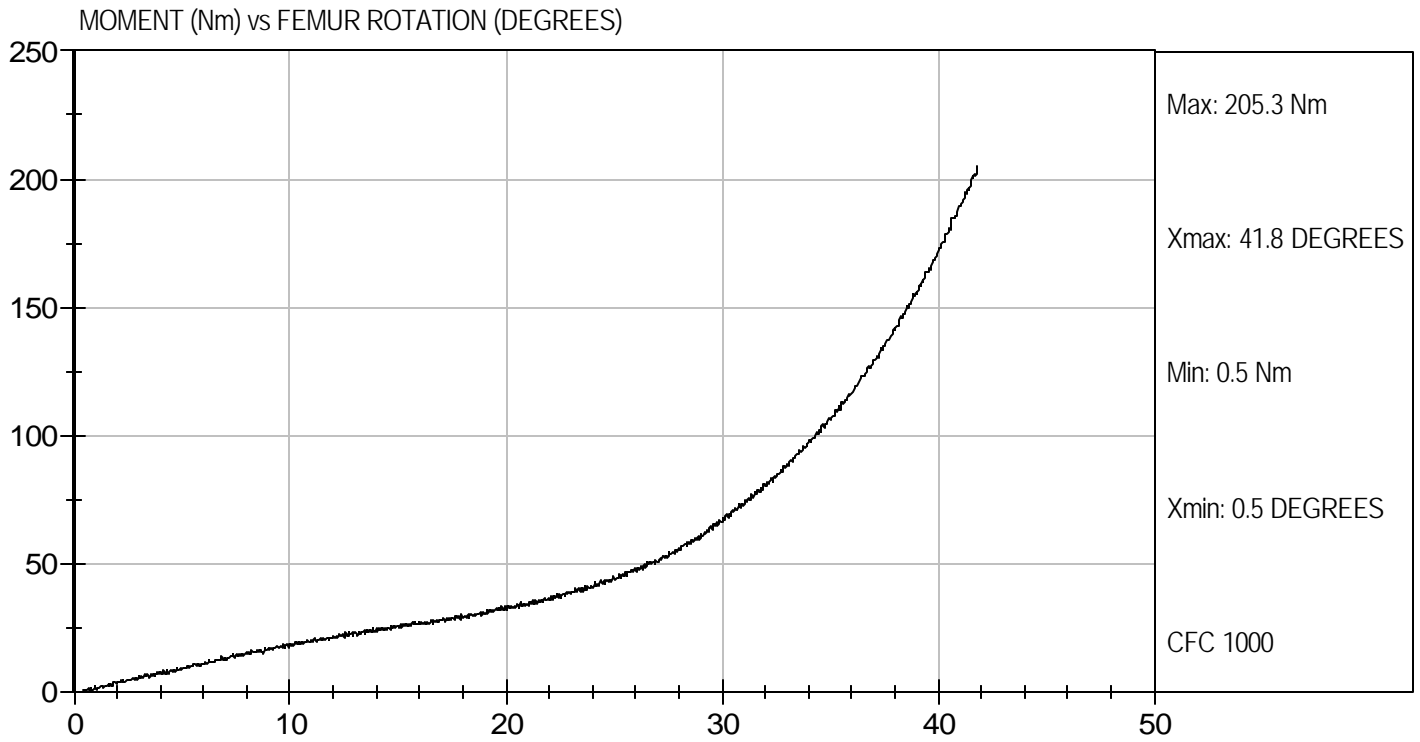


Approved By



Test Desc: Hip Femur Flexion
Component ID: D071009

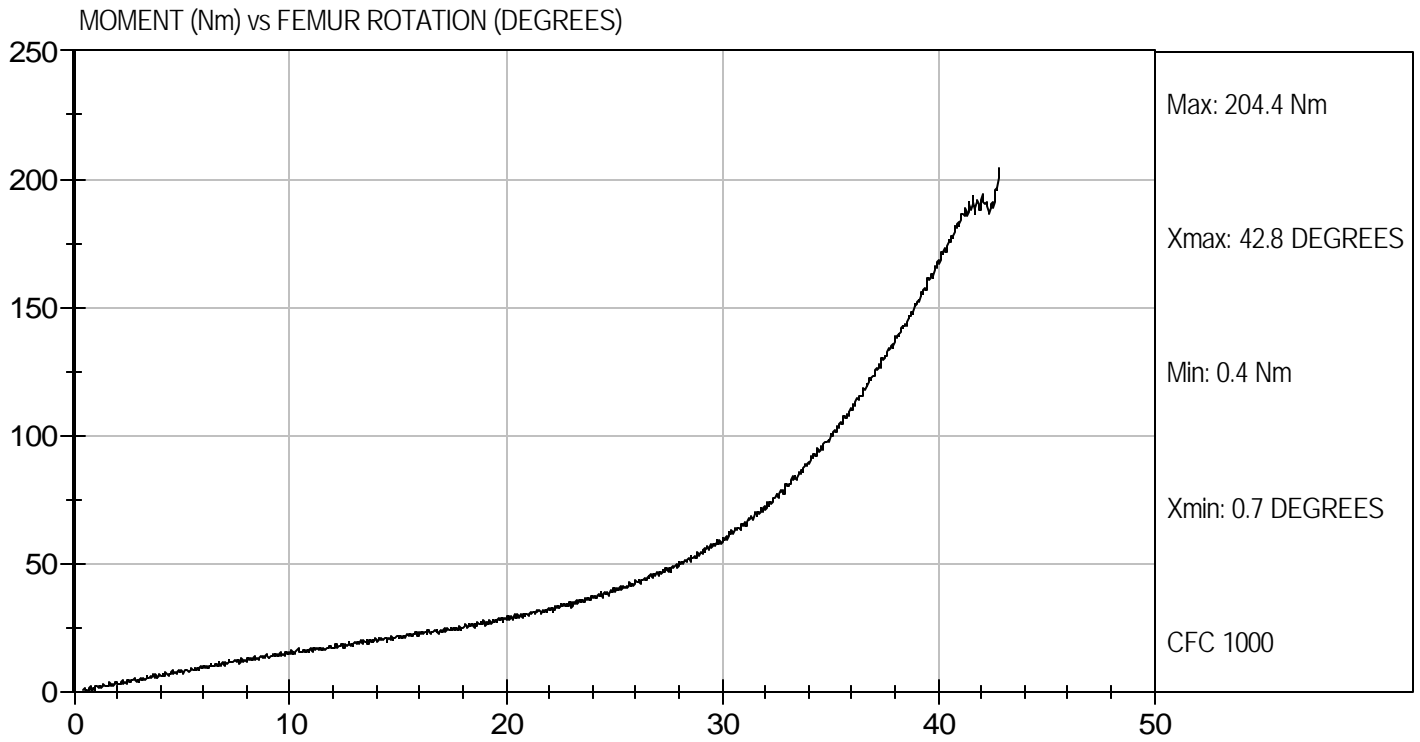
Test Date: 4/13/07
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D071000

Test Date: 4/13/07
Velocity: 0 ft/s, 0.00 m/s



DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 401

Test Date 4/27/07

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 3 hours since the last head drop. (572.32(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))

3. Torque the skull cap screws to 160 lbf-in.

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

5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))

6. 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. (572.32(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.3

Record the maximum humidity 38%

Record the minimum humidity 37%

7. 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.

8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, 1,1,1 trichloroethane or equivalent prior to the test. (572.32(c)(2))

X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(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 10. The 1.6 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 7A.
Record the right side distance 469mm
Record the left side distance 469mm

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is rigidly supported. (572.32(c)(4))

X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm

X 14. 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. (572.32(b) & (572.32(c)(4))

X 15. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	239
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 $\leq 15 \text{ g}$	-13

X 16. Plots of the x, y, z, and resultant acceleration data follow this sheet.



Signature

4/27/07

Date

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 401

Test ID: D071181

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Peak Resultant Acceleration	G's	225 - 275	239	Pass
Peak Lateral Acceleration	G's	≤ +/- 15.0	-13.2	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

4/27/07

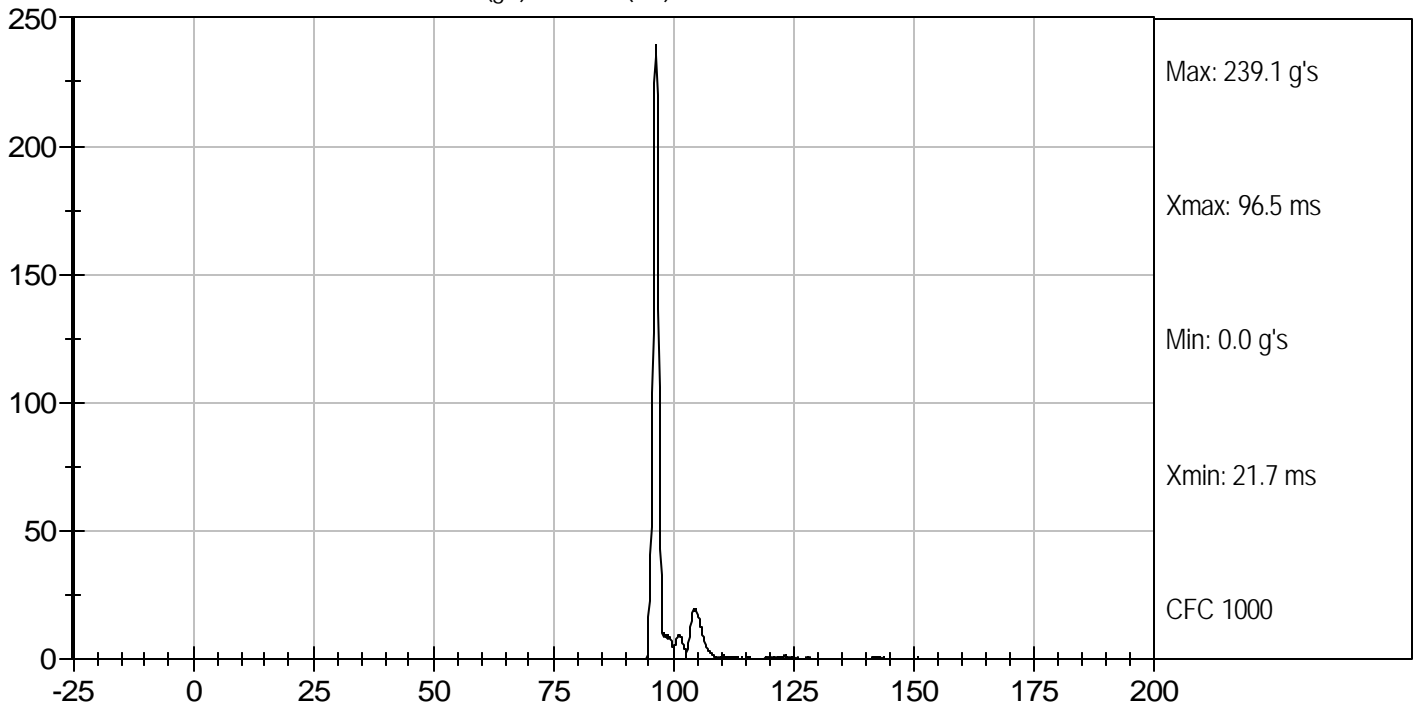
Test Date



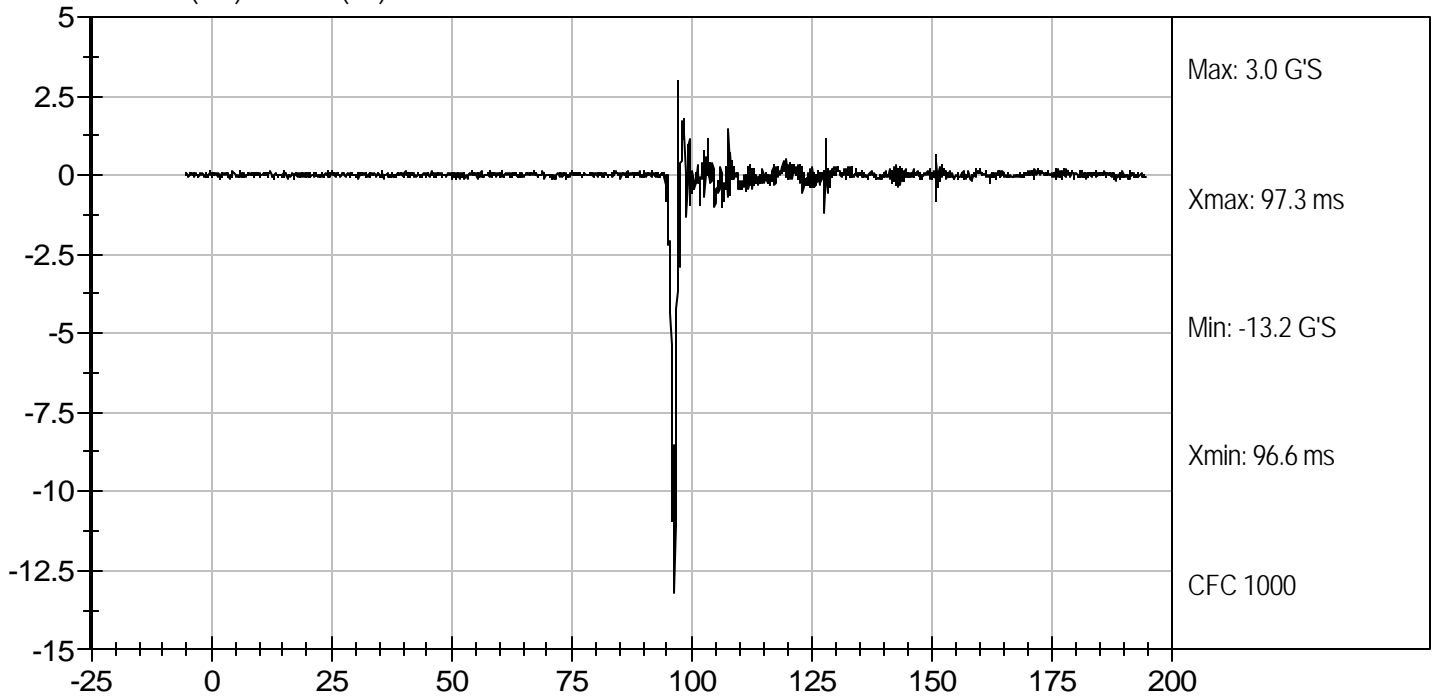
Approved By



HEAD RESULTANT ACCELERATION (g's) vs TIME (ms)



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



DATA SHEET A4
NECK FLEXION TEST (572.33)

Dummy Serial Number 401

Test Date 5/1/07

Technician Tim Bratz

- 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. (572.36(m))
 N/A, ONLY one flexion test performed
2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(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. (572.33(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.3</u> |
| Record the minimum temperature | <u>20.5</u> |
| Record the maximum humidity | <u>43%</u> |
| Record the minimum humidity | <u>41%</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. (78051-90). Record findings and actions: No Deterioration Hardness Front 88; Rear 85
6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 9A for the flexion test. (572.33(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 11A.
- 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 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Flexion Test Results (572.33(b)(1) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	22.6 ft/sec ≤ speed ≤ 23.4 ft/sec	22.8
Pendulum Deceleration Versus Time Pulse	@ 10ms	22.5 ≤ g ≤ 27.5
	@ 20 ms	17.6 ≤ g ≤ 22.6
	@30ms	12.5 ≤ g ≤ 18.5
	Above 30 ms	29 g maximum
First Pendulum Decay to 5g	34 ms ≤ time ≤ 42 ms	35
Plane D Rotation	64° ≤ max. rotation ≤ 78°	74
	57 ms ≤ time of max. rotation ≤ 64 ms	58
Time for Plane D Rotation to Cross 0° During First Rebound	113 ms ≤ time ≤ 128 ms	116
Maximum Moment	65 lbf-ft ≤ moment ≤ 80 lbf-ft	65
	47 ms ≤ time of max. moment ≤ 58 ms	49
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)	97 ms ≤ time ≤ 107ms	101


*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$
(572.33(b)(1)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf 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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature

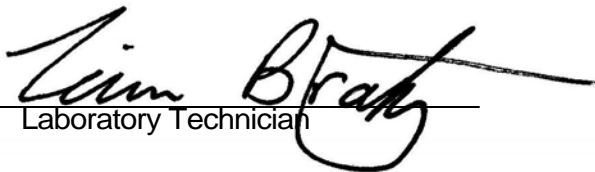
5/1/07
Date

**MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE**

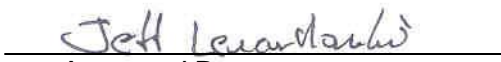
ATD Serial No: 401

Test I.D.: D071182

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	41	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.74	Pass
	20 msec	G's	17.60 to 22.60	19.75	Pass
	30 msec	G's	12.50 to 18.50	14.30	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	14.27	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	35.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	74.1	Pass
	Time	msec	57.0 to 64.0	57.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	115.7	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	88.1	Pass
	Time	msec	47.0 to 58.0	48.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	101.1	Pass
Overall Test Results					Pass

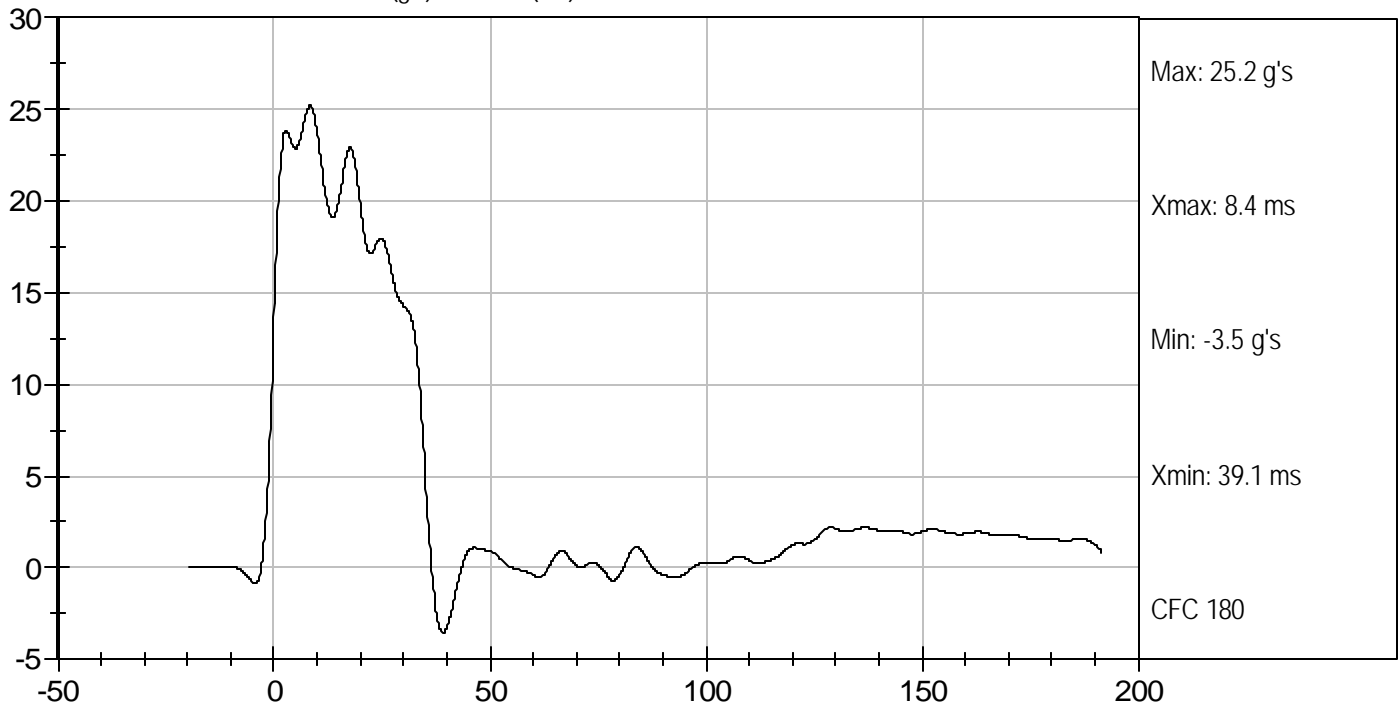

Laboratory Technician

5/1/07
Test Date

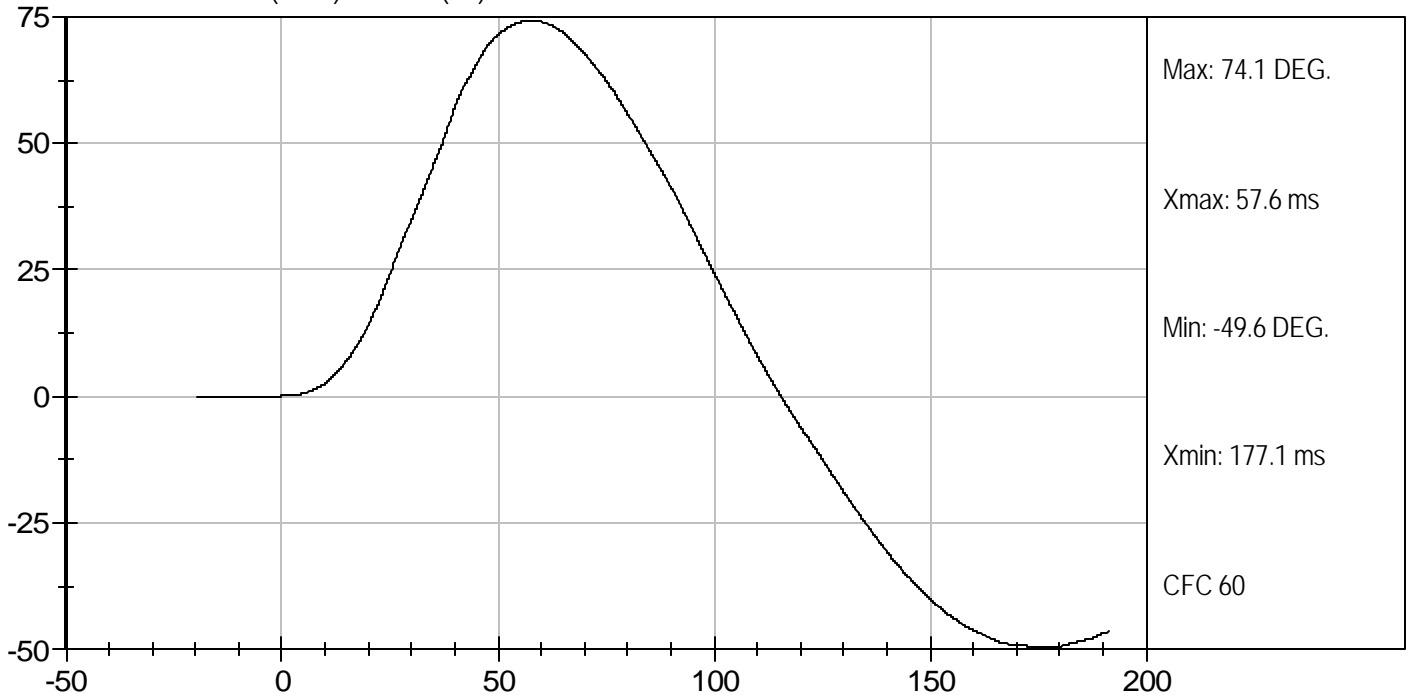

Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



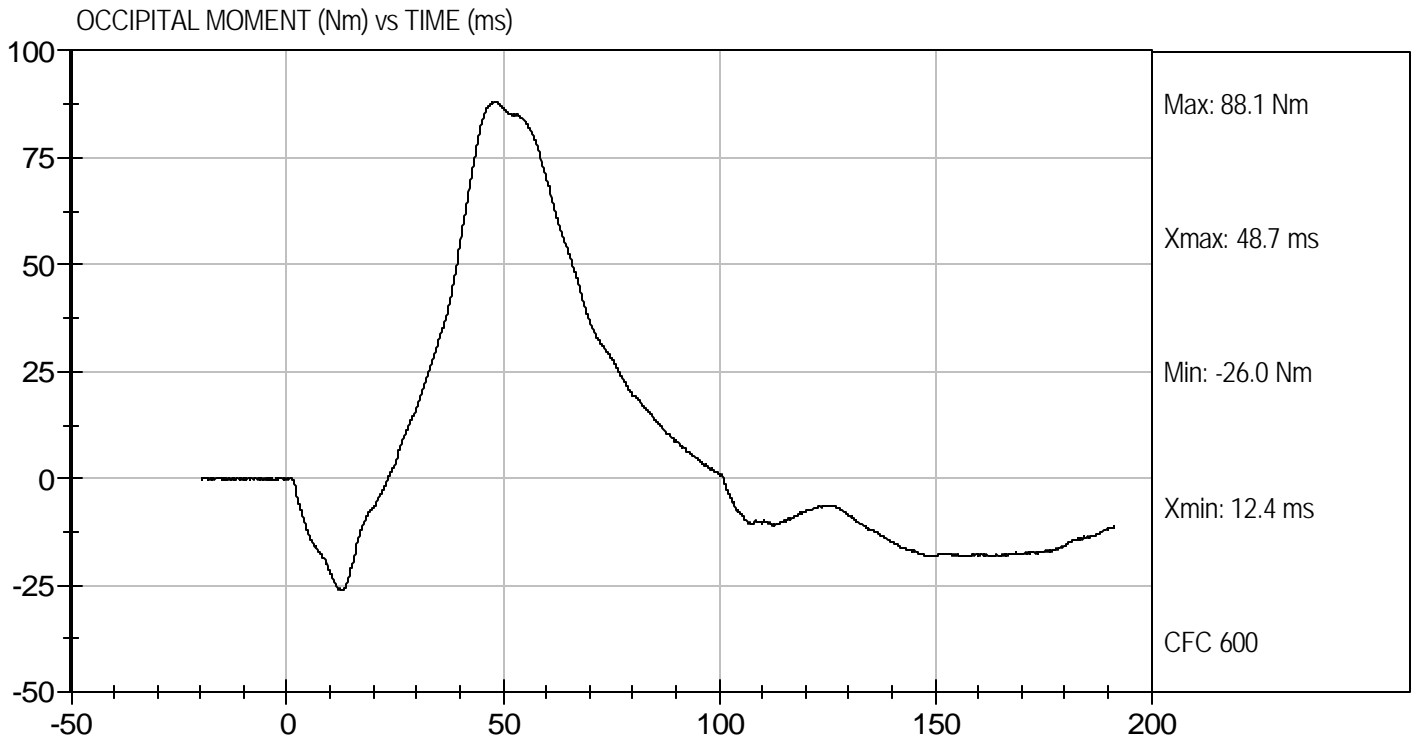
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D071182

Test Date: 5/1/07
Velocity: 22.83 ft/s, 6.96 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 401

Test Date 5/1/07

Technician Tim Bratz

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. (572.36(m))

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. (572.33(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. (572.33(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.5

Record the maximum humidity 43%

Record the minimum humidity 41%

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 88; Rear 85

- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))
 N/A – post test calibration
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(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 10A for the extension test. (572.33(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 11A.
- 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 19.5 ft/s to 20.3 ft/s as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Extension Test Results (572.33(b)(2) & (572.33(c)(4))

Parameter	Specification	Result
Pendulum impact speed	19.5 ft/sec ≤ speed ≤ 20.3 ft/sec	19.8
Pendulum Deceleration versus time pulse	@ 10ms	17.2 ≤ g ≤ 21.2
	@ 20 ms	14 ≤ g ≤ 19
	@30ms	11.0 ≤ g ≤ 16.0
	Above 30 ms	22 g maximum
First Pendulum Decay to 5g	38 ms ≤ time ≤ 46 ms	40
Plane D Rotation	81° ≤ max. rotation ≤ 106°	97
	72 ms ≤ time of max. rotation ≤ 82 ms	78
Time for Plane D Rotation to Cross 0° During First Rebound	147 ms ≤ time ≤ 174 ms	158
Maximum Moment	-59 lbf-ft ≤ moment ≤ -39 lbf-ft	-46
	65 ms ≤ time ≤ 79 ms	72
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)	120 ms ≤ time ≤ 148 ms	138

*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 pendulum acceleration, y-axis moment, x-axis force, y-axis moment about the occipital condyle, and D plane rotation follows this sheet.


Signature


5/1/07
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE**

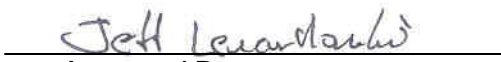
ATD Serial No: 401

Test I.D.: D071183

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	17.44	Pass
	20 msec	G's	14.00 to 19.00	16.17	Pass
	30 msec	G's	11.00 to 16.00	12.61	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	12.53	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.8	Pass
	Time	msec	72.0 to 82.0	78.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	157.8	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-62.7	Pass
	Time	msec	65.0 to 79.0	72.0	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	137.5	Pass
Overall Test Results					Pass

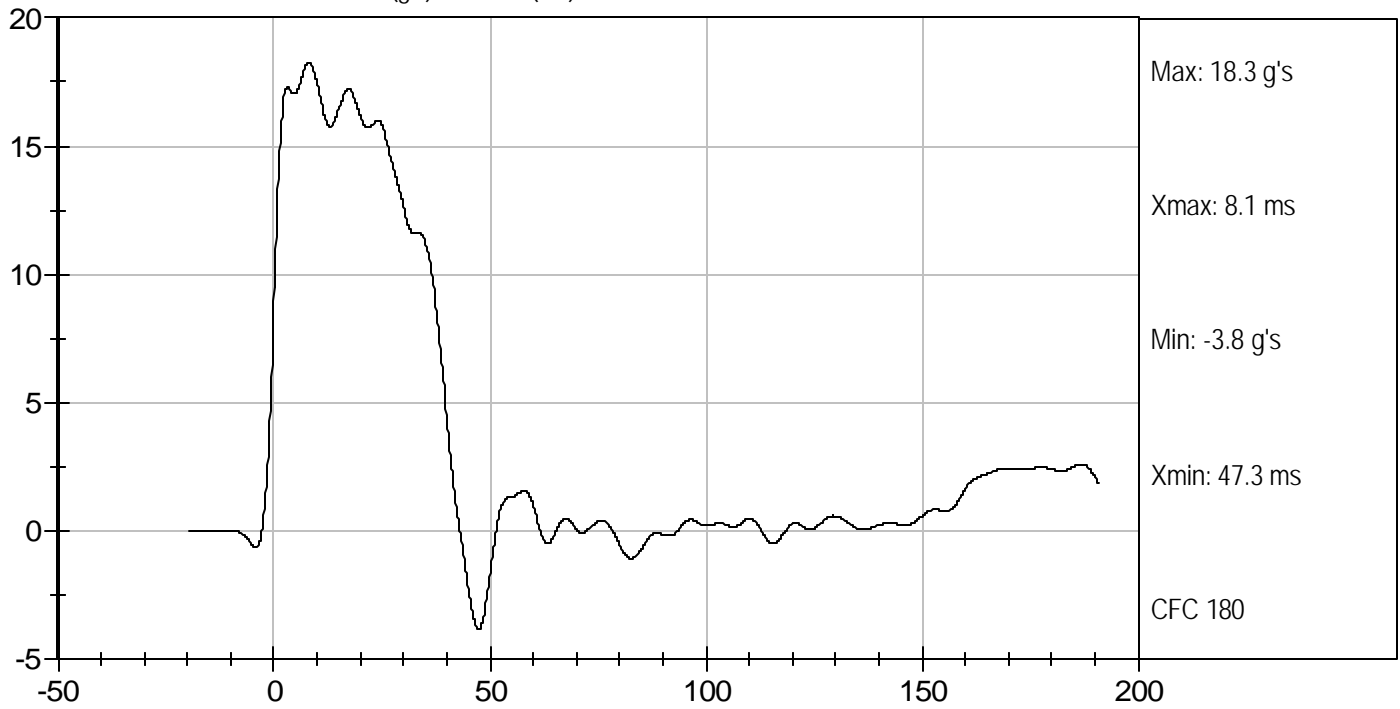

Laboratory Technician

5/1/07
Test Date

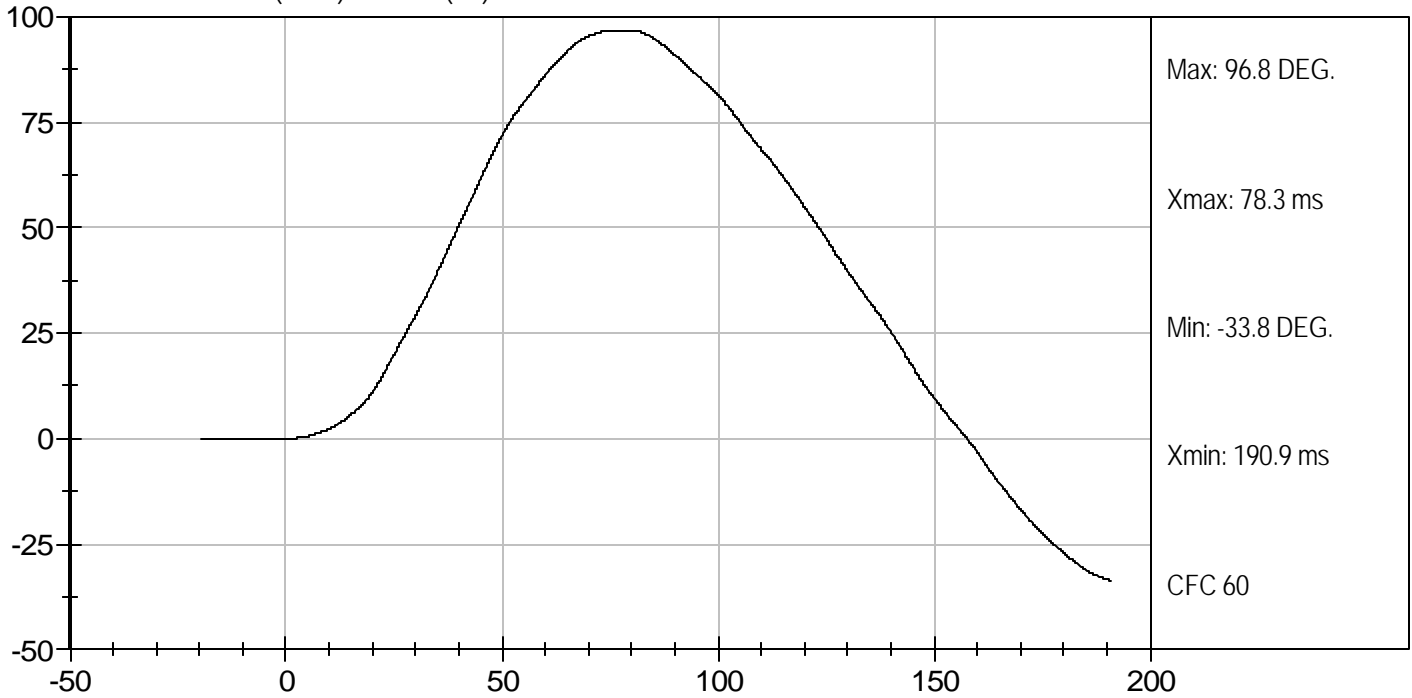

Approved By



PENDULUM DECELERATION (g's) vs TIME (ms)



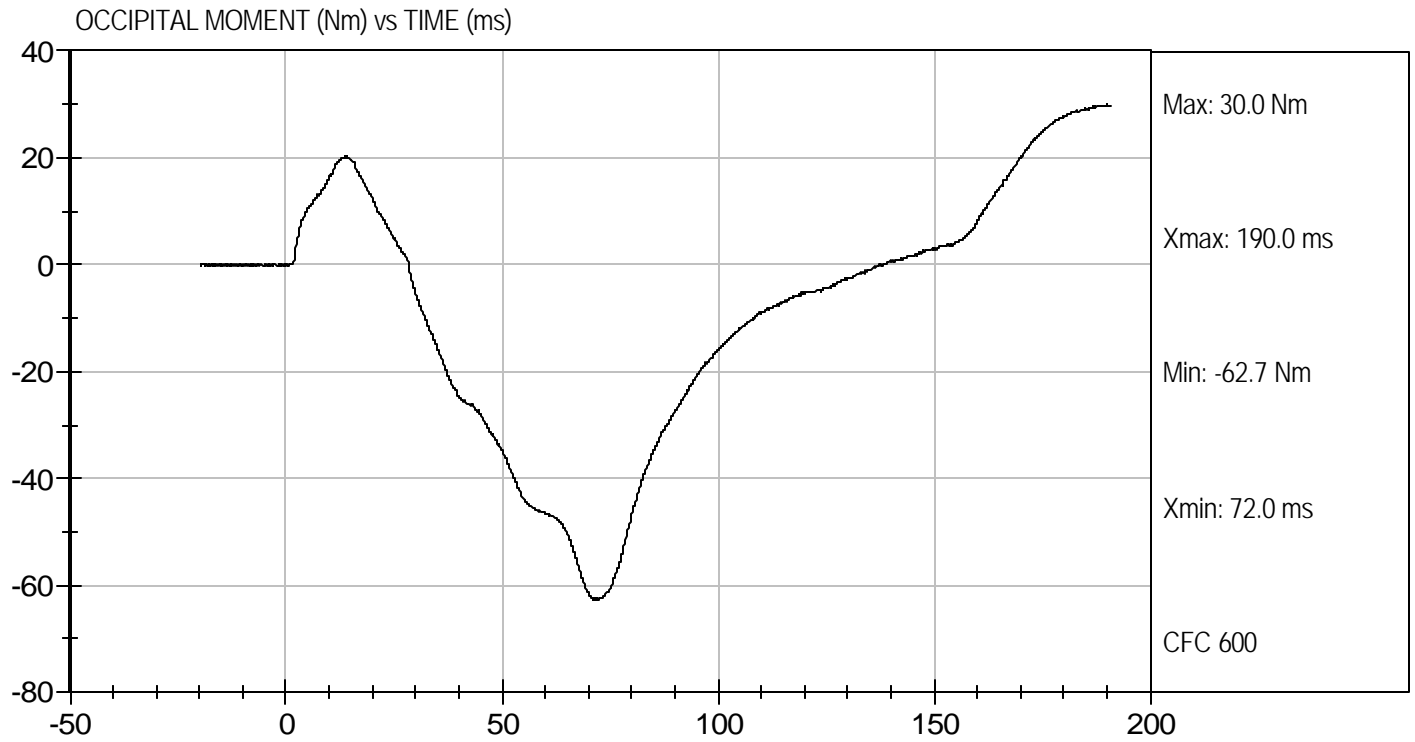
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Component ID: D071183

Test Date: 5/1/07
Velocity: 19.84 ft/s, 6.05 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 401

Test Date 5/1/07

Technician Tim Bratz

- 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 12A.

3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(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. (572.34(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.5

Record the maximum humidity 43%

Record the minimum humidity 41%

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 (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). 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

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- 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. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- 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. 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 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. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s \leq speed \leq 22.4 f/s	21.9
Chest Compression	2.50 in. \leq compression \leq 2.86 in.	2.56
Peak resistance force**	1160 lb \leq peak force \leq 1325 lb	1207
Internal Hysteresis***	69% \leq 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 (572.34(b))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve.

X 17. Plots of chest compression, pendulum acceleration, pendulum speed, and force, follow this sheet.


Signature

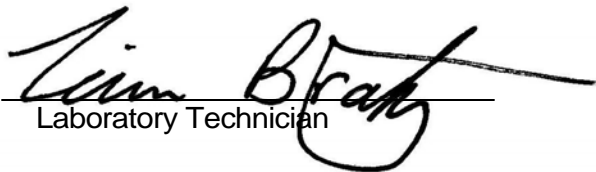
5/1/07
Date

**MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE**

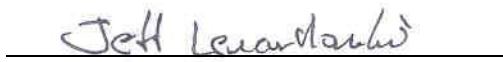
ATD Serial No: 401

Test I.D: D071184

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,367	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.51	Pass
Internal Hysteresis	%	69 to 85	69	Pass
			Overall Test Results	Pass


Laboratory Technician

05/01/07
Test Date

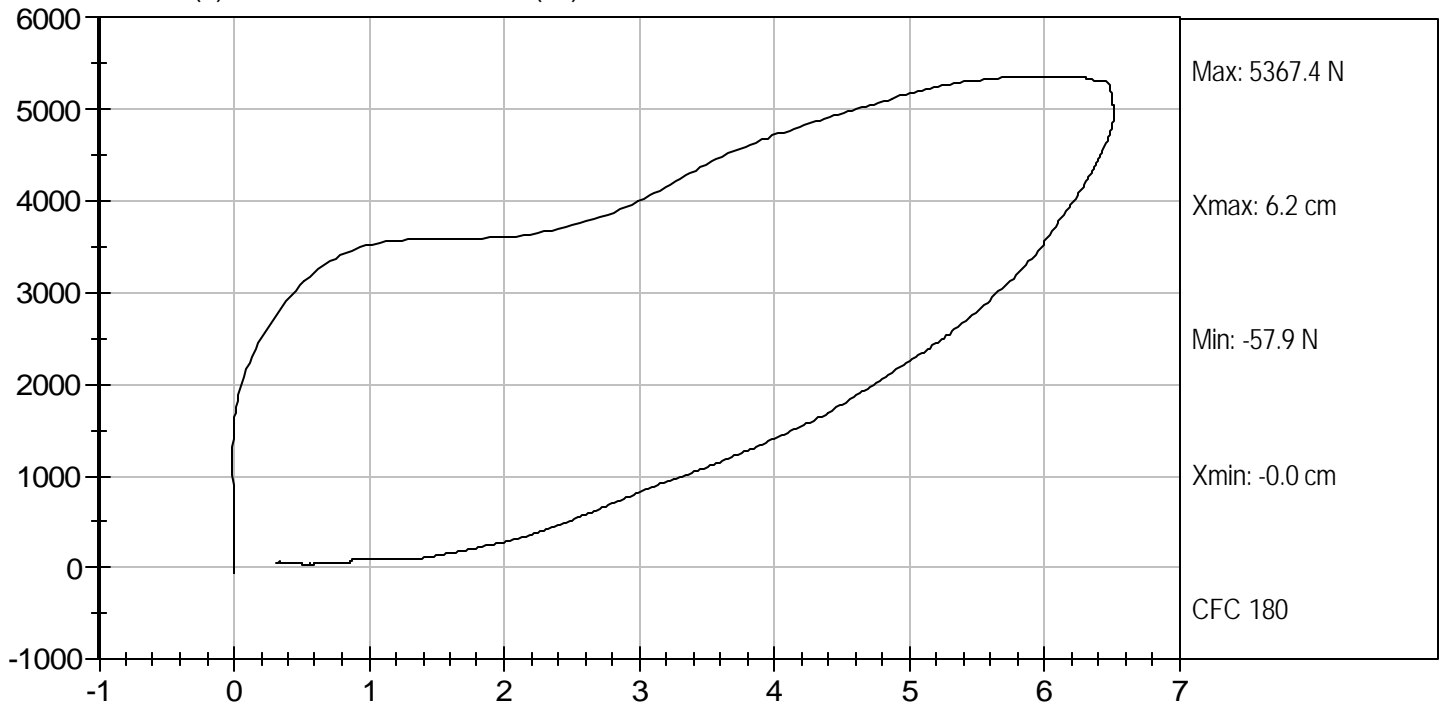

Approved By



Test Desc: Thorax Impact
Component ID: D071184

Test Date: 05/01/07
Velocity: 21.92 ft/s, 6.68 m/s

FORCE (N) vs CHEST DISPLACEMENT (cm)



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 4/27/07

Technician Jessica Gall

- Pretest calibration
 Post test calibration verification

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

1. It has been at least 30 minutes since the last knee impact test. (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
Record the maximum temperature 21.5
Record the minimum temperature 21.3
Record the maximum humidity 38%
Record the minimum humidity 37%
5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1131

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))

Jessica Hall
Signature

4/27/07
Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 401

Test I.D: D071186

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,031	Pass
Overall Test Results				Pass

Jessica Hall
 Laboratory Technician

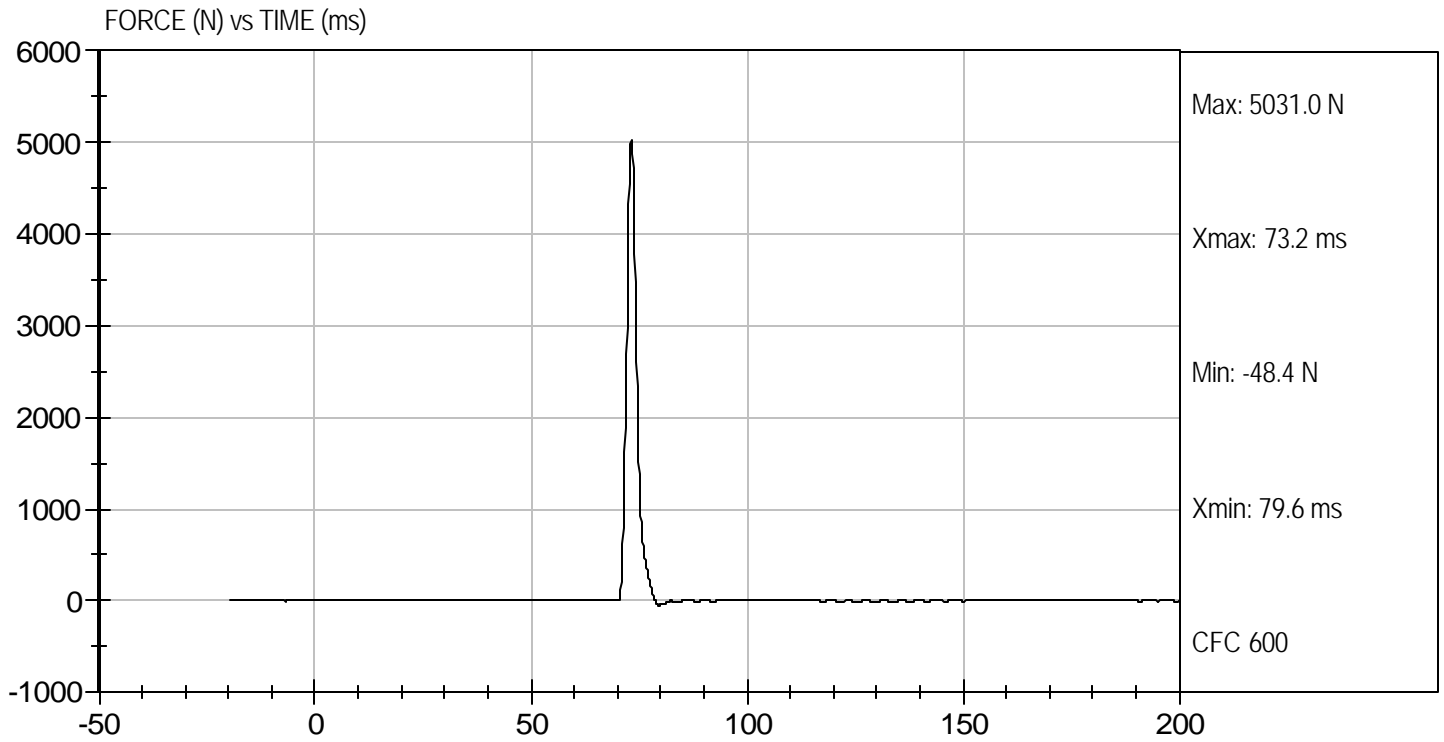
4/27/07
 Test Date

David Winkelbauer
 Approved By



Test Desc: Left Knee
Component ID: D071186

Test Date: 4/27/07
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 4/27/07

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. (572.36(m))
 N/A, ONLY one knee impact test performed
2. The test fixture conforms to the specifications in Figure 14A.
3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
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. (572.35(b)(2)(ii))
Record the maximum temperature 21.5
Record the minimum temperature 21.3
Record the maximum humidity 38%
Record the minimum humidity 37%
5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
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 6.8 ft/s and 7.0 ft/s. (572.35(b))
11. Complete the following table:

Knee Impact Results (572.35(b)(1))

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1115

*Force = impactor mass x deceleration (572.35(b)(1))

X 12. Plots of pendulum acceleration, pendulum speed, and force, follow this sheet. Time zero is defined as the time of contact between the test probe and the knee. (572.3(b)(2)(vii))

Jessica Hall
Signature

4/27/07
Date

**MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE**

ATD Serial No: 401

Test I.D: D071185

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,959	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

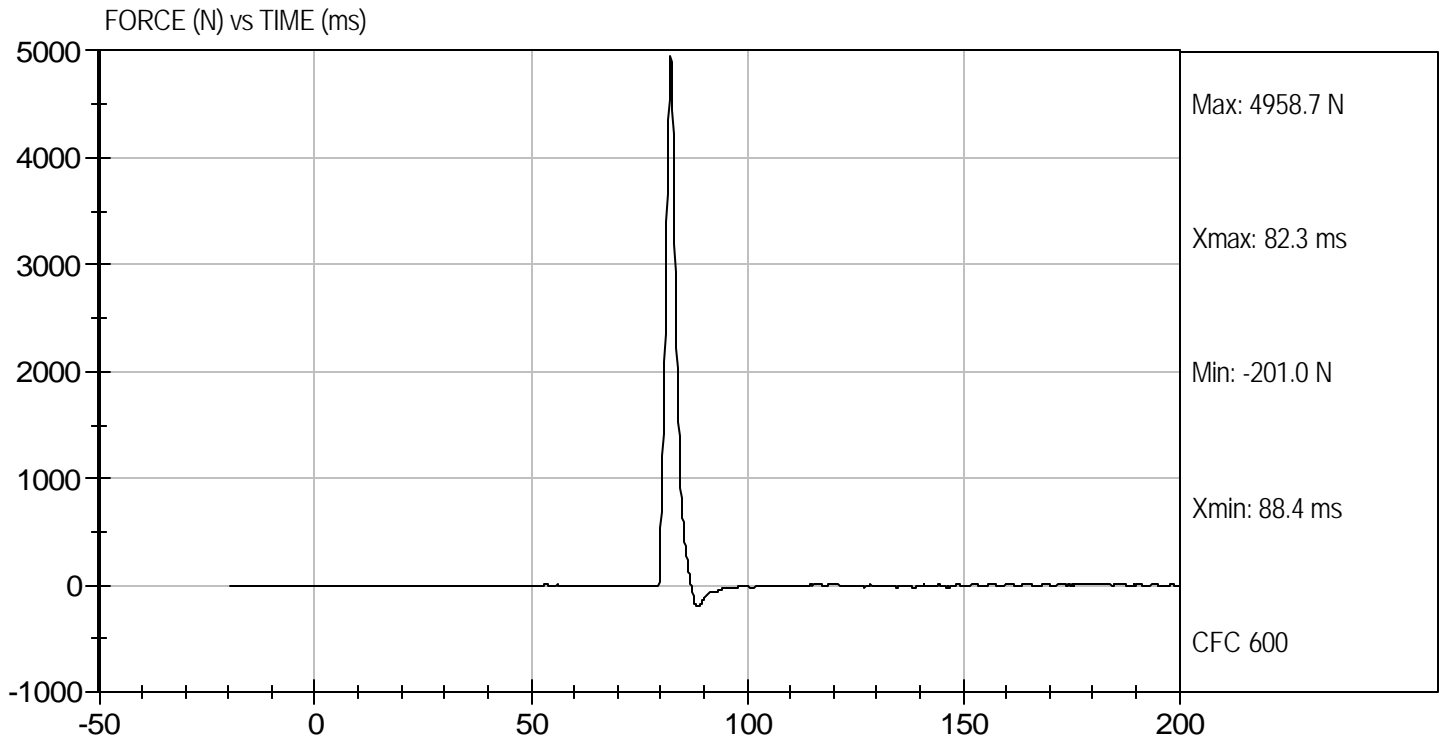
4/27/07
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D071185

Test Date: 4/27/07
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c))

Dummy Serial Number 401

Test Date 4/30/07

Technician Tim Bratz

- Pretest calibration
 Post test calibration verification

Test attempt no. 1 (when successive hip joint-femur flexion tests are necessary)

1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
 N/A, ONLY one hip joint-femur flexion test performed
2. The test fixture conforms to the specifications in Figure 17A.
3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 3.2 remove the abdominal insert (78051-52)
 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
4. The 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. (572.35(c)(v))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.2</u> |
| Record the minimum temperature | <u>20.5</u> |
| Record the maximum humidity | <u>40%</u> |
| Record the minimum humidity | <u>33%</u> |
5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
7. Adjust the threaded rods until plane B is horizontal.
8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

X 10. Complete the following table:

Left Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^\circ \leq \text{rotation rate} \leq 10^\circ$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	51
Rotation at 150 lbf-ft	$40^\circ \leq \text{rotation} \leq 50^\circ$	40

X 11. Secure the lever arm into the right femur shaft opening of the upper leg structure assembly (78051-44) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))

X 12. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the $\frac{1}{2}$ in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19). (572.35(c)(2)(iv))

X 13. Complete the following table:

Right Hip Joint-Femur Flexion Results (572.35(c)(1) & (c)(2)(iv))

Parameter	Specification	Result
Rotation Rate	$5^\circ \leq \text{rotation rate} \leq 10^\circ$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	56
Rotation at 15 lbf-ft	$40^\circ \leq \text{rotation} \leq 50^\circ$	40


Signature

4/30/07
Date

MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

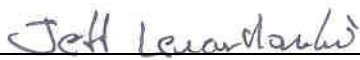
ATD Serial No: 401

Test I.D: D071189

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.5	20.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	40	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	75.8	69.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	40	40	Pass
Overall Test Results					Pass


 Laboratory Technician

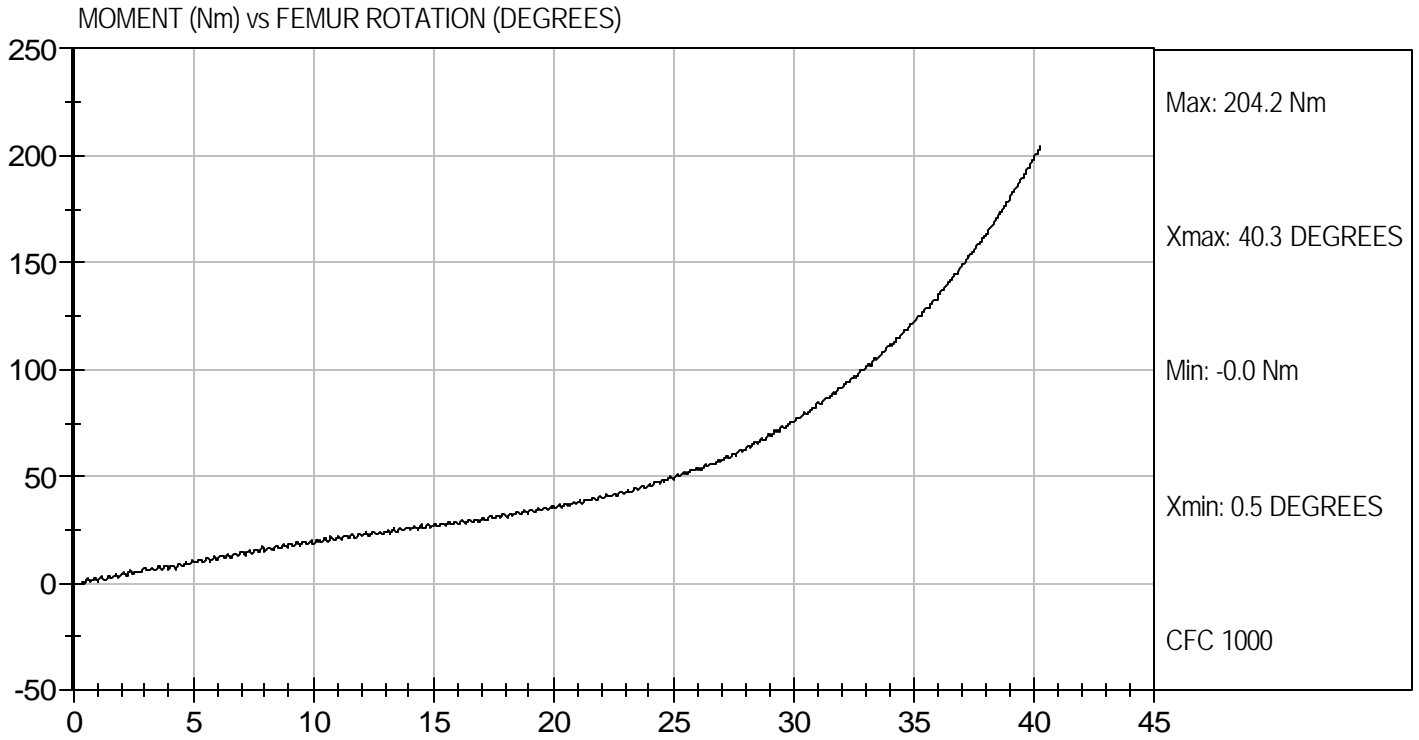
04/30/07
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D071189

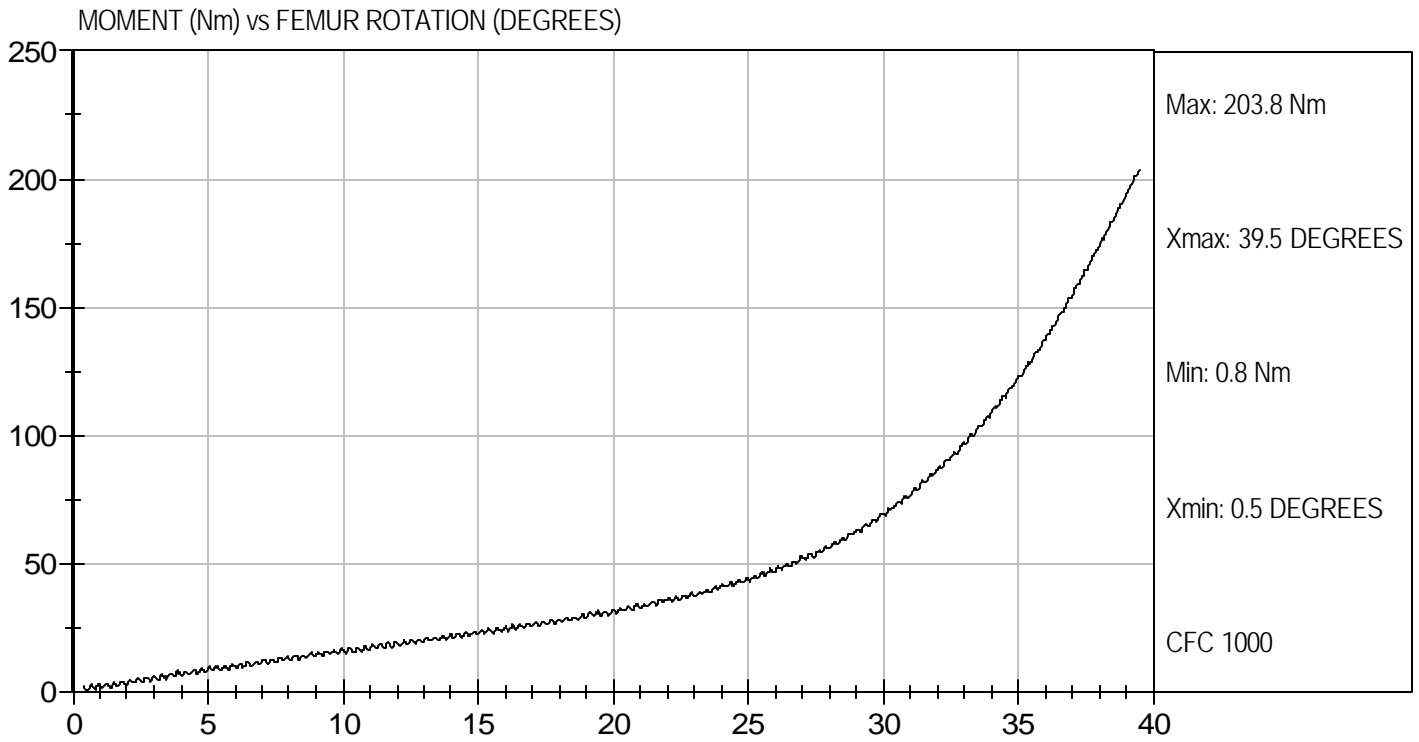
Test Date: 04/30/07
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D071180

Test Date: 04/30/07
Velocity: 0 ft/s, 0.00 m/s



HYBRID III 50 th SN #401, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.7
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.2
C	H-POINT HEIGHT	Reference	3.3-3.5	3.5
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.8
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.	13.0-13.6	13.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
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".	17.8-18.8	18.5

HYBRID III 50th SN #401, PART 572, SUBPART E EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.2
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.7
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.5
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

DATA SHEET A1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 401

Test Date 4/26/07

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
Spine	Nodding blocks cracked or out of position			X
	Broken or cracks in rubber.			X
	Broken or bent ribs			X
Ribs	Broken or bent rib supports			X
	Damping material separated or cracked			X
Chest Displacement Assembly	Rubber bumpers in place			X
	Bent shaft			X
Transducer leads	Slider arm riding in track			X
	Torn cables			X

Dummy Item	Inspect for	Comments	Damaged	OK
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			
	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

5/1/07
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

5/1/07
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #510, 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	786.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.0
C	H-POINT HEIGHT	Reference	81.3-86.3	84.1
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	82.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	133.9
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	249.6
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.0
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	278.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	202.1
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	543.6
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	358.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	397.0
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".	414.0-439.4	434.2

HYBRID III 5th SN #510, PART 572, 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	181.0
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.4
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	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.9
U	HIP BREADTH	The widest part of the hip	299.7-314.9	301.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	351.4
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	79.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	539.5
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	876.4
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	788.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	334.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	168.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 510 Test Date 2/15/06

Technician Tim Bratz

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>22.1</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>21%</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	$250 \text{ g} \leq x \leq 300 \text{ g}$	255
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.


Signature

2/15/06
Date

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 510

Test ID: D06411

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	250 - 300	255	Pass
Peak Lateral Acceleration	G's	+/- 15	-11.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

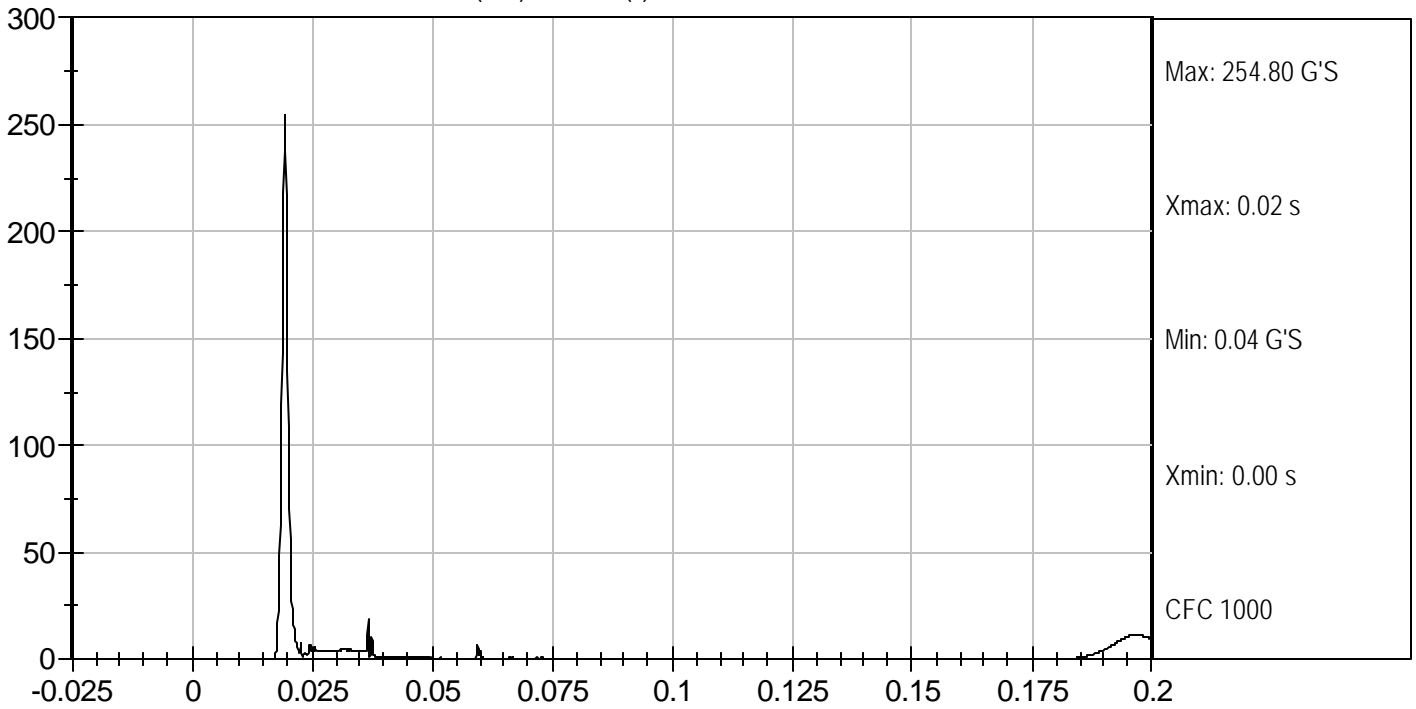

 Laboratory Technician

02/15/2006
 Test Date

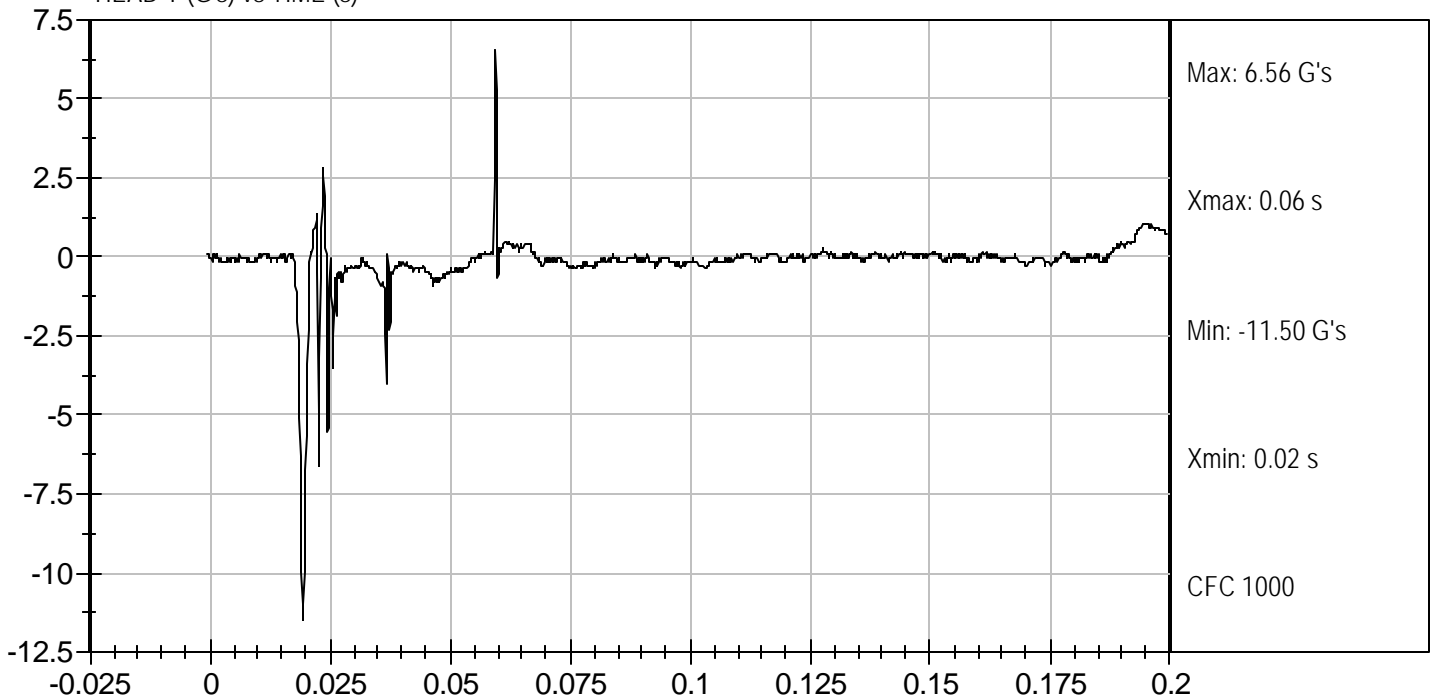

 Approved By



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 510 Test Date 2/15/06

Technician Tim Bratz

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>21.3</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>21%</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 86; 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 m/s \leq speed \leq 7.13 m/s	6.96 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.3 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.3 m/s
	@30ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	5.8 m/s
Plane D Rotation		Peak moment* 69 Nm \leq moment \leq 83 Nm during the following rotation range $77^\circ \leq$ angle $\leq 91^\circ$	<u>79</u> Nm @ <u>75</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms \leq time \leq 100ms	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.


Signature

2/15/06
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

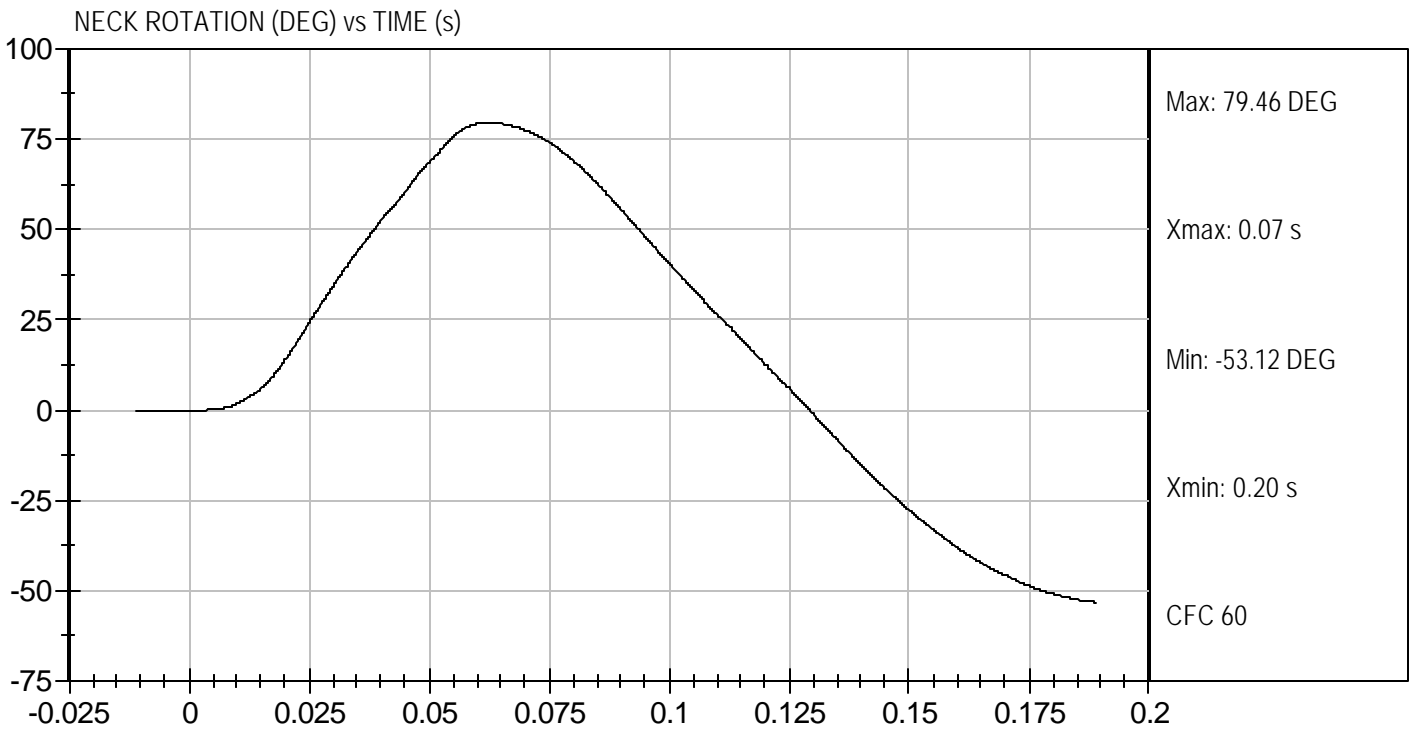
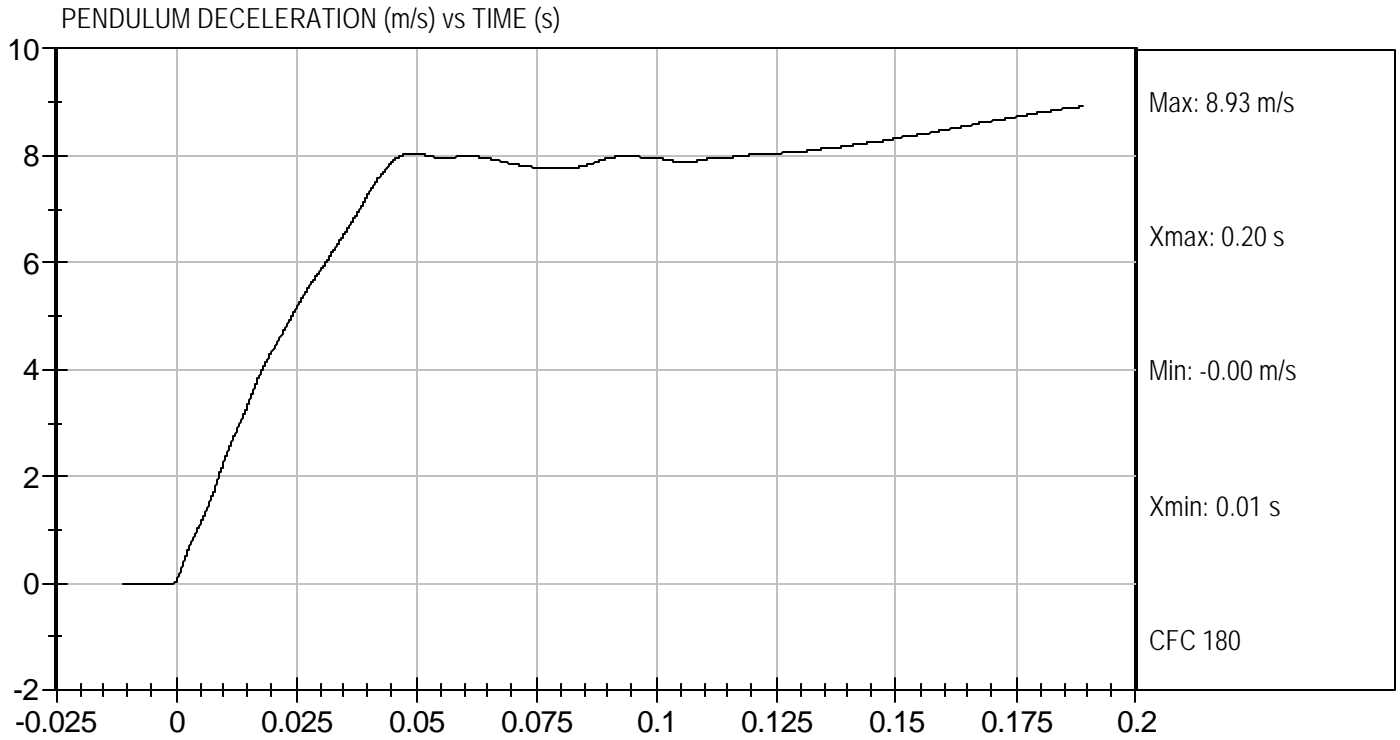
Test I.D.: D06412

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	22	Pass	
Pendulum Speed	m/sec	6.89 to 7.13	6.96	Pass	
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.3	Pass
	20 msec	m/sec	4.0 to 5.0	4.3	Pass
	30 msec	m/sec	5.8 to 7.0	5.8	Pass
D Plane Rotation	Max	deg	77 to 91	79	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	90	Pass	
			Overall Results	Pass	


 Laboratory Technician

02/15/2006
 Test Date

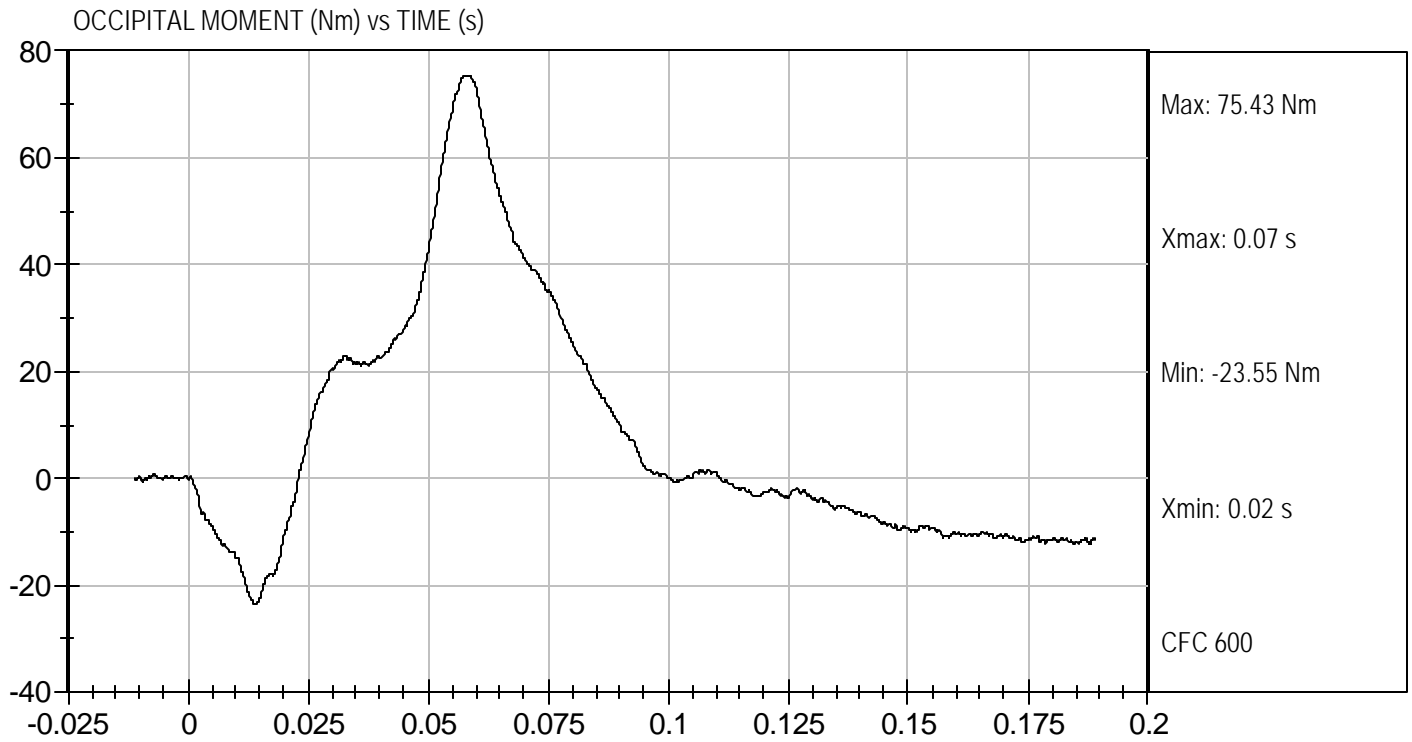

 Approved By





Test Desc: Neck Flexion
Component ID: D06412

Test Date: 02/15/2006
Velocity: 22.84 ft/s, 6.96 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 510 Test Date 2/15/06

Technician Tim Bratz

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>22.1</u>
Record the minimum temperature	<u>21.3</u>
Record the maximum humidity	<u>22%</u>
Record the minimum humidity	<u>21%</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 86; 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 m/s \leq speed \leq 6.19 m/s	6.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s
	@30ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s
Plane D Rotation	Peak moment* -65 Nm \leq moment \leq -53 Nm during the following rotation range $99^\circ \leq$ angle \leq 114°	<u>-58</u> Nm @ <u>109</u> degrees
Negative Moment Decay** (Extension)	Time to decay to -10 Nm 94 ms \leq time \leq 114 ms	104 ms

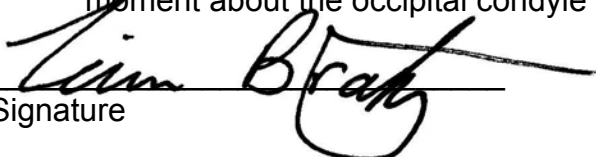
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

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

2/15/06
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

Test I.D: D06413

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	21	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	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	109	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

