

REPORT NO. 208-MGA-2015-DC013

**DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208**

**BAYERISCHE MOTOREN WERKE AG
2015 BMW MINI COOPER PASSENGER CAR
NHTSA NO.: C20154103**

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



TEST DATES: JANUARY 14, 2016 – FEBRUARY 22, 2016

FINAL REPORT DATE: MAY 16, 2016

FINAL REPORT

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

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EXTERNAL DIMENSIONS

HYBRID III 5 th SN #125, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	448.6
C	H-POINT HEIGHT	Reference	81.3-86.3	86.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.7
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
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	248.3
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	43.4
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	285.4
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	192.9
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	542.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	356.8
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	394.2
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	428.5

HYBRID III 5 th SN #125, PART 572, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	185.2
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	219.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	471.8
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.2
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	182.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	301.6
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.0
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	93.9
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	547.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	852.6
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	789.1
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: Andy Warczytowa

- X Pre test calibration
 Post test calibration verification

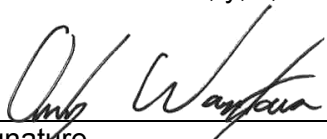
Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>19%</u> |
- 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: 501 mm
Record the left side distance: 501 mm
- 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: 50.9 micro inches
- X 13. The impact surface is rigidly supported. (572.132(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	279 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	5.9 g

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


Signature

02/15/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test ID: D16651

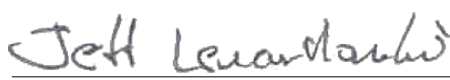
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	250 to 300	279	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



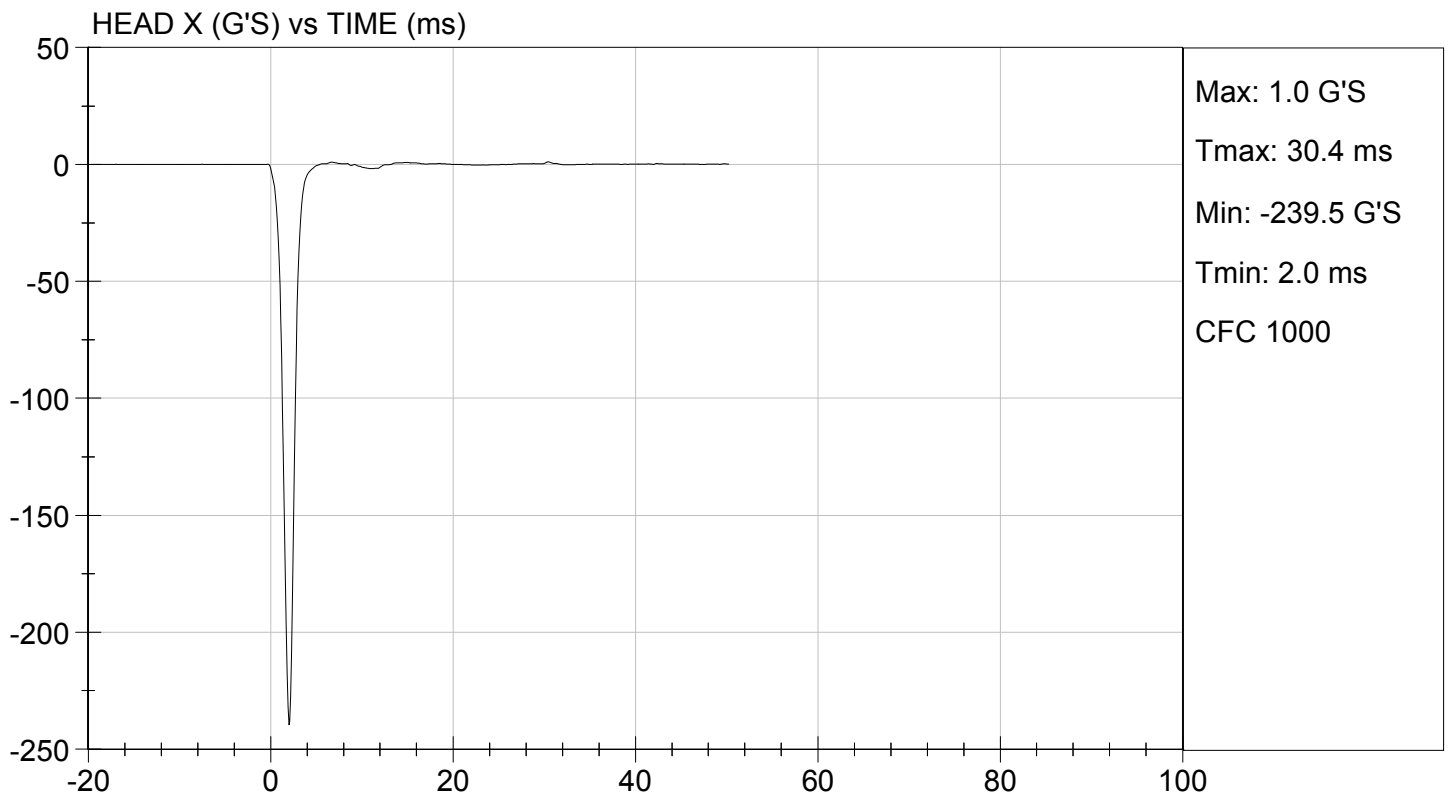
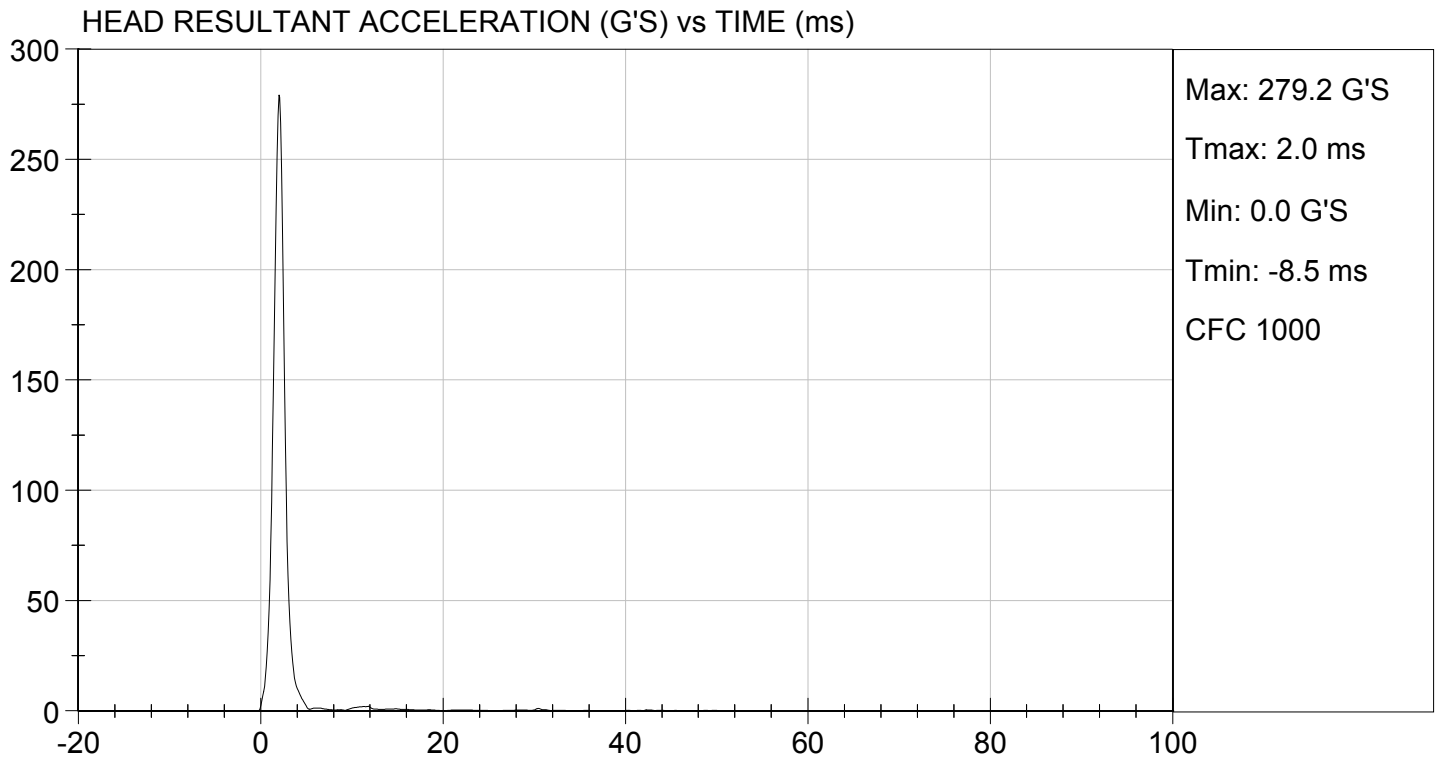
Laboratory Technician

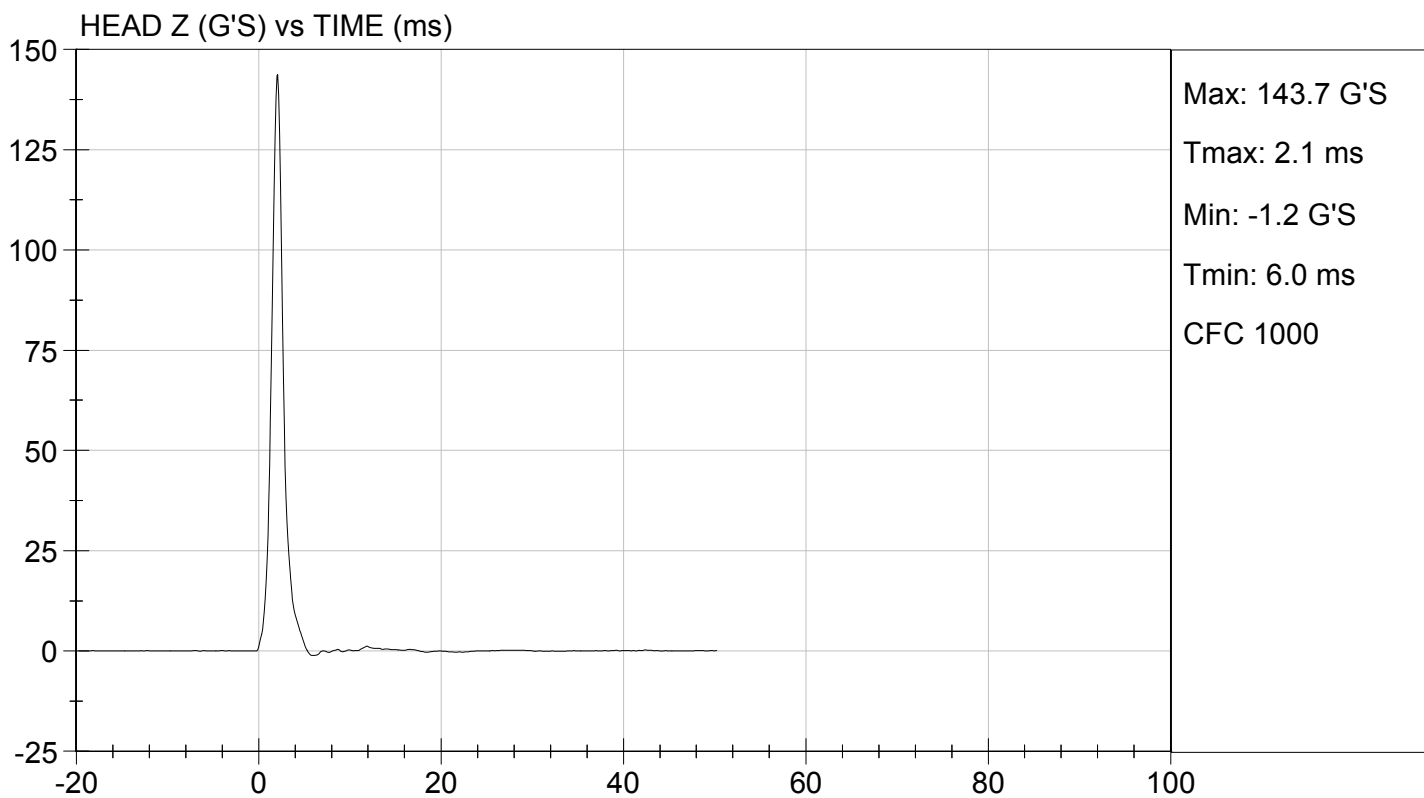
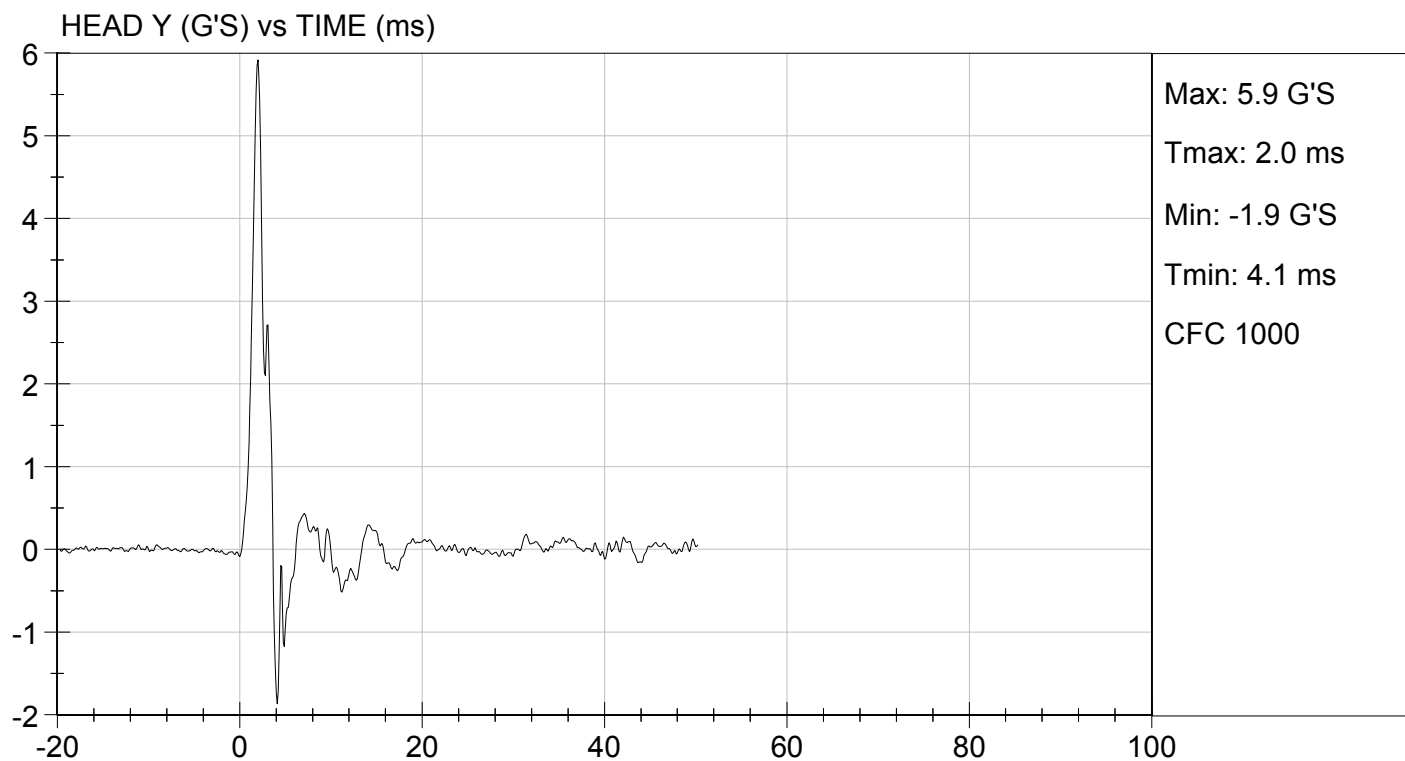
02/15/2016

Test Date



Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: David Schoedel

X Pre test calibration
 Post test calibration verification

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

X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck 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:	<u>21.1°C</u>
Record the minimum temperature:	<u>20.9°C</u>
Record the maximum humidity:	<u>22%</u>
Record the minimum humidity:	<u>19%</u>

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

Record findings and actions: No damage

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

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

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

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.4 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.1 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	70 Nm @ 78 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	91 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel

Signature

02/15/2016

Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

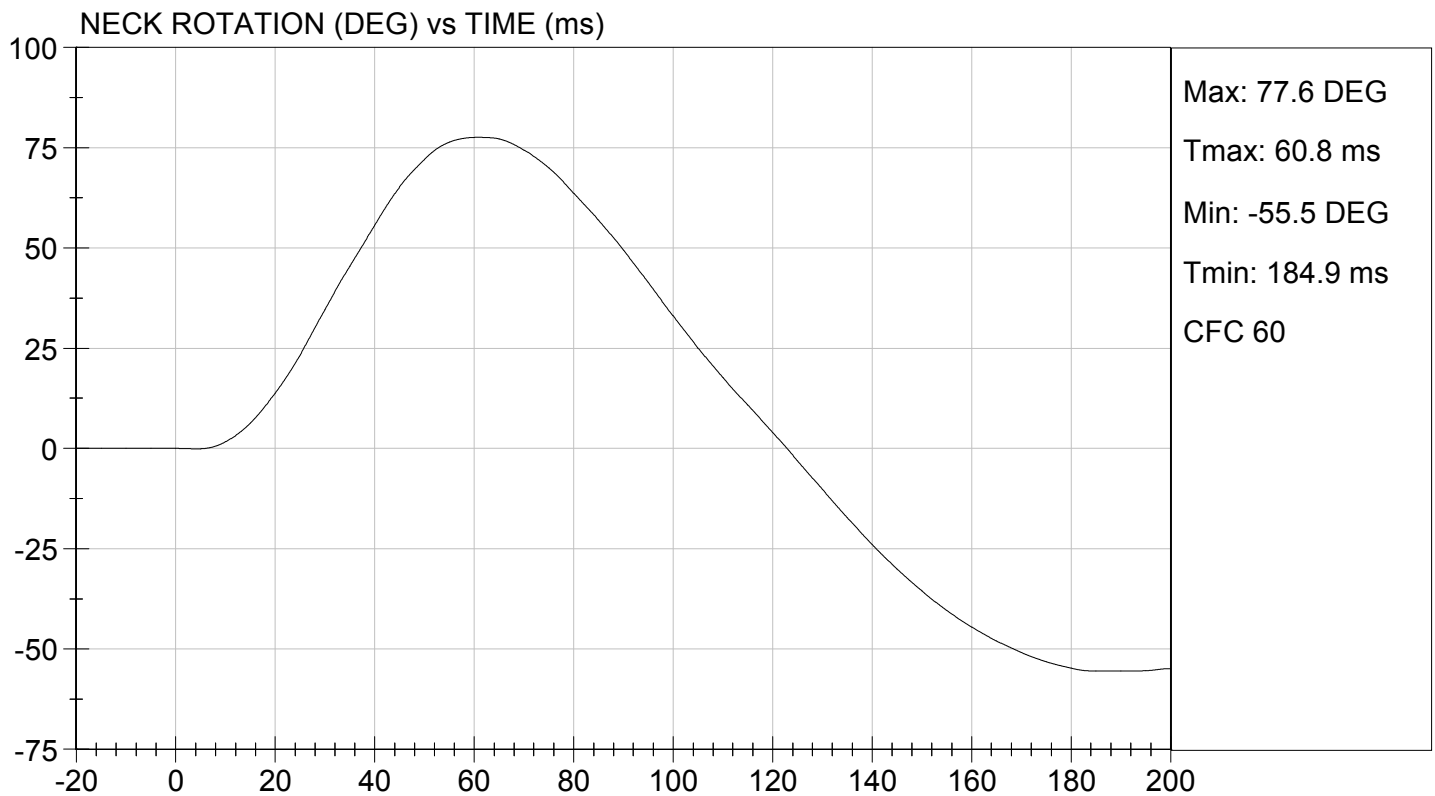
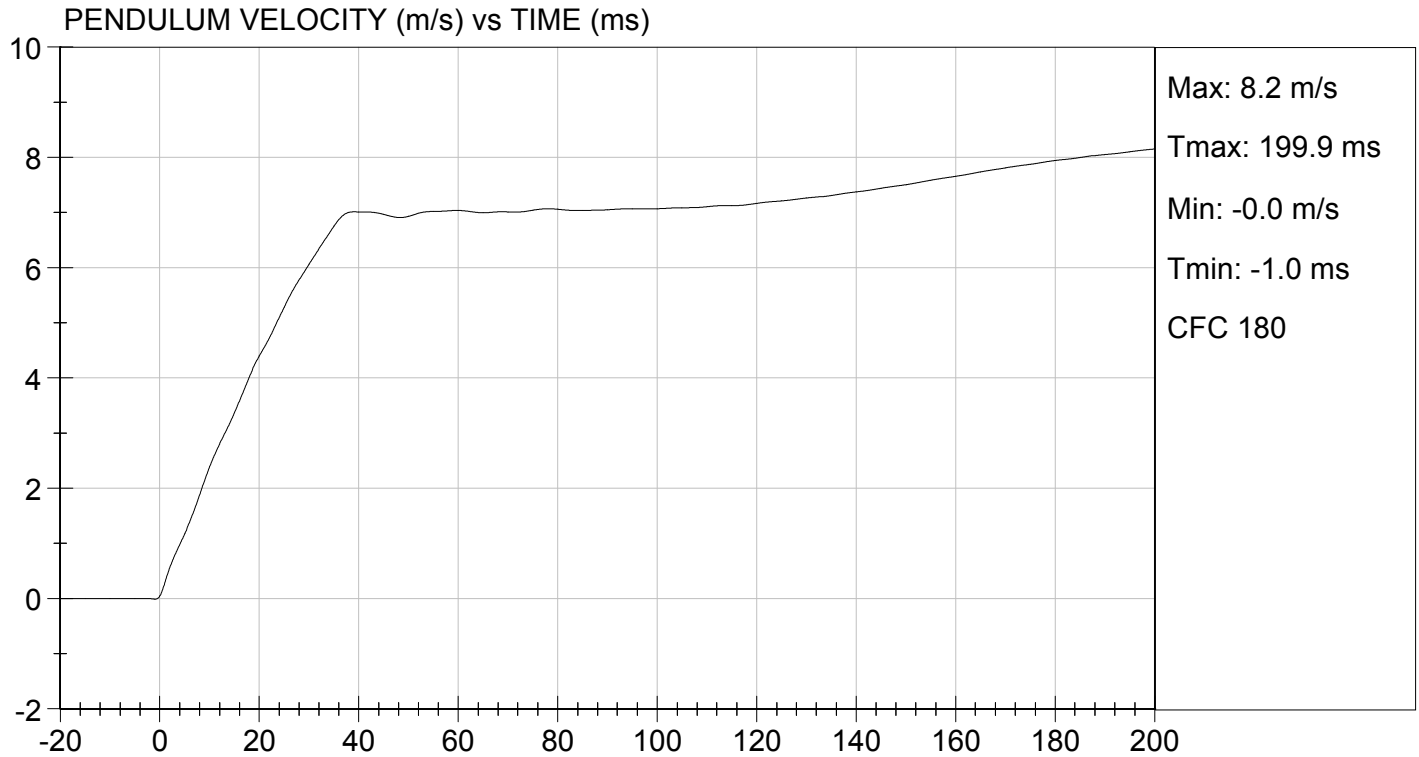
Test I.D: D16652

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	19	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	91	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

02/15/2016
Test Date

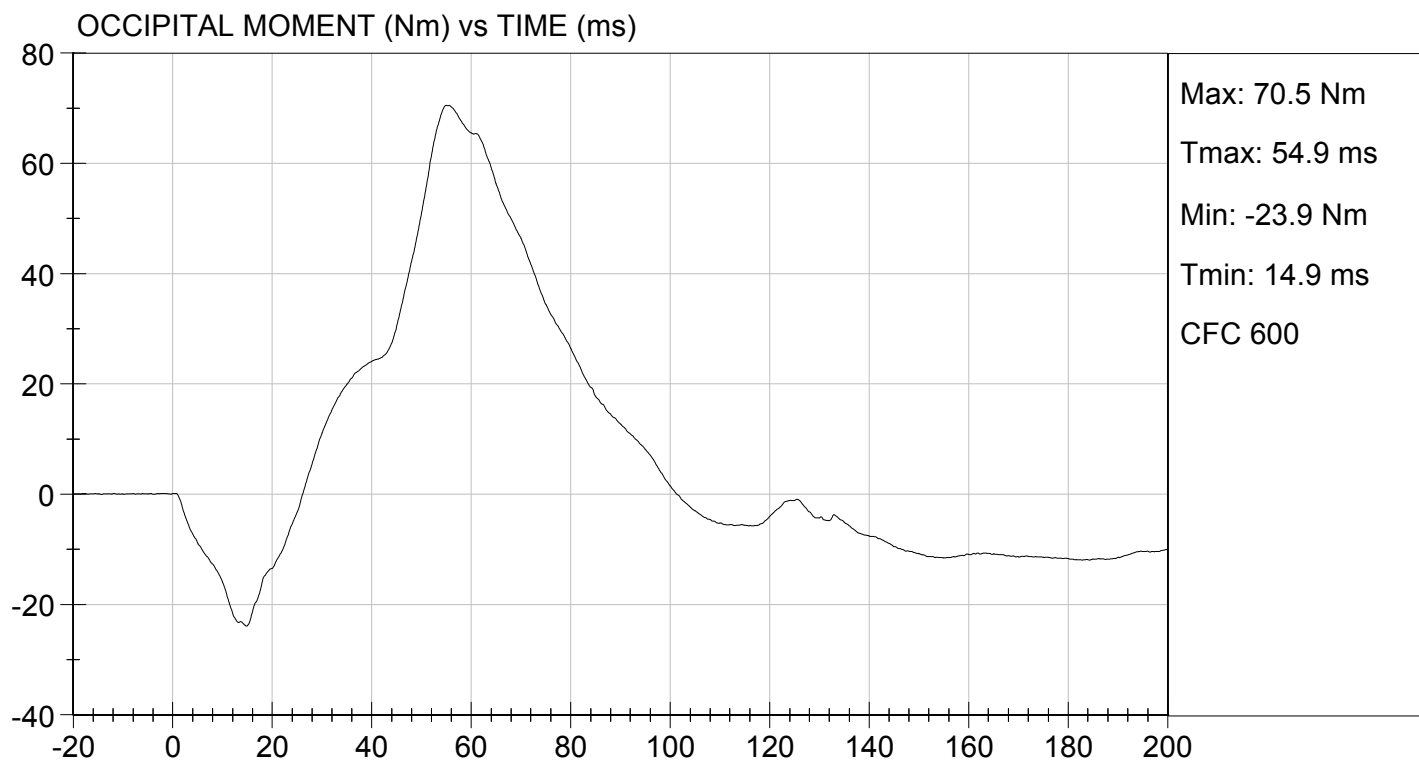
Jeff Leonard
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/15/2016
TEST #: D16652



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>19%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- 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	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.8 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.7 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.4 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-54 Nm @ 108 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	104 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

02/15/2016
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16653

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	19	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass

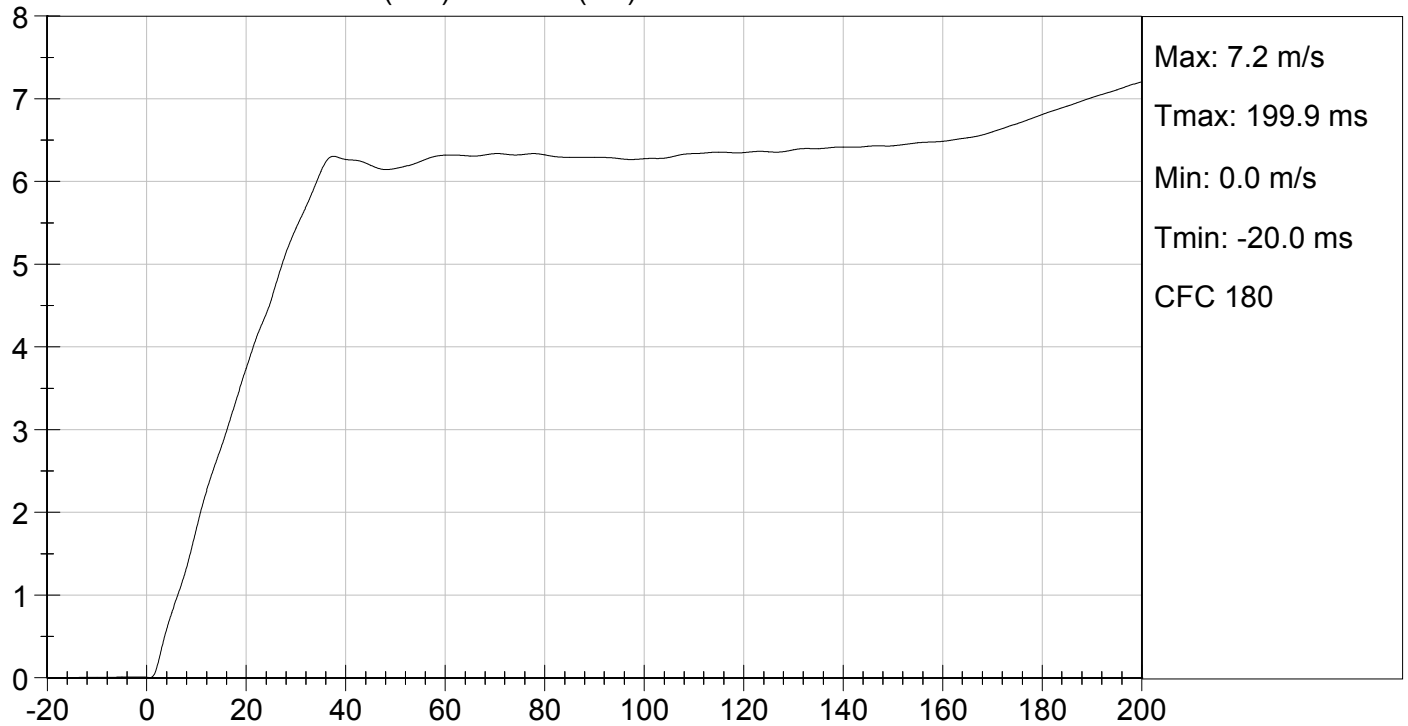
David Schoedel
Laboratory Technician

02/15/2016
Test Date

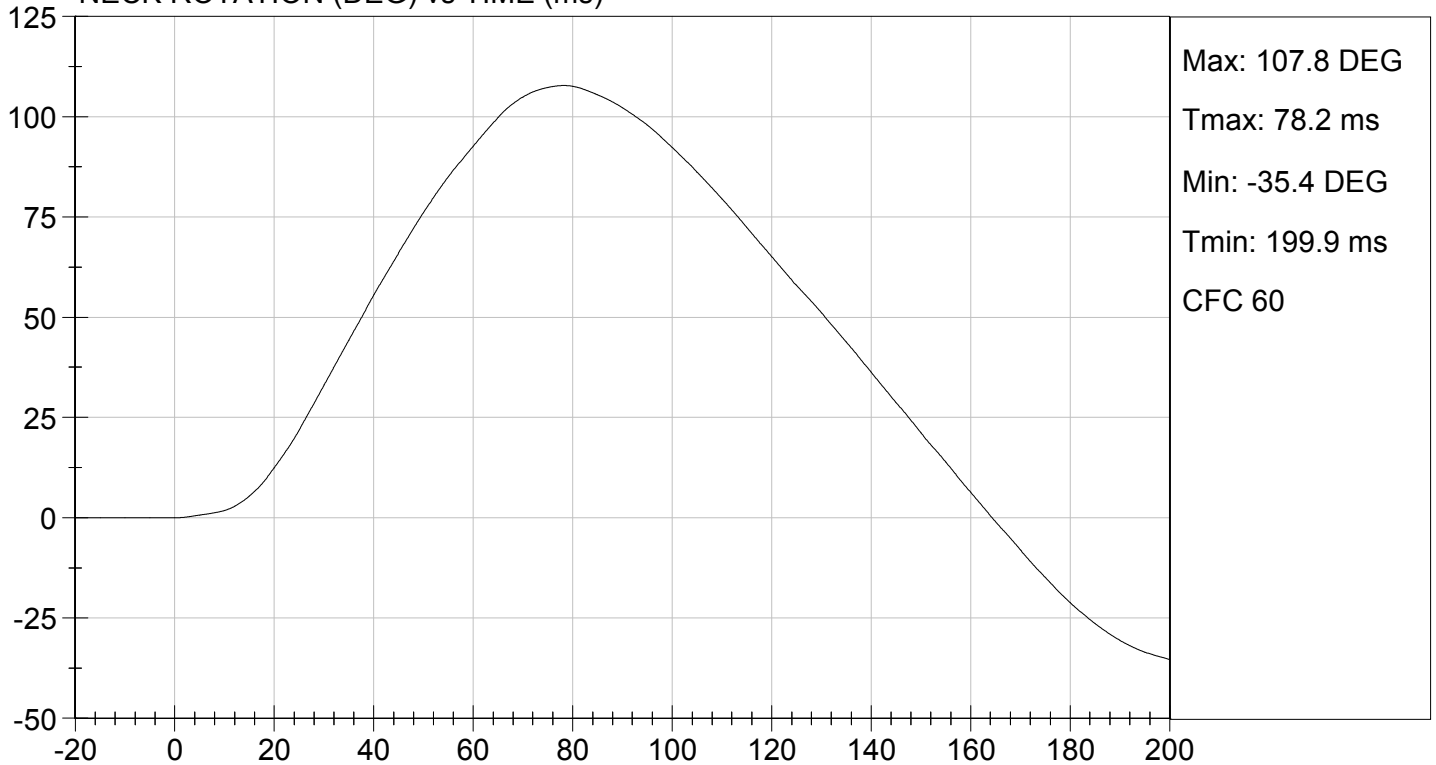
Jeff Leonard
Approved By



PENDULUM VELOCITY (m/s) vs TIME (ms)



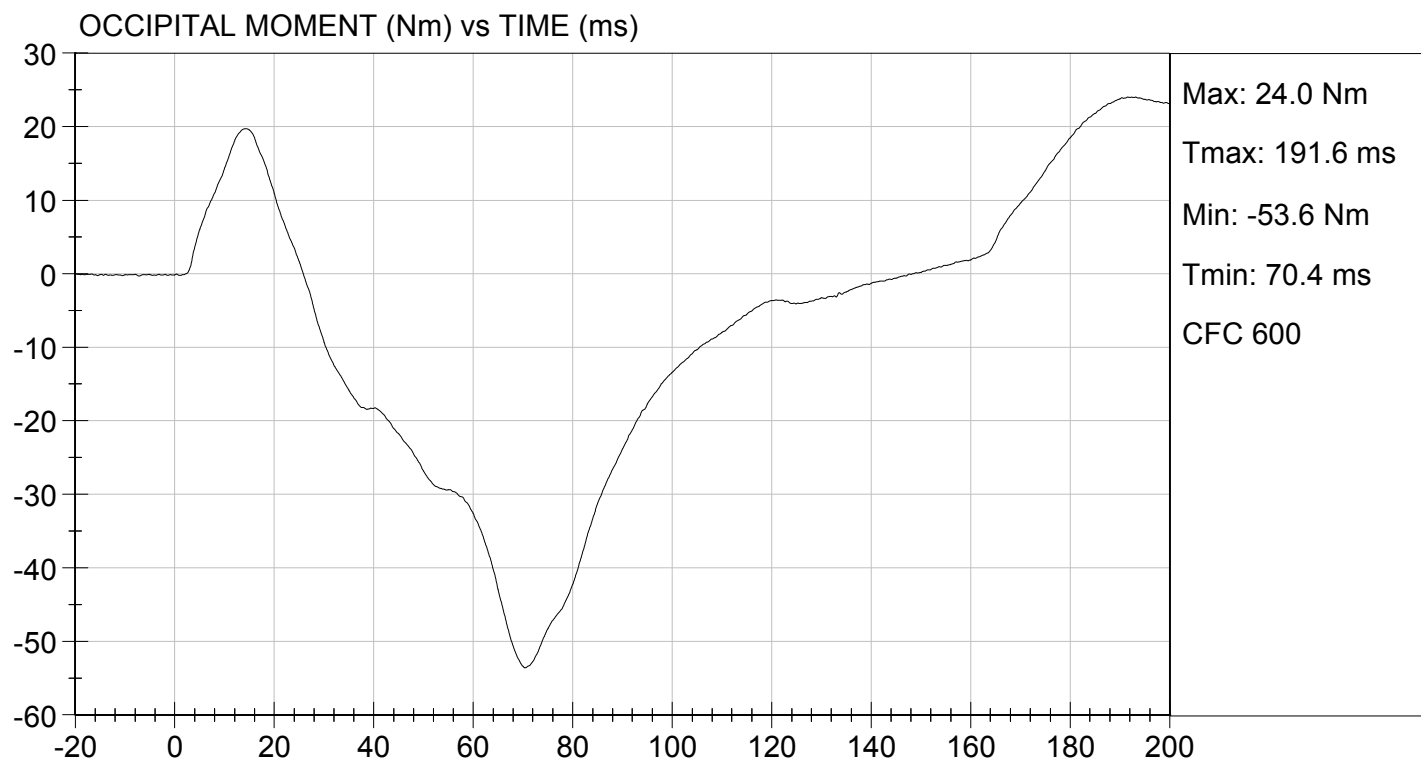
NECK ROTATION (DEG) vs TIME (ms)





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/15/2016
TEST #: D16653



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: Andy Warczytowa

X Pre test calibration

 Post test calibration verification

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

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

X N/A, ONLY one thorax impact test performed

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

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

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

Record the maximum temperature: 21.1°C

Record the minimum temperature: 20.9°C

Record the maximum humidity: 22%

Record the minimum humidity: 19%

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

X - No Damage

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

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

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

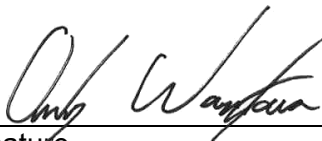
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	54 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4313 N
Peak Force** between 18.0 and 50.0 mm chest compression	$\text{Peak Force} \leq 4600 \text{ N}$	4315 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

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

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

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



Signature

02/15/2016

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16654

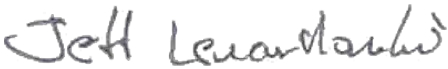
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4313	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4315	Pass
Overall Test Results				Pass



Laboratory Technician

02/15/2016

Test Date

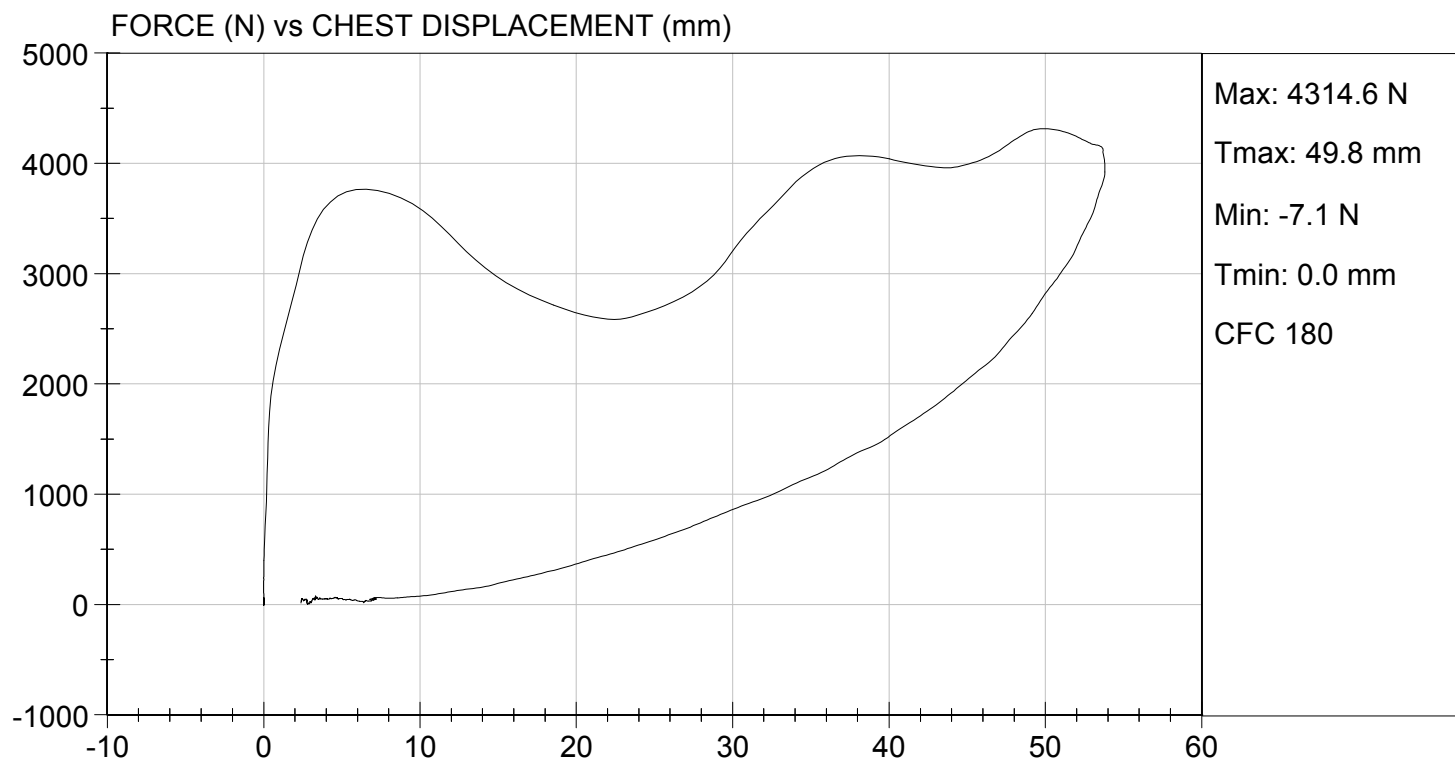


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/15/2016
TEST #: D16654



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: Andy Warczytowa

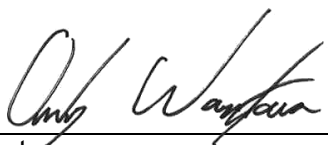
X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion 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 femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>19%</u> |
- 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°): See Result Table
- 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°	19 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	357 N
Final ref. plane angle	Initial ref. plane angle ± 8°	22 deg



 Signature

02/15/2016

 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16657

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	22	Pass
Force at 45 deg	N	320 to 390	357	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

02/15/2016

Test Date


Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: David Schoedel

X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>19%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3664 N

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

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

David Schoedel

Signature

02/15/2016

Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 125

Test I.D: D16656

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3664	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

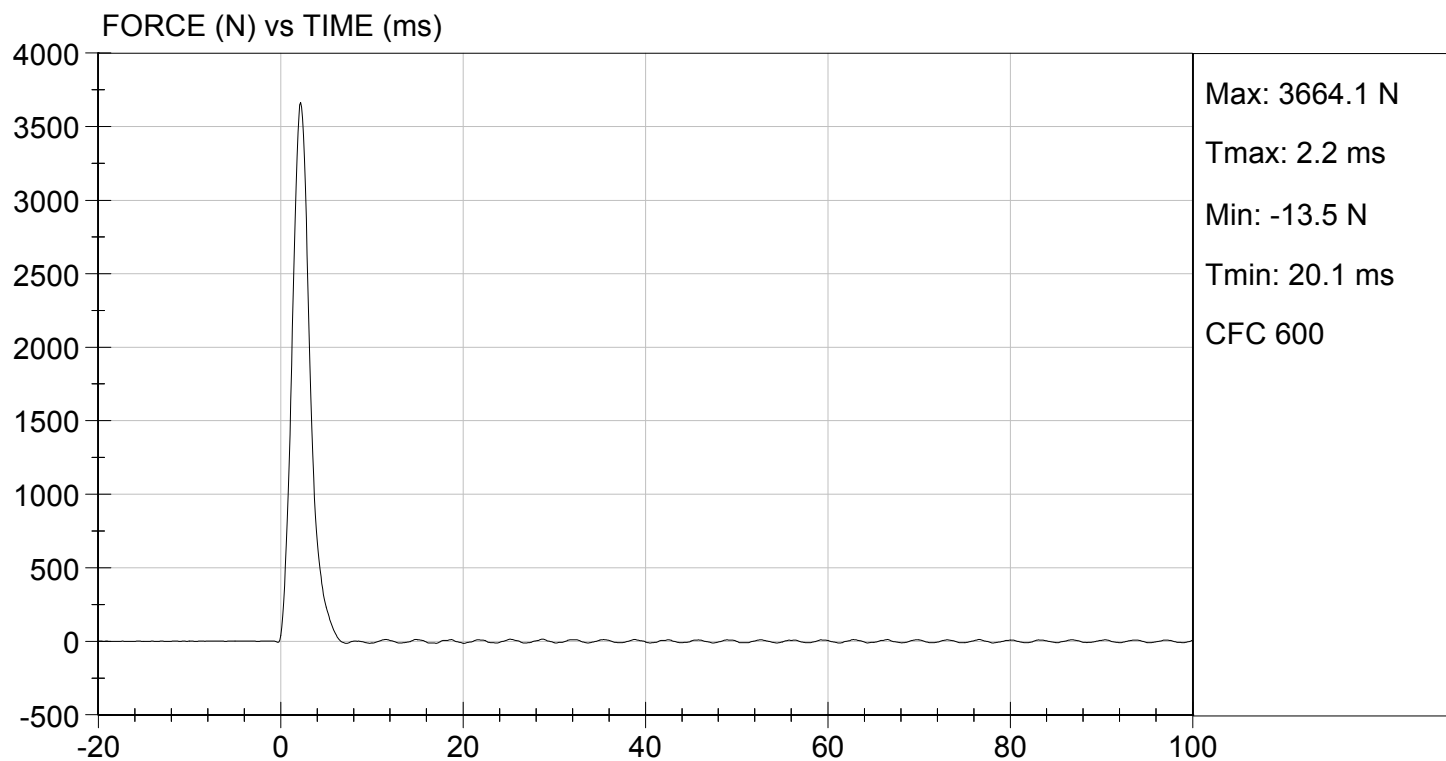
02/15/2016
Test Date

Jeff Leonard
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 02/15/2016
TEST #: D16656



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/15/2016

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.1°C</u>
Record the minimum temperature:	<u>20.9°C</u>
Record the maximum humidity:	<u>22%</u>
Record the minimum humidity:	<u>19%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3544 N

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

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

David Schoedel

Signature

02/15/2016

Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16655

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	3544	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/15/2016

Test Date

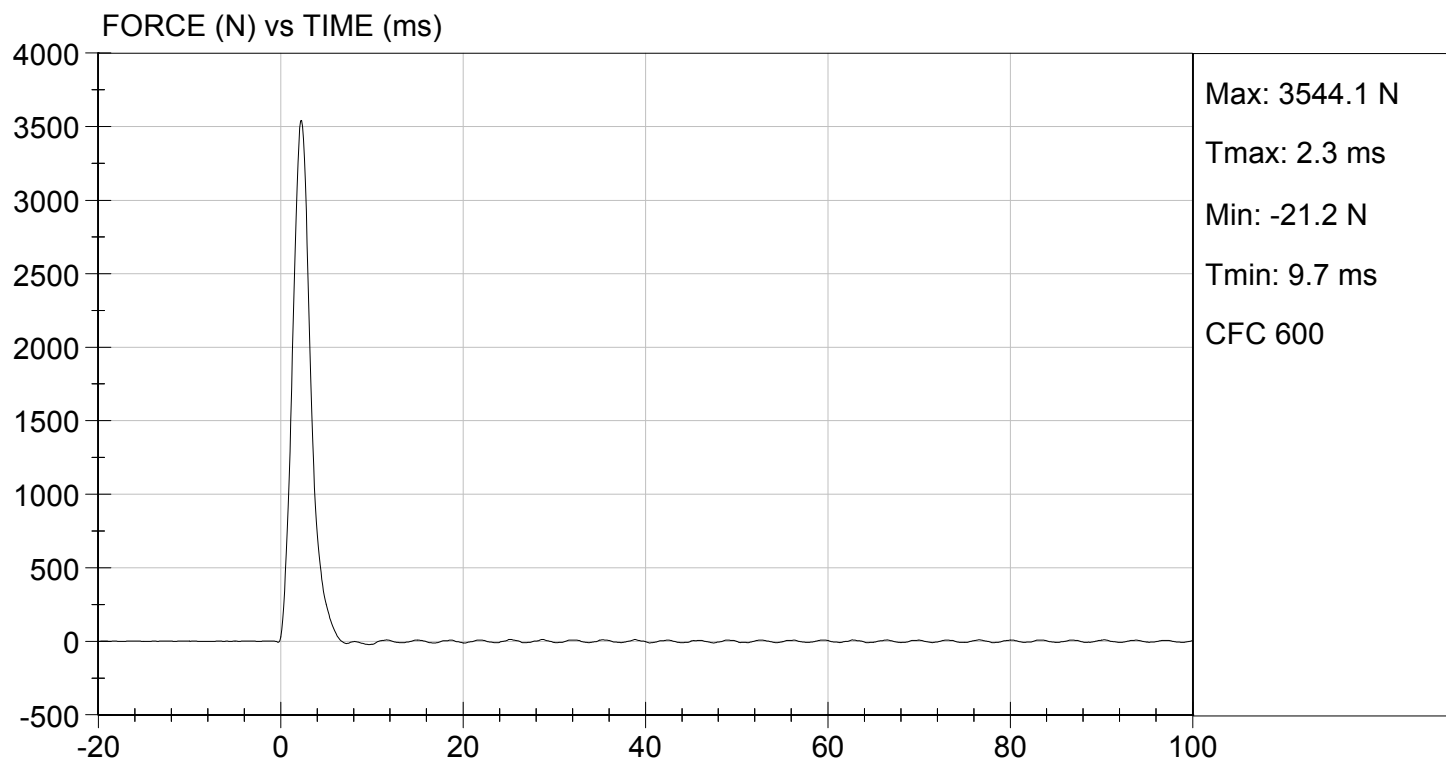
Jeff Leonard

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.89 ft/s, 2.10 m/s

TEST DATE: 02/15/2016
TEST #: D16655



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82075	09/04/2015	03/04/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82076	09/04/2015	03/04/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82077	09/04/2015	03/04/2016
NECK TRANSDUCER	Denton	1716	1206	01/12/2016	07/12/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P84464	09/04/2015	03/04/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P84466	09/04/2015	03/04/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P84467	09/04/2015	03/04/2016
CHEST POTENTIOMETER	Servo	14CBI-2897	125	09/08/2015	03/08/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121	6673	02/16/2016	08/16/2016
(2) LEFT FEMUR	Denton	2121	6674	02/16/2016	08/16/2016
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2015
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2015
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	23	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.9°C</u> |
| Record the minimum temperature: | <u>21.7°C</u> |
| Record the maximum humidity: | <u>26%</u> |
| Record the minimum humidity: | <u>24%</u> |
- 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: 501 mm

Record the left side distance: 501 mm

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: 50.9 micro inches

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

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

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	276 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	3.3 g

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

David Schoedel
Signature

02/22/2015
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test ID: D16751

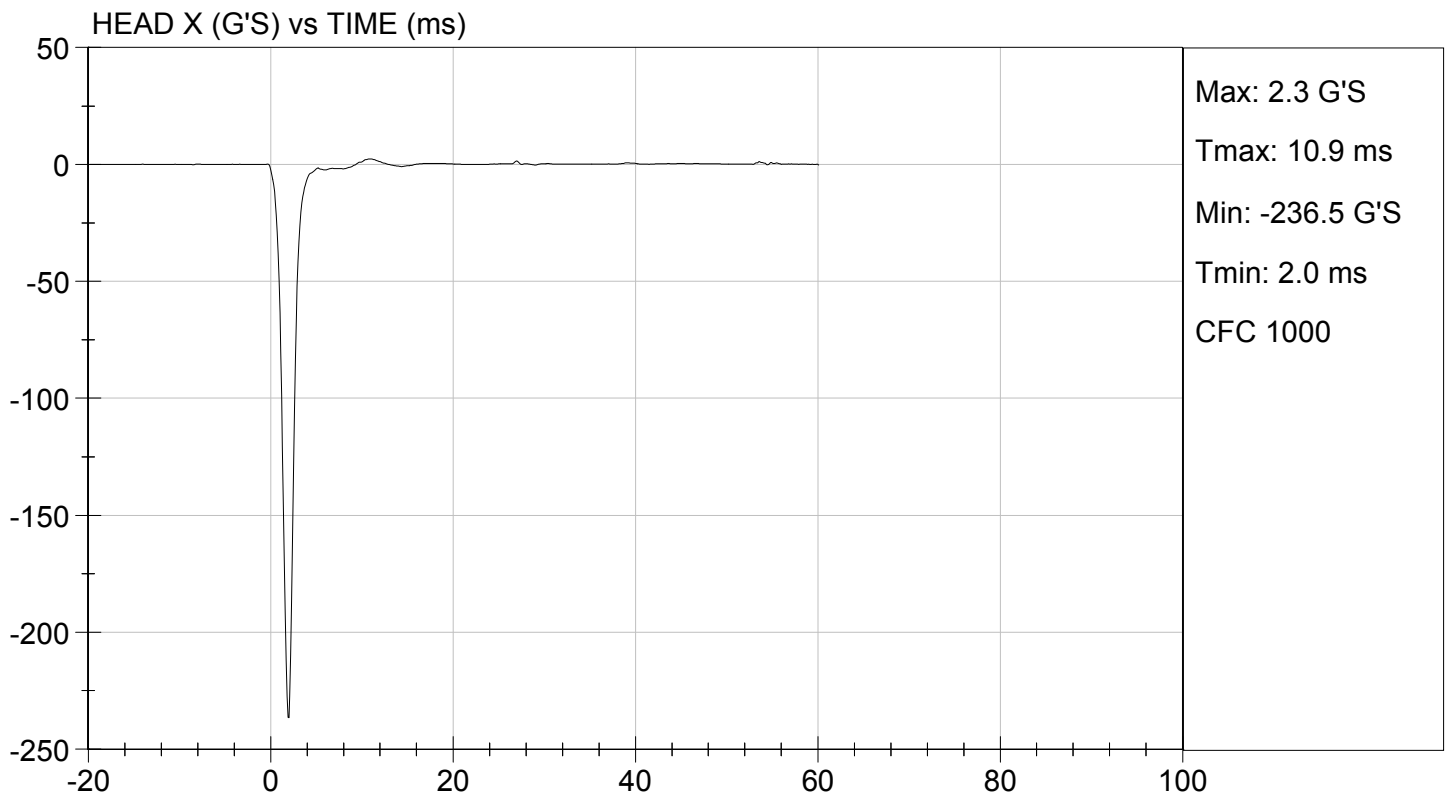
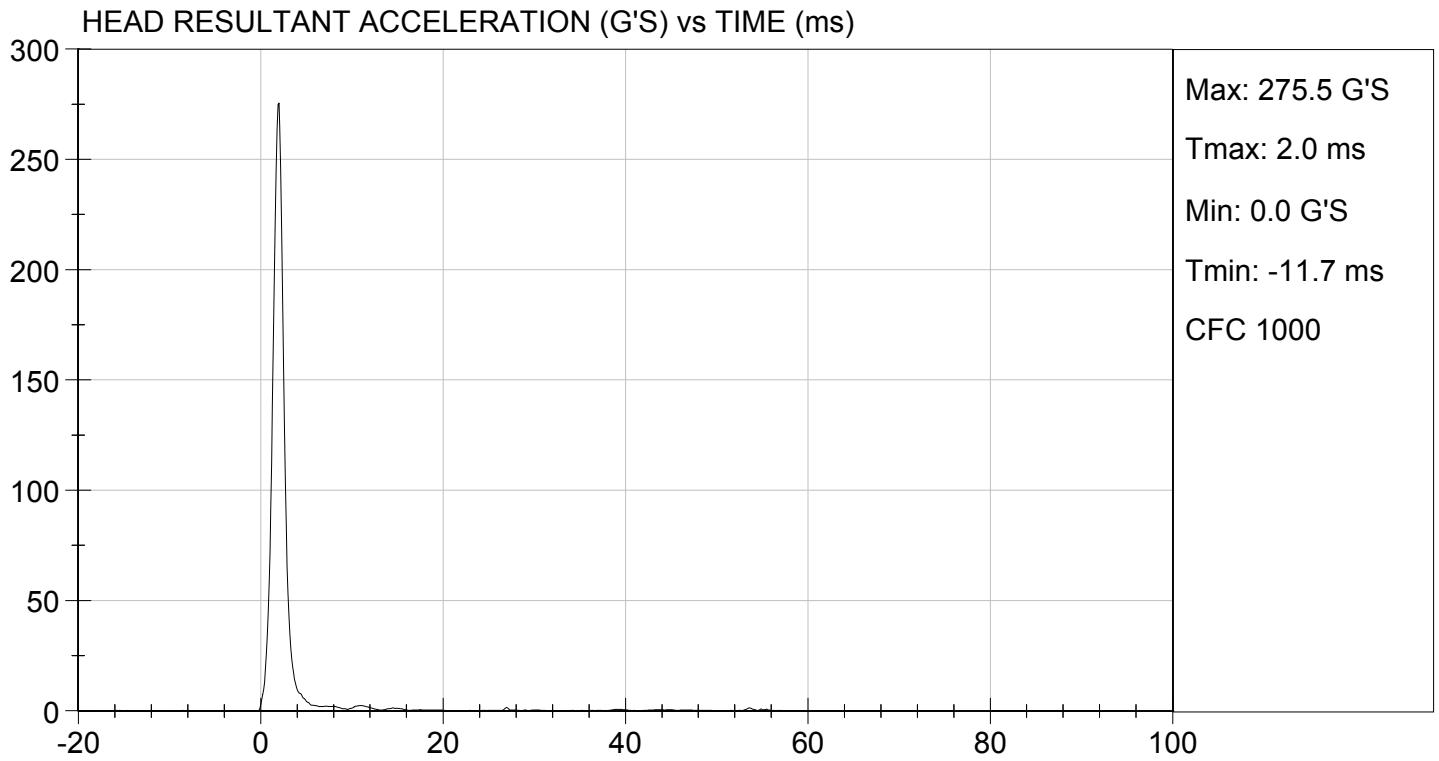
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	250 to 300	276	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

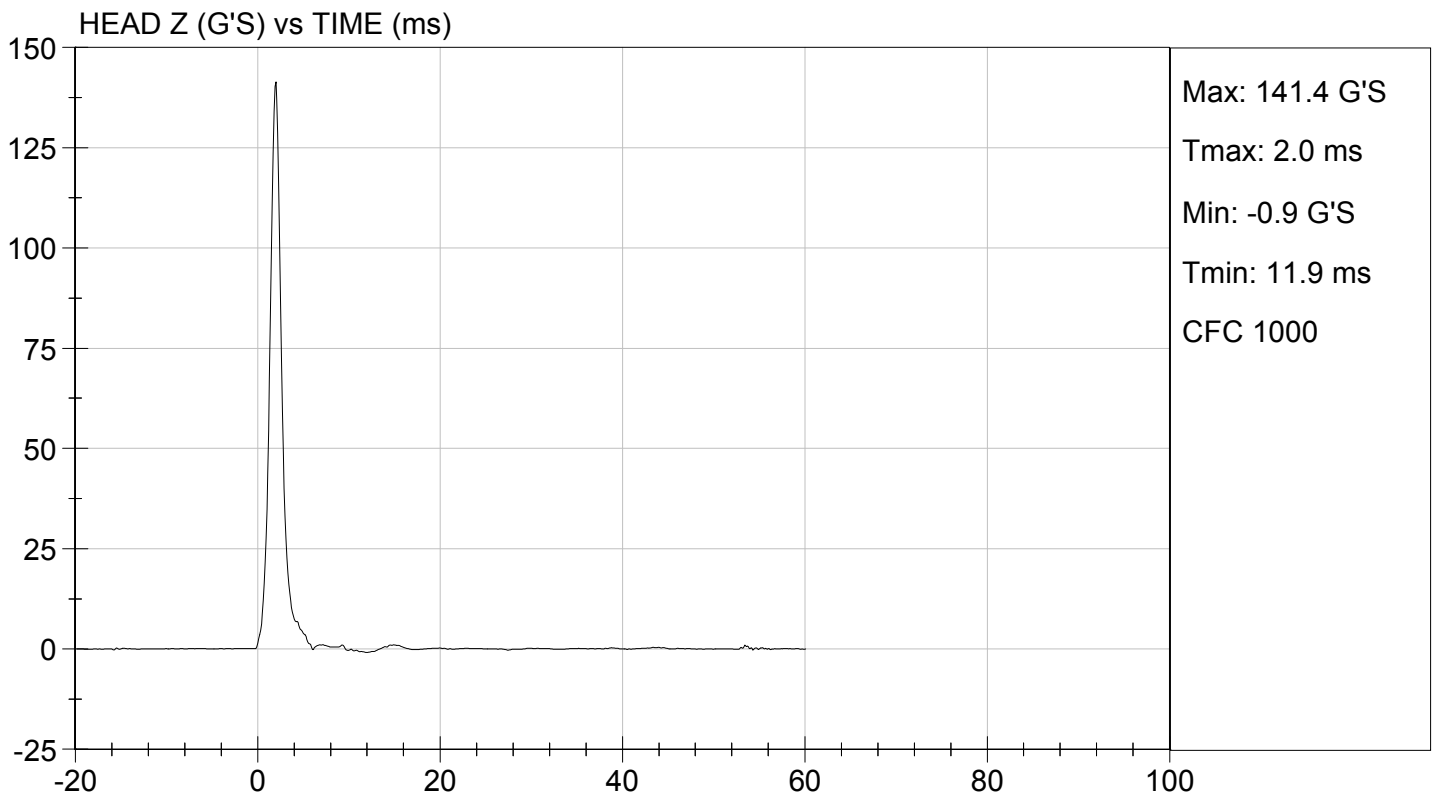
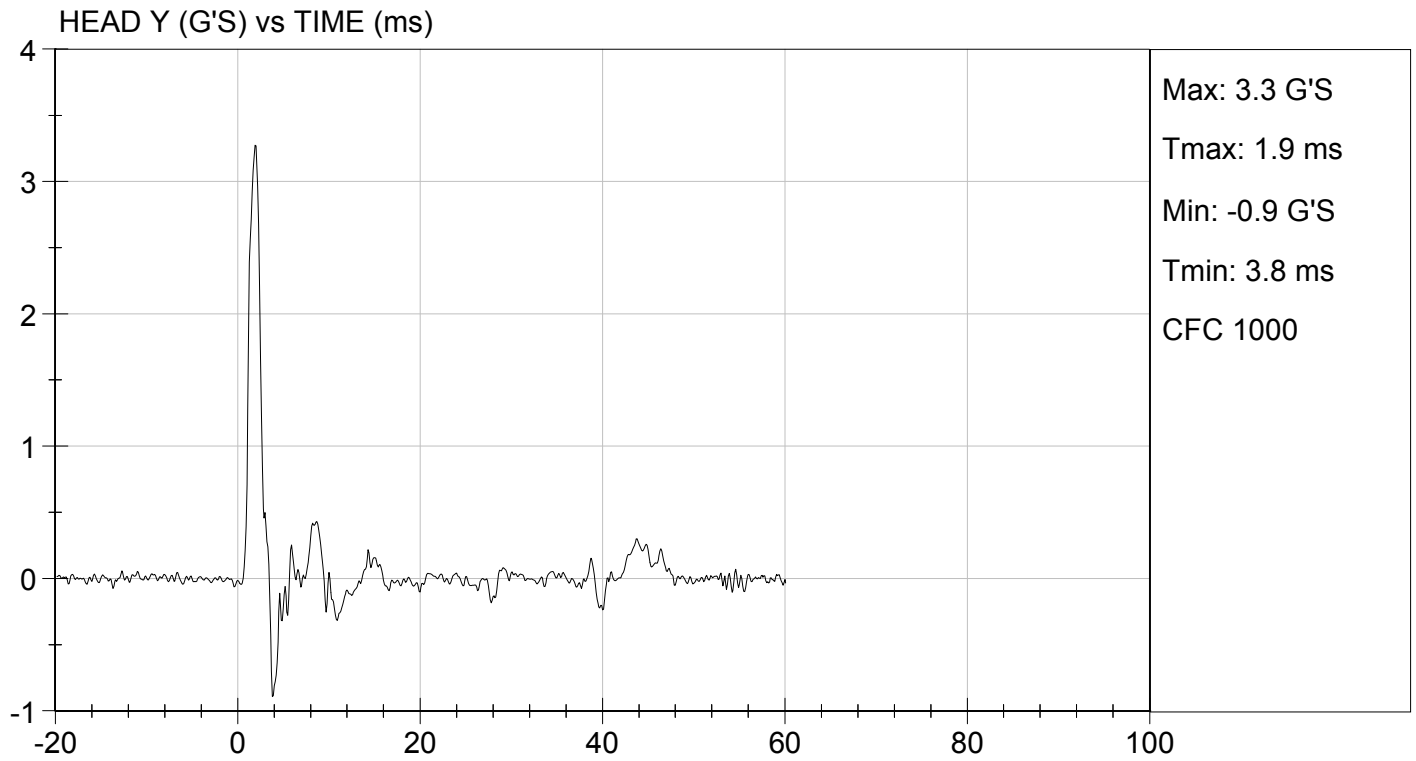
David Schoedel
Laboratory Technician

