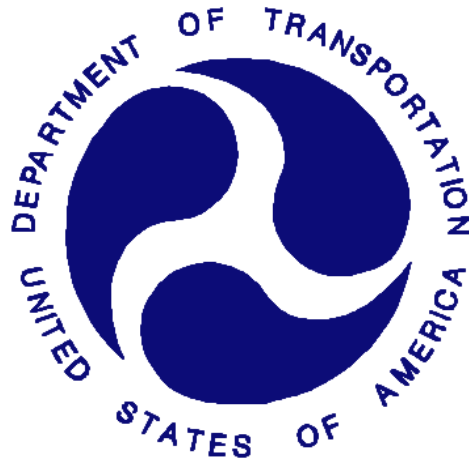


REPORT NUMBER: NCAP-MGA-2019-024

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

**AUDI AG
2019 Audi Q8 Premium Plus 5-Door SUV
NHTSA No.: O20195800**

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




Test Date: January 29, 2019

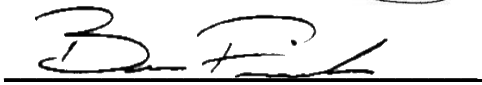
Final Report Date: April 16, 2019

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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Prepared by: 
Robert Schnorenberg, Project Engineer

Approved by: 
Ben Fischer, Project Engineer

Approval Date: April 16, 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 Audi Q8 Premium Plus 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 January 29, 2019.</p> <p>The impact velocity of the vehicle was 56.21 km/h and the ambient temperature at the barrier face at the time of impact was 21.0°C. The target vehicle post-test maximum crush was 624 mm located to the left of 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 (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td style="background-color: yellow;">296</td> <td>700</td> <td style="background-color: yellow;">238</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td>63</td> <td style="background-color: yellow;">25</td> <td>52</td> <td style="background-color: yellow;">12</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td style="background-color: yellow;">0.30</td> <td>1</td> <td style="background-color: yellow;">0.34</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td style="background-color: yellow;">1045</td> <td>2620</td> <td style="background-color: yellow;">533</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td style="background-color: yellow;">62</td> <td>2520</td> <td style="background-color: yellow;">520</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td style="background-color: yellow;">363</td> <td>6805</td> <td style="background-color: yellow;">209</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td style="background-color: yellow;">263</td> <td>6805</td> <td style="background-color: yellow;">208</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	296	700	238	Maximum Chest	mm	63	25	52	12	Nij	N/A	1	0.30	1	0.34	Neck Tension	N	4170	1045	2620	533	Neck Compression	N	4000	62	2520	520	Left Femur Force	N	10008	363	6805	209	Right Femur Force	N	10008	263	6805	208
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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 Audi Q8 Premium Plus 5-Door SUV at a velocity of 56.21 km/h. The test was performed at MGA Research Corporation on January 29, 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 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th 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. 138) 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 100 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 624 mm located to the left of 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 passenger's visible contact points were as follows: The passenger's head contacted the airbag. The passenger's head also contacted the headrest.

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	296	0.30	1045	62	43	25	363	263
Passenger (5 th)	238	0.34	533	520	45	12	209	208

The test data can be found on the NHTSA website at www.nhtsa.gov

TEST NOTES

Driver Right Ankle Z collected no valid data after 175 ms.

Top of Engine X collected no valid data after 10 ms.

Bottom of Engine X collected no valid data after 45 ms.

Driver Lap Belt not installed.

Passenger Lap Belt not installed.

Barrier C-01 Fx recorded no valid data.

Barrier C-01 Mz recorded no valid data.

Barrier I-05 My 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 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20195800	Traction Control System (TCS)	Yes
Model Year	2019	Power Steering	Yes
Make	Audi	Power Window Auto-Reverse	Yes
Model	Q8 Premium Plus	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	WA1AVAF19KD010530	Driver Head/Torso Airbag	No
Body Color	Samurai Gray Metallic	Driver Torso Airbag	No
Odometer (km/mi)	114 km / 71 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.0 L	Driver Pelvis Airbag	No
Type/No. Cylinders	V6	Driver Knee Airbag	No
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	Yes	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?

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	AUDI AG
Date of Manufacture	10/18

GVWR (kg)	2935
GAWR Front (kg)	1510
GAWR Rear (kg)	1765

VEHICLE SEATING AND WEIGHT CAPACITY DATA

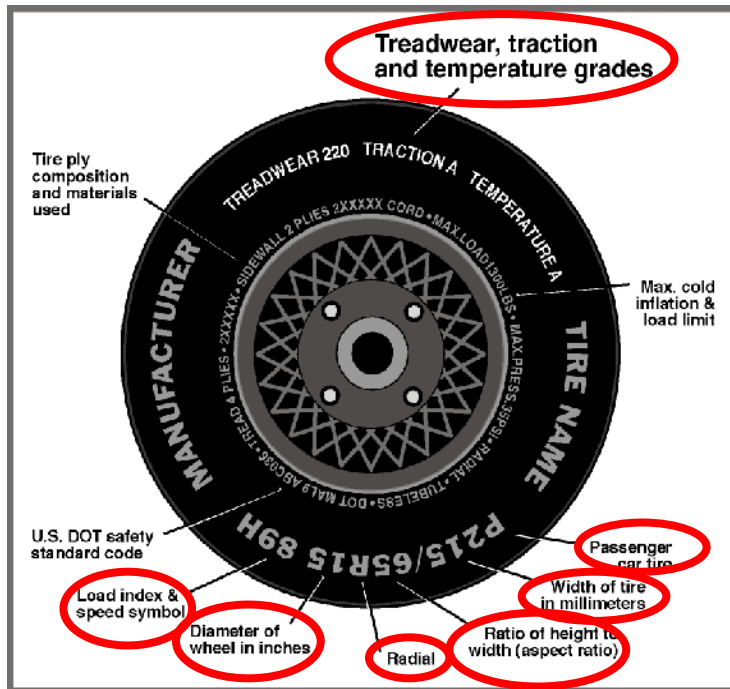
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				500
Cargo Weight (RCLW) (kg)				160

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	240	260
Recommended Tire Size	285/45R21	285/45R21
Tire Size on Vehicle	285/45R21	285/45R21
Tire Manufacturer	Hankook	Hankook
Tire Model	DynaPro HP2	DynaPro HP2
Treadwear	560	560
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 1 Polyamide	2 Rayon, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	113H	113H
Tire Material	Rubber	Rubber
DOT Safety Code Left	12XC7 UKHO 3818	12XC7 UKHO 3818
DOT Safety Code Right	12XC7 UKHO 3818	12XC7 UKHO 3918

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	618.0	492.5		648.5	609.0	
Right	kg	624.5	505.5		642.0	610.5	
Ratio	%	55.5%	44.5%		51.4%	48.6%	
Totals	kg	1242.5	998.0	2240.5	1290.5	1219.5	2510.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2240.5
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Test Vehicle Target Weight (TVTW)	kg	2517.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	865	861	884	881	1336
As Tested	mm	860	855	847	849	1458
Post Test	mm	950	952	850	840	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3000
Total Vehicle Length at Left Side	mm	4844
Total Vehicle Length at Centerline	mm	4975
Total Vehicle Length at Right Side	mm	4844
Weight of Ballast in Cargo Area	kg	124
Weight of Vehicle Components Removed	kg	54
Amount of Stoddard Solvent in Fuel Tank	L	78.7

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area cover, divider, jack/tool kit, spare tire, subwoofer, Cargo area speaker, RR taillight, LF RF underbody plastic.

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4975
2	Total Width	1996
3	Bumper Top Height	660
4	Bumper Bottom Height	542
5	Longitudinal Member Top Height	662
6	Distance between Longitudinal Members	960
7	Longitudinal Member Width	82
8	Engine Top Height	942
9	Engine Bottom Height	262
10	Engine and Gearbox Width	1120
11	Front Bumper-Engine Distance	N/A
12	Front Shock Absorber Fixing Height	N/A
13	Bonnet Leading Edge Height	956
14	Front Shock Absorber Fixing Width	N/A
15	Front Bumper – Front Axle Distance	985
16	Front Axle – A-Pillar Distance	496
17	A-Pillar – B-Pillar Distance	1173
18	B-Pillar – Rear Axle Distance	1328
19	B-Pillar – C-Pillar Distance	824
20	Roof Sill Bottom Height	1575
21	Roof Sill Top Height	1660
22	Floor Sill Bottom Height	320
23	Floor Sill Top Height	475

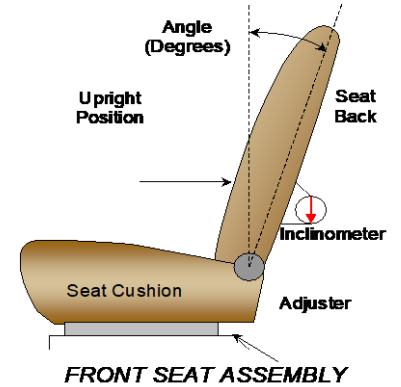
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

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	18.5° on outboard headrest post
Passenger Seat Back Angle	17.7° on outboard headrest post

SEAT FORE/AFT POSITIONS

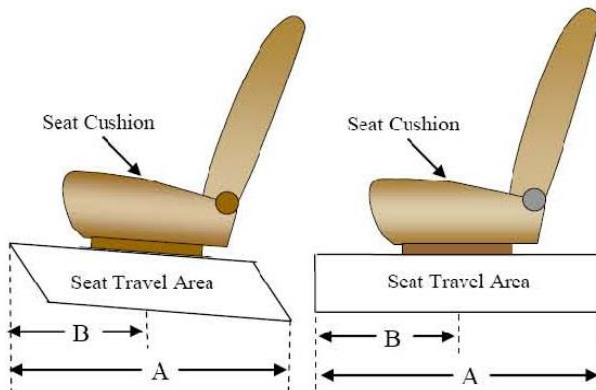
The driver and passenger seat fore/aft positions are adjusted following Appendix F, “Driver & Passenger Dummy Seating & Positioning Procedures” in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	309 mm	155 mm
Passenger Seat	246 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	4 (1 st as 1)	0 (1 st as 0)
Passenger Seat	4 (1 st as 1)	1 (1 st as 0)



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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

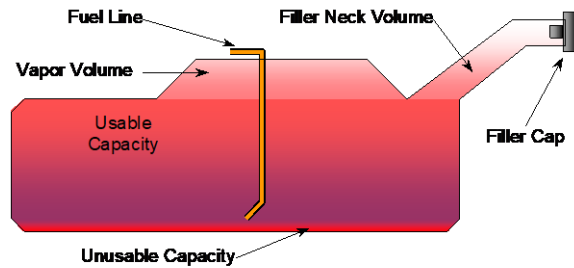
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	84.8
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	78.0 to 79.7
Actual Amount of Solvent used	78.7
1/3 of Usable Capacity	28.3

FUEL PUMP

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

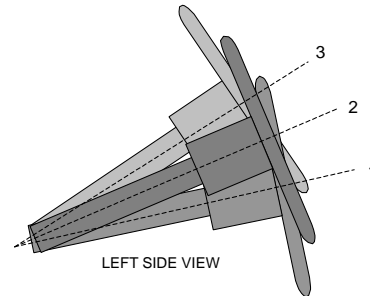
The vehicle is equipped with an electronic fuel pump. At ignition "on" the fuel pump will work for a short time to put pressure to the system. If the engine is started the pump works normally. The filler neck is located on the passenger's side.



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

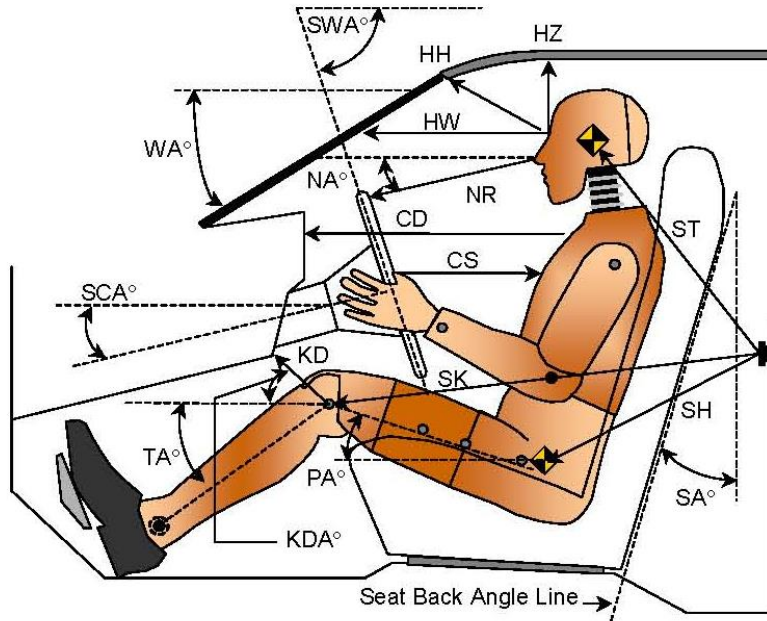
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	69.6	195
Geometric Center Position 2	67.5	160
Uppermost Position 3	65.3	125
Telescoping Steering Wheel Travel		70
Test Position	67.5	160

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019



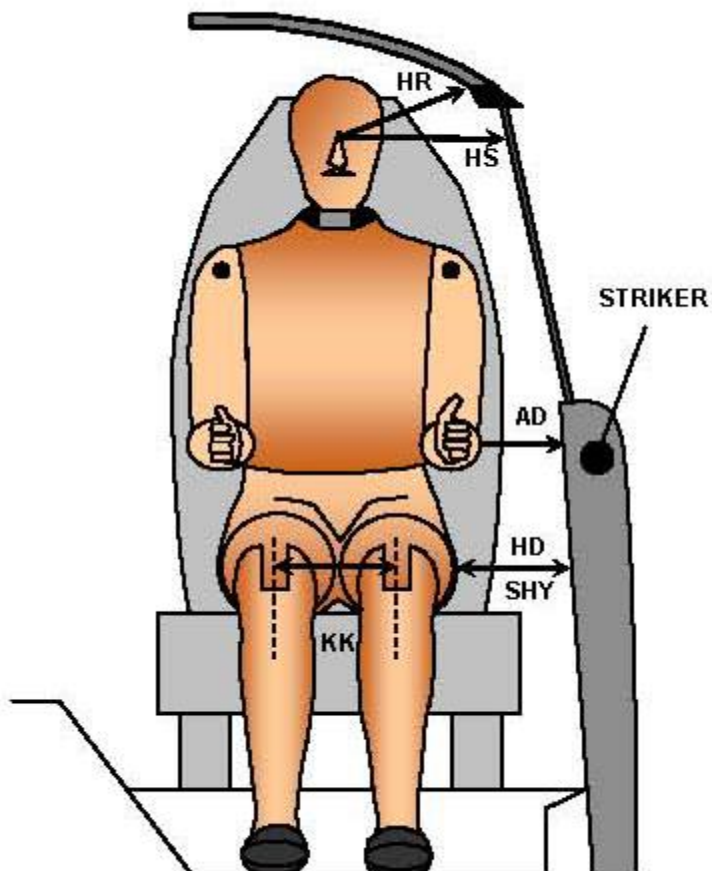
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		25.8		
SWA°	Steering Wheel Angle		67.5		
SCA°	Steering Column Angle		22.5		
SA°	Seat Back Angle		18.5		17.7
HZ	Head to Roof (Z)	165	90	202	90
HH	Head to Header	236	26.5	281	43.0
HW	Head to Windshield	626	0	647	0
NR	Nose to Rim	365	10.6		
CD	Chest to Dash	502		366	
CS	Chest to Steering Hub	301	5.4		
RA	Rim to Abdomen	182	0		
KDL	Left Knee to Dash	190	37.7	86	34.2
KDR	Right Knee to Dash	168	46.1	95	35.9
PA°	Pelvic Angle		23.7		21.7
TA°	Tibia Angle		40.5		53.1
SK	Striker to Knee	563	95.7	646	94.3
ST	Striker to Head	525	8.3	504	21.1
SH	Striker to H-Point	258	136.3	331	109.4

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019



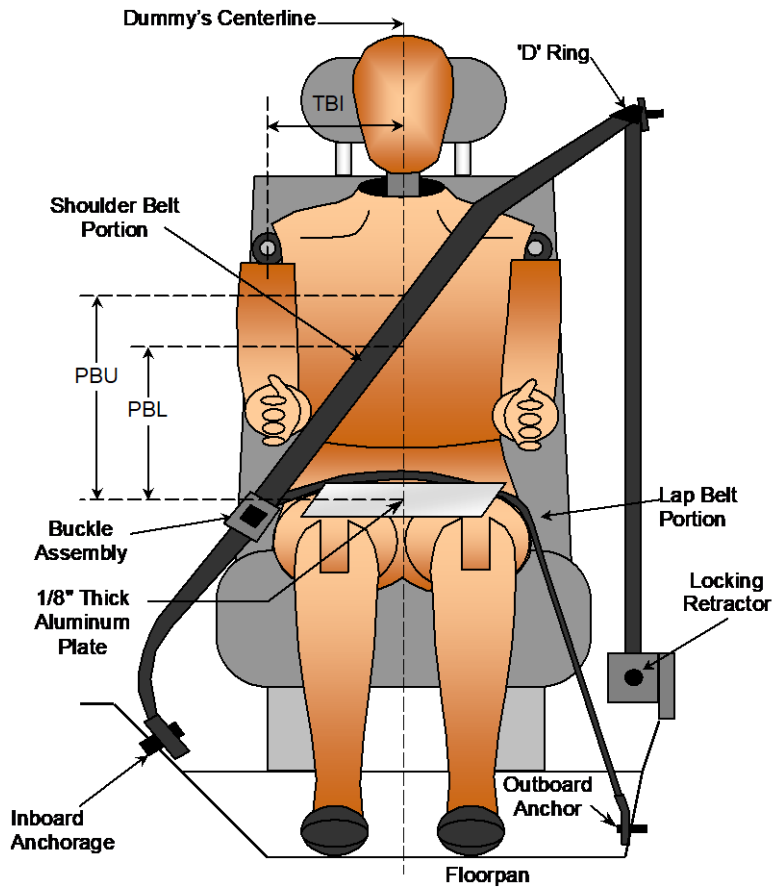
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	146	109
HD	H-Point to Door	165	185
HR	Head to Side Header	212	252
HS	Head to Side Window	322	365
KK	Knee to Knee	385	228
SHY	Striker to H-Point (Y Direction)	305	332
AA	Ankle to Ankle	347	176

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	345
PBL - Top surface of reference to belt lower edge	mm	275	265

BELT LENGTH DATA

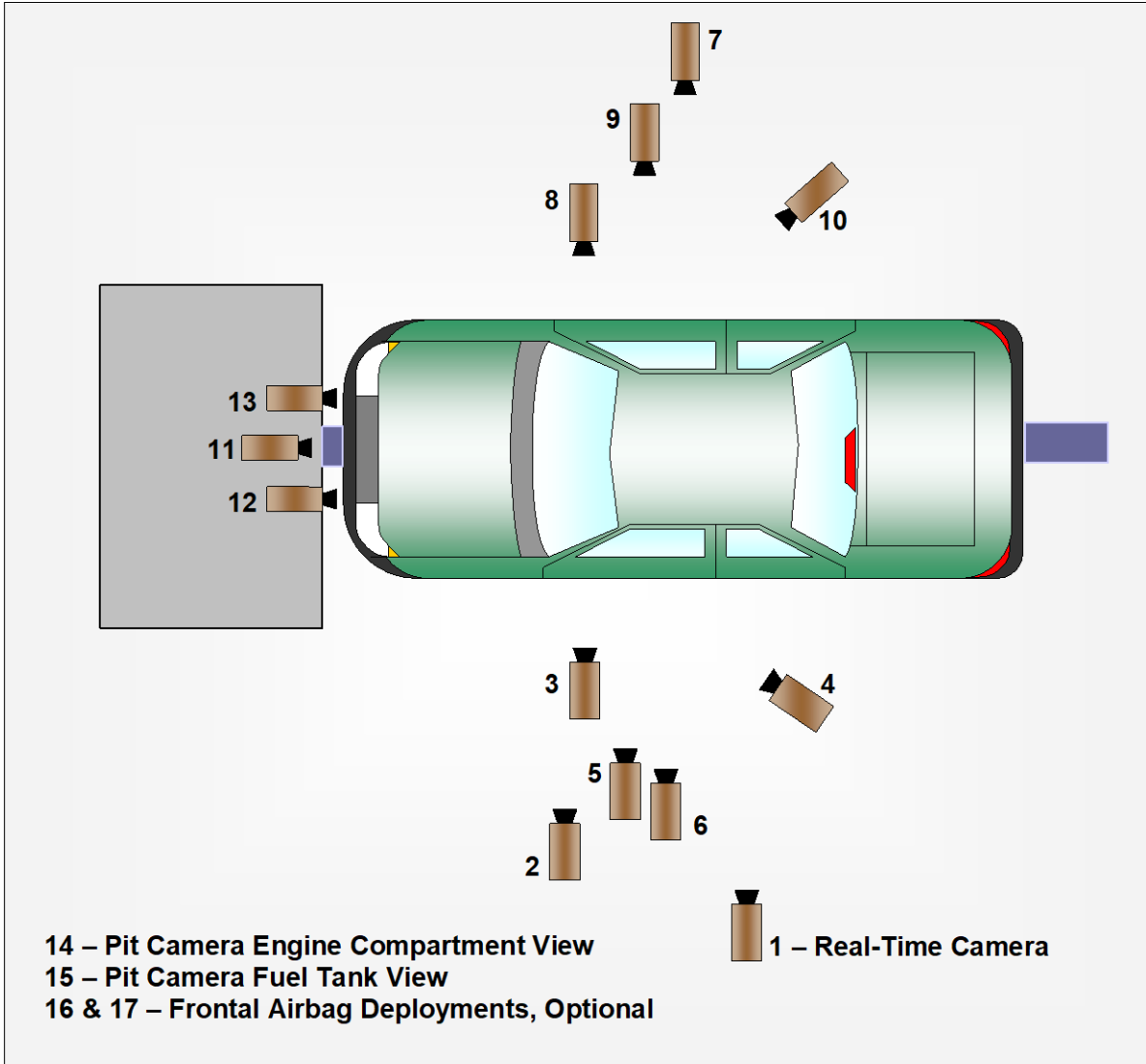
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	895	905
Lap Belt Length as measured on ATD	mm	805	870
Remainder of belt on reel	mm	900	825
Total Belt Length for Continuous Webbing Systems	mm	3200	3200

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1810	-6610	-1330	50	1000
3	Left Front Half	-1370	-5880	-1400	24	1000
4	Left Angle	-7400	-5850	-2400	75	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2280	6110	-1340	16	1000
8	Passenger Close-Up	-1800	6640	-2010	110	1000
9	Right Front Half	-1340	6070	-1370	50	1000
10	Right Angle	-7390	5630	-2060	75	1000
11	Windshield	100	0	-2310	11	1000
12	Driver Windshield	170	-370	-2230	25	1000
13	Passenger Windshield	170	370	-2230	25	1000
14	Pit Front	-1010	0	3340	24	1000
15	Pit Rear	-3160	0	3340	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

***COORDINATES:**

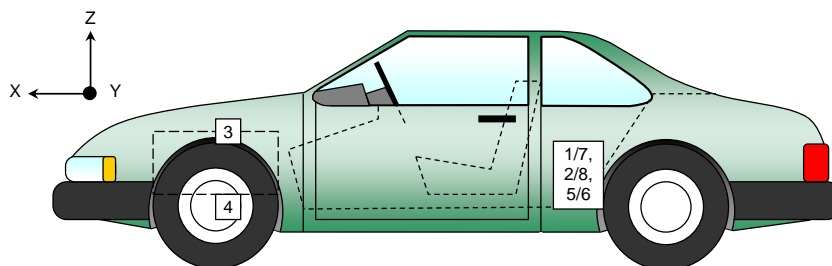
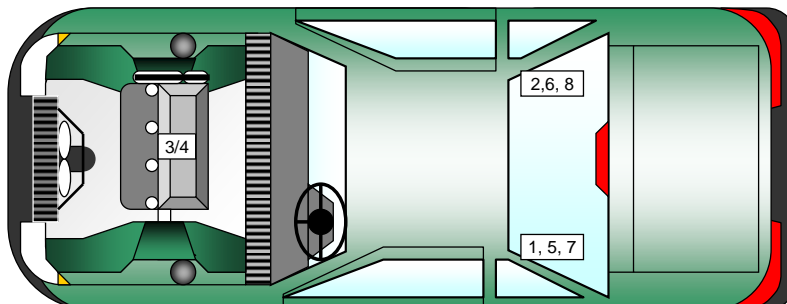
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 5 & 6 were not used for this test.

