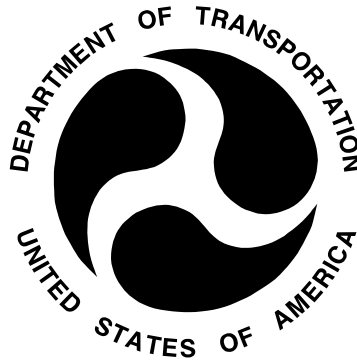


REPORT NO. 208-MGA-2005-DC004

DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208

**Daimler Chrysler Corporation
2005 Dodge Magnum MPV
NHTSA NO. C50304**

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



Test Date: January 3, 2005 – April 6, 2005

Report Date: June 3, 2005

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 #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 3/23/05

Technician Jim Carney

☒ 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 lb·in.

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

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

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.32(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

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

Record findings and actions: No Damage.

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

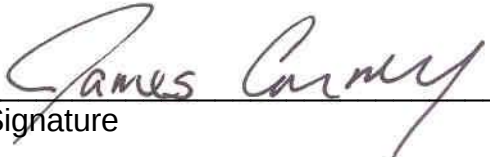
- X 10. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(c)(3))
Record the actual distance 14.8"

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 11. 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 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm
- X 13. The impact surface is rigidly supported. (572.32(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	240
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 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.


Signature

3/23/05
Date

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

ATD Serial No: 403

Test ID: D05901

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	225 - 275	240	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-7.3	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

03/23/2005
Test Date

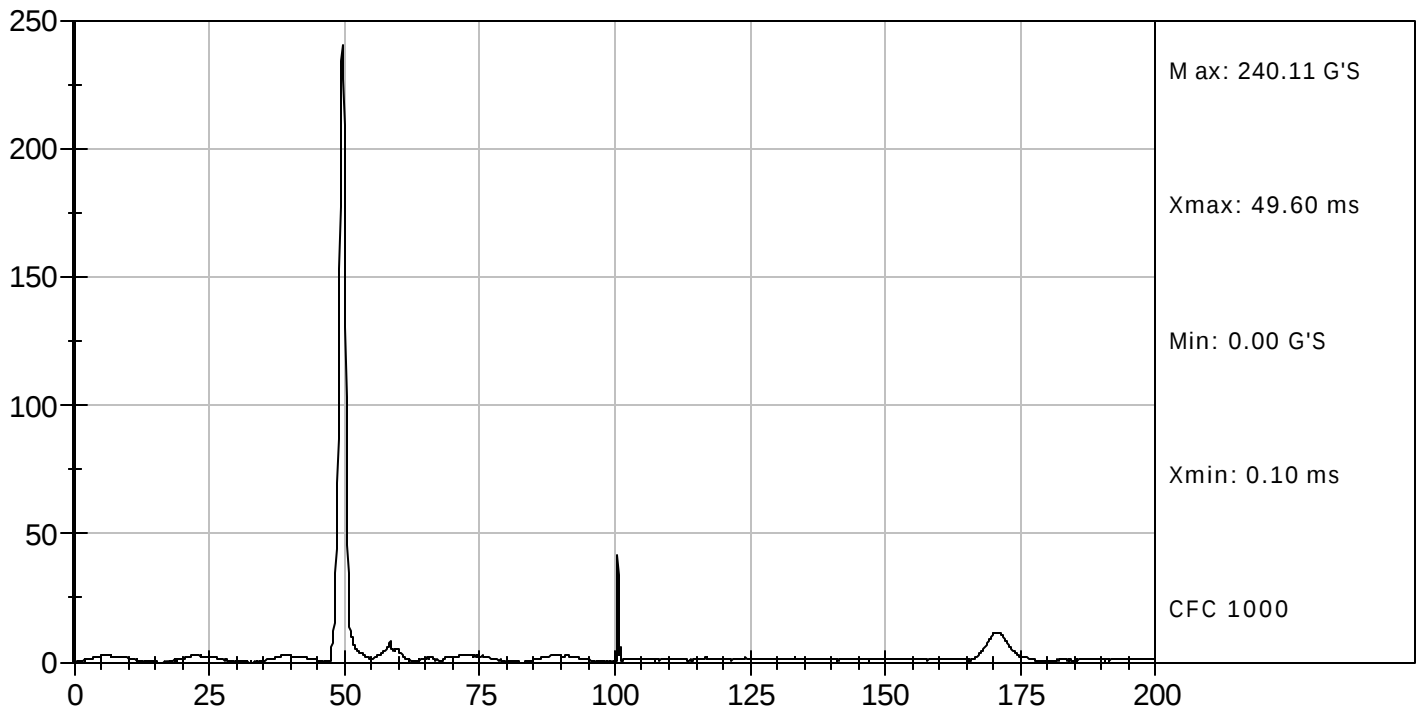

Approved By



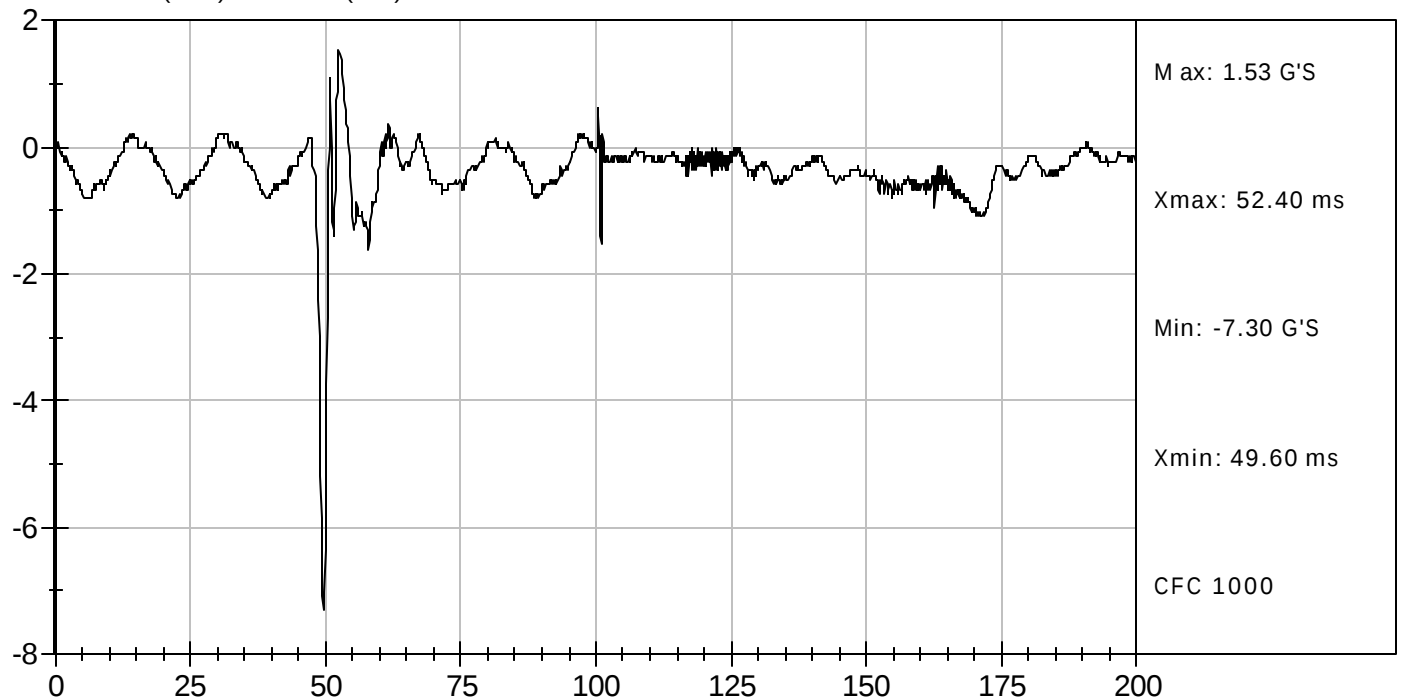
Test Desc: Head Drop
Componet ID: D05901

Test Date: 03/23/2005
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 3/24/05

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last 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 21.3

Record the minimum temperature 20.8

Record the maximum humidity 21%

Record the minimum humidity 17%

☒ 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 ft/sec ≤ speed ≤ 23.4 ft/sec	23.2
Pendulum Deceleration Versus Time Pulse	@ 10ms	22.5 ≤ g ≤ 27.5	23.5
	@ 20 ms	17.6 ≤ g ≤ 22.6	20.5
	@30ms	12.5 ≤ g ≤ 18.5	16.1
	Above 30 ms	29 g maximum	16
First Pendulum Decay to 5g		34 ms ≤ time ≤ 42 ms	38
Plane D Rotation		64° ≤ max. rotation ≤ 78°	77
		57 ms ≤ time of max. rotation ≤ 64 ms	61
Time for Plane D Rotation to Cross 0° During First Rebound		113 ms ≤ time ≤ 128 ms	120
Maximum Moment		65 lbf-ft ≤ moment ≤ 80 lbf-ft	71
		47 ms ≤ time of max. moment ≤ 58 ms	52
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		97 ms ≤ time ≤ 107ms	101

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

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum
striker plate and the honeycomb material. (572.133(b)(3))

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

Jessica Hall
Signature

3/24/05
Date

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

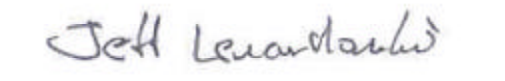
ATD Serial No: 403

Test I.D: D05902

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	20	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.48	Pass
	20 msec	G's	17.60 to 22.60	20.51	Pass
	30 msec	G's	12.50 to 18.50	16.06	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	16.02	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	77.0	Pass
	Time	msec	57.0 to 64.0	60.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	120.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	96.3	Pass
	Time	msec	47.0 to 58.0	52.0	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.9	Pass
Overall Test Results					Pass


 Laboratory Technician

03/24/2005
 Test Date

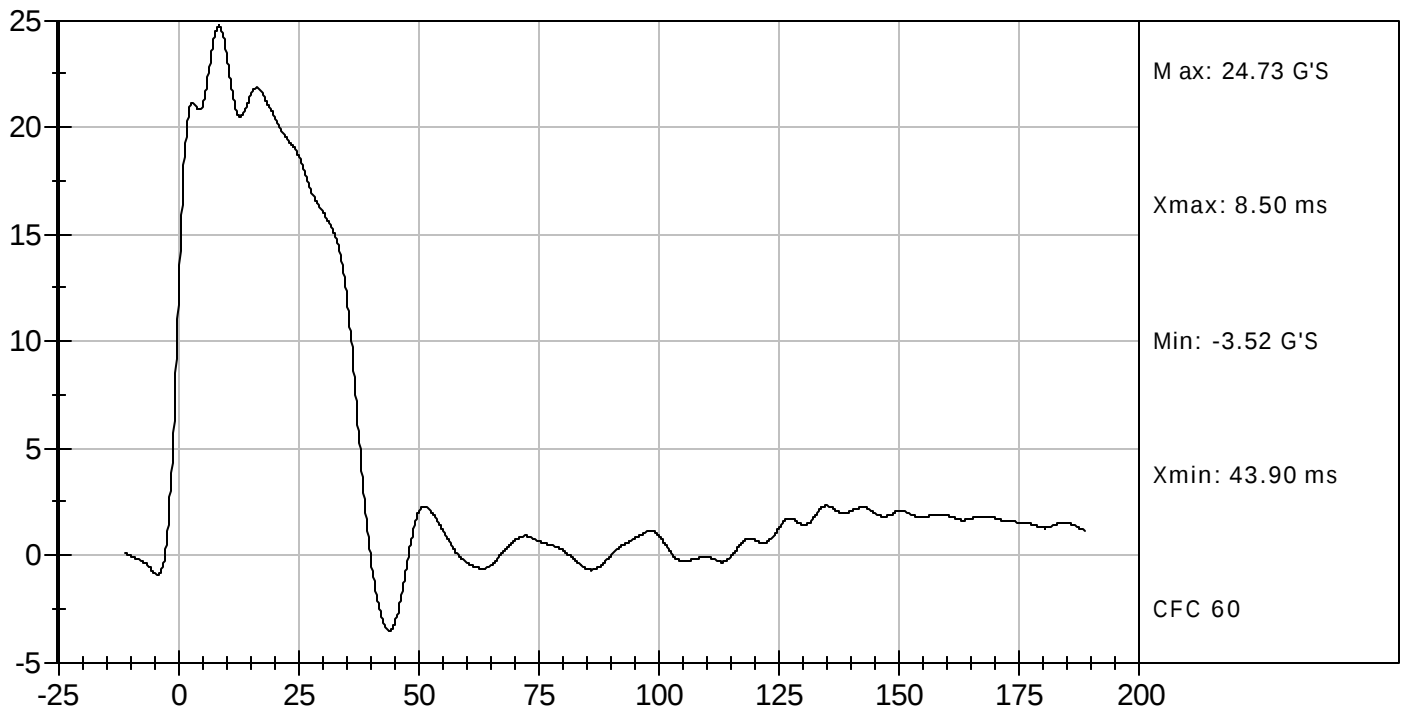

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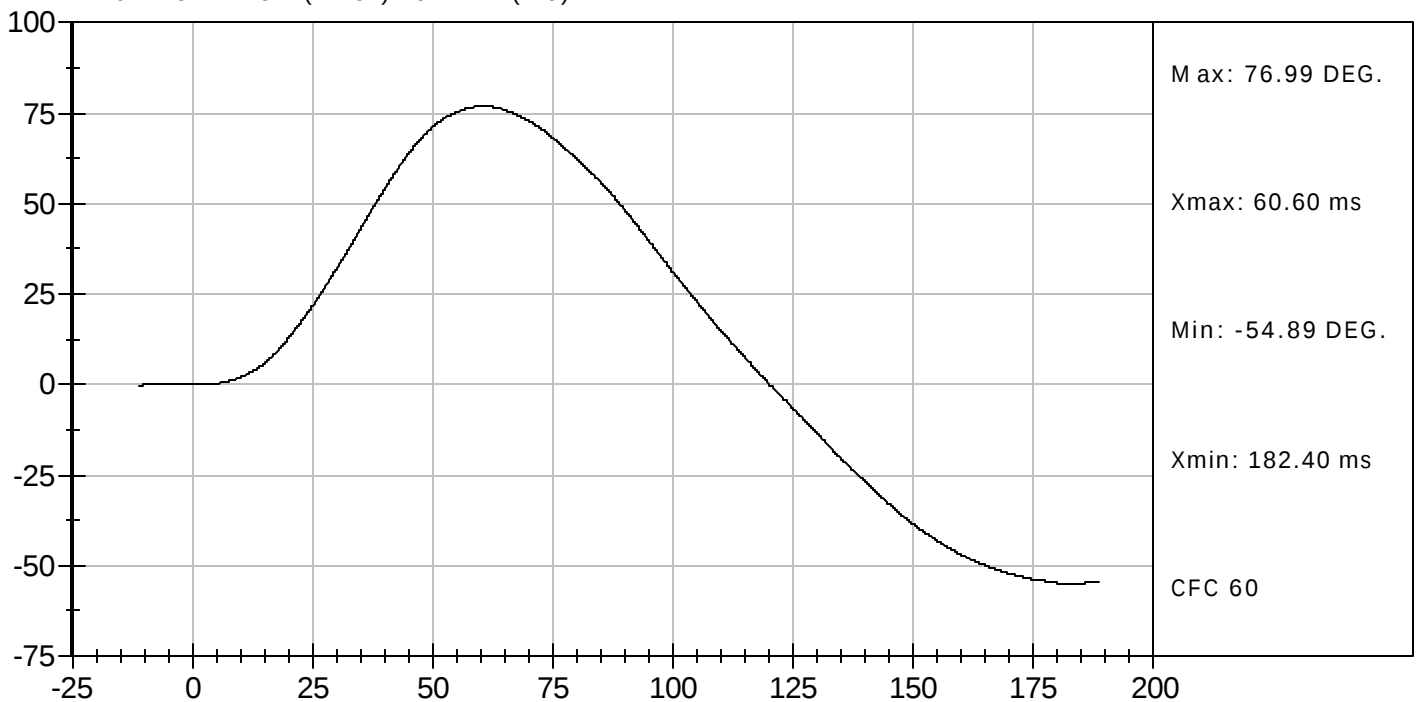
Test Desc: Neck Flexion
Componet ID: D05902

Test Date: 03/24/2005
Velocity: 23.19 ft/s, 7.07 m/s

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



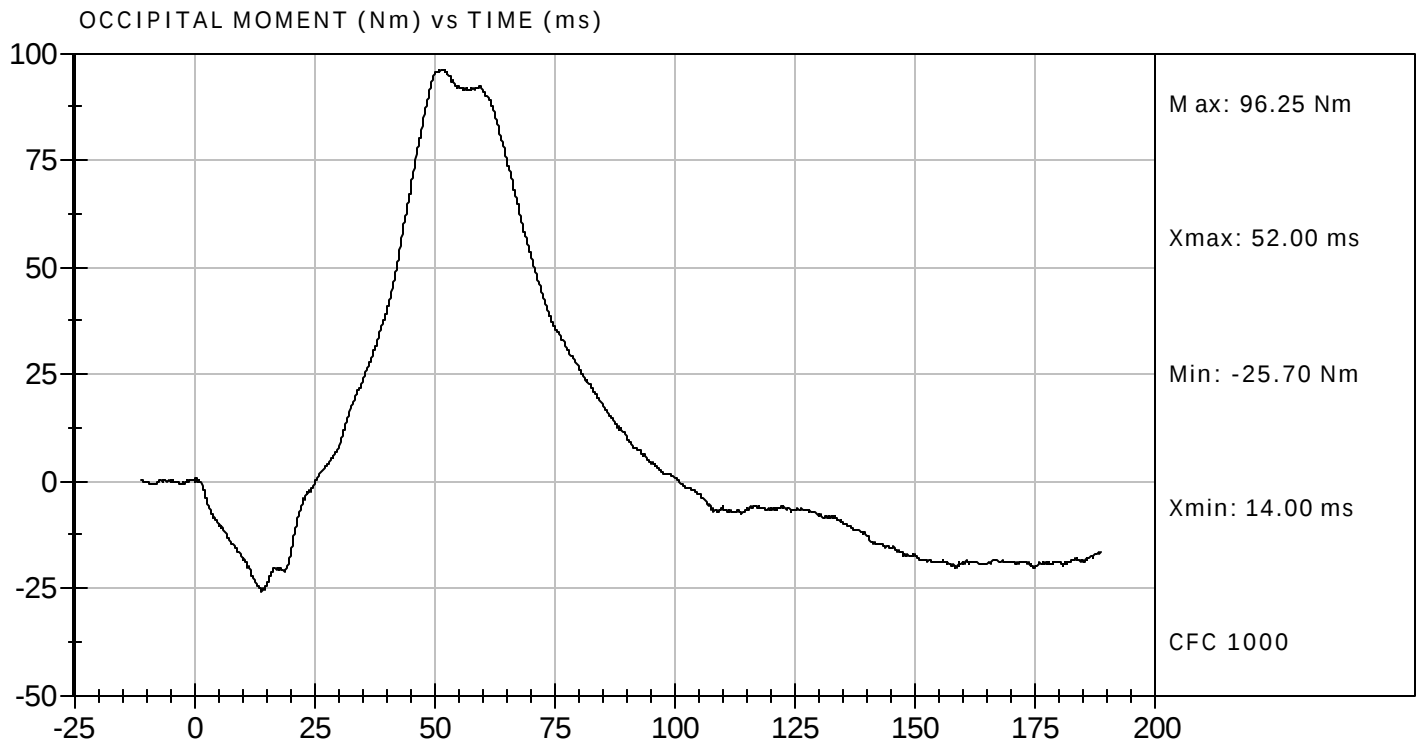
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D05902

Test Date: 03/24/2005
Velocity: 23.19 ft/s, 7.07 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 403

Test Date 3/24/05

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one extension test performed

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

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

Record the maximum temperature 21.3

Record the minimum temperature 20.8

Record the maximum humidity 21%

Record the minimum humidity 17%

☒ 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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	19.9
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	19.0
	@ 20 ms	$14 \leq g \leq 19$	17.3
	@30ms	$11.0 \leq g \leq 16.0$	13.7
	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
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	80
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	164
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-48
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	74
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	145

*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.

Jessica Hall
Signature

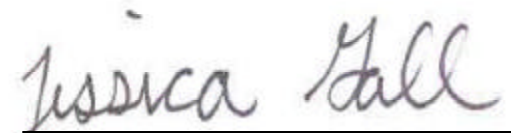
3/24/05
Date

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

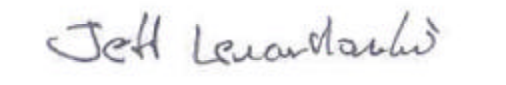
ATD Serial No: 403

Test I.D: D05903

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	21	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.07	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.02	Pass
	20 msec	G's	14.00 to 19.00	17.32	Pass
	30 msec	G's	11.00 to 16.00	13.73	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.68	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.9	Pass
	Time	msec	72.0 to 82.0	80.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	163.9	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-65.6	Pass
	Time	msec	65.0 to 79.0	74.4	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	145.3	Pass
Overall Test Results					Pass


 Laboratory Technician

03/24/2005
 Test Date


 Approved By



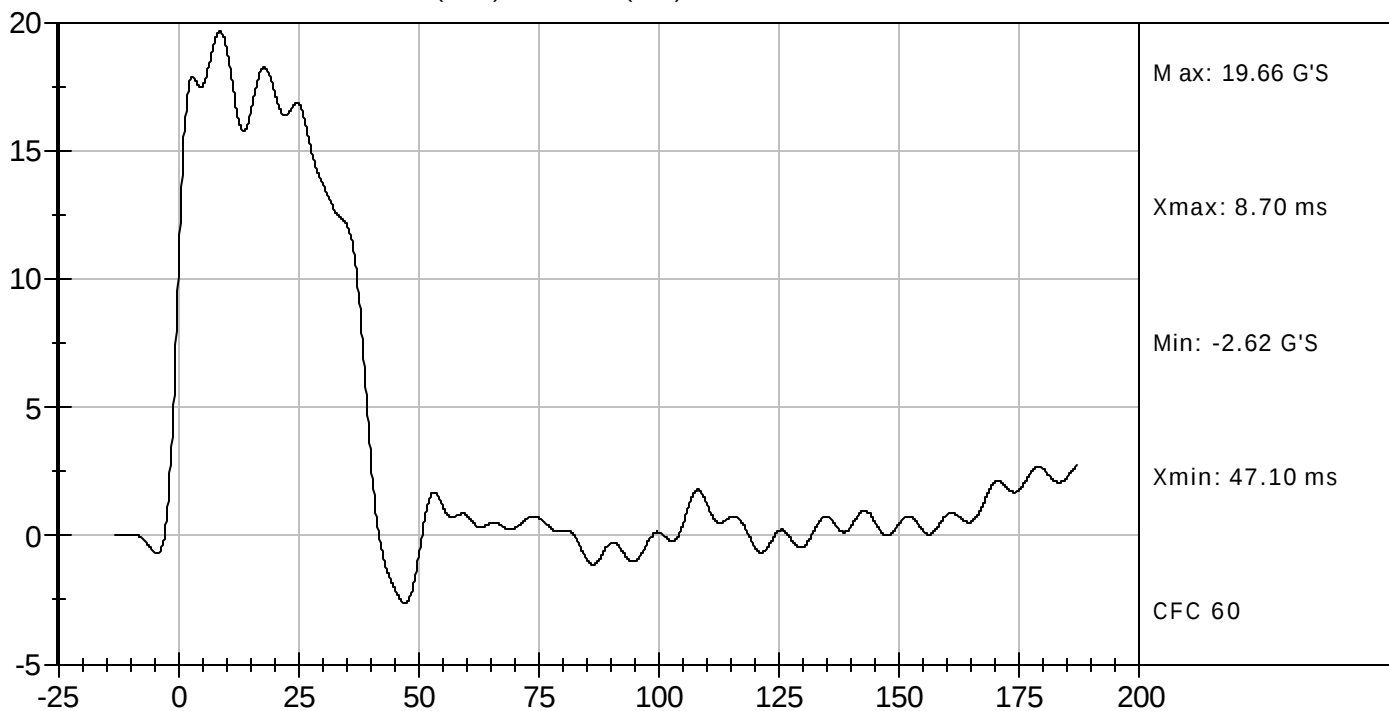
Test Desc: Neck Extension

Componet ID: D05903

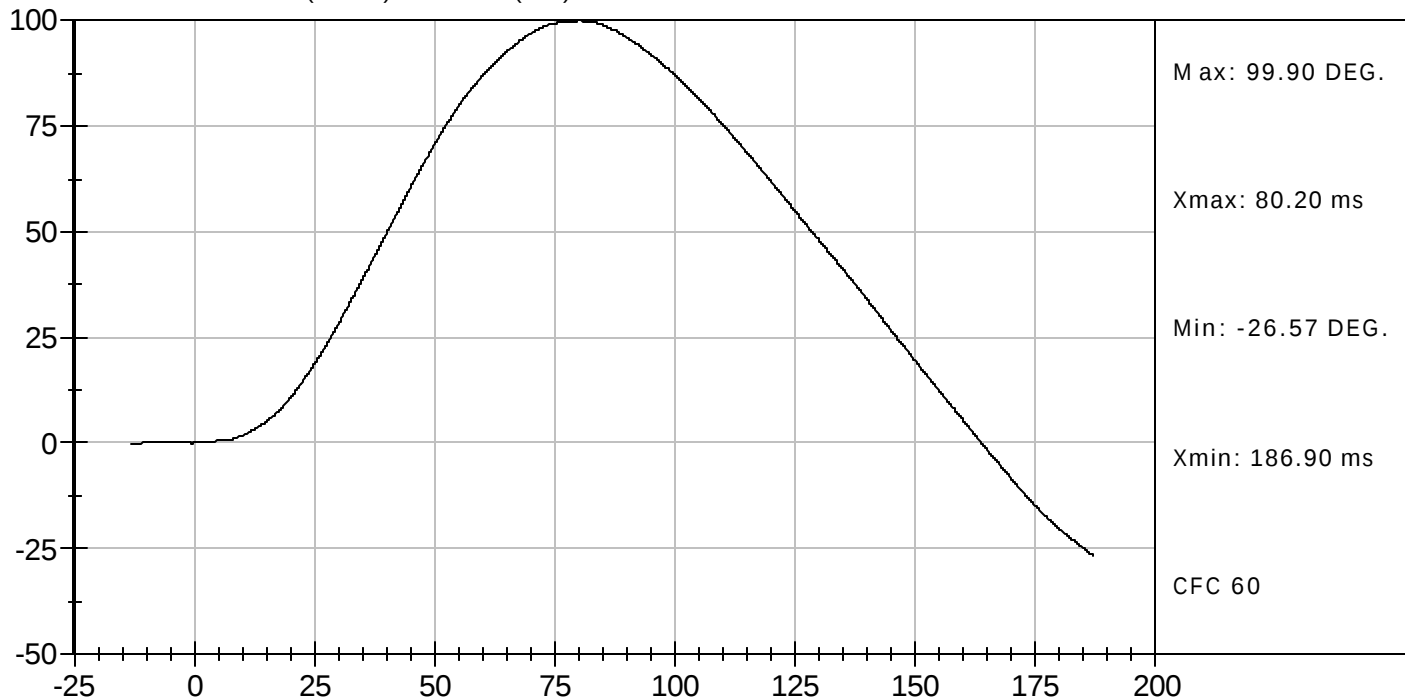
Test Date: 03/24/2005

Velocity: 19.91 ft/s, 6.07 m/s

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



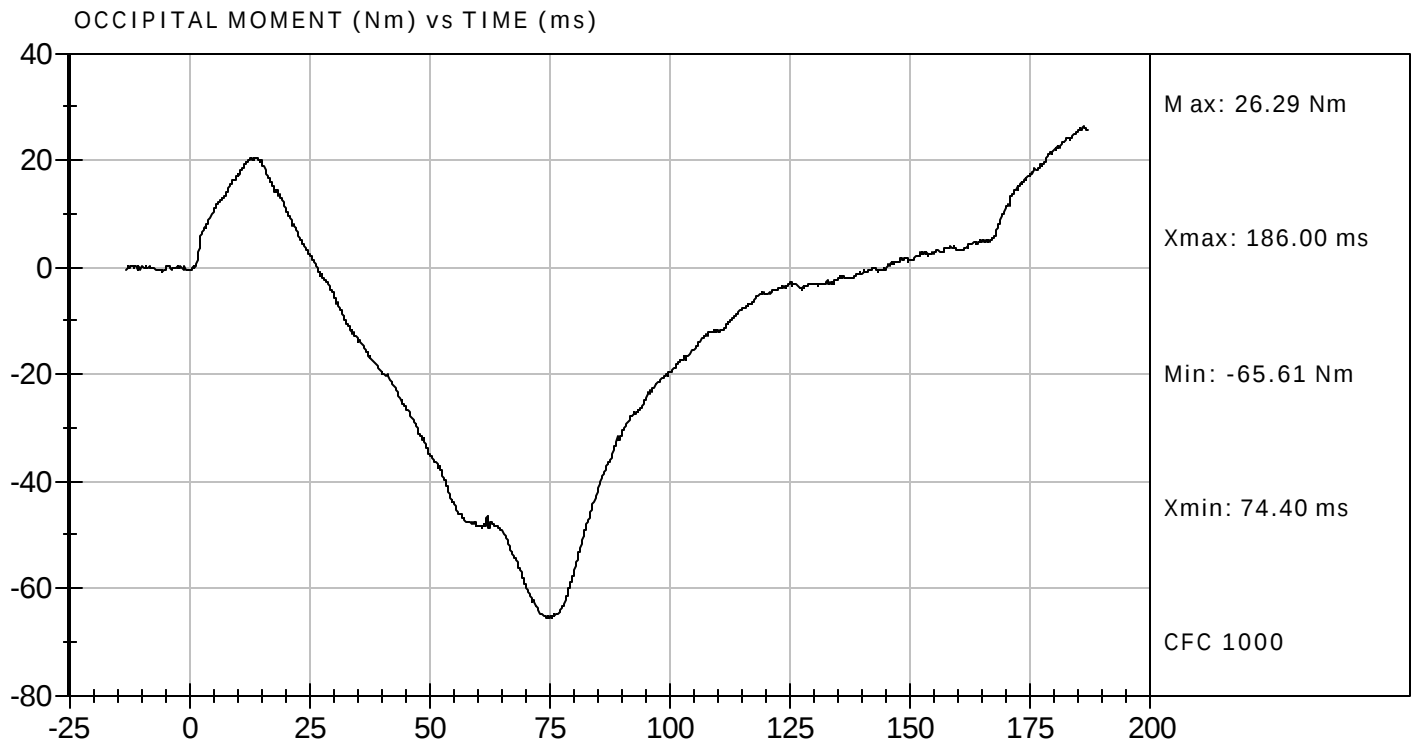
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D05903

Test Date: 03/24/2005
Velocity: 19.91 ft/s, 6.07 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 403

Test Date 3/24/05

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

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

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.34(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.8

Record the maximum humidity 21%

Record the minimum humidity 17%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage

☐ - The following repairs or replacement was performed. Record

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s $\leq$ speed $\leq$ 22.4 f/s	22.0
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.57
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1290
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	73%

*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

3/24/05

Date

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

ATD Serial No: 403

Test I.D: D05904

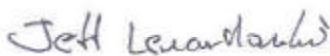
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.71	Pass
Peak Probe Force	N	5159 to 5893	5,736	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.53	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Overall Test Results				Pass



Laboratory Technician

03/24/2005

Test Date

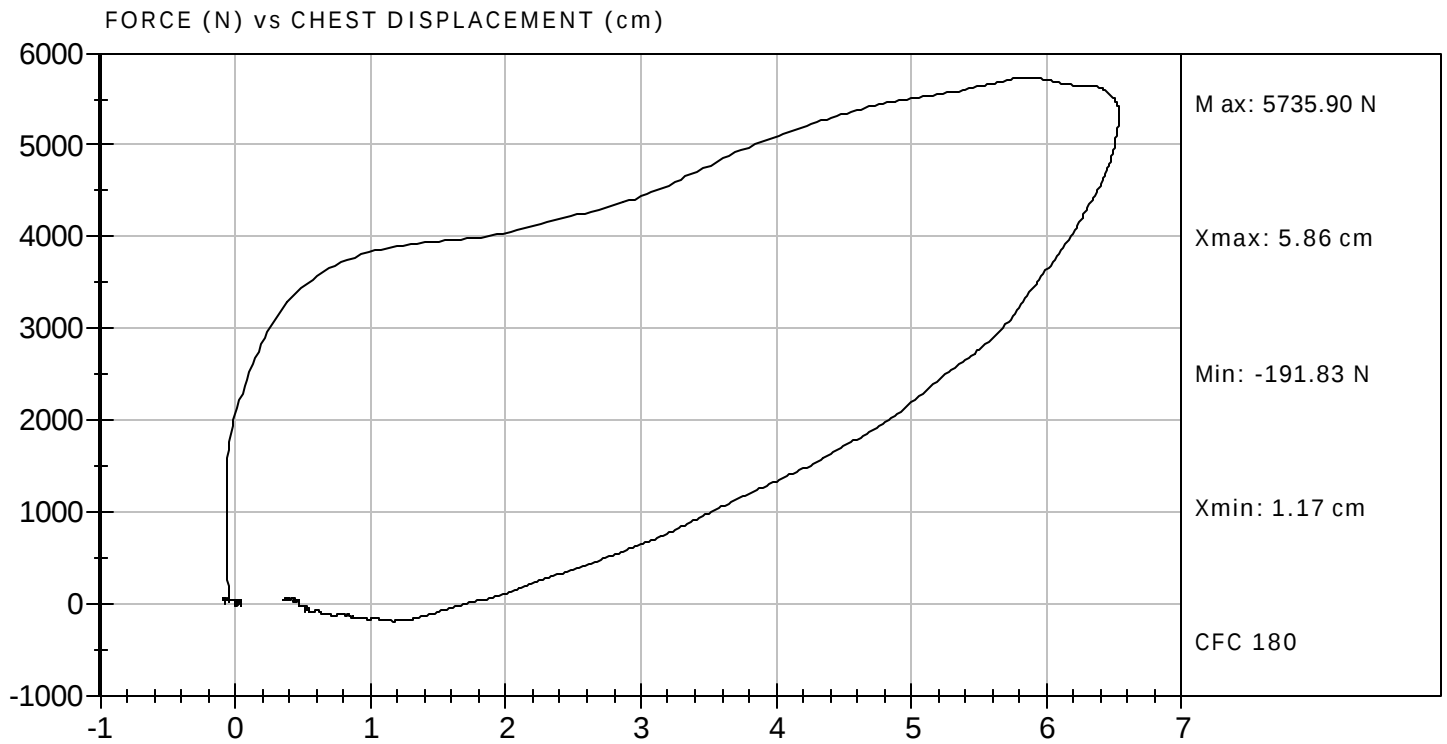


Approved By



Test Desc: Thorax Impact
Componet ID: D05904

Test Date: 03/24/2005
Velocity: 22.01 ft/s, 6.71 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 3/24/05

Technician Dave Wilcox

☒ Pretest calibration

☐ 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 21.3

Record the minimum temperature 20.8

Record the maximum humidity 21%

Record the minimum humidity 17%

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 J2111/1 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	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1146

*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

 3/24/05

Date

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

ATD Serial No: 403

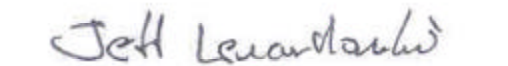
Test I.D: D05906

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,096	Pass
Overall Test Results				Pass


Laboratory Technician

03/24/2005

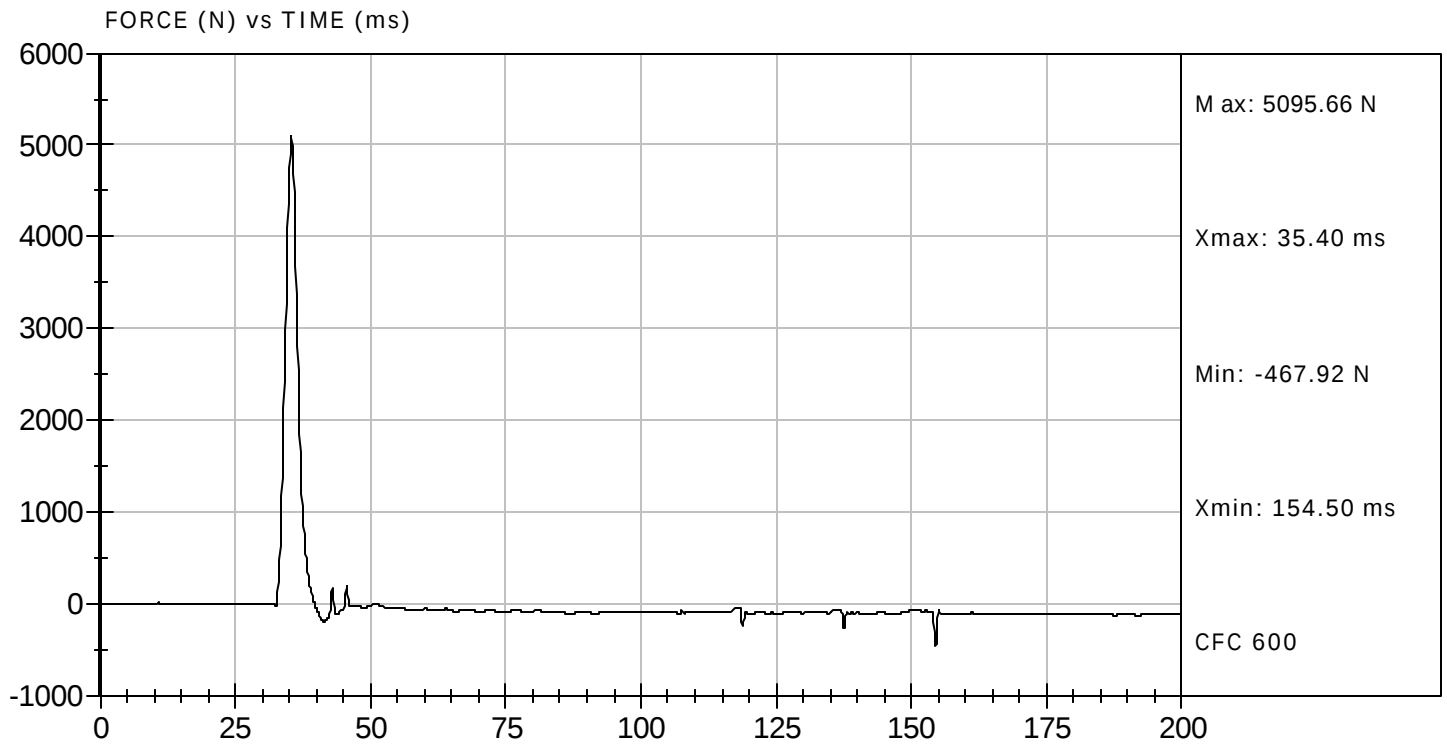
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D05906

Test Date: 03/24/2005
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 3/24/05

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

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

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 (86-5001-002) with the upper leg assembly (78051-47) 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 21.3

Record the minimum temperature 20.8

Record the maximum humidity 21%

Record the minimum humidity 17%

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 J2111/1 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	1086

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

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

Jessica Hall
Signature

3/24/05
Date

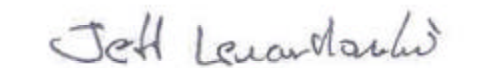
MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D05905

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	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,832	Pass
Overall Test Results				Pass


Laboratory Technician

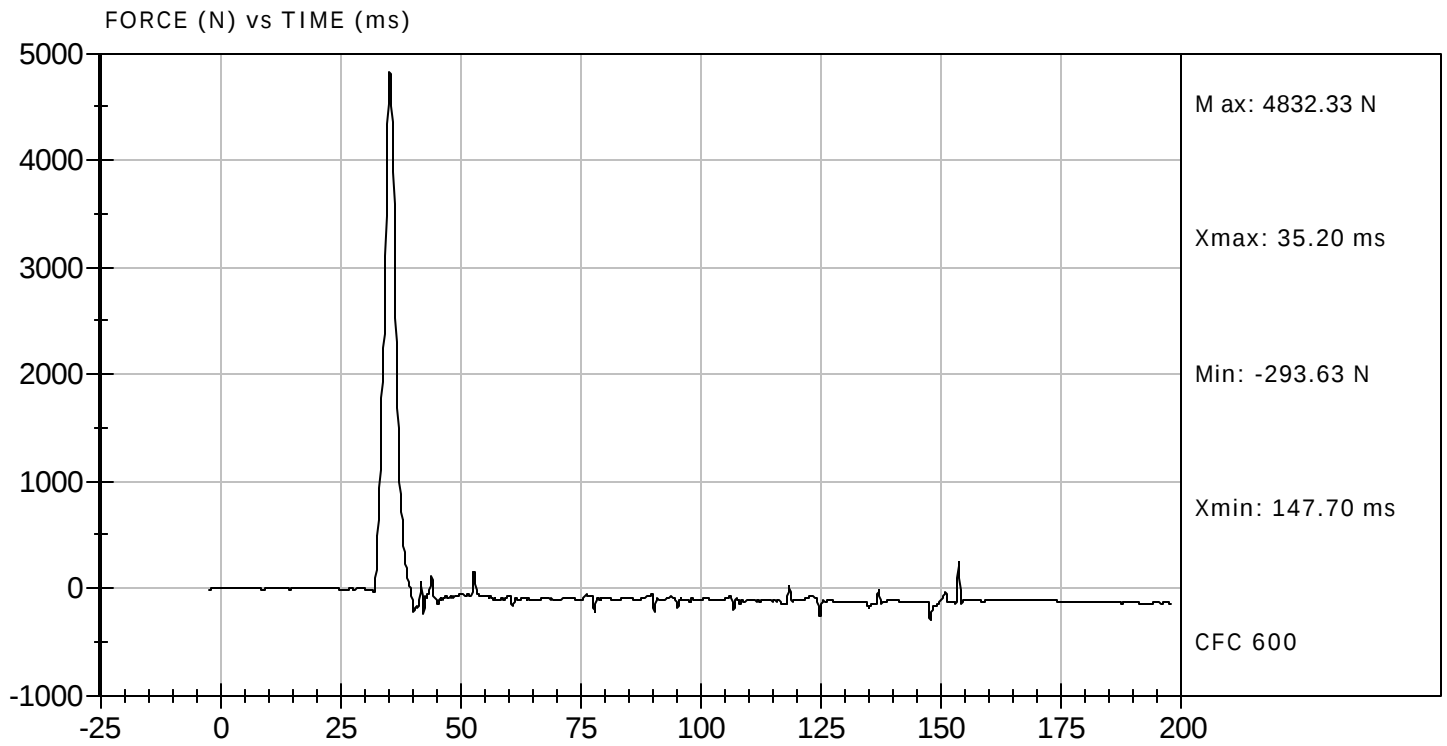

Approved By

03/24/2005
Test Date



Test Desc: Right Knee
Componet ID: D05905

Test Date: 03/24/2005
Velocity: 6.91 ft/s, 2.11 m/s



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

Dummy Serial Number 403

Test Date 3/23/05

Technician Jim Carney

☒ 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>21.3</u> |
| Record the minimum temperature | <u>20.8</u> |
| Record the maximum humidity | <u>20%</u> |
| Record the minimum humidity | <u>17%</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 ½in. 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°	$\text{torque} \leq 70 \text{ ft-lbf}$	45
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	47

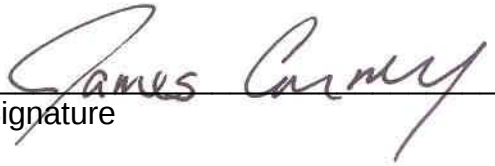
X 11. Secure the lever arm into the right femur shaft opening of the upper leg structure assembly (78051-44) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))

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°	$\text{torque} \leq 70 \text{ ft-lbf}$	64
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42


Signature

3/23/05
Date

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

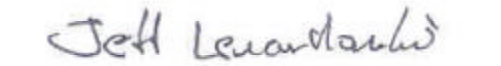
ATD Serial No: 403

Test I.D: D05900

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	17	17	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	86.8	60.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	47	Pass
Overall Test Results					Pass


 Laboratory Technician

03/23/2005
 Test Date


 Approved By



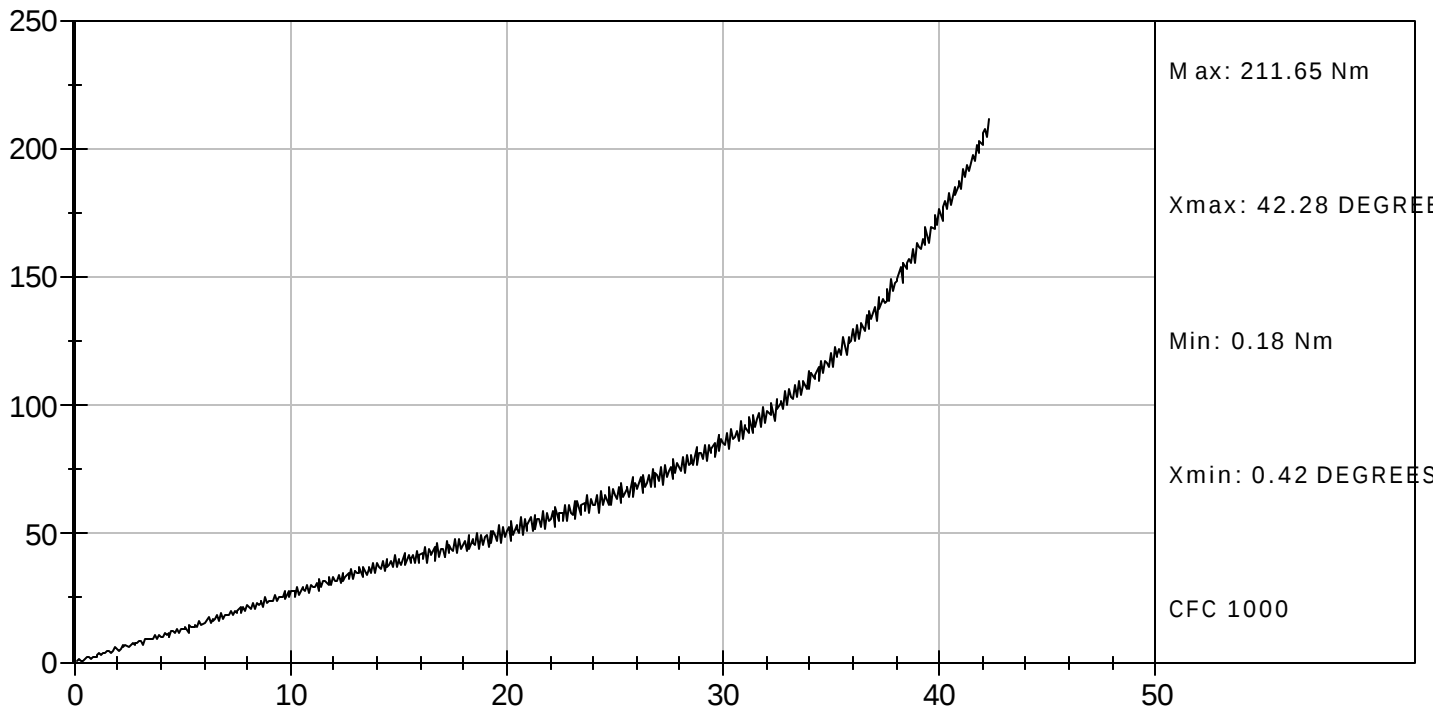
Test Desc: Hip Femur Flexion

Componet ID: D05909

Test Date: 03/23/2005

Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)





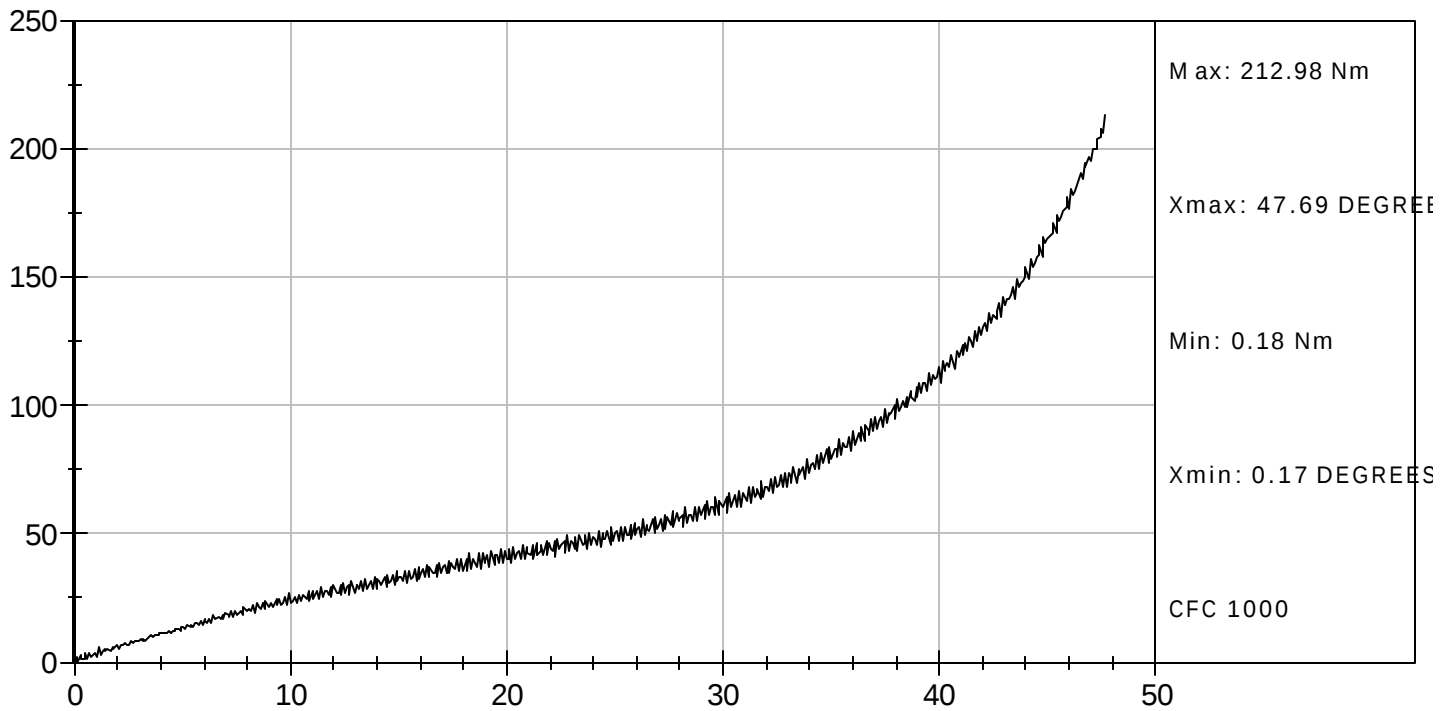
Test Desc: Hip Femur Flexion

Componet ID: D05900

Test Date: 03/23/2005

Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 403

Test Date 4/8/05

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

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

☒ 1. It has been at least 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.

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

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.32(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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

Record findings and actions: No Damage.

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

- X 10. 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 11. 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 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm
- X 13. The impact surface is rigidly supported. (572.32(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	241
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-6

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

Joe Fleck
Signature

4/8/05
Date

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

ATD Serial No: 403

Test ID: D05981

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	225 - 275	241	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.8	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

04/08/2005

Test Date



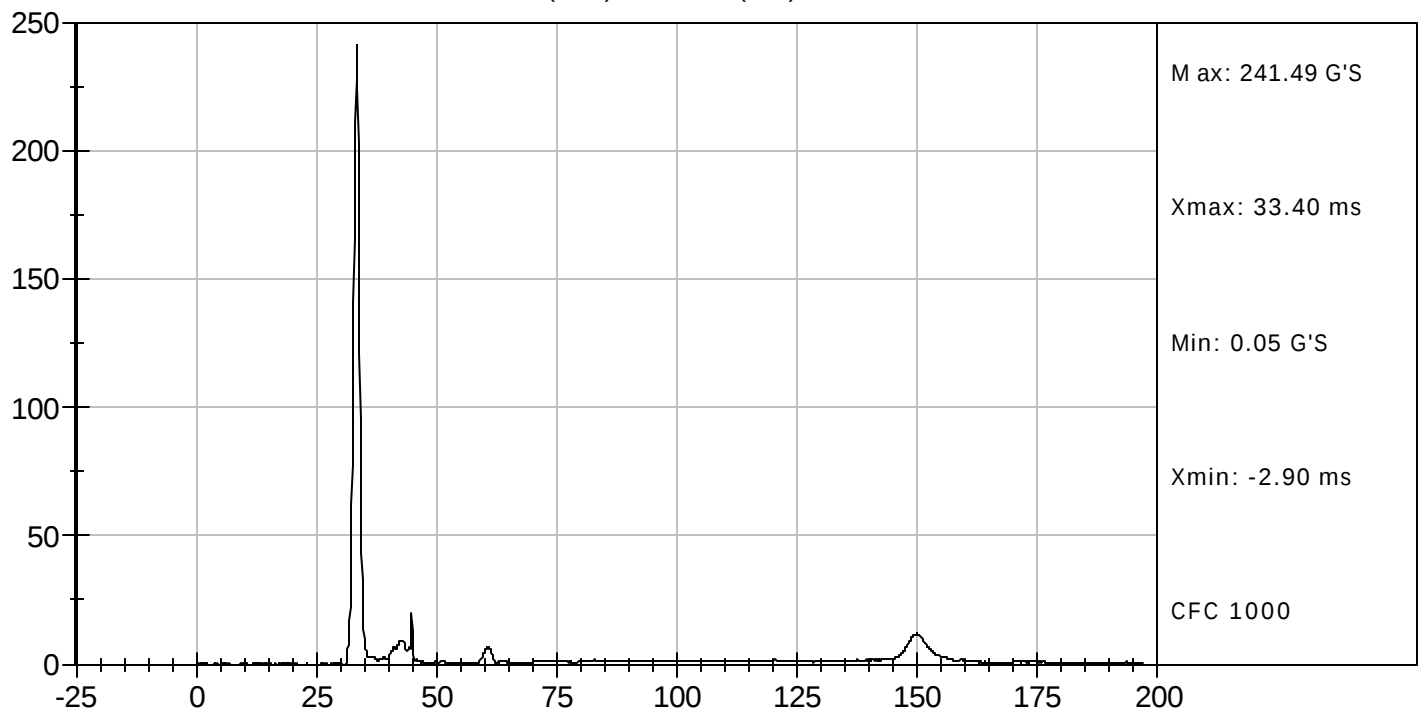
Approved By



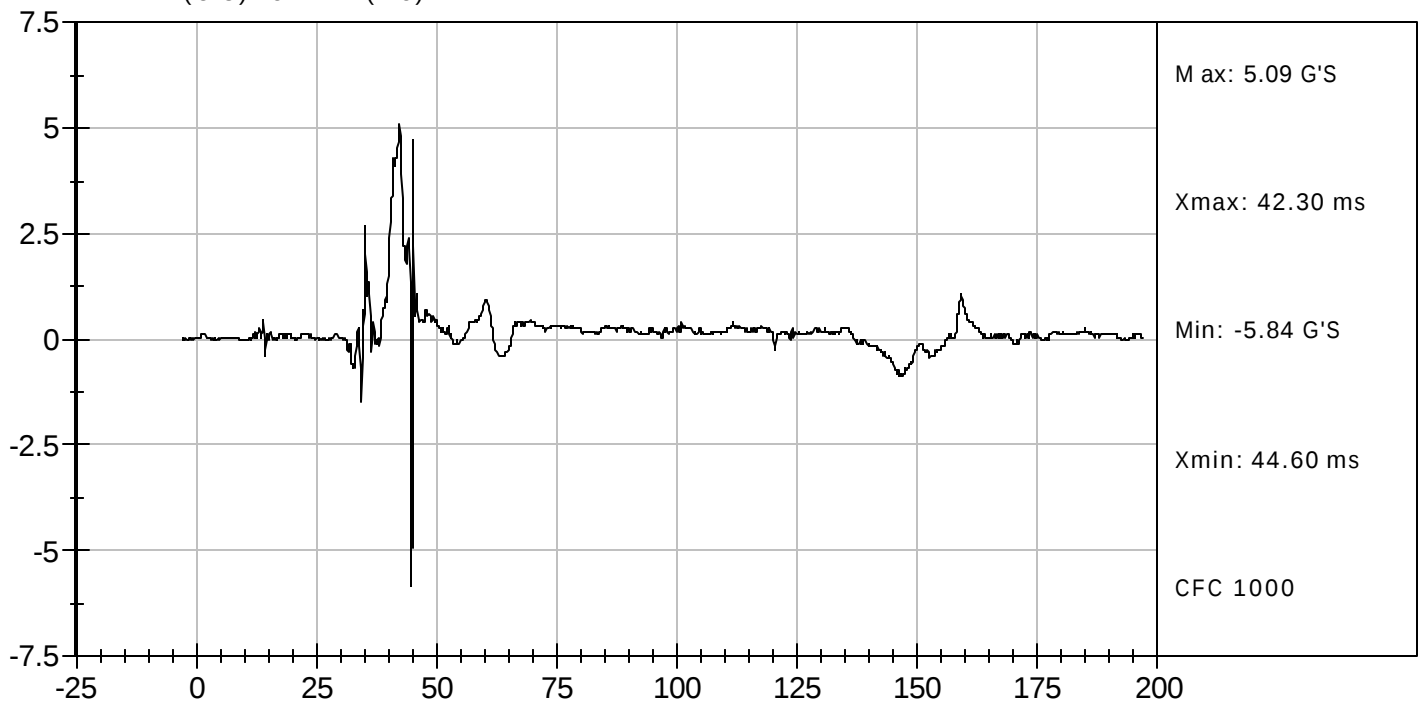
Test Desc: Head Drop
Componet ID: D05981

Test Date: 04/08/2005
Velocity: 0 ft/s, 0.00 m/s

HEAD RESULTANT ACCELERATION (G'S) vs TIME (ms)



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



DATA SHEET A4
NECK FLEXION TEST (572.33)

Dummy Serial Number 403

Test Date 4/8/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last flexion test. (572.36(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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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 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 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		$22.6 \text{ ft/sec} \leq \text{speed} \leq 23.4 \text{ ft/sec}$	22.8
Pendulum Deceleration Versus Time Pulse	@ 10ms	$22.5 \leq g \leq 27.5$	24.2
	@ 20 ms	$17.6 \leq g \leq 22.6$	21.9
	@ 30ms	$12.5 \leq g \leq 18.5$	17.2
	Above 30 ms	29 g maximum	17
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	36
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	73
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	60
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	117
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	72
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	50
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	98

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

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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



Signature

4/8/05

Date

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

ATD Serial No: 403

Test I.D: D05982

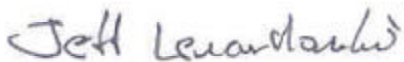
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.94	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.19	Pass
	20 msec	G's	17.60 to 22.60	21.92	Pass
	30 msec	G's	12.50 to 18.50	17.23	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	17.16	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	35.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.3	Pass
	Time	msec	57.0 to 64.0	59.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	116.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	97.0	Pass
	Time	msec	47.0 to 58.0	50.0	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.3	Pass
Overall Test Results					Pass



Laboratory Technician

04/08/2005

Test Date



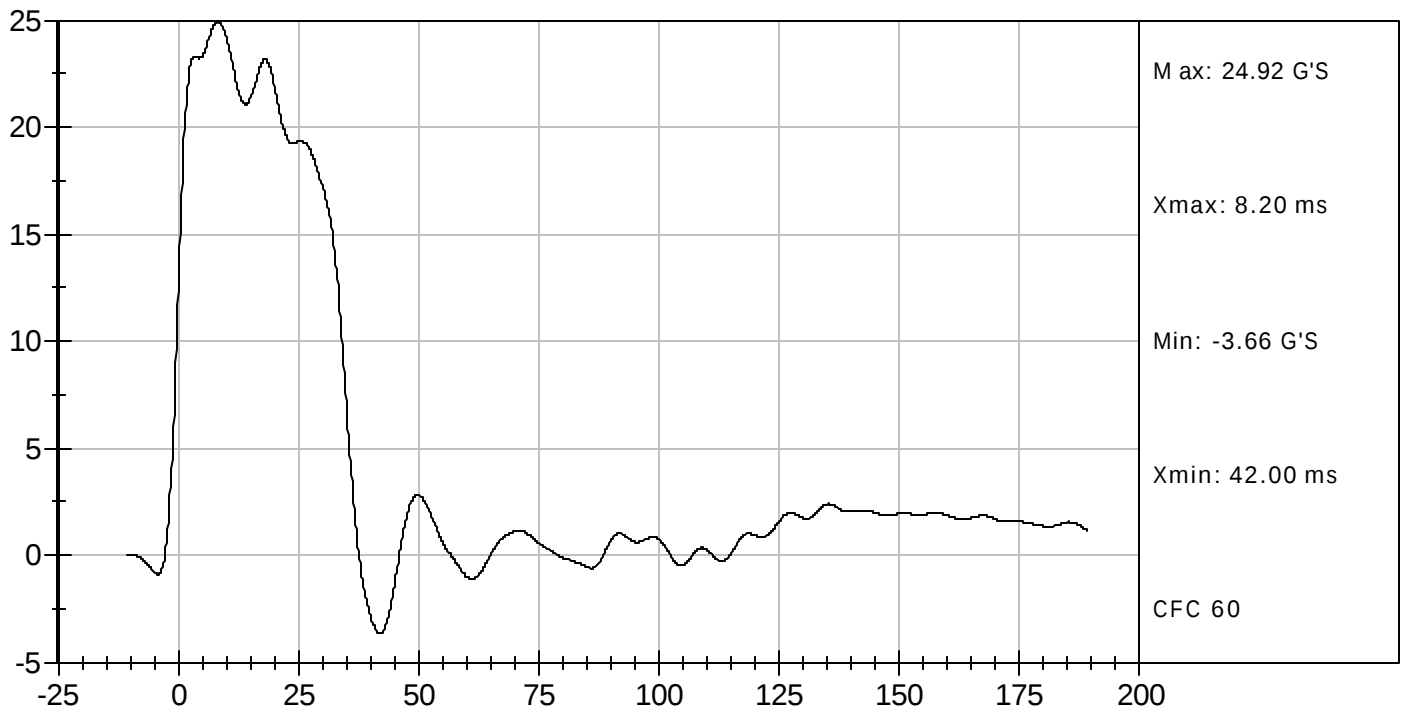
Approved By



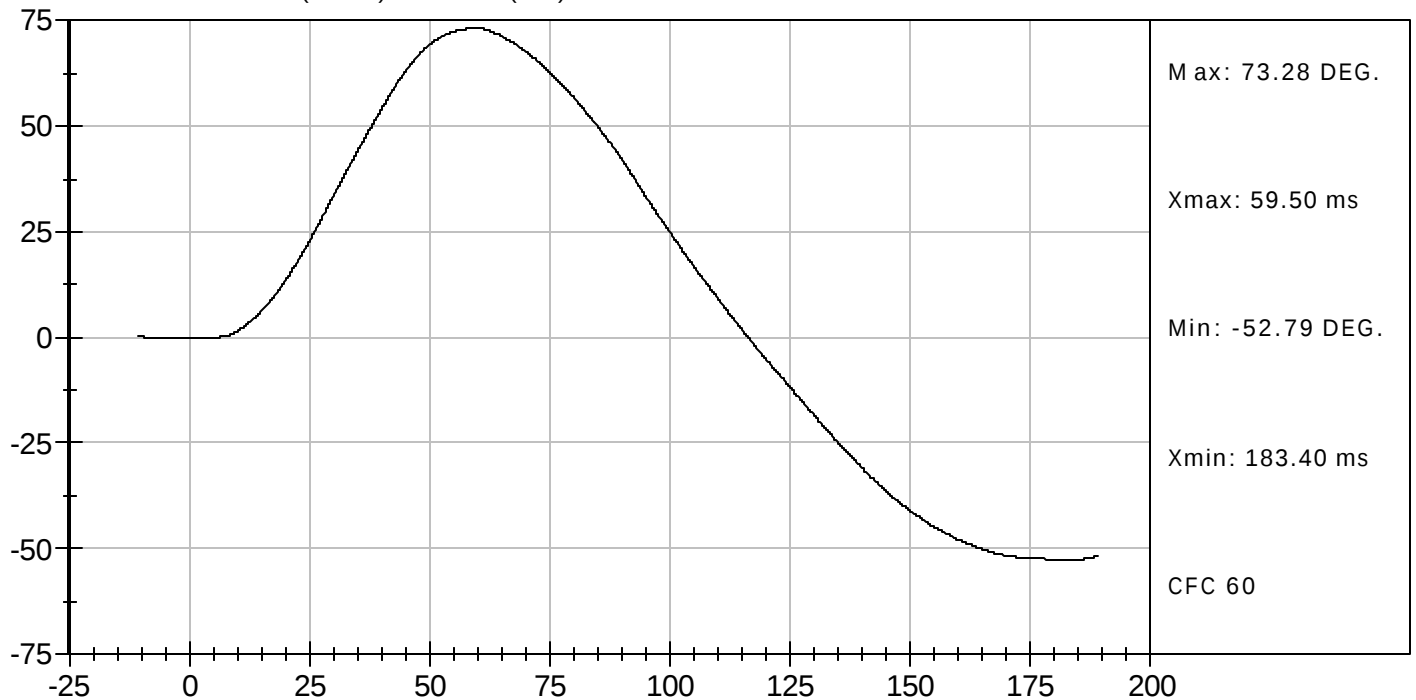
Test Desc: Neck Flexion
Componet ID: D05982

Test Date: 04/08/2005
Velocity: 22.77 ft/s, 6.94 m/s

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



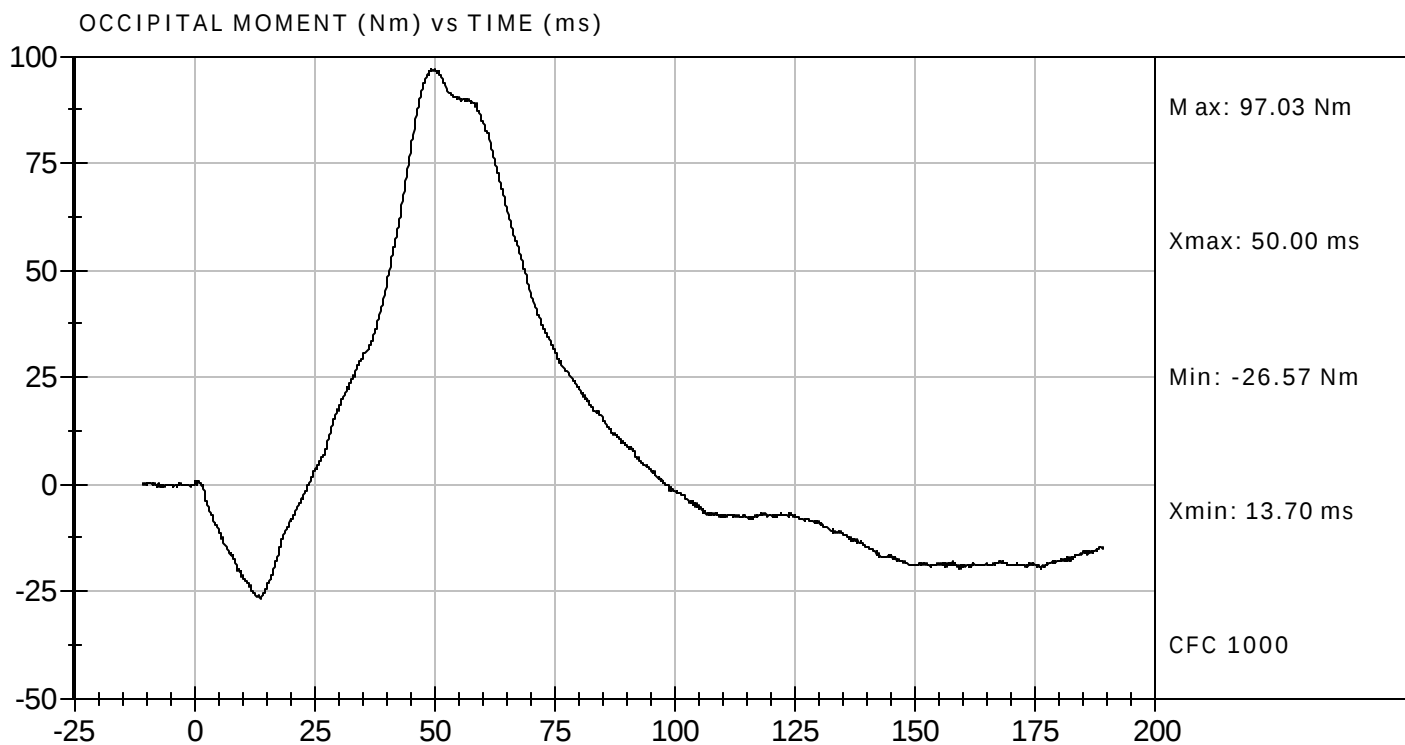
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D05982

Test Date: 04/08/2005
Velocity: 22.77 ft/s, 6.94 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 403

Test Date 4/8/05

Technician Joe Fleck

 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	19.7
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	20.2
	@ 20 ms	$14 \leq g \leq 19$	16.4
	@30ms	$11.0 \leq g \leq 16.0$	12.3
	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		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	99
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	79
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	162
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-49
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	74
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	142

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

4/8/05
Date

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

ATD Serial No: 403

Test I.D: D05983

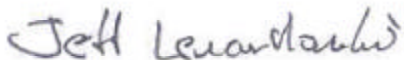
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.00	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.23	Pass
	20 msec	G's	14.00 to 19.00	16.41	Pass
	30 msec	G's	11.00 to 16.00	12.34	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.90	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.2	Pass
	Time	msec	72.0 to 82.0	79.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	161.7	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-66.9	Pass
	Time	msec	65.0 to 79.0	73.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	142.3	Pass
Overall Test Results					Pass



Laboratory Technician

04/08/2005

Test Date



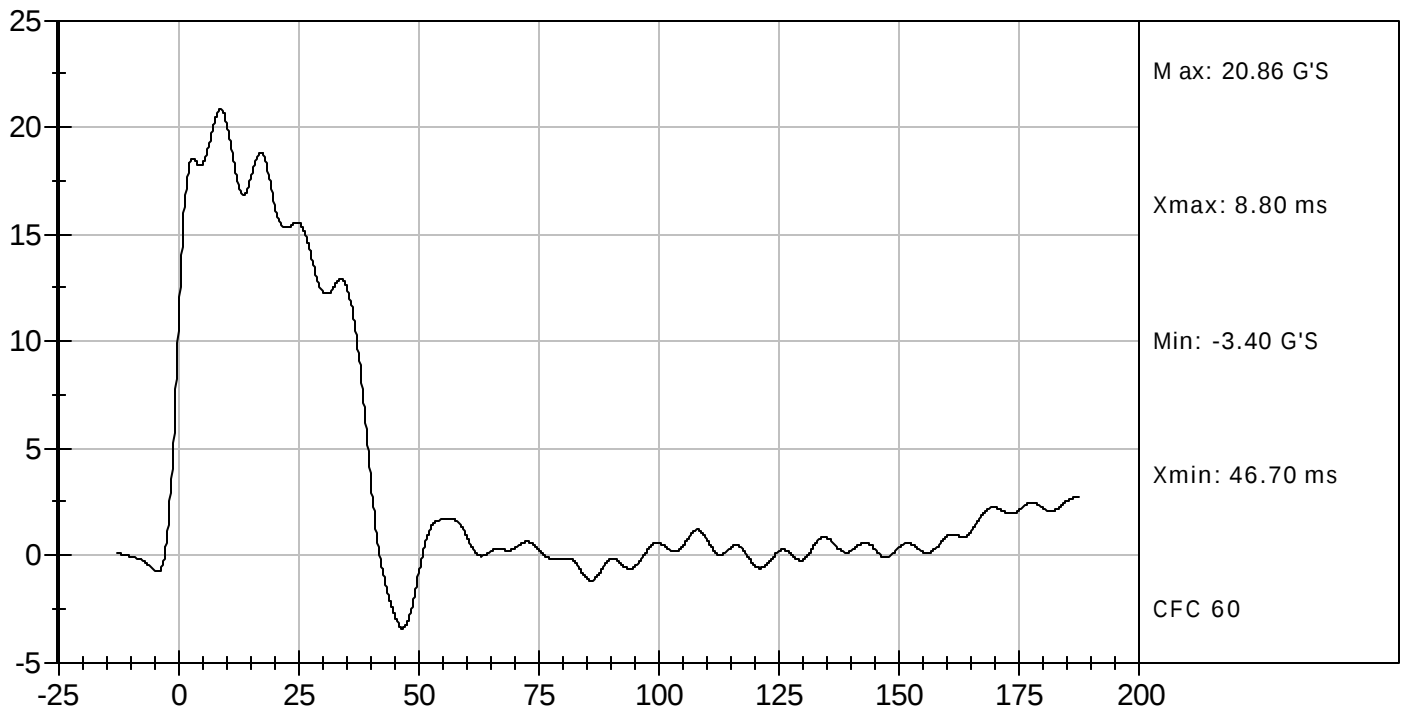
Approved By



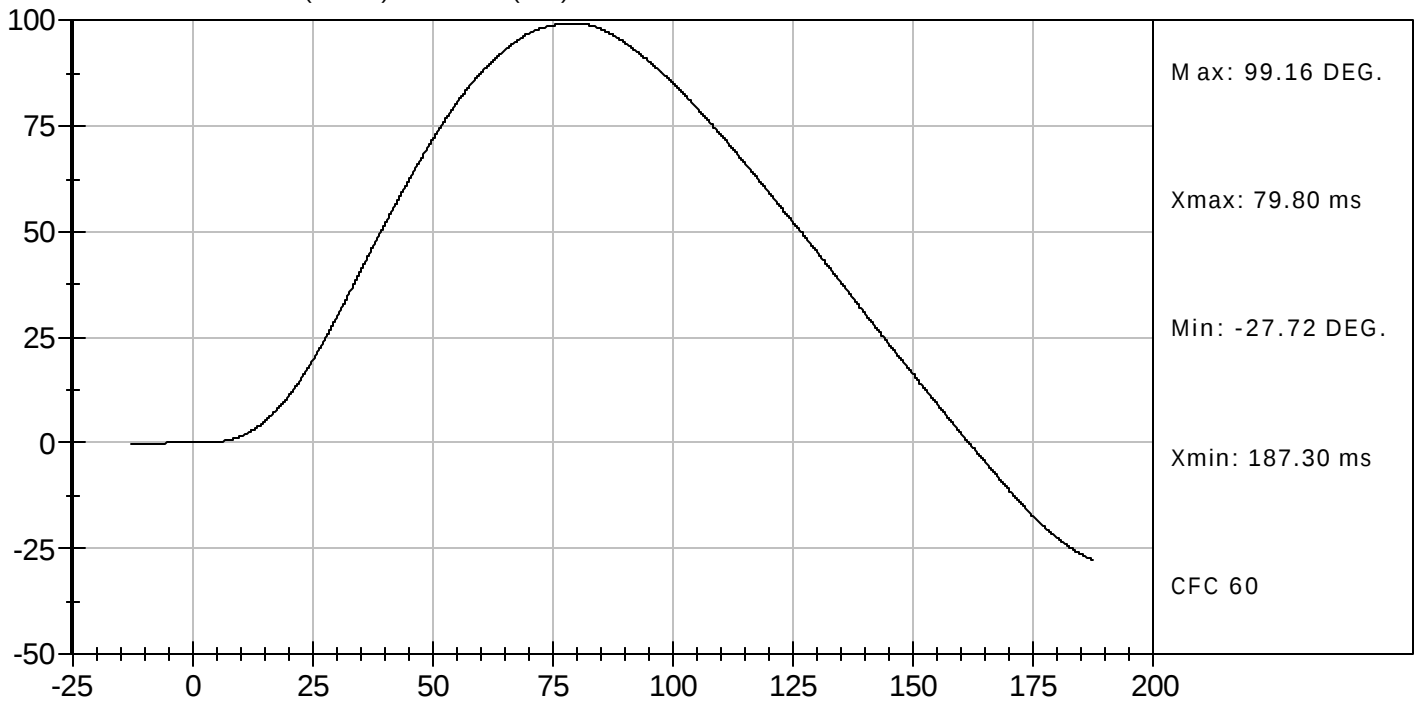
Test Desc: Neck Extension
Componet ID: D05983

Test Date: 04/08/2005
Velocity: 19.68 ft/s, 6.00 m/s

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



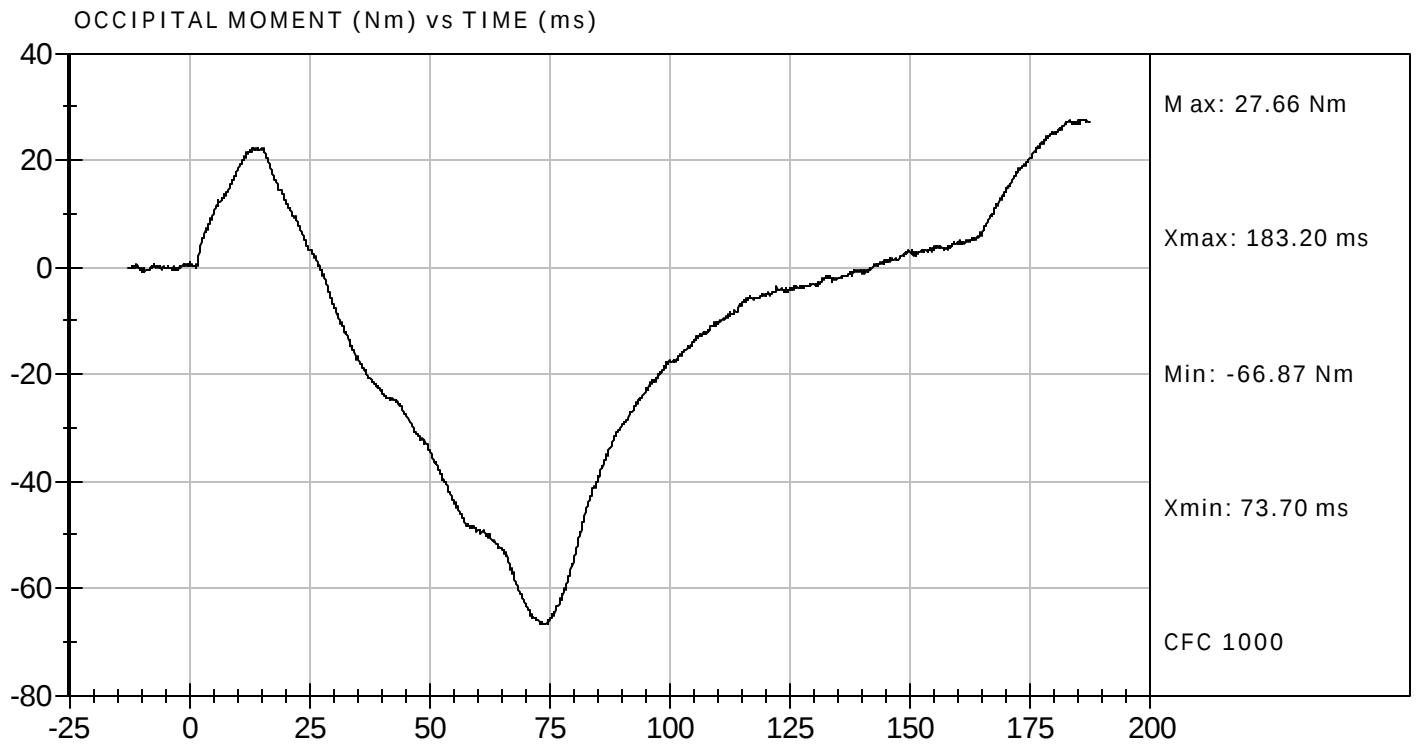
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D05983

Test Date: 04/08/2005
Velocity: 19.68 ft/s, 6.00 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 403

Test Date 4/8/05

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage

☐ - The following repairs or replacement was performed. Record

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s $\leq$ speed $\leq$ 22.4 f/s	22.0
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.61
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1290
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	77%

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

**Force = impactor mass x acceleration (572.34(b))

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

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



Signature

4/8/05

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D05984

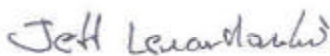
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	6.58 to 6.82	6.72	Pass
Peak Probe Force	N	5159 to 5893	5,736	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.64	Pass
Internal Hysteresis	%	69 to 85	77	Pass
Overall Test Results			Pass	



Laboratory Technician

04/08/2005

Test Date

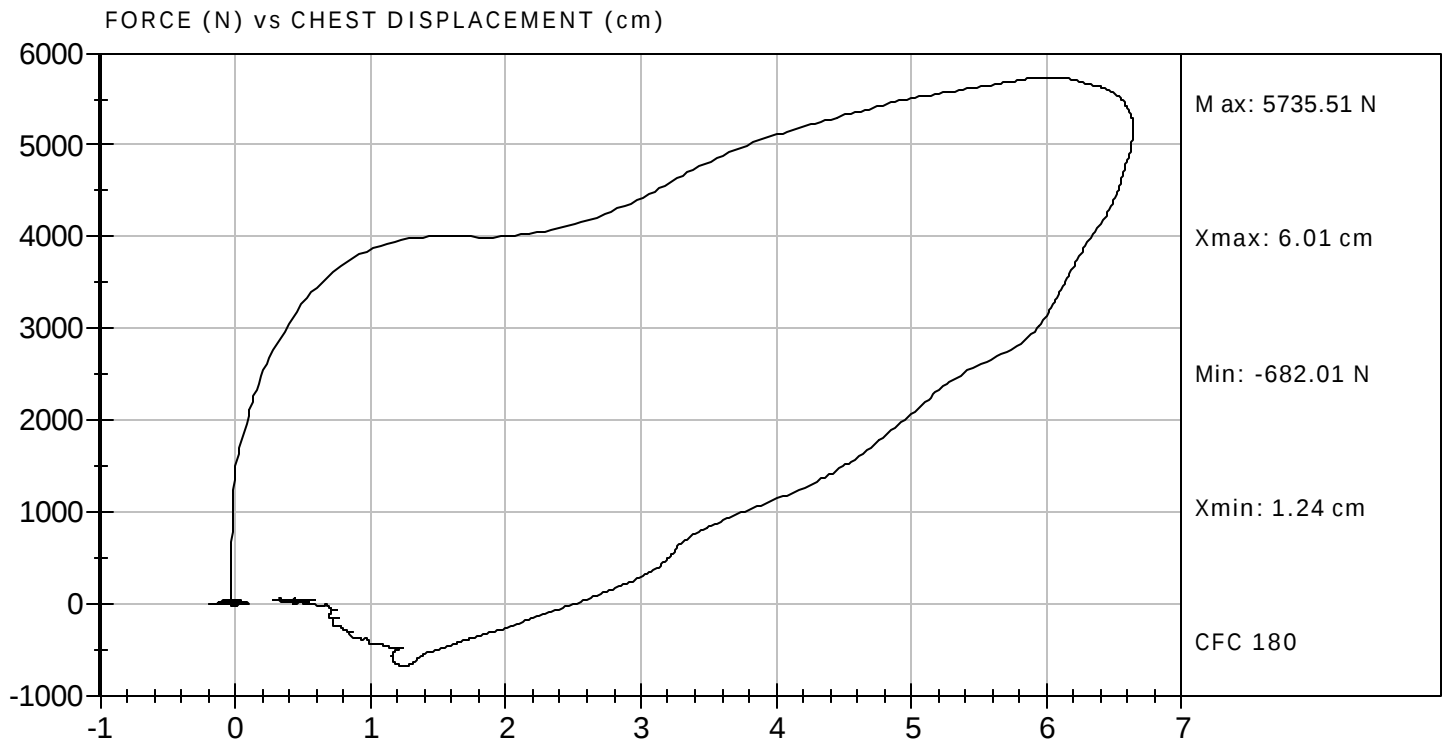


Approved By



Test Desc: Thorax Impact
Componet ID: D05984

Test Date: 04/08/2005
Velocity: 22.04 ft/s, 6.72 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 4/8/05

Technician Dave Wilcox

 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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	1107

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

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



Signature

 4/8/05

Date

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

ATD Serial No: 403

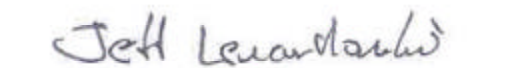
Test I.D: D05986

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,926	Pass
Overall Test Results				Pass


Laboratory Technician

04/08/2005

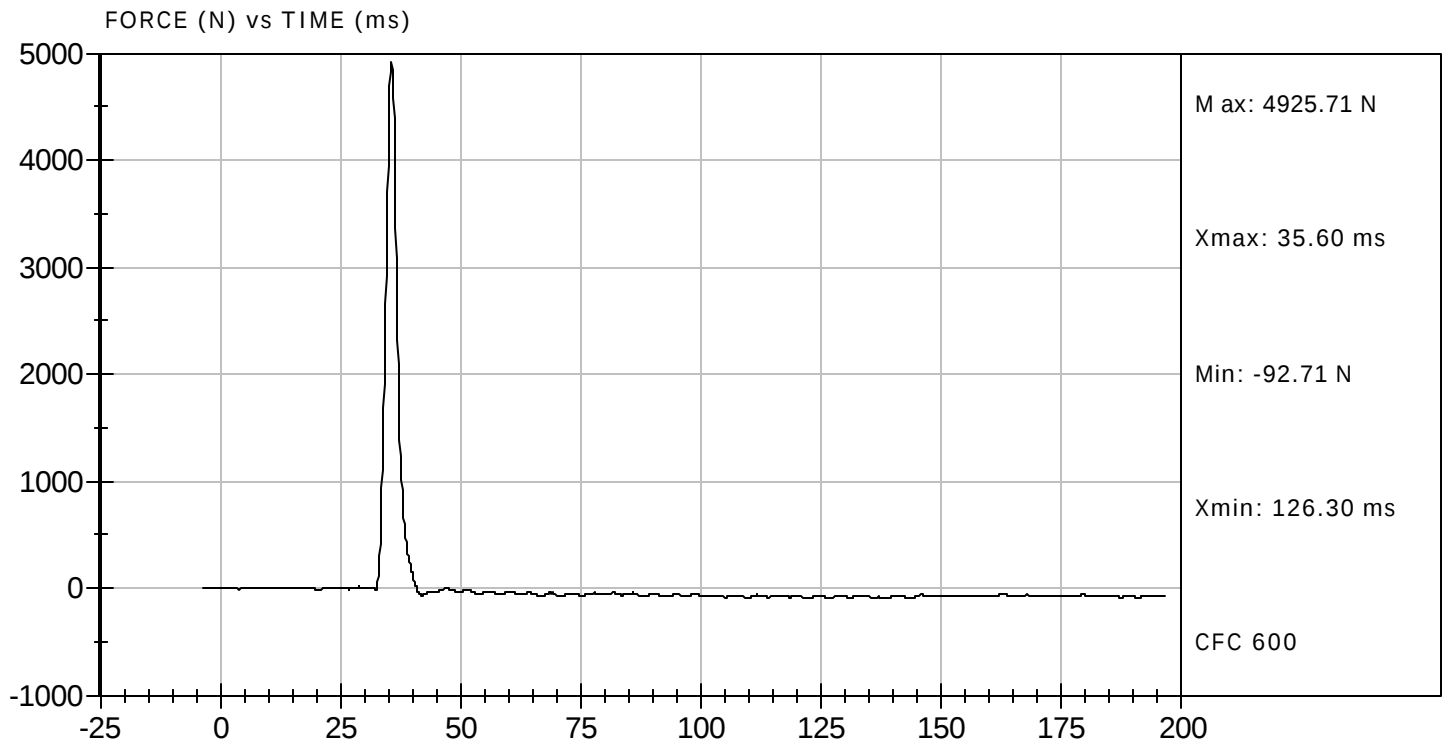
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D05986

Test Date: 04/08/2005
Velocity: 6.89 ft/s, 2.10 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 403

Test Date 4/8/05

Technician Dave Wilcox

 Pretest calibration

X 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))

 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 (86-5001-002) with the upper leg assembly (78051-47) 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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	1135

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

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



Signature

 4/8/05

Date

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

ATD Serial No: 403

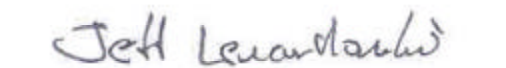
Test I.D: D05985

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,050	Pass
Overall Test Results				Pass


Laboratory Technician

04/08/2005

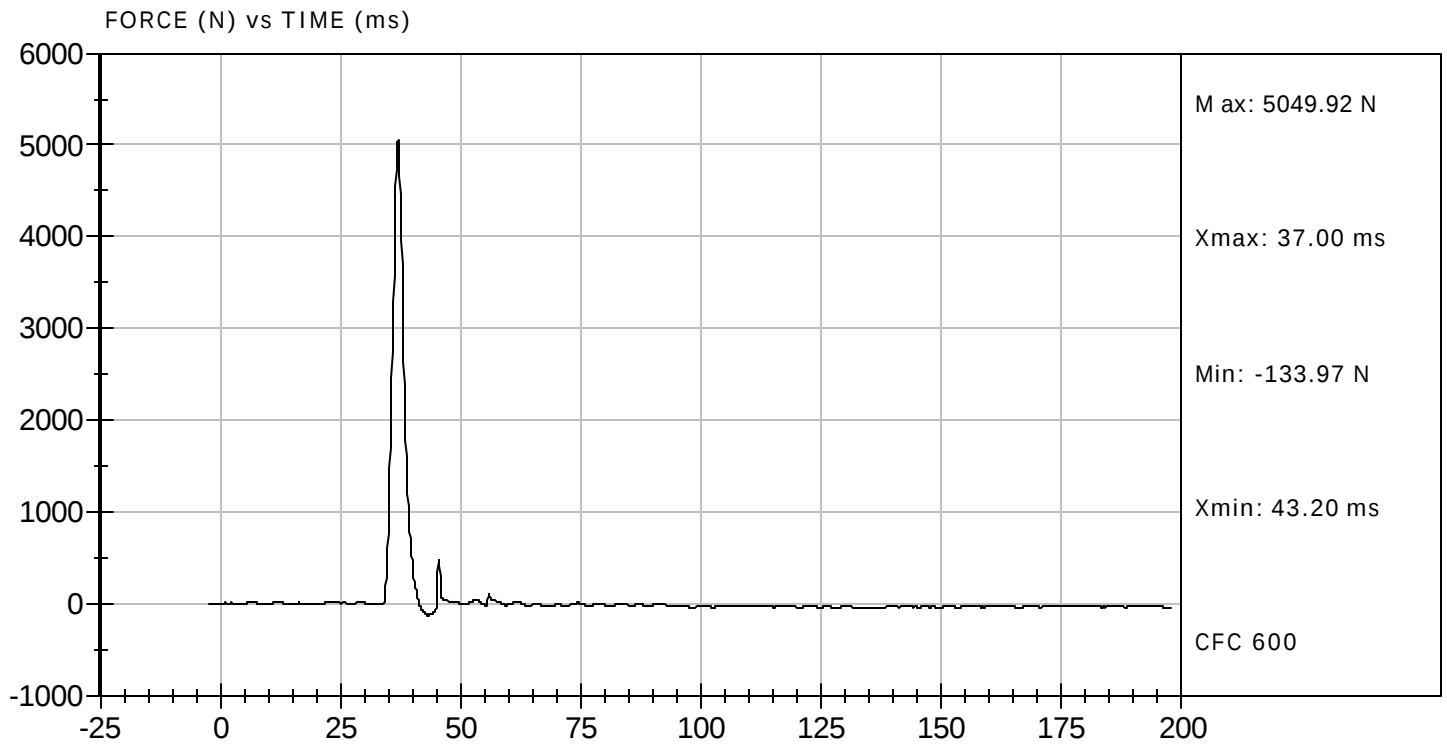
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D05985

Test Date: 04/08/2005
Velocity: 6.88 ft/s, 2.10 m/s



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

Dummy Serial Number 403

Test Date 4/8/05

Technician Joe Fleck

 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>22.1</u> |
| Record the minimum temperature | <u>21.7</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>26%</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°	torque ≤ 70 ft-lbf	45
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	47

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

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

X 13. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	60
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42

Joe Flack

Signature

4/8/05

Date

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

ATD Serial No: 403

Test I.D: D05980

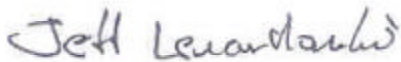
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.1	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	81.2	60.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	47	Pass
Overall Test Results					Pass



Laboratory Technician

04/08/2005

Test Date



Approved By

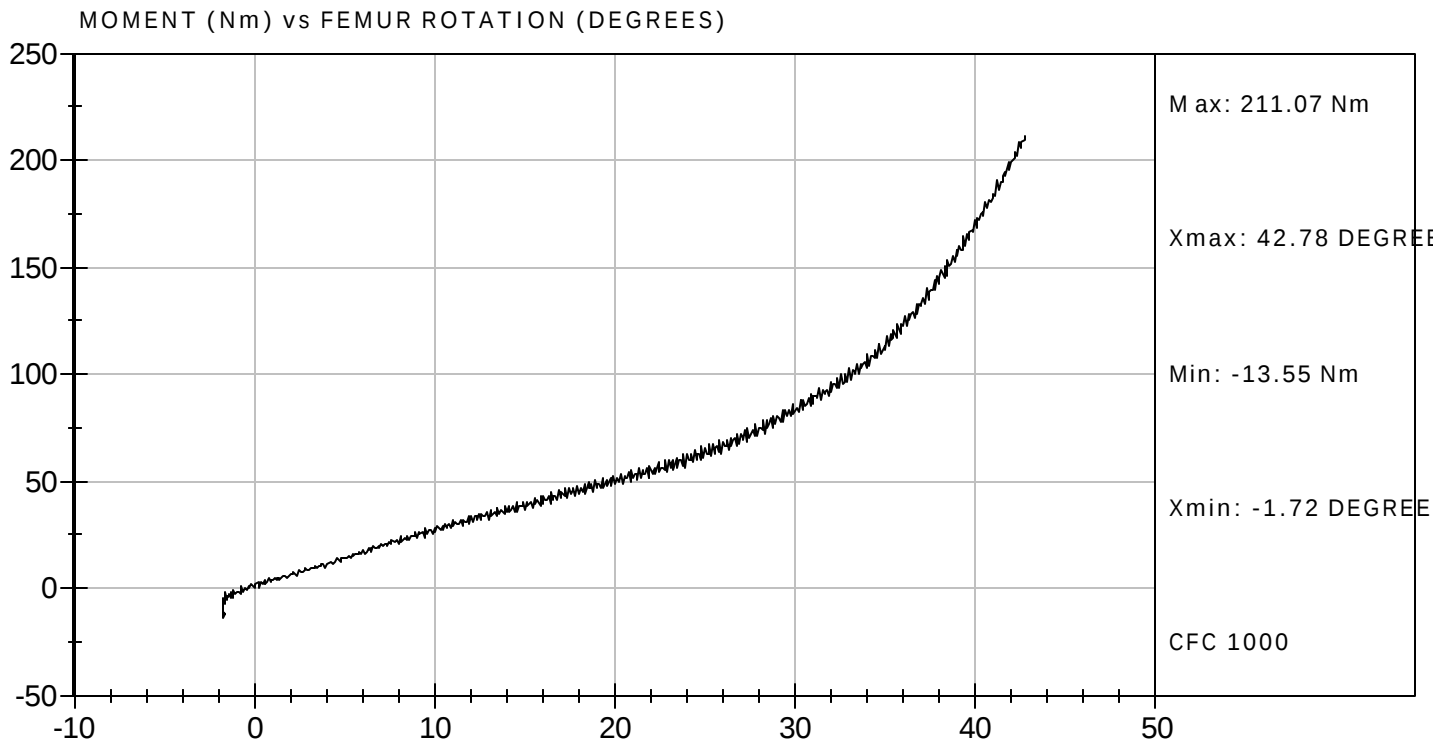


Test Desc: Hip Femur Flexion

Componet ID: D05989

Test Date: 04/08/2005

Velocity: 0 ft/s, 0.00 m/s





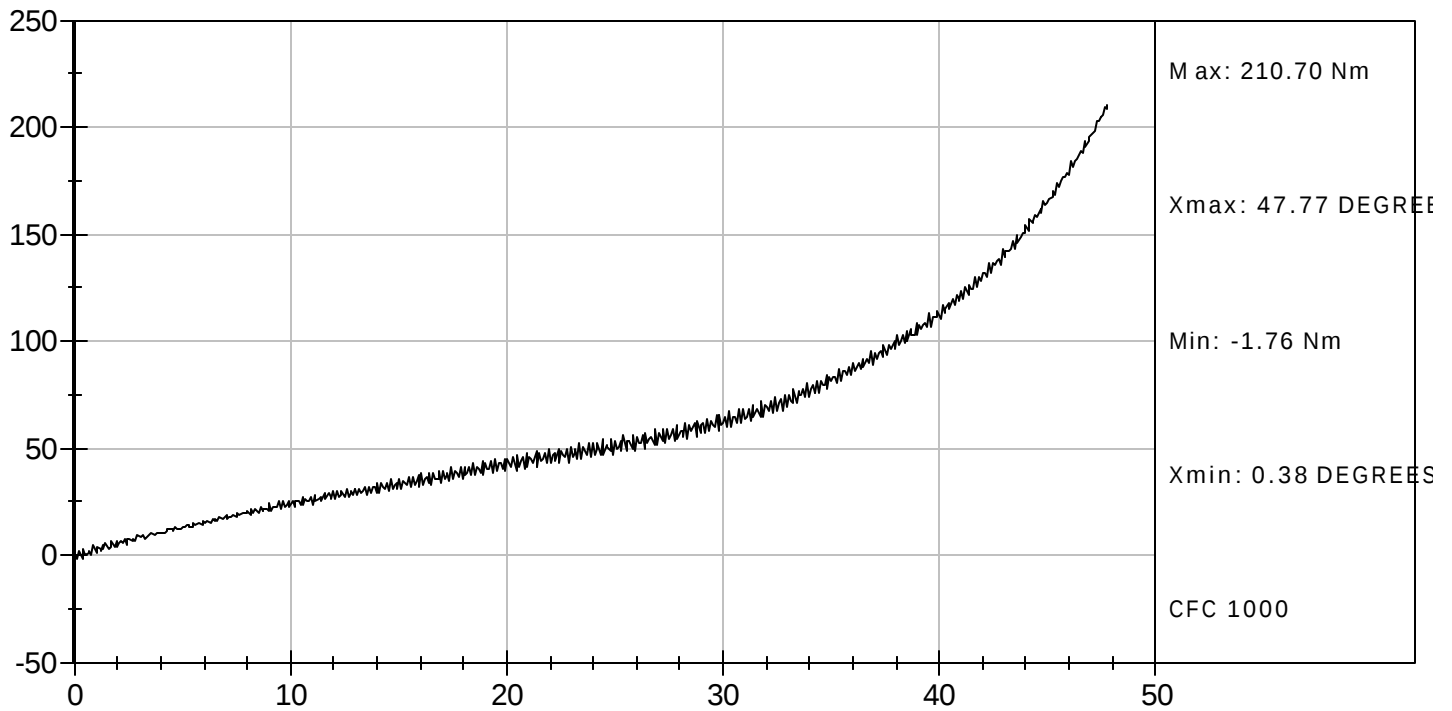
Test Desc: Hip Femur Flexion

Componet ID: D05980

Test Date: 04/08/2005

Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



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

HYBRID III 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 4/6/05

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

4/7/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Levanthaler
Signature

4/7/05
Date

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

HYBRID III 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 3/23/05

Technician Jim Carney

☒ 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 lb·in.