02/22/2016

Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck 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: | <u>21.9°C</u> |
| Record the minimum temperature: | <u>21.7°C</u> |
| Record the maximum humidity: | <u>26%</u> |
| Record the minimum humidity: | <u>24%</u> |
- 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: | <u>No damage</u> |
|------------------------------|------------------|
- 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: | <u>No Deterioration; Hardness: Front 89; Back 90.</u> |
|------------------------------|---|
- 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	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.6 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.3 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	72 Nm @ 79 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	86 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

02/22/2015
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16752

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass



Laboratory Technician

02/22/2016

Test Date

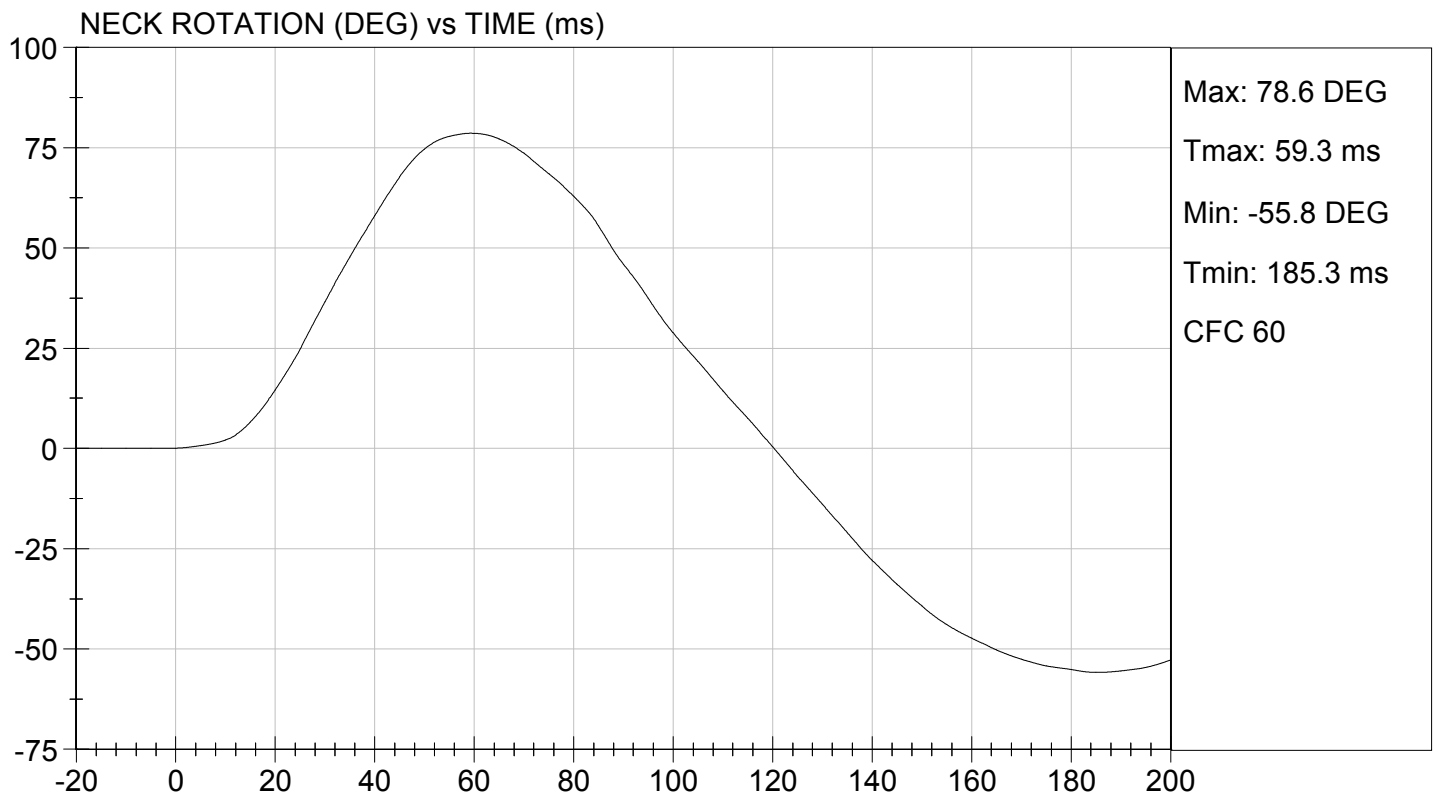
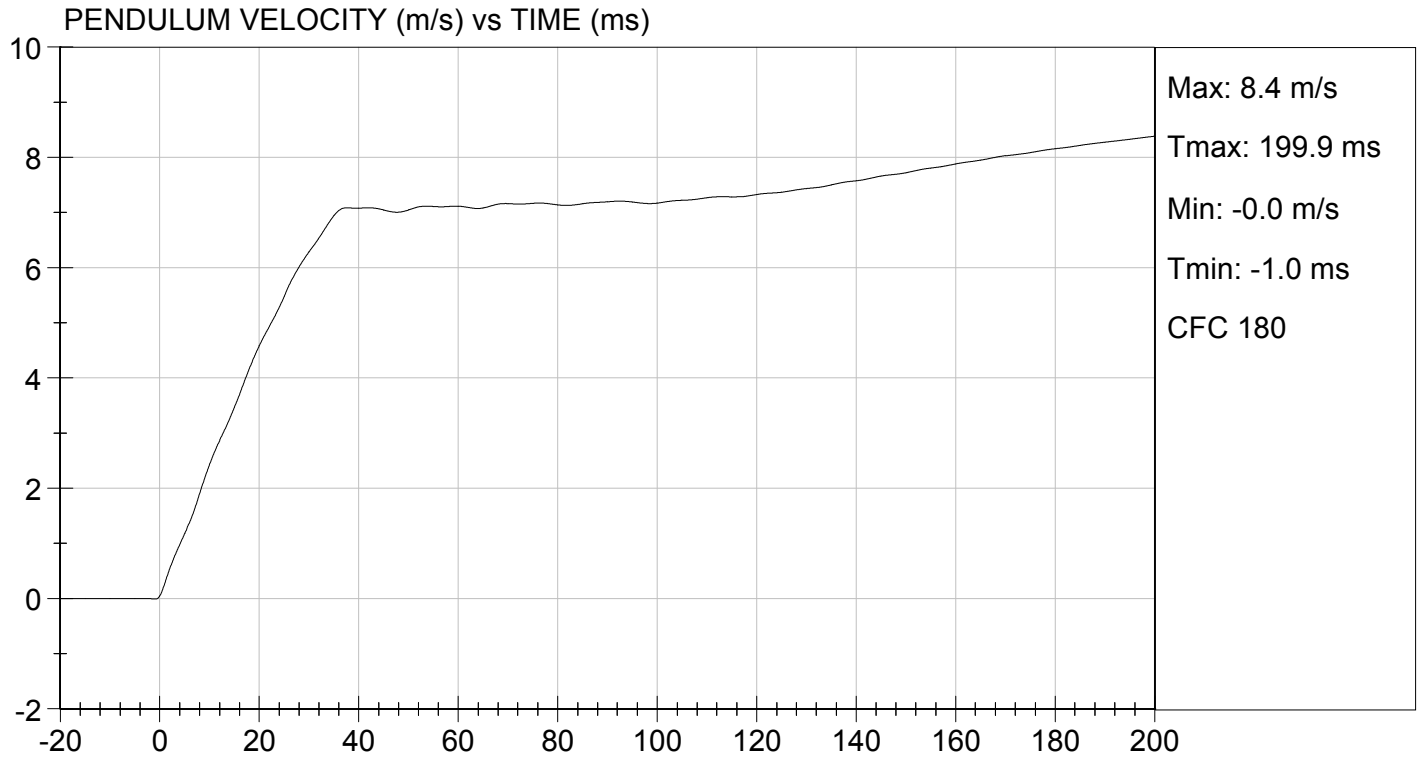


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

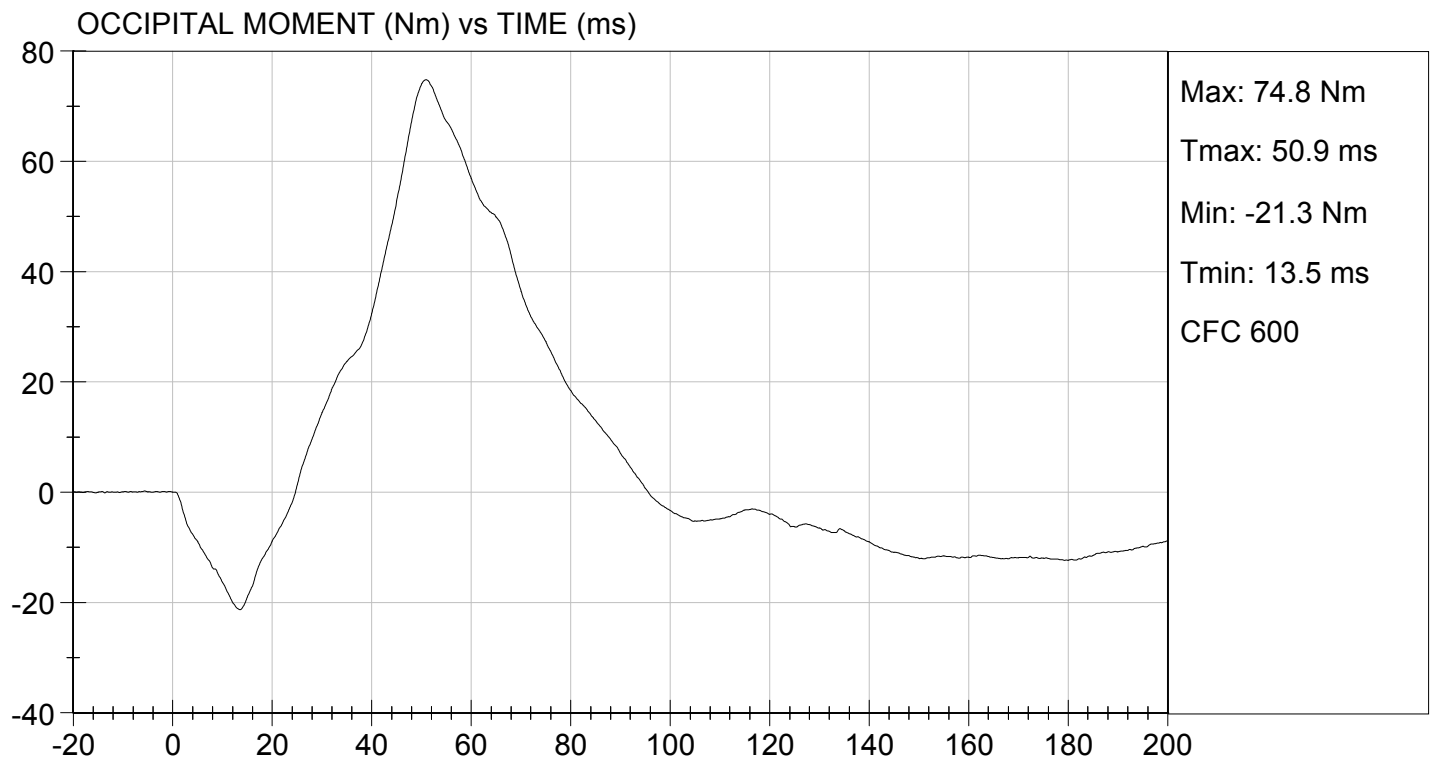
TEST DATE: 02/22/2016
TEST #: D16752





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/22/2016
TEST #: D16752



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

- ☐ Pre test calibration
☒ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.9°C</u> |
| Record the minimum temperature: | <u>21.7°C</u> |
| Record the maximum humidity: | <u>26%</u> |
| Record the minimum humidity: | <u>24%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- 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	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.7 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.6 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.4 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-55 Nm @ 106 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	104 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

02/22/2015
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

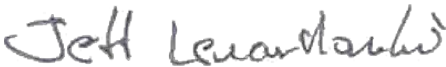
ATD Serial No: 125

Test I.D: D16753

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


 Laboratory Technician

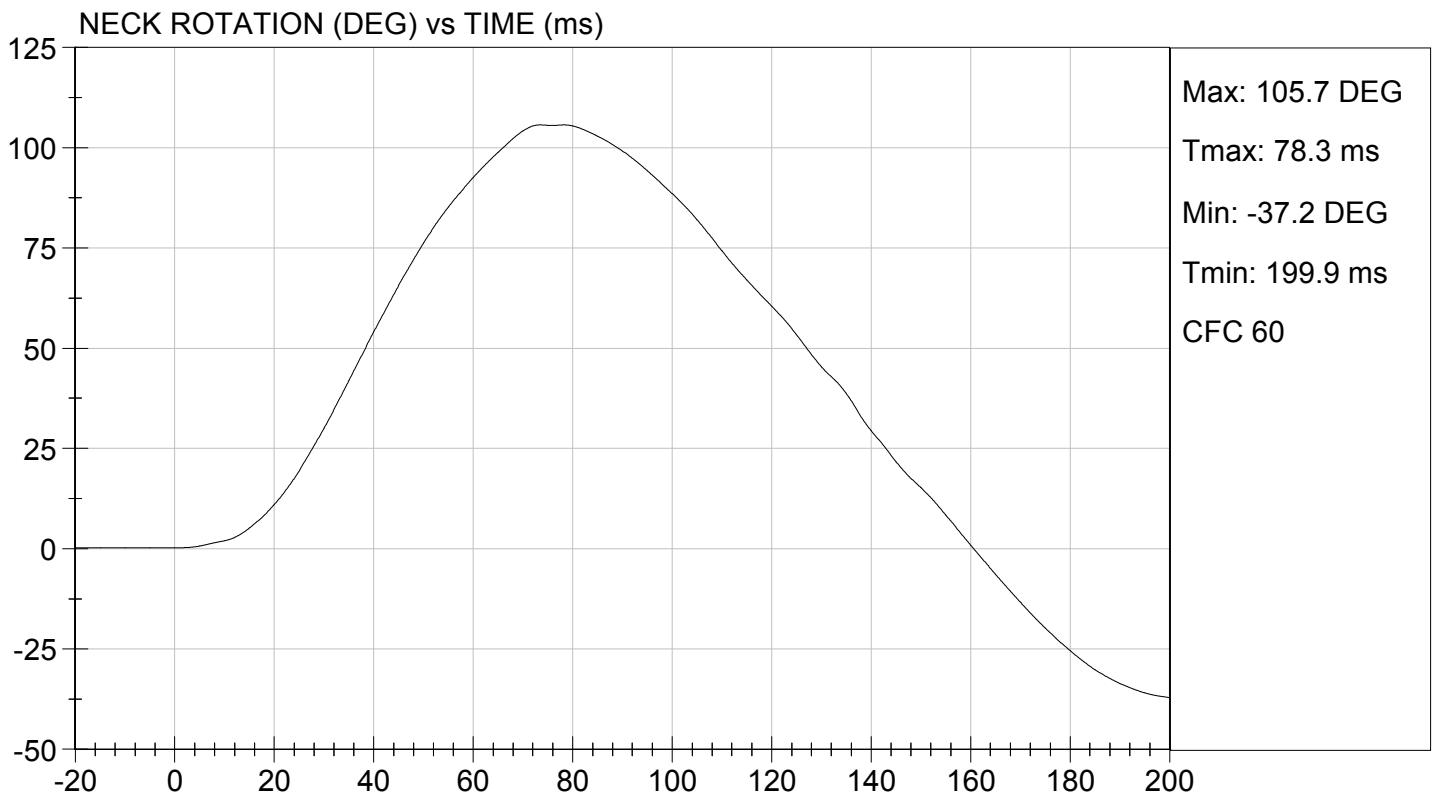
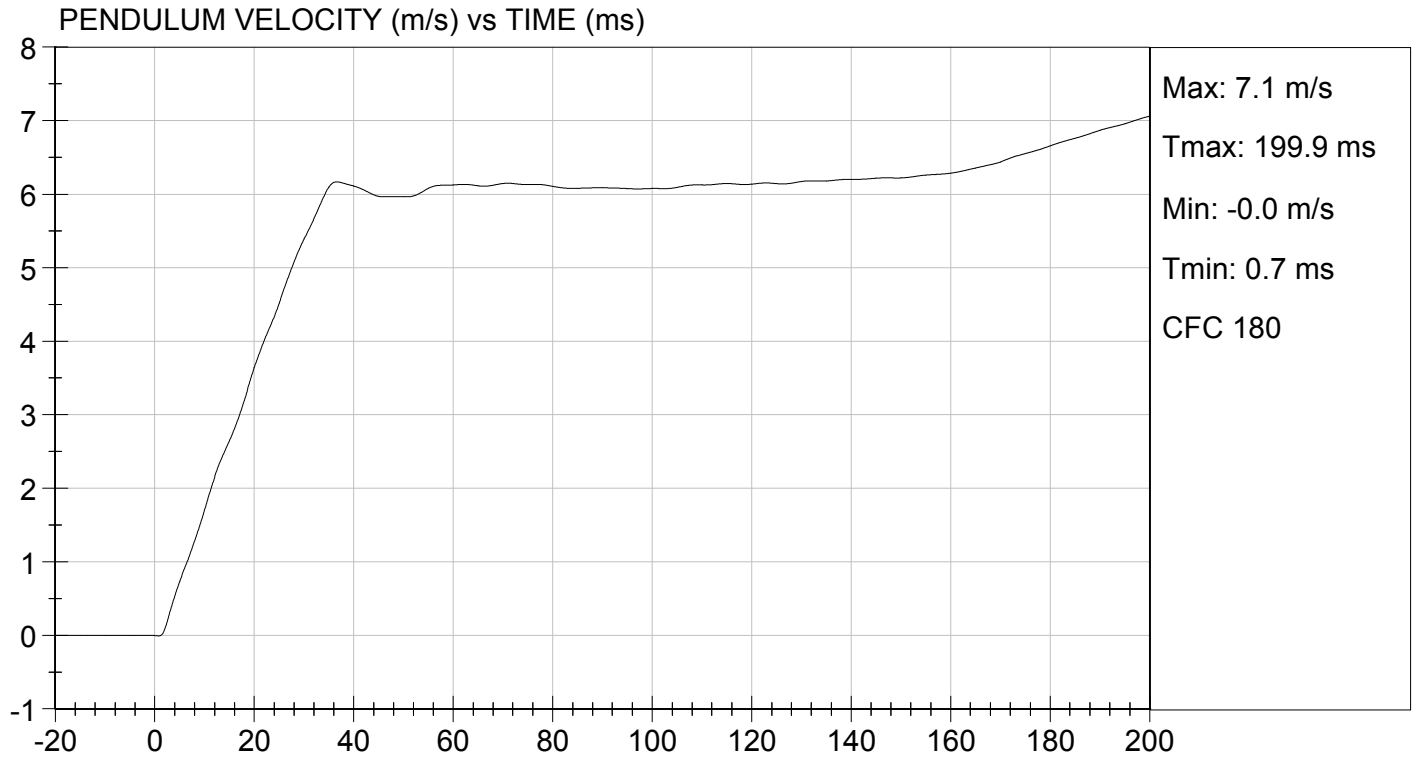
02/22/2016
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

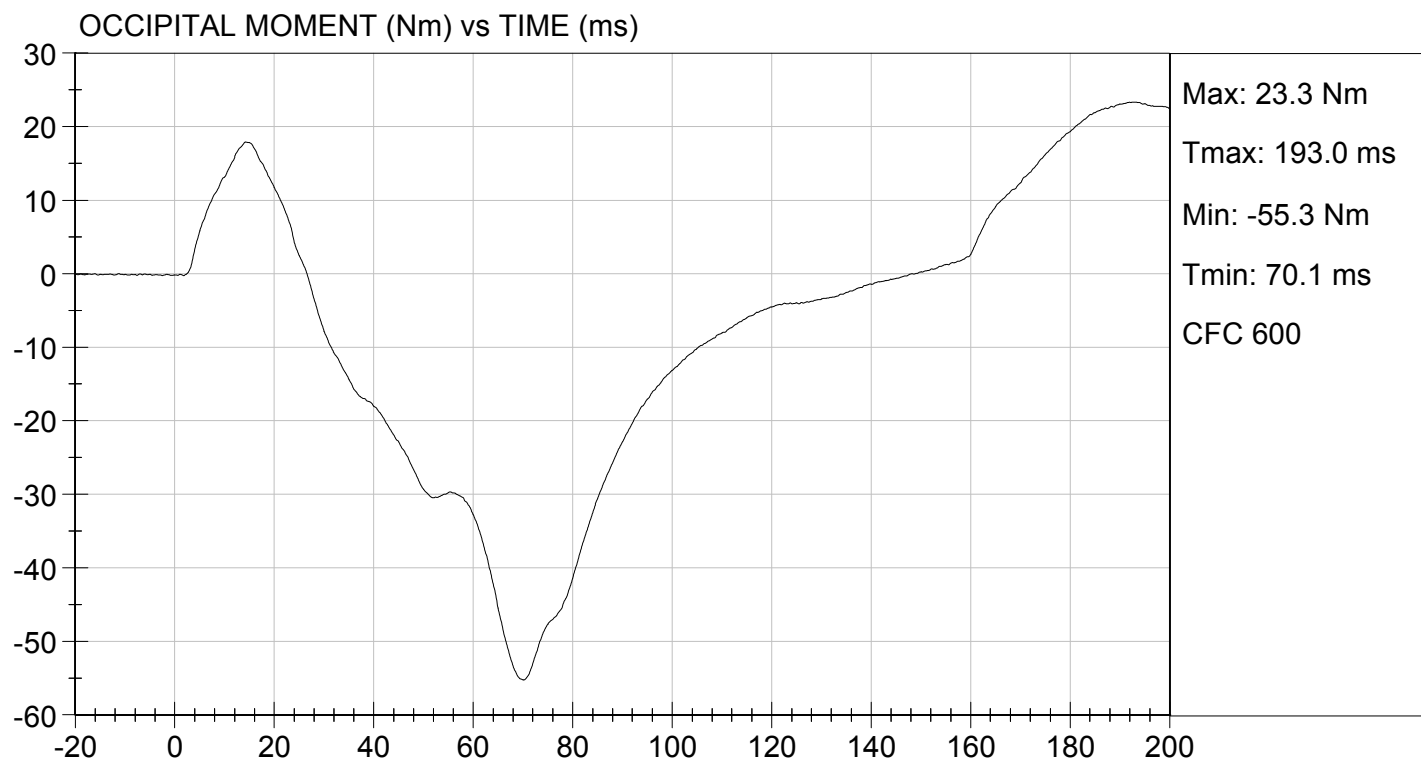
TEST DATE: 02/22/2016
TEST #: D16753





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/22/2016
TEST #: D16753



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
 X N/A, ONLY one thorax impact test performed
- X 2. The test fixture conforms to the specifications in Figure 11B.
- X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.9°C</u>
Record the minimum temperature:	<u>21.7°C</u>
Record the maximum humidity:	<u>26%</u>
Record the minimum humidity:	<u>24%</u>

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

X - No Damage

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

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	55 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4138 N
Peak Force** between 18.0 and 50.0 mm chest compression	$\text{Peak Force} \leq 4600 \text{ N}$	4125 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

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

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

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

David Schoedel
Signature

02/22/2015
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16754

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4138	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4125	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/22/2016

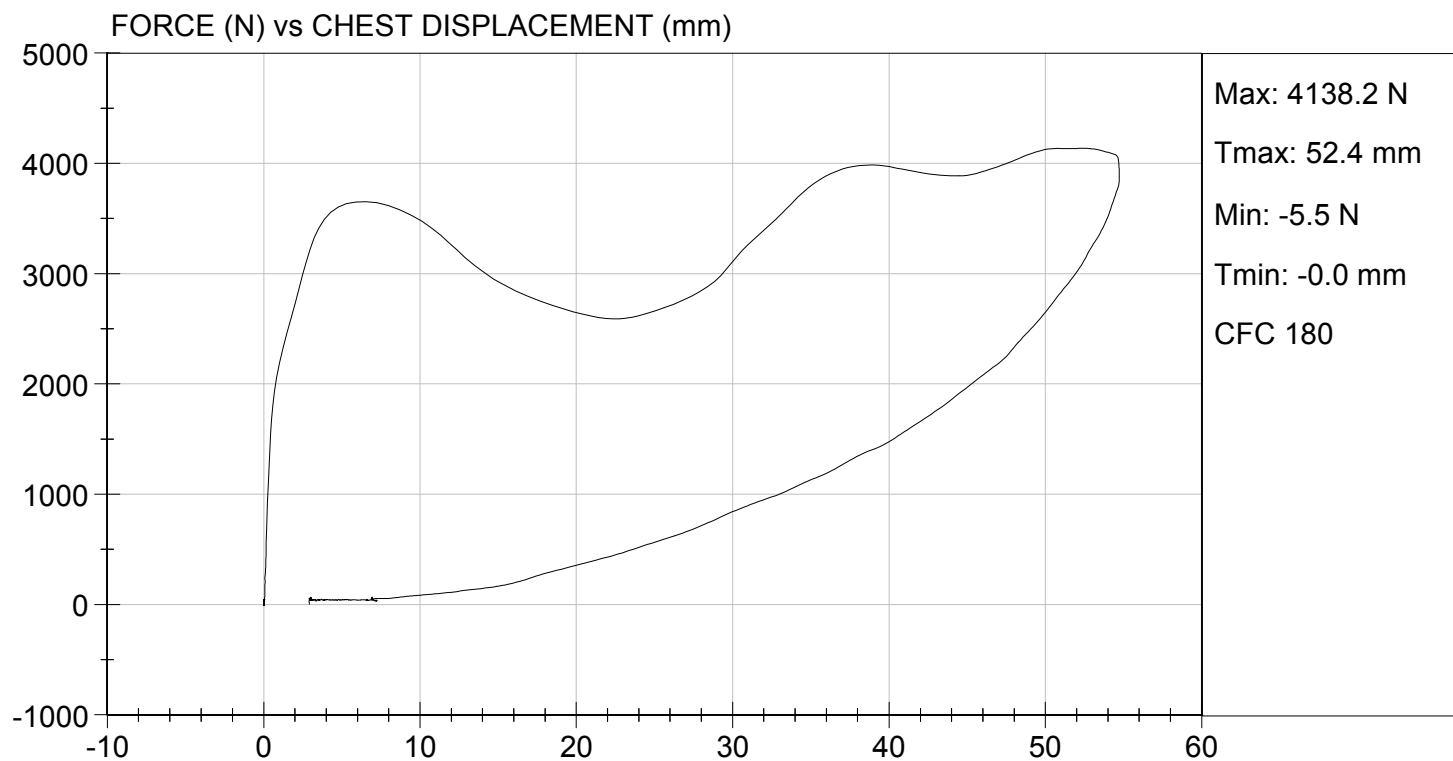
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 02/22/2016
TEST #: D16754



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion 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 femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.9°C</u> |
| Record the minimum temperature: | <u>21.7°C</u> |
| Record the maximum humidity: | <u>26%</u> |
| Record the minimum humidity: | <u>24%</u> |
- 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°): See Result Table
- 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°	19 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	379 N
Final ref. plane angle	Initial ref. plane angle ± 8°	24 deg

David Schoedel
 Signature

02/22/2015
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16757

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	24	Pass
Force at 45 deg	N	320 to 390	379	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

David Schoedel

Laboratory Technician

02/22/2016

Test Date

Jeff Leonard

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.9°C</u> |
| Record the minimum temperature: | <u>21.7°C</u> |
| Record the maximum humidity: | <u>26%</u> |
| Record the minimum humidity: | <u>24%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3476 N

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

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

David Schoedel
Signature

02/22/2015
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 125

Test I.D: D16756

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3476	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/22/2016

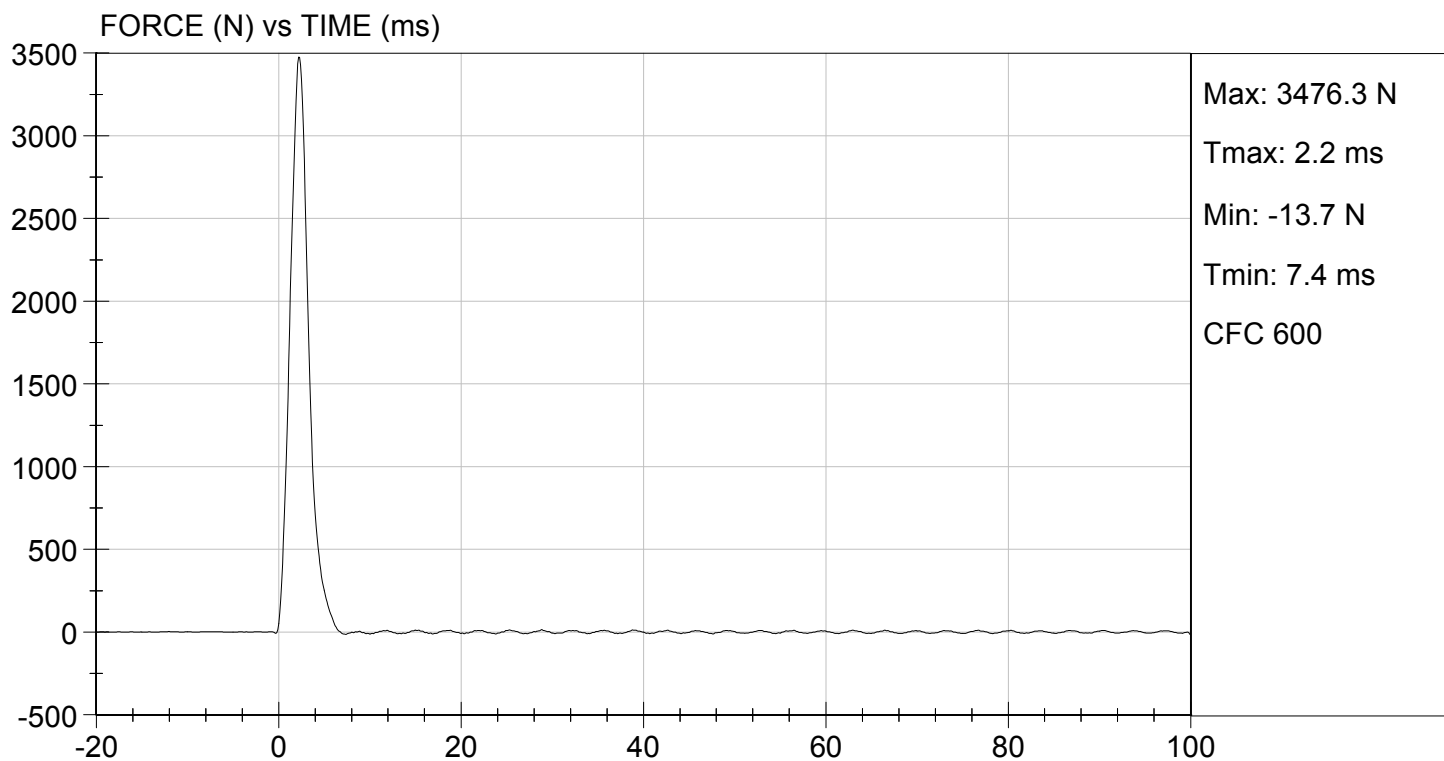
Test Date

Jeff LevanMarsh
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 02/22/2016
TEST #: D16756



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/22/2015

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.9°C</u>
Record the minimum temperature:	<u>21.7°C</u>
Record the maximum humidity:	<u>26%</u>
Record the minimum humidity:	<u>24%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

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

David Schoedel
Signature

02/22/2015
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D16755

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3560	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/22/2016

Test Date

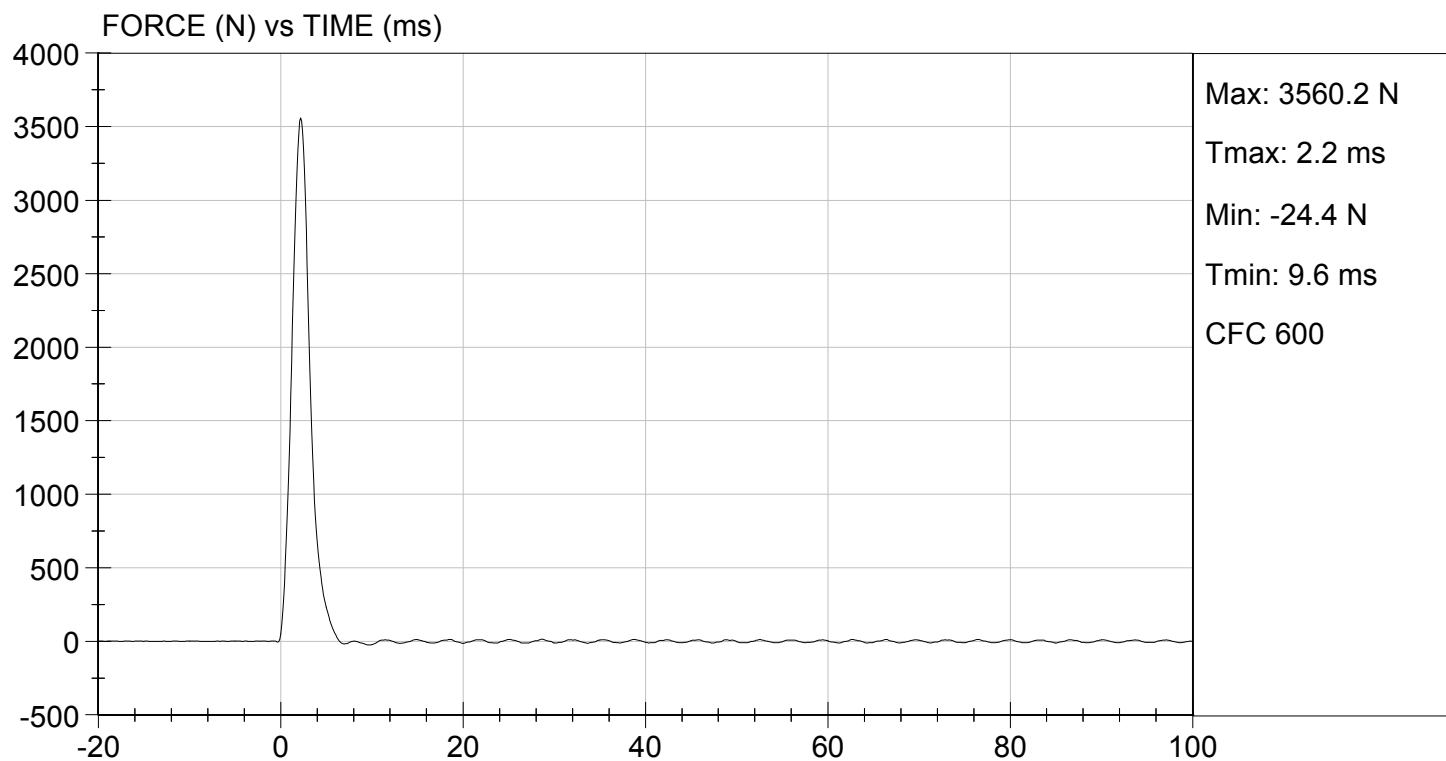
Jeff Leonard

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.86 ft/s, 2.09 m/s

TEST DATE: 02/22/2016
TEST #: D16755



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82075	09/04/2015	03/04/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82076	09/04/2015	03/04/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82077	09/04/2015	03/04/2016
NECK TRANSDUCER	Denton	1716	1206	01/12/2016	07/12/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P84464	09/04/2015	03/04/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P84466	09/04/2015	03/04/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P84467	09/04/2015	03/04/2016
CHEST POTENTIOMETER	Servo	14CBI-2897	125	09/08/2015	03/08/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121	6673	02/16/2016	08/16/2016
(2) LEFT FEMUR	Denton	2121	6674	02/16/2016	08/16/2016
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2015
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2015
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	23	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 125

Test Date: 02/22/2016

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

02/22/2016
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/22/2016
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #124, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.1
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.6
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
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	245.9
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	296.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	192.3
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	540.2
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	365.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	395.8
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	434.5

HYBRID III 5 th SN #124, PART 572, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	176.0
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	219.4
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	481.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	186.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	310.7
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	354.9
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	547.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	881.0
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	357.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	169.8

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: Andy Warczytowa

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- 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: 501 mm
Record the left side distance: 501 mm

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: 50.9 micro inches

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

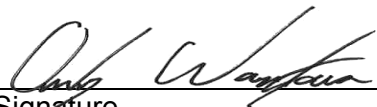
X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm

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

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

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	262 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	5.5 g

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


Signature

02/19/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

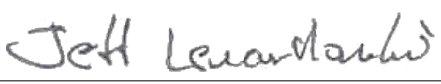
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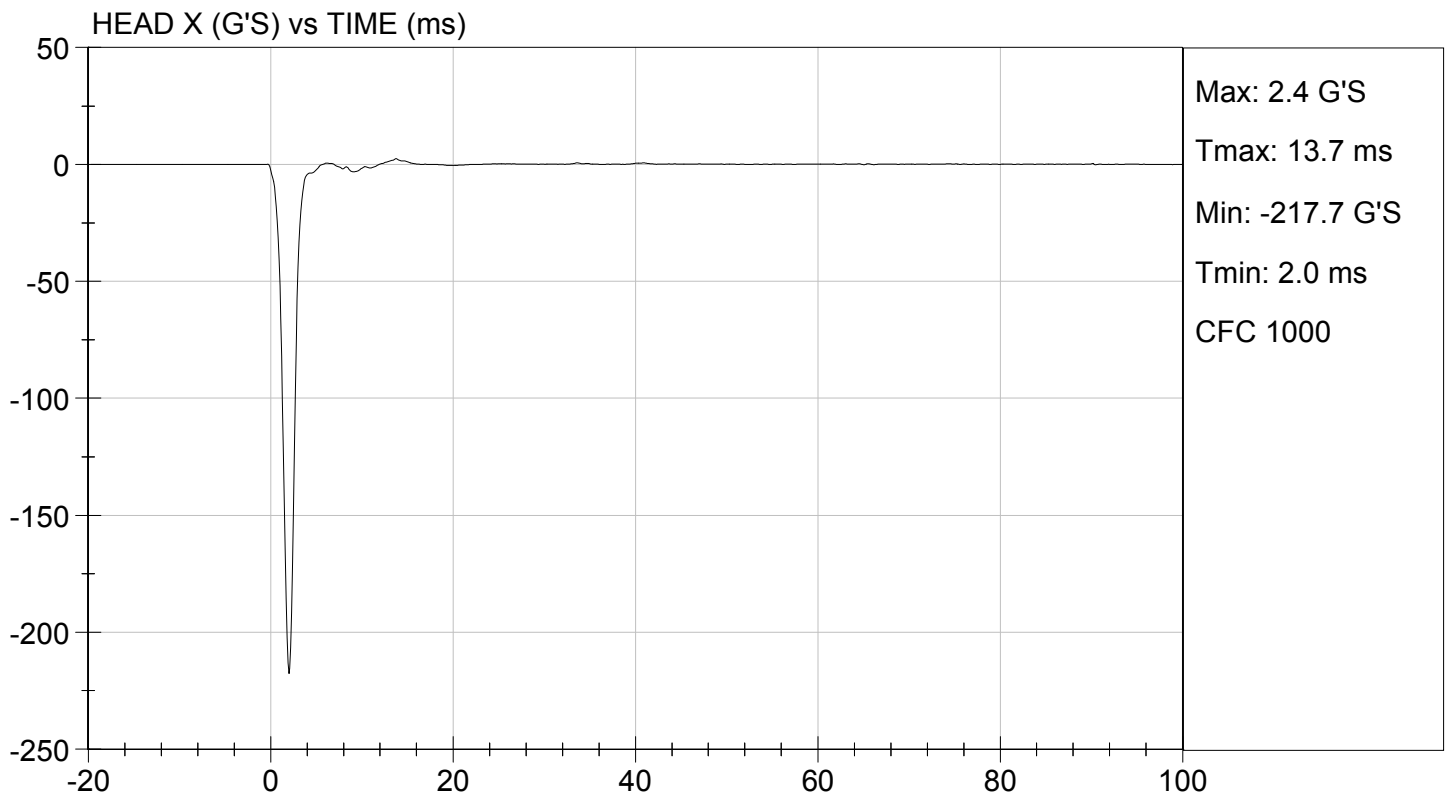
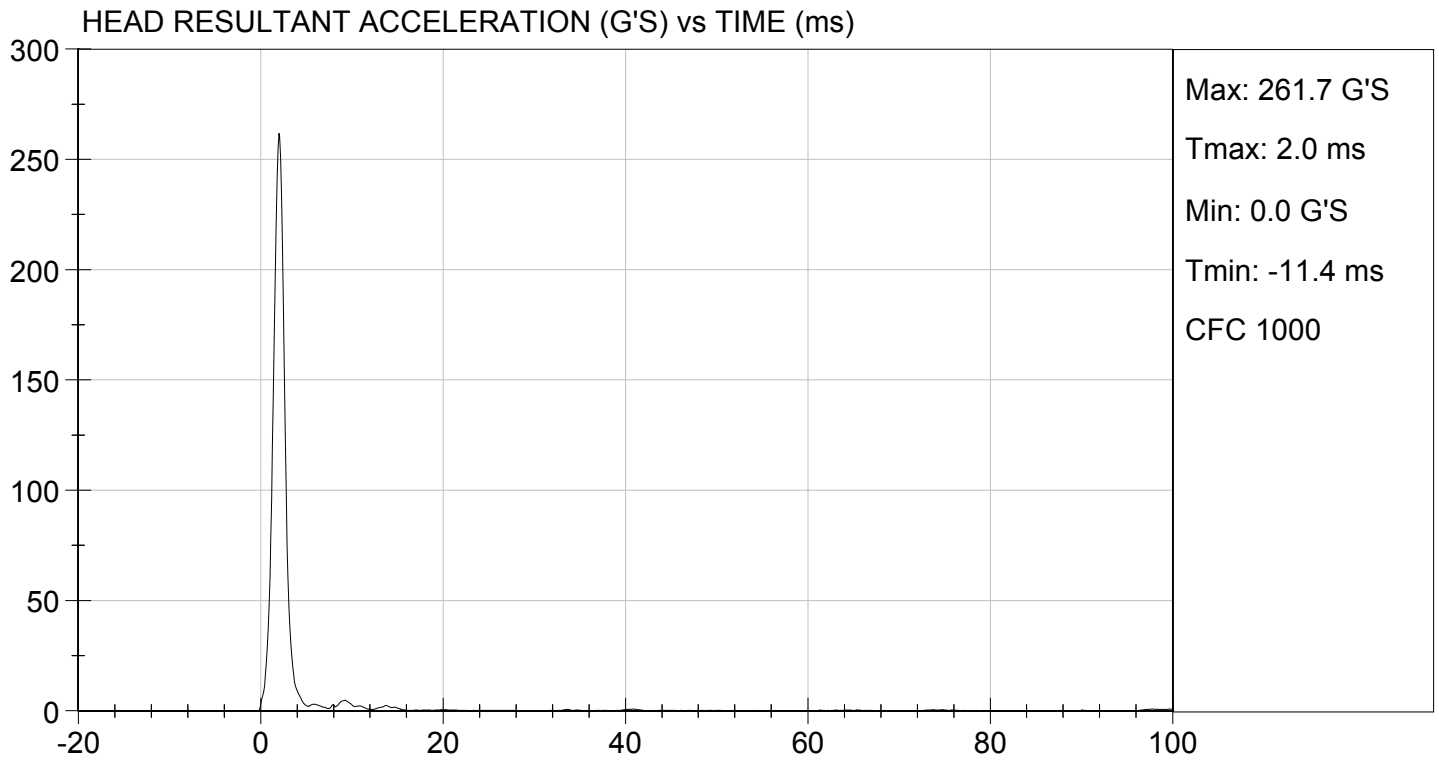
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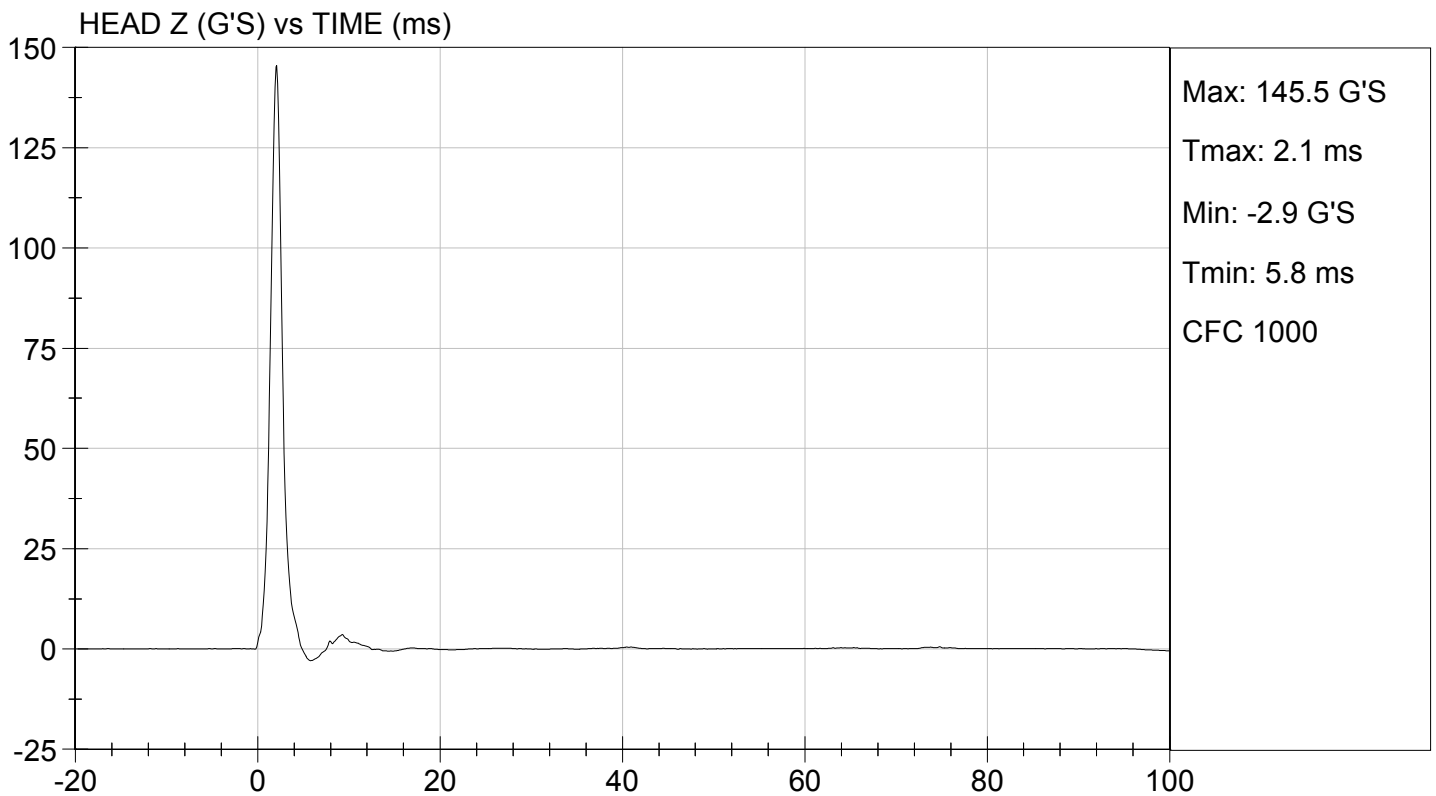
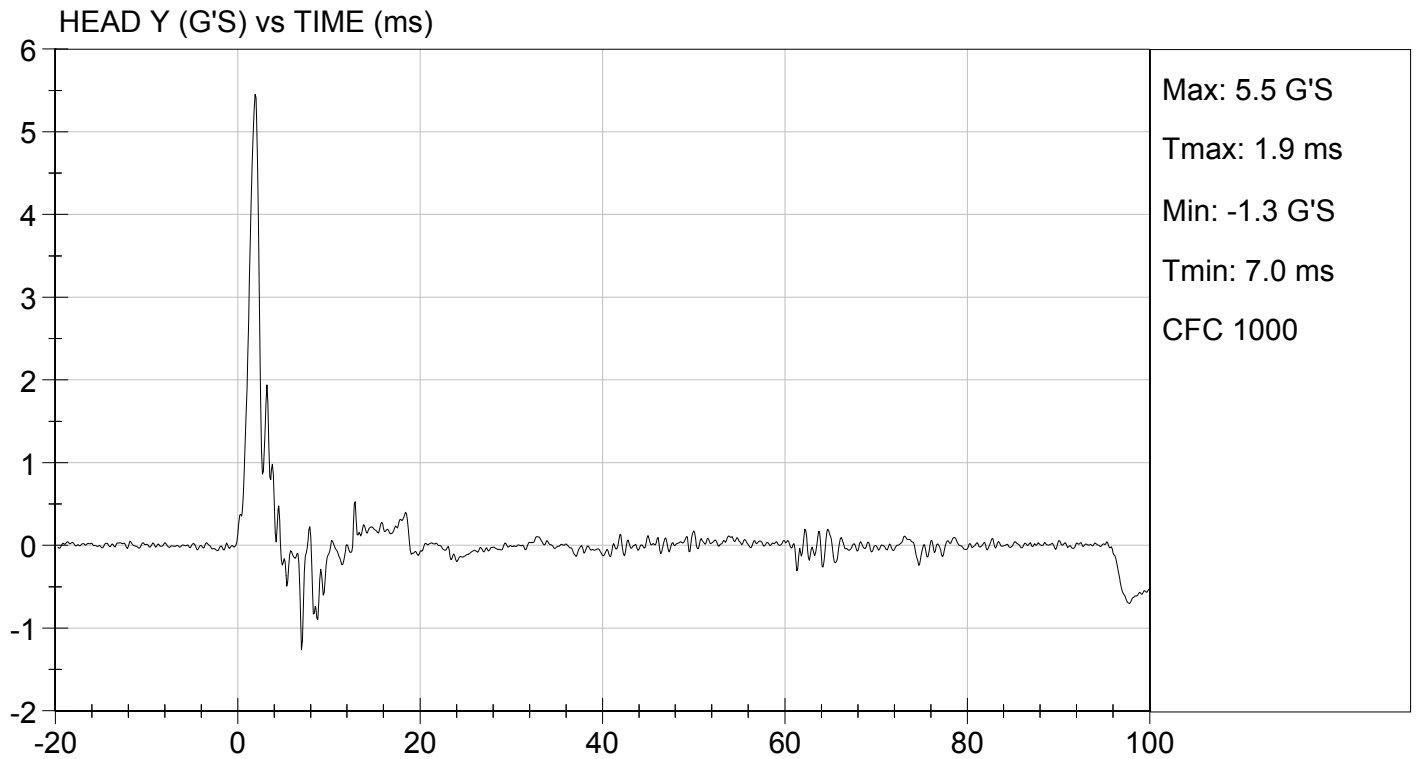
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Peak Resultant Acceleration	G's	250 to 300	262	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

02/19/2016
Test Date


Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: David Schoedel

X Pre test calibration

 Post test calibration verification

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

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

X N/A, ONLY one neck 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°C

Record the minimum temperature: 21.6°C

Record the maximum humidity: 33%

Record the minimum humidity: 28%

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

Record findings and actions: No damage

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

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

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

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.5 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.2 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	70 Nm @ 78 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	90 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

02/19/2016
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16712

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	90	Pass
Overall Results					Pass



Laboratory Technician

02/19/2016

Test Date

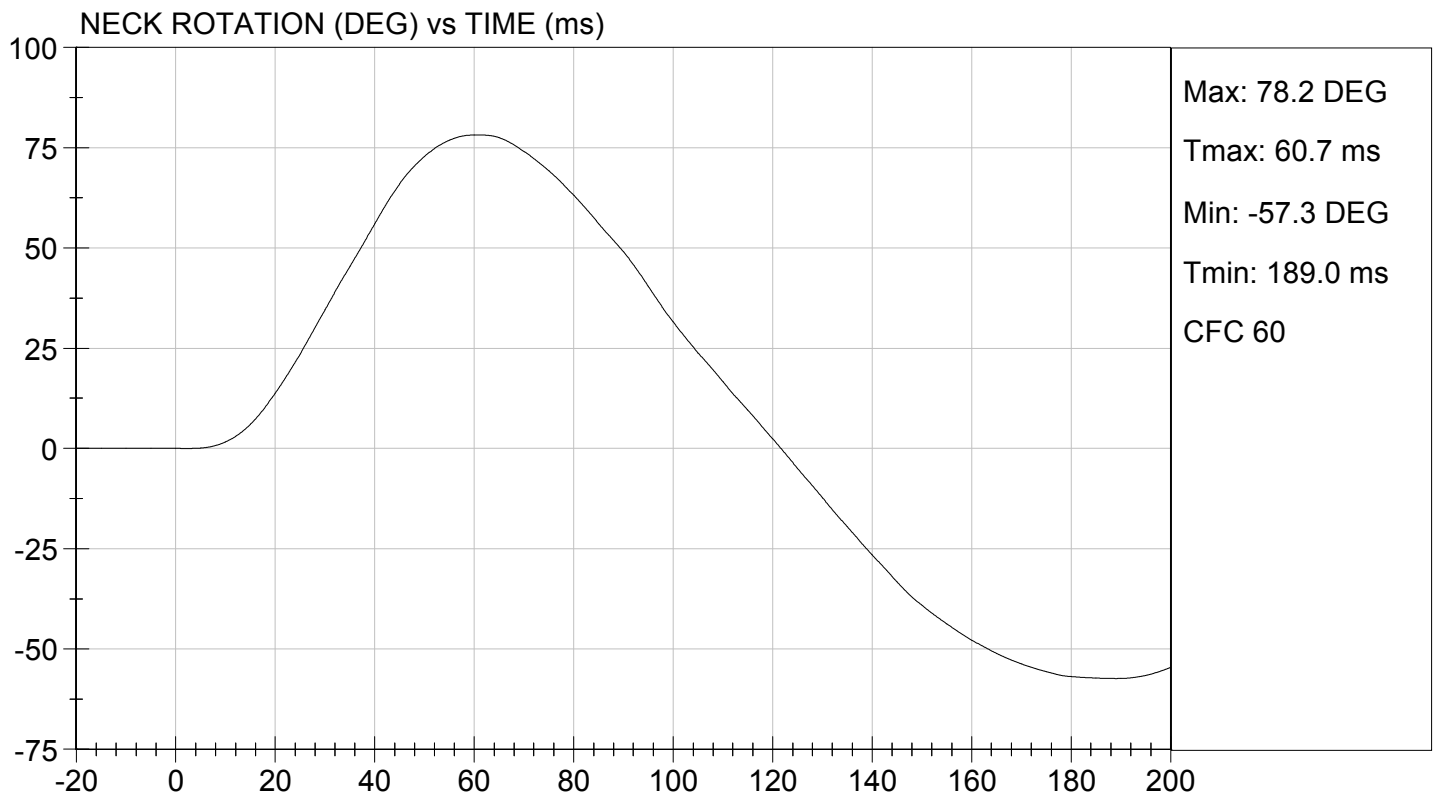
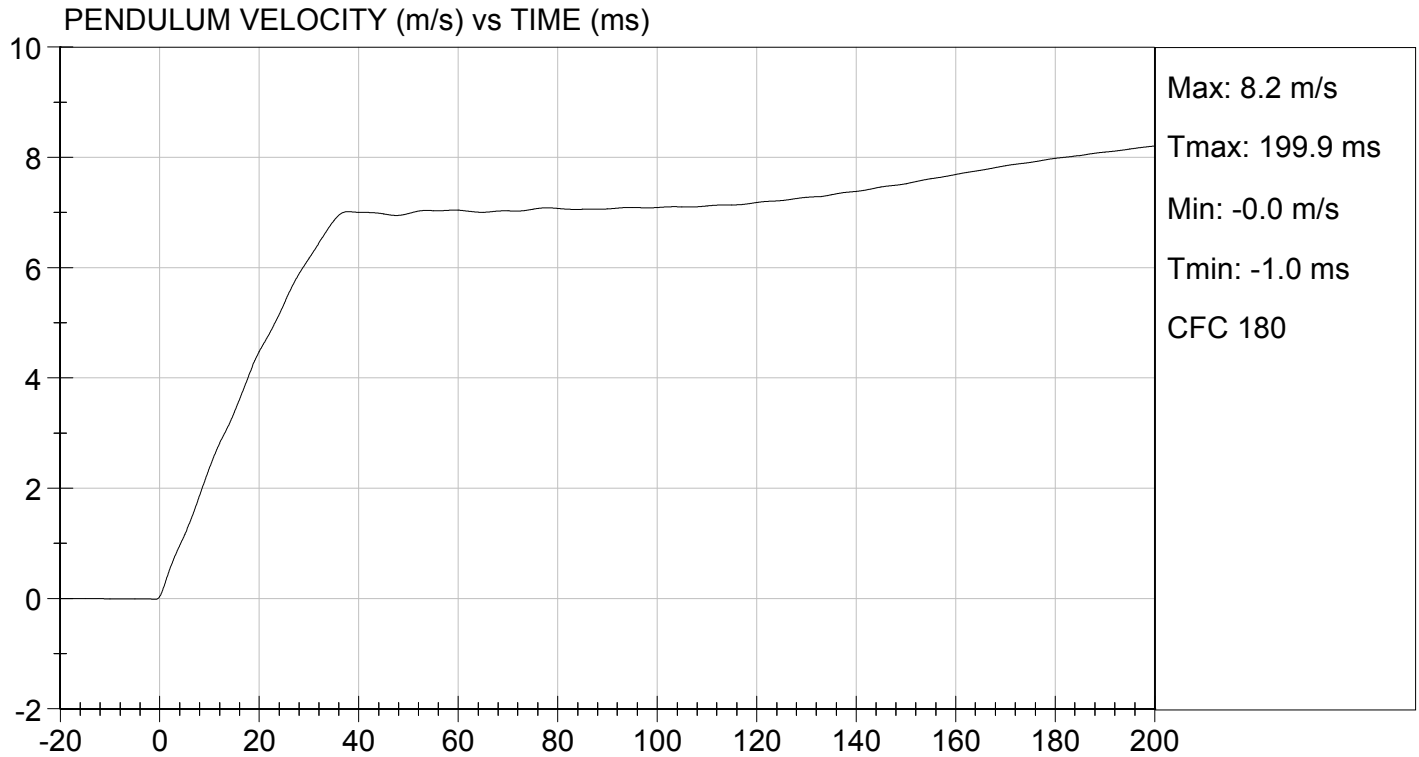


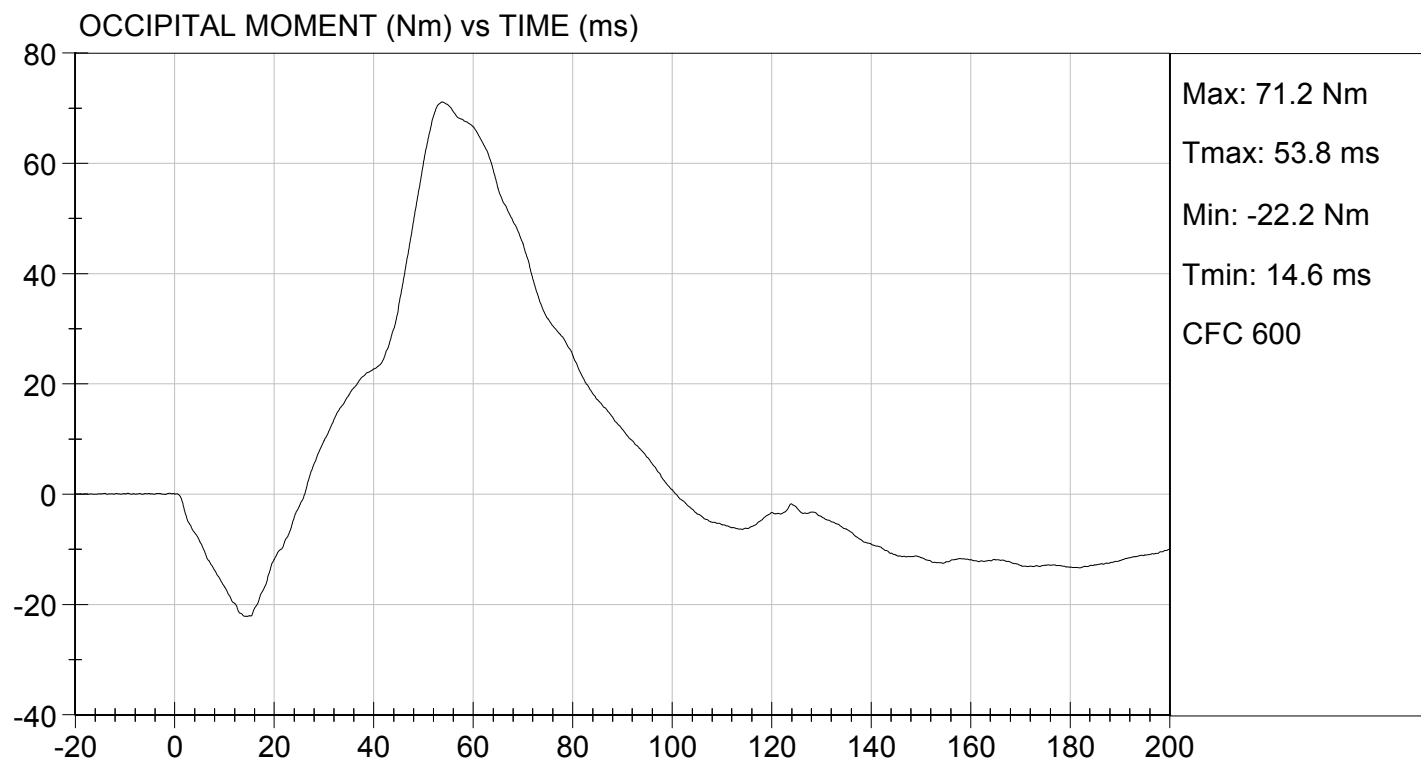
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/19/2016
TEST #: D16712





DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- 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	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.6 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.5 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.1 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-56 Nm @ 105 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	104 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

02/19/2016
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16713

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	105	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass