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1939	-665	-605
2	Right Rear Crossmember Accelerometer – X Direction	1939	665	-604
3	Engine Top X	4275	35	-942
4	Engine Bottom X	4338	0	-262
5	Left Rear Crossmember Accelerometer – Z Direction	1939	-665	-605
6	Right Rear Crossmember Accelerometer – Z Direction	1939	665	-604
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1939	-675	-605
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1939	675	-604

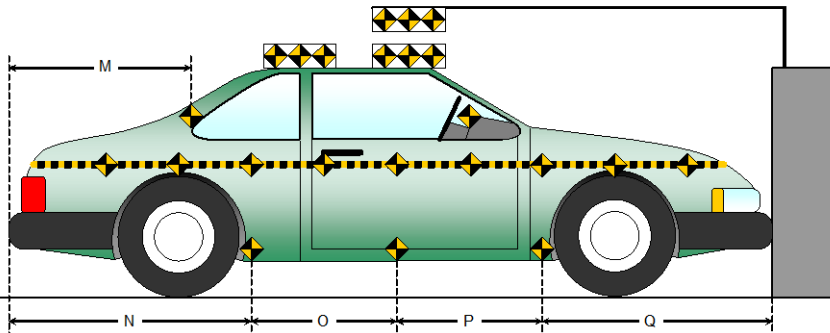
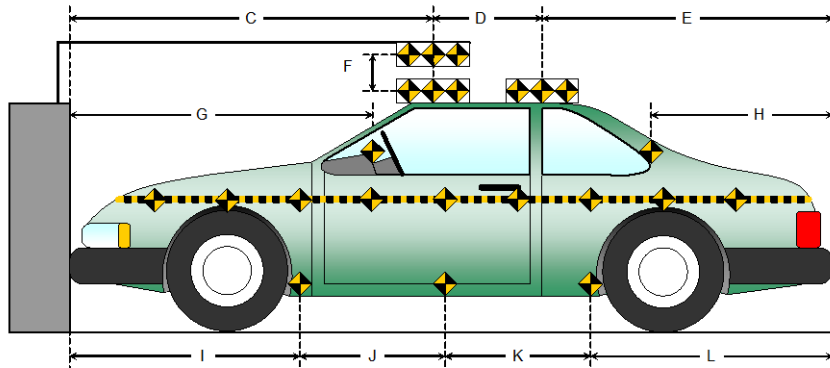
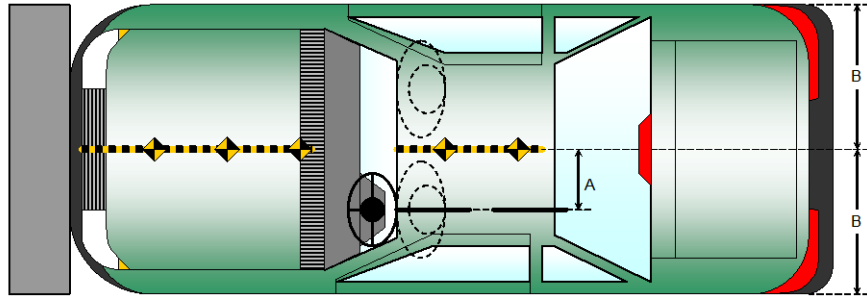
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

Item	Value (mm)
A	396
B	998
C	2485
D	618
E	1872
F	60
G	
H	1438
I	1490
J	1000
K	1000
L	1485
M	1438
N	1490
O	1000
P	1000
Q	1485



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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

Advanced Research Load Cell Barrier

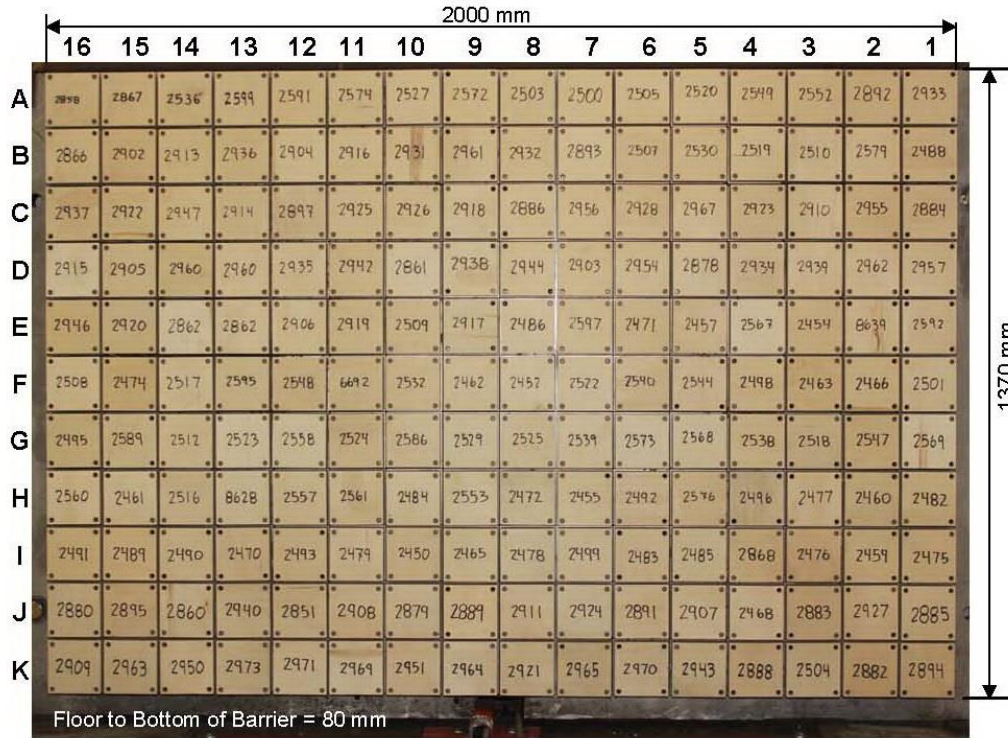


Photo for Reference Only

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 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

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 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 138
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	None	None
Right Knee Contact	None	None

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
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	1064
Center	mm	1120
Right Side	mm	1104
Average	mm	1096

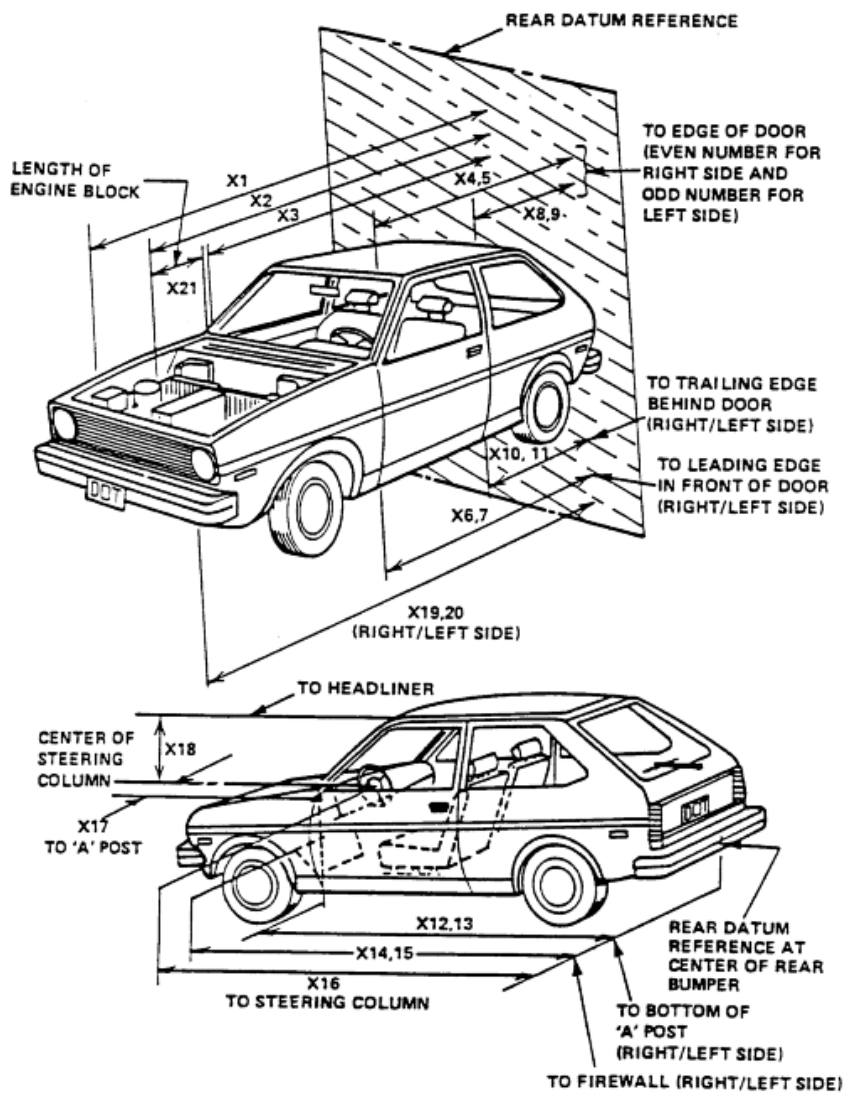
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019



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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4975	4370	605
2	RSOV to Front of Engine	mm	4330	4145	185
3	RSOV to Firewall	mm	3915	3889	26
4	RSOV to Upper Leading Edge of Right Door	mm	3408	3403	5
5	RSOV to Upper Leading Edge of Left Door	mm	3408	3405	3
6	RSOV to Lower Leading Edge of Right Door	mm	3401	3409	-8
7	RSOV to Lower Leading Edge of Left Door	mm	3401	3399	2
8	RSOV to Upper Trailing Edge of Right Door	mm	2260	2261	-1
9	RSOV to Upper Trailing Edge of Left Door	mm	2261	2259	2
10	RSOV to Lower Trailing Edge of Right Door	mm	2320	2321	-1
11	RSOV to Lower Trailing Edge of Left Door	mm	2320	2316	4
12	RSOV to Bottom of "A" Post of Right Side	mm	3410	3404	6
13	RSOV to Bottom of "A" Post of Left Side	mm	3408	3407	1
14	RSOV to Firewall, Right Side	mm	3850	3822	28
15	RSOV to Firewall, Left Side	mm	3850	3827	23
16	RSOV to Steering Column	mm	2890	2930	-40
17	Center of Steering Column to "A" Post	mm	368	365	3
18	Center of Steering Column to Headliner	mm	408	444	-36
19	RSOV to Right Side of Front Bumper	mm	4844	4460	384
20	RSOV to Left Side of Front Bumper	mm	4844	4461	383
21	Length of Engine Block	mm	730	730	0
RD	RSOV to Right Side of Dash Panel	mm	3092	3070	22
CD	RSOV to Center of Dash Panel	mm	3110	3102	8
LD	RSOV to Left Side of Dash Panel	mm	3090	3079	11

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

VEHICLE INFORMATION

VIN: WA1AVAF19KD010530 Wheelbase (mm): 3000
Vehicle Size Category: MPV Test Weight (kg): 2510.0

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): 56.21

Velocity Change (km/h): 66.7

Time of Separation (msec): 77

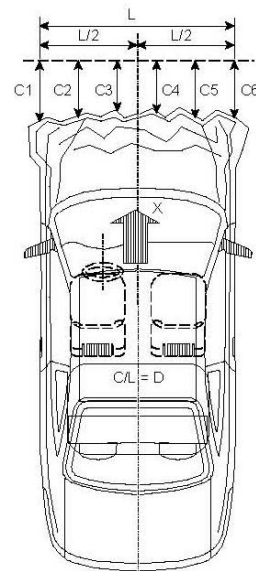
CRUSH PROFILE

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Centerline

Damage Region Length (mm): 1360

Impact Mode: Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4844	4461	383
C2	Crush zone 2 at left side	mm	4940	4394	546
C3	Crush zone 3 at left side	mm	4958	4334	624
C4	Crush zone 4 at right side	mm	4958	4391	567
C5	Crush zone 5 at right side	mm	4940	4461	479
C6	Crush zone 6 at right side	mm	4844	4460	384
L	C1 TO C6	mm	1360	1384	-24

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

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

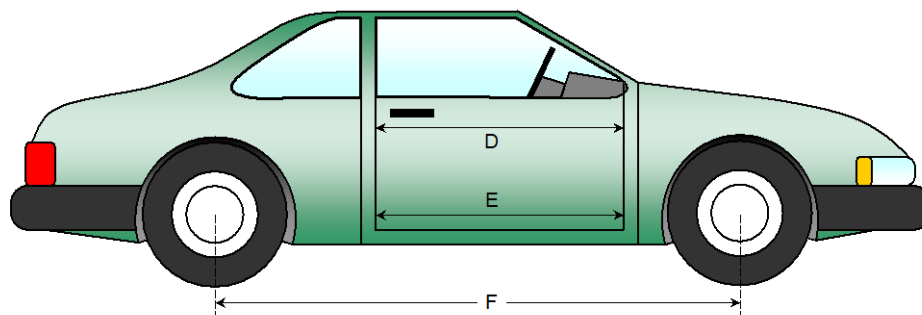
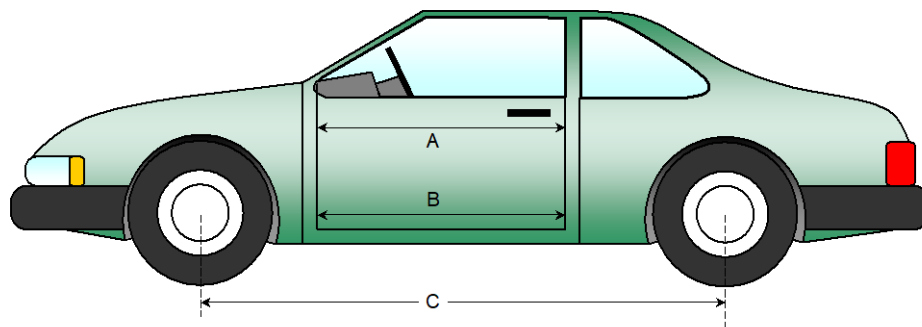
NHTSA No.: O20195800
 Test Date: 01/29/2019

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	970	970	0
B	Left Side Lower	mm	852	852	0
D	Right Side Upper	mm	970	970	0
E	Right Side Lower	mm	856	856	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3000	2953	47
F	Right Side Wheelbase	mm	3000	2975	25



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

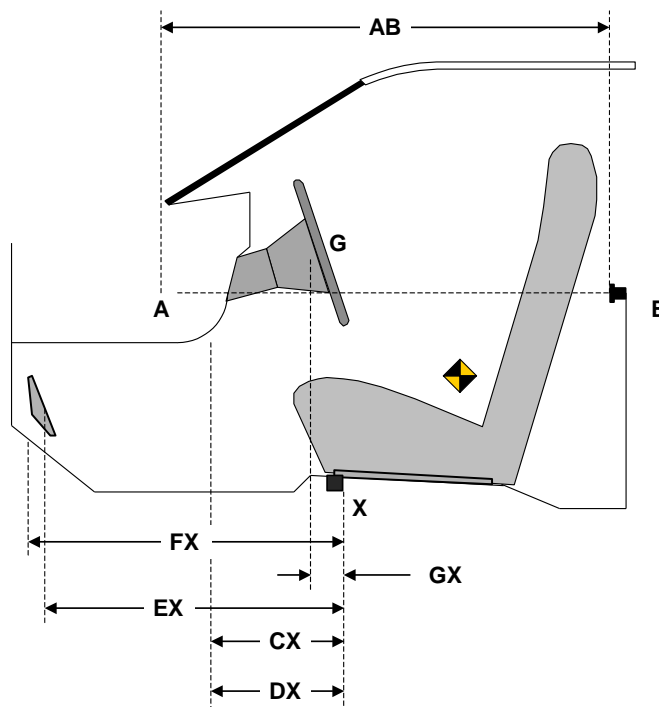
Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	808	808	0
CX	Left Knee Bolster to X	mm	335	341	-6
DX	Right Knee Bolster to X	mm	332	350	-18
EX	Brake Pedal to X	mm	526	545	-19
FX	Foot Rest to X	mm	590	593	-3
GX	Center of Steering Column Wheel Hub to X	mm	53	123	-70

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 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019

Windshield Mounting Details:

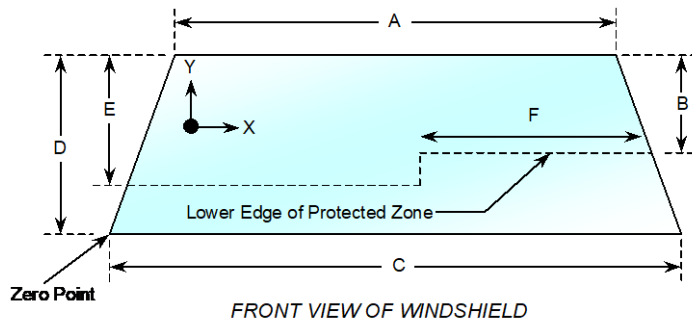
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.0° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2230	2230	100.0
Right Side	2230	2230	100.0
Total	4460	4460	100.0



Item	Units	Value
A	mm	1244
B	mm	376
C	mm	1628
D	mm	794
E	mm	461
F	mm	520

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: 2019 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.0°C

Test Time: 10:44 a.m.