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

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

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.32(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

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

Record findings and actions: No Damage.

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

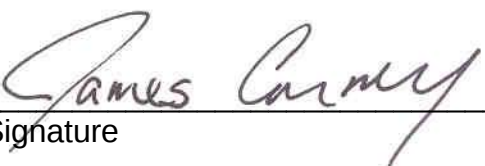
- X 10. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(c)(3))
Record the actual distance 14.8"

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 11. 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 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm
- X 13. The impact surface is rigidly supported. (572.32(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	262
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 $\leq 15 \text{ g}$	5

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


Signature

3/23/05
Date

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

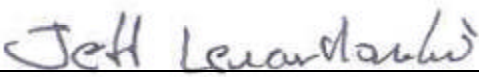
ATD Serial No: 401

Test ID: D05891

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	225 - 275	262	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.0	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

03/23/2005
Test Date

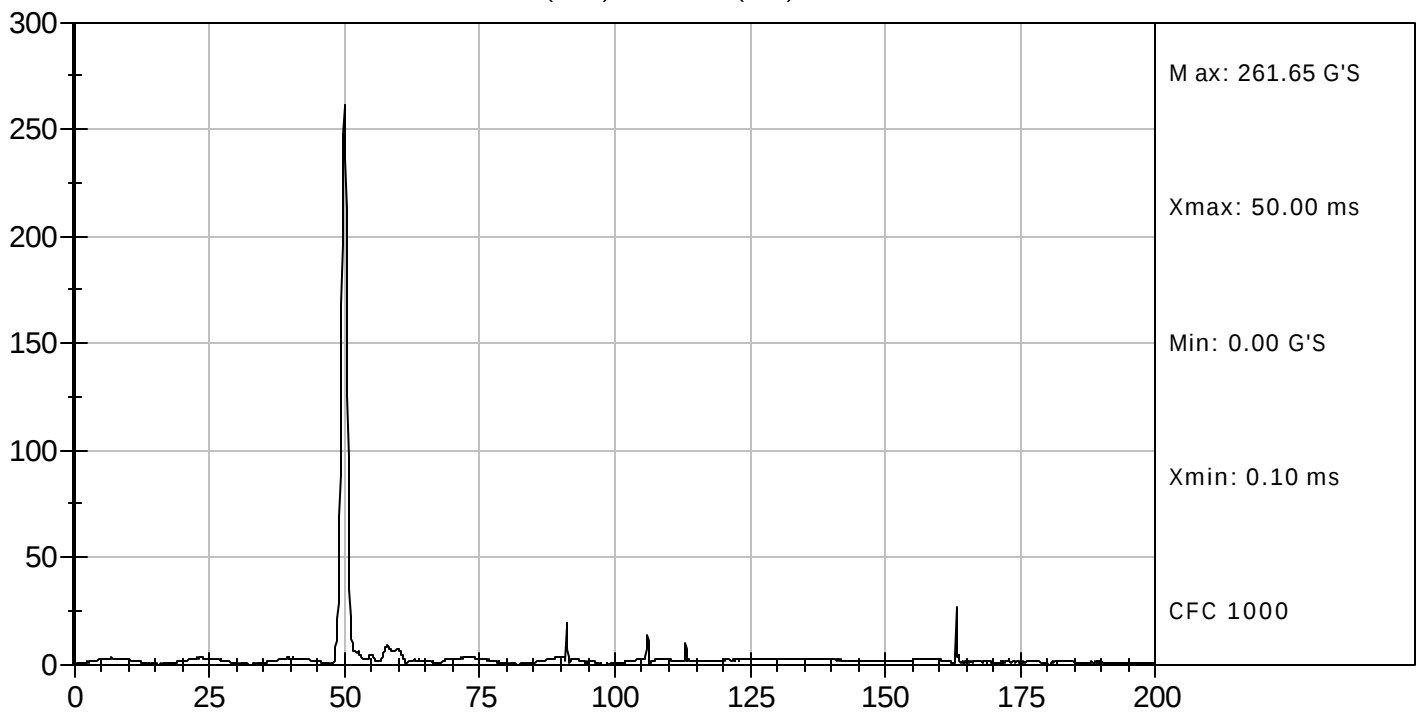

Approved By



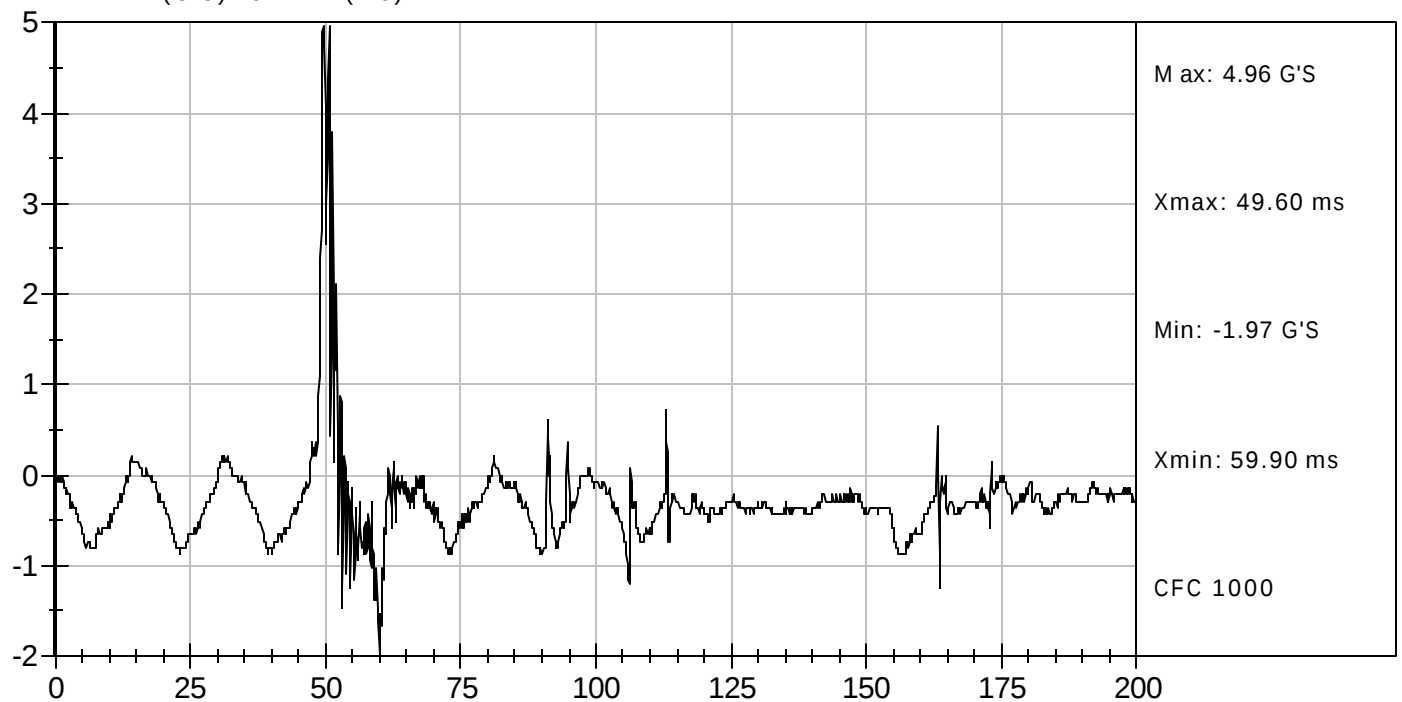
Test Desc: Head Drop
Componet ID: D05891

Test Date: 03/23/2005
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 3/24/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last flexion test. (572.36(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 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

☒ 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		$22.6 \text{ ft/sec} \leq \text{speed} \leq 23.4 \text{ ft/sec}$	23.4
Pendulum Deceleration Versus Time Pulse	@ 10ms	$22.5 \leq g \leq 27.5$	24.8
	@ 20 ms	$17.6 \leq g \leq 22.6$	20.3
	@ 30ms	$12.5 \leq g \leq 18.5$	14.6
	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		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	78
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	60
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	120
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	67
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	53
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	101

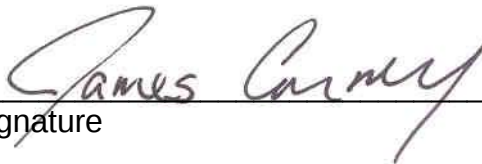
*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$
(572.33(b)(1)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

3/24/05

Date

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

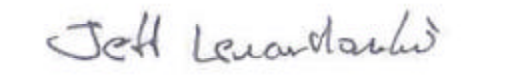
ATD Serial No: 401

Test I.D: D05892

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	17	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.12	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.83	Pass
	20 msec	G's	17.60 to 22.60	20.31	Pass
	30 msec	G's	12.50 to 18.50	14.64	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.60	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	77.8	Pass
	Time	msec	57.0 to 64.0	60.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	120.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	91.0	Pass
	Time	msec	47.0 to 58.0	52.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.5	Pass
Overall Test Results					Pass


 Laboratory Technician

03/24/2005
 Test Date

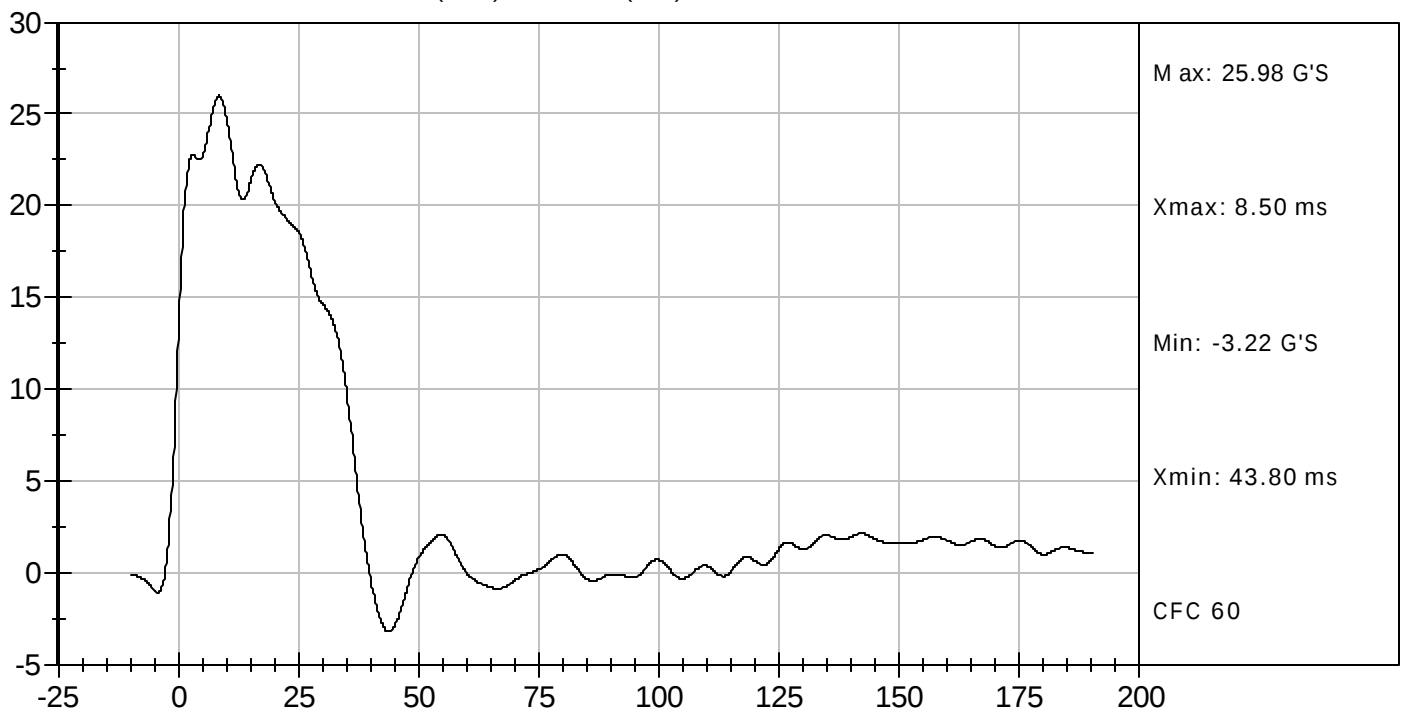

 Approved By



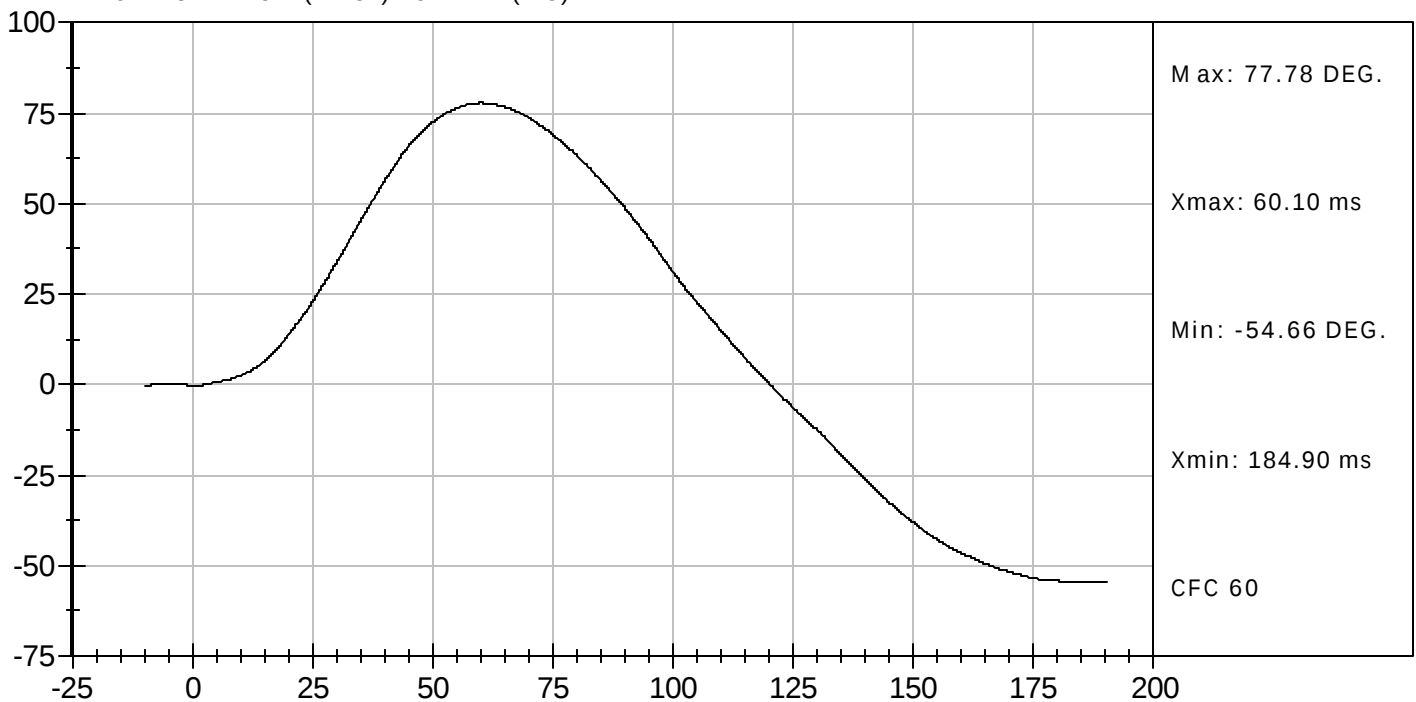
Test Desc: Neck Flexion
Componet ID: D05892

Test Date: 03/24/2005
Velocity: 23.36 ft/s, 7.12 m/s

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



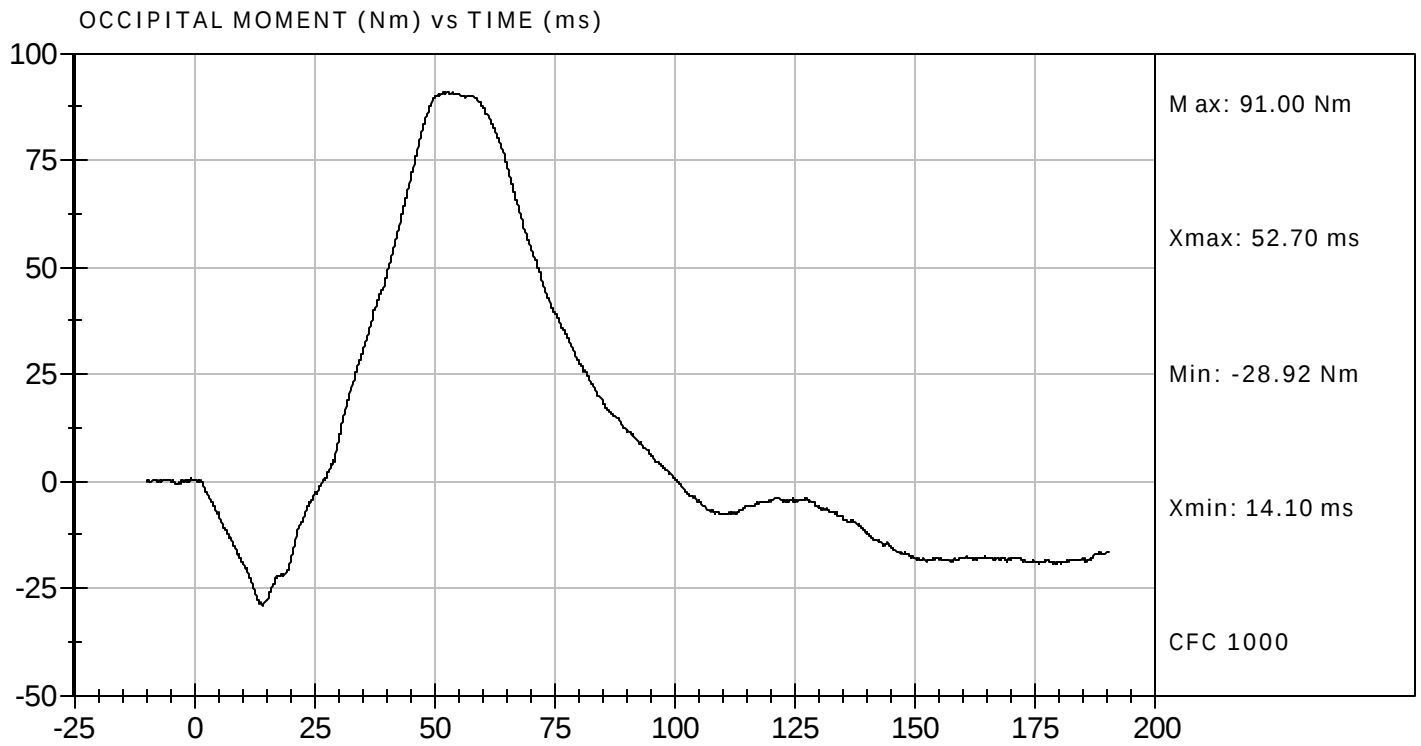
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D05892

Test Date: 03/24/2005
Velocity: 23.36 ft/s, 7.12 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 401

Test Date 3/24/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one extension test performed

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

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

Record the maximum temperature 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

☒ 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		$19.5 \text{ ft/sec} \leq \text{speed} \leq 20.3 \text{ ft/sec}$	19.6
Pendulum Deceleration versus time pulse	@ 10ms	$17.2 \leq g \leq 21.2$	18.2
	@ 20 ms	$14 \leq g \leq 19$	16.2
	@30ms	$11.0 \leq g \leq 16.0$	12.9
	Above 30 ms	22 g maximum	13
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	41
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	96
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	80
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	163
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-47
		$65 \text{ ms} \leq \text{time} \leq 79 \text{ ms}$	76
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	143

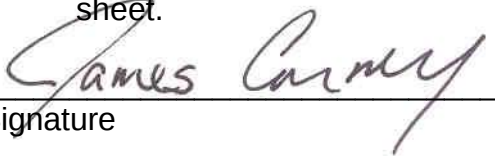
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$
(572.133(b)(1)(ii))

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

3/24/05
Date

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

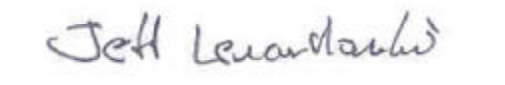
ATD Serial No: 401

Test I.D: D05893

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	17	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.99	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.21	Pass
	20 msec	G's	14.00 to 19.00	16.22	Pass
	30 msec	G's	11.00 to 16.00	12.87	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.81	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	40.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.9	Pass
	Time	msec	72.0 to 82.0	79.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	163.1	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-64.1	Pass
	Time	msec	65.0 to 79.0	75.8	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	143.3	Pass
Overall Test Results					Pass


Laboratory Technician

03/24/2005
Test Date


Approved By



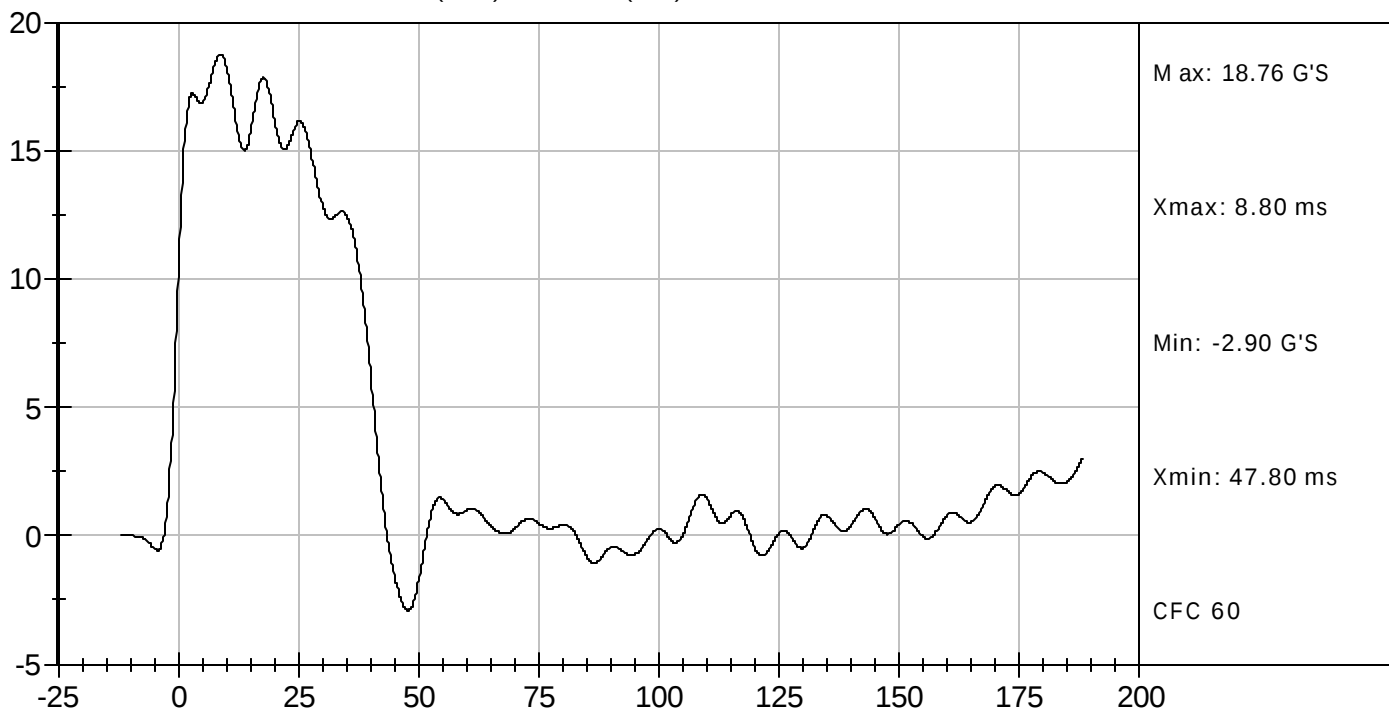
Test Desc: Neck Extension

Componet ID: D05893

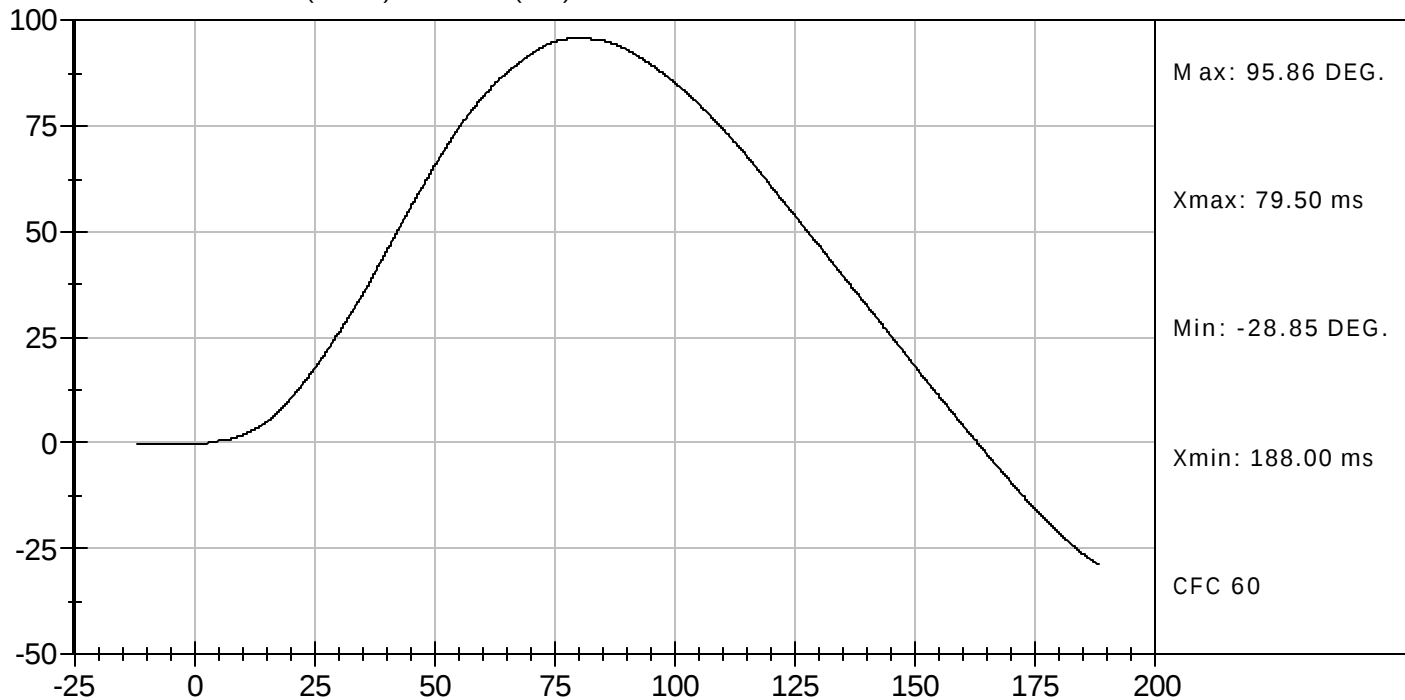
Test Date: 03/24/2005

Velocity: 19.64 ft/s, 5.99 m/s

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



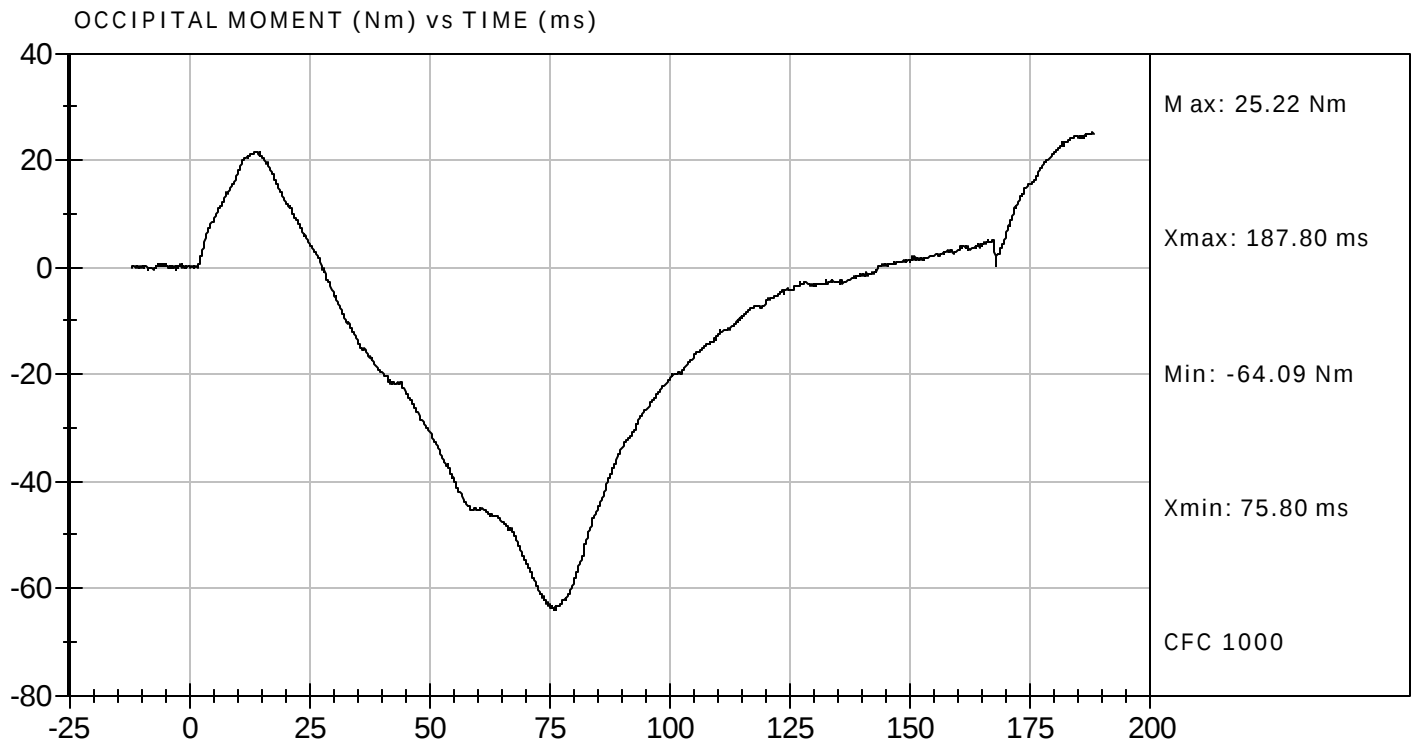
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D05893

Test Date: 03/24/2005
Velocity: 19.64 ft/s, 5.99 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 401 Test Date 3/24/05

Technician Joe Fleck

☒ Pretest calibration
☐ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

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

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.34(c)(1))

Record the maximum temperature 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage

☐ - The following repairs or replacement was performed. Record

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s $\leq$ speed $\leq$ 22.4 f/s	22.0
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.74
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1272
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	72%

*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

3/24/05

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 401

Test I.D: D05894

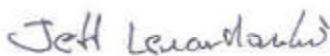
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.71	Pass
Peak Probe Force	N	5159 to 5893	5,656	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.95	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass



Laboratory Technician

03/24/2005

Test Date

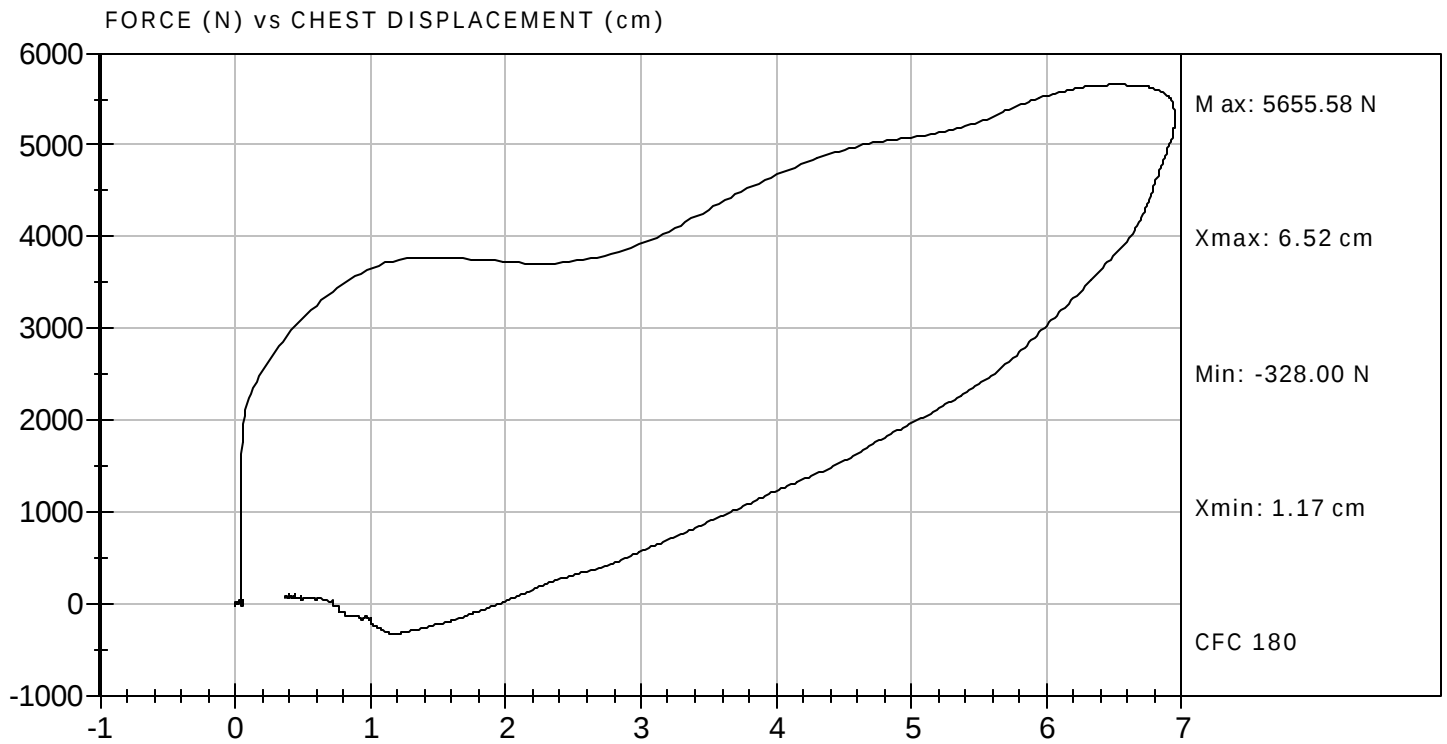


Approved By



Test Desc: Thorax Impact
Componet ID: D05894

Test Date: 03/24/2005
Velocity: 22.01 ft/s, 6.71 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 3/24/05

Technician Dave Wilcox

☒ 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 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

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

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

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

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

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

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

☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	6.8 ft/s ≤ speed ≤ 7.0 ft/s	6.9
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1215

*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

3/24/05

Date

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

ATD Serial No: 401

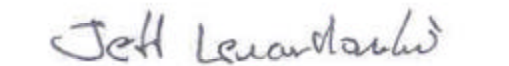
Test I.D: D05896

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,403	Pass
Overall Test Results				Pass


Laboratory Technician

03/24/2005

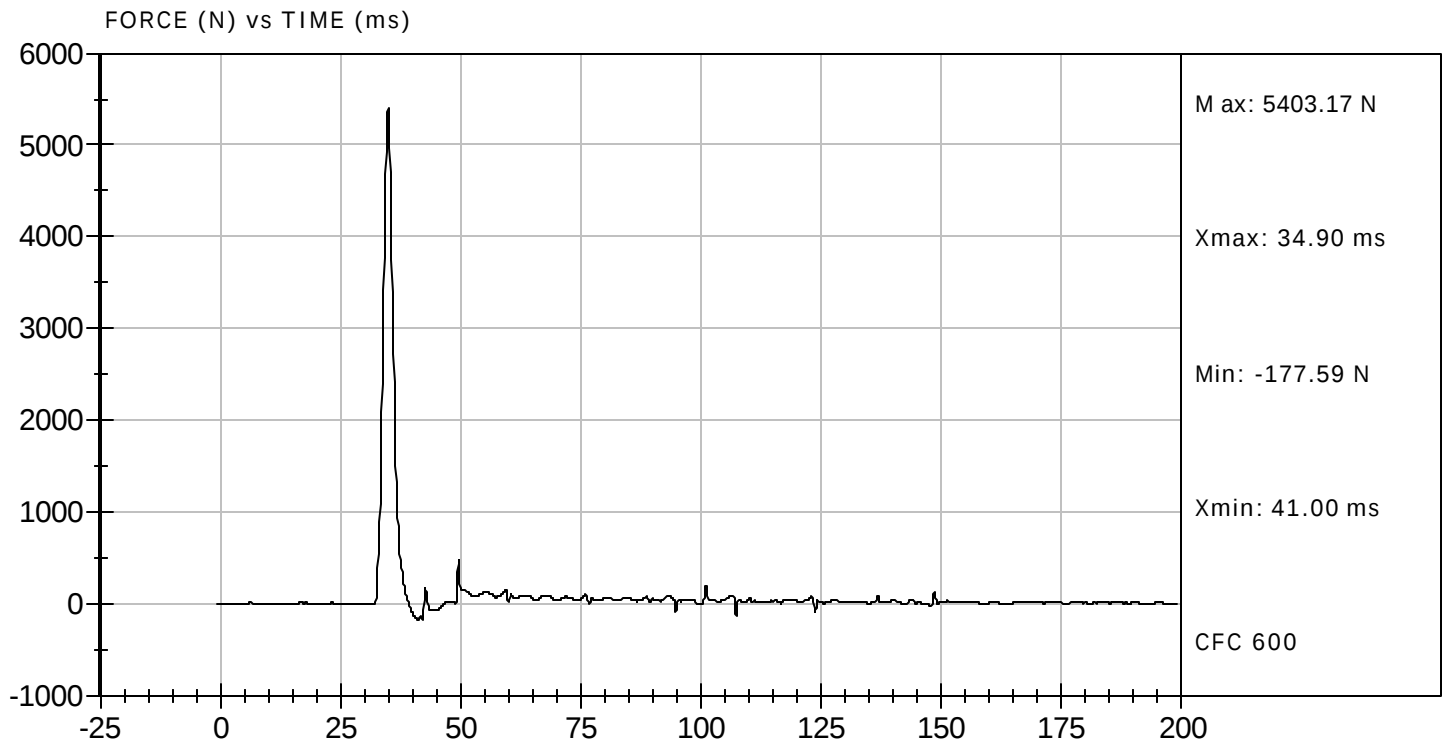
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D05896

Test Date: 03/24/2005
Velocity: 6.92 ft/s, 2.11 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 3/24/05

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

1. It has been at least 30 minutes since the last knee impact test.
(572.36(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 (86-5001-002) with the upper leg assembly (78051-47) 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 21.3

Record the minimum temperature 20.8

Record the maximum humidity 20%

Record the minimum humidity 17%

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	7.0
Peak resistance force*	1060 lb ≤ force ≤ 1300 lb	1120

*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

3/24/05

Date

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

ATD Serial No: 401

Test I.D: D05895

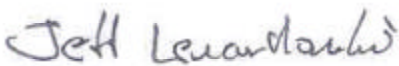
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,983	Pass
Overall Test Results				Pass



Laboratory Technician

03/24/2005

Test Date

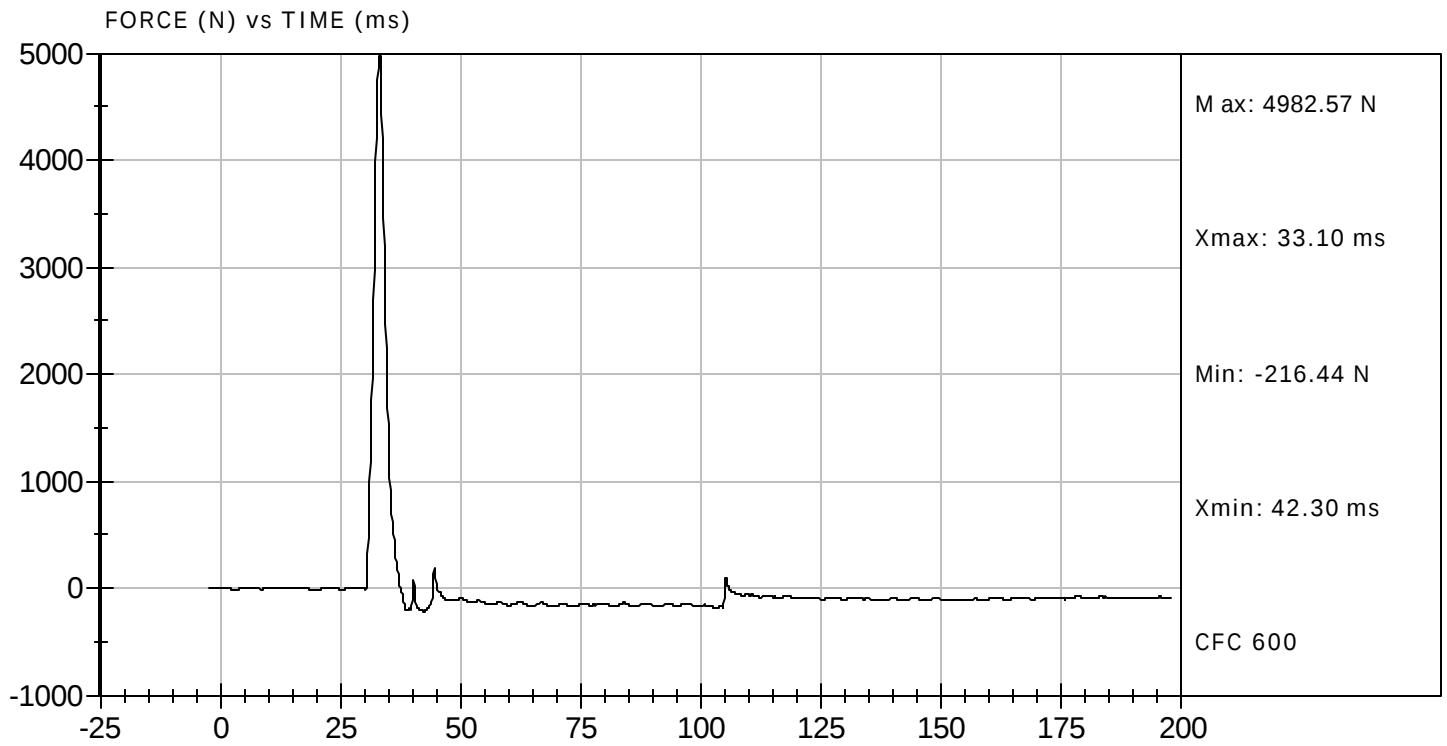


Approved By



Test Desc: Right Knee
Componet ID: D05895

Test Date: 03/24/2005
Velocity: 6.95 ft/s, 2.12 m/s



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

Dummy Serial Number 401

Test Date 3/23/05

Technician Jim Carney

☒ 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>21.3</u> |
| Record the minimum temperature | <u>20.8</u> |
| Record the maximum humidity | <u>20%</u> |
| Record the minimum humidity | <u>17%</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 ½in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	55
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41

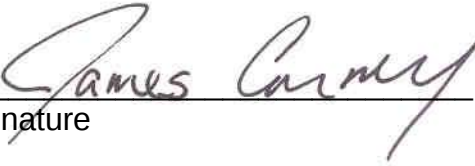
X 11. Secure the lever arm into the right femur shaft opening of the upper leg structure assembly (78051-44) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))

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°	torque ≤ 70 ft-lbf	65
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41


Signature

3/23/05
Date

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

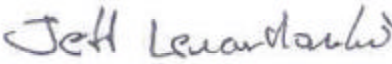
ATD Serial No: 401

Test I.D: D05890

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	17	17	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	87.8	74.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	41	Pass
Overall Test Results					Pass


 Laboratory Technician

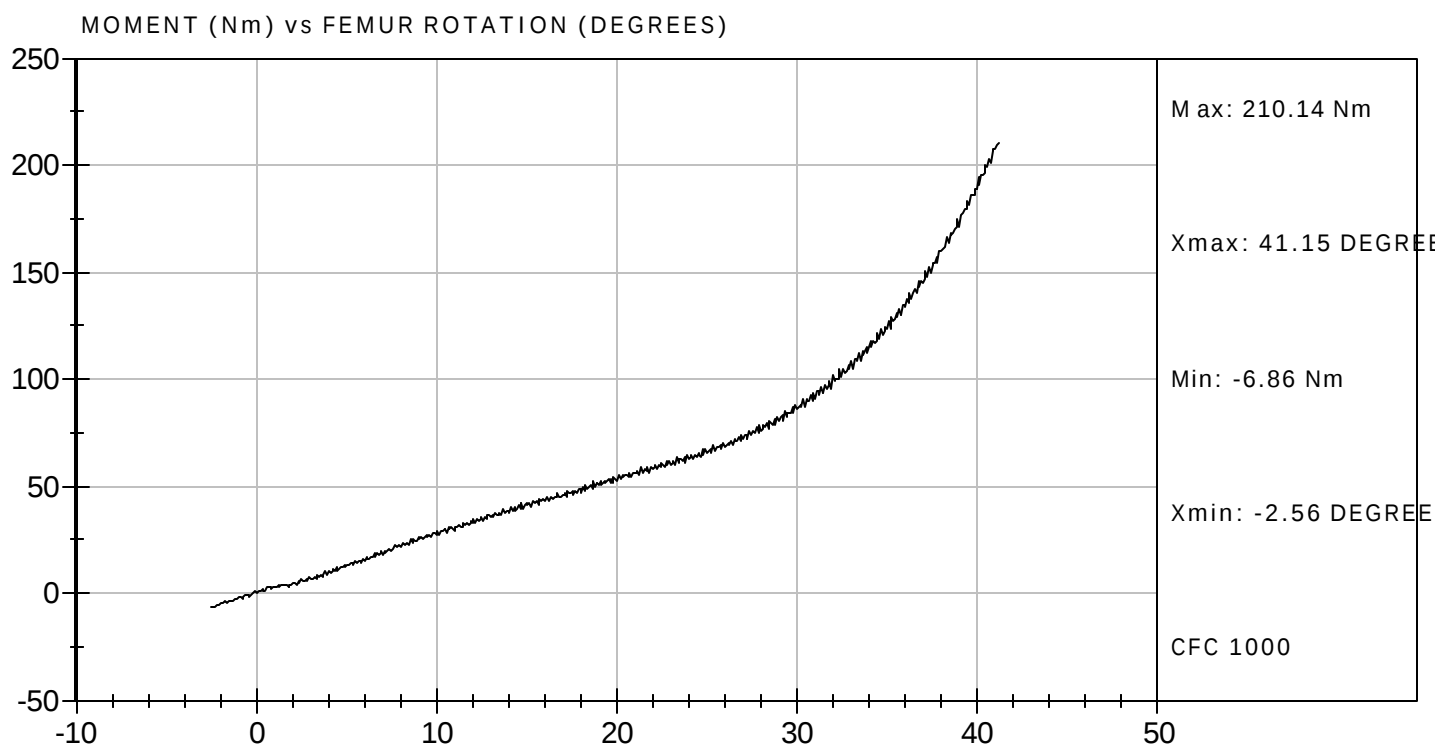
03/23/2005
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Componet ID: D05899

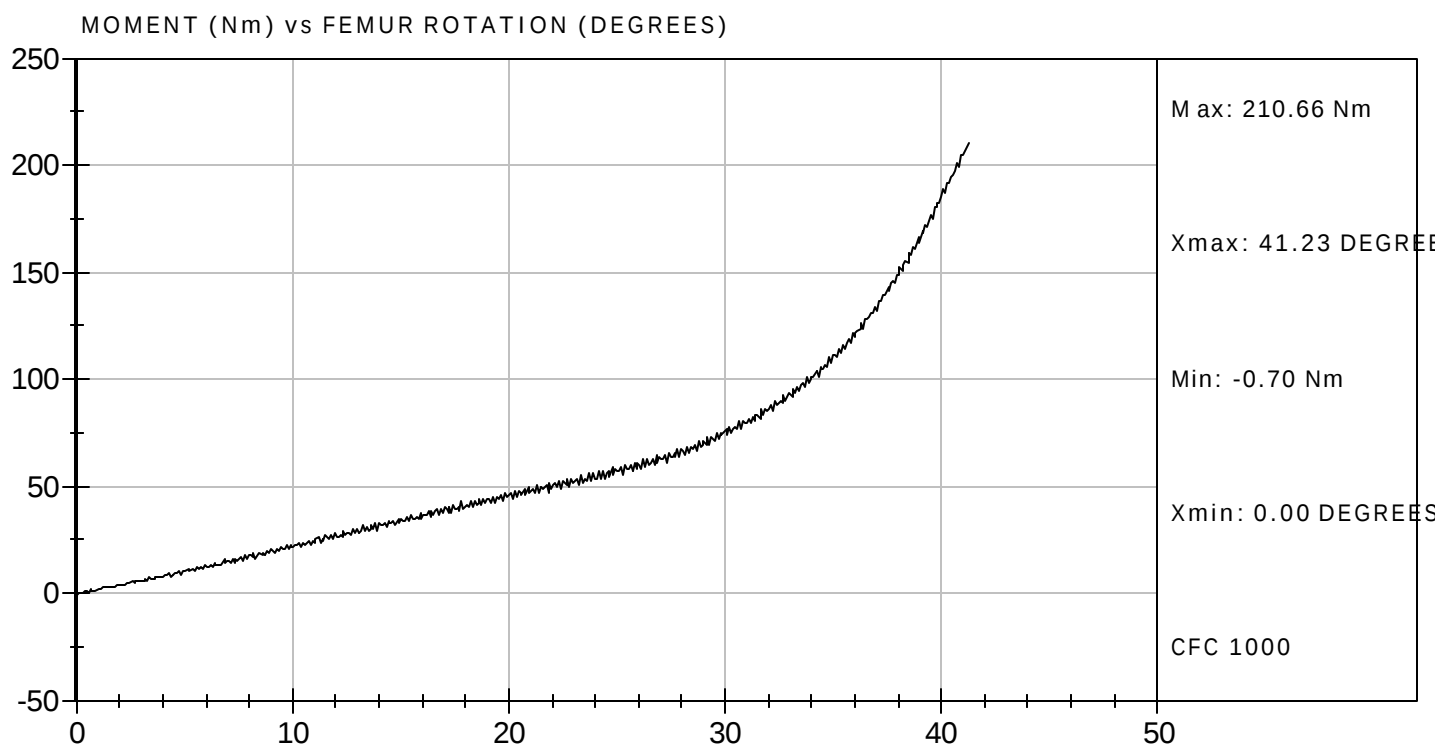
Test Date: 03/23/2005
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D05890

Test Date: 03/23/2005
Velocity: 0 ft/s, 0.00 m/s



DATA SHEET A3
HEAD DROP TEST (572.32)

Dummy Serial Number 401

Test Date 4/08/05

Technician Joe Fleck

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

X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.32(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, 1,1,1 trichloroethane or equivalent prior to the test. (572.32(c)(2))

- X 10. 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 11. 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 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.32(c)(4))
Record actual micro finish 656×10^{-6} mm
- X 13. The impact surface is rigidly supported. (572.32(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)
Record thickness 50.9mm
Record width 60.4mm
Record length 595mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	257
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	13

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



Signature

04/08/05

Date

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

ATD Serial No: 401

Test ID: D05971

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	225 - 275	257	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.5	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

04/08/2005

Test Date



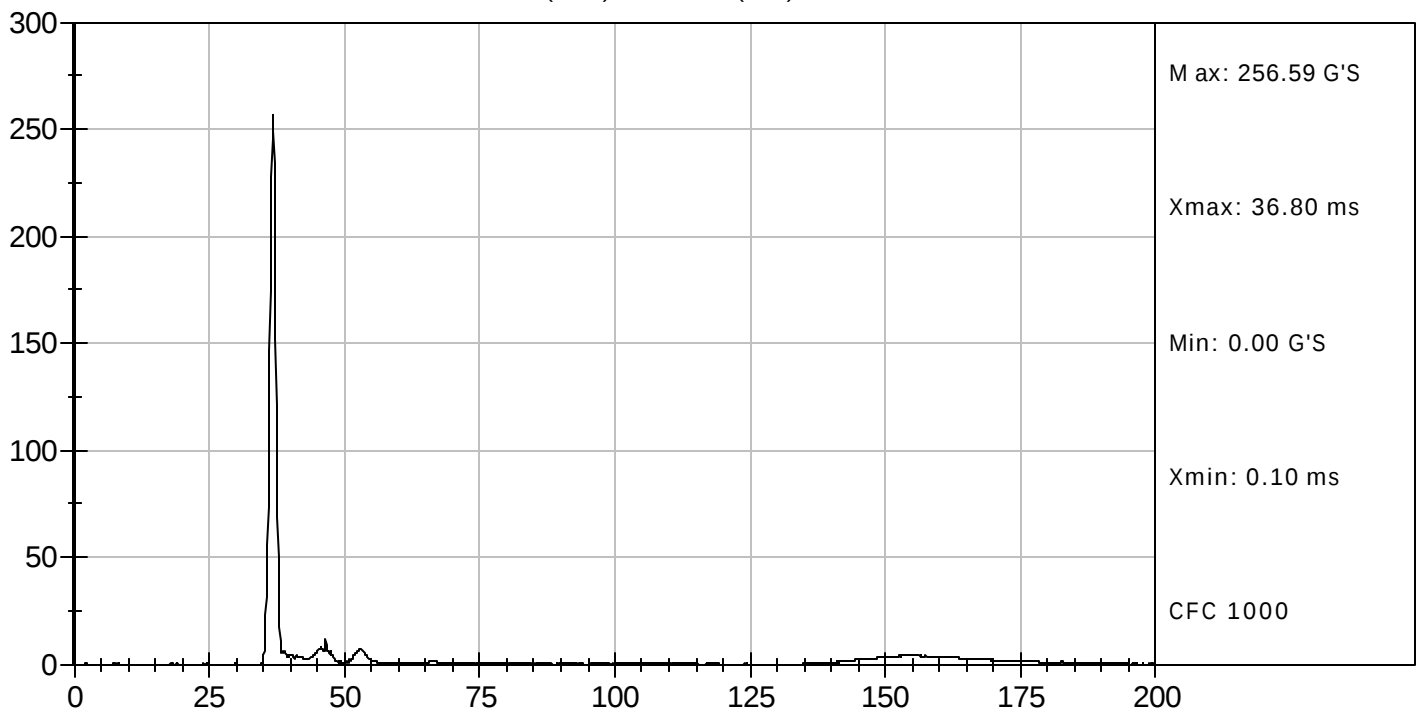
Approved By



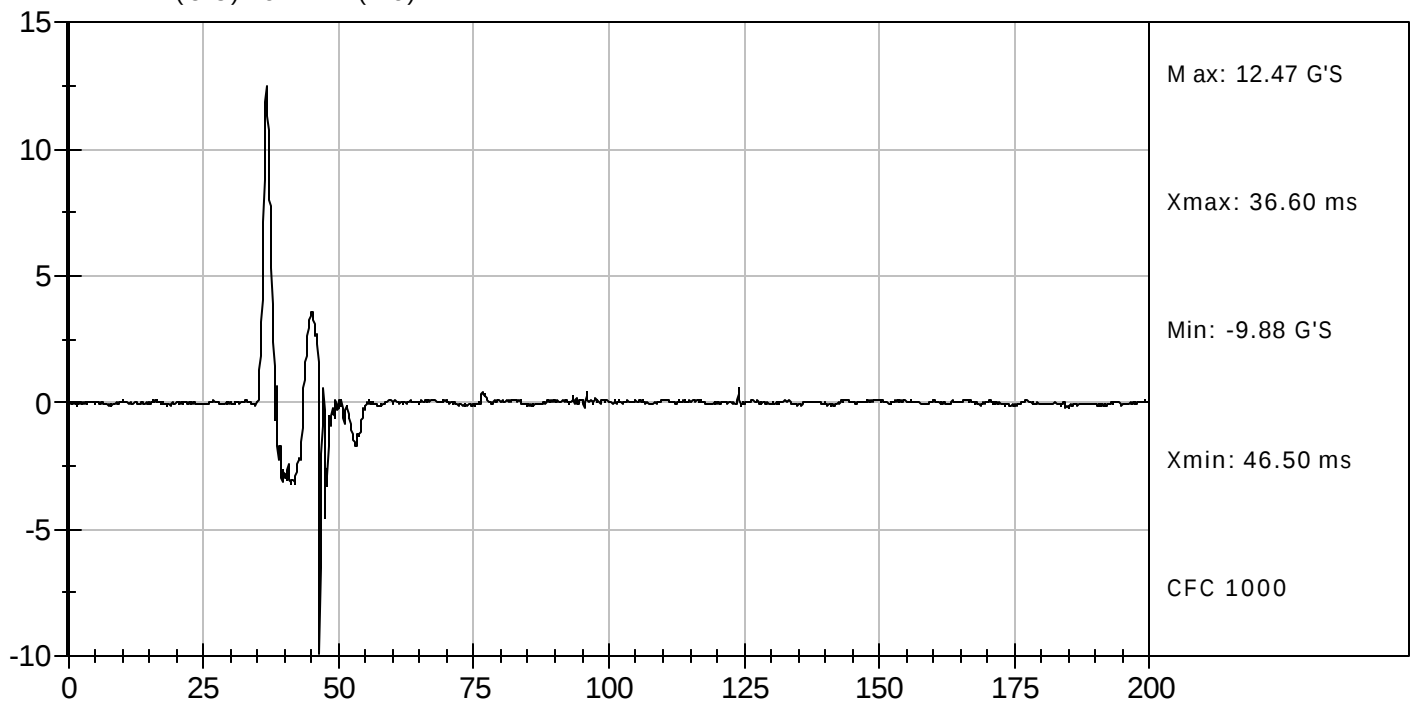
Test Desc: Head Drop
Componet ID: D05971

Test Date: 04/08/2005
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 04/08/05

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last flexion test. (572.36(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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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

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

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

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

☒ 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

☐ N/A – post test calibration

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9A for the flexion test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))

X 13. Complete the following table:

Neck Flexion Test Results (572.33(b)(1) & (572.33(c)(4))			
Parameter		Specification	Result
Pendulum impact speed		22.6 ft/sec ≤ speed ≤ 23.4 ft/sec	23.2
Pendulum Deceleration Versus Time Pulse	@ 10ms	22.5 ≤ g ≤ 27.5	24.7
	@ 20 ms	17.6 ≤ g ≤ 22.6	21.4
	@30ms	12.5 ≤ g ≤ 18.5	16.6
	Above 30 ms	29 g maximum	17
First Pendulum Decay to 5g		34 ms ≤ time ≤ 42 ms	37
Plane D Rotation		64° ≤ max. rotation ≤ 78°	75
		57 ms ≤ time of max. rotation ≤ 64 ms	60
Time for Plane D Rotation to Cross 0° During First Rebound		113 ms ≤ time ≤ 128 ms	118
Maximum Moment		65 lbf-ft ≤ moment ≤ 80 lbf-ft	67
		47 ms ≤ time of max. moment ≤ 58 ms	51
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		97 ms ≤ time ≤ 107ms	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

04/08/05

Date

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

ATD Serial No: 401

Test I.D.: D05972

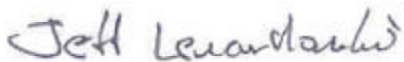
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.08	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.65	Pass
	20 msec	G's	17.60 to 22.60	21.35	Pass
	30 msec	G's	12.50 to 18.50	16.60	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	16.56	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	75.2	Pass
	Time	msec	57.0 to 64.0	59.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	118.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	90.2	Pass
	Time	msec	47.0 to 58.0	50.9	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	99.4	Pass
Overall Test Results					Pass



Laboratory Technician

04/08/2005

Test Date



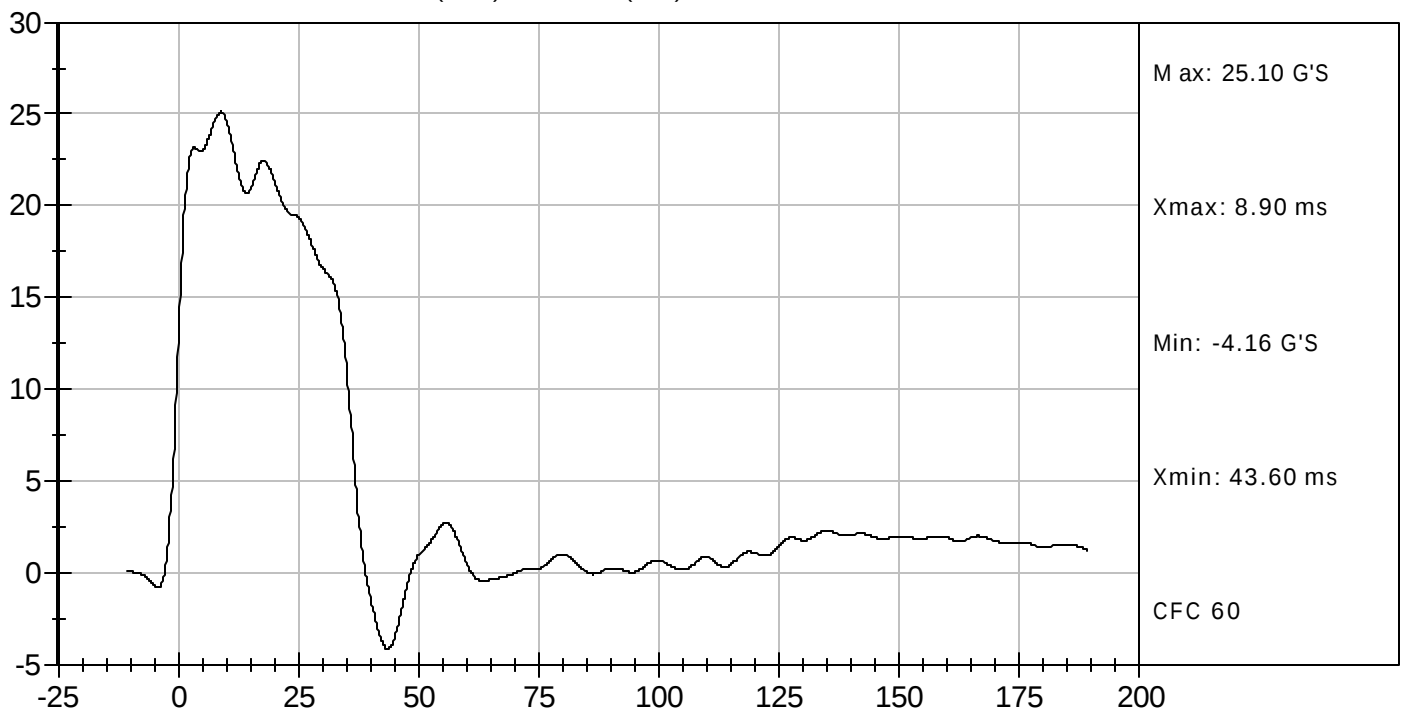
Approved By



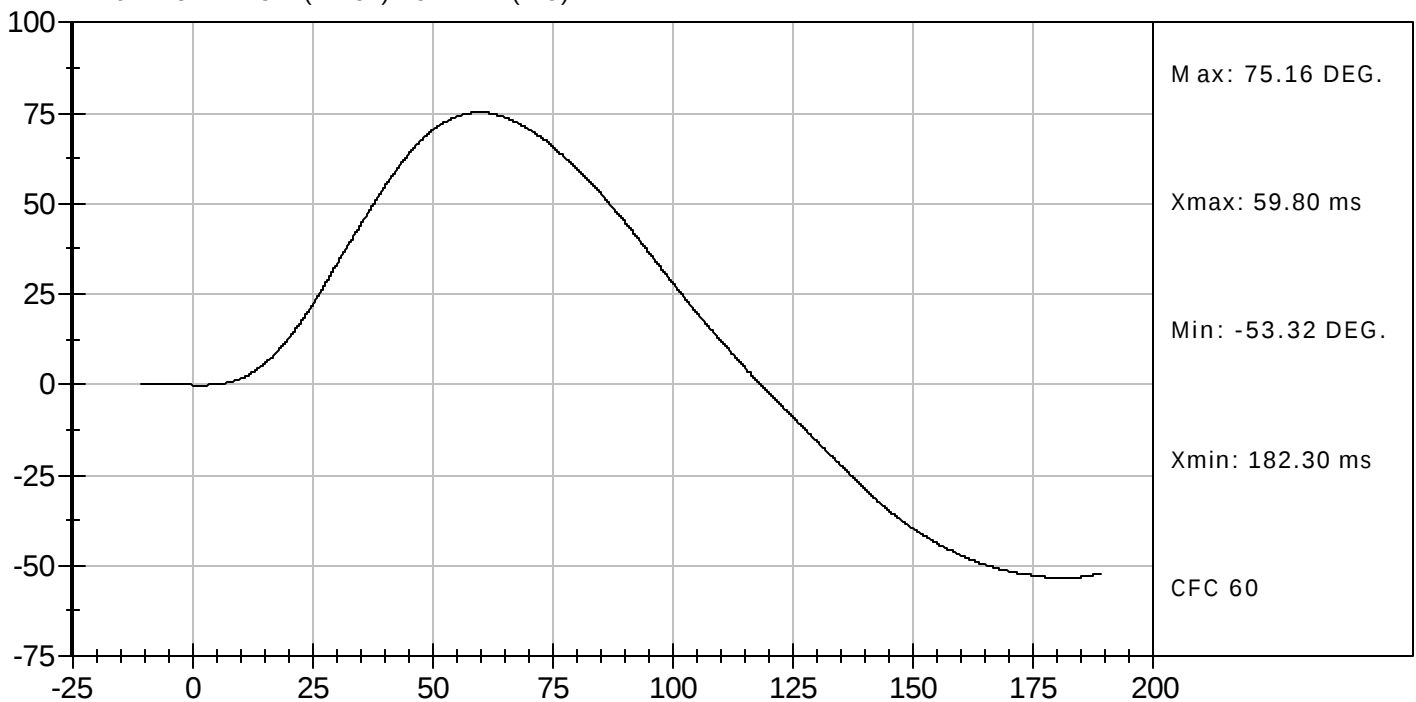
Test Desc: Neck Flexion
Componet ID: D05972

Test Date: 04/08/2005
Velocity: 23.24 ft/s, 7.08 m/s

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



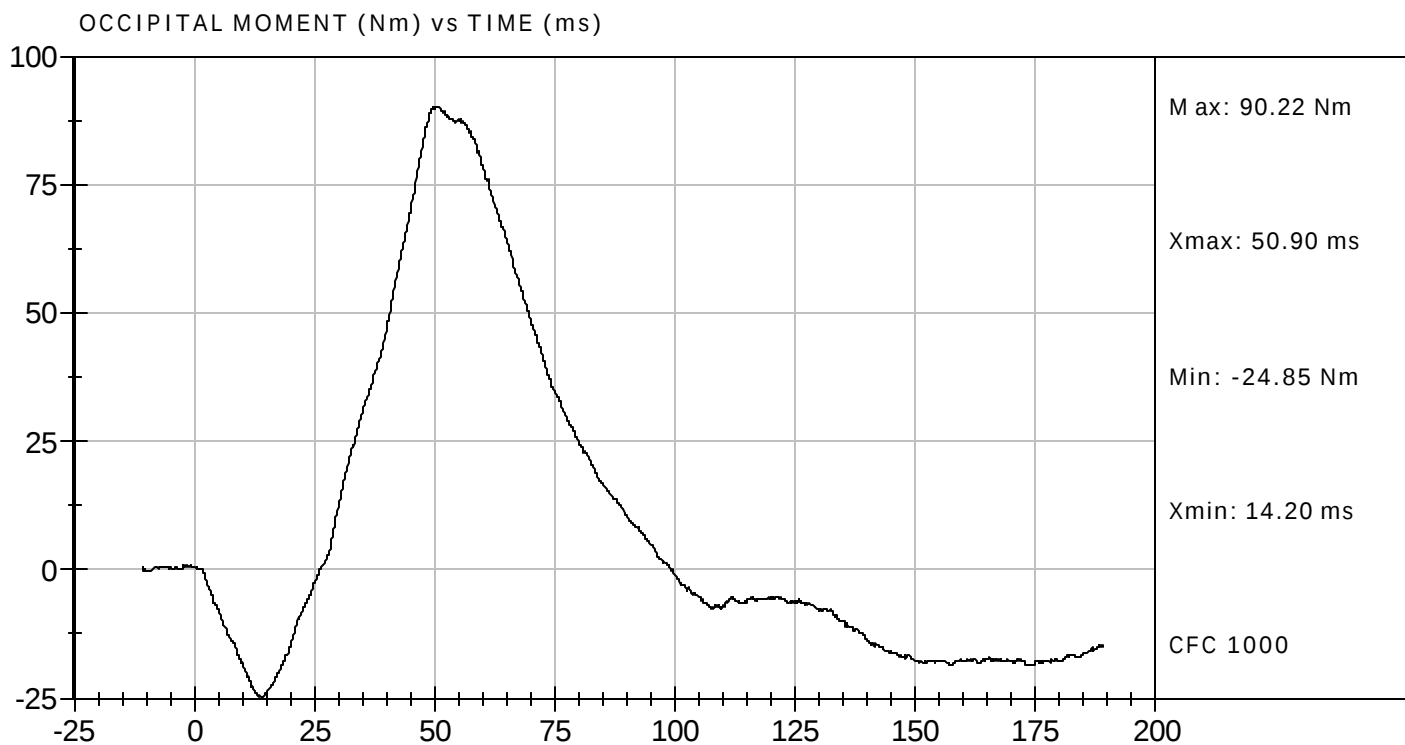
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D05972

Test Date: 04/08/2005
Velocity: 23.24 ft/s, 7.08 m/s



DATA SHEET A5
NECK EXTENSION TEST (572.33)

Dummy Serial Number 401

Test Date 04/08/05

Technician Joe Fleck

 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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 ft/sec $\leq$ speed $\leq$ 20.3 ft/sec	19.9
Pendulum Deceleration versus time pulse	@ 10ms	17.2 $\leq$ g $\leq$ 21.2	18.3
	@ 20 ms	14 $\leq$ g $\leq$ 19	16.5
	@30ms	11.0 $\leq$ g $\leq$ 16.0	13.4
	Above 30 ms	22 g maximum	14
First Pendulum Decay to 5g		38 ms $\leq$ time $\leq$ 46 ms	42
Plane D Rotation		81° $\leq$ max. rotation $\leq$ 106°	99
		72 ms $\leq$ time of max. rotation $\leq$ 82 ms	80
Time for Plane D Rotation to Cross 0° During First Rebound		147 ms $\leq$ time $\leq$ 174 ms	160
Maximum Moment		-59 lbf-ft $\leq$ moment $\leq$ -39 lbf-ft	-49
		65 ms $\leq$ time $\leq$ 79 ms	74
Time of first decay to 0 lbf-ft Negative Moment Decay** (Extension)		120 ms $\leq$ time $\leq$ 148 ms	143

*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

04/08/05
Date

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

ATD Serial No: 401

Test I.D: D05973

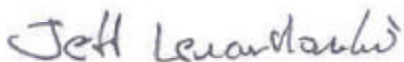
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.28	Pass
	20 msec	G's	14.00 to 19.00	16.49	Pass
	30 msec	G's	11.00 to 16.00	13.44	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.92	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	41.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.9	Pass
	Time	msec	72.0 to 82.0	80.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	160.1	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-66.0	Pass
	Time	msec	65.0 to 79.0	74.4	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	142.5	Pass
Overall Test Results					Pass



Laboratory Technician

04/08/2005

Test Date



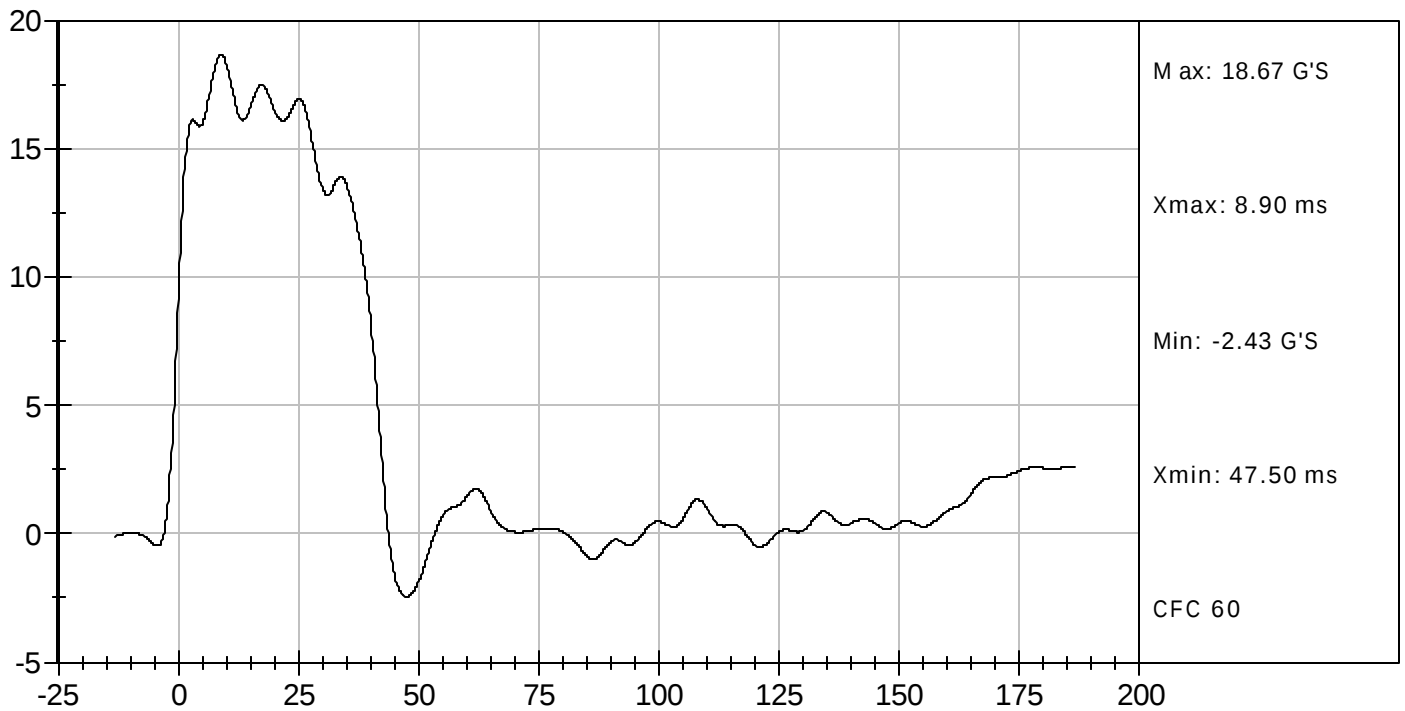
Approved By



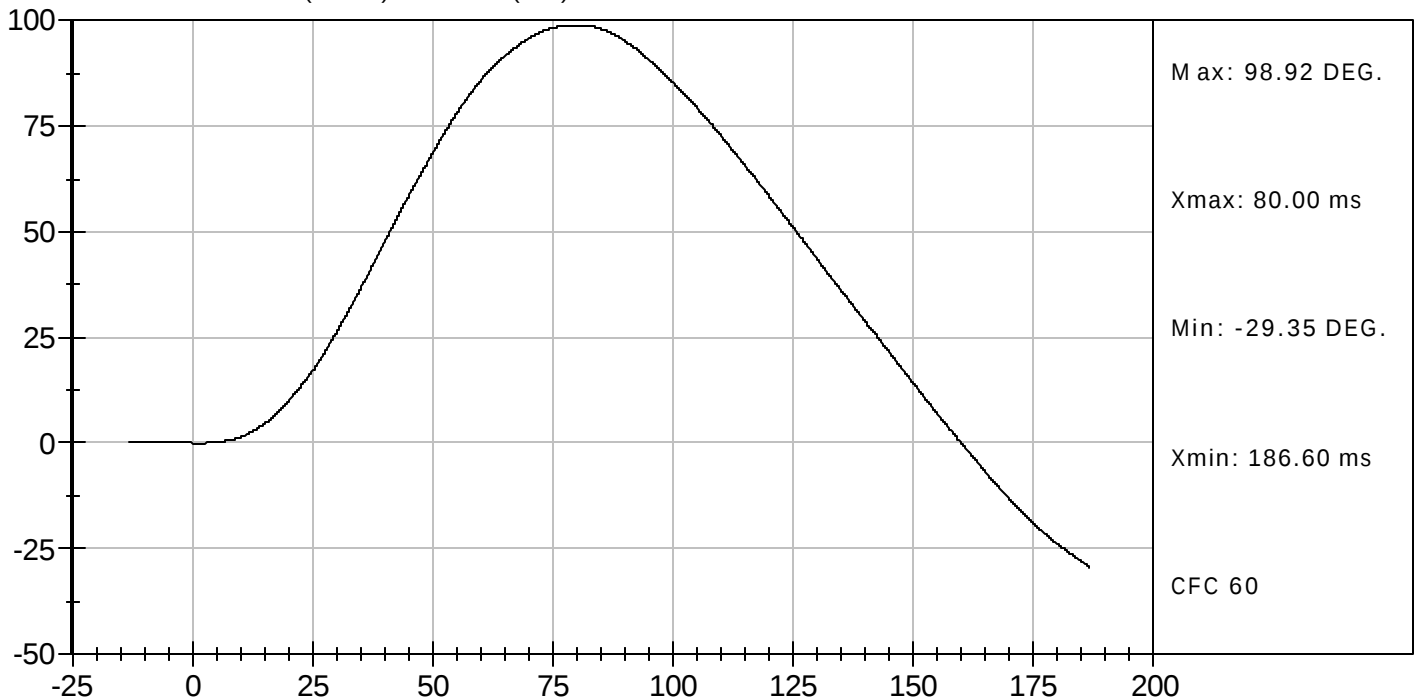
Test Desc: Neck Extension
Componet ID: D05973

