REPORT NO. 208-MGA-2005-DC008

DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208

Jaguar Cars LTD
2005 Jaguar X Type Passenger Car
NHTSA NO.: C50508

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

Test Date: April 20, 2005 - June 9, 2005

Report Date: August 29, 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

TABLE OF CONTENTS

			Page No.
DUMMY S/N:	511	PRE-TEST CERTIFICATION DATA	1-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	511	POST-TEST CERTIFICATION DATA	2-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	516	PRE-TEST CERTIFICATION DATA	3-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	516	POST-TEST CERTIFICATION DATA	4-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	505	PRE-TEST CERTIFICATION DATA	5-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	505	POST-TEST CERTIFICATION DATA	6-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	511	PRE-TEST CERTIFICATION DATA	7-1
		PASSED ALL CALIBRATION CHECKS	
DUMMY S/N:	511	POST-TEST CERTIFICATION DATA	8-1
		PASSED ALL CALIBRATION CHECKS	

EXTERNAL DIMENSIONS

HYBRID III 5th SN #511, 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	782.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.8
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	75.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.9
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.2
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	282.7
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	540.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	358.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	406.3
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	414.0-439.4	434.4

HYBRID III 5th SN #511, 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	186.4
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	222.3
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	476.3
S	HEAD BREADTH	The widest part of the head	137.1-147.3	142.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	299.9
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.2
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	83.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	539.4
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	851.9
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	762.4
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 511 Test Date 5/20/05

Technician Joe Fleck

_X_ 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))
__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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))

Record the maximum temperature 22.0
Record the minimum temperature 21.3
Record the maximum humidity 42%
Record the minimum humidity 39%

_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 ± 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 g ≤ x ≤ 300 g	268
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 ≤ 15 g	-3

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

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test ID:** D051381

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	250 - 300	268	Pass
Peak Lateral Acceleration	G's	+/- 15	-3.4	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

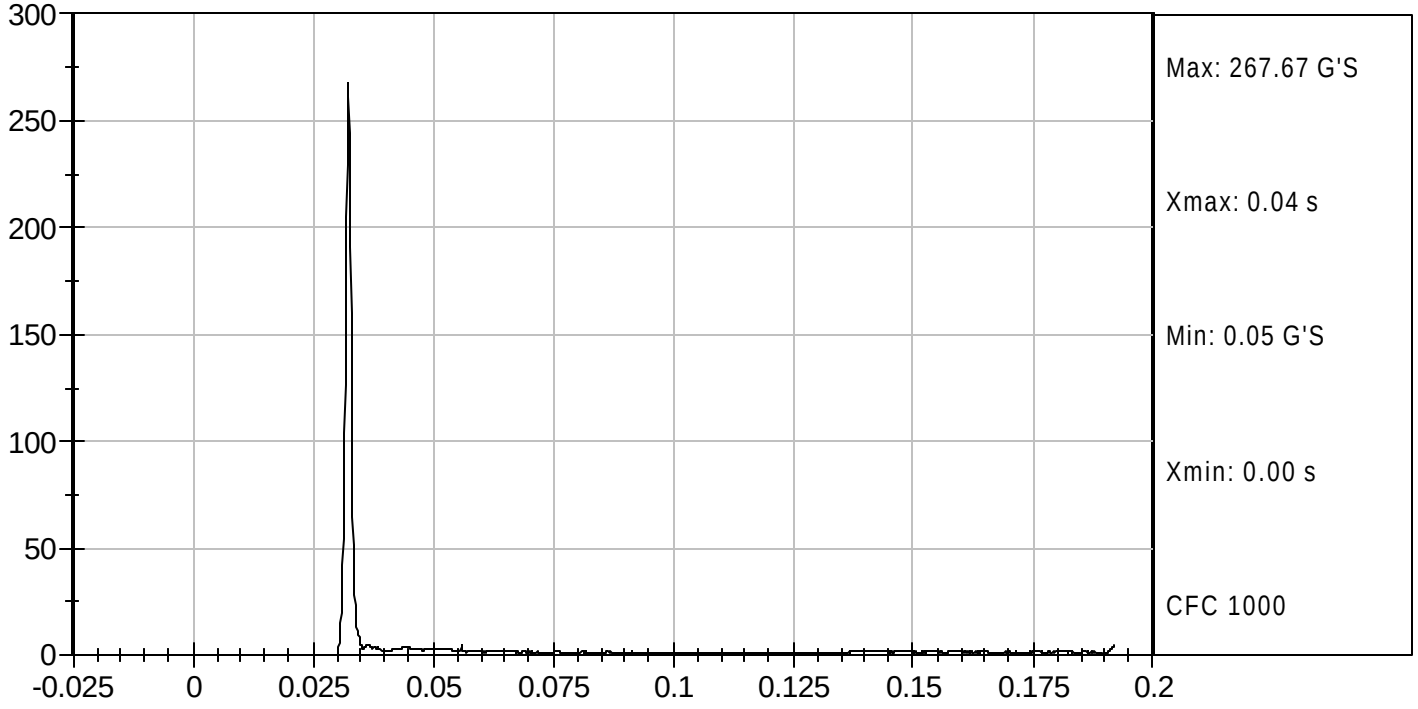
05/20/2005
Test Date

Approved By

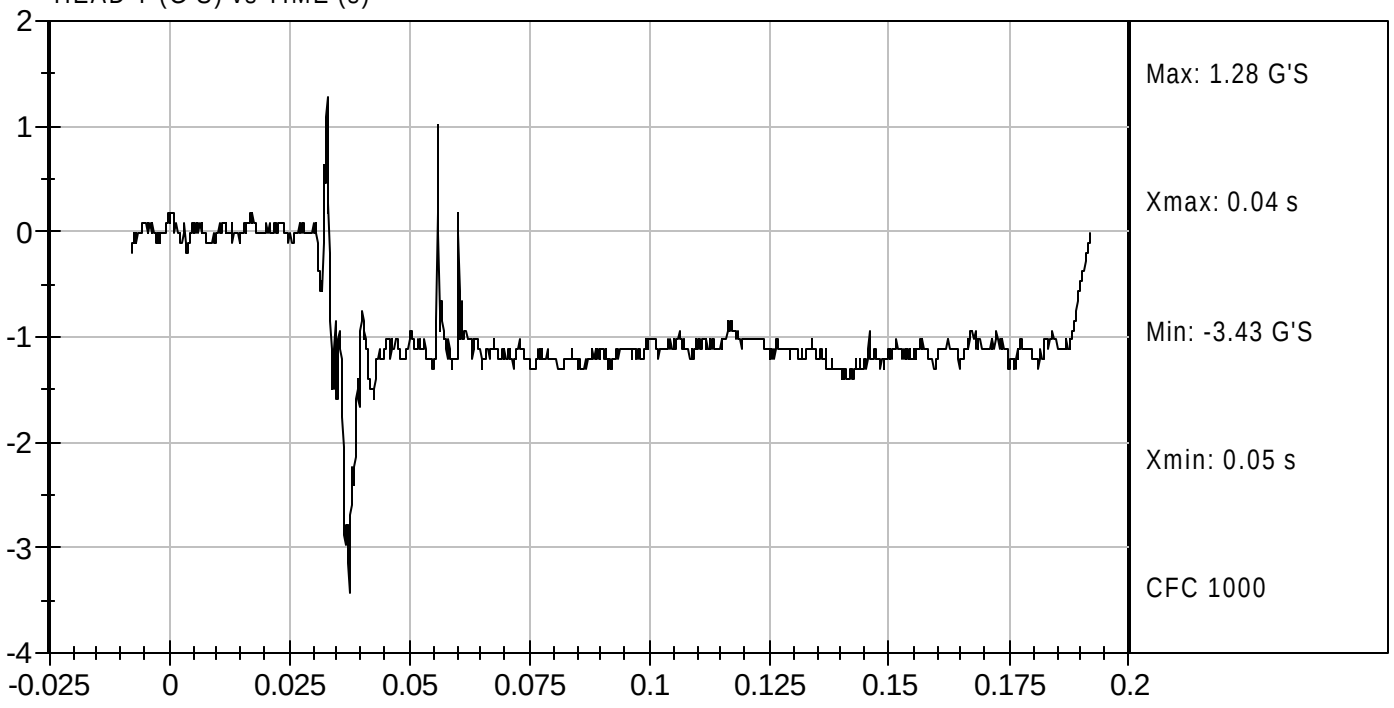
Test Desc: Head Drop
Componet ID: D051381

Test Date: 05/20/2005
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 ___511___ Test Date ___5/20/05___

Technician ___Joe Fleck___

_X_ 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))
_X_ N/A, ONLY one flexion test performed

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

_X_ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature 22.0
Record the minimum temperature 21.3
Record the maximum humidity 42%
Record the minimum humidity 39%

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

_X_ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 89; Back 89.

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

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

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

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_ 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_ 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_ 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	6.98 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.3 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.6 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.4 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__78__ Nm @ __78__ degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	87 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

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

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051382

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	41	Pass
Pendulum Speed		m/sec	6.89 to 7.13	6.98	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	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	78	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	87	Pass
			Overall Results		Pass

Laboratory Technician

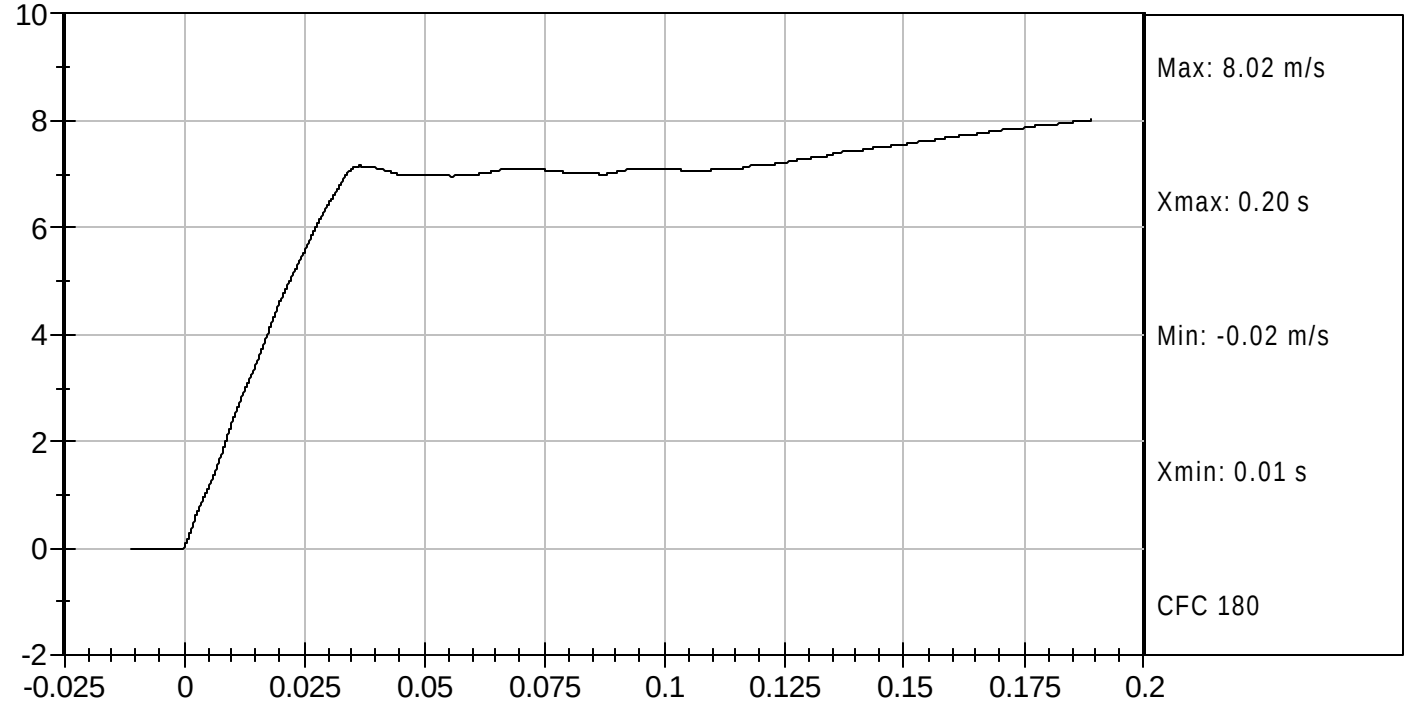
05/20/2005
Test Date

Approved By

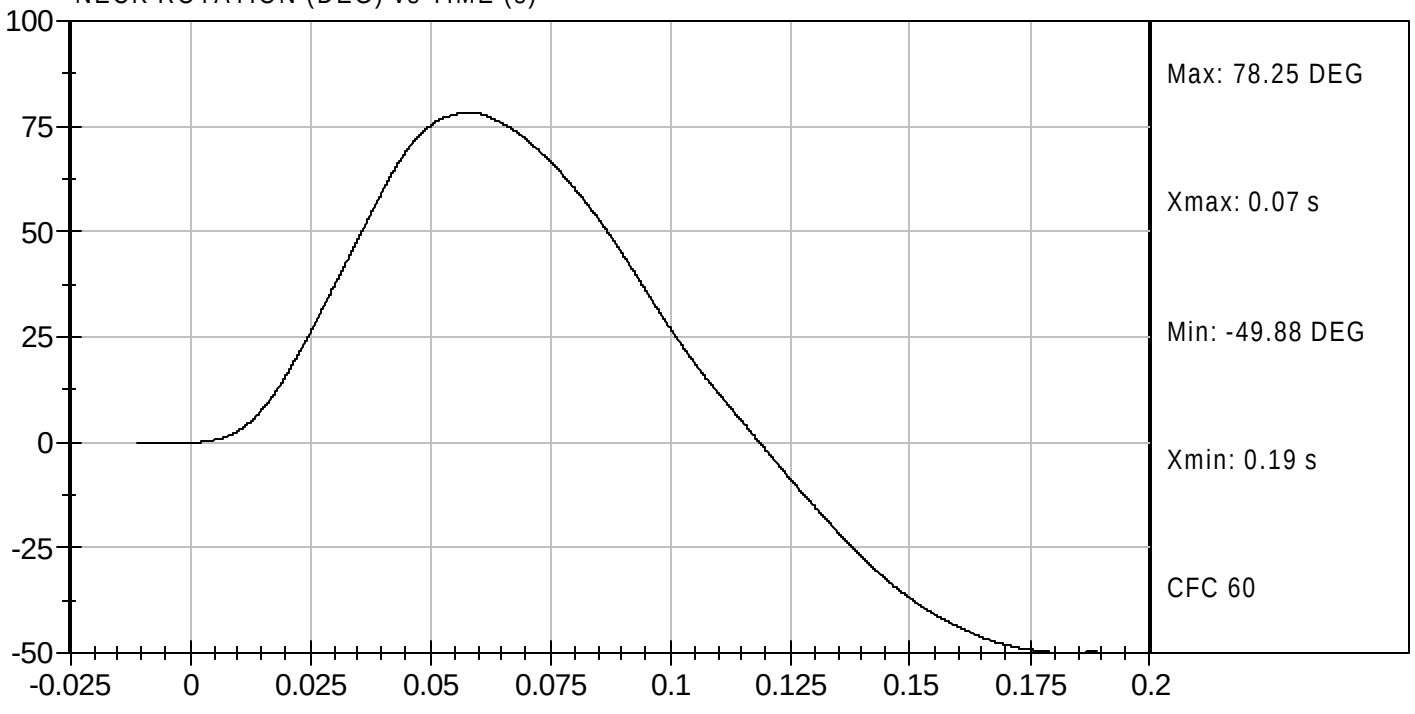
Test Desc: Neck Flexion
Componet ID: D051382

Test Date: 05/20/2005
Velocity: 22.9 ft/s, 6.98 m/s

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

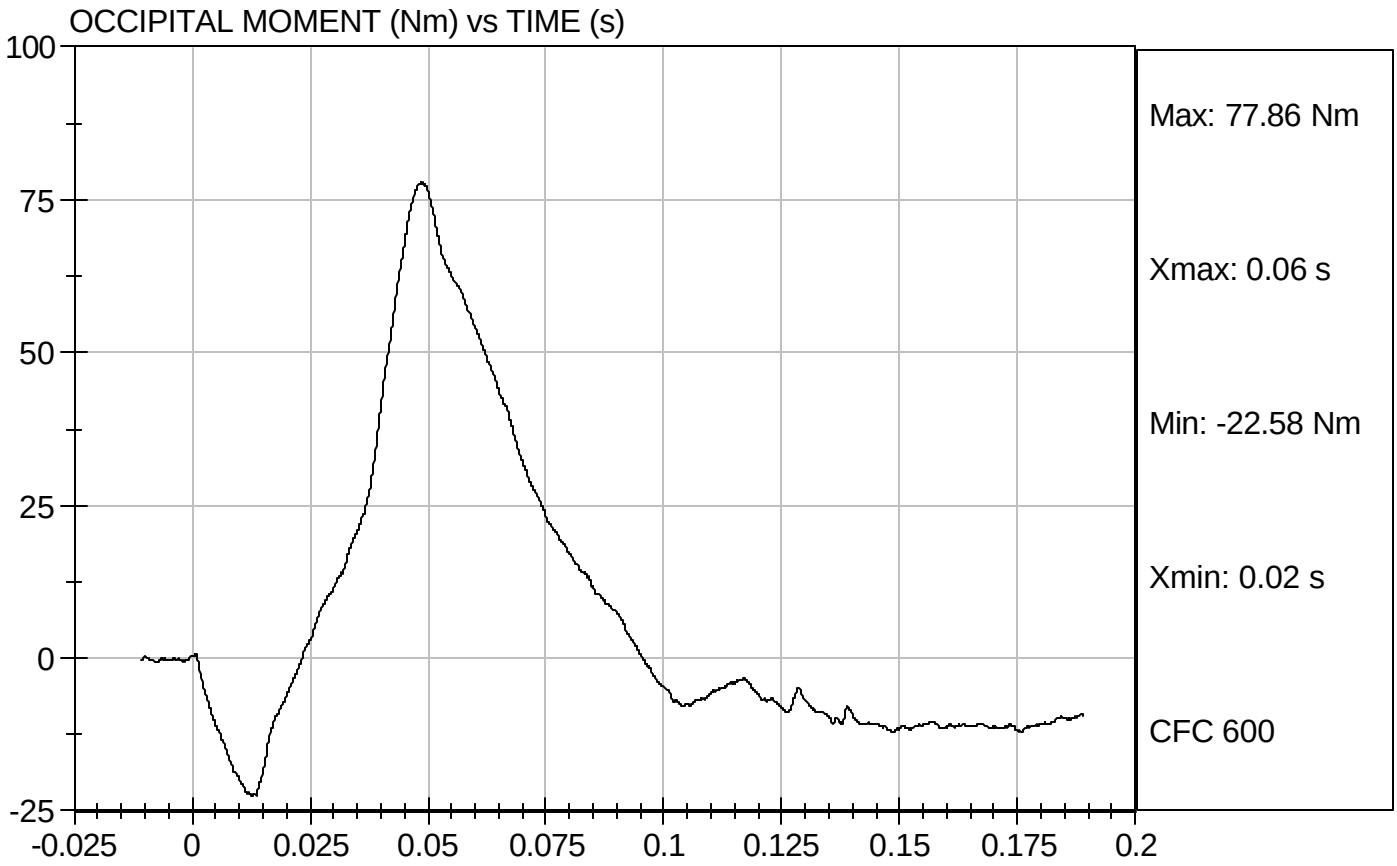


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051382

Test Date: 05/20/2005
Speed: 22.9 ft/sec, 6.98 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ___511_____ Test Date ___5/20/05_____

Technician _____Joe Fleck_____

_X_ 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))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __22.0___
Record the minimum temperature __21.3___
Record the maximum humidity __42%__
Record the minimum humidity __39%__

_X_4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: __No Damage._____

_X_5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: __No Deterioration. Hardness Front 89; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.13 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.7 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.4 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-54_ Nm @ _107_ degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	104 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

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

Joe Fleck _____ 5/20/05

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051383

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	42	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	104	Pass
			Overall Results		Pass

Laboratory Technician

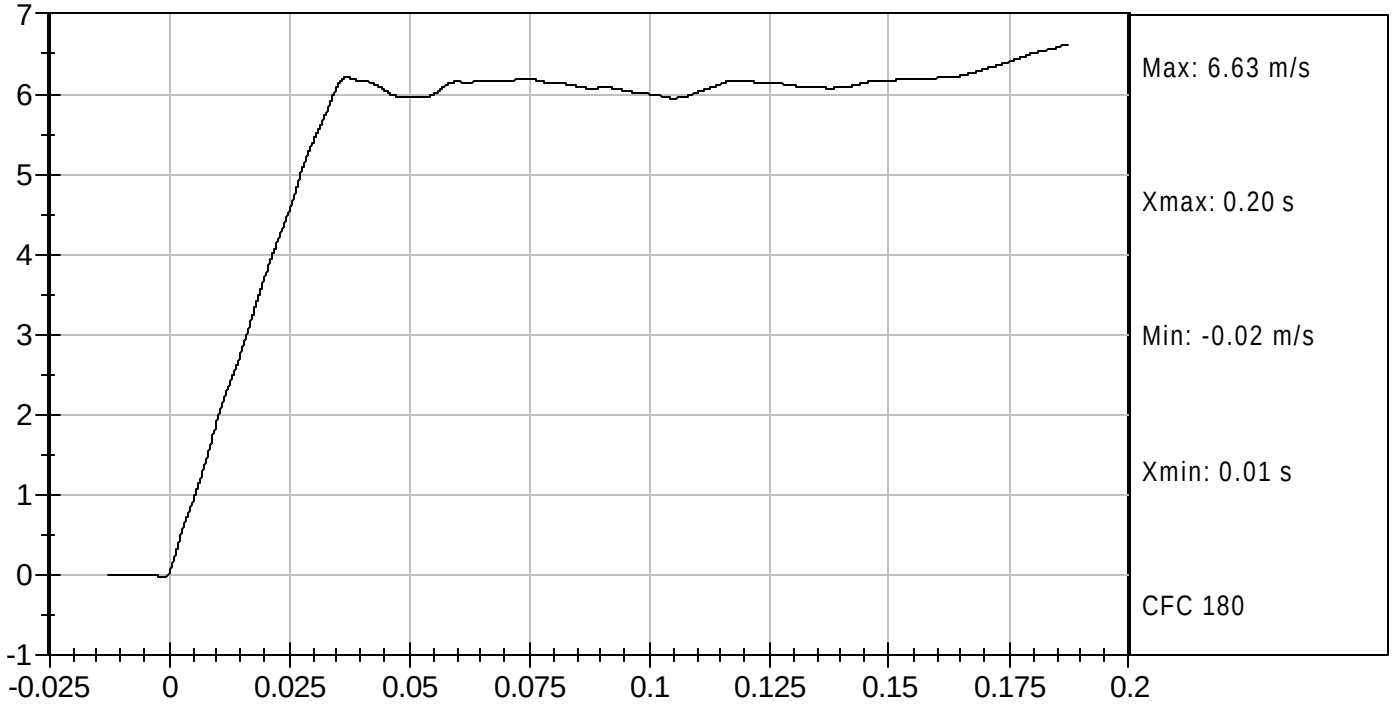
05/20/2005
Test Date

Approved By

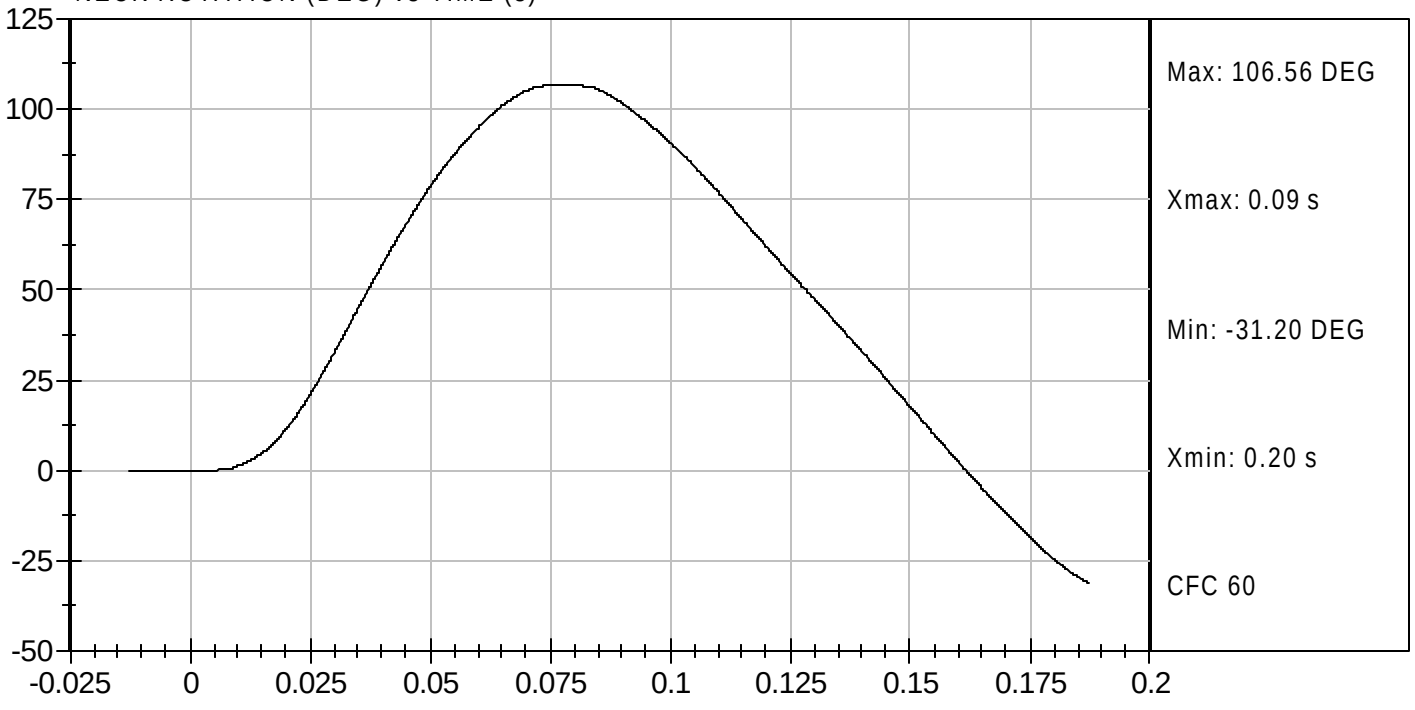
Test Desc: Neck Extension
Componet ID: D051383

Test Date: 05/20/2005
Velocity: 20.11 ft/s, 6.13 m/s

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

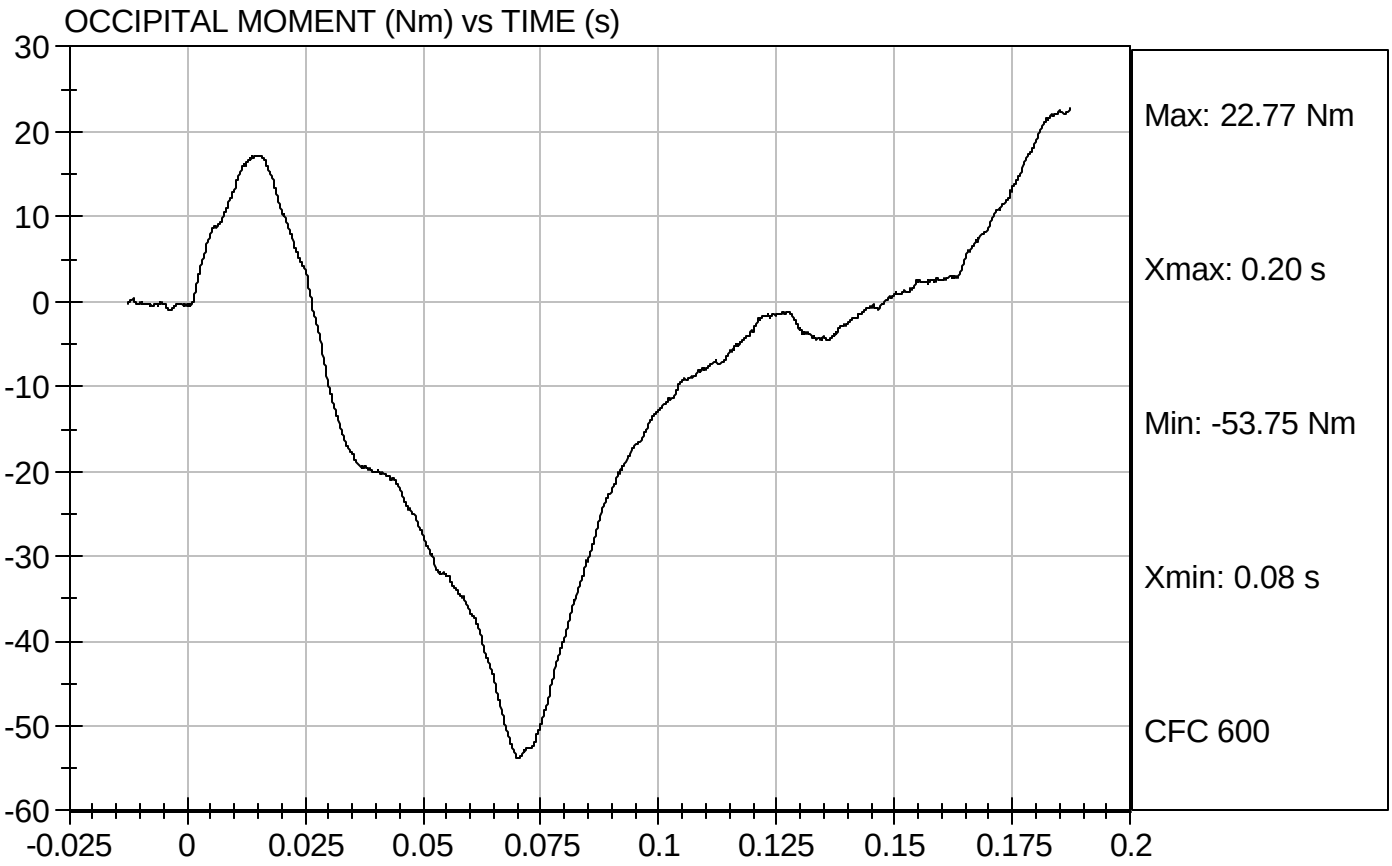


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051383

Test Date: 05/20/2005
Speed: 20.11 ft/sec, 6.13 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __511_____ Test Date __5/20/05_____

Technician ____Joe Fleck _____

_X_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))
_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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature __22.0
Record the minimum temperature _21.3__
Record the maximum humidity _42%__
Record the minimum humidity _39%__
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_ 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.59 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	55 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4130 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	3937 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 85%	69%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.
**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051384

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	6.59 to 6.83	6.59	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.1	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	3937	Pass
		Overall Test Results		Pass

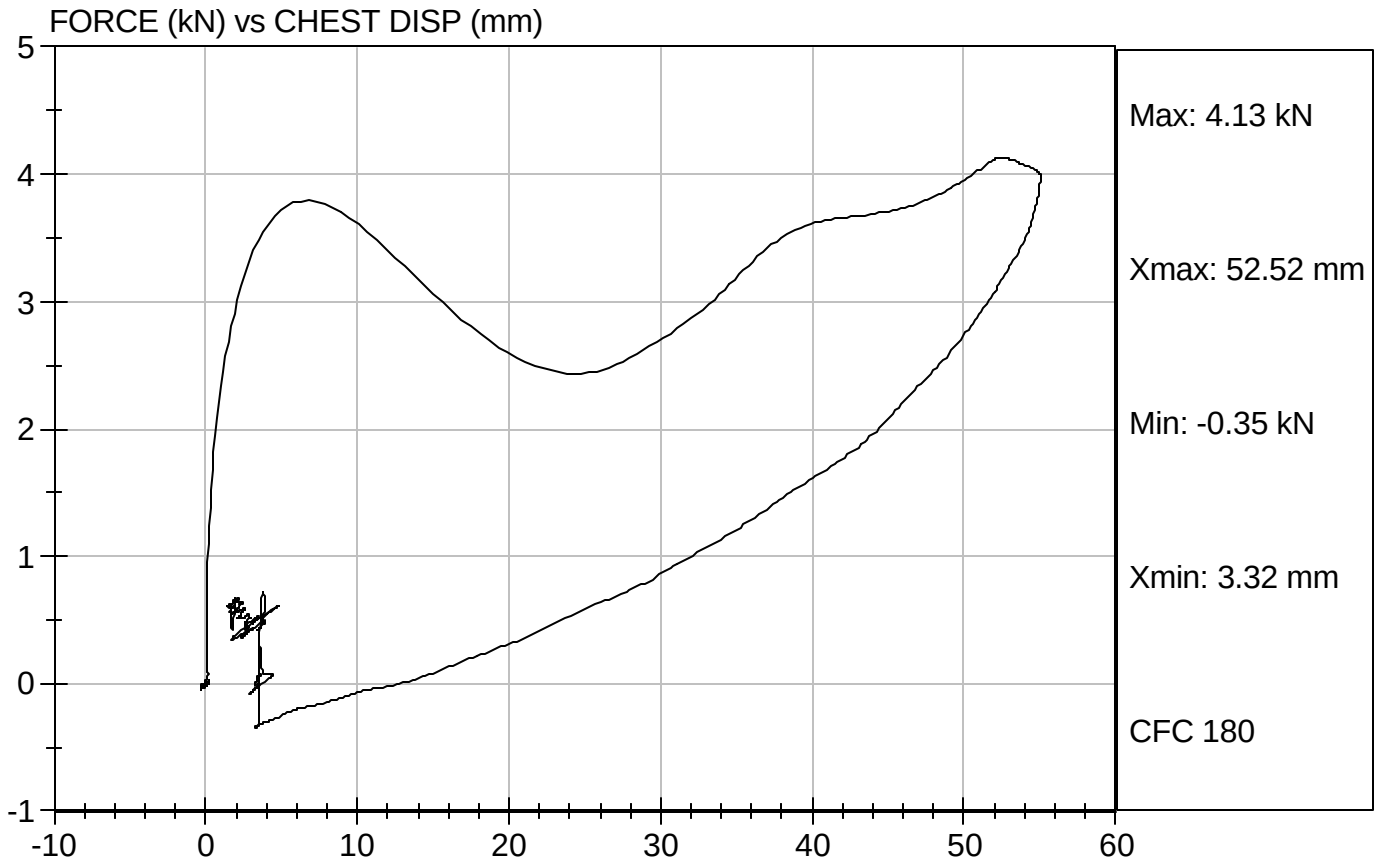
Laboratory Technician

05/20/2005
Test Date

Approved By

Test Desc: Thorax Impact
Component ID: D051384

Test Date: 05/20/2005
Speed: 21.62 ft/sec, 6.59 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __511_____ Test Date __5/20/05_____

Technician _____Dave Wilcox_____

_X_ 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))
_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 (66ºF) and 25.6°C (78ºF) 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 __42%__
Record the minimum humidity __39%__
_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°)___15°___
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	15°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	359 N
Final ref. plane angle	Initial ref. plane angle ±8°	17°

Signature

5/20/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051387

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Initial Angle	deg	0 to 20	15	Pass
Return Angle	deg	+/- 8	17	Pass
Force at 45 deg	N	320 to 390	359	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Laboratory Technician

05/20/2005
Test Date

Jeff LeVan Mankin
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __511_____ Test Date __5/20/05_____

Technician ____Joe Fleck _____

_X_ 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))
_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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature __22.0__
Record the minimum temperature __21.3__
Record the maximum humidity __42%__
Record the minimum humidity __39%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3570 N

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

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

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051386

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	40	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.57	Pass
		Overall Test Results		Pass

Joe Fleck

Laboratory Technician

05/20/2005

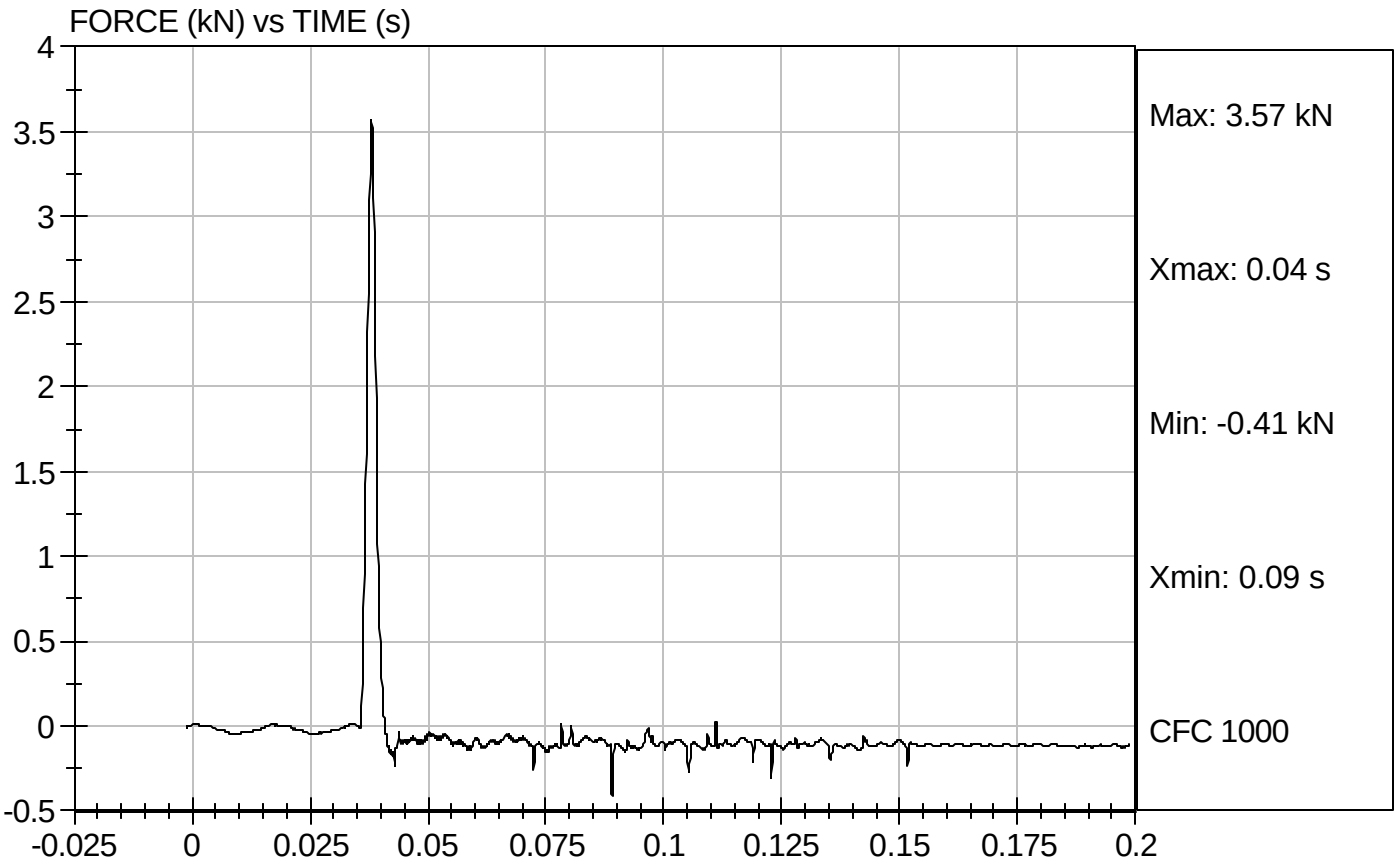
Test Date

Jeff Leonardelli

Approved By

Test Desc: Left Knee
Component ID: D051386

Test Date: 05/20/2005
Speed: 6.92 ft/sec, 2.11 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___511_____ Test Date __5/20/05_____

Technician ___Joe Fleck_____

_X_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))
_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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _22.0___
Record the minimum temperature _21.3___
Record the maximum humidity _42 %___
Record the minimum humidity _39 %___
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3690 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

5/20/05
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051385

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	40	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.69	Pass
		Overall Test Results		Pass

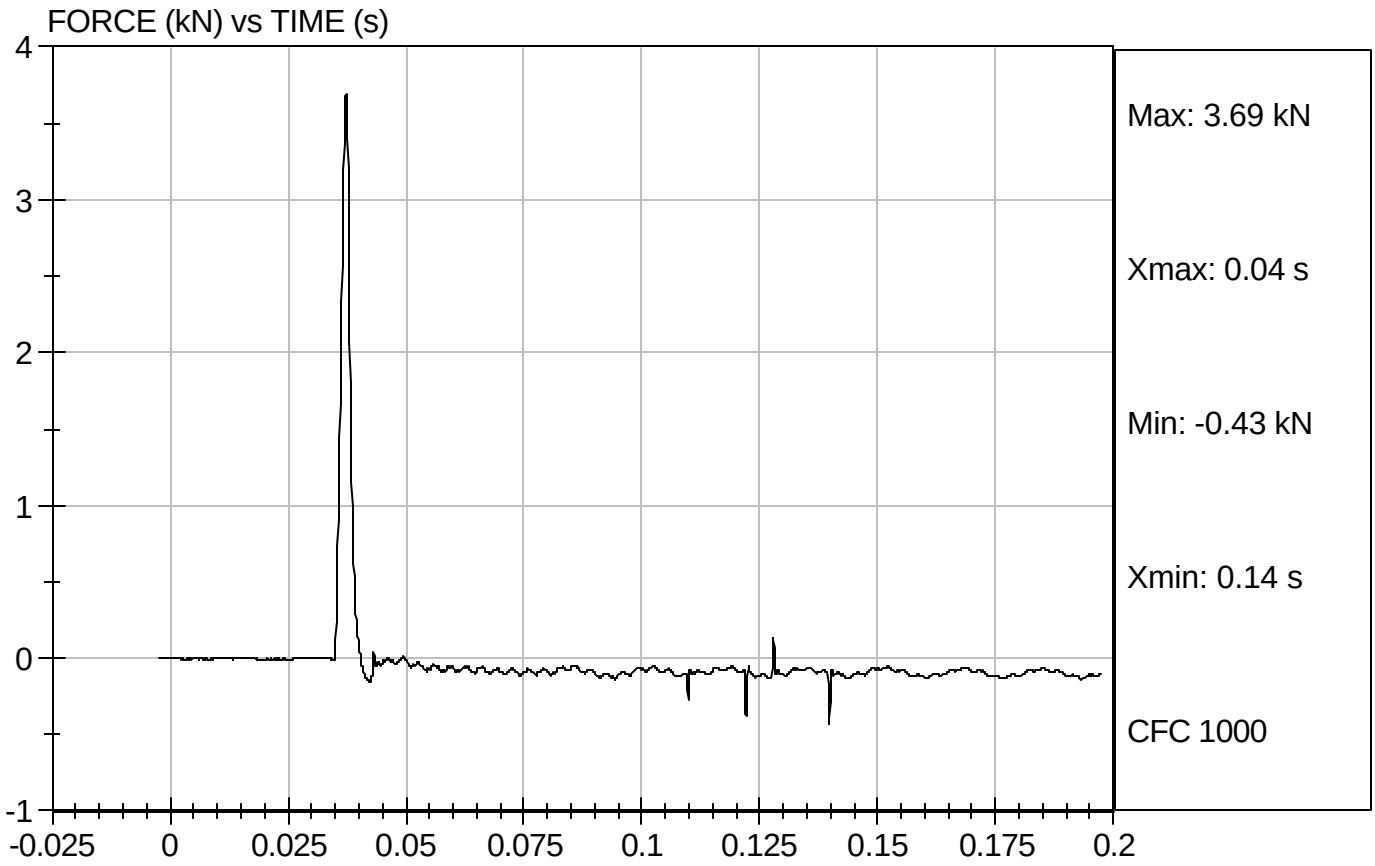
Joe Fleck
Laboratory Technician

05/20/2005
Test Date

Jeff Leonardelli
Approved By

Test Desc: Right Knee
Component ID: D051385

Test Date: 05/20/2005
Speed: 6.93 ft/sec, 2.11 m/sec



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 511 Test Date 6/13/05

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. (572.132(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 (66ºF) and 25.6°C (78ºF) 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 21.5
Record the minimum temperature 21.1
Record the maximum humidity 45%
Record the minimum humidity 41%
_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 ± 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 g ≤ x ≤ 300 g	261
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 ≤ 15 g	8

