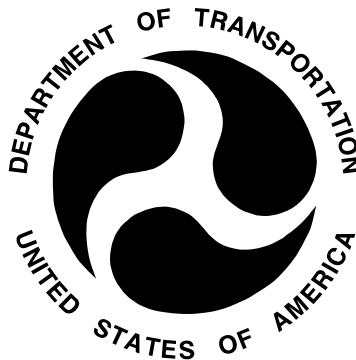


REPORT NO. 208-MGA-2006-DC001-ODI

DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208

**Diamler Chrysler Corporation
2005 Dodge Grand Caravan
NHTSA No.: C50313**

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



Test Date: September 12, 2006

Report Date: October 24, 2006

FINAL REPORT

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

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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 50 th SN #401, SUBPART E EXTERIOR 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 8/14/06

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 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(ii))

☒ 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 20.9

Record the minimum temperature 20.6

Record the maximum humidity 44%

Record the minimum humidity 42%

☒ 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

8/14/06
Date

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

ATD Serial No: 401

Test ID: D062441

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	225 to 275	260	Pass
Peak Lateral Acceleration	G's	$\leq \pm 15.0$	12.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

08/14/2006
Test Date

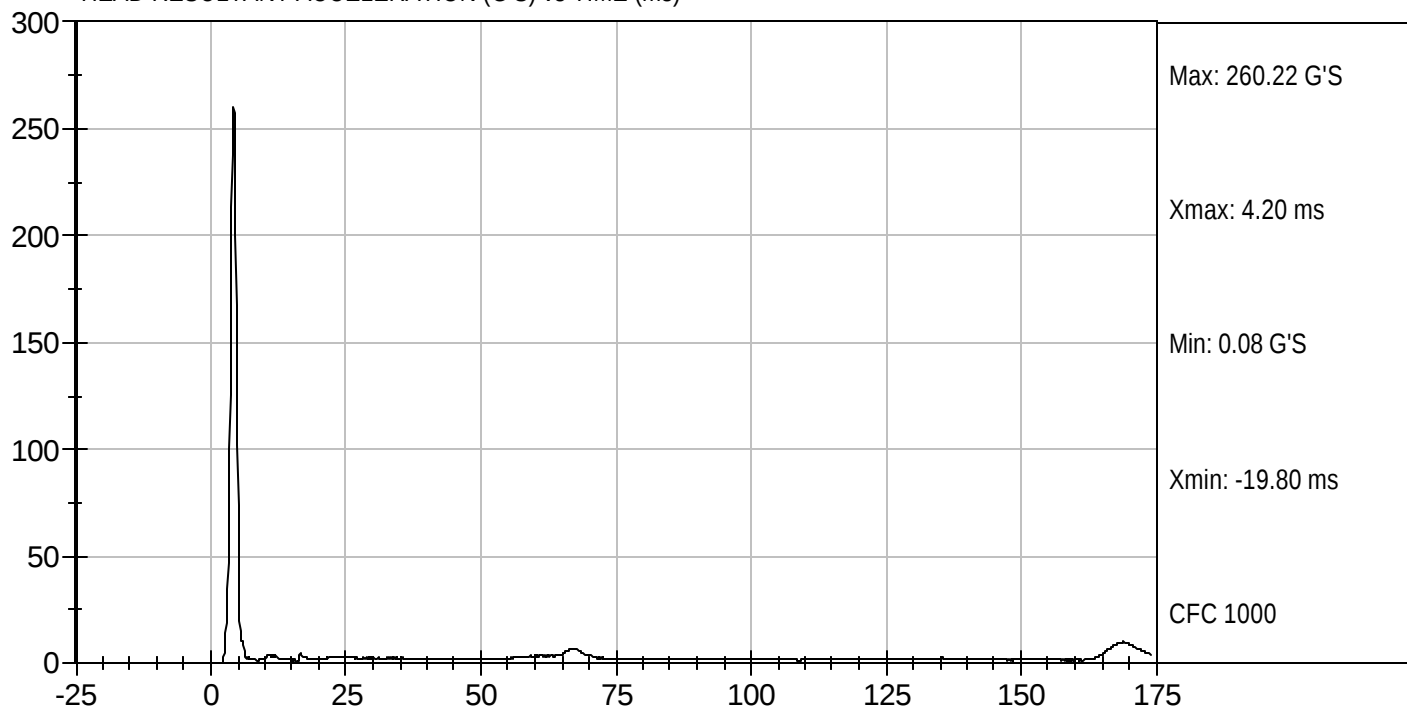

Approved By



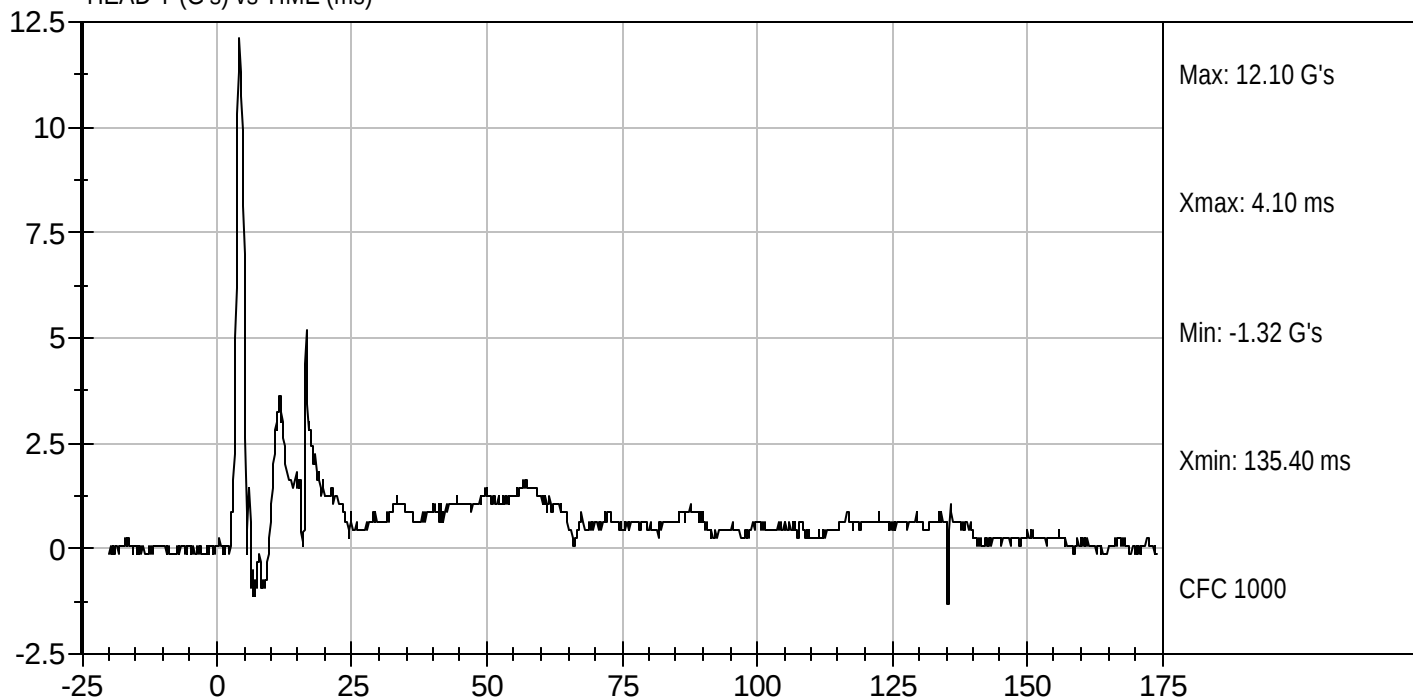
Test Desc: Head Drop
Componet ID: D062441

Test Date: 08/14/2006
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 8/15/06

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. (572.36(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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (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		$22.6 \text{ ft/sec} \leq \text{speed} \leq 23.4 \text{ ft/sec}$	23.1
Pendulum Deceleration Versus Time Pulse	@ 10ms	$22.5 \leq g \leq 27.5$	24.8
	@ 20 ms	$17.6 \leq g \leq 22.6$	20.1
	@30ms	$12.5 \leq g \leq 18.5$	15.6
	Above 30 ms	29 g maximum	16
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	37
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	73
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	58
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	115
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	68
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	49
Time of first decay to 0 lbf- ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	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

8/15/06
Date

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

ATD Serial No: 401

Test I.D: D062442

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.77	Pass
	20 msec	G's	17.60 to 22.60	20.05	Pass
	30 msec	G's	12.50 to 18.50	15.63	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	15.62	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.1	Pass
	Time	msec	57.0 to 64.0	58.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	115.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	91.9	Pass
	Time	msec	47.0 to 58.0	48.9	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.4	Pass
Overall Test Results					Pass


 Laboratory Technician

08/15/2006
 Test Date

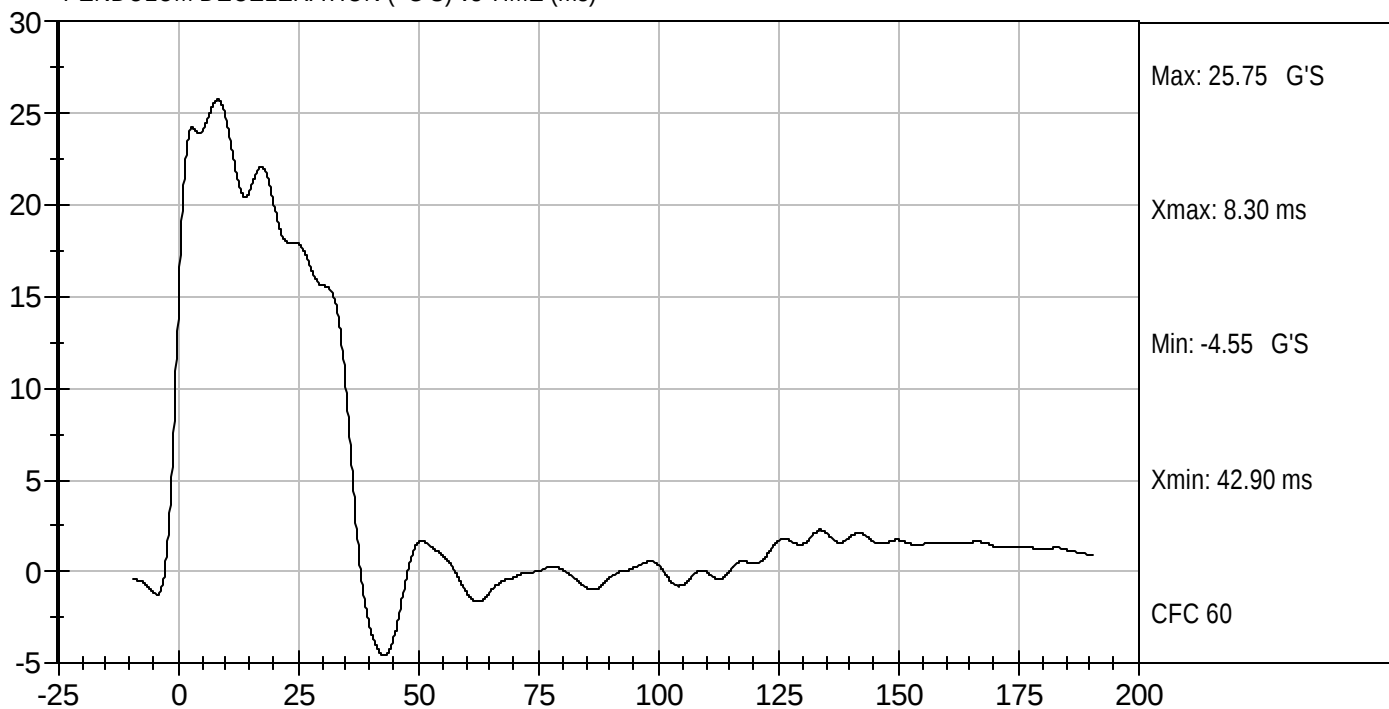

 Approved By



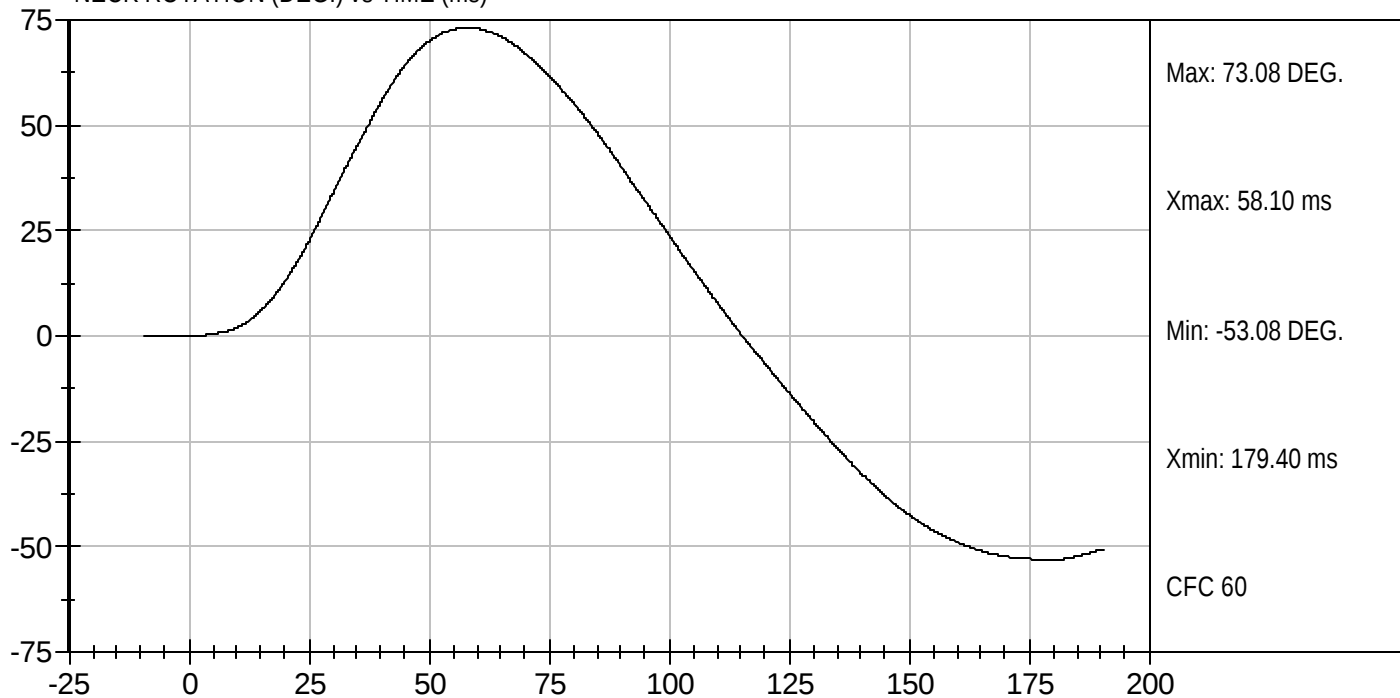
Test Desc: Neck Flexion
Componet ID: D062442

Test Date: 08/15/2006
Velocity: 23.12 ft/s, 7.05 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



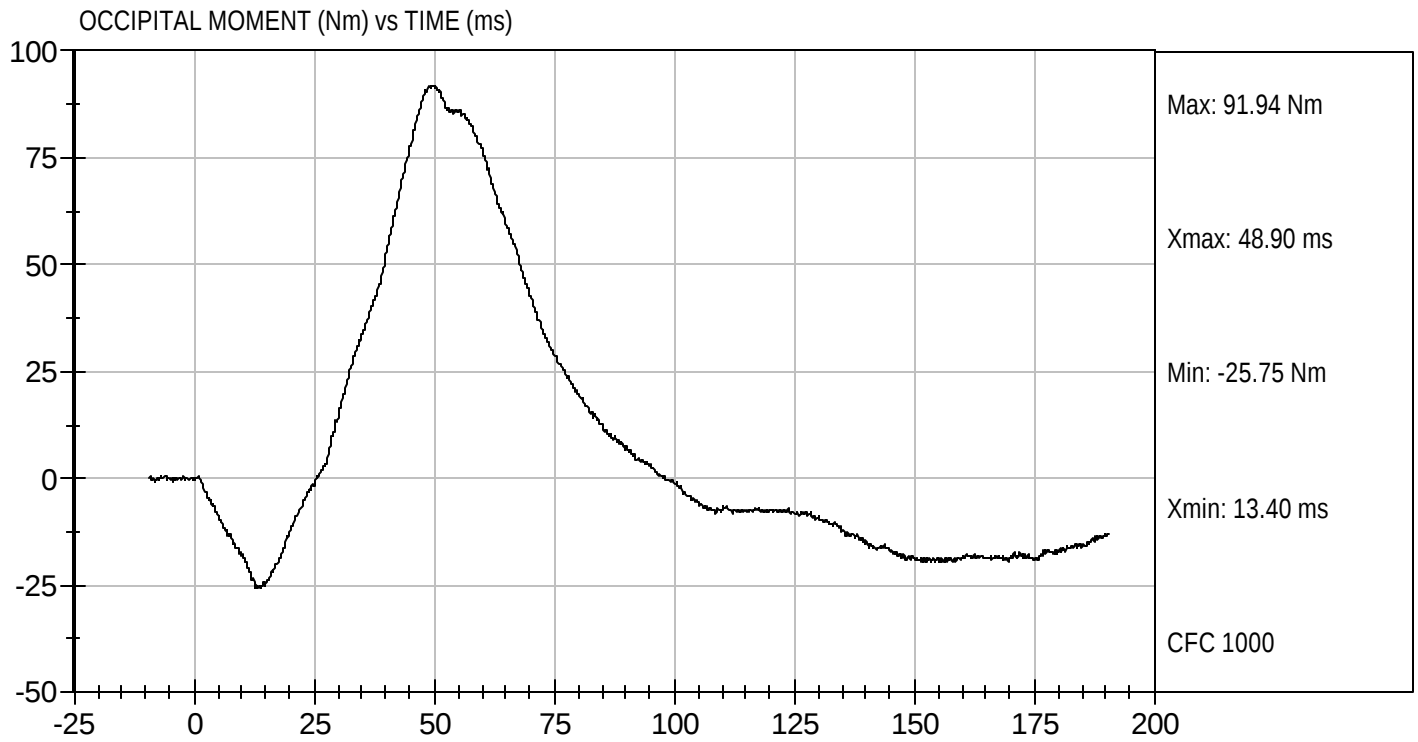
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D062442

Test Date: 08/15/2006
Velocity: 23.12 ft/s, 7.05 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 401

Test Date 8/15/06

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. (572.36(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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration Hardness Front 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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	20.0
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	19.0
	@ 20 ms	$14 \leq g \leq 19$	17.7
	@30ms	$11.0 \leq g \leq 16.0$	13.9
	Above 30 ms	22 g maximum	14
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	39
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	100
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	77
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	157
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-51
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	72
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	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

8/15/06
Date

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

ATD Serial No: 401

Test I.D: D062443

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	43	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.11	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.98	Pass
	20 msec	G's	14.00 to 19.00	17.73	Pass
	30 msec	G's	11.00 to 16.00	13.90	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	13.88	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.2	Pass
	Time	msec	72.0 to 82.0	76.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	156.9	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-68.7	Pass
	Time	msec	65.0 to 79.0	72.3	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	138.1	Pass
Overall Test Results				Pass	


 Laboratory Technician

08/15/2006
 Test Date

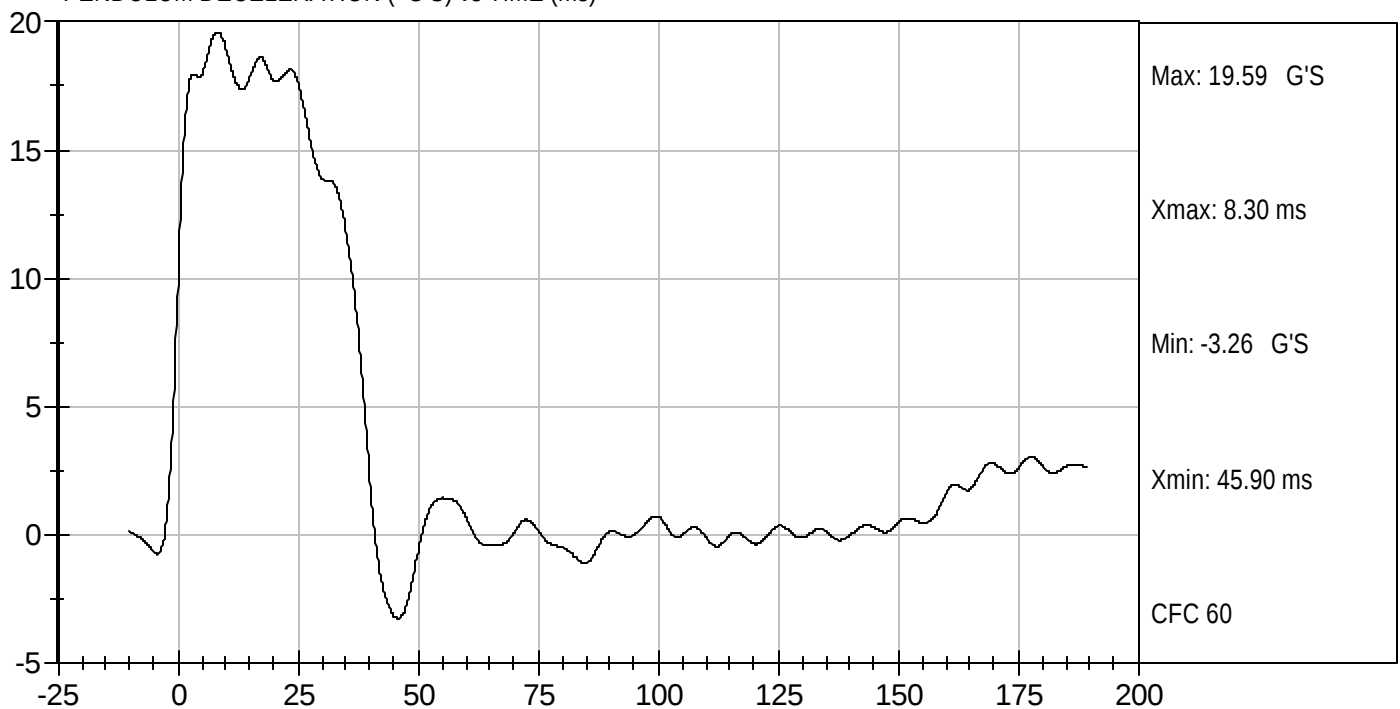

 Approved By



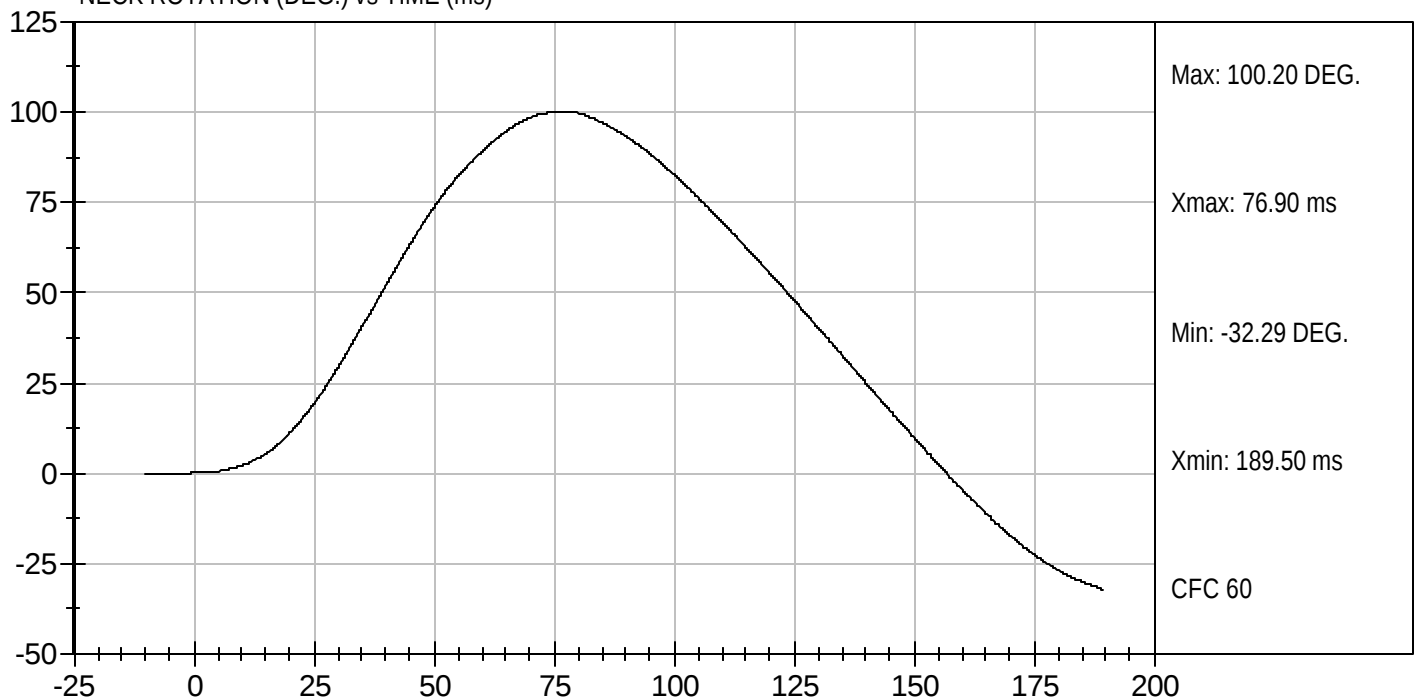
Test Desc: Neck Extension
Componet ID: D062443