Test Date: 04/08/2005
Velocity: 19.86 ft/s, 6.05 m/s

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



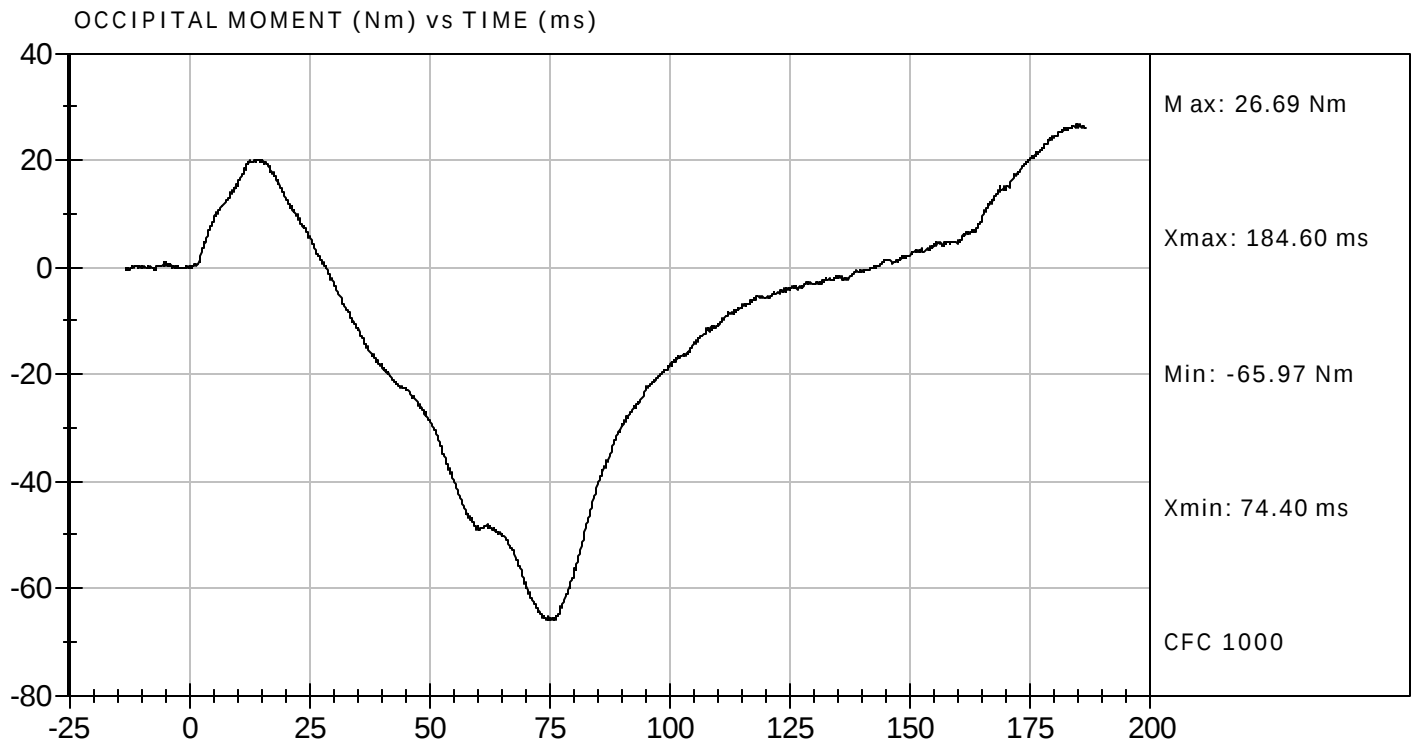
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D05973

Test Date: 04/08/2005
Velocity: 19.86 ft/s, 6.05 m/s



DATA SHEET A6
THORAX IMPACT TEST (572.34)

Dummy Serial Number 401

Test Date 04/08/05

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage

_____ - The following repairs or replacement was performed. Record

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))

X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 f/s $\leq$ speed $\leq$ 22.4 f/s	21.6
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.63
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1242
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	75%

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

**Force = impactor mass x acceleration (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.

Jessica Hall
Signature

04/08/05
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

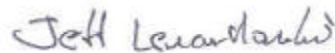
ATD Serial No: 401

Test I.D: D05974

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/s	6.58 to 6.82	6.59	Pass
Peak Probe Force	N	5159 to 5893	5,525	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.69	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Overall Test Results				Pass


Laboratory Technician

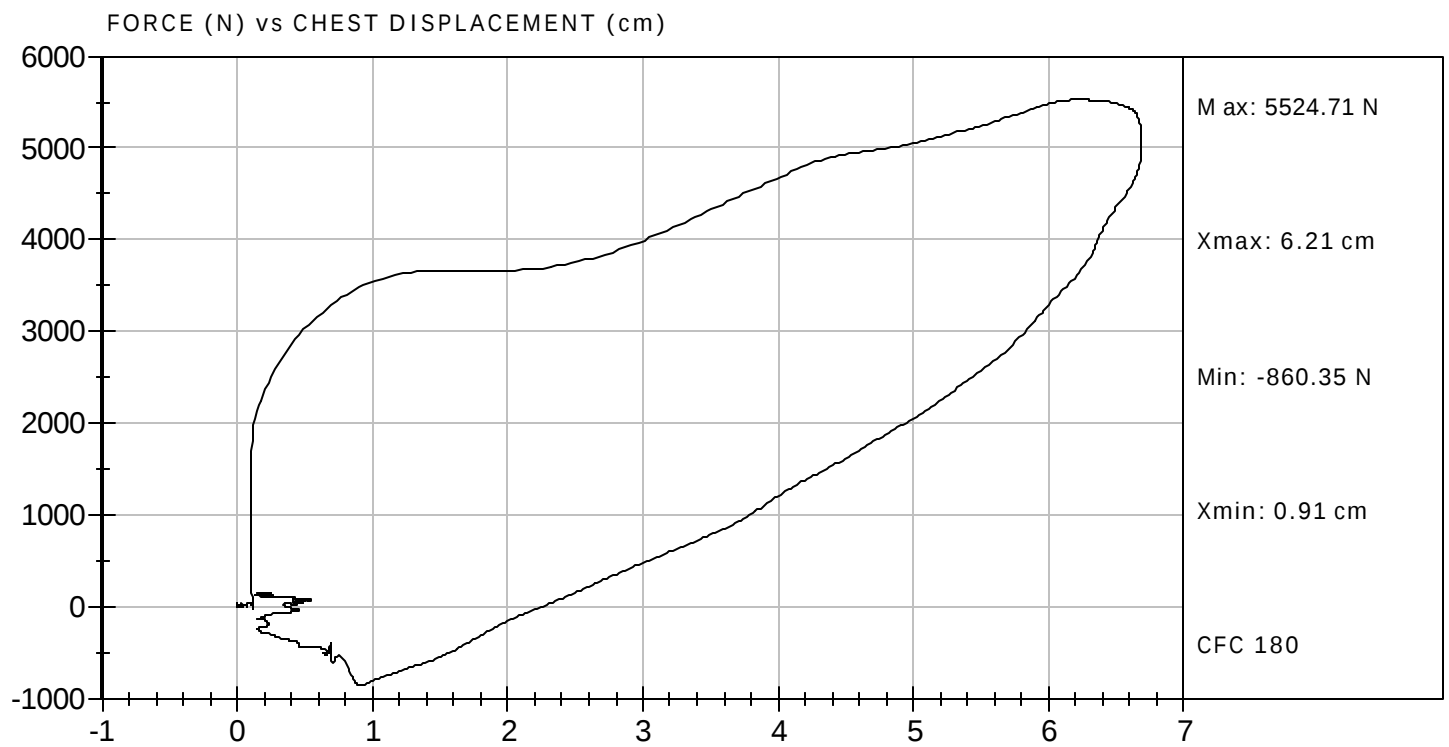
04/08/2005
Test Date


Approved By



Test Desc: Thorax Impact
Componet ID: D05974

Test Date: 04/08/2005
Velocity: 21.63 ft/s, 6.59 m/s



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 04/08/05

Technician Dave Wilcox

 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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	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

04/08/05

Date

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

ATD Serial No: 401

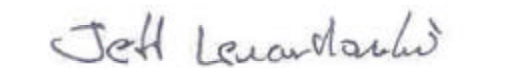
Test I.D: D05976

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,244	Pass
Overall Test Results				Pass


Laboratory Technician

04/08/2005

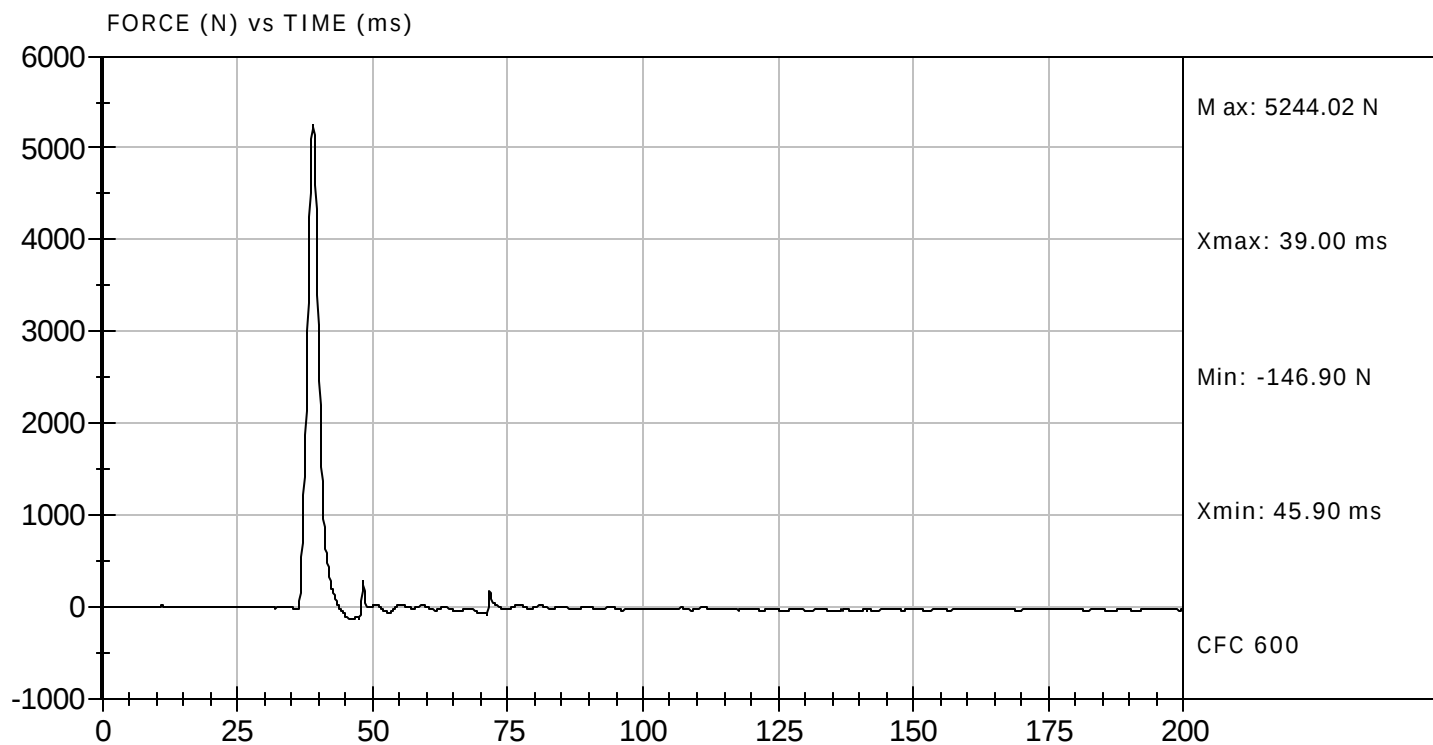
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D05976

Test Date: 04/08/2005
Velocity: 6.9 ft/s, 2.10 m/s



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35)

Dummy Serial Number 401

Test Date 04/0805

Technician Dave Wilcox

 Pretest calibration

X 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))

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 (86-5001-002) with the upper leg assembly (78051-47) 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 22.1

Record the minimum temperature 21.7

Record the maximum humidity 27%

Record the minimum humidity 26%

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	1097

*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

04/08/05

Date

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

ATD Serial No: 401

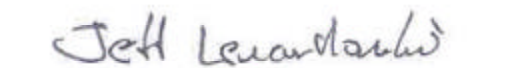
Test I.D: D05975

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,881	Pass
Overall Test Results				Pass


Laboratory Technician

04/08/2005

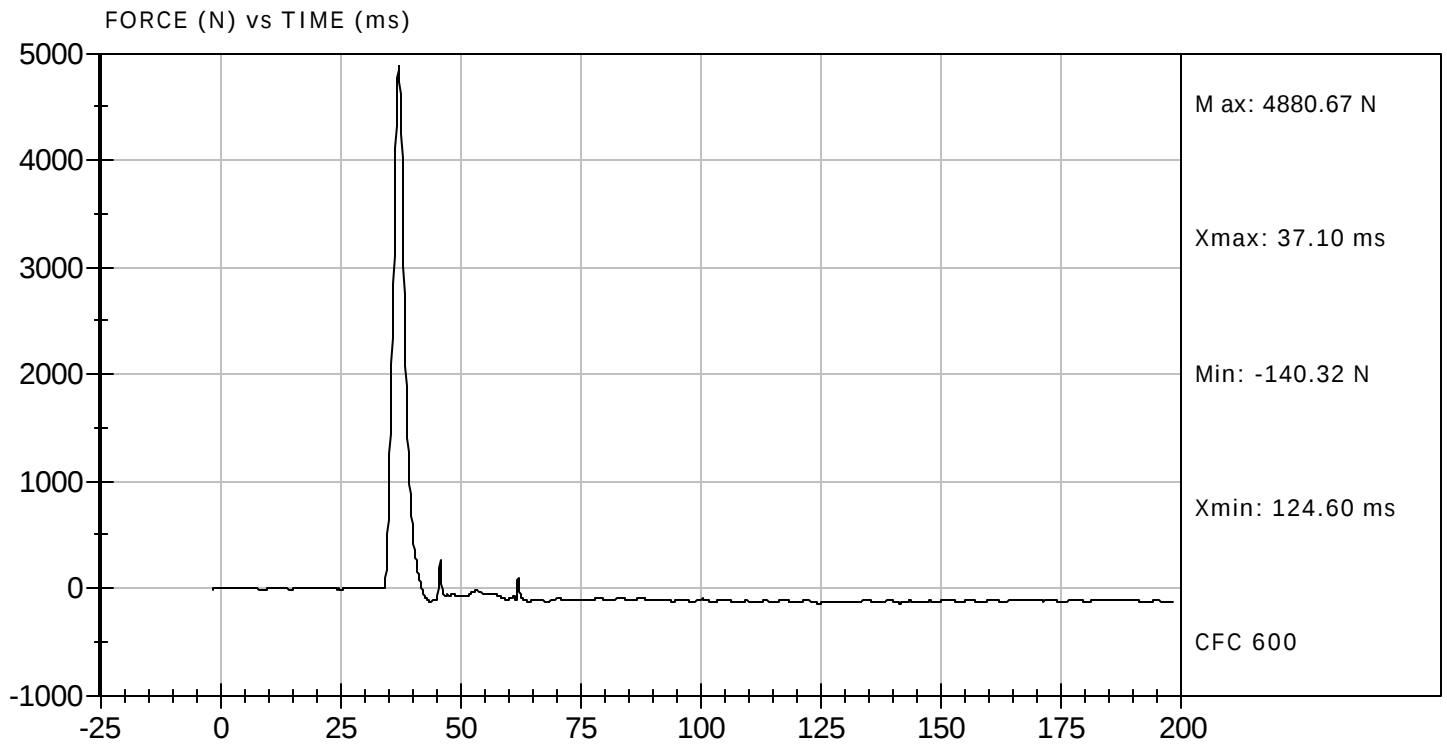
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D05975

Test Date: 04/08/2005
Velocity: 6.92 ft/s, 2.11 m/s



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

Dummy Serial Number 401

Test Date 04/08/05

Technician Joe Fleck

 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>22.1</u> |
| Record the minimum temperature | <u>21.7</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>26%</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 ½in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ} \leq \text{rotation rate} \leq 10^{\circ}$	8
Femur Torque at 30°	torque ≤ 70 ft-lbf	57
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°	torque ≤ 70 ft-lbf	64
Rotation at 15 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	41

Joe Fleck

Signature

04/08/05

Date

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

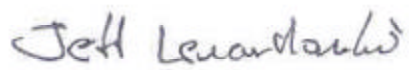
ATD Serial No: 401

Test I.D: D05970

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.1	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	26	26	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	87.3	77.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	41	Pass
Overall Test Results					Pass


 Laboratory Technician

04/08/2005
 Test Date


 Approved By

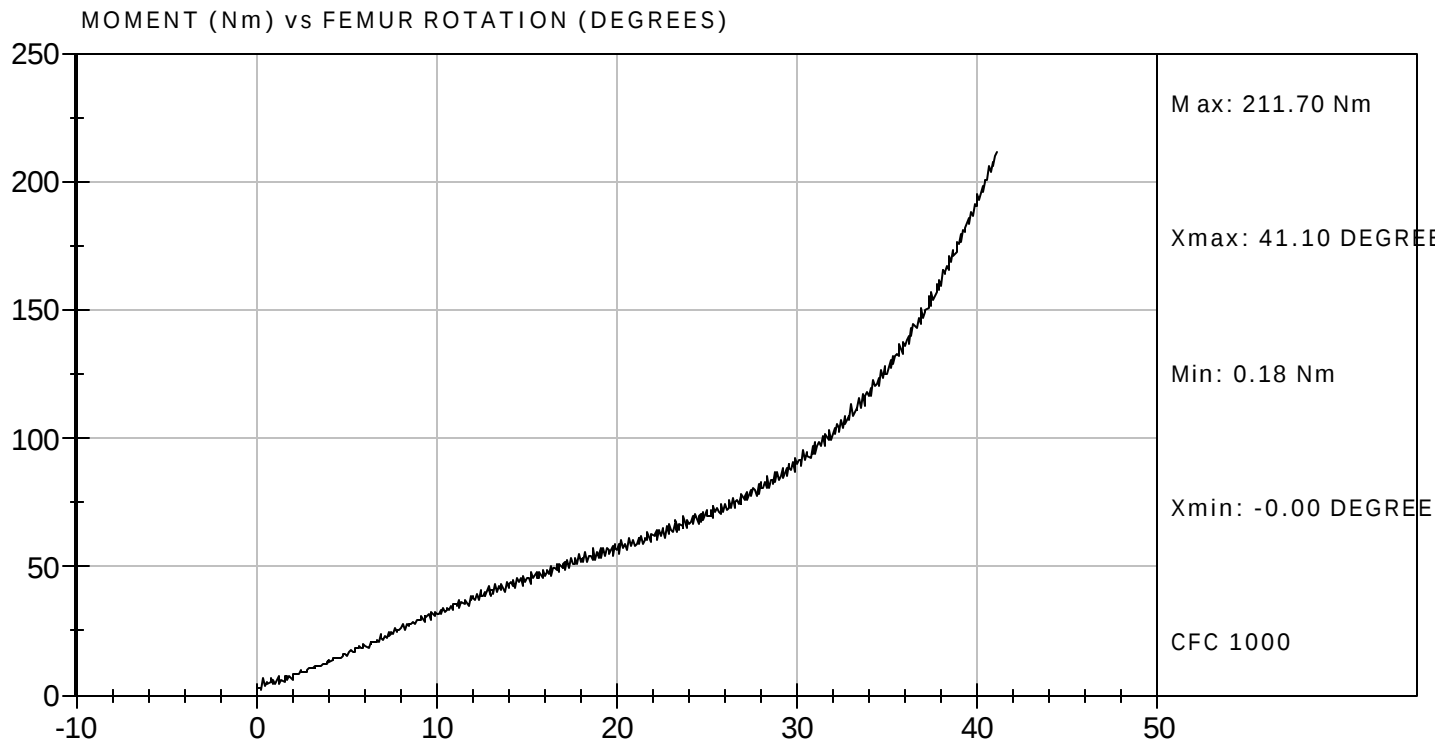


Test Desc: Hip Femur Flexion

Componet ID: D05979

Test Date: 04/08/2005

Velocity: 0 ft/s, 0.00 m/s





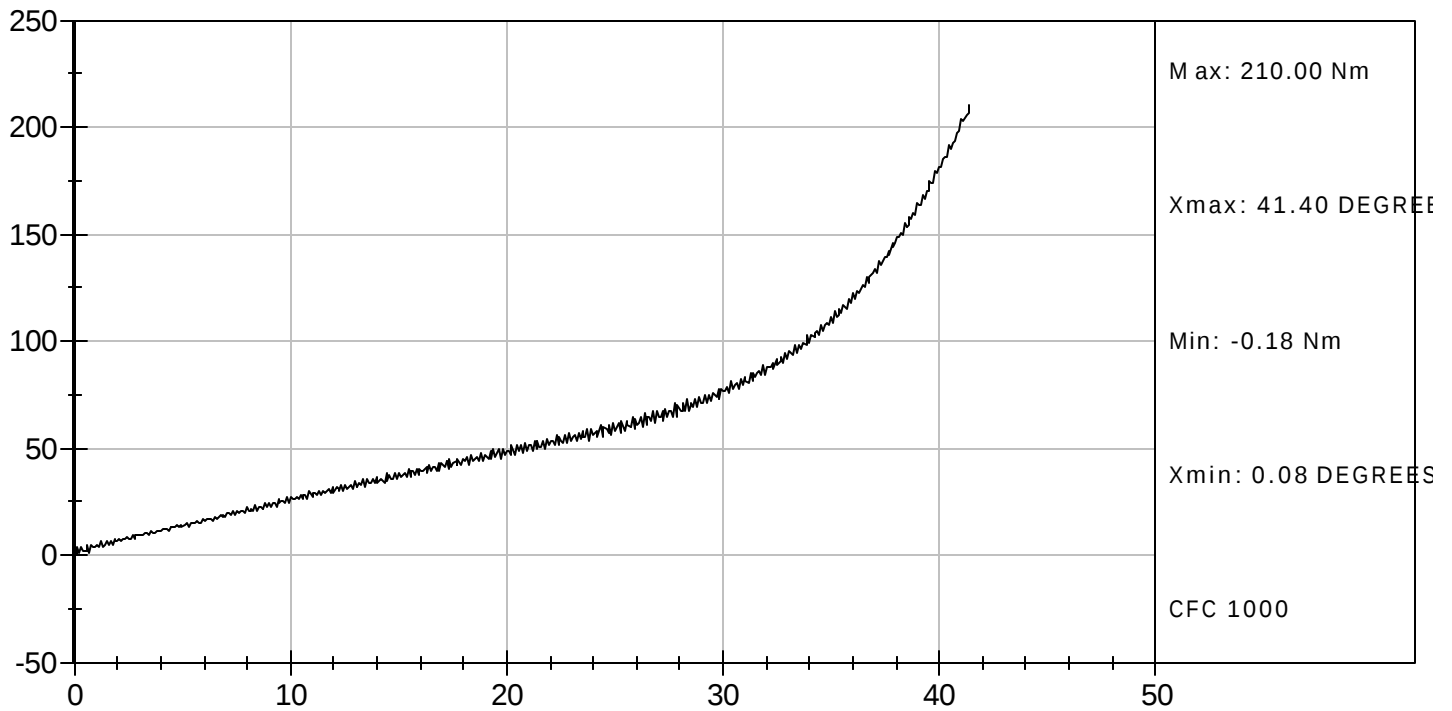
Test Desc: Hip Femur Flexion

Componet ID: D05970

Test Date: 04/08/2005

Velocity: 0 ft/s, 0.00 m/s

MOMENT (Nm) vs FEMUR ROTATION (DEGREES)



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 4/6/05

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

4/7/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

4/7/05
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #516, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	783.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.8
C	H-POINT HEIGHT	Reference	81.3-86.3	83.9
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.3
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.5
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	249.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.6
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.	276.8-297.2	283.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	542.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	359.9
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.1
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	436.4

HYBRID III 5 th SN #516, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	177.8
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.1
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	480.4
S	HEAD BREADTH	The widest part of the head	137.1-147.3	143.2
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.3
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.9
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.1
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	545.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	865.4
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	783.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	340.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 516 Test Date 12/19/04

Technician Jim Carney

☒ Pretest calibration
☐ Post test calibration verification

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

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6 °C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.1</u> |
| Record the minimum temperature | <u>20.8</u> |
| Record the maximum humidity | <u>15%</u> |
| Record the minimum humidity | <u>13%</u> |
- ☒ 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

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

Record the actual distance 376 mm

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

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

Record the right side distance 501mm

Record the left side distance 501mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

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

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

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

Record thickness 50.9 mm

Record width 604 mm

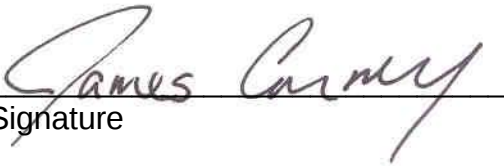
Record length 595 mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	282
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-13

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


Signature

12/19/04
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test ID: D042861

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Peak Resultant Acceleration	G's	250 - 300	282	Pass
Peak Lateral Acceleration	G's	+/- 15	-12.7	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

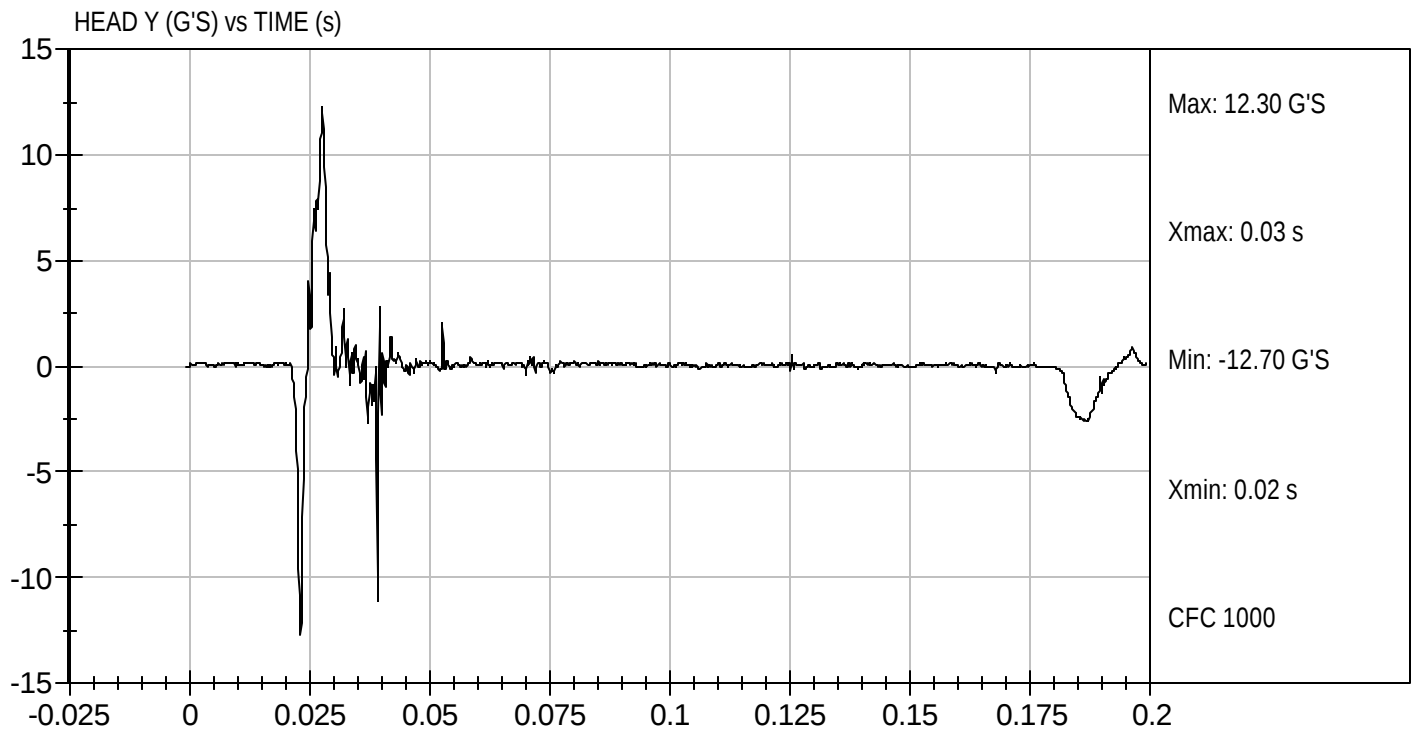
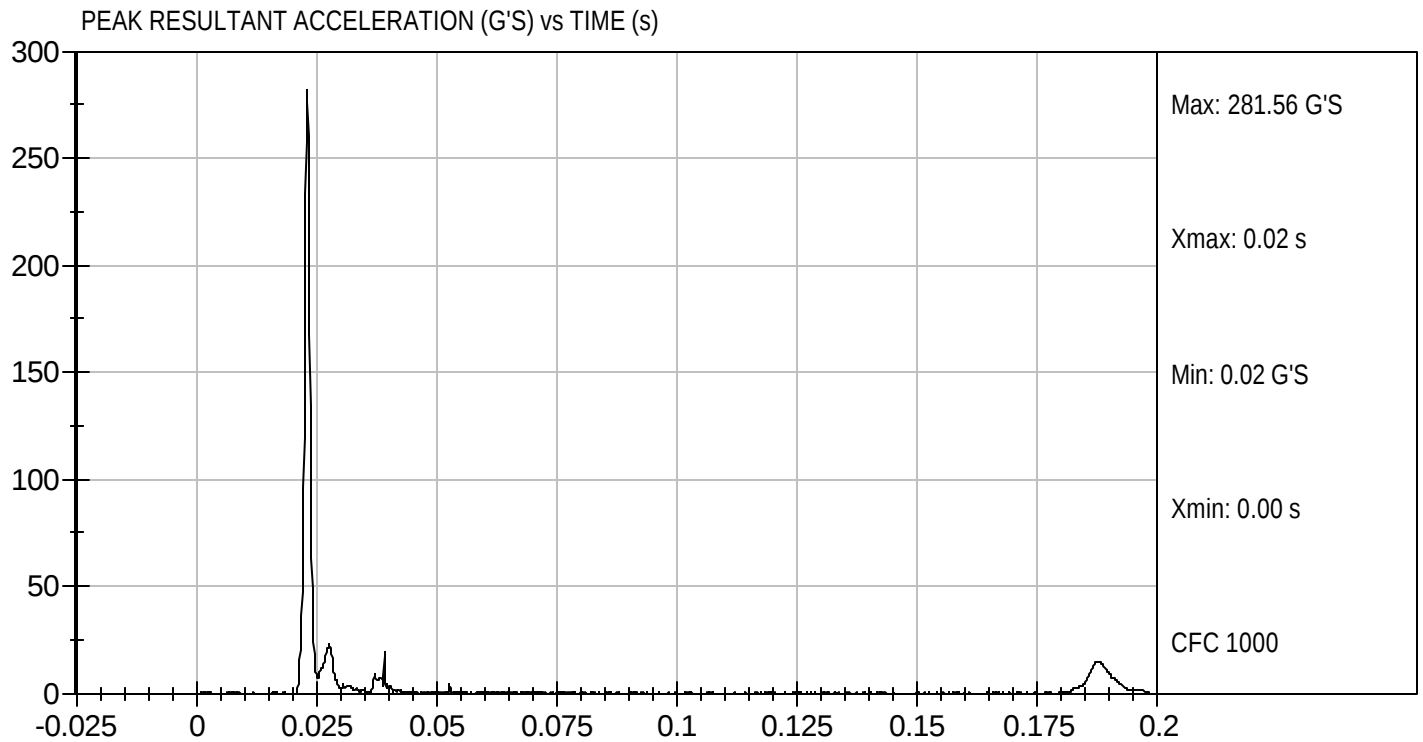
12/19/2004
Test Date


Approved By



Test Desc: Head Drop
Componet ID: D042861

Test Date: 12/19/2004
Velocity: 0 ft/s, 0 m/s



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 516 Test Date 12/19/04

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2 °C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.1</u> |
| Record the minimum temperature | <u>20.8</u> |
| Record the maximum humidity | <u>15%</u> |
| Record the minimum humidity | <u>13%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
 Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
 Record findings and actions: No Deterioration. Hardness Front 89; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

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

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

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.3 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.6 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.5 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>76</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	86 ms

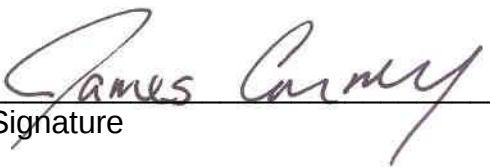
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

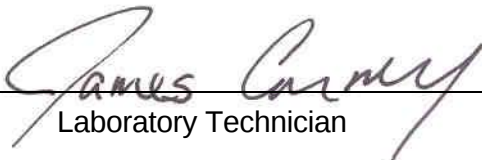
12/19/04
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

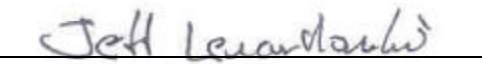
ATD Serial No: 516

Test I.D: D042862

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	13	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.3	Pass
	20 msec	m/sec	4.0 to 5.0	4.6	Pass
	30 msec	m/sec	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	76	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	86	Pass
Overall Results					Pass


 Laboratory Technician

12/19/2004
 Test Date

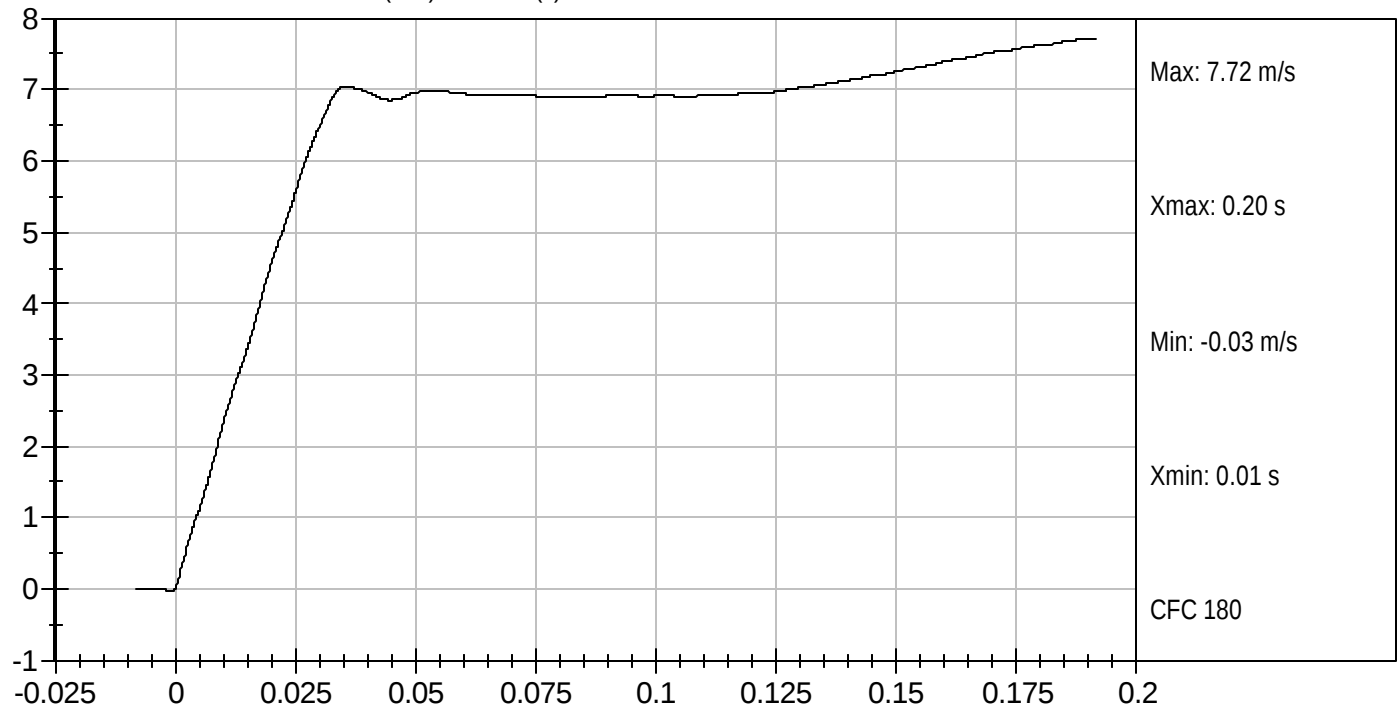

 Approved By



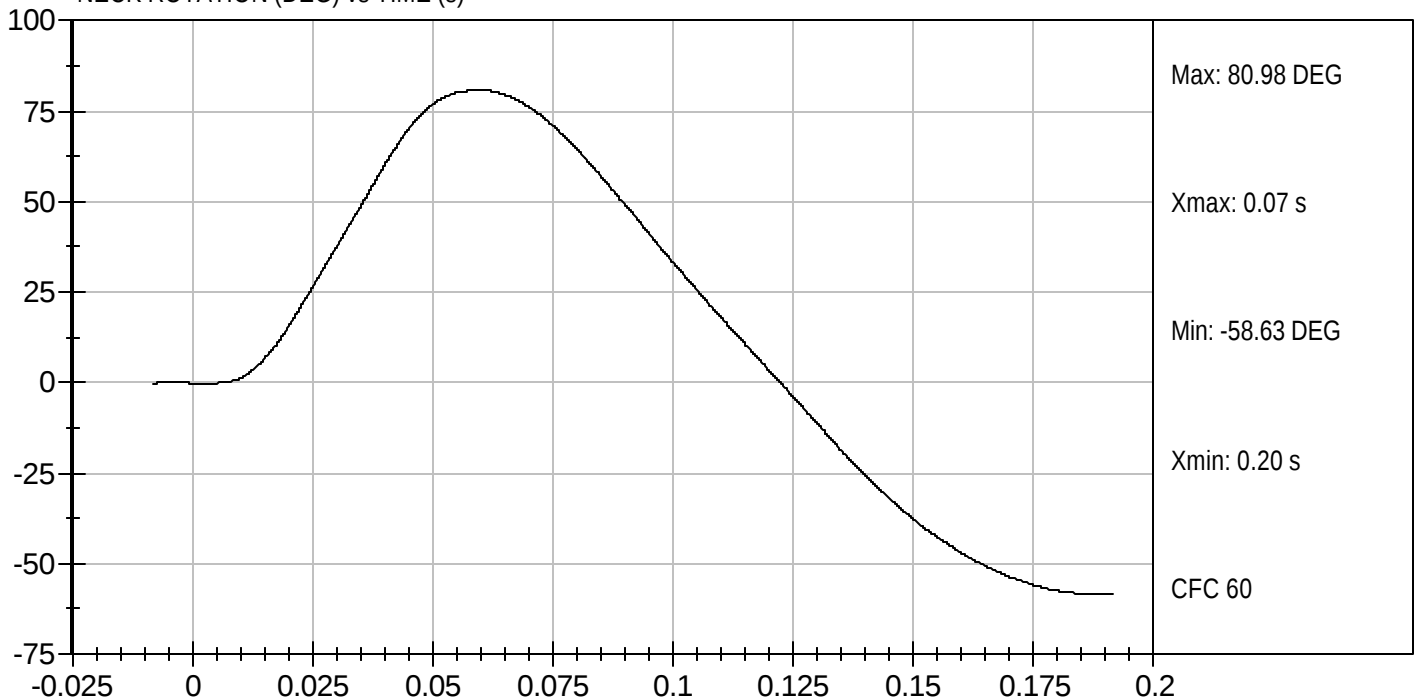
Test Desc: Neck Flexion
Componet ID: D042862

Test Date: 12/19/2004
Velocity: 23.21 ft/s, 7.07 m/s

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



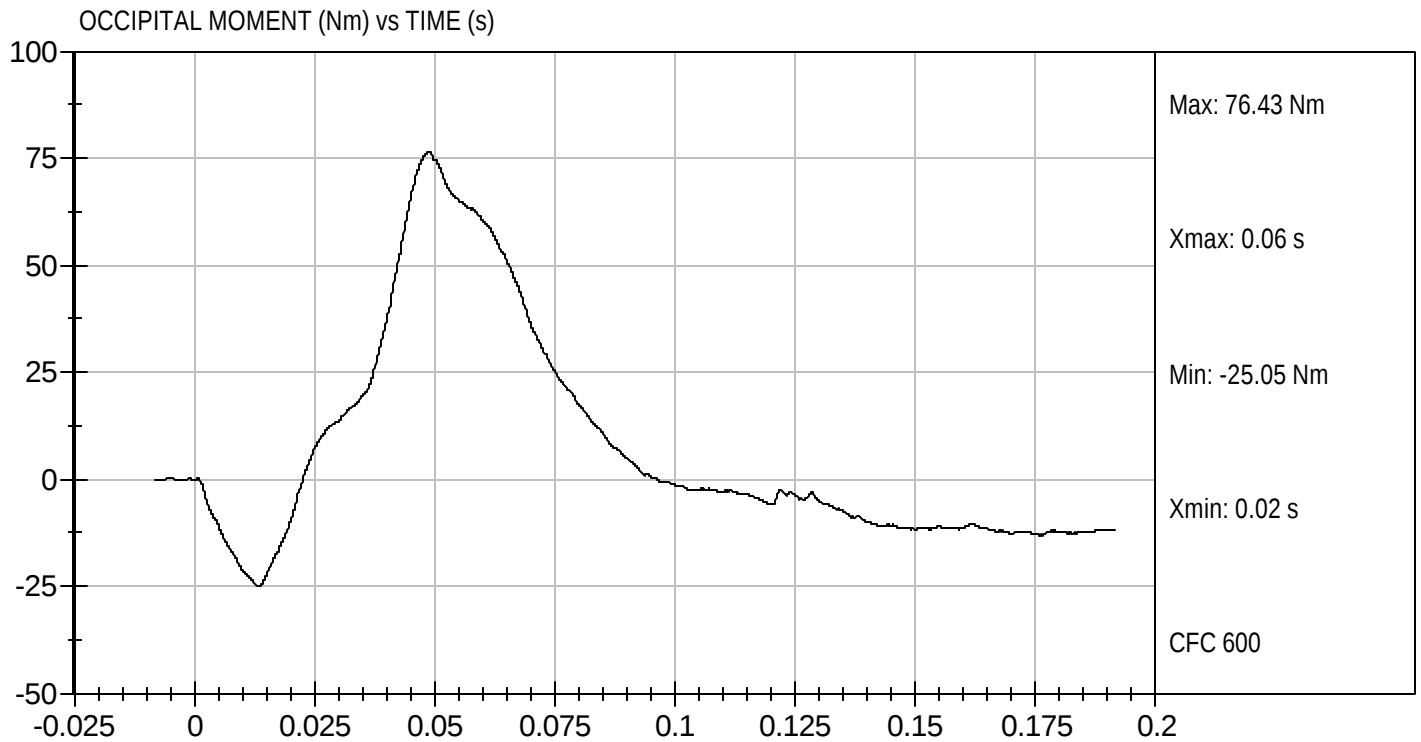
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D042862

Test Date: 12/19/2004
Velocity: 23.21 ft/s, 7.07 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 516 Test Date 12/19/04

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one extension test performed

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

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2 °C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))

Record the maximum temperature 21.1

Record the minimum temperature 20.8

Record the maximum humidity 15%

Record the minimum humidity 13%

☒ 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; Back 89.

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

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

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

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

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

Parameter		Specification	Result
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.16 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.8 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.6 m/s
	@ 30ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.1 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range $99^\circ \leq$ angle $\leq 114^\circ$	-56 Nm @ 109 degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	99 ms

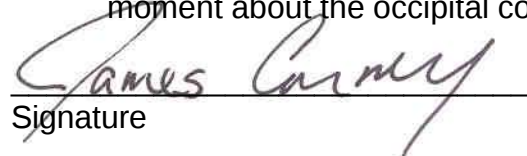
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

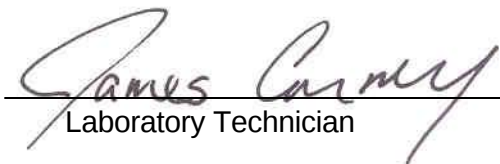
12/19/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

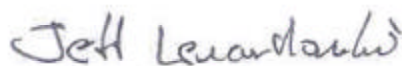
Test I.D: D042863

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	13	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	99	Pass
Overall Results					Pass


Laboratory Technician

12/19/2004

Test Date

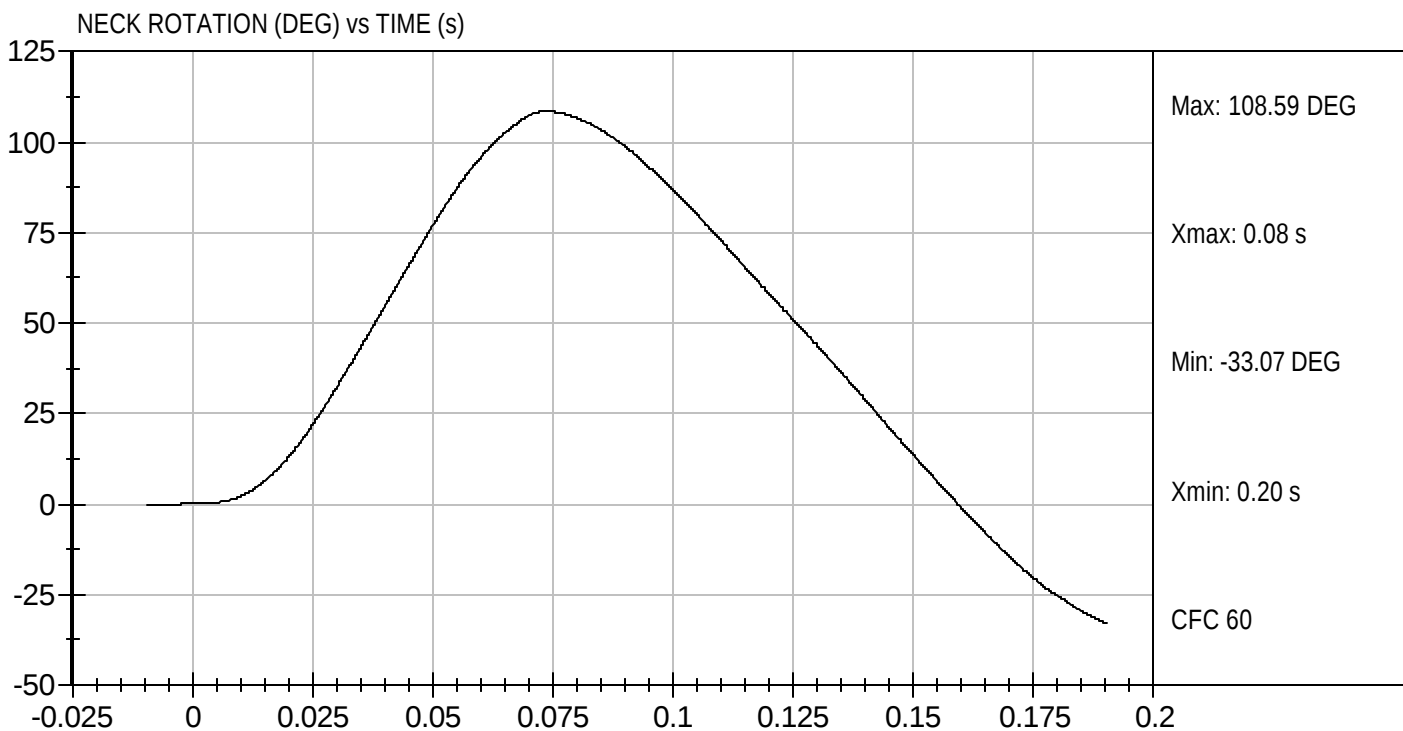
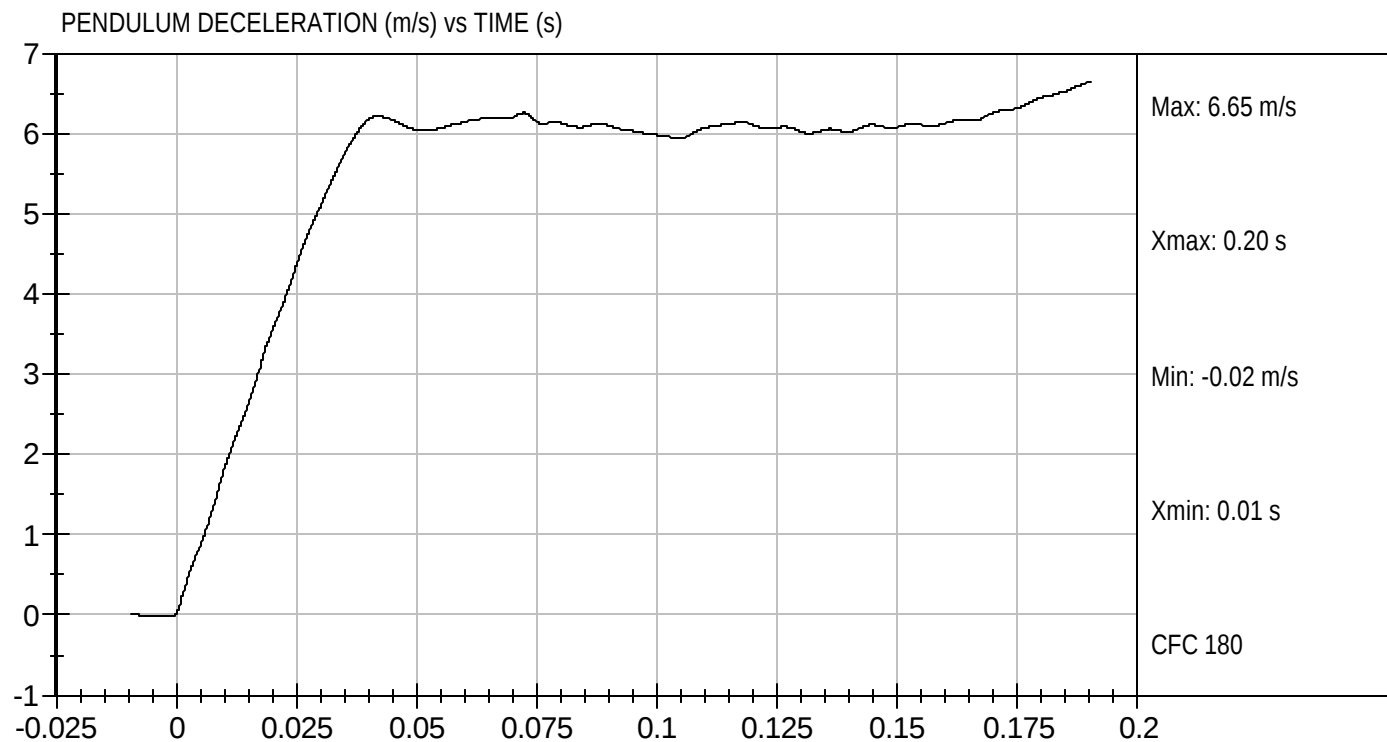


Approved By



Test Desc: Neck Extension
Componet ID: D042863

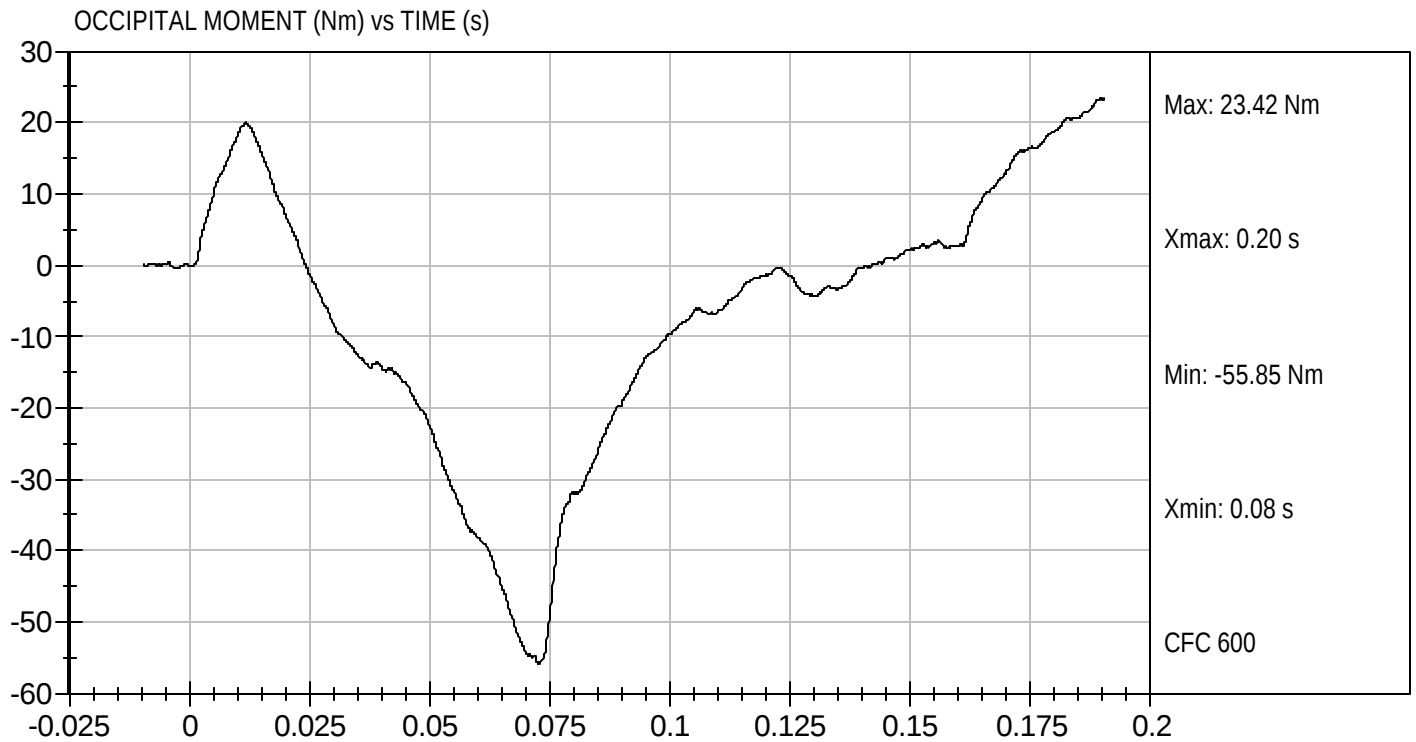
Test Date: 12/19/2004
Velocity: 20.21 ft/s, 6.16 m/s





Test Desc: Neck Extension
Componet ID: D042863

Test Date: 12/19/2004
Velocity: 20.21 ft/s, 6.16 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 516

Test Date 12/20/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature 21.5

Record the minimum temperature 21.1

Record the maximum humidity 14%

Record the minimum humidity 11%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____

☐ - The following repairs or replacement was performed. Record _____

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

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

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

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.73 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4180 N
Peak force** between 18.0 and 50.0 mm chest compression	Peak force $\leq 4600 \text{ N}$	4196 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

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

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

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

Jessica Hall
Signature

12/20/04
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042864

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	12	Pass
Probe Speed	m/s	6.59 to 6.83	6.73	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	< 4600 N	4,196	Pass
Overall Test Results				Pass


 Laboratory Technician

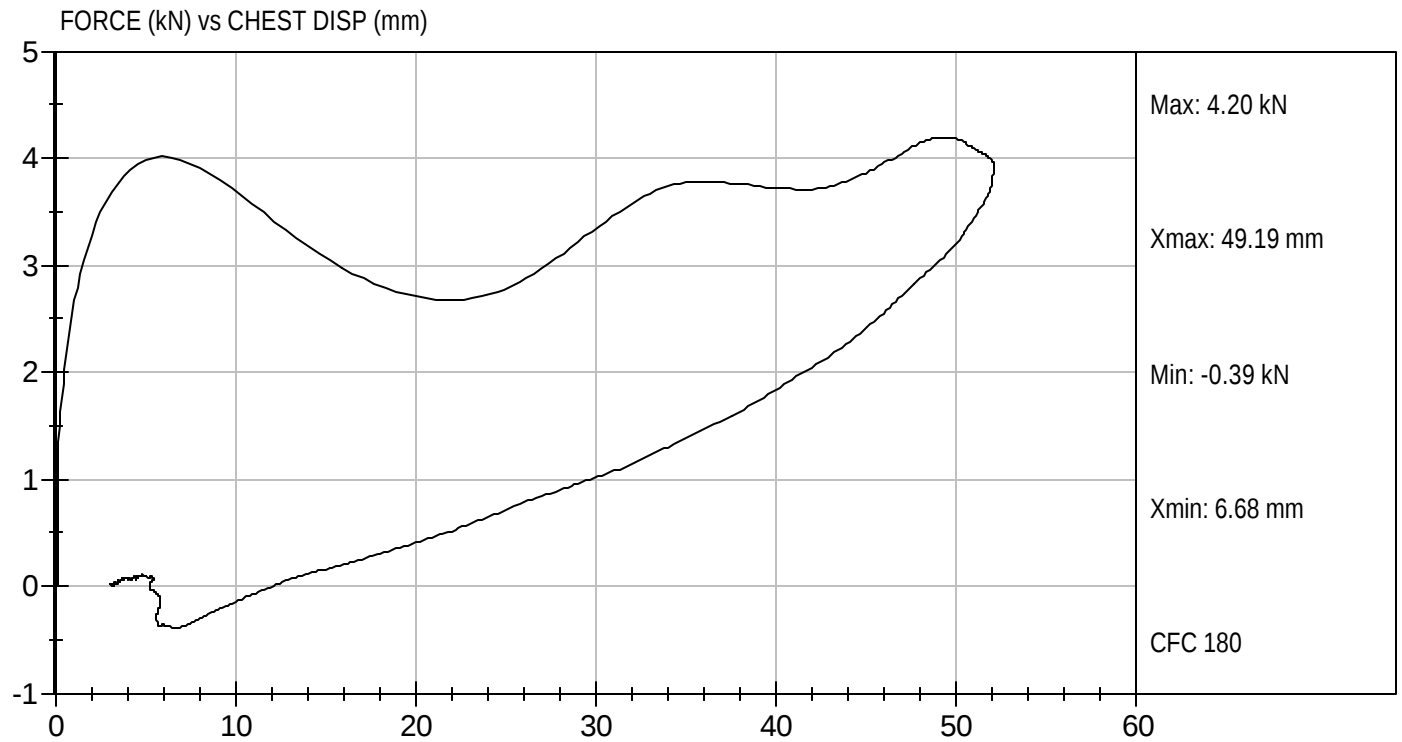
12/20/2004
 Test Date


 Approved By



Test Desc: Thorax Impact
Componet ID: D042864

Test Date: 12/20/2004
Velocity: 22.08 ft/s, 6.73 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 516

Test Date 12/20/04

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).

☐ with legs below the femurs.

☒ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.1

Record the maximum humidity 14%

Record the minimum humidity 11%

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

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

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

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

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

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

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

Record reference plane angle (max. allowed 20°) 15.5°

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

- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at $45^{\circ} \pm 0.5^{\circ}$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.135(c)(11))
- X 17. Complete the following table:

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

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^{\circ}$	15.5°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	1.0
Force at $45^{\circ} \pm 0.5^{\circ}$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	370 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	19°

Jessica Hall
Signature

12/20/04
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

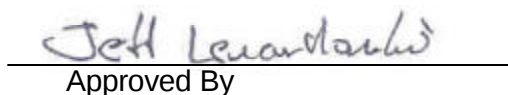
ATD Serial No: 516

Test I.D: D042867

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	11	Pass
Initial Angle	deg	0 to 20	15.5	Pass
Return Angle	deg	+/- 8	3.5	Pass
Force at 45 deg	N	320 to 390	370	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result			Pass	


Laboratory Technician

12/20/2004
Test Date


Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516Test Date 12/20/04Technician Jim Carney☒ Pretest calibration☐ Post test calibration verificationTest attempt no. 1 (when successive knee impact tests are necessary)☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))☒ N/A, ONLY one knee impact test performed☒ 2. The test fixture conforms to the specifications in Figure 14B☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))Record the maximum temperature 21.5Record the minimum temperature 21.1Record the maximum humidity 14%Record the minimum humidity 11%☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

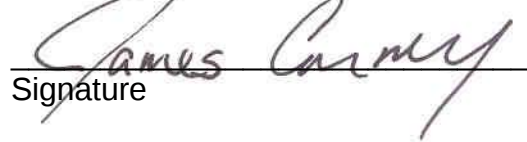
X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3610 N

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

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


Signature

12/20/04
Date

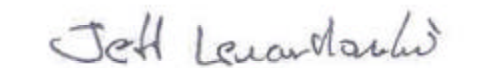
MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042866

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	14	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.61	Pass
Overall Test Results				Pass


Laboratory Technician

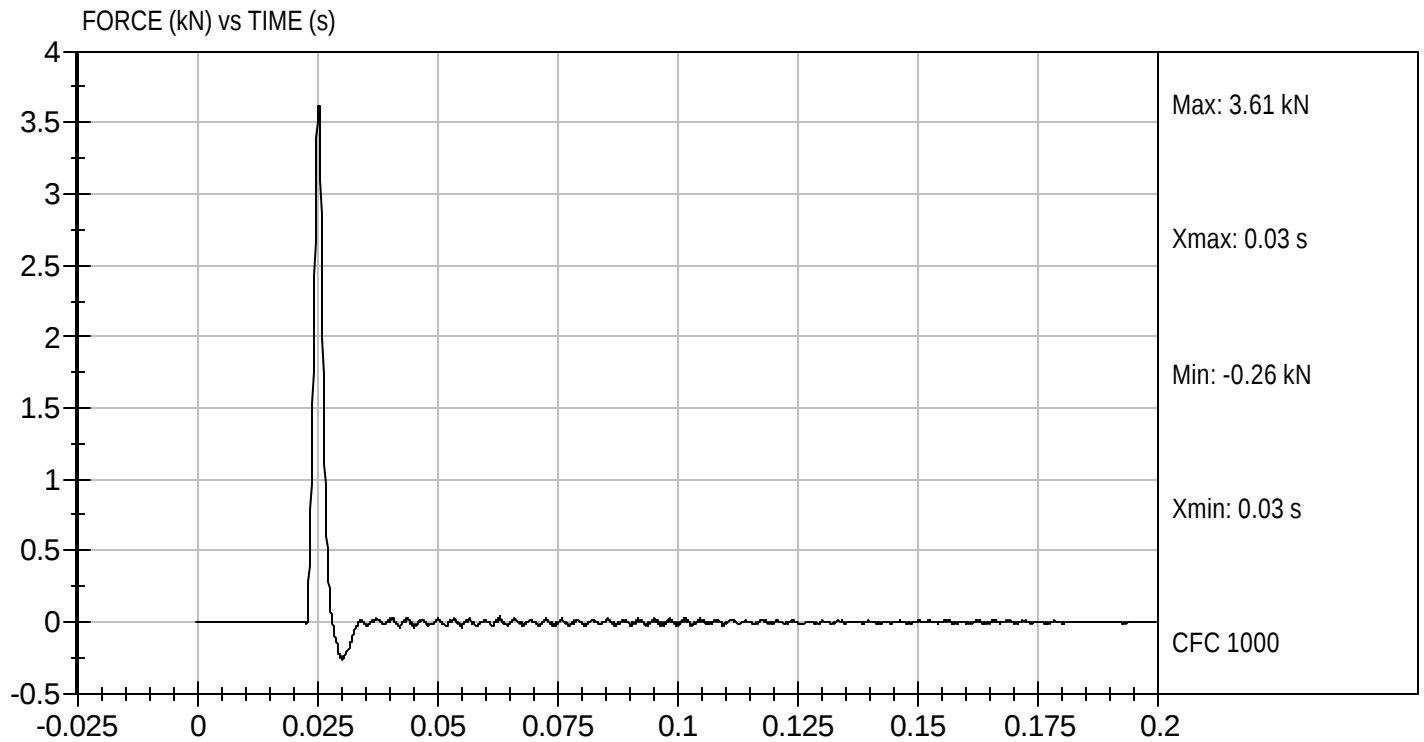

Approved By

12/20/2004
Test Date



Test Desc: Left Knee
Componet ID: D042866

Test Date: 12/20/2004
Velocity: 6.91 ft/s, 2.11 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 12/20/04

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one knee impact test performed

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

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

☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6 °C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature 21.5

Record the minimum temperature 21.1

Record the maximum humidity 14 %

Record the minimum humidity 11 %

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

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

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

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

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

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

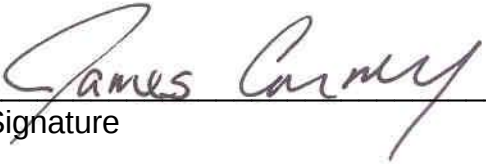
☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.09 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3620 N

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

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


Signature

12/20/04
Date

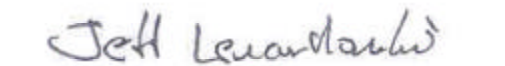
MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D042865

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	14	Pass
Probe Speed	m/sec	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.62	Pass
Overall Test Results				Pass


Laboratory Technician

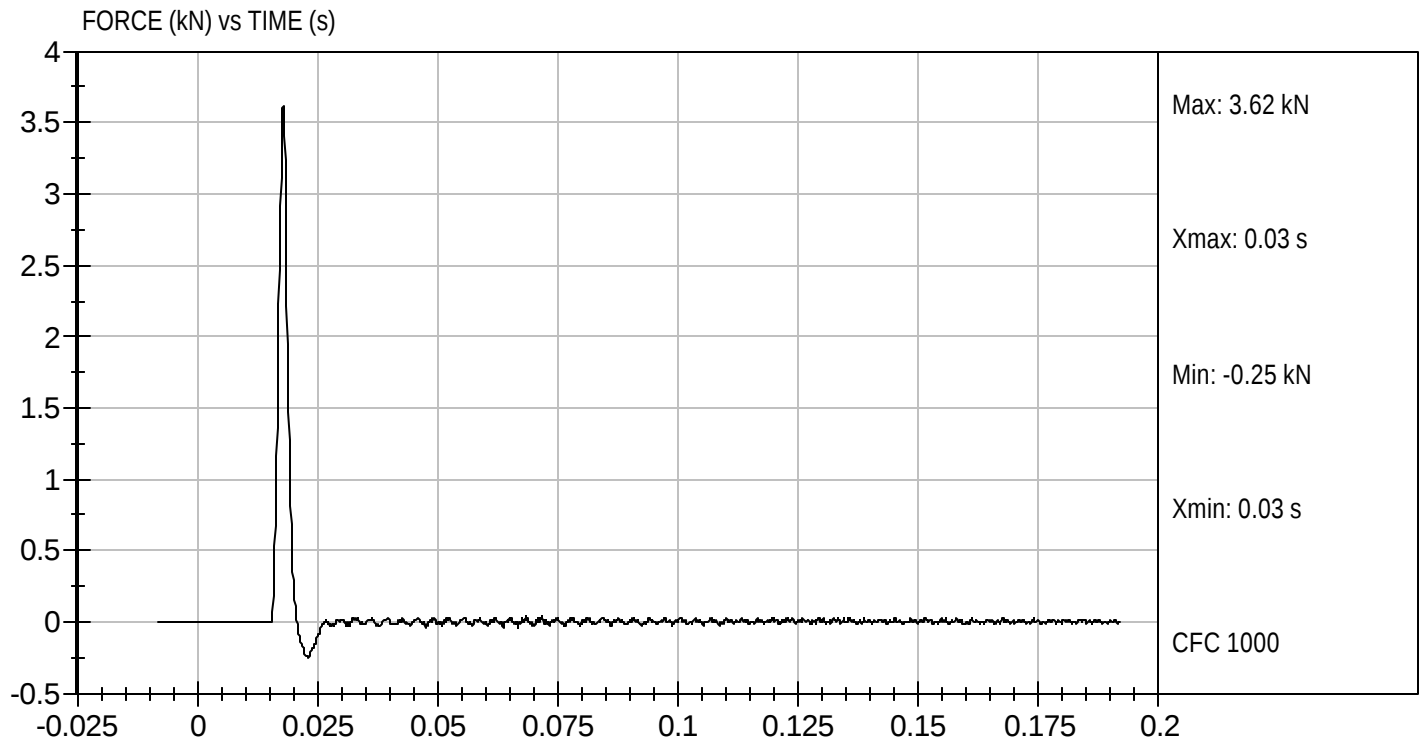

Approved By

12/20/2004
Test Date



Test Desc: Right Knee
Componet ID: D042865

Test Date: 12/20/2004
Velocity: 6.87 ft/s, 2.09 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 516 Test Date 1/30/05

Technician Jim Carney

 Pretest calibration

X Post test calibration verification

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

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

 X N/A, ONLY one head drop performed

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

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

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

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

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

X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 20%

Record the minimum humidity 17%

X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

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

Record the actual distance 376 mm

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

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

Record the right side distance 501mm

Record the left side distance 501mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

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

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

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

Record thickness 50.9 mm

Record width 604 mm

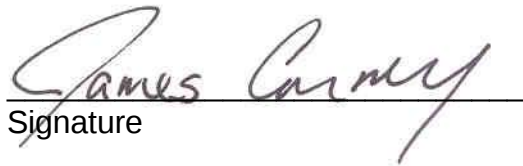
Record length 595 mm

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

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

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

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


Signature

1/30/05
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test ID: D05231

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	250 - 300	270	Pass
Peak Lateral Acceleration	G's	+/- 15	14.6	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

01/30/2005
Test Date

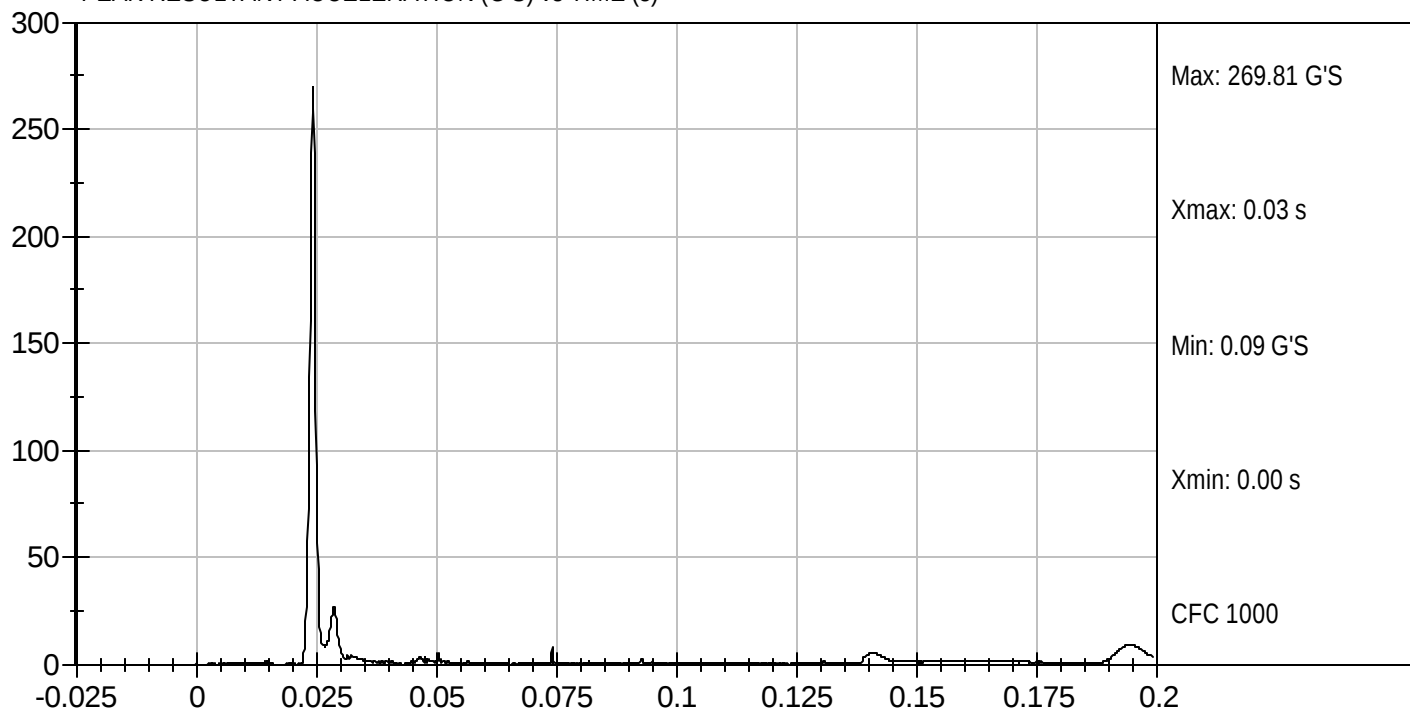

Approved By



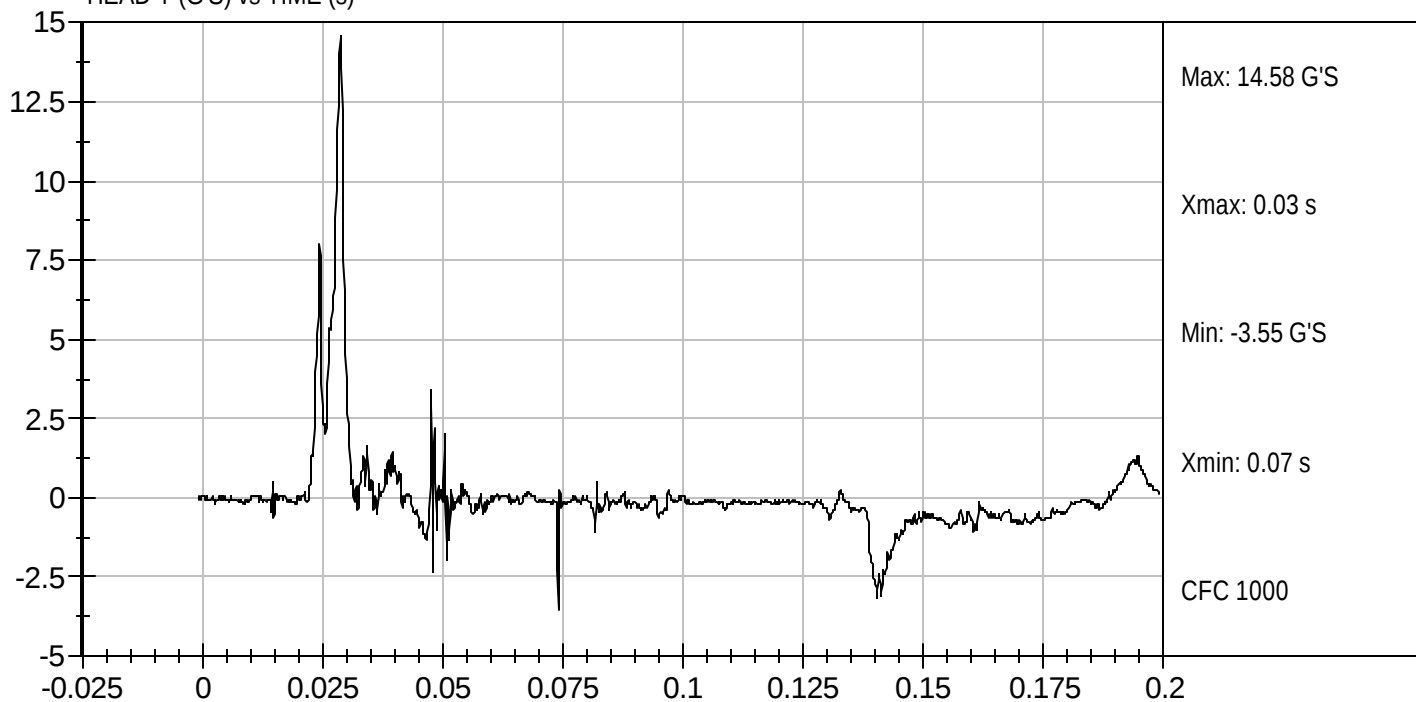
Test Desc: Head Drop
Componet ID: D05231

Test Date: 01/30/2005
Velocity: 0 ft/s, 0 m/s

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



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



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 516 Test Date 1/31/05

Technician Jim Carney

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>21%</u> |
| Record the minimum humidity | <u>20%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 89; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

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

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	6.99 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.3 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.5 m/s
	@30ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.5 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range $77^\circ \leq$ angle $\leq 91^\circ$	<u>78</u> Nm @ <u>79</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100ms	86 ms

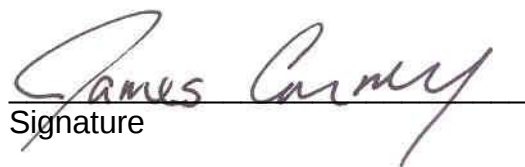
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

1/31/05
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

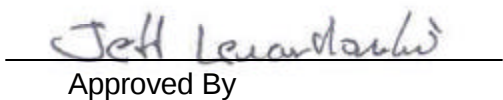
ATD Serial No: 516

Test I.D.: D05232

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	20	Pass
Pendulum Speed		m/sec	6.89 to 7.13	6.99	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.3	Pass
	20 msec	m/sec	4.0 to 5.0	4.5	Pass
	30 msec	m/sec	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	78	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	86	Pass
Overall Results					Pass


Laboratory Technician

01/31/2005
Test Date

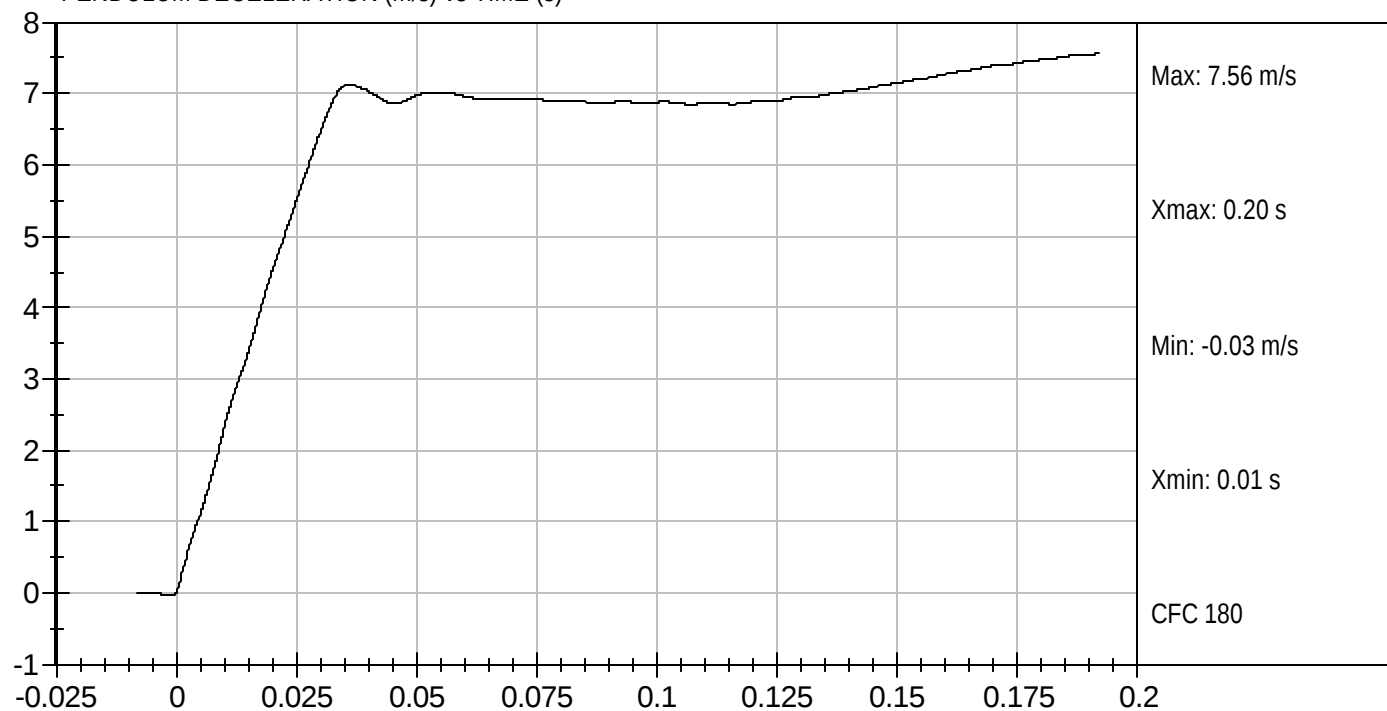

Approved By



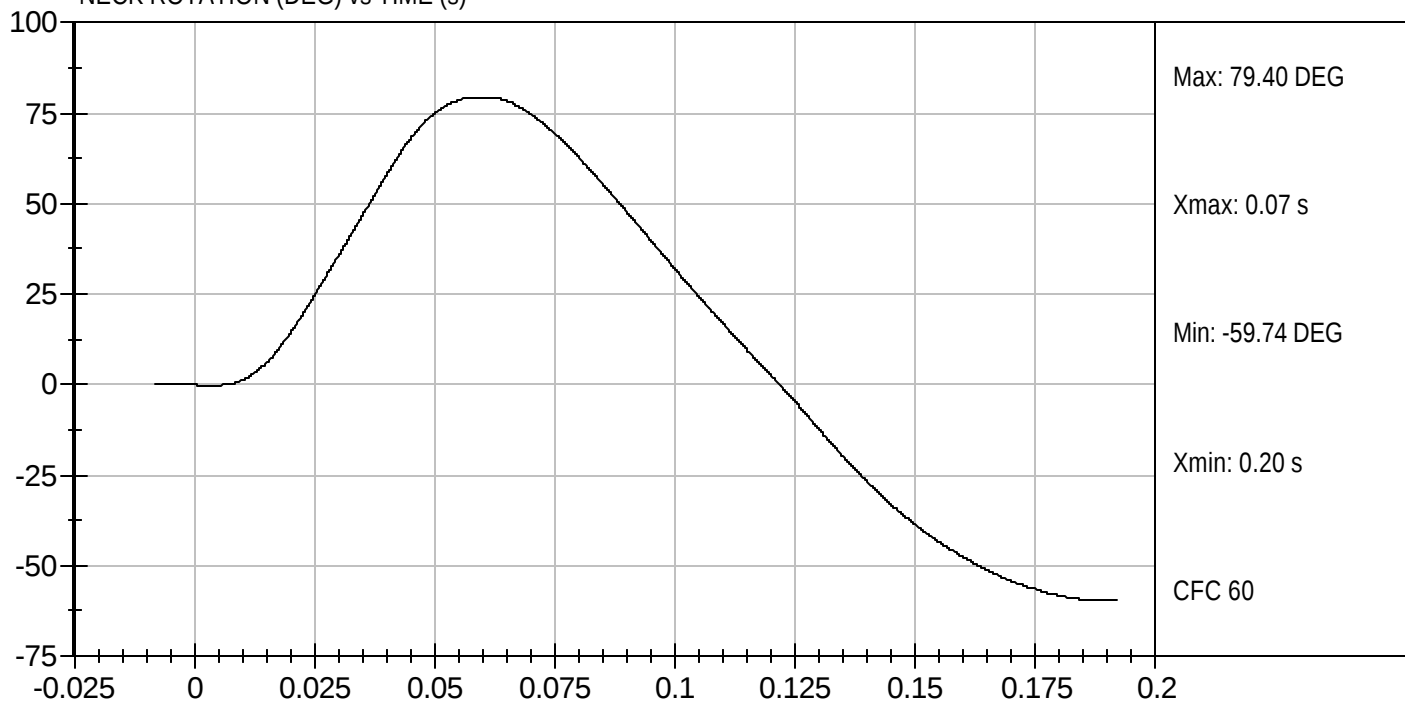
Test Desc: Neck Flexion
Componet ID: D05232

Test Date: 01/31/2005
Velocity: 22.92 ft/s, 6.99 m/s

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



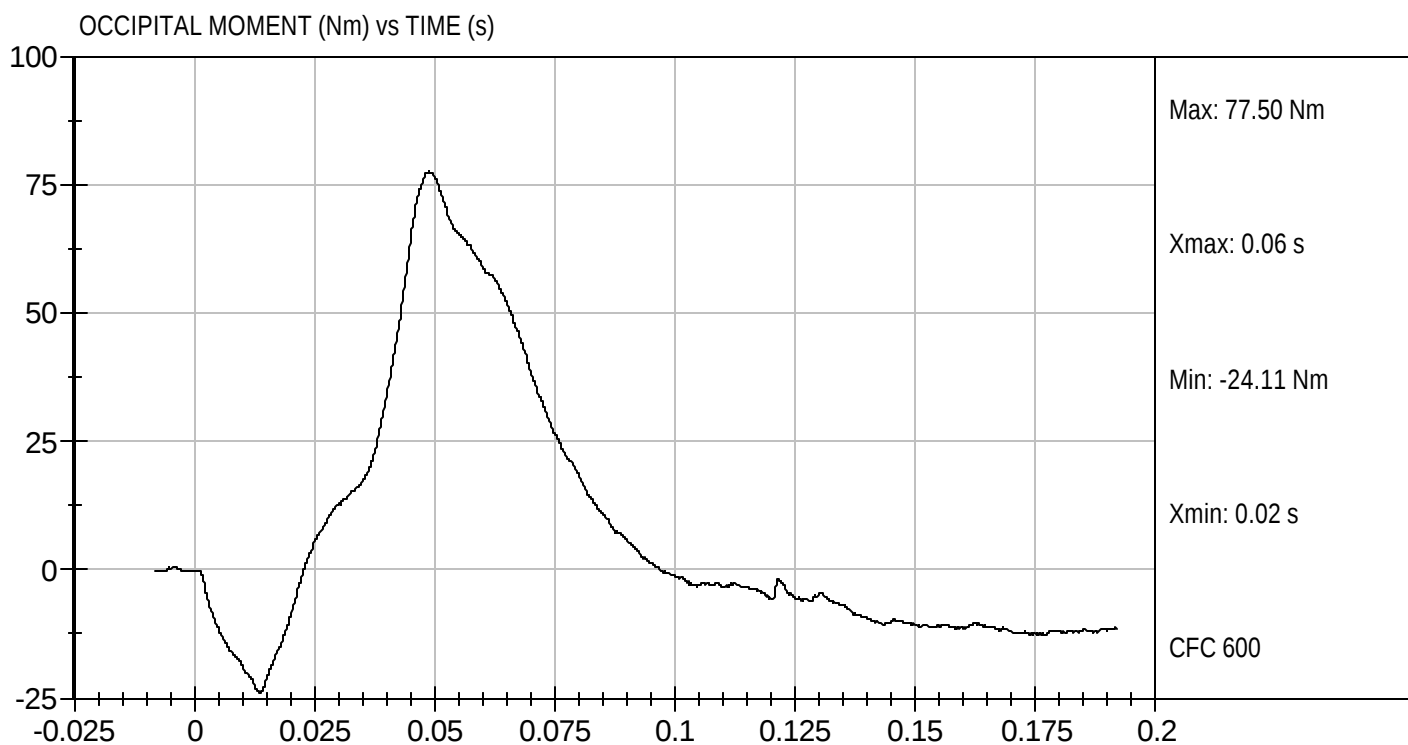
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D05232

Test Date: 01/31/2005
Velocity: 22.92 ft/s, 6.99 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 516 Test Date 1/31/05

Technician Jim Carney

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one extension test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>21%</u> |
| Record the minimum humidity | <u>20%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 89; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

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

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

Parameter		Specification	Result
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.8 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.6 m/s
	@ 30ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.2 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range $99^\circ \leq$ angle $\leq 114^\circ$	-55 Nm @ 110 degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	100 ms

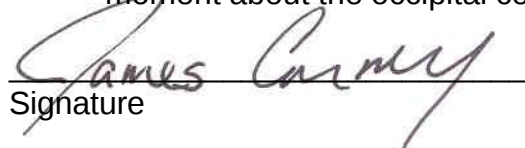
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

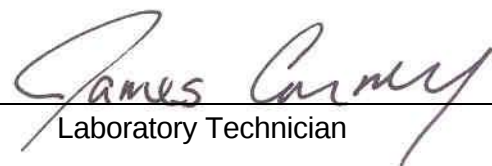
1/31/05
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

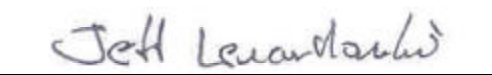
ATD Serial No: 516

Test I.D: D05233

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	100	Pass
Overall Results				Pass	


