

REPORT NUMBER: 208-2360083-TEST

**DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208**

**MITSUBISHI MOTORS CORPORATION
2023 MITSUBISHI OUTLANDER MPV
NHTSA NO.: C20235600**

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



TEST DATES: JULY 7, 2023 – DECEMBER 18, 2023

FINAL REPORT DATE: FEBRUARY 13, 2024

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

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

DATA SHEET A3
HEAD DROP TEST (572.32) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.32(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))
- X 3. Torque the skull cap screws to 160 lbf-in.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))
- 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. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.5°C</u> |
| Record the minimum temperature: | <u>21.2°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>11%</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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- X 8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.32(c)(2))

- X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(c)(3))

Record the actual distance: 0.5 inches

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

- X 10. The 1.6 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 7A.

Record the right side distance: 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). (572.32(c)(4))

Record actual micro finish: 24.8 micro inches

- X 12. The impact surface is rigidly supported. (572.132(c)(4))

- X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

- X 14. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	263 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 $\leq 15 \text{ g}$	-4.4 g

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


Signature

12/11/2023
Date

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

ATD Serial No: 401

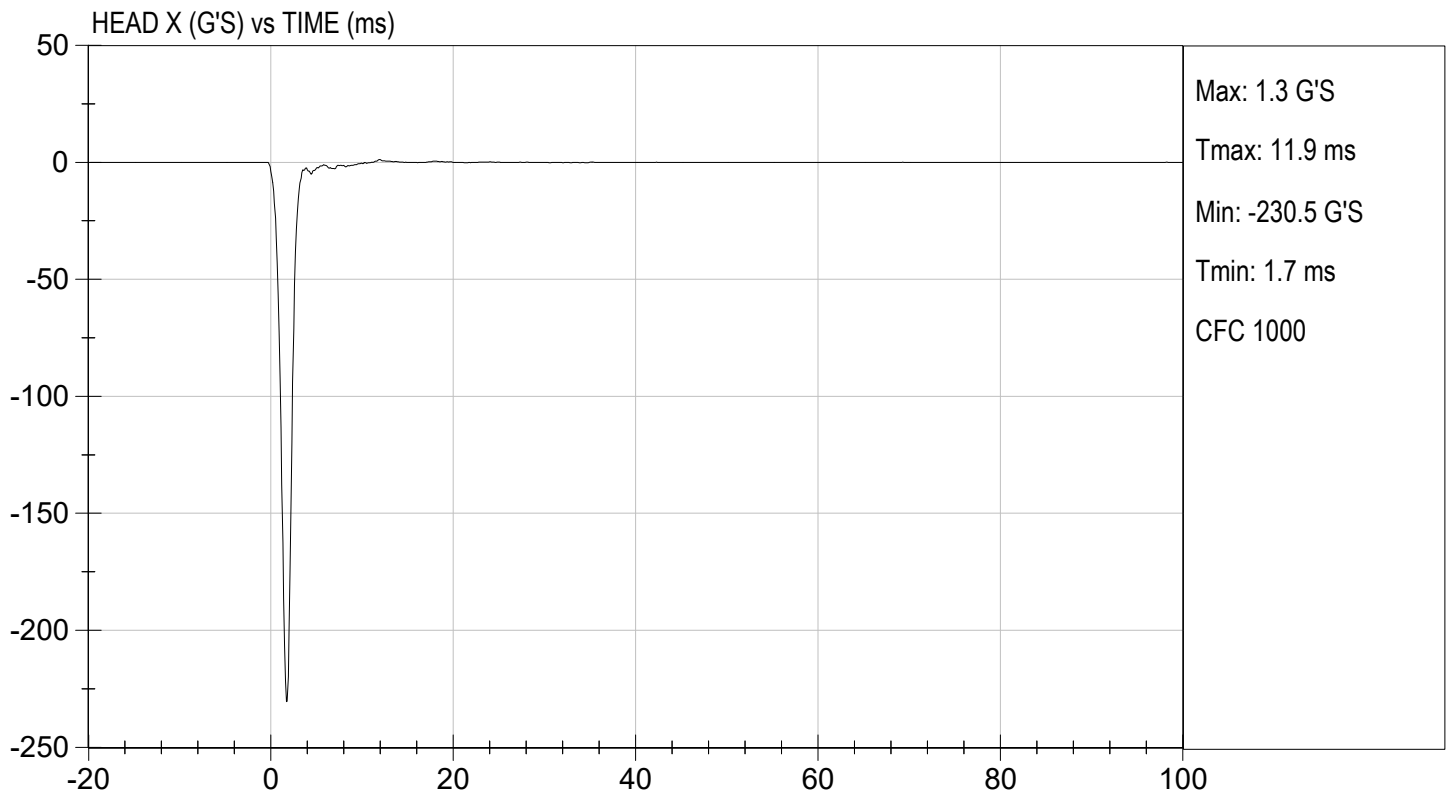
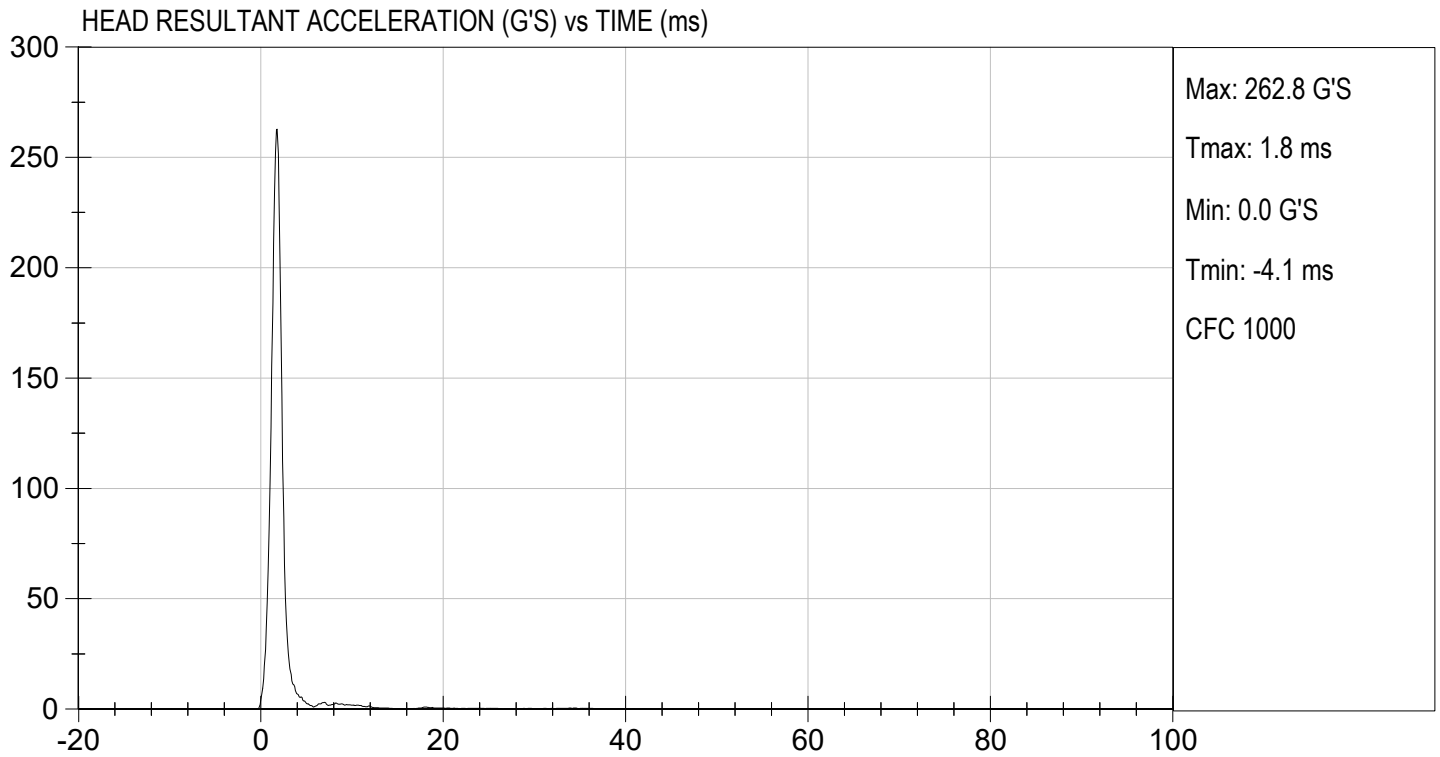
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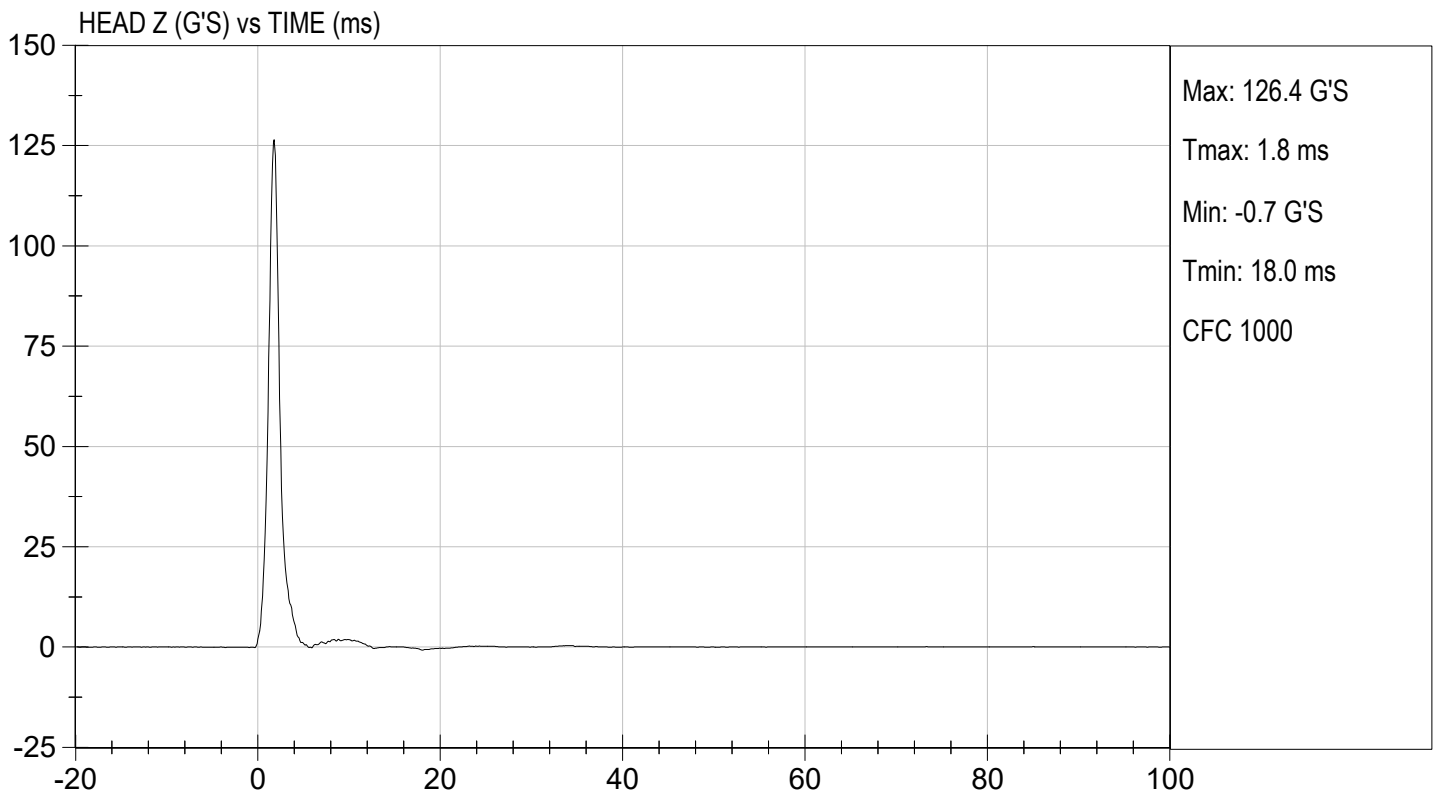
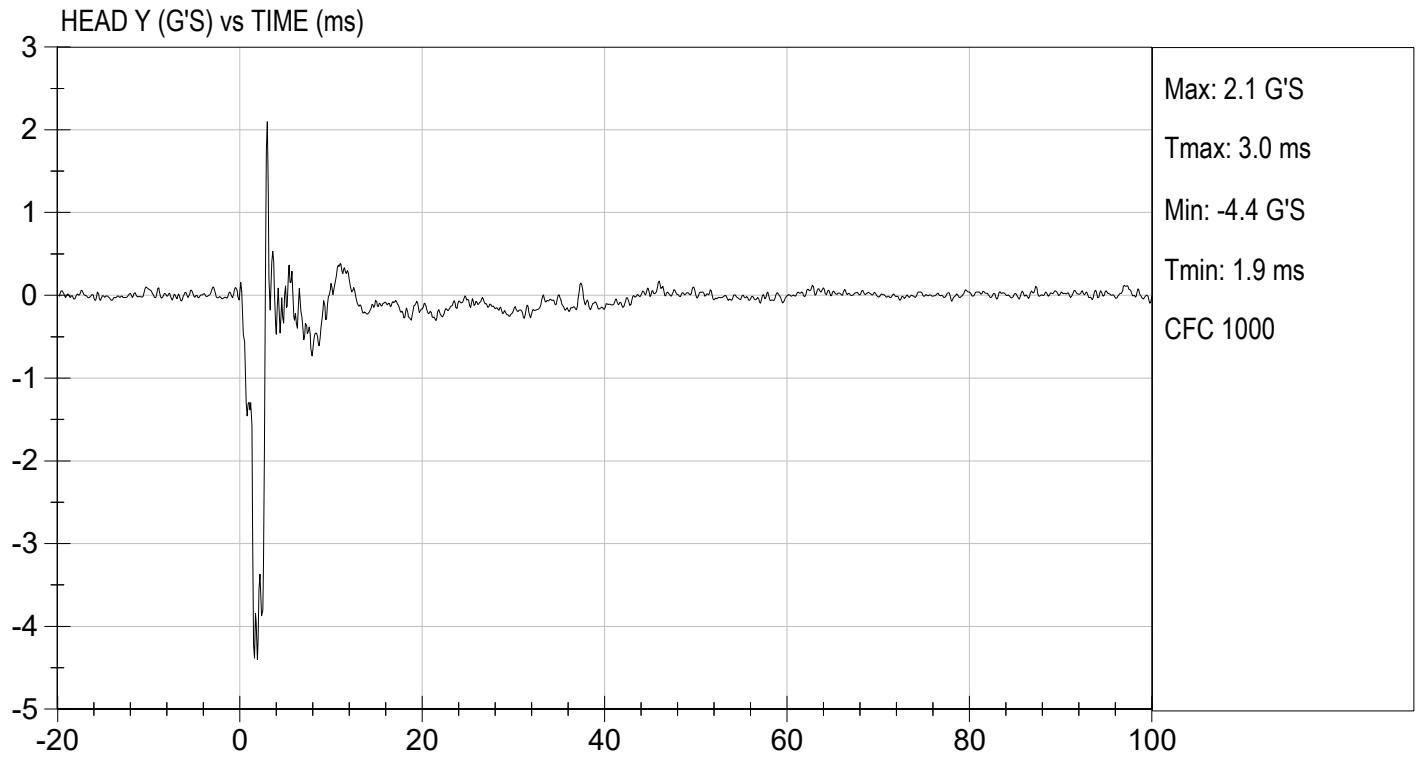
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	225 to 275	263	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

12/11/2023
Test Date


Approved By





DATA SHEET A4
NECK FLEXION TEST (572.33) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.9°C</u> |
| Record the minimum temperature: | <u>21.6°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</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. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9A for the flexion test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Results
Pendulum impact speed		$22.6 \text{ ft/s} \leq \text{speed} \leq 23.4 \text{ ft/s}$	22.83 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	$22.5 \leq g \leq 27.5$	23.44 g
	@ 20 ms	$17.6 \leq g \leq 22.6$	19.56 g
	@ 30 ms	$12.5 \leq g \leq 18.5$	16.01 g
	Above 30 ms	29 g maximum	16.10 g
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	39.5 ms
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	70.0°
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	59.8 ms
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	115.1 ms
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	67.6 lbf-ft
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	51.4 ms
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	98.9 ms

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

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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



Signature

12/11/2023
Date

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

ATD Serial No: 401

Test I.D: D233262

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	21	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.44	Pass
	20 ms	G's	17.60 to 22.60	19.56	Pass
	30 ms	G's	12.50 to 18.50	16.01	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	70.0	Pass
	Time	ms	57.0 to 64.0	59.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	115.1	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.6	Pass
	Time	ms	47.0 to 58.0	51.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.9	Pass
Overall Test Results					Pass


 Laboratory Technician

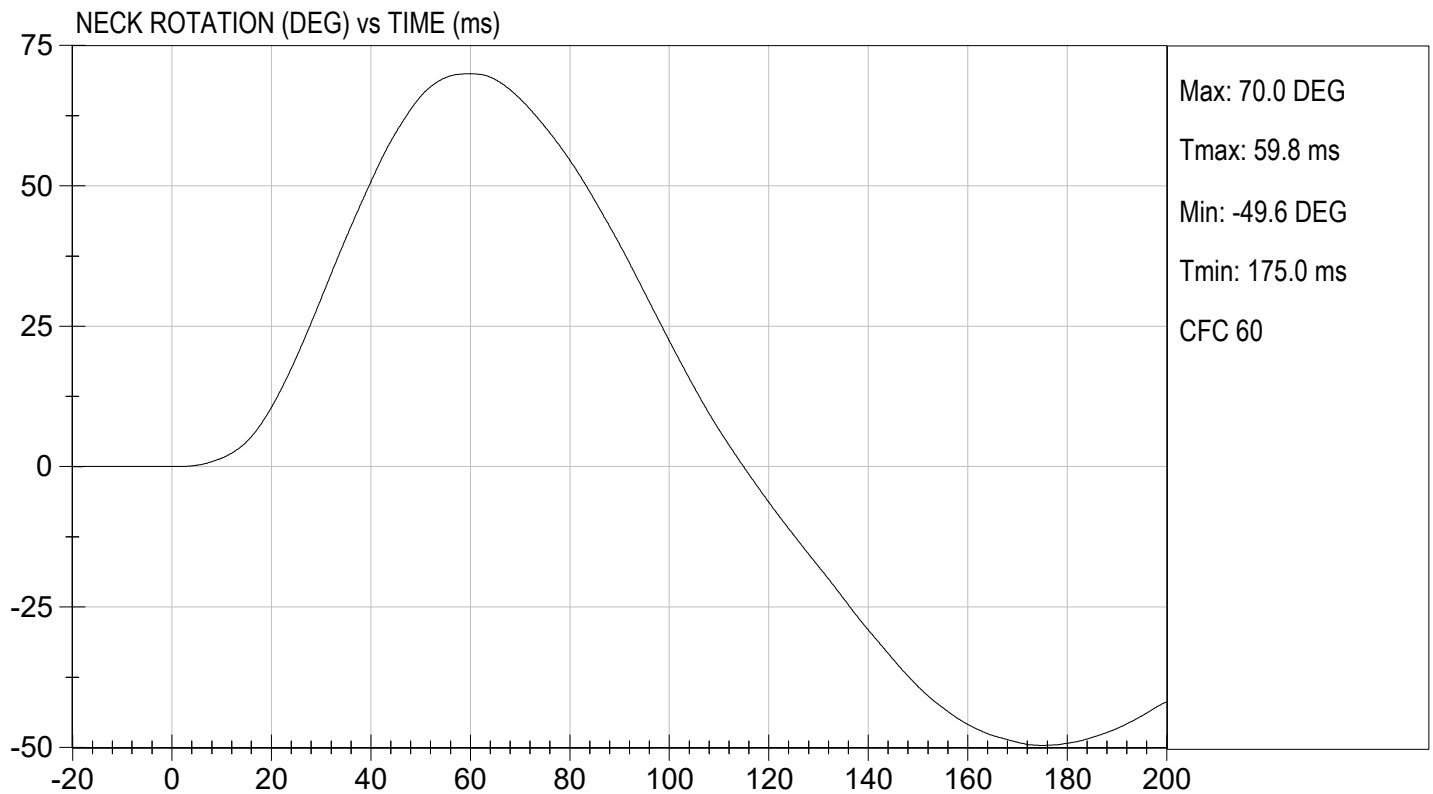
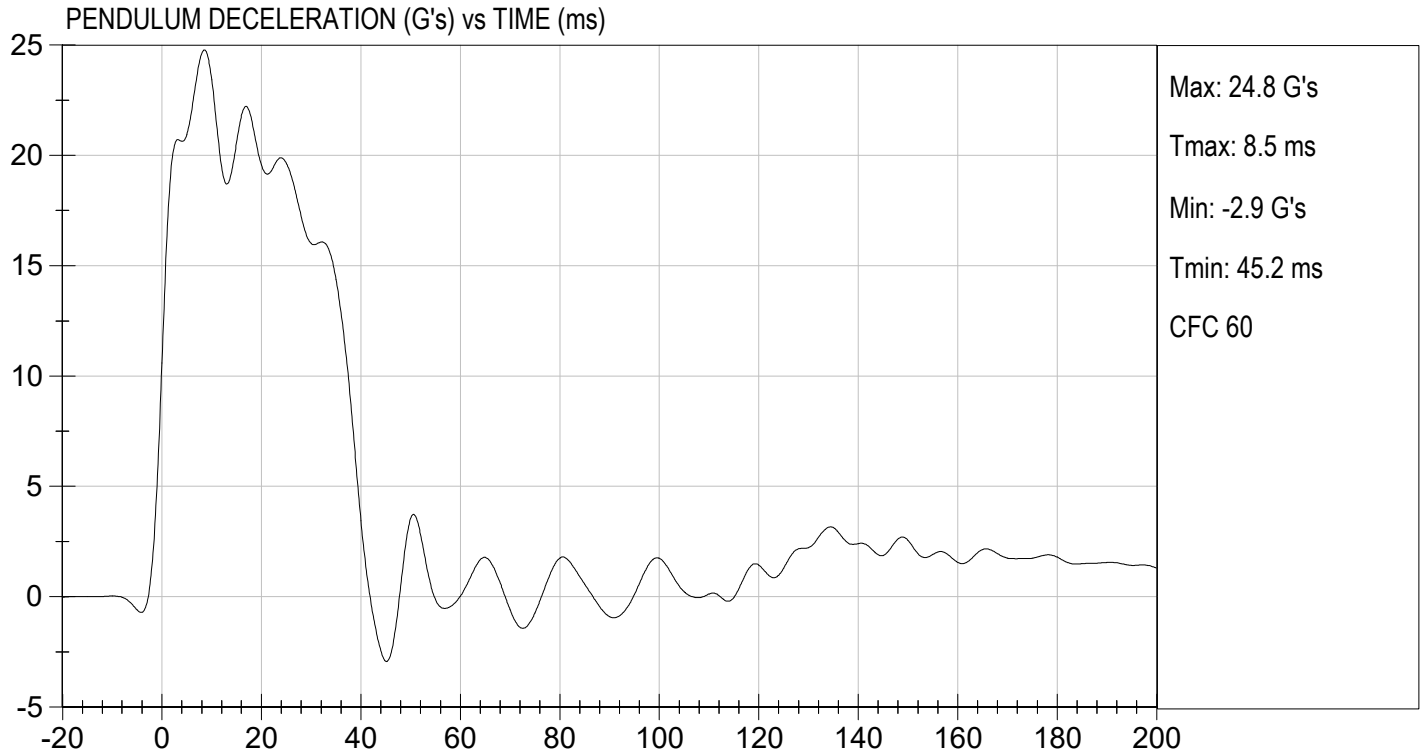
12/11/2023
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

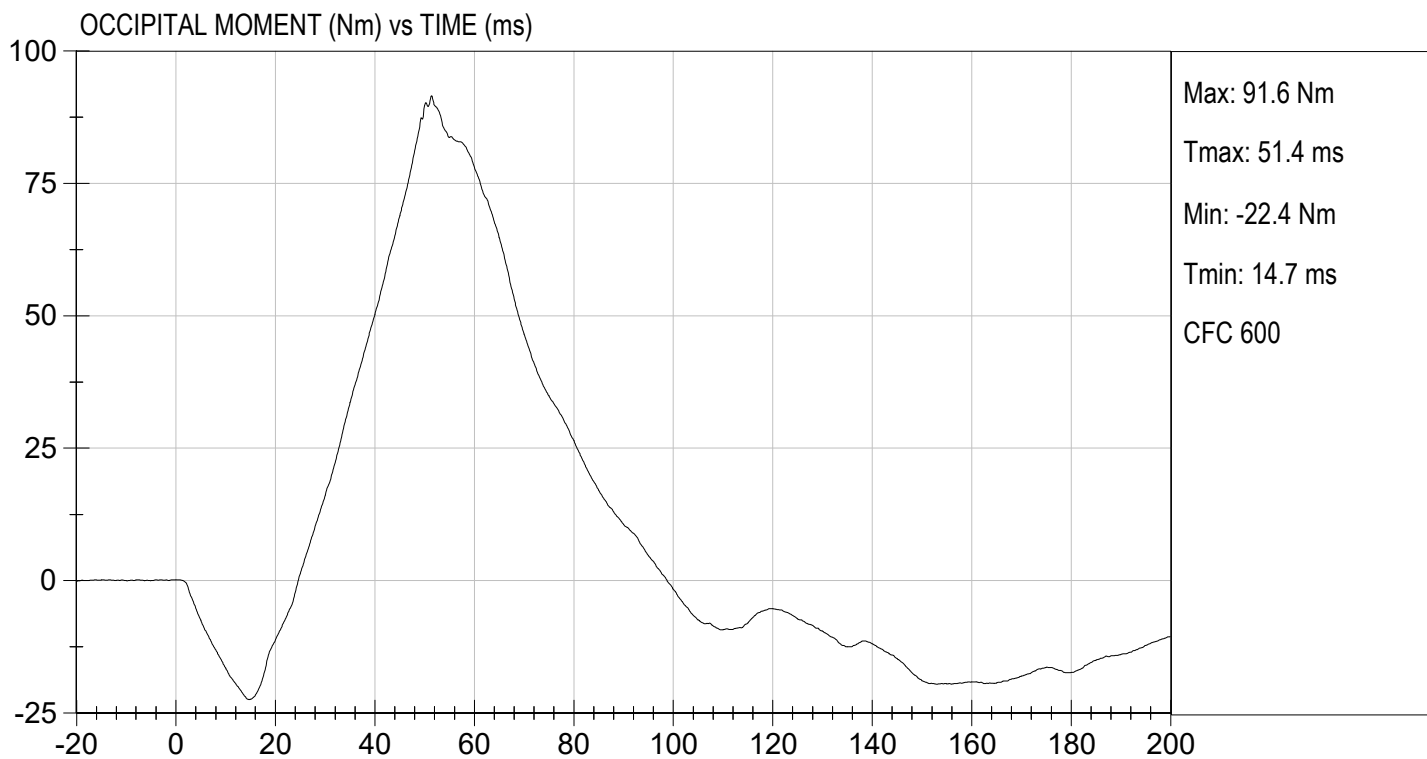
TEST DATE: 12/11/2023
TEST #: D233262





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 12/11/2023
TEST #: D233262



DATA SHEET A5
NECK EXTENSION TEST (572.33) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.5°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</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. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- | | | |
|----------|-----|--|
| <u>X</u> | 7. | The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i)) |
| <u>X</u> | 8. | The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3)) |
| <u>X</u> | 9. | The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 10A for the extension test. (572.33(c)(3)) |
| <u>X</u> | 10. | Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A. |
| <u>X</u> | 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. |
| <u>X</u> | 12. | Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 19.5 ft/s to 20.3 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4)) |
| <u>X</u> | 13. | Complete the following table:
Neck Extension Test Results (572.33(b)(2) & 572.33(c)(4)) |

Parameter		Specification	Results
Pendulum impact speed		19.5 ft/s $\leq$ speed $\leq$ 20.3 ft/s	19.80 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	17.2 $\leq$ g $\leq$ 21.2	19.83 g
	@ 20 ms	14 $\leq$ g $\leq$ 19	17.50 g
	@ 30 ms	11.0 $\leq$ g $\leq$ 16.0	12.66 g
	Above 30 ms	22 g maximum	13.60 g
First Pendulum Decay to 5g		38 ms $\leq$ time $\leq$ 46 ms	40.0 ms
Plane D Rotation		81° $\leq$ max. rotation $\leq$ 106°	98.8°
		72 ms $\leq$ time of max. rotation $\leq$ 82 ms	77.4 ms
Time for Plane D Rotation to Cross 0° During First Rebound		147 ms $\leq$ time $\leq$ 174 ms	158.0 ms
Maximum Moment		-59 lbf-ft $\leq$ moment $\leq$ -39 lbf-ft	-41.9 lbf-ft
		65 ms $\leq$ time of max. moment $\leq$ 79 ms	73.5 ms
Time of first decay to 0 lbf-ft Positive Moment Decay** (Extension)		120 ms $\leq$ time $\leq$ 148 ms	140.8 ms

My = Moment in lbf-ft measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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


Signature

12/11/2023
Date

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

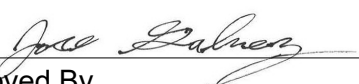
ATD Serial No: 401

Test I.D: D233263

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	21	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.83	Pass
	20 ms	G's	14.00 to 19.00	17.50	Pass
	30 ms	G's	11.00 to 16.00	12.66	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.8	Pass
	Time	ms	72.0 to 82.0	77.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	158.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-56.8	Pass
	Time	ms	65.0 to 79.0	73.5	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.8	Pass
Overall Test Results					Pass


 Laboratory Technician

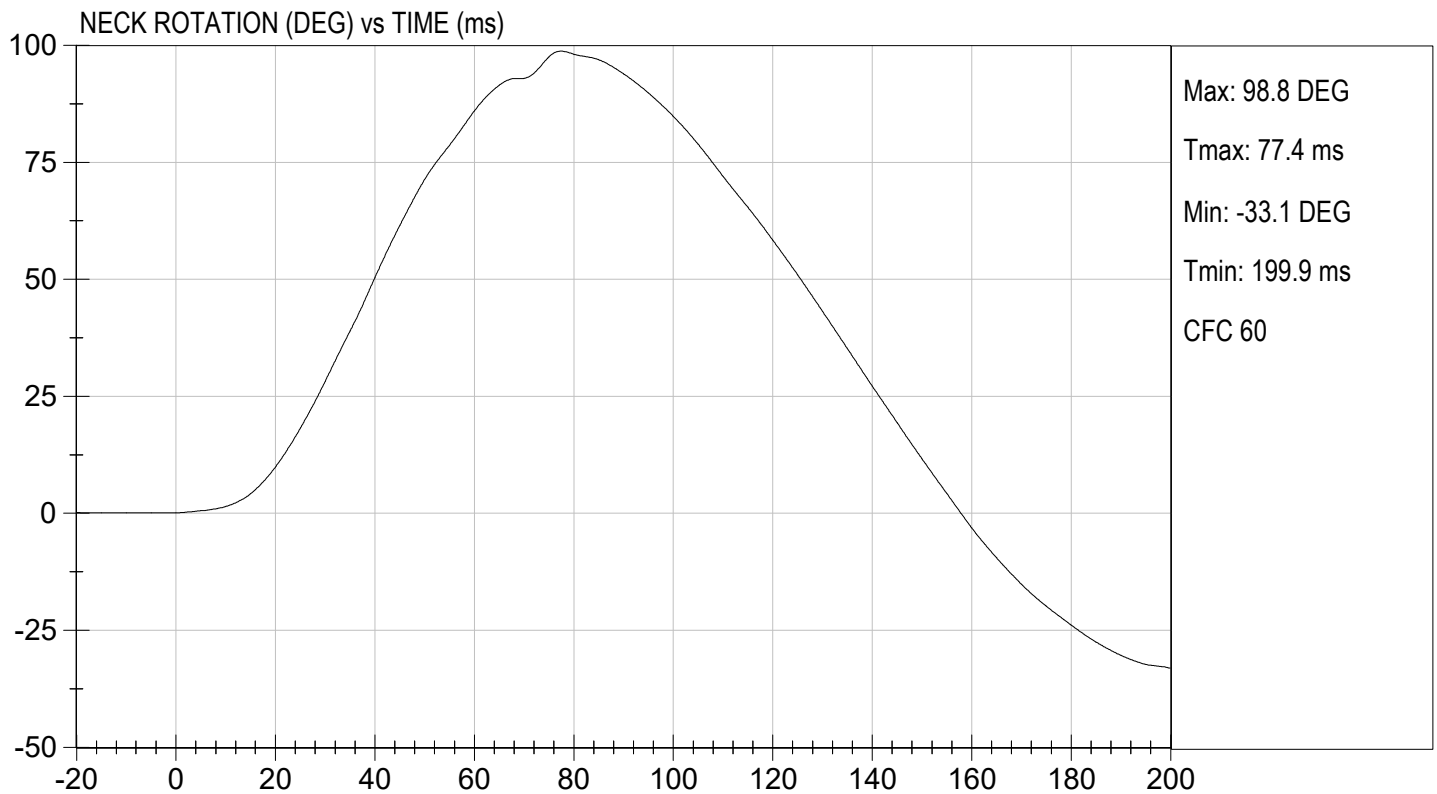
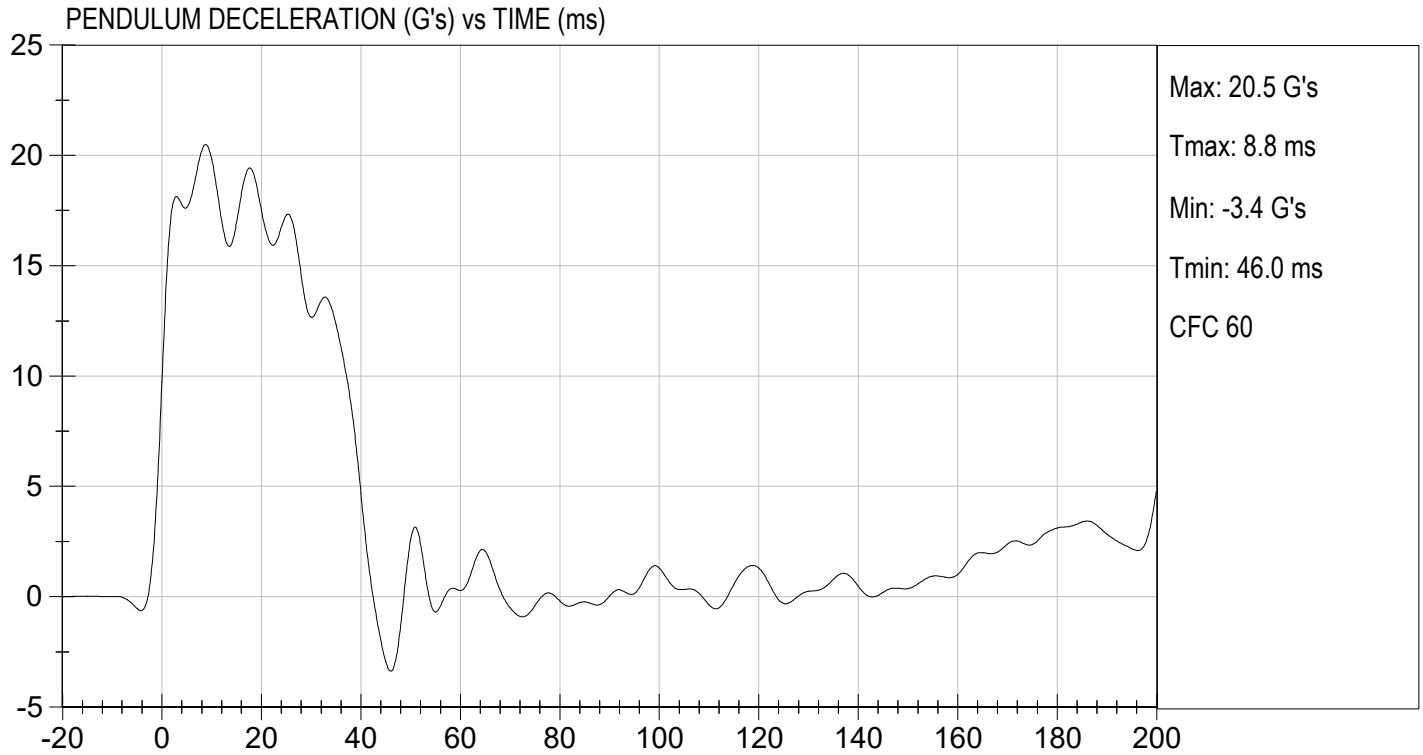
12/11/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

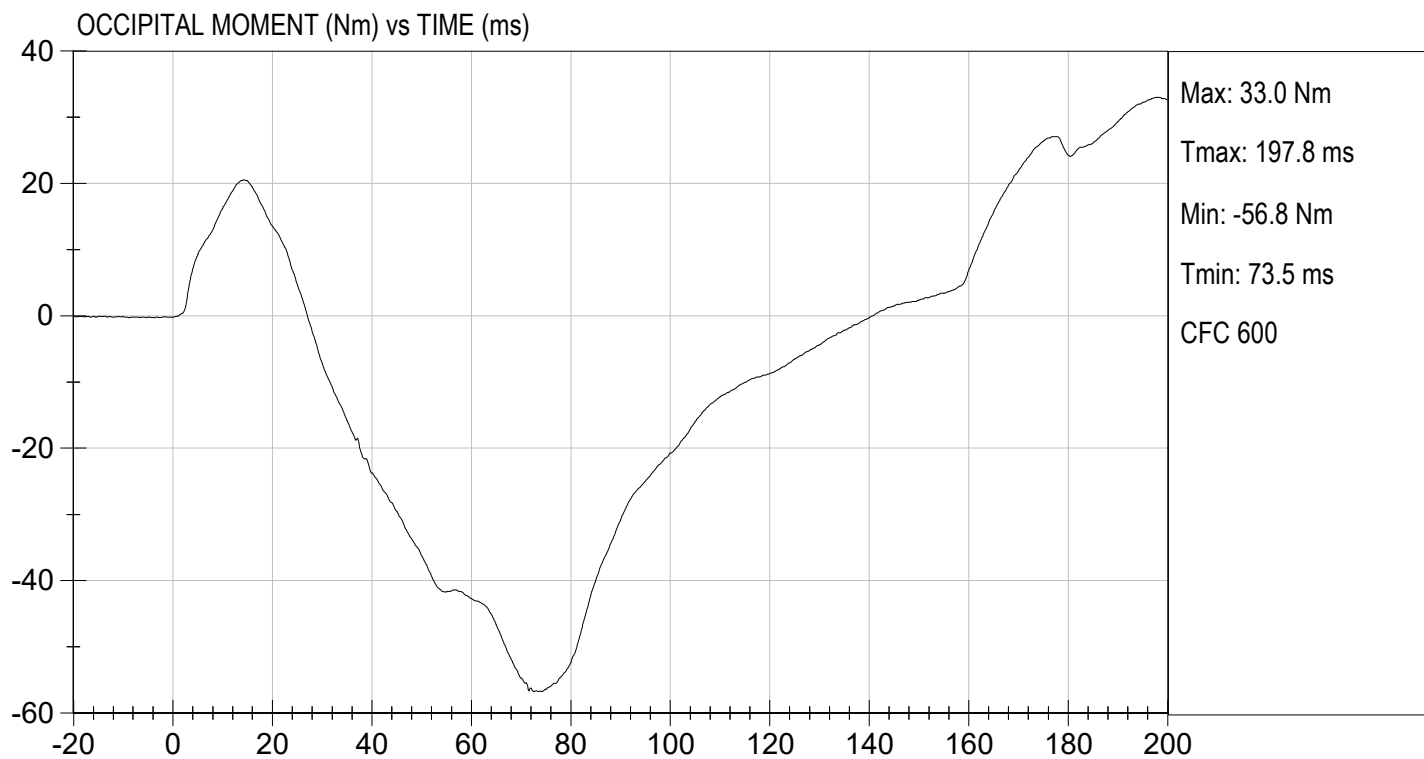
TEST DATE: 12/11/2023
TEST #: D233263





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 12/11/2023
TEST #: D233263



DATA SHEET A6
THORAX IMPACT TEST (572.34) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- ☒ 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 12A.
- ☒ 3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(b))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.34(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.6°C</u> |
| Record the minimum temperature: | <u>21.3°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</u> |
- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No Damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:
- ☐ - The following repairs or replacement was performed. Record:
-
- ☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture

- _____ surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))
- X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 ft/s $\leq$ speed $\leq$ 22.4 ft/s	22.20 ft/s
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.67 in.
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1254 lb
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	72 %

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

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

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

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


Signature

12/11/2023
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 401

Test I.D: D233264

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,578	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.77	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass


Laboratory Technician

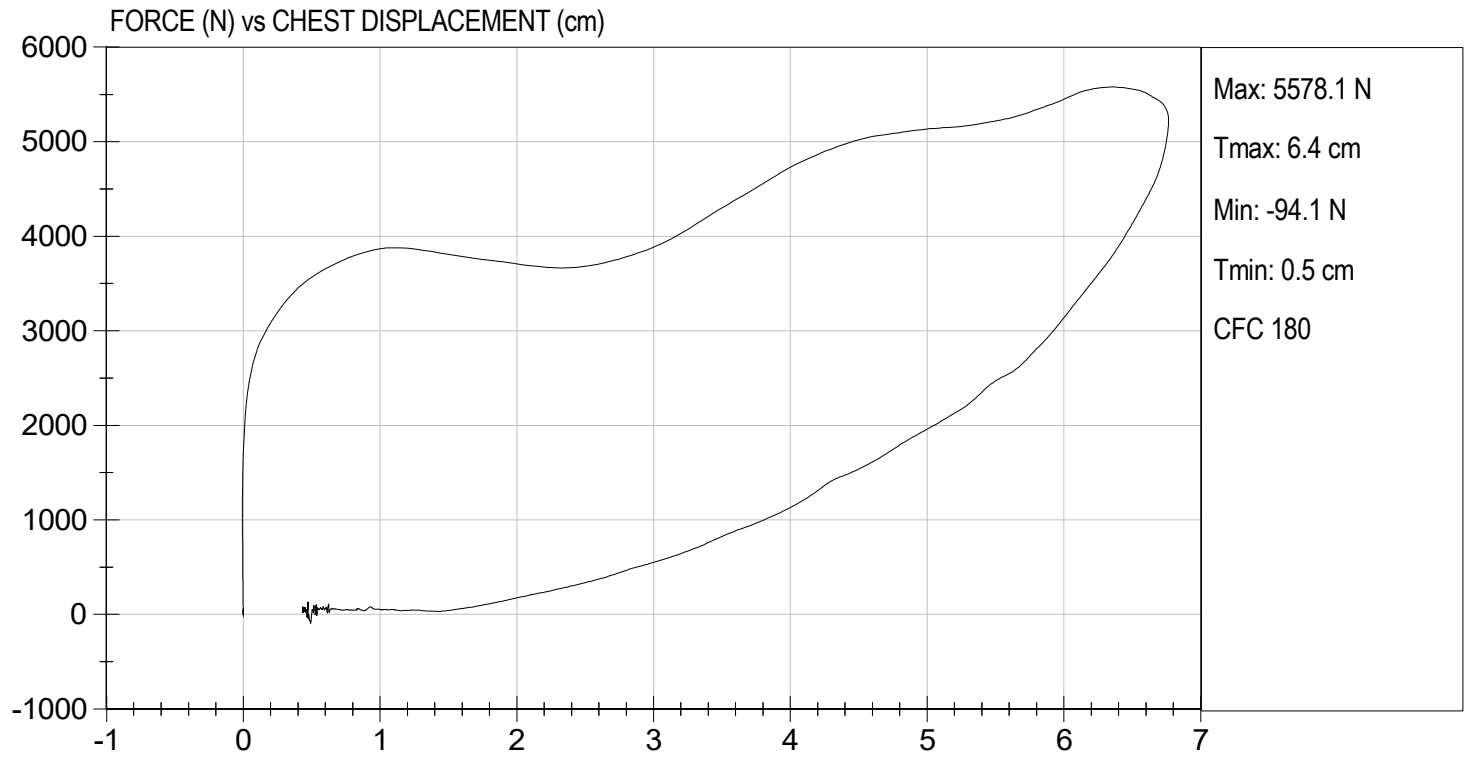
12/11/2023
Test Date


Approved By



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

TEST DATE: 12/11/2023
TEST #: D233264



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14A.
- X 3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>21.4°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- X 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- X 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.89 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1200 lb

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

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



Signature

12/11/2023
Date

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

ATD Serial No: 401

Test I.D: D233266

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	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,338	Pass
Overall Test Results				Pass


Laboratory Technician

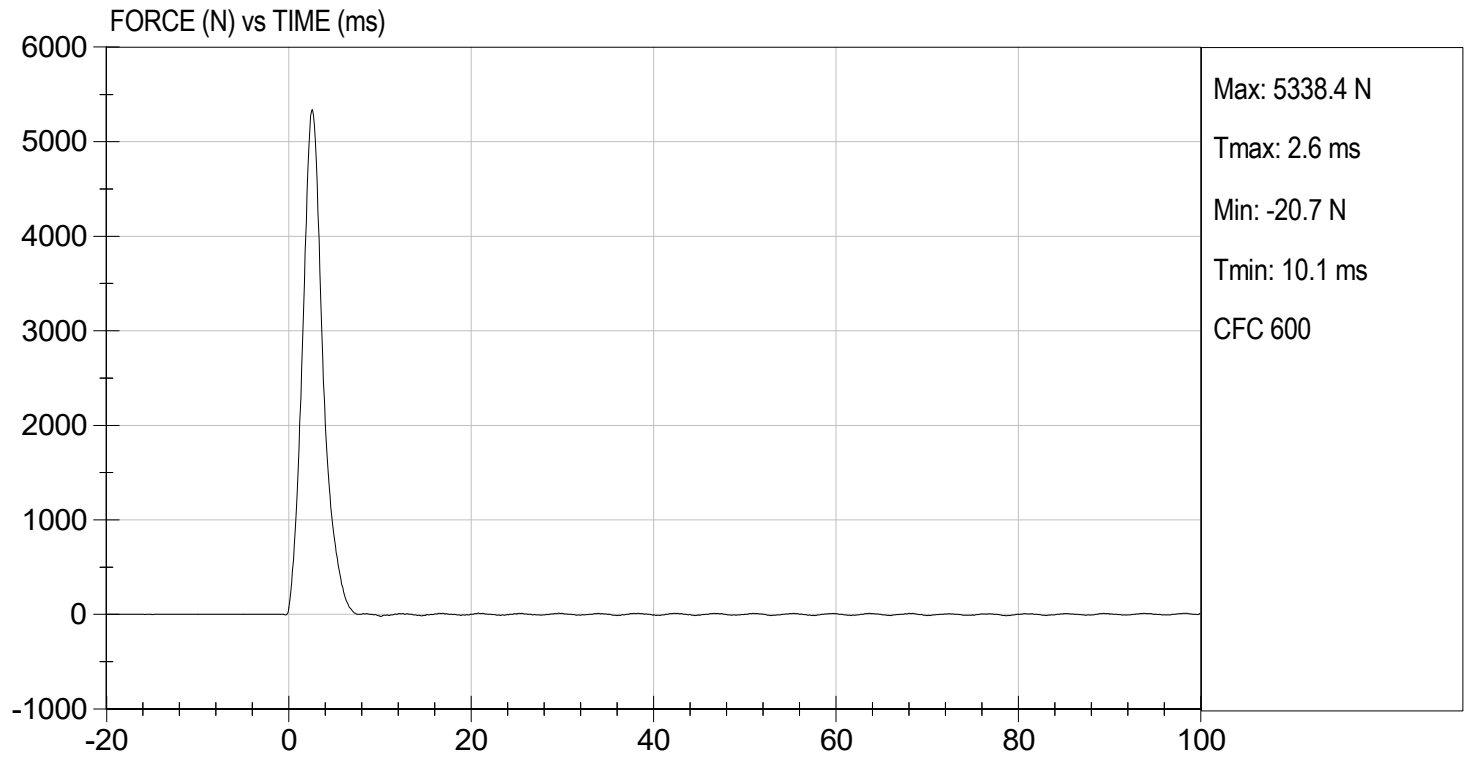
12/11/2023
Test Date


Approved By



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

TEST DATE: 12/11/2023
TEST #: D233266



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14A.
- X 3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>21.4°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- X 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- X 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.89 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1107 lb

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

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

Jonah Pilotas
Signature

12/11/2023
Date

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

ATD Serial No: 401

Test I.D: D233265

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	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	4,924	Pass
Overall Test Results				Pass


Laboratory Technician

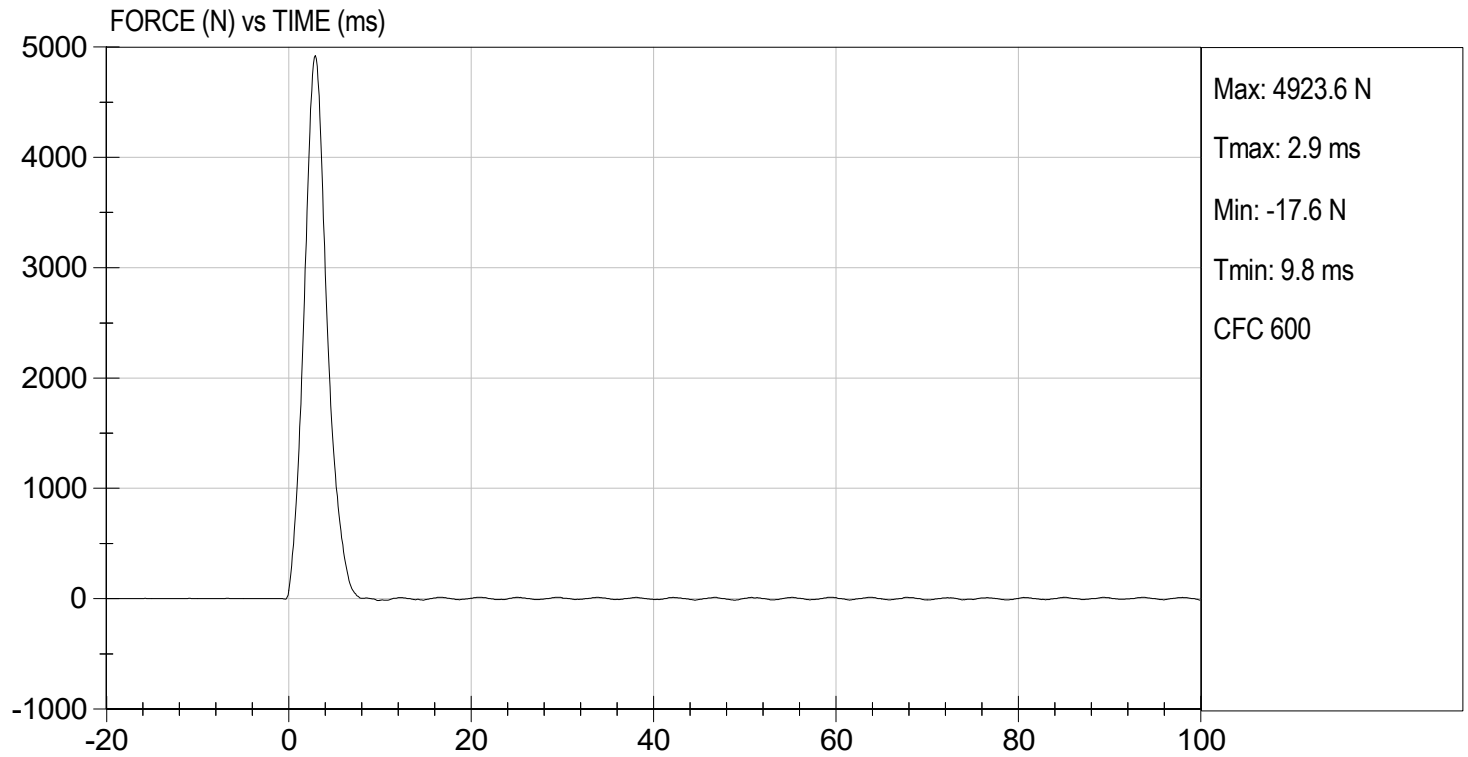
12/11/2023
Test Date


Approved By



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

TEST DATE: 12/11/2023
TEST #: D233265



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c)) (50th Male)

Dummy Serial Number: 401

Test Date: 12/11/2023

Technician: Jonah Pulokas

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
 X N/A, ONLY one hip joint-femur flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 17A.
- X 3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
- X 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
- X 3.2 remove the abdominal insert (78051-52)
- X 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
- X 4. The assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(c)(v))
- | | |
|---------------------------------|--------|
| Record the maximum temperature: | 21.3°C |
| Record the minimum temperature: | 21.0°C |
| Record the maximum humidity: | 22% |
| Record the minimum humidity: | 11% |
- X 5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
- X 6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
- X 7. Adjust the threaded rods until plane B is horizontal.
- X 8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
- X 9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline

horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	Torque ≤ 70 ft-lbf	69.6 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	43°

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

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

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	torque ≤ 70 ft-lbf	69.3 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42°


Signature

12/11/2023
Date

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

ATD Serial No: 401

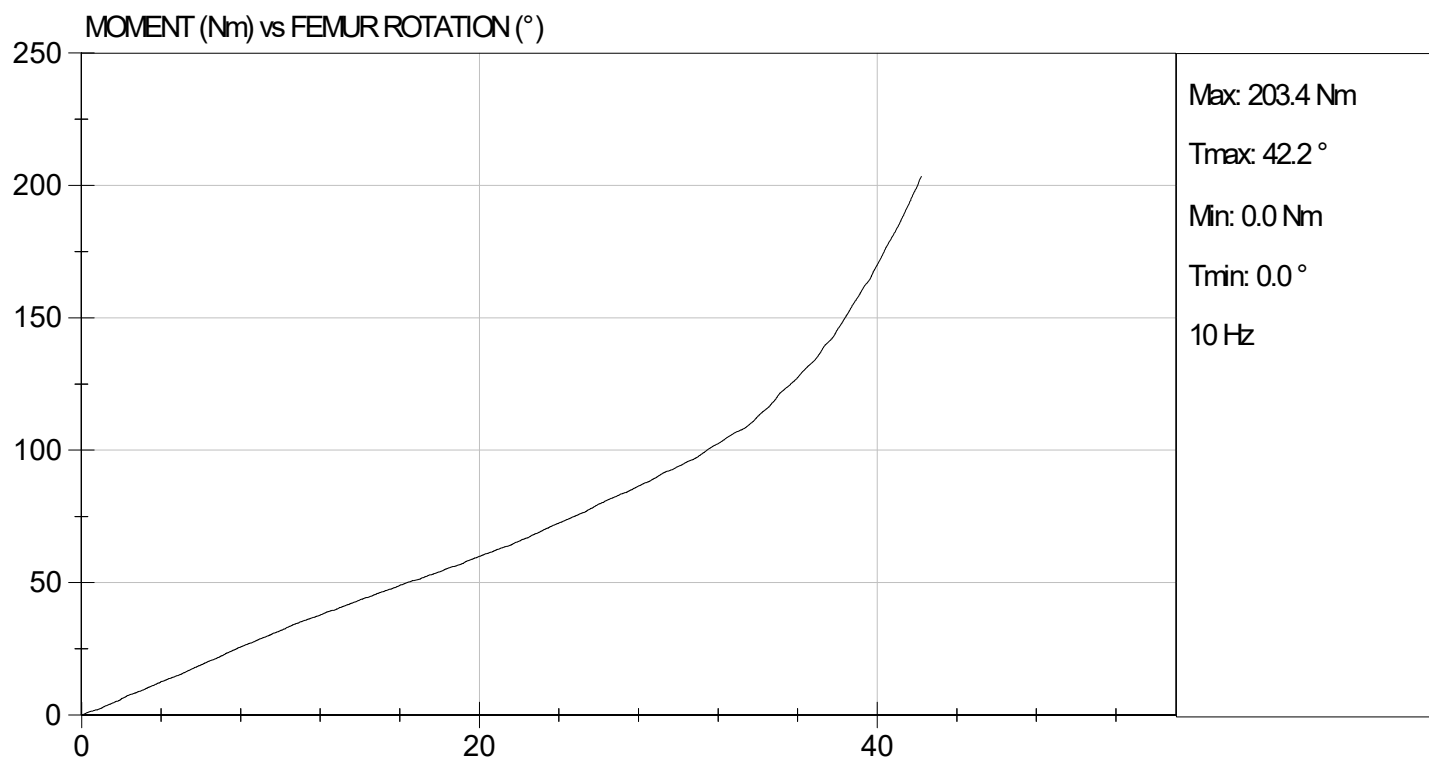
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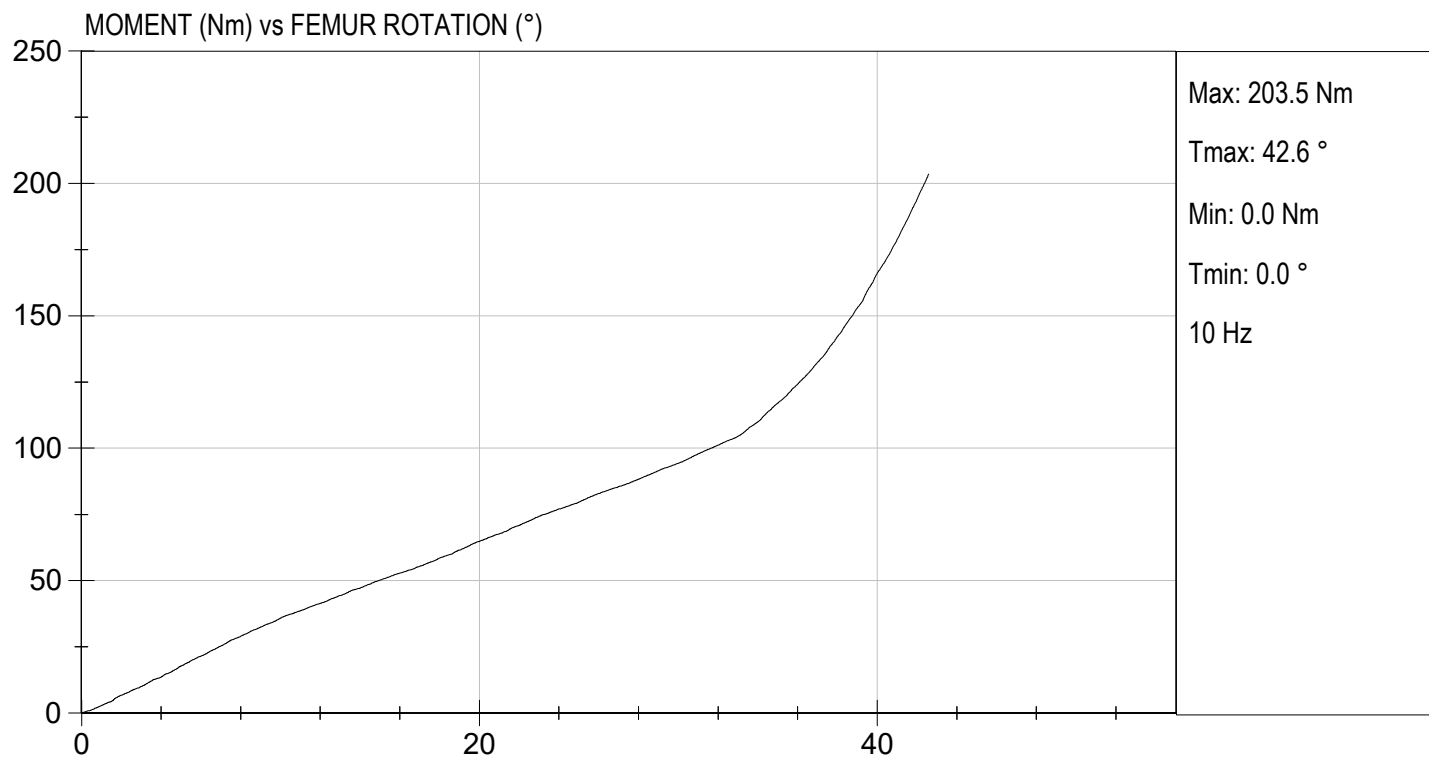
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	22	22	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	94.0	94.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	42.2	42.6	Pass
Overall Test Results					Pass


 Laboratory Technician

12/11/2023
 Test Date


 Approved By





DATA SHEET A10
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	7231C-750	AH5D9	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	AGH74	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	C19307	10/09/2023	04/09/2024
NECK TRANSDUCER	Denton	1716A	N1145	09/05/2023	03/06/2024
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7231C-750	AH5J3	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	AGH90	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	C12885	10/09/2023	04/09/2024
CHEST POTENTIOMETER	Humanetics	78051-317	401	10/09/2023	04/09/2024
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121AJTF	F2026	10/09/2023	04/09/2024
(2) LEFT FEMUR	Denton	2121AJTF	F2027	10/09/2023	04/09/2024
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/17/2023	01/06/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-360M17	P97372	11/20/2023	05/21/2024
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-360M17	P82128	11/27/2023	05/28/2024
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	C3036	09/20/2023	03/21/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	C3034	09/06/2023	03/07/2024

LABORATORY TECHNICIAN: _____

Jonah Pulokas

DATA SHEET A3
HEAD DROP TEST (572.32) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.32(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))
- ☒ 3. Torque the skull cap screws to 160 lbf-in.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))
- ☒ 6. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 7. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- ☒ 8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.32(c)(2))

- X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(c)(3))

Record the actual distance: 0.5 inches

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

- X 10. The 1.6 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 7A.