Test Date: 08/15/2006
Velocity: 20.04 ft/s, 6.11 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



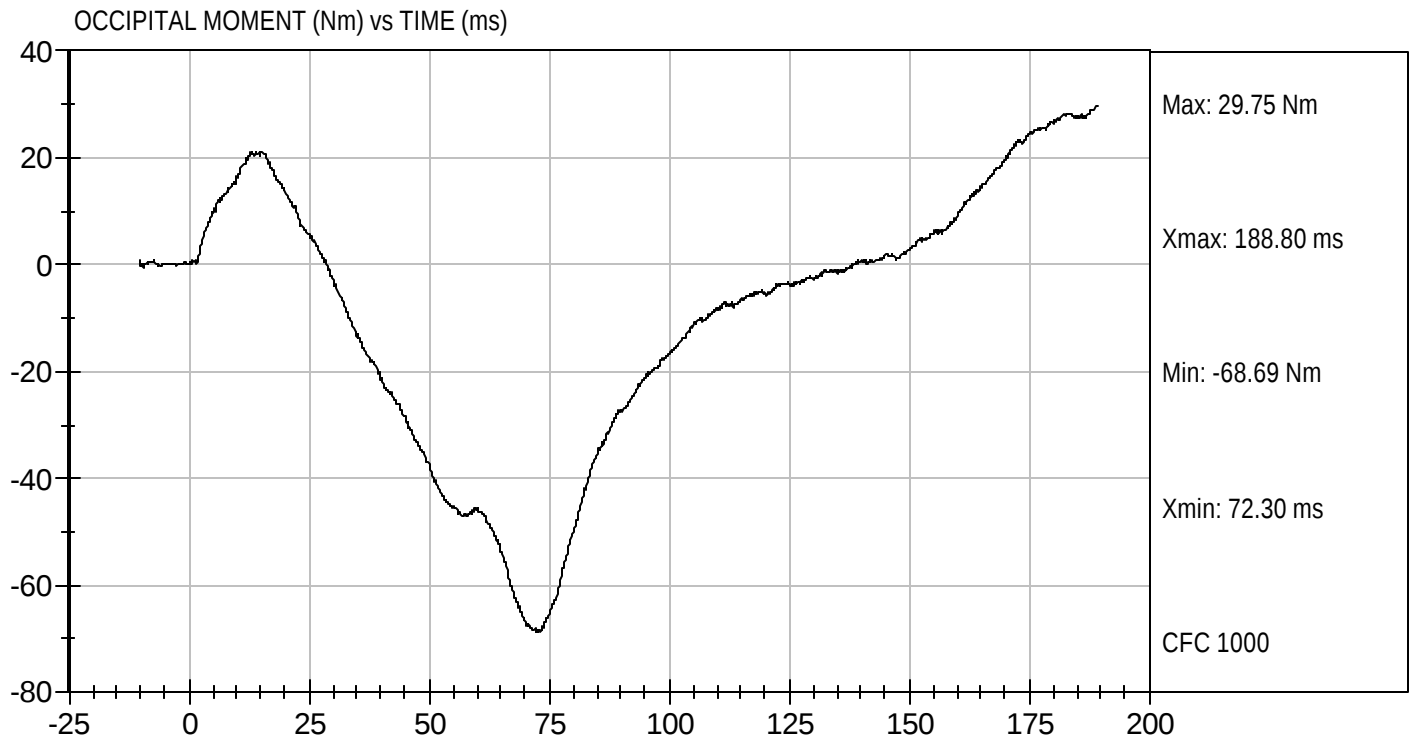
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D062443

Test Date: 08/15/2006
Velocity: 20.04 ft/s, 6.11 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 401 Test Date 8/15/06

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 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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (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	$21.6 \text{ f/s} \leq \text{speed} \leq 22.4 \text{ f/s}$	22.2
Chest Compression	$2.5 \text{ in.} \leq \text{compression} \leq 2.86 \text{ in.}$	2.76
Peak resistance force**	$1160 \text{ lb} \leq \text{peak force} \leq 1325 \text{ lb}$	1258
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 (572.34(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

8/15/06
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 401

Test I.D: D062444

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	40	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,597	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.76	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

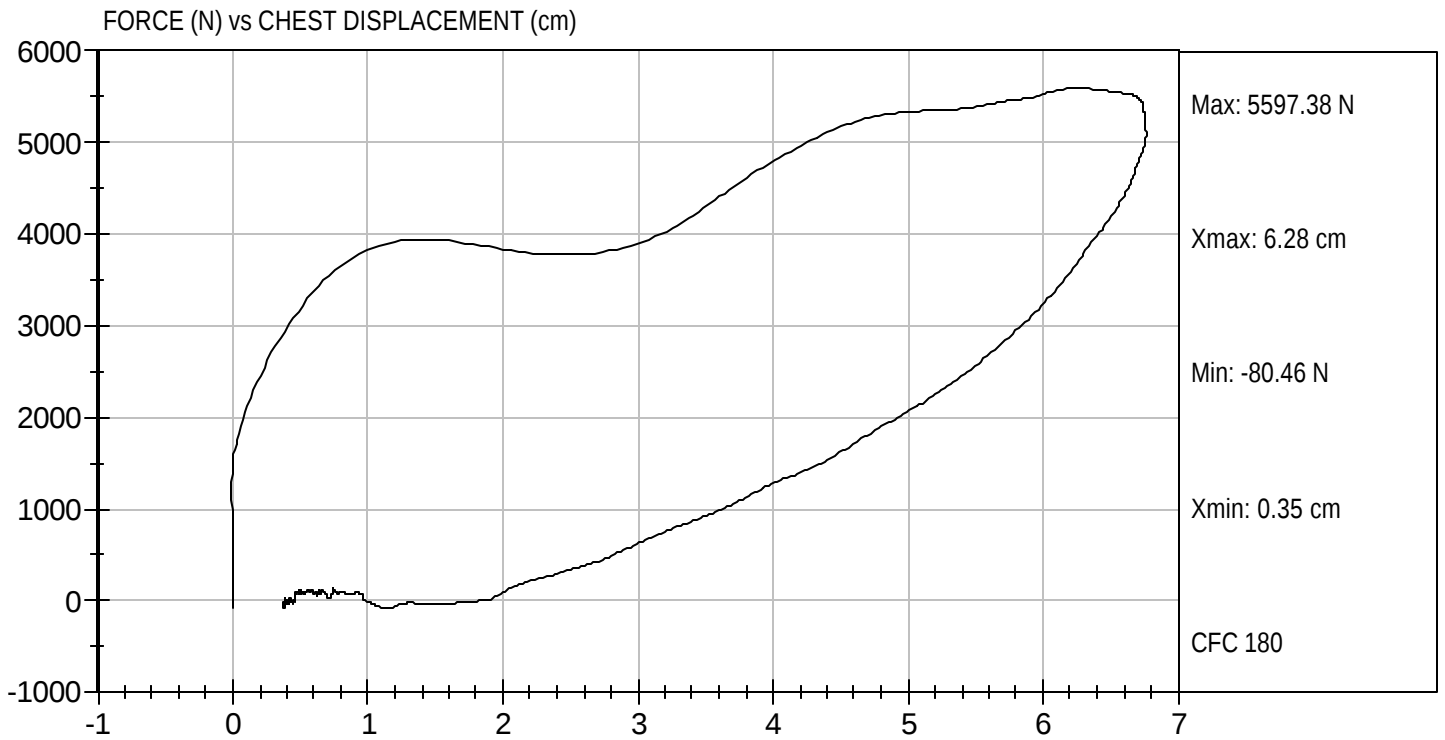

Approved By

08/15/2006
Test Date



Test Desc: Thorax Impact
Componet ID: D062444

Test Date: 08/15/2006
Velocity: 22.2 ft/s, 6.77 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 8/15/06

Technician Tim Bratz

☒ 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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 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))

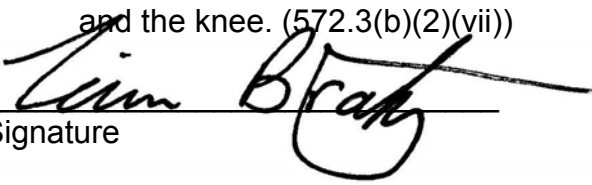
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s $\leq$ speed $\leq$ 7.0 ft/s	6.9
Peak resistance force*	1060 lb $\leq$ force $\leq$ 1300 lb	1179

*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

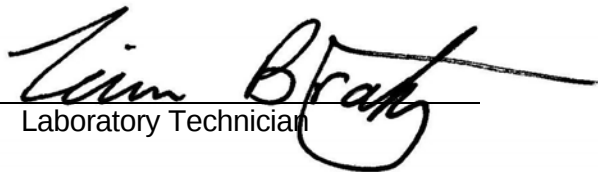
8/15/06
Date

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

ATD Serial No: 401

Test I.D: D062446

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	41	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,243	Pass
Overall Test Results				Pass


Laboratory Technician

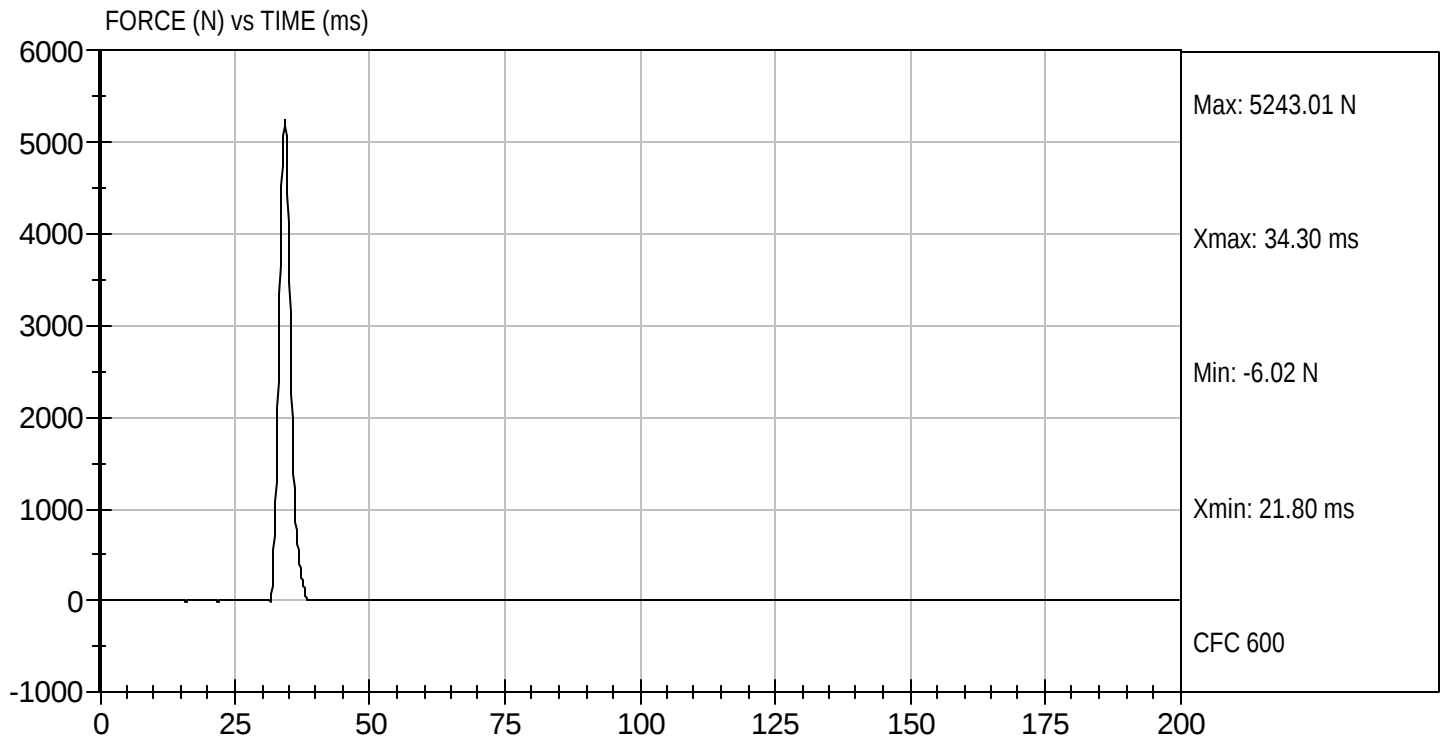
08/15/2006
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D062446

Test Date: 08/15/2006
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 8/15/06

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.
(572.36(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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 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))

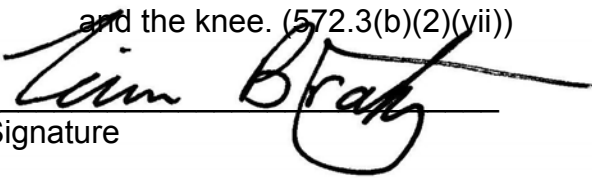
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s $\leq$ speed $\leq$ 7.0 ft/s	6.9
Peak resistance force*	1060 lb $\leq$ force $\leq$ 1300 lb	1065

*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

8/15/06
Date

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

ATD Serial No: 401

Test I.D: D062445

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,738	Pass
Overall Test Results				Pass


Laboratory Technician

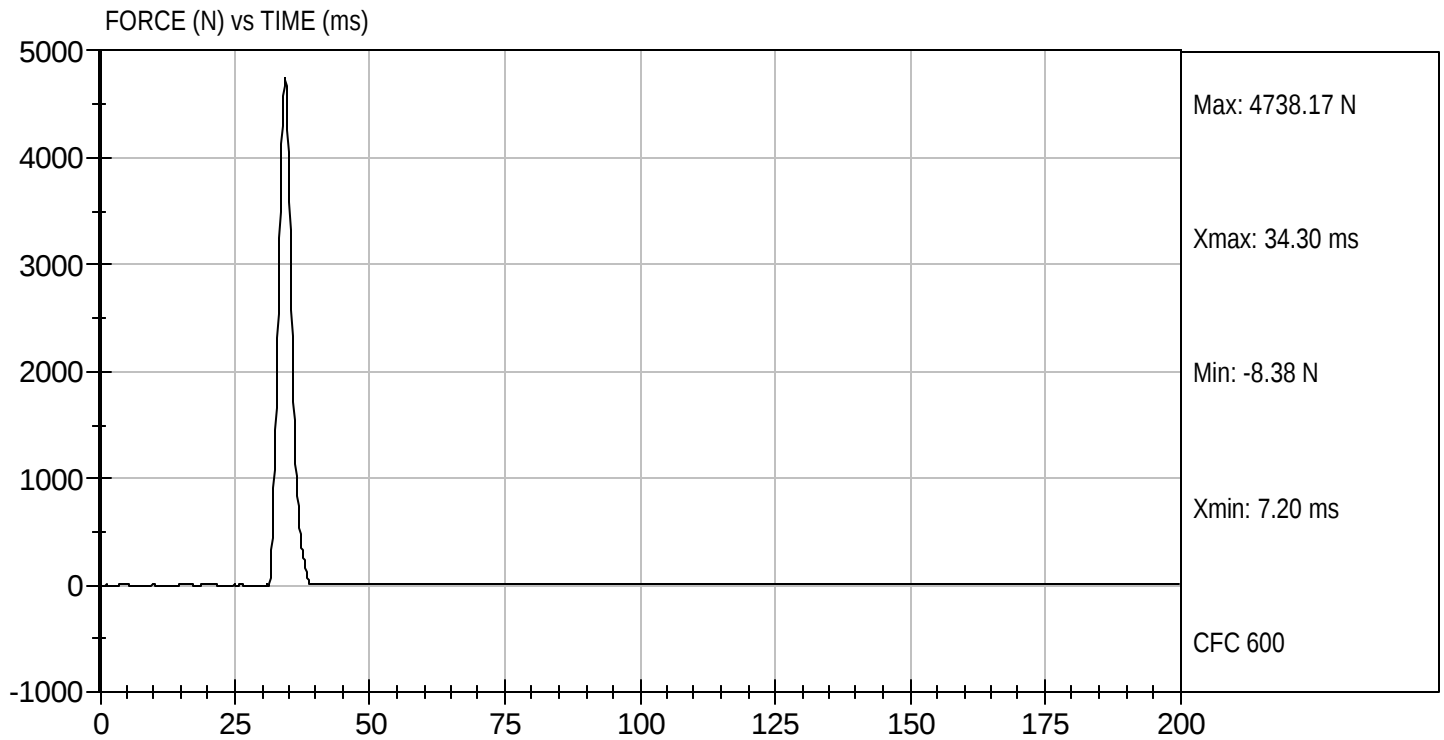
08/15/2006
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D062445

Test Date: 08/15/2006
Velocity: 6.93 ft/s, 2.11 m/s



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

Dummy Serial Number 401

Test Date 8/15/06

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>21.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>46%</u> |
| Record the minimum humidity | <u>40%</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°	$\text{torque} \leq 70 \text{ ft-lbf}$	44
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42

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°	$\text{torque} \leq 70 \text{ ft-lbf}$	60
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41


Signature

8/15/06
Date

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

ATD Serial No: 401

Test I.D: D062440

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	41	41	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	81.8	60.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	42	Pass
				Overall Test Results	Pass


 Laboratory Technician

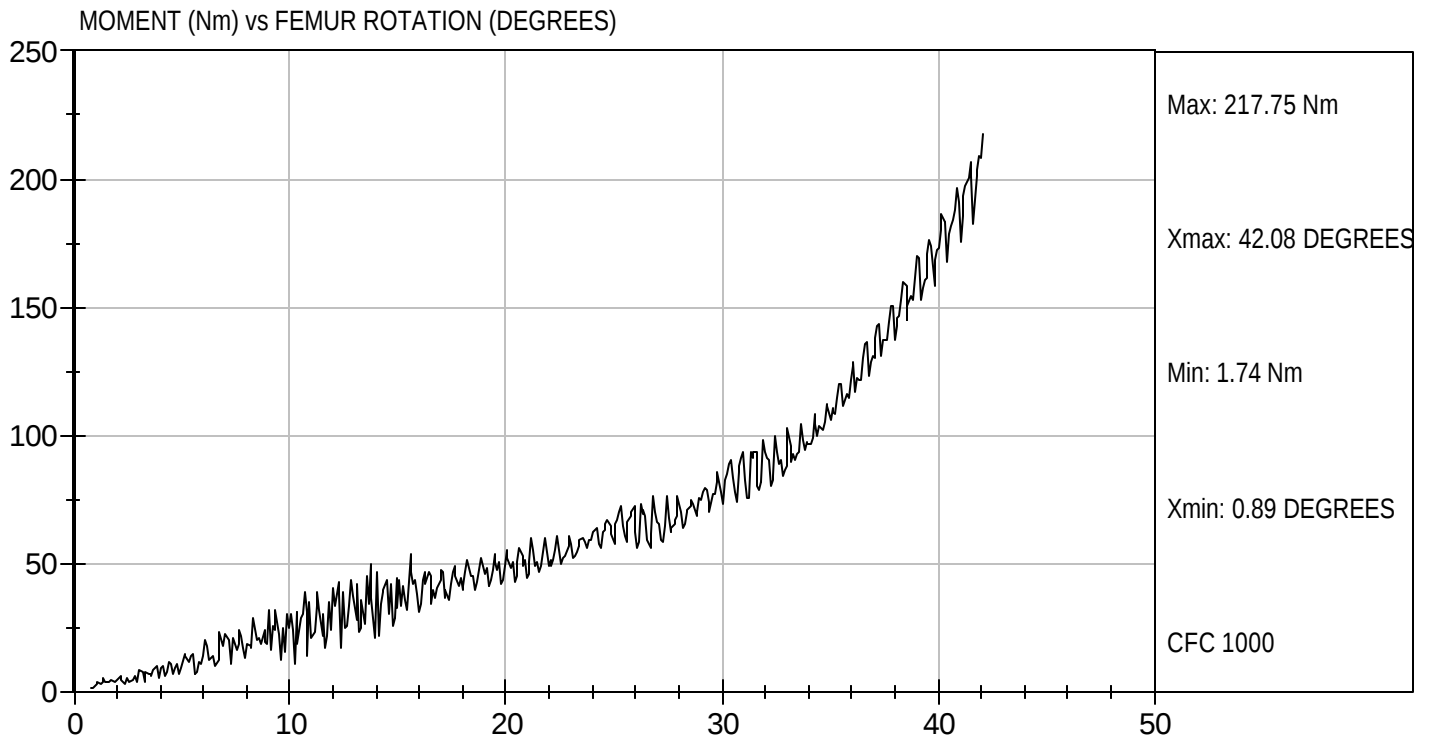
08/15/2006
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D062449

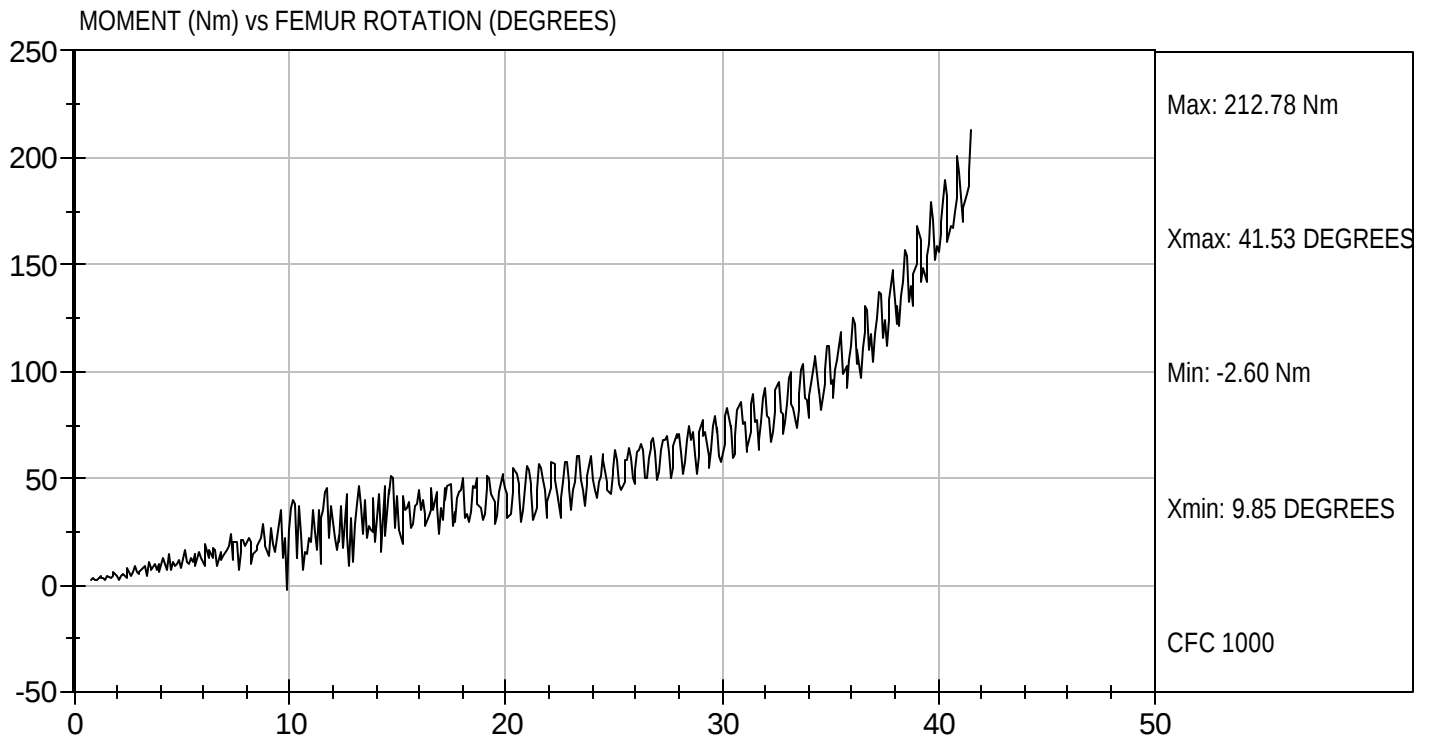
Test Date: 08/15/2006
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D062440

Test Date: 08/15/2006
Velocity: 0 ft/s, 0.00 m/s



DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 401

Test Date 9/12/06

Technician Tim Bratz

 Pretest calibration

X Post test calibration verification

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

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

X N/A, ONLY one head drop performed

X 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))

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

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

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

X 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 20.9

Record the minimum temperature 20.6

Record the maximum humidity 47%

Record the minimum humidity 44%

X 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.