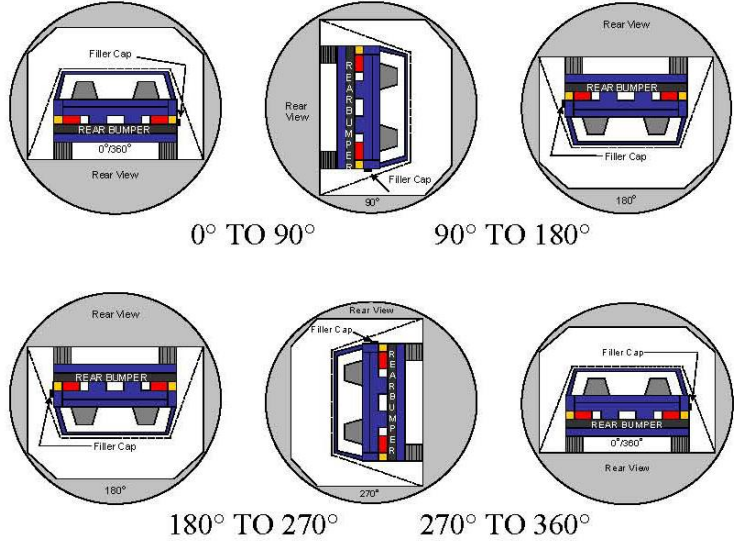
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2019 Audi Q8 Premium Plus 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
Test Date: 01/29/2019

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°	114	300	414
90° to 180°	112	300	412
180° to 270°	111	300	411
270° to 360°	115	300	415

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

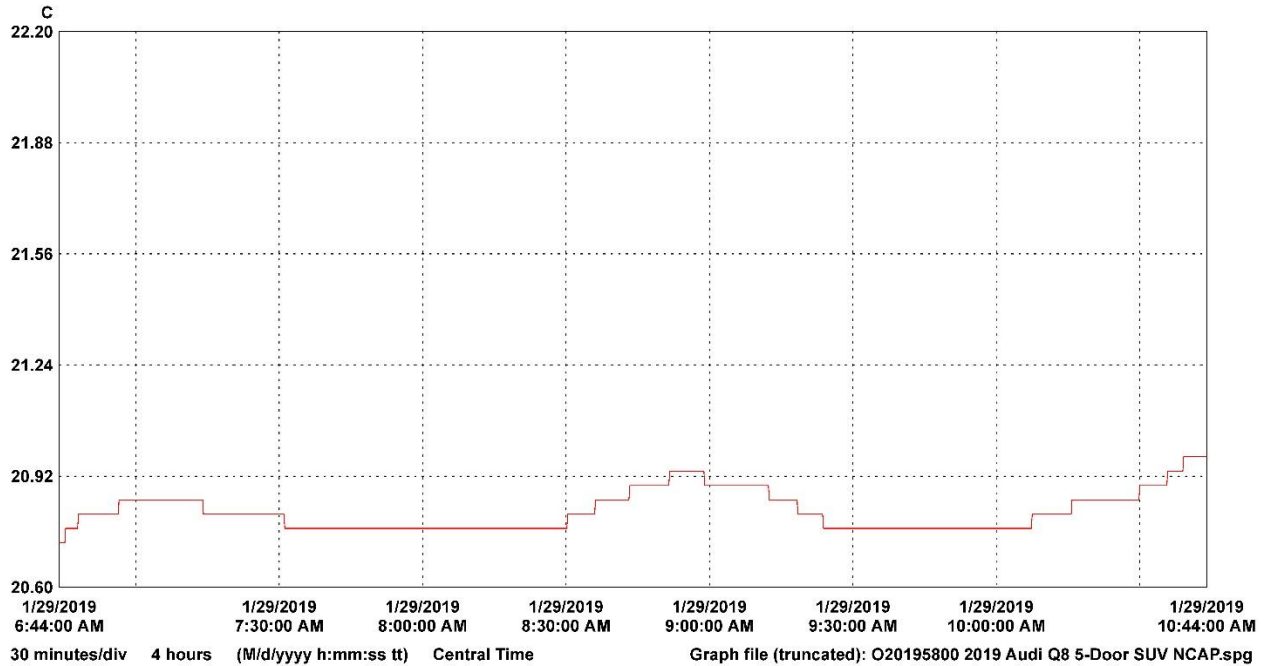
SOLVENT SPILLAGE LOCATION TABLE

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 Audi Q8 Premium Plus 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195800
 Test Date: 01/29/2019



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	12032257	VSC_Prep_Room	1	20.98	20.82	20.73	C	Temperature	12032257_VSC_Prep_Room.spl	

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Photo No. 079	Monroney Label Photograph	A-40

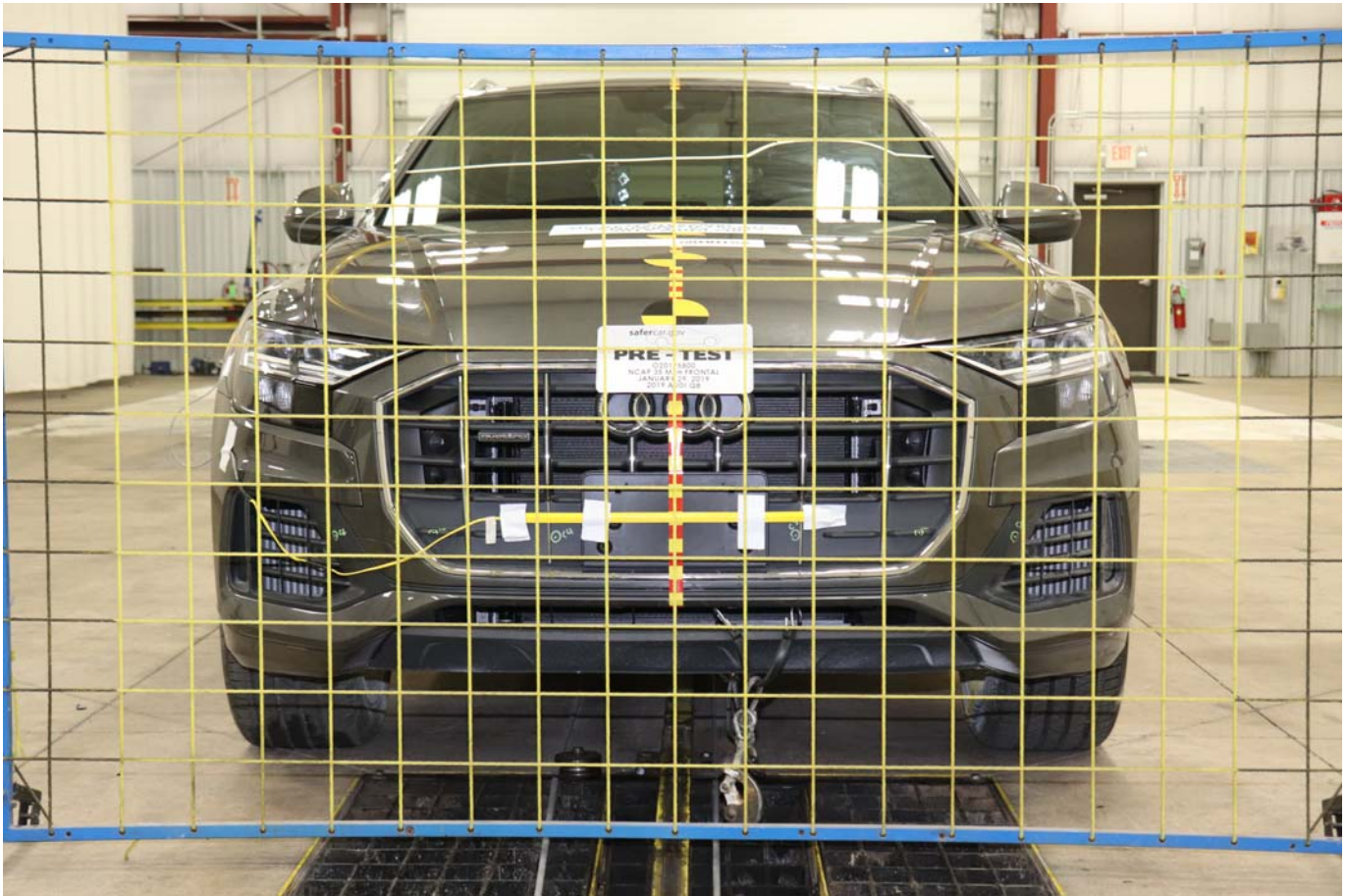


Photo No. 001 - Load Cell Location



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 Audi Q8 Premium Plus 5-Door SUV Frontal As Delivered