Record the right side distance: 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). (572.32(c)(4))

Record actual micro finish: 24.8 micro inches

- X 12. The impact surface is rigidly supported. (572.132(c)(4))

- X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

- X 14. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	254 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.

 Jonah Pulokas
Signature

 12/19/2023
Date

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

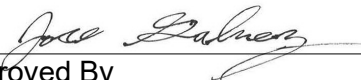
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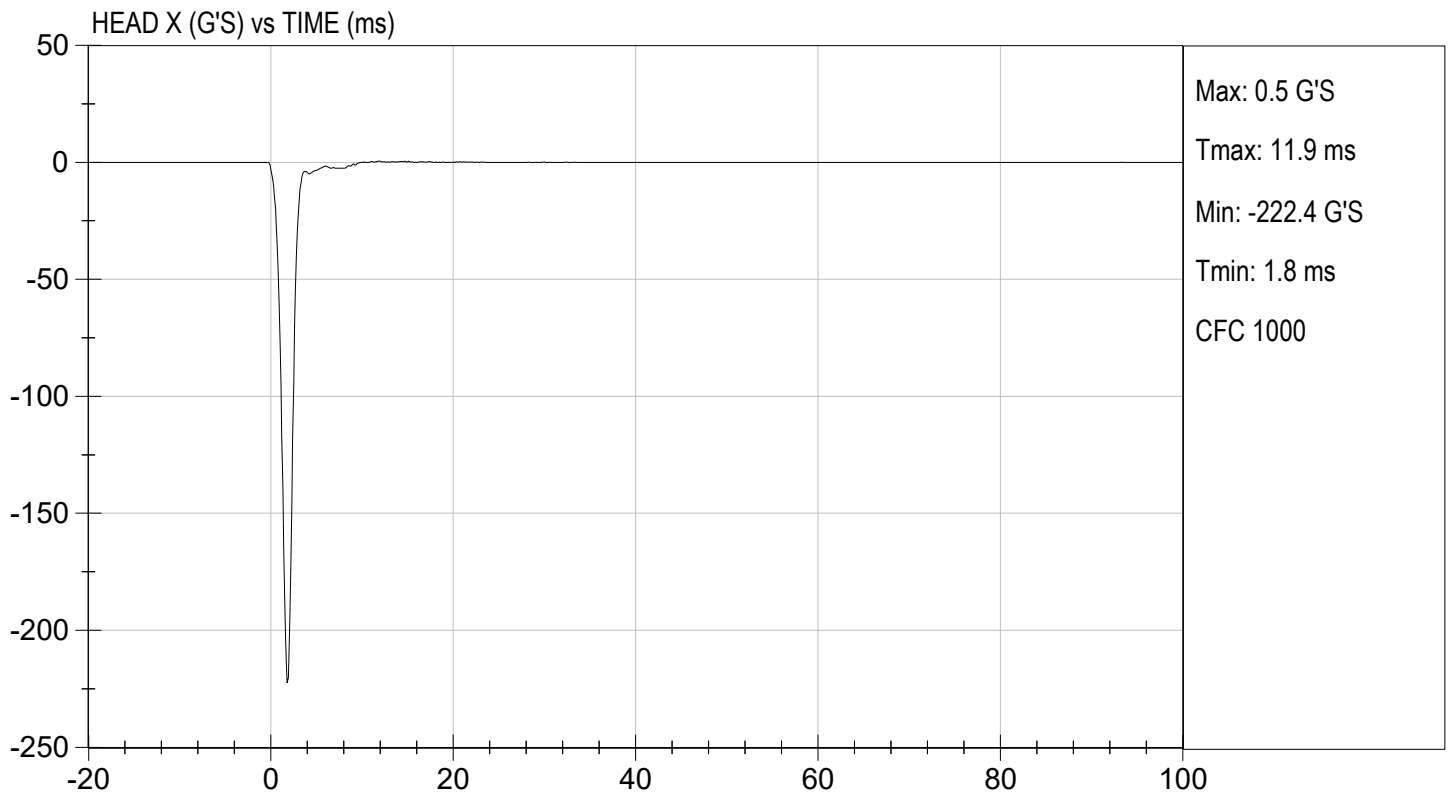
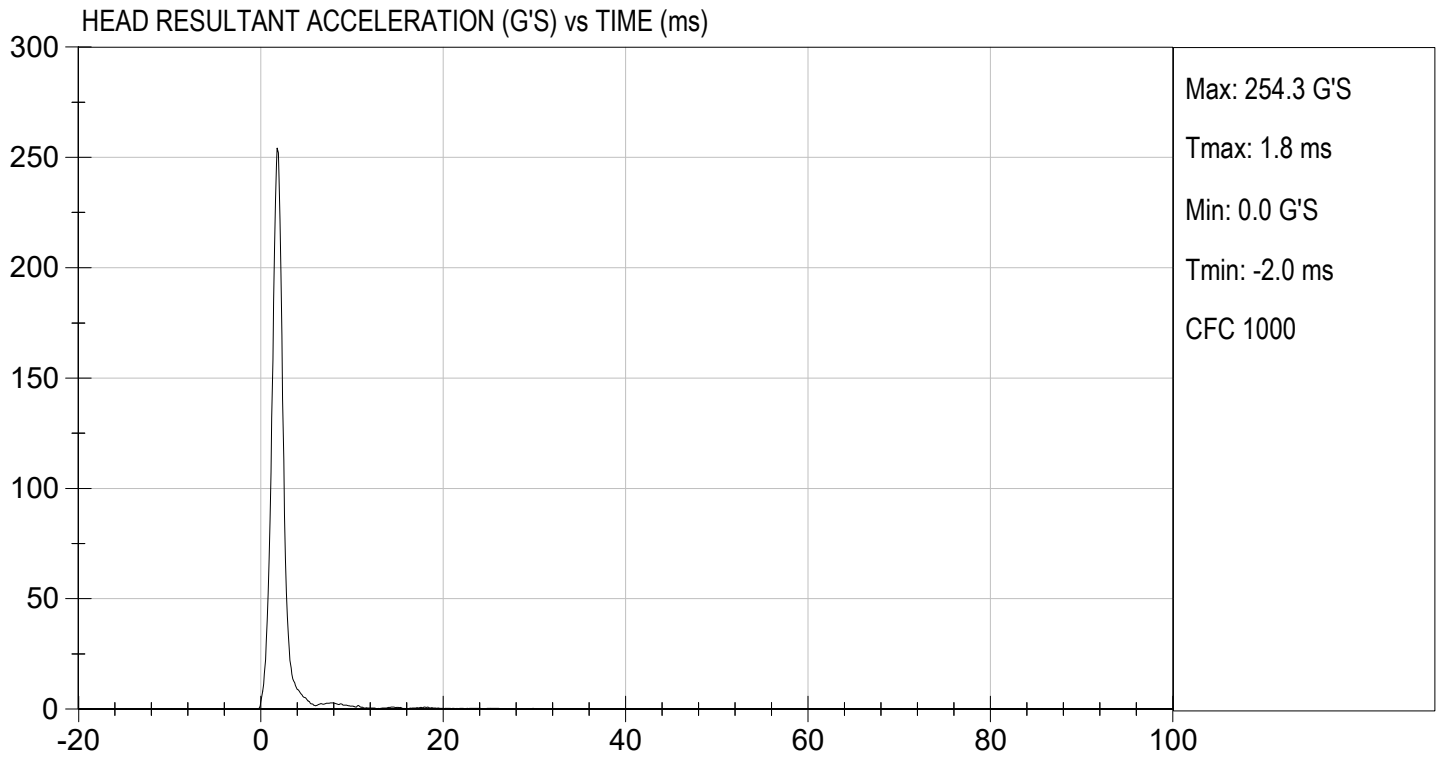
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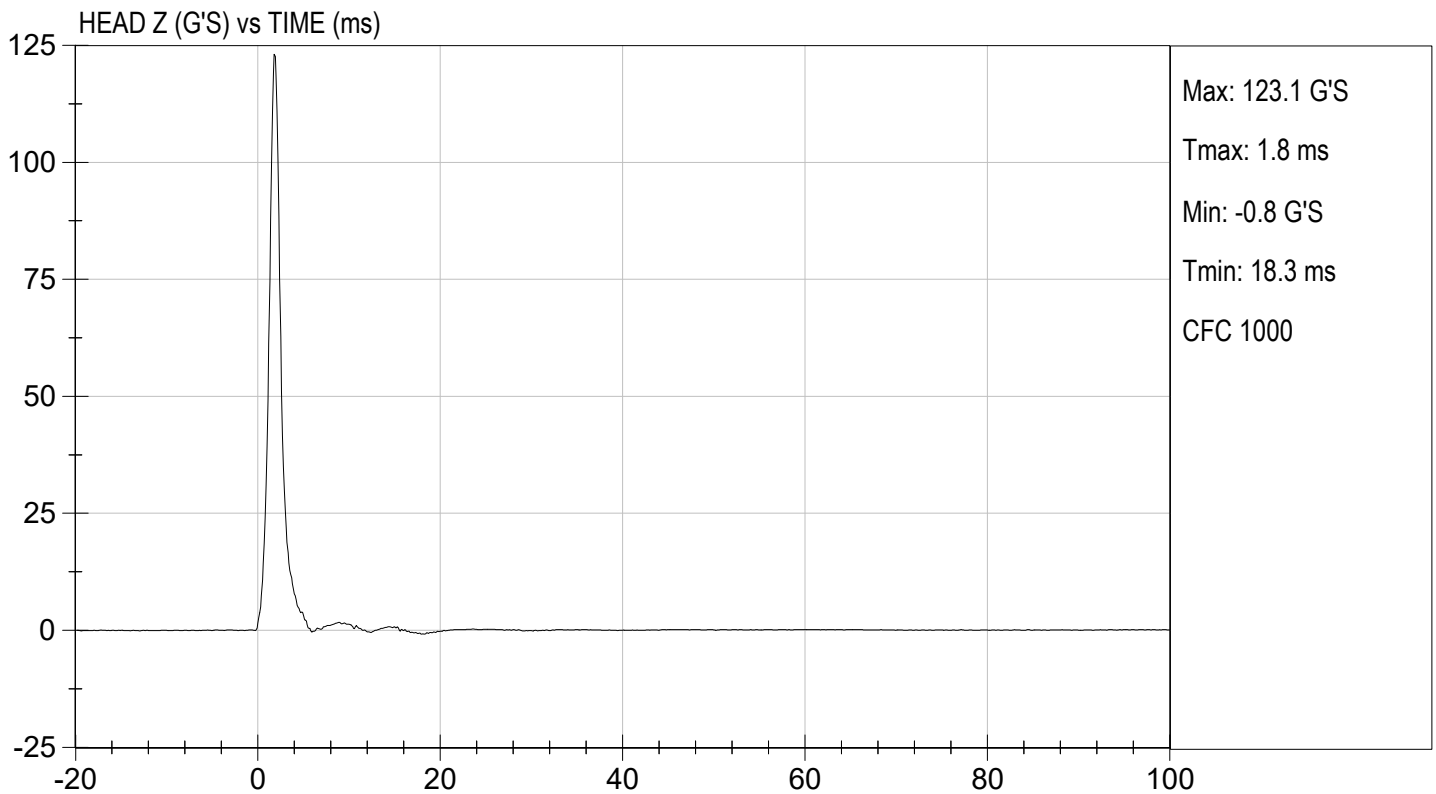
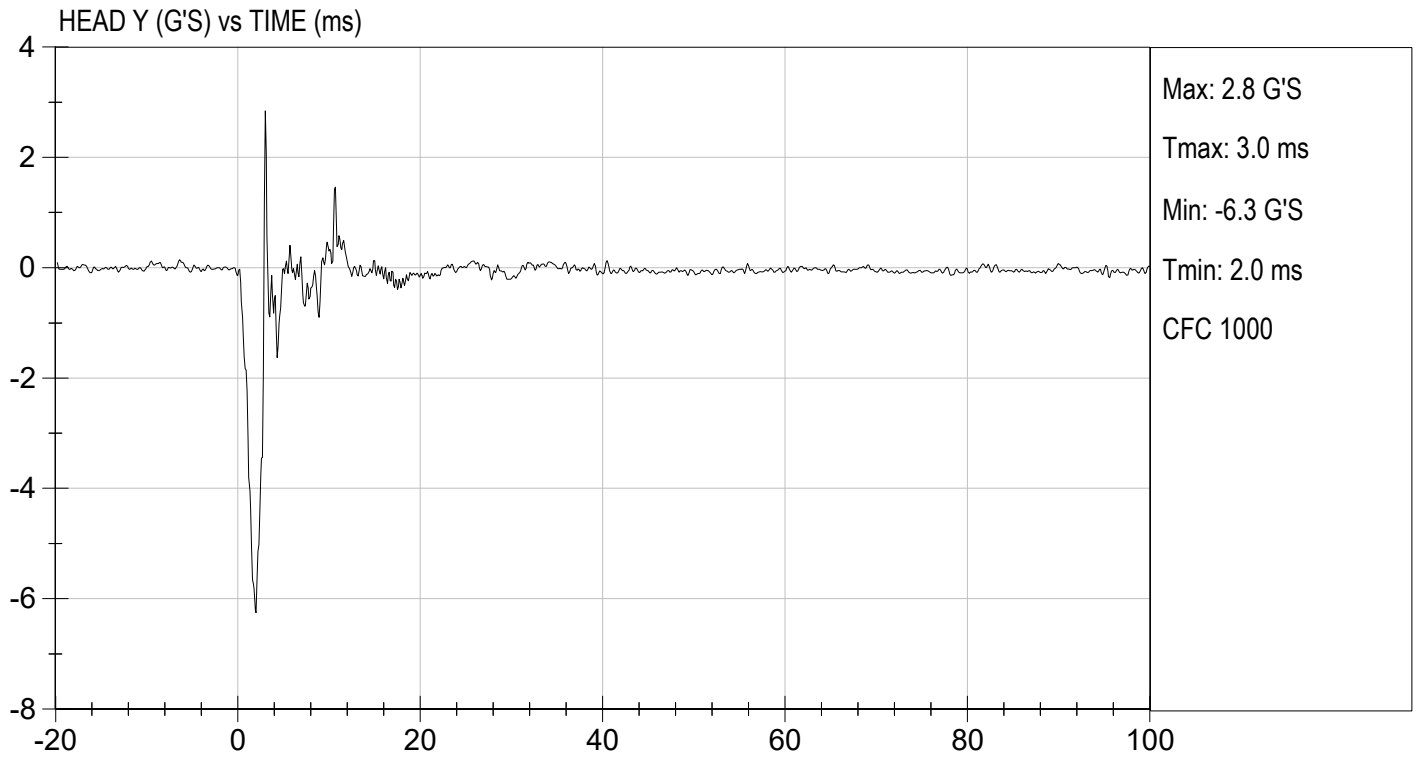
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	225 to 275	254	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

12/19/2023
Test Date


Approved By





DATA SHEET A4
NECK FLEXION TEST (572.33) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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 flexion test. (572.36(m))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>11%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9A for the flexion test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Results
Pendulum impact speed		$22.6 \text{ ft/s} \leq \text{speed} \leq 23.4 \text{ ft/s}$	23.16 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	$22.5 \leq g \leq 27.5$	23.79 g
	@ 20 ms	$17.6 \leq g \leq 22.6$	18.95 g
	@ 30 ms	$12.5 \leq g \leq 18.5$	15.02 g
	Above 30 ms	29 g maximum	15.30 g
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	39.5 ms
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	69.8°
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	58.9 ms
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	113.7 ms
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	69.3 lbf-ft
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	51.1 ms0
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	97.8 ms

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

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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

Jonah Pollock
Signature

12/19/2023
Date

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

ATD Serial No: 401

Test I.D: D233402

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.79	Pass
	20 ms	G's	17.60 to 22.60	18.95	Pass
	30 ms	G's	12.50 to 18.50	15.02	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.8	Pass
	Time	ms	57.0 to 64.0	58.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.7	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	93.9	Pass
	Time	ms	47.0 to 58.0	51.0	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.8	Pass
Overall Test Results					Pass


 Laboratory Technician

12/19/2023

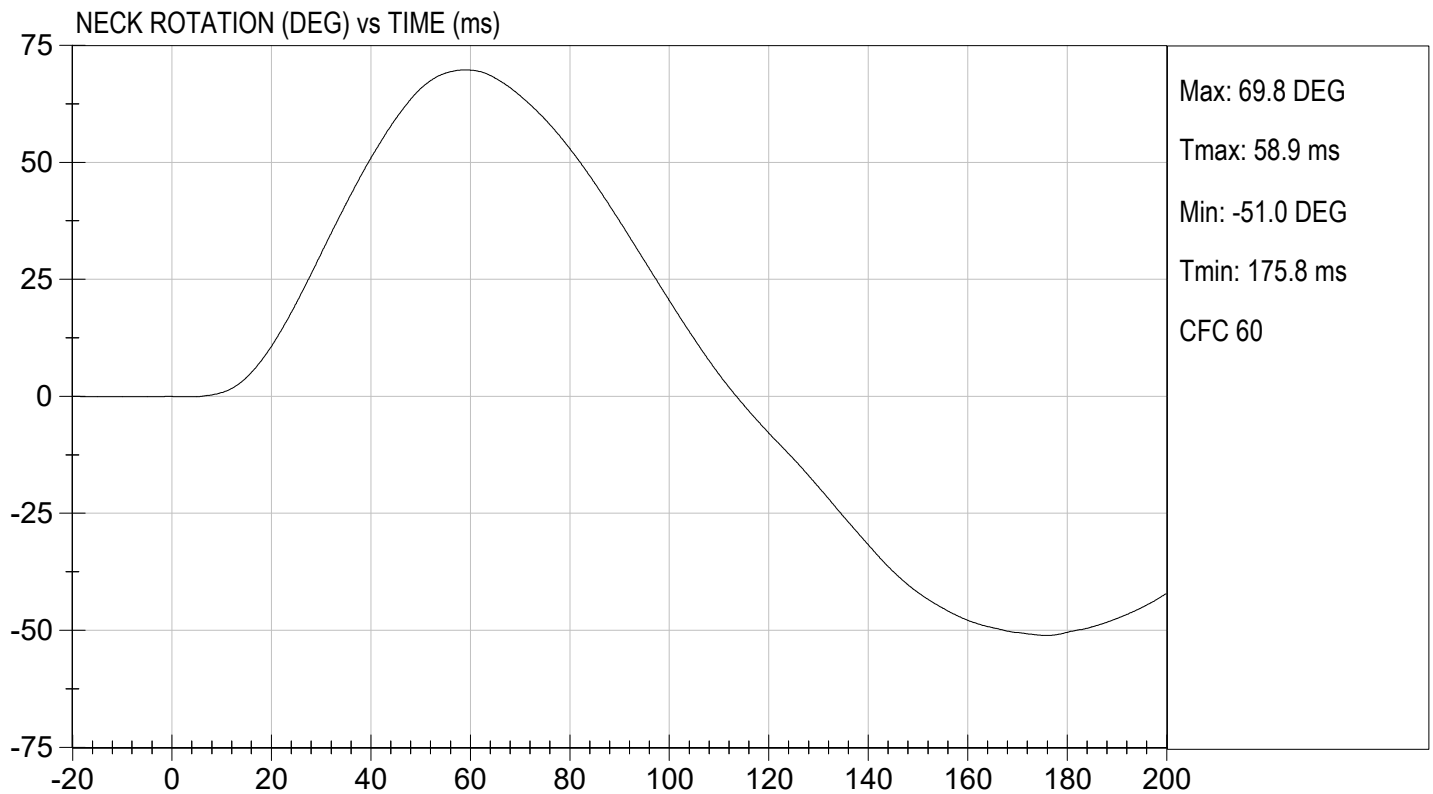
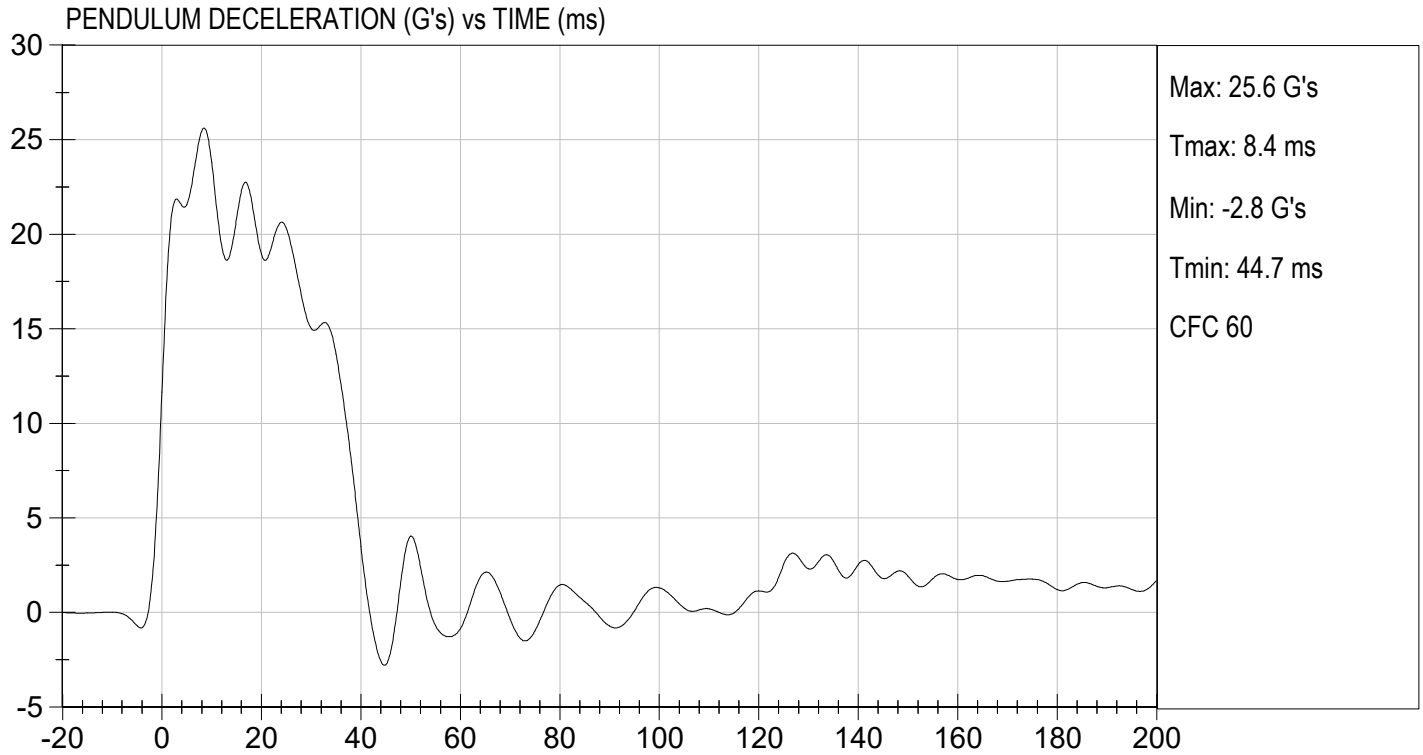
Test Date


 Approved By



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

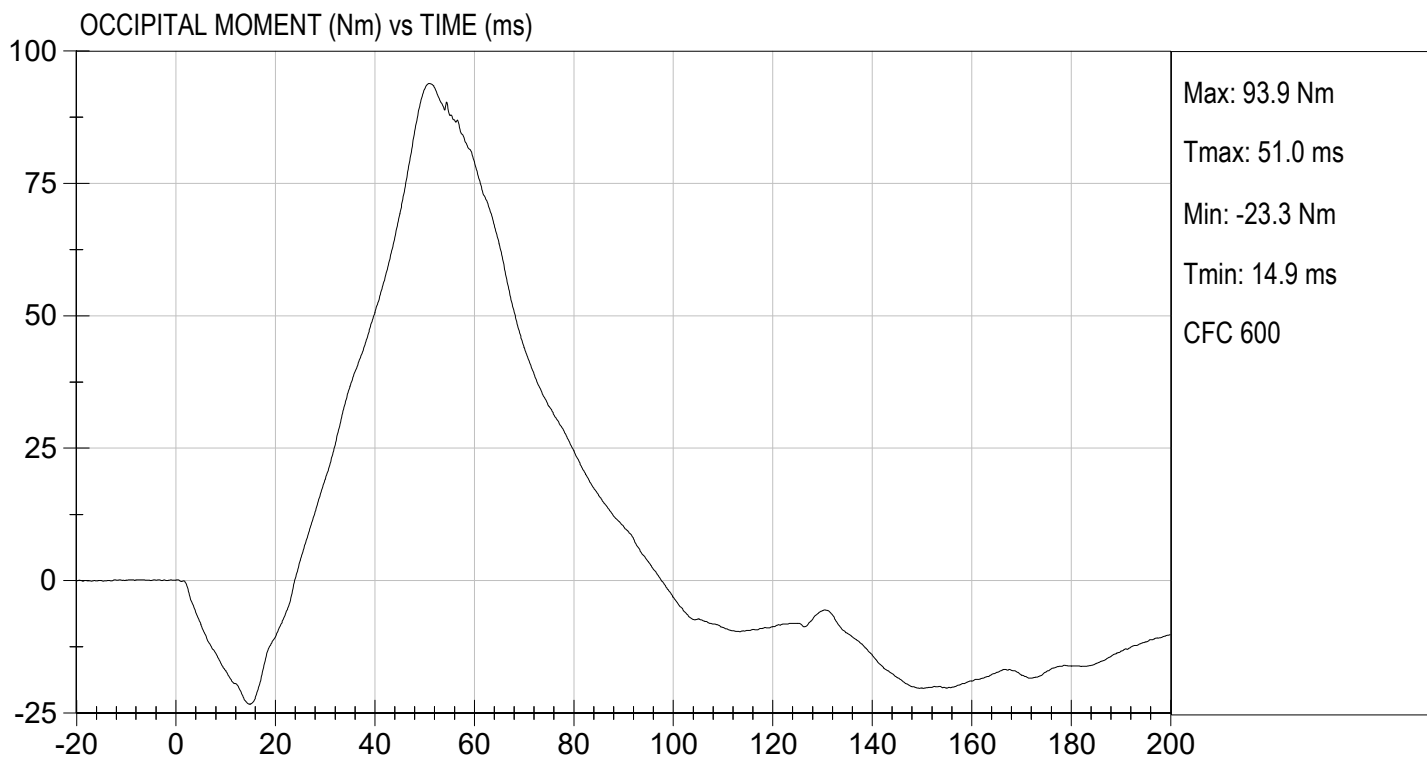
TEST DATE: 12/19/2023
TEST #: D233402





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

TEST DATE: 12/19/2023
TEST #: D233402



DATA SHEET A5
NECK EXTENSION TEST (572.33) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.36(m))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>11%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J2111/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 10A for the extension test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 19.5 ft/s to 20.3 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Results
Pendulum impact speed		$19.5 \text{ ft/s} \leq \text{speed} \leq 20.3 \text{ ft/s}$	19.85 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	$17.2 \leq g \leq 21.2$	18.74 g
	@ 20 ms	$14 \leq g \leq 19$	16.04 g
	@ 30 ms	$11.0 \leq g \leq 16.0$	13.99 g
	Above 30 ms	22 g maximum	14.0 g
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	41.7 ms
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	98.2°
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	80.4 ms
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	159.7 ms
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-40.2 lbf-ft
		$65 \text{ ms} \leq \text{time of max. moment} \leq 79 \text{ ms}$	76.0 ms
Time of first decay to 0 lbf-ft Positive Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	142.2 ms

*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$ (572.33(b)(2)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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



Signature

12/19/2023
Date

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

ATD Serial No: 401

Test I.D: D233403

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.74	Pass
	20 ms	G's	14.00 to 19.00	16.04	Pass
	30 ms	G's	11.00 to 16.00	13.99	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.2	Pass
	Time	ms	72.0 to 82.0	80.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	159.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-54.5	Pass
	Time	ms	65.0 to 79.0	76.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.2	Pass
Overall Test Results					Pass


 Laboratory Technician

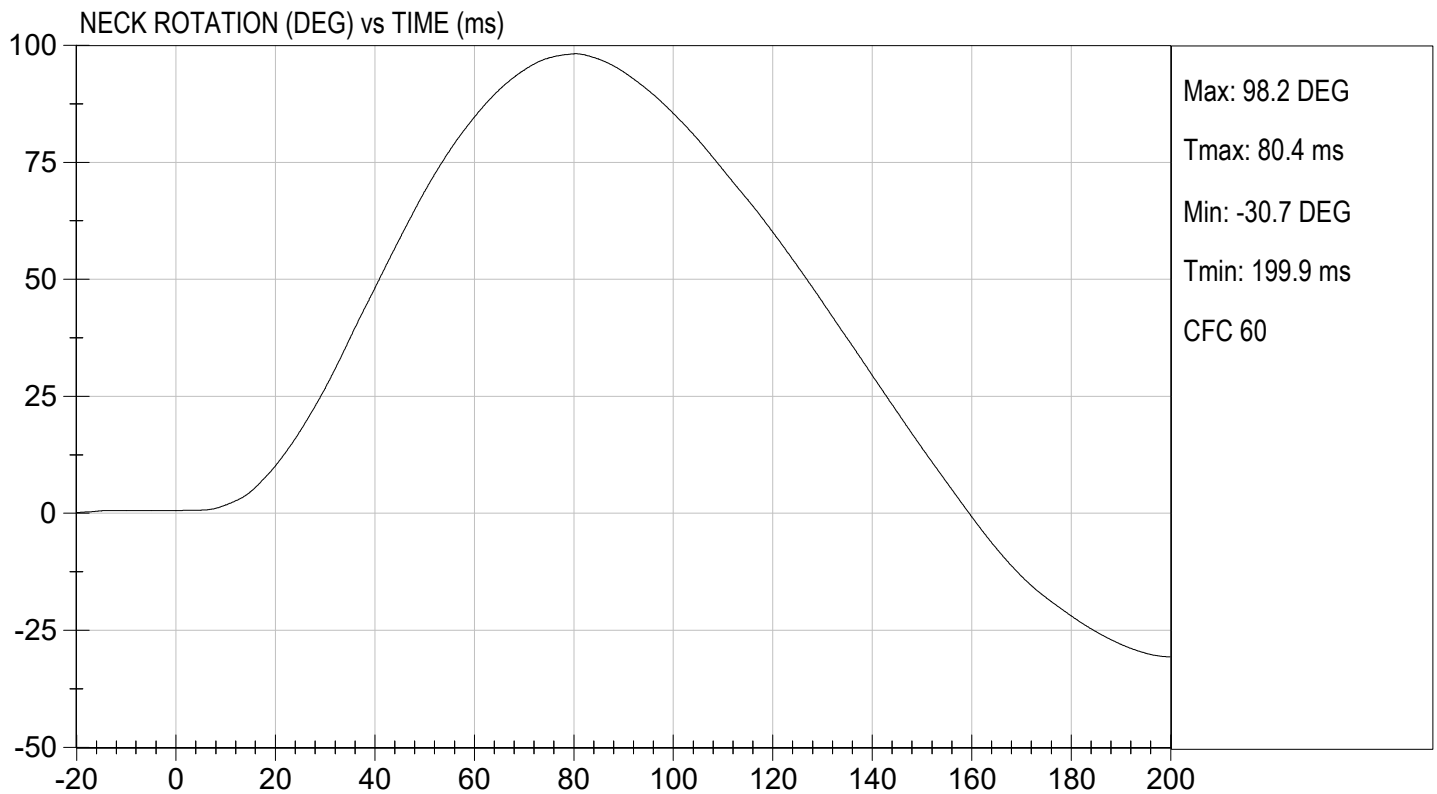
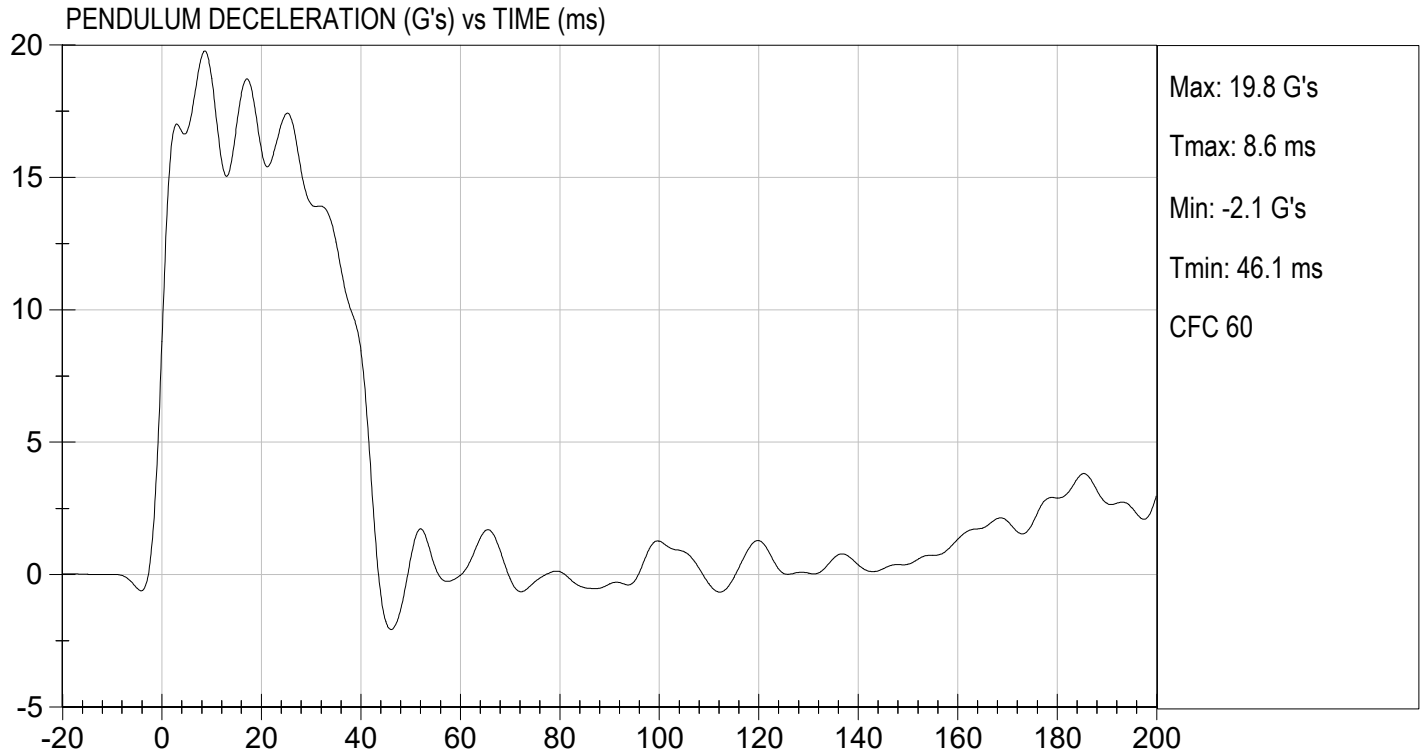
12/19/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

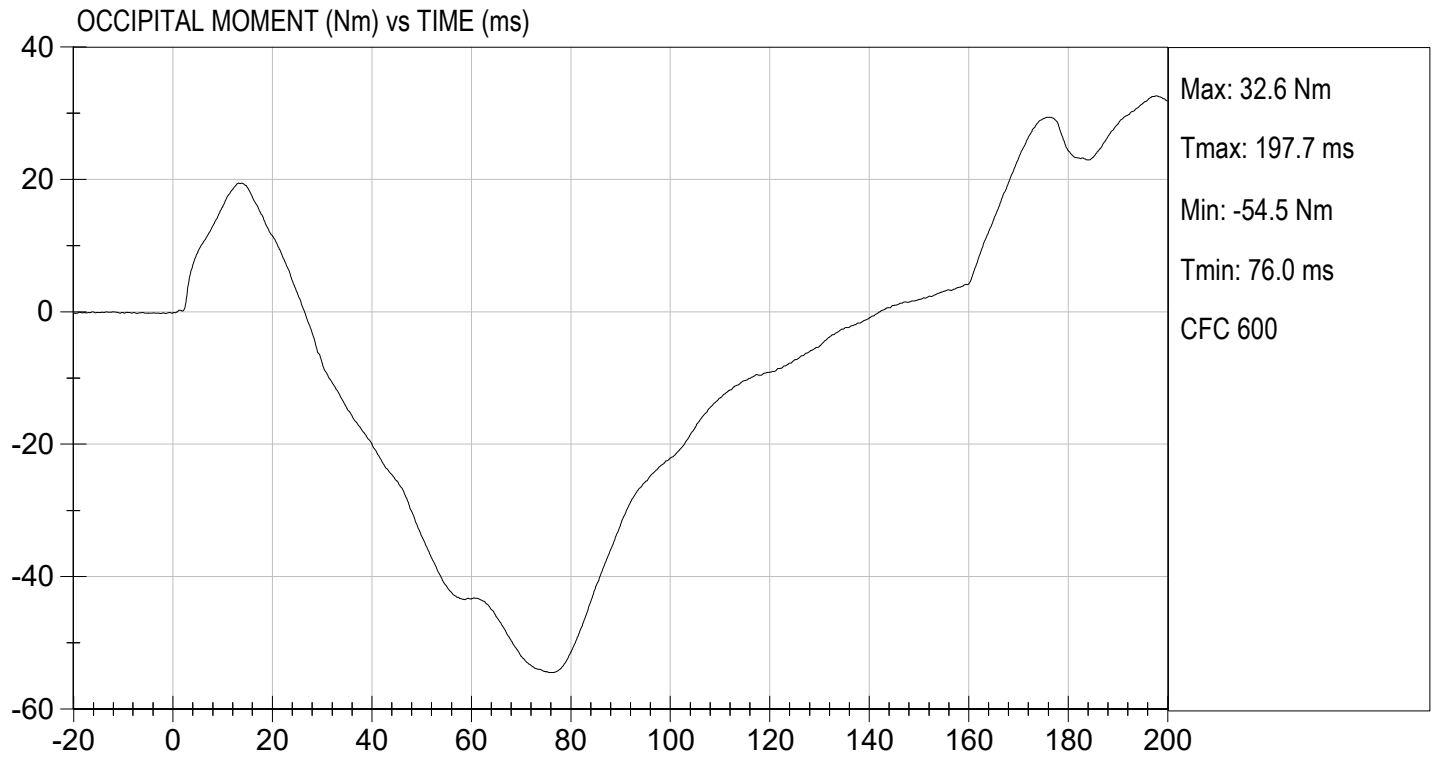
TEST DATE: 12/19/2023
TEST #: D233403





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 12/19/2023
TEST #: D233403



DATA SHEET A6
THORAX IMPACT TEST (572.34) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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 12A.
- ☒ 3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(b))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.34(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.5°C</u> |
| Record the minimum temperature: | <u>20.2°C</u> |
| Record the maximum humidity: | <u>18%</u> |
| Record the minimum humidity: | <u>10%</u> |
- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No Damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:
- ☐ - The following repairs or replacement was performed. Record:
-
- ☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture

- _____ surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))
- X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 ft/s $\leq$ speed $\leq$ 22.4 ft/s	21.65 ft/s
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.61 in.
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1284 lb
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	73 %

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

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

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

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



Signature

12/19/2023

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 401

Test I.D: D233404

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,713	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.63	Pass
Internal Hysteresis	%	69 to 85	73	Pass
			Overall Test Results	Pass


Laboratory Technician

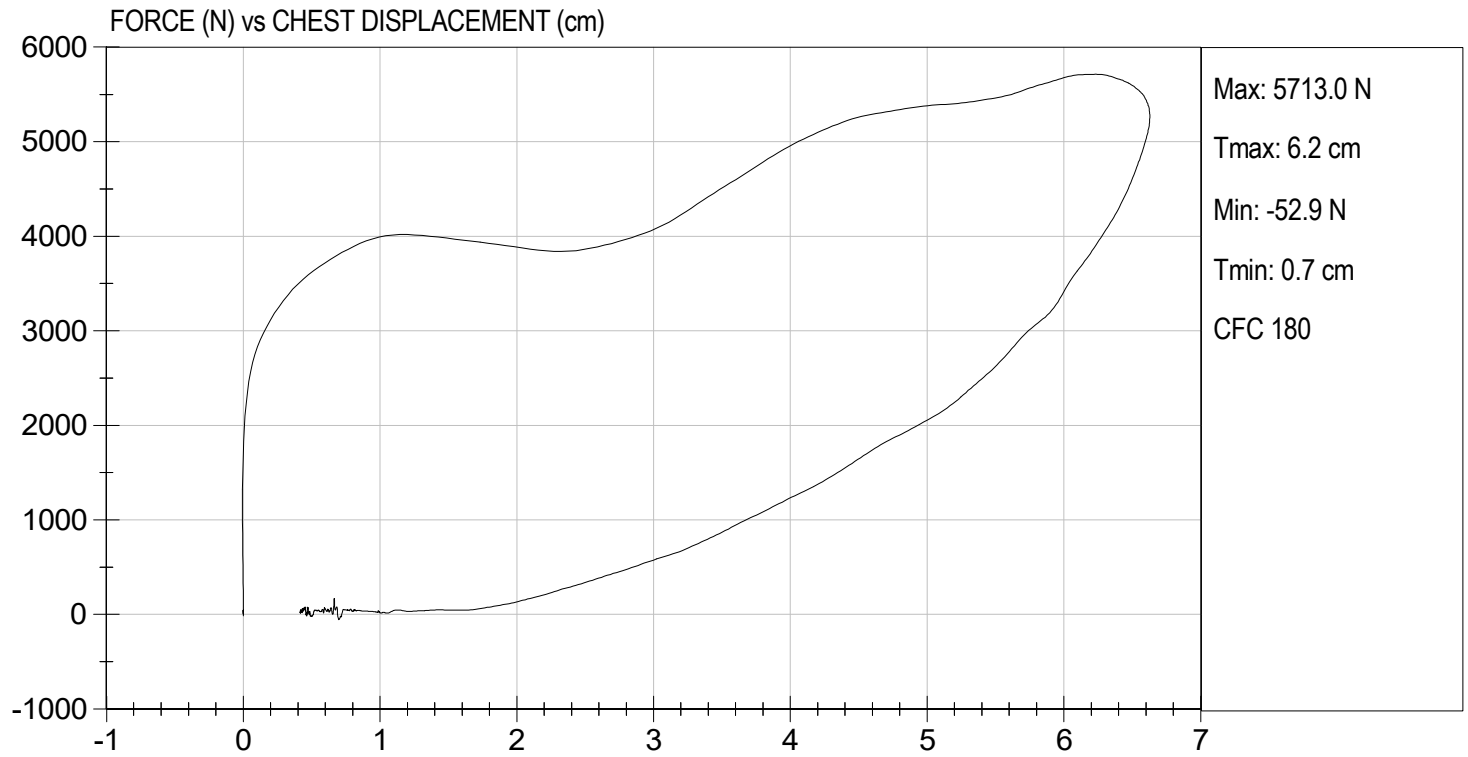
12/19/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 12/19/2023
TEST #: D233404



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.36(m))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14A.
- ☒ 3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- ☒ 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.89 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1147 lb

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

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



Signature

12/19/2023
Date

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

ATD Serial No: 401

Test I.D: D233406

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,100	Pass
Overall Test Results				Pass


Laboratory Technician

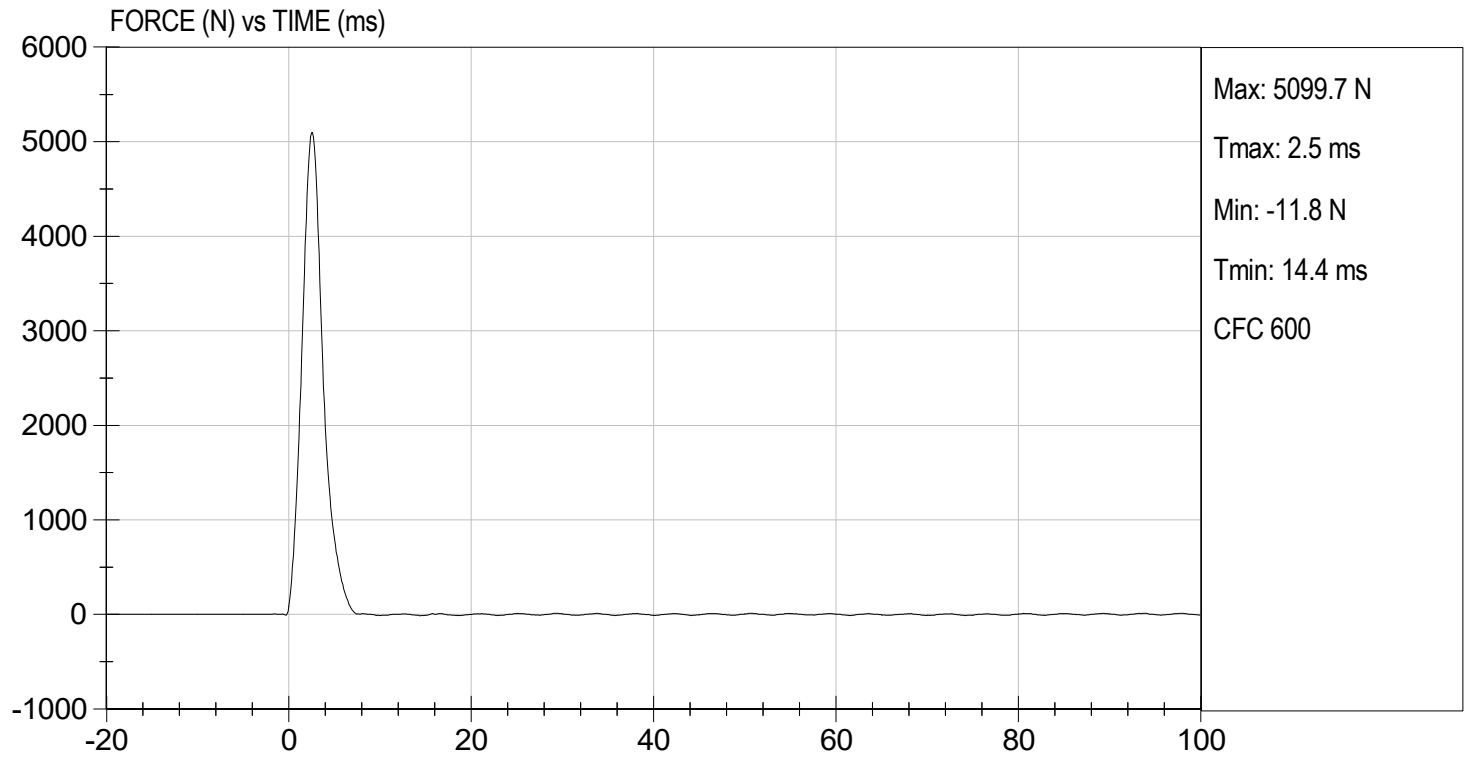
12/19/2023
Test Date


Approved By



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

TEST DATE: 12/19/2023
TEST #: D233406



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.36(m))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14A.
- ☒ 3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>11%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- ☒ 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.92 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1067 lb

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

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



Signature

12/19/2023
Date

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

ATD Serial No: 401

Test I.D: D233405

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	4,746	Pass
Overall Test Results				Pass


Laboratory Technician

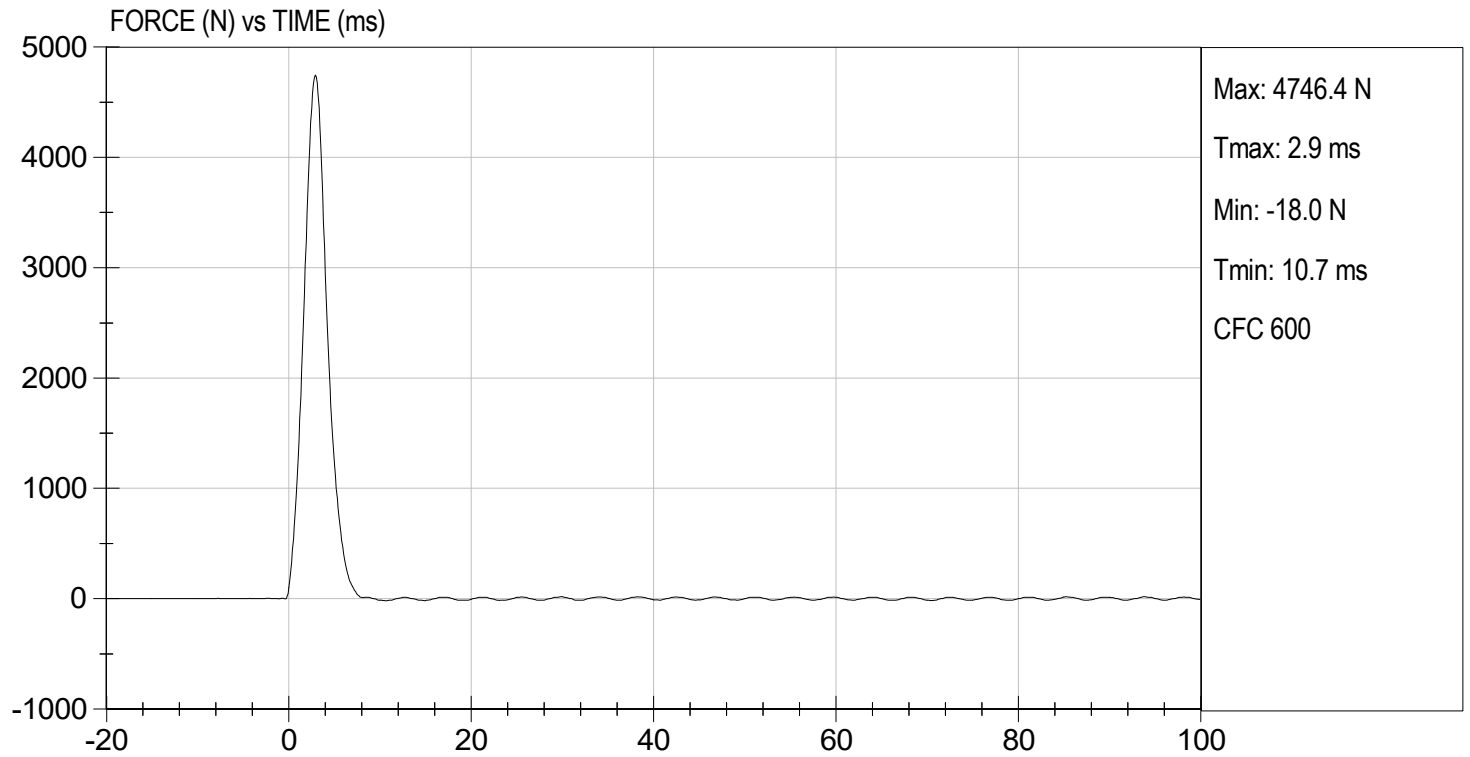
12/19/2023
Test Date


Approved By



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

TEST DATE: 12/19/2023
TEST #: D233405



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c)) (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ Pre test calibration
☒ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
☒ N/A, ONLY one hip joint-femur flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 17A.
- ☒ 3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
- ☒ 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 - ☒ 3.2 remove the abdominal insert (78051-52)
 - ☒ 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
- ☒ 4. The assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(c)(v))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
- ☒ 6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
- ☒ 7. Adjust the threaded rods until plane B is horizontal.
- ☒ 8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
- ☒ 9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline

horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	Torque ≤ 70 ft-lbf	61.5 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	43°

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

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

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	torque ≤ 70 ft-lbf	62.5 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	42°


Signature

12/19/2023
Date

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

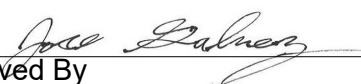
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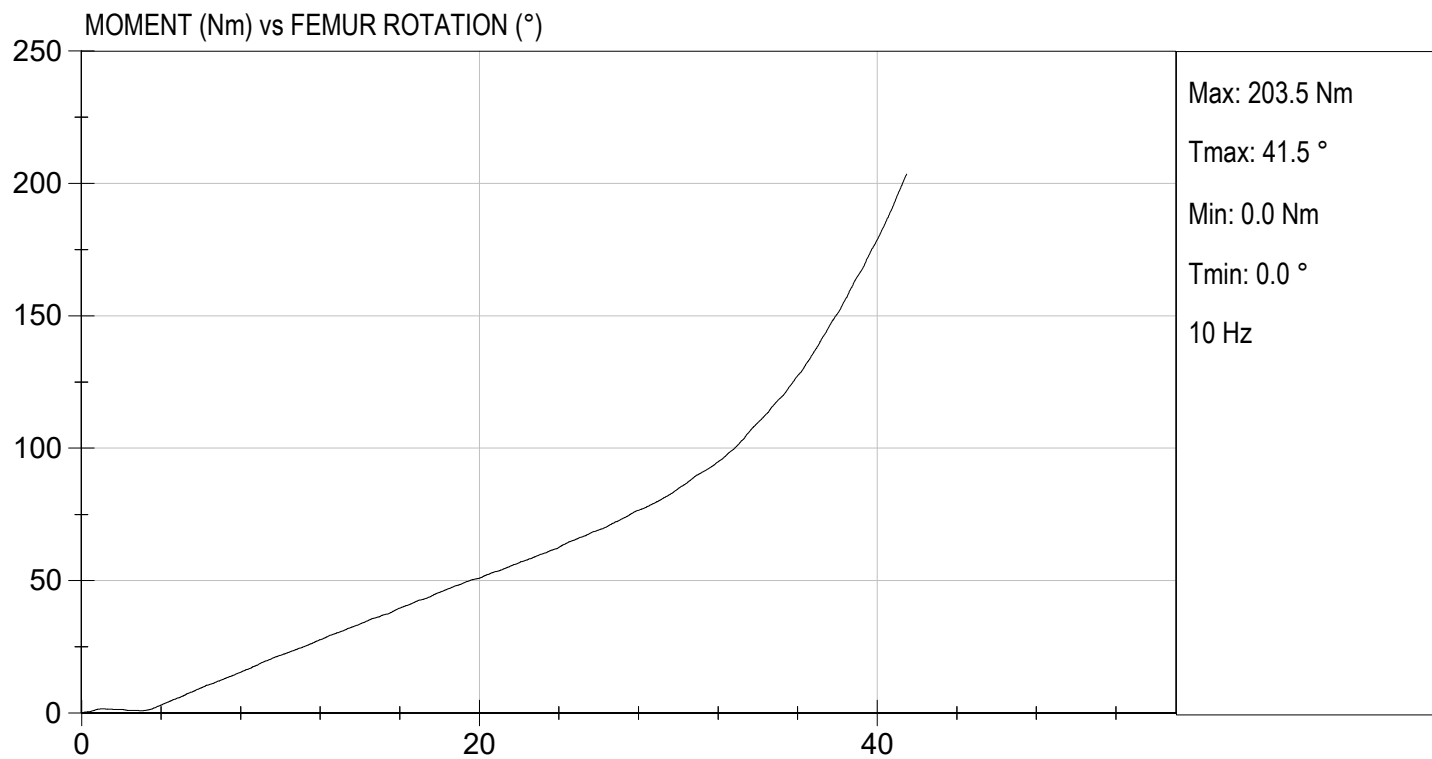
Test I.D: D233400

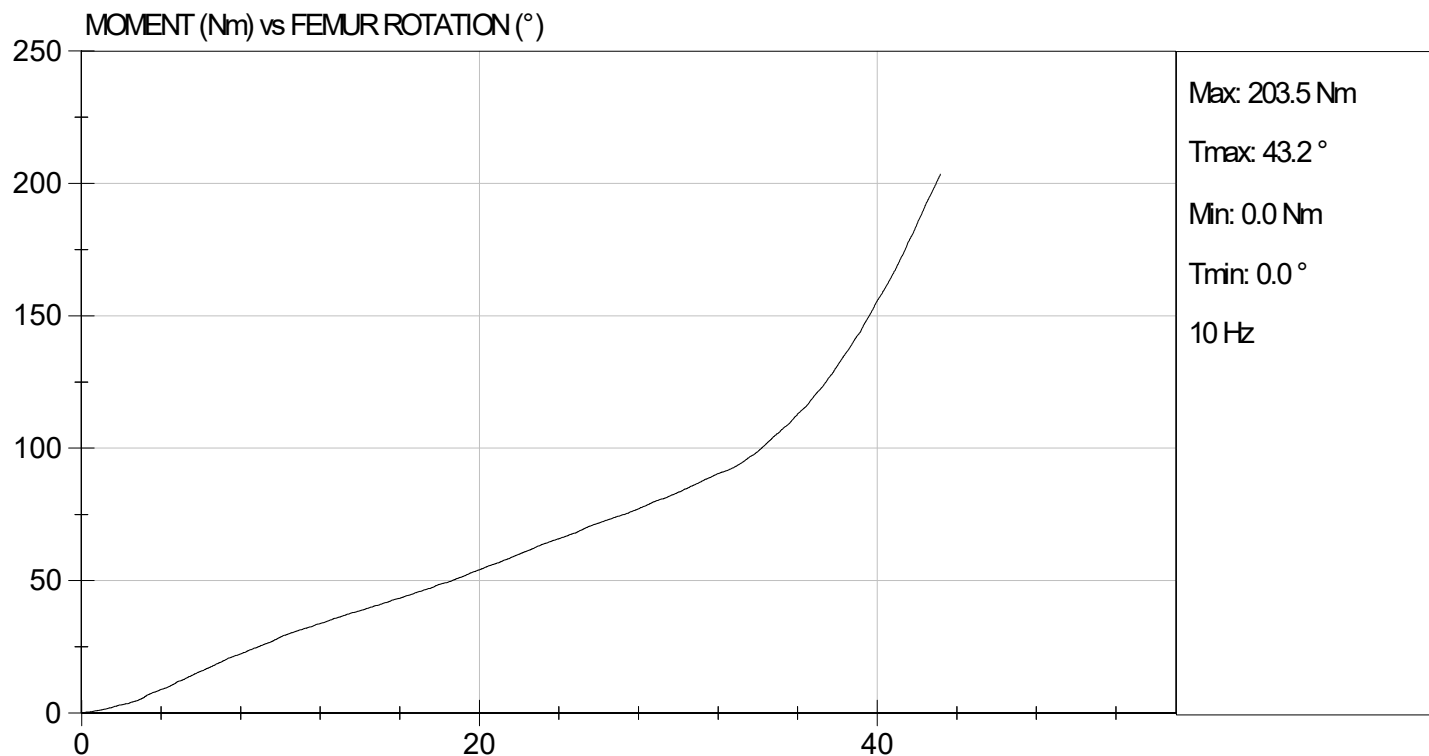
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	24	24	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	84.8	83.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	41.5	43.2	Pass
Overall Test Results					Pass


 Laboratory Technician

12/19/2023
 Test Date


 Approved By





DATA SHEET A1
DUMMY DAMAGE CHECKLIST (50th Male)

Dummy Serial Number: 401

Test Date: 12/19/2023

Technician: Jonah Pulokas

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:



Signature

12/19/2023
Date

Describe the repair or replacement of parts:

Checked by:



Signature

12/19/2023
Date

DATA SHEET A10
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	7231C-750	AL6Y2	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	C12853	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	C12811	10/09/2023	04/09/2024
NECK TRANSDUCER	Denton	1716A	N1206	08/09/2023	02/08/2024
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7231C-750	AGH70	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	AGH55	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	AGH72	10/09/2023	04/09/2024
CHEST POTENTIOMETER	Humanetics	78051-317	401	10/09/2023	04/09/2024
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Humanetics	2121AJLN2	F3137	10/09/2023	04/09/2024
(2) LEFT FEMUR	Humanetics	2121AJLN2	F3138	10/09/2023	04/09/2024
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/17/2023	01/06/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-360M17	P97372	11/20/2023	05/21/2024
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-360M17	P82128	11/27/2023	05/28/2024
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	C3036	09/20/2023	03/21/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	C3034	09/06/2023	03/07/2024

LABORATORY TECHNICIAN: 

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

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

DATA SHEET A3
HEAD DROP TEST (572.32) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.32(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))
- X 3. Torque the skull cap screws to 160 lbf-in.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))
- 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. (572.132(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>22%</u> |
| Record the minimum humidity: | <u>11%</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 vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- X 8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.32(c)(2))

- X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(c)(3))

Record the actual distance: 0.5 inches

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

- X 10. The 1.6 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 7A.