X 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	$225 \text{ g} \leq x \leq 275 \text{ g}$	231
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-8

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


Signature

9/12/06
Date

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

ATD Serial No: 401

Test ID: D062761

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	225 to 275	231	Pass
Peak Lateral Acceleration	G's	$\leq \pm 15.0$	-7.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

09/12/2006
Test Date

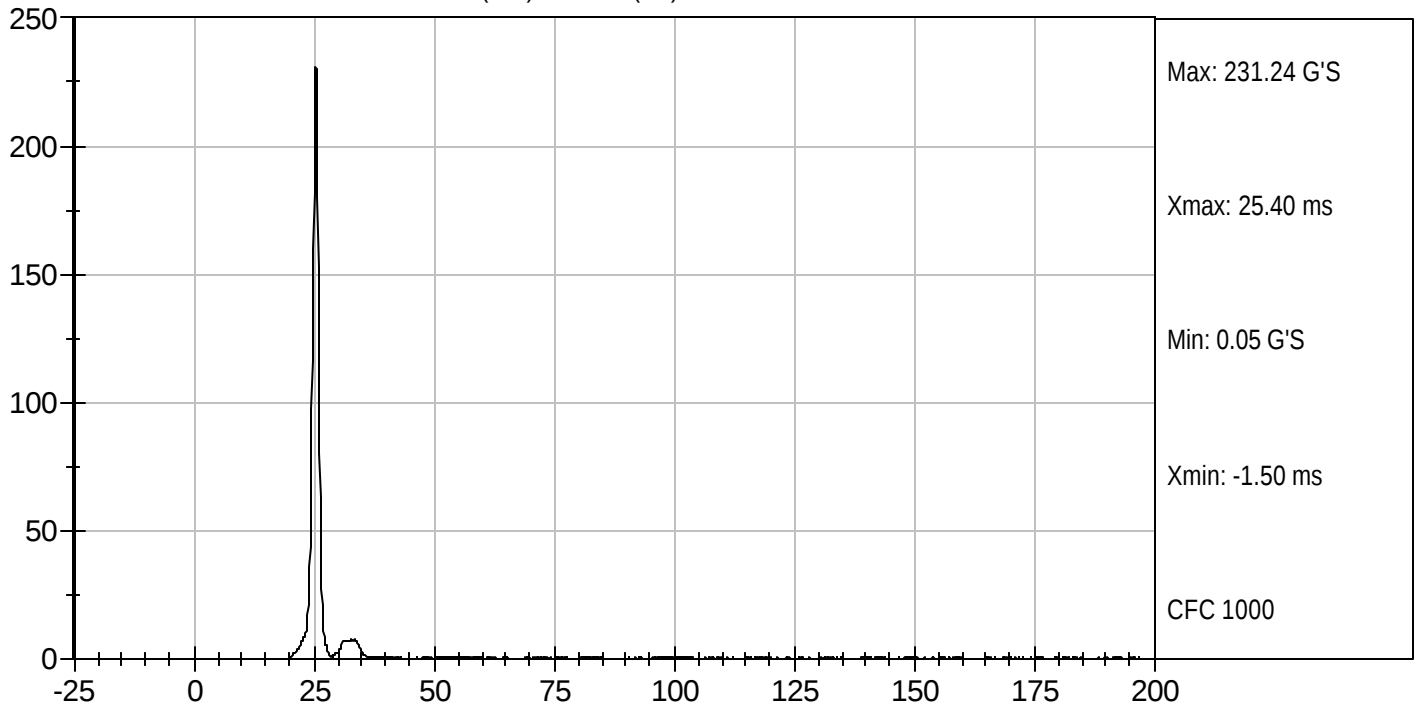

Approved By



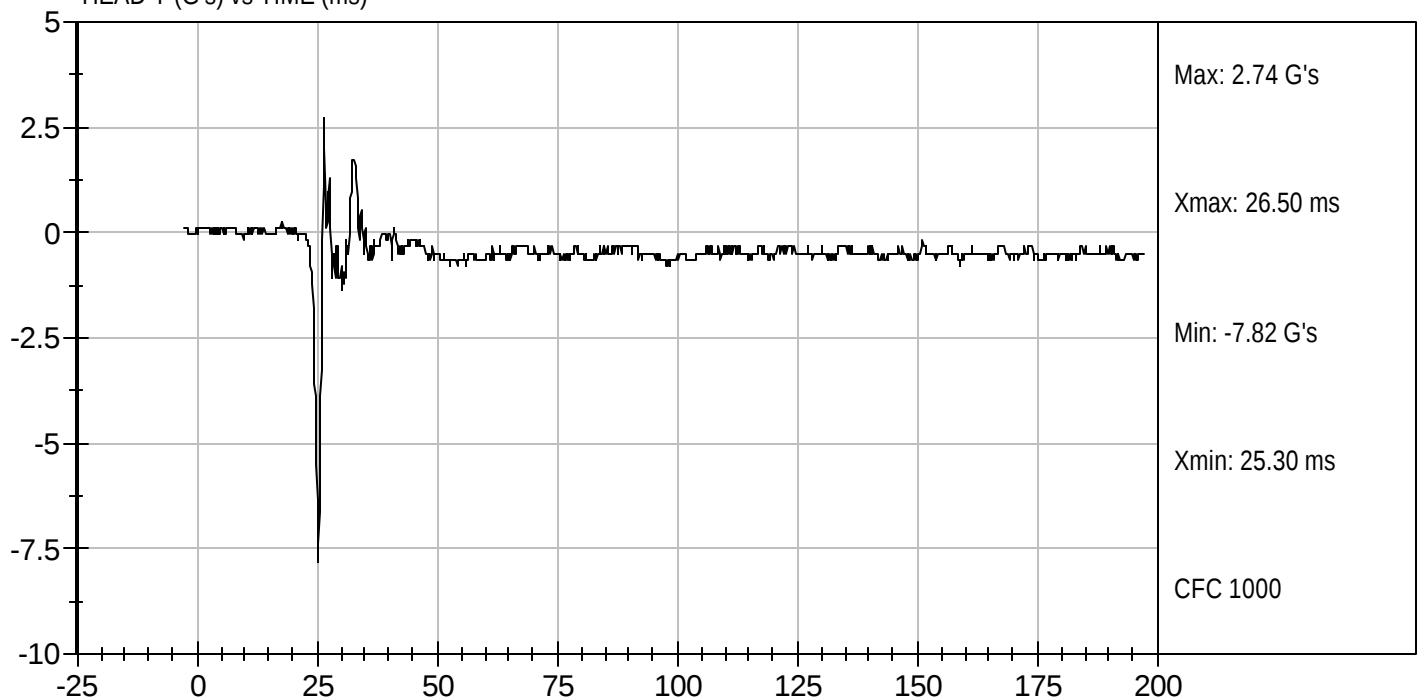
Test Desc: Head Drop
Componet ID: D062761

Test Date: 09/12/2006
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 9/13/06

Technician Tim Bratz

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last flexion test. (572.36(m))

X N/A, ONLY one flexion test performed

X 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))

X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.0

Record the maximum humidity 56%

Record the minimum humidity 47%

X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (78051-90).

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 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		$22.6 \text{ ft/sec} \leq \text{speed} \leq 23.4 \text{ ft/sec}$	23.0
Pendulum Deceleration Versus Time Pulse	@ 10ms	$22.5 \leq g \leq 27.5$	23.3
	@ 20 ms	$17.6 \leq g \leq 22.6$	20.2
	@30ms	$12.5 \leq g \leq 18.5$	15.5
	Above 30 ms	29 g maximum	15
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	37
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	75
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	59
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	118
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	67
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	50
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	100

*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

9/13/06
Date

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

ATD Serial No: 401

Test I.D: D062762

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	49	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.01	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.28	Pass
	20 msec	G's	17.60 to 22.60	20.15	Pass
	30 msec	G's	12.50 to 18.50	15.49	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	15.43	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	74.8	Pass
	Time	msec	57.0 to 64.0	59.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	118.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	90.3	Pass
	Time	msec	47.0 to 58.0	50.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	99.5	Pass
Overall Test Results					Pass


 Laboratory Technician

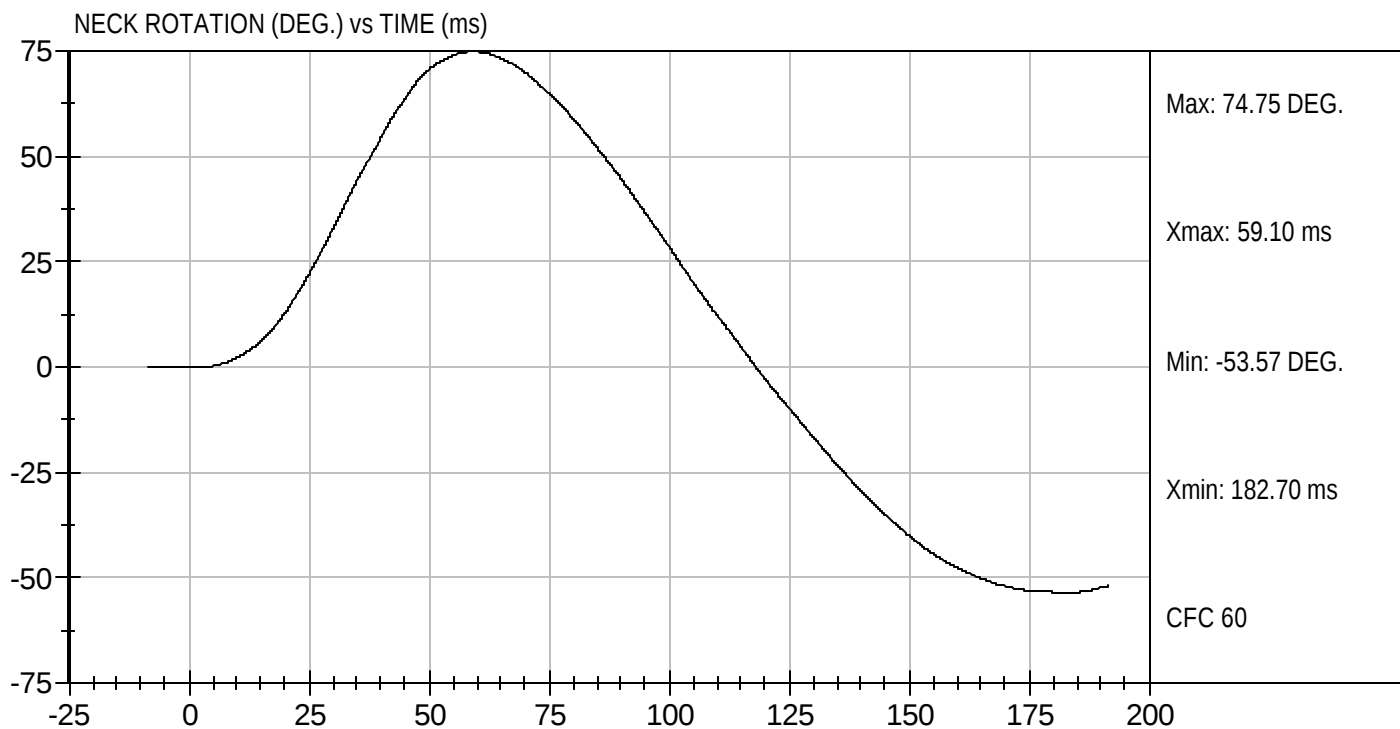
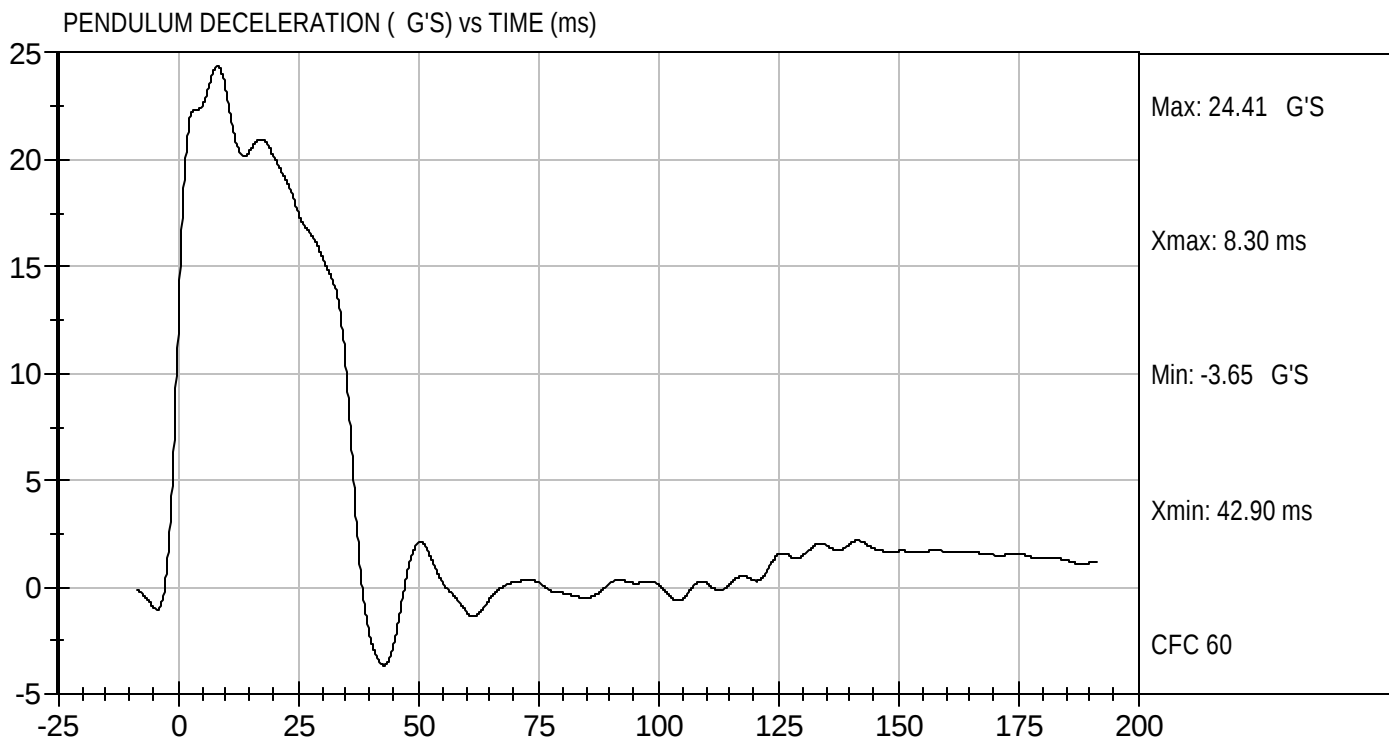
09/13/2006
 Test Date


 Approved By



Test Desc: Neck Flexion
Componet ID: D062762

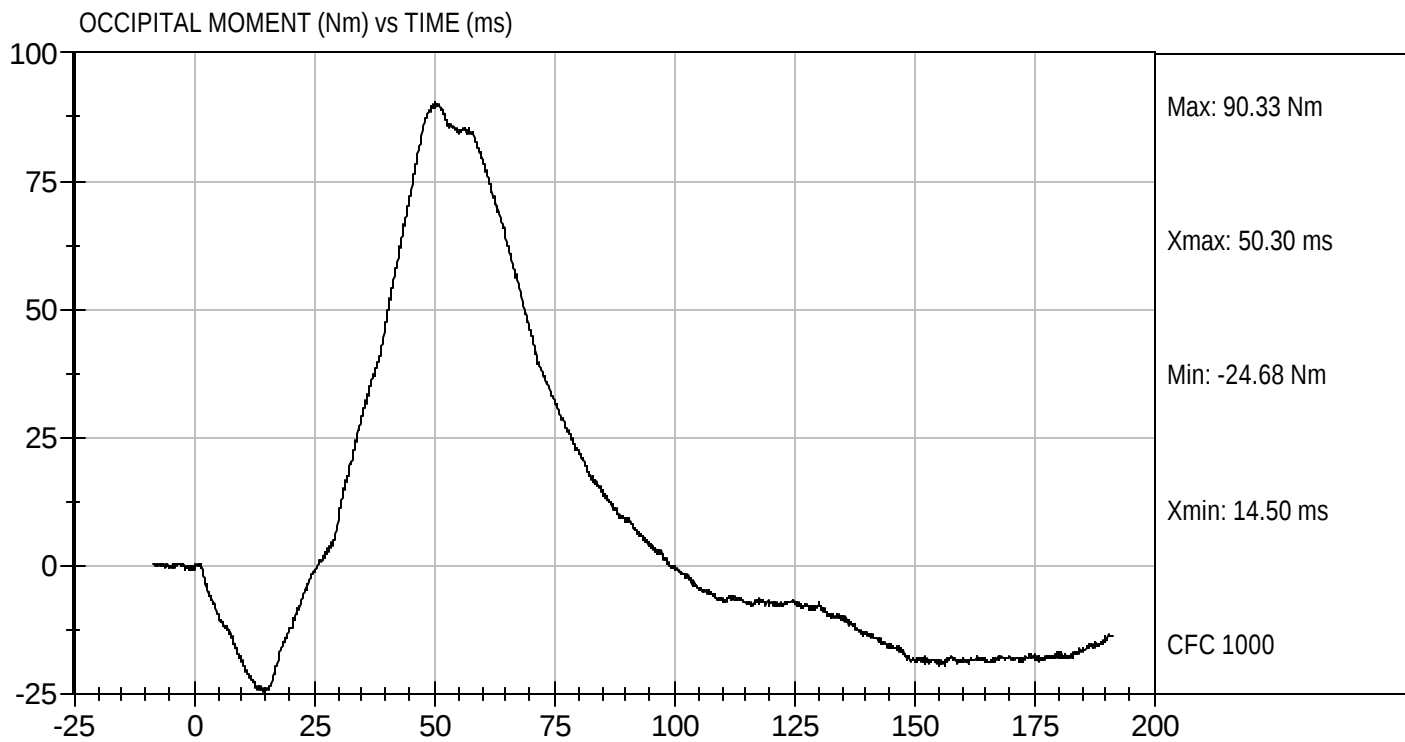
Test Date: 09/13/2006
Velocity: 23.01 ft/s, 7.01 m/s





Test Desc: Neck Flexion
Componet ID: D062762

Test Date: 09/13/2006
Velocity: 23.01 ft/s, 7.01 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 401

Test Date 9/13/06

Technician Tim Bratz

 Pretest calibration

X 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))

 X N/A, ONLY one extension test performed

X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.33(b))

X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.0

Record the maximum humidity 56%

Record the minimum humidity 47%

X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration Hardness Front 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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	20.2
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	18.8
	@ 20 ms	$14 \leq g \leq 19$	17.3
	@30ms	$11.0 \leq g \leq 16.0$	13.9
	Above 30 ms	22 g maximum	14
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	39
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	103
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	77
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	158
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-53
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	73
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	137

*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

9/13/06
Date

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

ATD Serial No: 401

Test I.D: D062763

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.15	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.81	Pass
	20 msec	G's	14.00 to 19.00	17.26	Pass
	30 msec	G's	11.00 to 16.00	13.93	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	13.93	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	103.2	Pass
	Time	msec	72.0 to 82.0	76.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.3	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-72.3	Pass
	Time	msec	65.0 to 79.0	72.6	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	136.5	Pass
Overall Test Results				Pass	


 Laboratory Technician

09/13/2006
 Test Date

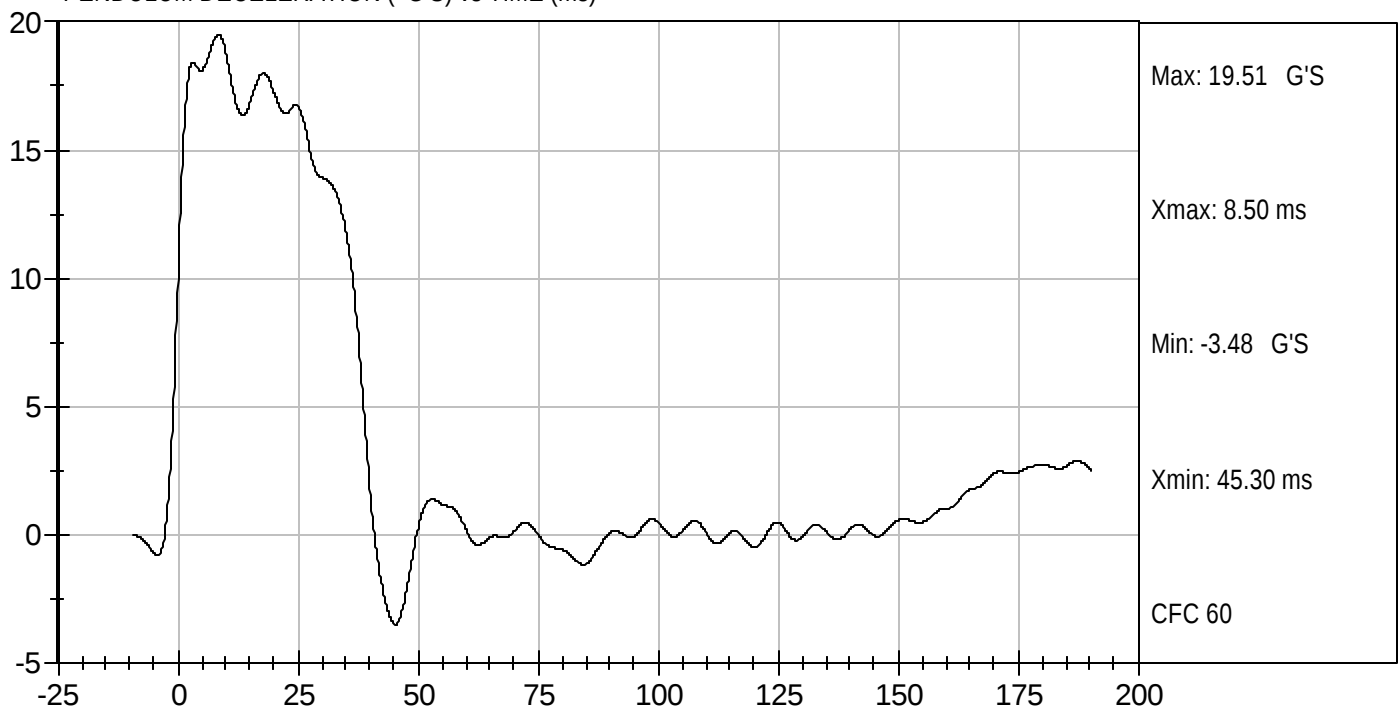

 Approved By



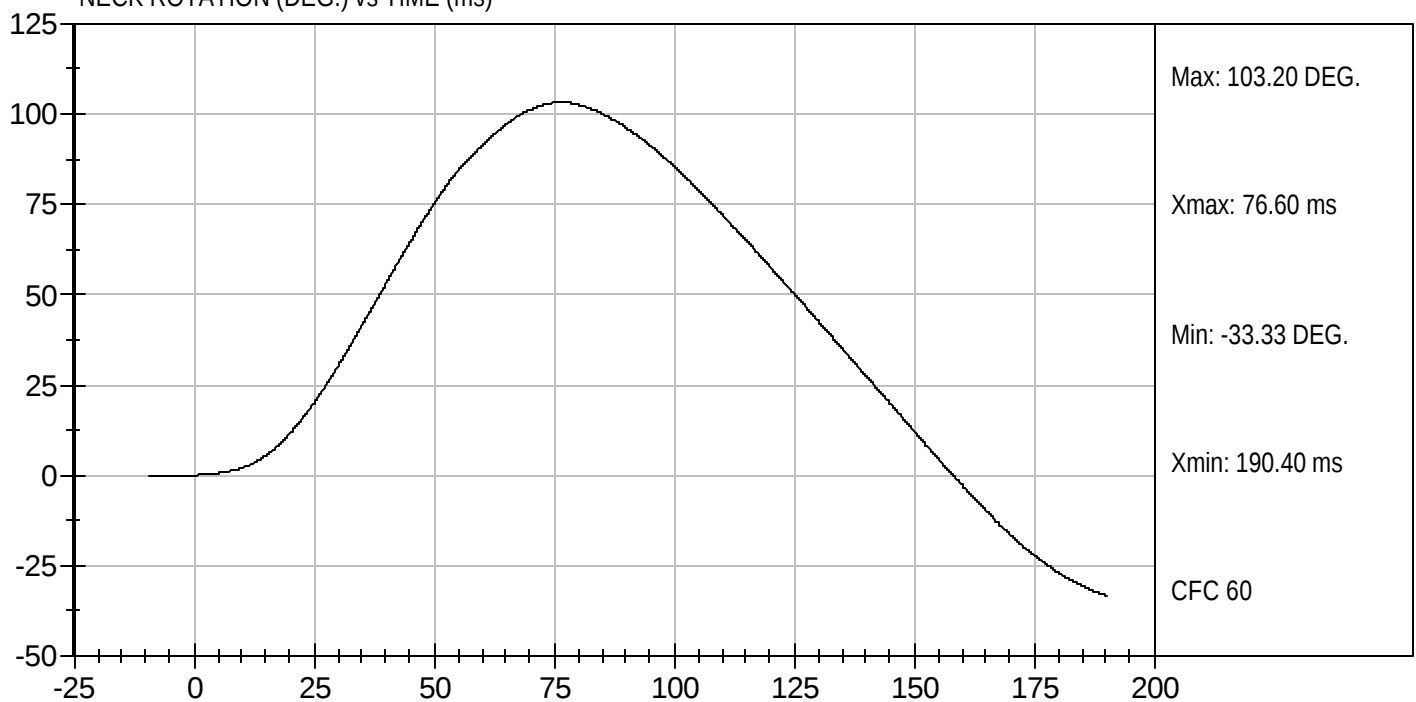
Test Desc: Neck Extension
Componet ID: D062763

Test Date: 09/13/2006
Velocity: 20.17 ft/s, 6.15 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



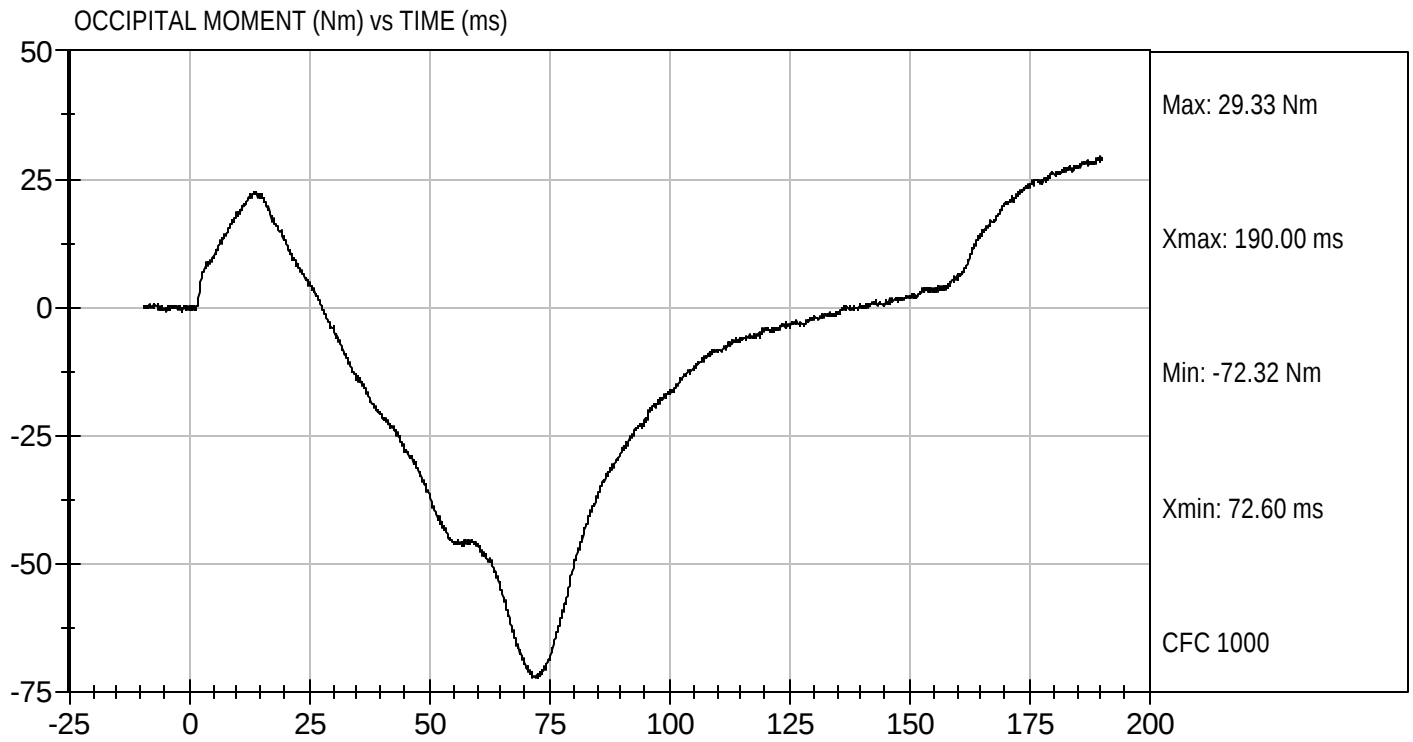
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D062763

Test Date: 09/13/2006
Velocity: 20.17 ft/s, 6.15 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 401 Test Date 9/13/06

Technician Tim Bratz

 Pretest calibration

X 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))

X N/A, ONLY one thorax impact test performed

X 2. The test fixture conforms to the specifications in Figure 12A.