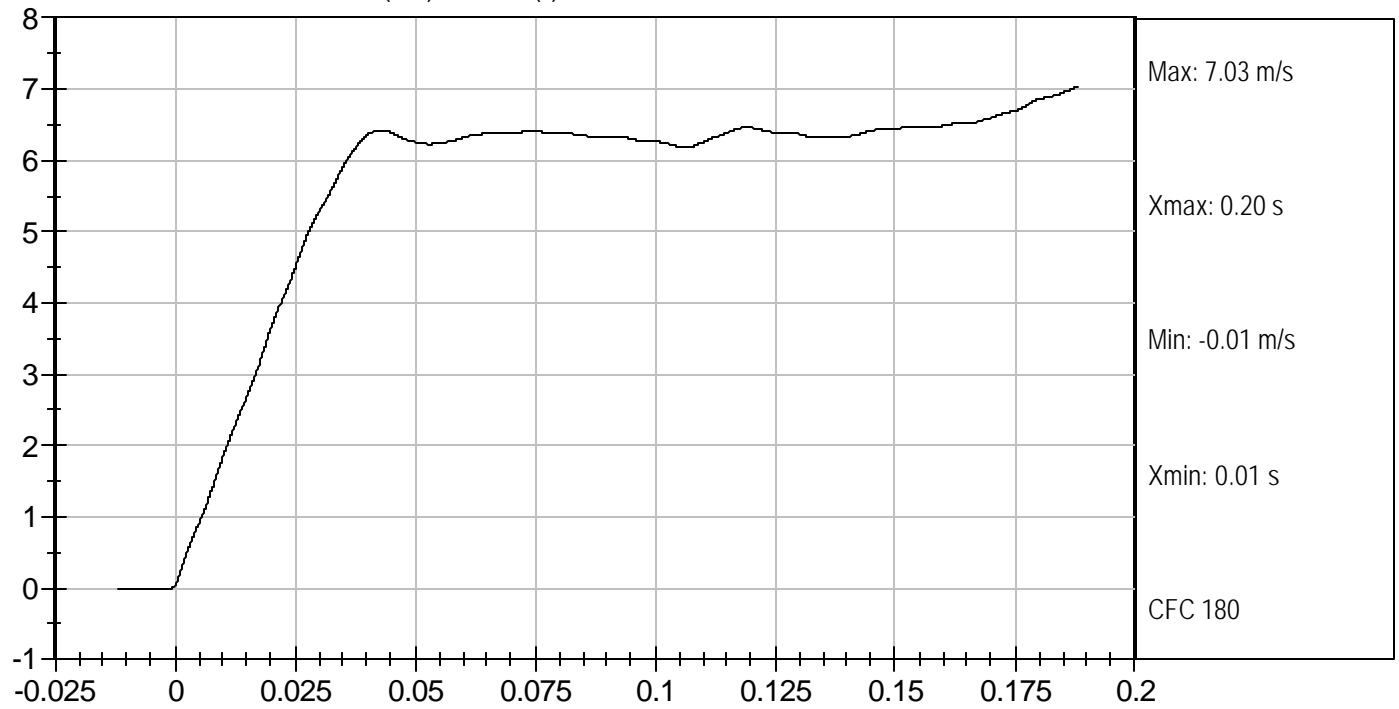
02/15/2006

Test Date

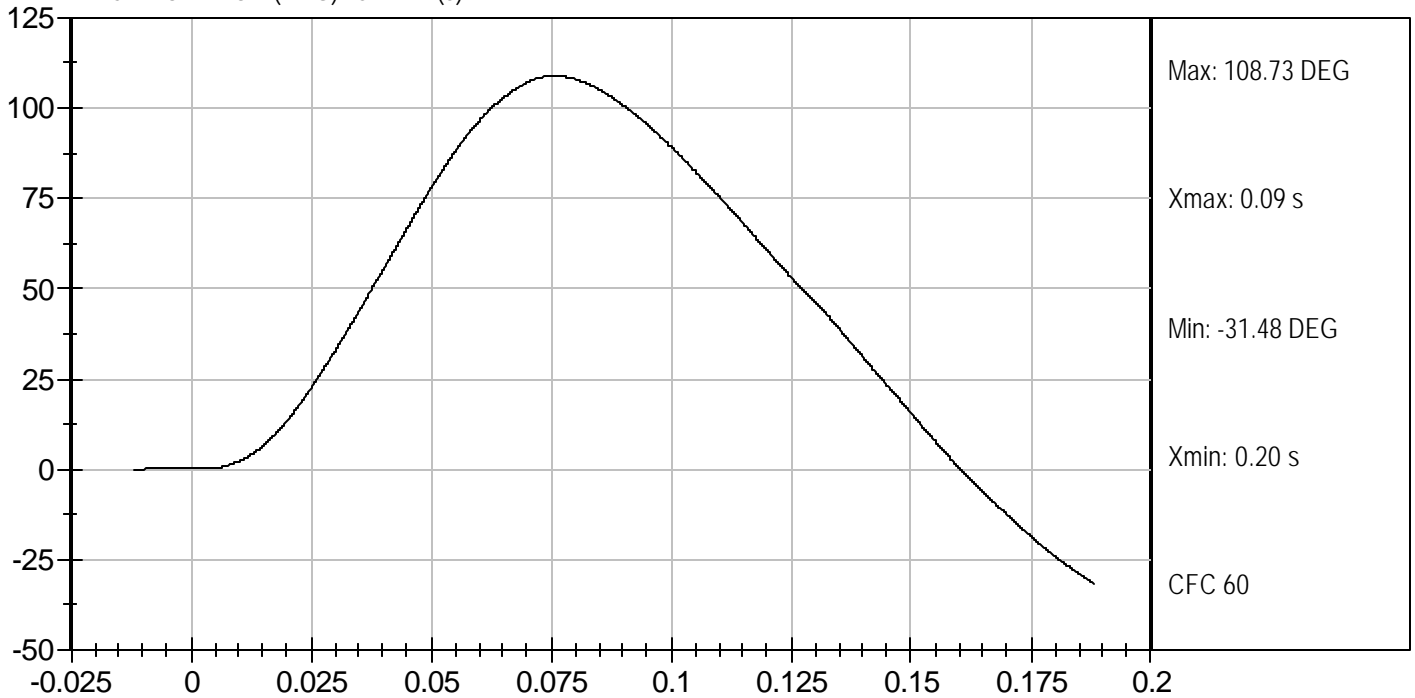

 Approved By

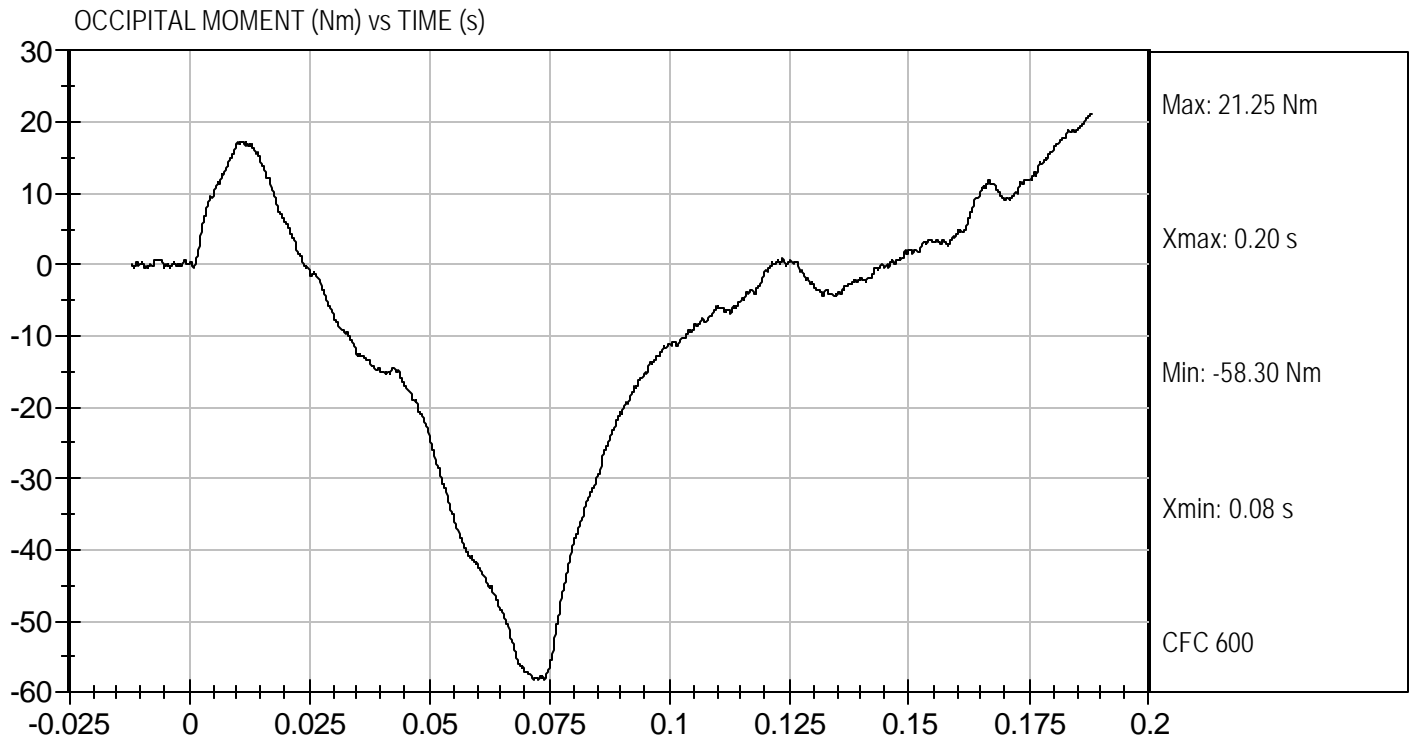


PENDULUM DECELERATION (m/s) vs TIME (s)



NECK ROTATION (DEG) vs TIME (s)





DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 510 Test Date 2/16/06

Technician Tim Bratz

- 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	<u>21.5</u>
Record the minimum temperature	<u>21.3</u>
Record the maximum humidity	<u>26%</u>
Record the minimum humidity	<u>24%</u>

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	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.71 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	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4100 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force $\leq 4600 \text{ N}$	4118 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

2/16/06
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

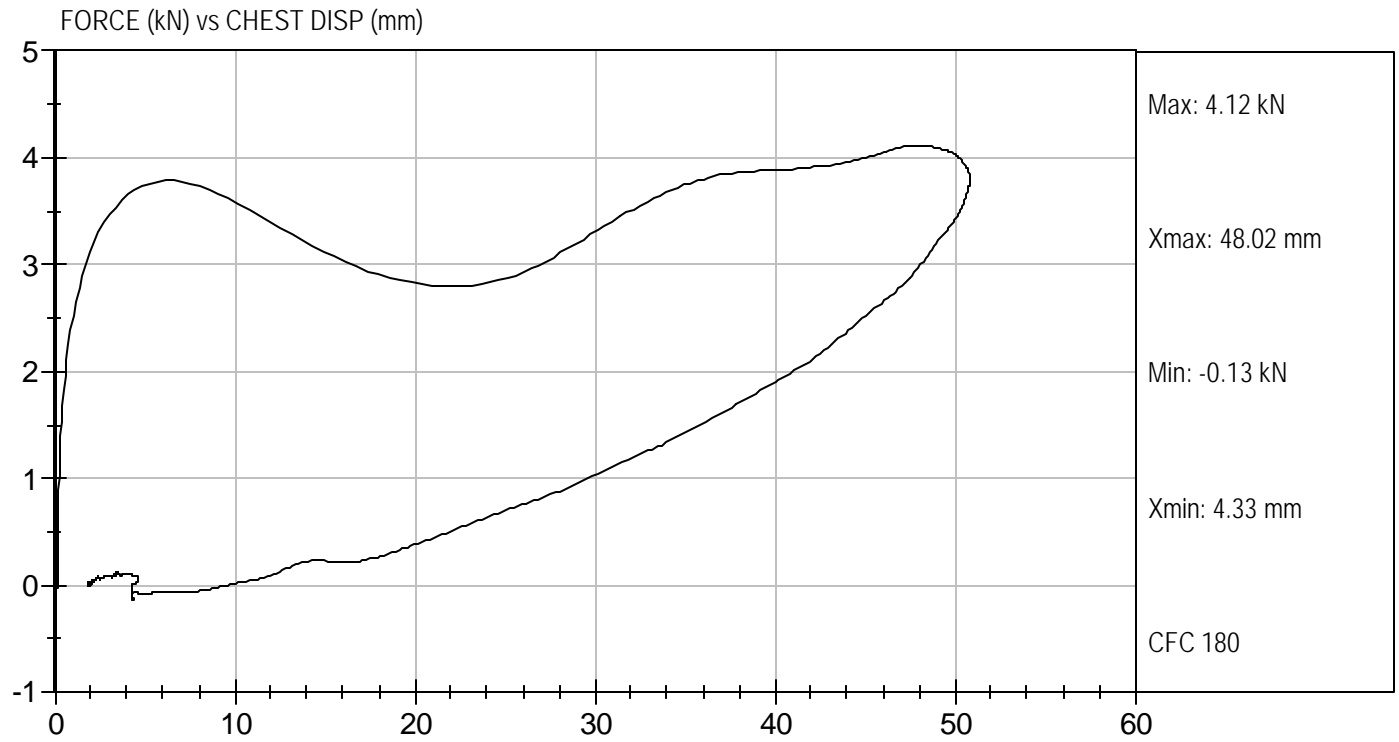
Test I.D.: D06414

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.1	Pass
Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	6.59 to 6.83	6.71	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.1	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4118	Pass
Overall Test Results				Pass


 Laboratory Technician

02/15/2006
 Test Date


 Approved By



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 510 Test Date 2/15/06

Technician Tim Bratz

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>22.1</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>21%</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°) 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 $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	375 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	17°



 Signature

2/15/06

 Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

Test I.D: D06417

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Initial Angle	deg	0 to 20	15	Pass
Return Angle	deg	+/- 8	17	Pass
Force at 45 deg	N	320 to 390	375	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


 Laboratory Technician

02/15/2006
 Test Date


 Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 510

Test Date 2/16/06

Technician Tim Bratz

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 21.5

Record the minimum temperature 21.3

Record the maximum humidity 26%

Record the minimum humidity 24%

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*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3590 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

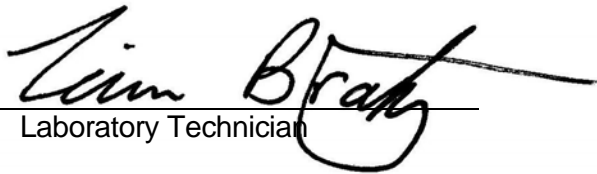
2/16/06
Date

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

ATD Serial No: 510

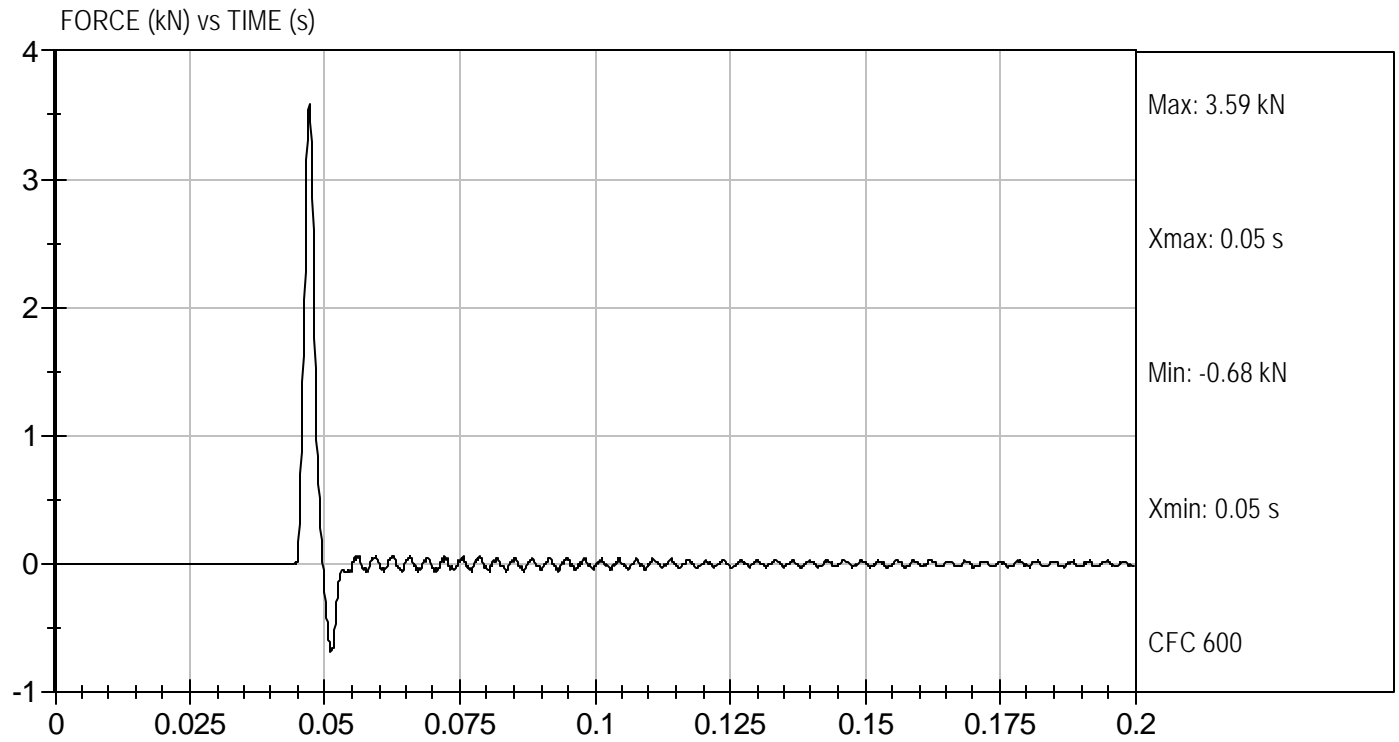
Test I.D.: D06416

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.59	Pass
Overall Test Results				Pass


Laboratory Technician

02/16/2006
Test Date


Approved By



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 510 Test Date 2/16/06

Technician Tim Bratz

- 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	<u>21.5</u>
Record the minimum temperature	<u>21.3</u>
Record the maximum humidity	<u>26%</u>
Record the minimum humidity	<u>24%</u>
- 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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3720 N

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

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


Signature

2/16/06
Date

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

ATD Serial No: 510

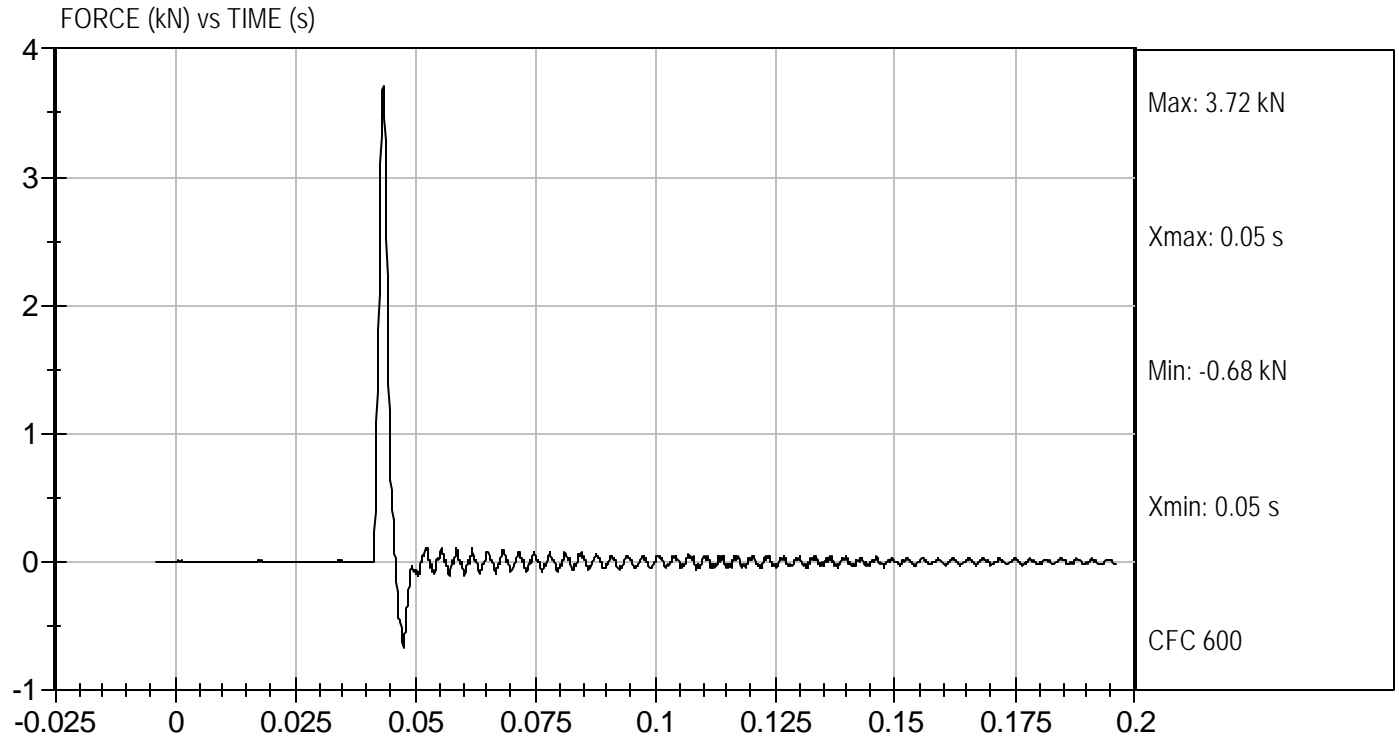
Test I.D.: D06415

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.72	Pass
Overall Test Results				Pass


 Laboratory Technician

02/16/2006
 Test Date


 Approved By



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 510 Test Date 3/29/06

Technician Tim Bratz

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>21.5</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>28%</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	$250 \text{ g} \leq x \leq 300 \text{ g}$	266
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 $\leq 15 \text{ g}$	4

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


Signature


3/29/06
Date

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 510

Test ID: D06841

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	250 - 300	266	Pass
Peak Lateral Acceleration	G's	+/- 15	4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

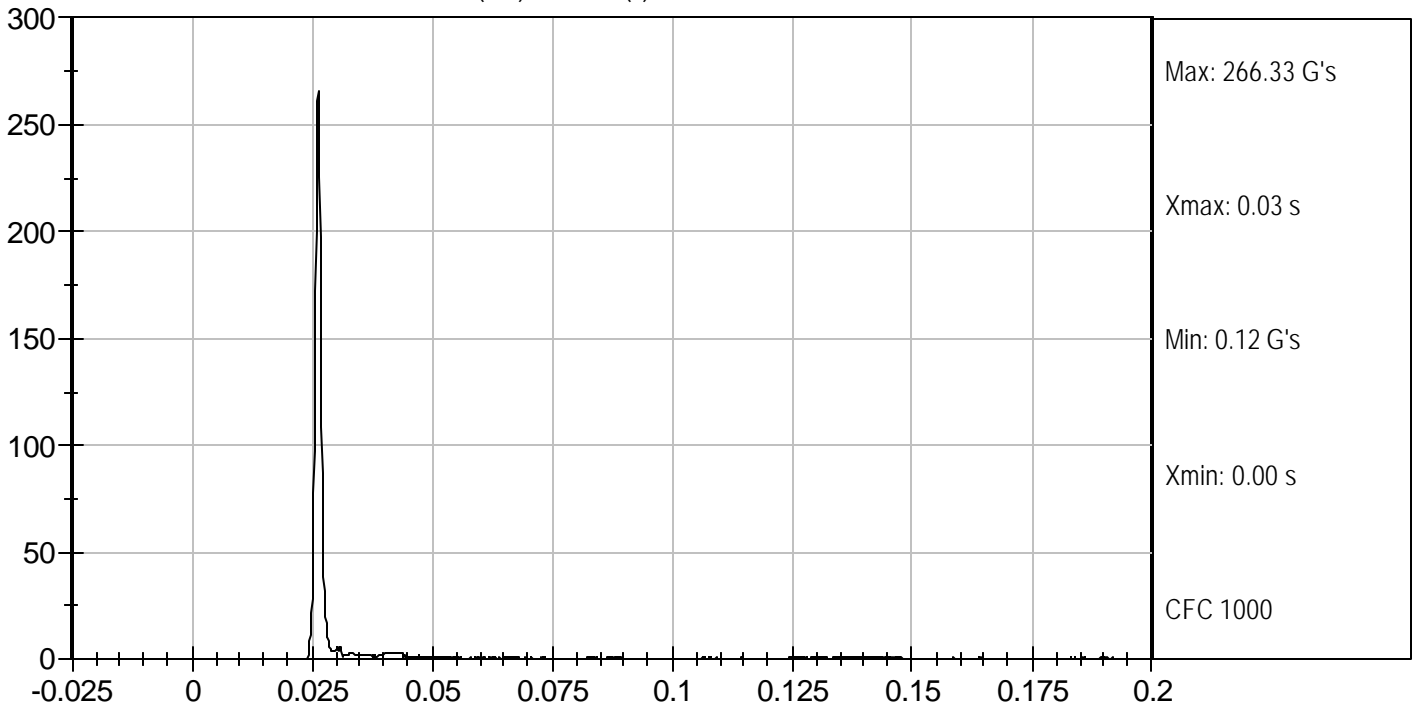

Laboratory Technician

03/29/2006
Test Date

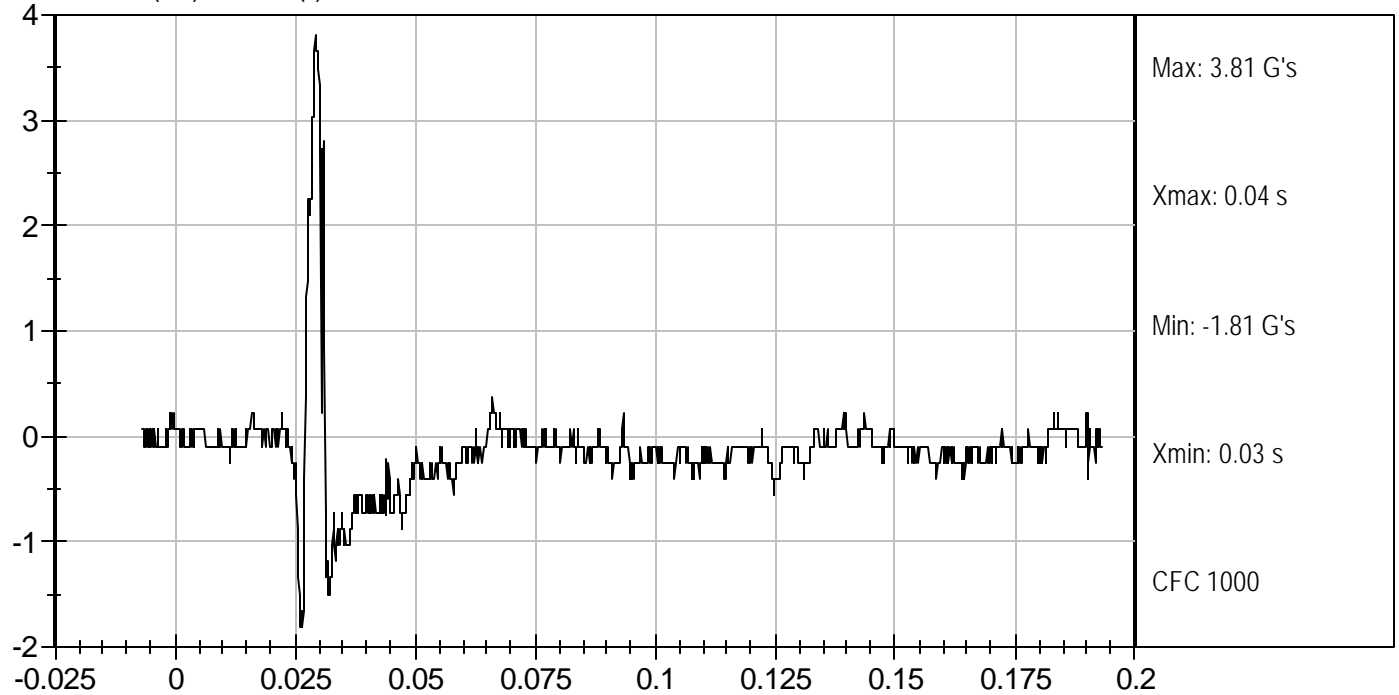

Approved By



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 510 Test Date 3/29/06

Technician Tim Bratz

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>21.7</u> |
| Record the minimum temperature | <u>21.5</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>28%</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 86; 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 m/s \leq speed \leq 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.8 m/s
	@30ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.7 m/s
Plane D Rotation		Peak moment* 69 Nm \leq moment \leq 83 Nm during the following rotation range 77° \leq angle \leq 91°	<u>74</u> Nm @ <u>82</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms \leq time \leq 100ms	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.


Signature

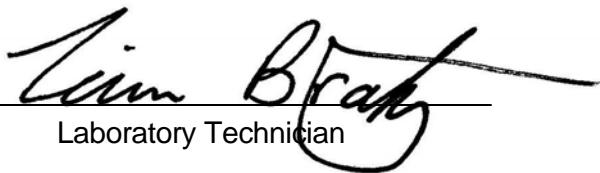
3/29/06
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

Test I.D: D06842

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	32	Pass	
Pendulum Speed	m/sec	6.89 to 7.13	7.06	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	82	Pass
Occipital Condyle Moment within Deflection Corridor	Nm	69 to 83	74	Pass	
Positive Moment Time Curve Decay to 10 Nm	msec	80 to 100	87	Pass	
			Overall Results	Pass	

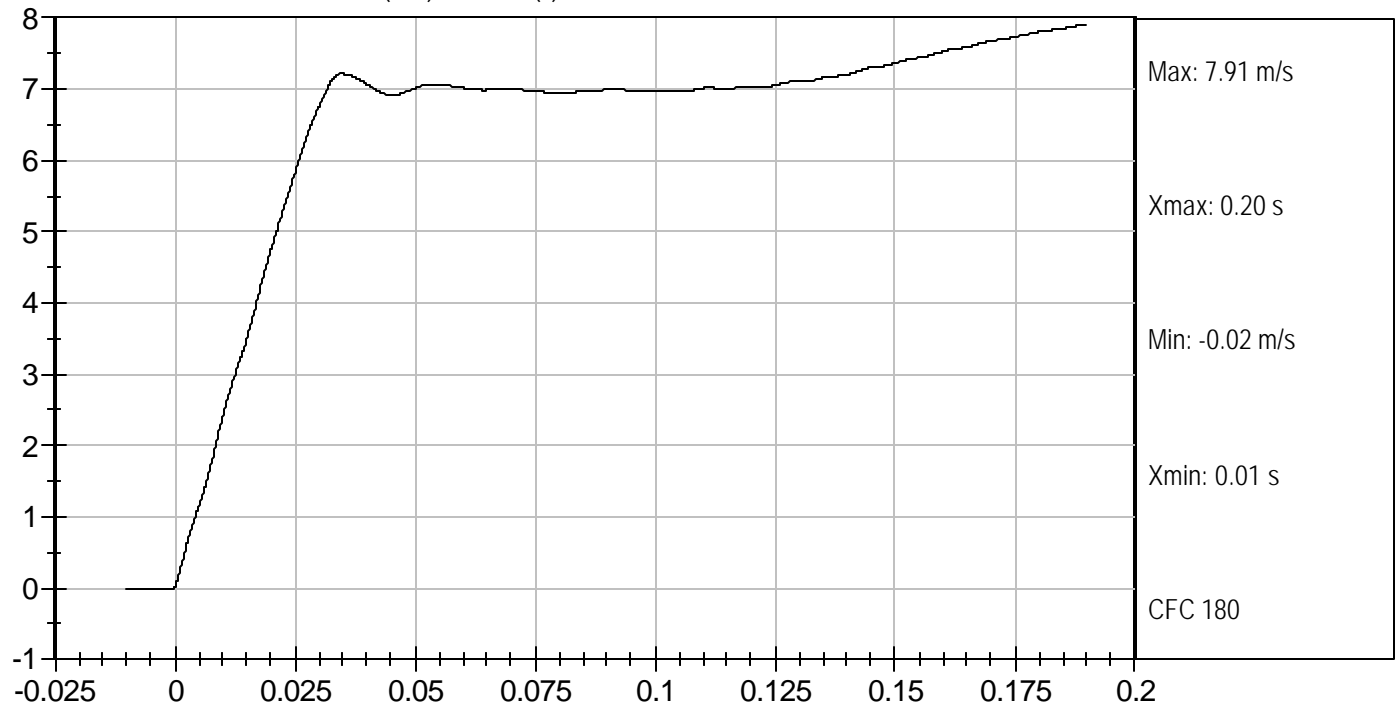

 Laboratory Technician

03/29/2006
 Test Date

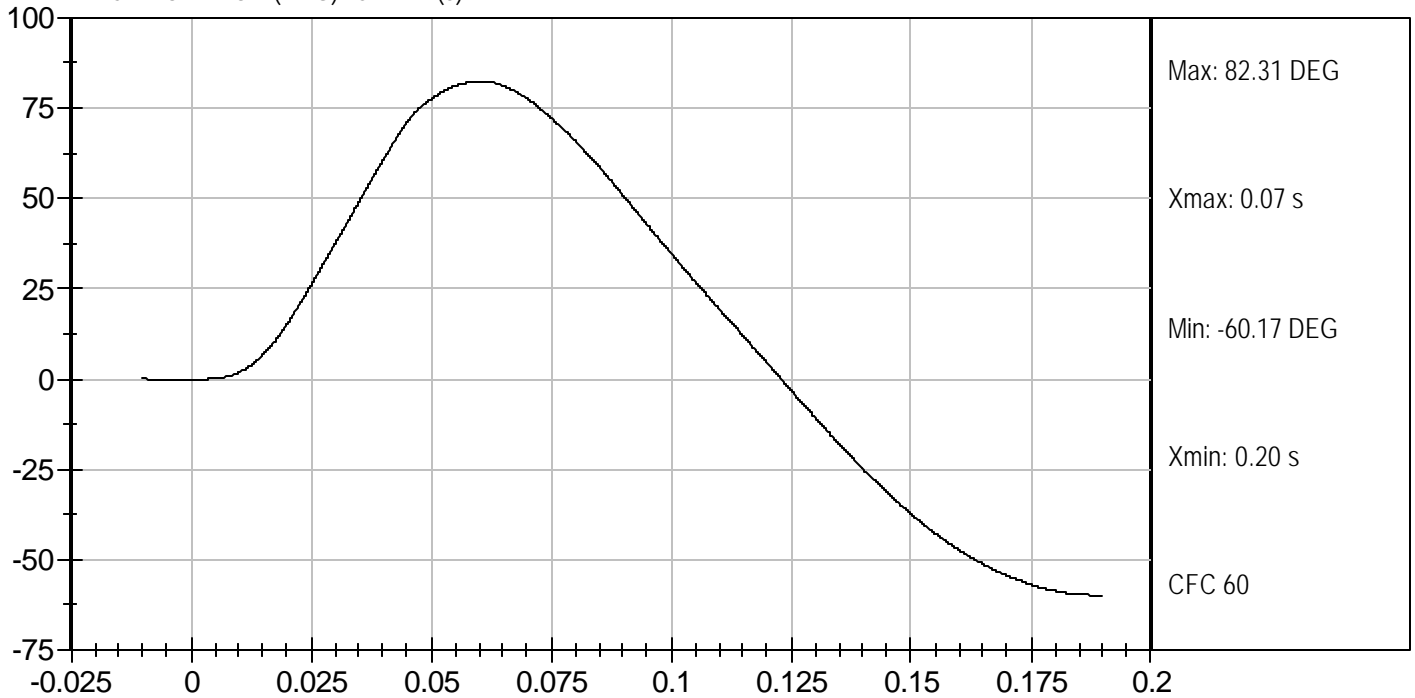

 Approved By



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



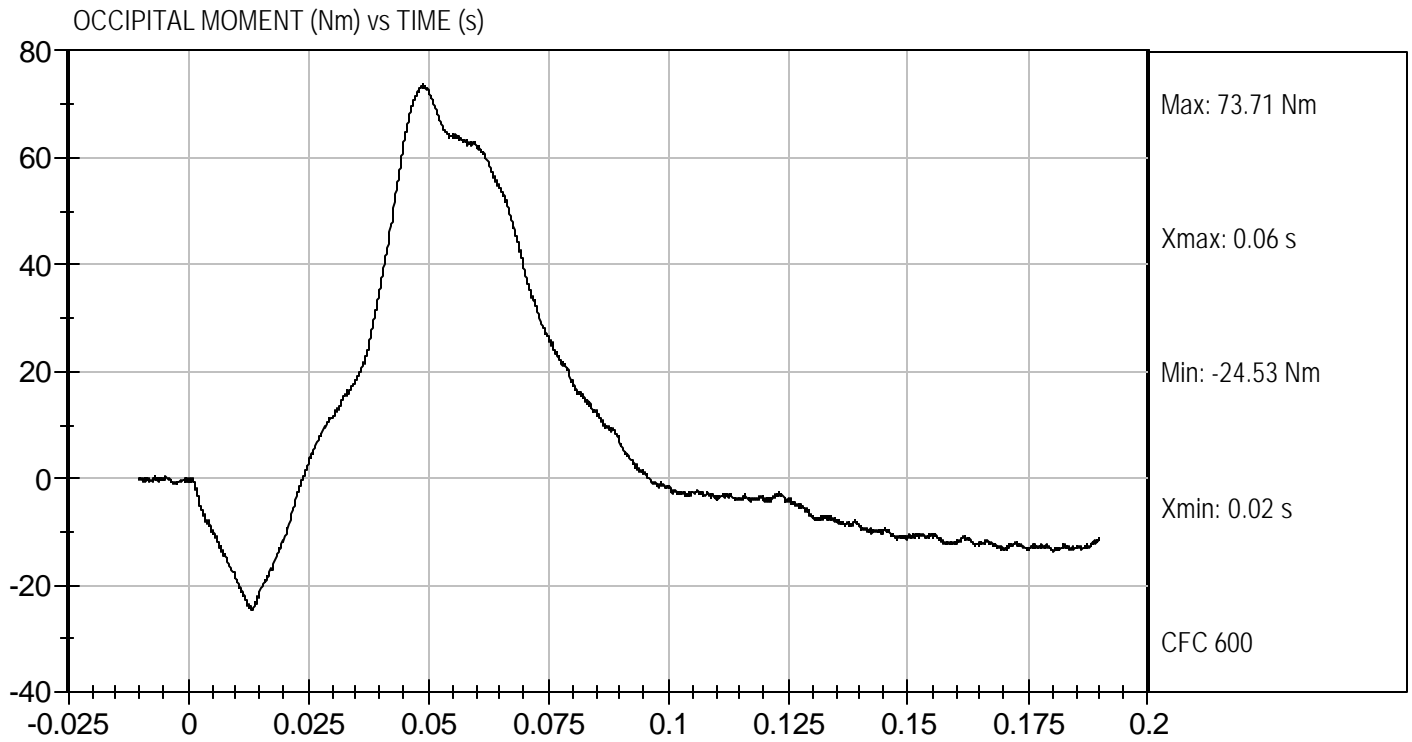
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D06842

Test Date: 03/29/2006
Velocity: 23.17 ft/s, 7.06 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 510 Test Date 3/29/06

Technician Tim Bratz

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>21.7</u> |
| Record the minimum temperature | <u>21.5</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>28%</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 86; 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	$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.17 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$
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>-53</u> Nm @ <u>110</u> degrees
Negative Moment Decay** (Extension)	Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	107 ms

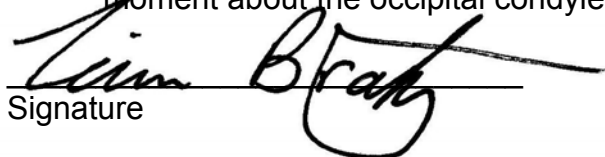
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

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

3/29/06
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

Test I.D: D06843

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.17	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.7	Pass
	20 msec	m/sec	3.1 to 3.9	3.4	Pass
	30 msec	m/sec	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-53	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	107	Pass
Overall Results					Pass


 Laboratory Technician

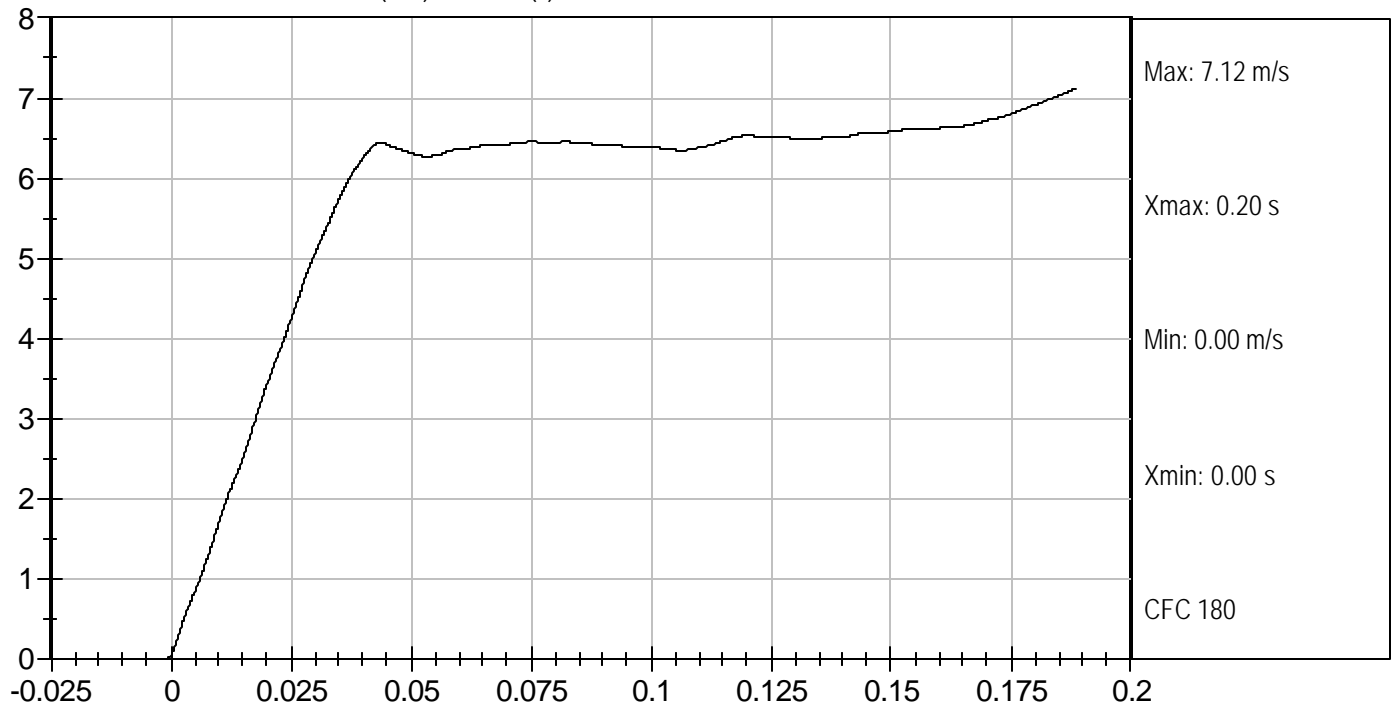
03/29/2006

Test Date

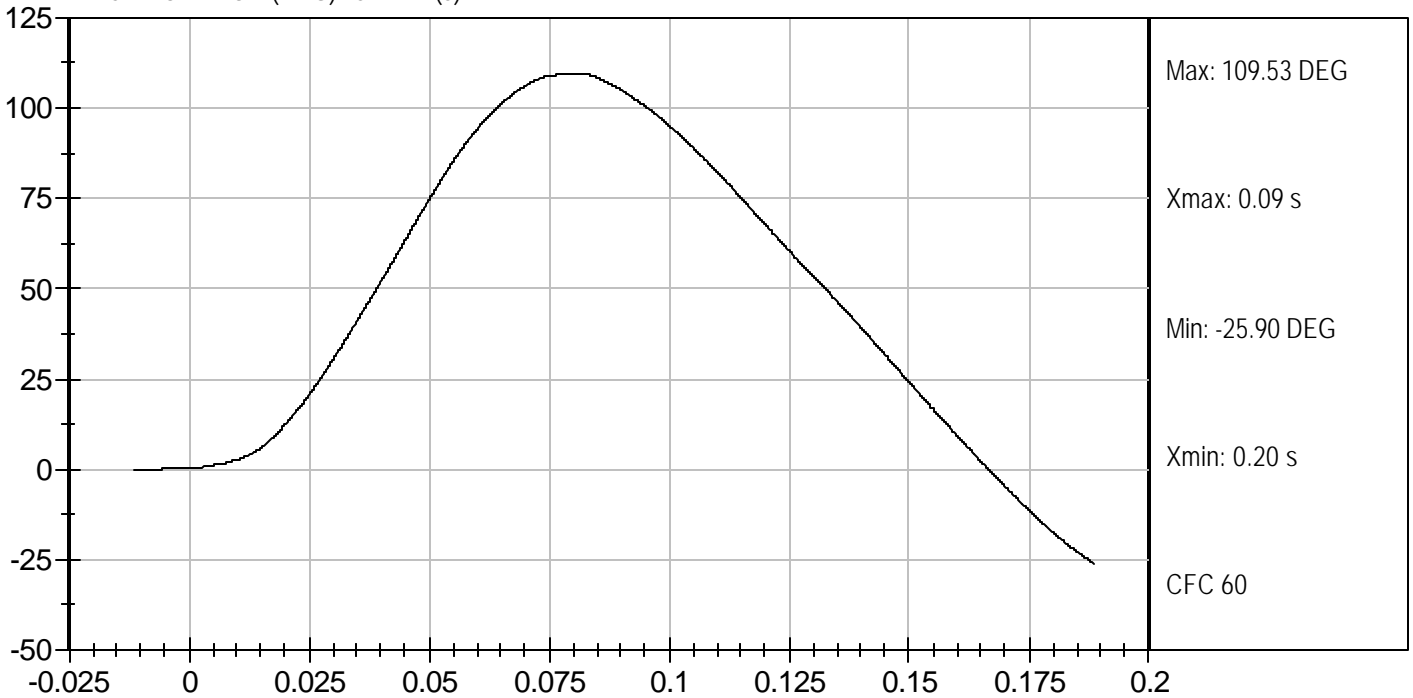

 Approved By



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



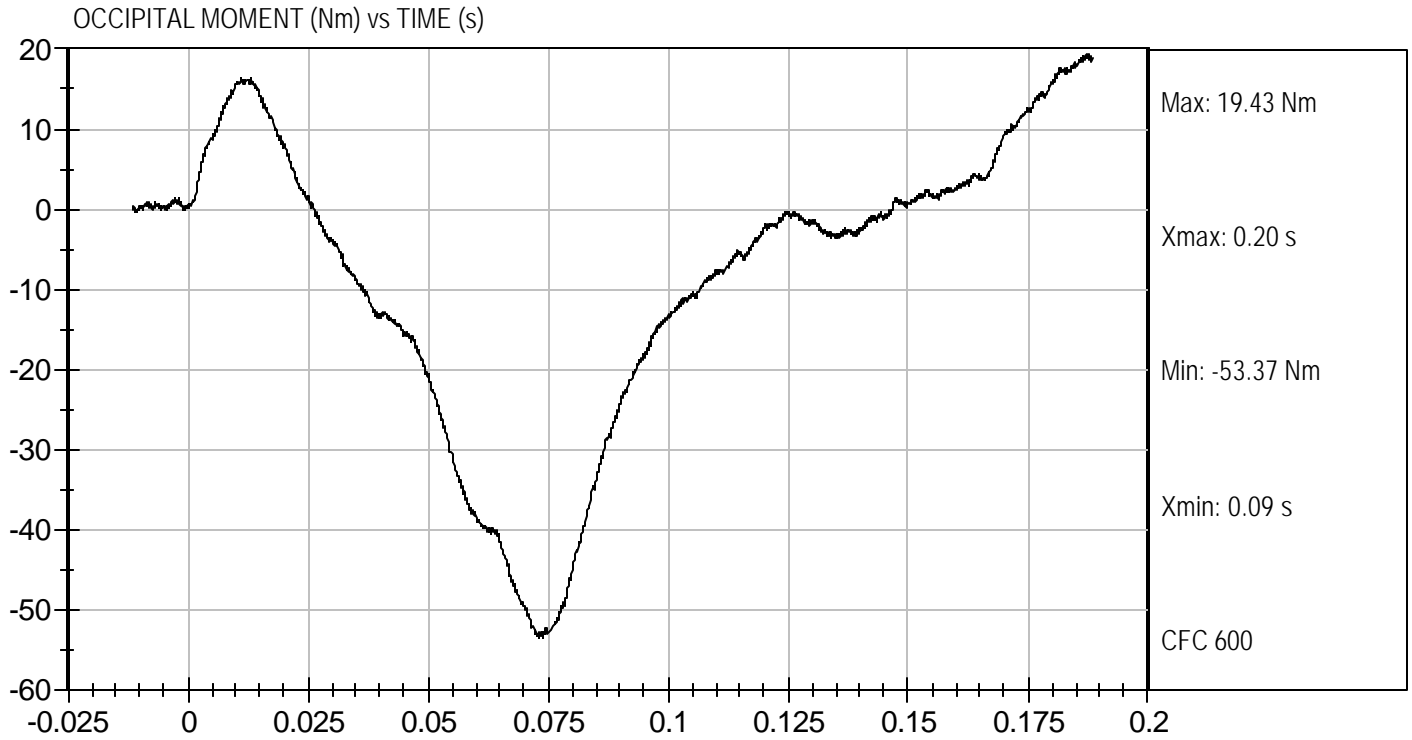
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Extension
Component ID: D06843

Test Date: 03/29/2006
Velocity: 20.24 ft/s, 6.17 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 510 Test Date 3/29/06

Technician Tim Bratz

- 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	<u>21.7</u>
Record the minimum temperature	<u>21.5</u>
Record the maximum humidity	<u>32%</u>
Record the minimum humidity	<u>28%</u>
- 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 m/s ≤ speed ≤ 6.83 m/s	6.77 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4010 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	3973 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 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

3/29/06
 Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

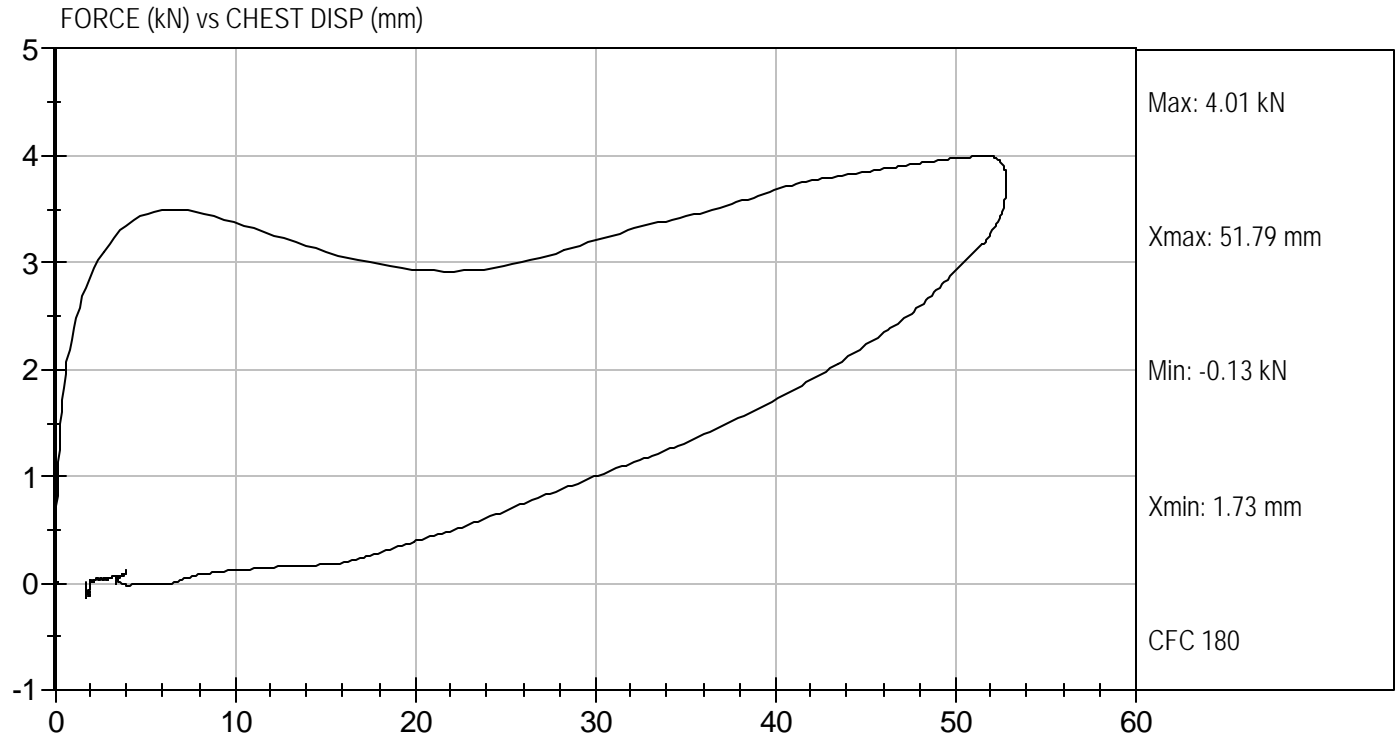
Test I.D.: D06844

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	32	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	53	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	N	≤ 4600 N	3973	Pass
Overall Test Results				Pass


 Laboratory Technician

03/29/2006
 Test Date


 Approved By



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 510 Test Date 3/29/06

Technician Tim Bratz

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>21.7</u> |
| Record the minimum temperature | <u>21.5</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>28%</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°) 18°
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 $\leq 20^\circ$	18°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	368 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	18°

Signature Tim Brab

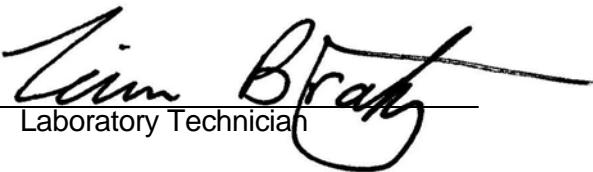
Date 3/29/06

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 510

Test I.D.: D06847

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	18	Pass
Force at 45 deg	N	320 to 390	368	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


 Laboratory Technician

03/29/2006
 Test Date


 Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 510

Test Date 3/29/06

Technician Tim Bratz

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 21.5

Record the maximum humidity 32%

Record the minimum humidity 28%

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))

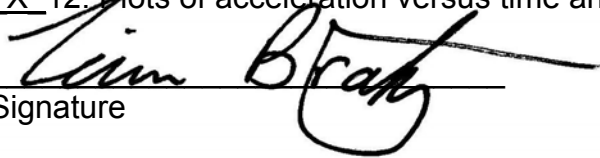
X 11. Complete the following table:

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*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3540 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

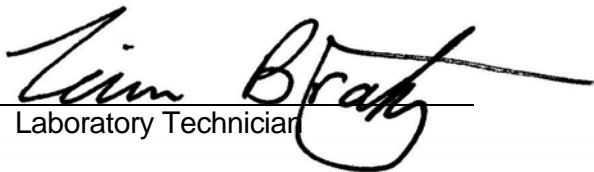
3/29/06
Date

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

ATD Serial No: 510

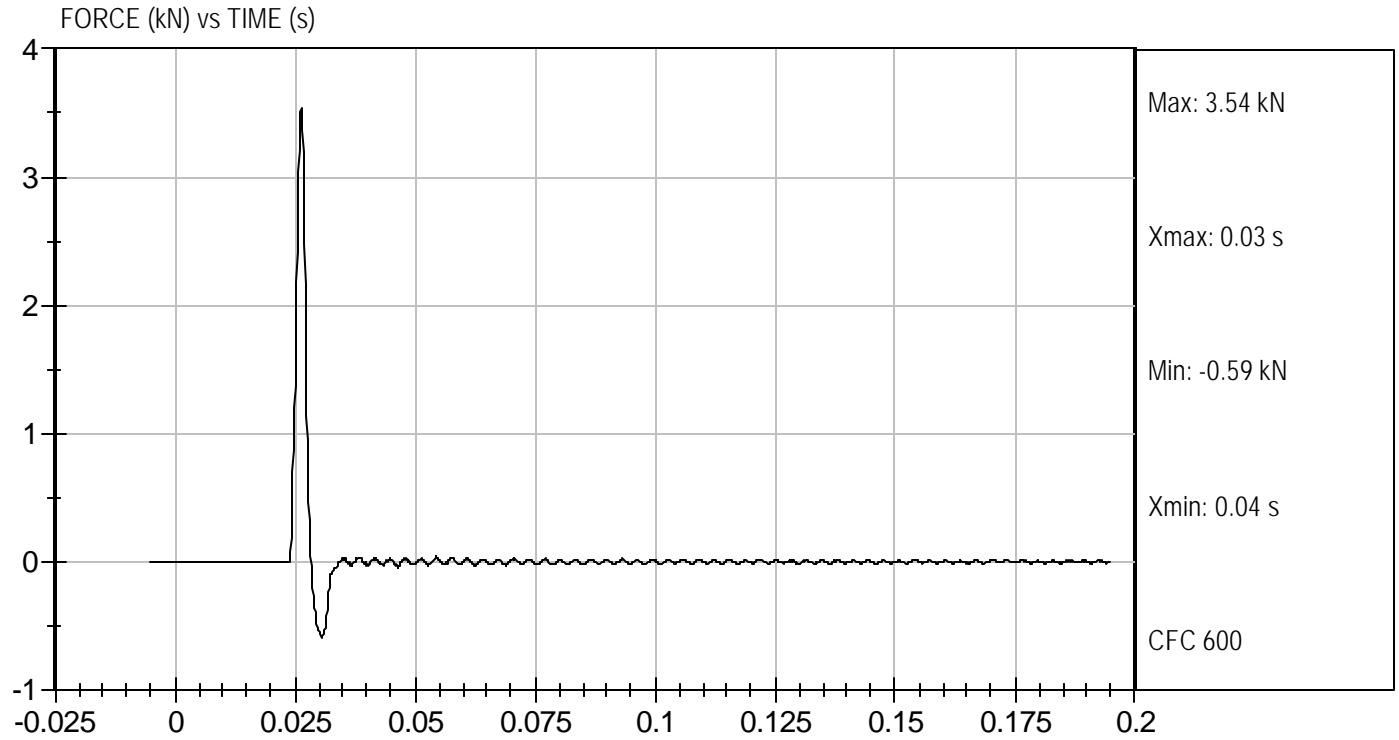
Test I.D: D06846

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.54	Pass
Overall Test Results				Pass


Laboratory Technician

03/29/2006
Test Date


Approved By



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 510 Test Date 3/29/06

Technician Tim Bratz

- 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	21.5
Record the maximum humidity	32%
Record the minimum humidity	28%
- 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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3840 N

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

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


Signature


3/29/06
Date

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

ATD Serial No: 510

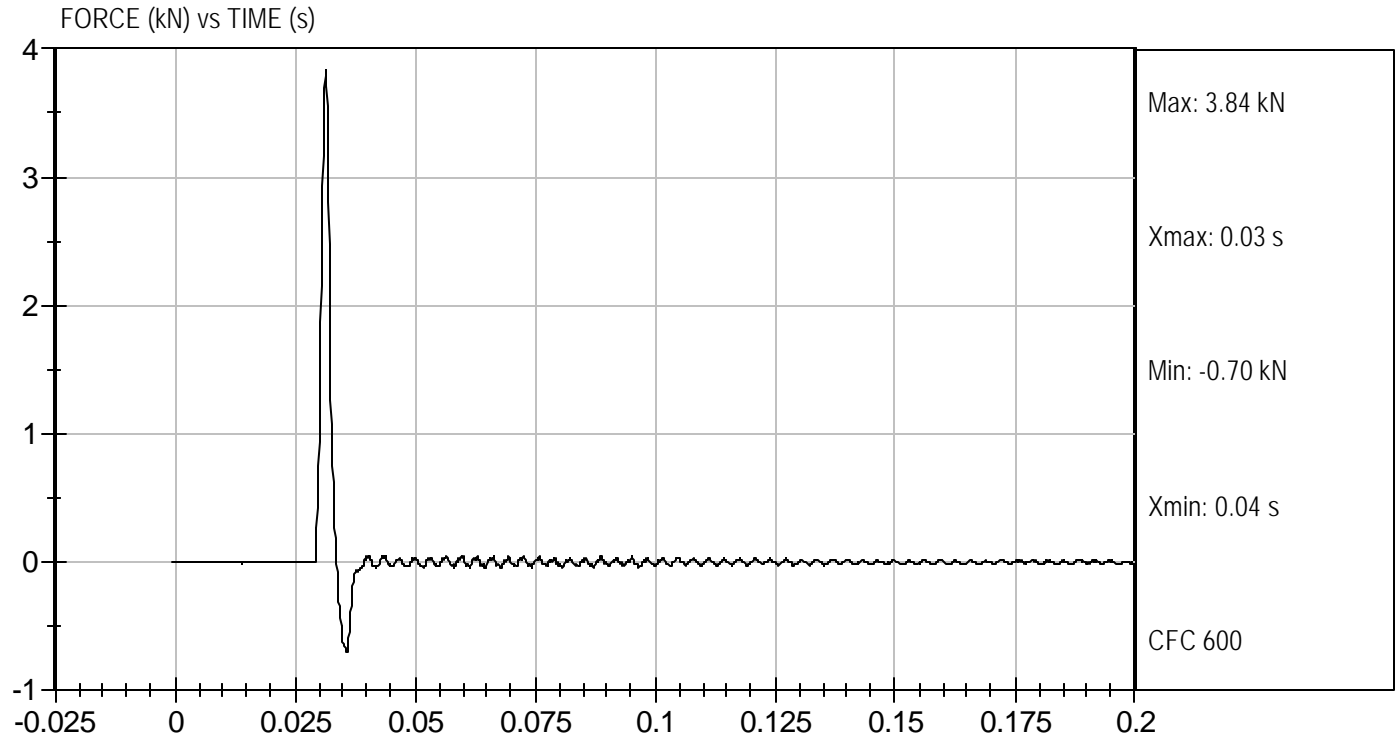
Test I.D.: D06845

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.84	Pass
Overall Test Results				Pass


Laboratory Technician

03/29/2006
Test Date


Approved By



EXTERNAL DIMENSIONS

HYBRID III 5 th SN #510, 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	786.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.0
C	H-POINT HEIGHT	Reference	81.3-86.3	84.1
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	82.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	133.9
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	249.6
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.0
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	278.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	202.1
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	543.6
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	358.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	397.0
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".	414.0-439.4	434.2

HYBRID III 5th SN #510, PART 572, 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	181.0
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.4
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	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.9
U	HIP BREADTH	The widest part of the hip	299.7-314.9	301.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	351.4
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	79.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	539.5
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	876.4
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	788.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	334.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	168.0

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 510

Test Date 3/28/06

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

3/29/06
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

3/29/06
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #505, 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	778.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.3
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.8
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.3
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	248.7
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.2
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	278.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.5
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	541.9
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	402.4
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".	414.0-439.4	436.8

HYBRID III 5th SN #505, PART 572, 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	188.7
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	223.3
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	481.1
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.4
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.8
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	359.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	84.2
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	531.7
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	853.2
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	773.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	340.0
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 3/19/07

Technician Justino Diaz

- 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>22.1</u>
Record the minimum temperature	<u>21.6</u>
Record the maximum humidity	<u>25%</u>
Record the minimum humidity	<u>21%</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	$250 \text{ g} \leq x \leq 300 \text{ g}$	259
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 $\leq 15 \text{ g}$	2

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

Justin Du J.
Signature

3/19/07
Date

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 505

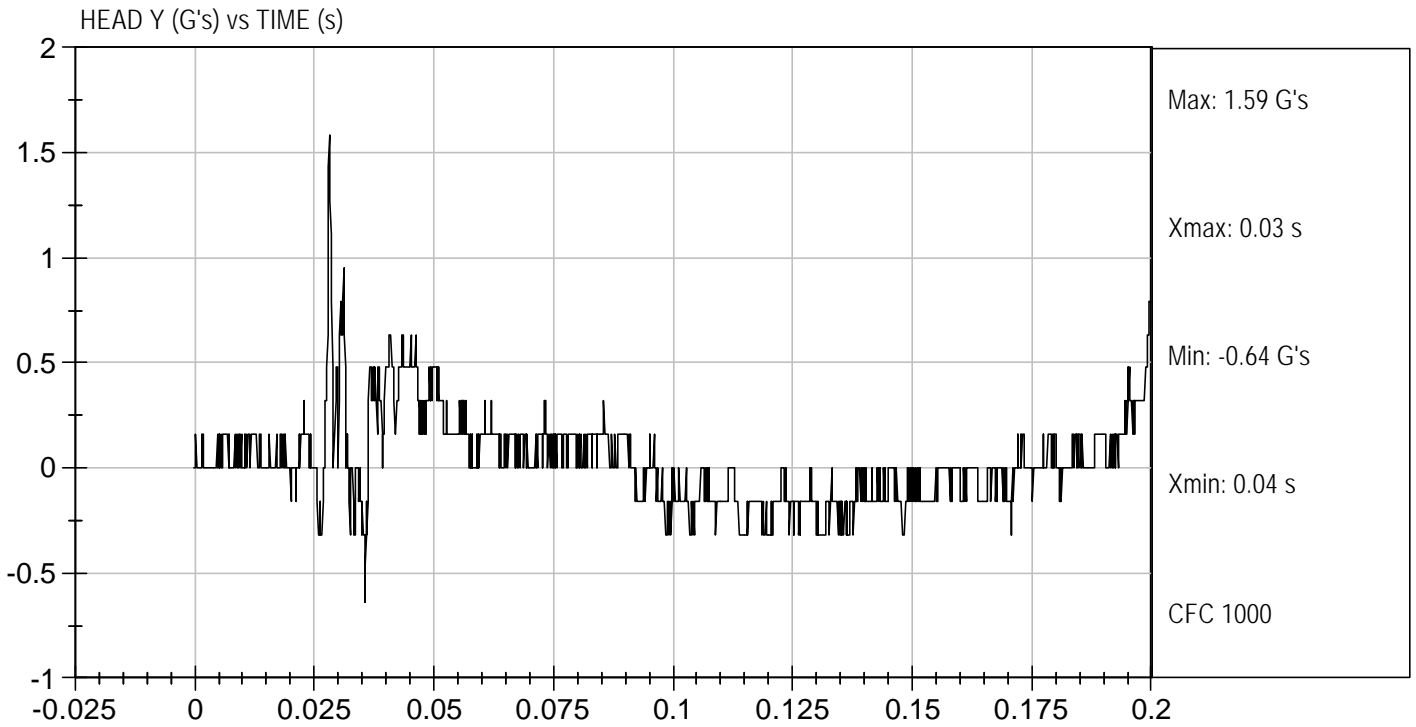
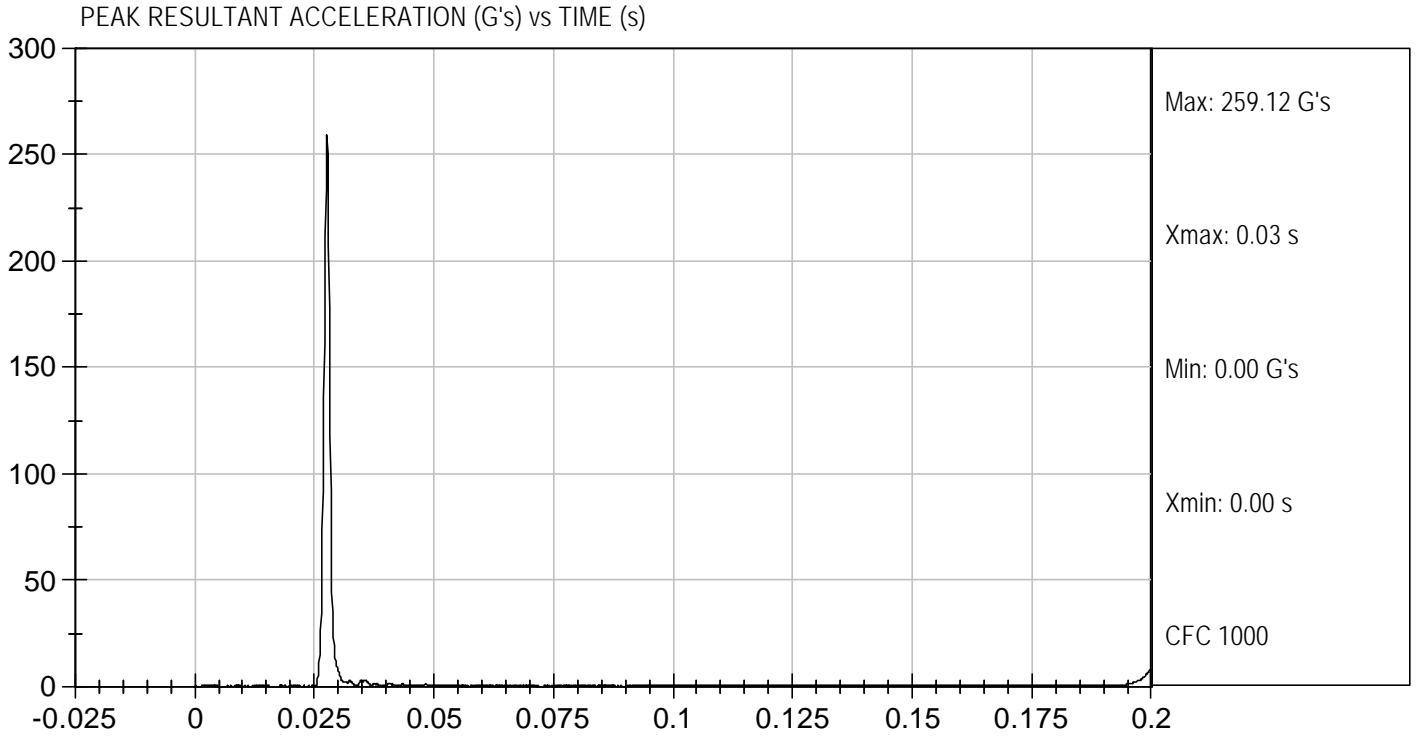
Test ID: D07721

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	250 to 300	259	Pass
Peak Lateral Acceleration	G's	+/- 15	1.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

03/19/2007
Test Date


Approved By



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 505 Test Date 3/19/07

Technician Justino Diaz

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>25%</u> |
| Record the minimum humidity | <u>21%</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 86; 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 m/s \leq speed \leq 7.13 m/s	7.09 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.2 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.4 m/s
	@30ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.4 m/s
Plane D Rotation		Peak moment* 69 Nm \leq moment \leq 83 Nm during the following rotation range 77° \leq angle \leq 91°	<u>78</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms \leq time \leq 100ms	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.