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

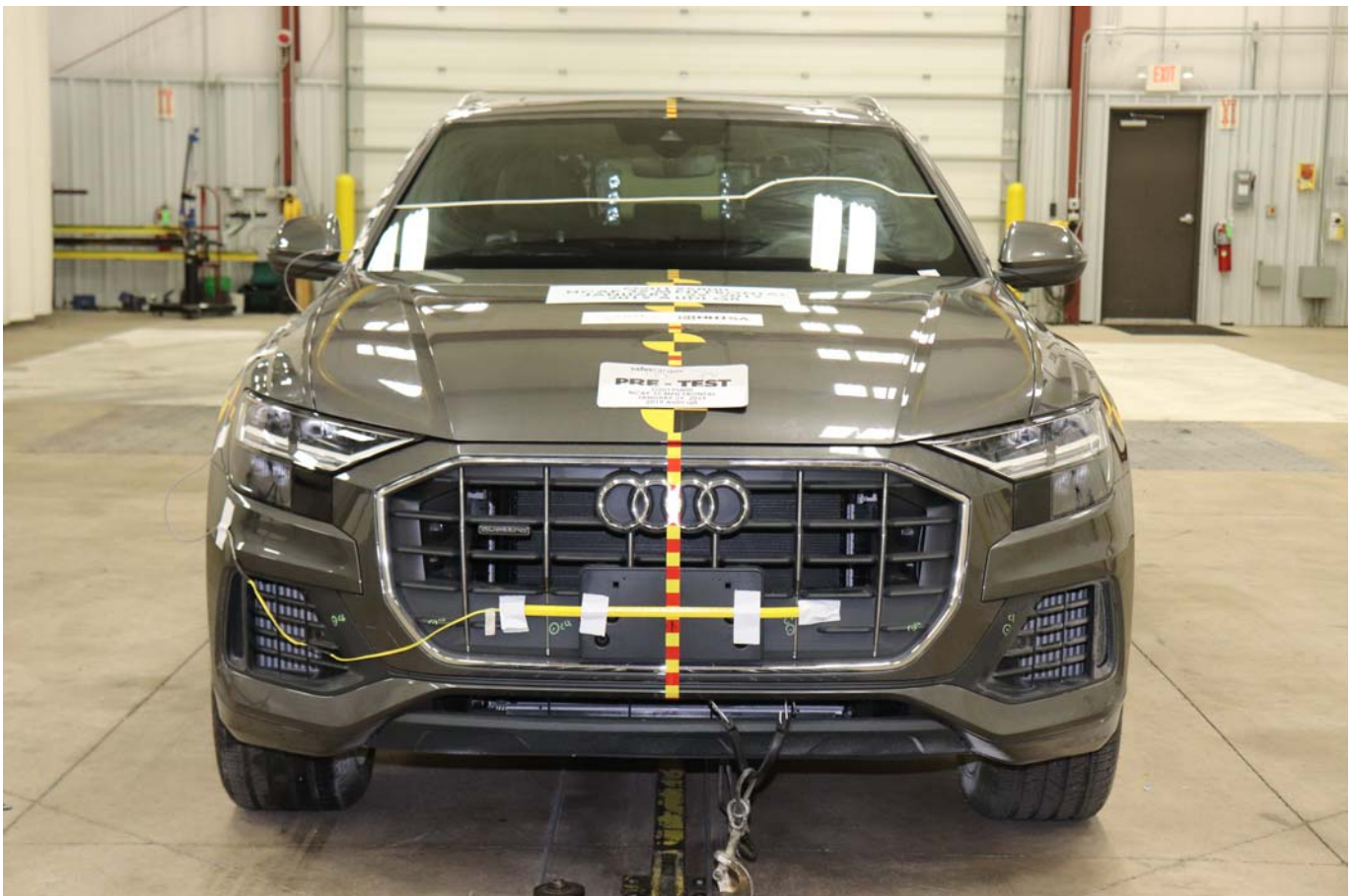


Photo No. 008 - Pre-Test Front View of Test Vehicle

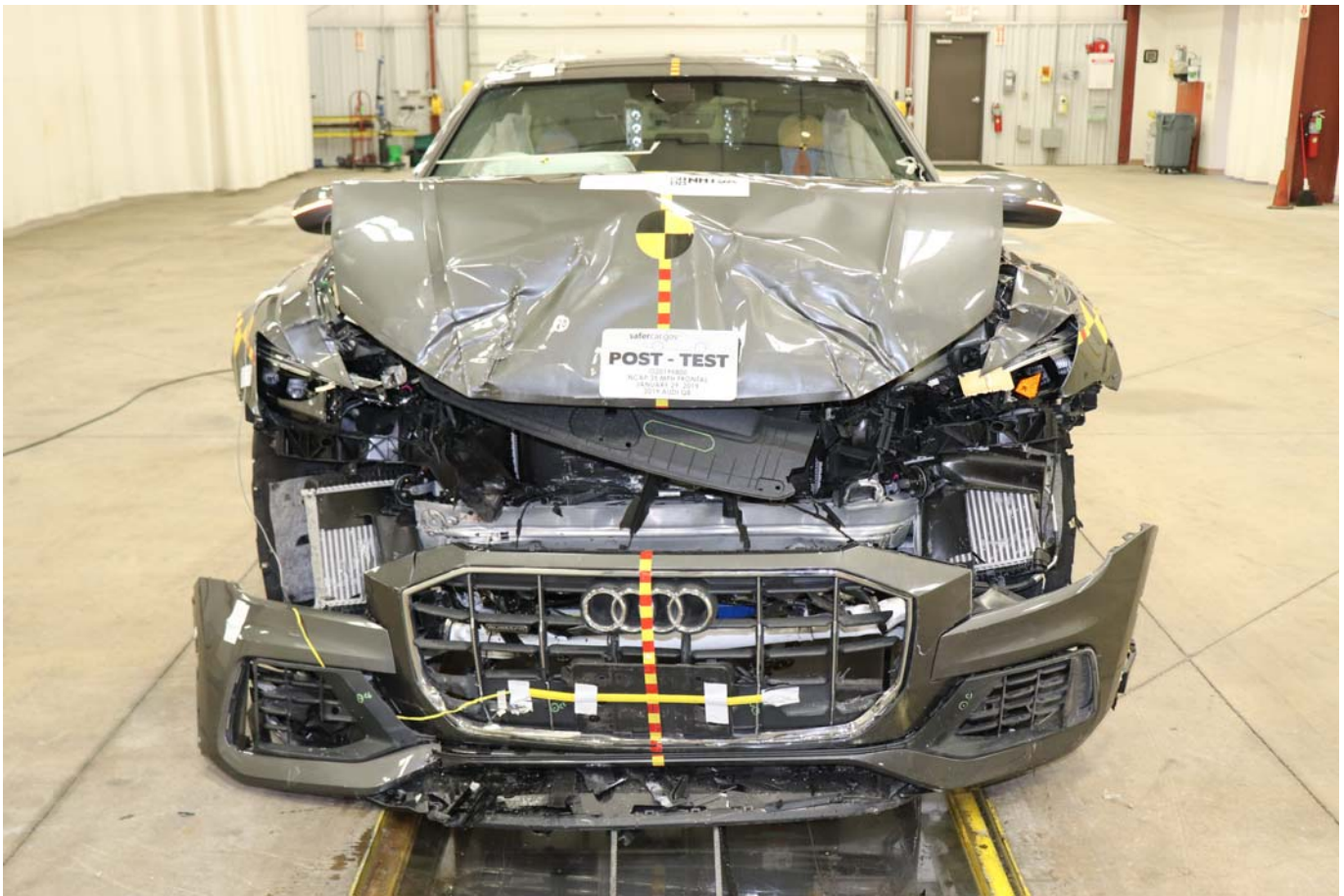


Photo No. 009 - Post-Test Front View of Test Vehicle



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

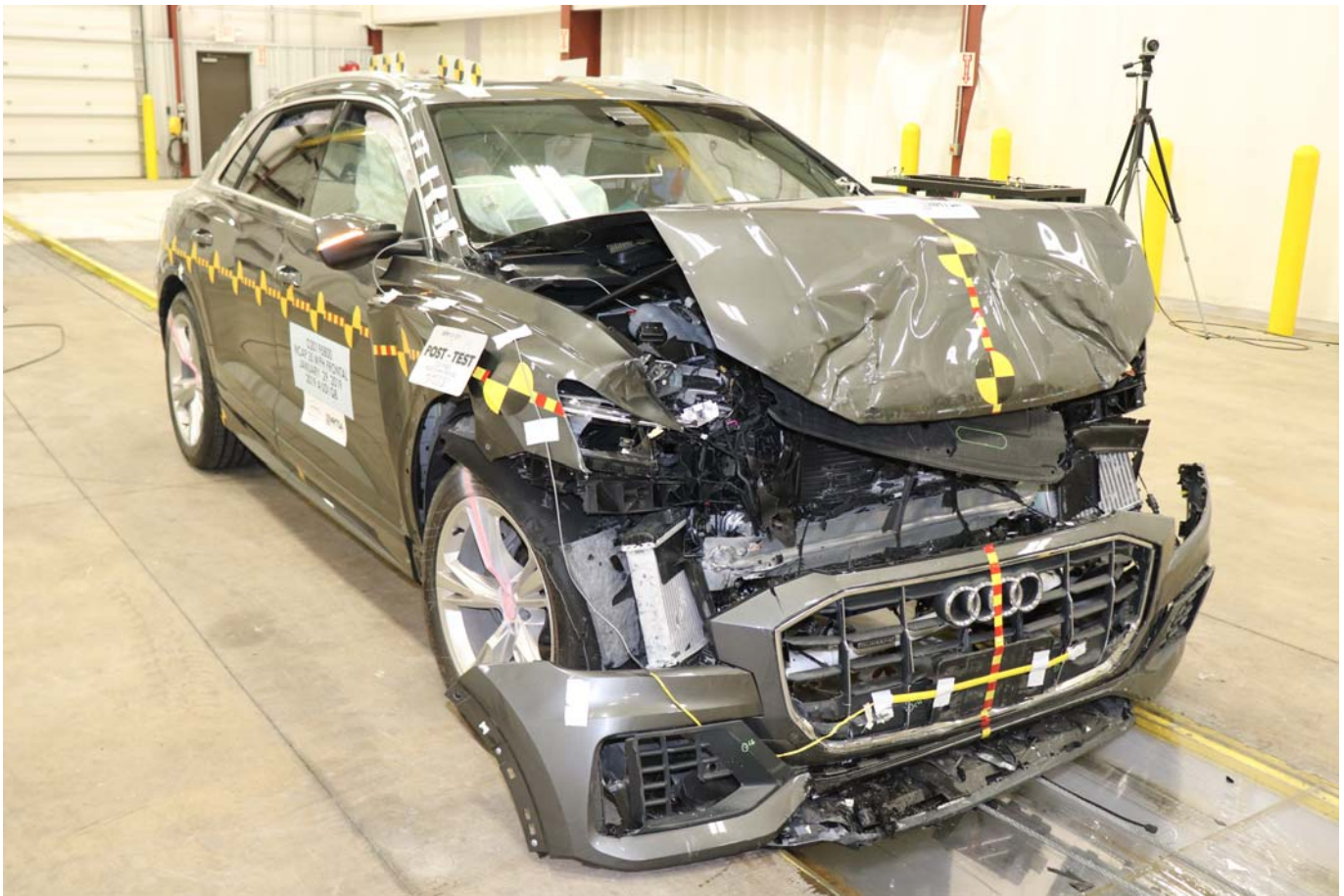


Photo No. 015 - Post-Test Right Front 3-4 View

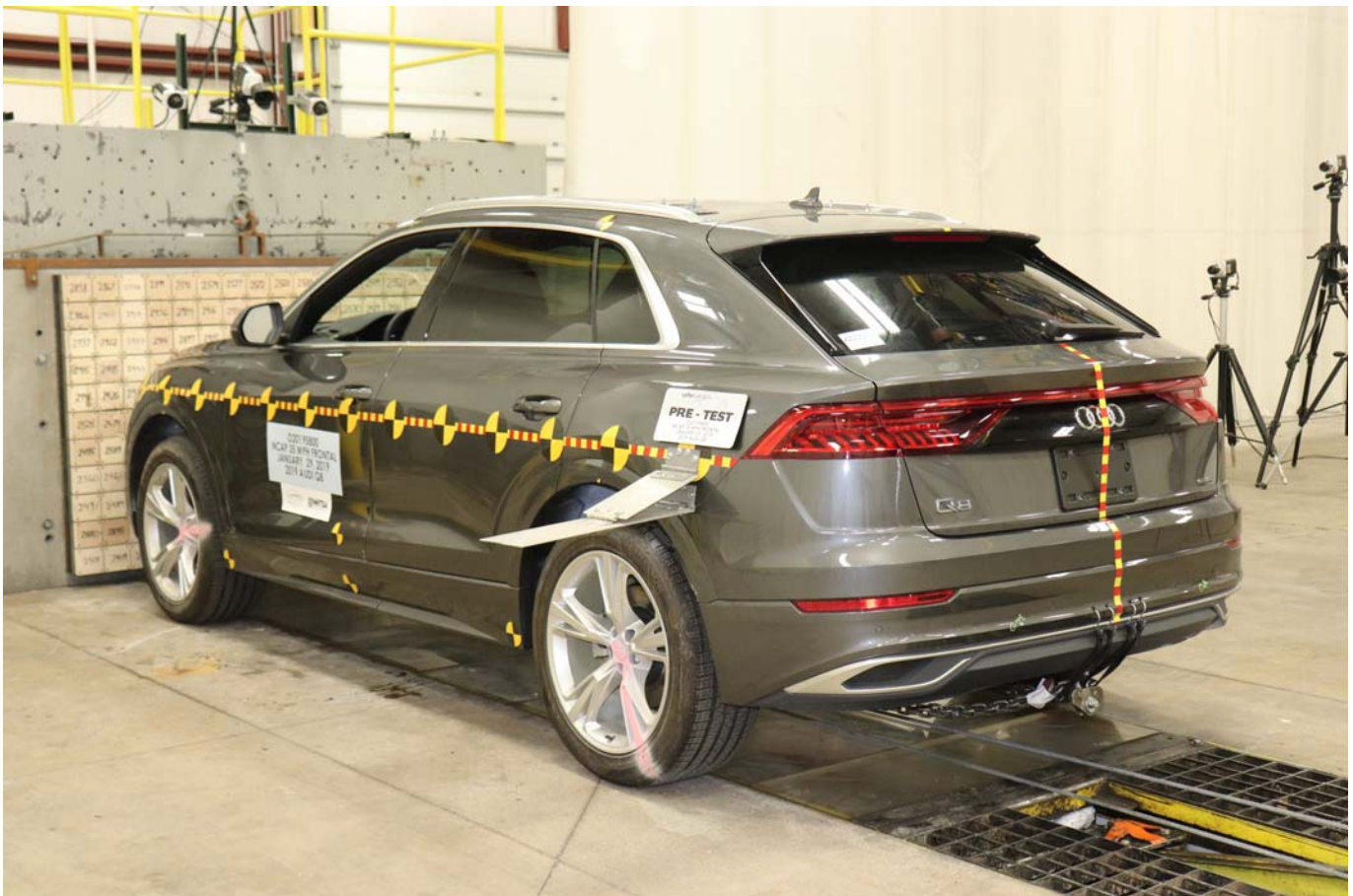


Photo No. 016 - Pre-Test Left Rear 3-4 View

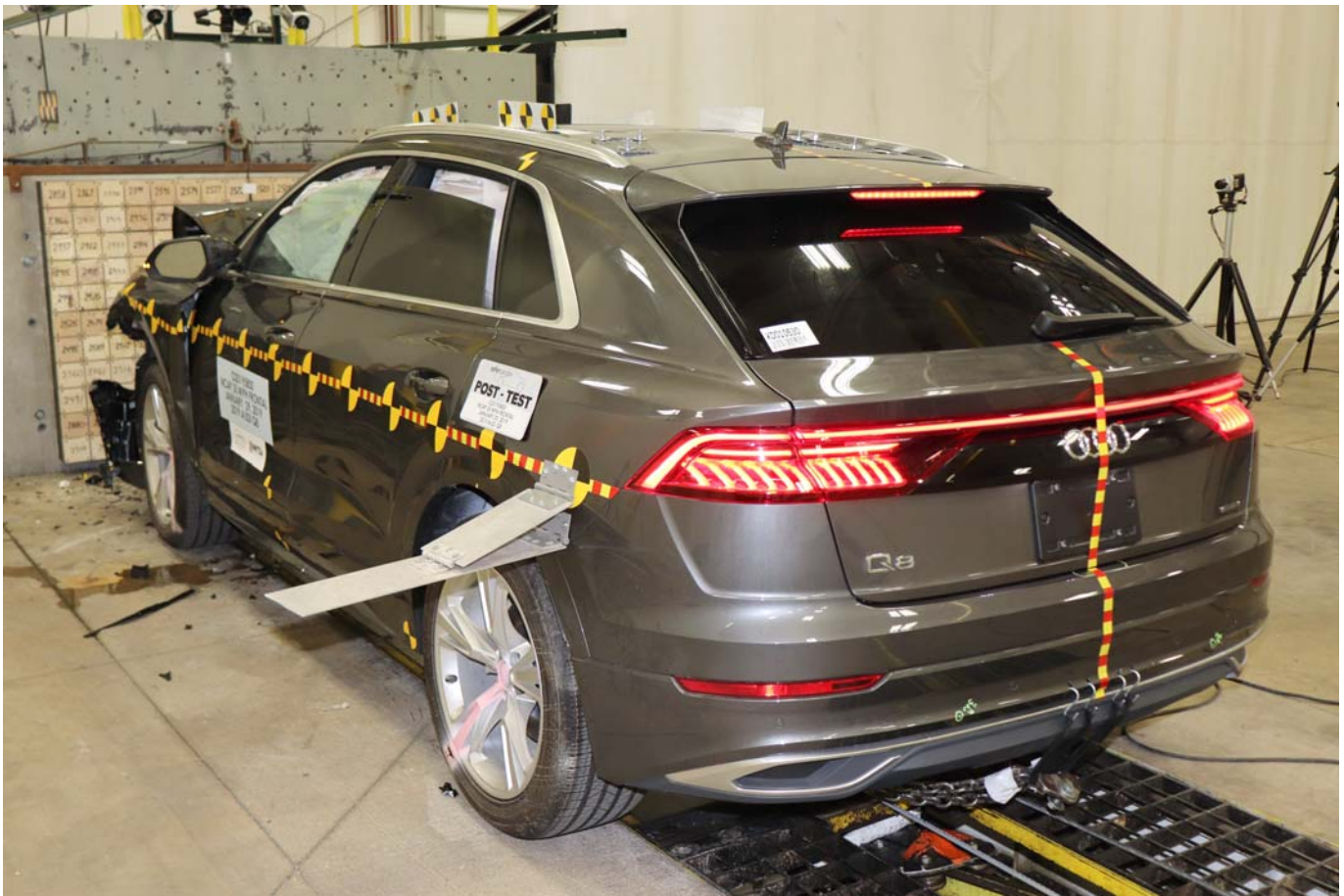


Photo No. 017 - Post-Test Left Rear 3-4 View



Photo No. 018 - Pre-Test Windshield View



Photo No. 019 - Post-Test Windshield View



Photo No. 020 - Pre-Test Engine Compartment View

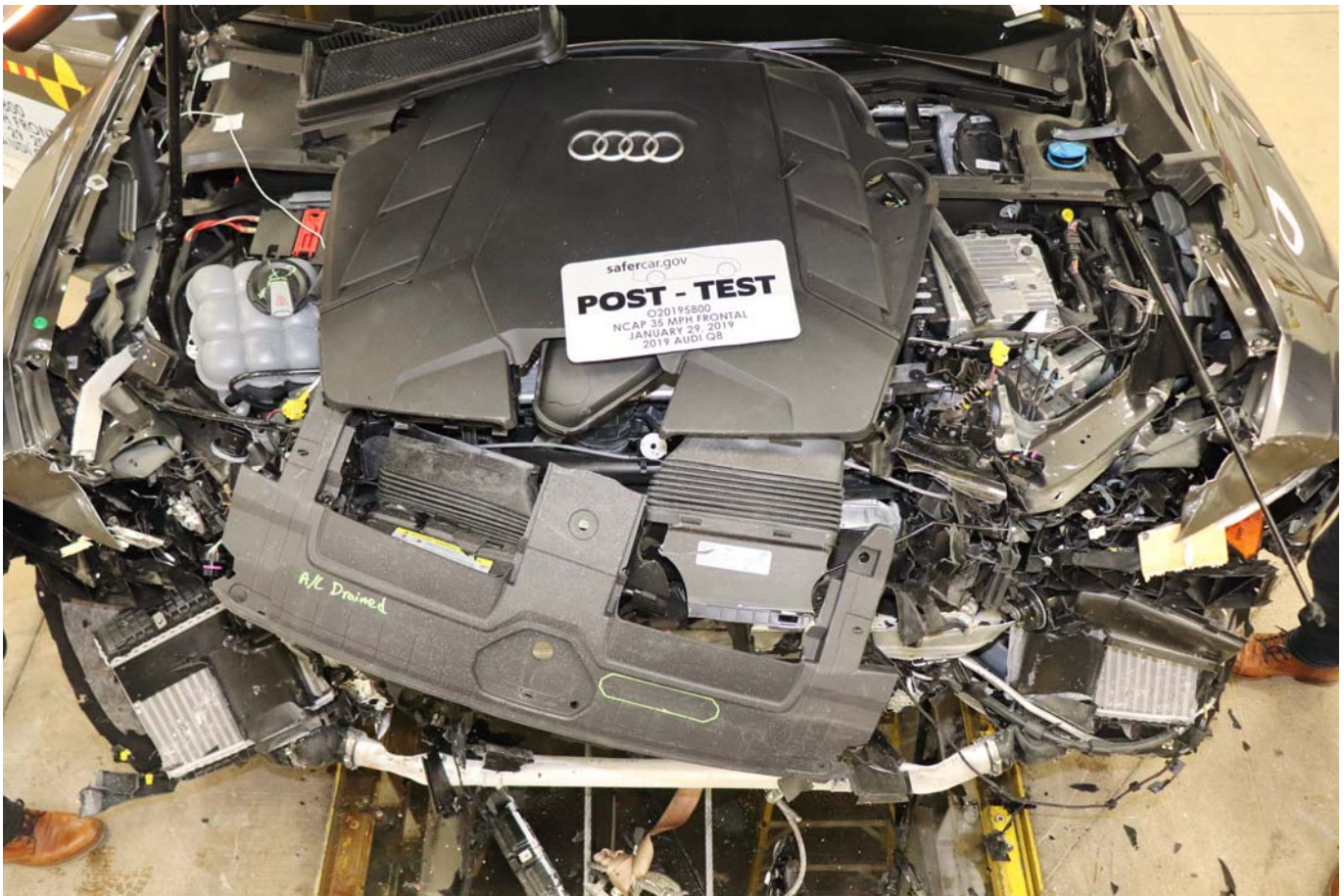


Photo No. 021 - Post-Test Engine Compartment View



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



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

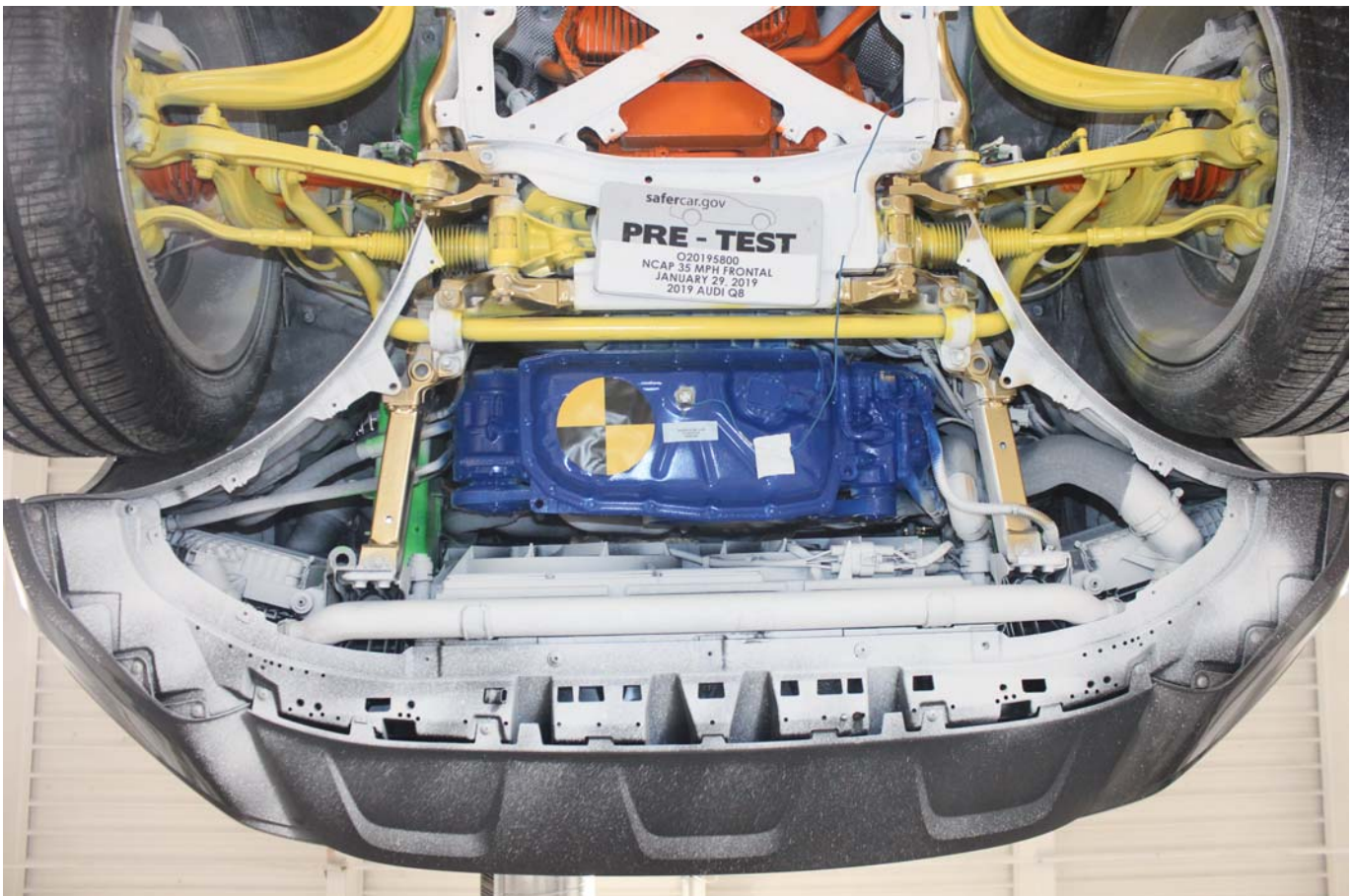


Photo No. 024 - Pre-Test Front Underbody View

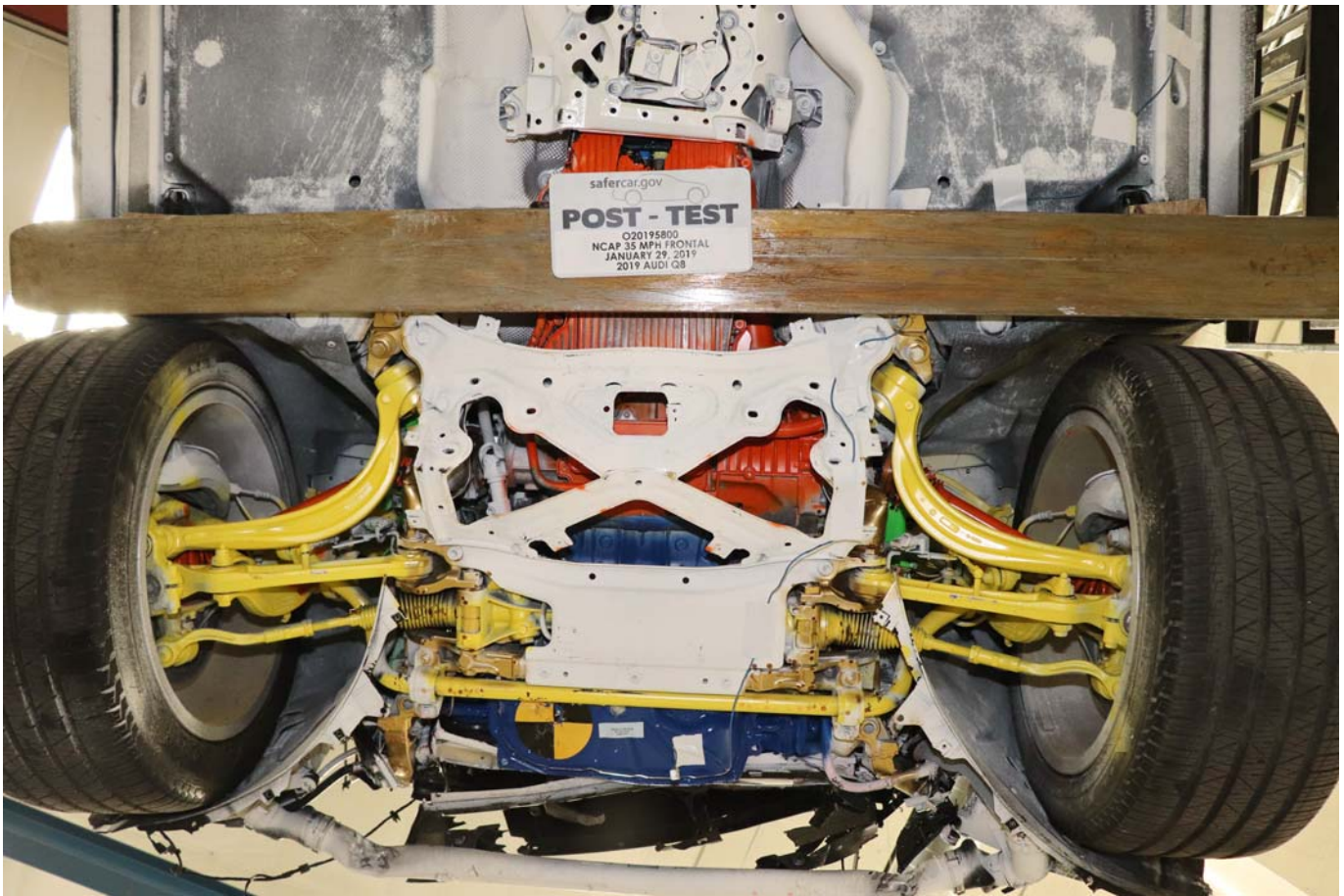


Photo No. 025 - Post-Test Front Underbody View

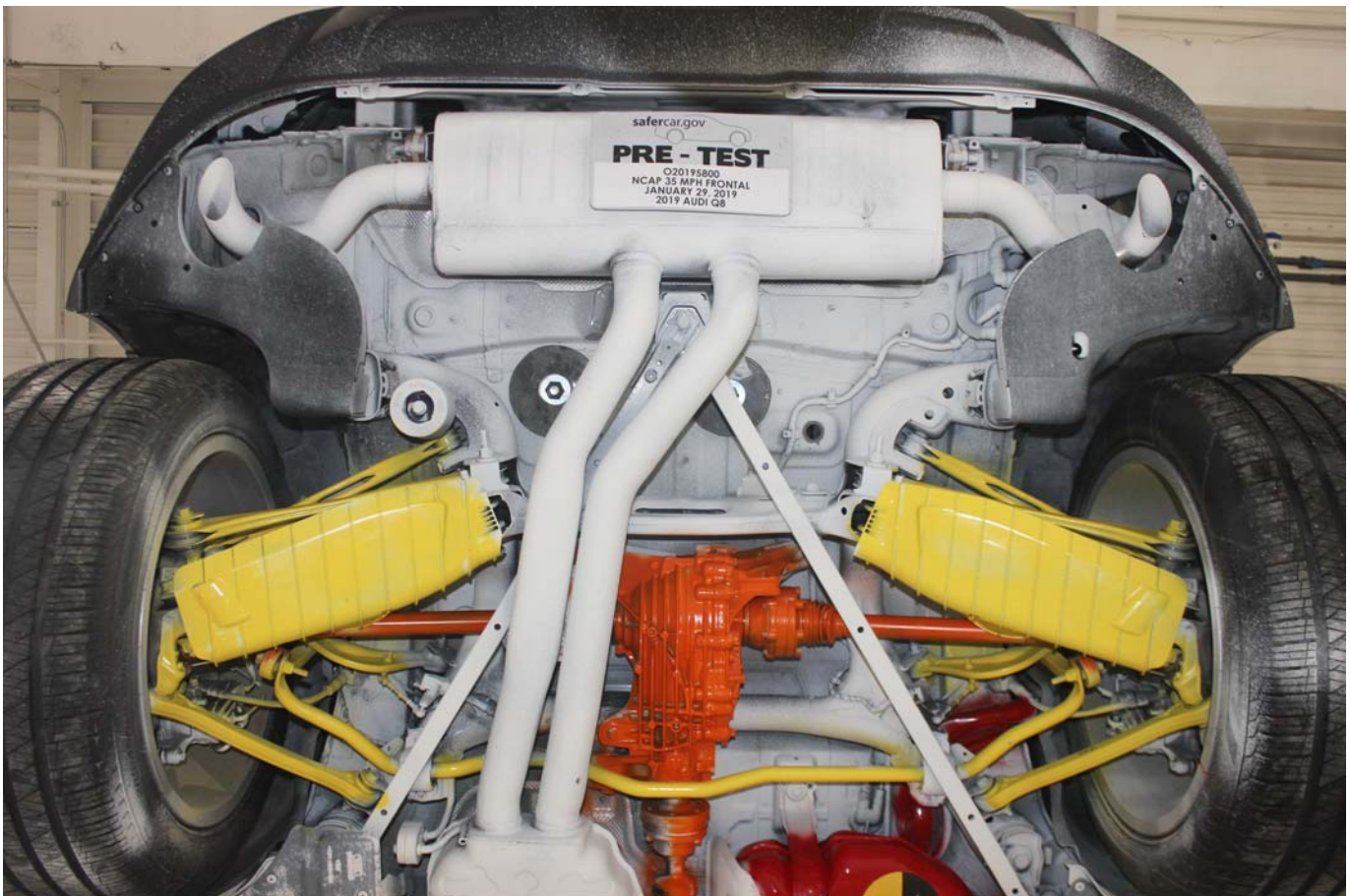


Photo No. 026 - Pre-Test Rear Underbody View

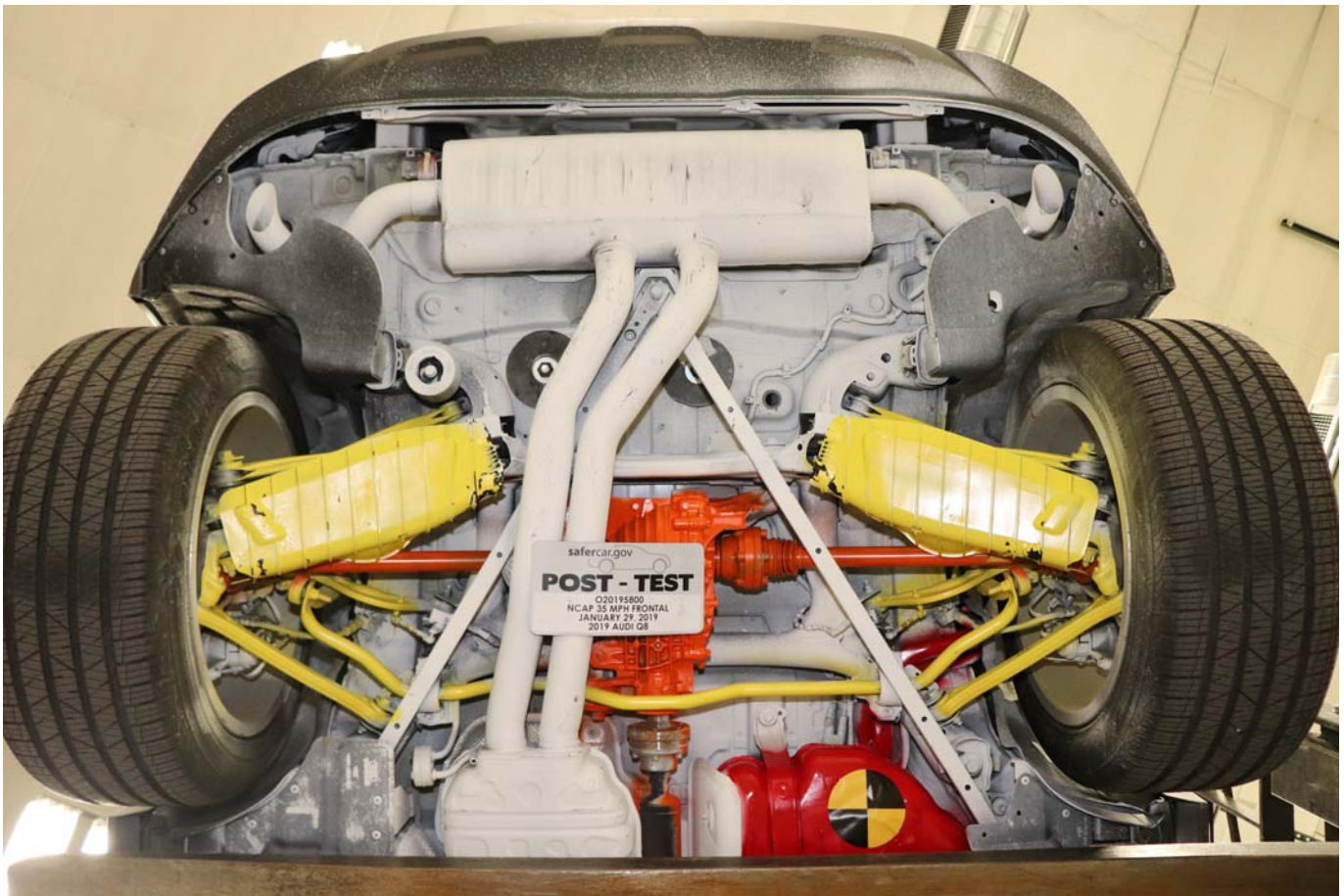


Photo No. 027 - Post-Test Rear Underbody View



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

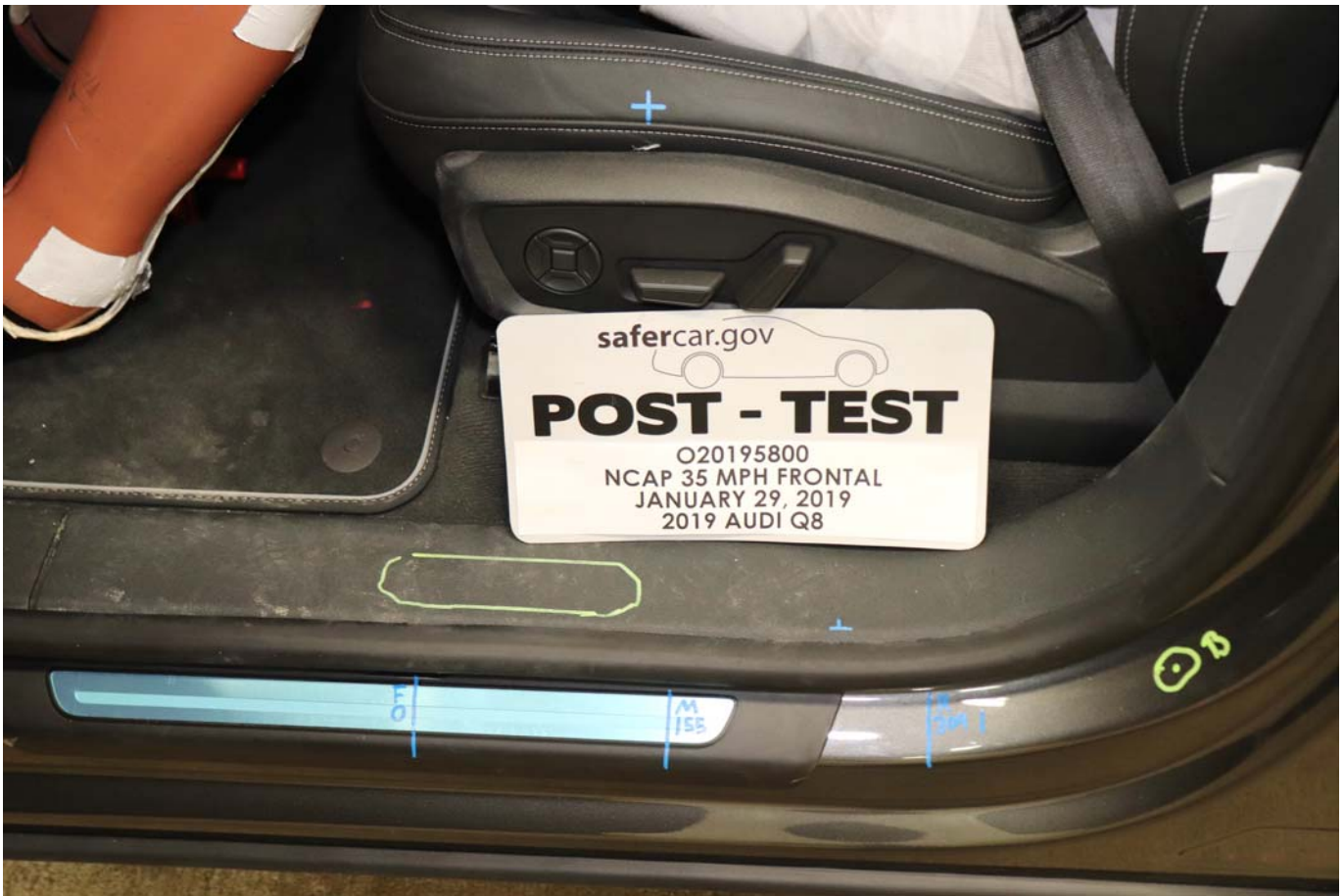


Photo No. 037 - Post-Test Driver Seat Fore-Aft Markings



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

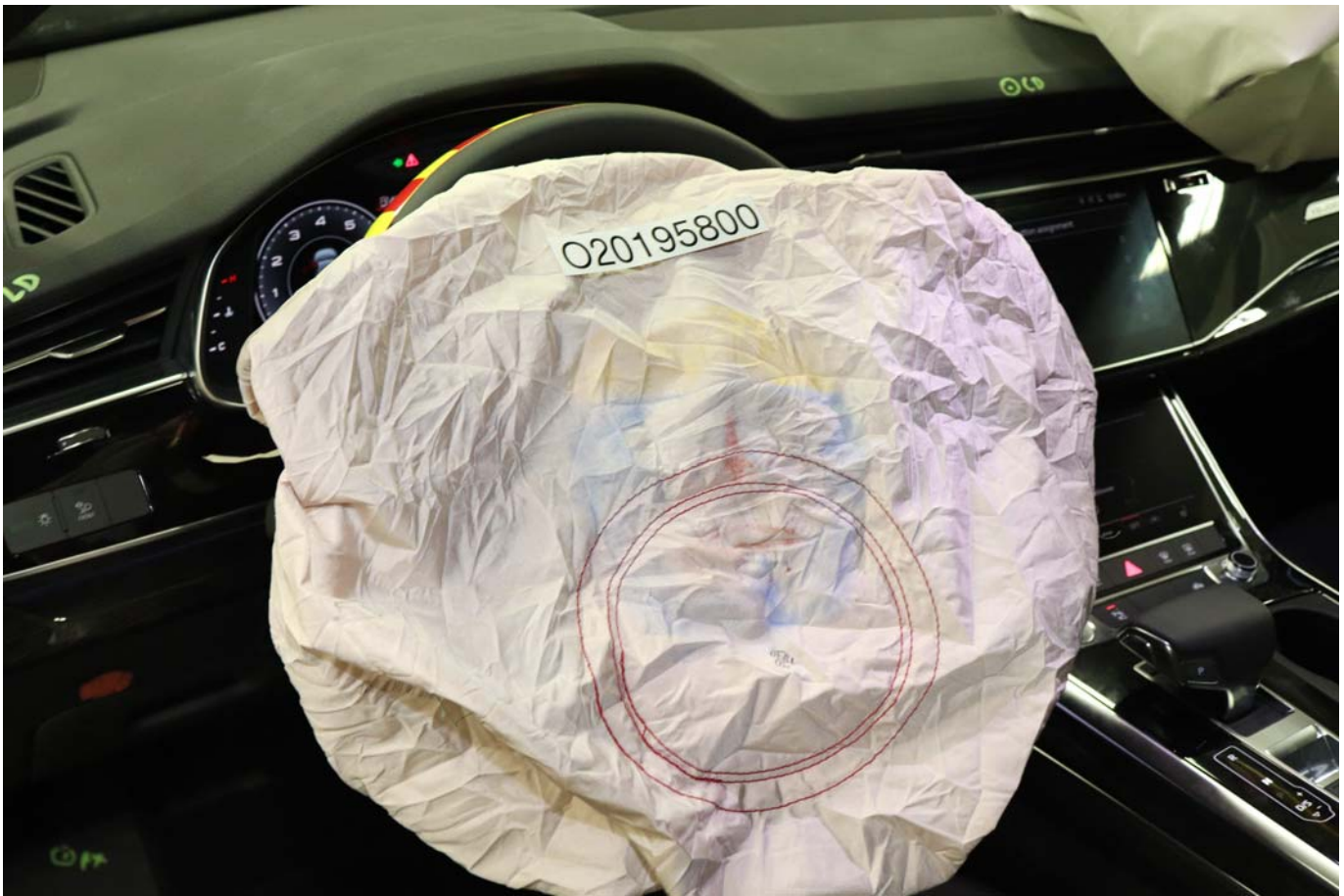


Photo No. 047 - Post-Test Driver Dummy Contact with Airbag



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

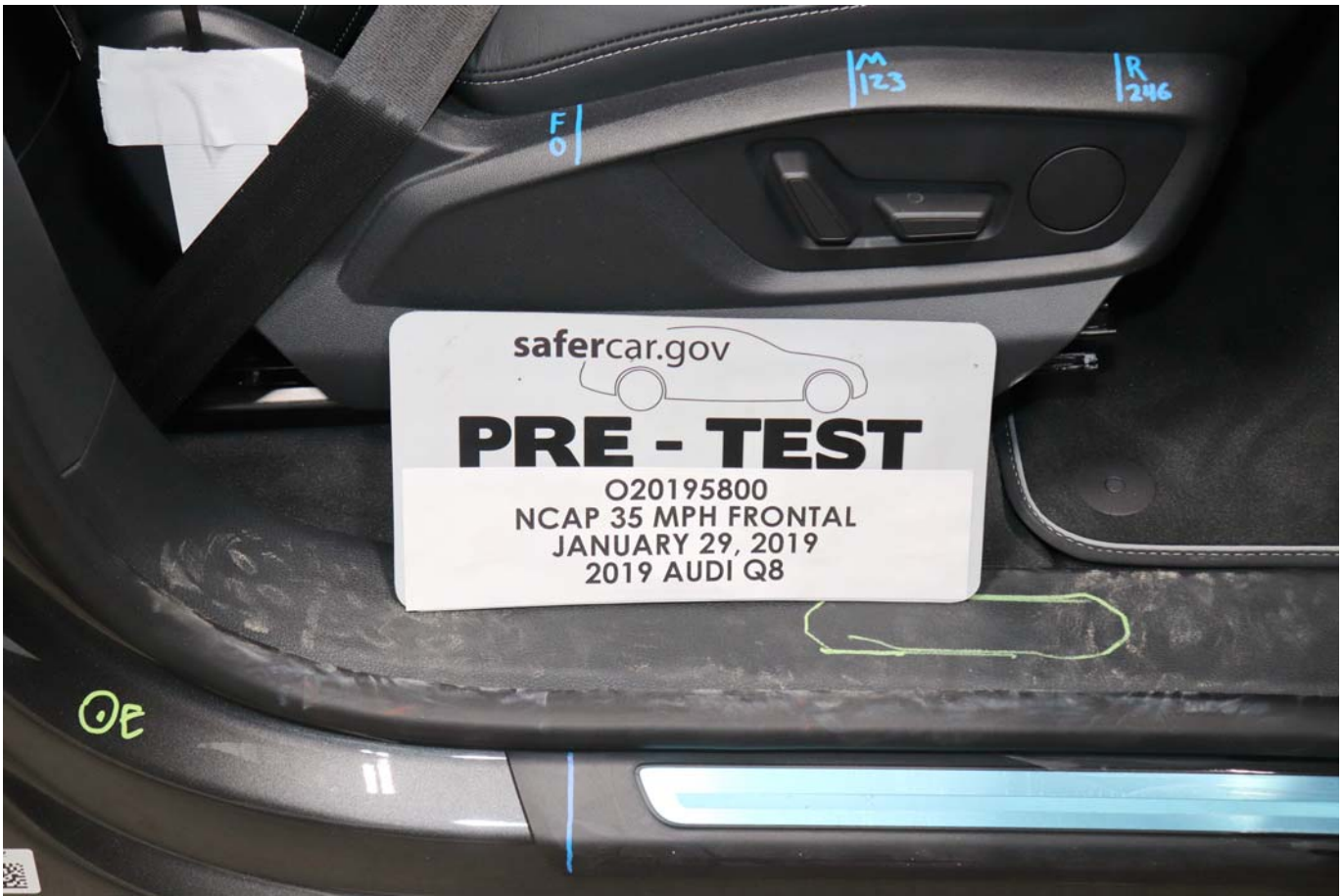


Photo No. 057 - Pre-Test Passenger Seat Fore-Aft Markings

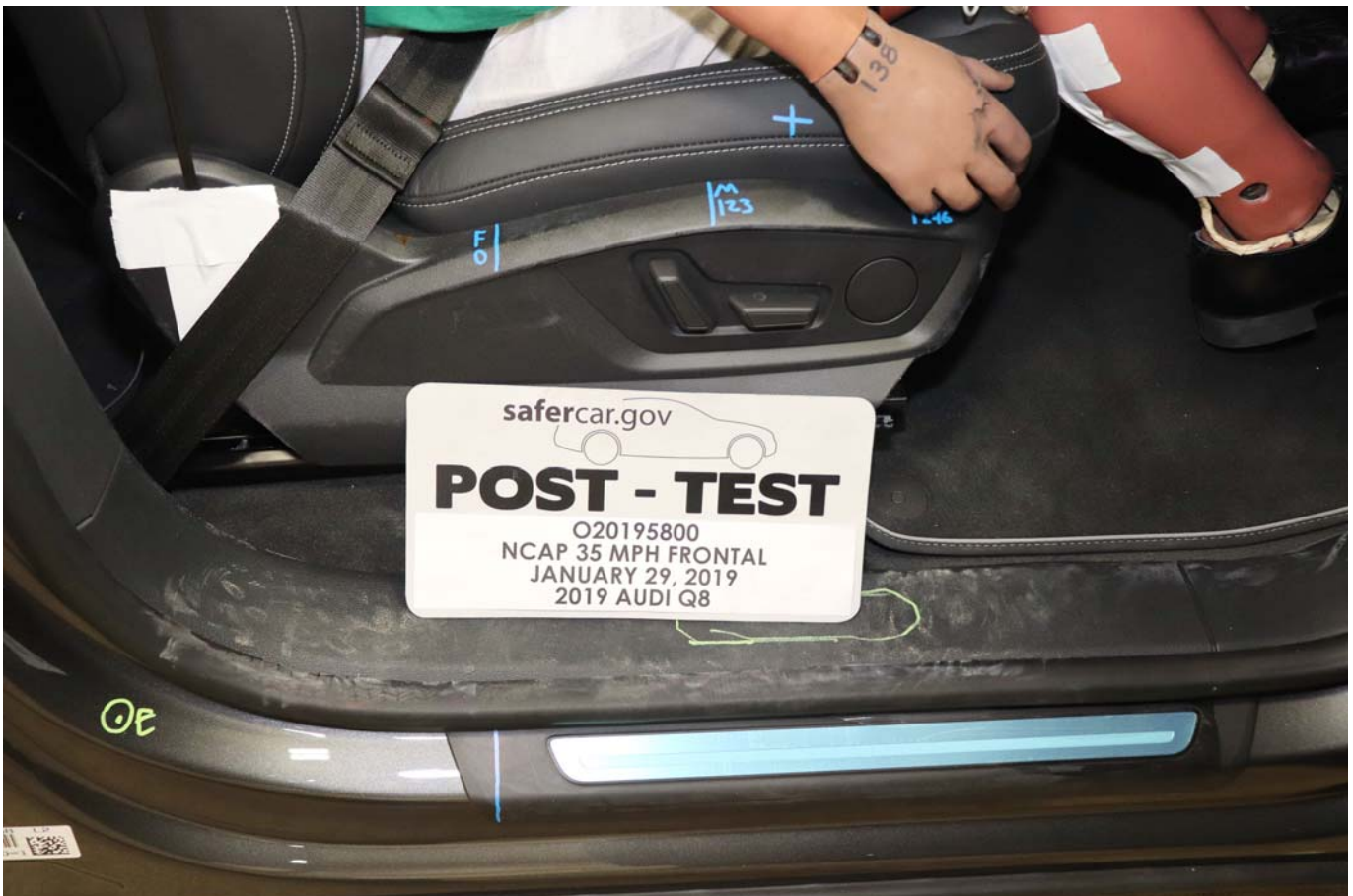


Photo No. 058 - Post-Test Passenger Seat Fore-Aft Markings



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

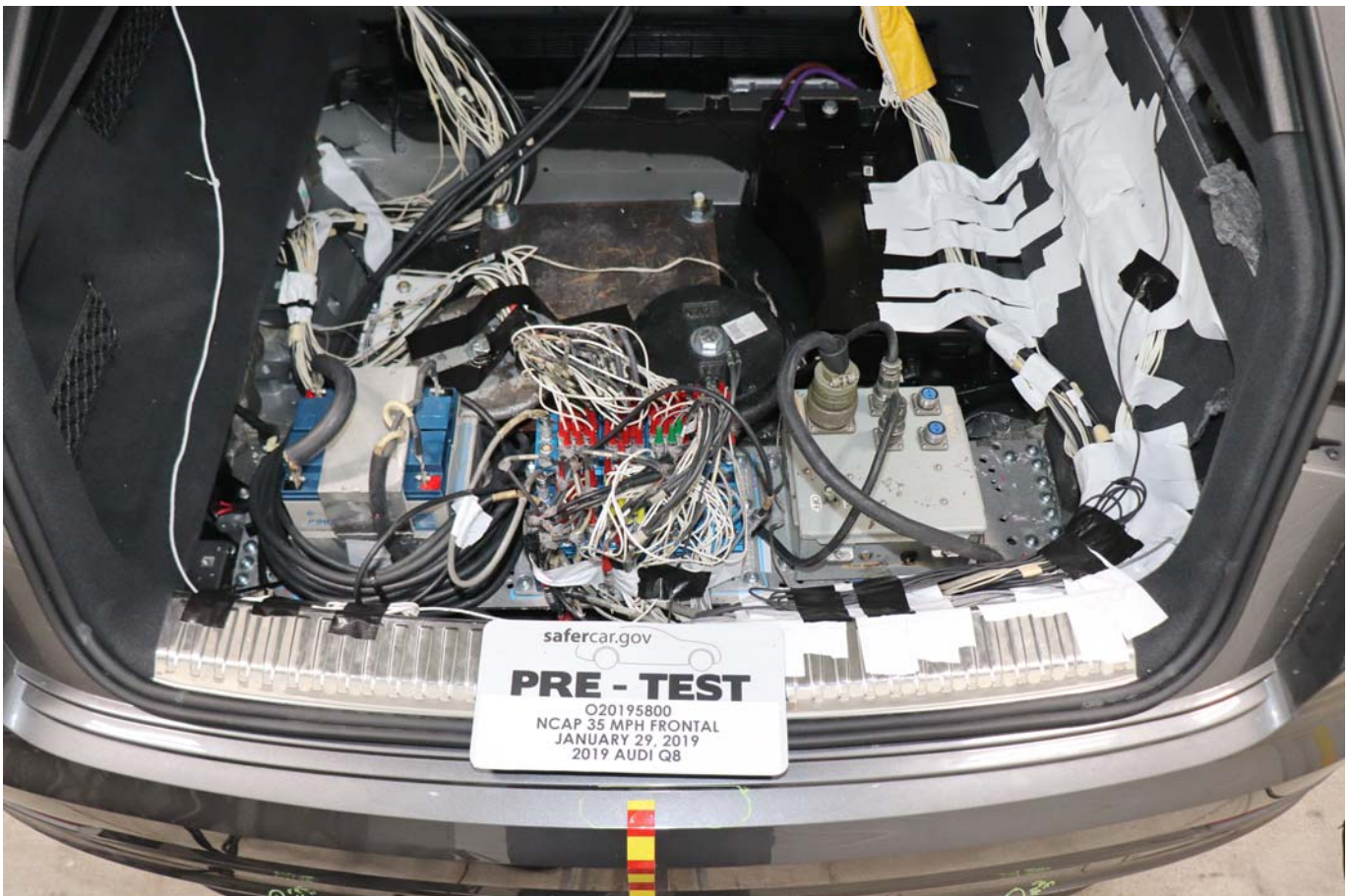


Photo No. 070 - Ballast Installed in Vehicle

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

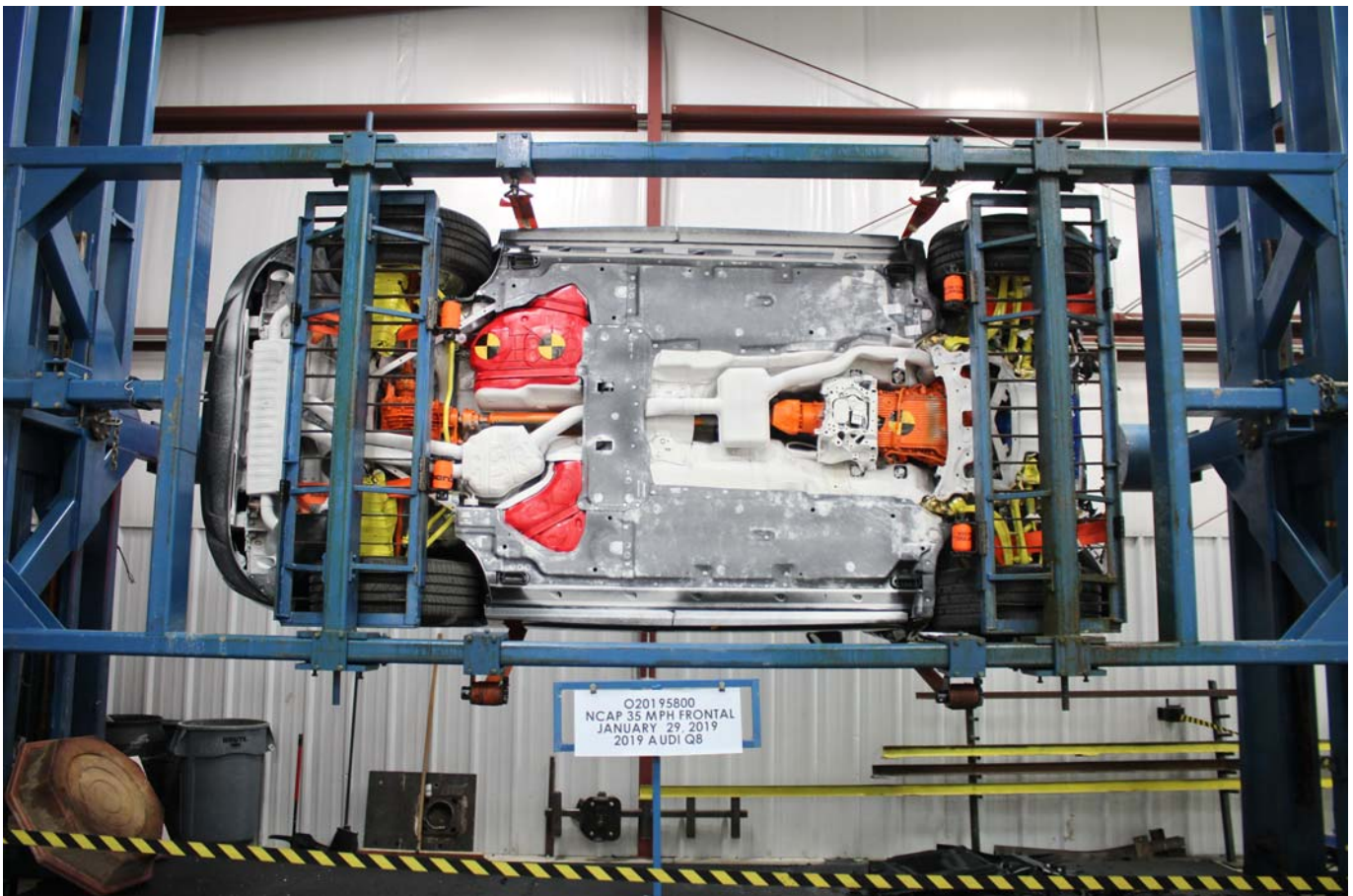


Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device



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



Photo No. 078 - 2019 Audi Q8 Premium Plus 5-Door SUV Frontal Impact Event

2019 Audi Q8 55 TFSI (3.0T) quattro



STANDARD EQUIPMENT (unless replaced by options)

TECHNICAL

- 3.0L TFSI® V6 engine
- 8-speed Tiptronic® transmission
- quattro® all-wheel drive system
- 20" 5-spoke wheels, 275/50 all-season tires

COMFORT/TECHNOLOGY

- Audi advanced key w/ handsfree tailgate (open/close)
- Audi connect® CARE (limited time subscription)
- Audi connect® PRIME & PLUS (6 month trial)