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

Joe Fleck _____ 6/13/05_____
Signature Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test ID:** D051601

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	250 - 300	261	Pass
Peak Lateral Acceleration	G's	+/- 15	7.6	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

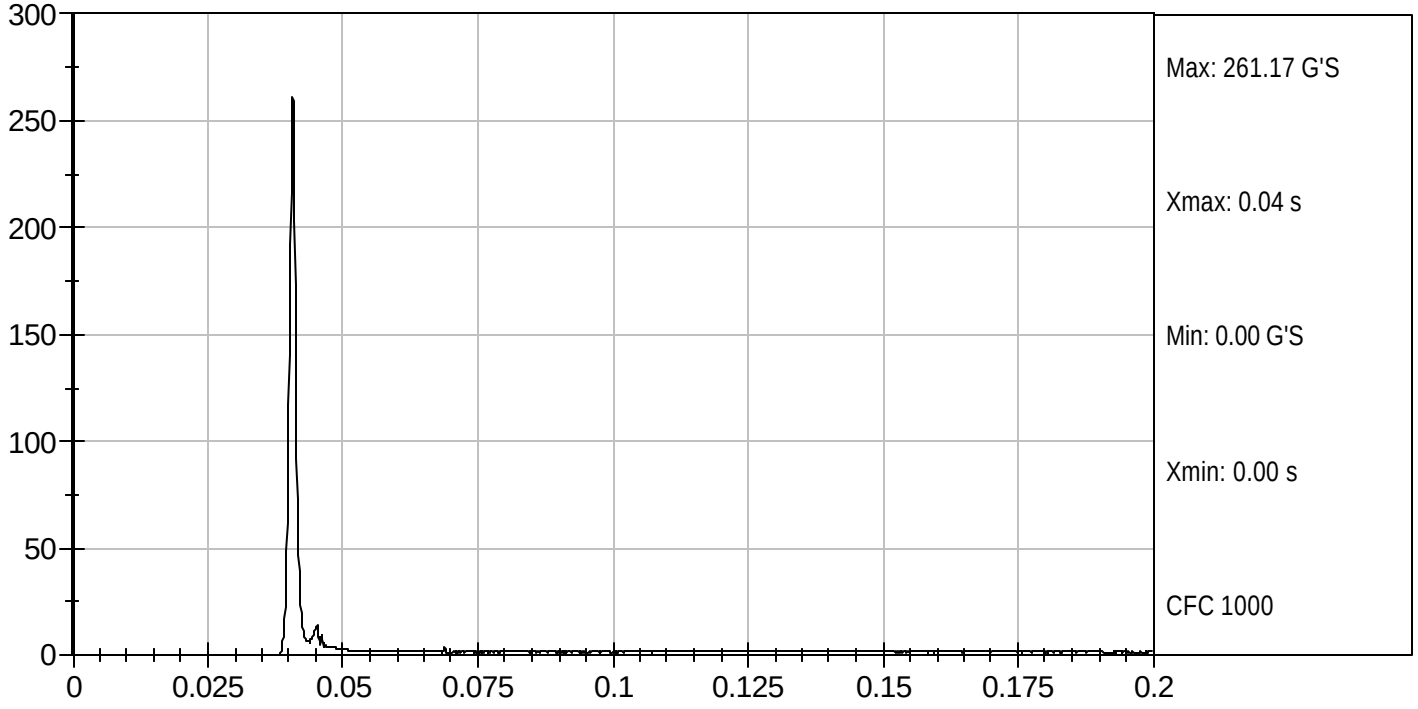
06/13/2005
Test Date

Approved By

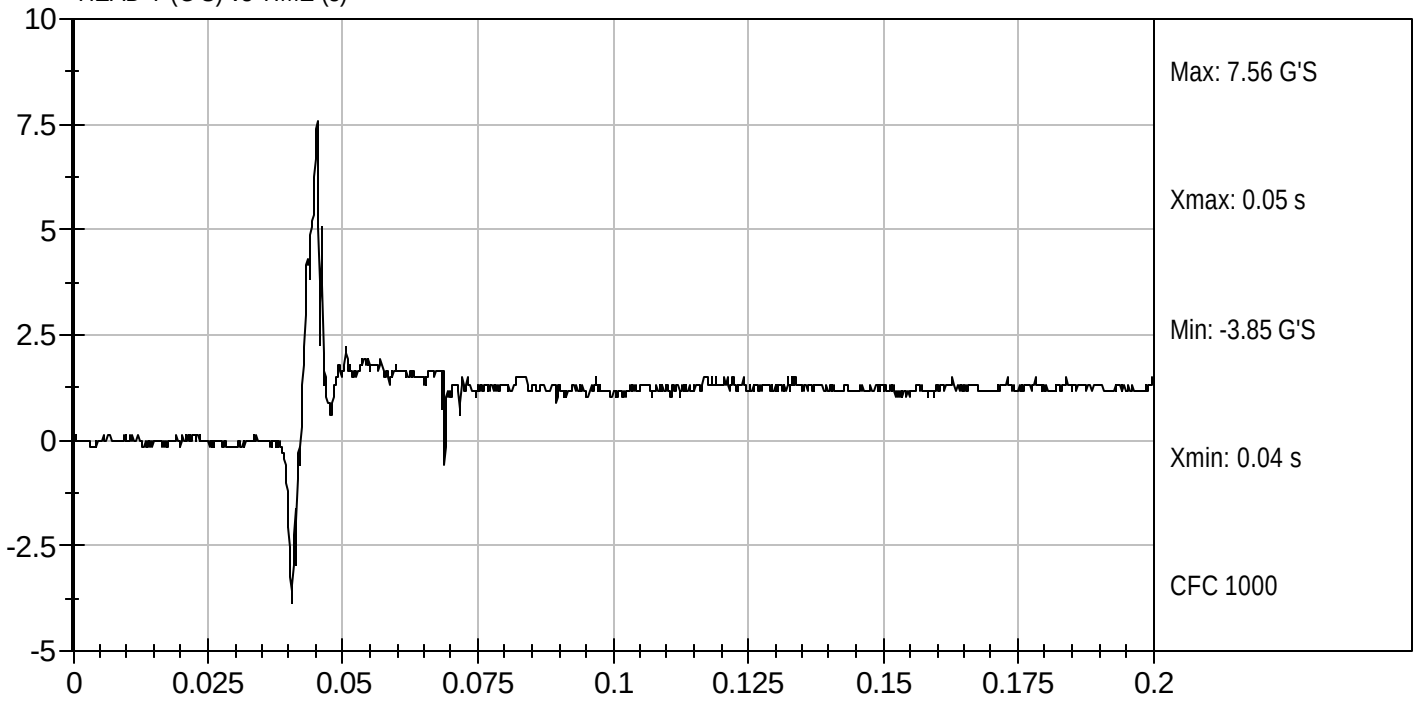
Test Desc: Head Drop
Componet ID: D051601

Test Date: 06/13/2005
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 ___511___ Test Date ___6/13/05___

Technician ___Dave Wilcox___

___Pretest calibration
_X_Post test calibration verification

Test attempt no. _1_ (when successive flexion tests are necessary)

__1. It has been at least 30 minutes since the last flexion test. (572.137(q))
_X_ N/A, ONLY one flexion test performed

_X_2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.5__
Record the minimum temperature __21.1__
Record the maximum humidity __45%__
Record the minimum humidity __41%__

_X_4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: __No Damage.___

_X_5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: __No Deterioration. Hardness Front 89; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_ 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_ 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_ 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	7.02 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.5 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.8 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.8 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__76__ Nm @ __79__ degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	85 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

6/13/05

Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051602

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	41	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.02	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	79	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

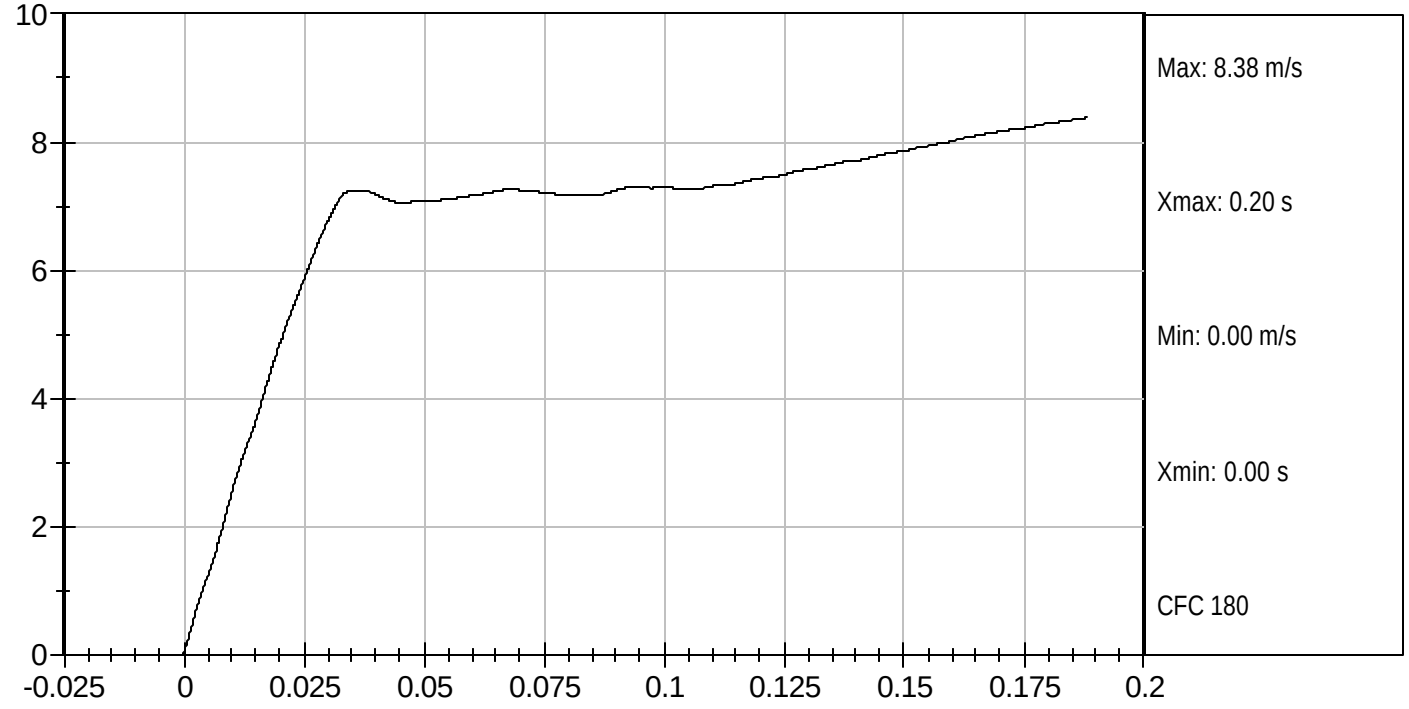
06/13/2005
Test Date

Jeff Levandoski
Approved By

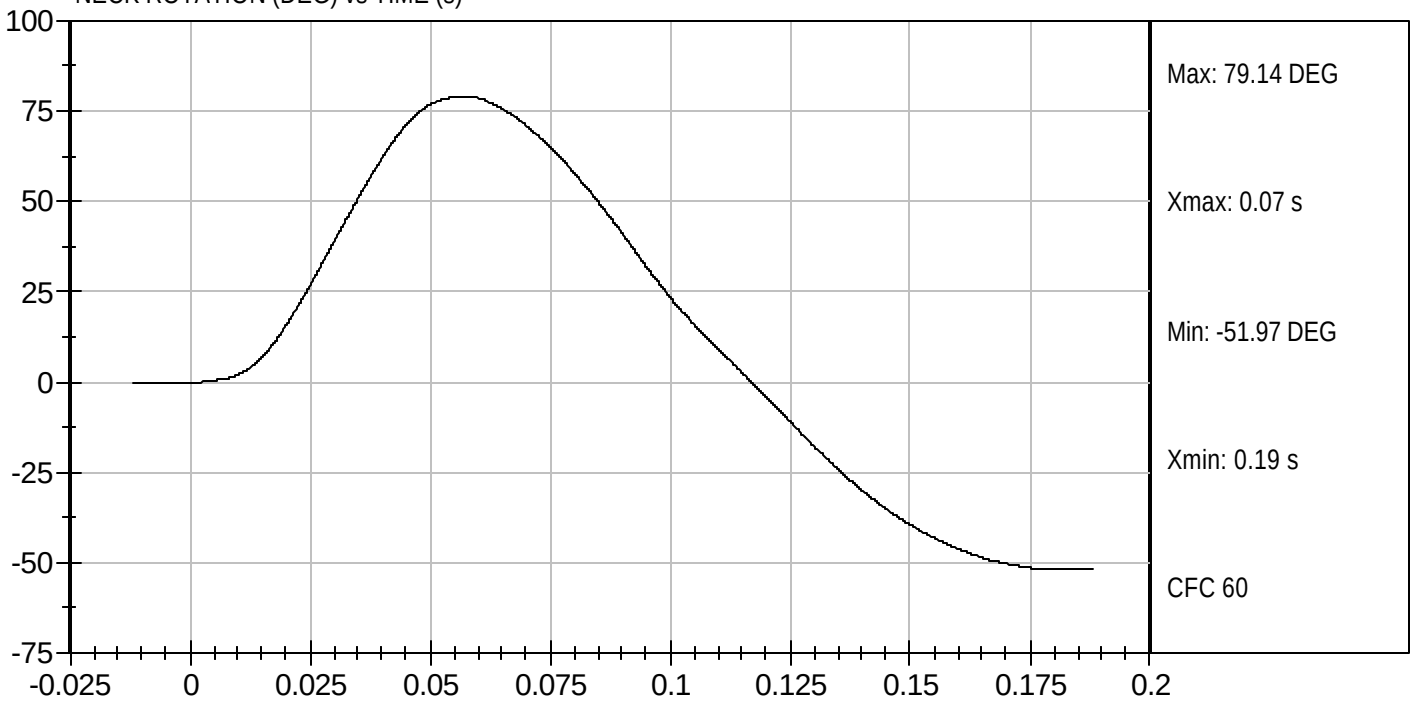
Test Desc: Neck Flexion
Componet ID: D051602

Test Date: 06/13/2005
Velocity: 23.03 ft/s, 7.02 m/s

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

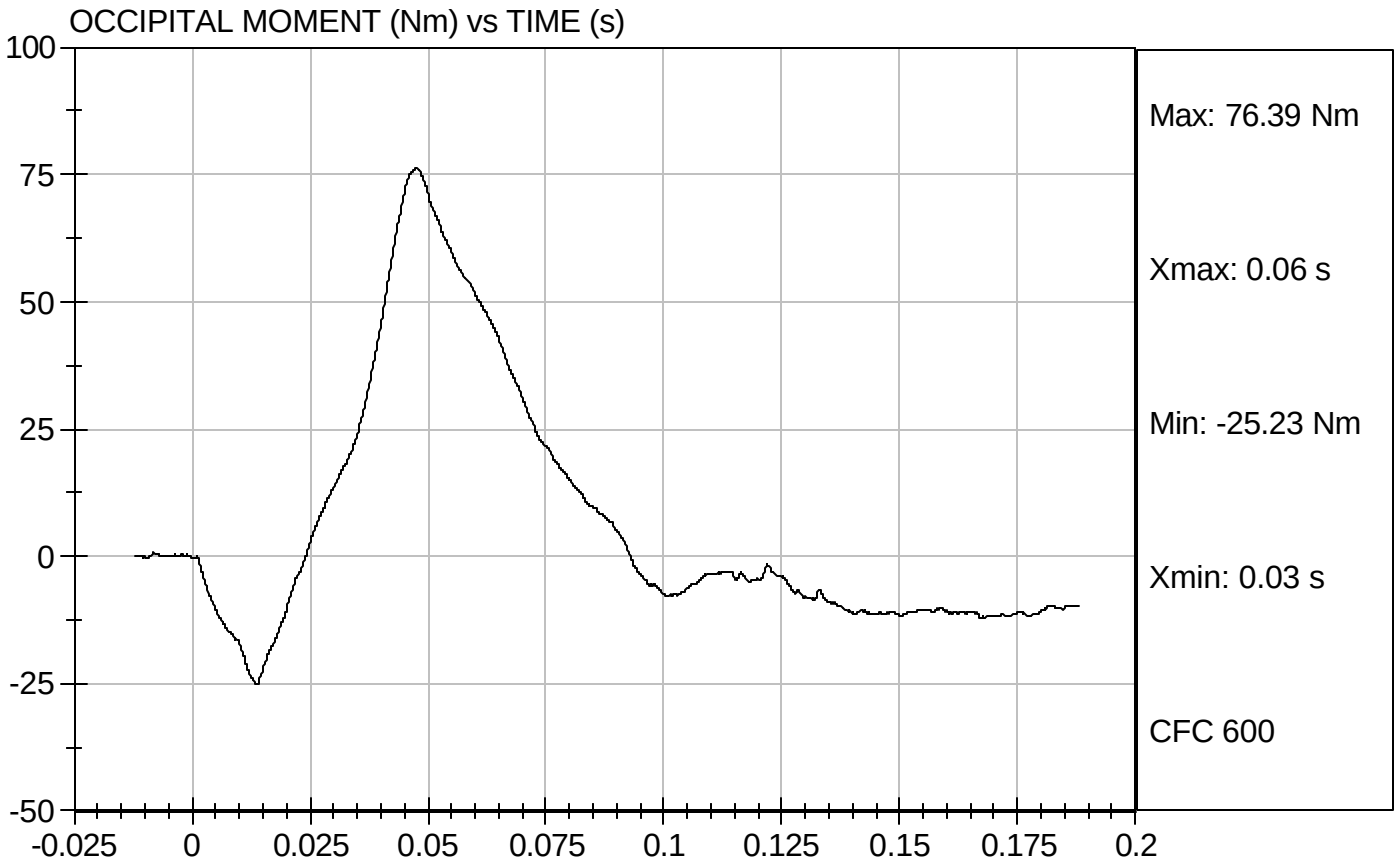


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051602

Test Date: 06/13/2005
Speed: 23.03 ft/sec, 7.02 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ___511_____ Test Date ___6/14/05_____

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. (572.137(q))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.3___
Record the minimum temperature __20.9___
Record the maximum humidity __44%__
Record the minimum humidity __42%__

_X_4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: __No Damage._____

_X_5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: __No Deterioration. Hardness Front 89; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.14 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.8 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.6 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.5 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-54_ Nm @ _107_ degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	106 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

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

Joe Fleck _____ 6/14/05

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051603

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.14	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	107	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	106	Pass
			Overall Results		Pass

Laboratory Technician

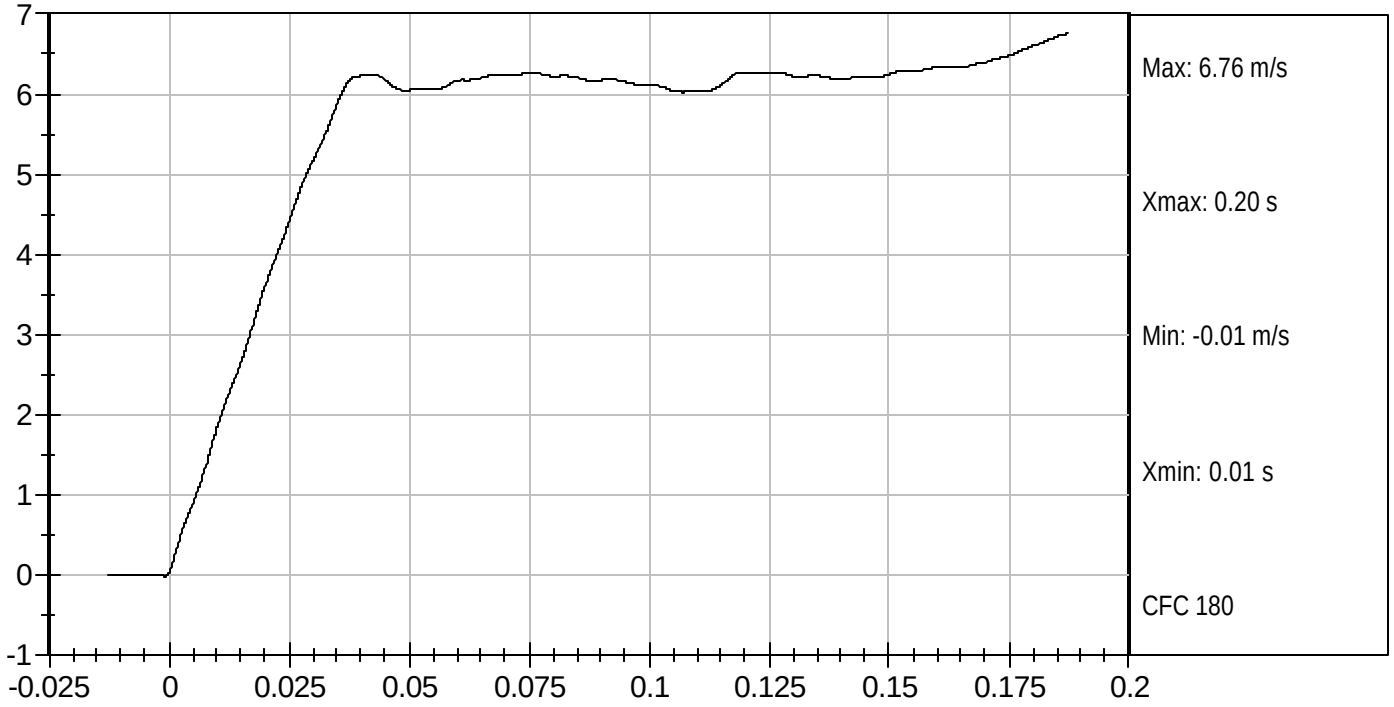
06/14/2005
Test Date

Approved By

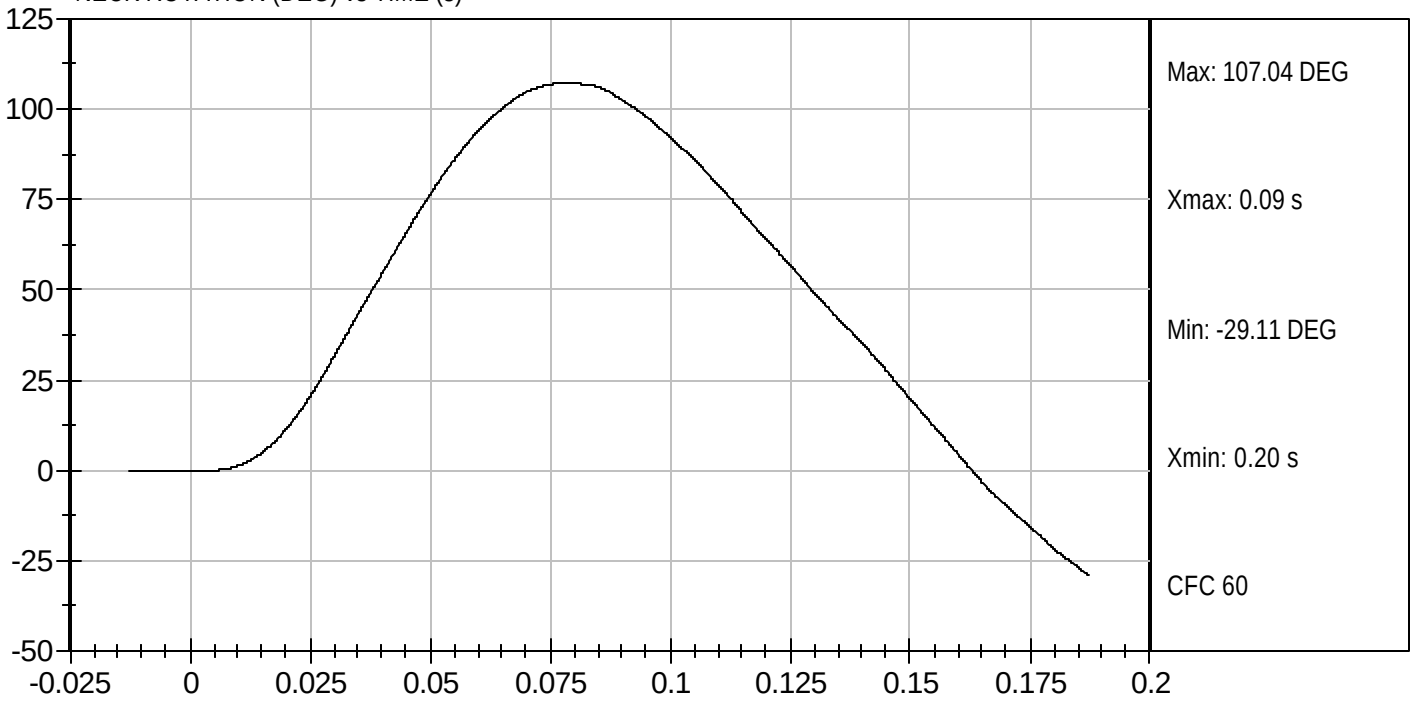
Test Desc: Neck Extension
Componet ID: D051603

Test Date: 06/14/2005
Velocity: 20.15 ft/s, 6.14 m/s

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

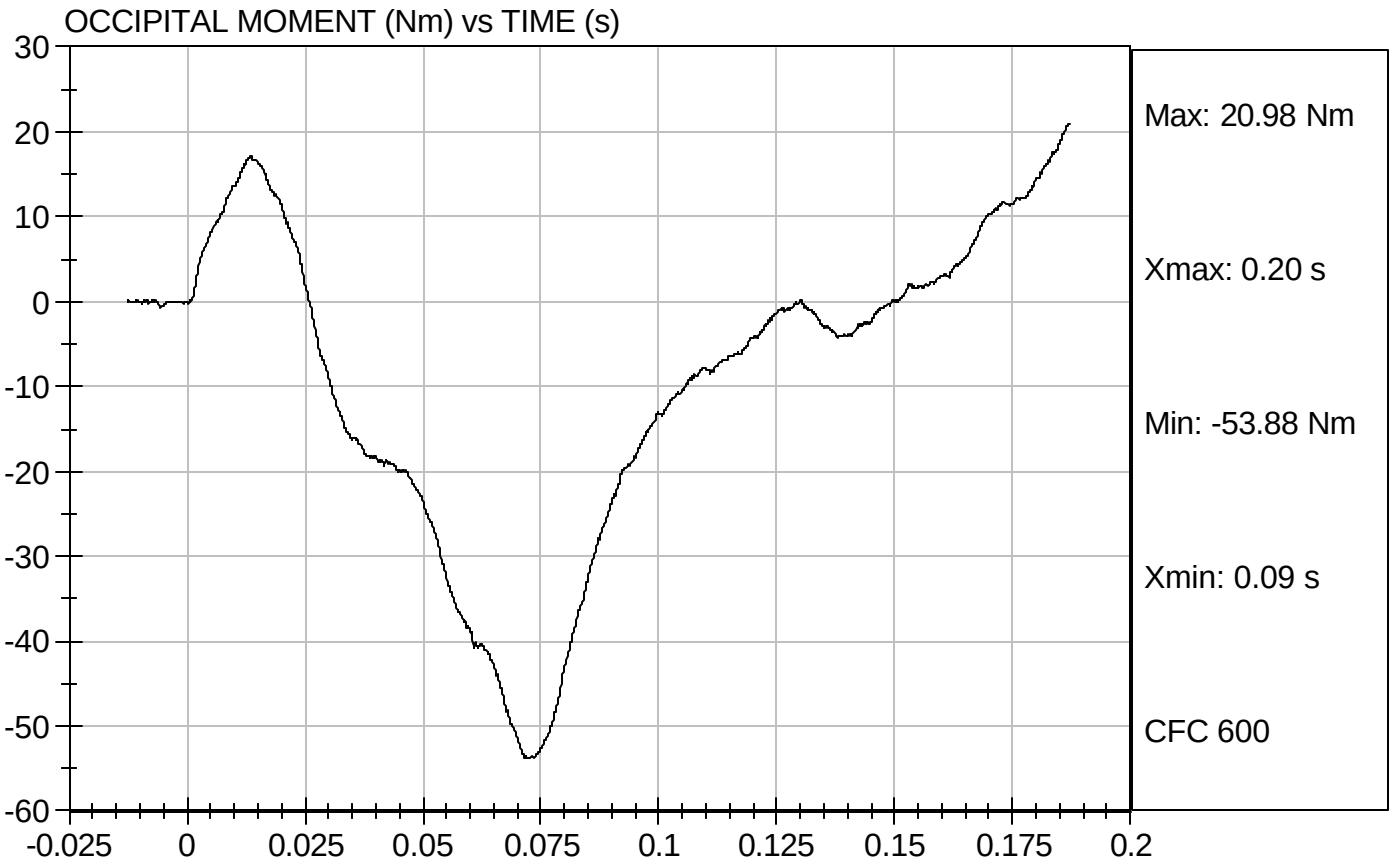


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051603

Test Date: 06/14/2005
Speed: 20.15 ft/sec, 6.14 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __511_____ Test Date __6/14/05_____

Technician ____Jessica Gall _____

___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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _21.3
Record the minimum temperature _20.9
Record the maximum humidity _44%
Record the minimum humidity _42%
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_ 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.72 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	54 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4020 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4003 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 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

6/14/05
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051604

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	6.59 to 6.83	6.72	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.0	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4,003	Pass
		Overall Test Results		Pass

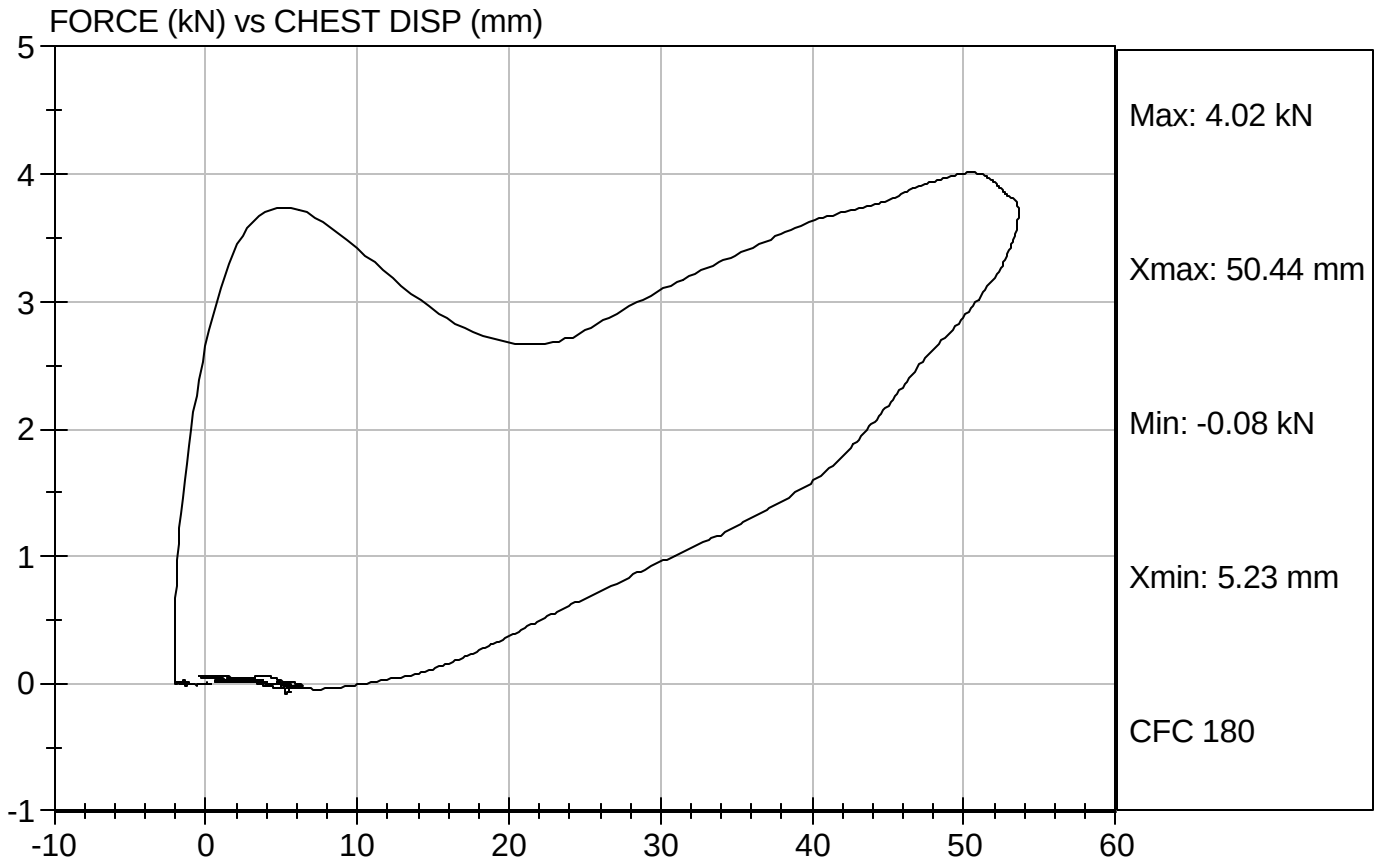
Jessica Hall
Laboratory Technician

06/14/2005
Test Date

Jeff Leonardis
Approved By

Test Desc: Thorax Impact
Component ID: D051604

Test Date: 06/14/2005
Speed: 22.04 ft/sec, 6.72 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __511_____ Test Date __6/13/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) 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 __45%__
Record the minimum humidity __41%__
_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°)___11^0___
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	11°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	386 N
Final ref. plane angle	Initial ref. plane angle ±8°	13°

Signature

6/13/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051607

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Initial Angle	deg	0 to 20	11	Pass
Return Angle	deg	+/- 8	13	Pass
Force at 45 deg	N	320 to 390	386	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Laboratory Technician

06/13/2005
Test Date

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __511_____ Test Date __6/13/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) 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 _45%__
Record the minimum humidity _41%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3700 N

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

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

Joe Fleck _____ 6/13/05

Signature Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051606

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	44	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.70	Pass
		Overall Test Results		Pass

Joe Fleck

Laboratory Technician

06/13/2005

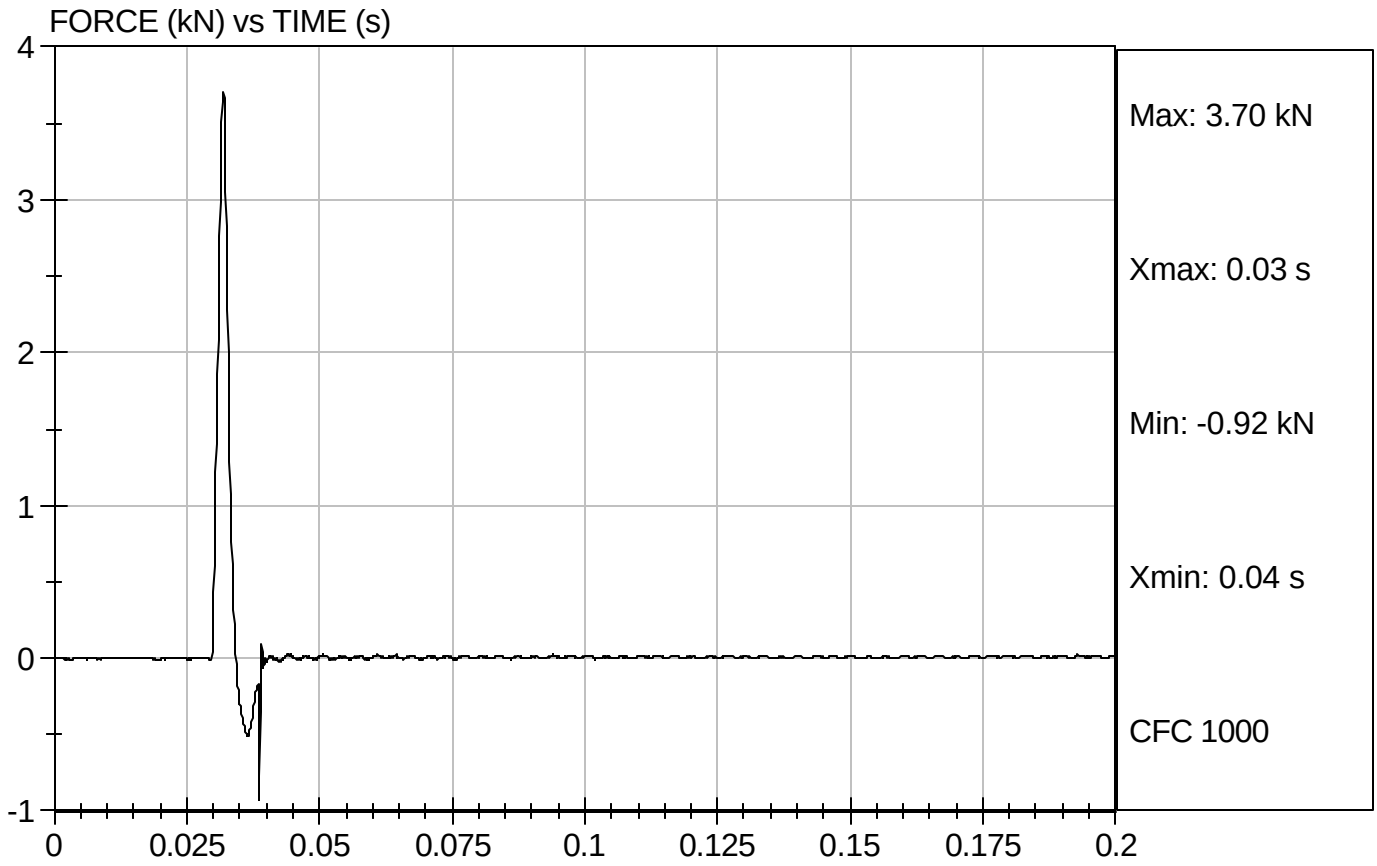
Test Date

Jeff Levandoski

Approved By

Test Desc: Left Knee
Component ID: D051606

Test Date: 06/13/2005
Speed: 6.93 ft/sec, 2.11 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___511_____ Test Date __6/13/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) 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 _45 %___
Record the minimum humidity _41 %___
_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 m/s ≤ speed ≤ 2.13 m/s	2.10 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3560 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

6/13/05
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051605

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	45	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.56	Pass
		Overall Test Results		Pass

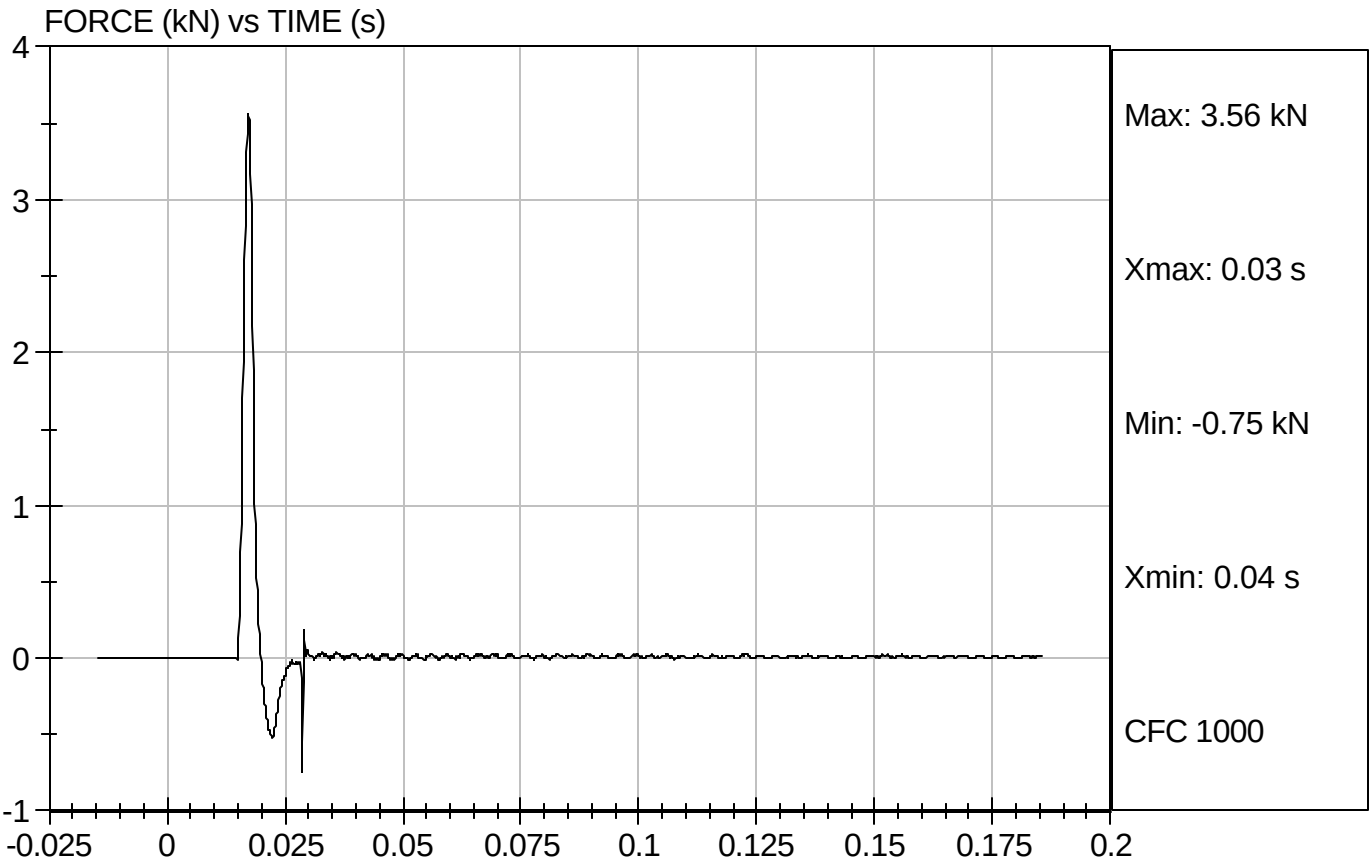
Joe Fleck
Laboratory Technician

06/13/2005
Test Date

Jeff Leonardelli
Approved By

Test Desc: Right Knee
Component ID: D051605

Test Date: 06/13/2005
Speed: 6.89 ft/sec, 2.10 m/sec



EXTERNAL DIMENSIONS

HYBRID III 5th SN #511, 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	782.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.8
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	75.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.9
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.2
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	282.7
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	540.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	358.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	406.3
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	414.0-439.4	434.4

HYBRID III 5th SN #511, 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	186.4
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	222.3
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	476.3
S	HEAD BREADTH	The widest part of the head	137.1-147.3	142.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	299.9
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.2
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	83.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	539.4
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	851.9
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	762.4
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 __511_____ Test Date __6/8/05____

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 Gall _____ 6/8/05_____
Signature Date

Describe the repair or replacement of parts:

Checked by

Jeff Levandoski _____ 6/8/05_____
Signature Date

EXTERNAL DIMENSIONS

HYBRID III 5th 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 5th 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 5/20/05

Technician Joe Fleck

_X_ 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))
__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 (66ºF) and 25.6°C (78ºF) 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 21.7
Record the minimum temperature 21.6
Record the maximum humidity 40%
Record the minimum humidity 38%