Record the right side distance: 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). (572.32(c)(4))

Record actual micro finish: 24.8 micro inches

- X 12. The impact surface is rigidly supported. (572.132(c)(4))

- X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

- X 14. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	247 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 $\leq 15 \text{ g}$	-2.8 g

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


Signature

12/11/2023
Date

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

ATD Serial No: 403

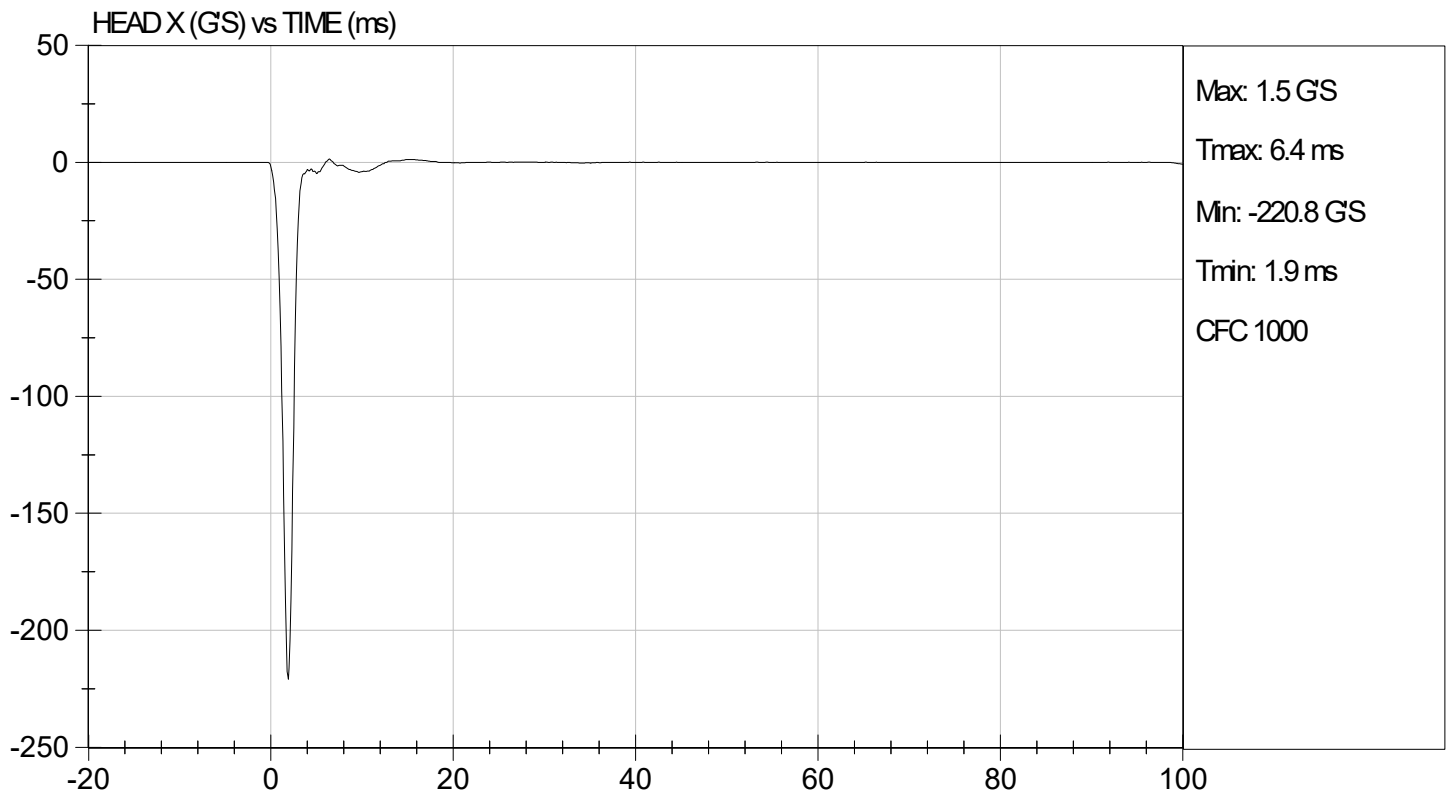
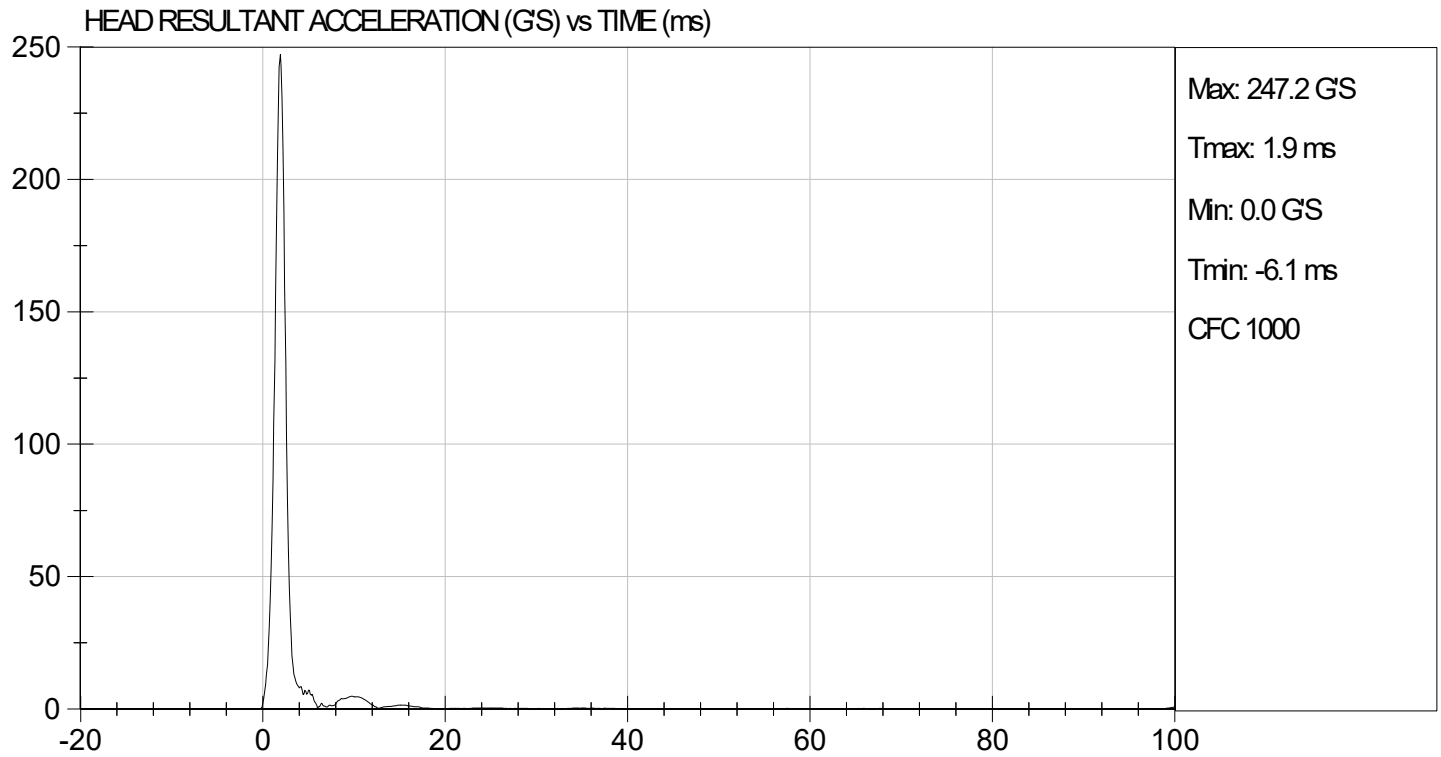
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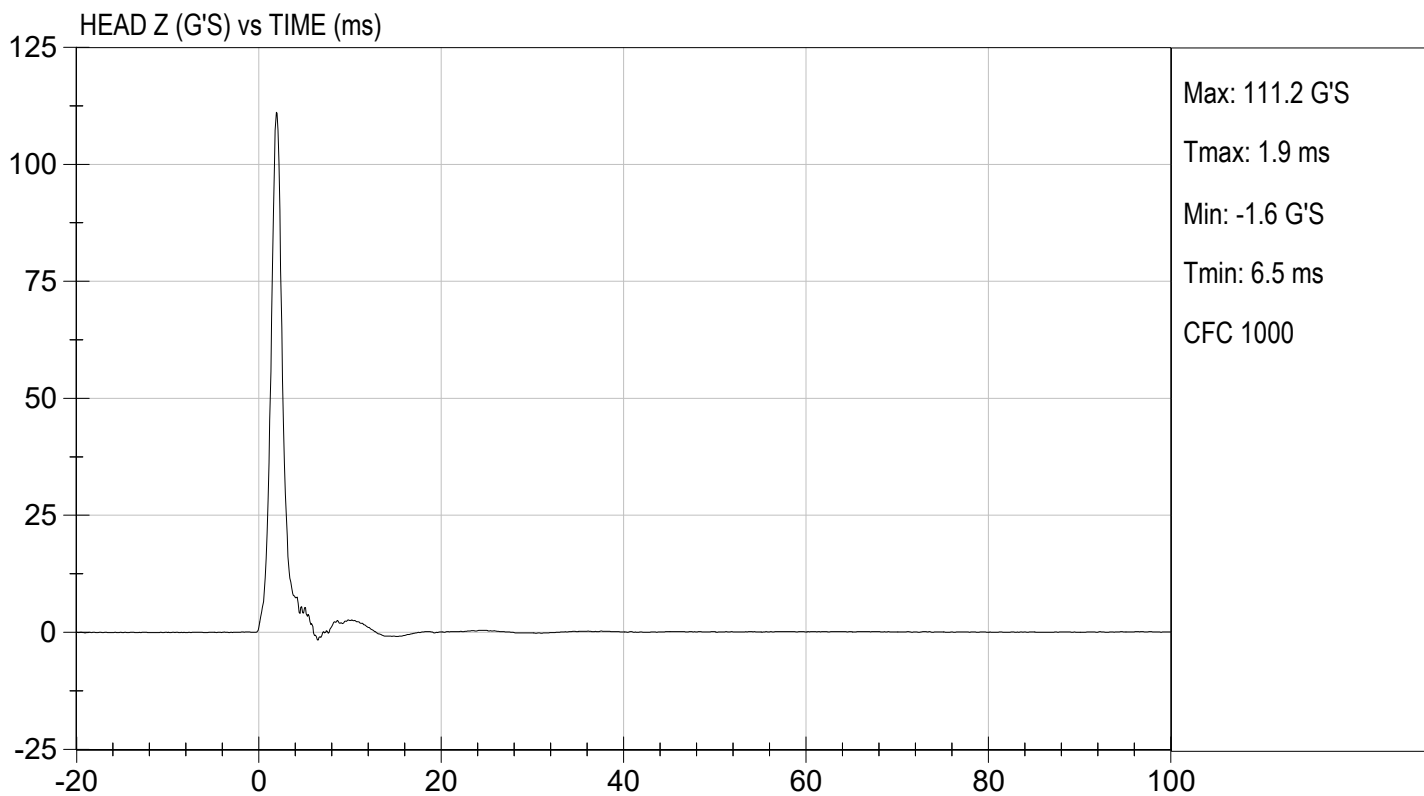
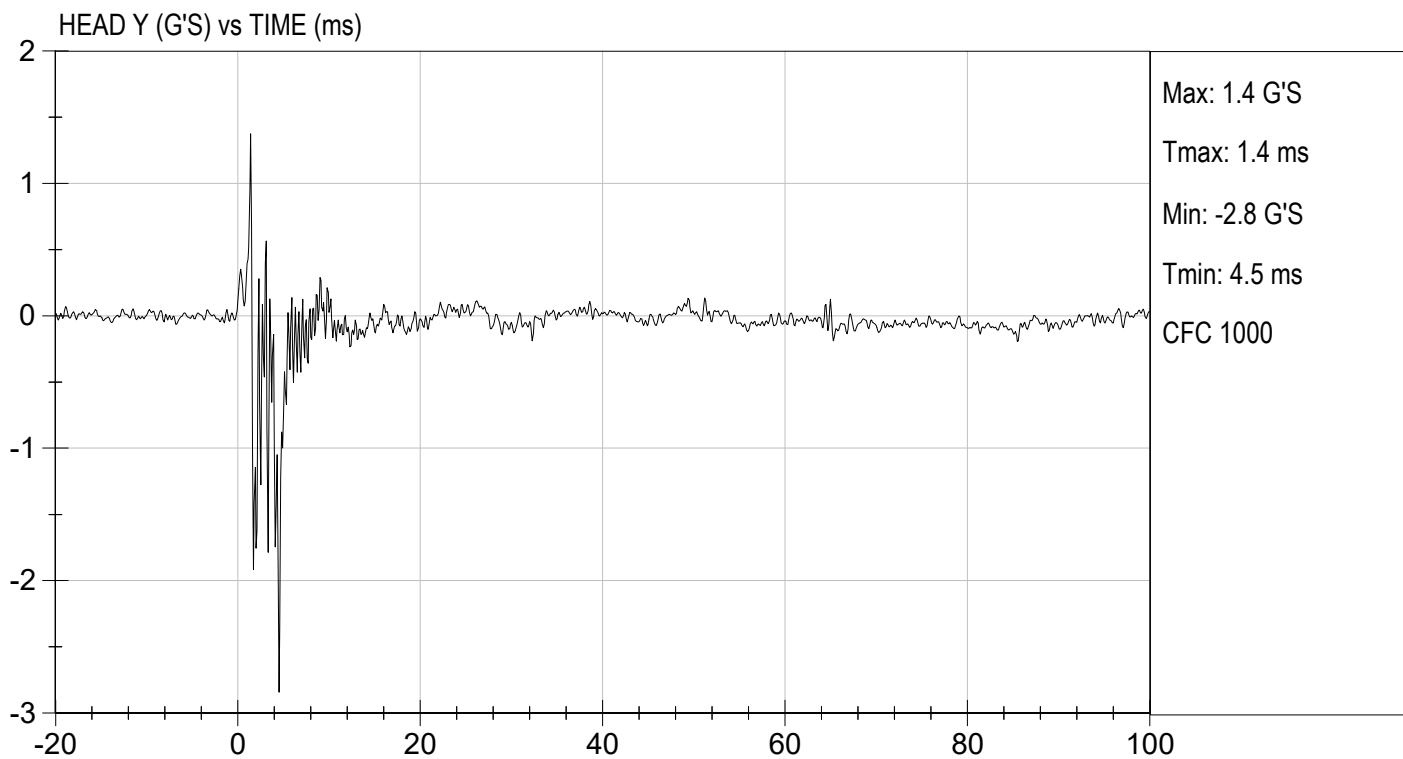
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	225 to 275	247	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

12/11/2023
Test Date


Approved By





DATA SHEET A4
NECK FLEXION TEST (572.33) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>22.0°C</u> |
| Record the minimum temperature: | <u>21.7°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>11%</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. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9A for the flexion test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Results
Pendulum impact speed		$22.6 \text{ ft/s} \leq \text{speed} \leq 23.4 \text{ ft/s}$	23.16 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	$22.5 \leq g \leq 27.5$	24.92 g
	@ 20 ms	$17.6 \leq g \leq 22.6$	21.56 g
	@ 30 ms	$12.5 \leq g \leq 18.5$	16.98 g
	Above 30 ms	29 g maximum	17.10 g
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	35.6 ms
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	72.7°
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	59.4 ms
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	115.6 ms
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	72.1 lbf-ft
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	47.6 ms
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	97.5 ms

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

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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


Signature

12/11/2023
Date

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

ATD Serial No: 403

Test I.D: D233272

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.92	Pass
	20 ms	G's	17.60 to 22.60	21.56	Pass
	30 ms	G's	12.50 to 18.50	16.98	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	17.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	72.7	Pass
	Time	ms	57.0 to 64.0	59.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	115.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	97.7	Pass
	Time	ms	47.0 to 58.0	47.6	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.5	Pass
Overall Test Results					Pass


 Laboratory Technician

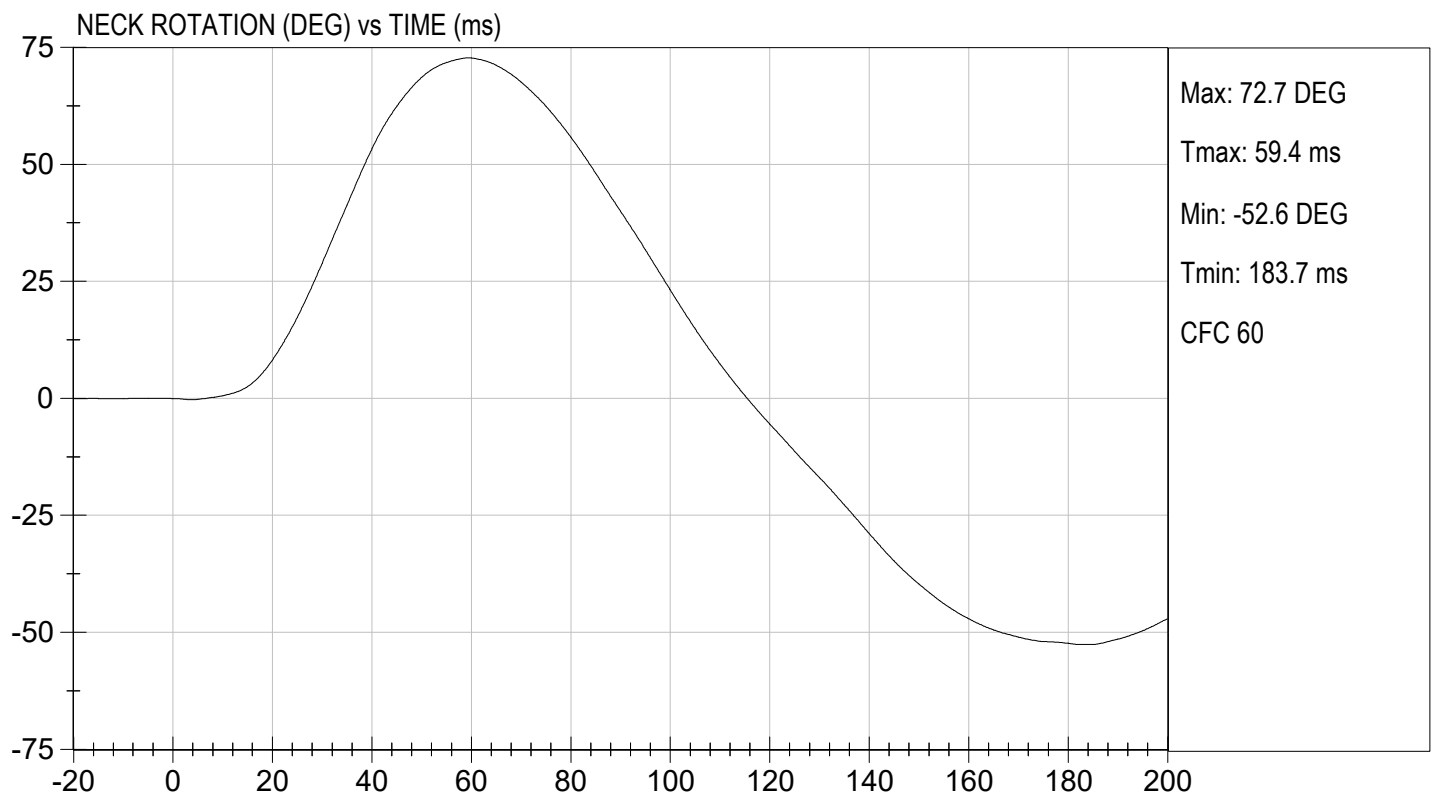
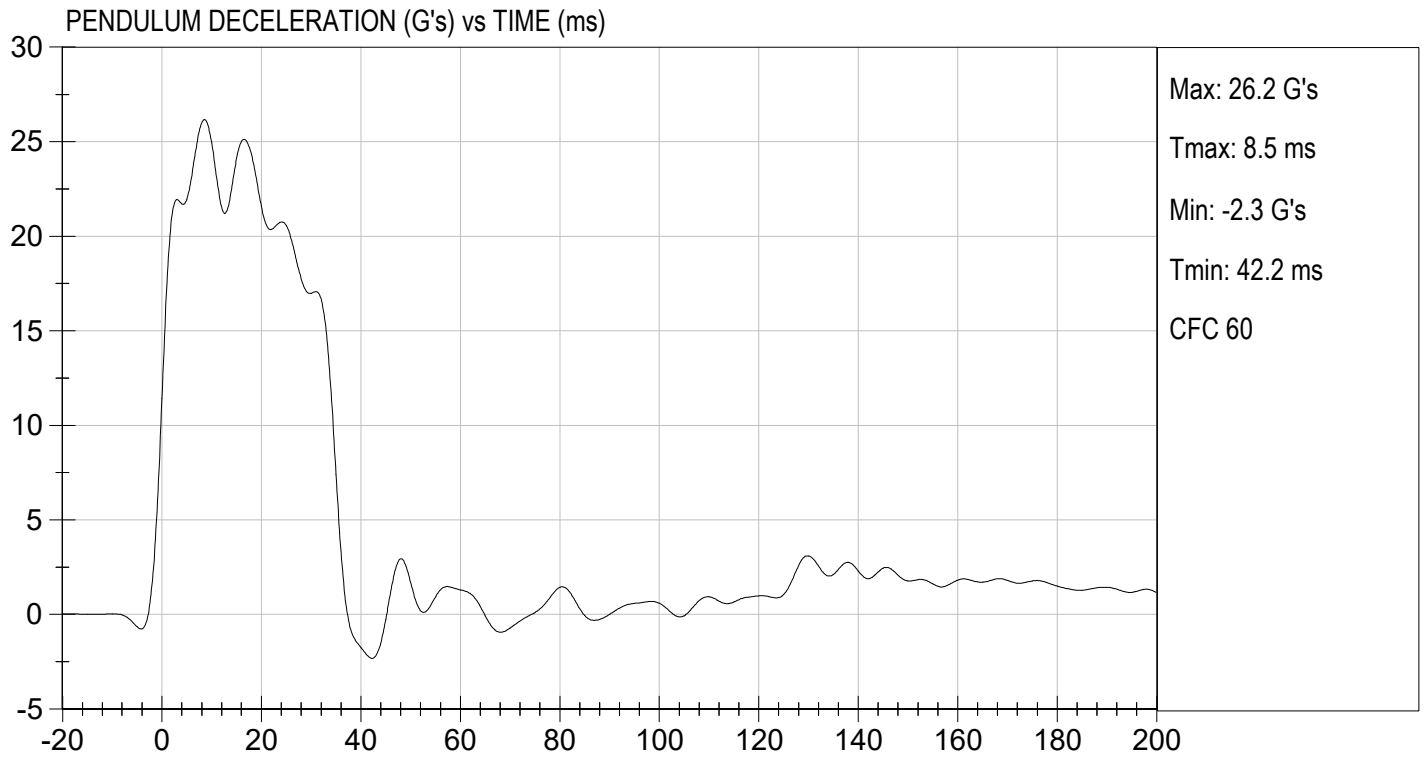
12/11/2023
 Test Date


 Approved By



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

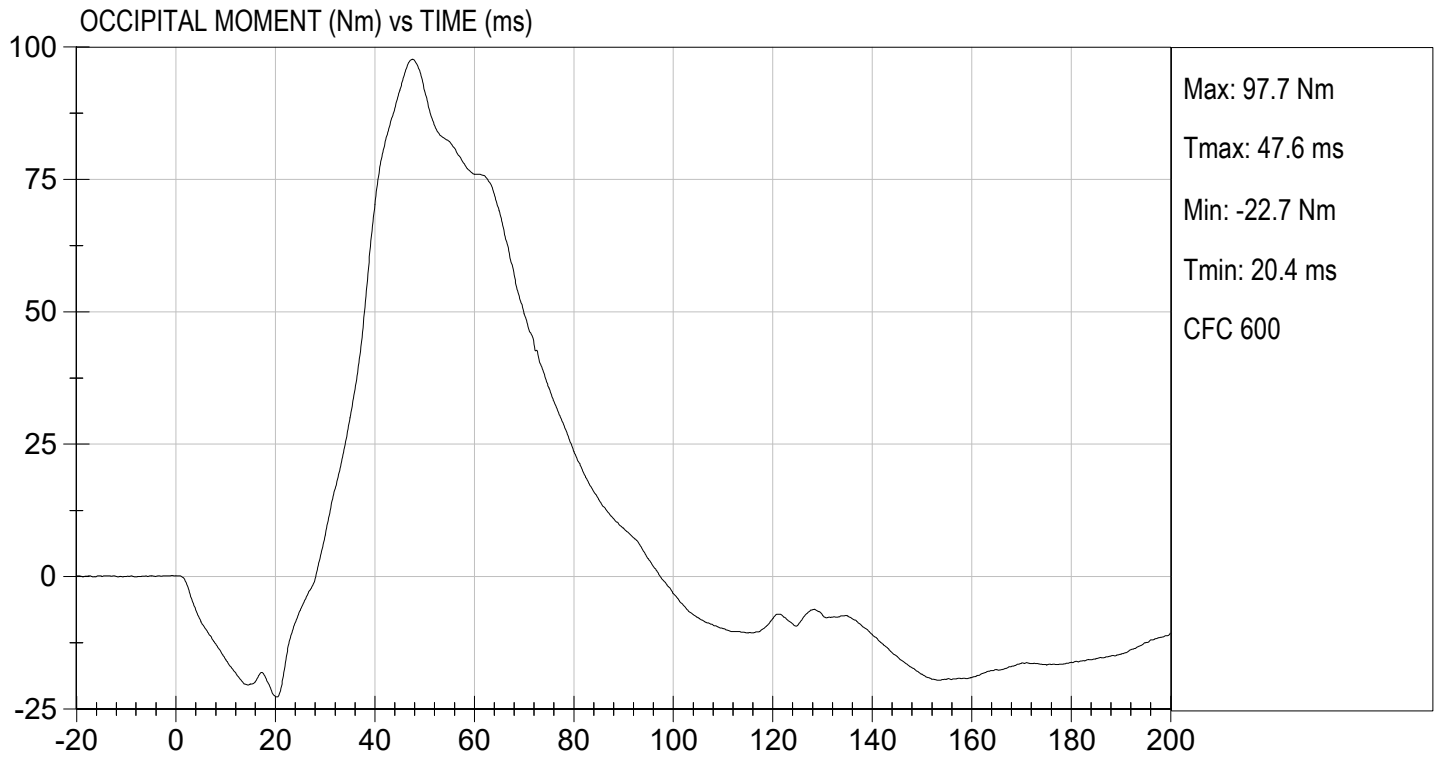
TEST DATE: 12/11/2023
TEST #: D233272





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

TEST DATE: 12/11/2023
TEST #: D233272



DATA SHEET A5
NECK EXTENSION TEST (572.33) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>22%</u> |
| Record the minimum humidity: | <u>11%</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. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J2111/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 10A for the extension test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 19.5 ft/s to 20.3 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))
- X 13. Complete the following table:
Neck Extension Test Results (572.33(b)(2) & 572.33(c)(4))

Parameter		Specification	Results
Pendulum impact speed		$19.5 \text{ ft/s} \leq \text{speed} \leq 20.3 \text{ ft/s}$	19.60 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	$17.2 \leq g \leq 21.2$	20.04 g
	@ 20 ms	$14 \leq g \leq 19$	16.64 g
	@ 30 ms	$11.0 \leq g \leq 16.0$	13.24 g
	Above 30 ms	22 g maximum	14.30 g
First Pendulum Decay to 5g		$38 \text{ ms} \leq \text{time} \leq 46 \text{ ms}$	39.5 ms
Plane D Rotation		$81^\circ \leq \text{max. rotation} \leq 106^\circ$	101.3°
		$72 \text{ ms} \leq \text{time of max. rotation} \leq 82 \text{ ms}$	78.0 ms
Time for Plane D Rotation to Cross 0° During First Rebound		$147 \text{ ms} \leq \text{time} \leq 174 \text{ ms}$	163.0 ms
Maximum Moment		$-59 \text{ lbf-ft} \leq \text{moment} \leq -39 \text{ lbf-ft}$	-47.2 lbf-ft
		$65 \text{ ms} \leq \text{time of max. moment} \leq 79 \text{ ms}$	72.2 ms
Time of first decay to 0 lbf-ft Positive Moment Decay** (Extension)		$120 \text{ ms} \leq \text{time} \leq 148 \text{ ms}$	140.9 ms

*Moment about the occipital condyle = $M_y - (0.058 \text{ ft} \times F_x)$ (572.33(b)(2)(ii))

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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


Signature

12/11/2023
Date

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

ATD Serial No: 403

Test I.D: D233273

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.04	Pass
	20 ms	G's	14.00 to 19.00	16.64	Pass
	30 ms	G's	11.00 to 16.00	13.24	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.3	Pass
	Time	ms	72.0 to 82.0	78.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-64.0	Pass
	Time	ms	65.0 to 79.0	72.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.9	Pass
Overall Test Results					Pass


 Laboratory Technician

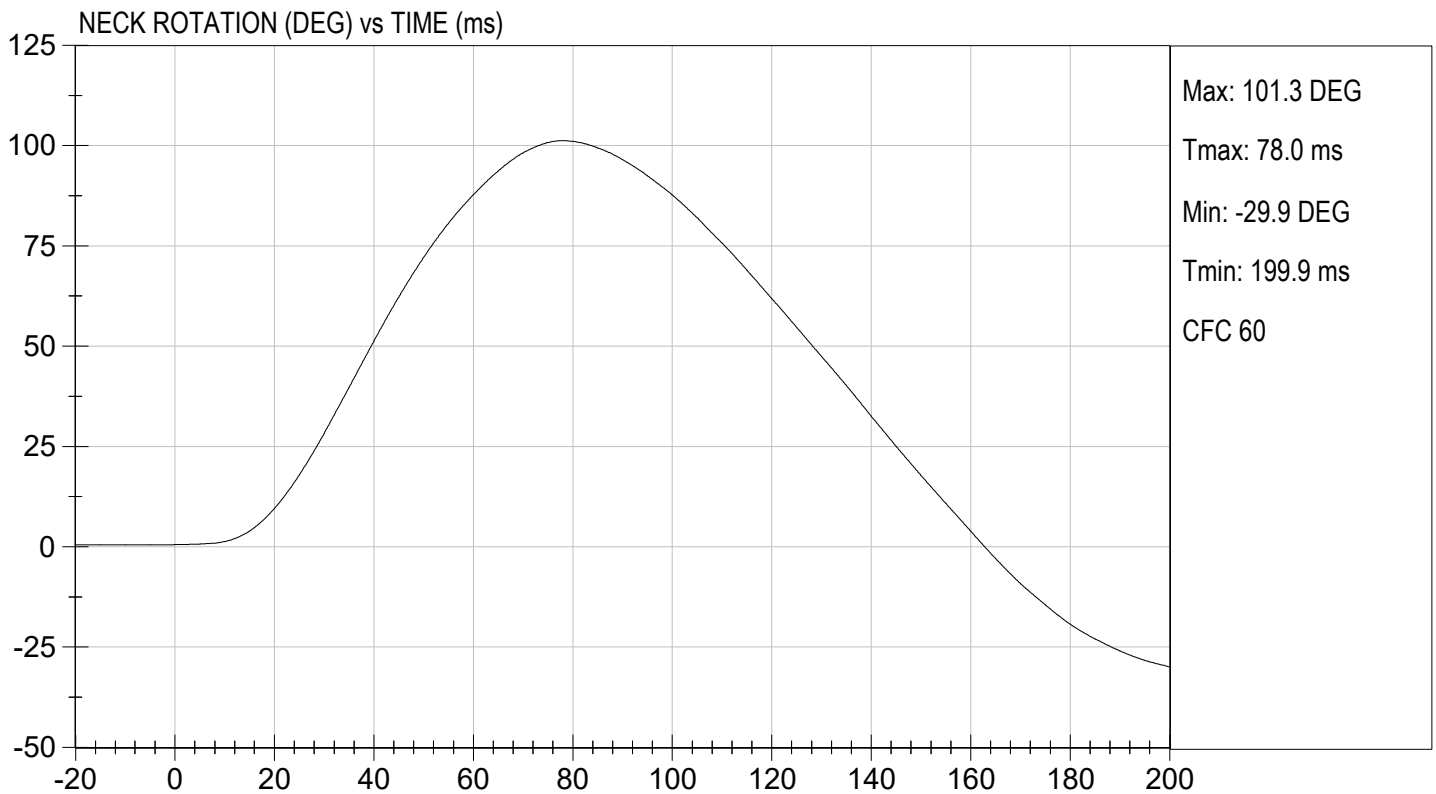
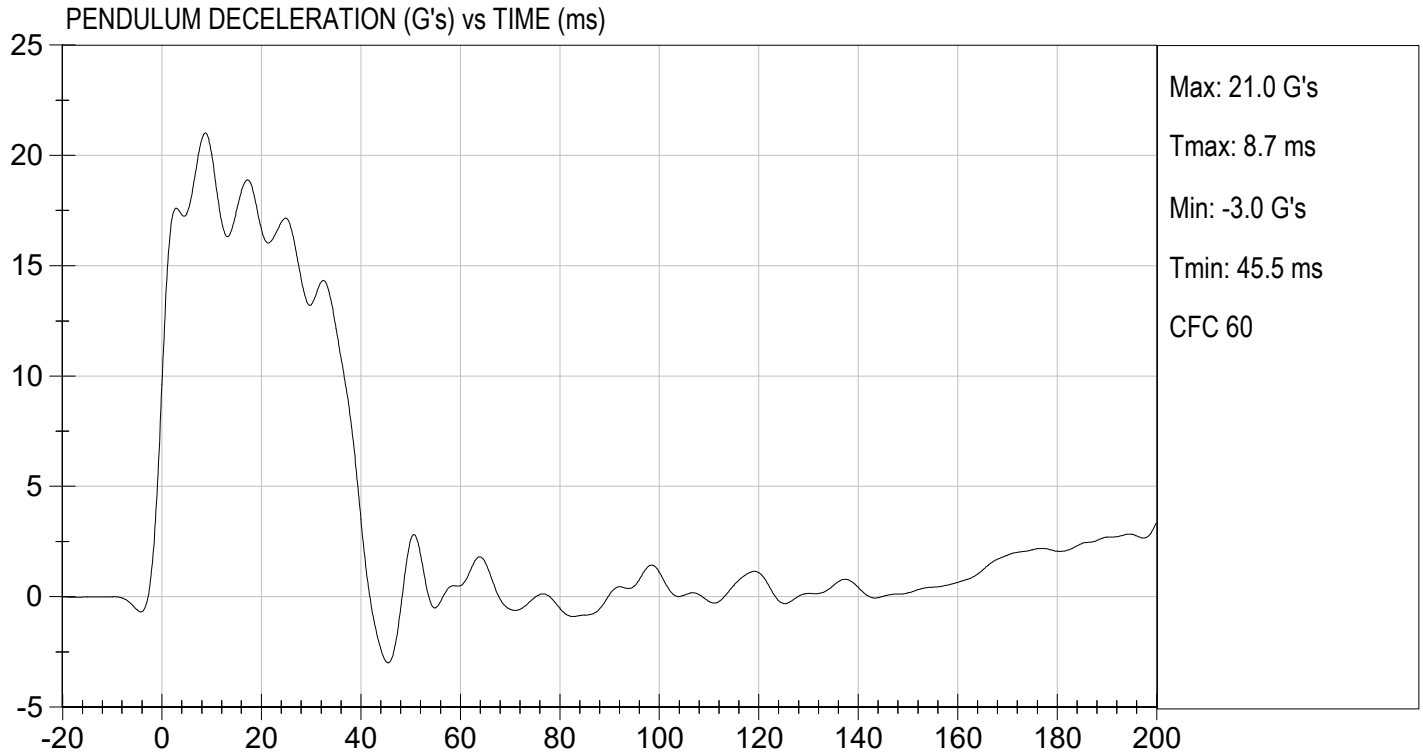
12/11/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 12/11/2023
TEST #: D233273





TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 12/11/2023
TEST #: D233273



DATA SHEET A6
THORAX IMPACT TEST (572.34) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- ☒ 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 12A.
- ☒ 3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(b))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.34(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.8°C</u> |
| Record the minimum temperature: | <u>21.5°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</u> |
- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No Damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:
- ☐ - The following repairs or replacement was performed. Record:
- ☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture

- _____ surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))
- X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 ft/s $\leq$ speed $\leq$ 22.4 ft/s	22.20 ft/s
Chest Compression	2.5 in. $\leq$ compression $\leq$ 2.86 in.	2.53 in.
Peak resistance force**	1160 lb $\leq$ peak force $\leq$ 1325 lb	1292 lb
Internal Hysteresis***	69% $\leq$ hysteresis $\leq$ 85%	70 %

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

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

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

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


Signature

12/11/2023
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D233274

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	21	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,748	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.45	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results				Pass


Laboratory Technician

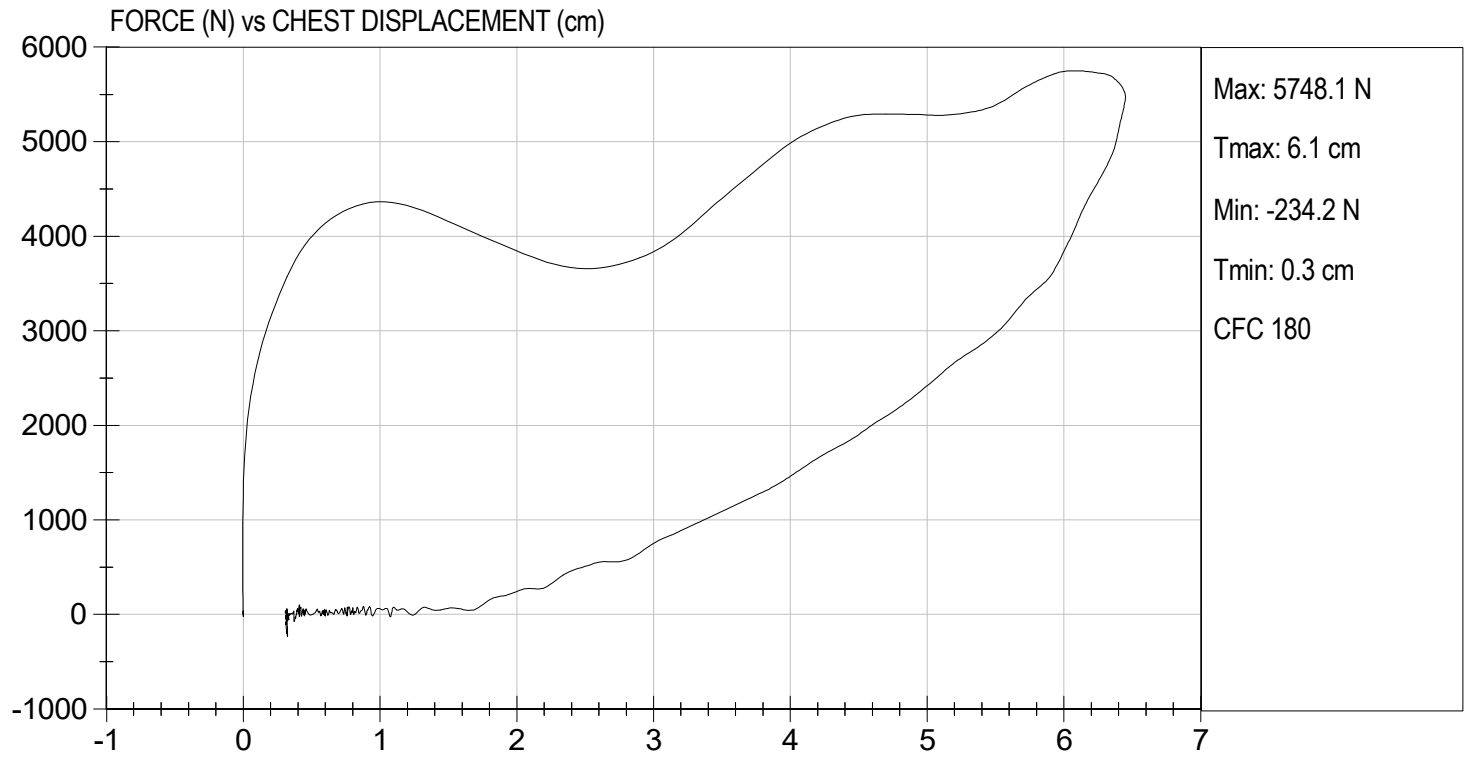
12/11/2023
Test Date


Approved By



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

TEST DATE: 12/11/2023
TEST #: D233274



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14A.
- X 3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>21.4°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- X 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- X 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.89 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1150 lb

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

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


Signature

12/11/2023
Date

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

ATD Serial No: 403

Test I.D: D233276

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	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,116	Pass
Overall Test Results				Pass


Laboratory Technician

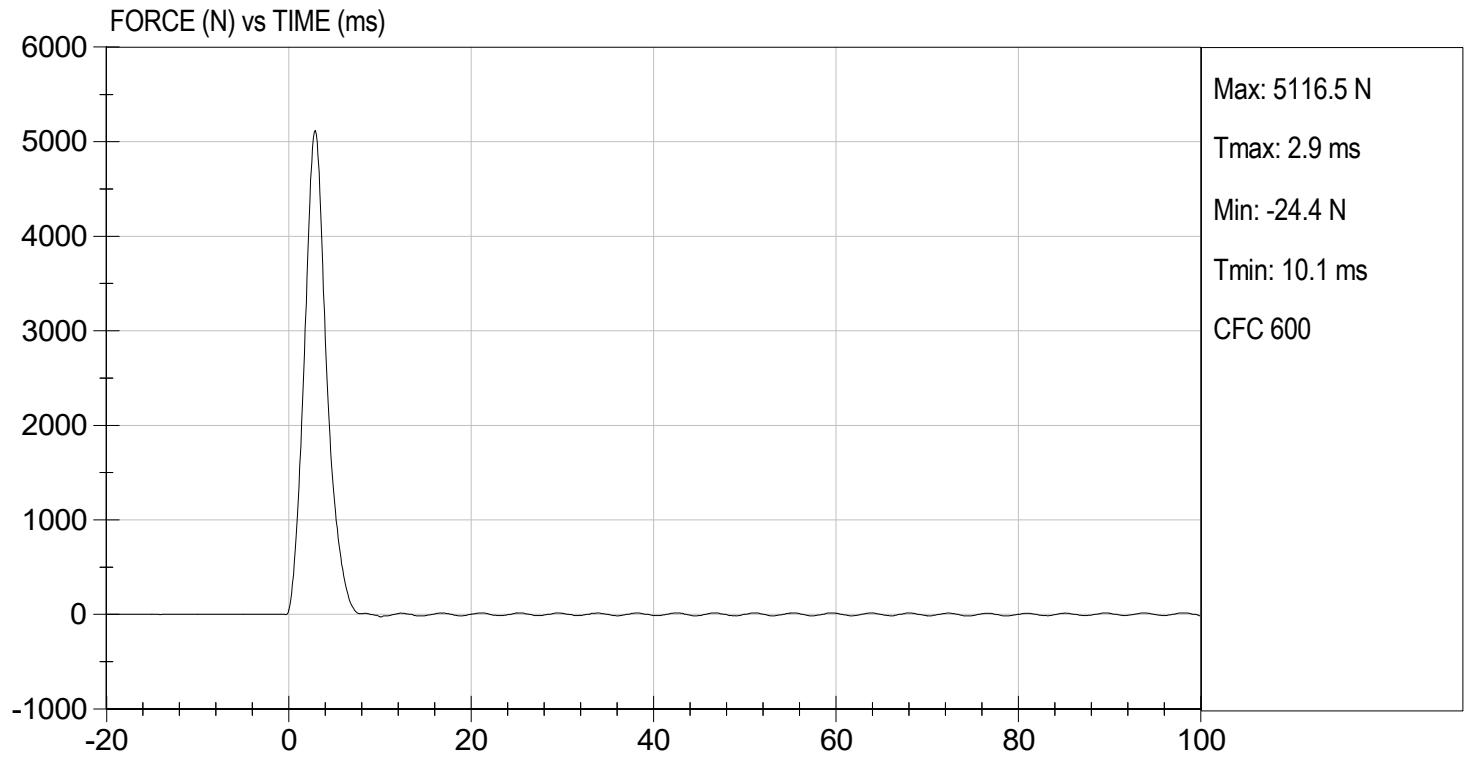
12/11/2023
Test Date


Approved By



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

TEST DATE: 12/11/2023
TEST #: D233276



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14A.
- X 3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.7°C</u> |
| Record the minimum temperature: | <u>21.4°C</u> |
| Record the maximum humidity: | <u>21%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- X 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- X 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.89 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1171 lb

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

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


Signature

12/11/2023
Date

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

ATD Serial No: 403

Test I.D: D233275

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	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,210	Pass
Overall Test Results				Pass


Laboratory Technician

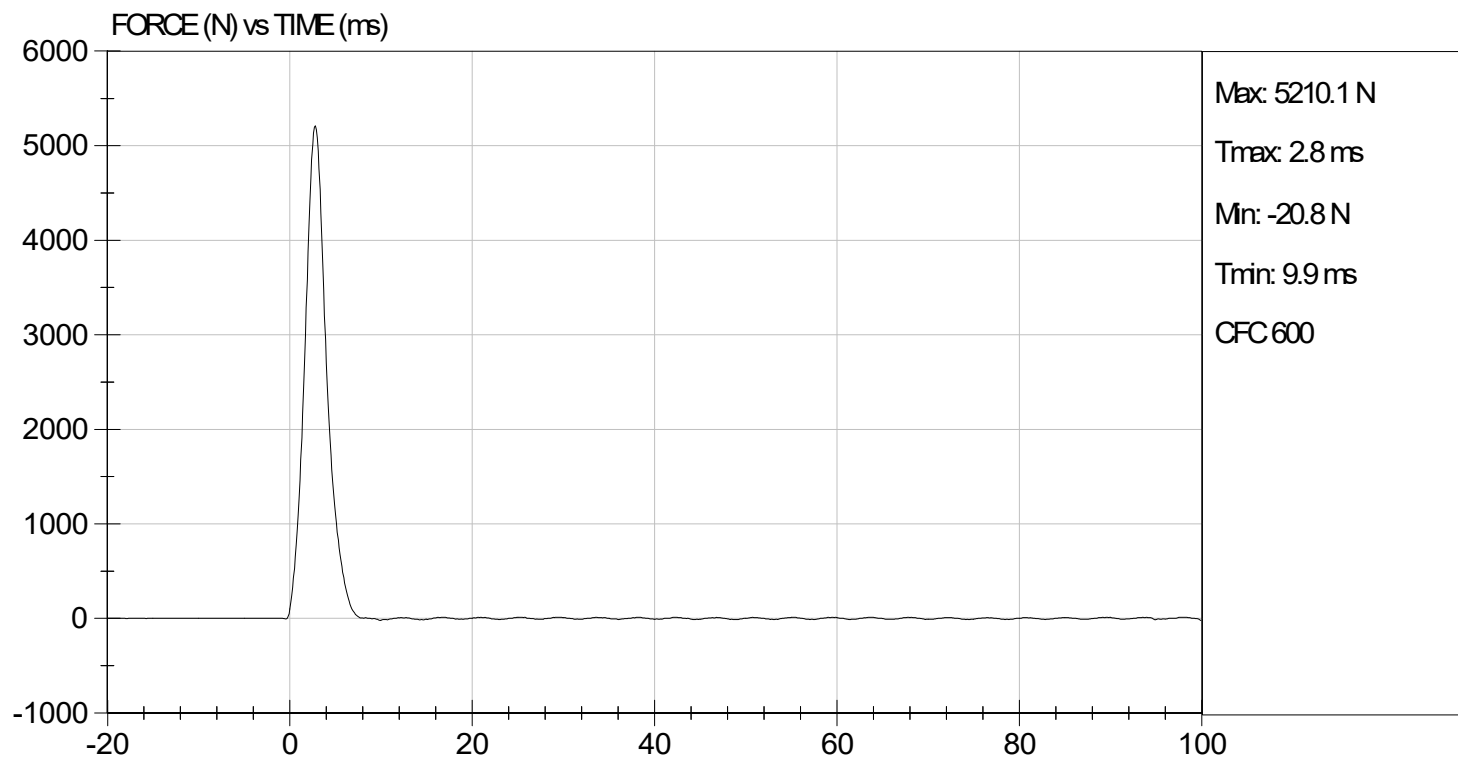
12/11/2023
Test Date


Approved By



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

TEST DATE: 12/11/2023
TEST #: D233275



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c)) (50th Male)

Dummy Serial Number: 403

Test Date: 12/11/2023

Technician: Jonah Pulokas

- X Pre test calibration
 Post test calibration verification

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

- X 1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
 X N/A, ONLY one hip joint-femur flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 17A.
- X 3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
 X 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 X 3.2 remove the abdominal insert (78051-52)
 X 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
- X 4. The assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(c)(v))
- | | |
|---------------------------------|-------------------------|
| Record the maximum temperature: | <u> 21.3°C </u> |
| Record the minimum temperature: | <u> 21.0°C </u> |
| Record the maximum humidity: | <u> 22% </u> |
| Record the minimum humidity: | <u> 11% </u> |
- X 5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
- X 6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
- X 7. Adjust the threaded rods until plane B is horizontal.
- X 8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
- X 9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline

horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	Torque ≤ 70 ft-lbf	58.4 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	49°

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

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

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	torque ≤ 70 ft-lbf	65.0 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	46°


Signature

12/11/2023
Date

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

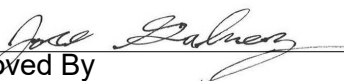
ATD Serial No: 403

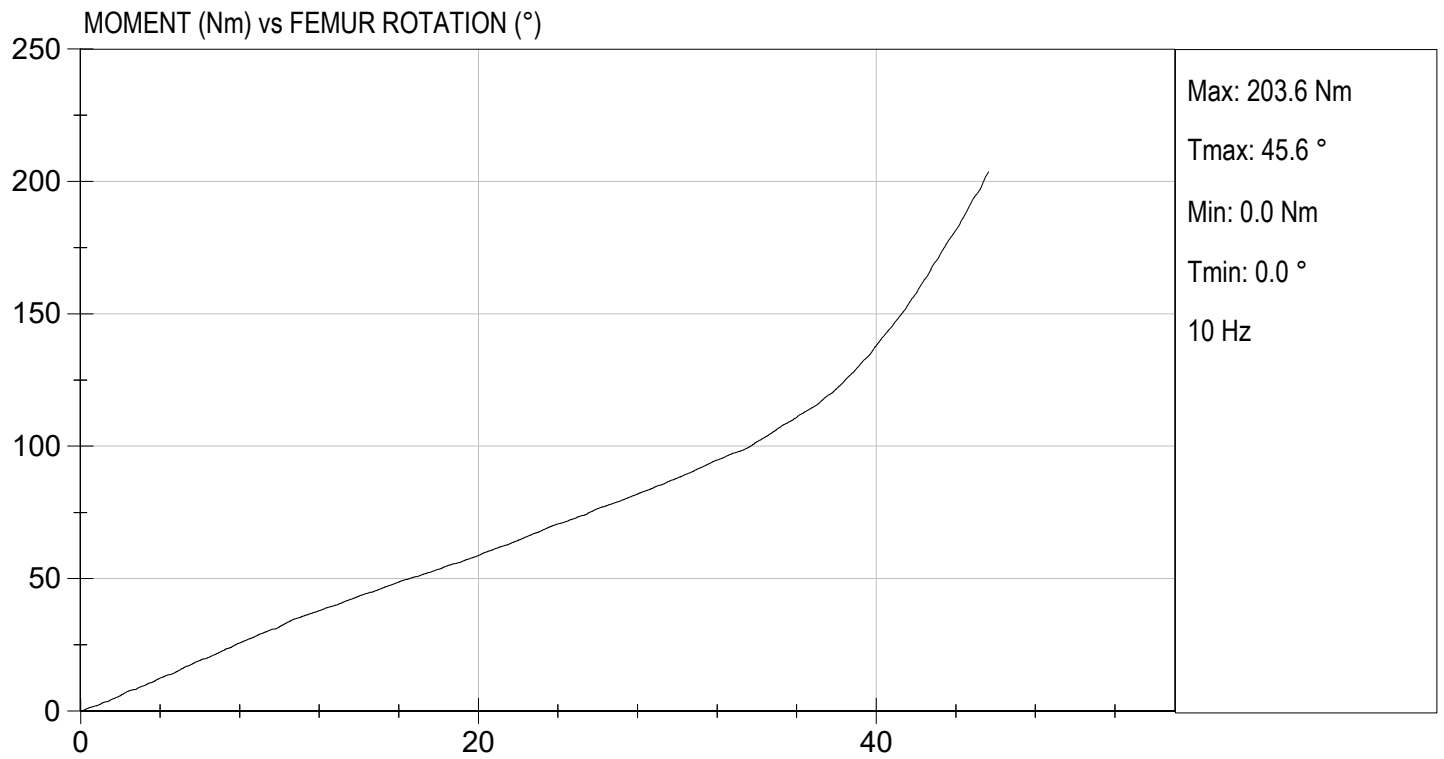
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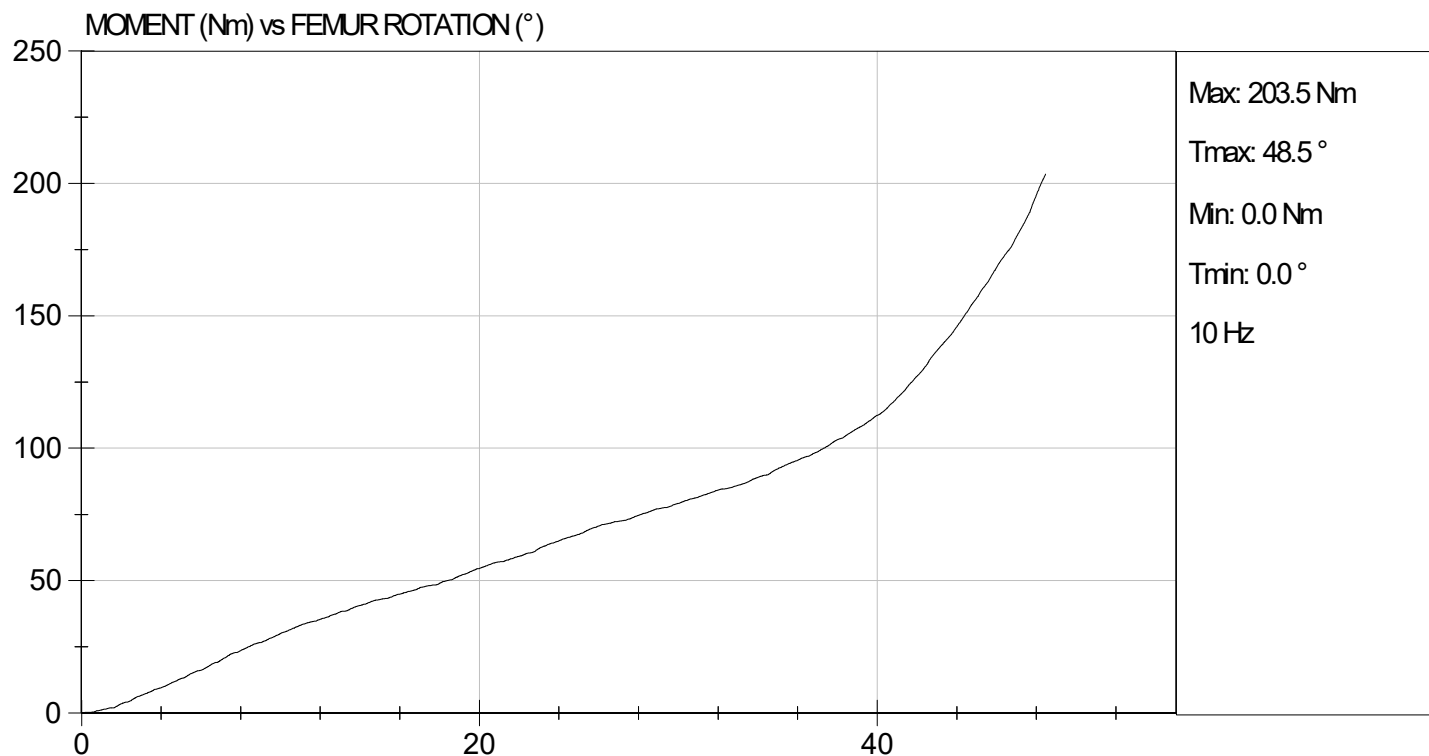
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	22	22	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	88.1	79.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	45.6	48.5	Pass
Overall Test Results					Pass


 Laboratory Technician

12/11/2023
 Test Date


 Approved By





DATA SHEET A10
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	7231C-750	AH5D9	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	AGH74	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	C19307	10/09/2023	04/09/2024
NECK TRANSDUCER	Denton	1716A	N1145	09/05/2023	03/06/2024
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7231C-750	AH5J3	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	AGH90	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	C12885	10/09/2023	04/09/2024
CHEST POTENTIOMETER	Humanetics	78051-317	403	10/09/2023	04/09/2024
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121AJTF	F2026	10/09/2023	04/09/2024
(2) LEFT FEMUR	Denton	2121AJTF	F2027	10/09/2023	04/09/2024
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/17/2023	01/06/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-360M17	P97372	11/20/2023	05/21/2024
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-360M17	P82128	11/27/2023	05/28/2024
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	C3036	09/20/2023	03/21/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	C3034	09/06/2023	03/07/2024

LABORATORY TECHNICIAN: _____

Jonah Pulokas

DATA SHEET A3
HEAD DROP TEST (572.32) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.32(c)(5))
☒ N/A, ONLY one head drop performed
- ☒ 2. The head assembly consists of the complete head (78051-61X), the neck transducer structural replacement (78051-383X), and three (3) accelerometers. (572.32(b))
- ☒ 3. Torque the skull cap screws to 160 lbf-in.
- ☒ 4. Accelerometers and their respective mounts are smooth and clean.
- ☒ 5. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.35(i))
- ☒ 6. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>24%</u> |
| Record the minimum humidity: | <u>13%</u> |
- ☒ 7. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage
- ☒ 8. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.32(c)(2))

- X 9. Suspend and orient the head assembly as shown in Figure 6A. The lowest point on the forehead is 0.5 in. below the lowest point on the dummy's nose when the midsagittal plane is vertical. (572.32(c)(3))

Record the actual distance: 0.5 inches

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

- X 10. The 1.6 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 7A.