 Laboratory Technician

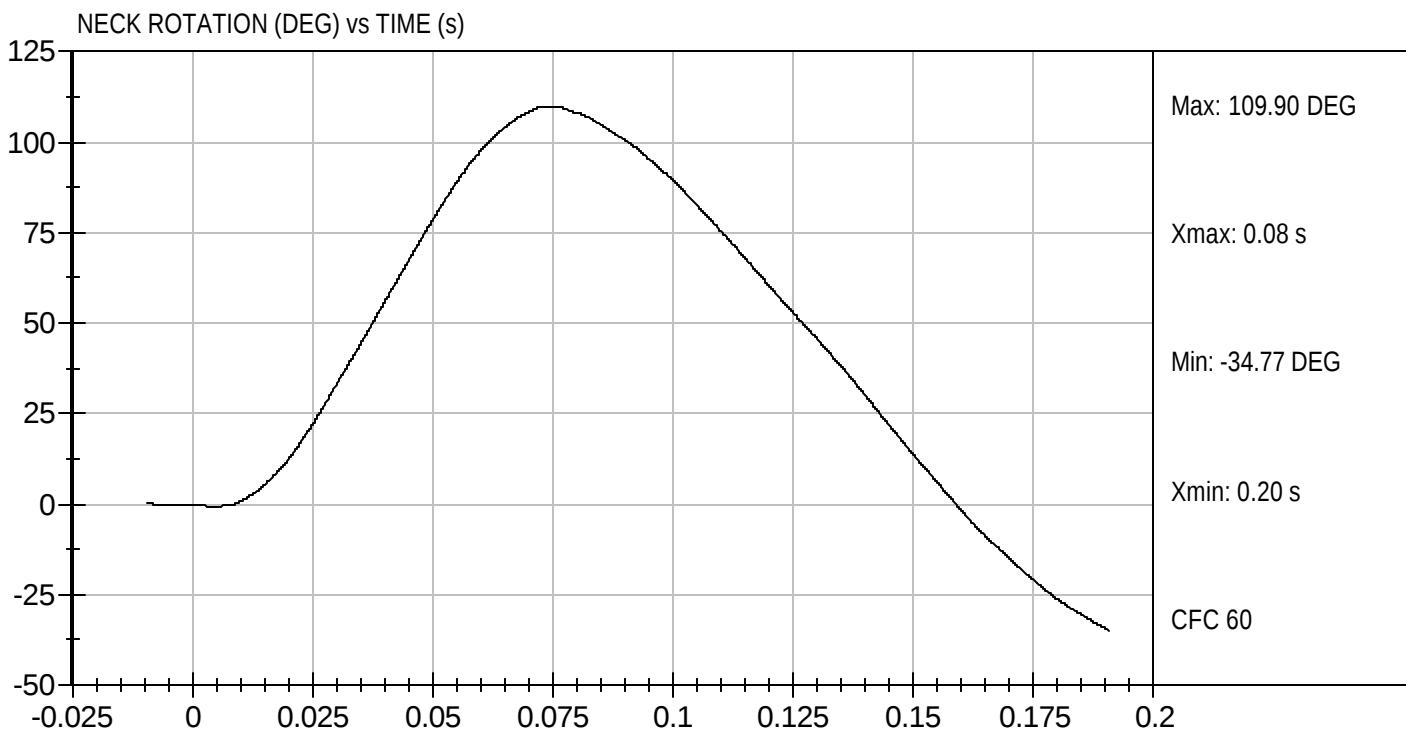
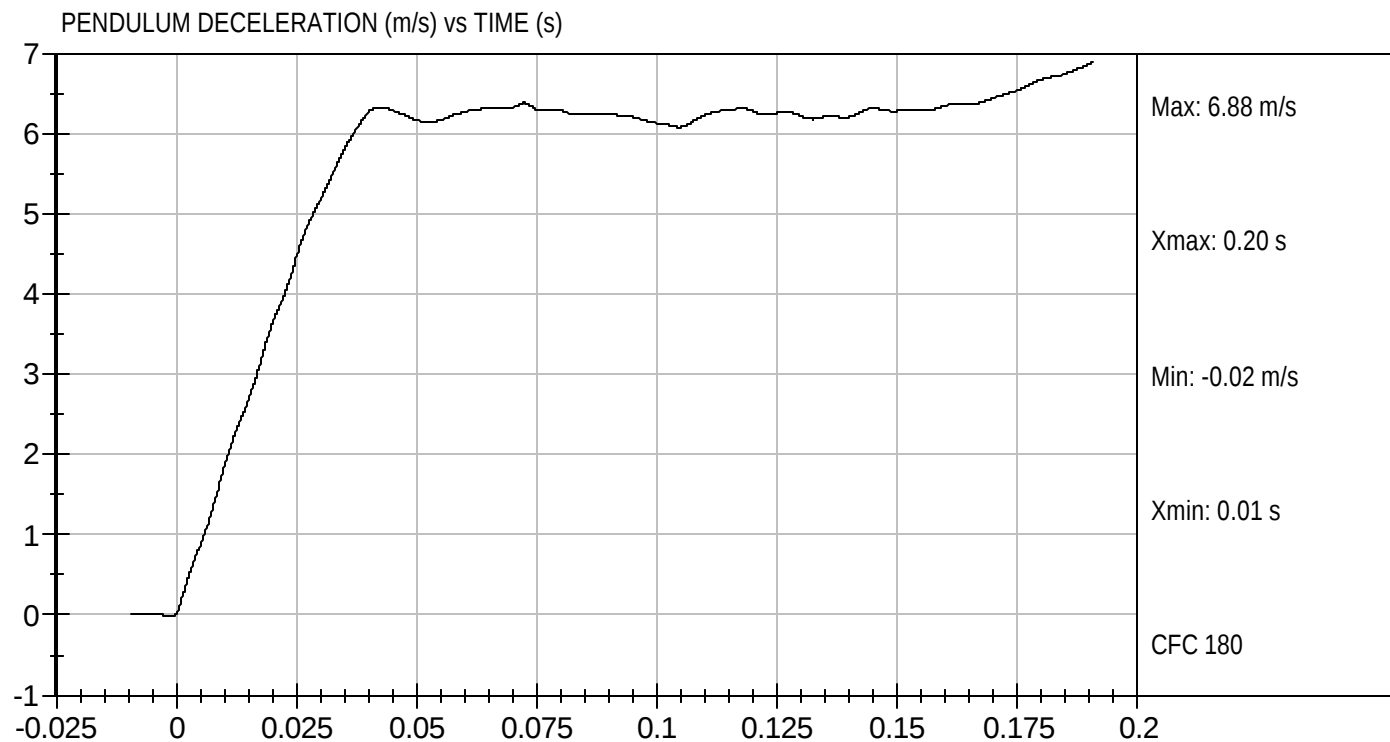
01/31/2005
 Test Date


 Approved By



Test Desc: Neck Extension
Componet ID: D05233

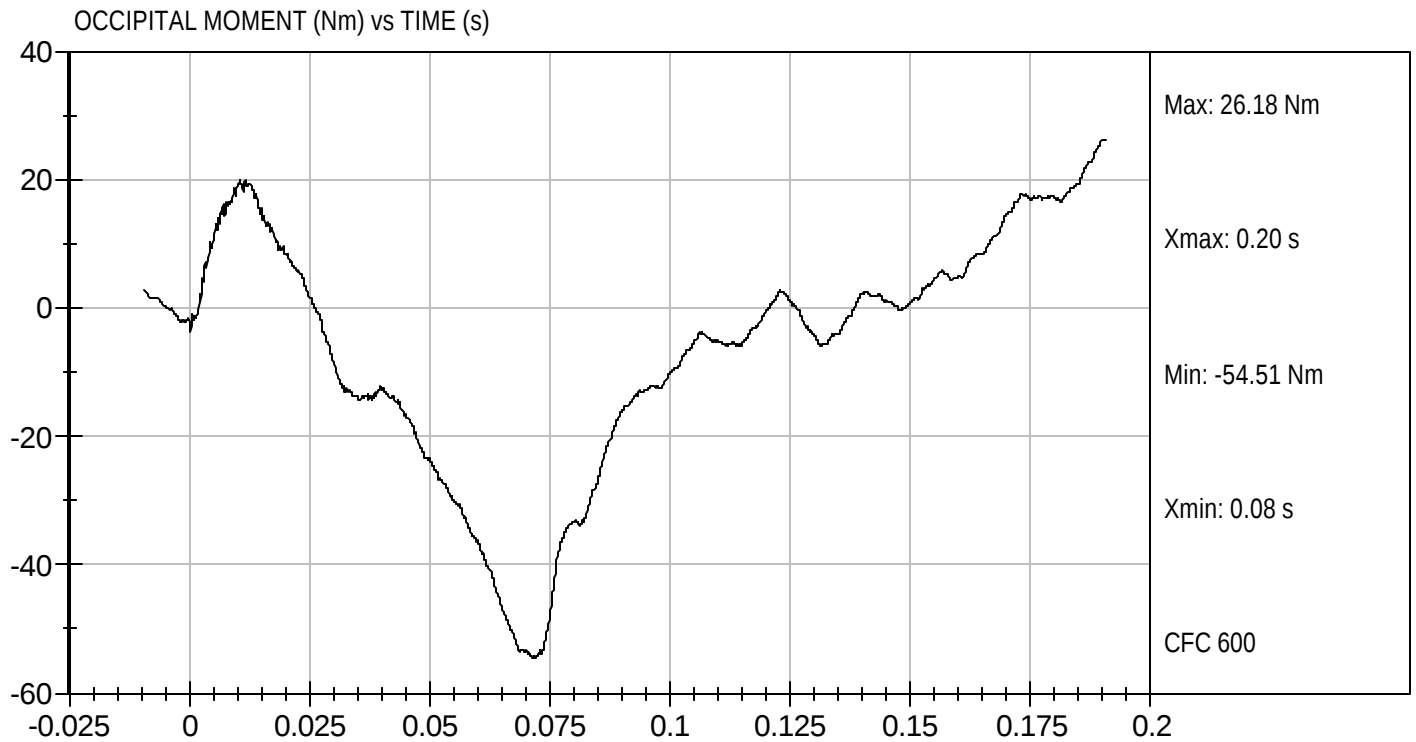
Test Date: 01/31/2005
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Componet ID: D05233

Test Date: 01/31/2005
Velocity: 20.08 ft/s, 6.12 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 516

Test Date 1/31/05

Technician Jessica Gall

☐ Pretest calibration

☒ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature 21.6

Record the minimum temperature 21.4

Record the maximum humidity 21%

Record the minimum humidity 20%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____

☐ - The following repairs or replacement was performed. Record _____

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

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

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

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.76 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4350 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force $\leq 4600 \text{ N}$	4376 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	70%

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

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

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

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

Jessica Gall
Signature

1/31/05
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D05234

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	6.59 to 6.83	6.76	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.4	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	< 4600 N	4,376	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

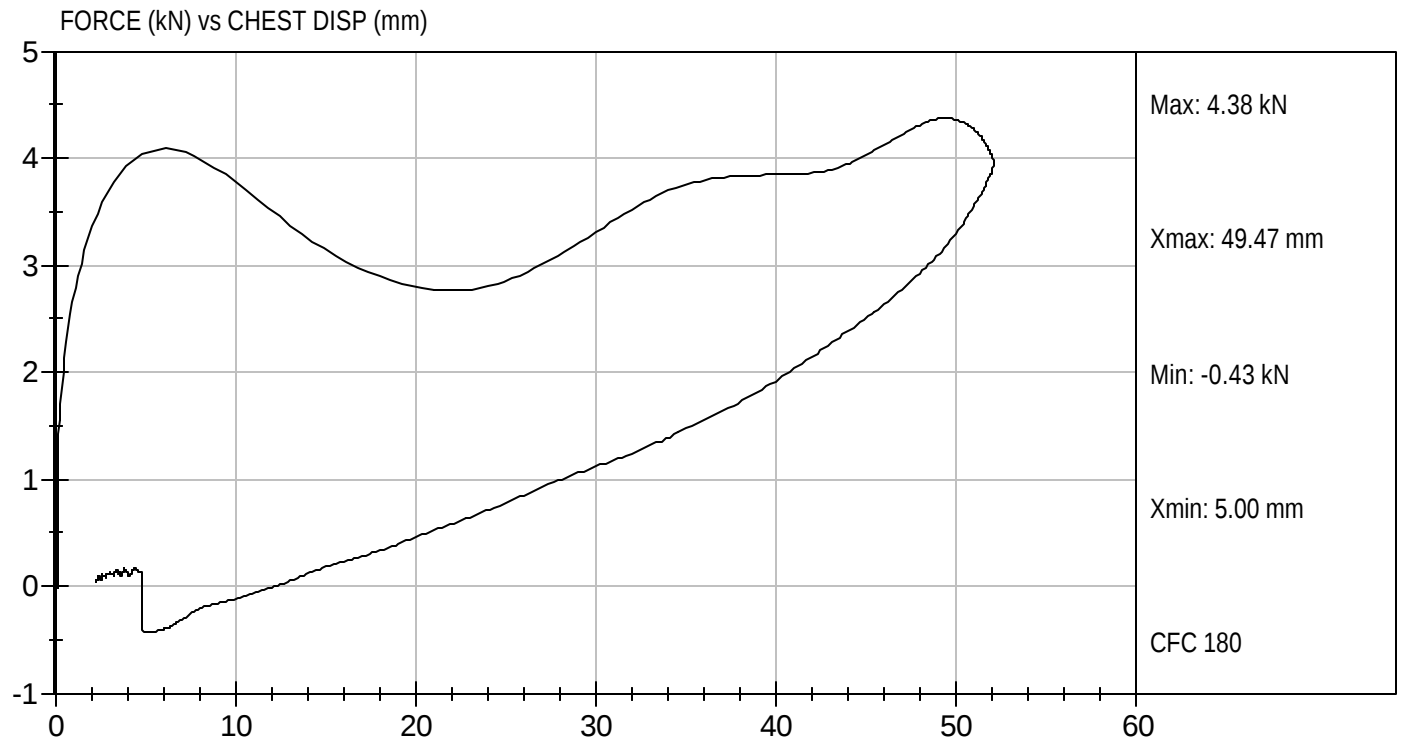
01/31/2005
Test Date

Jeff Leonard
Approved By



Test Desc: Thorax Impact
Componet ID: D05234

Test Date: 01/31/2005
Velocity: 22.18 ft/s, 6.76 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 516

Test Date 1/28/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

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

 X N/A, ONLY one thorax impact test performed

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

X 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).

 with legs below the femurs.

 X without legs below the femurs.

X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 21.9

Record the minimum temperature 21.3

Record the maximum humidity 15%

Record the minimum humidity 12%

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

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

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

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

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

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

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

Record reference plane angle (max. allowed 20°) 13.5°

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

- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at $45^{\circ} \pm 0.5^{\circ}$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.135(c)(11))
- X 17. Complete the following table:

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

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^{\circ}$	13.5°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	1.0
Force at $45^{\circ} \pm 0.5^{\circ}$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	378 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	16°

Joe Fleck
Signature

1/28/05
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D05237

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Initial Angle	deg	0 to 20	13.5	Pass
Return Angle	deg	+/- 8	16	Pass
Force at 45 deg	N	320 to 390	378	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result			Pass	



Laboratory Technician

01/28/2005

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 1/28/05

Technician Jessica Gall

 Pretest calibration

X Post test calibration verification

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

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

X N/A, ONLY one knee impact test performed

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

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

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. (572.136(c)(1))

Record the maximum temperature 21.9

Record the minimum temperature 21.3

Record the maximum humidity 15%

Record the minimum humidity 12%

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

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

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

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

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 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.09 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3650 N

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

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

Jessica Hall
Signature

1/28/05
Date

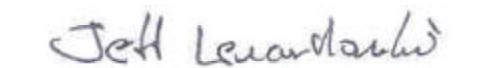
MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D05236

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	15	Pass
Probe Speed	m/sec	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.65	Pass
Overall Test Results				Pass


Laboratory Technician

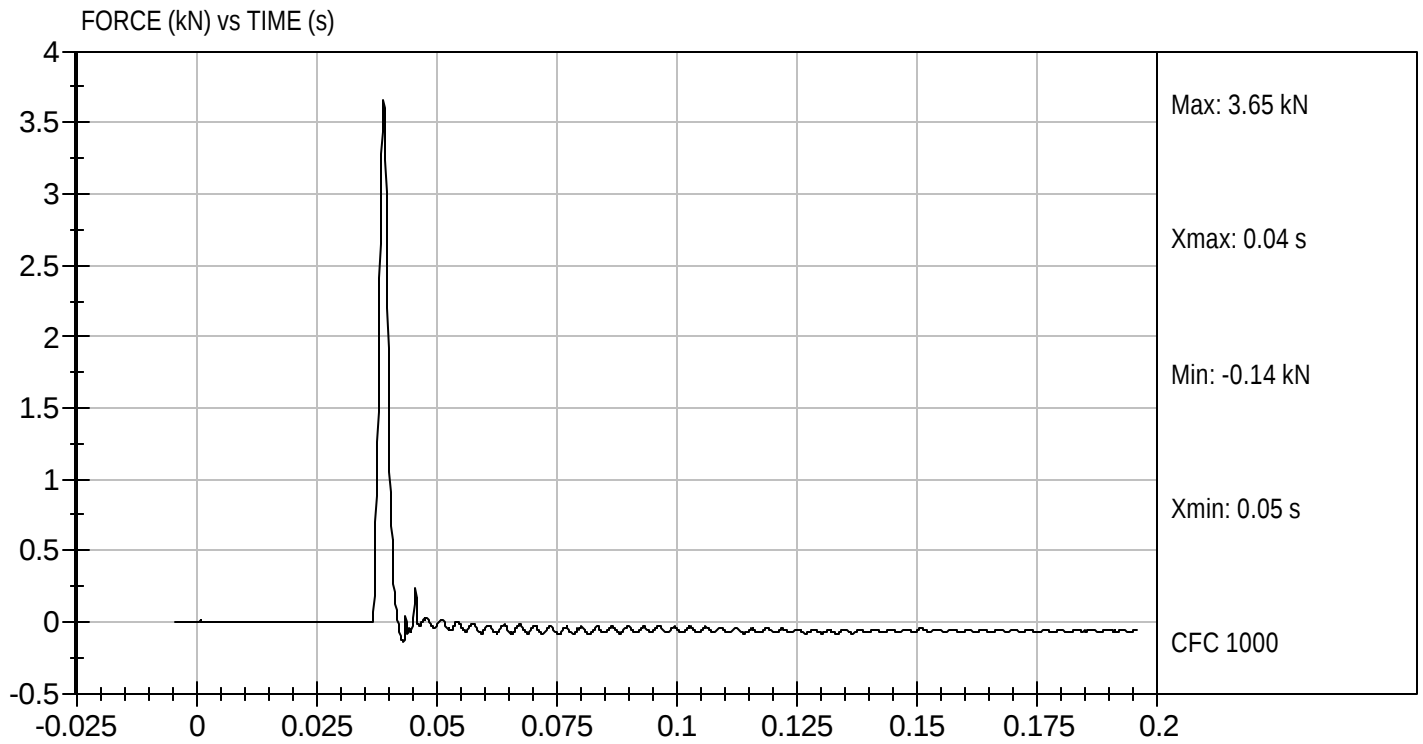

Approved By

01/28/2005
Test Date



Test Desc: Left Knee
Componet ID: D05236

Test Date: 01/28/2005
Velocity: 6.87 ft/s, 2.09 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 516

Test Date 1/28/05

Technician Jessica Gall

 Pretest calibration

X Post test calibration verification

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

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

 X N/A, ONLY one knee impact test performed

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

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

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. (572.136(c)(1))

Record the maximum temperature 21.9

Record the minimum temperature 21.3

Record the maximum humidity 15 %

Record the minimum humidity 12 %

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

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

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

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

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 2.07 m/s and 2.13 m/s. (572.136(c)(5))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3500 N

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

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

Jessica Hall
Signature

1/28/05
Date

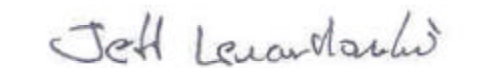
MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 516

Test I.D: D05235

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	15	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	3.45 to 4.06	3.50	Pass
Overall Test Results				Pass


Laboratory Technician

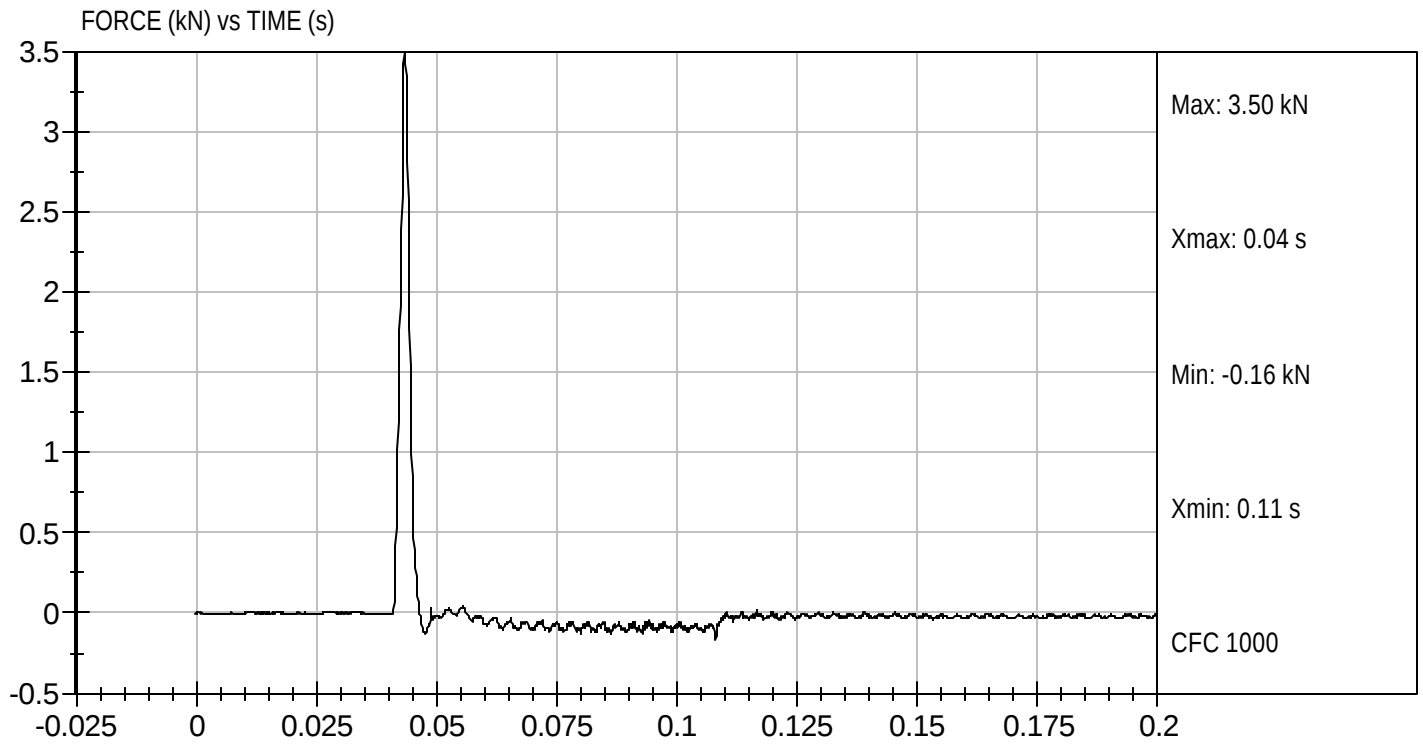

Approved By

01/28/2005
Test Date



Test Desc: Right Knee
Componet ID: D05235

Test Date: 01/28/2005
Velocity: 6.83 ft/s, 2.08 m/s



EXTERNAL DIMENSIONS

HYBRID III 5 th SN #516, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	783.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.8
C	H-POINT HEIGHT	Reference	81.3-86.3	83.9
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.3
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.5
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	249.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.6
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.	276.8-297.2	283.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	542.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	359.9
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.1
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	436.4

HYBRID III 5 th SN #516, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	177.8
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.1
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	480.4
S	HEAD BREADTH	The widest part of the head	137.1-147.3	143.2
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.3
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.9
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.1
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	545.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	865.4
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	783.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	340.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 516

Test Date 1/27/05

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

1/28/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

1/28/05
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #505, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	778.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.3
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.8
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.3
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	248.7
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.2
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	278.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	541.9
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	361.7
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	402.4
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	436.8

HYBRID III 5 th SN #505, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	188.7
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.3
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	481.1
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.4
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.8
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	359.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	84.2
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	531.7
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	853.2
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	773.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	340.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 505 Test Date 1/27/05

Technician Dave Wilcox

☒ Pretest calibration
☐ Post test calibration verification

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

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.9</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>15%</u> |
| Record the minimum humidity | <u>12%</u> |
- ☒ 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

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

Record the actual distance 376 mm

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

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

Record the right side distance 501mm

Record the left side distance 501mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

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

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

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

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	264
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	9

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


Signature

1/27/05
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test ID: D05201

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Peak Resultant Acceleration	G's	250 - 300	264	Pass
Peak Lateral Acceleration	G's	+/- 15	8.8	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

01/27/2005
Test Date

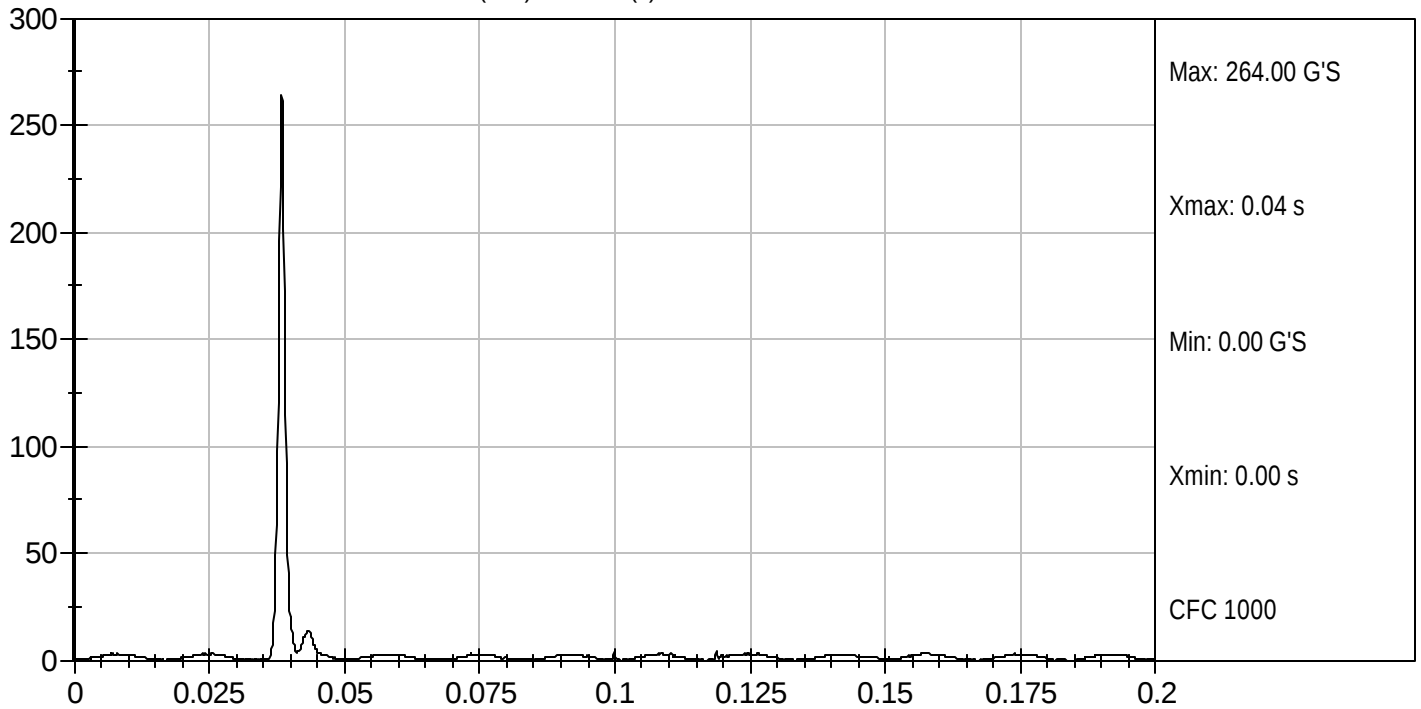

Approved By



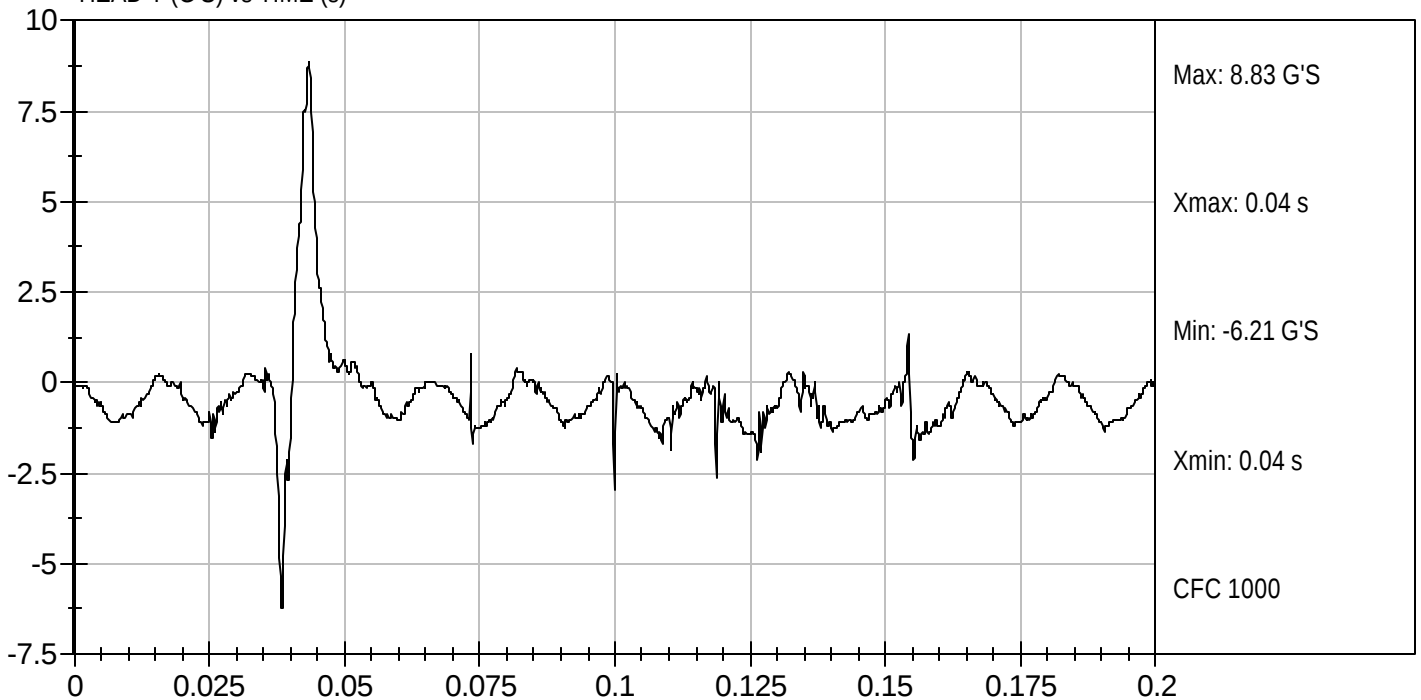
Test Desc: Head Drop
Componet ID: D05201

Test Date: 01/27/2005
Velocity: 0 ft/s, 6.02 m/s

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



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



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 505 Test Date 1/27/05

Technician Joe Fleck

☒ Pretest calibration
☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.9</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>15%</u> |
| Record the minimum humidity | <u>12%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 81; Back 89.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

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

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

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	6.95 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.4 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.7 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.7 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>76</u> Nm @ <u>83</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	85 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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

Joe Flack
Signature

1/27/05
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D05202

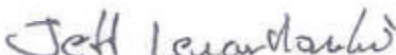
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Speed		m/sec	6.89 to 7.13	6.95	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.7	Pass
	30 msec	m/sec	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	83	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	76	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	85	Pass
Overall Results					Pass



Laboratory Technician

01/27/2005

Test Date

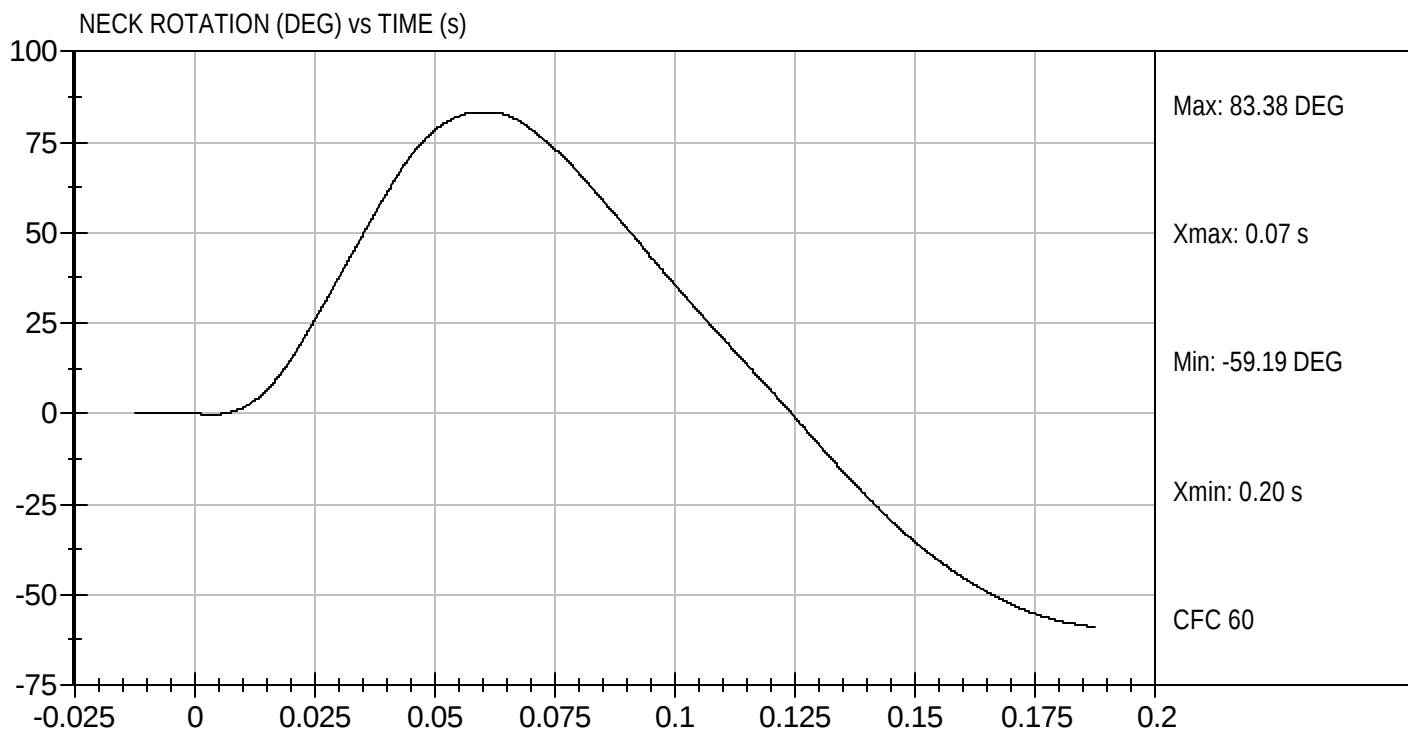
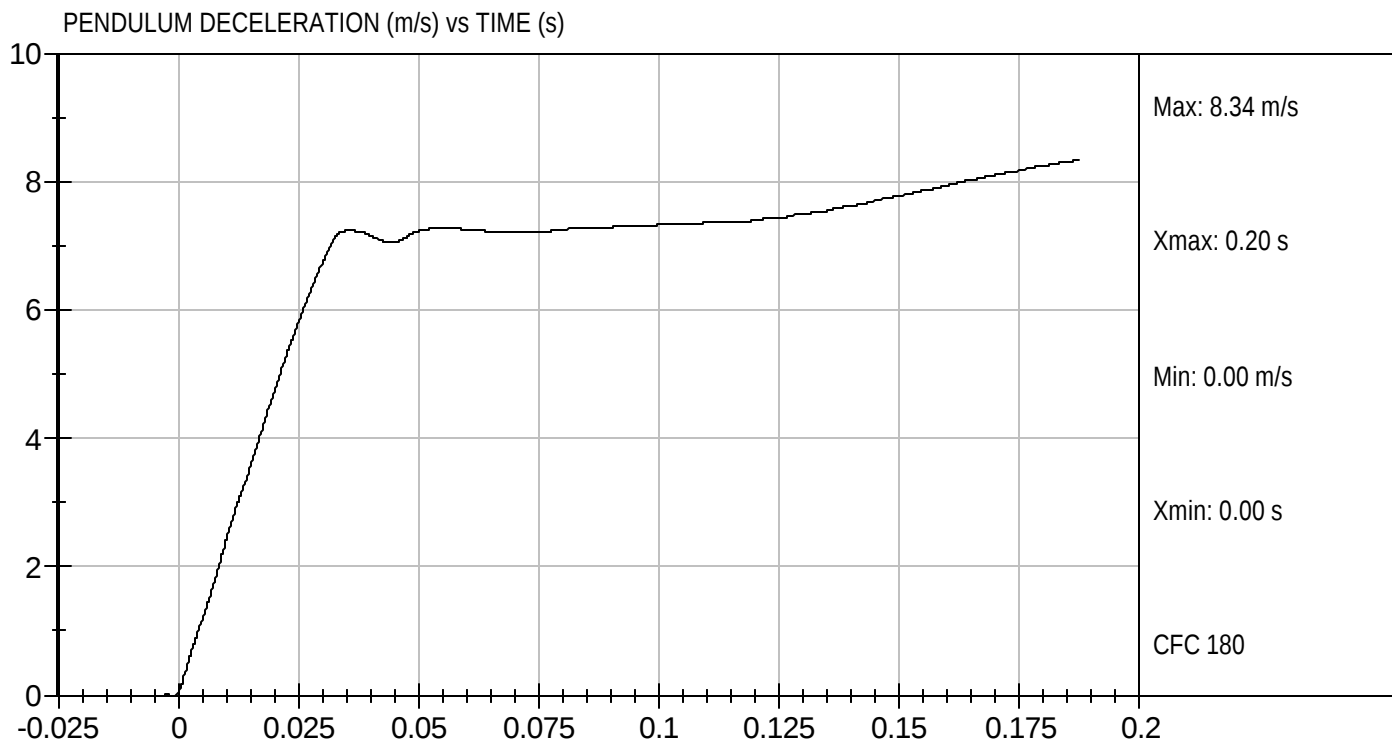


Approved By



Test Desc: Neck Flexion
Componet ID: D05202

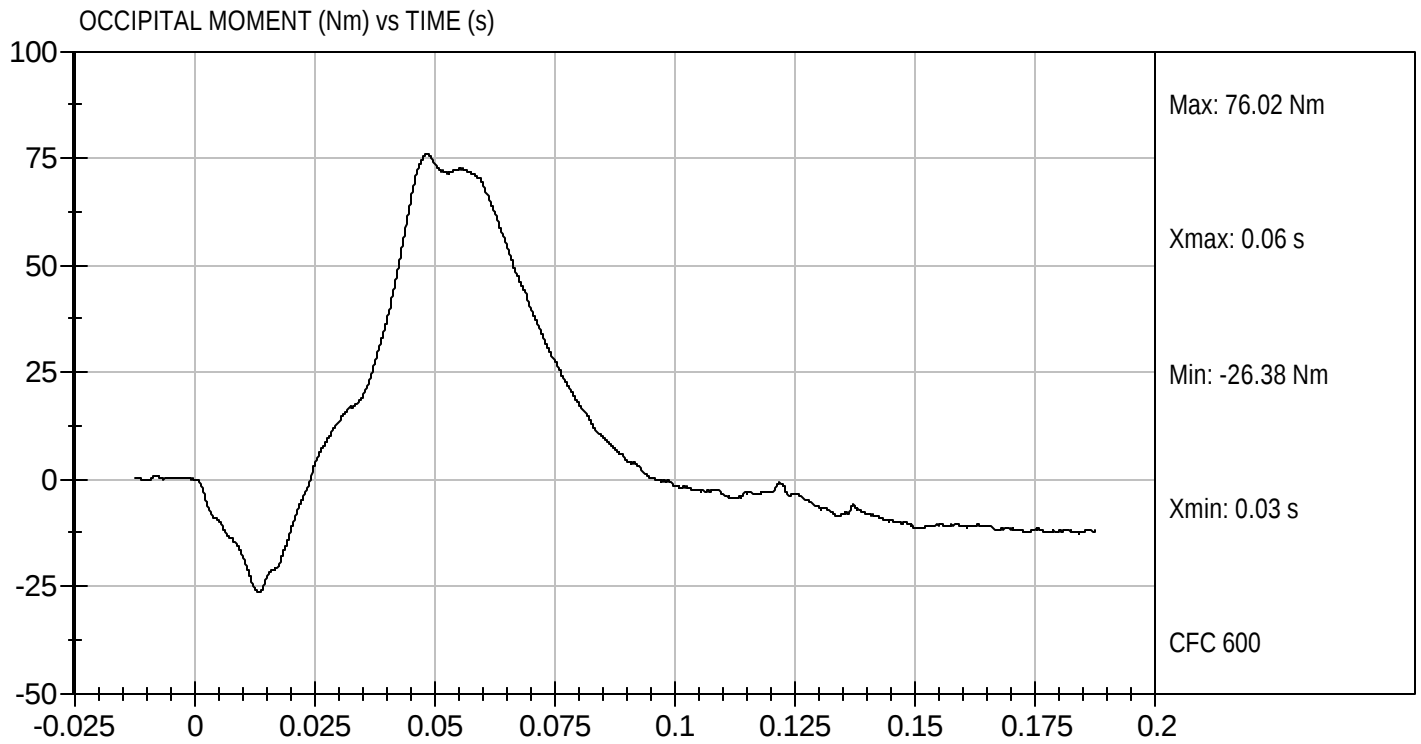
Test Date: 01/27/2005
Velocity: 22.8 ft/s, 6.95 m/s





Test Desc: Neck Flexion
Componet ID: D05202

Test Date: 01/27/2005
Velocity: 22.8 ft/s, 6.95 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 505 Test Date 1/27/05

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one extension test performed

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

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))

Record the maximum temperature 21.9

Record the minimum temperature 21.3

Record the maximum humidity 15%

Record the minimum humidity 12%

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

Record findings and actions: No Damage.

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

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

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

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

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

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

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

Parameter		Specification	Result
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.08 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.8 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.5 m/s
	@ 30ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.1 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range $99^\circ \leq$ angle $\leq 114^\circ$	-64 Nm @ 109 degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	102 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

1/27/05
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

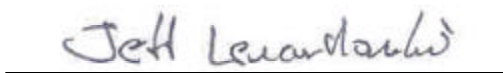
ATD Serial No: 505

Test I.D: D05203

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	15	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.5	Pass
	30 msec	m/sec	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-64	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	102	Pass
Overall Results					Pass


Laboratory Technician

01/27/2005
Test Date

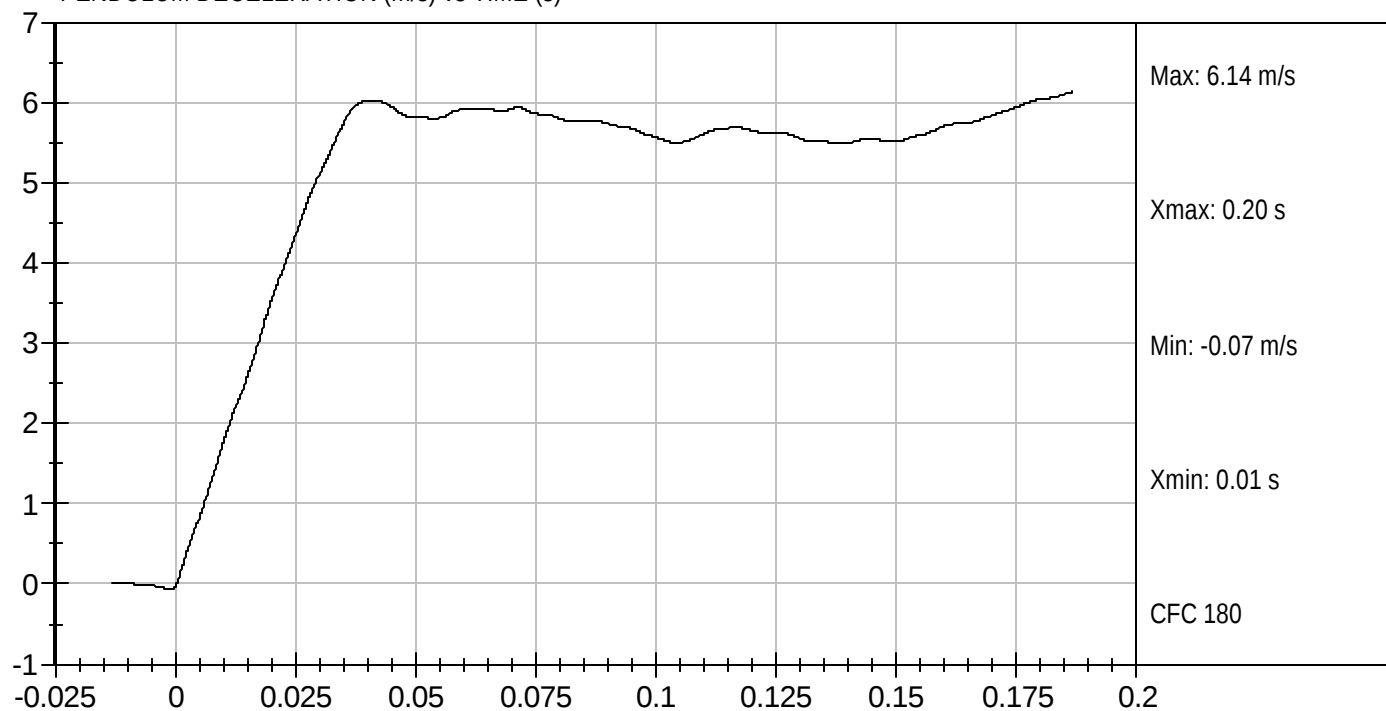

Approved By



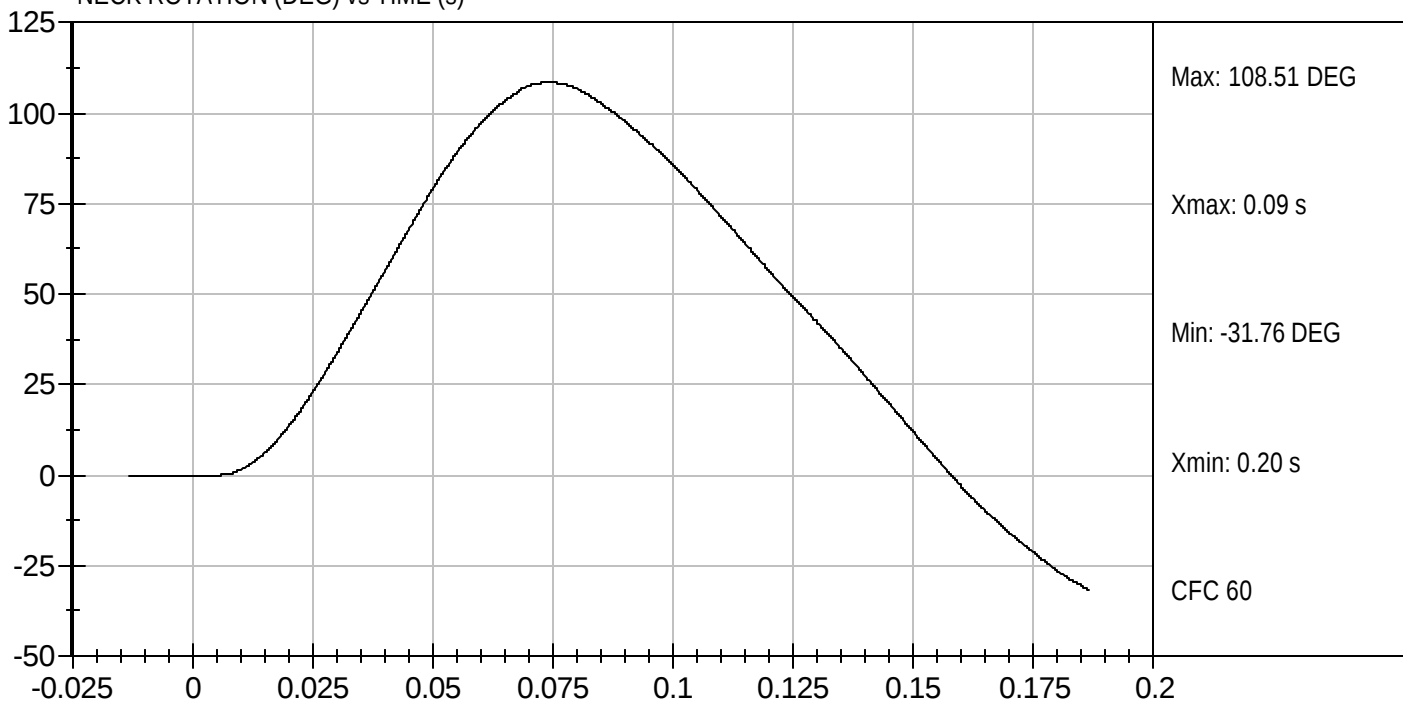
Test Desc: Neck Extension
Componet ID: D05203

Test Date: 01/27/2005
Velocity: 19.960 ft/s, 6.08 m/s

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



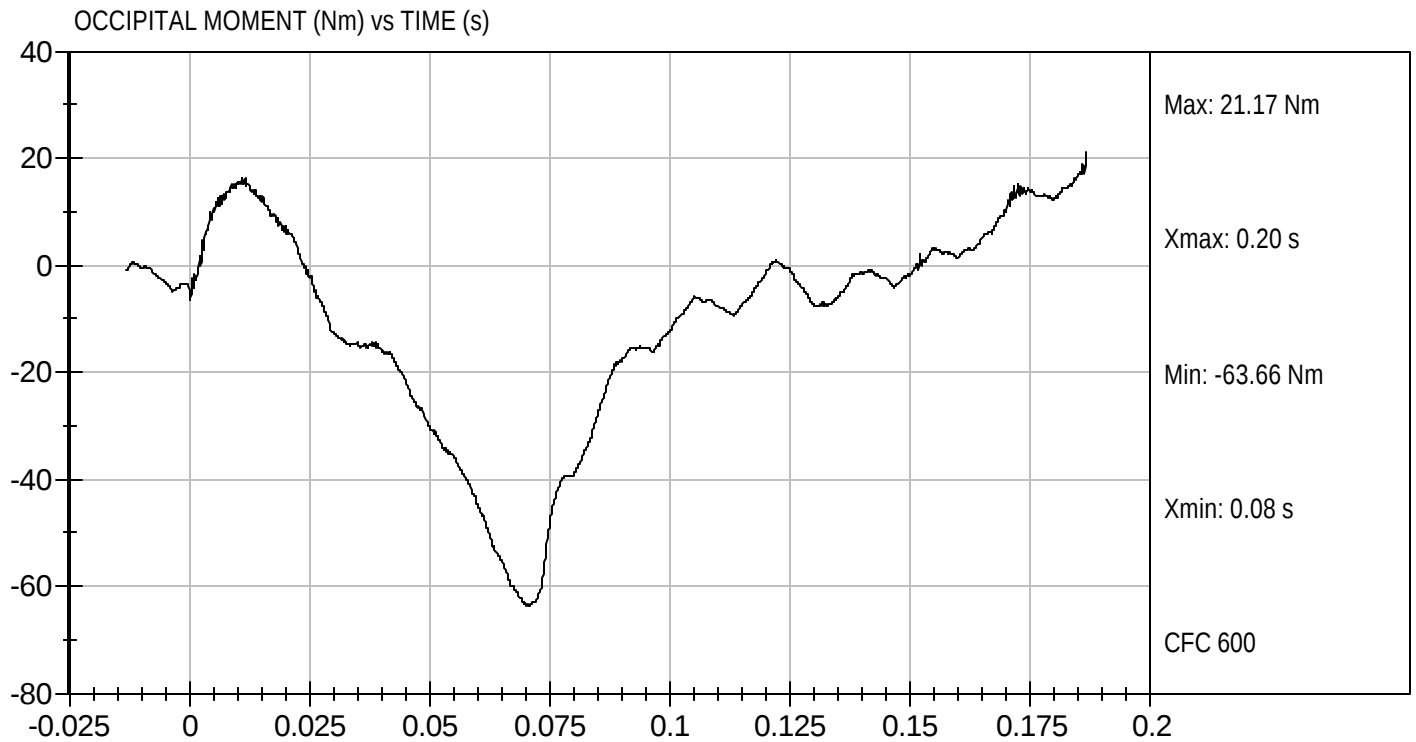
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Extension
Componet ID: D05203

Test Date: 01/27/2005
Velocity: 19.960 ft/s, 6.08 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 505

Test Date 1/27/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature 21.9

Record the minimum temperature 21.3

Record the maximum humidity 15%

Record the minimum humidity 12%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____

☐ - The following repairs or replacement was performed. Record _____

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

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

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

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

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

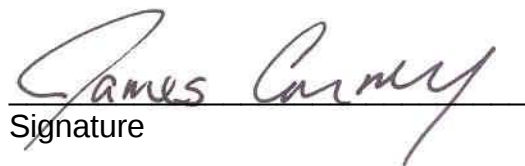
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.72 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	55 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4255 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force $\leq 4600 \text{ N}$	4108 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

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

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

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


Signature

1/27/05
Date

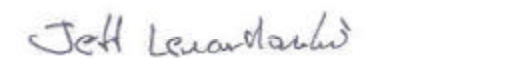
MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D05204

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	15	Pass
Probe Speed	m/s	6.59 to 6.83	6.72	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.3	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	< 4600 N	4108	Pass
Overall Test Results			Pass	


Laboratory Technician

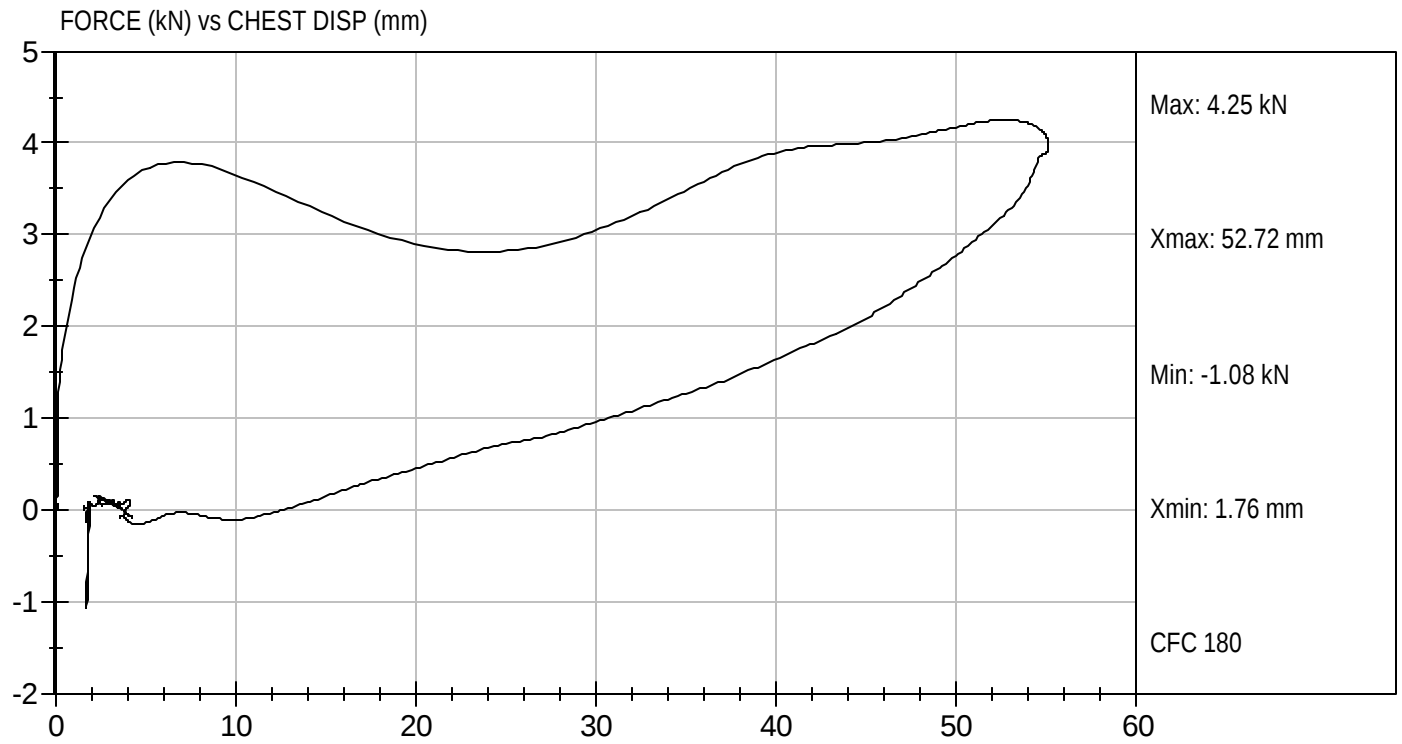

Approved By

01/27/2005
Test Date



Test Desc: Thorax Impact
Componet ID: D05204

Test Date: 01/27/2005
Velocity: 22.04 ft/s, 6.72 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 505

Test Date 1/27/05

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
☐ with legs below the femurs.
☒ without legs below the femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.9</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>15%</u> |
| Record the minimum humidity | <u>12%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- ☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- ☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))
- ☒ 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- ☒ 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- ☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
- | | |
|---|------------|
| Record reference plane angle (max. allowed 20°) | <u>16°</u> |
|---|------------|
- ☒ 12. Attach the pull cable and the load cell. (572.135(c)(8))

- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at $45^{\circ} \pm 0.5^{\circ}$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.135(c)(11))
- X 17. Complete the following table:

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

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^{\circ}$	16°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	1.0
Force at $45^{\circ} \pm 0.5^{\circ}$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	373 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	20°

Joe Flier
Signature

1/27/05
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D05207

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	20	Pass
Force at 45 deg	N	320 to 390	373	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result			Pass	



Laboratory Technician

01/27/2005

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505Test Date 1/27/05Technician Joe Fleck☒ Pretest calibration☐ Post test calibration verificationTest attempt no. 1 (when successive knee impact tests are necessary)☐ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))☒ N/A, ONLY one knee impact test performed☒ 2. The test fixture conforms to the specifications in Figure 14B☒ 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))Record the maximum temperature 21.9Record the minimum temperature 21.3Record the maximum humidity 15%Record the minimum humidity 12%☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3530 N

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

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

Joe Flores
Signature

1/27/05
Date

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

ATD Serial No: 505

Test I.D: D05206

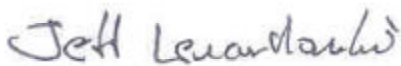
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.53	Pass
			Overall Test Results	Pass



Laboratory Technician

01/27/2005

Test Date

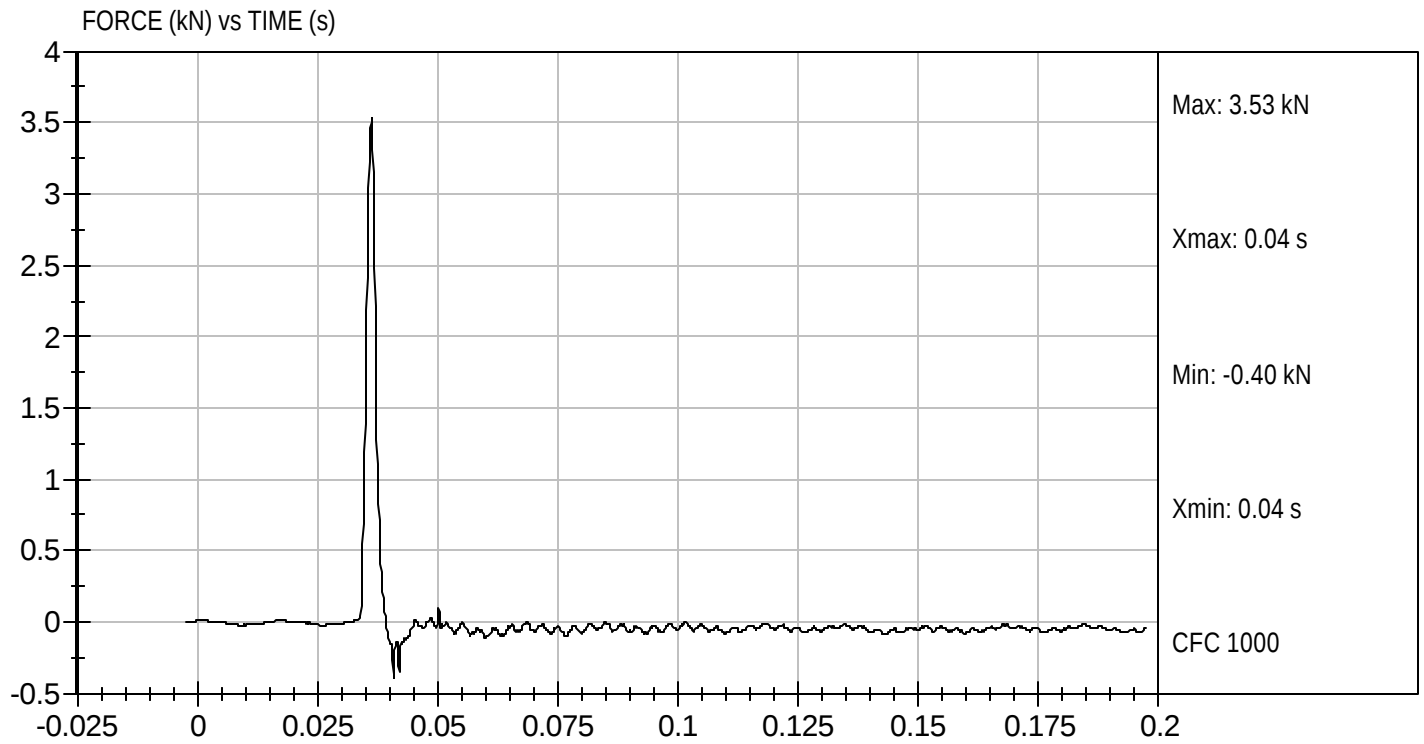


Approved By



Test Desc: Left Knee
Componet ID: D05206

Test Date: 01/27/2005
Velocity: 6.95 ft/s, 2.12 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 1/27/05

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

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

☒ N/A, ONLY one knee impact test performed

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

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

☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature 21.9

Record the minimum temperature 21.3

Record the maximum humidity 15 %

Record the minimum humidity 12 %

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

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

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

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

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

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

☒ 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3640 N

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

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



Signature

1/27/05
Date

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

ATD Serial No: 505

Test I.D: D05205

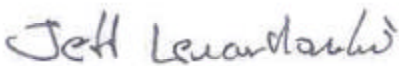
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.64	Pass
			Overall Test Results	Pass



Laboratory Technician

01/27/2005

Test Date

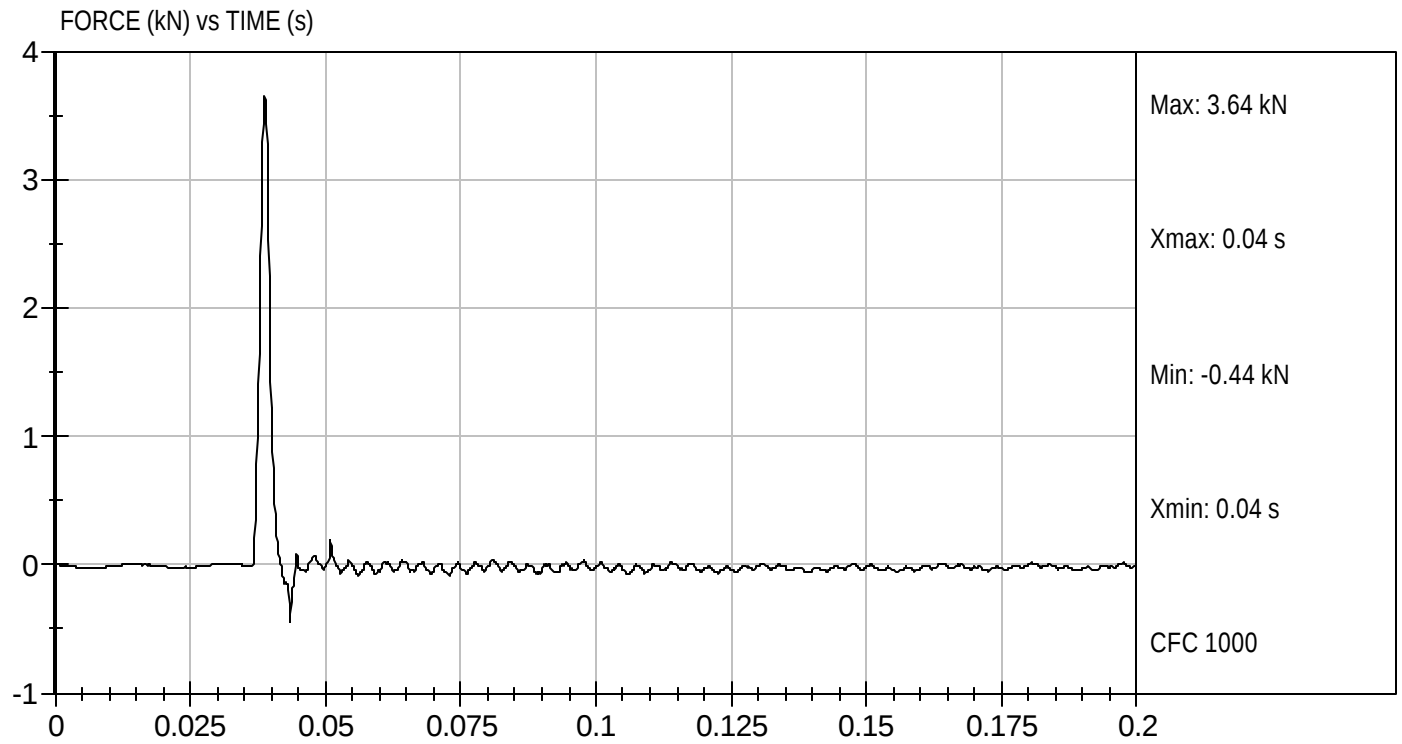


Approved By



Test Desc: Right Knee
Componet ID: D05205

Test Date: 01/27/2005
Velocity: 6.93 ft/s, 2.11 m/s



DATA SHEET B3
HEAD DROP TEST (572.132)Dummy Serial Number 505 Test Date 2/14/05Technician Jim Carney☐ Pretest calibration
☒ Post test calibration verificationTest attempt no. 1 (when successive head drops are necessary)

- ☐ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>29%</u> |
| Record the minimum humidity | <u>27%</u> |
- ☒ 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

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

Record the actual distance 376 mm

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

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

Record the right side distance 501mm

Record the left side distance 501mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

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

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

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

Record thickness 50.9 mm

Record width 604 mm

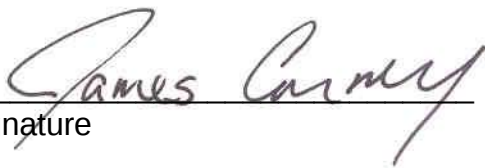
Record length 595 mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	279
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	10

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


Signature

2/14/05
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

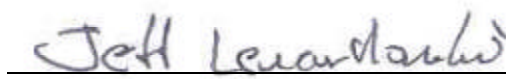
ATD Serial No: 505

Test ID: D05361

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	250 - 300	279	Pass
Peak Lateral Acceleration	G's	+/- 15	10.3	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

02/14/2005
Test Date

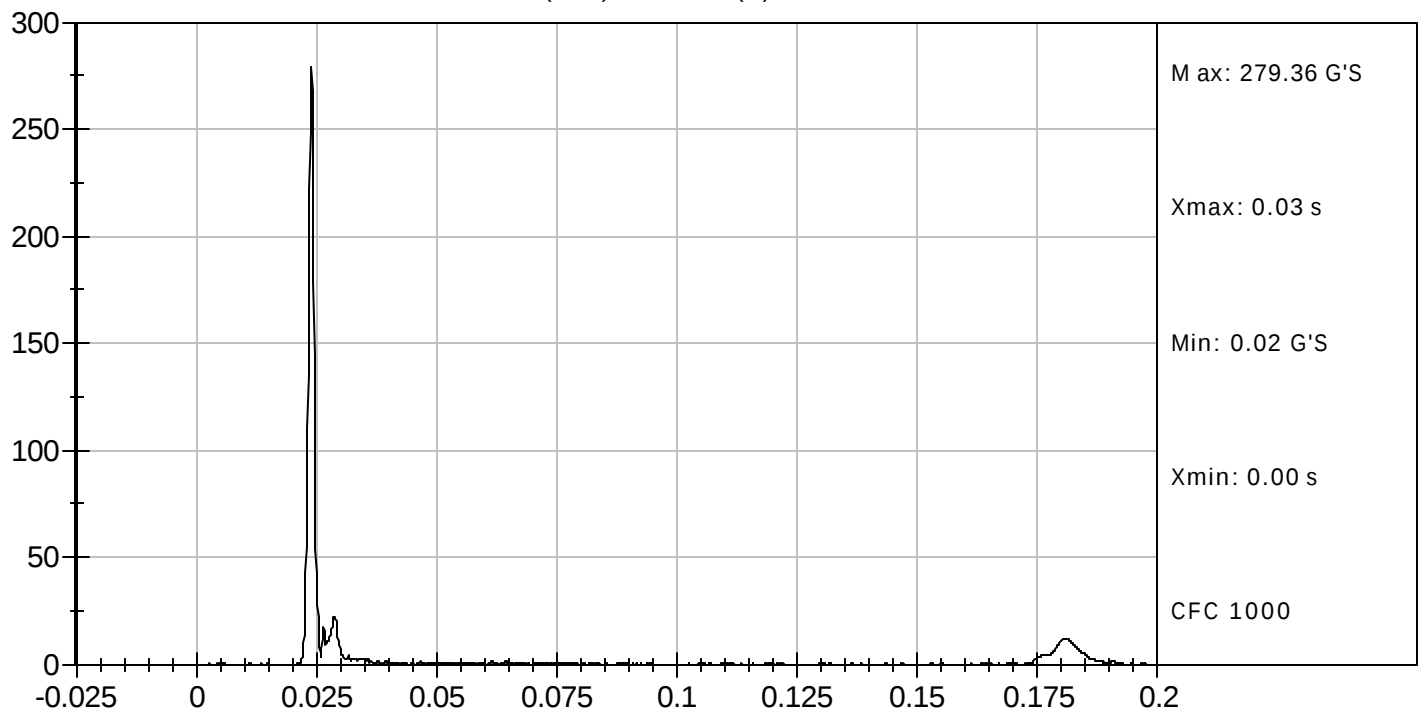

Approved By



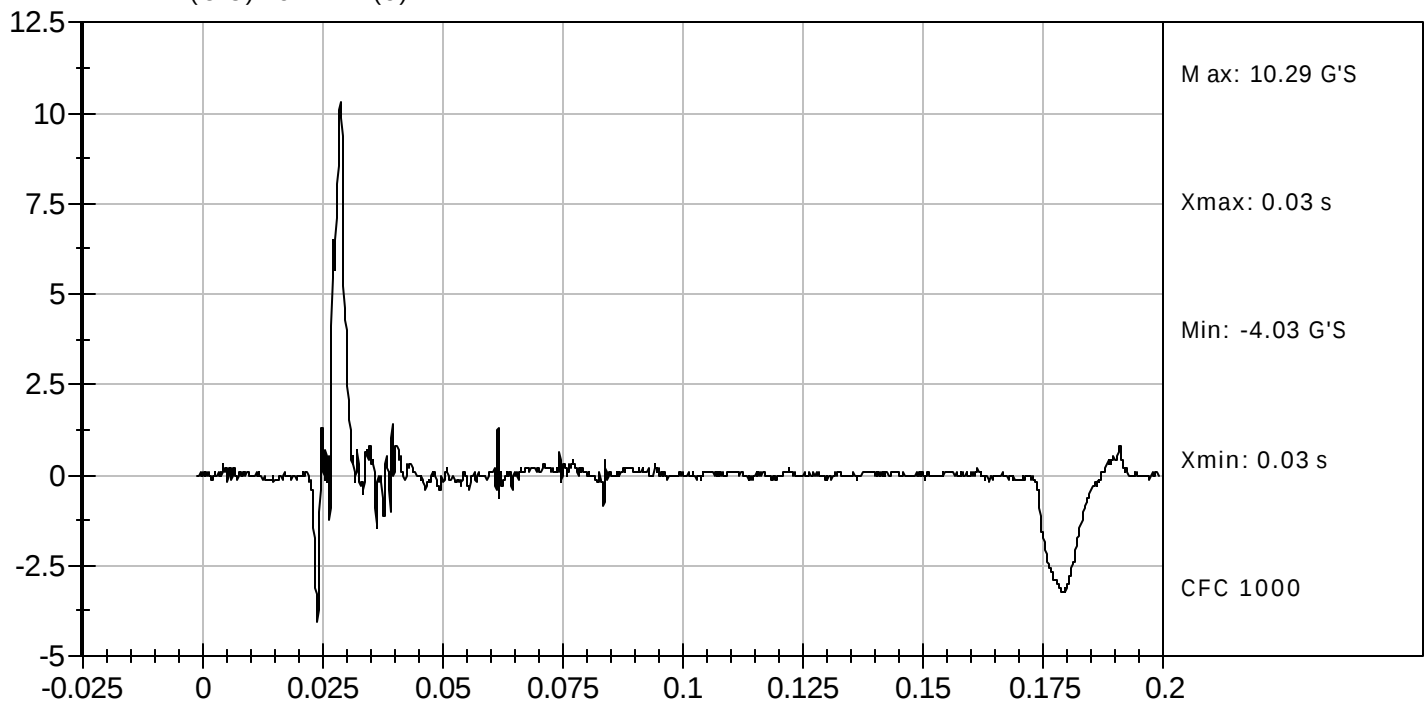
Test Desc: Head Drop
Componet ID: D05361

Test Date: 02/14/2005
Velocity: 0 ft/s, 0 m/s

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



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



DATA SHEET B4
NECK FLEXION TEST (572.133)

Dummy Serial Number 505 Test Date 2/14/05

Technician Jim Carney

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>29%</u> |
| Record the minimum humidity | <u>27%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 85; Back 88.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

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

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

Parameter		Specification	Result
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	6.95 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.2 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.4 m/s
	@30ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.2 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	<u>77</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	88 ms

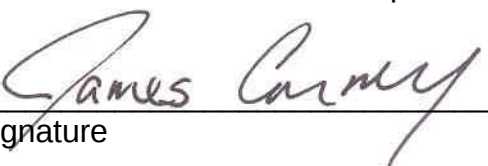
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

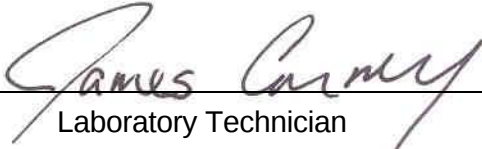
2/14/05
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

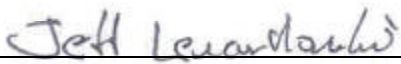
ATD Serial No: 505

Test I.D: D05362

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	28	Pass
Pendulum Speed		m/sec	6.89 to 7.13	6.95	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.2	Pass
	20 msec	m/sec	4.0 to 5.0	4.4	Pass
	30 msec	m/sec	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	77	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	88	Pass
Overall Results				Pass	


Laboratory Technician

02/14/2005
Test Date

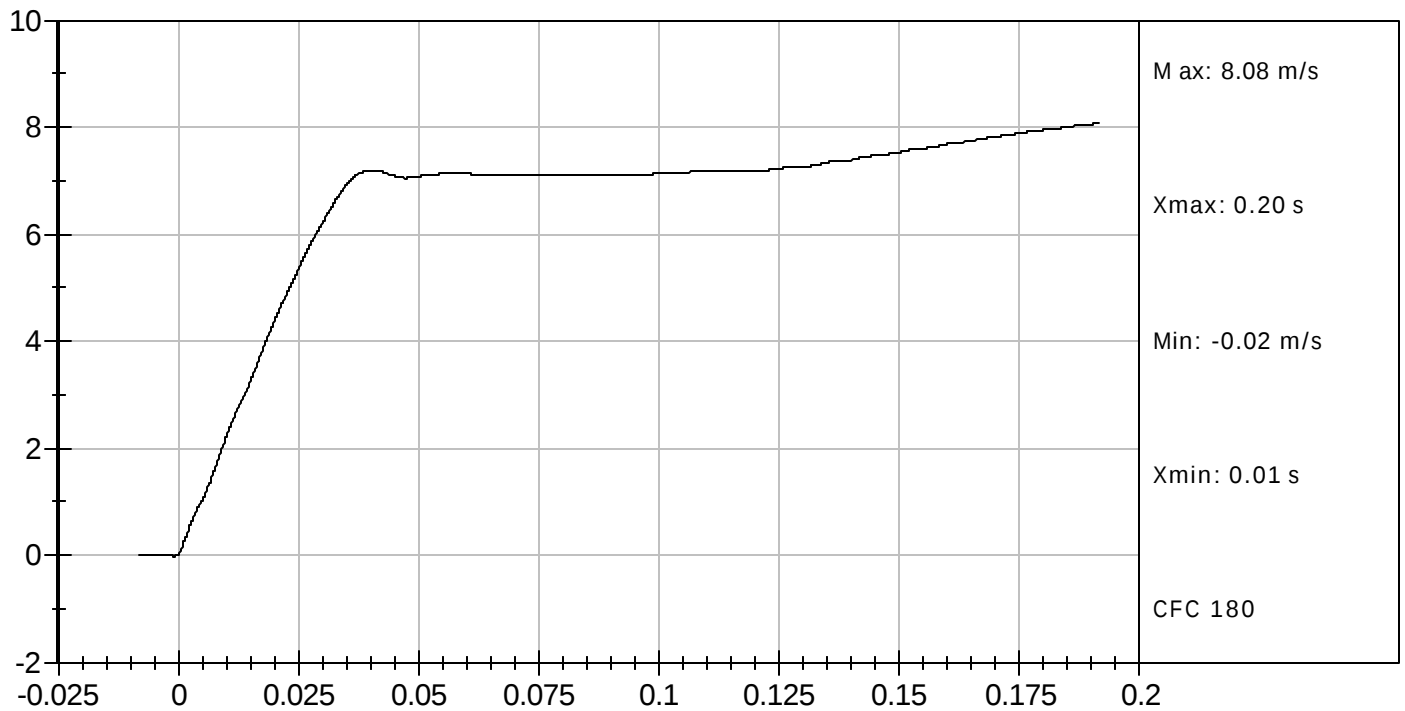

Approved By



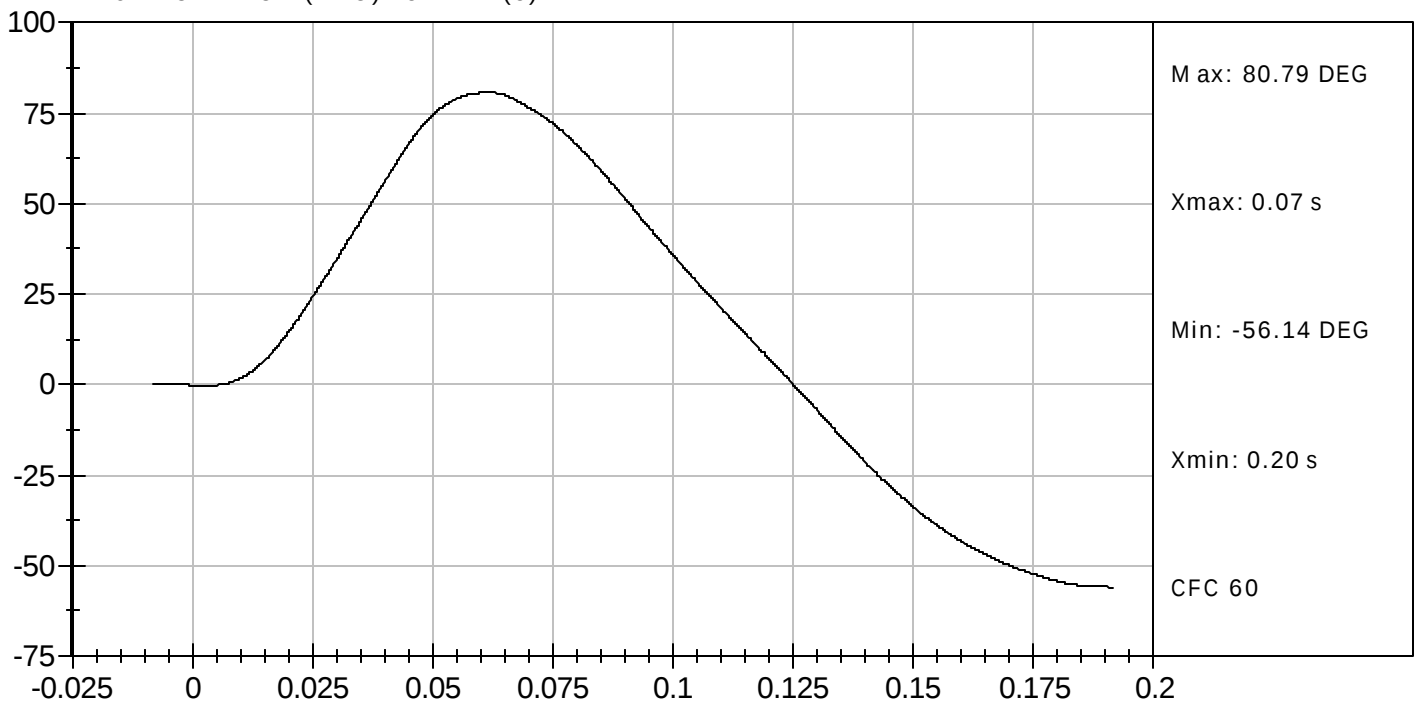
Test Desc: Neck Flexion
Componet ID: D05362

Test Date: 02/14/2005
Velocity: 22.81 ft/s, 6.95 m/s

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



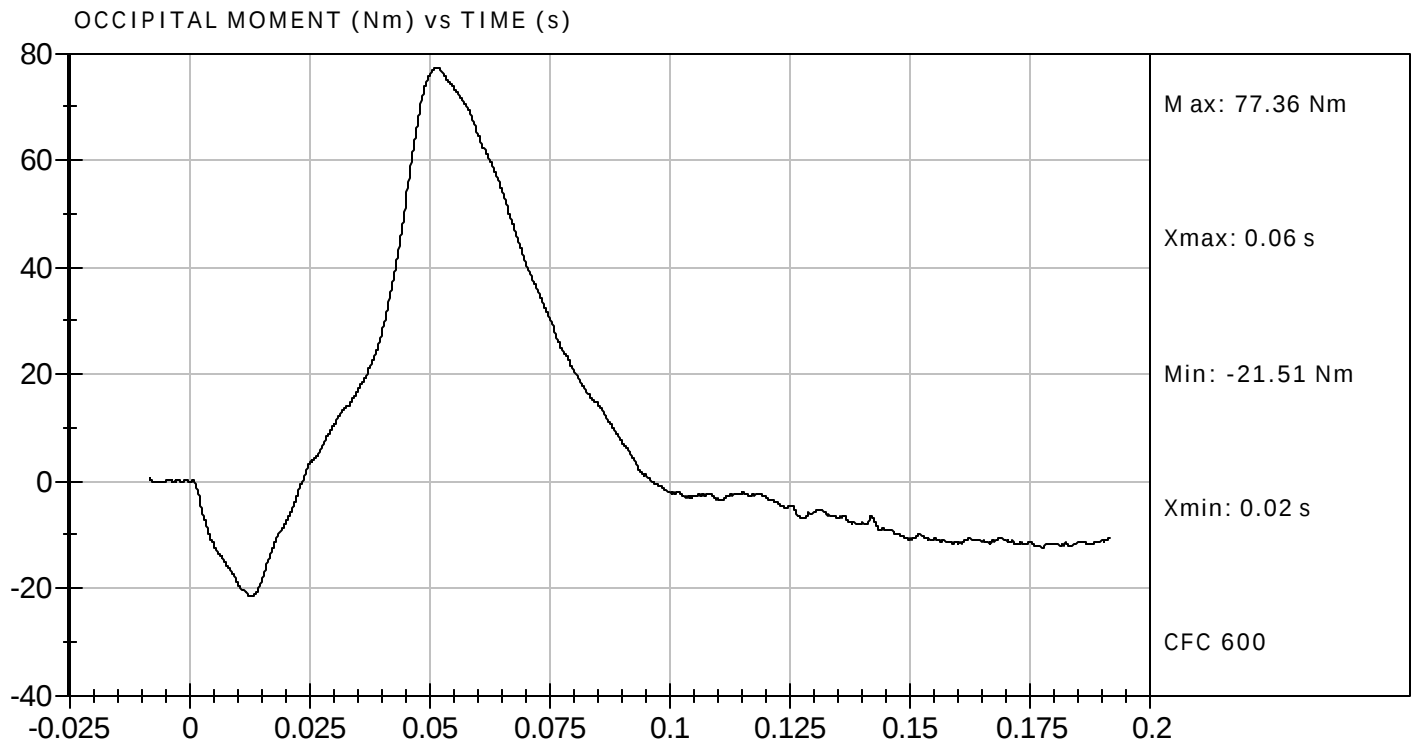
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Componet ID: D05362

Test Date: 02/14/2005
Velocity: 22.81 ft/s, 6.95 m/s



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 505 Test Date 2/14/05

Technician Jim Carney

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one extension test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.4</u> |
| Record the maximum humidity | <u>29%</u> |
| Record the minimum humidity | <u>27%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 85; Back 88.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- ☒ 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

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

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

Parameter		Specification	Result
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.07 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.8 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.6 m/s
	@ 30ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.2 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range $99^\circ \leq$ angle $\leq 114^\circ$	<u>-62</u> Nm @ <u>110</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	99 ms

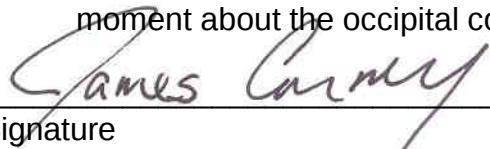
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

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


Signature

2/14/05
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

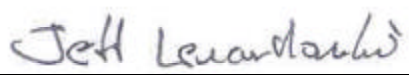
ATD Serial No: 505

Test I.D: D05363

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	28	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.07	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-62	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	99	Pass
Overall Results					Pass


 Laboratory Technician

02/14/2005
 Test Date

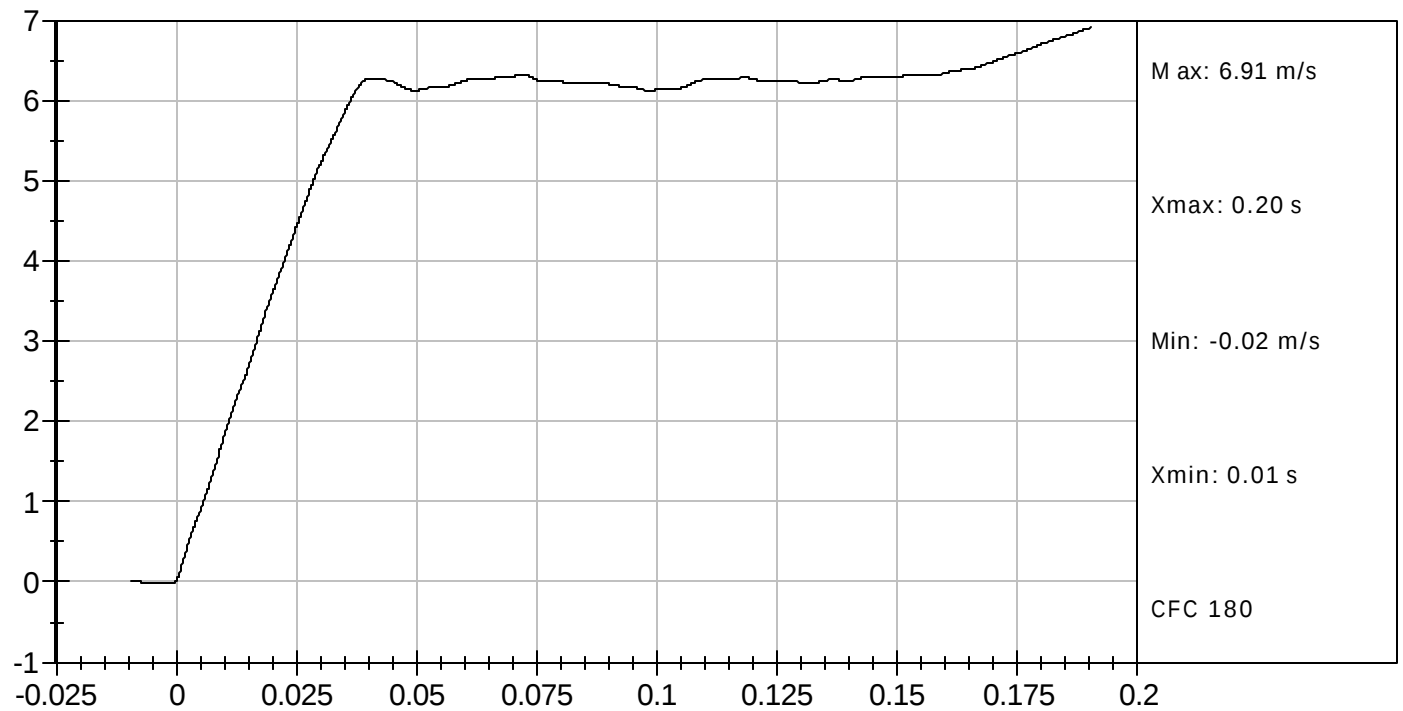

 Approved By



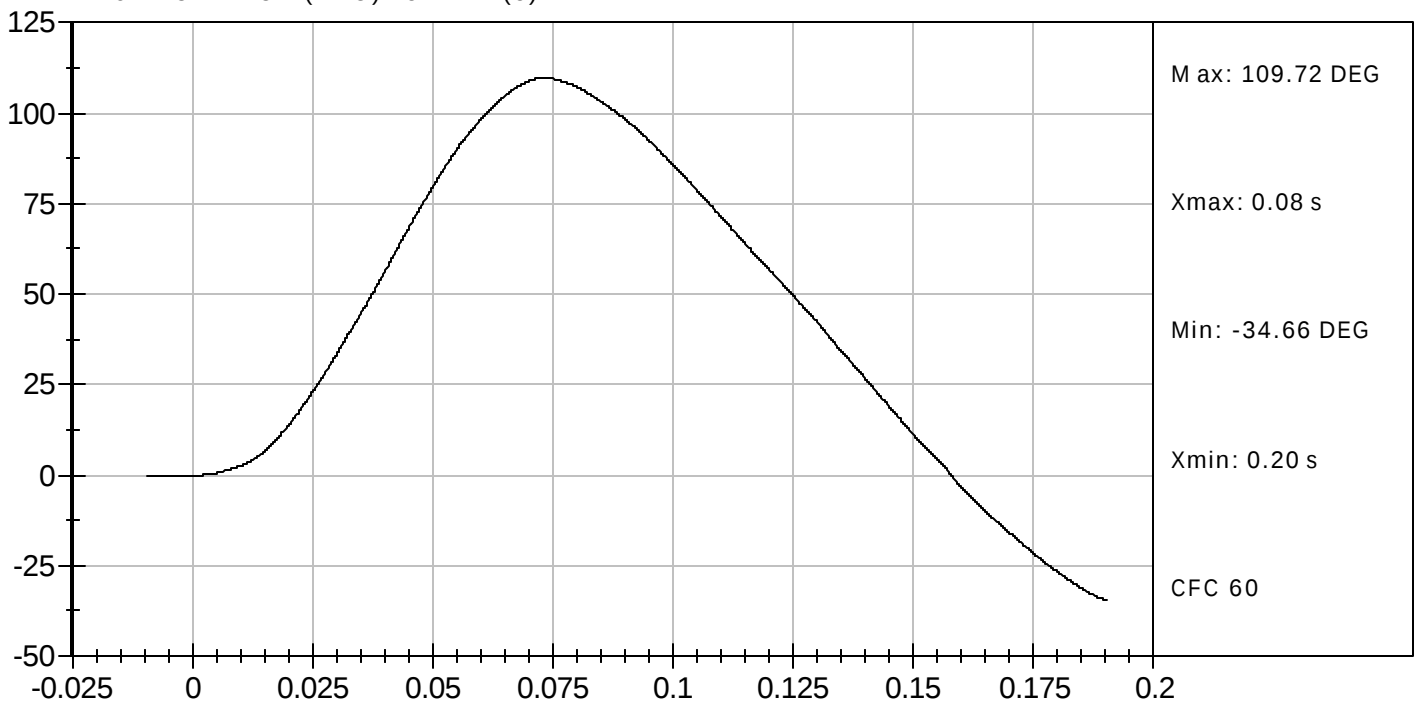
Test Desc: Neck Extension
Componet ID: D05363

Test Date: 02/14/2005
Velocity: 19.91 ft/s, 6.07 m/s

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



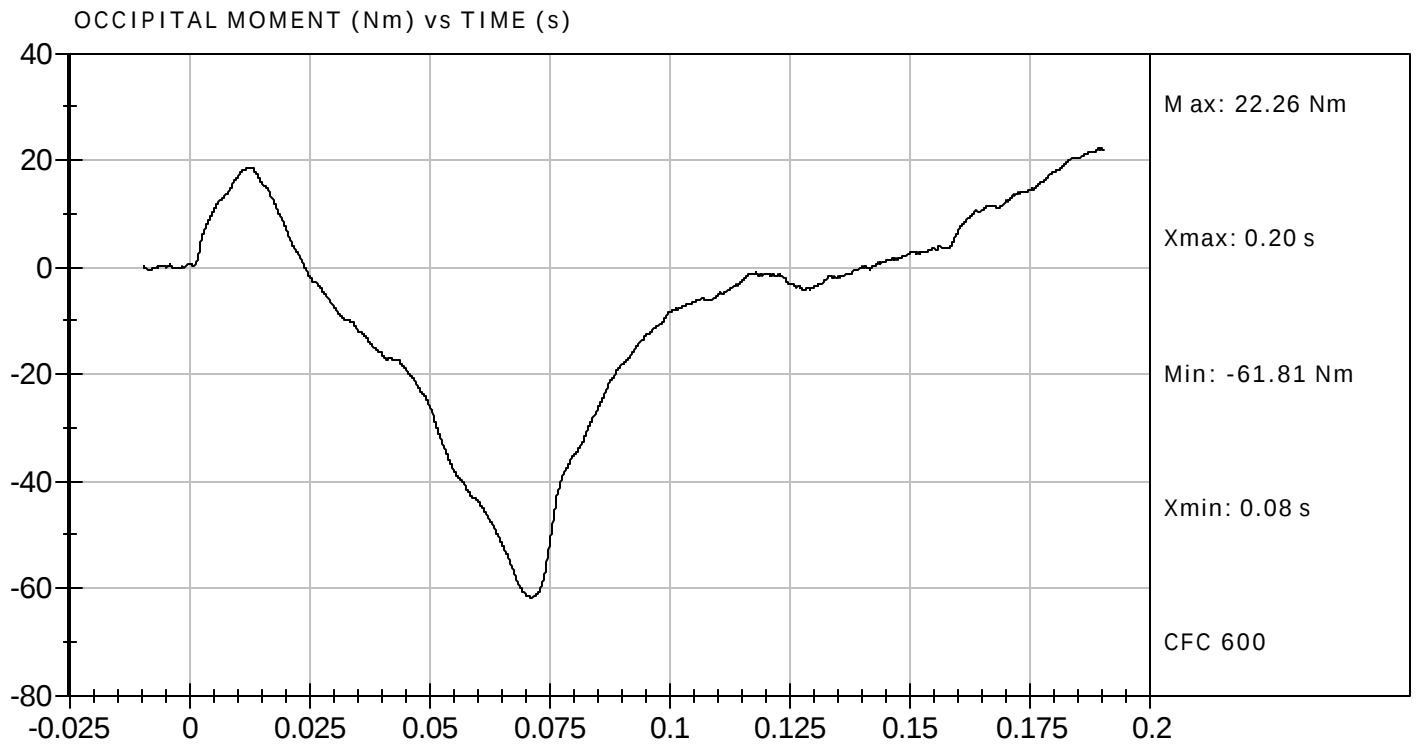
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Extension
Componet ID: D05363

Test Date: 02/14/2005
Velocity: 19.91 ft/s, 6.07 m/s



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 505

Test Date 2/14/05

Technician Jim Carney

 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 11B.