_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 ± 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 g ≤ x ≤ 300 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 ≤ 15 g	-12

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

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test ID:** D051391

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	250 - 300	267	Pass
Peak Lateral Acceleration	G's	+/- 15	-12	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

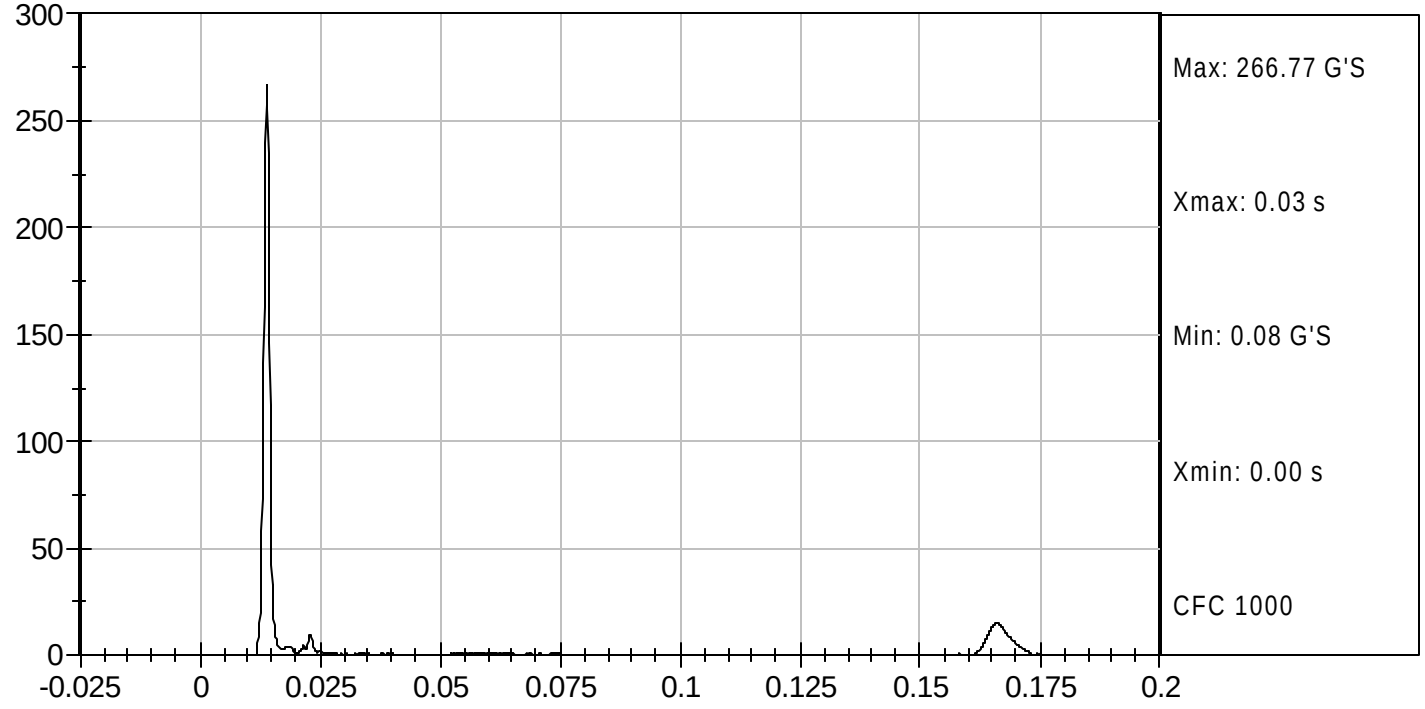
05/20/2005
Test Date

Approved By

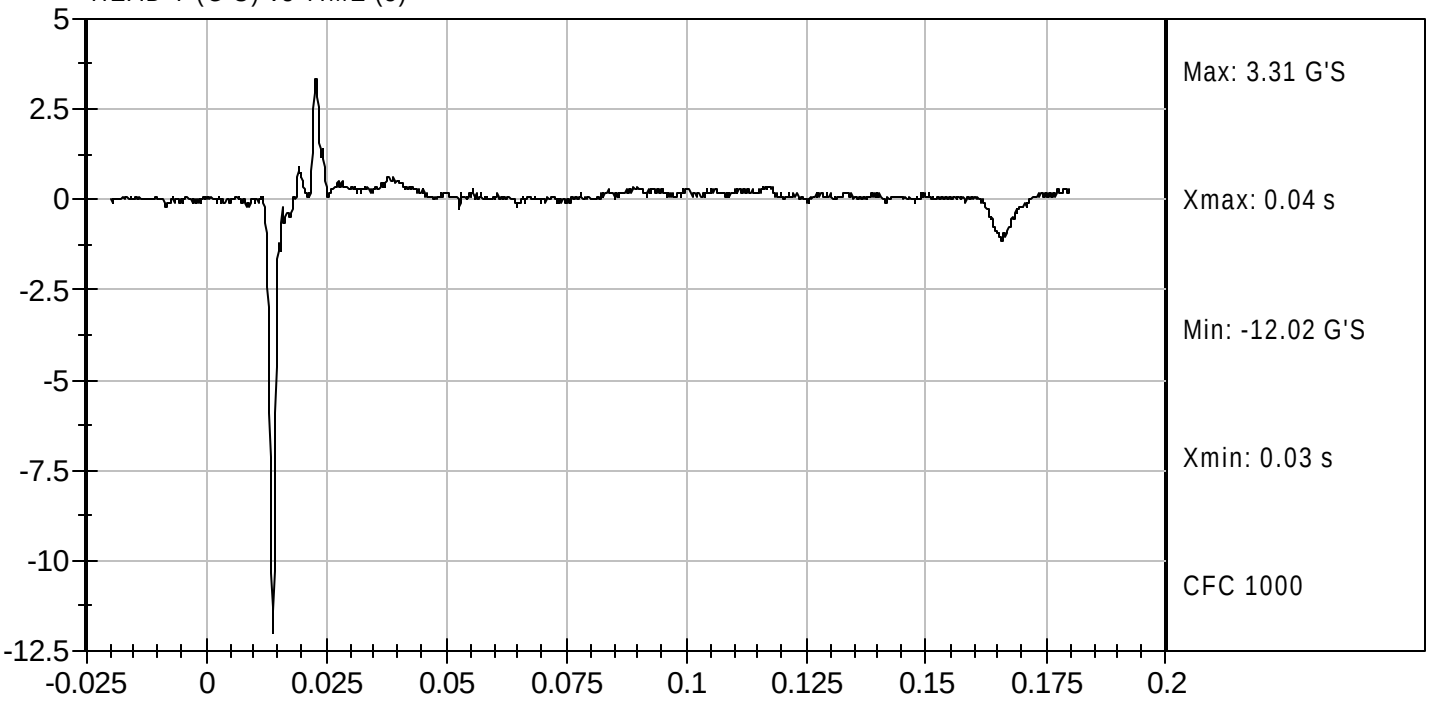
Test Desc: Head Drop
Componet ID: D051391

Test Date: 05/20/2005
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 ___5/20/05___

Technician ___Joe Fleck___

_X_ 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))
_X_ N/A, ONLY one flexion test performed

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

_X_ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature 21.7
Record the minimum temperature 21.6
Record the maximum humidity 40%
Record the minimum humidity 38%

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

_X_ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: No Deterioration. Hardness Front 89; Back 89.

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

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

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

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_ 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_ 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_ 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	6.98 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.8 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.8 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77° ≤ angle ≤ 91°	__80__ Nm @ __79__ degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	85 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Ian Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051392

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	39	Pass
Pendulum Speed		m/sec	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	79	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	85	Pass
			Overall Results		Pass

Laboratory Technician

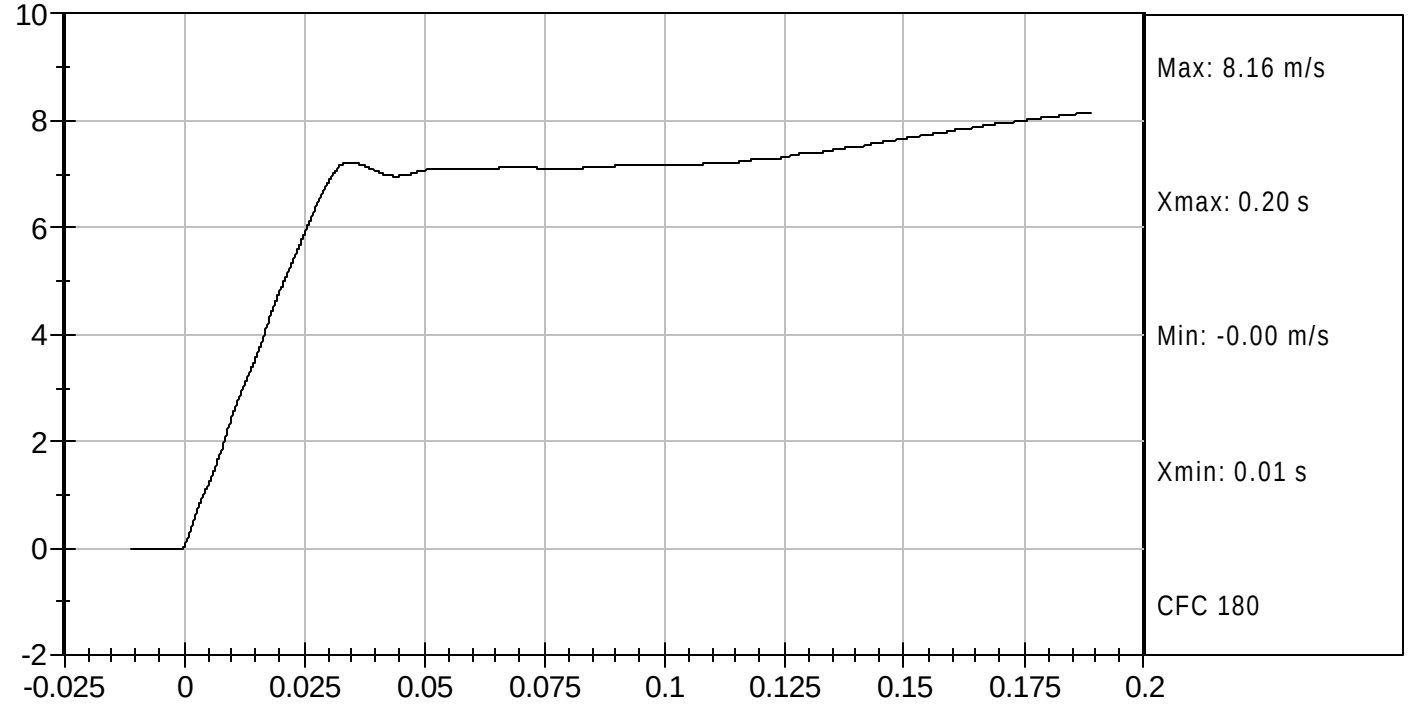
05/20/2005
Test Date

Approved By

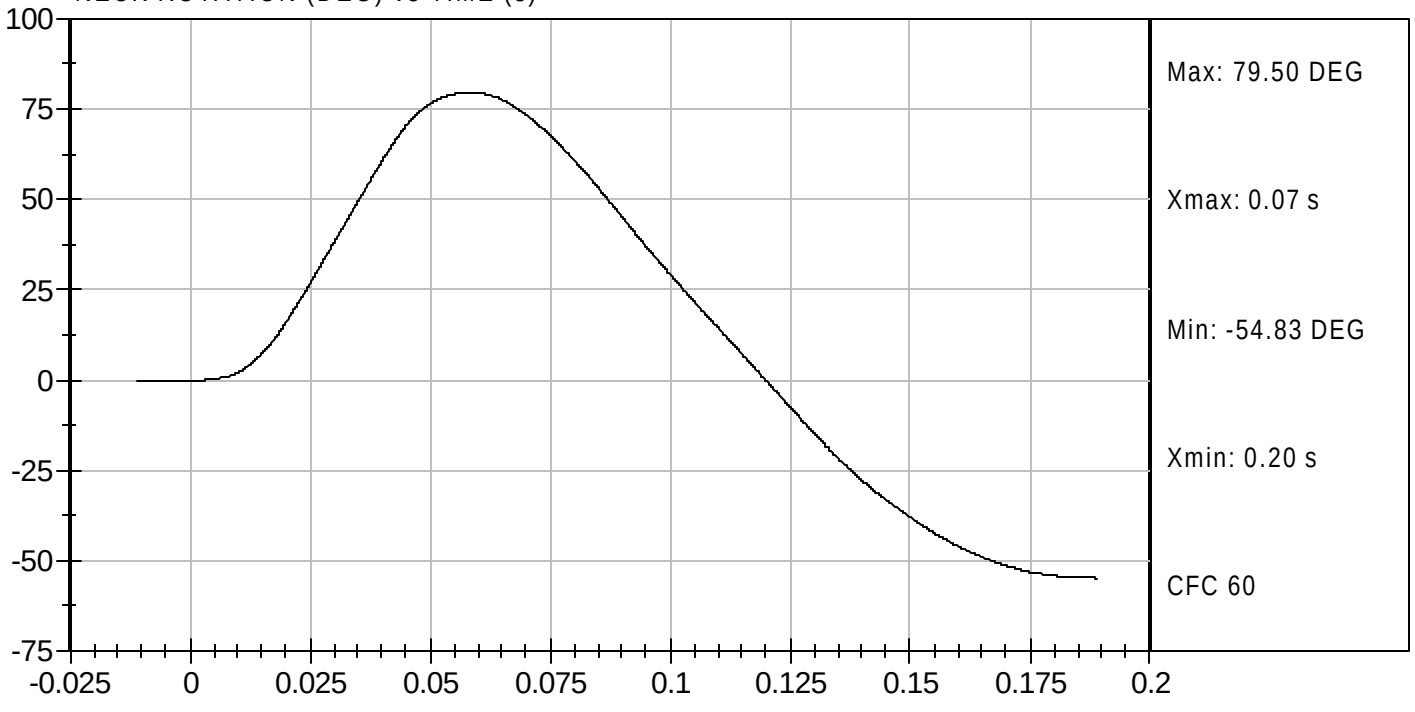
Test Desc: Neck Flexion
Componet ID: D051392

Test Date: 05/20/2005
Velocity: 22.89 ft/s, 6.98 m/s

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

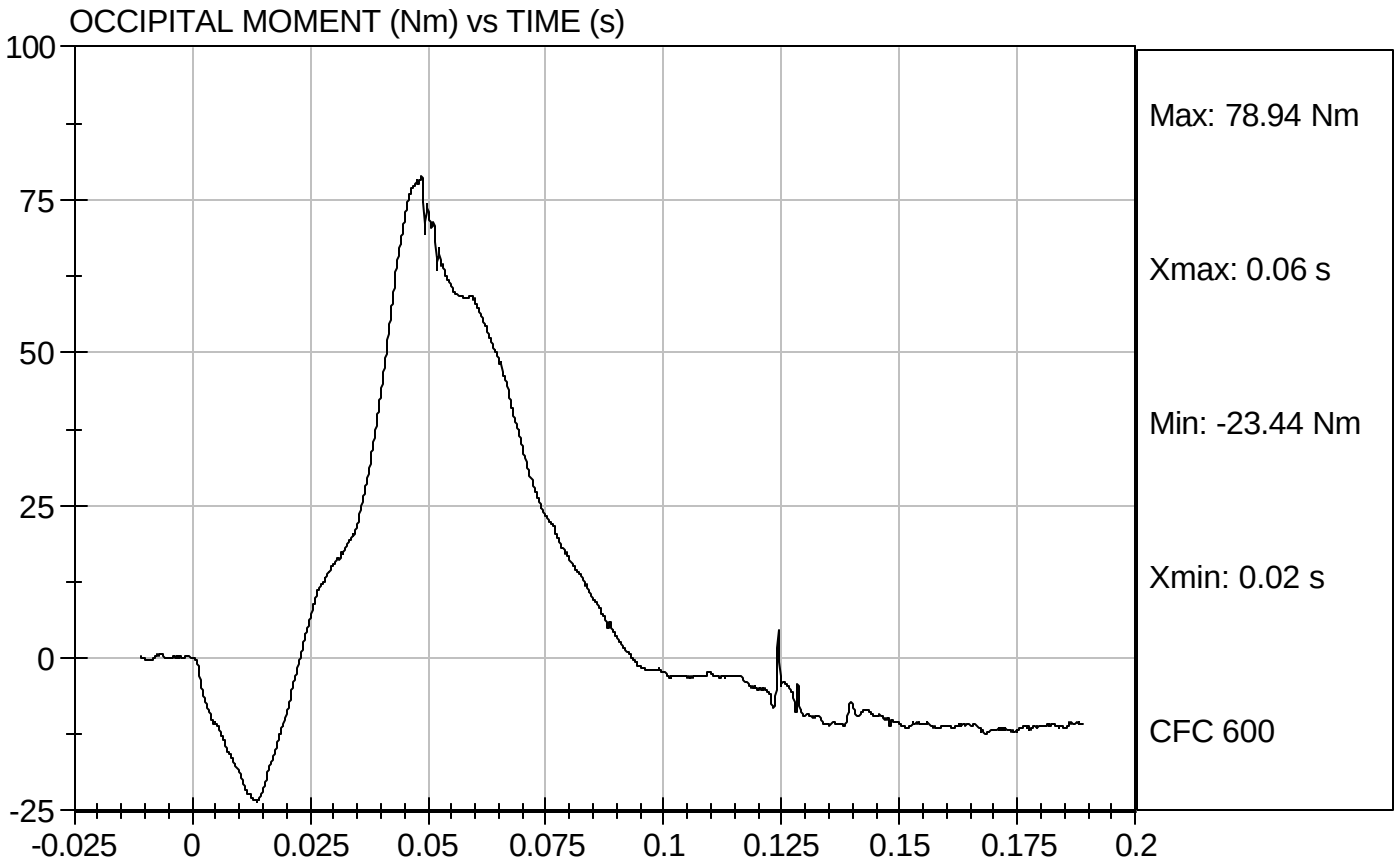


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051392

Test Date: 05/20/2005
Speed: 22.89 ft/sec, 6.98 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ___516_____ Test Date ___5/20/05_____

Technician _____Joe Fleck_____

_X_ 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))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.7___
Record the minimum temperature __21.6___
Record the maximum humidity __40%__
Record the minimum humidity __38%__

_X_4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: __No Damage._____

_X_5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: __No Deterioration. Hardness Front 89; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.13 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.9 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.5 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99° ≤ angle ≤ 114°	_-55_ Nm @ _109_ degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	103 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

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

Joe Fleck _____ 5/20/05_____

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051393

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	39	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.9	Pass
	30 msec	m/sec	4.6 to 5.6	5.5	Pass
D Plane Rotation	Max	deg	99 to 114	109	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	103	Pass
			Overall Results		Pass

Laboratory Technician

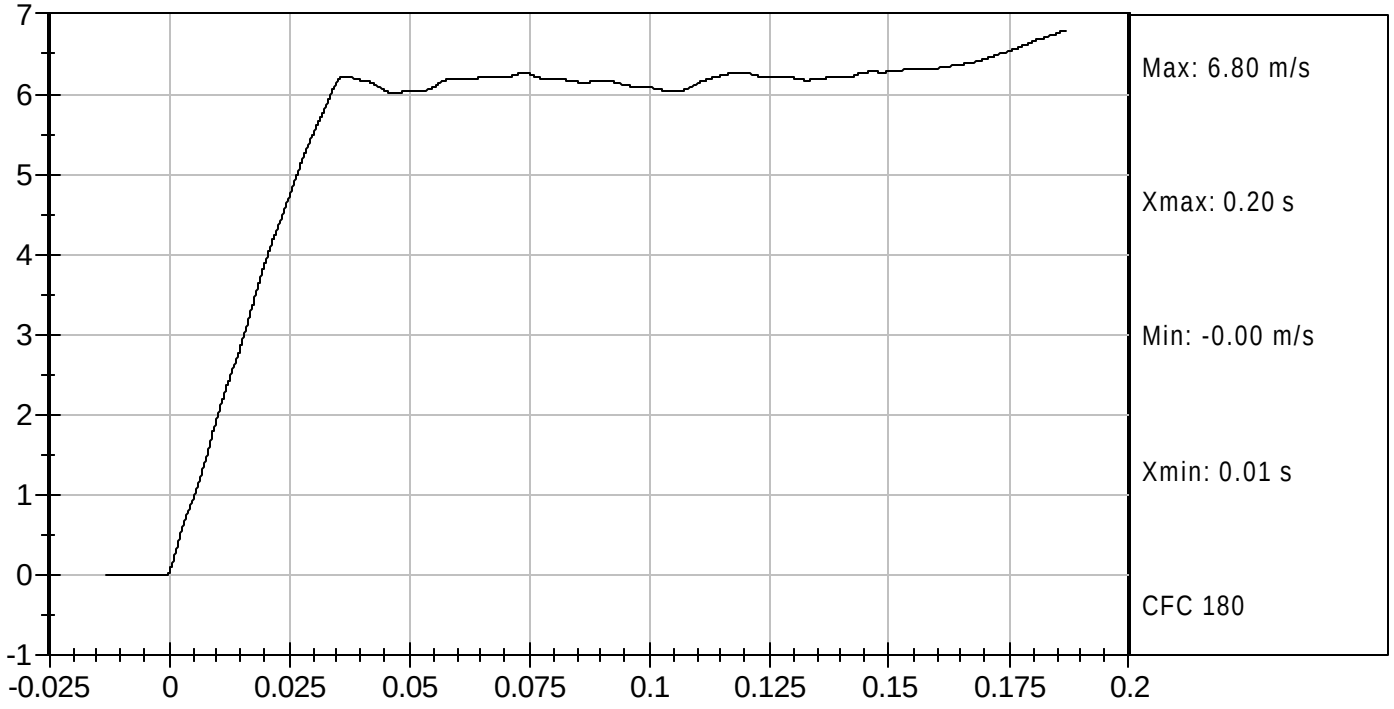
05/20/2005
Test Date

Approved By

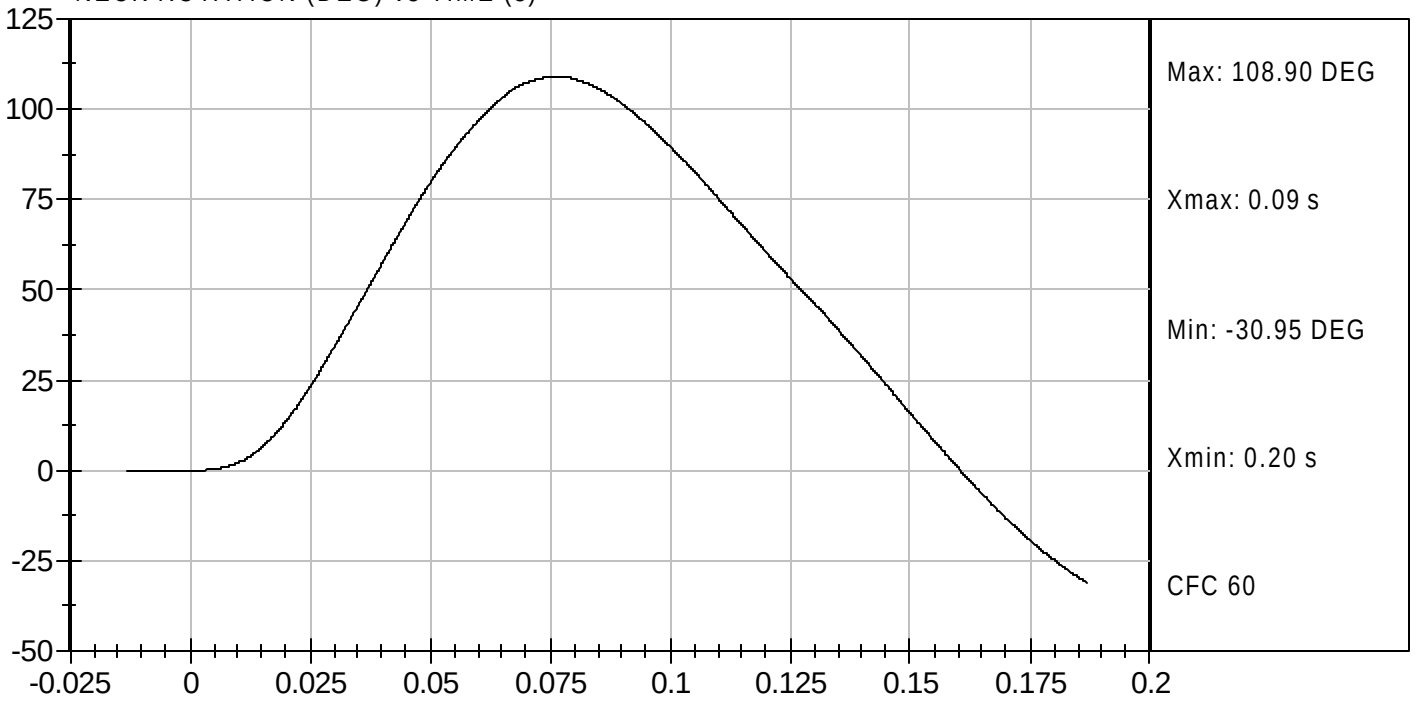
Test Desc: Neck Extension
Componet ID: D051393

Test Date: 05/20/2005
Velocity: 20.11 ft/s, 6.13 m/s

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

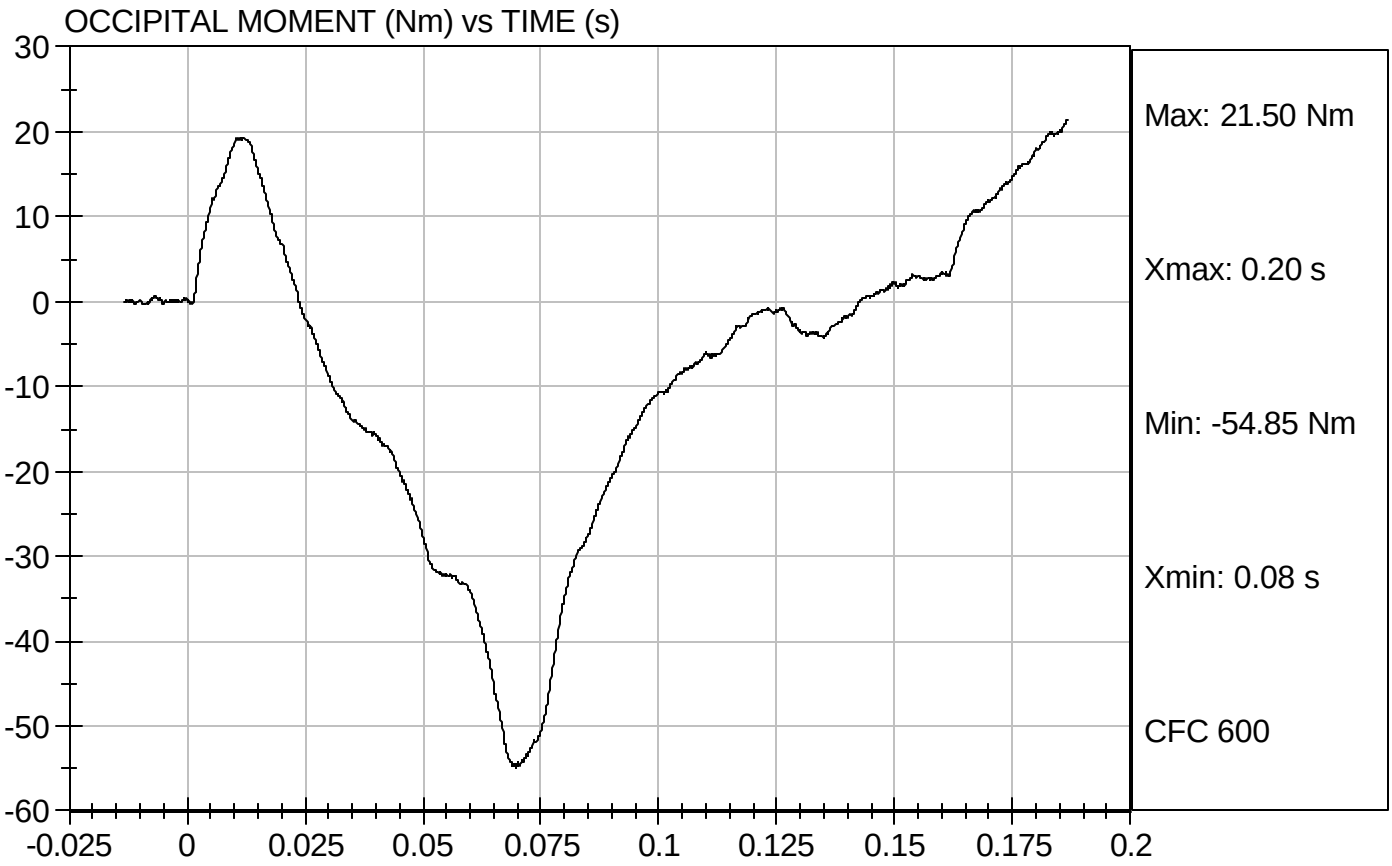


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051393

Test Date: 05/20/2005
Speed: 20.11 ft/sec, 6.13 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __516_____ Test Date __5/20/05_____

Technician ____Joe Fleck_____

_X_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))
_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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _21.7_
Record the minimum temperature _21.6_
Record the maximum humidity _40%_
Record the minimum humidity _38%_
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_ 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.62 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4100 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4028 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 85%	69%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.
**Force = impactor mass x acceleration (572.134(b)(3))

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

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

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051394

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	6.59 to 6.83	6.62	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.1	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4,028	Pass
		Overall Test Results		Pass

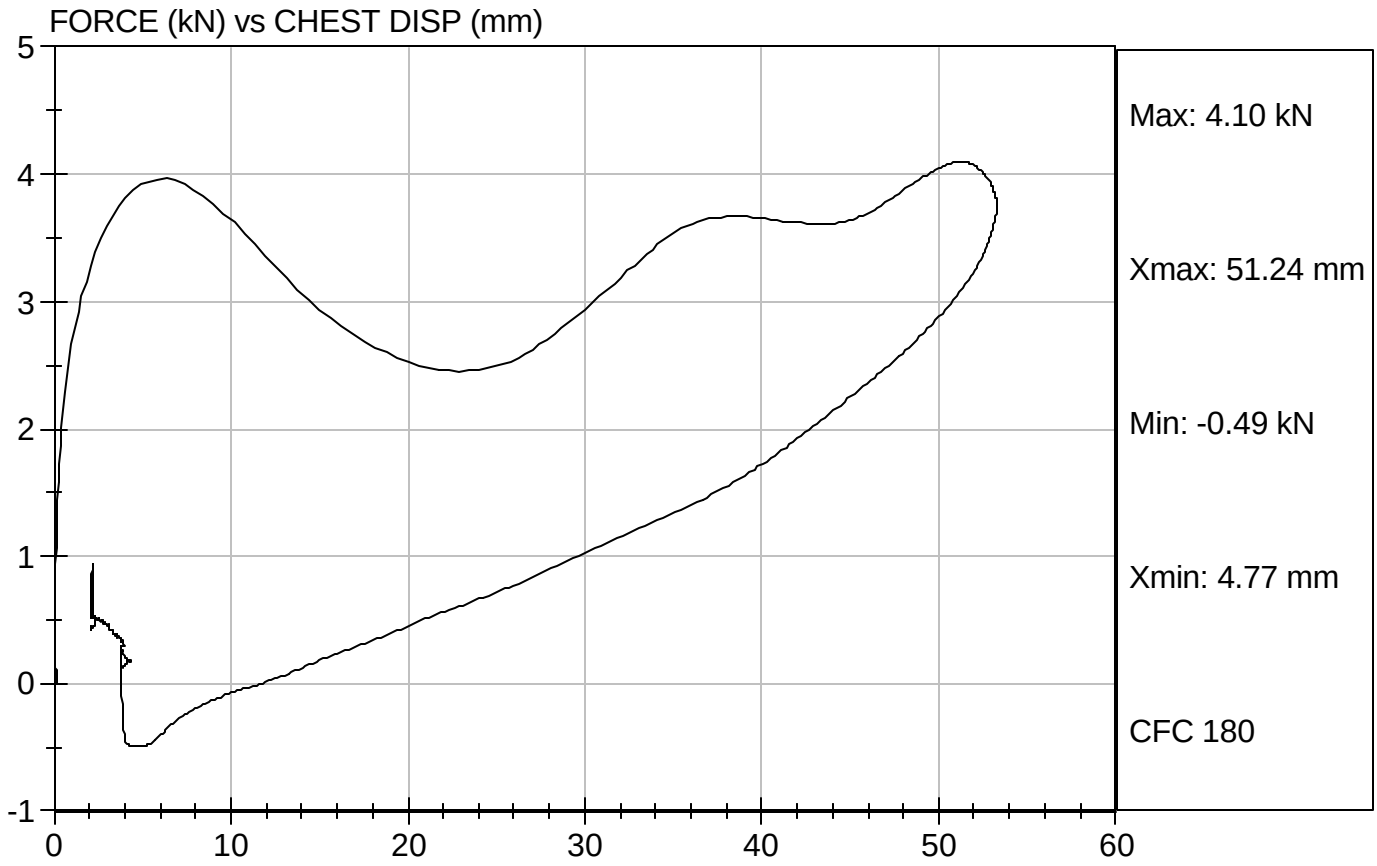
Laboratory Technician

05/20/2005
Test Date

Approved By

Test Desc: Thorax Impact
Component ID: D051394

Test Date: 05/20/2005
Speed: 21.71 ft/sec, 6.62 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __516_____ Test Date __5/20/05_____

Technician _____Joe Fleck_____

_X_ 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))
_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 (66ºF) and 25.6°C (78ºF) 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 __21.6__
Record the maximum humidity __40%__
Record the minimum humidity __38%__
_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°)___16⁰___
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	16°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	331 N
Final ref. plane angle	Initial ref. plane angle ±8°	19°

Joe Fleck
Signature

5/20/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051397

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	19	Pass
Force at 45 deg	N	320 to 390	331	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Joe Fleck
Laboratory Technician

05/20/2005
Test Date

Jeff Leuenhagen
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __516_____ Test Date __5/20/05_____

Technician ____Joe Fleck _____

_X_ 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))
_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 (66ºF) and 25.6°C (78ºF) 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 _21.6__
Record the maximum humidity _40%__
Record the minimum humidity _38%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3810 N

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

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

Joe Fleck
_____ 5/20/05_____
Signature Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051396

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	40	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.81	Pass
		Overall Test Results		Pass

Joe Fleck

Laboratory Technician

05/20/2005

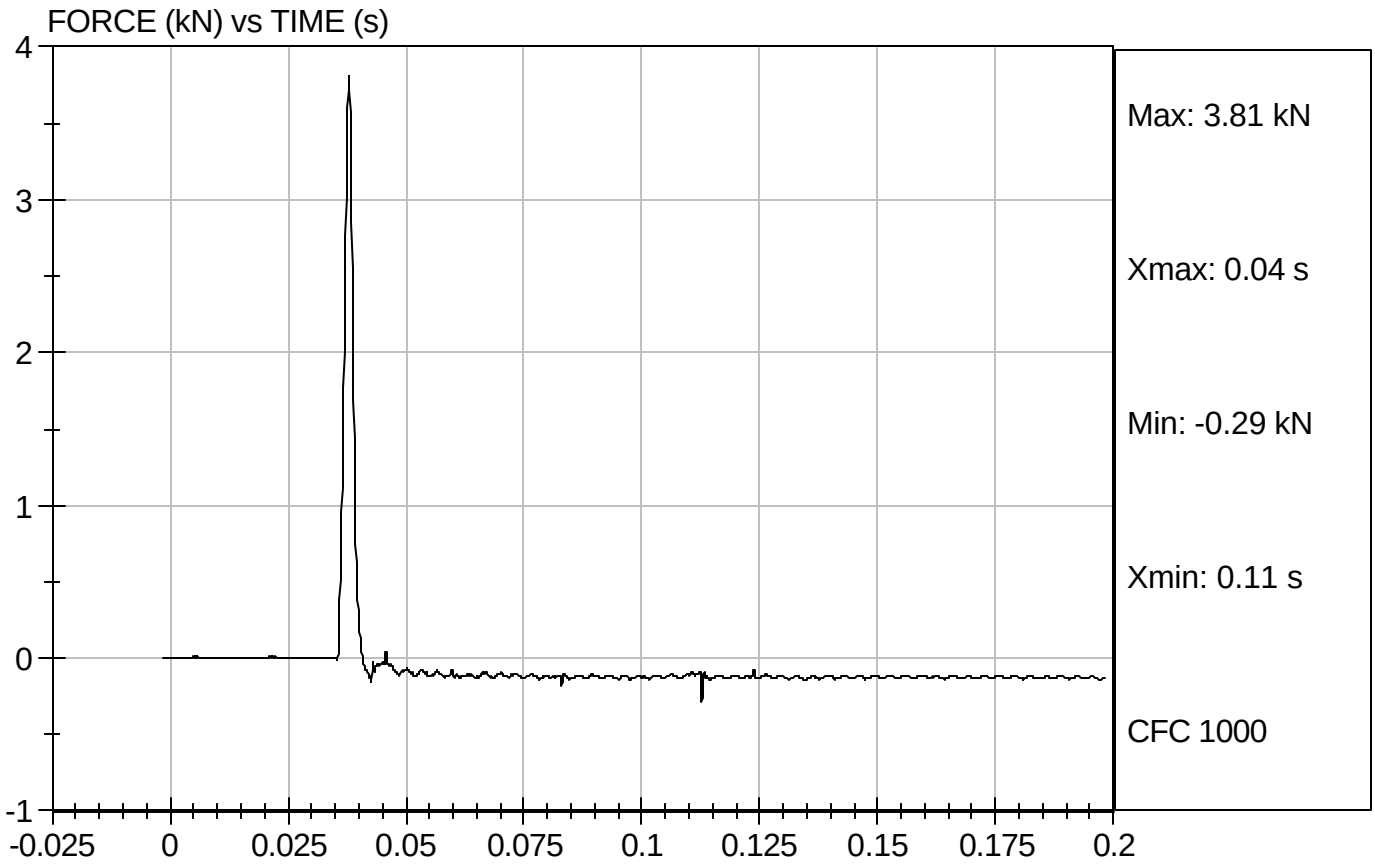
Test Date

Jeff Leonardelli

Approved By

Test Desc: Left Knee
Component ID: D051396

Test Date: 05/20/2005
Speed: 6.92 ft/sec, 2.11 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___516_____ Test Date __5/20/05_____

Technician ___Joe Fleck _____

_X_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))
_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 (66ºF) and 25.6°C (78ºF) 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 _21.6___
Record the maximum humidity _40%___
Record the minimum humidity _38%___
_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 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3820 N

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

_X_12. Plots of acceleration versus time and force versus time follow this sheet.