X 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))

X 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 21.6

Record the minimum temperature 21.0

Record the maximum humidity 56%

Record the minimum humidity 47%

X 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.

X - 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	$21.6 \text{ f/s} \leq \text{speed} \leq 22.4 \text{ f/s}$	21.8
Chest Compression	$2.5 \text{ in.} \leq \text{compression} \leq 2.86 \text{ in.}$	2.69
Peak resistance force**	$1160 \text{ lb} \leq \text{peak force} \leq 1325 \text{ lb}$	1235
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 (572.34(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

9/13/06
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 401

Test I.D: D062764

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	47	Pass
Probe Velocity	m/s	6.58 to 6.82	6.65	Pass
Peak Probe Force	N	5159 to 5893	5,493	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.84	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

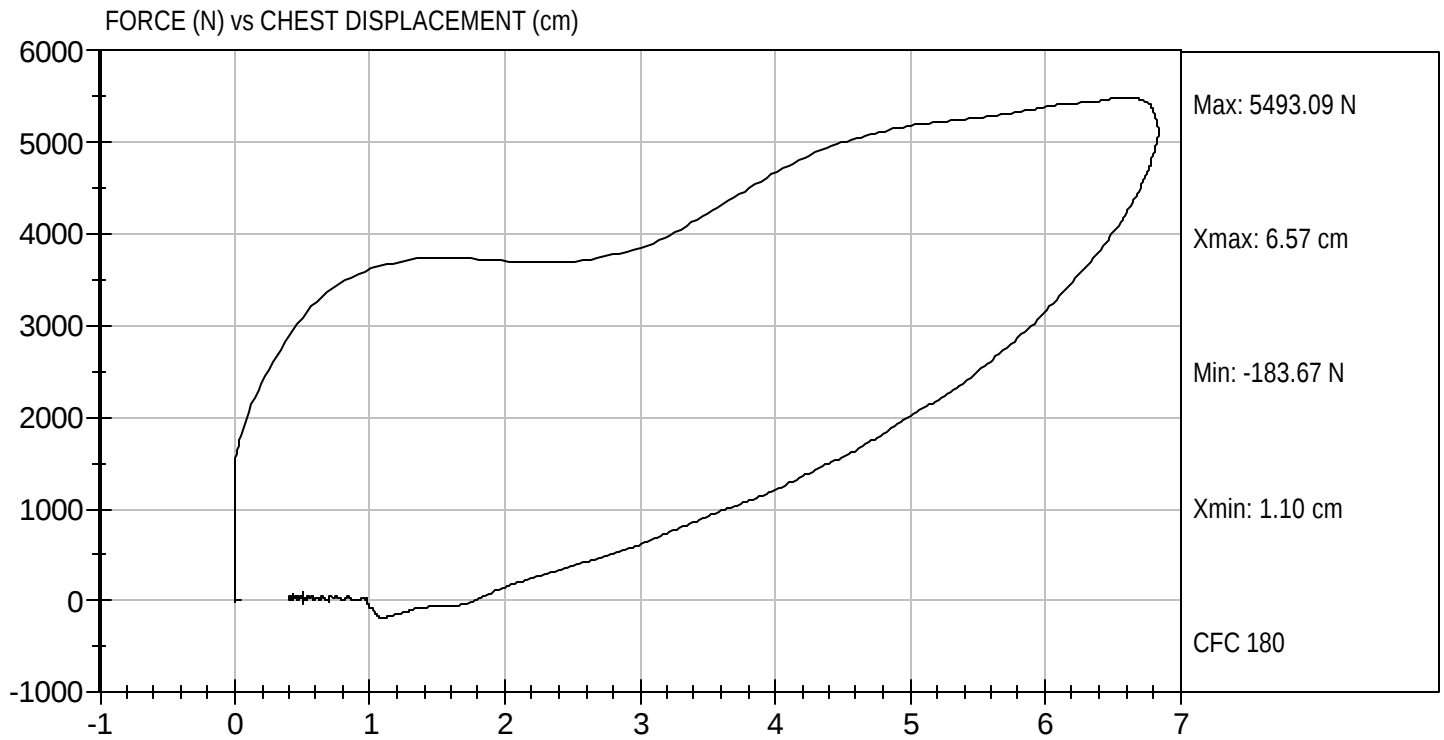

Approved By

09/13/2006
Test Date



Test Desc: Thorax Impact
Componet ID: D062764

Test Date: 09/13/2006
Velocity: 21.82 ft/s, 6.65 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 9/13/06

Technician Tim Bratz

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last knee impact test.
(572.36(m))

 X N/A, ONLY one knee impact test performed

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

 X 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))

 X 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 21.6

Record the minimum temperature 21.0

Record the maximum humidity 56%

Record the minimum humidity 47%

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

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

 X 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))

 X 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))

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

 X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

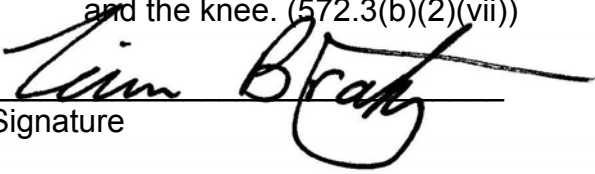
 X 11. Complete the following table:

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	1169

*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

9/13/06
Date

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

ATD Serial No: 401

Test I.D: D062766

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	56	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,199	Pass
Overall Test Results				Pass


Laboratory Technician

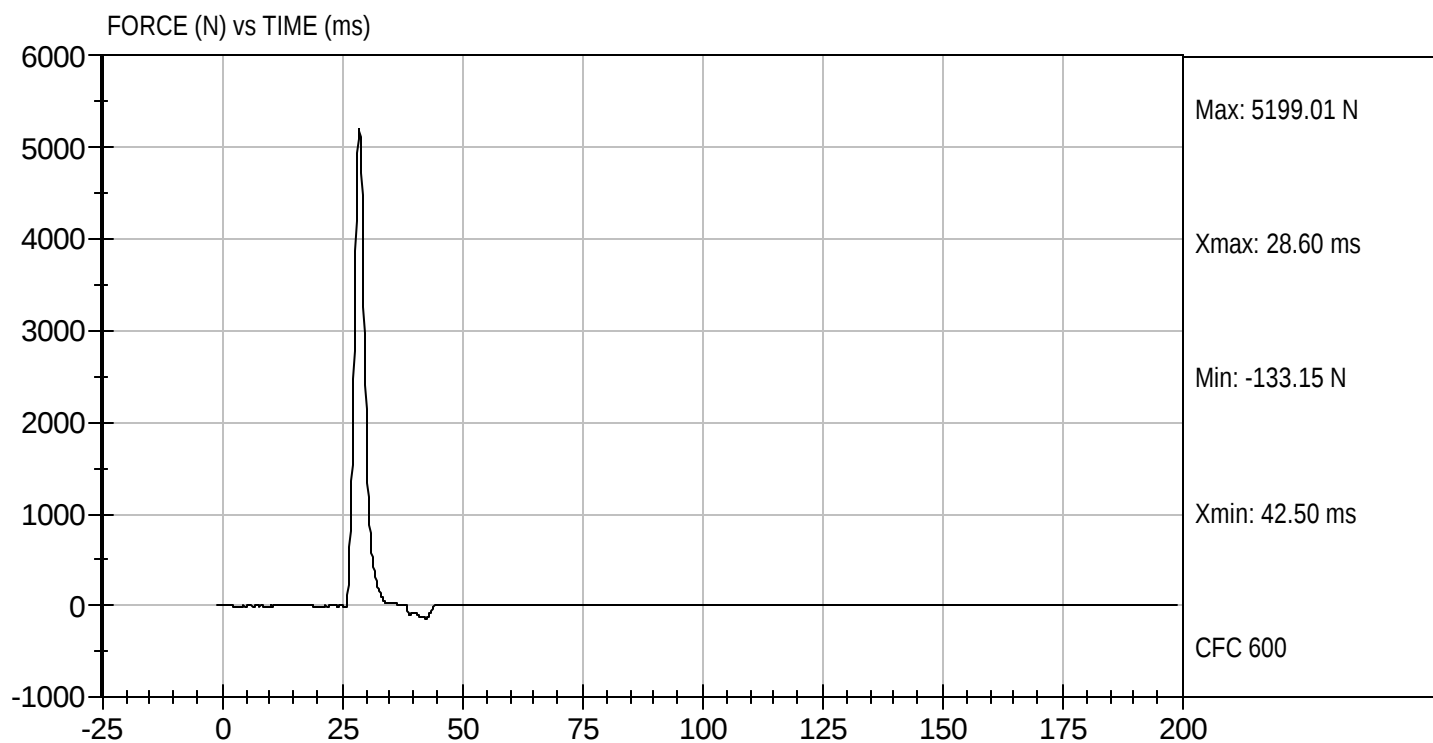
09/13/2006
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D062766

Test Date: 09/13/2006
Velocity: 6.89 ft/s, 2.10 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 9/13/06

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.
(572.36(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 21.6

Record the minimum temperature 21.0

Record the maximum humidity 56%

Record the minimum humidity 47%

☒ 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))

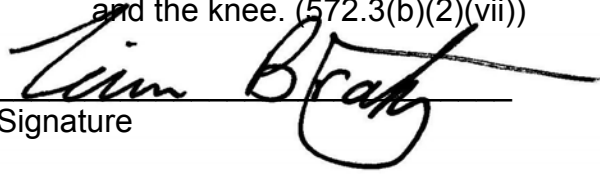
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s $\leq$ speed $\leq$ 7.0 ft/s	6.9
Peak resistance force*	1060 lb $\leq$ force $\leq$ 1300 lb	1113

*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

9/13/06
Date

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

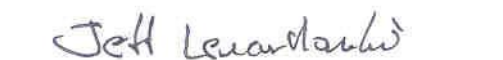
ATD Serial No: 401

Test I.D: D062765

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	55	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	4,952	Pass
Overall Test Results				Pass


Laboratory Technician

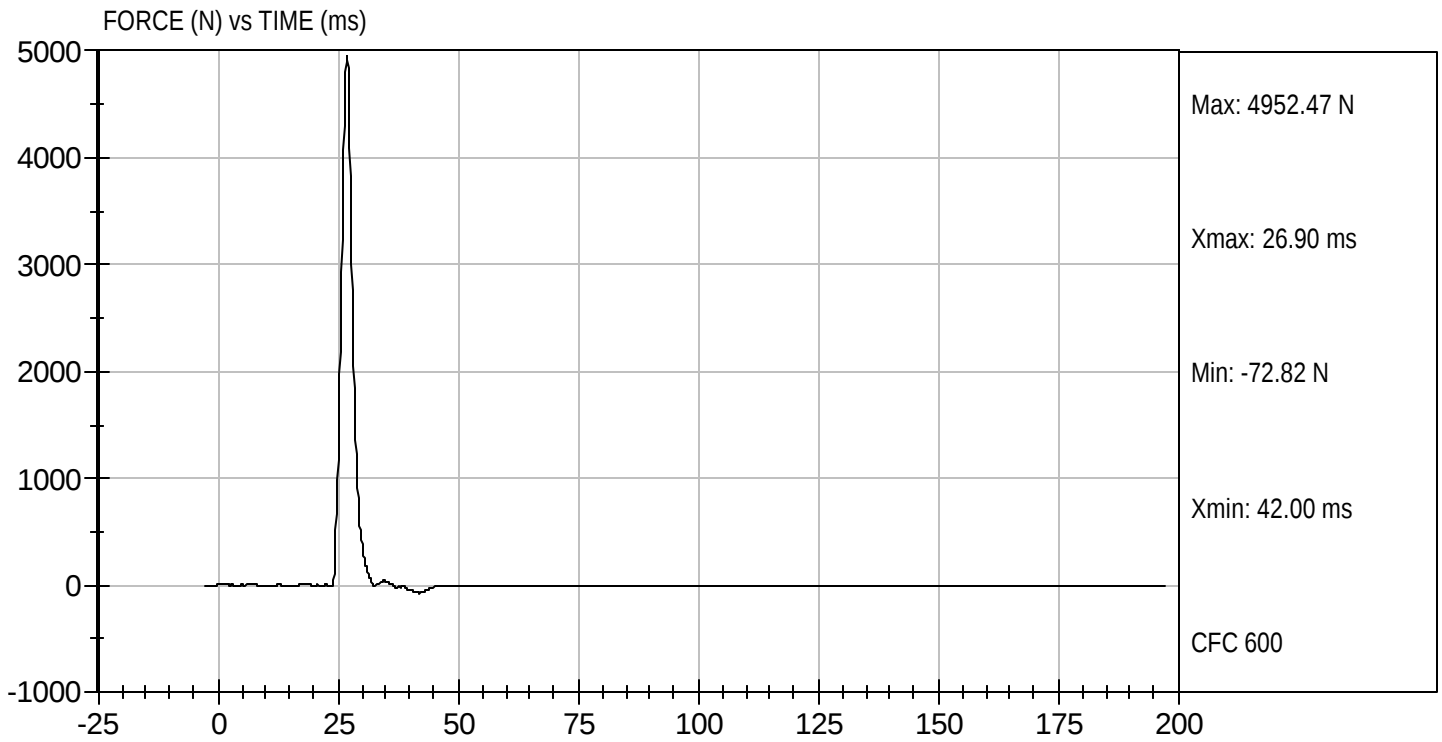
09/13/2006
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D062765

Test Date: 09/13/2006
Velocity: 6.86 ft/s, 2.09 m/s



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

Dummy Serial Number 401

Test Date 9/12/06

Technician Dave Wilcox

 Pretest calibration

X 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))
 X N/A, ONLY one hip joint-femur flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 17A.
- X 3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
 X 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)
 X 3.2 remove the abdominal insert (78051-52)
 X 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).
- X 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>20.9</u> |
| Record the minimum temperature | <u>20.6</u> |
| Record the maximum humidity | <u>47%</u> |
| Record the minimum humidity | <u>44%</u> |
- X 5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
- X 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))
- X 7. Adjust the threaded rods until plane B is horizontal.
- X 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))
- X 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°	$\text{torque} \leq 70 \text{ ft-lbf}$	56
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41

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°	$\text{torque} \leq 70 \text{ ft-lbf}$	61
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41


Signature

9/12/06
Date

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

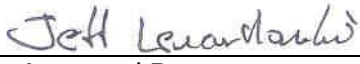
ATD Serial No: 401

Test I.D: D062760

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	47	47	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	82.1	76.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	41	Pass
Overall Test Results					Pass


 Laboratory Technician

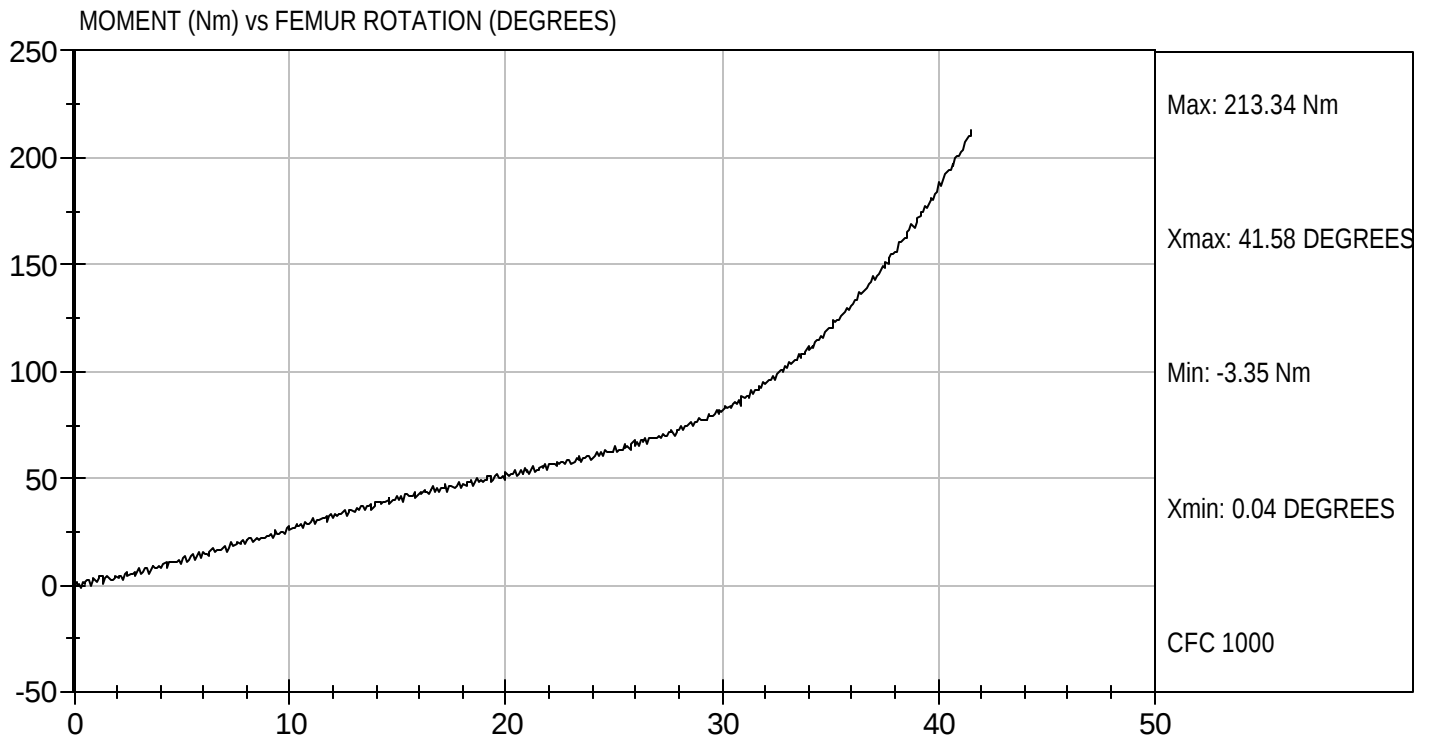
09/12/2006
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D062769

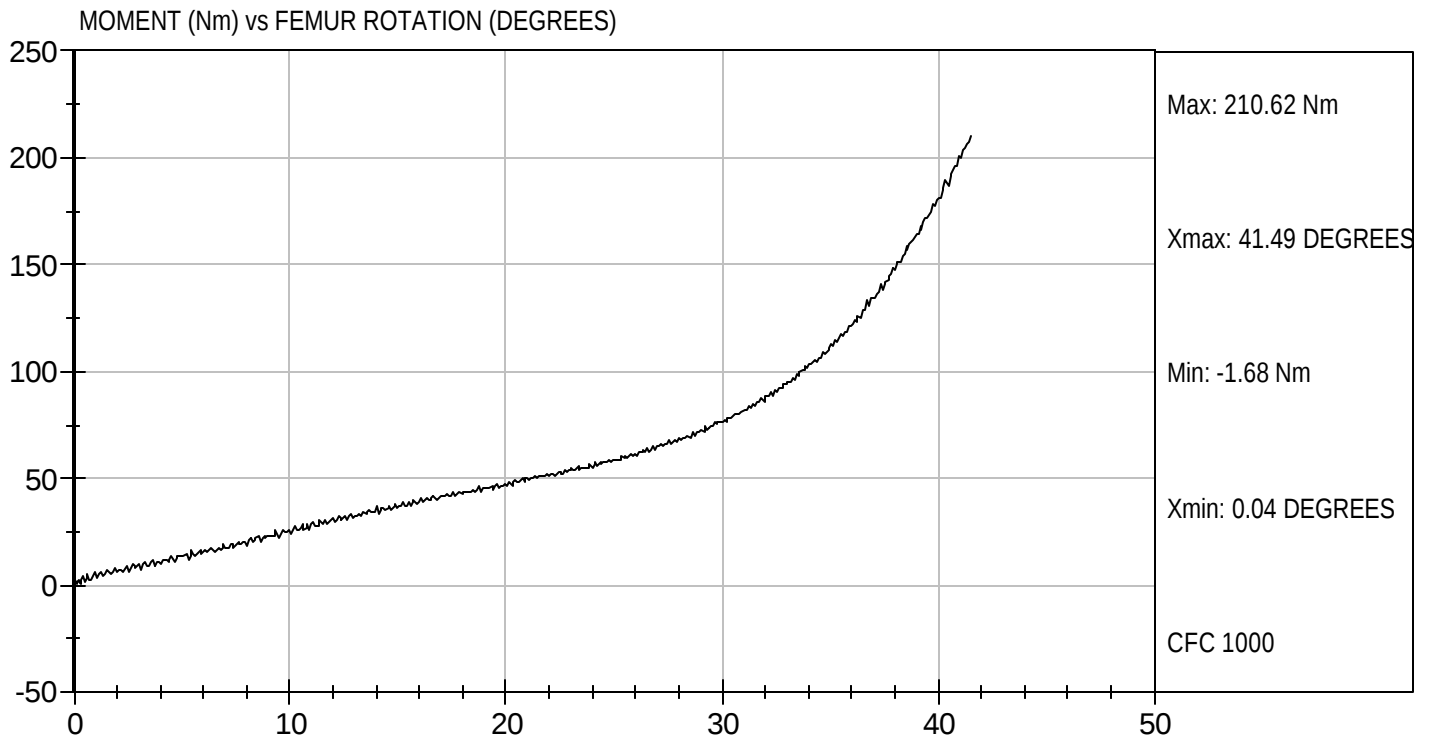
Test Date: 09/12/2006
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D062760

Test Date: 09/12/2006
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 50 th SN #401, SUBPART E EXTERIOR 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 9/12/06

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			
	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

9/13/06
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

9/13/06
Date

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 50 th SN #403, SUBPART E EXTERIOR 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 8/14/06

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 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(ii))

☒ 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 20.9

Record the minimum temperature 20.6

Record the maximum humidity 44%

Record the minimum humidity 42%

☒ 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 $\leq 15 \text{ g}$	9

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


Signature

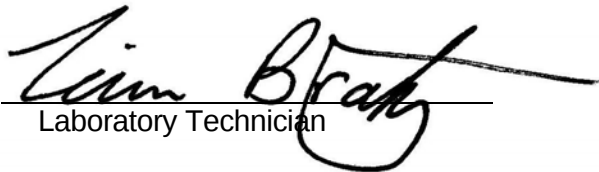
8/14/06
Date

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

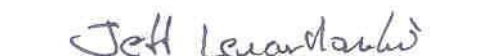
ATD Serial No: 403

Test ID: D062451

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	44	Pass
Peak Resultant Acceleration	G's	225 to 275	260	Pass
Peak Lateral Acceleration	G's	$\leq \pm 15.0$	9.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