- Audi MMI Navigation plus with MMI touch response
- Audi sound system
- Audi virtual cockpit
- Adaptive damping suspension
- Chrome exterior window surrounds, roof rails and exhaust tips
- Garage door opener (HomeLink®)
- Gray Brown Fine Grain Ash natural wood inlays
- Heated, 8-way power front seats w/ driver memory and 4-way lumbar adjustment
- Heated exterior mirrors, power-folding with memory
- Leather seating surfaces
- LED headlights
- Panoramic sunroof
- Power tailgate
- Power adjustable tilting & telescoping steering column
- Preparation for mobile phone (Bluetooth®)
- SiriusXM® All Access service (w/ 3-month trial subscription)
- Sliding 40/20/40 split-folding 2nd row with adjustable recline
- Three-zone automatic climate control
- USB Audi music interface, AM/FM/HD radio
- 3-spoke multifunction steering wheel, Q design w/ shift paddles

SAFETY/CONVENIENCE

- Advanced Airbag Protection System with 6 airbags
- Anti-lock Braking System (ABS) w/ Brake Assist
- Audi pre sense basic (preventative occupant protection)
- Audi pre sense front (low speed collision assist)
- Child safety locks in rear doors, power
- Electronic Stabilization Control (ESC) w/ Offroad mode
- Electronic vehicle immobilization w/ anti-theft alarm
- LED Daytime Running Lights (DRLs)
- LED taillights w/ dynamic turn signals
- Lower Anchors and Tethers for Children (LATCH)
- Rearview camera
- Tire Pressure Monitoring System (TPMS)

WARRANTY/MAINTENANCE

- 4 Year/50,000 mile (whichever occurs first) New Vehicle Limited Warranty*
 - 12 Year Limited Warranty Against Corrosion Perforation
 - 1 Year/10,000 mile (whichever occurs first) First Scheduled Maintenance Service FREE OF CHARGE
 - 4 Years Roadside Assistance coverage provided by a third party supplier
- *Please refer to the 2019 Audi Warranty and Maintenance Booklet for complete coverage information.

MANUFACTURER'S SUGGESTED RETAIL PRICE

2019 Audi Q8 55 TFSI (3.0T) quattro **\$67,400.00**

PACKAGES / OPTIONS

Samurai Gray metallic	\$595.00
Black interior	Included
21" 5-W-spoke design wheels, all-season tires	\$1,000.00
Convenience package	\$850.00
Audi phone box with wireless charging and antenna booster	
Audi side assist, rear cross traffic, vehicle exit warning	
Audi pre sense rear	
Heated, auto-dim, power-fold exterior mirrors w/memory	
Audi Beam - Rings	\$450.00
Apple® Lightning® and USB Type-C cables	\$110.00
First Aid Kit	\$50.00
Black cloth headliner	Included
Gray Oak wood inlays	Included
Destination Charge	\$995.00

Total Price: \$71,450.00

Fuel, license, title fees, taxes and dealer-installed accessories are not included.

MODEL: 4MN5X2

VIN: WA1AVAF19KD010530

DEALER: 422A25
AUDI WEST COVINA