Joe Fleck 5/20/05

Signature Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051395

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	40	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.82	Pass
		Overall Test Results		Pass

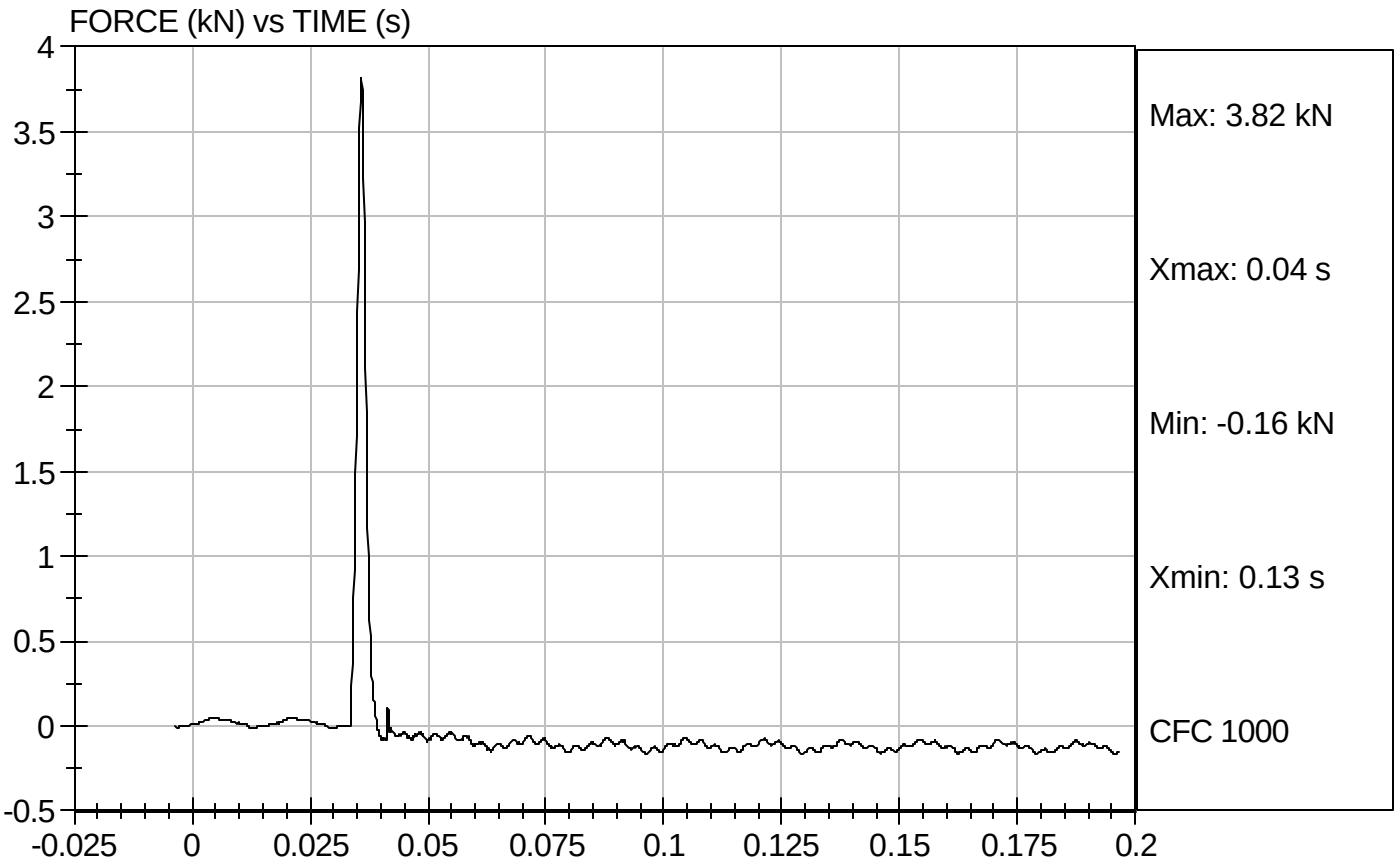
Joe Fleck
Laboratory Technician

05/20/2005
Test Date

Jeff Levandoski
Approved By

Test Desc: Right Knee
Component ID: D051395

Test Date: 05/20/2005
Speed: 6.95 ft/sec, 2.12 m/sec



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number 516 Test Date 6/13/05

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. (572.132(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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
Record the maximum temperature 21.8
Record the minimum temperature 21.2
Record the maximum humidity 44%
Record the minimum humidity 40%
_X_8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the 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 ± 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 g ≤ x ≤ 300 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 ≤ 15 g	10

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

Joe Fleck
Signature

6/13/05
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test ID:** D051611

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	250 - 300	262	Pass
Peak Lateral Acceleration	G's	+/- 15	9.6	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

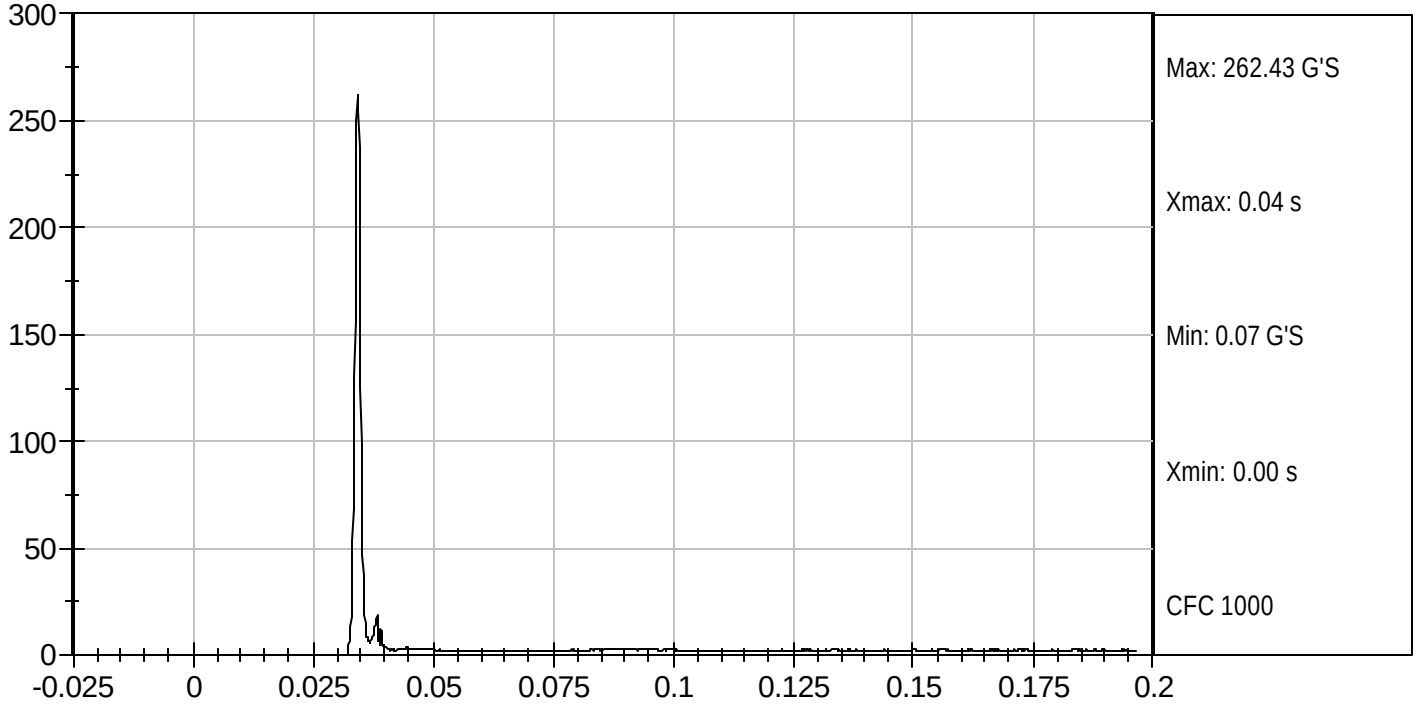
06/13/2005
Test Date

Approved By

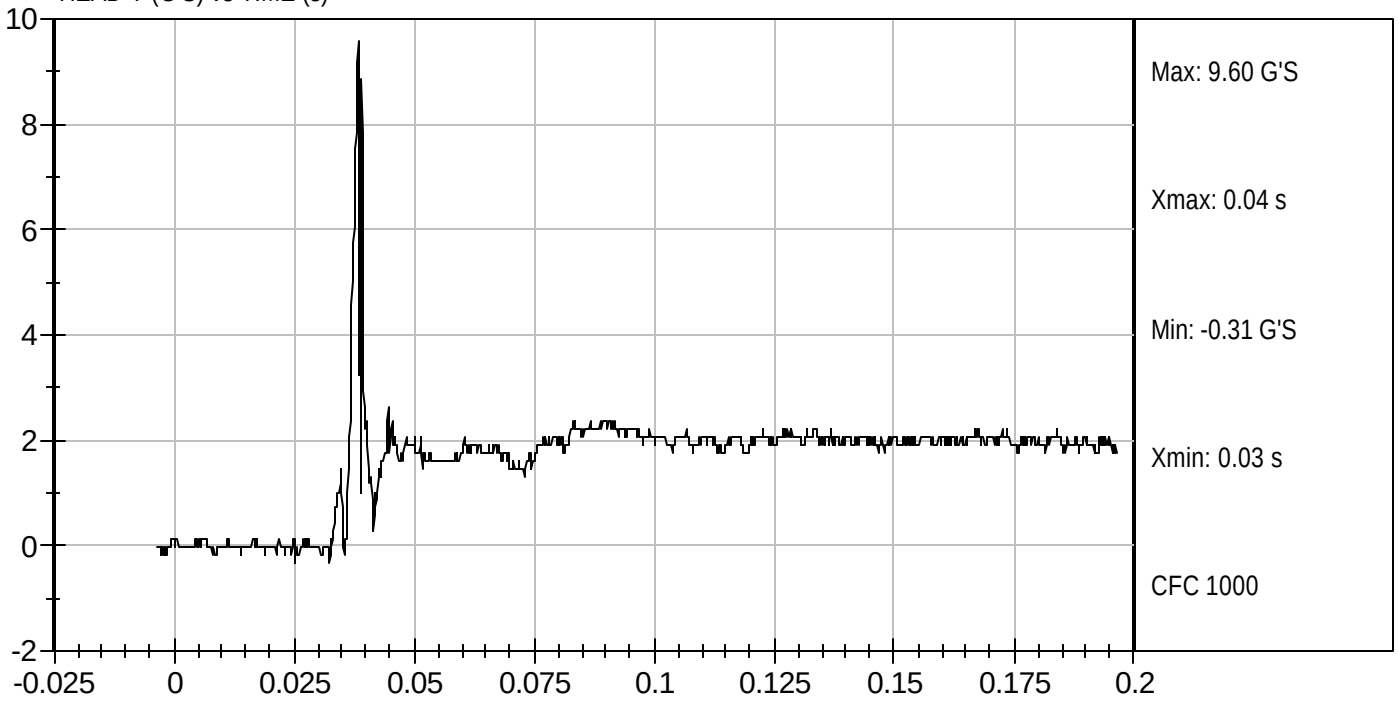
Test Desc: Head Drop
Componet ID: D051611

Test Date: 06/13/2005
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 ___6/14/05___

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. (572.137(q))
_X_ N/A, ONLY one flexion test performed

_X_2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.3__
Record the minimum temperature __21.0__
Record the maximum humidity __44%__
Record the minimum humidity __42%__

_X_4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: __No Damage.___

_X_5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: __No Deterioration. Hardness Front 89; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_ 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_ 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_ 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_ 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	7.13 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.3 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.6 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.6 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__72__ Nm @ __82__ degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	87 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Ian Fleck
Signature

6/14/05
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051612

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	44	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.13	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	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	87	Pass
			Overall Results		Pass

Laboratory Technician

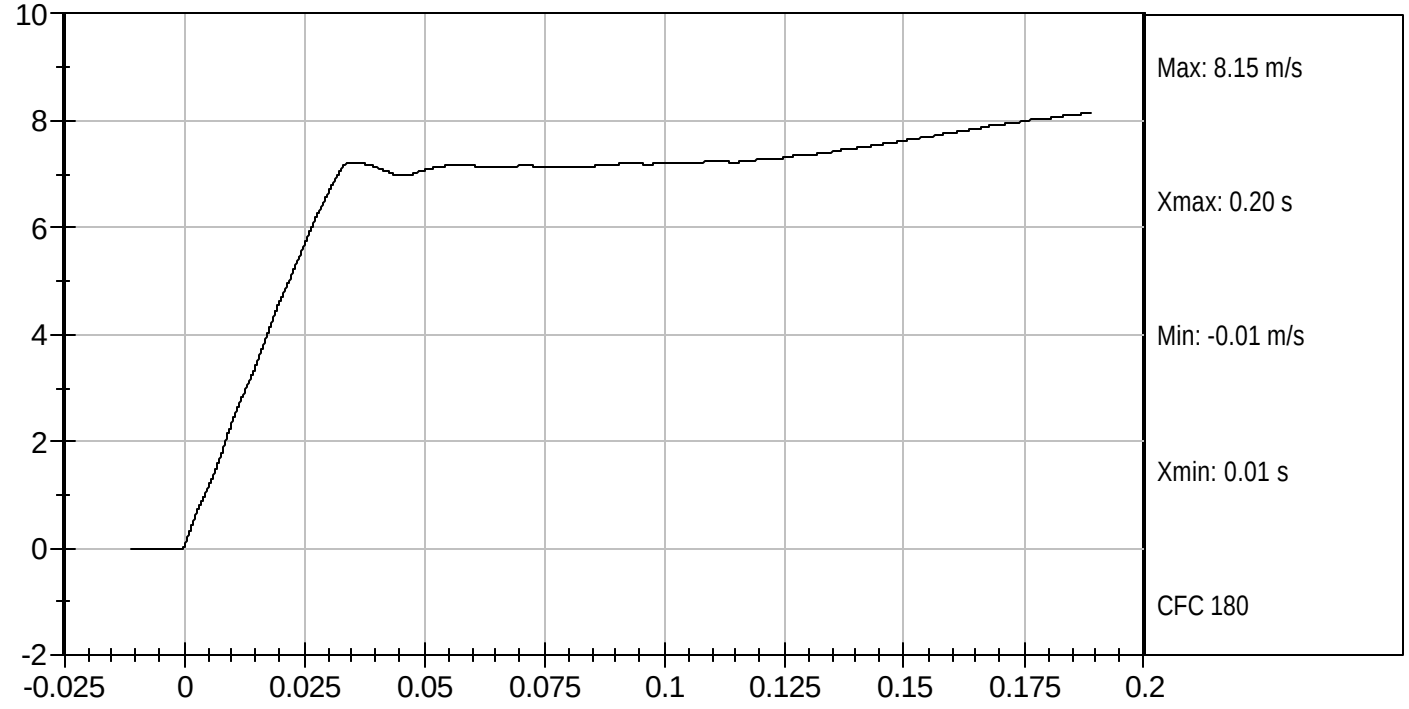
06/14/2005
Test Date

Approved By

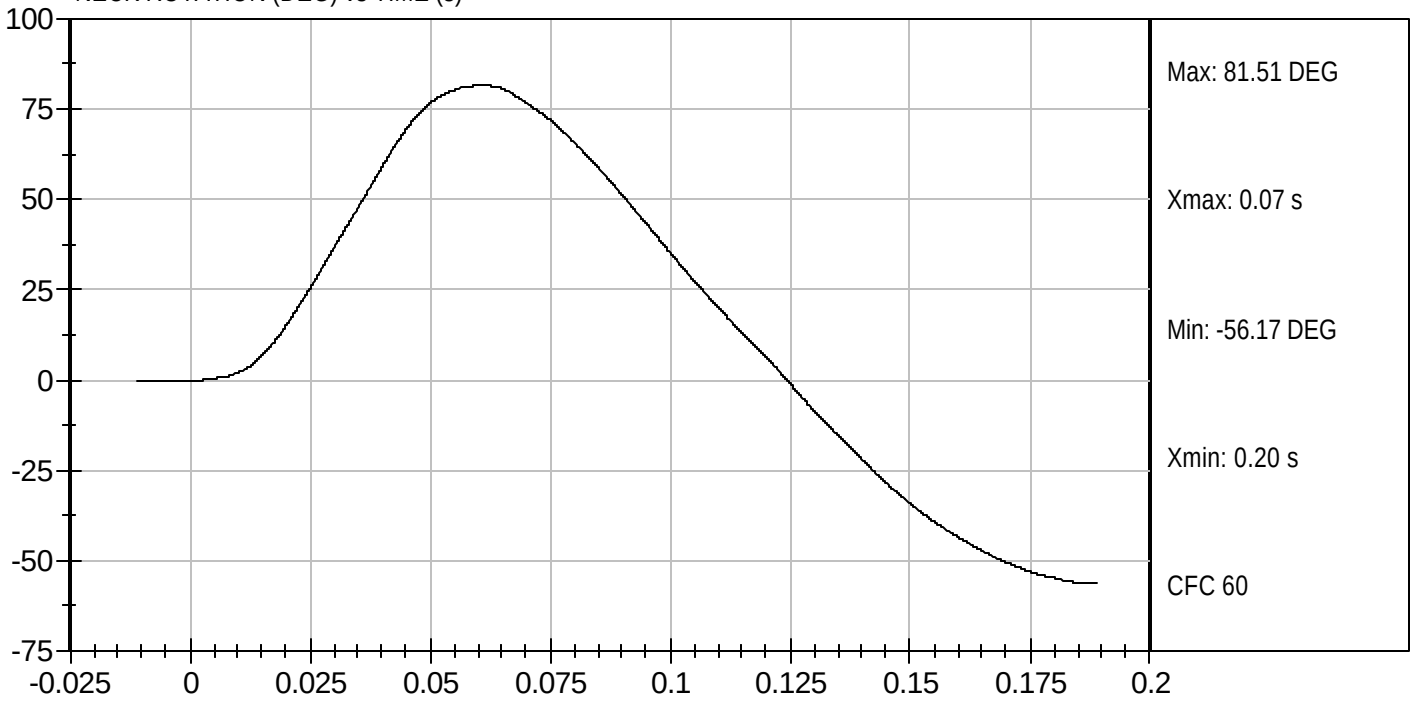
Test Desc: Neck Flexion
Componet ID: D051612

Test Date: 06/14/2005
Velocity: 23.39 ft/s, 7.13 m/s

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

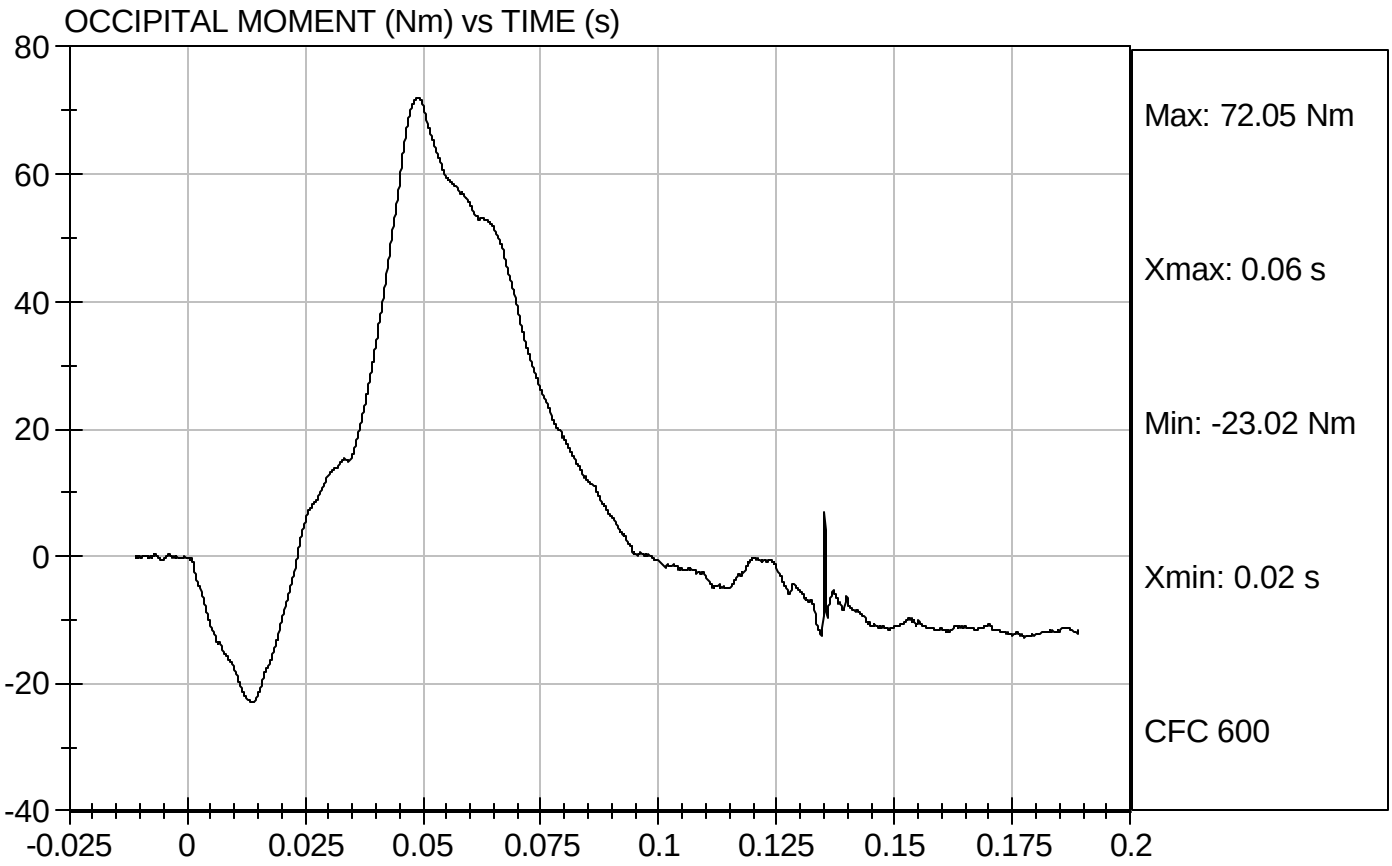


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051612

Test Date: 06/14/2005
Speed: 23.39 ft/sec, 7.13 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ___516_____ Test Date ___6/14/05_____

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. (572.137(q))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.3___
Record the minimum temperature __21.0___
Record the maximum humidity __44%__
Record the minimum humidity __40%__

_X_4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: __No Damage._____

_X_5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: __No Deterioration. Hardness Front 89; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_ 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.14 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.8 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.7 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.2 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-55_ Nm @ _109_ degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	102 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

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

Joe Fleck _____ 6/14/05_____

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051613

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.14	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.8	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	109	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	102	Pass
			Overall Results		Pass

Laboratory Technician

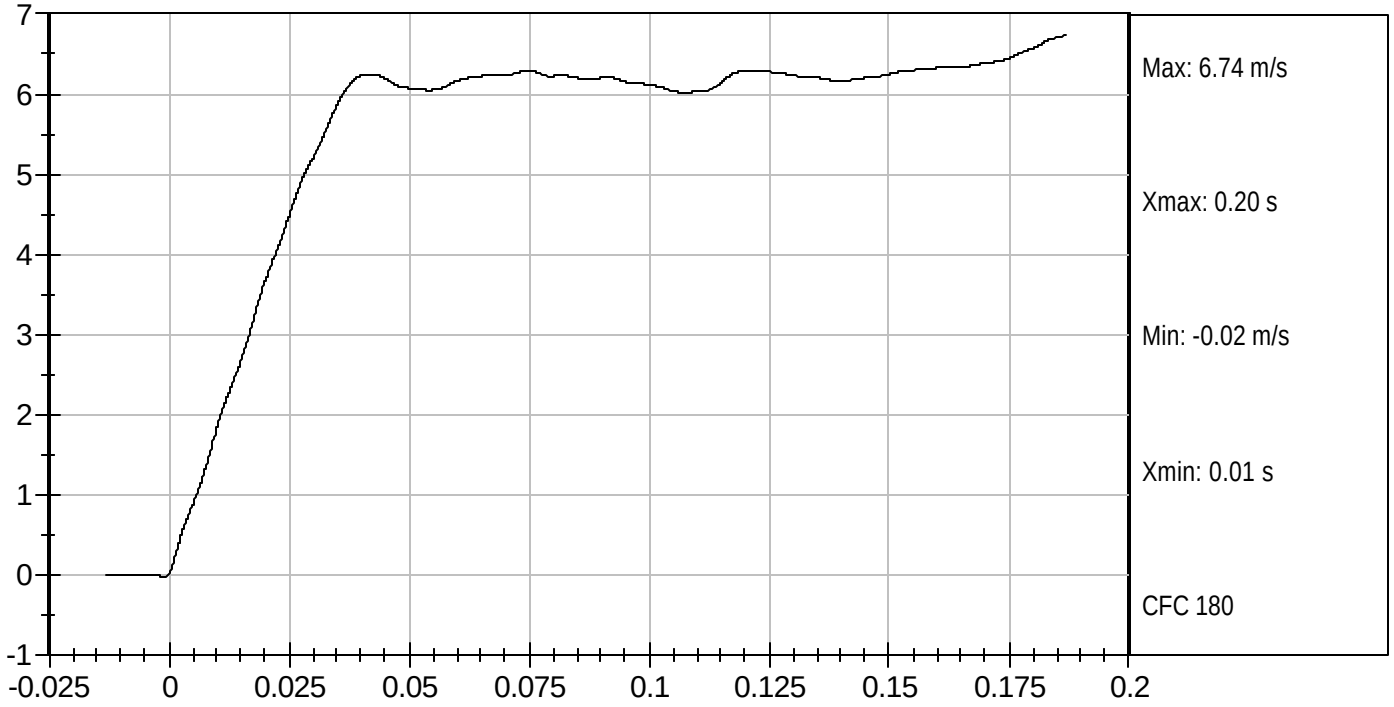
06/14/2005
Test Date

Approved By

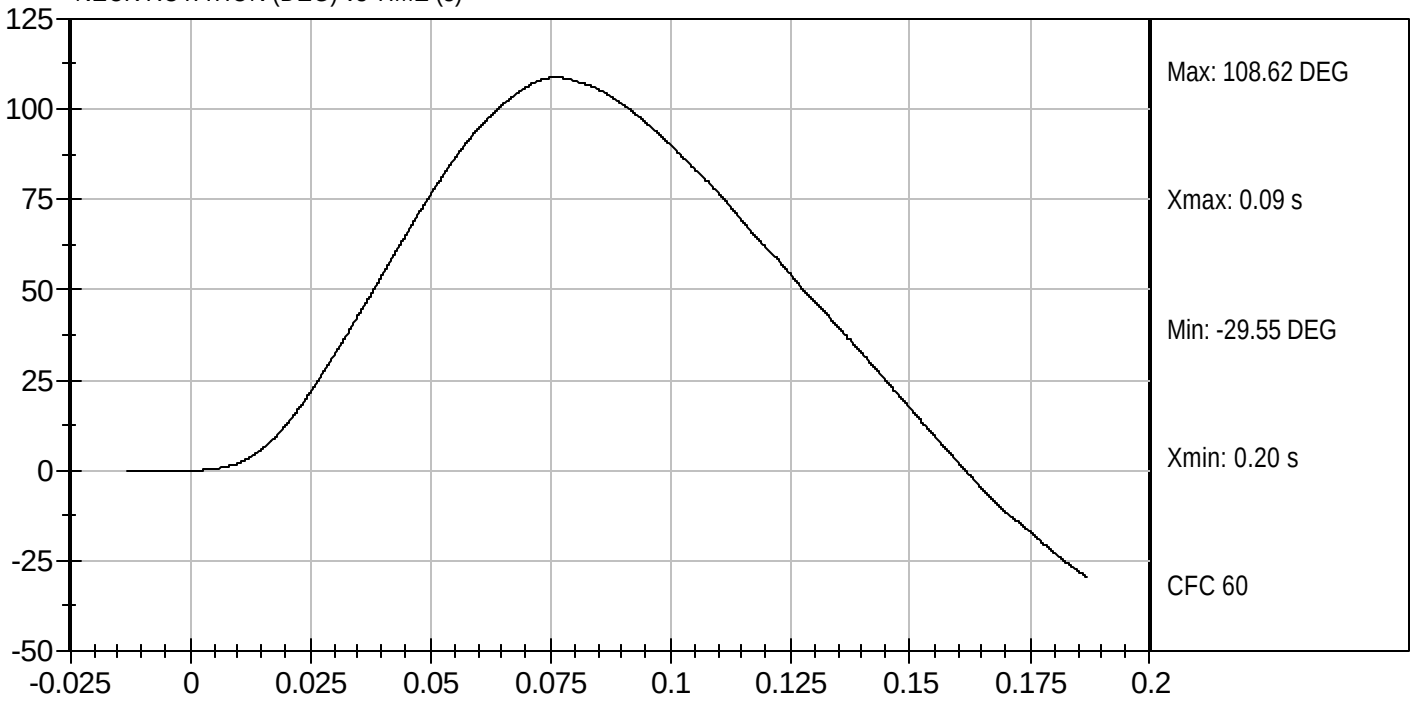
Test Desc: Neck Extension
Componet ID: D051613

Test Date: 06/14/2005
Velocity: 20.13 ft/s, 6.14 m/s

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

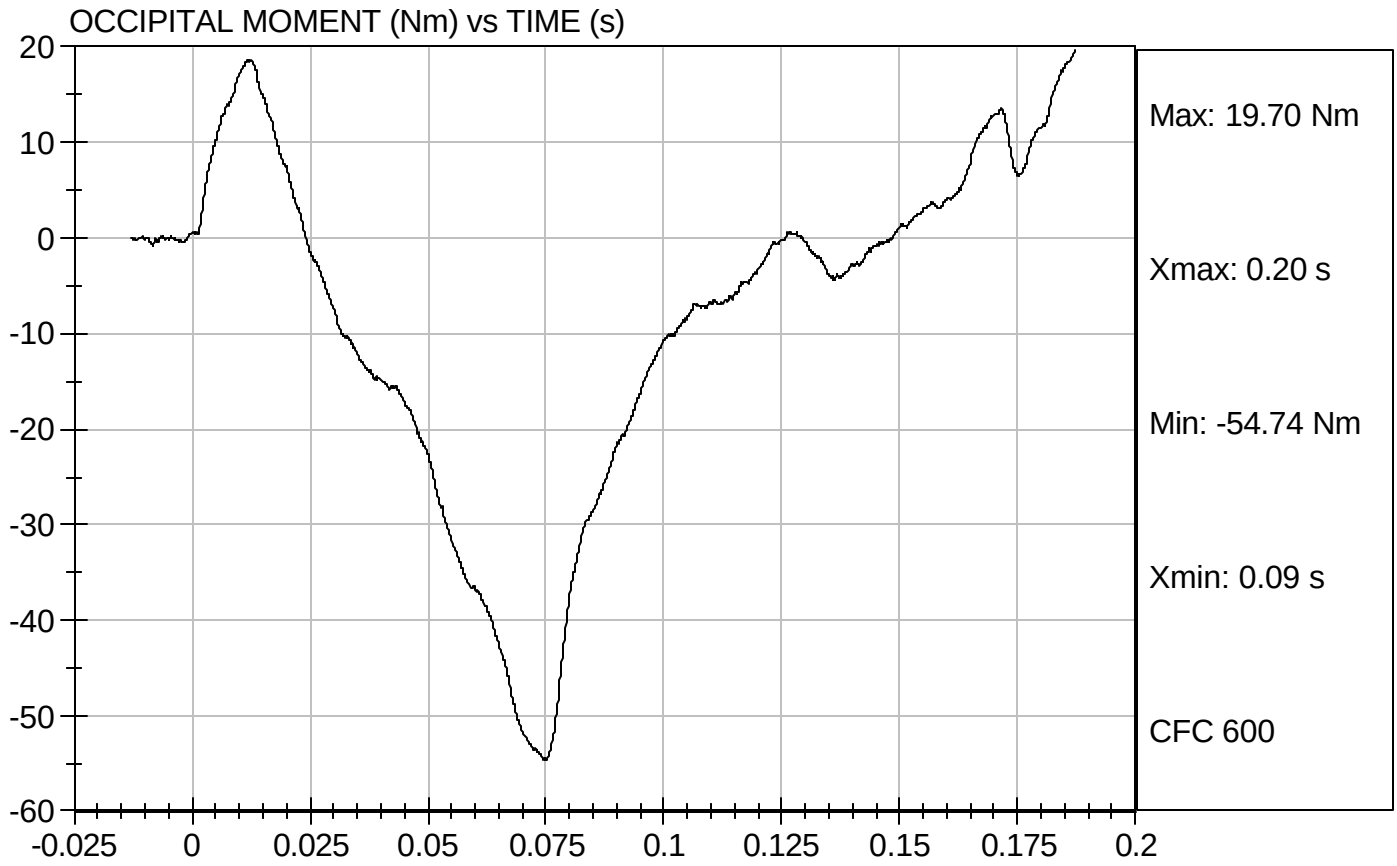


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051613

Test Date: 06/14/2005
Speed: 20.13 ft/sec, 6.14 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __516_____ Test Date __6/14/05_____

Technician ____Jessica Gall_____

___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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _21.3_
Record the minimum temperature _21.0_
Record the maximum humidity _44%_
Record the minimum humidity _42%_
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_ 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.82 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4060 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	3995 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 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 Hall _____ 6/14/05

Signature Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051614

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.0	Pass
Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	6.59 to 6.83	6.82	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.0	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4,060	Pass
		Overall Test Results		Pass

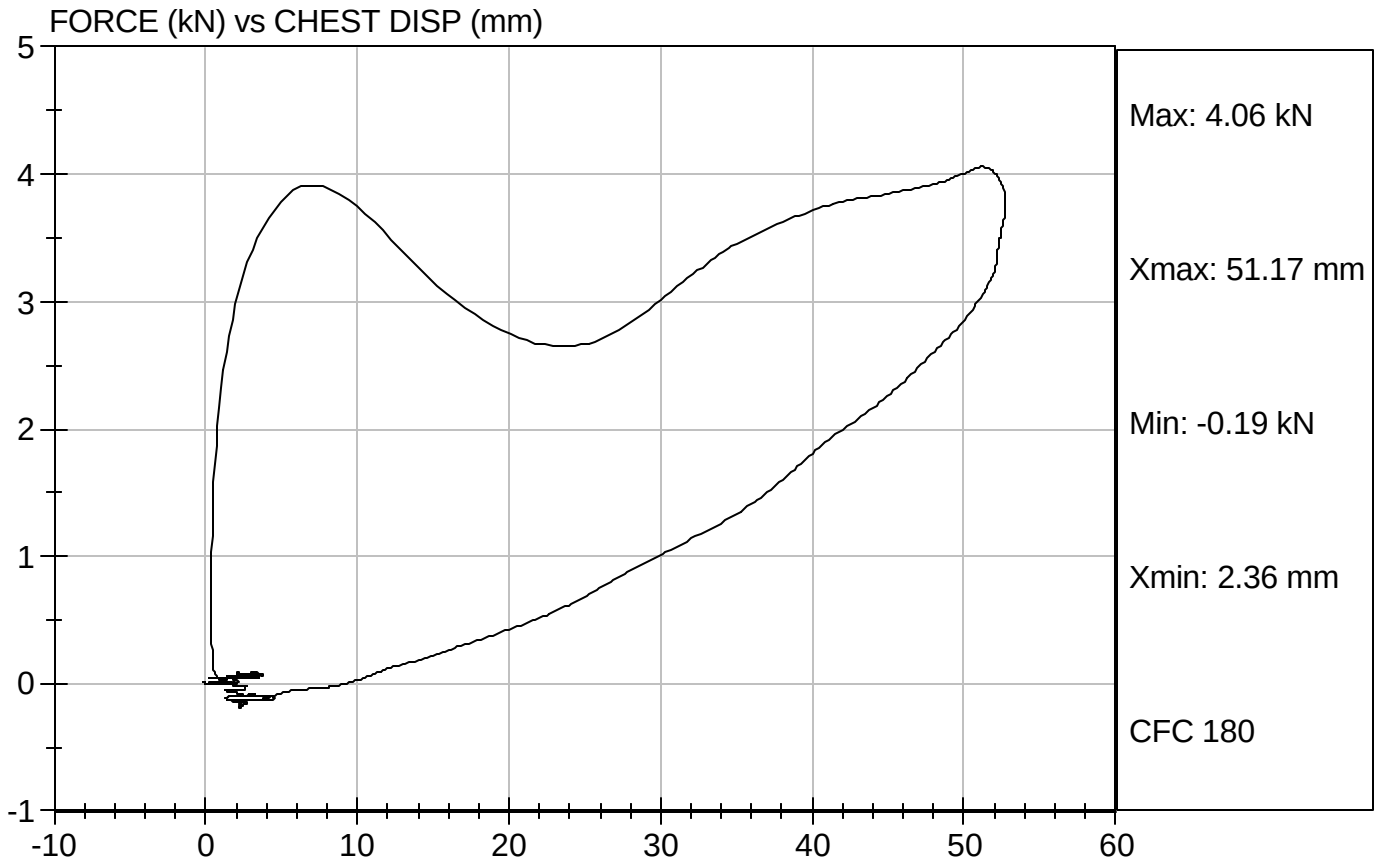
Jessica Hall
Laboratory Technician

06/14/2005
Test Date

Jeff Levandoski
Approved By

Test Desc: Thorax Impact
Component ID: D051614

Test Date: 06/14/2005
Speed: 22.37 ft/sec, 6.82 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __516_____ Test Date __6/13/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
Record the maximum temperature __21.8__
Record the minimum temperature __21.2__
Record the maximum humidity __44%__
Record the minimum humidity __40%__
_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°)___11^0___
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	11°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	375 N
Final ref. plane angle	Initial ref. plane angle ±8°	12°

Signature

6/13/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051617

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Initial Angle	deg	0 to 20	11	Pass
Return Angle	deg	+/- 8	12	Pass
Force at 45 deg	N	320 to 390	375	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Laboratory Technician

06/13/2005
Test Date

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __516_____ Test Date __6/13/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _21.8__
Record the minimum temperature _21.2__
Record the maximum humidity _44%__
Record the minimum humidity _40%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3730 N

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

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

Joe Fleck _____ 6/13/05

Signature Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051616

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	44	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.73	Pass
		Overall Test Results		Pass

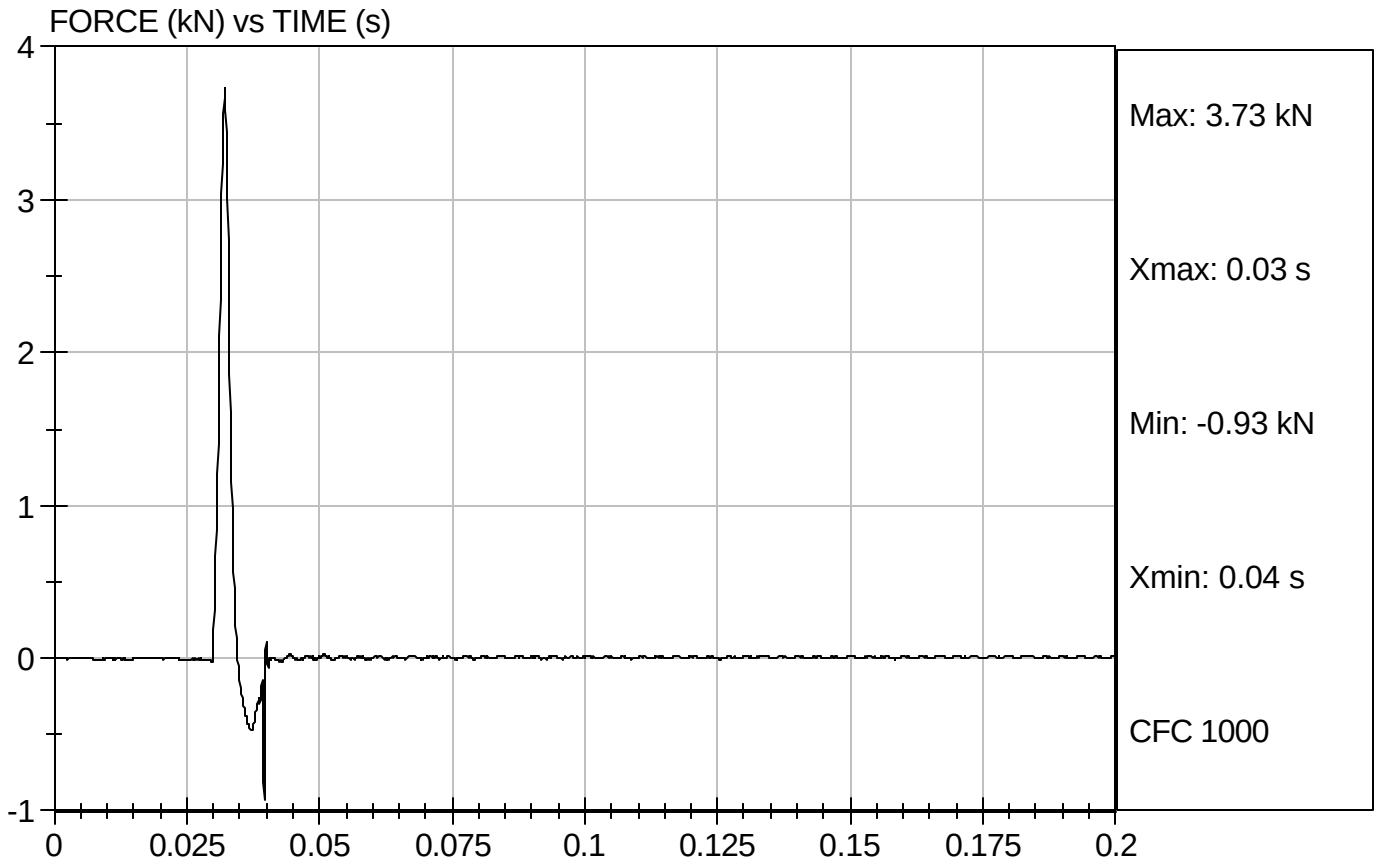
Joe Fleck
Laboratory Technician

06/13/2005
Test Date

Jeff Levandoski
Approved By

Test Desc: Left Knee
Component ID: D051616

Test Date: 06/13/2005
Speed: 6.93 ft/sec, 2.11 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___516_____ Test Date __6/13/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _21.8___
Record the minimum temperature _21.2___
Record the maximum humidity _44%___
Record the minimum humidity _40%___
_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 m/s ≤ speed ≤ 2.13 m/s	2.10 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3640 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

6/13/05
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 516 **Test I.D:** D051615

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	44	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.64	Pass
		Overall Test Results		Pass

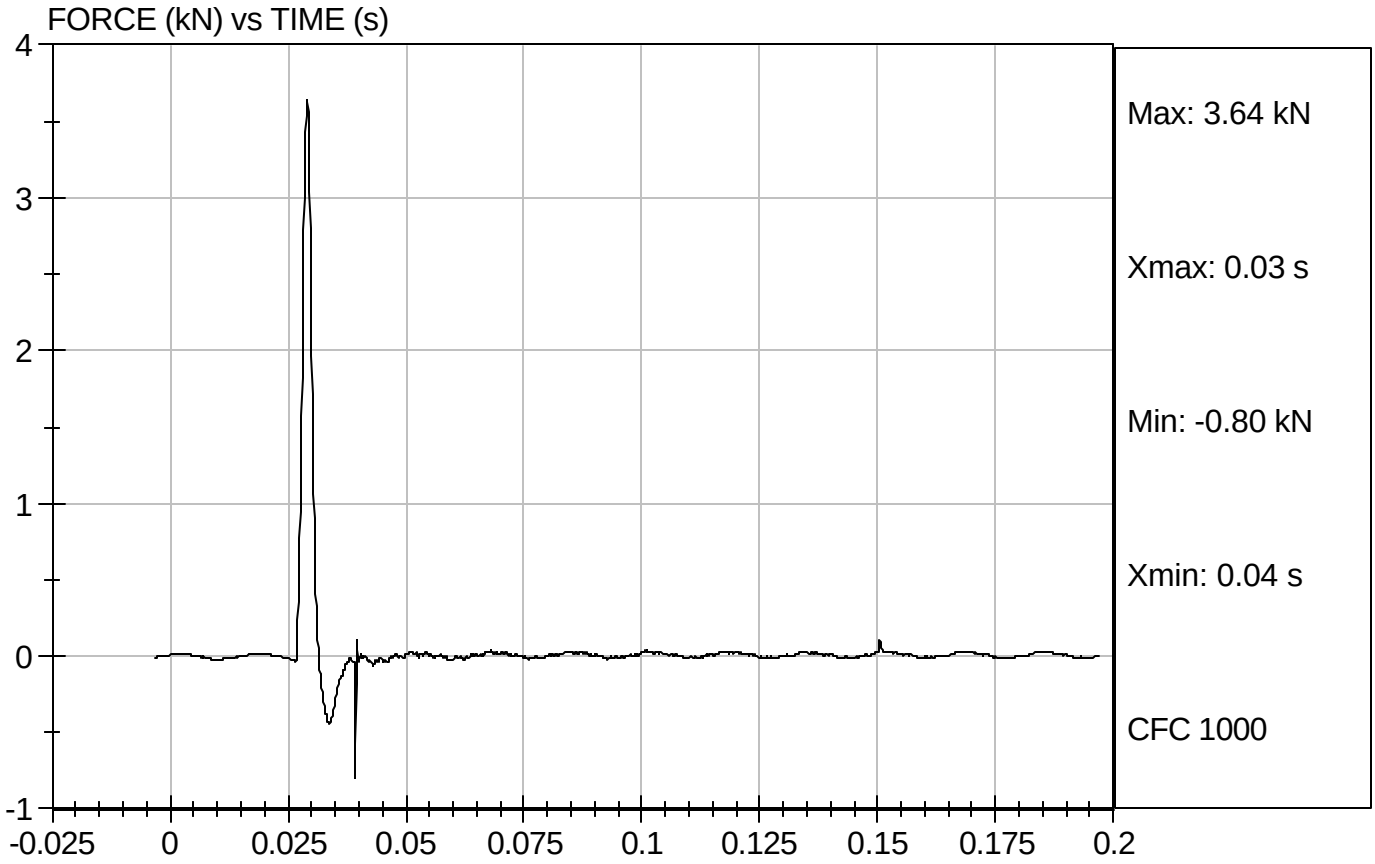
Joe Fleck
Laboratory Technician

06/13/2005
Test Date

Jeff Leonardelli
Approved By

Test Desc: Right Knee
Component ID: D051615

Test Date: 06/13/2005
Speed: 6.88 ft/sec, 2.10 m/sec



EXTERNAL DIMENSIONS

HYBRID III 5th 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 5th 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 __6/8/05____

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 _____ 6/8/05_____
Signature Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonardelli _____ 6/8/05_____
Signature Date

EXTERNAL DIMENSIONS

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

HYBRID III 5th SN #505, 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 ____5/03/05_____

Technician _____Dave Wilcox_____

_X_ 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))
__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 (66ºF) and 25.6°C (78ºF) 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 __21.9____
Record the minimum temperature __20.6____
Record the maximum humidity __27%____
Record the minimum humidity __20%___

__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 ± 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 g ≤ x ≤ 300 g	268
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 ≤ 15 g	8

__X__17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Signature

__5/03/05_____
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test ID:** D051151

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	250 - 300	268	Pass
Peak Lateral Acceleration	G's	+/- 15	8.4	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