X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))

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. (572.134(c)(2))

Record the maximum temperature 21.7

Record the minimum temperature 21.4

Record the maximum humidity 29%

Record the minimum humidity 27%

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, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

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 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))

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

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

- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

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

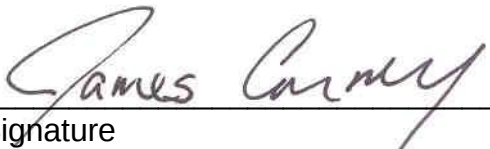
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.79 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4290 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force $\leq 4600 \text{ N}$	4281 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

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

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

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

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


Signature

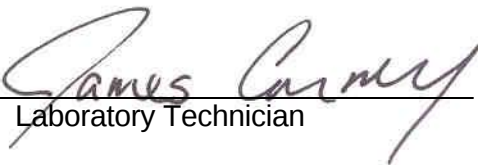
2/14/05
Date

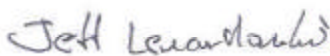
MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D05364

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	6.59 to 6.83	6.79	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.3	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	< 4600 N	4,281	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

02/14/2005
Test Date

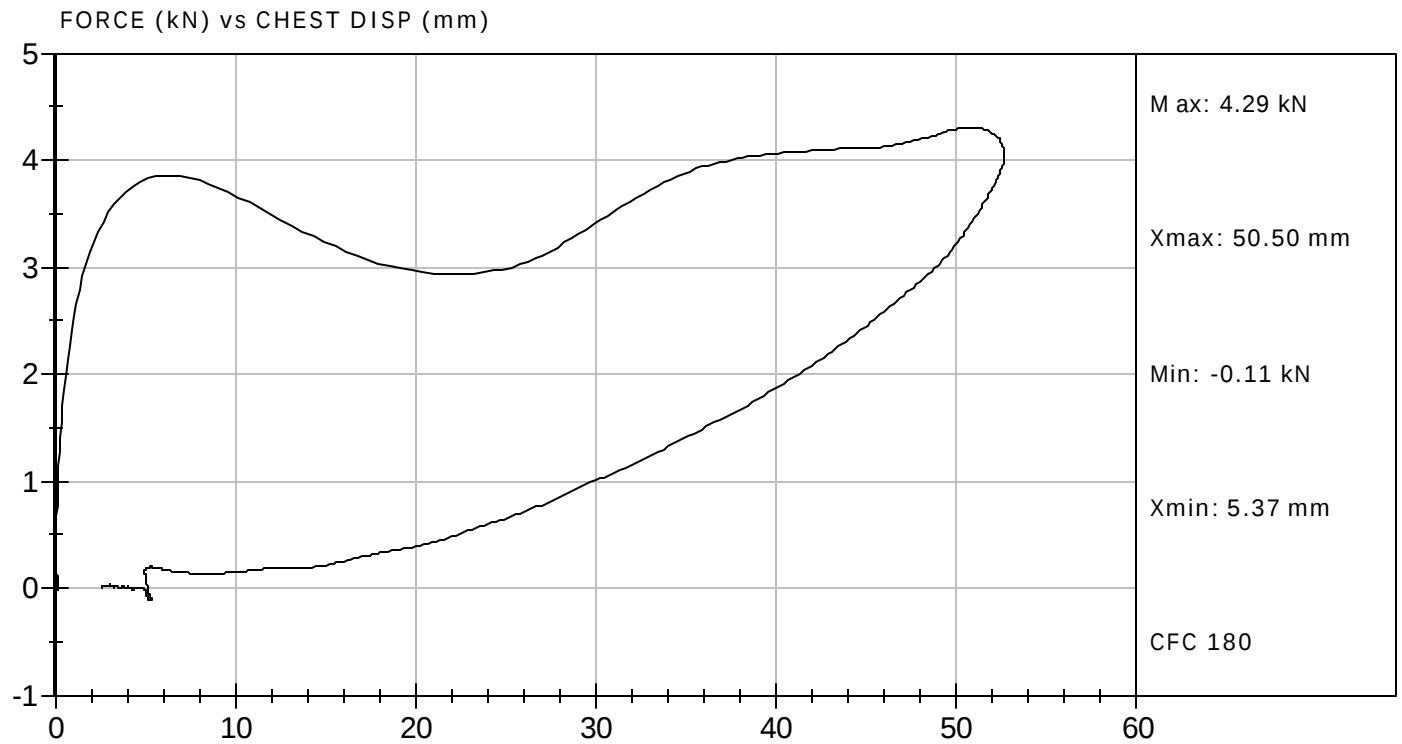


Test Desc: Thorax Impact

Componet ID: D05364

Test Date: 02/14/2005

Velocity: 22.28 ft/s, 6.79 m/s



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number 505

Test Date 2/15/05

Technician Joe Fleck

☐ Pretest calibration

☒ Post test calibration verification

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

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

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).

☐ with legs below the femurs.

☒ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.9

Record the maximum humidity 29%

Record the minimum humidity 27%

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

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

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

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

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

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

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

Record reference plane angle (max. allowed 20°) 10°

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

- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:

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

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 20^\circ$	10°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$320 \text{ N} \leq \text{force} \leq 390 \text{ N}$	390 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^\circ$	13°

Joe Fleck
Signature

2/15/05
Date

MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D05367

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Initial Angle	deg	0 to 20	10	Pass
Return Angle	deg	+/- 8	13	Pass
Force at 45 deg	N	320 to 390	390	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
Overall Result			Pass	



Laboratory Technician

02/15/2005

Test Date



Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 2/14/05

Technician Jim Carney

 Pretest calibration

X Post test calibration verification

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

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

X N/A, ONLY one knee impact test performed

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

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

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. (572.136(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.4

Record the maximum humidity 29%

Record the minimum humidity 27%

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

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

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

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

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 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))

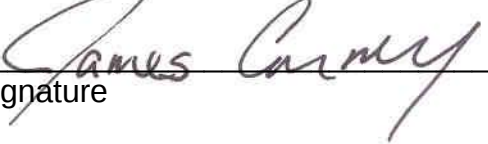
X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3720 N

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

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


Signature

2/14/05
Date

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

ATD Serial No: 505

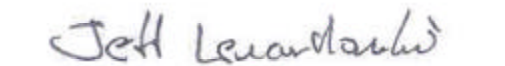
Test I.D: D05366

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Speed	m/sec	2.07 to 2.13	2.08	Pass
Maximum Force	kN	3.45 to 4.06	3.72	Pass
Overall Test Results				Pass


Laboratory Technician

02/14/2005

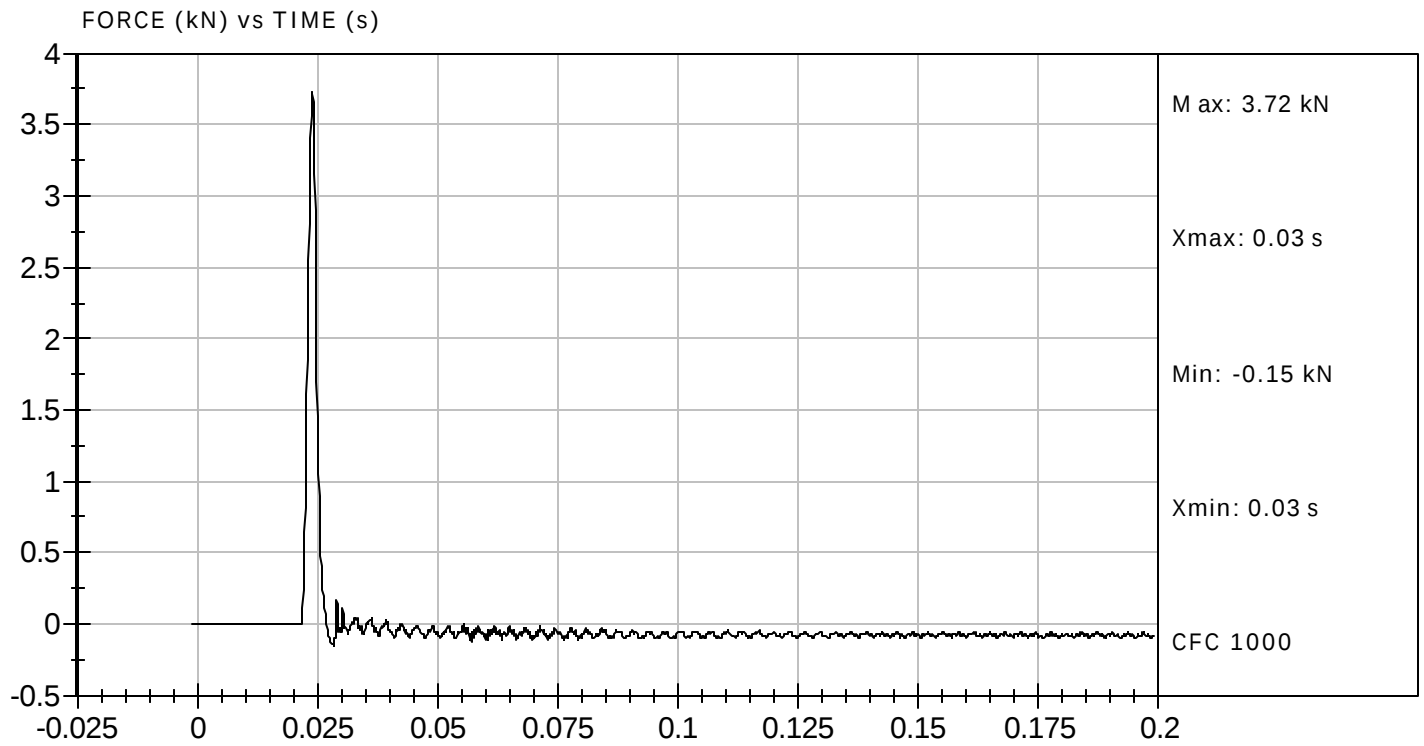
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D05366

Test Date: 02/14/2005
Velocity: 6.83 ft/s, 2.08 m/s



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number 505

Test Date 2/14/05

Technician Jim Carney

 Pretest calibration

X Post test calibration verification

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

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

X N/A, ONLY one knee impact test performed

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

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

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. (572.136(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.4

Record the maximum humidity 29 %

Record the minimum humidity 27 %

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

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

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

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

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 2.07 m/s and 2.13 m/s. (572.136(c)(5))

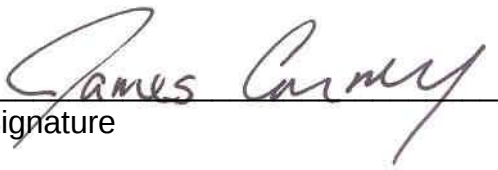
X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.09 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3620 N

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

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


Signature

2/14/05
Date

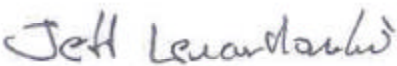
MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 505

Test I.D: D05365

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Speed	m/sec	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.62	Pass
Overall Test Results				Pass


Laboratory Technician

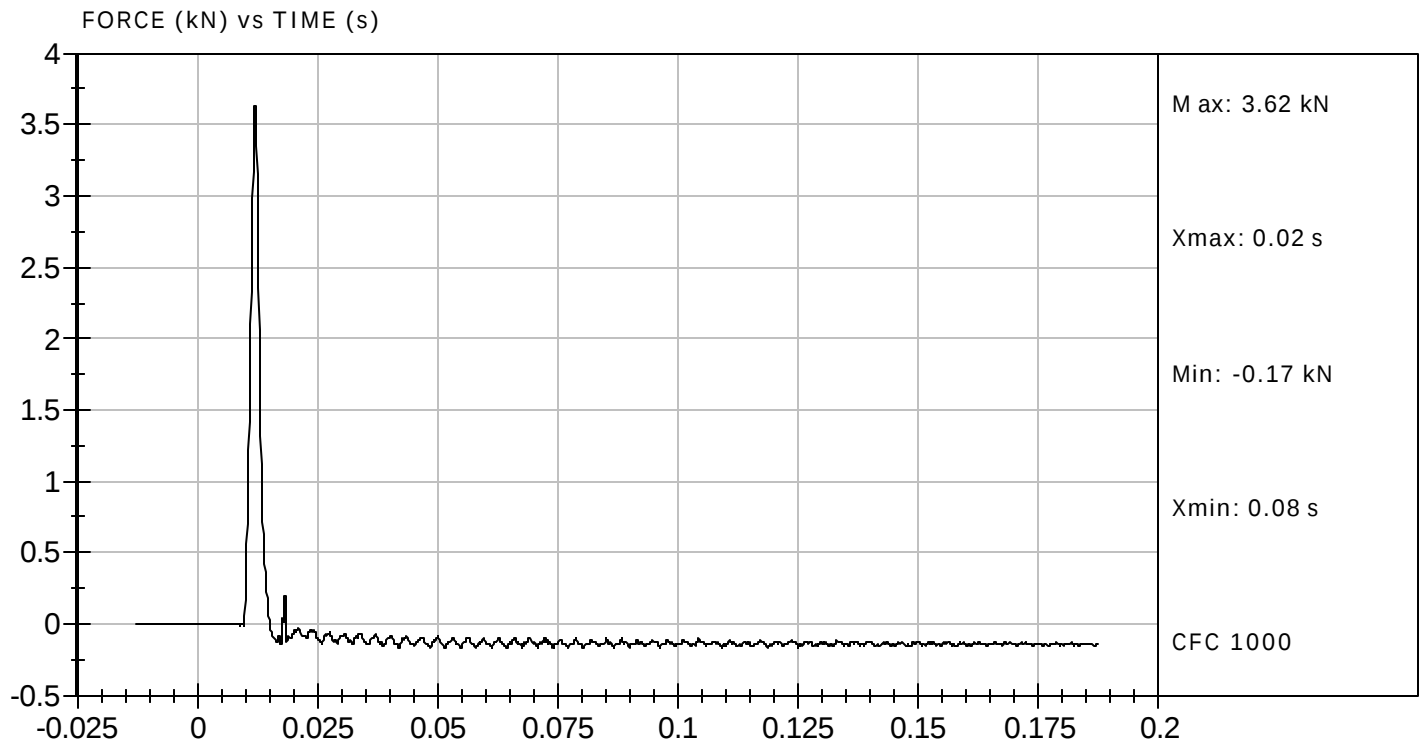

Approved By

02/14/2005
Test Date



Test Desc: Right Knee
Componet ID: D05365

Test Date: 02/14/2005
Velocity: 6.85 ft/s, 2.09 m/s



EXTERNAL DIMENSIONS

HYBRID III 5 th SN #505, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	778.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	450.3
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.8
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	76.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	128.3
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	248.7
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.2
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	278.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	187.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	541.9
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	361.7
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	402.4
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	436.8

HYBRID III 5 th SN #505, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	188.7
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	223.3
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	481.1
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.4
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.8
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	359.1
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	84.2
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	531.7
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	853.2
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	773.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	340.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 505

Test Date 2/10/05

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

2/11/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

2/11/05
Date

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #032, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	538.5-553.7	541.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	315.2
C	H-POINT HEIGHT	Reference	34.3-44.5	35.9
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	64.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	70.2
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	82.4
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	250.4
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder to the lowest part of the flesh on the elbow in line with the shoulder and elbow pivot bolts.	185.4-200.6	198.6
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	141.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300.0	285.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	230.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	252.9
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	225.5

HYBRID III 3 year SN #032, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	139.9
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	142.8
Q	STATURE	Lay the dummy out on a flat surface with the rear surfaces of the head, upper torso, buttocks and heels touching the surface and with the bottom of the feet perpendicular to that surface. Measure the distance from the bottom of the feet to the top of the head.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	255.2
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.7
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	173.8
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	509.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	531.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	541.2
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032

Test Date 12/29/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259), accelerometer mounting block (SA572-S80) structural replacement of ½ mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one ½ 20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))

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

☒ 5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6 °C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.142(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.4

Record the maximum humidity 25%

Record the minimum humidity 18%

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

Record findings and actions: No Damage.

☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.142(c)(3))

Record the actual distance 14.8"

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

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

Record the right side distance 463mm

Record the left side distance 462mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))

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

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

Record thickness 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	271
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	7

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

Joe Flack
Signature

12/29/04
Date

Hybrid III Calibration Data Sheet

3 Year Old

Head Drop Calibration

ATD Serial No: 032

Test I.D: D042991

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	19	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	270.6	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	7.3	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

12/29/2004
Test Date


Approved By



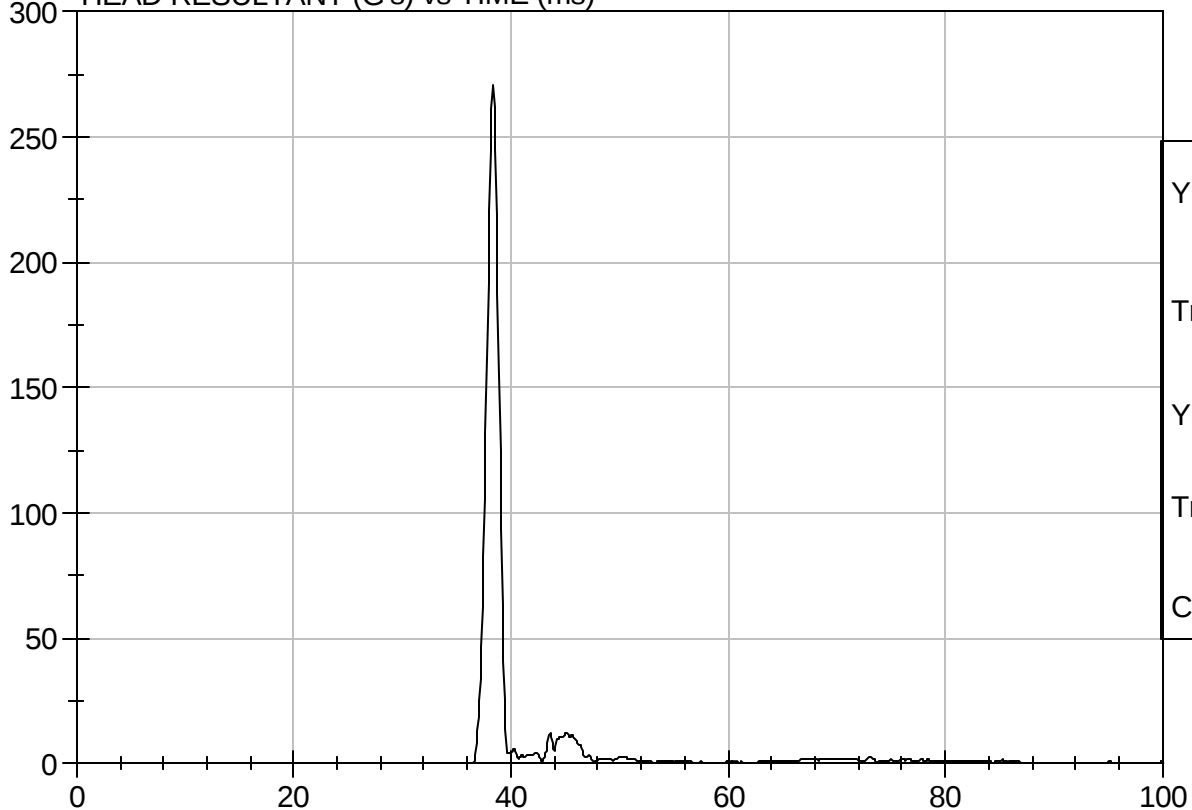
Test Description: Head Drop

Test Date: 12/29/2004

Component: D042991

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 270.6 G

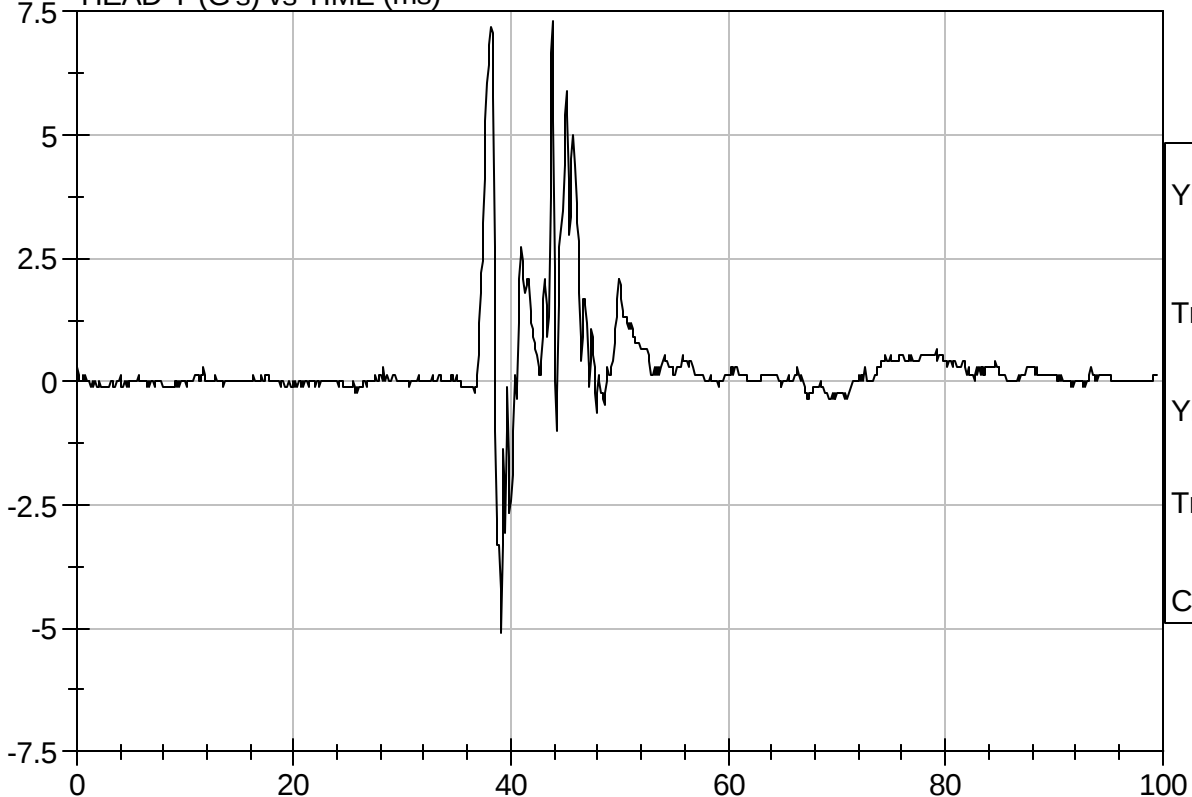
Tmax: 38.4 ms

YMin: 0.0 G

Tmin: 18.6 ms

CFC 1000

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



YMax: 7.3 G

Tmax: 43.8 ms

YMin: -5.1 G

Tmin: 39.1 ms

CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032

Test Date 12/29/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.146(p))

☒ N/A, this is the first neck test performed

☒ 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.4

Record the maximum humidity 25%

Record the minimum humidity 18%

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

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 8D.

☒ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9D for the flexion test. (572.143(c)(3))

☒ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(1)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.4 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.4 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.6 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>45</u> Nm @ <u>79</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	72 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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

Joe Fleck
Signature

12/29/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 032

Test I.D: D042992

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	19	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.5	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.4	Pass
	15 msec	m/s	3.0 - 4.0	3.4	Pass
	20 msec	m/s	4.0 - 5.1	4.6	Pass
D Plane Rotation		deg	70 - 82	79.1	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	45.1	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.9	Pass
Overall Test Results				Pass	


 Laboratory Technician

12/29/2004
 Test Date


 Approved By

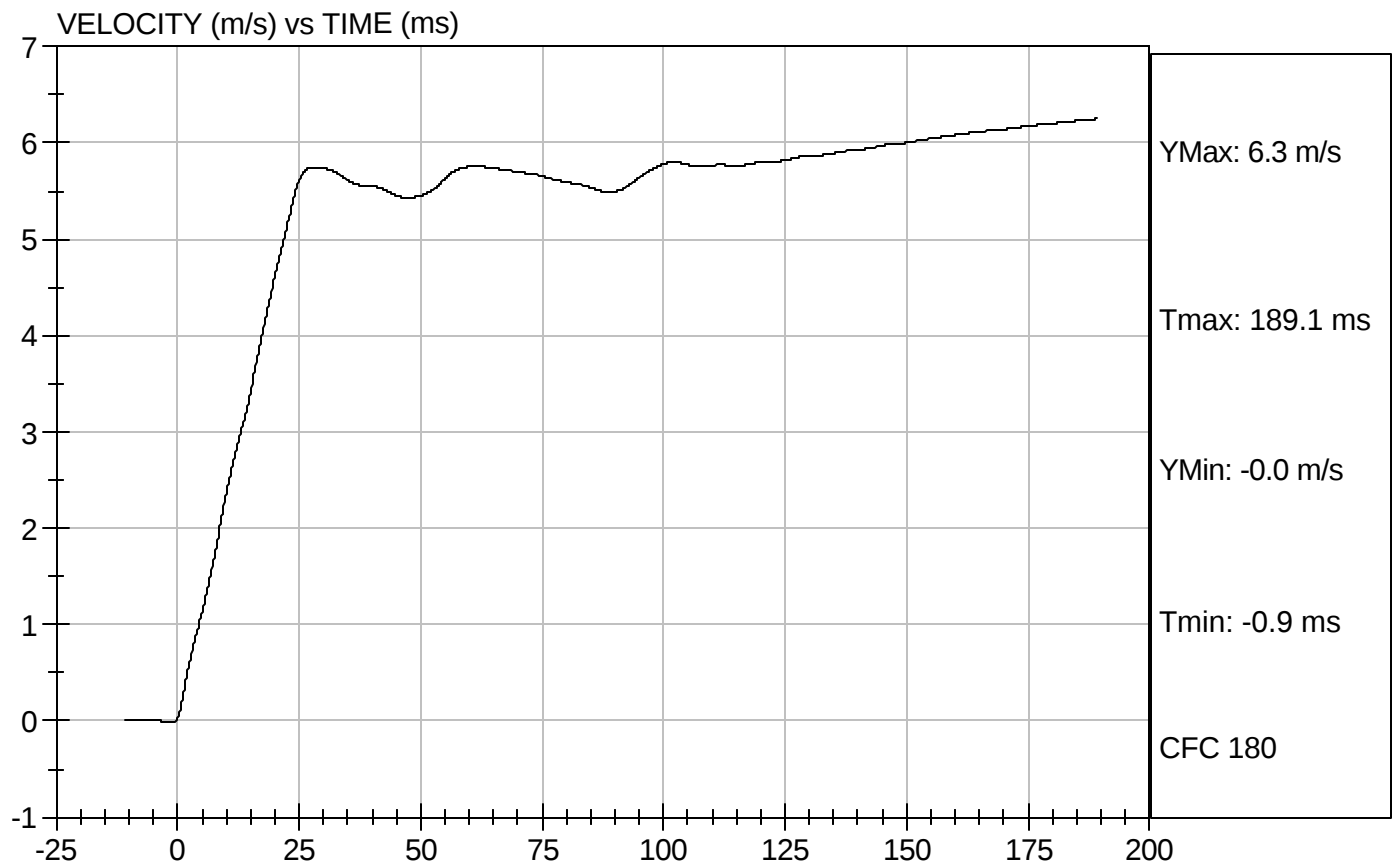


Test Description: Neck Flexion

Test Date: 12/29/2004

Component: D042992

Speed: 17.9 ft/sec, 5.46 m/sec





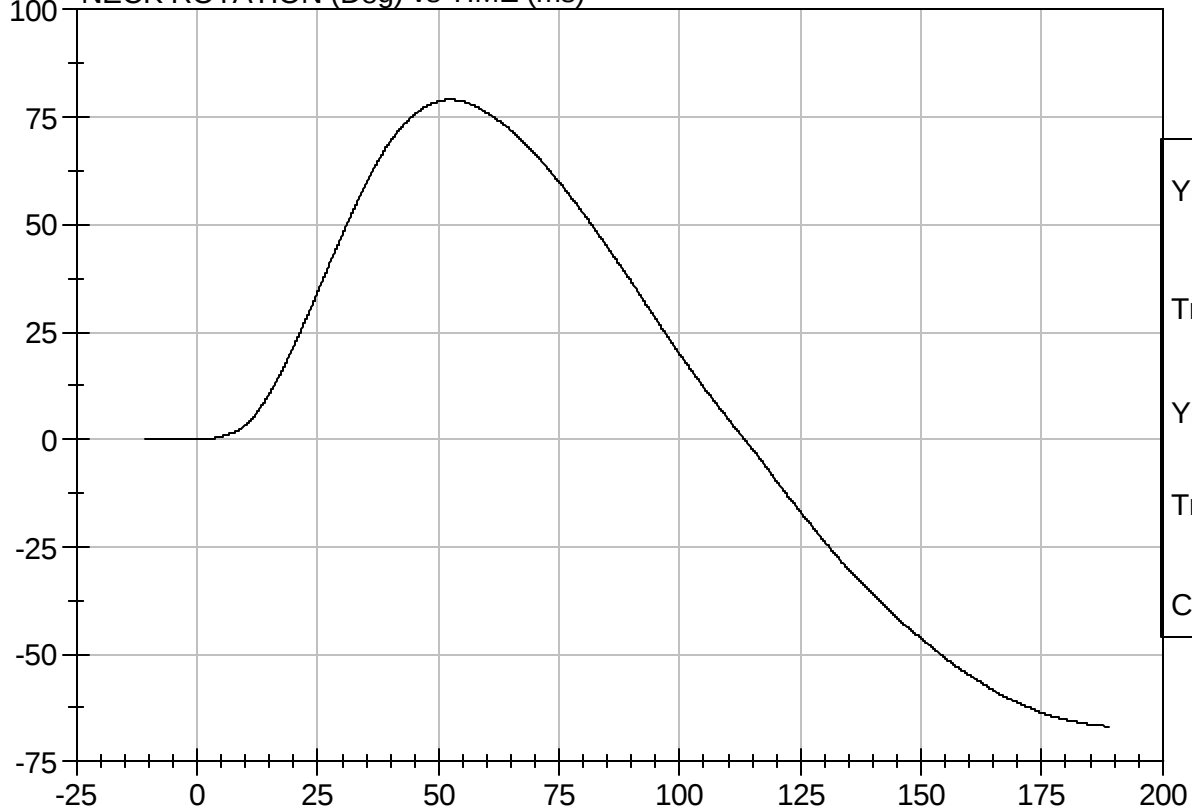
Test Description: Neck Flexion

Test Date: 12/29/2004

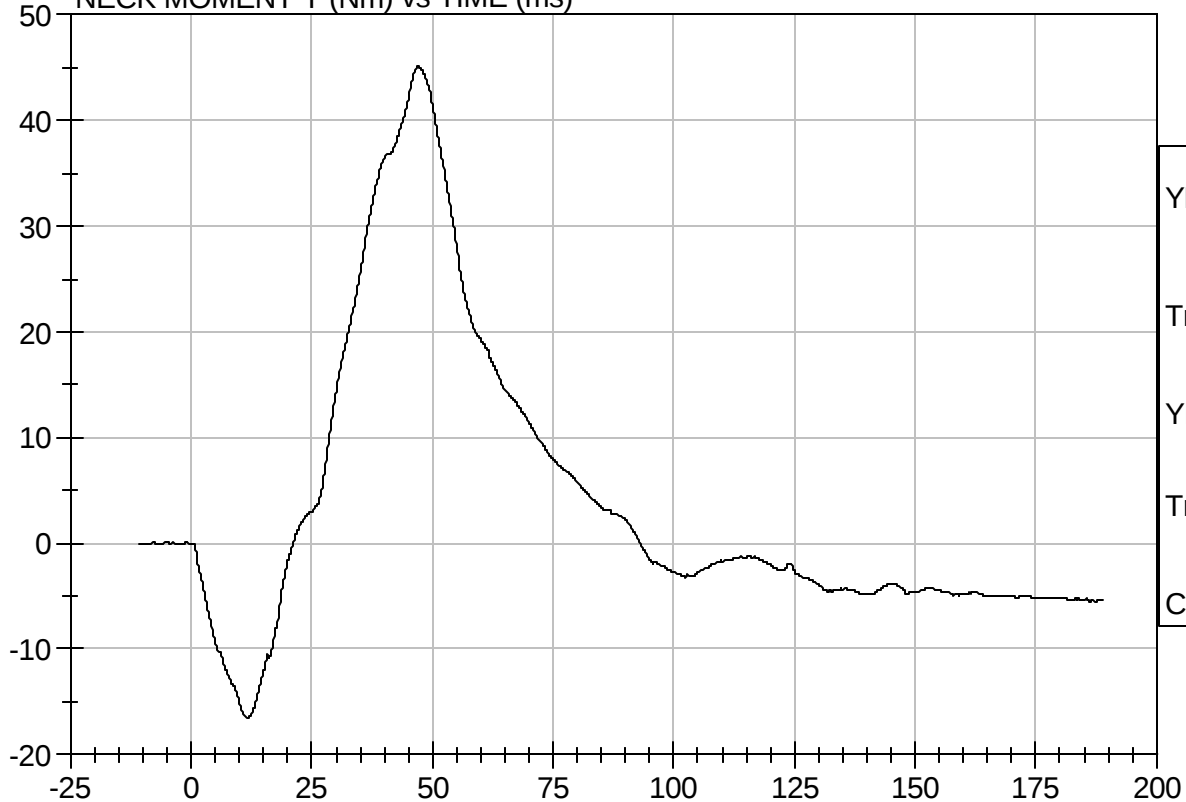
Component: D042992

Speed: 17.9 ft/s, 5.46 m/s

NECK ROTATION (Deg) vs TIME (ms)



NECK MOMENT Y (Nm) vs TIME (ms)



DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032

Test Date 12/29/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.146(p))

☒ N/A, this is the first neck test performed

☒ 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.4

Record the maximum humidity 25%

Record the minimum humidity 18%

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

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 8D.

☒ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 10D for the extension test. (572.143(c)(3))

☒ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(2)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.72 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.2 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.1 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	2.9 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-45.0</u> Nm @ <u>86</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	69 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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

Joe Fleck
Signature

12/29/04
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 032

Test I.D: D042993

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	19	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.72	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.2	Pass
	10 msec	m/s	1.9 - 2.5	2.1	Pass
	14 msec	m/s	2.8 - 3.5	2.9	Pass
D Plane Rotation		deg	83 - 93	86.2	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-45.0	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	69.2	Pass
Overall Test Results					Pass


 Laboratory Technician

12/29/2004
 Test Date


 Approved By

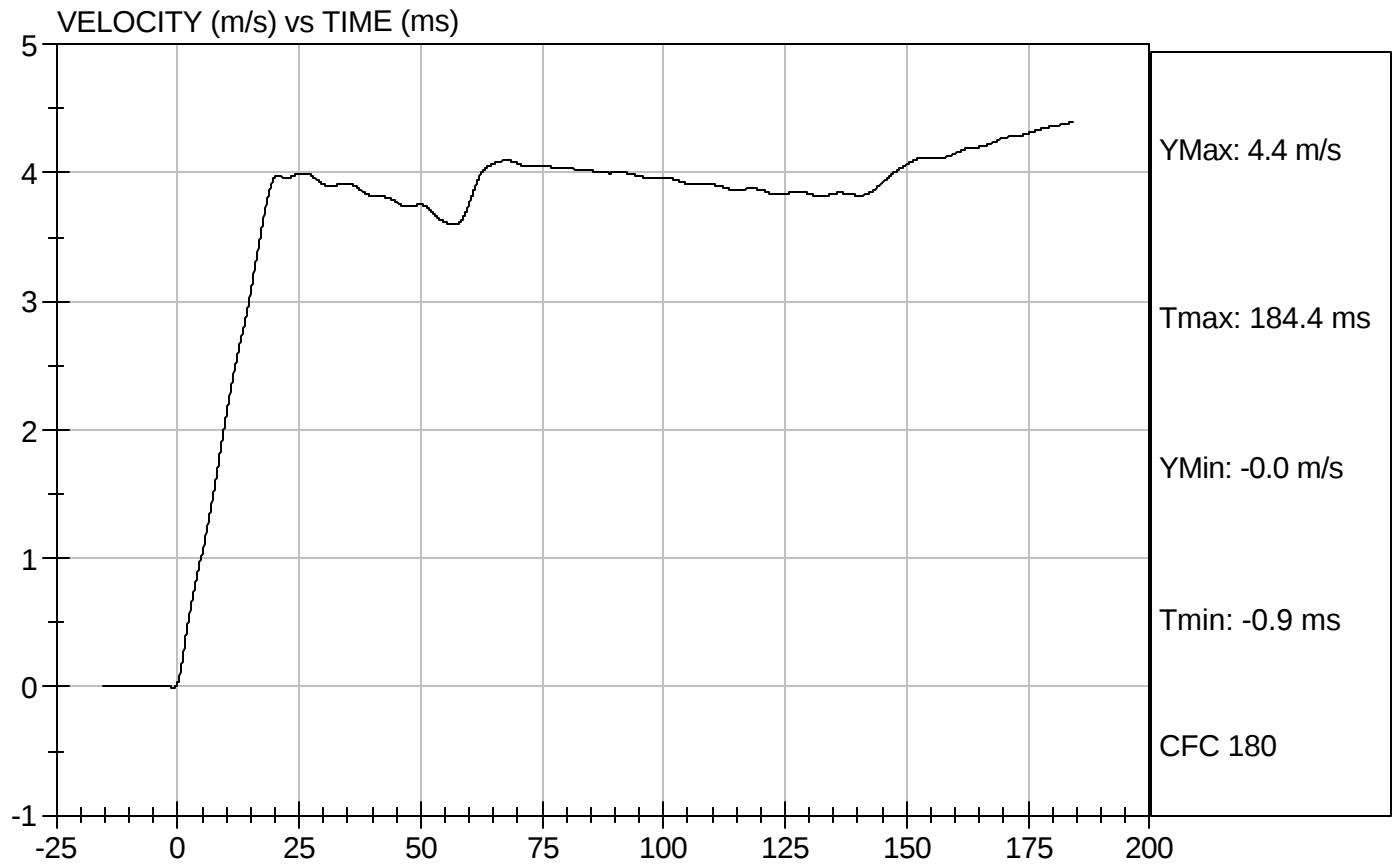


Test Description: Neck Extension

Test Date: 12/29/2004

Component: D042993

Speed: 12.22 ft/sec, 3.72 m/sec





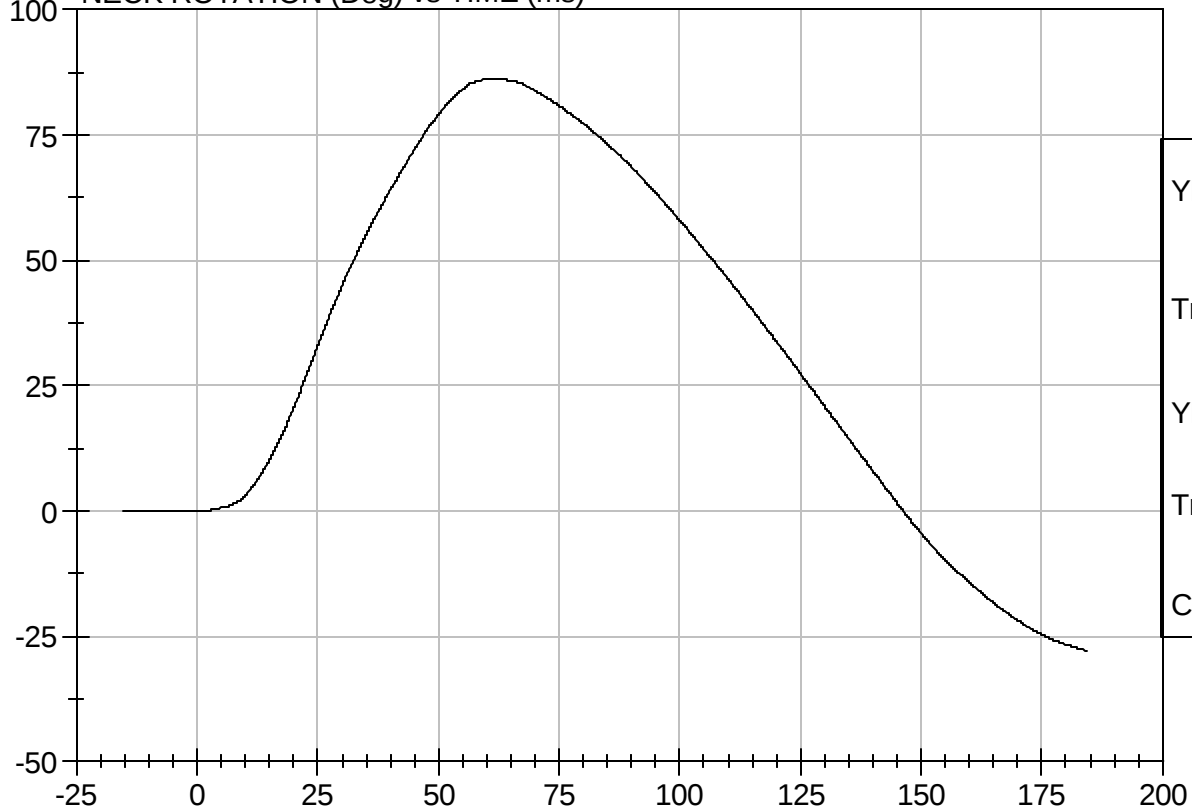
Test Description: Neck Extension

Test Date: 12/29/2004

Component: D042993

Speed: 12.22 ft/s, 3.72 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 86.2 Deg

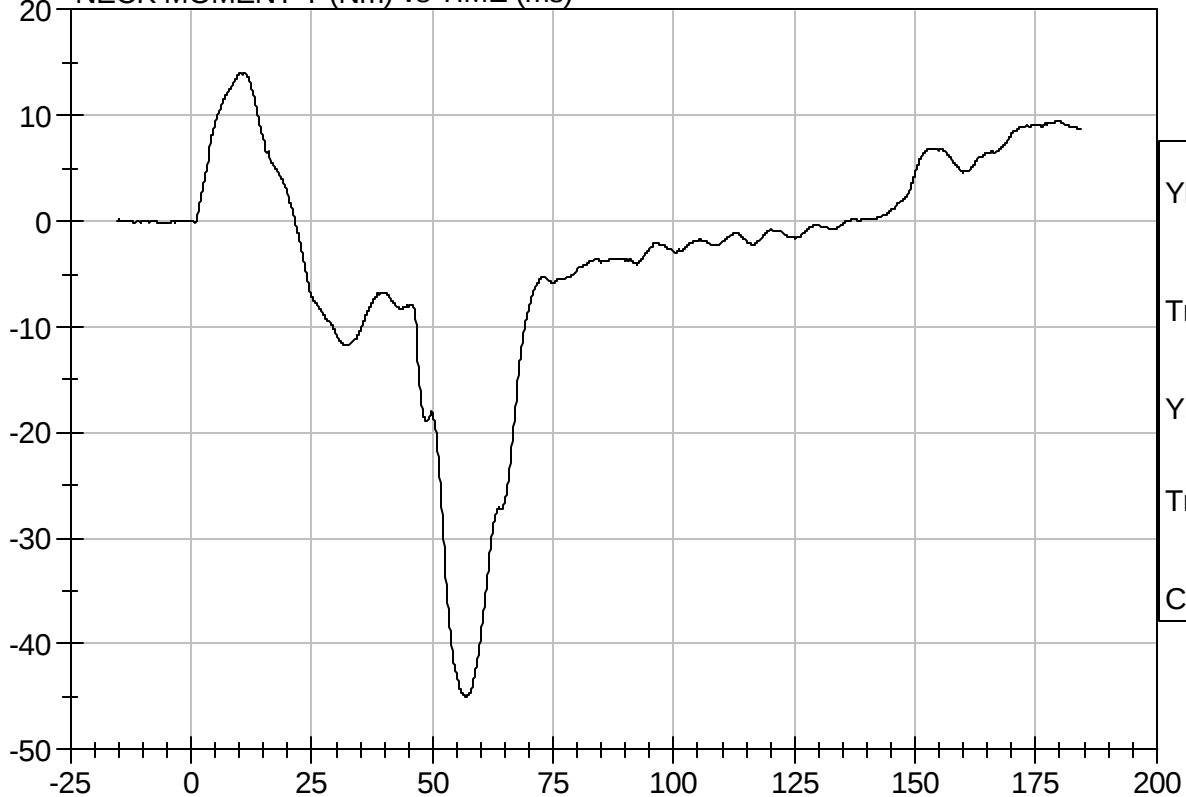
Tmax: 61.5 ms

YMin: -28.0 Deg

Tmin: 184.4 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 14.0 Nm

Tmax: 10.2 ms

YMin: -45.0 Nm

Tmin: 56.8 ms

CFC 600

DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 12/29/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (210-0000) is used (572.144(b)) and is dressed in cotton-polyester-based tight-fitting long sleeved shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.144(c)(1))

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.144(c)(2))

Record the maximum temperature 22.1

Record the minimum temperature 20.4

Record the maximum humidity 25%

Record the minimum humidity 18%

☒ 5. Remove the arms.

☒ 6. Unzip the 3 zippers and fold down the chest jacket. Visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____

☐ - The following repairs or replacement was performed. Record _____

☒ 7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))

☒ 8. Level the middle rib both longitudinally and laterally $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	35mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	740 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	800 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

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

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

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

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

Joe Fleck
Signature

12/29/04
Date

Hybrid III Calibration Data Sheet

3 Year Old

Thorax Impact Test

ATD Serial No: 032

Test I.D: D042994

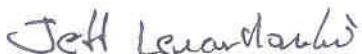
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	5.9 to 6.1	6.04	Pass
Peak Deflection	mm	32 - 38	35	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.74	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.80	Pass
Overall Test Results				Pass



Laboratory Technician

12/29/2004

Test Date



Approved By

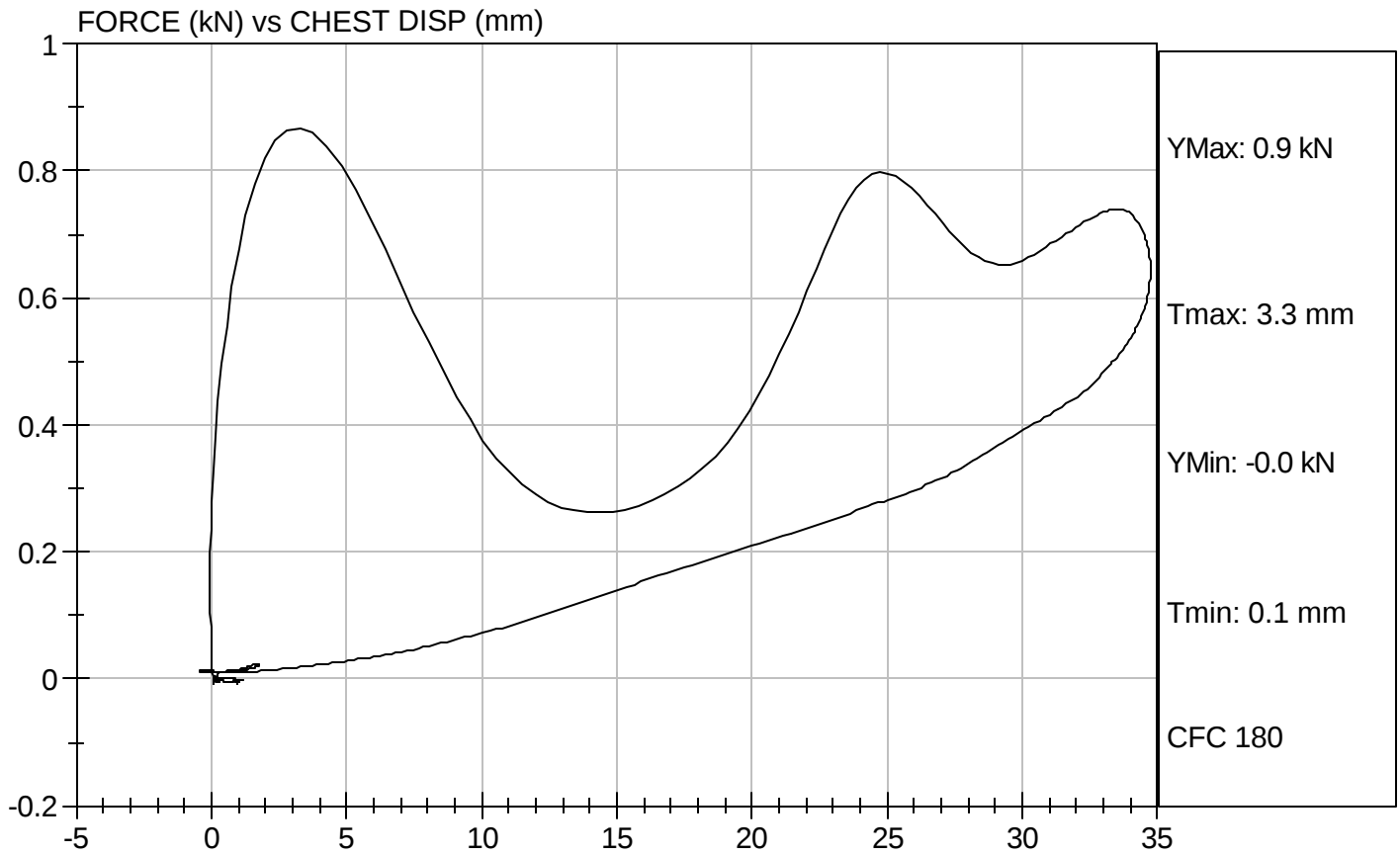


Test Description: Thorax Impact

Test Date: 12/29/2004

Component: D042994

Speed: 19.8 ft/sec, 6.04 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 12/29/04

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).

☒ with legs below the femurs.

☐ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.4

Record the maximum humidity 25%

Record the minimum humidity 18%

☒ 5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))

☒ 5. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within $\pm 1^\circ$ and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))

☒ 6. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))

☒ 7. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))

☒ 8. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and $30^\circ \pm 2^\circ$. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))

☒ 9. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0° . Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))

☒ 10. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))

- X 11. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
Record reference plane angle (max. allowed 15°) 5°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 17. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 15^\circ$	5°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	179 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	10°

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

Joe Fleck
Signature

12/29/04
Date

Hybrid III Calibration Data Sheet

3 Year Old

Torso Lumbar Flexion

ATD Serial No: 032

Test I.D: D042997

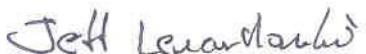
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Force At 45 deg.	N	130 - 180	179	Pass
Initial Angle	deg	0 - 15	5	Pass
Return Angle	deg	0 - 10	10	Pass
Overall Test Results				Pass



Laboratory Technician

12/29/2004

Test Date



Approved By

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032

Test Date 02/04/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))

X N/A, ONLY one head drop performed

X 2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259), accelerometer mounting block (SA572-S80) structural replacement of ½ mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one ½ 20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))

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

X 5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.142(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.142(c)(3))

Record the actual distance 14.8"

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

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

Record the right side distance 466mm

Record the left side distance 466mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))

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

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

Record thickness 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	258
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 $\leq 15 \text{ g}$	5

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


Signature

02/04/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 032

Test I.D: D05281

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	20	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	258.1	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/04/2005

Test Date



Approved By



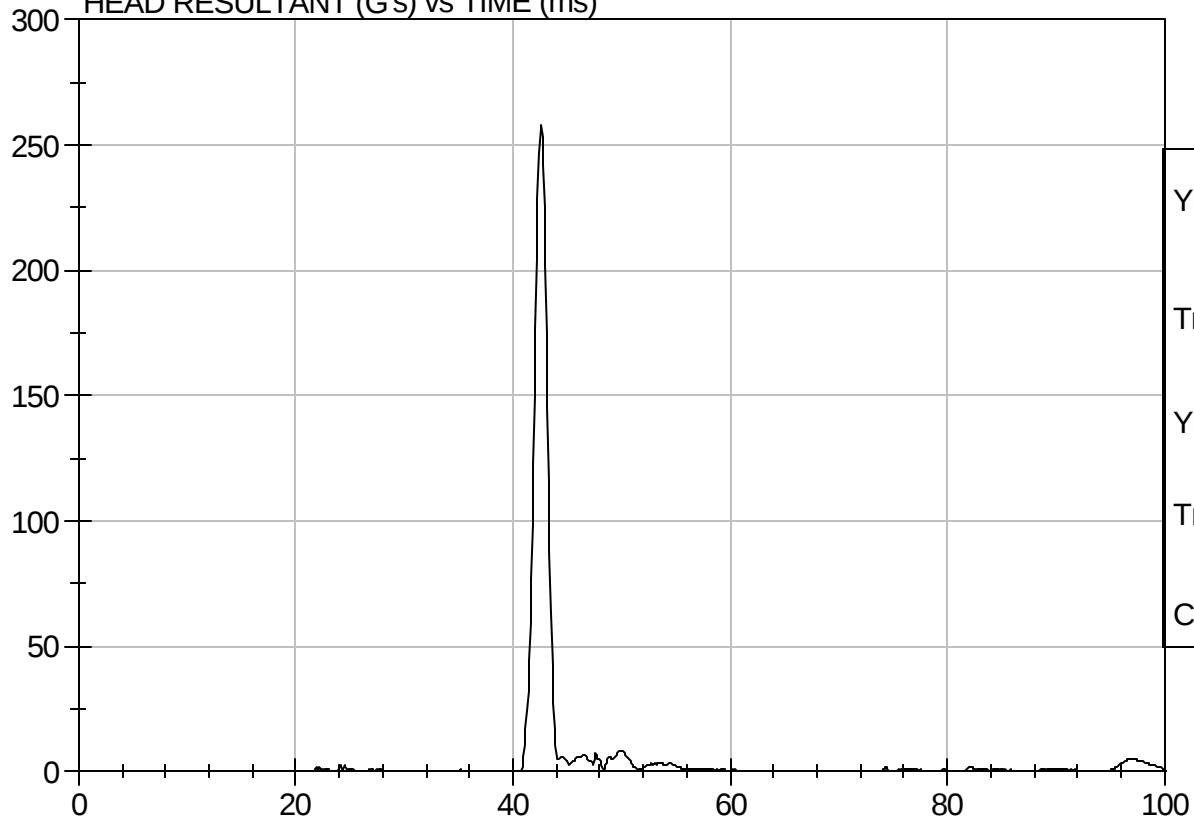
Test Description: Head Drop

Test Date: 02/04/2005

Component: D05281

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 258.1 G

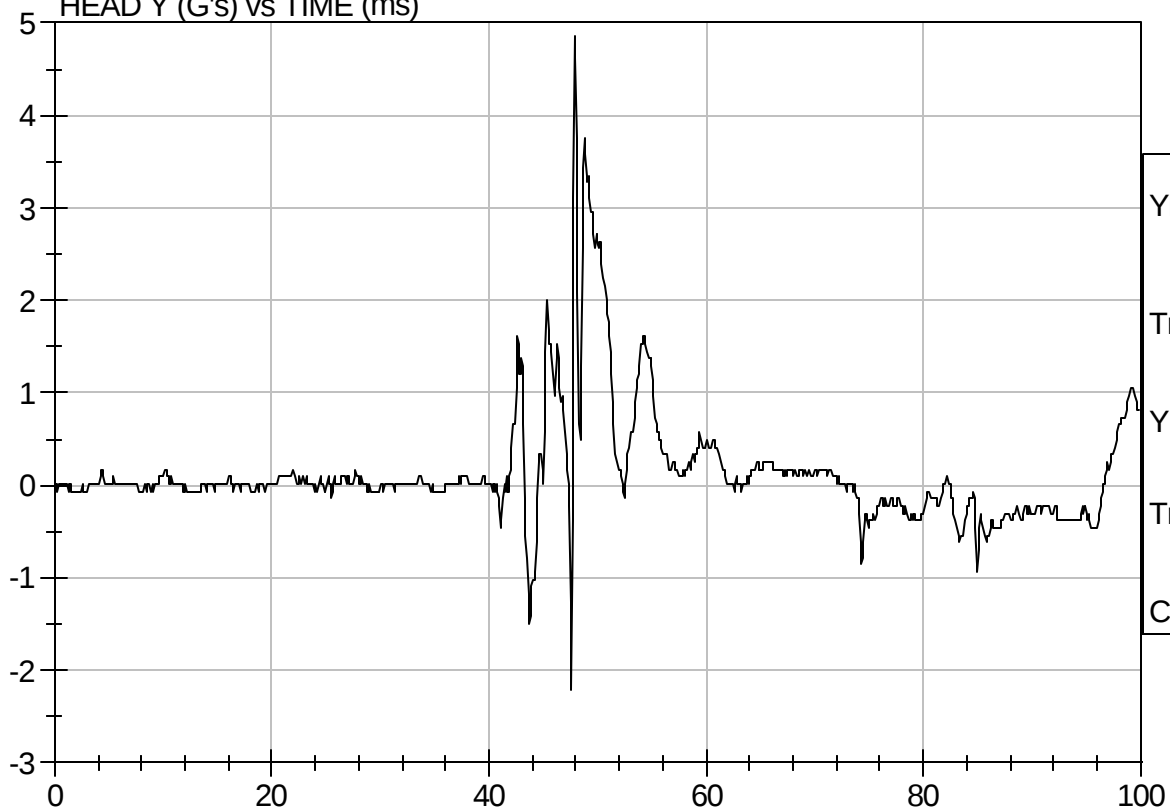
Tmax: 42.6 ms

YMin: 0.1 G

Tmin: 0.0 ms

CFC 1000

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



YMax: 4.9 G

Tmax: 47.9 ms

YMin: -2.2 G

Tmin: 47.6 ms

CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032

Test Date 02/04/05

Technician David Wilcox

☐ Pretest calibration

☒ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.146(p))

☒ N/A, this is the first neck test performed

☒ 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 8D.

☒ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9D for the flexion test. (572.143(c)(3))

☒ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(1)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.2 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.2 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.3 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>43</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	73 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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


Signature

02/04/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Neck Flexion Test

ATD Serial No: 032

Test I.D: D05282

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.51	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.2	Pass
	15 msec	m/s	3.0 - 4.0	3.2	Pass
	20 msec	m/s	4.0 - 5.1	4.3	Pass
D Plane Rotation		deg	70 - 82	77.7	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	43.2	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	72.9	Pass
Overall Test Results					Pass



Laboratory Technician

02/04/2005

Test Date



Approved By

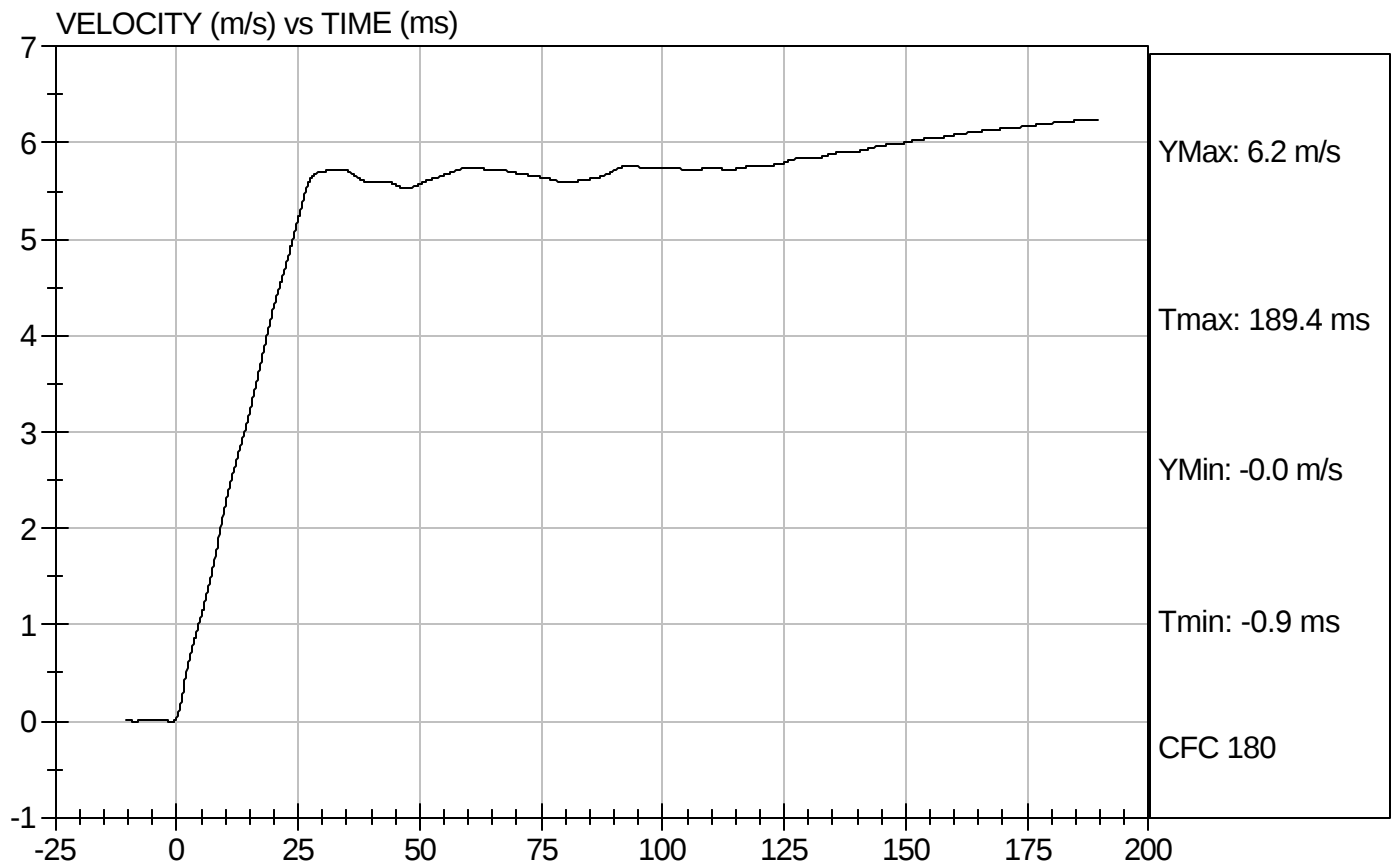


Test Description: Neck Flexion

Test Date: 02/04/2005

Component: D05282

Speed: 18.07 ft/sec, 5.51 m/sec





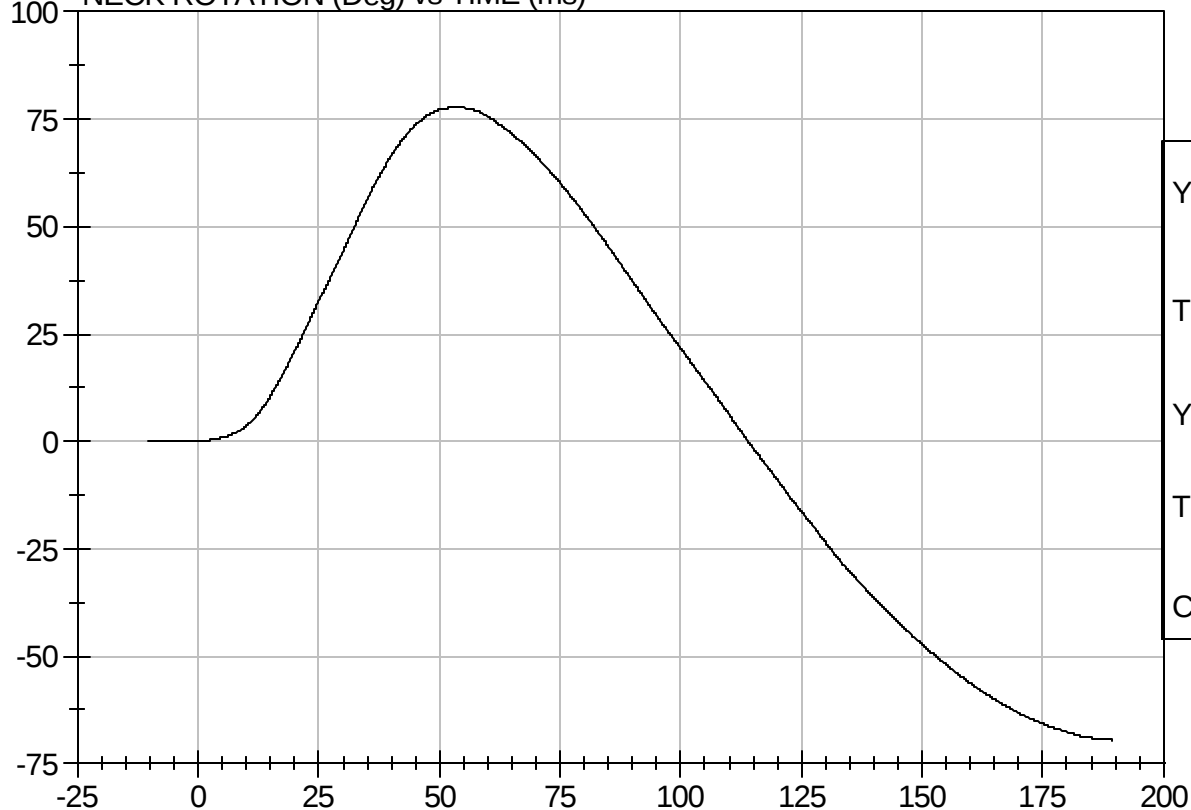
Test Description: Neck Flexion

Test Date: 02/04/2005

Component: D05282

Speed: 18.07 ft/s, 5.51 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 77.7 Deg

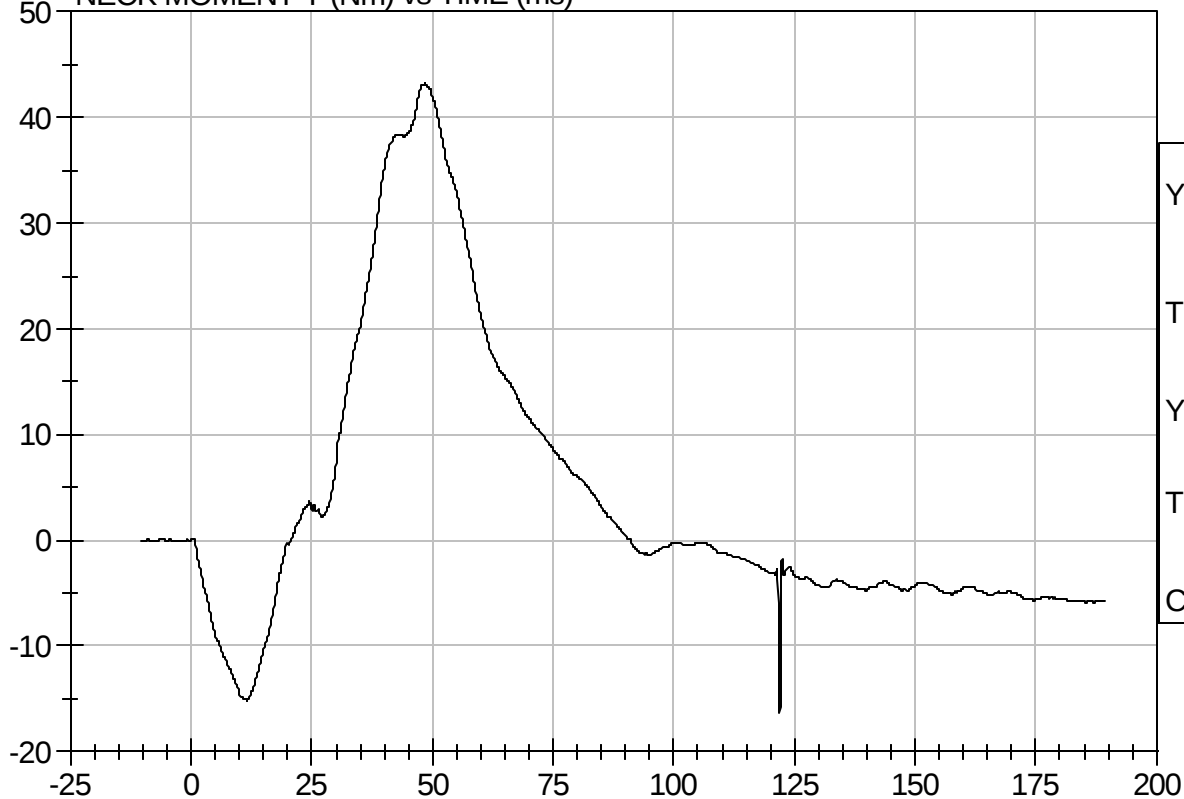
Tmax: 53.7 ms

YMin: -69.6 Deg

Tmin: 189.4 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 43.2 Nm

Tmax: 48.4 ms

YMin: -16.3 Nm

Tmin: 121.9 ms

CFC 600

DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032

Test Date 02/04/05

Technician David Wilcox

 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 neck test. (572.146(p))

 X N/A, this is the first neck test performed

X 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

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. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

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 low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 8. The test fixture pendulum conforms to the specifications in Figure 8D.

X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 10D for the extension test. (572.143(c)(3))

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 top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(2)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.73 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.1 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.0 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	2.8 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-45.2</u> Nm @ <u>84</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	69 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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


Signature

02/04/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

ATD Serial No: 032

Test I.D: D05283

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.73	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.1	Pass
	10 msec	m/s	1.9 - 2.5	2.0	Pass
	14 msec	m/s	2.8 - 3.5	2.8	Pass
D Plane Rotation		deg	83 - 93	84.3	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-45.2	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	68.8	Pass
Overall Test Results					Pass



Laboratory Technician

02/04/2005

Test Date



Approved By

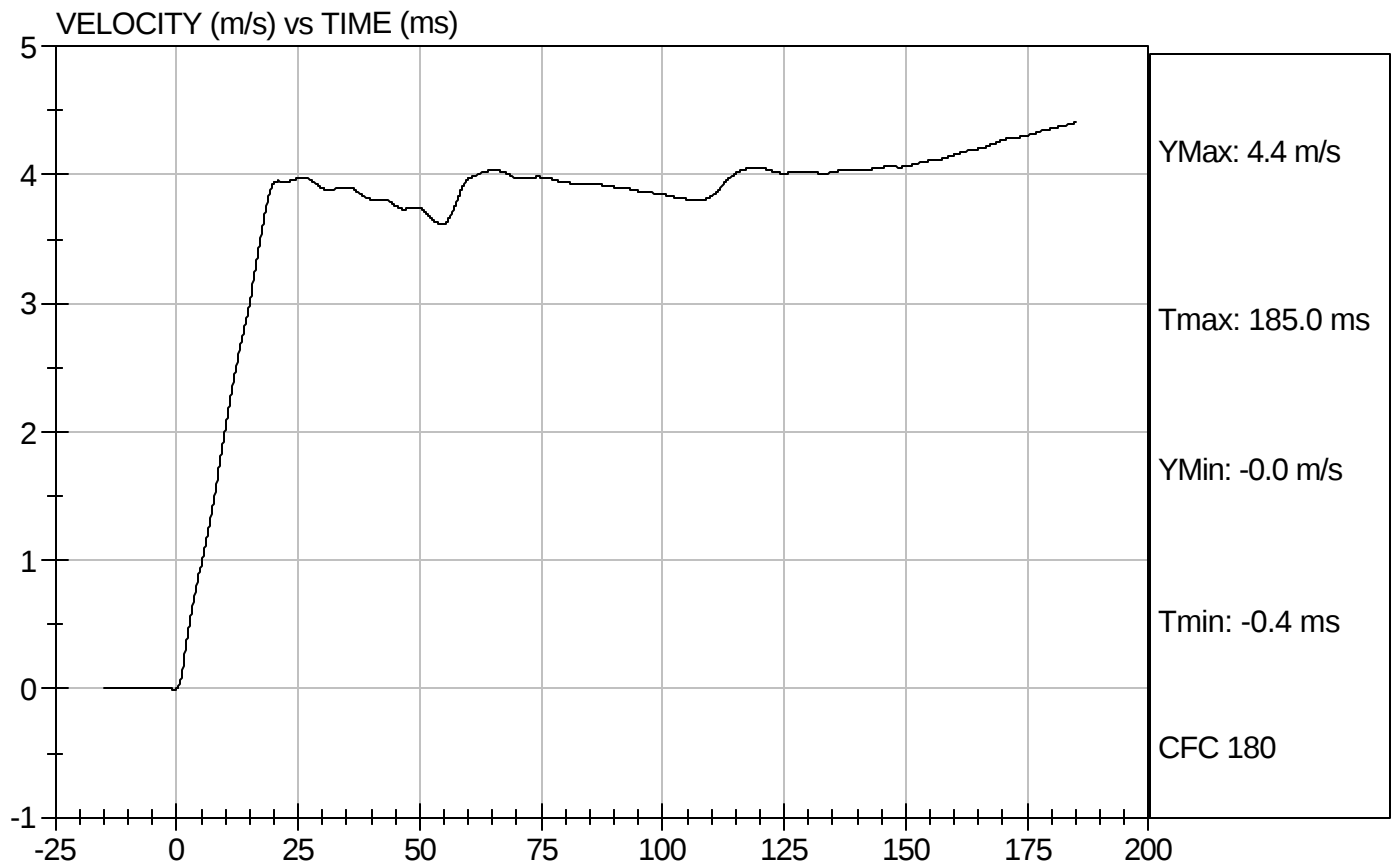


Test Description: Neck Extension

Test Date: 02/04/2005

Component: D05283

Speed: 12.25 ft/sec, 3.73 m/sec





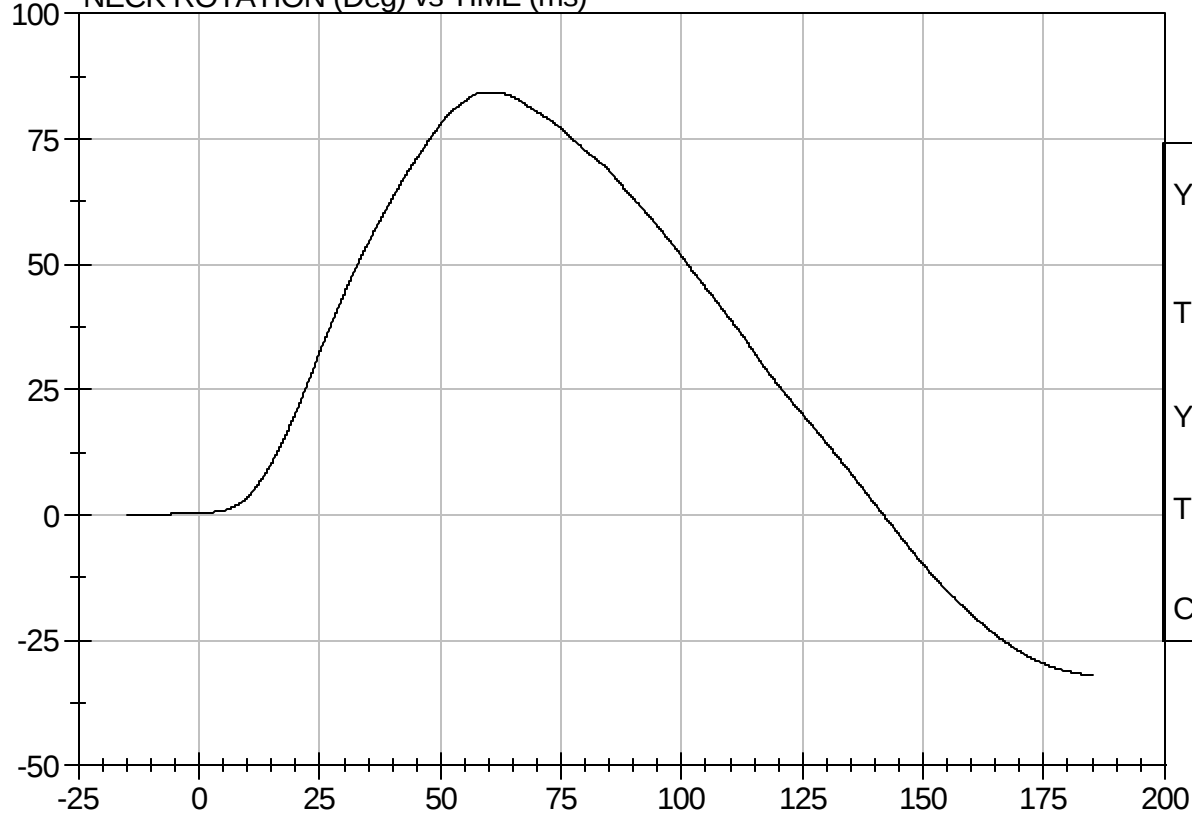
Test Description: Neck Extension

Test Date: 02/04/2005

Component: D05283

Speed: 12.25 ft/s, 3.73 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 84.3 Deg

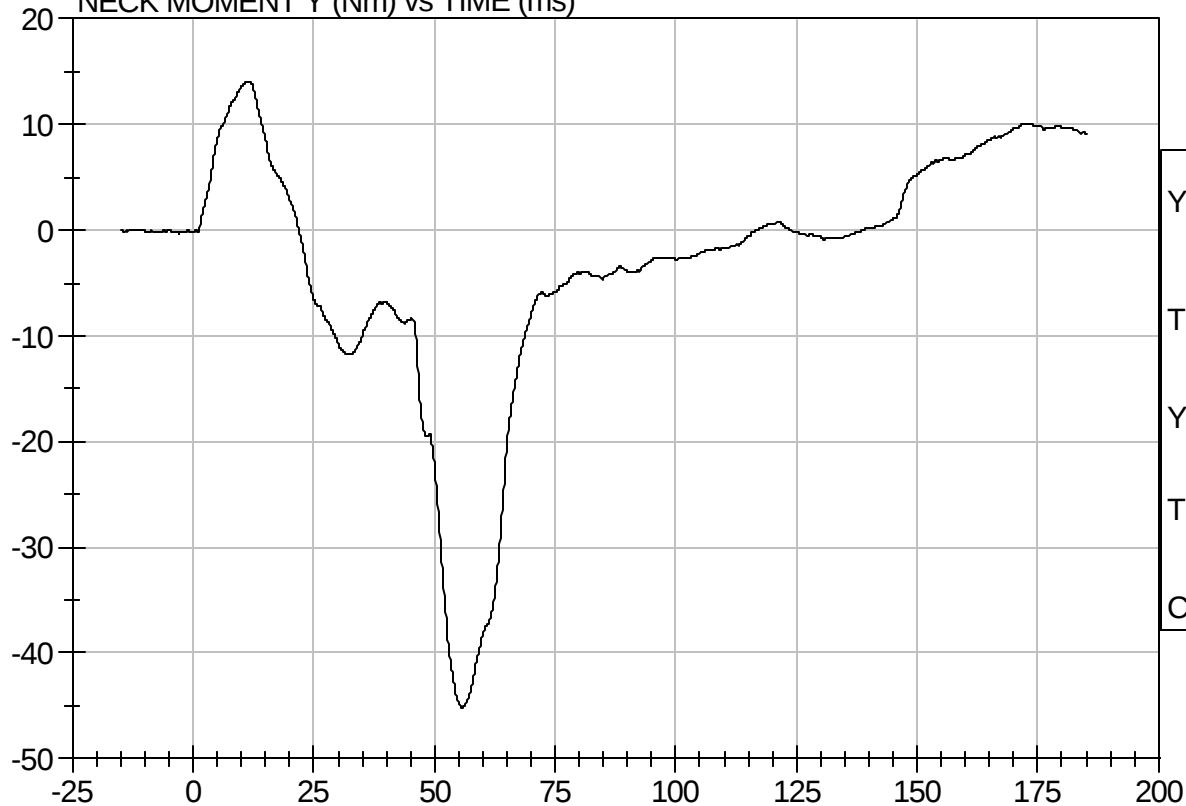
Tmax: 59.3 ms

YMin: -31.9 Deg

Tmin: 185.0 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 14.1 Nm

Tmax: 11.6 ms

YMin: -45.2 Nm

Tmin: 55.7 ms

CFC 600

DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 02/06/05

Technician Jim Carney

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11D.
- ☒ 3. The complete assembled dummy (210-0000) is used (572.144(b)) and is dressed in cotton-polyester-based tight-fitting long sleeved shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.144(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.144(c)(2))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.1</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>19%</u> |
- ☒ 5. Remove the arms.
- ☒ 6. Unzip the 3 zippers and fold down the chest jacket. Visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____
- ☐ - The following repairs or replacement was performed. Record _____
- ☒ 7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))
- ☒ 8. Level the middle rib both longitudinally and laterally $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

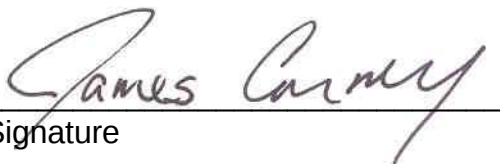
Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	35 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	700N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	740N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

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

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

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

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


Signature

02/06/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Thorax Impact Test

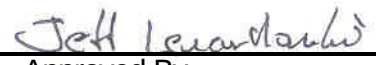
ATD Serial No: 032

Test I.D: D05284

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	5.9 to 6.1	6.00	Pass
Peak Deflection	mm	32 - 38	35	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.70	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.74	Pass
Overall Test Results				Pass


Laboratory Technician

02/06/2005
Test Date


Approved By

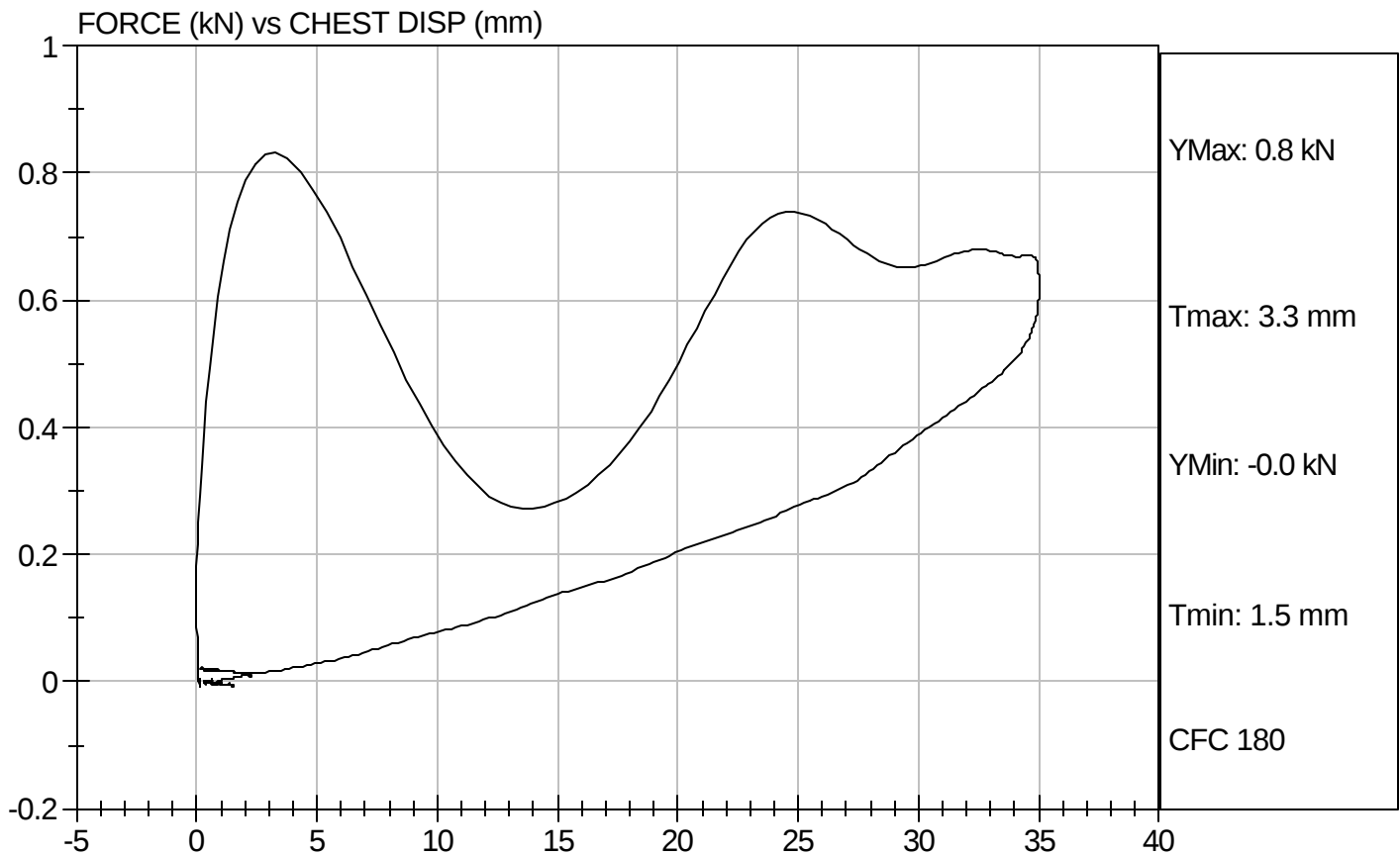


Test Description: Thorax Impact

Test Date: 02/06/2005

Component: D05284

Speed: 19.67 ft/sec, 6.00 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 02/04/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))

X N/A, ONLY one thorax impact test performed

X 2. The test fixture conforms to the specifications in Figure 13D.