 Laboratory Technician

08/14/2006
 Test Date

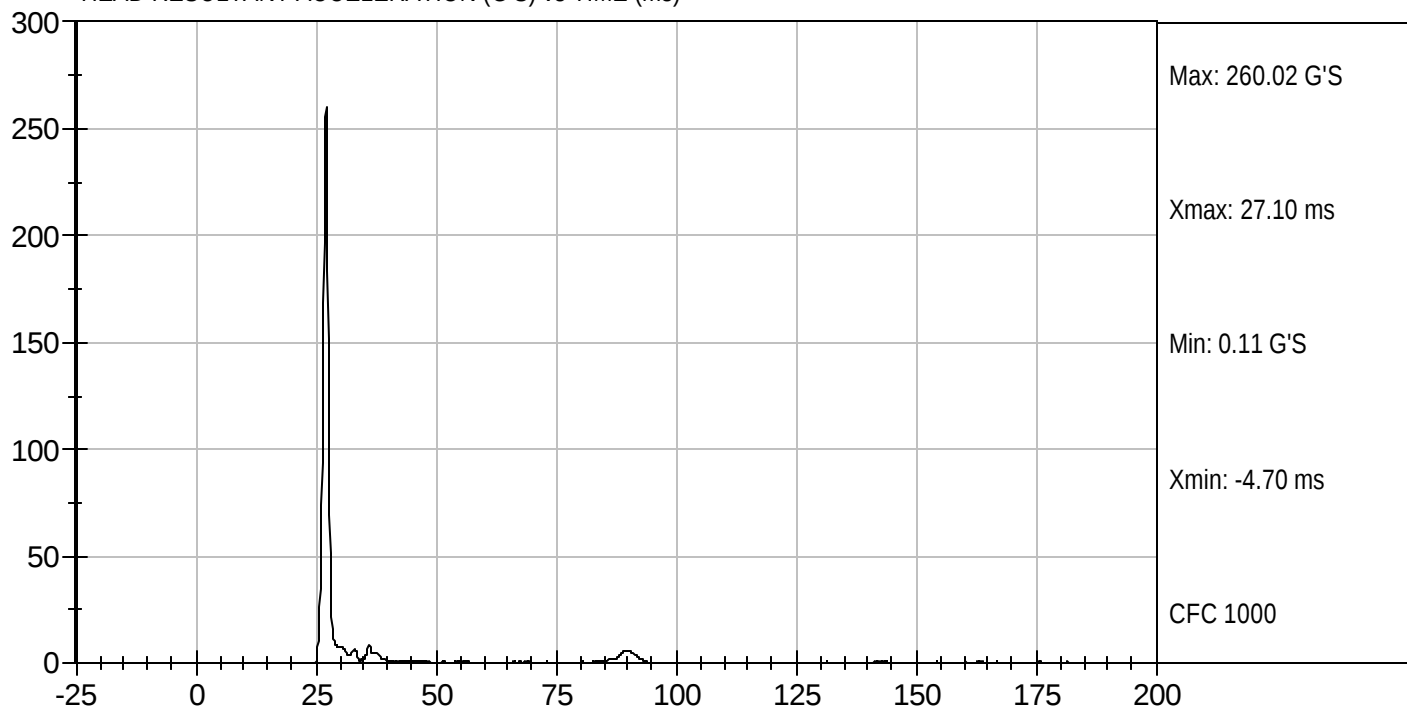

 Approved By



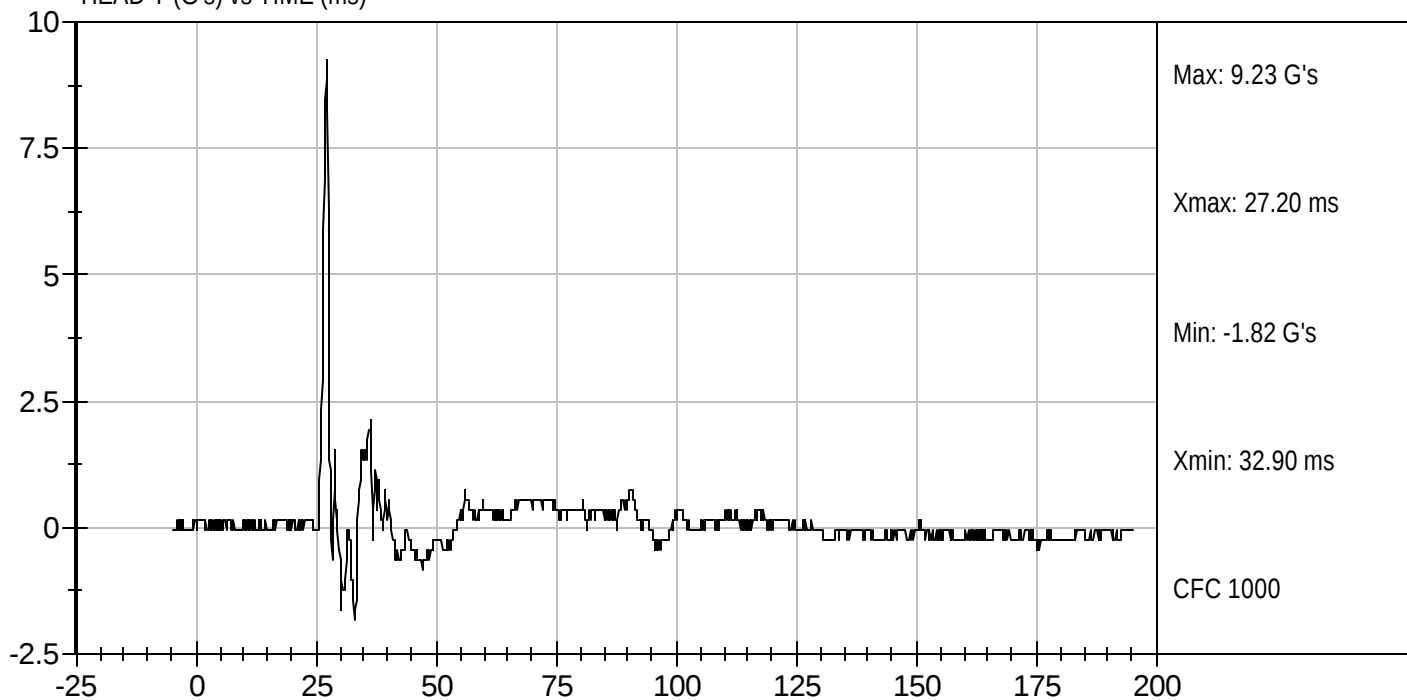
Test Desc: Head Drop
Componet ID: D062451

Test Date: 08/14/2006
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 8/15/06

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. (572.36(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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (78051-90).

Record findings and actions: No Deterioration Hardness Front 82; 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		$22.6 \text{ ft/sec} \leq \text{speed} \leq 23.4 \text{ ft/sec}$	23.1
Pendulum Deceleration Versus Time Pulse	@ 10ms	$22.5 \leq g \leq 27.5$	24.6
	@ 20 ms	$17.6 \leq g \leq 22.6$	20.3
	@30ms	$12.5 \leq g \leq 18.5$	16.0
	Above 30 ms	29 g maximum	16
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	37
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	73
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	59
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	115
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	67
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	51
Time of first decay to 0 lbf- ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	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

8/15/06
Date

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

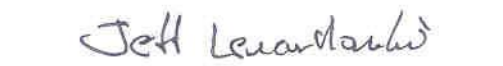
ATD Serial No: 403

Test I.D: D062452

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	43	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.58	Pass
	20 msec	G's	17.60 to 22.60	20.31	Pass
	30 msec	G's	12.50 to 18.50	16.01	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	15.91	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.6	Pass
	Time	msec	57.0 to 64.0	58.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	115.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	90.1	Pass
	Time	msec	47.0 to 58.0	51.2	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	99.2	Pass
Overall Test Results					Pass


 Laboratory Technician

08/15/2006
 Test Date

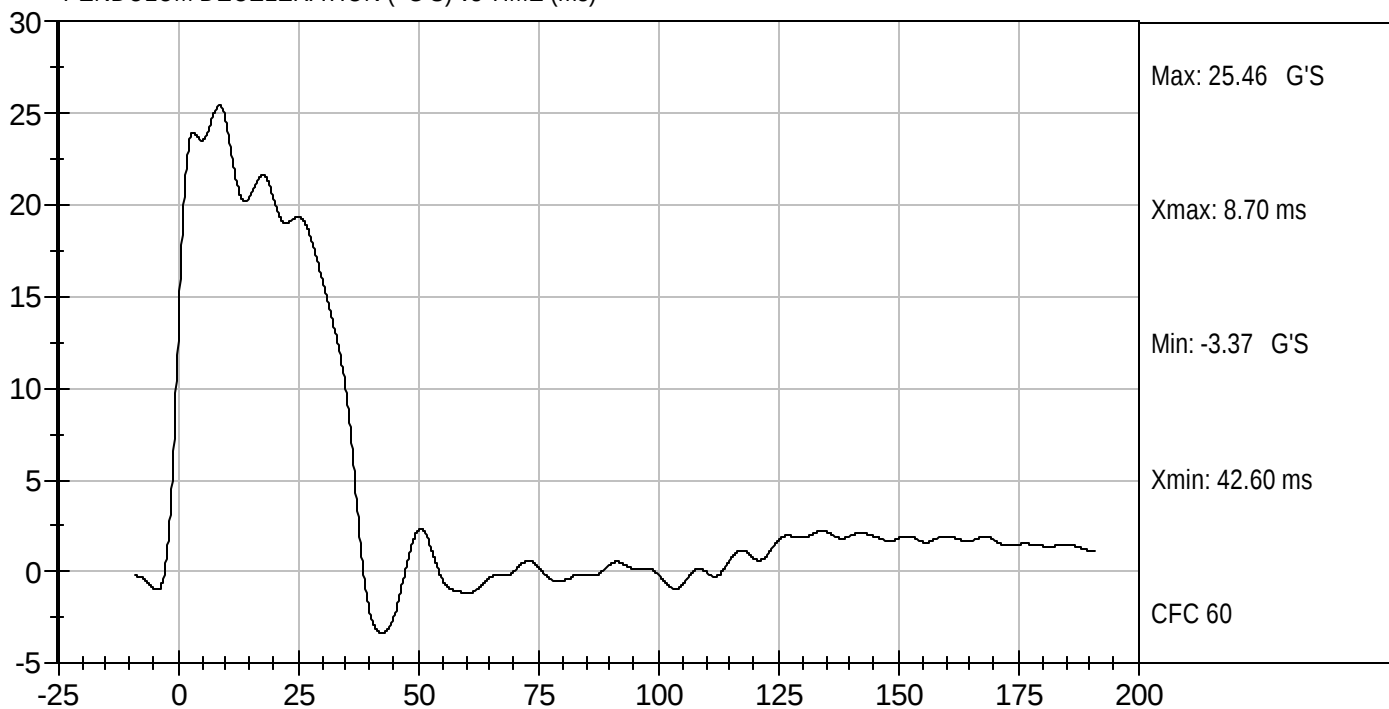

 Approved By



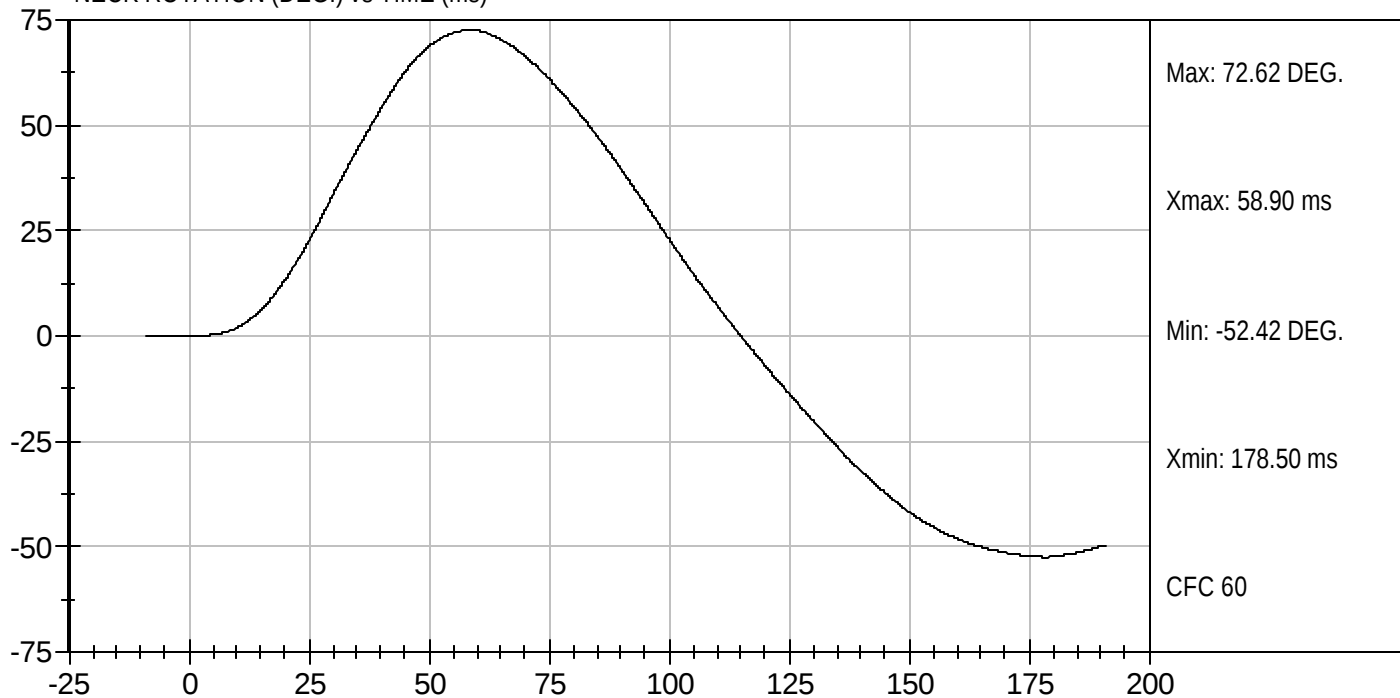
Test Desc: Neck Flexion
Componet ID: D062452

Test Date: 08/15/2006
Velocity: 23.09 ft/s, 7.04 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



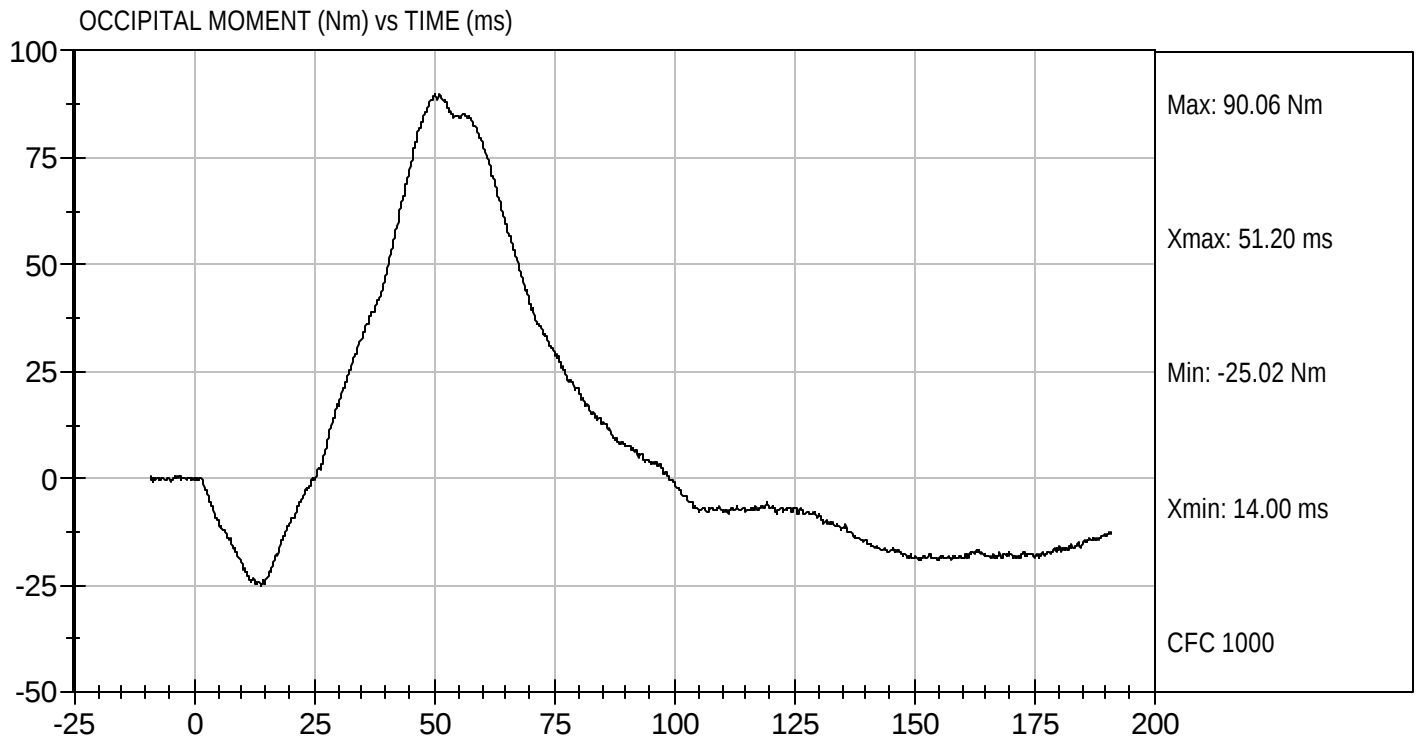
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D062452

Test Date: 08/15/2006
Velocity: 23.09 ft/s, 7.04 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 403

Test Date 8/15/06

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. (572.36(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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration Hardness Front 82; 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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	20.1
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	18.2
	@ 20 ms	$14 \leq g \leq 19$	16.7
	@30ms	$11.0 \leq g \leq 16.0$	13.9
	Above 30 ms	22 g maximum	14
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	41
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	98
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	78
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	159
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-47
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	74
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	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

8/15/06
Date

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

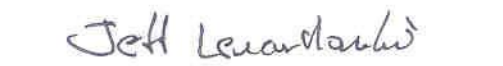
ATD Serial No: 403

Test I.D: D062453

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.20	Pass
	20 msec	G's	14.00 to 19.00	16.73	Pass
	30 msec	G's	11.00 to 16.00	13.92	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	13.89	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	41.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.9	Pass
	Time	msec	72.0 to 82.0	78.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.9	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-63.7	Pass
	Time	msec	65.0 to 79.0	73.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	138.2	Pass
Overall Test Results				Pass	


 Laboratory Technician

08/15/2006
 Test Date

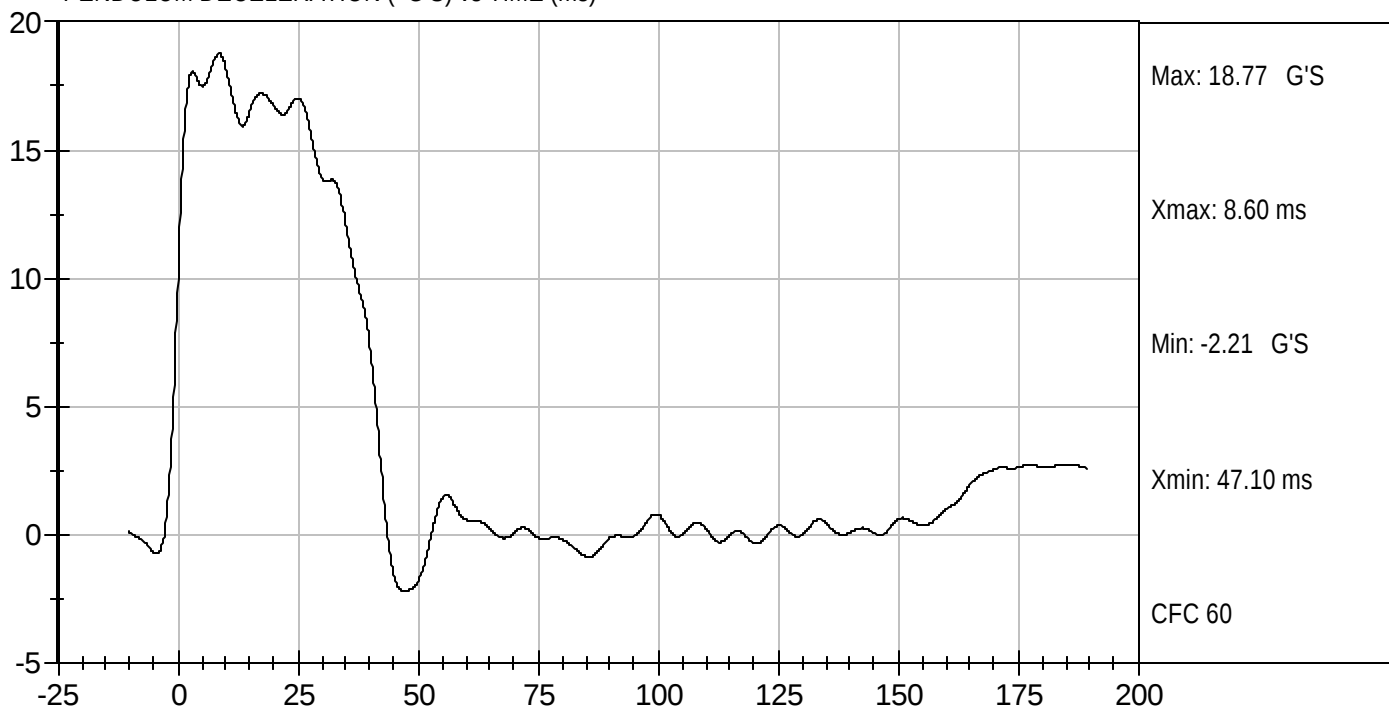

 Approved By



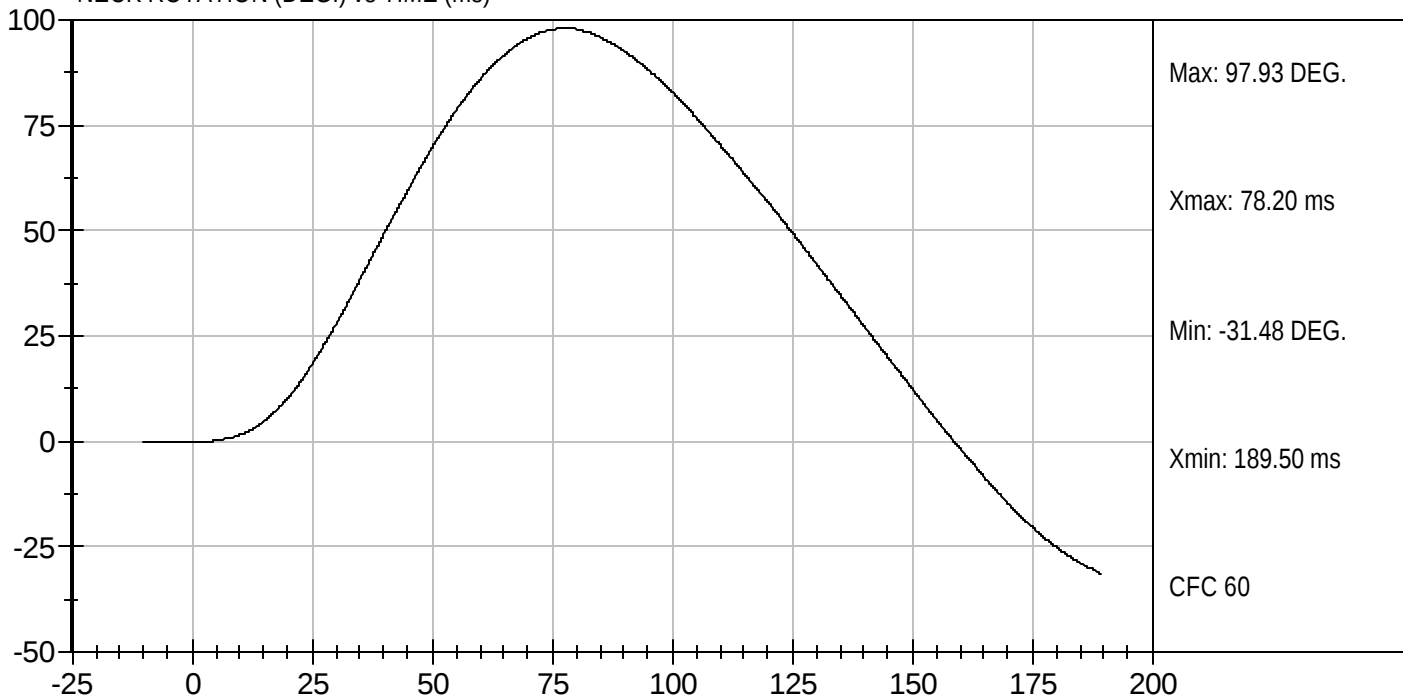
Test Desc: Neck Extension
Componet ID: D062453

Test Date: 08/15/2006
Velocity: 20.1 ft/s, 6.13 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