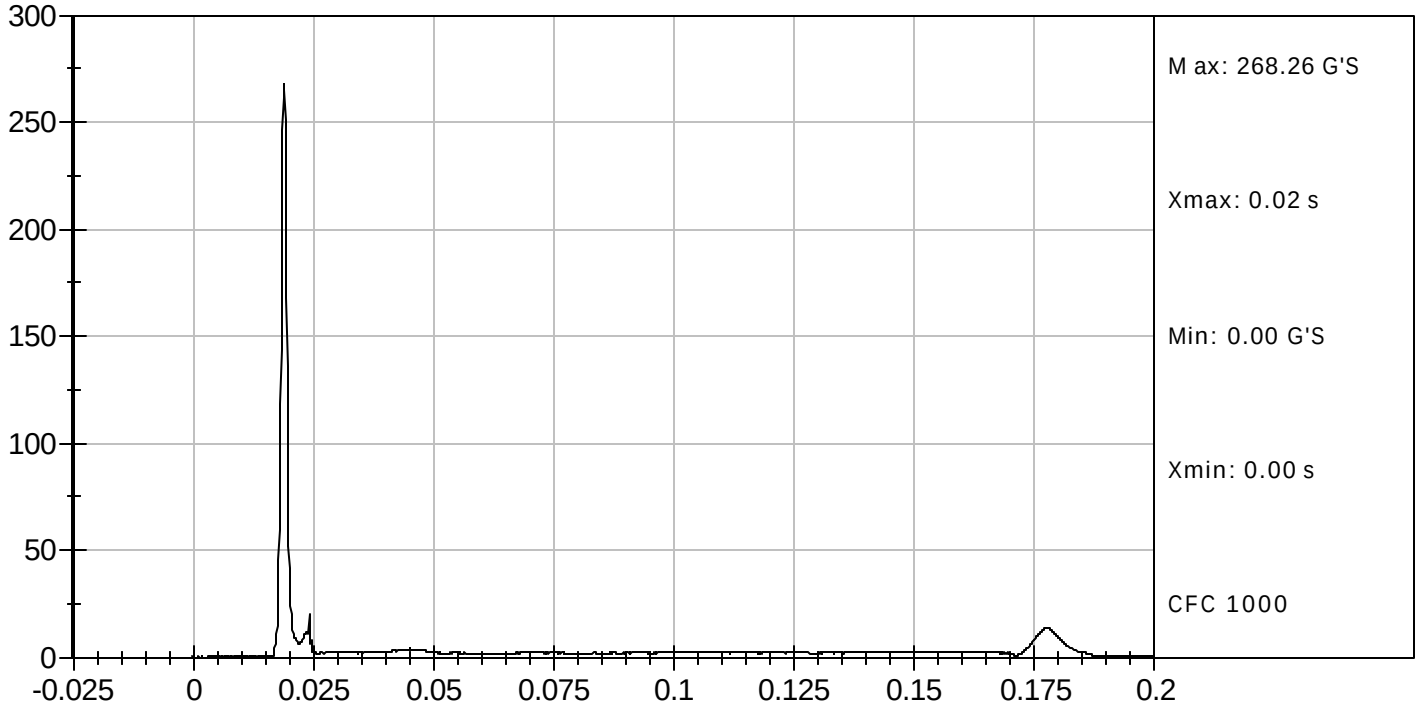
05/03/2005
Test Date

Approved By

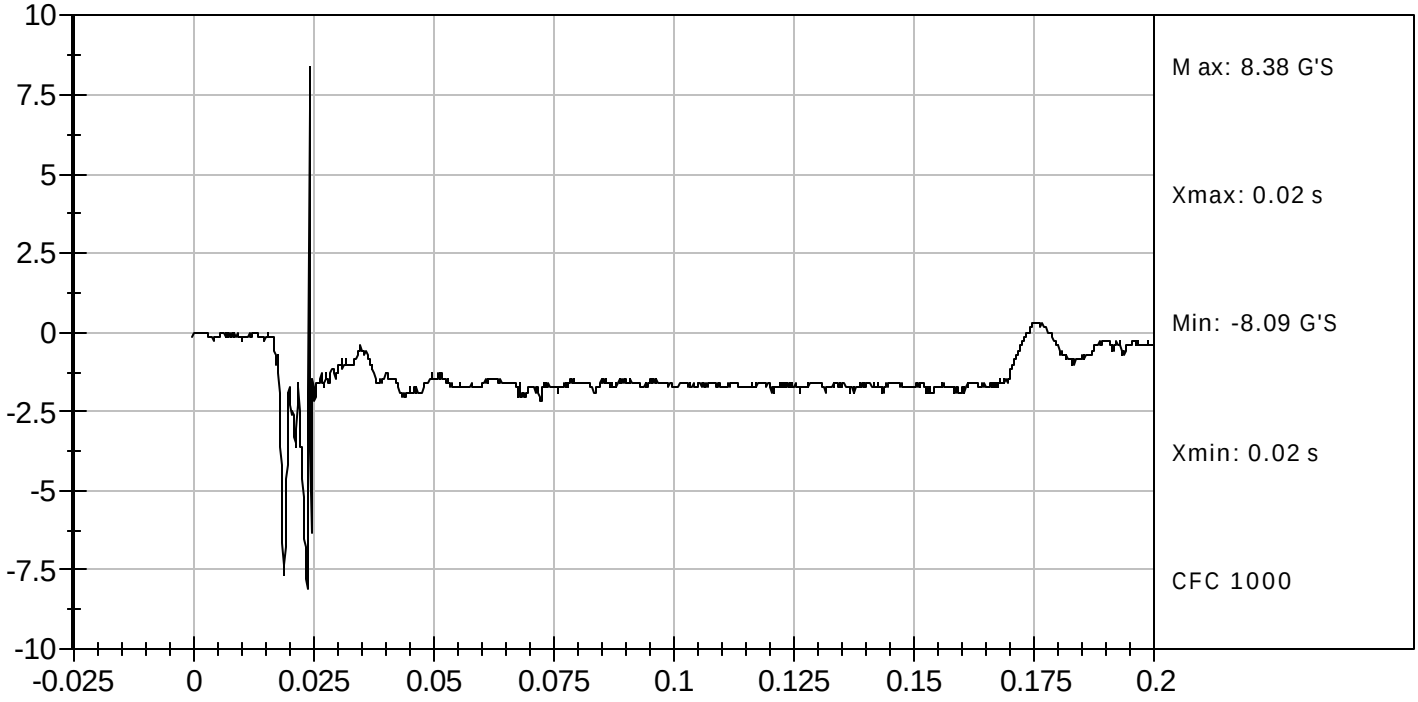
Test Desc: Head Drop
Componet ID: D051151

Test Date: 05/03/2005
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 ____4/29/05_____

Technician _____Jessica Gall_____

_X_ 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))
_X_ N/A, ONLY one flexion test performed

_X_2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.9__
Record the minimum temperature __20.6__
Record the maximum humidity __27%___
Record the minimum humidity __20%___

_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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.8 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.8 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__70__Nm @ _82__degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	87 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Gall
Signature

4/29/05
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051152

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.8	Pass
	30 msec	m/sec	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	87	Pass
			Overall Results		Pass

Jessica Gall
Laboratory Technician

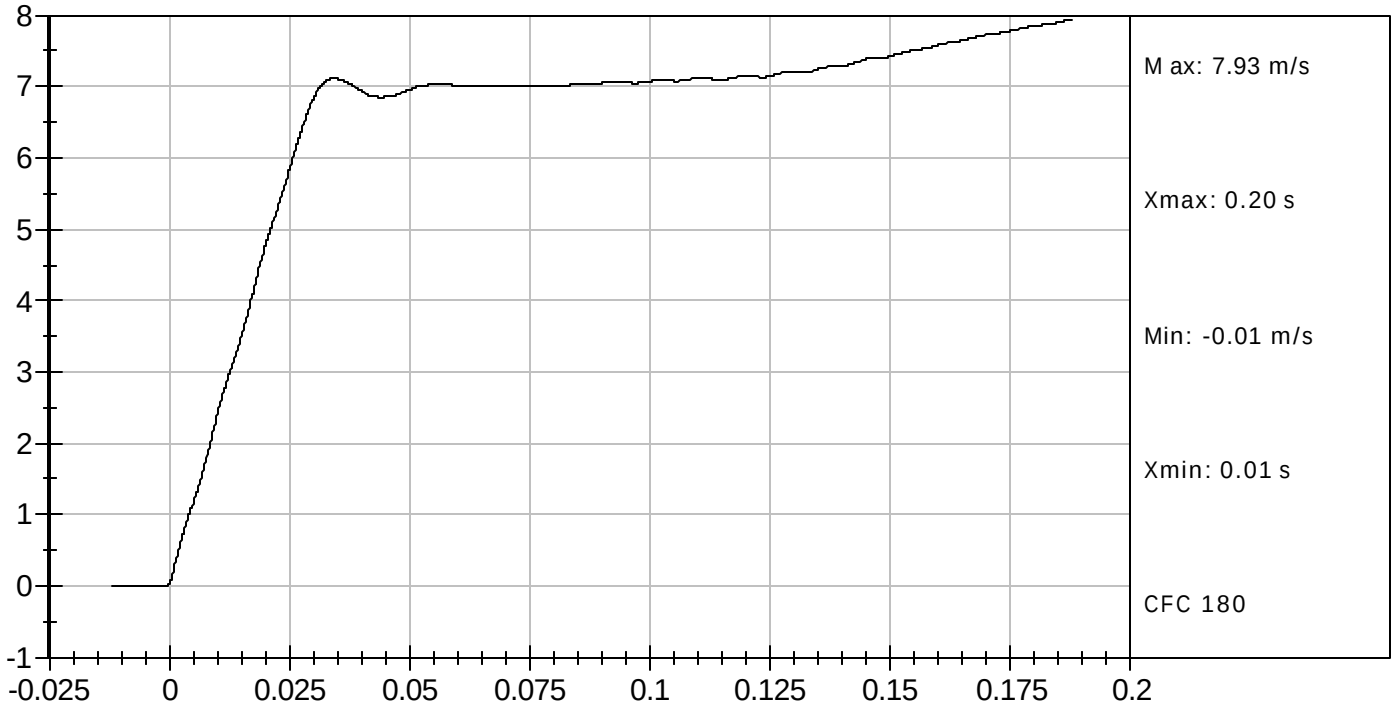
04/29/2005
Test Date

Jeff Levandoski
Approved By

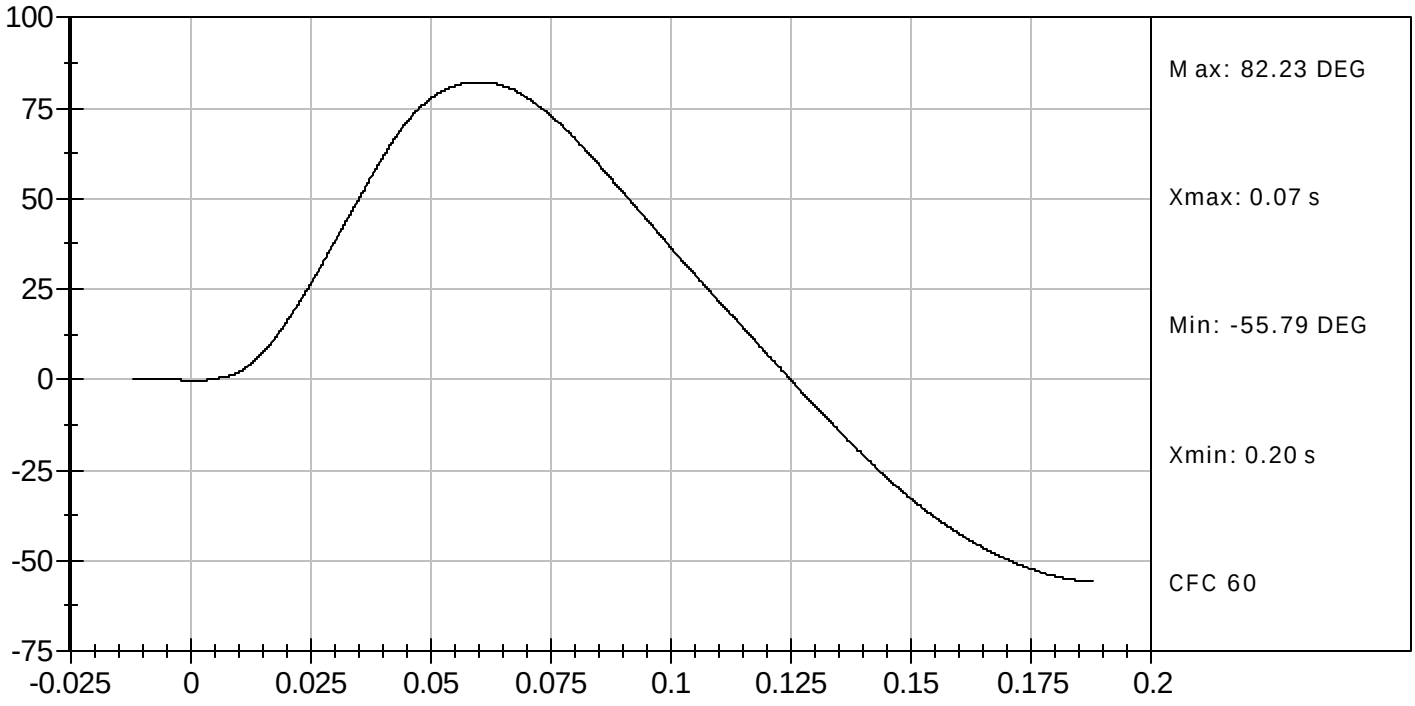
Test Desc: Neck Flexion
Componet ID: D051152

Test Date: 04/29/2005
Velocity: 23.17 ft/s, 7.06 m/s

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

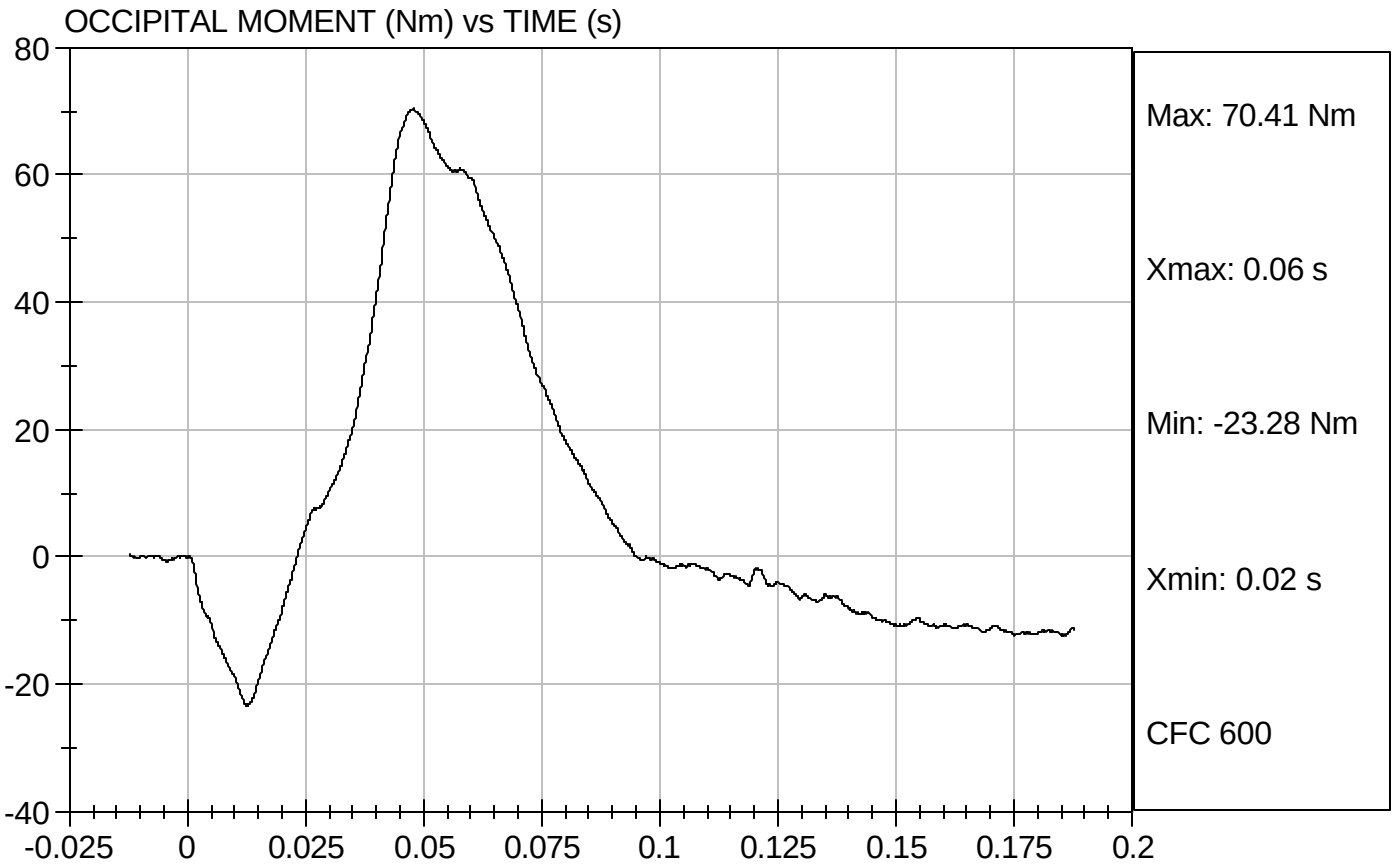


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051152

Test Date: 04/29/2005
Speed: 23.17 ft/sec, 7.06 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ____505_____ Test Date ___4/29/05_____

Technician _____Jessica Gall_____

_X_ 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))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.9___
Record the minimum temperature __20.6___
Record the maximum humidity __27%__
Record the minimum humidity __20%__

_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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.14 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.8 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.4 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-59___Nm @ _107__degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	96 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Hall _____ 4/29/05_____

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051153

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.14	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.8	Pass
	30 msec	m/sec	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-59	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	96	Pass
			Overall Results		Pass

Jessica Hall

Laboratory Technician

04/29/2005

Test Date

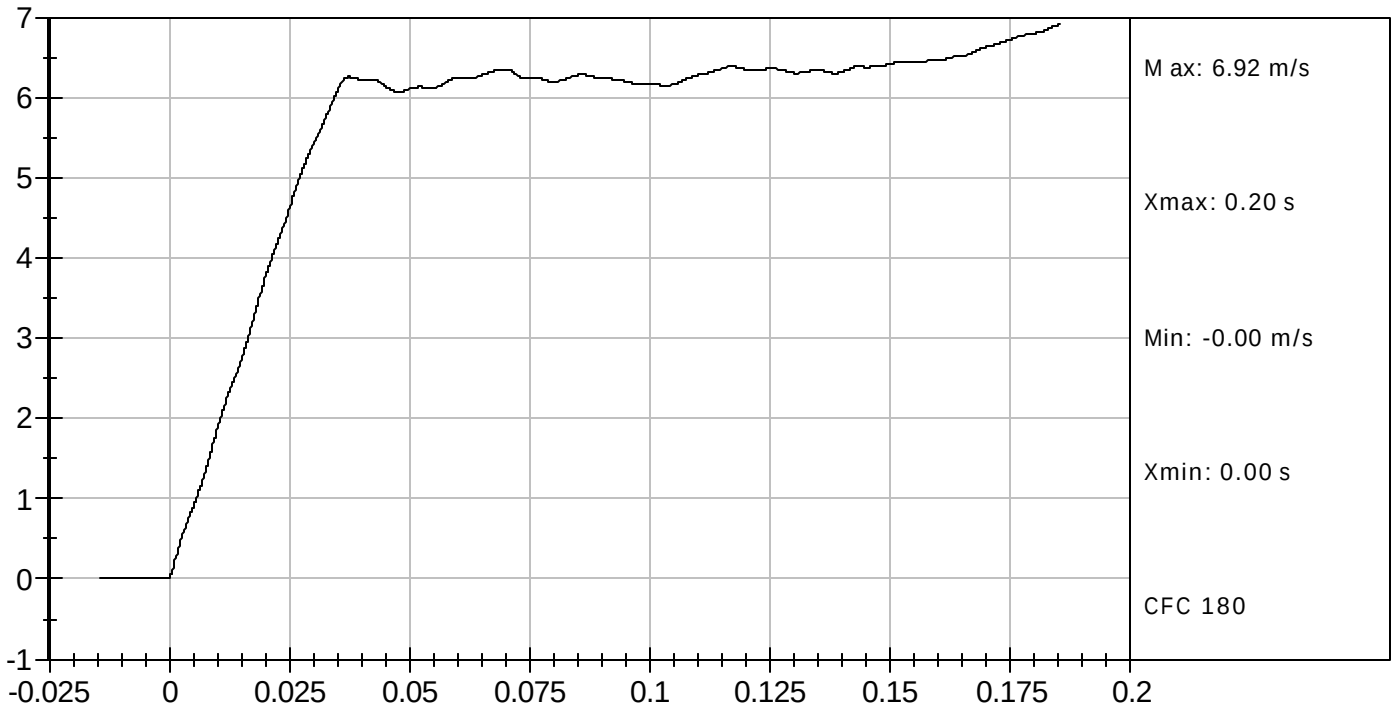
Jeff Leonardelli

Approved By

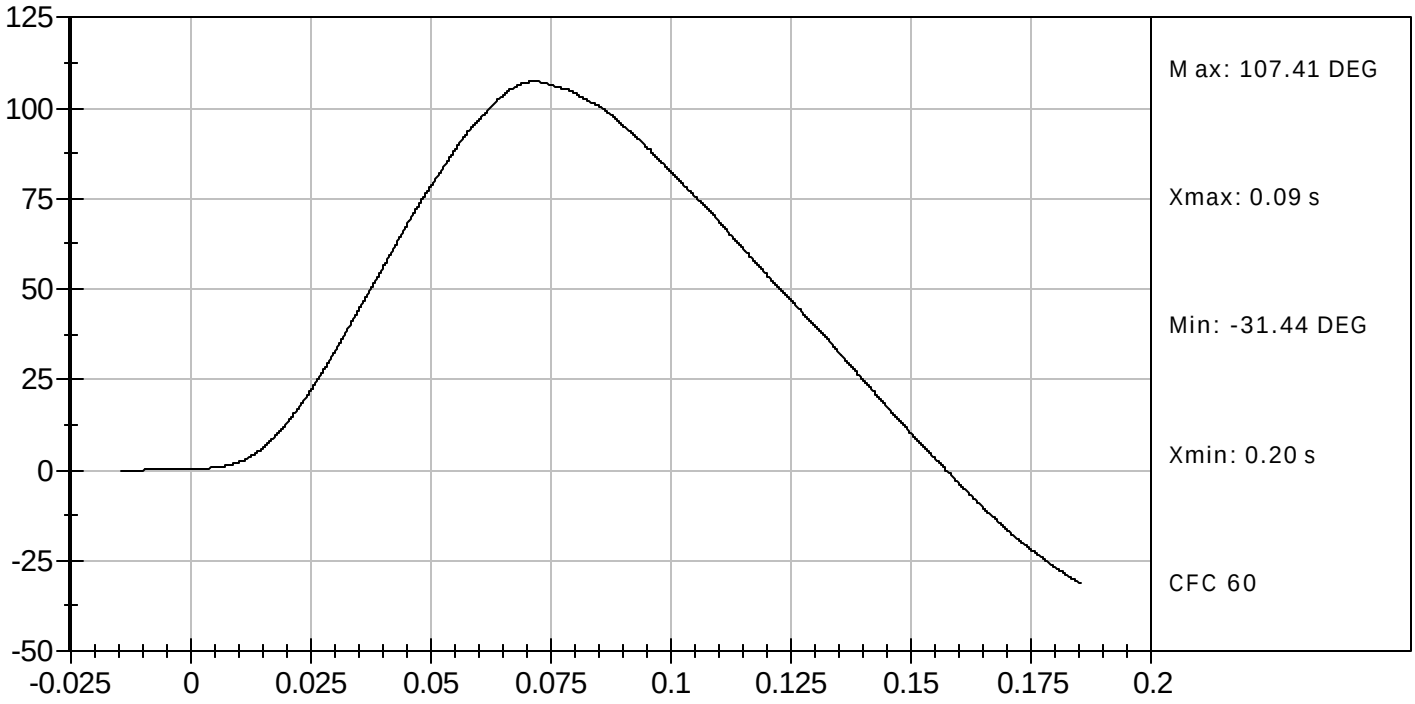
Test Desc: Neck Extension
Componet ID: D051153

Test Date: 04/29/2005
Velocity: 20.13 ft/s, 6.14 m/s

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

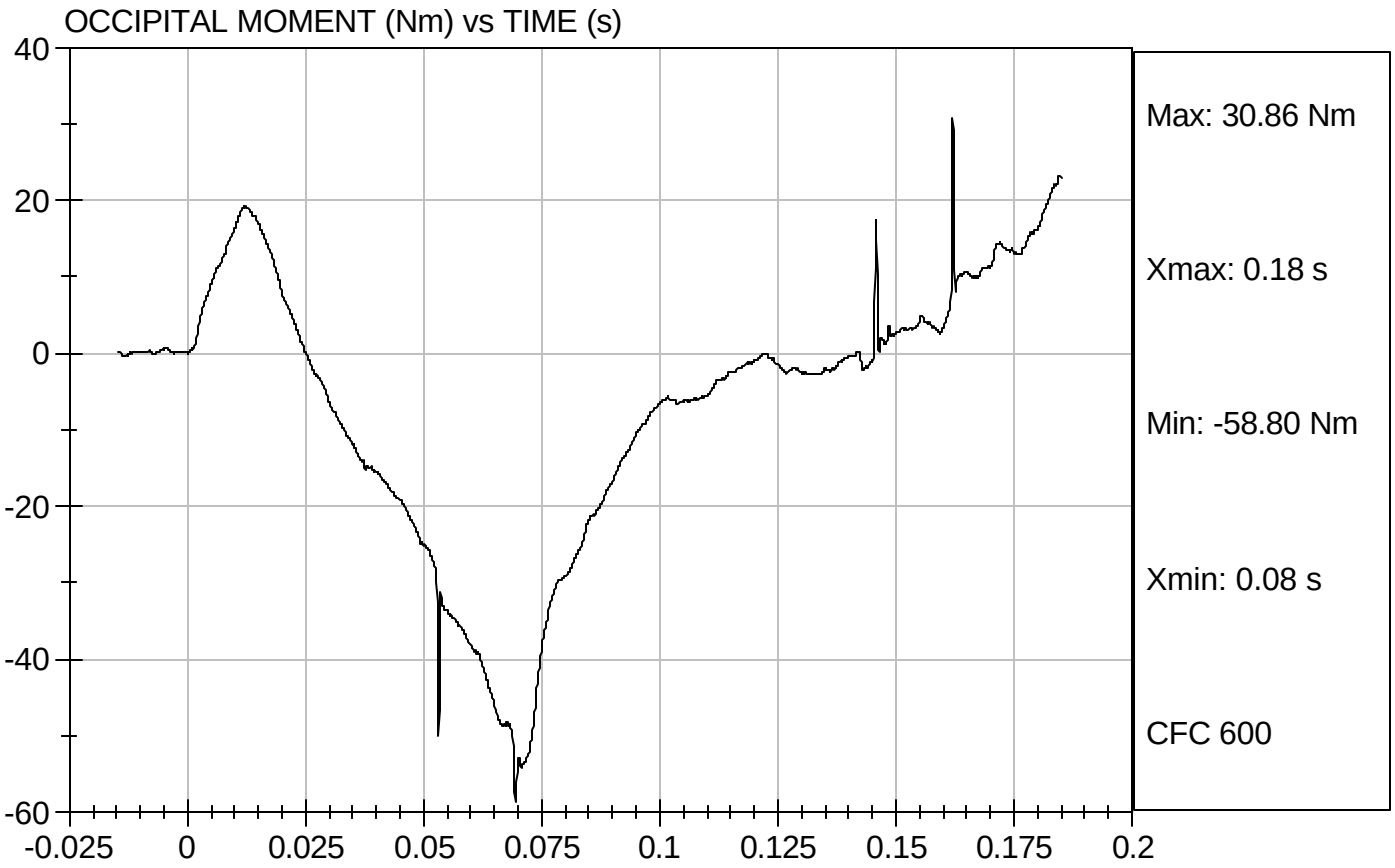


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051153

Test Date: 04/29/2005
Speed: 20.13 ft/sec, 6.14 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __505_____ Test Date __5/02/05_____

Technician ____Joe Fleck _____

_X 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))
_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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _21.9_
Record the minimum temperature _20.6_
Record the maximum humidity _27%_
Record the minimum humidity _20%_
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.59 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4270 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4118 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 85%	69%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.
**Force = impactor mass x acceleration (572.134(b)(3))

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

_X_17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Joe Fleck _____ 5/02/05_____

Signature Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051154

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	6.59 to 6.83	6.59	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	4,118	Pass
		Overall Test Results		Pass

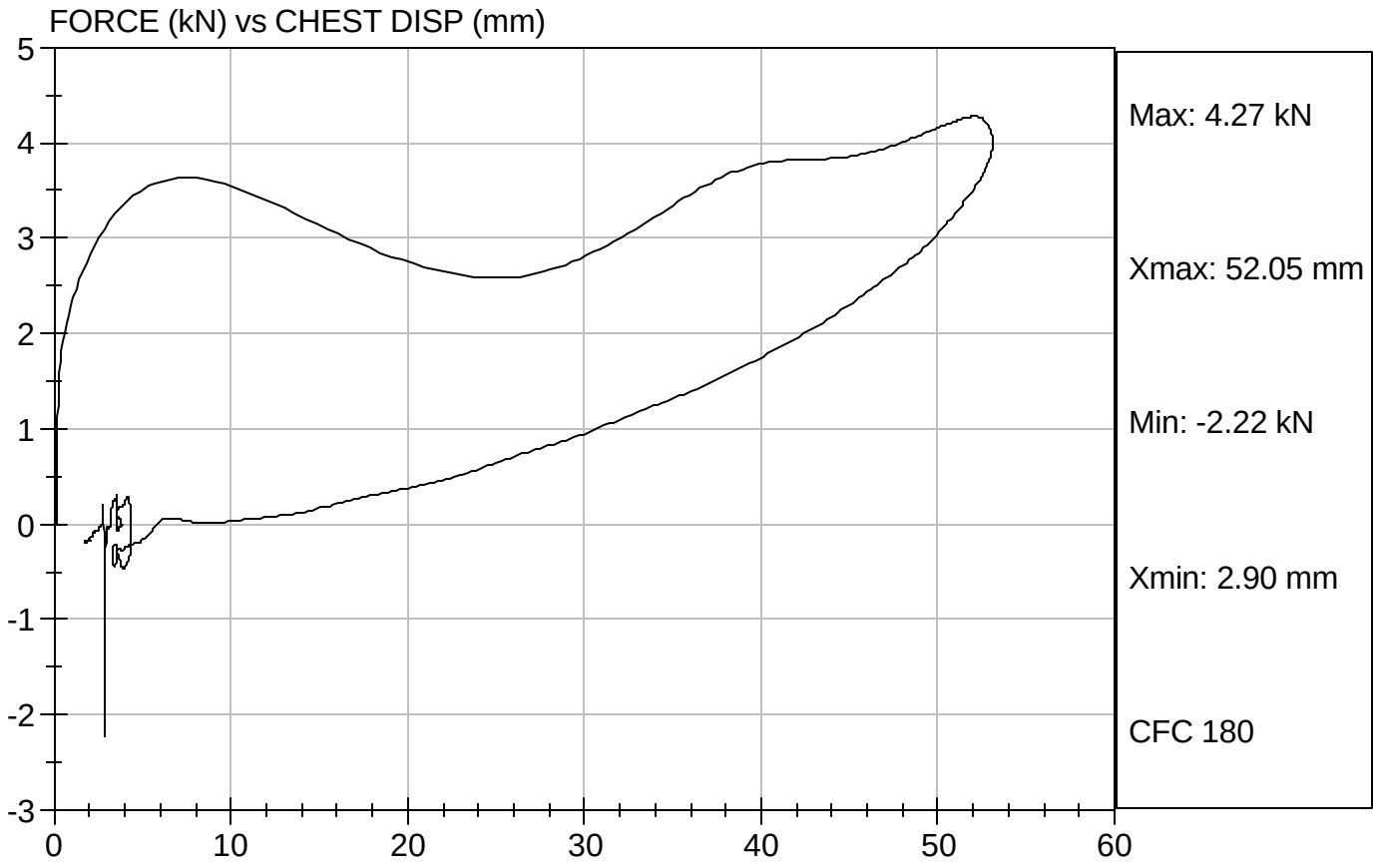
Laboratory Technician

05/02/2005
Test Date

Approved By

Test Desc: Thorax Impact
Component ID: D051154

Test Date: 05/02/2005
Speed: 21.63 ft/sec, 6.59 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __505_____ Test Date __5/03/05_____

Technician _____David Wilcox_____

_X 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))
_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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
Record the maximum temperature __21.9__
Record the minimum temperature __20.6__
Record the maximum humidity __27%__
Record the minimum humidity __20%__
_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°)___16°__
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	16°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	385 N
Final ref. plane angle	Initial ref. plane angle ±8°	16°

Signature

5/03/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051157

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	16	Pass
Force at 45 deg	N	320 to 390	385	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Laboratory Technician

05/03/2005
Test Date

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __505_____ Test Date __5/03/05_____

Technician ____David Wilcox_____

_X_ 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))
_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 (66ºF) and 25.6°C (78ºF) 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 _20.6__
Record the maximum humidity _27%__
Record the minimum humidity _20%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.10 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 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

5/03/05

Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051156

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	24	Pass
Probe Speed	m/sec	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.62	Pass
		Overall Test Results		Pass

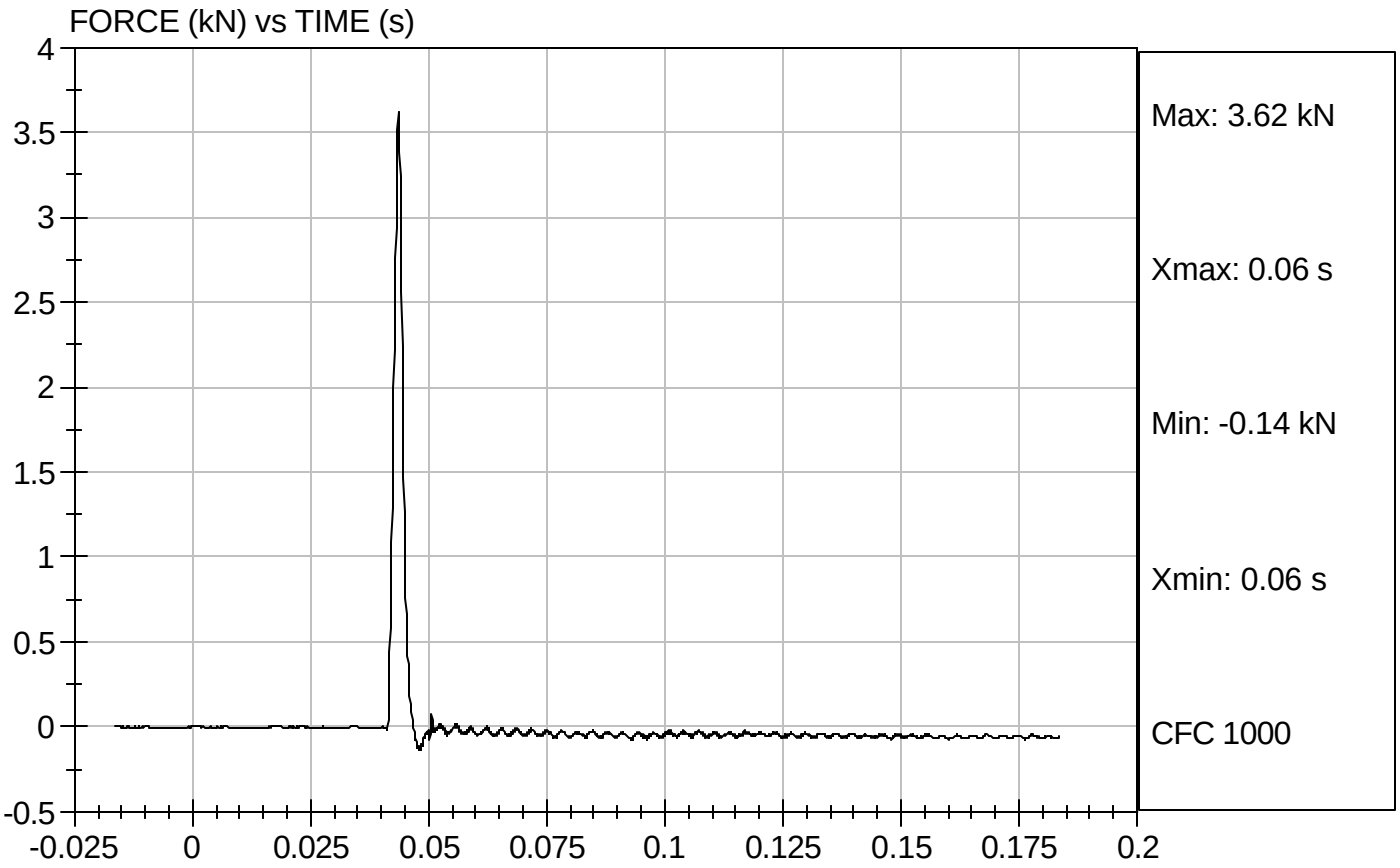
Laboratory Technician

05/03/2005
Test Date

Jeff Leonardelli
Approved By

Test Desc: Left Knee
Component ID: D051156

Test Date: 05/03/2005
Speed: 6.9 ft/sec, 2.10 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___505_____ Test Date __5/03/05_____

Technician ___David Wilcox_____

_X_ 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))
_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 (66ºF) and 25.6°C (78ºF) 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 _20.6___
Record the maximum humidity _27 %___
Record the minimum humidity _20 %___
_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 m/s ≤ speed ≤ 2.13 m/s	2.09 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3560 N

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

_X_12. Plots of acceleration versus time and force versus time follow this sheet.