X 3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).

X with legs below the femurs.

 without legs below the femurs.

X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

X 5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))

X 5. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within $\pm 1^\circ$ and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))

X 6. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))

X 7. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))

X 8. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and $30^\circ \pm 2^\circ$. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))

X 9. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0° . Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))

X 10. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))

- X 11. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
Record reference plane angle (max. allowed 15°) 6°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 17. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 15^\circ$	6°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	180 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	7°

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

Joe Fleck
Signature

02/04/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

ATD Serial No: 032

Test I.D: D05287

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Force At 45 deg.	N	130 - 180	180	Pass
Initial Angle	deg	0 - 15	6	Pass
Return Angle	deg	0 - 10	7	Pass
Overall Test Results				Pass



Laboratory Technician

02/04/2005

Test Date



Approved By

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #032, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	538.5-553.7	541.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	315.2
C	H-POINT HEIGHT	Reference	34.3-44.5	35.9
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	64.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	70.2
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	82.4
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	250.4
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder to the lowest part of the flesh on the elbow in line with the shoulder and elbow pivot bolts.	185.4-200.6	198.6
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	141.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300.0	285.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	230.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	252.9
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	225.5

HYBRID III 3 year SN #032, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	139.9
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	142.8
Q	STATURE	Lay the dummy out on a flat surface with the rear surfaces of the head, upper torso, buttocks and heels touching the surface and with the bottom of the feet perpendicular to that surface. Measure the distance from the bottom of the feet to the top of the head.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	255.2
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.7
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	173.8
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	509.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	531.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	541.2
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 032

Test Date 1/27/05

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

1/28/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

1/28/05
Date

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #032, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	538.5-553.7	541.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	315.2
C	H-POINT HEIGHT	Reference	34.3-44.5	35.9
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	64.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	70.2
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	82.4
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	250.4
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder to the lowest part of the flesh on the elbow in line with the shoulder and elbow pivot bolts.	185.4-200.6	198.6
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	141.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300.0	285.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	230.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	252.9
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	225.5

HYBRID III 3 year SN #032, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	139.9
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	142.8
Q	STATURE	Lay the dummy out on a flat surface with the rear surfaces of the head, upper torso, buttocks and heels touching the surface and with the bottom of the feet perpendicular to that surface. Measure the distance from the bottom of the feet to the top of the head.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	255.2
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.7
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	173.8
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	509.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	531.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	541.2
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032

Test Date 02/04/05

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259), accelerometer mounting block (SA572-S80) structural replacement of ½ mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one ½ 20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))

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

☒ 5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.142(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.142(c)(3))

Record the actual distance 14.8"

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

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

Record the right side distance 466mm

Record the left side distance 466mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))

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

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

Record thickness 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	258
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 $\leq 15 \text{ g}$	5

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


Signature

02/04/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Head Drop Calibration

ATD Serial No: 032

Test I.D: D05281

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	20	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	258.1	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.9	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
			Overall Test Results	Pass



Laboratory Technician

02/04/2005

Test Date



Approved By



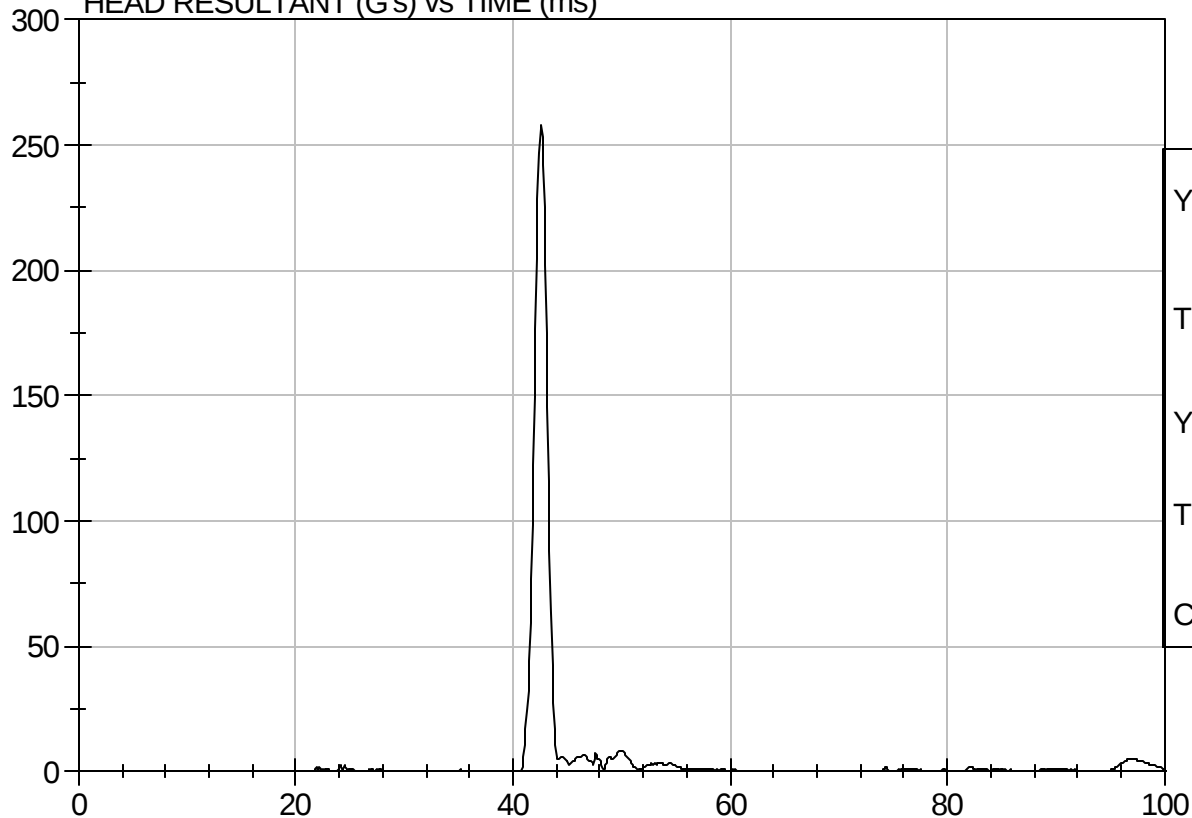
Test Description: Head Drop

Test Date: 02/04/2005

Component: D05281

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 258.1 G

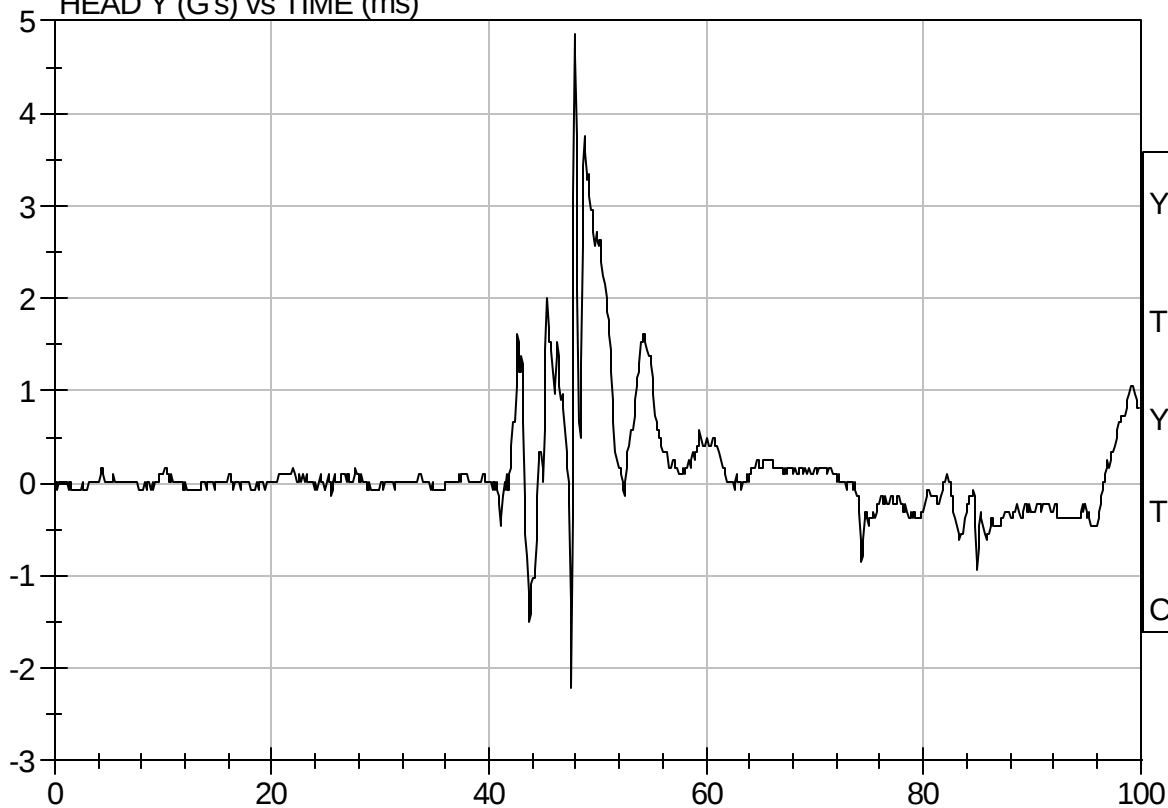
Tmax: 42.6 ms

YMin: 0.1 G

Tmin: 0.0 ms

CFC 1000

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



YMax: 4.9 G

Tmax: 47.9 ms

YMin: -2.2 G

Tmin: 47.6 ms

CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032

Test Date 02/04/05

Technician David Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.146(p))

☒ N/A, this is the first neck test performed

☒ 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 8D.

☒ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9D for the flexion test. (572.143(c)(3))

☒ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(1)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.2 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.2 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.3 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>43</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	73 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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


Signature

02/04/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Neck Flexion Test

ATD Serial No: 032

Test I.D: D05282

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.51	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.2	Pass
	15 msec	m/s	3.0 - 4.0	3.2	Pass
	20 msec	m/s	4.0 - 5.1	4.3	Pass
D Plane Rotation		deg	70 - 82	77.7	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	43.2	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	72.9	Pass
Overall Test Results					Pass



Laboratory Technician

02/04/2005

Test Date



Approved By

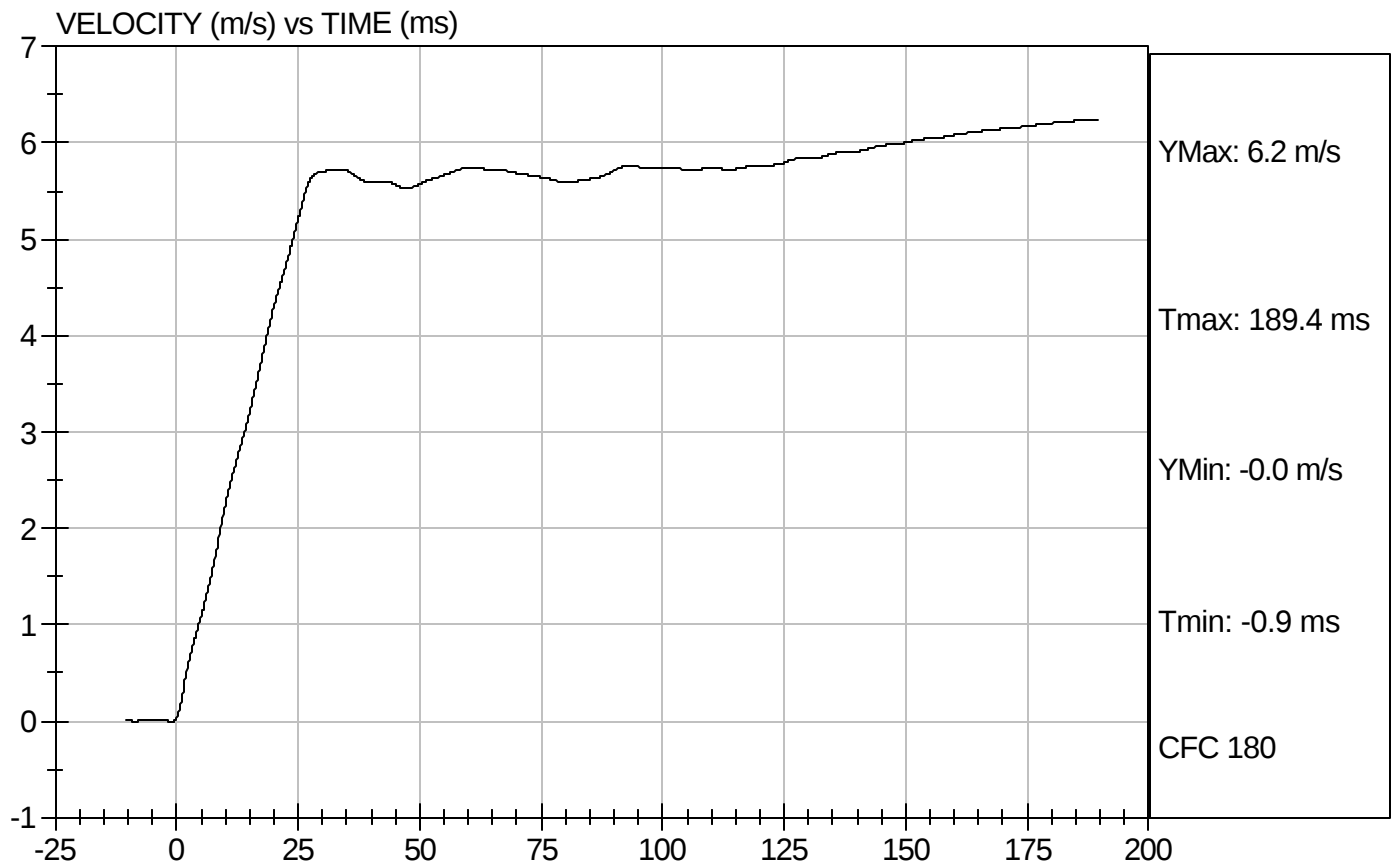


Test Description: Neck Flexion

Test Date: 02/04/2005

Component: D05282

Speed: 18.07 ft/sec, 5.51 m/sec





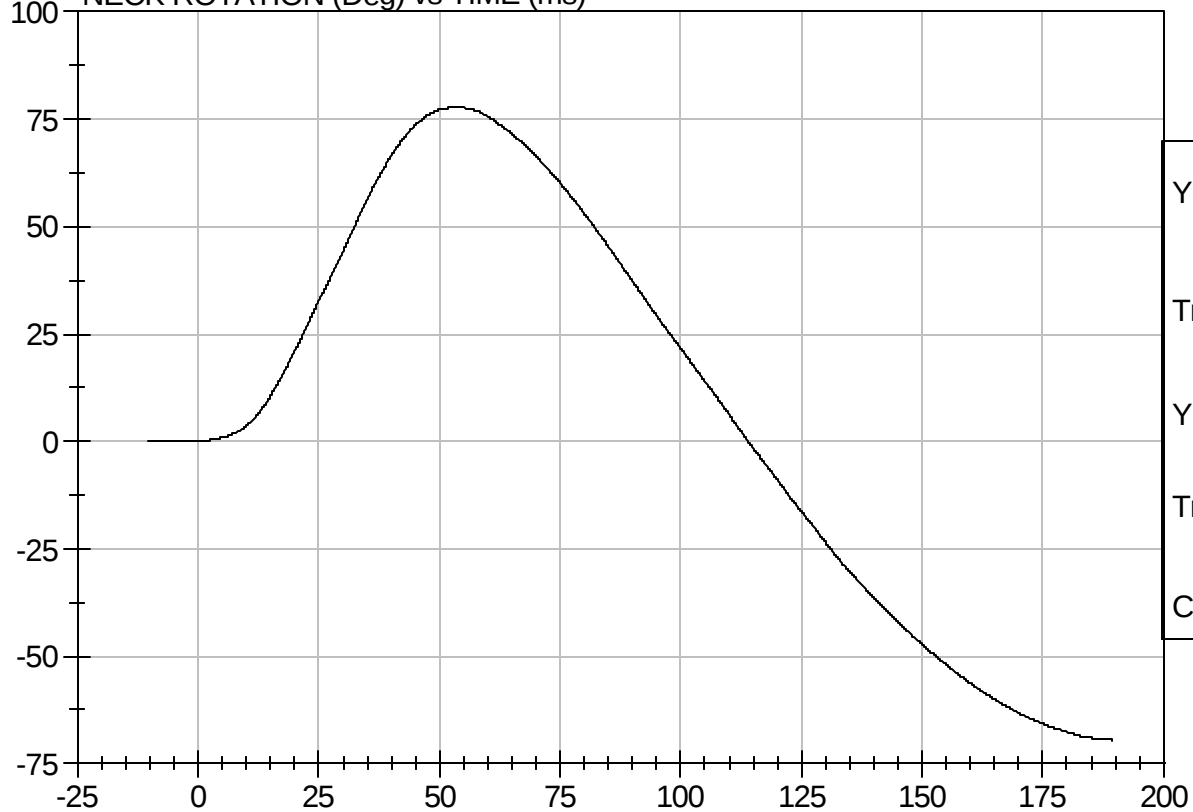
Test Description: Neck Flexion

Test Date: 02/04/2005

Component: D05282

Speed: 18.07 ft/s, 5.51 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 77.7 Deg

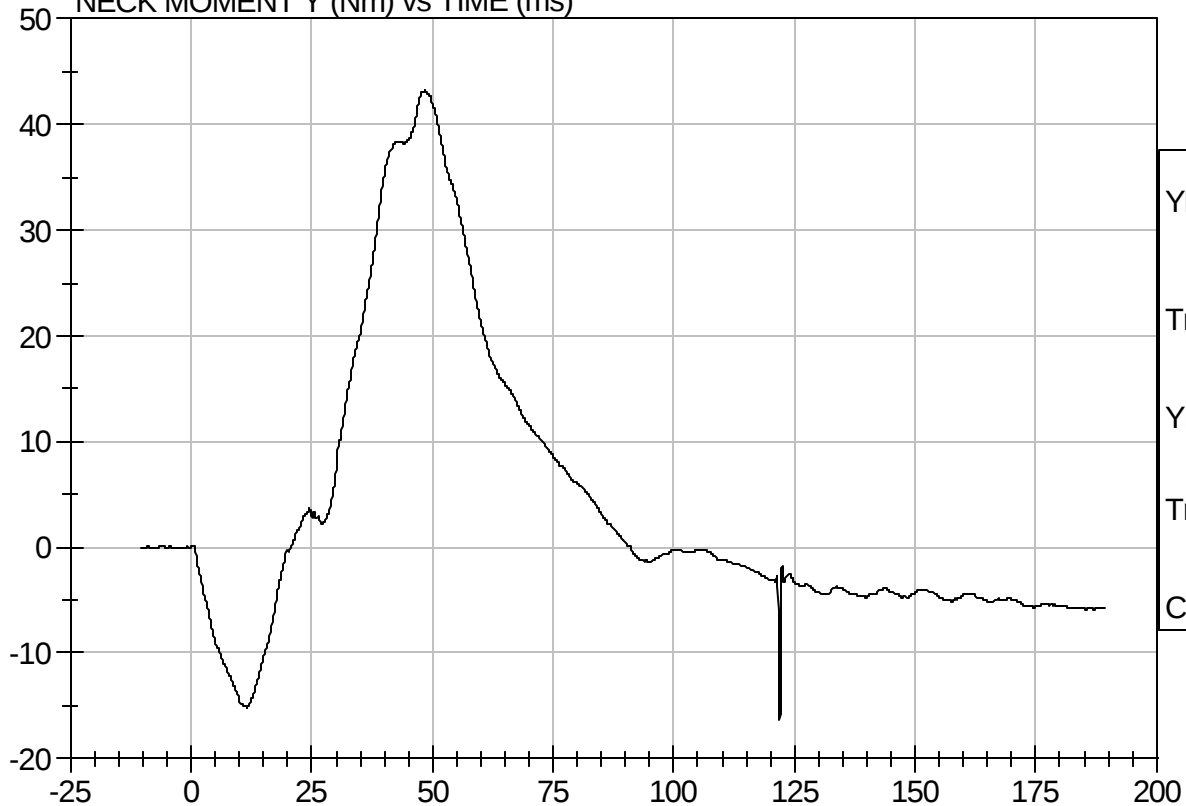
Tmax: 53.7 ms

YMin: -69.6 Deg

Tmin: 189.4 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 43.2 Nm

Tmax: 48.4 ms

YMin: -16.3 Nm

Tmin: 121.9 ms

CFC 600

DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032

Test Date 02/04/05

Technician David Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.146(p))

☒ N/A, this is the first neck test performed

☒ 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

☒ 8. The test fixture pendulum conforms to the specifications in Figure 8D.

☒ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 10D for the extension test. (572.143(c)(3))

☒ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(2)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.73 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.1 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.0 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	2.8 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-45.2</u> Nm @ <u>84</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	69 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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


Signature

02/04/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Neck Extension Test

ATD Serial No: 032

Test I.D: D05283

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.73	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.1	Pass
	10 msec	m/s	1.9 - 2.5	2.0	Pass
	14 msec	m/s	2.8 - 3.5	2.8	Pass
D Plane Rotation		deg	83 - 93	84.3	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-45.2	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	68.8	Pass
Overall Test Results					Pass



Laboratory Technician

02/04/2005

Test Date



Approved By

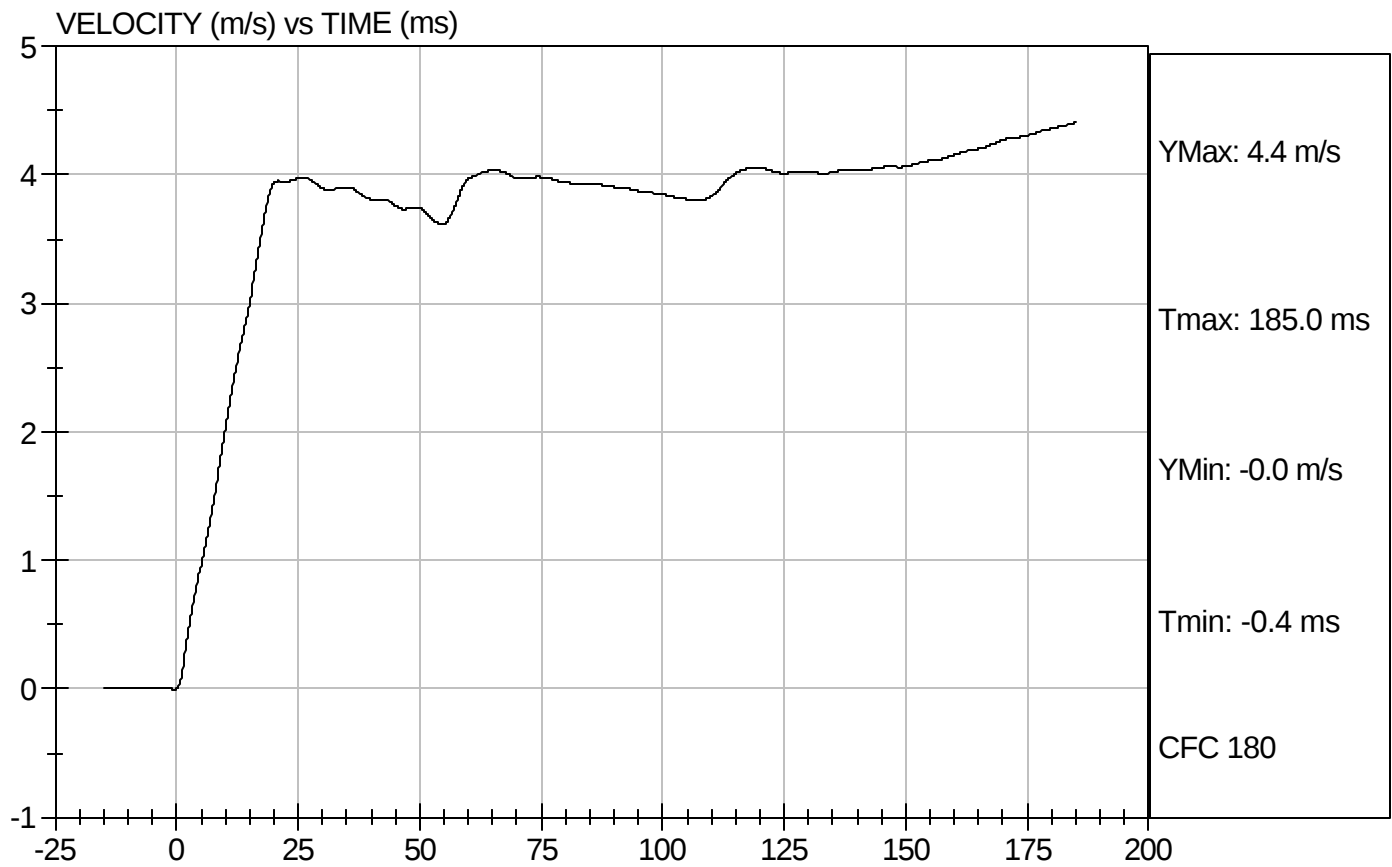


Test Description: Neck Extension

Test Date: 02/04/2005

Component: D05283

Speed: 12.25 ft/sec, 3.73 m/sec





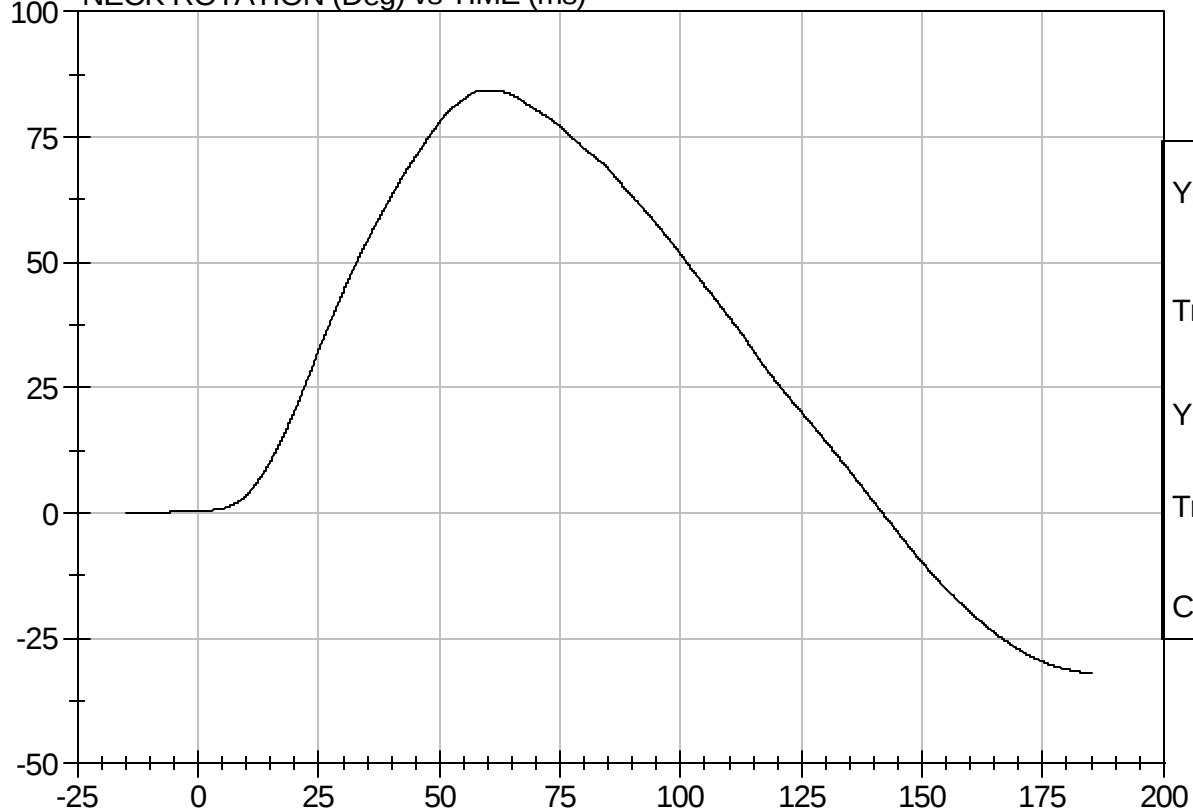
Test Description: Neck Extension

Test Date: 02/04/2005

Component: D05283

Speed: 12.25 ft/s, 3.73 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 84.3 Deg

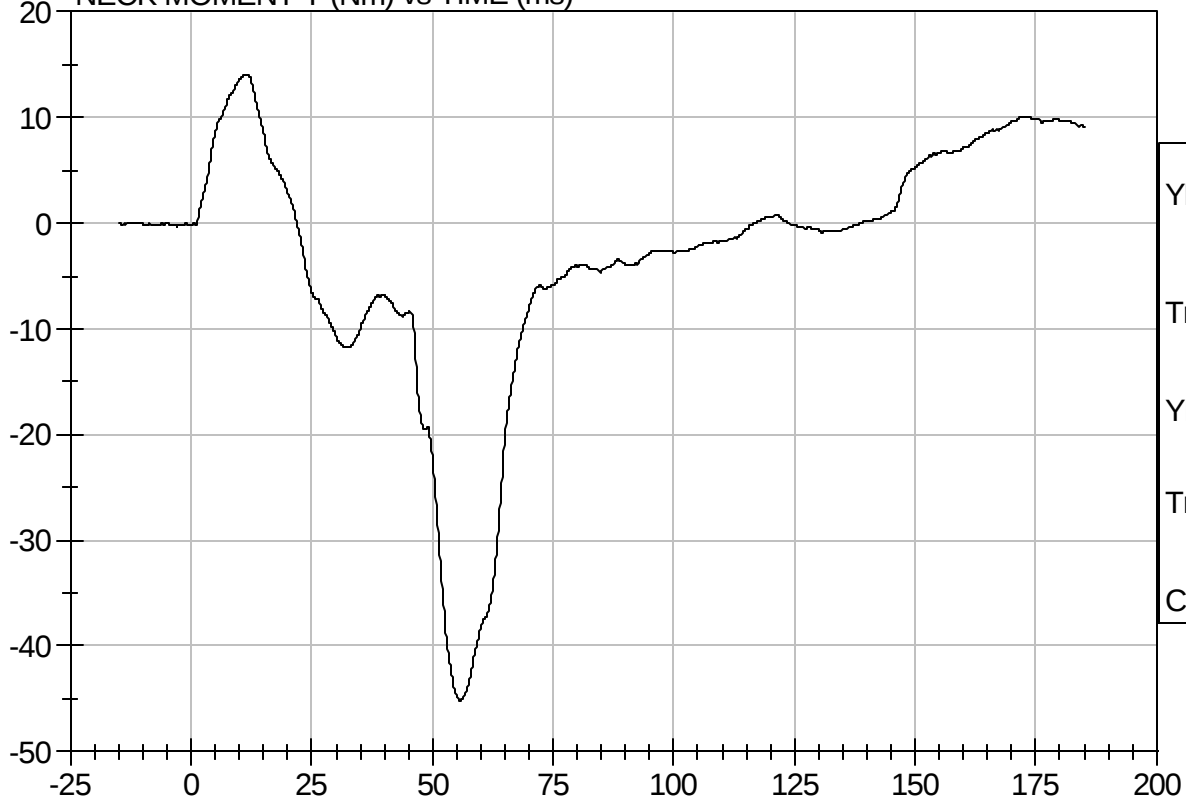
Tmax: 59.3 ms

YMin: -31.9 Deg

Tmin: 185.0 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 14.1 Nm

Tmax: 11.6 ms

YMin: -45.2 Nm

Tmin: 55.7 ms

CFC 600

DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 02/06/05

Technician Jim Carney

☒ Pretest calibration
☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11D.
- ☒ 3. The complete assembled dummy (210-0000) is used (572.144(b)) and is dressed in cotton-polyester-based tight-fitting long sleeved shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.144(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.144(c)(2))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.1</u> |
| Record the minimum temperature | <u>21.3</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>19%</u> |
- ☒ 5. Remove the arms.
- ☒ 6. Unzip the 3 zippers and fold down the chest jacket. Visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____
- ☐ - The following repairs or replacement was performed. Record _____
- ☒ 7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))
- ☒ 8. Level the middle rib both longitudinally and laterally $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

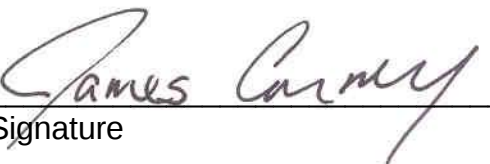
Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	35 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	700N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	740N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

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

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

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

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


Signature

02/06/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

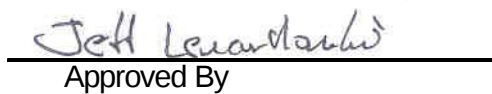
Thorax Impact Test

ATD Serial No: 032

Test I.D: D05284

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	5.9 to 6.1	6.00	Pass
Peak Deflection	mm	32 - 38	35	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.70	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.74	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

02/06/2005
Test Date

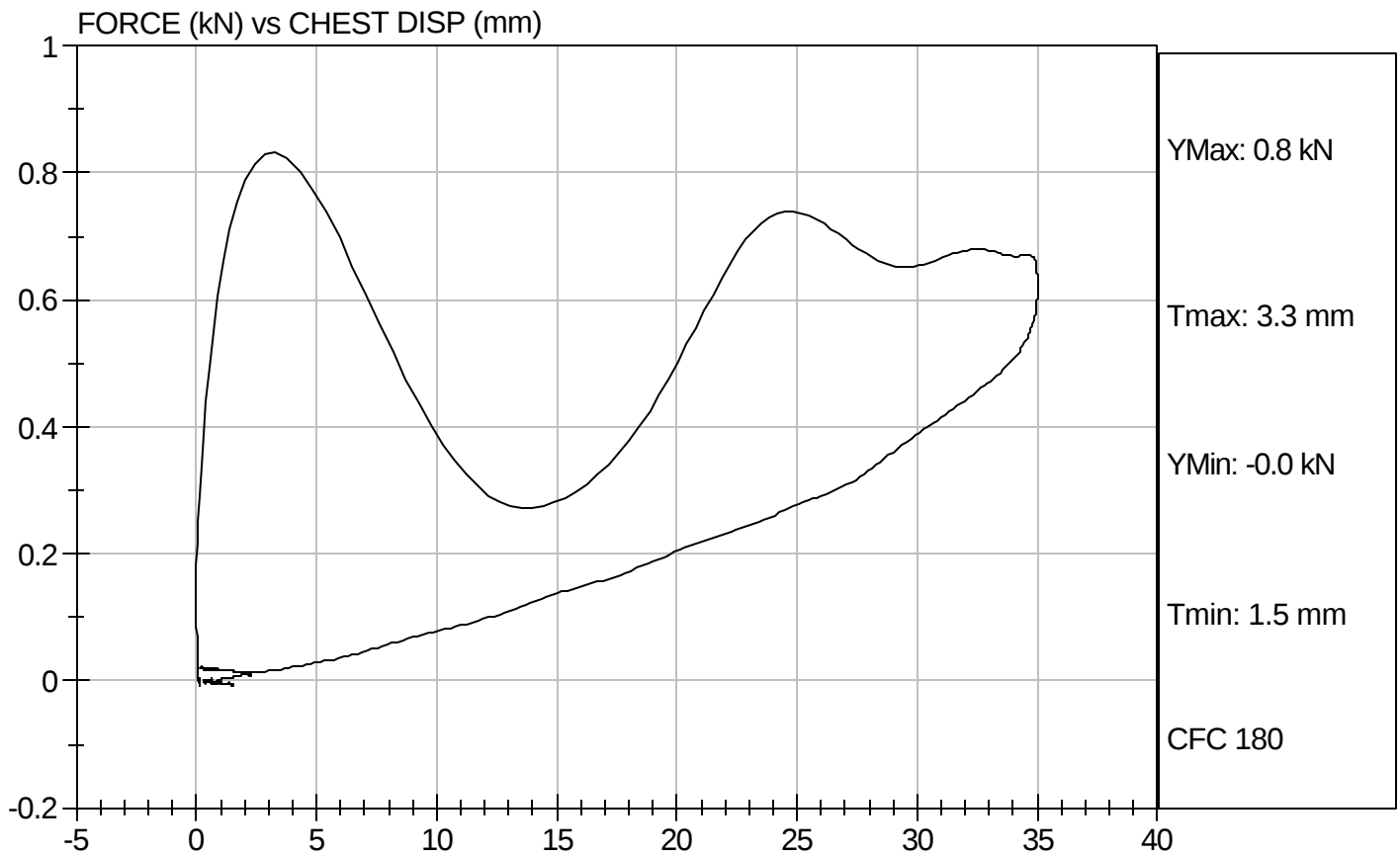


Test Description: Thorax Impact

Test Date: 02/06/2005

Component: D05284

Speed: 19.67 ft/sec, 6.00 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 02/04/05

Technician Joe Fleck

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).

☒ with legs below the femurs.

☐ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.3

Record the maximum humidity 27%

Record the minimum humidity 19%

☒ 5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))

☒ 5. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within $\pm 1^\circ$ and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))

☒ 6. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))

☒ 7. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))

☒ 8. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and $30^\circ \pm 2^\circ$. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))

☒ 9. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0° . Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))

☒ 10. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))

- X 11. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
Record reference plane angle (max. allowed 15°) 6°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 17. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 15^\circ$	6°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	180 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	7°

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

Joe Fleck
Signature

02/04/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Torso Lumbar Flexion

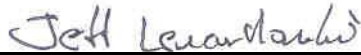
ATD Serial No: 032

Test I.D: D05287

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Force At 45 deg.	N	130 - 180	180	Pass
Initial Angle	deg	0 - 15	6	Pass
Return Angle	deg	0 - 10	7	Pass
Overall Test Results				Pass


Laboratory Technician

02/04/2005
Test Date


Approved By

DATA SHEET D3
HEAD DROP TEST (572.142)

Dummy Serial Number 032

Test Date 02/15/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))

X N/A, ONLY one head drop performed

X 2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259), accelerometer mounting block (SA572-S80) structural replacement of ½ mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one ½ 20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))

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

X 5. The head accelerometer mounting plate screws ((10-32 x 5/8 SHCS) are torqued to 10.2 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.142(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.5

Record the maximum humidity 31%

Record the minimum humidity 25%

X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.142(c)(3))

Record the actual distance 14.8"

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

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

Record the right side distance 466mm

Record the left side distance 466mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))

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

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

Record thickness 50.9mm

Record width 604mm

Record length 595mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	251
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	6

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


Signature

02/15/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Head Drop Calibration

ATD Serial No: 032

Test I.D: D05371

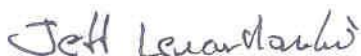
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	250.9	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.8	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/15/2005

Test Date



Approved By



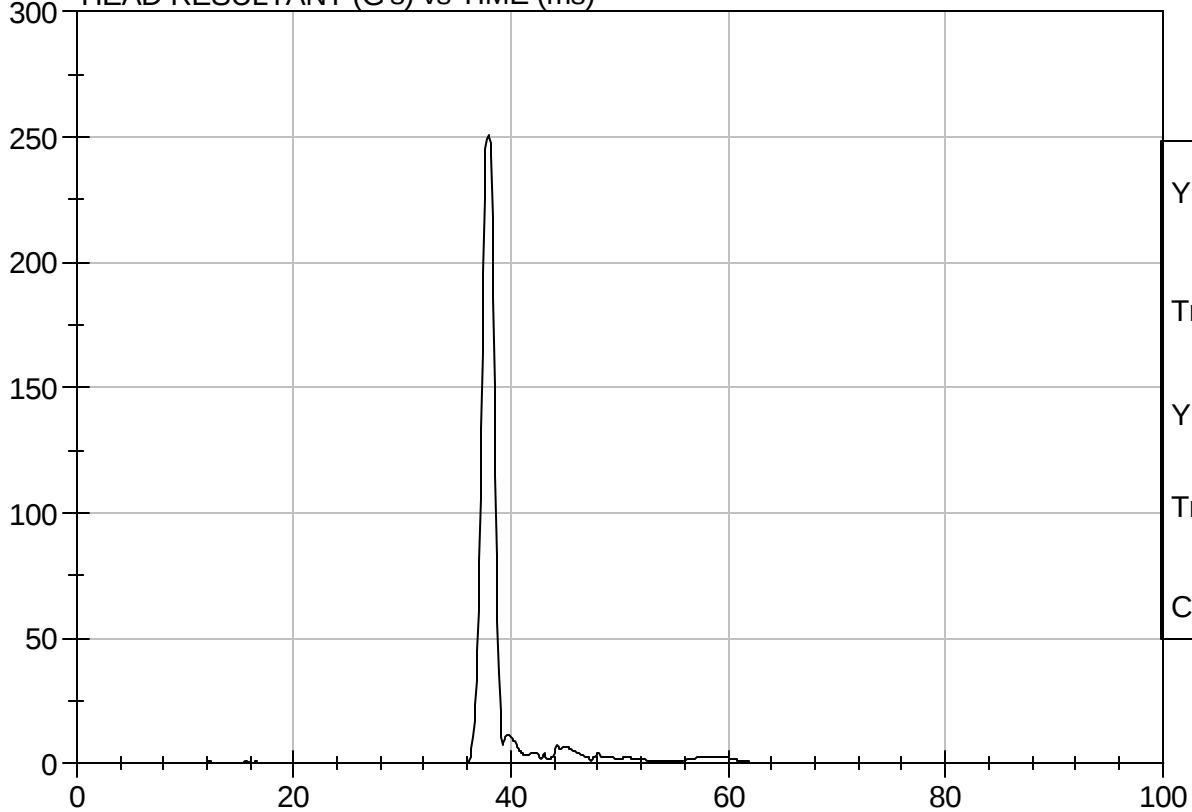
Test Description: Head Drop

Test Date: 02/15/2005

Component: D05371

Speed: 0 ft/s, 0.00 m/s

HEAD RESULTANT (G's) vs TIME (ms)



YMax: 250.9 G

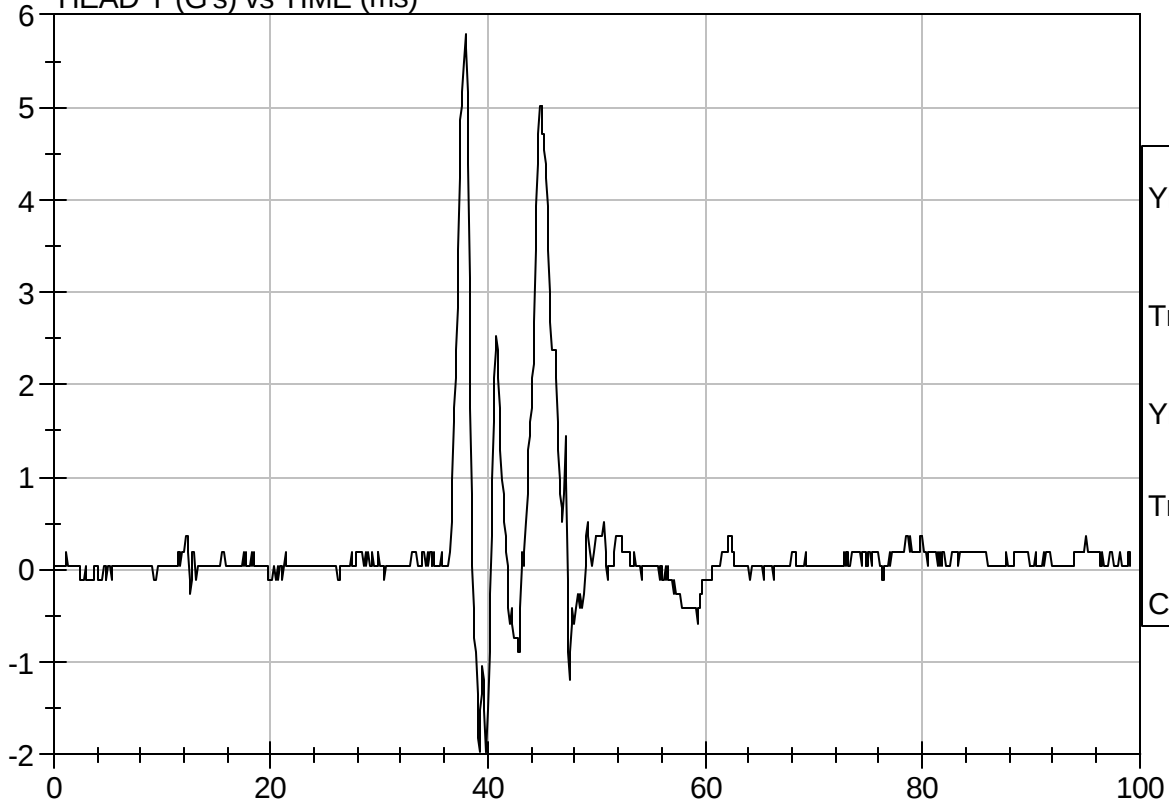
Tmax: 37.9 ms

YMin: 0.1 G

Tmin: -0.7 ms

CFC 1000

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



YMax: 5.8 G

Tmax: 37.9 ms

YMin: -2.0 G

Tmin: 39.2 ms

CFC 1000

DATA SHEET D4
NECK FLEXION TEST (572.143)

Dummy Serial Number 032

Test Date 02/15/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last neck test. (572.146(p))

X N/A, this is the first neck test performed

X 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

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. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.5

Record the maximum humidity 31%

Record the minimum humidity 25%

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 low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 8. The test fixture pendulum conforms to the specifications in Figure 8D.

X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9D for the flexion test. (572.143(c)(3))

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 top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(1)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$5.4 \text{ m/s} \leq \text{speed} \leq 5.6 \text{ m/s}$	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$2.0 \text{ m/s} \leq \Delta V \leq 2.7 \text{ m/s}$	2.3 m/s
	@ 15 ms	$3.0 \text{ m/s} \leq \Delta V \leq 4.0 \text{ m/s}$	3.4 m/s
	@ 20ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.1 \text{ m/s}$	4.5 m/s
Plane D Rotation		Peak moment* $42 \text{ Nm} \leq \text{moment} \leq 53 \text{ Nm}$ during the following rotation range $70^\circ \leq \text{angle} \leq 82^\circ$	<u>43</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	72 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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

Joe Fleck
Signature

02/15/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Flexion Test

ATD Serial No: 032

Test I.D: D05372

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	5.4 to 5.6	5.5	Pass
Pendulum Deceleration	10 msec	m/s	2.0 - 2.7	2.3	Pass
	15 msec	m/s	3.0 - 4.0	3.4	Pass
	20 msec	m/s	4.0 - 5.1	4.5	Pass
D Plane Rotation		deg	70 - 82	78.4	Pass
Peak Moment within Deflection Corridor		Nm	42.0 - 53.0	42.5	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 - 80.0	71.7	Pass
Overall Test Results				Pass	


 Laboratory Technician

02/15/2005
 Test Date


 Approved By

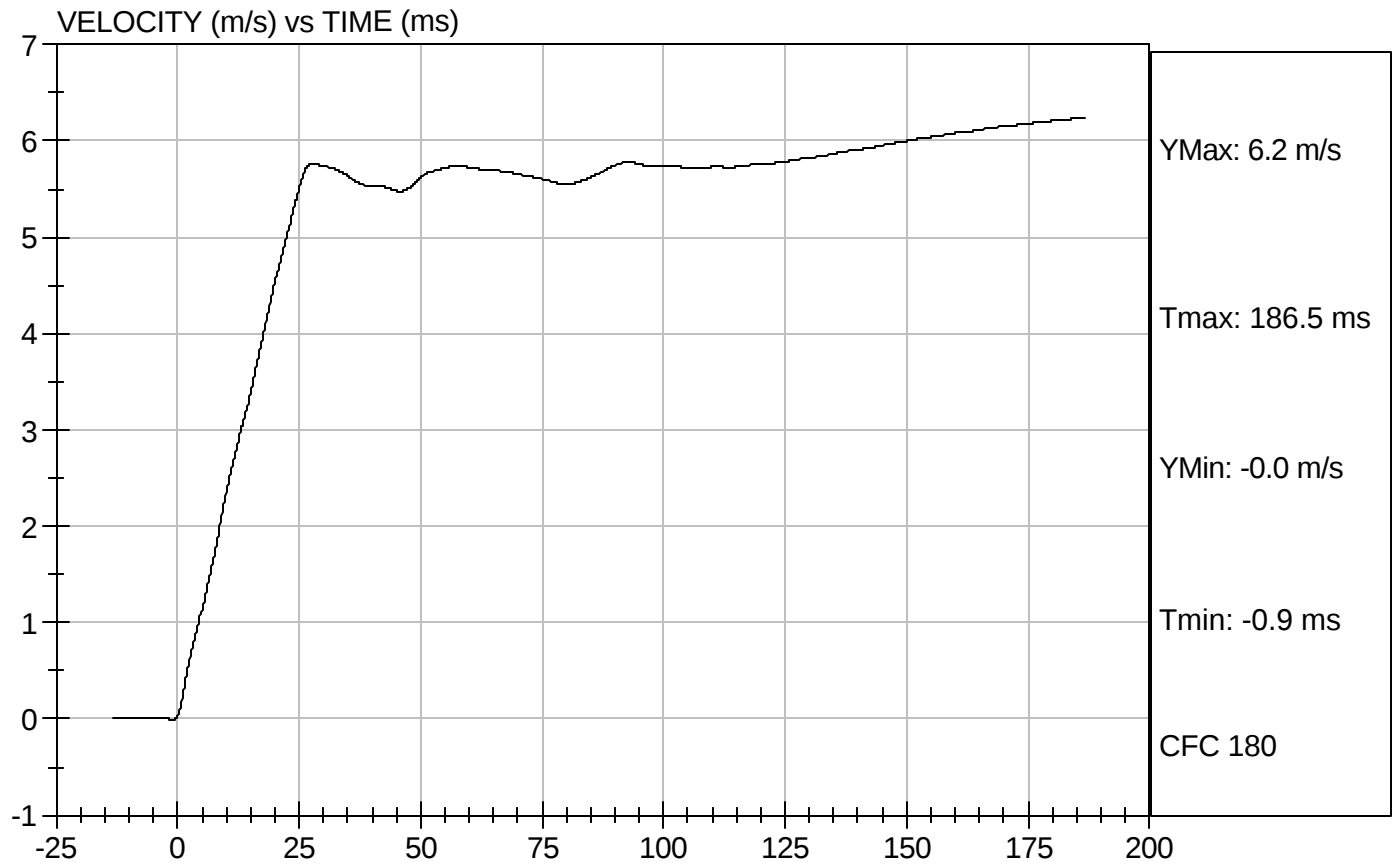


Test Description: Neck Flexion

Test Date: 02/15/2005

Component: D05372

Speed: 17.96 ft/sec, 5.47 m/sec





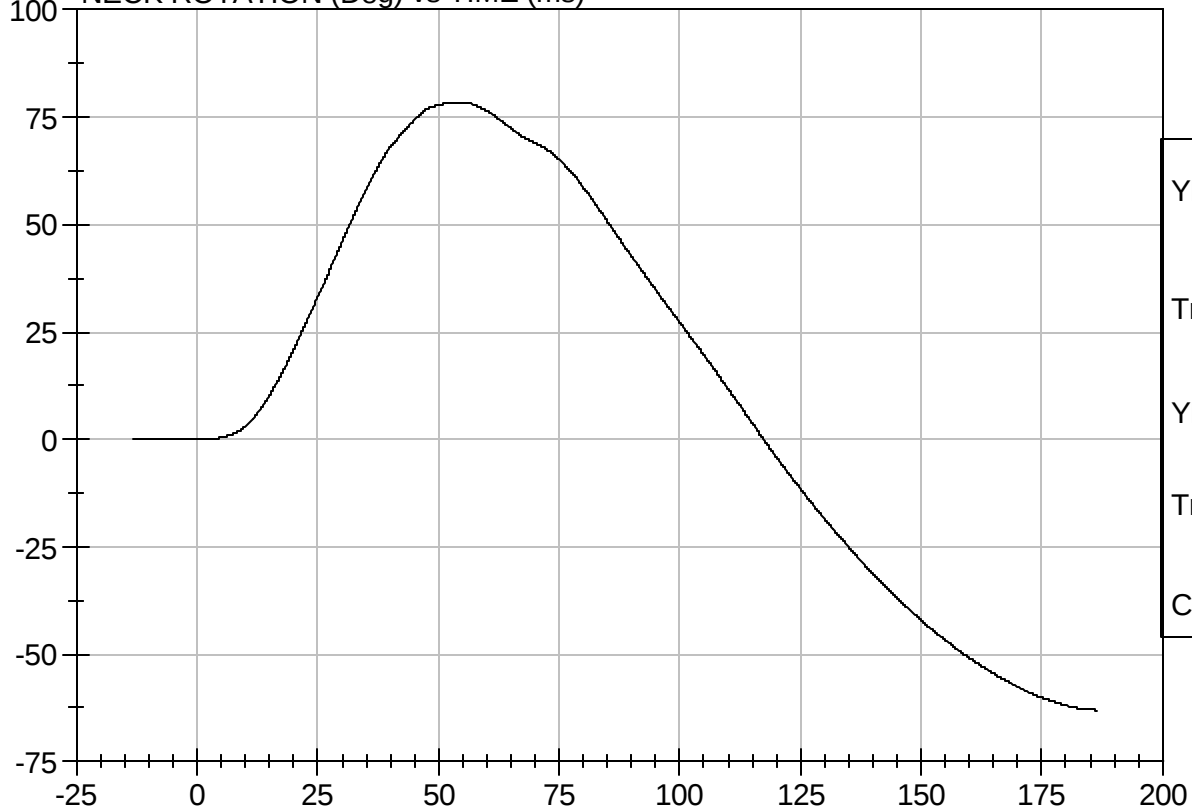
Test Description: Neck Flexion

Test Date: 02/15/2005

Component: D05372

Speed: 17.96 ft/s, 5.47 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 78.4 Deg

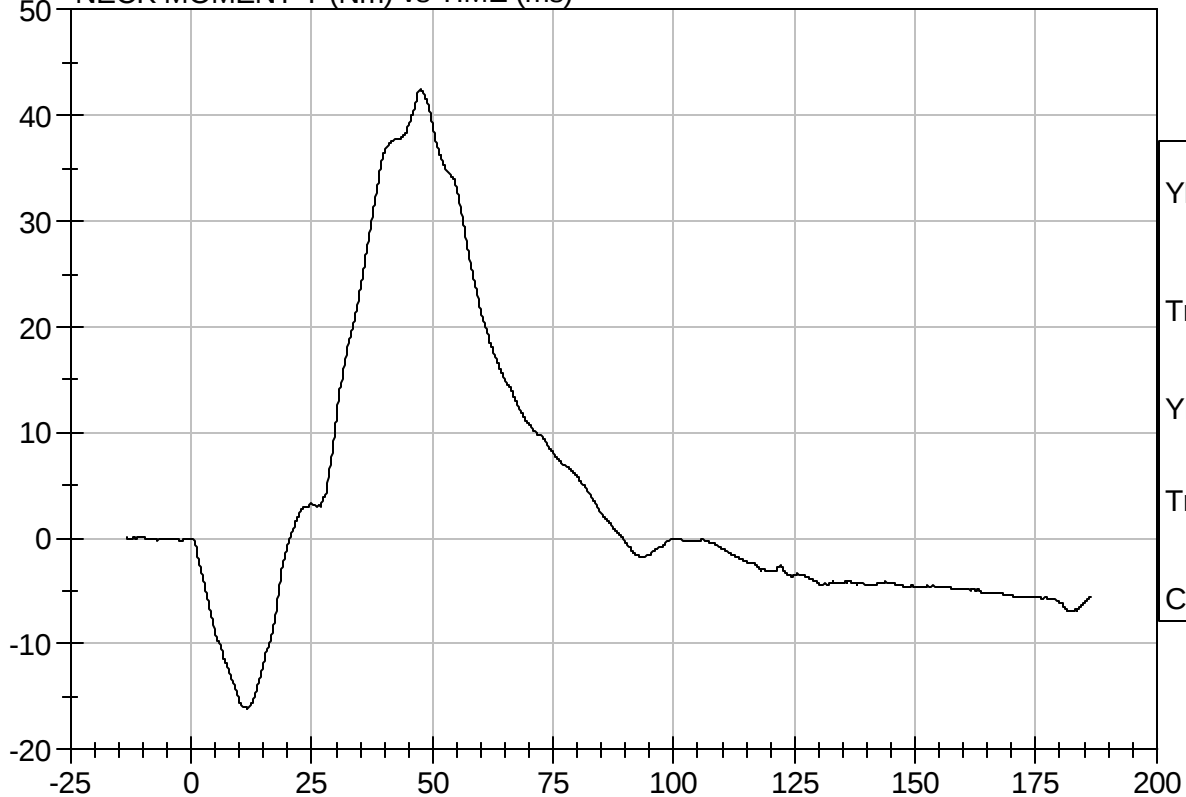
Tmax: 54.8 ms

YMin: -63.1 Deg

Tmin: 186.5 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 42.5 Nm

Tmax: 47.6 ms

YMin: -16.1 Nm

Tmin: 11.7 ms

CFC 600

DATA SHEET D5
NECK EXTENSION TEST (572.133)

Dummy Serial Number 032

Test Date 02/15/05

Technician Joe Fleck

 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 neck test. (572.146(p))

 X N/A, this is the first neck test performed

X 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))

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. (572.143(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.5

Record the maximum humidity 31%

Record the minimum humidity 25%

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 low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 6. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))

X 8. The test fixture pendulum conforms to the specifications in Figure 8D.

X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 10D for the extension test. (572.143(c)(3))

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 top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.

- X 11. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 12. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(2)(iii))
- X 13. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 14. Complete the following table:

Neck Extension Test Results (572.143(b)(2) & (572.143(c)(4)(ii))

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.69 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.2 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.1 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	2.9 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	<u>-44.0</u> Nm @ <u>85</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	69 ms

*The moment is a direct reading from the load cell

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.143(c)(4)(iii))

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

Joe Fleck
Signature

02/15/05
Date

Hybrid III Calibration Data Sheet
3 Year Old
Neck Extension Test

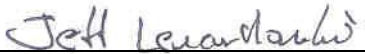
ATD Serial No: 032

Test I.D: D05373

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.69	Pass
Pendulum Deceleration	6 msec	m/s	1.0 - 1.4	1.2	Pass
	10 msec	m/s	1.9 - 2.5	2.1	Pass
	14 msec	m/s	2.8 - 3.5	2.9	Pass
D Plane Rotation		deg	83 - 93	85.0	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 - -43.7	-44.0	Pass
Negative Moment - Time Curve Decay to -10 Nm		msec	60.0 - 80.0	69.2	Pass
Overall Test Results				Pass	


 Laboratory Technician

02/15/2005
 Test Date


 Approved By

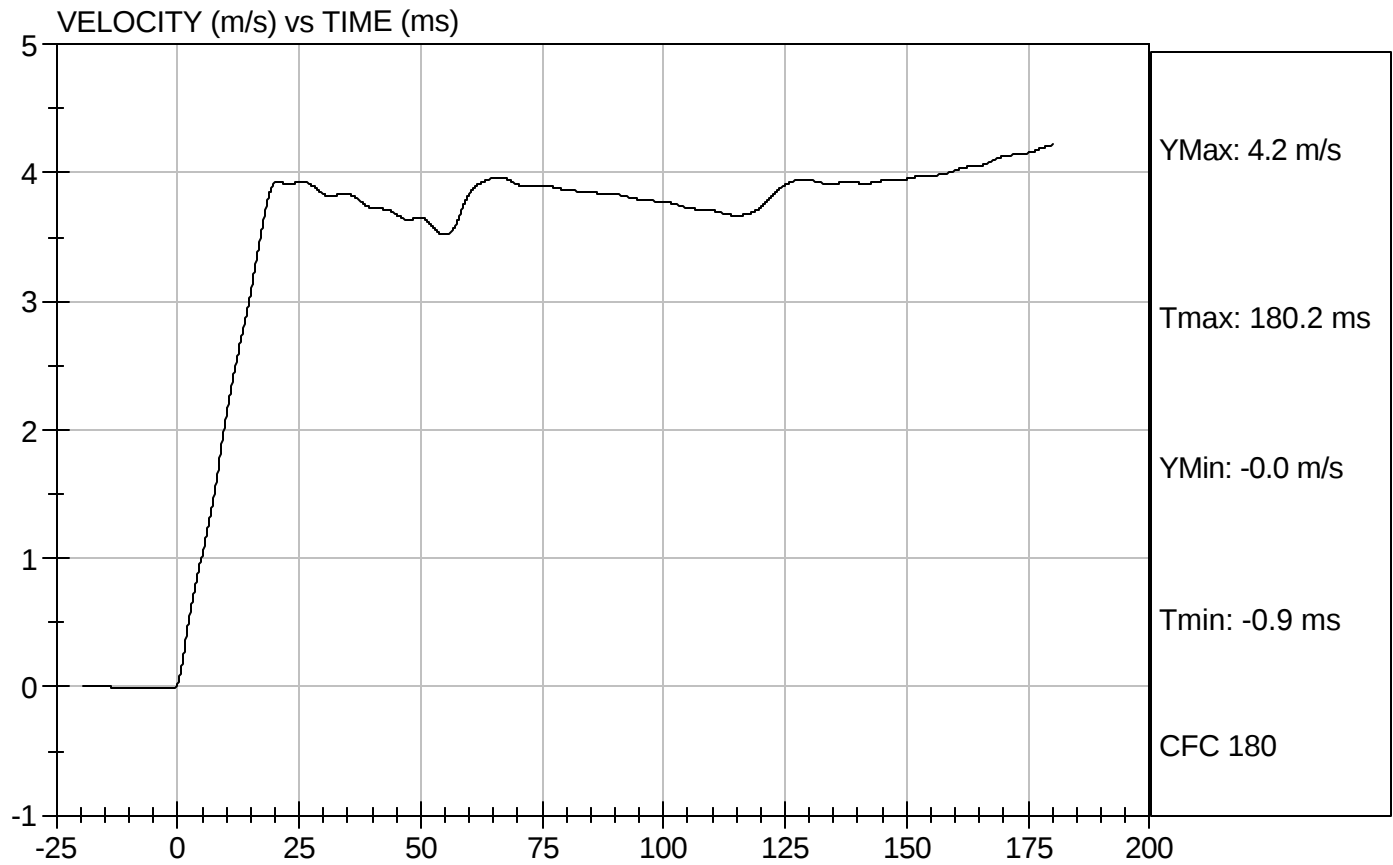


Test Description: Neck Extension

Test Date: 02/15/2005

Component: D05373

Speed: 12.1 ft/sec, 3.69 m/sec





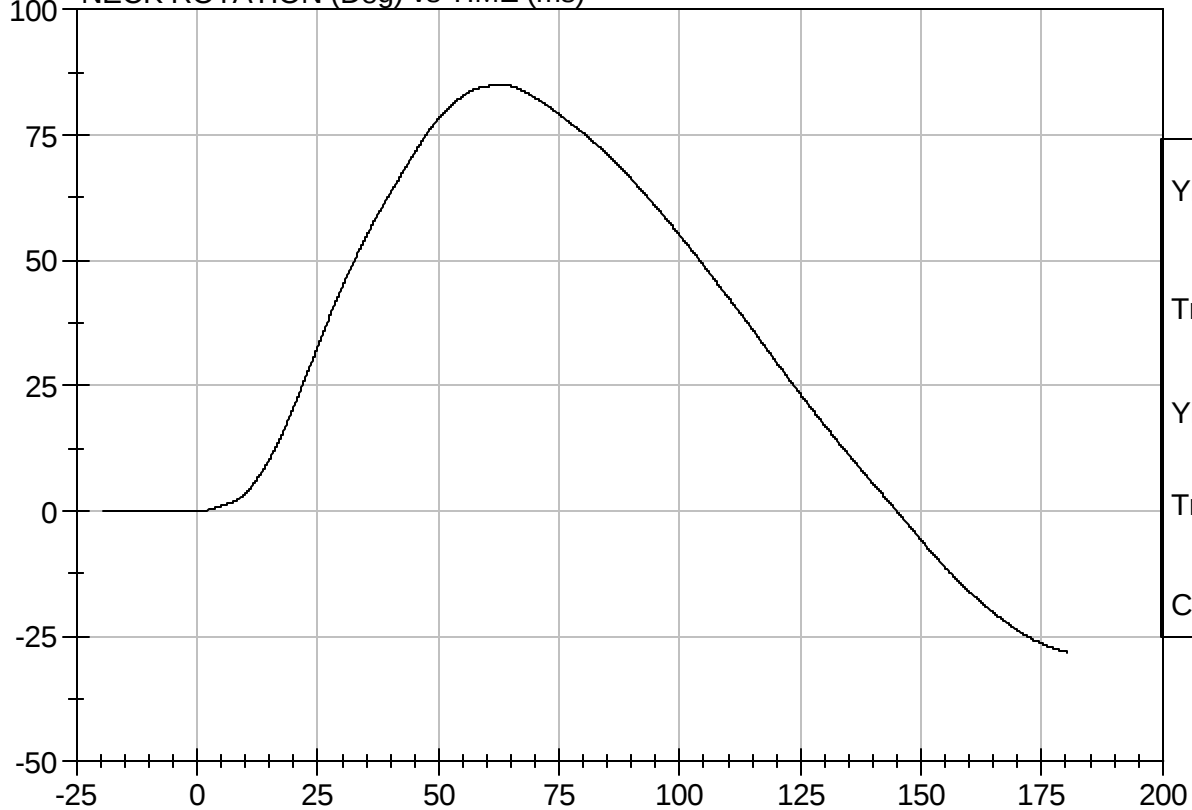
Test Description: Neck Extension

Test Date: 02/15/2005

Component: D05373

Speed: 12.1 ft/s, 3.69 m/s

NECK ROTATION (Deg) vs TIME (ms)



YMax: 85.0 Deg

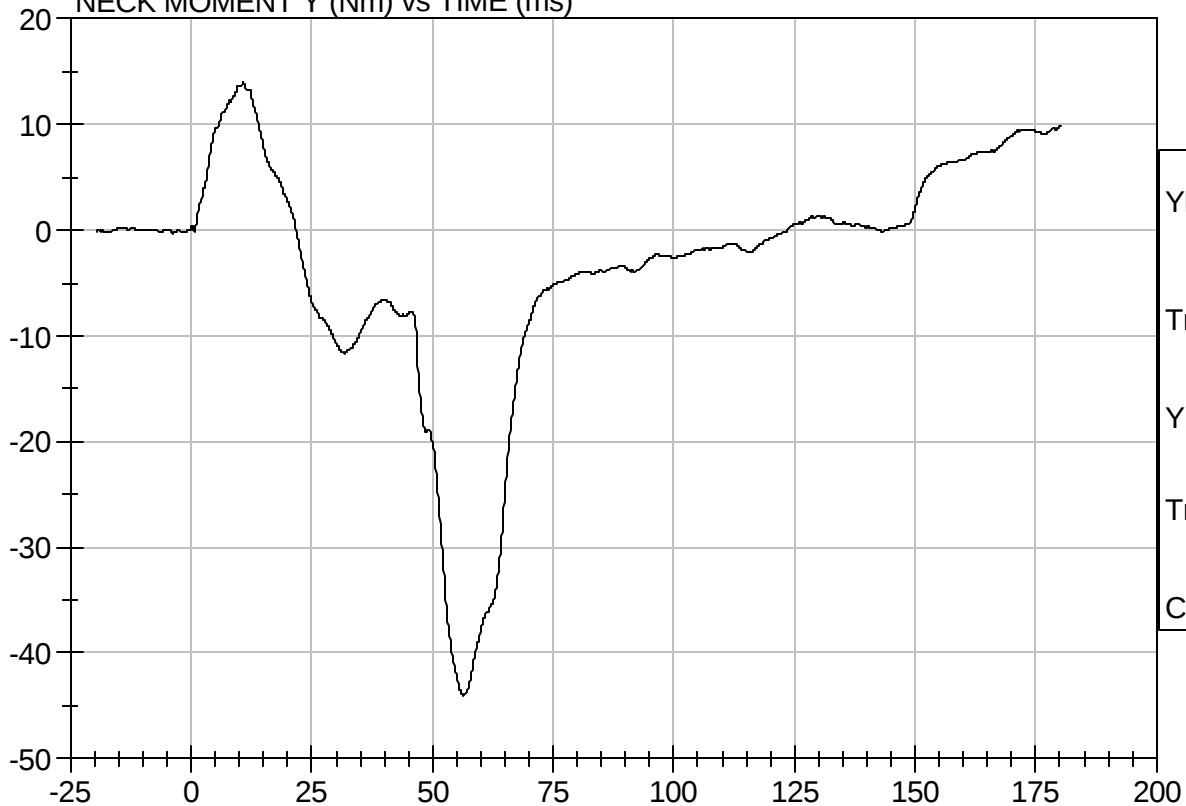
Tmax: 63.0 ms

YMin: -28.2 Deg

Tmin: 180.2 ms

CFC 60

NECK MOMENT Y (Nm) vs TIME (ms)



YMax: 14.0 Nm

Tmax: 10.8 ms

YMin: -44.0 Nm

Tmin: 56.4 ms

CFC 600

DATA SHEET D6
THORAX IMPACT TEST (572.144)

Dummy Serial Number 032 Test Date 02/15/05

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11D.
- ☒ 3. The complete assembled dummy (210-0000) is used (572.144(b)) and is dressed in cotton-polyester-based tight-fitting long sleeved shirt and ankle length pants. The weight of the shirt and pants shall not exceed 0.25 kg. (572.144(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.144(c)(2))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.1</u> |
| Record the minimum temperature | <u>21.5</u> |
| Record the maximum humidity | <u>31%</u> |
| Record the minimum humidity | <u>25%</u> |
- ☒ 5. Remove the arms.
- ☒ 6. Unzip the 3 zippers and fold down the chest jacket. Visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____
- ☐ - The following repairs or replacement was performed. Record _____
- ☒ 7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))
- ☒ 8. Level the middle rib both longitudinally and laterally $\pm 0.5^\circ$. (572.144(c)(3))

- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.144(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.144(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	33 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	700N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	760N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

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

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

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

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


Signature

02/15/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Thorax Impact Test

ATD Serial No: 032

Test I.D: D05374

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/s	5.9 to 6.1	6.0	Pass
Peak Deflection	mm	32 - 38	33	Pass
Peak Resistive Force w/in Deflection Corridor	kN	0.68 - 0.81	0.70	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	kN	Max 0.86	0.76	Pass
Overall Test Results				Pass



Laboratory Technician

02/15/2005

Test Date



Approved By

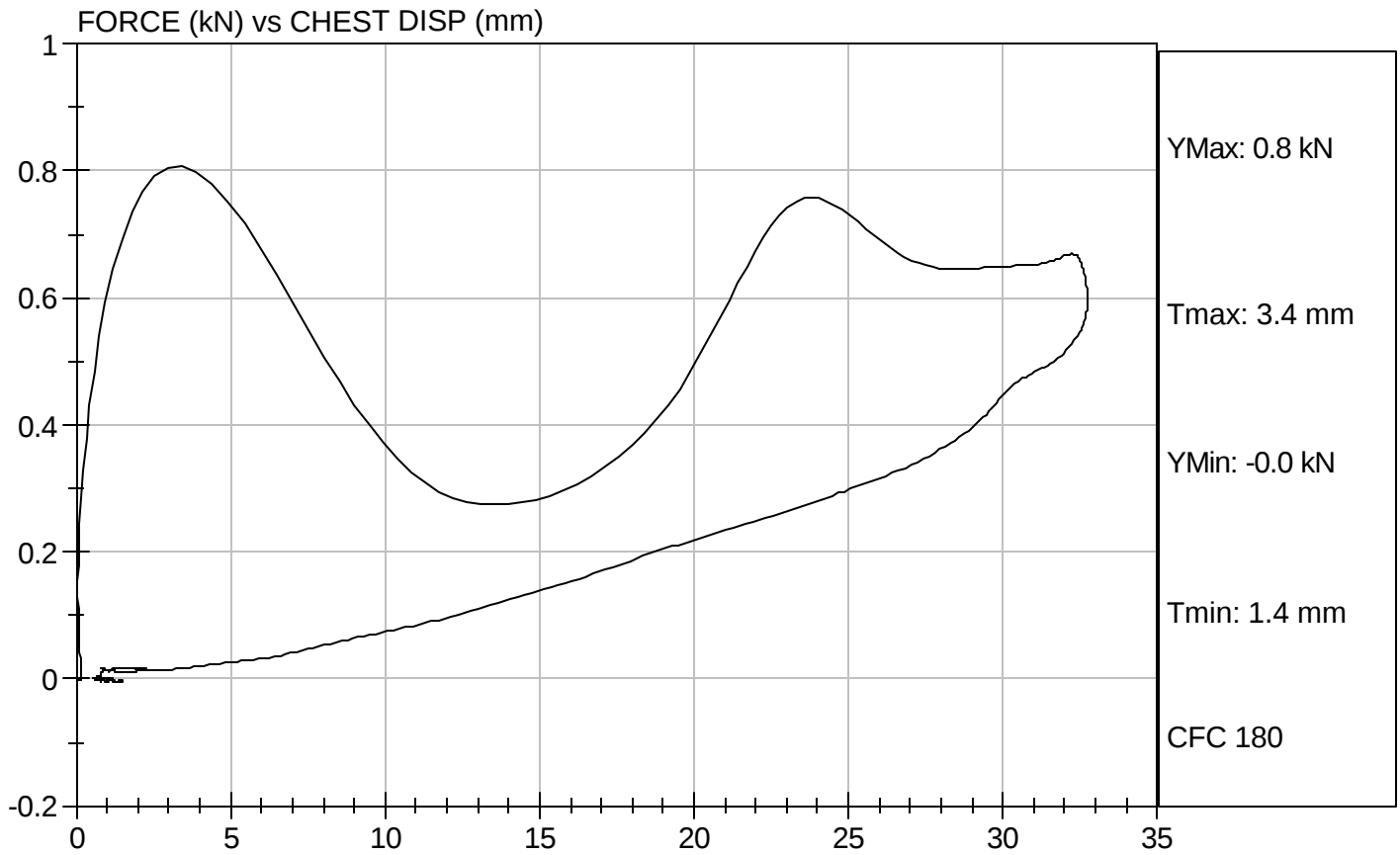


Test Description: Thorax Impact

Test Date: 02/15/2005

Component: D05374

Speed: 19.71 ft/sec, 6.01 m/sec



DATA SHEET D7
TORSO FLEXION TEST (572.145)

Dummy Serial Number 032

Test Date 02/15/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))

X N/A, ONLY one thorax impact test performed

X 2. The test fixture conforms to the specifications in Figure 13D.

X 3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).

X with legs below the femurs.

 without legs below the femurs.

X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))

Record the maximum temperature 22.1

Record the minimum temperature 21.5

Record the maximum humidity 31%

Record the minimum humidity 25%

X 5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))

X 5. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within $\pm 1^\circ$ and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))

X 6. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))

X 7. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))

X 8. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and $30^\circ \pm 2^\circ$. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))

X 9. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0° . Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))

X 10. Remove all external support that was implemented in 9 above and wait 2 minutes. (572.145(c)(4))

- X 11. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
Record reference plane angle (max. allowed 15°) 8°
- X 12. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 14. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 16. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 17. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2), 572.145(c)(4), (572.145(c)(5))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 15^\circ$	8°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	1.0
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	167 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	9°

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

Joe Flack
Signature

02/15/05
Date

Hybrid III Calibration Data Sheet

3 Year Old

Torso Lumbar Flexion

ATD Serial No: 032

Test I.D: D05377

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Force At 45 deg.	N	130 - 180	167	Pass
Initial Angle	deg	0 - 15	8	Pass
Return Angle	deg	0 - 10	9	Pass
Overall Test Results				Pass



Laboratory Technician

02/15/2005

Test Date



Approved By

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #032, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	538.5-553.7	541.4
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	315.2
C	H-POINT HEIGHT	Reference	34.3-44.5	35.9
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	64.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	70.2
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	82.4
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	250.4
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder to the lowest part of the flesh on the elbow in line with the shoulder and elbow pivot bolts.	185.4-200.6	198.6
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	141.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300.0	285.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	230.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	252.9
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	225.5

HYBRID III 3 year SN #032, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	139.9
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	142.8
Q	STATURE	Lay the dummy out on a flat surface with the rear surfaces of the head, upper torso, buttocks and heels touching the surface and with the bottom of the feet perpendicular to that surface. Measure the distance from the bottom of the feet to the top of the head.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	255.2
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.7
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	173.8
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	204.6
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.1
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	509.3
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	531.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	541.2
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 032

Test Date 2/10/05

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

2/11/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

2/11/05
Date

EXTERNAL DIMENSIONS

HYBRID III 6 year SN #155, PART 572, SUBPART N EXTERNAL DIMENSIONS

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	628.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	362.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	68.3
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	94.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	102.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	195.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	22.1
I	SHOULDER TO - ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	219.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	165.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	390.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	273.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	313.8

13-1

HYBRID III 6 year SN #155, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	322.4
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	140.2
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	173.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	355.7
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.0
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	174.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	221.5
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.1
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	66.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	529.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	609.5
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	583.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	159.0

DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 155

Test Date 01/05/05

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))

☒ 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.

