

**REPORT NUMBER: NCAP-MGA-2019-031**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
Frontal Barrier Impact Test**

**GENERAL MOTORS LLC  
2019 Chevrolet Suburban 4WD LS 5-Door SUV  
NHTSA No.: O20190102**

**MGA RESEARCH CORPORATION  
5000 Warren Road  
Burlington, WI 53105**



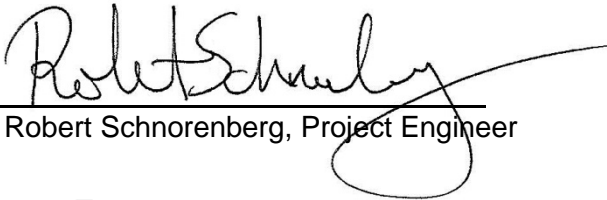
**Test Date: February 11, 2019**

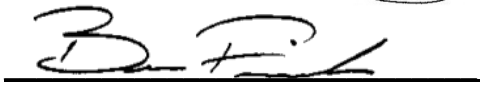
**Final Report Date: May 6, 2019**

**FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
Mail Code: NRM-110  
1200 New Jersey Ave, SE  
Room W43-410  
Washington, DC 20590**

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Ben Fischer, Project Engineer

Approval Date: May 6, 2019

FINAL REPORT ACCEPTANCE BY OCWS:

\_\_\_\_\_  
Division Chief, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date: \_\_\_\_\_

\_\_\_\_\_  
COTR, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date: \_\_\_\_\_

### Technical Report Documentation Page

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15. Supplementary Notes																																																									
<p>16. Abstract</p> <p>A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2019 Chevrolet Suburban 4WD LS 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on February 11, 2019.</p> <p>The impact velocity of the vehicle was 56.62 km/h and the ambient temperature at the barrier face at the time of impact was 21.1°C. The target vehicle post-test maximum crush was 666 mm located at the vehicle centerline. The test vehicle's performance was as follows:</p>																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td>N/A</td> <td>700</td> <td style="background-color: yellow;">359</td> <td>700</td> <td style="background-color: yellow;">342</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td>63</td> <td style="background-color: yellow;">24</td> <td>52</td> <td style="background-color: yellow;">14</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td style="background-color: yellow;">0.38</td> <td>1</td> <td style="background-color: yellow;">0.38</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td style="background-color: yellow;">1771</td> <td>2620</td> <td style="background-color: yellow;">726</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td style="background-color: yellow;">993</td> <td>2520</td> <td style="background-color: yellow;">395</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td style="background-color: yellow;">1390</td> <td>6805</td> <td style="background-color: yellow;">1629</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td style="background-color: yellow;">1836</td> <td>6805</td> <td style="background-color: yellow;">2596</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC <sub>15</sub> )	N/A	700	359	700	342	Maximum Chest	mm	63	24	52	14	Nij	N/A	1	0.38	1	0.38	Neck Tension	N	4170	1771	2620	726	Neck Compression	N	4000	993	2520	395	Left Femur Force	N	10008	1390	6805	1629	Right Femur Force	N	10008	1836	6805	2596
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## **SECTION 1 PURPOSE AND SUMMARY OF TEST**

### **PURPOSE**

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-12-D-00258. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure.

### **SUMMARY**

A load cell barrier consisting of 176 load cells was impacted by a 2019 Chevrolet Suburban 4WD LS 5-Door SUV at a velocity of 56.62 km/h. The test was performed at MGA Research Corporation on February 11, 2019. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two (2) real-time cameras and fourteen (14) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> percentile female test device (ATD) was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation.

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 634 channels of data were recorded on a data acquisition system. Appendix B contains the dummy response data traces.

There was 88 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 666 mm located at the vehicle centerline and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bolster. The passenger's visible contact points were as follows: The passenger's head contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 <sup>th</sup> )	359	0.38	1771	993	42	24	1390	1836
Passenger (5 <sup>th</sup> )	342	0.38	726	395	36	14	1629	2596

The test data can be found on the NHTSA website at [www.nhtsa.gov](http://www.nhtsa.gov).

### TEST NOTES

Driver Lap Belt was not installed.

Driver Right Ankle Z recorded no data.

Passenger Left Ankle X recorded no valid data after 200 ms.

Barrier C-01 Fx recorded no valid data.

Barrier K-15 My recorded no valid data.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

**SECTION 2**  
**OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

**DATA SHEET NO. 1  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	O20190102	Traction Control System (TCS)	Yes
Model Year	2019	Power Steering	Yes
Make	Chevrolet	Power Window Auto-Reverse	Yes
Model	Suburban 4WD LS	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	1GNSKGGKC1KR130233	Driver Head/Torso Airbag	No
Body Color	Silver Ice Metallic	Driver Torso Airbag	No
Odometer (km/mi)	230km / 143mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	5.3 L	Driver Pelvis Airbag	No
Type/No. Cylinders	V8	Driver Knee Airbag	No
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	4WD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

Does owner's manual provide instructions to turn off automatic door locks?	No
--	----

**DATA FROM CERTIFICATION LABEL**

Manufactured By	GENERAL MOTORS LLC
Date of Manufacture	08/18

GVWR (kg)	3402
GAWR Front (kg)	1633
GAWR Rear (kg)	1905

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

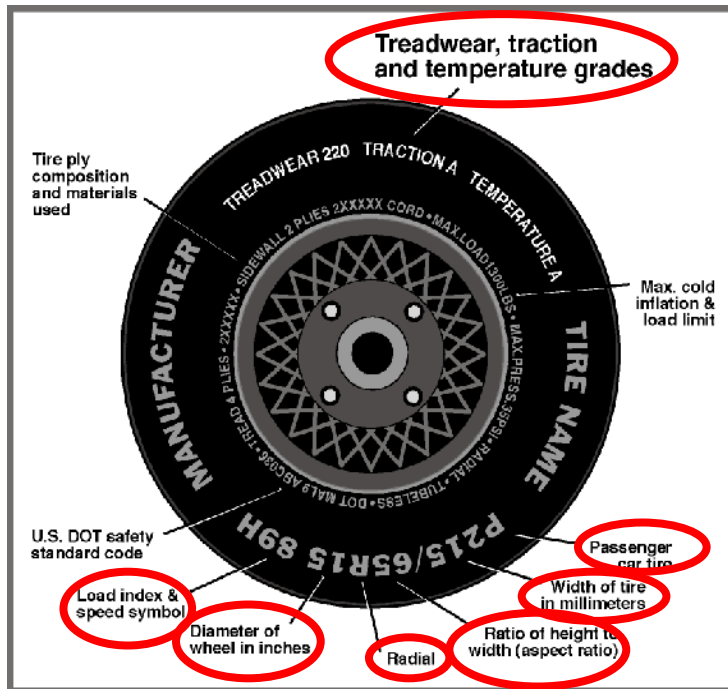
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Split Bench	
Designated Seating Capacity (DSC)	2	3	3	8
Capacity Weight (VCW) (kg)				760
Cargo Weight (RCLW) (kg)				216

**DATA SHEET NO. 1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**VEHICLE TIRE INFORMATION**



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	265/65R18	265/65R18
Tire Size on Vehicle	265/65R18	265/65R18
Tire Manufacturer	Michelin	Michelin
Tire Model	EnergySaver A/S	EnergySaver A/S
Treadwear	480	480
Traction	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	112T	112T
Tire Material	Rubber	Rubber
DOT Safety Code Left	M3K4 007X 2718	M3K4 007X 2718
DOT Safety Code Right	M3K4 007X 2718	M3K4 007X 2718

**DATA SHEET NO. 1 (CONTINUED)  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
Test Date: 2/11/2019

**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	698.5	625.0		726.5	742.5	
Right	kg	667.0	623.5		681.5	733.0	
Ratio	%	52.2%	47.8%		48.8%	51.2%	
Totals	kg	1365.5	1248.5	2614.0	1408.0	1475.5	2883.5

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2614.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Test Vehicle Target Weight (TVTW)	kg	2891.0

**TEST VEHICLE ATTITUDES AND CG**

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	912	909	965	968	1583
As Tested	mm	904	900	935	940	1696
Post Test	mm	877	902	943	941	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3315
Total Vehicle Length at Left Side	mm	5565
Total Vehicle Length at Centerline	mm	5688
Total Vehicle Length at Right Side	mm	5565
Weight of Ballast in Cargo Area	kg	88
Weight of Vehicle Components Removed	kg	28
Amount of Stoddard Solvent in Fuel Tank	L	110.9

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area cover and divider, RR taillight, LF and RF underbody plastic.

**DATA SHEET NO. 1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

	Elements	Pre-Test (mm)
1	Total Length	5688
2	Total Width	2030
3	Bumper Top Height	674
4	Bumper Bottom Height	525
5	Longitudinal Member Top Height	602
6	Distance between Longitudinal Members	710
7	Longitudinal Member Width	93
8	Engine Top Height	1140
9	Engine Bottom Height	325
10	Engine and Gearbox Width	1265
11	Front Bumper-Engine Distance	595
12	Front Shock Absorber Fixing Height	770
13	Bonnet Leading Edge Height	1105
14	Front Shock Absorber Fixing Width	920
15	Front Bumper – Front Axle Distance	1020
16	Front Axle – A-Pillar Distance	495
17	A-Pillar – B-Pillar Distance	1218
18	B-Pillar – Rear Axle Distance	1579
19	B-Pillar – C-Pillar Distance	1061
20	Roof Sill Bottom Height	1715
21	Roof Sill Top Height	1820
22	Floor Sill Bottom Height	390
23	Floor Sill Top Height	550

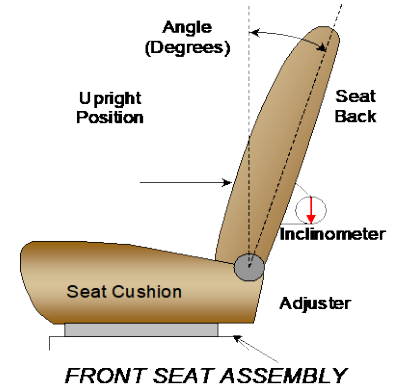
**DATA SHEET NO. 2**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**NOMINAL DESIGN RIDING POSITION**

The driver seat back is positioned as close as possible to the manufacturer’s design angle. For the passenger seat back, seat back is adjusted following Appendix F, “Driver & Passenger Dummy Seating & Positioning Procedures” in the NCAP Test Procedure dated October 2015.



	Degrees
Driver Seat Back Angle	3.0° on outboard headrest post
Passenger Seat Back Angle	0.7° on outboard headrest post

**SEAT FORE/AFT POSITIONS**

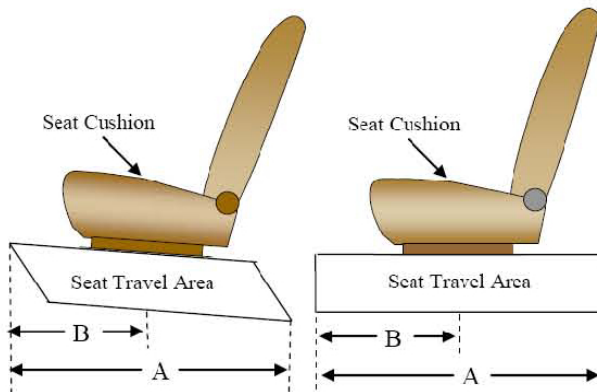
The driver and passenger seat fore/aft positions are adjusted following Appendix F, “Driver & Passenger Dummy Seating & Positioning Procedures” in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	334 mm	167 mm
Passenger Seat	212 mm	0 mm

**SEAT BELT UPPER ANCHORAGES**

The seat belt upper anchorages are positioning following the manufacturer’s specified position as listed in Form 1.

	Total # of Positions	Placed in Position #
Driver Seat	5 (1 <sup>st</sup> as 1)	0 (1 <sup>st</sup> as 0)
Passenger Seat	5 (1 <sup>st</sup> as 1)	0 (1 <sup>st</sup> as 0)





**DATA SHEET NO. 2 (CONTINUED)**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
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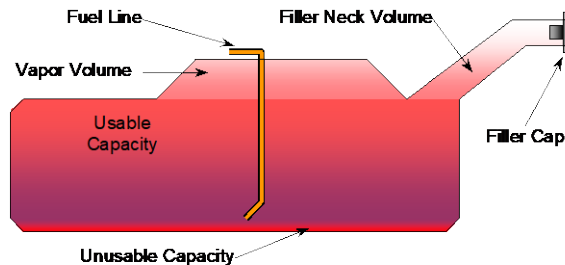
**FUEL TANK CAPACITY DATA**

	Liters
Usable Capacity of "Standard Tank"	119.2
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	109.7 to 112.0
Actual Amount of Solvent used	110.9
1/3 of Usable Capacity	39.7

**FUEL PUMP**

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

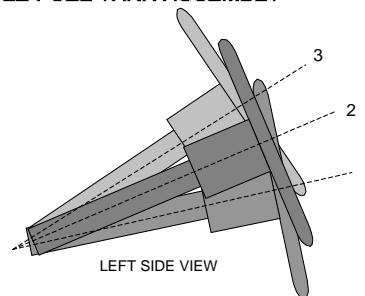
The vehicle is equipped with an electronic fuel pump. The fuel pump will run when the engine is running. The pump will also briefly run when the ignition key is turned to the "on" position. The filler neck is located on the driver's side.



VEHICLE FUEL TANK ASSEMBLY

**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

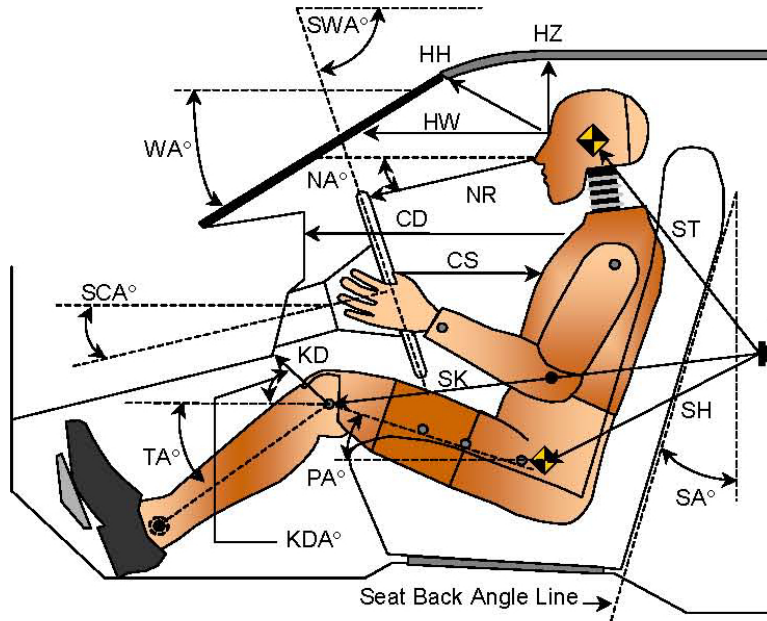
**STEERING COLUMN POSITION**

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	78.4	
Geometric Center Position 2	67.2	
Uppermost Position 3	56.0	
Telescoping Steering Wheel Travel		
Test Position	68.5	

**DATA SHEET NO. 3  
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019



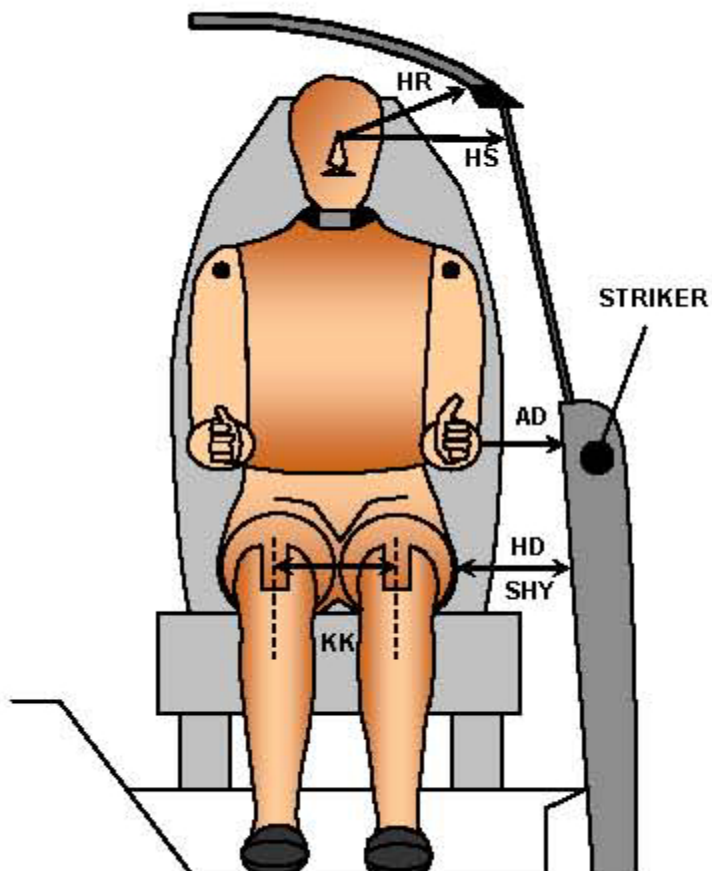
**LEFT SIDE VIEW**

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		28.4		
SWA°	Steering Wheel Angle		68.5		
SCA°	Steering Column Angle		21.5		
SA°	Seat Back Angle		3.0		0.7
HZ	Head to Roof (Z)	292	90	319	90
HH	Head to Header	464	25.0	420	32.9
HW	Head to Windshield	761	0	762	0
NR	Nose to Rim	406	6.5		
CD	Chest to Dash	543		449	
CS	Chest to Steering Hub	345	1.9		
RA	Rim to Abdomen	226	0		
KDL	Left Knee to Dash	187	36.8	138	28.5
KDR	Right Knee to Dash	170	34.4	141	30.8
PA°	Pelvic Angle		23.4		20.2
TA°	Tibia Angle		45.5		54.0
SK	Striker to Knee	596	82.7	563	89.0
ST	Striker to Head	614	13.2	595	23.2
SH	Striker to H-Point	219	104.5	320	91.9

**DATA SHEET NO. 4  
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019



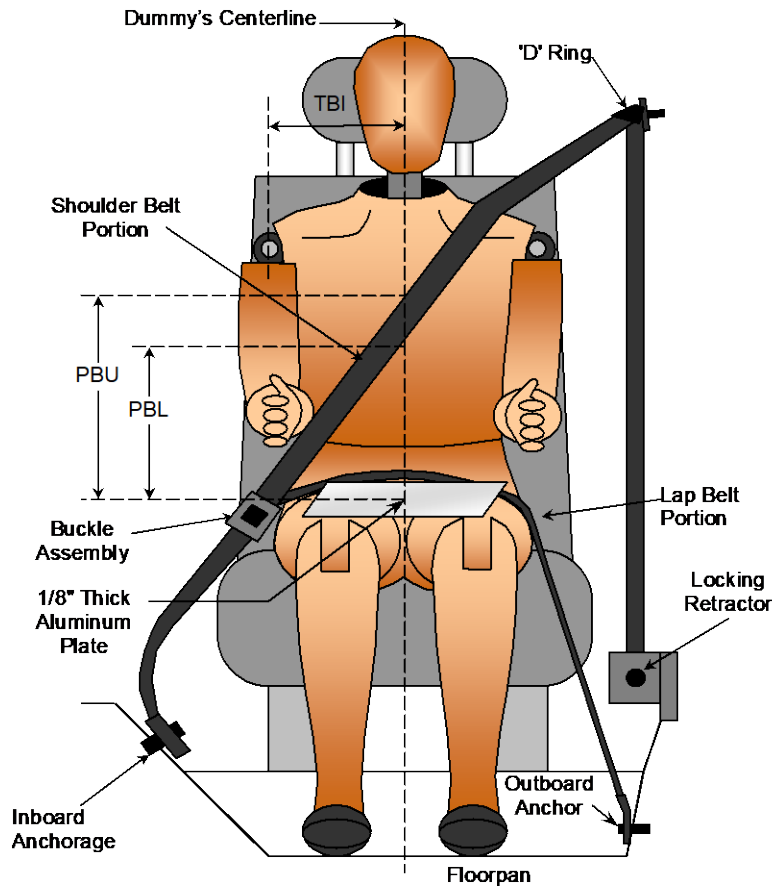
**FRONT VIEW OF DUMMY**

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	159	102
HD	H-Point to Door	136	170
HR	Head to Side Header	268	302
HS	Head to Side Window	347	361
KK	Knee to Knee	374	226
SHY	Striker to H-Point (Y Direction)	297	310
AA	Ankle to Ankle	380	162

**DATA SHEET NO. 5  
SEAT BELT POSITIONING DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019



**FRONT VIEW OF DUMMY**

**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	345	340
PBL - Top surface of reference to belt lower edge	mm	265	250

**BELT LENGTH DATA**

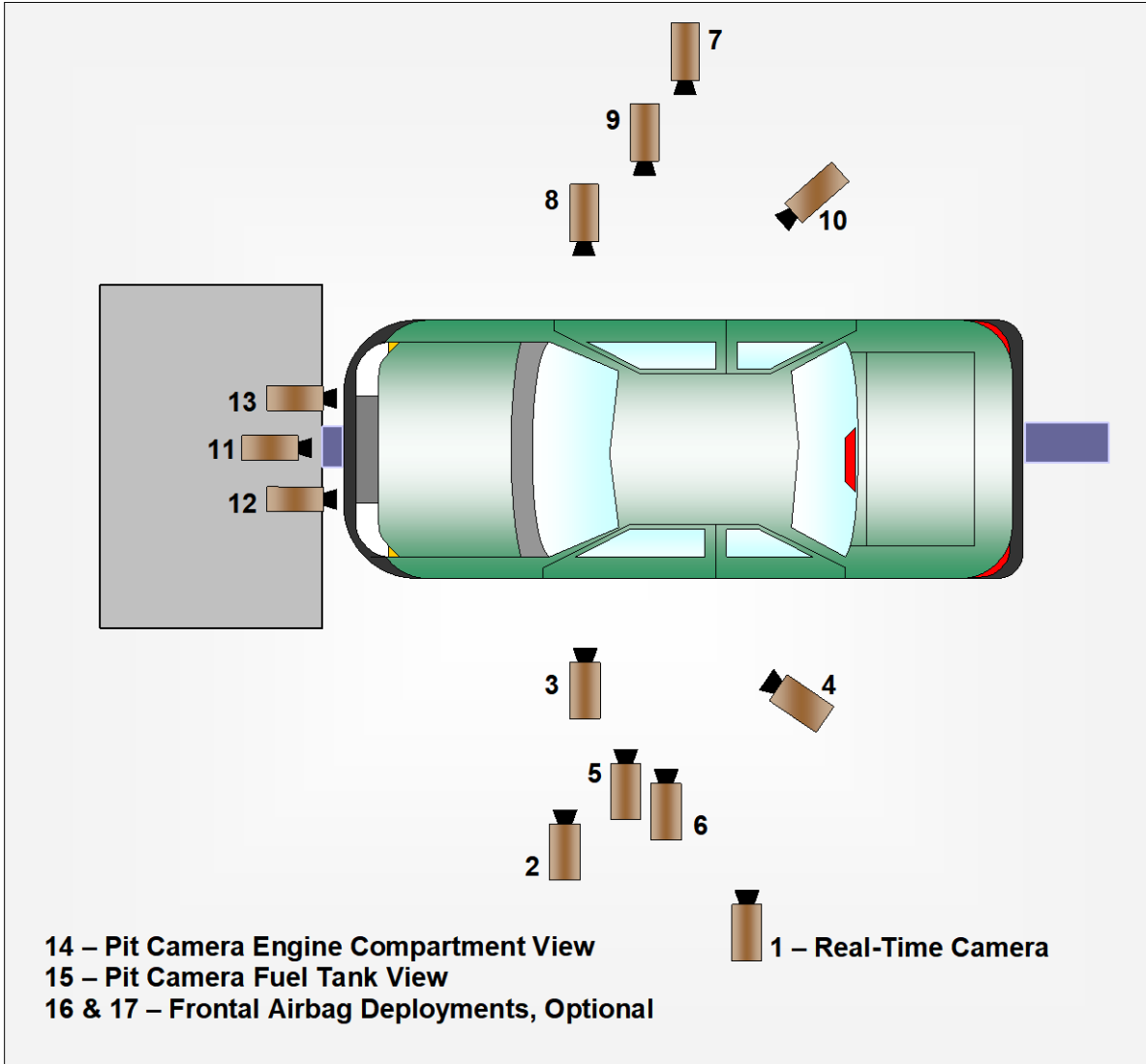
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	860	875
Lap Belt Length as measured on ATD	mm	430	465
Remainder of belt on reel	mm	1010	960
Total Belt Length for Continuous Webbing Systems	mm	2900	2900

**DATA SHEET NO. 6  
HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
Test Date: 2/11/2019

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



**DATA SHEET NO. 6 (CONTINUED)  
CAMERA LOCATIONS AND DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**CAMERA LOCATIONS**

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1900	-6540	-1900	50	1000
3	Left Front Half	-1190	-5870	-1320	24	1000
4	Left Angle	-7080	-5760	-2060	75	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2550	6230	-1400	14	1000
8	Passenger Close-Up	-1900	6300	-1960	50	1000
9	Right Front Half	-1160	6010	-1390	24	1000
10	Right Angle	-6910	5600	-2050	75	1000
11	Windshield	100	0	-2310	16	1000
12	Driver Windshield	170	-370	-2330	25	1000
13	Passenger Windshield	170	370	-2330	25	1000
14	Pit Front	-1090	0	3340	24	1000
15	Pit Rear	-3290	0	3340	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

**\*COORDINATES:**

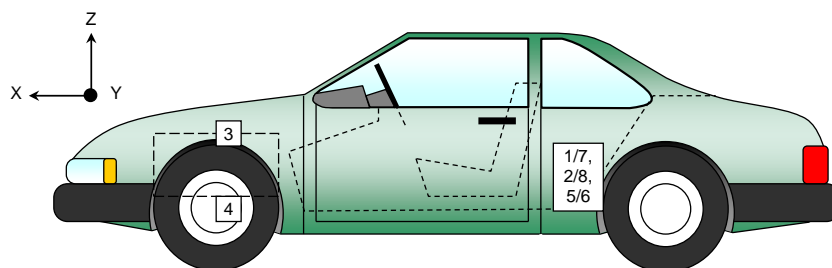
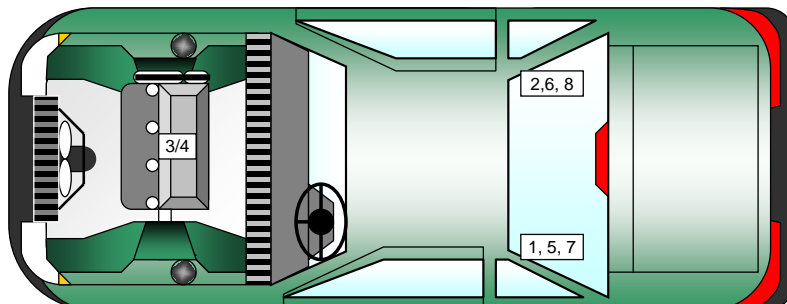
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 5 & 6 were not used for this test.

**DATA SHEET NO. 7  
VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	2678	-525	-550
2	Right Rear Crossmember Accelerometer – X Direction	2678	470	-547
3	Engine Top X	4683	25	-1150
4	Engine Bottom X	4326	50	-330
5	Left Rear Crossmember Accelerometer – Z Direction	2678	-525	-550
6	Right Rear Crossmember Accelerometer – Z Direction	2678	470	-547
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2723	-525	-550
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2723	470	-547

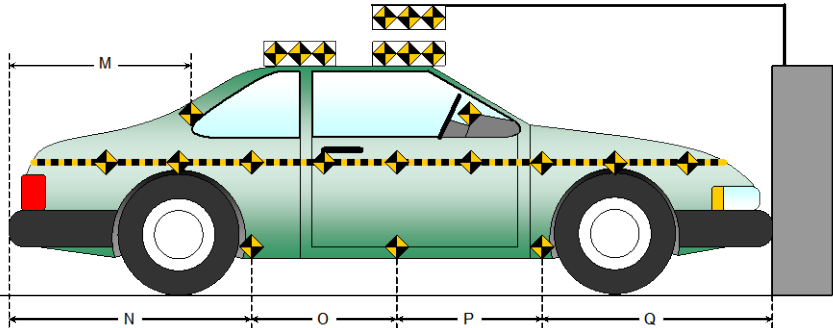
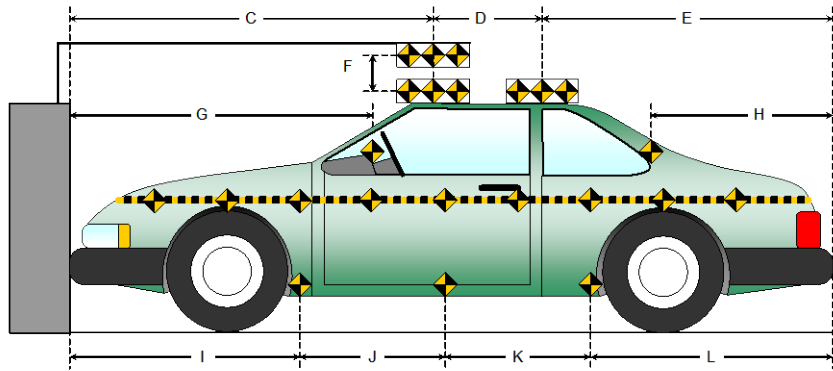
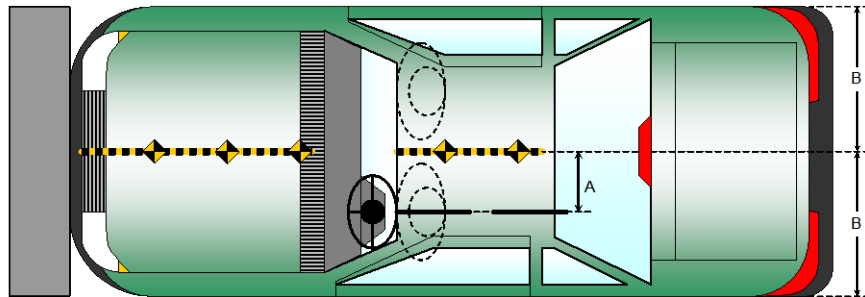
Reference Points: X - Rear Surface of Vehicle (+ forward)  
 Y - Vehicle Centerline (+ to right)  
 Z - Ground Plane (+ down)

**DATA SHEET NO. 8**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

Item	Value (mm)
A	440
B	1015
C	2510
D	643
E	2535
F	170
G	
H	1947
I	1527
J	1144
K	1144
L	1873
M	1947
N	1873
O	1144
P	1144
Q	1527





**DATA SHEET NO. 9  
LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**Advanced Research Load Cell Barrier**

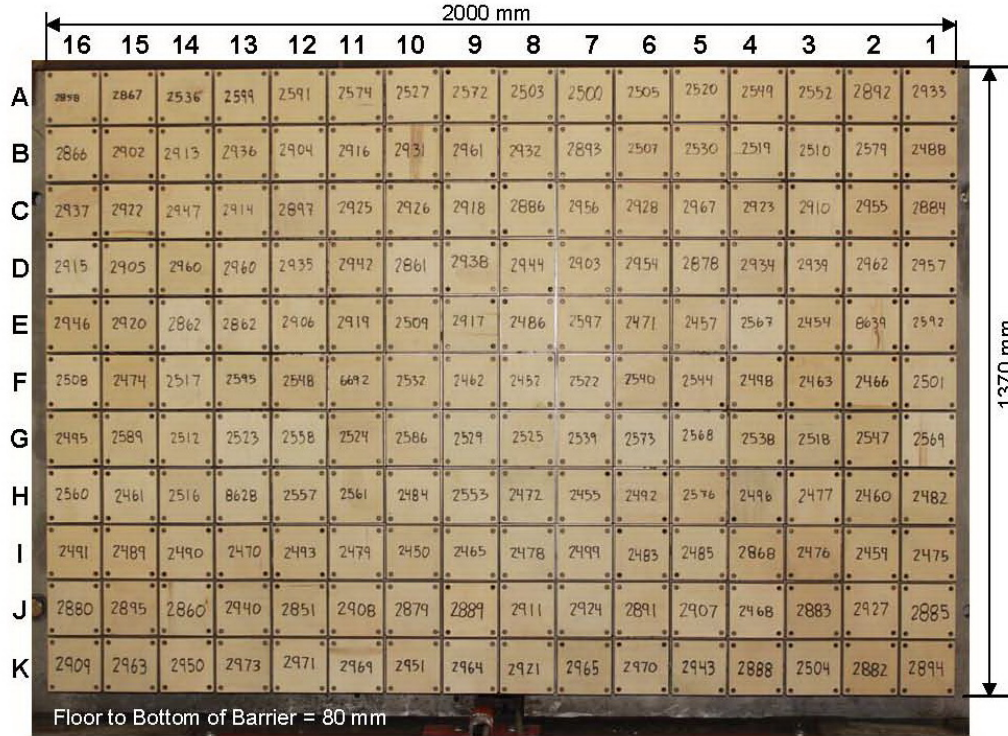


Photo for Reference Only

Centerline

A-16	A-15	A-14	A-13	A-12	A-11	A-10	A-09	A-08	A-07	A-06	A-05	A-04	A-03	A-02	A-01
B-16	B-15	B-14	B-13	B-12	B-11	B-10	B-09	B-08	B-07	B-06	B-05	B-04	B-03	B-02	B-01
C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-09	C-08	C-07	C-06	C-05	C-04	C-03	C-02	C-01
D-16	D-15	D-14	D-13	D-12	D-11	D-10	D-09	D-08	D-07	D-06	D-05	D-04	D-03	D-02	D-01
E-16	E-15	E-14	E-13	E-12	E-11	E-10	E-09	E-08	E-07	E-06	E-05	E-04	E-03	E-02	E-01
F-16	F-15	F-14	F-13	F-12	F-11	F-10	F-09	F-08	F-07	F-06	F-05	F-04	F-03	F-02	F-01
G-16	G-15	G-14	G-13	G-12	G-11	G-10	G-09	G-08	G-07	G-06	G-05	G-04	G-03	G-02	G-01
H-16	H-15	H-14	H-13	H-12	H-11	H-10	H-09	H-08	H-07	H-06	H-05	H-04	H-03	H-02	H-01
I-16	I-15	I-14	I-13	I-12	I-11	I-10	I-09	I-08	I-07	I-06	I-05	I-04	I-03	I-02	I-01
J-16	J-15	J-14	J-13	J-12	J-11	J-10	J-09	J-08	J-07	J-06	J-05	J-04	J-03	J-02	J-01
K-16	K-15	K-14	K-13	K-12	K-11	K-10	K-09	K-08	K-07	K-06	K-05	K-04	K-03	K-02	K-01

Load Cells are 121 mm x 121 mm with a 7 mm gap in between each load cell.

**DATA SHEET NO. 10**  
**TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
Test Date: 2/11/2019

**INSTRUMENTATION**

Driver Dummy Data Channels	49
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	634

**CAMERA COVERAGE**

High-Speed Vehicle Onboard	2
High-Speed Offboard	12
Real-Time	2
Total	16

**DATA SHEET NO. 11  
POST-TEST OBSERVATIONS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 634
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

**DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were locked	Doors were locked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

**POST TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked
Window Damage	None
Other Notable Effects	None

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	703
Center	mm	699
Right Side	mm	774
Average	mm	725

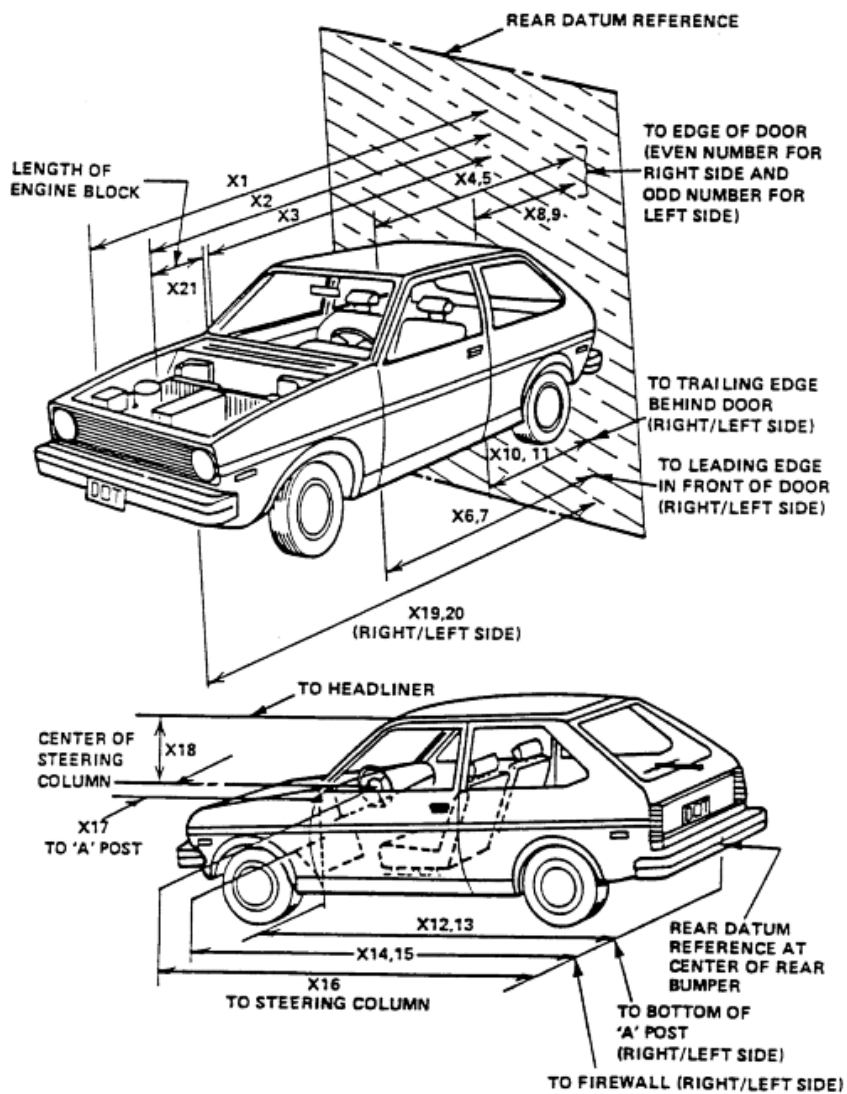
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	Yes	Yes	Yes
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

## DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019



**DATA SHEET NO. 12 (CONTINUED)  
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
Test Date: 2/11/2019

**RSOV (Rear Surface of Vehicle)**

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5688	5022	666
2	RSOV to Front of Engine	mm	4793	4606	187
3	RSOV to Firewall	mm	4460	4369	91
4	RSOV to Upper Leading Edge of Right Door	mm	4087	4099	-12
5	RSOV to Upper Leading Edge of Left Door	mm	4087	4090	-3
6	RSOV to Lower Leading Edge of Right Door	mm	4007	3991	16
7	RSOV to Lower Leading Edge of Left Door	mm	4007	3981	26
8	RSOV to Upper Trailing Edge of Right Door	mm	2929	2946	-17
9	RSOV to Upper Trailing Edge of Left Door	mm	2929	2940	-11
10	RSOV to Lower Trailing Edge of Right Door	mm	2900	2895	5
11	RSOV to Lower Trailing Edge of Left Door	mm	2900	2889	11
12	RSOV to Bottom of "A" Post of Right Side	mm	3994	3965	29
13	RSOV to Bottom of "A" Post of Left Side	mm	3992	3946	46
14	RSOV to Firewall, Right Side	mm	4372	4470	-98
15	RSOV to Firewall, Left Side	mm	4369	4375	-6
16	RSOV to Steering Column	mm	3582	3550	32
17	Center of Steering Column to "A" Post	mm	391	391	0
18	Center of Steering Column to Headliner	mm	412	366	46
19	RSOV to Right Side of Front Bumper	mm	5565	4976	589
20	RSOV to Left Side of Front Bumper	mm	5565	4974	591
21	Length of Engine Block	mm	490	490	0
RD	RSOV to Right Side of Dash Panel	mm	3855	3854	1
CD	RSOV to Center of Dash Panel	mm	3758	3755	3
LD	RSOV to Left Side of Dash Panel	mm	3855	3856	-1

**DATA SHEET NO. 13**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

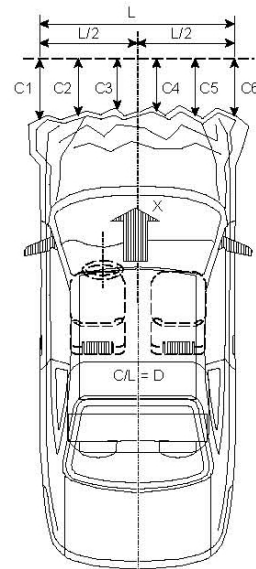
NHTSA No.: O20190102  
Test Date: 2/11/2019

**VEHICLE INFORMATION**

VIN: 1GNSKGGK1KR130233 Wheelbase (mm): 3315  
Vehicle Size Category: MPV Test Weight (kg): 2883.5

**ACCELEROMETER DATA**

Accelerometer Locations: As per measurements on Page 15  
Cal. Procedure/Interval: MGA procedure / 6 month  
Integration Algorithm: Trapezoidal  
Linearity: > 99%  
Impact Velocity (km/h): 56.62  
Velocity Change (km/h): 64.2  
Time of Separation (msec): 85



**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW2  
Midpoint of Damage: Centerline  
Damage Region Length (mm): 1246  
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	5565	4974	591
C2	Crush zone 2 at left side	mm	5624	4967	657
C3	Crush zone 3 at left side	mm	5656	5000	656
C4	Crush zone 4 at right side	mm	5656	5006	650
C5	Crush zone 5 at right side	mm	5624	4974	650
C6	Crush zone 6 at right side	mm	5565	4976	589
L	C1 TO C6	mm	1246	1232	14

**DATA SHEET NO. 14  
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

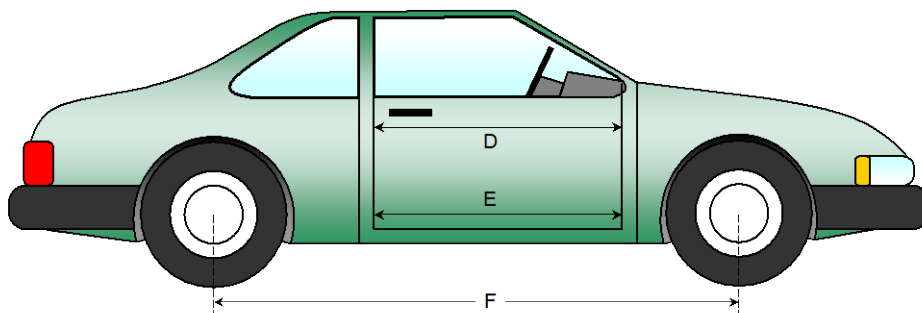
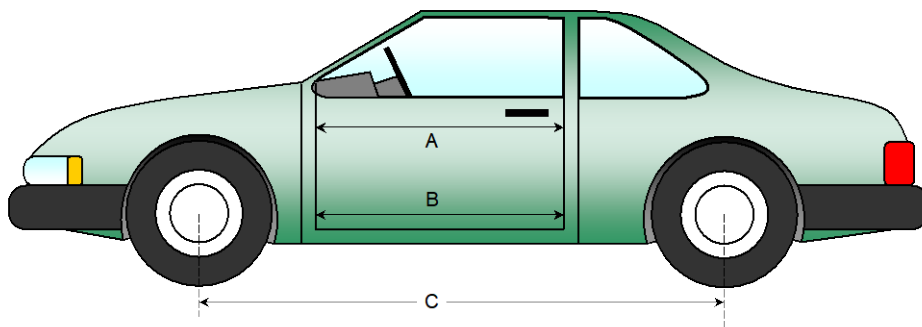
NHTSA No.: O20190102  
 Test Date: 2/11/2019

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1048	1048	0
B	Left Side Lower	mm	986	986	0
D	Right Side Upper	mm	1048	1047	1
E	Right Side Lower	mm	986	986	0

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3315	3218	97
F	Right Side Wheelbase	mm	3315	3242	73



**DATA SHEET NO. 14 (CONTINUED)  
VEHICLE INTRUSION MEASUREMENTS**

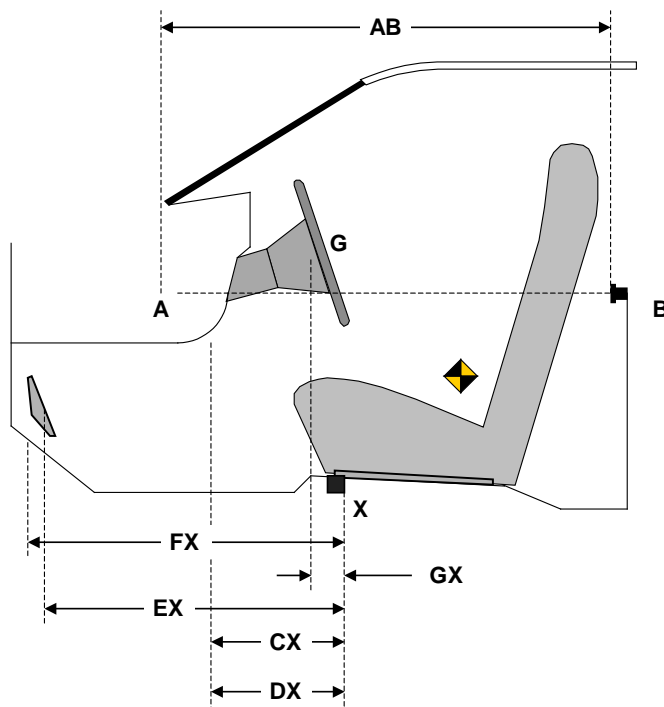
Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	740	740	0
CX	Left Knee Bolster to X	mm	285	279	6
DX	Right Knee Bolster to X	mm	283	257	26
EX	Brake Pedal to X	mm	560	556	4
FX	Foot Rest to X	mm	532	538	-6
GX	Center of Steering Column Wheel Hub to X	mm	119	120	-1

X = Front of Seat Track (stationary)



**DRIVER COMPARTMENT**



**DATA SHEET NO. 15**  
**SUMMARY OF FMVSS 212, FMVSS 219 (PARTIAL) DATA, AND 301 DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019

**Windshield Mounting Details:**

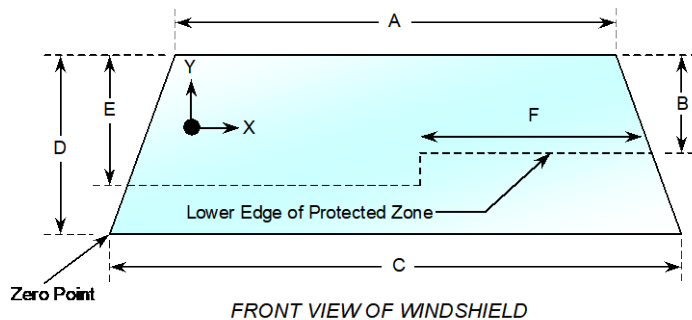
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.3° C.

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2312	2091	90.4
Right Side	2312	1982	85.7
Total	4624	4073	88.1



Item	Units	Value
A	mm	1370
B	mm	465
C	mm	1634
D	mm	810
E	mm	477
F	mm	554

**AREA OF PROTECTED ZONE FAILURES - NONE**

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

X	Y

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component. **None**

X	Y

**DATA SHEET NO. 15 (CONTINUED)**  
**SUMMARY OF FMVSS 212, FMVSS 219 (PARTIAL), AND 301 DATA**

Test Vehicle:	<u>2019 Chevrolet Suburban 4WD LS 5-Door SUV</u>	NHTSA No.:	<u>O20190102</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>2/11/2019</u>

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 21.1°C

Test Time: 10:18 a.m.