Record the right side distance: 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). (572.32(c)(4))

Record actual micro finish: 24.8 micro inches

- X 12. The impact surface is rigidly supported. (572.132(c)(4))

- X 13. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (Figure 6A)

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

- X 14. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.32(b) & (572.32(c)(4))

- X 16. Complete the following table using channel class 1000 data. (572.36(i)):

Parameter	Specification	Result
Peak resultant acceleration	$225 \text{ g} \leq x \leq 275 \text{ g}$	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 $\leq 15 \text{ g}$	-8.7 g

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


Signature

12/19/2023
Date

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

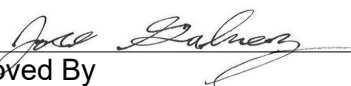
ATD Serial No: 403

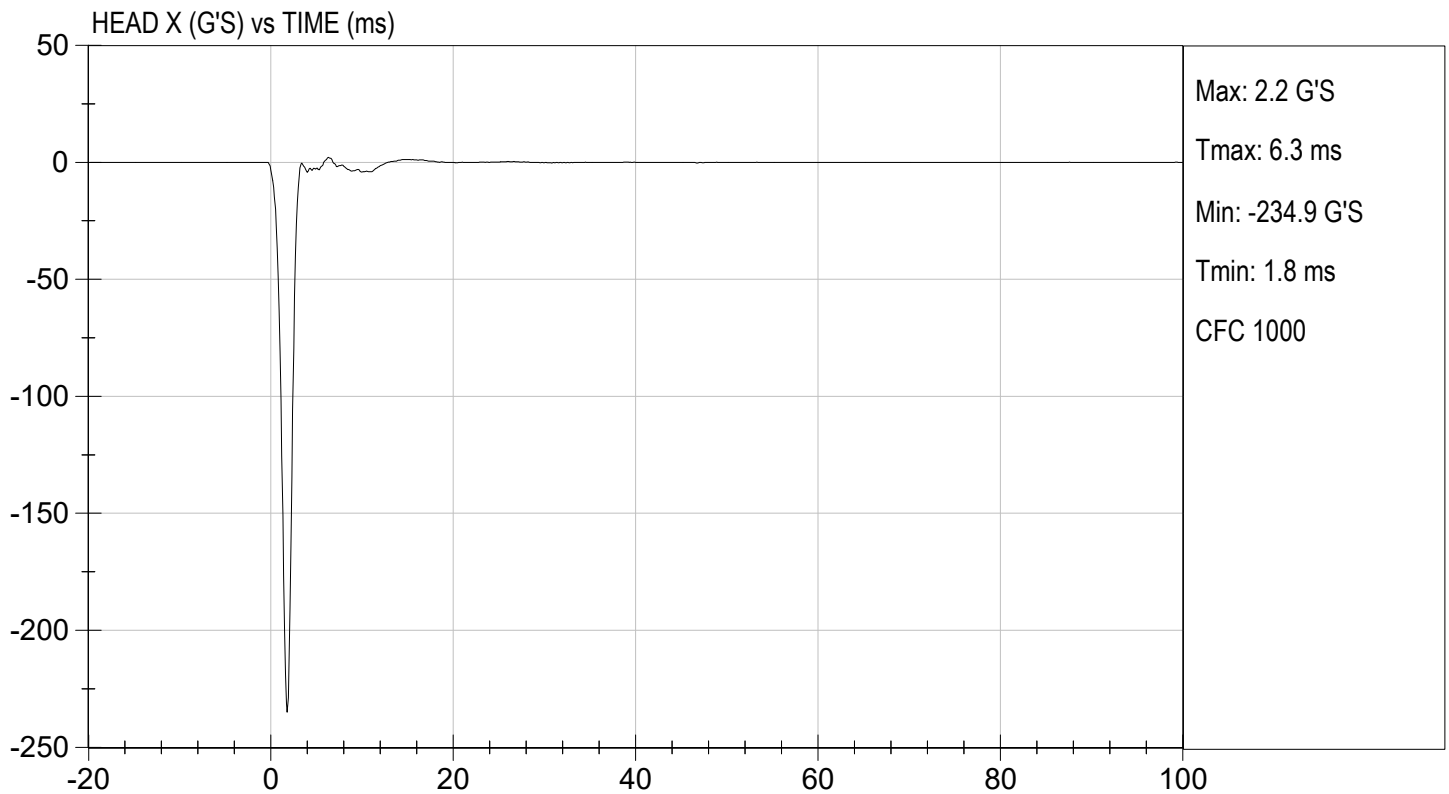
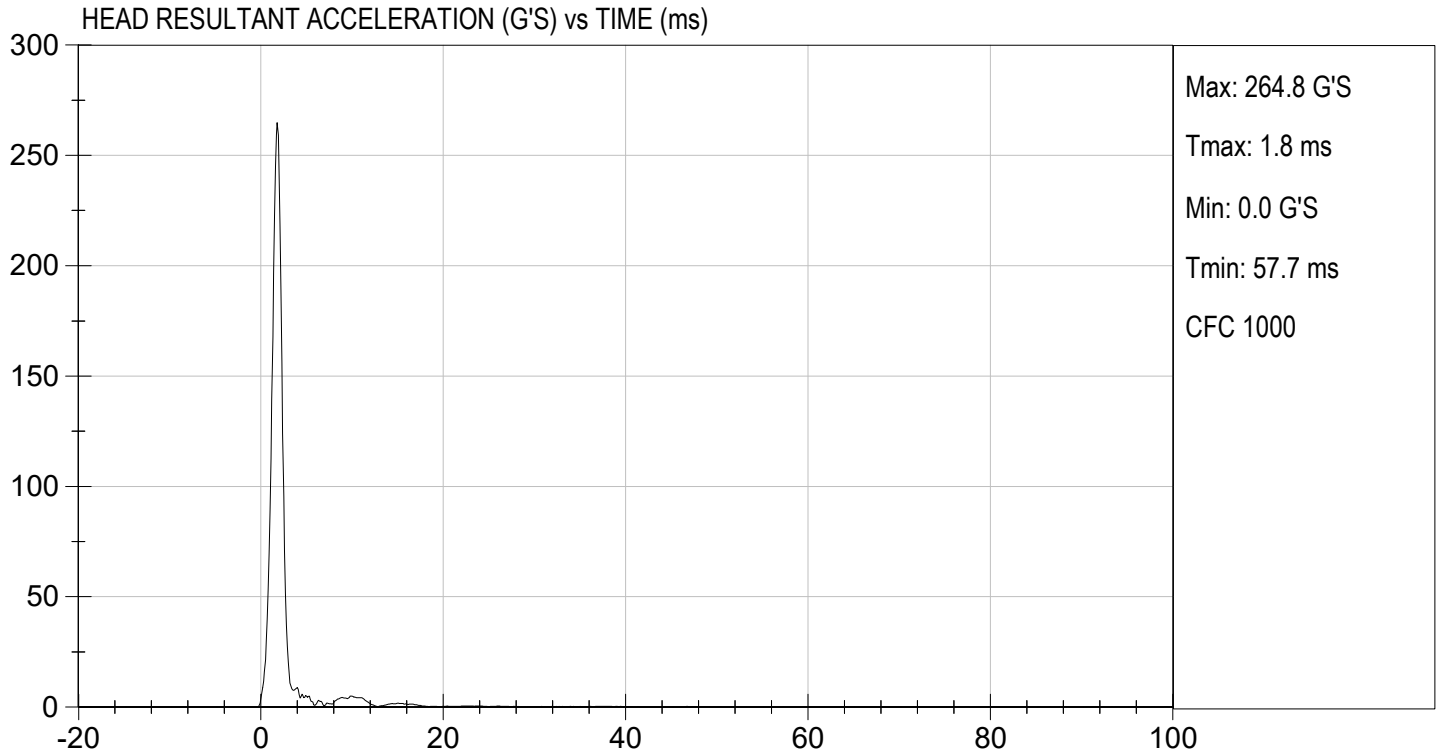
Test ID: D233411

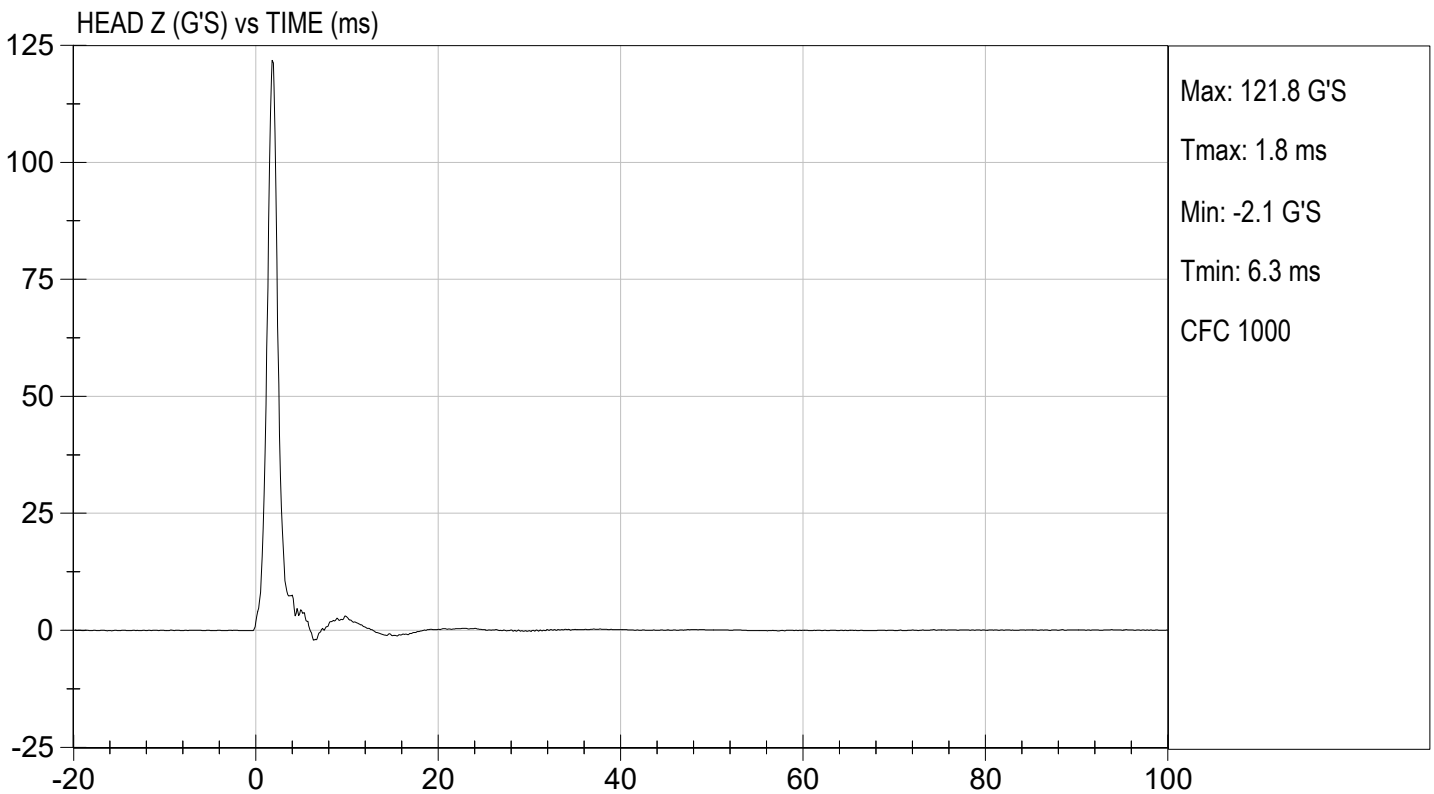
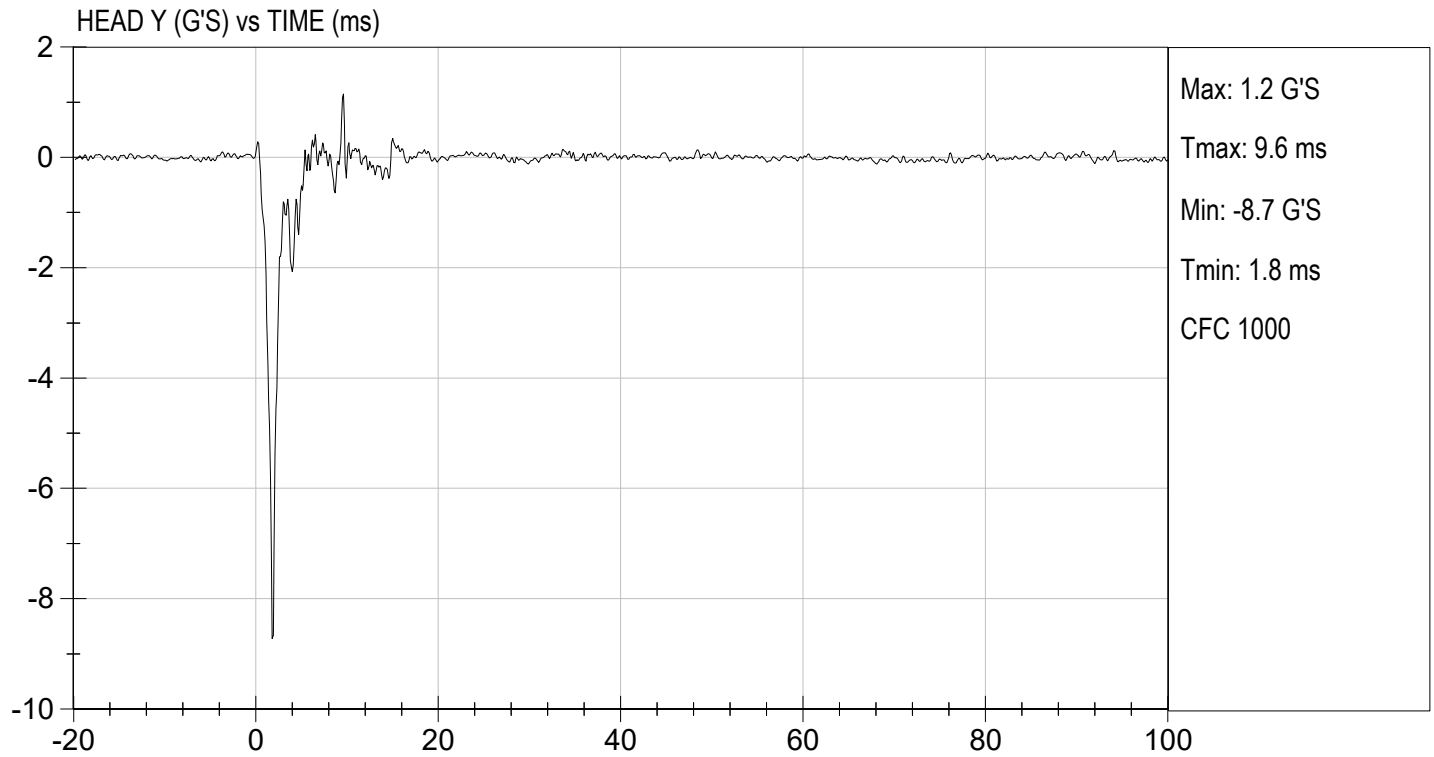
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	225 to 275	265	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-8.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

12/19/2023
Test Date


Approved By





DATA SHEET A4
NECK FLEXION TEST (572.33) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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 flexion test. (572.36(m))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J2111/1 MAR95. (572.36(i))
- X 8. The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9A for the flexion test. (572.33(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 22.6 to 23.4 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4))
- X 13. Complete the following table:

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

Parameter		Specification	Results
Pendulum impact speed		$22.6 \text{ ft/s} \leq \text{speed} \leq 23.4 \text{ ft/s}$	22.83 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	$22.5 \leq g \leq 27.5$	23.69 g
	@ 20 ms	$17.6 \leq g \leq 22.6$	21.27 g
	@ 30 ms	$12.5 \leq g \leq 18.5$	16.58 g
	Above 30 ms	29 g maximum	16.70 g
First Pendulum Decay to 5g		$34 \text{ ms} \leq \text{time} \leq 42 \text{ ms}$	36.8 ms
Plane D Rotation		$64^\circ \leq \text{max. rotation} \leq 78^\circ$	73.5°
		$57 \text{ ms} \leq \text{time of max. rotation} \leq 64 \text{ ms}$	59.7 ms
Time for Plane D Rotation to Cross 0° During First Rebound		$113 \text{ ms} \leq \text{time} \leq 128 \text{ ms}$	116.9 ms
Maximum Moment		$65 \text{ lbf-ft} \leq \text{moment} \leq 80 \text{ lbf-ft}$	70.3 lbf-ft
		$47 \text{ ms} \leq \text{time of max. moment} \leq 58 \text{ ms}$	48.8 ms0
Time of first decay to 0 lbf-ft Positive Moment Decay** (Flexion)		$97 \text{ ms} \leq \text{time} \leq 107 \text{ ms}$	98.2 ms

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

M_y = Moment in lbf-ft measured by the transducer

F_x = Force, in lbf measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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

Jonah Pollock
Signature

12/19/2023
Date

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

ATD Serial No: 403

Test I.D: D233412

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	23	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.69	Pass
	20 ms	G's	17.60 to 22.60	21.27	Pass
	30 ms	G's	12.50 to 18.50	16.58	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.8	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	73.5	Pass
	Time	ms	57.0 to 64.0	59.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.9	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.3	Pass
	Time	ms	47.0 to 58.0	48.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.2	Pass
Overall Test Results					Pass


 Laboratory Technician

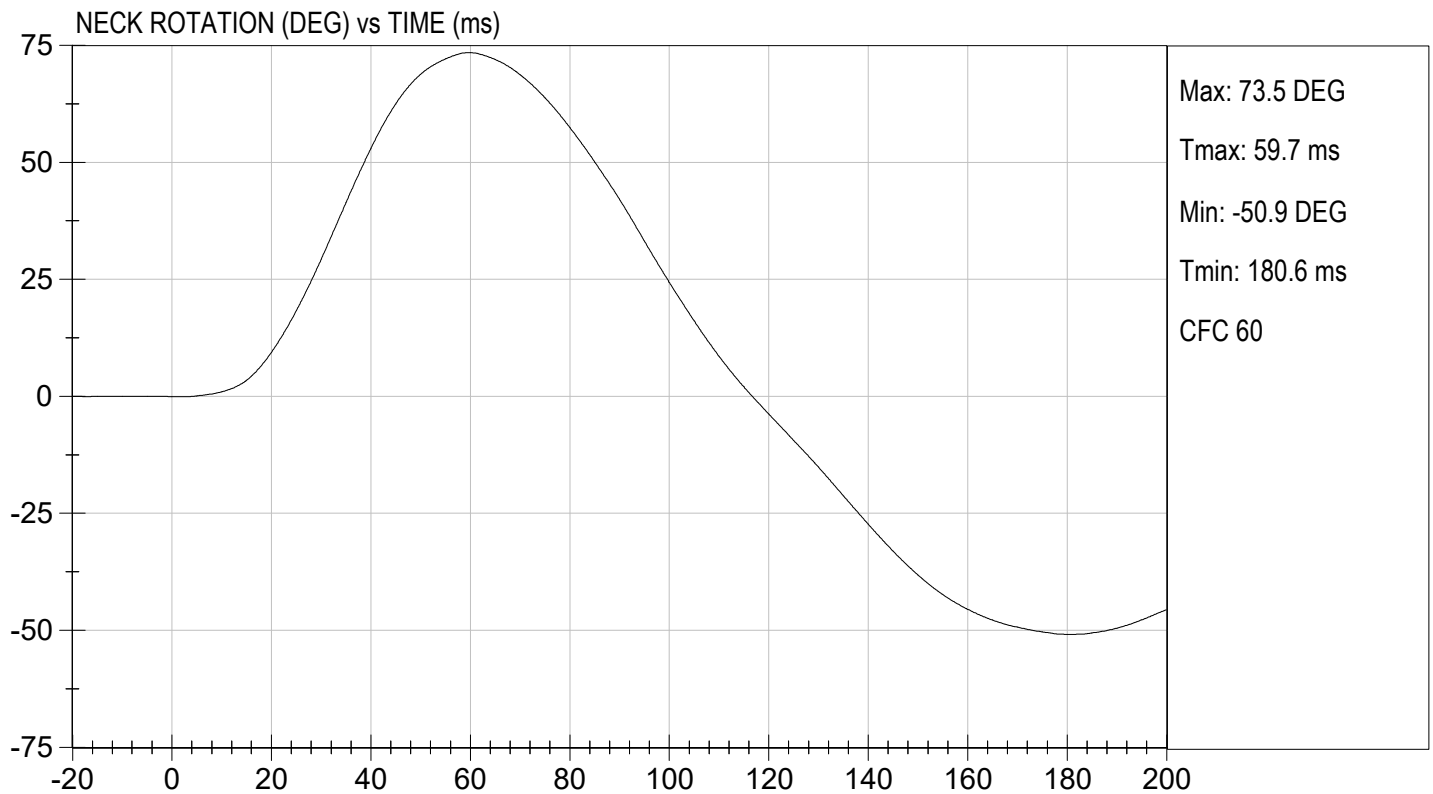
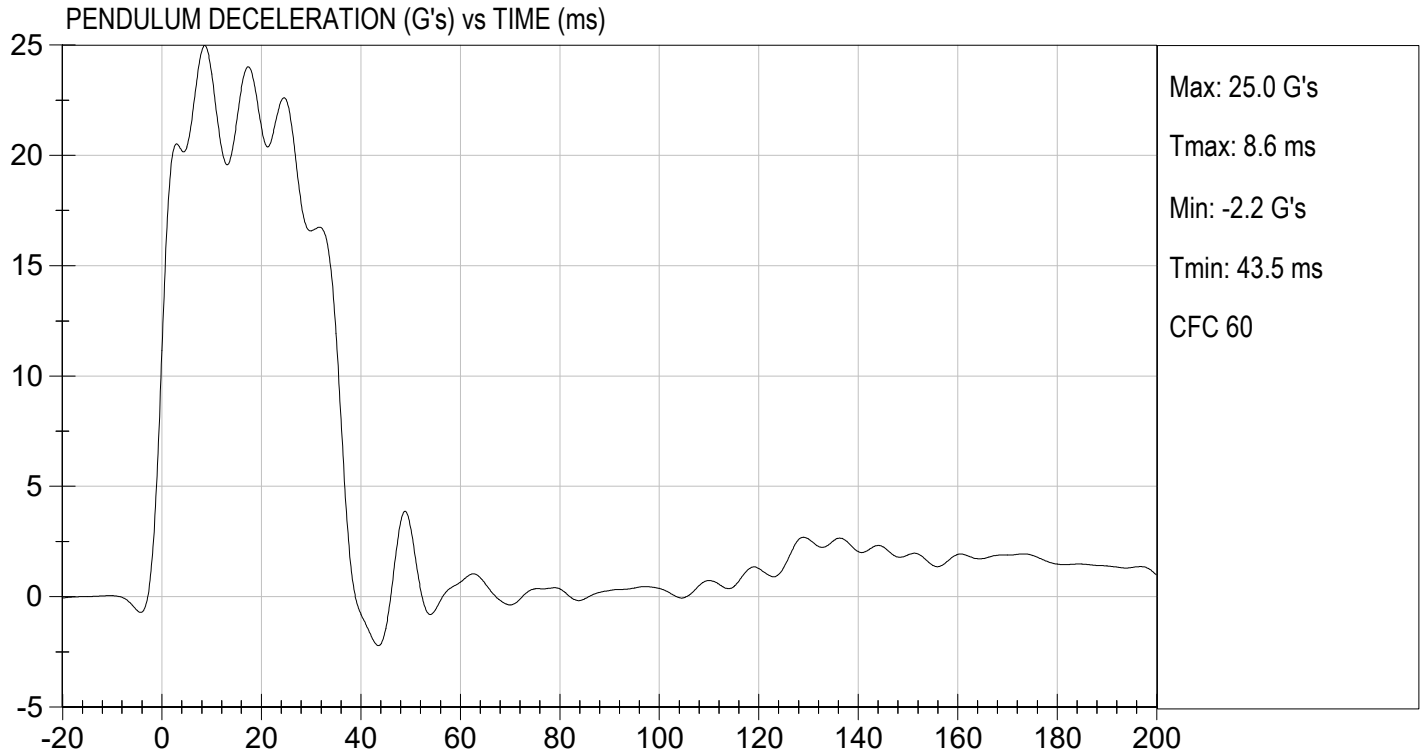
12/19/2023
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

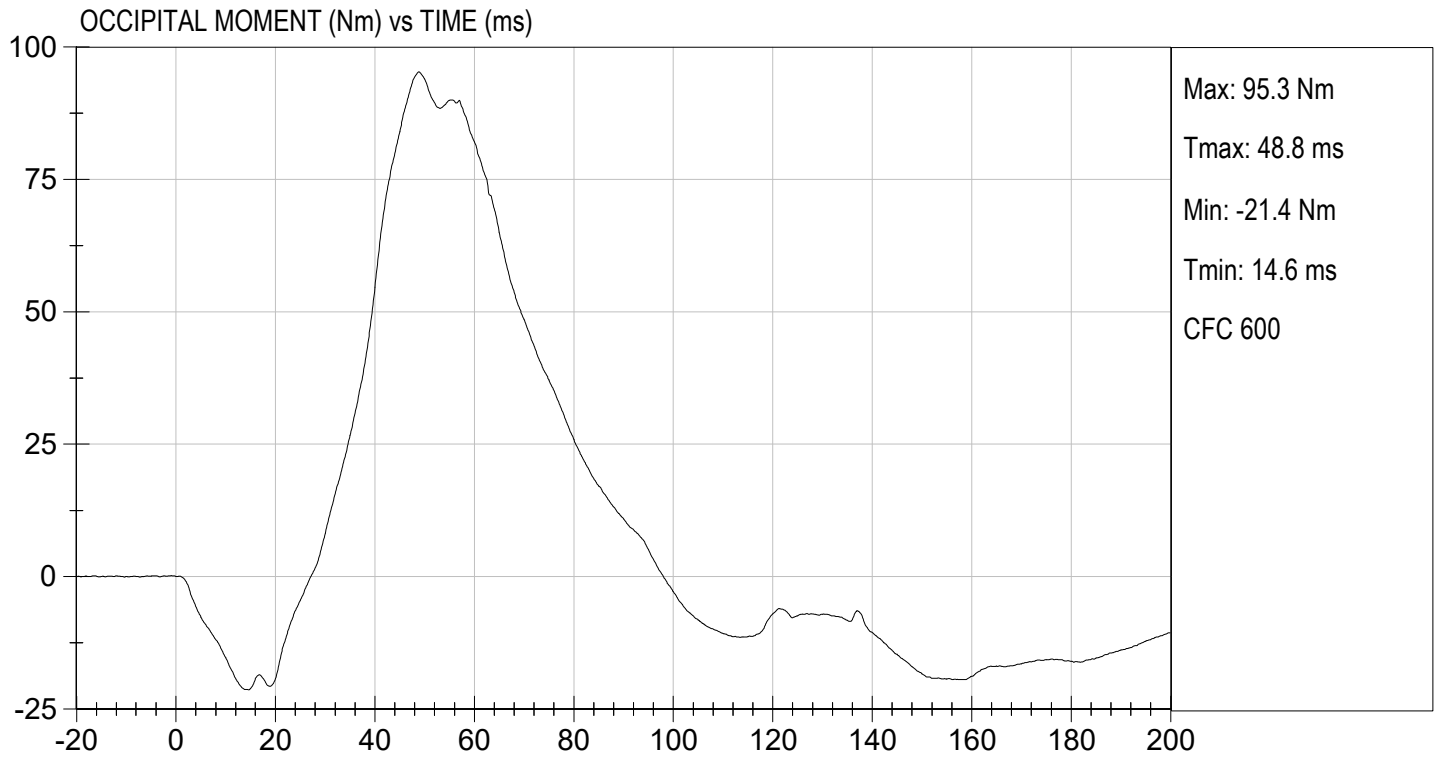
TEST DATE: 12/19/2023
TEST #: D233412





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 12/19/2023
TEST #: D233412



DATA SHEET A5
NECK EXTENSION TEST (572.33) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.36(m))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (78051-61X), neck assembly (78051-90), bib simulator (78051-84), upper neck adjusting bracket (78051-307), lower neck adjusting bracket (78051-303), six axis neck transducer (C-1709) and either three accelerometers or their mass equivalent installed in the head assembly. Data from the accelerometers are not required. (572.33(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.33(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (78051-90).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Pre-test calibration Neck cable torque: Torque the jam nut (78051-64) on the neck cable (78051-301) to 1.0 ± 0.2 lb-ft by loosening the jam nut and relaxing the neck cable before torquing. (572.33(c)(2))

- | | | |
|----------|-----|--|
| <u>X</u> | 7. | The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.36(i)) |
| <u>X</u> | 8. | The test fixture pendulum conforms to the specifications in Figure 8A. (572.33(c)(3)) |
| <u>X</u> | 9. | The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 10A for the extension test. (572.33(c)(3)) |
| <u>X</u> | 10. | Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 11A. |
| <u>X</u> | 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. |
| <u>X</u> | 12. | Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 19.5 ft/s to 20.3 ft/sec as measured at the center of the pendulum accelerometer. (572.33(c)(4)) |
| <u>X</u> | 13. | Complete the following table:
Neck Extension Test Results (572.33(b)(2) & 572.33(c)(4)) |

Parameter		Specification	Results
Pendulum impact speed		19.5 ft/s ≤ speed ≤ 20.3 ft/s	19.62 ft/s
Pendulum Deceleration Versus Time Pulse	@ 10 ms	17.2 ≤ g ≤ 21.2	20.00 g
	@ 20 ms	14 ≤ g ≤ 19	17.11 g
	@ 30 ms	11.0 ≤ g ≤ 16.0	13.39 g
	Above 30 ms	22 g maximum	14.0 g
First Pendulum Decay to 5g		38 ms ≤ time ≤ 46 ms	38.5 ms
Plane D Rotation		81° ≤ max. rotation ≤ 106°	102.1°
		72 ms ≤ time of max. rotation ≤ 82 ms	77.5 ms
Time for Plane D Rotation to Cross 0° During First Rebound		147 ms ≤ time ≤ 174 ms	160.8 ms
Maximum Moment		-59 lbf-ft ≤ moment ≤ -39 lbf-ft	-49.3 lbf-ft
		65 ms ≤ time of max. moment ≤ 79 ms	72.3 ms
Time of first decay to 0 lbf-ft Positive Moment Decay** (Extension)		120 ms ≤ time ≤ 148 ms	143.3 ms

My = Moment in lbf-ft measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.33(b)(3))

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



Signature

12/19/2023
Date

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

ATD Serial No: 403

Test I.D: D233413

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	23	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.00	Pass
	20 ms	G's	14.00 to 19.00	17.11	Pass
	30 ms	G's	11.00 to 16.00	13.39	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	102.1	Pass
	Time	ms	72.0 to 82.0	77.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	160.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-66.9	Pass
	Time	ms	65.0 to 79.0	72.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.3	Pass
Overall Test Results					Pass


 Laboratory Technician

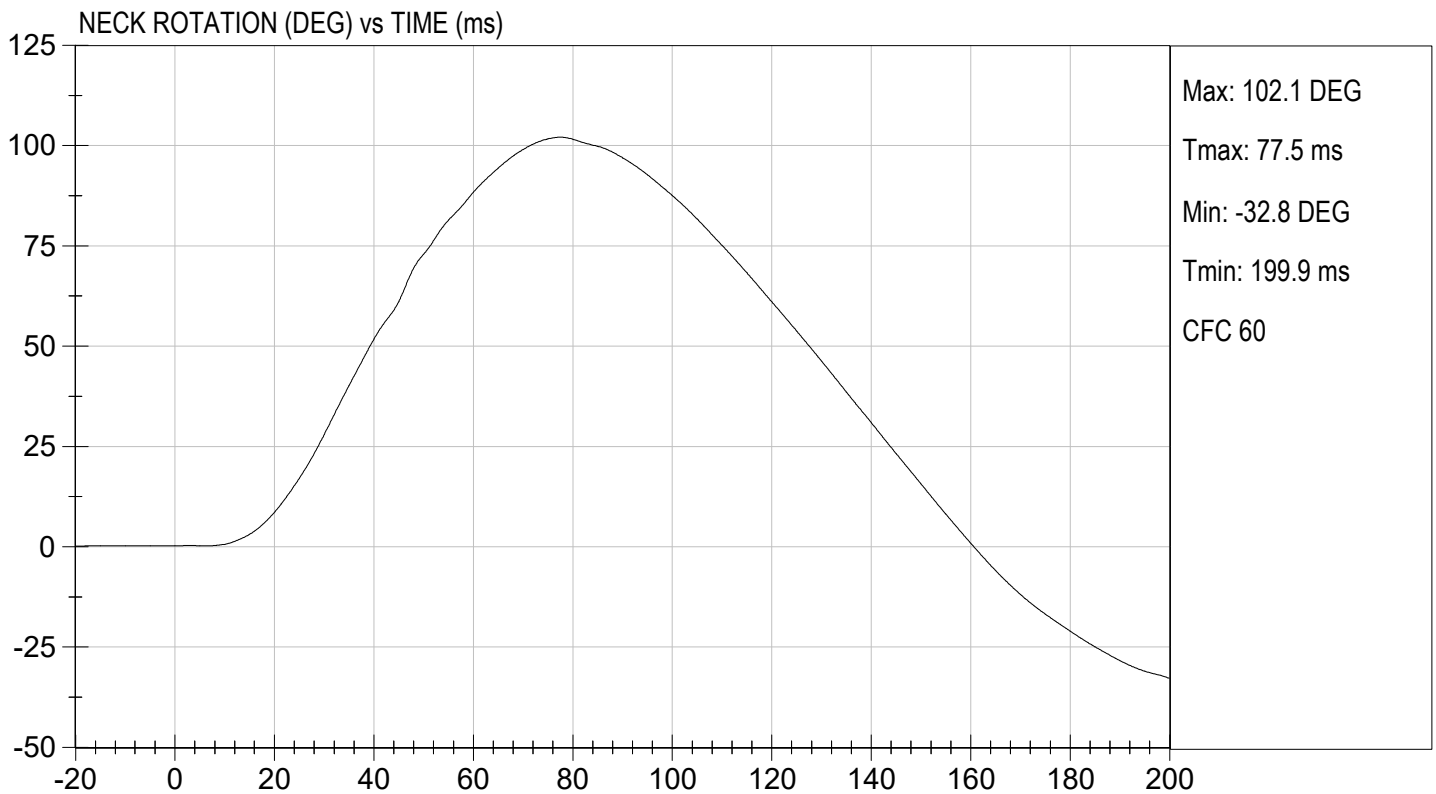
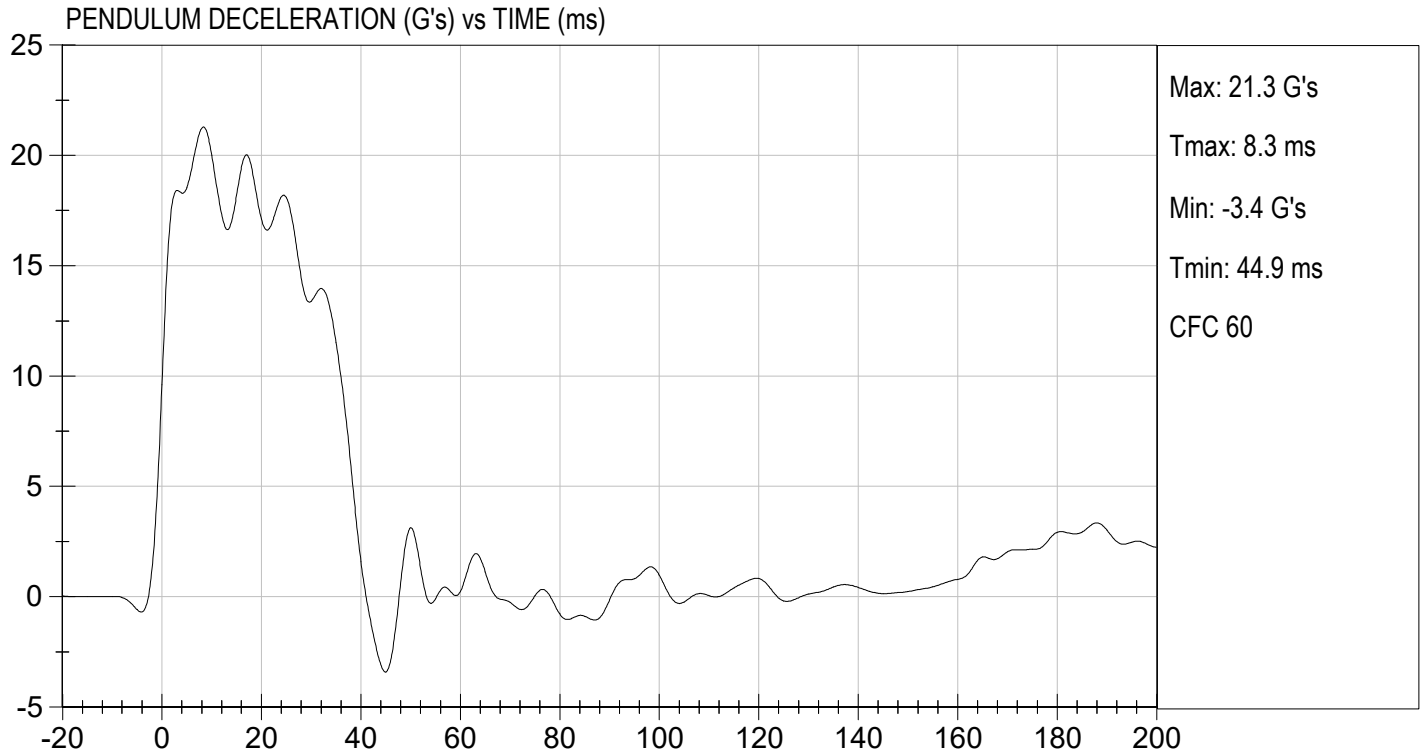
12/19/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 12/19/2023
TEST #: D233413





TEST DESC: NECK EXTENSION
VELOCITY: 19.61 ft/s, 5.98 m/s

TEST DATE: 12/19/2023
TEST #: D233413



DATA SHEET A6
THORAX IMPACT TEST (572.34) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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 12A.
- ☒ 3. The complete assembled dummy (78051-218) is used (572.34(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. No shoes are worn. (572.34(b))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.34(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>19%</u> |
| Record the minimum humidity: | <u>10%</u> |
- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.
- ☒ - No Damage
- ☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:
- ☐ - The following repairs or replacement was performed. Record:
-
- ☒ 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture

- _____ surface as shown in Figure 12A. The surface must be long enough to support the pelvis and outstretched legs. (572.34(c)(2))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (78051-532) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block. (572.34(c)(2))
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.34(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position. (Figure 12A)
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.34(c)(5)) The velocity of the test probe at the time of impact is $22 \text{ f/s} \pm 0.4 \text{ f/s}$. (572.34(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.34(c)(6))
- X 16. Complete the following table:

Thorax Impact Results (572.34(b))

Parameter*	Specification	Result
Test Probe Speed	21.6 ft/s ≤ speed ≤ 22.4 ft/s	21.92 ft/s
Chest Compression	2.5 in. ≤ compression ≤ 2.86 in.	2.51 in.
Peak resistance force**	1160 lb ≤ peak force ≤ 1325 lb	1303 lb
Internal Hysteresis***	69% ≤ hysteresis ≤ 85%	71 %

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

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

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

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


Signature

12/19/2023
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 403

Test I.D: D233414

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	19	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,795	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.38	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results				Pass


Laboratory Technician

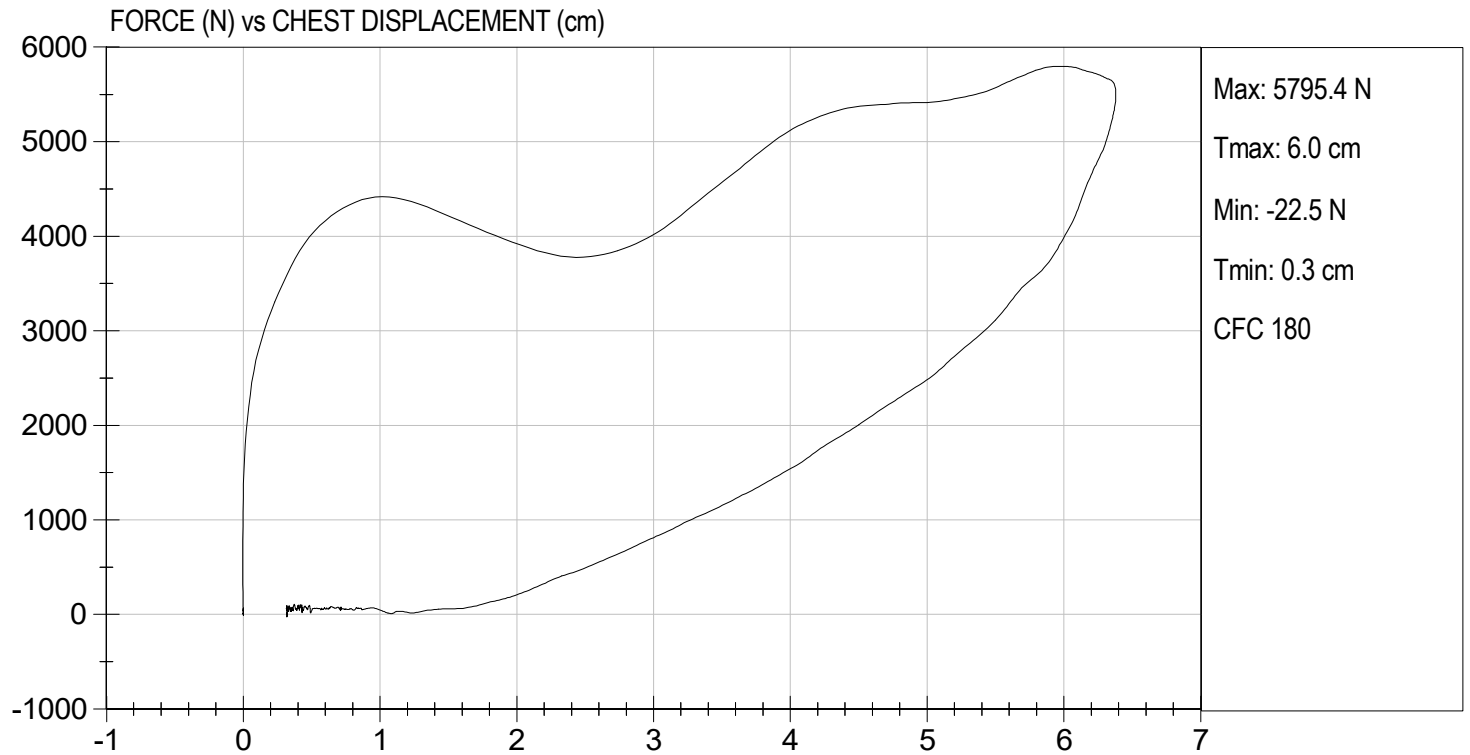
12/19/2023
Test Date


Approved By



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

TEST DATE: 12/19/2023
TEST #: D233414



DATA SHEET A7
LEFT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ 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. (572.36(m))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14A.
- ☒ 3. The leg assembly (86-5001-001) with the upper leg assembly (78051-46) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- ☒ 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.86 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1072 lb

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

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



Signature

12/19/2023
Date

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

ATD Serial No: 403

Test I.D: D233416

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,767	Pass
Overall Test Results				Pass


Laboratory Technician

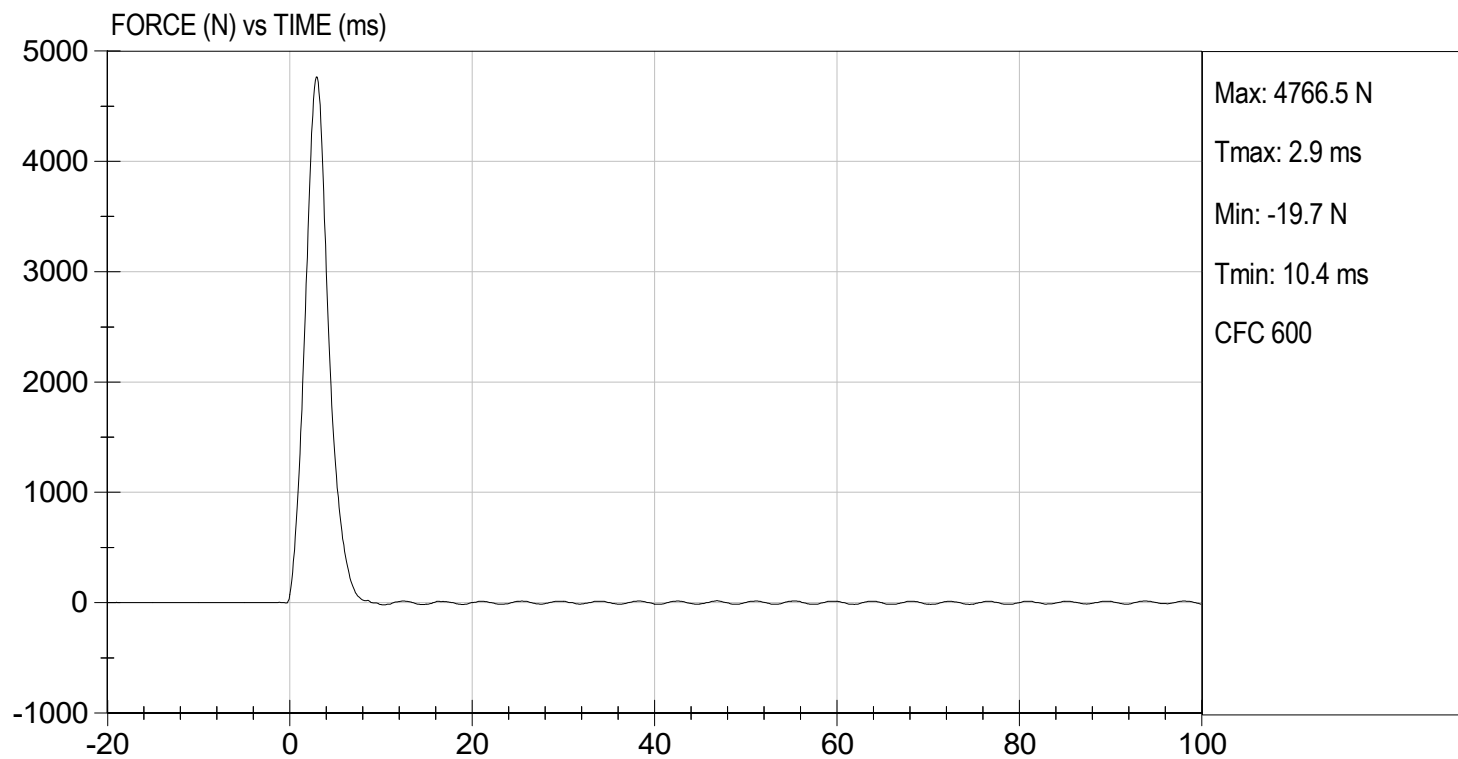
12/19/2023
Test Date


Approved By



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

TEST DATE: 12/19/2023
TEST #: D233416



DATA SHEET A8
RIGHT KNEE IMPACT TEST (572.35) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- 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. (572.36(m))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14A.
- X 3. The leg assembly (86-5001-002) with the upper leg assembly (78051-47) removed, and the load cell simulator (78051-319) is used. (572.35(b)(2))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(b)(2)(ii))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>23%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.35(b)(2)(iii)) (Figure 14A)
- X 6. No parts of the foot or tibia contact any exterior surface. (572.35(b)(2)(iii))
- X 7. Align the test probe so that at contact the longitudinal centerline of the probe is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator except it is within 0.5 degrees horizontally. (572.35(b)(2)(iv)&(vi))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.35(b)(2)(v))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (572.136(m)) Class 600.
- X 10. Contact the knee with the test probe at a speed between 6.8 ft/s and 7.0 ft/s. (572.35(b))

X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$6.8 \text{ ft/s} \leq \text{speed} \leq 7.0 \text{ ft/s}$	6.92 ft/s
Peak resistance force*	$1060 \text{ lb} \leq \text{force} \leq 1300 \text{ lb}$	1115 lb

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

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



Signature

12/19/2023
Date

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

ATD Serial No: 403

Test I.D: D233415

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	4,961	Pass
Overall Test Results				Pass


Laboratory Technician

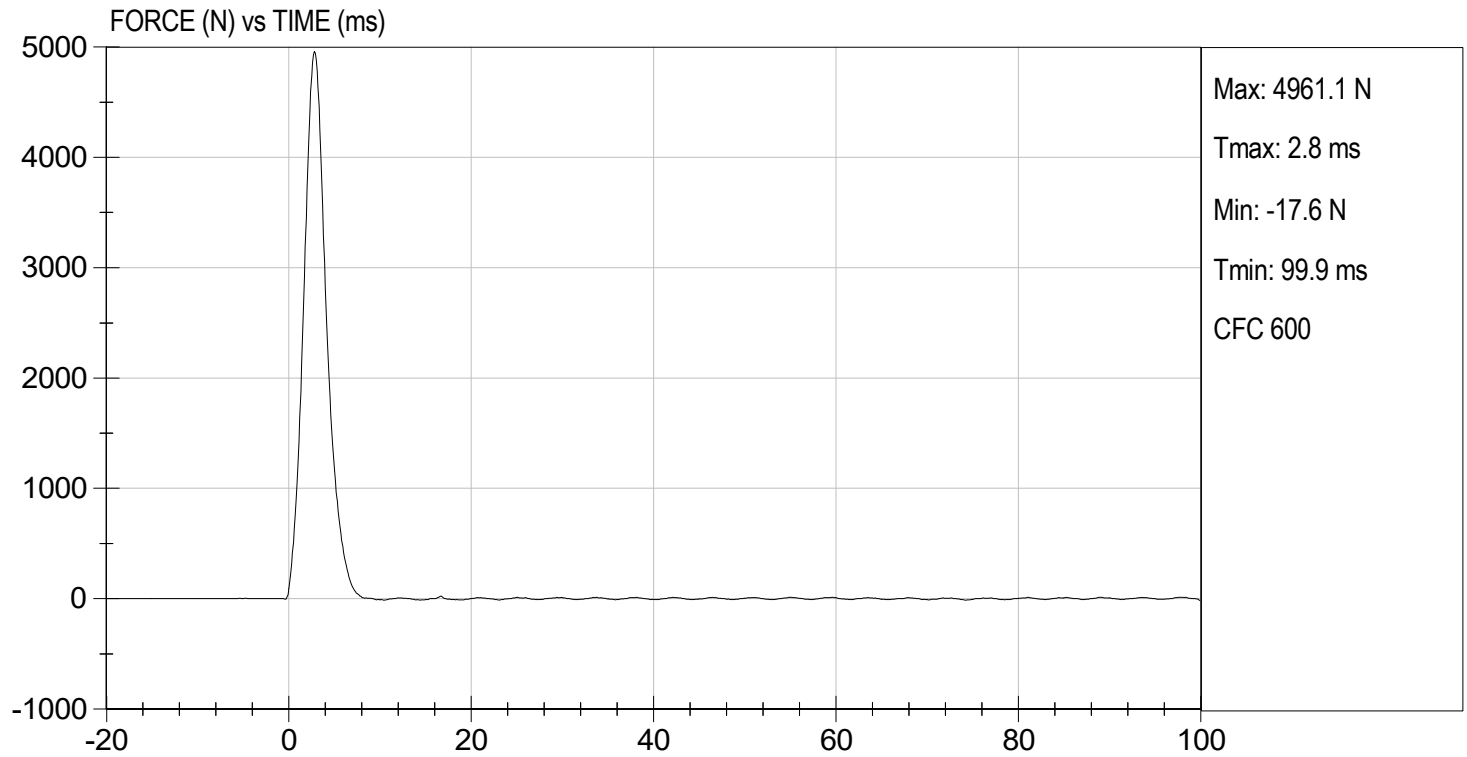
12/19/2023
Test Date


Approved By



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

TEST DATE: 12/19/2023
TEST #: D233415



DATA SHEET A9
HIP JOINT-FEMUR FLEXION (572.35(c)) (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

- ☐ Pre test calibration
☒ Post test calibration verification

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

- ☒ 1. It has been at least 30 minutes since the last hip joint-femur flexion test. (572.36(m))
☒ N/A, ONLY one hip joint-femur flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 17A.
- ☒ 3. Use the assembled dummy (78051-218) except (572.35(c)(2)):
- ☒ 3.1 remove the leg assemblies (86-5001-001 & 002) by removing 3/8-16 Socket Head Cap Screw and retaining the structural assembly of the upper legs (78051-43 & 44)
 - ☒ 3.2 remove the abdominal insert (78051-52)
 - ☒ 3.3 replace the instrument cover plate (78051-13) in the pelvic bone with a rigid pelvic bone stabilizer insert (Figure 15A) and attach the pelvis upper support device (Figure 16A).
- ☒ 4. The assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.35(c)(v))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.0°C</u> |
| Record the maximum humidity: | <u>24%</u> |
| Record the minimum humidity: | <u>13%</u> |
- ☒ 5. Seat the dummy on the rigid seat fixture. (572.35(c)(2)(ii))
- ☒ 6. Secure the dummy by bolting the stabilizer insert and the pelvis upper support device to the seat back of the test fixture as shown in Figures 17A, 18A, and 19A. (572.35(c)(2)(ii))
- ☒ 7. Adjust the threaded rods until plane B is horizontal.
- ☒ 8. Secure the lever arm into the left femur shaft opening of the upper leg structure assembly (78051-43) and firmly secure it using the 3/8-16 socket head cap screws (Figure 19A). (572.35(c)(2)(iii))
- ☒ 9. Lift the lever arm parallel to the midsagittal plane at a rotation rate between 5 and 10 degrees per second while maintaining the ½ in. shoulder bolt longitudinal centerline

horizontal throughout the range of motion until the 150 ft-lbf torque level is reached (Figures 18A and 19A). (572.35(c)(2)(iv))

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	Torque ≤ 70 ft-lbf	56.5 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	49°

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

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

- X 10. Complete the following table:

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

Parameter	Specification	Result
Rotation Rate	$5^{\circ}/s \leq \text{rotation rate} \leq 10^{\circ}/s$	$6^{\circ}/s$
Femur Torque at 30°	torque ≤ 70 ft-lbf	63.5 ft-lbf
Rotation at 150 lbf-ft	$40^{\circ} \leq \text{rotation} \leq 50^{\circ}$	46°


Signature

12/19/2023
Date

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

ATD Serial No: 403

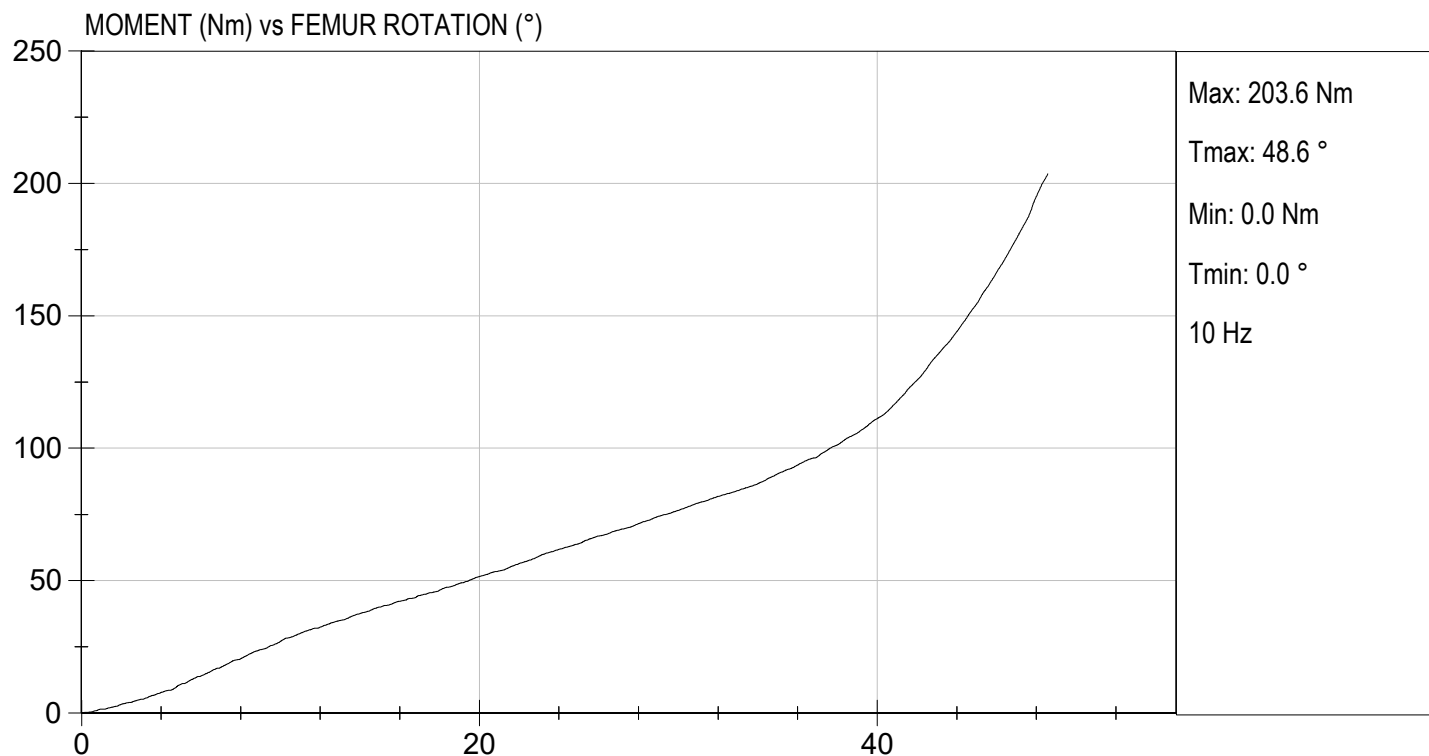
Test I.D: D233419

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	24	24	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	86.1	76.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	45.8	48.6	Pass
Overall Test Results					Pass


 Laboratory Technician

12/19/2023
 Test Date


 Approved By



DATA SHEET A1
DUMMY DAMAGE CHECKLIST (50th Male)

Dummy Serial Number: 403

Test Date: 12/19/2023

Technician: Jonah Pulokas

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:



Signature

12/19/2023
Date

Describe the repair or replacement of parts:

Checked by:



Signature

12/19/2023
Date

DATA SHEET A10
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	7231C-750	AH5D9	10/09/2023	AH5D9
(2) LATERAL	Endevco	7231C-750	AGH74	10/09/2023	AGH74
(3) VERTICAL	Endevco	7231C-750	C19307	10/09/2023	C19307
NECK TRANSDUCER	Denton	1716A	N1145	09/05/2023	N1145
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7231C-750	AH5J3	10/09/2023	04/09/2024
(2) LATERAL	Endevco	7231C-750	AGH90	10/09/2023	04/09/2024
(3) VERTICAL	Endevco	7231C-750	C12885	10/09/2023	04/09/2024
CHEST POTENTIOMETER	Humanetics	78051-317	403	10/09/2023	04/09/2024
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Denton	2121AJTF	F2026	10/09/2023	04/09/2024
(2) LEFT FEMUR	Denton	2121AJTF	F2027	10/09/2023	04/09/2024
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/17/2023	01/06/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-360M17	P97372	11/20/2023	05/21/2024
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-360M17	P82128	11/27/2023	05/28/2024
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	C3036	09/20/2023	03/21/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	C3034	09/06/2023	03/07/2024

LABORATORY TECHNICIAN: 

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #ER6928, 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	781.8
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.7
C	H-POINT HEIGHT	Reference	81.3-86.3	82.5
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	83.4
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.0
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	246.9
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	46.1
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	283.9
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	196.4
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	530.2
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376	358.0
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	407.3
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	420.8

HYBRID III 5 th SN #517, 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	180.8
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	226.3
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	475.8
S	HEAD BREADTH	The widest part of the head	137.1-147.3	137.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	302.5
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	361.1
W	FOOT BREADTH	The widest part of the foot	78.8-94	89.7
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	542.9
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	789.6
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- 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>21.3°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>43%</u> |
| Record the minimum humidity: | <u>33%</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: 24.8 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	$250 \text{ g} \leq x \leq 300 \text{ g}$	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 $\leq 15 \text{ g}$	5.5 g

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


Signature

08/30/2023
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

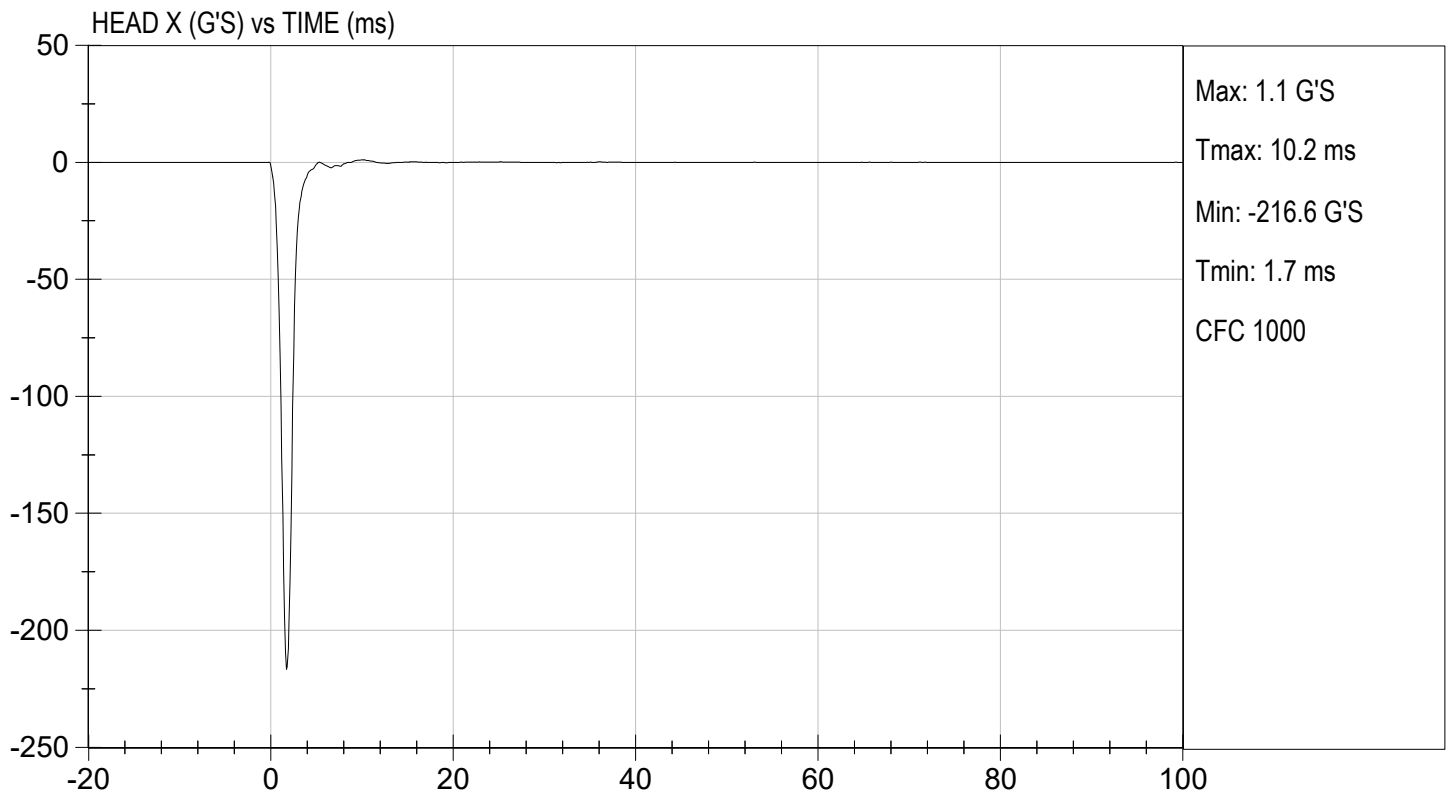
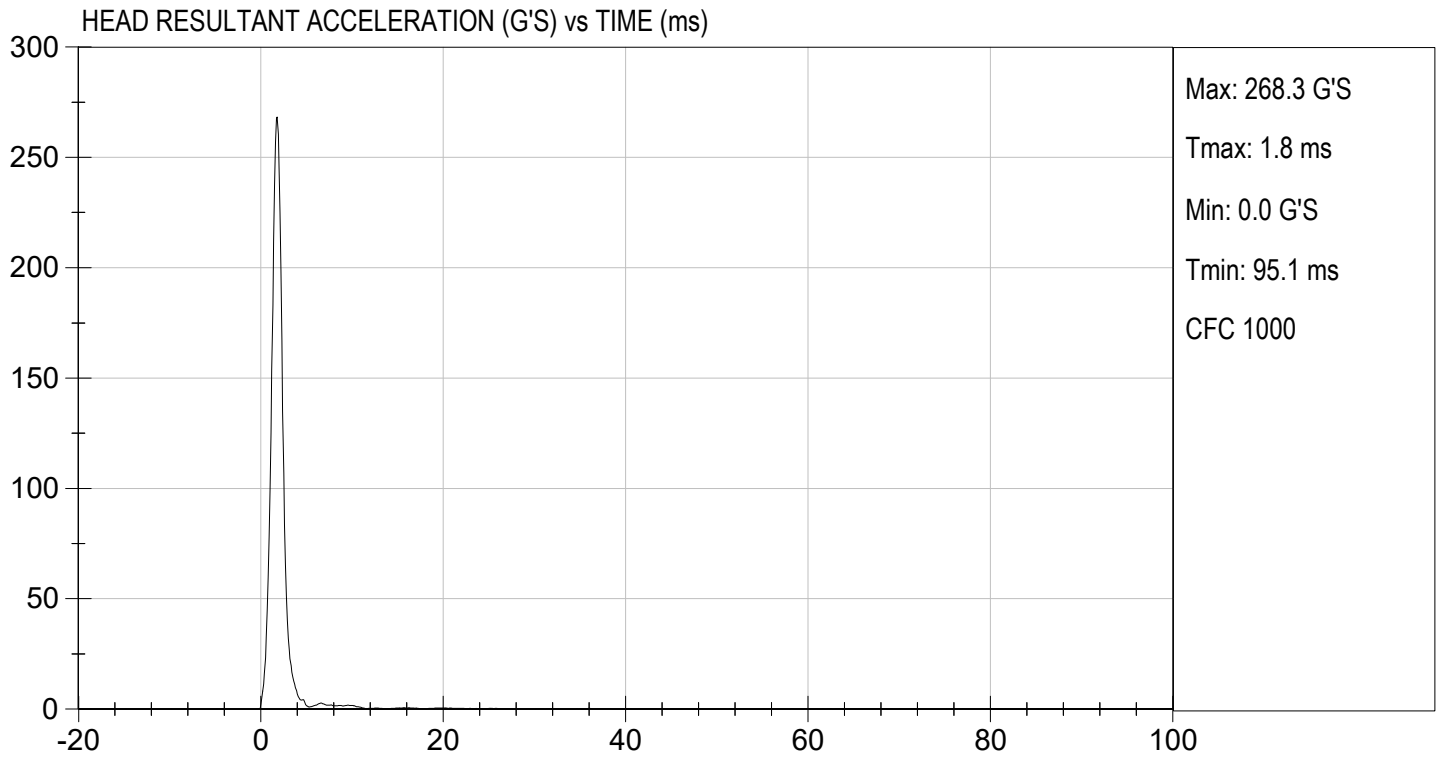
Test ID: D232321

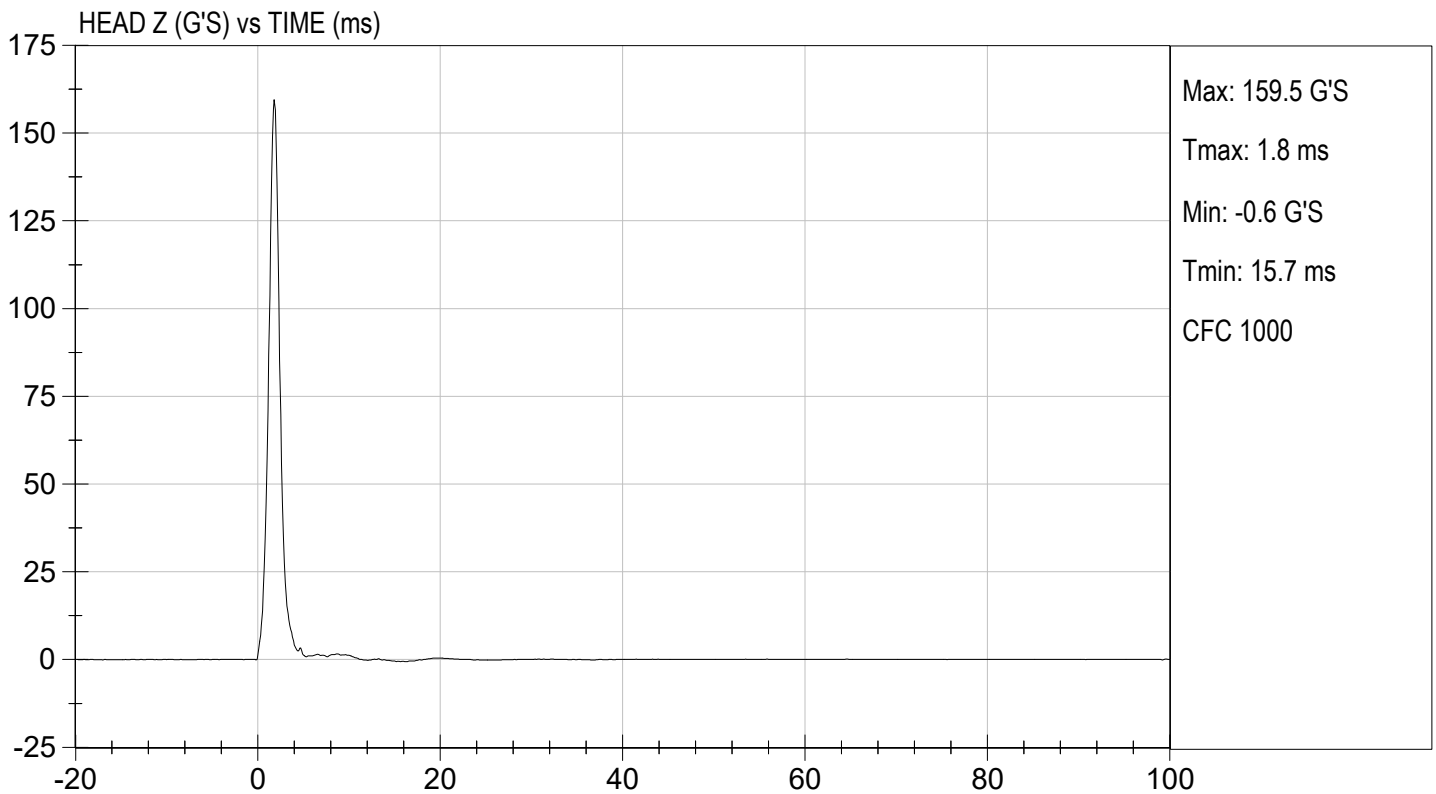
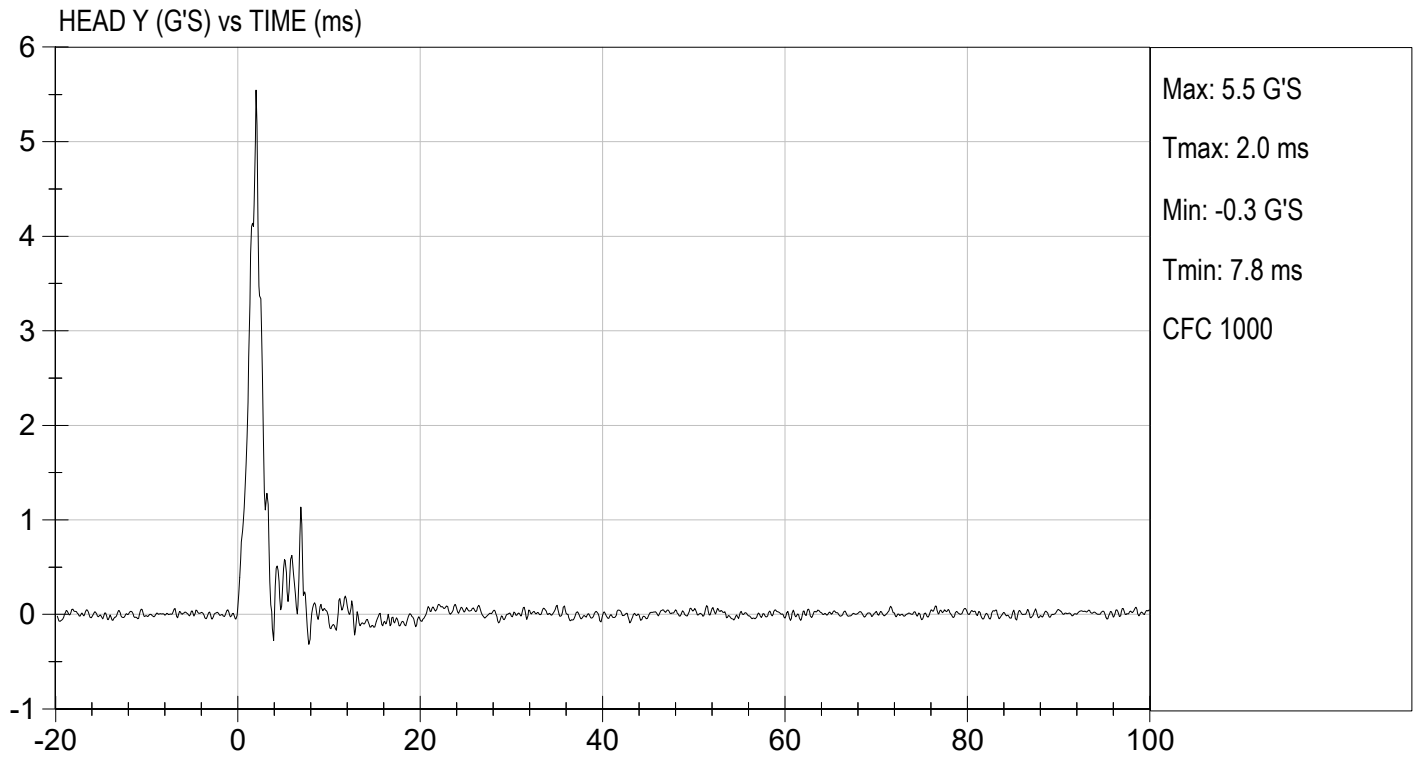
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	250 to 300	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


 Laboratory Technician

08/30/2023
 Test Date


 Approved By





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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- 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>21.3°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>41%</u> |
| Record the minimum humidity: | <u>31%</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		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	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	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.6 m/s
	@ 30 ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.5 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	75 Nm @ 82 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm $80 \text{ ms} \leq \text{time} \leq 100 \text{ ms}$	85 ms

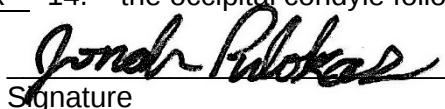
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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


Signature

08/30/2023
Date

MGA RESEARCH CORPORATION

**NECK FLEXION TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: ER6928

Test I.D: D232322

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum 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	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	75	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass


Laboratory Technician

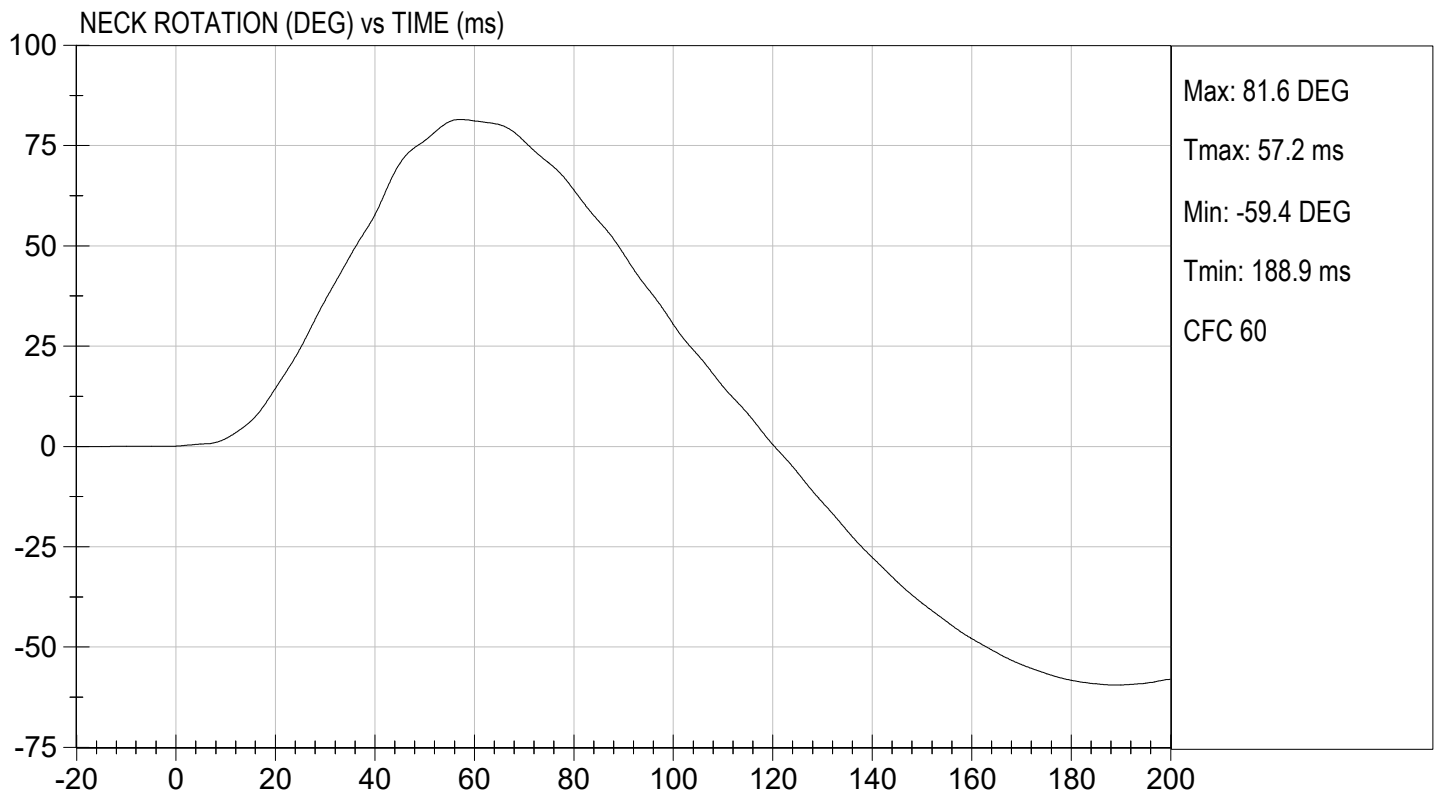
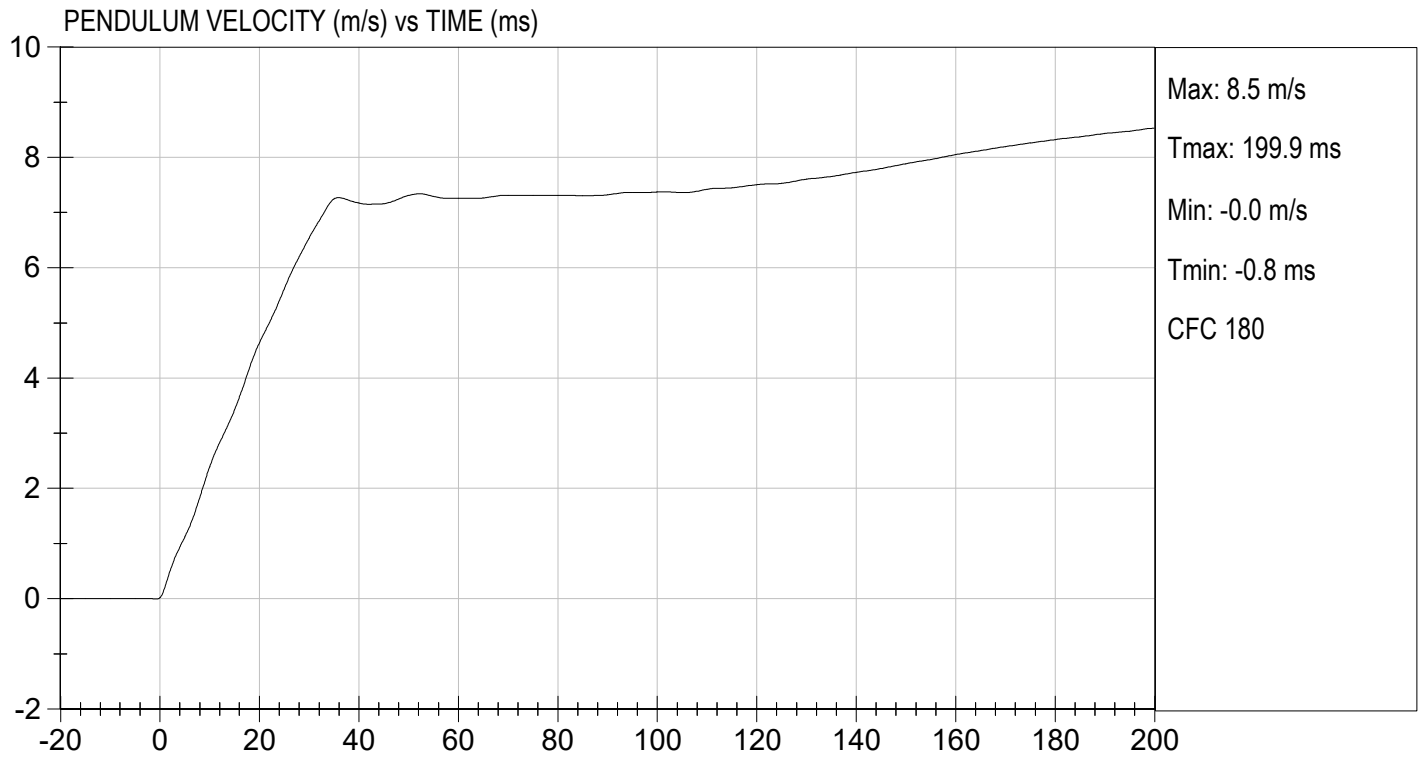
08/30/2023
Test Date


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

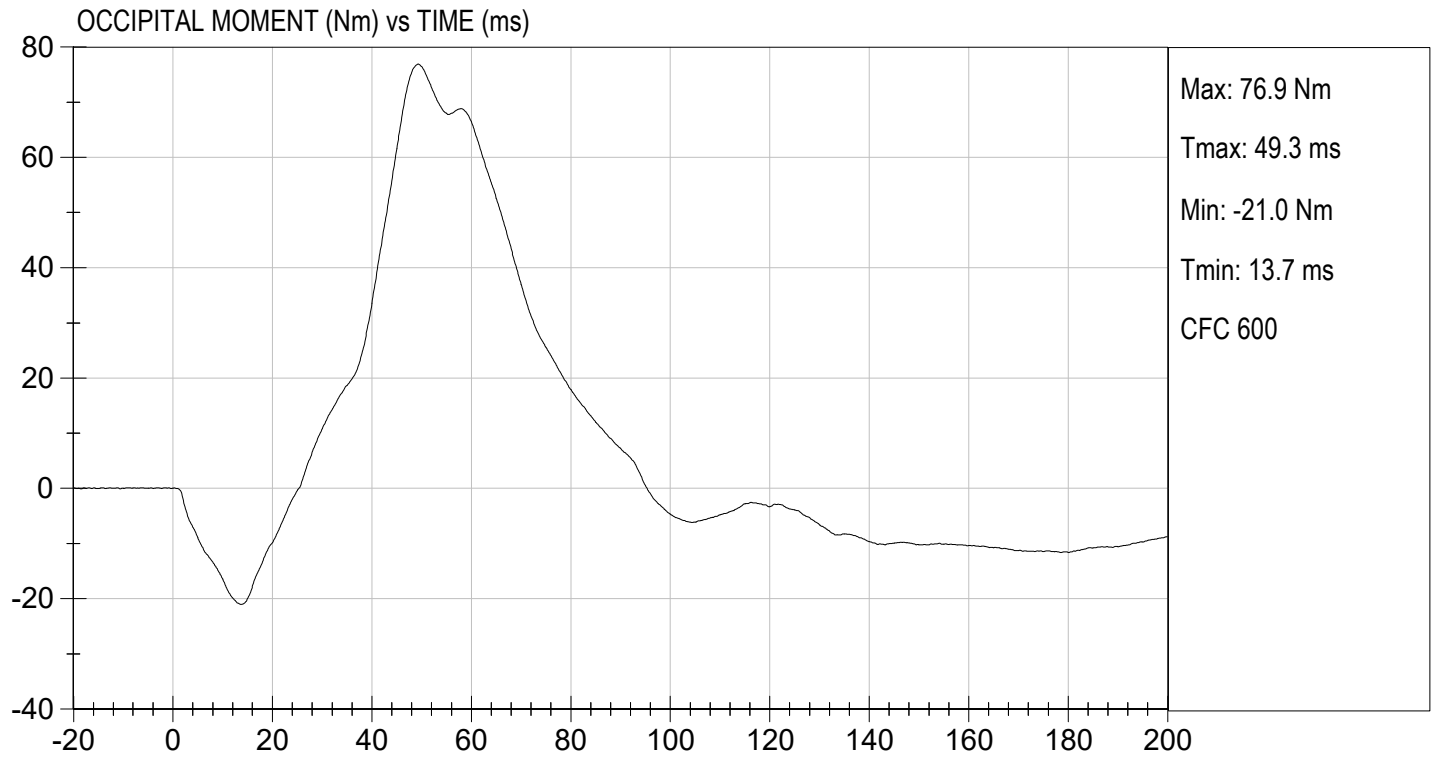
TEST DATE: 08/30/2023
TEST #: D232322





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 08/30/2023
TEST #: D232322



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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- 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>21.3°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>41%</u> |
| Record the minimum humidity: | <u>31%</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		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.7 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.3 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 @ 112 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.


Signature

08/30/2023
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232323

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum 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	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	112	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


 Laboratory Technician

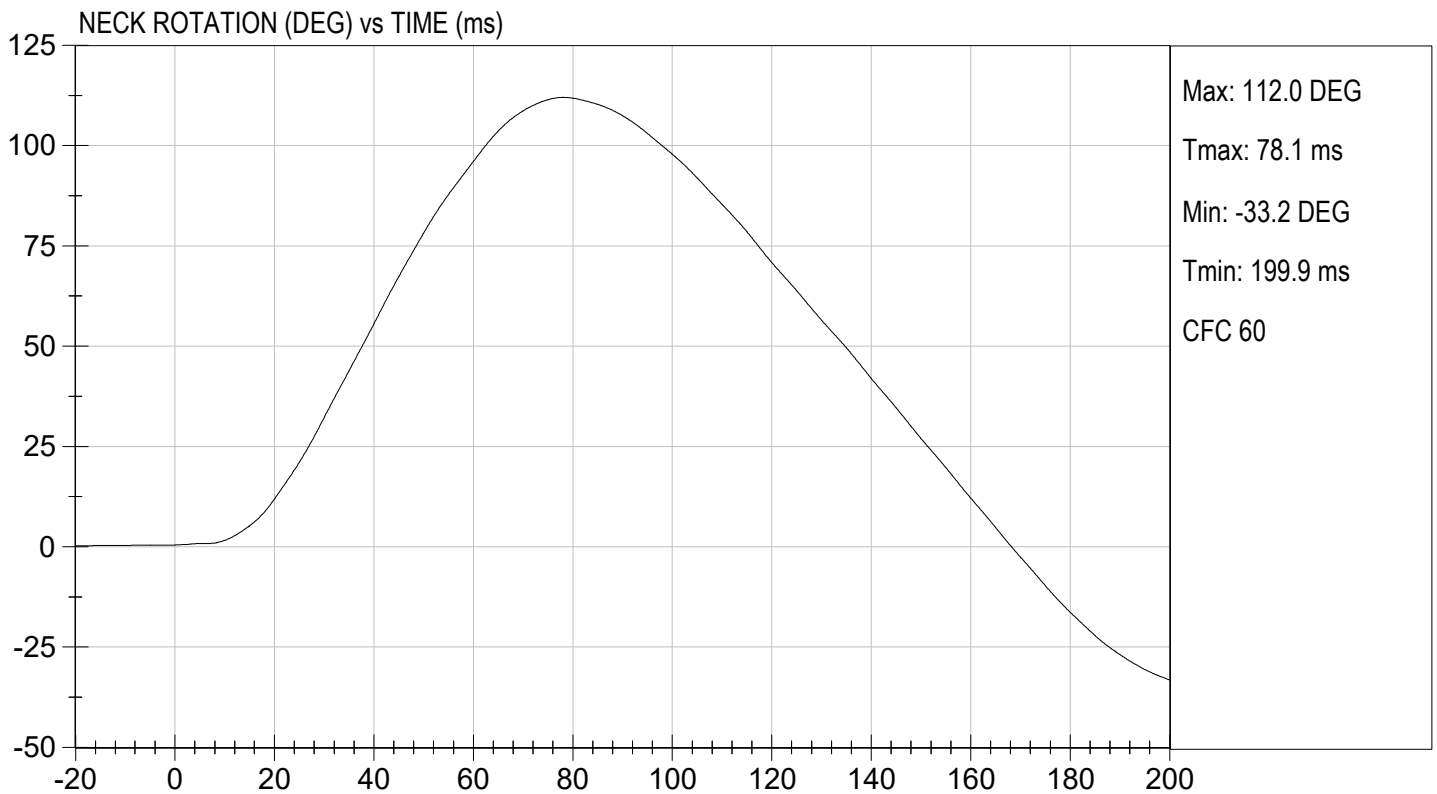
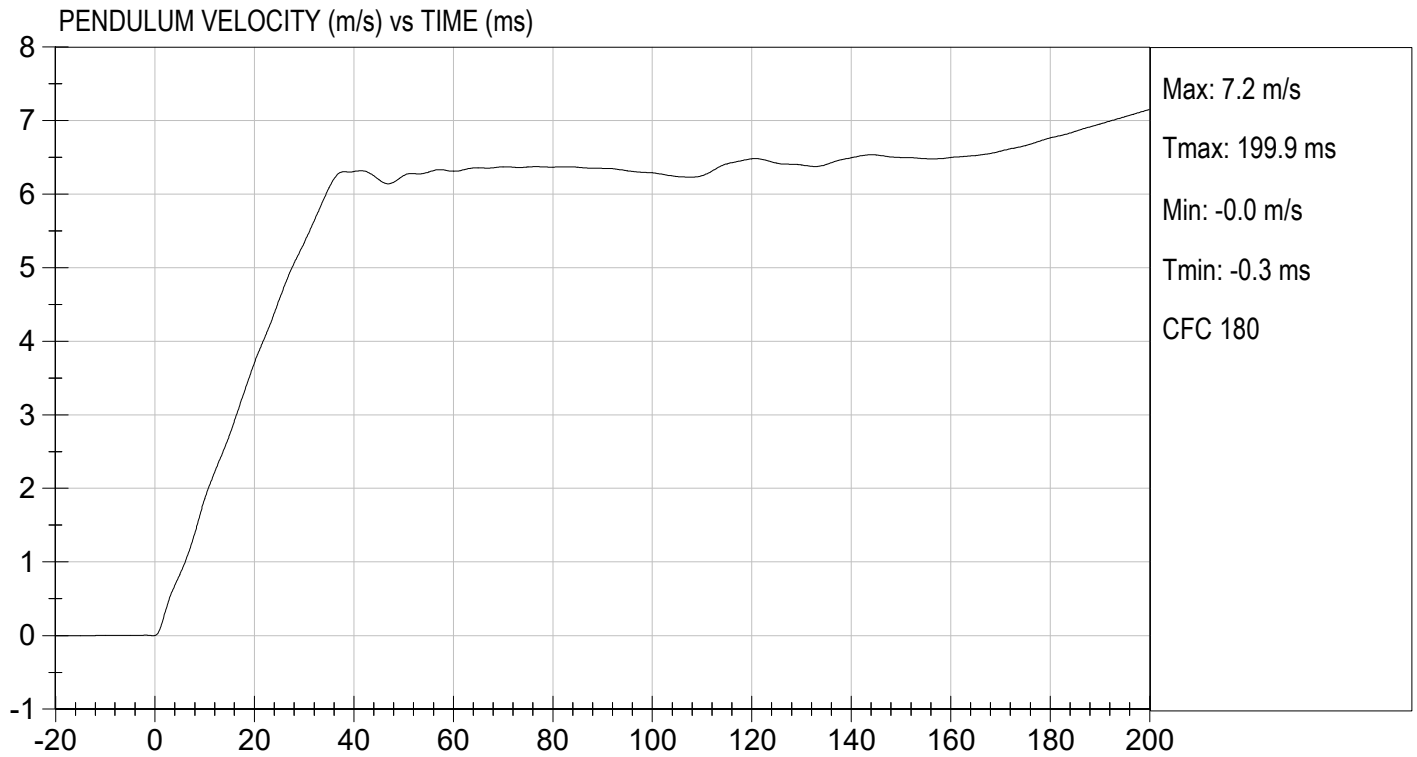
08/30/2023
 Test Date


 Approved By



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

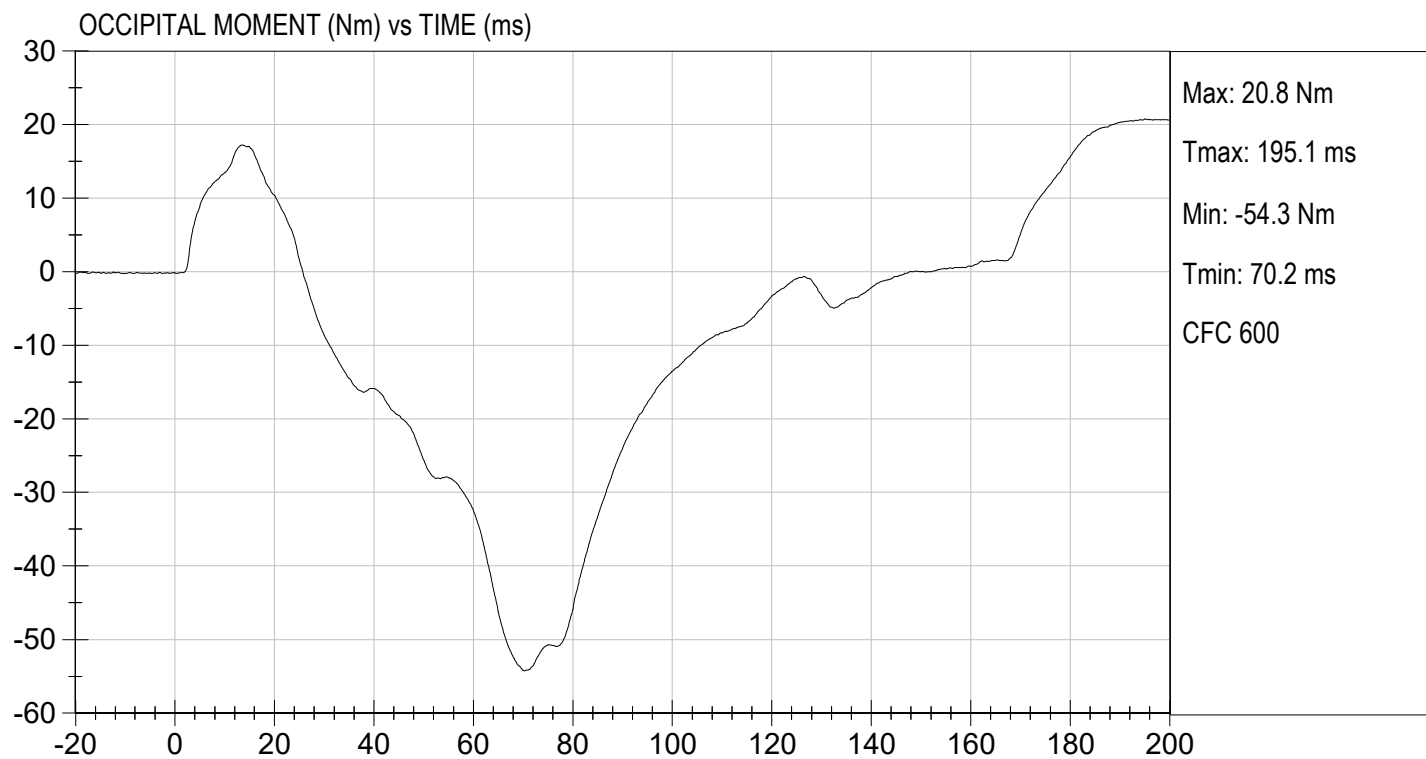
TEST DATE: 08/30/2023
TEST #: D232323





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

TEST DATE: 08/30/2023
TEST #: D232323



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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- ☒ 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>21.3°C</u>
Record the minimum temperature:	<u>21.0°C</u>
Record the maximum humidity:	<u>41%</u>
Record the minimum humidity:	<u>31%</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	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	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	$\text{Peak Force} \leq 4600 \text{ N}$	4114 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	75%

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

**Force = impactor mass x acceleration (572.134(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

08/30/2023
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232324

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	41	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	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	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4114	Pass
Overall Test Results				Pass


Laboratory Technician

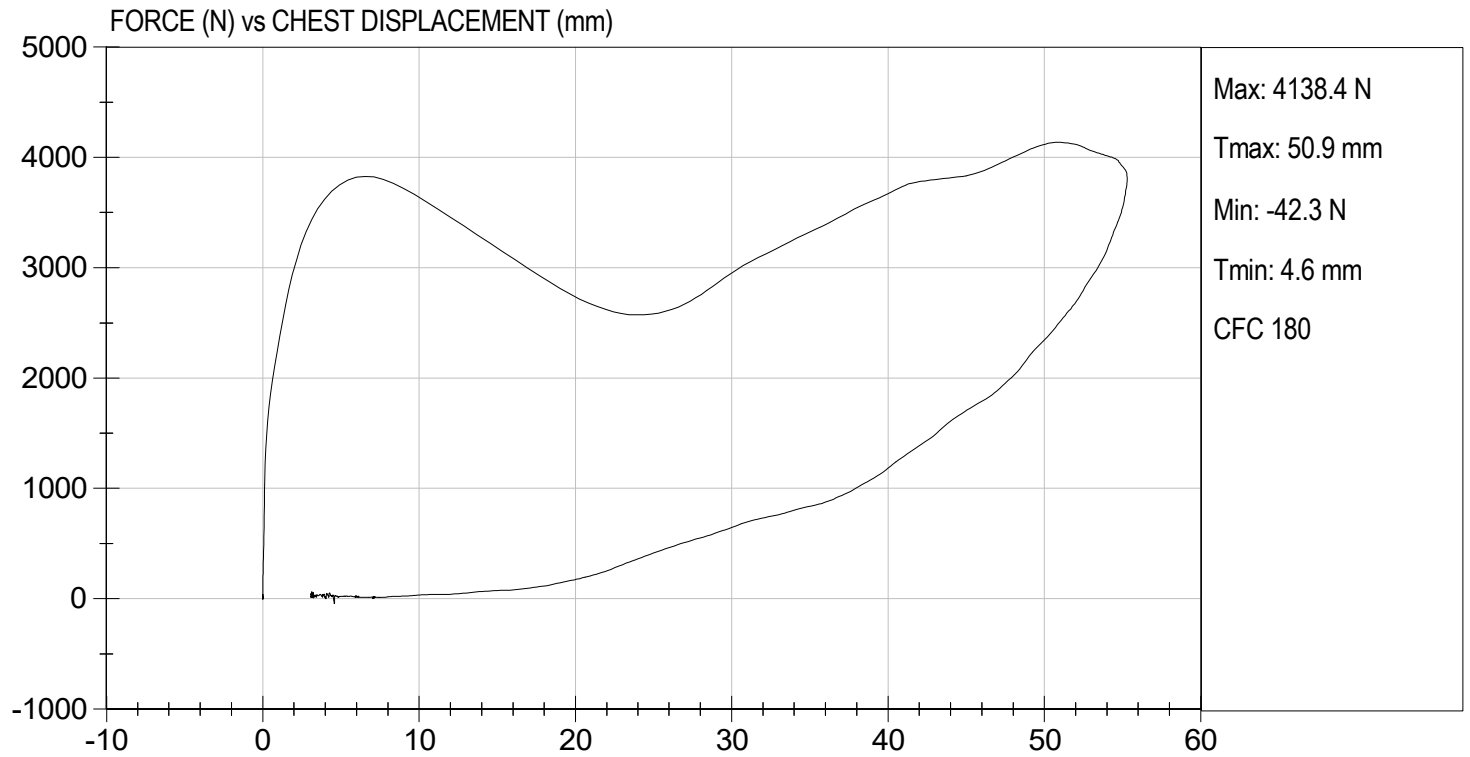
08/30/2023
Test Date


Approved By



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

TEST DATE: 08/30/2023
TEST #: D232324



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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- ☒ 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>21.3°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>42%</u> |
| Record the minimum humidity: | <u>39%</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	1.0 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	359 N
Final ref. plane angle	Initial ref. plane angle ± 8°	4 deg


 Signature

08/30/2023
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232327

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	359	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.0	Pass
Overall Result			Pass	



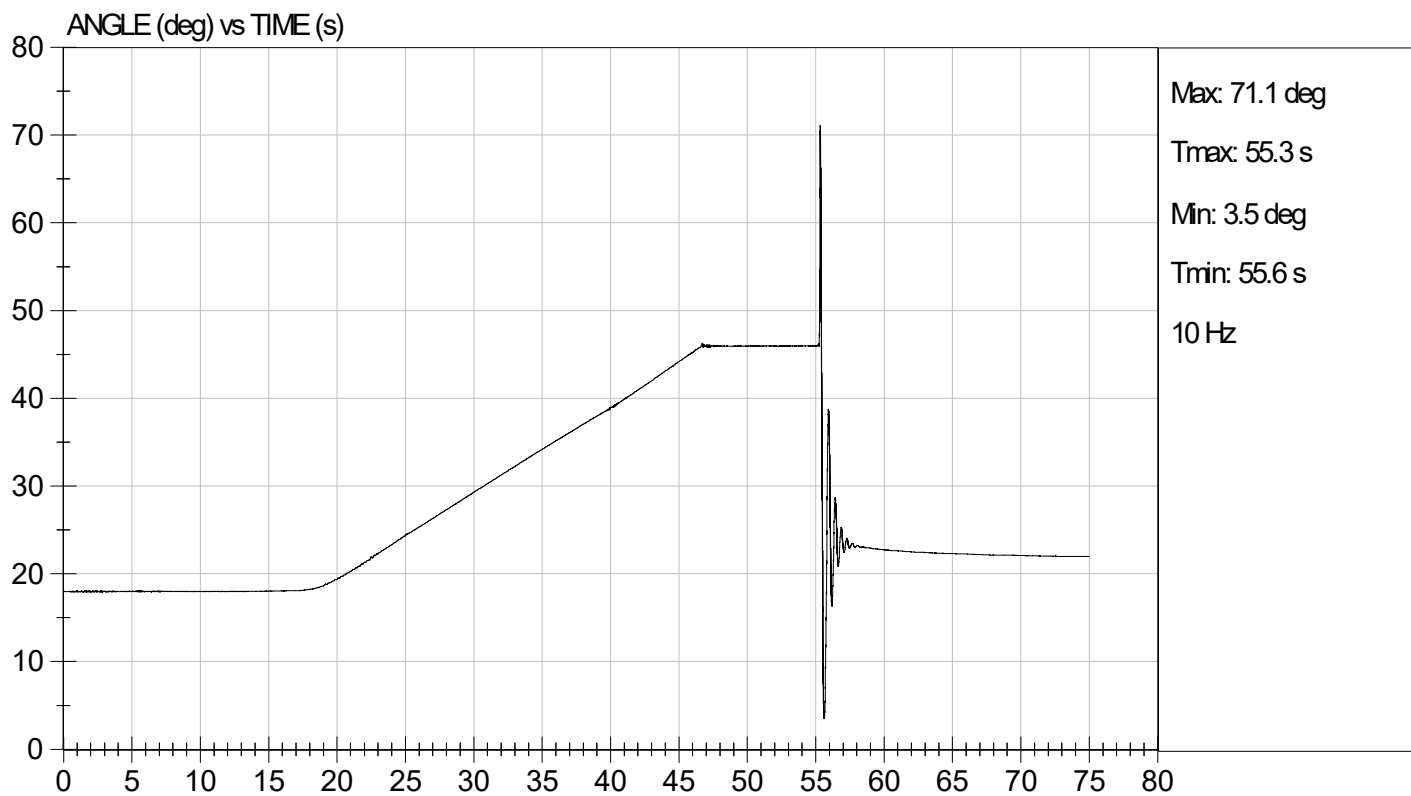
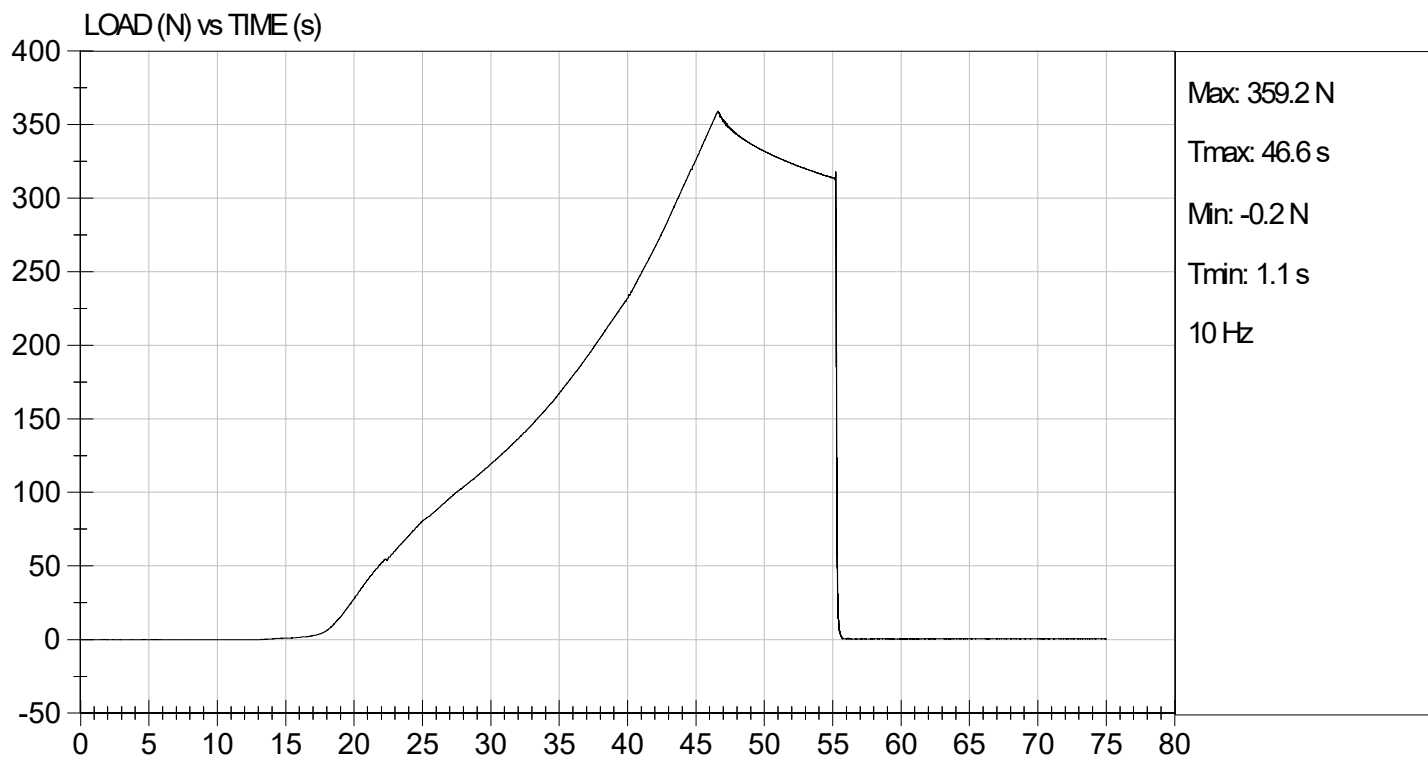
Laboratory Technician

08/30/2023

Test Date



Approved By



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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- 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>21.3°C</u>
Record the minimum temperature:	<u>21.0°C</u>
Record the maximum humidity:	<u>42%</u>
Record the minimum humidity:	<u>32%</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*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3925 N

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

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


Signature

08/30/2023
Date

MGA RESEARCH CORPORATION

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

ATD Serial No: ER6928

Test I.D: D232326

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3925	Pass
Overall Test Results				Pass



Laboratory Technician

08/30/2023

Test Date

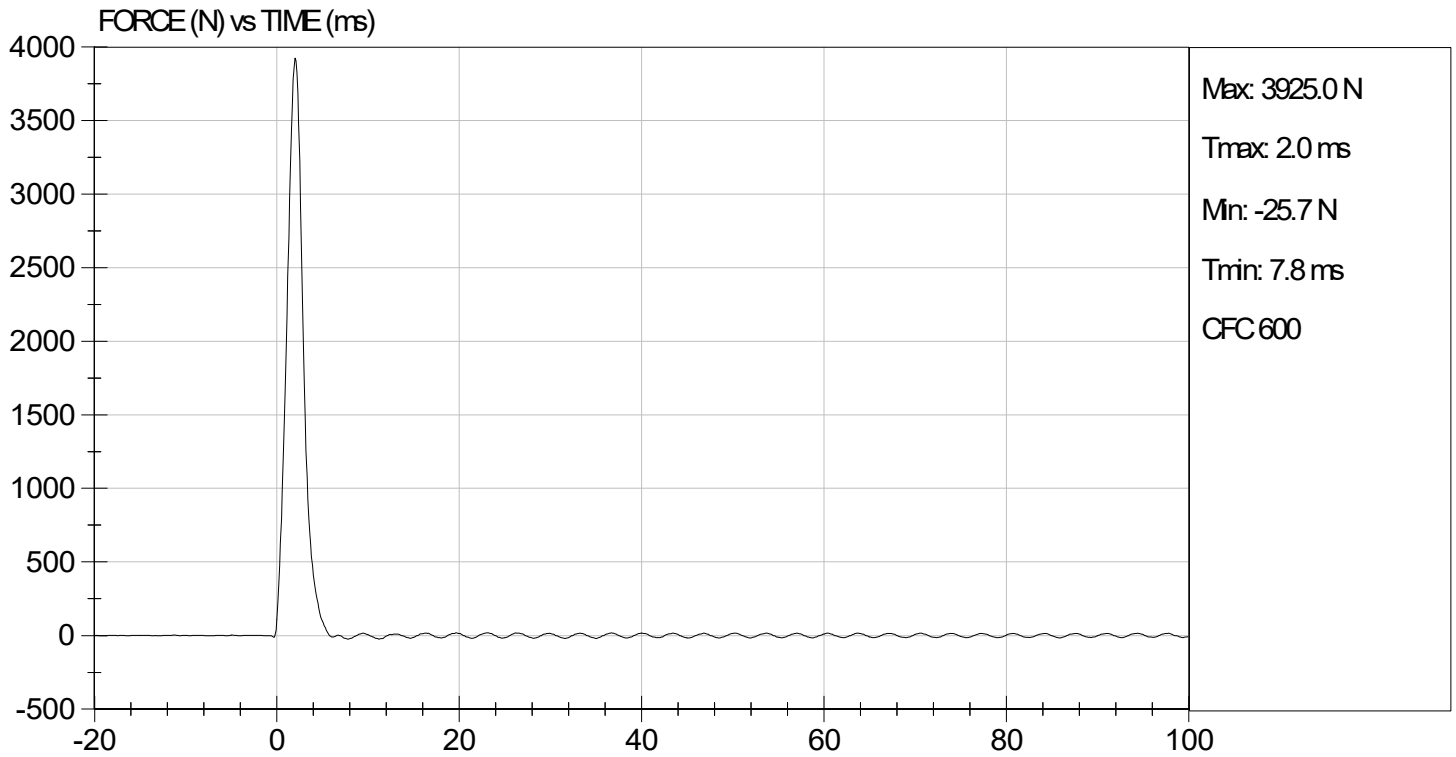


Approved By



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

TEST DATE: 08/30/2023
TEST #: D232326



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

Dummy Serial Number: ER6928

Test Date: 08/30/2023

Technician: Jonah Pulokas

- 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>21.3°C</u>
Record the minimum temperature:	<u>21.0°C</u>
Record the maximum humidity:	<u>42%</u>
Record the minimum humidity:	<u>32%</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*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3961 N

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

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


Signature

08/30/2023
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232325

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	3961	Pass
Overall Test Results				Pass



Laboratory Technician

08/30/2023

Test Date

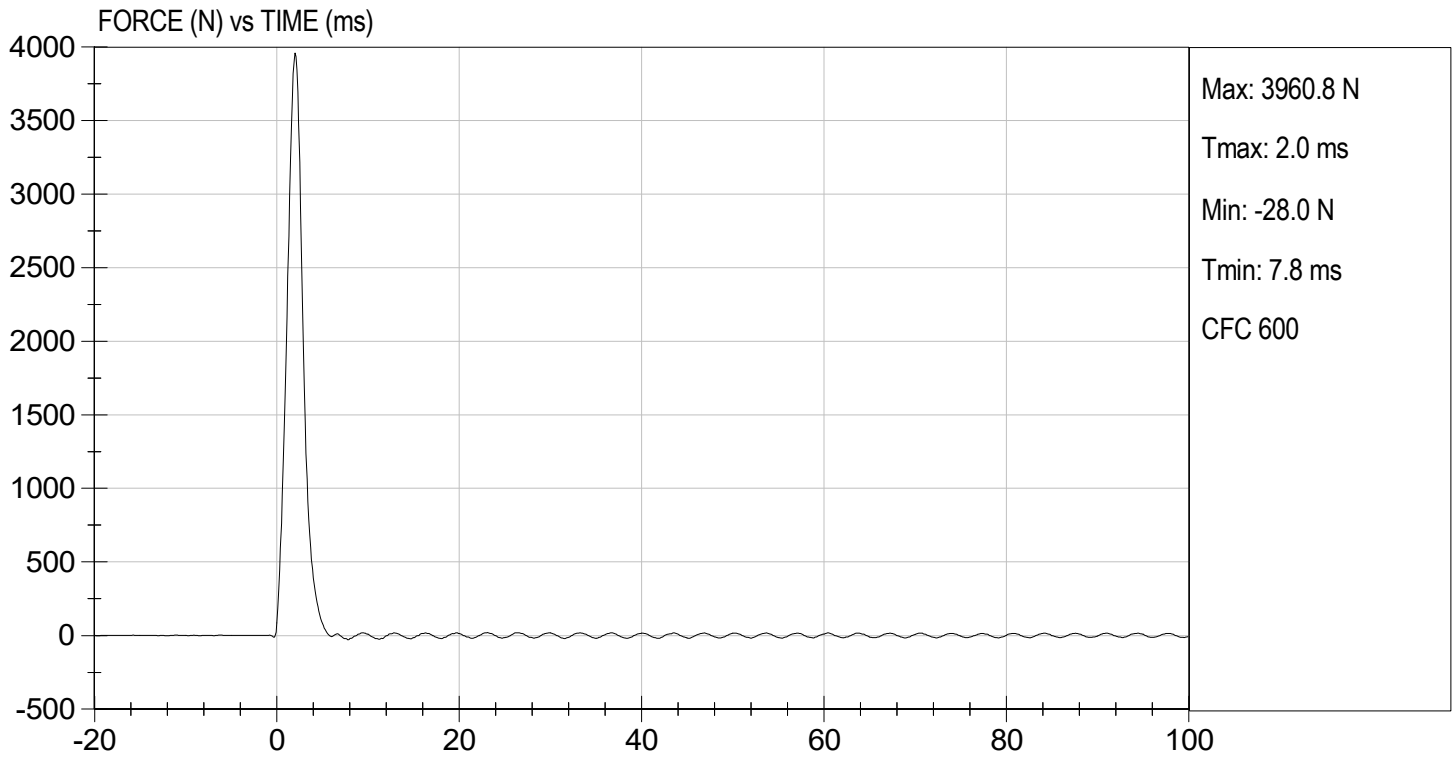


Approved By



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

TEST DATE: 08/30/2023
TEST #: D232325



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	7264CM47-2KTZ-360	T16416	06/09/2023	12/09/2023
(2) LATERAL	Endevco	7264CM47-2KTZ-360	T16420	06/09/2023	12/09/2023
(3) VERTICAL	Endevco	7264CM47-2KTZ-360	T22499	06/09/2023	12/09/2023
NECK TRANSDUCER	Denton	1716A	N742	08/09/2023	02/08/2024
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264CM47-2KTZ-360	T24766	06/09/2023	12/09/2023
(2) LATERAL	Endevco	7264CM47-2KTZ-360	T24816	06/09/2023	12/09/2023
(3) VERTICAL	Endevco	7264CM47-2KTZ-360	T24796	06/09/2023	12/09/2023
CHEST POTENTIOMETER	Humanetics	880105-1080	ER6928	06/08/2023	12/08/2023
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Humanetics	2121AJLN2	F2181	06/08/2023	12/08/2023
(2) LEFT FEMUR	GSE	2430	F9428	06/08/2023	12/08/2023
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/17/2023	01/16/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P97372	05/22/2023	11/21/2023
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-420	P82128	06/01/2023	12/01/2023
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	4707	08/11/2023	02/10/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	7297	08/11/2023	02/10/2024

LABORATORY TECHNICIAN: 

HEAD DROP TEST (572.132) (5th Female)

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: 24.8 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	$250 \text{ g} \leq x \leq 300 \text{ g}$	263 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 $\leq 15 \text{ g}$	5.2 g