2016 E GARVEY AVE S
WEST COVINA, CA 91791
Port of Entry: SAN DIEGO

SHIP TO: 422A25
AUDI WEST COVINA
2016 E GARVEY AVE S
WEST COVINA, CA 91791
COMM NUM: TG3498
Transportation Method: TRUCK

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated

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	Not Rated
----------------------	-------------------------	------------------

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	Not Rated
-------------------	-----------------------------	------------------

Based on the risk of injury in a side impact.

Rollover	Not Rated
-----------------	------------------

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 or 1-888-327-4236

EPA DOT Fuel Economy and Environment Gasoline Vehicle

Fuel Economy

19 MPG
combined city/hwy

17 city 22 highway

5.3 gallons per 100 miles

Standard Sport Utility Vehicles range from 11 to 93 MPG. The best vehicle rates 136 MPG.

You spend \$4,750
more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$2,350

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

1 3 10 Best

Smog Rating (tailpipe only)

1 3 10 Best

This vehicle emits 474 grams of CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The 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 \$3.00 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:	FOR THIS VEHICLE:
U.S./CANADIAN PARTS CONTENT:	1% FINAL ASSEMBLY POINT: BRATISLAVA, SLOVAKIA
MAJOR SOURCES OF FOREIGN PARTS CONTENT:	COUNTRY OF ORIGIN: HUNGARY
SLOVAKIA: 39%	TRANSMISSION: GERMANY
GERMANY: 27%	

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

Photo No. 079 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
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Figure No. 8.	Driver Chest Z Acceleration vs. Time	B-3
Figure No. 9.	Driver Chest Resultant Acceleration vs. Time	B-3
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Figure No. 27.	Passenger Chest Resultant Z Acceleration vs. Time	B-9

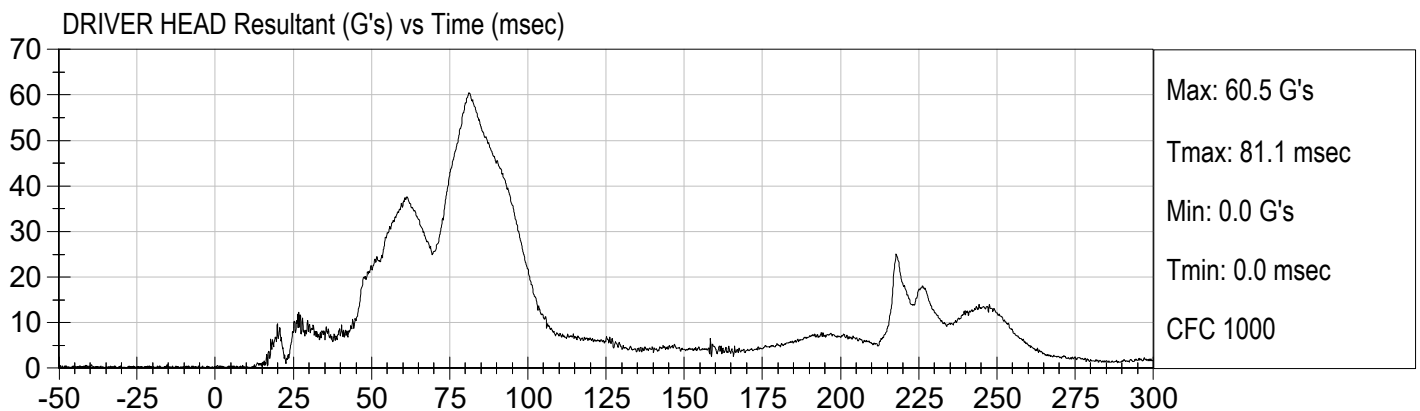
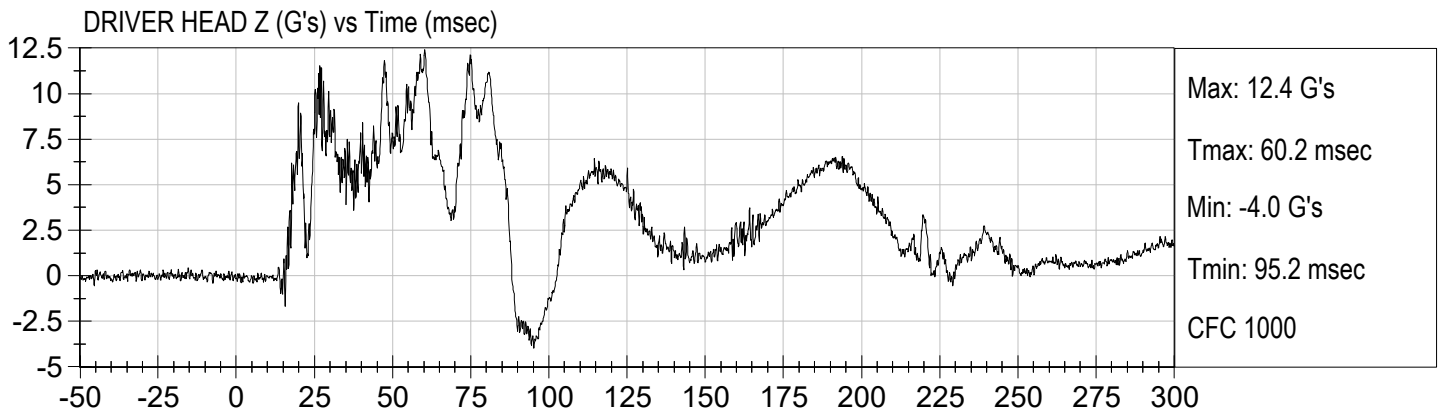
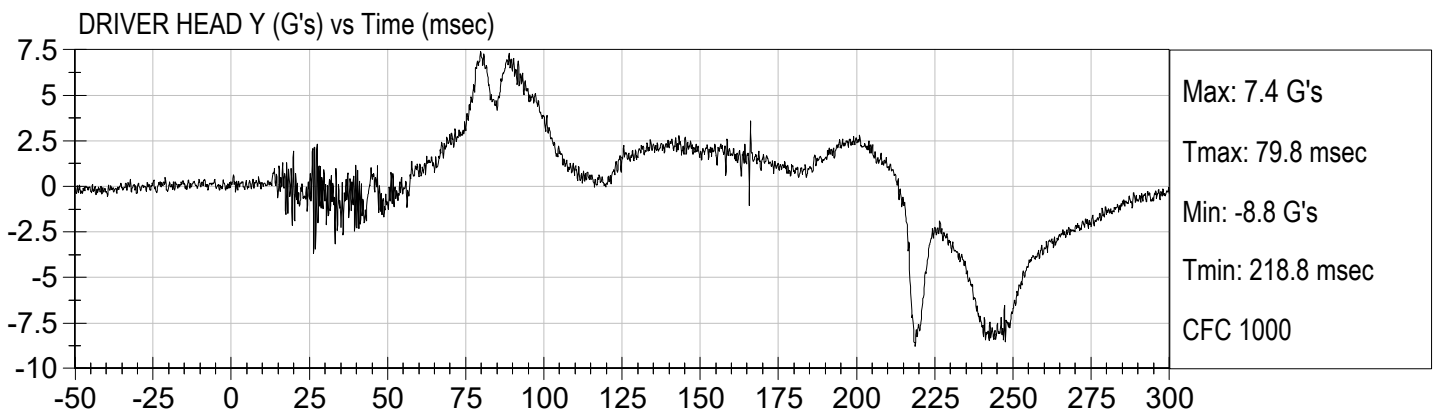
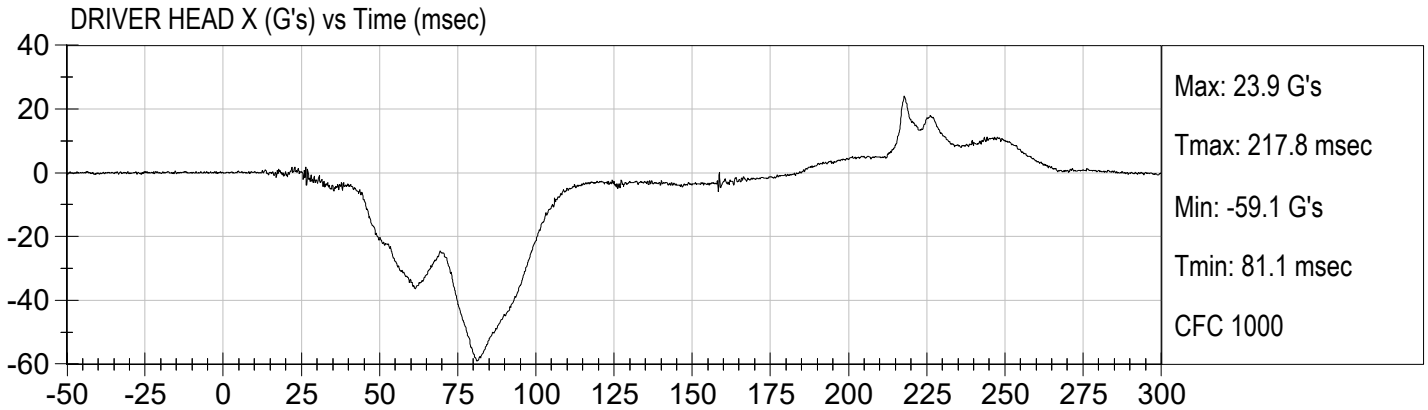
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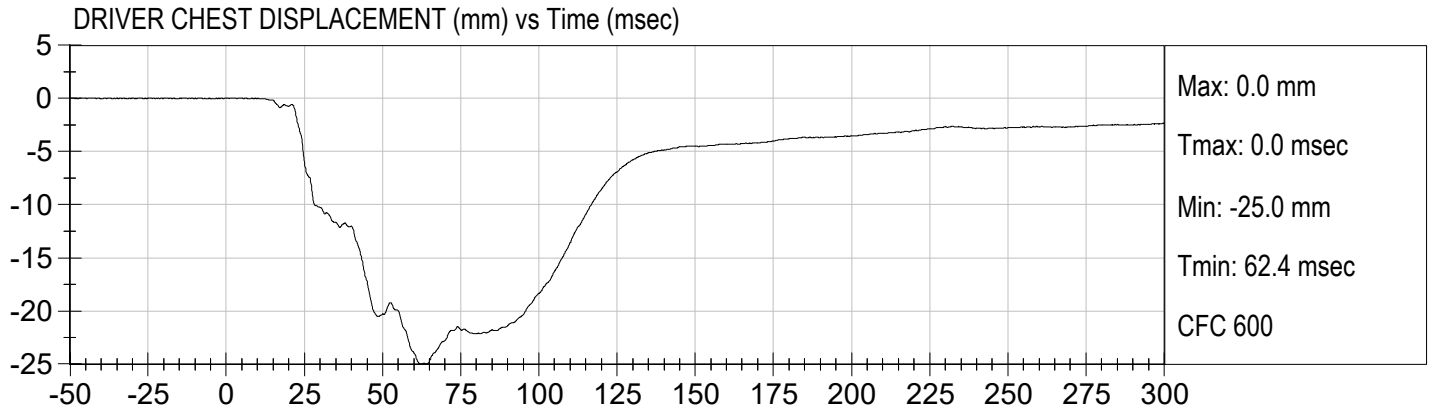
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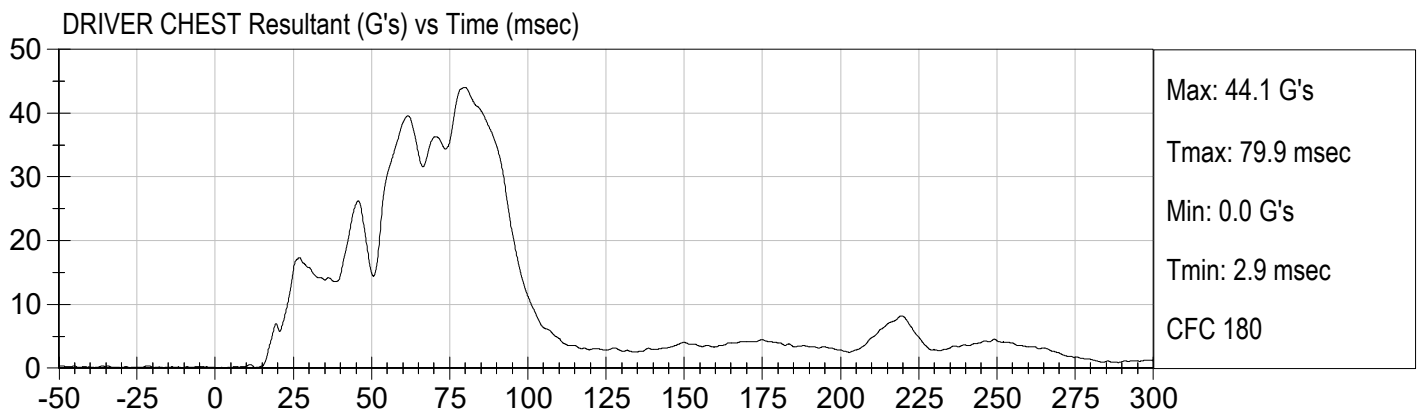
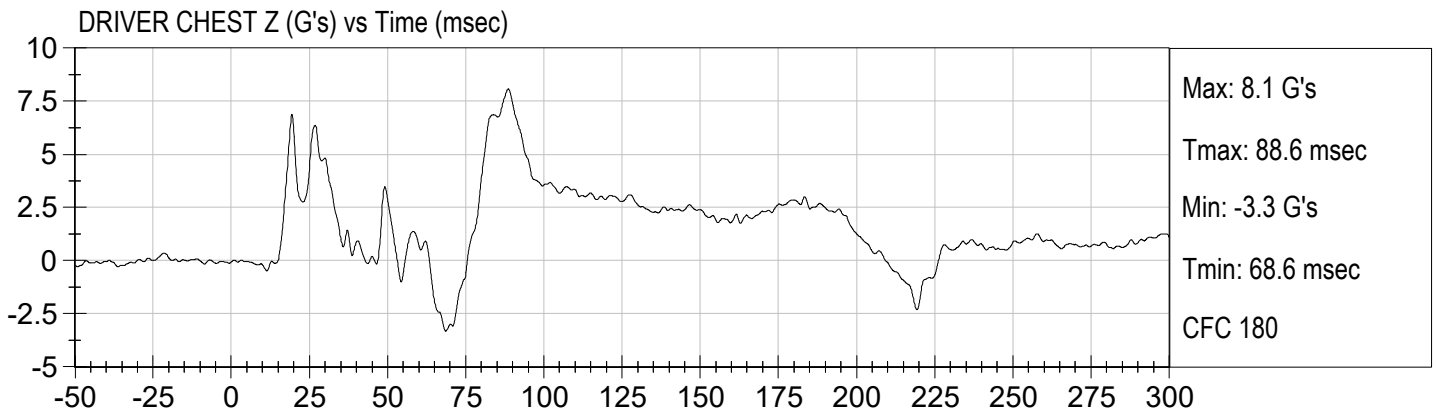
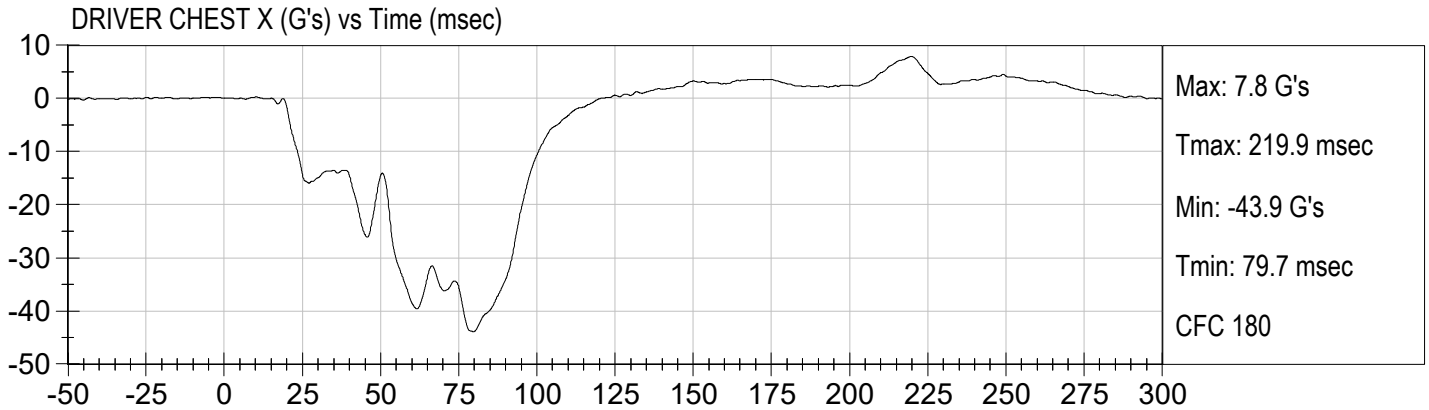
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 Driver Head Angular Velocity X
 Driver Head Angular Velocity Y
 Driver Head Angular Velocity Z
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 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant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