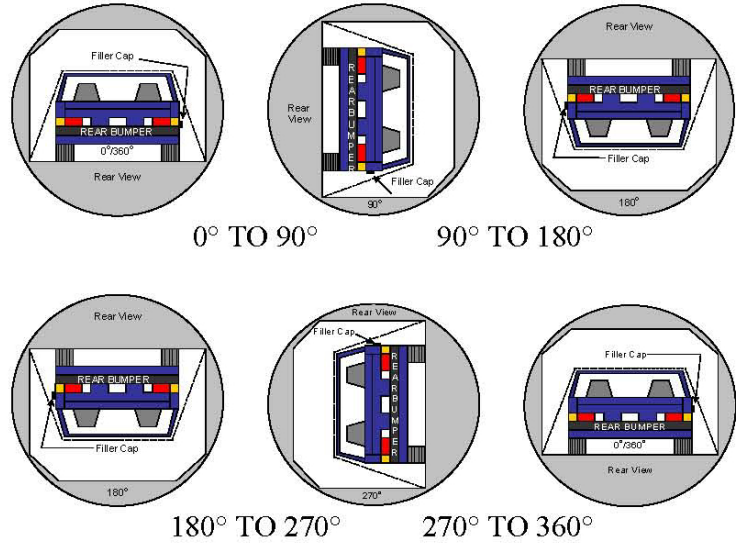
- A. From impact until vehicle motion ceases: 0 oz.  
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.  
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.  
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

**DATA SHEET NO. 16**  
**FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
Test Date: 2/11/2019

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage: **None**



**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	94	300	394
90° to 180°	90	300	390
180° to 270°	85	300	385
270° to 360°	84	300	384

**FMVSS 301 SPILLAGE TABLE (units in ounces)**

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

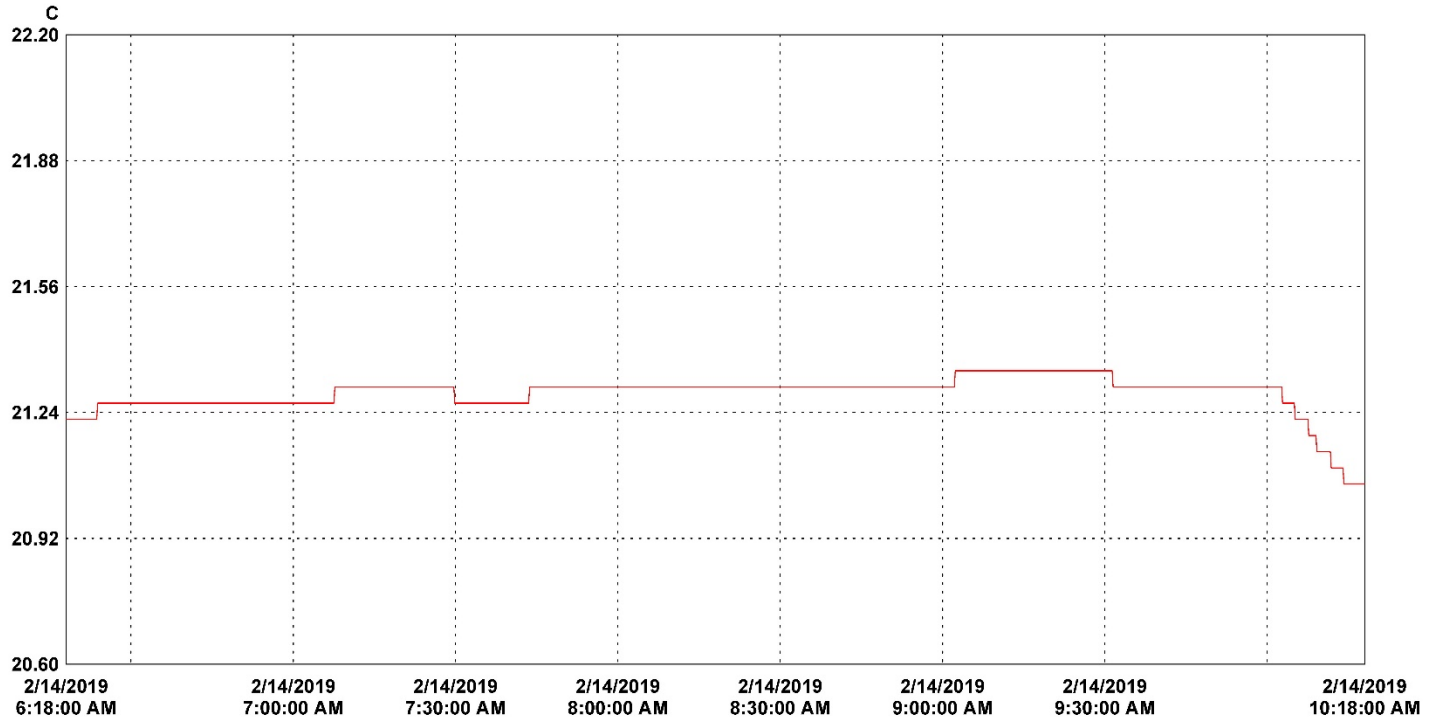
**SOLVENT SPILLAGE LOCATION TABLE**

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

**DATA SHEET NO. 17  
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA**

Test Vehicle: 2019 Chevrolet Suburban 4WD LS 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20190102  
 Test Date: 2/11/2019



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	12032257	VSC_Prep_Room	1	21.35	21.29	21.06	C	Temperature	12032257_VSC_Prep_Room.spl	

**APPENDIX A  
PHOTOGRAPHS**

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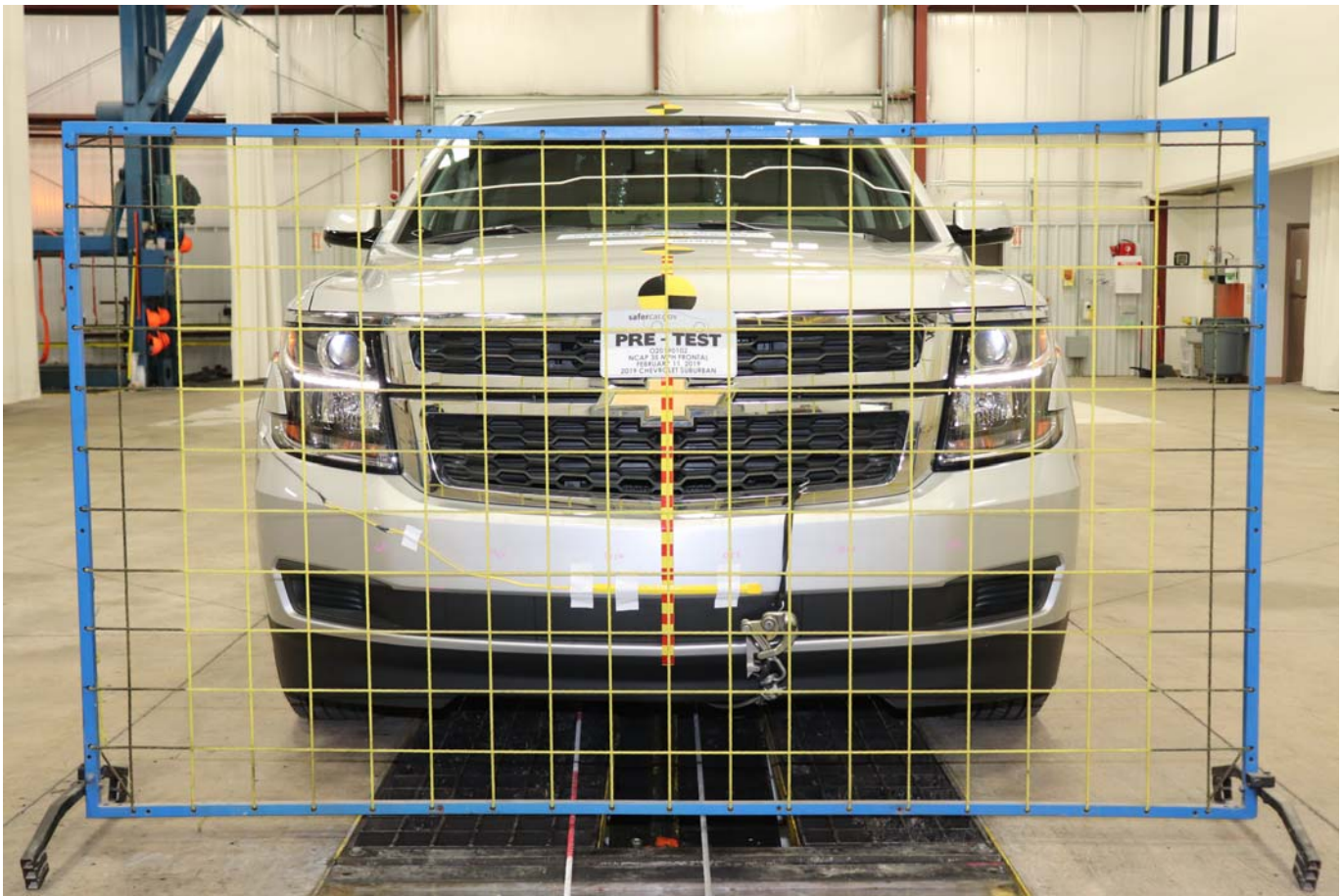


Photo No. 001 - Load Cell Location



Photo No. 002 - Pre-Test Load Cell Wall





Photo No. 003 - Post-Test Load Cell Wall

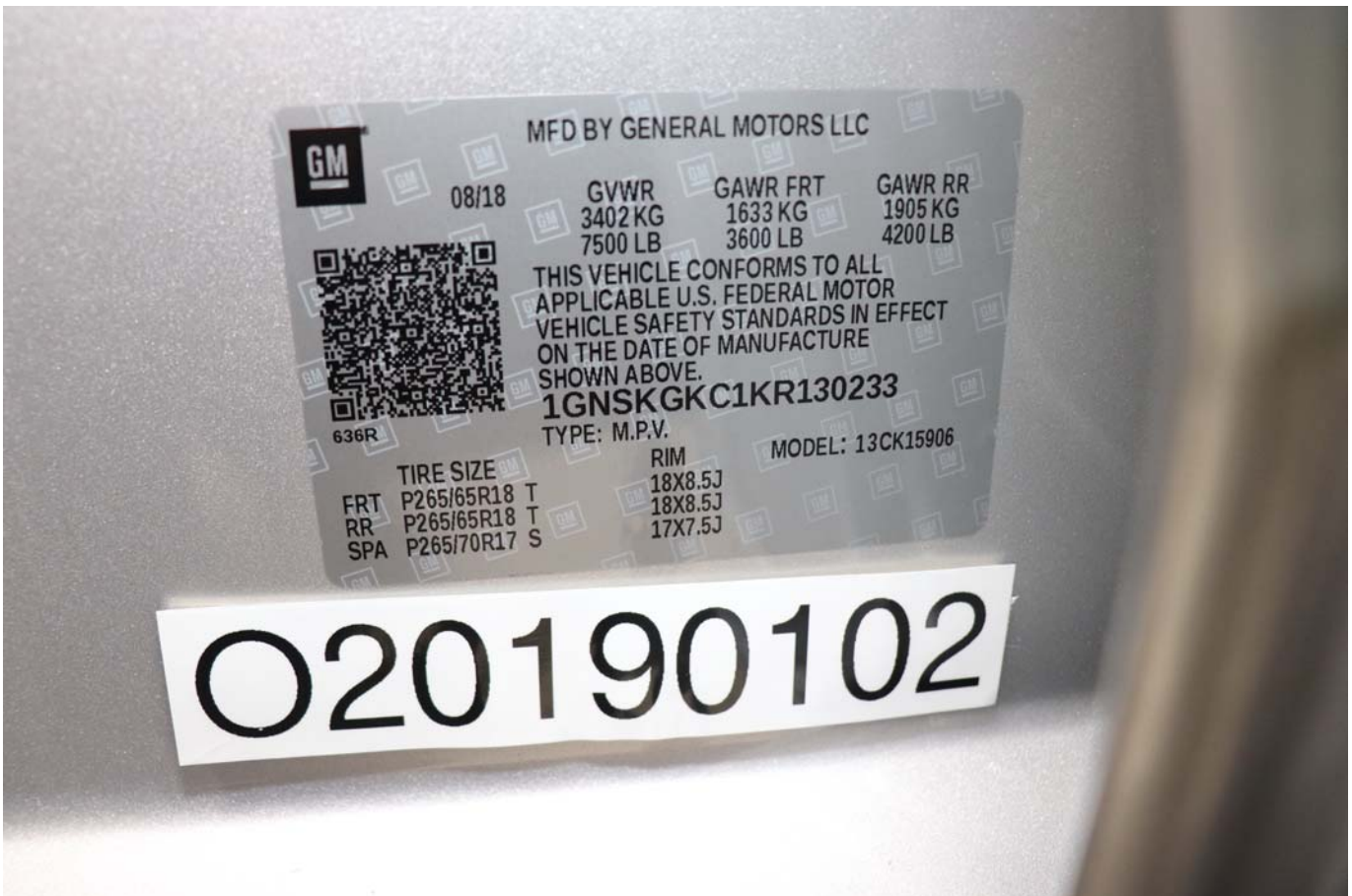


Photo No. 004 - Manufacturer Label





Photo No. 005 - Tire Placard



Photo No. 006 - 2019 Chevrolet Suburban 4WD LS 5-Door SUV Frontal As Delivered





Photo No. 007 - Left Rear 3-4 View, As Received

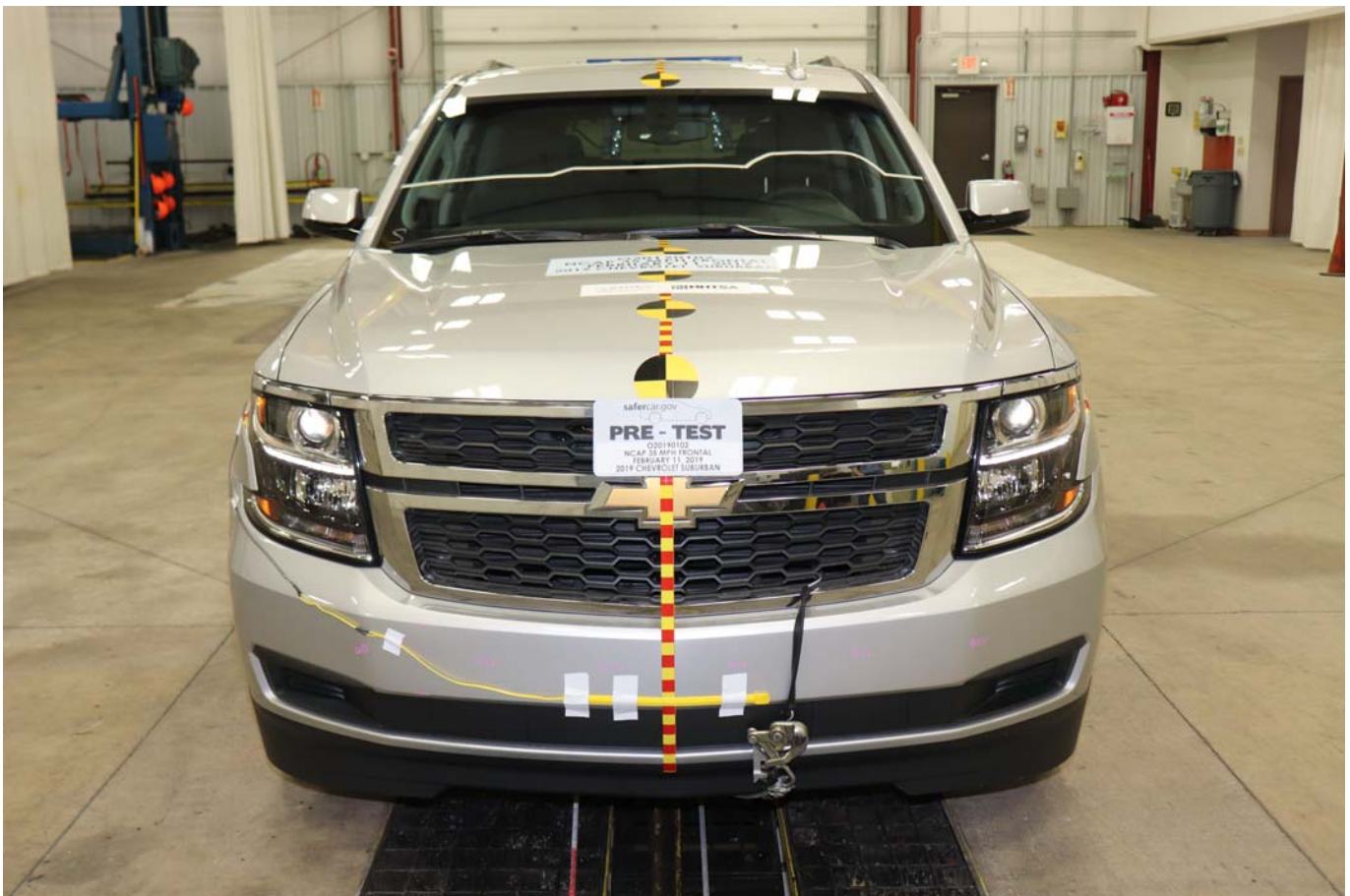


Photo No. 008 - Pre-Test Front View of Test Vehicle



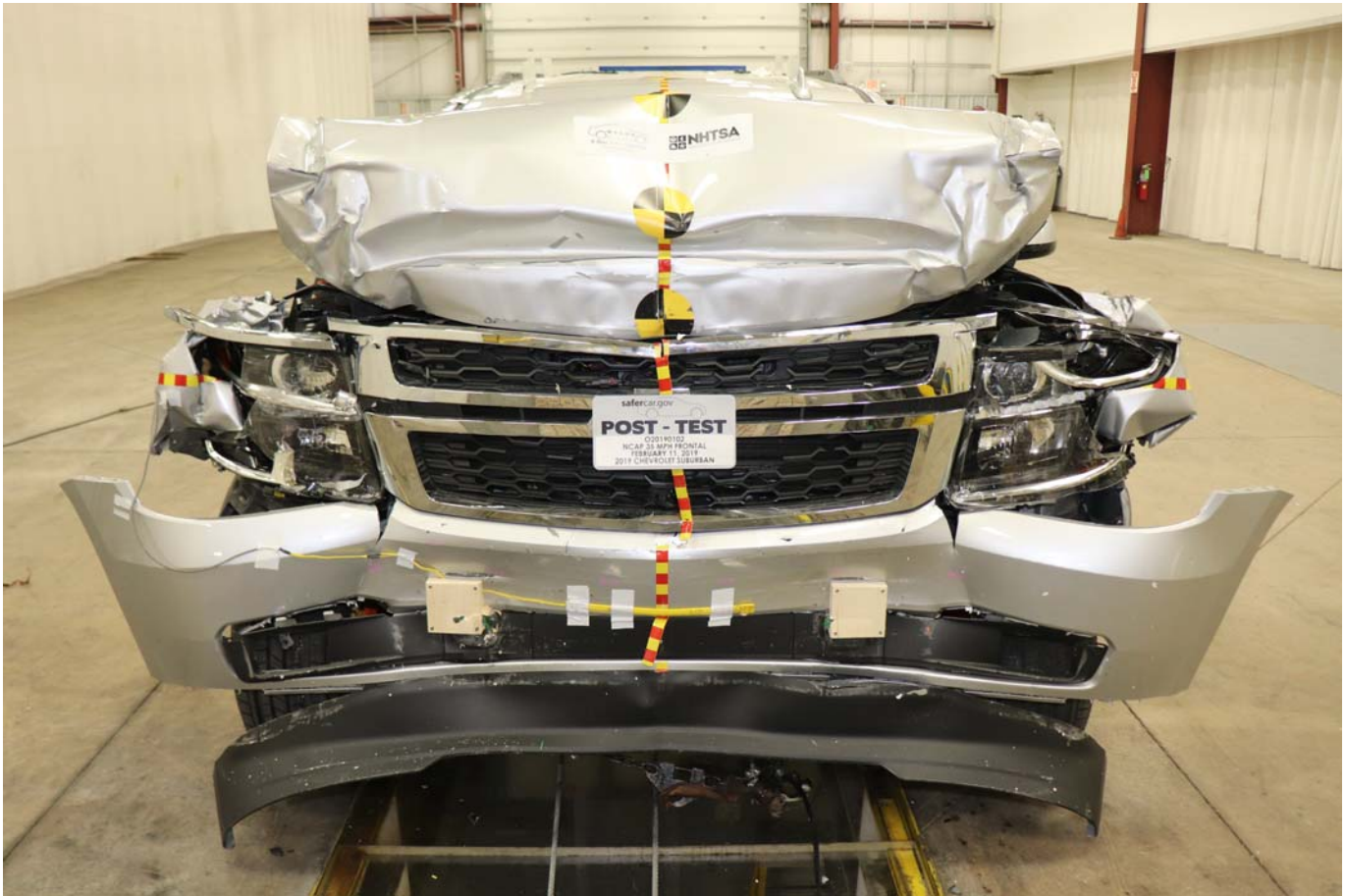


Photo No. 009 - Post-Test Front View of Test Vehicle



Photo No. 010 - Pre-Test Left View of Test Vehicle



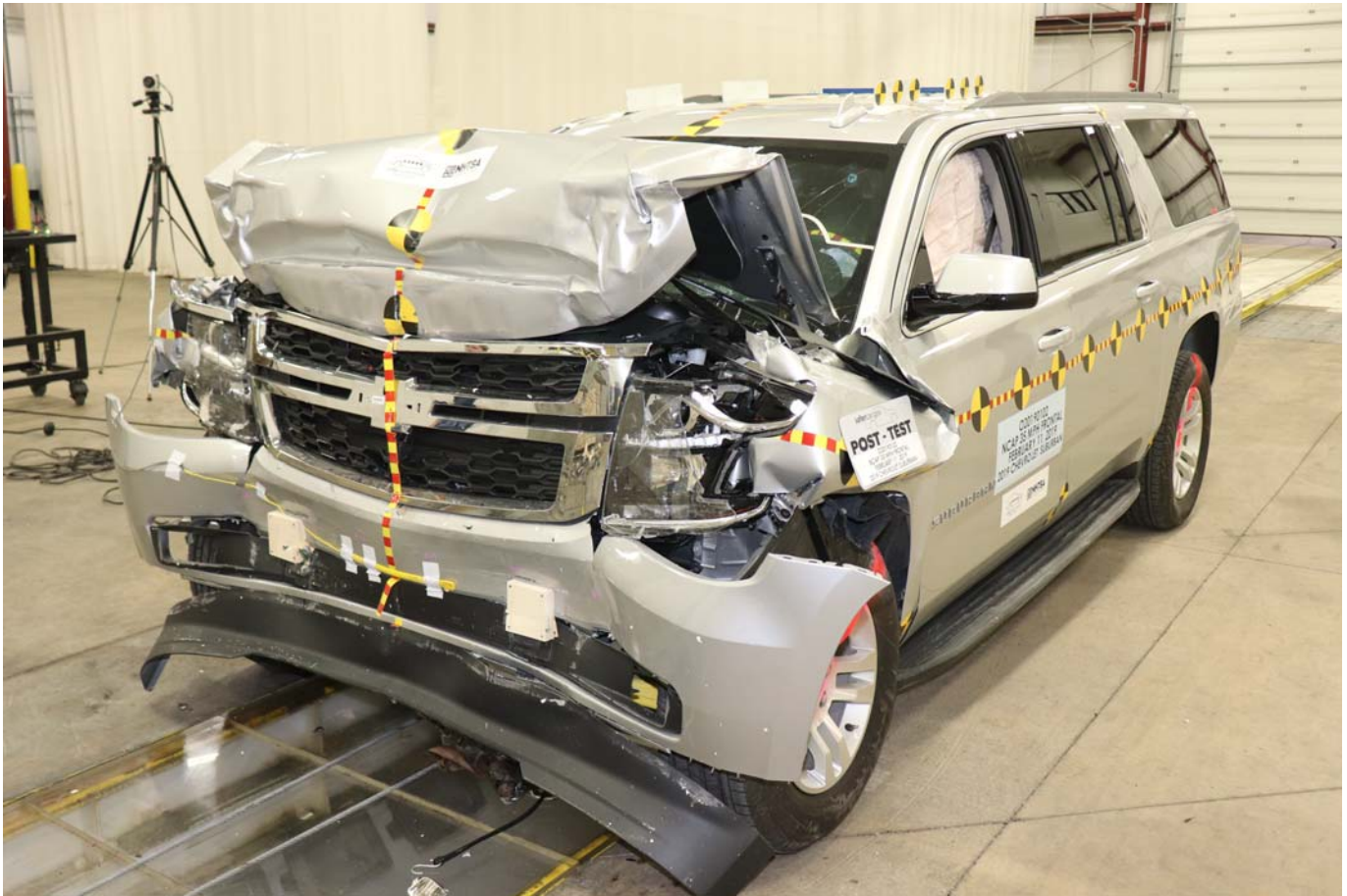


Photo No. 011 - Post-Test Left View of Test Vehicle



Photo No. 012 - Pre-Test Right View of Test Vehicle





Photo No. 013 - Post-Test Right View of Test Vehicle



Photo No. 014 - Pre-Test Right Front 3-4 View





Photo No. 015 - Post-Test Right Front 3-4 View



Photo No. 016 - Pre-Test Left Rear 3-4 View





Photo No. 017 - Post-Test Left Rear 3-4 View



Photo No. 018 - Pre-Test Windshield View





Photo No. 019 - Post-Test Windshield View



Photo No. 020 - Pre-Test Engine Compartment View

**PHOTOGRAPH NOT AVAILABLE**

Photo No. 021 - Post-Test Engine Compartment View



Photo No. 022 - Pre-Test Fuel Filler Cap View





Photo No. 023 - Post-Test Fuel Filler Cap View

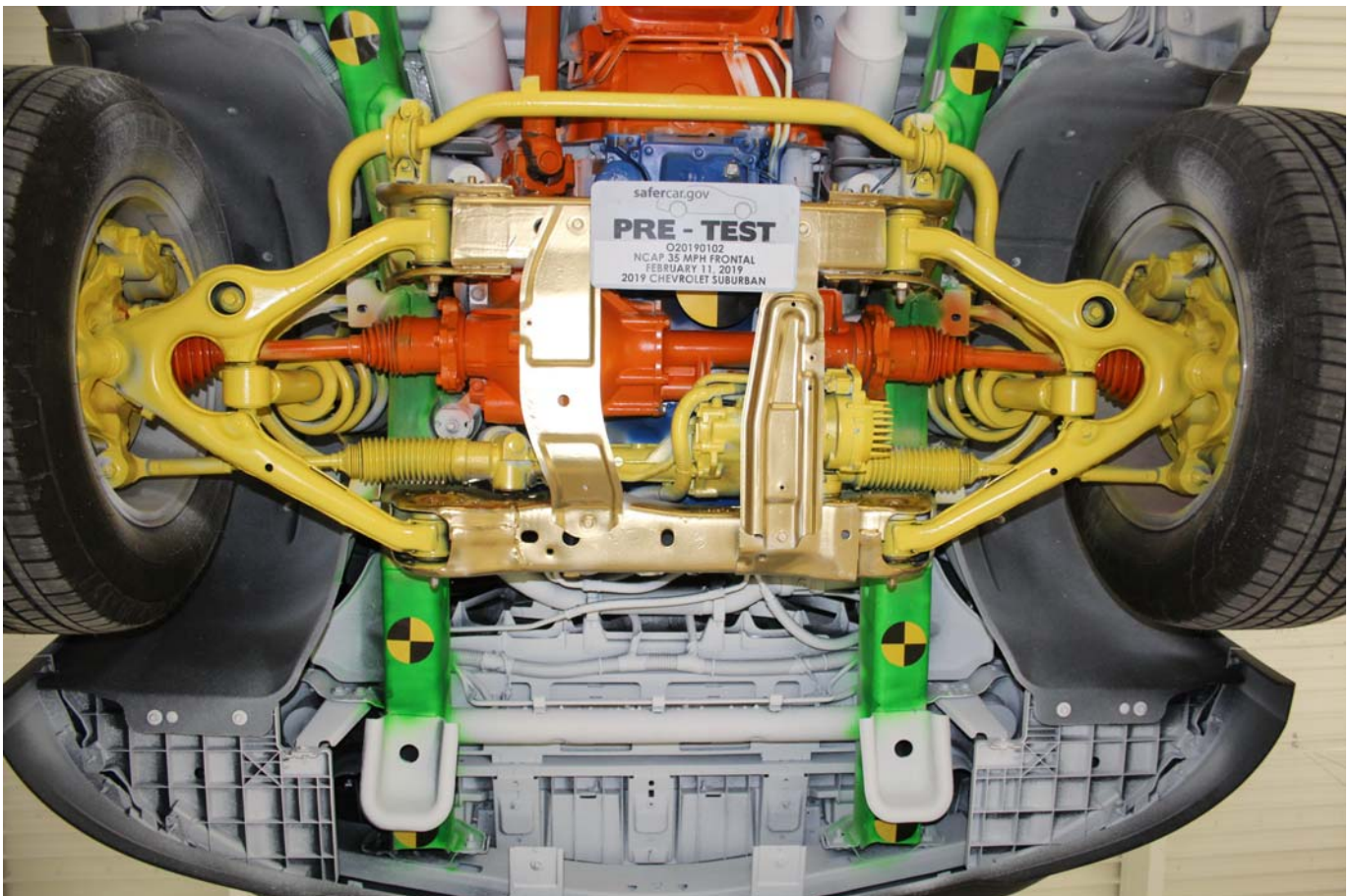


Photo No. 024 - Pre-Test Front Underbody View



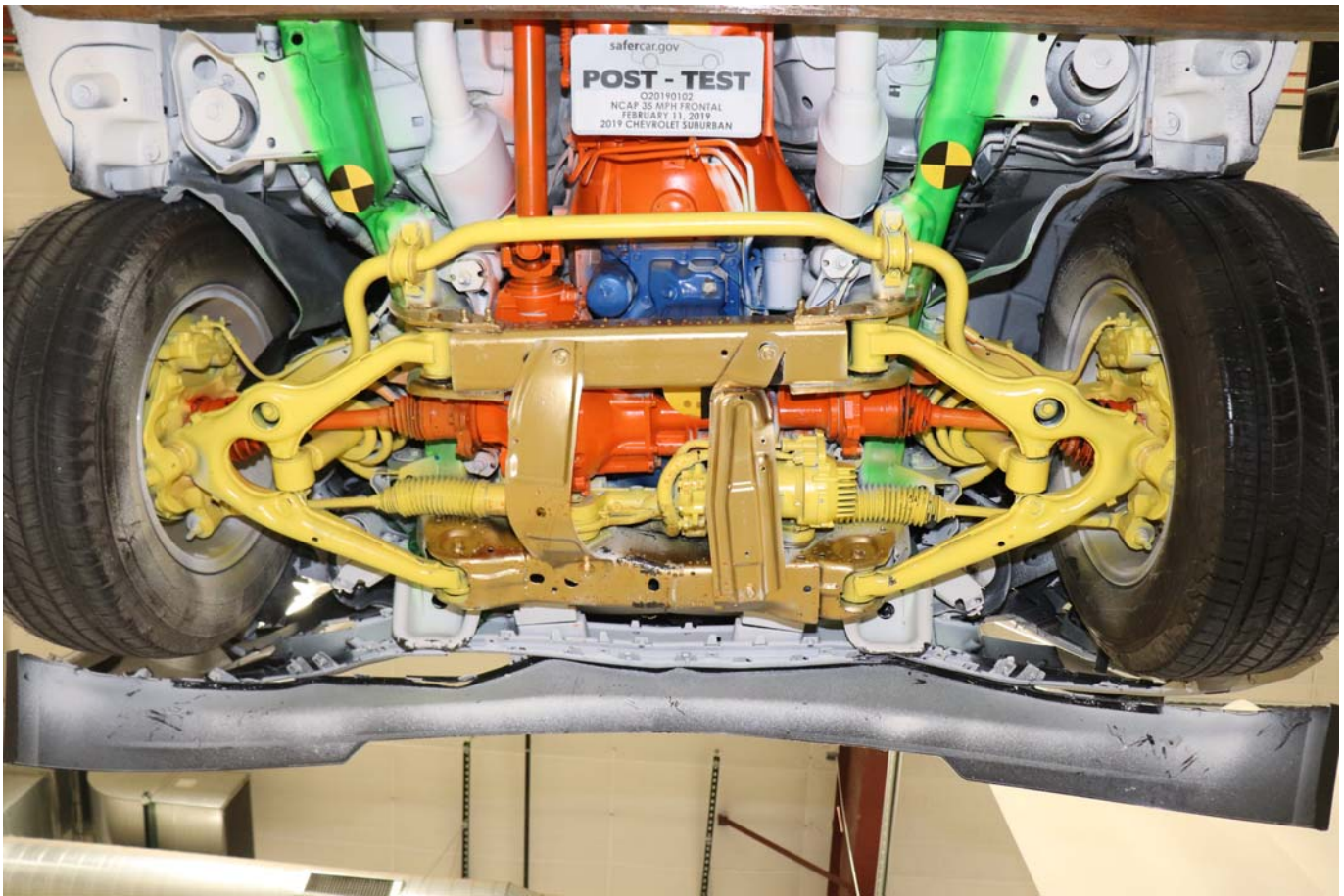


Photo No. 025 - Post-Test Front Underbody View

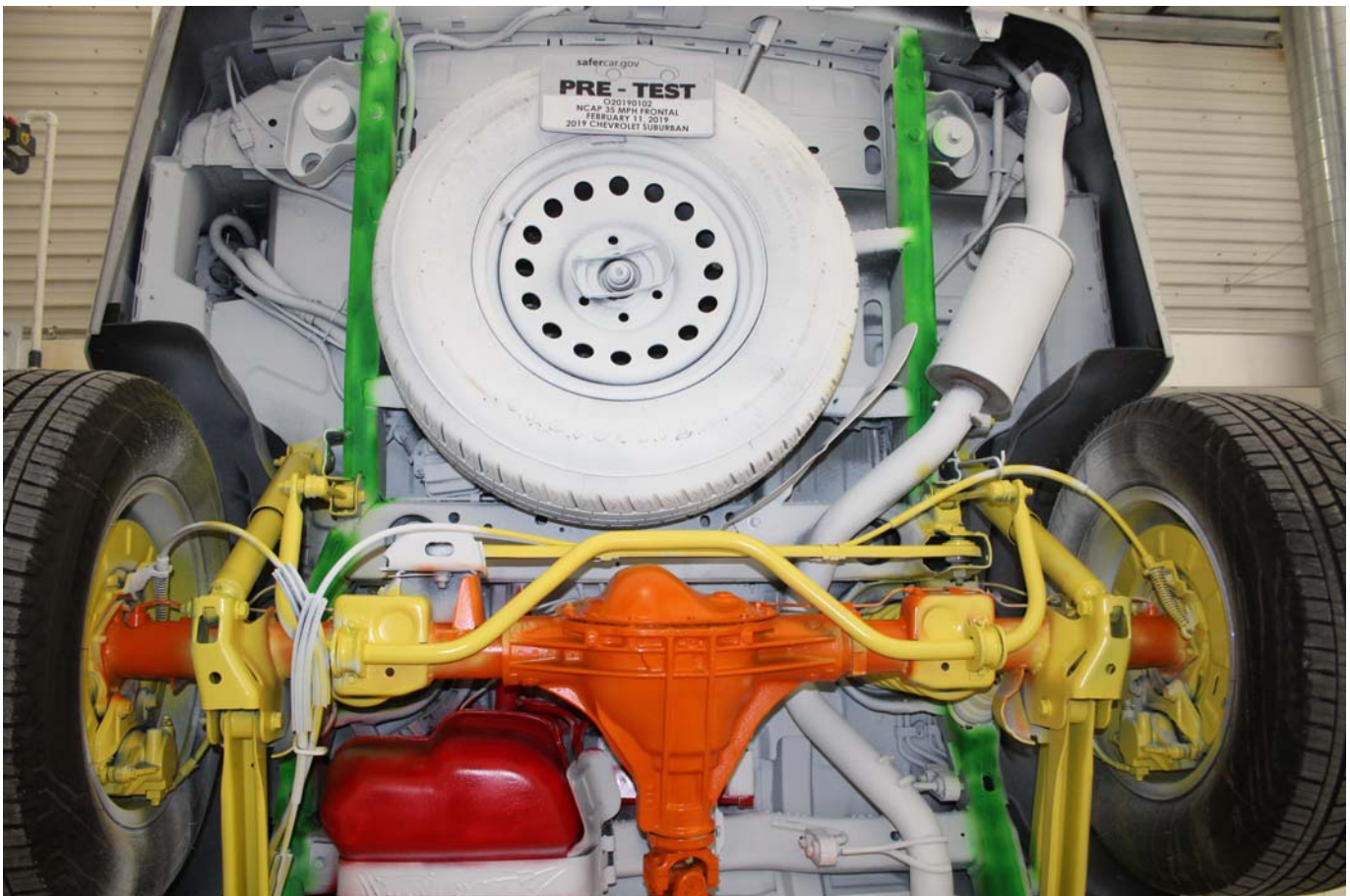


Photo No. 026 - Pre-Test Rear Underbody View





Photo No. 027 - Post-Test Rear Underbody View



Photo No. 028 - Pre-Test Dummy Cable Routing



Photo No. 029 - Post-Test Dummy Cable Routing



Photo No. 030 - Pre-Test Driver Dummy Front View



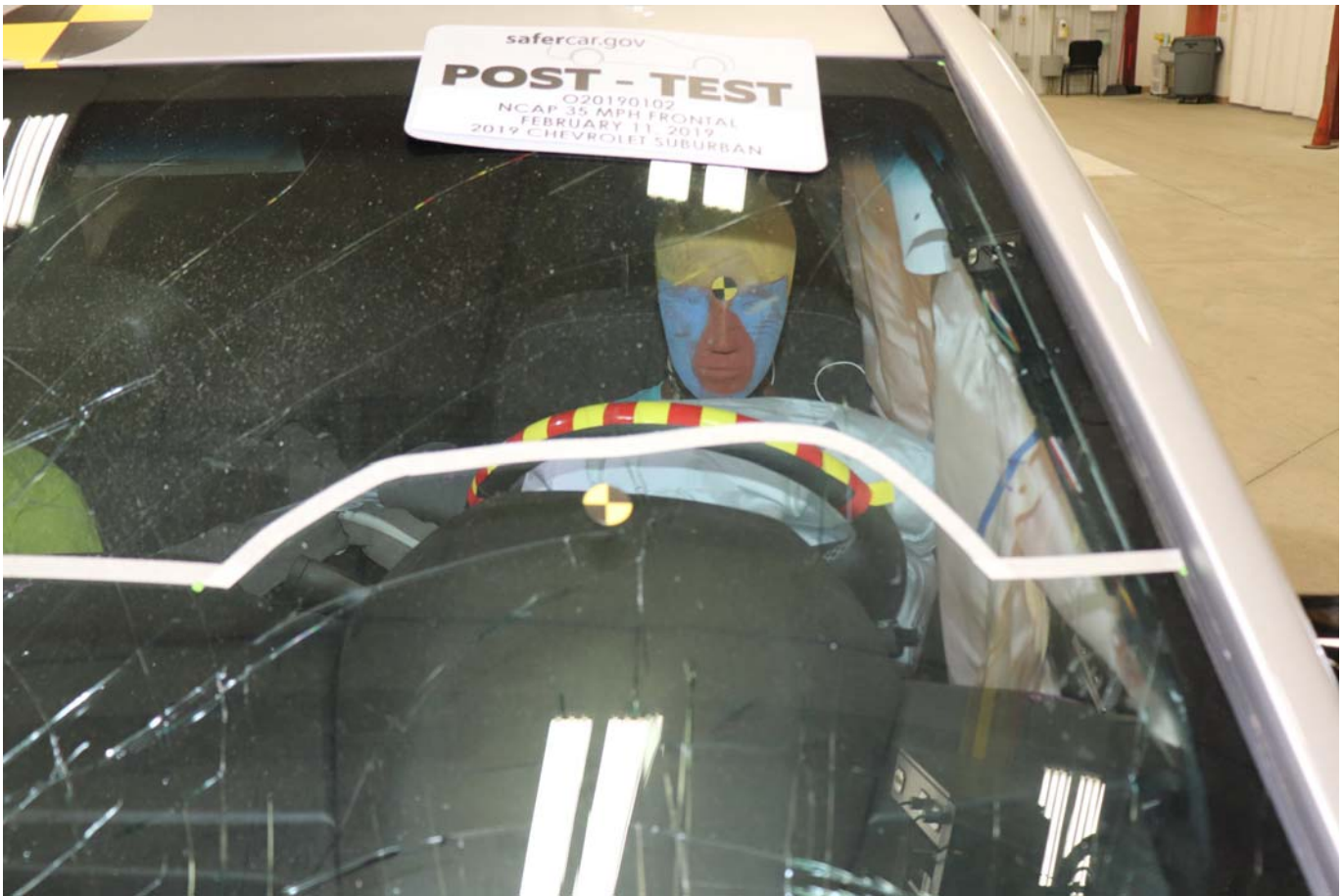


Photo No. 031 - Post-Test Driver Dummy Front View



Photo No. 032 - Pre-Test Driver Dummy Window View





Photo No. 033 - Post-Test Driver Dummy Window View



Photo No. 034 - Pre-Test Driver Dummy and Vehicle Interior



Photo No. 035 - Post-Test Driver Dummy and Vehicle Interior

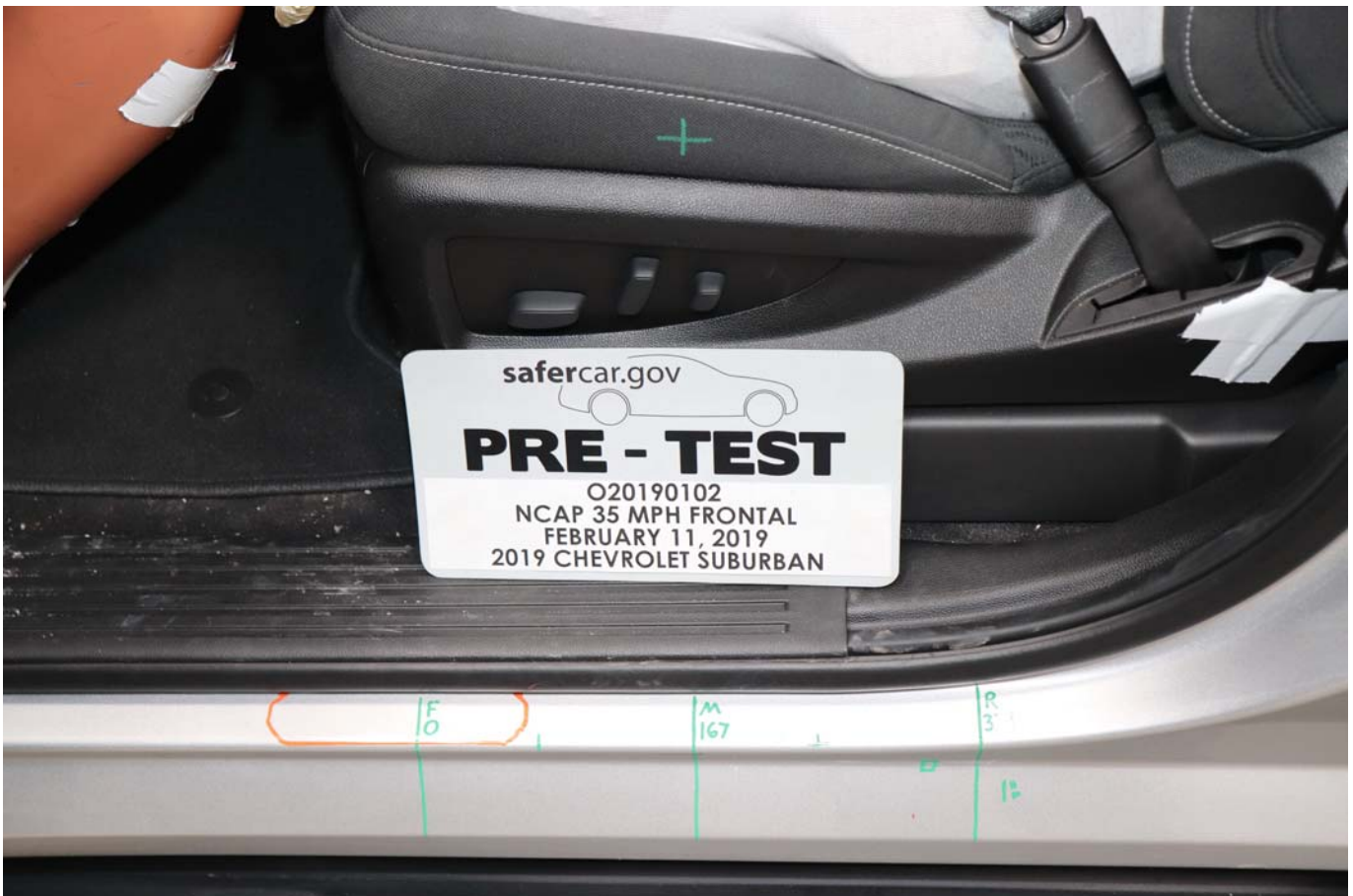


Photo No. 036 - Pre-Test Driver Seat Fore-Aft Markings



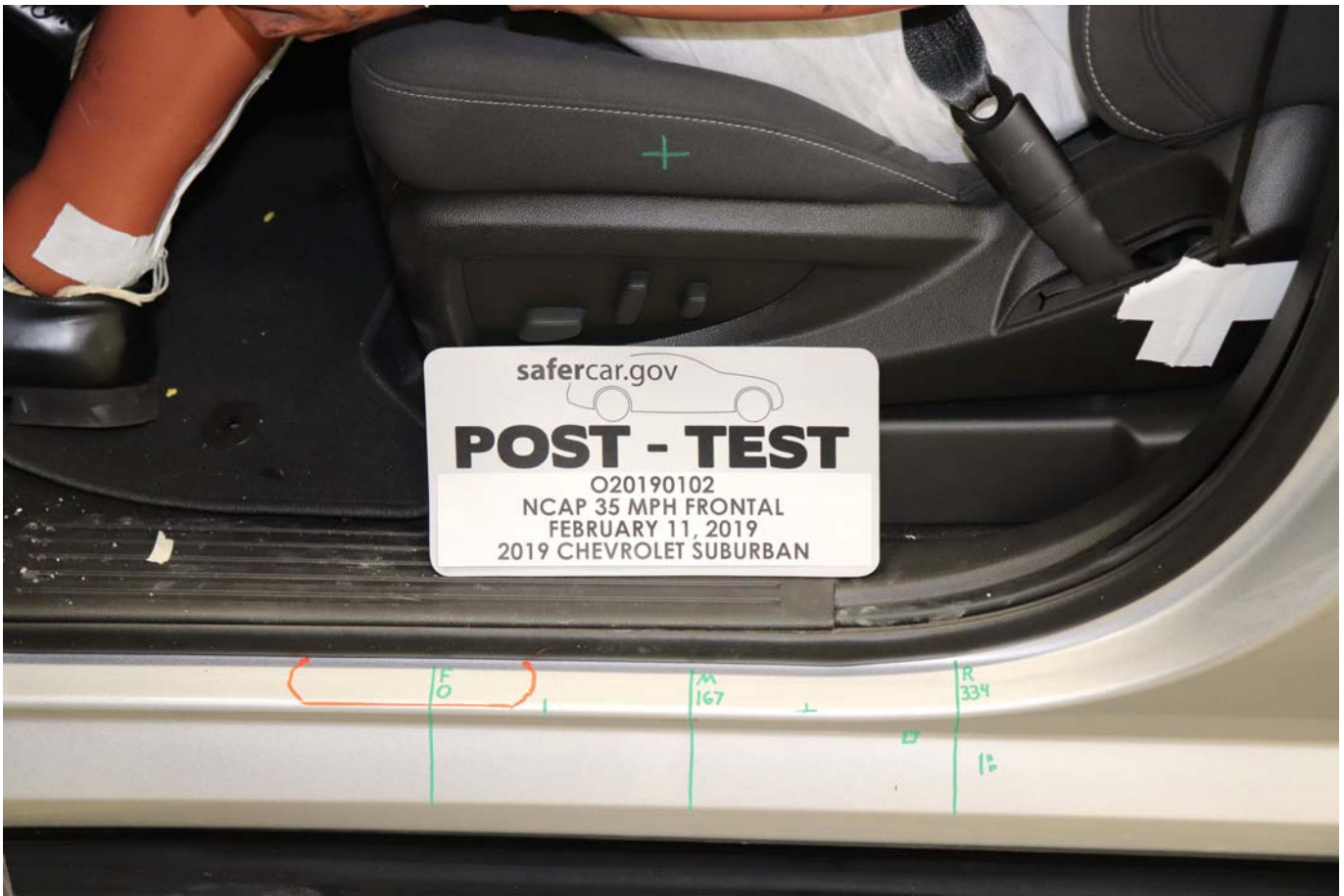


Photo No. 037 - Post-Test Driver Seat Fore-Aft Markings



Photo No. 038 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 039 - Post-Test View of Belt Anchorage for Driver Dummy