David Schoedel

Laboratory Technician

02/19/2016

Test Date

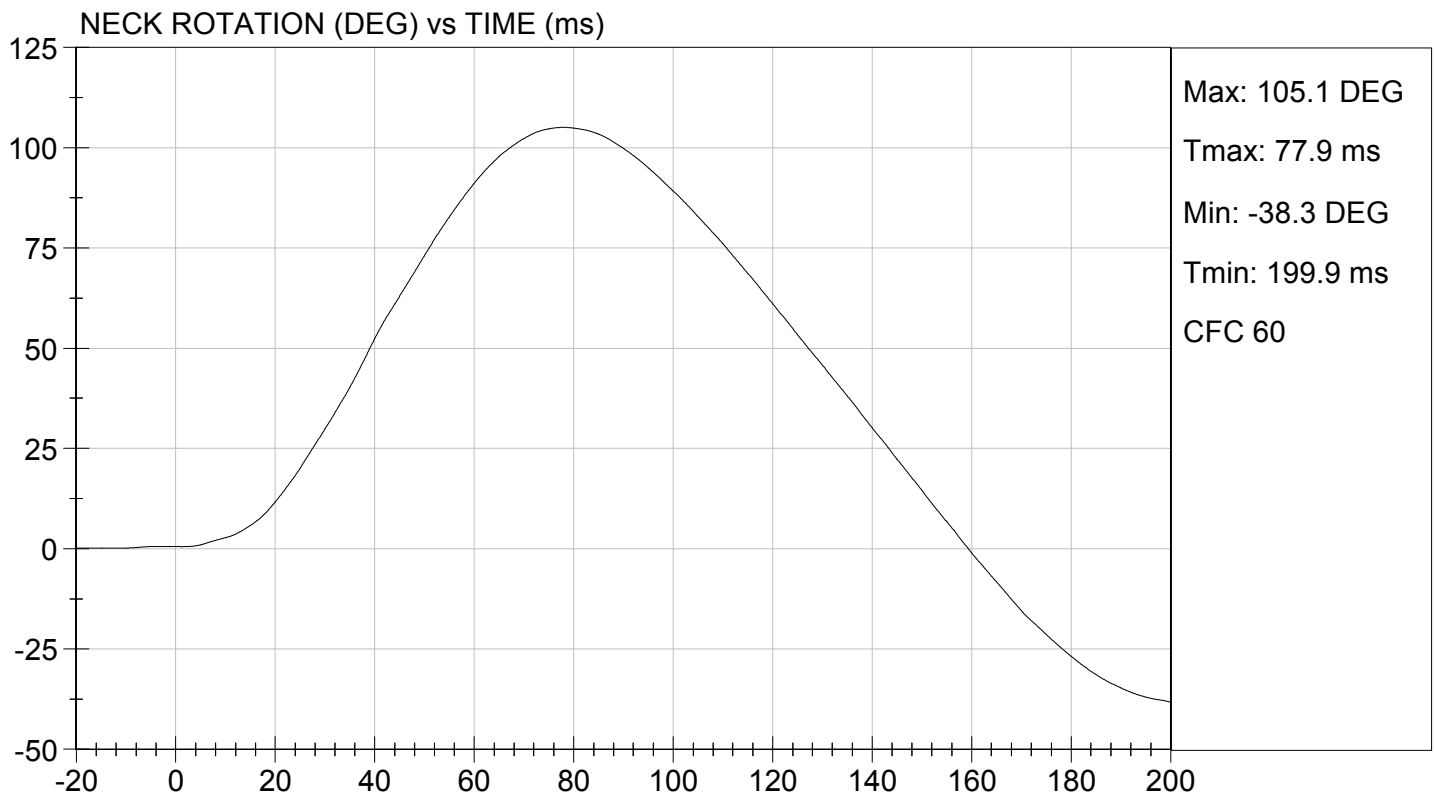
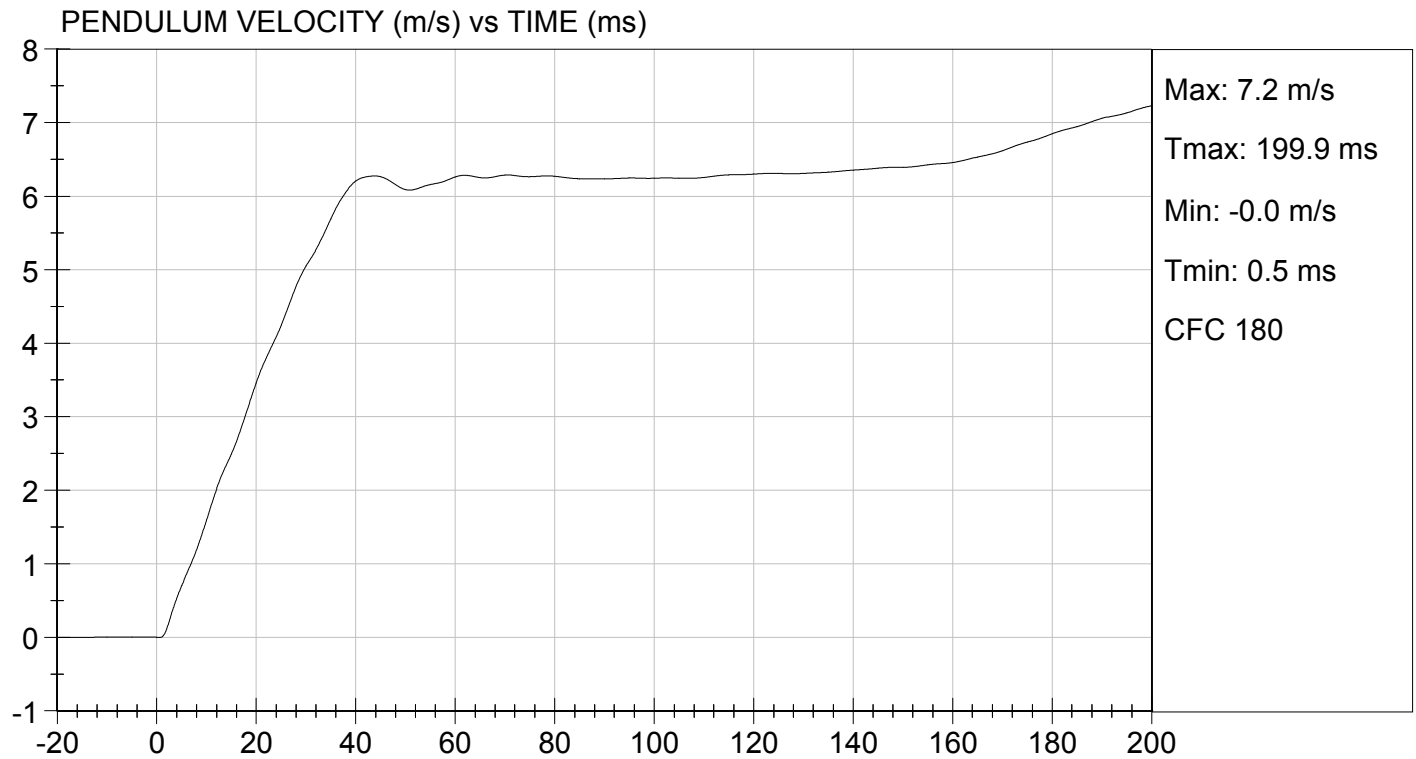
Jeff Leonard

Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

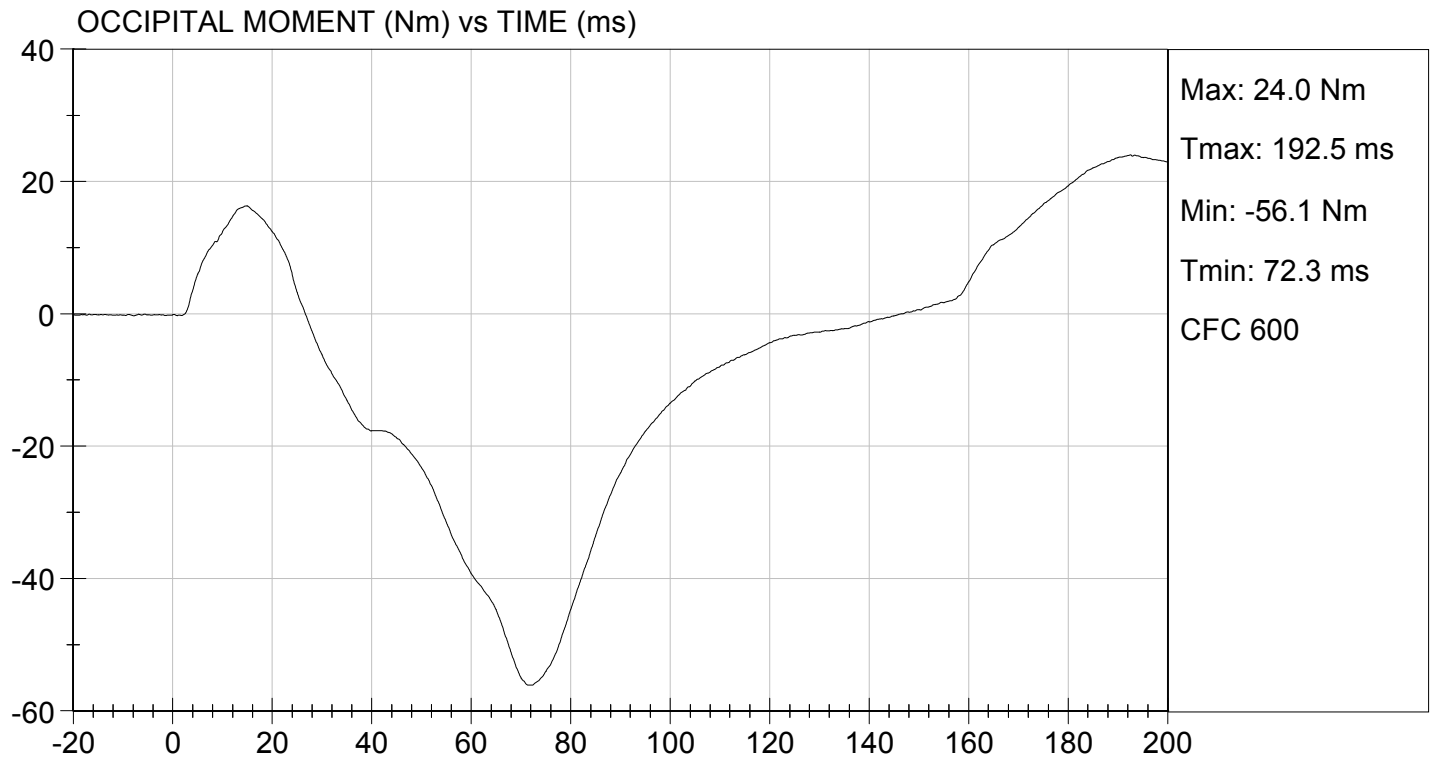
TEST DATE: 02/19/2016
TEST #: D16713





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/19/2016
TEST #: D16713



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: Andy Warczytowa

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.6°C</u>
Record the maximum humidity:	<u>33%</u>
Record the minimum humidity:	<u>28%</u>

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

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

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

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	56 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4312 N
Peak Force** between 18.0 and 50.0 mm chest compression	$\text{Peak Force} \leq 4600 \text{ N}$	4161 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	70%

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

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

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

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



Signature

02/19/2016

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

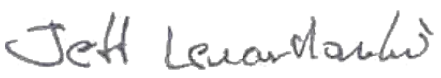
Test I.D: D16714

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	56	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4312	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4161	Pass
Overall Test Results				Pass


Laboratory Technician

02/19/2016

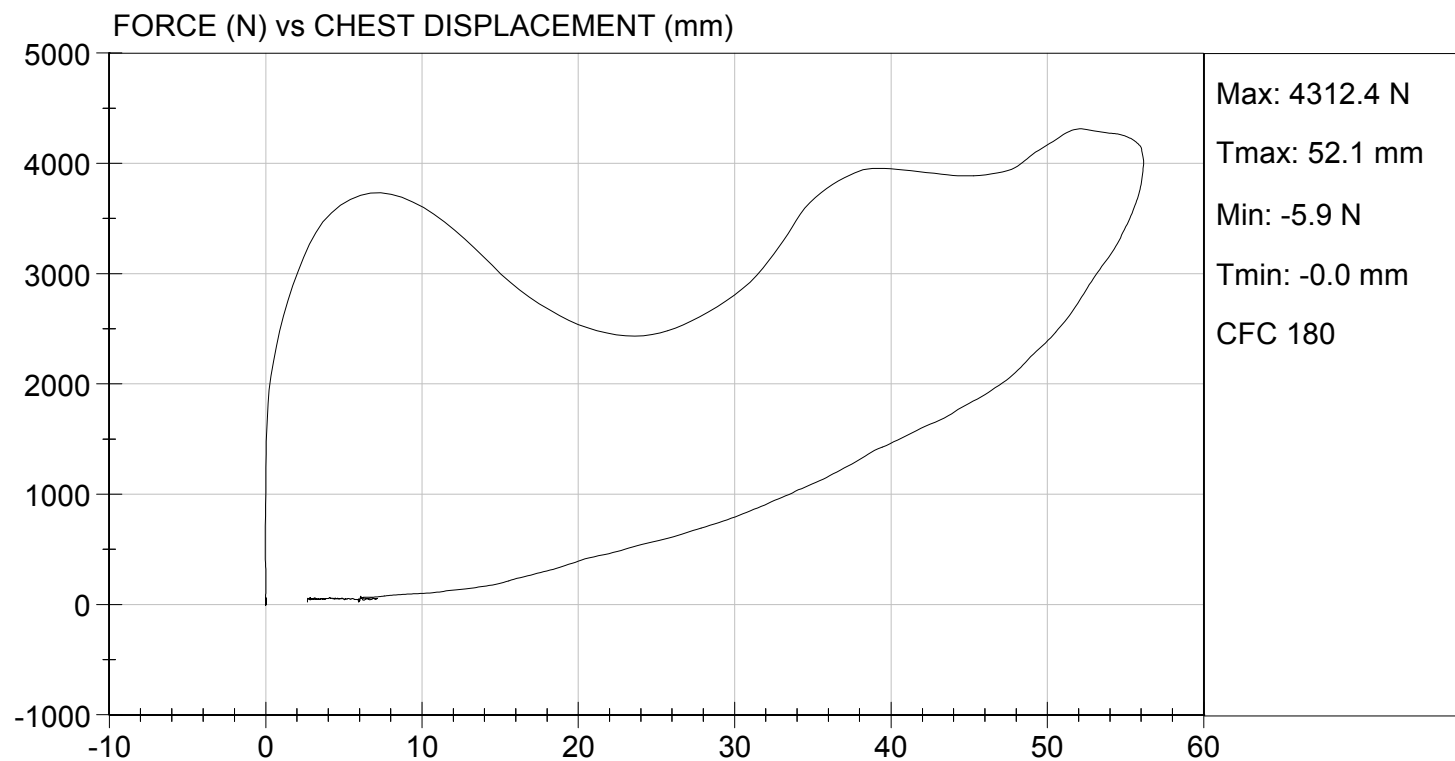
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 02/19/2016
TEST #: D16714



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: Andy Warczytowa

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
☒ N/A, ONLY one torso flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
☐ With legs below femurs.
☒ Without legs below femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- ☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- ☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- 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°): See Result Table
- 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°	18 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	381 N
Final ref. plane angle	Initial ref. plane angle ± 8°	19 deg



 Signature

02/19/2016

 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16717

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	19	Pass
Force at 45 deg	N	320 to 390	381	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

02/19/2016

Test Date


Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: David Schoedel

X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3643 N

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

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

David Schoedel
Signature

02/19/2016
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

Test I.D: D16716

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3643	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/19/2016

Test Date

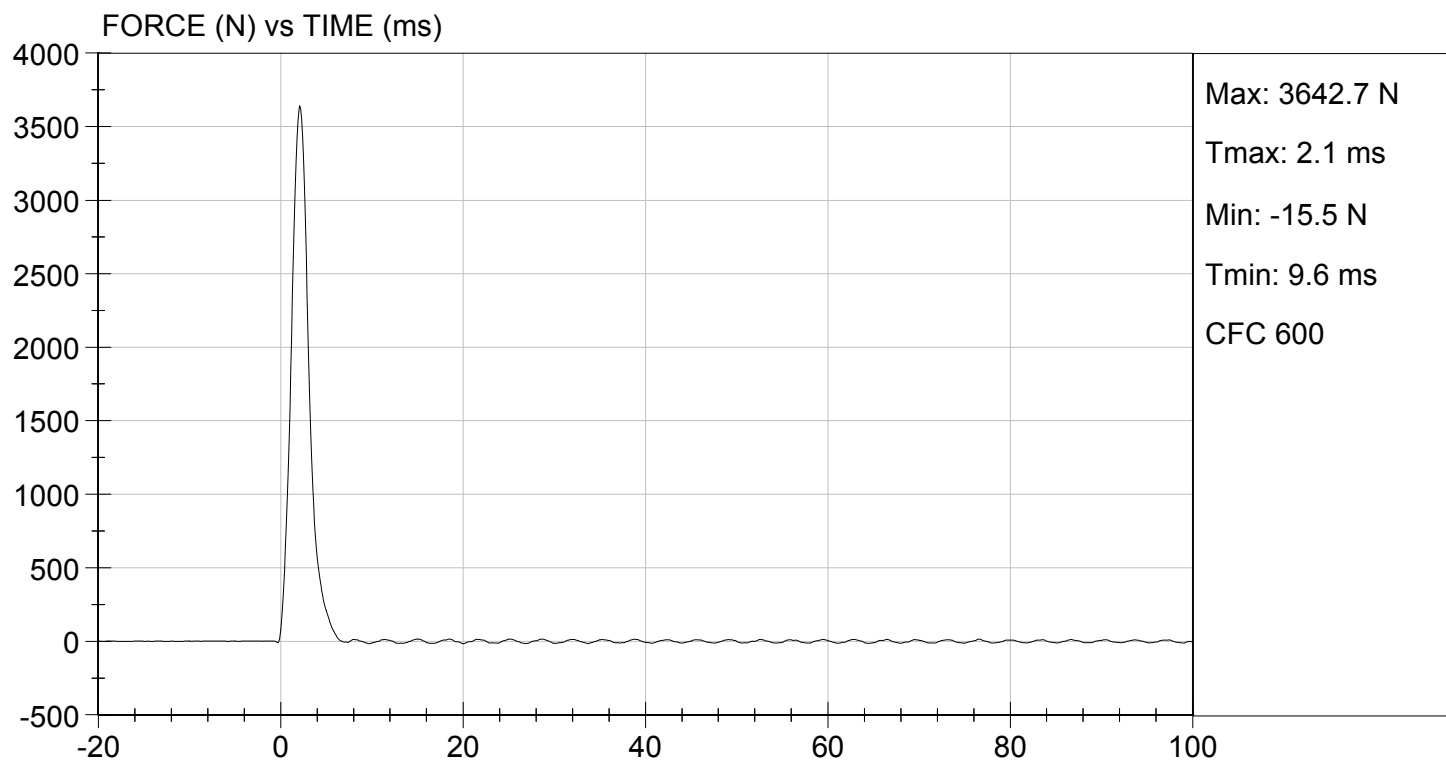
Jeff Leonard

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.94 ft/s, 2.12 m/s

TEST DATE: 02/19/2016
TEST #: D16716



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/19/2016

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.6°C</u>
Record the maximum humidity:	<u>33%</u>
Record the minimum humidity:	<u>28%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3781 N

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

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

David Schoedel
Signature

02/19/2016
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16715

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3781	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/19/2016

Test Date

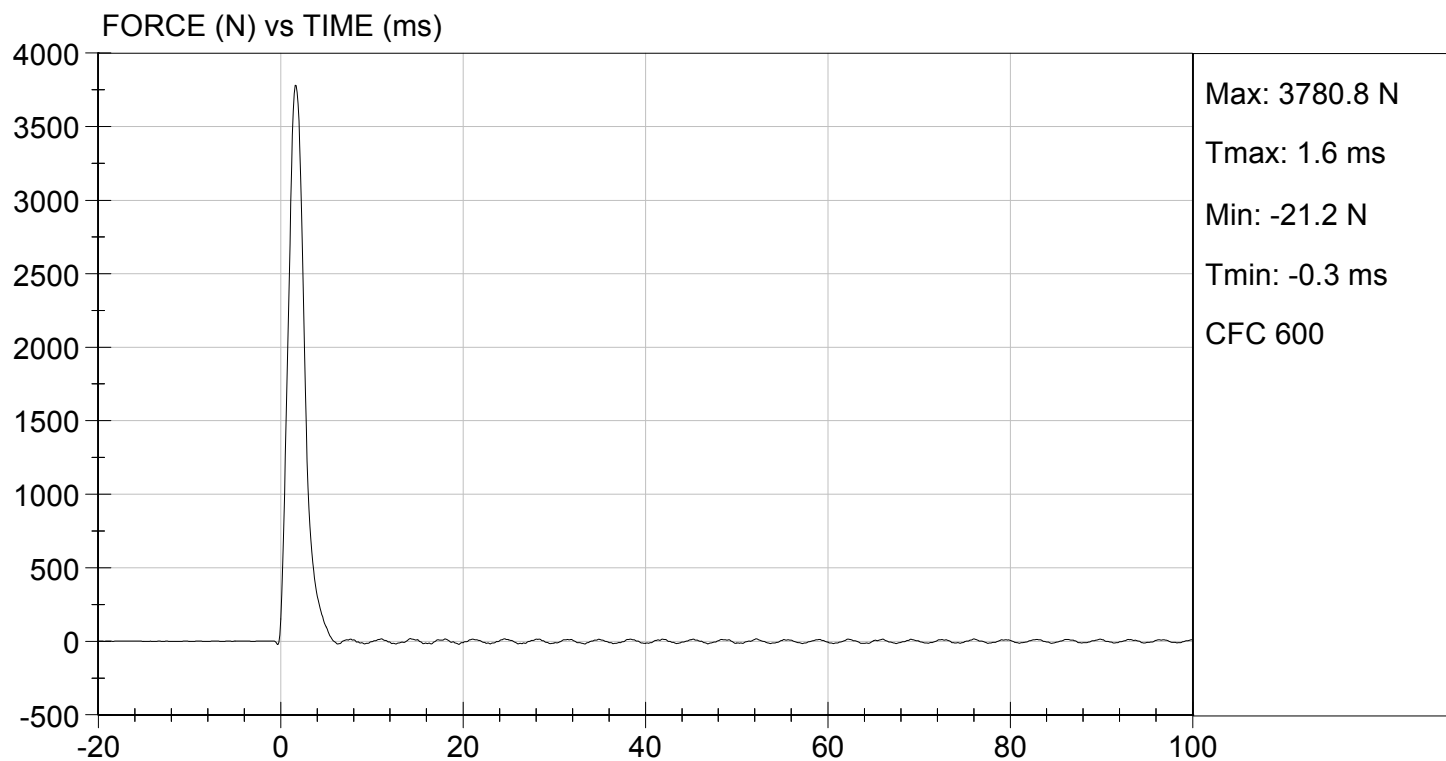
Jeff Levan-Marsh

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.94 ft/s, 2.12 m/s

TEST DATE: 02/19/2016
TEST #: D16715



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P86739	01/27/2016	07/27/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P86740	01/27/2016	07/27/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P86741	01/27/2016	07/27/2016
NECK TRANSDUCER	Denton	2320	2146	10/21/2015	04/21/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P85149	01/27/2016	07/27/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P85150	01/27/2016	07/27/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P85151	01/27/2016	07/27/2016
CHEST POTENTIOMETER	Servo	14CBI-2897	124	01/27/2016	07/27/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121	950	01/27/2016	07/27/2016
(2) LEFT FEMUR	Denton	2121	959	01/27/2016	07/27/2016
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	23	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- 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: | <u>No Damage</u> |
|------------------------------|------------------|

- 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: 501 mm
Record the left side distance: 501 mm
- 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: 50.9 micro inches
- X 13. The impact surface is rigidly supported. (572.132(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	268 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-11.1 g

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

David Schoedel
Signature

02/22/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

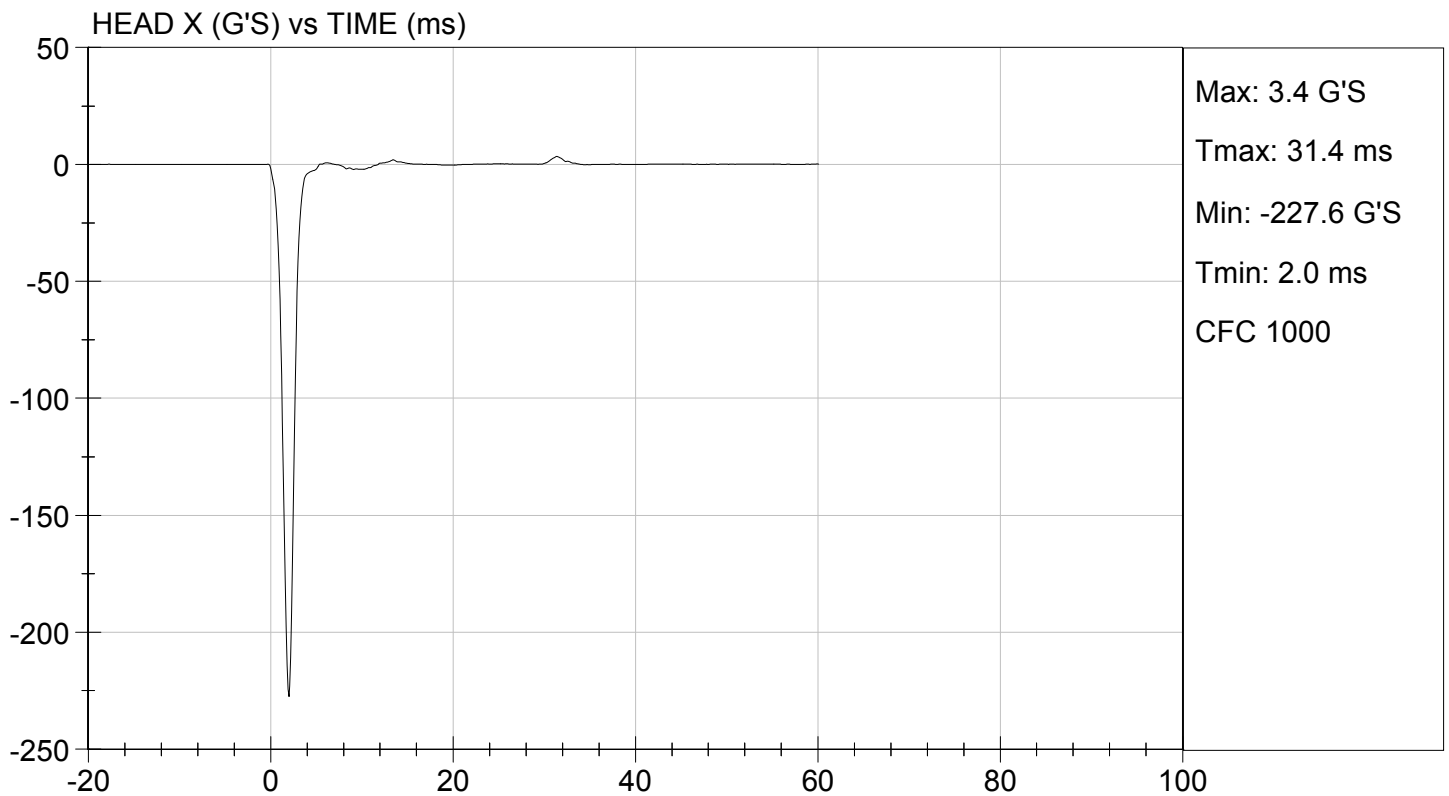
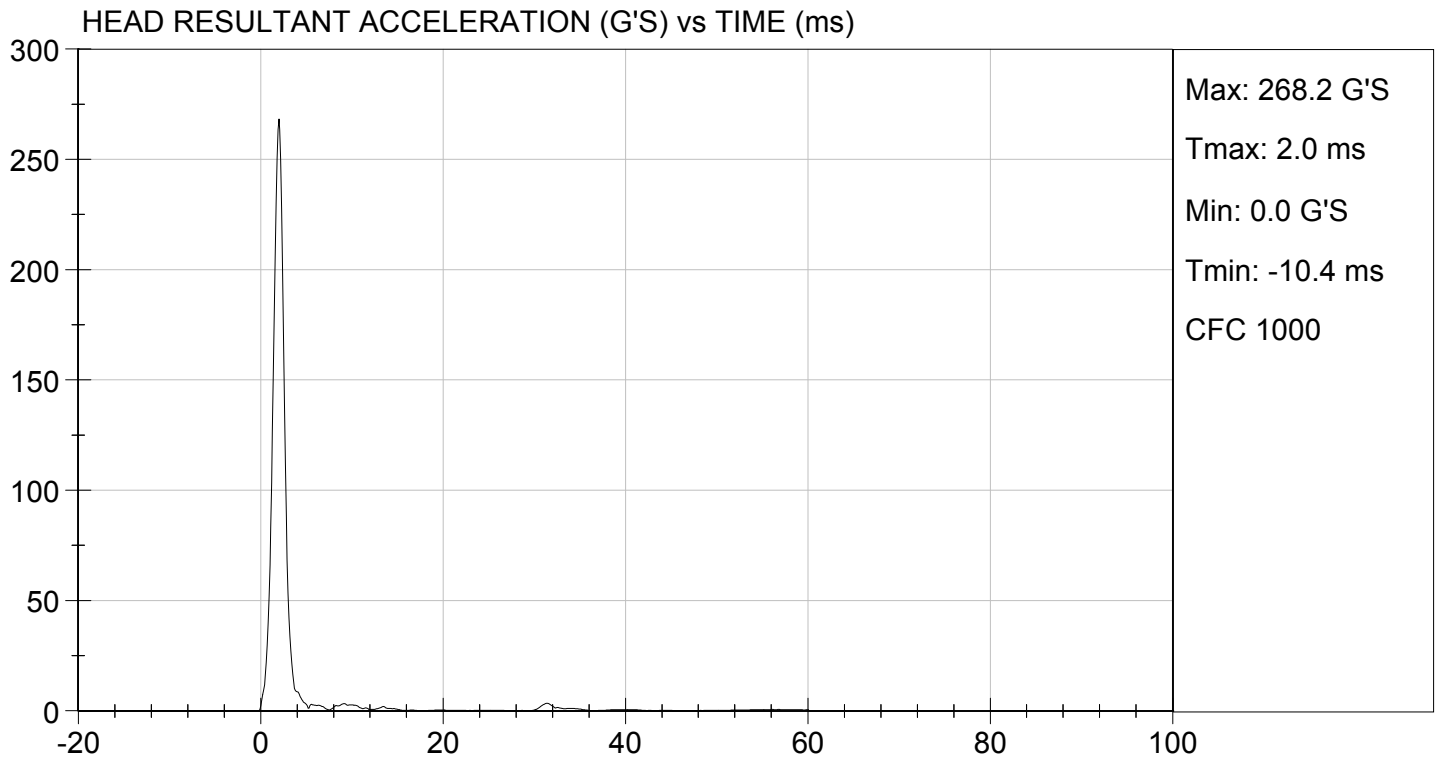
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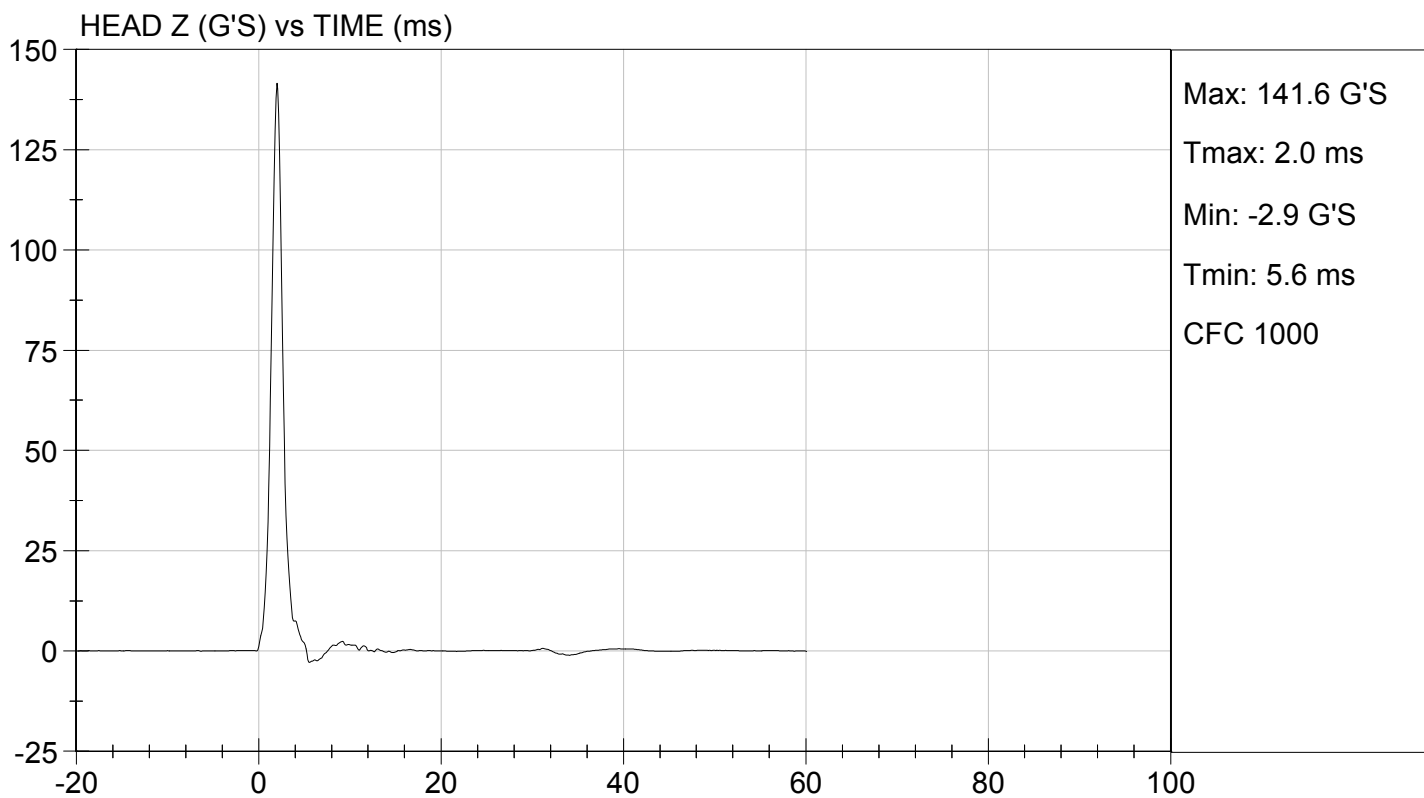
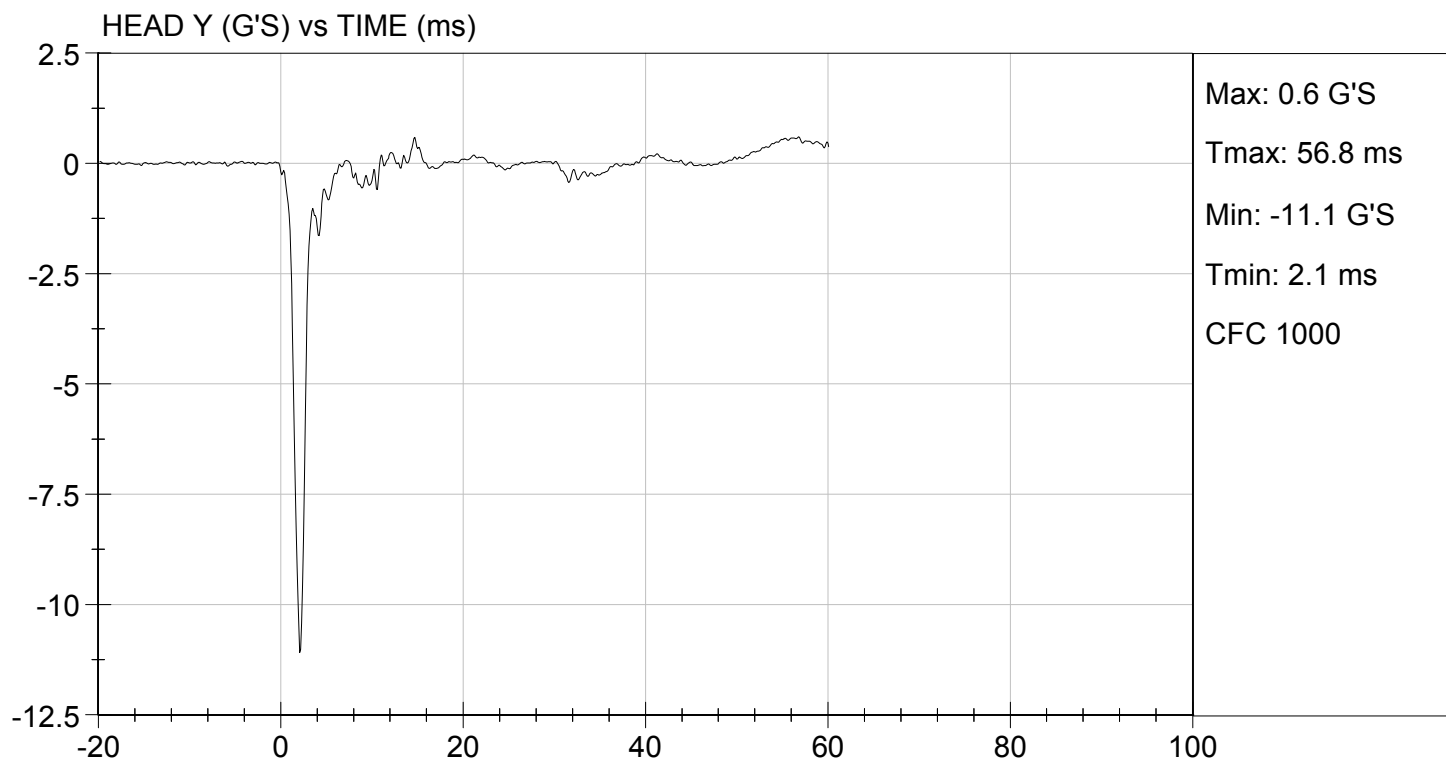
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	250 to 300	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/22/2016
Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: Thomas Miller

 Pre test calibration
 X Post test calibration verification

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

 X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck 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:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.6°C</u>
Record the maximum humidity:	<u>33%</u>
Record the minimum humidity:	<u>28%</u>

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

Record findings and actions: No damage

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

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

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

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

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

Parameter		Specification	Results
Pendulum impact speed		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	6.96 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.4 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.5 m/s
	@ 30 ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.2 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	74 Nm @ 81 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	87 ms

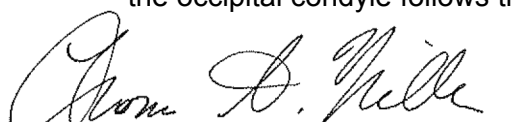
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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


Signature

02/22/2016
Date

MGA RESEARCH CORPORATION

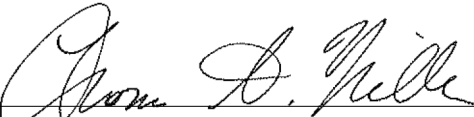
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

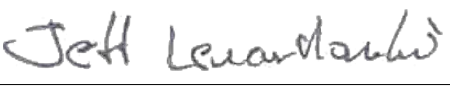
Test I.D: D16742

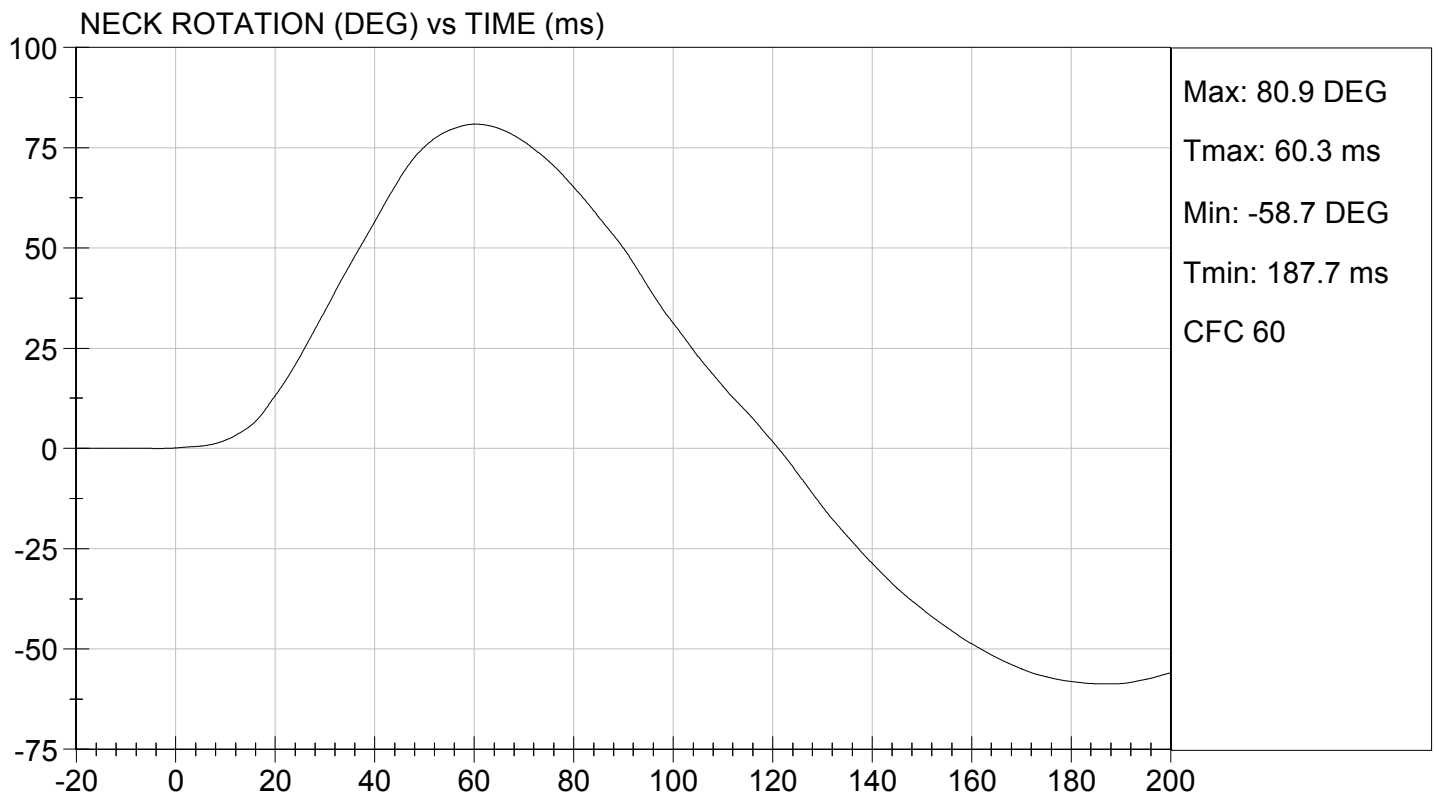
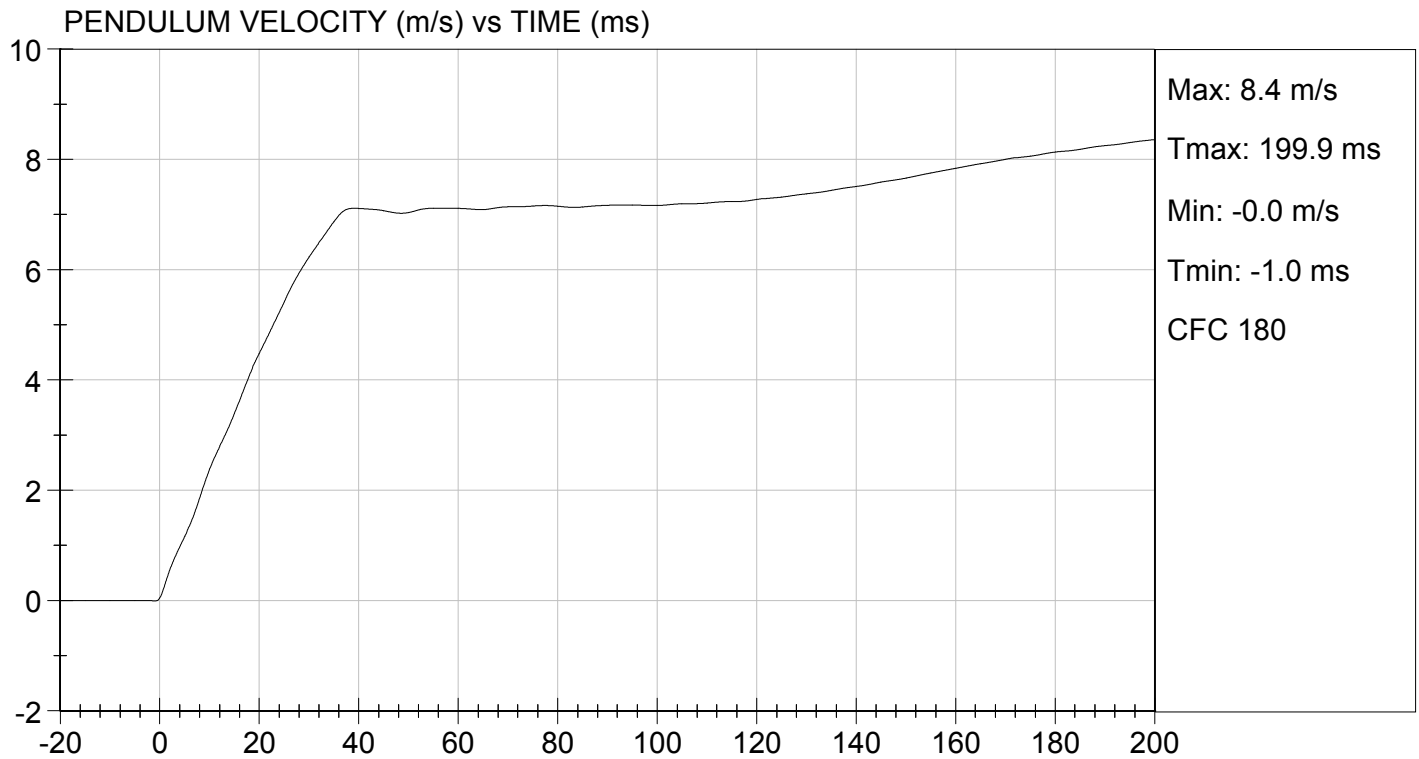
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
Overall Results					Pass

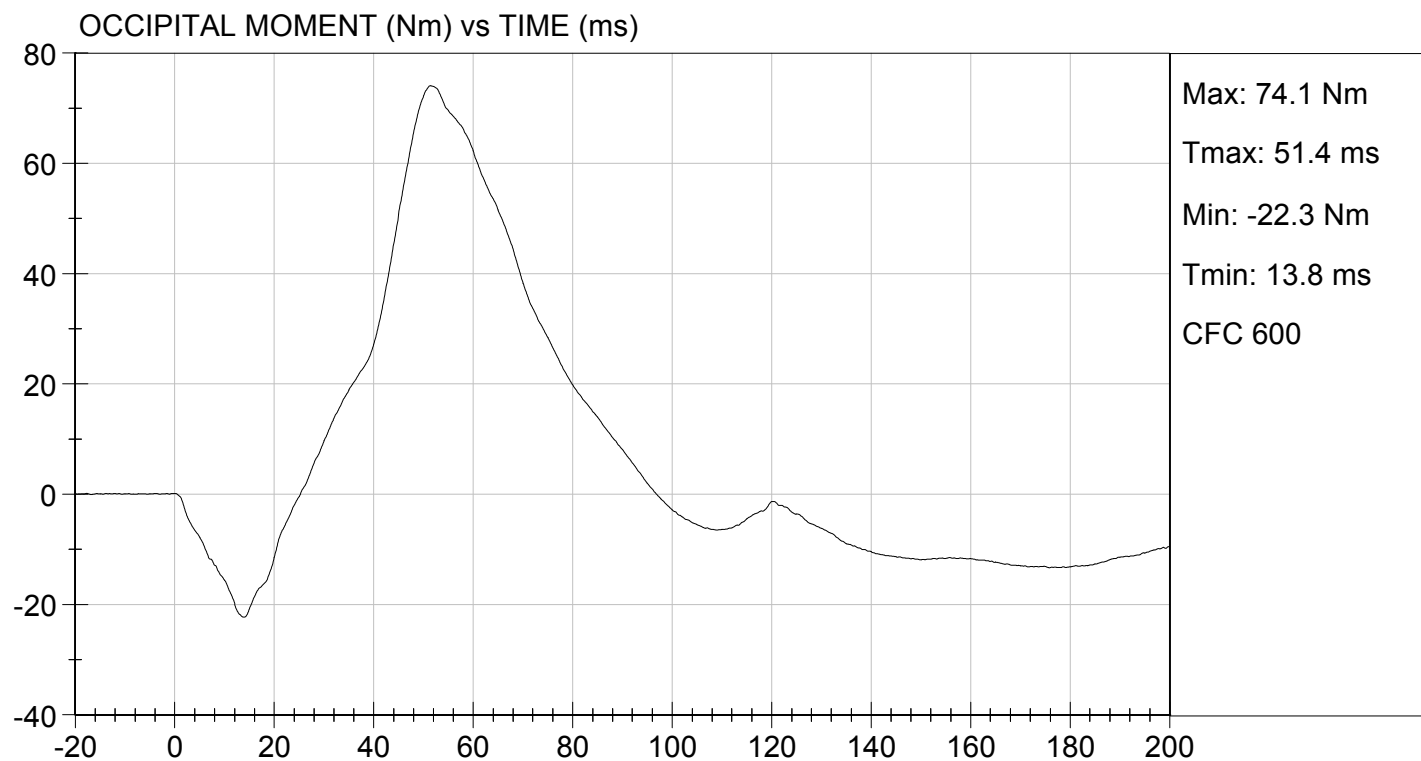

 Laboratory Technician

02/22/2016

Test Date


 Approved By





DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: Thomas Miller

- ☐ Pre test calibration
☒ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- | | |
|------------------------------|------------------|
| Record findings and actions: | <u>No damage</u> |
|------------------------------|------------------|
- ☒ 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: | <u>No Deterioration; Hardness: Front 89; Back 90.</u> |
|------------------------------|---|
- ☒ 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	Results
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.7 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.5 m/s
	@ 30 ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.1 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range 99° $\leq$ angle $\leq$ 114°	-55 Nm @ 106 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	104 ms

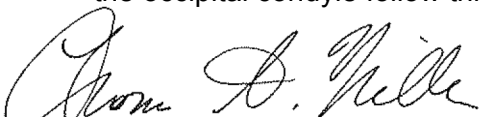
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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


Signature

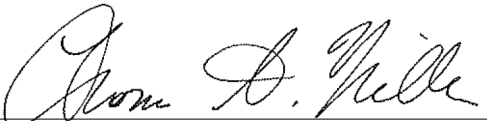
02/22/2016
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

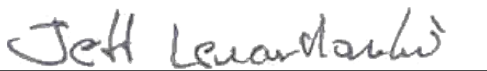
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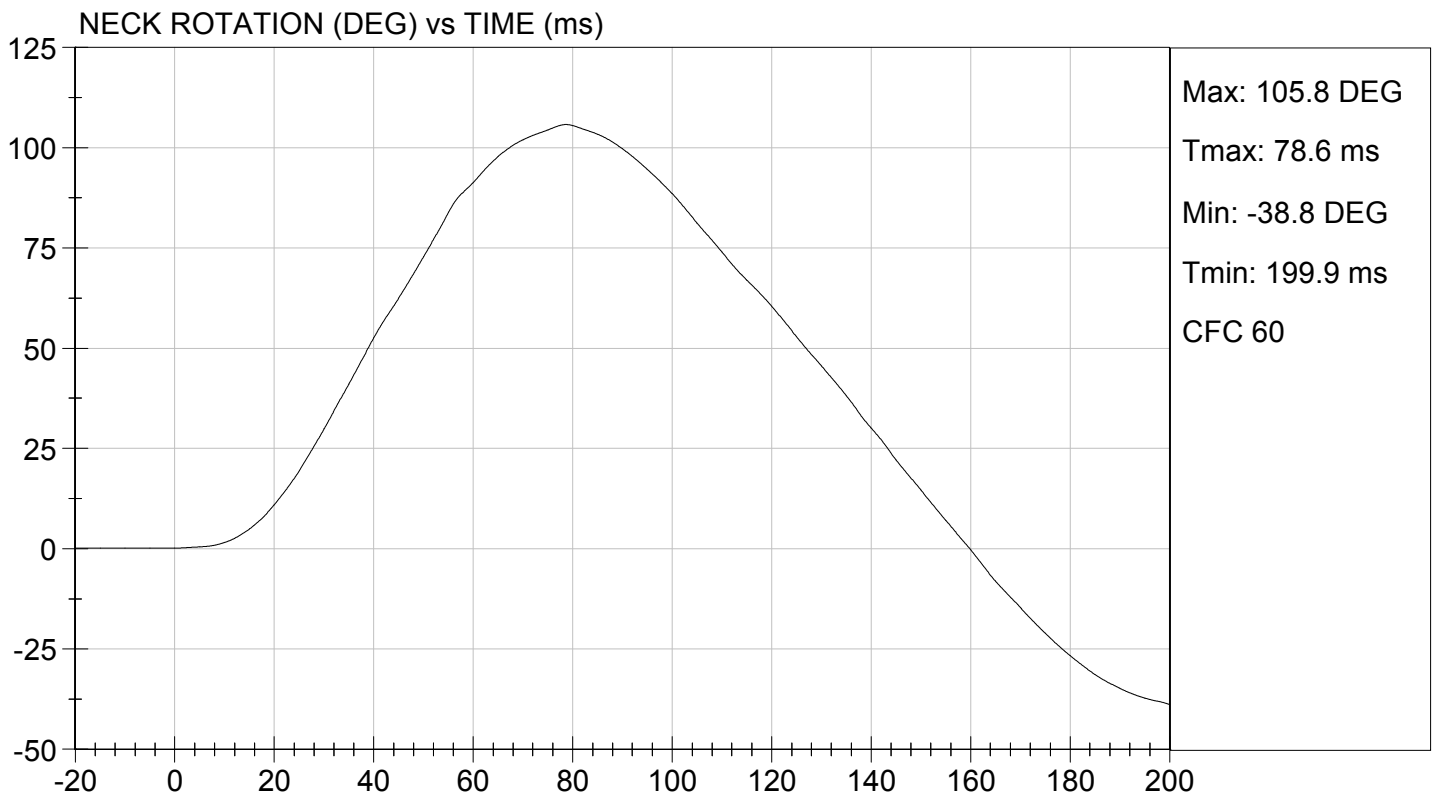
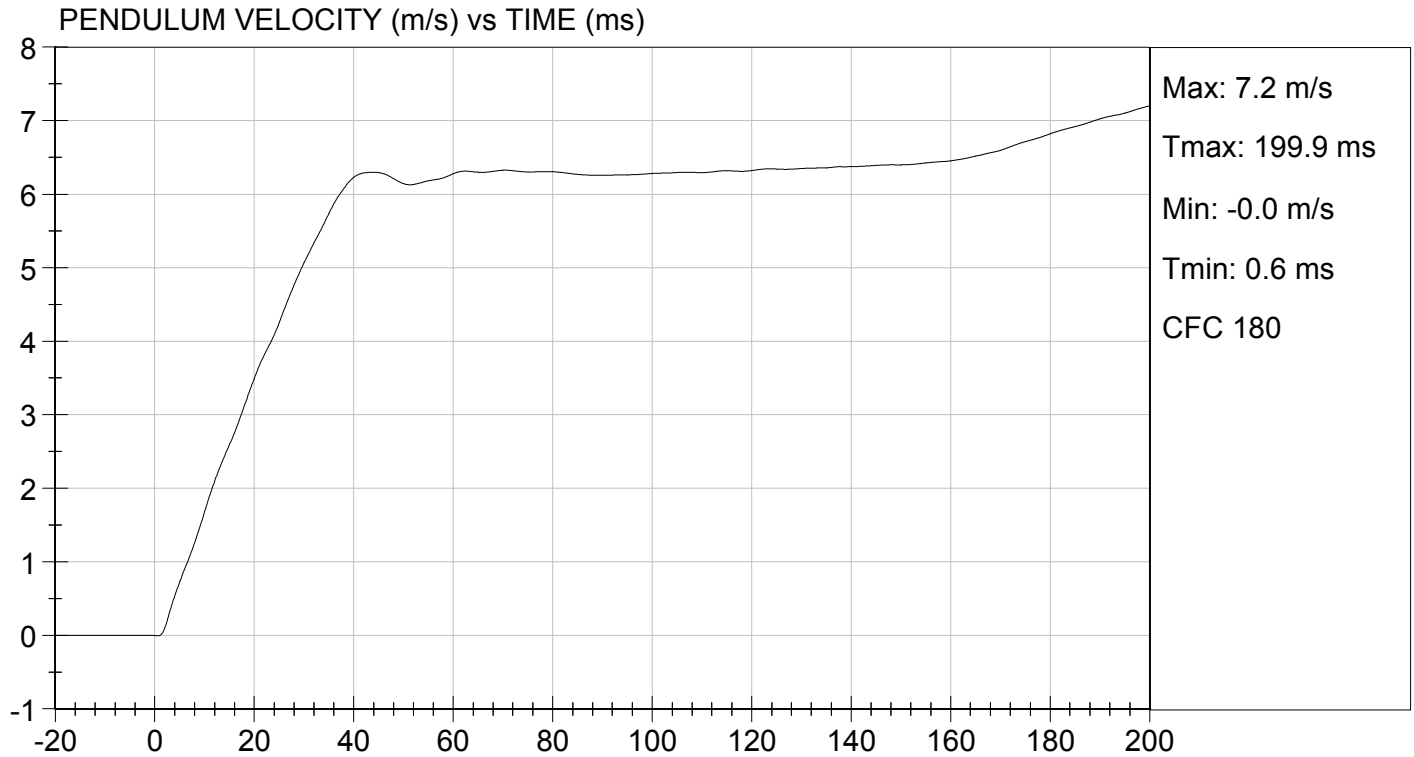
Test I.D: D16743

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


 Laboratory Technician

02/22/2016
 Test Date

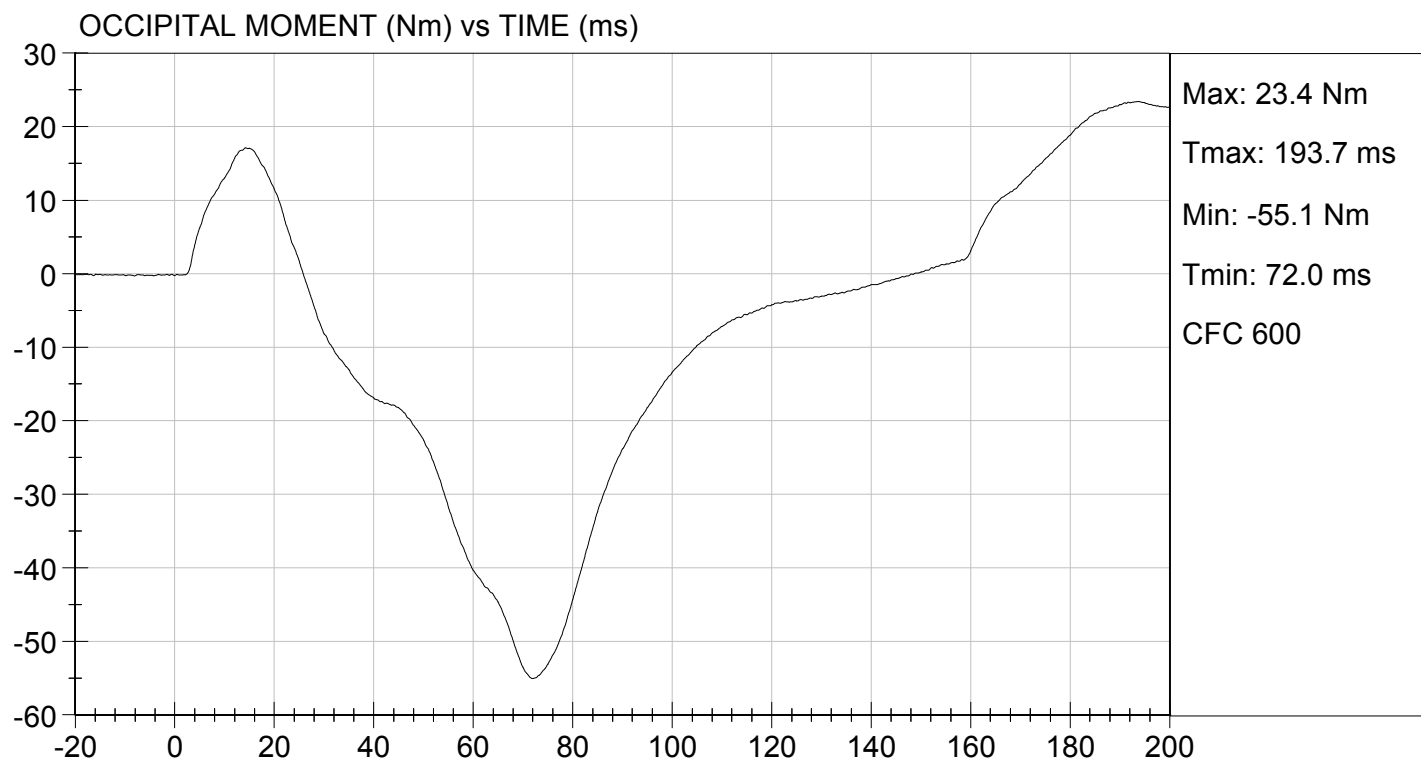

 Approved By





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/22/2016
TEST #: D16743



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
 X N/A, ONLY one thorax impact test performed
- X 2. The test fixture conforms to the specifications in Figure 11B.
- X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.6°C</u>
Record the maximum humidity:	<u>33%</u>
Record the minimum humidity:	<u>28%</u>

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

X - No Damage

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

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	56 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4332 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4153 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

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

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

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

David Schoedel
Signature

02/22/2016
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16744

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	56	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4332	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4153	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/22/2016

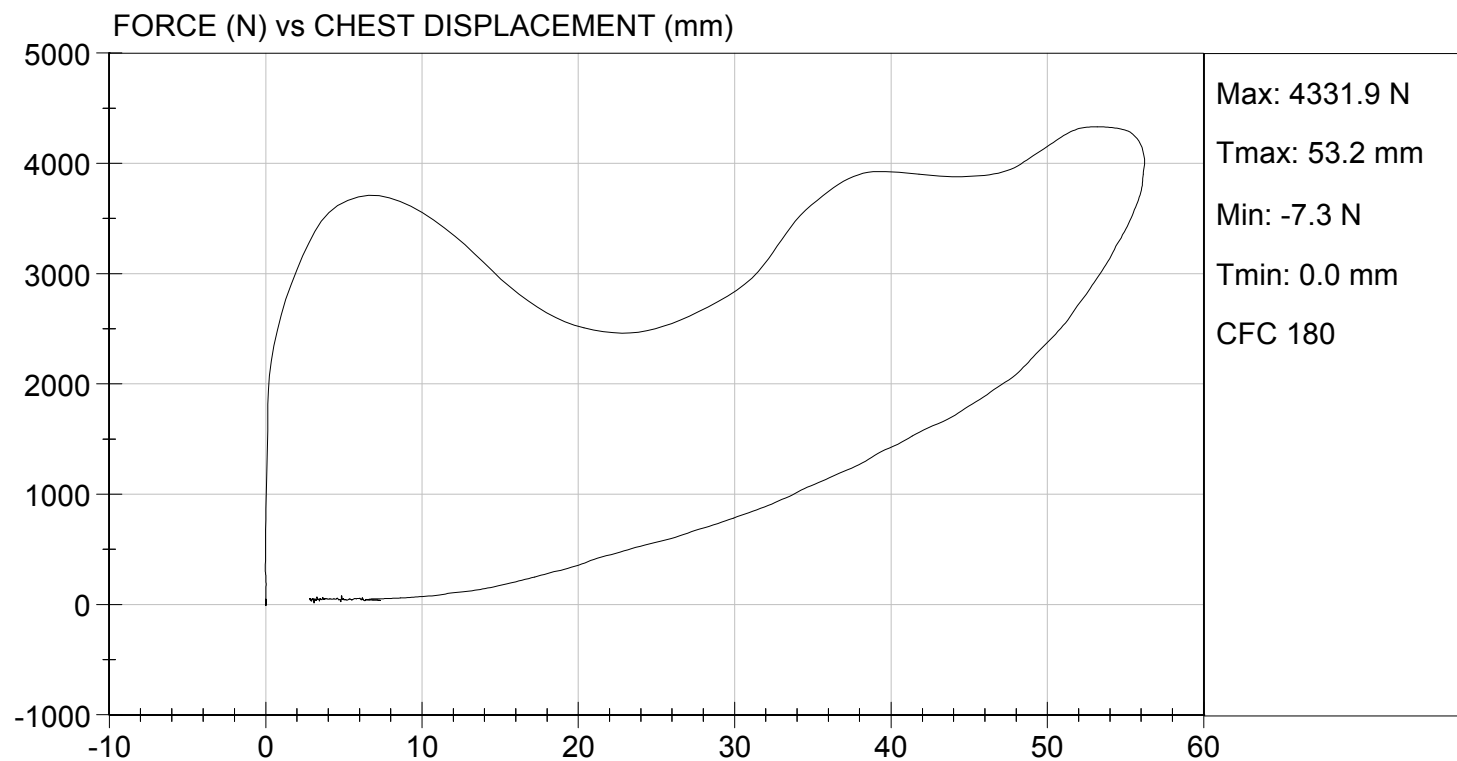
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 02/22/2016
TEST #: D16744



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion 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 femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- 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°): See Result Table
- 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°	19 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	385 N
Final ref. plane angle	Initial ref. plane angle ± 8°	20 deg

David Schoedel
 Signature

02/22/2016
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16747

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	20	Pass
Force at 45 deg	N	320 to 390	385	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

David Schoedel

Laboratory Technician

02/22/2016

Test Date

Jeff Leonard

Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>33%</u> |
| Record the minimum humidity: | <u>28%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3720 N

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

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

David Schoedel

Signature

02/22/2016

Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

Test I.D: D16746

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3720	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/22/2016

Test Date

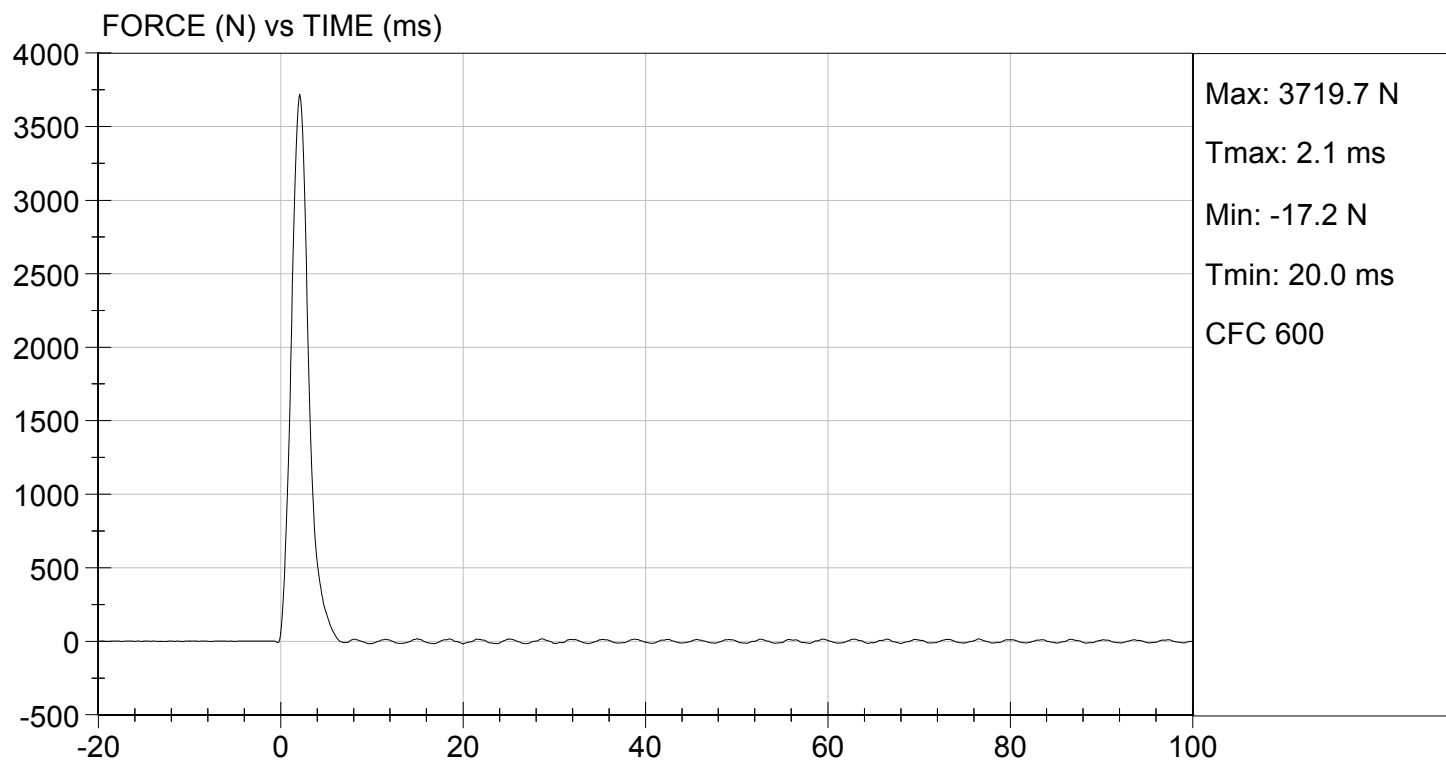
Jeff Leonard

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 02/22/2016
TEST #: D16746



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/22/2016

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.6°C</u>
Record the maximum humidity:	<u>33%</u>
Record the minimum humidity:	<u>28%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3617 N