5/03/05

Signature Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051155

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	24	Pass
Probe Speed	m/sec	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.56	Pass
		Overall Test Results		Pass

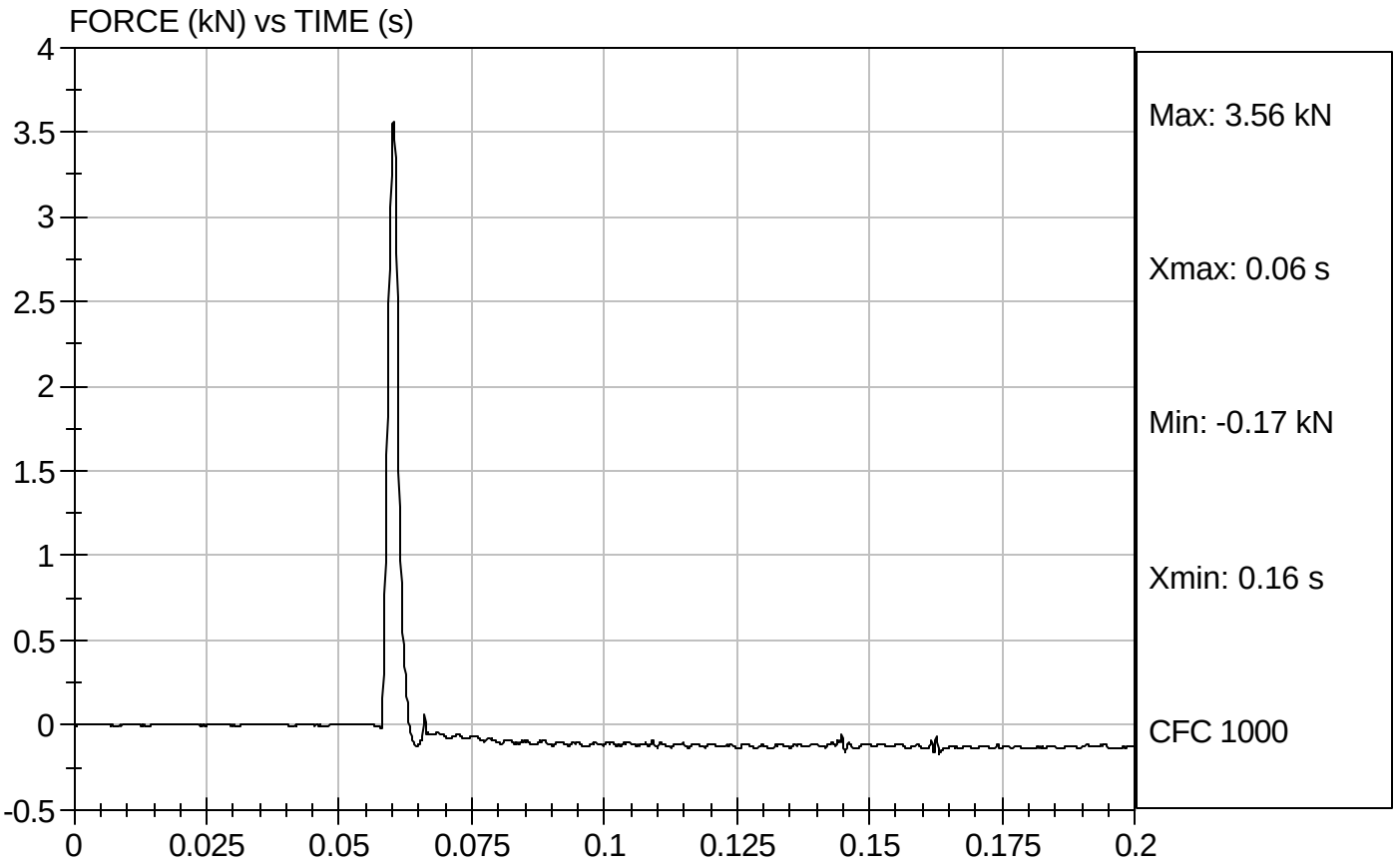
Laboratory Technician

05/03/2005
Test Date

Approved By

Test Desc: Right Knee
Component ID: D051155

Test Date: 05/03/2005
Speed: 6.85 ft/sec, 2.09 m/sec



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number _____505_____ Test Date ____5/06/05_____

Technician _____David 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. (572.132(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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
Record the maximum temperature __22.0____
Record the minimum temperature __21.0____
Record the maximum humidity __55%____
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 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 ± 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 g ≤ x ≤ 300 g	275
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration ≤ 15 g	-12

__X__17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Signature

__5/06/05_____
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test ID:** D051241

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	250 - 300	275	Pass
Peak Lateral Acceleration	G's	+/- 15	-12	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

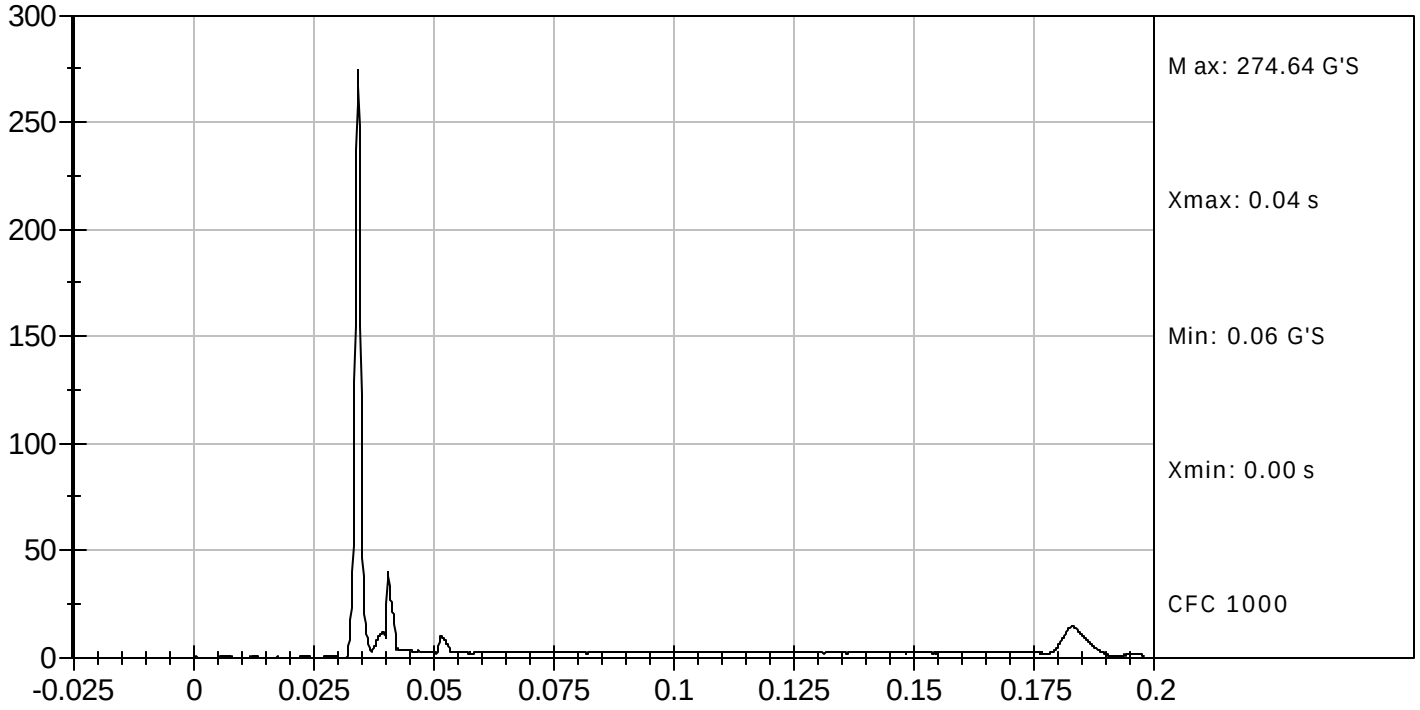
05/06/2005
Test Date

Approved By

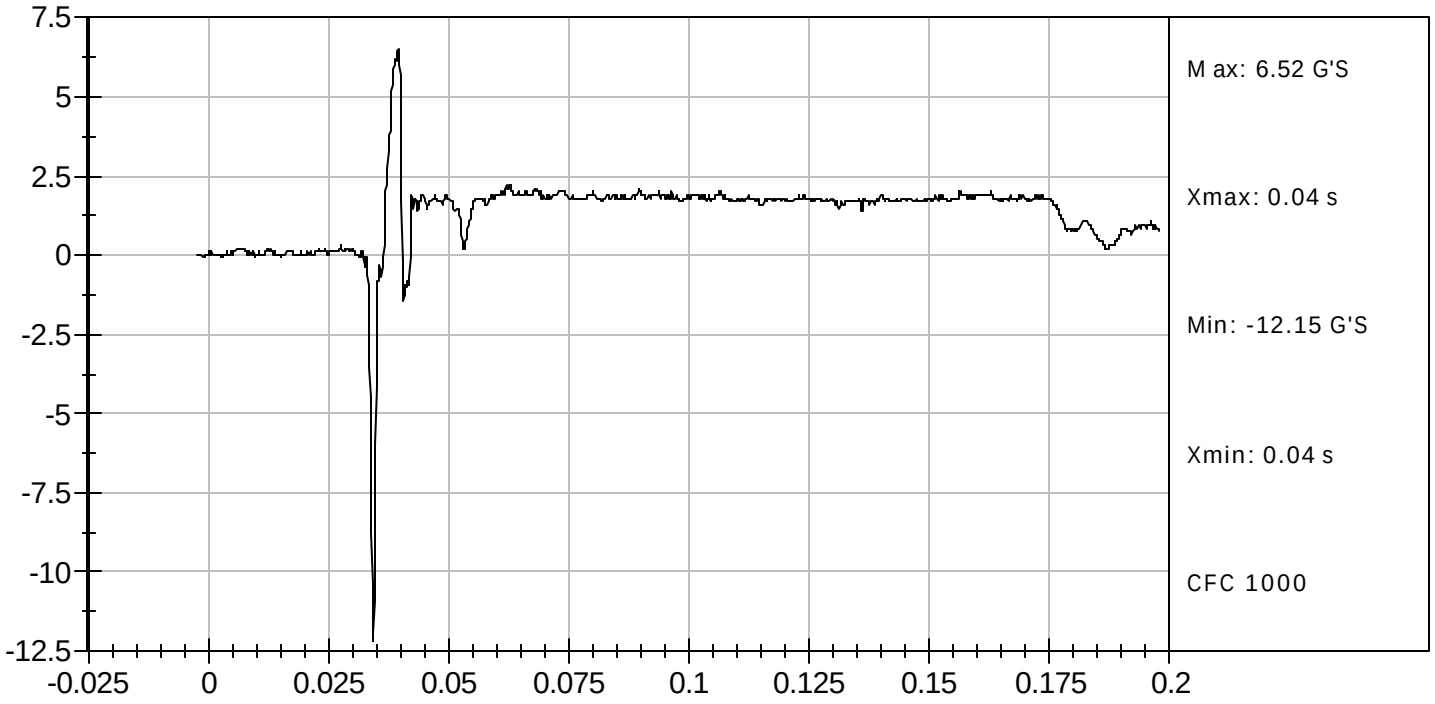
Test Desc: Head Drop
Componet ID: D051241

Test Date: 05/06/2005
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 ____5/09/05_____

Technician _____Jessica Gall_____

___Pretest calibration
_X_Post test calibration verification

Test attempt no. _1_ (when successive flexion tests are necessary)

__1. It has been at least 30 minutes since the last flexion test. (572.137(q))
_X_ N/A, ONLY one flexion test performed

_X_2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __22.0__
Record the minimum temperature __21.0__
Record the maximum humidity __55%___
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 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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	7.13 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.4 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.2 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__74__Nm @ _82__degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	89 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Hall
Signature

5/09/05
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051242

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	50	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.13	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.4	Pass
	30 msec	m/sec	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	89	Pass
			Overall Results		Pass

Jessica Gall

Laboratory Technician

05/09/2005

Test Date

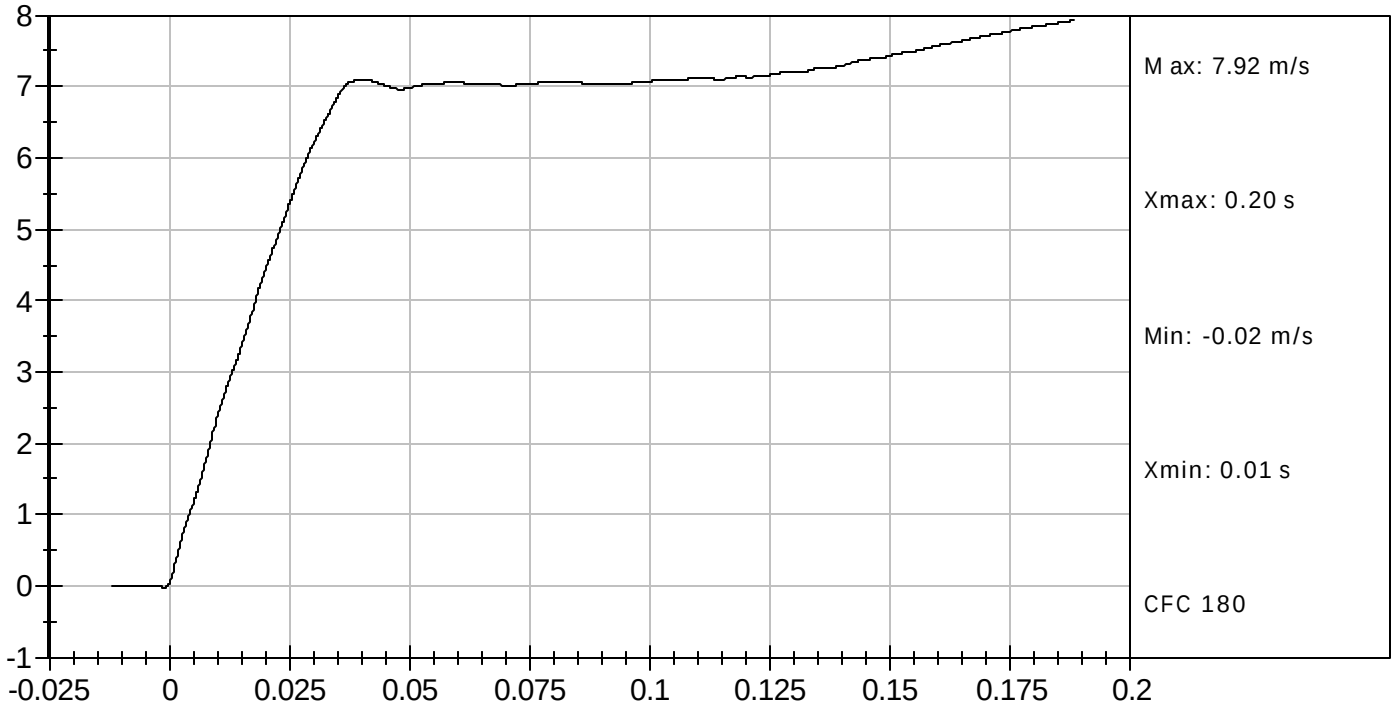
Jeff Levandoski

Approved By

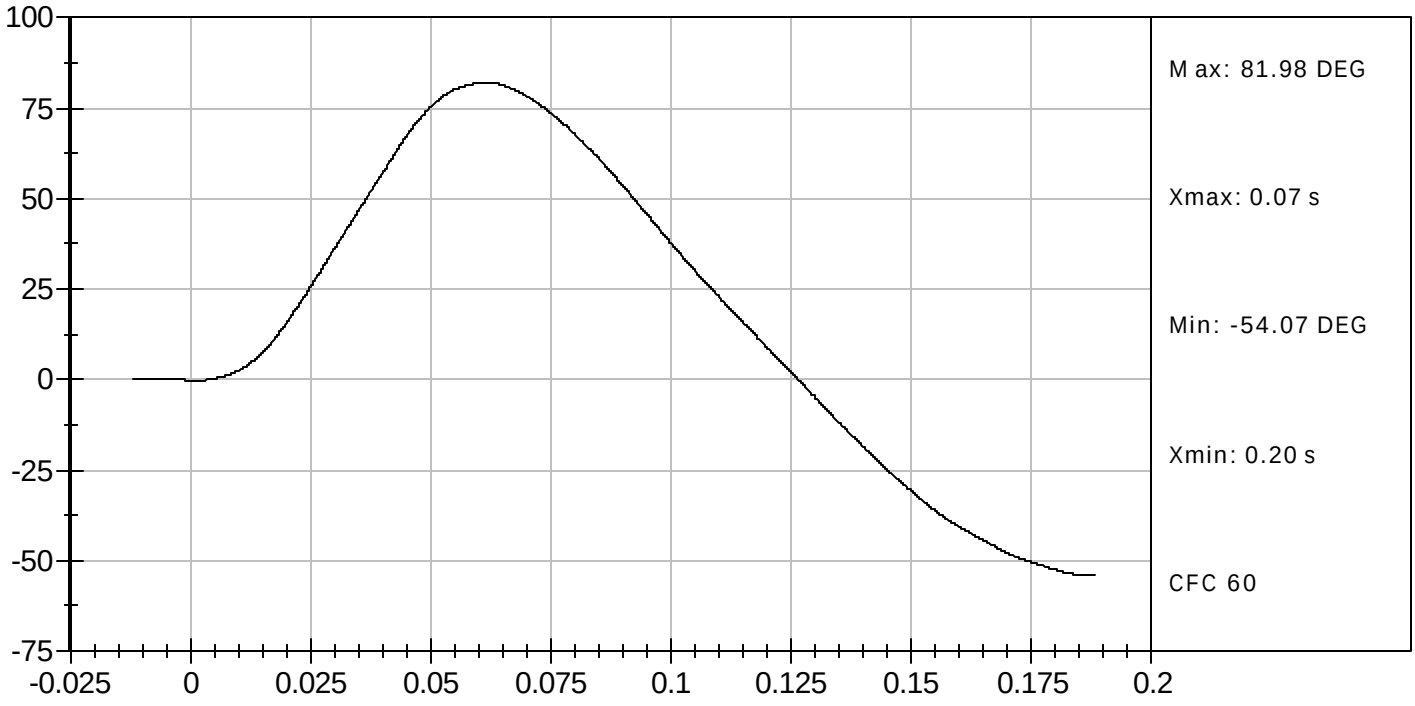
Test Desc: Neck Flexion
Componet ID: D051242

Test Date: 05/09/2005
Velocity: 23.4 ft/s, 7.13 m/s

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

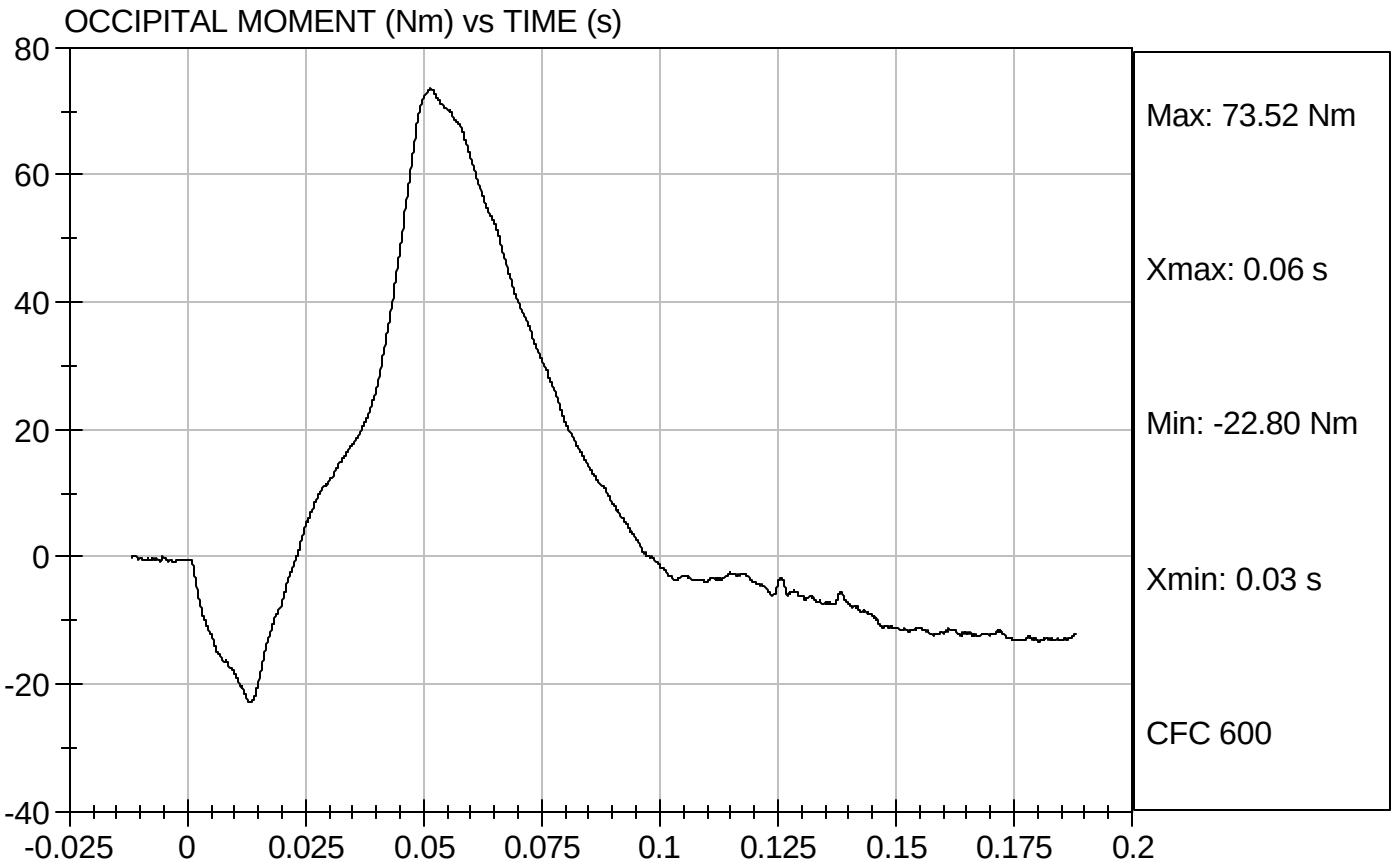


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051242

Test Date: 05/09/2005
Speed: 23.4 ft/sec, 7.13 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ____505_____ Test Date ___5/09/05_____

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 extension test. (572.137(q))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __22.0___
Record the minimum temperature __21.0___
Record the maximum humidity __55%__
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 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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.7 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.3 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-58___Nm @ _106__degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	103 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Hall _____ 5/09/05_____

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051243

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.7	Pass
	30 msec	m/sec	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-58	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	103	Pass
			Overall Results		Pass

Jessica Hall

Laboratory Technician

05/09/2005

Test Date

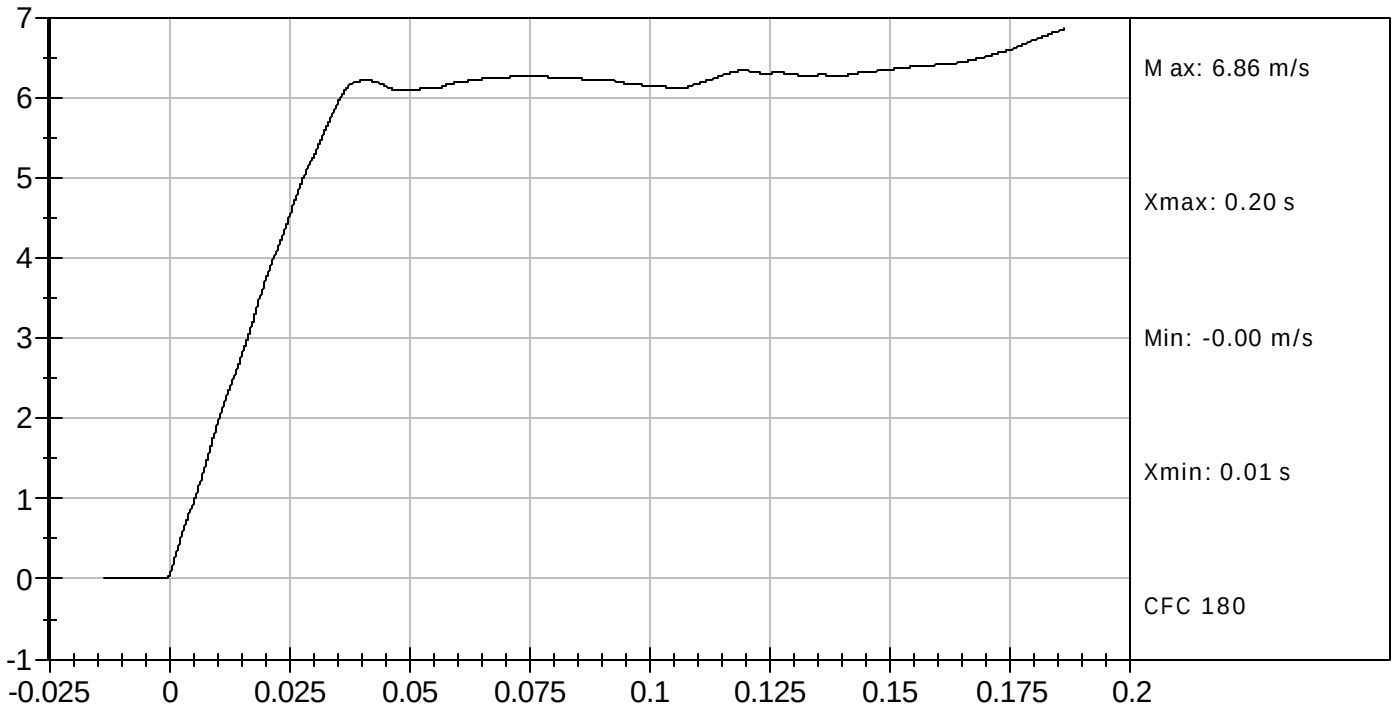
Jeff Leonardelli

Approved By

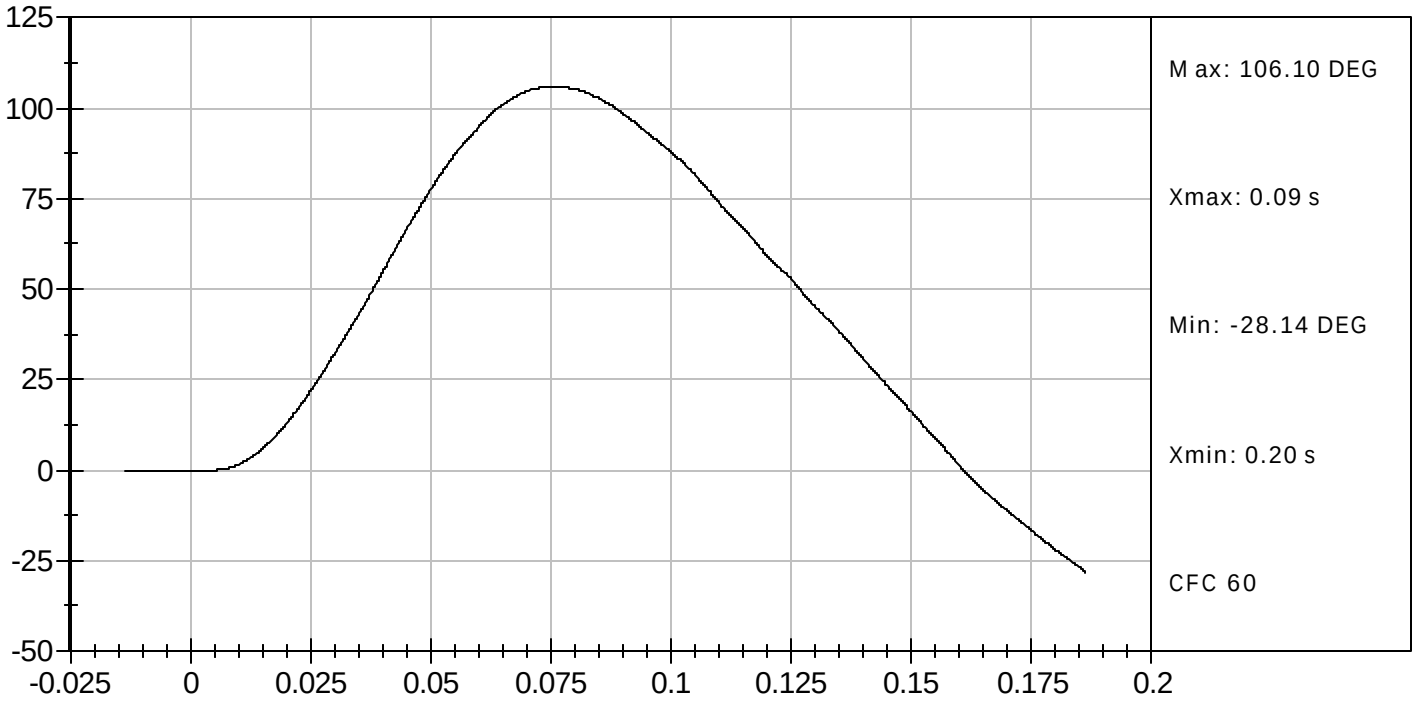
Test Desc: Neck Extension
Componet ID: D051243

Test Date: 05/09/2005
Velocity: 20.09 ft/s, 6.12 m/s

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

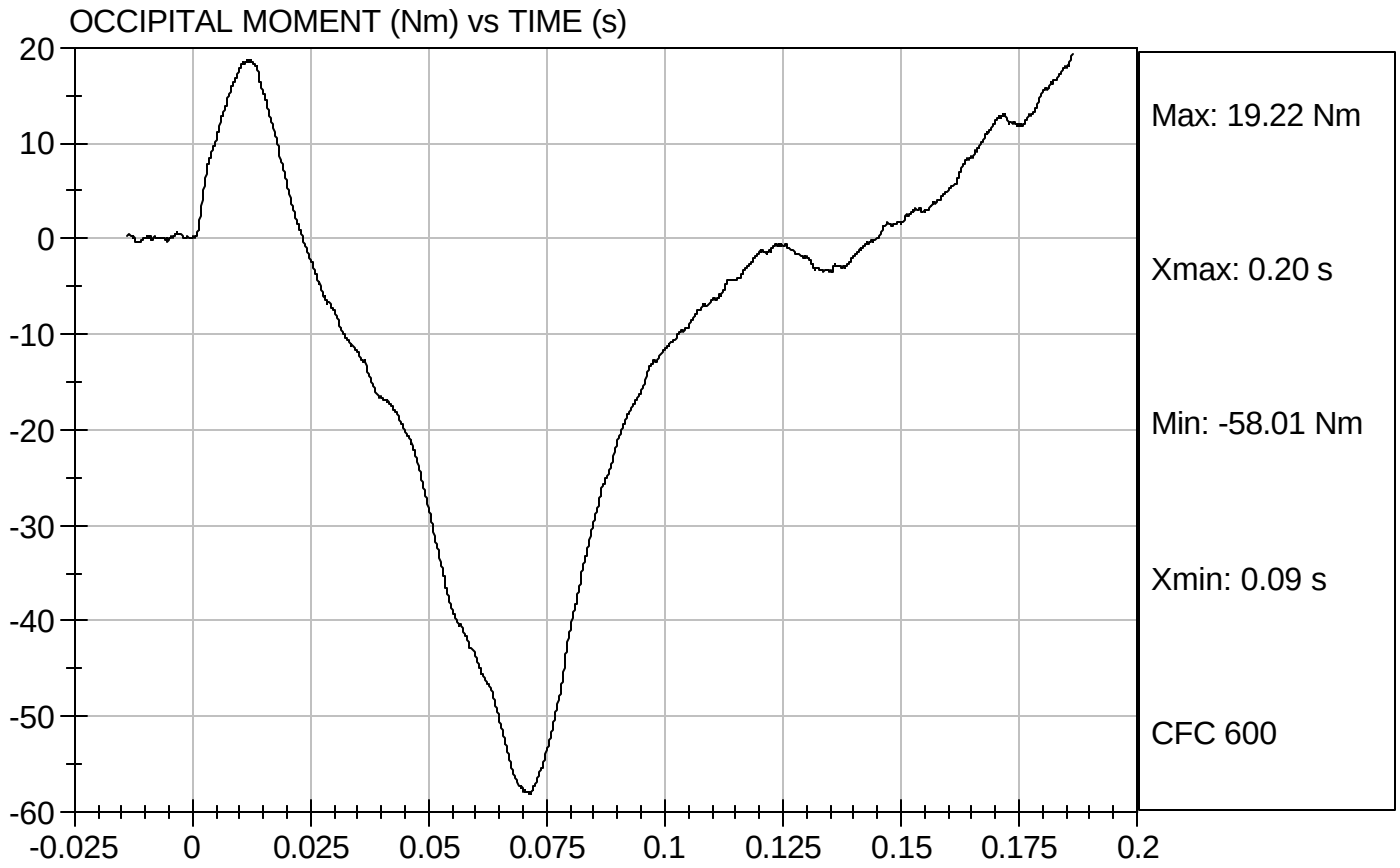


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051243

Test Date: 05/09/2005
Speed: 20.09 ft/sec, 6.12 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __505_____ Test Date __5/10/05_____

Technician ____David Wilcox_____

___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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _22.0_
Record the minimum temperature _21.0_
Record the maximum humidity _55%_
Record the minimum humidity _25%_
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.67 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4096 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4095 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 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.

Signature

5/10/05
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051244

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	6.59 to 6.83	6.67	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.1	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4,095	Pass
		Overall Test Results		Pass

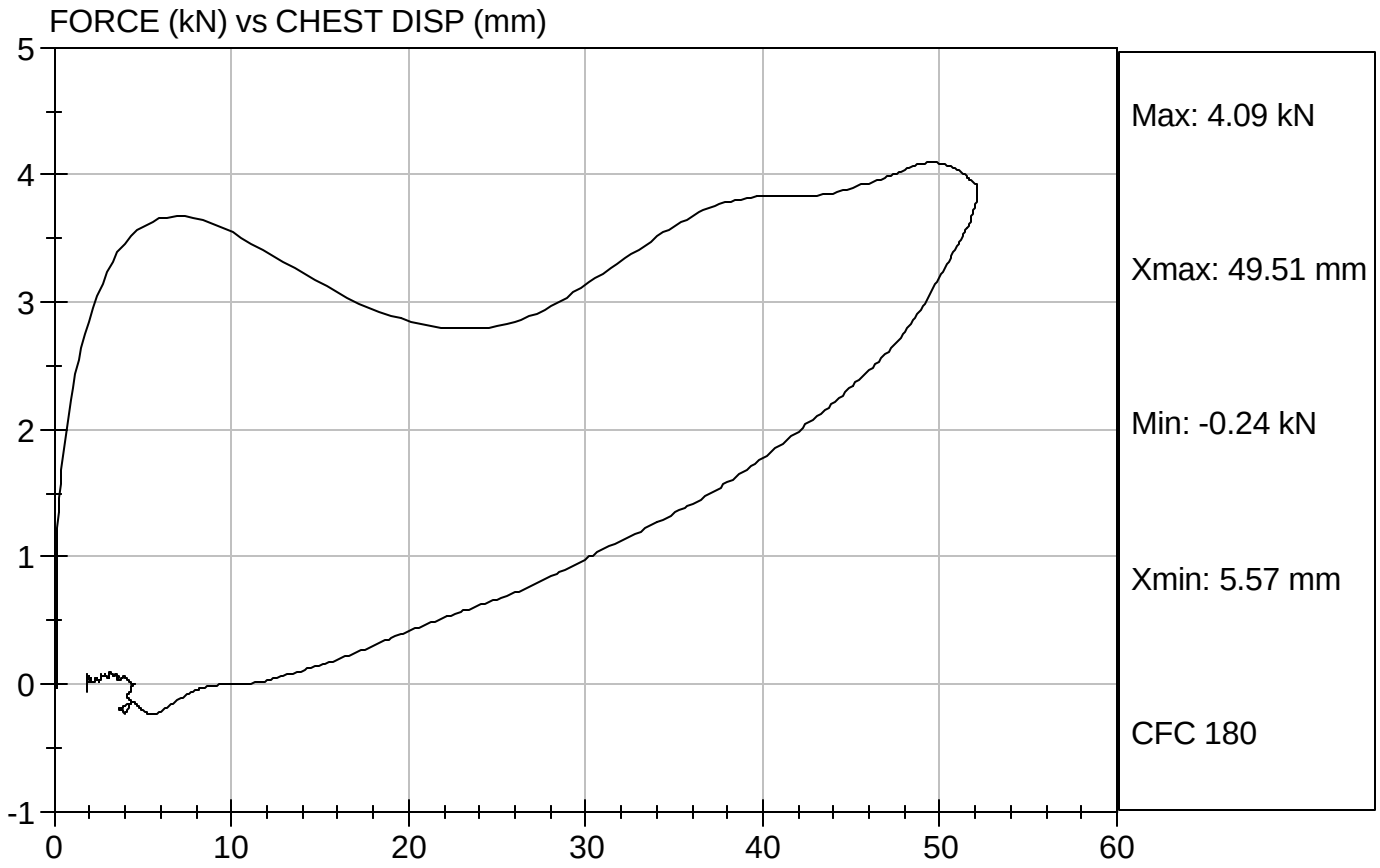
Laboratory Technician

05/10/2005
Test Date

Jeff Leonardelli
Approved By

Test Desc: Thorax Impact
Component ID: D051244

Test Date: 05/10/2005
Speed: 21.88 ft/sec, 6.67 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __505_____ Test Date __5/06/05_____

Technician _____David 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. (572.137(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 (66ºF) and 25.6°C (78ºF) 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 __21.0__
Record the maximum humidity __55%__
Record the minimum humidity __25%__
_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°)___14°___
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	14°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	371 N
Final ref. plane angle	Initial ref. plane angle ±8°	17°

Signature

5/06/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 506 **Test I.D:** D051247

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial Angle	deg	0 to 20	14	Pass
Return Angle	deg	+/- 8	17	Pass
Force at 45 deg	N	320 to 390	371	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Laboratory Technician

05/06/2005
Test Date

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __505_____ Test Date __5/06/05_____

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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _22.0__
Record the minimum temperature _21.0__
Record the maximum humidity _55%__
Record the minimum humidity _25%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3560 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

5/06/05
Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051246

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	28	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.56	Pass
		Overall Test Results		Pass

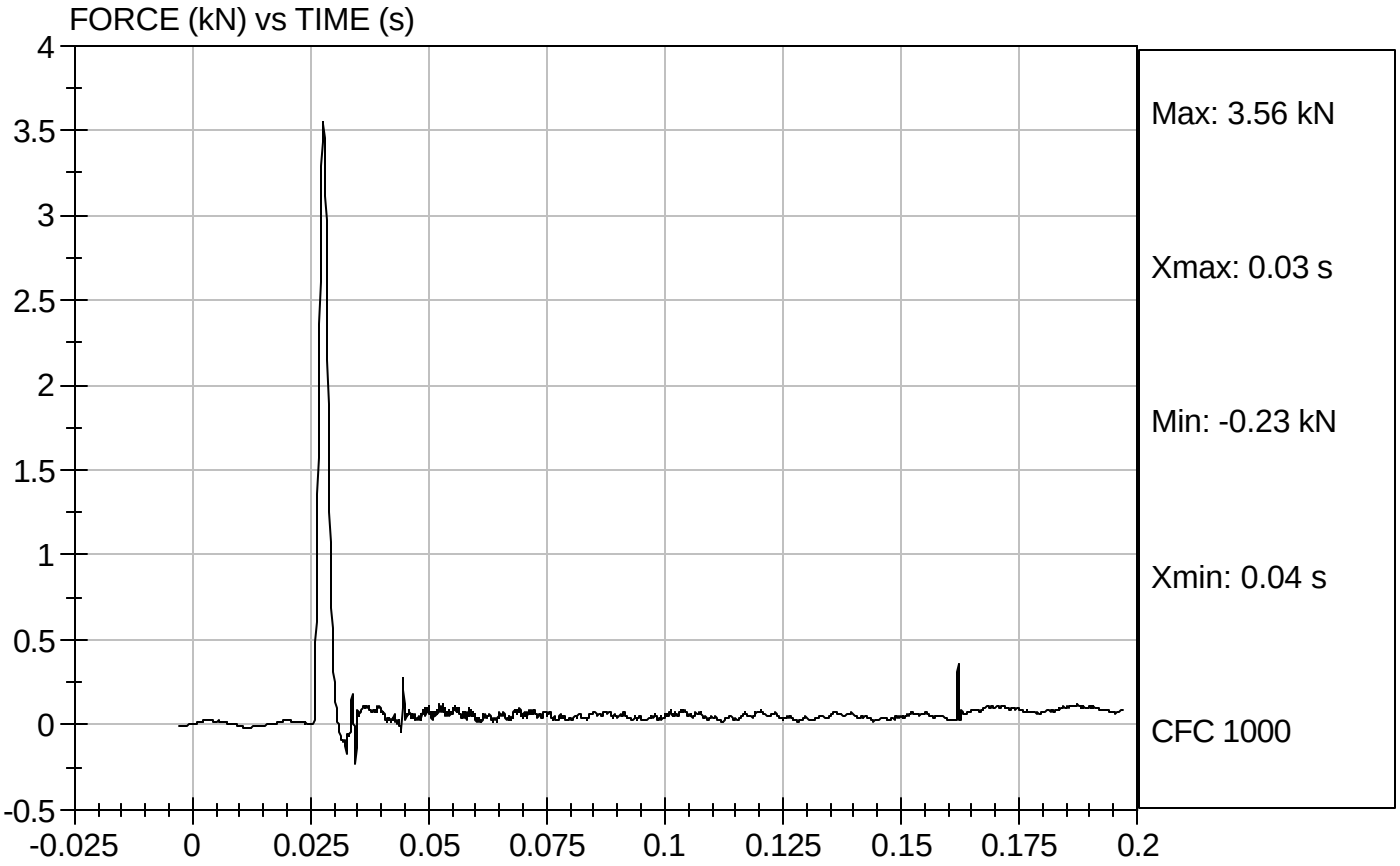
Jessica Hall
Laboratory Technician

05/06/2005
Test Date

Jeff Leonardski
Approved By

Test Desc: Left Knee
Component ID: D051246

Test Date: 05/06/2005
Speed: 6.96 ft/sec, 2.12 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___505_____ Test Date __5/06/05_____

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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _22.0___
Record the minimum temperature _21.0___
Record the maximum humidity _55 %___
Record the minimum humidity _25 %___
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 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.

Jessica Hall
Signature

5/06/05
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 505 **Test I.D:** D051245

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	28	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.53	Pass
		Overall Test Results		Pass

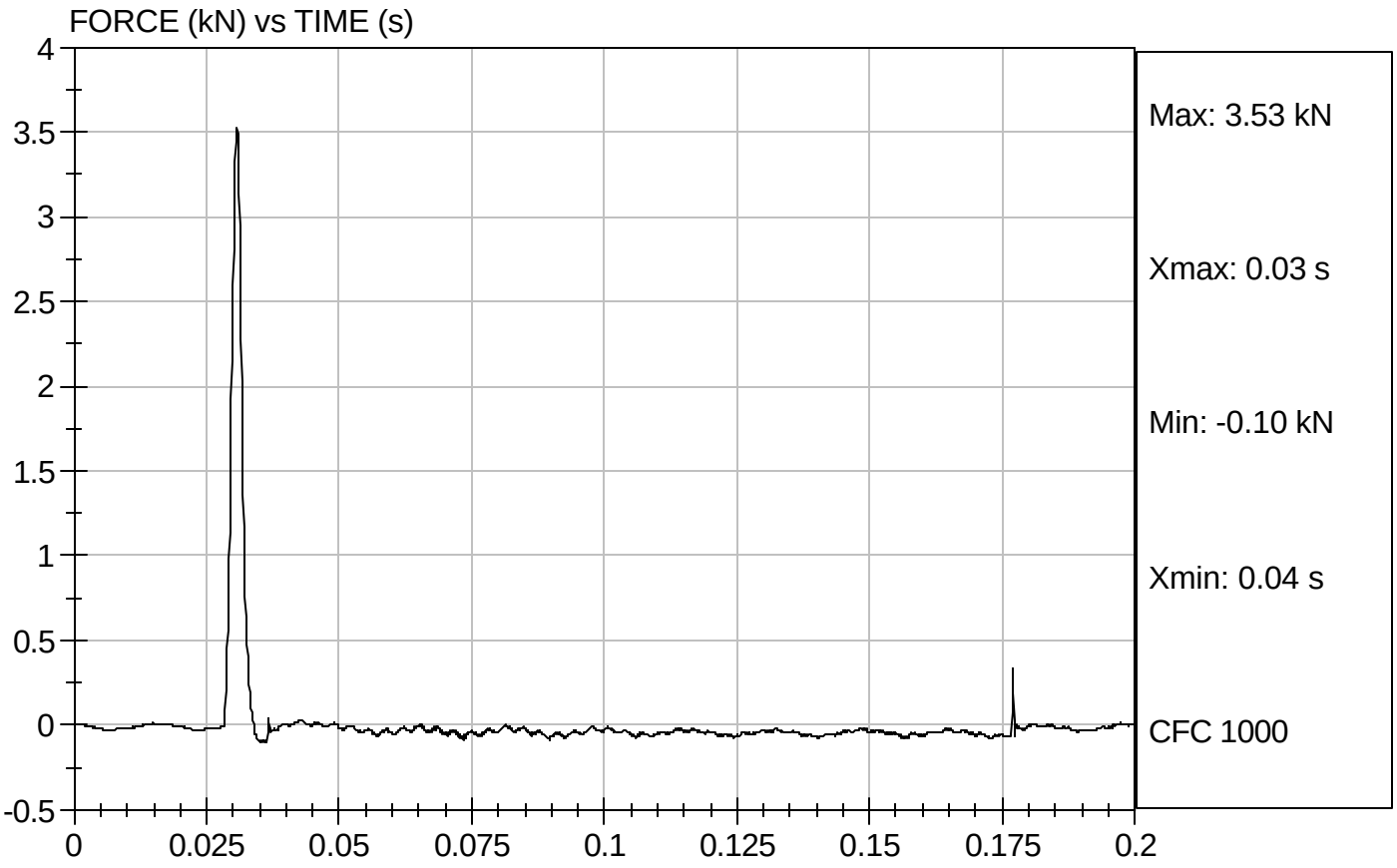
Jessica Hall
Laboratory Technician

05/06/2005
Test Date

Jeff Leonardski
Approved By

Test Desc: Right Knee
Component ID: D051245

Test Date: 05/06/2005
Speed: 6.92 ft/sec, 2.11 m/sec



EXTERNAL DIMENSIONS

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

HYBRID III 5th SN #505, 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 __5/5/05____

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 _____ 5/5/05_____
Signature Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonardelli _____ 5/5/05_____
Signature Date

EXTERNAL DIMENSIONS

HYBRID III 5th SN #511, 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	782.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.8
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	75.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.9
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.2
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	282.7
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	540.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	358.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	406.3
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	414.0-439.4	434.4

HYBRID III 5th SN #511, 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	186.4
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	222.3
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	476.3
S	HEAD BREADTH	The widest part of the head	137.1-147.3	142.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	299.9
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.2
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	83.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	539.4
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	851.9
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	762.4
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 _____511_____ Test Date ____4/27/05_____

Technician _____David Wilcox_____

_X_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))
__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 (66ºF) and 25.6°C (78ºF) 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 __21.7_
Record the minimum temperature __21.4_
Record the maximum humidity __27%_
Record the minimum humidity __22%_
_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 ± 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 g ≤ x ≤ 300 g	266
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration ≤ 15 g	-9

_X_17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Signature

__4/27/05_____
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test ID:** D051141

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	266	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.3	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