Photo No. 040 - Pre-Test Driver Dummy Feet





Photo No. 041 - Post-Test Driver Dummy Feet



Photo No. 042 - Pre-Test Driver Side Knee Bolster





Photo No. 043 - Post-Test Driver Side Knee Bolster

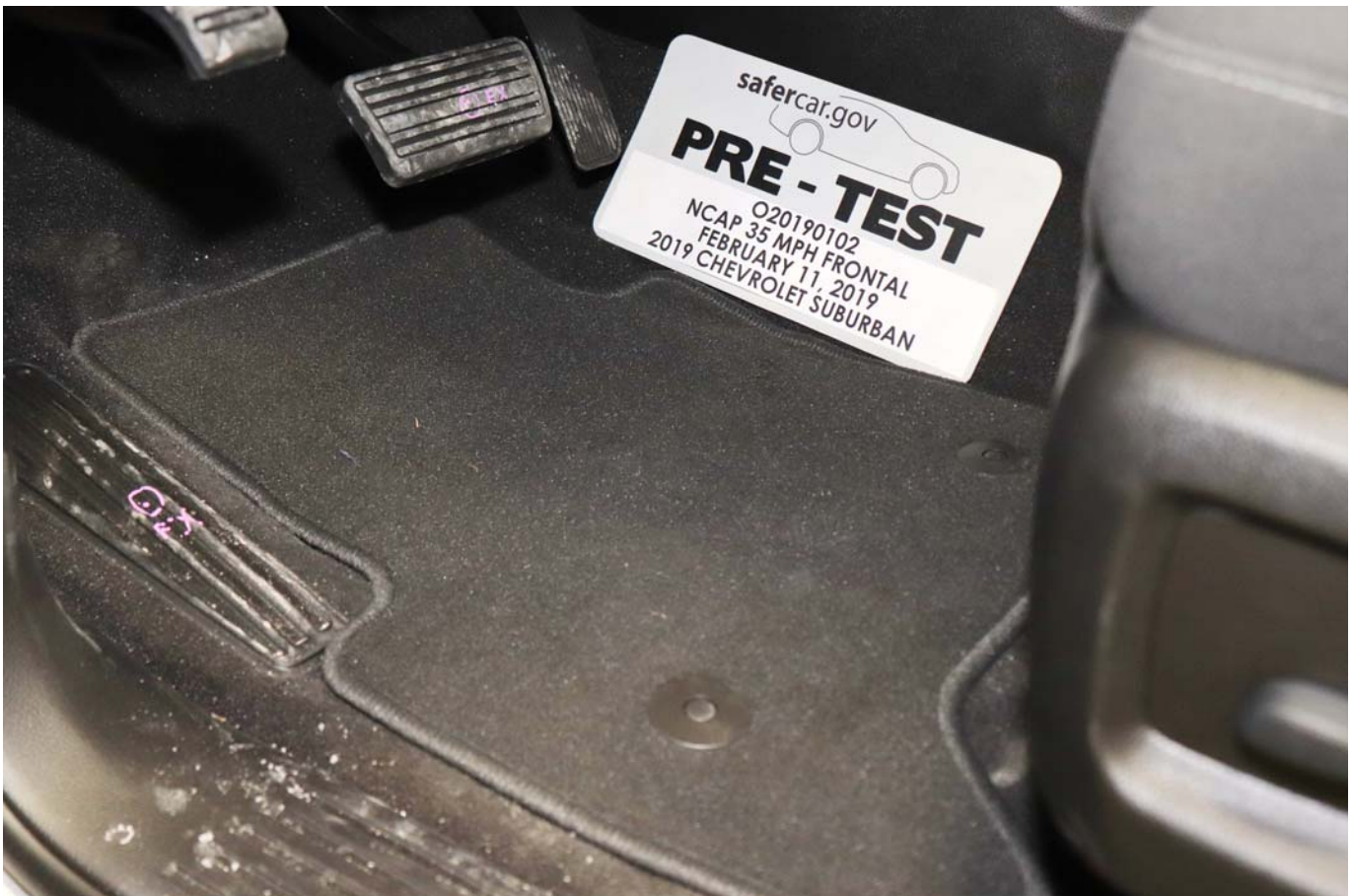


Photo No. 044 - Pre-Test Driver Side Floorpan





Photo No. 045 - Post-Test Driver Side Floorpan



Photo No. 046 - Post-Test Driver Dummy Face



Photo No. 047 - Post-Test Driver Dummy Contact with Airbag

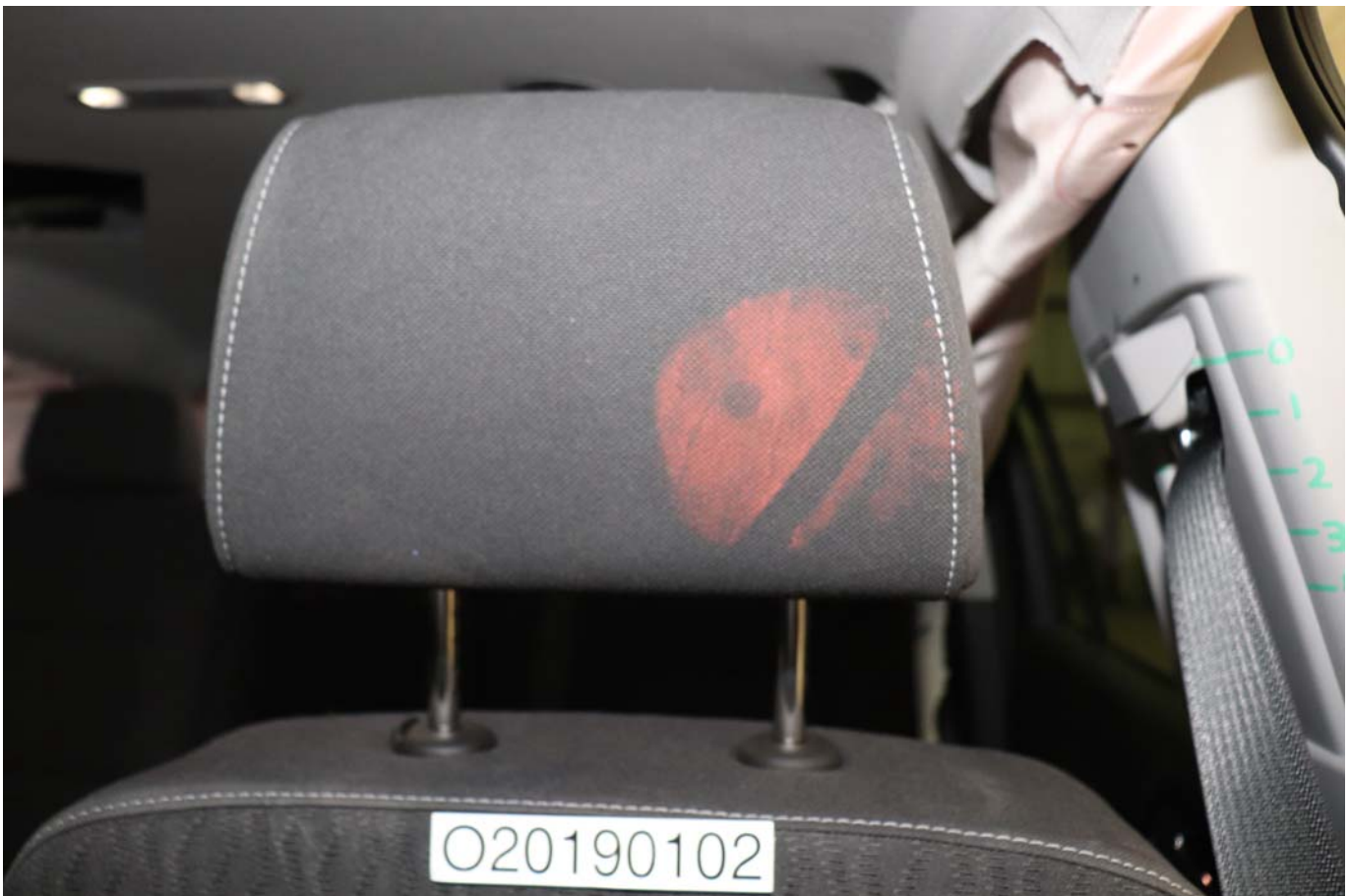


Photo No. 048 - Post-Test Driver Dummy Contact with Headrest





Photo No. 049 - Pre-Test View of the Steering Wheel



Photo No. 050 - Post-Test View of the Steering Wheel



Photo No. 051 - Pre-Test Passenger Dummy Front View



Photo No. 052 - Post-Test Passenger Dummy Front View





Photo No. 053 - Pre-Test Passenger Dummy Window View



Photo No. 054 - Post-Test Passenger Dummy Window View



Photo No. 055 - Pre-Test Passenger Dummy and Vehicle Interior



Photo No. 056 - Post-Test Passenger Dummy and Vehicle Interior





Photo No. 057 - Pre-Test Passenger Seat Fore-Aft Markings

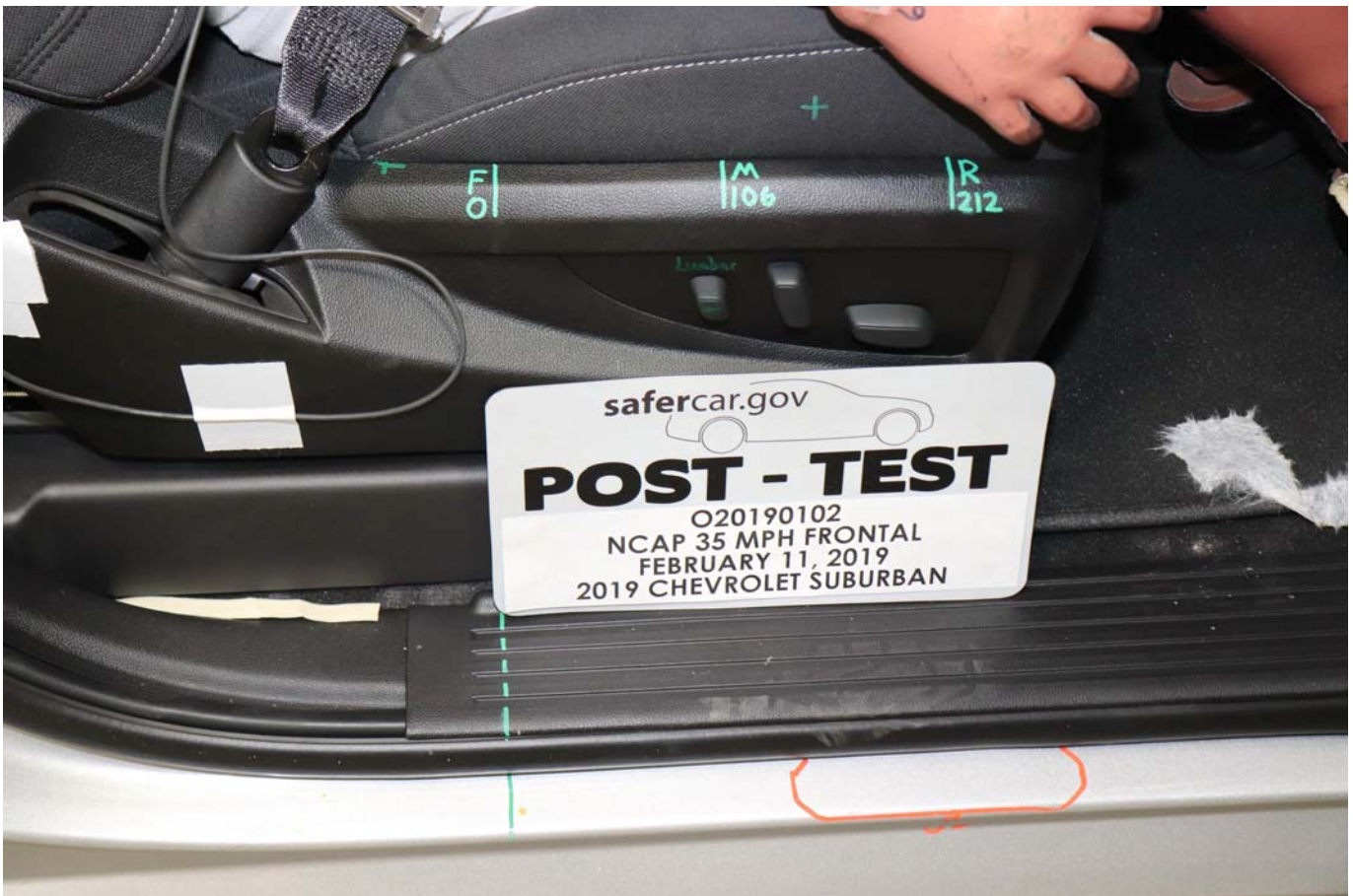


Photo No. 058 - Post-Test Passenger Seat Fore-Aft Markings



Photo No. 059 - Pre-Test View of Belt Anchorage for Passenger Dummy



Photo No. 060 - Post-Test View of Belt Anchorage for Passenger Dummy





Photo No. 061 - Pre-Test Passenger Dummy Feet



Photo No. 062 - Post-Test Passenger Dummy Feet



Photo No. 063 - Pre-Test Passenger Side Knee Bolster



Photo No. 064 - Post-Test Passenger Side Knee Bolster





Photo No. 065 - Pre-Test Passenger Side Floorpan



Photo No. 066 - Post-Test Passenger Side Floorpan





Photo No. 067 - Post-Test Passenger Dummy Face



Photo No. 068 - Post-Test Passenger Dummy Contact with Airbag



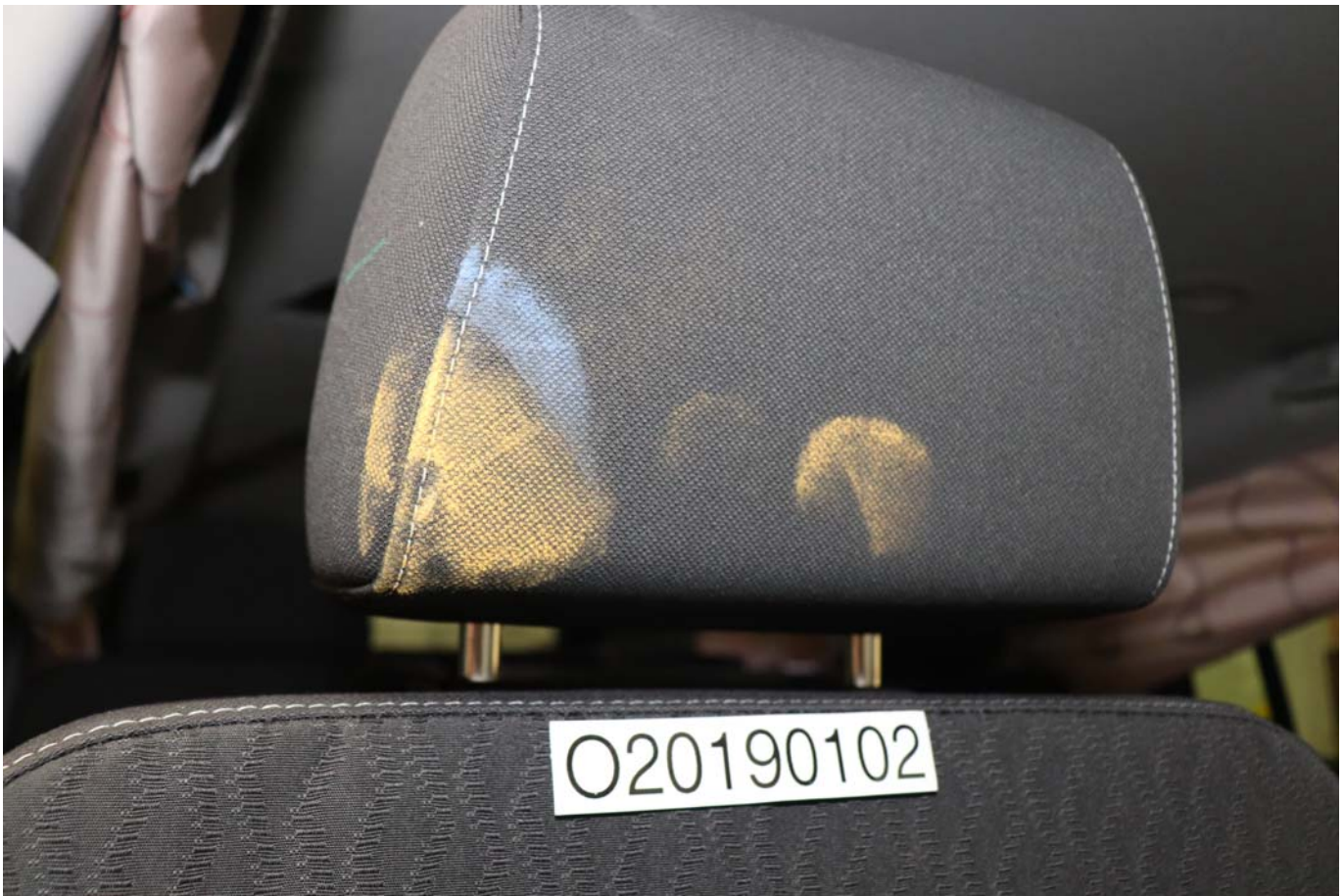


Photo No. 069 - Post-Test Passenger Dummy Contact with Headrest



Photo No. 070 - Ballast Installed in Vehicle



# PHOTOGRAPH NOT APPLICABLE

Photo No. 071 - Post-Test Stoddard Solvent Spillage Location View



Photo No. 072 - Post-Test Speed Trap Read-Out



Photo No. 073 - Vehicle at 0 Degree on Static Rollover Device

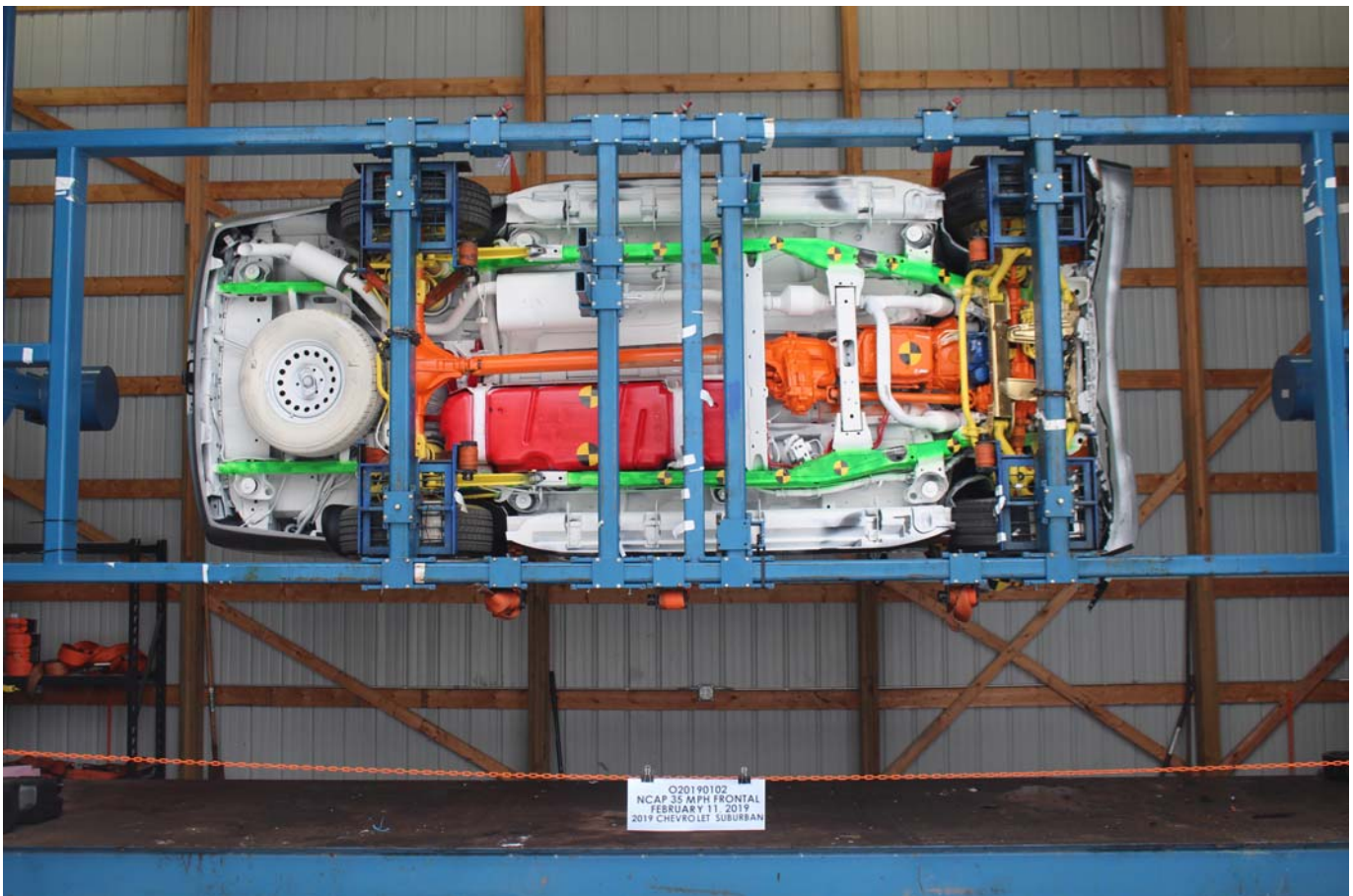


Photo No. 074 - Vehicle at 90 Degrees on Static Rollover Device





Photo No. 075 - Vehicle at 180 Degrees on Static Rollover Device



Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device





Photo No. 077 - Vehicle at 360 Degrees on Static Rollover Device



Photo No. 078 - 2019 Chevrolet Suburban 4WD LS 5-Door SUV Frontal Impact Event



2019 SUBURBAN 4WD 1/2 TON LS

EXTERIOR: SILVER ICE METALLIC  
INTERIOR: JET BLACK

ENGINE, 5.3L V8 ECOTEC3  
TRANSMISSION, 6 SPD AUTOMATIC

**STANDARD EQUIPMENT**  
ITEMS FEATURED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN.

- 5 YEAR / 60,000 MILE POWERTRAIN LIMITED WARRANTY
- FIRST MAINTENANCE VISIT
- OIL CHANGE, TIRE ROTATION MULTI-POINT VEH. INSPECTION
- SEE WWW.CHEVY.COM OR DEALER FOR DETAILS.

**MECHANICAL**

- 5.3L V8 ECOTEC3 ENGINE
- 6 SPD AUTOMATIC TRANSMISSION
- FULLY AUTOMATIC LOCKING REAR DIFFERENTIAL
- PREMIUM RIDE SUSPENSION
- ENGINE OIL COOLING SYSTEM
- REAR PARK ASSIST
- TRAILERING EQUIPMENT
- 4-WHEEL ANTILOCK DISC BRAKES
- DURALIFE BRAKE ROTORS
- TRANSFER CASE SINGLE SPEED

**SAFETY & SECURITY**

- REAR VISION CAMERA
- TIRE PRESSURE MONITOR SYSTEM (EXCL. SPARE TIRE)
- THEFT DETERRENT SYSTEM
- STABILITRAK ELECTRONIC STABILITY CONTROL SYSTEM

**EXTERIOR**

- RAIN SENSING WIPERS
- POWER HEATED OUTSIDE MIRRORS
- REMOTE KEYLESS ENTRY
- 18" POLISHED ALUMINUM WHEELS
- 17" STEEL SPARE WHEEL

**INTERIOR**

- CLOTH FRONT BUCKET SEATS
- DRIVER AND FRONT PASSENGER POWER SEAT ADJUSTER
- SECOND ROW 60/40 SPLIT FOLD FLAT BENCH SEAT
- 3RD ROW 60/40 FOLD FLAT BENCH SEAT
- REMOTE VEHICLE START

- EXPRESS DOWN, EXPRESS UP FRONT, POWER WINDOWS
- TILTING STEERING COLUMN
- LEATHER WRAP STEERING WHEEL
- STEERING WHEEL CONTROLS
- TRI-ZONE AUTOMATIC CLIMATE CONTROL
- 110-VOLT AC POWER OUTLET

**CONNECTIVITY FEATURES**

- ONSTAR (R) SERVICES CAPABLE (SUBJECT TO TERMS SEE ONSTAR.COM)
- 4G LTE WI-FI (R) HOTSPOT CAPABLE (SUBJECT TO TERMS SEE ONSTAR.COM)
- CHEVROLET INFOTAINMENT SYSTEM W/ 8" DIAG. COLOR TOUCHSCREEN VOICE RECOGNITION
- BLUETOOTH AUDIO STREAMING, APPLE CARPLAY & ANDROID AUTO CAPABLE, IN-VEH. APPS CAPABLE
- SIRIUSXM ALL ACCESS + SERVICE

Visit us at [www.chevy.com](http://www.chevy.com)

SUBSCRIPTION SOLD SEPARATELY BY SIRIUSXM AFTER 3 MTHS

**OPTIONS & PRICING**

MANUFACTURER'S SUGGESTED RETAIL PRICE

**STANDARD VEHICLE PRICE \$53,600.00**

OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)

GWR RATING 7,500 LBS INC.

TOTAL OPTIONS \$0.00  
TOTAL VEHICLE & OPTIONS \$53,600.00  
DESTINATION CHARGE 1,295.00

**TOTAL VEHICLE PRICE\* \$54,895.00**

**EPA DOT Fuel Economy and Environment** Gasoline Vehicle

**Fuel Economy**  
16 MPG combined city/hwy  
14 MPG city  
21 MPG highway  
6.2 gallons per 100 miles

Standard SUVs range from 11 to 33 MPG. The best vehicle rates 136 MPG.

**You spend \$5,000 more in fuel costs over 5 years** compared to the average new vehicle.

**Annual fuel cost \$2,400**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only): 2 (Best)

**Smog Rating** (tailpipe only): 3 (Best)

This vehicle emits 341 grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions. Learn more at [fuelconomy.gov](http://fuelconomy.gov).

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. This average new vehicle gets 27 MPG and costs \$7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.25 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

[fuelconomy.gov](http://fuelconomy.gov)  
Calculate personalized estimates and compare vehicles

Smartphone QR Code

**GOVERNMENT 5-STAR SAFETY RATINGS**

**Overall Vehicle Score** ★★★★★  
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

**Frontal Crash** Driver Passenger ★★★★★  
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.

**Side Crash** Front seat Rear seat ★★★★★  
Based on the risk of injury in a side impact.

**Rollover** ★★★★★  
Based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA) [www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

**PARTS CONTENT INFORMATION**

FOR VEHICLES IN THIS CARLINE:  
U.S./CANADIAN PARTS CONTENT: 41%  
MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 46%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE:  
FINAL ASSEMBLY POINT: ARLINGTON, TX U.S.A.  
COUNTRY OF ORIGIN: ENGINE: UNITED STATES  
TRANSMISSION: UNITED STATES

ORDER NO WFO086 SALES CODE E  
DEALER MODEL CODE CK1906  
DEALER NO 11200  
FINAL ASSEMBLY: ARLINGTON, TX U.S.A.  
VIN 1GNSKGGC1KR130233

DEALER TO WHOM DELIVERED:  
TEAM CHEVROLET, INC.  
1856 W US HWY 30  
VALPARAISO, IN 46385-5443

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CE  
1AZ1902731

Photo No. 079 - Monroney Label Photograph

**APPENDIX B**  
**DUMMY RESPONSE DATA TRACES**



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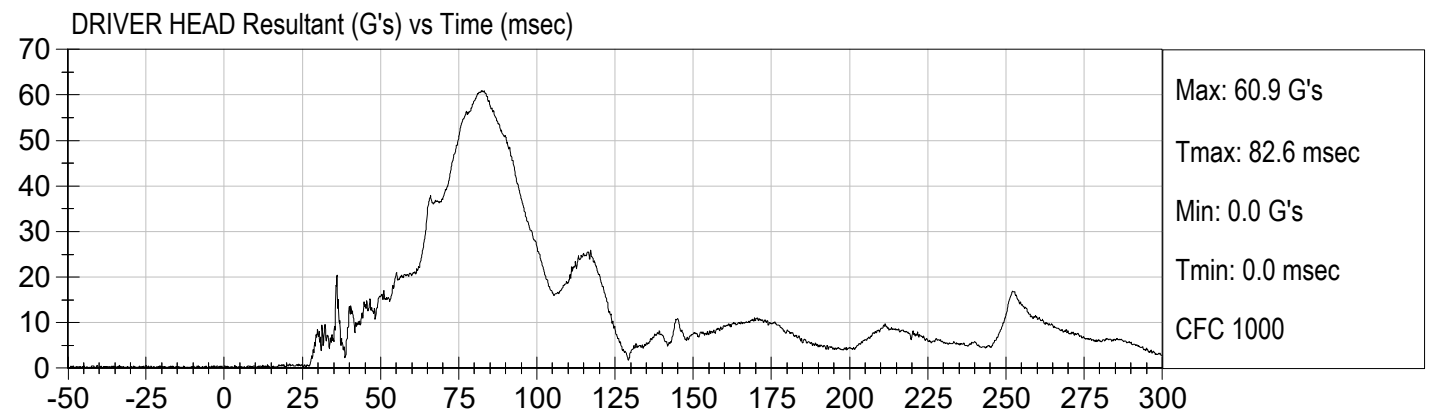
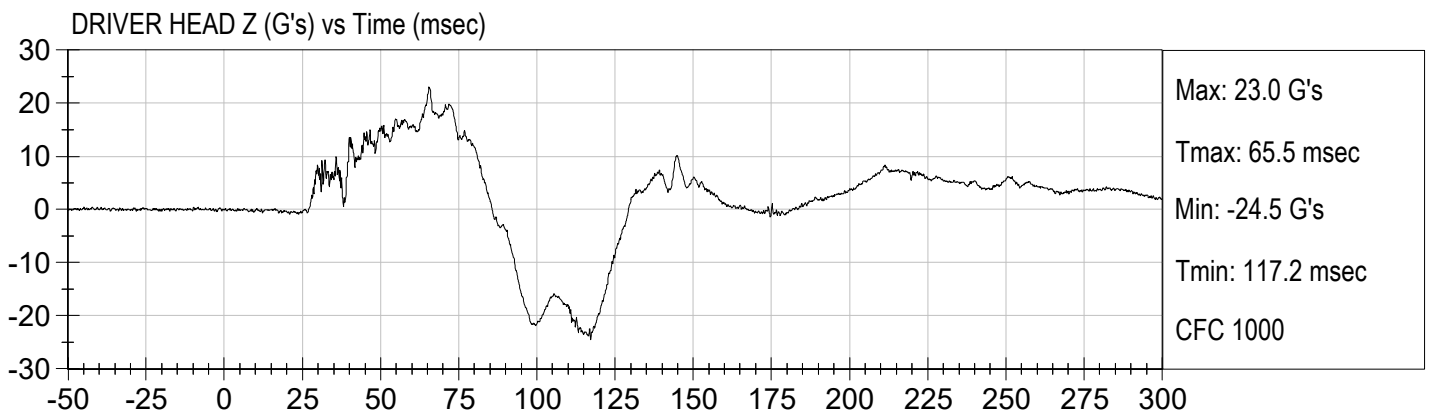
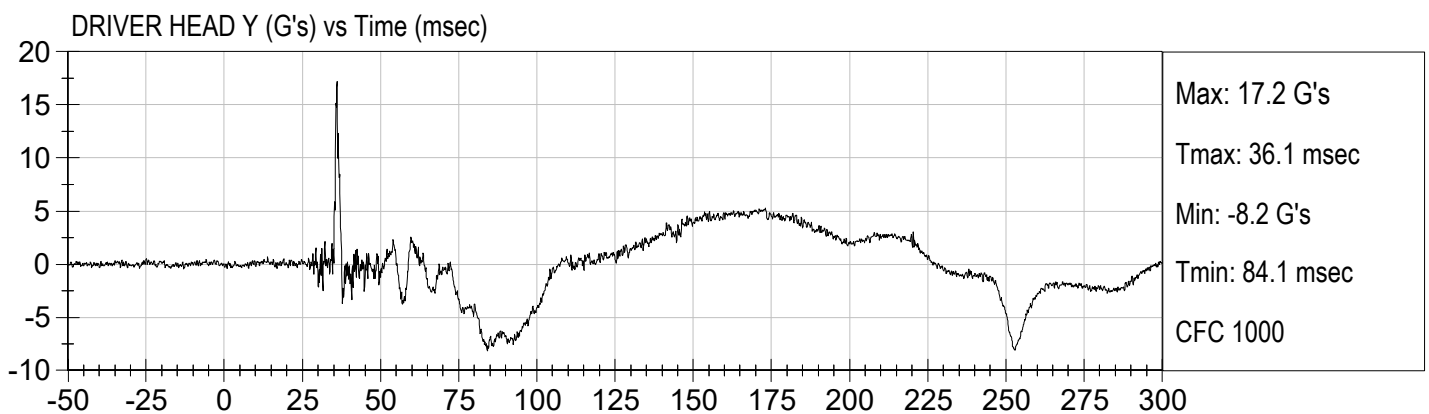
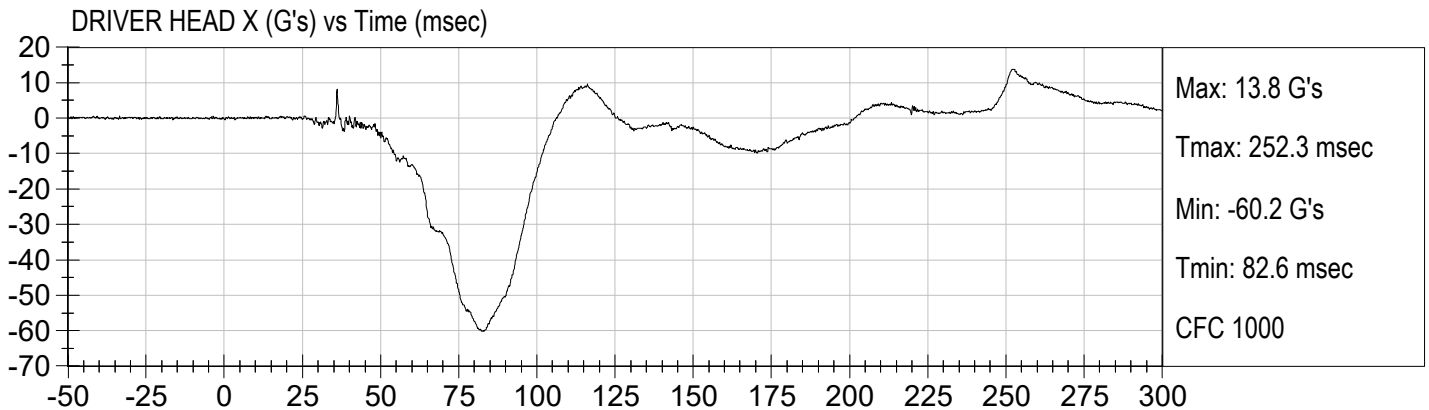
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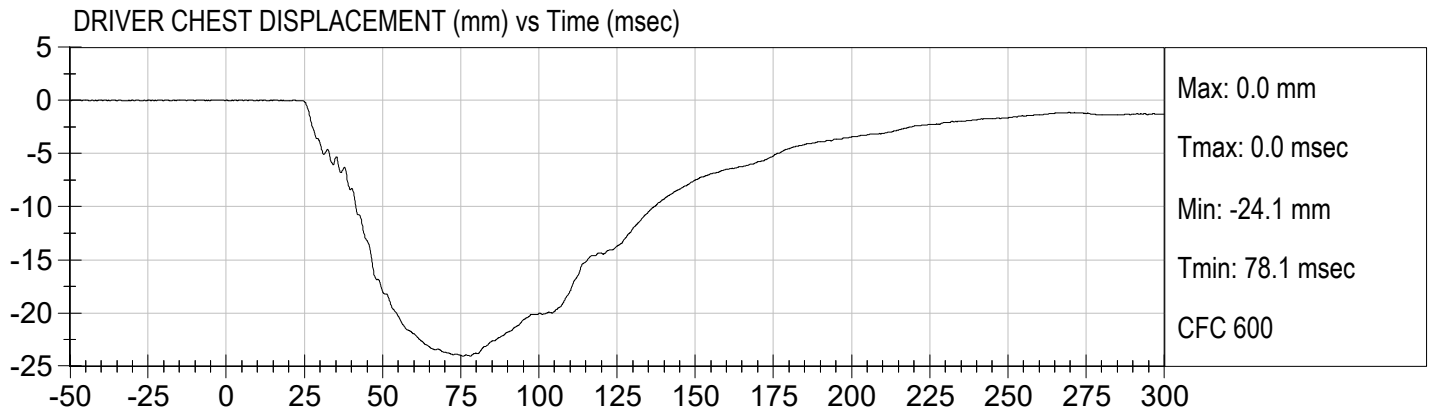
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 Driver Upper Neck Moment Z  
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 Driver Chest Y Redundant  
 Driver Chest Z Redundant  
 Driver Pelvis X  
 Driver Pelvis Y  
 Driver Pelvis Z  
 Driver Left Femur Redundant  
 Driver Right Femur Redundant  
 Driver Left Upper Tibia Moment X  
 Driver Left Upper Tibia Moment Y

Driver Left Upper Tibia Force Z  
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Driver Right Lower Tibia Moment Y  
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Passenger Pelvis Y

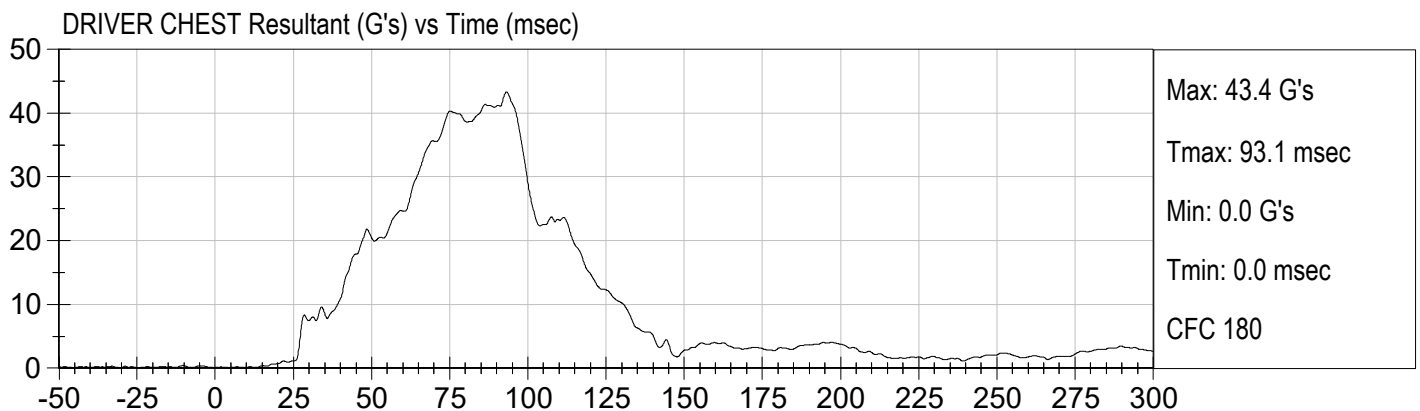
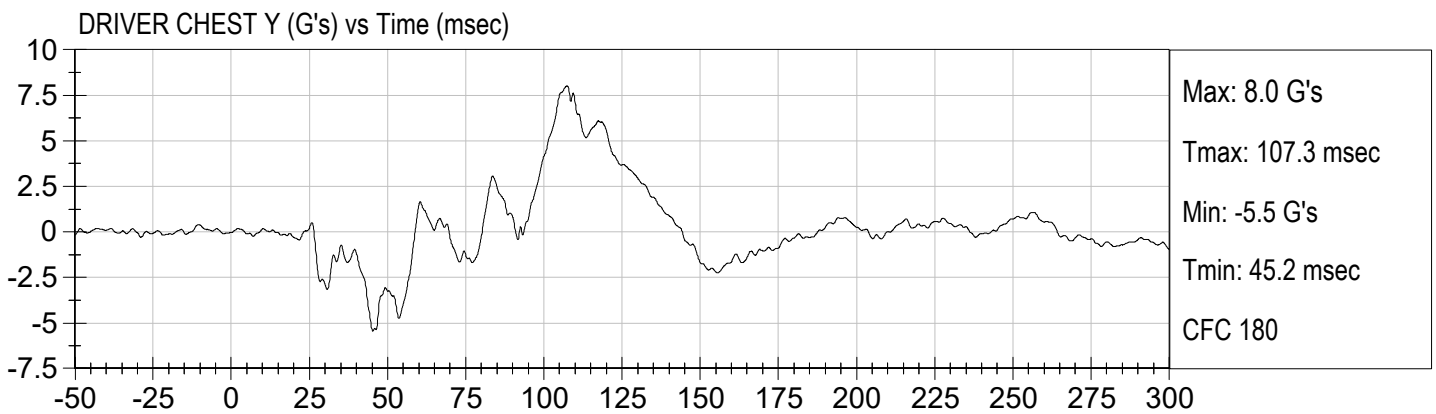
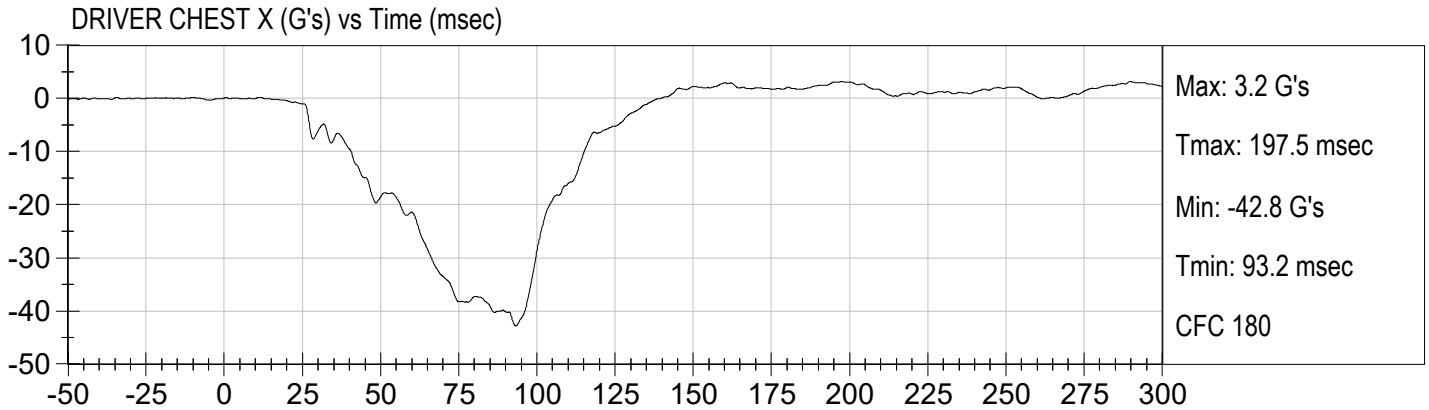


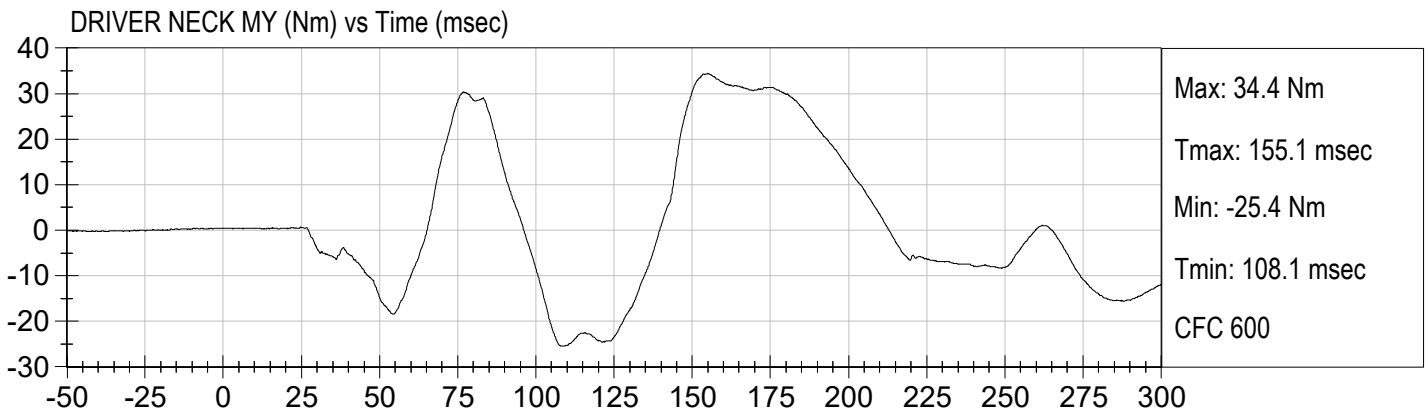
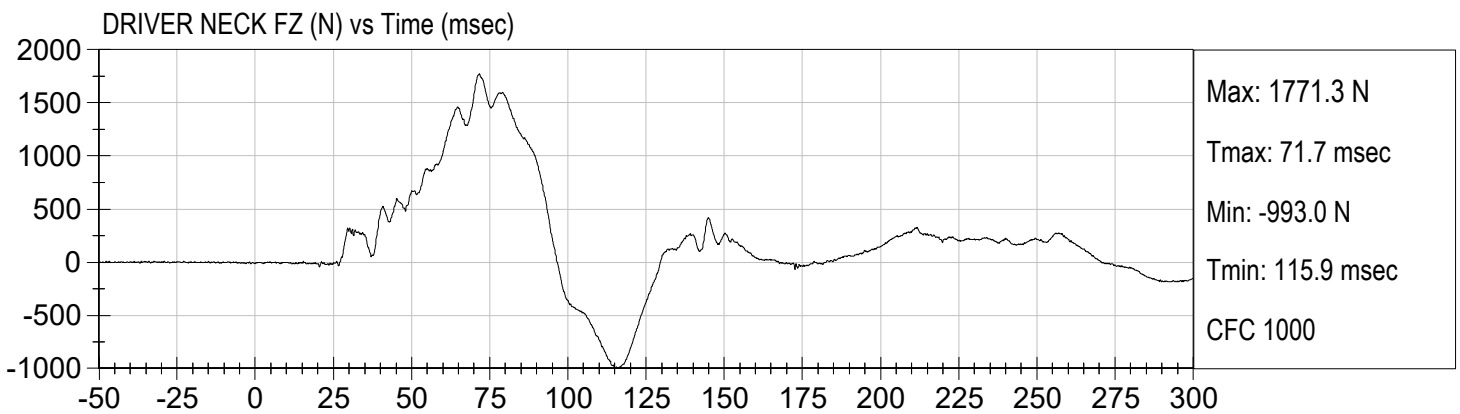
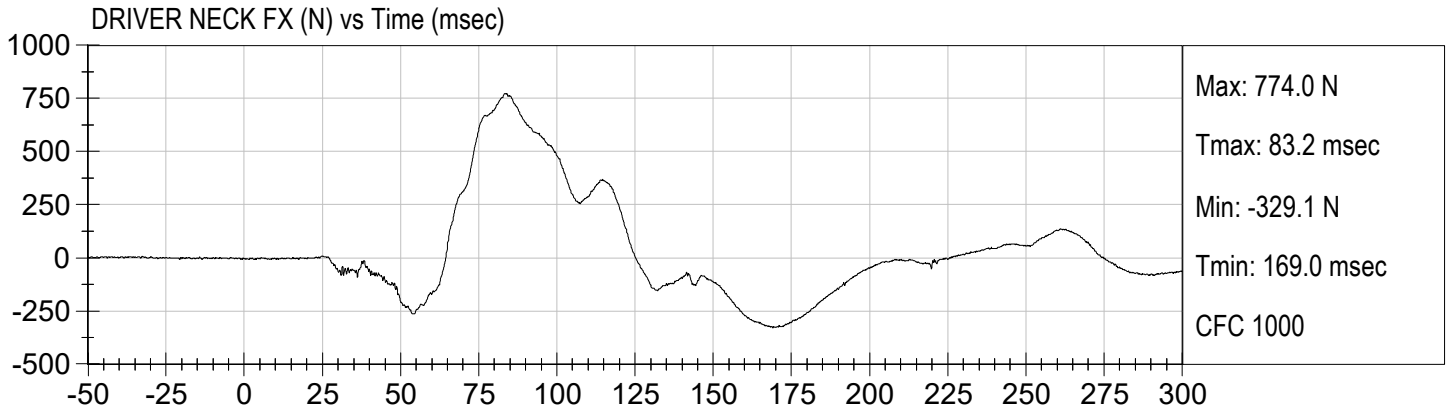
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Passenger Right Upper Tibia Force Z  
Passenger Right Lower Tibia Moment X  
Passenger Right Lower Tibia Moment Y  
Passenger Right Lower Tibia Force Z  
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Passenger Left Foot Aft Z  
Passenger Right Foot Fore Z  
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Vehicle Engine Bottom X  
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Advanced Research Load Cell Barrier – 528 channels

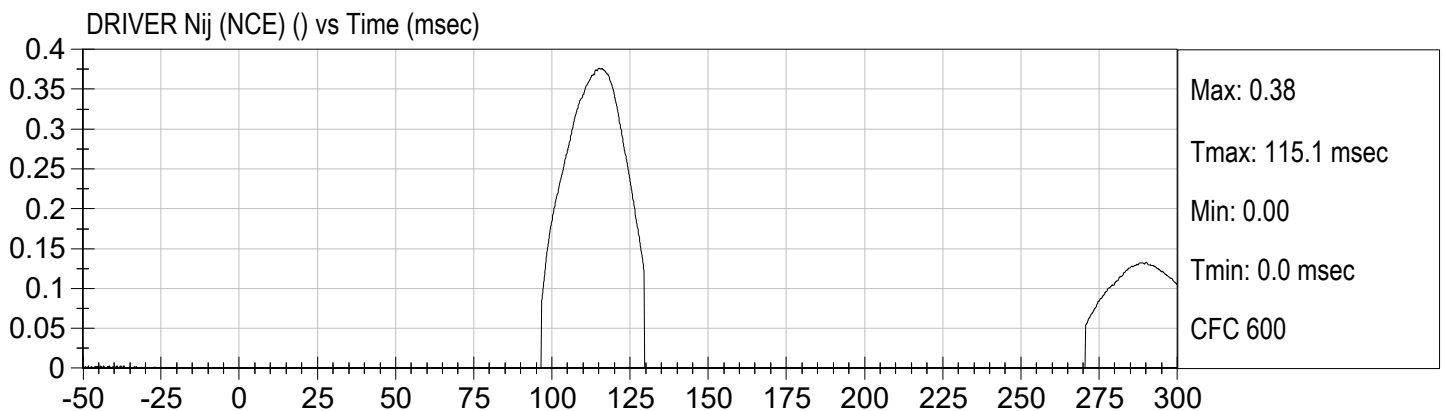
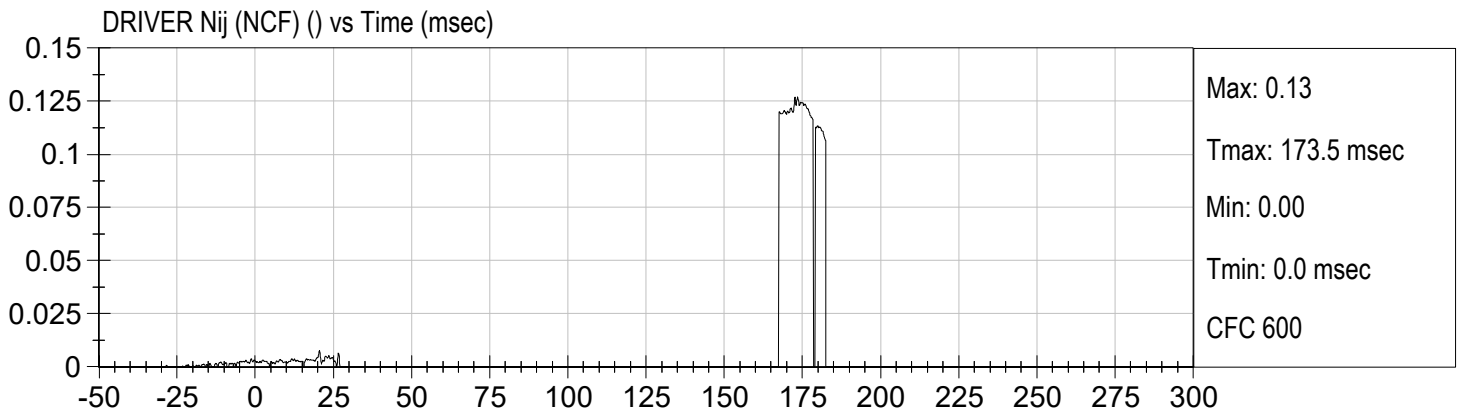
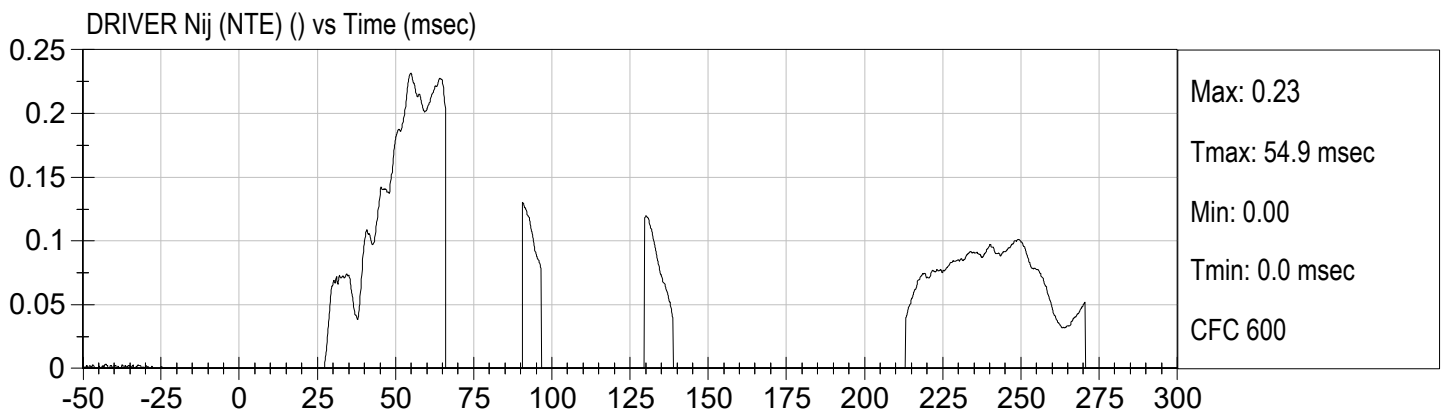
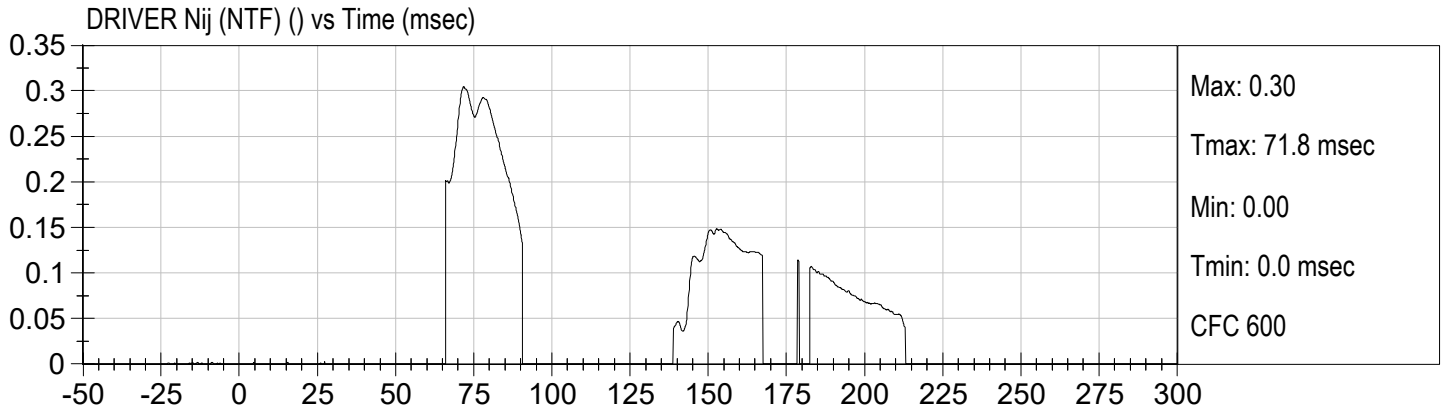