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

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

David Schoedel
Signature

02/22/2016
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D16745

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3617	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/22/2016

Test Date

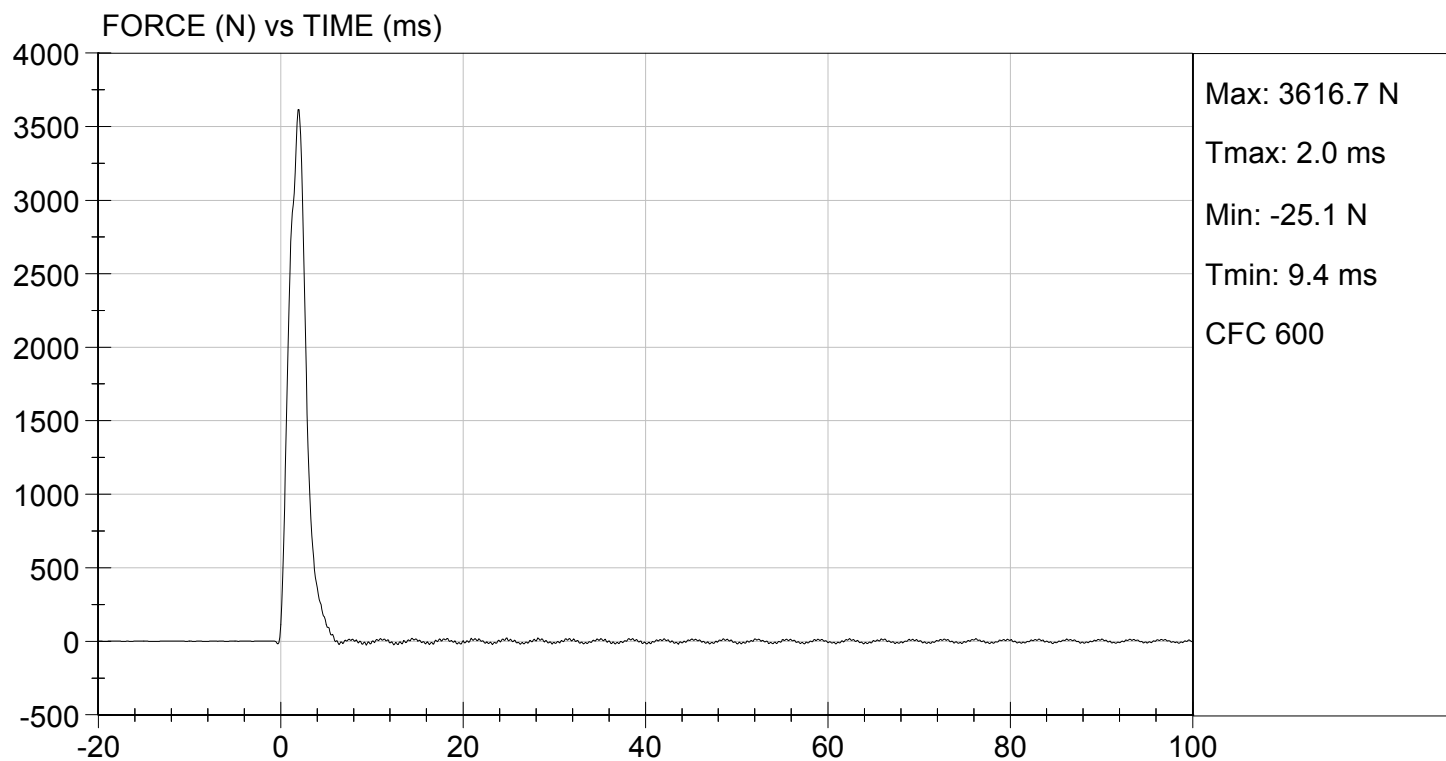
Jeff Leonard

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 02/22/2016
TEST #: D16745



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P86739	01/27/2016	07/27/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P86740	01/27/2016	07/27/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P86741	01/27/2016	07/27/2016
NECK TRANSDUCER	Denton	2320	2146	10/21/2015	04/21/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P85149	01/27/2016	07/27/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P85150	01/27/2016	07/27/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P85151	01/27/2016	07/27/2016
CHEST POTENTIOMETER	Servo	14CBI-2897	124	01/27/2016	07/27/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121	950	01/27/2016	07/27/2016
(2) LEFT FEMUR	Denton	2121	959	01/27/2016	07/27/2016
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	23	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 124

Test Date: 02/22/2016

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

02/22/2016
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/22/2016
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #507, 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	781.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.4
C	H-POINT HEIGHT	Reference	81.3-86.3	84.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	148.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	79.2
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130.3
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	249
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	44.8
I	SHOULDER TO ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	280.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	201.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	544.1
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	356.5
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	394.0
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	434.2

HYBRID III 5 th SN #507, PART 572, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	186.7
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	222.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	481.3
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.4
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	178.1
U	HIP BREADTH	The widest part of the hip	299.7-314.9	309.6
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	363.9
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	89.0
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	863.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	787.1
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	342.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	168.0

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- ☒ 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- ☒ 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- ☒ 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.1°C</u> |
| Record the maximum humidity: | <u>42%</u> |
| Record the minimum humidity: | <u>38%</u> |
- ☒ 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage

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: 501 mm

Record the left side distance: 501 mm

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: 50.9 micro inches

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	$250 \text{ g} \leq x \leq 300 \text{ g}$	265 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	8.1 g

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

David Schoedel

Signature

11/19/2015

Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test ID: D153831

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Peak Resultant Acceleration	G's	250 to 300	265	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

David Schoedel

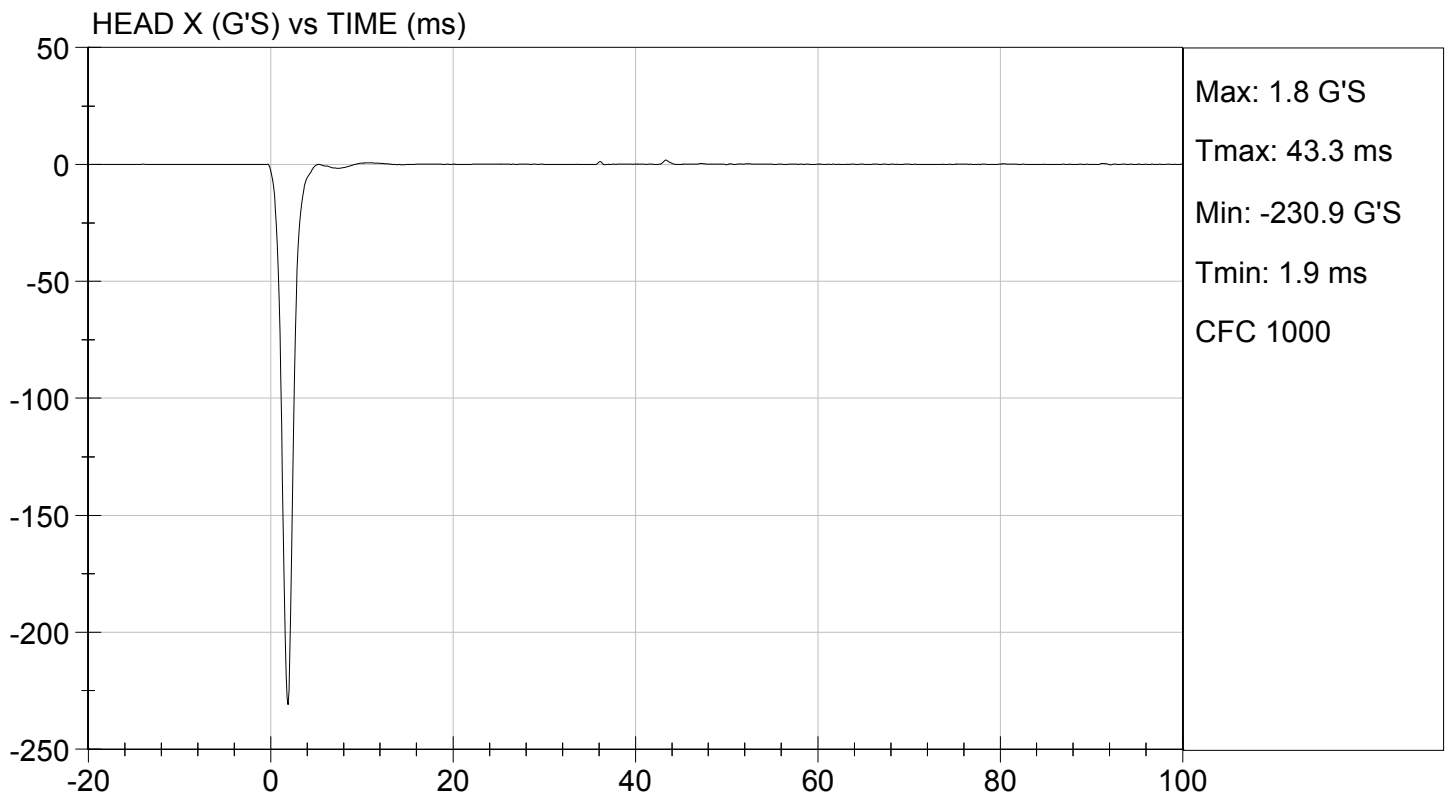
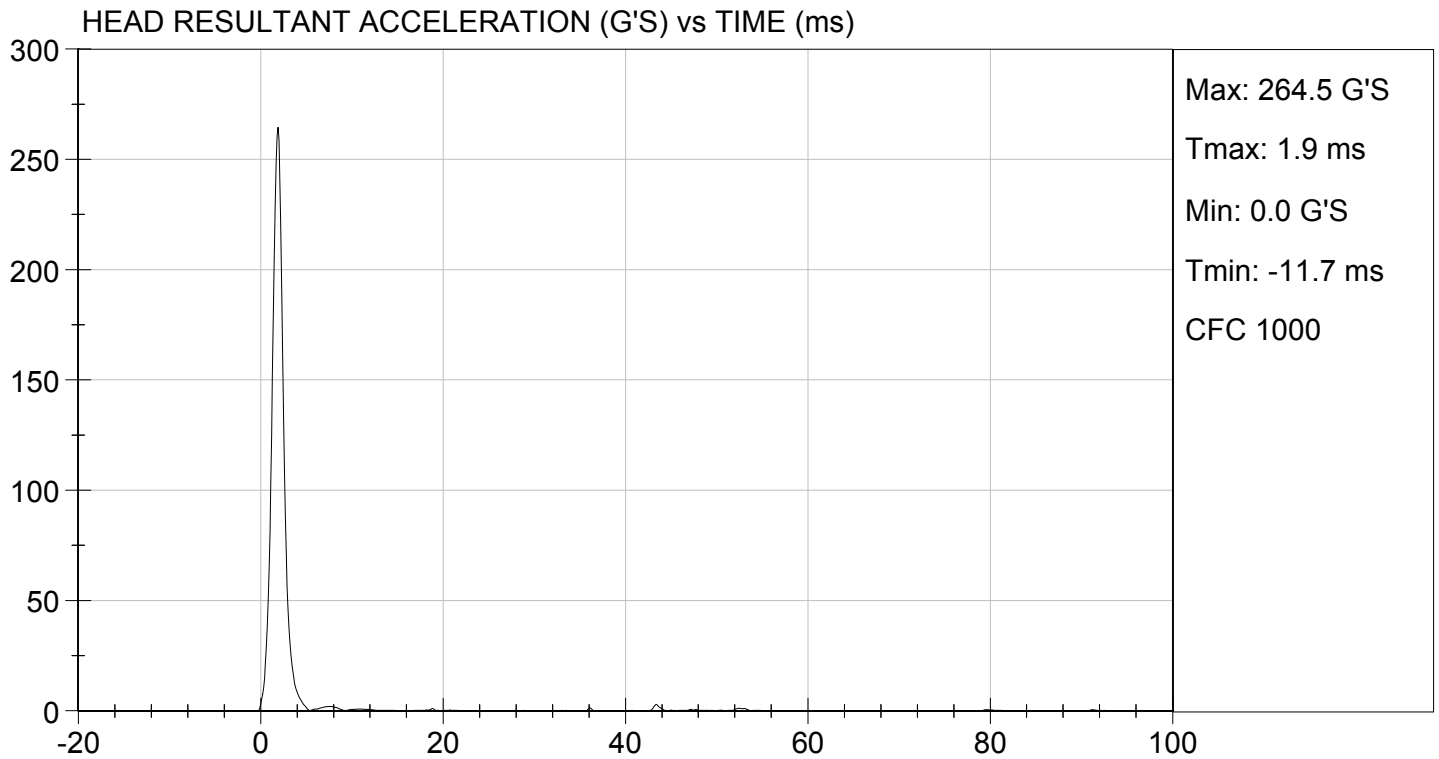
Laboratory Technician

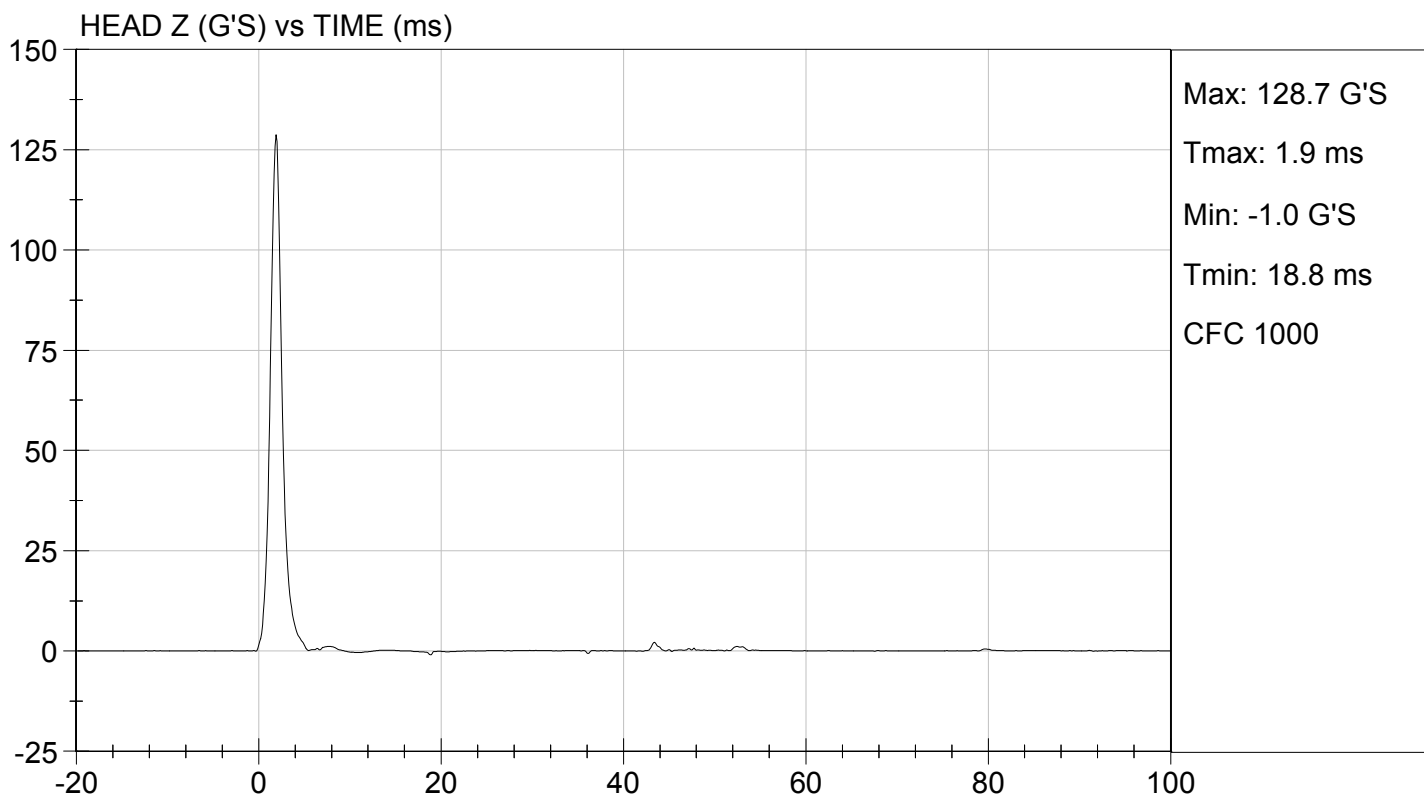
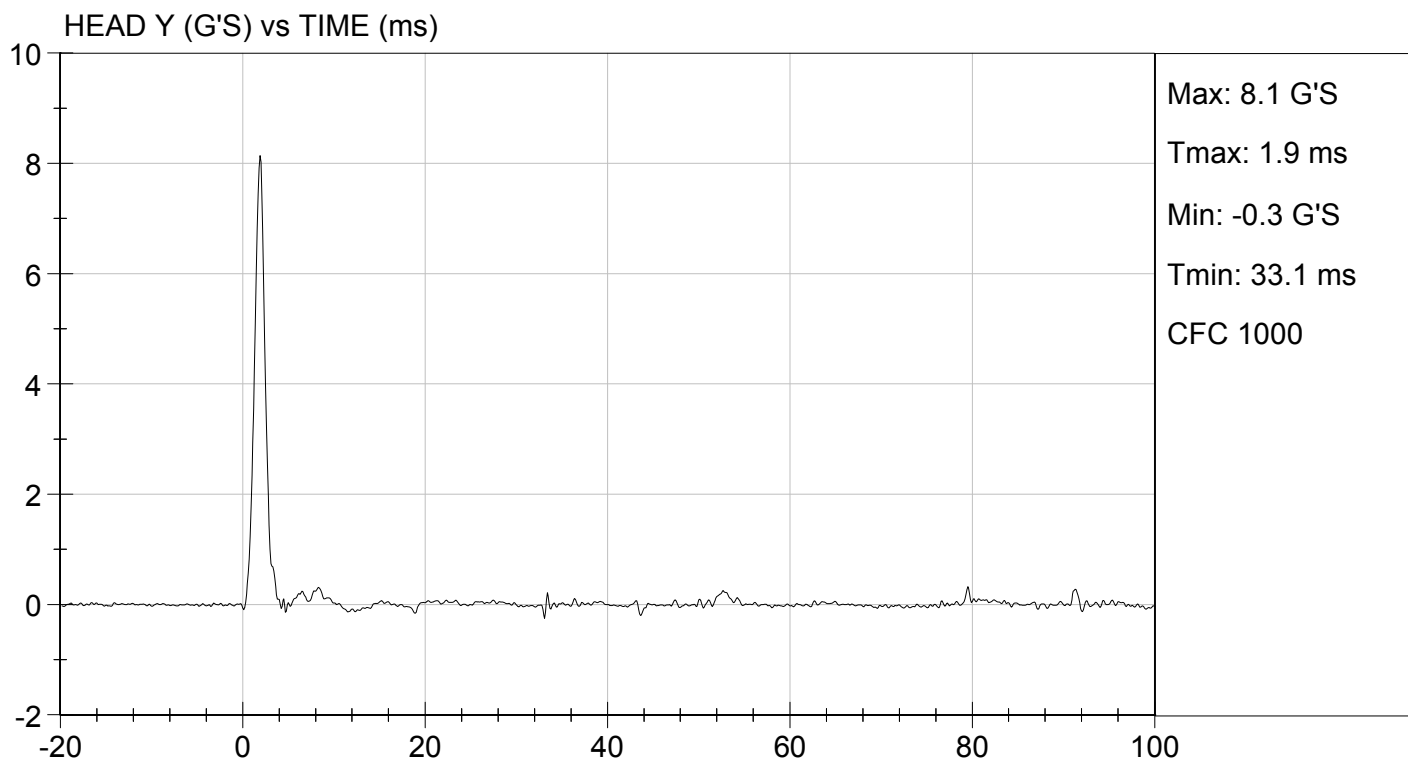
11/19/2015

Test Date

Jeff Leonard

Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck 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: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.1°C</u> |
| Record the maximum humidity: | <u>42%</u> |
| Record the minimum humidity: | <u>38%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.5 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.7 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.5 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	70 Nm @ 79 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	85 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

11/19/2015
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D153832

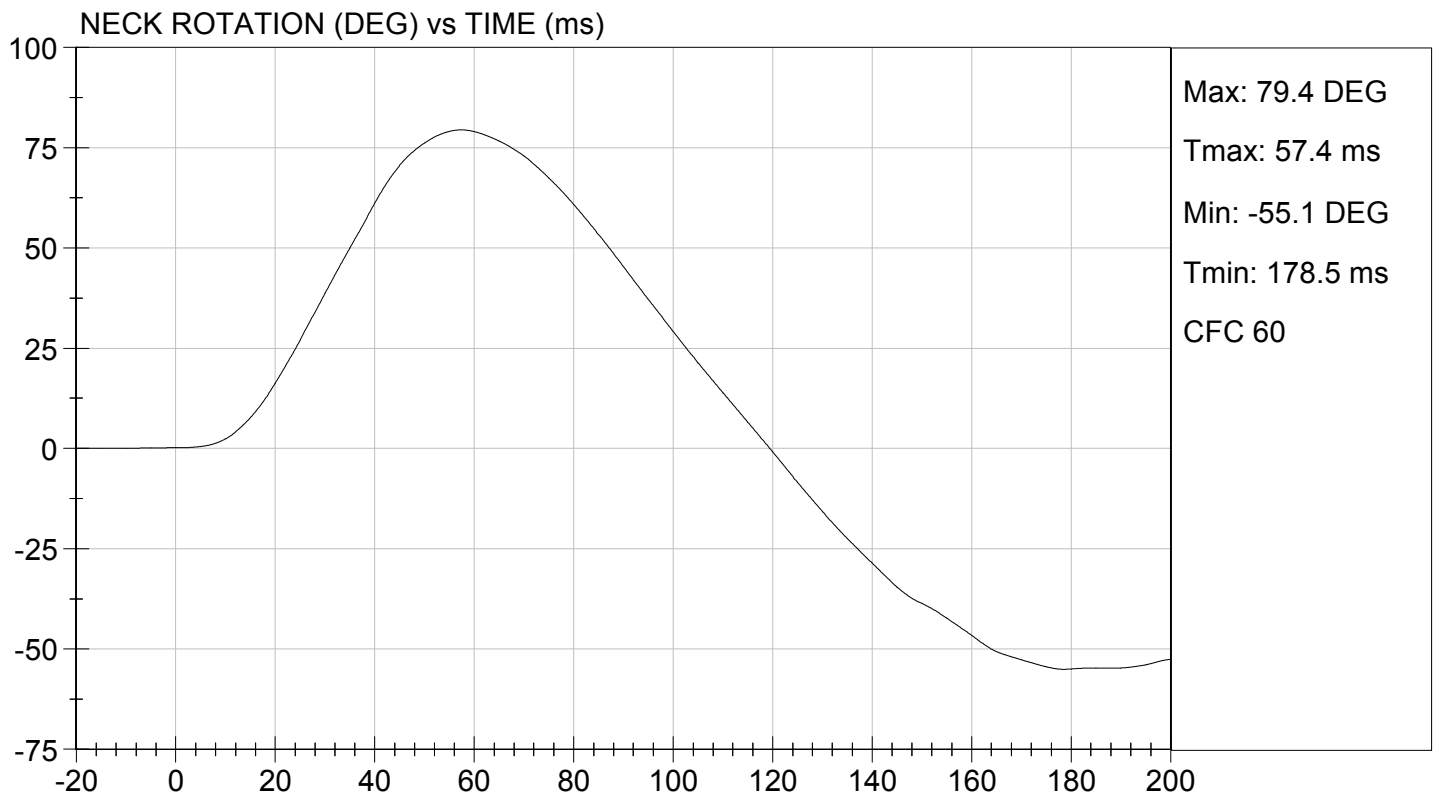
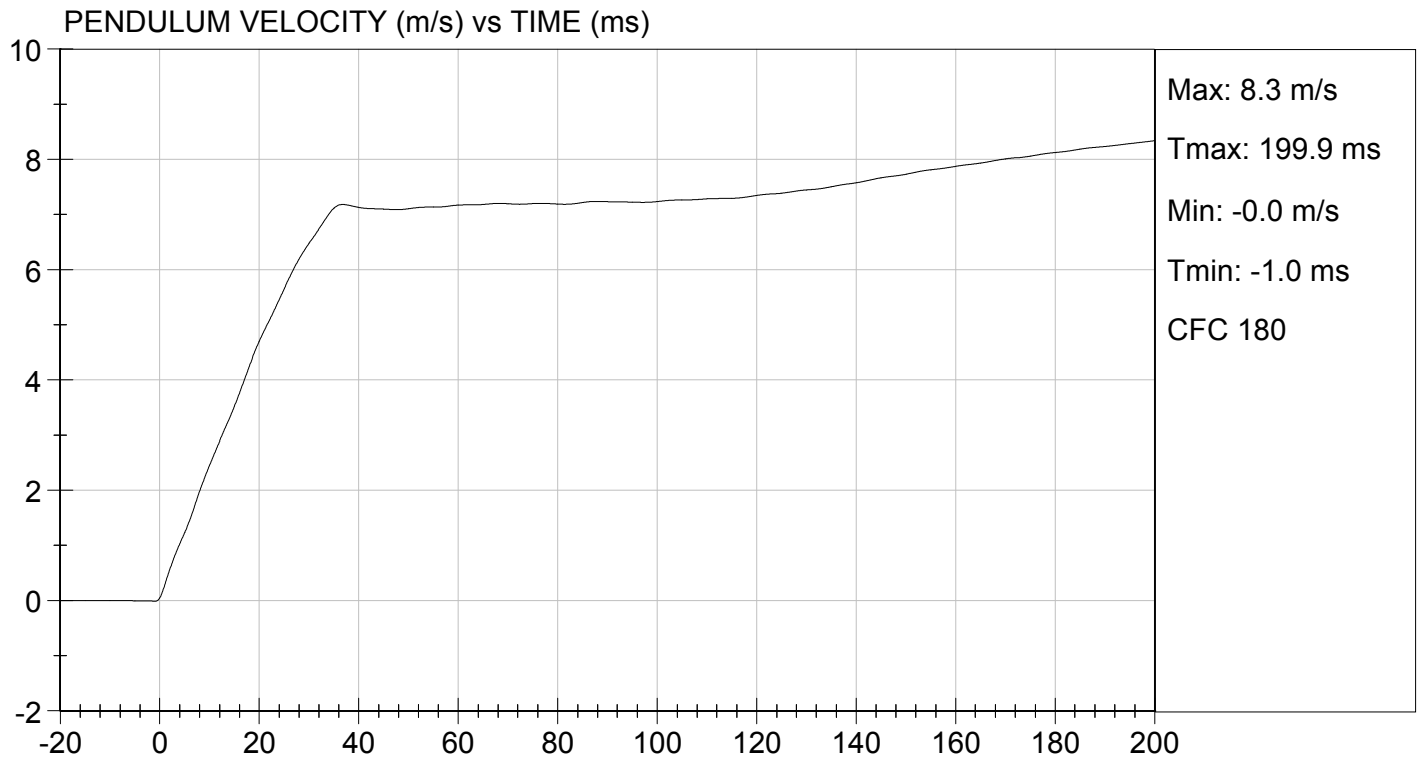
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	38	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

11/19/2015

Test Date

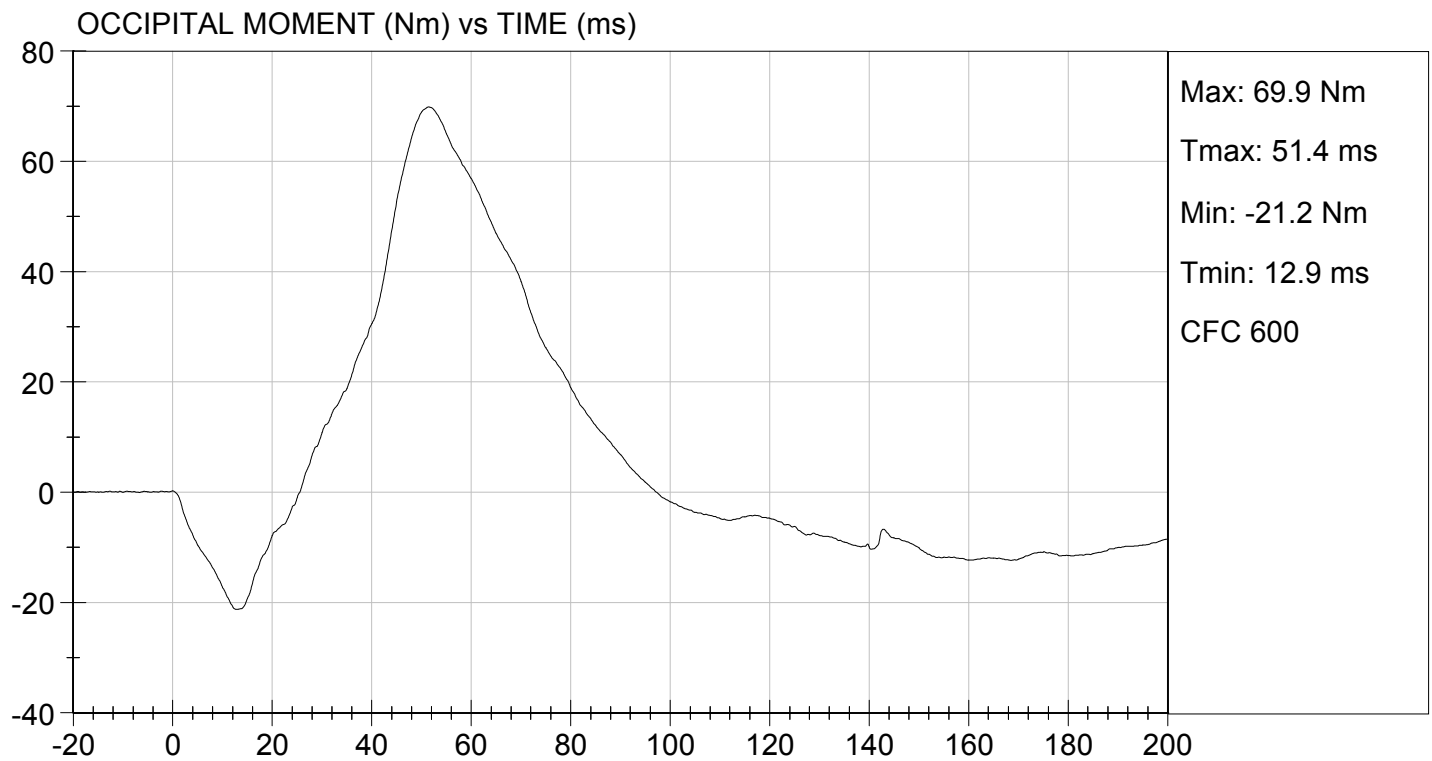
Jeff Leonard
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/19/2015
TEST #: D153832



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last extension test. (572.137(q))
 X N/A, ONLY one neck 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: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.1°C</u> |
| Record the maximum humidity: | <u>42%</u> |
| Record the minimum humidity: | <u>38%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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	Results
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.9 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.8 m/s
	@ 30 ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.5 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range 99° $\leq$ angle $\leq$ 114°	-54 Nm @ 111 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	104 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel
Signature

11/19/2015
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D153833

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	38	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.8	Pass
	30 ms	m/s	4.6 to 5.6	5.5	Pass
D Plane Rotation	Max	deg	99 to 114	111	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

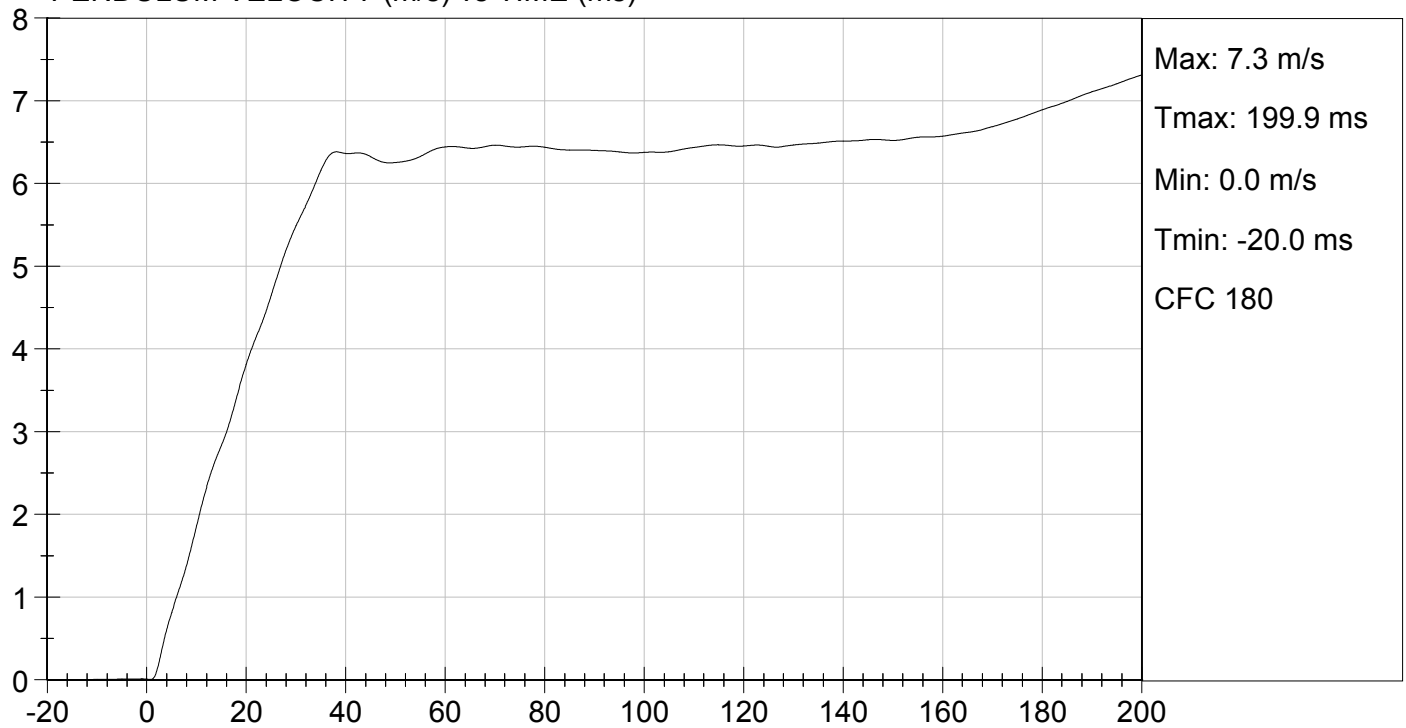
11/19/2015

Test Date

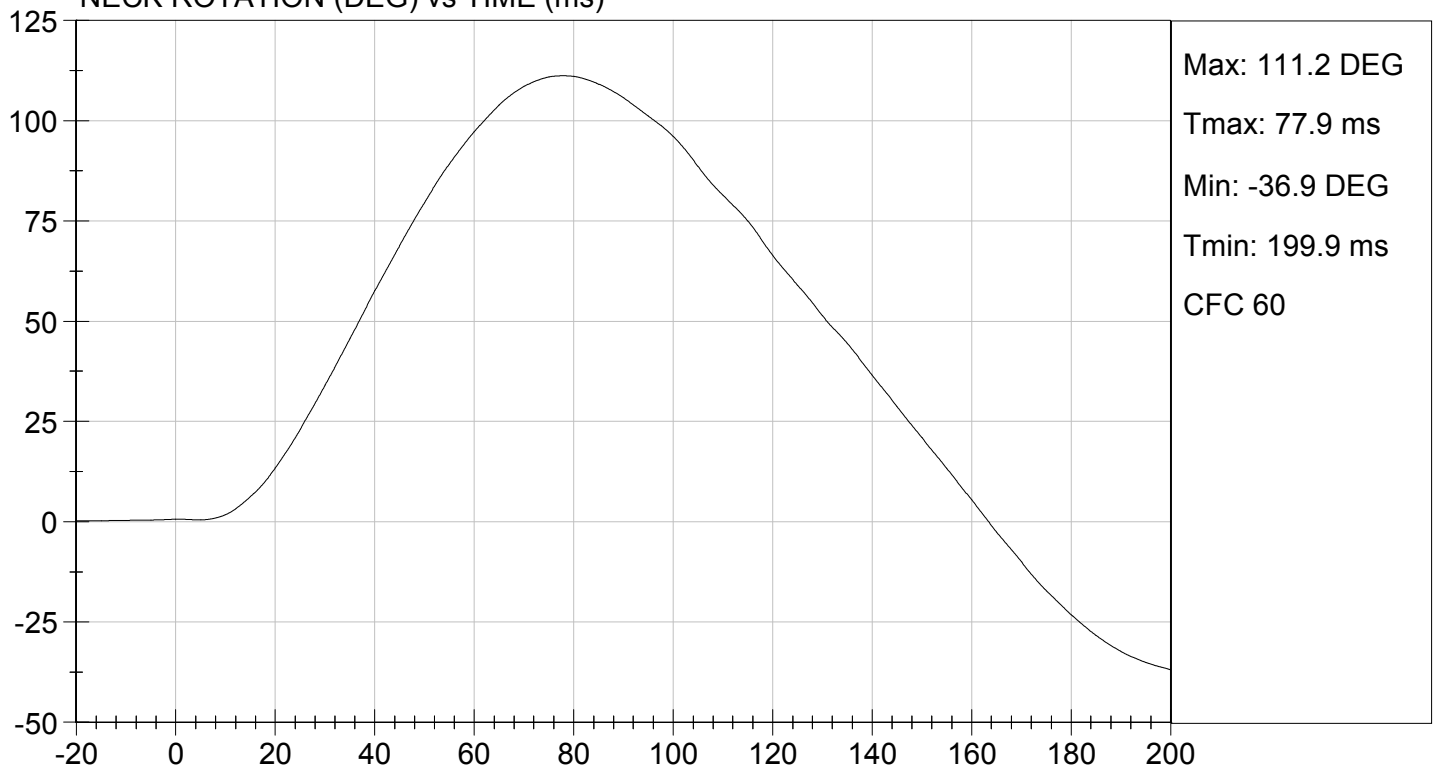
Jeff Leonard
Approved By

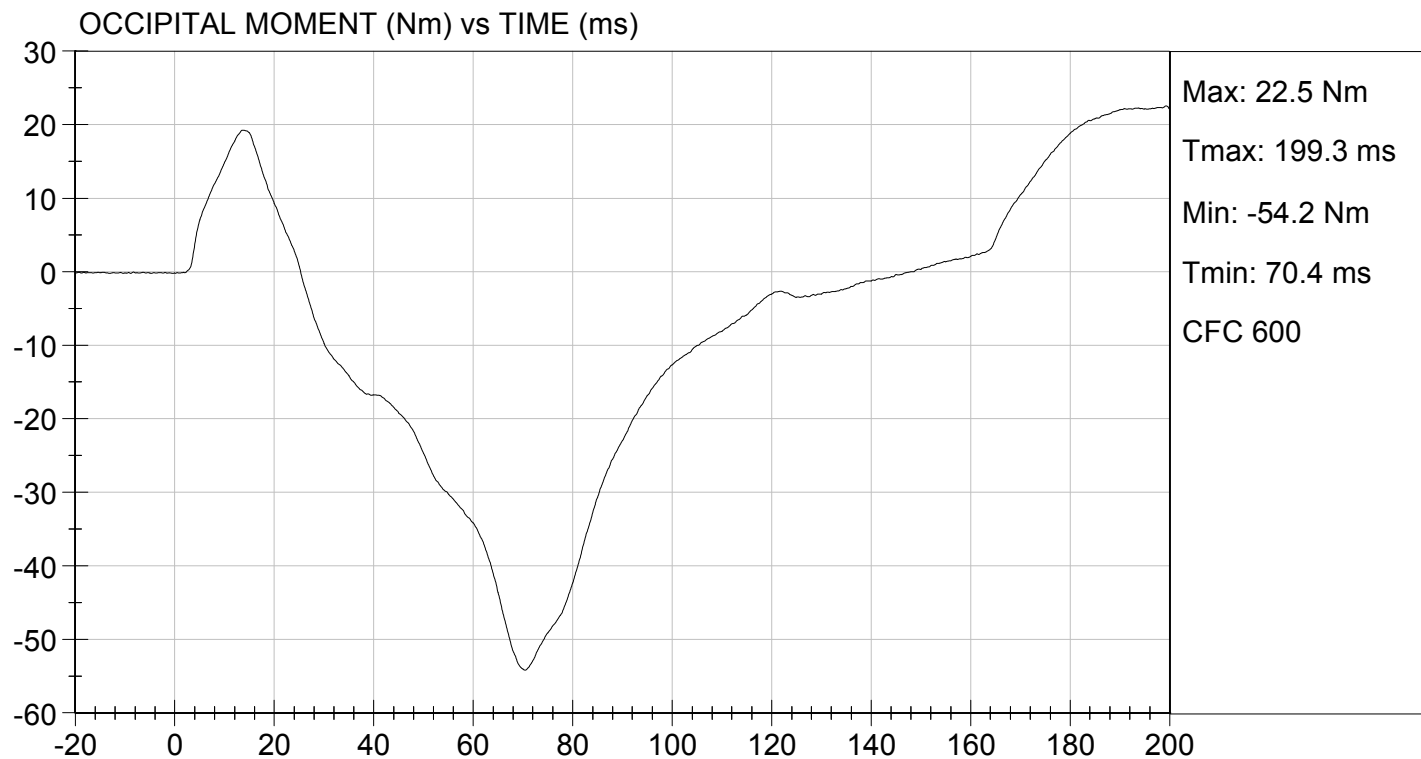


PENDULUM VELOCITY (m/s) vs TIME (ms)



NECK ROTATION (DEG) vs TIME (ms)





DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.1°C</u>
Record the maximum humidity:	<u>42%</u>
Record the minimum humidity:	<u>38%</u>

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

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

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

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4201 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4355 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

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

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

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

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

David Schoedel
Signature

11/19/2015
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D153834

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4201	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4355	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

11/19/2015

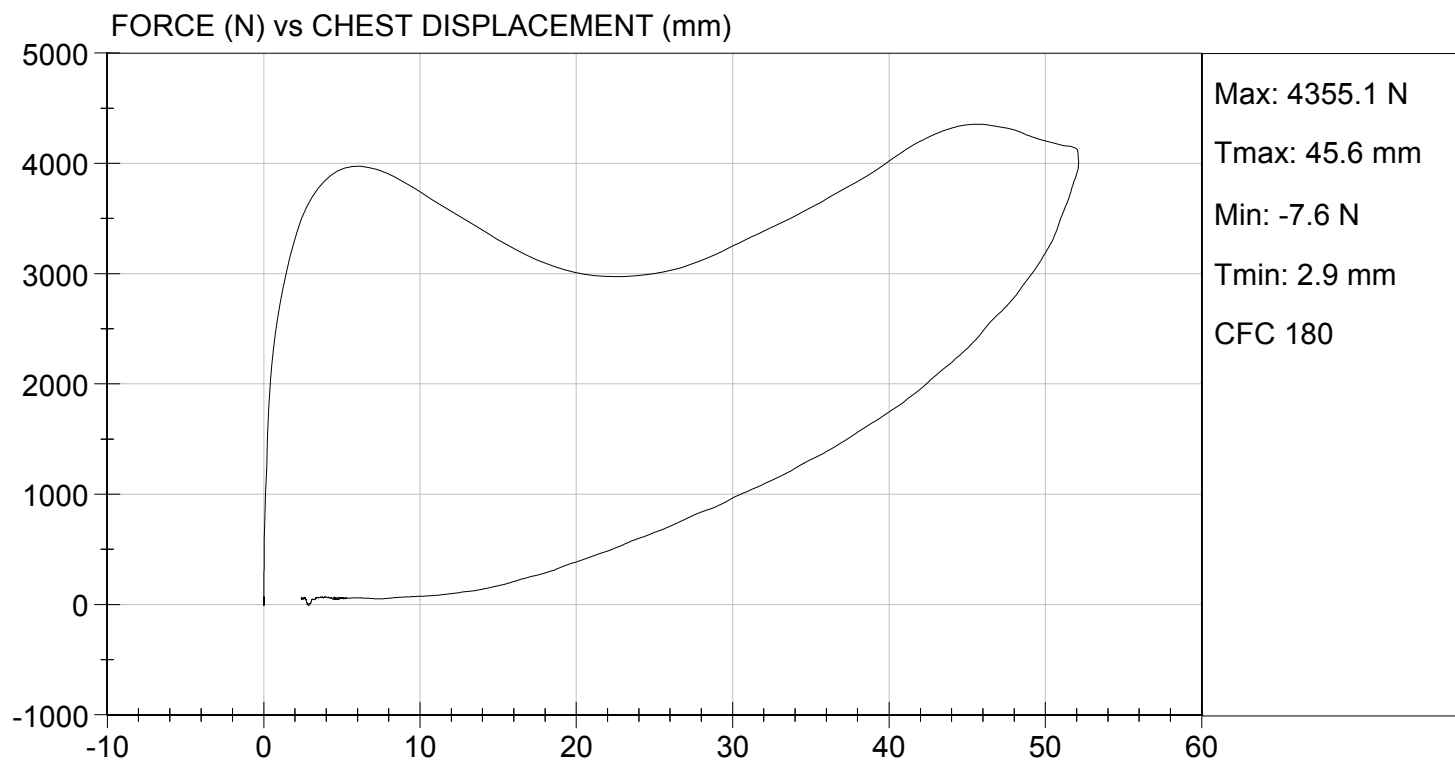
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 11/19/2015
TEST #: D153834



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
☒ N/A, ONLY one torso flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
☐ With legs below femurs.
☒ Without legs below femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.1°C</u> |
| Record the maximum humidity: | <u>42%</u> |
| Record the minimum humidity: | <u>38%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- ☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- ☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- 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°): See Result Table
- 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°	19 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.7 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	385 N
Final ref. plane angle	Initial ref. plane angle ± 8°	23 deg

David Schoedel
 Signature

11/19/2015
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D153837

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	23	Pass
Force at 45 deg	N	320 to 390	385	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result				Pass

David Schoedel
Laboratory Technician

11/19/2015

Test Date

Jeff Leonardakis
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.1°C</u>
Record the maximum humidity:	<u>42%</u>
Record the minimum humidity:	<u>38%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3602 N

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

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

David Schoedel
Signature

11/19/2015
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 507

Test I.D: D153836

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3602	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

11/19/2015

Test Date

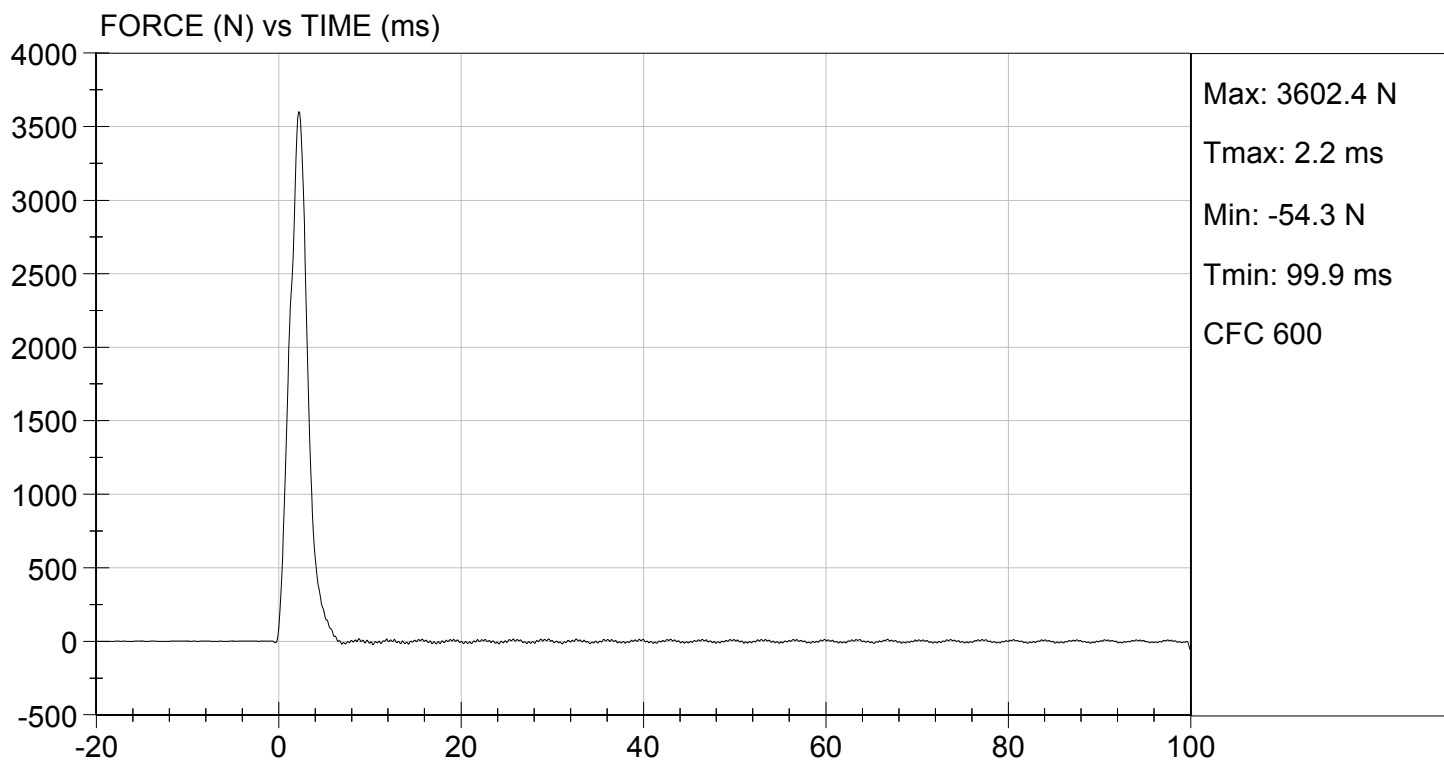
Jeff Leonard

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 11/19/2015
TEST #: D153836



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 507

Test Date: 11/19/2015

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14B.
- ☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.8°C</u>
Record the minimum temperature:	<u>21.1°C</u>
Record the maximum humidity:	<u>42%</u>
Record the minimum humidity:	<u>38%</u>

- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3934 N

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

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

David Schoedel

Signature

11/19/2015

Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D153835

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3934	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

11/19/2015

Test Date

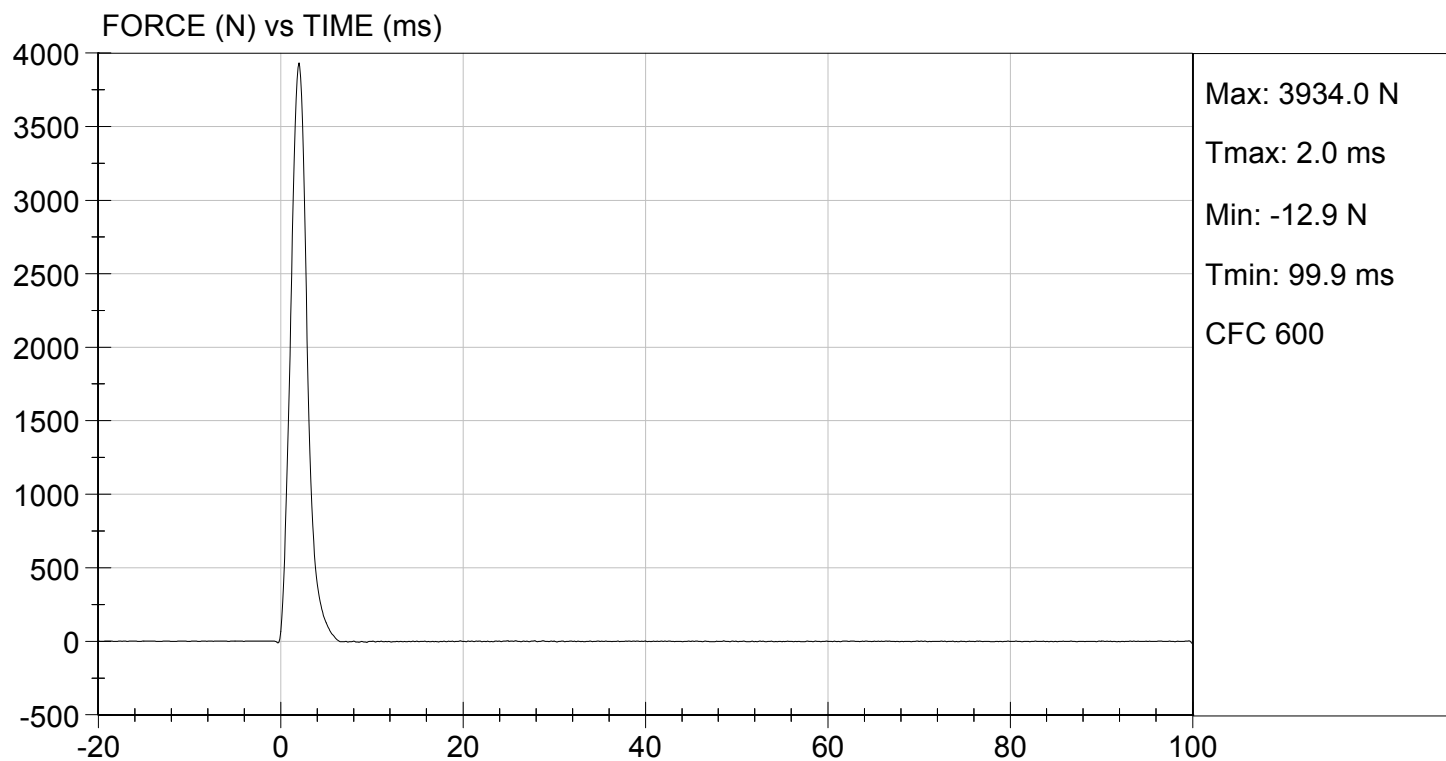
Jeff Leonard

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 11/19/2015
TEST #: D153835



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P80121	11/09/2015	05/09/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P80122	11/09/2015	05/09/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P80123	11/09/2015	05/09/2016
NECK TRANSDUCER	Denton	1716	1159	10/23/2015	04/23/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P79647	11/09/2015	05/09/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82319	11/09/2015	05/09/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82673	11/09/2015	05/09/2016
CHEST POTENTIOMETER	Servo	14CBI-2897	507	11/09/2015	05/09/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121	2026	11/09/2015	05/09/2016
(2) LEFT FEMUR	Denton	2121	2027	11/09/2015	05/09/2016
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/24/2015	01/24/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	06/16/2015	12/16/2015
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	06/03/2015	12/03/2015
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	09/28/2015	03/28/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: _____

Jessica Hall

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 507

Test Date: 02/01/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>27%</u> |
| Record the minimum humidity: | <u>26%</u> |
- 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: | <u>No Damage</u> |
|------------------------------|------------------|

- 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: 501 mm
Record the left side distance: 501 mm
- 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: 50.9 micro inches
- X 13. The impact surface is rigidly supported. (572.132(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	269 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	6.3 g

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

David Schoedel
Signature

02/01/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test ID: D16421

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	250 to 300	269	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	6.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

David Schoedel

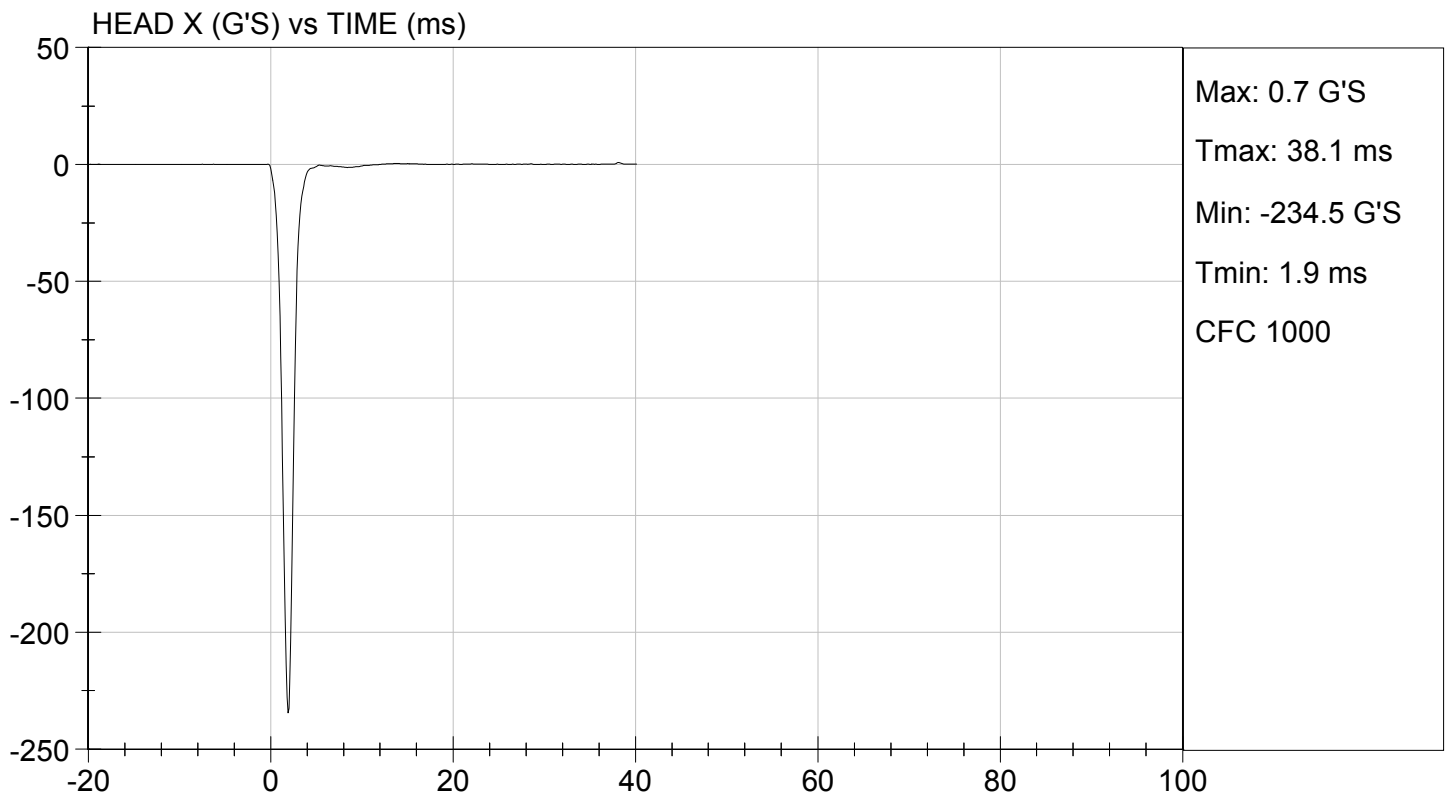
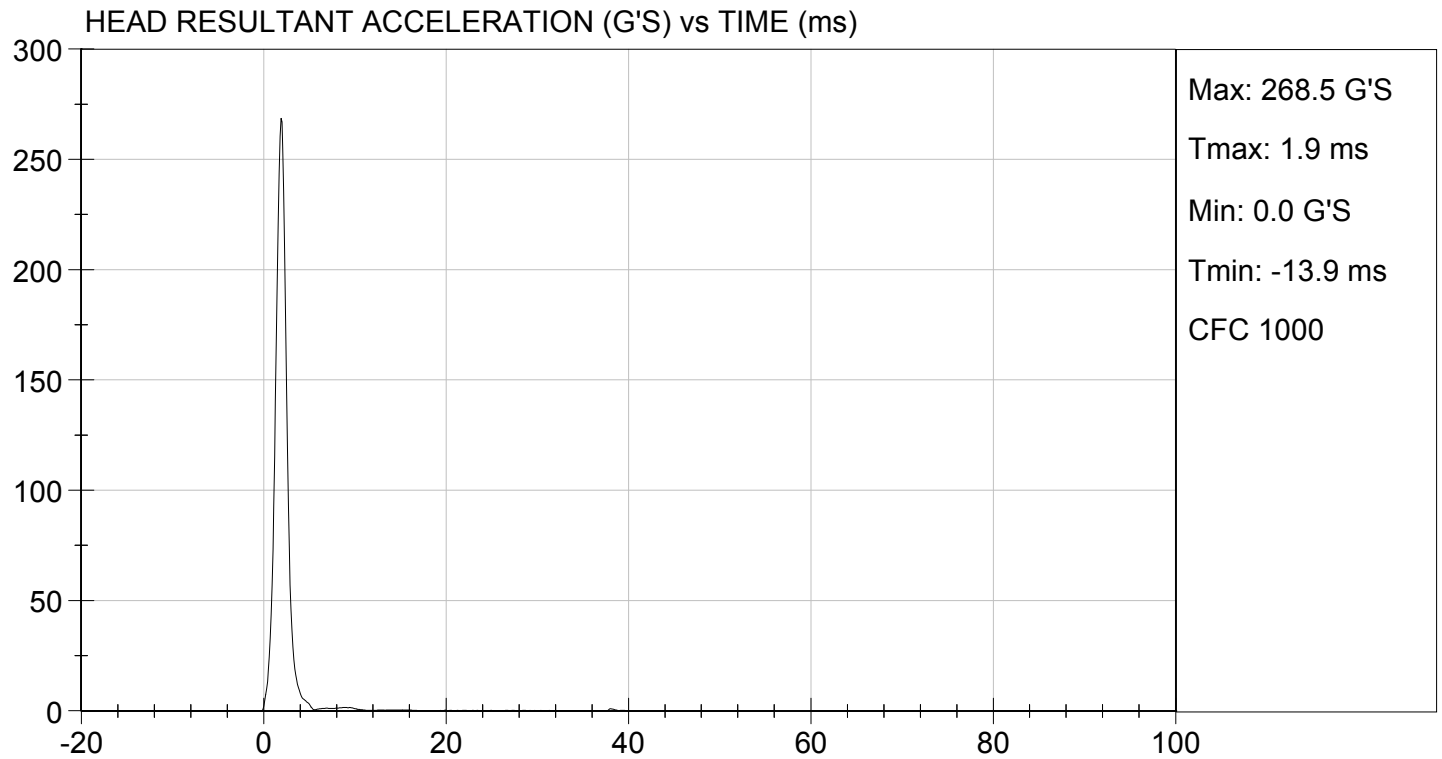
Laboratory Technician