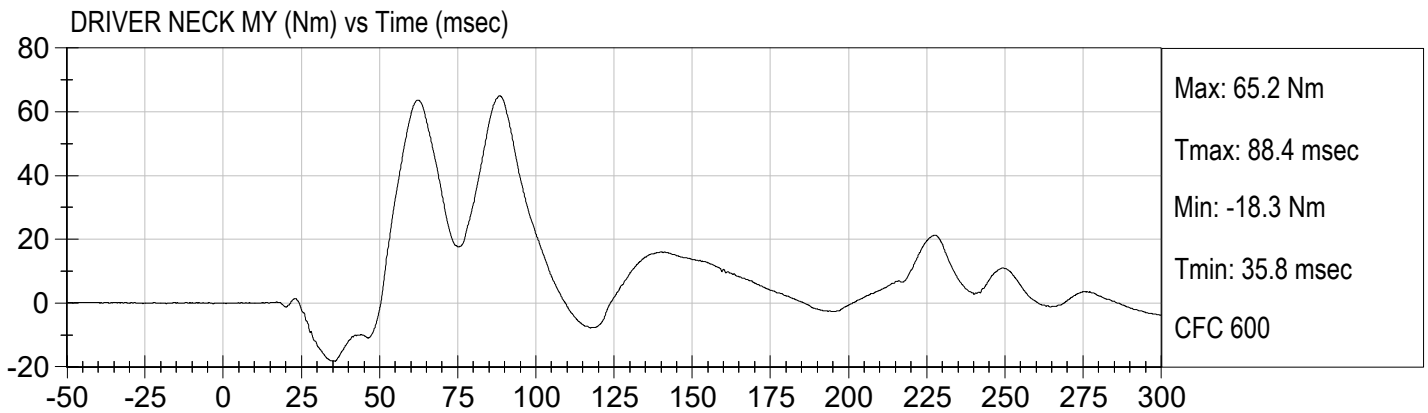
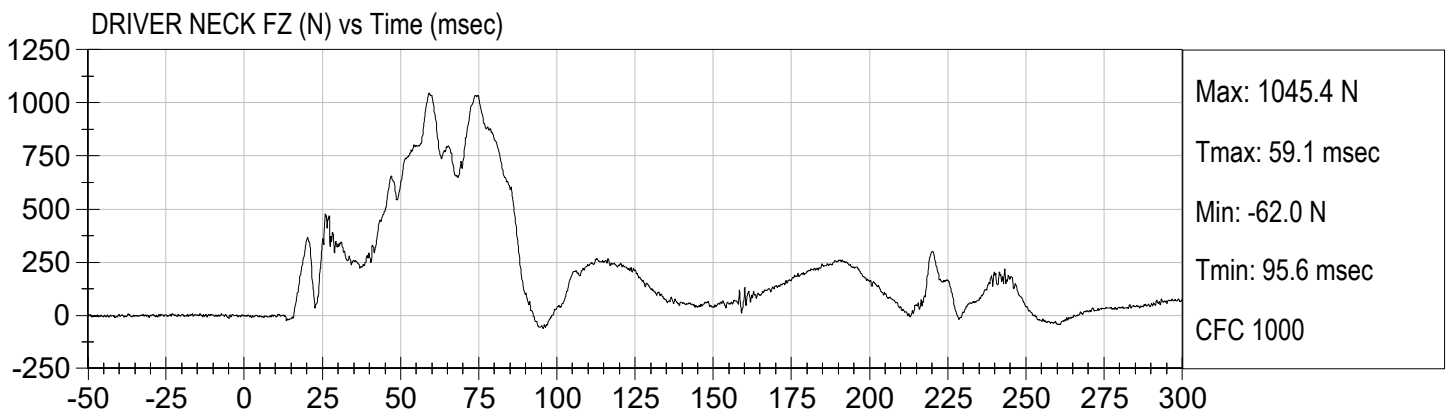
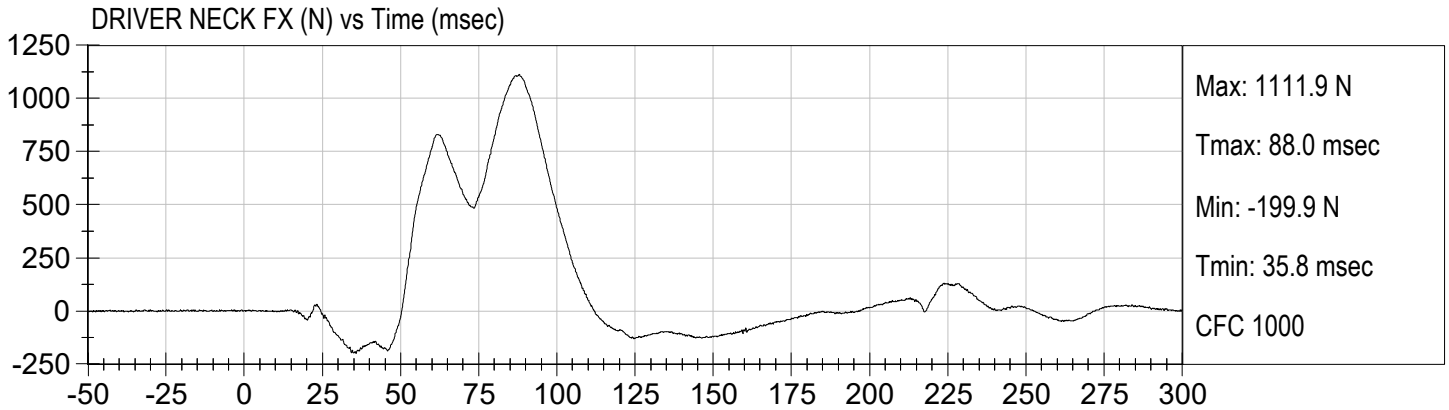
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Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
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Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Lap Belt Force
Driver Shoulder Belt Force
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z Redundant
Passenger Pelvis X
Passenger Pelvis Y

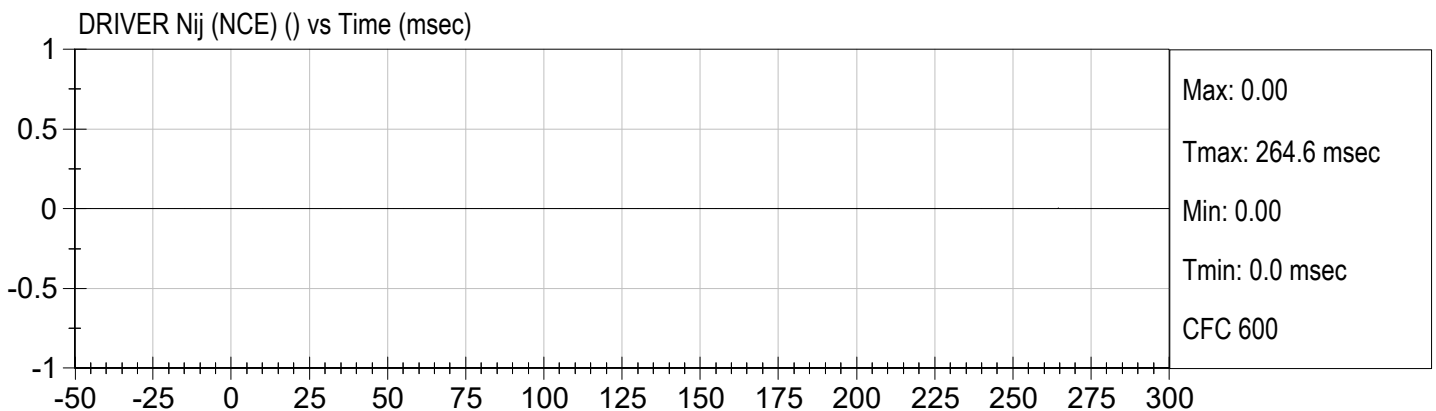
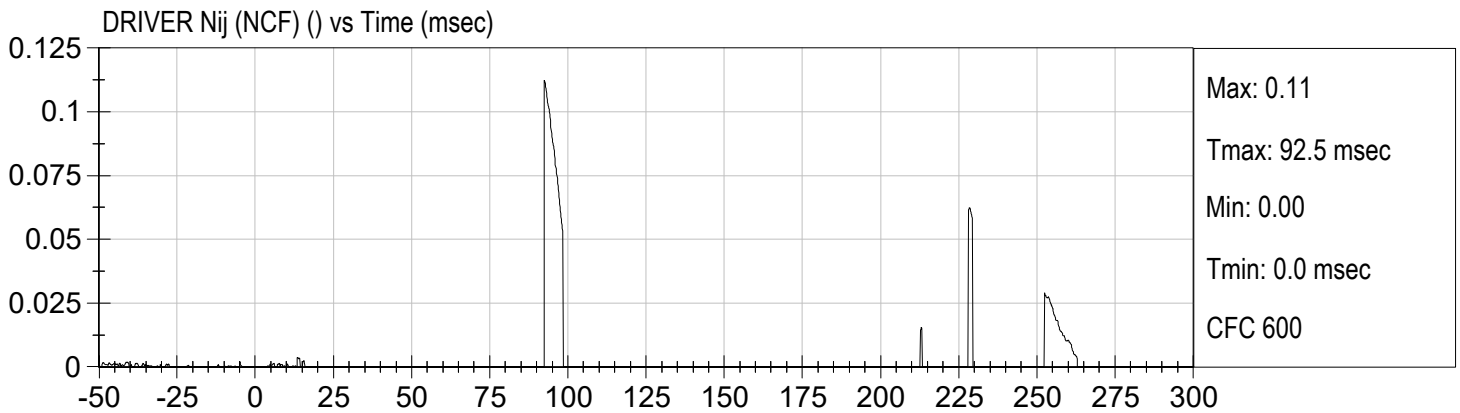
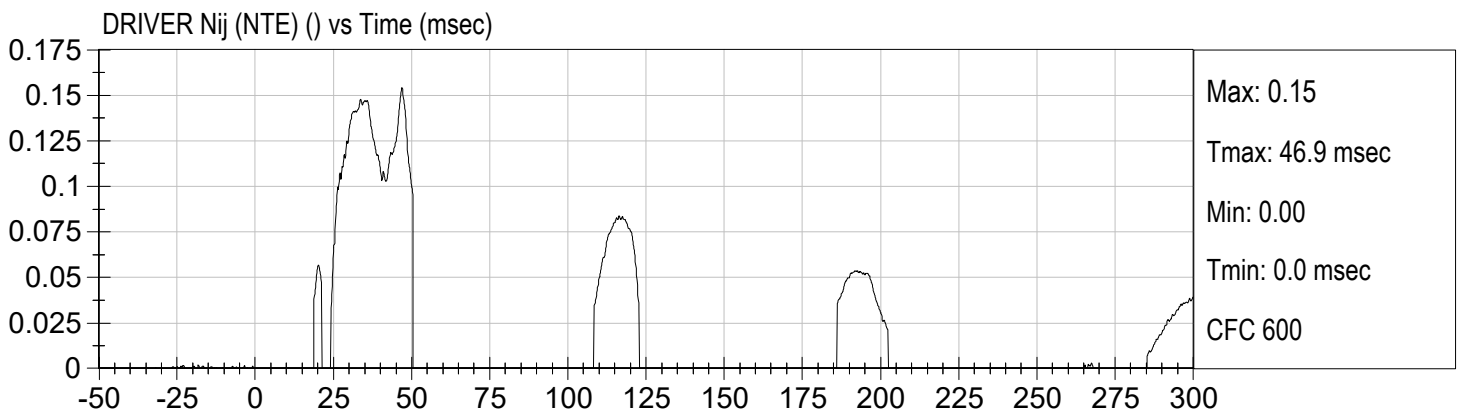
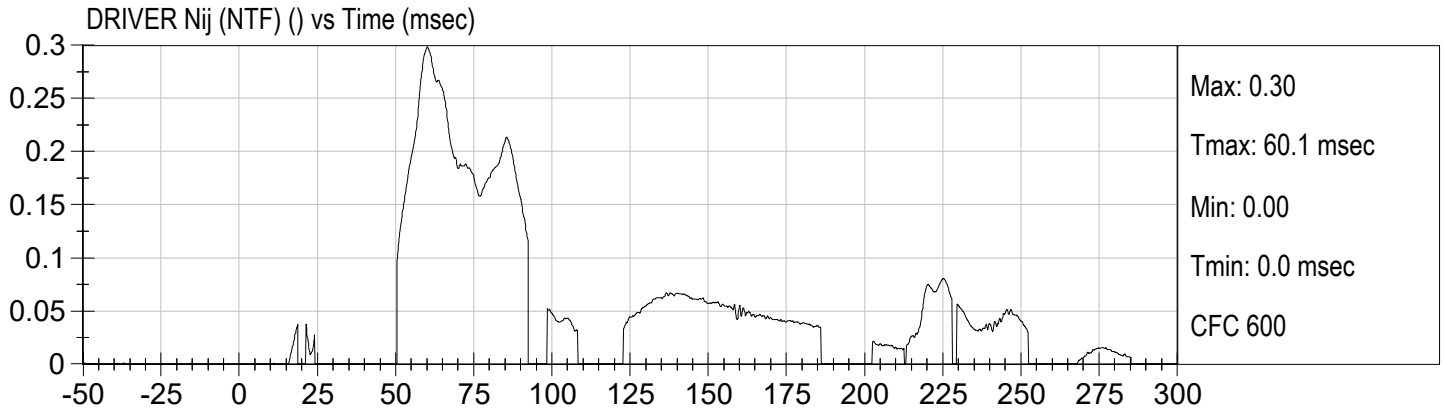
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Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Lap Belt Force
Passenger Shoulder Belt Force
Left Rear Seat Crossmember X
Right Rear Seat Crossmember X
Vehicle Engine Top X
Vehicle Engine Bottom X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr
Advanced Research Load Cell Barrier – 528 channels

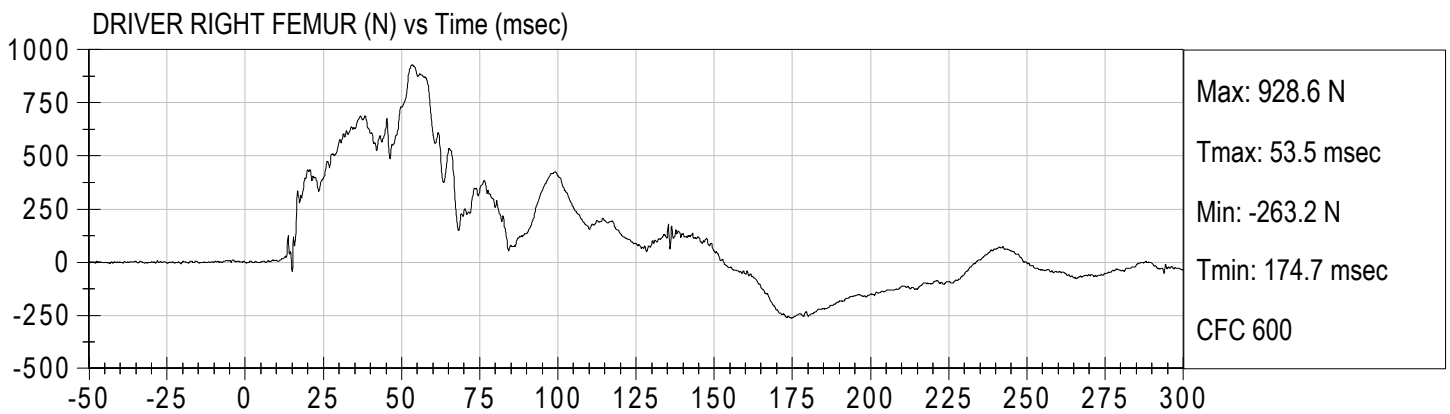
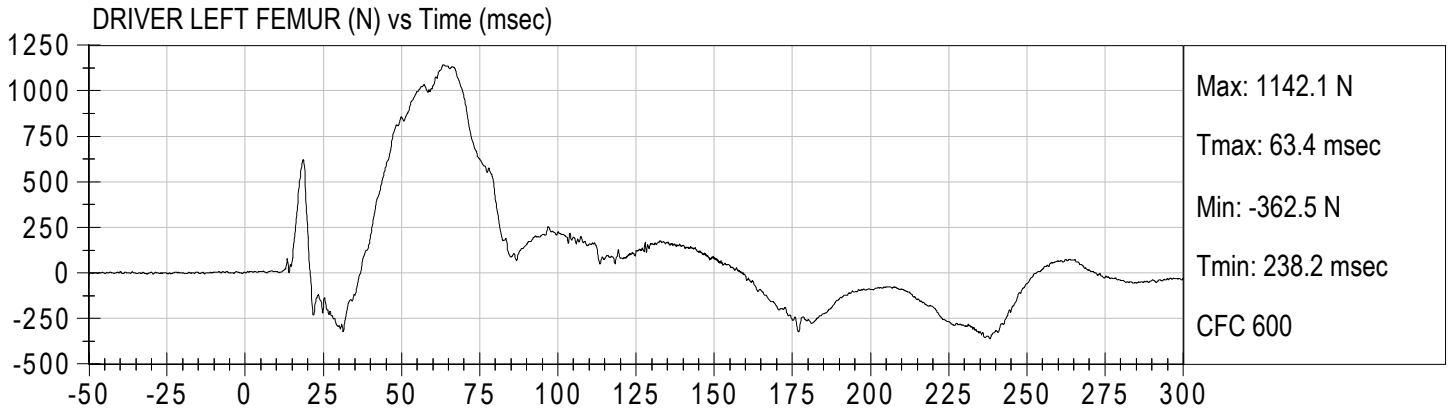