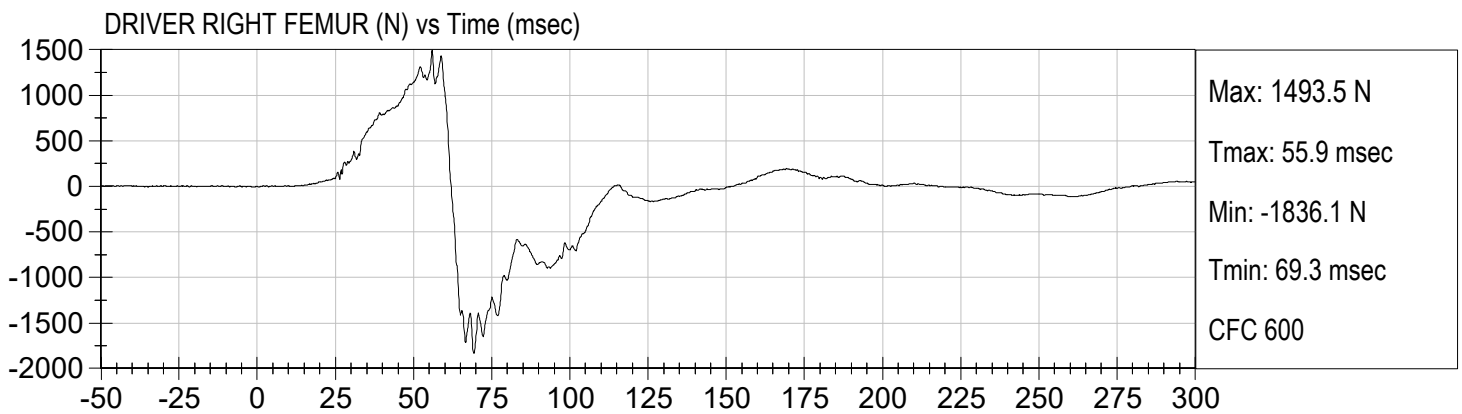
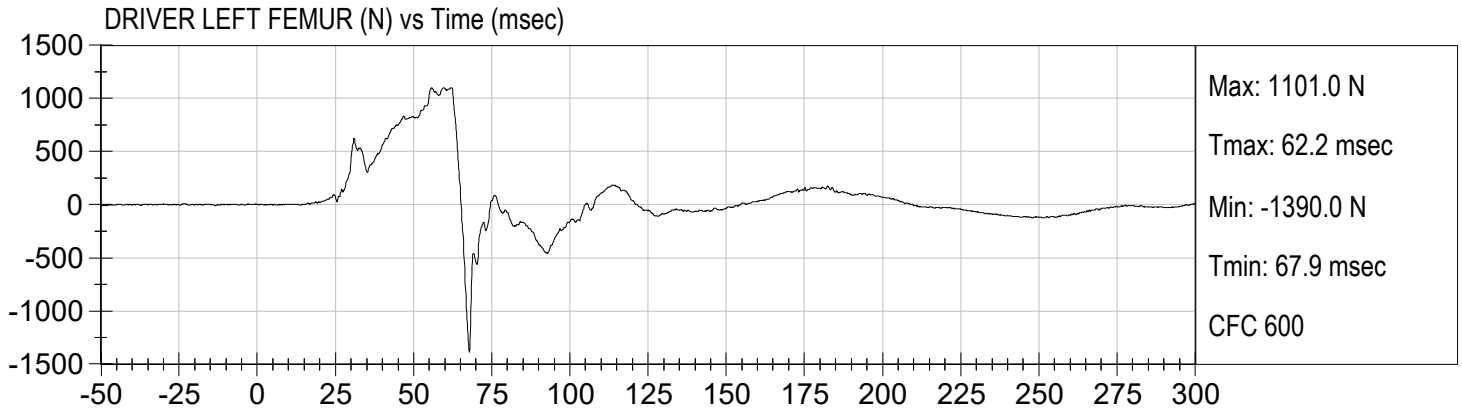


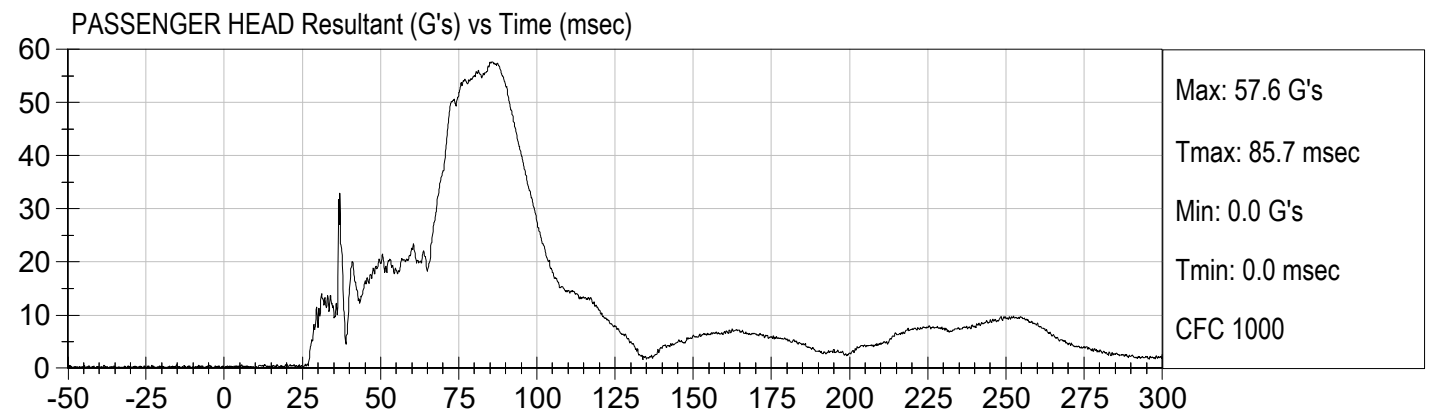
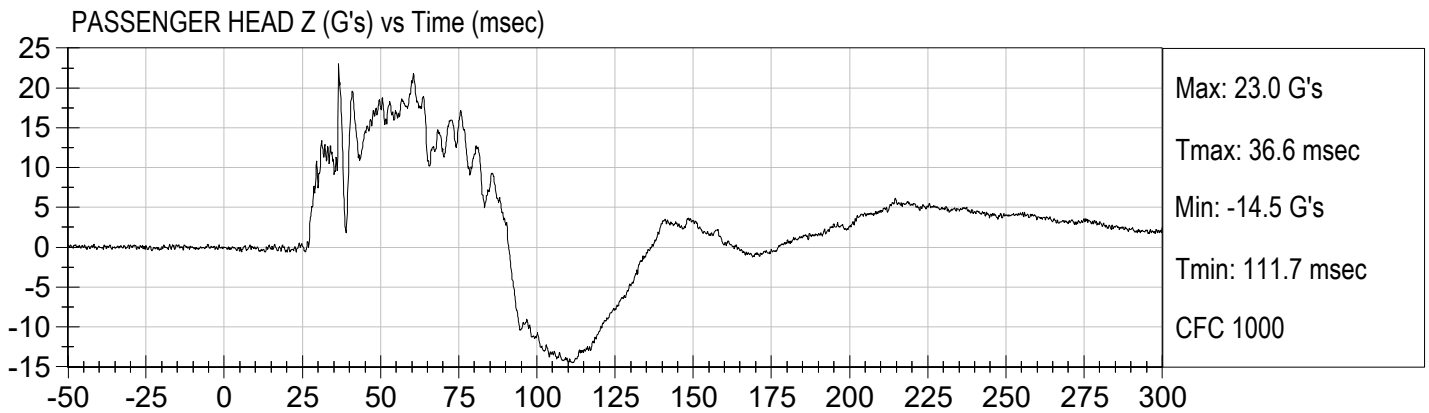
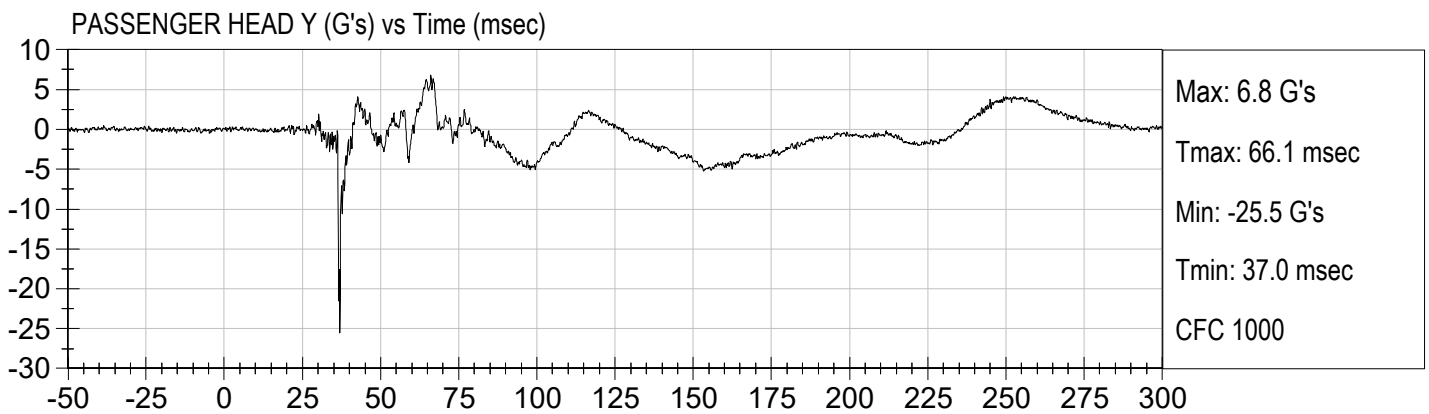
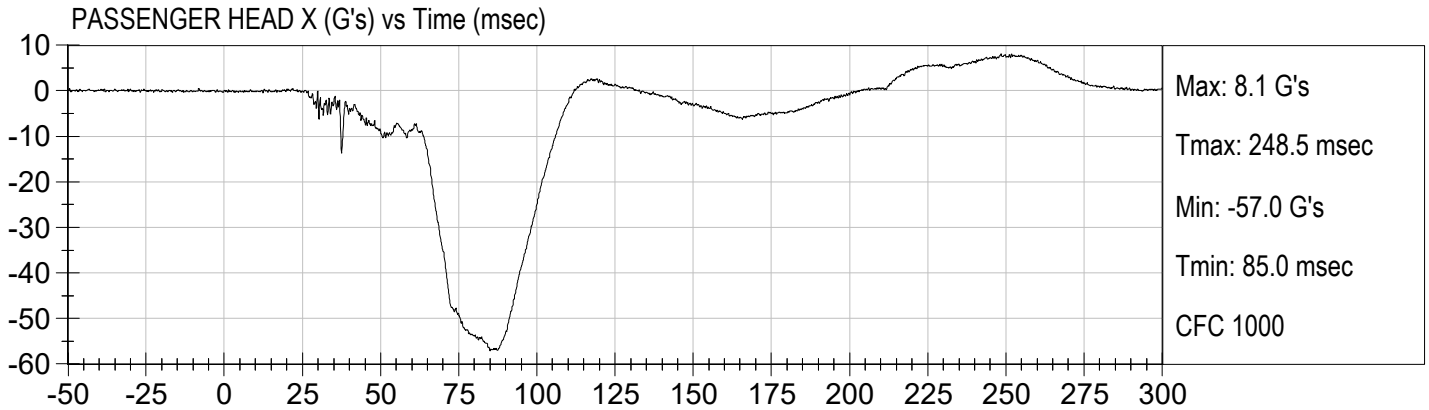


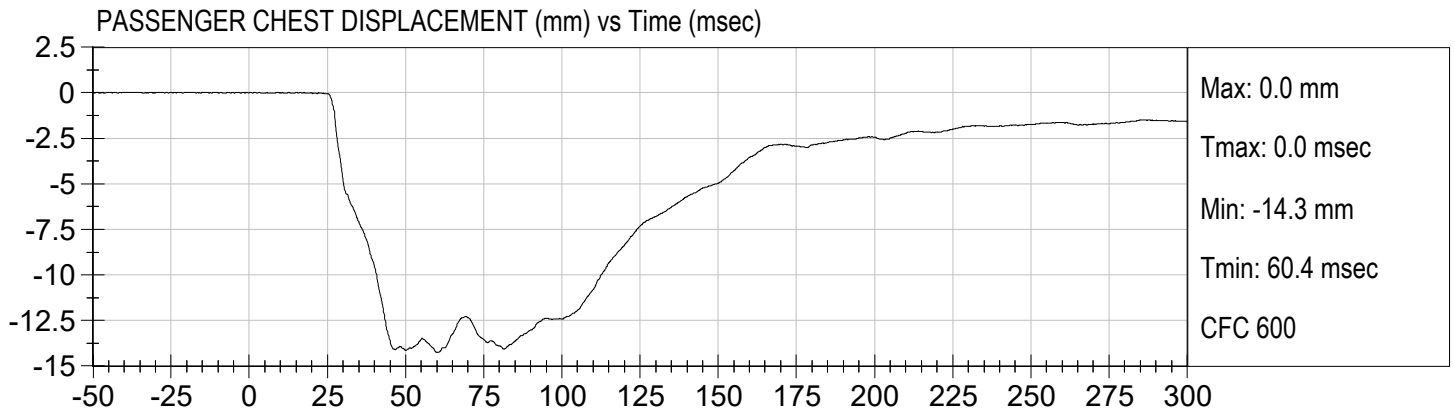




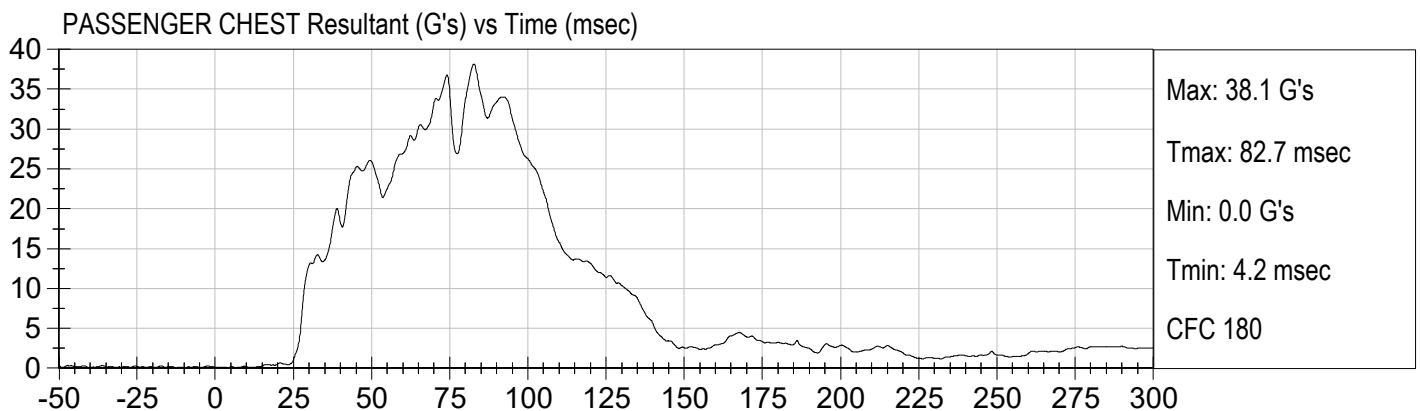
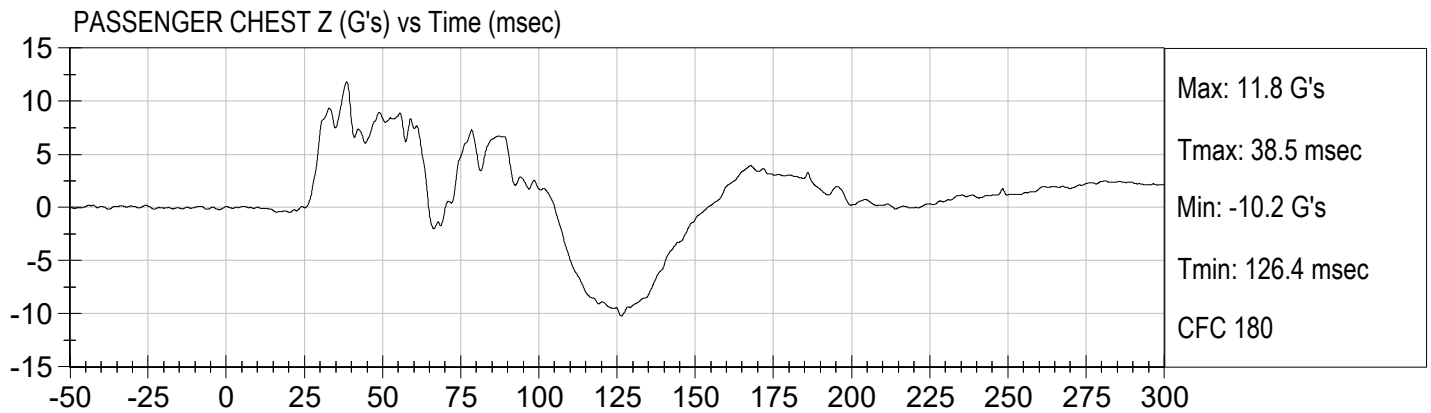
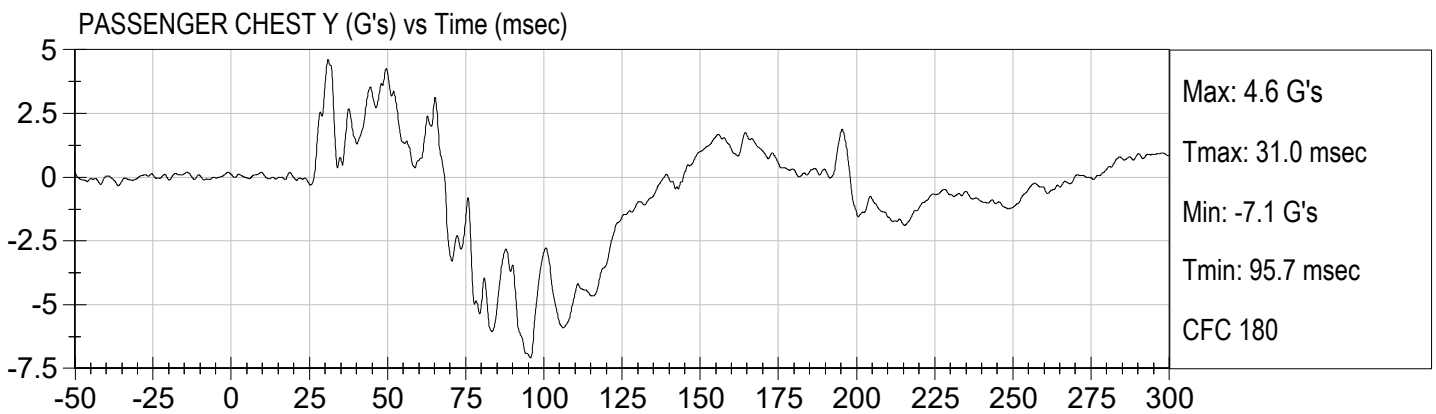
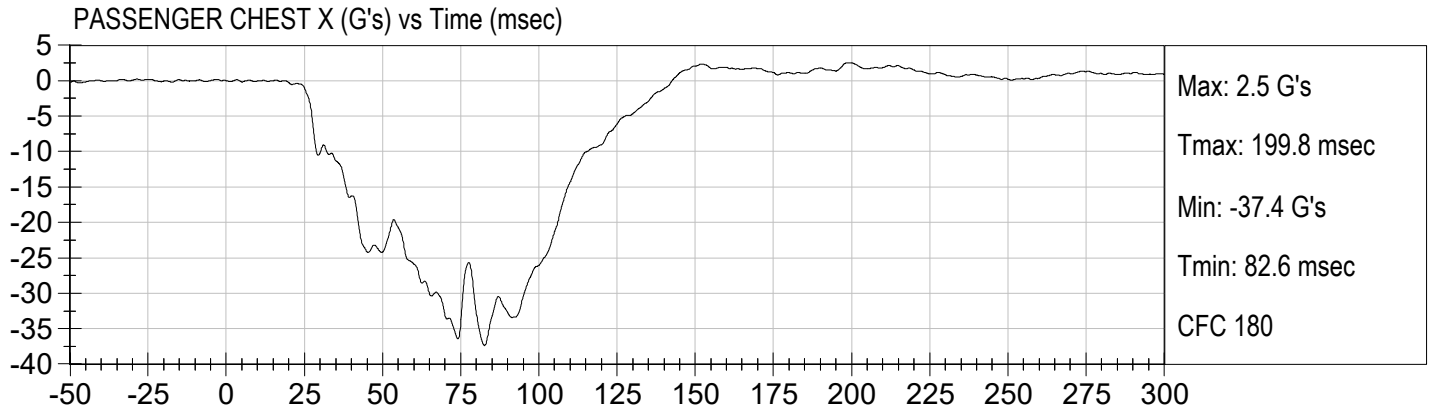


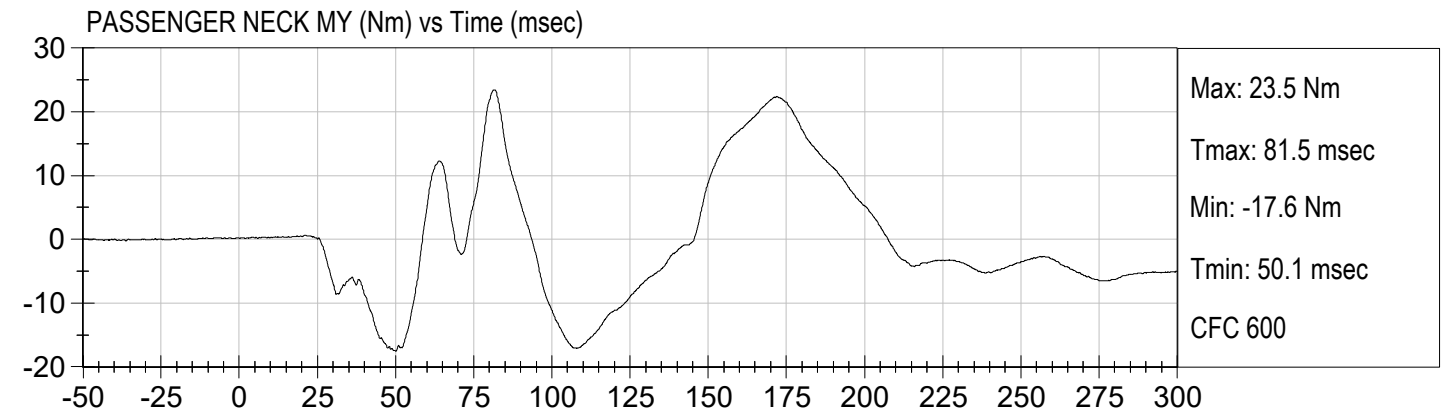
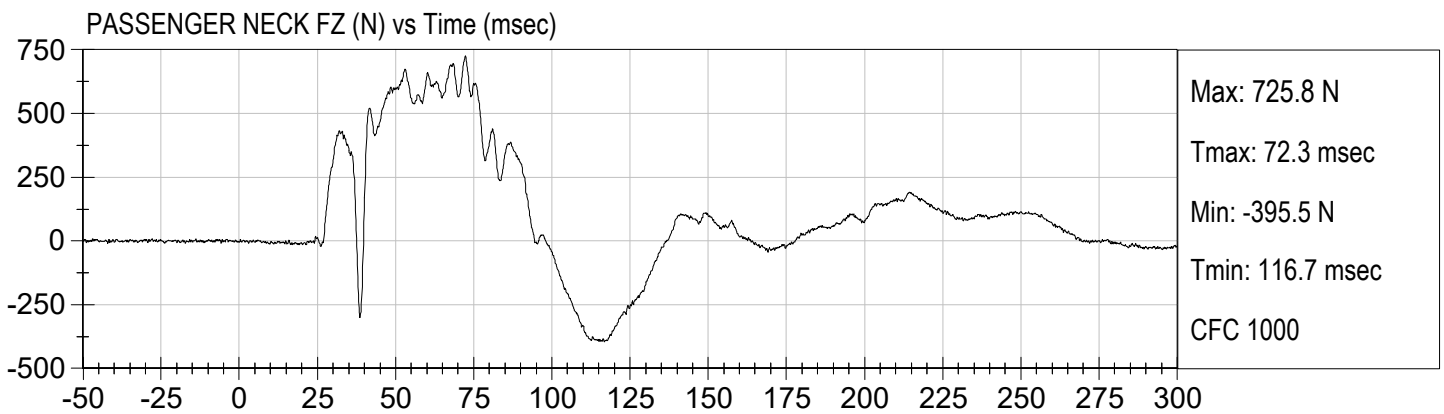
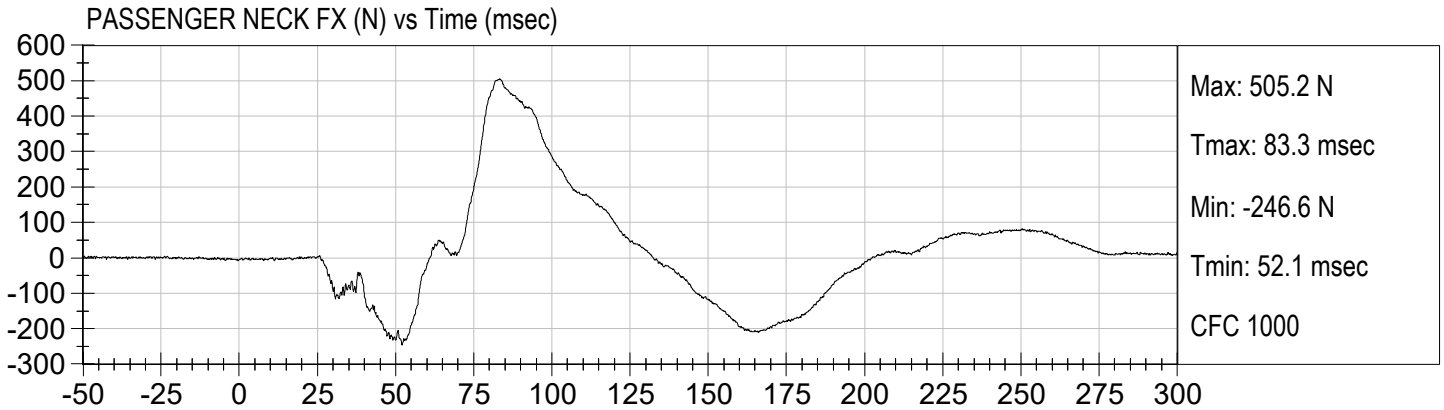


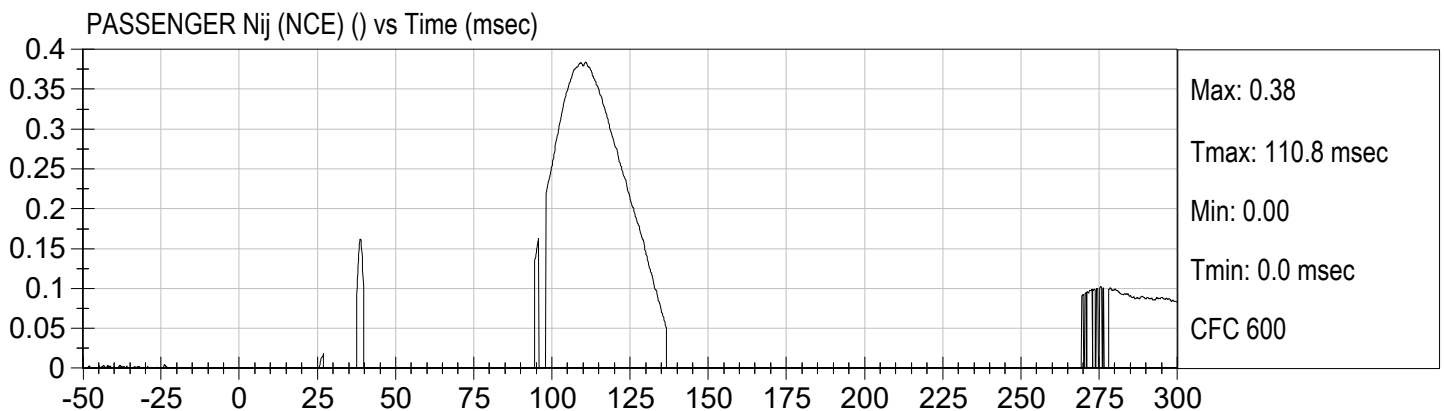
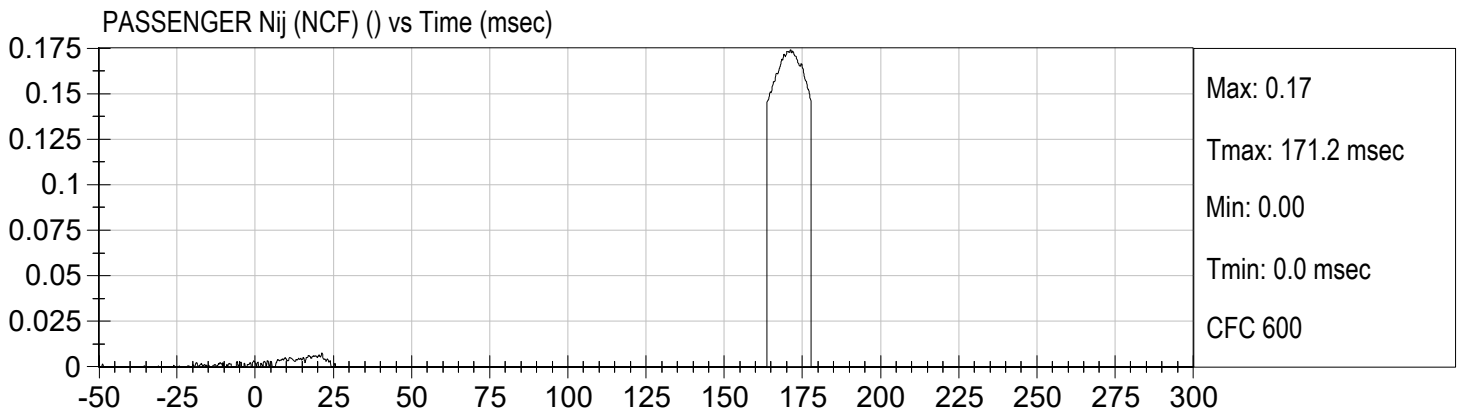
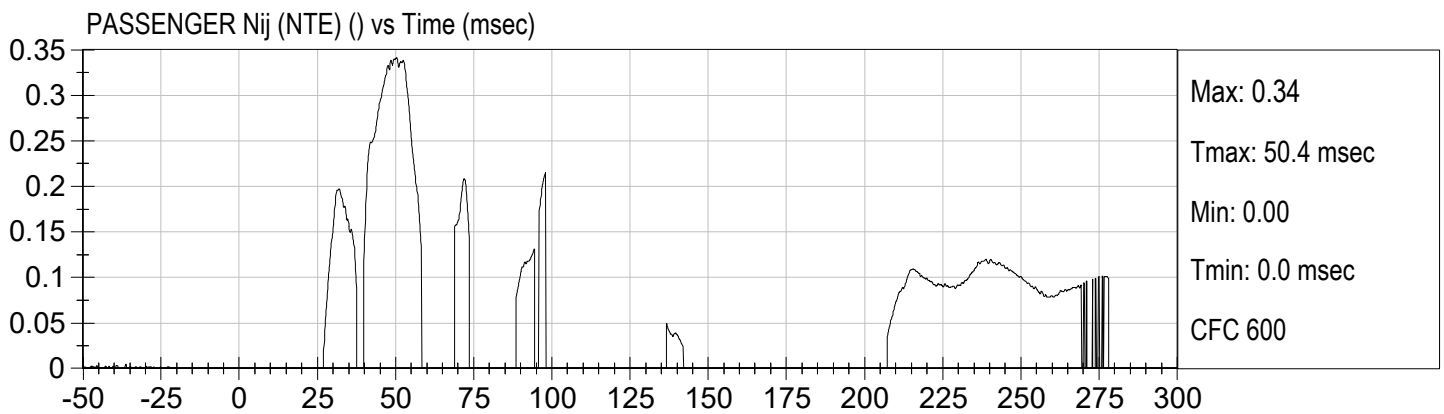
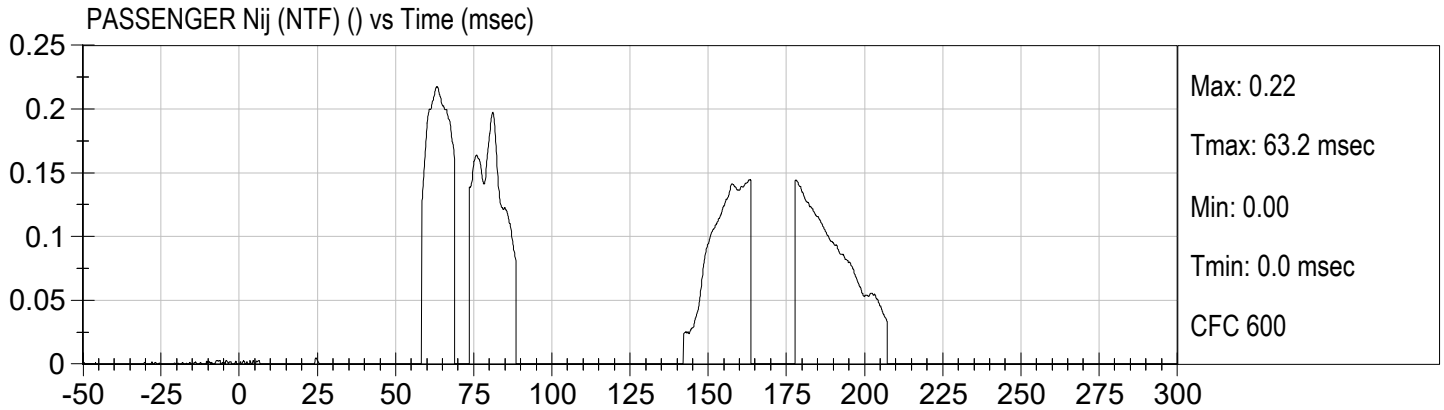




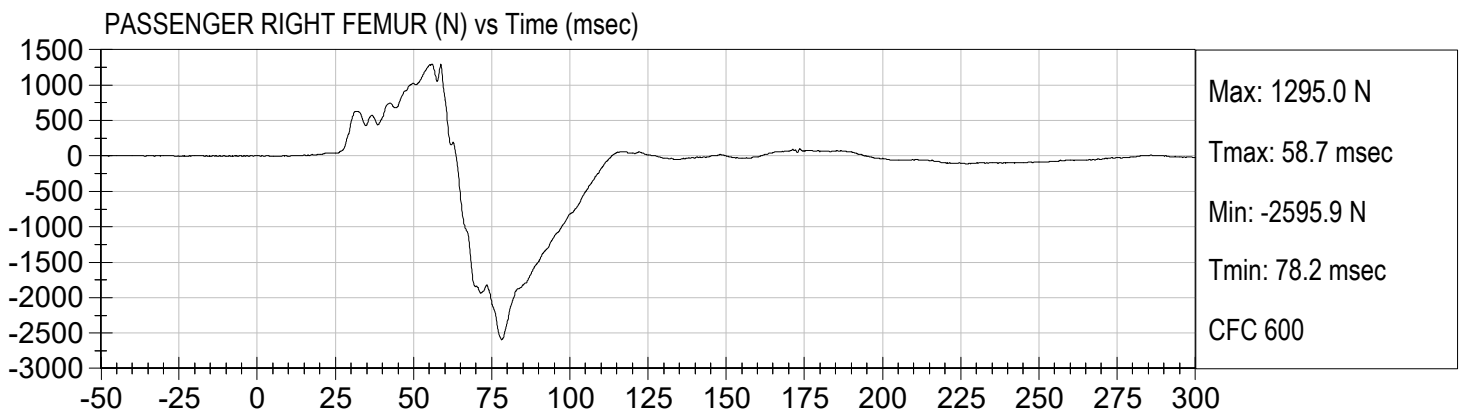
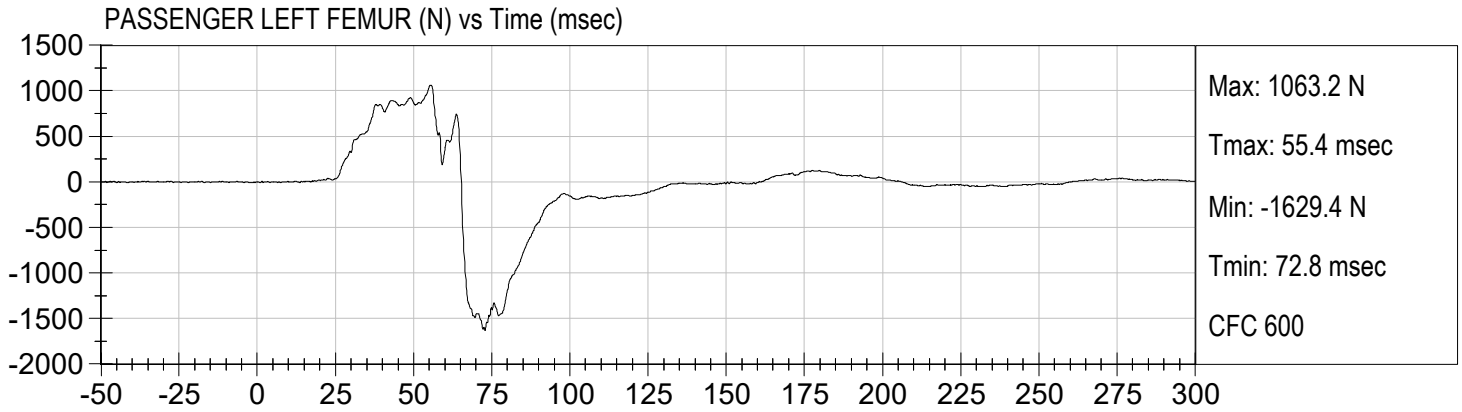












**APPENDIX C**  
**DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA**

**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**



**Hybrid III, 50th External Measurements**  
**SN: 351**

HYBRID III, 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	34.8
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	3.4
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	3.5
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	11.8
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
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	13.3
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	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.0
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	18.8

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
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	39.2
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.7
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

**NOTE:** THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

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

**ATD Serial No:** 351

**Test ID:** D190551

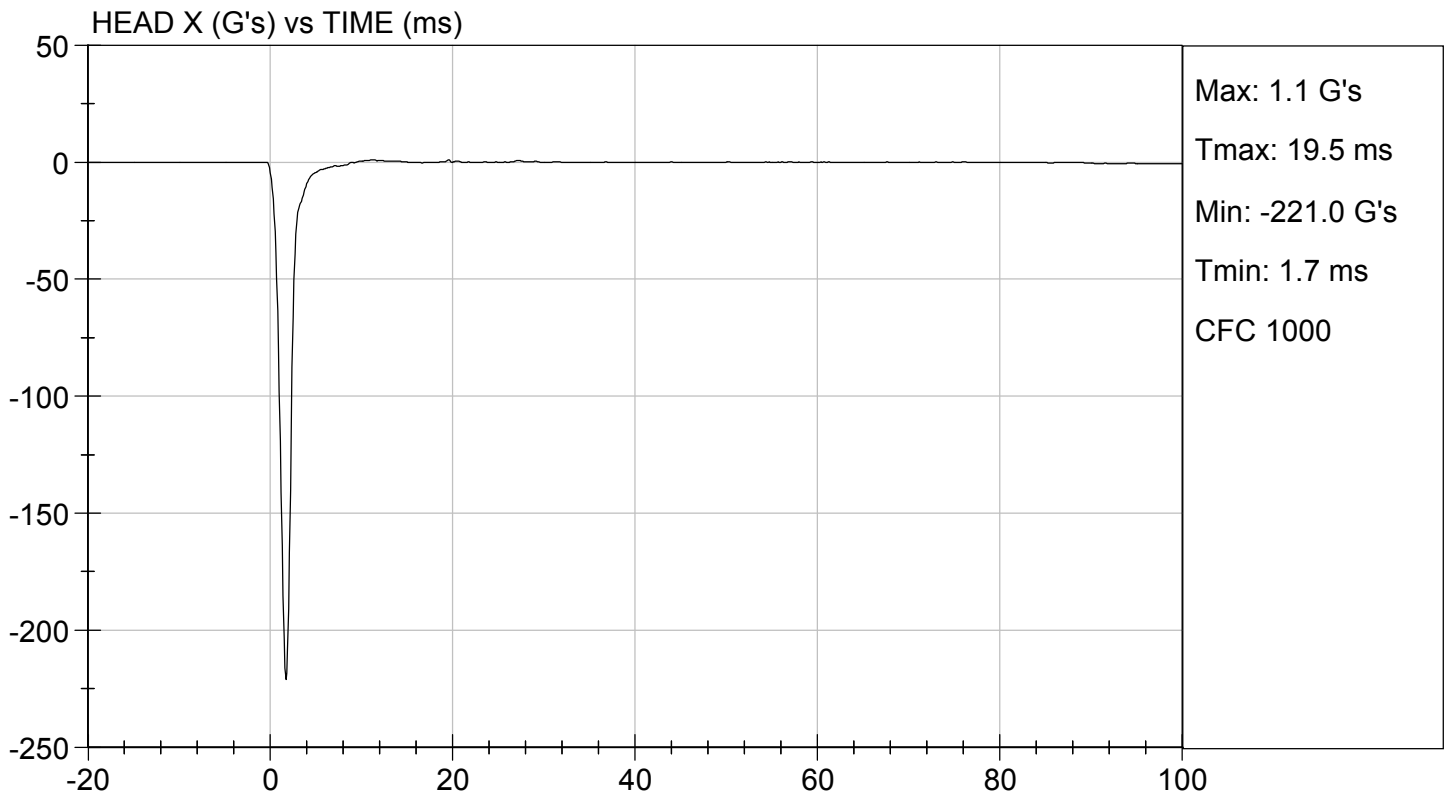
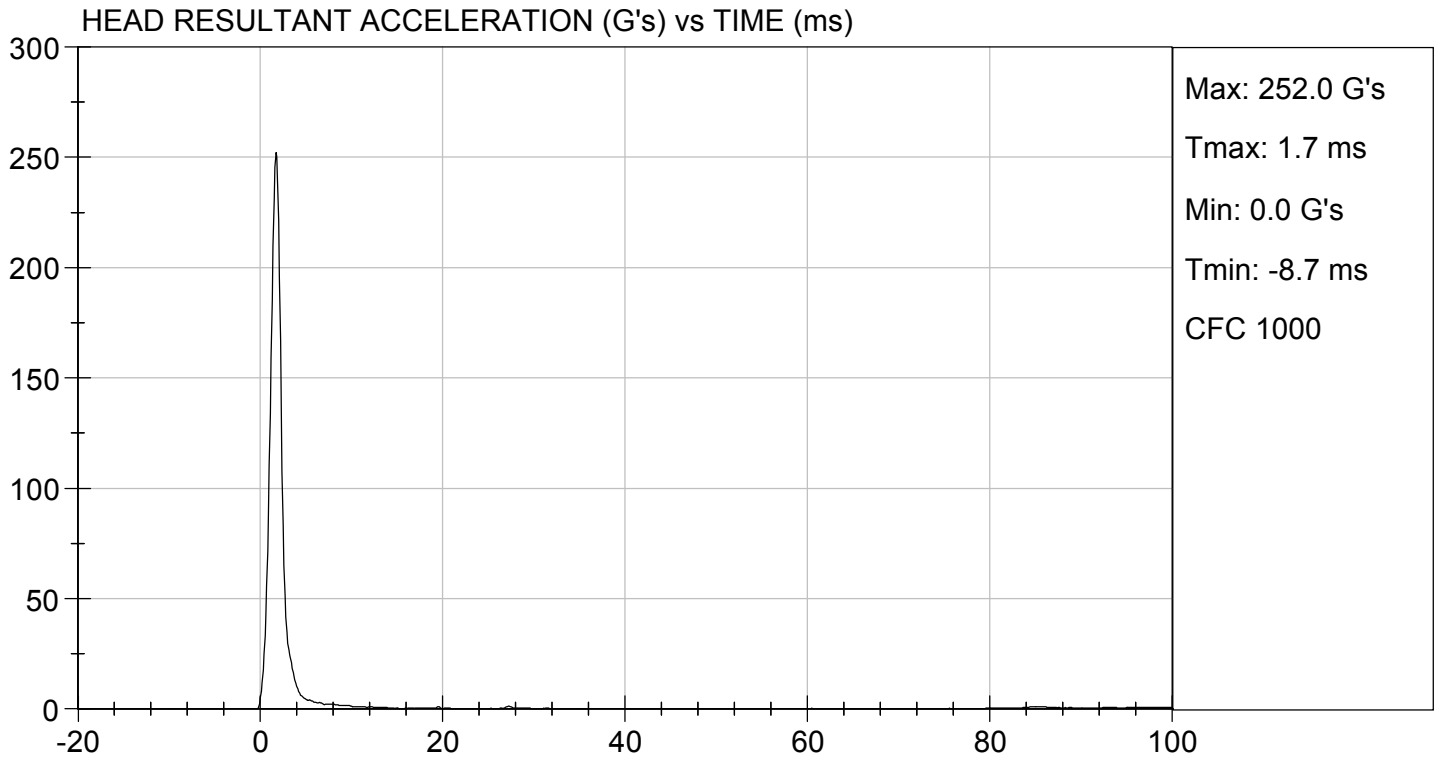
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	225 to 275	252	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
<b>Overall Test Results</b>				<b>Pass</b>

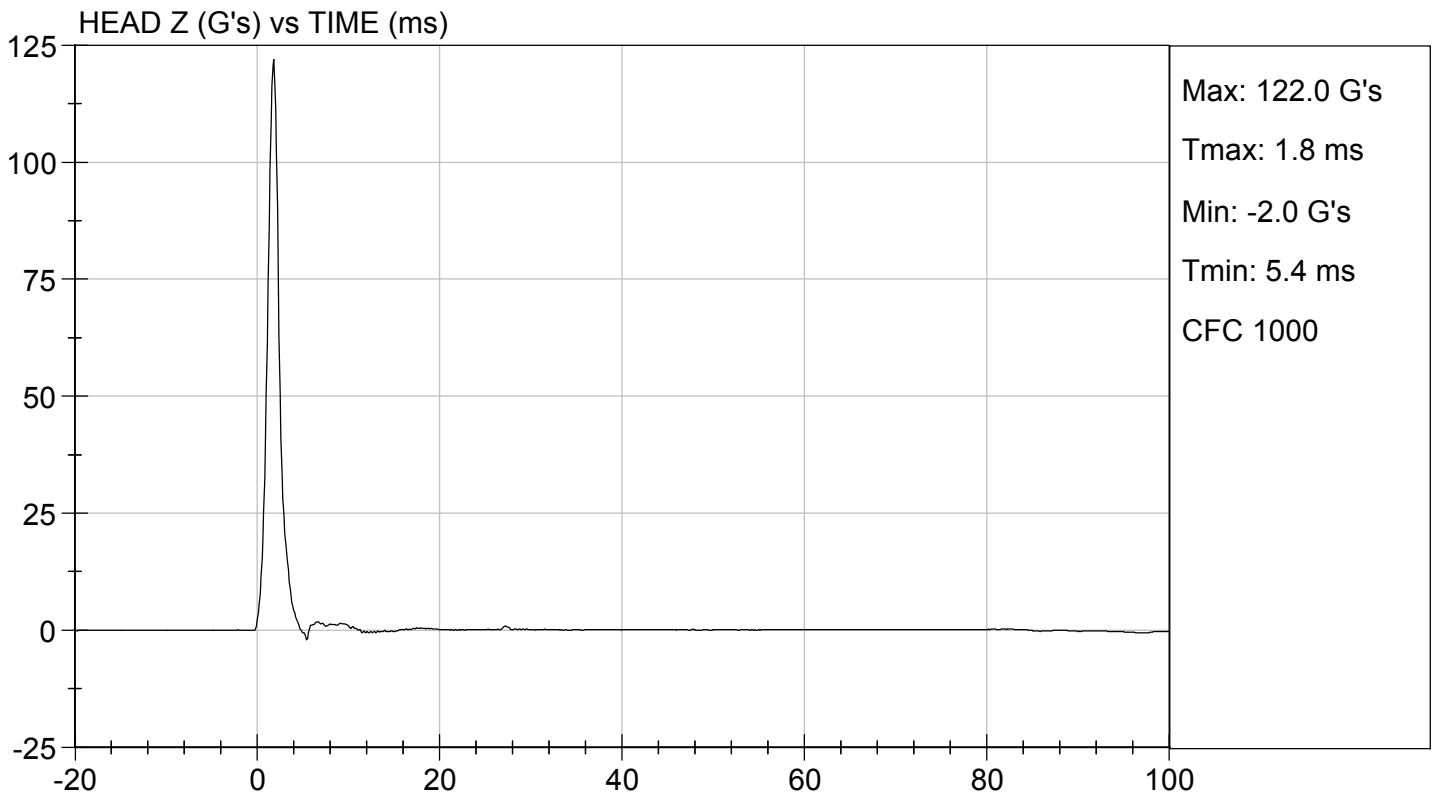
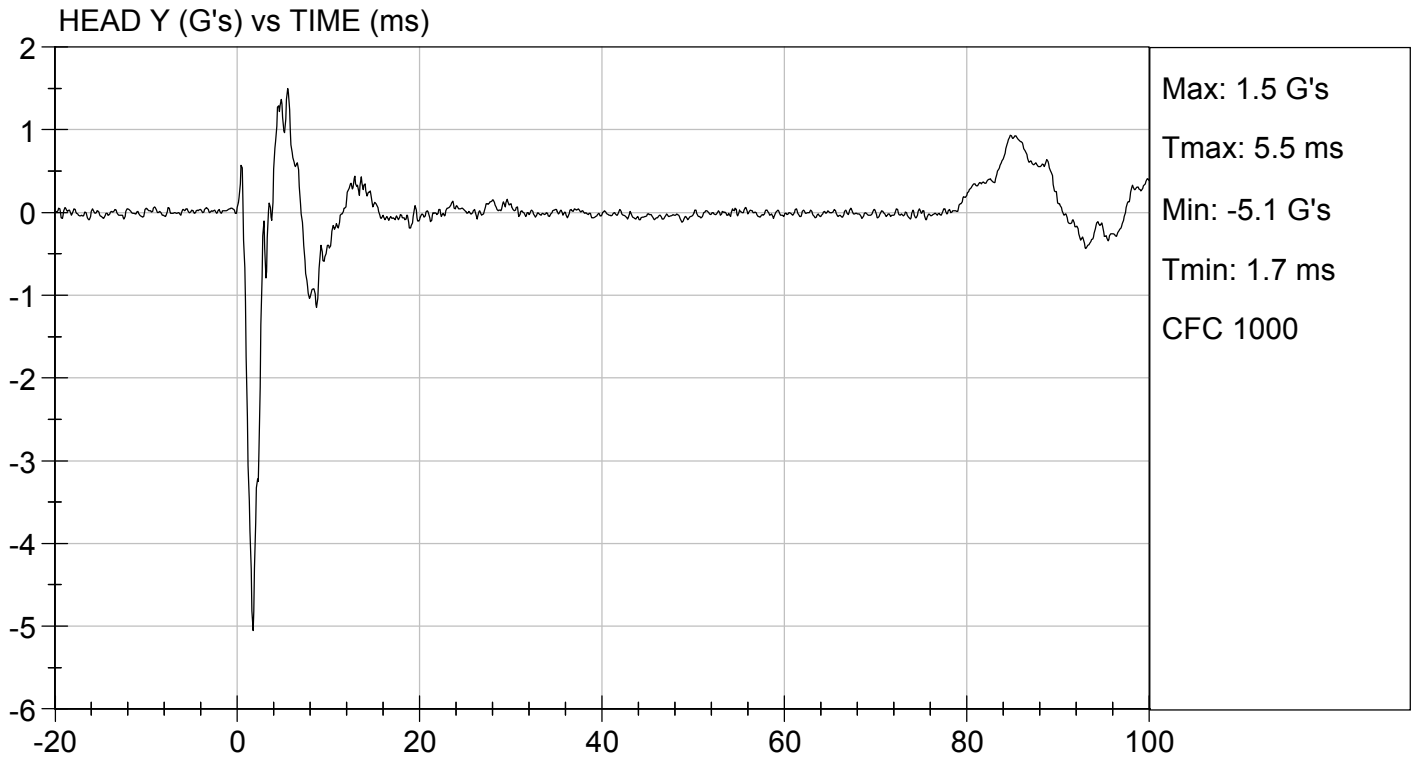
*Danielle Redinlaugh*  
Laboratory Technician