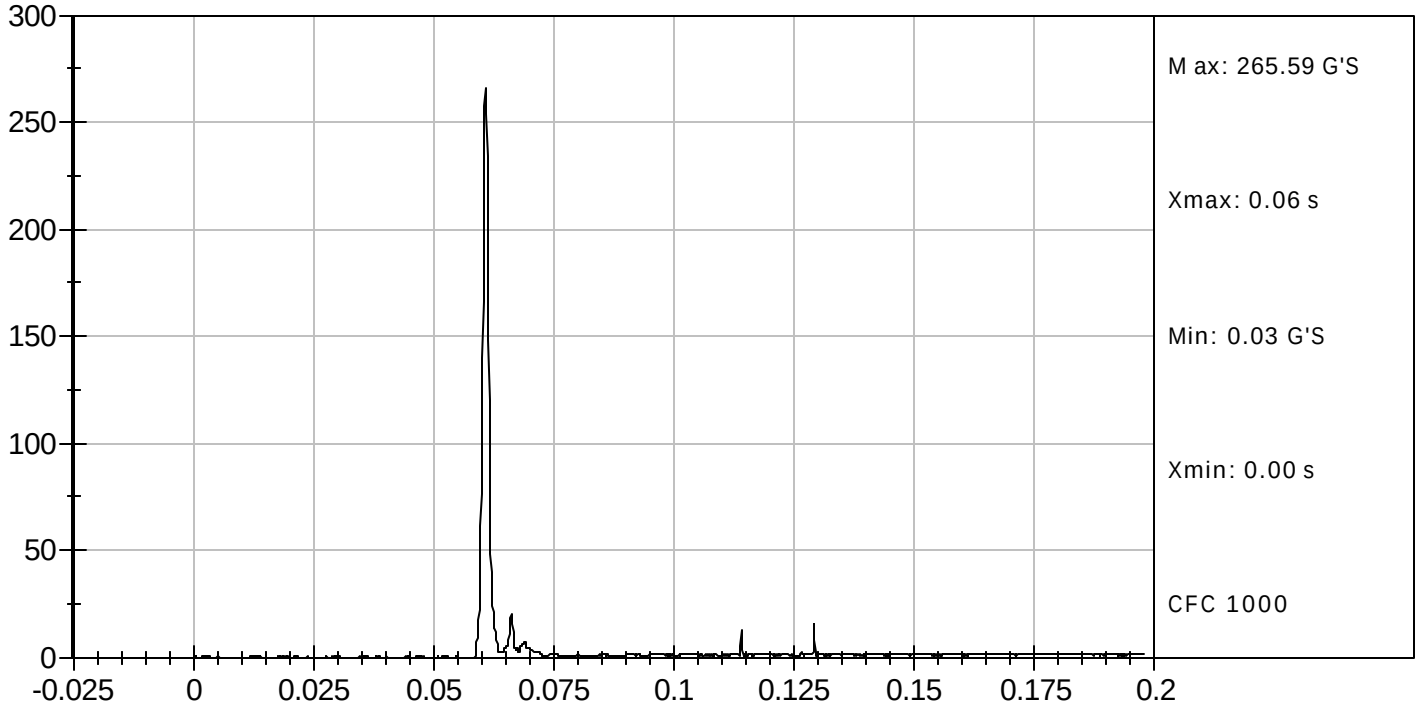
04/27/2005
Test Date

Approved By

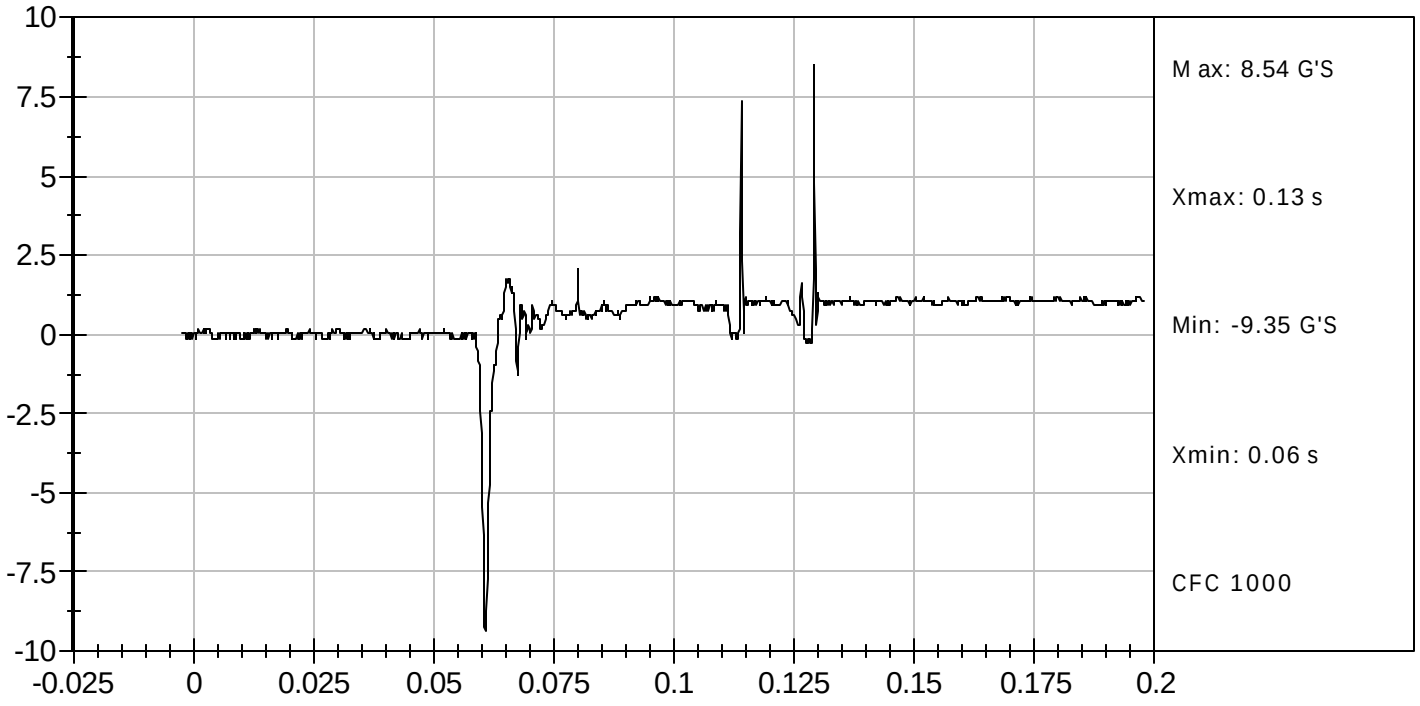
Test Desc: Head Drop
Componet ID: D051141

Test Date: 04/27/2005
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 ____511_____ Test Date ____4/28/05_____

Technician _____Jessica Gall_____

_X_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))
_X_ N/A, ONLY one flexion test performed

_X_2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.8__
Record the minimum temperature __21.0__
Record the maximum humidity __24%__
Record the minimum humidity __21%__

_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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	7.10 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.7 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.5 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__78_Nm @ _79__degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	87 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Gall _____ 4/28/05

Signature Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051142

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.10	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.4	Pass
	20 msec	m/sec	4.0 to 5.0	4.7	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	87	Pass
			Overall Results		Pass

Jessica Gall

Laboratory Technician

04/28/2005

Test Date

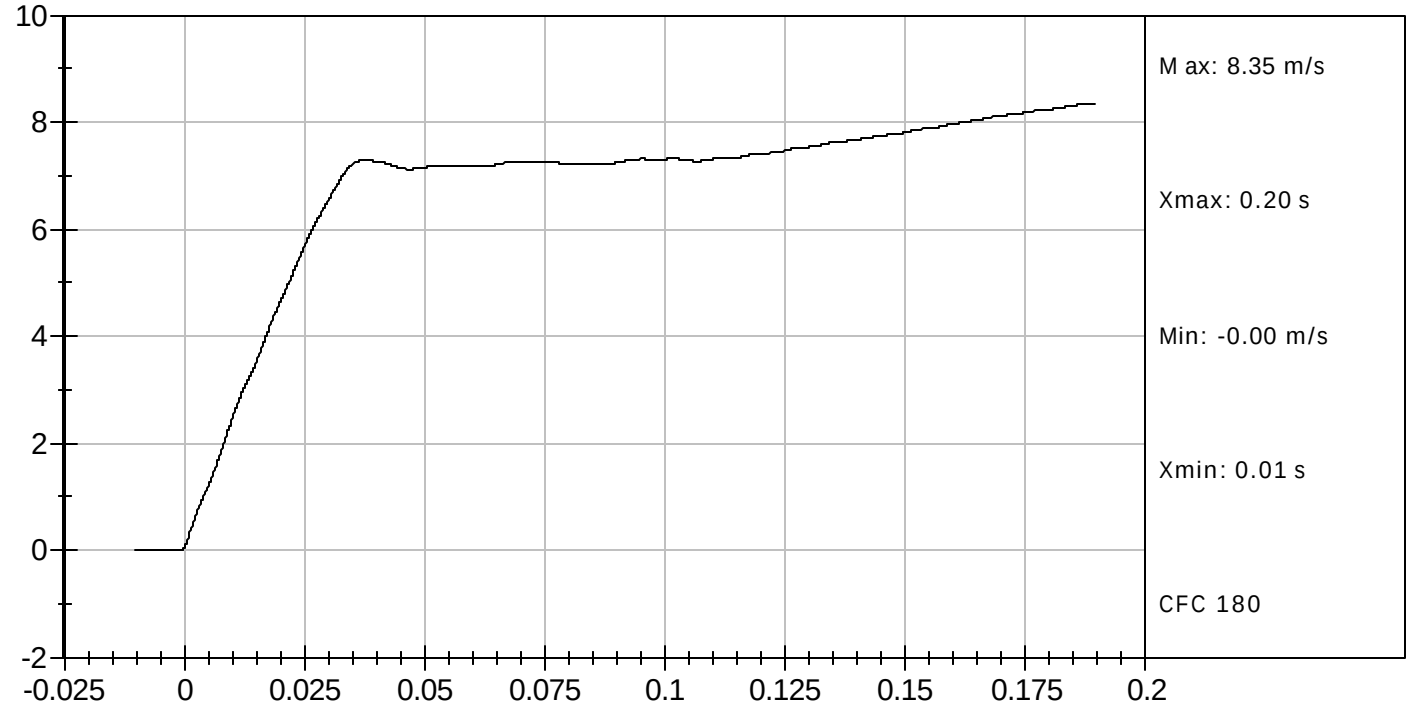
Jeff Levandoski

Approved By

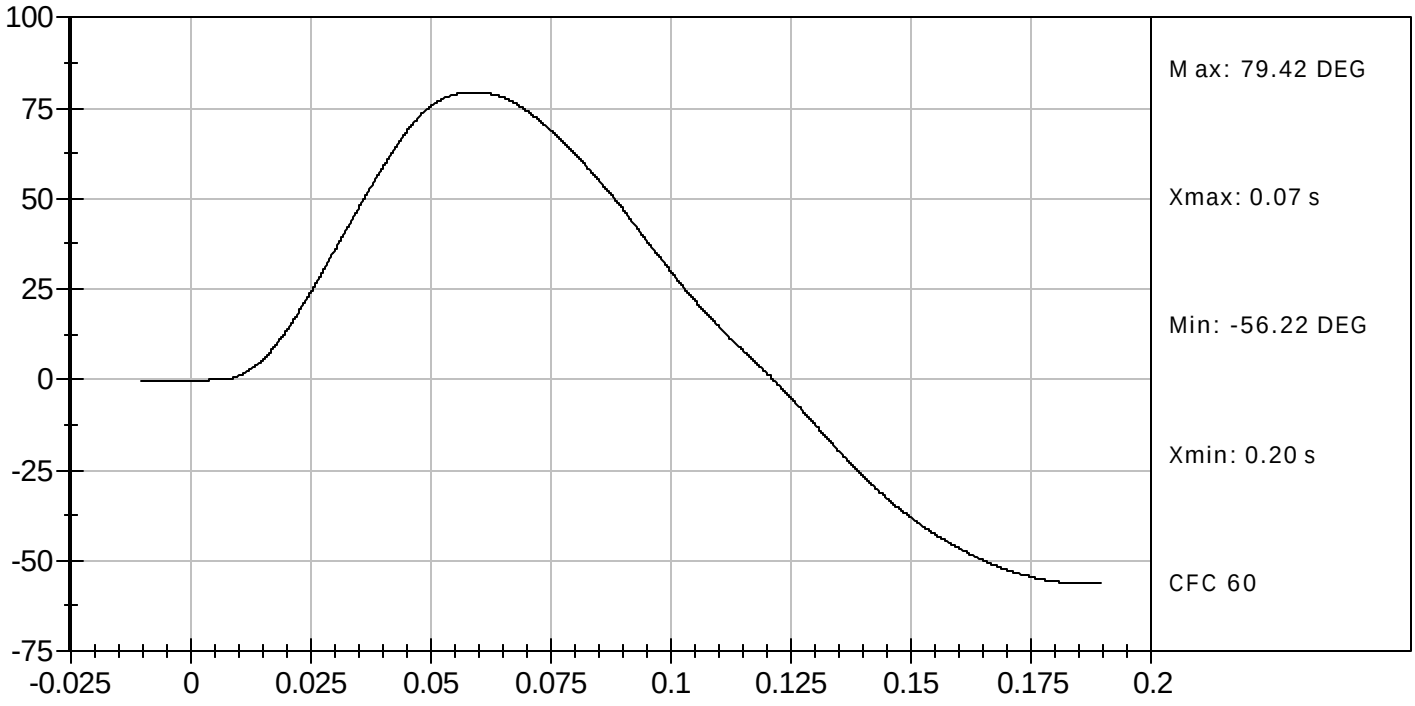
Test Desc: Neck Flexion
Componet ID: D051142

Test Date: 04/28/2005
Velocity: 23.3 ft/s, 7.10 m/s

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

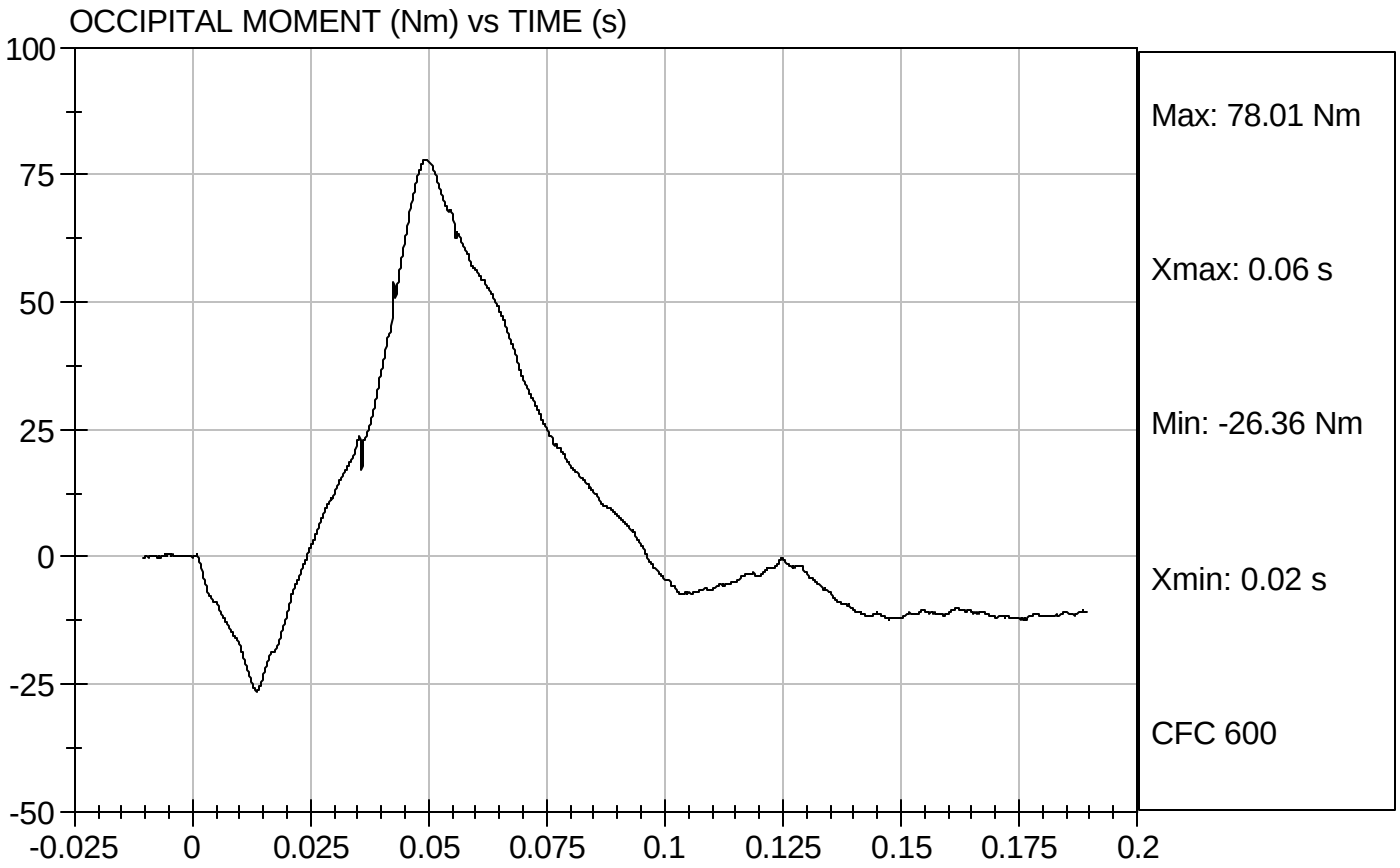


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051142

Test Date: 04/28/2005
Speed: 23.3 ft/sec, 7.10 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ____511_____ Test Date ___5/2/05_____

Technician _____Jessica Gall_____

__X 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))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.2___
Record the minimum temperature __20.9___
Record the maximum humidity __22%__
Record the minimum humidity __20%__

_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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.14m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.6 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	5.2 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-54___Nm @ _110__degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	105 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Hall _____ 5/2/05_____

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051143

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.14	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	105	Pass
			Overall Results		Pass

Jessica Hall

Laboratory Technician

05/02/2005

Test Date

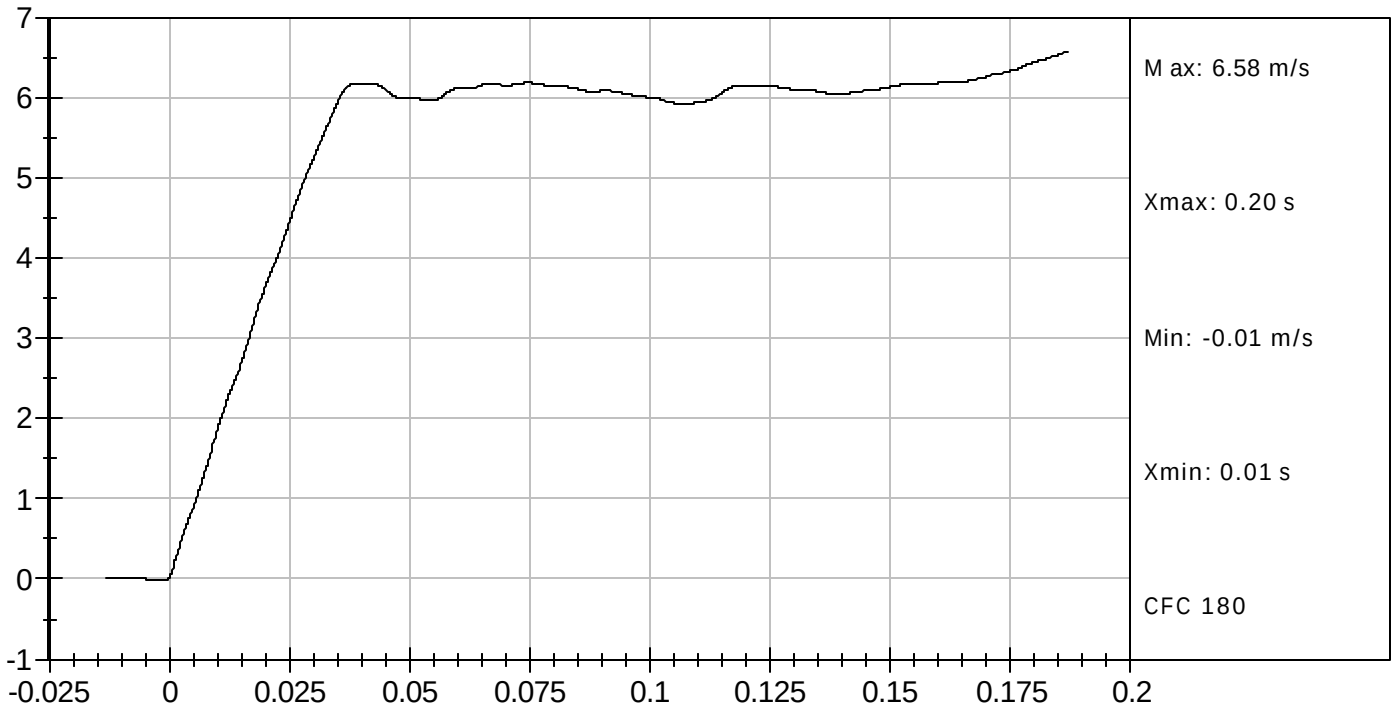
Jeff Leonardelli

Approved By

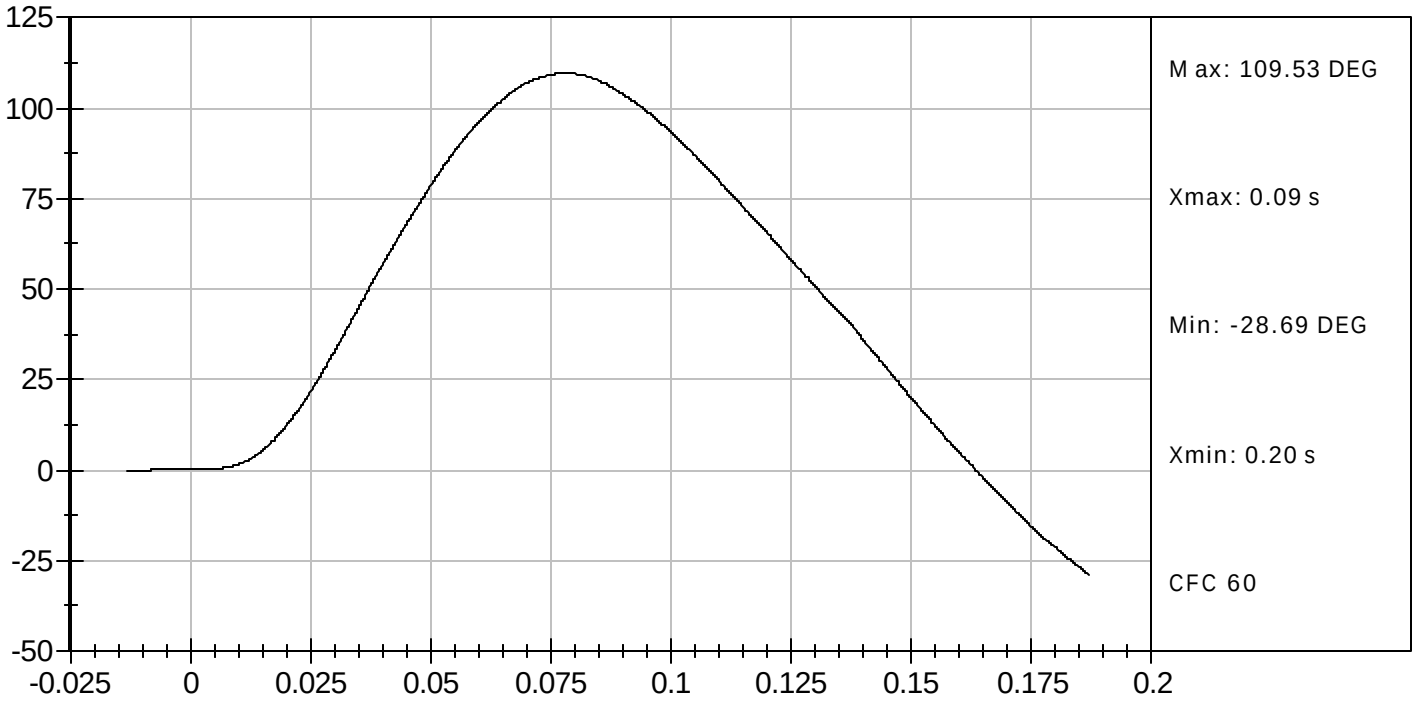
Test Desc: Neck Extension
Componet ID: D051143

Test Date: 05/02/2005
Velocity: 20.16 ft/s, 6.14 m/s

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

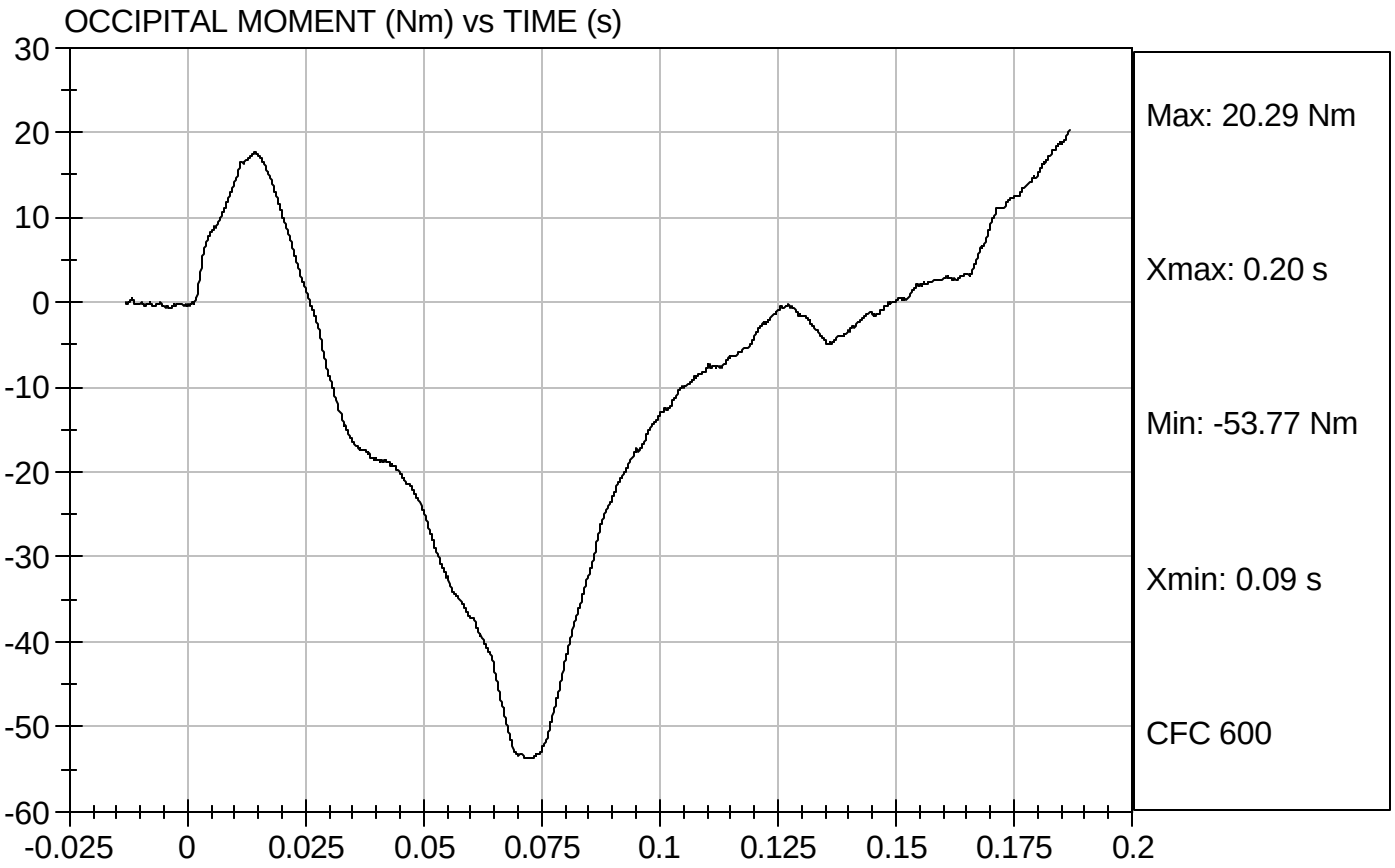


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051143

Test Date: 05/02/2005
Speed: 20.16 ft/sec, 6.14 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __511_____ Test Date __5/3/05_____

Technician ____Jessica Gall_____

_X_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))
_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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _21.0_
Record the minimum temperature _20.7_
Record the maximum humidity _24%_
Record the minimum humidity _20%_
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.80 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	54 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4220 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4104 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 85%	69%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.
**Force = impactor mass x acceleration (572.134(b)(3))

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

_X_17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Jessica Hall
Signature

5/3/05
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051144

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Relative Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	6.59 to 6.83	6.80	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4,104	Pass
		Overall Test Results		Pass

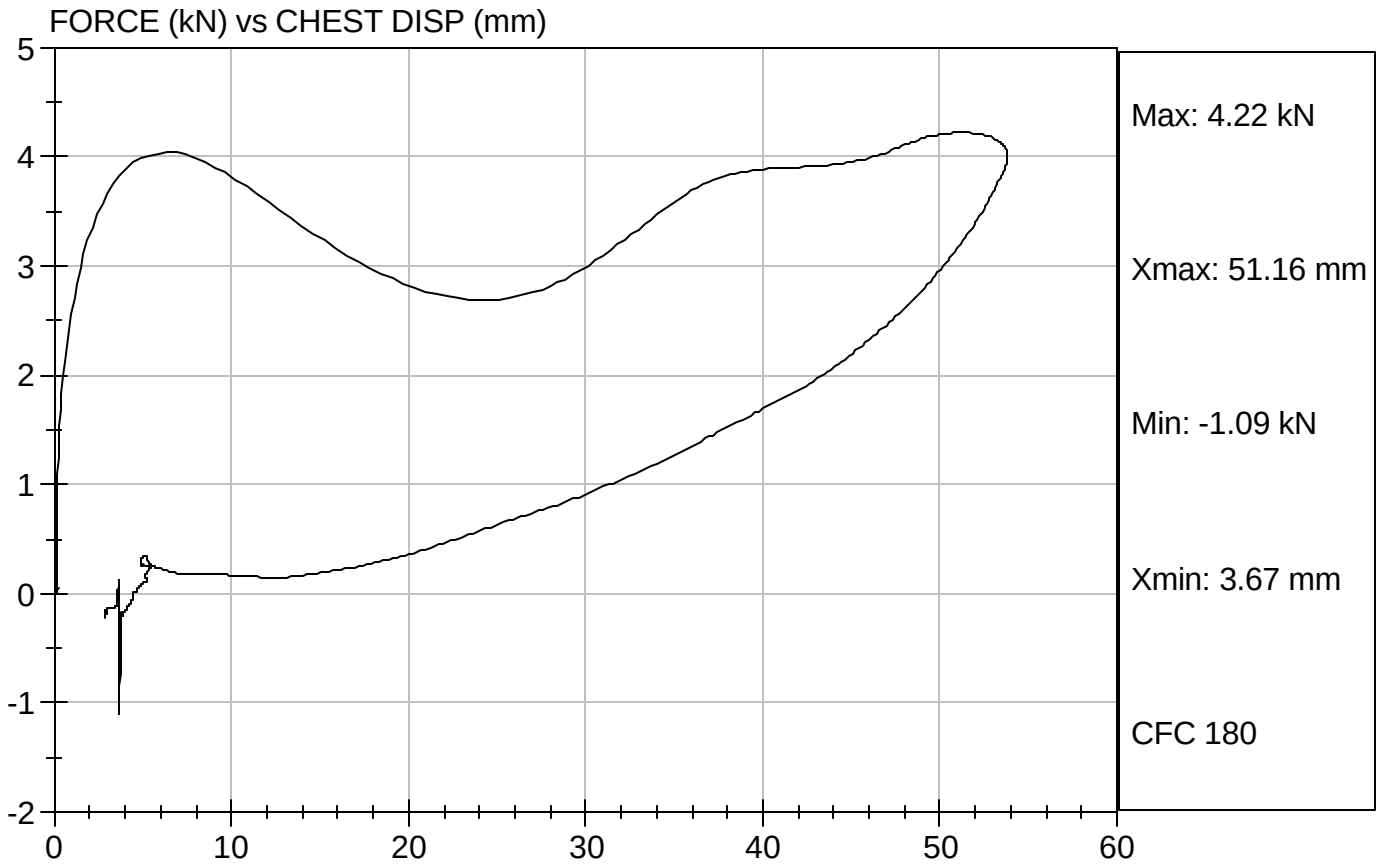
Jessica Hall
Laboratory Technician

05/03/2005
Test Date

Jeff Levandoski
Approved By

Test Desc: Thorax Impact
Component ID: D051144

Test Date: 05/03/2005
Speed: 22.32 ft/sec, 6.80 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __511_____ Test Date __4/28/05_____

Technician _____Dave Wilcox_____

_X_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))
_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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
Record the maximum temperature __21.8__
Record the minimum temperature __21.0__
Record the maximum humidity __24%__
Record the minimum humidity __21%__
_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°)___14°__
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))

_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	14°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	349 N
Final ref. plane angle	Initial ref. plane angle ±8°	15°

Signature

4/28/05

Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051147

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Initial Angle	deg	0 to 20	14	Pass
Return Angle	deg	+/- 8	15	Pass
Force at 45 deg	N	320 to 390	349	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 - 1.5	1.0	Pass
		Overall Result		Pass

Laboratory Technician

04/28/2005

Test Date

Jeff Leonard

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __511_____ Test Date __4/28/05_____

Technician ____Dave Wilcox_____

_X_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))
_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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _21.8__
Record the minimum temperature _21.0__
Record the maximum humidity _24%__
Record the minimum humidity _21%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.12 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3460 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

4/28/05

Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051146

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	24	Pass
Probe Speed	m/sec	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.46	Pass
		Overall Test Results		Pass

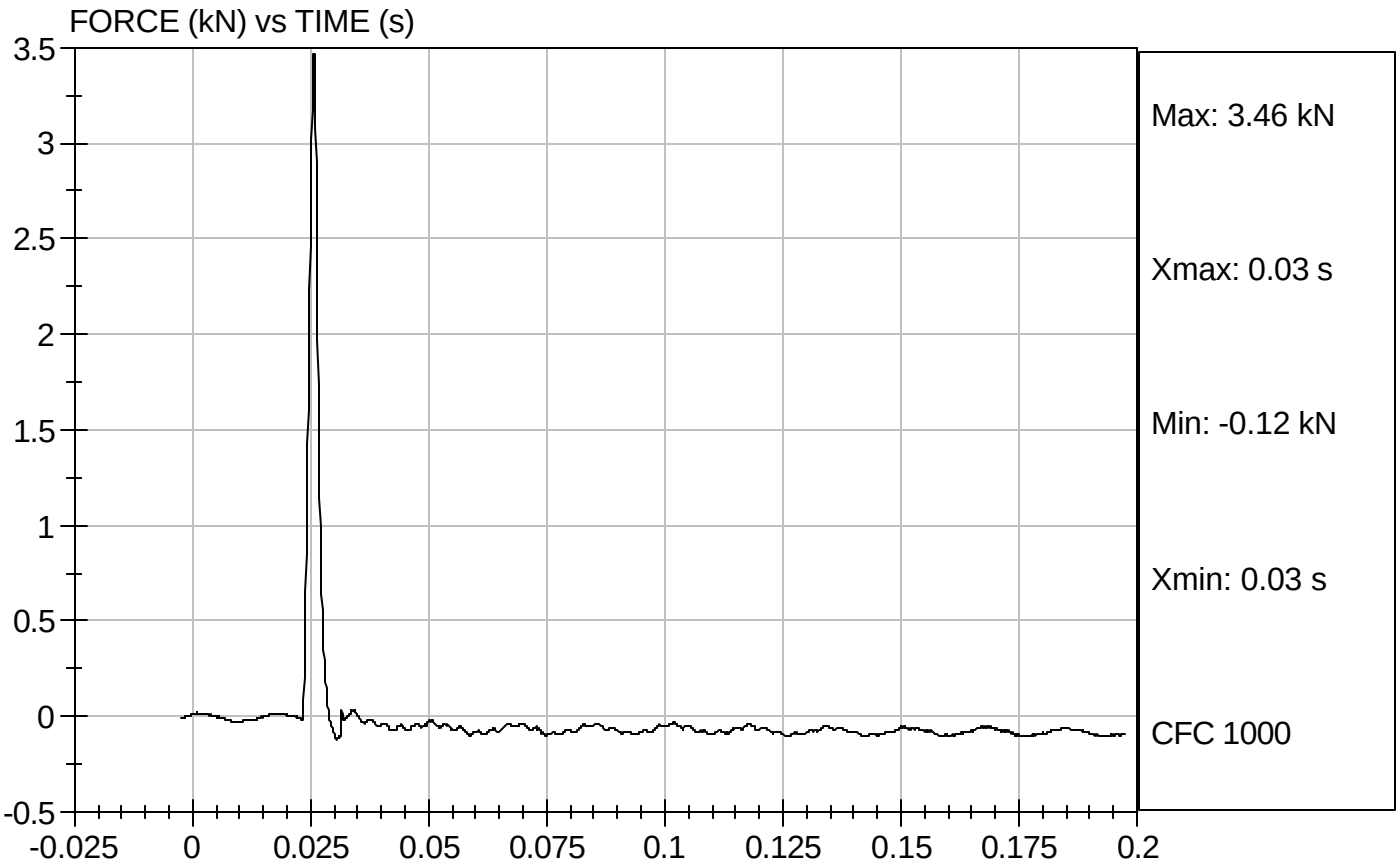
Laboratory Technician

04/28/2005
Test Date

Jeff Leonardski
Approved By

Test Desc: Left Knee
Component ID: D051146

Test Date: 04/28/2005
Speed: 6.94 ft/sec, 2.12 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___511_____ Test Date __4/28/05_____

Technician ___Dave Wilcox_____

_X_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))
_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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _21.8__
Record the minimum temperature _21.0__
Record the maximum humidity _24%__
Record the minimum humidity _21%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3540 N

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

_X_12. Plots of acceleration versus time and force versus time follow this sheet.

4/28/05

Signature Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051145

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	24	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.54	Pass
		Overall Test Results		Pass

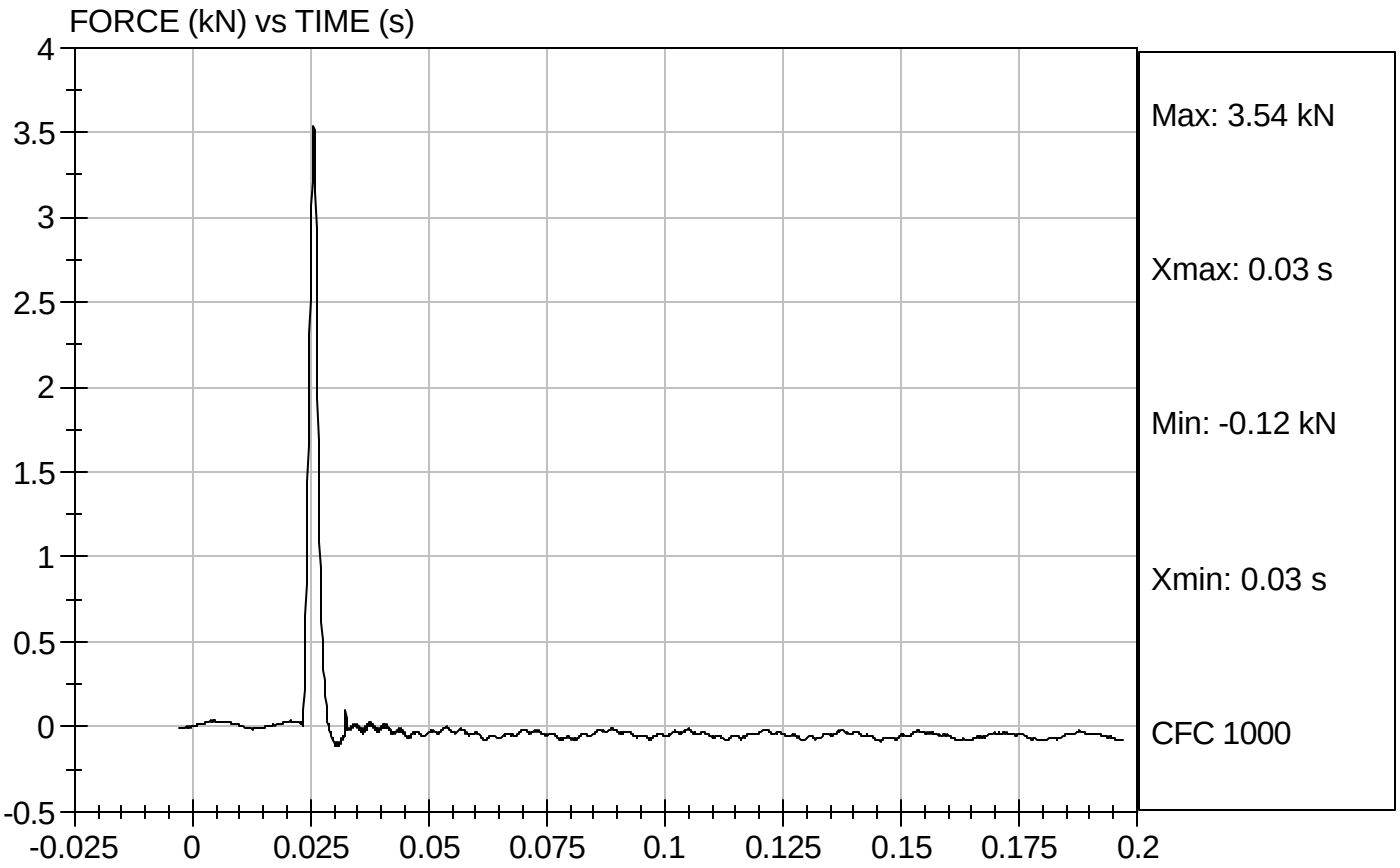
Laboratory Technician

04/28/2005
Test Date

Approved By

Test Desc: Right Knee
Component ID: D051145

Test Date: 04/28/2005
Speed: 6.93 ft/sec, 2.11 m/sec



DATA SHEET B3
HEAD DROP TEST (572.132)

Dummy Serial Number _____511_____ Test Date ____5/6/05_____

Technician _____David 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. (572.132(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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
Record the maximum temperature __22.0_
Record the minimum temperature __20.9_
Record the maximum humidity __37%_
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, 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 ± 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 g ≤ x ≤ 300 g	268
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 ≤ 15 g	10

_X_17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Signature

__5/6/05_____
Date

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test ID:** D051231

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	250 - 300	268	Pass
Peak Lateral Acceleration	G's	+/- 15	10	Pass
Unimodal	NA	Yes	Yes	Pass
Oscillations	NA	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