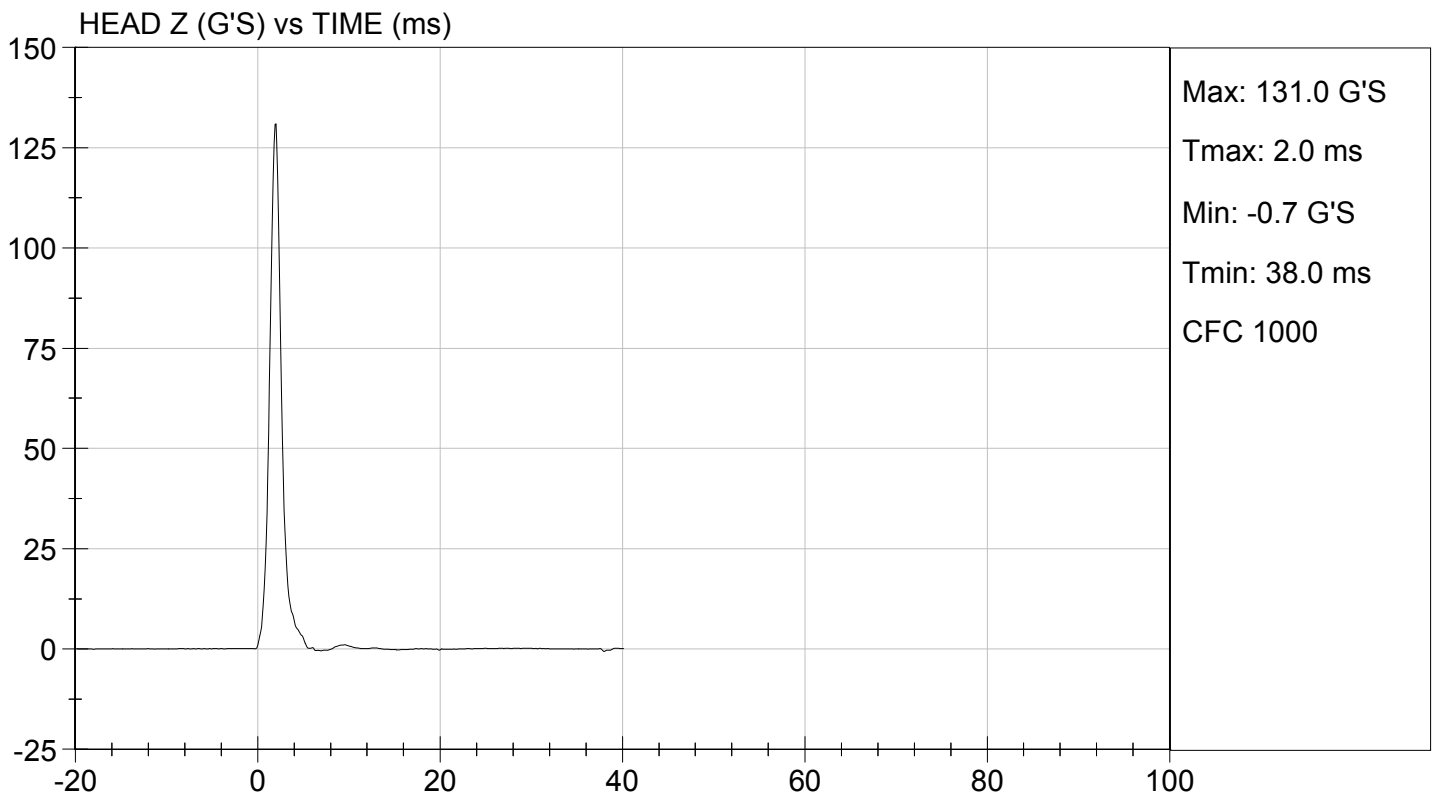
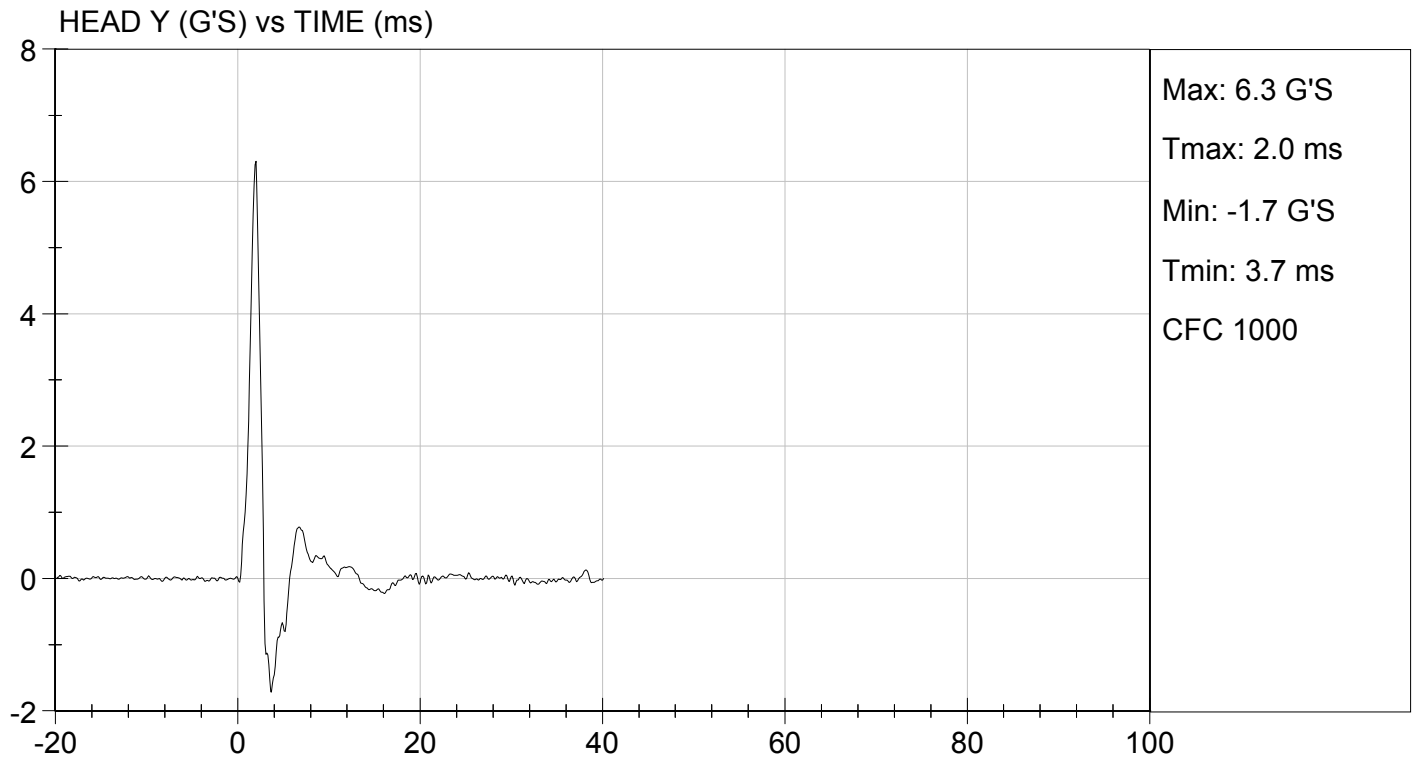
02/01/2016

Test Date

Jeff Leonard

Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 507

Test Date: 02/01/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck 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: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>27%</u> |
| Record the minimum humidity: | <u>26%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.5 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.3 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	71 Nm @ 77 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	90 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel

Signature

02/01/2016

Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D16422

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	26	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	77	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	90	Pass
Overall Results					Pass



Laboratory Technician

02/01/2016

Test Date

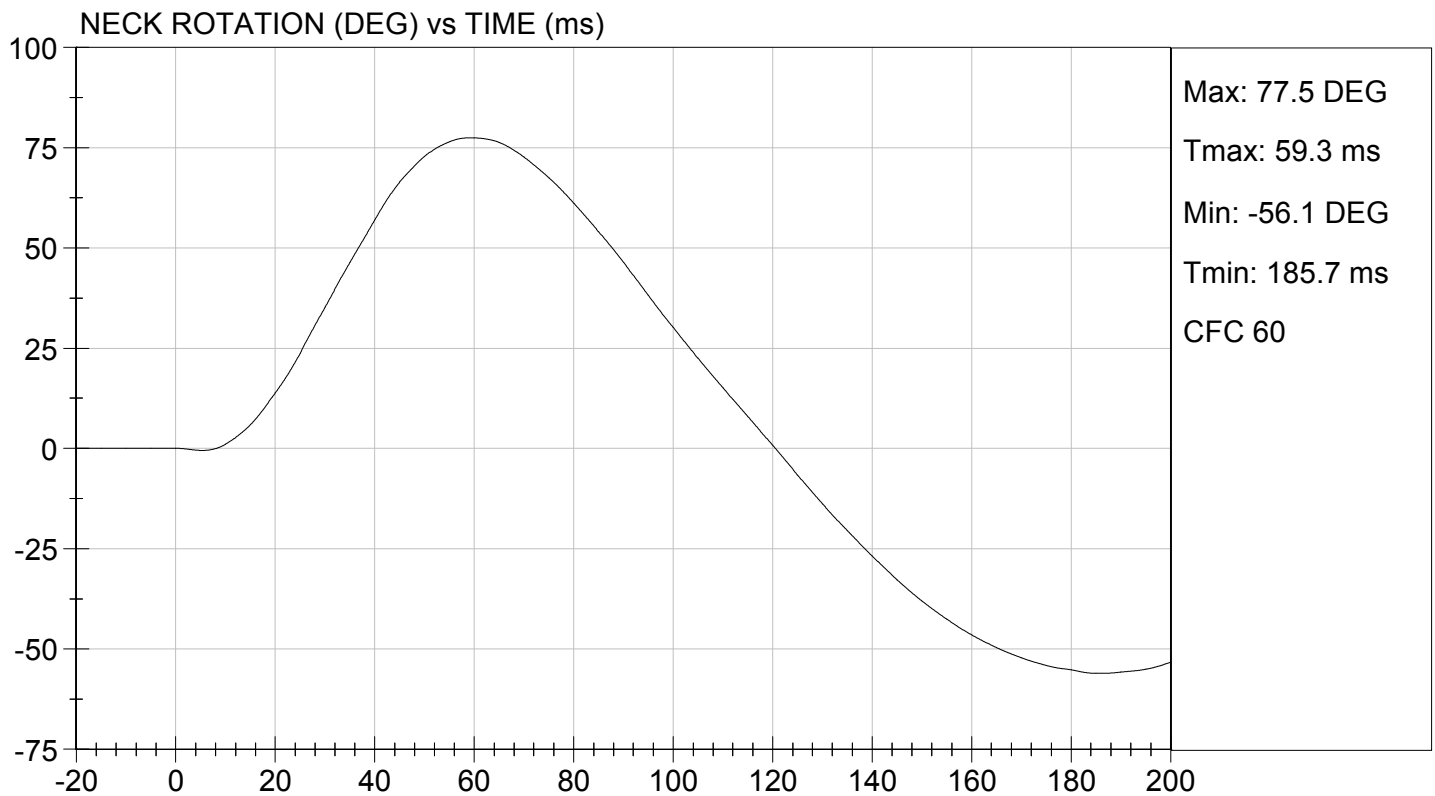
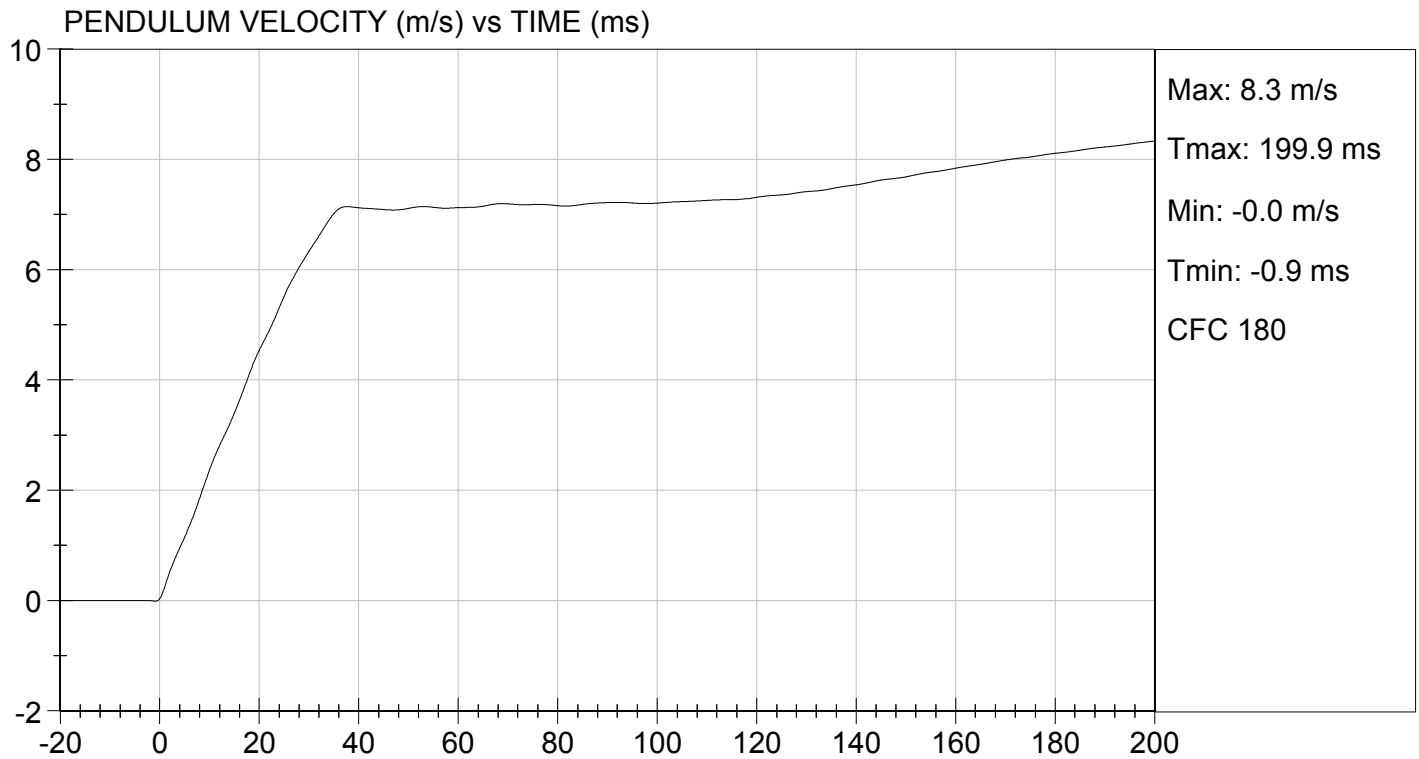


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

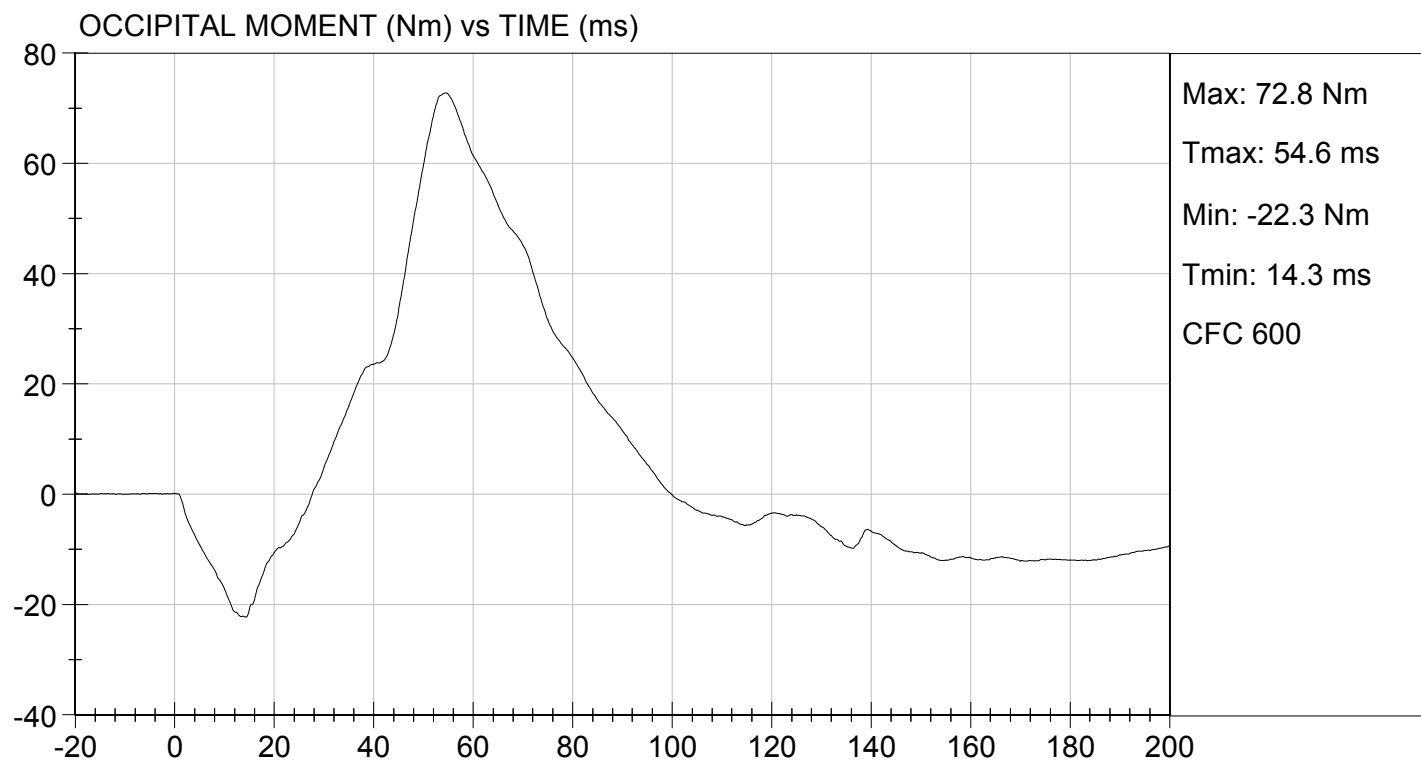
TEST DATE: 02/01/2016
TEST #: D16422





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/01/2016
TEST #: D16422



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 507

Test Date: 02/01/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

 X 1. It has been at least 30 minutes since the last extension test. (572.137(q))
 X N/A, ONLY one neck 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:	<u>21.7°C</u>
Record the minimum temperature:	<u>20.9°C</u>
Record the maximum humidity:	<u>27%</u>
Record the minimum humidity:	<u>26%</u>

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

Record findings and actions: No damage

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

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

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

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 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	Results
Pendulum impact speed		5.95 m/s $\leq$ speed $\leq$ 6.19 m/s	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	1.5 m/s $\leq \Delta V \leq$ 1.9 m/s	1.7 m/s
	@ 20 ms	3.1 m/s $\leq \Delta V \leq$ 3.9 m/s	3.6 m/s
	@ 30 ms	4.6 m/s $\leq \Delta V \leq$ 5.6 m/s	5.3 m/s
Plane D Rotation		Peak moment* -65 Nm $\leq$ moment $\leq$ -53 Nm during the following rotation range 99° $\leq$ angle $\leq$ 114°	-55 Nm @ 110 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm 94 ms $\leq$ time $\leq$ 114 ms	105 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

David Schoedel

Signature

02/01/2016

Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D16423

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	26	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

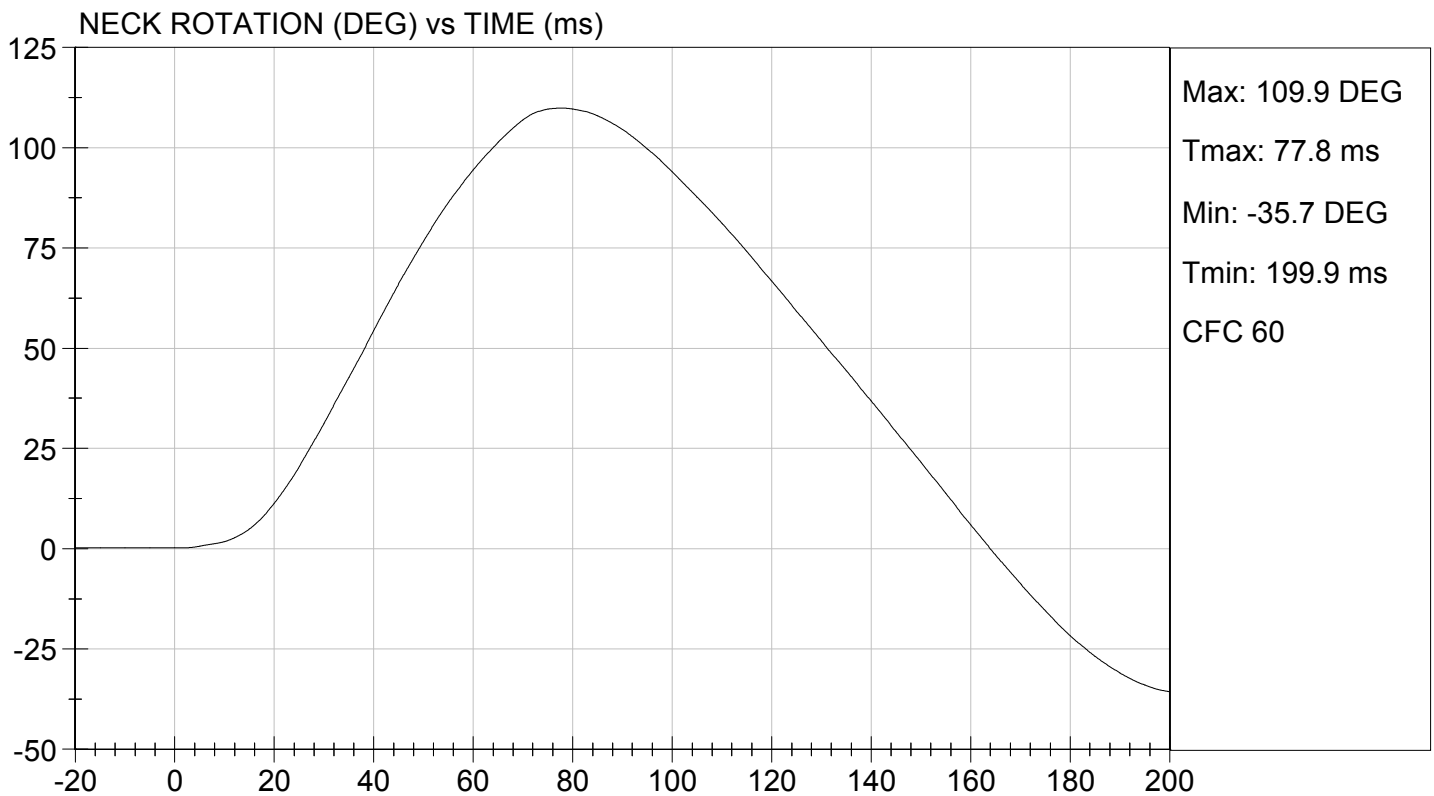
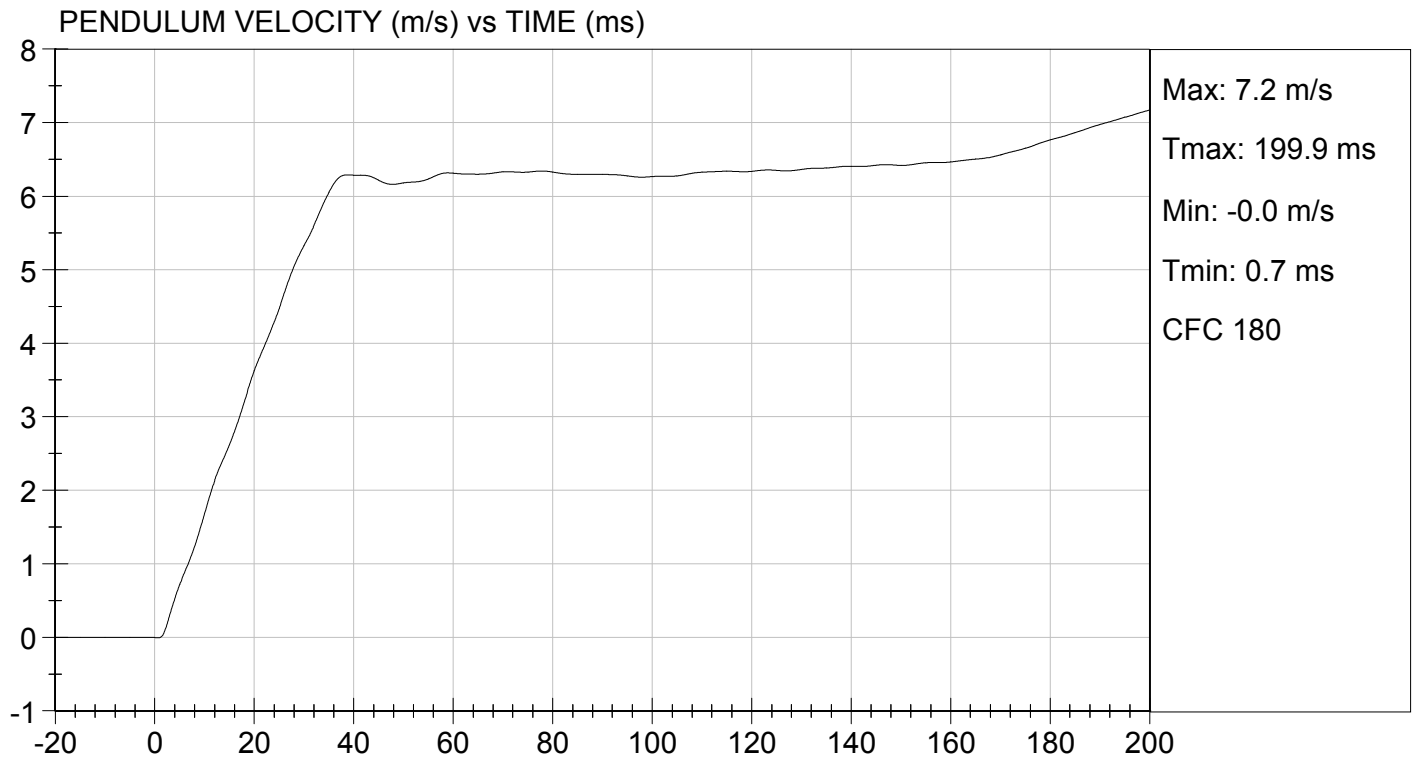
02/01/2016
Test Date

Jeff Leonard
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

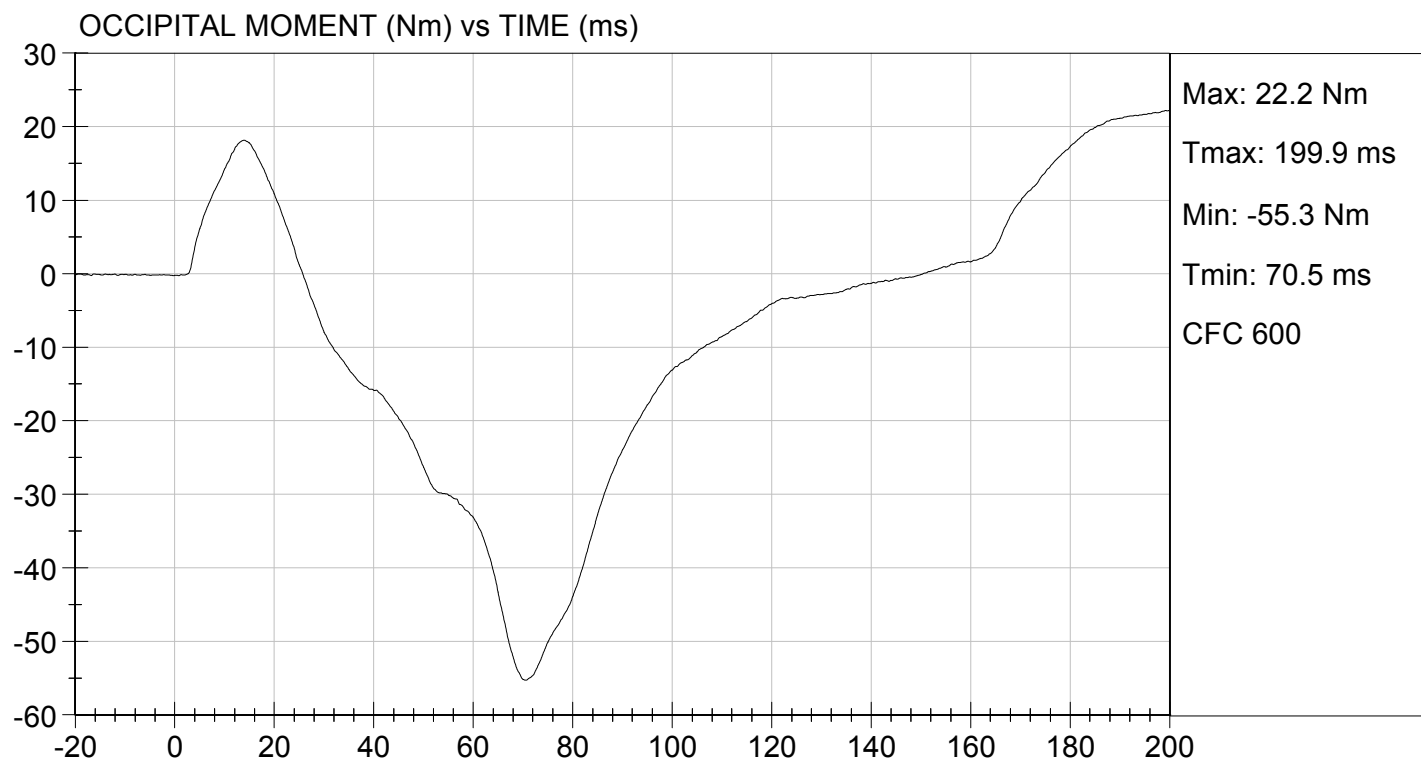
TEST DATE: 02/01/2016
TEST #: D16423





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/01/2016
TEST #: D16423



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 507

Test Date: 02/02/2016

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
 X N/A, ONLY one thorax impact test performed
- X 2. The test fixture conforms to the specifications in Figure 11B.
- X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.7°C</u>
Record the minimum temperature:	<u>20.9°C</u>
Record the maximum humidity:	<u>27%</u>
Record the minimum humidity:	<u>26%</u>

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

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

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	50 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	3941 N
Peak Force** between 18.0 and 50.0 mm chest compression	$\text{Peak Force} \leq 4600 \text{ N}$	4334 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	72%

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

**Force = impactor mass x acceleration (572.134(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.

David Schoedel

Signature

02/02/2016

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D16424

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	3941	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4334	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/02/2016

Test Date

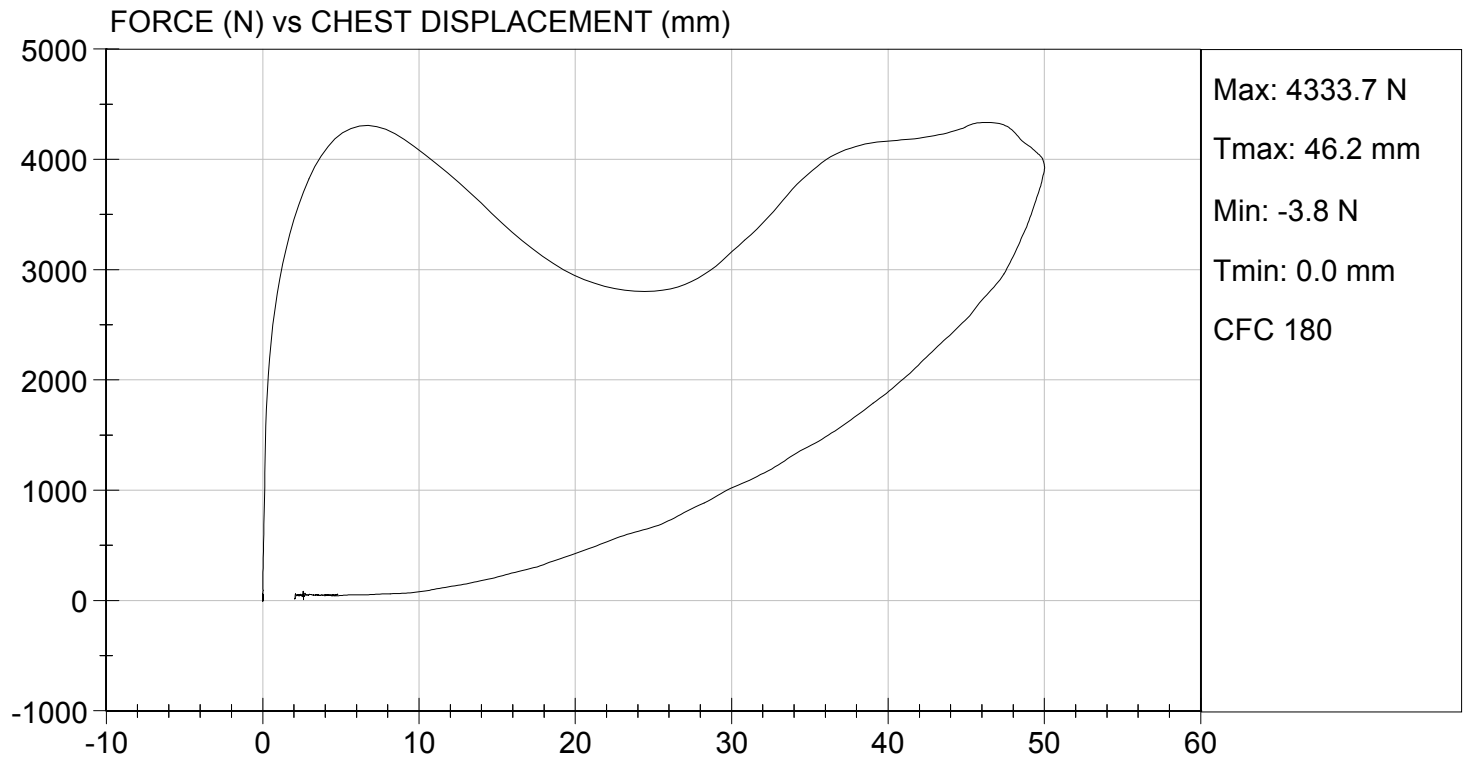
Jeff LevanMarx

Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 02/02/2016
TEST #: D16424



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 507

Test Date: 02/01/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion 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 femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>20.9°C</u> |
| Record the maximum humidity: | <u>27%</u> |
| Record the minimum humidity: | <u>26%</u> |
- 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°): See Result Table
- 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°	20 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.8 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	372 N
Final ref. plane angle	Initial ref. plane angle ± 8°	25 deg

David Schoedel
 Signature

02/01/2016
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D16427

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	25	Pass
Force at 45 deg	N	320 to 390	372	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
Overall Result				Pass

David Schoedel
Laboratory Technician

02/02/2016

Test Date

Jeff Leonard
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 507

Test Date: 02/01/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.7°C</u>
Record the minimum temperature:	<u>20.9°C</u>
Record the maximum humidity:	<u>27%</u>
Record the minimum humidity:	<u>26%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3764 N

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

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

David Schoedel
Signature

02/01/2016
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 507

Test I.D: D16426

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	3764	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/01/2016

Test Date

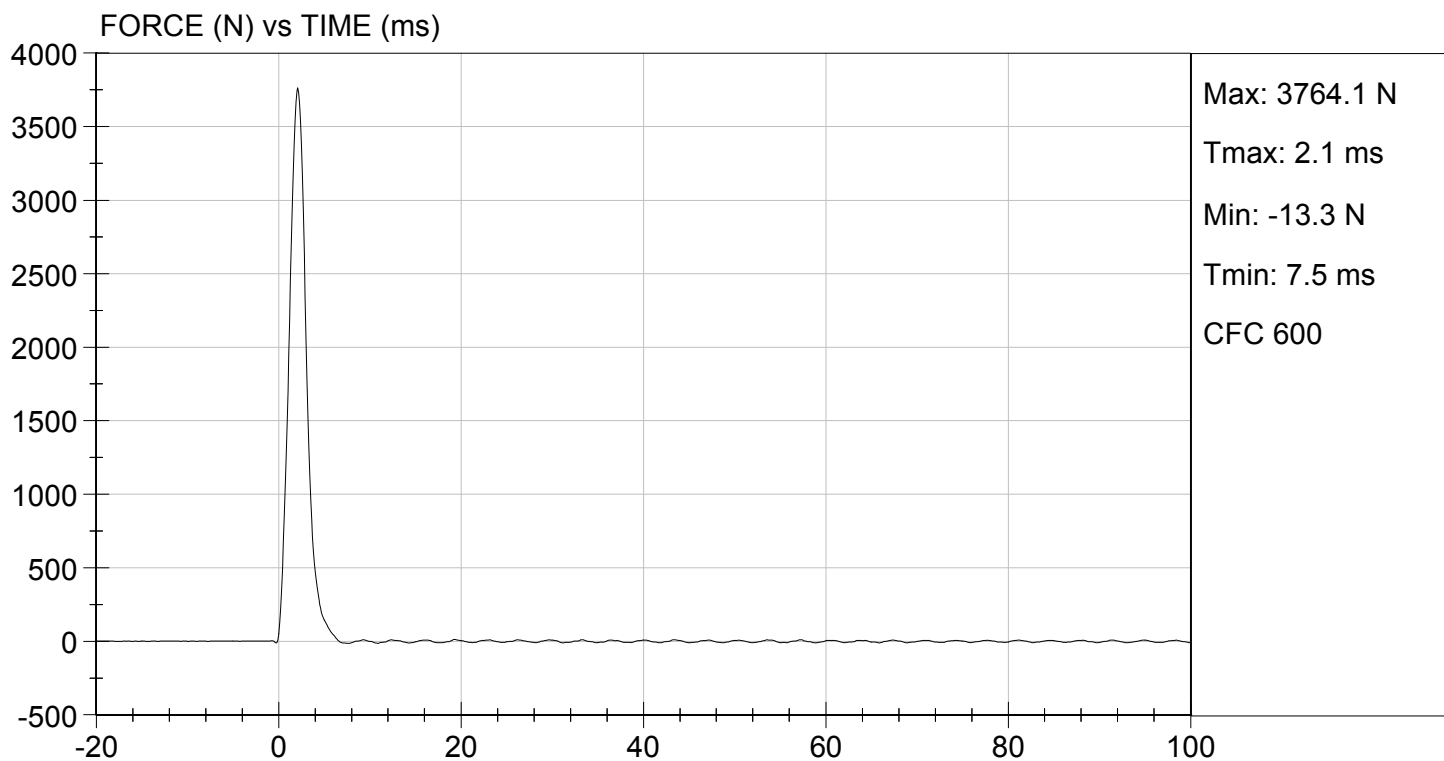
Jeff Leonard

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.89 ft/s, 2.10 m/s

TEST DATE: 02/01/2016
TEST #: D16426



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 507

Test Date: 02/01/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.7°C</u>
Record the minimum temperature:	<u>20.9°C</u>
Record the maximum humidity:	<u>27%</u>
Record the minimum humidity:	<u>26%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3584 N

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

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

David Schoedel

Signature

02/01/2016

Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 507

Test I.D: D16425

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3584	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/01/2016

Test Date

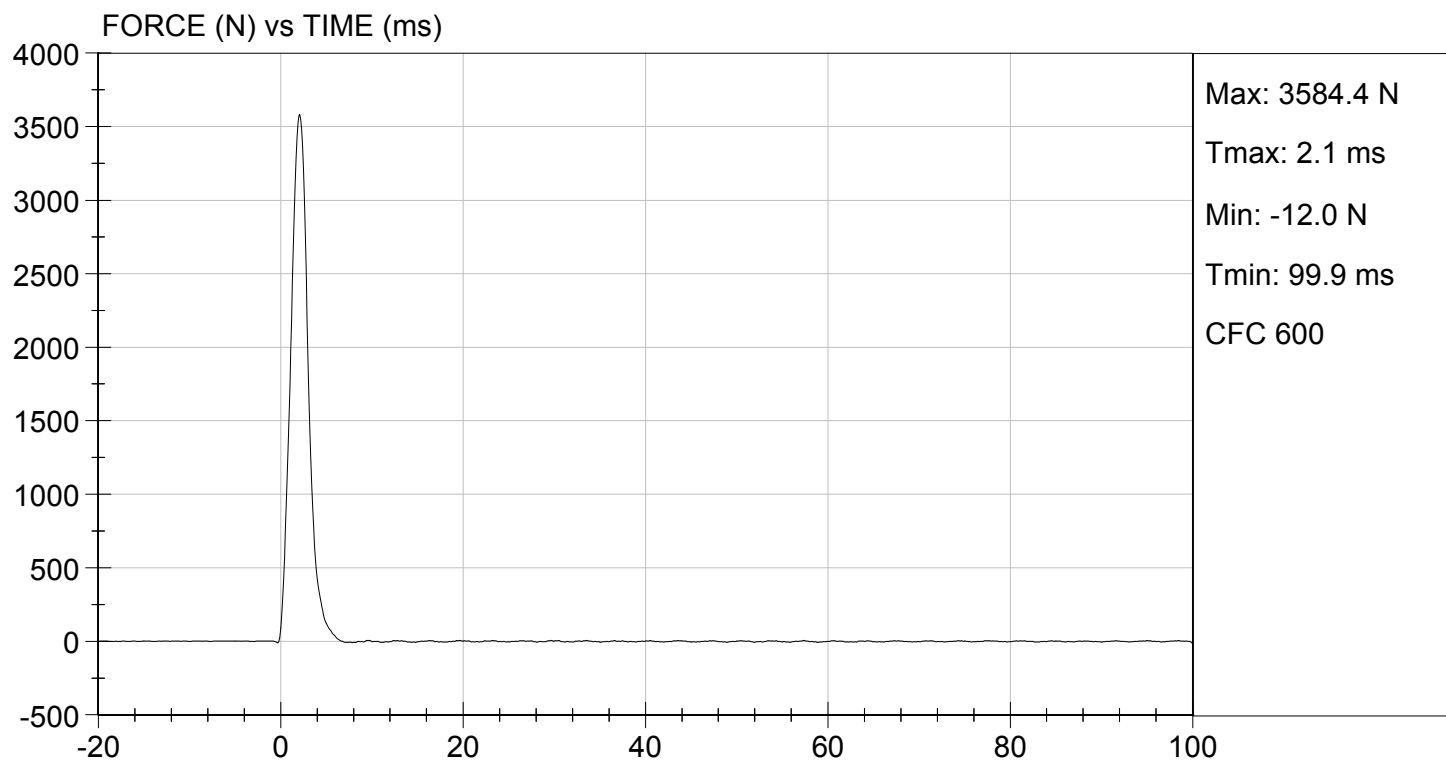
Jeff Leonard

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 02/01/2016
TEST #: D16425



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P80121	11/09/2015	05/09/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P80122	11/09/2015	05/09/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P80123	11/09/2015	05/09/2016
NECK TRANSDUCER	Denton	1716	1175	11/20/2015	05/20/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P79647	11/09/2015	05/09/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82319	11/09/2015	05/09/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82673	11/09/2015	05/09/2016
CHEST POTENTIOMETER	Servo	14CBI-2897	507	11/09/2015	05/09/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121	2026	11/09/2015	05/09/2016
(2) LEFT FEMUR	Denton	2121	2027	11/09/2015	05/09/2016
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: _____

Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 507

Test Date: 02/01/2016

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

02/02/2016
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/02/2016
Date

EXTERNAL DIMENSIONS

HYBRID III 6 year-old SN #155, PART 572, SUBPART N EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	622.3 - 647.7	628.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	348.0 - 363.2	362.0
C	H-POINT HEIGHT	Reference	63.5 - 73.7	68.3
D	H-POINT LOCATION FROM BACKLINE	Reference	88.9 - 99.1	94.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	53.3 - 63.5	61.7
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	88.9 - 104.1	102.0
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	182.9 - 198.1	195.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	17.8 - 22.8	22.1
I	SHOULDER TO ELBOW LENGTH	Measure from the highest point on top of the broad upper surface of clavicle link below the collar to the lowest part of the flesh of the elbow in line with the elbow pivot bolt.	215.9 - 231.1	219.5
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	157.4 - 177.8	165.0
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	370.8 - 391.2	390.7
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane at the bottom of the feet.	269.2 - 289.6	273.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	307.4 - 322.6	313.8

HYBRID III 6 year-old SN #155, PART 572, SUBPART N EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	320.0 - 340.4	322.4
O	CHEST DEPTH WITHOUT JACKET	Measured 330.2 ± 5.1 mm above seat surface	129.6 - 144.8	140.2
P	FOOT LENGTH	Tip of toe to rear of heel	170.2 - 185.4	173.4
Q	STATURE	(THEORETICAL) (Q = A - C - D + R + M)	1099.9 - 1181.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	342.9 - 363.3	355.7
S	HEAD BREADTH	The widest part of the head	137.1 - 147.3	139.0
T	HEAD DEPTH	Back of the head to the forehead	167.6 - 177.8	174.2
U	HIP BREADTH	The widest part of the hips	208.3 - 223.5	221.5
V	SHOULDER BREADTH	Outside shoulder edges, in line with the shoulder pivot bolts	259.1 - 274.3	272.1
W	FOOT BREADTH	The widest part of the foot	62.3 - 77.5	66.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "I"	510.5 - 530.9	529.3
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 3330.2 ± 5.1 mm above seat surface	596.9 - 622.3	609.5
Z	WAIST CIRCUMFERENCE (with chest jacket and abdominal insert)	Measured 158.8 ± 5.1 mm above seat surface	558.8 - 584.2	583.2
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	325.1 - 335.3	330.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	153.7 - 163.9	159.0

DATA SHEET C3
HEAD DROP TEST (572.122) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))
- X 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.122(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>26%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.122(c)(2))

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

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 5C. (572.122(c)(3))

Record the right side distance: 501 mm

Record the left side distance: 501 mm

- 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 2155.0×10^{-6} mm (80 micro inches) (RMS). (572.122(c)(4))

Record actual micro finish: 50.9 micro inches

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness: 50.9 mm

Record width: 604 mm

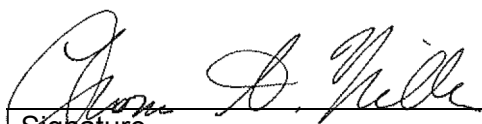
Record length: 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b)) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	284 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-10.1 g

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


Signature

01/15/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test ID: D16191

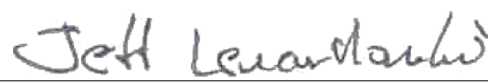
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	245 to 300	284	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-10.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass



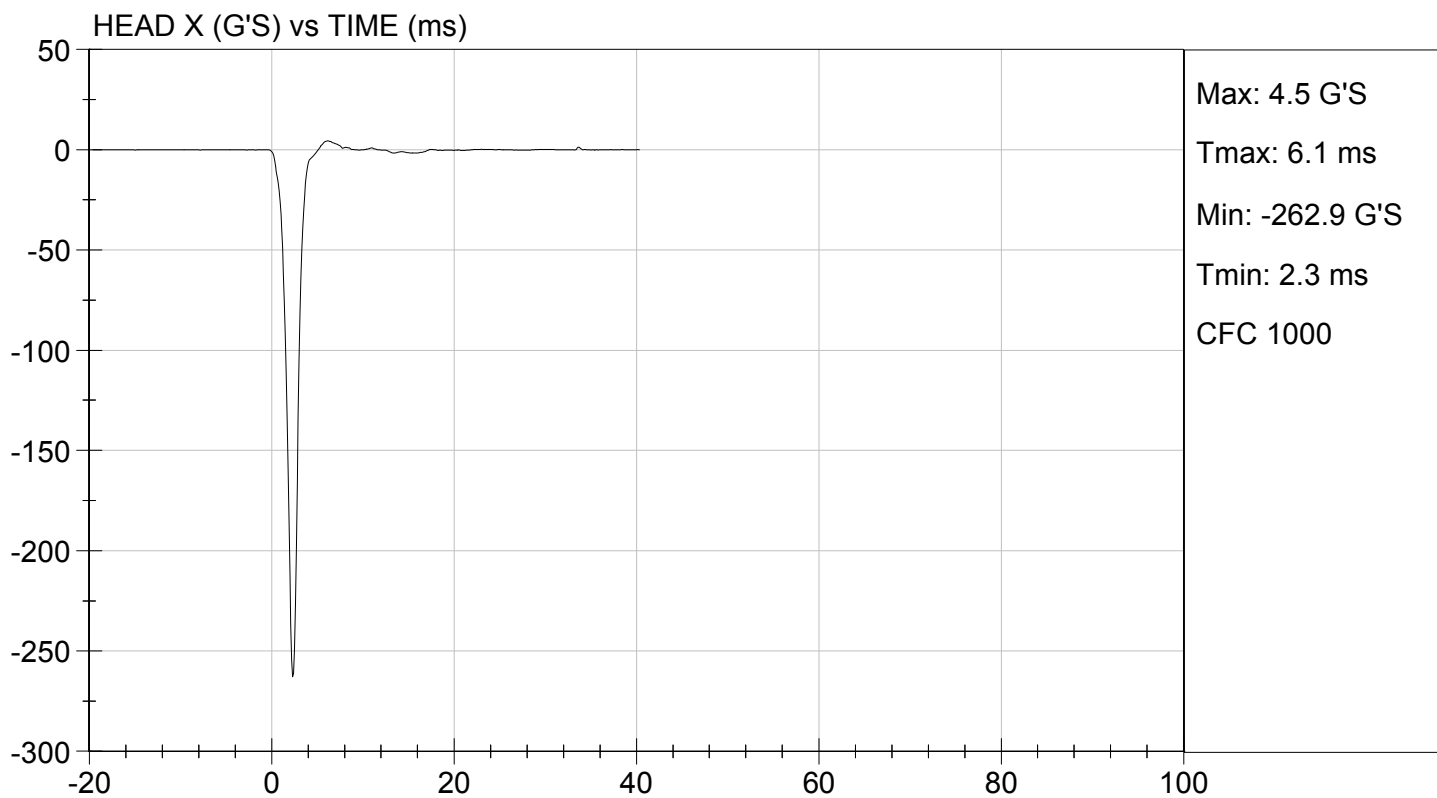
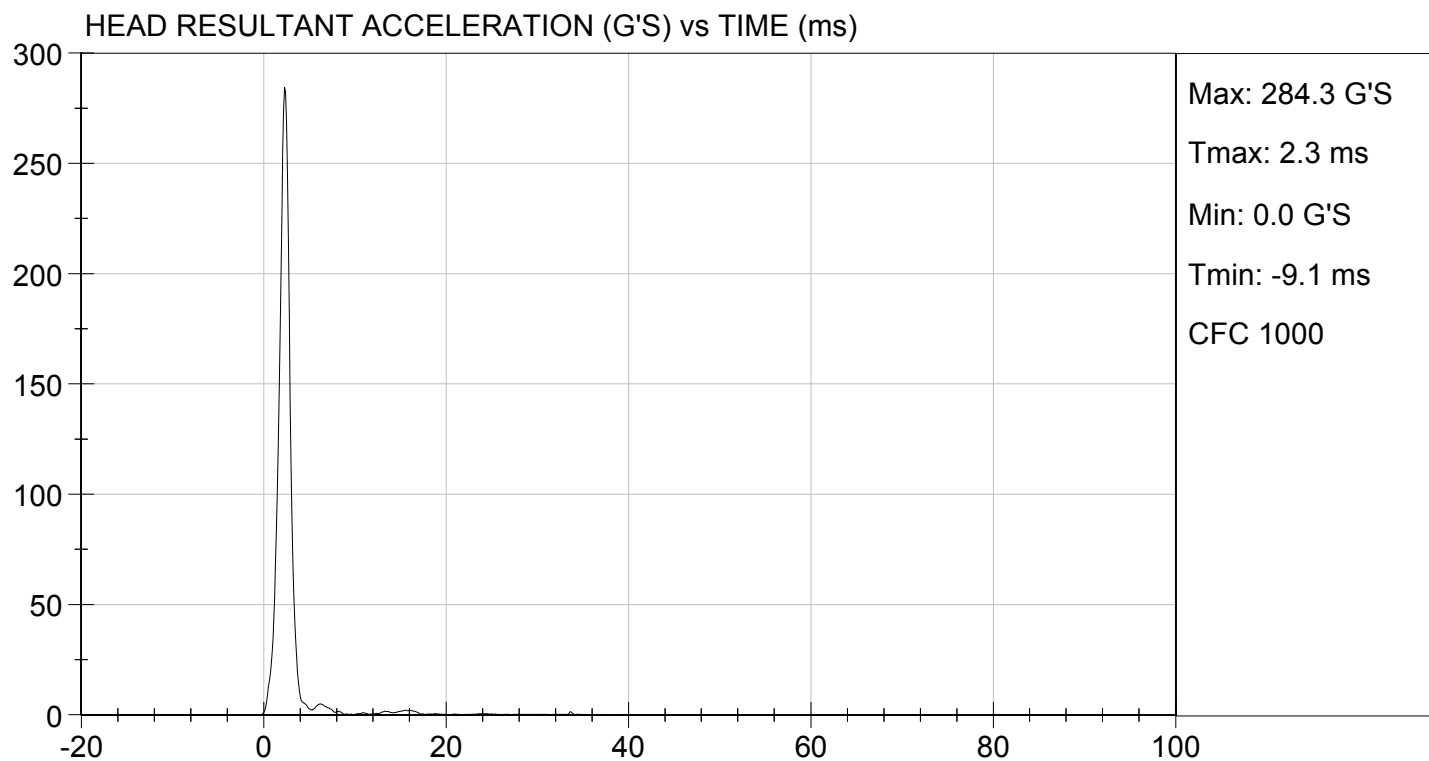
Laboratory Technician

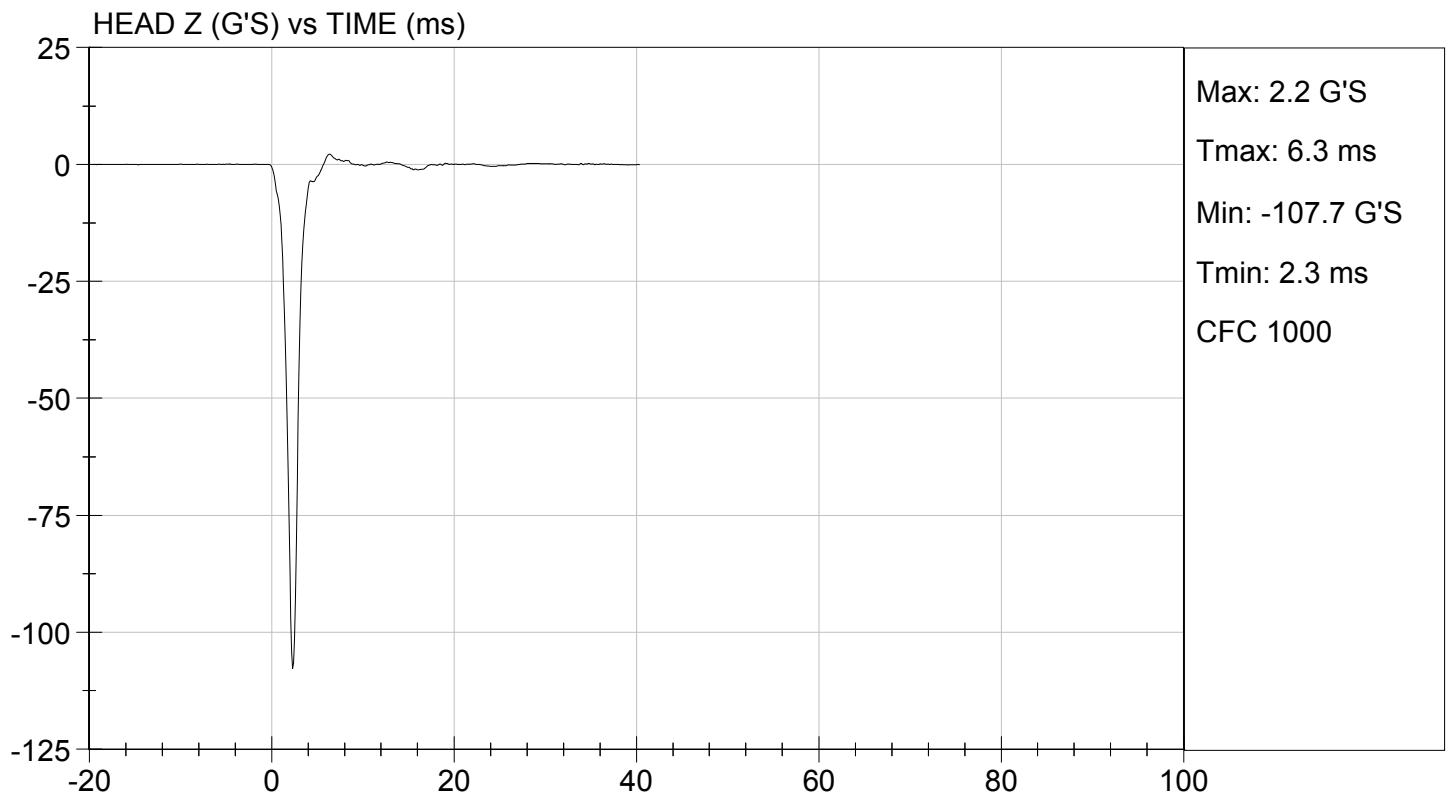
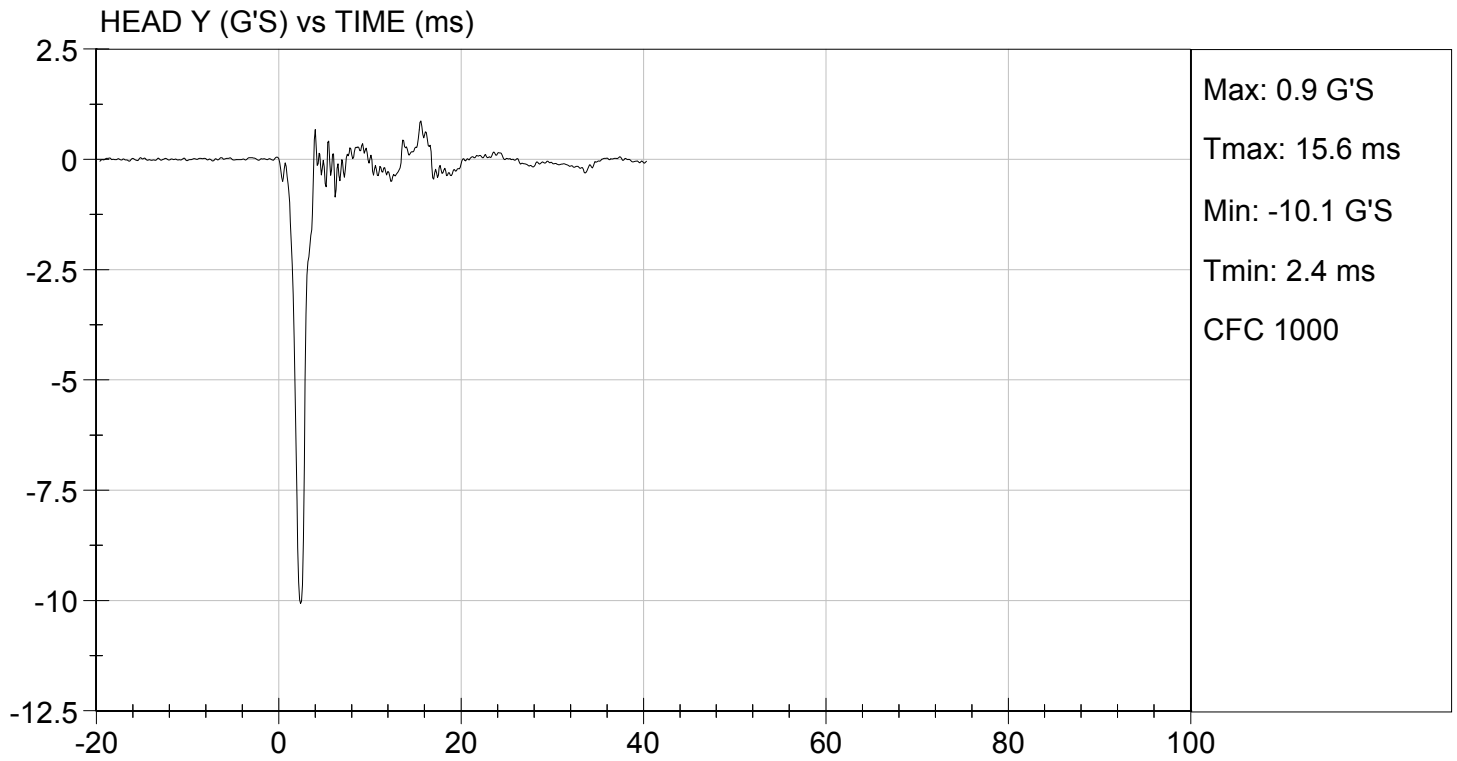
01/15/2016

Test Date



Approved By





DATA SHEET C4
NECK FLEXION TEST (572.123) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last neck test. (572.127(o))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.2°C</u> |
| Record the minimum temperature | <u>20.9°C</u> |
| Record the maximum humidity | <u>34%</u> |
| Record the minimum humidity | <u>31%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pretest calibration.
- Record findings and actions: No damage
- ☒ 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- ☒ 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123I(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123I(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123I(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1)) & (572.123(c)(4)(I & ii))

Parameter		Specification	Result
Pendulum impact speed		4.83 m/s $\leq$ speed $\leq$ 5.07 m/s	4.98 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	1.2 m/s $\leq \Delta V \leq$ 1.6 m/s	1.5 m/s
	@ 20 ms	2.4 m/s $\leq \Delta V \leq$ 3.4 m/s	2.9 m/s
	@ 30 ms	3.8 m/s $\leq \Delta V \leq$ 5.0 m/s	4.1 m/s
Plane D Rotation		Peak moment* 27 Nm $\leq$ moment $\leq$ 33 Nm during the following rotation range 74° $\leq$ angle $\leq$ 92°	28 Nm @ 79 degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm 103 ms $\leq$ time $\leq$ 123 ms	112 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

- X 13. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

01/15/2016
Date

MGA RESEARCH CORPORATION

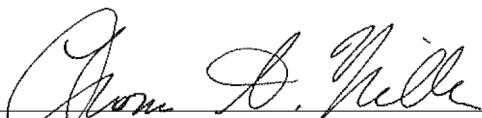
NECK FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16192

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	4.83 to 5.07	4.98	Pass
Pendulum Velocity	10 ms	m/s	1.2 to 1.6	1.5	Pass
	20 ms	m/s	2.4 to 3.4	2.9	Pass
	30 ms	m/s	3.8 to 5.0	4.1	Pass
D Plane Rotation	Max	deg	74 to 92	79	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	28	Pass
Positive Moment Time Curve Decay to 5 Nm		ms	103 to 123	112	Pass
Overall Results					Pass

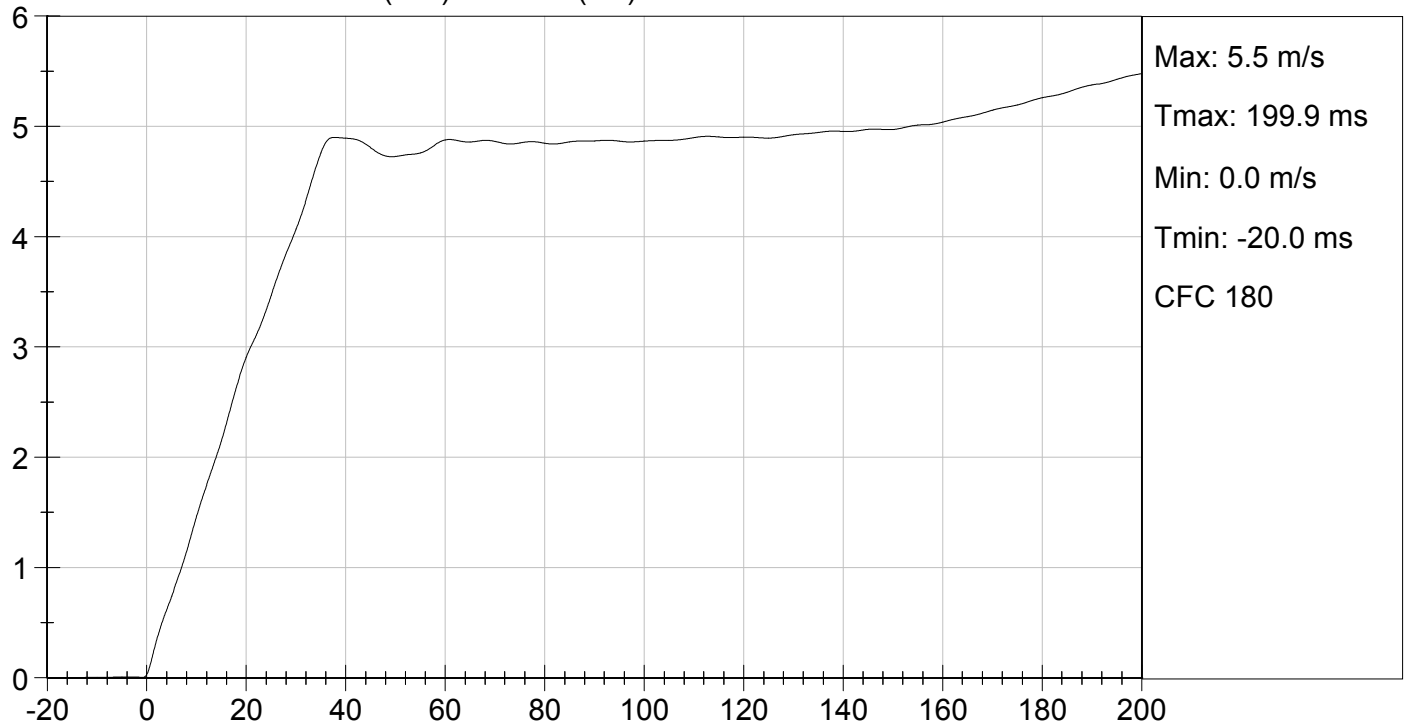

Laboratory Technician

01/15/2016
Test Date

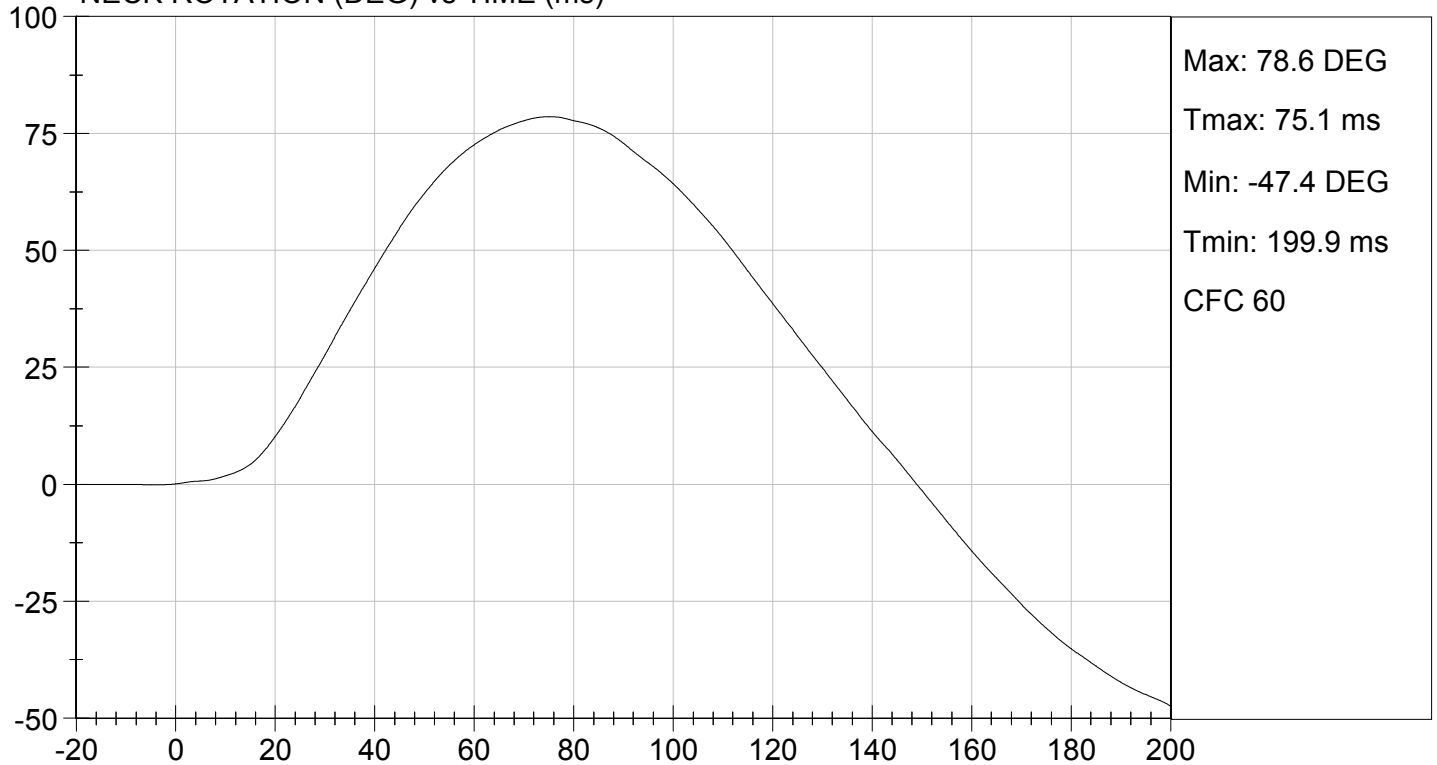

Approved By



PENDULUM VELOCITY (m/s) vs TIME (ms)