02/07/2019  
Test Date

*B. F. K.*  
Approved By







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

ATD Serial No: 351

Test I.D.: D190552

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.02	Pass
	20 ms	G's	17.60 to 22.60	21.33	Pass
	30 ms	G's	12.50 to 18.50	14.65	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.0	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	72.6	Pass
	Time	ms	57.0 to 64.0	60.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.7	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	90.4	Pass
	Time	ms	47.0 to 58.0	48.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.9	Pass
Overall Test Results					Pass

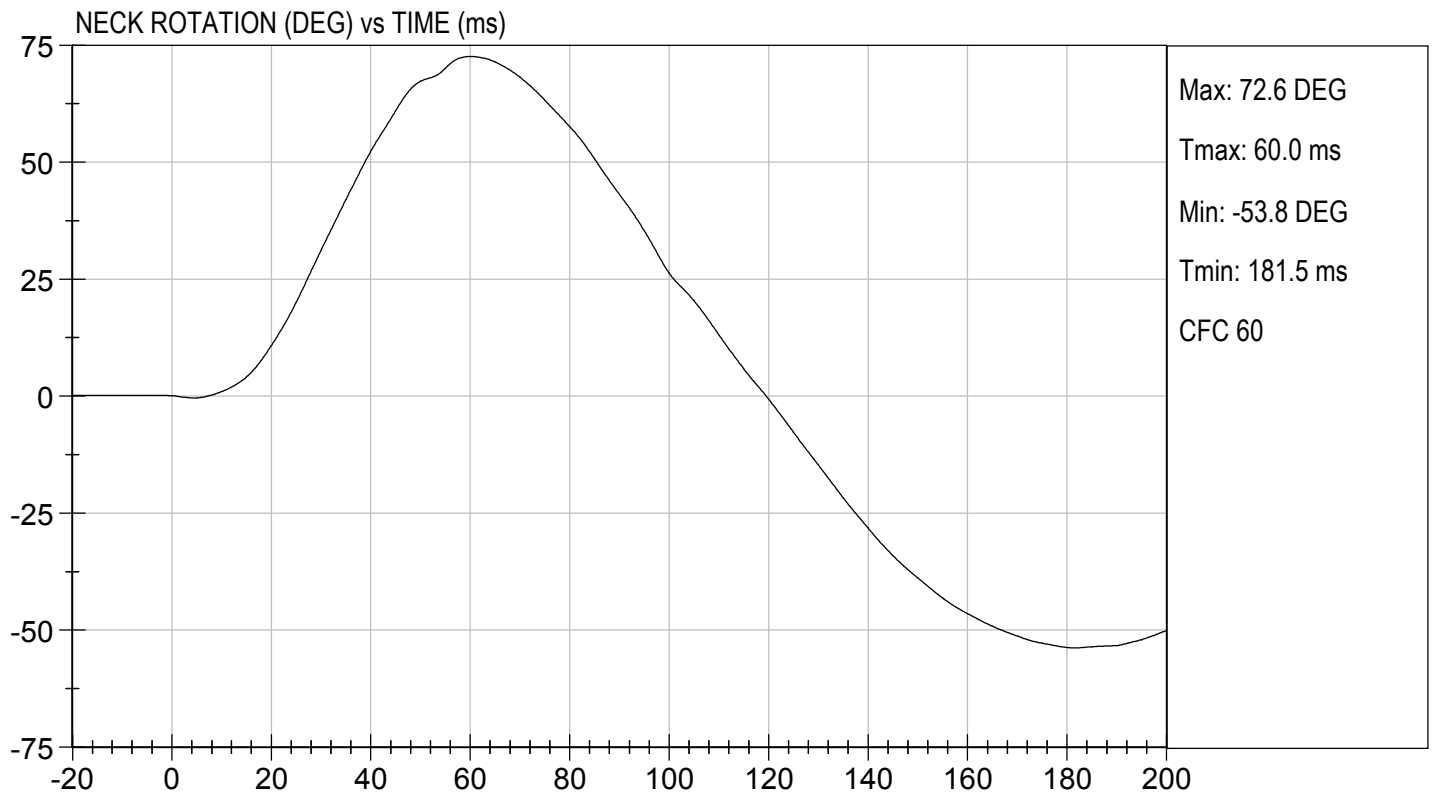
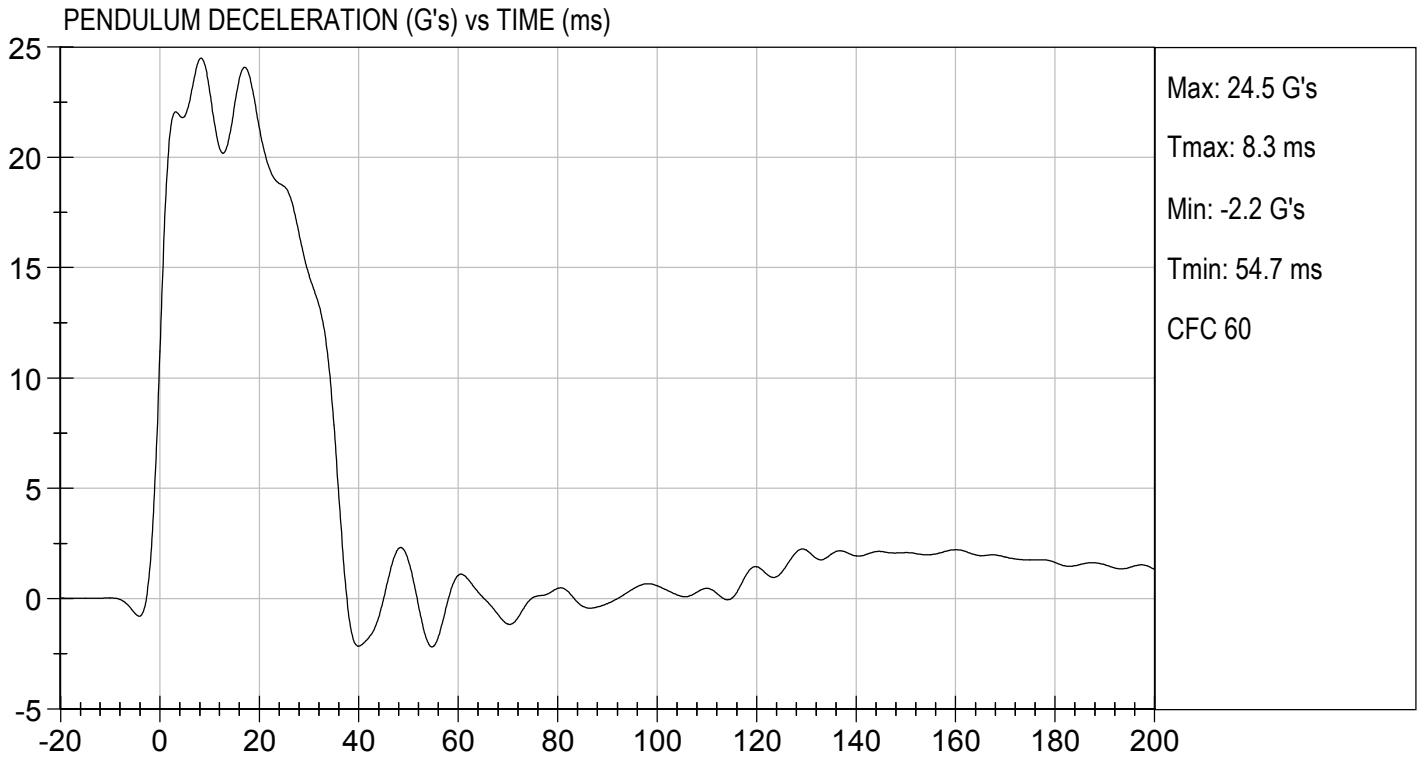
*Danielle Redinlaugh*  
 \_\_\_\_\_  
 Laboratory Technician

02/08/2019

\_\_\_\_\_ Test Date

*B. F. K.*  
 \_\_\_\_\_

Approved By

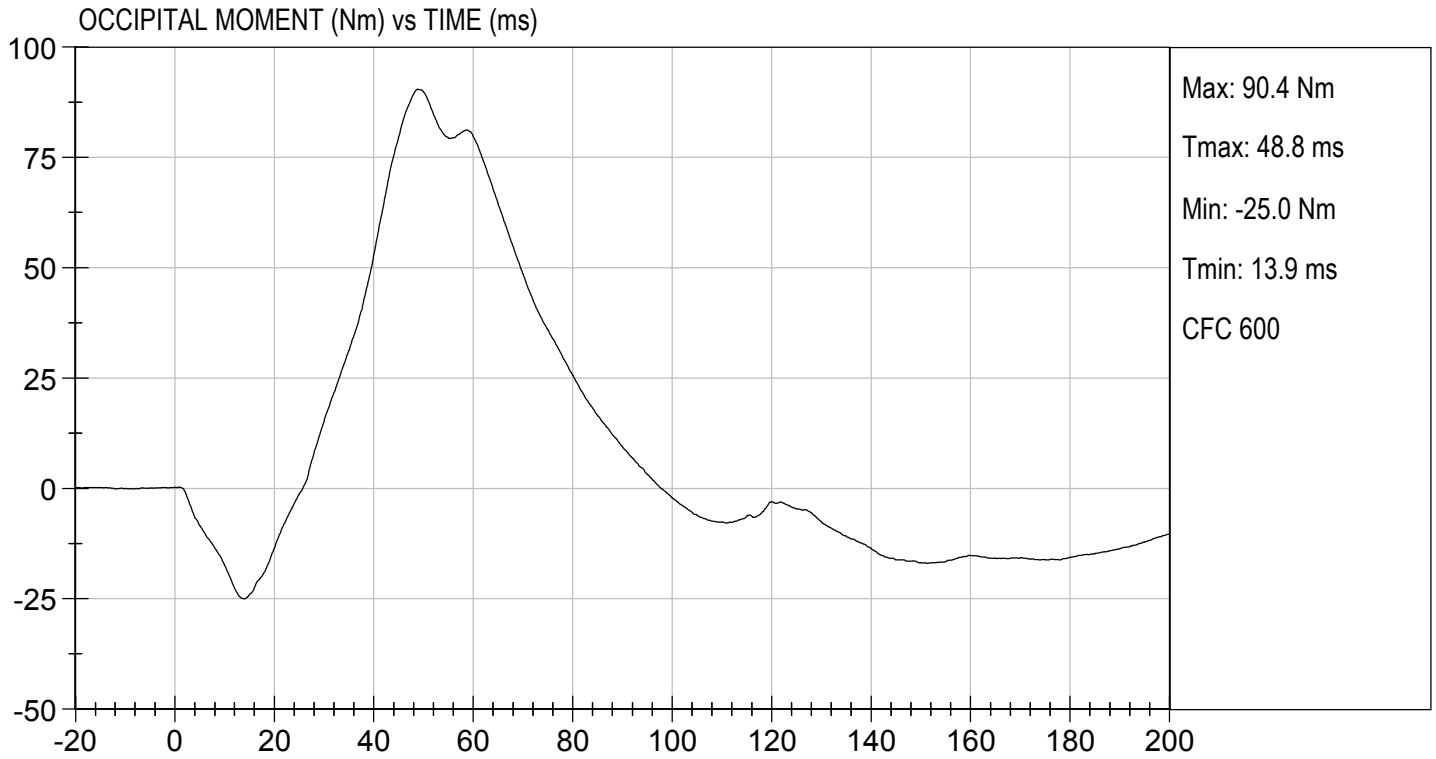






TEST DESC: NECK FLEXION  
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/08/2019  
TEST #: D190552



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

ATD Serial No: 351

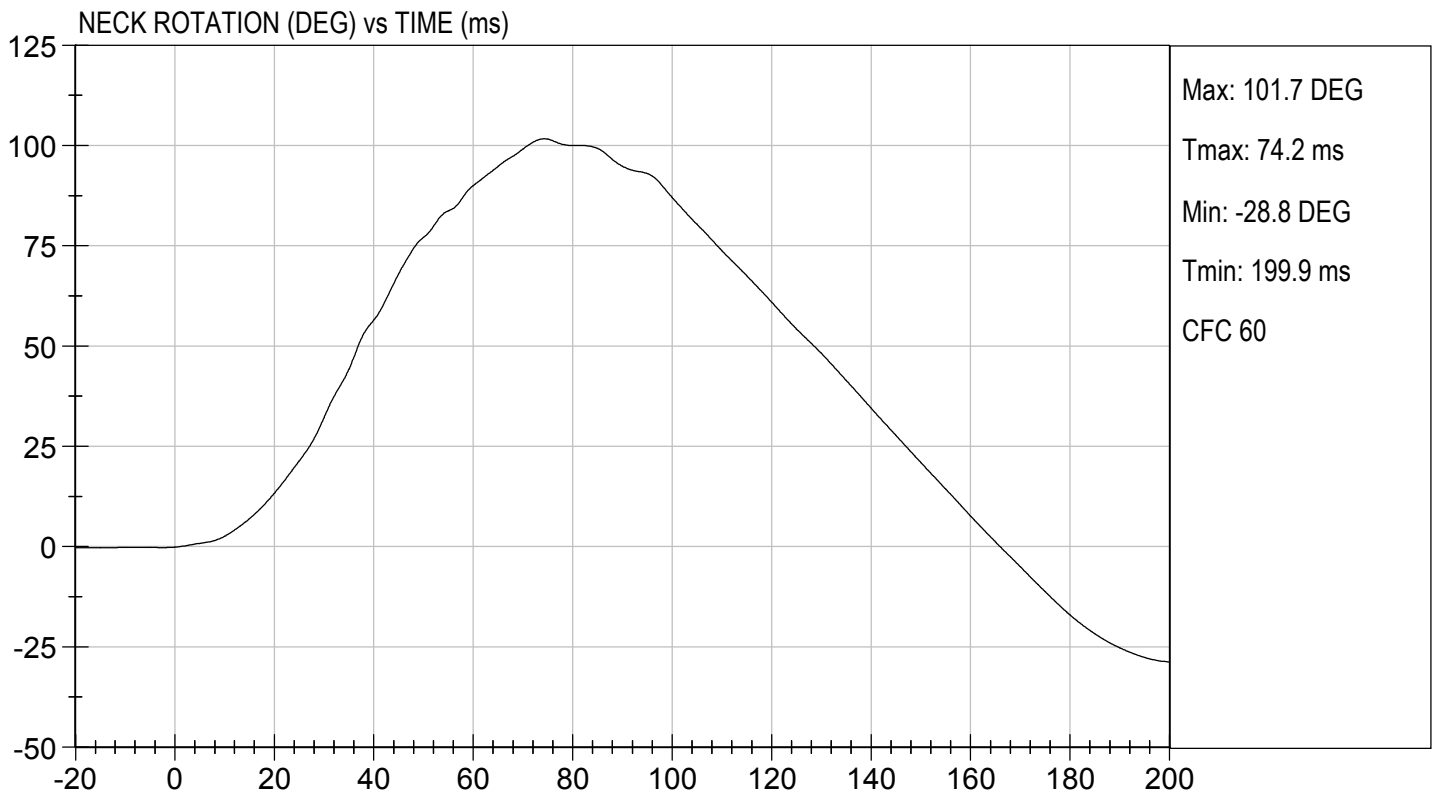
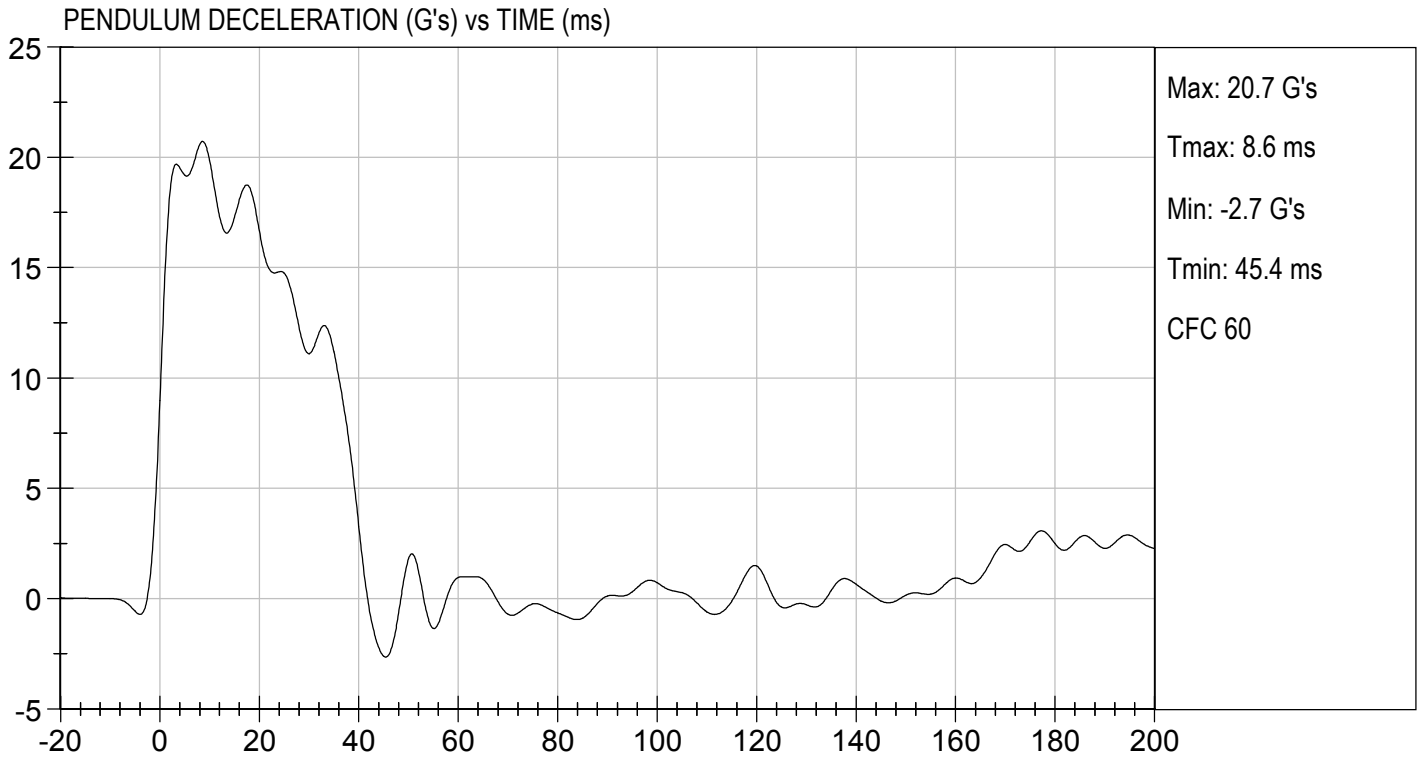
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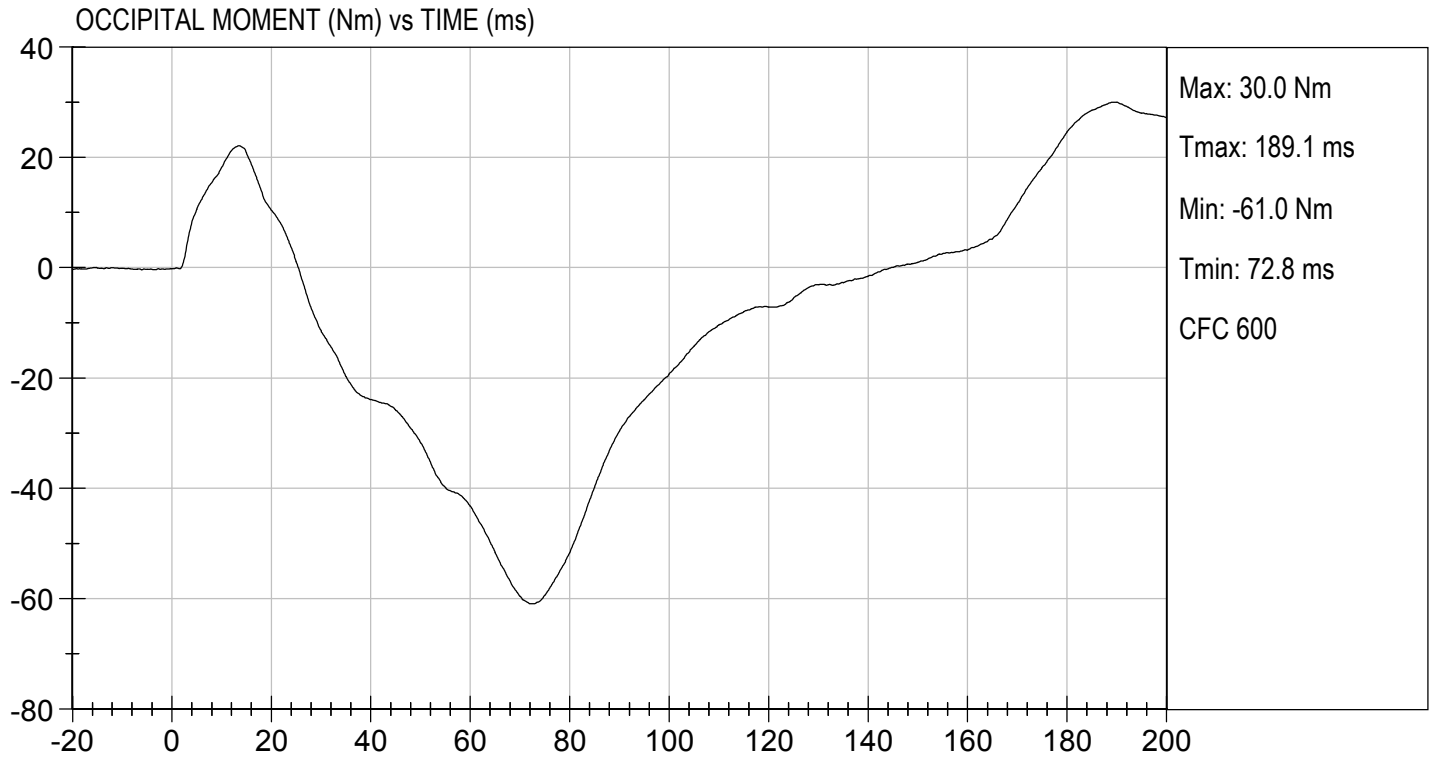
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.85	Pass
	20 ms	G's	14.00 to 19.00	16.66	Pass
	30 ms	G's	11.00 to 16.00	11.10	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.7	Pass
	Time	ms	72.0 to 82.0	74.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	166.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.0	Pass
	Time	ms	65.0 to 79.0	72.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.8	Pass
Overall Test Results					Pass

*Danielle Redinlaugh*  
 Laboratory Technician

02/08/2019  
 Test Date

*B. F. K.*  
 Approved By







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

ATD Serial No: 351

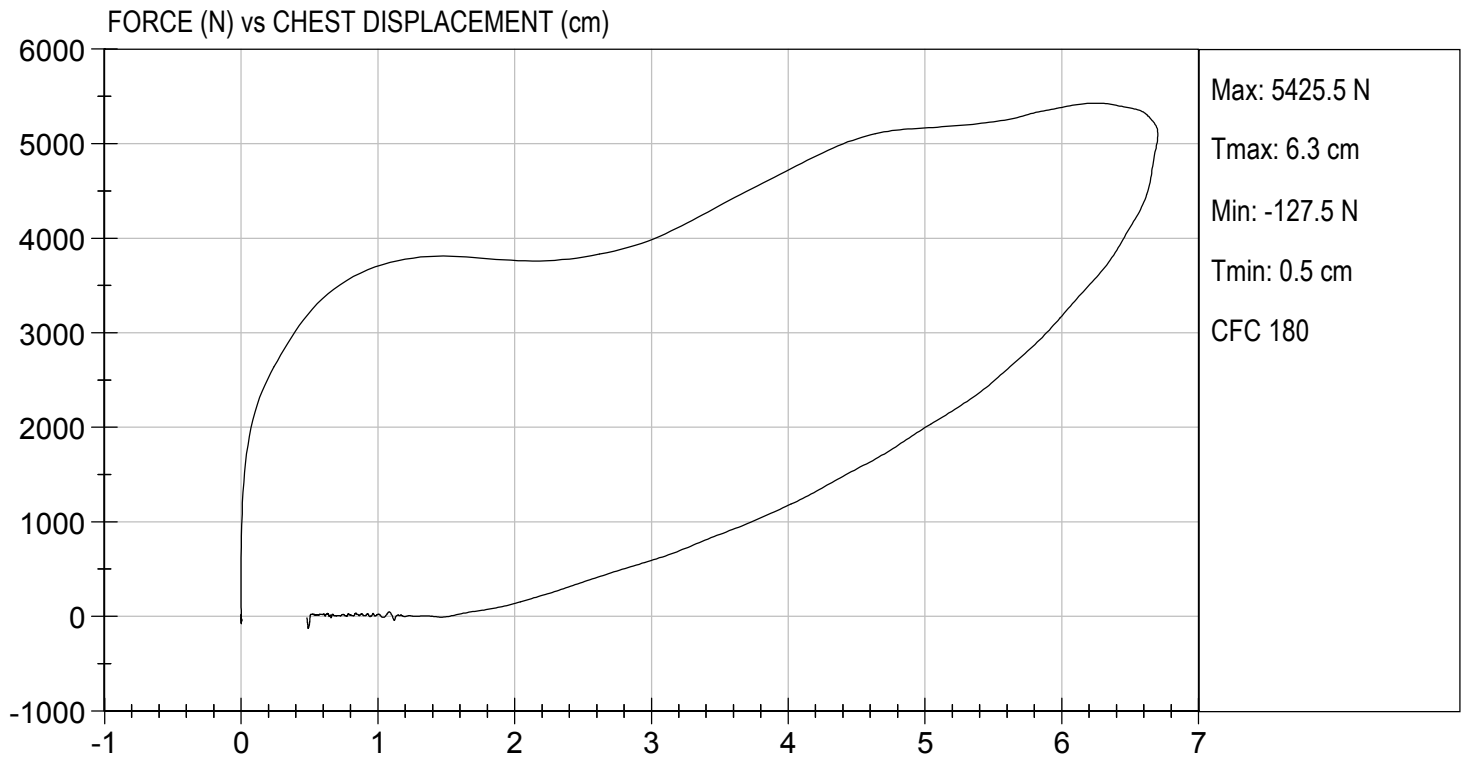
Test I.D: D190554

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,426	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.70	Pass
Internal Hysteresis	%	69 to 85	72	Pass
<b>Overall Test Results</b>				<b>Pass</b>

*Danielle Redinlaugh*  
 Laboratory Technician

02/07/2019  
 Test Date

*B. F.*  
 Approved By



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

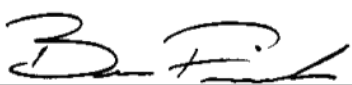
ATD Serial No: 351

Test I.D: D190555

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	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	4,889	Pass
Overall Test Results				Pass

  
 \_\_\_\_\_  
 Laboratory Technician

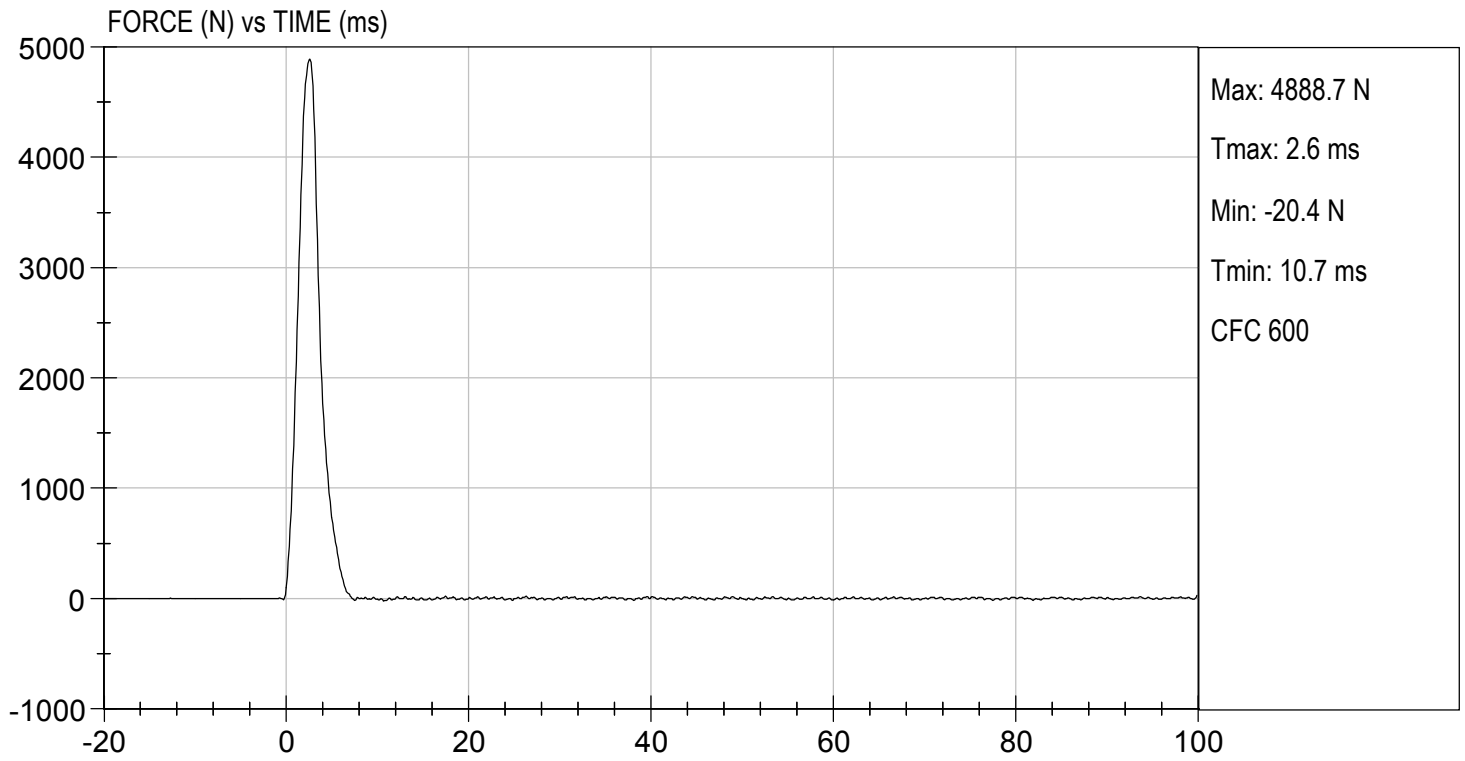
02/07/2019  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By



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

TEST DATE: 02/07/2019  
TEST #: D190555





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

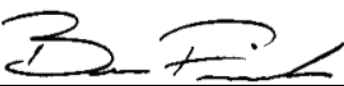
ATD Serial No: 351

Test I.D: D190556

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	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,477	Pass
Overall Test Results				Pass

  
 Laboratory Technician

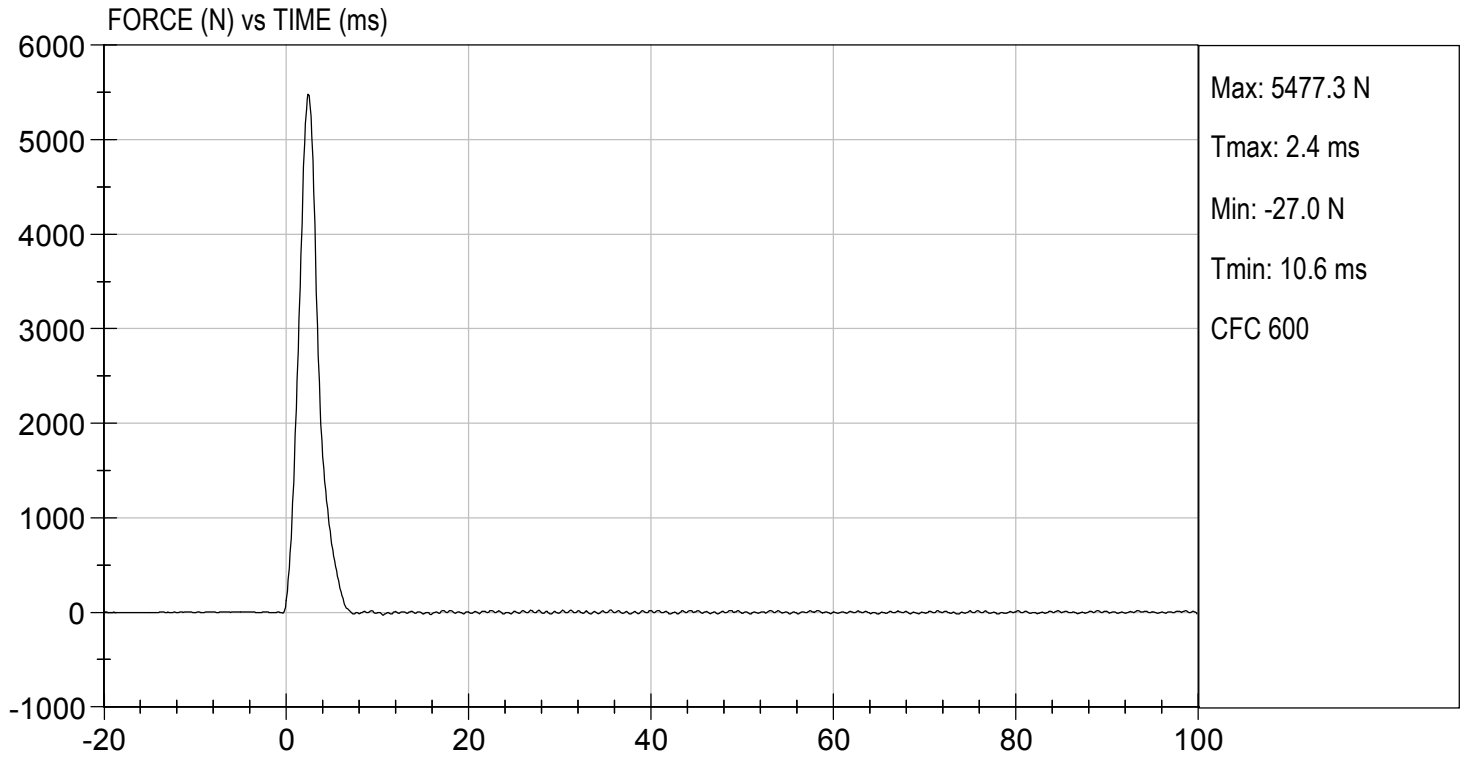
02/07/2019  
 Test Date

  
 Approved By



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

TEST DATE: 02/07/2019  
TEST #: D190556




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

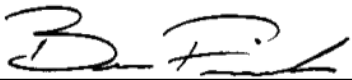
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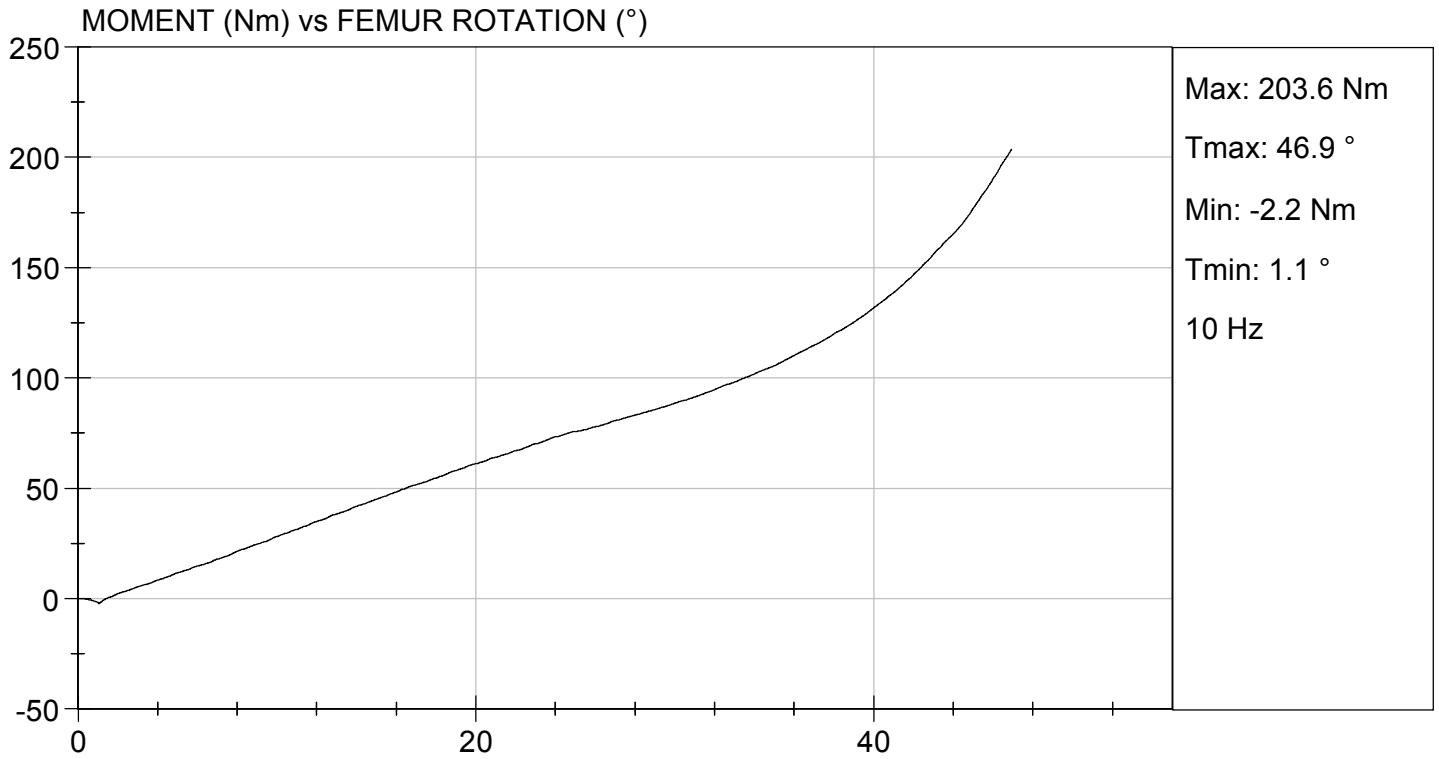
**Test I.D:** D190550

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	32	32	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	88.5	88.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	46.9	44.9	Pass
Overall Test Results					Pass

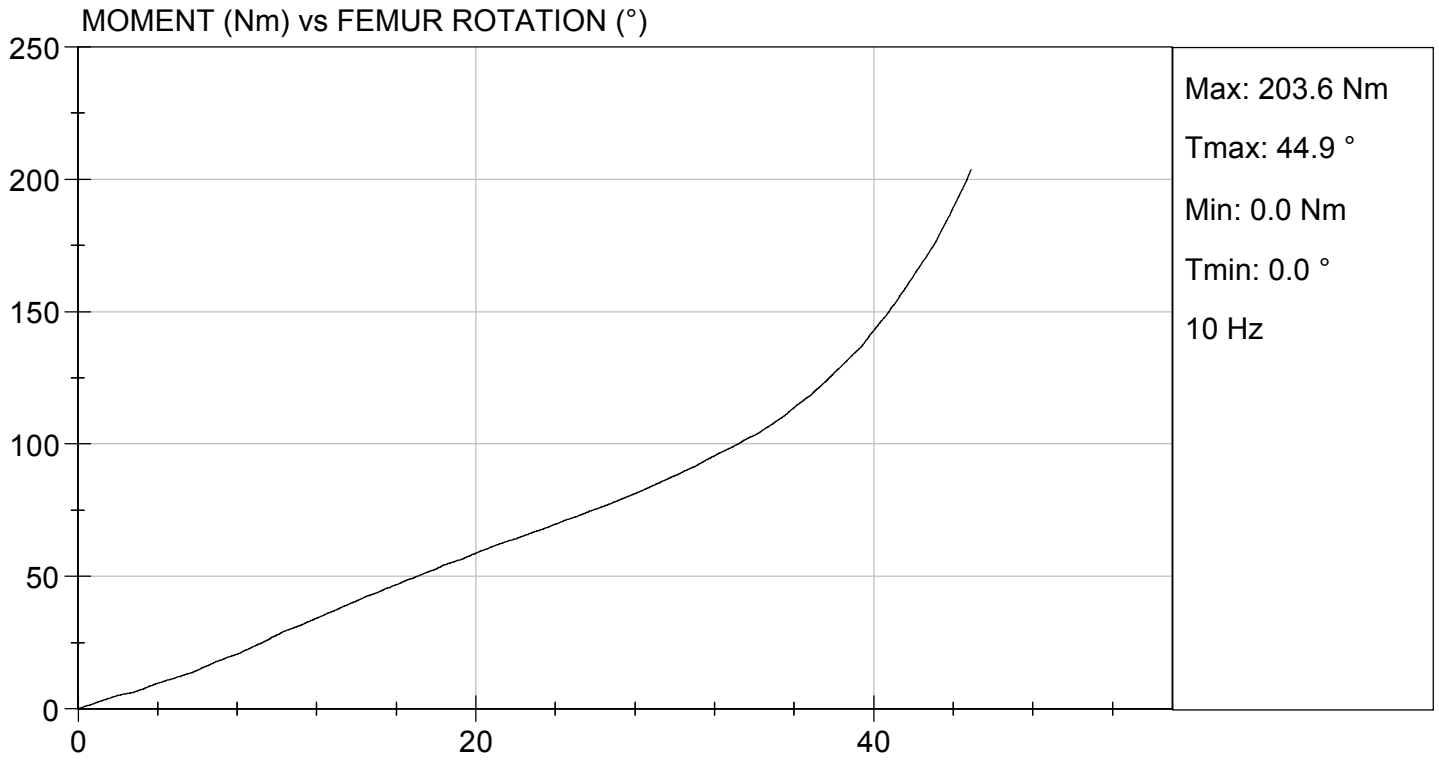
  
 Laboratory Technician

02/07/2019  
 Test Date

  
 Approved By







**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

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

**ATD Serial No:** 351

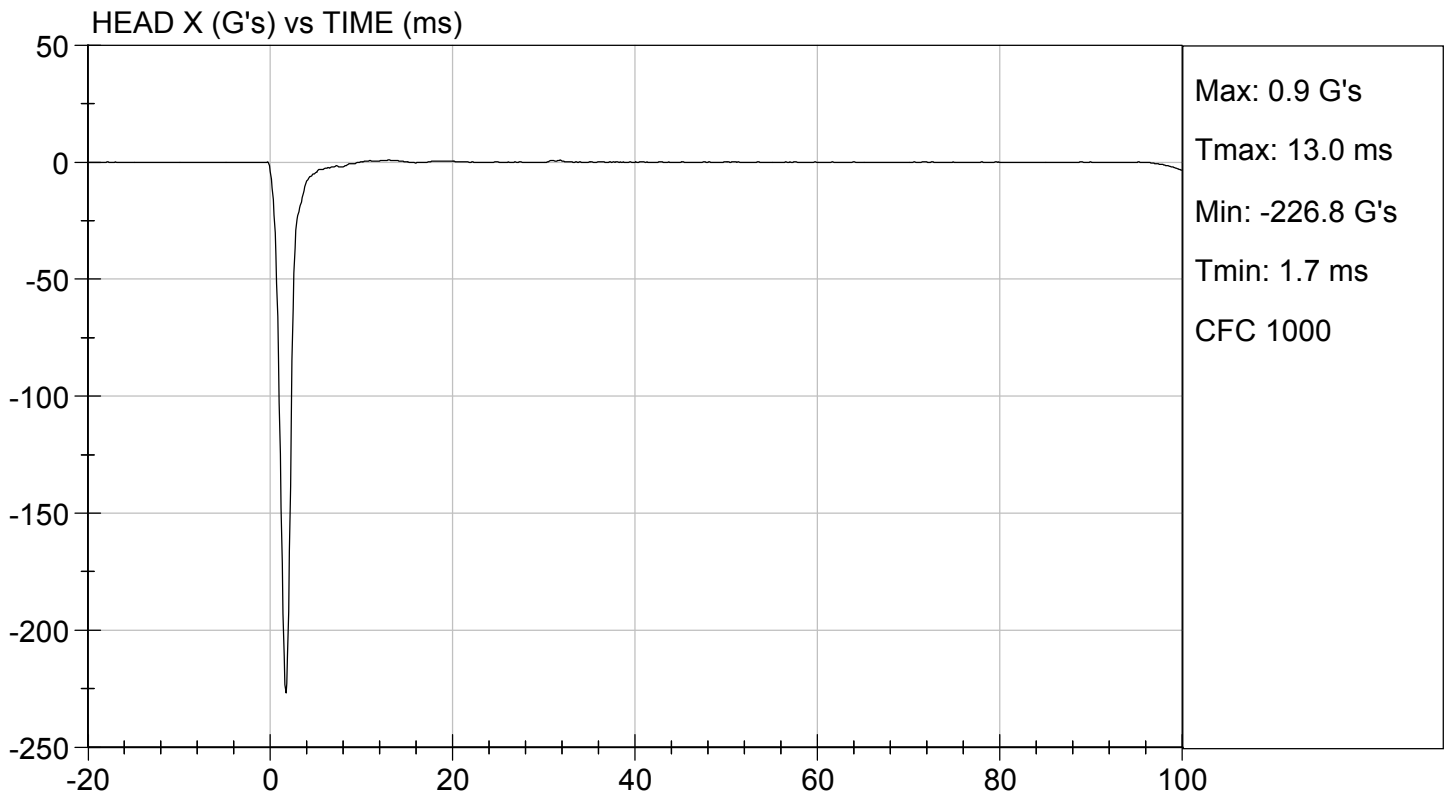
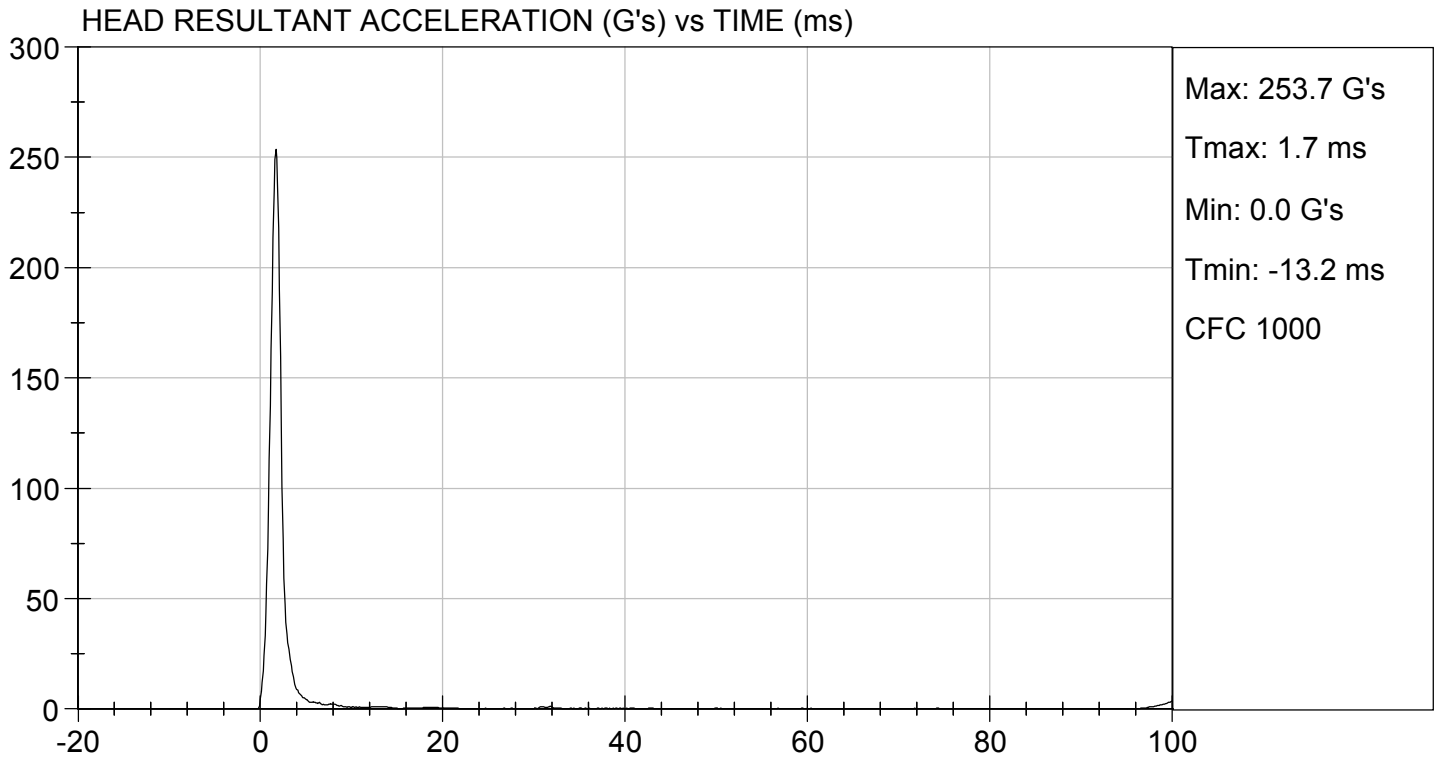
**Test ID:** D190591

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	225 to 275	254	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
<b>Overall Test Results</b>				<b>Pass</b>