Signature

3/19/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE


ATD Serial No: 505

Test I.D: D07722

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	21	Pass	
Pendulum Speed	m/sec	6.89 to 7.13	7.09	Pass	
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.2	Pass
	20 msec	m/sec	4.0 to 5.0	4.4	Pass
	30 msec	m/sec	5.8 to 7.0	6.4	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	

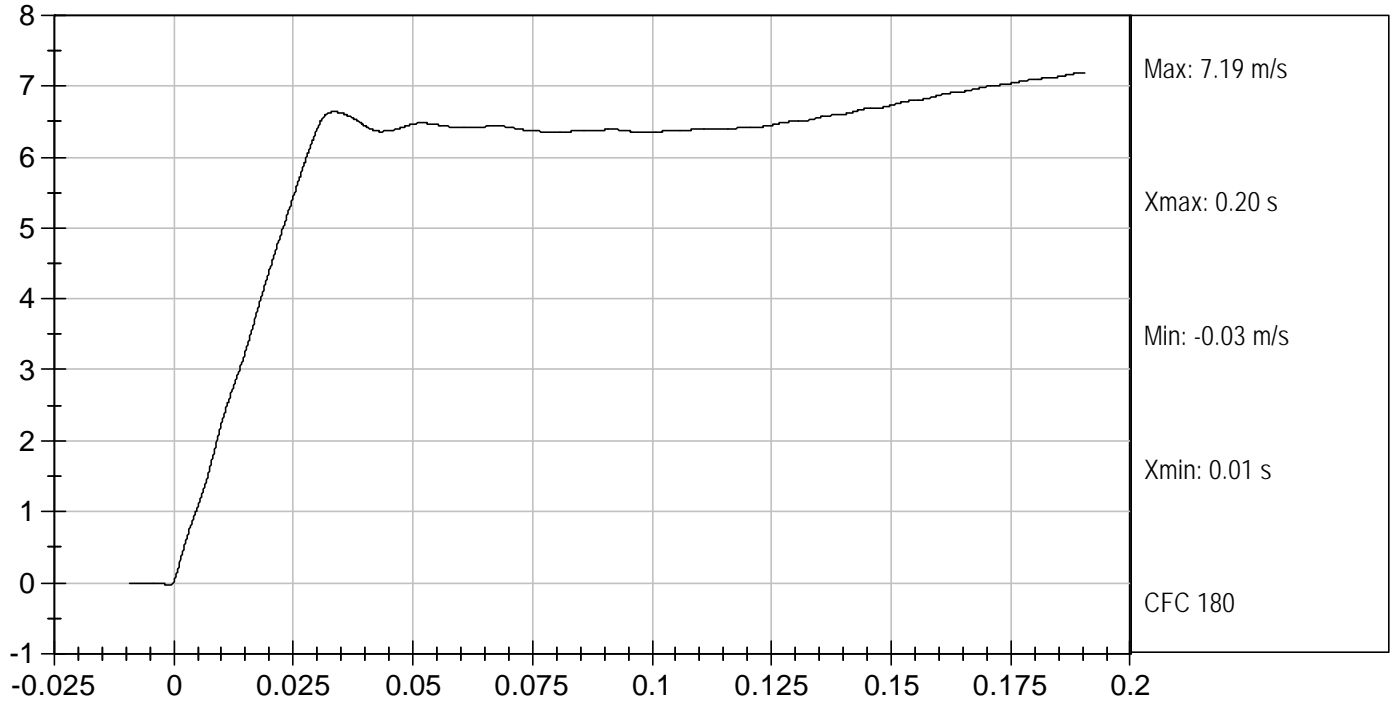

 Laboratory Technician

03/19/2007
 Test Date

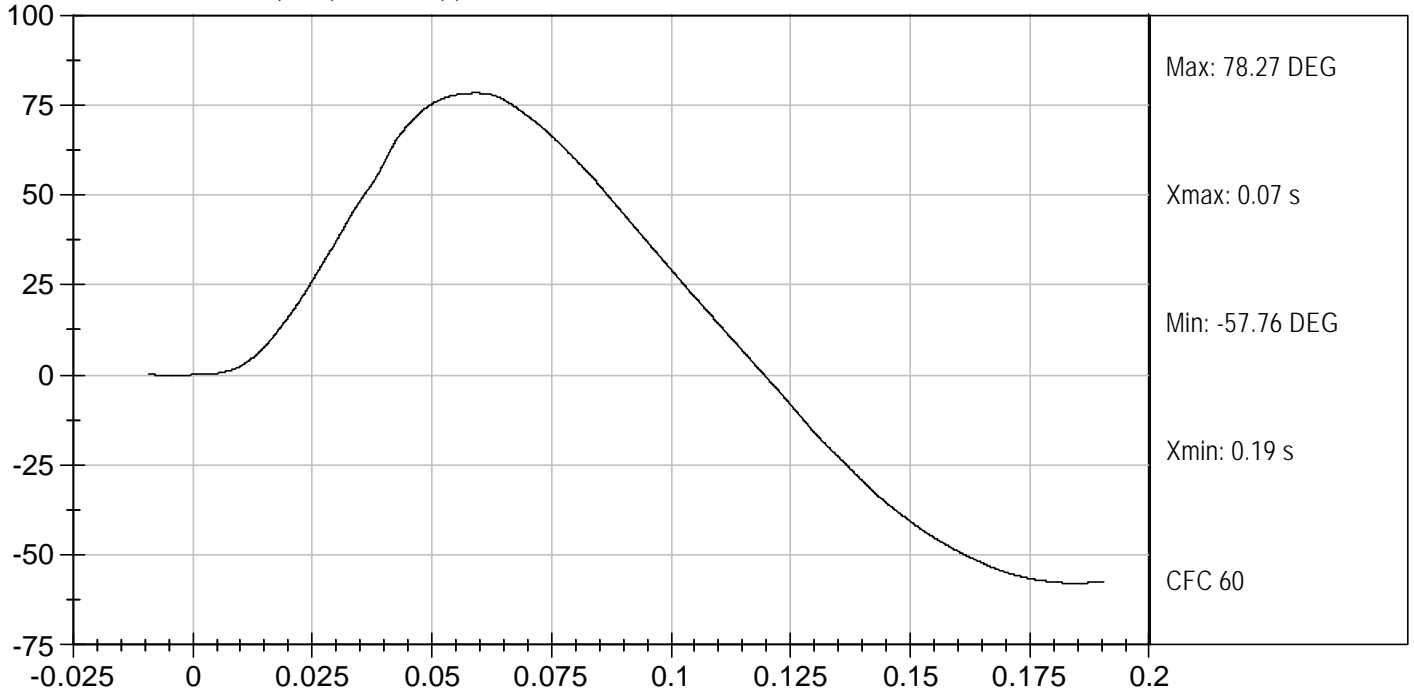

 Approved By



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



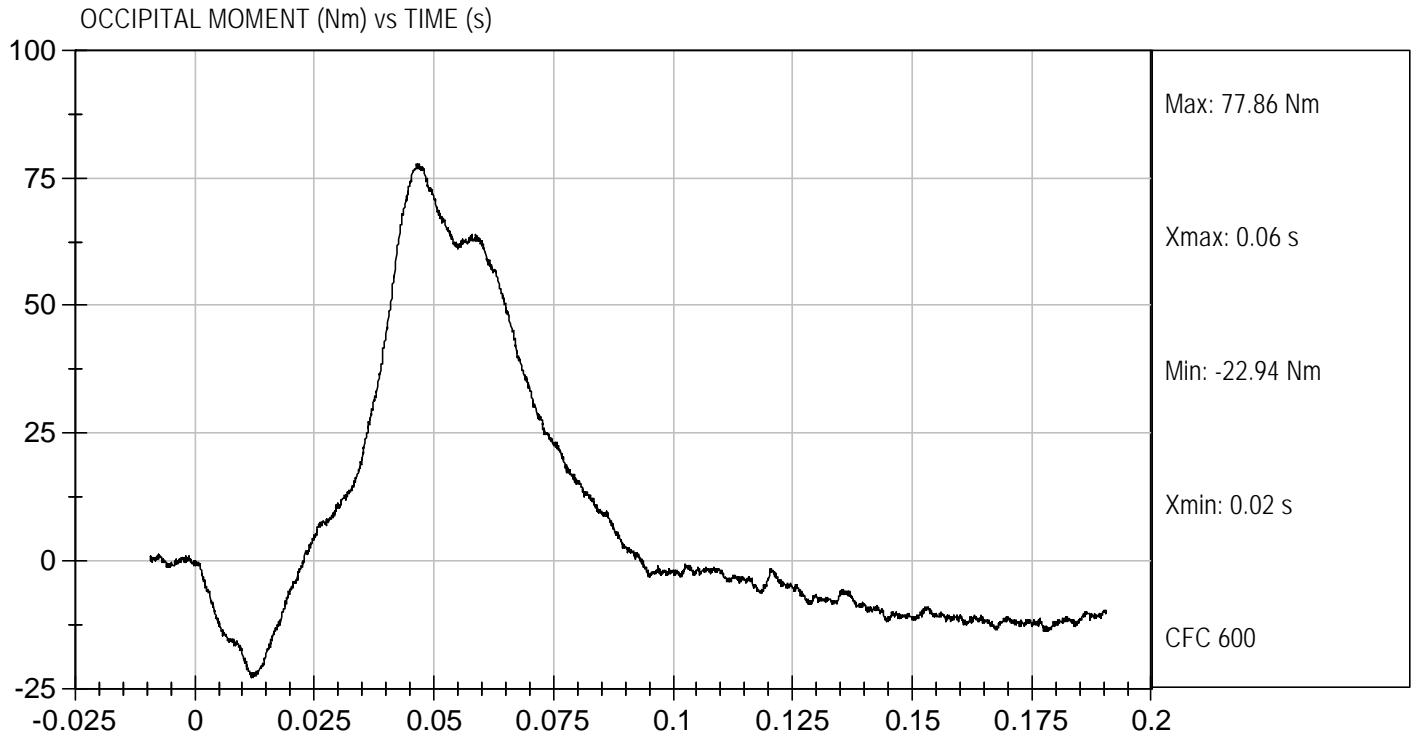
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D07722

Test Date: 03/19/2007
Velocity: 23.26 ft/s, 7.09 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 505 Test Date 3/19/07

Technician Justino Diaz

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>22.1</u> |
| Record the minimum temperature | <u>21.6</u> |
| Record the maximum humidity | <u>25%</u> |
| Record the minimum humidity | <u>21%</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 86; 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 m/s \leq speed \leq 6.19 m/s	6.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s
	@30ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s
Plane D Rotation	Peak moment* -65 Nm \leq moment \leq -53 Nm during the following rotation range $99^\circ \leq$ angle \leq 114°	<u>-60</u> Nm @ <u>108</u> degrees
Negative Moment Decay** (Extension)	Time to decay to -10 Nm 94 ms \leq time \leq 114 ms	99 ms

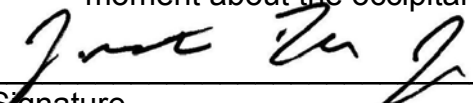
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

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

3/19/07
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D.: D07723

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	21	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	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Deflection Corridor	Nm	-65 to -53	-60	Pass	
Negative Moment Time Curve Decay to -10 Nm	msec	94 to 114	99	Pass	
Overall Results				Pass	

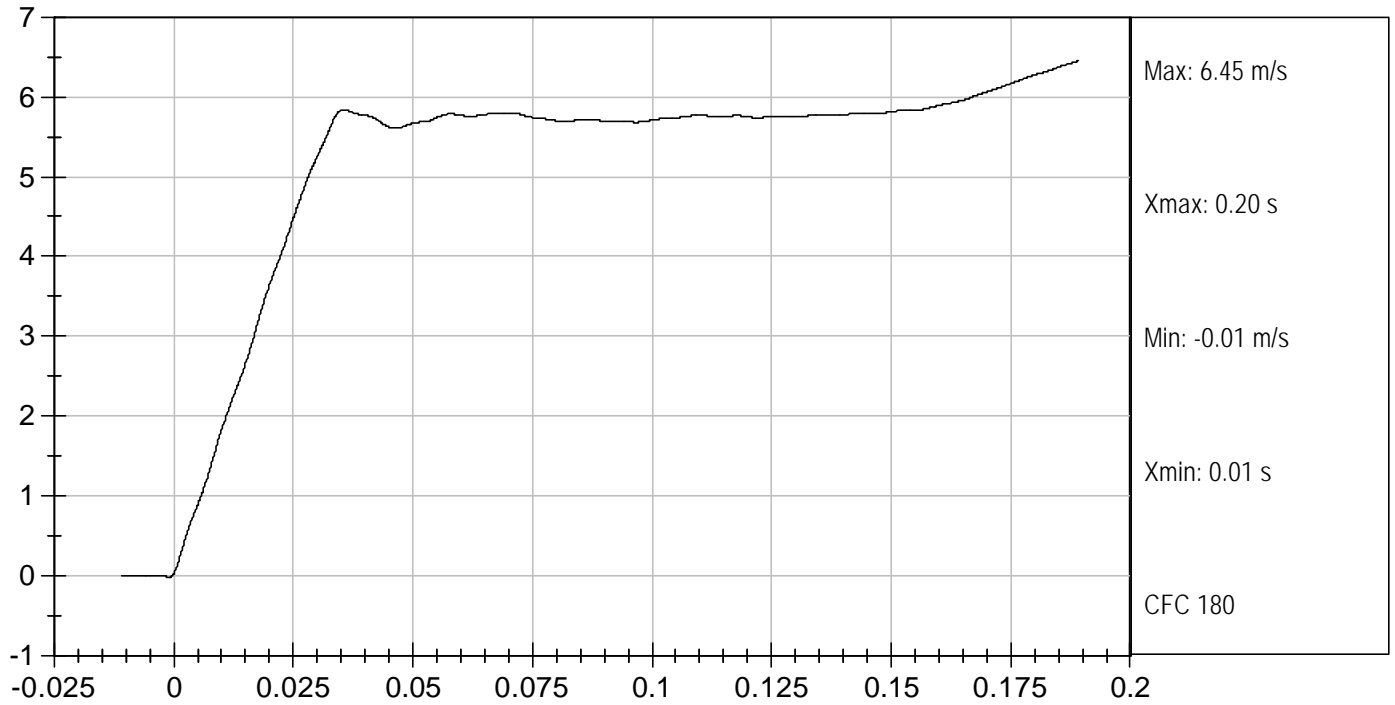

 Laboratory Technician

03/19/2007
 Test Date

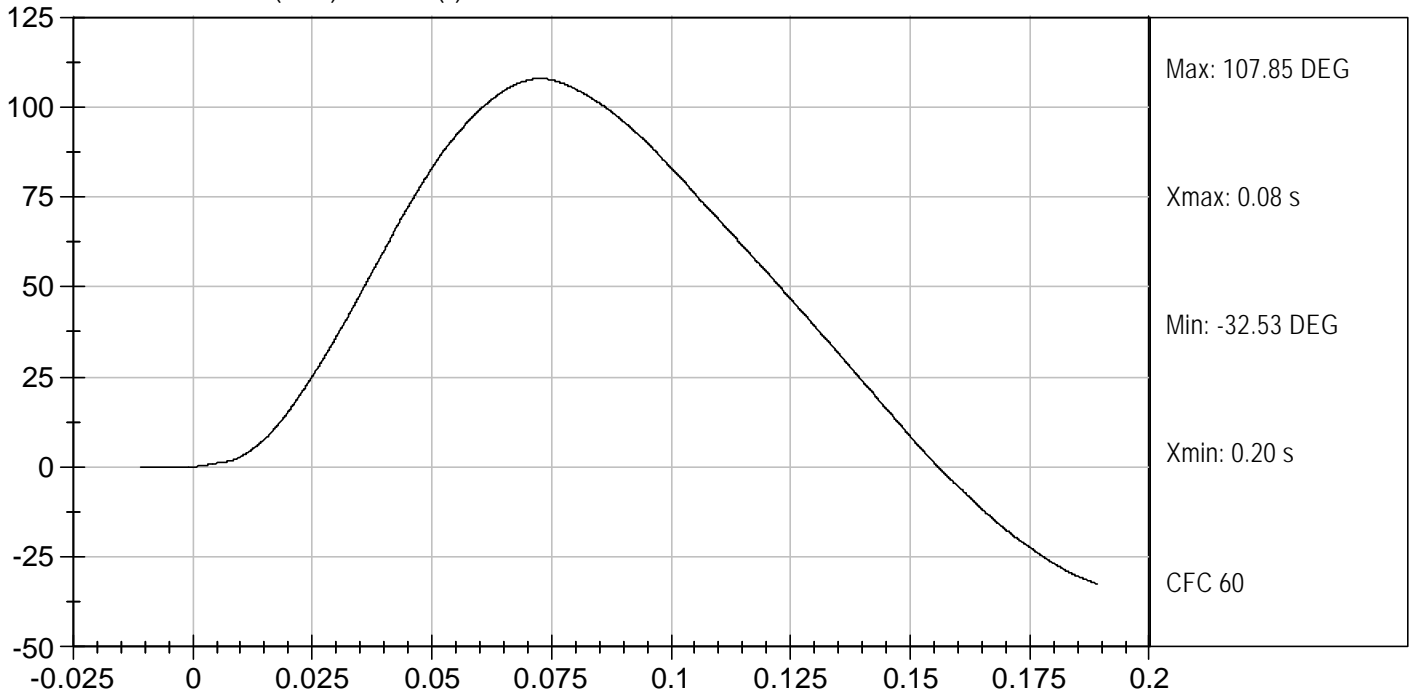

 Approved By

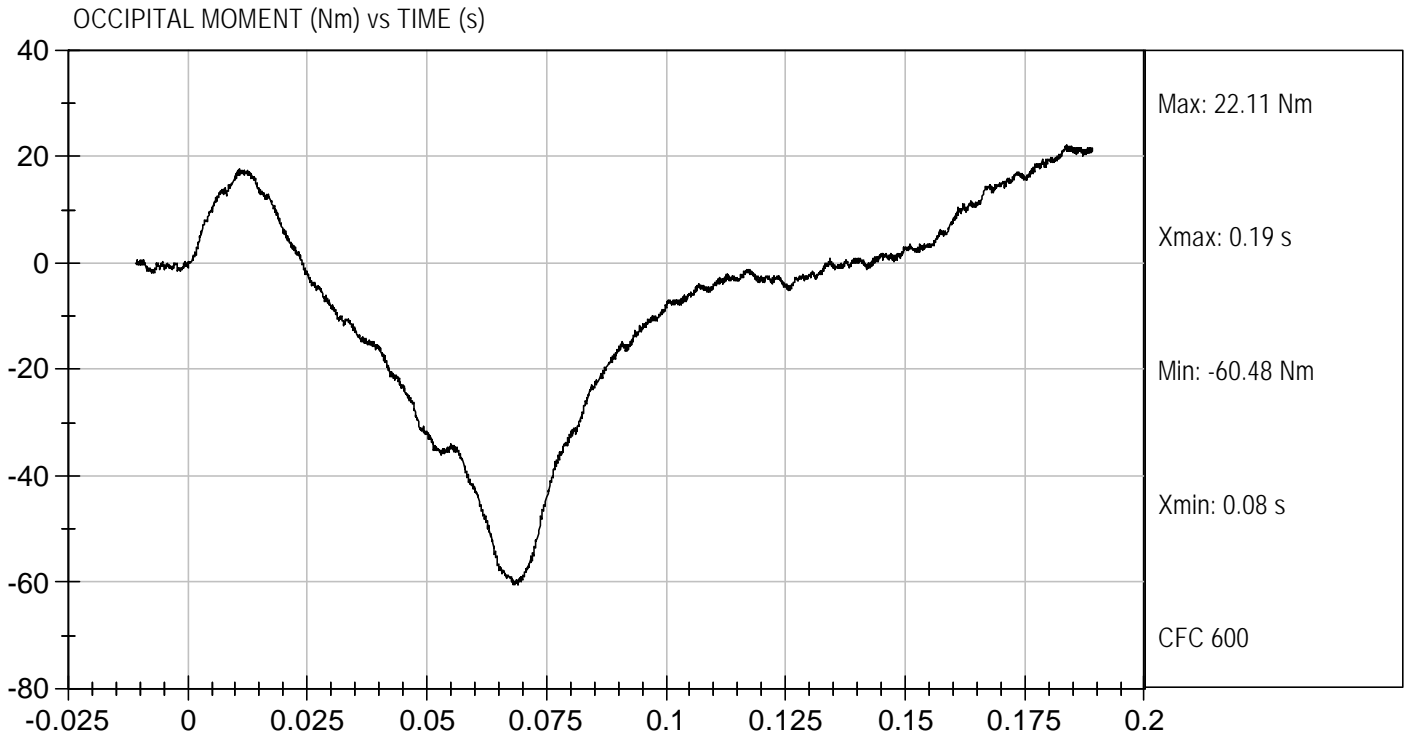


PENDULUM DECELERATION (m/s) vs TIME (s)



NECK ROTATION (DEG) vs TIME (s)





DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 505 Test Date 3/20/07

Technician Dave Wilcox

- 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 20.9

Record the maximum humidity 19%

Record the minimum humidity 17%

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 m/s ≤ speed ≤ 6.83 m/s	6.66 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4150 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4025 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 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

3/20/07

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D07724


Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	17	Pass
Probe Speed	m/s	6.59 to 6.83	6.66	Pass
Peak Deflection	mm	50 to 58	53	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	N	≤ 4600 N	4025	Pass
Overall Test Results				Pass



 Laboratory Technician

03/20/2007

 Test Date

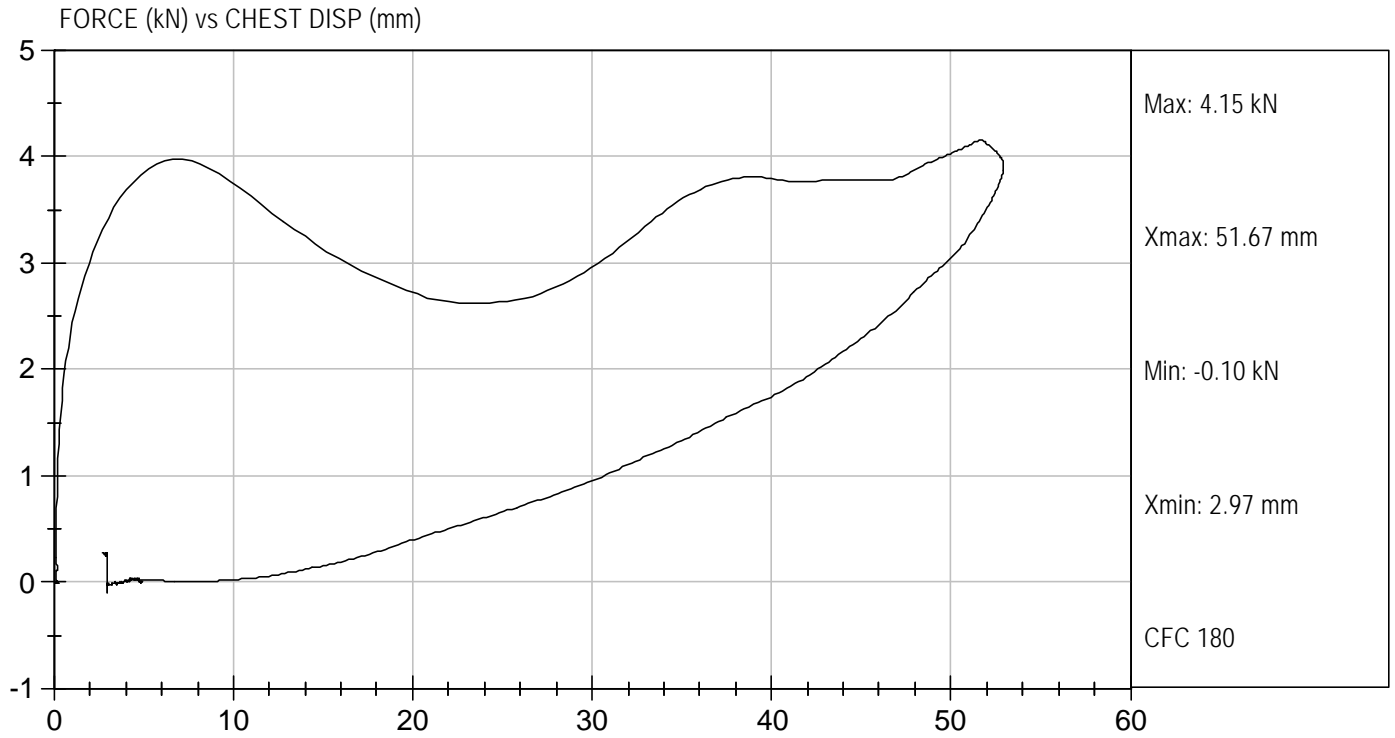


 Approved By



Test Desc: Thorax Impact
Component ID: D07724

Test Date: 03/20/2007
Velocity: 21.85 ft/s, 6.66 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 505 Test Date 3/20/07

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 21.7
Record the minimum temperature 20.9
Record the maximum humidity 19%
Record the minimum humidity 17%
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 $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	370 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	16°



 Signature

3/20/07

 Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D07727

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Initial Angle	deg	0 to 20	15	Pass
Return Angle	deg	+/- 8	16	Pass
Force at 45 deg	N	320 to 390	370	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
			Overall Result	Pass



 Laboratory Technician

03/20/2007

 Test Date



 Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 3/20/07

Technician Justino Diaz

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 20.9

Record the maximum humidity 19%

Record the minimum humidity 17%

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))

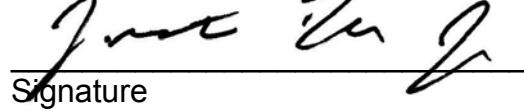
X 11. Complete the following table:

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*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3540 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

3/20/07
Date

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

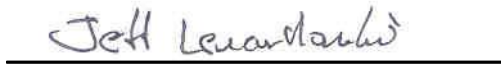
ATD Serial No: 505

Test I.D: D07726

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
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.54	Pass
Overall Test Results				Pass


Laboratory Technician

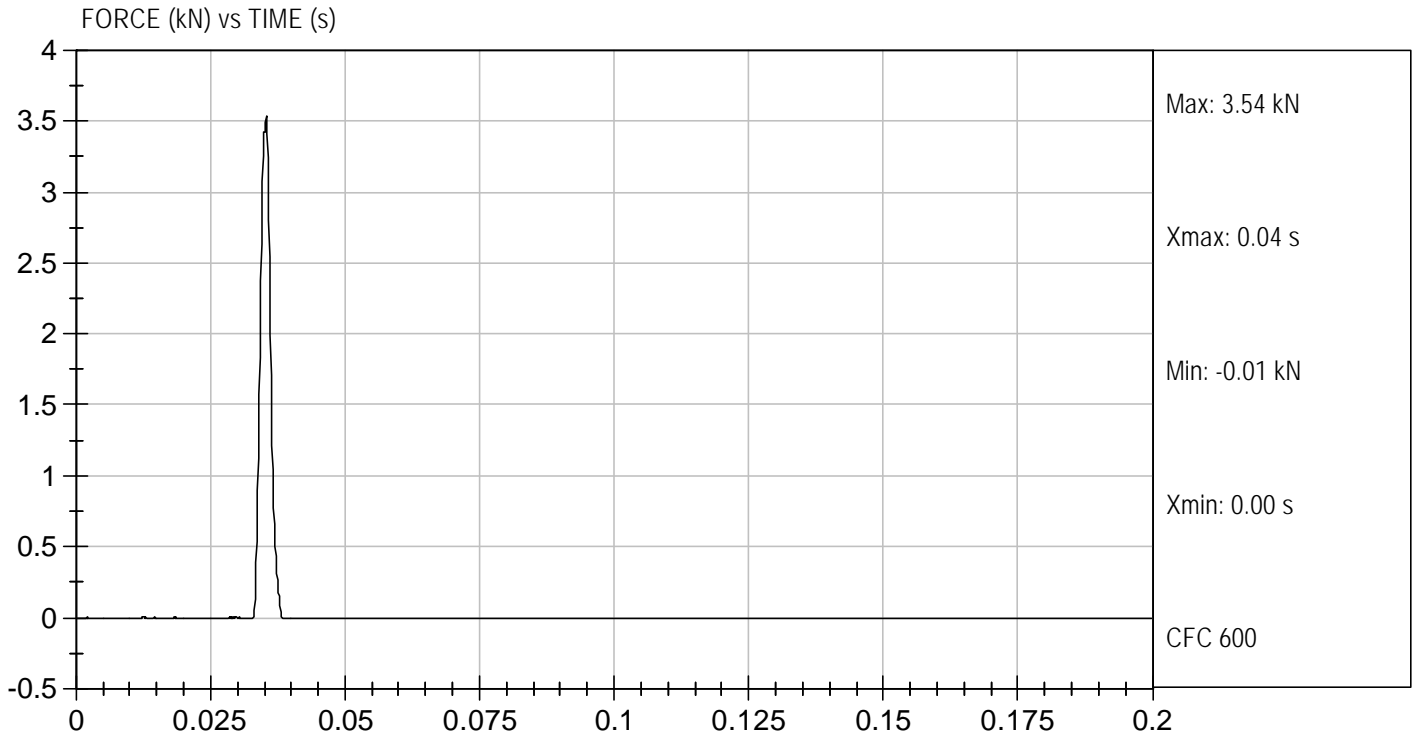
03/20/2007
Test Date


Approved By



Test Desc: Left Knee
Component ID: D07726

Test Date: 03/20/2007
Velocity: 6.9 ft/s, 2.10 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505 Test Date 3/20/07

Technician Justino Diaz

- 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 20.9
 - Record the maximum humidity 19%
 - Record the minimum humidity 17%
- 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 m/s ≤ speed ≤ 2.13 m/s	2.10 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3750 N

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

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


Signature

3/20/07
Date

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


ATD Serial No: 505

Test I.D: D07725

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
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.75	Pass
Overall Test Results				Pass


Laboratory Technician

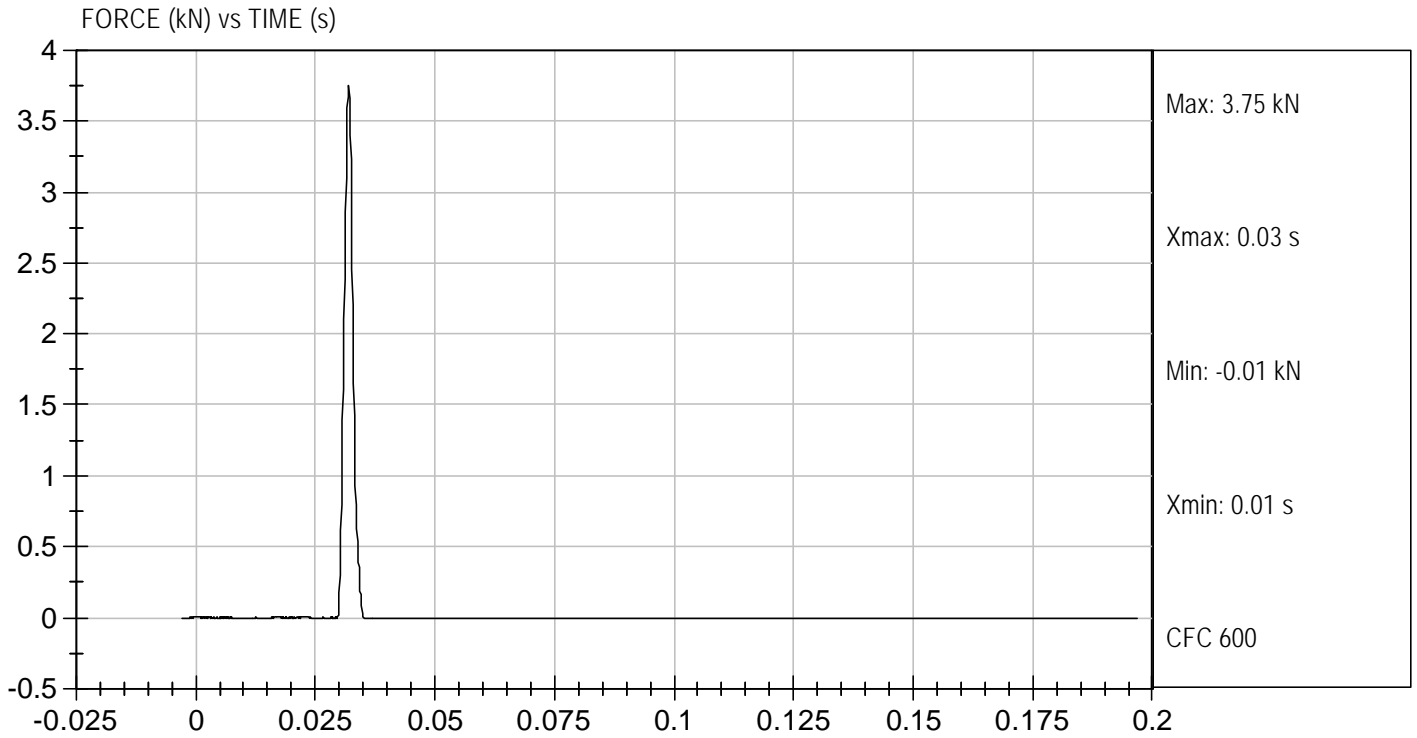
03/20/2007
Test Date


Approved By



Test Desc: Right Knee
Component ID: D07725

Test Date: 03/20/2007
Velocity: 6.89 ft/s, 2.10 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 505 Test Date 3/29/07

Technician Justino Diaz

- 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>21.3</u>
Record the maximum humidity	<u>28%</u>
Record the minimum humidity	<u>27%</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	$250 \text{ g} \leq x \leq 300 \text{ g}$	267
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 $\leq 15 \text{ g}$	14

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

Justin Du J
Signature

3/29/07
Date

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

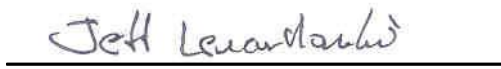
ATD Serial No: 505

Test ID: D07851

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	250 to 300	267	Pass
Peak Lateral Acceleration	G's	+/- 15	13.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

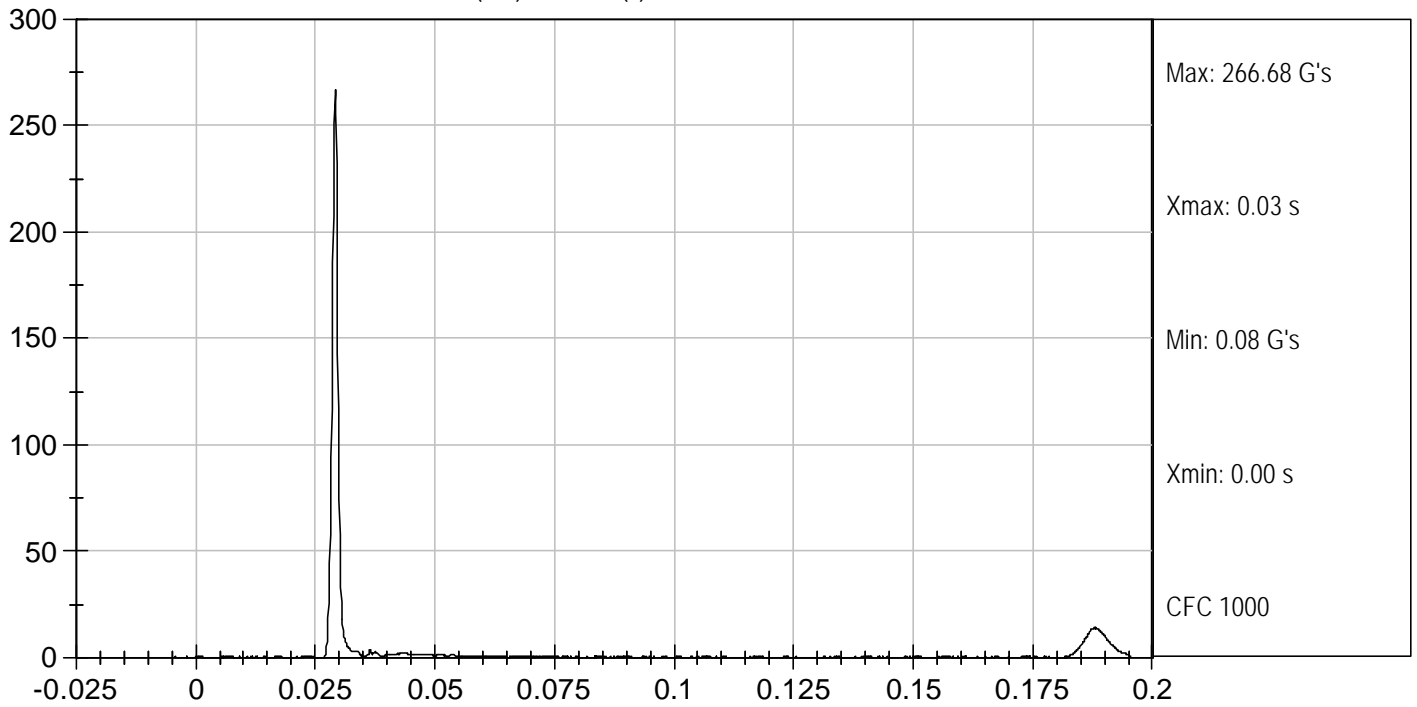

Laboratory Technician

03/29/2007
Test Date

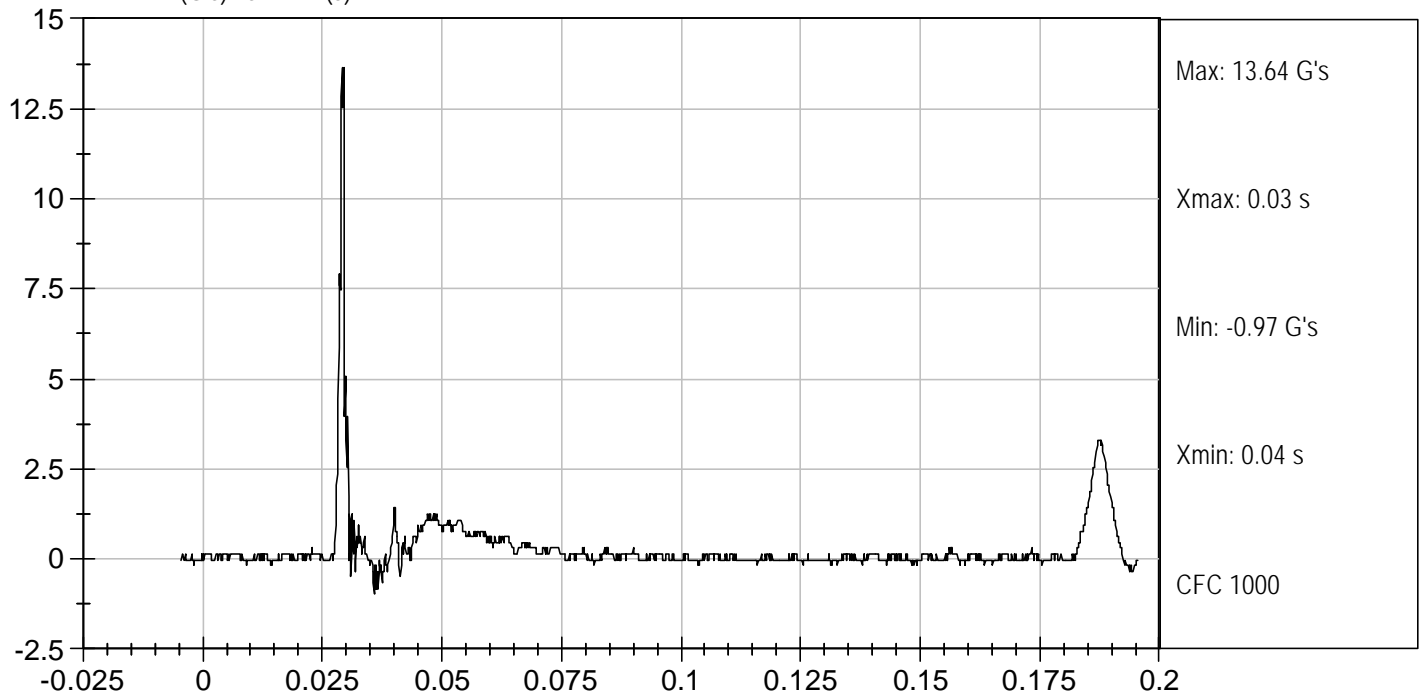

Approved By



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 3/29/07

Technician Justino Diaz

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>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>27%</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 86; 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 m/s \leq speed \leq 7.13 m/s	7.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.5 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.7 m/s
	@30ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.7 m/s
Plane D Rotation		Peak moment* 69 Nm \leq moment \leq 83 Nm during the following rotation range 77° \leq angle \leq 91°	<u>74</u> Nm @ <u>80</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms \leq time \leq 100ms	86 ms

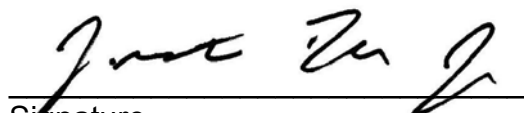
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

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.


Signature

3/29/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

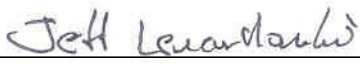
ATD Serial No: 505

Test I.D: D07852

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	27	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	4.7	Pass
	30 msec	m/sec	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	86	Pass
Overall Results					Pass

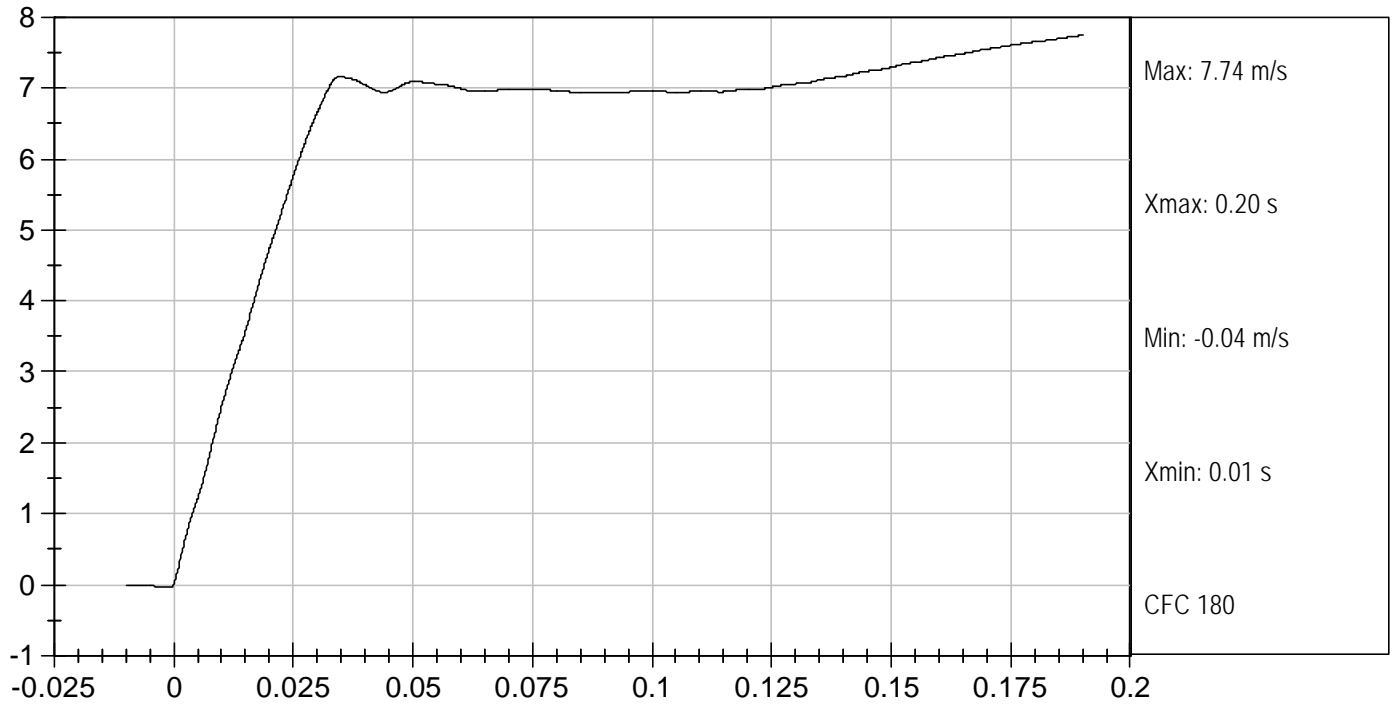

 Laboratory Technician

03/29/2007
 Test Date

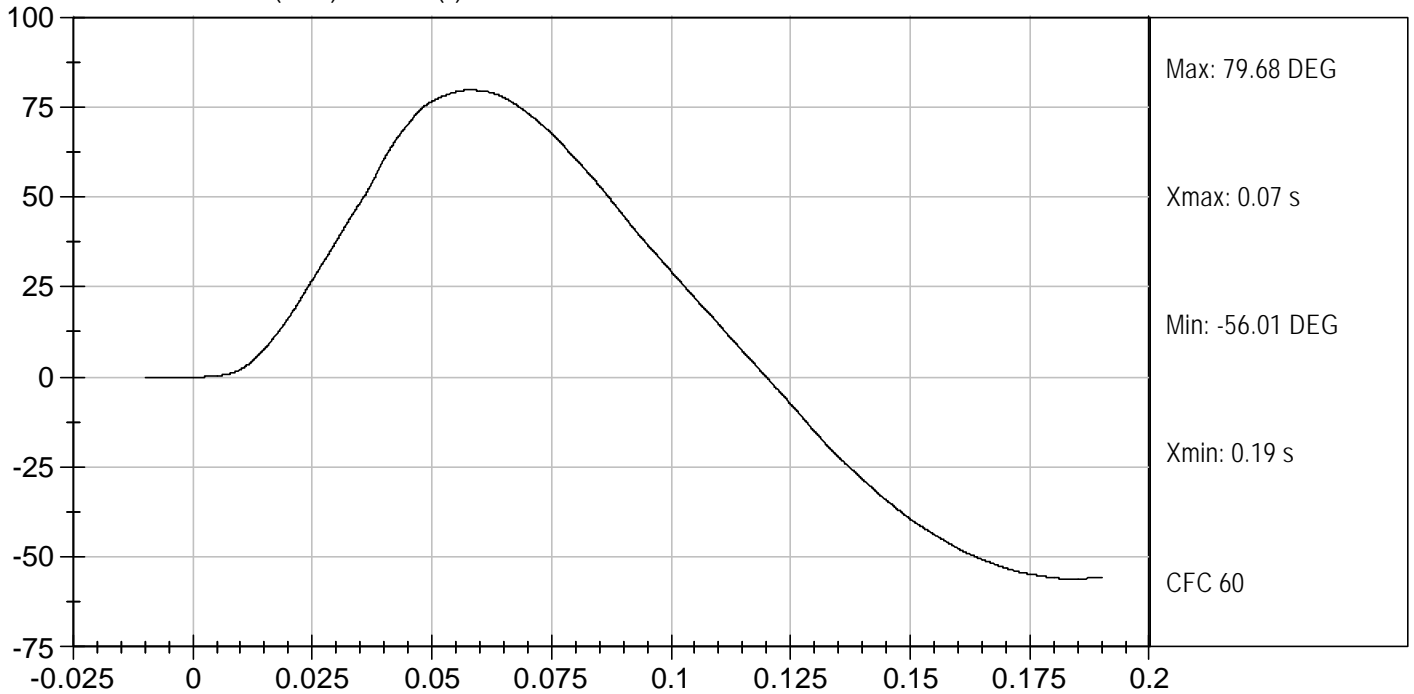

 Approved By

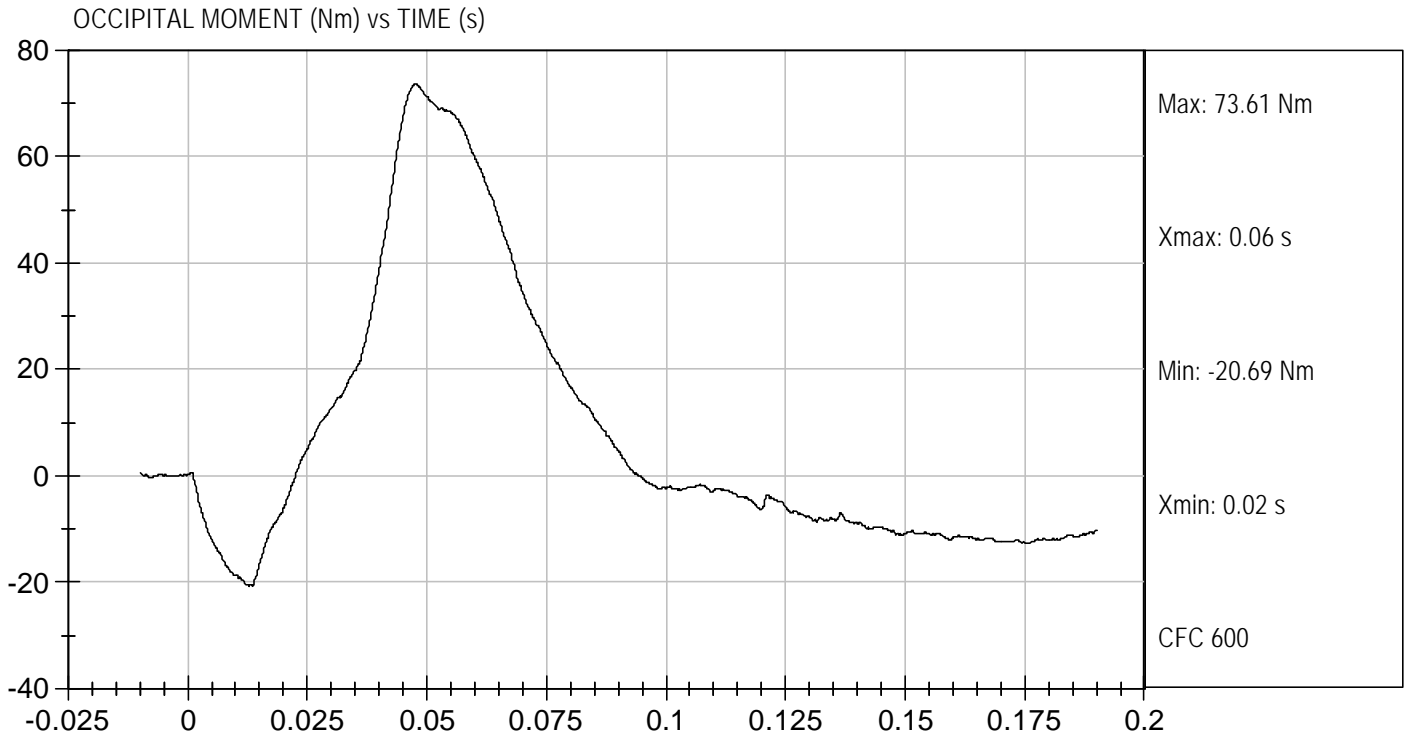


PENDULUM DECELERATION (m/s) vs TIME (s)



NECK ROTATION (DEG) vs TIME (s)





DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 505 Test Date 3/29/07

Technician Justino Diaz

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>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>27%</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 86; 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	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$
	@30ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$
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>108</u> degrees
Negative Moment Decay** (Extension)	Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	106 ms

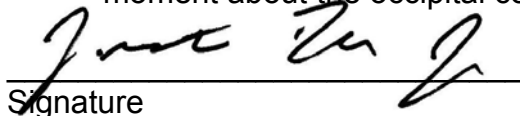
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

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

3/29/07
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

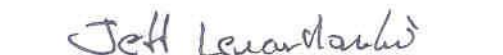
ATD Serial No: 505

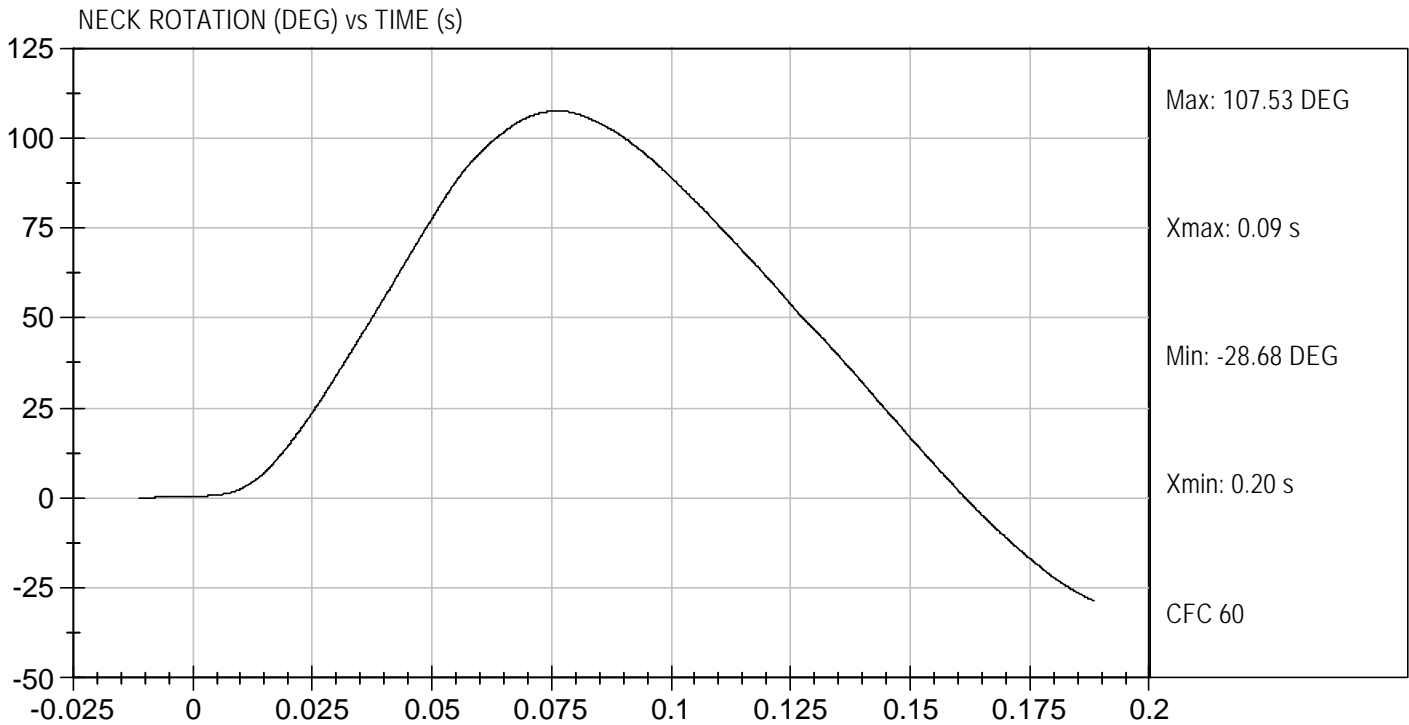
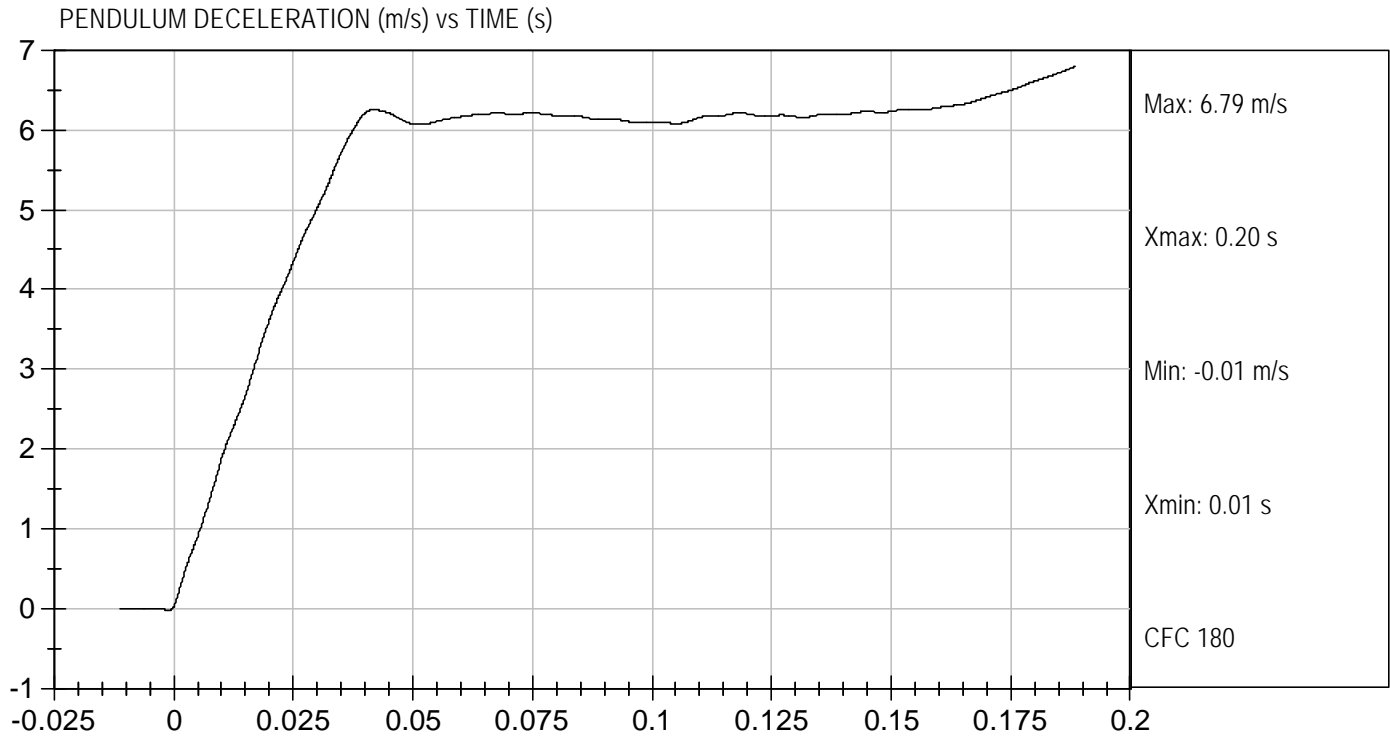
Test I.D.: D07853

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	28	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	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.0	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-54	Pss
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	106	Pass
Overall Results					Pass


 Laboratory Technician

03/29/2007
 Test Date

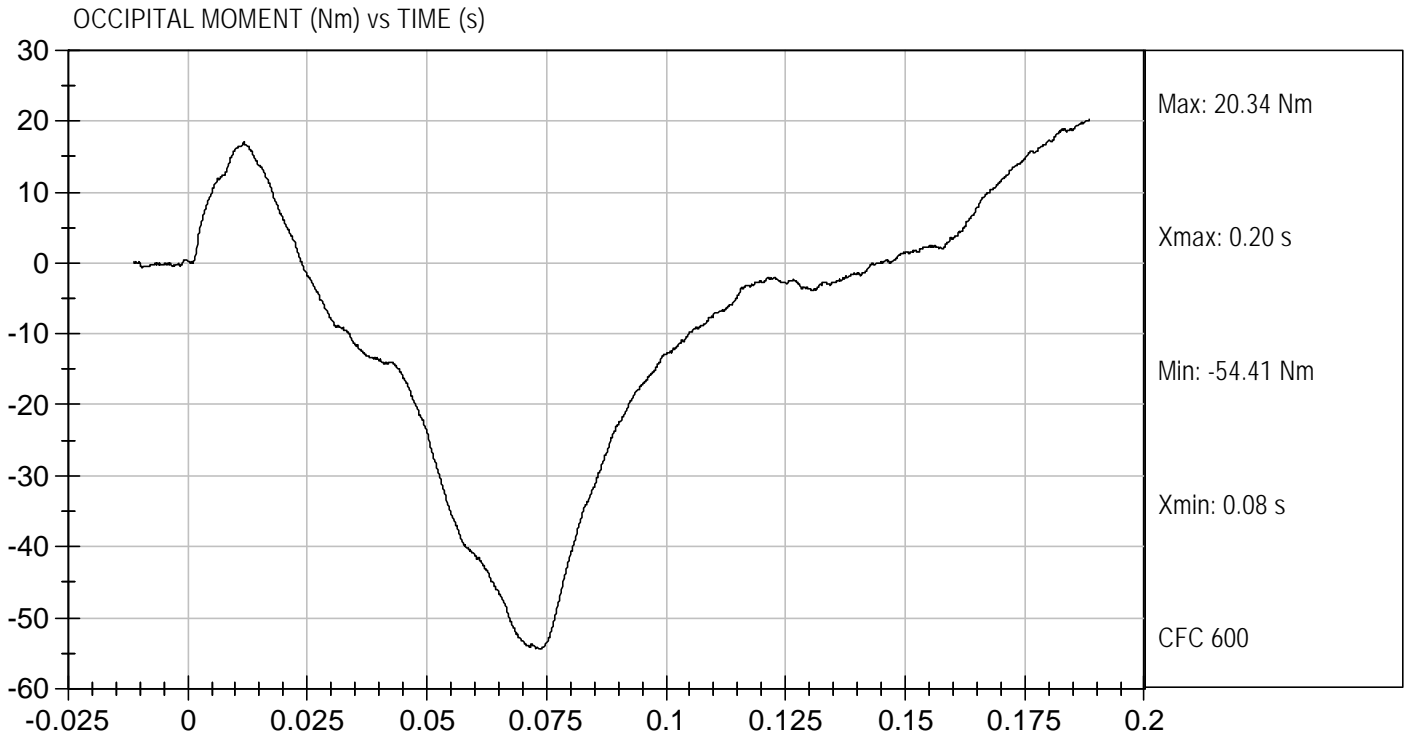

 Approved By





Test Desc: Neck Extension
Component ID: D07853

Test Date: 03/29/2007
Velocity: 20.1 ft/s, 6.13 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 505 Test Date 3/30/07

Technician Dave Wilcox

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 21.4

Record the maximum humidity 32%

Record the minimum humidity 27%

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 m/s ≤ speed ≤ 6.83 m/s	6.61 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4117 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4117 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 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

3/30/07

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D07854


Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	6.59 to 6.83	6.61	Pass
Peak Deflection	mm	50 to 58	53	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	N	≤ 4,600 N	4,117	Pass
Overall Test Results				Pass



Laboratory Technician

03/30/2007

Test Date

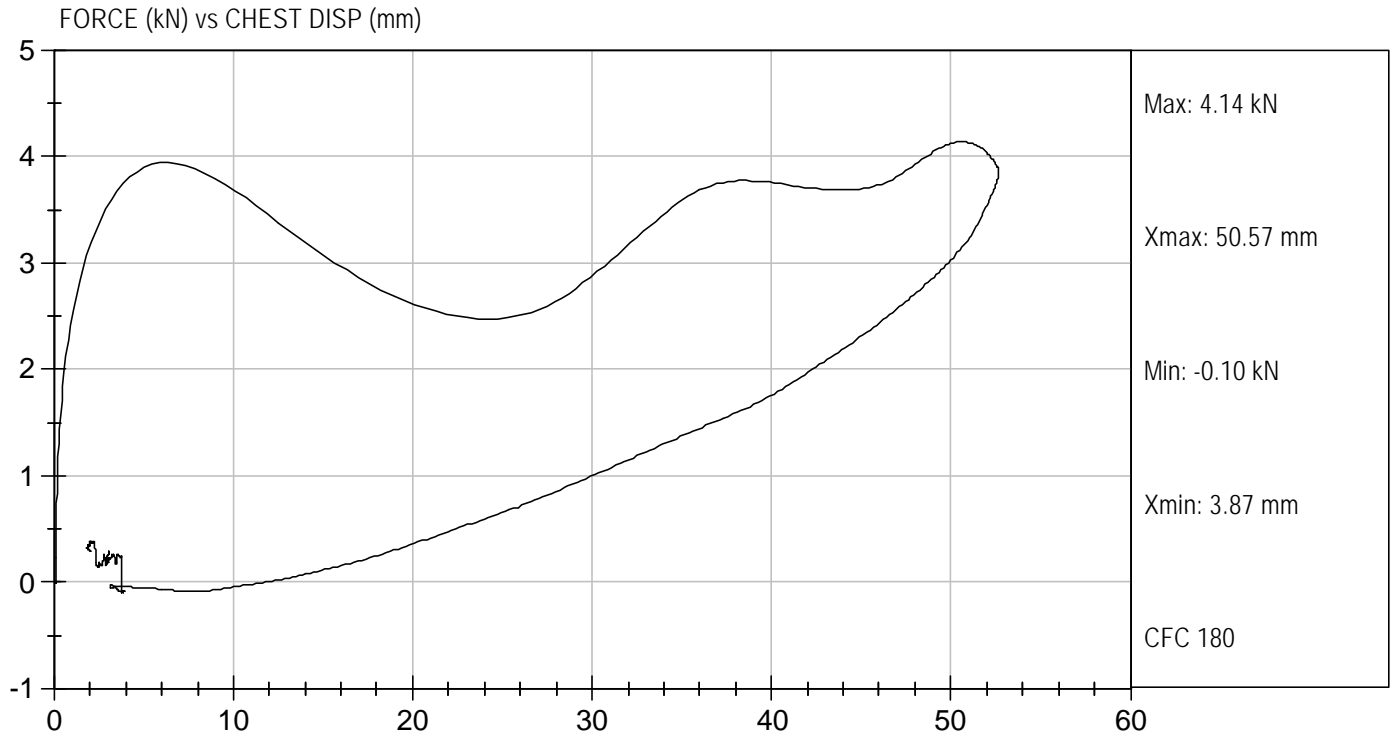


Approved By



Test Desc: Thorax Impact
Component ID: D07854

Test Date: 03/30/2007
Velocity: 21.7 ft/s, 6.61 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 505 Test Date 3/30/07

Technician Justino Diaz

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>21.4</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>27%</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°) 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 $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	361 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	19°



 Signature

3/30/07

 Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

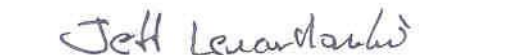
ATD Serial No: 505

Test I.D.: D07857

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	19	Pass
Force at 45 deg	N	320 to 390	361	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


 Laboratory Technician

03/30/2007
 Test Date


 Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 3/30/07

Technician Tim Bratz

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 21.4

Record the maximum humidity 32%

Record the minimum humidity 27%

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*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3840 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

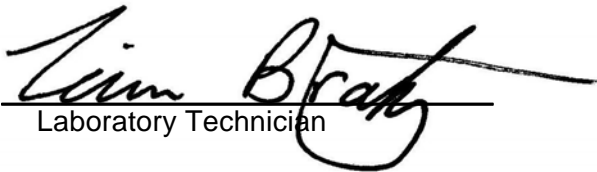
3/30/07
Date

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

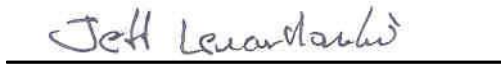
ATD Serial No: 505

Test I.D: D07856

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	32	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.84	Pass
Overall Test Results				Pass


 Laboratory Technician

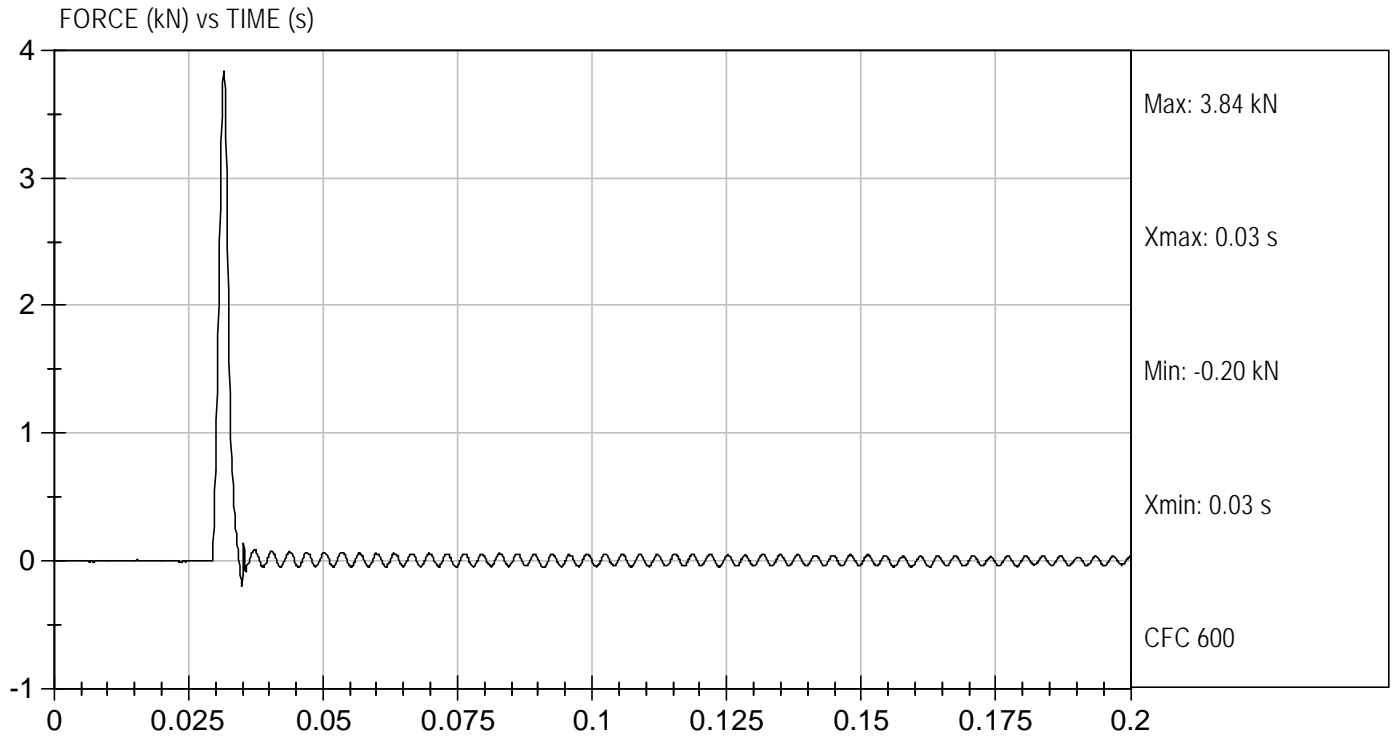
03/30/2007
 Test Date


 Approved By



Test Desc: Left Knee
Component ID: D07856

Test Date: 03/30/2007
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505 Test Date 3/30/07

Technician Tim Bratz

- 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	<u>21.8</u>
Record the minimum temperature	<u>21.4</u>
Record the maximum humidity	<u>32%</u>
Record the minimum humidity	<u>27%</u>
- 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 m/s ≤ speed ≤ 2.13 m/s	2.10 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3650 N

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

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


Signature

3/30/07
Date

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

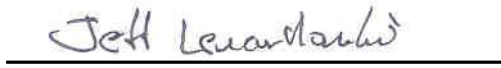
ATD Serial No: 505

Test I.D: D07855

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	32	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.65	Pass
Overall Test Results				Pass


 Laboratory Technician

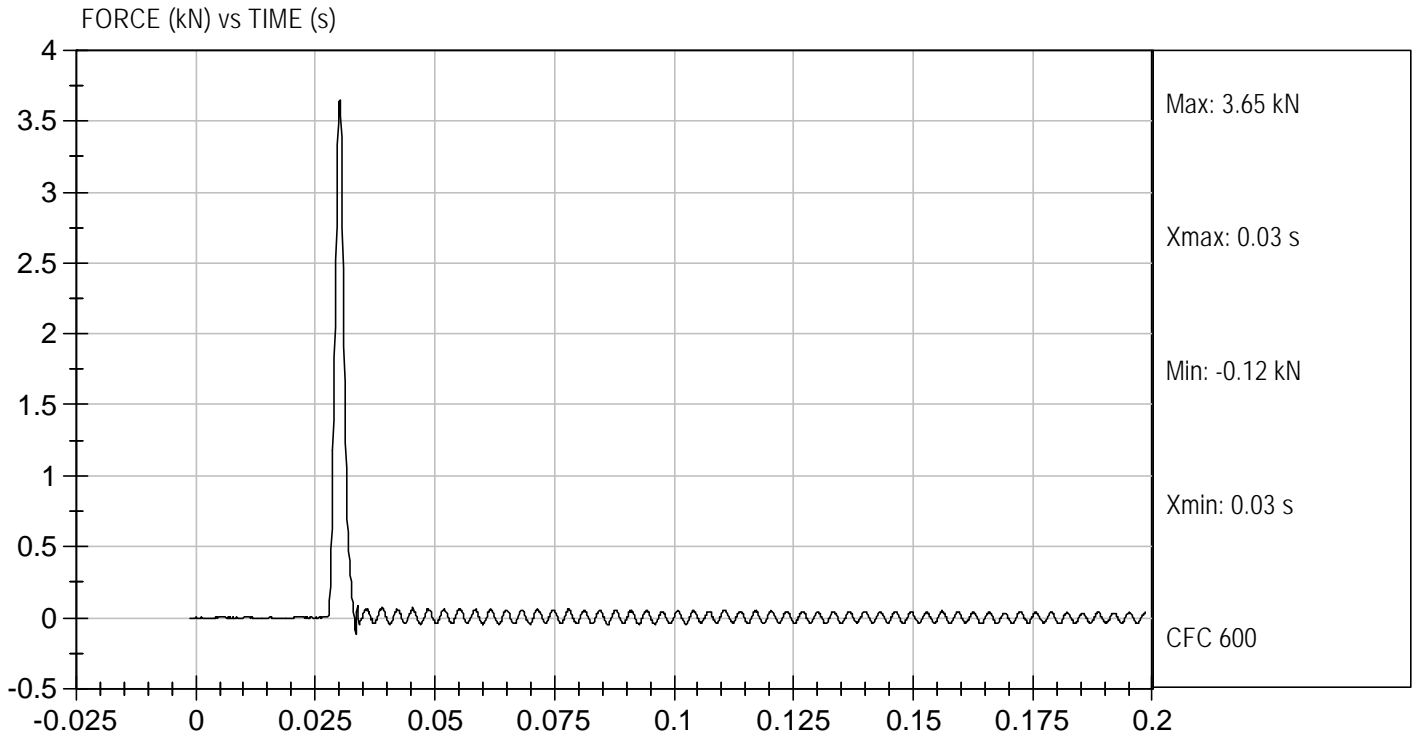
03/30/2007
 Test Date


 Approved By



Test Desc: Right Knee
Component ID: D07855

Test Date: 03/30/2007
Velocity: 6.88 ft/s, 2.10 m/s



EXTERNAL DIMENSIONS

HYBRID III 5 th SN #505, 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	778.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.3
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.8
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.3
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	248.7
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.2
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	278.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.5
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	541.9
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	402.4
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".	414.0-439.4	436.8

HYBRID III 5 th SN #505, PART 572, 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	188.7
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.3
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	481.1
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.4
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.8
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	359.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	84.2
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	531.7
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	853.2
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	773.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	340.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 505

Test Date 3/29/07

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

3/30/07
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

3/30/07
Date

EXTERNAL DIMENSIONS

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456.0-471.2	470.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	288.2
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	31.3
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	44.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	53.8
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	71.1
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	186.0
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	108.2
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	156.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	204.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	151.4
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	174.6
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	156.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	110.3
P	FOOT LENGTH	Tip of toe to rear of heel	92.4-102.6	95.0
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsagittal plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	184.7
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	127.4
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.	149.9-165.1	164.0
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	170.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	209.3
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	44.1
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	472.6
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447-472.4	467.8
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	259.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	113.2
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	310.0
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	303.1

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

Dummy Serial Number 083

Test Date 3/20/06

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
3. Accelerometers and their respective mounts are smooth and clean.
4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.5</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>23%</u> |
| Record the minimum humidity | <u>22%</u> |
6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(i))

Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(i))

Record the right side distance 439 mm
Record the left side distance 439 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))

Record the angle 45 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))

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

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))

Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$100 \text{ g} \leq x \leq 120 \text{ g}$	108
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	3

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

Jessica Hall
Signature

3/20/06
Date

**MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D06731

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	100 to 120	108	Pass
Peak Lateral Acceleration	G's	+/- 15	3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

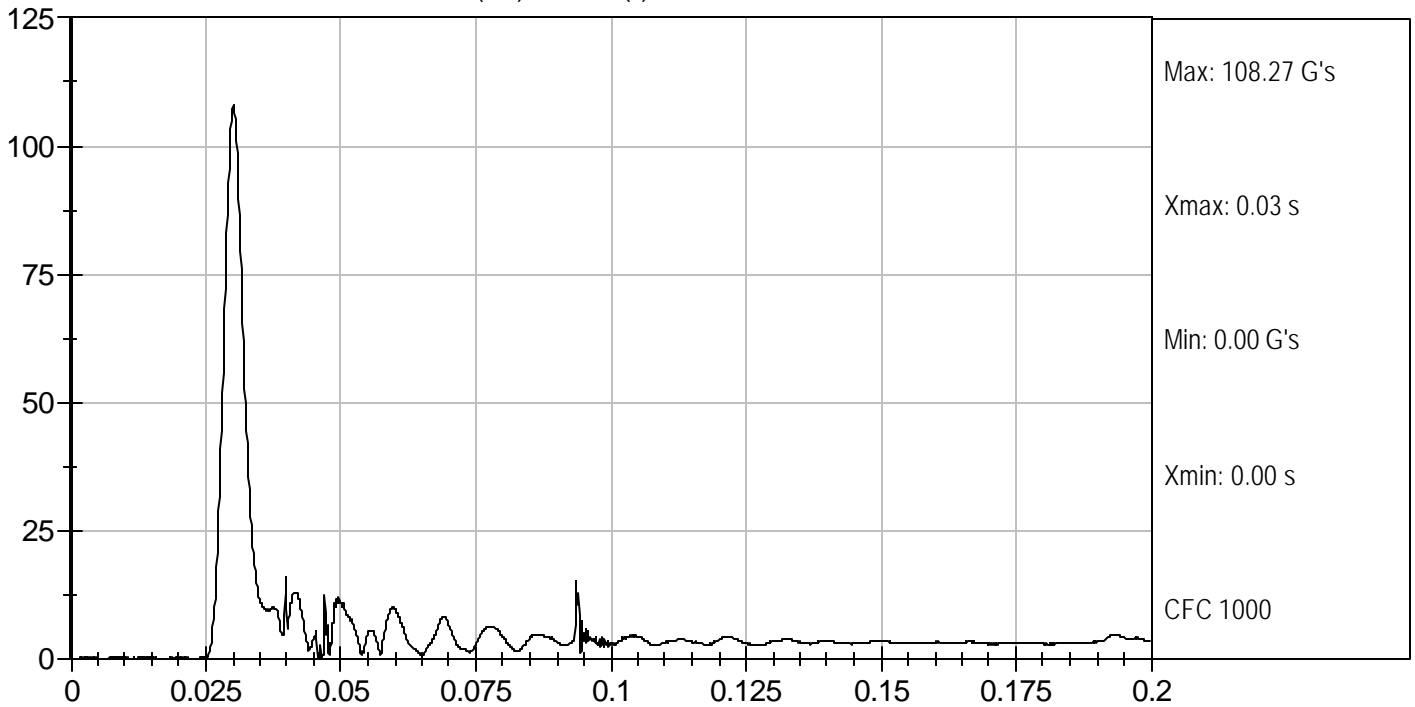
Jessica Hall
Laboratory Technician

03/20/2006
Test Date

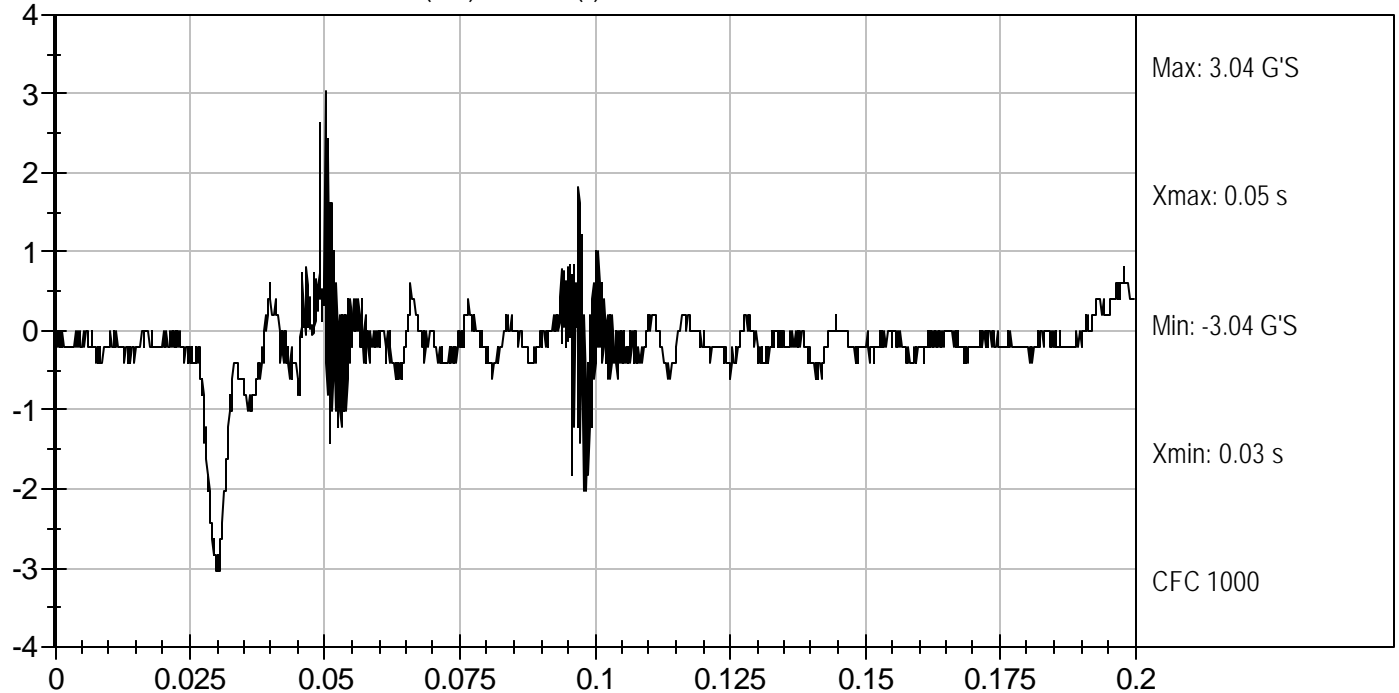
Jeff Levanthasi
Approved By



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



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



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

Dummy Serial Number 083

Test Date 3/20/06

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
3. Accelerometers and their respective mounts are smooth and clean.
4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.5</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>23%</u> |
| Record the minimum humidity | <u>22%</u> |
6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(ii))
 Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(ii))
 Record the right side distance 467 mm
 Record the left side distance 467 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
 Record the angle 90 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
 Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
 Record thickness 50.9 mm
 Record width 604 mm
 Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$55 \text{ g} \leq x \leq 71 \text{ g}$	65
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	-1

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
 Signature

3/20/06
 Date

**MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D06735

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	55 to 71	65	Pass
Peak Lateral Acceleration	G's	+/- 15	-1	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

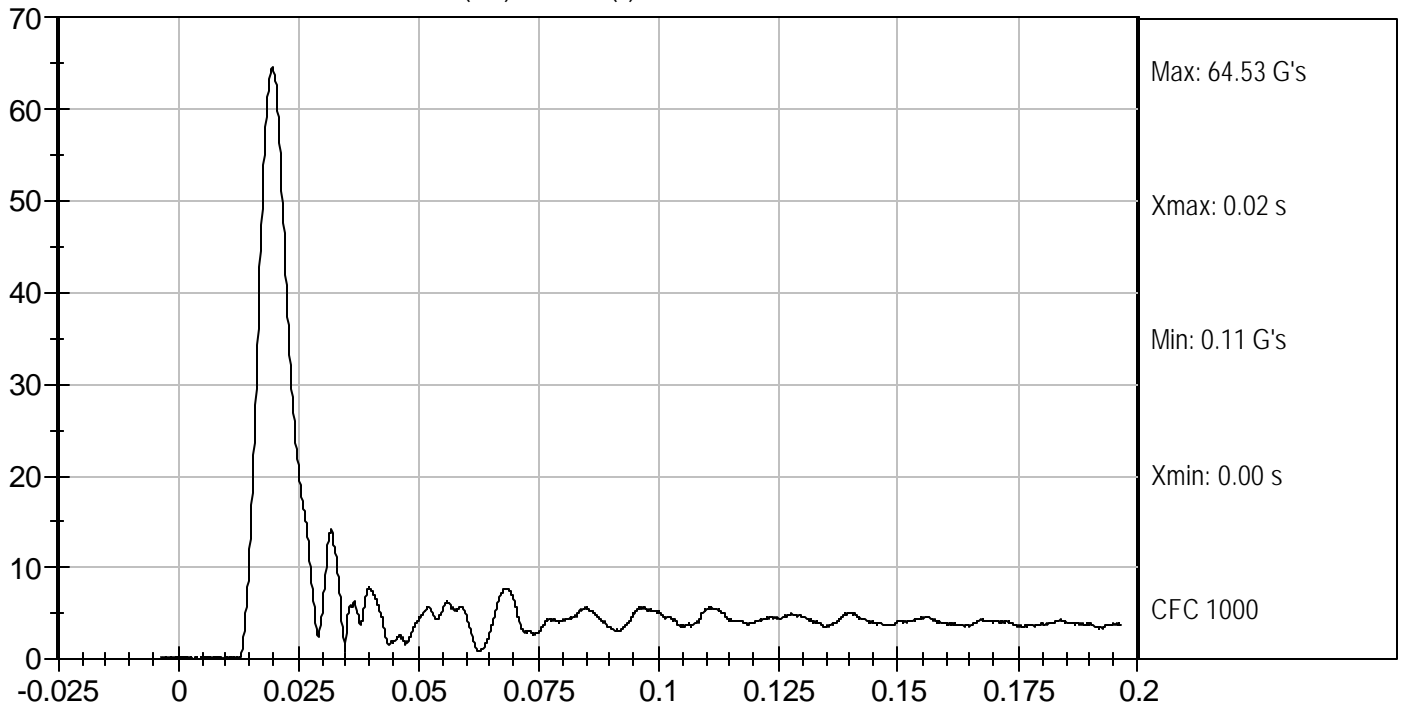
Jessica Hall
Laboratory Technician

03/20/2006
Test Date

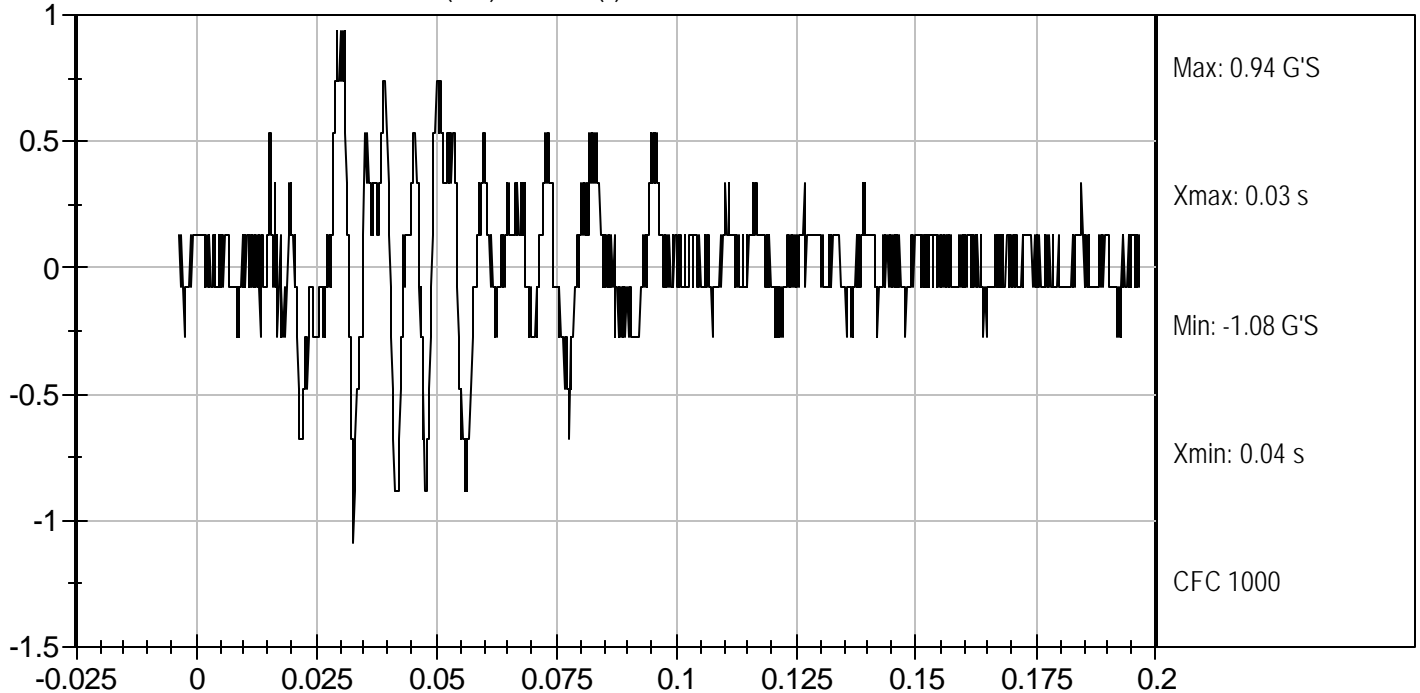
Jeff Leonard
Approved By



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



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



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

Dummy Serial Number 083

Test Date 3/20/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.5</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>23%</u> |
| Record the minimum humidity | <u>22%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 8E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	5.2 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	2.0 m/s
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	3.8 m/s
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	4.7 m/s
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75° ≤ angle ≤ 86°	<u>43</u> Nm @ <u>84</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	74 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/20/06
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 083

Test I.D.: D06732

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.2	Pass
Humidity		%	10 to 70	22	Pass
Impact Velocity		m/s	5.1 to 5.3	5.2	Pass
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	2.0	Pass
	20 msec	m/s	3.4 to 4.2	3.8	Pass
	25 msec	m/s	4.3 to 5.2	4.7	Pass
D Plane Rotation		deg	75.0 to 86.0	83.8	Pass
Moment About Occipital Condyle		Nm	36.0 to 45.0	43.4	Pass
Positive Moment - Time Curve Decay to 5 Nm		msec	60 to 80	74	Pass
Overall Test Results					Pass