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


Signature

09/14/2023
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

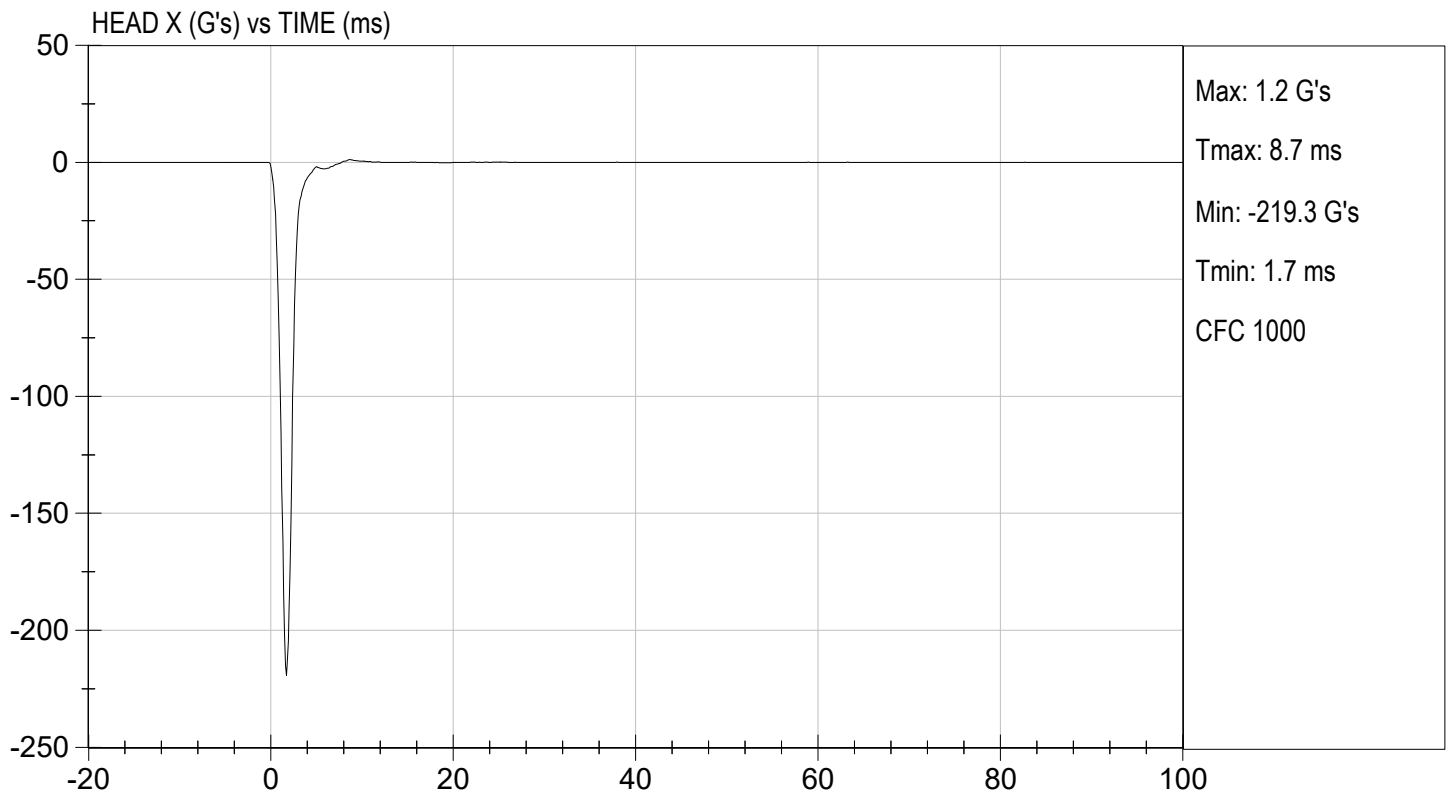
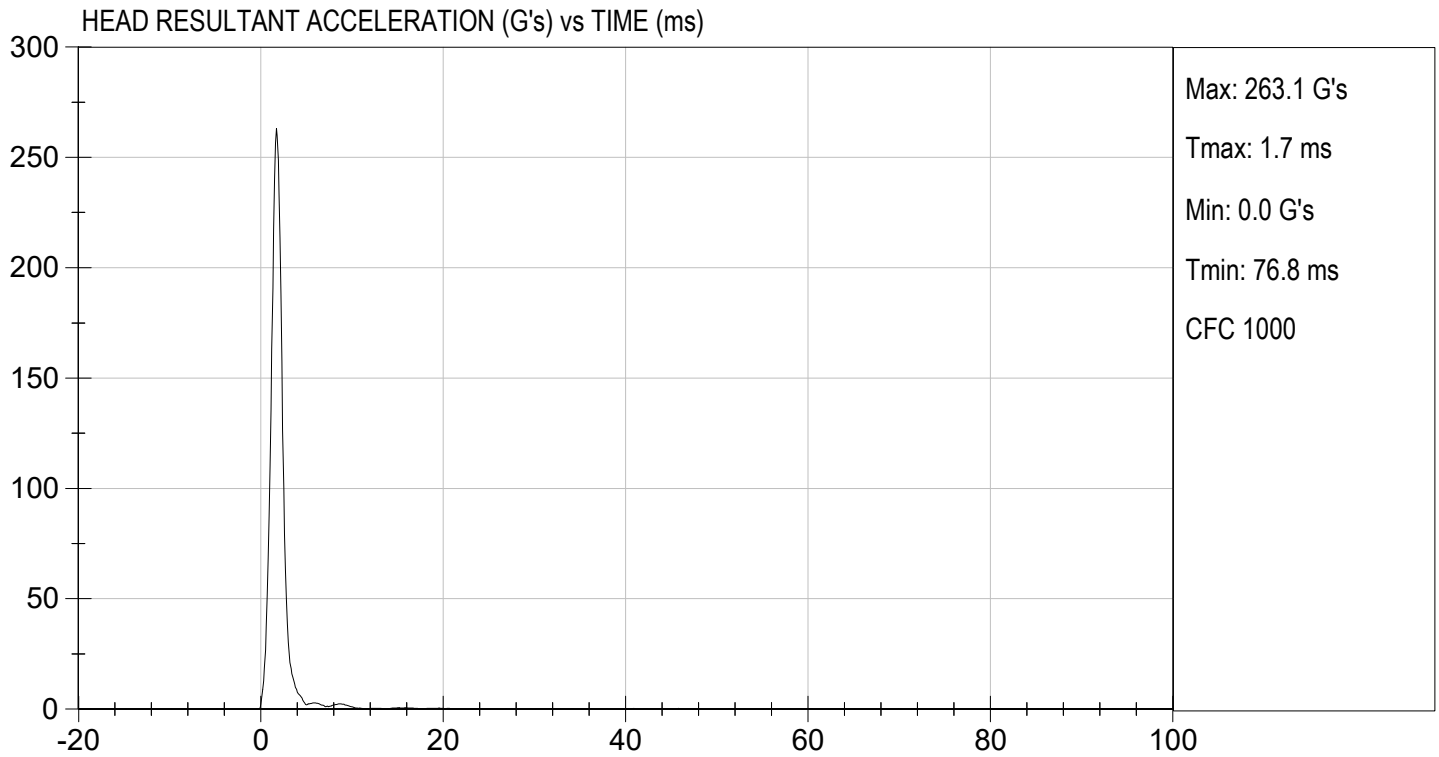
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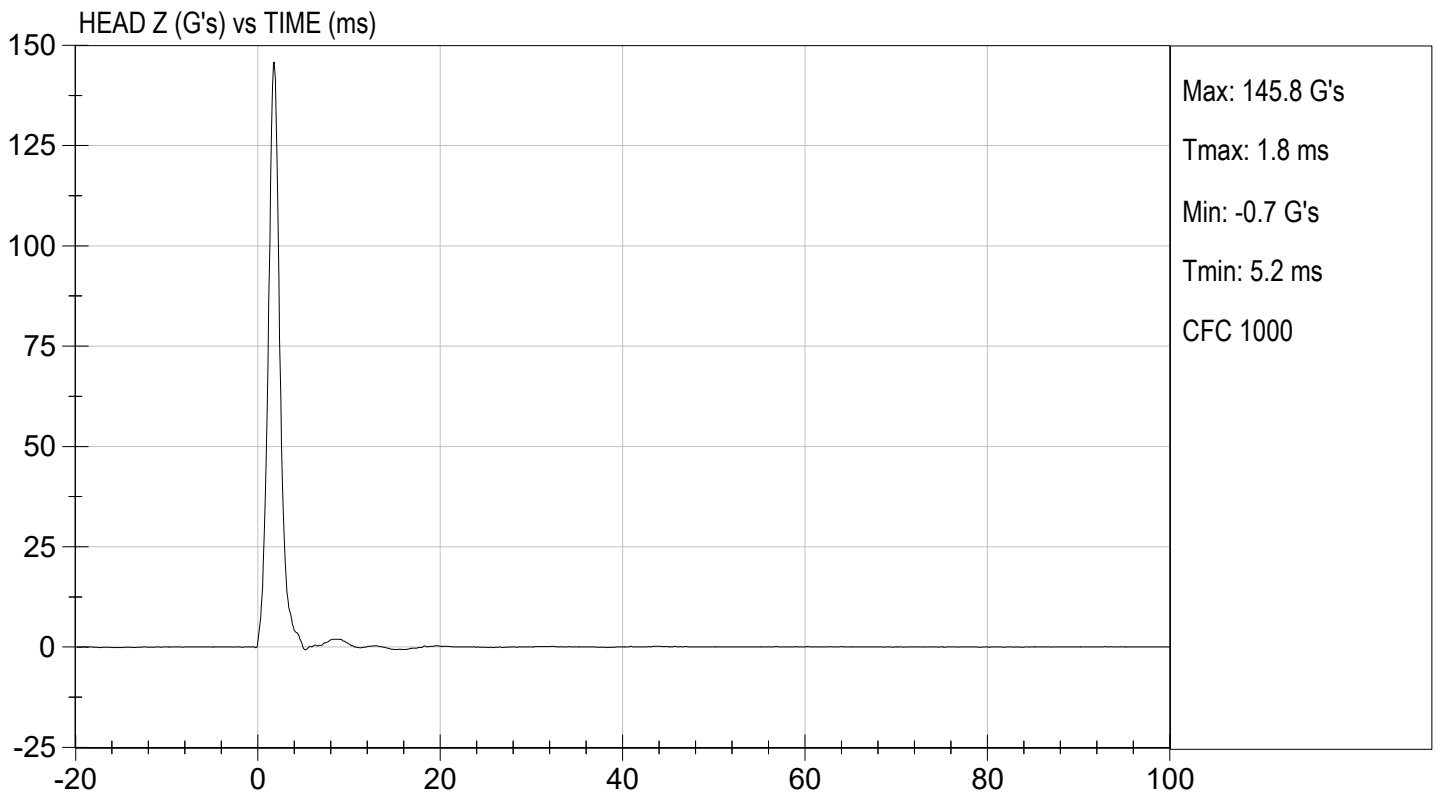
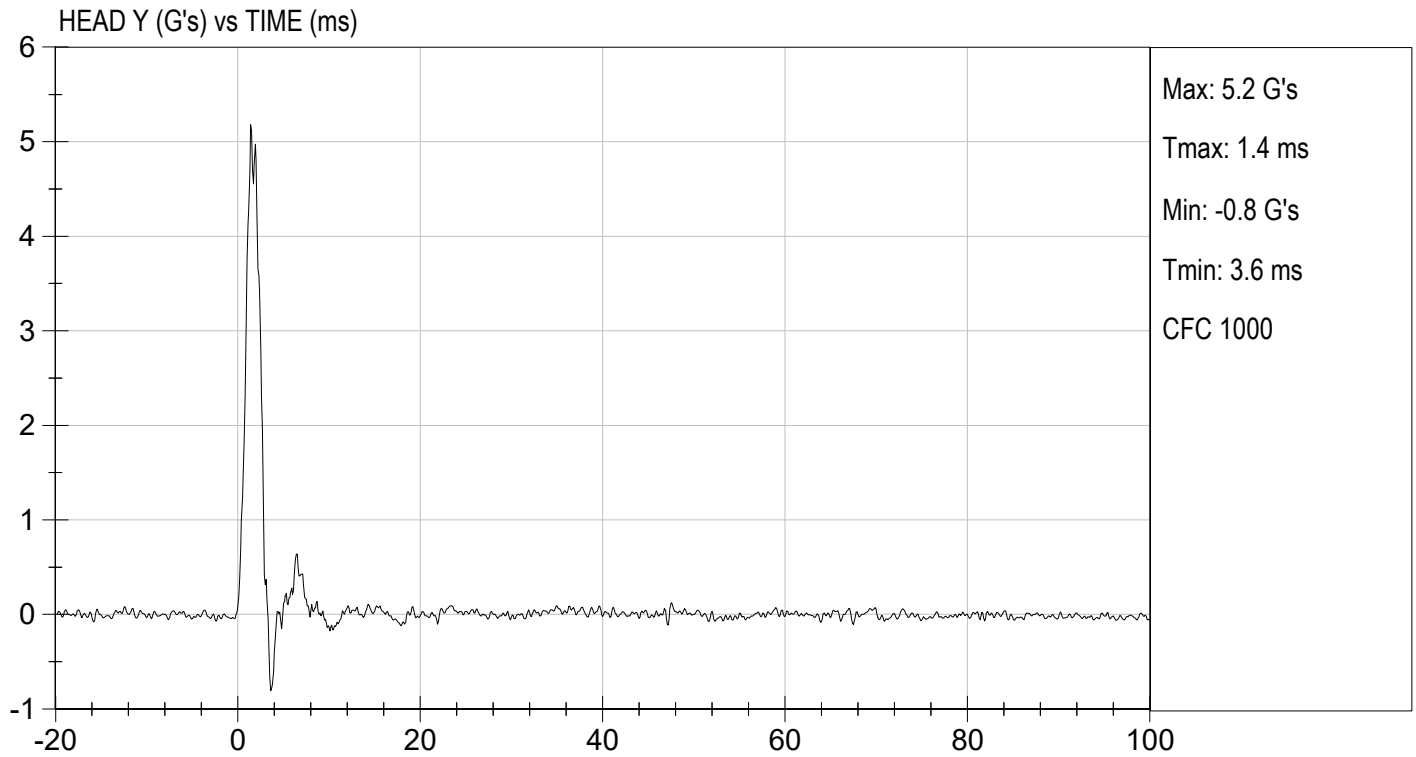
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	250 to 300	263	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


 Laboratory Technician

09/14/2023
 Test Date


 Approved By





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

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

- 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>21.3°C</u> |
| Record the minimum temperature: | <u>20.3°C</u> |
| Record the maximum humidity: | <u>41%</u> |
| Record the minimum humidity: | <u>31%</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		$6.89 \text{ m/s} \leq \text{speed} \leq 7.13 \text{ m/s}$	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$2.1 \text{ m/s} \leq \Delta V \leq 2.5 \text{ m/s}$	2.3 m/s
	@ 20 ms	$4.0 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.4 m/s
	@ 30 ms	$5.8 \text{ m/s} \leq \Delta V \leq 7.0 \text{ m/s}$	6.3 m/s
Plane D Rotation		Peak moment* $69 \text{ Nm} \leq \text{moment} \leq 83 \text{ Nm}$ during the following rotation range $77^\circ \leq \text{angle} \leq 91^\circ$	71 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

09/14/2023
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232482

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	81	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	87	Pass
Overall Results					Pass



Laboratory Technician

09/14/2023

Test Date

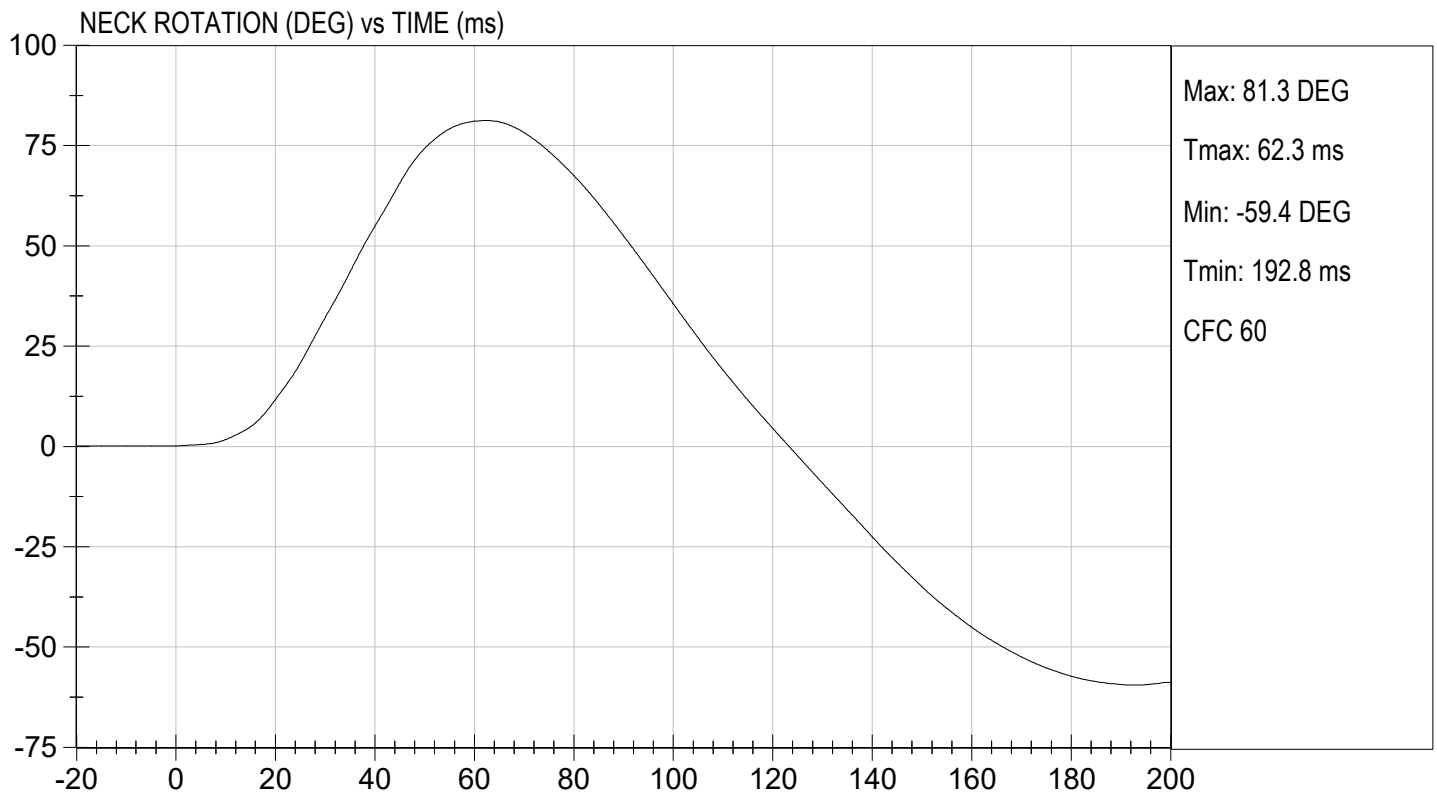
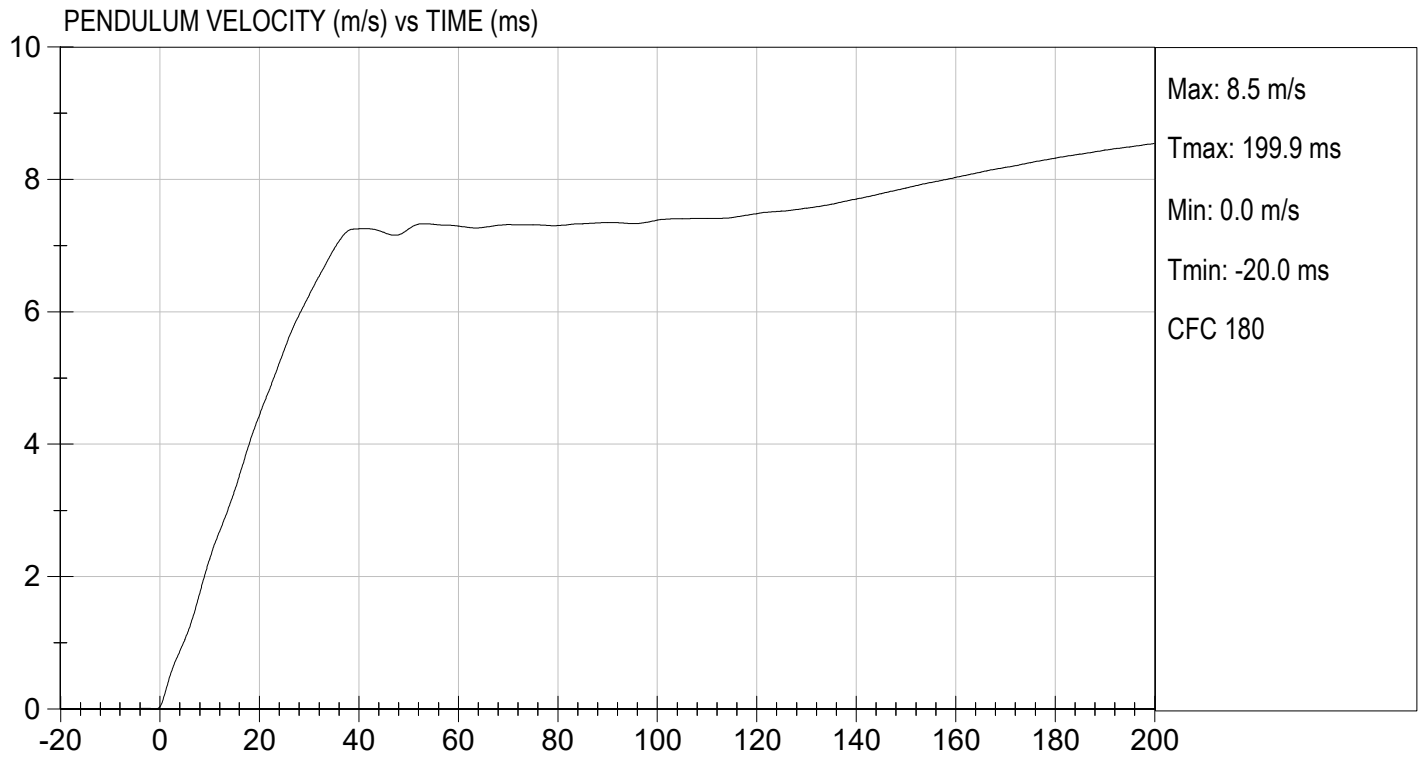


Approved By



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

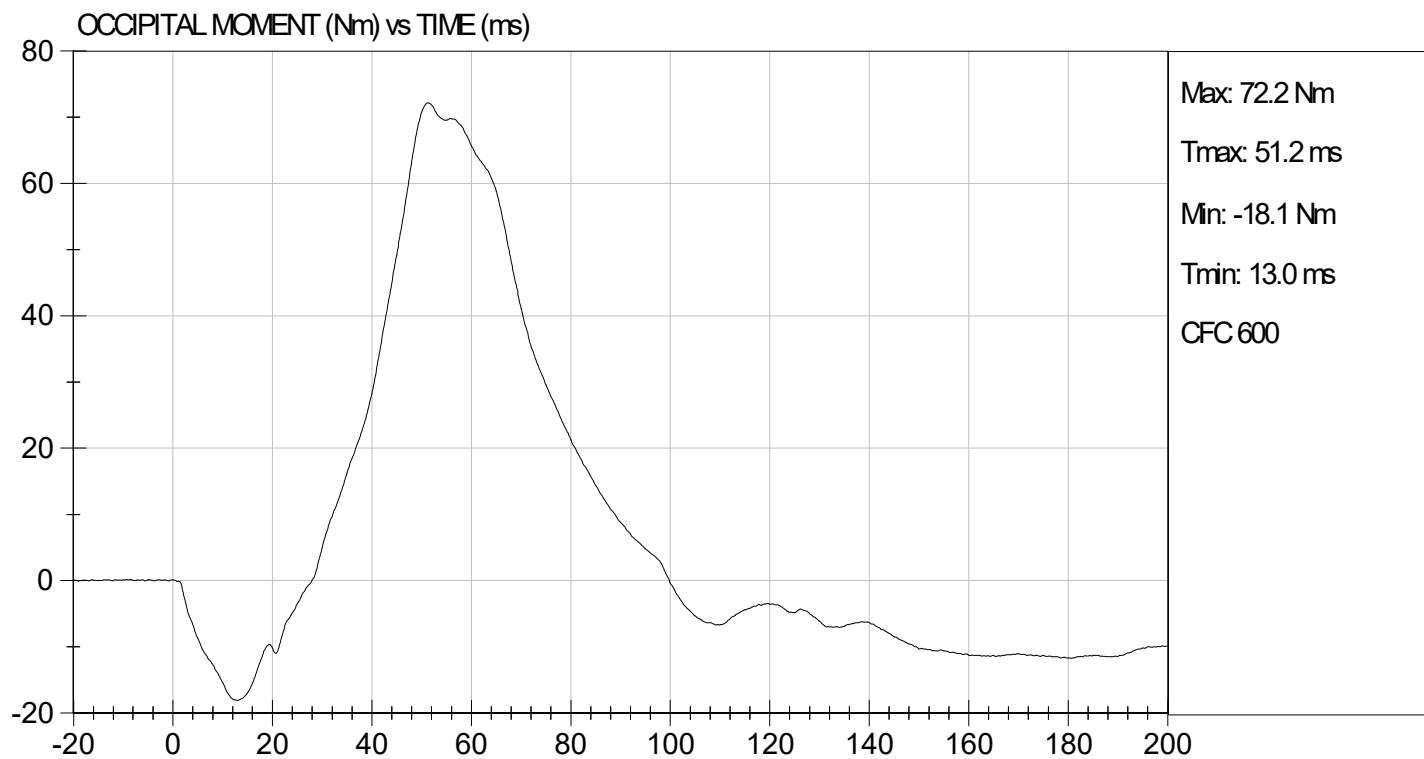
TEST DATE: 09/14/2023
TEST #: D232482





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

TEST DATE: 09/14/2023
TEST #: D232482



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

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

- ☐ 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>21.2°C</u> |
| Record the minimum temperature: | <u>19.9°C</u> |
| Record the maximum humidity: | <u>41%</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 (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	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.5 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 $99^\circ \leq \text{angle} \leq 114^\circ$	-54 Nm @ 112 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	106 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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


Signature

09/14/2023
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232483

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum Speed		m/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	112	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	106	Pass
Overall Results					Pass


 Laboratory Technician

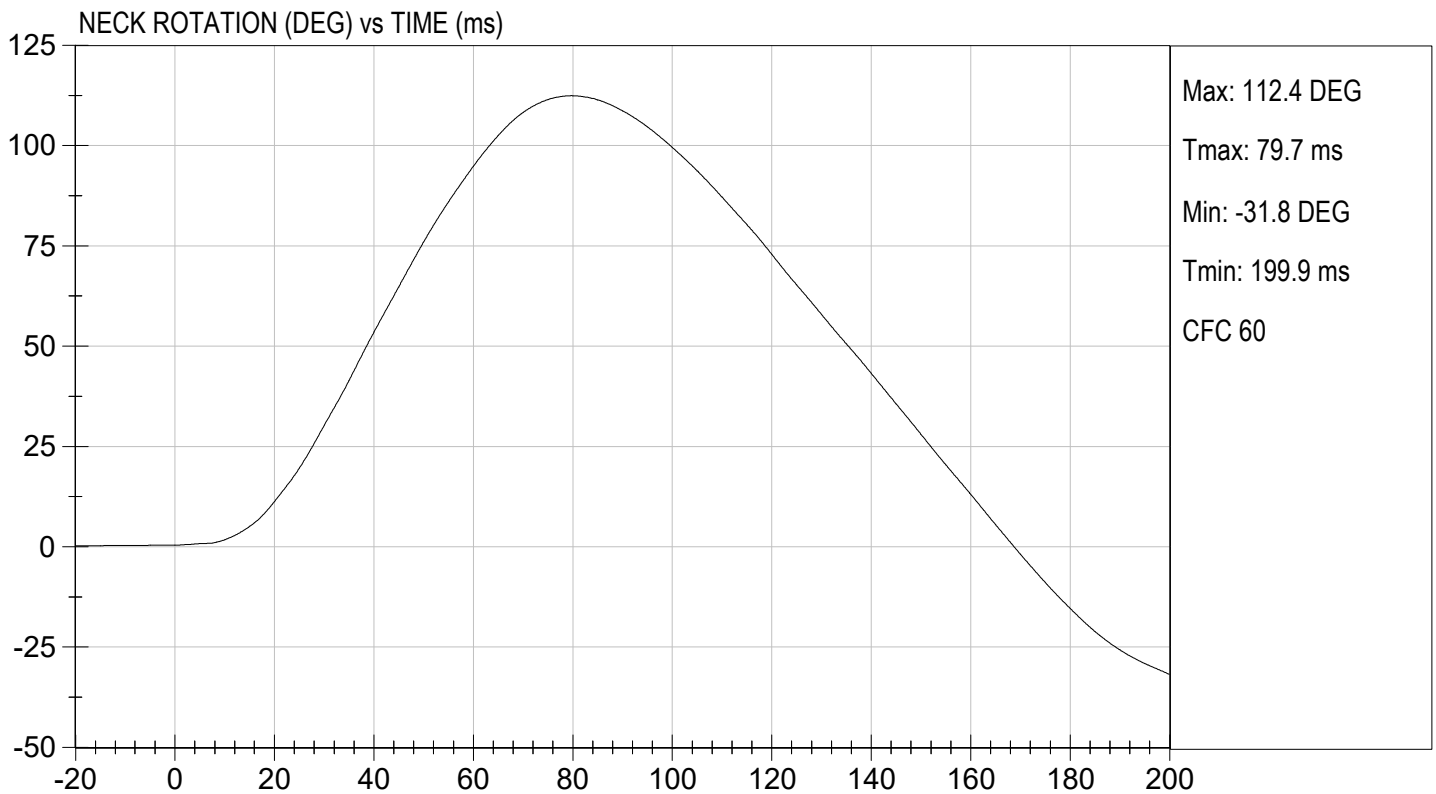
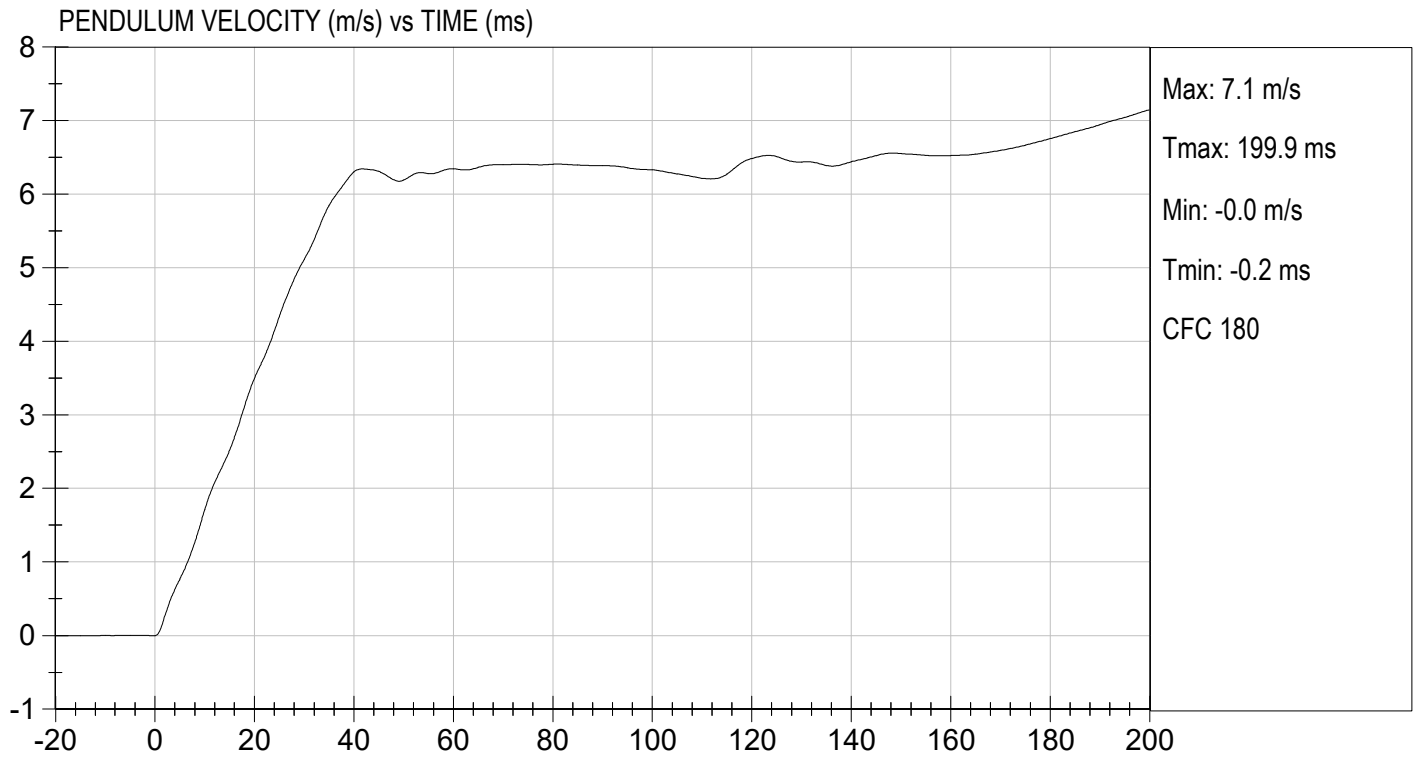
09/14/2023
 Test Date


 Approved By



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

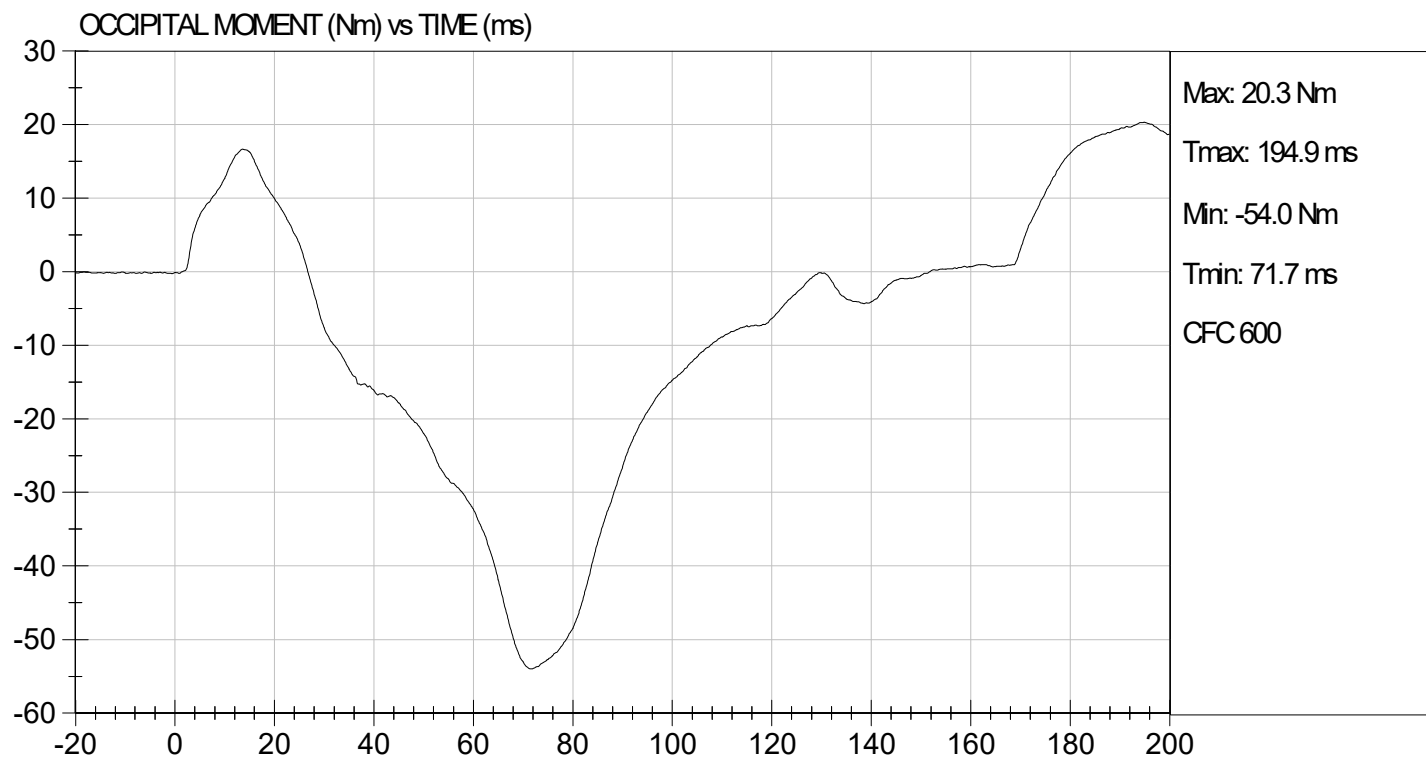
TEST DATE: 09/14/2023
TEST #: D232483





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

TEST DATE: 09/14/2023
TEST #: D232483



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

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

- ☐ 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>21.3°C</u>
Record the minimum temperature:	<u>20.0°C</u>
Record the maximum humidity:	<u>44%</u>
Record the minimum humidity:	<u>34%</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	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	54.0 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4196 N
Peak Force** between 18.0 and 50.0 mm chest compression	$\text{Peak Force} \leq 4600 \text{ N}$	4220 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	76%

*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

09/14/2023
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232484

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4196	Pass
Internal Hysteresis	%	69 to 85	76	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4220	Pass
Overall Test Results				Pass



Laboratory Technician

09/14/2023

Test Date

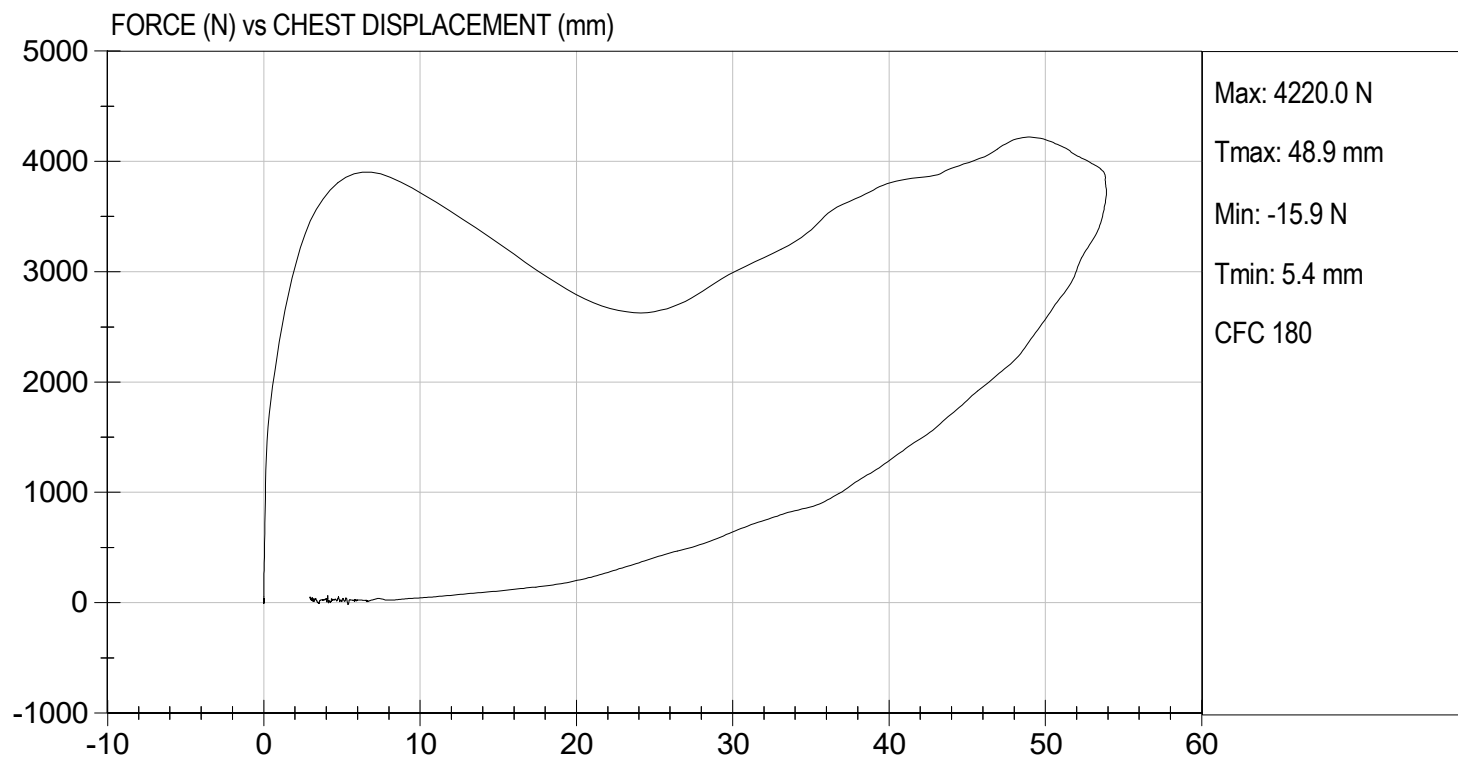


Approved By



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

TEST DATE: 09/14/2023
TEST #: D232484



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

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

- ☐ 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>21.2°C</u> |
| Record the minimum temperature: | <u>19.9°C</u> |
| Record the maximum humidity: | <u>42%</u> |
| Record the minimum humidity: | <u>32%</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°	17 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	338 N
Final ref. plane angle	Initial ref. plane angle ± 8°	4 deg


 Signature

09/14/2023
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232487

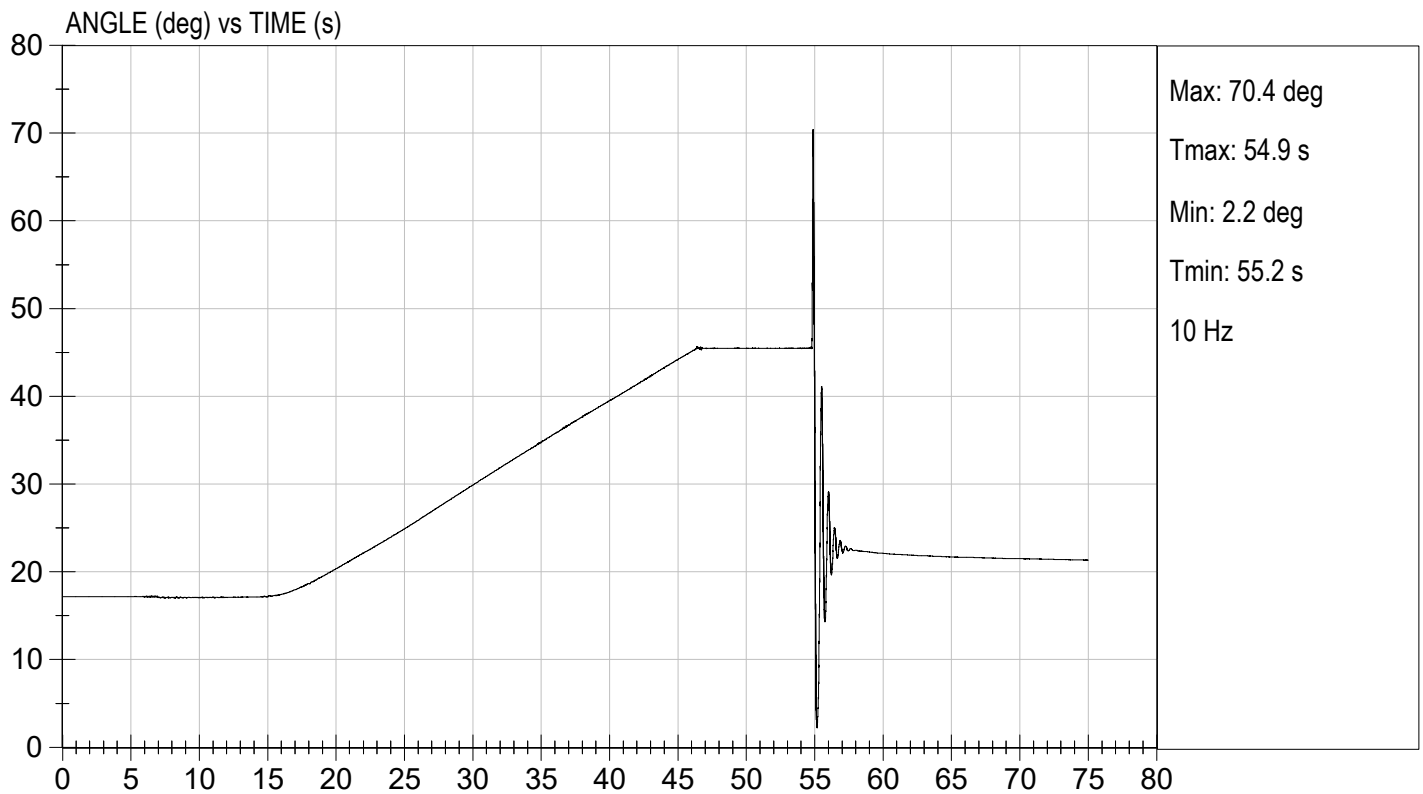
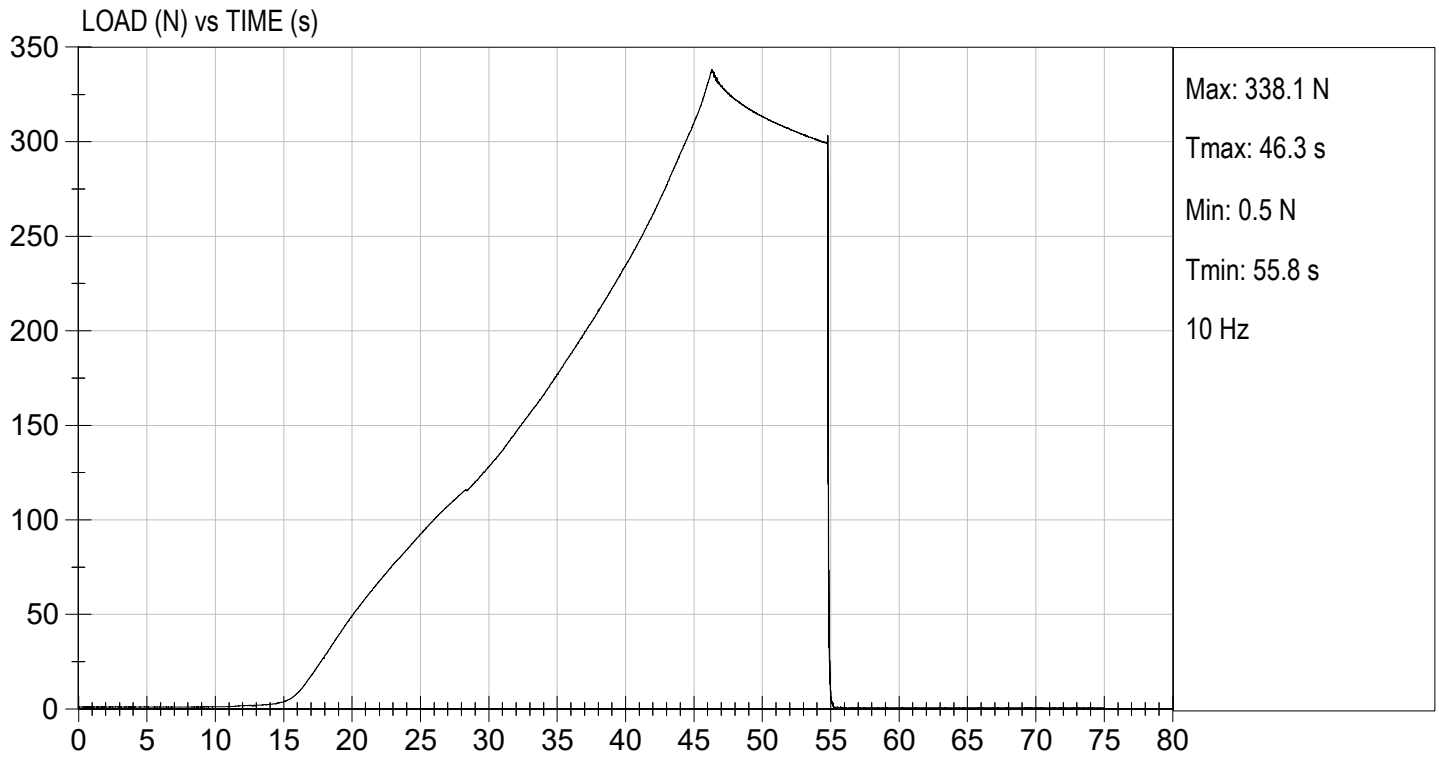
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	338	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

09/14/2023

Test Date


Approved By



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

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

- ☐ 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 (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.3°C</u> |
| Record the maximum humidity: | <u>45%</u> |
| Record the minimum humidity: | <u>35%</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	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3872 N

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

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


Signature

09/14/2023
Date

MGA RESEARCH CORPORATION

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

ATD Serial No: ER6928

Test I.D: D232486

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3872	Pass
Overall Test Results				Pass



Laboratory Technician

09/14/2023

Test Date

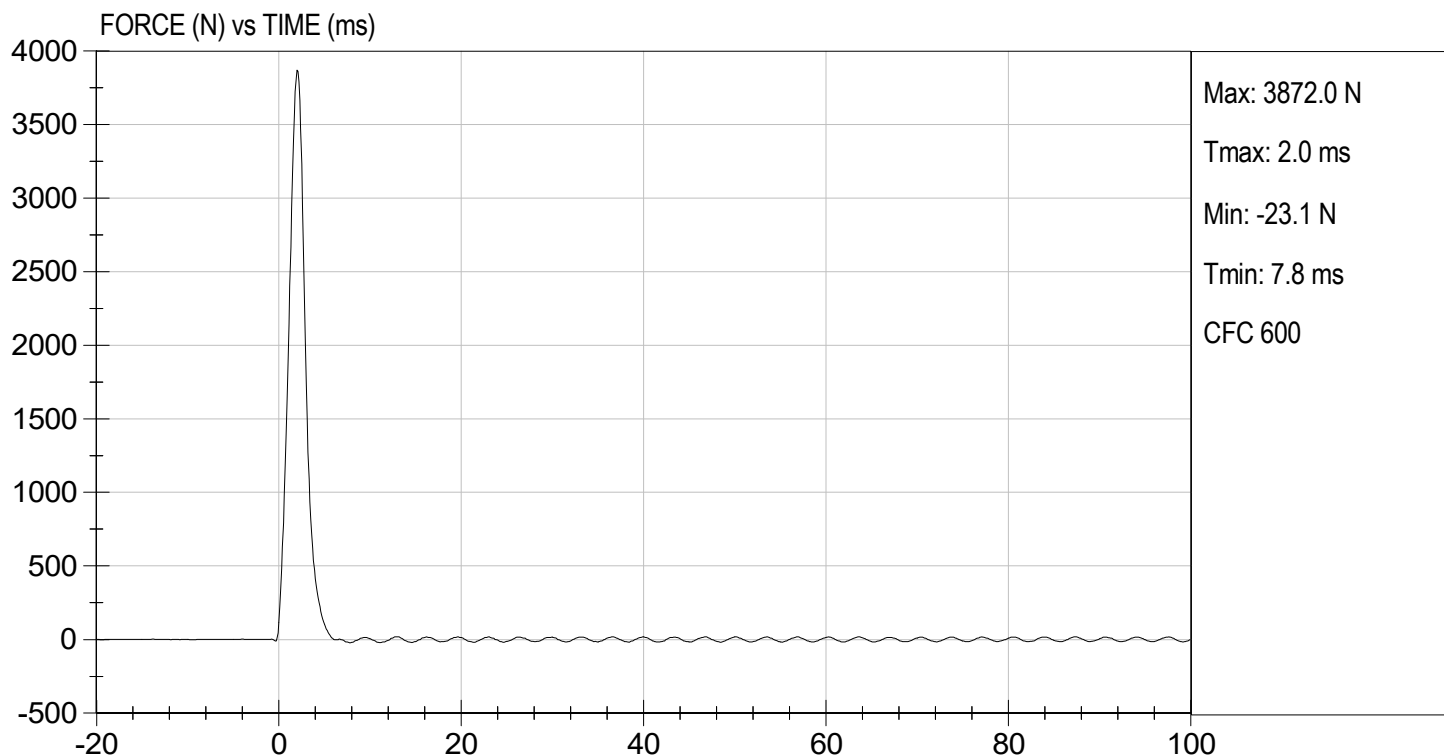


Approved By



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

TEST DATE: 09/14/2023
TEST #: D232486



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

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

- ☐ 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>21.3°C</u>
Record the minimum temperature:	<u>20.3°C</u>
Record the maximum humidity:	<u>44%</u>
Record the minimum humidity:	<u>34%</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	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.11 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3892 N

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

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



Signature

09/14/2023
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: ER6928

Test I.D: D232485

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3892	Pass
Overall Test Results				Pass



Laboratory Technician

09/14/2023

Test Date

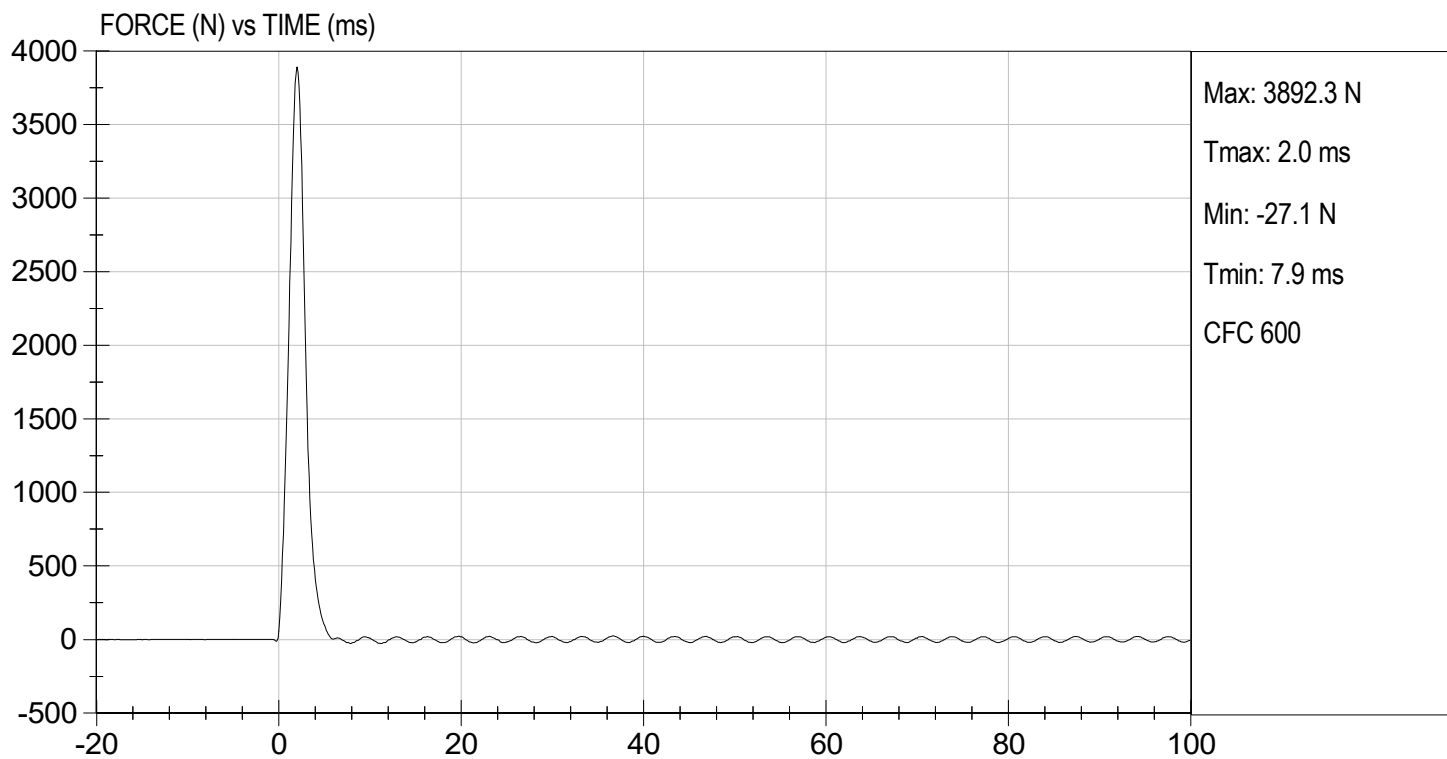


Approved By



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

TEST DATE: 09/14/2023
TEST #: D232485



DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: ER6928

Test Date: 09/14/2023

Technician: Jonah Pulokas

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.