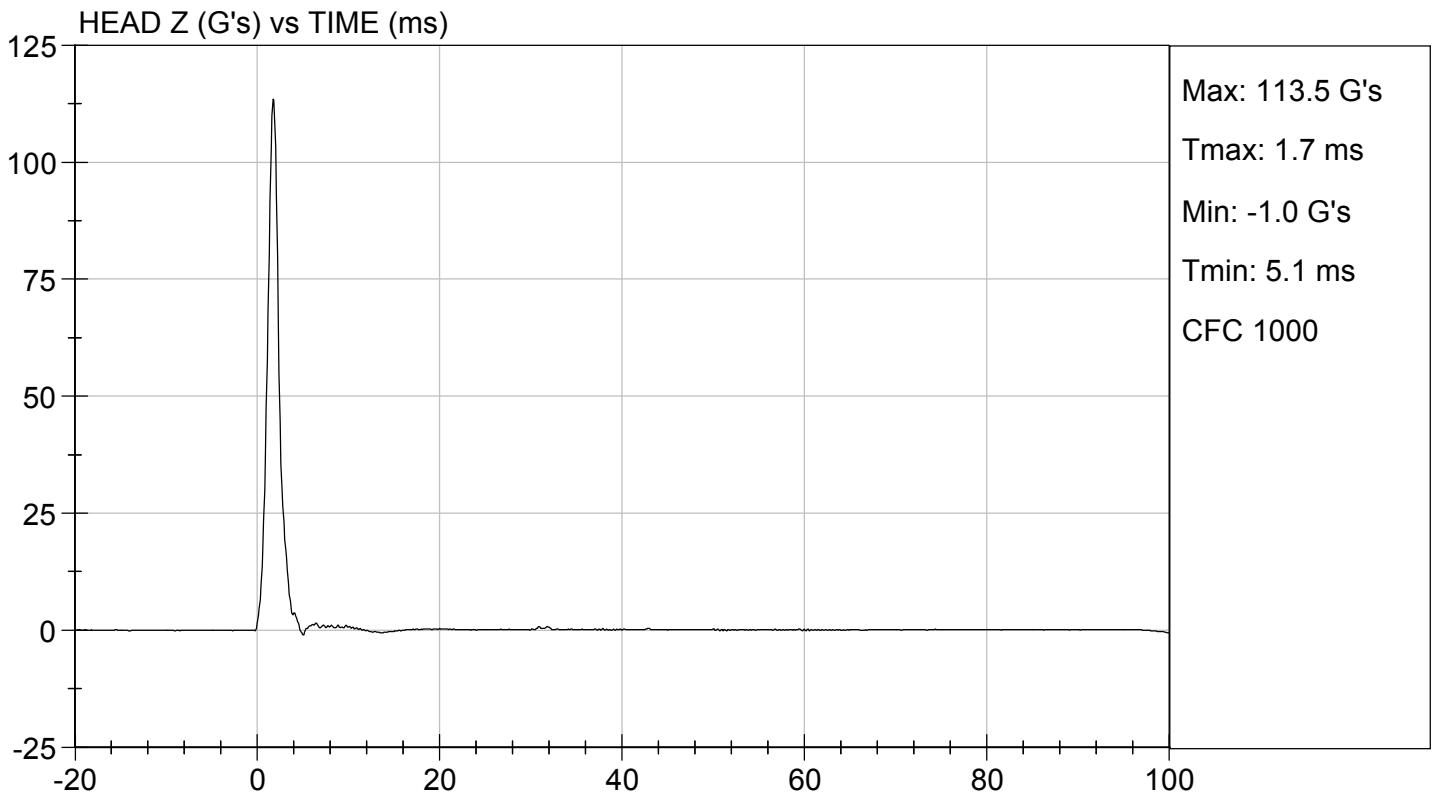
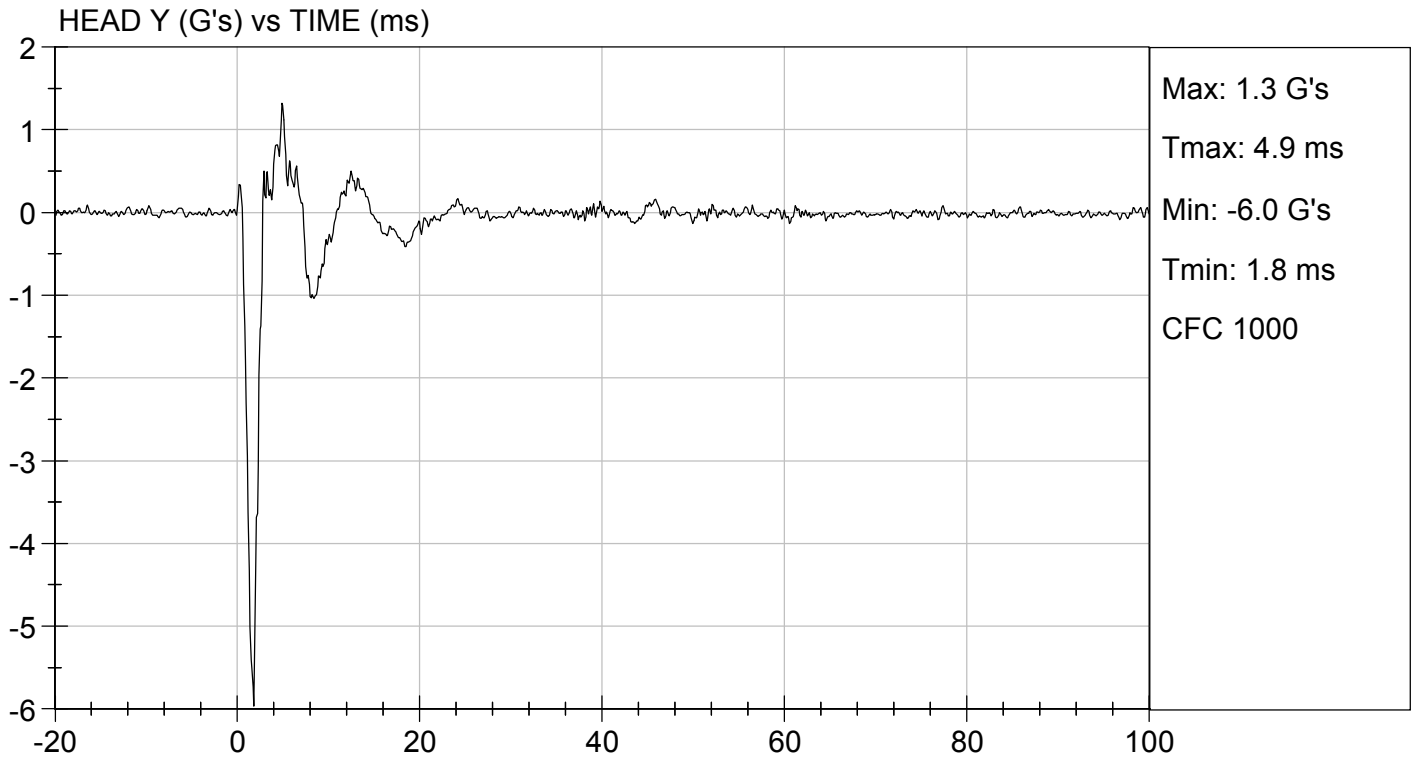
*Danielle Redinlaugh*  
Laboratory Technician

02/13/2019  
Test Date

*B. F. K.*  
Approved By







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

ATD Serial No: 351

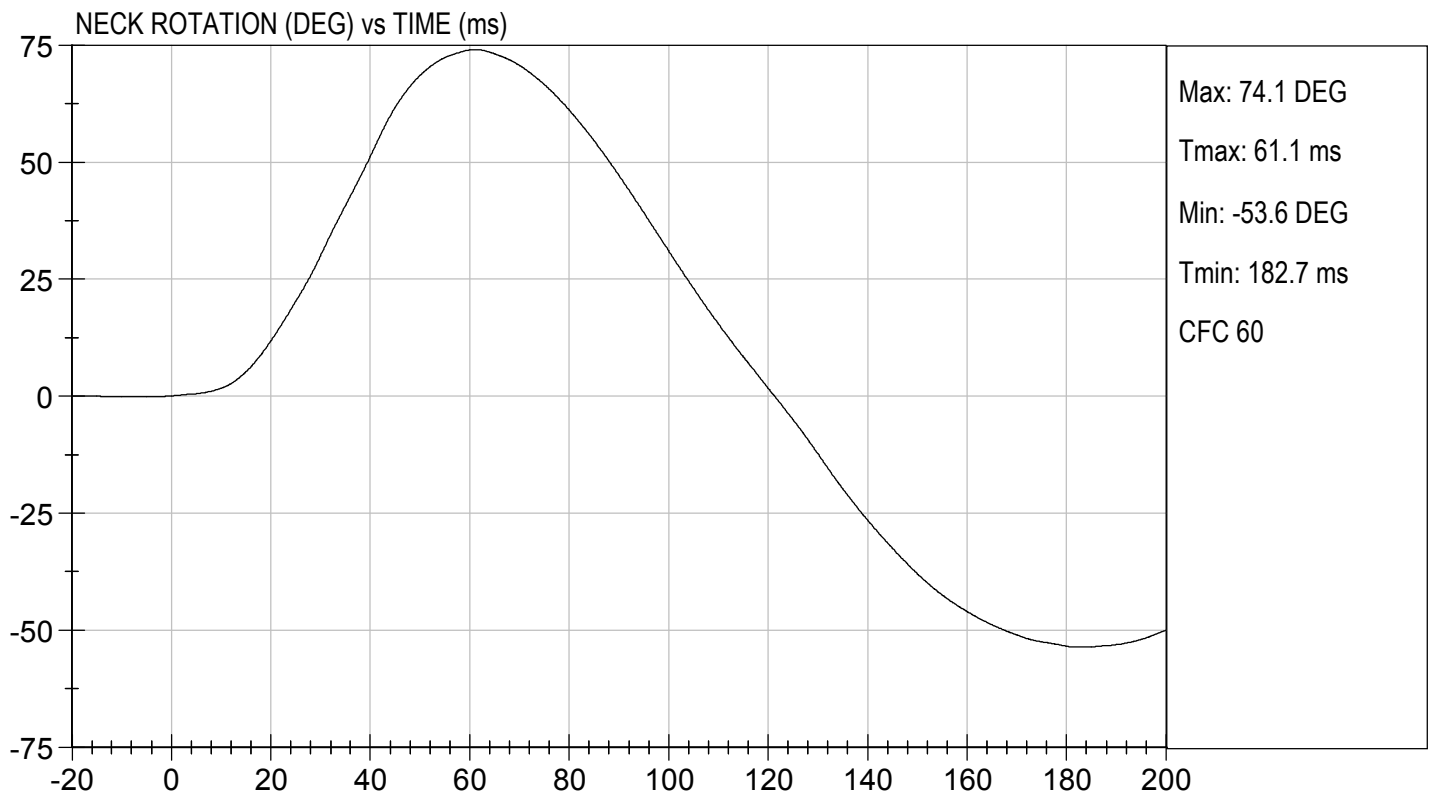
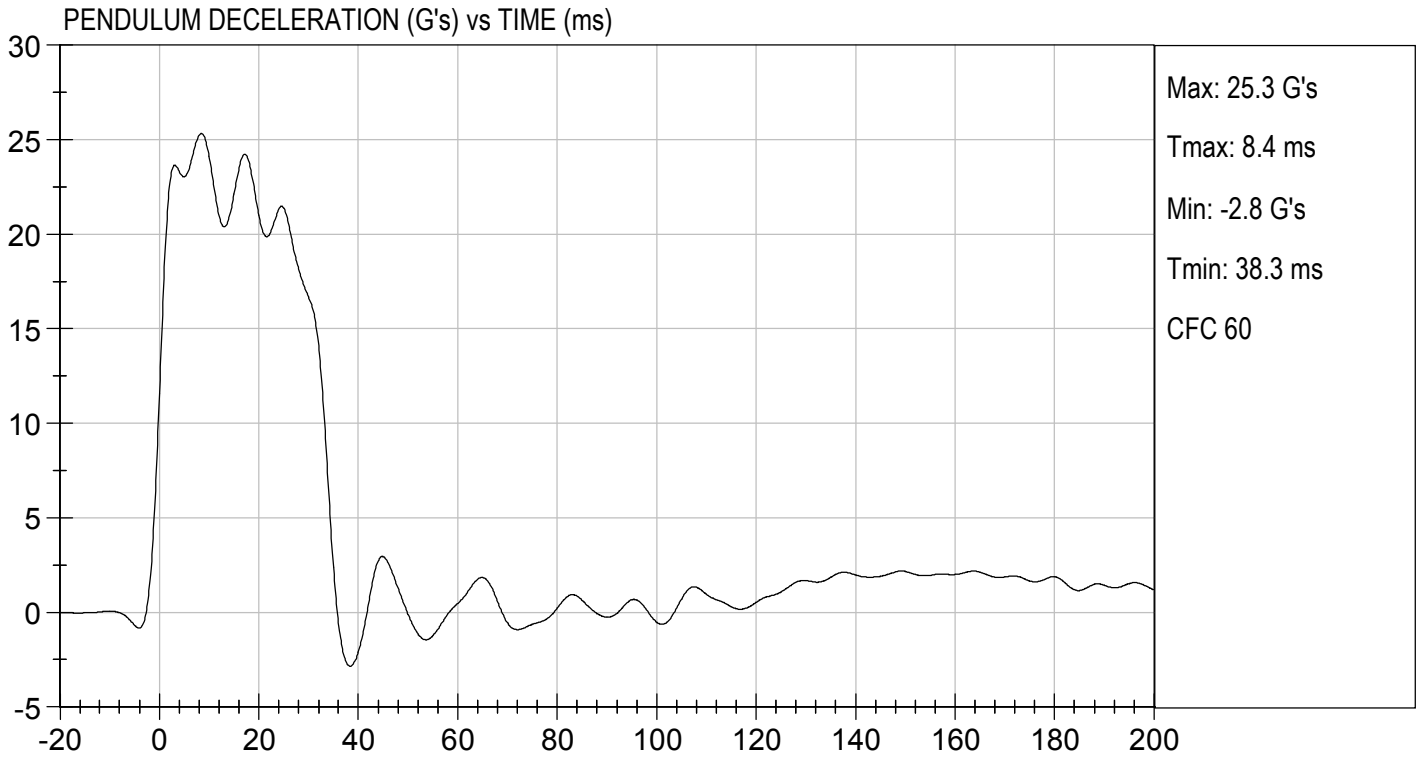
Test I.D: D190592

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.10	Pass
	20 ms	G's	17.60 to 22.60	20.99	Pass
	30 ms	G's	12.50 to 18.50	16.67	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.4	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	74.1	Pass
	Time	ms	57.0 to 64.0	61.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	121.5	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.1	Pass
	Time	ms	47.0 to 58.0	48.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.4	Pass
Overall Test Results					Pass

*Danielle Redinlaugh*  
 Laboratory Technician

02/13/2019  
 Test Date

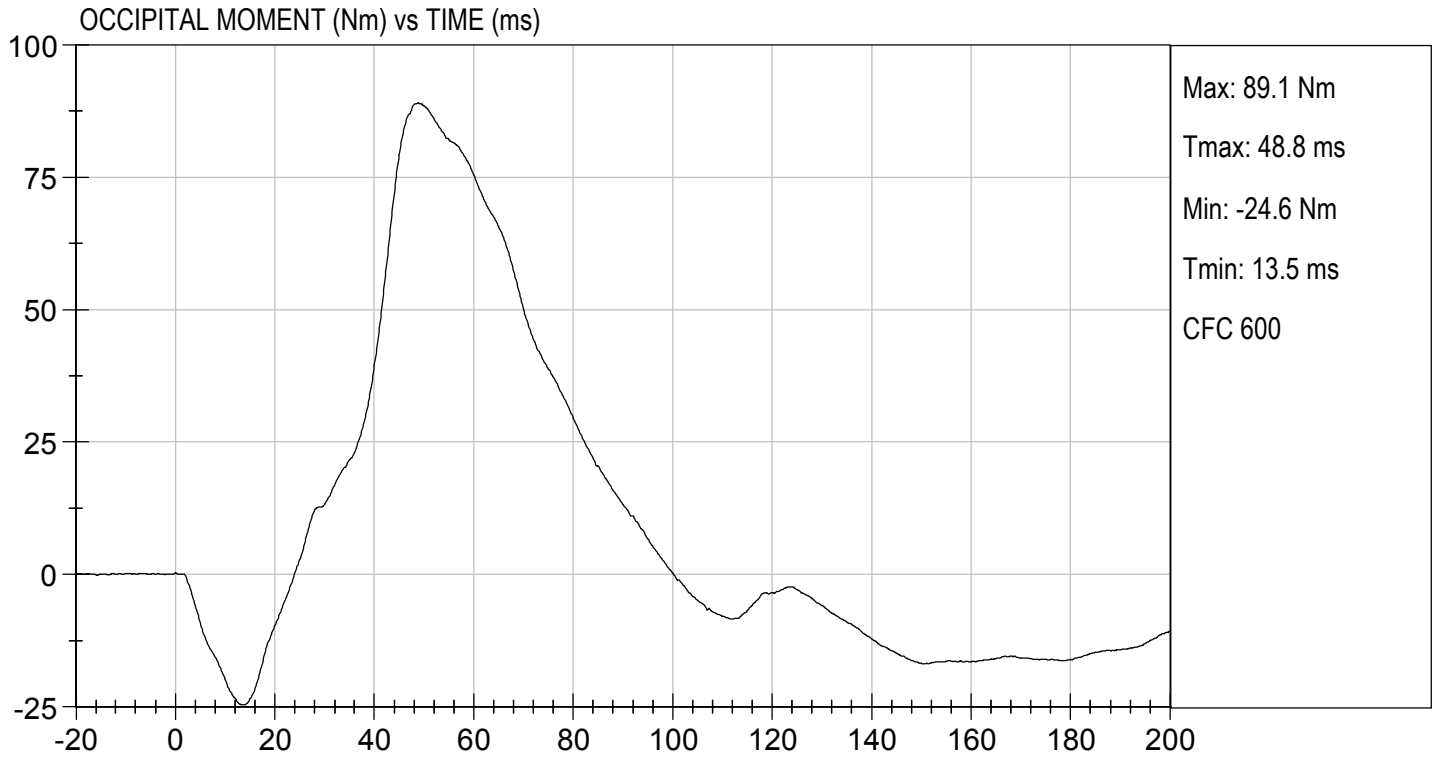
*B. F. K.*  
 Approved By





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

TEST DATE: 02/13/2019  
TEST #: D190592





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

ATD Serial No: 351

Test I.D.: D190593

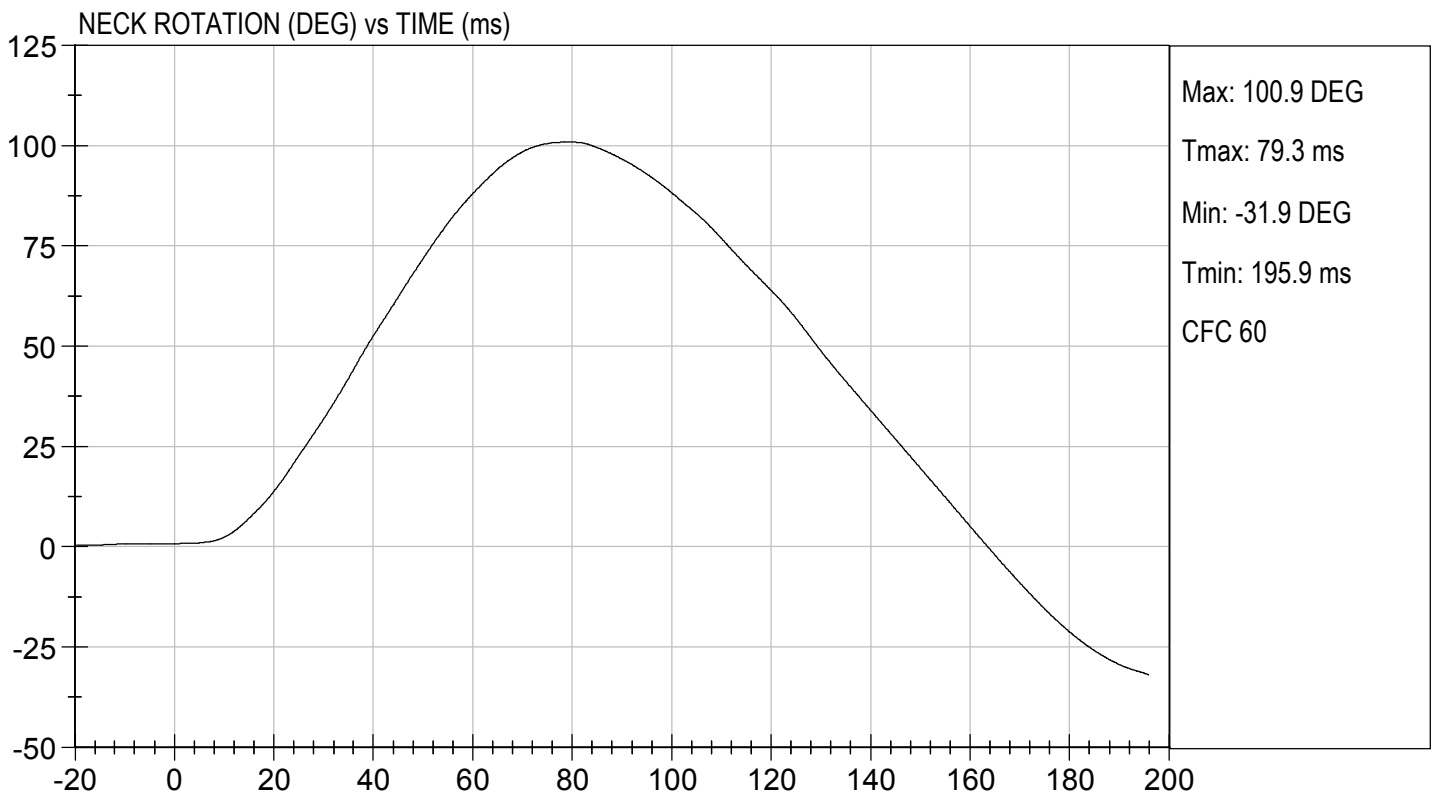
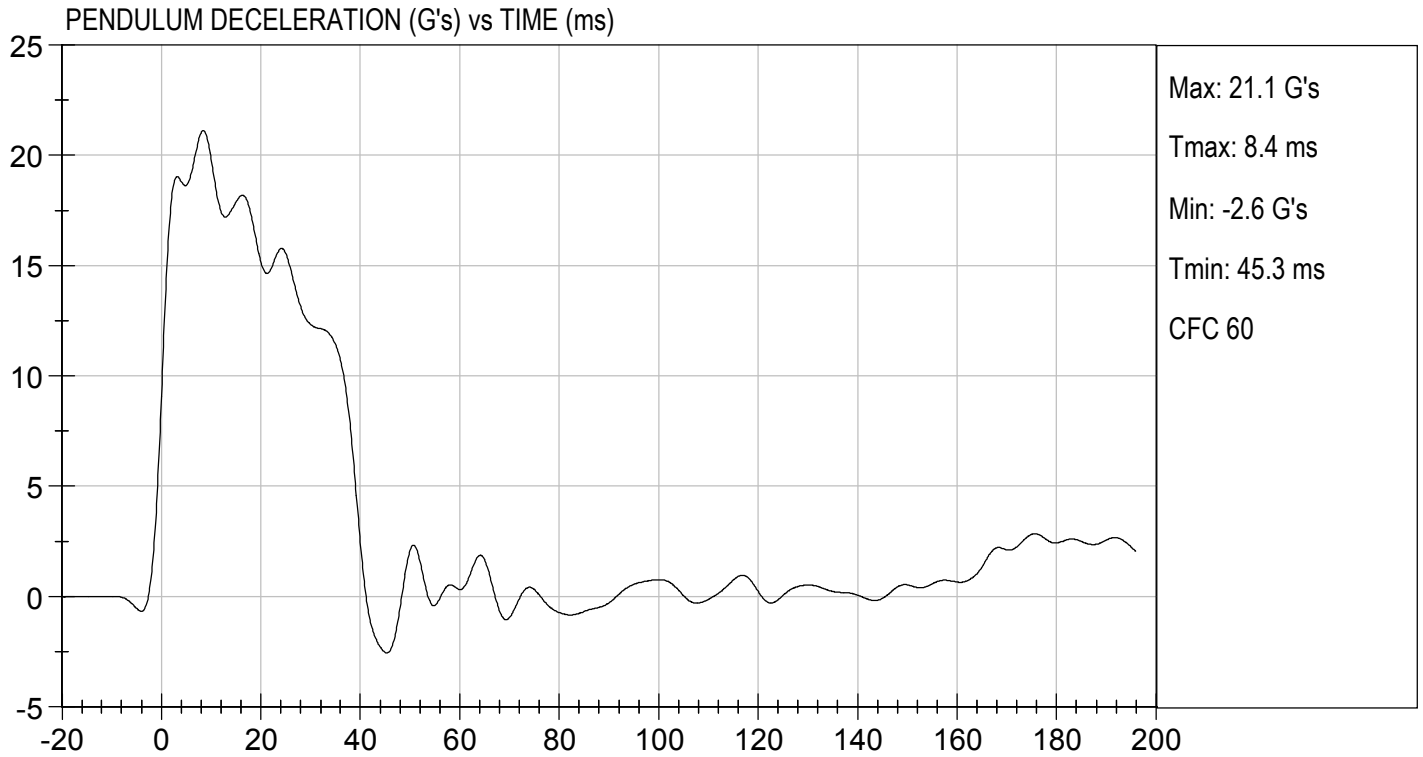
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.70	Pass
	20 ms	G's	14.00 to 19.00	15.09	Pass
	30 ms	G's	11.00 to 16.00	12.32	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.9	Pass
	Time	ms	72.0 to 82.0	79.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-62.3	Pass
	Time	ms	65.0 to 79.0	71.4	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	147.6	Pass
Overall Test Results					Pass

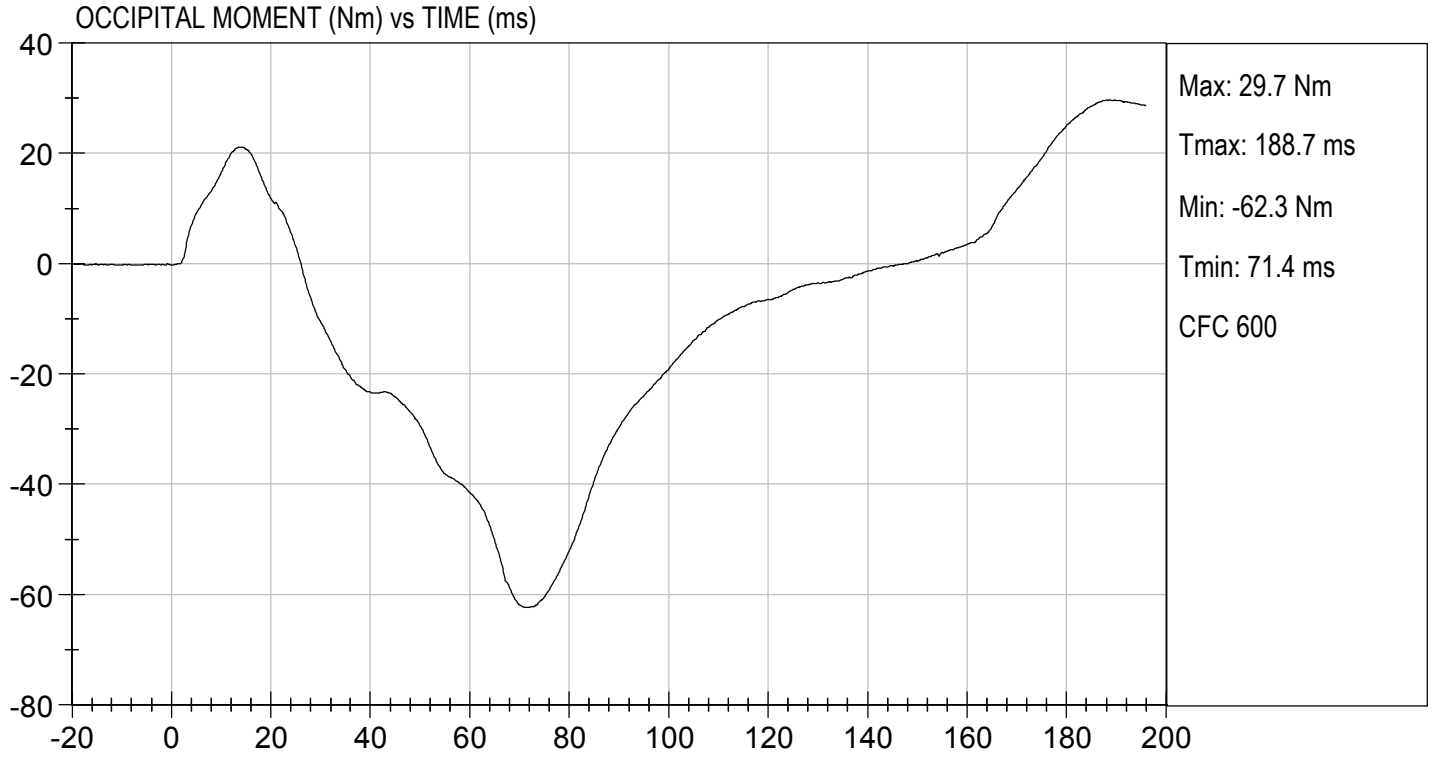
*Danielle Redinlaugh*  
 Laboratory Technician

02/13/2019

Test Date

*B. F. K.*  
 Approved By





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

**ATD Serial No:** 351

**Test I.D:** D190594

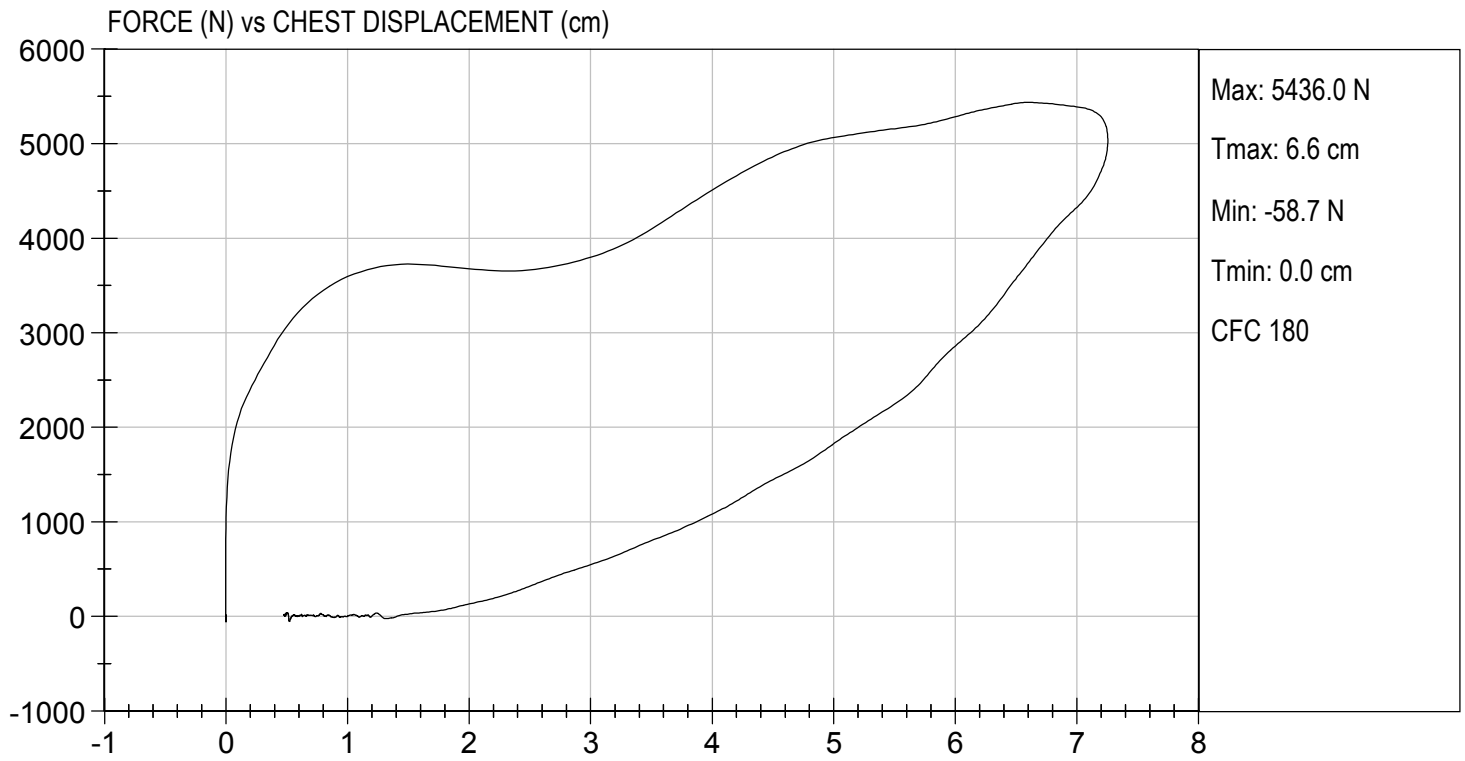
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,436	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.25	Pass
Internal Hysteresis	%	69 to 85	69	Pass
<b>Overall Test Results</b>				<b>Pass</b>

*Danielle Redinlaugh*  
 \_\_\_\_\_  
 Laboratory Technician

02/12/2019  
 \_\_\_\_\_  
 Test Date

*B. F. K.*  
 \_\_\_\_\_  
 Approved By





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

ATD Serial No: 351

Test I.D: D190595

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,976	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
 Laboratory Technician

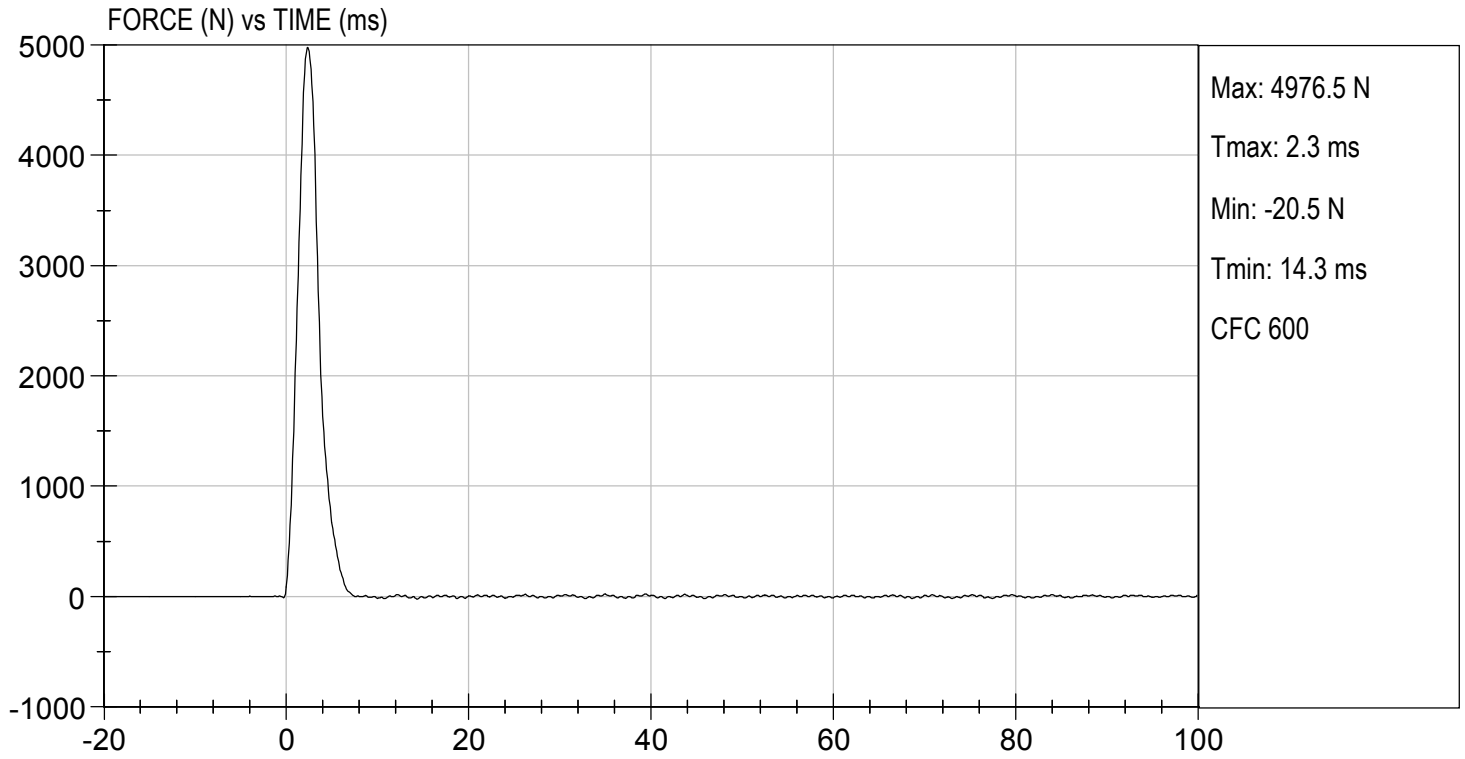
02/13/2019  
 Test Date

*B. F. K.*  
 Approved By



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

TEST DATE: 02/13/2019  
TEST #: D190595



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

ATD Serial No: 351

Test I.D: D190596

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,476	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
 Laboratory Technician

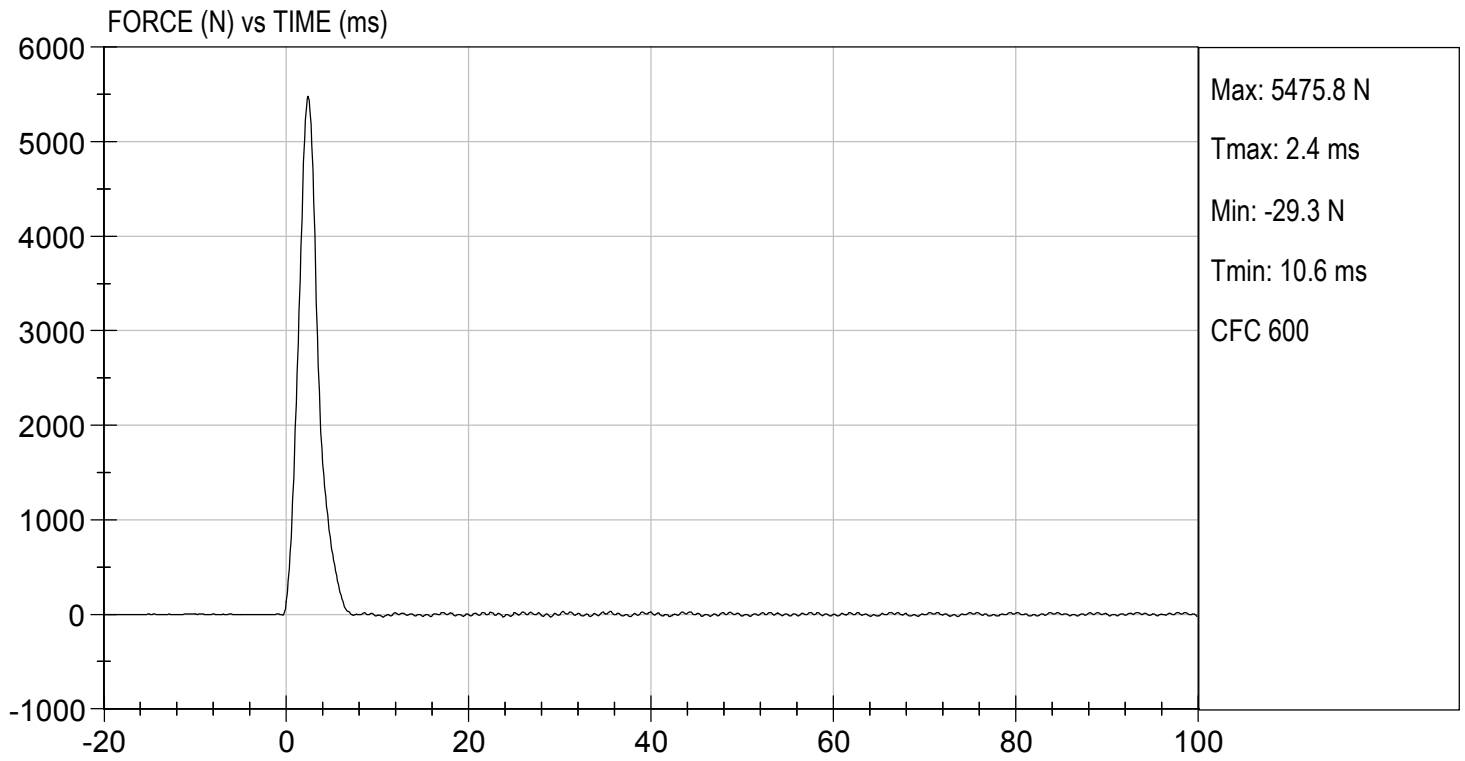
02/13/2019  
 Test Date

*B. Fink*  
 Approved By



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

TEST DATE: 02/13/2019  
TEST #: D190596





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

ATD Serial No: 351

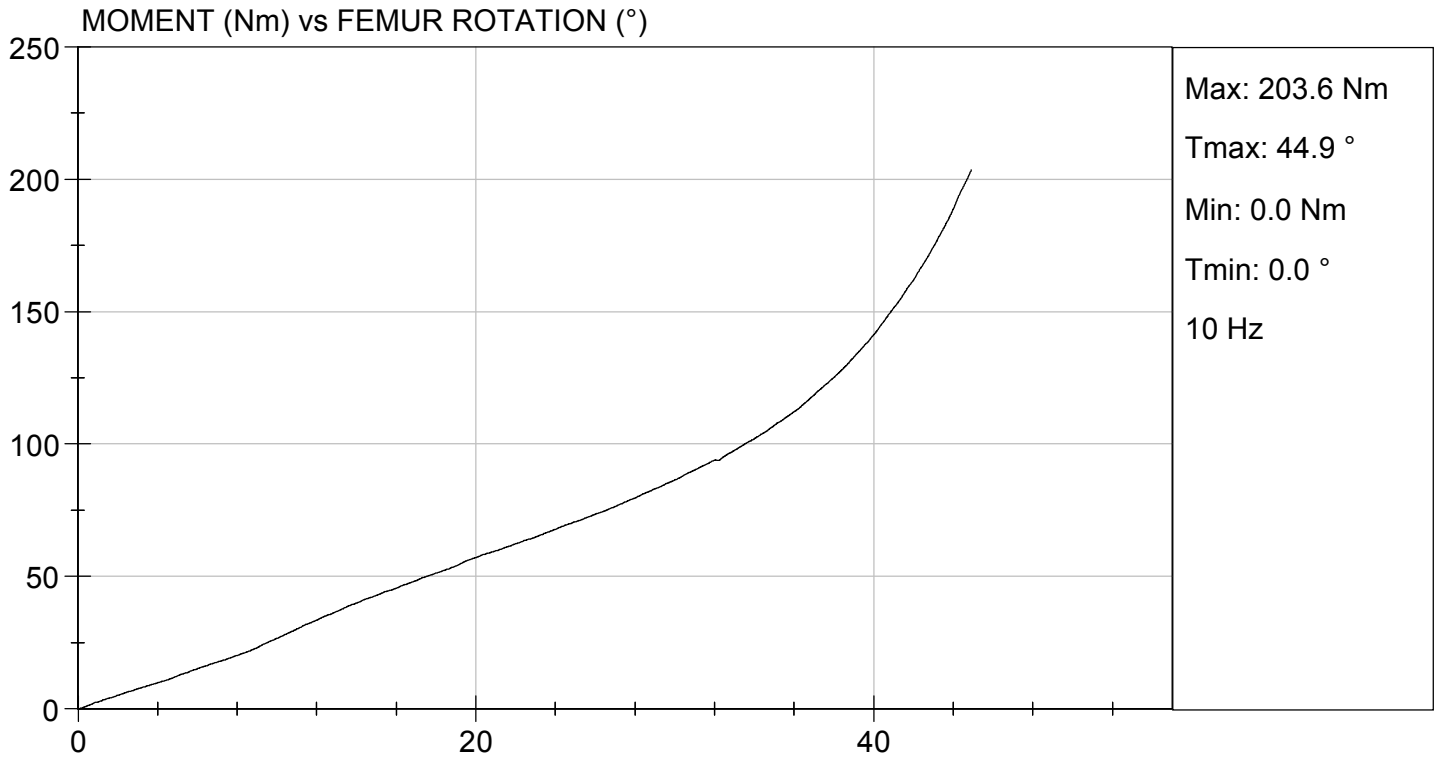
Test I.D: D190590

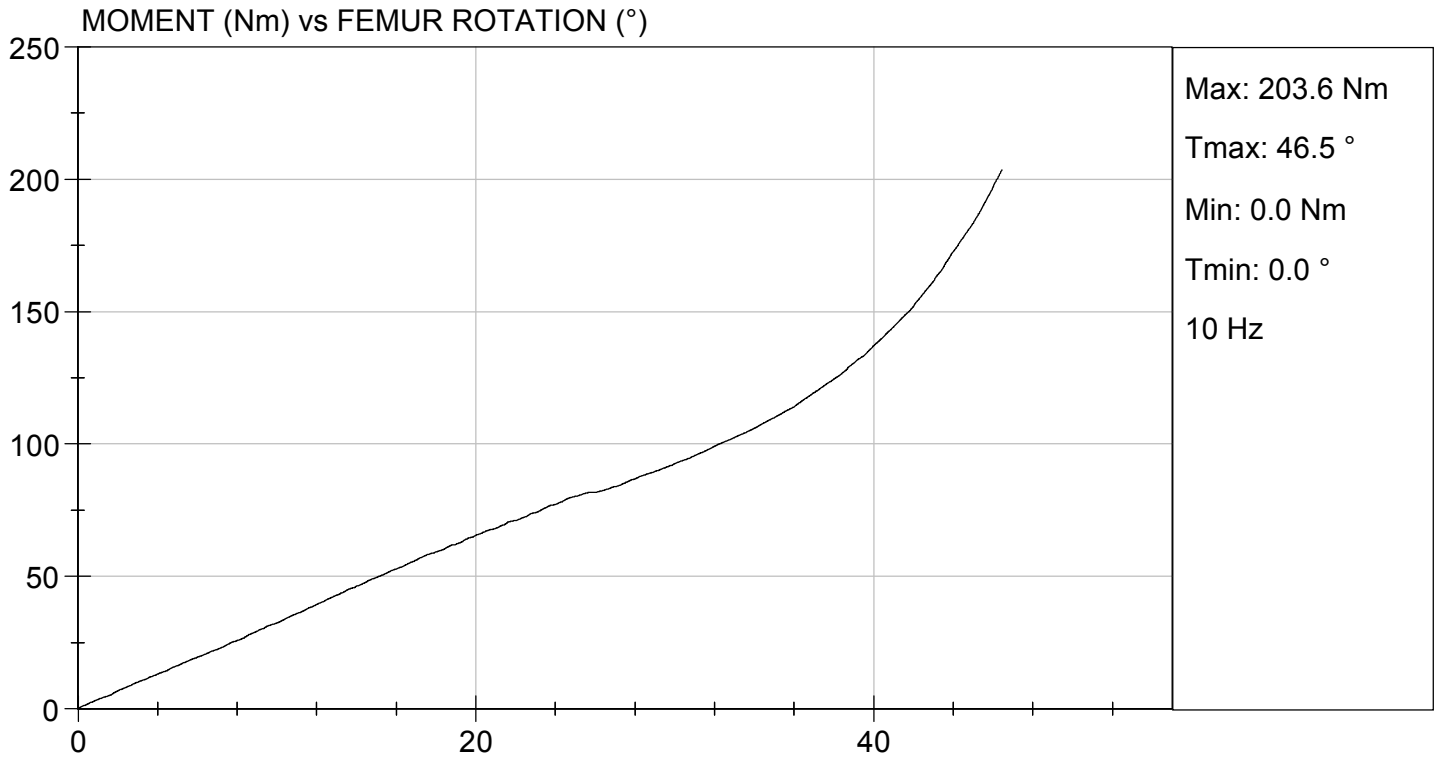
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.4	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	18	18	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.5	Pass
30 Degrees	Nm	94.9 Nm Max	92.6	86.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	46.5	44.9	Pass
Overall Test Results					Pass

*Danielle Redinlaugh*  
 Laboratory Technician

02/13/2019  
 Test Date

*B. F. K.*  
 Approved By





**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE FEMALE - PASSENGER ATD**

**Hybrid III, 5th External Measurements  
SN: 634**

HYBRID III, 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	784.6
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	79.2
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	253.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	277.8
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	541.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.4
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	428.6



HYBRID III, 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	181.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	224.7
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	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	139.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	355.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	90.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	540.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	868.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.8
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

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**HYBRID III 5TH PERCENTILE**