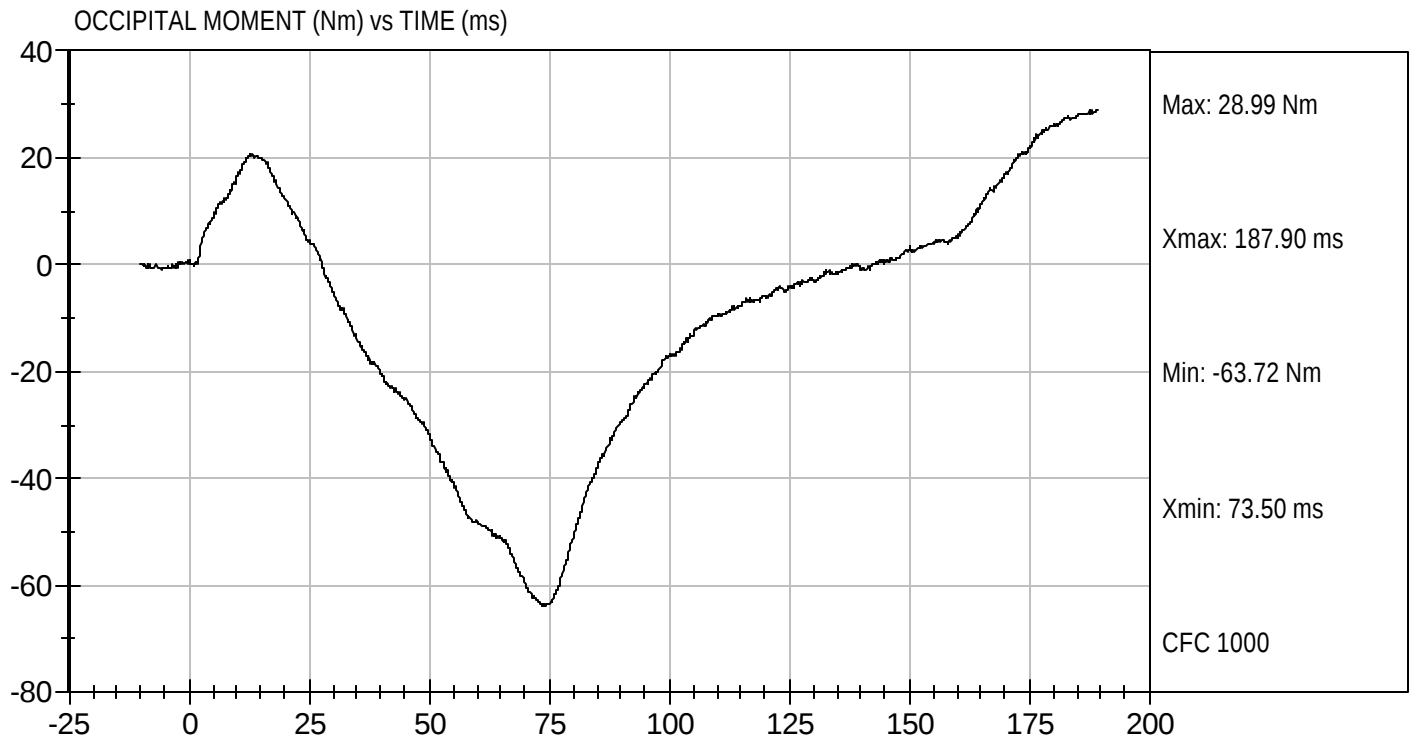
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D062453

Test Date: 08/15/2006
Velocity: 20.1 ft/s, 6.13 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 403 Test Date 8/15/06

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 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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (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	$21.6 \text{ f/s} \leq \text{speed} \leq 22.4 \text{ f/s}$	22.1
Chest Compression	$2.5 \text{ in.} \leq \text{compression} \leq 2.86 \text{ in.}$	2.6
Peak resistance force**	$1160 \text{ lb} \leq \text{peak force} \leq 1325 \text{ lb}$	1275
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	70

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

**Force = impactor mass x acceleration (572.34(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

8/15/06
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D062454

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	41	Pass
Probe Velocity	m/s	6.58 to 6.82	6.72	Pass
Peak Probe Force	N	5159 to 5893	5,670	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.60	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results			Pass	


Laboratory Technician

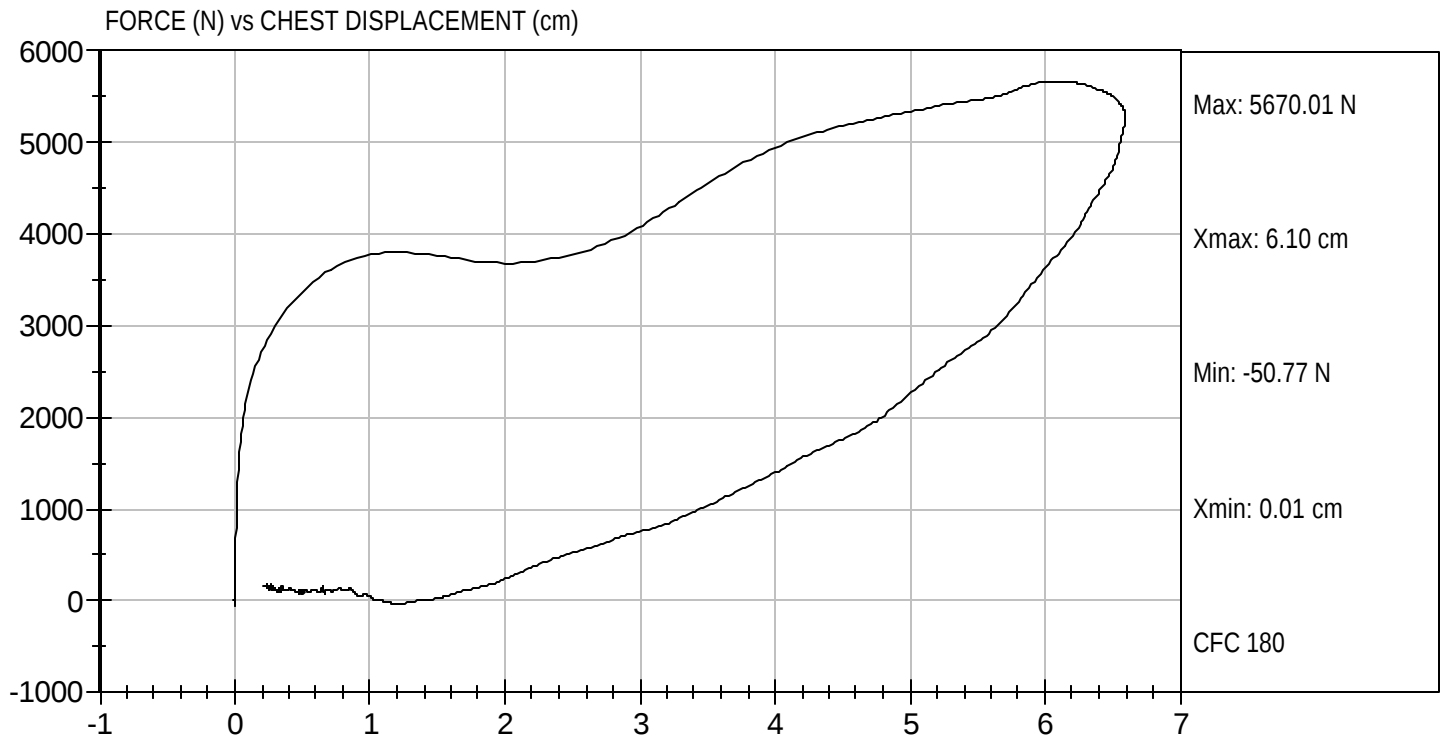
08/15/2006
Test Date


Approved By



Test Desc: Thorax Impact
Componet ID: D062454

Test Date: 08/15/2006
Velocity: 22.05 ft/s, 6.72 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 8/15/06

Technician Tim Bratz

☒ 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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 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))

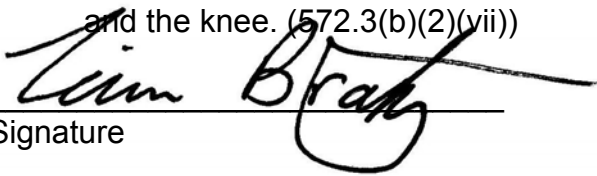
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s $\leq$ speed $\leq$ 7.0 ft/s	6.9
Peak resistance force*	1060 lb $\leq$ force $\leq$ 1300 lb	1124

*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

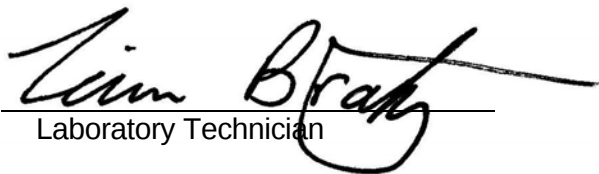
8/15/06
Date

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

ATD Serial No: 403

Test I.D: D062456

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	42	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,999	Pass
Overall Test Results				Pass


Laboratory Technician

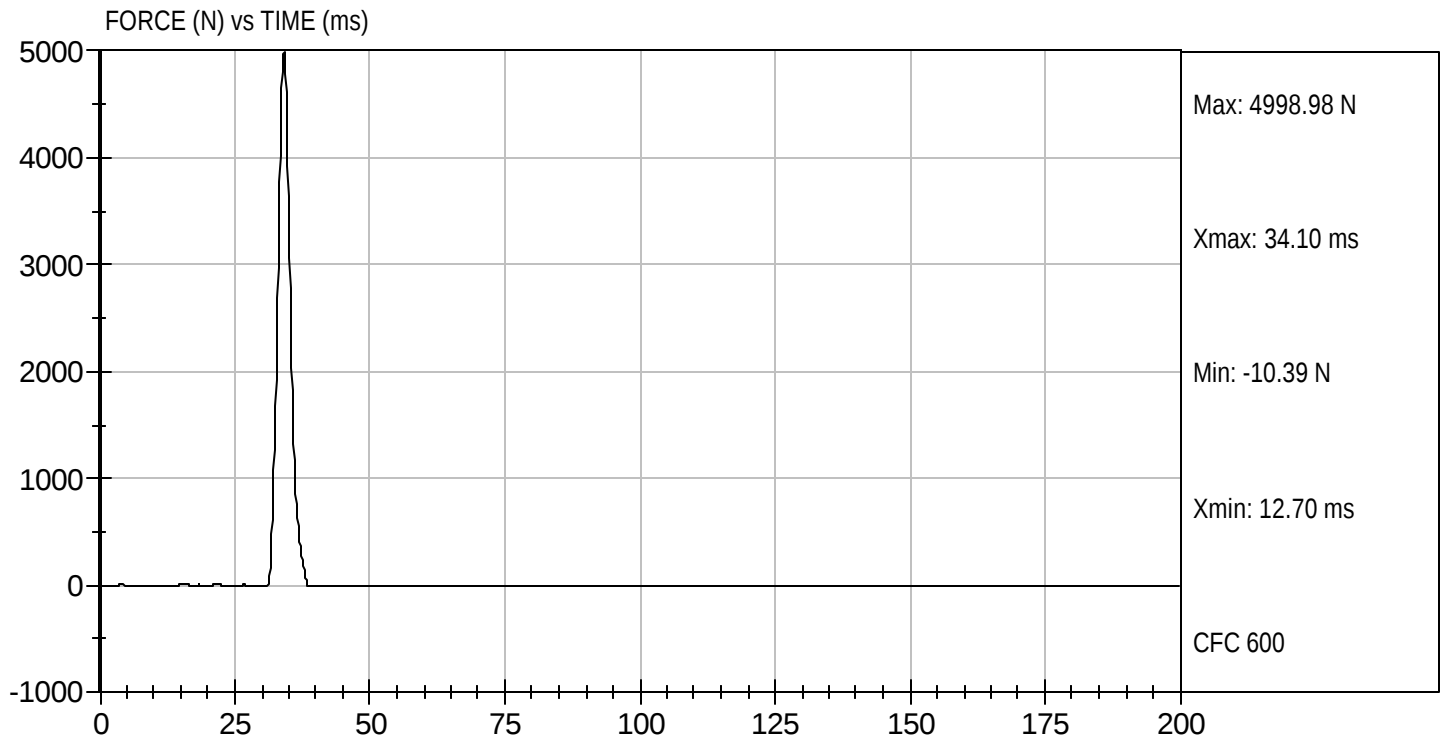
08/15/2006
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D062456

Test Date: 08/15/2006
Velocity: 6.93 ft/s, 2.11 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 8/15/06

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.
(572.36(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 21.8

Record the minimum temperature 20.7

Record the maximum humidity 46%

Record the minimum humidity 40%

☒ 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))

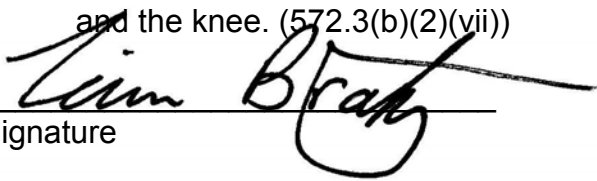
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s $\leq$ speed $\leq$ 7.0 ft/s	6.9
Peak resistance force*	1060 lb $\leq$ force $\leq$ 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

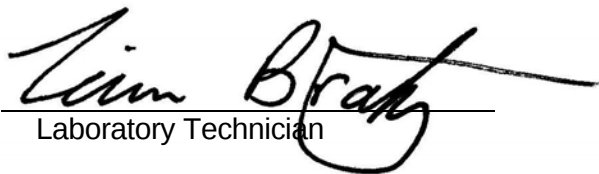
8/15/06
Date

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

ATD Serial No: 403

Test I.D: D062455

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	42	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,094	Pass
Overall Test Results				Pass


Laboratory Technician

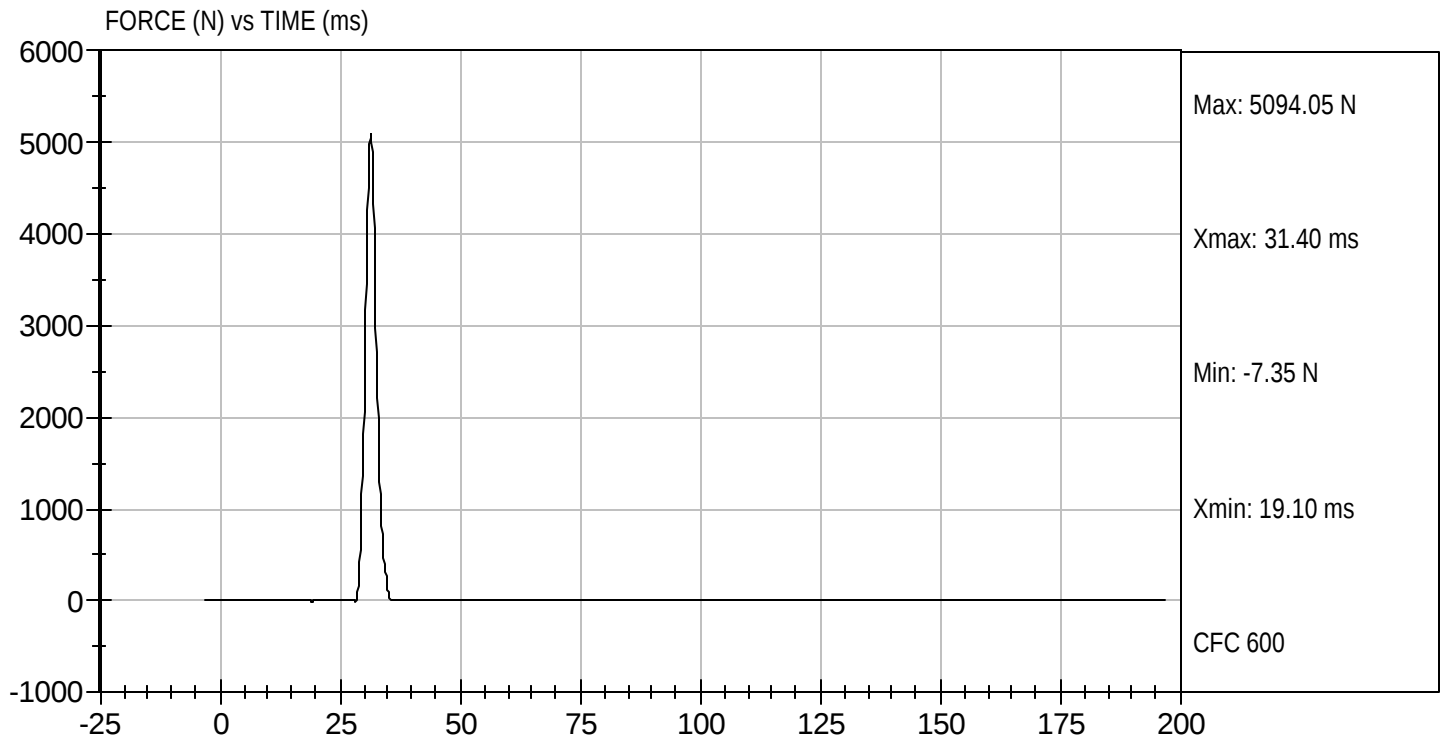
08/15/2006
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D062455

Test Date: 08/15/2006
Velocity: 6.9 ft/s, 2.10 m/s



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

Dummy Serial Number 403

Test Date 8/15/06

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>21.8</u> |
| Record the minimum temperature | <u>20.7</u> |
| Record the maximum humidity | <u>46%</u> |
| Record the minimum humidity | <u>40%</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°	$\text{torque} \leq 70 \text{ ft-lbf}$	62
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41

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°	$\text{torque} \leq 70 \text{ ft-lbf}$	68
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42


Signature

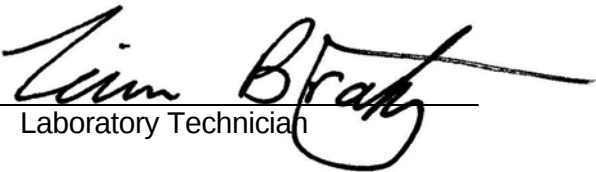
8/15/06
Date

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

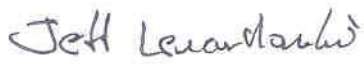
ATD Serial No: 403

Test I.D: D062459

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	44	44	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	91.7	83.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	41	Pass
Overall Test Results				Pass	


 Laboratory Technician

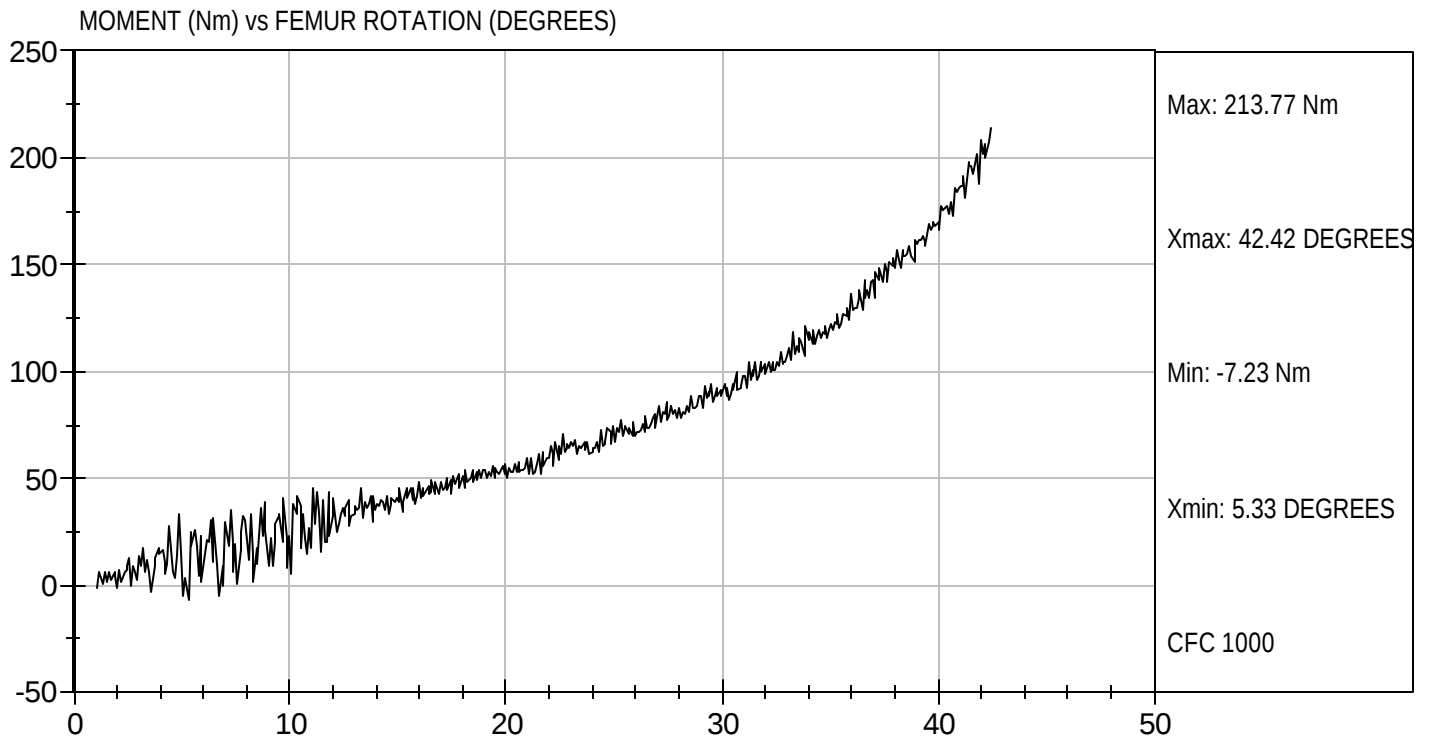
08/15/2006
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D062459

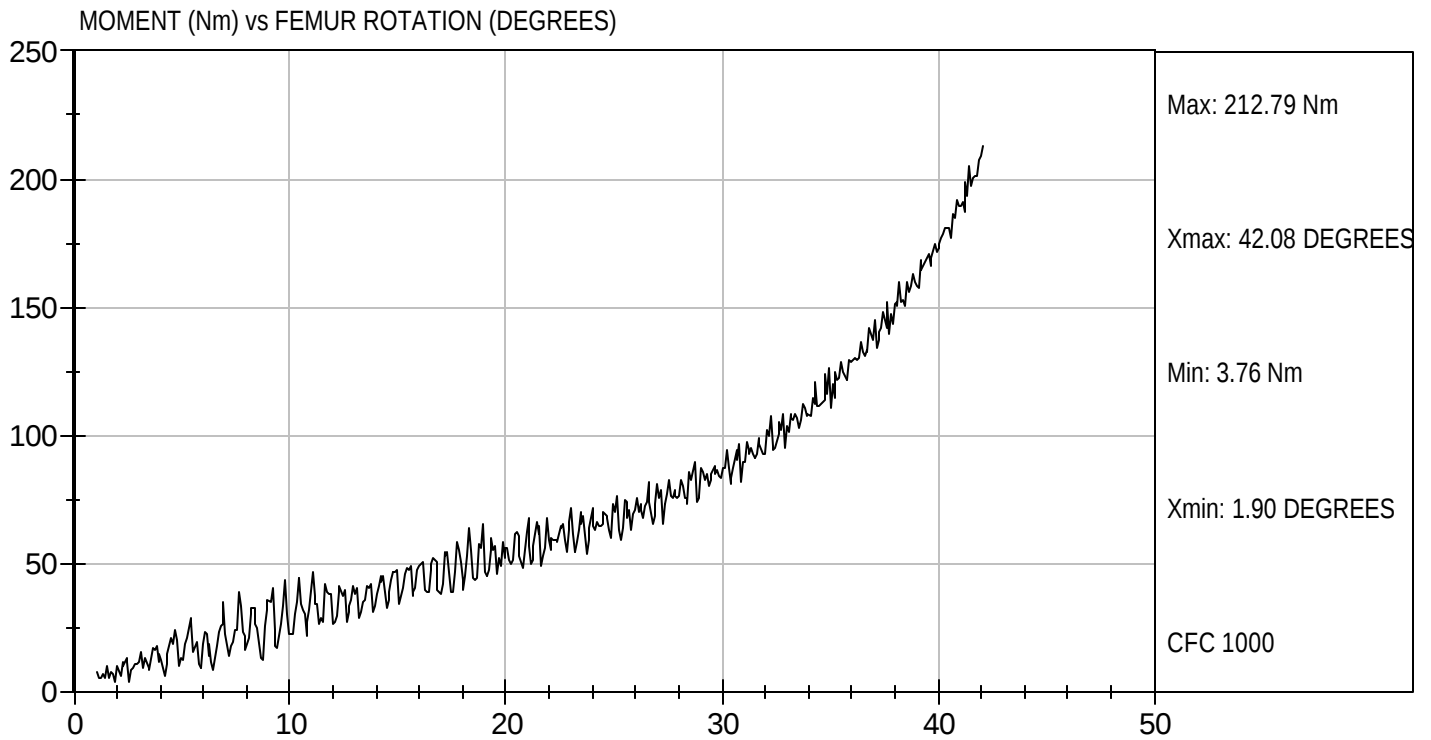
Test Date: 08/15/2006
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D062450

Test Date: 08/15/2006
Velocity: 0 ft/s, 0.00 m/s



DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 403

Test Date 9/13/06

Technician Tim Bratz

 Pretest calibration

X Post test calibration verification

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

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

X N/A, ONLY one head drop performed

X 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))

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

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

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

X 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 21.6

Record the minimum temperature 20.9

Record the maximum humidity 56%

Record the minimum humidity 47%

X 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.