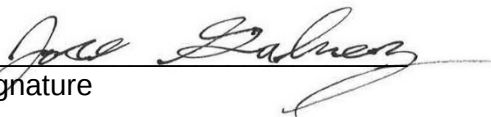
Repair or Replacement approved by:


Signature

09/14/2023
Date

Describe the repair or replacement of parts:

Checked by:


Signature

09/14/2023
Date

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	7264CM47-2KTZ-360	T16416	06/09/2023	12/09/2023
(2) LATERAL	Endevco	7264CM47-2KTZ-360	T16420	06/09/2023	12/09/2023
(3) VERTICAL	Endevco	7264CM47-2KTZ-360	T22499	06/09/2023	12/09/2023
NECK TRANSDUCER	Denton	1716A	N742	08/09/2023	02/08/2024
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264CM47-2KTZ-360	T24766	06/09/2023	12/09/2023
(2) LATERAL	Endevco	7264CM47-2KTZ-360	T24816	06/09/2023	12/09/2023
(3) VERTICAL	Endevco	7264CM47-2KTZ-360	T24796	06/09/2023	12/09/2023
CHEST POTENTIOMETER	Humanetics	880105-1080	ER6928	06/08/2023	12/08/2023
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	Humanetics	2121AJLN2	F2181	06/08/2023	12/08/2023
(2) LEFT FEMUR	GSE	2430	F9428	06/08/2023	12/08/2023
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AH5P1	07/17/2023	01/16/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P97372	05/22/2023	11/21/2023
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-420	P82128	06/01/2023	12/01/2023
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	4707	08/11/2023	02/10/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	7297	08/11/2023	02/10/2024

LABORATORY TECHNICIAN: 

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: 08/22/2023

Technician: Brian Roach

- 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>42%</u> |
| Record the minimum humidity | <u>33%</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: 24.8 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	$245 \text{ g} \leq x \leq 300 \text{ g}$	281 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 $\leq 15 \text{ g}$	4.7 g

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

Brian Road
Signature

08/22/2023
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

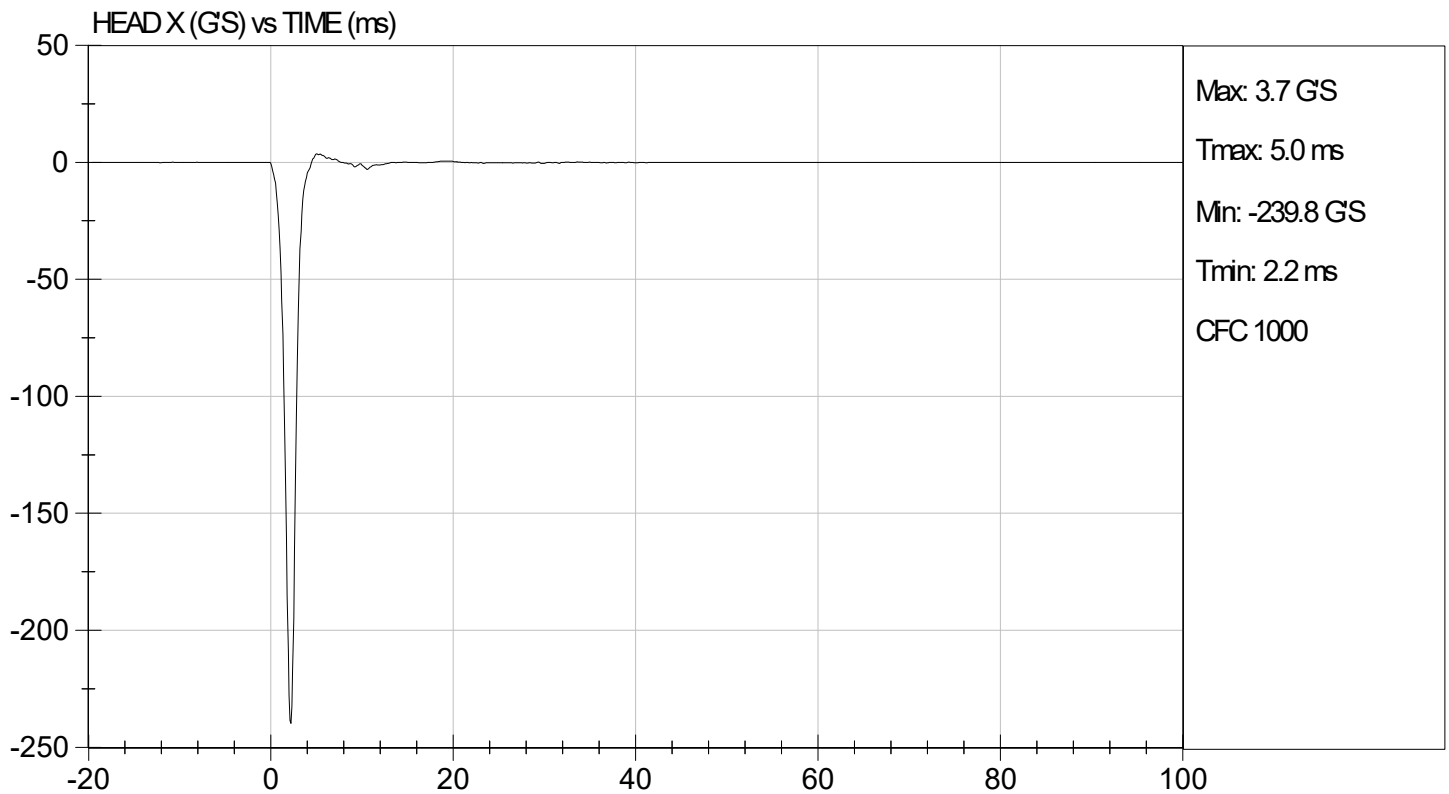
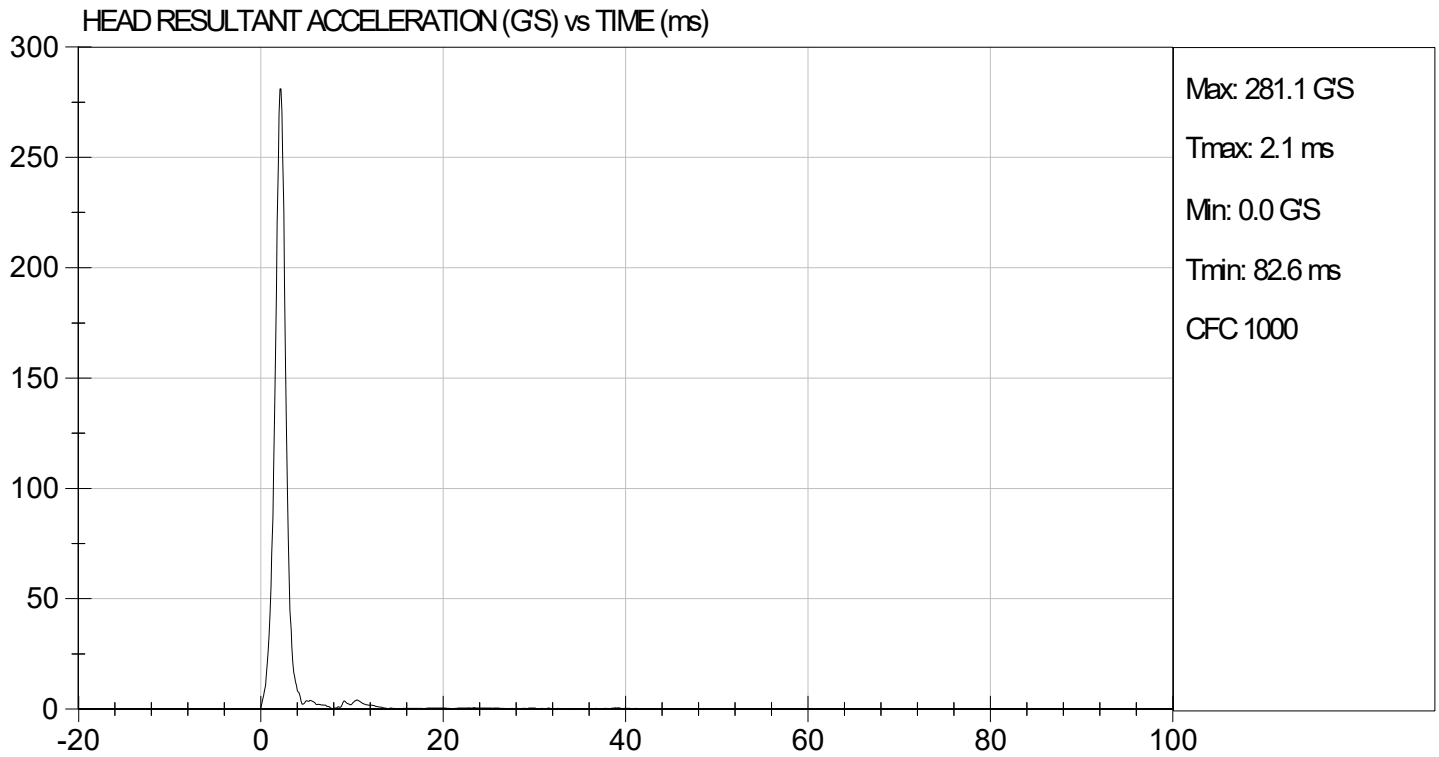
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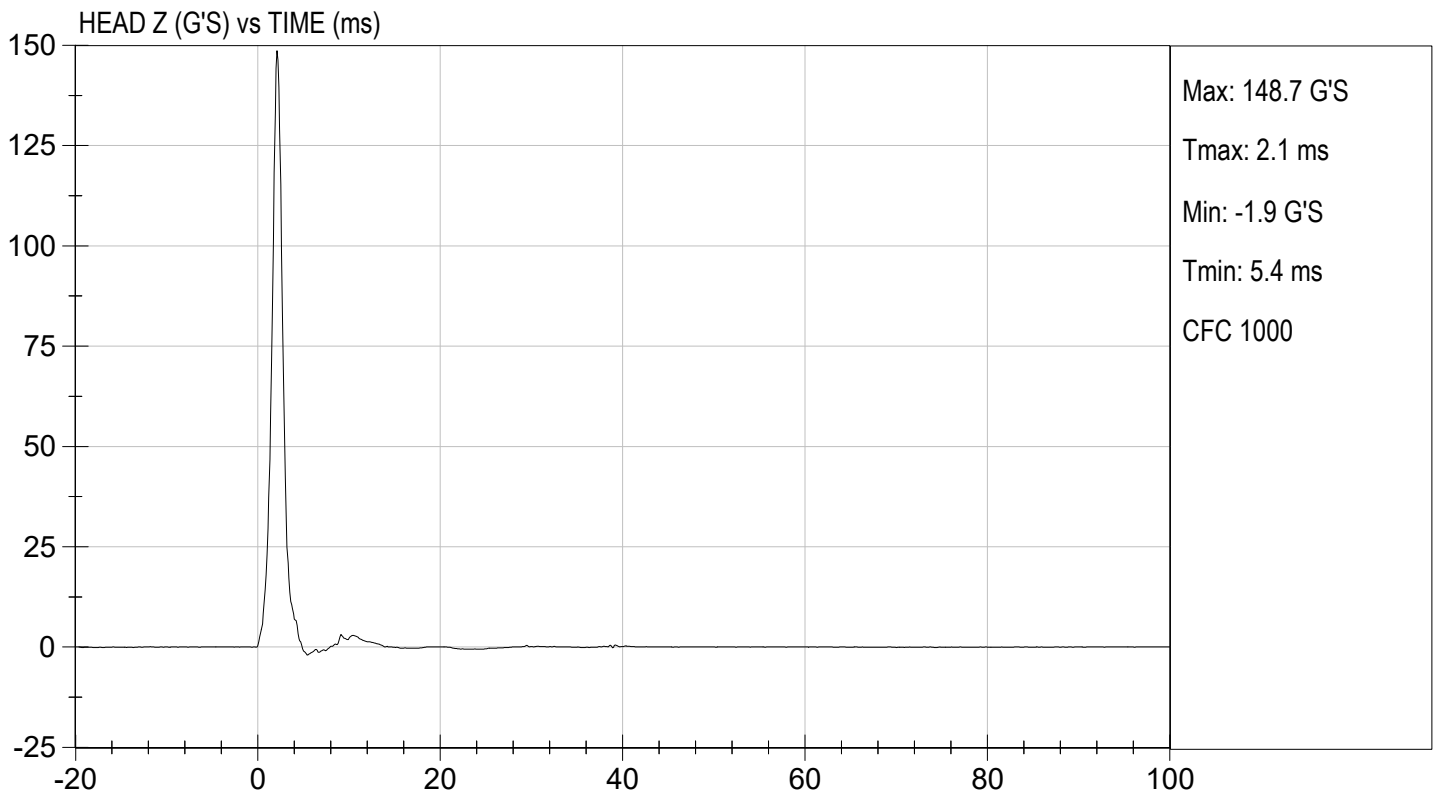
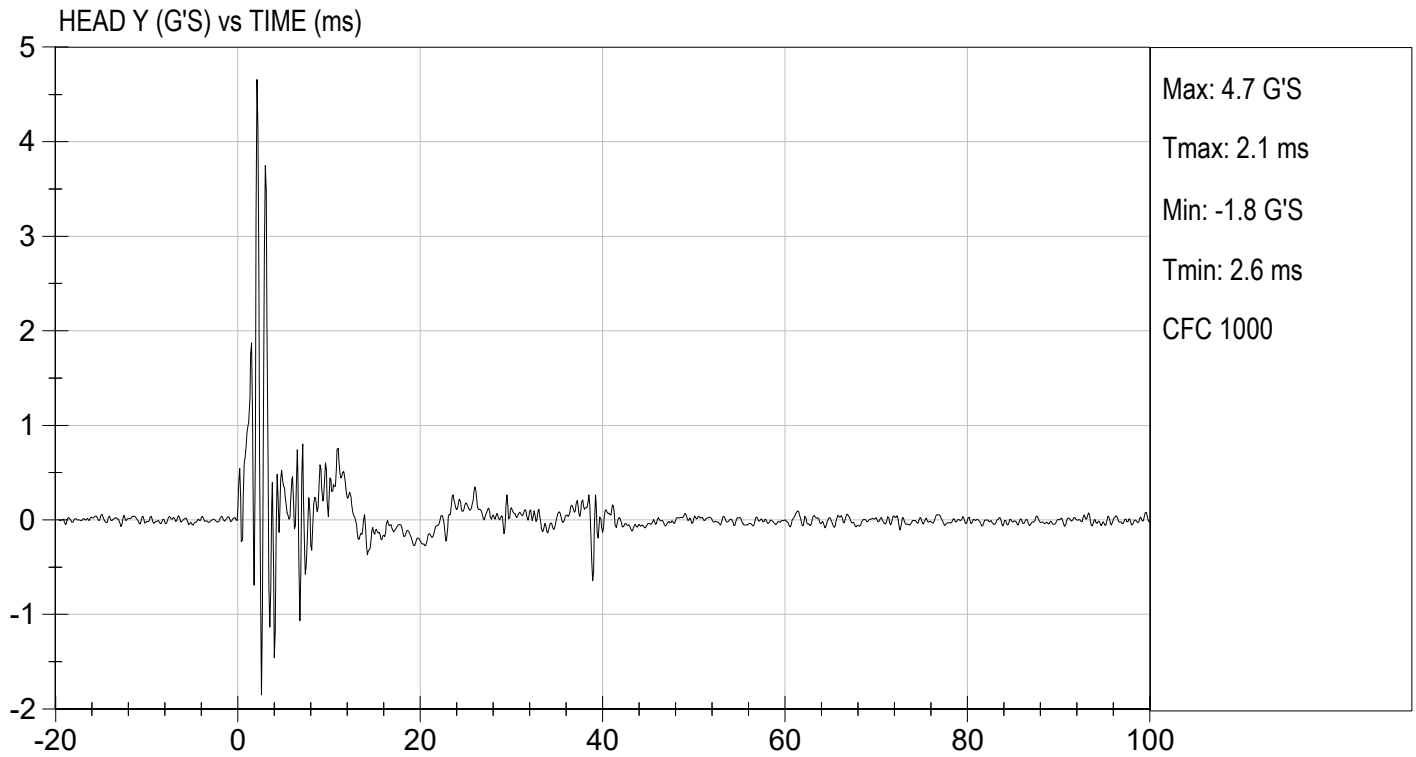
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	245 to 300	281	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

08/22/2023
Test Date


Approved By





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

Dummy Serial Number: 155

Test Date: 08/22/2023

Technician: Brain Roach

- 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 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>42%</u> |
| Record the minimum humidity | <u>33%</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	4.89 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	1.2 m/s $\leq \Delta V \leq$ 1.6 m/s	1.4 m/s
	@ 20 ms	2.4 m/s $\leq \Delta V \leq$ 3.4 m/s	2.8 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 $74^\circ \leq$ angle $\leq$ 92°	30.1 Nm @ 79 degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm 103 ms $\leq$ time $\leq$ 123 ms	114 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.

Brian Road
Signature

08/22/2023
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D232112

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	42	Pass
Pendulum Speed		m/s	4.83 to 5.07	4.89	Pass
Pendulum Velocity	10 ms	m/s	1.2 to 1.6	1.4	Pass
	20 ms	m/s	2.4 to 3.4	2.8	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	30.1	Pass
Positive Moment Time Curve Decay to 5 Nm		ms	103 to 123	114	Pass
Overall Results					Pass


 Laboratory Technician

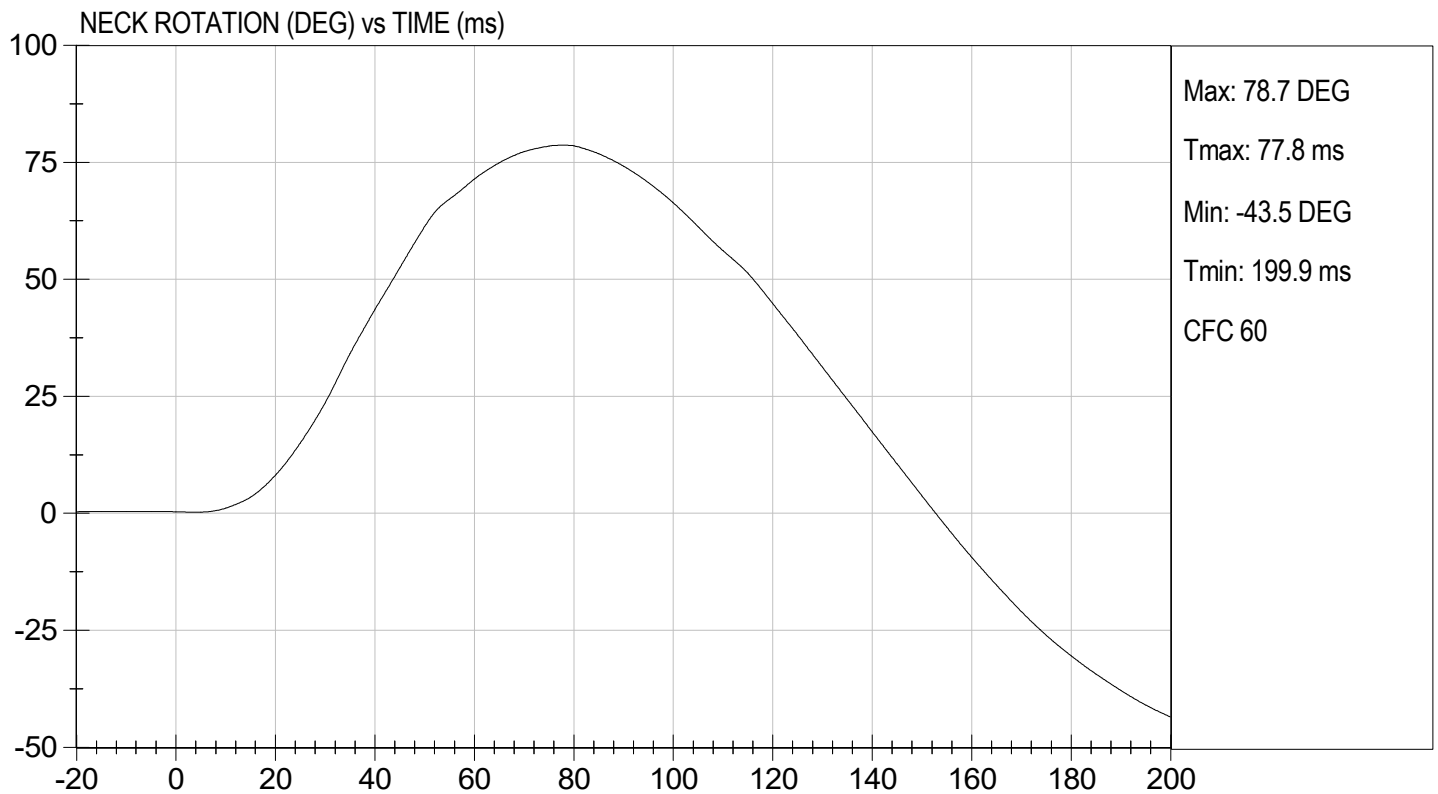
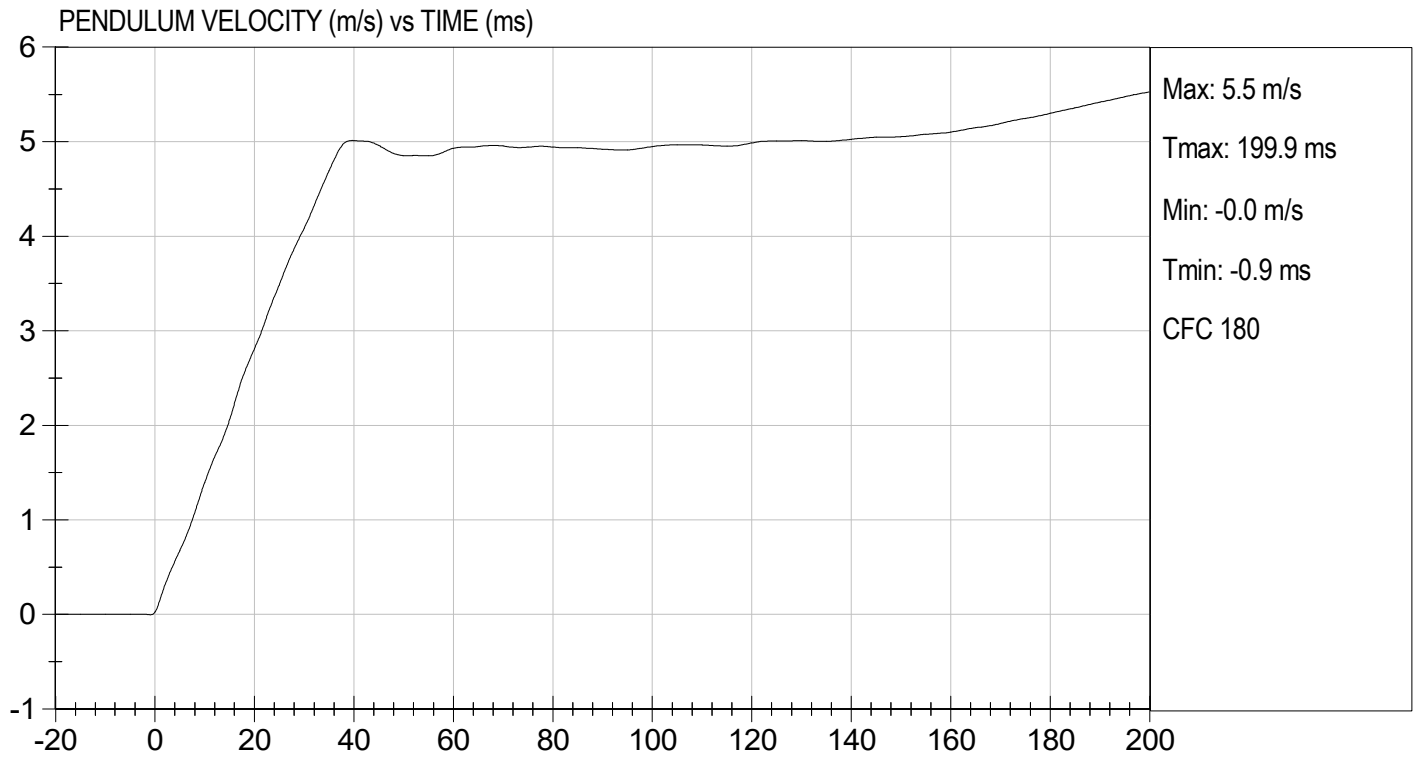
08/22/2023
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 16.03 ft/s, 4.89 m/s

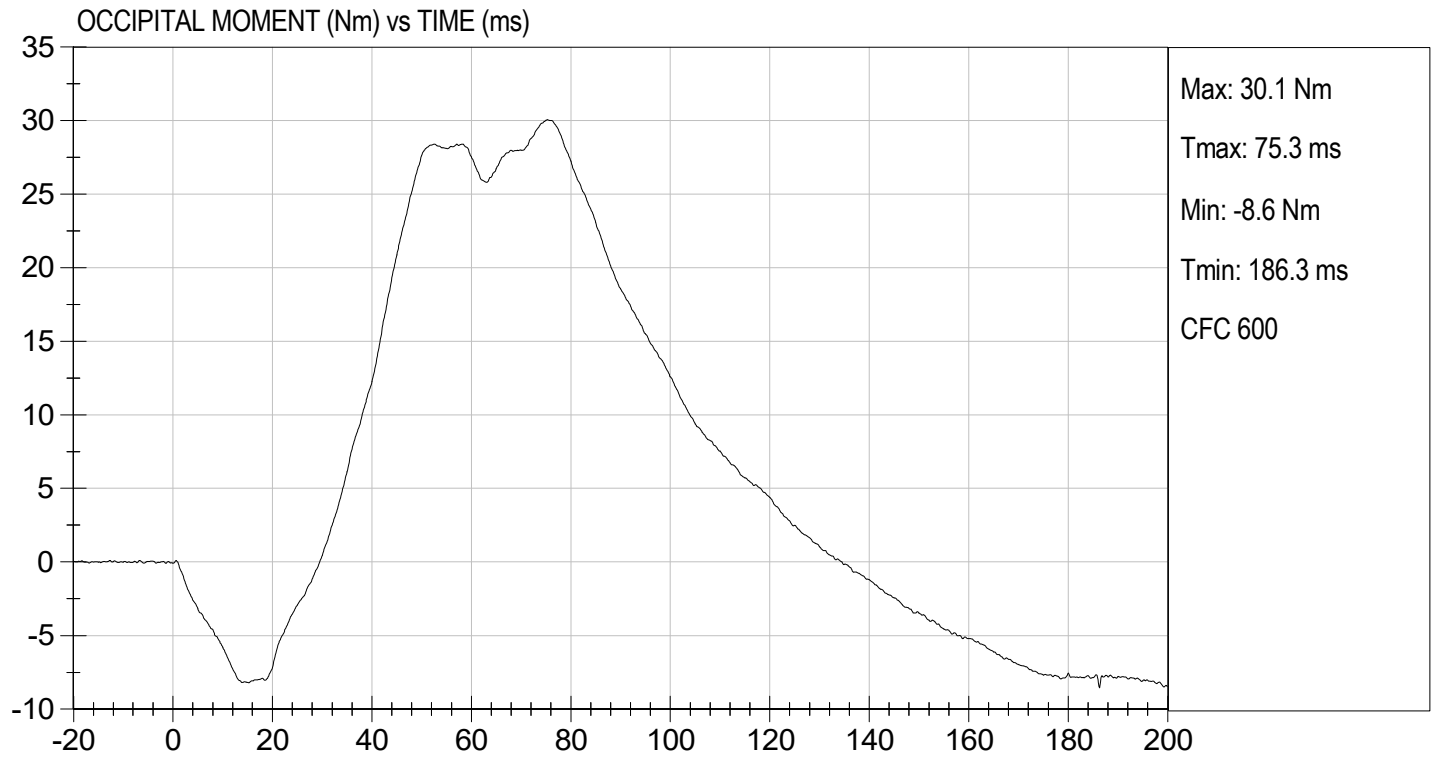
TEST DATE: 08/22/2023
TEST #: D232112





TEST DESC: NECK FLEXION
VELOCITY: 16.03 ft/s, 4.89 m/s

TEST DATE: 08/22/2023
TEST #: D232112



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

Dummy Serial Number: 155

Test Date: 08/22/2023

Technician: Brian Roach

- 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>42%</u> |
| Record the minimum humidity | <u>33%</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		$4.18 \text{ m/s} \leq \text{speed} \leq 4.42 \text{ m/s}$	4.27 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.3 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.4 m/s
	@ 30 ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.6 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	-21 Nm @ 93 degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	138 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.

Brian Road
Signature

08/22/2023
Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D232113

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	42	Pass
Pendulum Speed		m/s	4.18 to 4.42	4.27	Pass
Pendulum Velocity	10 ms	m/s	1.0 to 1.4	1.3	Pass
	20 ms	m/s	2.2 to 3.0	2.4	Pass
	30 ms	m/s	3.2 to 4.2	3.6	Pass
D Plane Rotation	Max	deg	85 to 103	93	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	138	Pass
Overall Results					Pass



Laboratory Technician

08/22/2023

Test Date

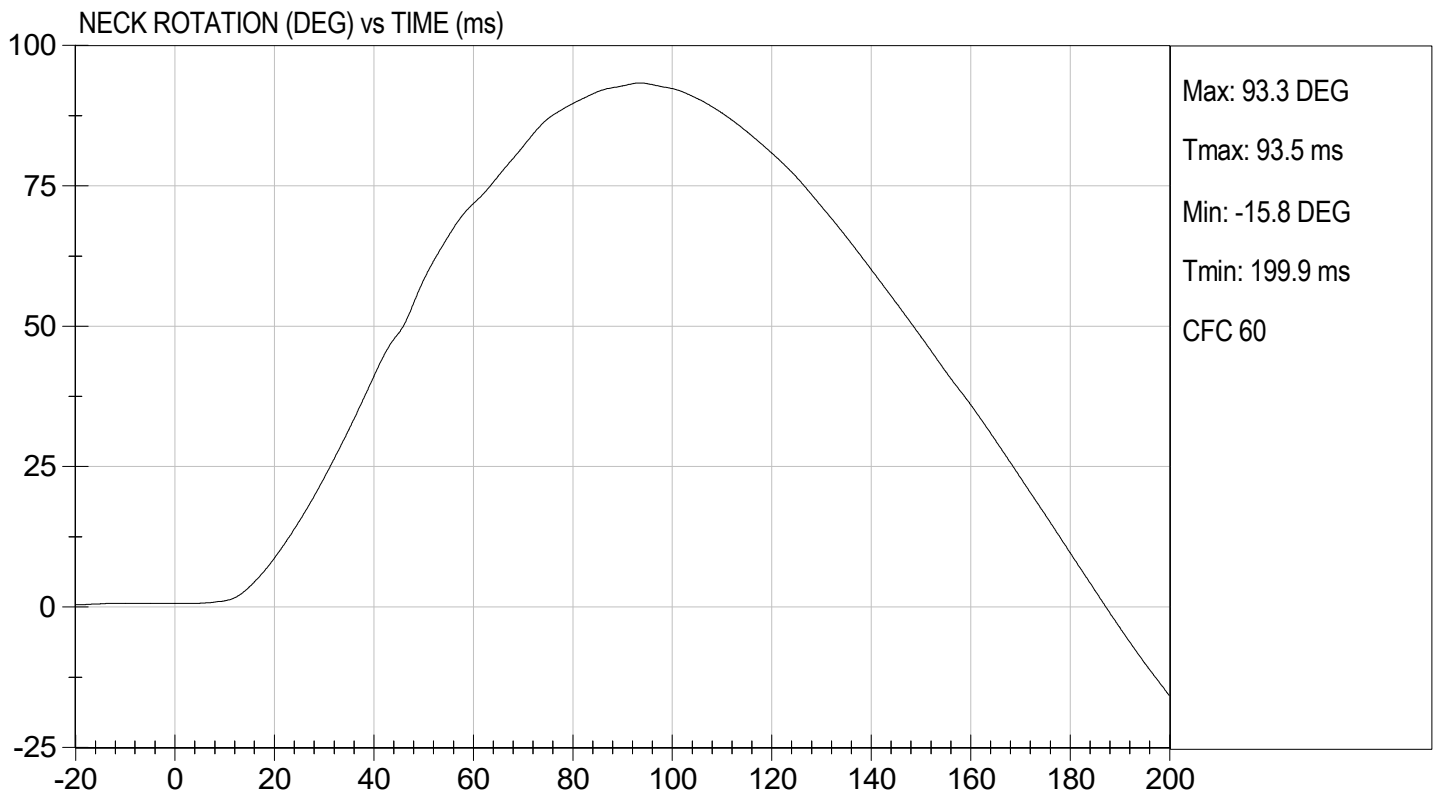
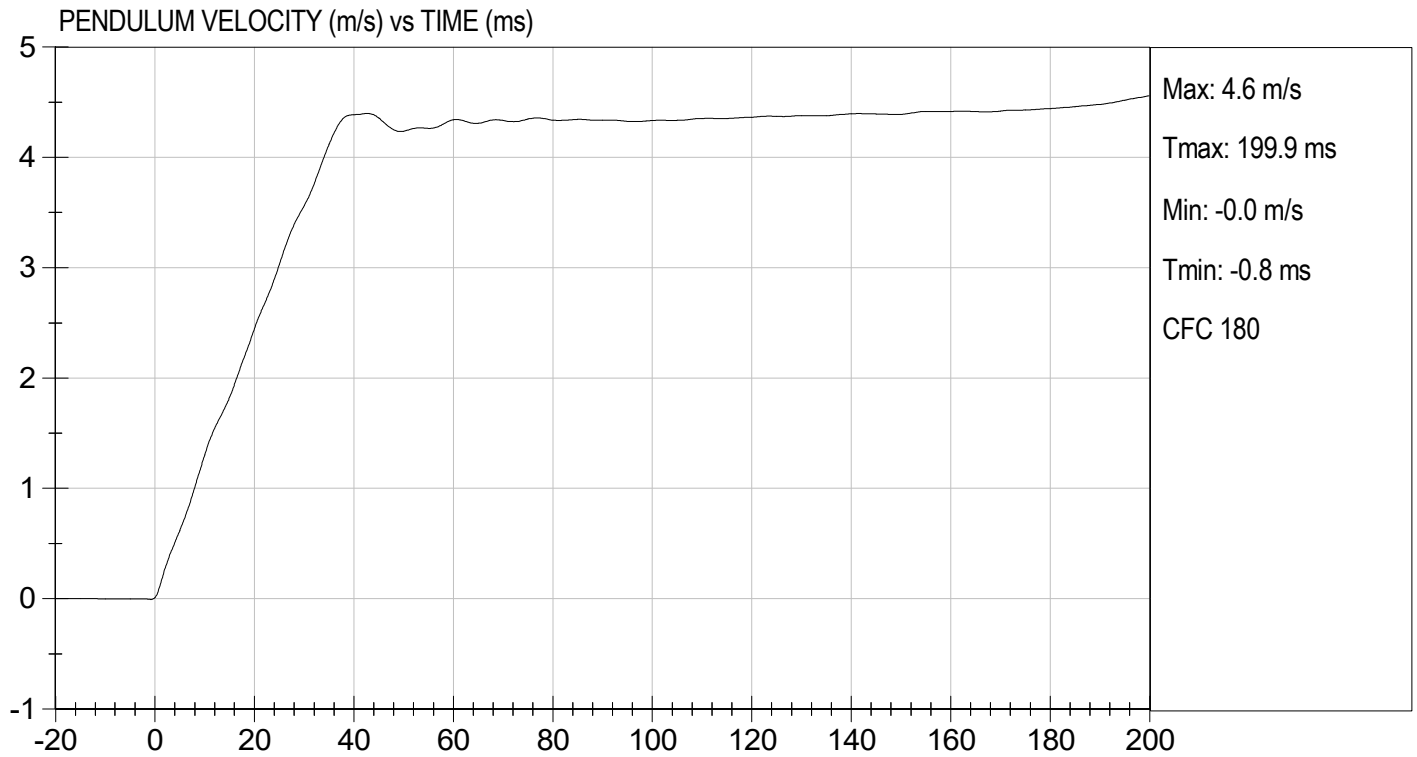


Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 14.01 ft/s, 4.27 m/s

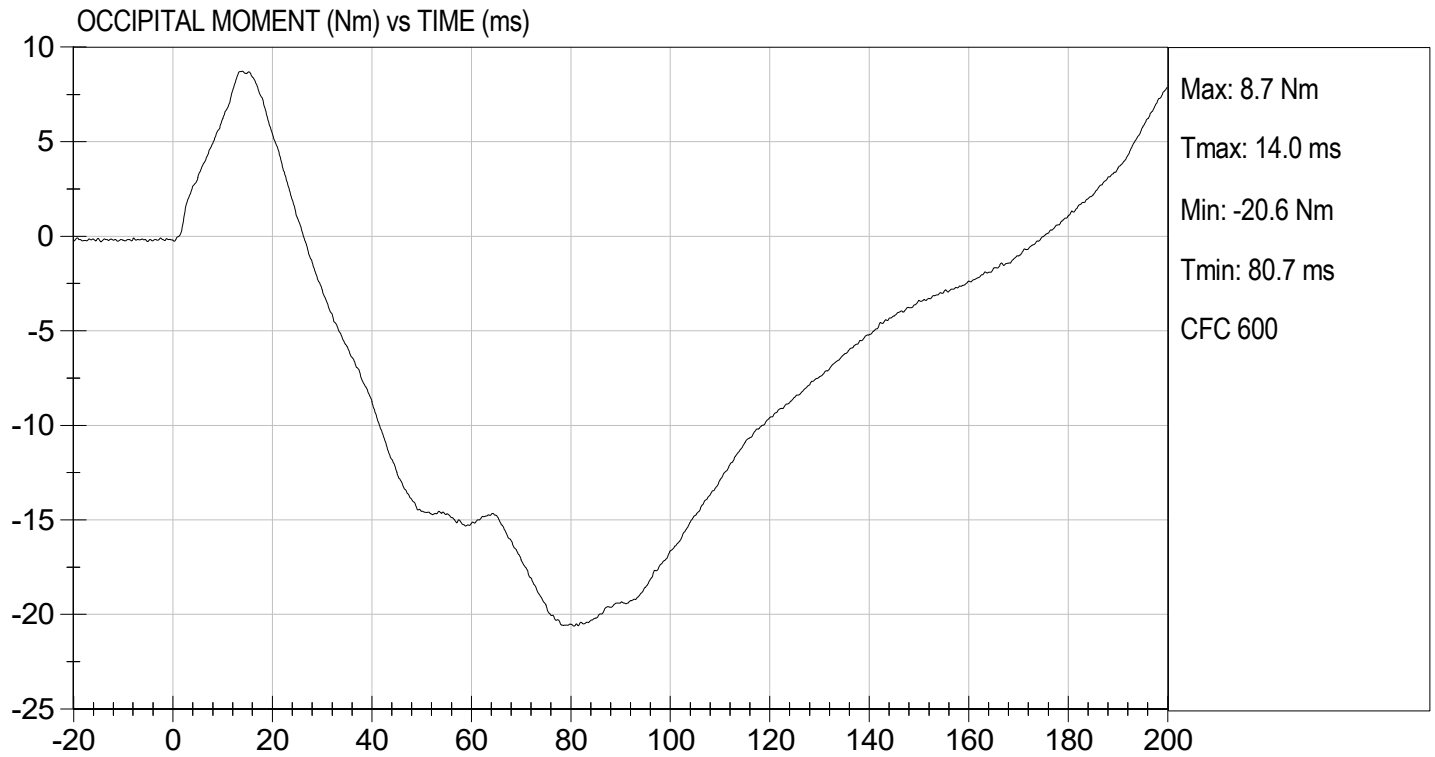
TEST DATE: 08/22/2023
TEST #: D232113





TEST DESC: NECK EXTENSION
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 08/22/2023
TEST #: D232113



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

Dummy Serial Number: 155

Test Date: 08/07/2023

Technician: Brian Roach

- ☒ 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>21.3°C</u>
Record the minimum temperature	<u>21.1°C</u>
Record the maximum humidity	<u>42%</u>
Record the minimum humidity	<u>33%</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))

- ☒ 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	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	41.5 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1257 N
Peak force** between 12.5 and 38.0 mm chest compression	Peak force $\leq 1500 \text{ N}$	1370 N
Internal Hysteresis***	$65\% \leq \text{hysteresis} \leq 85\%$	72%

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

**Force = impactor mass x acceleration

***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.

Brian Roach
Signature

08/07/2023
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D232114

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	38.0 to 46.0	41.5	Pass
Peak Resistive Force w/in Deflection Corridor	N	1150 to 1380	1,257	Pass
Internal Hysteresis	%	65 to 85	72	Pass
Peak Force 12.5 mm - 38.0 mm	N	<= 1,500	1,370	Pass
Overall Test Results				Pass


Laboratory Technician

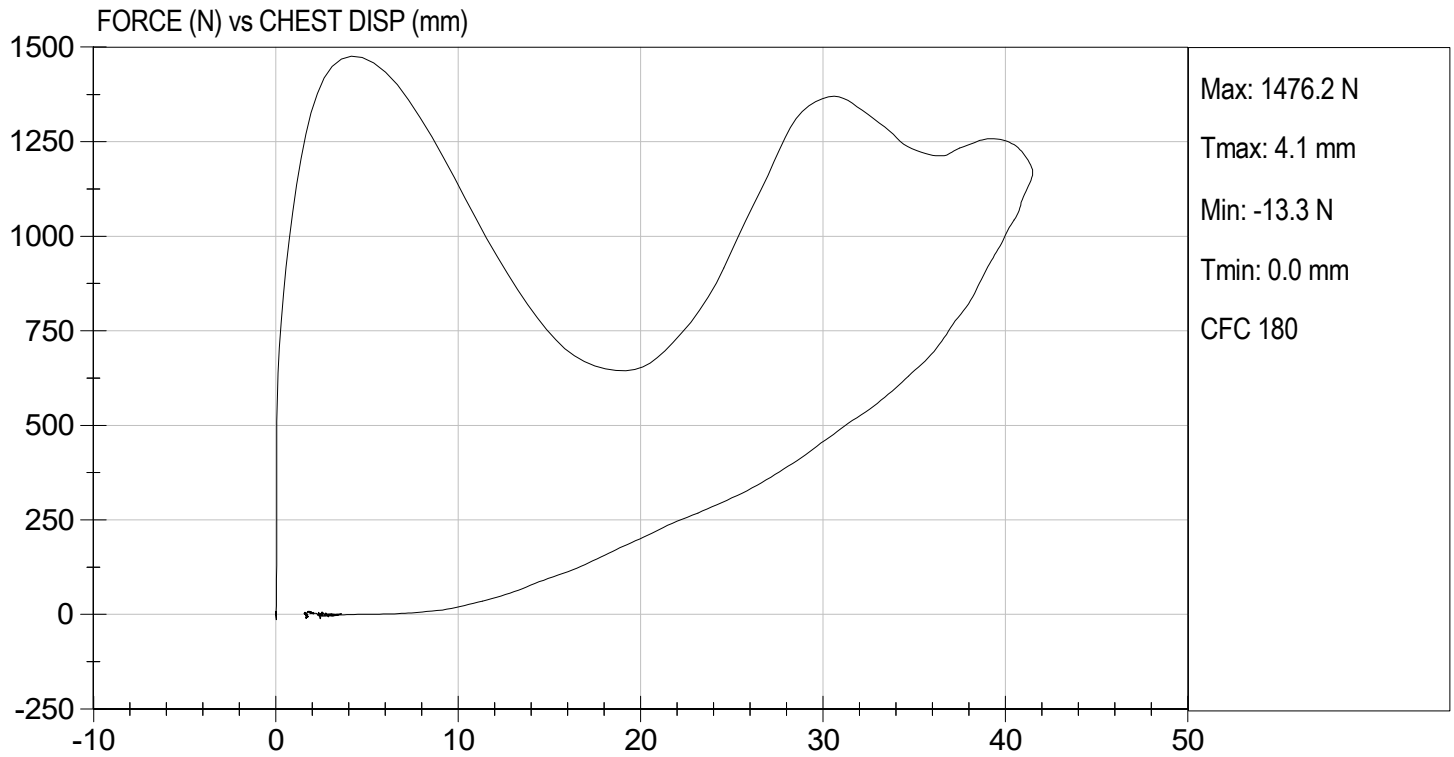
08/07/2023
Test Date


Approved By



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

TEST DATE: 08/07/2023
TEST #: D232114



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

Dummy Serial Number: 155

Test Date: 08/09/2023

Technician: Brain Roach

- 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. (572.127(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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>45%</u> |
| Record the minimum humidity | <u>33%</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°	21°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.7°/s
Force at 45° ± 0.5°	147 N ≤ force ≤ 200 N	178 N
Final ref. plane angle	Initial ref. plane angle ± 8°	0.7°

Brian Roach
Signature

08/09/2023
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D232117

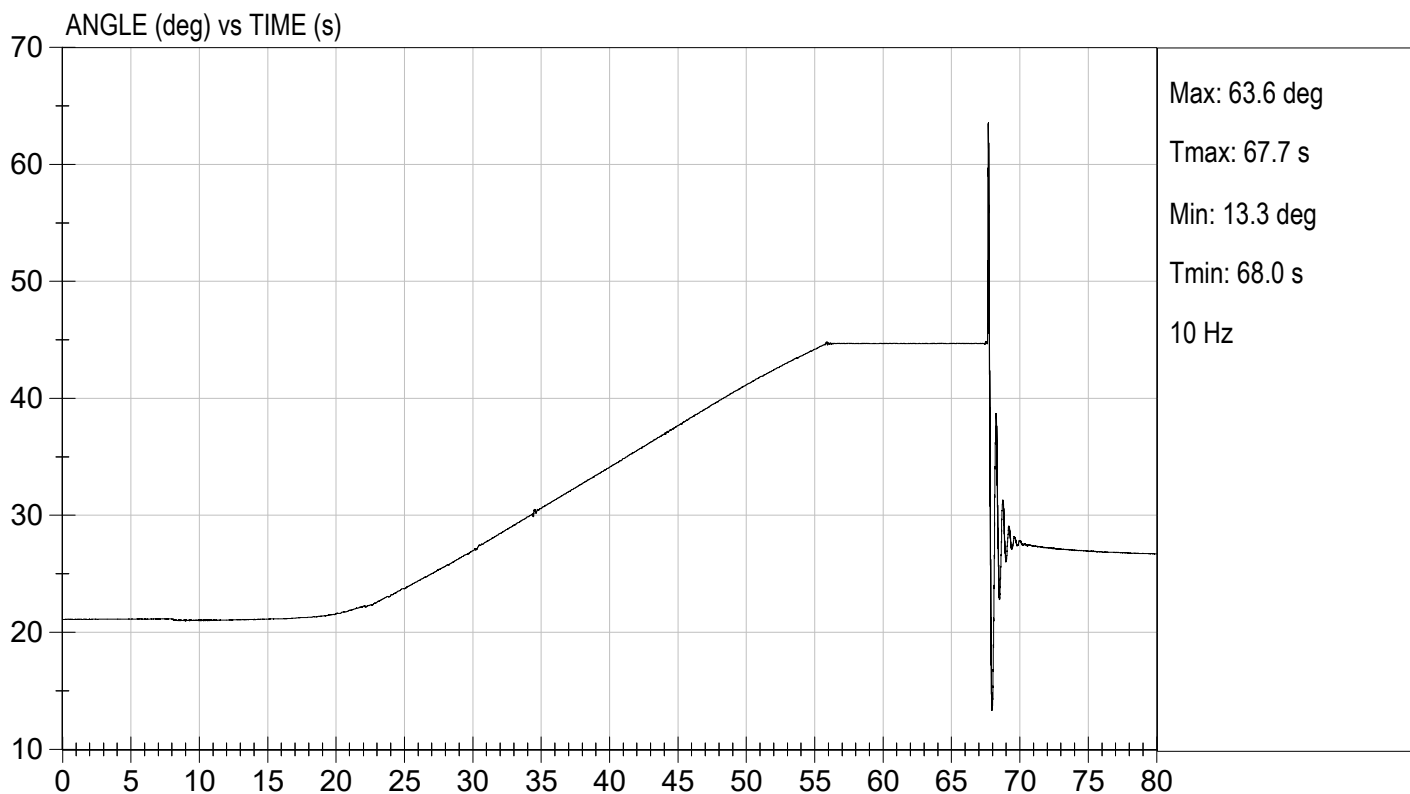
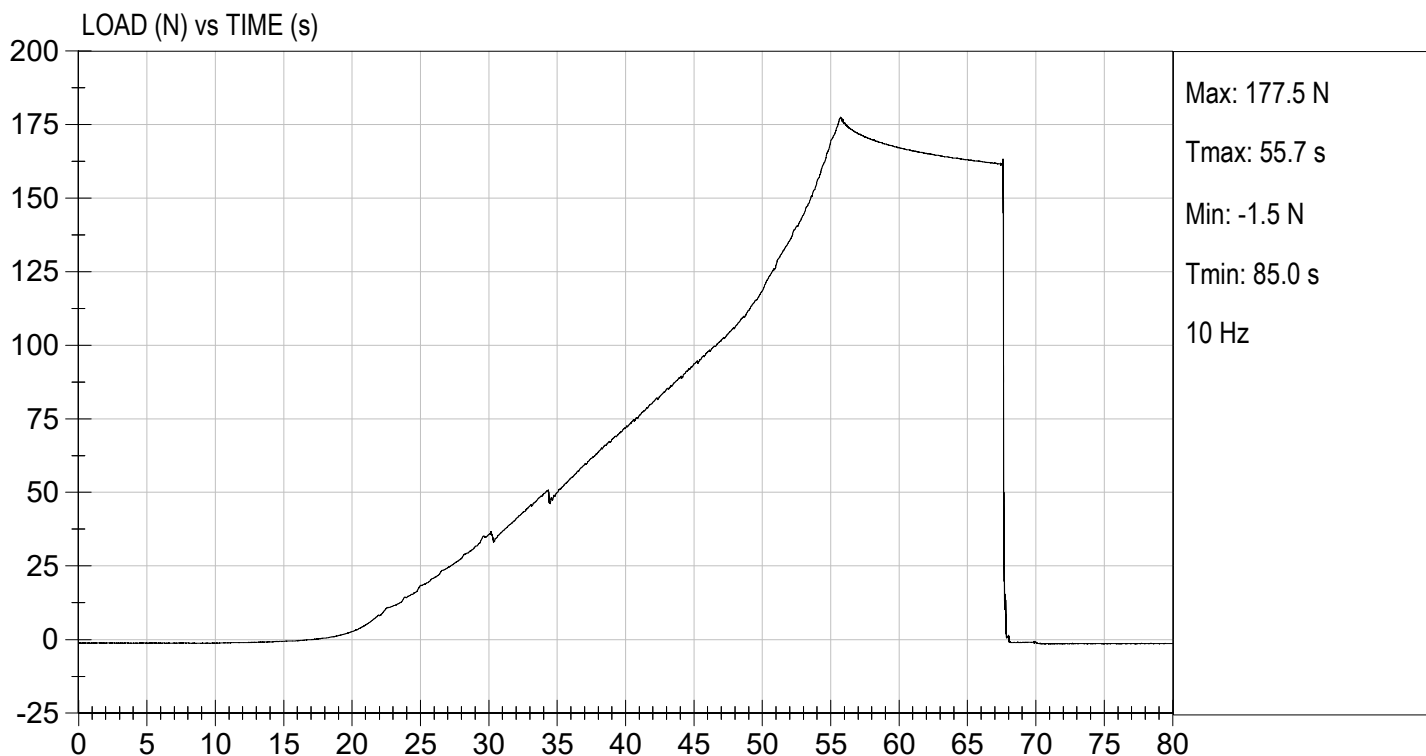
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Initial Angle	deg	0 to 22	21	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	147 to 200	178	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result			Pass	

Brian Roud
Laboratory Technician

08/09/2023

Test Date

Jose Salazar
Approved By



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

Dummy Serial Number: 155

Test Date: 08/07/2023

Technician: Brain Roach

- 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. (572.127(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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>45%</u> |
| Record the minimum humidity | <u>33%</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	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.07 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2426 N

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

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

Brian Road
Signature

08/07/2023
Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D232116

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	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	2000 to 3000	2426	Pass
Overall Test Results				Pass



Laboratory Technician

08/07/2023

Test Date

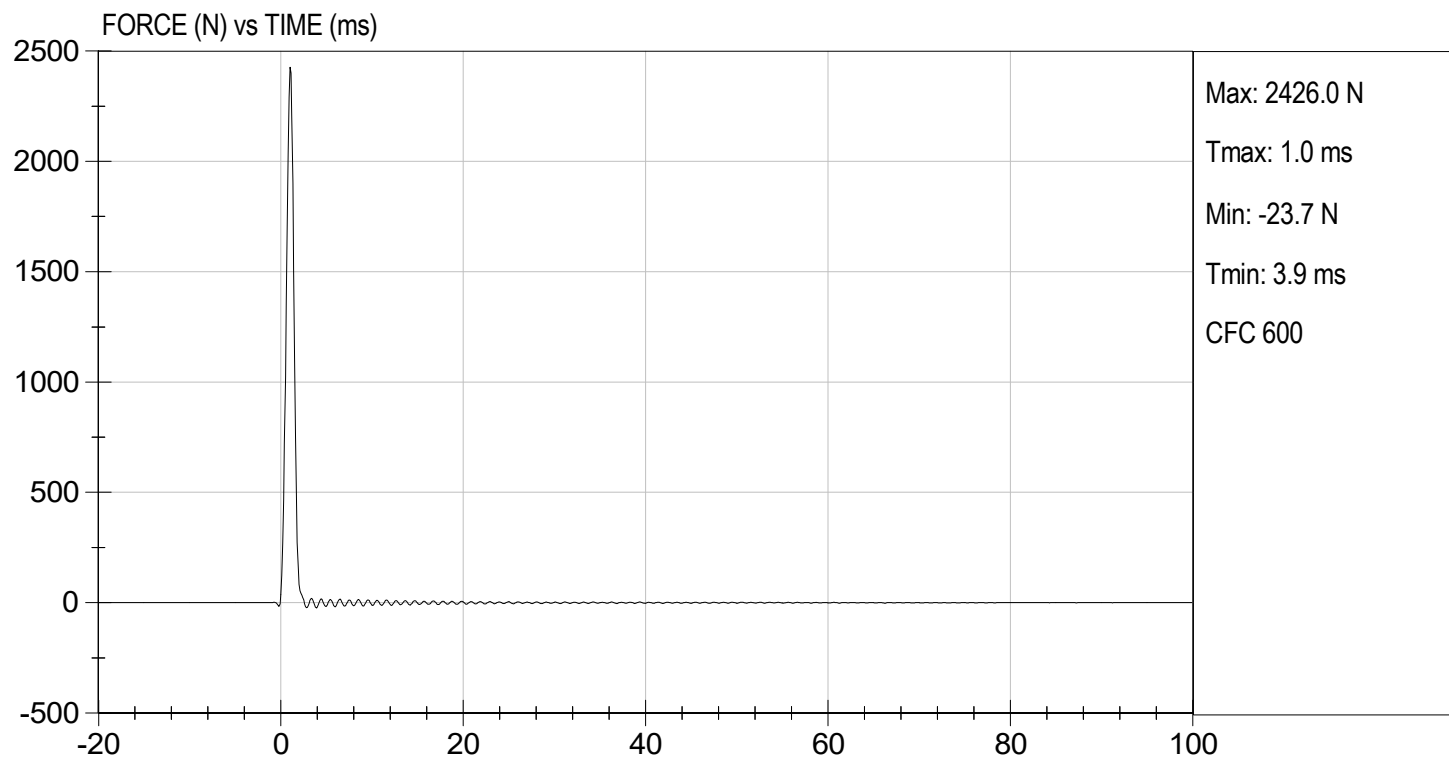


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.80 ft/s, 2.07 m/s

TEST DATE: 08/07/2023
TEST #: D232116



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

Dummy Serial Number: 155

Test Date: 08/07/2023

Technician: Brain Roach

- ☒ 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>21.8°C</u> |
| Record the minimum temperature | <u>21.6°C</u> |
| Record the maximum humidity | <u>45%</u> |
| Record the minimum humidity | <u>44%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.