Jessica Gall

 Laboratory Technician

03/20/2006

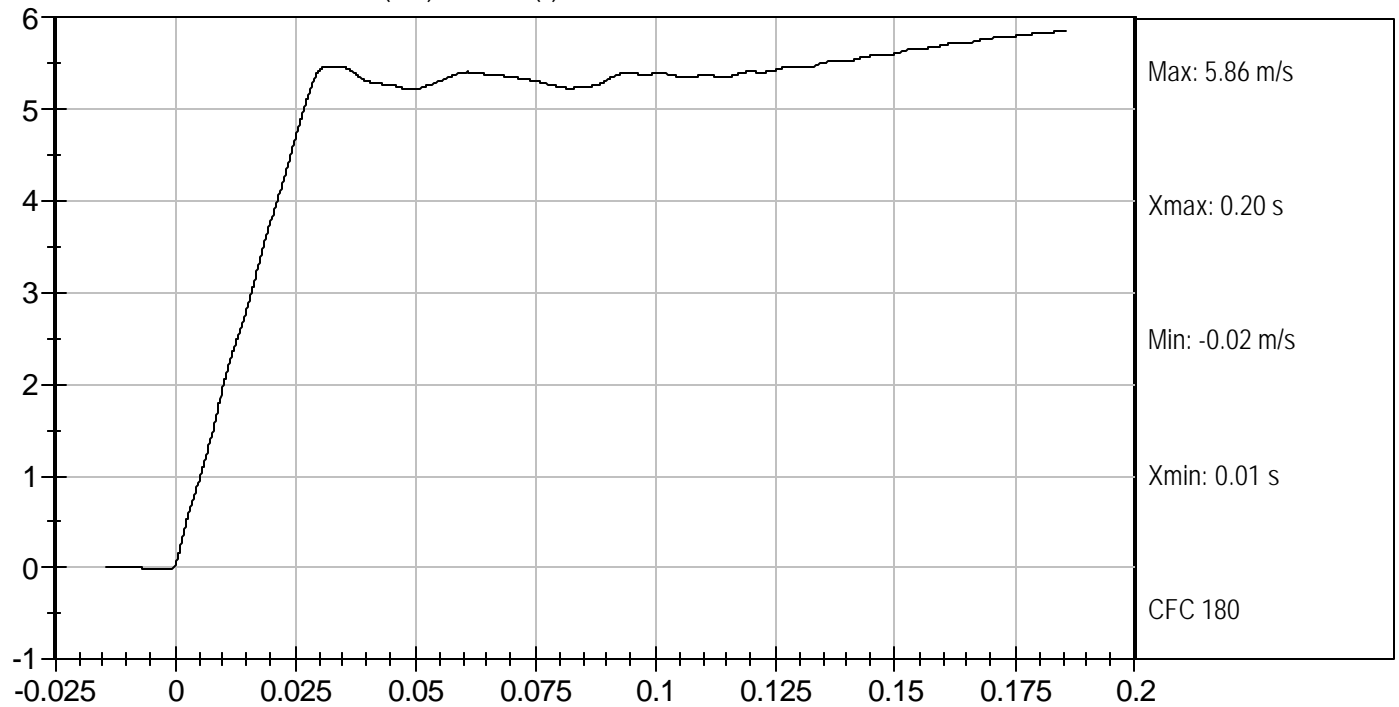
 Test Date

Jeff Leonard

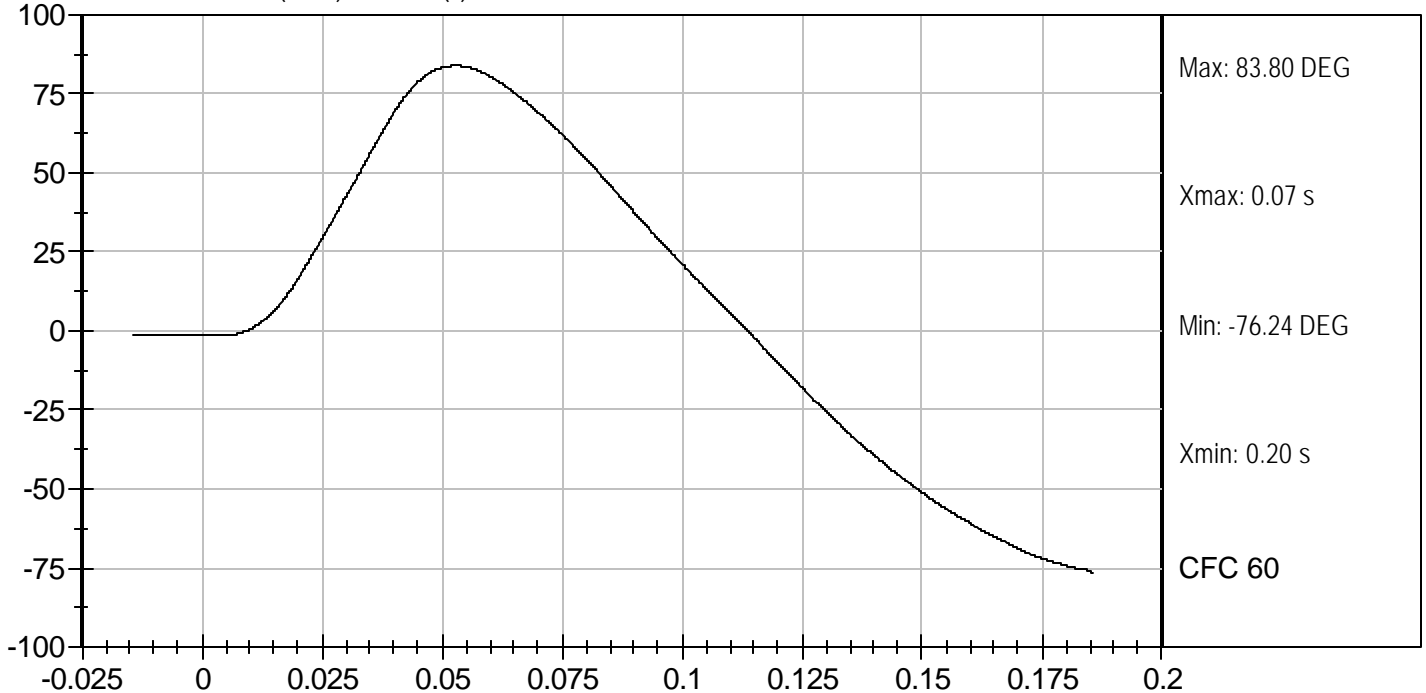
 Approved By



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



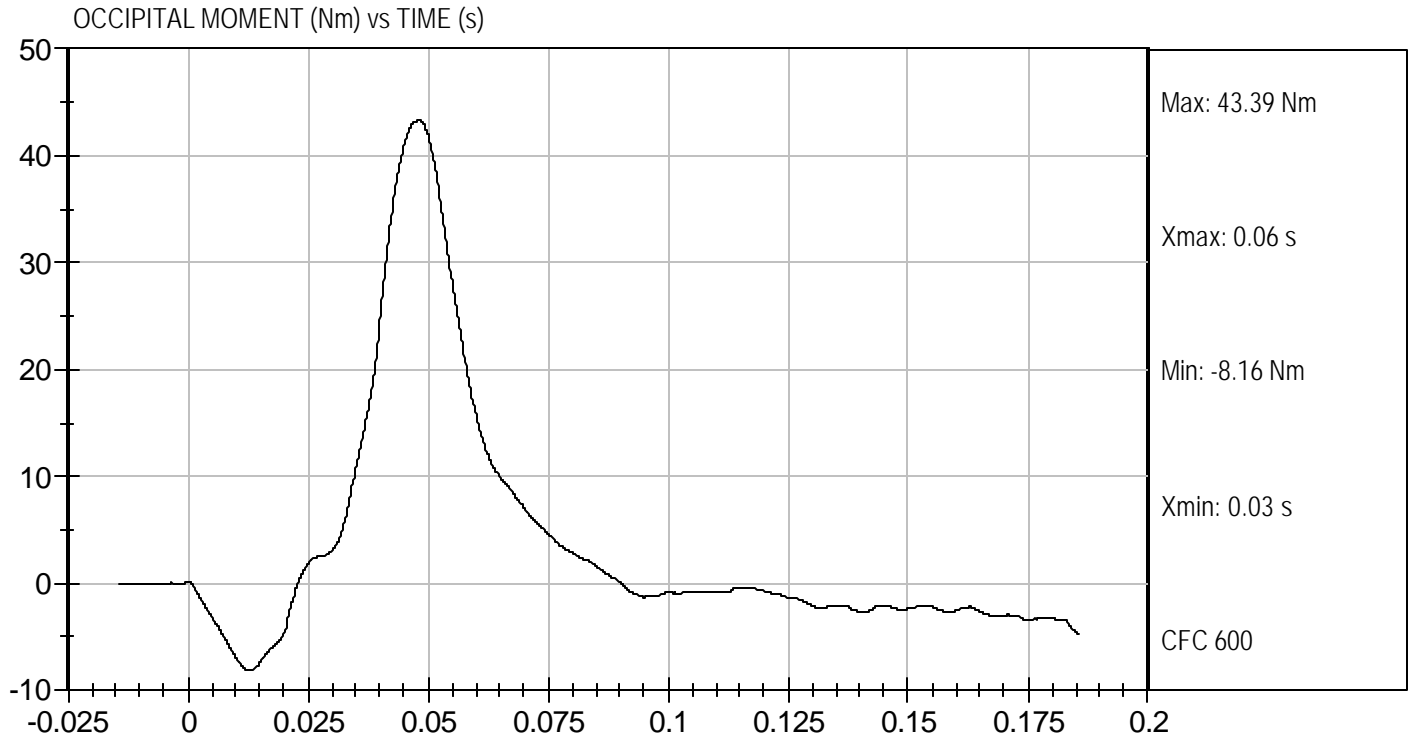
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D06732

Test Date: 03/20/2006
Velocity: 16.93 ft/s, 5.2 m/s



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

Dummy Serial Number 083

Test Date 3/20/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.5</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>23%</u> |
| Record the minimum humidity | <u>22%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$2.4 \text{ m/s} \leq \text{speed} \leq 2.6 \text{ m/s}$	2.5 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$0.8 \text{ m/s} \leq \Delta V \leq 1.2 \text{ m/s}$	0.8 m/s
	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 2.1 \text{ m/s}$	1.5 m/s
	@ 14 ms	$2.2 \text{ m/s} \leq \Delta V \leq 2.9 \text{ m/s}$	2.2 m/s
Plane D Rotation		Peak moment* $-12 \text{ Nm} \leq \text{moment} \leq -23 \text{ Nm}$ during the following rotation range $80^\circ \leq \text{angle} \leq 92^\circ$	<u>-16</u> Nm @ <u>81</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm $76 \text{ ms} \leq \text{time} \leq 90 \text{ ms}$	82 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/20/06
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test I.D.: D06733

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.2	Pass	
Humidity	%	10 to 70	22	Pass	
Pendulum Speed	m/s	2.4 to 2.6	2.5	Pass	
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	0.8	Pass
	10 msec	m/s	1.5 to 2.1	1.5	Pass
	14 msec	m/s	2.2 to 2.9	2.2	Pass
D Plane Rotation	deg	80.0 to 92.0	80.8	Pass	
Moment About Occipital Condyle	Nm	-23.0 to -12.0	-15.6	Pass	
Negative Moment - Time Curve Decay to -5 Nm	msec	76 to 90	82	Pass	
Overall Test Results				Pass	

Jessica Hall

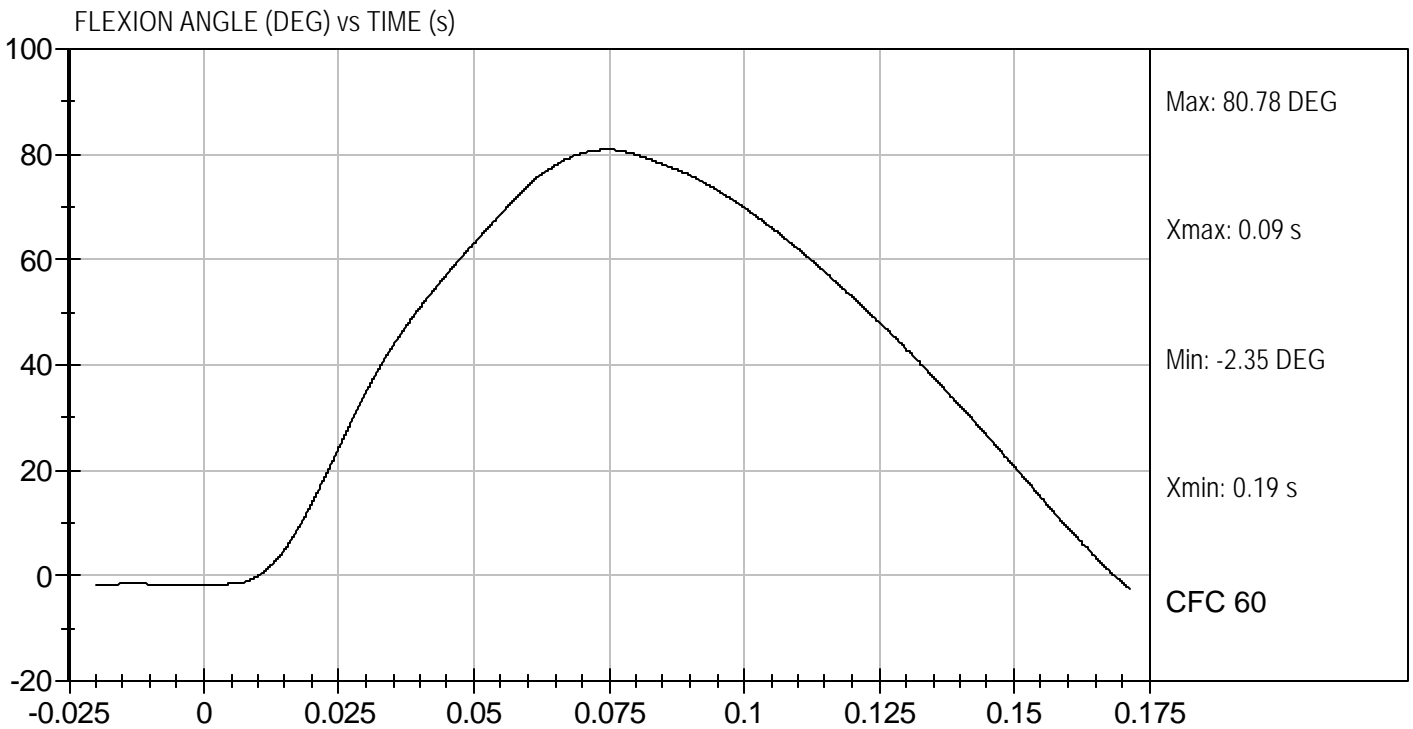
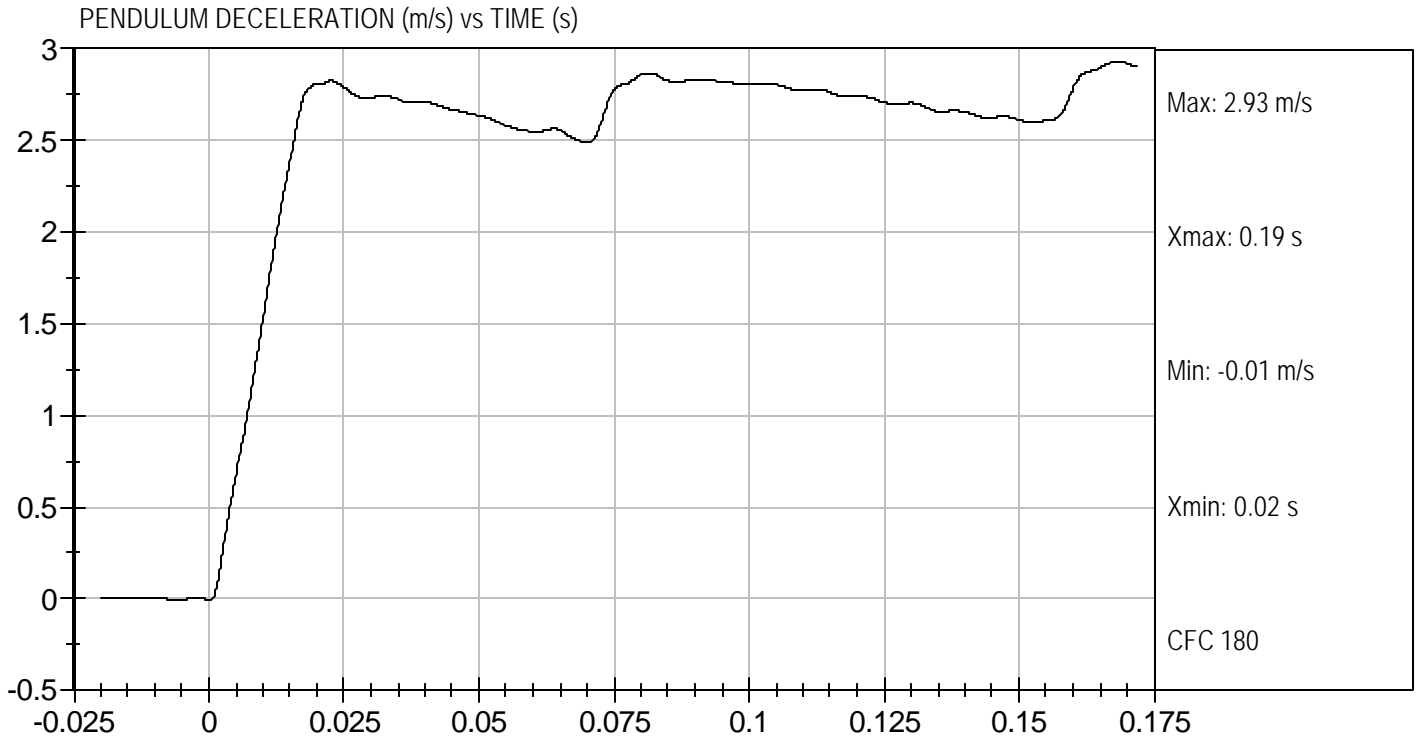
 Laboratory Technician

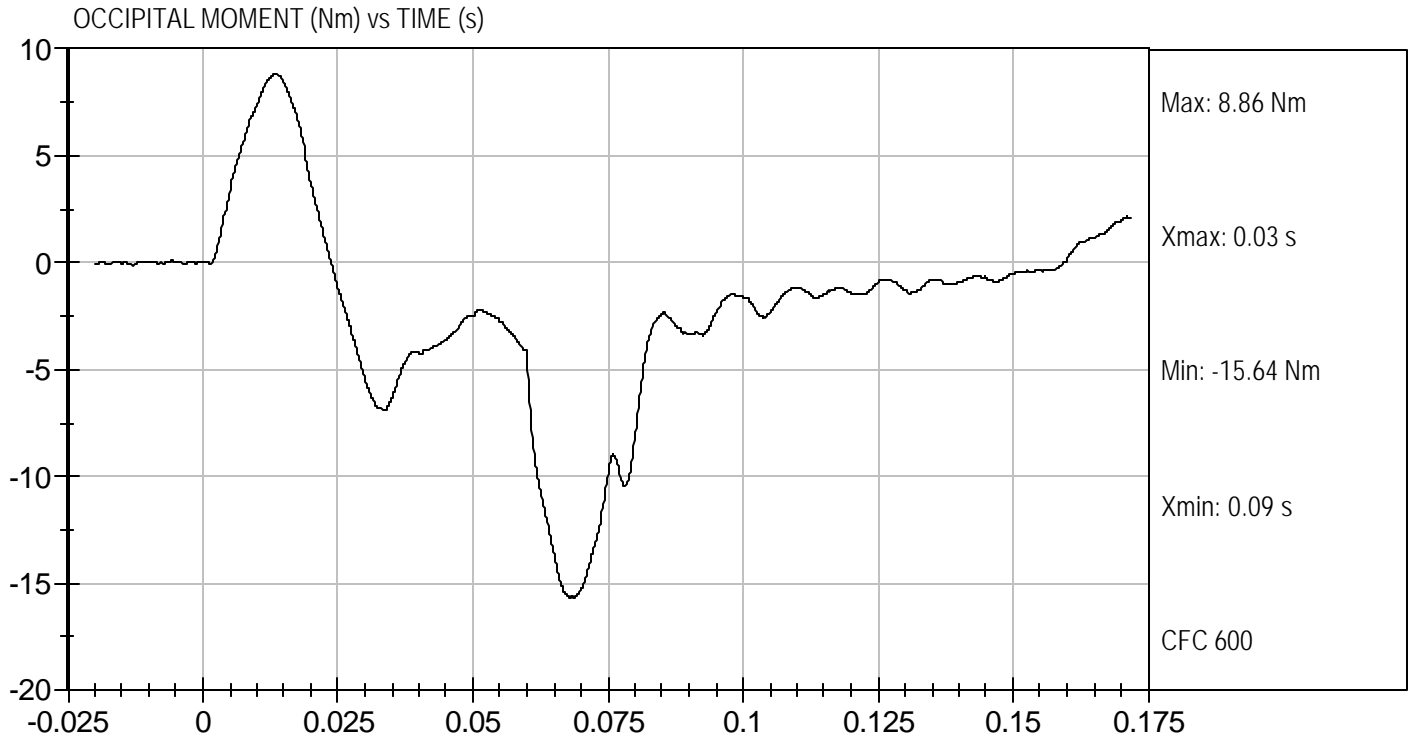
03/20/2006

 Test Date

Jeff Leonard

 Approved By





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

Dummy Serial Number 083

Test Date 3/20/06

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. (572.155(m))
 N/A, ONLY one thorax impact test performed
2. The test fixture conforms to the specifications in Figure 10E.
3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))
4. The dummy assembly soaked at a temperature between 20.6°C (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. (572.154(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.5</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>23%</u> |
| Record the minimum humidity | <u>22%</u> |
5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))
6. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.154(c)(3))
7. The posterior surface of the upper spine box is $90^\circ \pm 1^\circ$ from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))
8. Place the upper arms parallel to the torso. Place the lower arms 0° to 5° forward of vertical. (572.154(c)(3))
9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))
10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.146(l)).
11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The

MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH

ATD Serial No: 083

Test I.D: D06734

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	23	Pass
Probe Speed	m/sec	4.9 to 5.1	5.1	Pass
Probe Force	Newtons	1.51 to 1.80	1.53	Pass
Overall Test Results				Pass

Jessica Gall
 Laboratory Technician

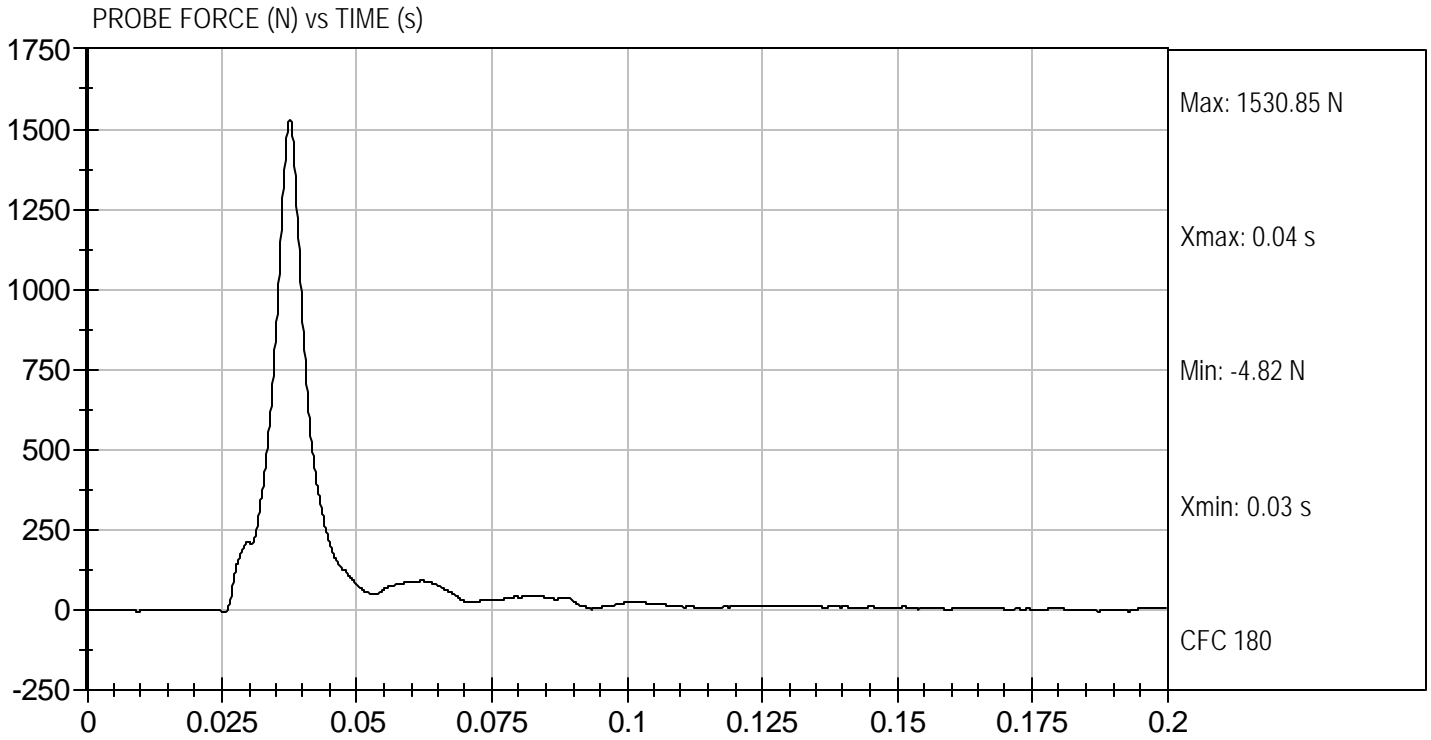
03/20/2006
 Test Date

Jeff Leonard
 Approved By



Test Desc: Thorax Impact
Component ID: D06734

Test Date: 03/20/2006
Velocity: 16.69 ft/s, 5.09 m/s



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

Dummy Serial Number 083

Test Date 3/29/06

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))

3. Accelerometers and their respective mounts are smooth and clean.

4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.3

Record the maximum humidity 32%

Record the minimum humidity 31%

6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(i))
Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(i))
Record the right side distance 439 mm
Record the left side distance 439 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))
Record the angle 45 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$100 \text{ g} \leq x \leq 120 \text{ g}$	115
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	-3

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

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D06851

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	100 to 120	115	Pass
Peak Lateral Acceleration	G's	+/- 15	-3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

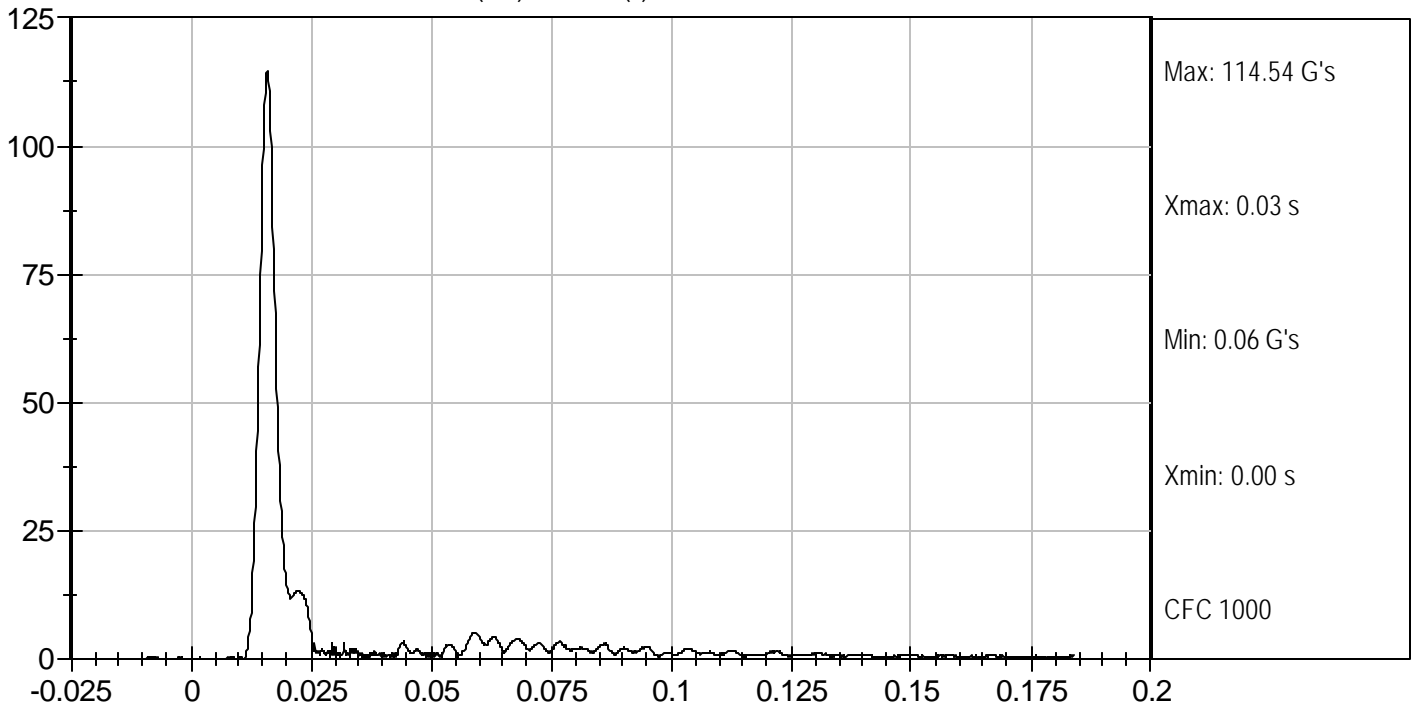
Jessica Hall
Laboratory Technician

03/29/2006
Test Date

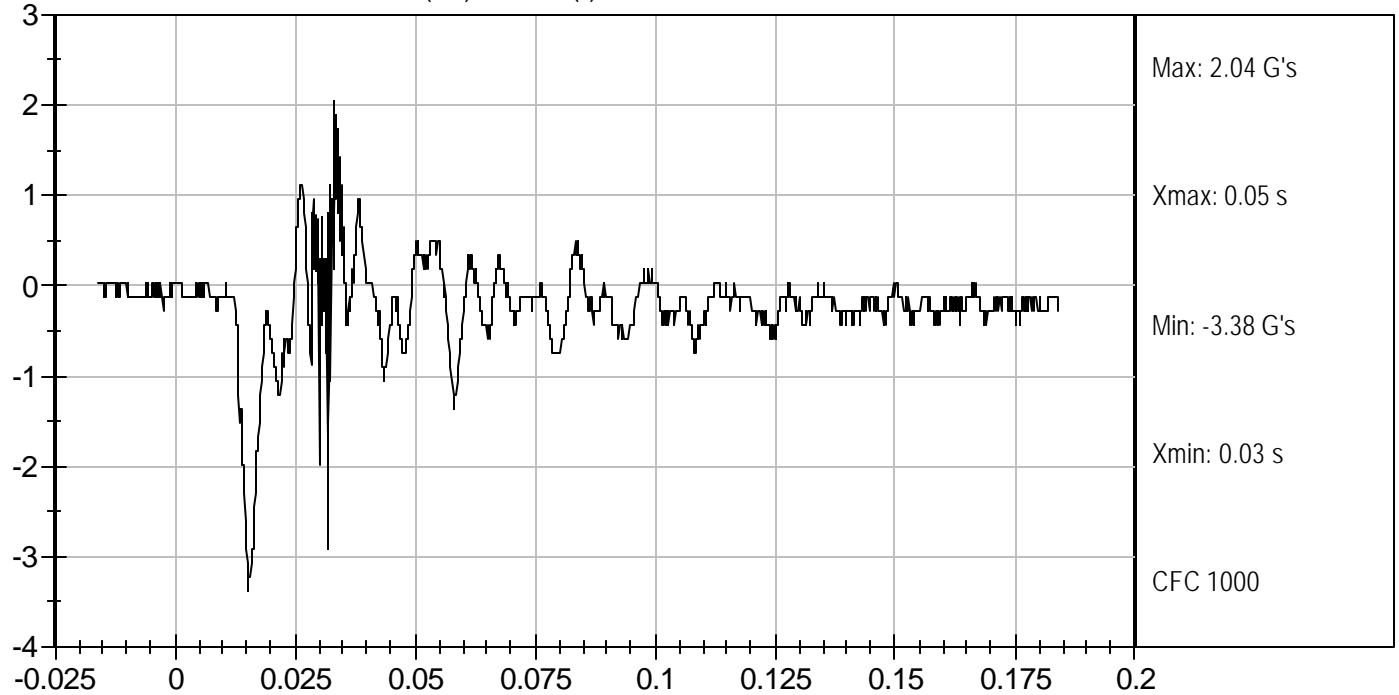
Jeff Levanthasi
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 083

Test Date 3/29/06

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))

3. Accelerometers and their respective mounts are smooth and clean.

4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.3

Record the maximum humidity 32%

Record the minimum humidity 31%

6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(ii))
Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(ii))
Record the right side distance 467 mm
Record the left side distance 467 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
Record the angle 90 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$55 \text{ g} \leq x \leq 71 \text{ g}$	69
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	2

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D06855

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	55 to 71	69	Pass
Peak Lateral Acceleration	G's	+/- 15	2	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall

Laboratory Technician

03/29/2006

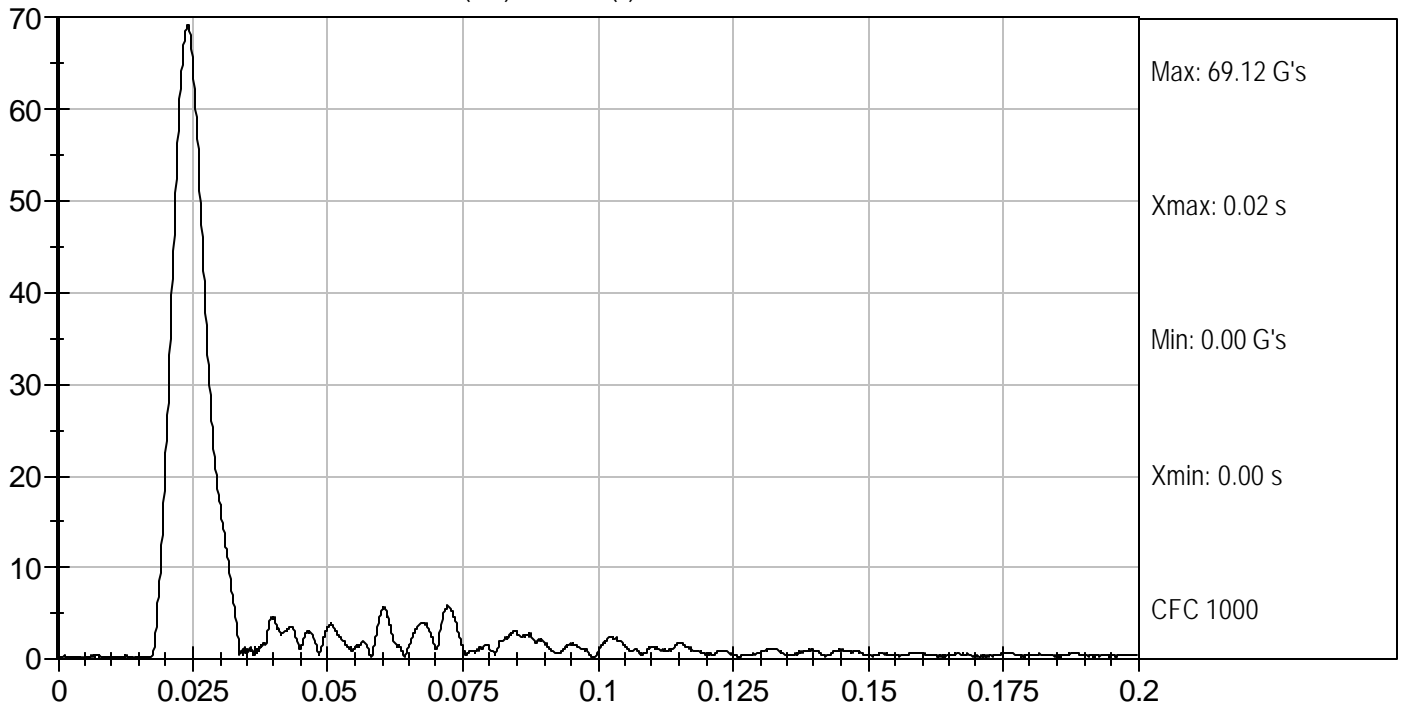
Test Date

David Winkelbauer

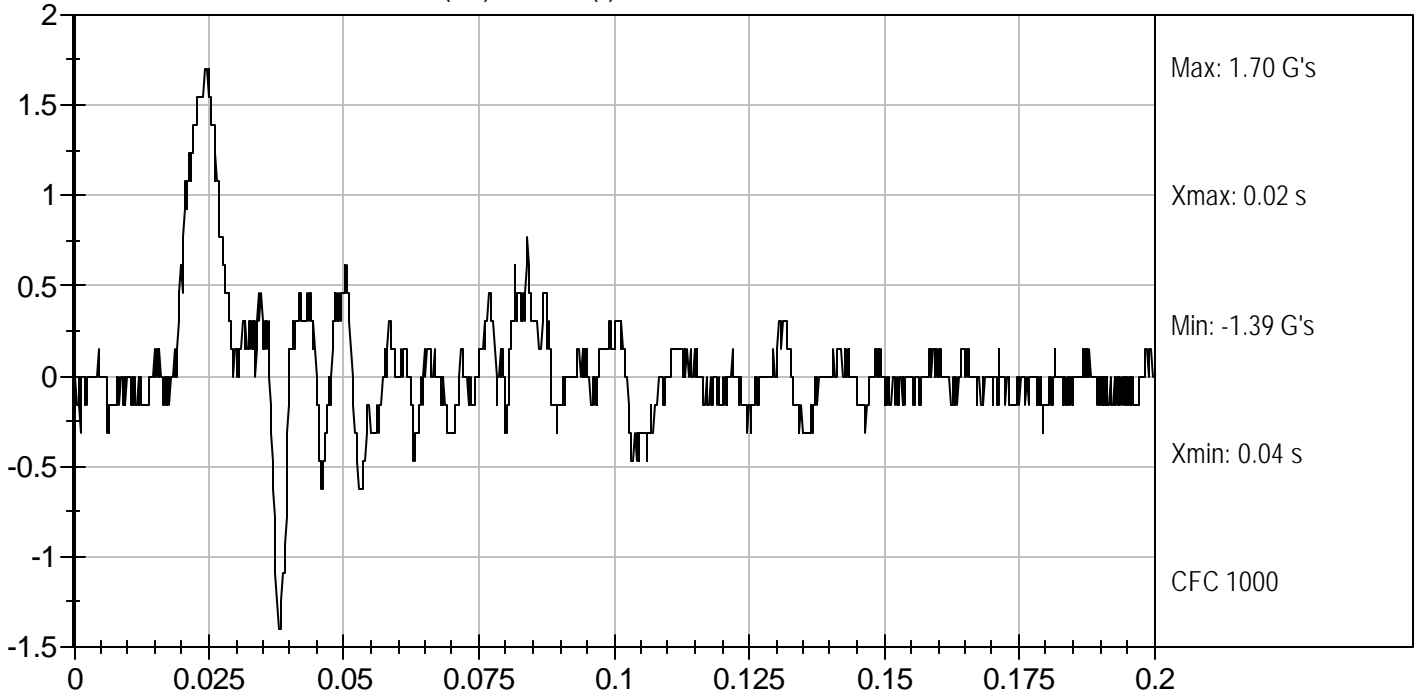
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 083

Test Date 3/29/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 8E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	5.3 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	1.9 m/s
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	3.8 m/s
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	4.6 m/s
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75° ≤ angle ≤ 86°	<u>41</u> Nm @ <u>83</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	75 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/29/06
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 083

Test I.D.: D06852


Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.4	Pass
Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	5.1 to 5.3	5.3	Pass
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	1.9	Pass
	20 msec	m/s	3.4 to 4.2	3.8	Pass
	25 msec	m/s	4.3 to 5.2	4.6	Pass
D Plane Rotation		deg	75.0 to 86.0	82.5	Pass
Moment About Occipital Condyle		Nm	36.0 to 45.0	41.4	Pass
Positive Moment - Time Curve Decay to 5 Nm		msec	60 to 80	75	Pass
Overall Test Results					Pass



 Laboratory Technician

03/29/2006

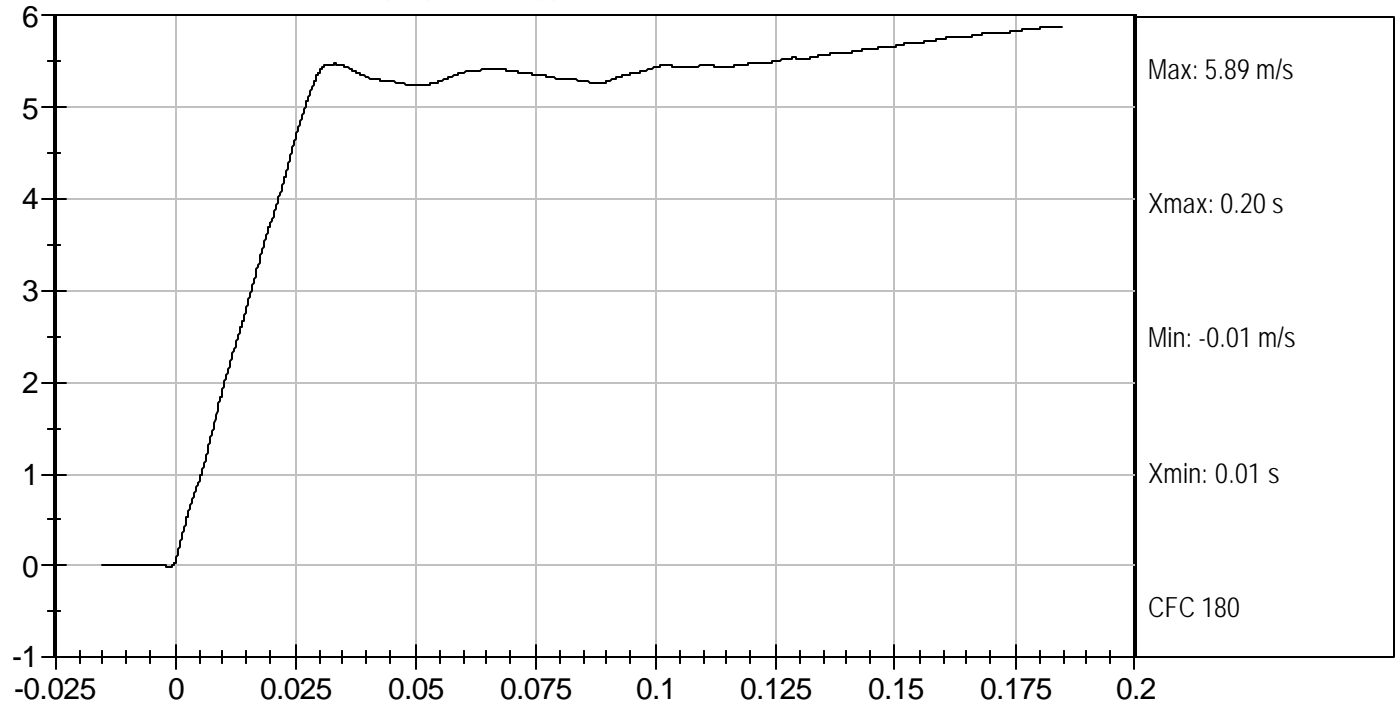
 Test Date



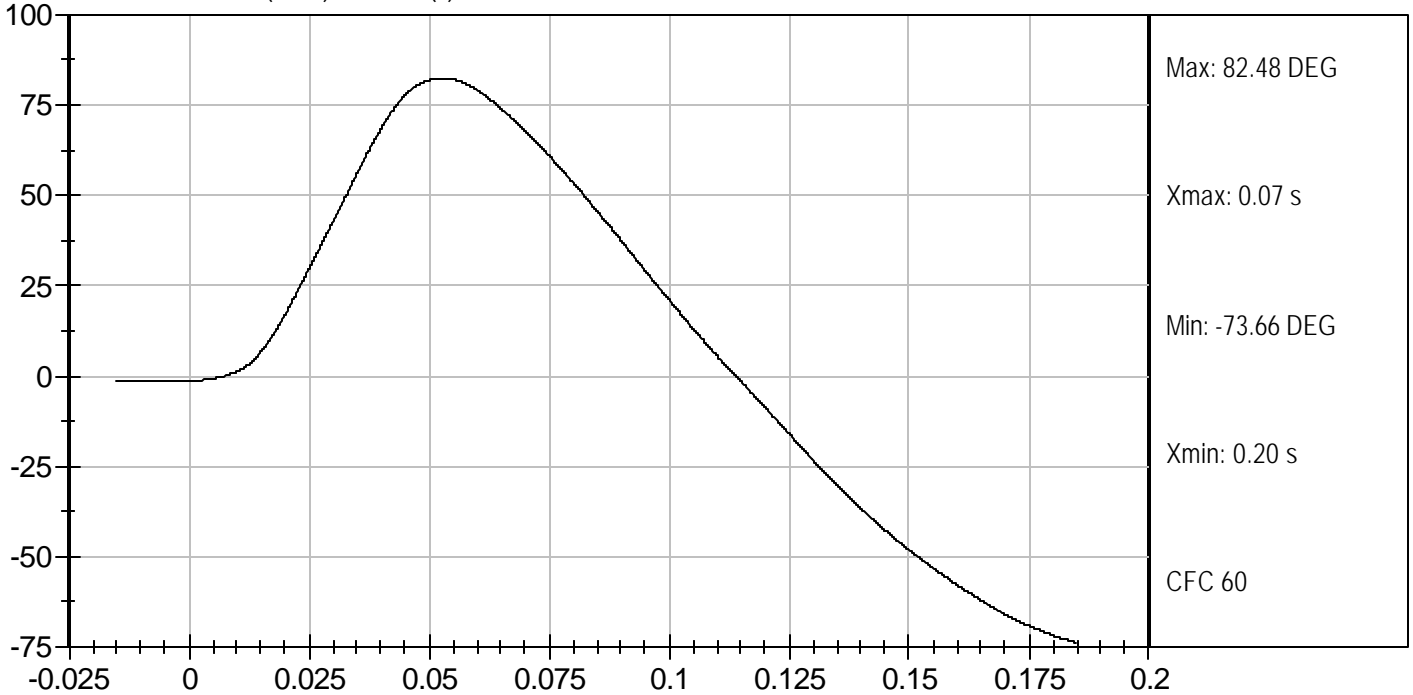
 Approved By



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



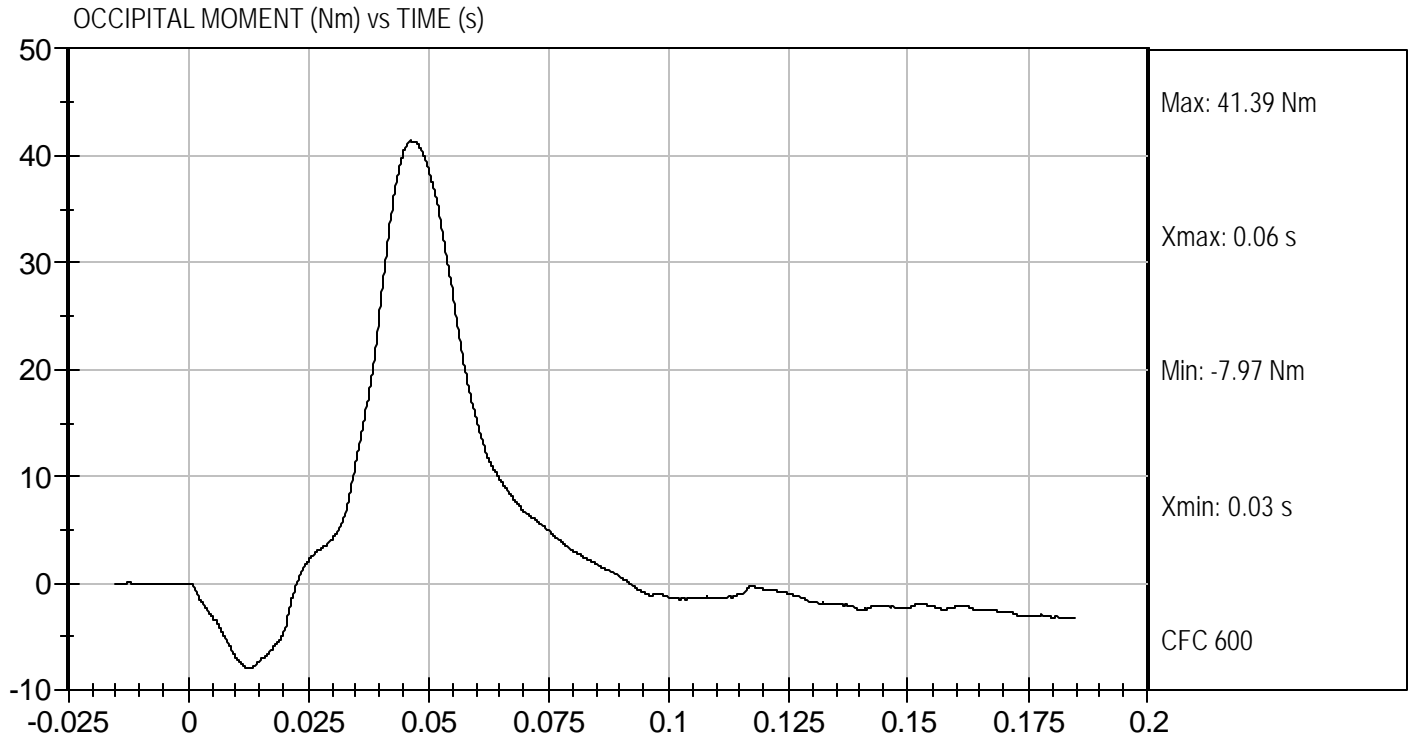
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D06852

Test Date: 03/29/2006
Velocity: 17.23 ft/s, 5.3 m/s



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

Dummy Serial Number 083

Test Date 3/29/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$2.4 \text{ m/s} \leq \text{speed} \leq 2.6 \text{ m/s}$	2.5 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$0.8 \text{ m/s} \leq \Delta V \leq 1.2 \text{ m/s}$	1.0 m/s
	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 2.1 \text{ m/s}$	1.9 m/s
	@ 14 ms	$2.2 \text{ m/s} \leq \Delta V \leq 2.9 \text{ m/s}$	2.7 m/s
Plane D Rotation		Peak moment* $-12 \text{ Nm} \leq \text{moment} \leq -23 \text{ Nm}$ during the following rotation range $80^\circ \leq \text{angle} \leq 92^\circ$	<u>-16</u> Nm @ <u>81</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm $76 \text{ ms} \leq \text{time} \leq 90 \text{ ms}$	81 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test I.D.: D06853

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.3	Pass	
Humidity	%	10 to 70	32	Pass	
Pendulum Speed	m/s	2.4 to 2.6	2.5	Pass	
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	1.0	Pass
	10 msec	m/s	1.5 to 2.1	1.9	Pass
	14 msec	m/s	2.2 to 2.9	2.7	Pass
D Plane Rotation	deg	80.0 to 92.0	81.0	Pass	
Moment About Occipital Condyle	Nm	-23.0 to -12.0	-16.2	Pass	
Negative Moment - Time Curve Decay to -5 Nm	msec	76 to 90	81	Pass	
Overall Test Results				Pass	

Jessica Gall

 Laboratory Technician

03/29/2006

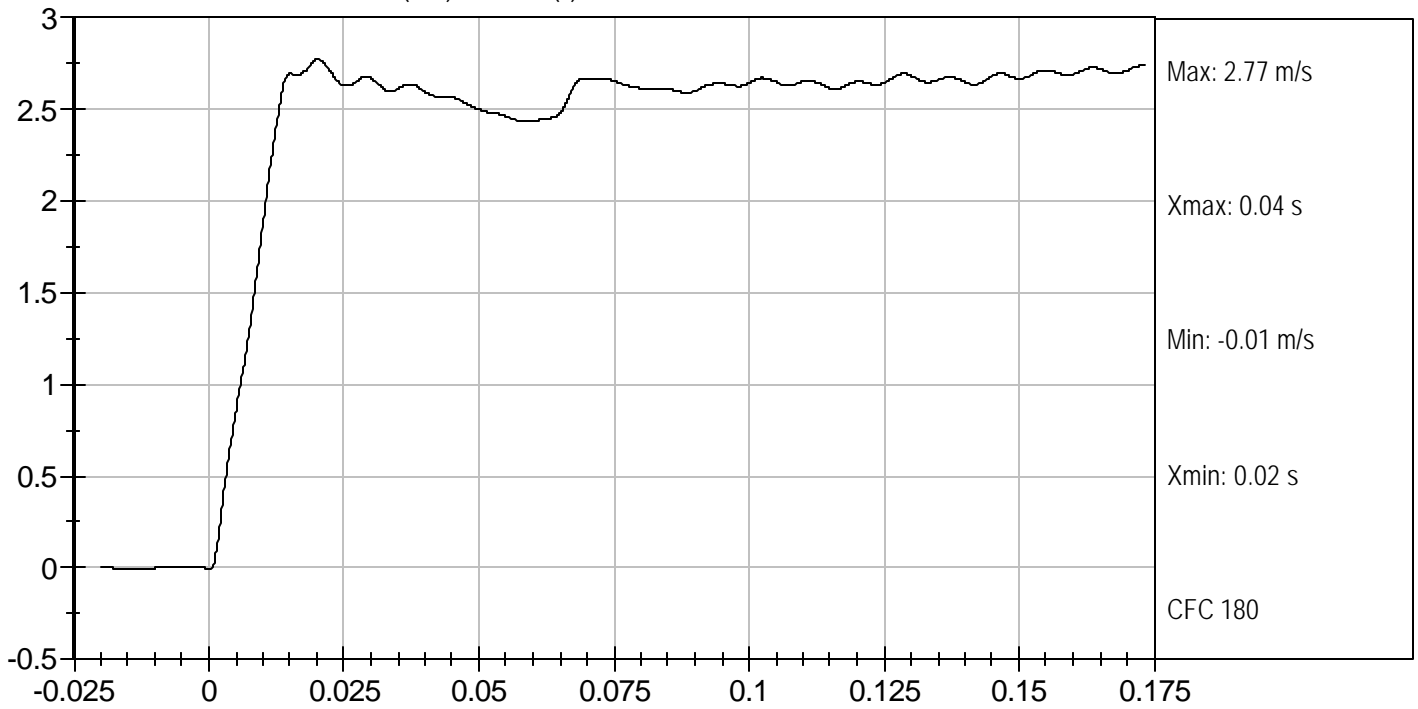
 Test Date

Jeff Leonard

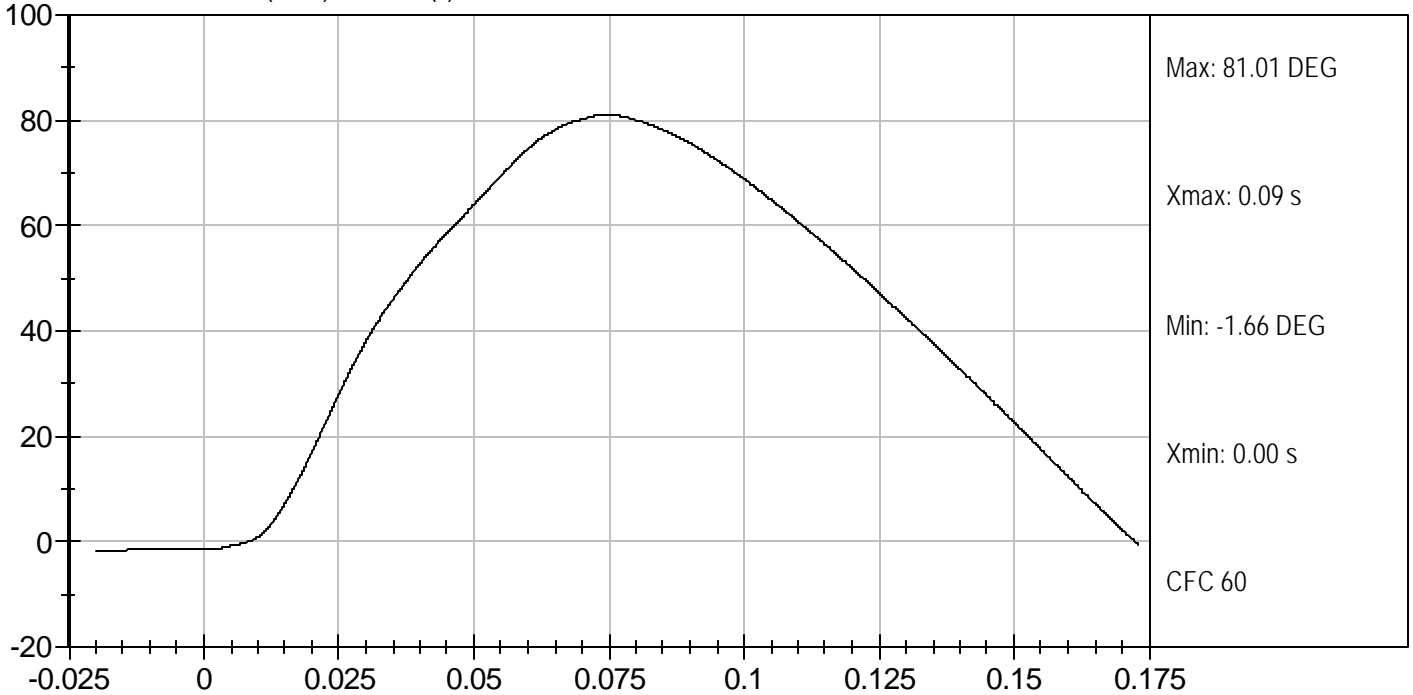
 Approved By

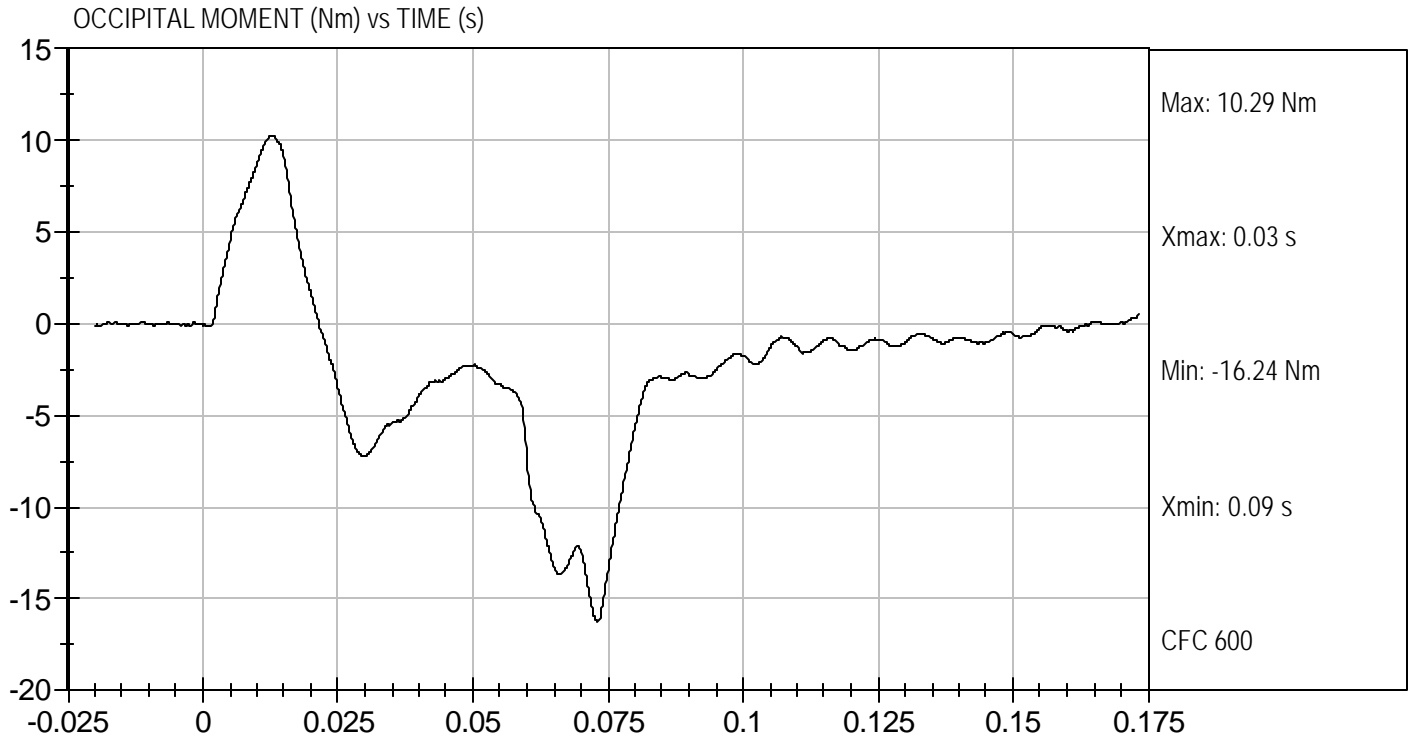


PENDULUM DECELERATION (m/s) vs TIME (s)



FLEXION ANGLE (DEG) vs TIME (s)





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

Dummy Serial Number 083

Test Date 3/29/06

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.
(572.155(m))

N/A, ONLY one thorax impact test performed

2. The test fixture conforms to the specifications in Figure 10E.

3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))

4. The dummy assembly soaked at a temperature between 20.6°C (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. (572.154(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.3

Record the maximum humidity 32%

Record the minimum humidity 31%

5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))

6. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.154(c)(3))

7. The posterior surface of the upper spine box is $90^\circ \pm 1^\circ$ from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))

8. Place the upper arms parallel to the torso. Place the lower arms 0° to 5° forward of vertical. (572.154(c)(3))

9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))

10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.146(l)).

11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The

**MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test I.D: D06854

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	32	Pass
Probe Speed	m/sec	4.9 to 5.1	5.1	Pass
Probe Force	Newtons	1.51 to 1.80	1.56	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

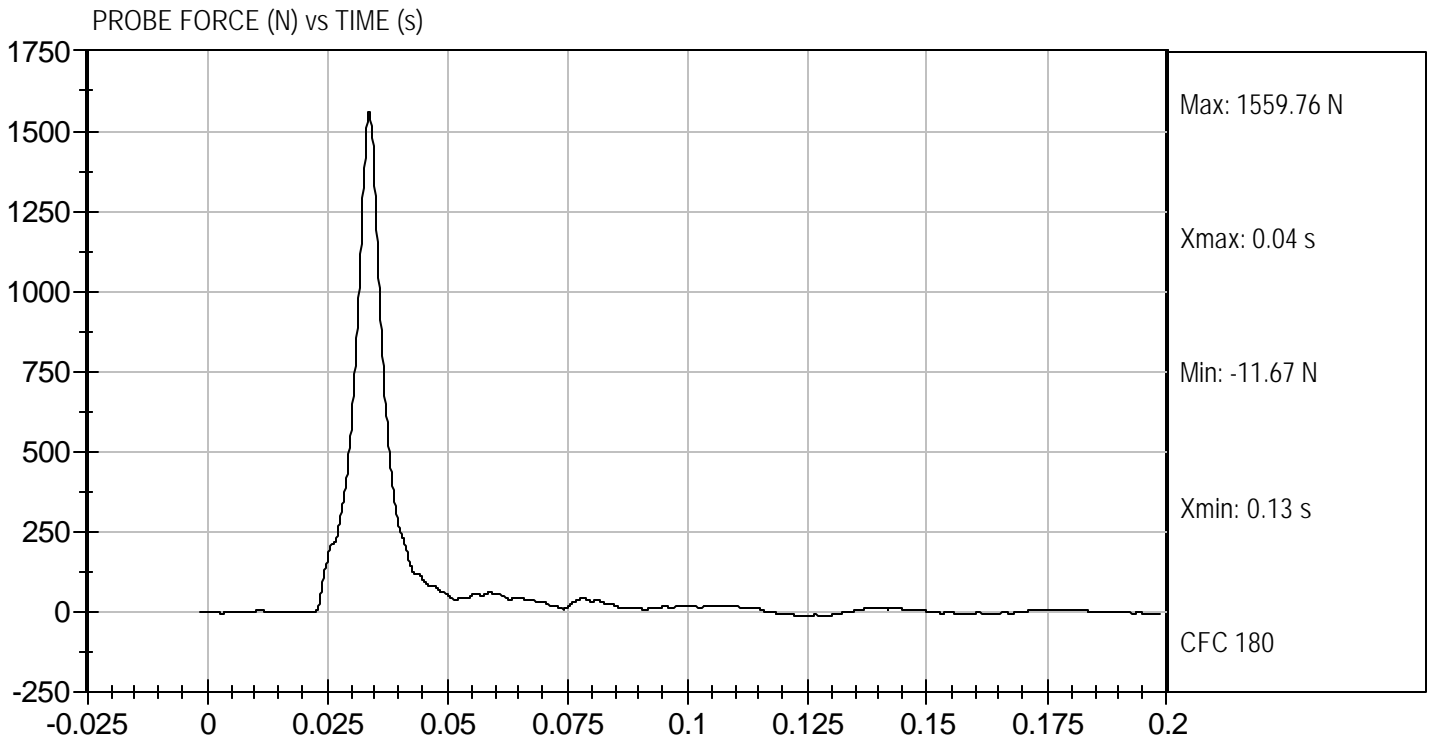
03/29/2006
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Impact
Component ID: D06854

Test Date: 03/29/2006
Velocity: 16.6 ft/s, 5.06 m/s



EXTERNAL DIMENSIONS

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456.0-471.2	470.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	288.2
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	31.3
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	44.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	53.8
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	71.1
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	186.0
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	108.2
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	156.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	204.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	151.4
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	174.6
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	156.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	110.3
P	FOOT LENGTH	Tip of toe to rear of heal	92.4-102.6	95.0
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsagittal plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	184.7
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	127.4
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.	149.9-165.1	164.0
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	170.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	209.3
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	44.1
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	472.6
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447-472.4	467.8
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	259.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	113.2
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	310.0
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	303.1

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

Dummy Serial Number 083

Test Date 3/28/06

Technician Jessica Gall

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

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

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			NA
Spine	Broken or cracks in rubber.			NA
Ribs	Broken or bent ribs			NA
	Broken or bent rib supports			NA
	Damping material separated or cracked			NA
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			NA
	Slider arm riding in track			NA
Transducer leads	Torn cables			NA

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			NA
	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

3/29/06
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

3/29/06

EXTERNAL DIMENSIONS

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456.0-471.2	470.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	288.2
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	31.3
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	44.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	53.8
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	71.1
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	186.0
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	108.2
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	156.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	204.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	151.4
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	174.6
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	156.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	110.3
P	FOOT LENGTH	Tip of toe to rear of heel	92.4-102.6	95.0
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsagittal plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	184.7
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	127.4
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.	149.9-165.1	164.0
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	170.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	209.3
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	44.1
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	472.6
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447-472.4	467.8
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	259.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	113.2
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	310.0
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	303.1

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

Dummy Serial Number 083

Test Date 3/29/06

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
3. Accelerometers and their respective mounts are smooth and clean.
4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</u> |
6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(i))

Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(i))

Record the right side distance 439 mm

Record the left side distance 439 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))

Record the angle 45 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))

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

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$100 \text{ g} \leq x \leq 120 \text{ g}$	115
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	-3

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

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D06851

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	100 to 120	115	Pass
Peak Lateral Acceleration	G's	+/- 15	-3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

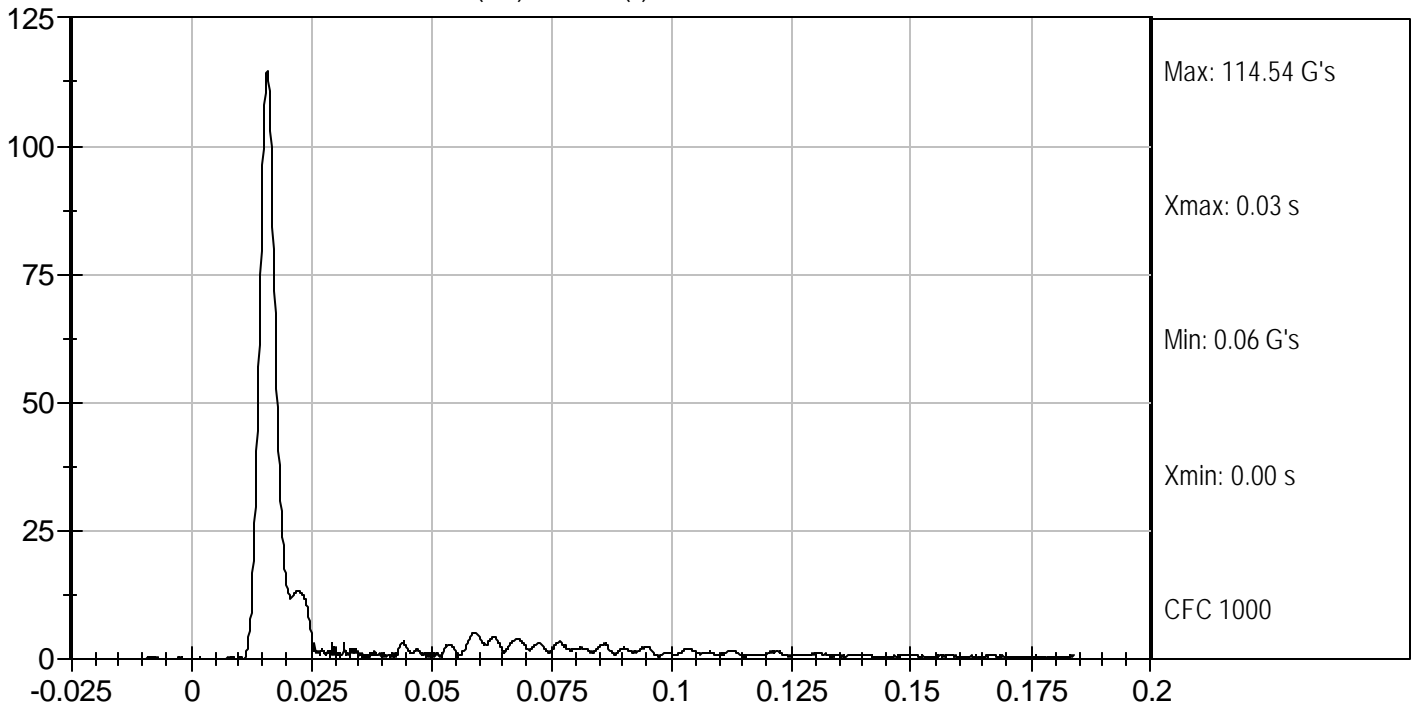
Jessica Hall
Laboratory Technician

03/29/2006
Test Date

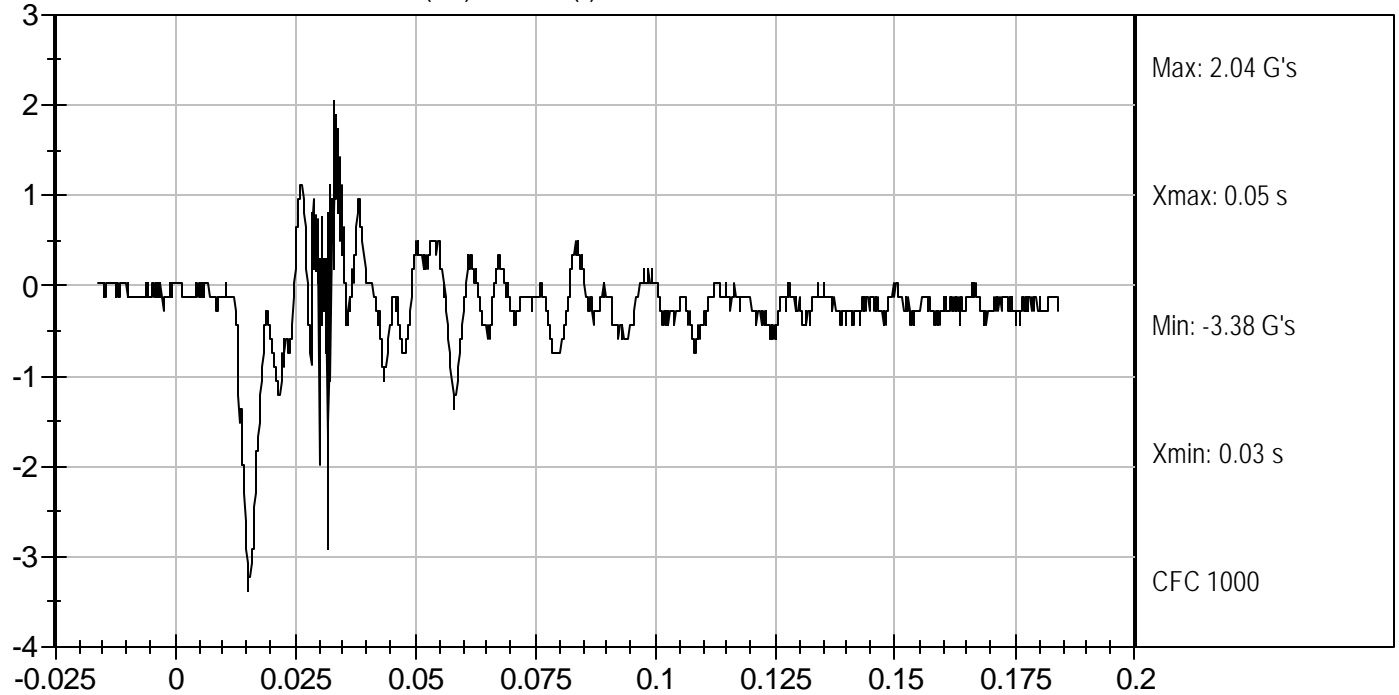
Jeff Levanthaler
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 083

Test Date 3/29/06

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
3. Accelerometers and their respective mounts are smooth and clean.
4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</u> |
6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(ii))
Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(ii))
Record the right side distance 467 mm
Record the left side distance 467 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
Record the angle 90 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$55 \text{ g} \leq x \leq 71 \text{ g}$	69
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	2

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D06855

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	55 to 71	69	Pass
Peak Lateral Acceleration	G's	+/- 15	2	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

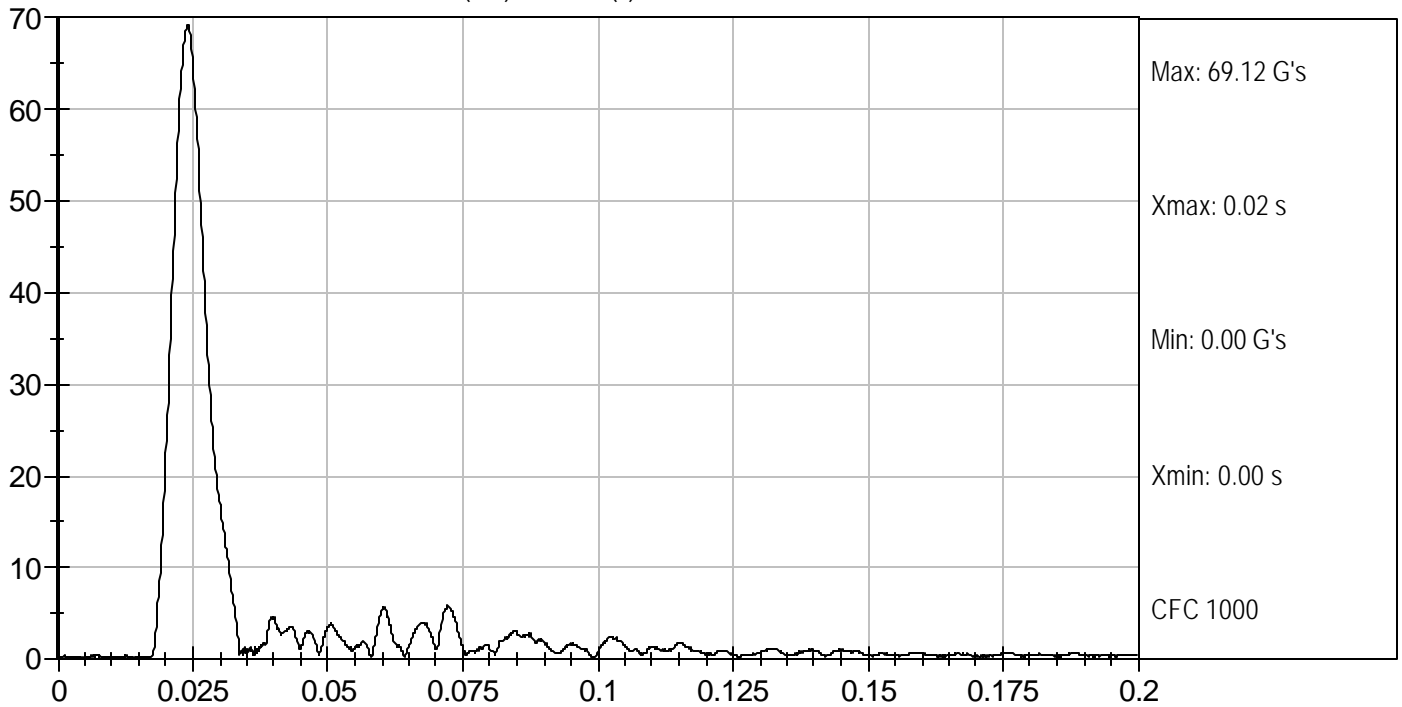
Jessica Hall
Laboratory Technician

03/29/2006
Test Date

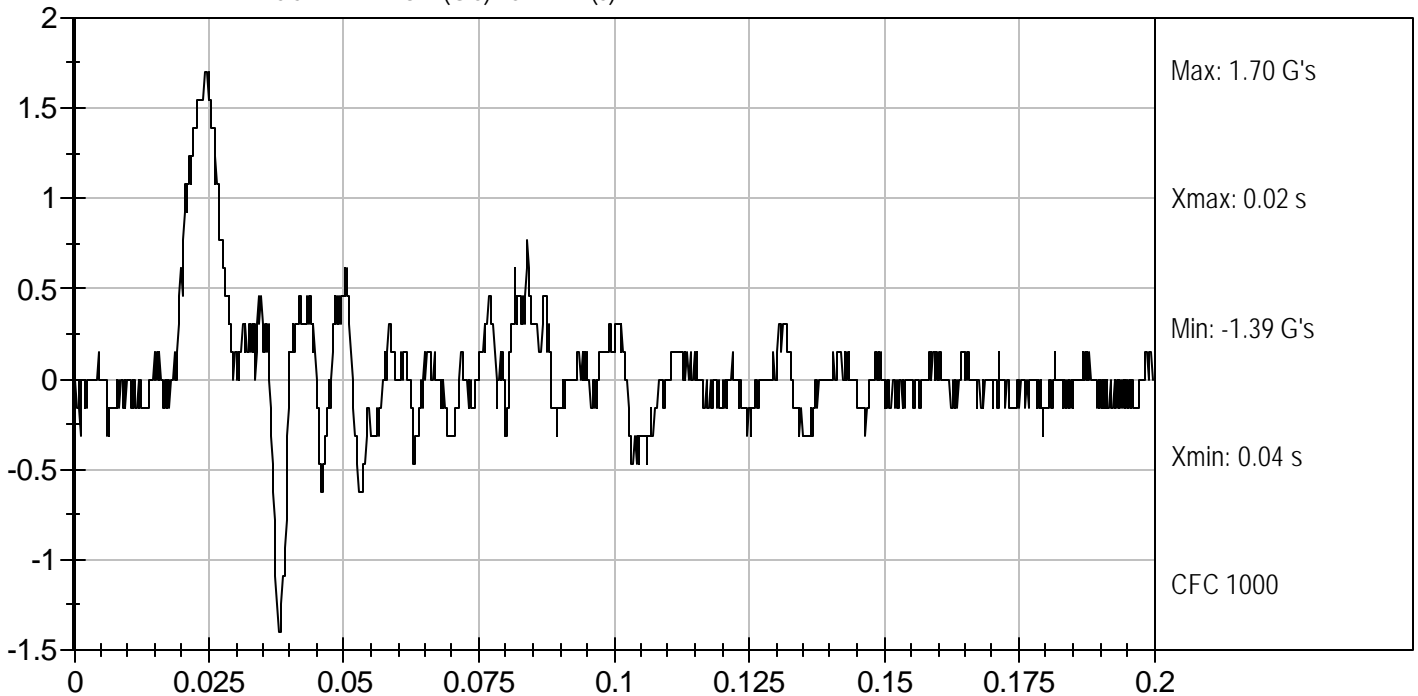
David Winkelbauer
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 083

Test Date 3/29/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 8E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	5.3 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	1.9 m/s
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	3.8 m/s
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	4.6 m/s
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75° ≤ angle ≤ 86°	<u>41</u> Nm @ <u>83</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	75 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test I.D.: D06852

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.4	Pass
Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	5.1 to 5.3	5.3	Pass
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	1.9	Pass
	20 msec	m/s	3.4 to 4.2	3.8	Pass
	25 msec	m/s	4.3 to 5.2	4.6	Pass
D Plane Rotation		deg	75.0 to 86.0	82.5	Pass
Moment About Occipital Condyle		Nm	36.0 to 45.0	41.4	Pass
Positive Moment - Time Curve Decay to 5 Nm		msec	60 to 80	75	Pass
Overall Test Results					Pass