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

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

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.122(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.122(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5C. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.122(c)(3))
Record the actual distance 14.8"

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

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 5C. (572.122(c)(3))
Record the right side distance 490mm
Record the left side distance 489mm
- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.122(c)(4))
Record actual micro finish 656×10^{-6} mm
- X 13. The impact surface is rigidly supported. (572.122(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))
Record thickness 50.9 mm
Record width 604 mm
Record length 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b) & (572.122(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	283
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 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

01/05/05
Date

MGA RESEARCH CORPORATION

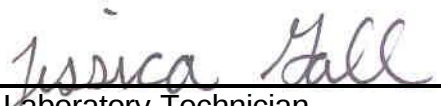
HEAD DROP TEST

HYBRID III 6 YEAR OLD

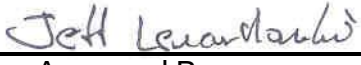
ATD Serial No: 155

Test I.D: D05021

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	245 - 300	283	Pass
Peak Lateral Acceleration	G's	+/- 15	-7	Pass
Unimodal above 50 G's	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

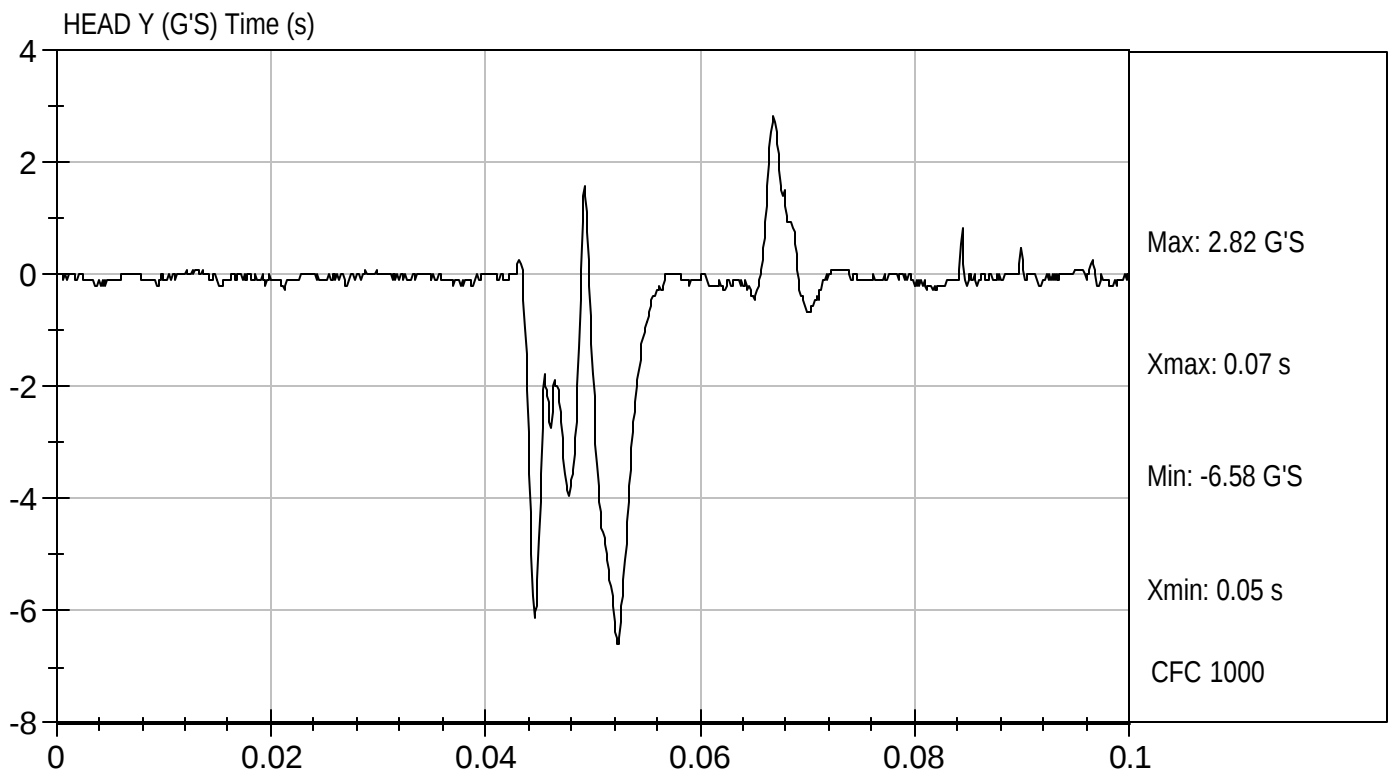
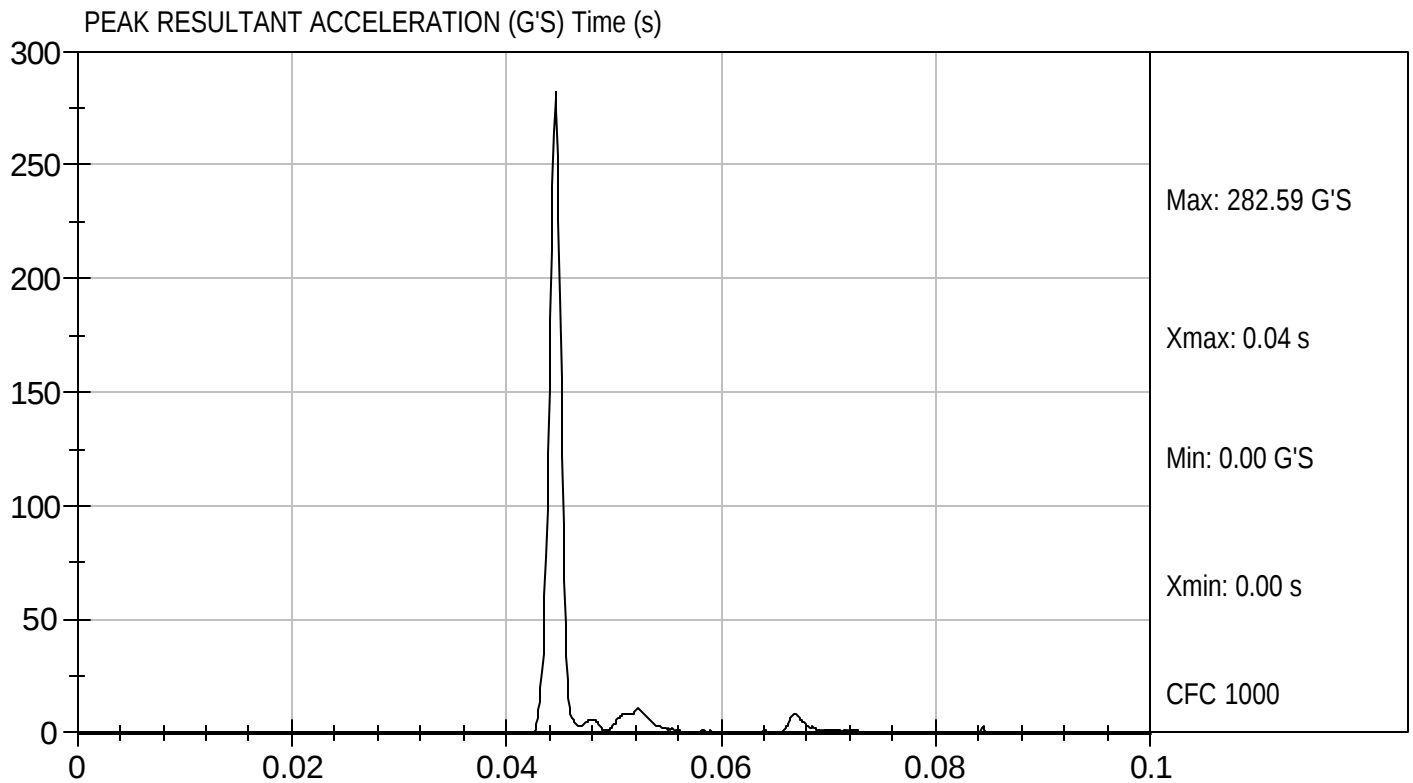
01/05/2005
Test Date


Approved By



Test Desc: Head Drop
Componet ID: D05021

Test Date: 01/05/2005
Velocity: 0 ft/s, 0 m/s



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 155

Test Date 01/04/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))

☒ N/A, ONLY one flexion test performed

☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.94 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.6 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	3.1 m/s
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.5 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	<u>31</u> Nm @ <u>78</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	109 ms

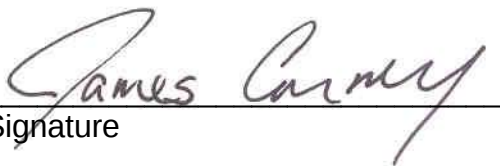
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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


Signature

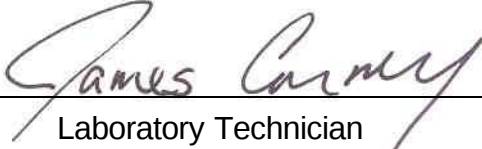
01/04/05
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD

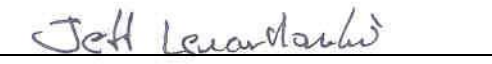
ATD Serial No: 155

Test I.D: D05022

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.94	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	3.1	Pass
	30 msec	msec	3.8 to 5.0	4.5	Pass
D Plane Rotation	Max	deg	74 to 92	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	31	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 - 123	109	Pass
Overall Results				Pass	


Laboratory Technician

01/04/2005
Test Date

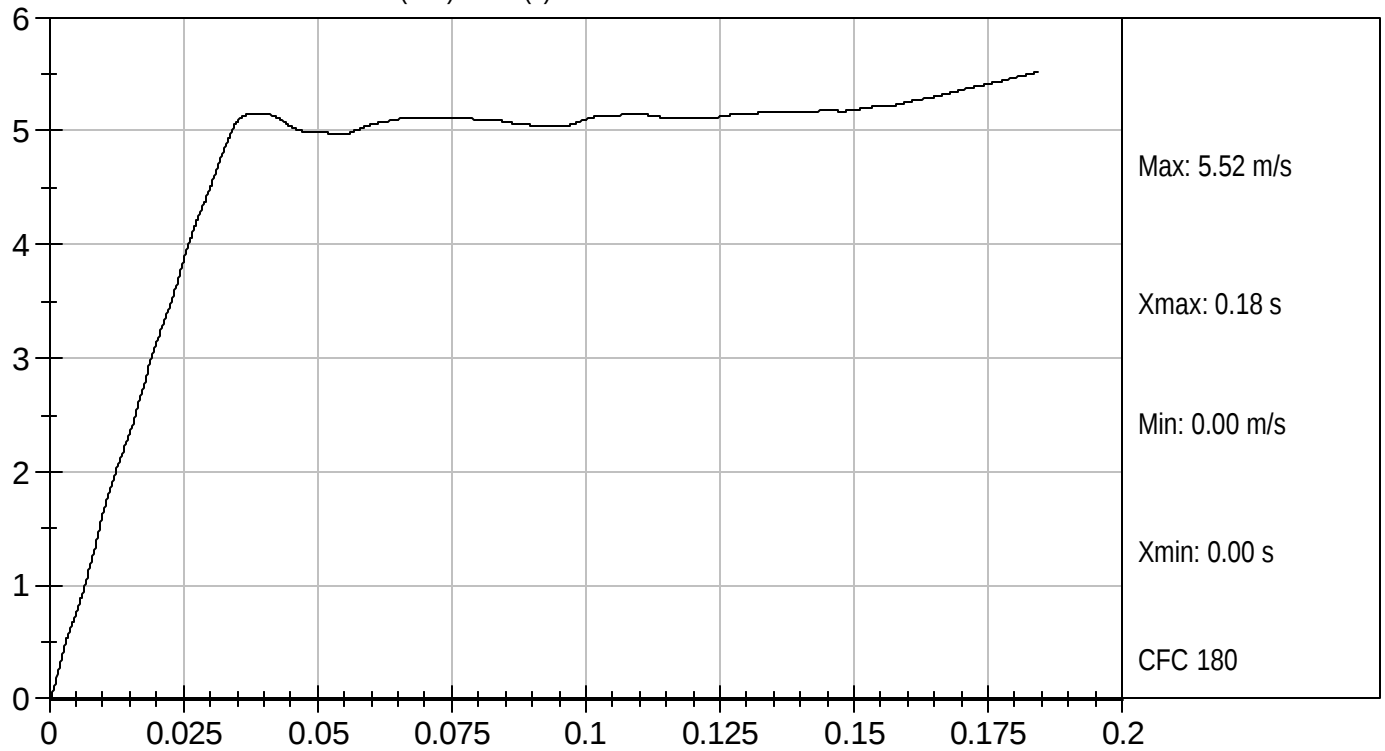

Approved By



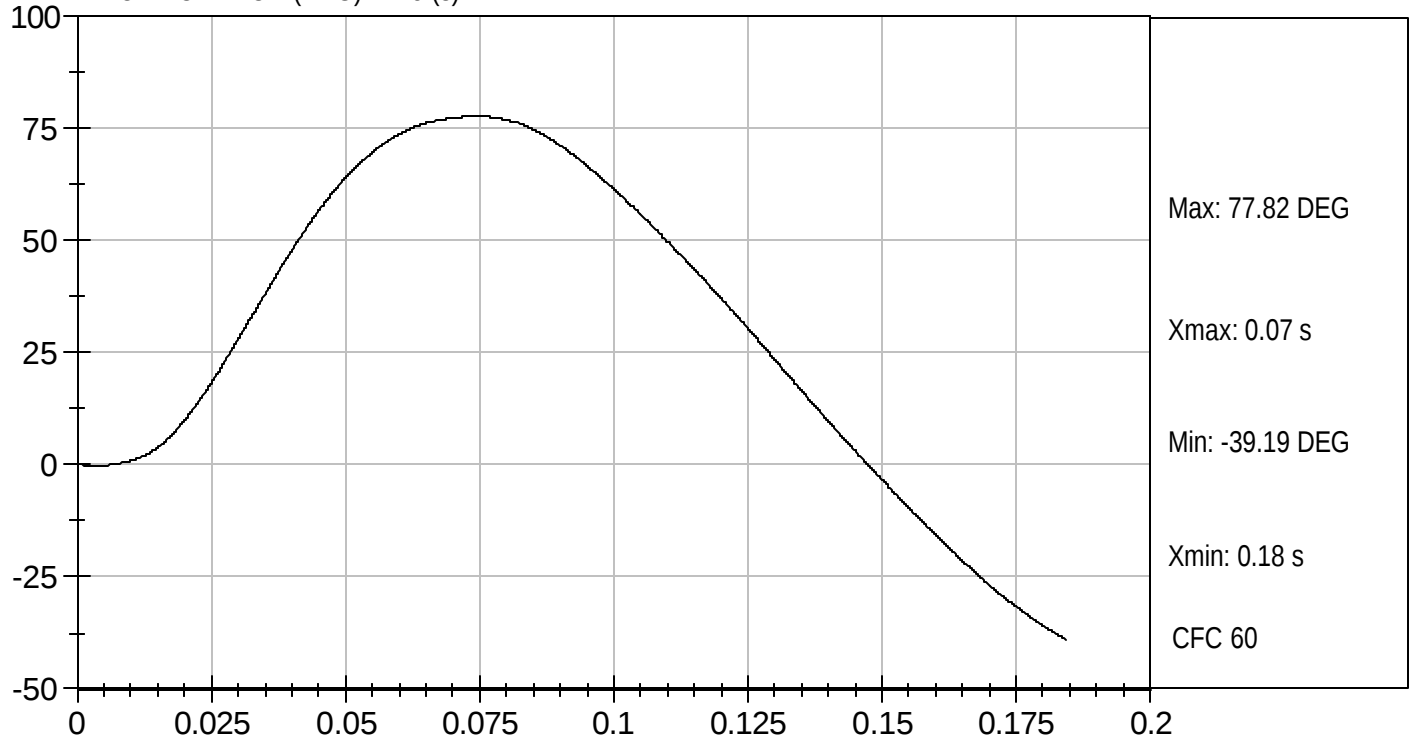
Test Desc: Neck Flexion
Componet ID: D05022

Test Date: 01/04/2005
Velocity: 16.2 ft/s, 4.94 m/s

PENDULUM DECELERATION (m/s) Time (s)



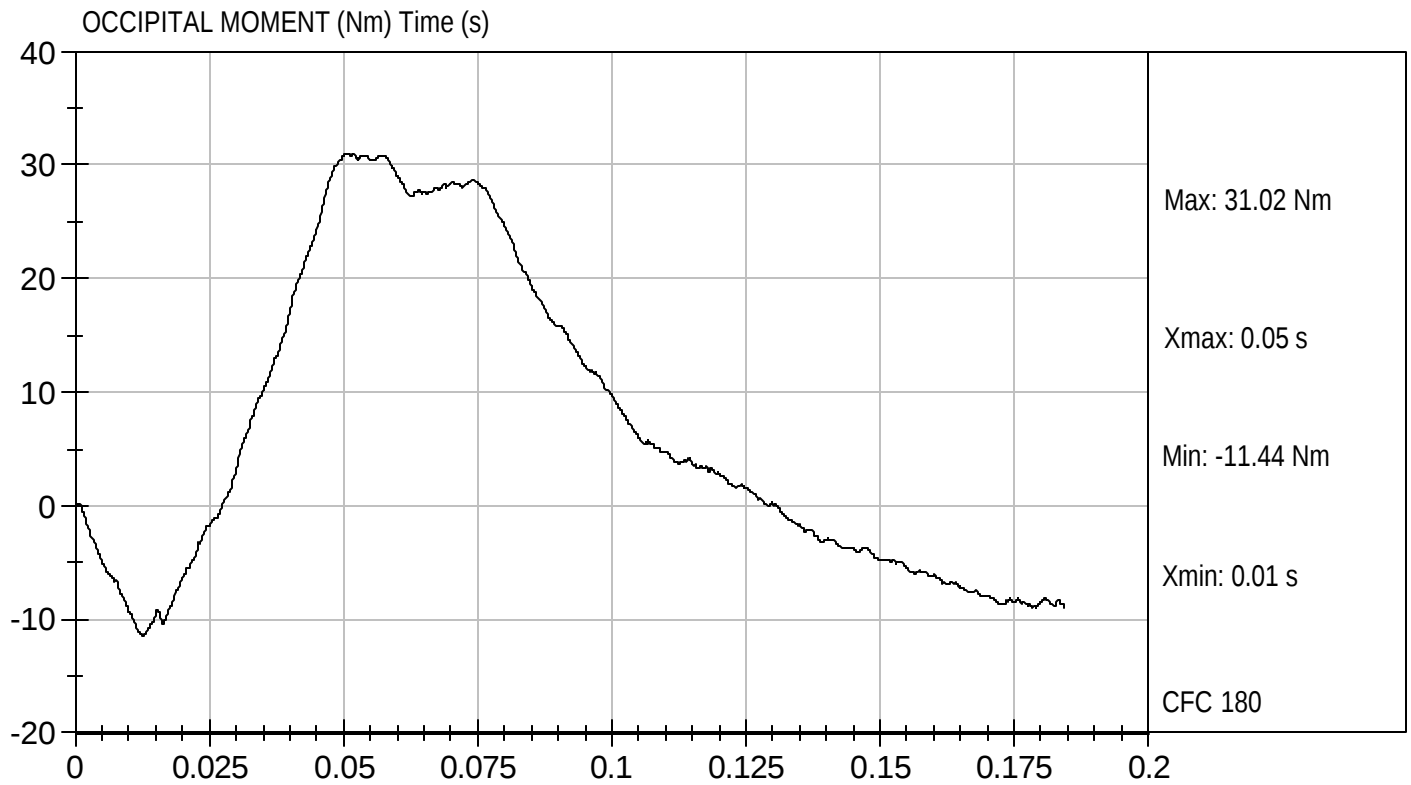
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Flexion
Componet ID: D05022

Test Date: 01/04/2005
Velocity: 16.2 ft/s, 4.94 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 155

Test Date 01/04/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

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

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C.
(572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test.
(572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 12. Complete the following table:

Neck Extension Test Results (572.123(b)(2) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.29 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.9 m/s
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	4.2 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	<u>-23</u> Nm @ <u>97</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	132 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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

James Carney
Signature

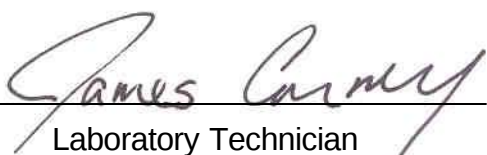
01/04/05
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05023

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.29	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.9	Pass
	30 msec	msec	3.2 to 4.2	4.2	Pass
D Plane Rotation	Max	deg	85 to 103	97	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-23	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	132	Pass
Overall Results				Pass	


Laboratory Technician

01/04/2005
Test Date

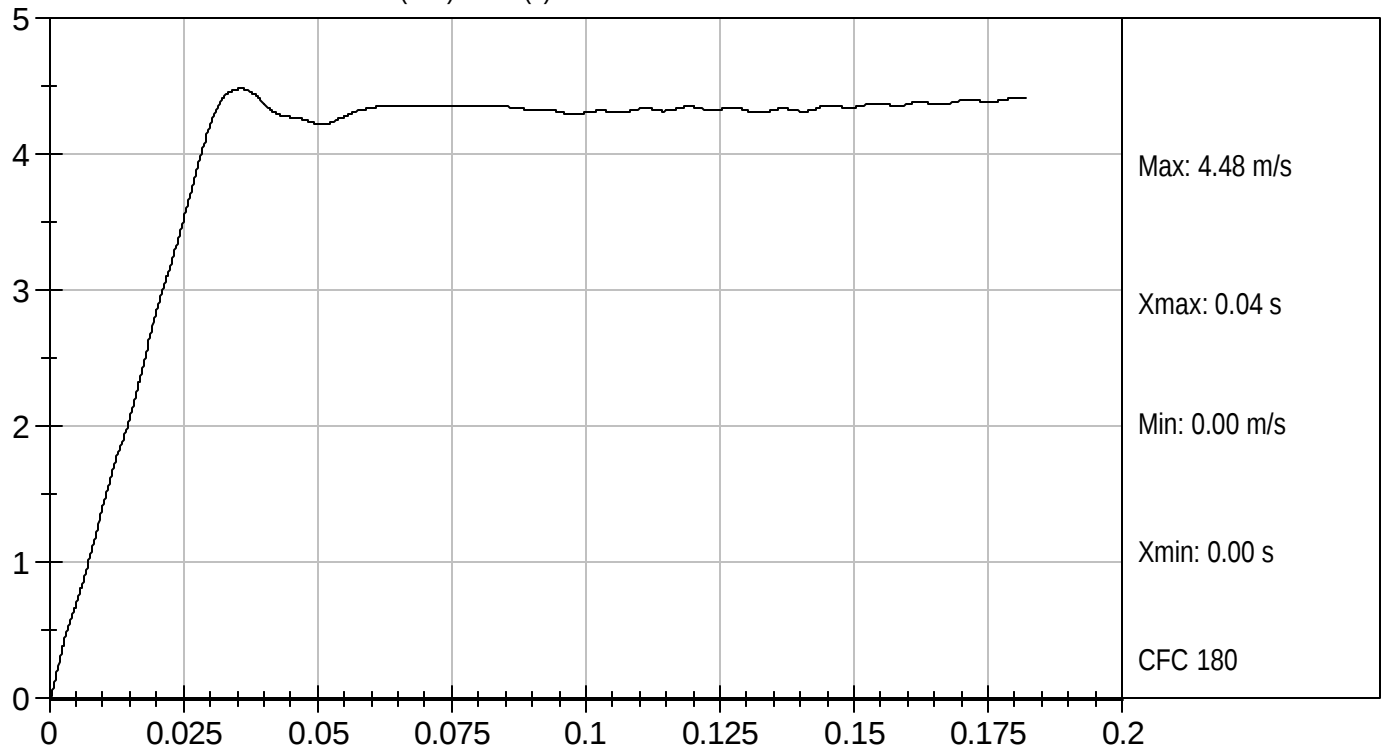

Approved By



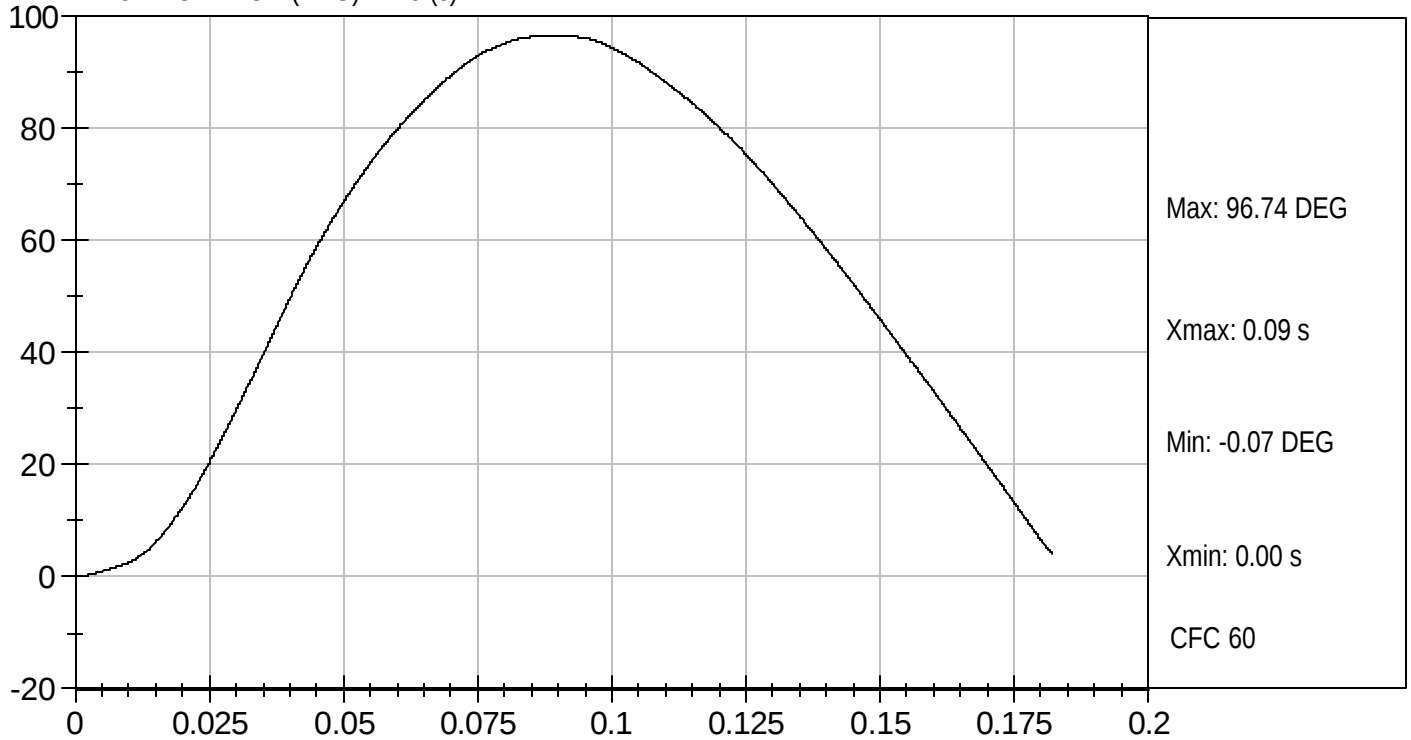
Test Desc: Neck Extension
Componet ID: D05023

Test Date: 01/04/2005
Velocity: 14.07 ft/s, 4.29 m/s

PENDULUM DECELERATION (m/s) Time (s)



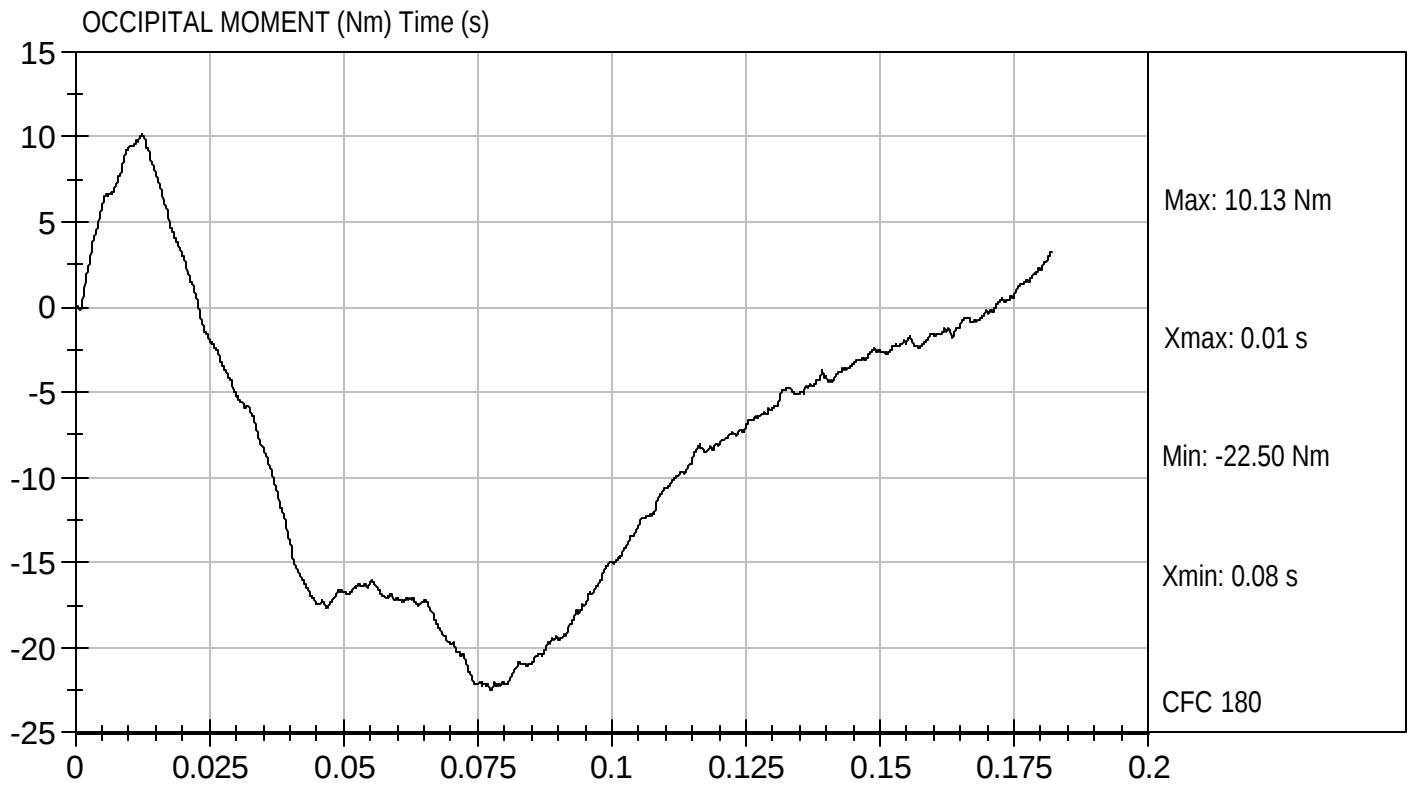
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Extension
Componet ID: D05023

Test Date: 01/04/2005
Velocity: 14.07 ft/s, 4.29 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 155

Test Date 01/05/05

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))

☒ N/A, ONLY one thorax impact test performed

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

☒ 3. The complete assembled dummy (127-0000) is used (572.124(b)).

☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____

☐ - The following repairs or replacement was performed. Record _____

☒ 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))

☒ 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))

- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

Thorax Impact Results (572.124(b) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	39 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1330 N
Peak force** between 12.5 and 38.0 mm chest compression	Max. 1.05 times the peak force between 38.0 and 46.0 mm chest compression	YES
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	78 %

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Jessica Hall
Signature

01/05/05
Date

Hybrid III Calibration Data Sheet
THORAX IMPACT
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05024

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	38 to 46	39	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.33	Pass
Internal Hysteresis	%	65 to 85	78	Pass
Peak Force 12.5 mm - 38 mm	Yes/No	< 105% of Peak Force in Deflection Corridor	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

01/05/2005
Test Date

Jeff Leonard
Approved By

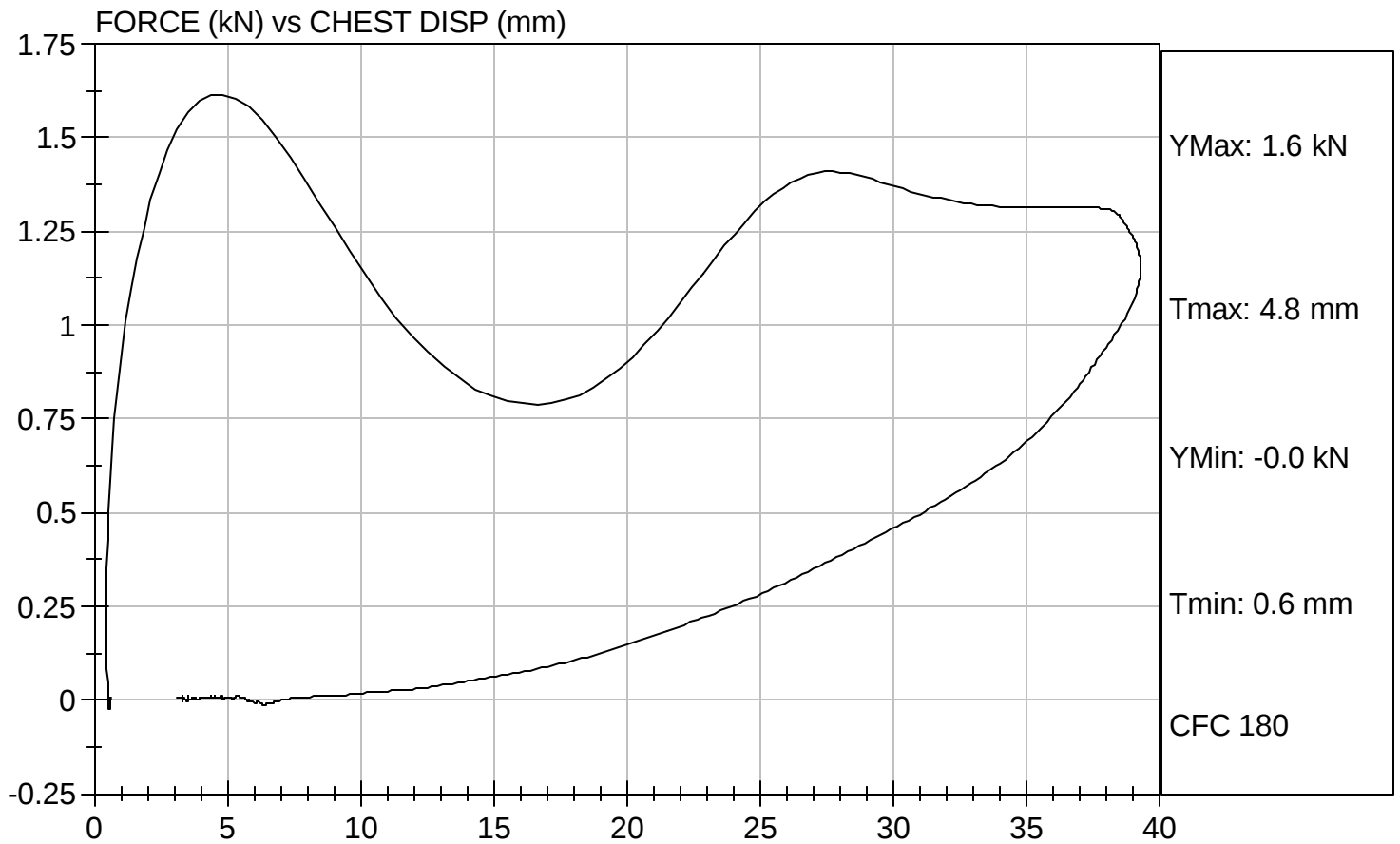


Test Description: Thorax Impact

Test Date: 01/05/2005

Component: D05024

Speed: 21.9 ft/sec, 6.68 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 155

Test Date 01/04/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))

☒ N/A, ONLY one torso flexion test performed

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

☒ 3. The complete assembled dummy (127-0000) is used (572.125(c)(2)).
☐ with legs below the femurs.

☒ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x ½inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))

☒ 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))

☒ 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))

☒ 10. Remove all external support that was implemented in 9 above. (572.125(c)(5))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))

Record reference plane angle (max. allowed 22°) 12°

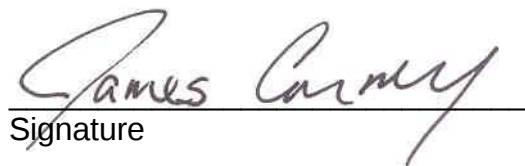
☒ 12. Attach the pull cable and the load cell. (572.125(c)(6))

☒ 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))

- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.125(c)(8))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 17. Complete the following table:

Torso Flexion Results (572.125(b), 572.125(c)(7), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 22^{\circ}$	12°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	YES
Force at $45^{\circ} \pm 0.5^{\circ}$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	192 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	15°


Signature

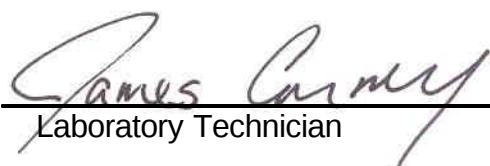
01/04/05
Date

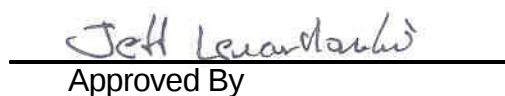
MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05027

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Initial Angle	deg	0 to 22	12	Pass
Return Angle	deg	0 to 8	15	Pass
Force at 45 deg	N	147 to 200	192	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

01/04/2005
Test Date

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 01/05/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

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

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

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

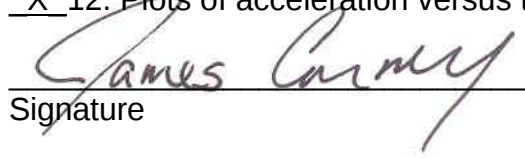
Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2050 N

*Force = impactor mass x deceleration (572.126(b))

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

Signature



01/05/05
Date

MGA RESEARCH CORPORATION

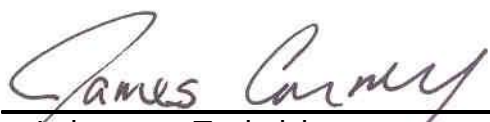
LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05026

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	21	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	2.0 to 3.0	2.1	Pass
Overall Test Results				Pass


Laboratory Technician

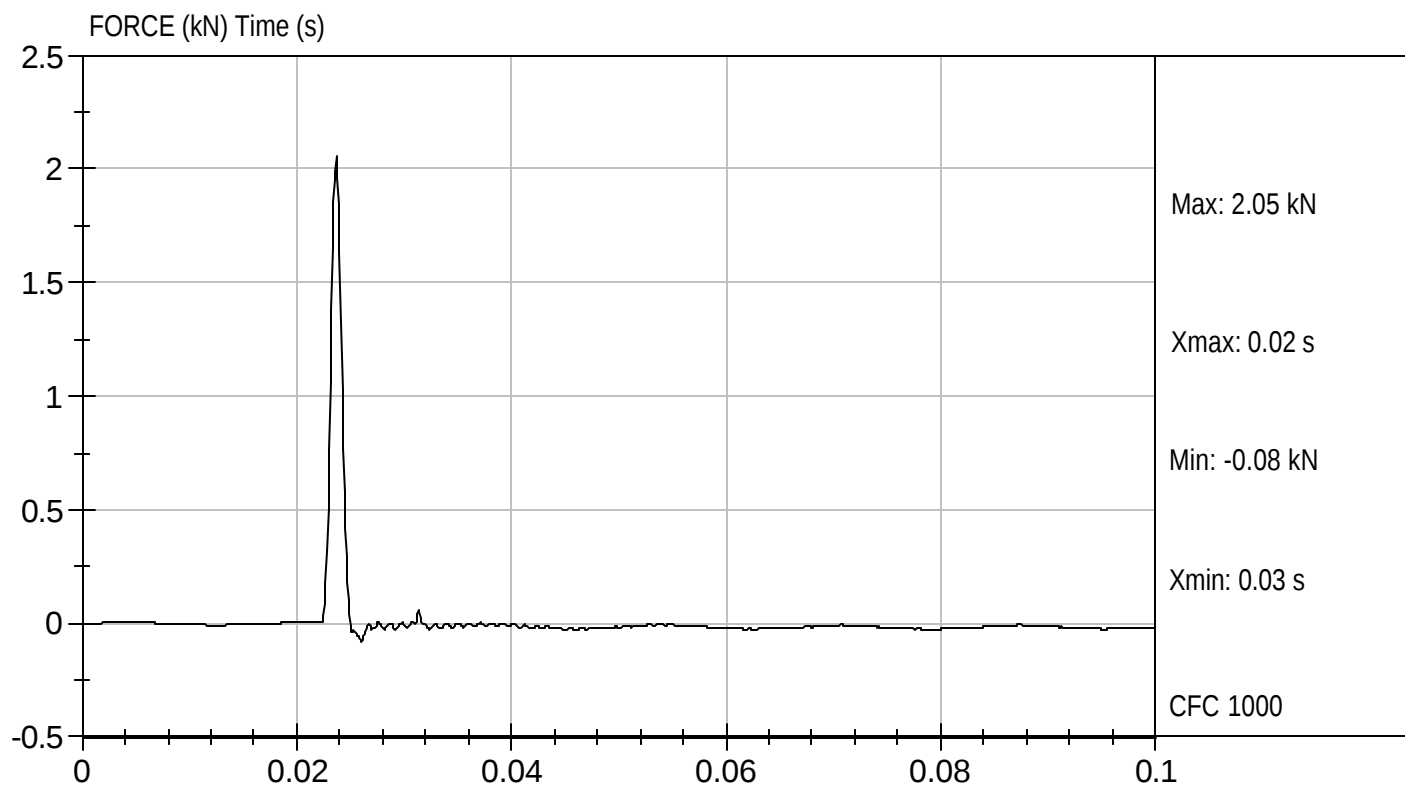

Approved By

01/05/2005
Test Date



Test Desc: Left Knee
Componet ID: D05026

Test Date: 01/05/2005
Velocity: 6.97 ft/s, 2.12 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 01/04/05

Technician Jim Carney

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.3

Record the maximum humidity 25%

Record the minimum humidity 19%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

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

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

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

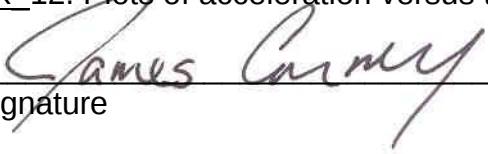
Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2140 N

*Force = impactor mass x deceleration (572.126(b))

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

Signature



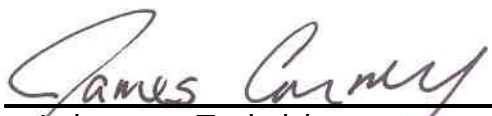
01/04/05
Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05025

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	21	Pass
Probe Speed	m/sec	2.07 to 2.13	2.13	Pass
Maximum Force	kN	2.0 to 3.0	2.1	Pass
Overall Test Results				Pass


Laboratory Technician

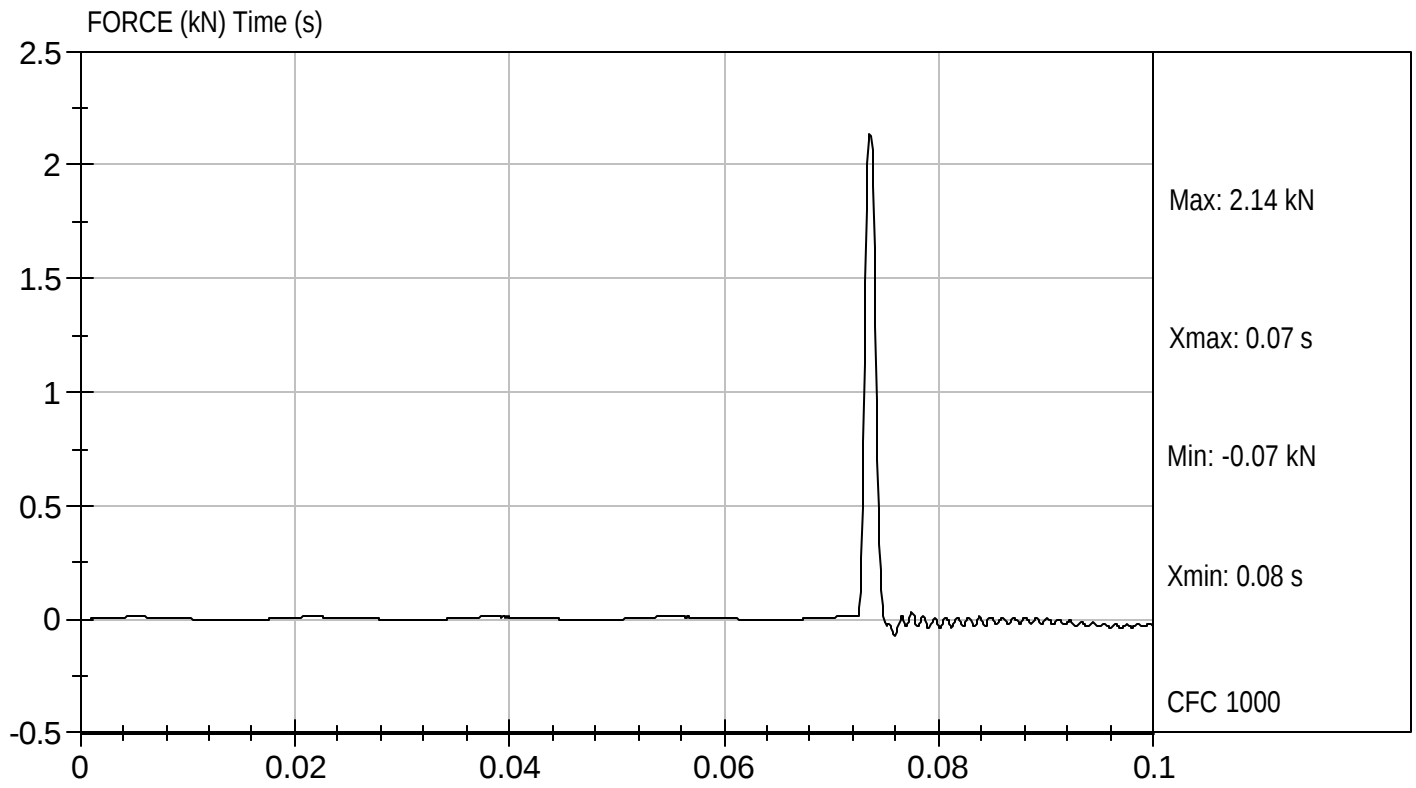

Approved By

01/04/2005
Test Date



Test Desc: Right Knee
Componet ID: D05025

Test Date: 01/04/2005
Velocity: 7 ft/s, 2.13 m/s



DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 155

Test Date 2/25/05

Technician Dave Wilcox

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))

X N/A, ONLY one head drop performed

X 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))

X 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.

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

X 5. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.

X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))

X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.122(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.8

Record the maximum humidity 27%

Record the minimum humidity 21%

X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No Damage.

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.122(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5C. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.122(c)(3))

Record the actual distance 14.8"

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

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 5C. (572.122(c)(3))

Record the right side distance 490mm

Record the left side distance 489mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.122(c)(4))

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

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	277
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	14

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


Signature

2/25/05
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05531

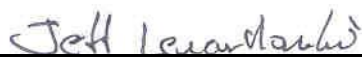
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	245 - 300	277	Pass
Peak Lateral Acceleration	G's	+/- 15	14	Pass
Unimodal above 50 G's	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/25/2005

Test Date



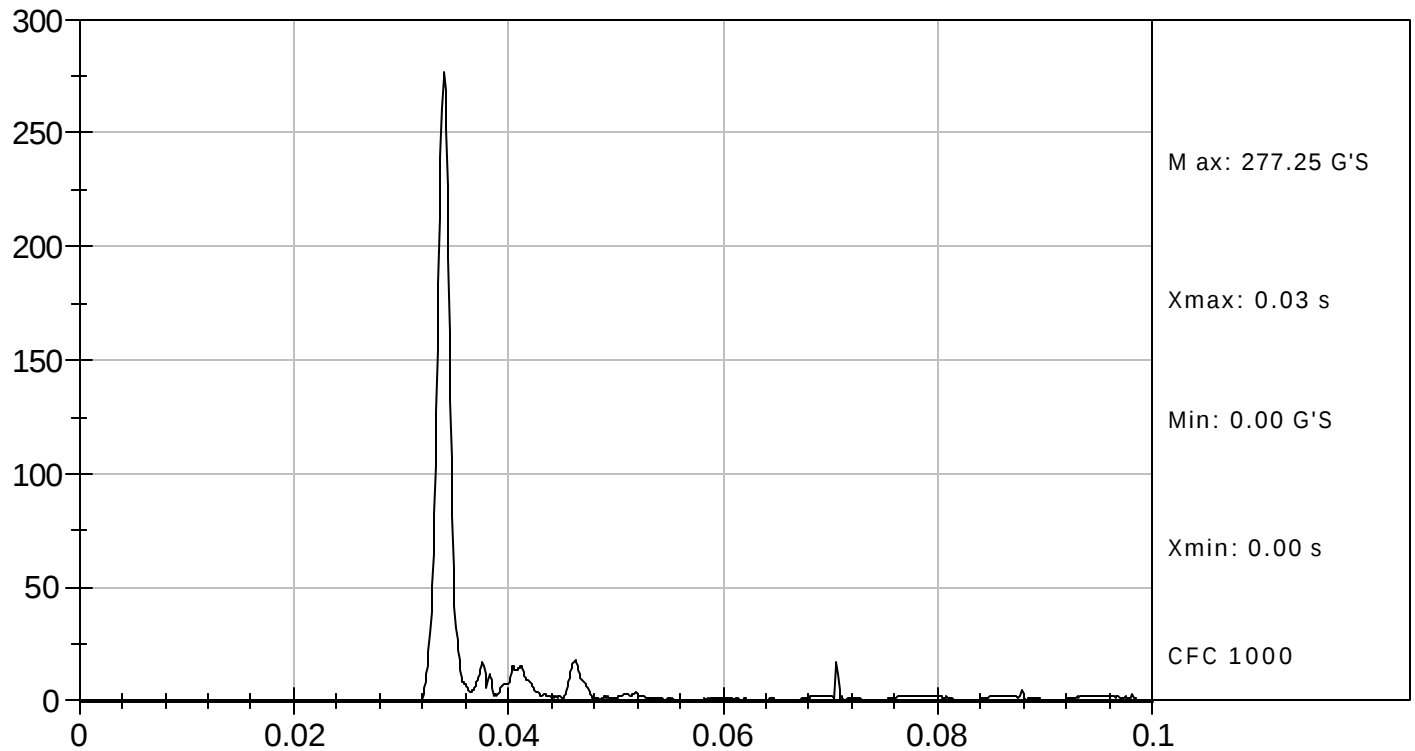
Approved By



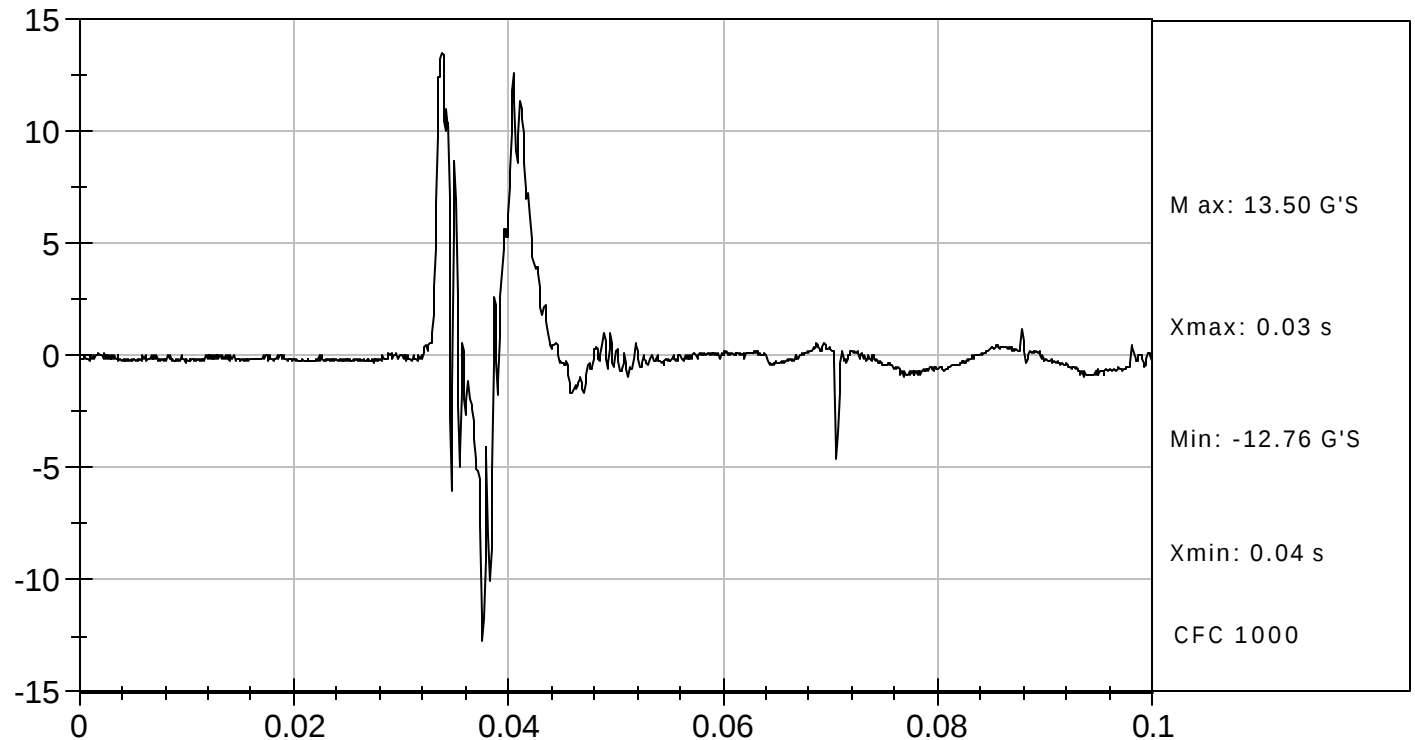
Test Desc: Head Drop
Componet ID: D05531

Test Date: 02/25/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) Time (s)



HEAD Y (G'S) Time (s)



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 155 Test Date 2/25/05

Technician Dave Wilcox

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))

Record the maximum temperature	<u>22.0</u>
Record the minimum temperature	<u>21.8</u>
Record the maximum humidity	<u>27%</u>
Record the minimum humidity	<u>21%</u>
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.
Record findings and actions: No Damage.
- ☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.96 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.6 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	3.0 m/s
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.3 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	<u>32</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	112 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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


Signature

2/25/05
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155Test I.D.: D05532

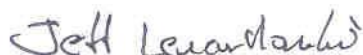
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.96	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	3.0	Pass
	30 msec	msec	3.8 to 5.0	4.3	Pass
D Plane Rotation	Max	deg	74 to 92	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	32	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 - 123	112	Pass
Overall Results				Pass	



Laboratory Technician

02/25/2005

Test Date



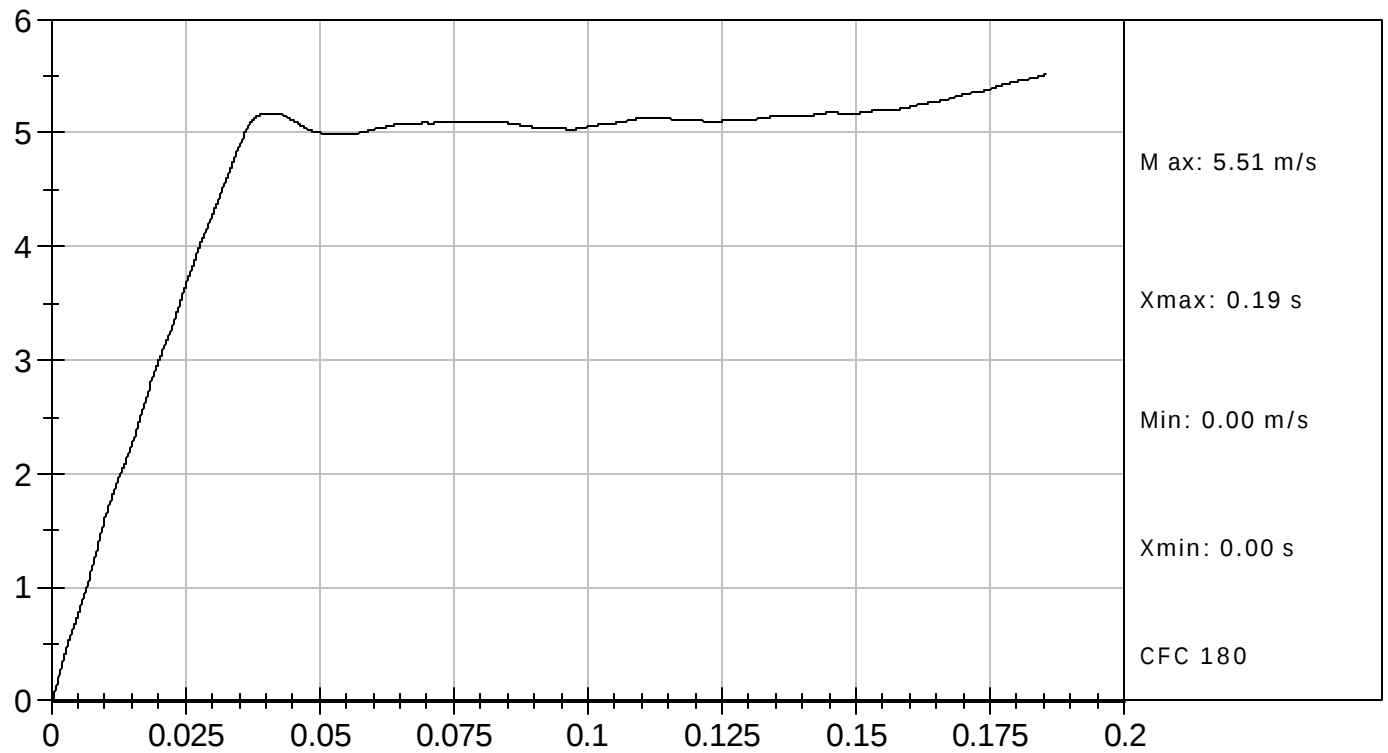
Approved By



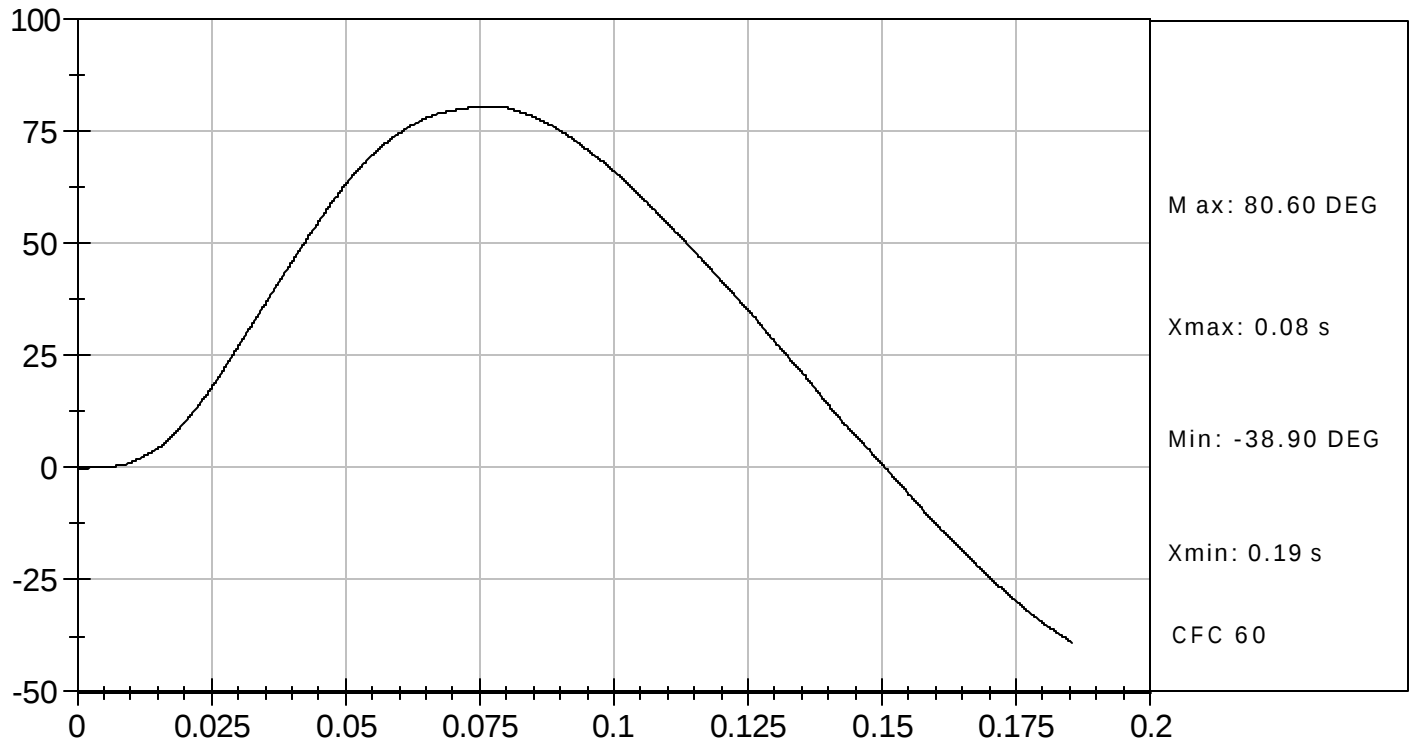
Test Desc: Neck Flexion
Componet ID: D05532

Test Date: 02/25/2005
Velocity: 16.27 ft/s, 4.96 m/s

PENDULUM DECELERATION (m/s) Time (s)



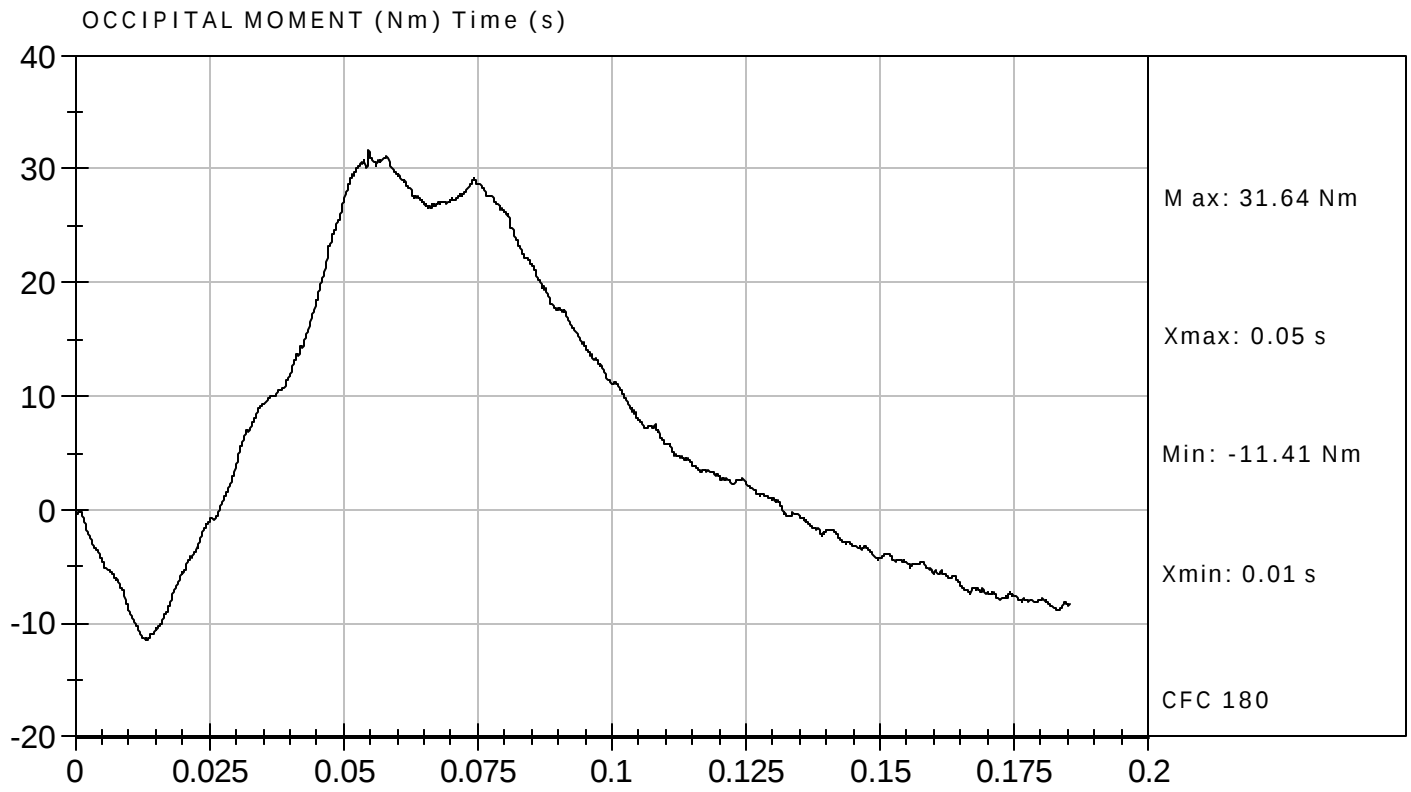
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Flexion
Componet ID: D05532

Test Date: 02/25/2005
Velocity: 16.27 ft/s, 4.96 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 155

Test Date 2/26/05

Technician Jessica Gall

 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 neck test. (572.127(o))

X N/A, ONLY one extension test performed

X 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

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. (572.123(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.1

Record the maximum humidity 17%

Record the minimum humidity 14%

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 (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

X 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C.
(572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test.
(572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 12. Complete the following table:

Neck Extension Test Results (572.123(b)(2) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.20 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.7 m/s
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.9 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	<u>-21</u> Nm @ <u>95</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	135 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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

Jessica Hall
Signature

2/26/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05533

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	16	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.20	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.7	Pass
	30 msec	msec	3.2 to 4.2	3.9	Pass
D Plane Rotation	Max	deg	85 to 103	95	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-21	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	135	Pass
Overall Results				Pass	

Jessica Hall
Laboratory Technician

02/26/2005
Test Date

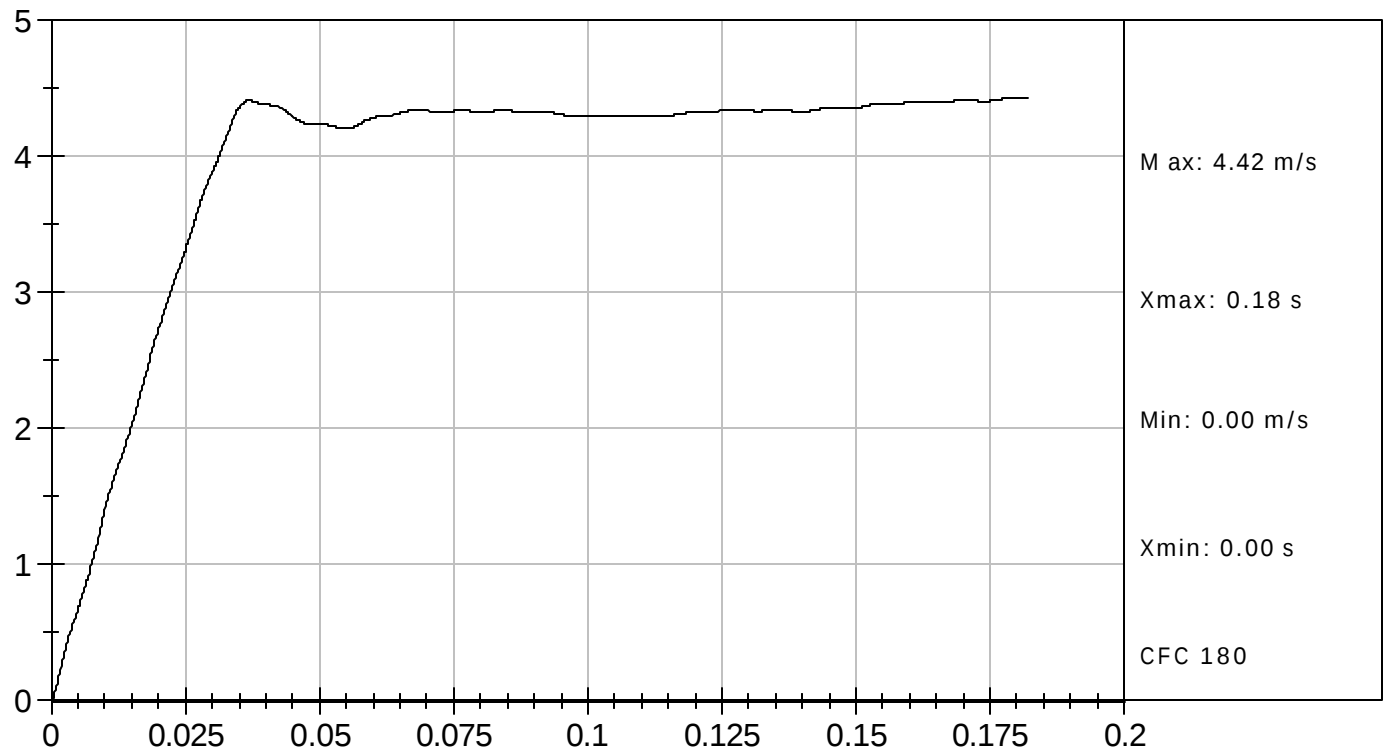
Jeff Levanthaler
Approved By



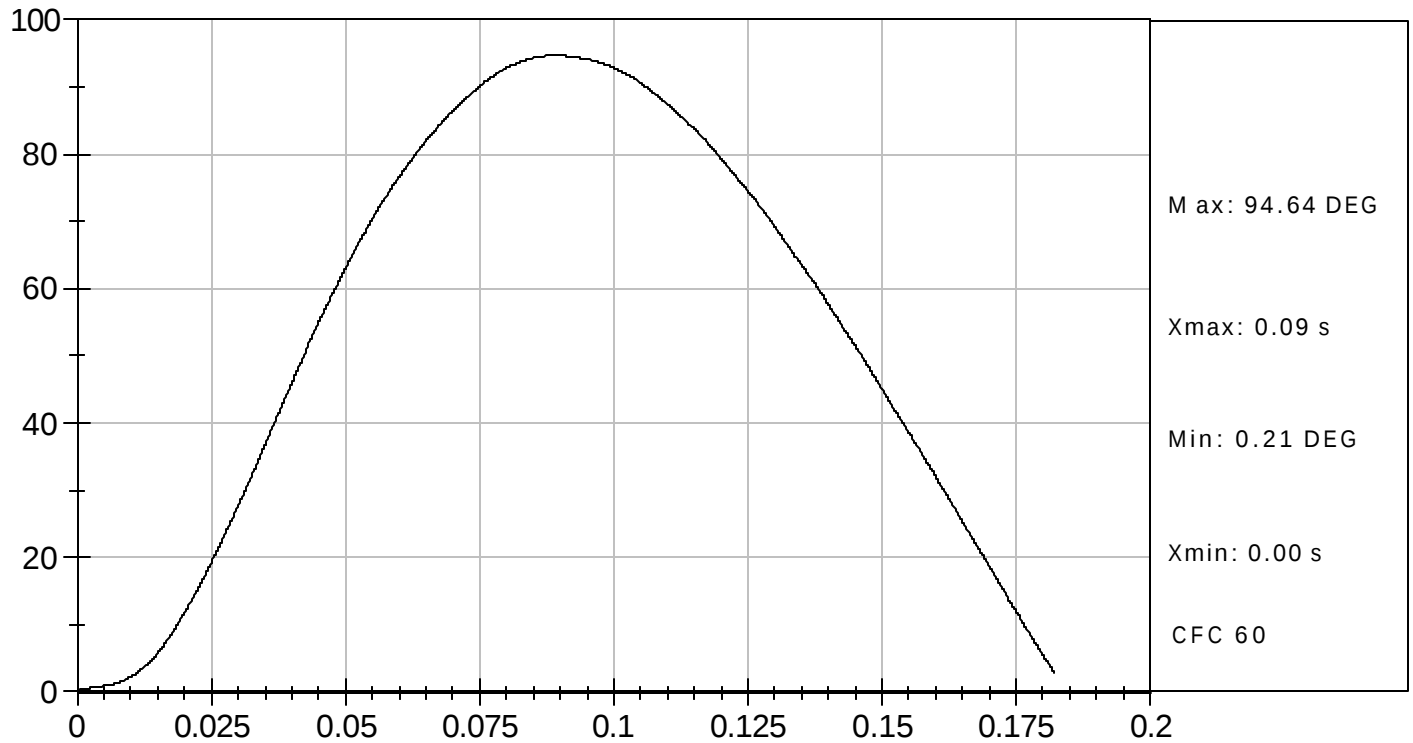
Test Desc: Neck Extension
Componet ID: D05533

Test Date: 02/26/2005
Velocity: 13.78 ft/s, 4.20 m/s

PENDULUM DECELERATION (m/s) Time (s)



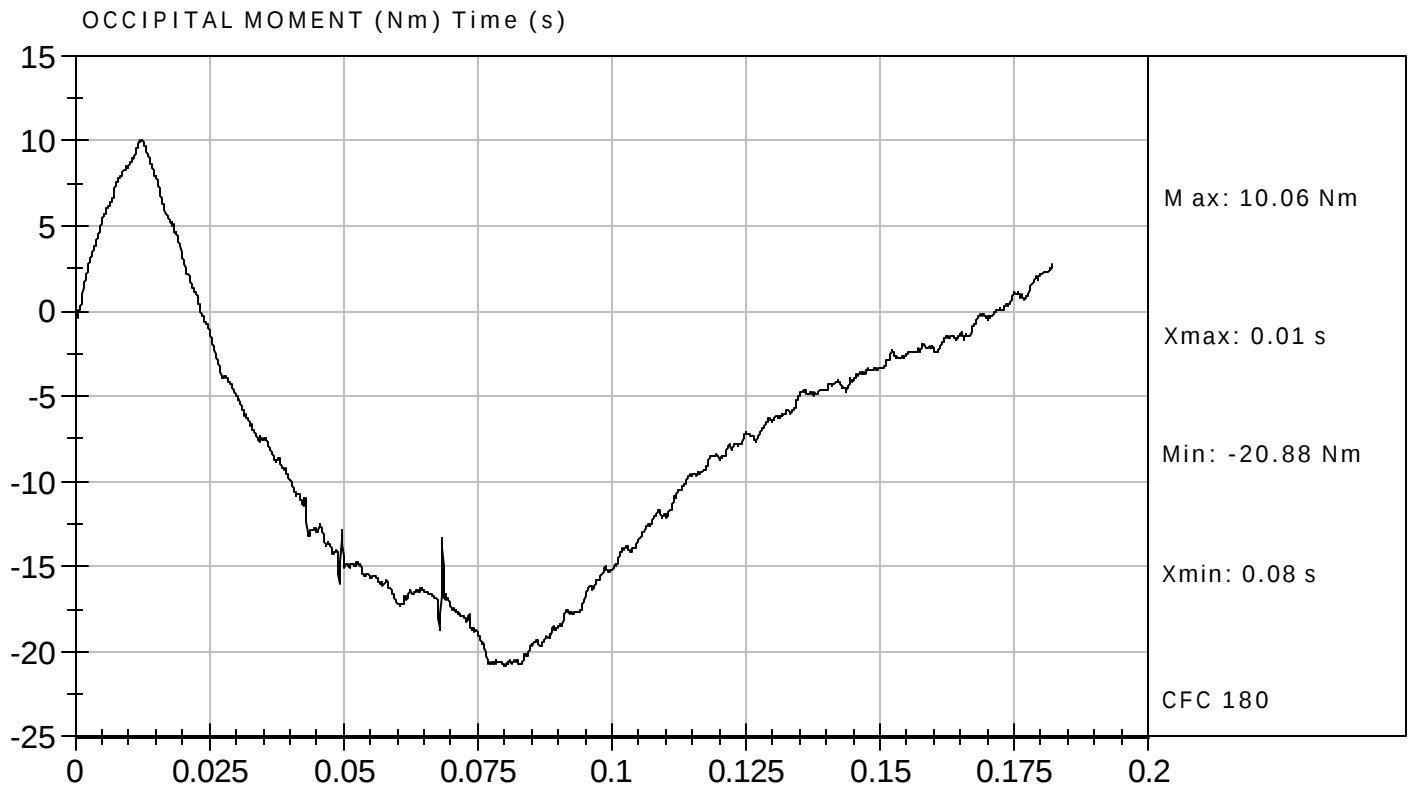
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Extension
Componet ID: D05533

Test Date: 02/26/2005
Velocity: 13.78 ft/s, 4.20 m/s



- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

Thorax Impact Results (572.124(b) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	40 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1370 N
Peak force** between 12.5 and 38.0 mm chest compression	Max. 1.05 times the peak force between 38.0 and 46.0 mm chest compression	YES
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	78 %

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

 X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.



 Signature

2/28/05

 Date

Hybrid III Calibration Data Sheet
THORAX IMPACT
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05534

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	38 to 46	40	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.37	Pass
Internal Hysteresis	%	65 to 85	78	Pass
Peak Force 12.5 mm - 38 mm	Yes/No	< 105% of Peak Force in Deflection Corridor	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/28/2005

Test Date



Approved By

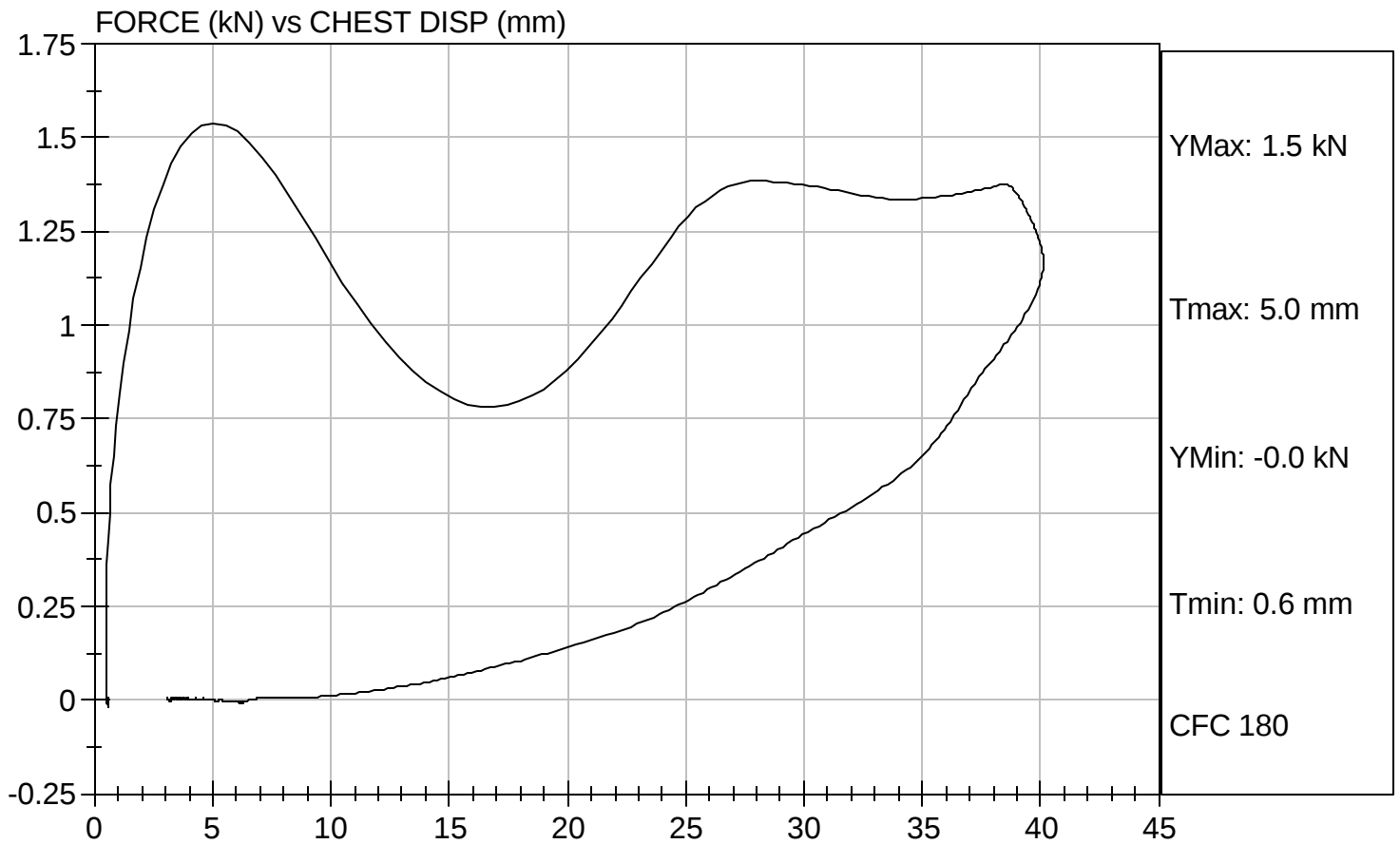


Test Description: Thorax Impact

Test Date: 02/28/2005

Component: D05534

Speed: 21.91 ft/sec, 6.68 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 155

Test Date 2/28/05

Technician Dave Wilcox

☐ Pretest calibration

☒ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))

☒ N/A, ONLY one torso flexion test performed

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

☒ 3. The complete assembled dummy (127-0000) is used (572.125(c)(2)).
☐ with legs below the femurs.

☒ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.5

Record the maximum humidity 22%

Record the minimum humidity 20%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x ½inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))

☒ 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))

☒ 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))

☒ 10. Remove all external support that was implemented in 9 above. (572.125(c)(5))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))

Record reference plane angle (max. allowed 22°) 15°

☒ 12. Attach the pull cable and the load cell. (572.125(c)(6))

☒ 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))

- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.125(c)(8))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 17. Complete the following table:

Torso Flexion Results (572.125(b), 572.125(c)(7), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 22^{\circ}$	15°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	1.0
Force at $45^{\circ} \pm 0.5^{\circ}$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	197 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	20°


Signature

2/28/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05537

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Initial Angle	deg	0 to 22	15	Pass
Return Angle	deg	0 to 8	20	Pass
Force at 45 deg	N	147 to 200	197	Pass
Overall Test Results				Pass



Laboratory Technician

02/28/2005

Test Date



Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 2/25/05

Technician Dave Wilcox

☐ Pretest calibration

☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 12C.
- ☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.8</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>21%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))
- ☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2240 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

2/25/05

Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05536

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	2.0 to 3.0	2.2	Pass
Overall Test Results				Pass



Laboratory Technician

02/25/2005

Test Date

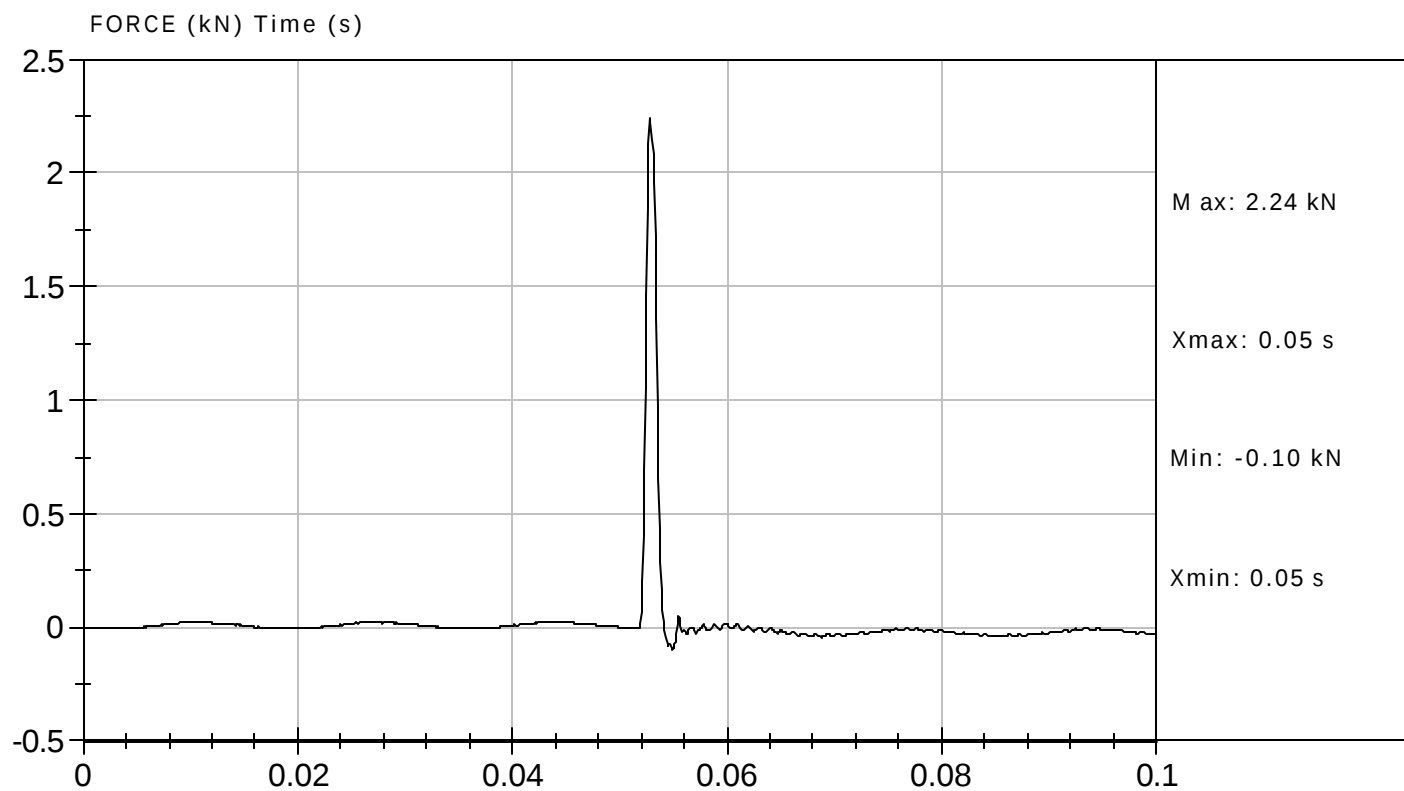


Approved By



Test Desc: Left Knee
Componet ID: D05536

Test Date: 02/25/2005
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 2/25/05

Technician Dave Wilcox

☐ Pretest calibration

☒ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.8

Record the maximum humidity 27%

Record the minimum humidity 21%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

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

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

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2180 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

2/25/05

Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05535

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	2.0 to 3.0	2.2	Pass
Overall Test Results				Pass



Laboratory Technician

02/25/2005

Test Date

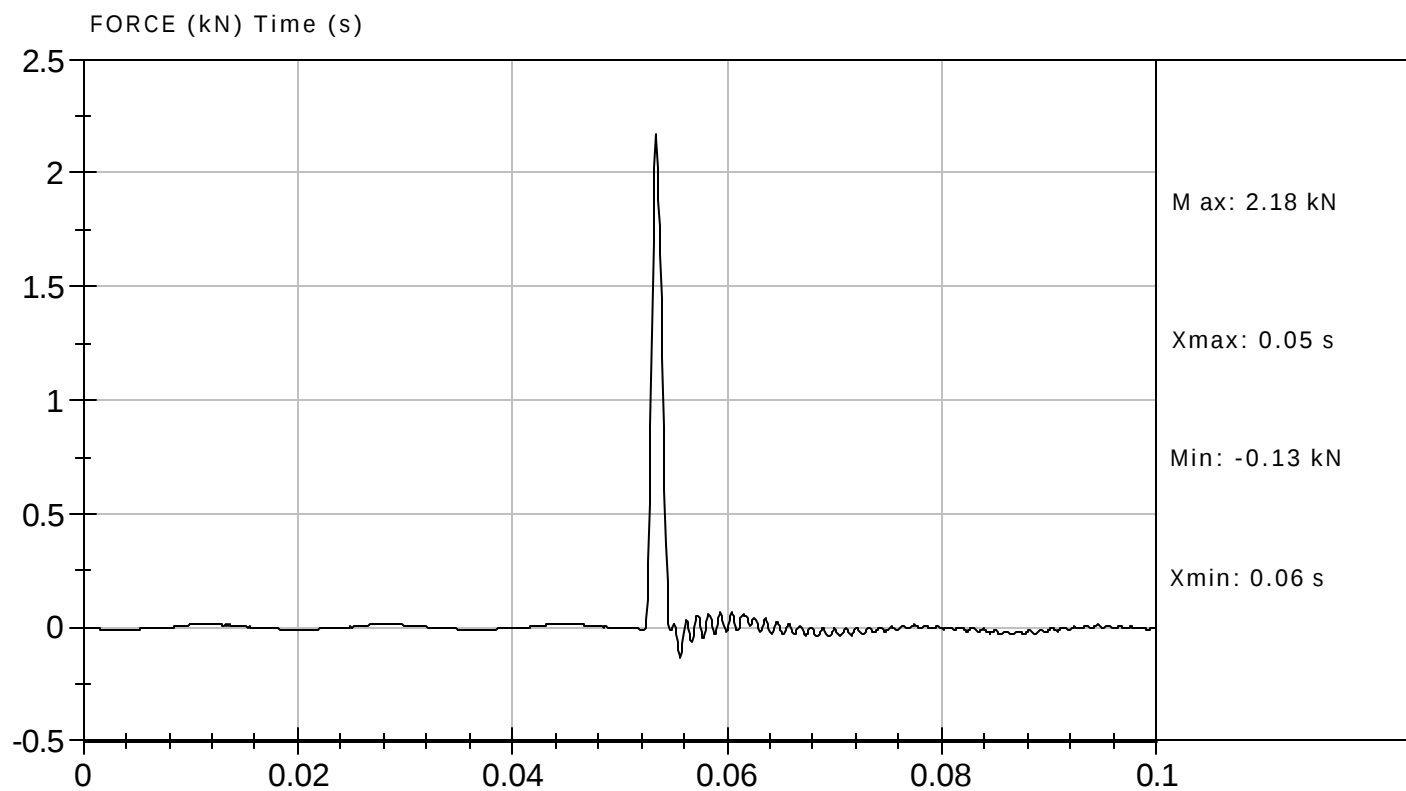


Approved By



Test Desc: Right Knee
Componet ID: D05535

Test Date: 02/25/2005
Velocity: 6.9 ft/s, 2.10 m/s



EXTERNAL DIMENSIONS

HYBRID III 6 year SN #155, PART 572, SUBPART N EXTERNAL DIMENSIONS

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	628.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	362.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	68.3
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	94.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	102.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	195.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	22.1
I	SHOULDER TO - ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	219.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	165.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	390.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	273.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	313.8

14-31

HYBRID III 6 year SN #155, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	322.4
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	140.2
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	173.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	355.7
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.0
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	174.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	221.5
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.1
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	66.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	529.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	609.5
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	583.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	159.0

DATA SHEET C1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 155

Test Date 2/23/05

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

2/24/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

2/24/05
Date

EXTERNAL DIMENSIONS

HYBRID III 6 year SN #155, PART 572, SUBPART N EXTERNAL DIMENSIONS

DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	628.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	362.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	68.3
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	94.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	102.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	195.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	22.1
I	SHOULDER TO - ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	219.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	165.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	390.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	273.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	313.8

15-1

HYBRID III 6 year SN #155, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	322.4
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	140.2
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	173.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	355.7
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.0
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	174.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	221.5
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.1
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	66.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	529.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	609.5
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	583.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	159.0

DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 155

Test Date 2/25/05

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))

☒ N/A, ONLY one head drop performed

☒ 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))

☒ 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.

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

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

☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))

☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.122(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.8

Record the maximum humidity 27%

Record the minimum humidity 21%

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

Record findings and actions: No Damage.

☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.122(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5C. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.122(c)(3))

Record the actual distance 14.8"

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

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 5C. (572.122(c)(3))

Record the right side distance 490mm

Record the left side distance 489mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.122(c)(4))

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

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	277
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	14

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


Signature

2/25/05
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05531

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	245 - 300	277	Pass
Peak Lateral Acceleration	G's	+/- 15	14	Pass
Unimodal above 50 G's	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/25/2005

Test Date



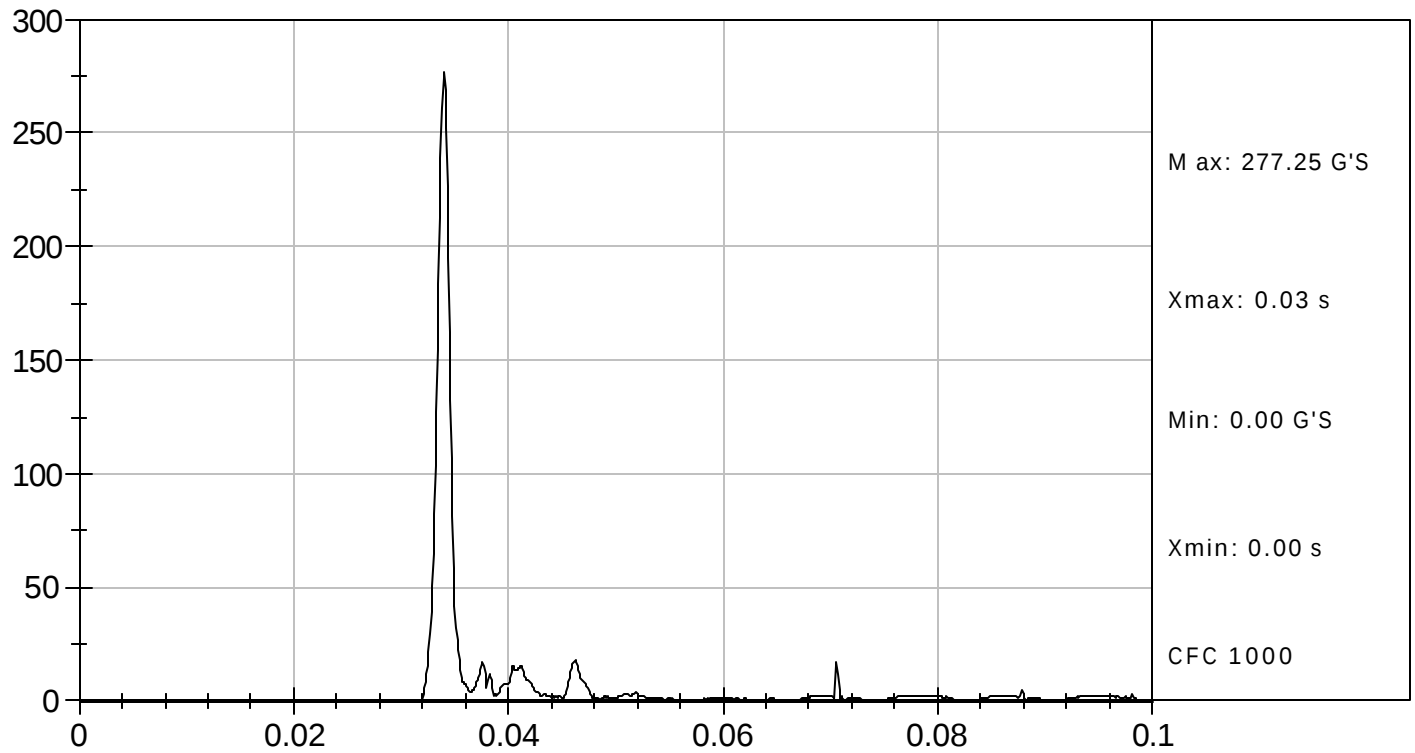
Approved By



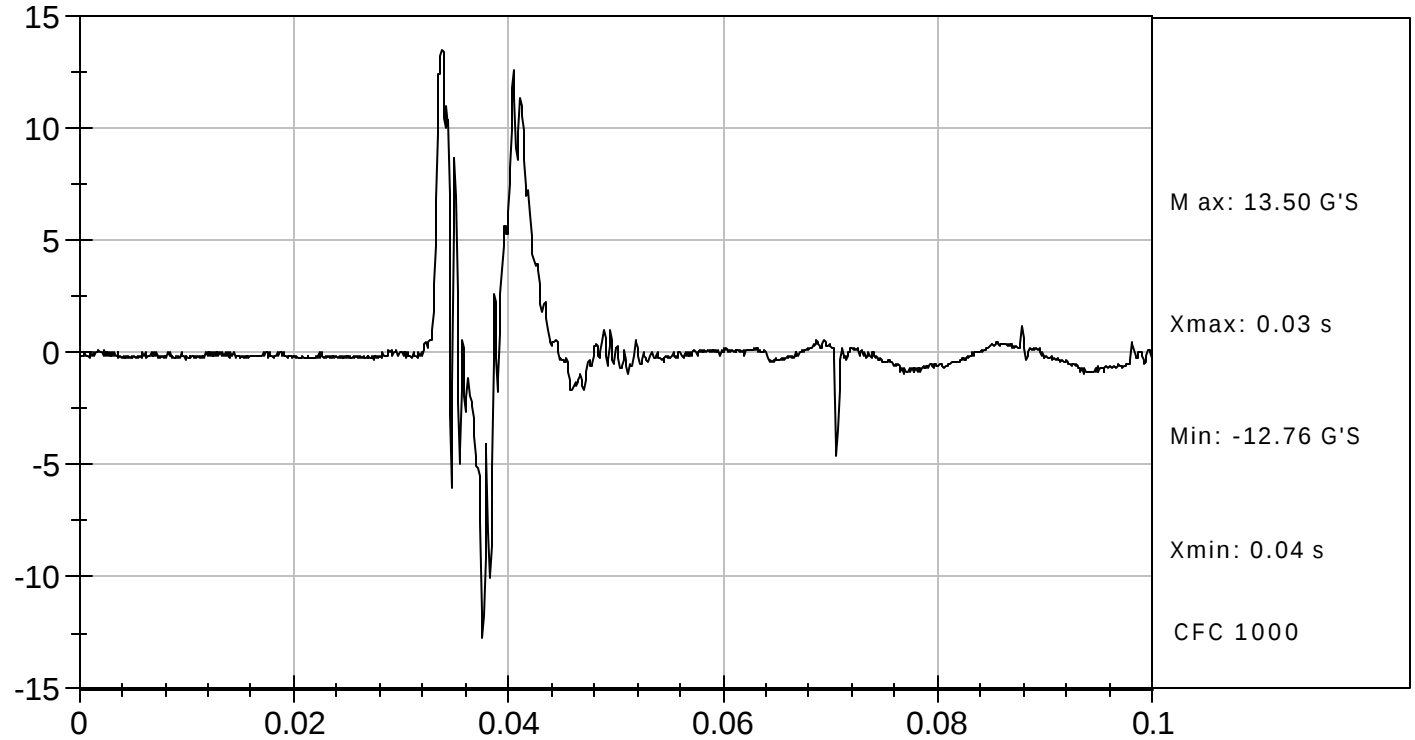
Test Desc: Head Drop
Componet ID: D05531

Test Date: 02/25/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) Time (s)



HEAD Y (G'S) Time (s)



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 155 Test Date 2/25/05

Technician Dave Wilcox

☒ Pretest calibration
☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.8</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>21%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.
Record findings and actions: No Damage.
- ☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.96 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.6 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	3.0 m/s
	@30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.3 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	<u>32</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	112 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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


Signature

2/25/05
Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05532

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	27	Pass
Pendulum Speed		m/sec	4.83 to 5.07	4.96	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	3.0	Pass
	30 msec	msec	3.8 to 5.0	4.3	Pass
D Plane Rotation	Max	deg	74 to 92	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	32	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 - 123	112	Pass
Overall Results				Pass	



Laboratory Technician

02/25/2005

Test Date



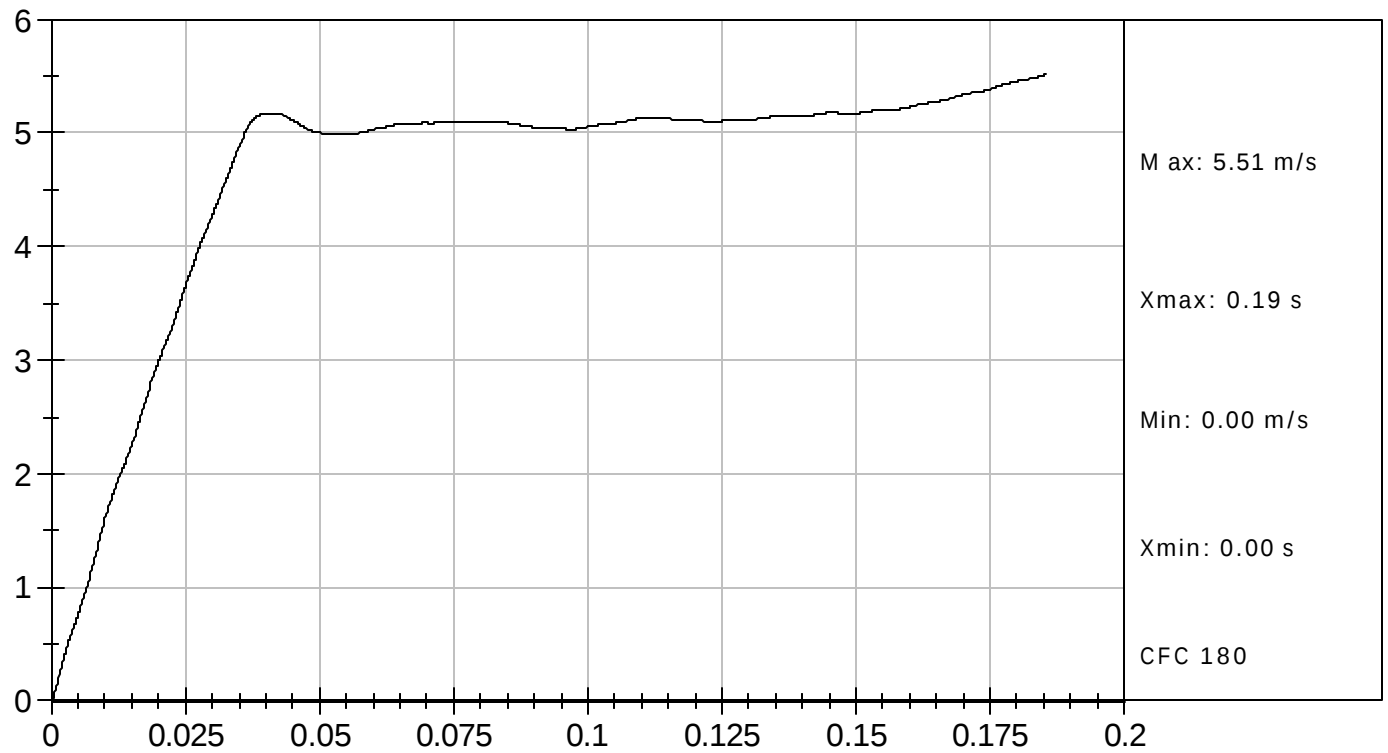
Approved By



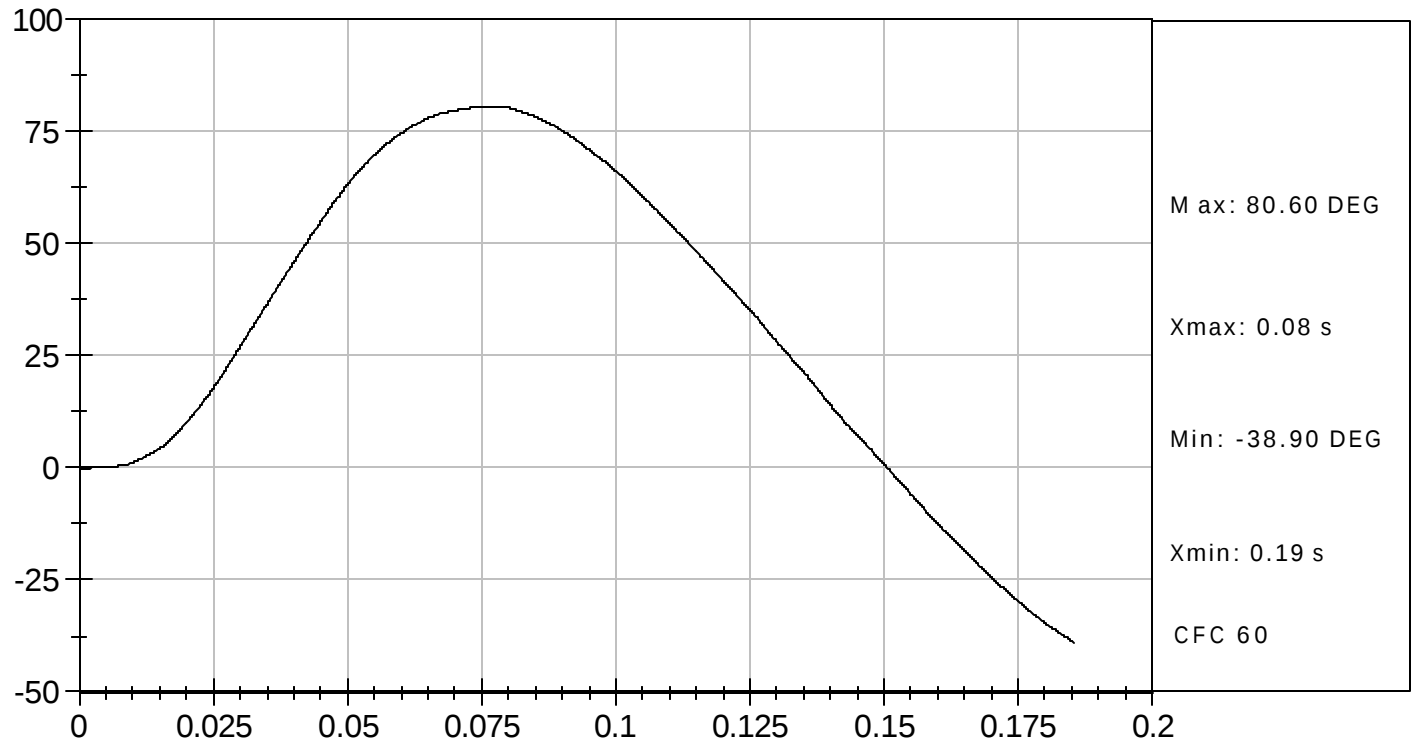
Test Desc: Neck Flexion
Componet ID: D05532

Test Date: 02/25/2005
Velocity: 16.27 ft/s, 4.96 m/s

PENDULUM DECELERATION (m/s) Time (s)



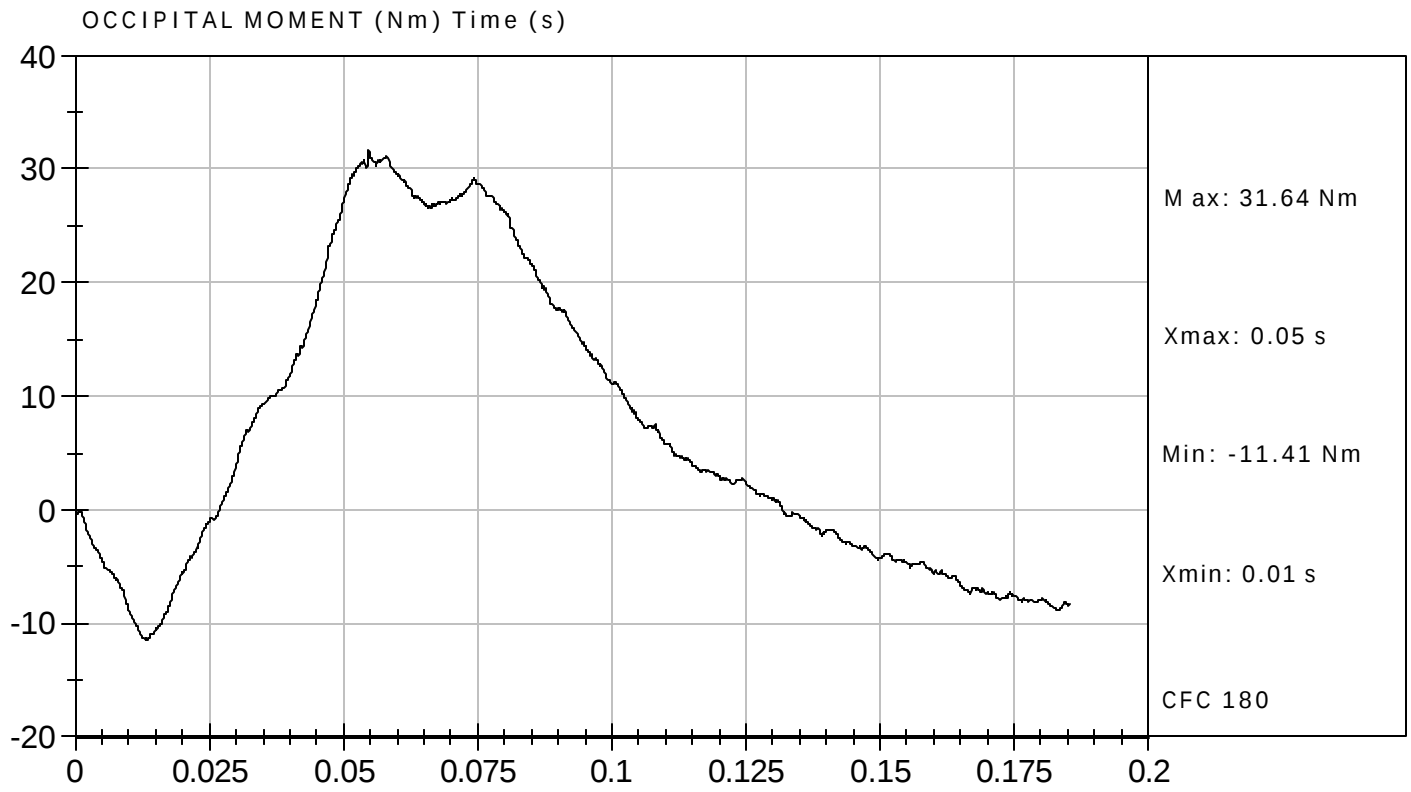
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Flexion
Componet ID: D05532

Test Date: 02/25/2005
Velocity: 16.27 ft/s, 4.96 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 155

Test Date 2/26/05

Technician Jessica Gall

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))

☒ N/A, ONLY one extension test performed

☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.1

Record the maximum humidity 17%

Record the minimum humidity 14%

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

Record findings and actions: No Damage.

☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation.

Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.

Record findings and actions: No Damage.

☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))

☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C.
(572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test.
(572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 12. Complete the following table:

Neck Extension Test Results (572.123(b)(2) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.20 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.7 m/s
	@30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.9 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	<u>-21</u> Nm @ <u>95</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	135 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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

Jessica Hall
Signature

2/26/04
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: d05533

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	16	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.20	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.4	Pass
	20 msec	msec	2.2 to 3.0	2.7	Pass
	30 msec	msec	3.2 to 4.2	3.9	Pass
D Plane Rotation	Max	deg	85 to 103	95	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-21	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	135	Pass
Overall Results				Pass	

Jessica Hall
Laboratory Technician

02/26/2005
Test Date

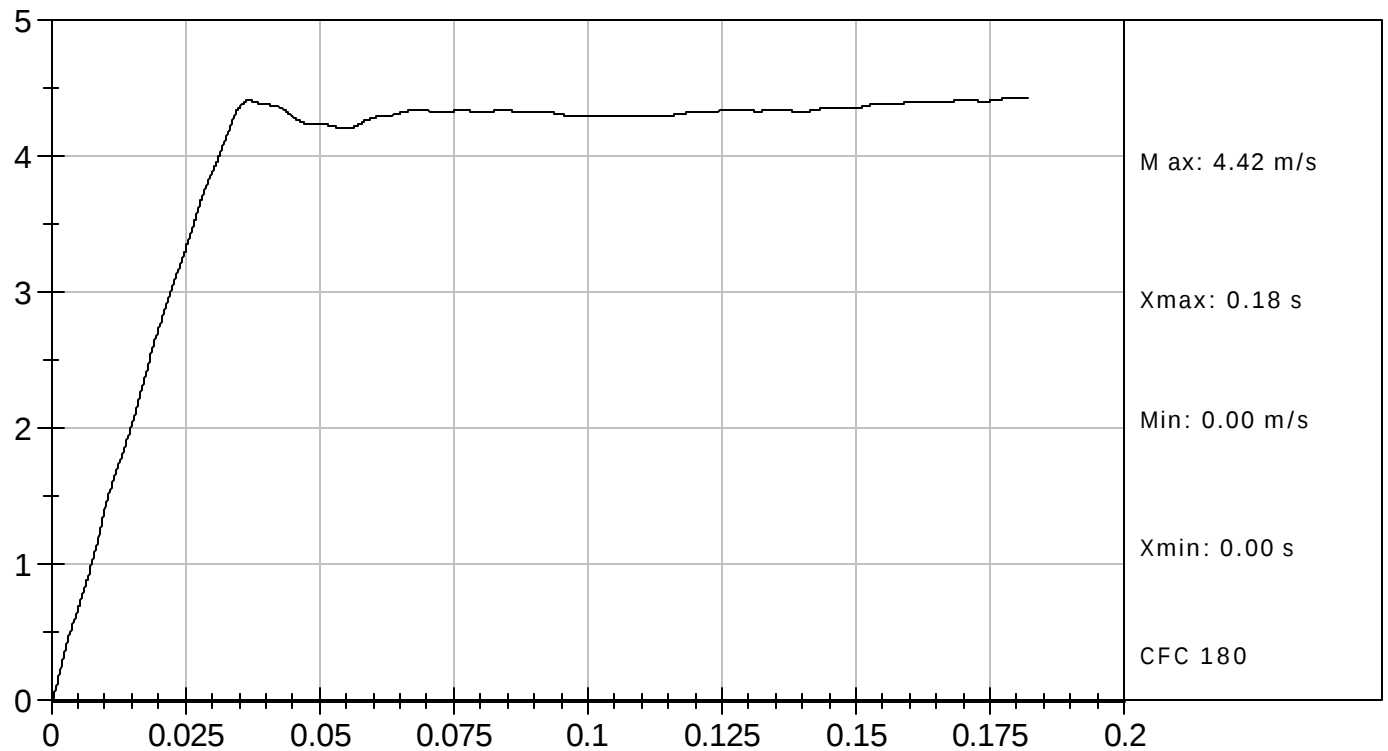
Jeff Leonard
Approved By



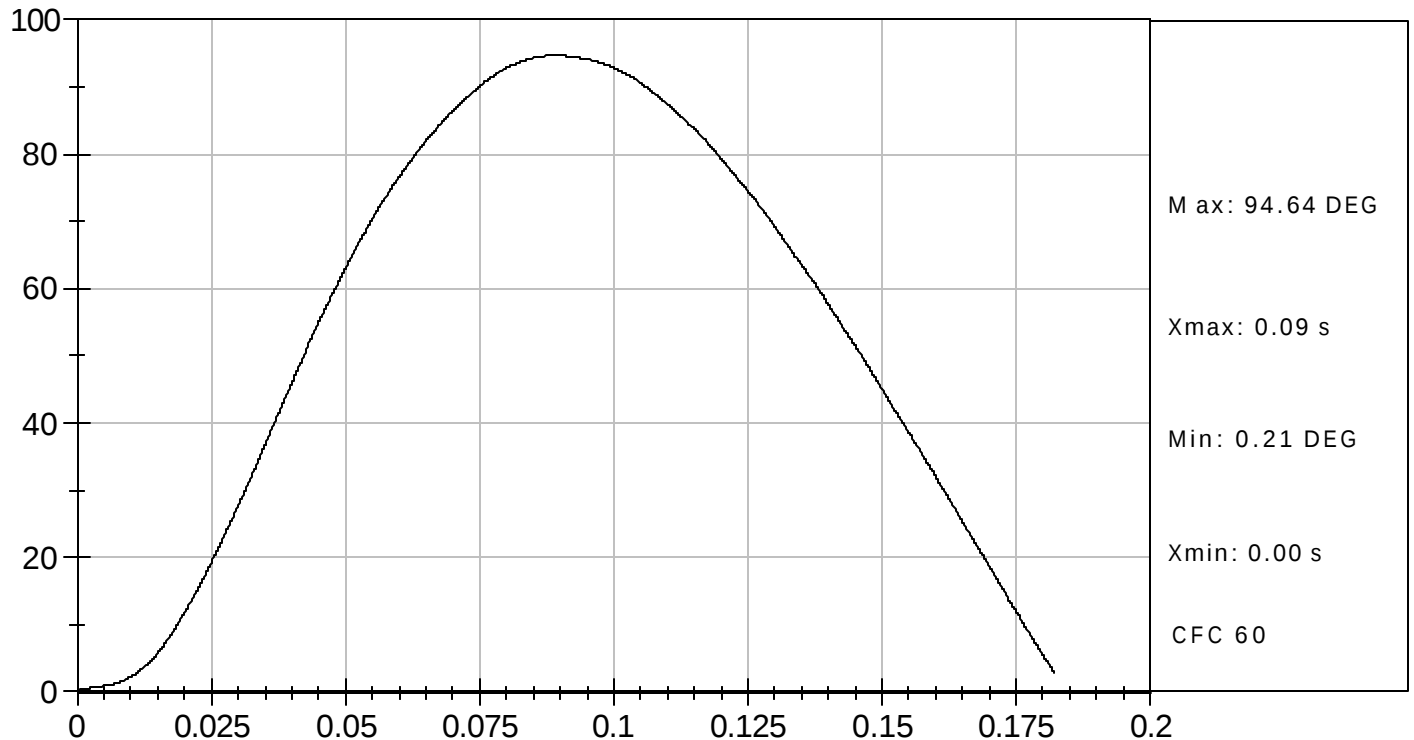
Test Desc: Neck Extension
Componet ID: d05533

Test Date: 02/26/2005
Velocity: 13.78 ft/s, 4.20 m/s

PENDULUM DECELERATION (m/s) Time (s)



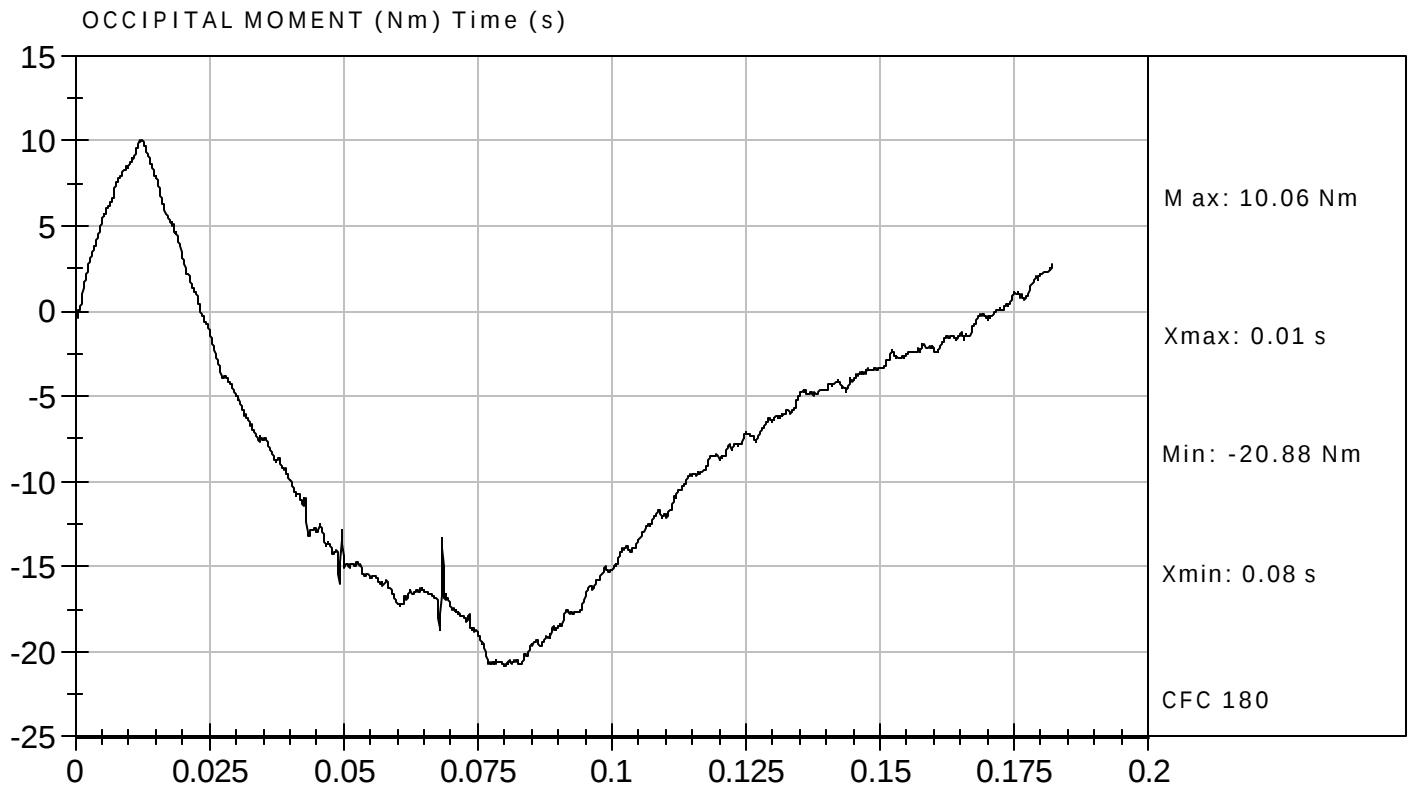
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Extension
Componet ID: d05533

Test Date: 02/26/2005
Velocity: 13.78 ft/s, 4.20 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 155 Test Date 2/28/05

Technician Dave Wilcox

☒ Pretest calibration
☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11C.
- ☒ 3. The complete assembled dummy (127-0000) is used (572.124(b)).
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.7</u> |
| Record the minimum temperature | <u>21.5</u> |
| Record the maximum humidity | <u>22%</u> |
| Record the minimum humidity | <u>20%</u> |
- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No damage
☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____
- ☐ - The following repairs or replacement was performed. Record _____
- ☒ 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))
- ☒ 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))

- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

Thorax Impact Results (572.124(b) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	40 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1370 N
Peak force** between 12.5 and 38.0 mm chest compression	Max. 1.05 times the peak force between 38.0 and 46.0 mm chest compression	YES
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	78 %

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.


Signature

2/28/05
Date

Hybrid III Calibration Data Sheet
THORAX IMPACT
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05534

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	38 to 46	40	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.37	Pass
Internal Hysteresis	%	65 to 85	78	Pass
Peak Force 12.5 mm - 38 mm	Yes/No	< 105% of Peak Force in Deflection Corridor	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

02/28/2005

Test Date



Approved By

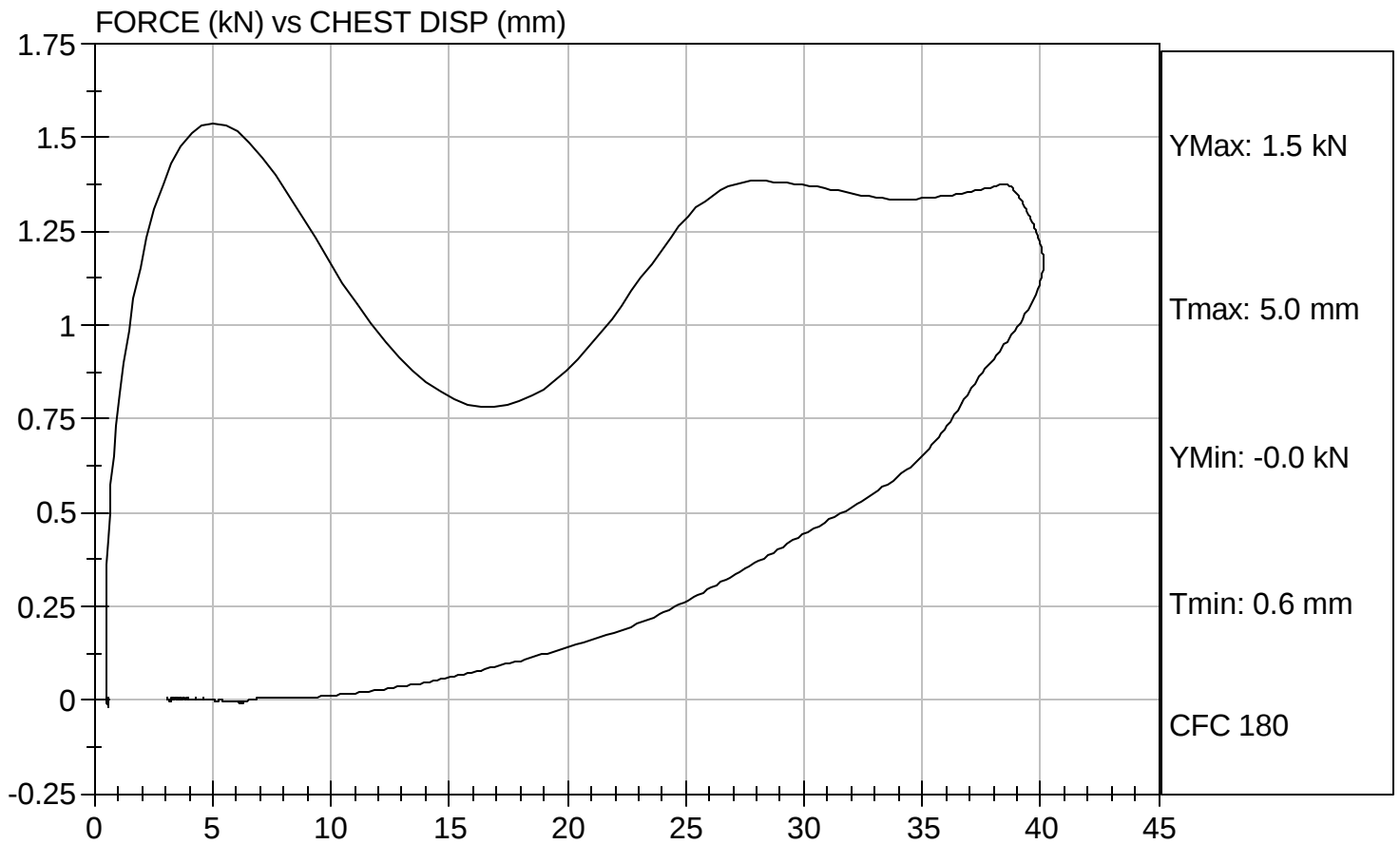


Test Description: Thorax Impact

Test Date: 02/28/2005

Component: D05534

Speed: 21.91 ft/sec, 6.68 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 155

Test Date 2/28/05

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))

☒ N/A, ONLY one torso flexion test performed

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

☒ 3. The complete assembled dummy (127-0000) is used (572.125(c)(2)).
☐ with legs below the femurs.

☒ without legs below the femurs.

☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 21.7

Record the minimum temperature 21.5

Record the maximum humidity 22%

Record the minimum humidity 20%

☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x ½inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))

☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))

☒ 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))

☒ 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))

☒ 10. Remove all external support that was implemented in 9 above. (572.125(c)(5))

☒ 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))

Record reference plane angle (max. allowed 22°) 15°

☒ 12. Attach the pull cable and the load cell. (572.125(c)(6))

☒ 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))

- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.125(c)(8))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 17. Complete the following table:

Torso Flexion Results (572.125(b), 572.125(c)(7), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 22^{\circ}$	15°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	1.0
Force at $45^{\circ} \pm 0.5^{\circ}$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	197 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	20°



Signature

2/28/05

Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05537

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Initial Angle	deg	0 to 22	15	Pass
Return Angle	deg	0 to 8	20	Pass
Force at 45 deg	N	147 to 200	197	Pass
Overall Test Results				Pass



Laboratory Technician

02/28/2005

Test Date



Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 2/25/05

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 12C.
- ☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>22.0</u> |
| Record the minimum temperature | <u>21.8</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>21%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))
- ☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2240 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

02/25/05

Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05536

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	2.0 to 3.0	2.2	Pass
Overall Test Results				Pass



Laboratory Technician

02/25/2005

Test Date

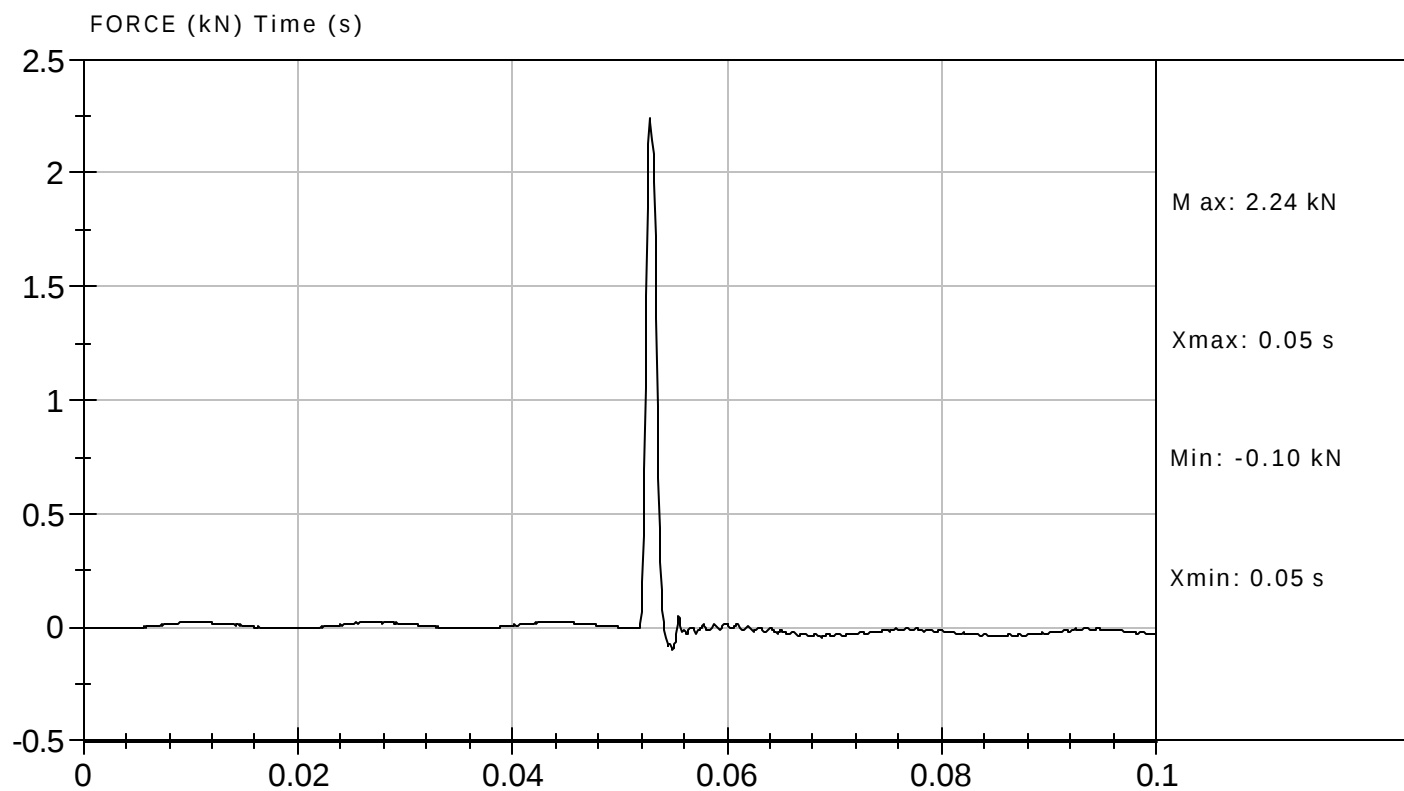


Approved By



Test Desc: Left Knee
Componet ID: D05536

Test Date: 02/25/2005
Velocity: 6.88 ft/s, 2.10 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 2/25/05

Technician Dave Wilcox

☒ Pretest calibration

☐ Post test calibration verification

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

☐ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

☒ N/A, ONLY one knee impact test performed

☒ 2. The test fixture conforms to the specifications in Figure 12C.

☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))

Record the maximum temperature 22.0

Record the minimum temperature 21.8

Record the maximum humidity 27%

Record the minimum humidity 21%

☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

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

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

☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

☒ 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2180 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

2/25/05

Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05535

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	2.0 to 3.0	2.2	Pass
Overall Test Results				Pass



Laboratory Technician

02/25/2005

Test Date

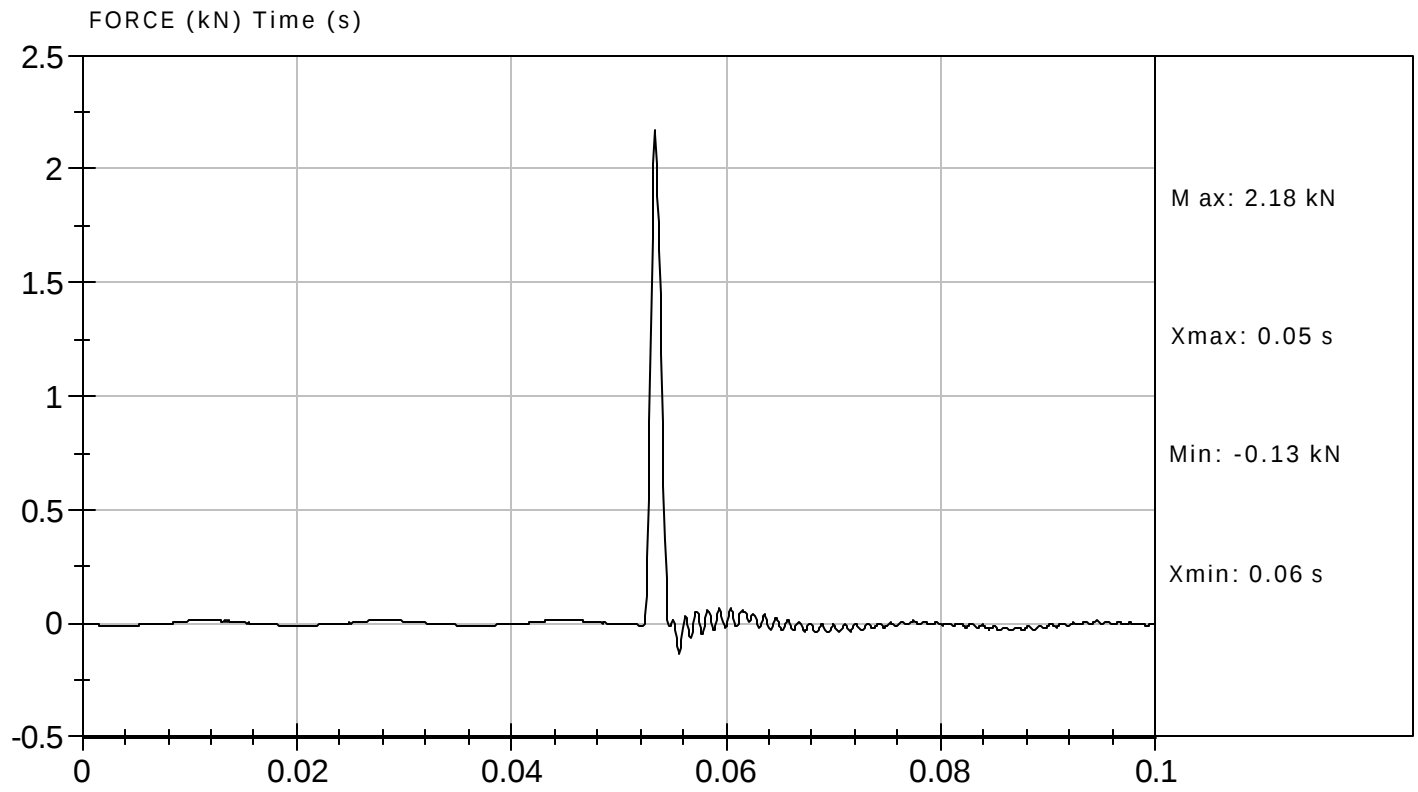


Approved By



Test Desc: Right Knee
Componet ID: D05535

Test Date: 02/25/2005
Velocity: 6.9 ft/s, 2.10 m/s



DATA SHEET C3
HEAD DROP TEST (572.122)

Dummy Serial Number 155 Test Date 3/10/05

Technician Joe Fleck

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))
- ☒ 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))
- ☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.122(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>21%</u> |
| Record the minimum humidity | <u>16%</u> |
- ☒ 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage.
- ☒ 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.122(c)(2))

- X 10. Suspend and orient the head assembly as shown in Figure 5C. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.122(c)(3))

Record the actual distance 14.8"

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

- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 5C. (572.122(c)(3))

Record the right side distance 490mm

Record the left side distance 489mm

- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.122(c)(4))

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

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness 50.9 mm

Record width 604 mm

Record length 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	267
Resultant versus time history curve	Unimodal	YES
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	YES
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	11

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

Joe Fleck
Signature

3/10/05
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05711

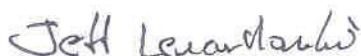
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	16	Pass
Peak Resultant Acceleration	G's	245 - 300	267	Pass
Peak Lateral Acceleration	G's	+/- 15	11	Pass
Unimodal above 50 G's	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

03/10/2005

Test Date



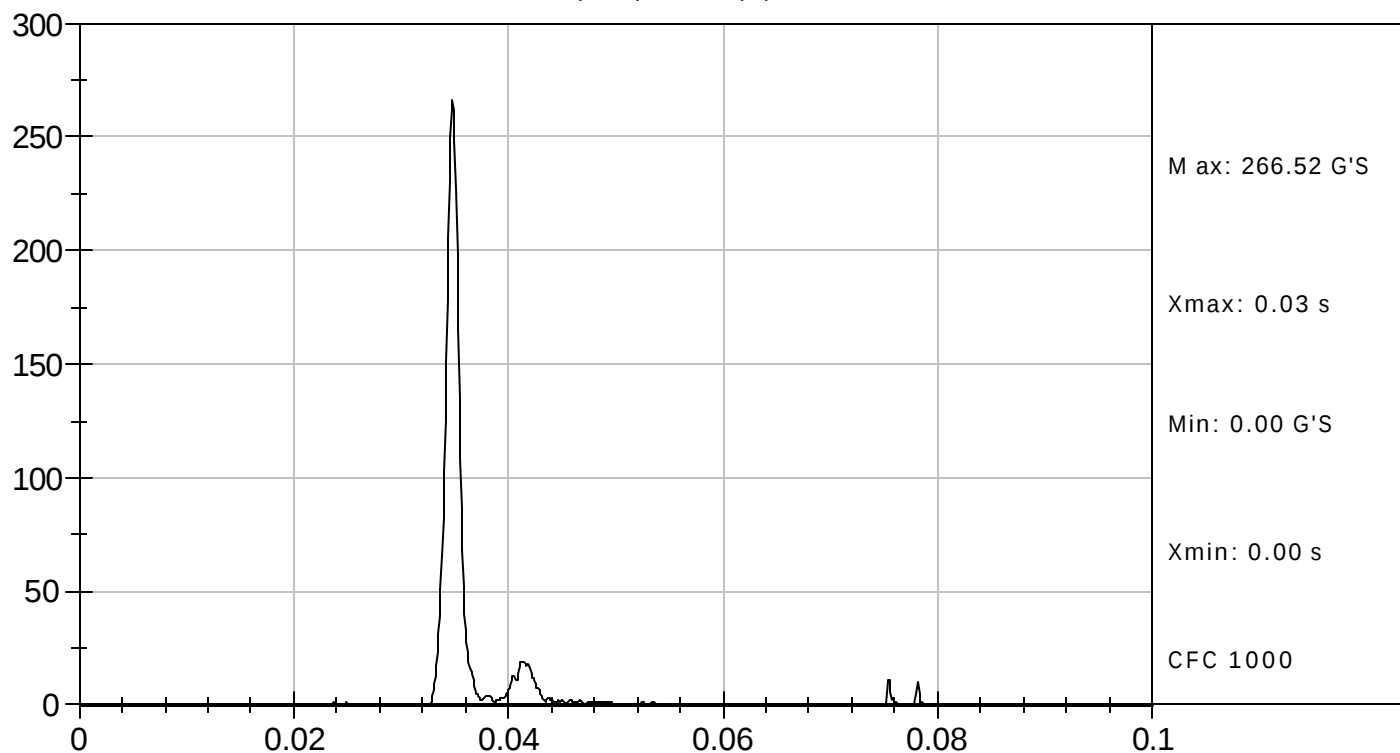
Approved By



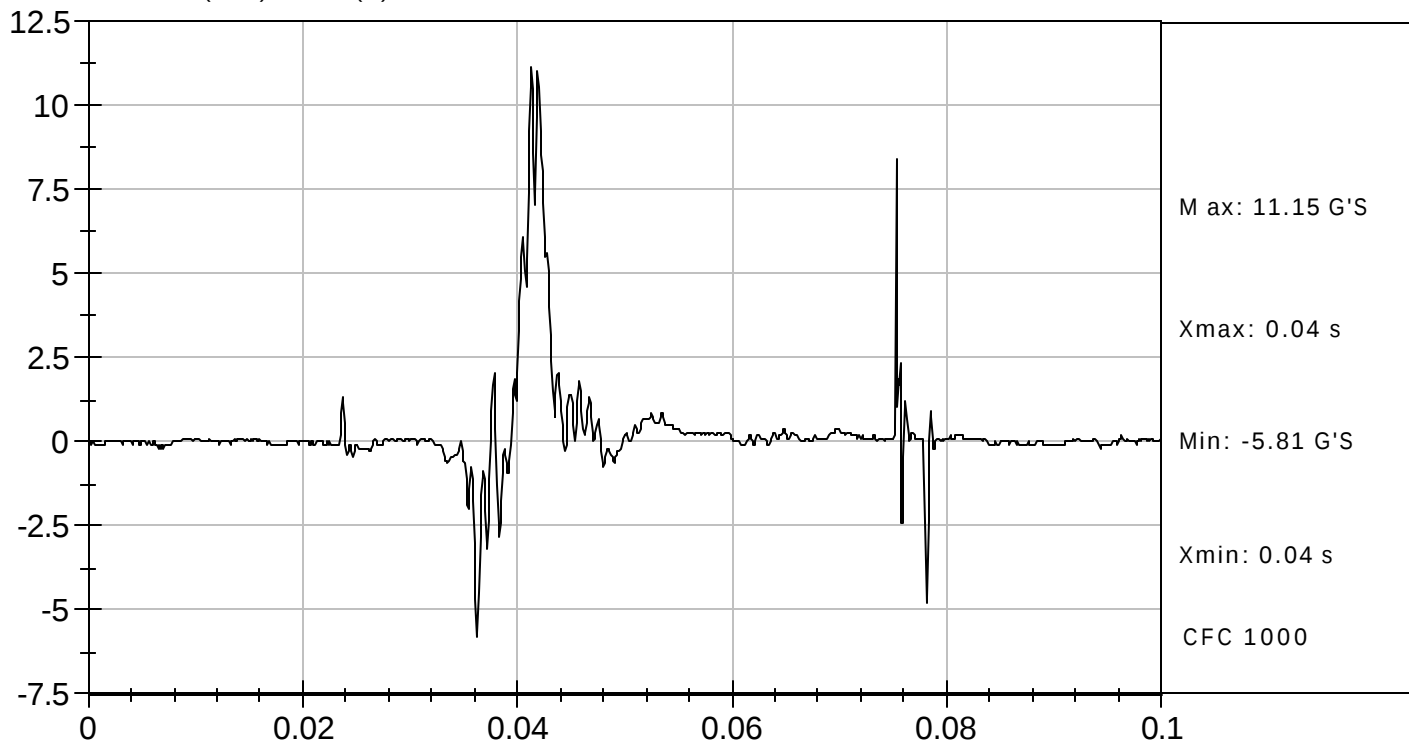
Test Desc: Head Drop
Componet ID: D05711

Test Date: 03/10/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) Time (s)



HEAD Y (G'S) Time (s)



DATA SHEET C4
NECK FLEXION TEST (572.123)

Dummy Serial Number 155 Test Date 3/10/05

Technician Dave Wilcox

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))
☒ N/A, ONLY one flexion test performed
- ☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>21%</u> |
| Record the minimum humidity | <u>16%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.
Record findings and actions: No Damage.
- ☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	5.02 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.6 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	3.1 m/s
	@ 30ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.5 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	<u>31</u> Nm @ <u>81</u> degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	112 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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



Signature

3/10/05

Date

MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05712

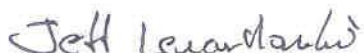
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Speed		m/sec	4.83 to 5.07	5.02	Pass
Pendulum Deceleration	10 msec	msec	1.2 to 1.6	1.6	Pass
	20 msec	msec	2.4 to 3.4	3.1	Pass
	30 msec	msec	3.8 to 5.0	4.5	Pass
D Plane Rotation	Max	deg	74 to 92	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	31	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	103 - 123	112	Pass
Overall Results				Pass	



Laboratory Technician

03/10/2005

Test Date



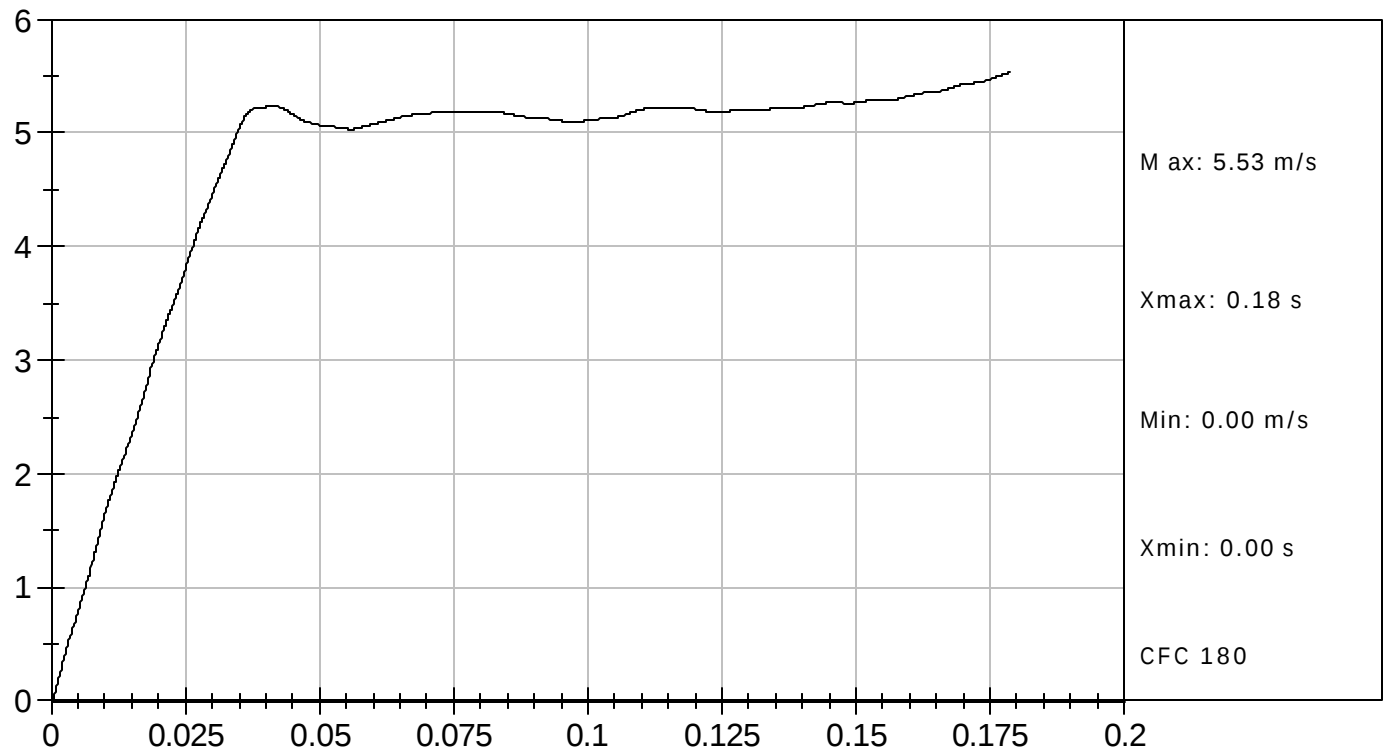
Approved By



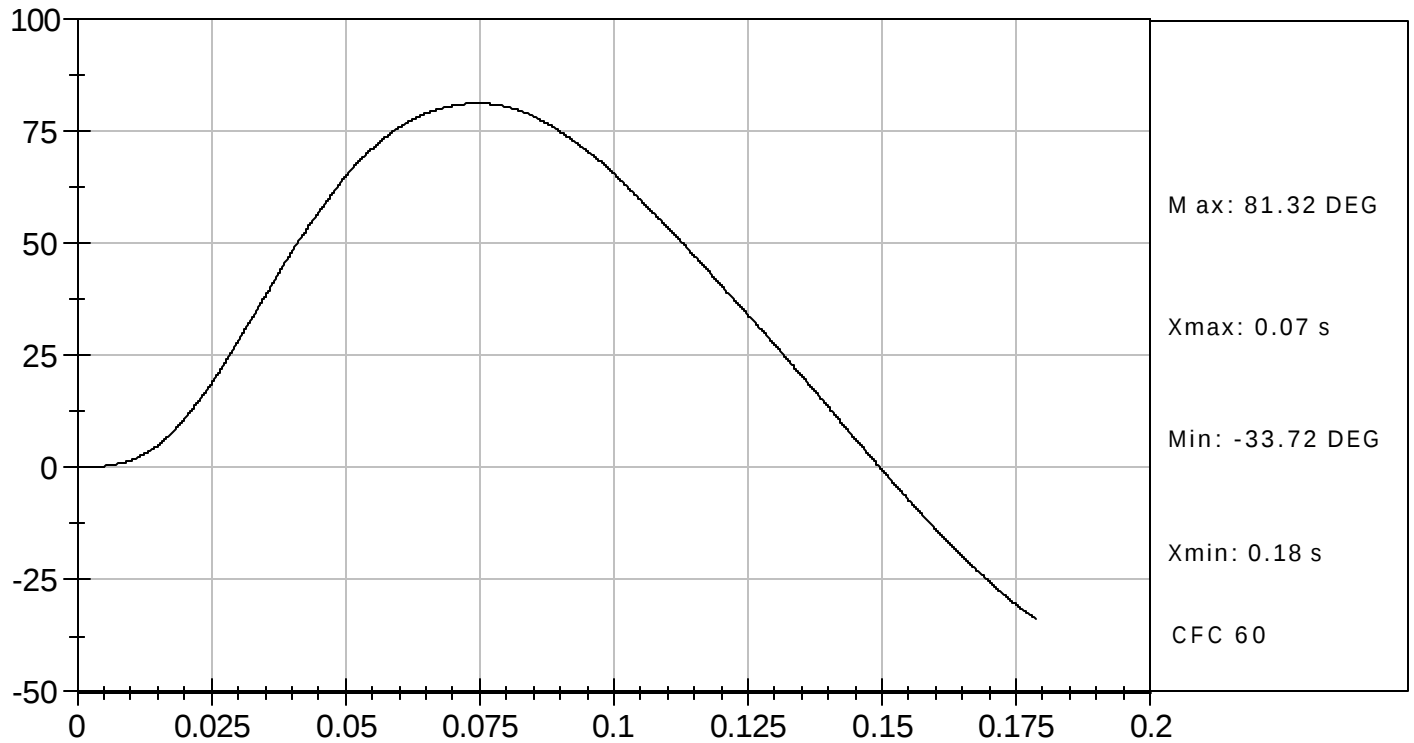
Test Desc: Neck Flexion
Componet ID: D05712

Test Date: 03/10/2005
Velocity: 16.48 ft/s, 5.02 m/s

PENDULUM DECELERATION (m/s) Time (s)



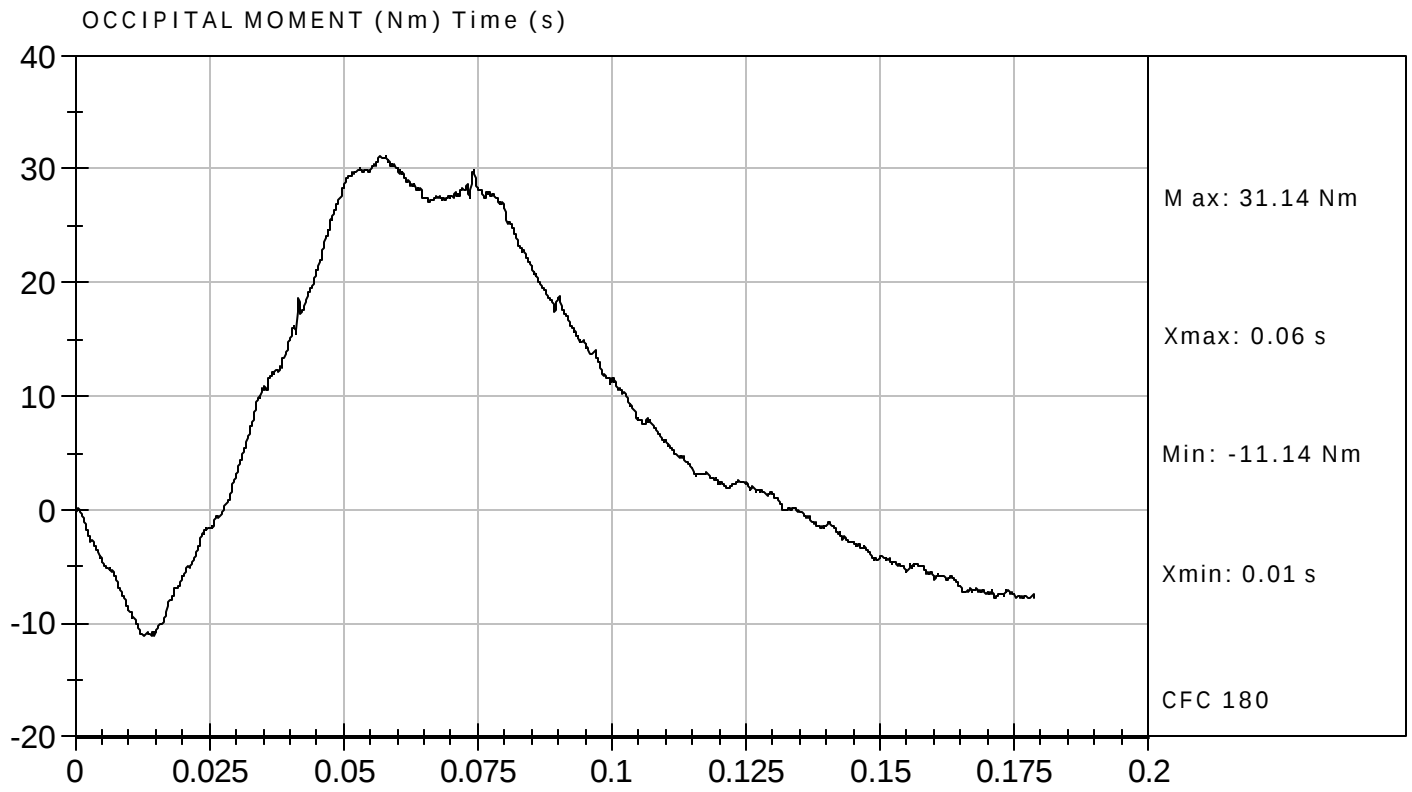
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Flexion
Componet ID: D05712

Test Date: 03/10/2005
Velocity: 16.48 ft/s, 5.02 m/s



DATA SHEET C5
NECK EXTENSION TEST (572.123)

Dummy Serial Number 155 Test Date 3/10/05

Technician Dave Wilcox

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last neck test. (572.127(o))
☒ N/A, ONLY one extension test performed
- ☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>21%</u> |
| Record the minimum humidity | <u>16%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No Damage.
- ☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pre-test calibration.
Record findings and actions: No Damage.
- ☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C.
(572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test.
(572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 12. Complete the following table:

Neck Extension Test Results (572.123(b)(2) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.42 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.3 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.4 m/s
	@ 30ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.6 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	<u>-22</u> Nm @ <u>98</u> degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	136 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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



Signature

3/10/05

Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05713

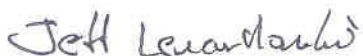
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	20.8	Pass
Pendulum Speed		m/sec	4.18 to 4.42	4.42	Pass
Pendulum Deceleration	10 msec	msec	1.0 to 1.4	1.3	Pass
	20 msec	msec	2.2 to 3.0	2.4	Pass
	30 msec	msec	3.2 to 4.2	3.6	Pass
D Plane Rotation	Max	deg	85 to 103	98	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-22	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	136	Pass
Overall Results				Pass	



Laboratory Technician

03/10/2005

Test Date



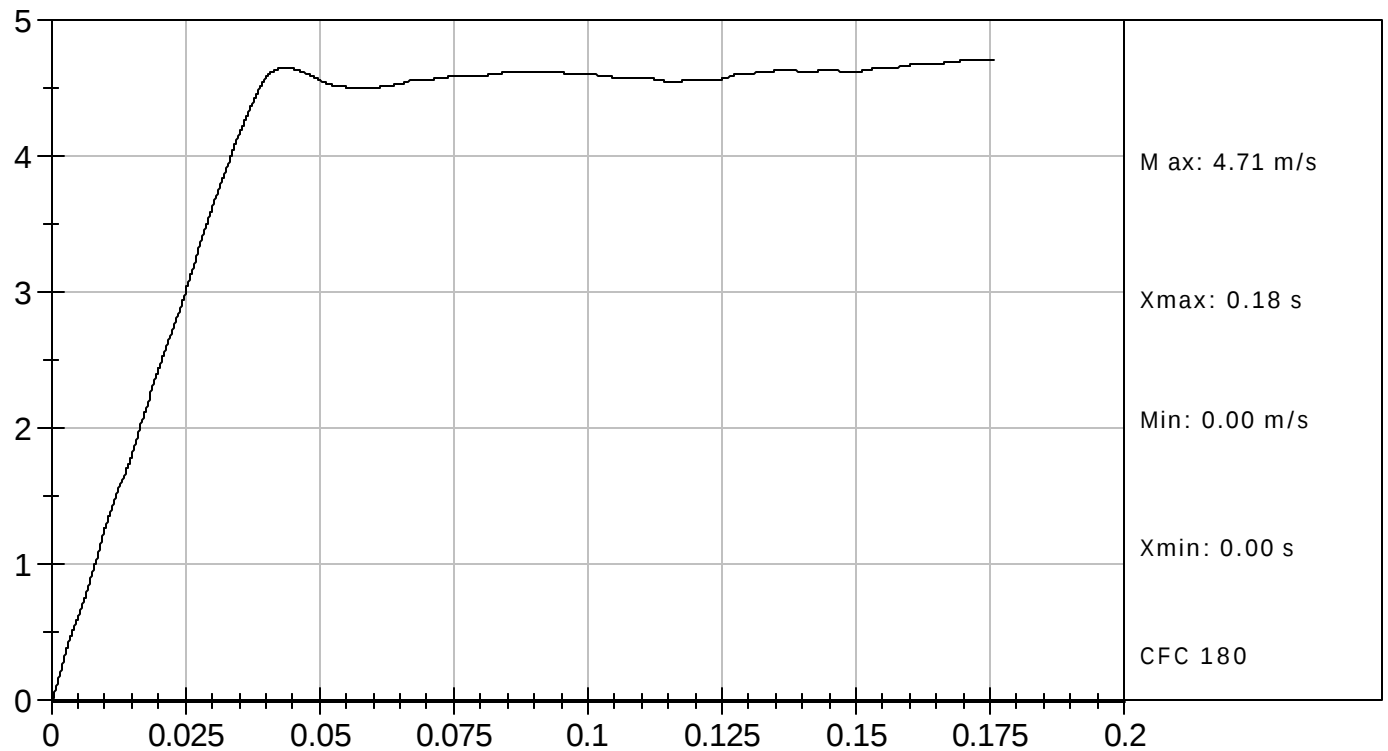
Approved By



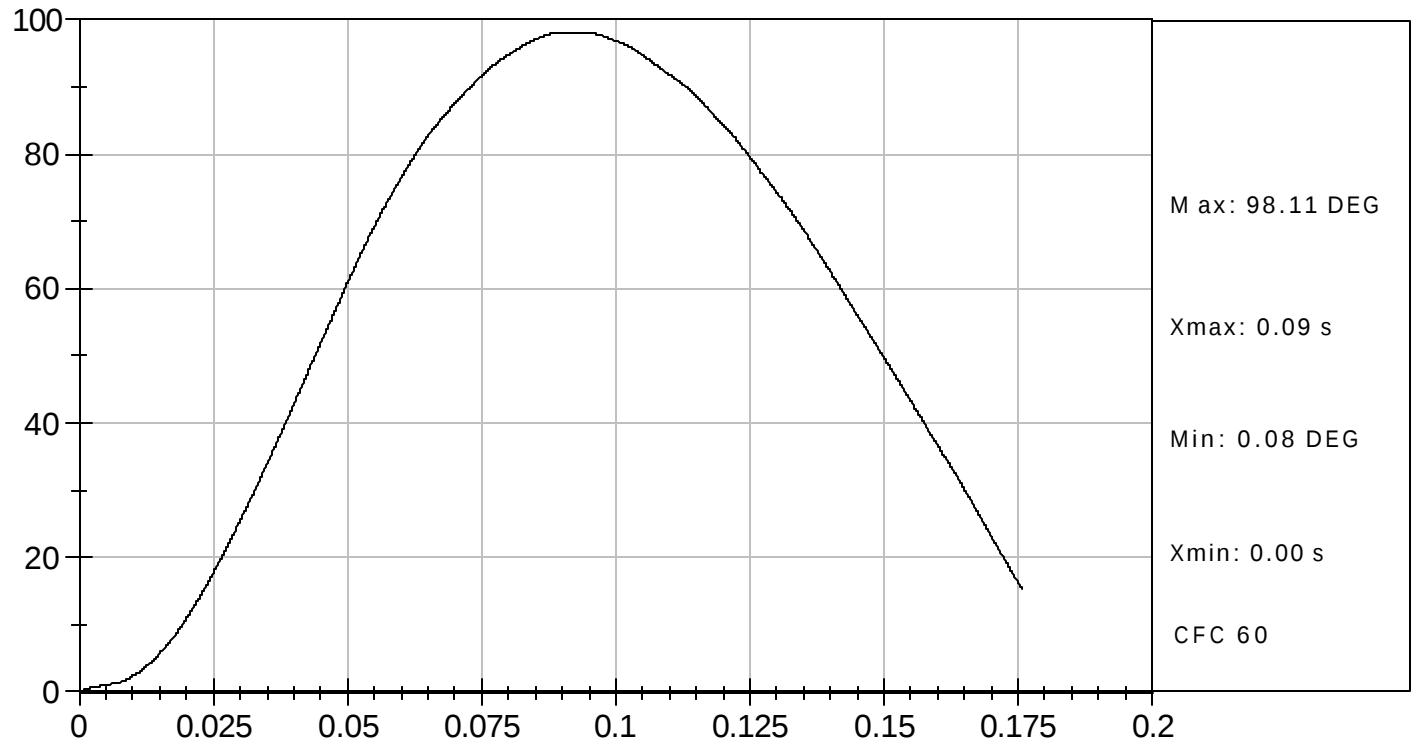
Test Desc: Neck Extension
Componet ID: D05713

Test Date: 03/10/2005
Velocity: 14.49 ft/s, 4.42 m/s

PENDULUM DECELERATION (m/s) Time (s)



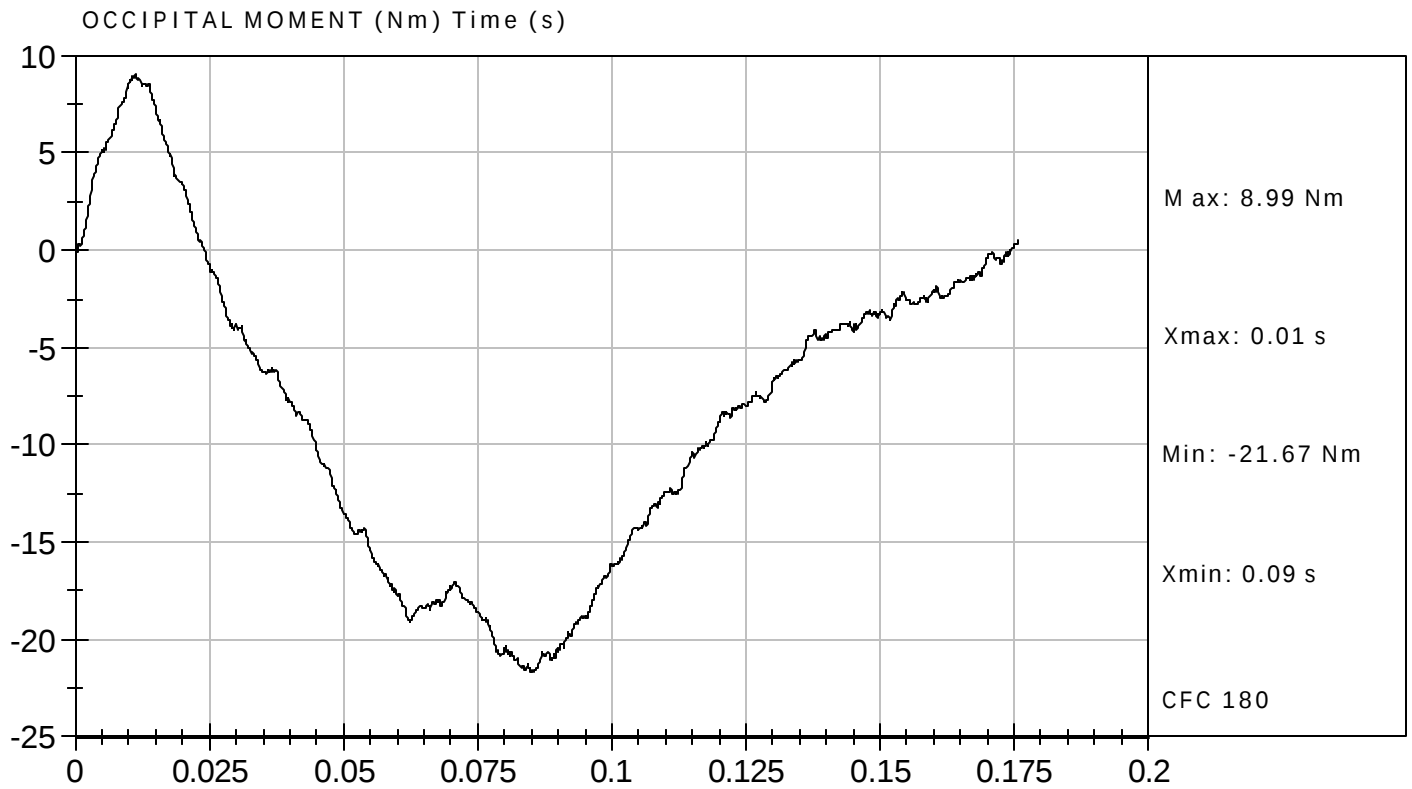
NECK ROTATION (DEG) Time (s)





Test Desc: Neck Extension
Componet ID: D05713

Test Date: 03/10/2005
Velocity: 14.49 ft/s, 4.42 m/s



DATA SHEET C6
THORAX IMPACT TEST (572.134)

Dummy Serial Number 155 Test Date 3/10/05

Technician Jessica Gall

☐ Pretest calibration
☒ Post test calibration verification

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

- ☐ 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11C.
- ☒ 3. The complete assembled dummy (127-0000) is used (572.124(b)).
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(1))
- | | |
|--------------------------------|-------------|
| Record the maximum temperature | <u>21.6</u> |
| Record the minimum temperature | <u>21.2</u> |
| Record the maximum humidity | <u>21%</u> |
| Record the minimum humidity | <u>16%</u> |
- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage _____
- ☐ - The following repairs or replacement was performed. Record _____
- ☒ 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))
- ☒ 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))

- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

Thorax Impact Results (572.124(b) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.79 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	39 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1330 N
Peak force** between 12.5 and 38.0 mm chest compression	Max. 1.05 times the peak force between 38.0 and 46.0 mm chest compression	YES
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	78 %

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Jessica Hall
Signature

3/10/05
Date

Hybrid III Calibration Data Sheet
THORAX IMPACT
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05714

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	6.59 to 6.83	6.79	Pass
Peak Deflection	mm	38 to 46	39	Pass
Peak Resistive Force w/in Deflection Corridor	kN	1.15 to 1.38	1.33	Pass
Internal Hysteresis	%	65 to 85	78	Pass
Peak Force 12.5 mm - 38 mm	Yes/No	< 105% of Peak Force in Deflection Corridor	Yes	Pass
Overall Test Results				Pass


 Laboratory Technician

03/10/2005
 Test Date


 Approved By

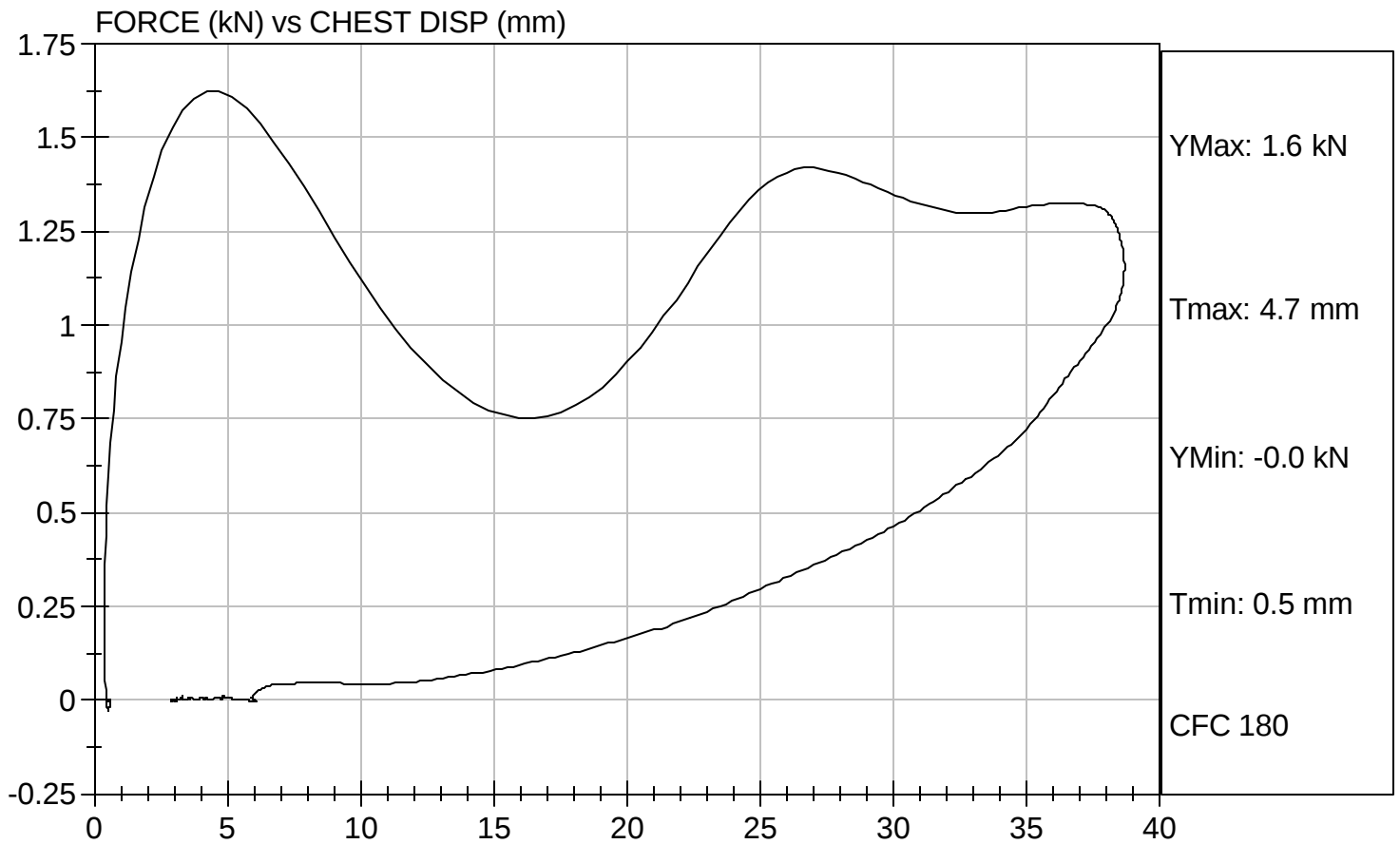


Test Description: Thorax Impact

Test Date: 03/10/2005

Component: D05714

Speed: 22.28 ft/sec, 6.79 m/sec



DATA SHEET C7
TORSO FLEXION TEST (572.125)

Dummy Serial Number 155

Test Date 3/10/05

Technician Dave Wilcox

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))

 X N/A, ONLY one torso flexion test performed

X 2. The test fixture conforms to the specifications in Figure 11C.

X 3. The complete assembled dummy (127-0000) is used (572.125(c)(2)).
 with legs below the femurs.

 X without legs below the femurs.

X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 21%

Record the minimum humidity 16%

X 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x ½inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))

X 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))

X 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))

X 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))

X 10. Remove all external support that was implemented in 9 above. (572.125(c)(5))

X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))

Record reference plane angle (max. allowed 22°) 13°

X 12. Attach the pull cable and the load cell. (572.125(c)(6))

X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))

- X 14. Maintain angle reference plane at $45^{\circ} \pm 0.5^{\circ}$ of flexion for 10 seconds.
(572.125(c)(8))
- X 15. As quickly as possible release the force applied to the attachment bracket.
(572.125(c)(9))
- X 16. 3 minutes after the release of the force, measure the reference plane angle.
(572.125(c)(9))
- X 17. Complete the following table:

Torso Flexion Results (572.125(b), 572.125(c)(7), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 22^{\circ}$	13°
Torso rotation rate	$0.5^{\circ}/s \leq \text{rate} \leq 1.5^{\circ}/s$	1.0
Force at $45^{\circ} \pm 0.5^{\circ}$	$147 \text{ N} \leq \text{force} \leq 200 \text{ N}$	198 N
Final ref. plane angle	Initial ref. plane angle $\pm 8^{\circ}$	14°



Signature

3/10/05

Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05717

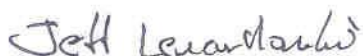
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Initial Angle	deg	0 to 22	13	Pass
Return Angle	deg	0 to 8	14	Pass
Force at 45 deg	N	147 to 200	198	Pass
Overall Test Results				Pass



Laboratory Technician

03/10/2005

Test Date



Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 3/10/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

X N/A, ONLY one knee impact test performed

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

X 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

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. (572.126(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 21%

Record the minimum humidity 16%

X 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

X 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

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

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 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	2.07 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	2000 N ≤ force ≤ 3000 N	2240 N

*Force = impactor mass x deceleration (572.126(b))

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

Joe Fleck
Signature

3/10/05
Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05716

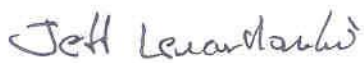
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	2.0 to 3.0	2.2	Pass
Overall Test Results				Pass



Laboratory Technician

03/10/2005

Test Date

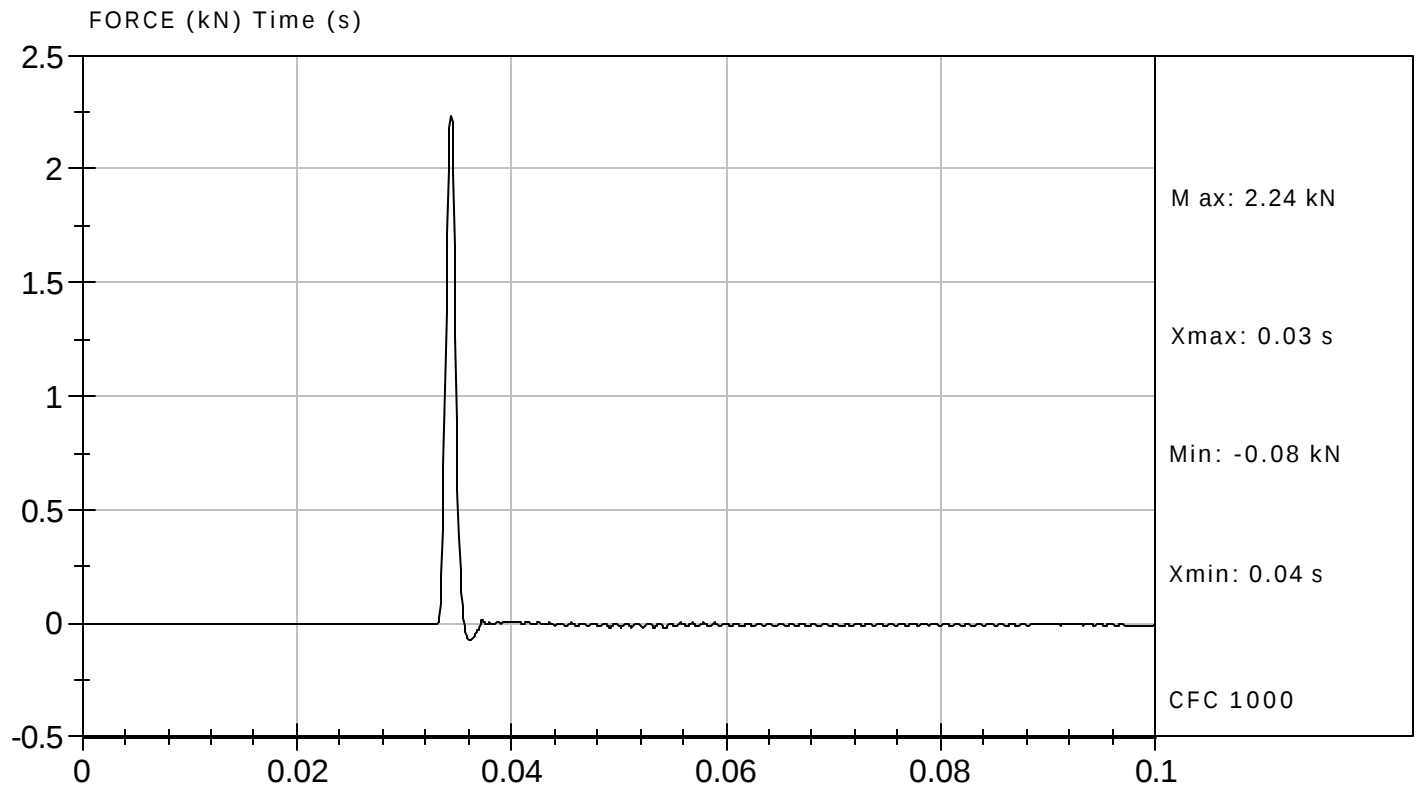


Approved By



Test Desc: Left Knee
Componet ID: D05716

Test Date: 03/10/2005
Velocity: 6.94 ft/s, 2.12 m/s



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126)

Dummy Serial Number 155

Test Date 3/10/05

Technician Joe Fleck

 Pretest calibration

X Post test calibration verification

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

 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))

X N/A, ONLY one knee impact test performed

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

X 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))

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. (572.126(c)(1))

Record the maximum temperature 21.6

Record the minimum temperature 21.2

Record the maximum humidity 21%

Record the minimum humidity 16%

X 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))

X 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))

X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))

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

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 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

X 11. Complete the following table:

Knee Impact Results (572.126(b)(1) and 572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2220 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

3/10/05

Date

MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D05715

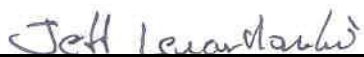
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	2.0 to 3.0	2.2	Pass
Overall Test Results				Pass



Laboratory Technician

03/10/2005

Test Date

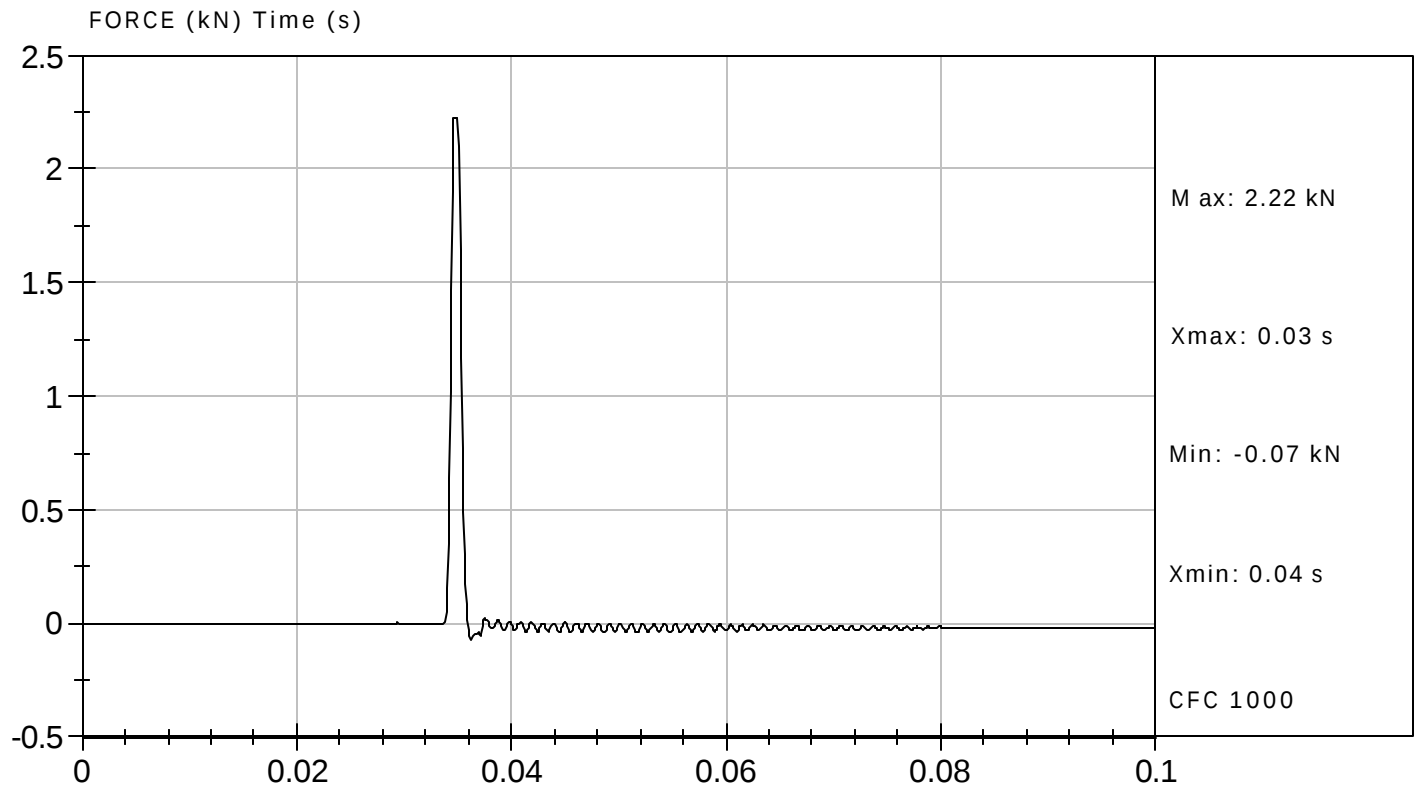


Approved By



Test Desc: Right Knee
Componet ID: D05715

Test Date: 03/10/2005
Velocity: 6.89 ft/s, 2.10 m/s



EXTERNAL DIMENSIONS

HYBRID III 6 year SN #155, PART 572, SUBPART N EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	628.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	362.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	68.3
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	94.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	102.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	195.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	22.1
I	SHOULDER TO - ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	219.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	165.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	390.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	273.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	313.8

HYBRID III 6 year SN #155, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	322.4
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	140.2
P	FOOT LENGTH	Tip of toe to rear of heal	170.2 - 185.4	173.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	355.7
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.0
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	174.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	221.5
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.1
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	66.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	510.5 - 530.9	529.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	609.5
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	583.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	159.0

DATA SHEET C1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number 155

Test Date 3/9/05

Technician Jessica Gall

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

X Perform general cleaning.

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

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

3/10/05
Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonard
Signature

3/10/05
Date