(572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy.
(572.126(c)(6))

- X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2321 N

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

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

Brian Roach
Signature

08/07/2023
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D232115

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	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	2000 to 3000	2321	Pass
Overall Test Results				Pass


Laboratory Technician

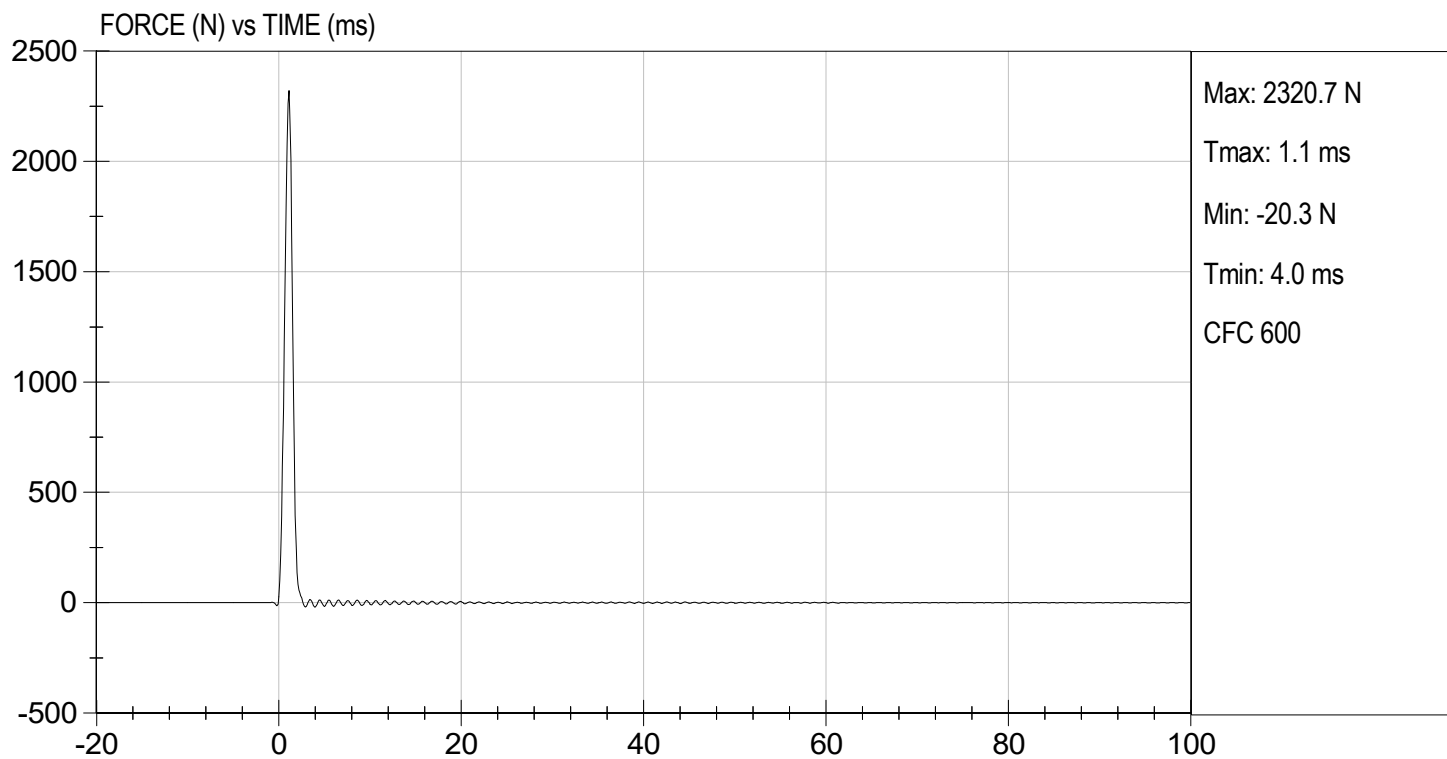
08/07/2023
Test Date


Approved By



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

TEST DATE: 08/07/2023
TEST #: D232115



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	P79723	05/24/2023	11/23/2023
(2) LATERAL	Endevco	7264C-2KTZ-360M17	P84426	05/24/2023	11/23/2023
(3) VERTICAL	Endevco	7264C-2KTZ-360M17	P84428	05/24/2023	11/23/2023
NECK TRANSDUCER	Denton	1716-03-06N	N253	05/05/2023	11/04/2023
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-360M17	P88330	05/24/2023	11/23/2023
(2) LATERAL	Endevco	7264C-2KTZ-360M17	P88331	05/24/2023	11/23/2023
(3) VERTICAL	Endevco	7264C-2KTZ-360M17	P88332	05/24/2023	11/23/2023
CHEST POTENTIOMETER	Humanetics	127-8050	155	05/31/2023	11/30/2023
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	C13081	05/02/2023	11/01/2023
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-360M17	P97372	05/22/2023	11/21/2023
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-360M17	P82128	06/01/2023	12/01/2023
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	1320-0-0102	018	07/21/2023	01/20/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	023	07/21/2023	01/20/2024

LABORATORY TECHNICIAN: Brian Road

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

Dummy Serial Number: 155

Test Date: 11/09/2023

Technician: Brian Roach

- 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>36%</u> |
| Record the minimum humidity | <u>27%</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: 24.8 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	$245 \text{ g} \leq x \leq 300 \text{ g}$	289 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 $\leq 15 \text{ g}$	-12.1 g

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

Brian Roach
Signature

11/09/2023
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

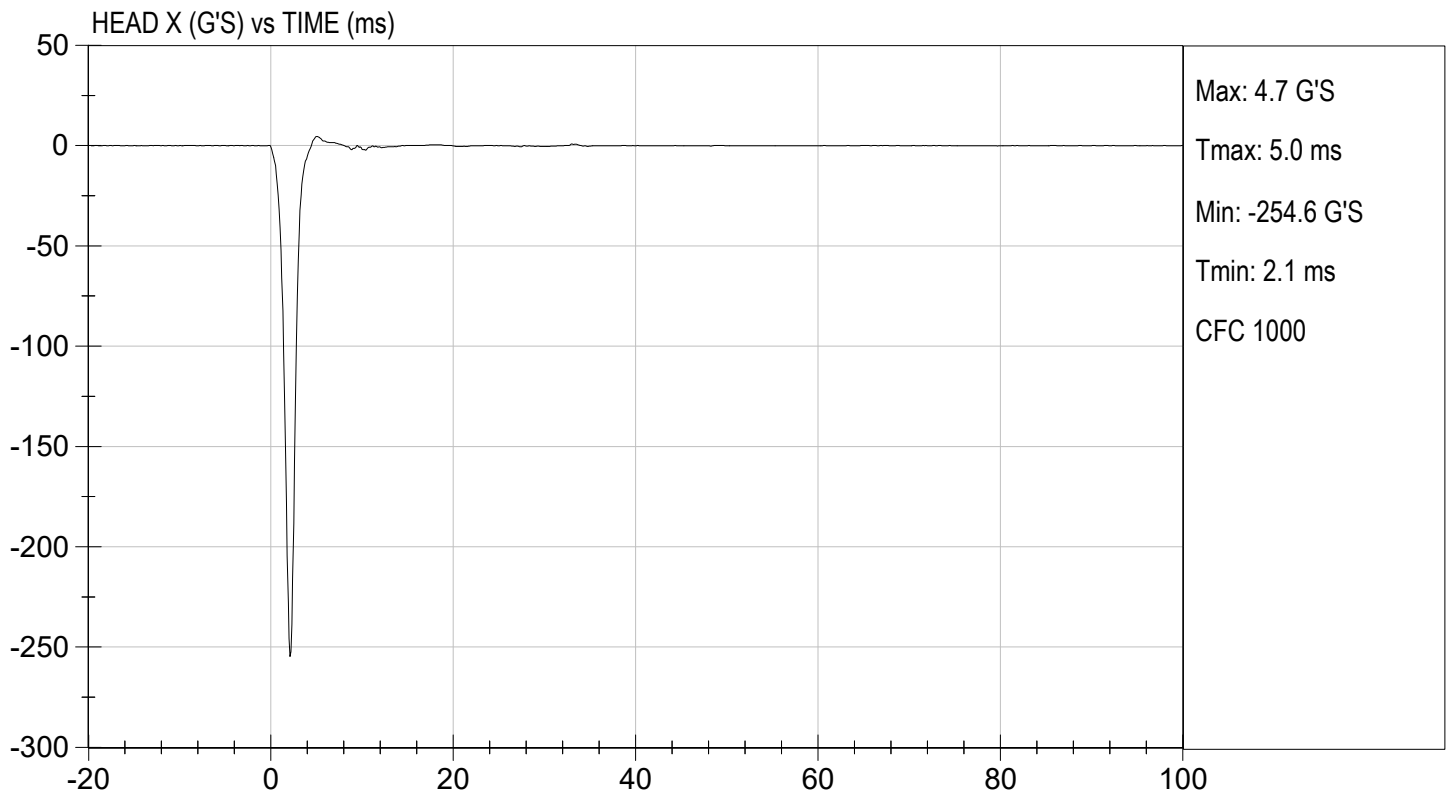
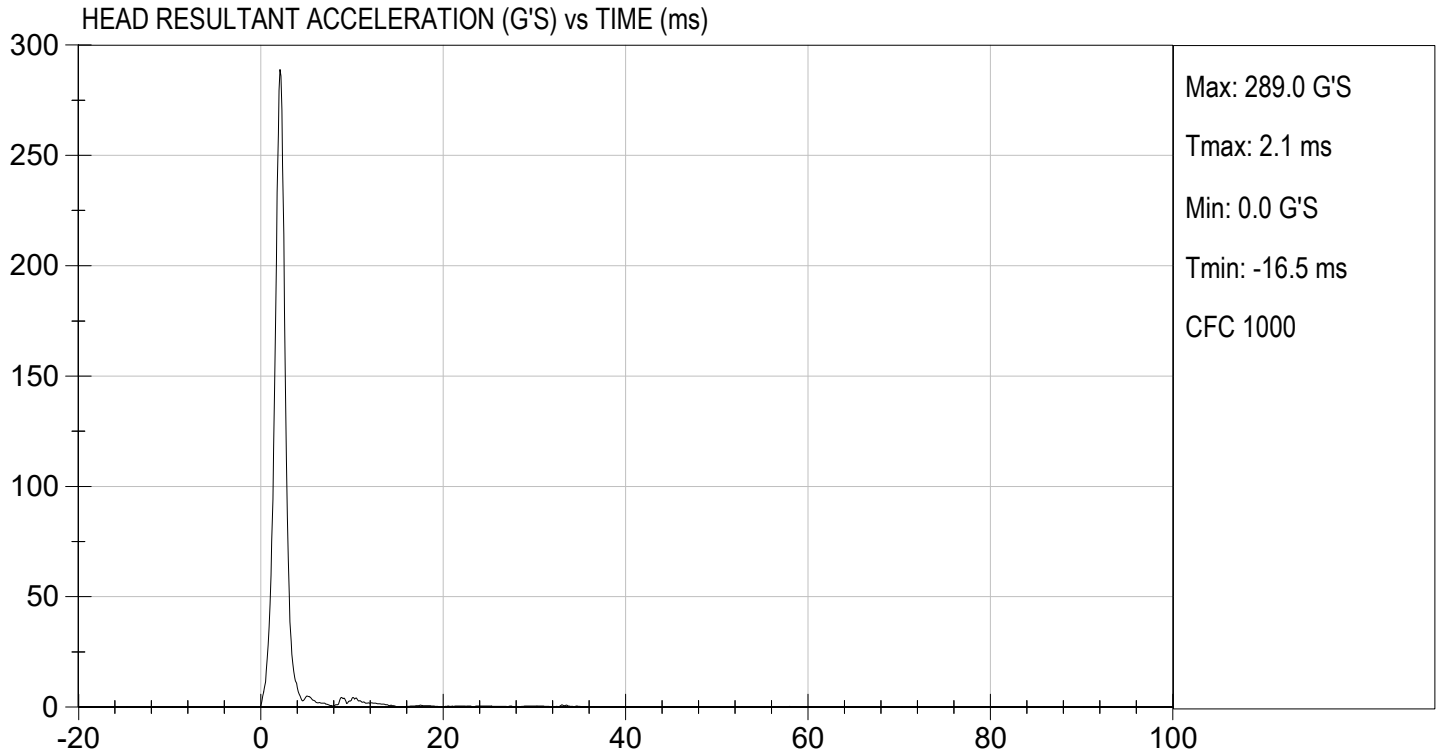
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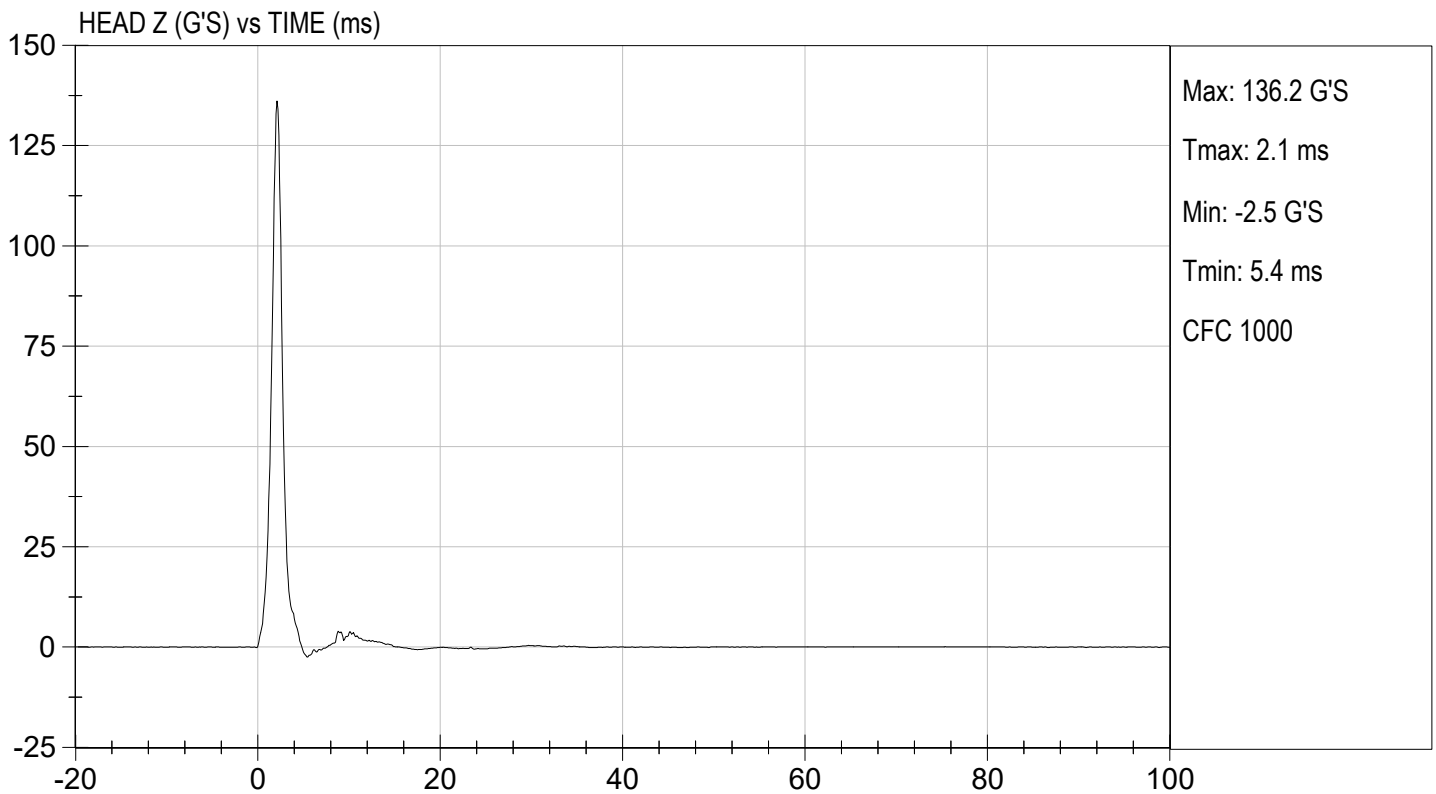
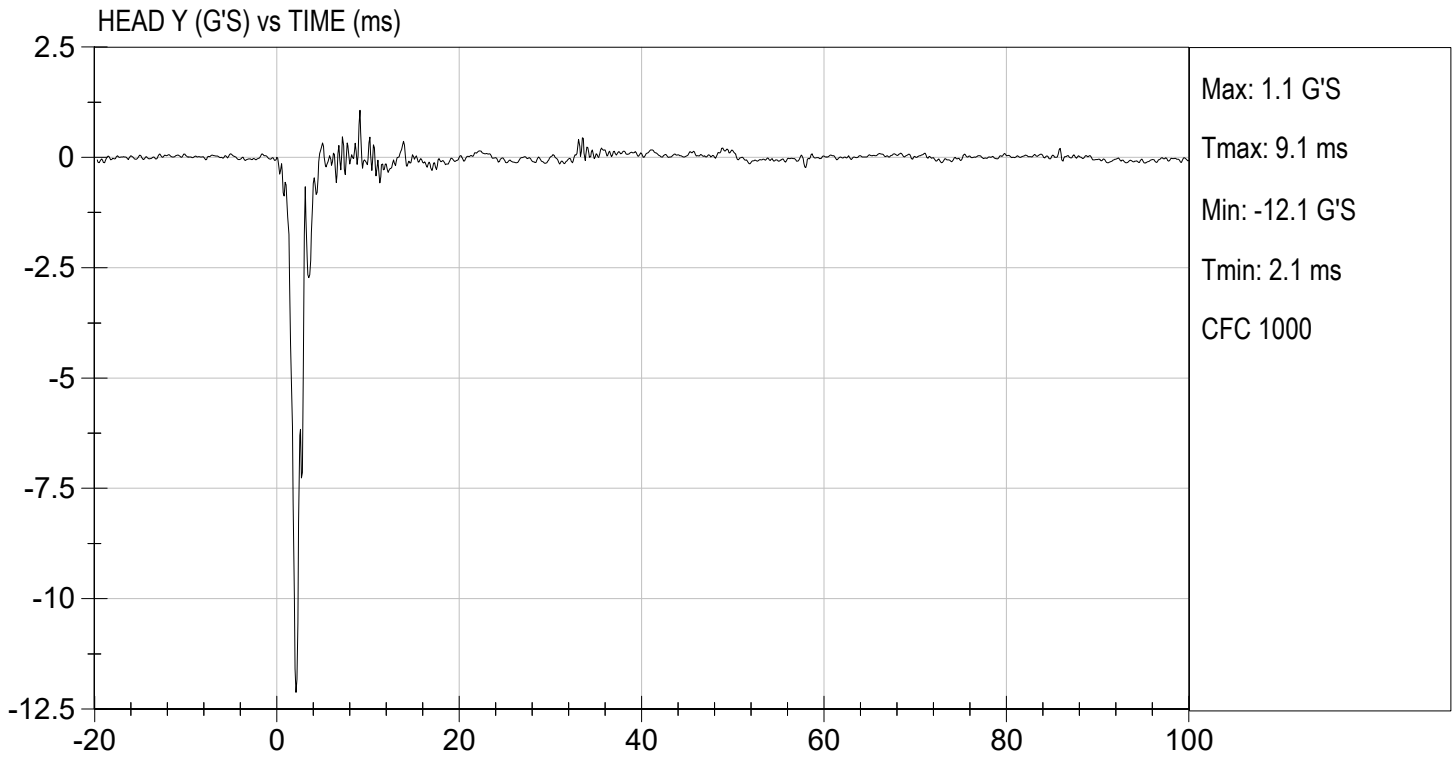
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Peak Resultant Acceleration	G's	245 to 300	289	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-12.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	

Brian Roach
Laboratory Technician

11/09/2023
Test Date

Joe Palmer
Approved By





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

Dummy Serial Number: 155

Test Date: 11/09/2023

Technician: Brian Roach

- ☐ 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>37%</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 (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		$4.83 \text{ m/s} \leq \text{speed} \leq 5.07 \text{ m/s}$	4.89 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.2 \text{ m/s} \leq \Delta V \leq 1.6 \text{ m/s}$	1.6 m/s
	@ 20 ms	$2.4 \text{ m/s} \leq \Delta V \leq 3.4 \text{ m/s}$	3.2 m/s
	@ 30 ms	$3.8 \text{ m/s} \leq \Delta V \leq 5.0 \text{ m/s}$	4.7 m/s
Plane D Rotation		Peak moment* $27 \text{ Nm} \leq \text{moment} \leq 33 \text{ Nm}$ during the following rotation range $74^\circ \leq \text{angle} \leq 92^\circ$	30.3 Nm @ 83 degrees
Positive Moment Decay** (Flexion)		Time to decay to 5 Nm $103 \text{ ms} \leq \text{time} \leq 123 \text{ ms}$	109 ms

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

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

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

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

Brian Road
Signature

11/09/2023
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST
HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D233062

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	37	Pass
Pendulum Speed		m/s	4.83 to 5.07	4.89	Pass
Pendulum Velocity	10 ms	m/s	1.2 to 1.6	1.6	Pass
	20 ms	m/s	2.4 to 3.4	3.2	Pass
	30 ms	m/s	3.8 to 5.0	4.7	Pass
D Plane Rotation	Max	deg	74 to 92	83	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	27 to 33	30.3	Pass
Positive Moment Time Curve Decay to 5 Nm		ms	103 to 123	109	Pass
Overall Results					Pass



Laboratory Technician

11/09/2023

Test Date

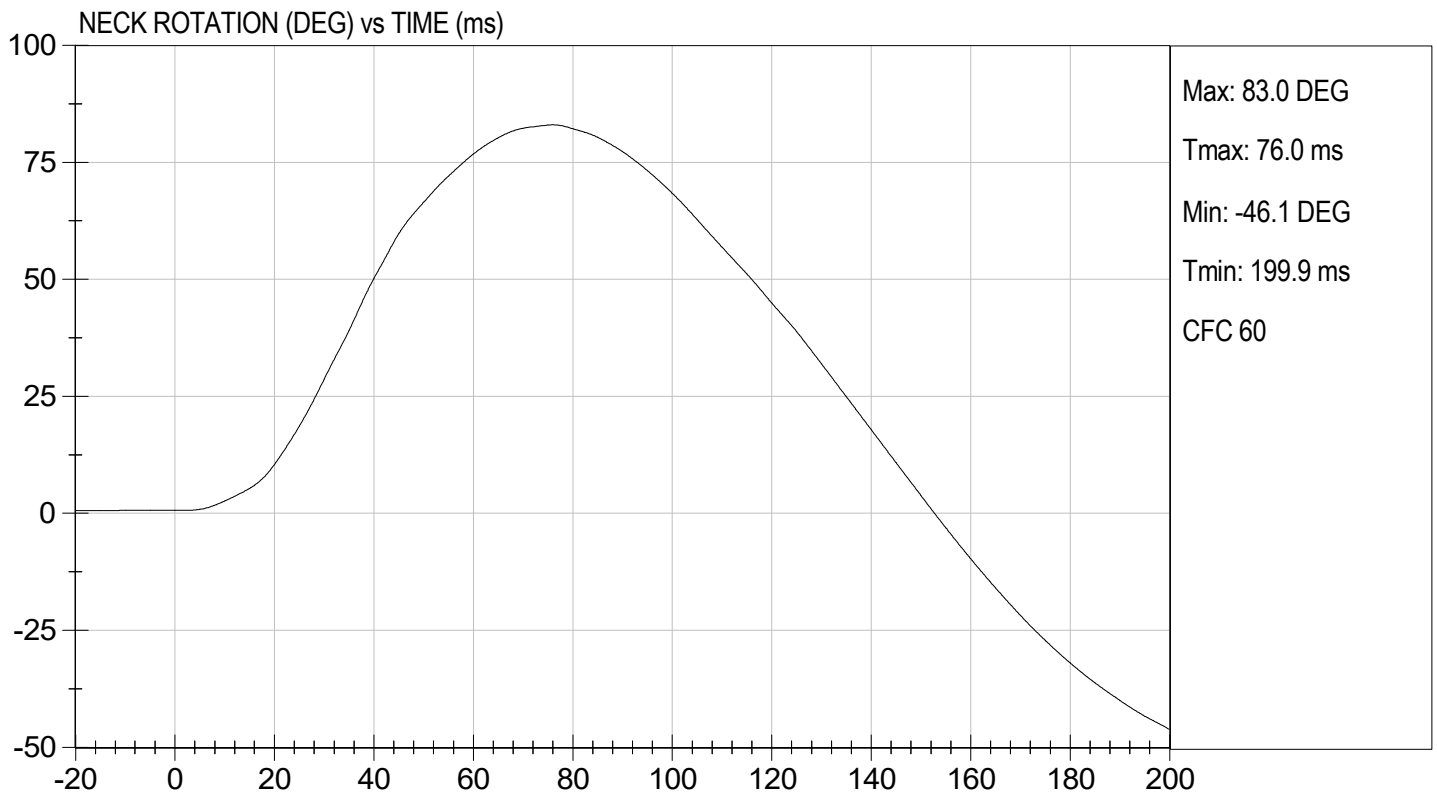
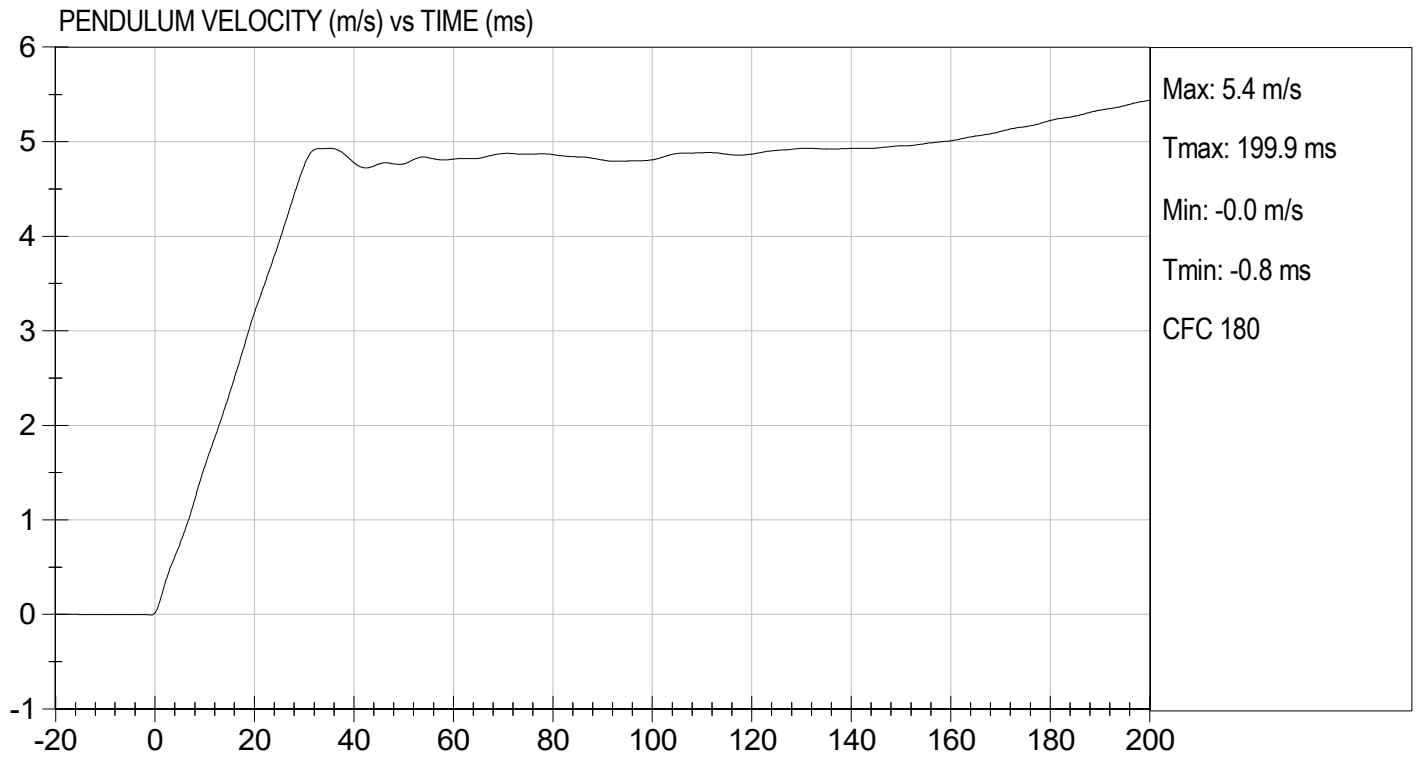


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 16.03 ft/s, 4.89 m/s

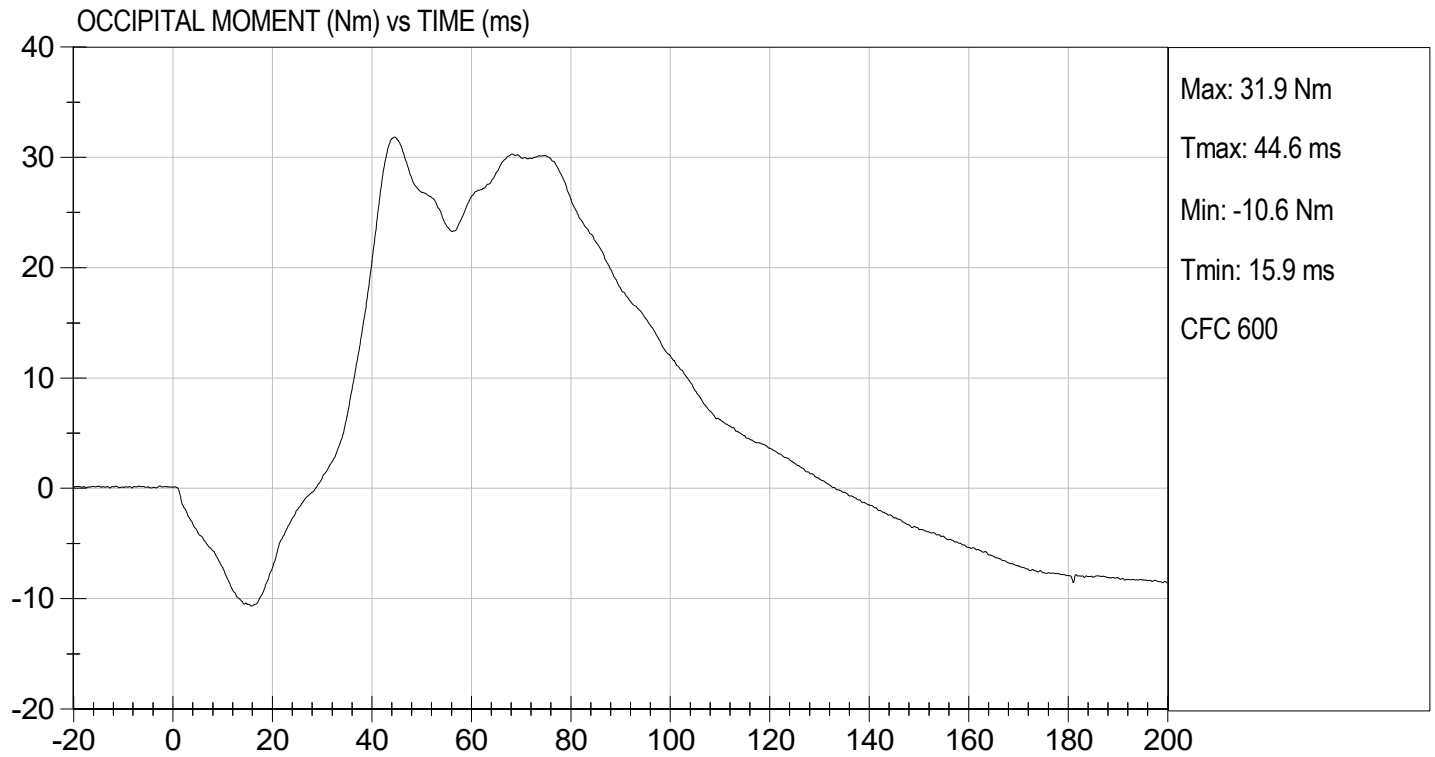
TEST DATE: 11/09/2023
TEST #: D233062





TEST DESC: NECK FLEXION
VELOCITY: 16.03 ft/s, 4.89 m/s

TEST DATE: 11/09/2023
TEST #: D233062



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

Dummy Serial Number: 155

Test Date: 11/09/2023

Technician: Brian Roach

- ☐ 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 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>37%</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 (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	$1.0 \text{ m/s} \leq \Delta V \leq 1.4 \text{ m/s}$	1.3 m/s
	@ 20 ms	$2.2 \text{ m/s} \leq \Delta V \leq 3.0 \text{ m/s}$	2.5 m/s
	@ 30 ms	$3.2 \text{ m/s} \leq \Delta V \leq 4.2 \text{ m/s}$	3.6 m/s
Plane D Rotation		Peak moment* $-24 \text{ Nm} \leq \text{moment} \leq -19 \text{ Nm}$ during the following rotation range $85^\circ \leq \text{angle} \leq 103^\circ$	-21 Nm @ 99 degrees
Negative Moment Decay** (Extension)		Time to decay to -5 Nm $123 \text{ ms} \leq \text{time} \leq 147 \text{ ms}$	140 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.

Brian Road
Signature

11/09/2023
Date

MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D233063

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	37	Pass
Pendulum Speed		m/s	4.18 to 4.42	4.30	Pass
Pendulum Velocity	10 ms	m/s	1.0 to 1.4	1.3	Pass
	20 ms	m/s	2.2 to 3.0	2.5	Pass
	30 ms	m/s	3.2 to 4.2	3.6	Pass
D Plane Rotation	Max	deg	85 to 103	99	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	140	Pass
Overall Results					Pass

Brian Roud
Laboratory Technician

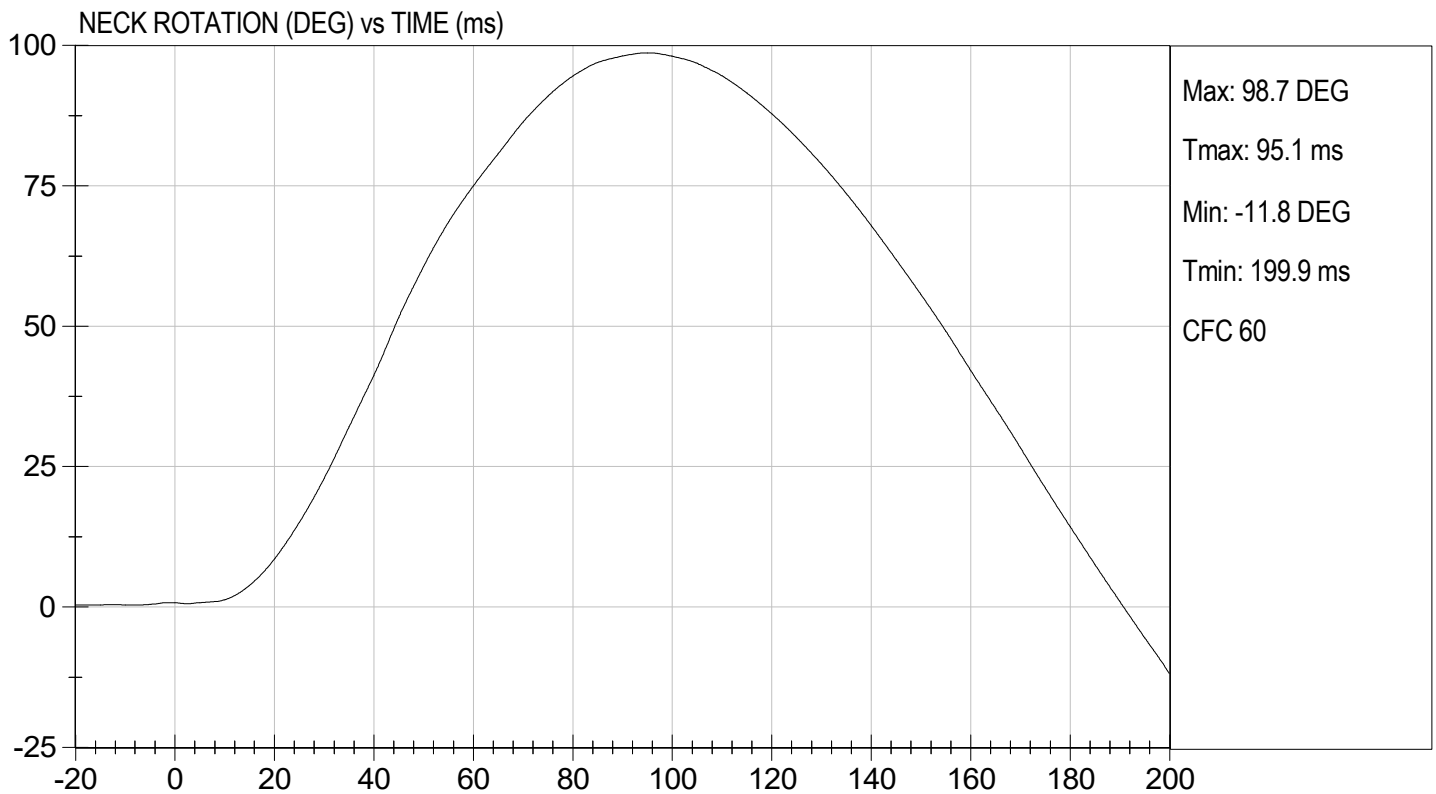
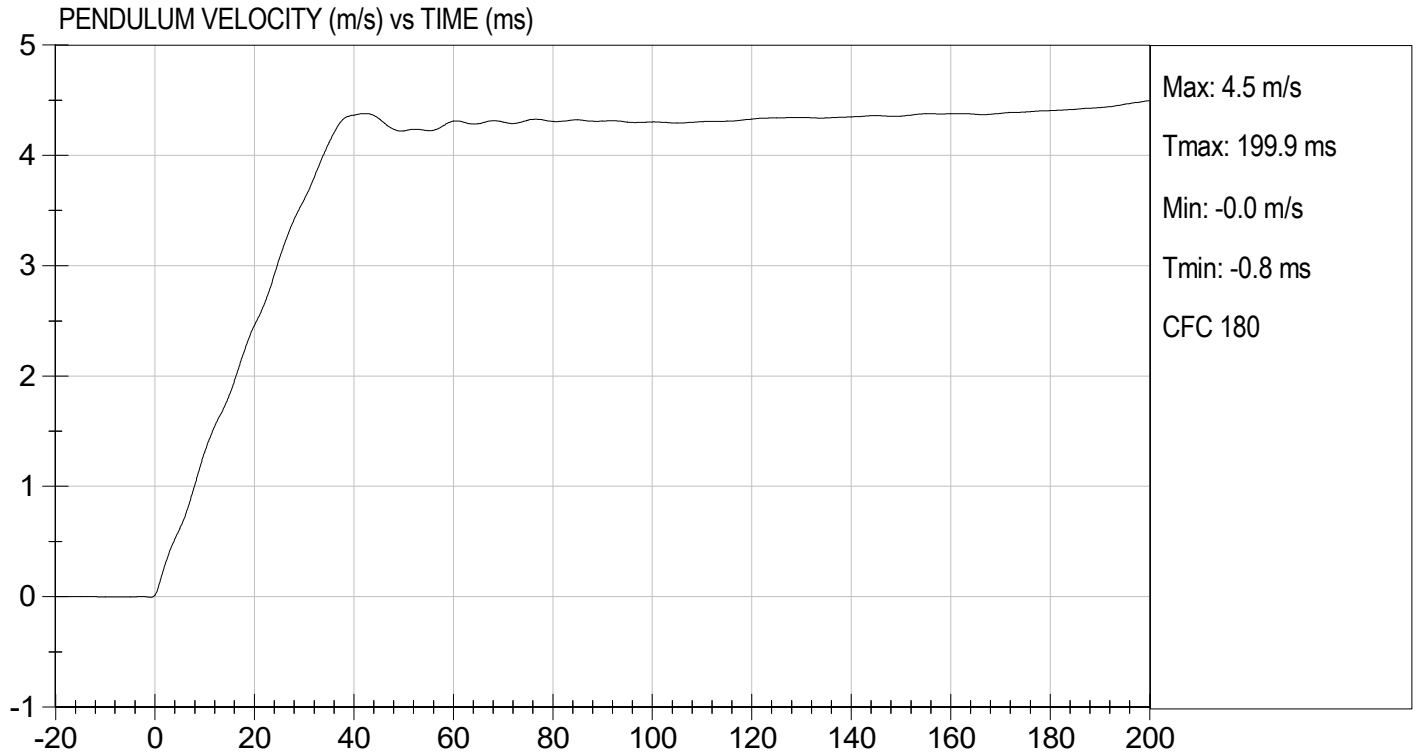
11/09/2023
Test Date

Joe Salner
Approved By



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

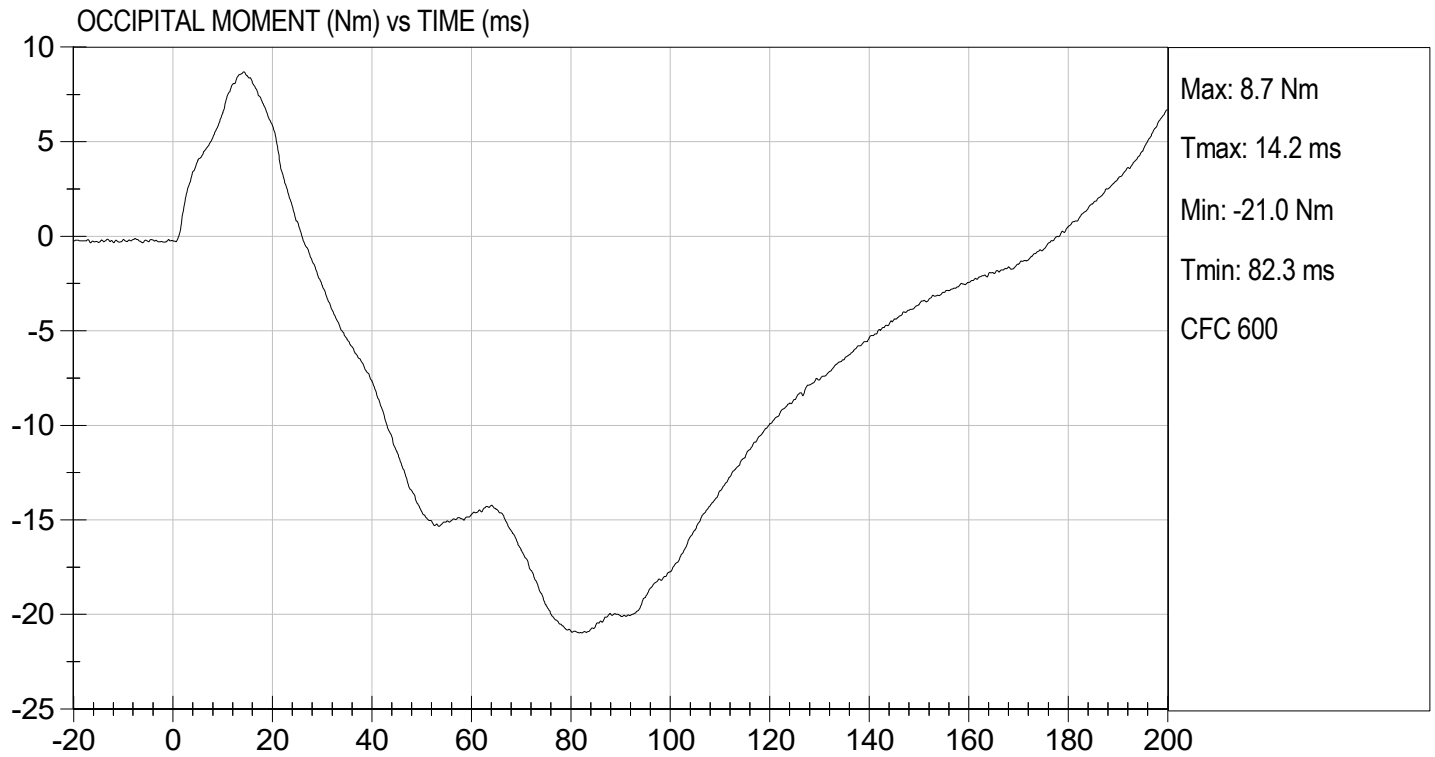
TEST DATE: 11/09/2023
TEST #: D233063





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

TEST DATE: 11/09/2023
TEST #: D233063



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

Dummy Serial Number: 155

Test Date: 11/13/2023

Technician: Brian Roach

- ☐ 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>21.8°C</u>
Record the minimum temperature	<u>21.6°C</u>
Record the maximum humidity	<u>26%</u>
Record the minimum humidity	<u>17%</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))

- ☒ 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	$38.0 \text{ mm} \leq \text{compression} \leq 46.0 \text{ mm}$	41.2 mm
Peak force** between 38.0 and 46.0 mm chest compression	$1150\text{N} \leq \text{peak force} \leq 1380\text{N}$	1302 N
Peak force** between 12.5 and 38.0 mm chest compression	Peak force $\leq 1500 \text{ N}$	1399 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.

Brian Roach
Signature

11/13/2023
Date

MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D233064

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	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	41.2	Pass
Peak Resistive Force w/in Deflection Corridor	N	1150 to 1380	1,302	Pass
Internal Hysteresis	%	65 to 85	73	Pass
Peak Force 12.5 mm - 38.0 mm	N	<= 1,500	1,399	Pass
Overall Test Results				Pass



Laboratory Technician

11/13/2023

Test Date

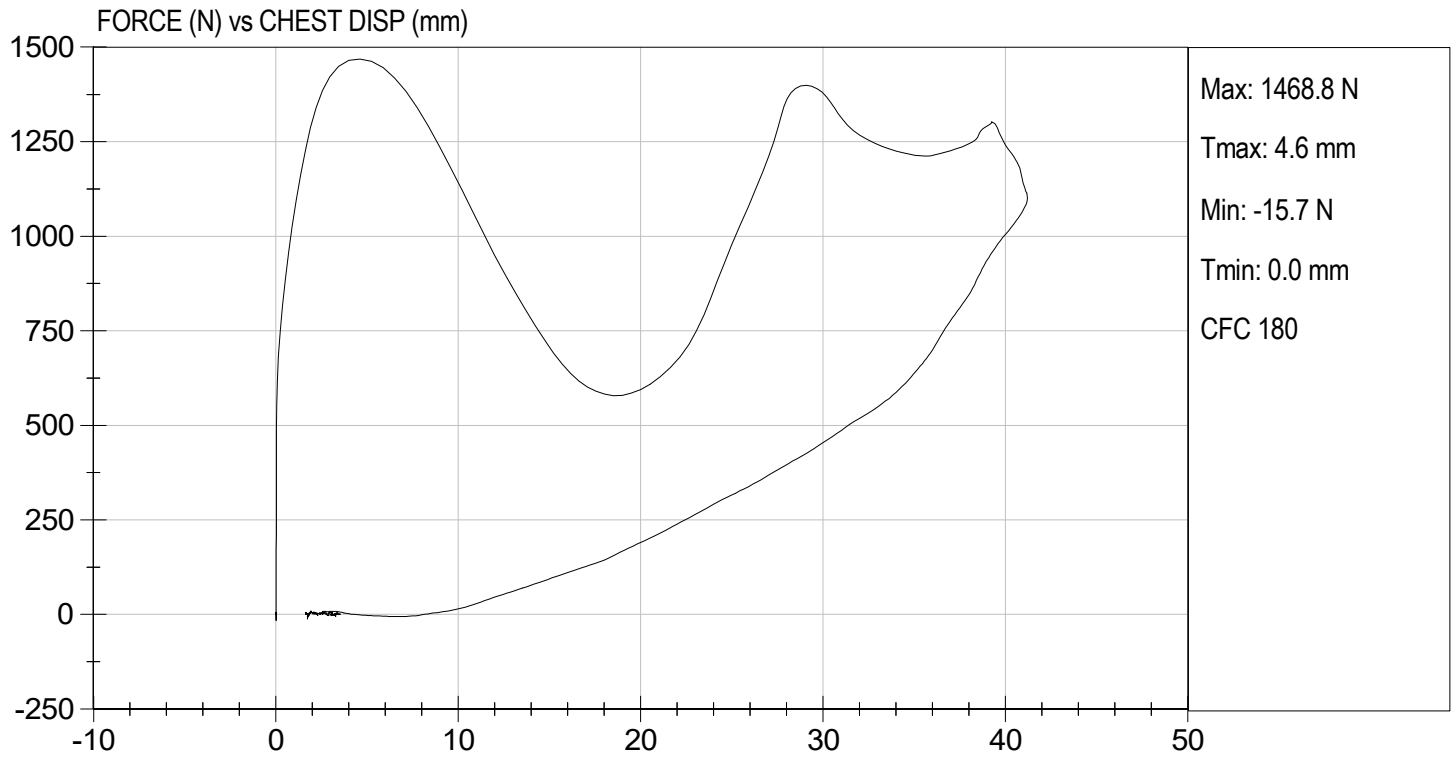


Approved By



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

TEST DATE: 11/13/2023
TEST #: D233064



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

Dummy Serial Number: 155

Test Date: 11/13/2023

Technician: Brian Roach

- ☐ 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>21.8°C</u> |
| Record the minimum temperature | <u>21.6°C</u> |
| Record the maximum humidity | <u>33%</u> |
| Record the minimum humidity | <u>24%</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°	21°
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.7°/s
Force at 45° ± 0.5°	147 N ≤ force ≤ 200 N	166 N
Final ref. plane angle	Initial ref. plane angle ± 8°	6°

Brian Roach
Signature

11/13/2023
Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D233067

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	33	Pass
Initial Angle	deg	0 to 22	21	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	147 to 200	166	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result			Pass	



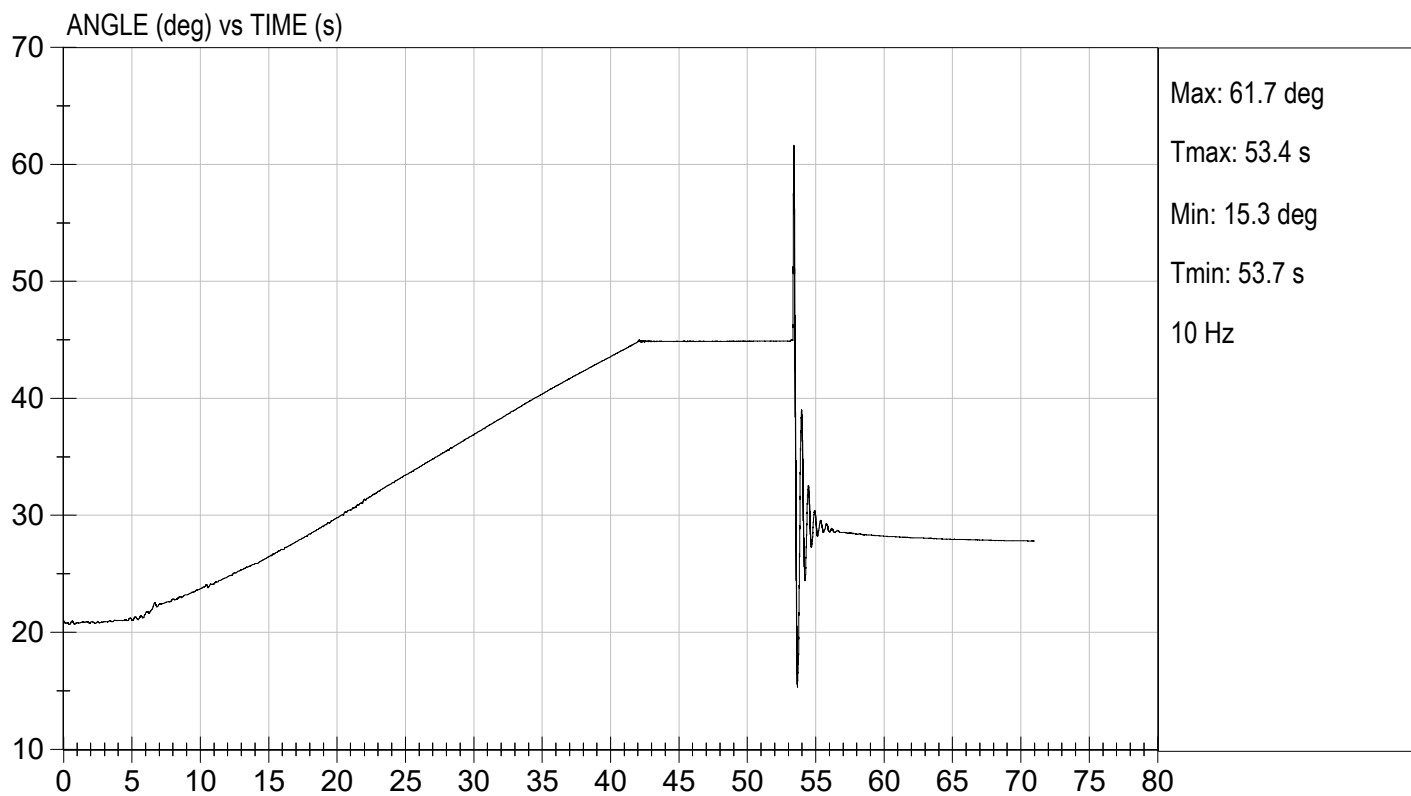
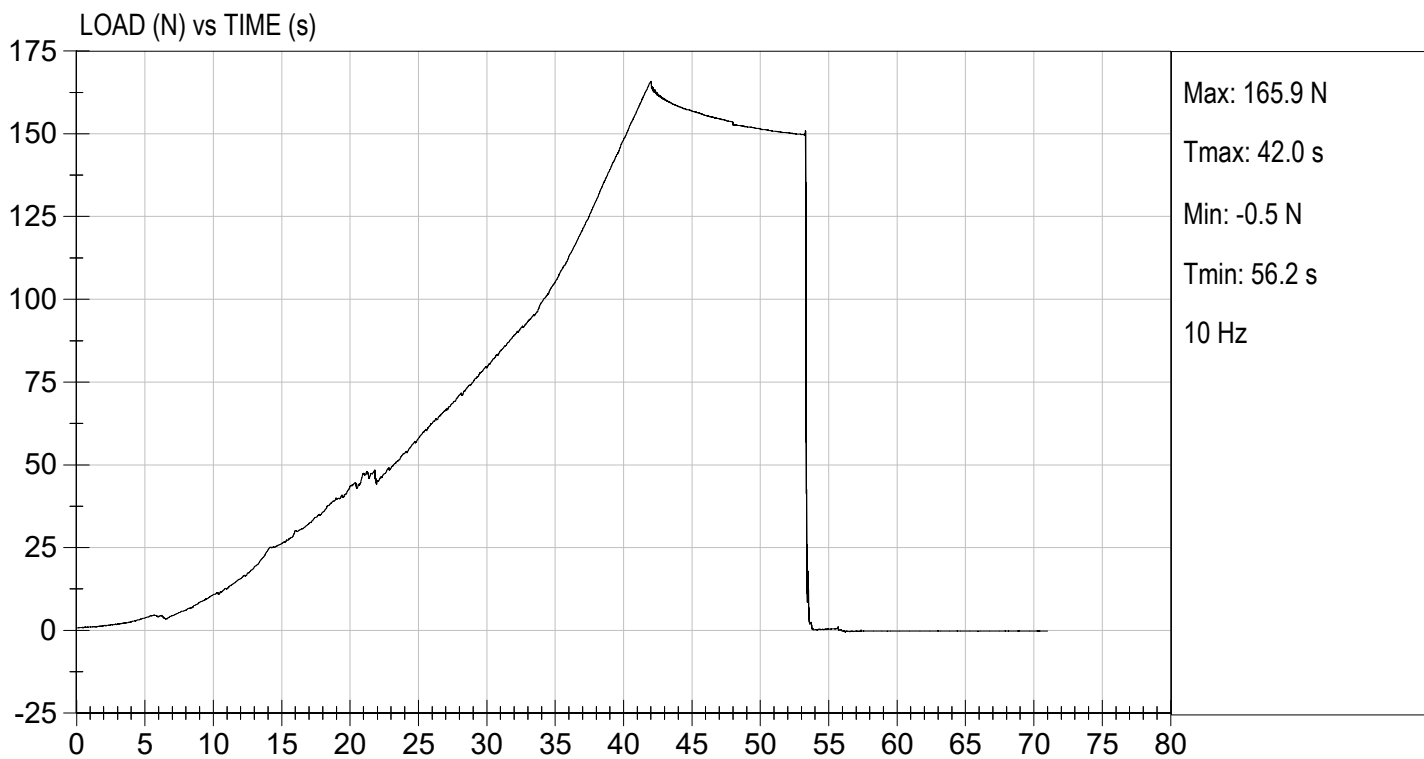
Laboratory Technician

11/10/2023

Test Date



Approved By



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

Dummy Serial Number: 155

Test Date: 11/09/2023

Technician: Brian Roach

- ☐ 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>37%</u> |
| Record the minimum humidity | <u>28%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.

(572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy.
(572.126(c)(6))

- X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2380 N

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

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

Brian Road
Signature

11/09/2023
Date

MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D233066

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	37	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	2000 to 3000	2380	Pass
Overall Test Results				Pass



Laboratory Technician

11/09/2023

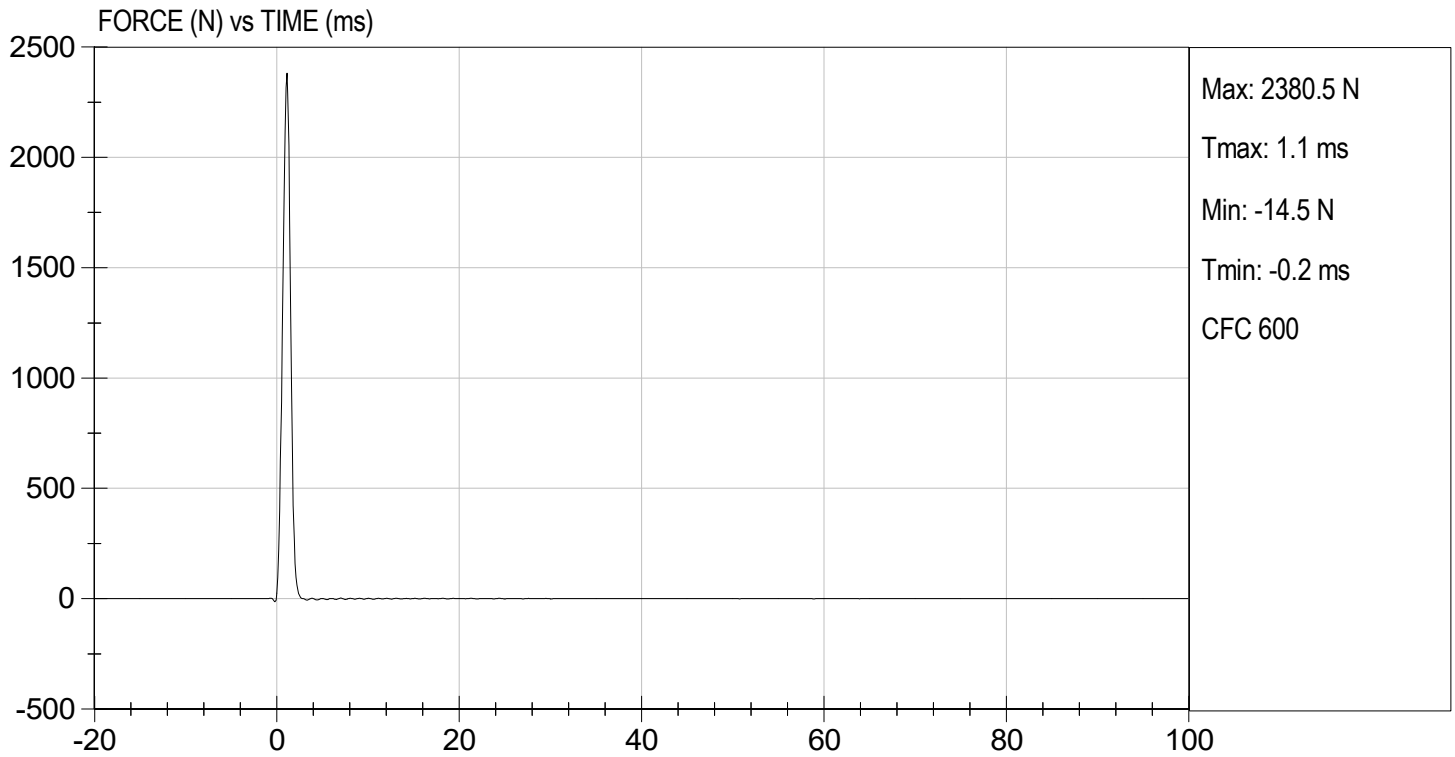
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 11/09/2023
TEST #: D233066



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

Dummy Serial Number: 155

Test Date: 11/09/2023

Technician: Brian Roach

- ☐ 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>21.3°C</u> |
| Record the minimum temperature | <u>21.1°C</u> |
| Record the maximum humidity | <u>37%</u> |
| Record the minimum humidity | <u>28%</u> |
- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.126(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.126(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.126(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
- ☒ 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.

(572.126(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy.
(572.126(c)(6))

- X 11. Complete the following table:

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

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$2000 \text{ N} \leq \text{force} \leq 3000 \text{ N}$	2411 N

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

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

Brian Roach
Signature

11/09/2023
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 6 YEAR OLD

ATD Serial No: 155

Test I.D: D233065

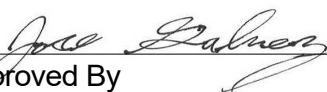
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	2000 to 3000	2411	Pass
Overall Test Results				Pass



Laboratory Technician

11/09/2023

Test Date

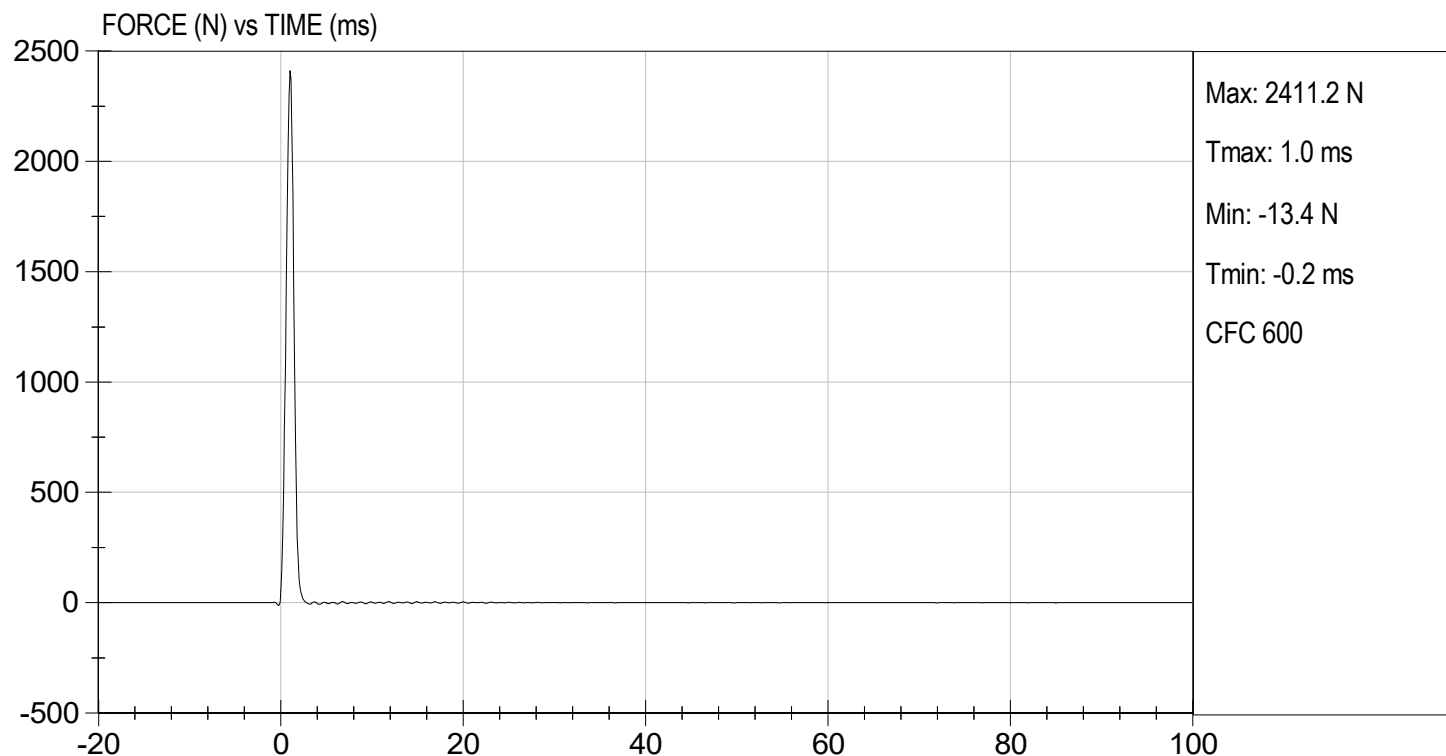


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 11/09/2023
TEST #: D233065



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	P79723	05/24/2023	11/23/2023
(2) LATERAL	Endevco	7264C-2KTZ-360M17	P84426	05/24/2023	11/23/2023
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P84428	05/24/2023	11/23/2023
NECK TRANSDUCER	Denton	1716-03-6N	N253	05/05/2023	11/04/2023
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-360M17	P88330	05/24/2023	11/23/2023
(2) LATERAL	Endevco	7264C-2KTZ-360M17	P88331	05/24/2023	11/23/2023
(3) VERTICAL	Endevco	7264C-2KTZ-360M17	P88332	05/24/2023	11/23/2023
CHEST POTENTIOMETER	Humanetics	127-8050	155	05/31/2023	11/30/2023
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	C13081	11/03/2023	05/04/2024
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-360M17	P97372	05/22/2023	11/21/2023
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-360M17	P82128	06/01/2023	12/01/2023
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	07/21/2023	01/20/2024
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	23	07/21/2023	01/20/2024

LABORATORY TECHNICIAN: Brian Roach

DATA SHEET C1
DUMMY DAMAGE CHECKLIST (6 YEAR-OLD)

Dummy Serial Number: 155

Test Date: 11/13/2023

Technician: Brian Roach

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:

Brian Roach
Signature

Date 11/13/2023

Describe the repair or replacement of parts:

Checked by:

Jose Galvez
Signature

Date 11/13/2023