Jessica Hall

Laboratory Technician

03/29/2006

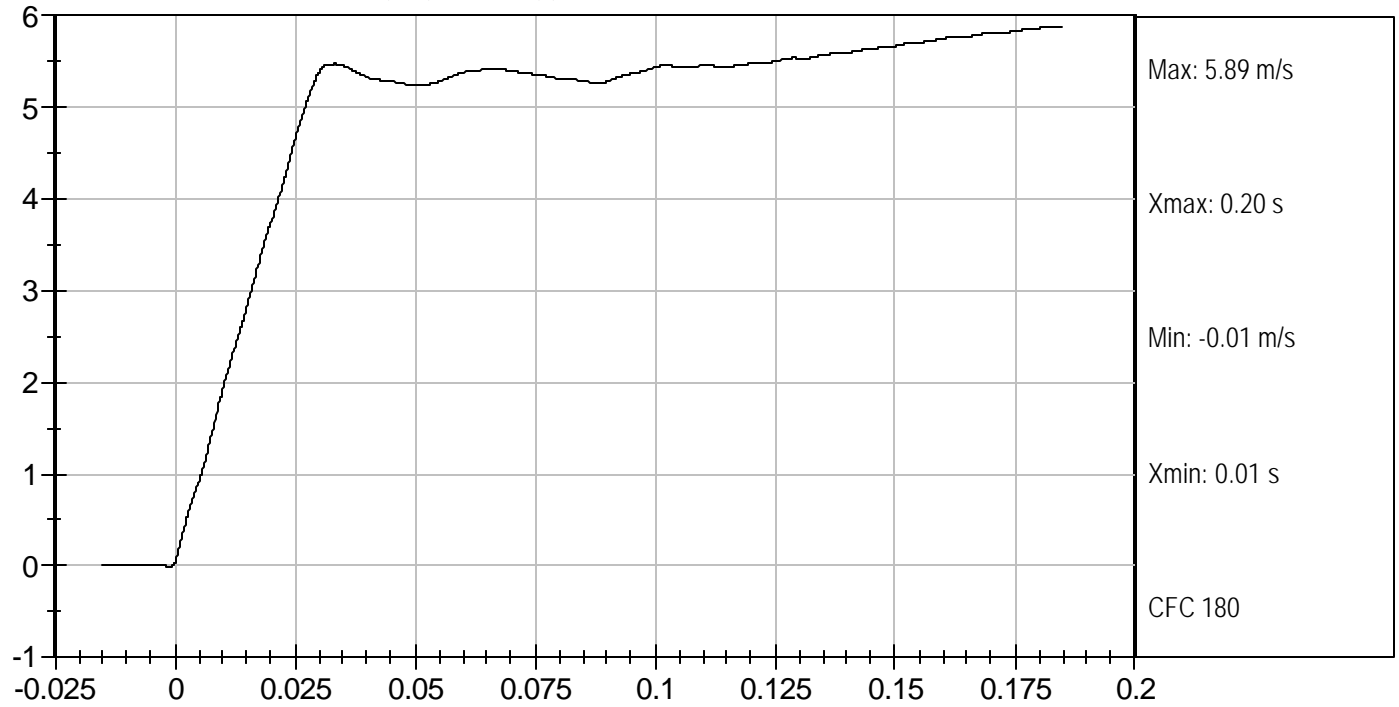
Test Date

David Winkelbauer

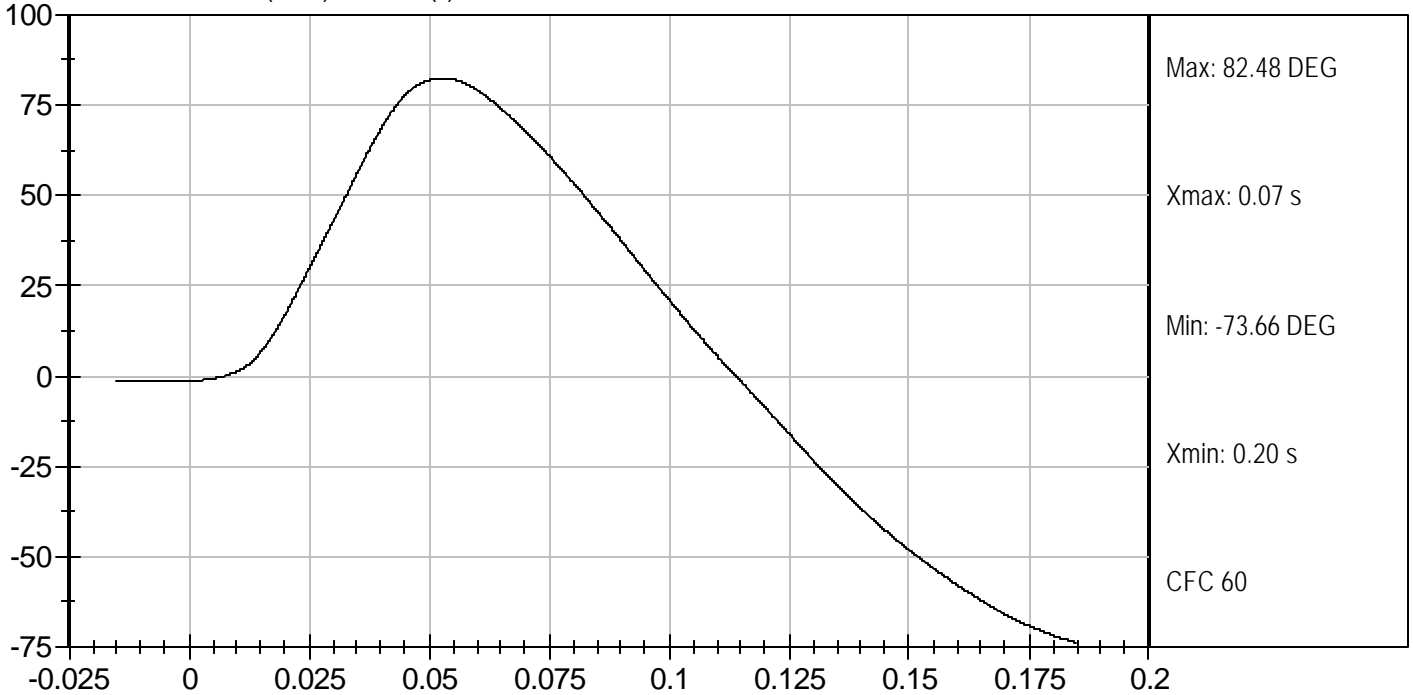
Approved By



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



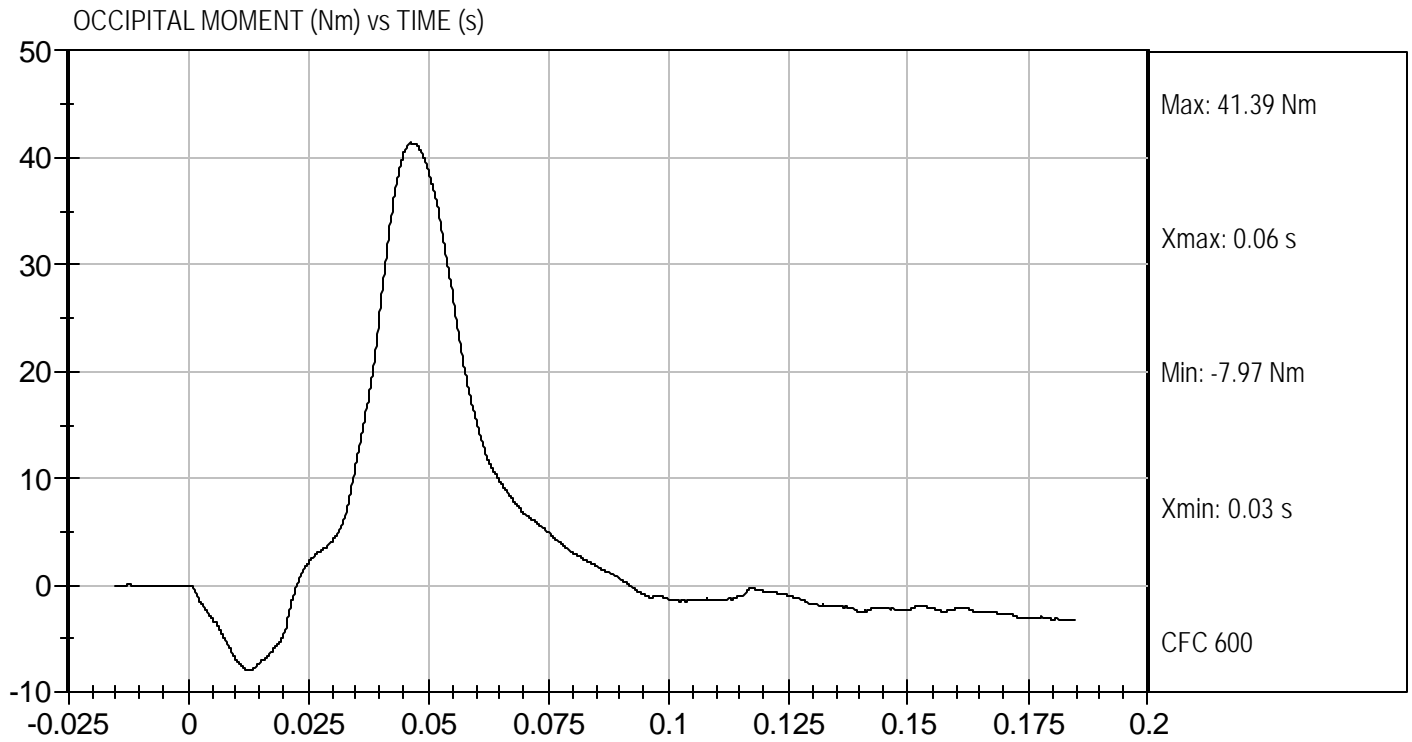
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D06852

Test Date: 03/29/2006
Velocity: 17.23 ft/s, 5.3 m/s



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

Dummy Serial Number 083

Test Date 3/29/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		2.4 m/s \leq speed \leq 2.6 m/s	2.5 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	0.8 m/s $\leq \Delta V \leq$ 1.2 m/s	1.0 m/s
	@ 10 ms	1.5 m/s $\leq \Delta V \leq$ 2.1 m/s	1.9 m/s
	@ 14 ms	2.2 m/s $\leq \Delta V \leq$ 2.9 m/s	2.7 m/s
Plane D Rotation		Peak moment* -12 Nm \leq moment \leq -23 Nm during the following rotation range 80° \leq angle \leq 92°	<u>-16</u> Nm @ <u>81</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm 76 ms \leq time \leq 90ms	81 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/29/06
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test I.D.: D06853

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.3	Pass	
Humidity	%	10 to 70	32	Pass	
Pendulum Speed	m/s	2.4 to 2.6	2.5	Pass	
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	1.0	Pass
	10 msec	m/s	1.5 to 2.1	1.9	Pass
	14 msec	m/s	2.2 to 2.9	2.7	Pass
D Plane Rotation	deg	80.0 to 92.0	81.0	Pass	
Moment About Occipital Condyle	Nm	-23.0 to -12.0	-16.2	Pass	
Negative Moment - Time Curve Decay to -5 Nm	msec	76 to 90	81	Pass	
Overall Test Results				Pass	

Jessica Hall

Laboratory Technician

03/29/2006

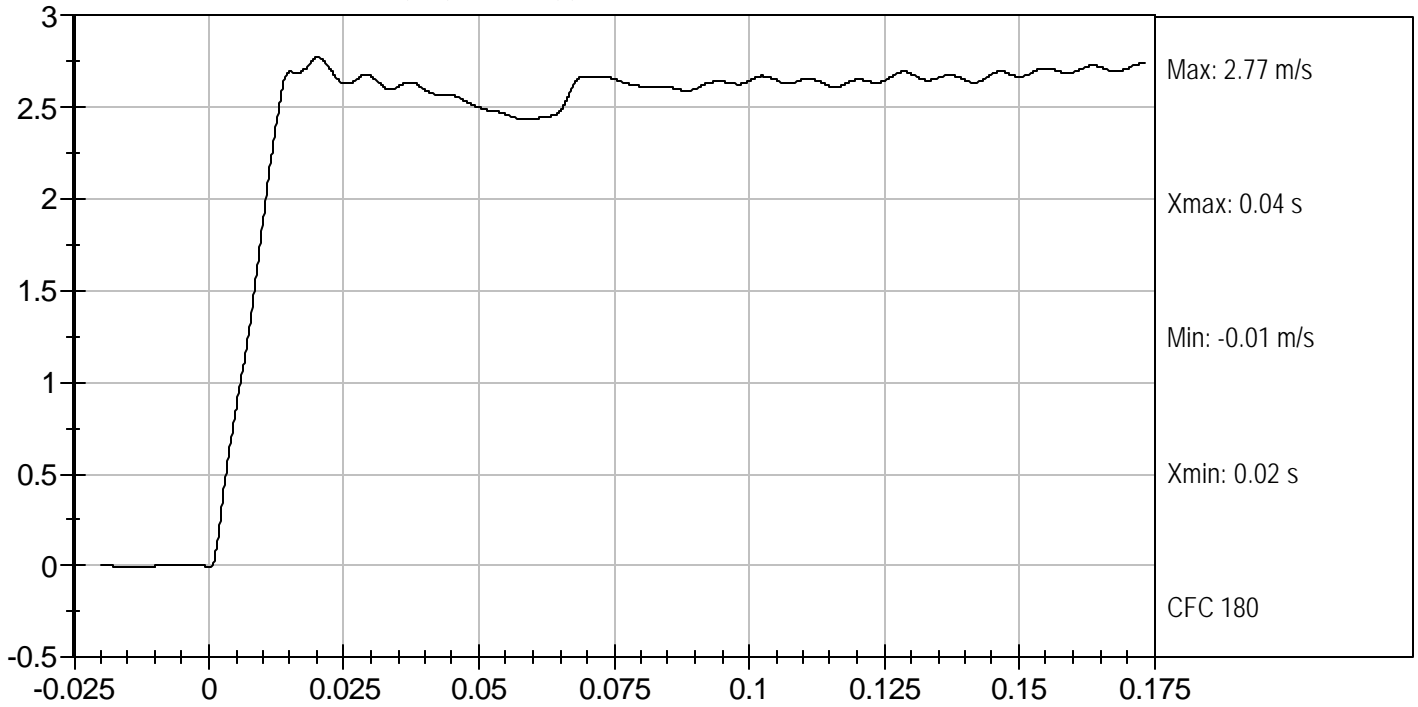
Test Date

Jeff Levanowski

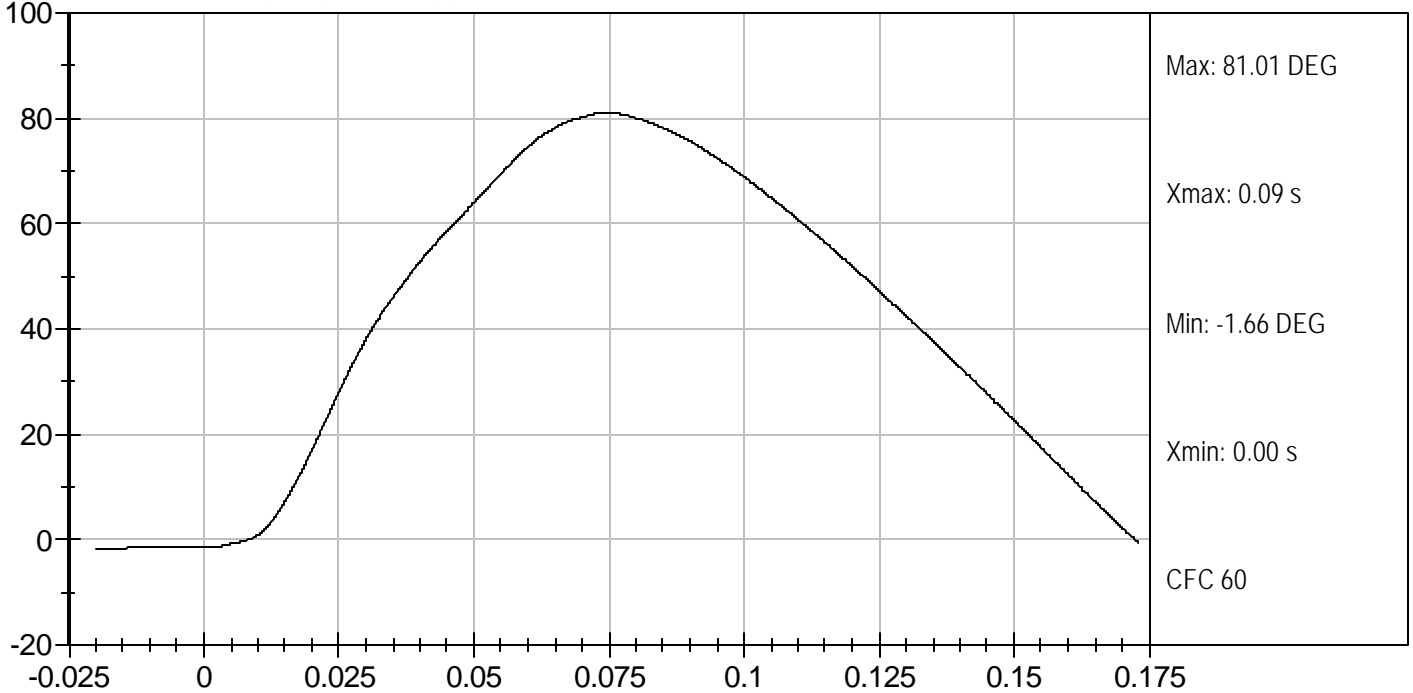
Approved By

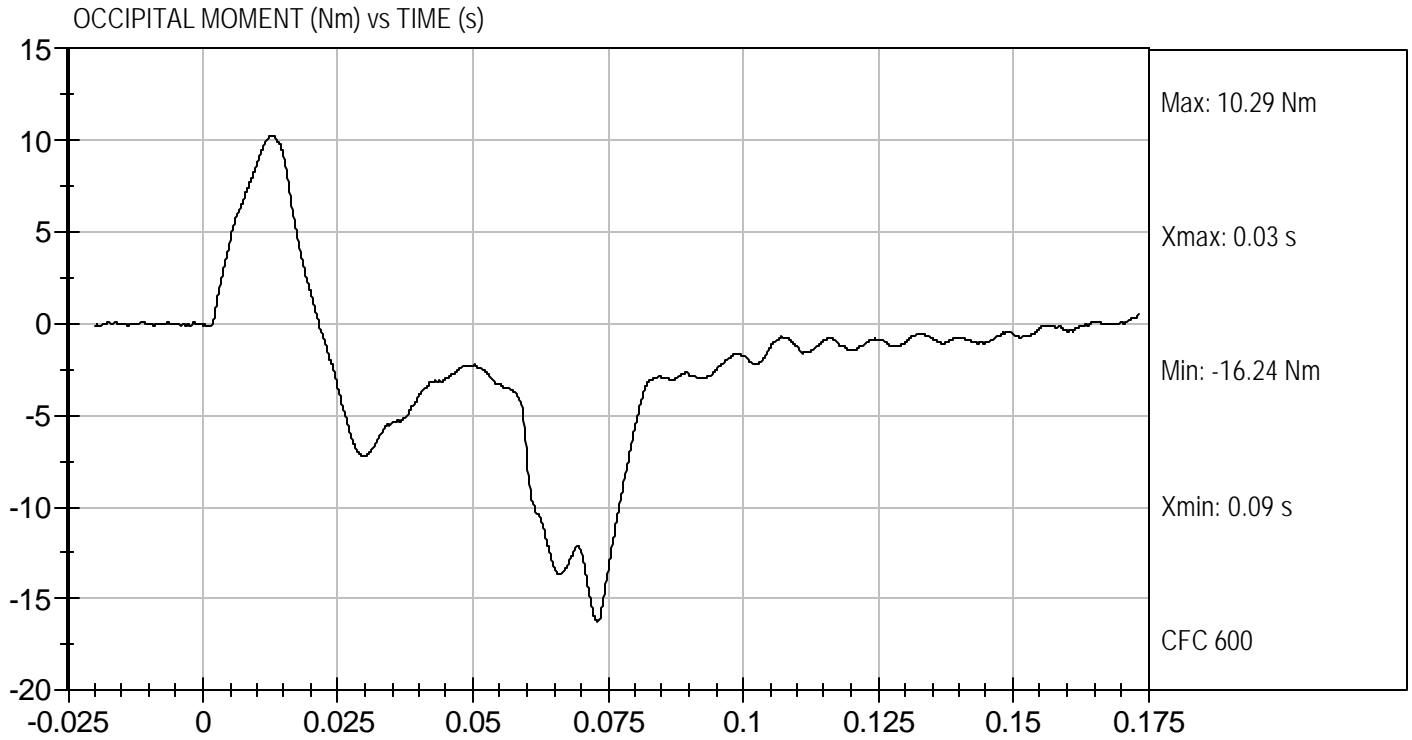


PENDULUM DECELERATION (m/s) vs TIME (s)



FLEXION ANGLE (DEG) vs TIME (s)





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

Dummy Serial Number 083

Test Date 3/29/06

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. (572.155(m))
 N/A, ONLY one thorax impact test performed
2. The test fixture conforms to the specifications in Figure 10E.
3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))
4. The dummy assembly soaked at a temperature between 20.6°C (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. (572.154(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</u> |
5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))
6. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.154(c)(3))
7. The posterior surface of the upper spine box is $90^\circ \pm 1^\circ$ from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))
8. Place the upper arms parallel to the torso. Place the lower arms 0° to 5° forward of vertical. (572.154(c)(3))
9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))
10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.146(l)).
11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The

**MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test I.D: D06854

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	32	Pass
Probe Speed	m/sec	4.9 to 5.1	5.1	Pass
Probe Force	Newtons	1.51 to 1.80	1.56	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

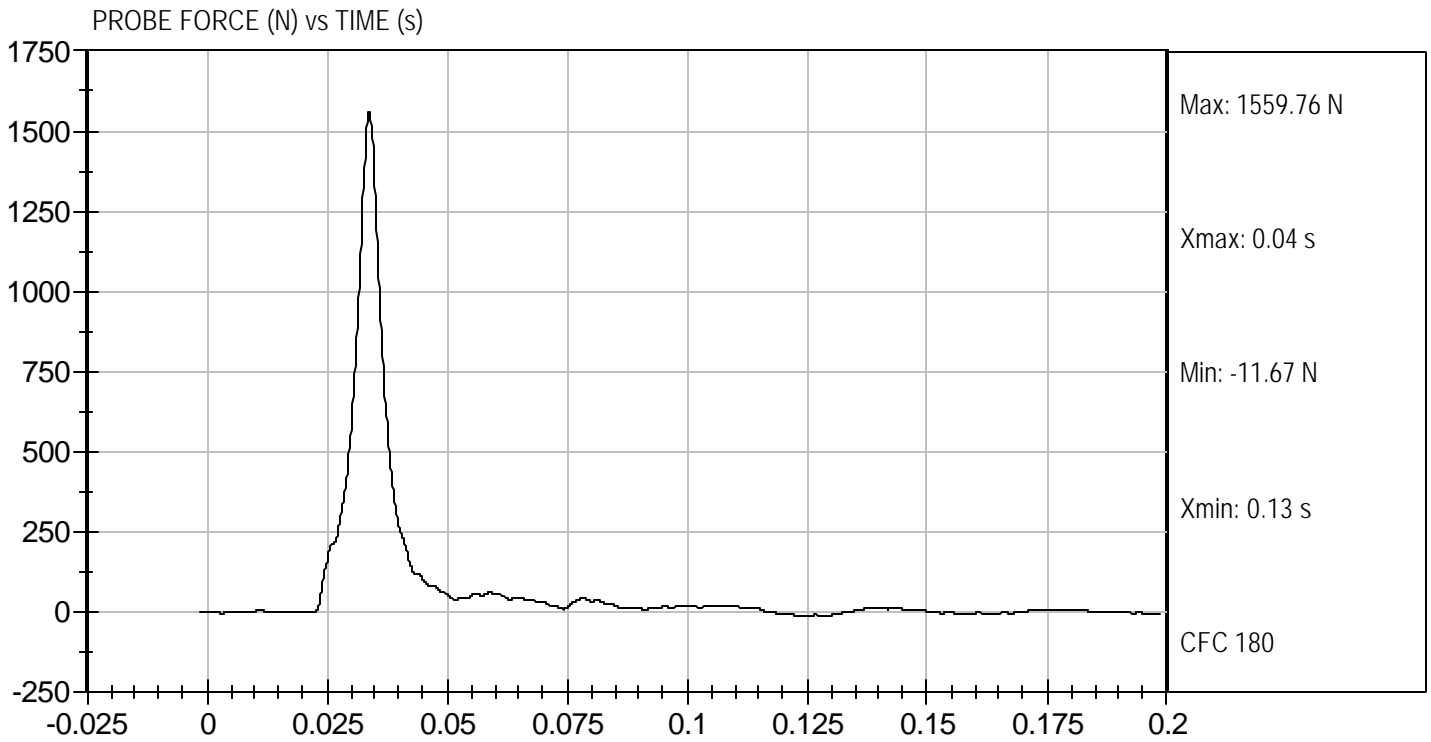
03/29/2006
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Impact
Component ID: D06854

Test Date: 03/29/2006
Velocity: 16.6 ft/s, 5.06 m/s



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

Dummy Serial Number 083

Test Date 6/26/06

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))

3. Accelerometers and their respective mounts are smooth and clean.

4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 50%

Record the minimum humidity 44%

6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(i))

Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(i))

Record the right side distance 439 mm

Record the left side distance 439 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))

Record the angle 45 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))

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

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$100 \text{ g} \leq x \leq 120 \text{ g}$	103
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	10

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

Jessica Hall
Signature

6/26/06
Date

**MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D061801

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	100 to 120	103	Pass
Peak Lateral Acceleration	G's	+/- 15	10	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

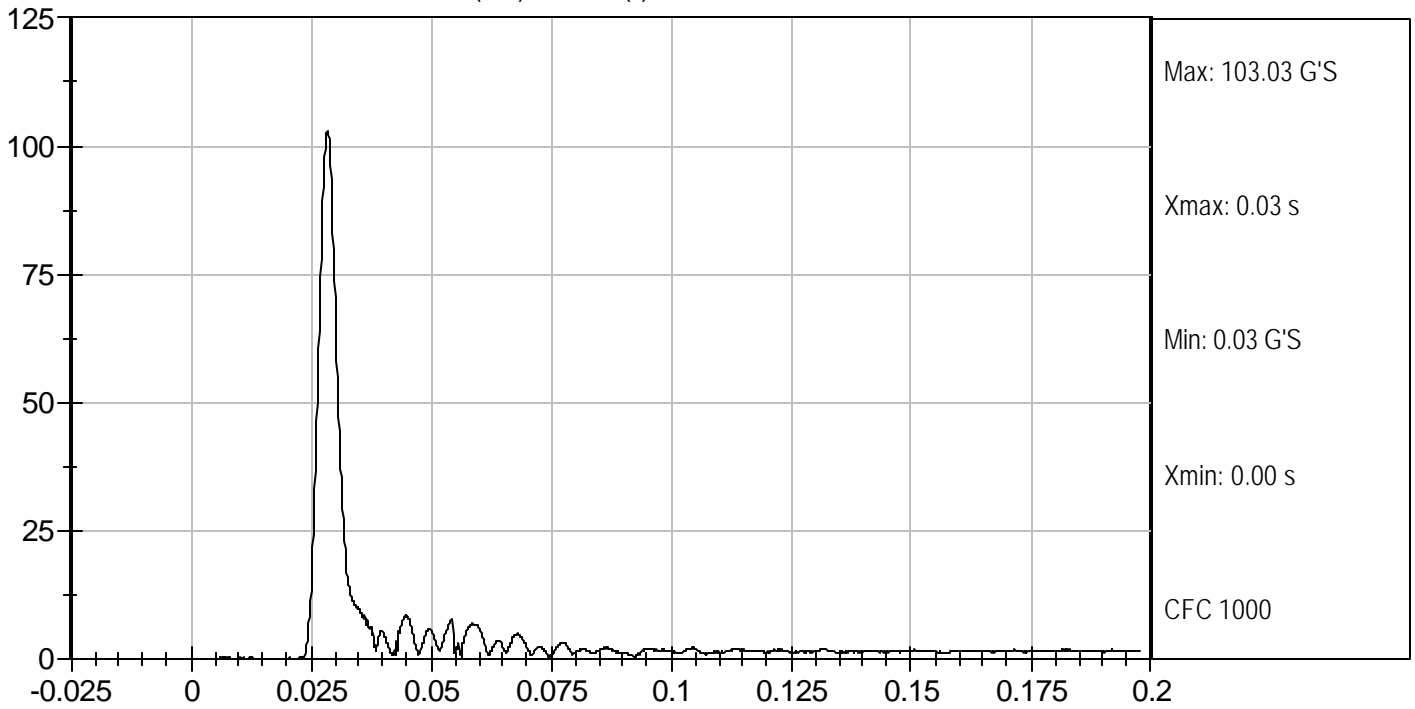
Jessica Hall
Laboratory Technician

06/26/2006
Test Date

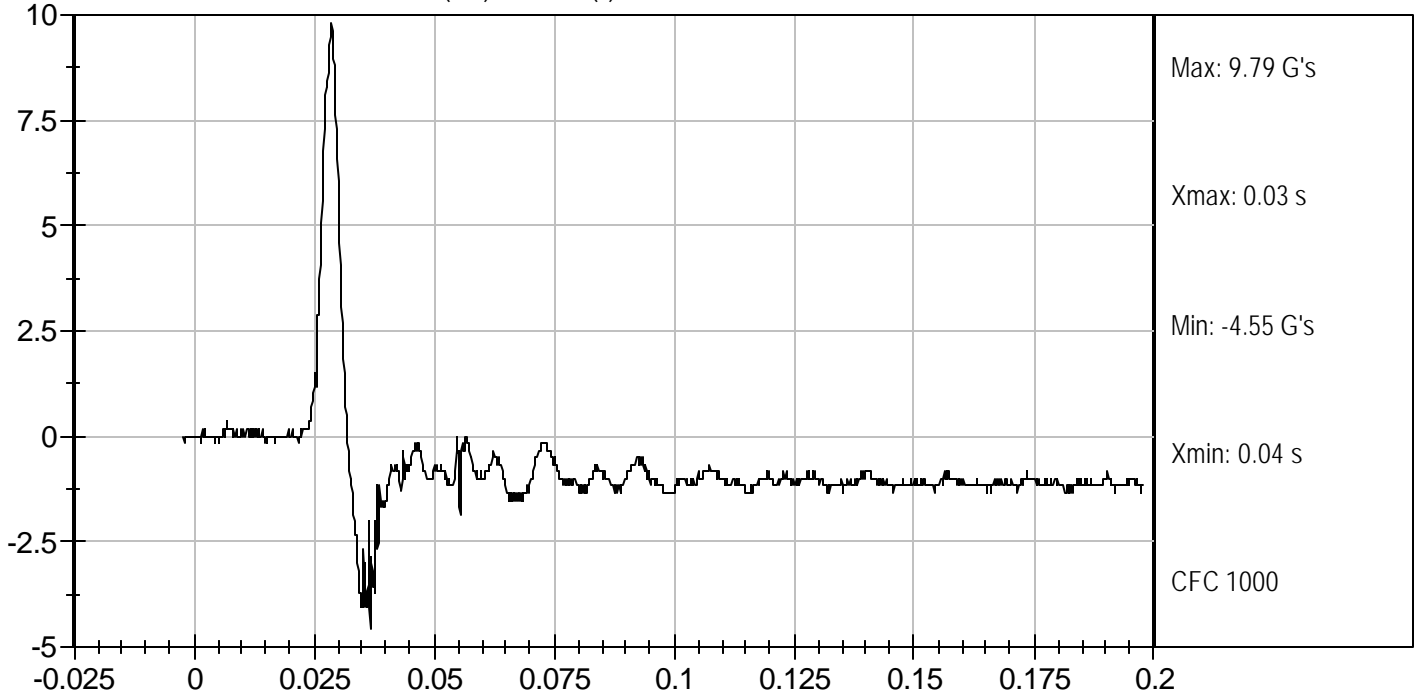
Jeff Leonard
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 083

Test Date 6/26/06

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))

3. Accelerometers and their respective mounts are smooth and clean.

4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 50%

Record the minimum humidity 44%

6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(ii))
Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(ii))
Record the right side distance 467 mm
Record the left side distance 467 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
Record the angle 90 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$55 \text{ g} \leq x \leq 71 \text{ g}$	67
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	-2

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

6/26/06
Date

**MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 083

Test ID: D061805

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Peak Resultant Acceleration	G's	55 to 71	67	Pass
Peak Lateral Acceleration	G's	+/- 15	-2	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

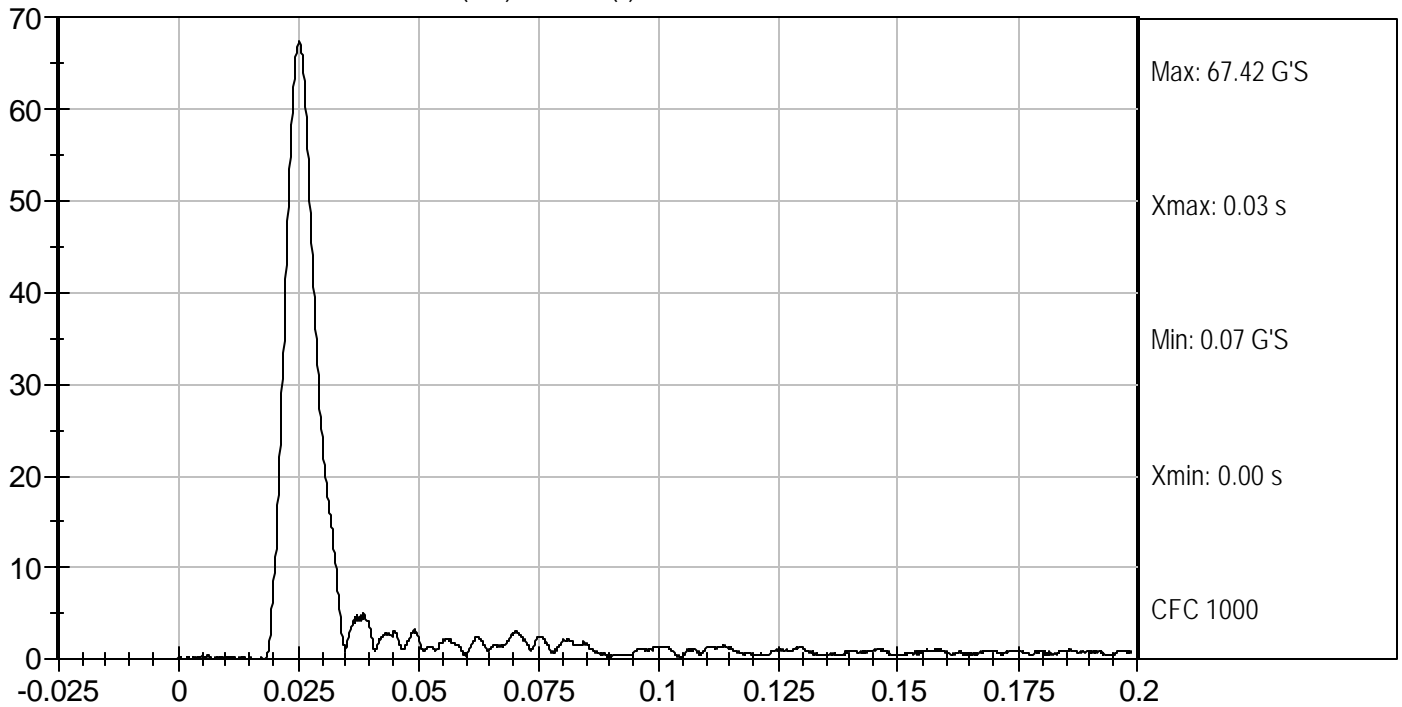
Jessica Hall
Laboratory Technician

06/26/2006
Test Date

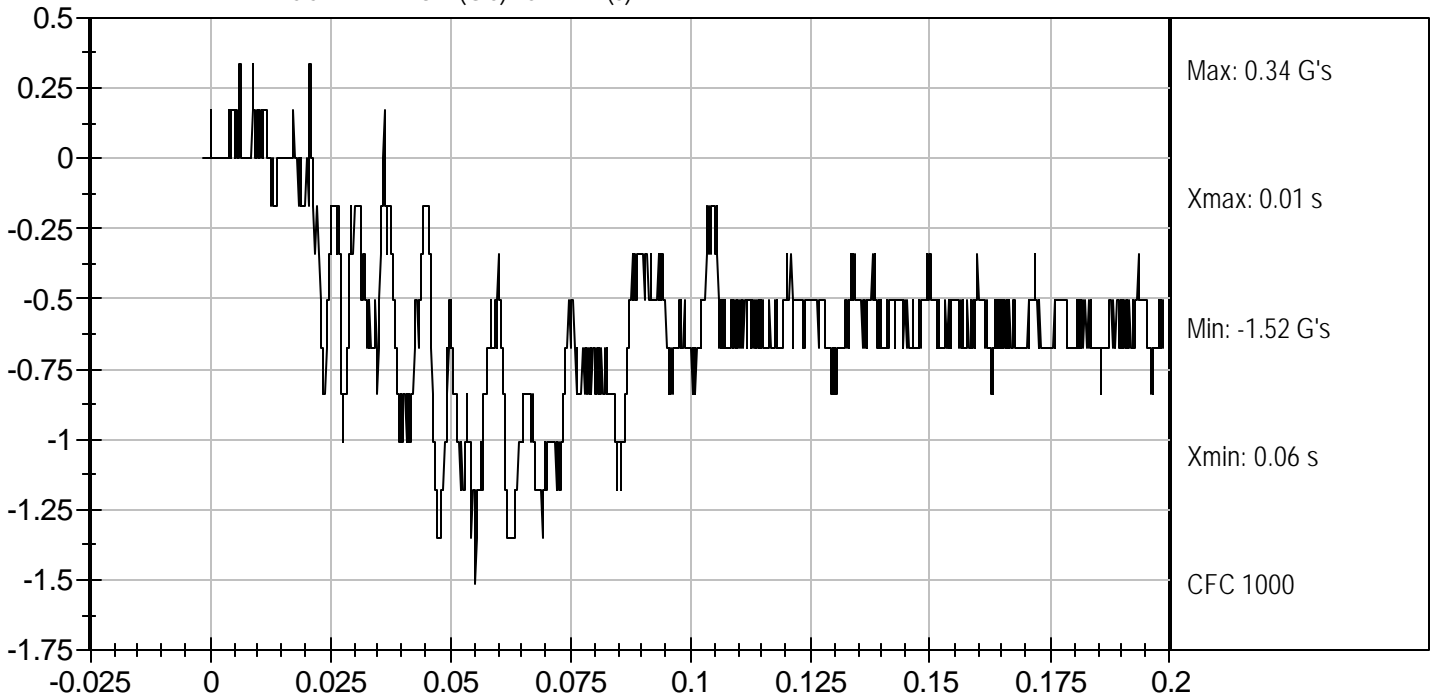
Jeff Leonard
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 083

Test Date 6/26/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>50%</u> |
| Record the minimum humidity | <u>44%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 8E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	5.2 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	2.1 m/s
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	4.0 m/s
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	5.0 m/s
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75° ≤ angle ≤ 86°	<u>41</u> Nm @ <u>82</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	73 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

6/26/06
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 083

Test I.D.: D061802


Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.3	Pass
Humidity		%	10 to 70	46	Pass
Impact Velocity		m/s	5.1 to 5.3	5.2	Pass
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	2.1	Pass
	20 msec	m/s	3.4 to 4.2	4.0	Pass
	25 msec	m/s	4.3 to 5.2	5.0	Pass
D Plane Rotation		deg	75.0 to 86.0	81.9	Pass
Moment About Occipital Condyle		Nm	36.0 to 45.0	41.4	Pass
Positive Moment - Time Curve Decay to 5 Nm		msec	60 to 80	73	Pass
Overall Test Results					Pass



 Laboratory Technician

06/26/2006

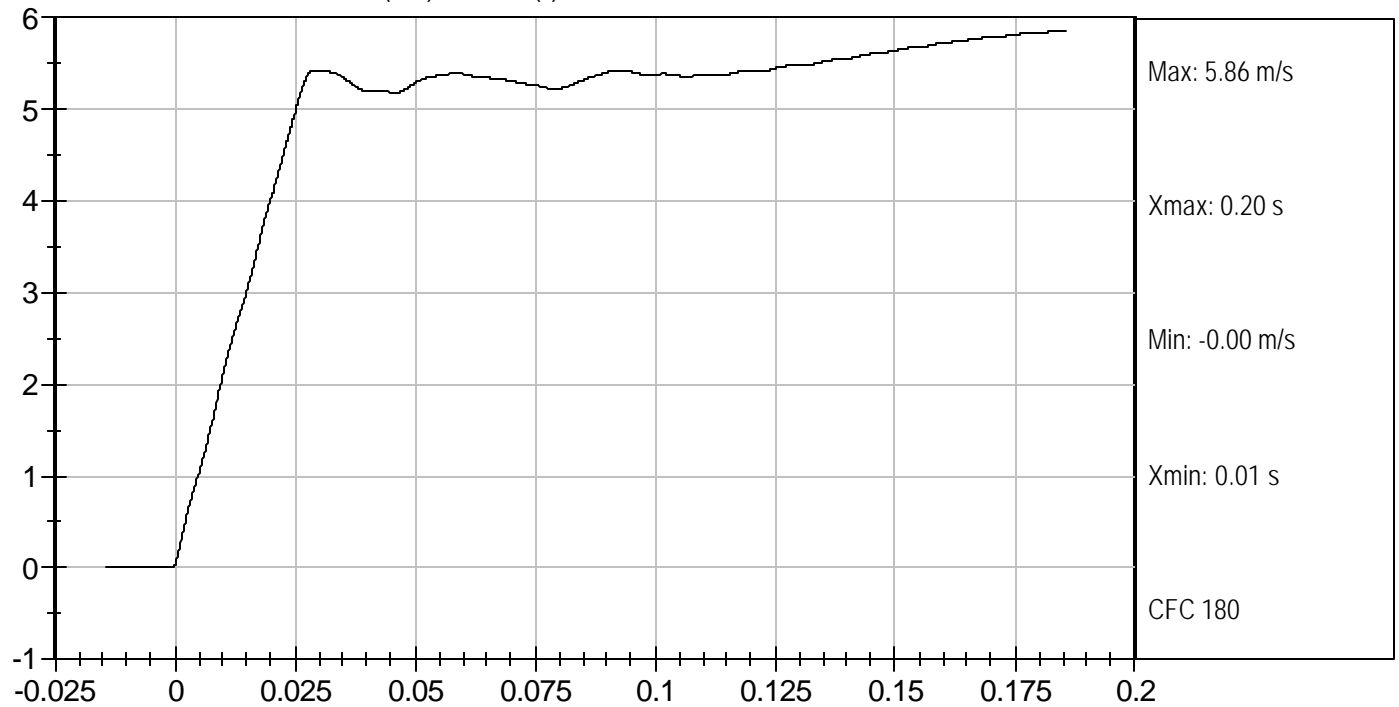
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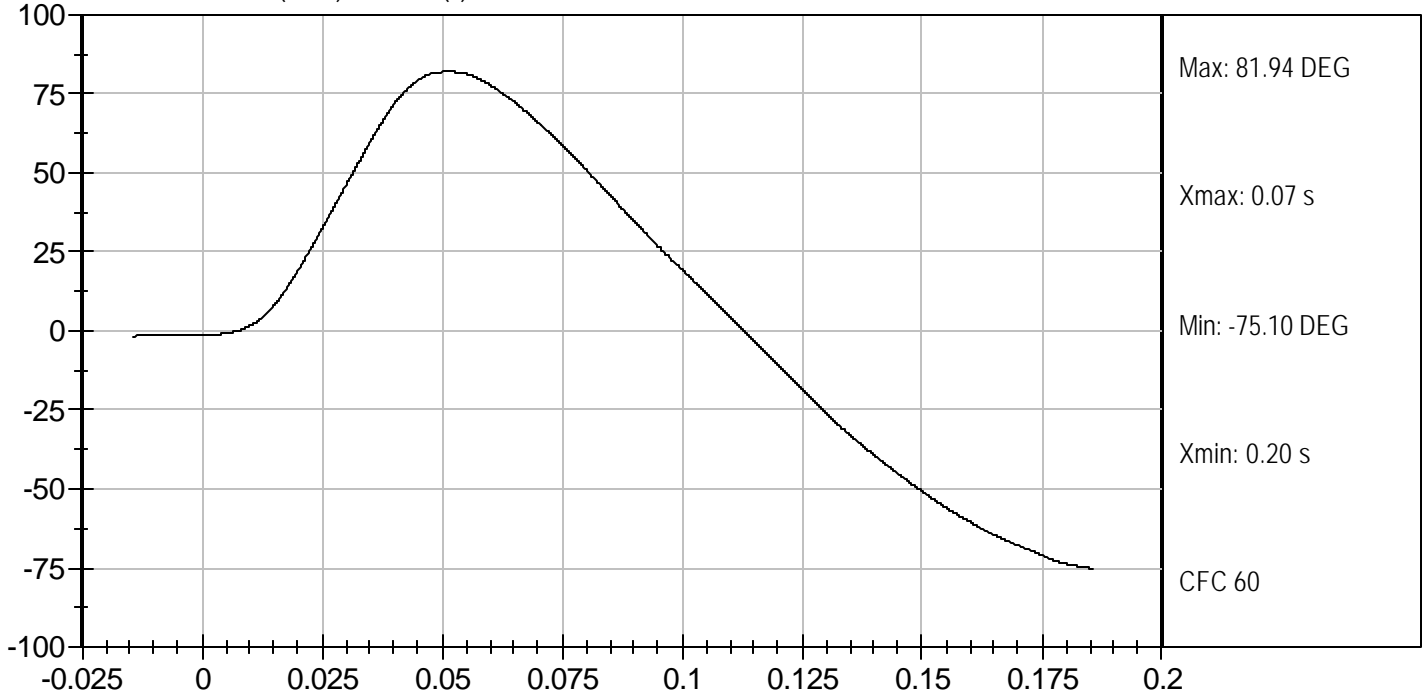
 Approved By



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



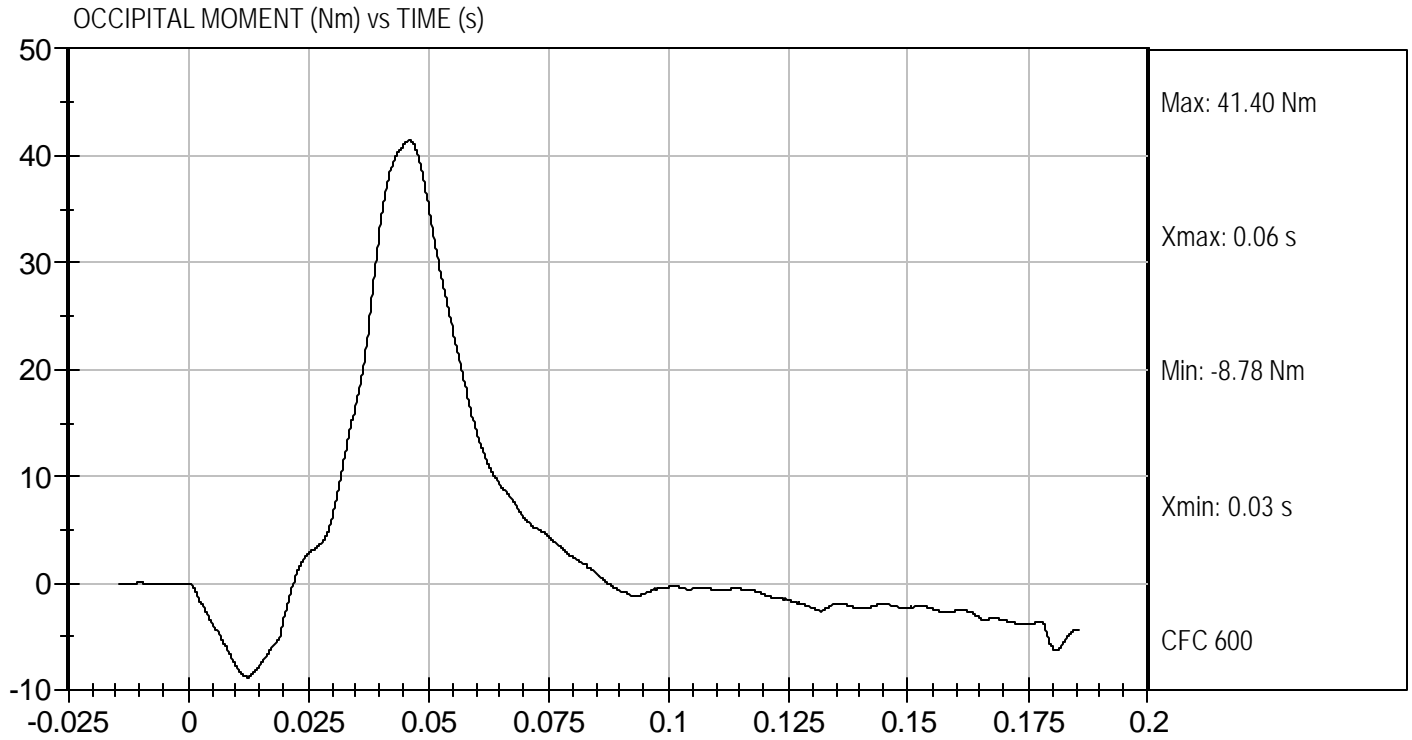
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D061802

Test Date: 06/26/2006
Velocity: 17.02 ft/s, 5.2 m/s



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

Dummy Serial Number 083

Test Date 6/26/06

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>50%</u> |
| Record the minimum humidity | <u>44%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$2.4 \text{ m/s} \leq \text{speed} \leq 2.6 \text{ m/s}$	2.5 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$0.8 \text{ m/s} \leq \Delta V \leq 1.2 \text{ m/s}$	0.9 m/s
	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 2.1 \text{ m/s}$	1.7 m/s
	@ 14 ms	$2.2 \text{ m/s} \leq \Delta V \leq 2.9 \text{ m/s}$	2.4 m/s
Plane D Rotation		Peak moment* $-12 \text{ Nm} \leq \text{moment} \leq -23 \text{ Nm}$ during the following rotation range $80^\circ \leq \text{angle} \leq 92^\circ$	<u>-16</u> Nm @ <u>80</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm $76 \text{ ms} \leq \text{time} \leq 90 \text{ ms}$	78 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

6/26/06
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH**

ATD Serial No: 083

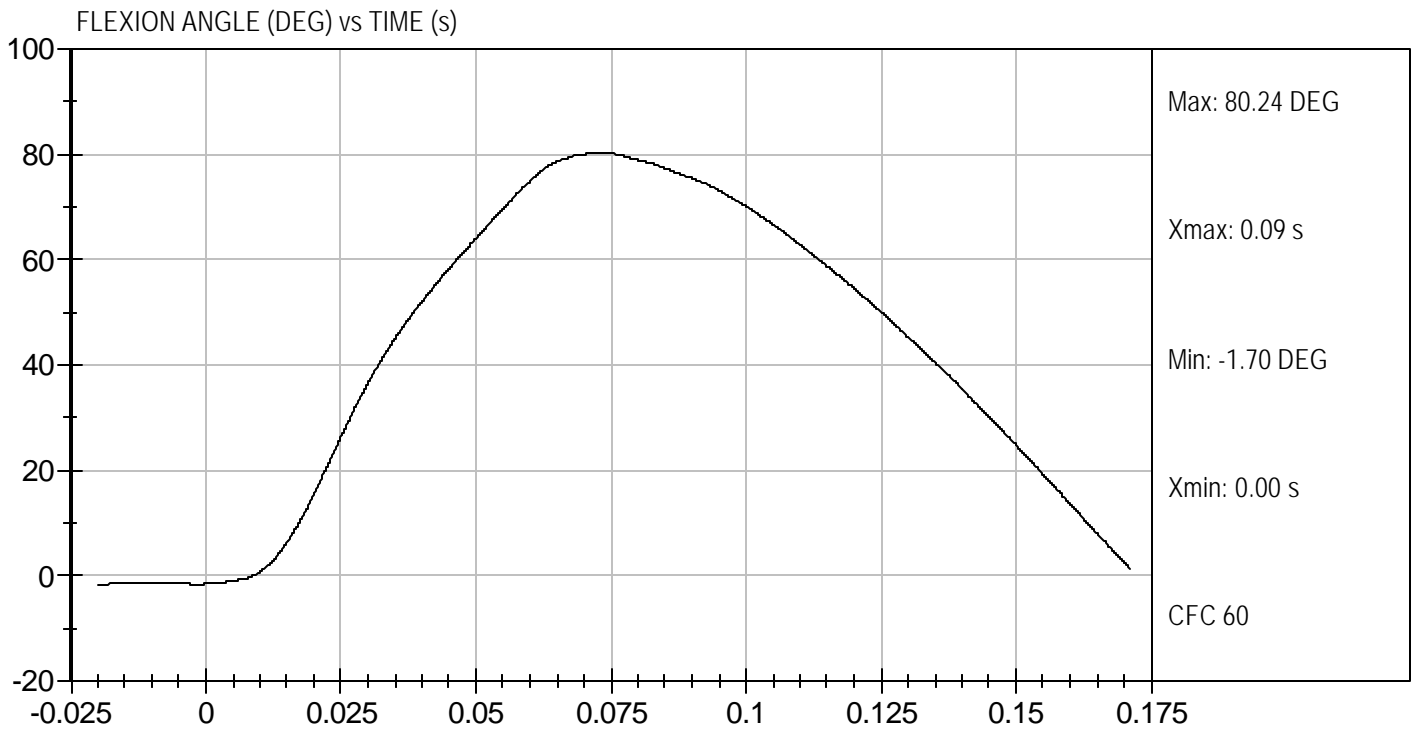
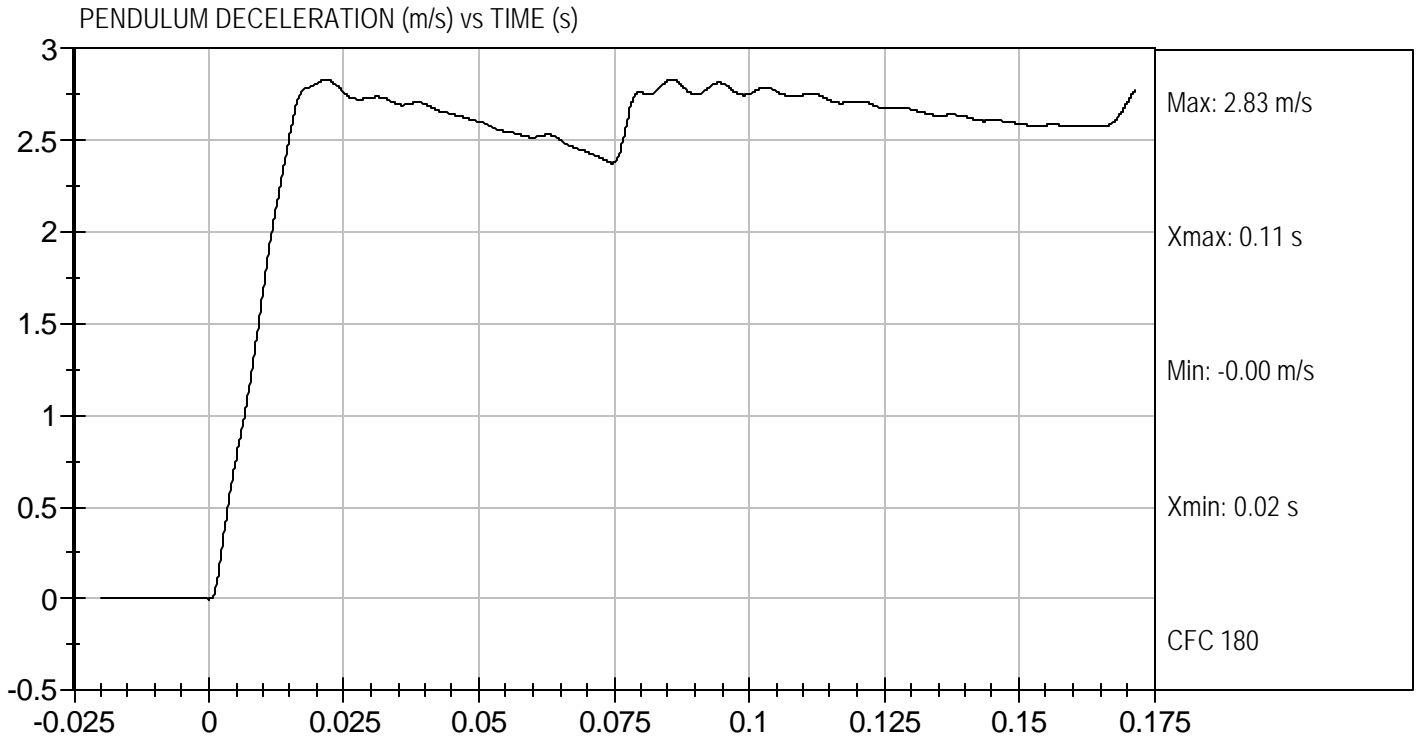
Test I.D.: D061803

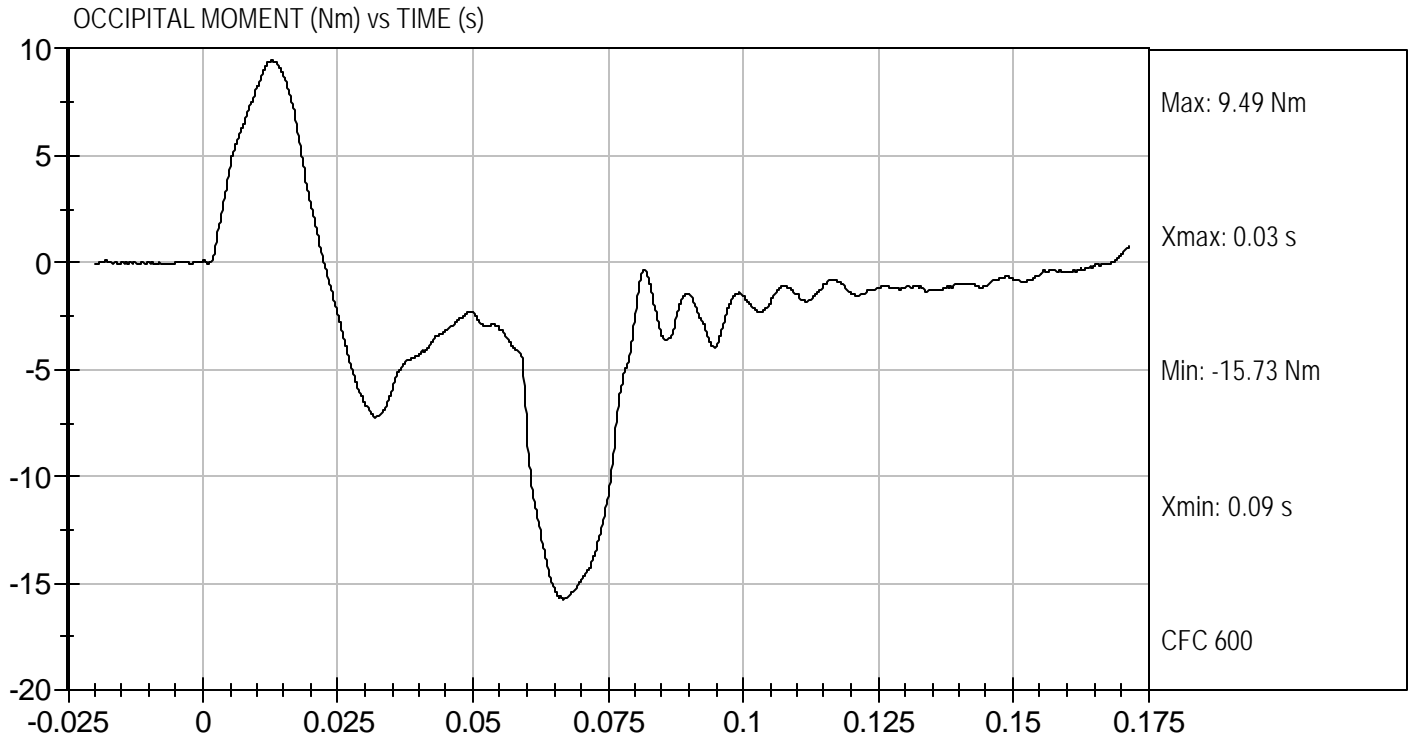
Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.6	Pass	
Humidity	%	10 to 70	50	Pass	
Pendulum Speed	m/s	2.4 to 2.6	2.5	Pass	
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	0.9	Pass
	10 msec	m/s	1.5 to 2.1	1.7	Pass
	14 msec	m/s	2.2 to 2.9	2.4	Pass
D Plane Rotation	deg	80.0 to 92.0	80.2	Pass	
Moment About Occipital Condyle	Nm	-23.0 to -12.0	-15.7	Pass	
Negative Moment - Time Curve Decay to -5 Nm	msec	76 to 90	78	Pass	
Overall Test Results				Pass	

Jessica Hall
Laboratory Technician

06/26/2006
Test Date

Jeff Leonard
Approved By





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

Dummy Serial Number 083

Test Date 6/26/06

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.
(572.155(m))

N/A, ONLY one thorax impact test performed

2. The test fixture conforms to the specifications in Figure 10E.

3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))

4. The dummy assembly soaked at a temperature between 20.6°C (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. (572.154(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 50%

Record the minimum humidity 44%

5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))

6. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.154(c)(3))

7. The posterior surface of the upper spine box is $90^\circ \pm 1^\circ$ from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))

8. Place the upper arms parallel to the torso. Place the lower arms 0° to 5° forward of vertical. (572.154(c)(3))

9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))

10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.146(l)).

11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The

velocity of the test probe at the time of impact is between 4.9 m/s and 5.1 m/s. (572.154(b)). The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.154(c)(6) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.154(c)(7)

X 12. Complete the following table:

Thorax Impact Results (572.154(b))

Parameter*	Specification	Result
Test Probe Speed	$4.9 \text{ m/s} \leq \text{speed} \leq 5.1 \text{ m/s}$	5.1 m/s
Peak force**	$1514 \text{ N} \leq \text{peak force} \leq 1796 \text{ N}$	1690 N

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

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

X 13. Plots of pendulum acceleration, and pendulum force, follow this sheet.

Jessica Hall
Signature

6/26/06
Date

MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH

ATD Serial No: 083

Test I.D: D061804

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
Probe Speed	m/sec	4.9 to 5.1	5.1	Pass
Probe Force	Newtons	1.51 to 1.80	1.69	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

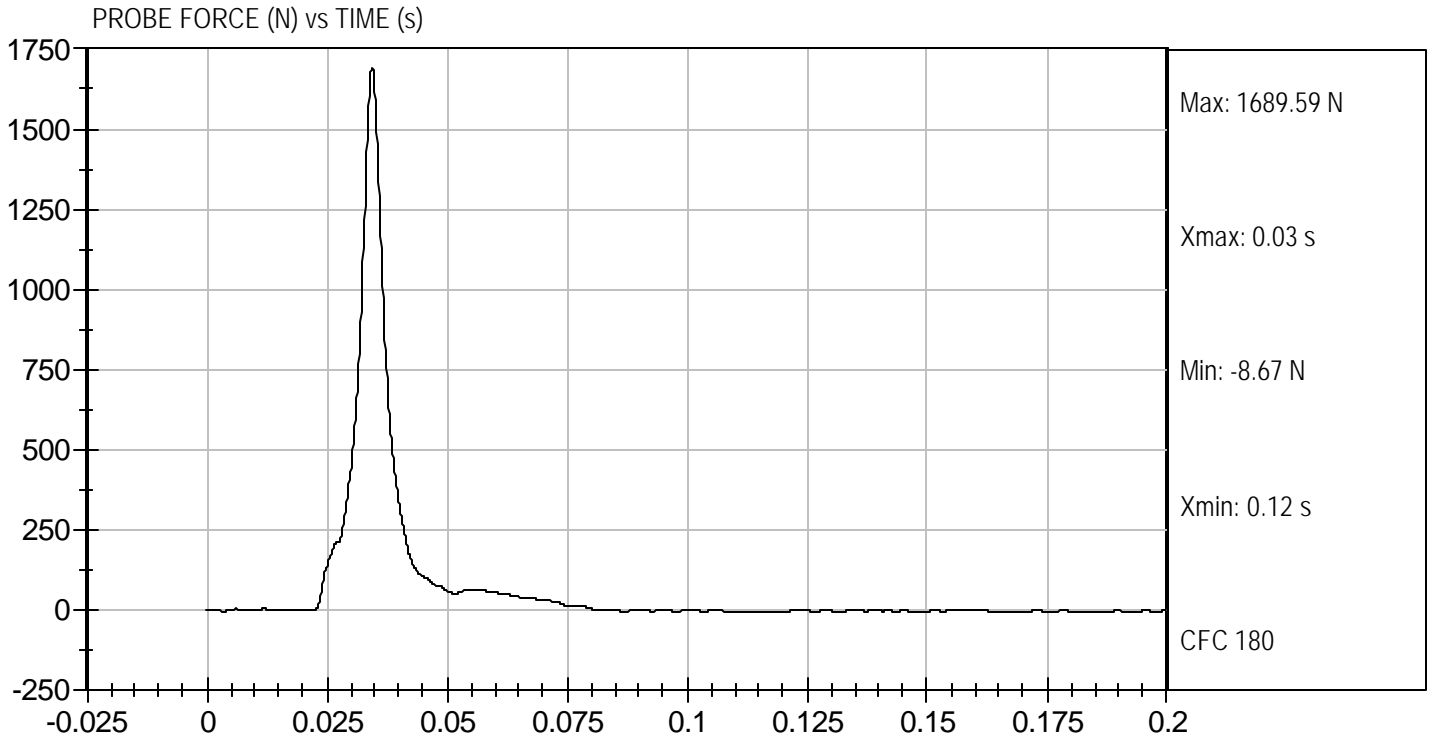
06/26/2006
Test Date

Jeff Levanthasi
Approved By



Test Desc: Head Drop
Component ID: D061804

Test Date: 06/26/2006
Velocity: 16.57 ft/s, 5.05 m/s



EXTERNAL DIMENSIONS

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456.0-471.2	470.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	288.2
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	31.3
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	44.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	53.8
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	71.1
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	186.0
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	108.2
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	156.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	204.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	151.4
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	174.6
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	156.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	110.3
P	FOOT LENGTH	Tip of toe to rear of heal	92.4-102.6	95.0
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsagittal plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	184.7
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	127.4
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.	149.9-165.1	164.0
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	170.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	209.3
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	44.1
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	472.6
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447-472.4	467.8
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	259.0

CRABI 12 month #083, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	113.2
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	310.0
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	303.1

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

Dummy Serial Number 083

Test Date 6/22/06

Technician Jessica Gall

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

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

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			NA
Spine	Broken or cracks in rubber.			NA
Ribs	Broken or bent ribs			NA
	Broken or bent rib supports			NA
	Damping material separated or cracked			NA
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			NA
	Slider arm riding in track			NA
Transducer leads	Torn cables			NA

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			NA
	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

6/26/06
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

6/26/06

EXTERNAL DIMENSIONS

CRABI 12 month #084, PART 572, SUBPART R EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456.0-471.2	468.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	285.0
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	33.1
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	49.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	53.5
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	69.9
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	182.7
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	105.5
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	158.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	208.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	141.2
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	171.1
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	153.2

CRABI 12 month #084, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	113.1
P	FOOT LENGTH	Tip of toe to rear of heel	92.4-102.6	98.1
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsagittal plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	185.6
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	128.3
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.	149.9-165.1	157.1
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	163.1
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	211.5
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	41.9
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	468.0
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447.0-472.4	459.8
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	261.6

CRABI 12 month #084, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	111.8
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	307.2
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	301.6

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

Dummy Serial Number 084

Test Date 3/23/07

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
3. Accelerometers and their respective mounts are smooth and clean.
4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.8</u> |
| Record the maximum humidity | <u>29%</u> |
| Record the minimum humidity | <u>28%</u> |
6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(i))

Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(i))

Record the right side distance 439 mm
Record the left side distance 439 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))

Record the angle 45 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))

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

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))

Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$100 \text{ g} \leq x \leq 120 \text{ g}$	110
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	4

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

Jessica Hall
Signature

3/23/07
Date

**MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 084

Test ID: D07791

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	29	Pass
Peak Resultant Acceleration	G's	100 to 120	110	Pass
Peak Lateral Acceleration	G's	+/- 15	4	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

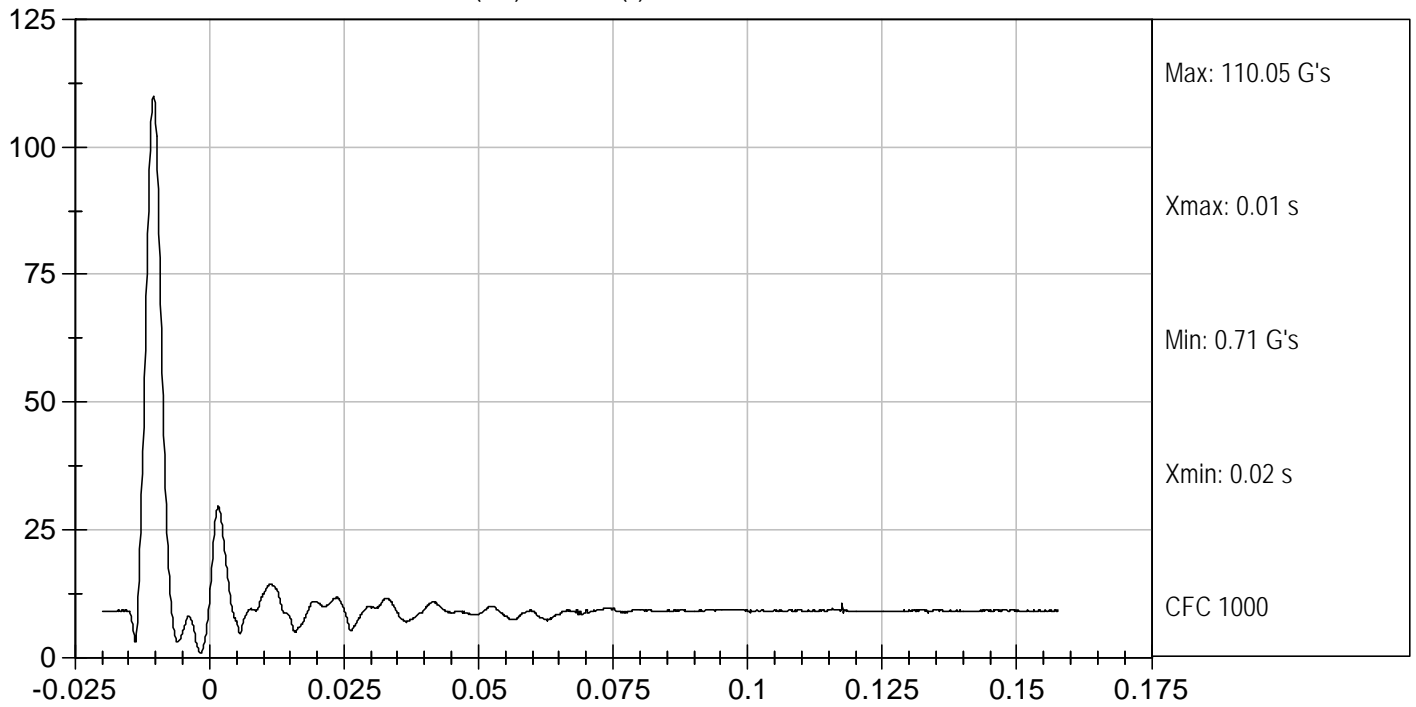
Jessica Hall
Laboratory Technician

03/23/2007
Test Date

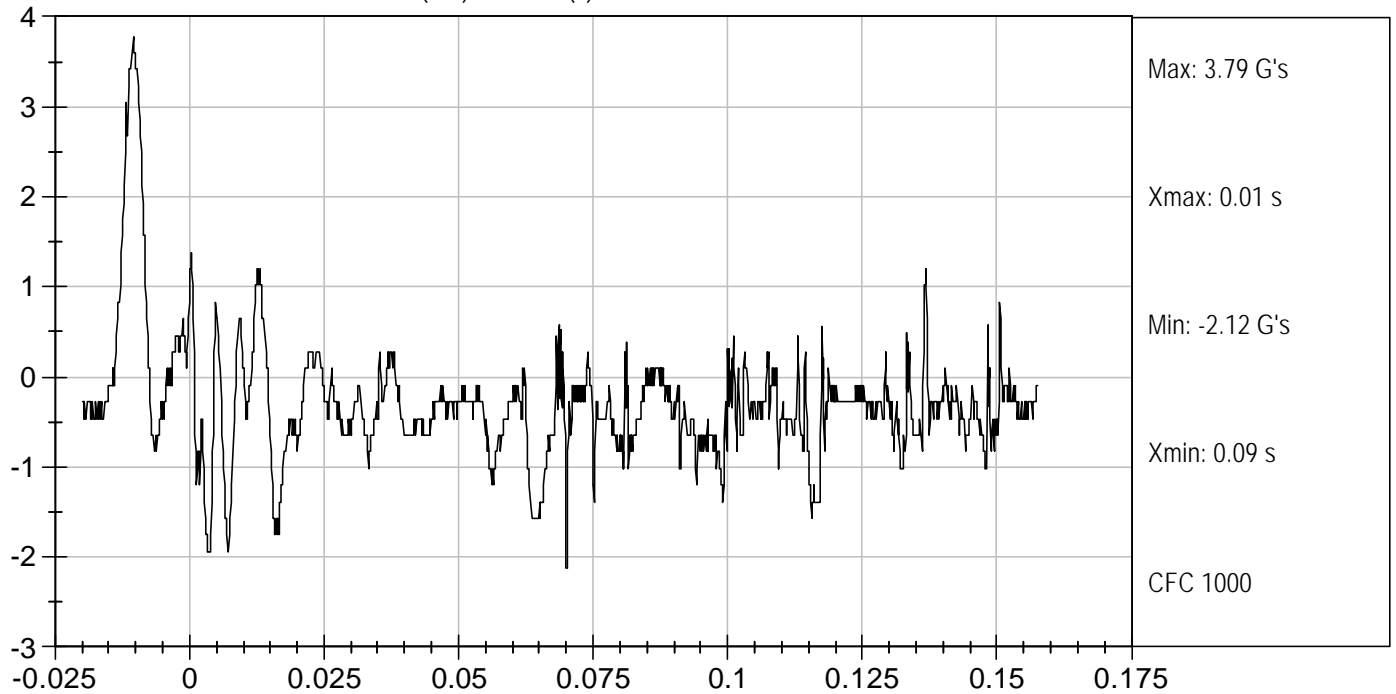
Jeff Leonard
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 084

Test Date 3/26/07

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))
 N/A, ONLY one head drop performed
2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))
3. Accelerometers and their respective mounts are smooth and clean.
4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.6</u> |
| Record the maximum humidity | <u>55%</u> |
| Record the minimum humidity | <u>50%</u> |
6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(ii))
Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(ii))
Record the right side distance 467 mm
Record the left side distance 467 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
Record the angle 90 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$55 \text{ g} \leq x \leq 71 \text{ g}$	65
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	3

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

3/26/07
Date

**MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 084

Test ID: D07795

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	55	Pass
Peak Resultant Acceleration	G's	55 to 71	65	Pass
Peak Lateral Acceleration	G's	+/- 15	3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall

Laboratory Technician

03/26/2007

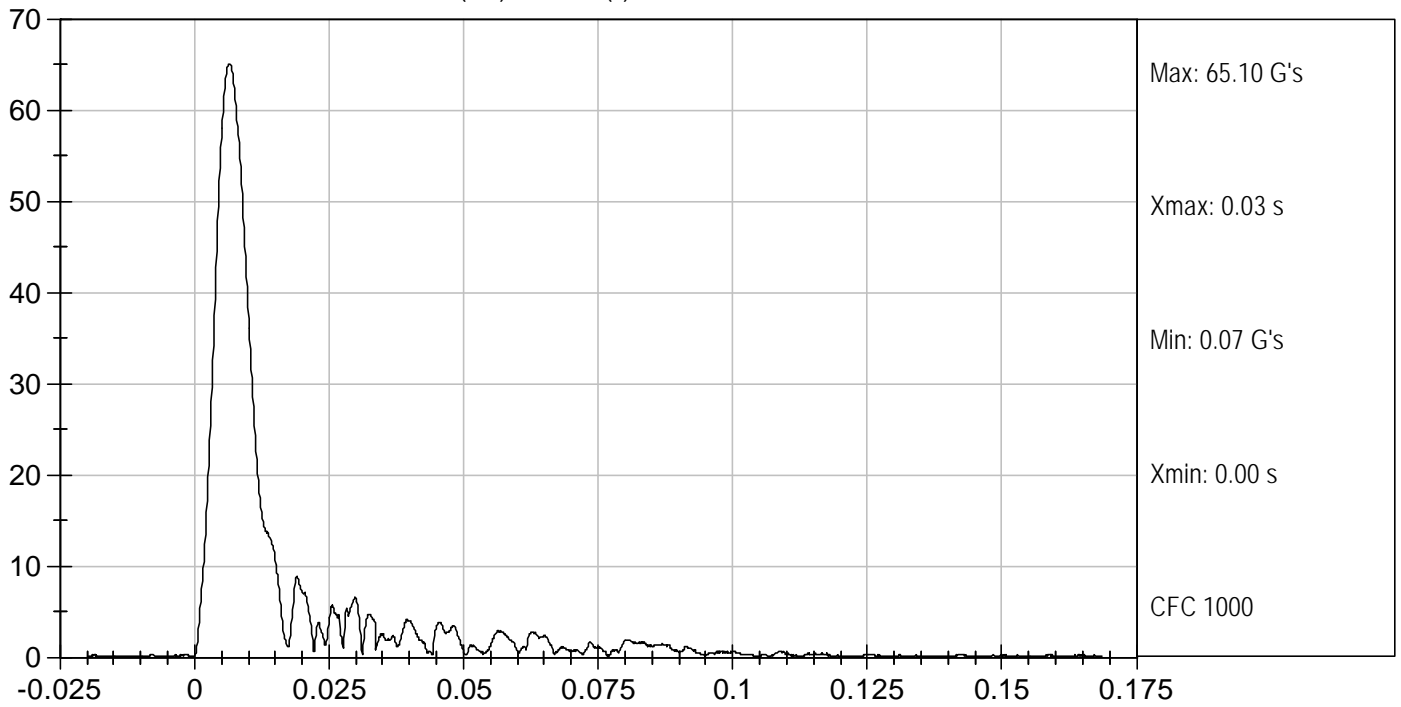
Test Date

Jeff Leonard

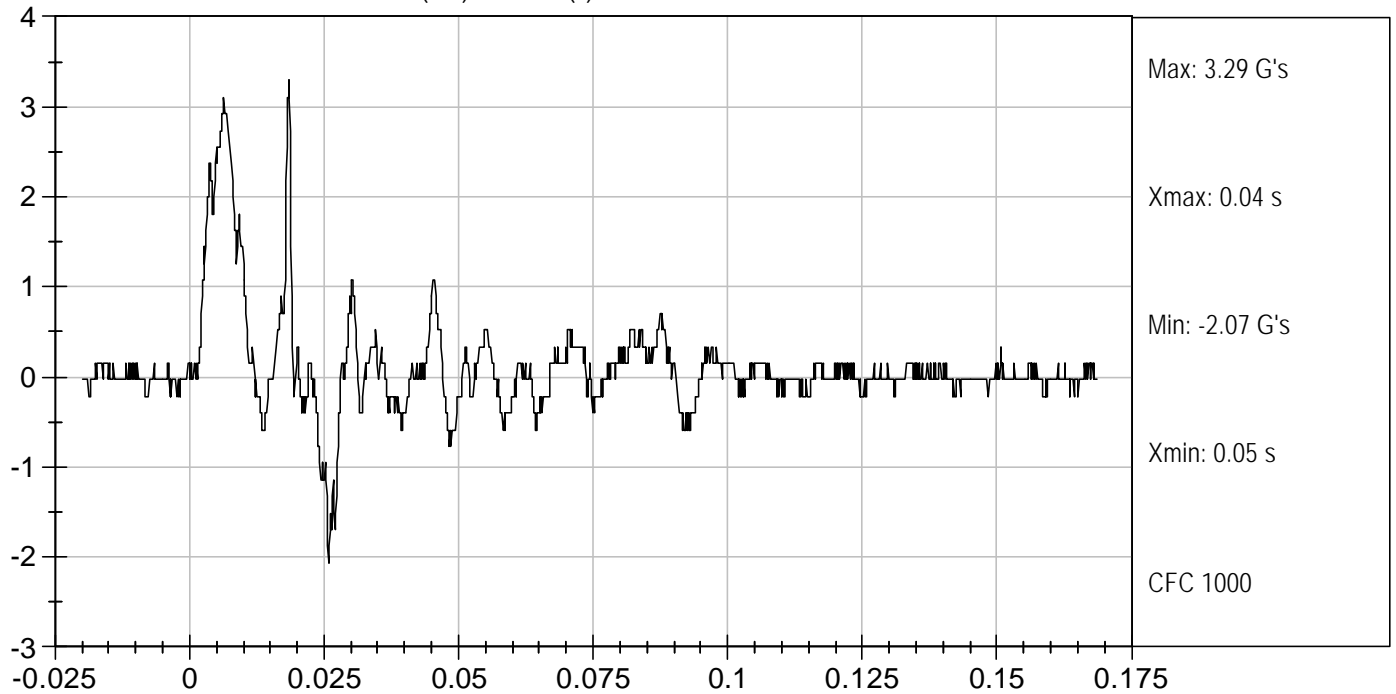
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 084