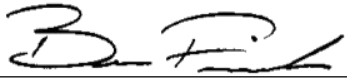
ATD Serial No: 634

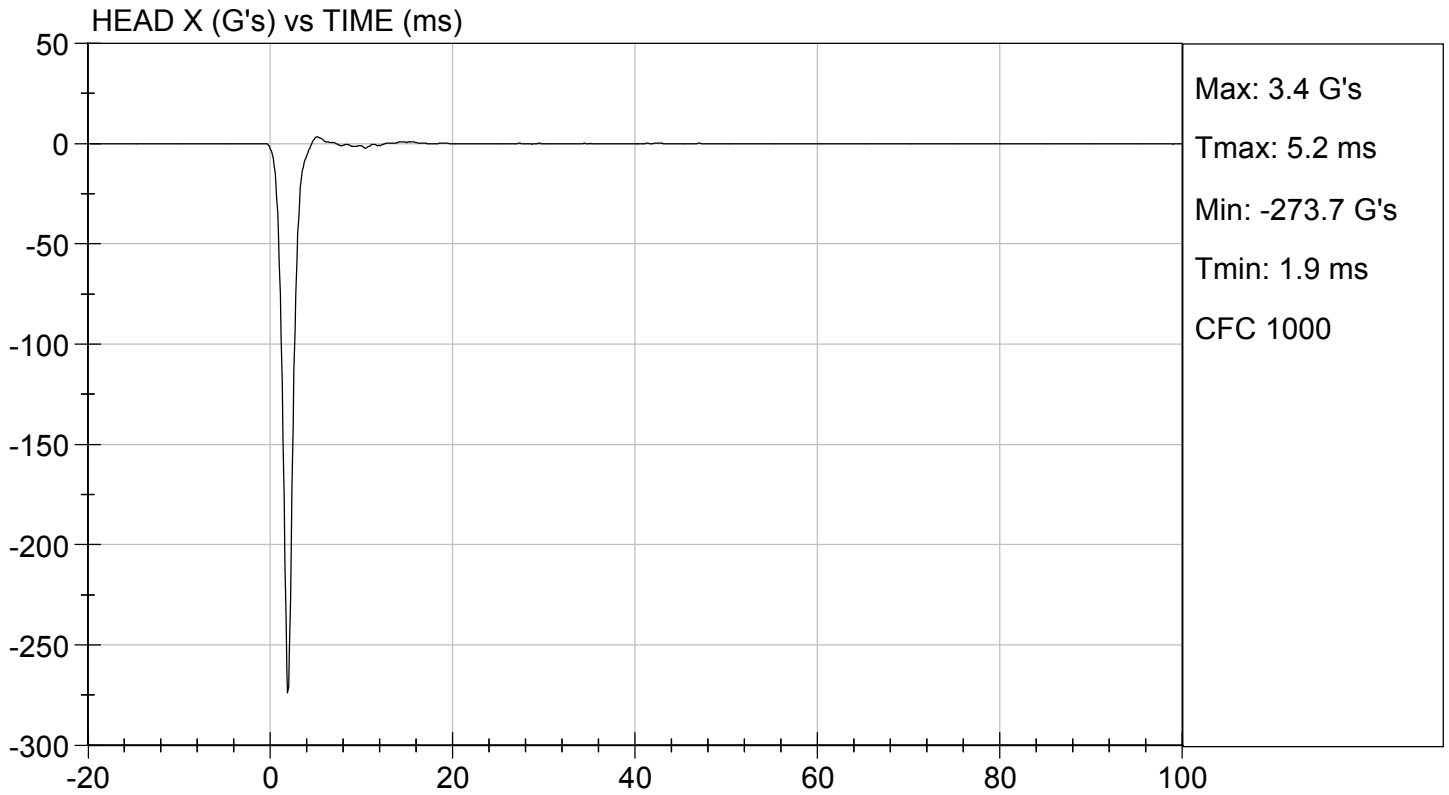
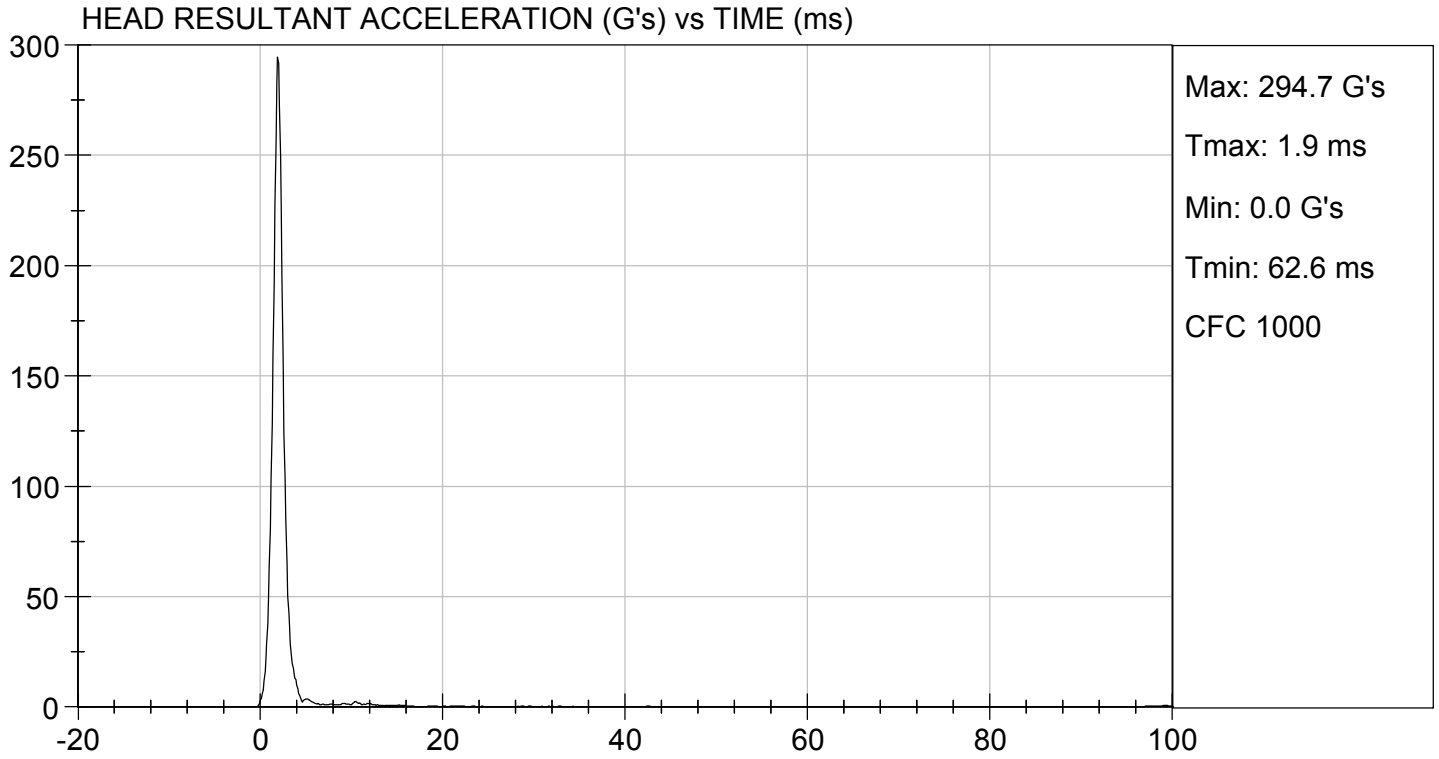
Test ID: D183681

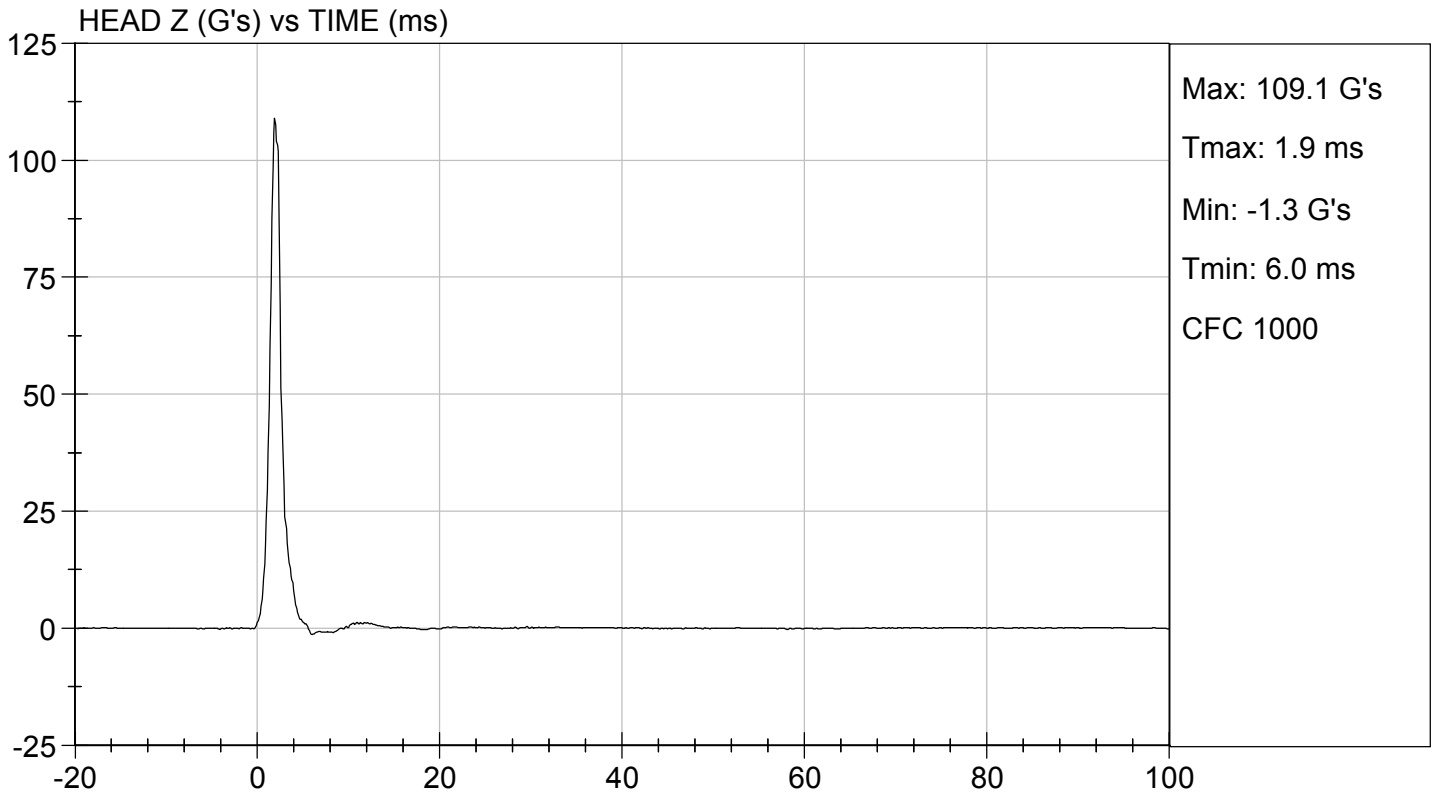
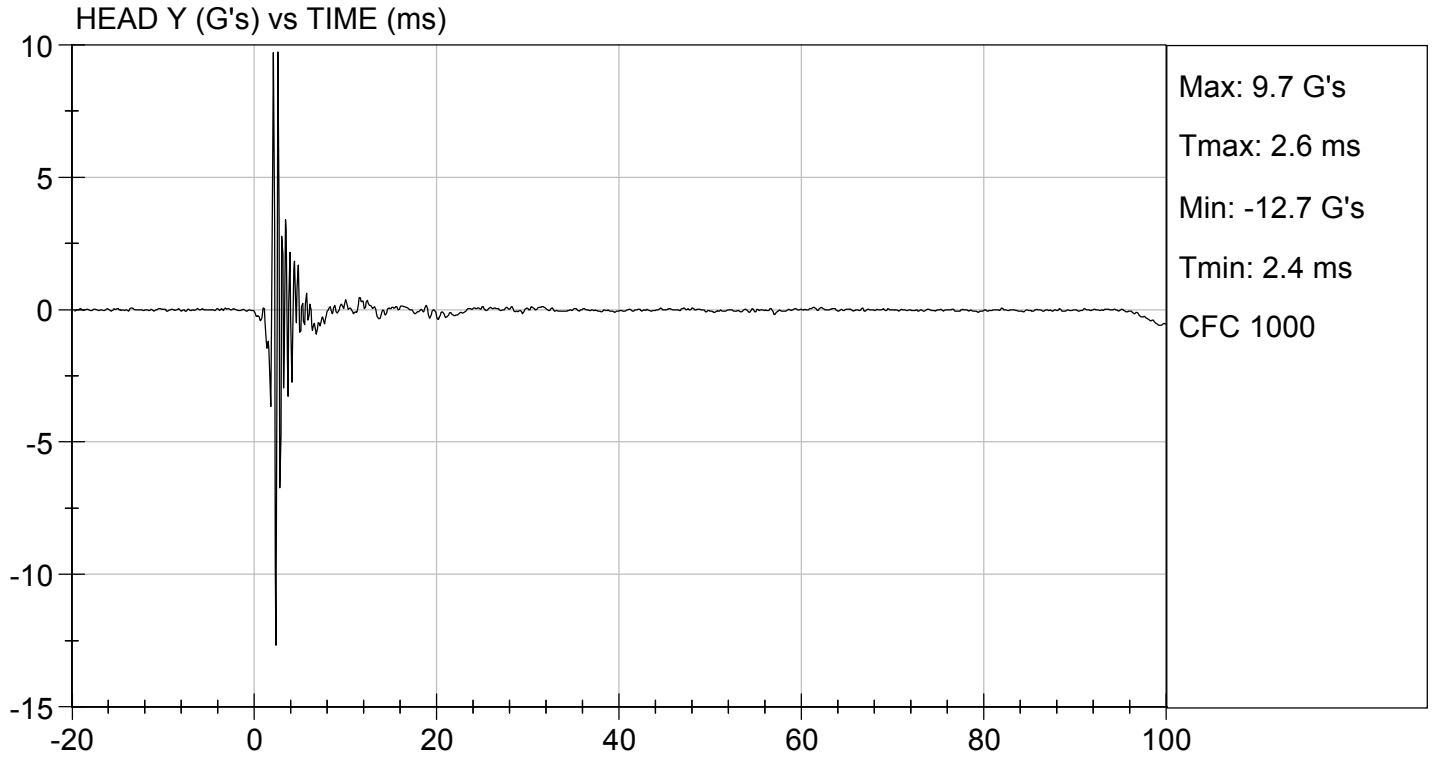
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	250 to 300	295	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-12.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

  
 Laboratory Technician

12/18/2018  
 Test Date

  
 Approved By





**MGA RESEARCH CORPORATION**

**NECK FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

Test I.D.: D183682

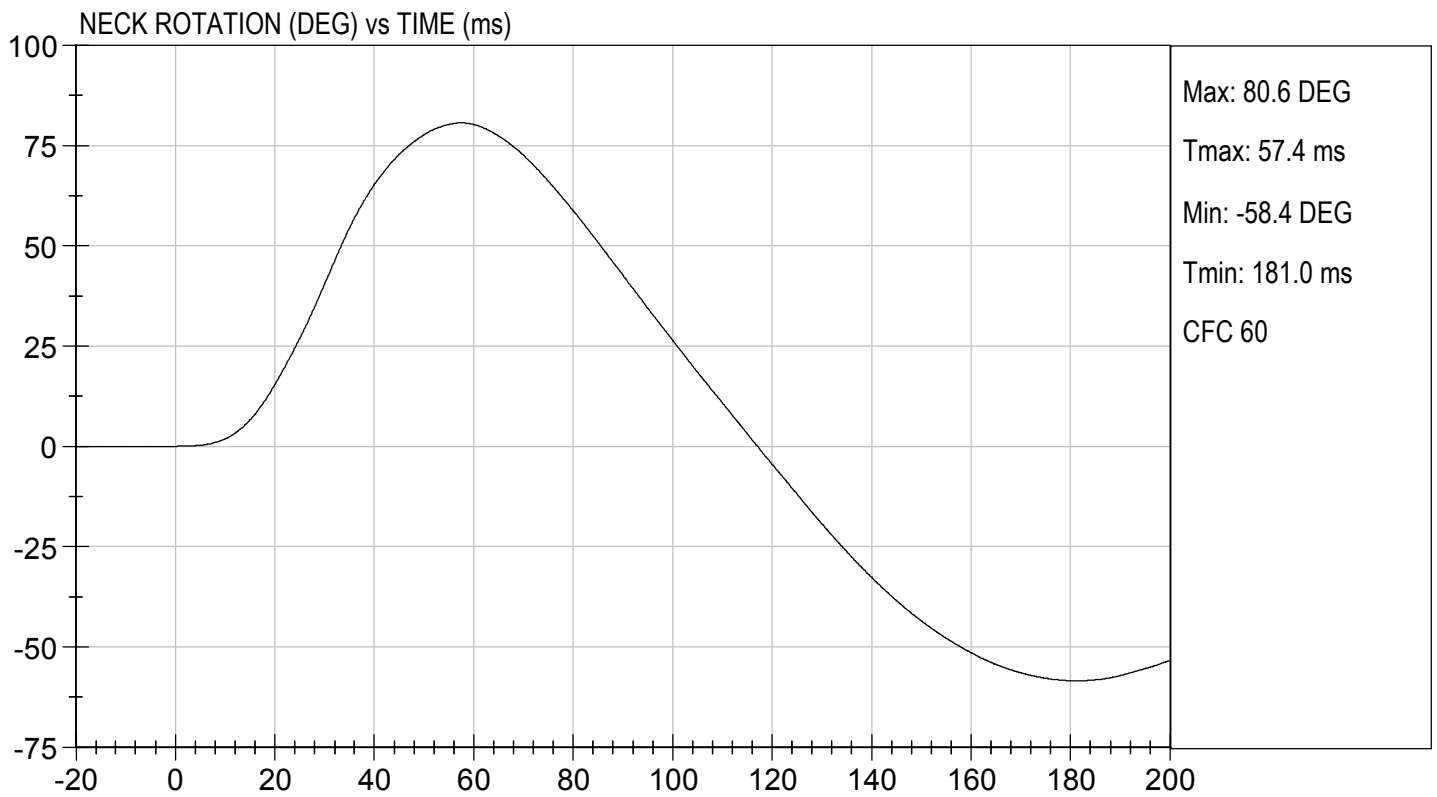
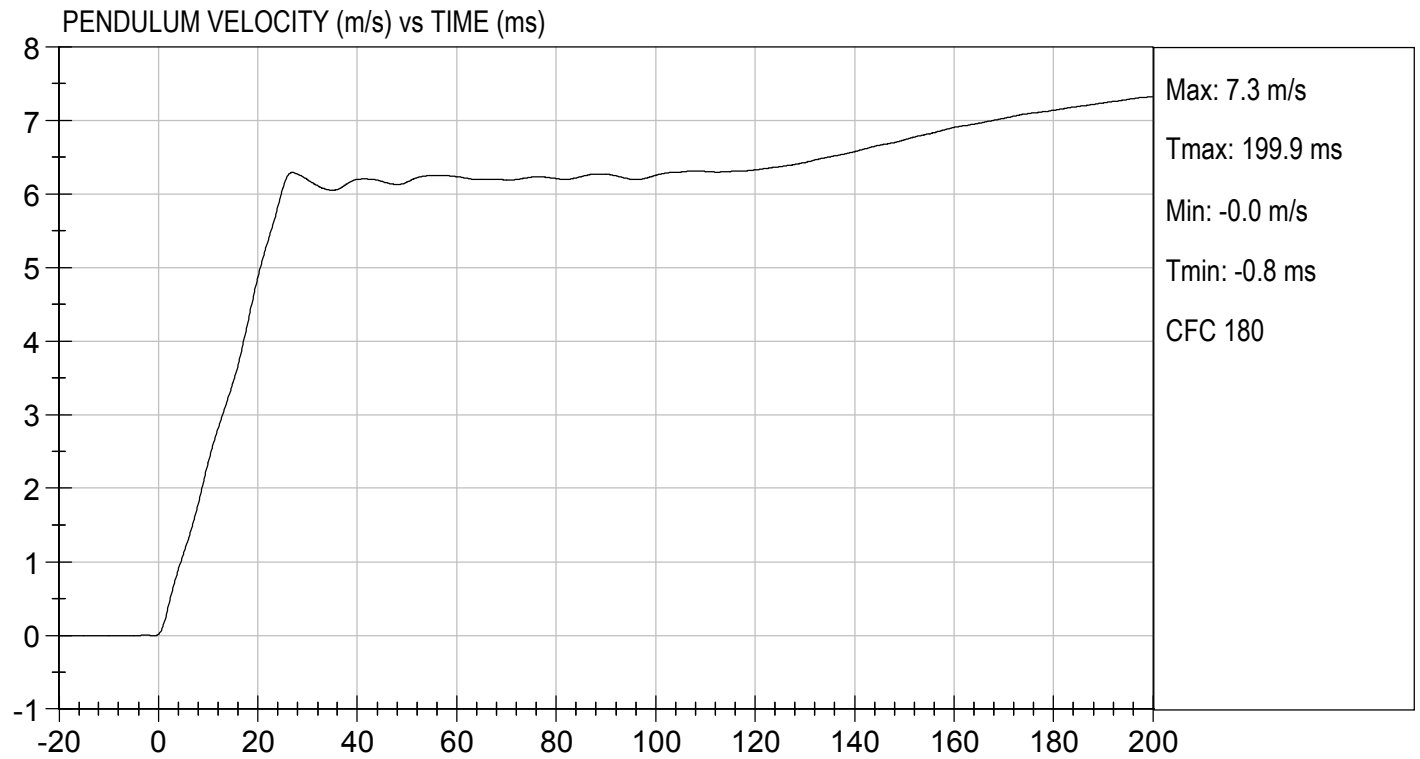
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	80	Pass
Overall Results					Pass

*Danielle Redinlaugh*  
Laboratory Technician

12/19/2018  
Test Date

*B. F. H.*  
Approved By

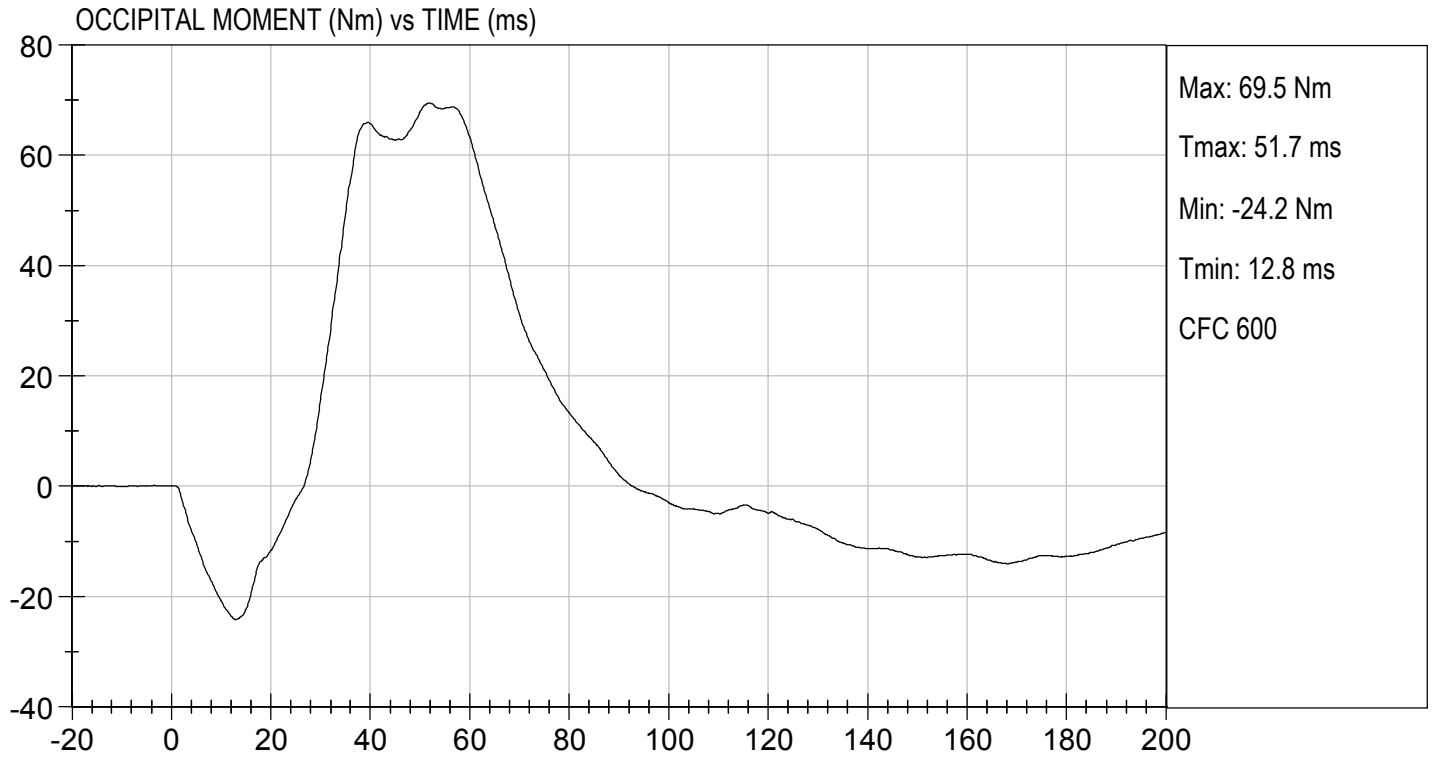






TEST DESC: NECK FLEXION  
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 12/19/2018  
TEST #: D183682




**MGA RESEARCH CORPORATION**  
**NECK EXTENSION TEST**  
**HYBRID III 5TH PERCENTILE**

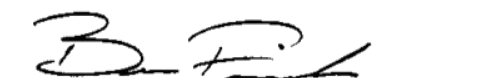
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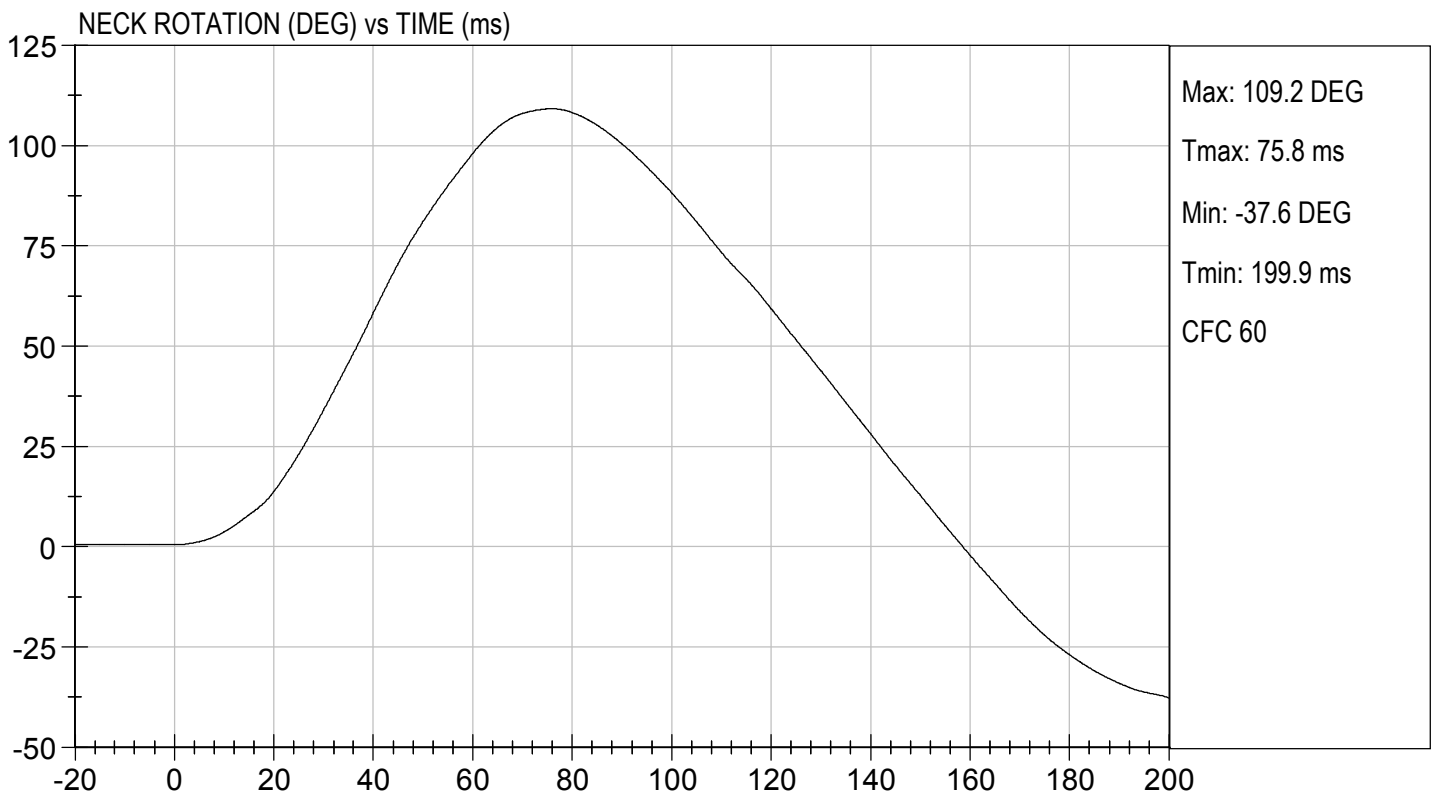
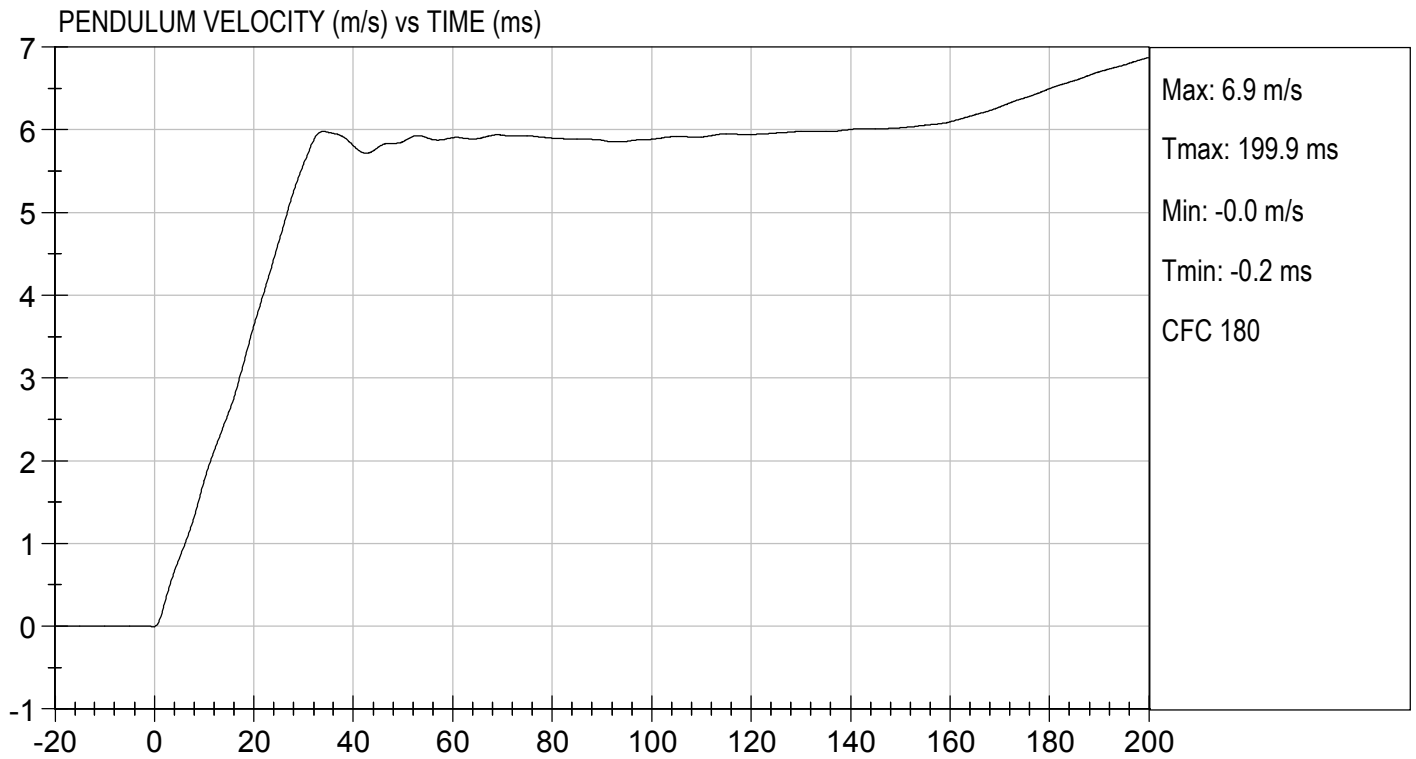
Test I.D: D183683

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.16	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.6	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-61	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
Overall Results					Pass

  
 Laboratory Technician

12/19/2018  
 Test Date

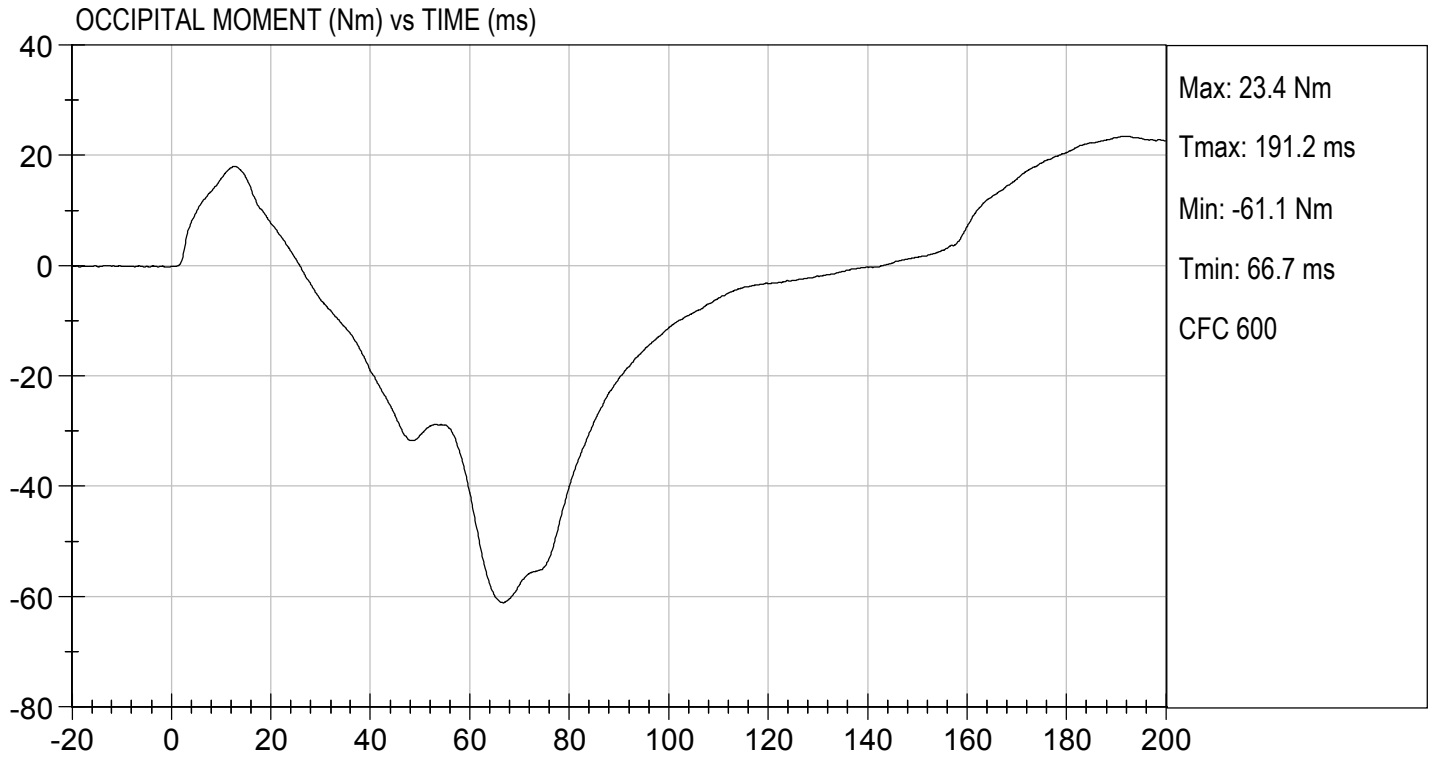
  
 Approved By





TEST DESC: NECK EXTENSION  
VELOCITY: 20.20 ft/s, 6.16 m/s

TEST DATE: 12/19/2018  
TEST #: D183683





**MGA RESEARCH CORPORATION**  
**THORAX IMPACT**  
**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

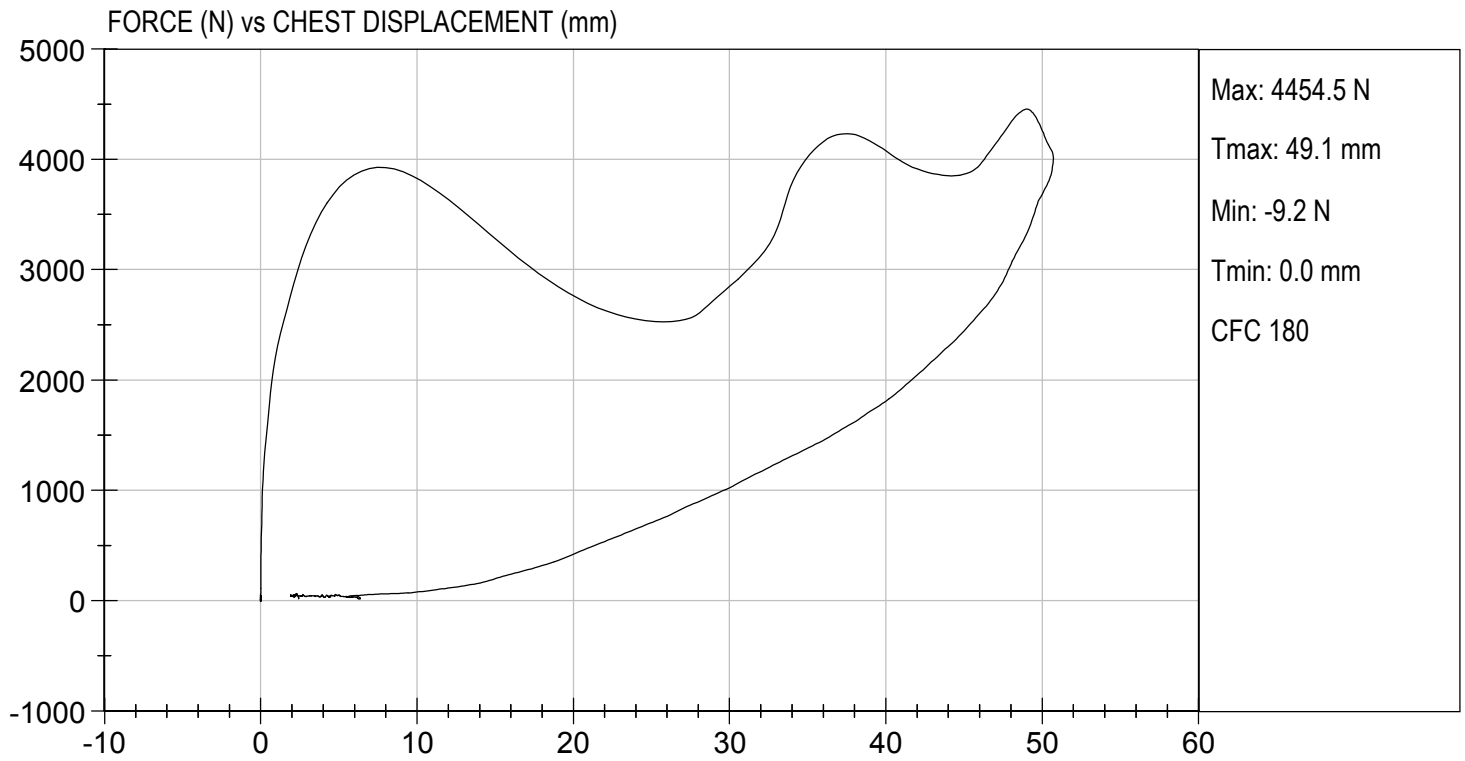
Test I.D: D183684

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	6.59 to 6.83	6.60	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4259	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4454	Pass
Overall Test Results				Pass

  
 Laboratory Technician

12/19/2018  
 Test Date

  
 Approved By



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

ATD Serial No: 634

Test I.D: D183685

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	25	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	3756	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
 Laboratory Technician

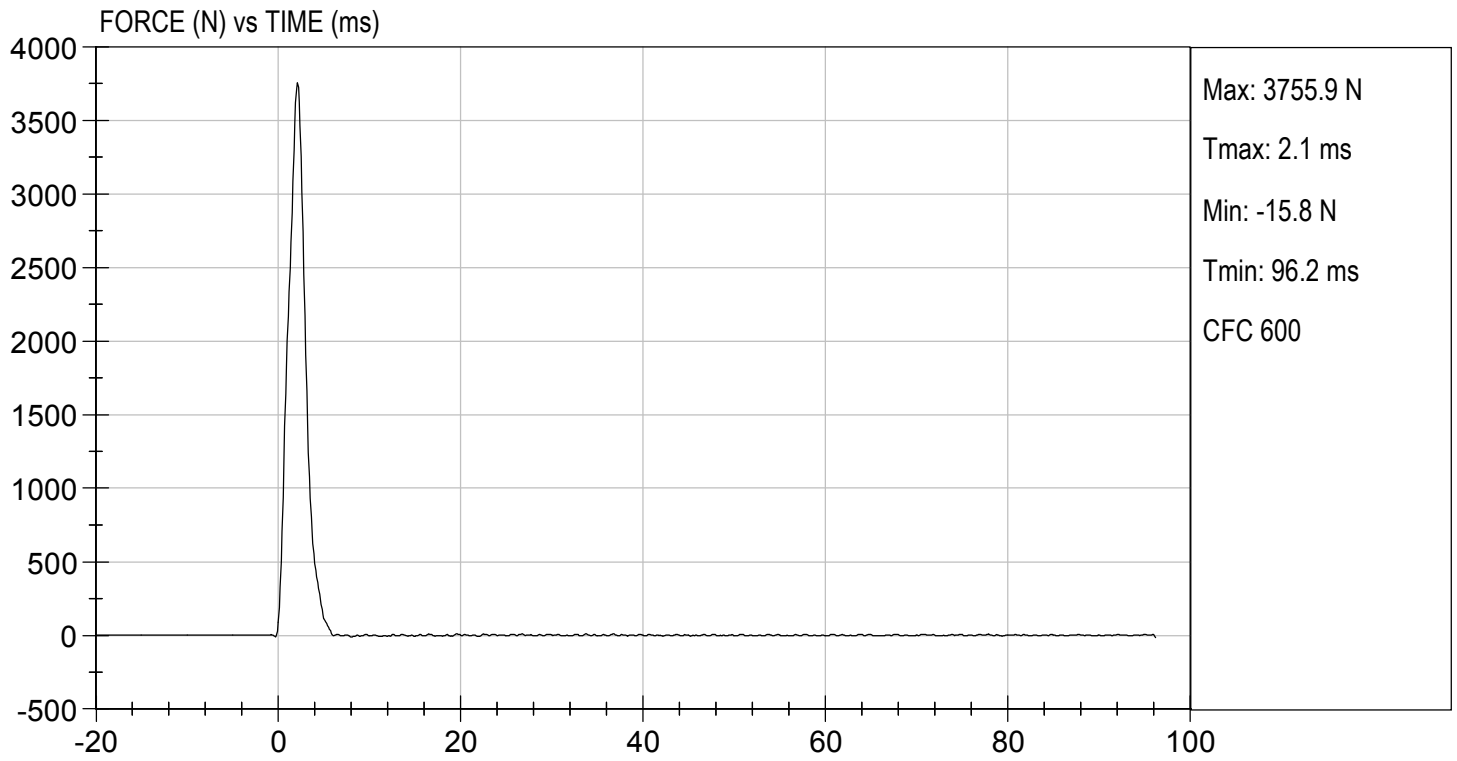
12/18/2018  
 Test Date

*B. F.*  
 Approved By



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

TEST DATE: 12/18/2018  
TEST #: D183685



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST  
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D183686

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	25	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	4058	Pass
Overall Test Results				Pass

Danielle Redinlaugh  
Laboratory Technician

12/18/2018  
Test Date

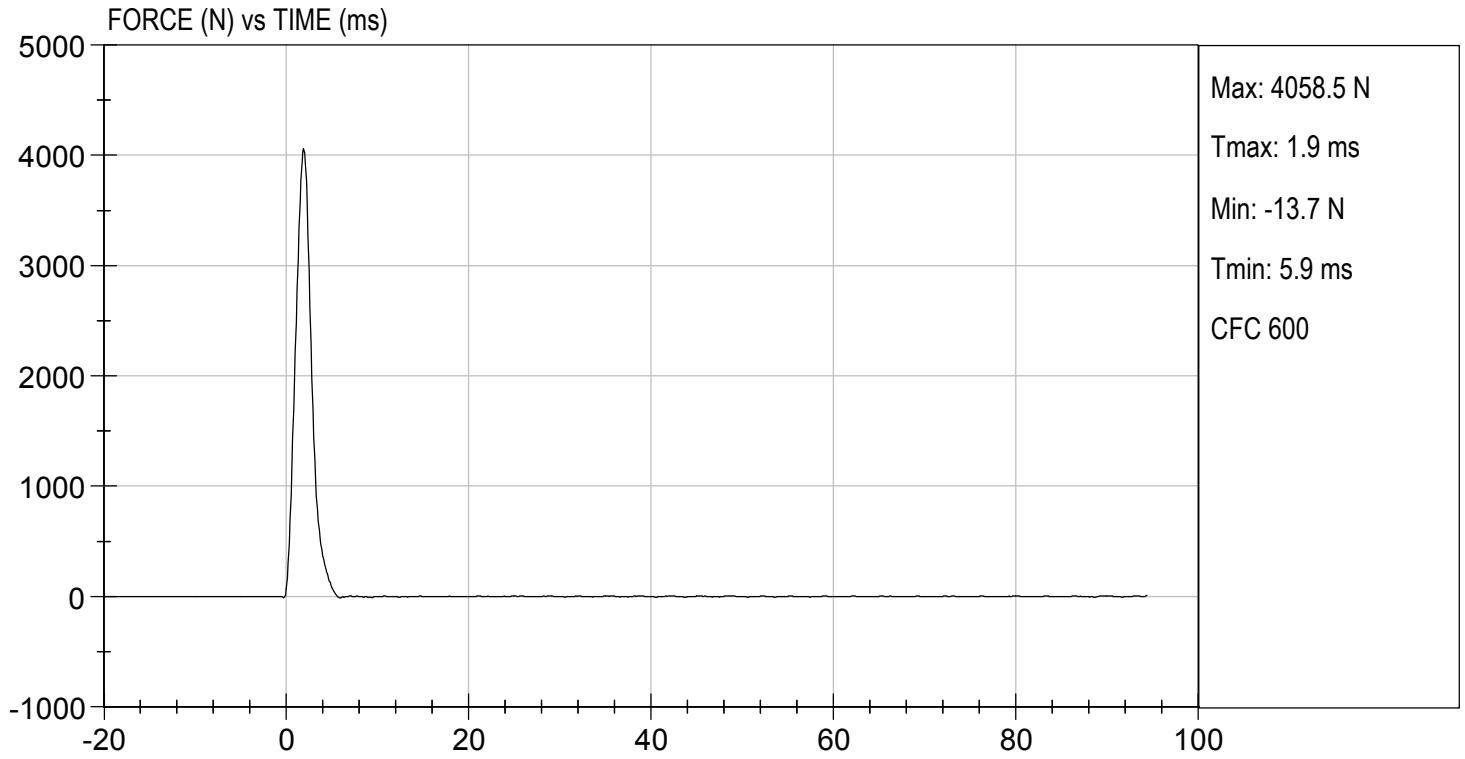
B. F. K.  
Approved By





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

TEST DATE: 12/18/2018  
TEST #: D183686



**MGA RESEARCH CORPORATION**  
**TORSO FLEXION TEST**  
**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

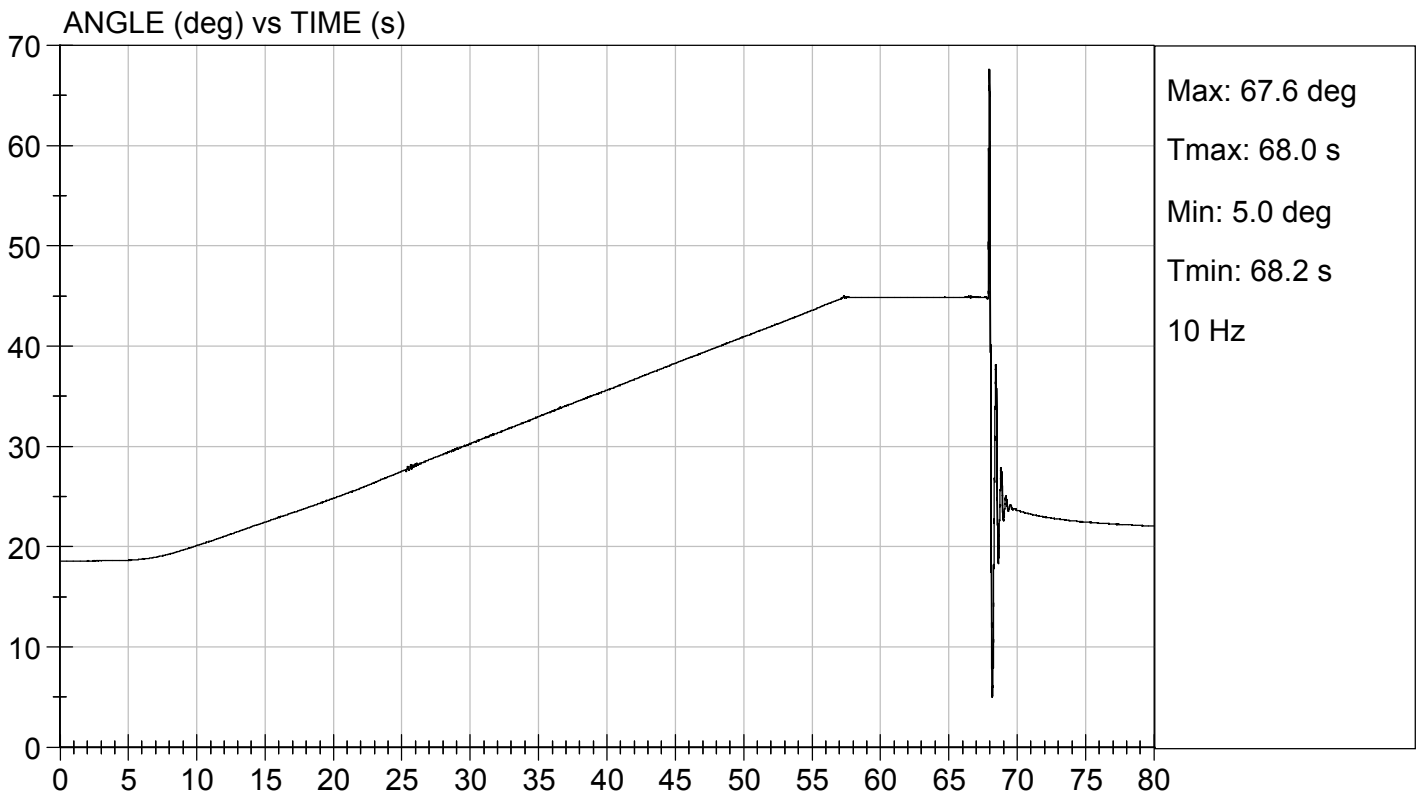
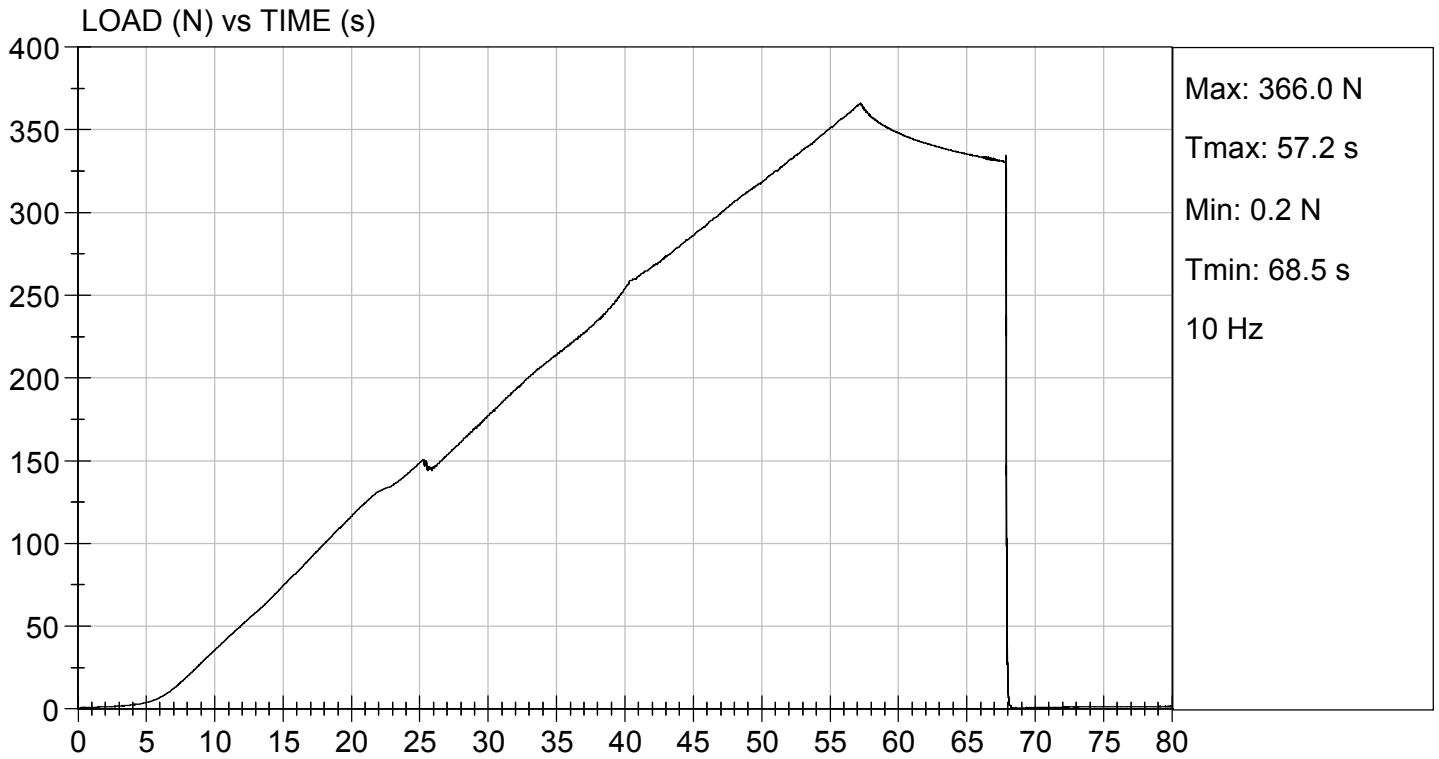
Test I.D: D183687