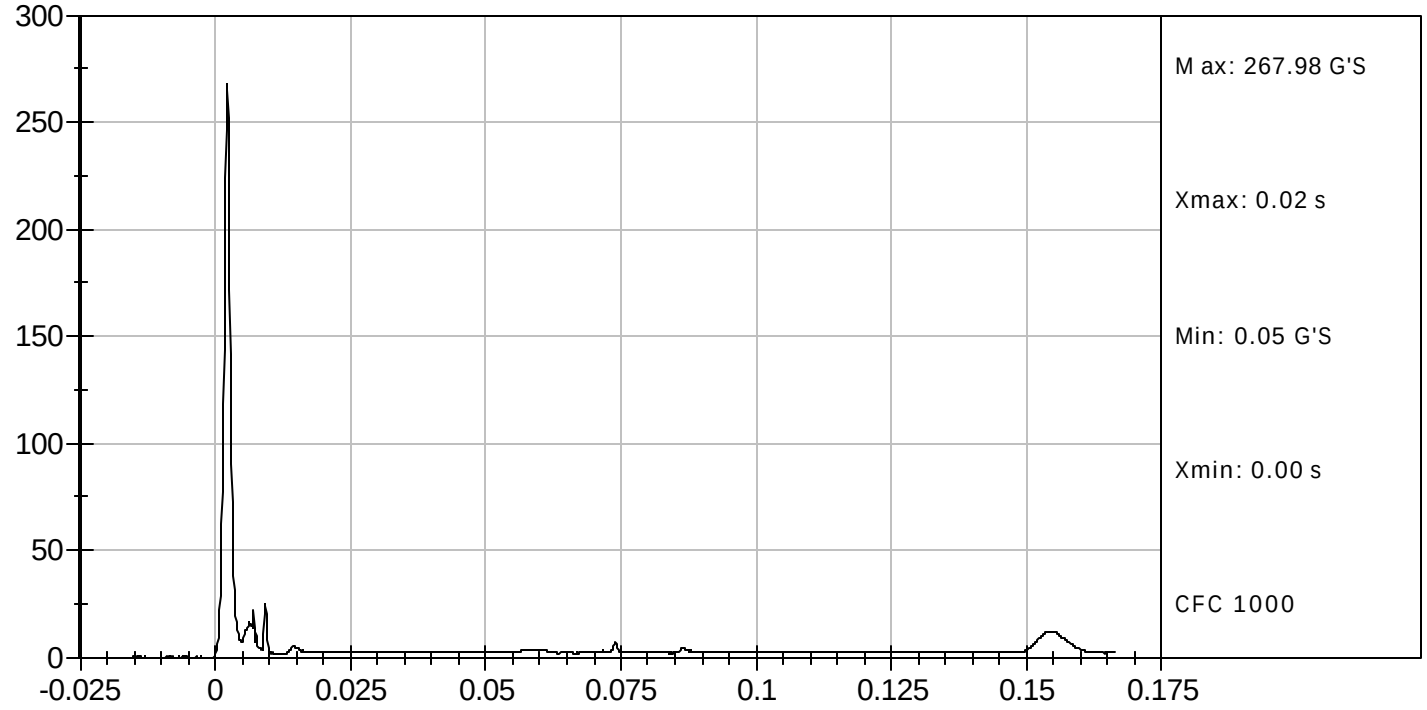
05/06/2005
Test Date

Approved By

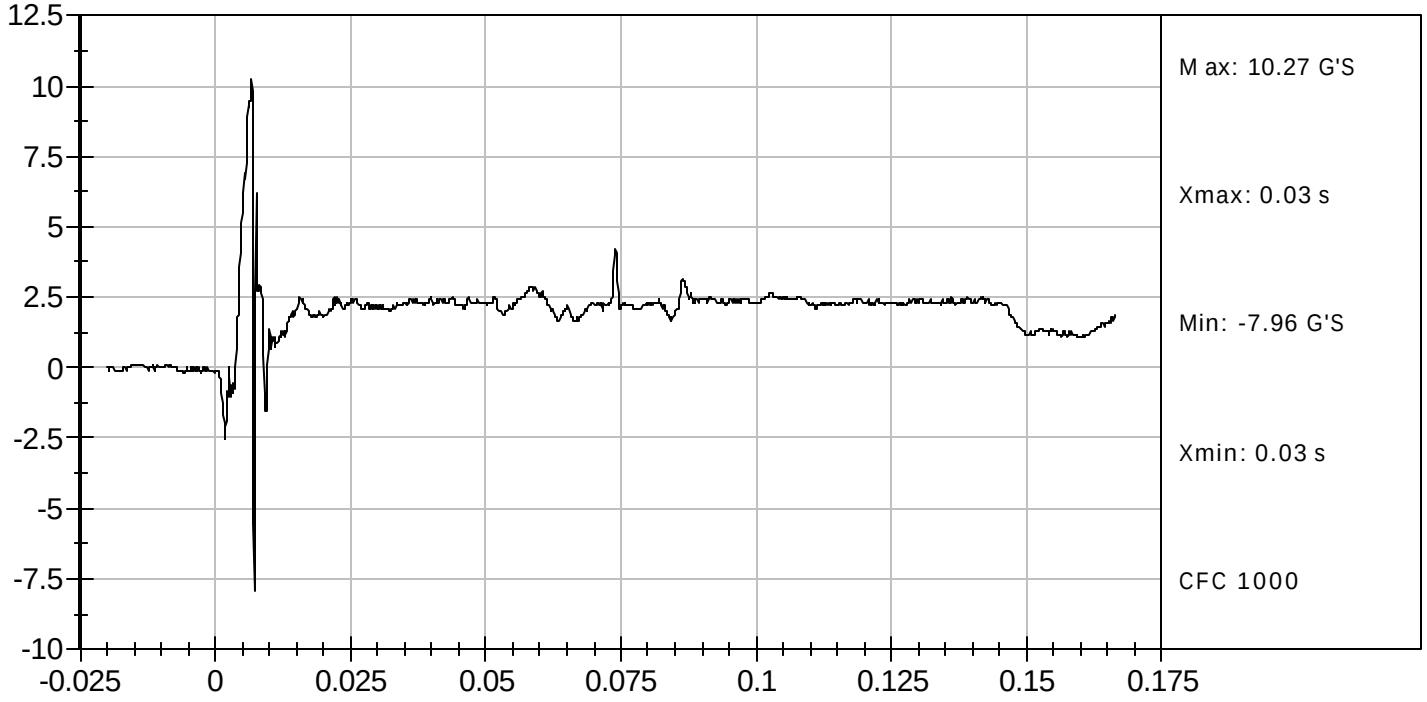
Test Desc: Head Drop
Componet ID: D051231

Test Date: 05/06/2005
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 ____511_____ Test Date ____5/6/05_____

Technician _____Dave Wilcox_____

___Pretest calibration
_X_Post test calibration verification

Test attempt no. _1_ (when successive flexion tests are necessary)

__1. It has been at least 30 minutes since the last flexion test. (572.137(q))
_X_ N/A, ONLY one flexion test performed

_X_2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __22.0__
Record the minimum temperature __20.9__
Record the maximum humidity __37%__
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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))

_X_10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

_X_11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

_X_12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

_X_13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		6.89 m/s ≤ speed ≤ 7.13 m/s	7.12 m/s
Pendulum ΔV with respect to impact speed	@ 10ms	2.1 m/s ≤ ΔV ≤ 2.5 m/s	2.5 m/s
	@ 20 ms	4.0 m/s ≤ ΔV ≤ 5.0 m/s	4.7 m/s
	@30ms	5.8 m/s ≤ ΔV ≤ 7.0 m/s	6.8 m/s
Plane D Rotation		Peak moment* 69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77^o ≤ angle ≤ 91^o	__81_Nm @ _81__degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms ≤ time ≤ 100ms	87 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

5/6/05

Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051232

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/sec	6.89 to 7.13	7.12	Pass
Pendulum Deceleration	10 msec	m/sec	2.1 to 2.5	2.5	Pass
	20 msec	m/sec	4.0 to 5.0	4.7	Pass
	30 msec	m/sec	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	81	Pass
Positive Moment Time Curve Decay to 10 Nm		msec	80 to 100	87	Pass
			Overall Results		Pass

Laboratory Technician

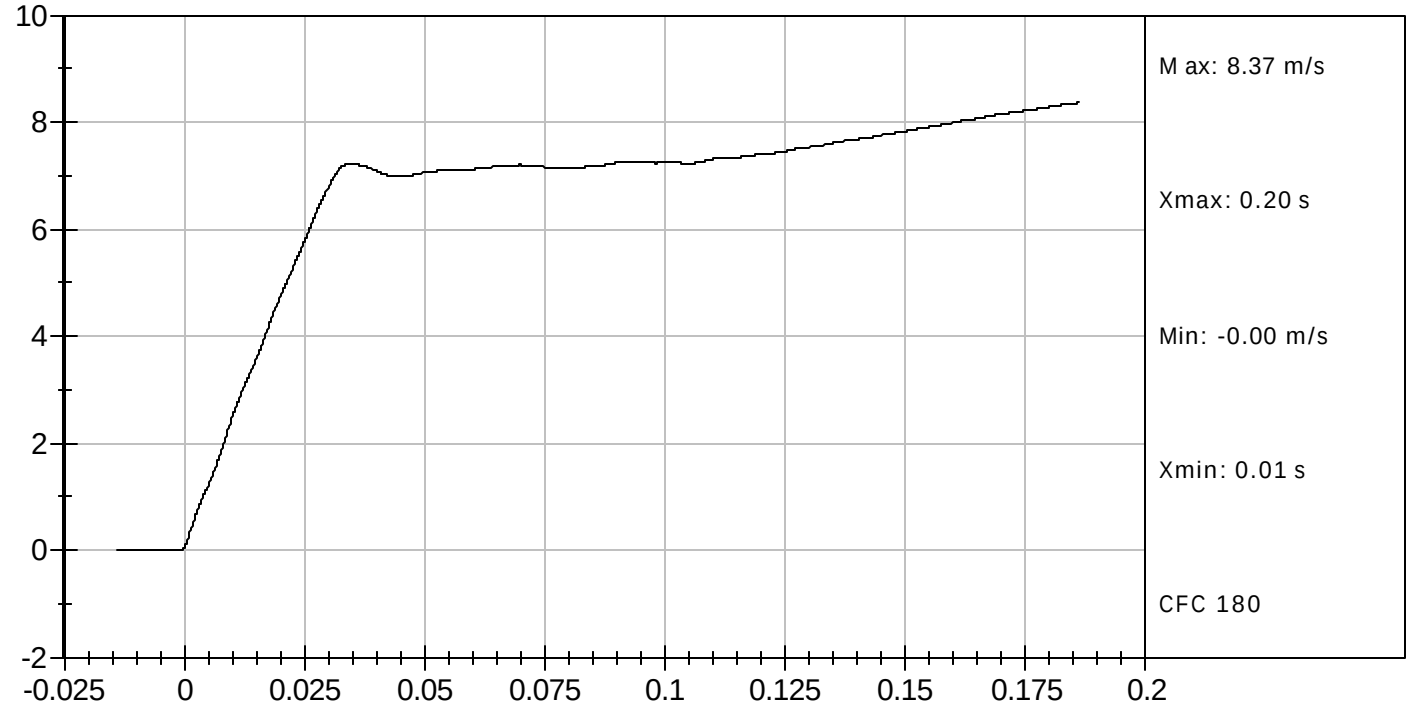
05/06/2005
Test Date

Jeff Levandoski
Approved By

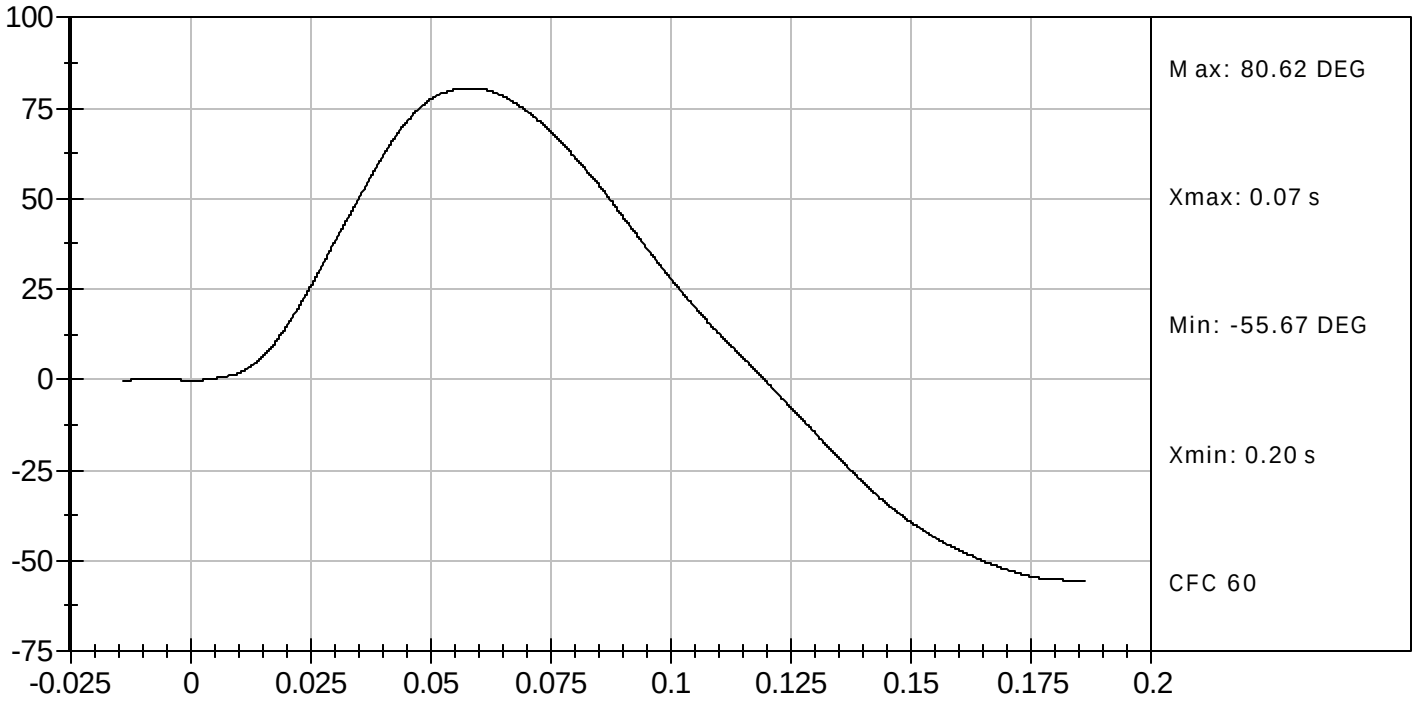
Test Desc: Neck Flexion
Componet ID: D051232

Test Date: 05/06/2005
Velocity: 23.37 ft/s, 7.12 m/s

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

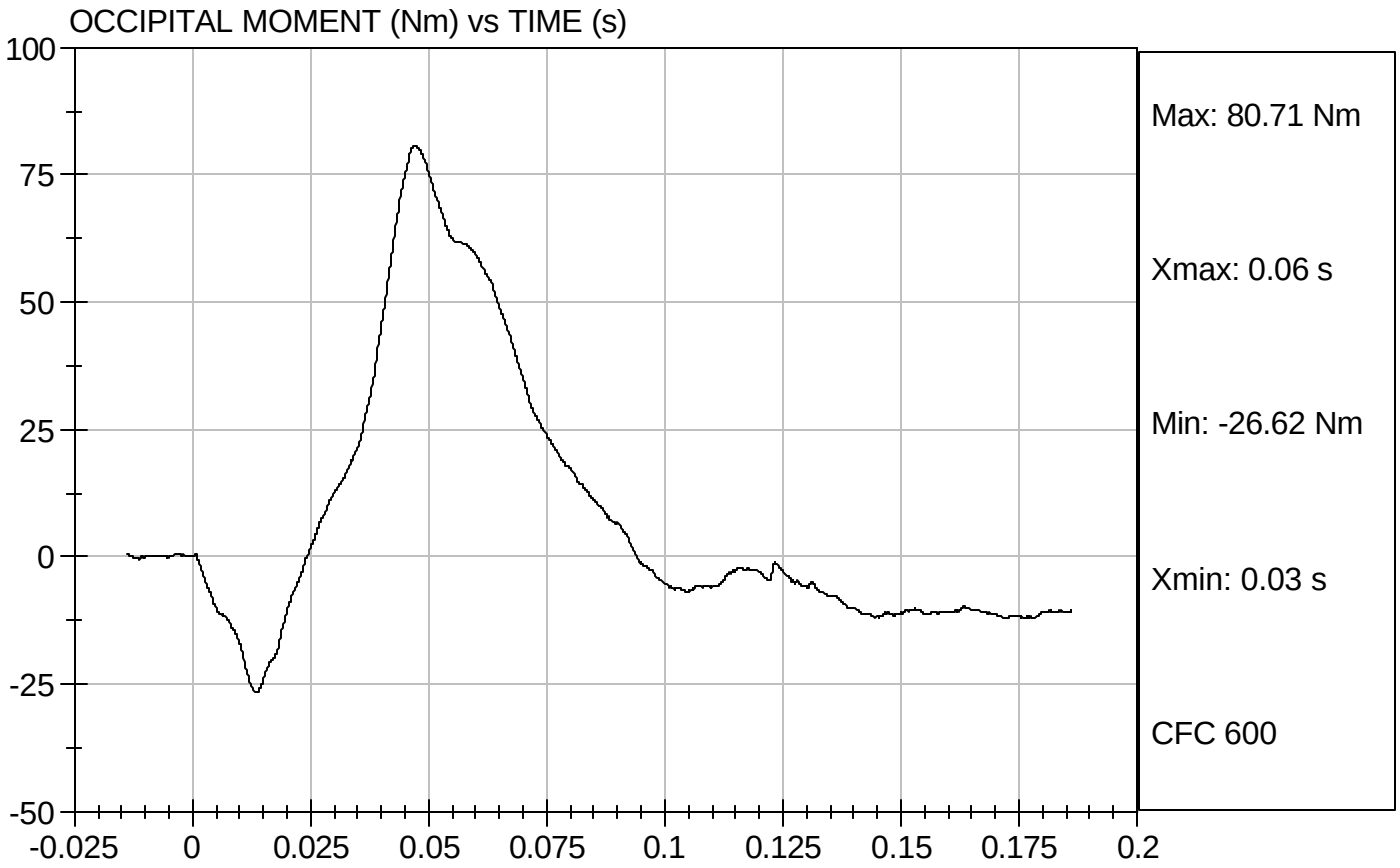


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D051232

Test Date: 05/06/2005
Speed: 23.37 ft/sec, 7.12 m/sec



DATA SHEET B5
NECK EXTENSION TEST (572.133)

Dummy Serial Number ____511_____ Test Date ___5/9/05_____

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 extension test. (572.137(q))
_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. (572.133(b))

_X_3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature __21.6___
Record the minimum temperature __21.3___
Record the maximum humidity __55%__
Record the minimum humidity __48%__

_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 81; Back 89.

_X_6, Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2)

_X_7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

_X_8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

_X_9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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 ≤ speed ≤ 6.19 m/s	6.04m/s
Pendulum ΔV with respect to impact speed	@ 10ms	1.5 m/s ≤ ΔV ≤ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s ≤ ΔV ≤ 3.9 m/s	3.6 m/s
	@30ms	4.6 m/s ≤ ΔV ≤ 5.6 m/s	4.9 m/s
Plane D Rotation		Peak moment* -65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99^o ≤ angle ≤ 114^o	_-60___Nm @ _109__degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms ≤ time ≤ 114 ms	100 ms

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii)

My = Moment in Nm measured by the transducer

Fx = Force, in N measured by the transducer

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

Jessica Hall _____ 5/9/05_____

Signature Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051233

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	55	Pass
Pendulum Speed		m/sec	5.95 to 6.19	6.04	Pass
Pendulum Deceleration	10 msec	m/sec	1.5 to 1.9	1.9	Pass
	20 msec	m/sec	3.1 to 3.9	3.6	Pass
	30 msec	m/sec	4.6 to 5.6	4.9	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-60	Pass
Negative Moment Time Curve Decay to -10 Nm		msec	94 to 114	100	Pass
			Overall Results		Pass

Jessica Hall

Laboratory Technician

05/09/2005

Test Date

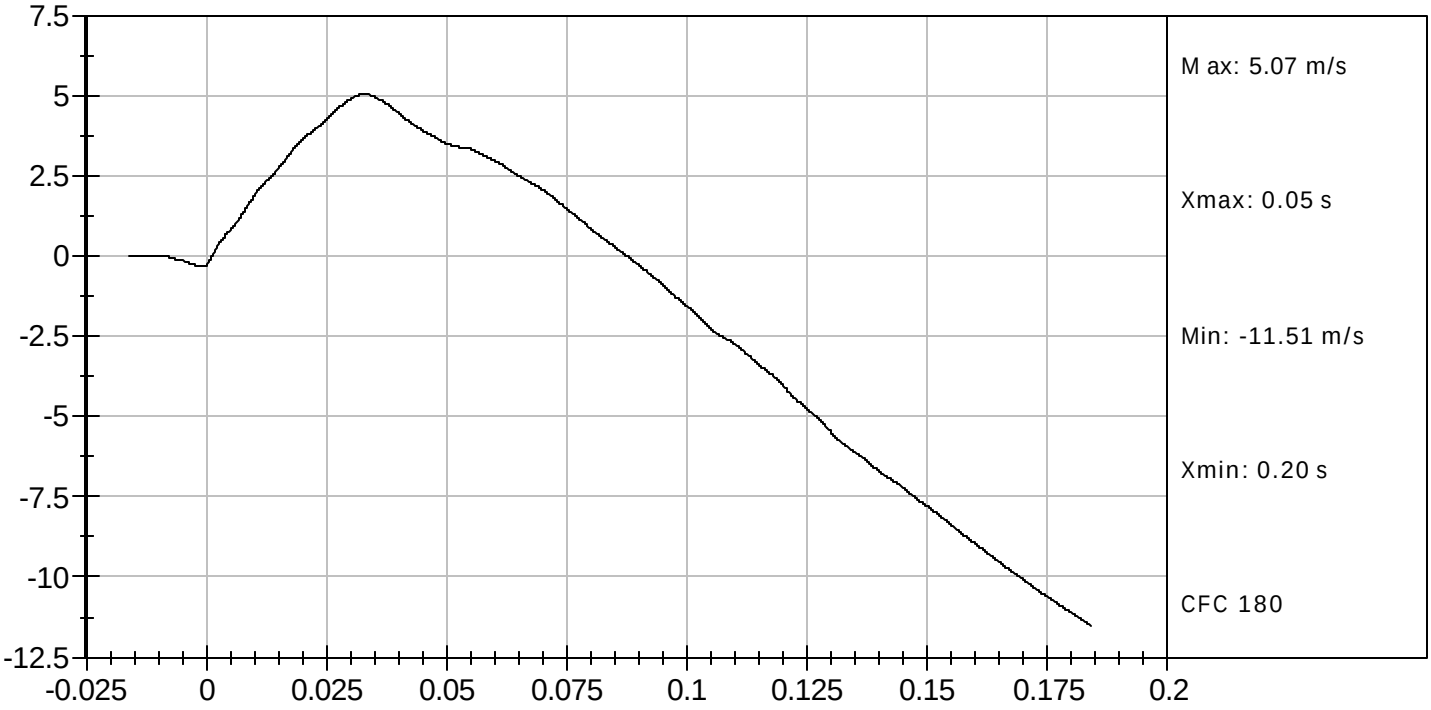
Jeff Leonardelli

Approved By

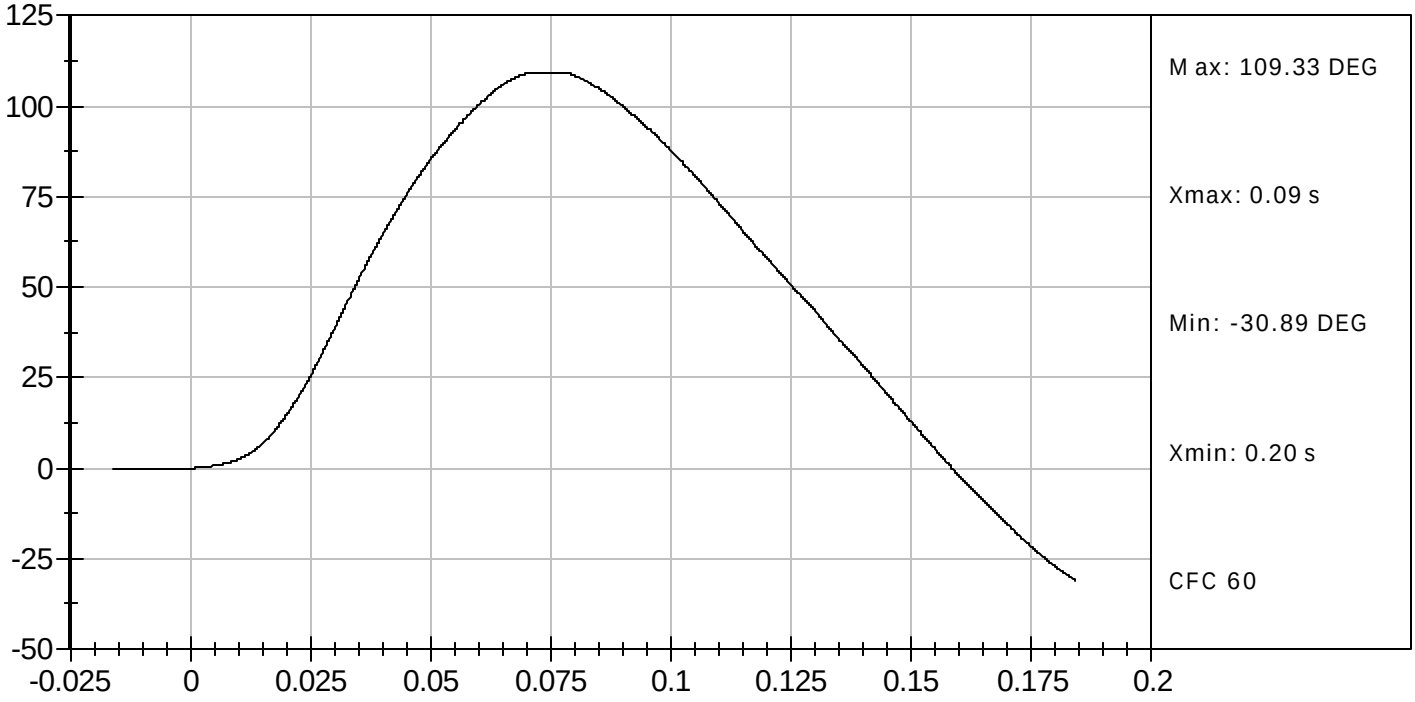
Test Desc: Neck Extension
Componet ID: D051233

Test Date: 05/09/2005
Velocity: 19.82 ft/s, 6.04 m/s

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

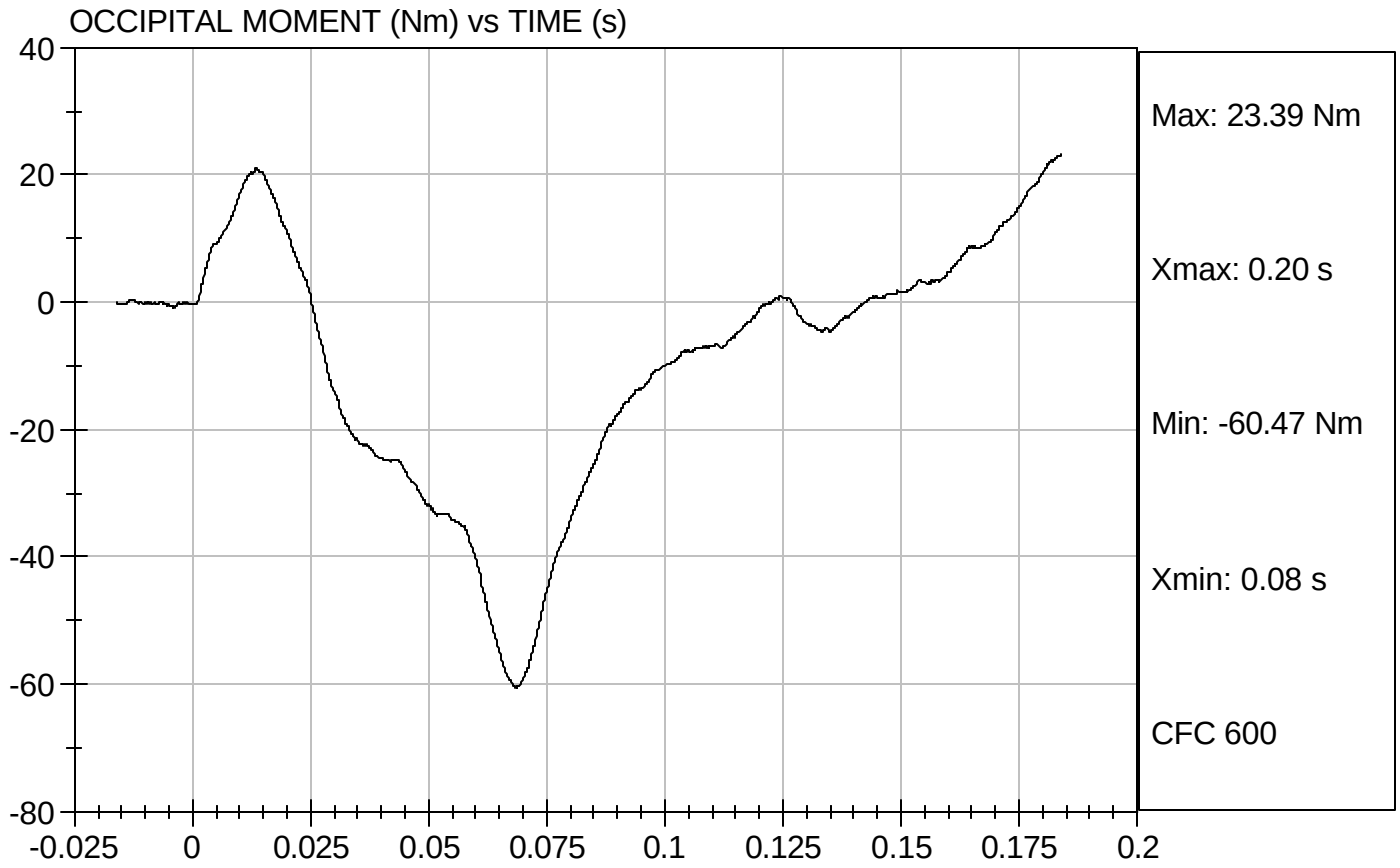


NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D051233

Test Date: 05/09/2005
Speed: 19.82 ft/sec, 6.04 m/sec



DATA SHEET B6
THORAX IMPACT TEST (572.134)

Dummy Serial Number __511_____ Test Date __5/9/05_____

Technician ____Jessica Gall_____

___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 (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))
Record the maximum temperature _21.6_
Record the minimum temperature _21.3_
Record the maximum humidity _55%_
Record the minimum humidity 48%___
_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 ± 0.5º and adjust the pelvis angle to 7º ± 2º. 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 ± 1º. (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 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º 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 ± 2º 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 2º 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 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

_X_16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	6.59 m/s ≤ speed ≤ 6.83 m/s	6.73 m/s
Chest Compression	50.0 mm ≤ compression ≤ 58.0 mm	55 mm
Peak force** between 50.0 and 58.0 mm chest compression	3900N ≤ peak force ≤ 4400N	4220 N
Peak force** between 18.0 and 50.0 mm chest compression	peak force ≤ 4600 N	4006 N
Internal Hysteresis***	69% ≤ hysteresis ≤ 85%	69%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.
**Force = impactor mass x acceleration (572.134(b)(3))

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

_X_17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

Jessica Hall
Signature

5/9/05
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051234

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	6.59 to 6.83	6.73	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	≤ 4600 N	4,006	Pass
		Overall Test Results		Pass

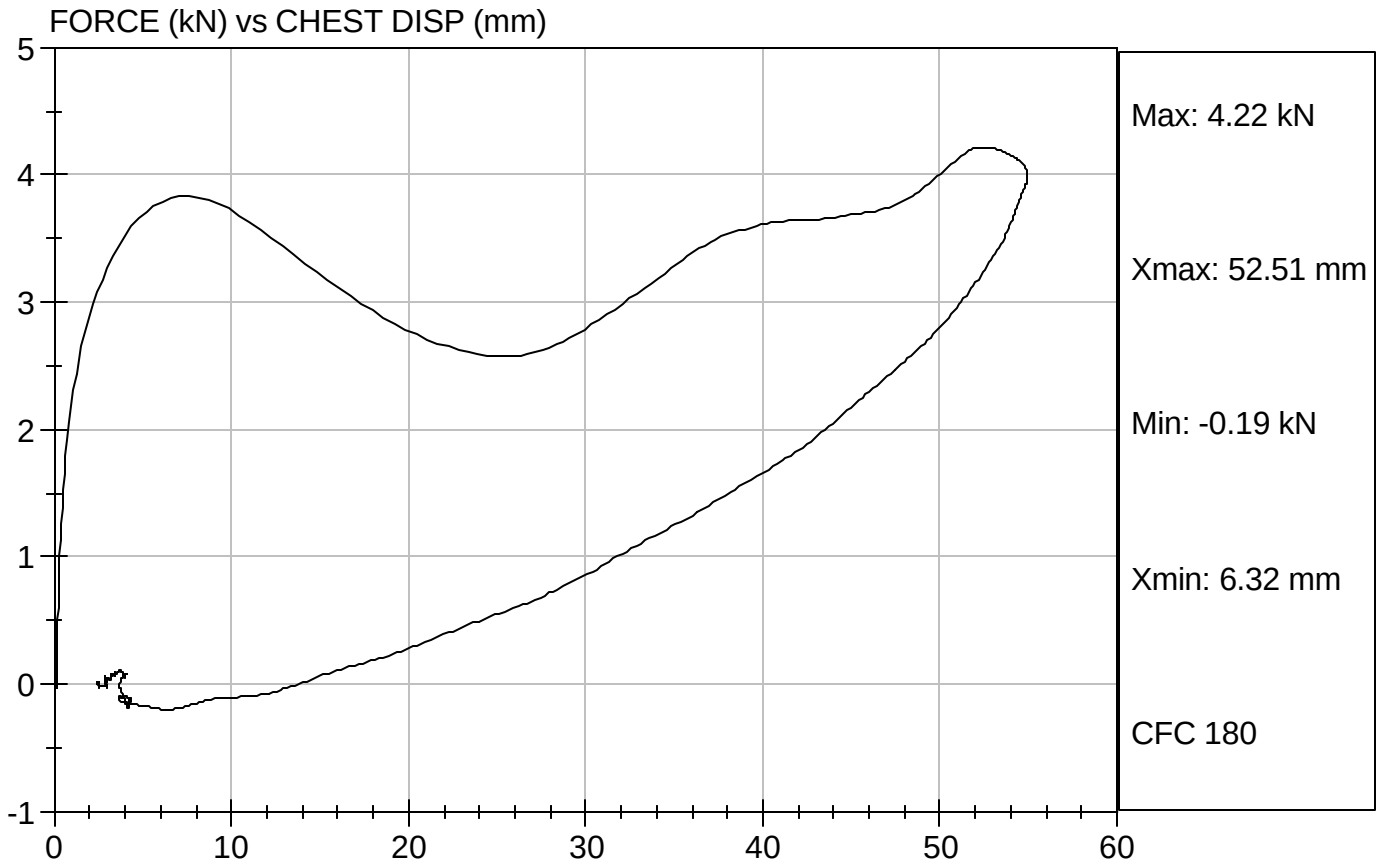
Jessica Hall
Laboratory Technician

05/09/2005
Test Date

Jeff Levandoski
Approved By

Test Desc: Thorax Impact
Component ID: D051234

Test Date: 05/09/2005
Speed: 22.07 ft/sec, 6.73 m/sec



DATA SHEET B7
TORSO FLEXION TEST (572.135)

Dummy Serial Number __511_____ Test Date __5/6/05_____

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. (572.137(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 (66ºF) and 25.6°C (78ºF) 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 __20.9__
Record the maximum humidity __37%__
Record the minimum humidity __26%__
_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°)___17°___
_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° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
_X_14. Maintain angle reference plane at 45° ± 0.5° 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 ≤ 20°	17°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	1.0
Force at 45° ±0.5°	320 N ≤ force ≤ 390 N	378 N
Final ref. plane angle	Initial ref. plane angle ±8°	21°

Signature

5/6/05
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051237

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	21	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

05/06/2005
Test Date

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136)

Dummy Serial Number __511_____ Test Date __5/6/05_____

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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _22.0__
Record the minimum temperature _20.9__
Record the maximum humidity _37%__
Record the minimum humidity _26%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.13 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3570 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 _____ 5/6/05_____

Signature Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051236

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	27	Pass
Probe Speed	m/sec	2.07 to 2.13	2.13	Pass
Maximum Force	kN	3.45 to 4.06	3.57	Pass
		Overall Test Results		Pass

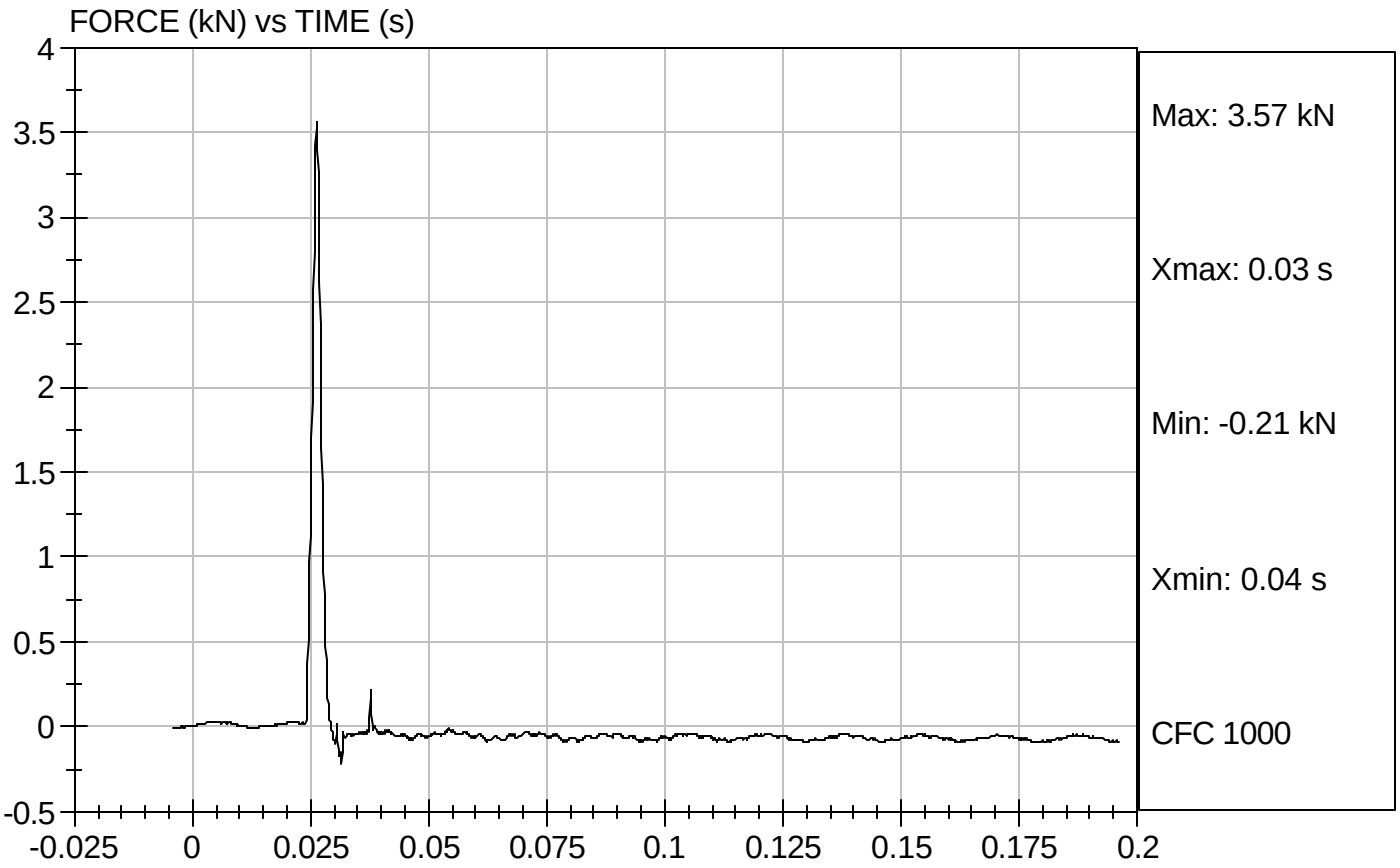
Jessica Hall
Laboratory Technician

05/06/2005
Test Date

Jeff Leonardski
Approved By

Test Desc: Left Knee
Component ID: D051236

Test Date: 05/06/2005
Speed: 6.98 ft/sec, 2.13 m/sec



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136)

Dummy Serial Number ___511_____ Test Date __5/6/05_____

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 (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
Record the maximum temperature _22.0__
Record the minimum temperature _20.9__
Record the maximum humidity _37%__
Record the minimum humidity _26%__
_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 m/s ≤ speed ≤ 2.13 m/s	2.11 m/s
Peak resistance force*	3450 N ≤ force ≤ 4060 N	3540 N

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

_X_12. Plots of acceleration versus time and force versus time follow this sheet.

Jessica Hall 5/6/05

Signature Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 511 **Test I.D:** D051235

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	27	Pass
Probe Speed	m/sec	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.54	Pass
		Overall Test Results		Pass

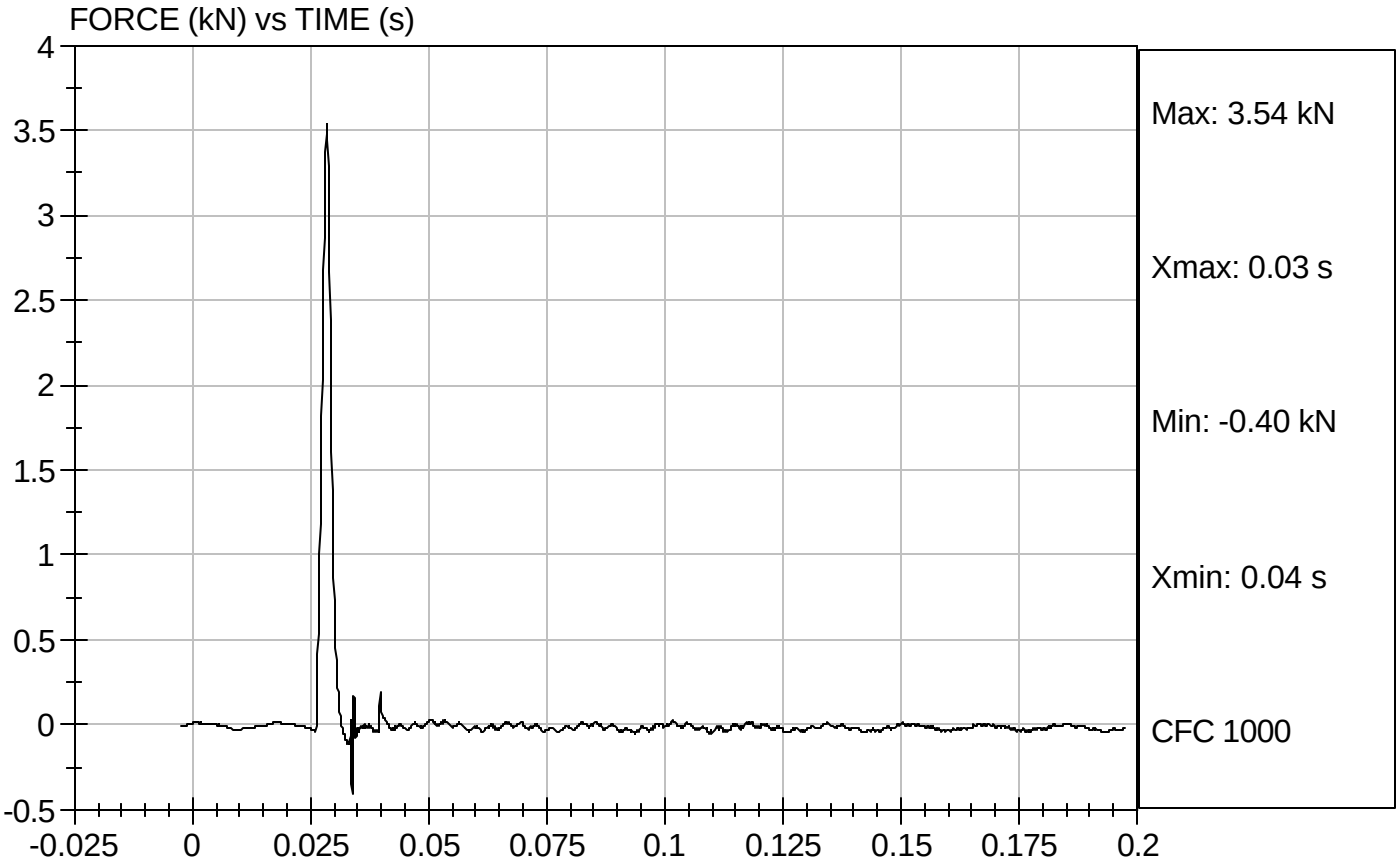
Jessica Gall
Laboratory Technician

05/06/2005
Test Date

Jeff Leonardski
Approved By

Test Desc: Right Knee
Component ID: D051235

Test Date: 05/06/2005
Speed: 6.92 ft/sec, 2.11 m/sec



EXTERNAL DIMENSIONS

HYBRID III 5th SN #511, 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	782.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.8
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	75.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.9
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	250.5
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.2
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	282.7
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	540.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	358.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	406.3
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	414.0-439.4	434.4

HYBRID III 5th SN #511, 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	186.4
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	222.3
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	476.3
S	HEAD BREADTH	The widest part of the head	137.1-147.3	142.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	299.9
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.2
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	83.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	539.4
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	851.9
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	762.4
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 __511_____ Test Date __5/5/05____

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 Gall _____ 5/5/05_____
Signature Date

Describe the repair or replacement of parts:

Checked by

Jeff Leonardi _____ 5/5/05_____
Signature Date