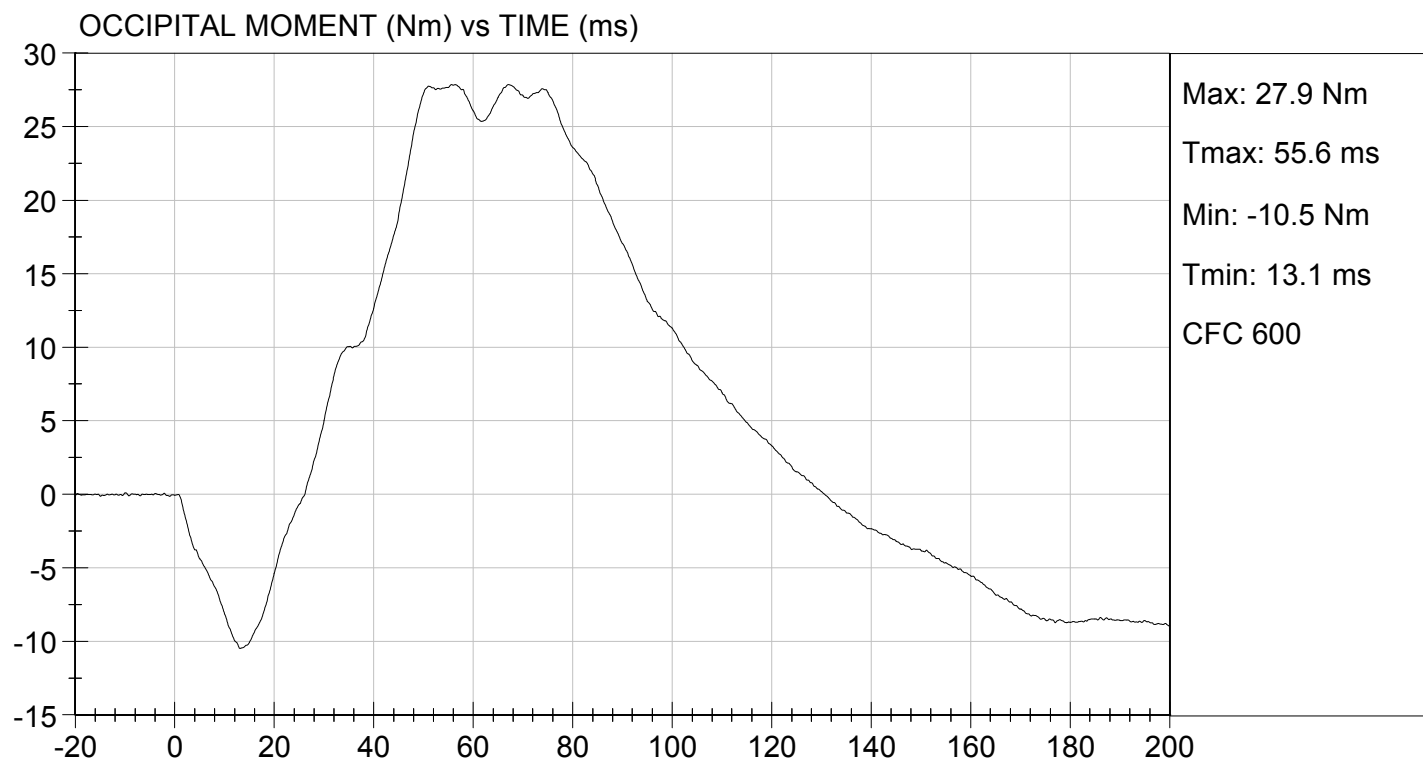
NECK ROTATION (DEG) vs TIME (ms)





TEST DESC: NECK FLEXION
VELOCITY: 16.34 ft/s, 4.98 m/s

TEST DATE: 01/15/2016
TEST #: D16192



DATA SHEET C5
NECK EXTENSION TEST (572.123) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last neck test. (572.127(o))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>26%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pretest calibration.
- Record findings and actions: No damage

- X 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))
- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 13. Complete the following table:

Neck Extension Test Results (572.123(b)(2)) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.42 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.7 m/s
	@ 30 ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.9 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	-21 Nm @ 95 degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	134 ms

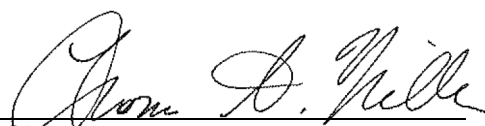
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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


Signature

01/15/2016
Date

MGA RESEARCH CORPORATION

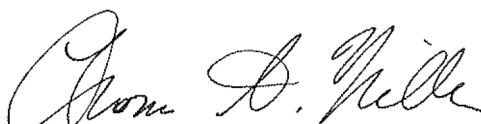
NECK EXTENSION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

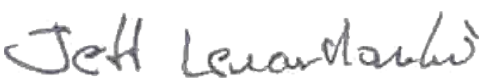
Test I.D: D16193

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	4.18 to 4.42	4.42	Pass
Pendulum Velocity	10 ms	m/s	1.0 to 1.4	1.4	Pass
	20 ms	m/s	2.2 to 3.0	2.7	Pass
	30 ms	m/s	3.2 to 4.2	3.9	Pass
D Plane Rotation	Max	deg	85 to 103	95	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-21	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	134	Pass
Overall Results					Pass


 Laboratory Technician

01/15/2016

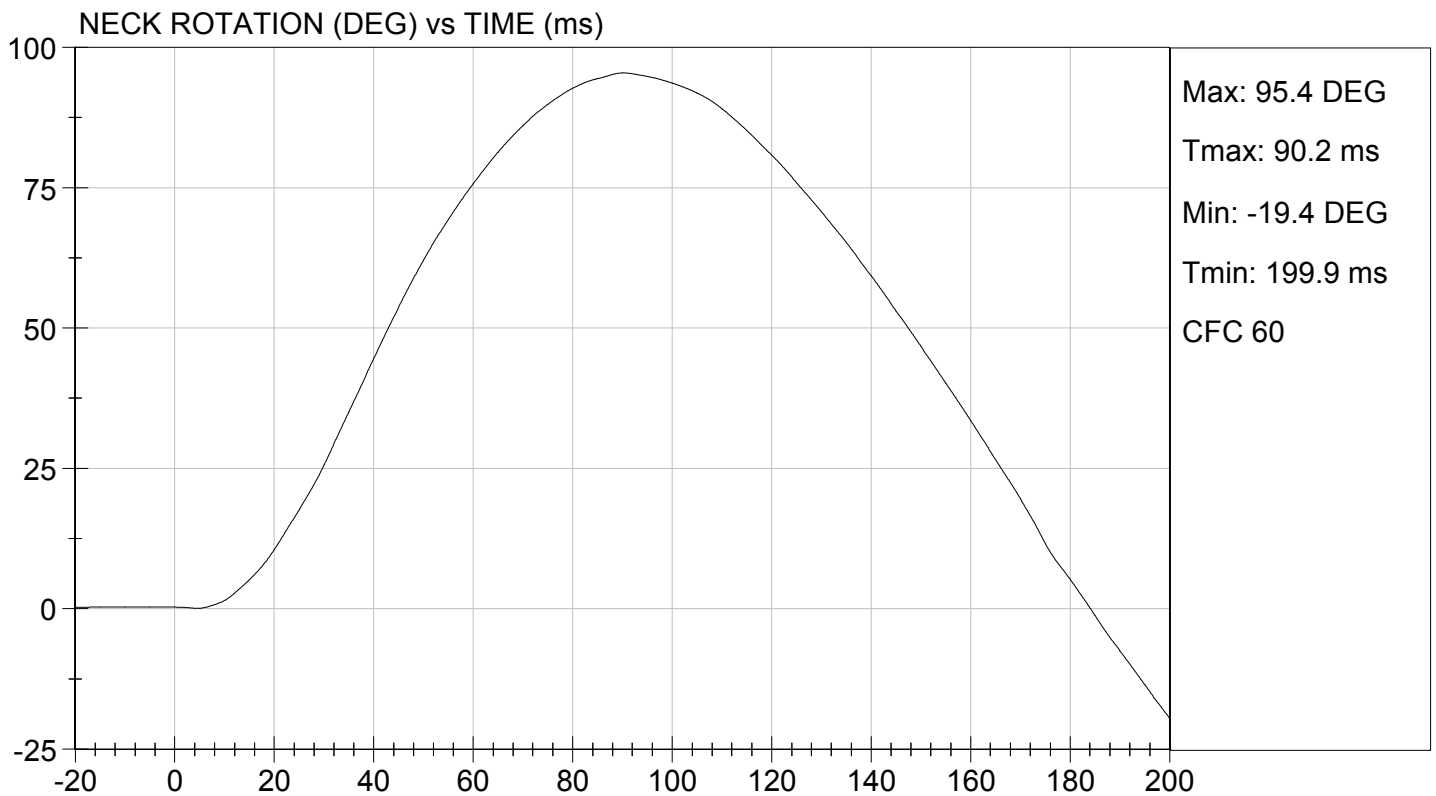
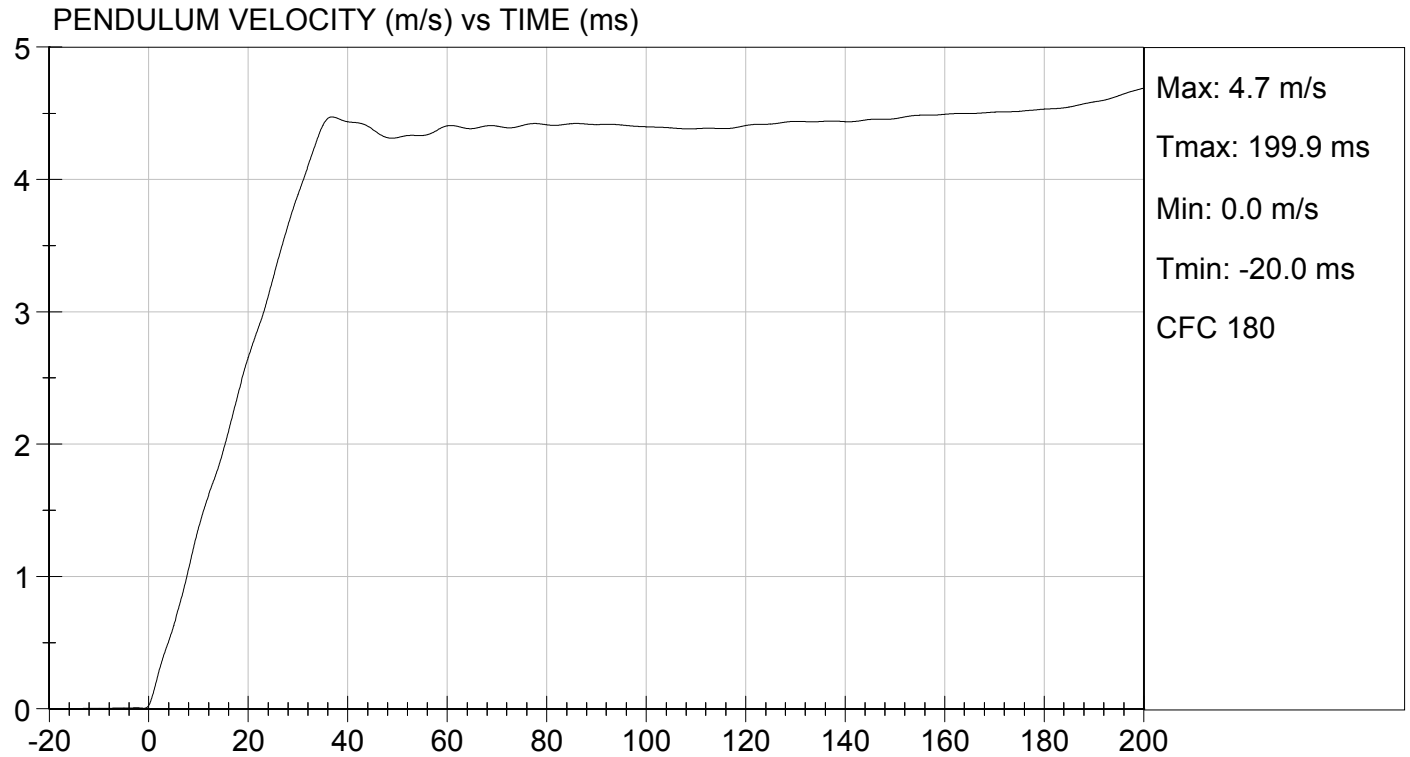
Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 14.49 ft/s, 4.42 m/s

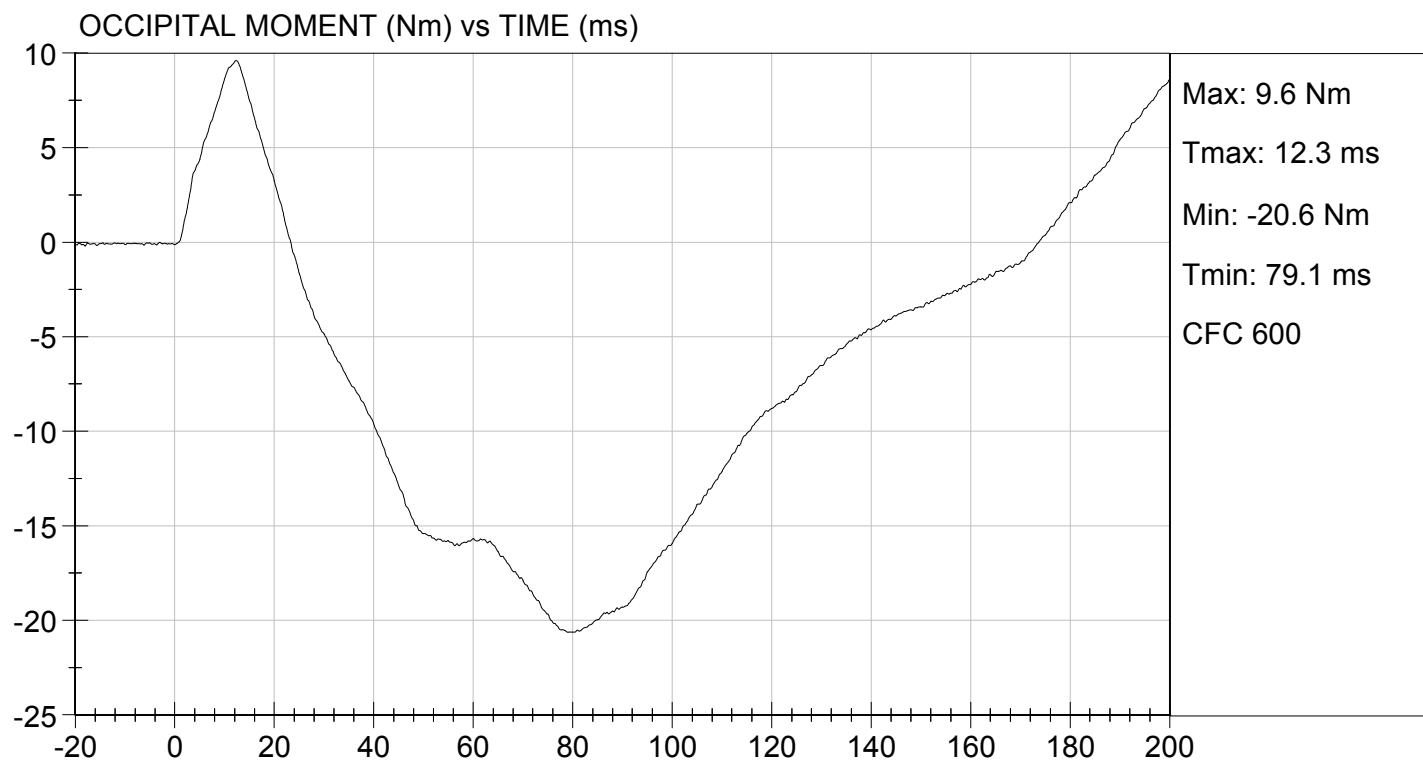
TEST DATE: 01/15/2016
TEST #: D16193





TEST DESC: NECK EXTENSION
VELOCITY: 14.49 ft/s, 4.42 m/s

TEST DATE: 01/15/2016
TEST #: D16193



DATA SHEET C6
THORAX IMPACT TEST (572.124) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))
☒ N/A, ONLY one thorax impact test performed

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

- ☒ 3. The complete assembled dummy (127-0000) is used (572.124(b)).

- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(1))

Record the maximum temperature	<u>21.4°C</u>
Record the minimum temperature	<u>21.1°C</u>
Record the maximum humidity	<u>28%</u>
Record the minimum humidity	<u>26%</u>

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

Record findings and actions:

- ☒ - 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 damage.

- ☒ 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))

- X 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))
- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

X 17. Complete the following table:

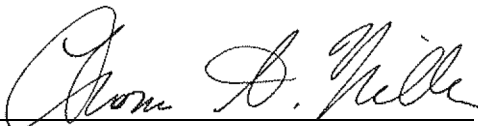
Thorax Impact Results (572.124(b)) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	42.0 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1295 N
Peak force** between 12.5 and 38.0 mm chest compression	Peak force $\leq 1500 \text{ N}$	1348 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	73%

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.


Signature

01/15/2016
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16194

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	38.0 to 46.0	42.0	Pass
Peak Resistive Force w/in Deflection Corridor	N	1150 to 1380	1,295	Pass
Internal Hysteresis	%	65 to 85	73	Pass
Peak Force 12.5 mm - 38.0 mm	N	<= 1,500	1,348	Pass
Overall Test Results				Pass


Laboratory Technician

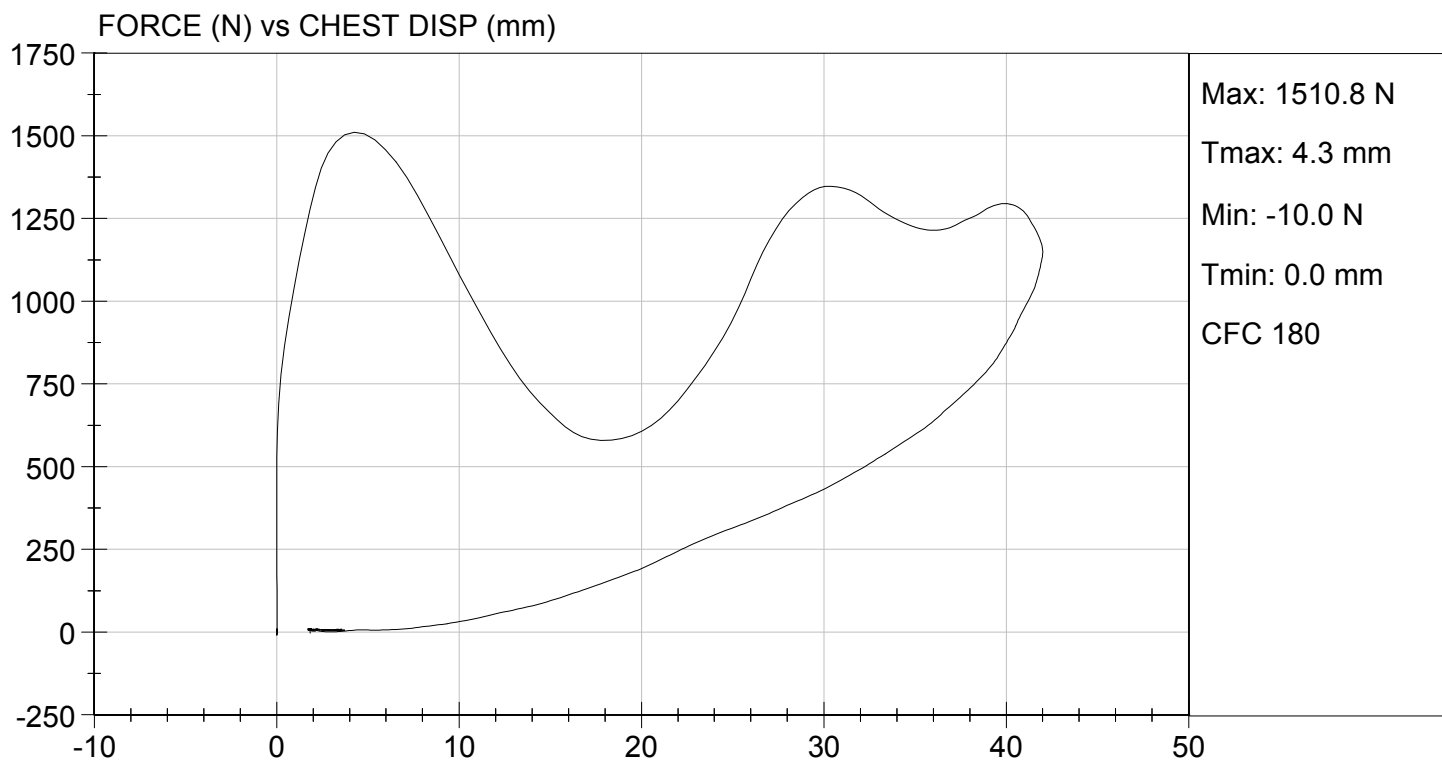
01/15/2016
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 01/15/2016
TEST #: D16194



DATA SHEET C7
TORSO FLEXION TEST (572.125) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- ☒ Pre test calibration
☐ Post test calibration verification

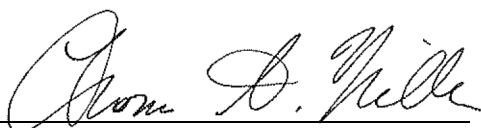
Test attempt no. 1 (when successive torso flexion tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))
☒ N/A, ONLY one torso flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11C.
- ☒ 3. The complete assembled dummy (127-0000) is used (572.125(c)(2)).
☒ with legs below the femurs.
☐ without legs below the femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>26%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x½ inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))
- ☒ 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))
- ☒ 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))
- ☒ 9. Remove all external support that was implemented in 9 above. (572.125(c)(5))

- X 10. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))
 Record reference plane angle (max. allowed 22°) See Result Table
- X 11. Attach the pull cable and the load cell. (572.125(c)(6))
- X 12. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))
- X 13. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.125(c)(8))
- X 14. As quickly as possible release the force applied to the attachment bracket. (572.125(c)(9))
- X 15. 3 minutes after the release of the force, measure the reference plane angle. (572.125(c)(9))
- X 16. Complete the following table:

Torso Flexion Results (572.125(b)), (572.125(c)(7)), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 22°	16°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.6°/s
Force at 45° ± 0.5°	147 N ≤ force ≤ 200 N	160 N
Final ref. plane angle	Initial ref. plane angle ± 8°	21°


 Signature

 01/15/2016
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

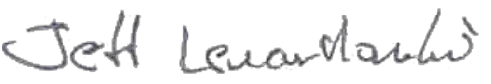
Test I.D: D16197

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Initial Angle	deg	0 to 22	16	Pass
Return Angle	deg	+/- 8	21	Pass
Force at 45 deg	N	147 to 200	160	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.6	Pass
Overall Result				Pass


Laboratory Technician

01/15/2016

Test Date


Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 12C.
- ☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>26%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.126(c)(6))

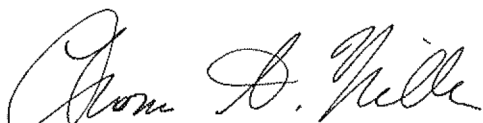
X 11. Complete the following table:

Knee Impact Results (572.126(b)(1)) & (572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2120 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

01/15/2016

Date

MGA RESEARCH CORPORATION

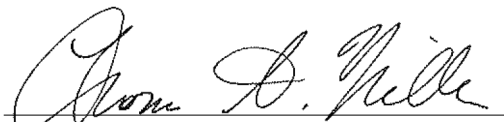
LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16196

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	2000 to 3000	2120	Pass
Overall Test Results				Pass


Laboratory Technician

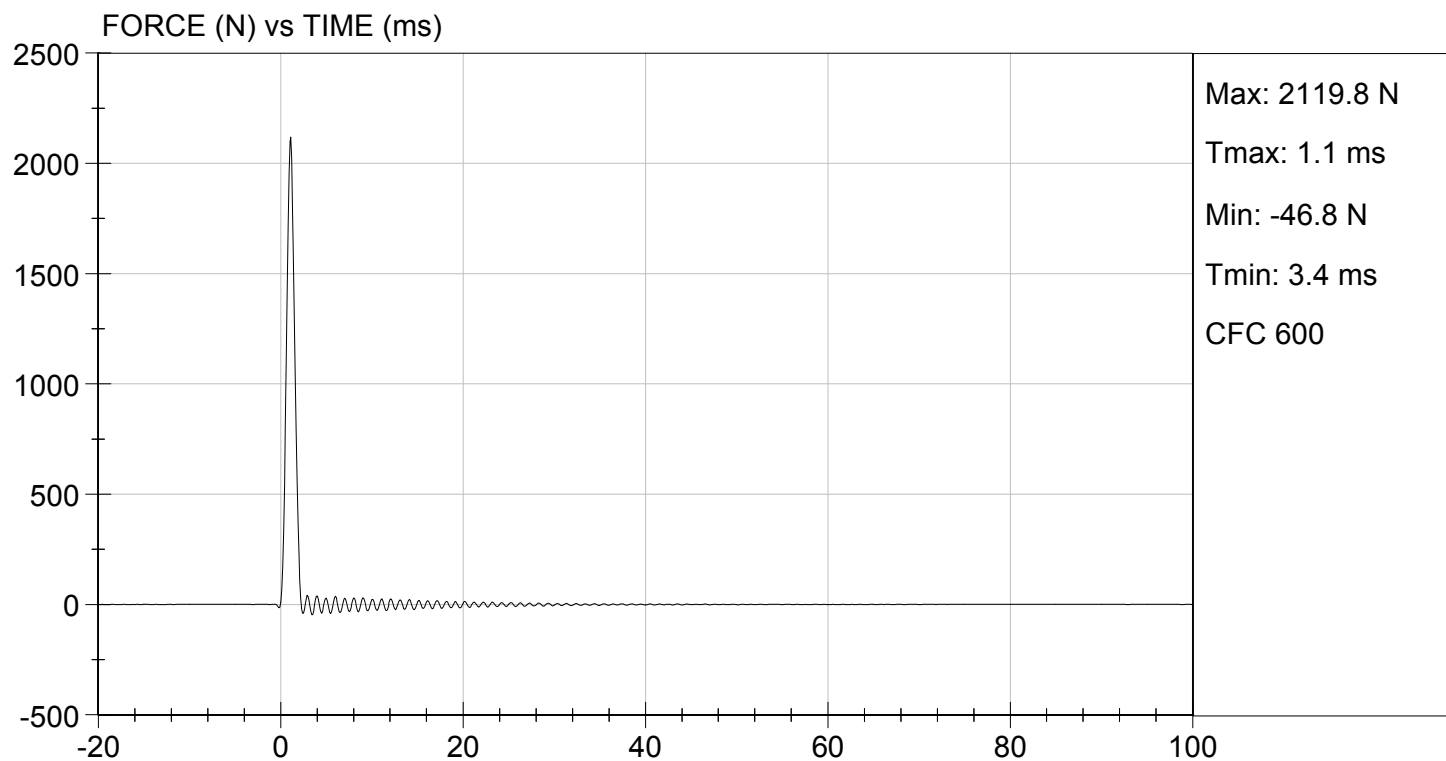
01/15/2016
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.83 ft/s, 2.08 m/s

TEST DATE: 01/15/2016
TEST #: D16196



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 01/15/2016

Technician: Thomas Miller

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 12C.
- ☒ 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>28%</u> |
| Record the minimum humidity | <u>26%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

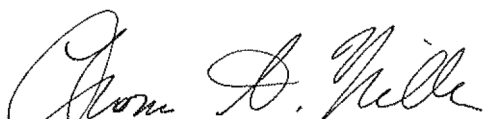
 X 11. Complete the following table:

Knee Impact Results (572.126(b)(1)) & (572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2062 N

*Force = impactor mass x deceleration (572.126(b))

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



Signature

01/15/2016

Date

MGA RESEARCH CORPORATION

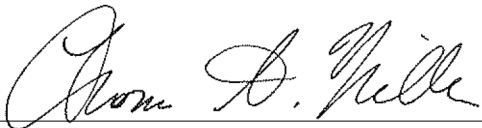
RIGHT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

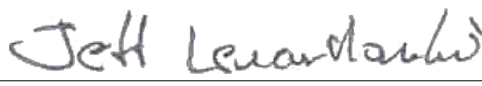
ATD Serial No: 155

Test I.D: D16195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	2000 to 3000	2062	Pass
Overall Test Results				Pass


Laboratory Technician

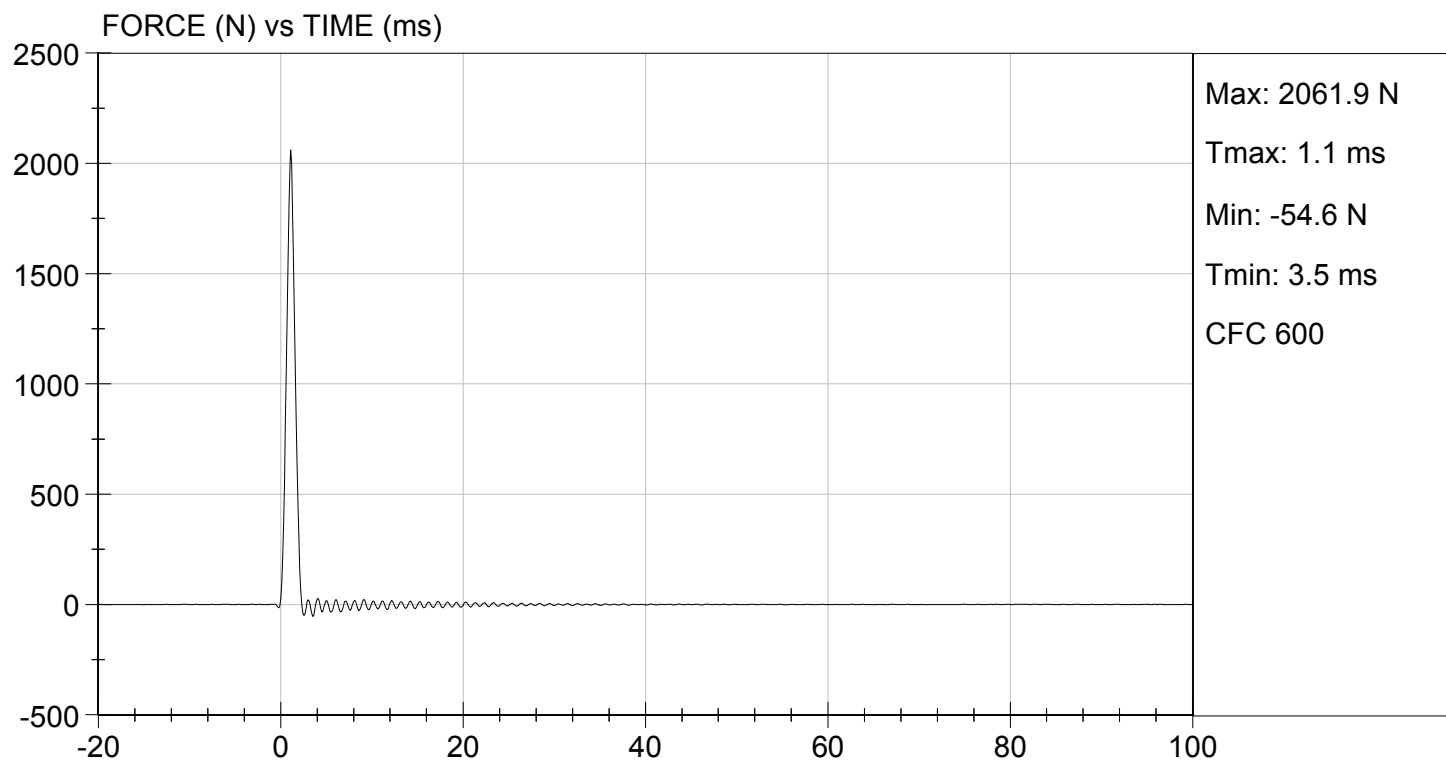
01/15/2016
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 01/15/2016
TEST #: D16195



DATA SHEET C10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P79819	10/14/2015	04/14/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P79821	10/14/2015	04/14/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P79822	10/14/2015	04/14/2016
NECK TRANSDUCER	Denton	1716A	1175	11/20/2015	05/20/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82128	10/14/2015	04/14/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82129	10/14/2015	04/14/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82130	10/14/2015	04/14/2016
CHEST POTENTIOMETER	Servo	08C1-3179	155	10/14/2015	04/14/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	N/A	N/A	N/A	N/A	N/A
(2) LEFT FEMUR	N/A	N/A	N/A	N/A	N/A
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/24/2015	01/24/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	09/28/2015	03/28/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: _____

Jessica Hall

DATA SHEET C3
HEAD DROP TEST (572.122) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Schoedel

- Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.122(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (127-1000), a six-axis neck transducer (SA572-S11) or its structural replacement (78051-383X), a head to neck pivot pin (78051-339), and three (3) accelerometers (SA572-S4). (572.122(a))
- X 3. Torque the skull cap screws (10-32 x 1/2 SHCS) to 10.2 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.126(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.122(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.9°C</u> |
| Record the minimum temperature | <u>21.3°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.122(c)(2))

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

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 5C. (572.122(c)(3))

Record the right side distance: 501 mm

Record the left side distance: 501 mm

- 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 2155.0×10^{-6} mm (80 micro inches) (RMS). (572.122(c)(4))

Record actual micro finish: 50.9 micro inches

- X 13. The impact surface is rigidly supported. (572.122(c)(4))

- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.122(c)(4))

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.122(b)) & (572.122(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.122(b)):

Parameter	Specification	Result
Peak resultant acceleration	$245 \text{ g} \leq x \leq 300 \text{ g}$	296 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	9.7 g

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

David Schoedel

Signature

02/03/2016

Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

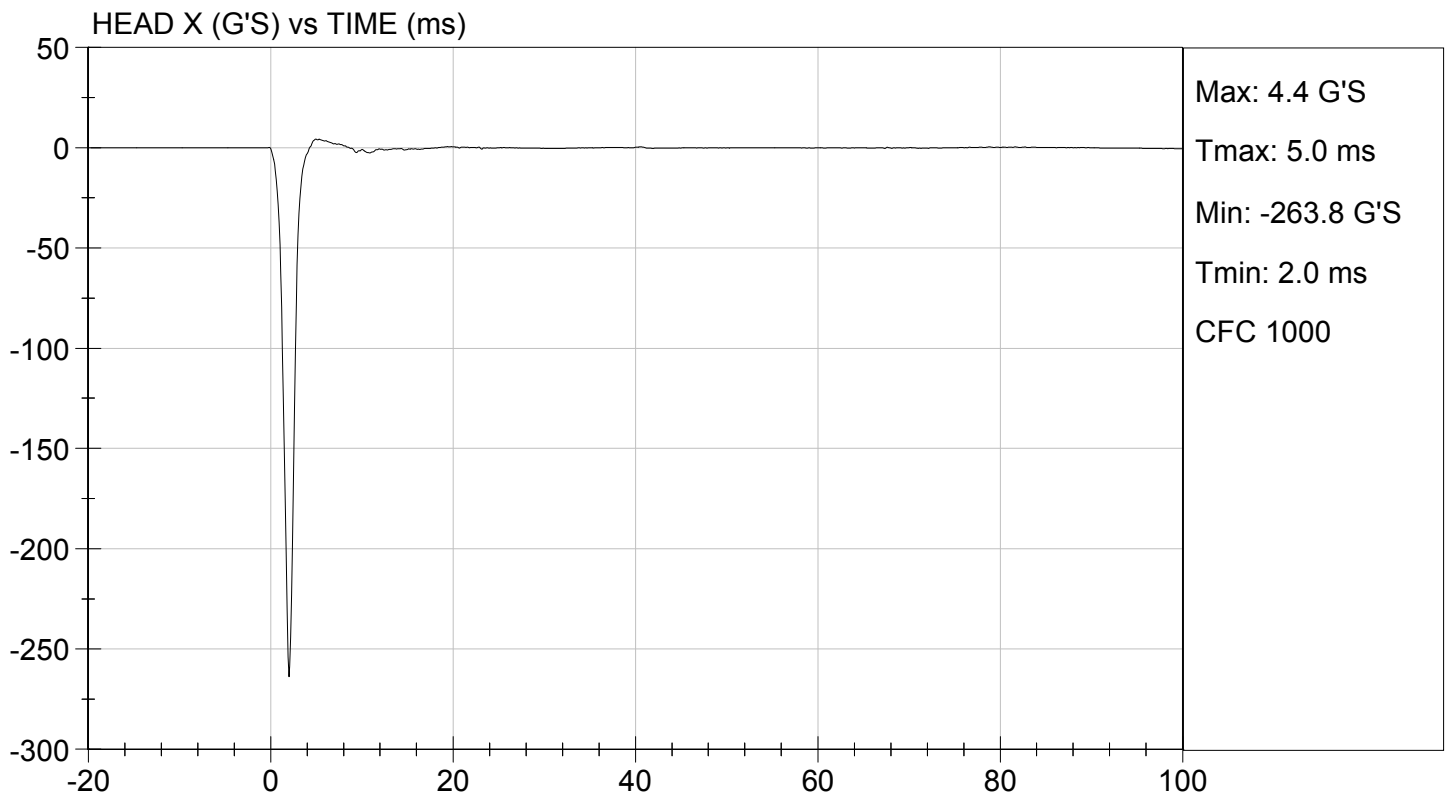
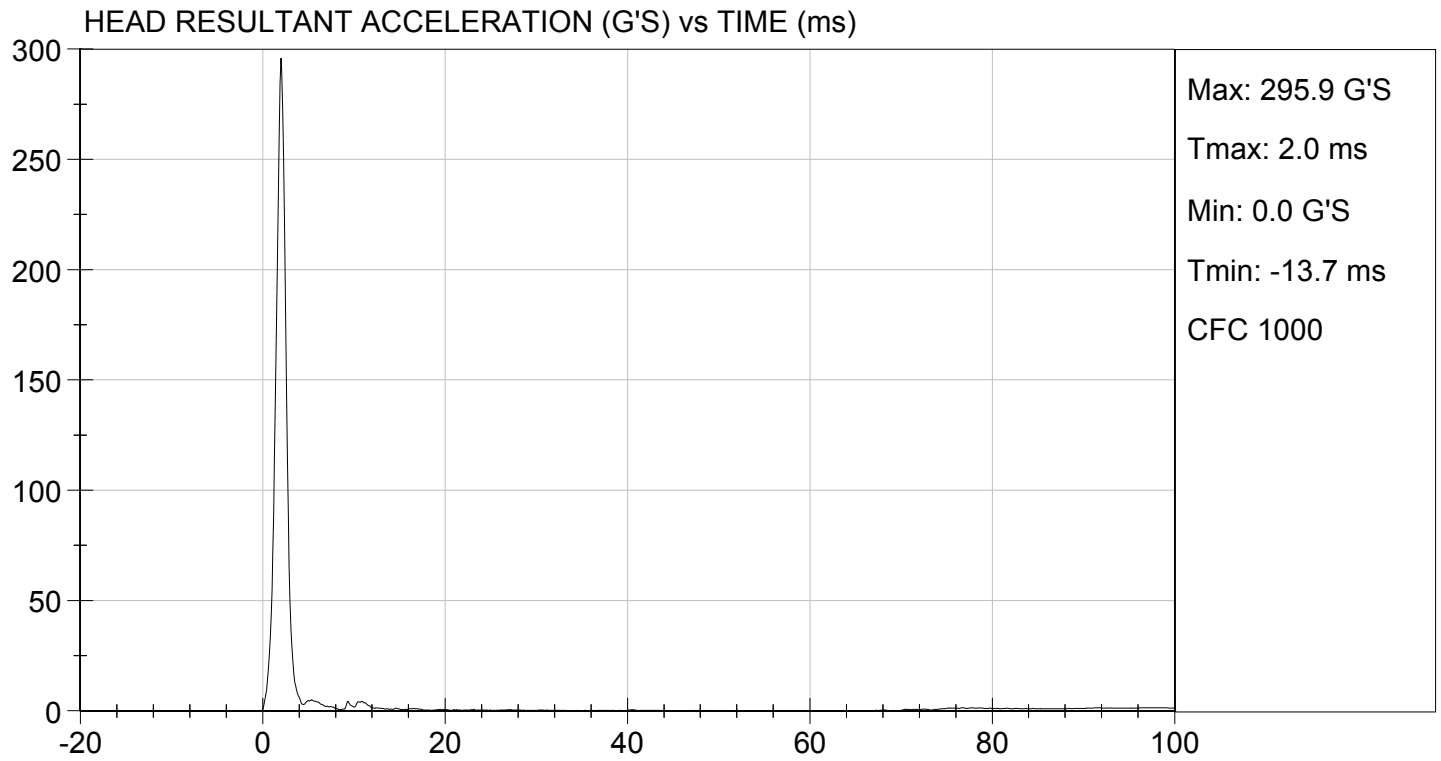
Test ID: D16471

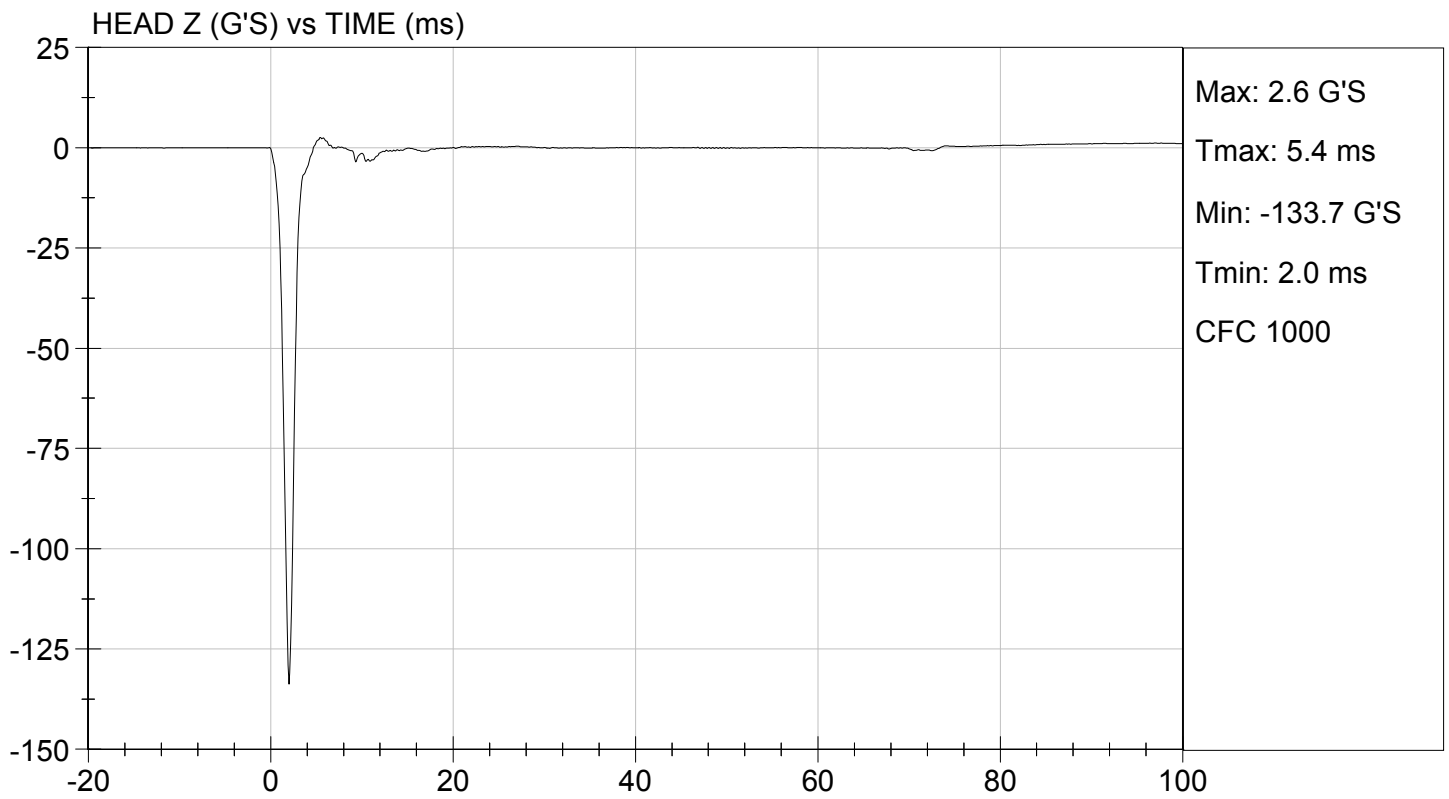
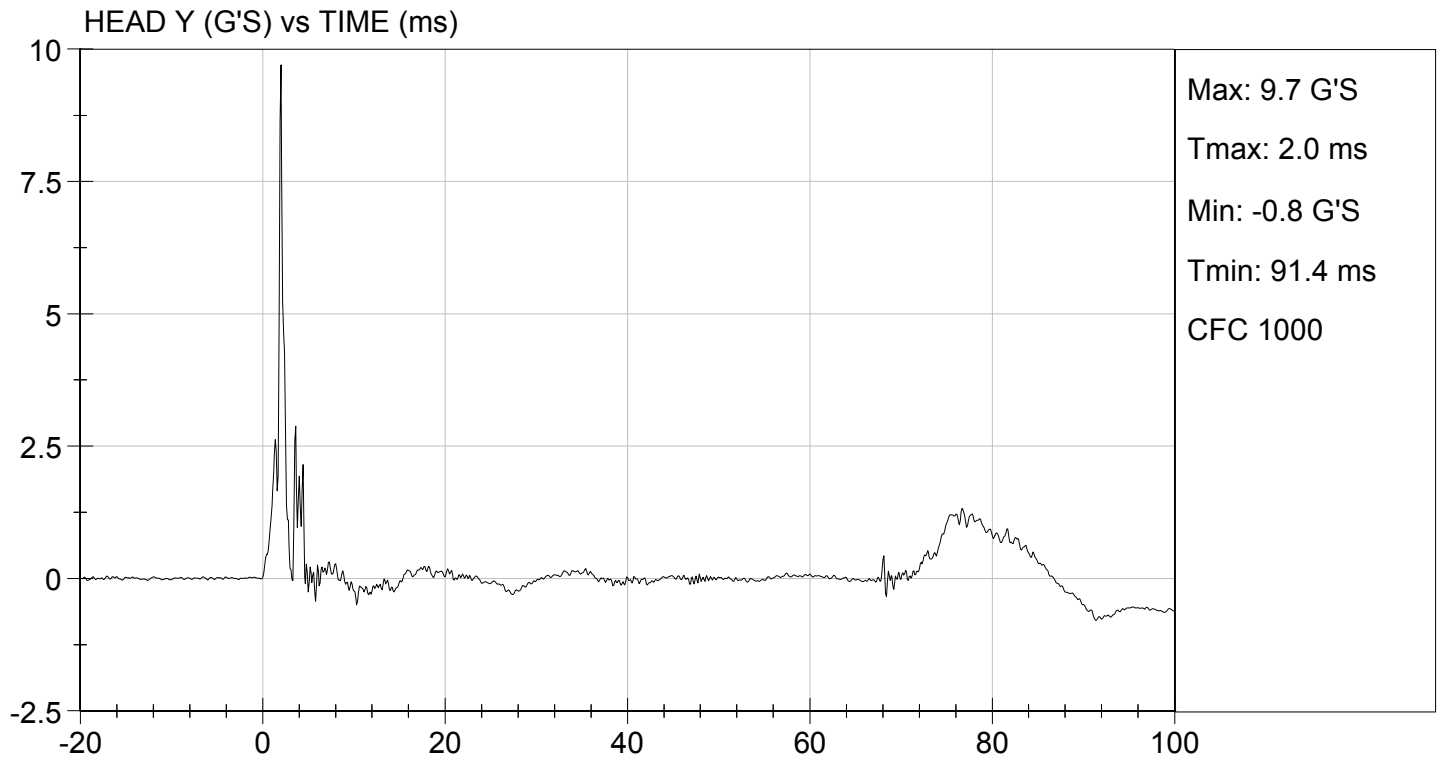
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	245 to 300	296	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

David Schoedel
Laboratory Technician

02/03/2016
Test Date

Jeff Leonard
Approved By





DATA SHEET C4
NECK FLEXION TEST (572.123) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Shoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last neck test. (572.127(o))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.9°C</u> |
| Record the minimum temperature | <u>21.3°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pretest calibration.
- Record findings and actions: No damage
- X 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))

- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123I(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 7C for the flexion test. (572.123I(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.83 m/s to 5.07 m/s as measured at the center of the pendulum accelerometer. (572.123I(4)(i))
- X 12. Complete the following table:

Neck Flexion Test Results (572.123(b)(1)) & (572.123(c)(4)(I & ii))

Parameter		Specification	Result
Pendulum impact speed		4.83 m/s $\leq$ speed $\leq$ 5.07 m/s	4.84 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	1.2 m/s $\leq \Delta V \leq$ 1.6 m/s	1.5 m/s
	@ 20 ms	2.4 m/s $\leq \Delta V \leq$ 3.4 m/s	3.0 m/s
	@ 30 ms	3.8 m/s $\leq \Delta V \leq$ 5.0 m/s	4.3 m/s
Plane D Rotation		Peak moment* 27 Nm $\leq$ moment $\leq$ 33 Nm during the following rotation range 74° $\leq$ angle $\leq$ 92°	31 Nm @ 81 degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm 103 ms $\leq$ time $\leq$ 123 ms	112 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(1)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

- X 13. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

David Schoedel

Signature

02/03/2016

Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16472

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Speed		m/s	4.83 to 5.07	4.84	Pass
Pendulum Velocity	10 ms	m/s	1.2 to 1.6	1.5	Pass
	20 ms	m/s	2.4 to 3.4	3.0	Pass
	30 ms	m/s	3.8 to 5.0	4.3	Pass
D Plane Rotation	Max	deg	74 to 92	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	31	Pass
Positive Moment Time Curve Decay to 5 Nm		ms	103 to 123	112	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

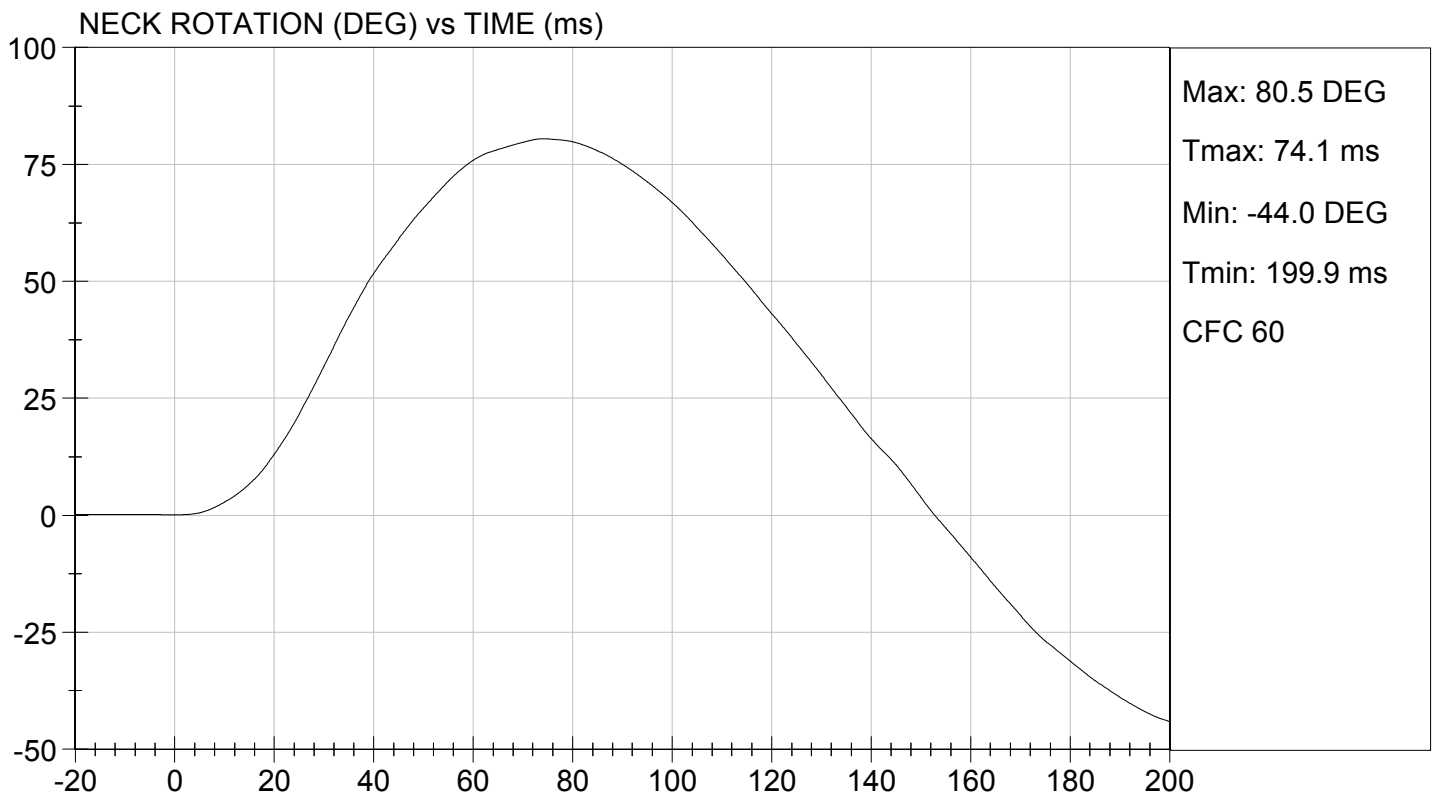
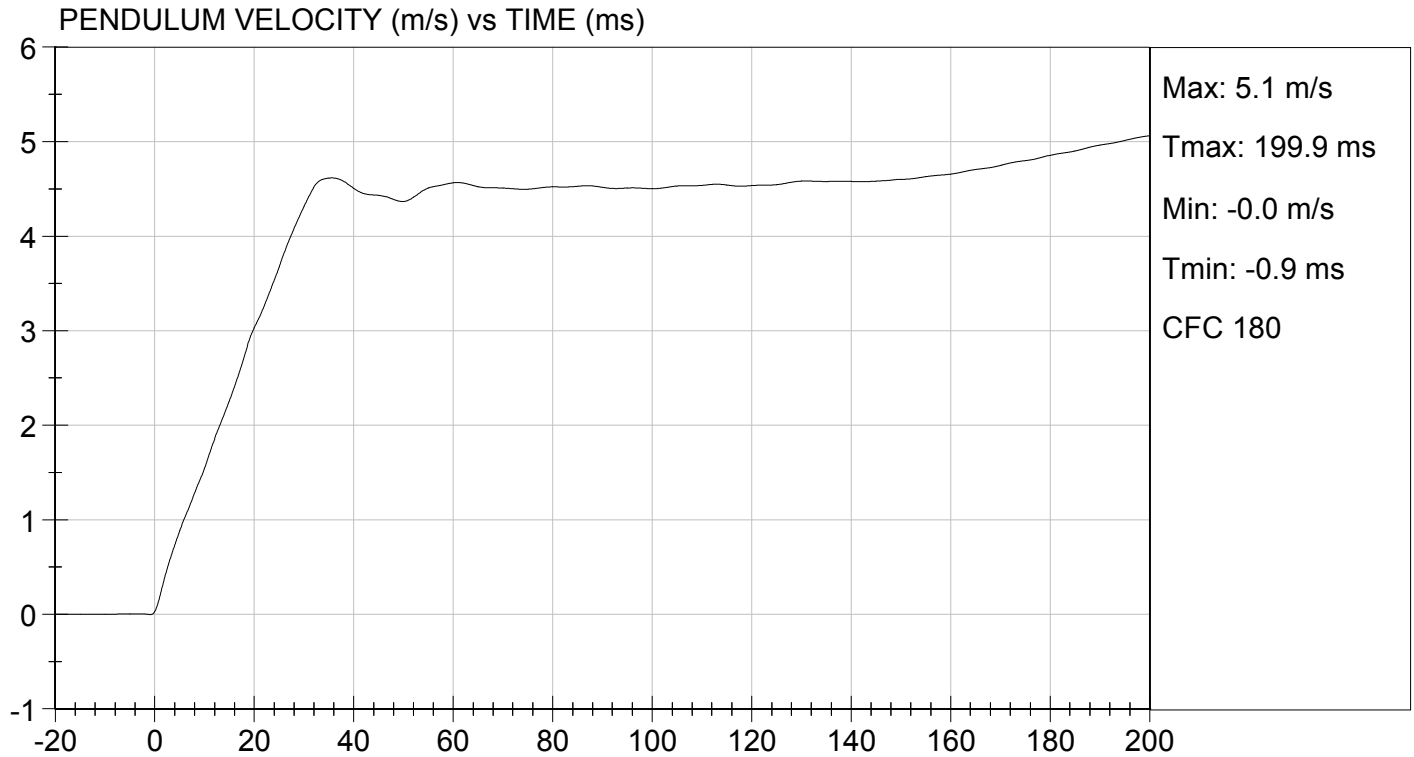
02/03/2016
Test Date

Jeff LevanMarx
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 15.87 ft/s, 4.84 m/s

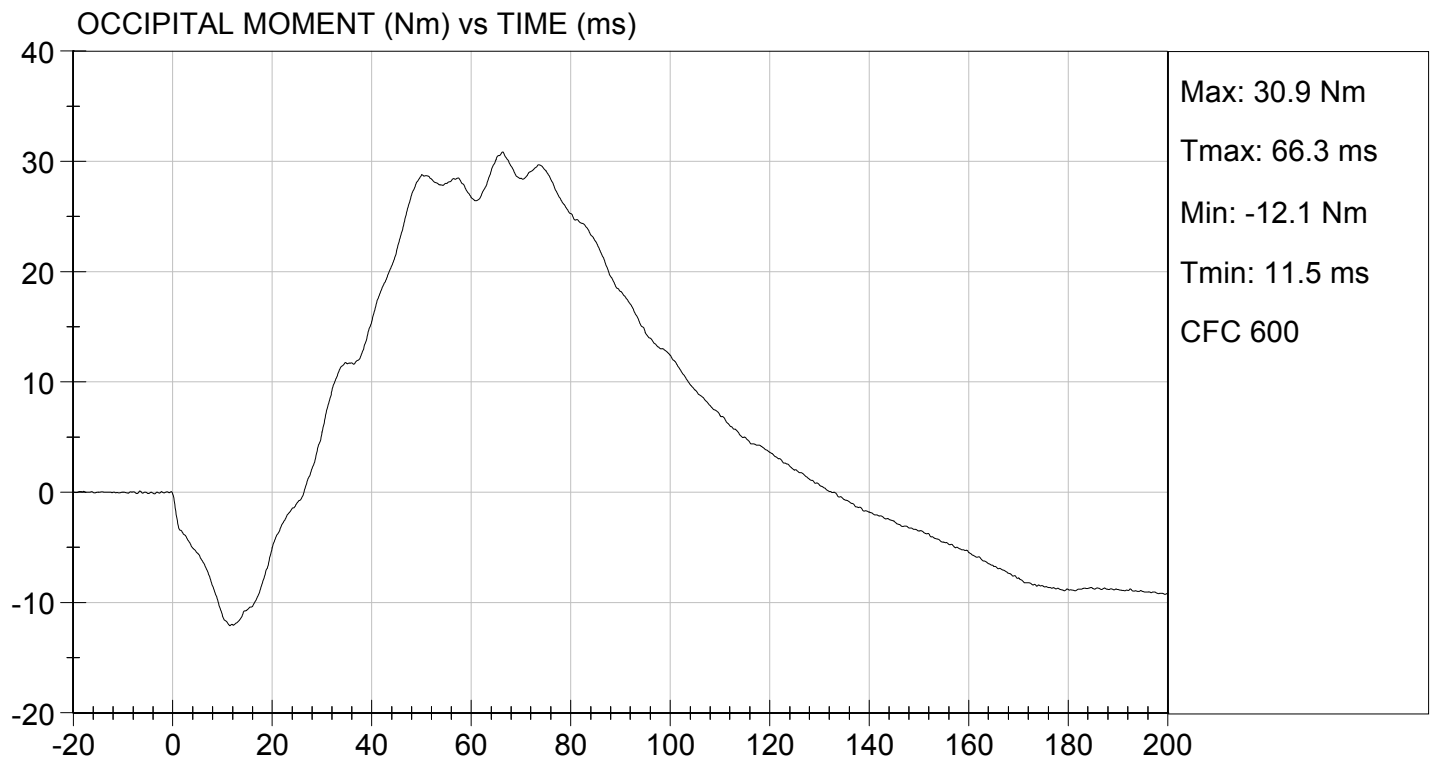
TEST DATE: 02/03/2016
TEST #: D16472





TEST DESC: NECK FLEXION
VELOCITY: 15.87 ft/s, 4.84 m/s

TEST DATE: 02/03/2016
TEST #: D16472



DATA SHEET C5
NECK EXTENSION TEST (572.123) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

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

X 1. It has been at least 30 minutes since the last neck test. (572.127(o))
 X N/A, ONLY one neck test performed

X 2. The components required for the neck tests include the head assembly (127-1000), neck (127-1015), pivot pin (78051-339), bib simulator (TE127-1025), neck bracket assembly (127-8221), six axis neck transducer (SA572-S11), neck mounting adaptor (TE-2208-001) and three accelerometers (SA572-S4) installed in the head assembly as specified in S572.122. Data from the accelerometers are not required. (572.123(b))

X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.123(c)(1))

Record the maximum temperature	<u>21.9°C</u>
Record the minimum temperature	<u>21.3°C</u>
Record the maximum humidity	<u>30%</u>
Record the minimum humidity	<u>28%</u>

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

Record findings and actions: No damage

X 5. Inspect the nodding blocks (127-1020, 127-1021) for splits or deformation. Inspect the Neck Cable (127-1016) for deformation. Inspect the mounting plate insert (910420-048) and the nylon shoulder bushing (9001373) and replace if they are torn or worn. When replacement is necessary, ONLY replace during pretest calibration.