Test Date 3/26/07

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.6</u> |
| Record the maximum humidity | <u>55%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 8E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	5.2 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	2.0 m/s
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	3.8 m/s
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	4.6 m/s
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75° ≤ angle ≤ 86°	<u>37</u> Nm @ <u>82</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	75 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/26/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 084

Test I.D: D07792

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.6	Pass	
Humidity	%	10 to 70	55	Pass	
Impact Velocity	m/s	5.1 to 5.3	5.2	Pass	
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	2.0	Pass
	20 msec	m/s	3.4 to 4.2	3.8	Pass
	25 msec	m/s	4.3 to 5.2	4.6	Pass
D Plane Rotation	deg	75.0 to 86.0	81.5	Pass	
Moment About Occipital Condyle	Nm	36.0 to 45.0	37.4	Pass	
Positive Moment - Time Curve Decay to 5 Nm	msec	60 to 80	75	Pass	
Overall Test Results				Pass	

Jessica Hall

 Laboratory Technician

03/26/2007

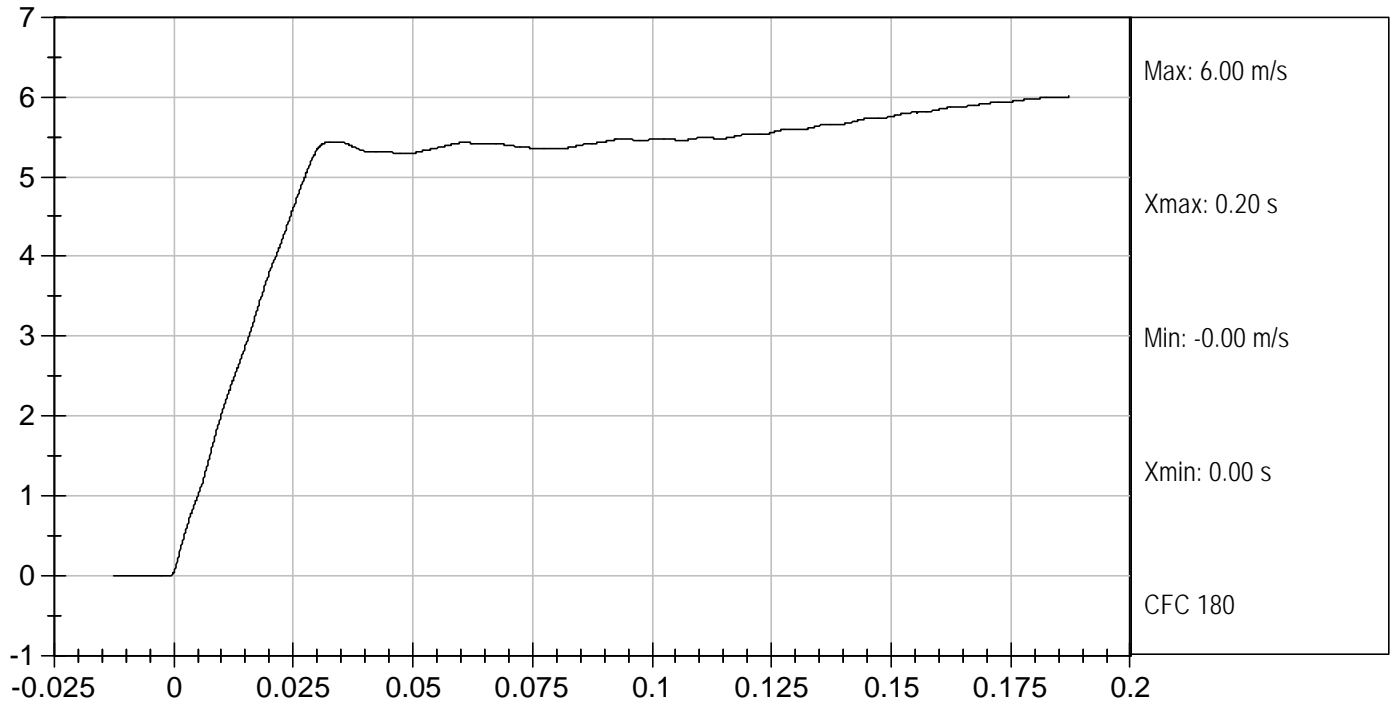
 Test Date

Jeff Leonard

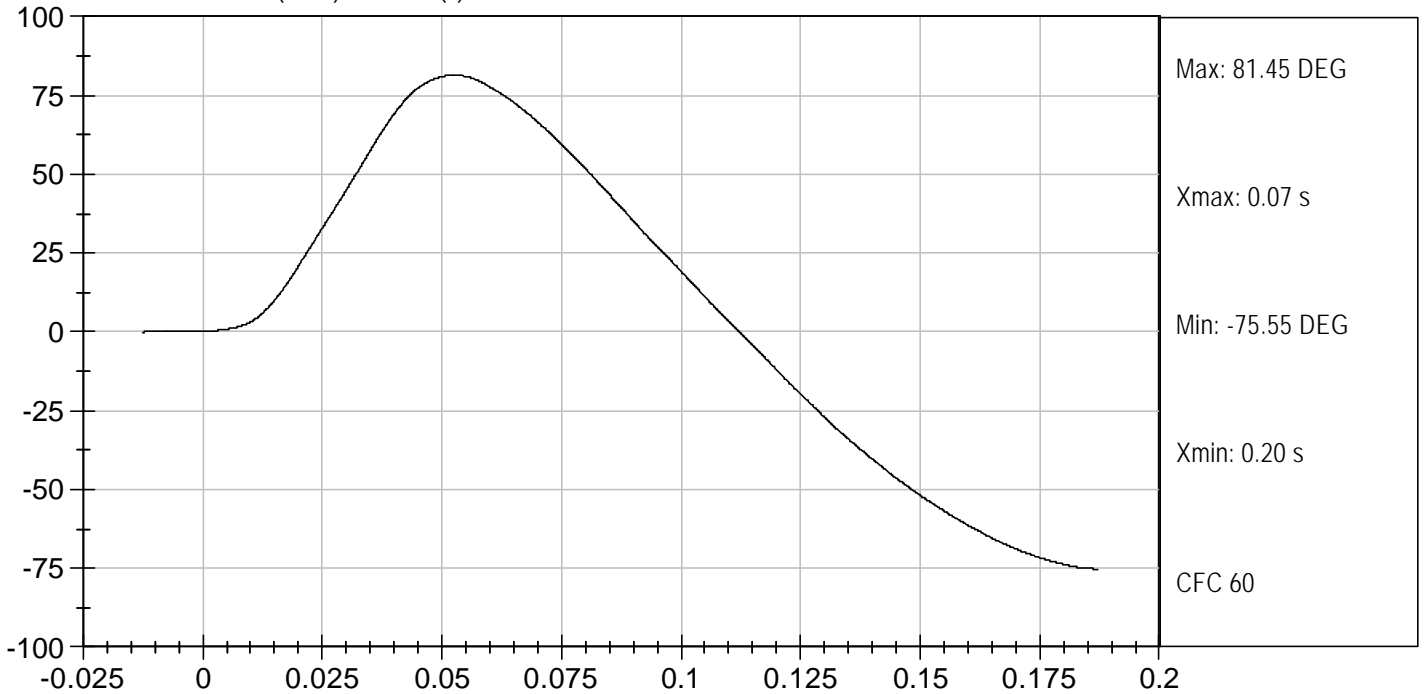
 Approved By



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



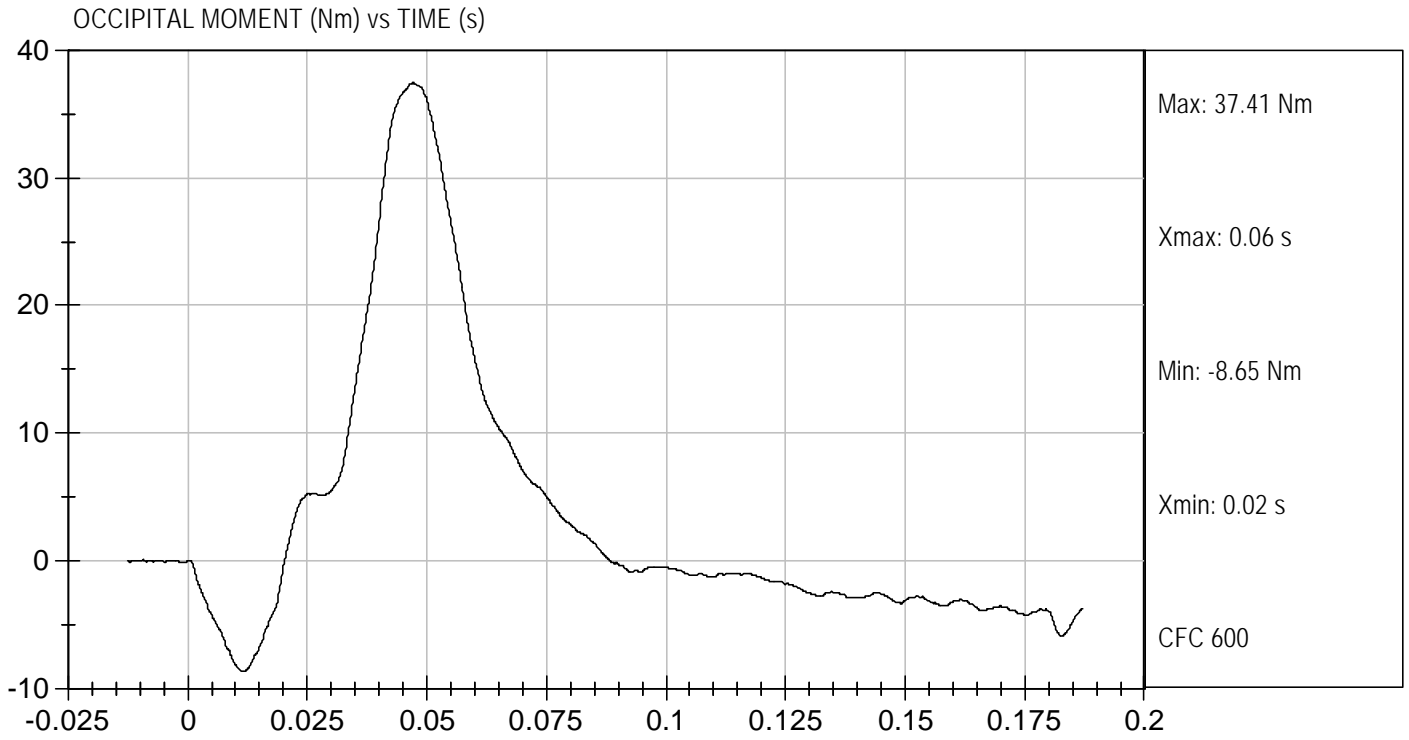
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Head Drop
Component ID: D07792

Test Date: 03/26/2007
Velocity: 16.96 ft/s, 5.2 m/s



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

Dummy Serial Number 084

Test Date 3/26/07

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.8</u> |
| Record the minimum temperature | <u>21.6</u> |
| Record the maximum humidity | <u>55%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$2.4 \text{ m/s} \leq \text{speed} \leq 2.6 \text{ m/s}$	2.5 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$0.8 \text{ m/s} \leq \Delta V \leq 1.2 \text{ m/s}$	0.9 m/s
	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 2.1 \text{ m/s}$	1.7 m/s
	@ 14 ms	$2.2 \text{ m/s} \leq \Delta V \leq 2.9 \text{ m/s}$	2.4 m/s
Plane D Rotation		Peak moment* $-12 \text{ Nm} \leq \text{moment} \leq -23 \text{ Nm}$ during the following rotation range $80^\circ \leq \text{angle} \leq 92^\circ$	<u>-17</u> Nm @ <u>84</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm $76 \text{ ms} \leq \text{time} \leq 90 \text{ ms}$	81 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/26/07
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH**

ATD Serial No: 084

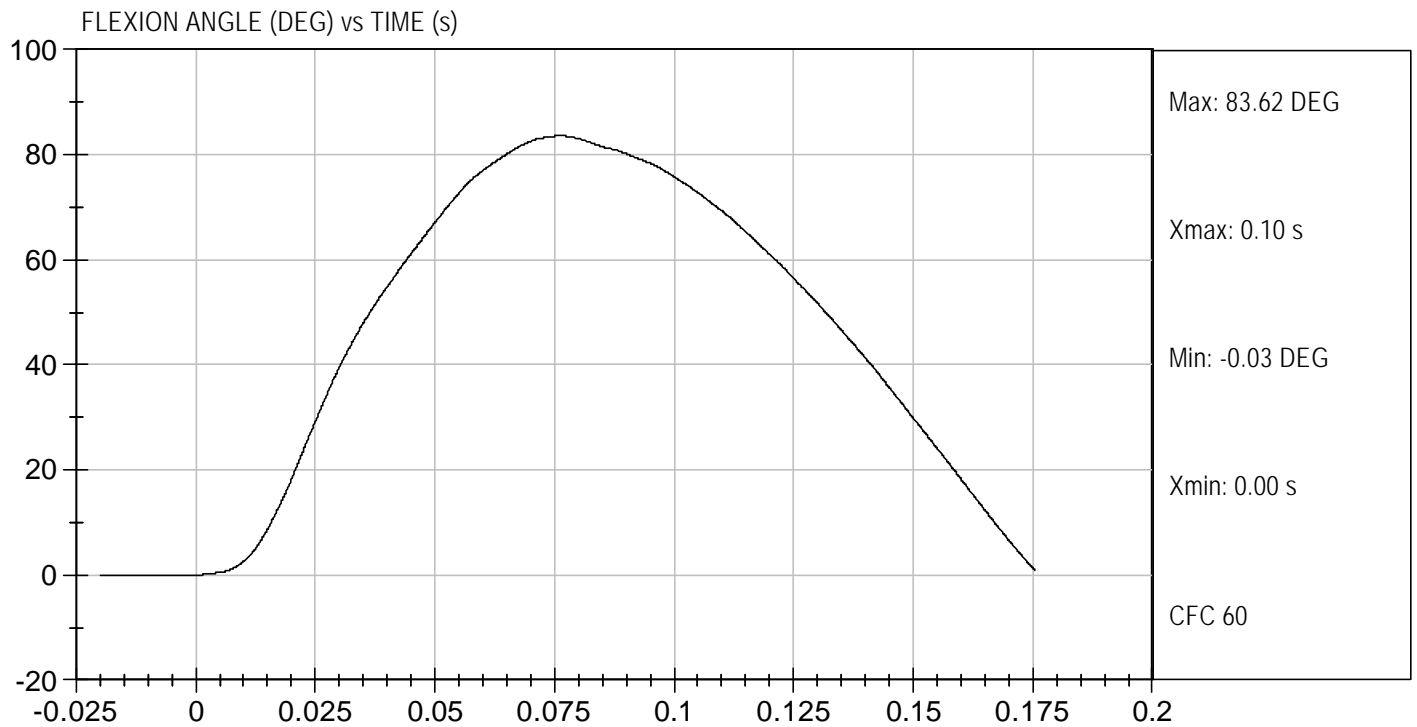
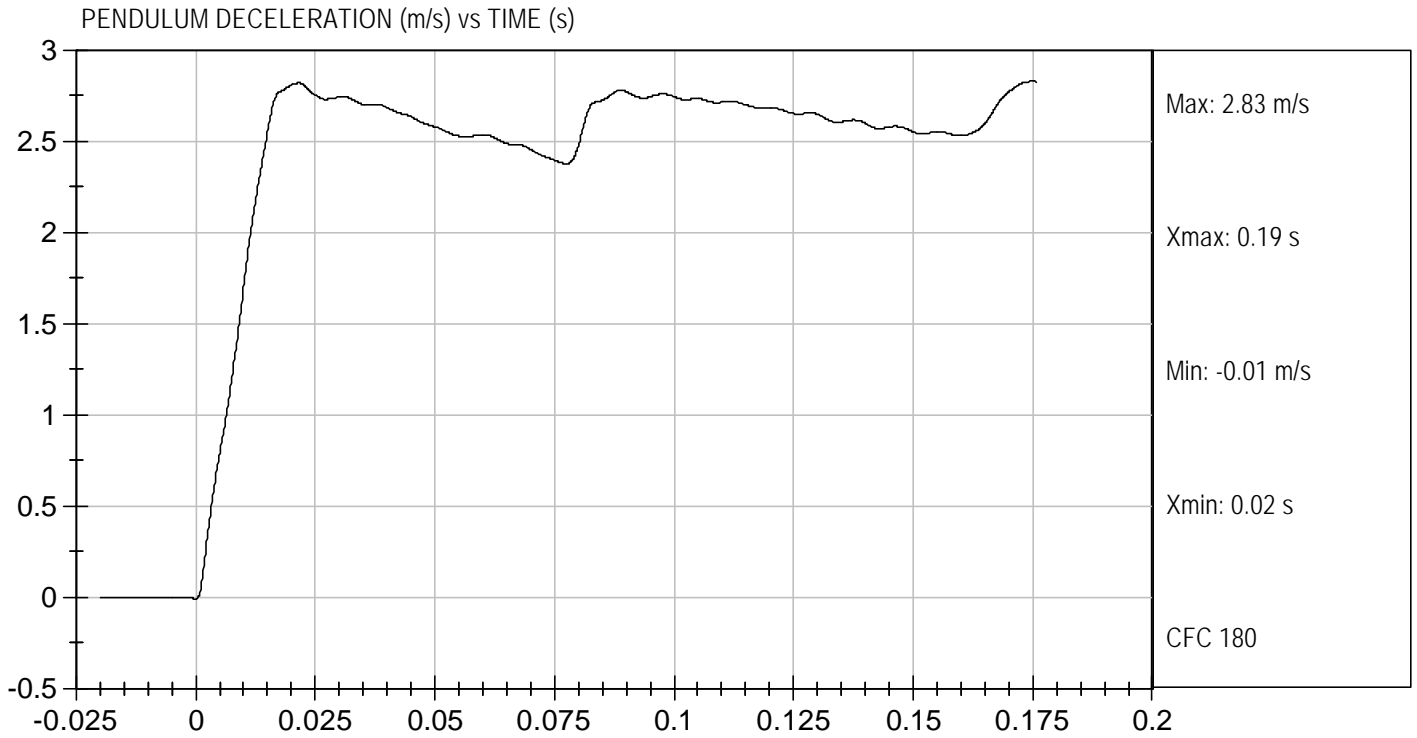
Test I.D: D07793

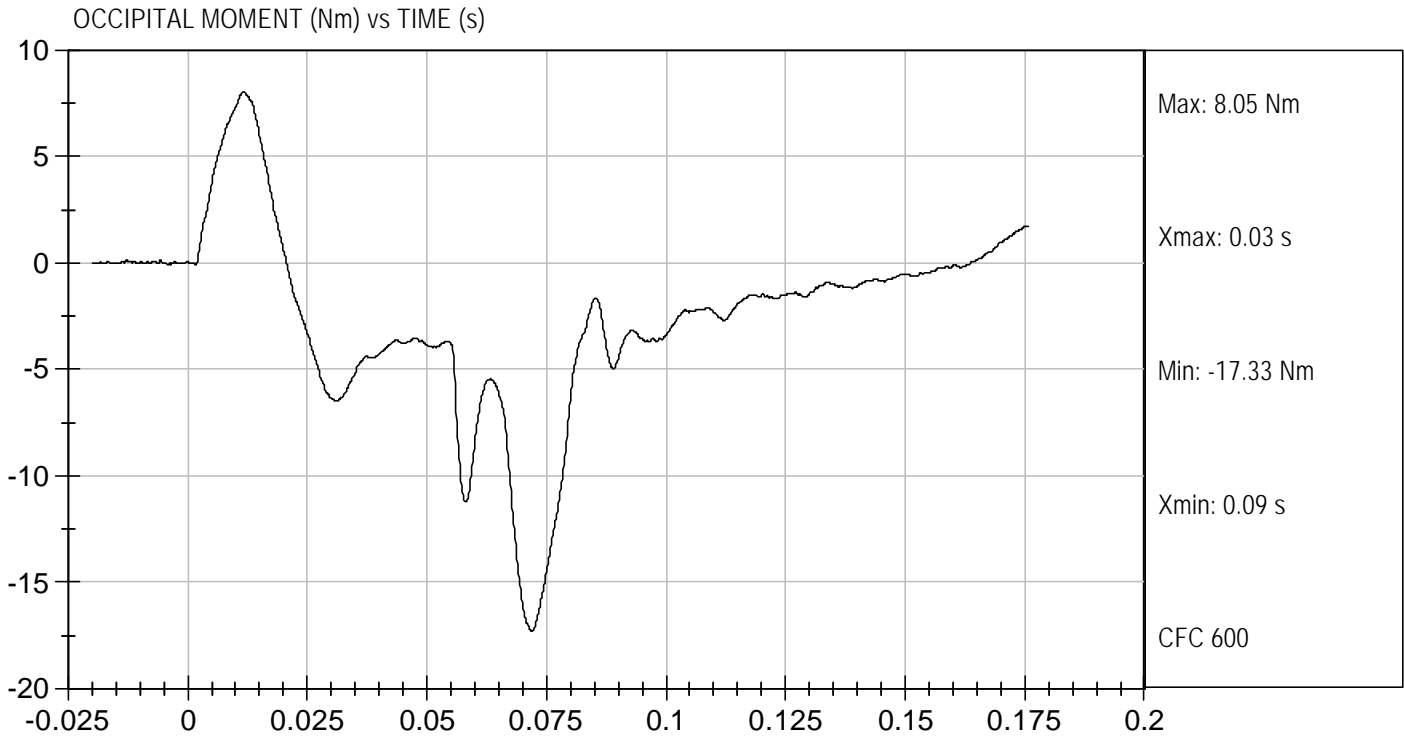
Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.8	Pass	
Humidity	%	10 to 70	50	Pass	
Pendulum Speed	m/s	2.4 to 2.6	2.5	Pass	
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	0.9	Pass
	10 msec	m/s	1.5 to 2.1	1.7	Pass
	14 msec	m/s	2.2 to 2.9	2.4	Pass
D Plane Rotation	deg	80.0 to 92.0	83.6	Pass	
Moment About Occipital Condyle	Nm	-23.0 to -12.0	-17.3	Pass	
Negative Moment - Time Curve Decay to -5 Nm	msec	76 to 90	81	Pass	
Overall Test Results				Pass	

Jessica Hall
Laboratory Technician

03/26/2007
Test Date

Jeff Leonard
Approved By





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

Dummy Serial Number 084

Test Date 3/23/07

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. (572.155(m))
 N/A, ONLY one thorax impact test performed
2. The test fixture conforms to the specifications in Figure 10E.
3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))
4. The dummy assembly soaked at a temperature between 20.6°C (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. (572.154(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.8</u> |
| Record the maximum humidity | <u>29%</u> |
| Record the minimum humidity | <u>28%</u> |
5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))
6. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.154(c)(3))
7. The posterior surface of the upper spine box is $90^\circ \pm 1^\circ$ from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))
8. Place the upper arms parallel to the torso. Place the lower arms 0° to 5° forward of vertical. (572.154(c)(3))
9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))
10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.146(l)).
11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The

velocity of the test probe at the time of impact is between 4.9 m/s and 5.1 m/s. (572.154(b)). The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.154(c)(6) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.154(c)(7)

X 12. Complete the following table:

Thorax Impact Results (572.154(b))

Parameter*	Specification	Result
Test Probe Speed	$4.9 \text{ m/s} \leq \text{speed} \leq 5.1 \text{ m/s}$	5.0 m/s
Peak force**	$1514 \text{ N} \leq \text{peak force} \leq 1796 \text{ N}$	1601 N

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

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

X 13. Plots of pendulum acceleration, and pendulum force, follow this sheet.

Jessica Gall
Signature

3/23/07
Date

MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH

ATD Serial No: 084

Test I.D.: D07794

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	29	Pass
Probe Speed	m/sec	4.9 to 5.1	5.0	Pass
Probe Force	kN	1.51 to 1.80	1.6	Pass
Overall Test Results				Pass



 Laboratory Technician

03/23/2007

 Test Date



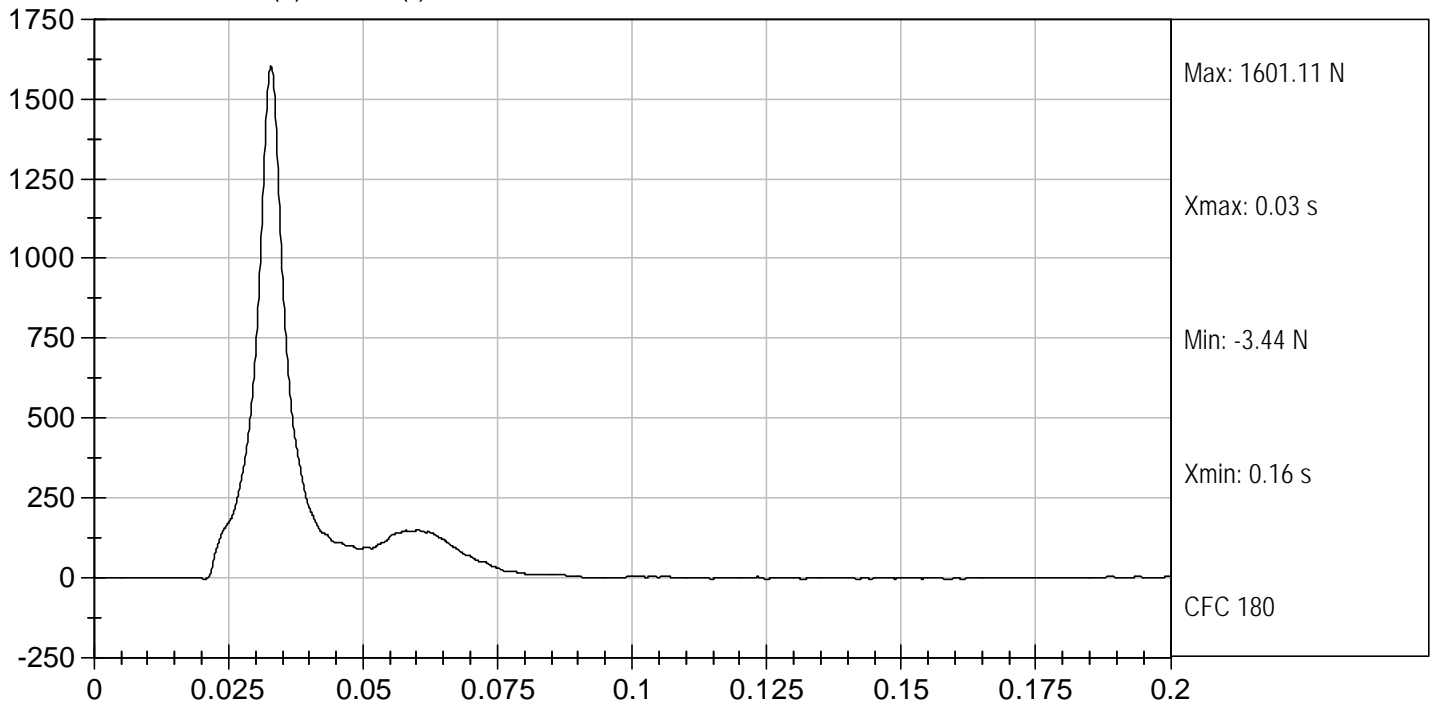
 Approved By



Test Desc: Thorax Impact
Component ID: D07794

Test Date: 03/23/2007
Velocity: 16.48 ft/s, 5.02 m/s

PROBE FORCE (N) vs TIME (s)



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

Dummy Serial Number 084

Test Date 3/28/07

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 frontal head drop and at least 30 minutes since the last rear head drop. (572.152(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))

3. Accelerometers and their respective mounts are smooth and clean.

4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.4

Record the maximum humidity 32%

Record the minimum humidity 31%

6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 5E. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(i))

Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(i))

Record the right side distance 439 mm

Record the left side distance 439 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 45 ± 1 degrees. (572.152(c)(3)(i))

Record the angle 45 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))

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

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$100 \text{ g} \leq x \leq 120 \text{ g}$	104
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	2

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

Jessica Hall
Signature

3/28/07
Date

**MGA RESEARCH CORPORATION
FRONT HEAD DROP TEST
CRABI 12 MONTH**

ATD Serial No: 084

Test ID: D07841

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	100 to 120	104	Pass
Peak Lateral Acceleration	G's	+/- 15	2	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass

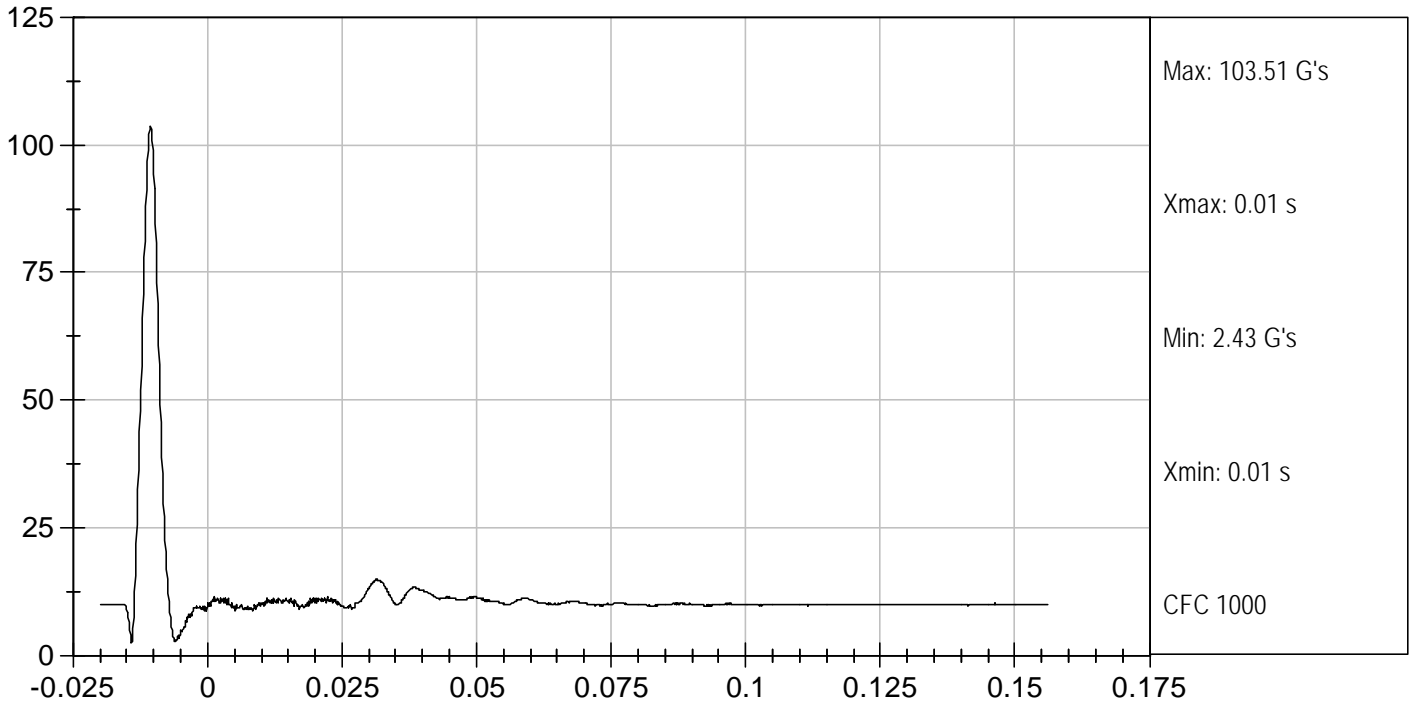
Jessica Hall
Laboratory Technician

03/28/2007
Test Date

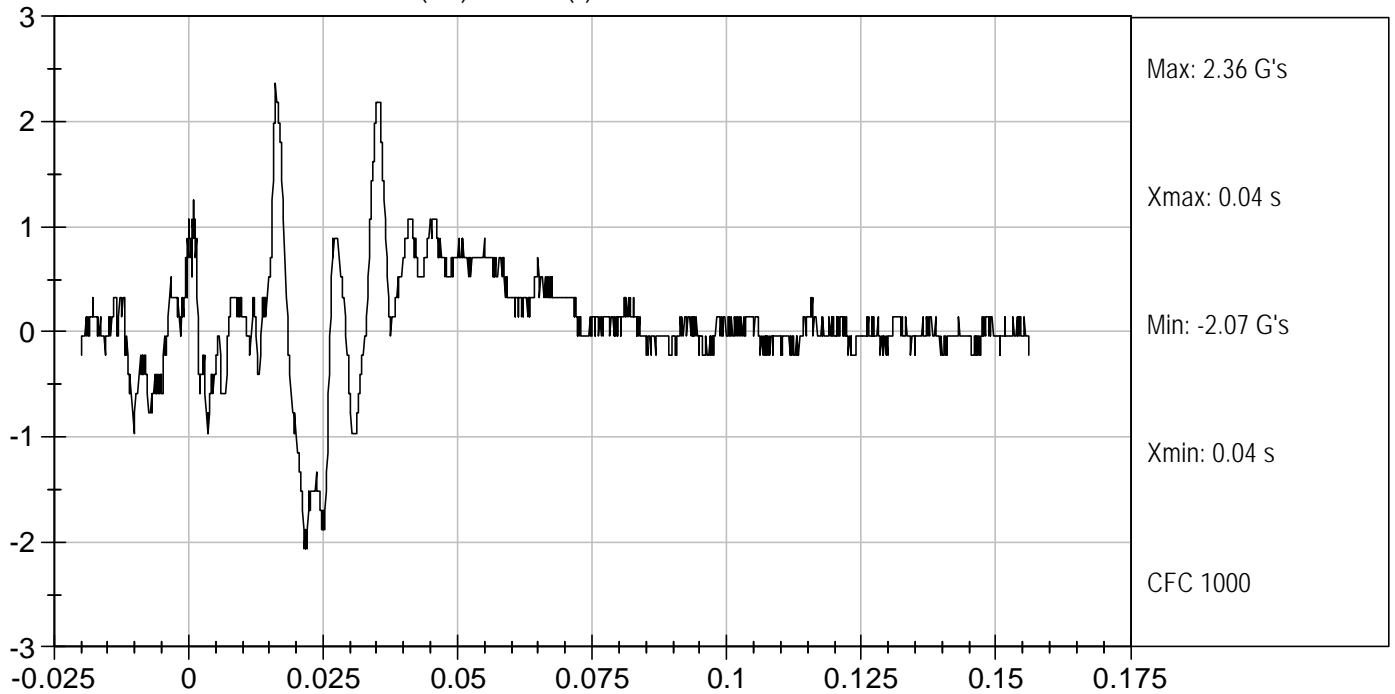
Jeff Leonard
Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 084

Test Date 3/28/07

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 rear head drop and at least 30 minutes since the last frontal head drop. (572.152(c)(5))

N/A, ONLY one head drop performed

2. The head assembly consists of the head (921022-001), triaxial accelerometer mounting block (SA572-S80), and three (3) accelerometers (SA572-S4). (572.152(a))

3. Accelerometers and their respective mounts are smooth and clean.

4. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

5. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.152(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.4

Record the maximum humidity 32%

Record the minimum humidity 31%

6. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

7. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.152(c)(2))

X 8. Suspend and orient the head assembly as shown in Figure 6E. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.152(c)(3)(ii))
Record the actual distance 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 9. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.152(c)(3)(ii))
Record the right side distance 467 mm
Record the left side distance 467 mm

X 10. The angle between the lower surface plane of the neck transducer mass simulator (910420-003) and the plane of the impact surface is 90 ± 1 degrees. (572.152(c)(3)(ii))
Record the angle 90 degrees

X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.152(c)(4))
Record actual micro finish 656×10^{-6} mm

X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.152(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm

X 13. 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. (572.152(b) & (572.152(c)(4))

X 14. Complete the following table. (572.152(b)):

Parameter	Specification	Result
Peak resultant acceleration	$55 \text{ g} \leq x \leq 71 \text{ g}$	66
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 17% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq \pm 15 \text{ g}$	3

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

3/28/07
Date

MGA RESEARCH CORPORATION
REAR HEAD DROP TEST
CRABI 12 MONTH

ATD Serial No: 084

Test ID: D07845


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	32	Pass
Peak Resultant Acceleration	G's	55 to 71	66	Pass
Peak Lateral Acceleration	G's	+/- 15	3	Pass
Unimodal	N/A	within 17% of peak	Yes	Pass
Overall Test Results				Pass



 Laboratory Technician

03/28/2007

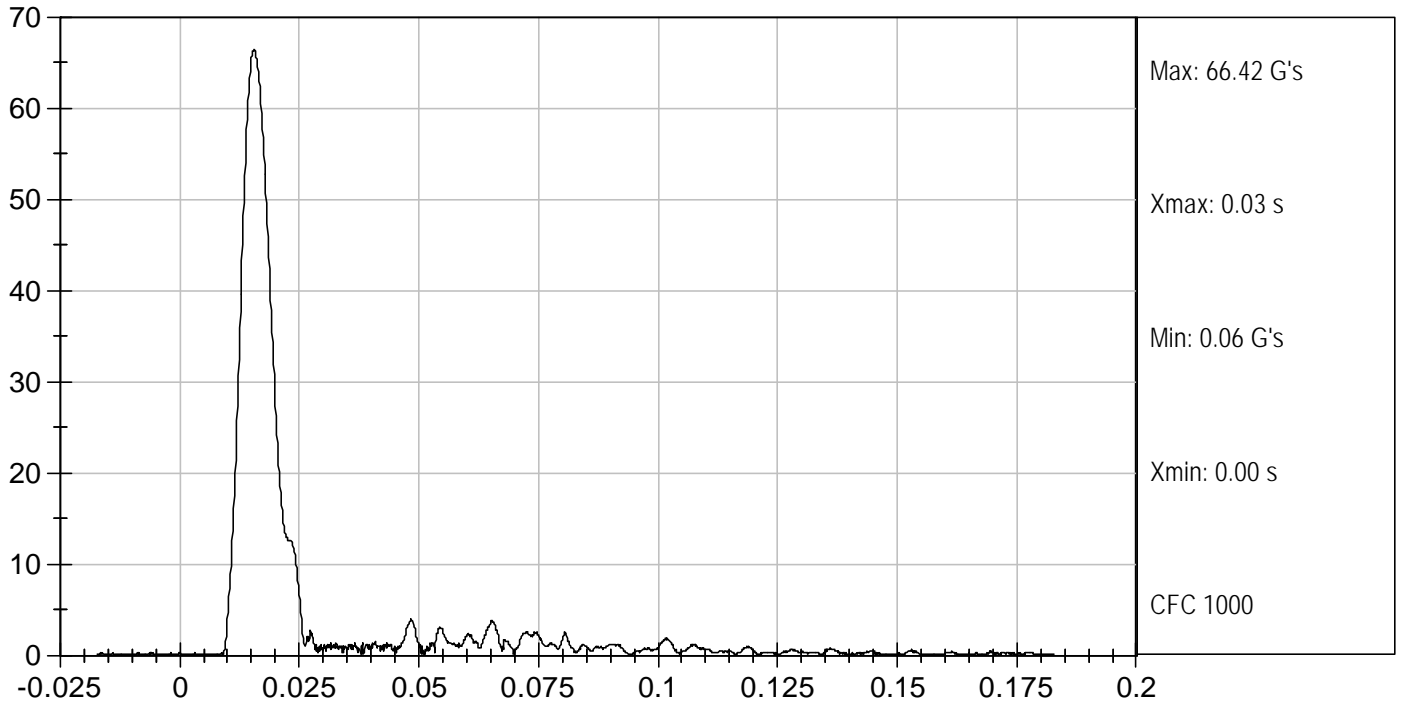
 Test Date



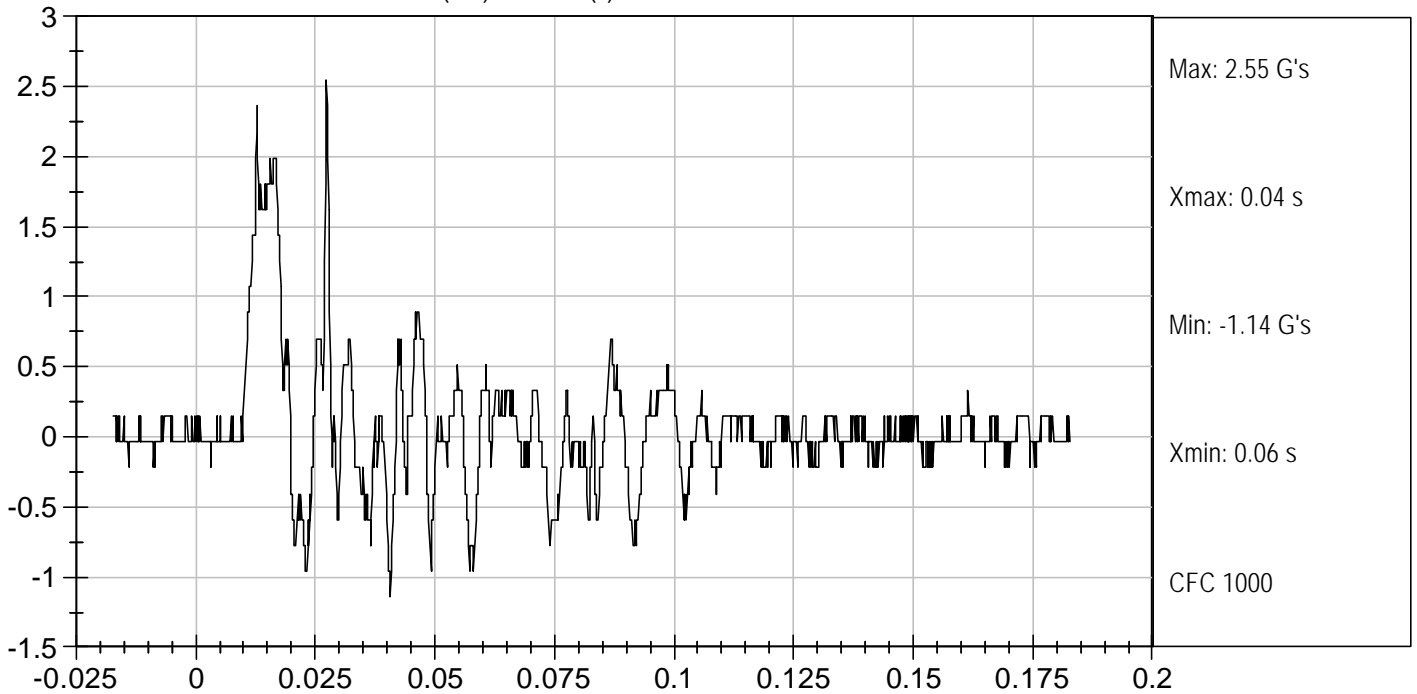
 Approved By



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



PEAK LATERAL ACCELERATION (G's) vs TIME (s)



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

Dummy Serial Number 084

Test Date 3/28/07

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. (572.155(m))

N/A, this is the first neck test performed

2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))

3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.4

Record the maximum humidity 32%

Record the minimum humidity 31%

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.

5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))

6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))

7. The test fixture pendulum conforms to the specifications in Figure 7E.

8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 8E for the flexion test. (572.153(c)(3))

9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))

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

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.1 m/s to 5.3 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		5.1 m/s ≤ speed ≤ 5.3 m/s	5.2 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.6 m/s ≤ ΔV ≤ 2.3 m/s	1.9 m/s
	@ 20 ms	3.4 m/s ≤ ΔV ≤ 4.2 m/s	3.5 m/s
	@25ms	4.3 m/s ≤ ΔV ≤ 5.2 m/s	4.3 m/s
Plane D Rotation		Peak moment* 36 Nm ≤ moment ≤ 45 Nm during the following rotation range 75° ≤ angle ≤ 86°	<u>37</u> Nm @ <u>80</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5Nm 60 ms ≤ time ≤ 80ms	79 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/28/07
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
CRABI 12 MONTH

ATD Serial No: 084

Test I.D: D07842

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.4	Pass	
Humidity	%	10 to 70	32	Pass	
Impact Velocity	m/s	5.1 to 5.3	5.2	Pass	
Pendulum Deceleration	10 msec	m/s	1.6 to 2.3	1.9	Pass
	20 msec	m/s	3.4 to 4.2	3.5	Pass
	25 msec	m/s	4.3 to 5.2	4.3	Pass
D Plane Rotation	deg	75.0 to 86.0	80.3	Pass	
Moment About Occipital Condyle	Nm	36.0 to 45.0	36.8	Pass	
Positive Moment - Time Curve Decay to 5 Nm	msec	60 to 80	79	Pass	
Overall Test Results				Pass	

Jessica Hall

 Laboratory Technician

03/28/2007

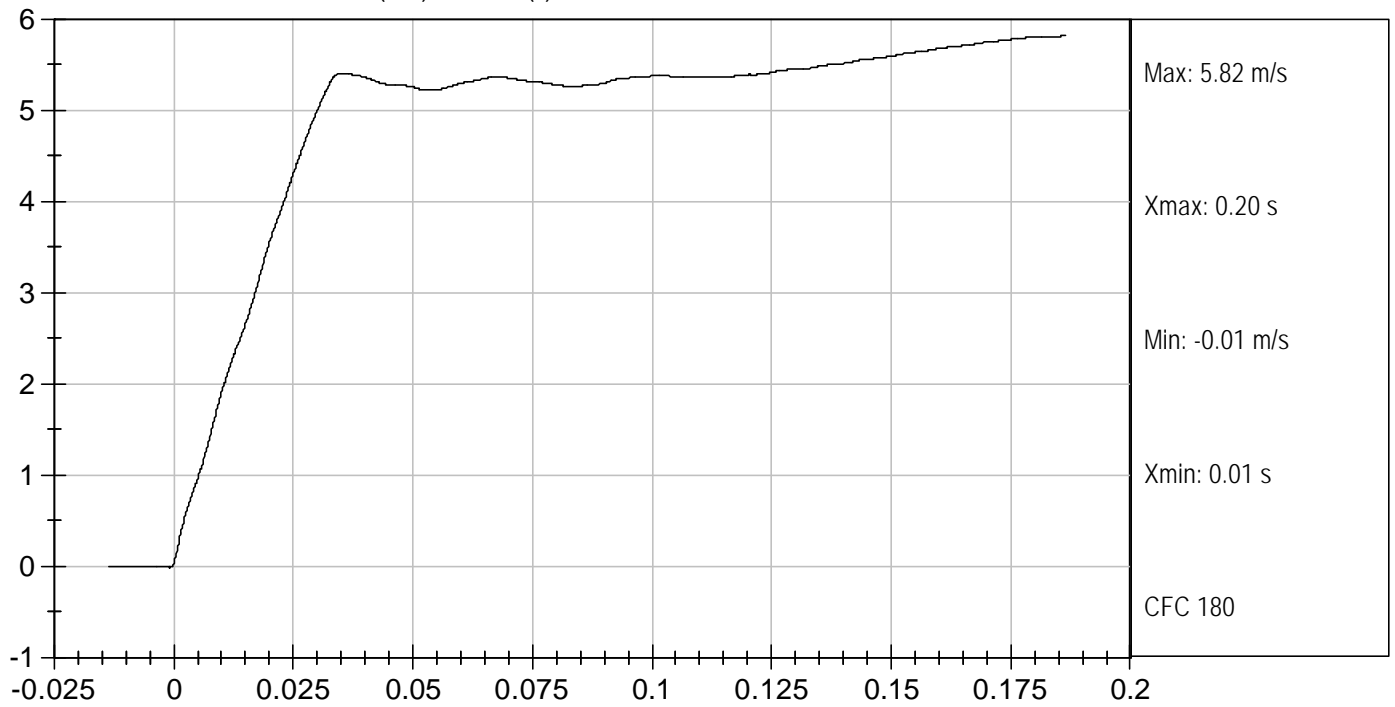
 Test Date

Jeff Leonard

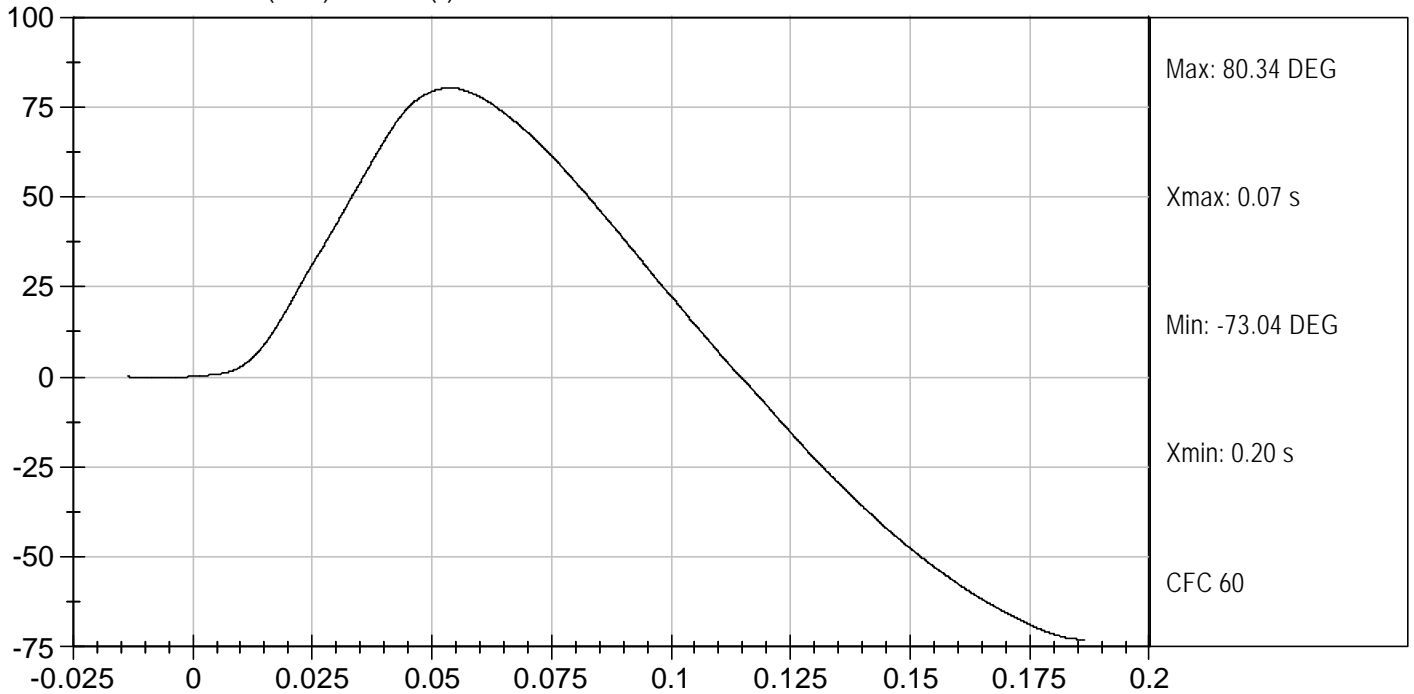
 Approved By



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



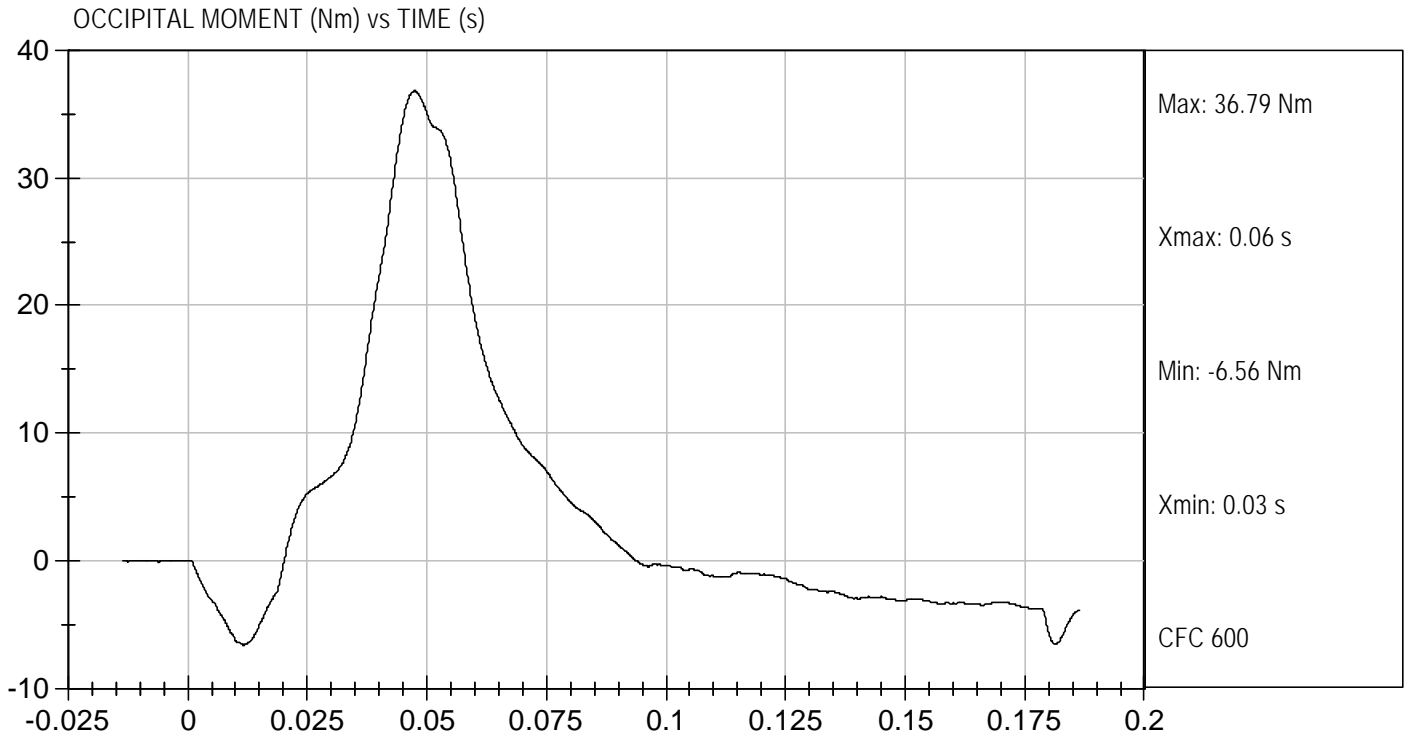
FLEXION ANGLE (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D07842

Test Date: 03/28/2007
Velocity: 17.11 ft/s, 5.2 m/s



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

Dummy Serial Number 084

Test Date 3/28/07

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. (572.155(m))
 N/A, this is the first neck test performed
2. The components required for the neck tests include the neck assembly (921022-041), and headform (TE-3200-160). (572.153(a))
3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.153(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>32%</u> |
| Record the minimum humidity | <u>31%</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 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.
5. Torque the jam nut (9001336) on the neck cable (ATD-6206) between 0.2 Nm and 0.3 Nm. (572.153(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.155(i))
7. The test fixture pendulum conforms to the specifications in Figure 7E.
8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9E for the flexion test. (572.153(c)(3))
9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly and not induce neck torsion. (572.153(c)(3)(ii))
10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.

- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.153(c)(3)(i))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 2.4 m/s to 2.6 m/s as measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb. (572.153(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$2.4 \text{ m/s} \leq \text{speed} \leq 2.6 \text{ m/s}$	2.5 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$0.8 \text{ m/s} \leq \Delta V \leq 1.2 \text{ m/s}$	0.9 m/s
	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 2.1 \text{ m/s}$	1.6 m/s
	@ 14 ms	$2.2 \text{ m/s} \leq \Delta V \leq 2.9 \text{ m/s}$	2.2 m/s
Plane D Rotation		Peak moment* -12 Nm \leq moment \leq -23 Nm during the following rotation range $80^\circ \leq$ angle $\leq 92^\circ$	<u>-16</u> Nm @ <u>83</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5Nm $76 \text{ ms} \leq \text{time} \leq 90 \text{ ms}$	86 ms

*Moment about the occipital condyle = $M_y - (0.005842 \text{ m} \times F_x)$
(572.153(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. (572.153(c)(4)(i))

- X 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.

Jessica Hall
Signature

3/28/07
Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
CRABI 12 MONTH**

ATD Serial No: 084

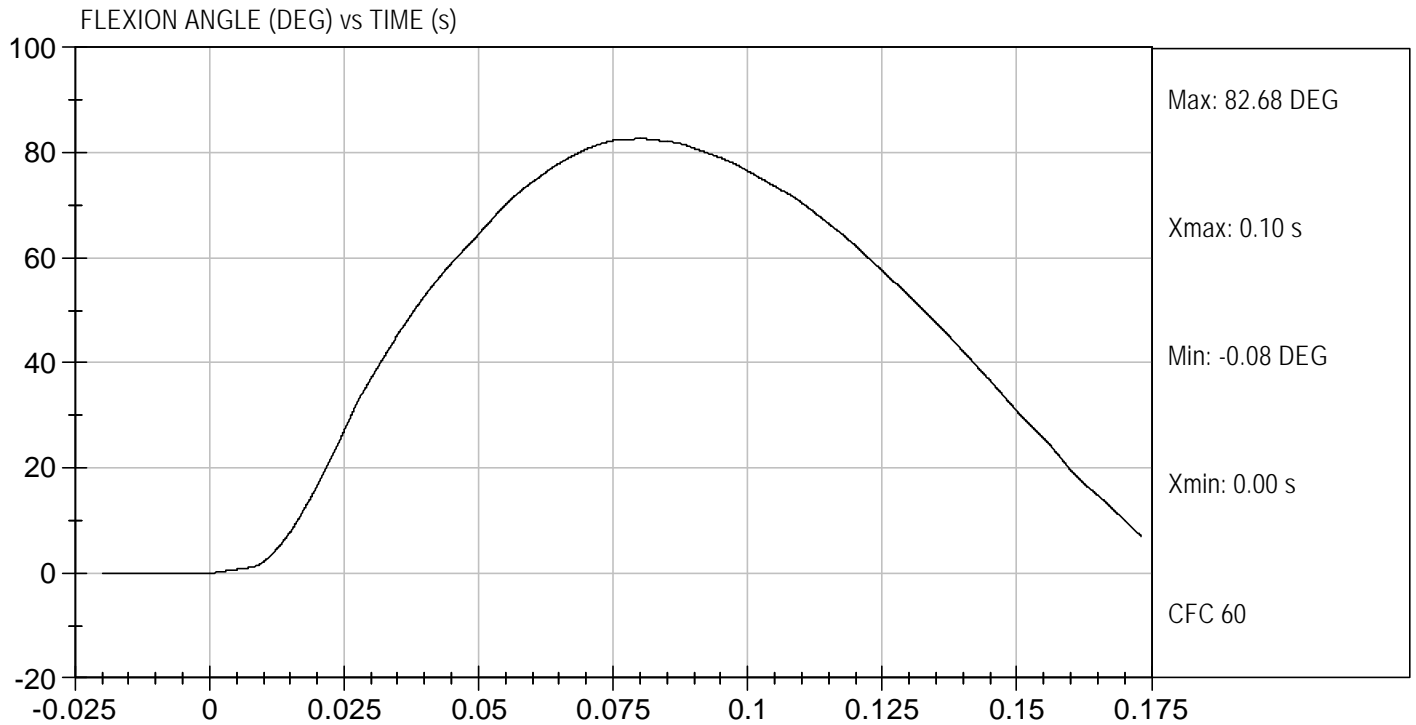
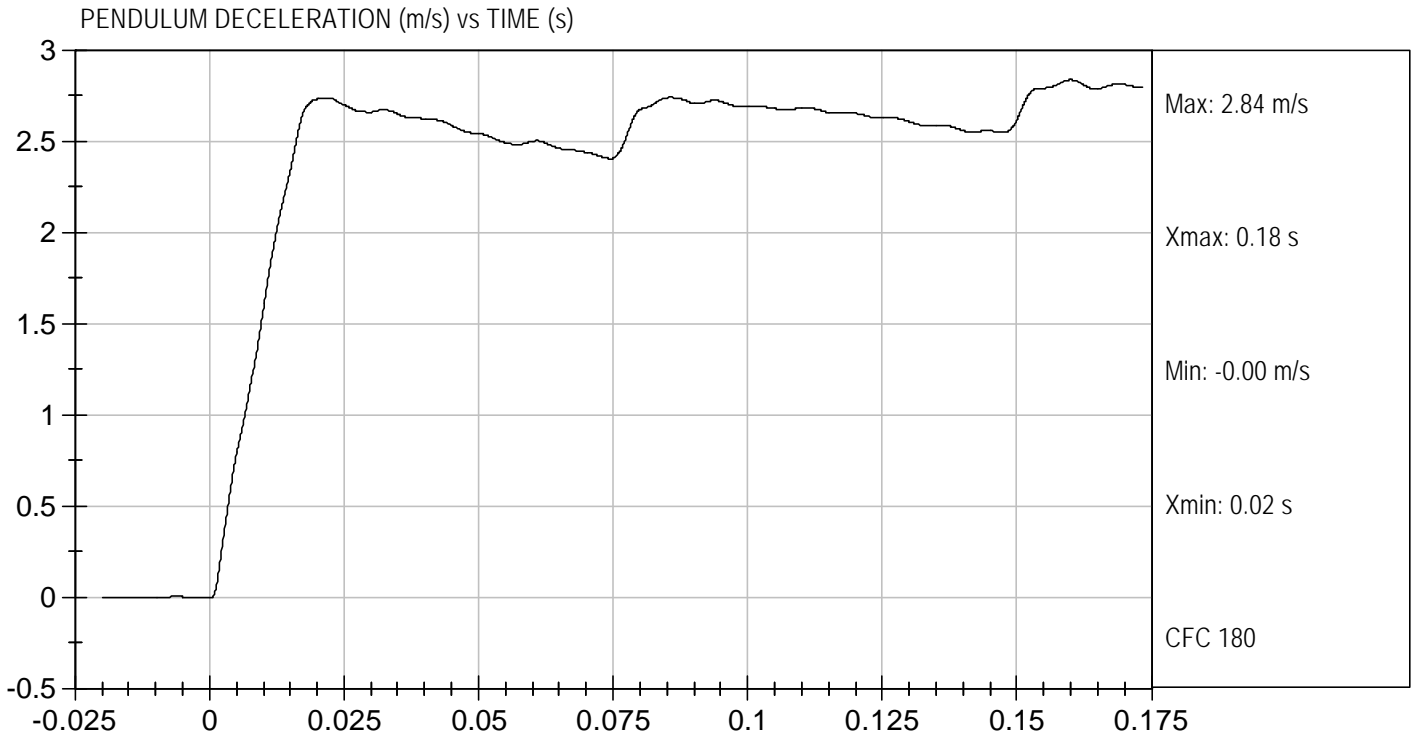
Test I.D: D07843

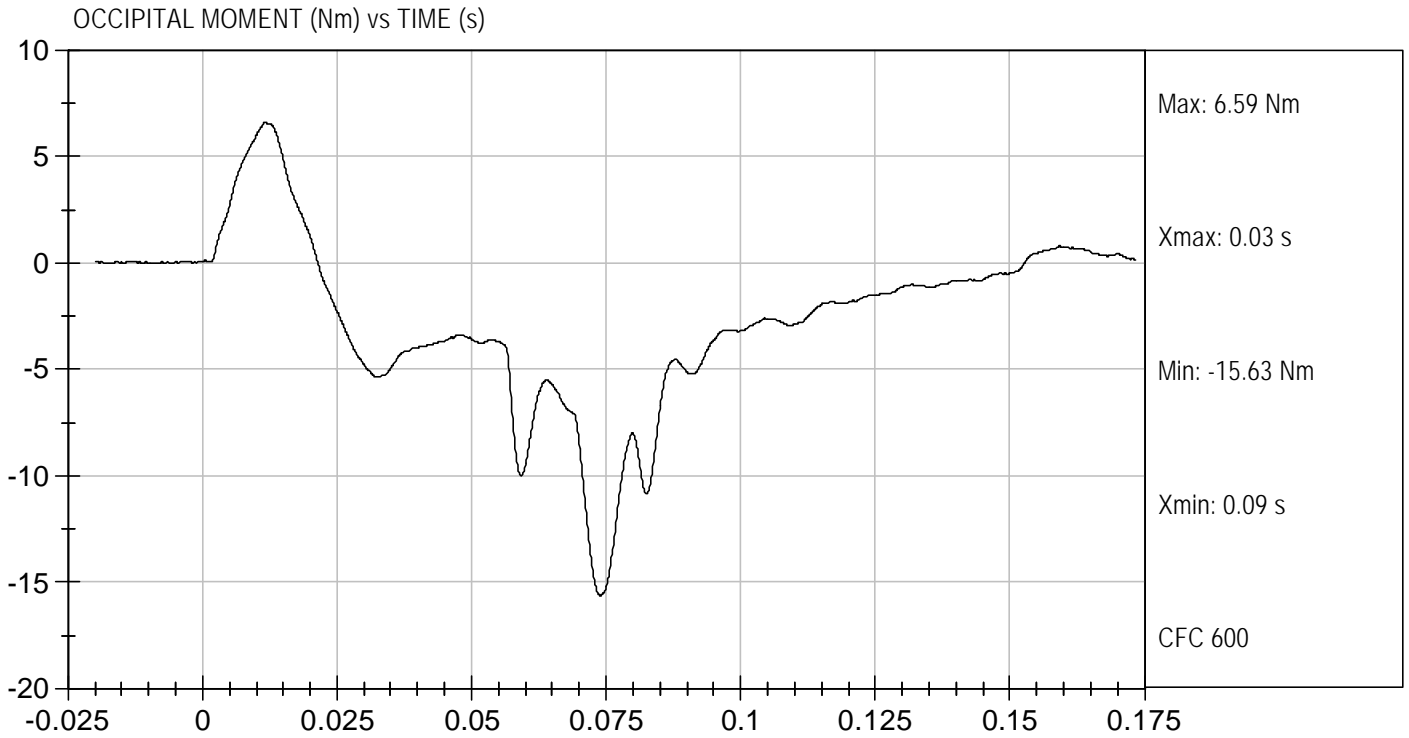
Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.6	Pass	
Humidity	%	10 to 70	31	Pass	
Pendulum Speed	m/s	2.4 to 2.6	2.5	Pass	
Pendulum Deceleration	6 msec	m/s	0.8 to 1.2	0.9	Pass
	10 msec	m/s	1.5 to 2.1	1.6	Pass
	14 msec	m/s	2.2 to 2.9	2.2	Pass
D Plane Rotation	deg	80.0 to 92.0	82.7	Pass	
Moment About Occipital Condyle	Nm	-23.0 to -12.0	-15.6	Pass	
Negative Moment - Time Curve Decay to -5 Nm	msec	76 to 90	86	Pass	
Overall Test Results				Pass	

Jessica Gall
Laboratory Technician

03/28/2007
Test Date

Jeff Leonard
Approved By





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

Dummy Serial Number 084

Test Date 3/29/07

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.
(572.155(m))

N/A, ONLY one thorax impact test performed

2. The test fixture conforms to the specifications in Figure 10E.

3. The complete assembled dummy (921022-000) is used (572.154(b)) and is dressed in cotton-polyester-based tight-fitting long-sleeved sweat shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.154(c)(2))

4. The dummy assembly soaked at a temperature between 20.6°C (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. (572.154(c)(1))

Record the maximum temperature 21.4

Record the minimum temperature 21.1

Record the maximum humidity 30%

Record the minimum humidity 28%

5. Seat the dummy, without back support on the test fixture surface as shown in Figure 10E. The legs are extended forward, parallel to the midsagittal plane. The surface must be long enough to support the pelvis and outstretched legs. (572.154(c)(3))

6. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.154(c)(3))

7. The posterior surface of the upper spine box is $90^\circ \pm 1^\circ$ from the horizontal. Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment. (572.154(c)(3))

8. Place the upper arms parallel to the torso. Place the lower arms 0° to 5° forward of vertical. (572.154(c)(3))

9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane, 196 ± 2.5 mm vertically from the plane of the seating surface and is within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.154(c)(4))

10. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.146(l)).

11. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.154(c)(5)) The

velocity of the test probe at the time of impact is between 4.9 m/s and 5.1 m/s. (572.154(b)). The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.154(c)(6) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.154(c)(7)

X 12. Complete the following table:

Thorax Impact Results (572.154(b))

Parameter*	Specification	Result
Test Probe Speed	$4.9 \text{ m/s} \leq \text{speed} \leq 5.1 \text{ m/s}$	5.0 m/s
Peak force**	$1514 \text{ N} \leq \text{peak force} \leq 1796 \text{ N}$	1585 N

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

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

X 13. Plots of pendulum acceleration, and pendulum force, follow this sheet.

Jessica Hall
Signature

3/29/07
Date

MGA RESEARCH CORPORATION
THORAX IMPACT TEST
CRABI 12 MONTH

ATD Serial No: 084

Test I.D: D07844

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	30	Pass
Probe Speed	m/sec	4.9 to 5.1	5.0	Pass
Probe Force	kN	1.51 to 1.80	1.59	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

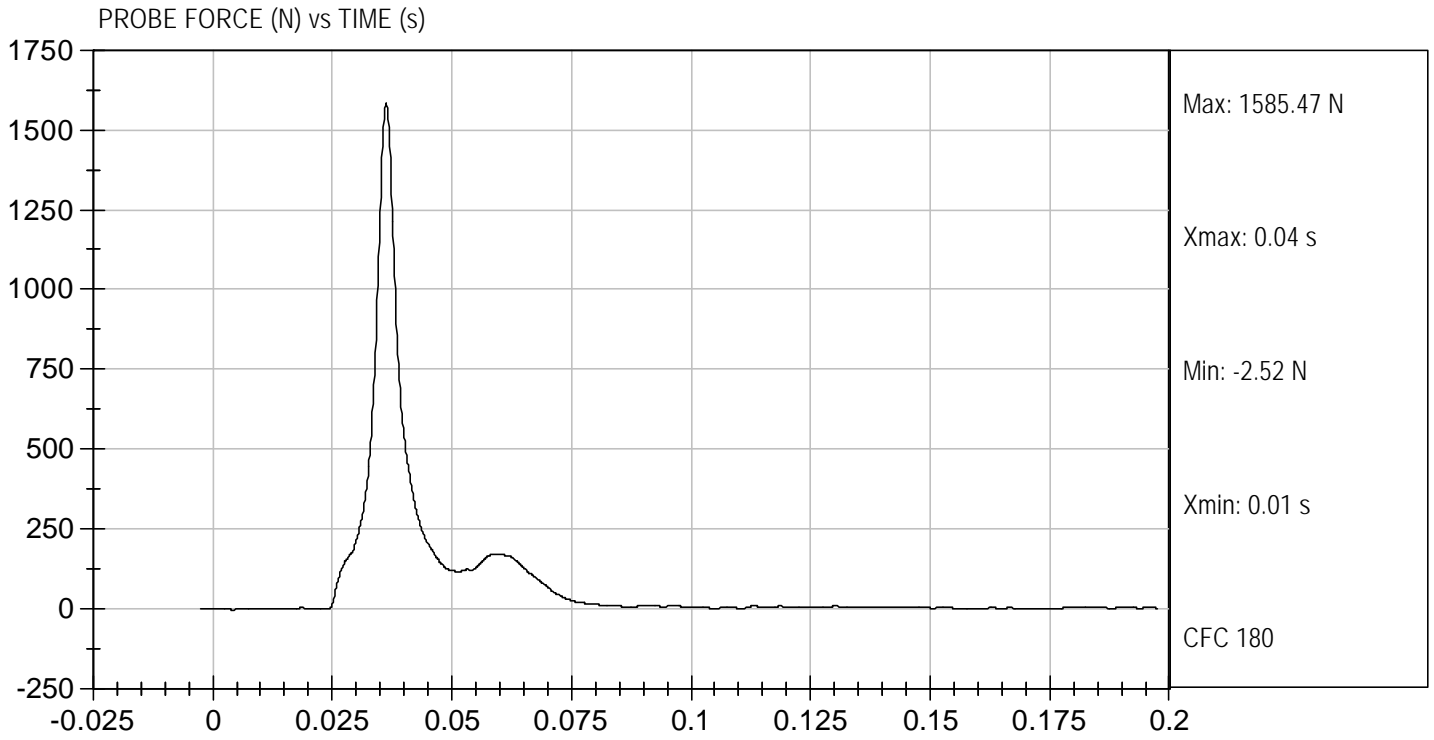
03/29/2007
Test Date

Jeff Leonard
Approved By



Test Desc: Thorax Impact
Component ID: D07844

Test Date: 03/29/2007
Velocity: 16.43 ft/s, 5.01 m/s



EXTERNAL DIMENSIONS

CRABI 12 month #084, PART 572, SUBPART R EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head with head pulled back to touch vertical surface of fixture.	456.0-471.2	468.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	276.6-291.8	285.0
C	HIP PIVOT HEIGHT	Centerline of hip pivot bolt to seat surface	27.9-38.1	33.1
D	HIP PIVOT FROM BACKLINE	Centerline of hip pivot bolt to vertical surface of seat	40.1-50.3	49.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	50.3-60.5	53.5
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper femur segment	63.0-73.2	69.9
G	ELBOW PIVOT TO FINGERTIP	Elbow pivot to the finger tip, in line with the elbow and wrist centerlines	176.6-191.8	182.7
I	SHOULDER PIVOT TO-ELBOW PIVOT	Shoulder pivot bolt to elbow pivot bolt	99.1-114.3	105.5
J	ELBOW REST HEIGHT	Seat surface to bottom of lower arm	150.1-165.3	158.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface	202.7-217.9	208.1
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	138.7-153.9	141.2
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	165.1-180.3	171.1
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of buttocks used for dimension K	144.8-160	153.2

CRABI 12 month #084, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 261.6 ± 5.1 mm above seat surface	107.5-122.7	113.1
P	FOOT LENGTH	Tip of toe to rear of heel	92.4-102.6	98.1
Q	STATURE	Place the dummy in supine position on the measurement surface. Place a block that is perpendicular to the table at both the head and feet of the dummy. Position the blocks perpendicular to the midsagittal plane of the dummy. Position the blocks so they are in contact with the head and the heels of the dummy. Measure the distance between the blocks.	727.7-753.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	178.5-188.7	185.6
S	HEAD BREADTH	Distance across the head at its widest point	124.4-134.6	128.3
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.	149.9-165.1	157.1
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	158.5-173.7	163.1
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	200.7-215.9	211.5
W	FOOT BREADTH	The widest part of the foot	39.1-49.3	41.9
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on. Measured 261.6 ± 5.1 mm above the seat surface.	452.4-477.8	468.0
Z	WAIST CIRCUMFERENCE	Distance around waist at reference location BB, with jacket on. Measured 111.8 ± 5.1 mm above the seat surface.	447.0-472.4	459.8
AA	REFERENCE LOCATION FOR DIMENSION Y & O	Reference: 261.6 ± 5.1 mm above the seat surface	256.5-266.7	261.6

CRABI 12 month #084, PART 572, SUBPART R EXTERNAL DIMENSIONS, continued

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 111.8 ± 5.1 mm above seat surface	106.7-116.9	111.8
CC	SHOULDER HEIGHT	Top of arm to seat surface	299.7-314.9	307.2
DD	CHIN HEIGHT	Bottom of chin to seat surface	289.6-304.8	301.6

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

Dummy Serial Number 084

Test Date 3/27/07

Technician Jessica Gall

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

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

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			NA
Spine	Broken or cracks in rubber.			NA
Ribs	Broken or bent ribs			NA
	Broken or bent rib supports			NA
	Damping material separated or cracked			NA
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			NA
	Slider arm riding in track			NA
Transducer leads	Torn cables			NA

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			NA
	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

3/29/07
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

3/29/07

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #032, PART 572, SUBPART P 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	541.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	315.2
C	H-POINT HEIGHT	Reference	34.3-44.5	35.9
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	64.3
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	82.4
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	250.4
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
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	141.8
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.	284.8-300.0	285.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	230.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	252.9
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	225.5

HYBRID III 3 year SN #032, PART 572, 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	139.9
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	142.8
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	255.2
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.7
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	173.8
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	509.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	531.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	541.2
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
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 4/4/07

Technician Tim Bratz

- 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 1/2 mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one 1/2-20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))
- 3. Accelerometers and their respective mounts are smooth and clean.
- 4. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.
- 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- 6. 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	<u>21.9</u>
Record the minimum temperature	<u>21.6</u>
Record the maximum humidity	<u>24%</u>
Record the minimum humidity	<u>22%</u>
- 7. 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.
- 8. 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 9. 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 10. 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 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))

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

X 12. 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 13. 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 14. Complete the following table. (572.142(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	271
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 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.


Signature

4/4/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 032

Test I.D: D07931

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	22	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	270.6	Pass
Peak Lateral Acceleration	G's	≤ +/- 15.0	-8.5	Pass
Is Acceleration Unimodal?	N/A	< 10% Peak	Yes	Pass
Overall Test Results				Pass


 Laboratory Technician

4/4/07
 Test Date


 Approved By



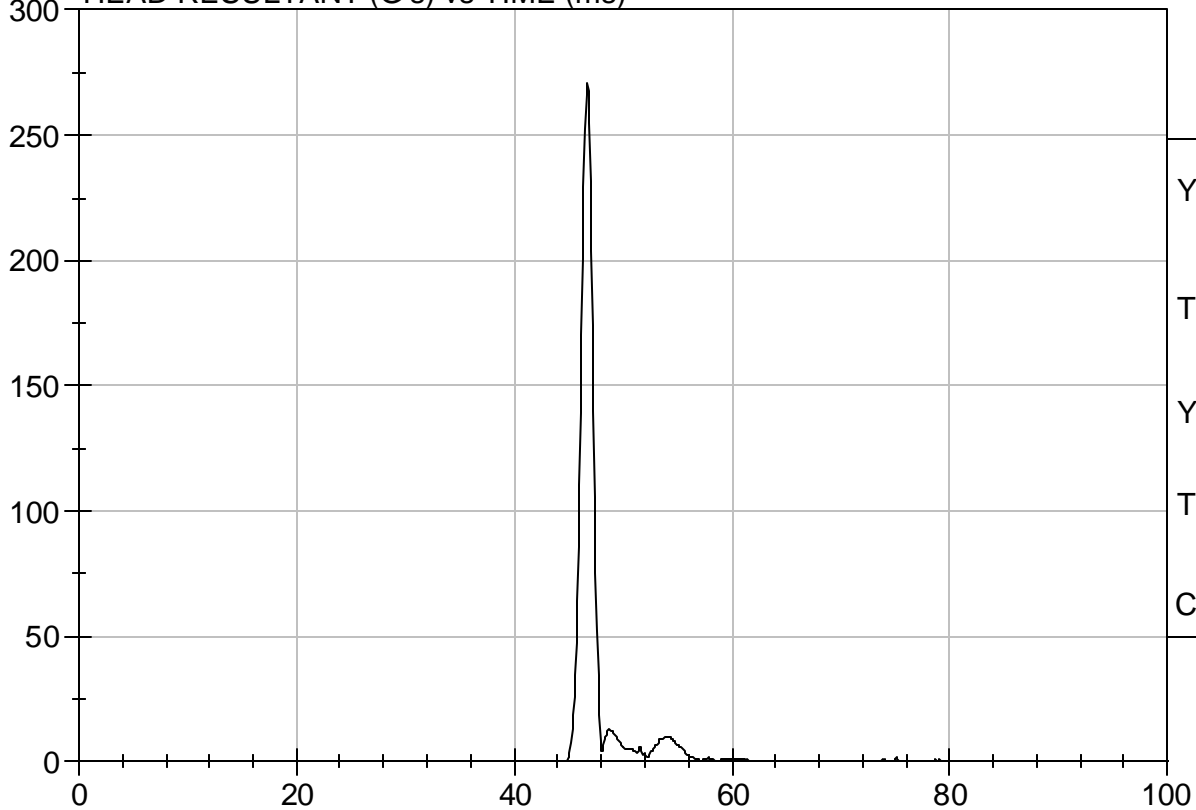
Test Description: Head Drop

Test Date: 4/4/07

Component: D07931

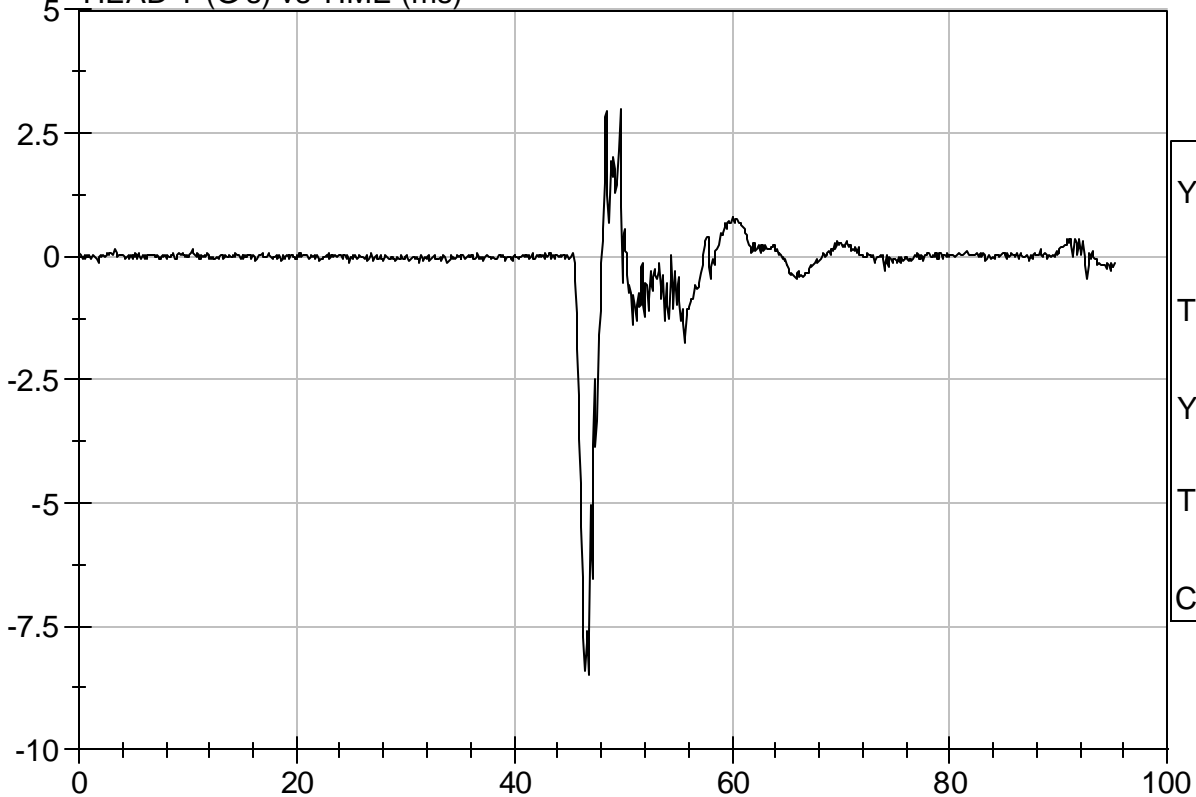
Speed: 0 ft/s, 0 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 270.6 G
Tmax: 46.7 ms
YMin: 0.0 G
Tmin: 25.9 ms
CFC 1000

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



YMax: 3.0 G
Tmax: 49.7 ms
YMin: -8.5 G
Tmin: 46.8 ms
CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032 Test Date 4/5/07

Technician Tim Bratz

- 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	<u>22.0</u>
Record the minimum temperature	<u>20.9</u>
Record the maximum humidity	<u>21%</u>
Record the minimum humidity	<u>20%</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 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.
- 5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))
- 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- 7. The test fixture pendulum conforms to the specifications in Figure 8D.
- 8. 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))
- 9. 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 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. 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 12. 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 13. 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	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$
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>42</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)	Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80\text{ms}$	73 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 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.