X 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	$225 \text{ g} \leq x \leq 275 \text{ g}$	244
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

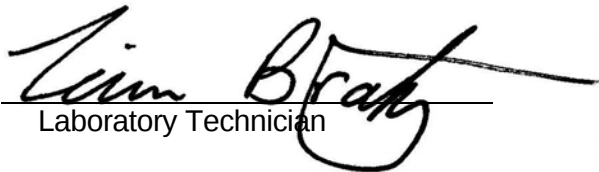
9/13/06
Date

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

ATD Serial No: 403

Test ID: D062771

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Peak Resultant Acceleration	G's	225 to 275	244	Pass
Peak Lateral Acceleration	G's	$\leq \pm 15.0$	-6.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

09/13/2006
Test Date

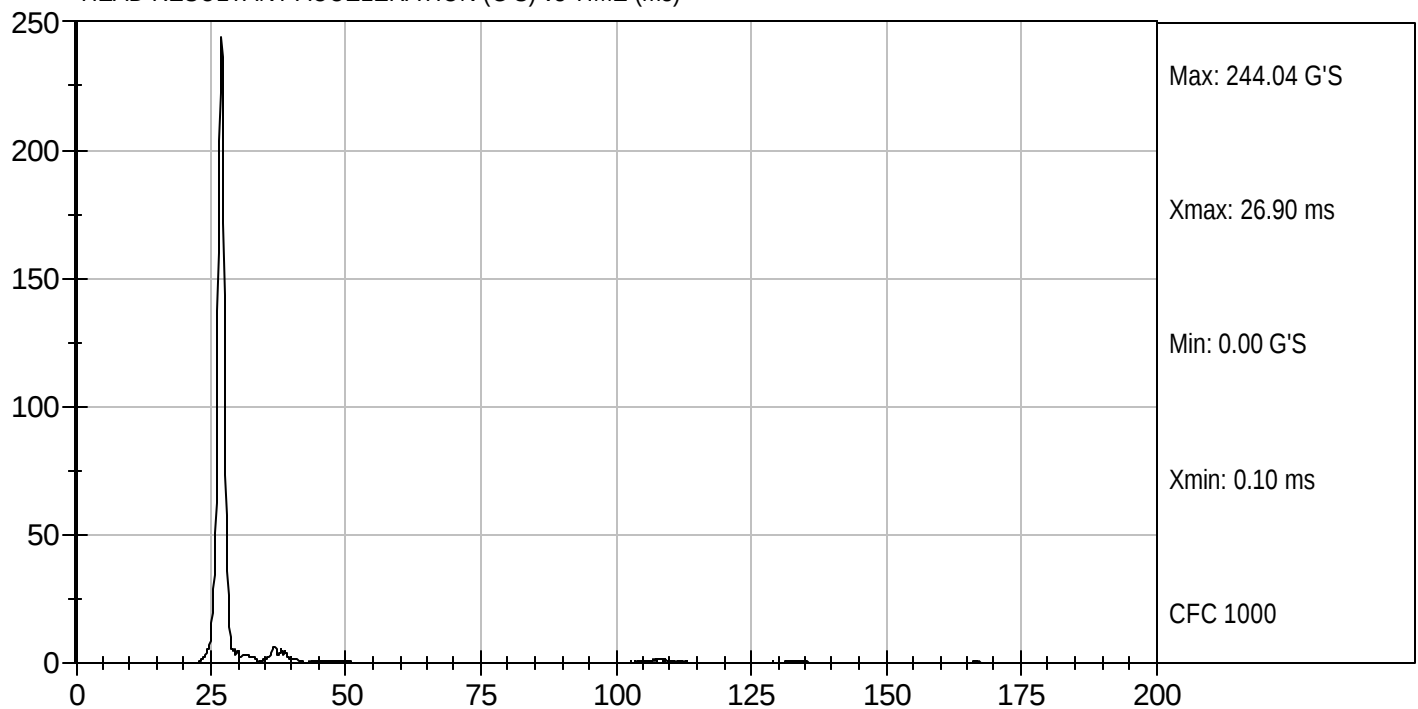

Approved By



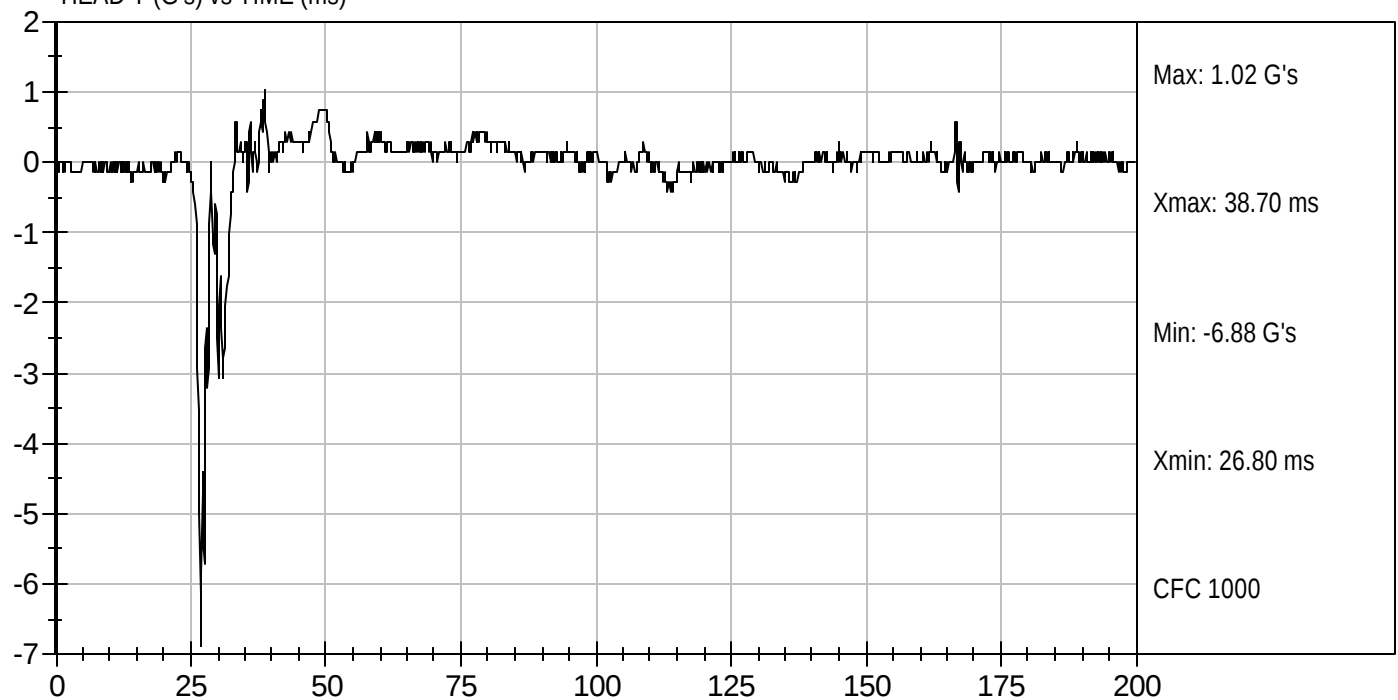
Test Desc: Head Impact
Componet ID: D062771

Test Date: 09/13/2006
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 9/13/06

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. (572.36(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 21.6

Record the minimum temperature 20.9

Record the maximum humidity 56%

Record the minimum humidity 47%

☒ 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 82; 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		$22.6 \text{ ft/sec} \leq \text{speed} \leq 23.4 \text{ ft/sec}$	22.9
Pendulum Deceleration Versus Time Pulse	@ 10ms	$22.5 \leq g \leq 27.5$	24.4
	@ 20 ms	$17.6 \leq g \leq 22.6$	20.8
	@30ms	$12.5 \leq g \leq 18.5$	14.0
	Above 30 ms	29 g maximum	14
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	37
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	74
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	58
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	116
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	71
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	49
Time of first decay to 0 lbf- ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	100

*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

9/13/06
Date

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

ATD Serial No: 403

Test I.D: D062772

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	47	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.99	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.43	Pass
	20 msec	G's	17.60 to 22.60	20.78	Pass
	30 msec	G's	12.50 to 18.50	13.97	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 29.0	13.93	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	74.2	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	116.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	96.3	Pass
	Time	msec	47.0 to 58.0	49.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.0	Pass
Overall Test Results				Pass	


 Laboratory Technician

09/13/2006
 Test Date

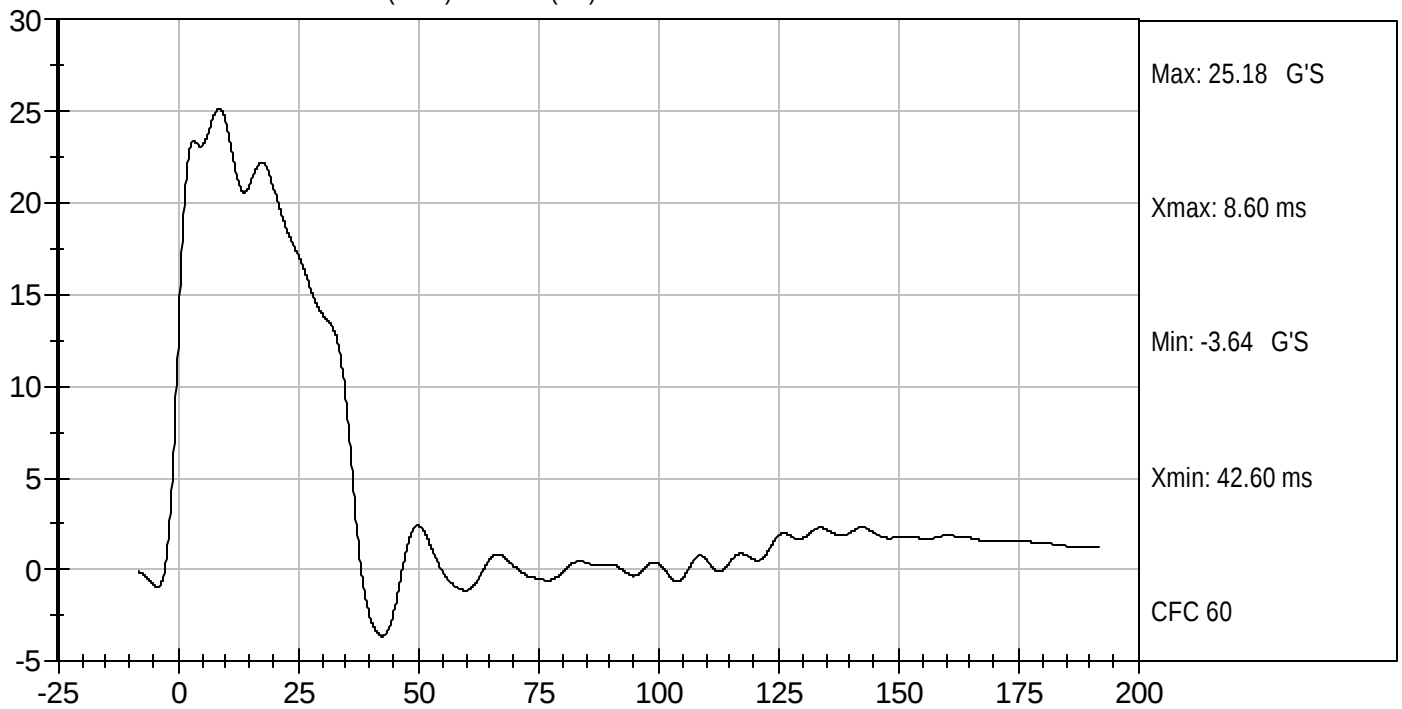

 Approved By



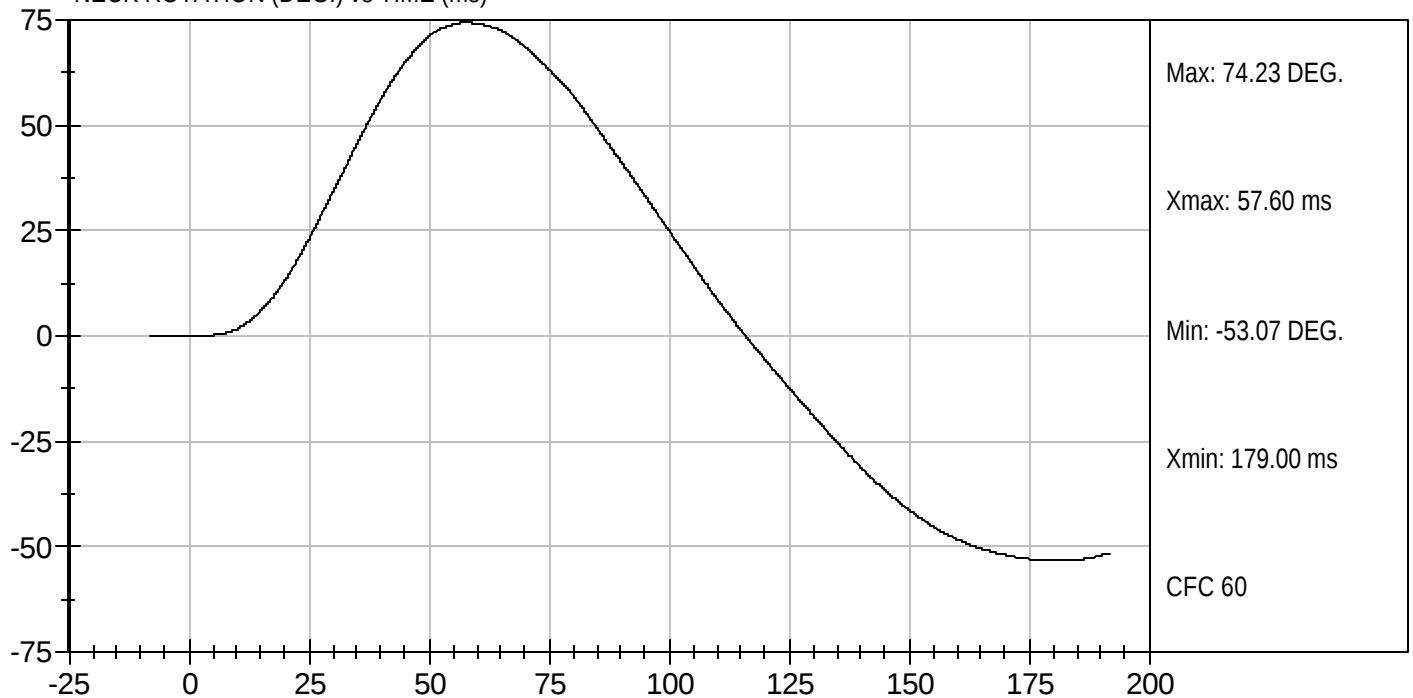
Test Desc: Neck Flexion
Componet ID: D062772

Test Date: 09/13/2006
Velocity: 22.94 ft/s, 6.99 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



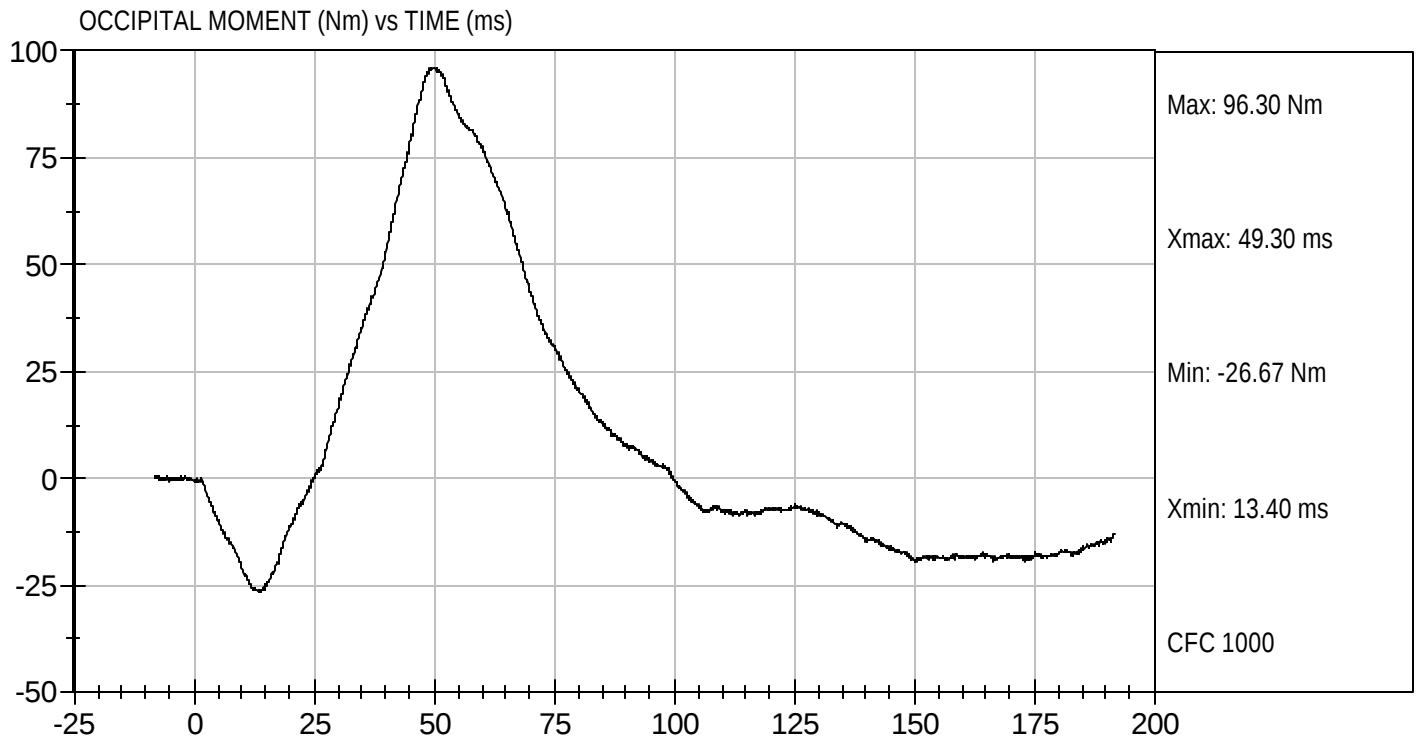
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D062772

Test Date: 09/13/2006
Velocity: 22.94 ft/s, 6.99 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 403

Test Date 9/13/06

Technician Tim Bratz

 Pretest calibration

X 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))

 X N/A, ONLY one extension test performed

X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.33(b))

X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 20.9

Record the maximum humidity 56%

Record the minimum humidity 47%

X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made. Record findings and actions: No Damage.

X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration.

Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration Hardness Front 82; 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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	20.1
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	19.3
	@ 20 ms	$14 \leq g \leq 19$	16.3
	@30ms	$11.0 \leq g \leq 16.0$	13.1
	Above 30 ms	22 g maximum	13
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	40
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	103
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	78
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	160
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-55
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	74
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	140

*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

9/13/06
Date

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

ATD Serial No: 403

Test I.D: D062773

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.34	Pass
	20 msec	G's	14.00 to 19.00	16.34	Pass
	30 msec	G's	11.00 to 16.00	13.06	Pass
Peak Pendulum Deceleration After 30 msec		G's	≤ 22.0	13.18	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	102.6	Pass
	Time	msec	72.0 to 82.0	77.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	160.2	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-74.1	Pass
	Time	msec	65.0 to 79.0	73.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	139.9	Pass
Overall Test Results				Pass	


 Laboratory Technician

09/13/2006
 Test Date

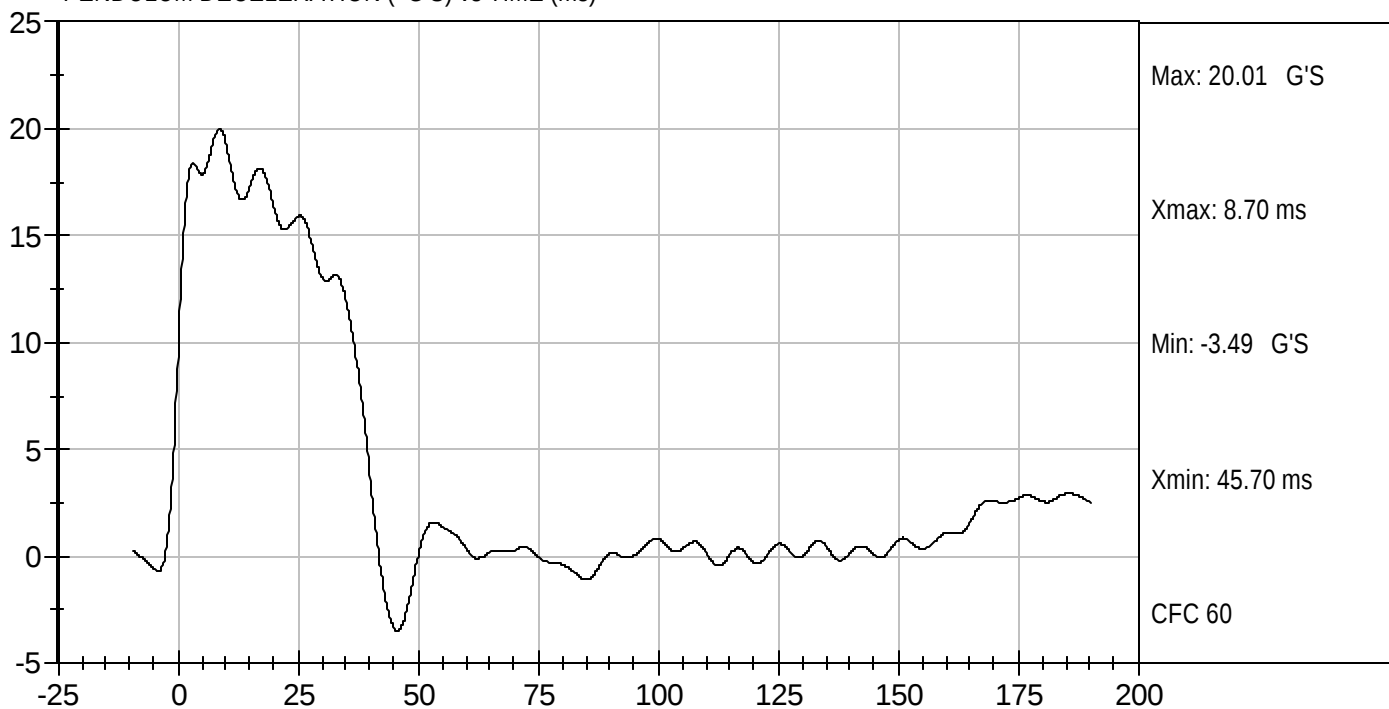

 Approved By



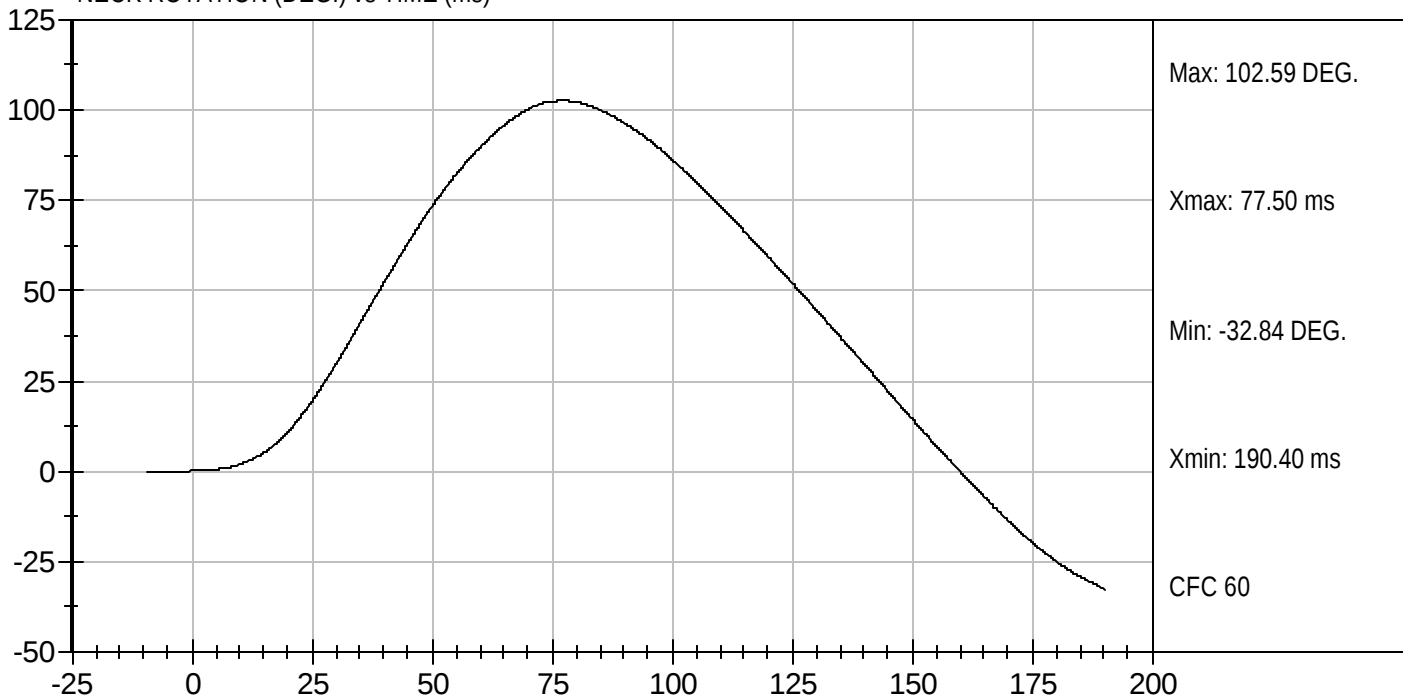
Test Desc: Neck Extension
Componet ID: D062773