Record findings and actions: No damage

- X 6. Torque the jam nut (9000341) on the neck cable (127-1016) to 0.23 ± 0.02 Nm (2.0 ± 0.2 in-lb). (572.123(c)(2))
- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.127(k))
- X 8. The test fixture pendulum conforms to the specifications in Figure 6C. (572.123(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8C for the extension test. (572.123(c)(3))
- X 10. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 11. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 4.18 m/s to 4.42 m/s as measured at the center of the pendulum accelerometer. (572.123(c)(4))
- X 13. Complete the following table:

Neck Extension Test Results (572.123(b)(2)) & (572.123(c)(4)(i & ii))

Parameter		Specification	Result
Pendulum impact speed		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.30 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.6 m/s
	@ 30 ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.7 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	-20 Nm @ 95 degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	137 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.123(b)(2)(iii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.123(b)(3))

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

David Schoedel

Signature

02/03/2016

Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16473

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Speed		m/s	4.18 to 4.42	4.30	Pass
Pendulum Velocity	10 ms	m/s	1.0 to 1.4	1.4	Pass
	20 ms	m/s	2.2 to 3.0	2.6	Pass
	30 ms	m/s	3.2 to 4.2	3.7	Pass
D Plane Rotation	Max	deg	85 to 103	95	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-19 to -24	-20	Pass
Positive Moment Time Curve Decay to 5 Nm		msec	123 to 147	137	Pass
Overall Results					Pass

David Schoedel

Laboratory Technician

02/03/2016

Test Date

Jeff Leonard

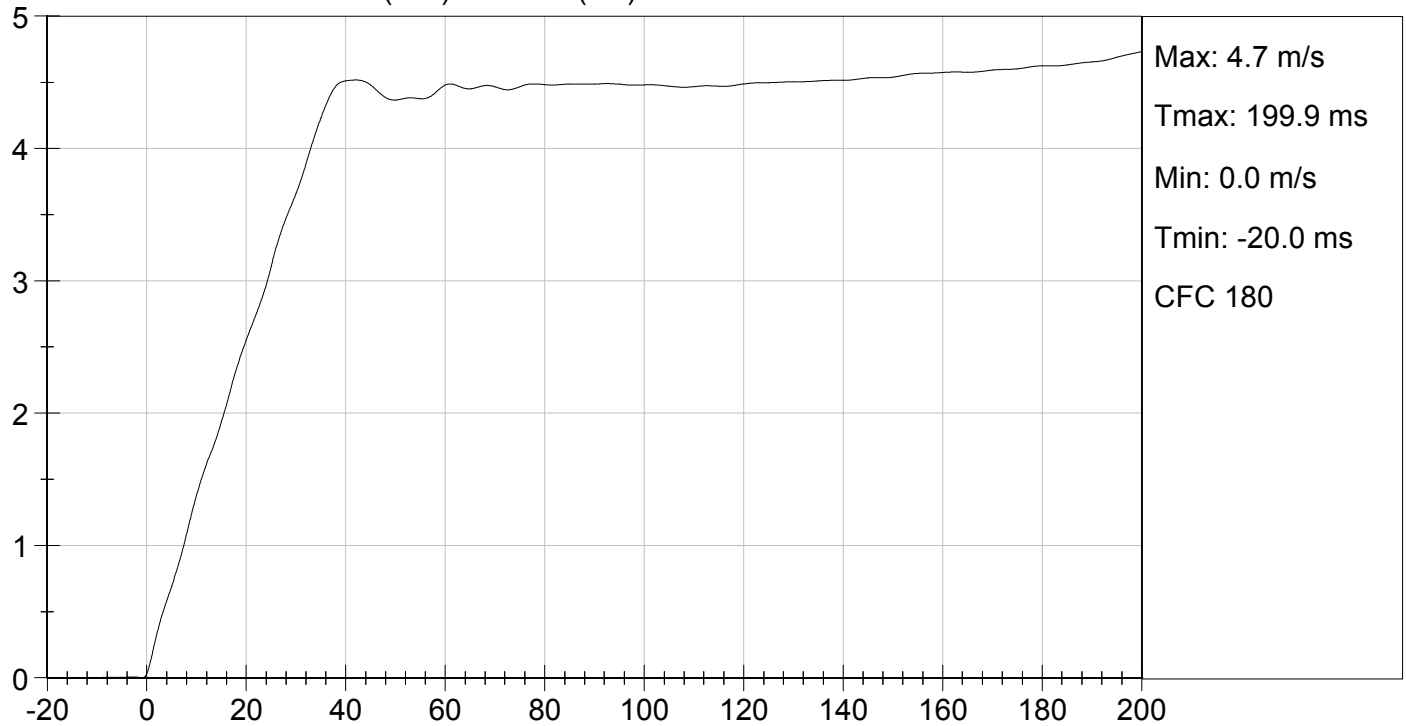
Approved By



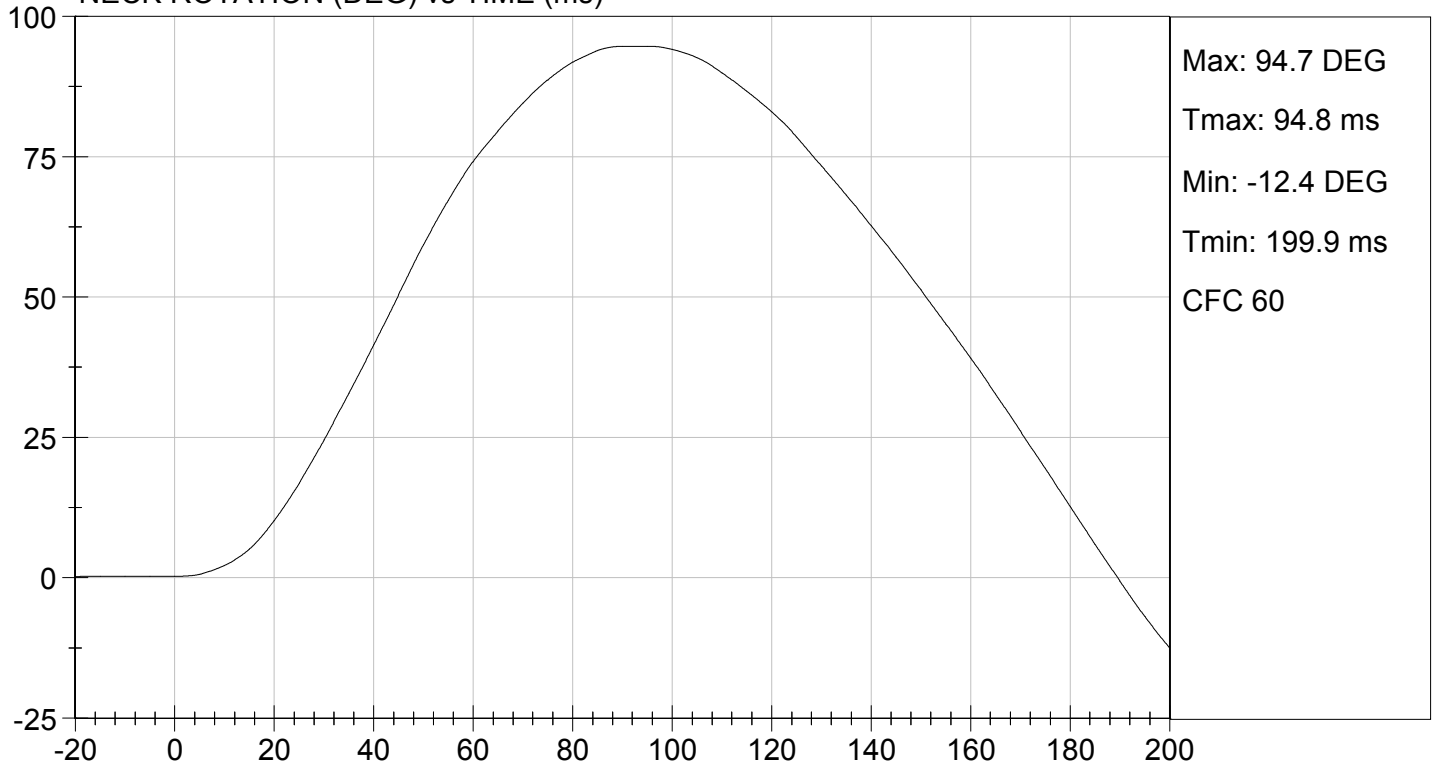
TEST DESC: NECK EXTENSION
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 02/03/2016
TEST #: D16473

PENDULUM VELOCITY (m/s) vs TIME (ms)



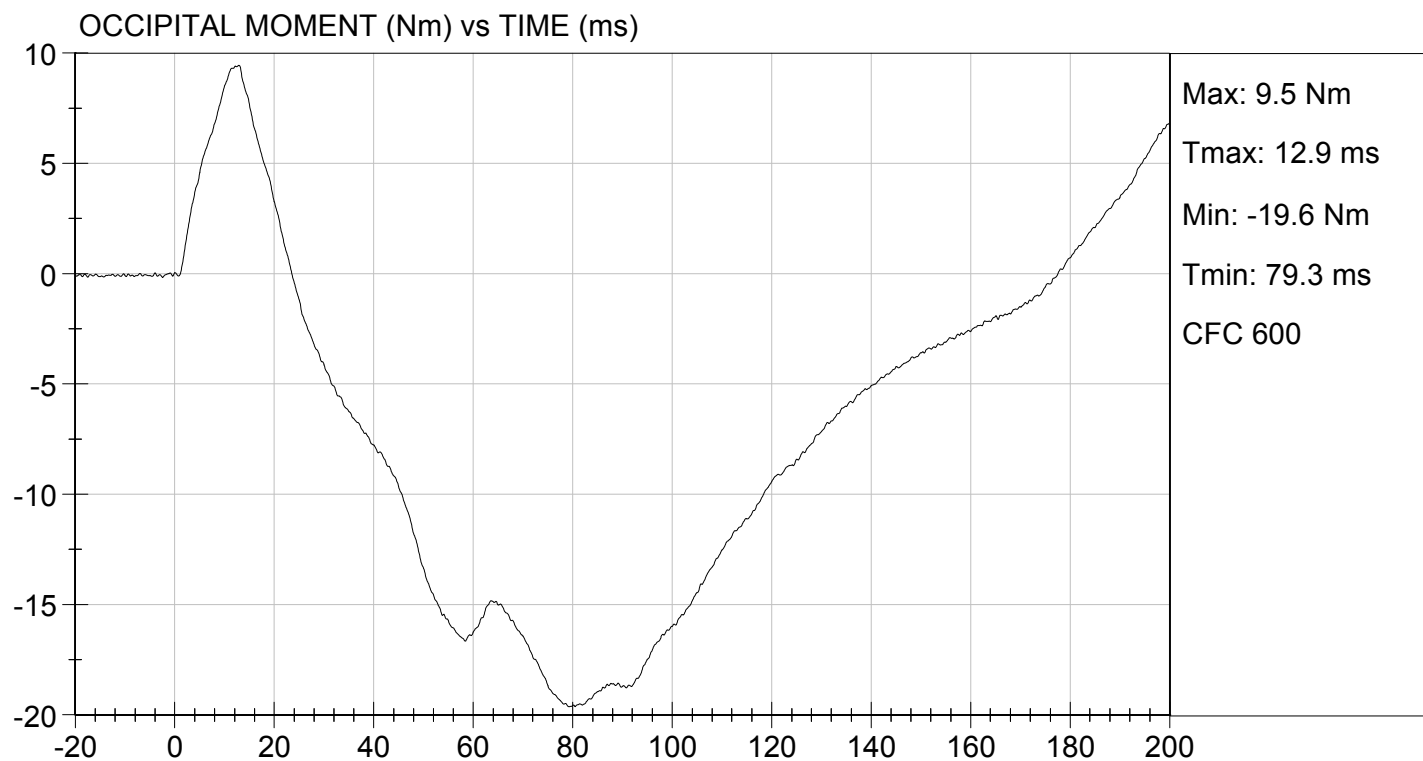
NECK ROTATION (DEG) vs TIME (ms)





TEST DESC: NECK EXTENSION
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 02/03/2016
TEST #: D16473



DATA SHEET C6
THORAX IMPACT TEST (572.124) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

X 1. It has been at least 30 minutes since the last thorax impact test. (572.127(o))
 X N/A, ONLY one thorax impact test performed

X 2. The test fixture conforms to the specifications in Figure 11C.

X 3. The complete assembled dummy (127-0000) is used (572.124(b)).

X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(1))

Record the maximum temperature	<u>21.9°C</u>
Record the minimum temperature	<u>21.3°C</u>
Record the maximum humidity	<u>30%</u>
Record the minimum humidity	<u>28%</u>

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.

Record findings and actions:

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 damage.

X 6. The dummy is dressed in a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible. (572.124(c)(2))

- X 7. Seat the dummy, (chest skin still removed) without back support on the test fixture surface as shown in Figure 9C. The surface must be long enough to support the pelvis and outstretched legs. (572.124(c)(2))
- X 8. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $8^\circ \pm 2^\circ$. The angle may be measured at the pelvis lumbar joining surface.
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.124(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.124(c)(3))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. The dummy is dressed in a tight-fitting size 5 short sleeve shirt. (572.124(c)(2))
- X 14. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut which holds the arm yoke to the clavicle assembly.
- X 15. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.127(k))
- X 16. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.124(c)(4)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.124(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.124(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.124(c)(6))

- X 17. Complete the following table:

Thorax Impact Results (572.124(b)) and 572.124(b)(1)&(2))		
Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	40.5 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1242 N
Peak force** between 12.5 and 38.0 mm chest compression	Peak force $\leq 1500 \text{ N}$	1286 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	73%

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

**Force = impactor mass x acceleration

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 10C)

- X 18. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

David Schoedel

Signature

02/03/2016

Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16474

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	38.0 to 46.0	40.5	Pass
Peak Resistive Force w/in Deflection Corridor	N	1150 to 1380	1,242	Pass
Internal Hysteresis	%	65 to 85	73	Pass
Peak Force 12.5 mm - 38.0 mm	N	<= 1,500	1,286	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

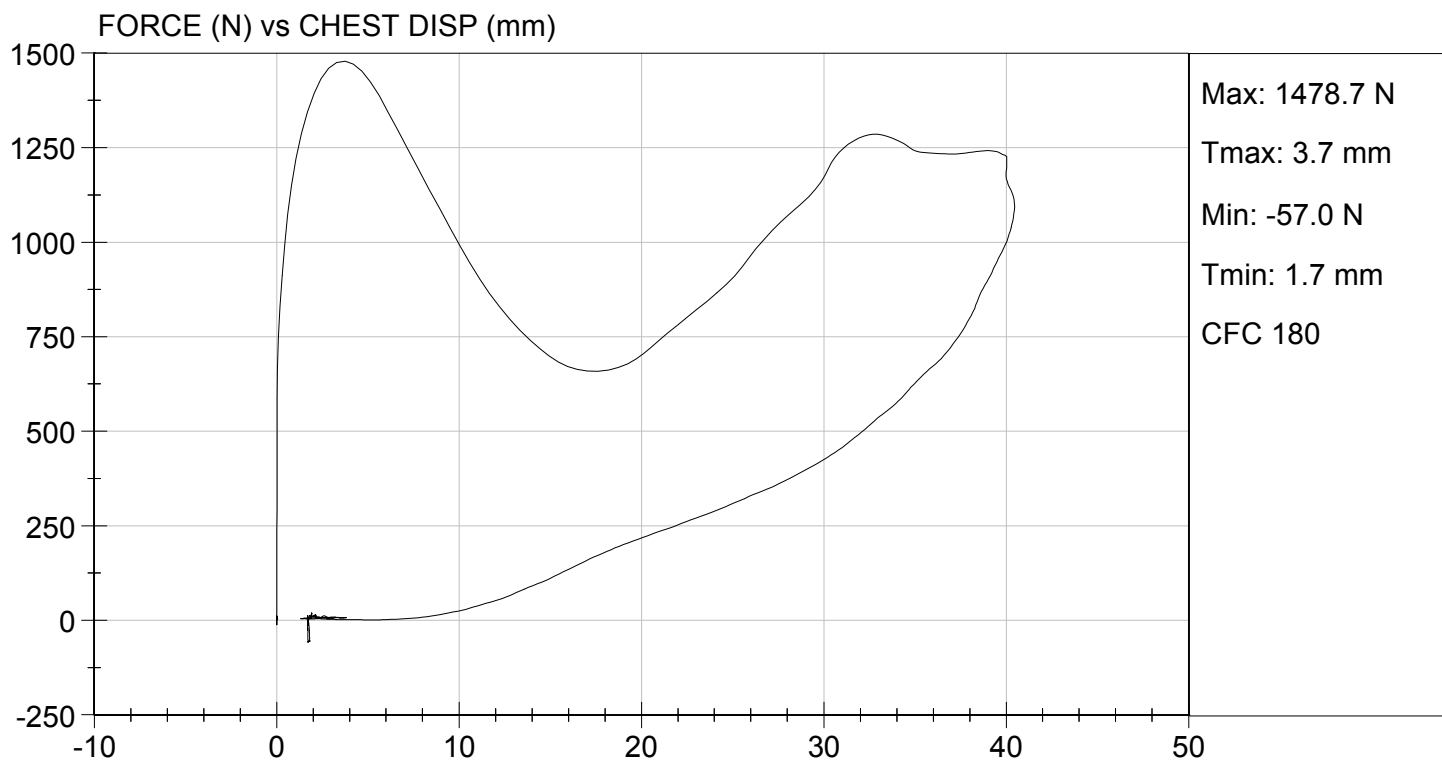
02/03/2016
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/03/2016
TEST #: D16474



DATA SHEET C7
TORSO FLEXION TEST (572.125) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.127(o))
 X N/A, ONLY one torso flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 11C.
- X 3. The complete assembled dummy (127-0000) is used (572.125(c)(2)).
 X with legs below the femurs.
 without legs below the femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.9°C</u> |
| Record the minimum temperature | <u>21.3°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼x20x½ inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.125(c)(3))
- X 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 11C. (572.125(c)(6))
- X 7. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.125(c)(4))
- X 8. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.125(c)(4))
- X 9. Remove all external support that was implemented in 9 above. (572.125(c)(5))

- X 10. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(5))
 Record reference plane angle (max. allowed 22°) See Result Table
- X 11. Attach the pull cable and the load cell. (572.125(c)(6))
- X 12. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.125(c)(7))
- X 13. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.125(c)(8))
- X 14. As quickly as possible release the force applied to the attachment bracket. (572.125(c)(9))
- X 15. 3 minutes after the release of the force, measure the reference plane angle. (572.125(c)(9))
- X 16. Complete the following table:

Torso Flexion Results (572.125(b)), (572.125(c)(7)), (572.125(c)(8))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 22°	17°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.7°/s
Force at 45° ± 0.5°	147 N ≤ force ≤ 200 N	147 N
Final ref. plane angle	Initial ref. plane angle ± 8°	21°

David Schoedel
 Signature

02/03/2016
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16477

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial Angle	deg	0 to 22	17	Pass
Return Angle	deg	+/- 8	21	Pass
Force at 45 deg	N	147 to 200	147	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result				Pass

David Schoedel

Laboratory Technician

02/03/2016

Test Date

Jeff Leonard

Approved By

DATA SHEET C8
LEFT KNEE IMPACT TEST (572.126) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 12C.
- X 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-1), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.9°C</u> |
| Record the minimum temperature | <u>21.3°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:

Knee Impact Results (572.126(b)(1)) & (572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.10 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2104 N

*Force = impactor mass x deceleration (572.126(b))

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

David Schoedel

Signature

02/03/2016

Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16476

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	30	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	2000 to 3000	2104	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/03/2016

Test Date

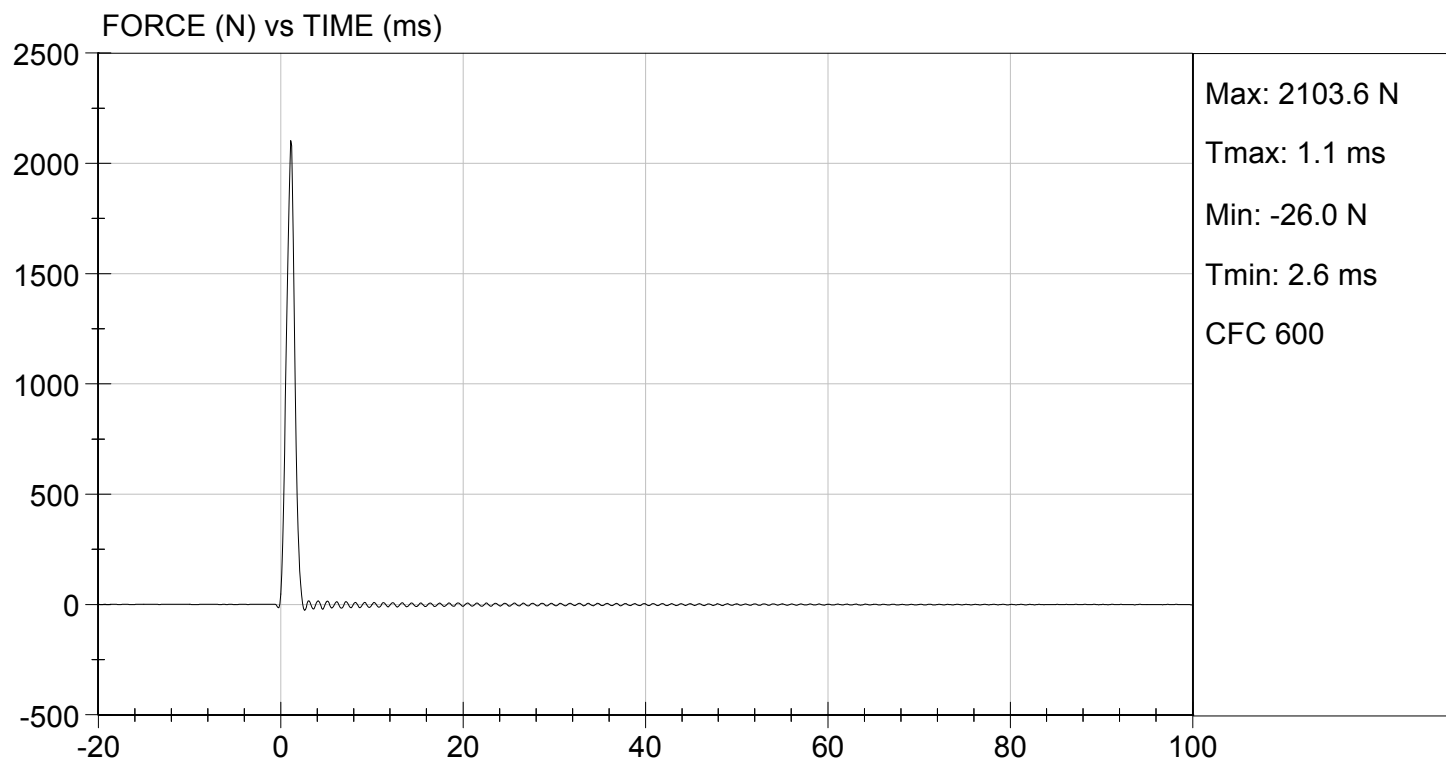
Jeff Leonard

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.88 ft/s, 2.10 m/s

TEST DATE: 02/03/2016
TEST #: D16476



DATA SHEET C9
RIGHT KNEE IMPACT TEST (572.126) (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 02/03/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last knee impact test. (572.127(o))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 12C.
- X 3. The knee assembly consisting of the knee machined (127-4013), knee flesh (127-4011), lower leg (127-4014), foot assembly (127-4030-2), and femur load transducer (SA572-S10) (may use the load cell structural replacement (127-4007)) were used. (572.126(b))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.126(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.9°C</u> |
| Record the minimum temperature | <u>21.3°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

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

 X 11. Complete the following table:

Knee Impact Results (572.126(b)(1)) & (572.126(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.08 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2194 N

*Force = impactor mass x deceleration (572.126(b))

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

David Schoedel
Signature

02/03/2016
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D16475

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	30	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	N	2000 to 3000	2194	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/03/2016

Test Date

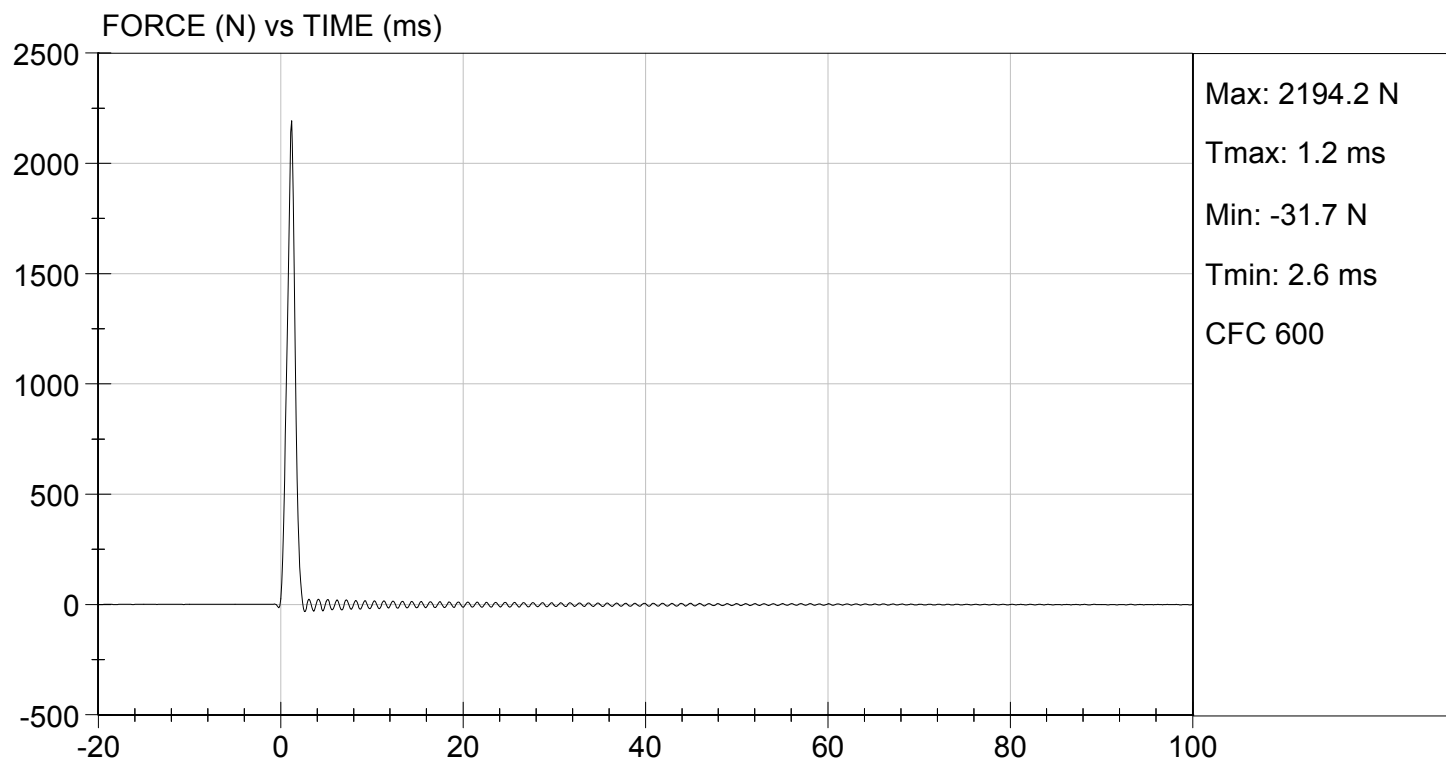
Jeff Levan Marsh

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.81 ft/s, 2.08 m/s

TEST DATE: 02/03/2016
TEST #: D16475



DATA SHEET C10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P79819	10/14/2015	04/14/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P79821	10/14/2015	04/14/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P79822	10/14/2015	04/14/2016
NECK TRANSDUCER	Denton	1716A	2146	10/21/2015	04/21/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82128	10/14/2015	04/14/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82129	10/14/2015	04/14/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82130	10/14/2015	04/14/2016
CHEST POTENTIOMETER	Servo	08C1-3179	155	10/14/2015	04/14/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	N/A	N/A	N/A	N/A	N/A
(2) LEFT FEMUR	N/A	N/A	N/A	N/A	N/A
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: _____

Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 155

Test Date: 02/02/2016

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

02/03/2016
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/03/2016
Date

EXTERNAL DIMENSIONS

HYBRID III 3 year SN #031, PART 572, SUBPART P EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	538.5-553.7	539.7
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	307.4-322.6	316.4
C	H-POINT HEIGHT	Reference	34.3-44.5	41.2
D	H-POINT LOCATION FROM BACKLINE	Reference	56.9-67.1	65.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder pivot bolt to the fixture's rear vertical surface.	60.9-71.1	65.8
F	THIGH CLEARANCE	Fixture's seat surface to highest point on the upper leg segment	81.0-91.2	85.7
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the finger tip, in line with the elbow and wrist centerlines	247.4-262.6	251.3
H	HEAD BACK TO BACKLINE	Rearmost surface of the head to the fixture's rear vertical surface (Reference)	48.2-58.4	53.1
I	SHOULDER TO - ELBOW LENGTH	Measure from the highest point on top of the shoulder to the lowest part of the flesh on the elbow in line with the shoulder and elbow pivot bolts.	185.4-200.6	199.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	133.6-148.8	141.4
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the fixture's rear vertical surface, in line with the knee and hip pivots.	284.8-300.0	288.6
L	POPLITEAL HEIGHT	Seat surface to the horizontal plane of the bottom of the feet.	218.5-233.7	225.9
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	241.6-256.8	251.3
N	BUTTOCK POPLITEAL LENGTH	The most forward portion of the crevice between the upper and lower legs behind the knee to the fixture's rear vertical surface.	218.0-233.2	230.1

HYBRID III 3 year SN #031, PART 572, SUBPART P EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITH JACKET	Measured 254.0 ± 5.1 mm above seat surface	138.5-153.7	151.7
P	FOOT LENGTH	Tip of toe to rear of heel	137.6-147.8	143.6
Q	STATURE	Lay the dummy out on a flat surface with the rear surfaces of the head, upper torso, buttocks and heels touching the surface and with the bottom of the feet perpendicular to that surface. Measure the distance from the bottom of the feet to the top of the head.	932.2-957.6	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	Knee pivot bolt to the fixture's rear vertical surface.	251.4-261.6	260.1
S	HEAD BREADTH	Distance across the widest of the head at its widest point	128.3-143.5	133.8
T	HEAD DEPTH	Distance from the forward most surface of the head to the rearmost surface of the head, in line with the midsagittal plane.	167.4-182.6	172.7
U	HIP BREADTH	Distance across the width of the hip at the widest point of the jacket	200.7-215.9	208.9
V	SHOULDER BREADTH	Distance between the outside edges of the shoulder flesh, in line with the shoulder pivot bolts	236.5-251.7	245.4
W	FOOT BREADTH	The widest part of the foot	53.6-63.8	57.3
X	HEAD CIRCUMFERENCE	At the largest location	500.4-515.6	513.2
Y	CHEST CIRCUMFERENCE WITH JACKET	Distance around chest at reference location AA, with jacket on.	527.1-552.5	541.3
Z	WAIST CIRCUMFERENCE	Distance around chest at reference location BB, with jacket on.	527.1-552.5	532.4
AA	REFERENCE LOCATION FOR DIMENSION Y	Reference: 254.0 ± 5.1 MM above the seat surface	248.9-259.1	254.0
BB	REFERENCE LOCATION FOR DIMENSION Z	Reference: 165.1 ± 5.1 MM above seat surface	160.0-170.2	165.0

DATA SHEET D3
HEAD DROP TEST (572.142) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 01/14/2016

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259), accelerometer mounting block (SA572-S80) structural replacement of ½ mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one ½-20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))
- X 3. Accelerometers and their respective mounts are smooth and clean.
- X 4. The head accelerometer mounting plate screws (10-32 x 5/8 SHCS) are torqued to 10.2 Nm.
- X 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- X 6. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.142(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>25%</u> |
- X 7. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- X 8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))

- X 9. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.142(c)(3))
Record the actual distance: 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 10. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.142(c)(3))
Record the right side distance: 501 mm
Record the left side distance: 501 mm

- X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))
Record actual micro finish: 50.9 micro inches

- X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.142(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm

- X 13. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches ± 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.142(b)) & (572.142(c)(4))

- X 14. Complete the following table. (572.142(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	258 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-9.8 g

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

David Schoedel
Signature

01/14/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test ID: D16181

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	250 to 280	258	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-9.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

David Schoedel

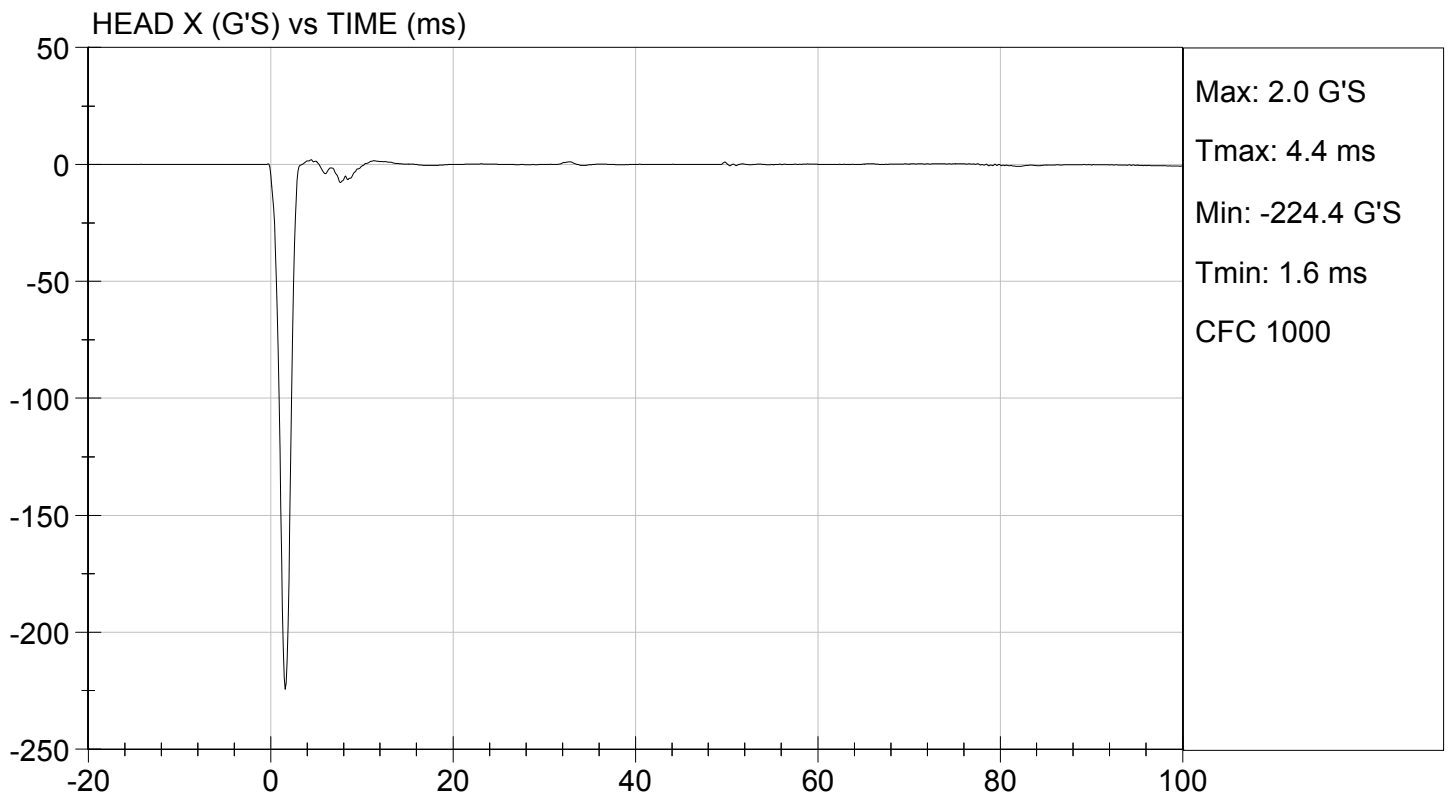
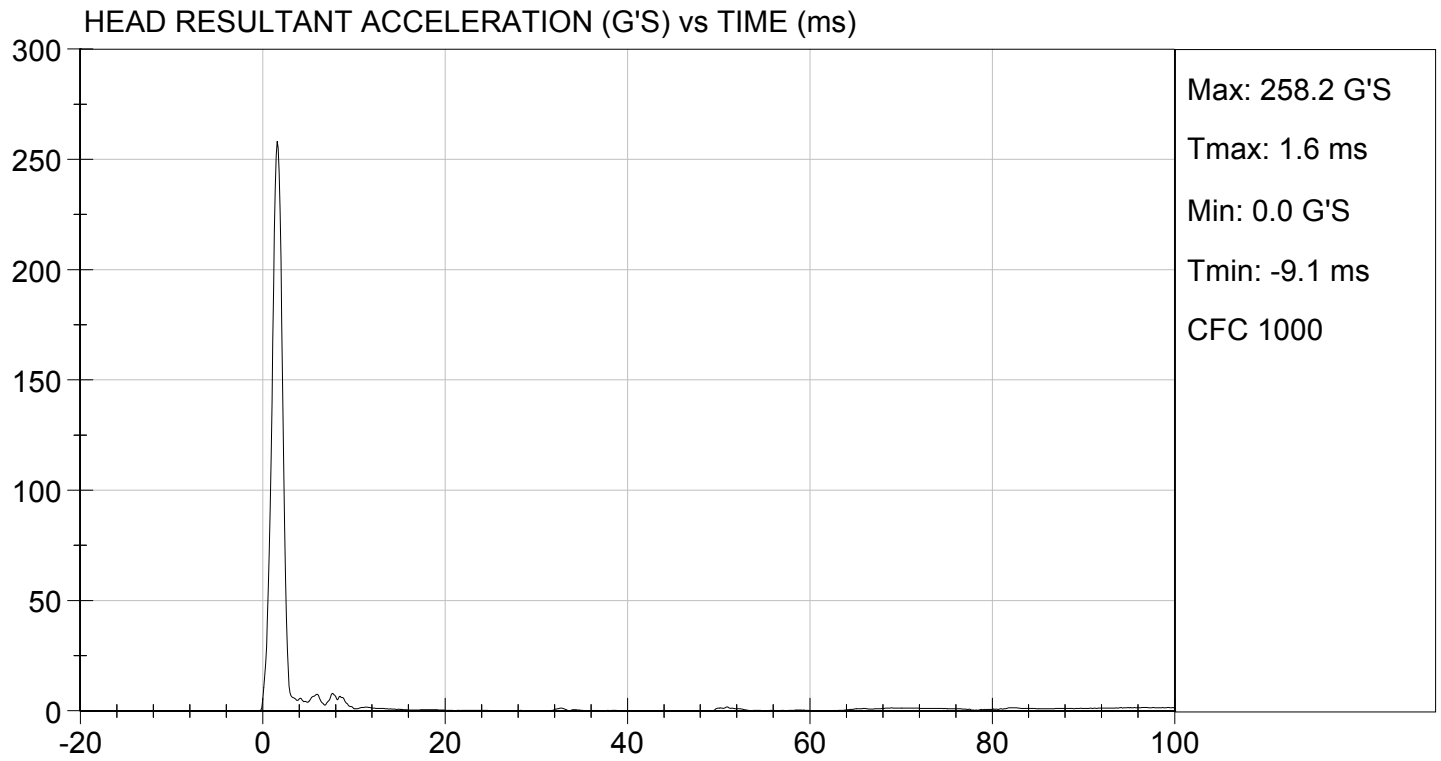
Laboratory Technician

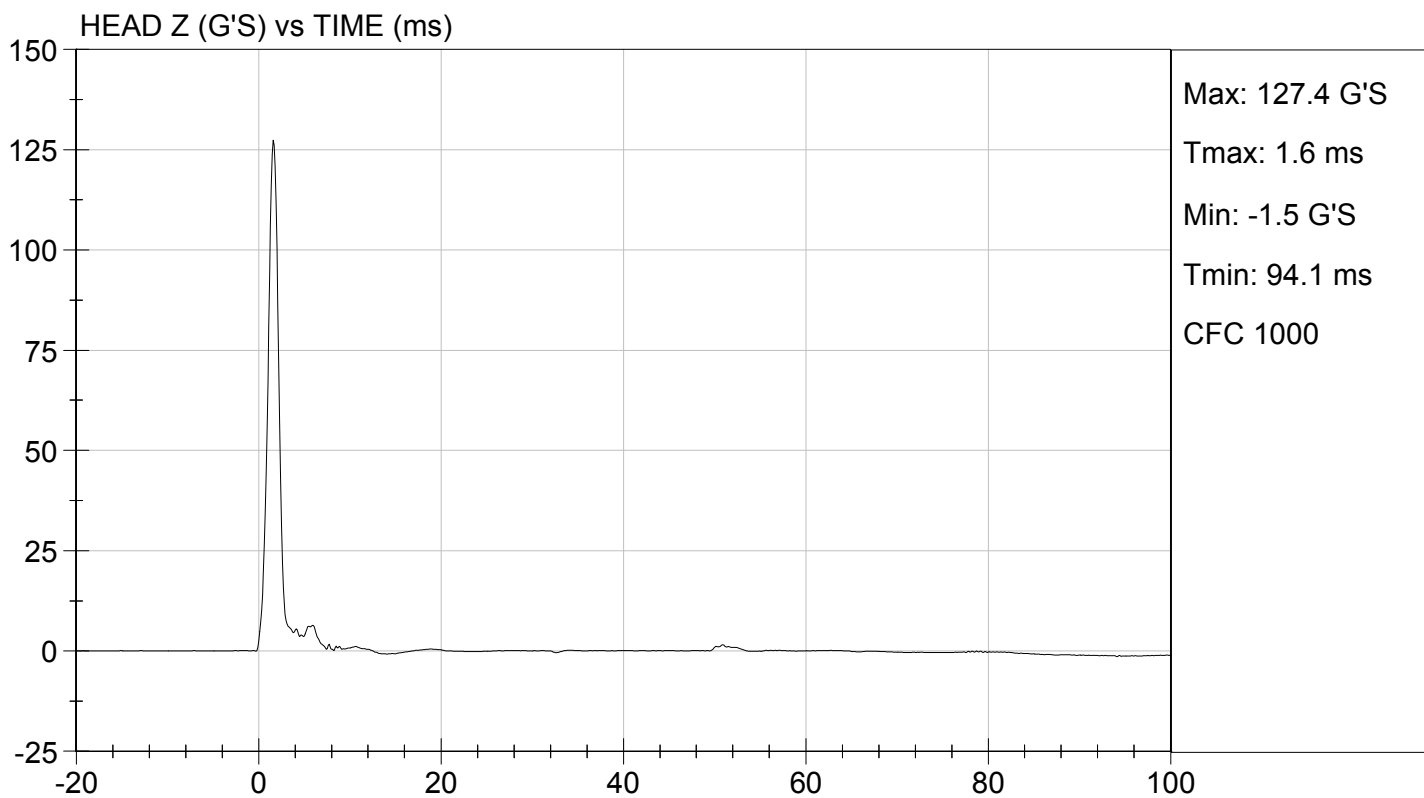
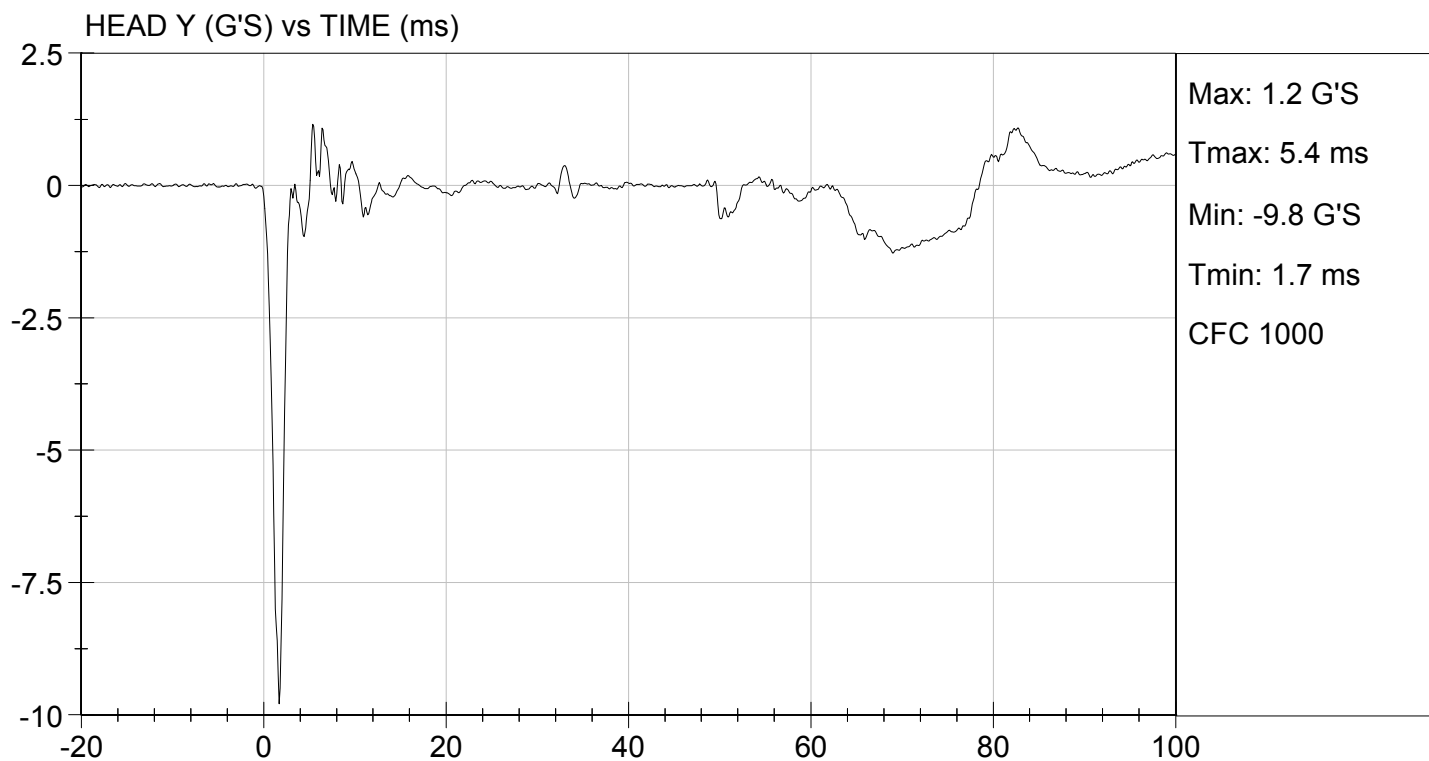
01/14/2016

Test Date

Jeff Leonard

Approved By





DATA SHEET D4
NECK FLEXION TEST (572.143) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 01/14/2016

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last neck test. (572.146(p))
 X N/A, this is the first neck test performed
- X 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>25%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- X 7. The test fixture pendulum conforms to the specifications in Figure 8D.
- X 8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9D for the flexion test. (572.143(c)(3))

- X 9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.
- X 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(1)(iii))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 13. Complete the following table:

Neck Flexion Test Results (572.143(b)(1)) & (572.143(c)(4)(ii))			
Parameter		Specification	Result
Pendulum impact speed		5.4 m/s $\leq$ speed $\leq$ 5.6 m/s	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.0 m/s $\leq \Delta V \leq$ 2.7 m/s	2.4 m/s
	@ 15 ms	3.0 m/s $\leq \Delta V \leq$ 4.0 m/s	3.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.1 m/s	4.6 m/s
Plane D Rotation		Peak moment* 42 Nm $\leq$ moment $\leq$ 53 Nm during the following rotation range 70° $\leq$ angle $\leq$ 82°	43.0 Nm @ 78 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 60 ms $\leq$ time $\leq$ 80 ms	70 ms

*The moment is a direct reading from the load cell

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

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

David Schoedel

Signature

01/14/2016

Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 3 YEAR OLD

ATD Serial No: 031

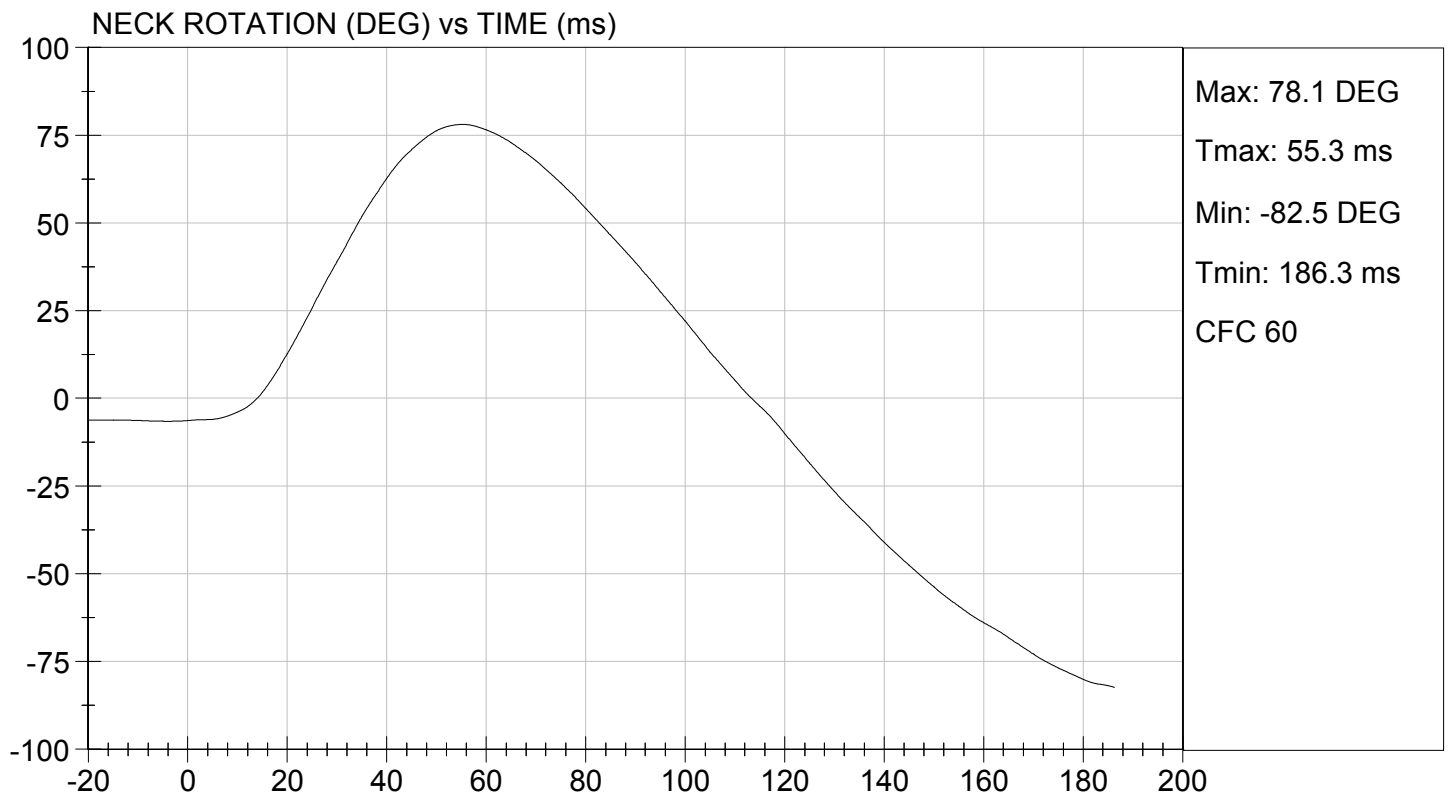
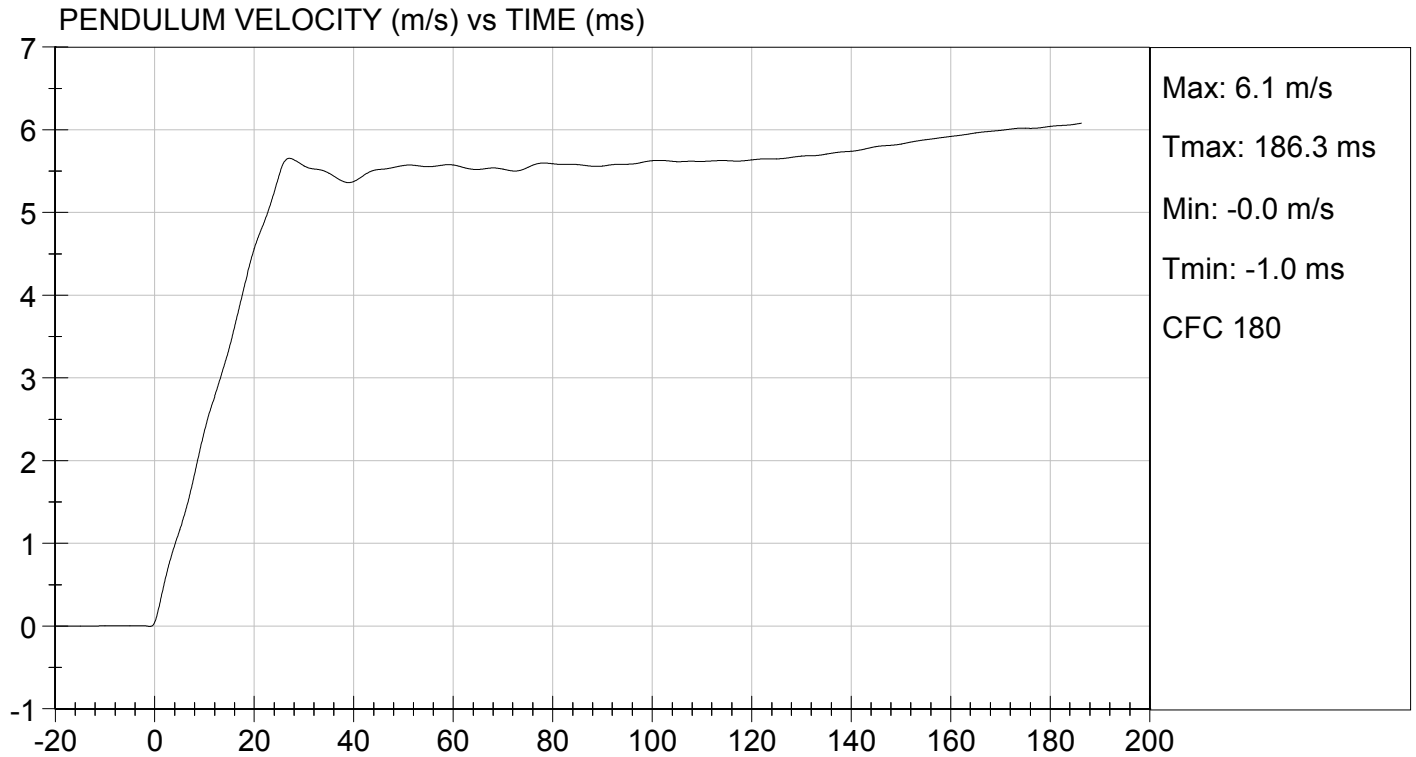
Test I.D: D16182

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	27	Pass
Pendulum Speed		m/s	5.40 to 5.60	5.52	Pass
Pendulum Velocity	10 msec	m/s	2.0 to 2.7	2.4	Pass
	15 msec	m/s	3.0 to 4.0	3.4	Pass
	20 msec	m/s	4.0 to 5.1	4.6	Pass
D Plane Rotation		deg	70 to 82	78	Pass
Peak Moment within Deflection Corridor		Nm	42.0 to 53.0	43.0	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 to 80.0	70	Pass
Overall Test Results				Pass	

David Schoedel
Laboratory Technician

01/14/2016
Test Date

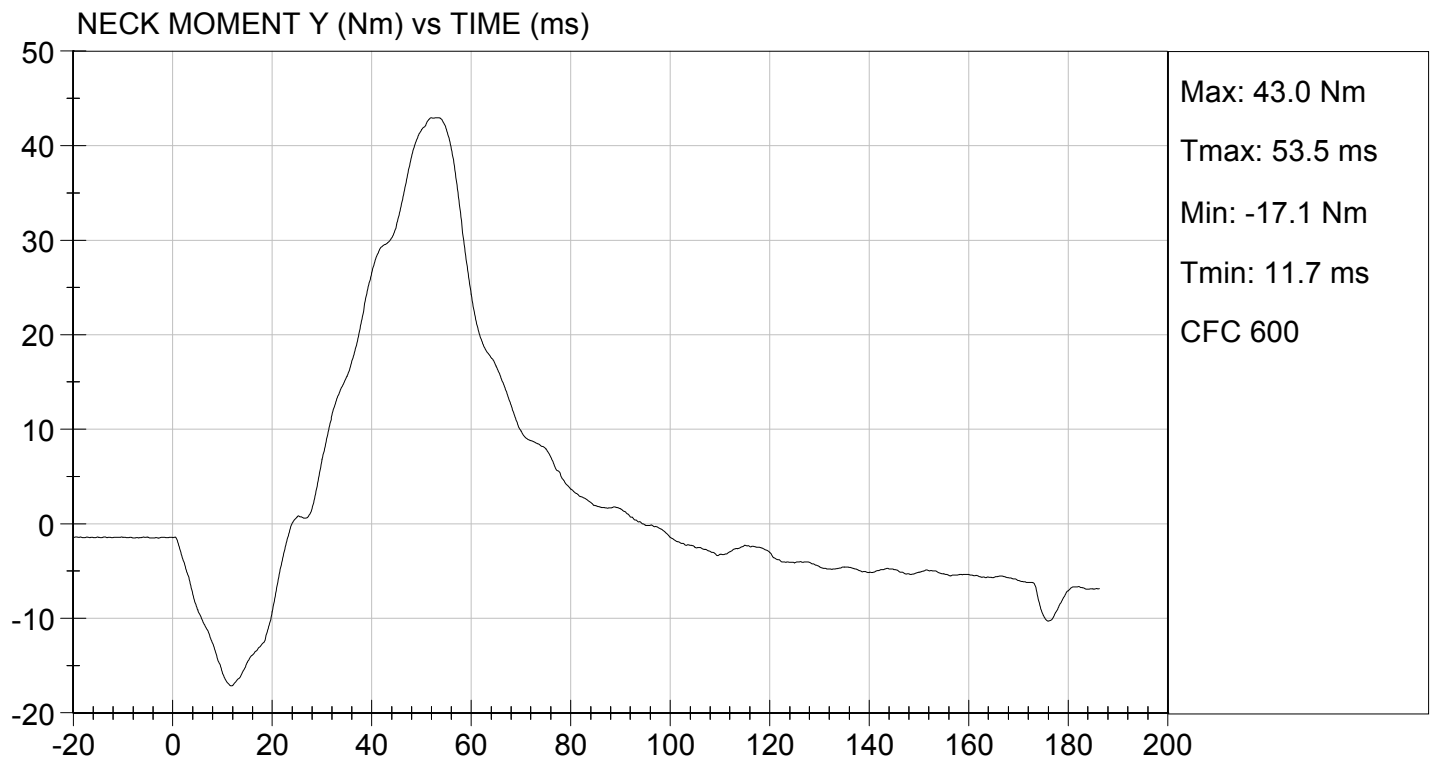
Jeff Leonard
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 01/14/2016
TEST #: D16182



DATA SHEET D5
NECK EXTENSION TEST (572.133) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 01/14/2016

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last neck test. (572.146(p))
 X N/A, this is the first neck test performed
- X 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>25%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: No damage
- X 5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- X 7. The test fixture pendulum conforms to the specifications in Figure 8D.
- X 8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 10D for the extension test. (572.143(c)(3))

- X 9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.
- X 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(2)(iii))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		3.55 m/s $\leq$ speed $\leq$ 3.75 m/s	3.65 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	1.0 m/s $\leq \Delta V \leq$ 1.4 m/s	1.2 m/s
	@ 10 ms	1.9 m/s $\leq \Delta V \leq$ 2.5 m/s	2.3 m/s
	@ 14 ms	2.8 m/s $\leq \Delta V \leq$ 3.5 m/s	3.1 m/s
Plane D Rotation		Peak moment* -53.3 Nm $\leq$ moment $\leq$ -43.7 Nm during the following rotation range 83 $\leq$ angle $\leq$ 93	-45.3 Nm @ 91 degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm 60 ms $\leq$ time $\leq$ 80 ms	73 ms

*The moment is a direct reading from the load cell

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

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

David Schoedel
Signature

01/14/2016
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test I.D: D16183

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	27	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.65	Pass
Pendulum Velocity	6 ms	m/s	1.0 to 1.4	1.2	Pass
	10 ms	m/s	1.9 to 2.5	2.3	Pass
	14 ms	m/s	2.8 to 3.5	3.1	Pass
D Plane Rotation		deg	83 to 93	91	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 to -43.7	-45.3	Pass
Negative Moment - Time Curve Decay to -10 Nm		ms	60.0 to 80.0	73	Pass
Overall Test Results				Pass	

David Schoedel
Laboratory Technician

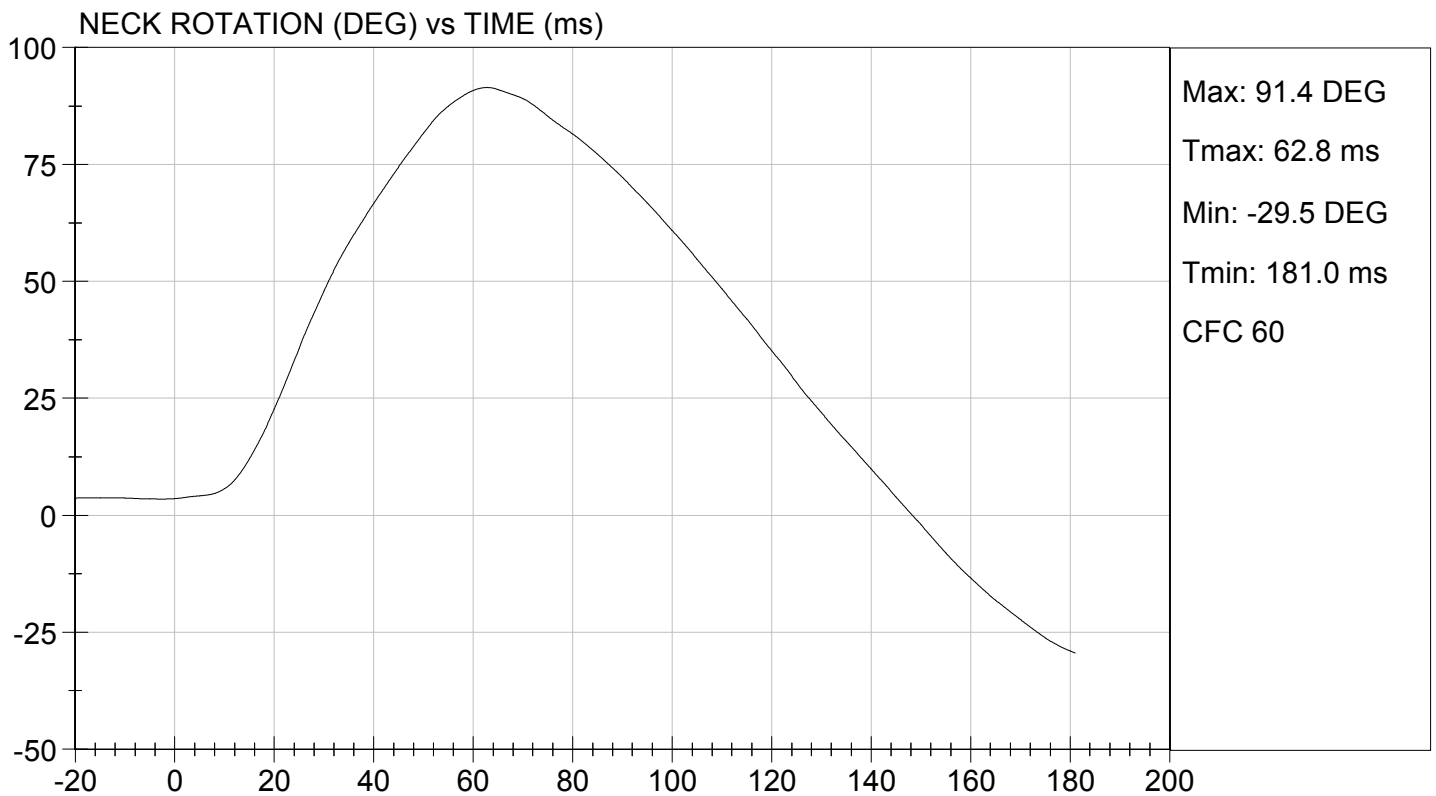
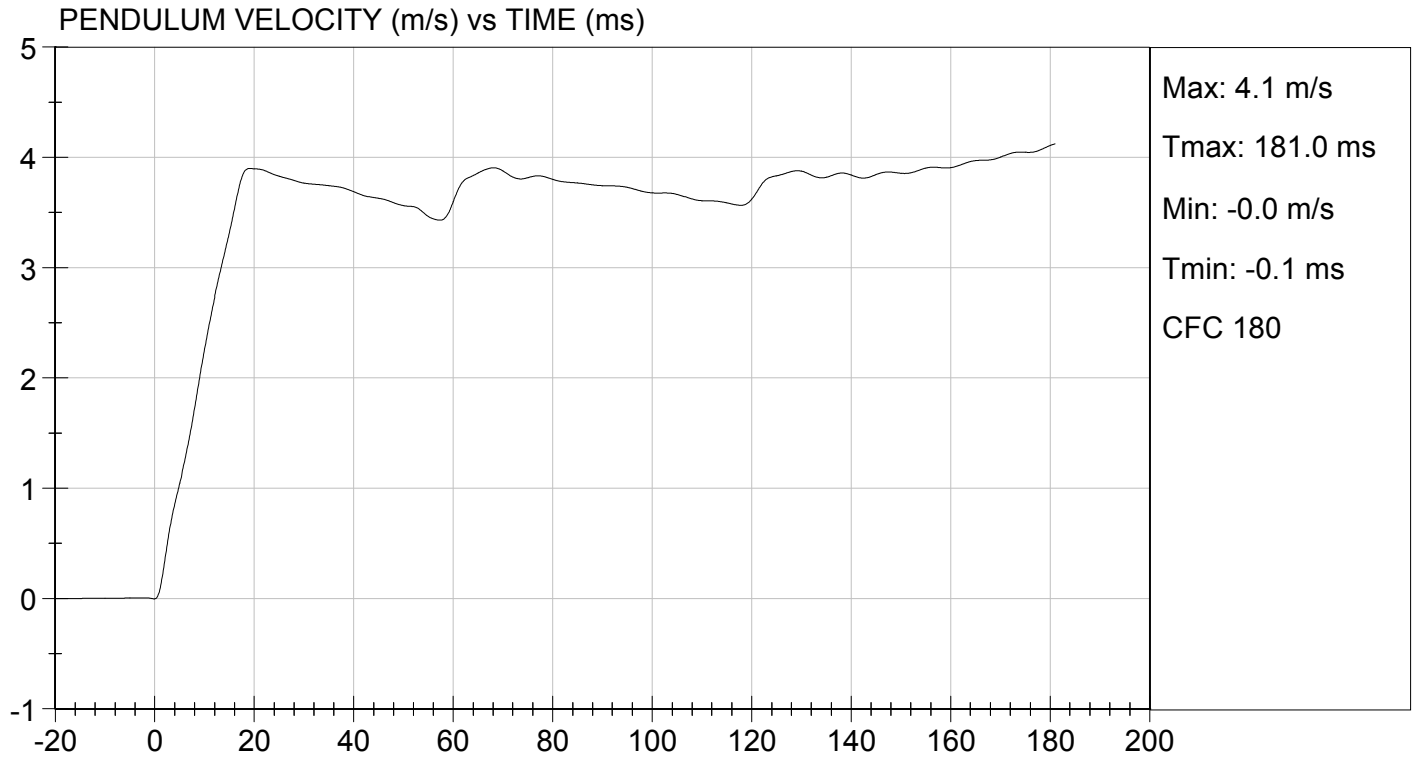
01/14/2016
Test Date

Jeff Levan-Marsh
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 11.99 ft/s, 3.65 m/s

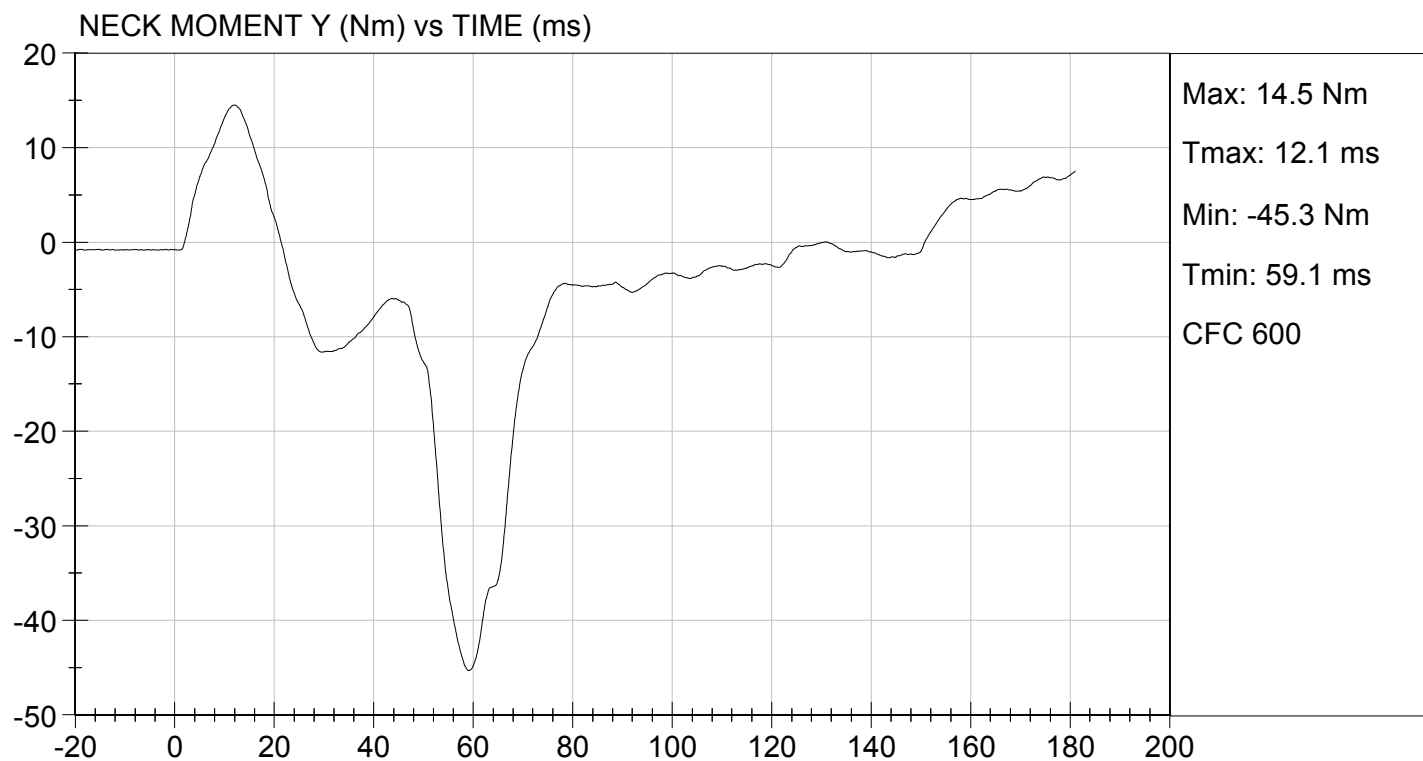
TEST DATE: 01/14/2016
TEST #: D16183





TEST DESC: NECK EXTENSION
VELOCITY: 11.99 ft/s, 3.65 m/s

TEST DATE: 01/14/2016
TEST #: D16183



DATA SHEET D6
THORAX IMPACT TEST (572.144) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 01/15/2016

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))
☒ N/A, ONLY one thorax impact test performed

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

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

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

Record the maximum temperature	<u>21.4°C</u>
Record the minimum temperature	<u>21.1°C</u>
Record the maximum humidity	<u>27%</u>
Record the minimum humidity	<u>25%</u>

- ☒ 5. Remove the arms.