Signature

4/5/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 032

Test I.D: D07932

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	20	Pass	
Pendulum Speed	m/s	5.4 to 5.6	5.52	Pass	
Pendulum Deceleration	10 msec	m/s	2.0 to 2.7	2.3	Pass
	15 msec	m/s	3.0 to 4.0	3.2	Pass
	20 msec	m/s	4.0 to 5.1	4.3	Pass
D Plane Rotation	deg	70 to 82	81	Pass	
Peak Moment within Deflection Corridor	Nm	42.0 to 53.0	42.3	Pass	
Positive Moment - Time Curve Decay to 10 Nm	msec	60.0 to 80.0	73.4	Pass	
Overall Test Results				Pass	


 Laboratory Technician

4/5/07

Test Date


 Approved By

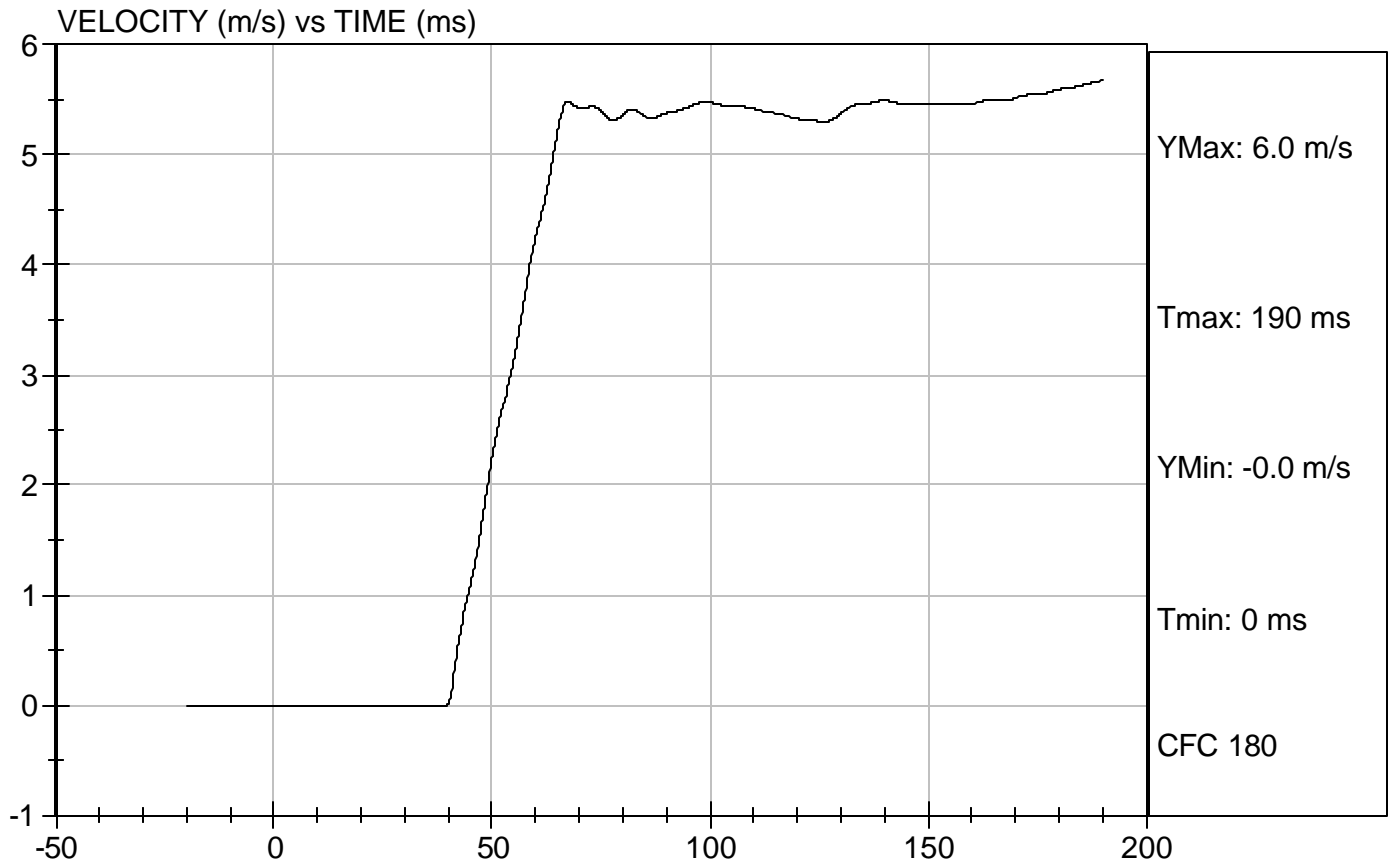


Test Description: Neck Flexion

Test Date: 4/5/07

Component: D07932

Speed: 18.12 ft/sec, 5.52 m/sec



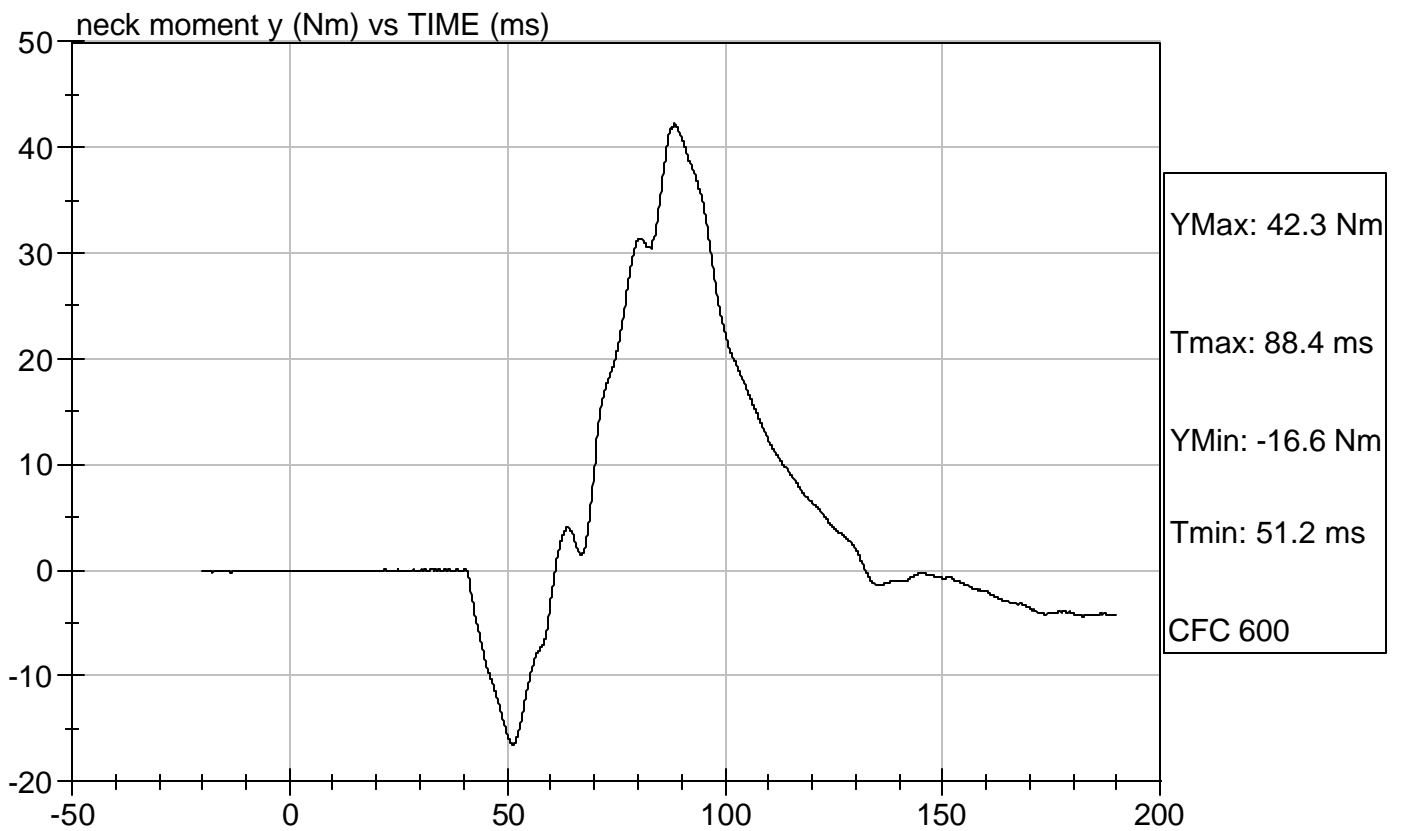
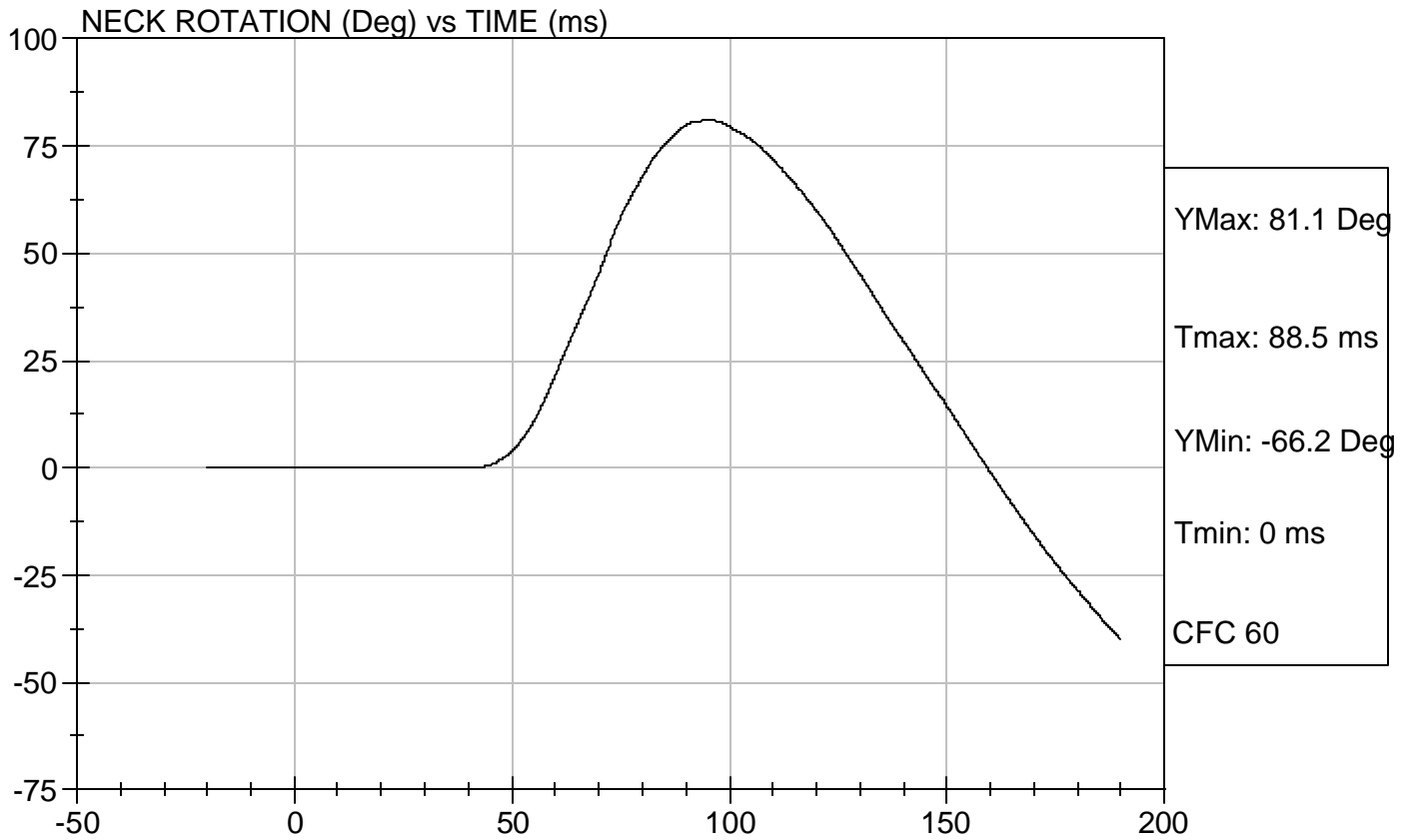


Test Description: Neck Flexion

Test Date: 4/5/07

Component: D07932

Speed: 18.12 ft/s, 5.52 m/s



DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032 Test Date 4/5/07

Technician Tim Bratz

- 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	<u>22.0</u>
Record the minimum temperature	<u>20.9</u>
Record the maximum humidity	<u>21%</u>
Record the minimum humidity	<u>20%</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 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.
- 5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))
- 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- 7. The test fixture pendulum conforms to the specifications in Figure 8D.
- 8. 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))
- 9. 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 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. 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 12. 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 13. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.71 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.4 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	3.2 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 Nm @ 91 degrees</u>
Negative Moment Decay** (Extension)		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 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.


Signature

4/5/07
Date

Hybrid III Calibration Data Sheet


3 Year Old

Neck Extension Test

ATD Serial No: 032

Test I.D: D07933

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	21	Pass	
Pendulum Speed	m/s	3.55 to 3.75	3.71	Pass	
Pendulum Deceleration	6 msec	m/s	1.0 to 1.4	1.4	Pass
	10 msec	m/s	1.9 to 2.5	2.4	Pass
	14 msec	m/s	2.8 to 3.5	3.2	Pass
D Plane Rotation	deg	83 to 93	91	Pass	
Peak Moment within Deflection Corridor	Nm	-53.3 to -43.7	-43.9	Pass	
Negative Moment - Time Curve Decay to -10 Nm	msec	60.0 to 80.0	71.2	Pass	
Overall Test Results				Pass	


 Laboratory Technician

4/5/07

Test Date

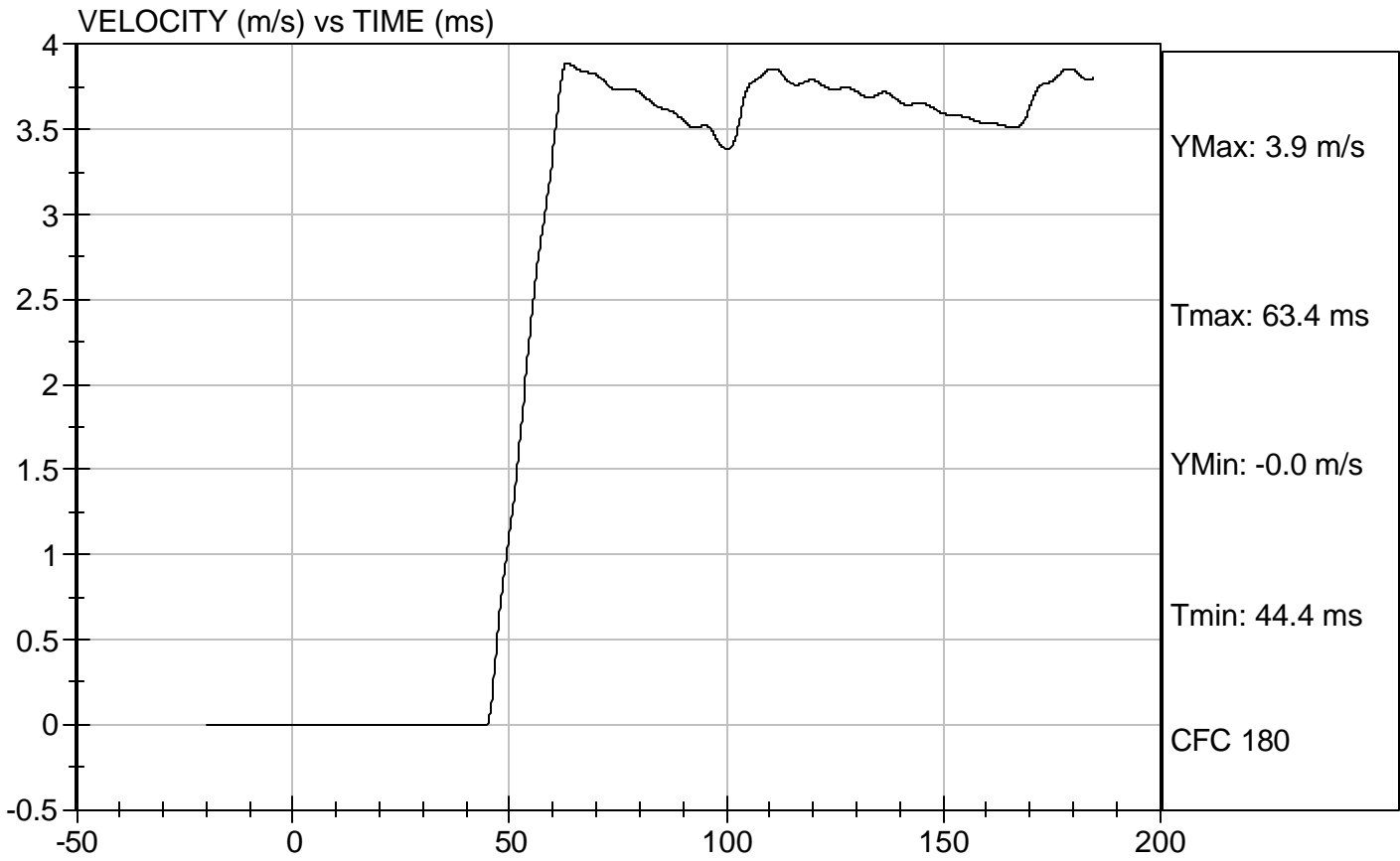

 Approved By



Test Description: Neck Extension Test Date: 4/5/07

Component: D07933

Speed: 12.16 ft/sec, 3.71 m/sec



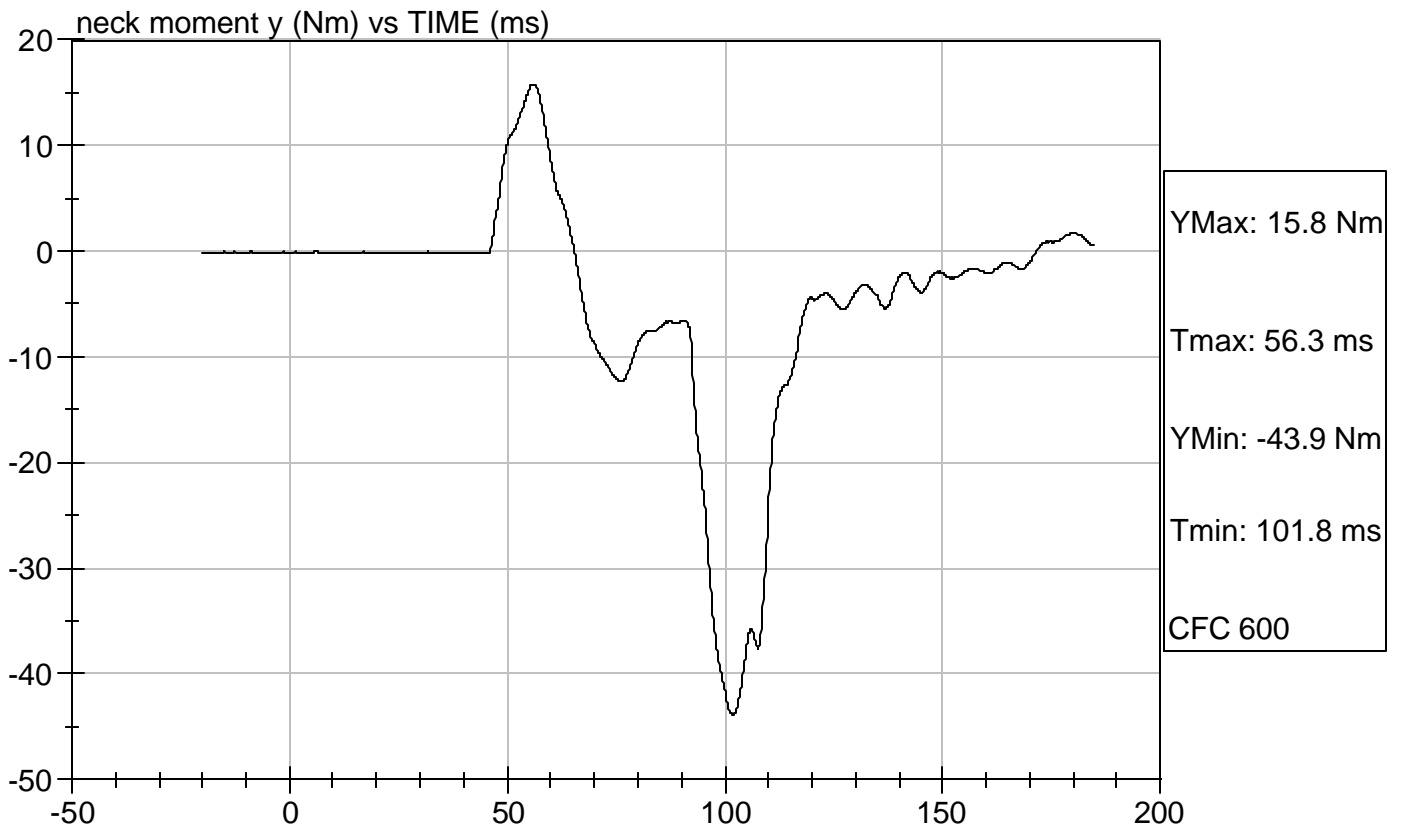
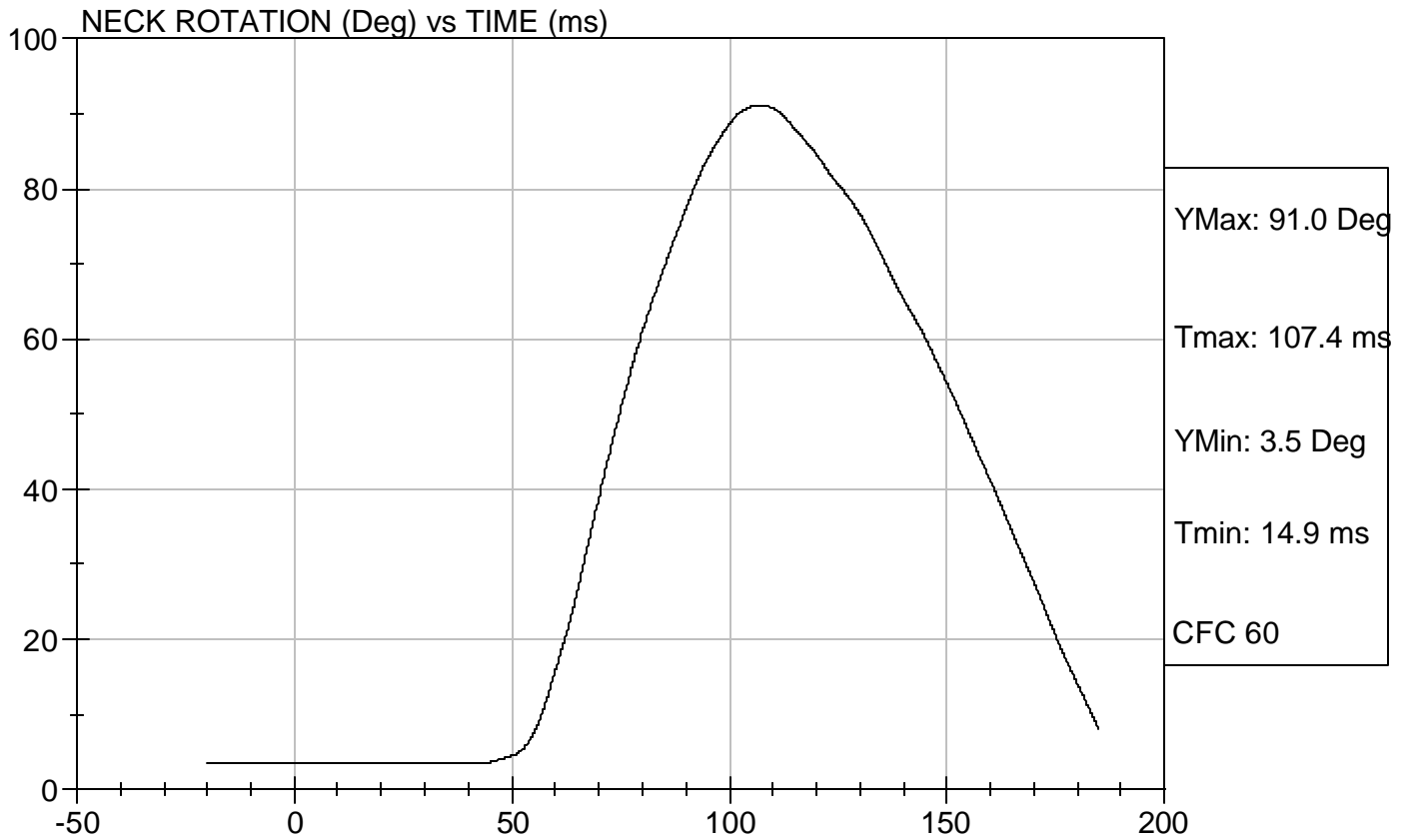


Test Description: Neck Extension

Test Date: 4/5/07

Component: D07933

Speed: 12.16 ft/s, 3.71 m/s



DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 4/4/07

Technician Tim Bratz

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>21.6</u> |
| Record the maximum humidity | <u>24%</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))
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	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	36 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	710 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	710 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.


Signature

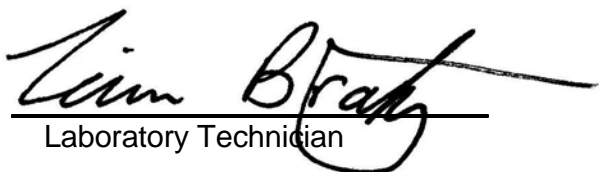
4/4/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

ATD Serial No: 032

Test I.D: D07934

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Velocity	m/s	5.9 to 6.1	6.00	Pass
Peak Deflection	mm	32 to 38	36	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 to 0.81	0.71	Pass
Internal Hysteresis	%	65 to 85	69	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.71	Pass
Overall Test Results				Pass


 Laboratory Technician

4/4/07
 Test Date


 Approved By

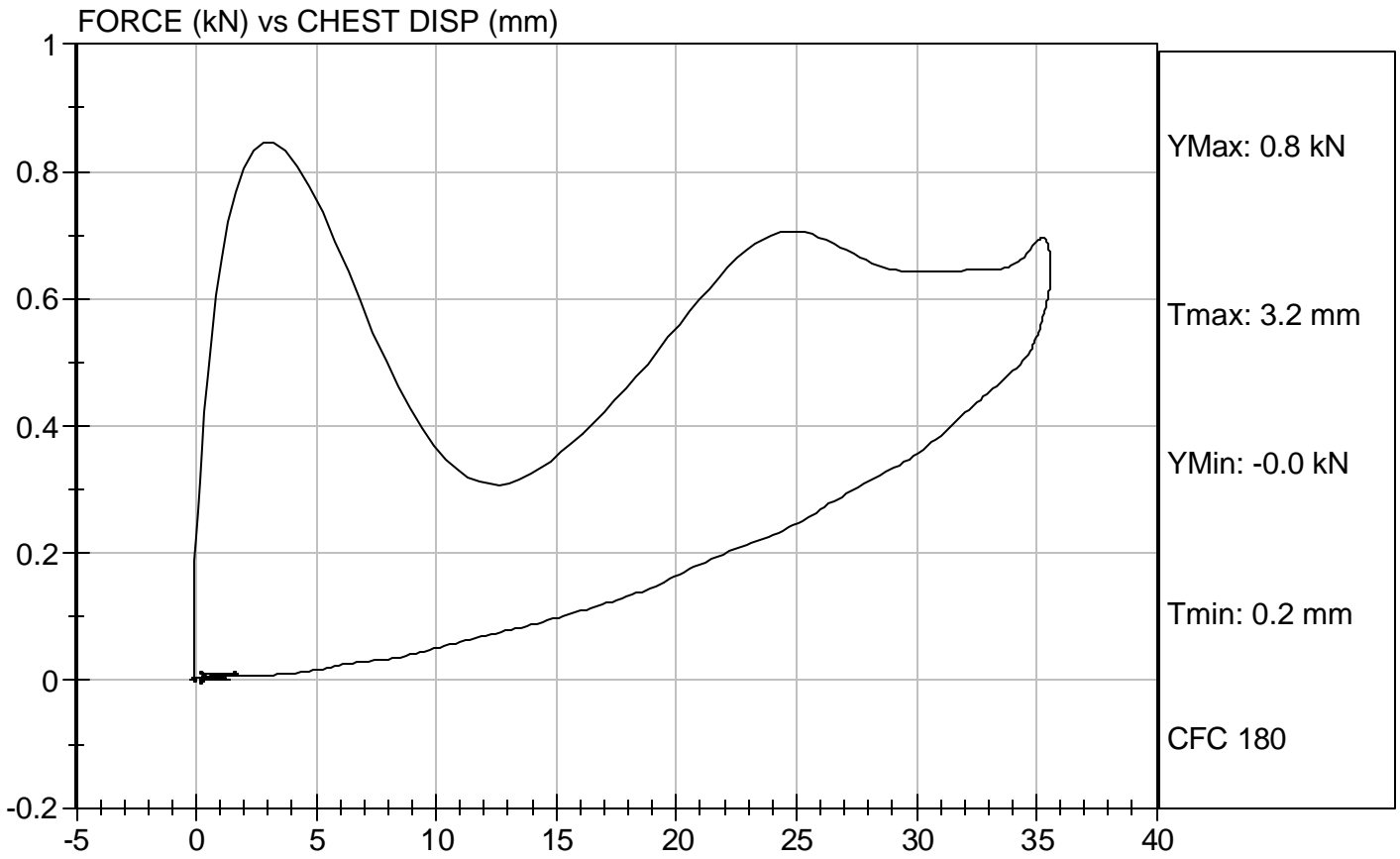


Test Description: Thorax Impact

Test Date: 4/4/07

Component: D07934

Speed: 19.69 ft/sec, 6.00 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032 Test Date 4/4/07

Technician Tim Bratz

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 | <u>21.9</u> |
| Record the minimum temperature | <u>21.6</u> |
| Record the maximum humidity | <u>24%</u> |
| Record the minimum humidity | <u>22%</u> |
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))
6. 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))
7. 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))
8. 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))
9. 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))
10. 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))
11. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))

- X 12. 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 13. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 14. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 15. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 16. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 17. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 18. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 15°	5°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ± 0.5°	130 N ≤ force ≤ 180 N	179 N
Final ref. plane angle	Initial ref. plane angle ± 10°	9°

- X 19. A plot of the force versus time follows this sheet.


Signature


4/4/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

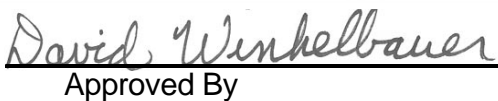
ATD Serial No: 032

Test I.D: D07937

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Force At 45 deg.	N	130 to 180	179	Pass
Initial Angle	deg	0 to 15	5	Pass
Return Angle	deg	0 to 10	9	Pass
Overall Test Results				Pass


 Laboratory Technician

4/4/07
 Test Date


 Approved By

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032 Test Date 4/10/07

Technician Tim Bratz

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))
3. Accelerometers and their respective mounts are smooth and clean.
4. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.
5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
6. 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 | <u>21.6</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>20%</u> |
7. 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.
8. 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 9. 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 10. 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 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))

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

X 12. 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 13. 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 14. Complete the following table. (572.142(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	273
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 $\leq 15 \text{ g}$	3

X 15. Plots of the x, y, z, and resultant acceleration data follow this sheet.


Signature

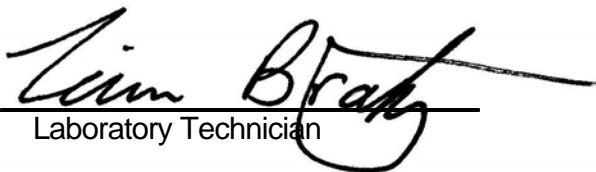
4/10/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 032

Test I.D.: D07951

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	20	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	273.0	Pass
Peak Lateral Acceleration	G's	≤ +/- 15.0	3.4	Pass
Is Acceleration Unimodal?	N/A	< 10% Peak	Yes	Pass
Overall Test Results				Pass


 Laboratory Technician

4/10/07
 Test Date


 Approved By



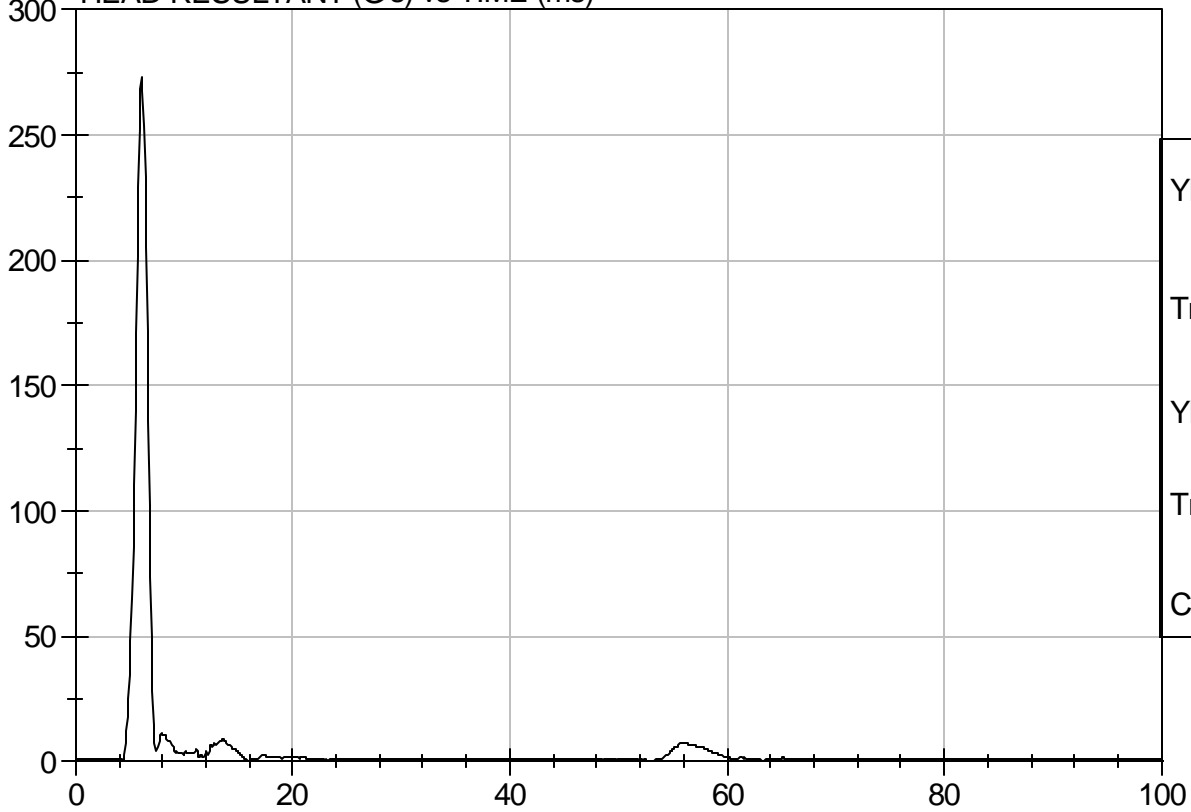
Test Description: Head Drop

Test Date: 4/10/07

Component: D07951

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 273.0 G

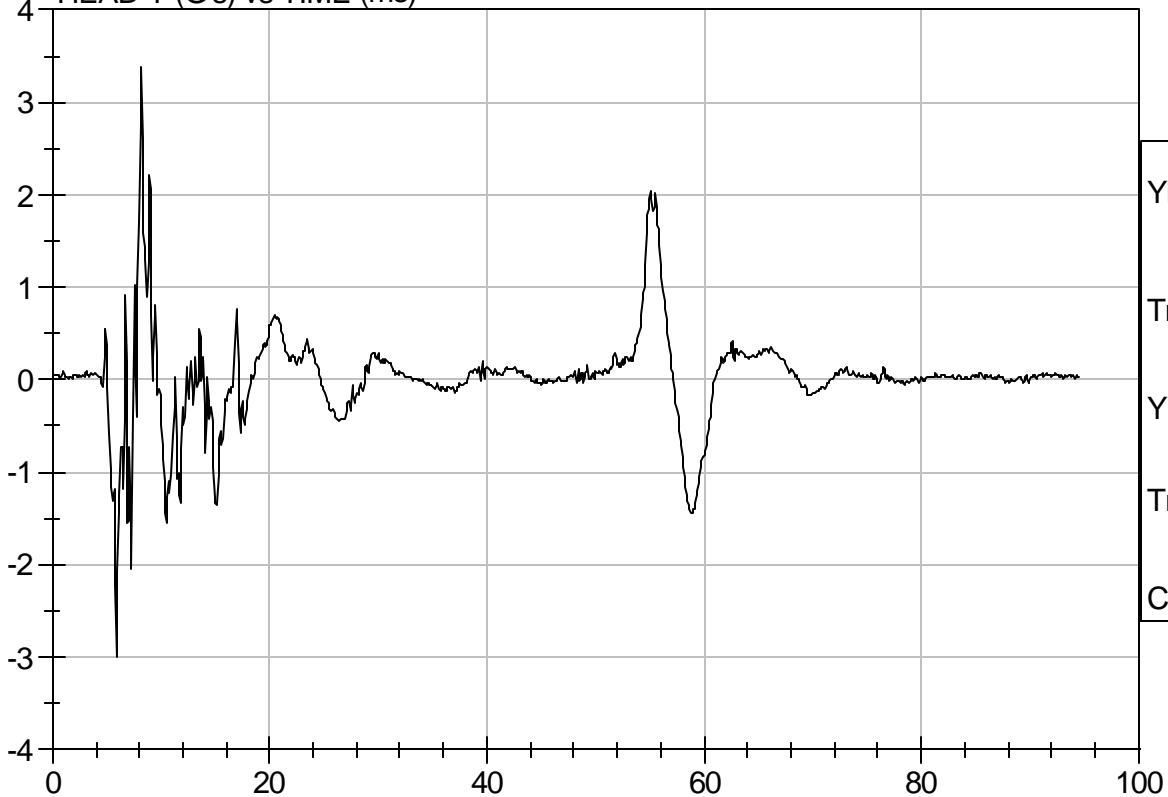
Tmax: 6.1 ms

YMin: 0.3 G

Tmin: 4.4 ms

CFC 1000

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



YMax: 3.4 G

Tmax: 8.2 ms

YMin: -3.0 G

Tmin: 5.9 ms

CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032 Test Date 4/10/07

Technician Tim Bratz

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 22%

Record the minimum humidity 20%

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.

5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

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

7. The test fixture pendulum conforms to the specifications in Figure 8D.

8. 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))

9. 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 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. 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 12. 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 13. 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 m/s \leq speed \leq 5.6 m/s	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.0 m/s $\leq \Delta V \leq$ 2.7 m/s	2.7 m/s
	@ 15 ms	3.0 m/s $\leq \Delta V \leq$ 4.0 m/s	3.7 m/s
	@ 20ms	4.0 m/s $\leq \Delta V \leq$ 5.1 m/s	4.9 m/s
Plane D Rotation		Peak moment* 42 Nm \leq moment \leq 53 Nm during the following rotation range $70^\circ \leq$ angle $\leq 82^\circ$	<u>47</u> Nm @ <u>77</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 60 ms \leq time \leq 80ms	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 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.


Signature

4/10/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 032

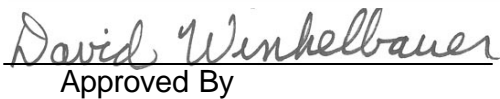
Test I.D: D07952

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	22	Pass	
Pendulum Speed	m/s	5.4 to 5.6	5.52	Pass	
Pendulum Deceleration	10 msec	m/s	2.0 to 2.7	2.7	Pass
	15 msec	m/s	3.0 to 4.0	3.7	Pass
	20 msec	m/s	4.0 to 5.1	4.9	Pass
D Plane Rotation	deg	70 to 82	77	Pass	
Peak Moment within Deflection Corridor	Nm	42.0 to 53.0	47.3	Pass	
Positive Moment - Time Curve Decay to 10 Nm	msec	60.0 to 80.0	69.2	Pass	
Overall Test Results				Pass	


 Laboratory Technician

4/10/07

Test Date


 Approved By

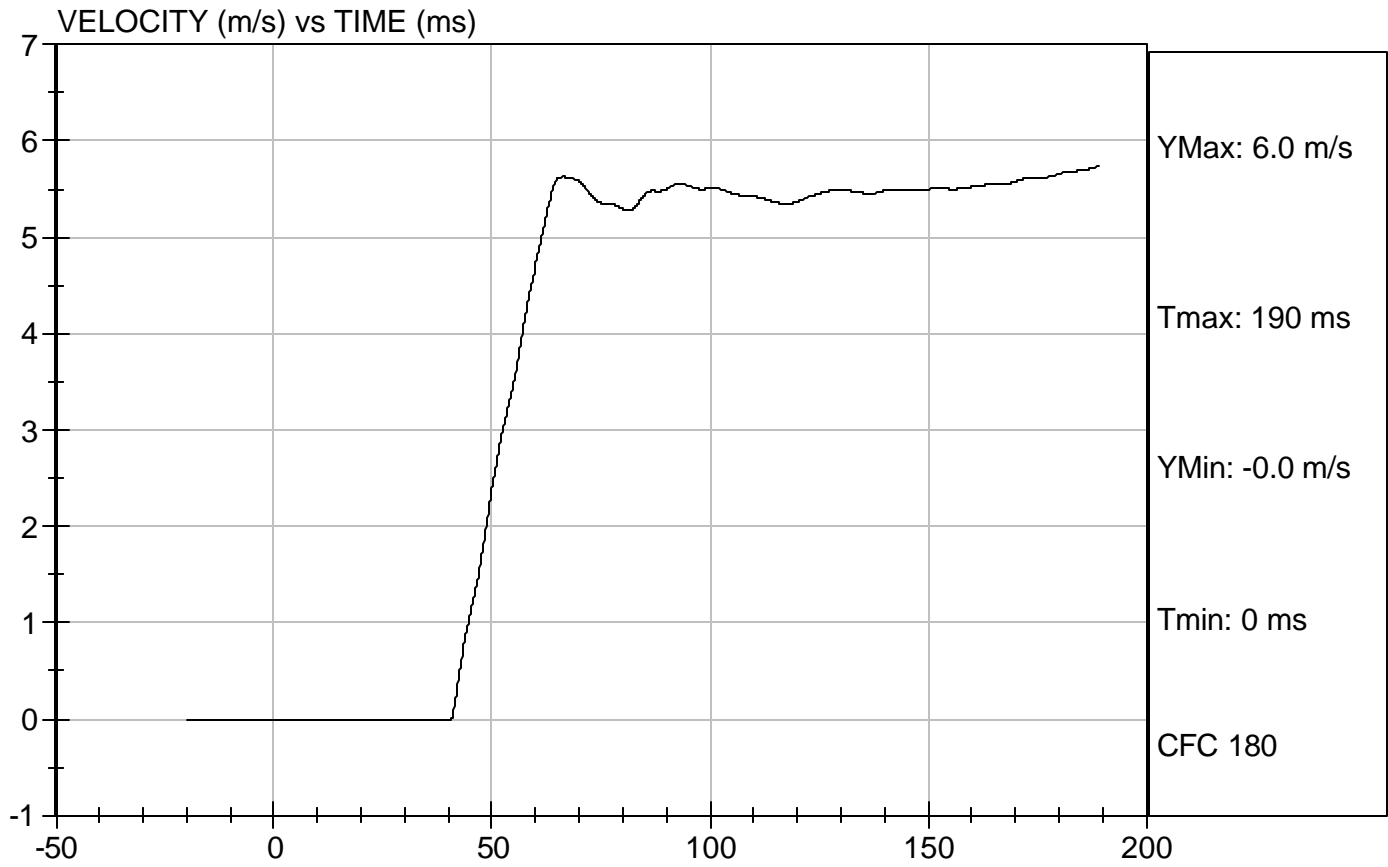


Test Description: Neck Flexion

Test Date: 4/10/07

Component: D07952

Speed: 18.116 ft/sec, 5.52 m/sec



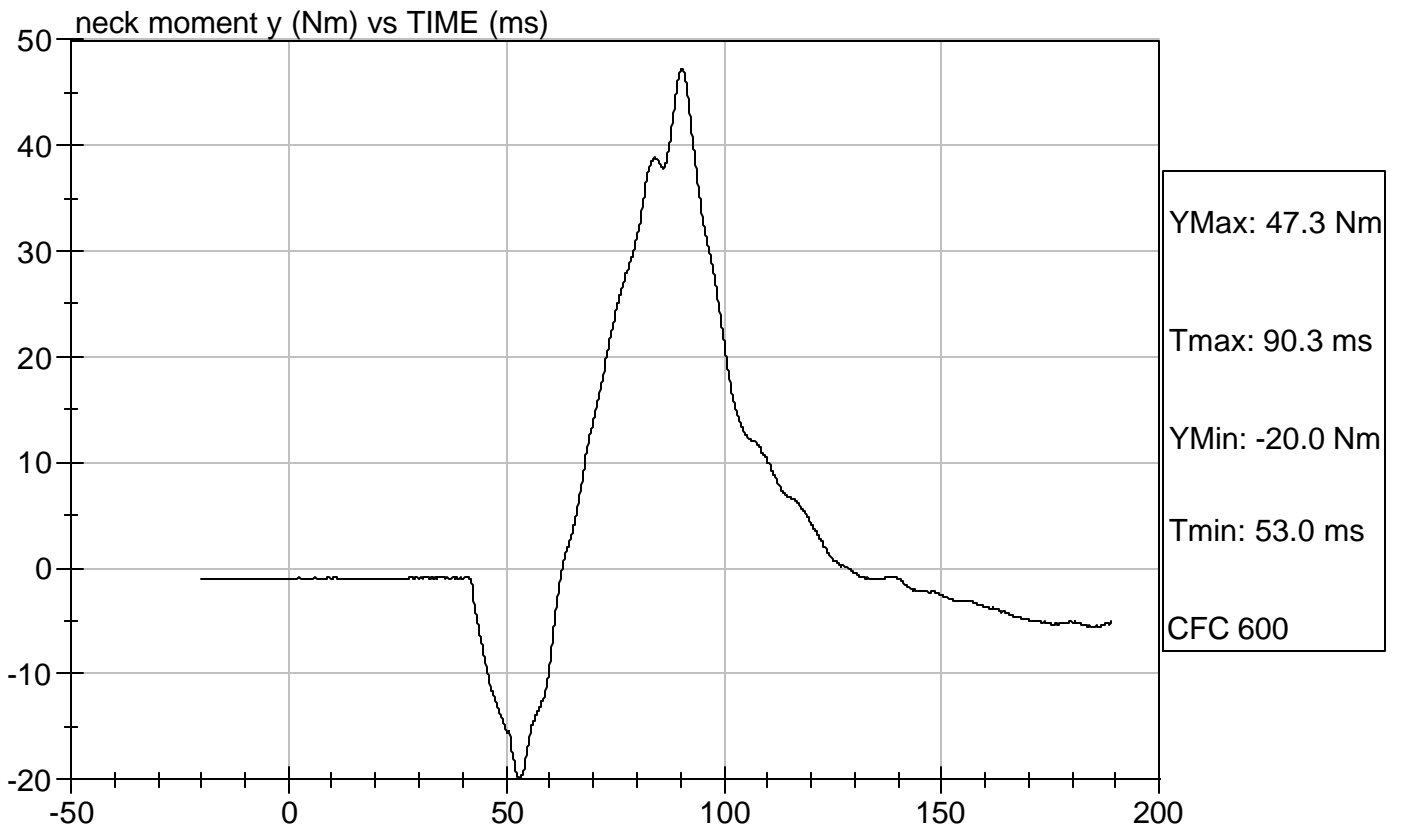
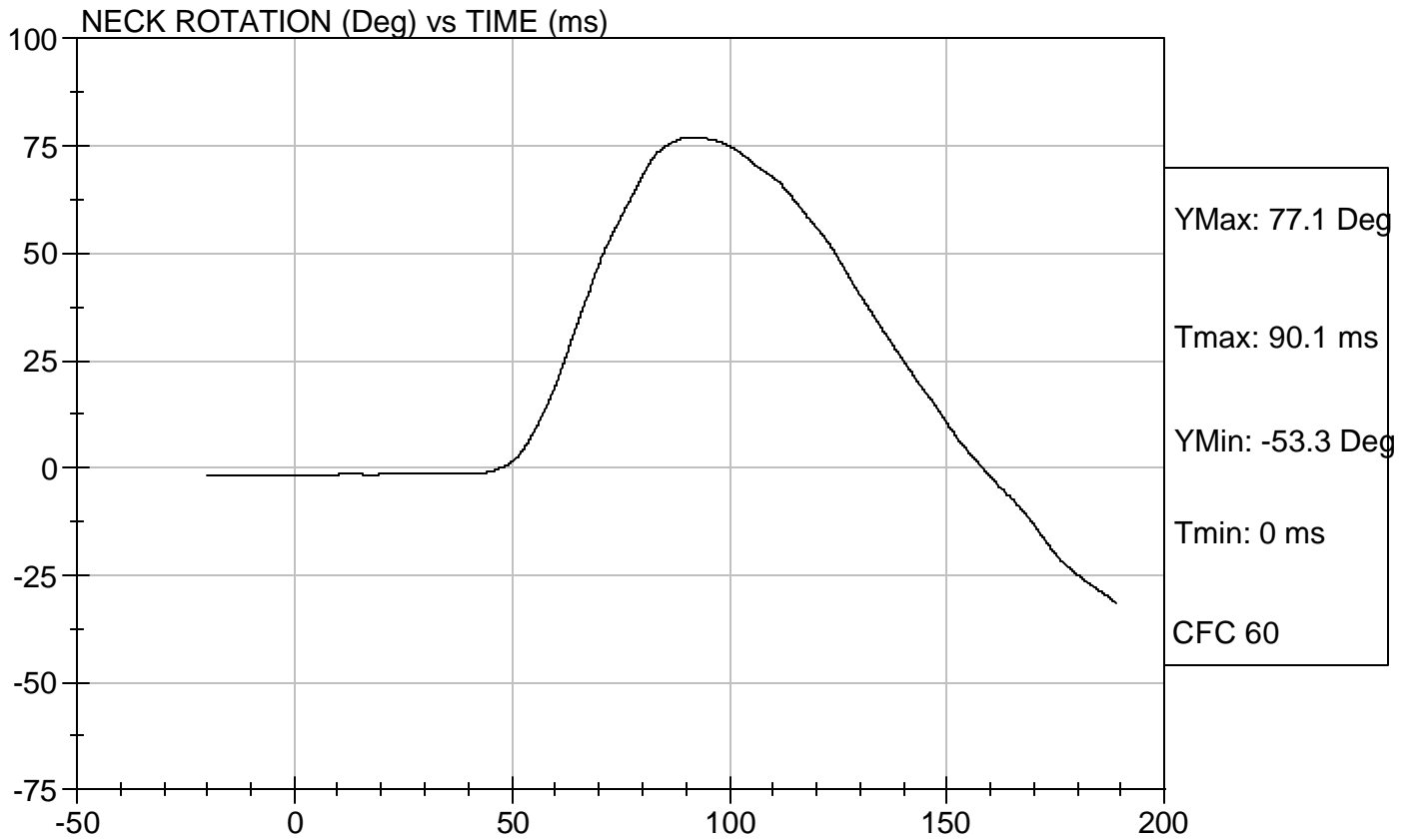


Test Description: Neck Flexion

Test Date: 4/10/07

Component: D07952

Speed: 18.116 ft/s, 5.52 m/s



DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032 Test Date 4/10/07

Technician Tim Bratz

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 | <u>21.6</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>20%</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 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.
5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))
6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
7. The test fixture pendulum conforms to the specifications in Figure 8D.
8. 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))
9. 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 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. 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 12. 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 13. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.71 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	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	3.0 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>-45</u> Nm @ <u>88</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	70 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 14. Plots of pendulum acceleration, pendulum velocity, neck y-axis moment, and neck rotation about the y-axis follow this sheet.


Signature

4/10/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 032

Test I.D: D07953

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	22	Pass	
Pendulum Speed	m/s	3.55 to 3.75	3.71	Pass	
Pendulum Deceleration	6 msec	m/s	1.0 to 1.4	1.3	Pass
	10 msec	m/s	1.9 to 2.5	2.3	Pass
	14 msec	m/s	2.8 to 3.5	3.0	Pass
D Plane Rotation	deg	83 to 93	88	Pass	
Peak Moment within Deflection Corridor	Nm	-53.3 to -43.7	-45.0	Pass	
Negative Moment - Time Curve Decay to -10 Nm	msec	60.0 - 80.0	69.7	Pass	
Overall Test Results				Pass	


 Laboratory Technician

4/10/07
 Test Date

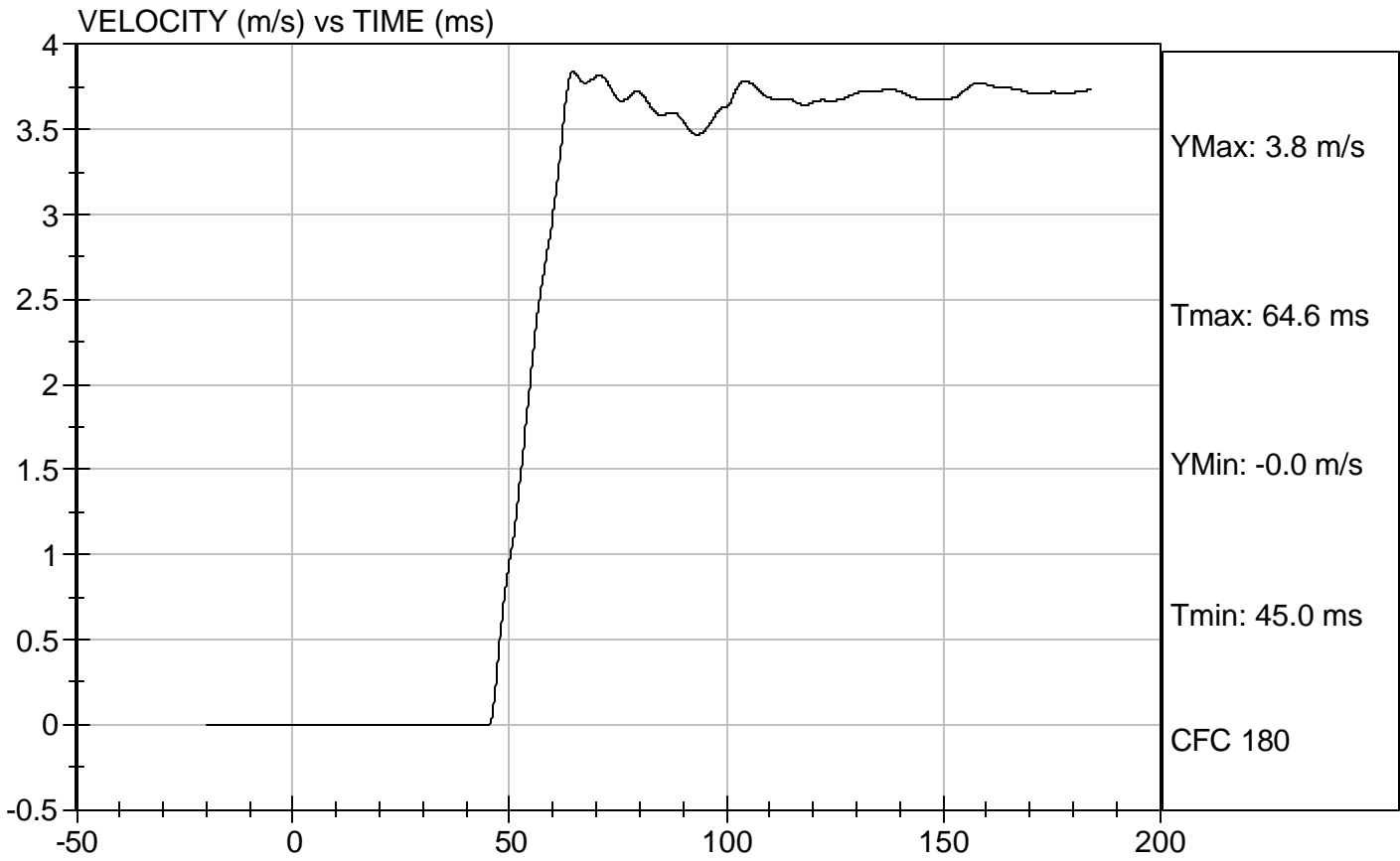

 Approved By



Test Description: Neck Extension Test Date: 4/10/07

Component: D07953

Speed: 12.17 ft/sec, 3.71 m/sec





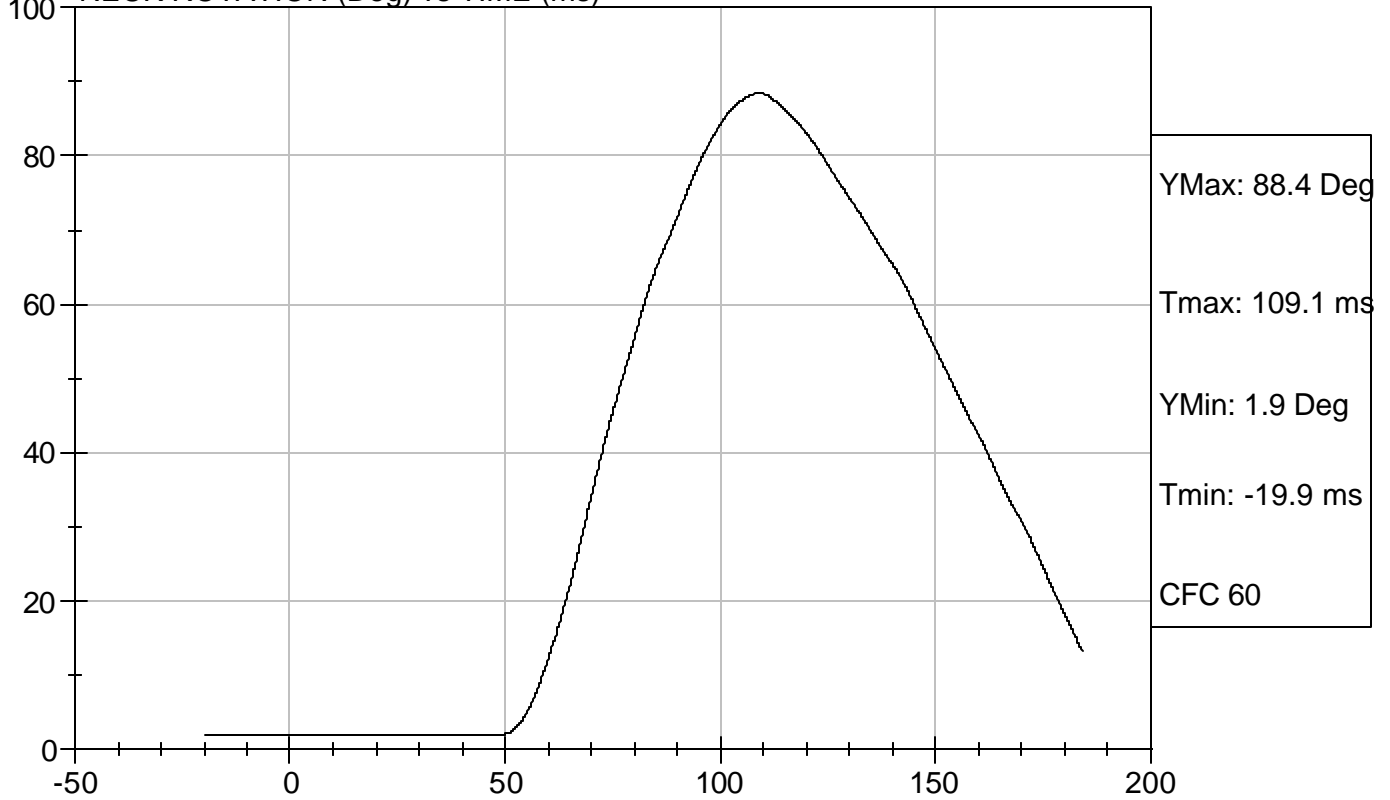
Test Description: Neck Extension

Test Date: 4/10/07

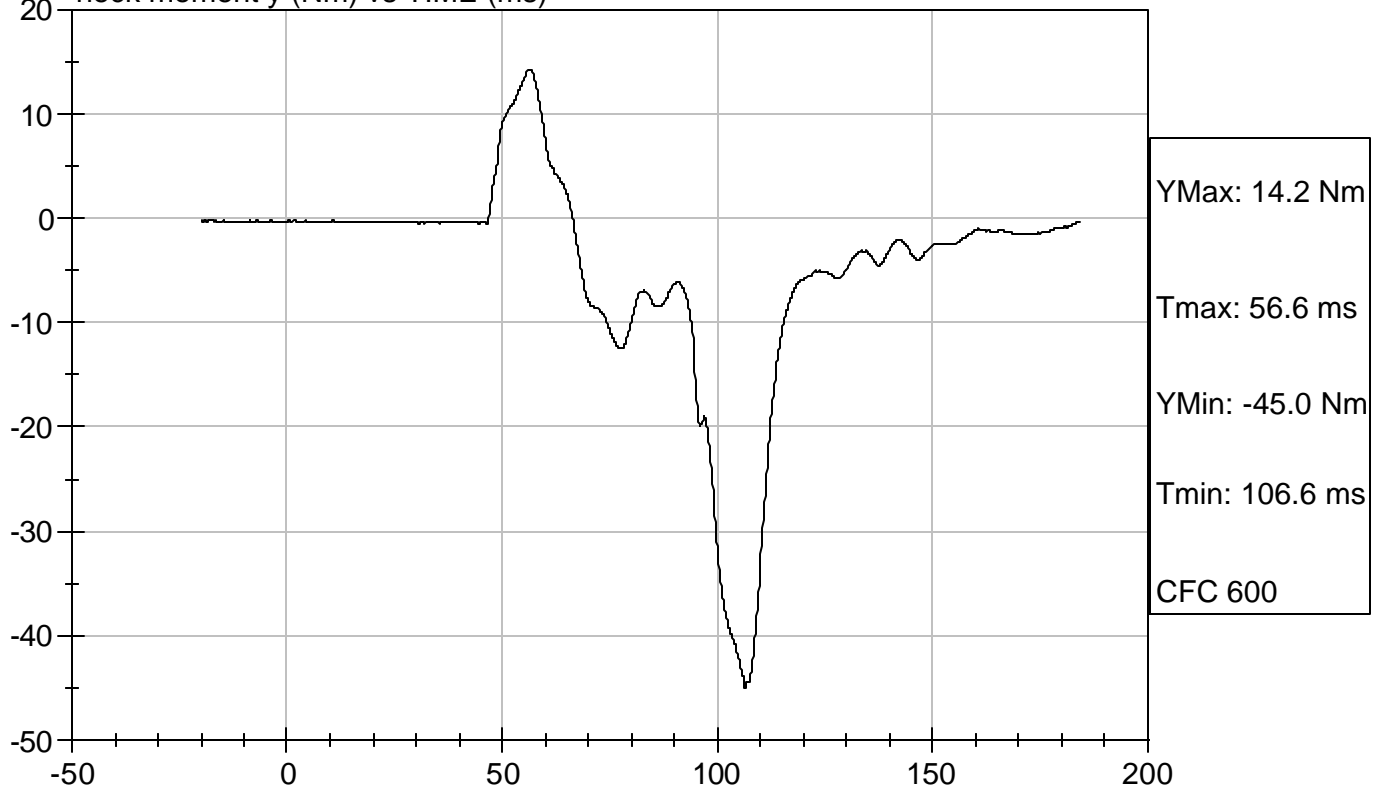
Component: D07953

Speed: 12.17 ft/s, 3.71 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 032 Test Date 4/10/07

Technician Tim Bratz

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>21.6</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>20%</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))
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	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	35 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	750 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	800 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	71%

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

**Force = impactor mass x acceleration (572.144(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

4/10/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Thorax Impact Test

ATD Serial No: 032

Test I.D: D07954

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	22	Pass
Probe Velocity	m/s	5.9 to 6.1	6.00	Pass
Peak Deflection	mm	32 to 38	35	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 to 0.81	0.75	Pass
Internal Hysteresis	%	65 to 85	71	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.80	Pass
Overall Test Results				Pass


 Laboratory Technician

4/10/07
 Test Date


 Approved By

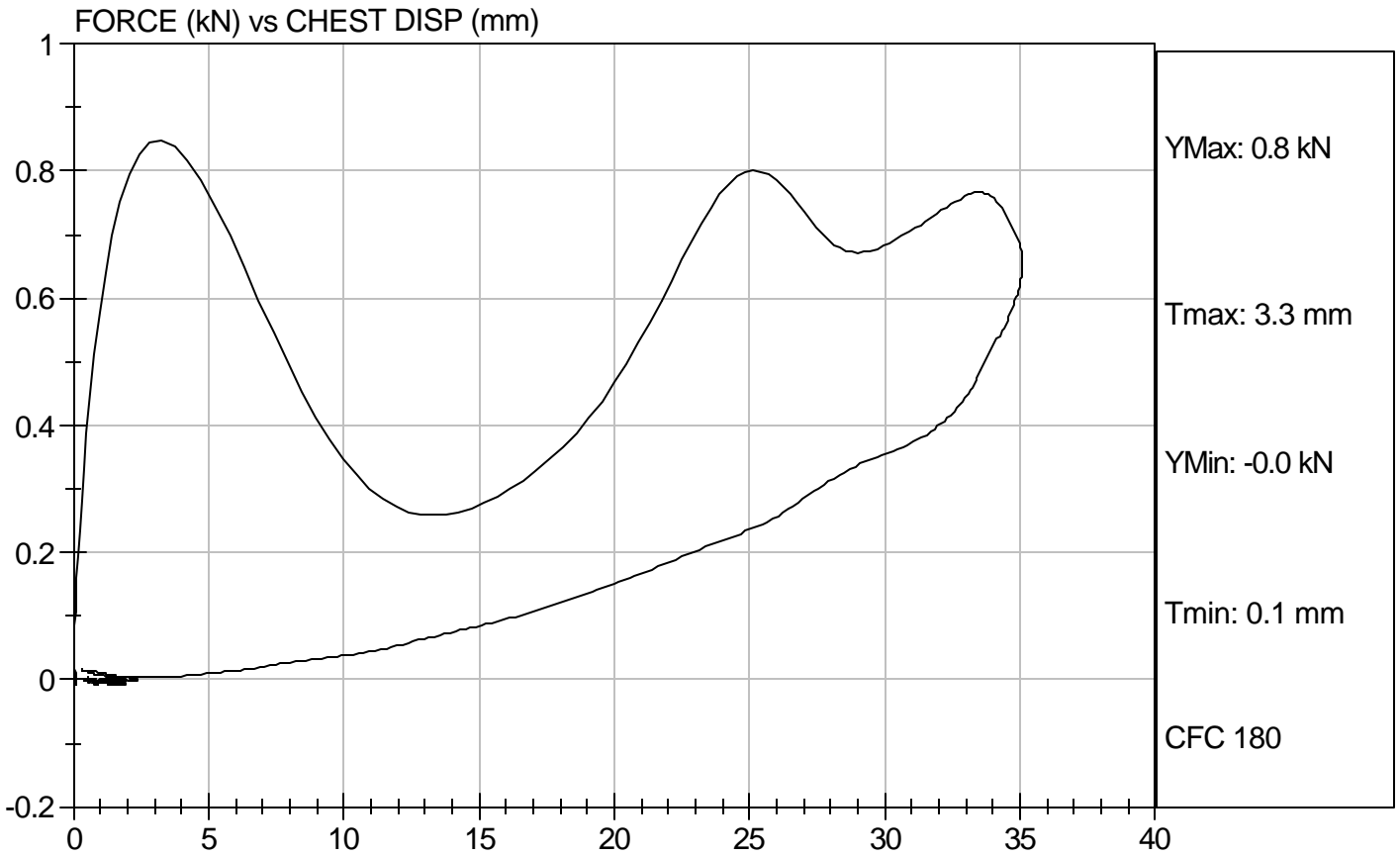


Test Description: Thorax Impact

Test Date: 4/10/07

Component: D07954

Speed: 19.69 ft/sec, 6.00 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 4/10/07

Technician Tim Bratz

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 22%

Record the minimum humidity 20%

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))

6. 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))

7. 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))

8. 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))

9. 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))

10. 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))

11. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))

- X 12. 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 13. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 14. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 15. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 16. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 17. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 18. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 15°	5°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ± 0.5°	130 N ≤ force ≤ 180 N	174 N
Final ref. plane angle	Initial ref. plane angle ± 10°	10°

- X 19. A plot of the force versus time follows this sheet.


Signature

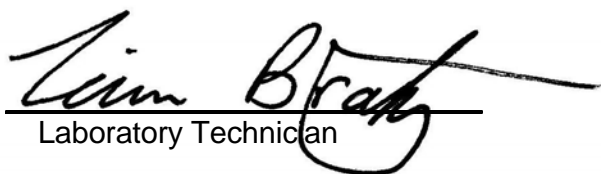
4/10/07
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 032

Test I.D: D07957

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Force At 45 deg.	N	130 to 180	174	Pass
Initial Angle	deg	0 to 15	5	Pass
Return Angle	deg	0 to 10	10	Pass
Overall Test Results				Pass


 Laboratory Technician

4/10/07
 Test Date


 Approved By

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #032, PART 572, SUBPART P 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	541.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	315.2
C	H-POINT HEIGHT	Reference	34.3-44.5	35.9
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	64.3
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	82.4
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	250.4
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
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	141.8
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.	284.8-300.0	285.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	230.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	252.9
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	225.5

HYBRID III 3 year SN #032, PART 572, 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	139.9
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	142.8
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	255.2
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.7
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	173.8
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	509.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	531.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	541.2
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 032 Test Date 4/10/07

Technician Jessica Gall

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

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

4/11/07
Date

Describe the repair or replacement of parts:

Checked by

David Winkelbauer
Signature

4/11/07
Date

EXTERNAL DIMENSIONS

HYBRID III 6 year SN#159, 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	631.5
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	361.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	71.1
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	91.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.3
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	91.7
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	188.3
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	20.0
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	224.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	168.0
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	386.5
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	274.2
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	317.6

17-1

HYBRID III 6 year SN#159, PART 572, 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	337.0
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	133.5
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	173.2
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	347.3
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	140.5
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	176.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	216.7
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.4
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	64.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	525.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	603.1
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	580.6
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	157.0

17-2

DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 159 Test Date 4/4/07

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. (572.122(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	<u>21.9</u>
Record the minimum temperature	<u>20.9</u>
Record the maximum humidity	<u>28%</u>
Record the minimum humidity	<u>24%</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. (572.122(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 490mm

Record the left side distance 489mm

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	$245 \text{ g} \leq x \leq 300 \text{ g}$	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 $\leq 15 \text{ g}$	-6

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


Signature

4/4/07
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07921

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	245 to 300	276	Pass
Peak Lateral Acceleration	G's	+/- 15	-6	Pass
Unimodal above 50 G's	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



 Laboratory Technician

4/4/07

 Test Date

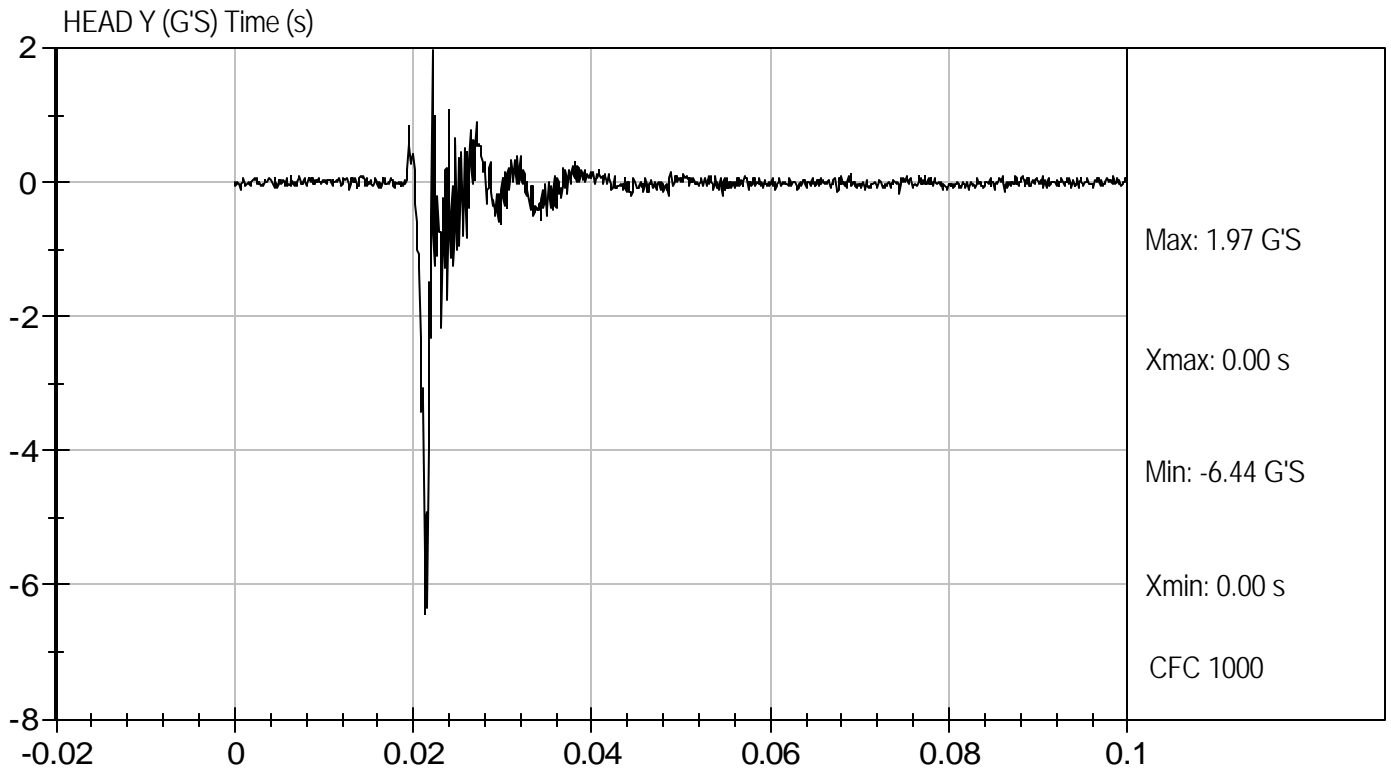
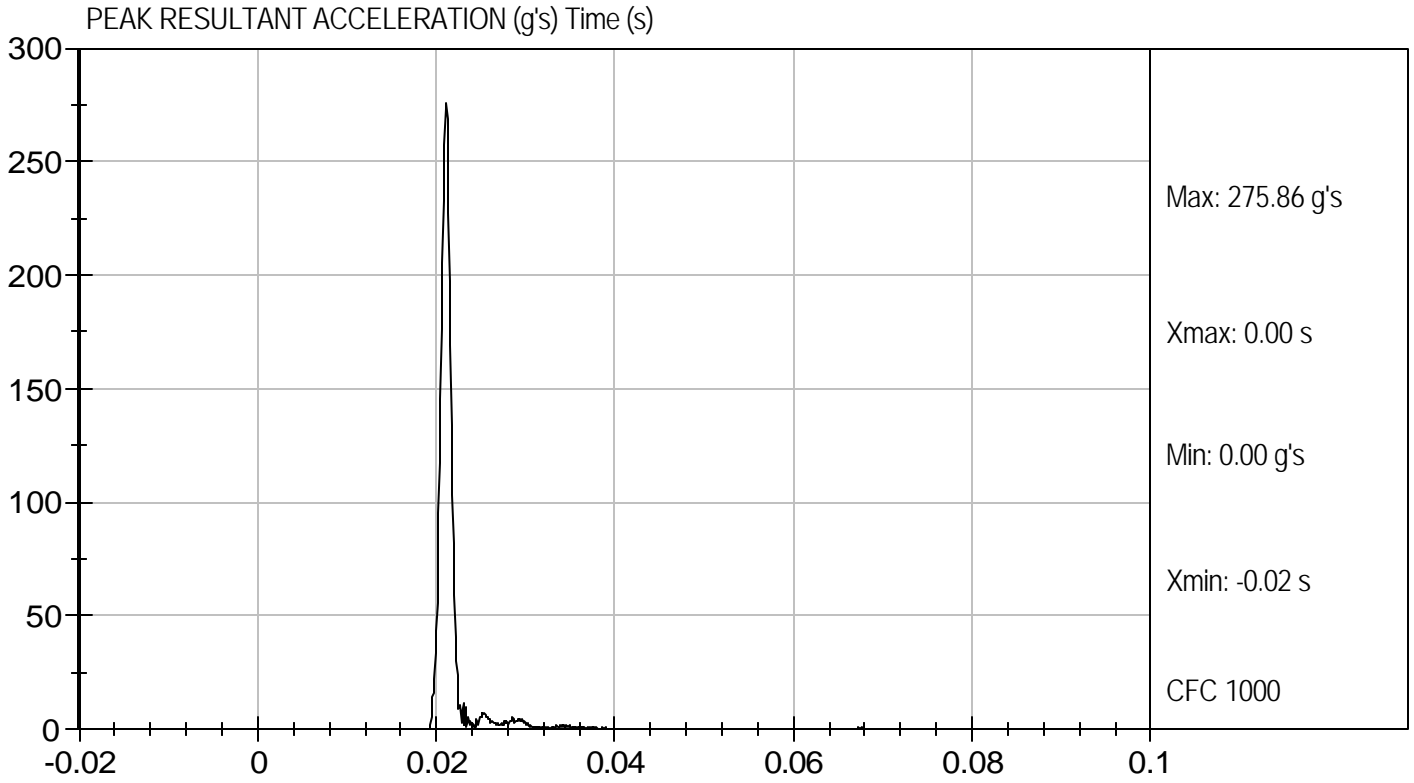


 Approved By



Test Desc: Head Drop
Component ID: D07921

Test Date: 4/4/07
Velocity: 0 ft/s, 0 m/s



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 159 Test Date 4/4/07

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 | <u>21.9</u> |
| Record the minimum temperature | <u>20.9</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>24%</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	$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.98 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$
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>31</u> Nm @ <u>80</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 13. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.