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	24	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	366	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.5	Pass
Overall Result				Pass

*Danielle Redinlaugh*  
 Laboratory Technician

12/19/2018  
 Test Date

*B. F. K.*  
 Approved By



**CALIBRATION TEST RESULTS**

**POST-TEST**

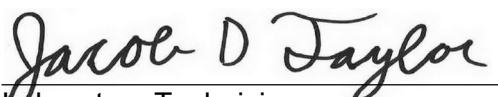
**HYBRID III 5<sup>TH</sup> PERCENTILE FEMALE - PASSENGER ATD**

**MGA RESEARCH CORPORATION  
HEAD DROP TEST  
HYBRID III 5TH PERCENTILE**

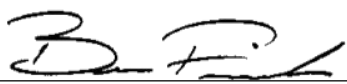
**ATD Serial No:** 634

**Test ID:** D190601

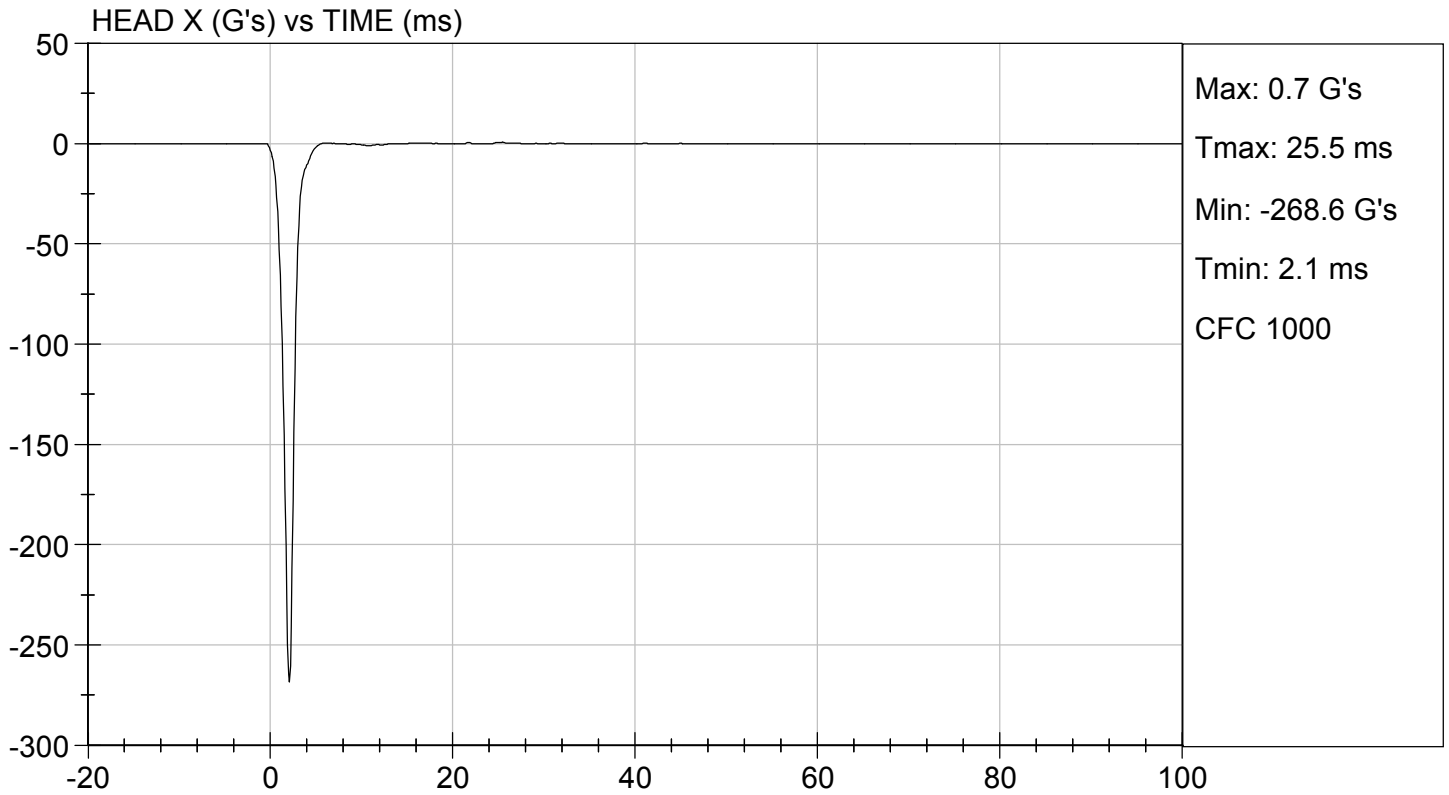
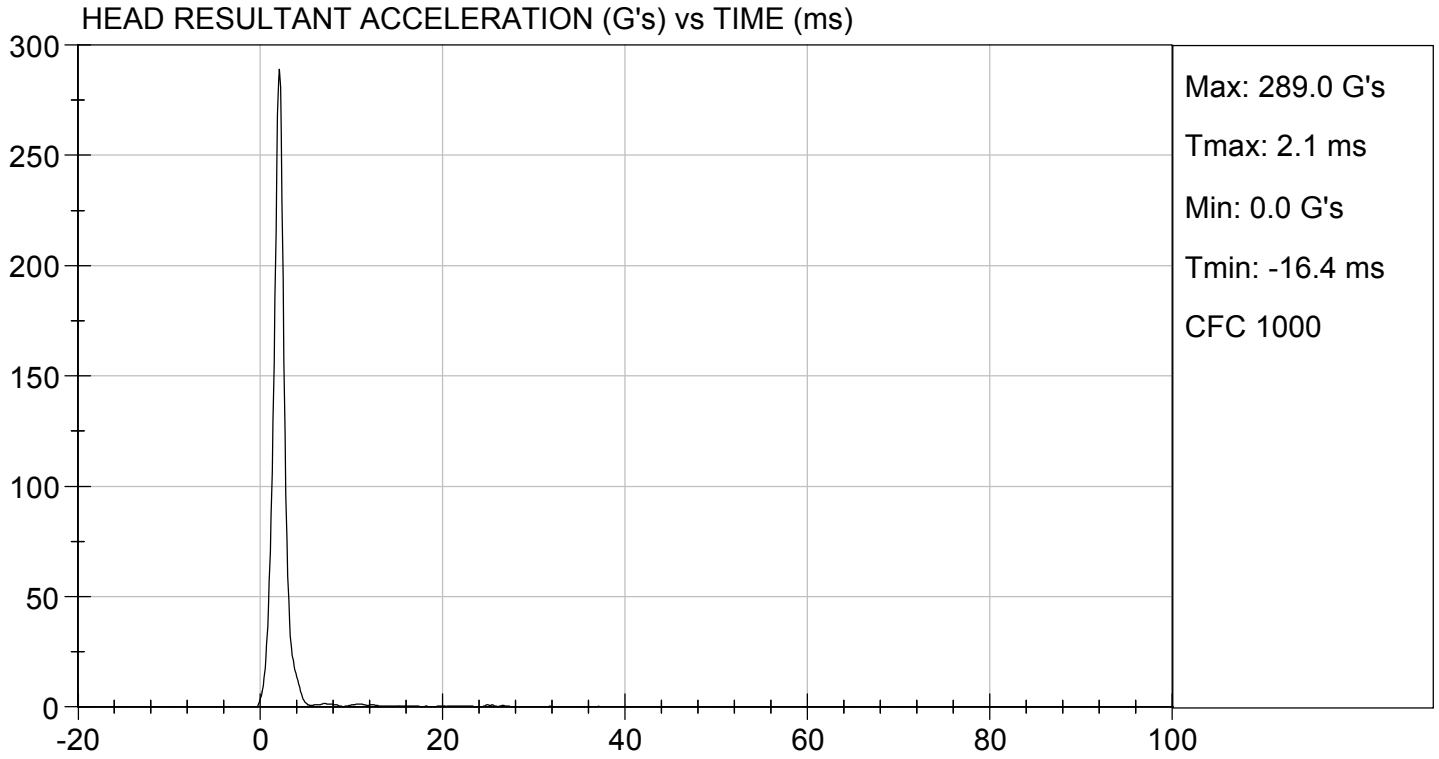
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	250 to 300	289	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
<b>Overall Test Results</b>				<b>Pass</b>

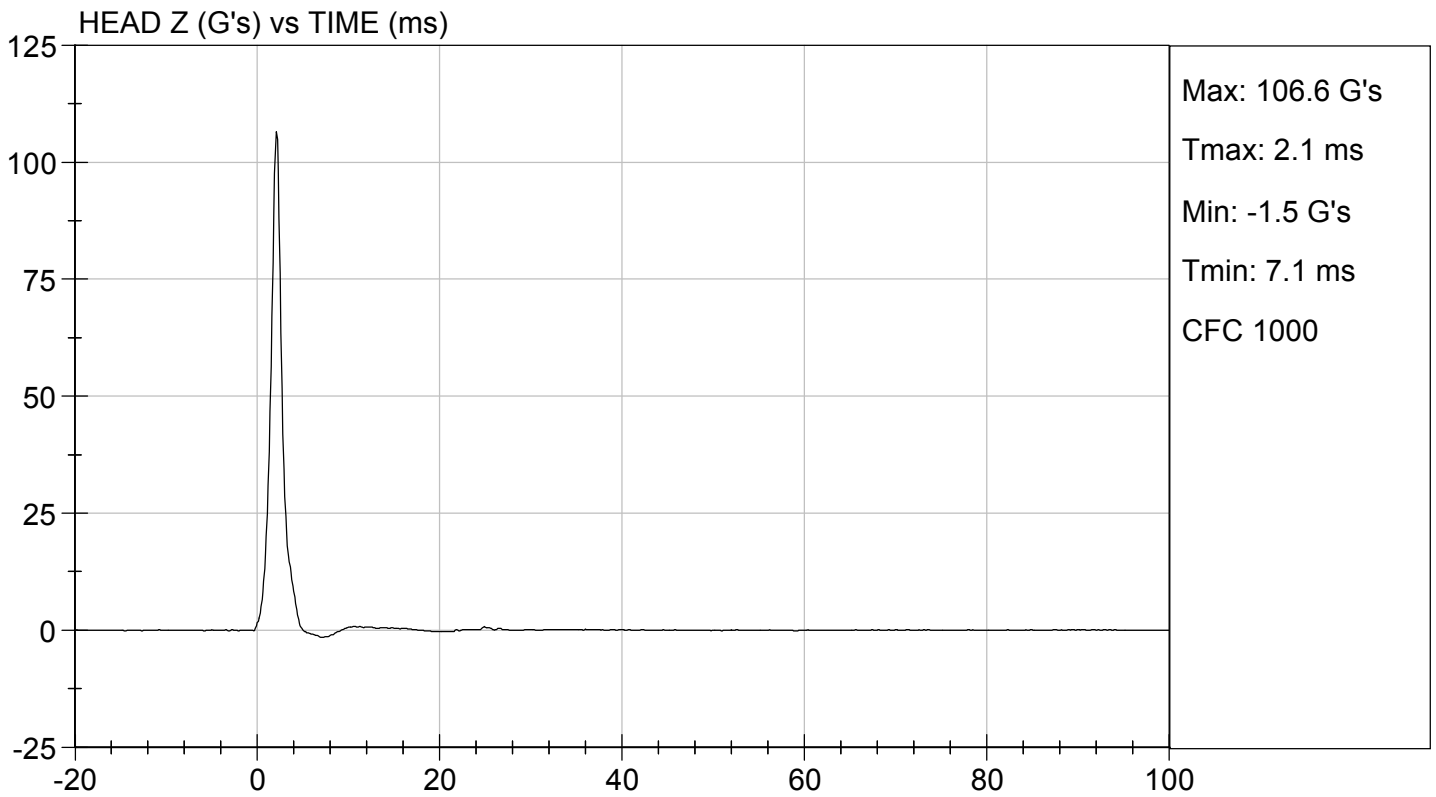
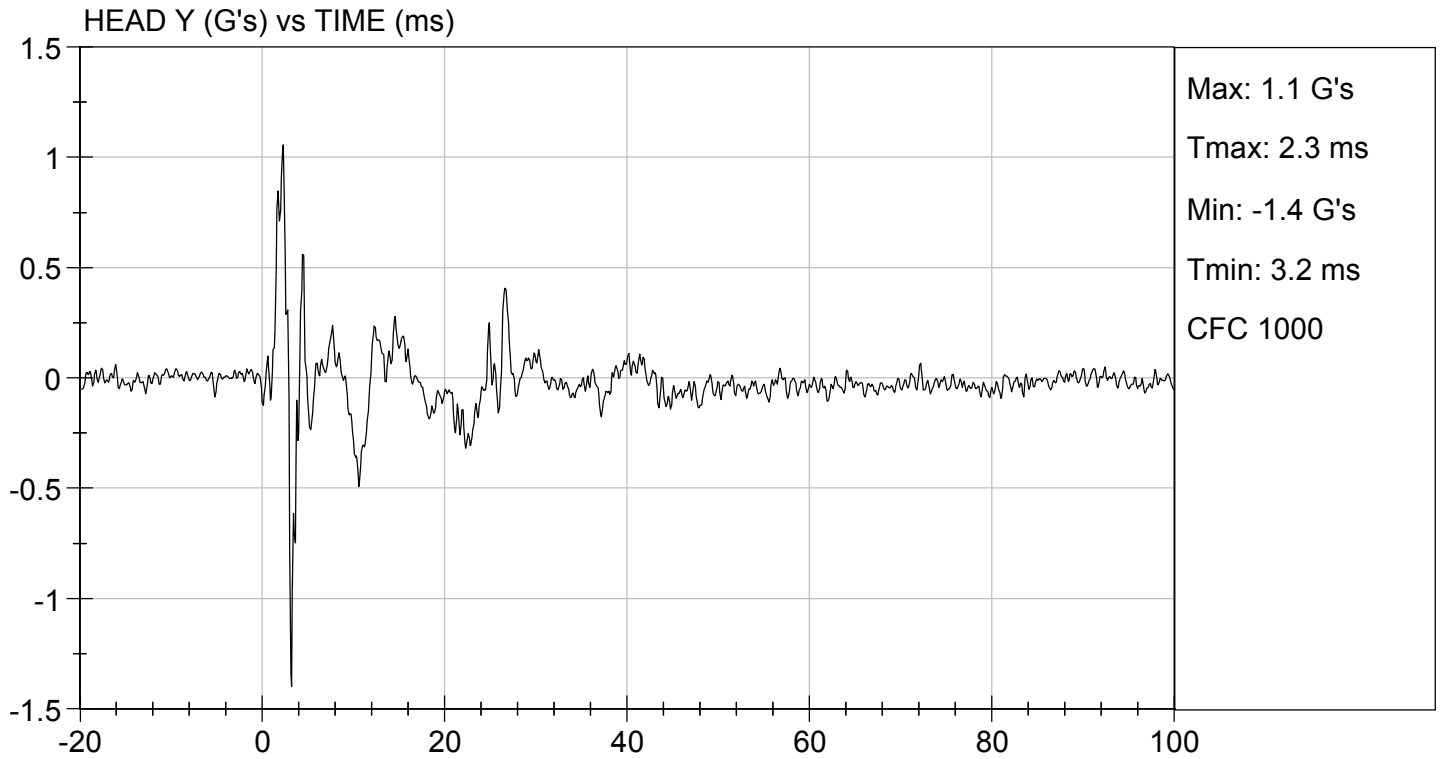
  
 Laboratory Technician

02/14/2019  
 Test Date

  
 Approved By







**MGA RESEARCH CORPORATION**

**NECK FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

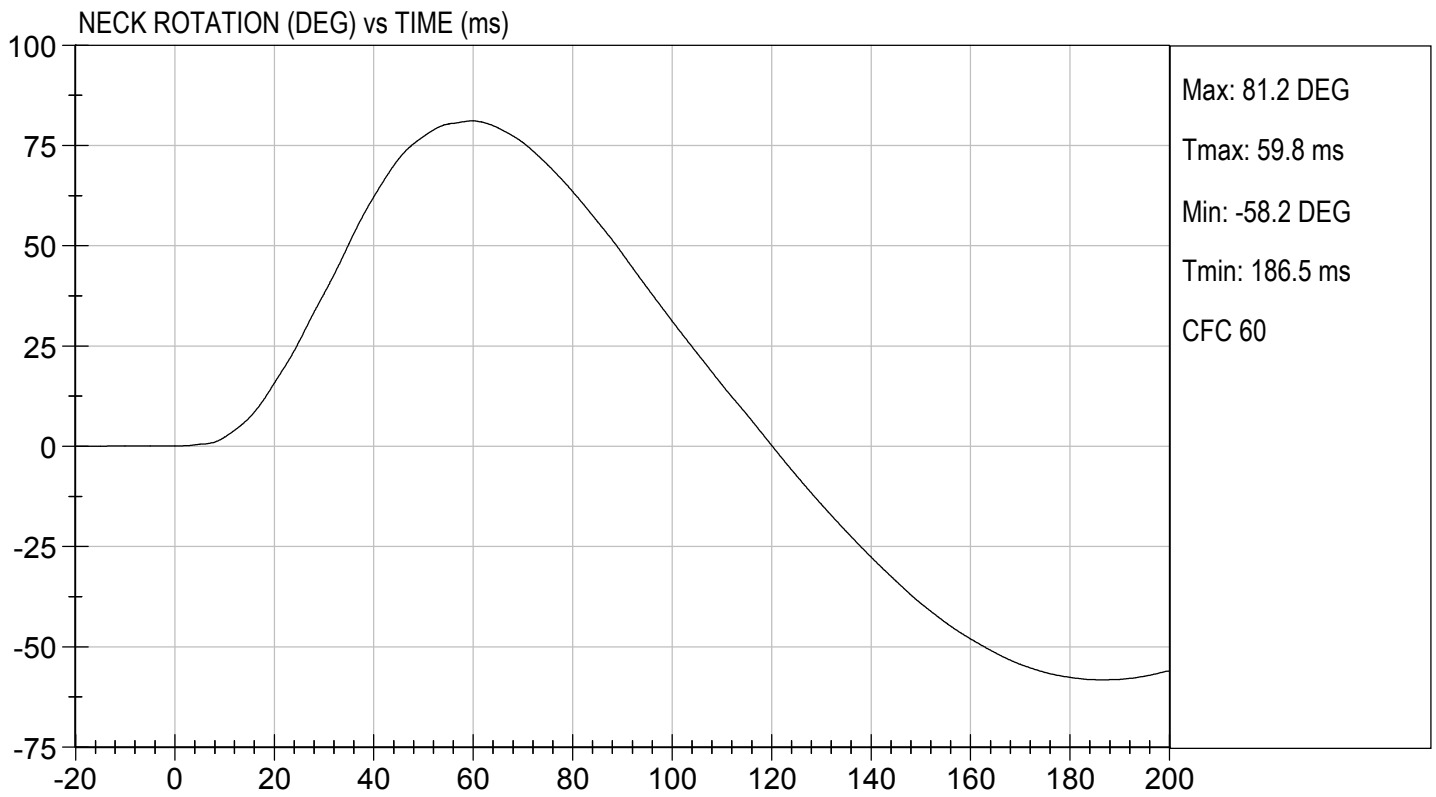
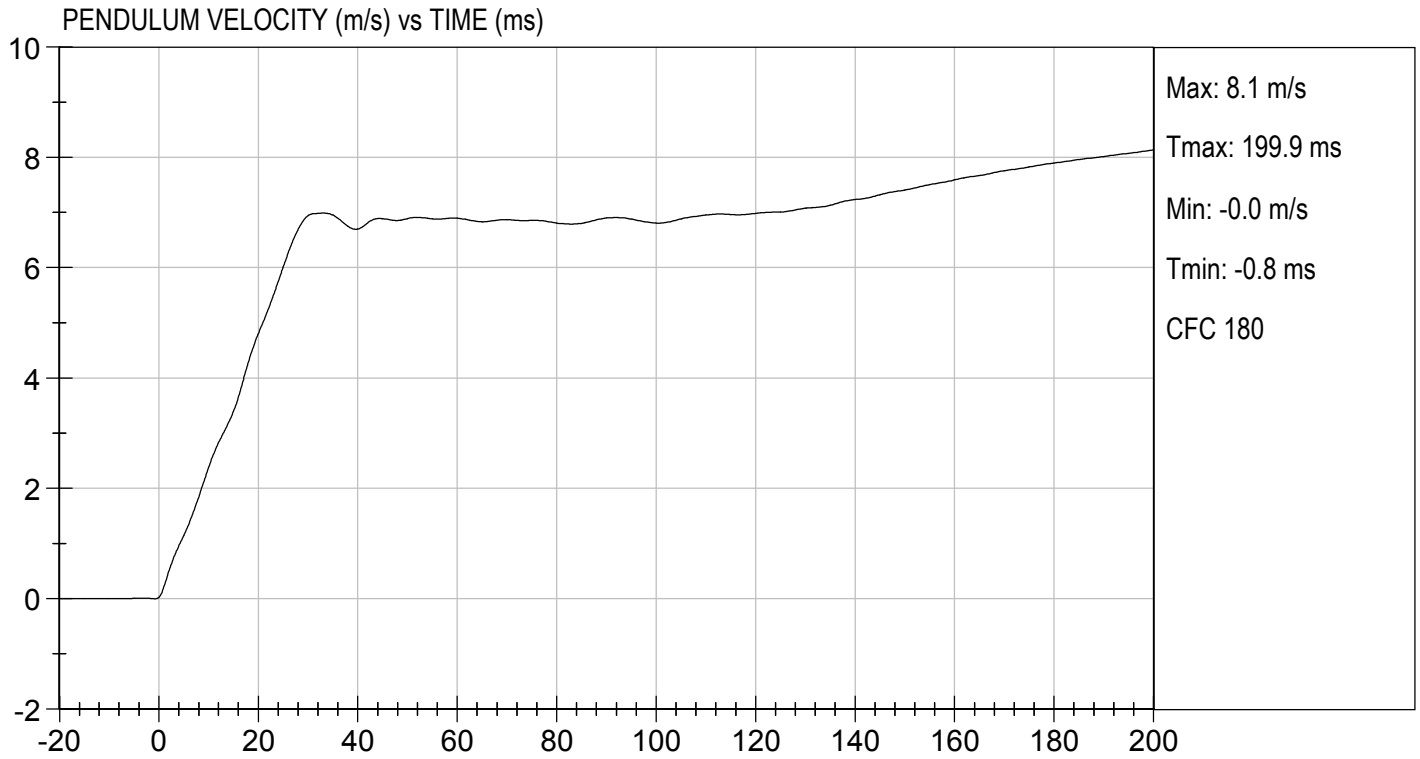
Test I.D.: D190602

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	19	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.8	Pass
	30 ms	m/s	5.8 to 7.0	6.9	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass

Jacob D Taylor  
Laboratory Technician

02/14/2019  
Test Date

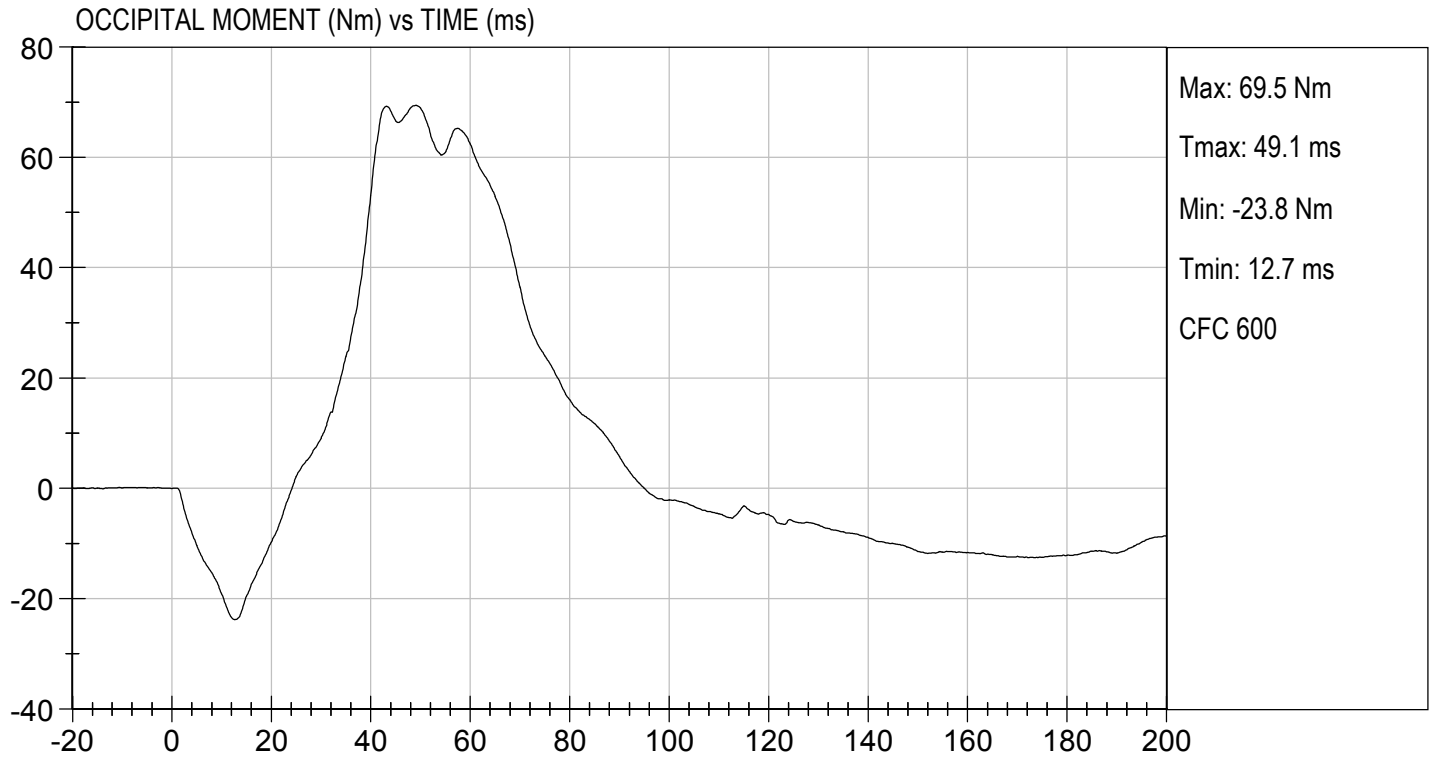
B. F. K.  
Approved By





TEST DESC: NECK FLEXION  
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 02/14/2019  
TEST #: D190602



**MGA RESEARCH CORPORATION**  
**NECK EXTENSION TEST**  
**HYBRID III 5TH PERCENTILE**

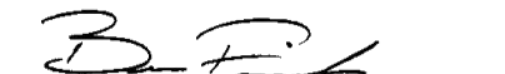
ATD Serial No: 634

Test I.D: D190603

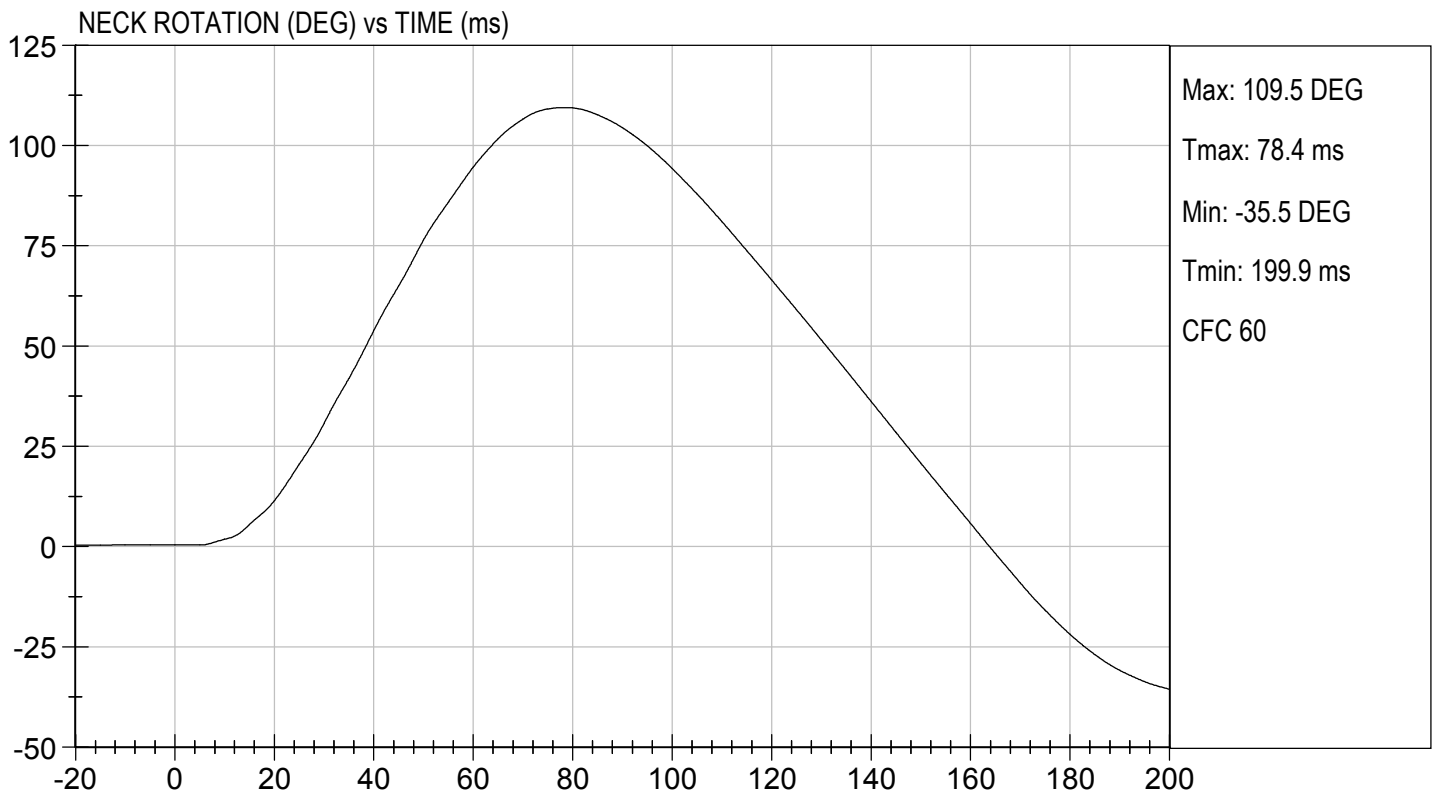
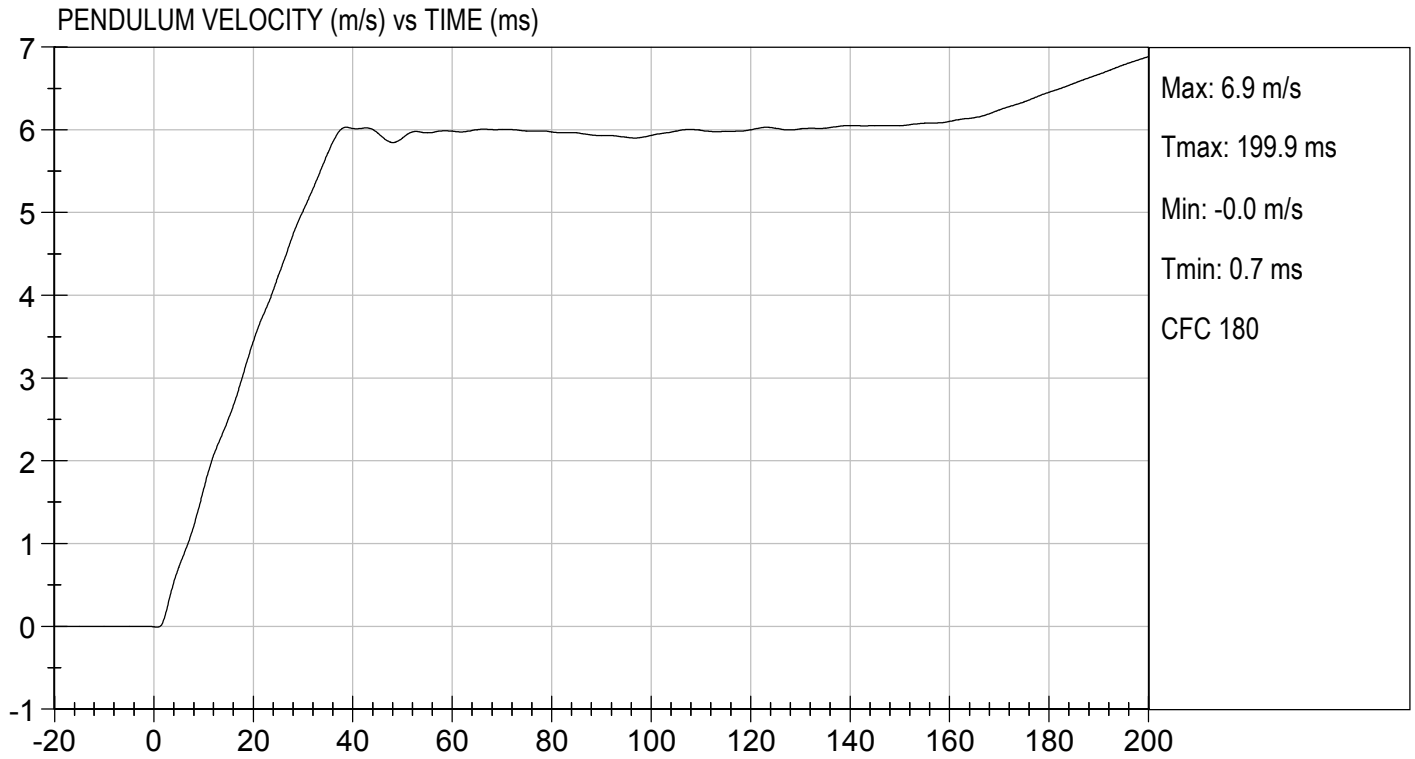
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	19	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.4	Pass
	30 ms	m/s	4.6 to 5.6	5	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	106	Pass
Overall Results					Pass

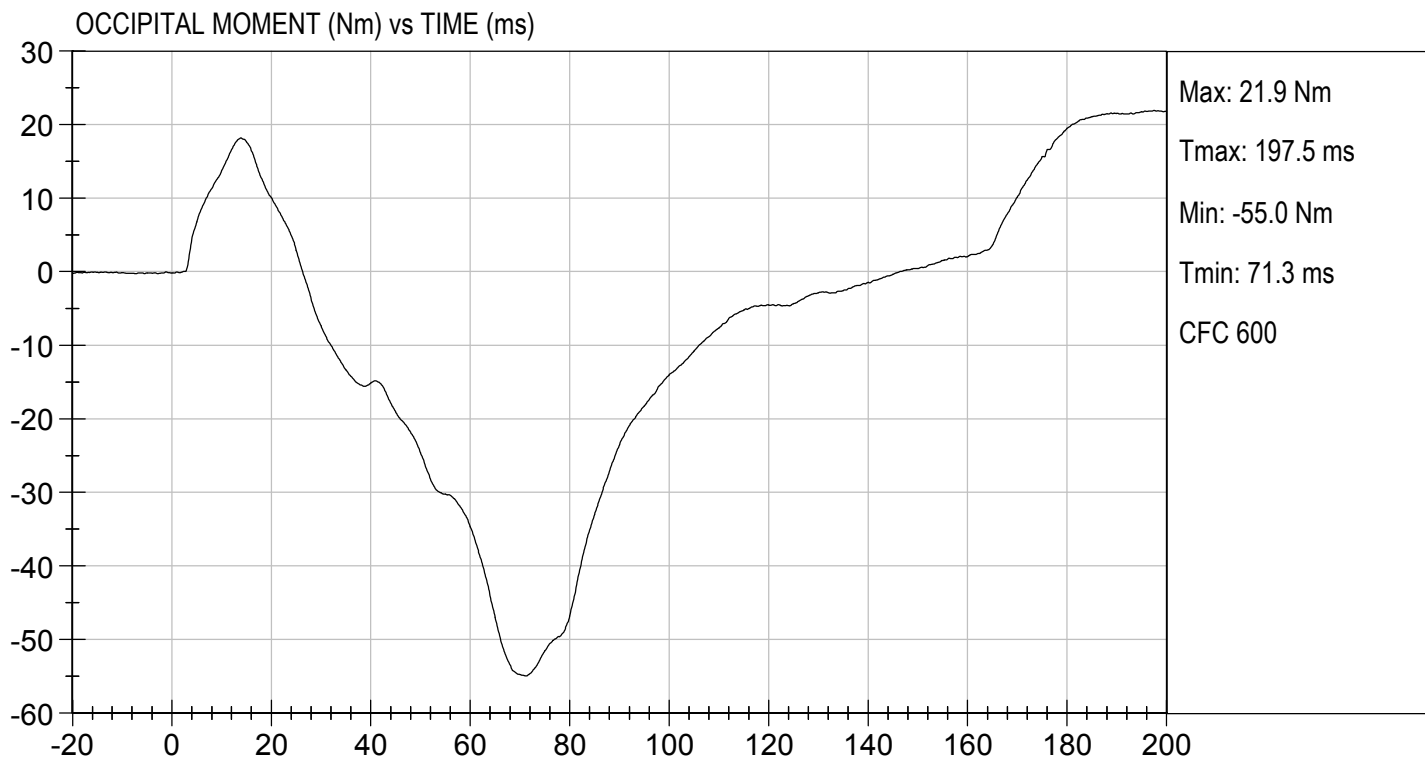
  
 Laboratory Technician

02/14/2019  
 Test Date

  
 Approved By







**MGA RESEARCH CORPORATION**  
**THORAX IMPACT**  
**HYBRID III 5TH PERCENTILE**

ATD Serial No: 634

Test I.D: D190604

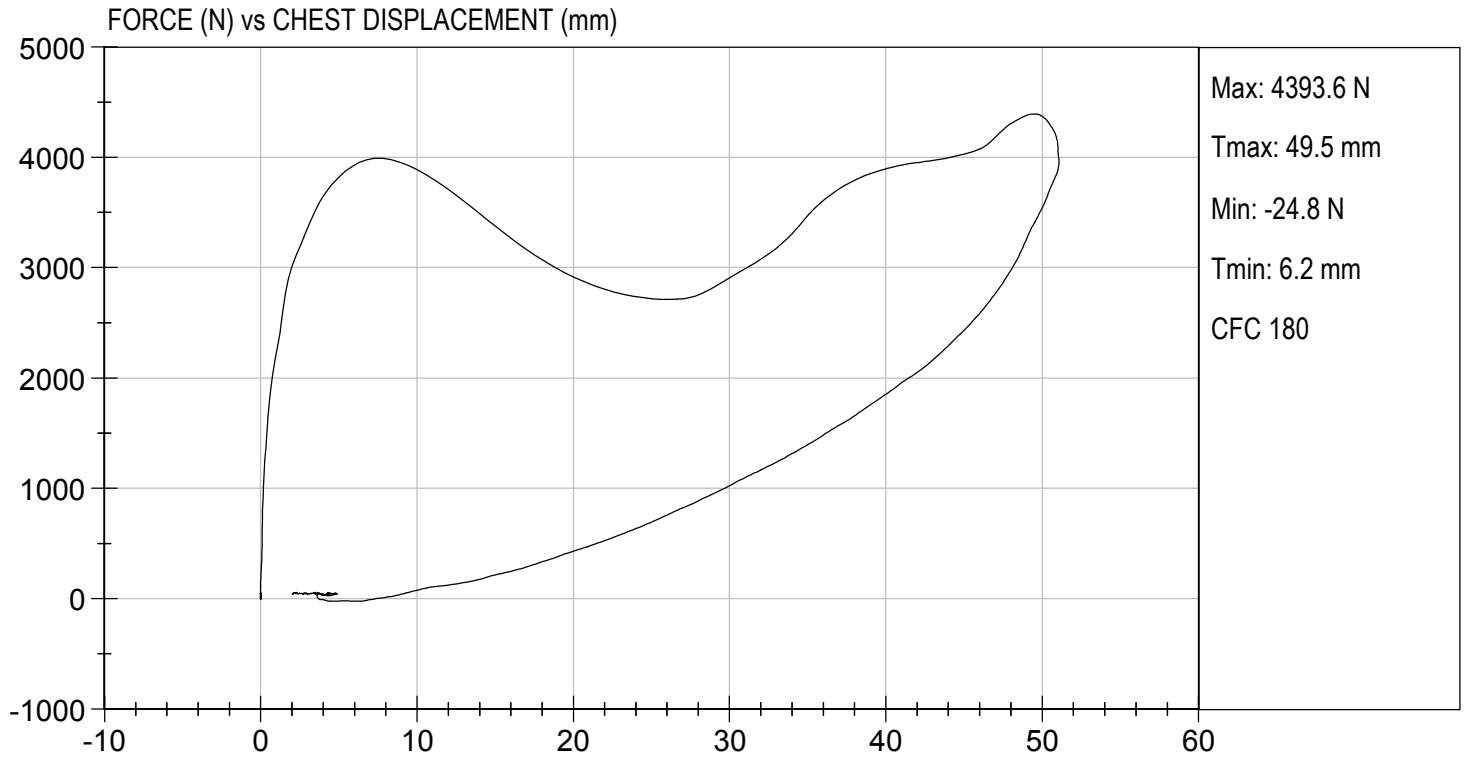
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	19	Pass
Probe Speed	m/s	6.59 to 6.83	6.60	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4366	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4394	Pass
Overall Test Results				Pass

*Jacob D Taylor*  
 Laboratory Technician

02/14/2019

Test Date

*B. F. H.*  
 Approved By

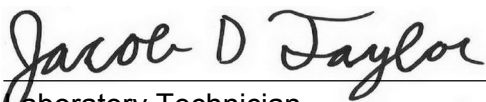


**MGA RESEARCH CORPORATION**  
**RIGHT KNEE IMPACT TEST**  
**HYBRID III 5TH PERCENTILE**

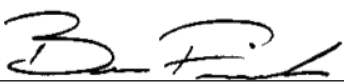
**ATD Serial No:** 634

**Test I.D:** D190605

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	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3788	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

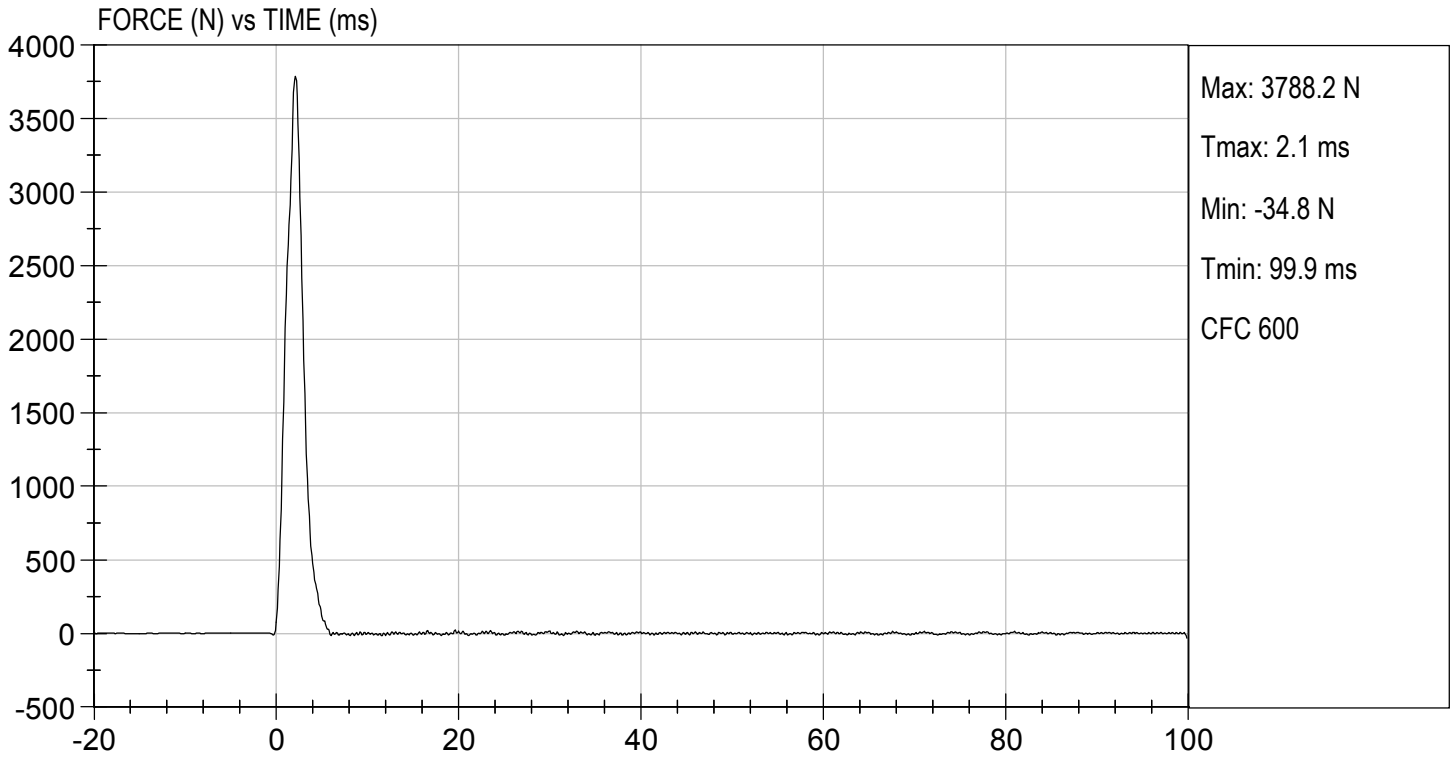
02/14/2019  
 Test Date

  
 Approved By



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

TEST DATE: 02/14/2019  
TEST #: D190605





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

**ATD Serial No:** 634

**Test I.D:** D190606

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	19	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3623	Pass
<b>Overall Test Results</b>				<b>Pass</b>

Jacob D Taylor  
 Laboratory Technician

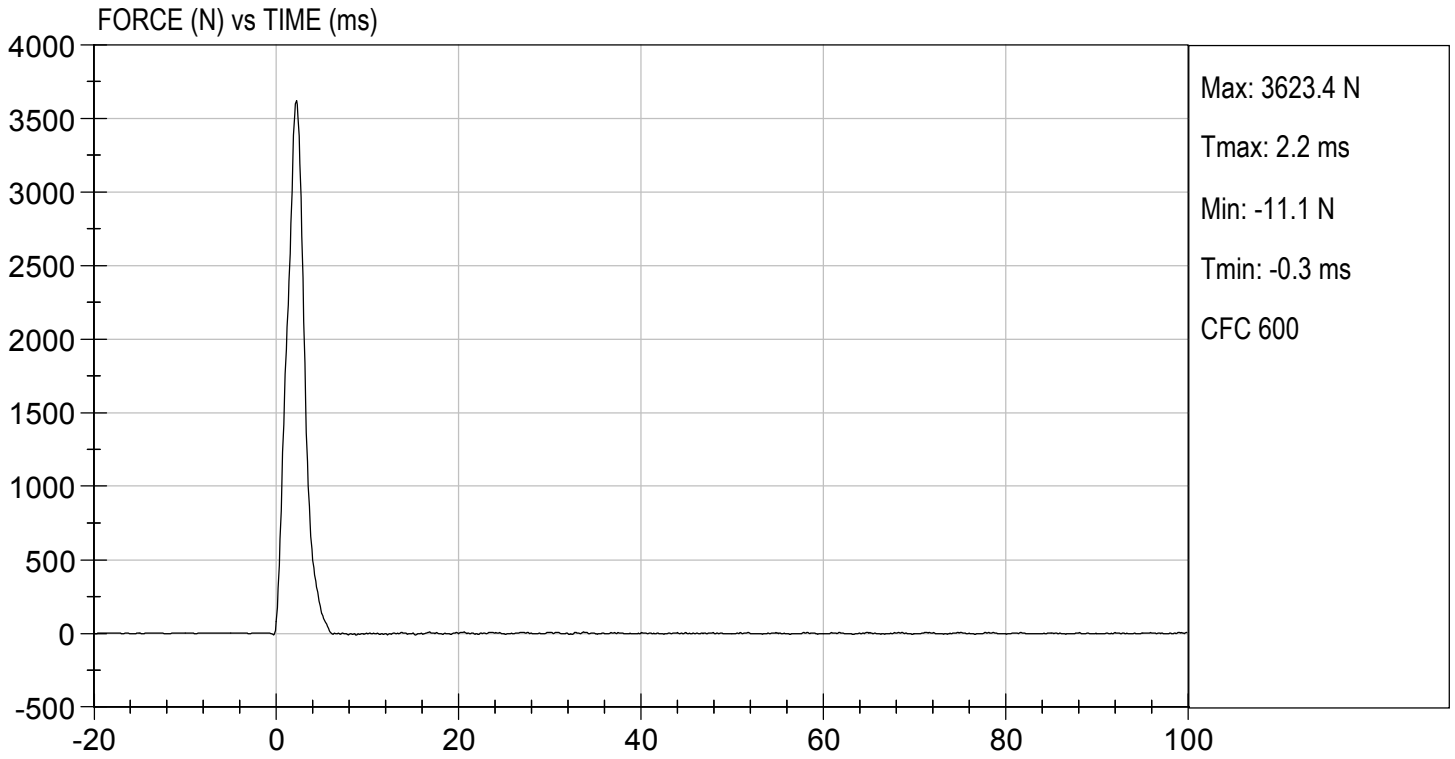
02/14/2019  
 Test Date

B. F. [Signature]  
 Approved By



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

TEST DATE: 02/14/2019  
TEST #: D190606



**MGA RESEARCH CORPORATION  
 TORSO FLEXION TEST  
 HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634

**Test I.D:** D190607

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	19	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	2	Pass
Force at 45 deg	N	320 to 390	330	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.0	Pass
<b>Overall Result</b>				<b>Pass</b>

*Jacob D Taylor*  
 Laboratory Technician

02/14/2019

Test Date

*B. F. K.*  
 Approved By