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

☒ - No damage

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

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

- X 7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))
- X 8. Level the middle rib both longitudinally and laterally $\pm 0.5^\circ$. (572.144(c)(3))
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.144(c)(7))

- X 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	35 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	742 N
Peak force** between 12.5 and 32.0 mm chest compression	$\text{Peak force} \leq 910 \text{ N}$	748 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	67%

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

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

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

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

David Schoedel

Signature

01/15/2016

Date

MGA RESEARCH CORPORATION
THORAX IMPACT TEST
HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test I.D: D16184

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	27	Pass
Probe Velocity	m/s	5.9 to 6.1	6.03	Pass
Peak Deflection	mm	32 to 38	35	Pass
Peak Resistive Force w/in Deflection Corridor	N	680 to 810	742	Pass
Internal Hysteresis	%	65 to 85	67	Pass
Max Force 12.5 mm - 32 mm Deflection	N	<= 910	748	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

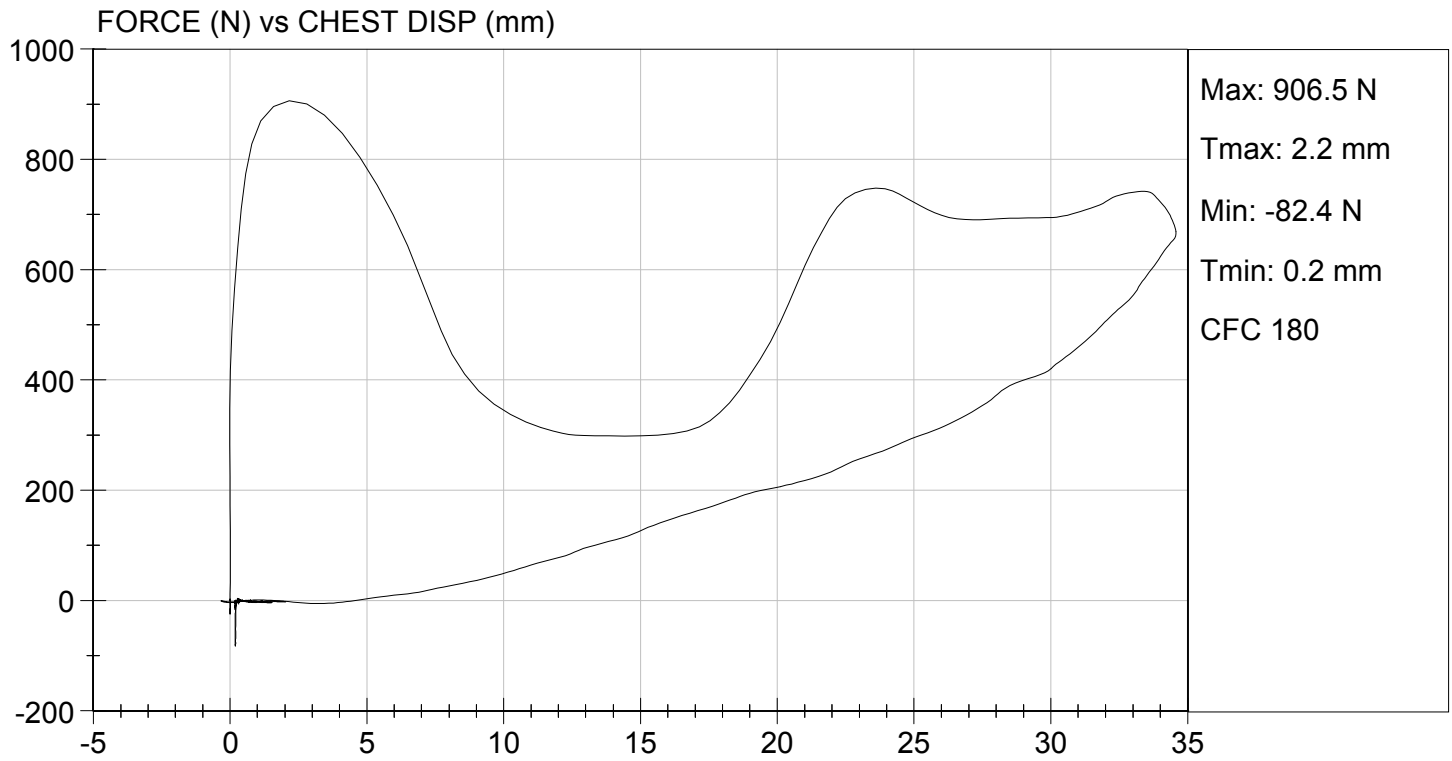
01/15/2016
Test Date

Jeff LevanMarx
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 19.78 ft/s, 6.03 m/s

TEST DATE: 01/15/2016
TEST #: D16184



DATA SHEET D7
TORSO FLEXION TEST (572.145) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 01/15/2016

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))
☒ N/A, ONLY torso flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13D.
- ☒ 3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).
☒ with legs below the femurs.
☐ without legs below the femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.4°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>27%</u> |
| Record the minimum humidity | <u>25%</u> |
- ☒ 5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))
- ☒ 6. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within $\pm 1^\circ$ and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))
- ☒ 7. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))
- ☒ 8. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))

- X 9. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and $30^\circ \pm 2^\circ$. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))
- X 10. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0° . Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))
- X 11. Remove all external support that was implemented in 10 above and wait 2 minutes. (572.145(c)(4))
- X 12. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
 Record reference plane angle (max. allowed 15°) See Result Table
- X 13. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 14. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 15. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 16. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 17. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 18. Complete the following table:

Torso Flexion Results (572.145(b)(1)&(2)), (572.145(c)(4)), (572.145(c)(5))		
Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 15^\circ$	10°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	$0.7^\circ/\text{s}$
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	164 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	12°

- X 19. A plot of the force versus time follows this sheet.

David Schoedel

Signature

01/15/2016

Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test I.D: D16187

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Initial Angle	deg	0 to 15	10	Pass
Return Angle	deg	-10 to 10	12	Pass
Force at 45 deg	N	130 to 180	164	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

01/15/2016

Test Date

Jeff Leonard

Approved By

DATA SHEET D8

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P88702	10/12/2015	04/12/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P88703	10/08/2015	04/08/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P88704	10/12/2015	04/12/2016
NECK TRANSDUCER	Denton	3303	184	11/20/2015	05/20/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P88698	10/12/2015	04/12/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P88700	10/12/2015	04/12/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P88701	10/12/2015	04/12/2016
CHEST POTENTIOMETER	Servo	08C1-3179	031	10/13/2015	04/13/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	N/A	N/A	N/A	N/A	N/A
(2) LEFT FEMUR	N/A	N/A	N/A	N/A	N/A
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/24/2015	01/24/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	09/28/2015	03/28/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: _____

Jessica Hall

DATA SHEET D3
HEAD DROP TEST (572.142) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 02/02/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 2 hours since the last head drop. (572.142(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the head (210-1000), adaptor plate (ATD 6259), accelerometer mounting block (SA572-S80) structural replacement of ½ mass of the neck load transducer (TE-107-001), head mounting washer (ATD 6262) one ½-20x1" flat head cap screw (9000150), and three (3) accelerometers (SA572-S4). (572.142(a))
- X 3. Accelerometers and their respective mounts are smooth and clean.
- X 4. The head accelerometer mounting plate screws (10-32 x 5/8 SHCS) are torqued to 10.2 Nm.
- X 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- X 6. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.142(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.7°C</u> |
| Record the minimum temperature | <u>21.0°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 7. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the low risk deployment test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- X 8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.142(c)(2))

- X 9. Suspend and orient the head assembly as shown in Figure 7D. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.142(c)(3))
Record the actual distance: 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 10. The 3.3 mm (0.13 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. (572.142(c)(3))
Record the right side distance: 501 mm
Record the left side distance: 501 mm

- X 11. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.142(c)(4))
Record actual micro finish: 50.9 micro inches

- X 12. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.142(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm

- X 13. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches ± 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.142(b)) & (572.142(c)(4))

- X 14. Complete the following table. (572.142(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 280 \text{ g}$	270 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	4.2 g

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

David Schoedel
Signature

02/02/2016
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test ID: D16451

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	250 to 280	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

David Schoedel

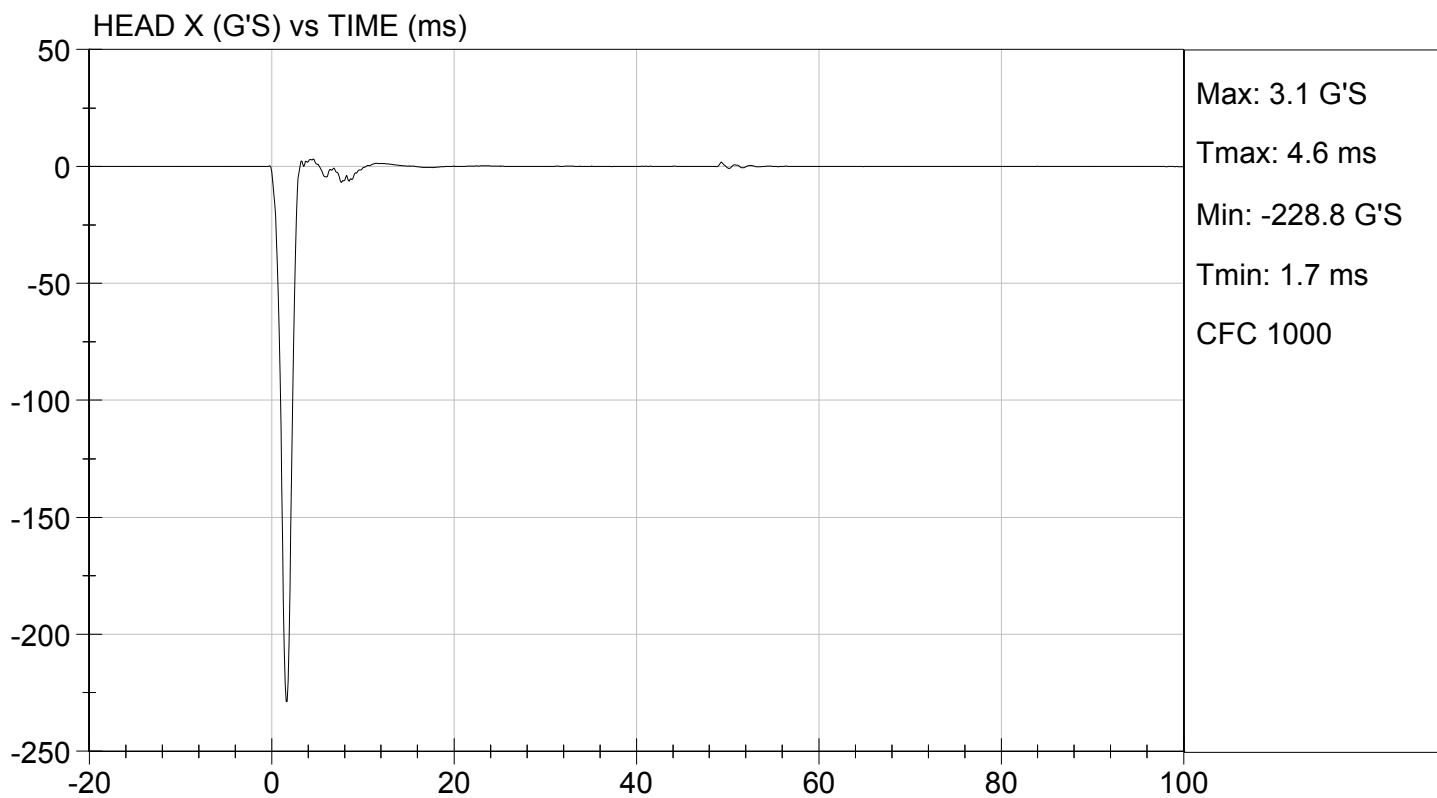
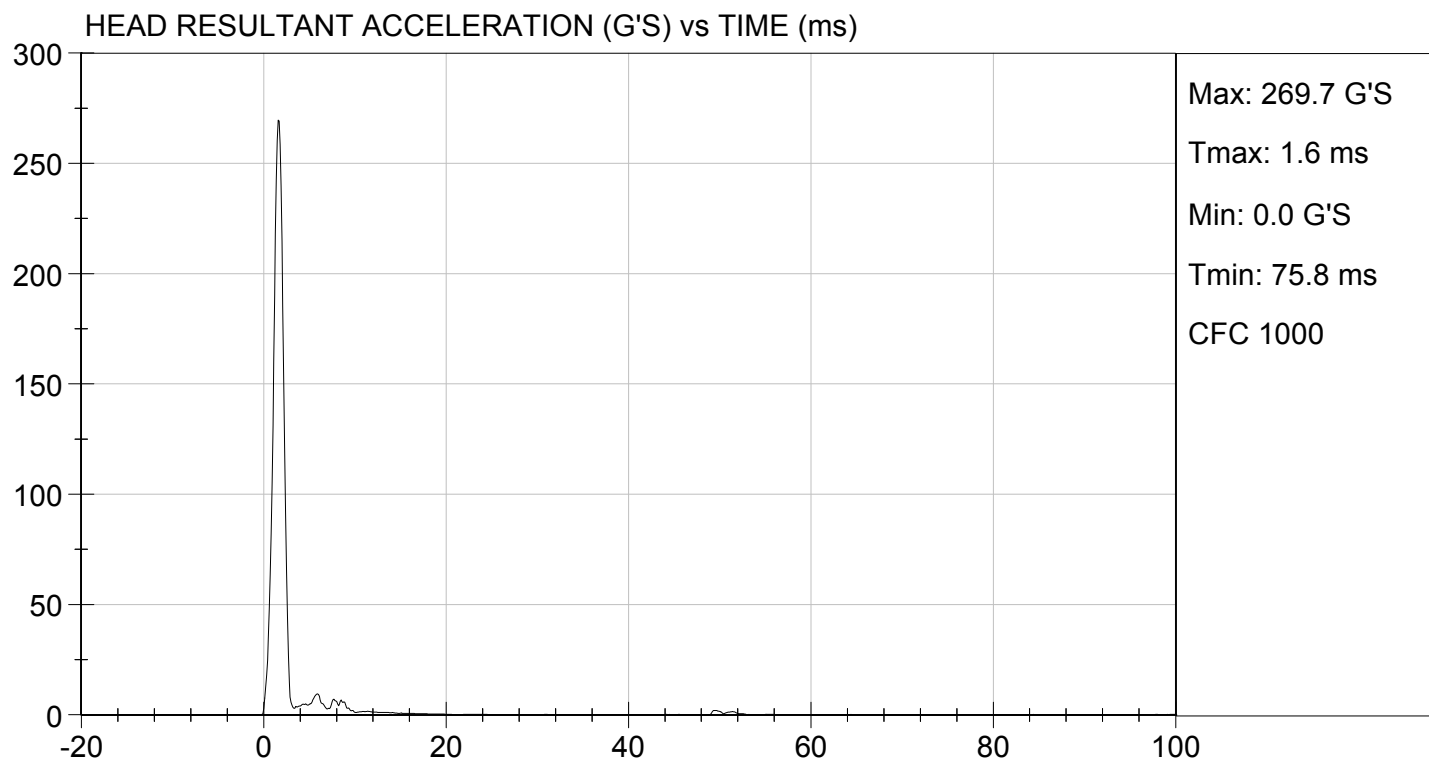
Laboratory Technician

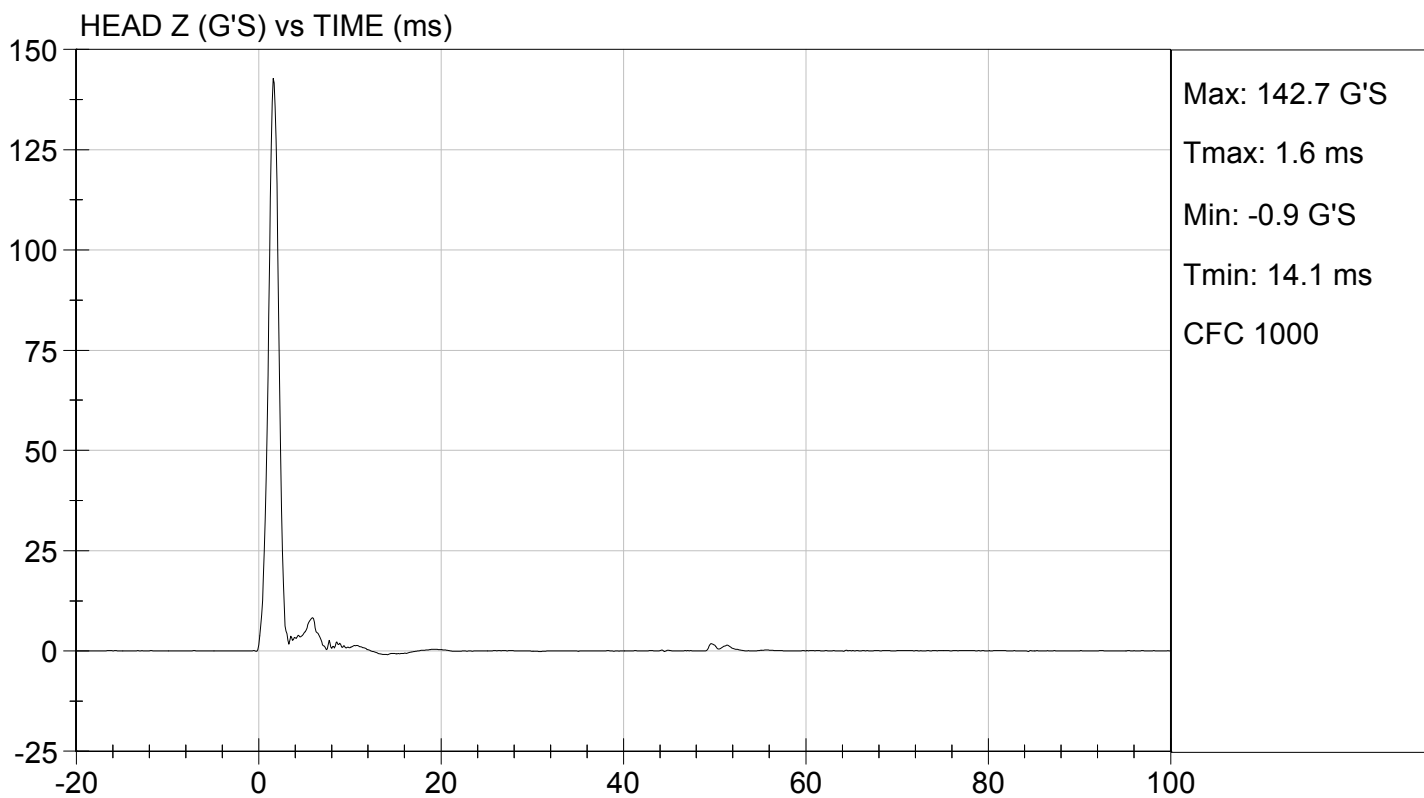
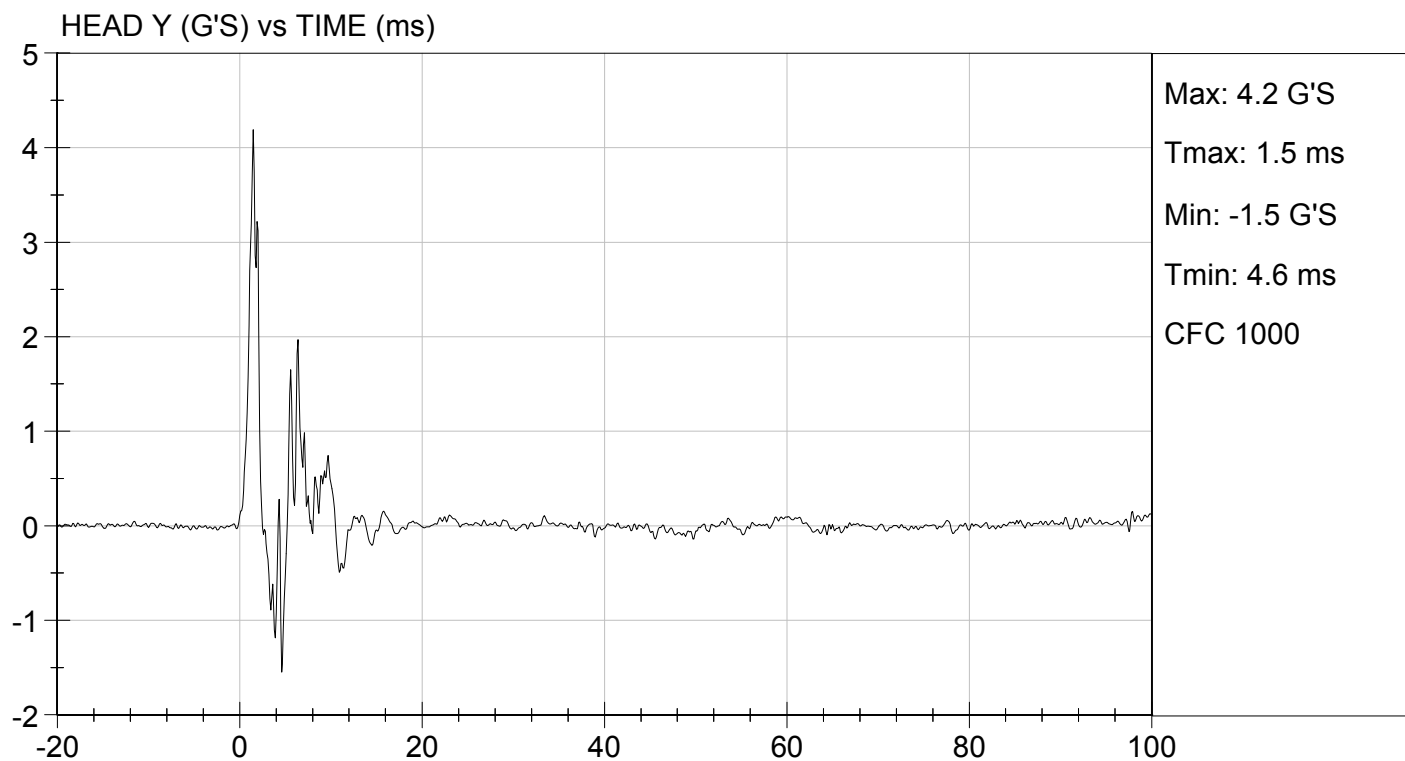
02/02/2016

Test Date

Jeff Leonard

Approved By





DATA SHEET D4
NECK FLEXION TEST (572.143) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 02/02/2016

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last neck test. (572.146(p))
X N/A, this is the first neck test performed
- X 2. The components required for the neck tests include the neck molding assembly (210-2015), neck cable (210-2040), nylon shoulder bushing (9001373), upper mount plate insert (910420-048), bib simulator (TE-208-050), urethane washer (210-2050), neck mounting plate (TE-250-021), two jam nuts (9001336), load moment transducer (SA572-S19) and headform (TE-208-000). (572.143(a))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.143(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.7°C</u> |
| Record the minimum temperature | <u>21.0°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the low risk deployment test, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.146(l))
- X 7. The test fixture pendulum conforms to the specifications in Figure 8D.
- X 8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 9D for the flexion test. (572.143(c)(3))

- X 9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.
- X 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(1)(iii))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.4 m/s to 5.6 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 13. Complete the following table:

Neck Flexion Test Results (572.143(b)(1)) & (572.143(c)(4)(ii))			
Parameter		Specification	Result
Pendulum impact speed		5.4 m/s $\leq$ speed $\leq$ 5.6 m/s	5.5 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.0 m/s $\leq \Delta V \leq$ 2.7 m/s	2.4 m/s
	@ 15 ms	3.0 m/s $\leq \Delta V \leq$ 4.0 m/s	3.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.1 m/s	4.5 m/s
Plane D Rotation		Peak moment* 42 Nm $\leq$ moment $\leq$ 53 Nm during the following rotation range $70^\circ \leq$ angle $\leq$ 82°	42.2 Nm @ 78 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 60 ms $\leq$ time $\leq$ 80 ms	70 ms

*The moment is a direct reading from the load cell

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

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

David Schoedel
Signature

02/02/2016
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test I.D: D16452

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	28	Pass
Pendulum Speed		m/s	5.40 to 5.60	5.52	Pass
Pendulum Velocity	10 msec	m/s	2.0 to 2.7	2.4	Pass
	15 msec	m/s	3.0 to 4.0	3.4	Pass
	20 msec	m/s	4.0 to 5.1	4.5	Pass
D Plane Rotation		deg	70 to 82	78	Pass
Peak Moment within Deflection Corridor		Nm	42.0 to 53.0	42.2	Pass
Positive Moment - Time Curve Decay to 10 Nm		msec	60.0 to 80.0	70	Pass
Overall Test Results				Pass	

David Schoedel

Laboratory Technician

02/02/2016

Test Date

Jeff Leonard

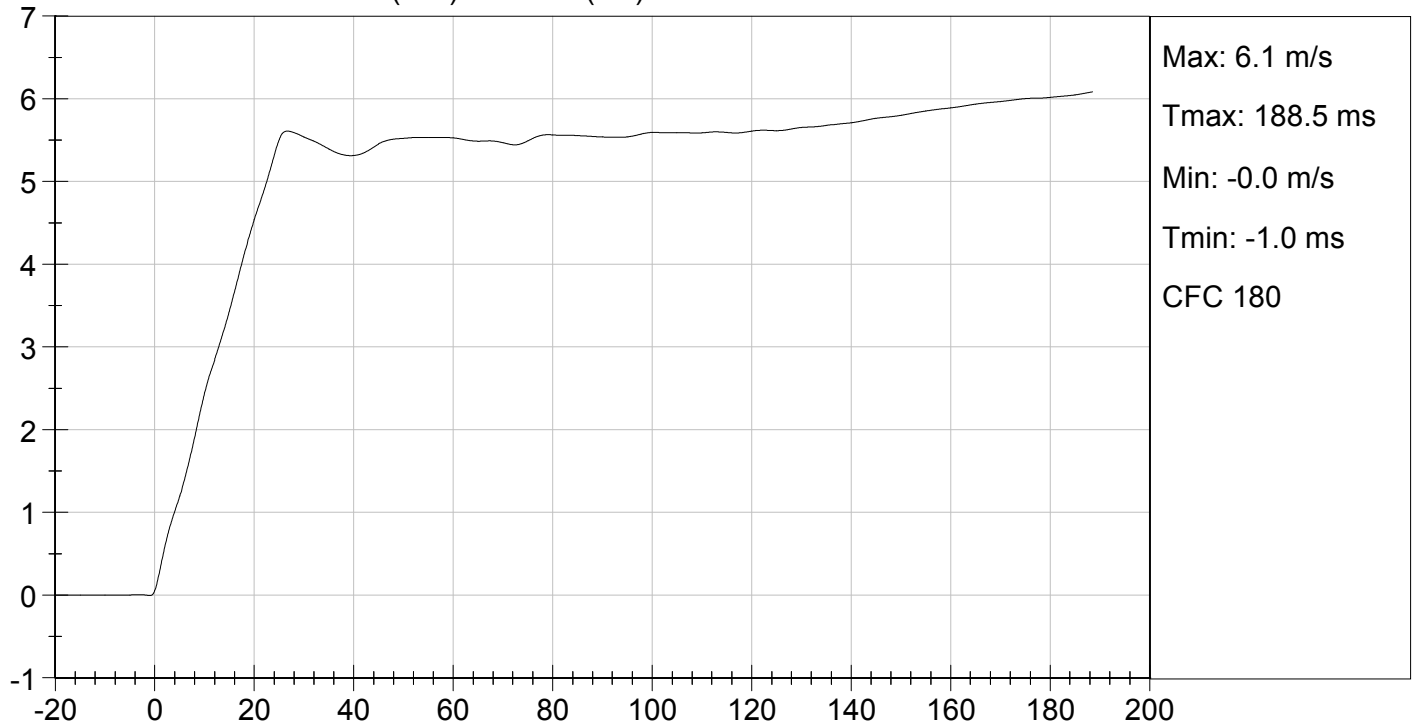
Approved By



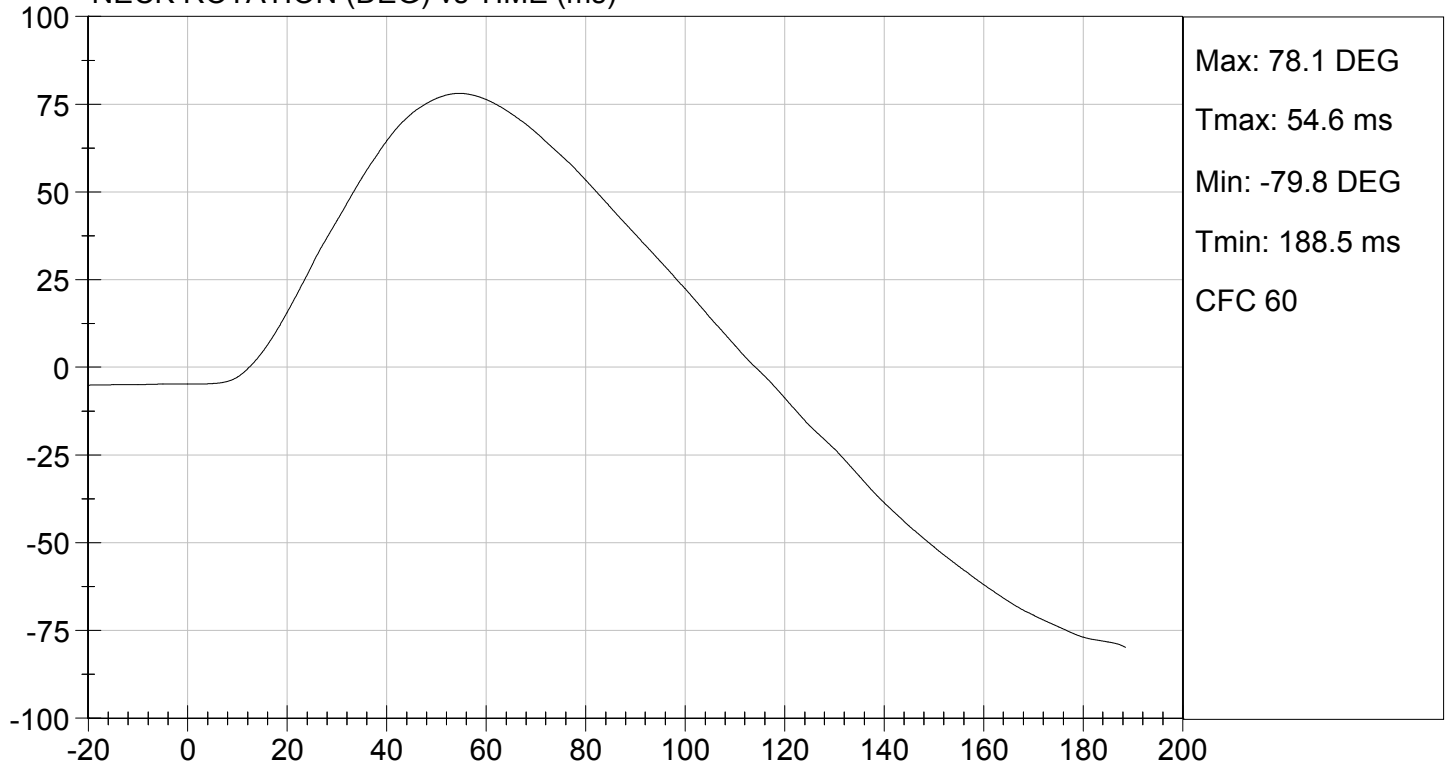
TEST DESC: NECK FLEXION
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 02/02/2016
TEST #: D16452

PENDULUM VELOCITY (m/s) vs TIME (ms)



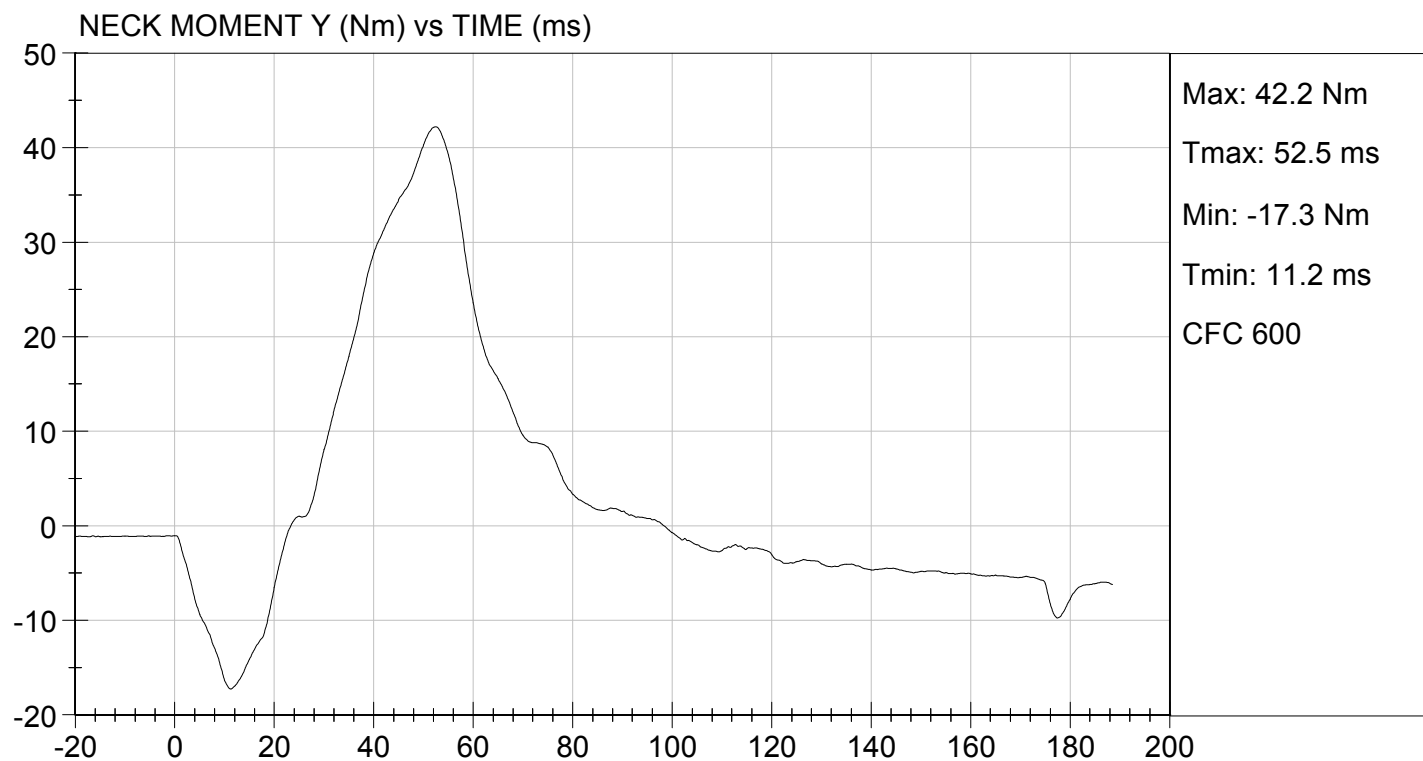
NECK ROTATION (DEG) vs TIME (ms)





TEST DESC: NECK FLEXION
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 02/02/2016
TEST #: D16452



DATA SHEET D5
NECK EXTENSION TEST (572.133) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 02/02/2016

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

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

X 1. It has been at least 30 minutes since the last neck test. (572.146(p))
 X N/A, this is the first neck test performed

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

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

Record the maximum temperature	<u>21.7°C</u>
Record the minimum temperature	<u>21.0°C</u>
Record the maximum humidity	<u>30%</u>
Record the minimum humidity	<u>28%</u>

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

Record findings and actions: No damage

X 5. Torque the jam nut (9001336) on the neck cable (210-2040) between 0.2 Nm and 0.3 Nm. (572.143(c)(2))

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

X 7. The test fixture pendulum conforms to the specifications in Figure 8D.

X 8. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure 10D for the extension test. (572.143(c)(3))

- X 9. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the top horizontal surface of the neck load cell. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly.
- X 10. Plane D is perpendicular ± 1 degree to the centerline of the pendulum.
- X 11. Set the instrumentation so that the moment and rotation are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel. (572.143(b)(2)(iii))
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 3.55 m/s to 3.75 m/s as measured at the center of the pendulum accelerometer. (572.143(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Result
Pendulum impact speed		$3.55 \text{ m/s} \leq \text{speed} \leq 3.75 \text{ m/s}$	3.68 m/s
Pendulum ΔV with respect to impact speed	@ 6 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.4 m/s
	@ 10 ms	$1.9 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.4 m/s
	@ 14 ms	$2.8 \text{ m/s} \leq \Delta V \leq 3.5 \text{ m/s}$	3.2 m/s
Plane D Rotation		Peak moment* $-53.3 \text{ Nm} \leq \text{moment} \leq -43.7 \text{ Nm}$ during the following rotation range $83 \leq \text{angle} \leq 93$	-44.3 Nm @ 87 degrees
Negative Moment Decay** (Extension)		Time to decay to -10 Nm $60 \text{ ms} \leq \text{time} \leq 80 \text{ ms}$	73 ms

*The moment is a direct reading from the load cell

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

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

David Schoedel
Signature

02/02/2016
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 3 YEAR OLD

ATD Serial No: 031

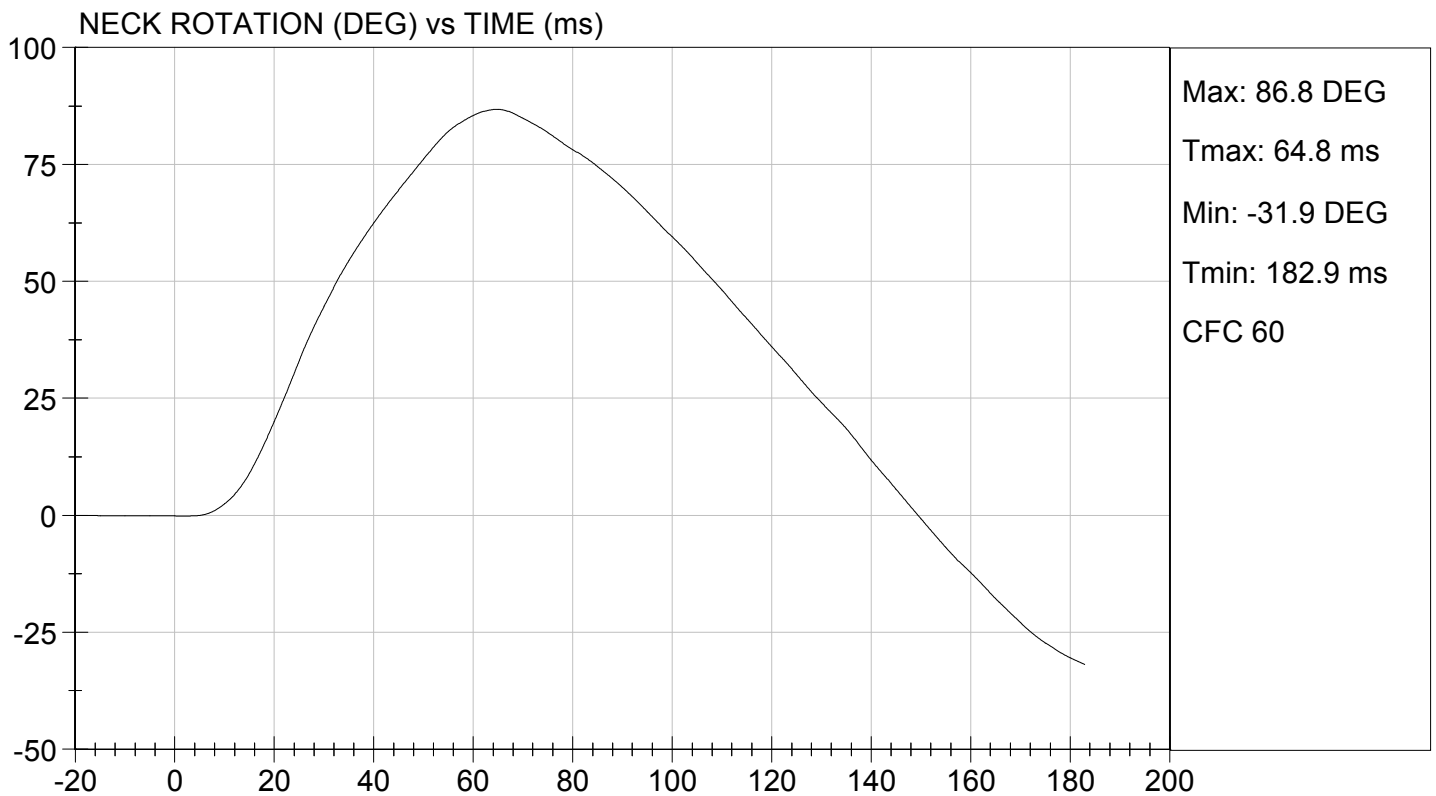
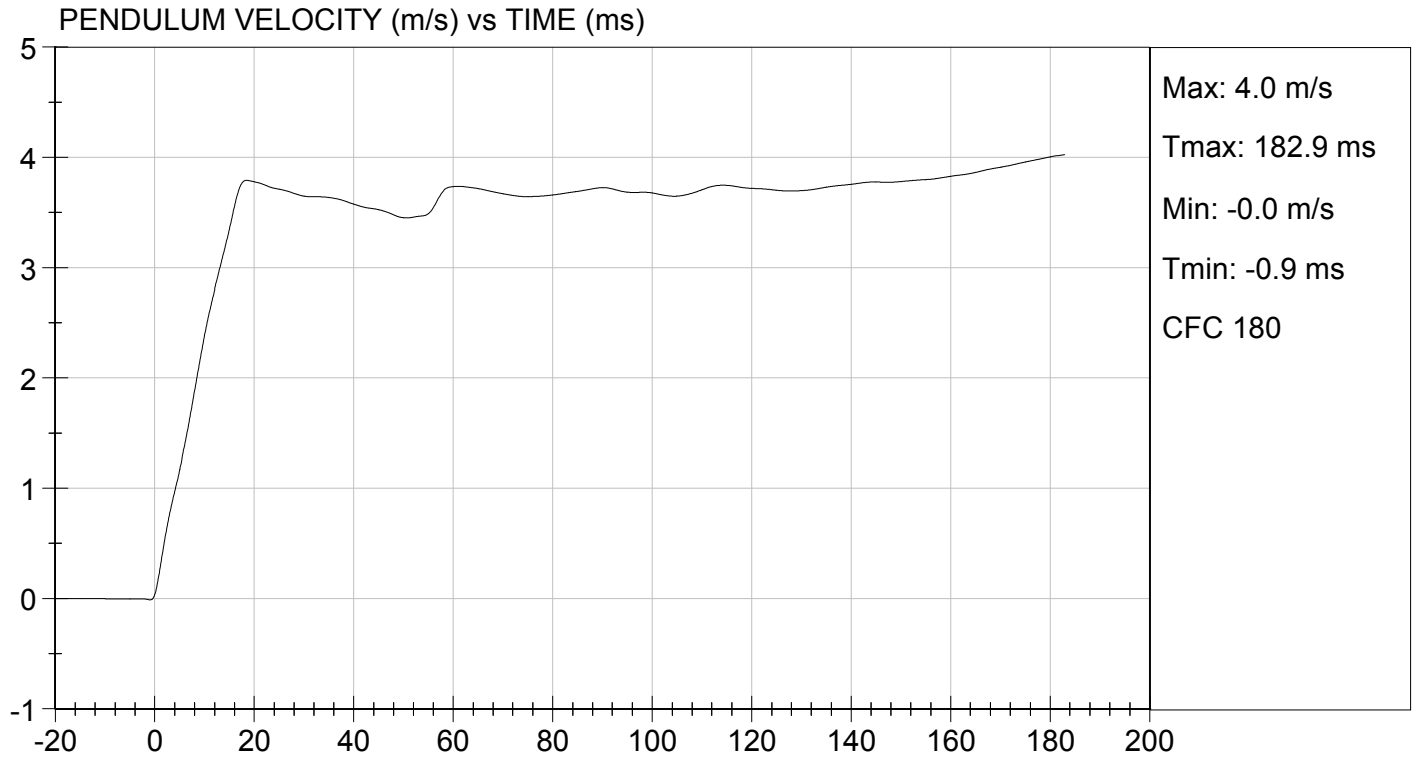
Test I.D: D16453

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	28	Pass
Pendulum Speed		m/s	3.55 to 3.75	3.68	Pass
Pendulum Velocity	6 ms	m/s	1.0 to 1.4	1.4	Pass
	10 ms	m/s	1.9 to 2.5	2.4	Pass
	14 ms	m/s	2.8 to 3.5	3.2	Pass
D Plane Rotation		deg	83 to 93	87	Pass
Peak Moment within Deflection Corridor		Nm	-53.3 to -43.7	-44.3	Pass
Negative Moment - Time Curve Decay to -10 Nm		ms	60.0 to 80.0	73	Pass
Overall Test Results					Pass

David Schoedel
Laboratory Technician

Jeff Leonard
Approved By

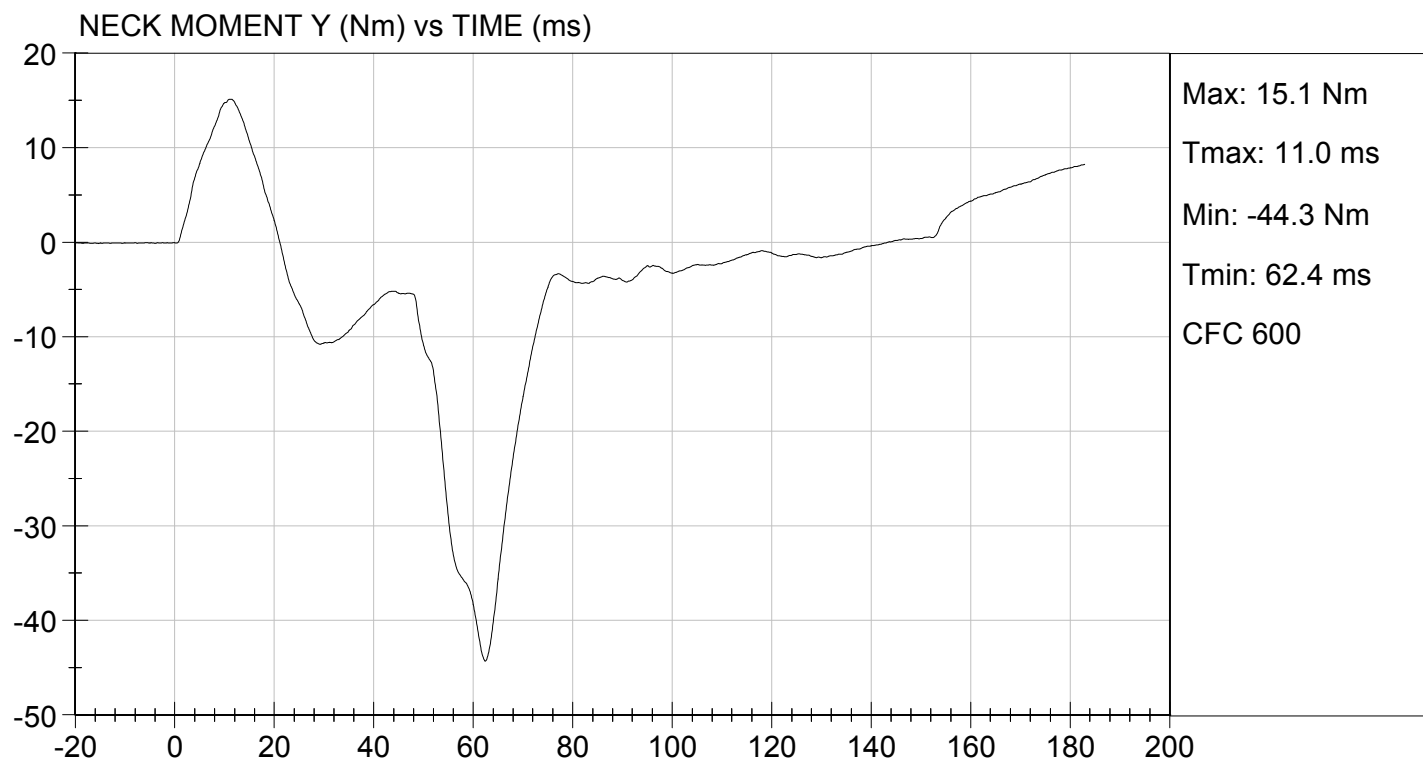
02/02/2016
Test Date





TEST DESC: NECK EXTENSION
VELOCITY: 12.08 ft/s, 3.68 m/s

TEST DATE: 02/02/2016
TEST #: D16453



DATA SHEET D6
THORAX IMPACT TEST (572.144) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 02/03/2016

Technician: David Schoedel

- Pre test calibration
X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.146(p))
 X N/A, ONLY one thorax impact test performed

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

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

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

Record the maximum temperature	<u>21.7°C</u>
Record the minimum temperature	<u>21.0°C</u>
Record the maximum humidity	<u>30%</u>
Record the minimum humidity	<u>28%</u>

- X 5. Remove the arms.

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

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 damage.

- X 7. Seat the dummy, without back and arm supports on the test fixture surface as shown in Figure 11D. The surface must be long enough to support the pelvis and outstretched legs. (572.144(c)(3))
- X 8. Level the middle rib both longitudinally and laterally $\pm 0.5^\circ$. (572.144(c)(3))
- X 9. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.144(c)(3))
- X 10. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is centered on the center of the No. 2 rib within ± 2.5 mm within $\pm 0.5^\circ$ of a horizontal line in the dummy's midsagittal plane. (572.144(c)(4))
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is rolled up and zipped, and the arms installed. The reference locations must be accessible after the chest skin is rolled up and the arms installed. It will be necessary to leave the chest skin zipper unfastened until the references are checked and then fasten it just prior to the test.
- X 12. Install the chest skin and arms, and reposition the dummy using the reference measurements recorded.
- X 13. Place the upper arms parallel to the torso. Place the lower arms horizontal and forward and parallel to the midsagittal plane. (572.144(c)(3))
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.146(l)).
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.144(c)(5)) The velocity of the test probe at the time of impact is between 5.9 m/s and 6.1 m/s. (572.144(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.144(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.144(c)(7))

- X 16. Complete the following table:

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

Parameter*	Specification	Result
Test Probe Speed	$5.9 \text{ m/s} \leq \text{speed} \leq 6.1 \text{ m/s}$	6.0 m/s
Chest Compression	$32 \text{ mm} \leq \text{compression} \leq 38 \text{ mm}$	34 mm
Peak force** between 32 and 38 mm chest compression	$680 \text{ N} \leq \text{peak force} \leq 810 \text{ N}$	762 N
Peak force** between 12.5 and 32.0 mm chest compression	Peak force $\leq 910 \text{ N}$	751 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	66%

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

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

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

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

David Schoedel
Signature

02/03/2016
Date

MGA RESEARCH CORPORATION
THORAX IMPACT TEST
HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test I.D: D16454

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	5.9 to 6.1	6.05	Pass
Peak Deflection	mm	32 to 38	34	Pass
Peak Resistive Force w/in Deflection Corridor	N	680 to 810	762	Pass
Internal Hysteresis	%	65 to 85	66	Pass
Max Force 12.5 mm - 32 mm Deflection	N	<= 910	751	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/03/2016

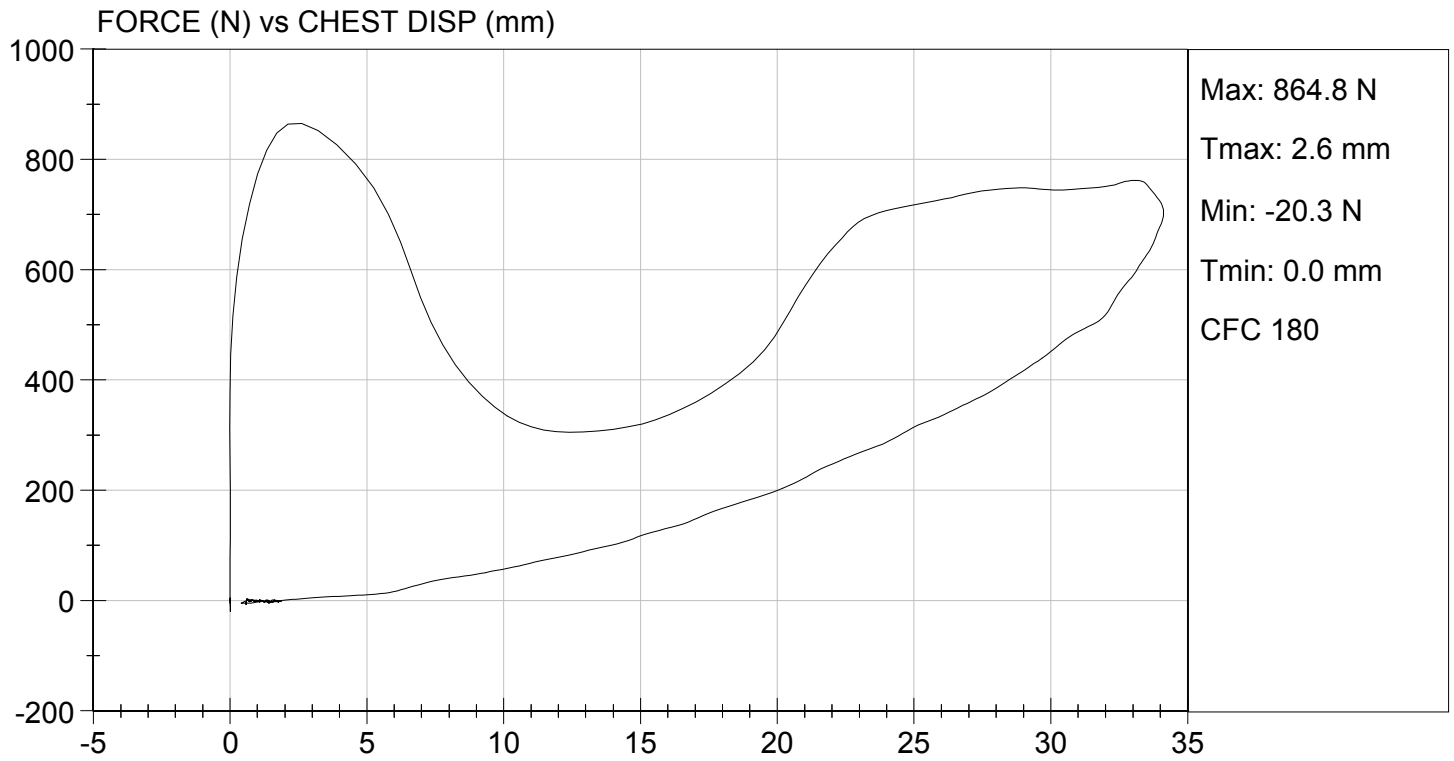
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 02/03/2016
TEST #: D16454



DATA SHEET D7
TORSO FLEXION TEST (572.145) (3 YEAR-OLD)

Dummy Serial Number: 031

Test Date: 01/15/2016

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.146(p))
 X N/A, ONLY torso flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 13D.
- X 3. The complete assembled dummy (210-0000) is used with or without the lower legs. (572.145(c)(2)).
 X with legs below the femurs.
 without legs below the femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.145(c)(1))
- | | |
|--------------------------------|---------------|
| Record the maximum temperature | <u>21.7°C</u> |
| Record the minimum temperature | <u>21.0°C</u> |
| Record the maximum humidity | <u>30%</u> |
| Record the minimum humidity | <u>28%</u> |
- X 5. Unzip the torso jacket and remove the lumbar load transducer or its structural replacement from the dummy. Attach the rigid pelvis attachment fixture to the lumbar spine. (572.145(c)(2)(i)&(ii))
- X 6. Secure the fixture to the table so that the pelvis-lumbar joining surface is horizontal within $\pm 1^\circ$ and the buttocks and upper legs of the seated dummy are in contact with the test surface. (572.145(c)(2)(iii))
- X 7. Attach the loading adapter bracket to the upper part of the torso as shown in Figure 13D and zip up the torso jacket. (572.145(c)(2)(iv))
- X 8. Place the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane. (572.145(c)(2)(v))

- X 9. Flex the dummy forward and back 3 times such that the angle of the torso reference plane moves between 0° and $30^\circ \pm 2^\circ$. The torso reference plane is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (210-8020). (572.145(c)(3)(i))
- X 10. Remove all externally applied flexion forces and support the dummy such that the torso reference plane is at or near 0° . Wait at least 30 minutes before continuing. (572.135(c)(3)(ii))
- X 11. Remove all external support that was implemented in 10 above and wait 2 minutes. (572.145(c)(4))
- X 12. Measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy. (572.145(c)(4))
Record reference plane angle (max. allowed 15°) See Result Table
- X 13. Attach the pull cable and the load cell while maintaining the initial torso orientation. (572.145(c)(5))
- X 14. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the torso reference plane reaches $45^\circ \pm 0.5^\circ$ of flexion relative to the vertical transverse plane. (572.145(c)(5))
- X 15. Maintain angle reference plane at $45^\circ \pm 0.5^\circ$ of flexion for 10 seconds and record the highest applied force during this period. (572.145(c)(6))
- X 16. As quickly as possible release the force applied to the attachment bracket. (572.145(c)(8))
- X 17. 3 to 4 minutes after the release of the force, measure the angle reference plane. (572.145(c)(8))
- X 18. Complete the following table:

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

Parameter	Specification	Result
Initial ref. plane angle	Angle $\leq 15^\circ$	9°
Torso rotation rate	$0.5^\circ/\text{s} \leq \text{rate} \leq 1.5^\circ/\text{s}$	$0.8^\circ/\text{s}$
Force at $45^\circ \pm 0.5^\circ$	$130 \text{ N} \leq \text{force} \leq 180 \text{ N}$	167 N
Final ref. plane angle	Initial ref. plane angle $\pm 10^\circ$	10°

- X 19. A plot of the force versus time follows this sheet.

David Schoedel

Signature

01/15/2016

Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 3 YEAR OLD

ATD Serial No: 031

Test I.D: D16457

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Initial Angle	deg	0 to 15	9	Pass
Return Angle	deg	-10 to 10	10	Pass
Force at 45 deg	N	130 to 180	167	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

Jeff Leonard

Approved By

02/02/2016

Test Date

DATA SHEET D8

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P88702	10/12/2015	04/12/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P88703	10/08/2015	04/08/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P88704	10/12/2015	04/12/2016
NECK TRANSDUCER	Denton	3303	184	11/20/2015	05/20/2016
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P88698	10/12/2015	04/12/2016
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P88700	10/12/2015	04/12/2016
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P88701	10/12/2015	04/12/2016
CHEST POTENTIOMETER	Servo	08C1-3179	031	10/13/2015	04/13/2016
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	N/A	N/A	N/A	N/A	N/A
(2) LEFT FEMUR	N/A	N/A	N/A	N/A	N/A
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	01/25/2016	07/25/2016
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82097	11/30/2015	05/30/2016
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P88169	11/30/2015	05/30/2016
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	01/22/2016	07/22/2016
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	09/28/2015	03/28/2016

LABORATORY TECHNICIAN: _____

Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 031

Test Date: 02/01/2016

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

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

Repair or Replacement approved by:

Jessica Hall
Signature

02/03/2016
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/03/2016
Date