 Signature

4/4/07

 Date

**MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD**

ATD Serial No: 159

Test I.D: D07922

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	28	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.98	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	2.9	Pass
	30 msec	msec	3.8 to 5.0	4.1	Pass
D Plane Rotation	Max	deg	74 to 92	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	31	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 to 123	108	Pass
				Overall Results	Pass



Laboratory Technician

4/4/07

Test Date

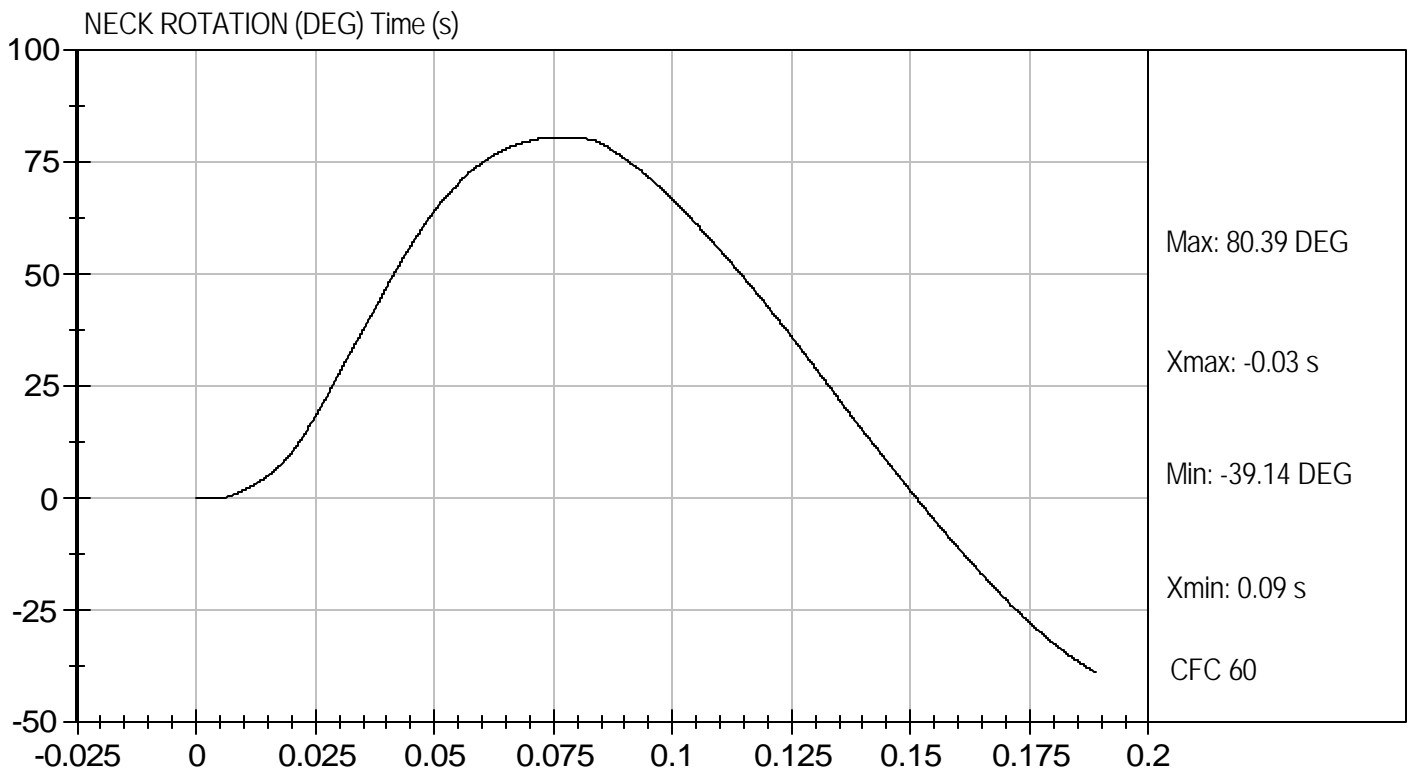
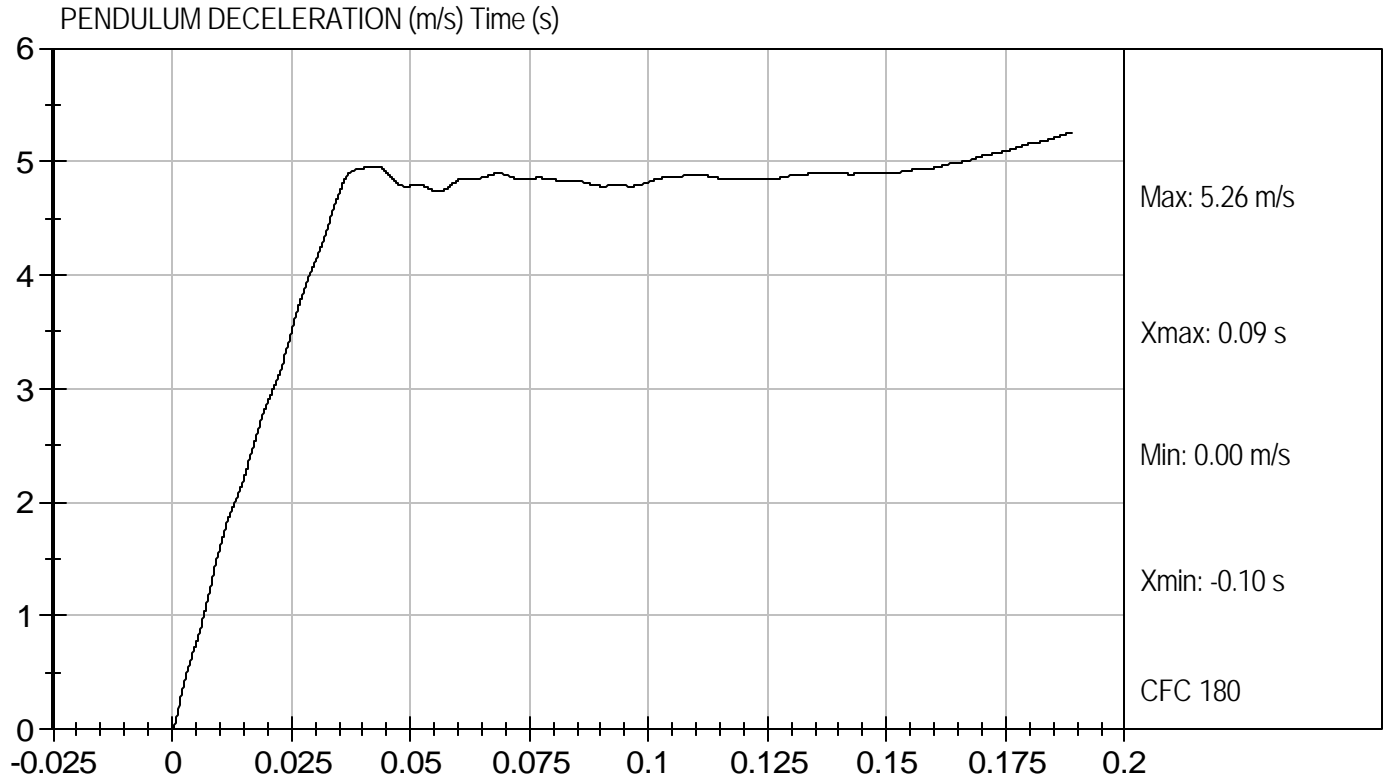


Approved By



Test Desc: Neck Flexion
Component ID: D07922

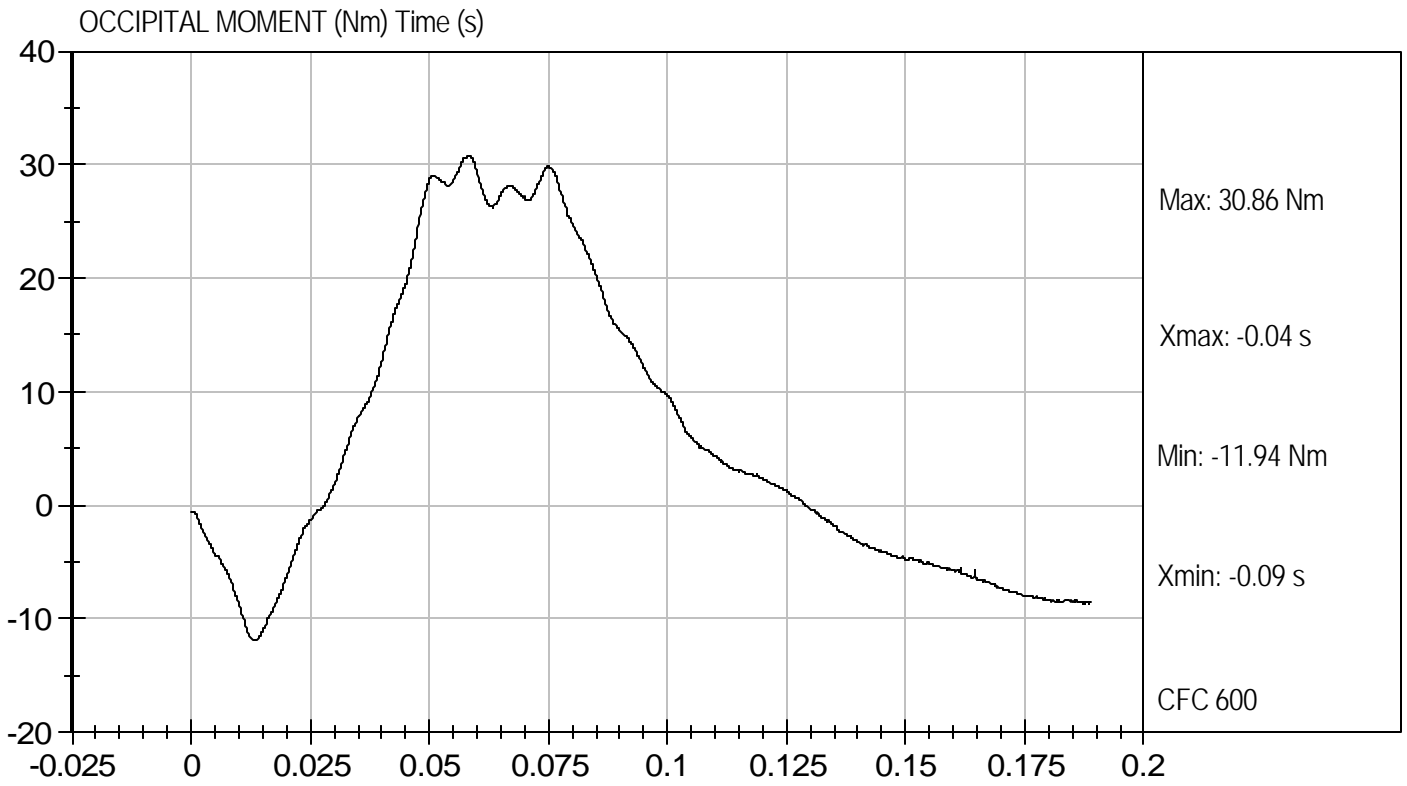
Test Date: 4/4/07
Velocity: 16.33 ft/s, 4.98 m/s





Test Desc: Neck Flexion
Component ID: D07922

Test Date: 4/4/07
Velocity: 16.33 ft/s, 4.98 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 159 Test Date 4/4/07

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 21.9

Record the minimum temperature 20.9

Record the maximum humidity 28%

Record the minimum humidity 24%

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	$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.30 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$
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>-21</u> Nm @ <u>95</u> degrees
Negative Moment Decay** (Extension)	Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	135 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 13. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.



Signature

4/4/07

Date

**MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD**

ATD Serial No: 159

Test I.D: D07923

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	28	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.30	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.6	Pass
	30 msec	msec	3.2 to 4.2	3.8	Pass
D Plane Rotation	Max	deg	85 to 103	95	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-21	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	134	Pass
Overall Results					Pass



Laboratory Technician

4/4/07

Test Date

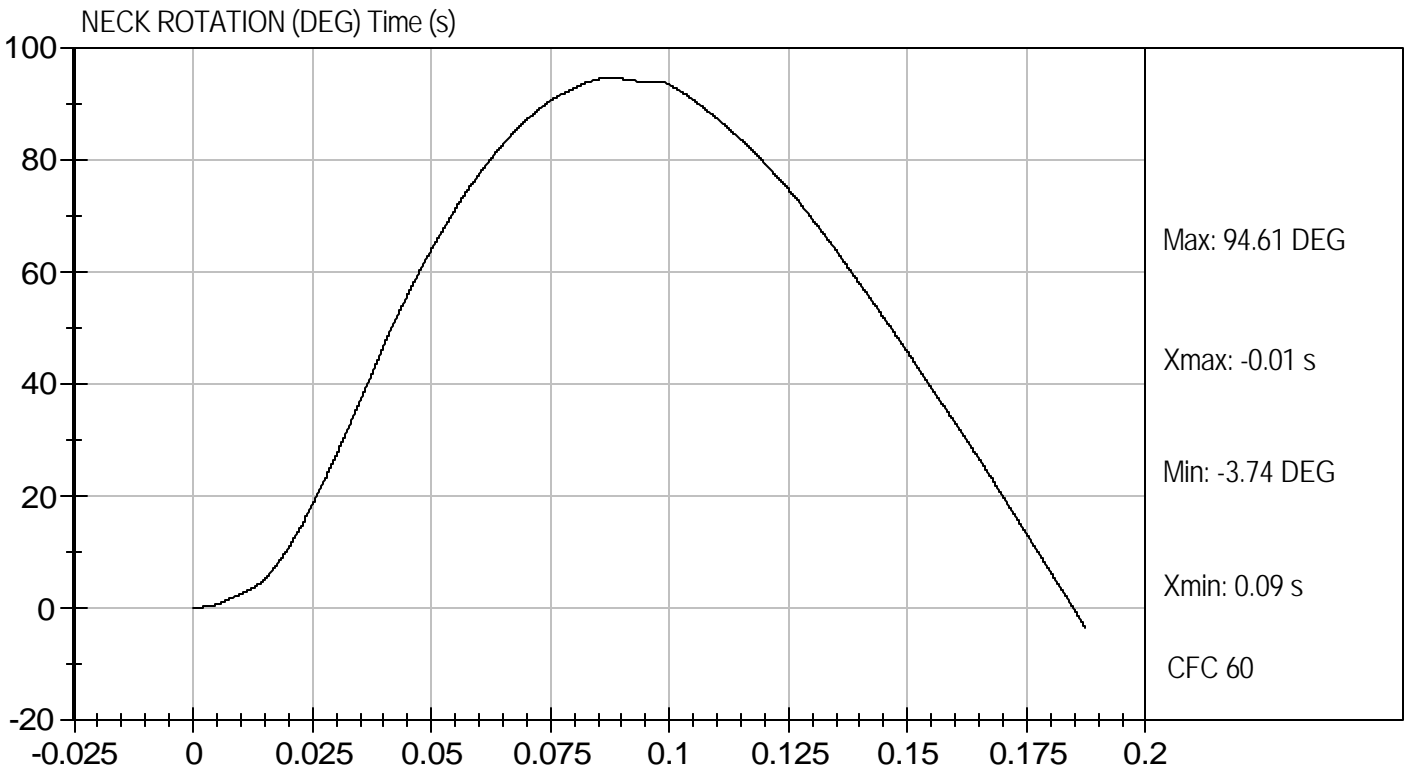
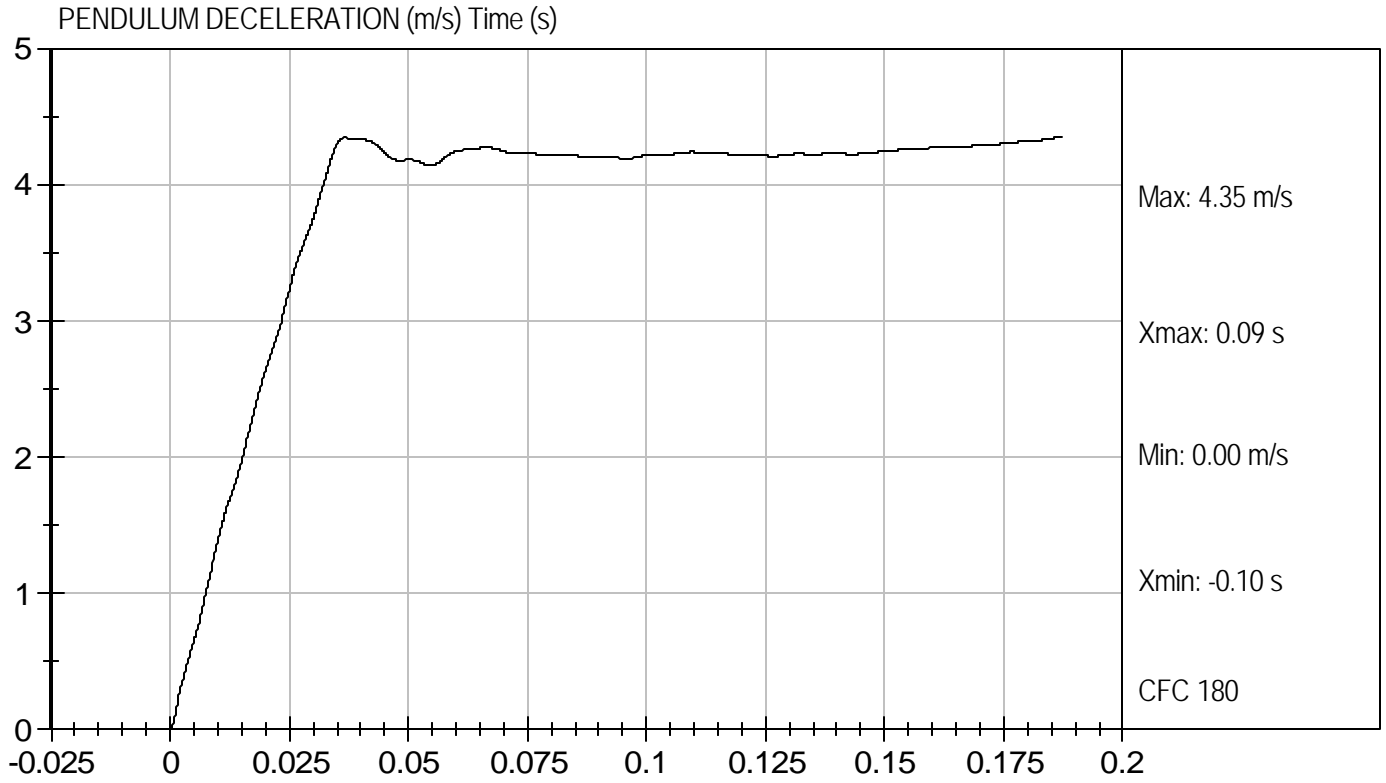


Approved By



Test Desc: Neck Extension
Component ID: D07923

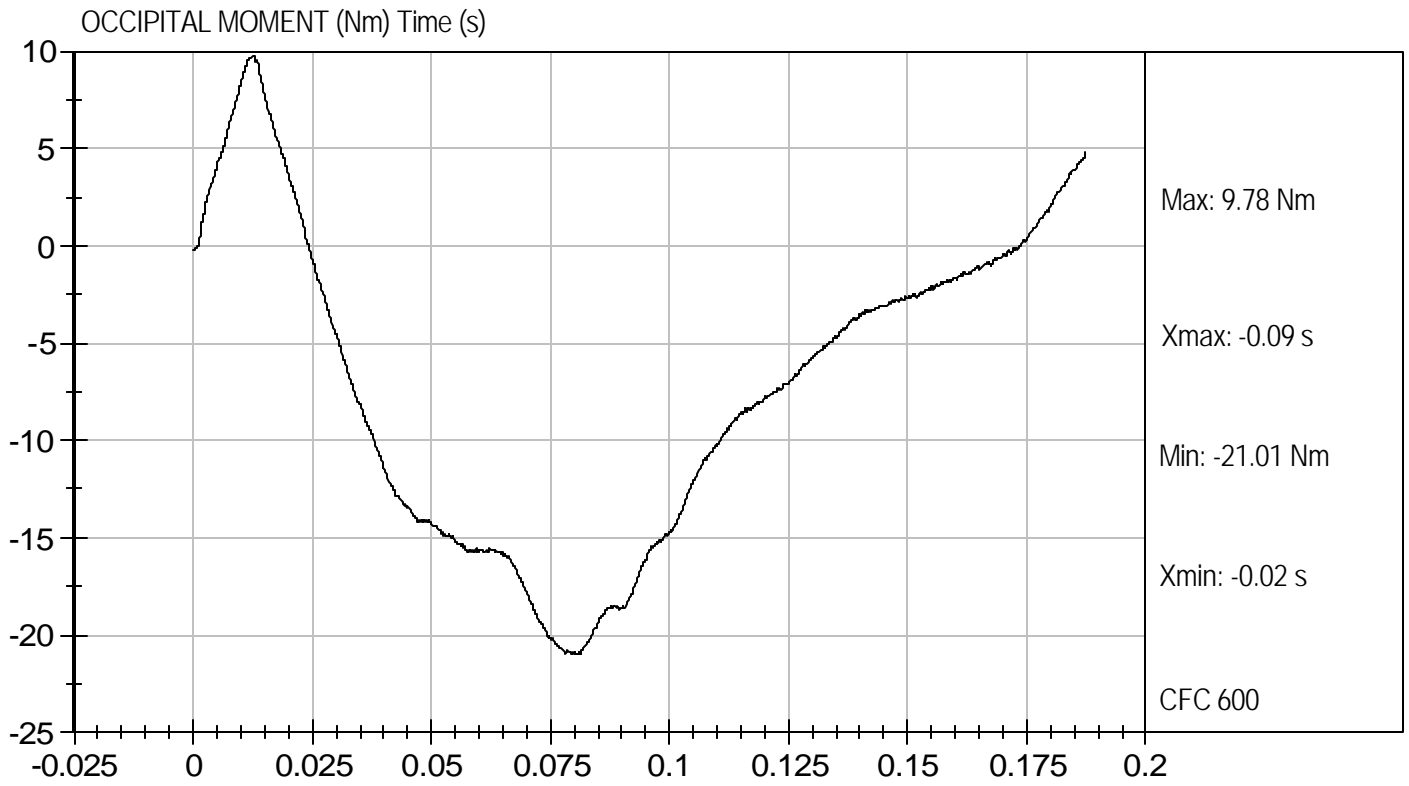
Test Date: 4/4/07
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Neck Extension
Component ID: D07923

Test Date: 4/4/07
Velocity: 14.12 ft/s, 4.30 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 159 Test Date 4/4/07

Technician Dave Wilcox

- 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 21.9

Record the minimum temperature 20.9

Record the maximum humidity 28%

Record the minimum humidity 24%

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 m/s ≤ speed ≤ 6.83 m/s	6.77 m/s
Chest Compression	38.0 mm ≤ compression ≤ 46.0 mm	39 mm
Peak force** between 38.0 and 46.0 mm chest compression	1150N ≤ peak force ≤ 1380N	1250 N
Peak force** between 12.5 and 38.0 mm chest compression	Max. 1.05 times the peak force between 38.0 and 46.0 mm chest compression	1361 n
Internal Hysteresis***	65% ≤ hysteresis ≤ 85%	75 %

*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.



Signature

4/4/07

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07924

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	38 to 46	39	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.25	Pass
Internal Hysteresis	%	65 to 85	75	Pass
Peak Force 12.5 mm - 38 mm	N	≤ 1,500	1,361	Pass
Overall Test Results				Pass



 Laboratory Technician

4/4/07

 Test Date



 Approved By

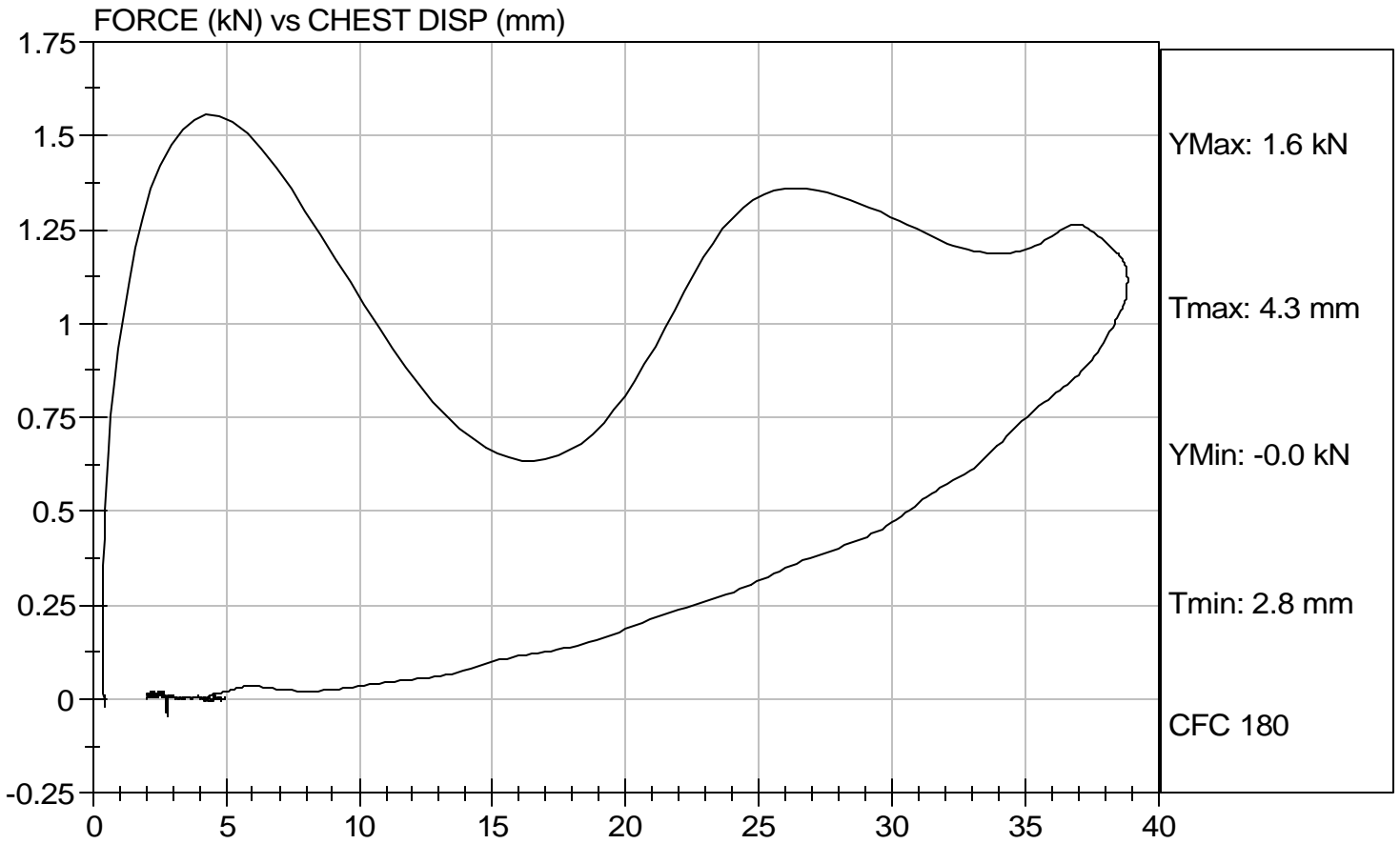


Test Description: Thorax Impact

Test Date: 4/4/07

Component: D07924

Speed: 22.22 ft/sec, 6.77 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 159

Test Date 4/4/07

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. (572.127(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 21.9

Record the minimum temperature 20.9

Record the maximum humidity 28%

Record the minimum humidity 24%

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))

9. Remove all external support that was implemented in 9 above. (572.125(c)(5))

10. 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°) 11°

11. Attach the pull cable and the load cell. (572.125(c)(6))

12. 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 13. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds.
(572.125(c)(8))
- X 14. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 15. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 16. 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 $\leq 22^\circ$	11 ⁰
Torso rotation rate	0.5 ⁰ /s \leq rate \leq 1.5 ⁰ /s	1.0
Force at $45^\circ \pm 0.5^\circ$	147 N \leq force \leq 200 N	168 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	17 ⁰



Signature

4/4/07

Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07927

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Initial Angle	deg	0 to 22	11	Pass
Return Angle	deg	0 to 8	17	Pass
Force at 45 deg	N	147 to 200	168	Pass
Overall Test Results				Pass



Laboratory Technician

4/4/07

Test Date



Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 159 Test Date 4/4/07

Technician Dave Wilcox

- 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	21.9
Record the minimum temperature	20.9
Record the maximum humidity	28%
Record the minimum humidity	24%
- 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 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	2000 N ≤ force ≤ 3000 N	2770 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

4/4/07

Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07926

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	27	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	2.0 to 3.0	2.8	Pass
Overall Test Results				Pass



Laboratory Technician

4/4/07

Test Date

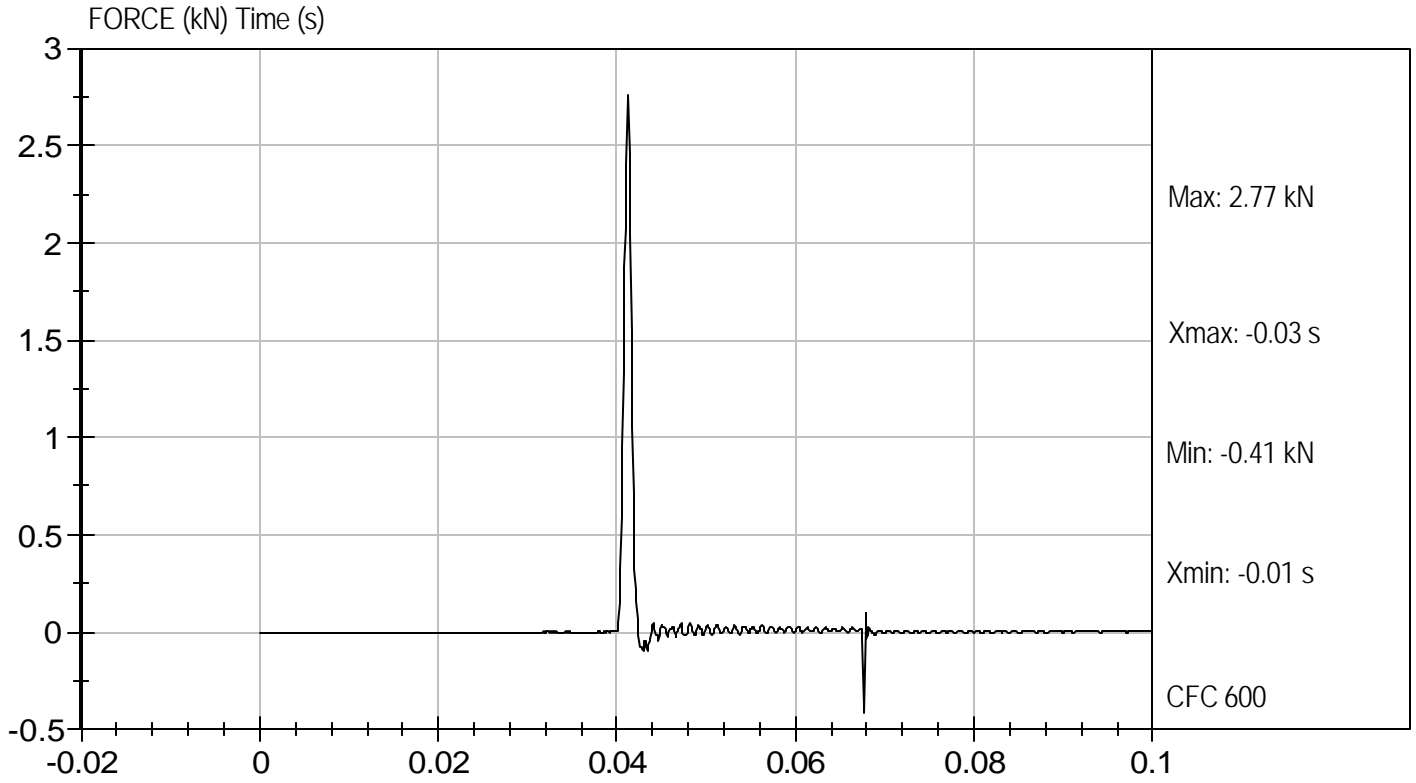


Approved By



Test Desc: Left Knee
Component ID: D07926

Test Date: 4/4/07
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 159 Test Date 4/4/07

Technician Dave Wilcox

- 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	21.9
Record the minimum temperature	20.9
Record the maximum humidity	28%
Record the minimum humidity	24%
- 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 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	2000 N ≤ force ≤ 3000 N	2940 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

4/4/07

Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07925

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	27	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	2.0 to 3.0	2.9	Pass
Overall Test Results				Pass



Laboratory Technician

4/4/07

Test Date

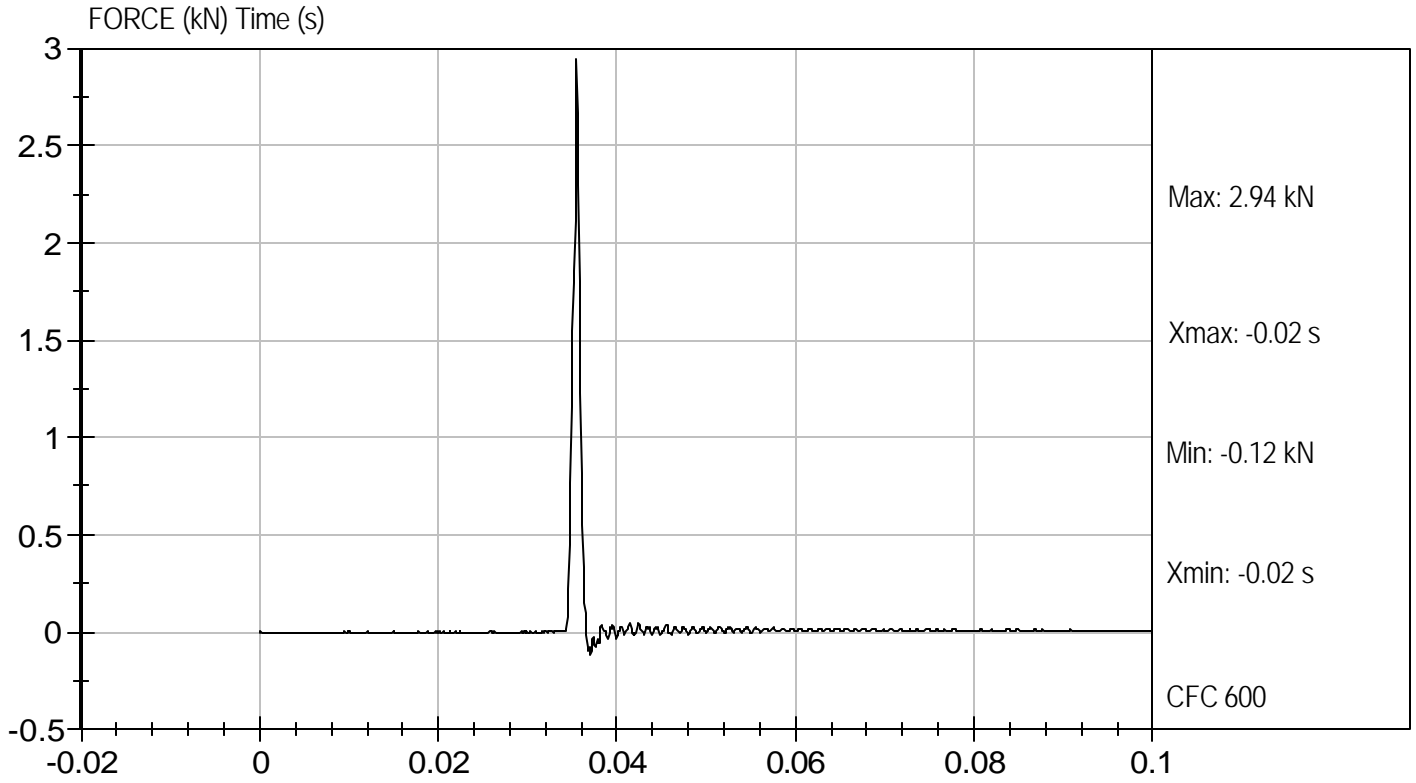


Approved By



Test Desc: Right Knee
Component ID: D07925

Test Date: 4/4/07
Velocity: 6.94 ft/s, 2.12 m/s



DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 159 Test Date 4/11/07

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. (572.122(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	<u>20.8</u>
Record the minimum temperature	<u>20.7</u>
Record the maximum humidity	<u>31%</u>
Record the minimum humidity	<u>23%</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. (572.122(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 490mm

Record the left side distance 489mm

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	$245 \text{ g} \leq x \leq 300 \text{ g}$	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 $\leq 15 \text{ g}$	4

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


Signature

4/11/07
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07961

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	245 to 300	263	Pass
Peak Lateral Acceleration	G's	+/- 15	4	Pass
Unimodal above 50 G's	N/A	w/in 10% of peak	Yes	Pass
Overall Test Results				Pass



 Laboratory Technician

4/11/07

 Test Date

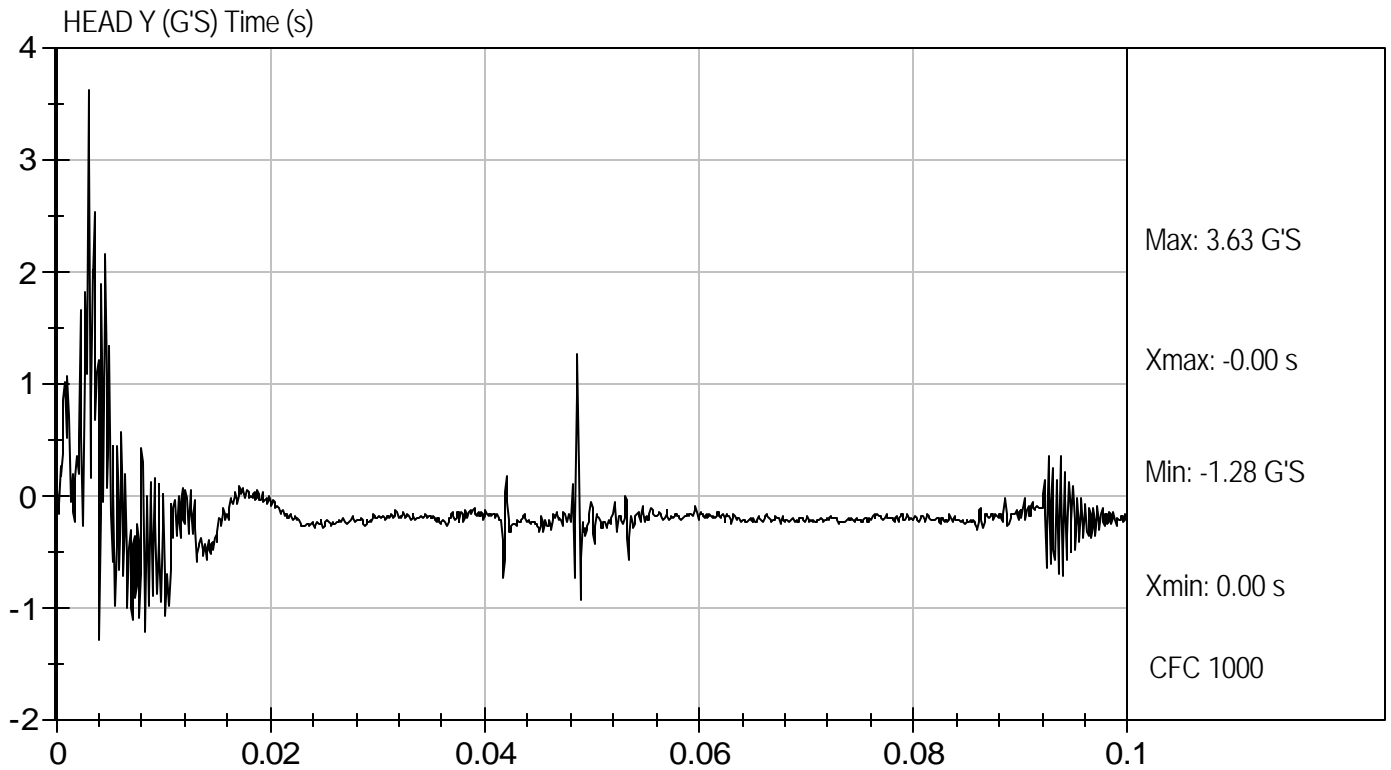
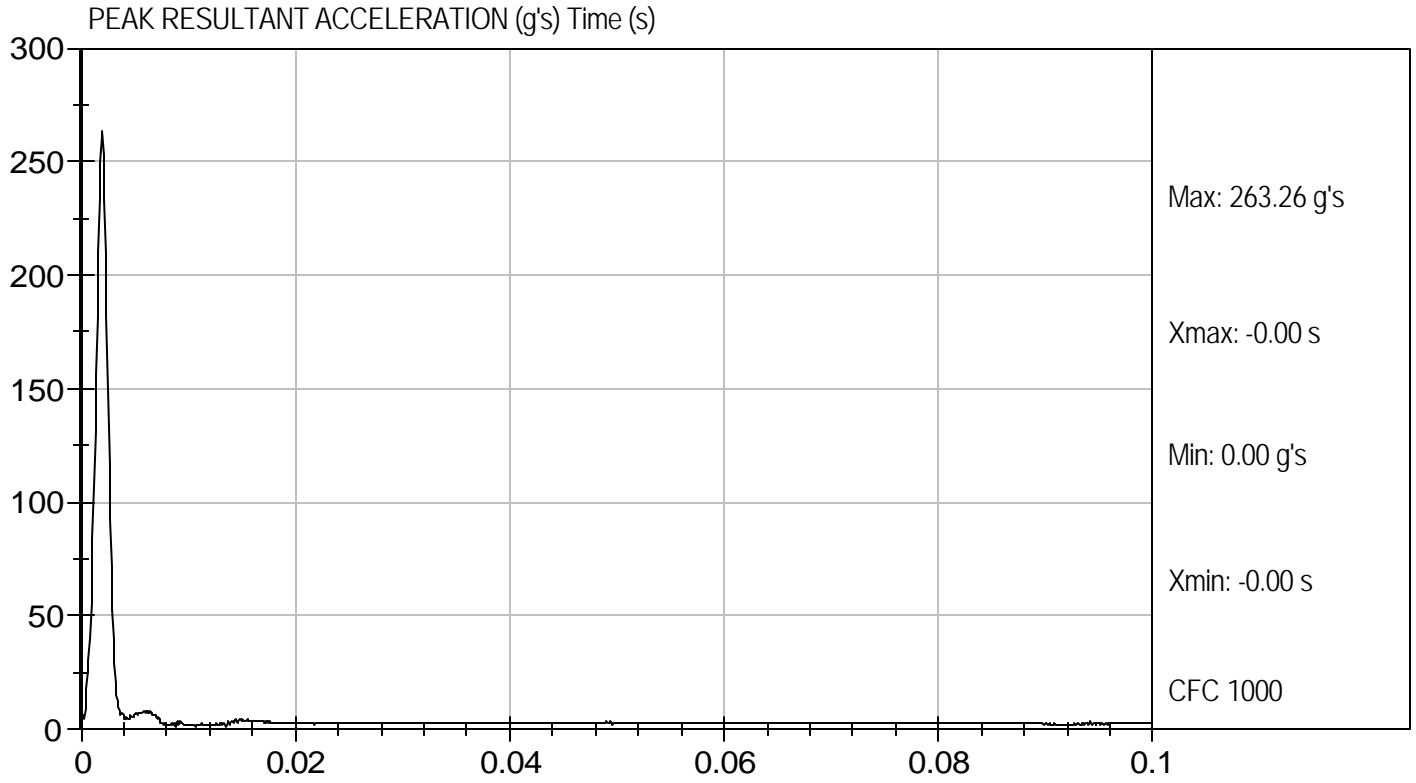


 Approved By



Test Desc: Head Drop
Component ID: D07961

Test Date: 4/11/07
Velocity: 0 ft/s, 0 m/s



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 159 Test Date 4/11/07

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 | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>31%</u> |
| Record the minimum humidity | <u>23%</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	$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.93 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$
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>31</u> Nm @ <u>76</u> degrees
Positive Moment Decay** (Flexion)	Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	104 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 13. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.



 Signature

4/11/07

 Date

**MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD**

ATD Serial No: 159

Test I.D: D07962

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.93	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	2.9	Pass
	30 msec	msec	3.8 to 5.0	4.1	Pass
D Plane Rotation	Max	deg	74 to 92	76	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	31	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 to 123	104	Pass
				Overall Results	Pass



Laboratory Technician

4/11/07

Test Date

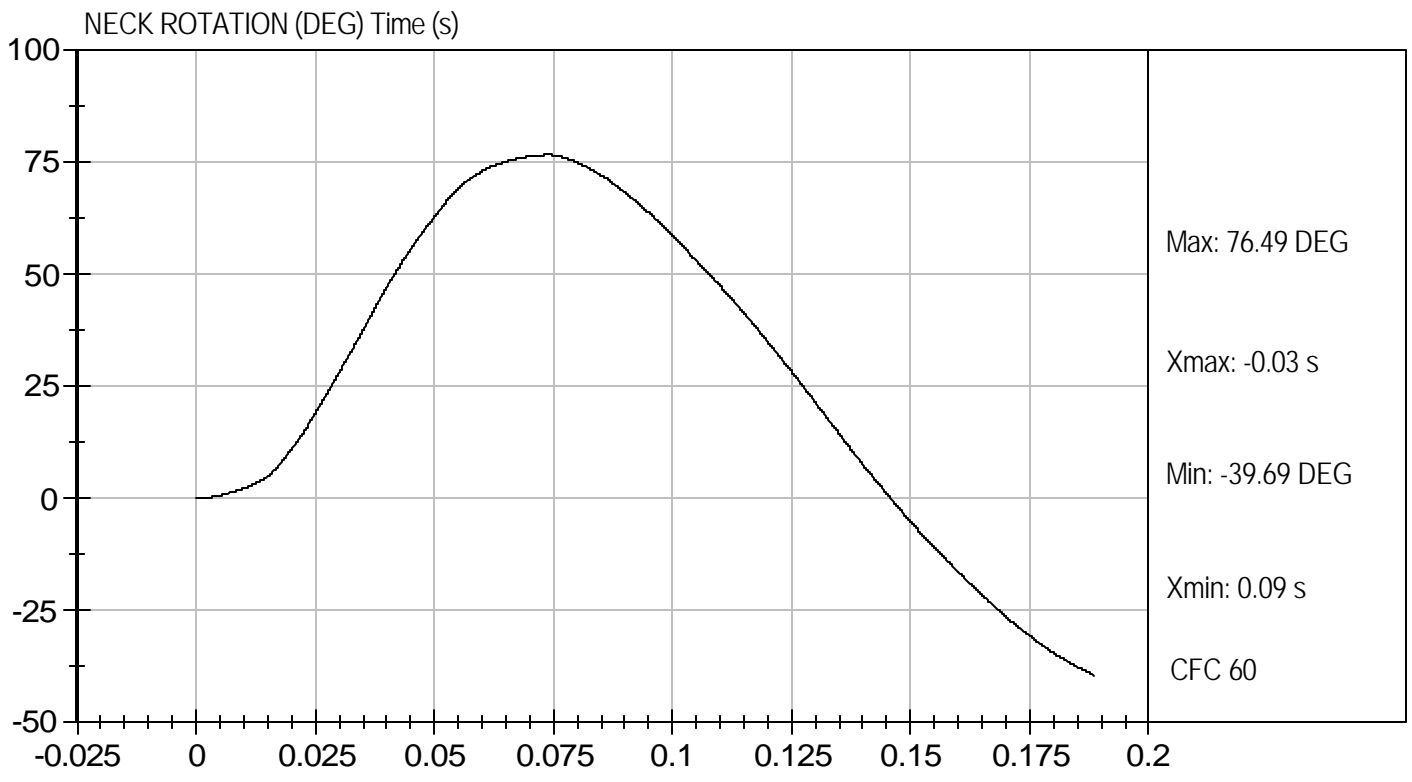
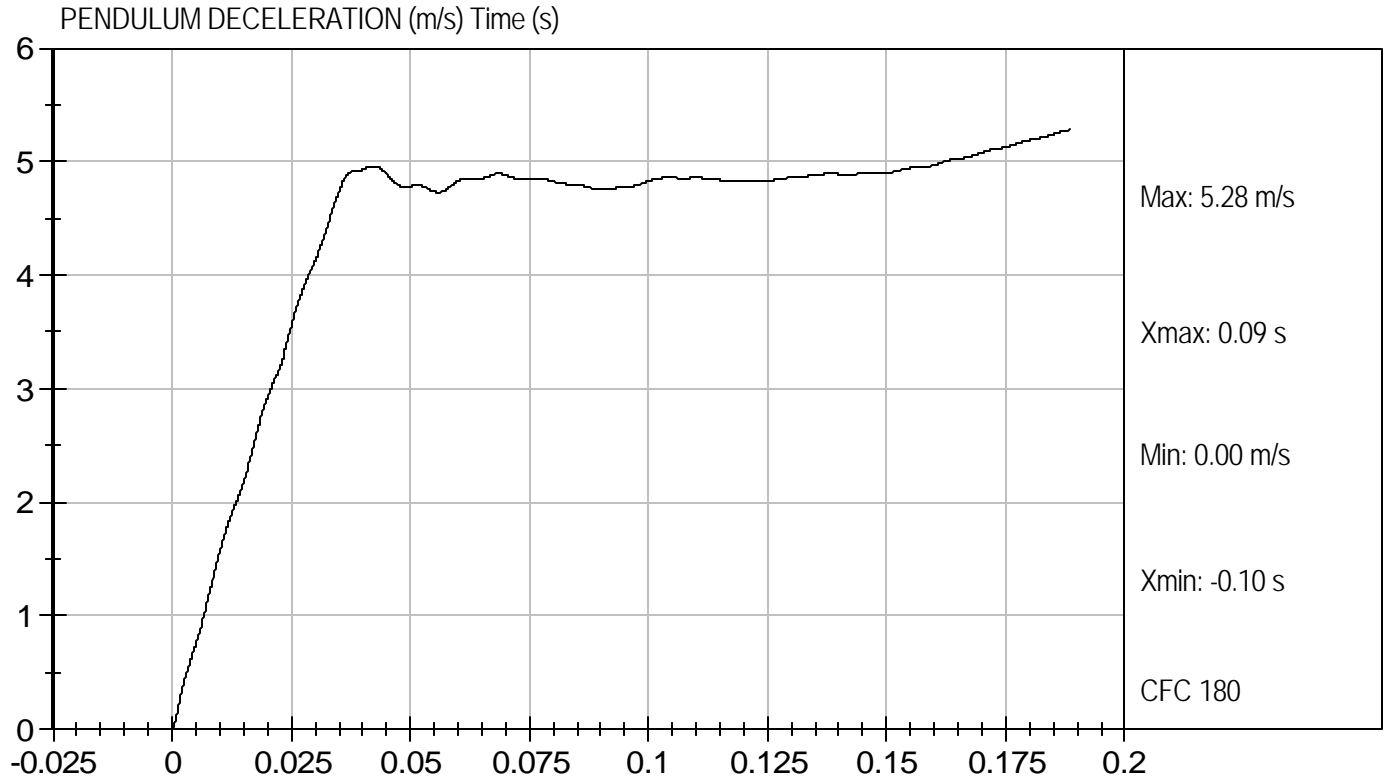


Approved By



Test Desc: Neck Flexion
Component ID: D07962

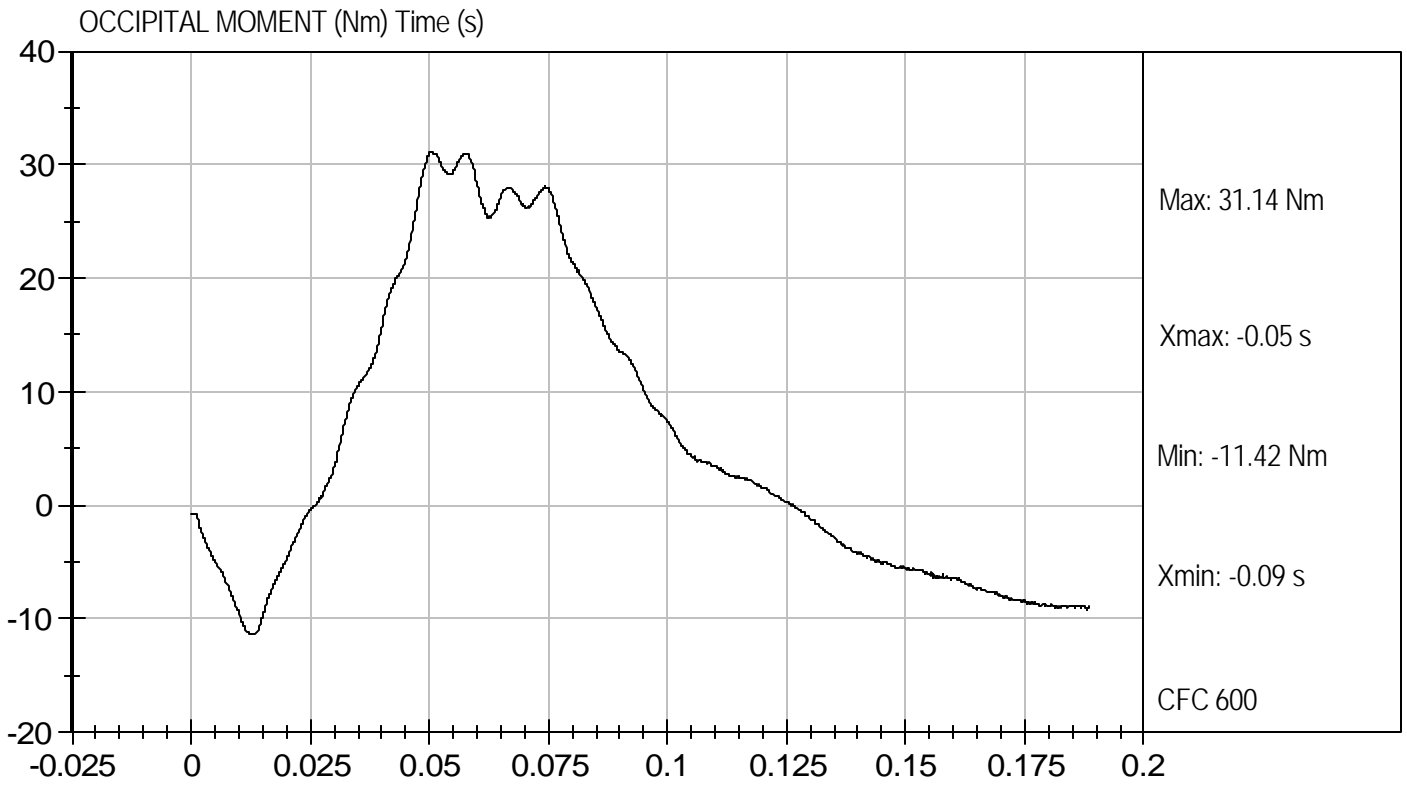
Test Date: 4/11/07
Velocity: 16.18 ft/s, 4.93 m/s





Test Desc: Neck Flexion
Component ID: D07962

Test Date: 4/11/07
Velocity: 16.18 ft/s, 4.93 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 159 Test Date 4/11/07

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 | <u>20.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>31%</u> |
| Record the minimum humidity | <u>23%</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 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	$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.34 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$
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>-20</u> Nm @ <u>94</u> degrees
Negative Moment Decay** (Extension)	Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	135 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 13. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.



 Signature

4/11/07

 Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07963

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	31	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.34	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.5	Pass
	30 msec	msec	3.2 to 4.2	3.5	Pass
D Plane Rotation	Max	deg	85 to 103	94	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-20	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	135	Pass
Overall Results					Pass



Laboratory Technician



Approved By

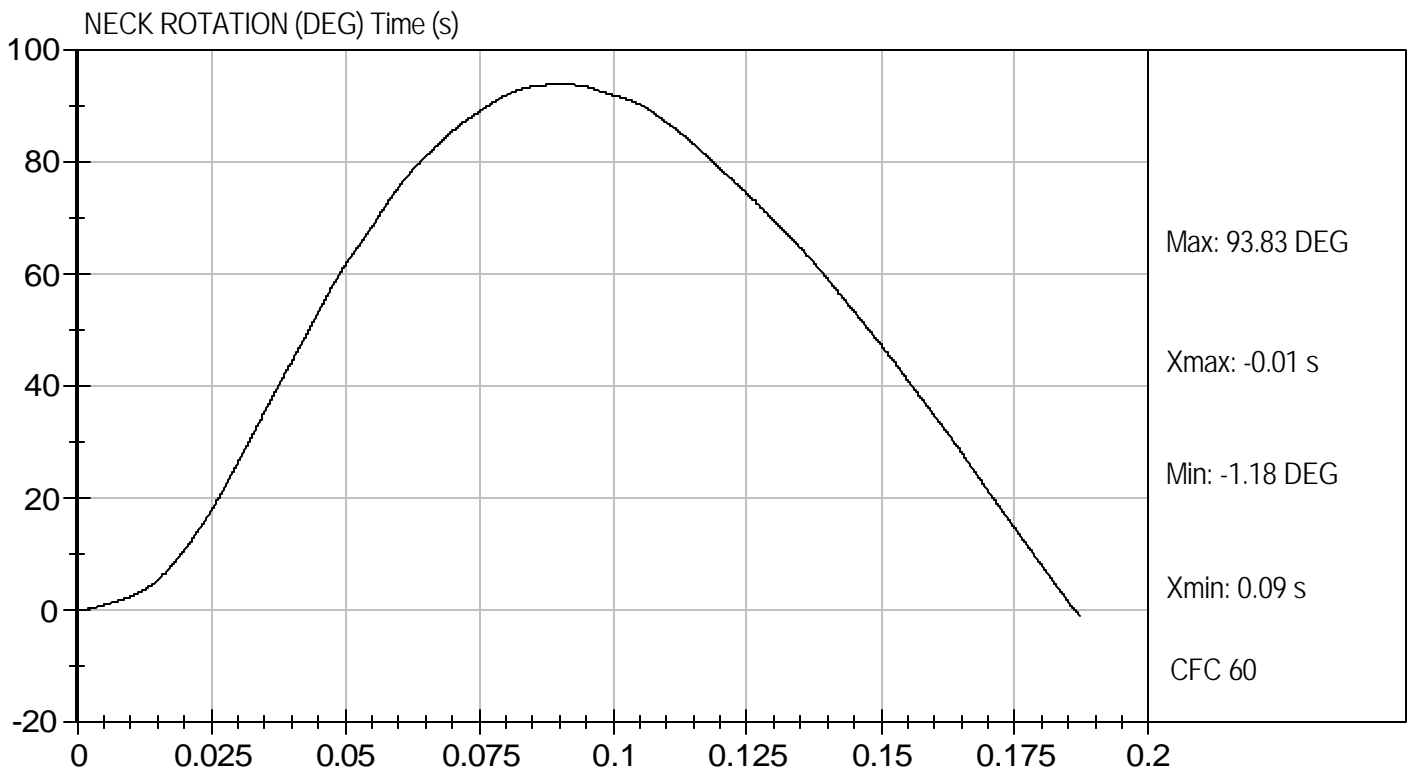
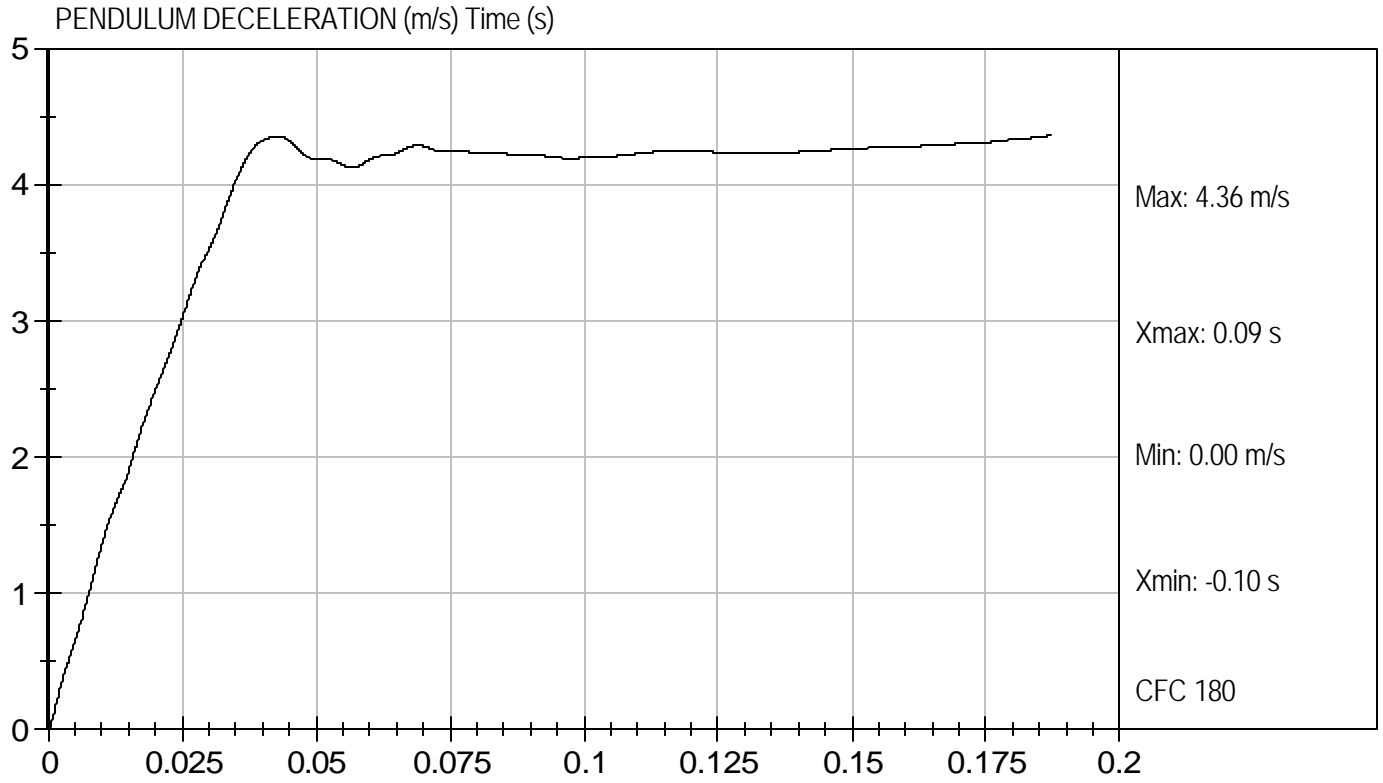
4/11/07

Test Date



Test Desc: Neck Extension
Component ID: D07963

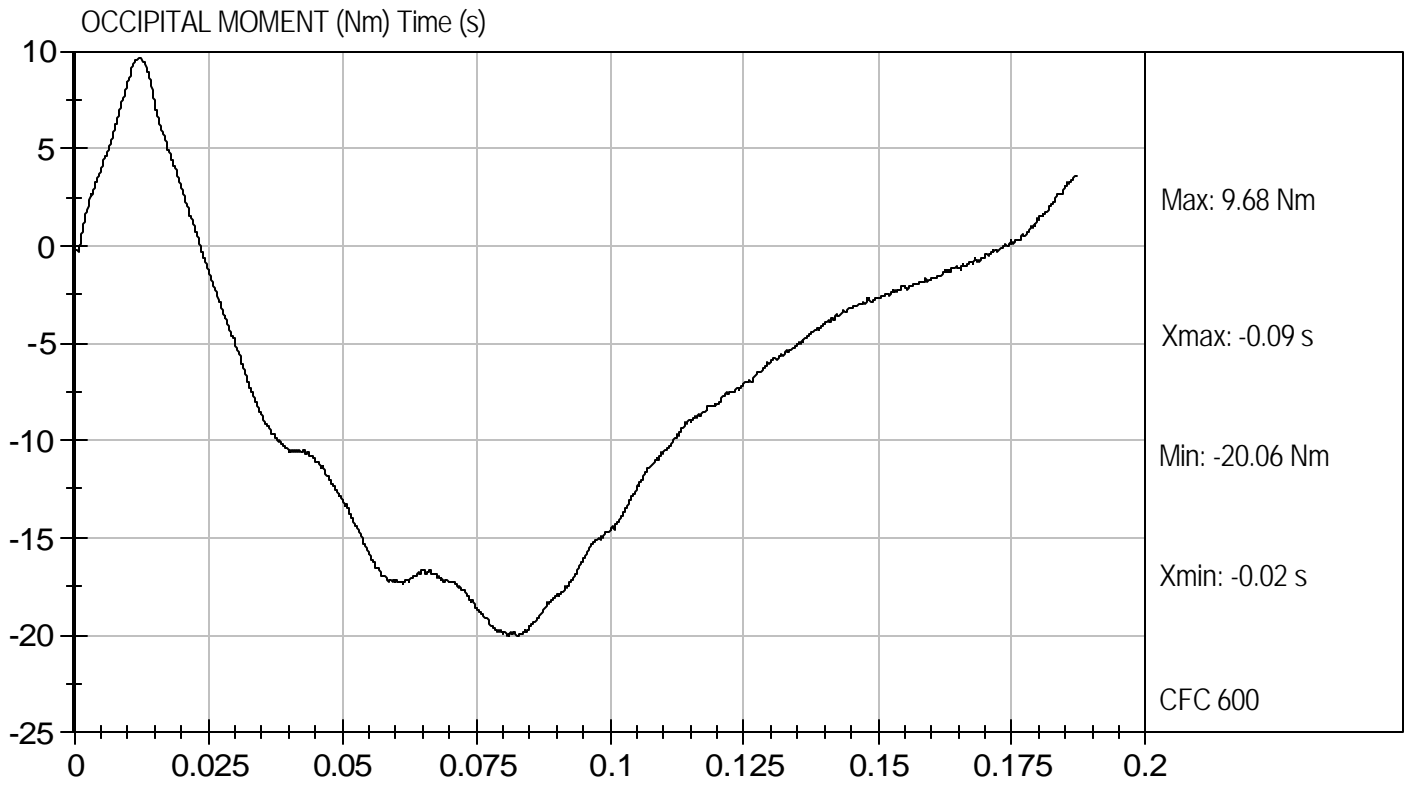
Test Date: 4/11/07
Velocity: 14.24 ft/s, 4.34 m/s





Test Desc: Neck Extension
Component ID: D07963

Test Date: 4/11/07
Velocity: 14.24 ft/s, 4.34 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 159 Test Date 4/11/07

Technician Dave Wilcox

- 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	<u>20.8</u>
Record the minimum temperature	<u>20.7</u>
Record the maximum humidity	<u>31%</u>
Record the minimum humidity	<u>23%</u>
- 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 m/s ≤ speed ≤ 6.83 m/s	6.68 m/s
Chest Compression	38.0 mm ≤ compression ≤ 46.0 mm	40 mm
Peak force** between 38.0 and 46.0 mm chest compression	1150N ≤ peak force ≤ 1380N	1260 N
Peak force** between 12.5 and 38.0 mm chest compression	Max. 1.05 times the peak force between 38.0 and 46.0 mm chest compression	1306 N
Internal Hysteresis***	65% ≤ hysteresis ≤ 85%	74 %

*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.



Signature

4/11/07

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D: D07964

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	38 to 46	40	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.26	Pass
Internal Hysteresis	%	65 to 85	74	Pass
Peak Force 12.5 mm - 38 mm	N	≤ 1,500	1,306	Pass
Overall Test Results				Pass



Laboratory Technician

4/11/07

Test Date



Approved By

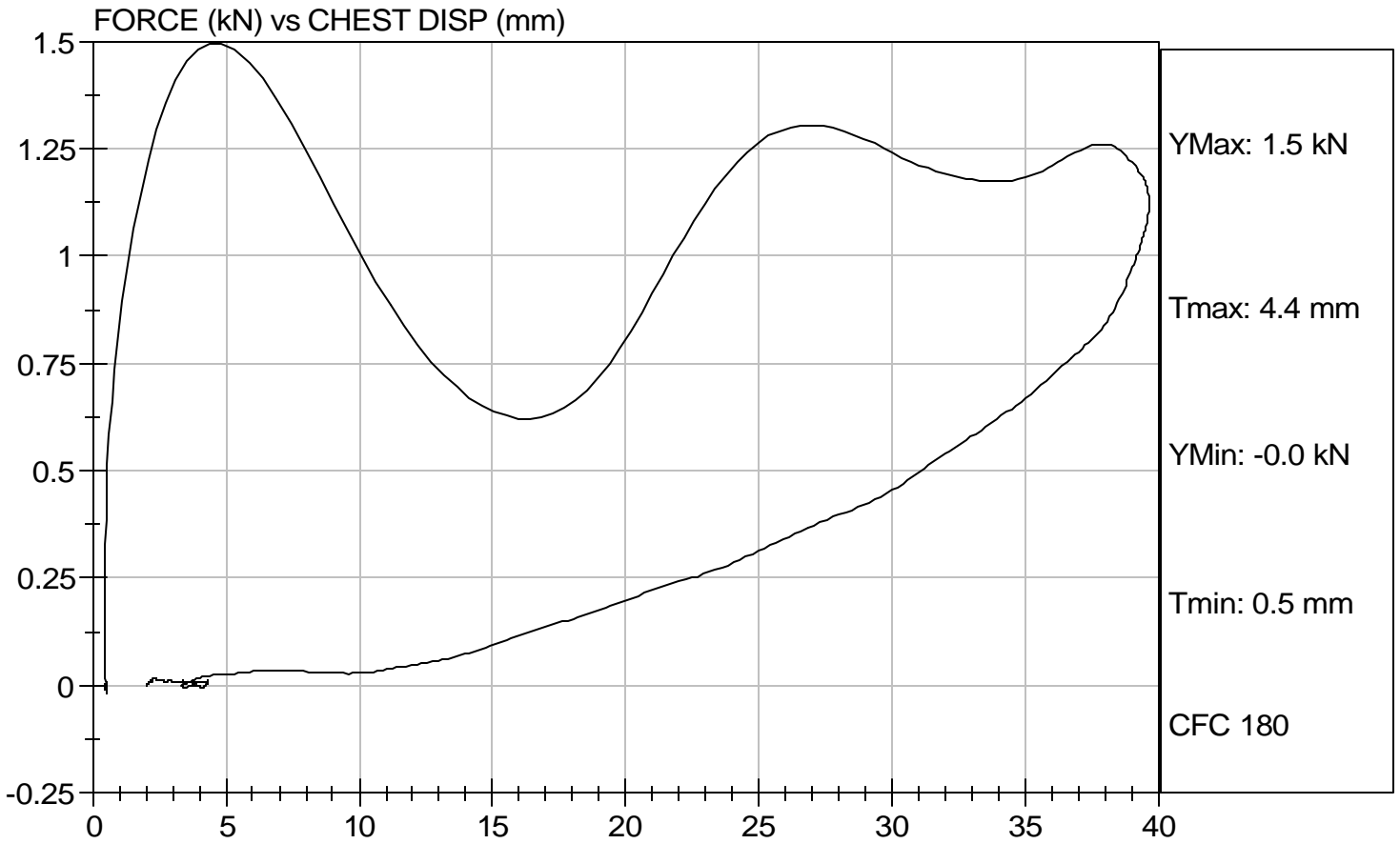


Test Description: Thorax Impact

Test Date: 4/11/07

Component: D07964

Speed: 21.92 ft/sec, 6.68 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 159

Test Date 4/11/07

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. (572.127(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 20.8

Record the minimum temperature 20.7

Record the maximum humidity 31%

Record the minimum humidity 23%

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))

9. Remove all external support that was implemented in 9 above. (572.125(c)(5))

10. 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°

11. Attach the pull cable and the load cell. (572.125(c)(6))

12. 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 13. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds.
(572.125(c)(8))
- X 14. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 15. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 16. 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	$0.5^\circ/s \leq \text{rate} \leq 1.5^\circ/s$	1.0
Force at $45^\circ \pm 0.5^\circ$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	182 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	13°



 Signature

4/11/07

 Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D.: D07967

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	27	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	182	Pass
Overall Test Results				Pass



 Laboratory Technician

4/11/07

 Test Date



 Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 159 Test Date 4/11/07

Technician Dave Wilcox

- 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	20.8
Record the minimum temperature	20.7
Record the maximum humidity	31%
Record the minimum humidity	23%
- 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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	2000 N ≤ force ≤ 3000 N	2370 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

4/11/07

Date

MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D.: D07966

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	2.0 to 3.0	2.4	Pass
Overall Test Results				Pass



Laboratory Technician

4/11/07

Test Date

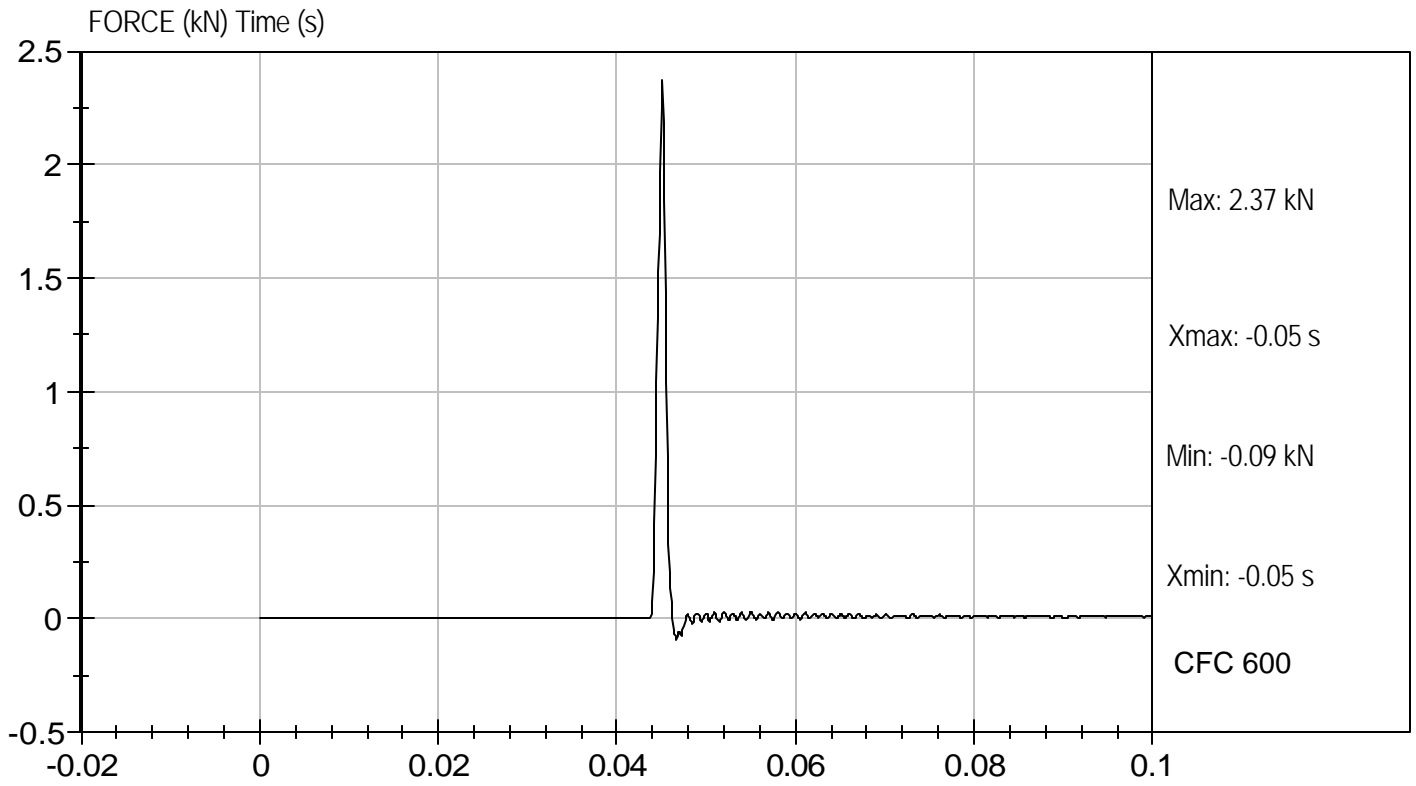


Approved By



Test Desc: Left Knee
Component ID: D07966

Test Date: 4/11/07
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 159 Test Date 4/11/07

Technician Dave Wilcox

- 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	20.8
Record the minimum temperature	20.7
Record the maximum humidity	31%
Record the minimum humidity	23%
- 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 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	2000 N ≤ force ≤ 3000 N	2900 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

4/11/07

Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 159

Test I.D.: D07965

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	2.0 to 3.0	2.9	Pass
Overall Test Results				Pass



Laboratory Technician

4/11/07

Test Date

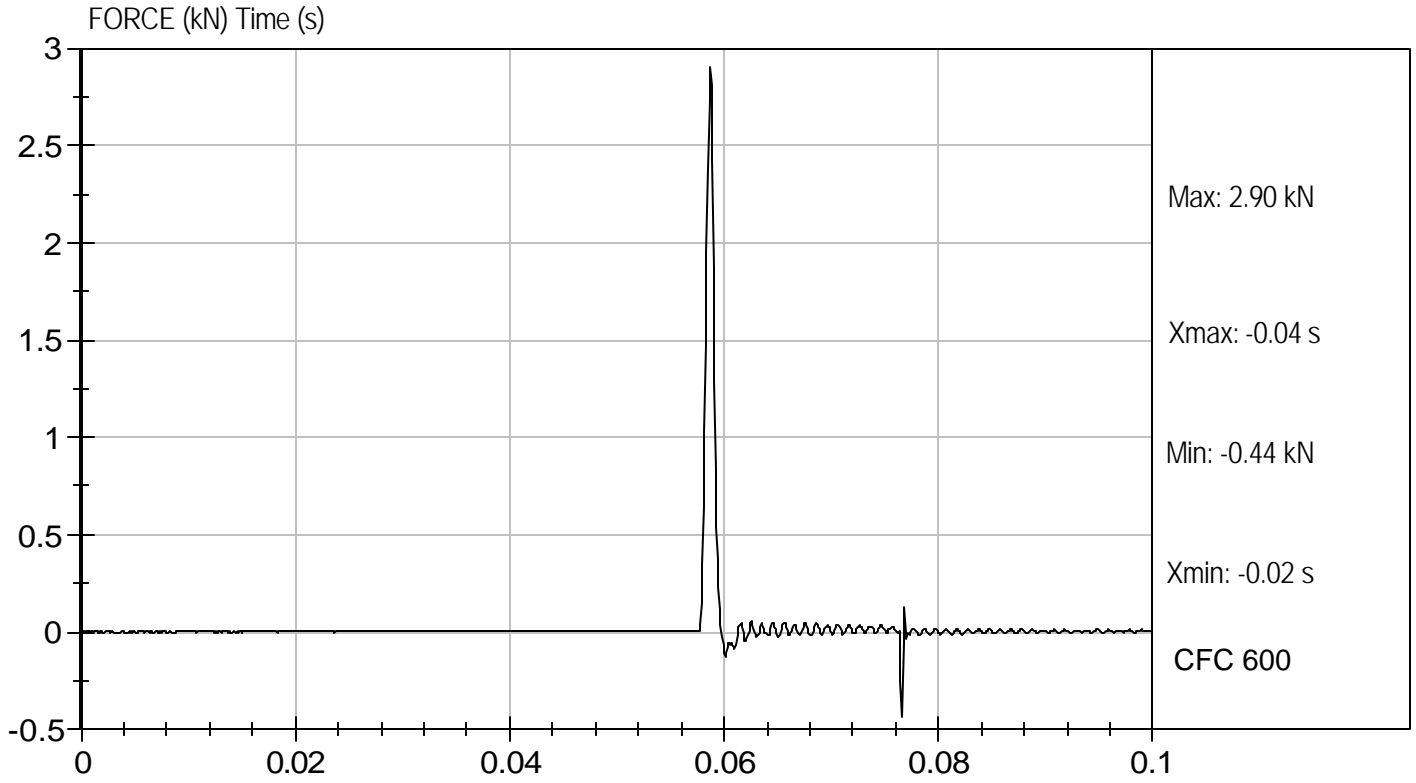


Approved By



Test Desc: Right Knee
Component ID: D07965

Test Date: 4/11/07
Velocity: 6.94 ft/s, 2.12 m/s



EXTERNAL DIMENSIONS

HYBRID III 6 year SN#159, 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	631.5
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	361.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	71.1
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	91.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.3
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	91.7
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	188.3
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	20.0
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	224.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	168.0
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	386.5
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	274.2
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	317.6

18-31

HYBRID III 6 year SN#159, PART 572, 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	337.0
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	133.5
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	173.2
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	347.3
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	140.5
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	176.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	216.7
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.4
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	64.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	525.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	603.1
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	580.6
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	157.0

18-32

DATA SHEET C1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 159

Test Date 4/10/07

Technician Jessica Gall

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

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

4/11/07
Date

Describe the repair or replacement of parts:

Checked by
David Winkelbauer
Signature

4/11/07
Date