Test Date: 09/13/2006
Velocity: 20.1 ft/s, 6.13 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



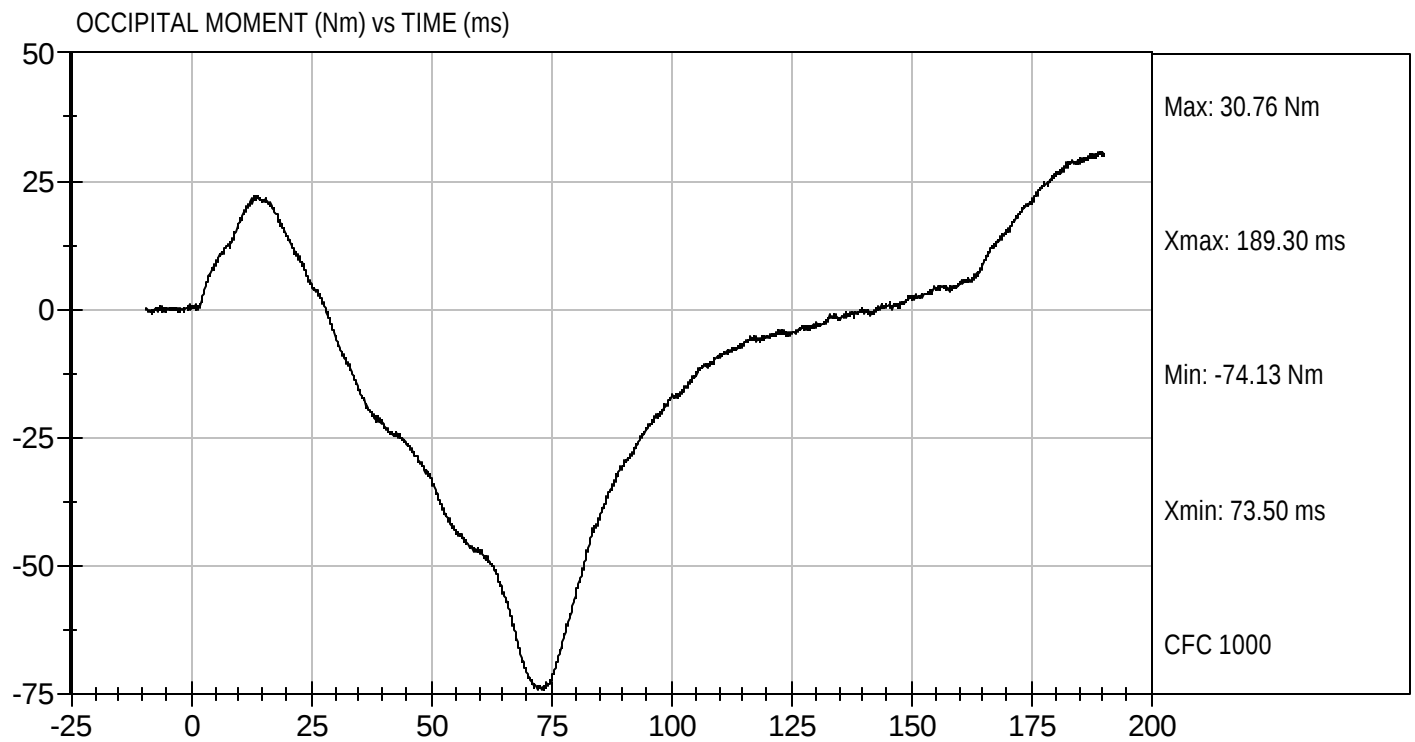
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D062773

Test Date: 09/13/2006
Velocity: 20.1 ft/s, 6.13 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 403

Test Date 9/13/06

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 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 21.6

Record the minimum temperature 20.9

Record the maximum humidity 56%

Record the minimum humidity 47%

☒ 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	$21.6 \text{ f/s} \leq \text{speed} \leq 22.4 \text{ f/s}$	22.1
Chest Compression	$2.5 \text{ in.} \leq \text{compression} \leq 2.86 \text{ in.}$	2.70
Peak resistance force**	$1160 \text{ lb} \leq \text{peak force} \leq 1325 \text{ lb}$	1256
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	70

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

**Force = impactor mass x acceleration (572.34(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

9/13/06
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D062774

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	6.58 to 6.82	6.74	Pass
Peak Probe Force	N	5159 to 5893	5,589	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.85	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results			Pass	


Laboratory Technician

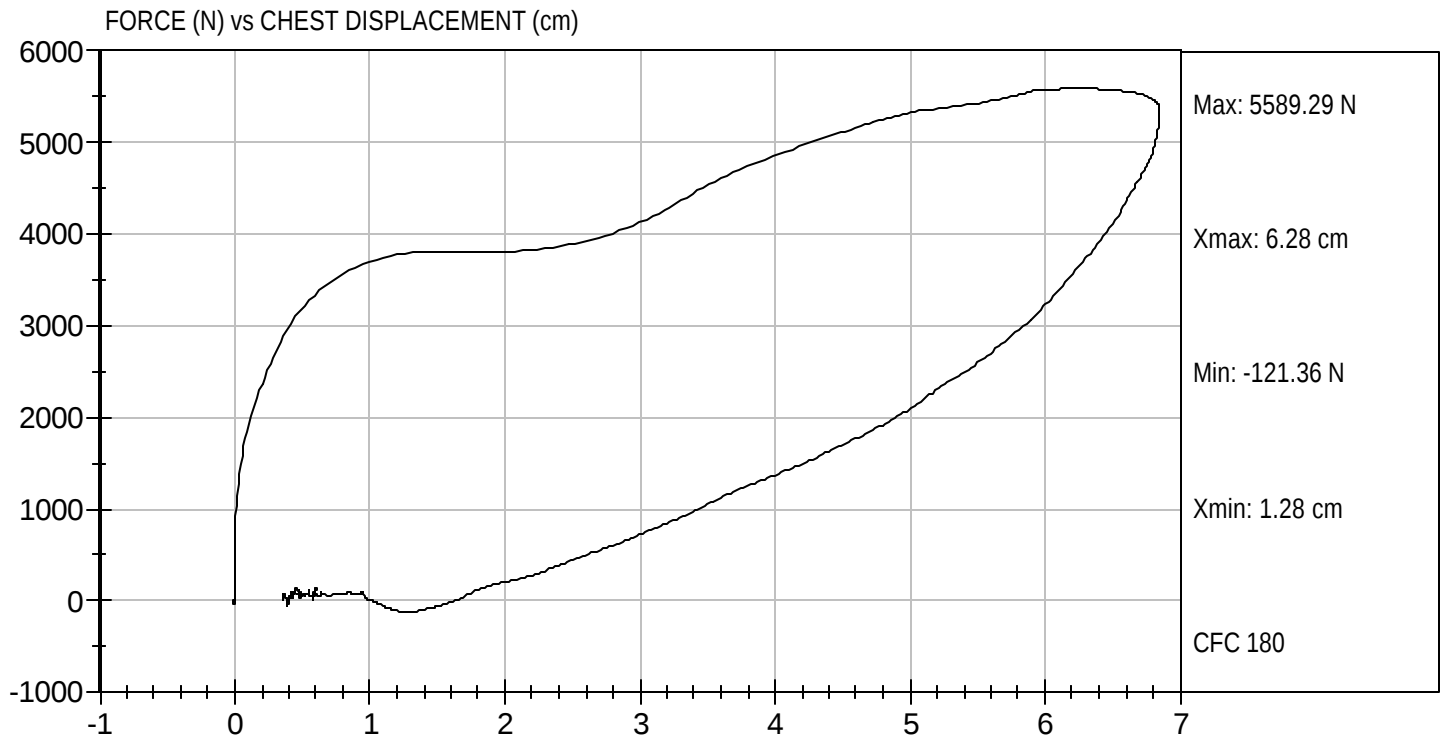
09/13/2006
Test Date


Approved By



Test Desc: Thorax Impact
Componet ID: D062774

Test Date: 09/13/2006
Velocity: 22.11 ft/s, 6.74 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 9/13/06

Technician Tim Bratz

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last knee impact test.
(572.36(m))

X N/A, ONLY one knee impact test performed

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

X 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))

X 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 21.6

Record the minimum temperature 20.9

Record the maximum humidity 56%

Record the minimum humidity 47%

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

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

X 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))

X 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))

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

X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

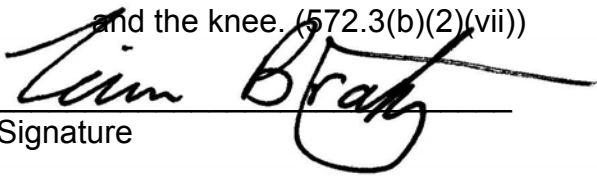
X 11. Complete the following table:

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	1076

*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

8/15/06
Date

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

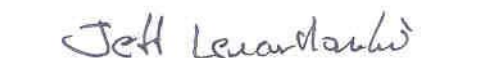
ATD Serial No: 403

Test I.D: D062776

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	55	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	4,785	Pass
Overall Test Results				Pass


Laboratory Technician

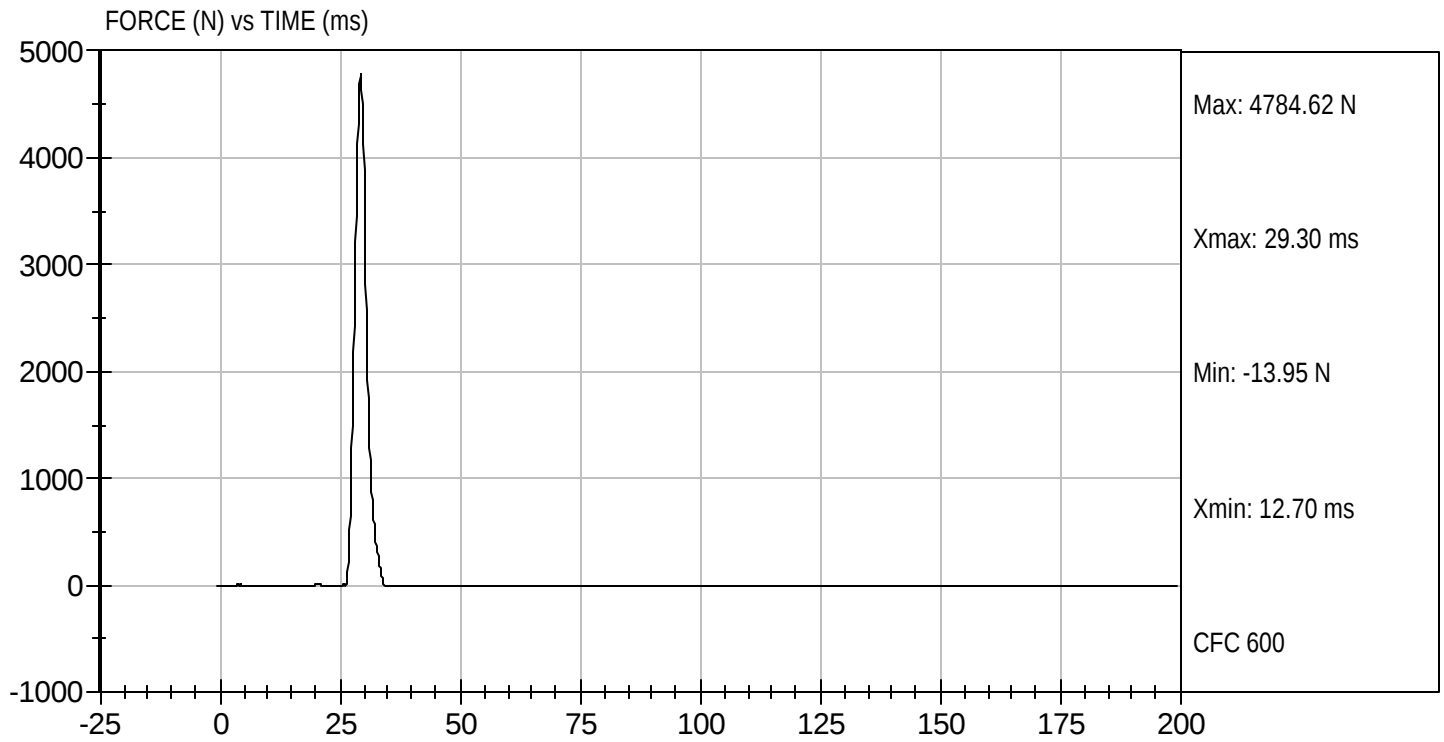
09/13/2006
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D062776

Test Date: 09/13/2006
Velocity: 6.87 ft/s, 2.09 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 9/13/06

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.
(572.36(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 21.6

Record the minimum temperature 20.9

Record the maximum humidity 56%

Record the minimum humidity 47%

☒ 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))

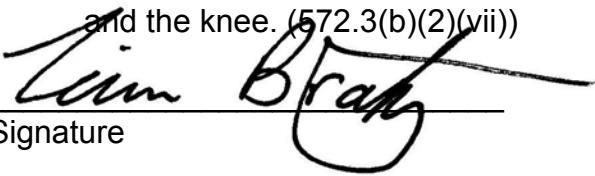
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s $\leq$ speed $\leq$ 7.0 ft/s	6.9
Peak resistance force*	1060 lb $\leq$ force $\leq$ 1300 lb	1080

*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

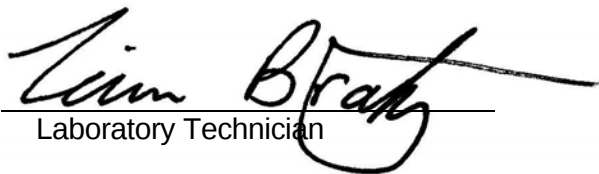
9/13/06
Date

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

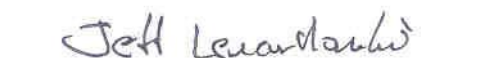
ATD Serial No: 403

Test I.D: D062775

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	56	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,803	Pass
Overall Test Results				Pass


Laboratory Technician

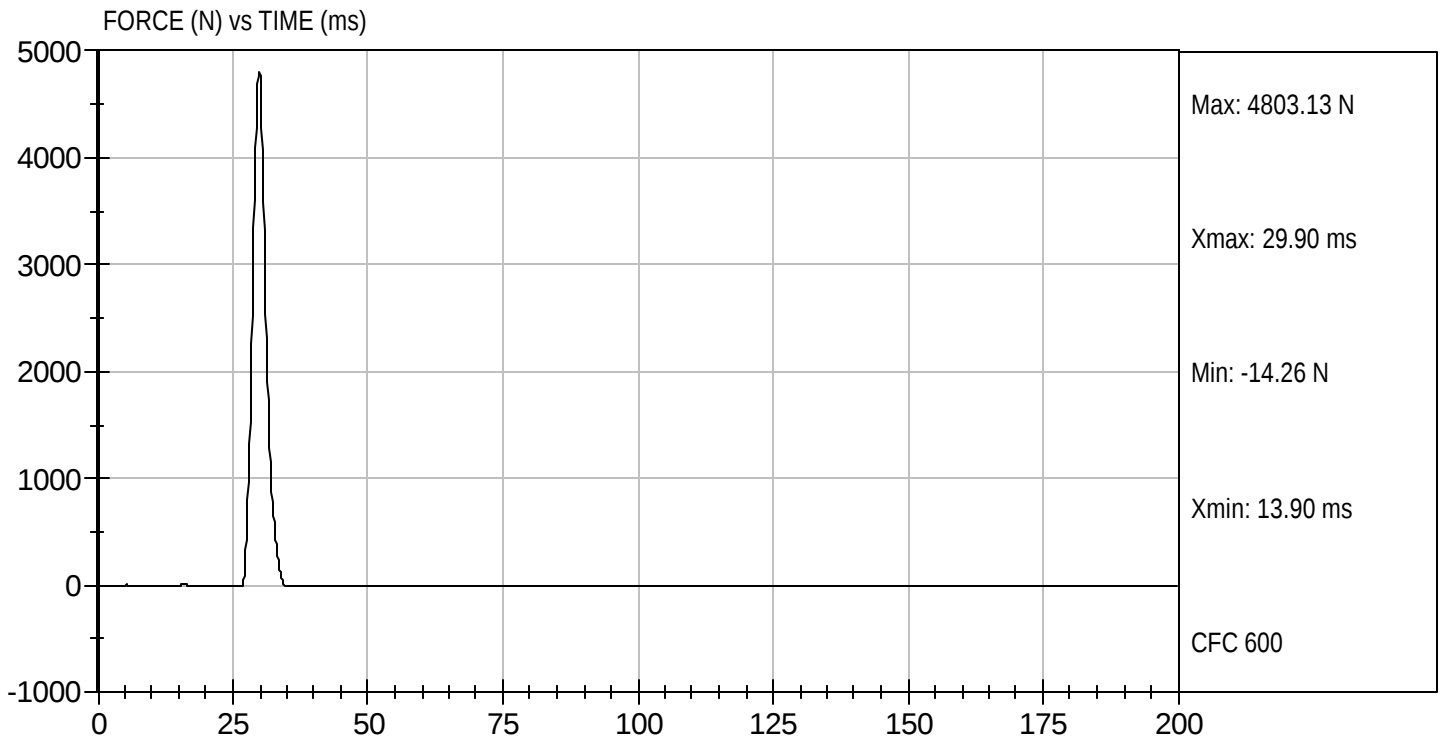
09/13/2006
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D062775

Test Date: 09/13/2006
Velocity: 6.89 ft/s, 2.10 m/s



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

Dummy Serial Number 403

Test Date 9/13/06

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>21.6</u> |
| Record the minimum temperature | <u>20.9</u> |
| Record the maximum humidity | <u>56%</u> |
| Record the minimum humidity | <u>47%</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°	$\text{torque} \leq 70 \text{ ft-lbf}$	53
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	44

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°	$\text{torque} \leq 70 \text{ ft-lbf}$	68
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	43


Signature

9/13/06
Date

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

ATD Serial No: 403

Test I.D: D062770

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.1	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	49	49	Pass
Rotation Rate	deg/sec	5 to 10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	91.7	72.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	44	Pass
Overall Test Results				Pass	


 Laboratory Technician

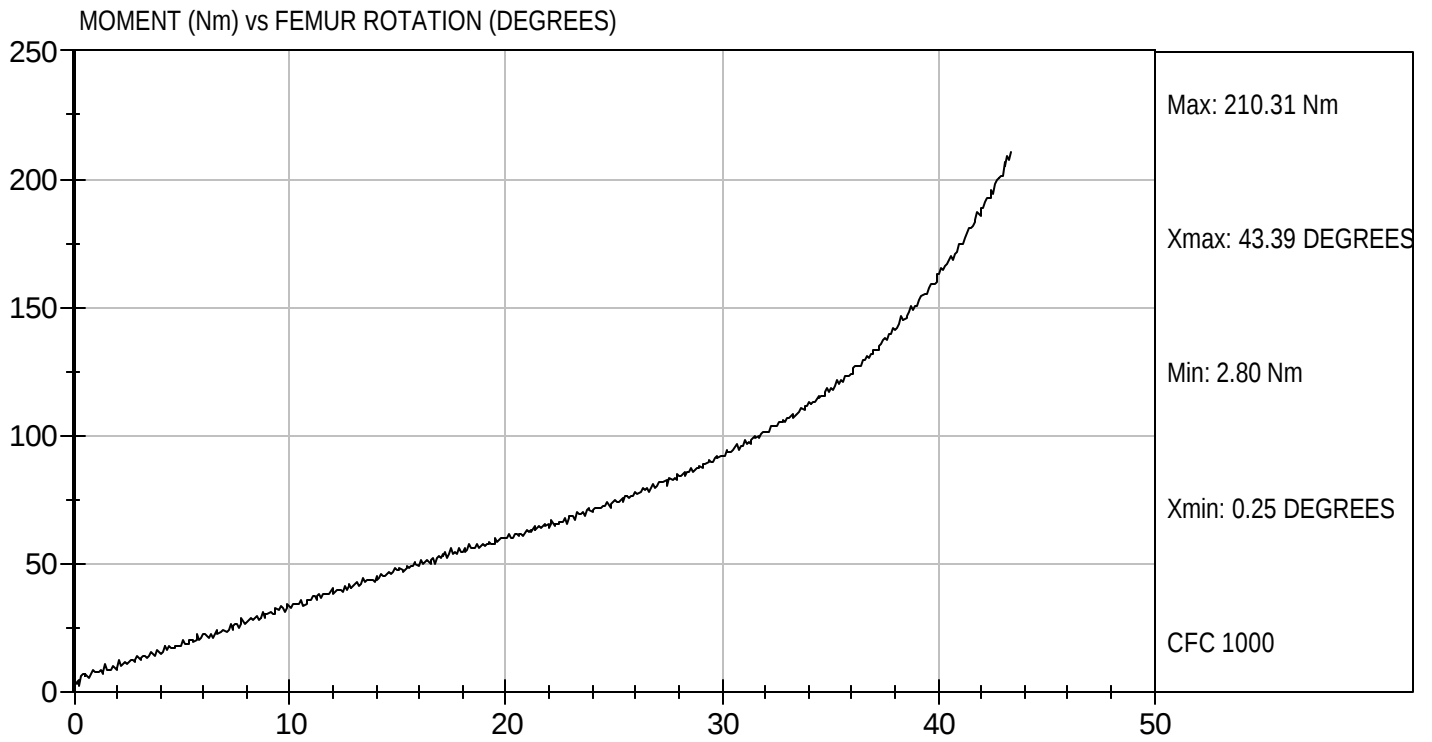
09/13/2006
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D062779

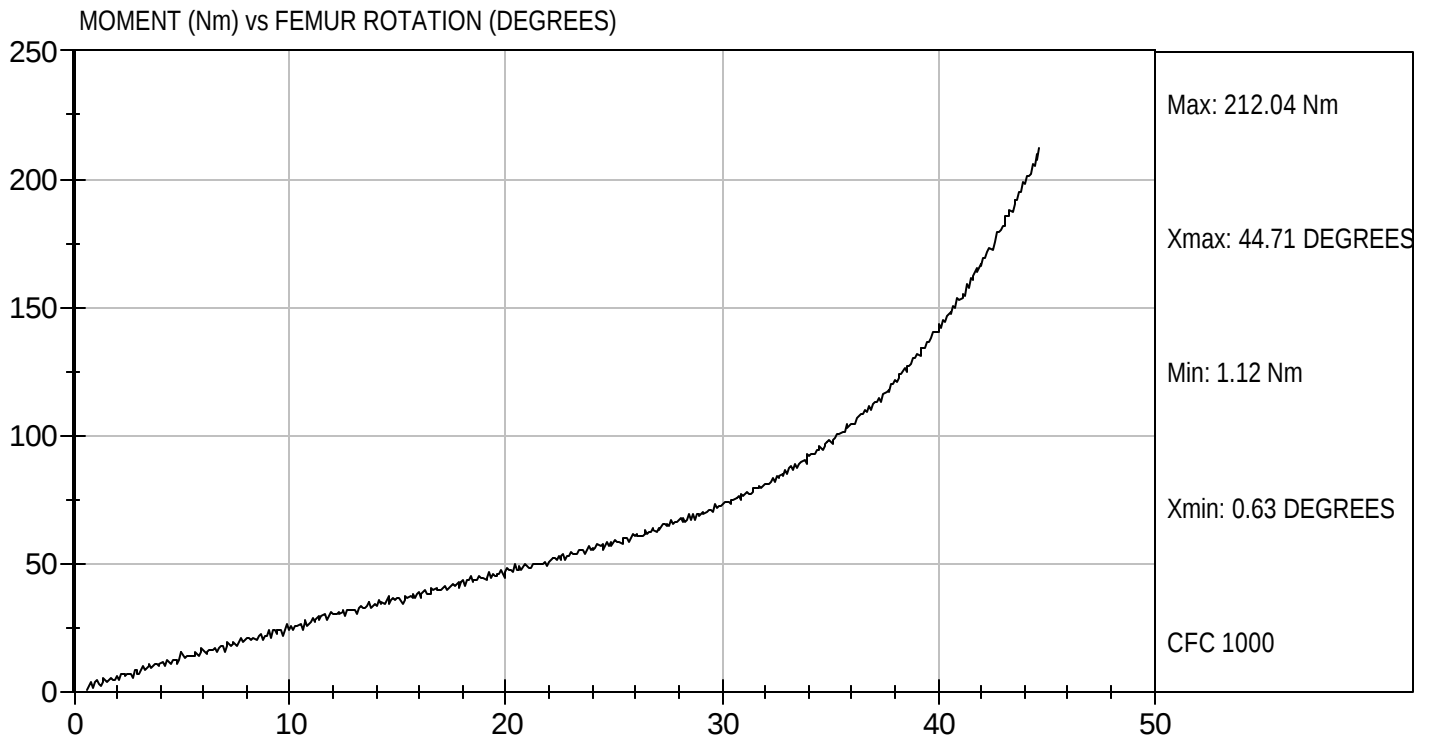
Test Date: 09/13/2006
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D062770

Test Date: 09/13/2006
Velocity: 0 ft/s, 0.00 m/s



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 50 th SN #403, SUBPART E EXTERIOR 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 9/12/06

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			
	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

9/13/06
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

9/13/06
Date