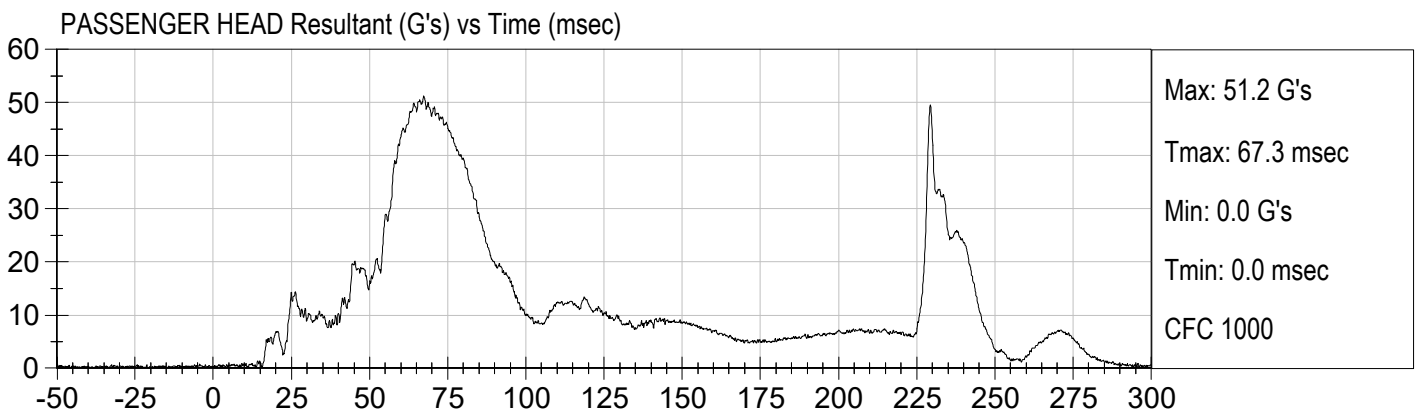
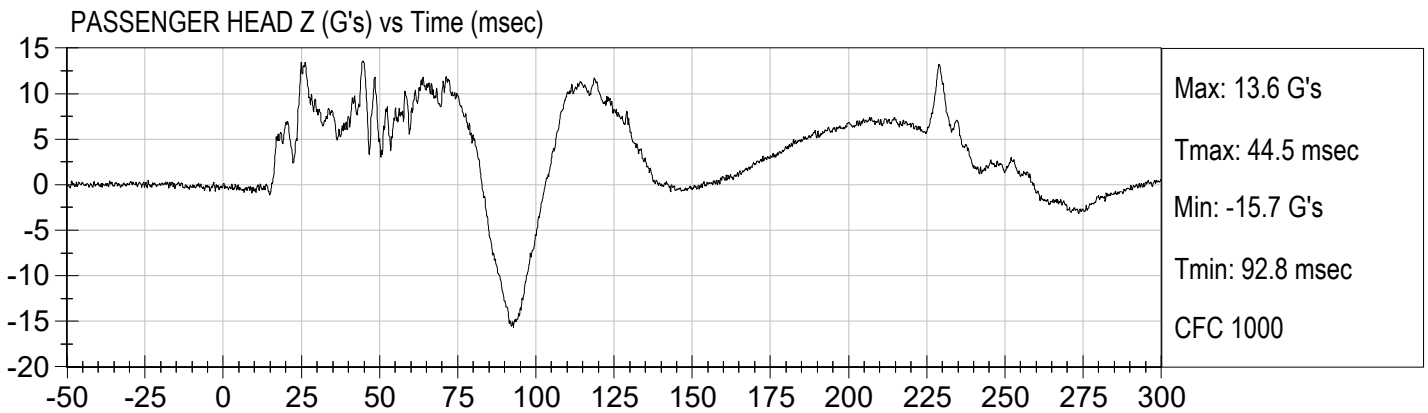
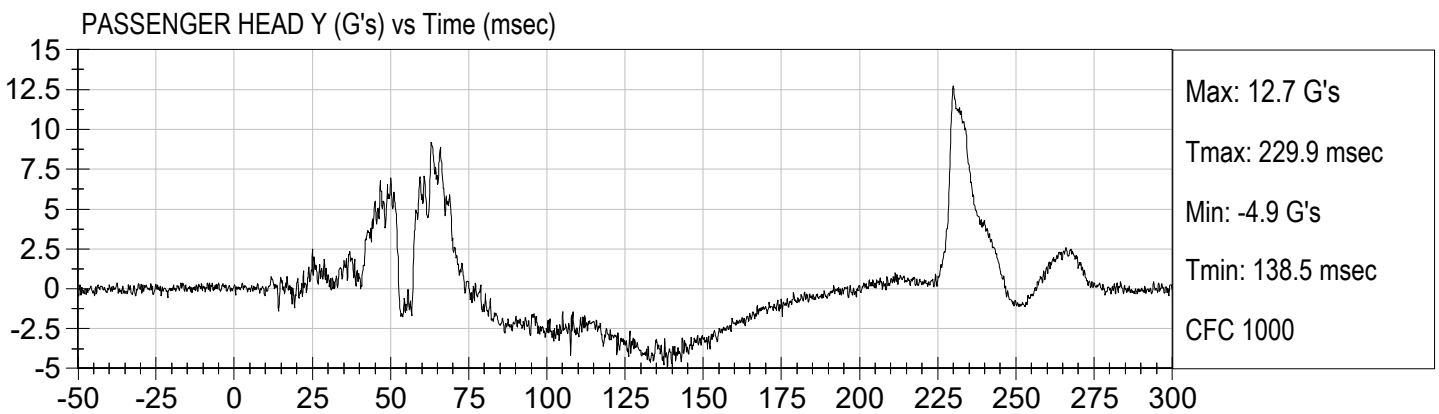
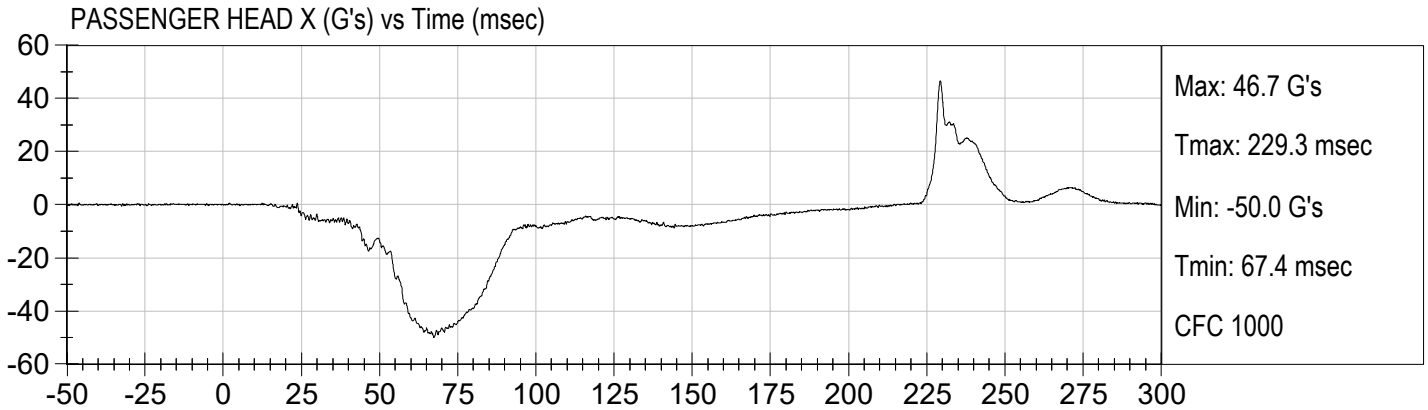


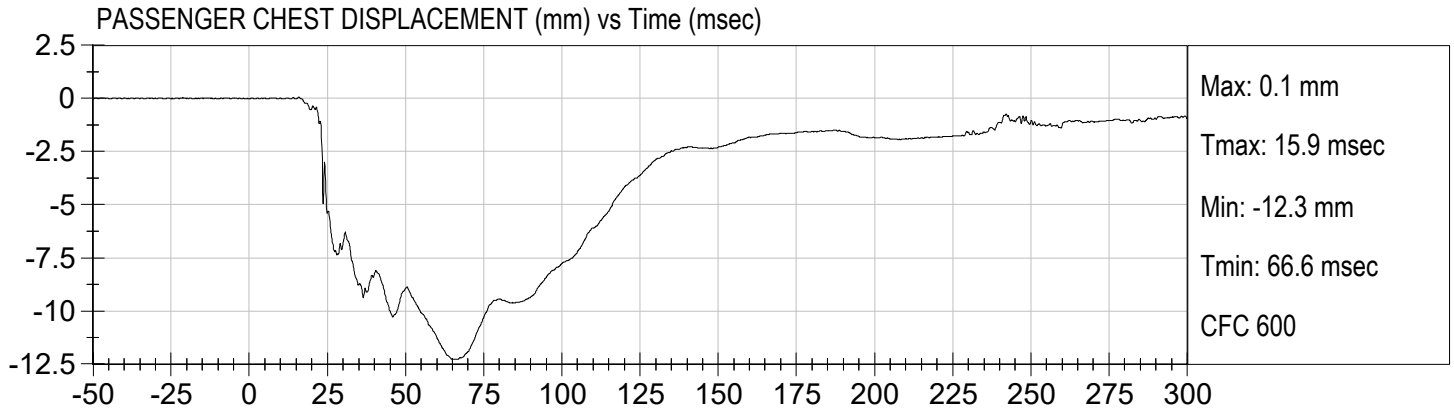


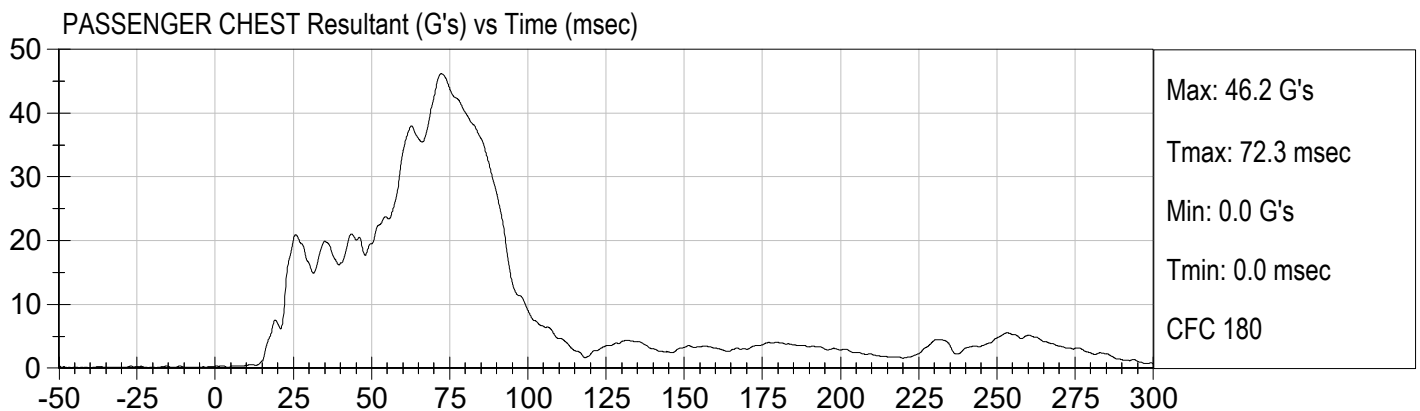
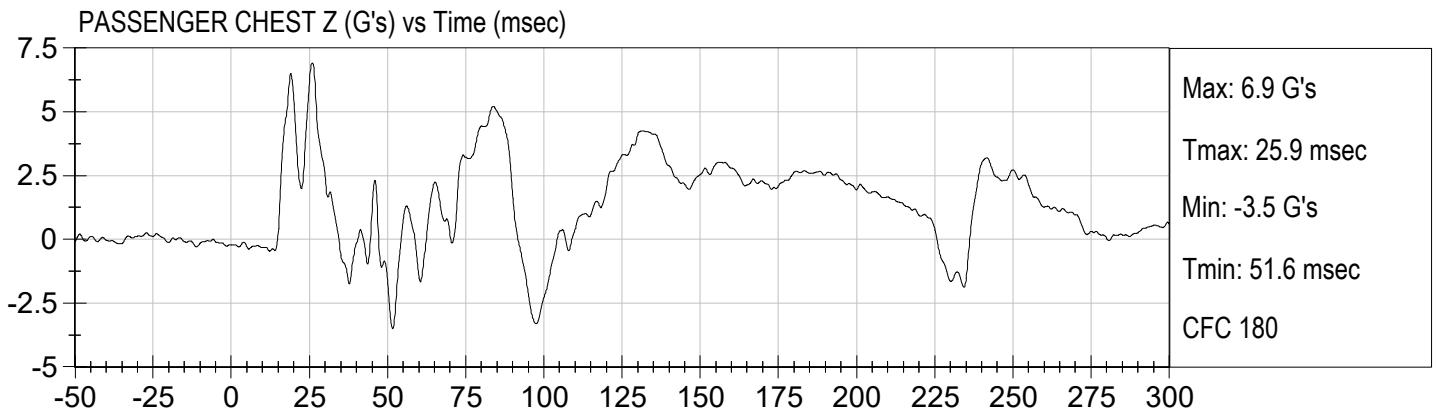
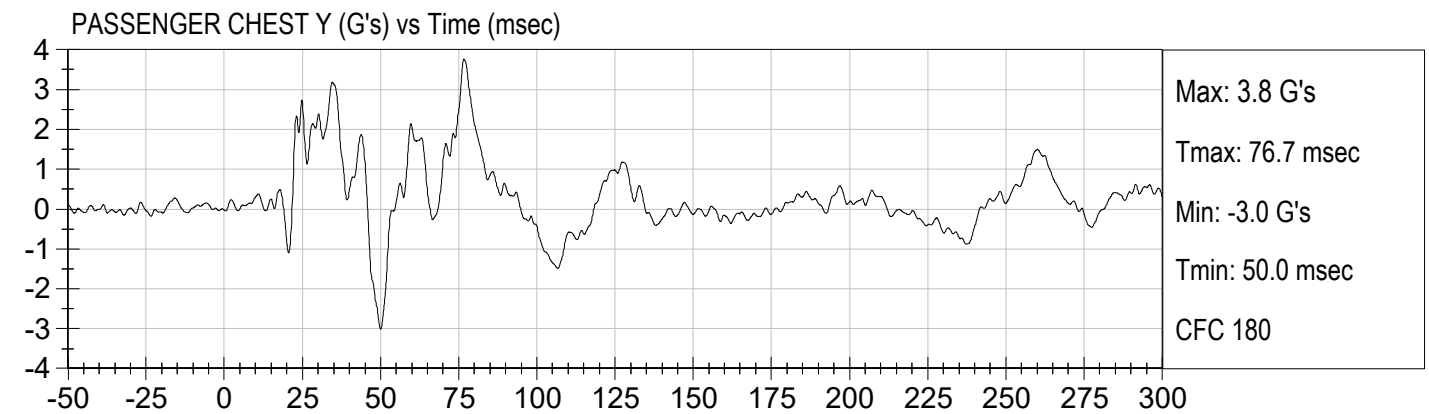
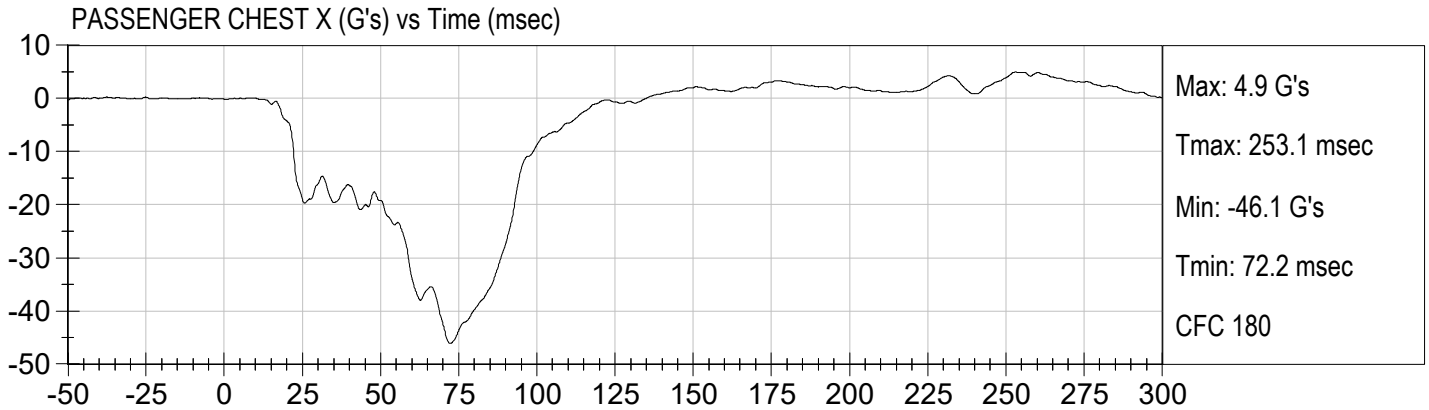


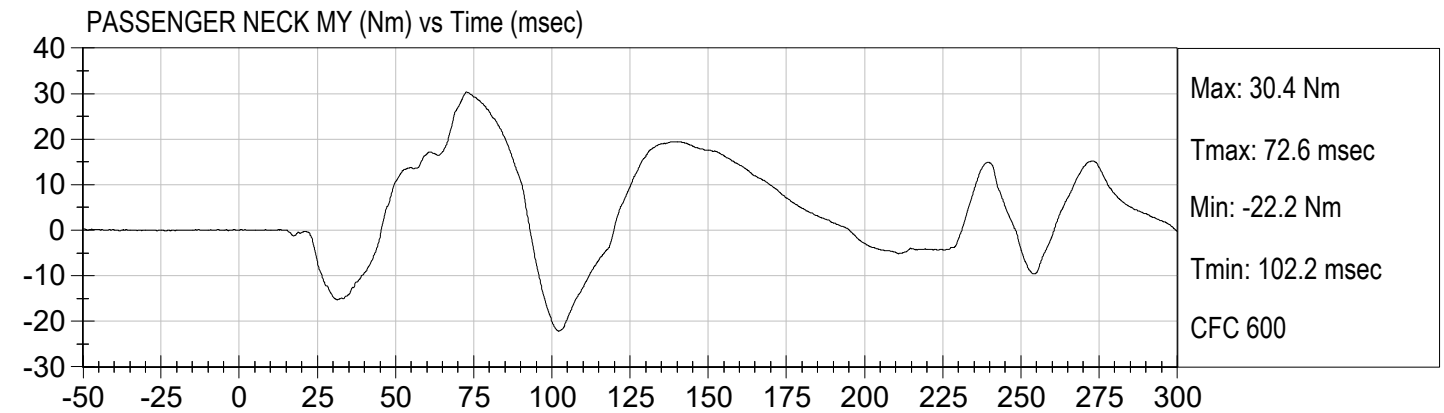
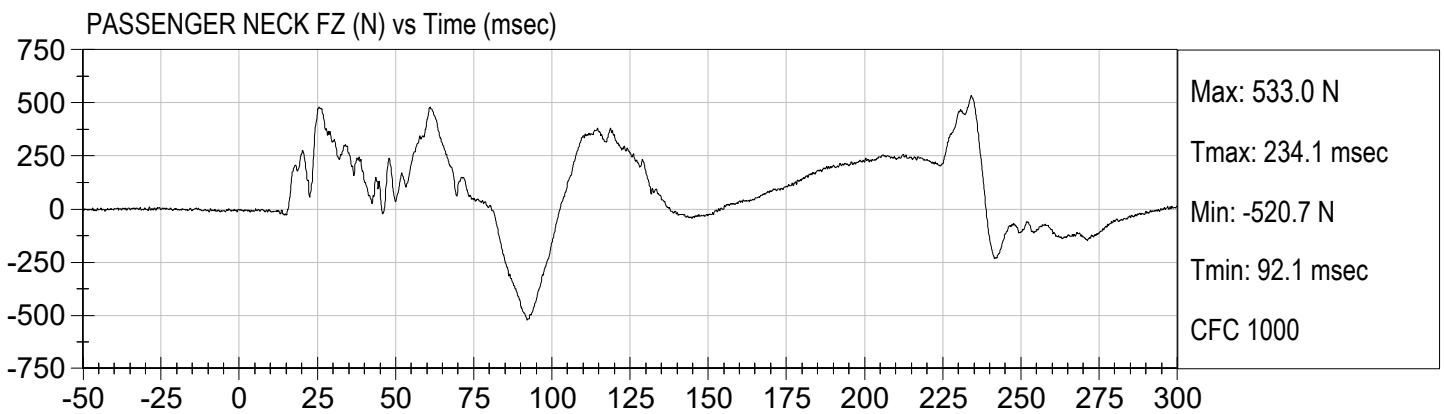
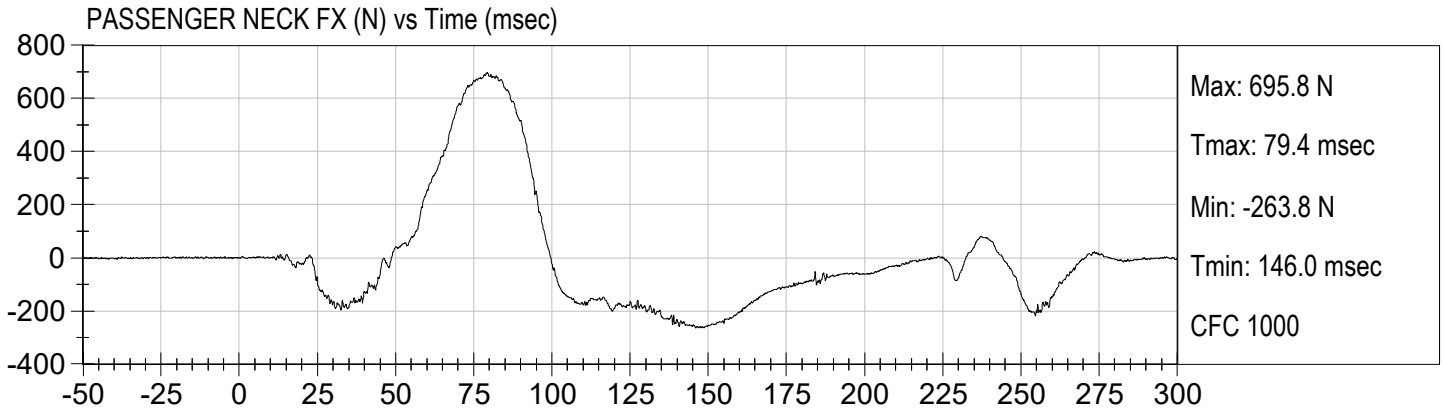


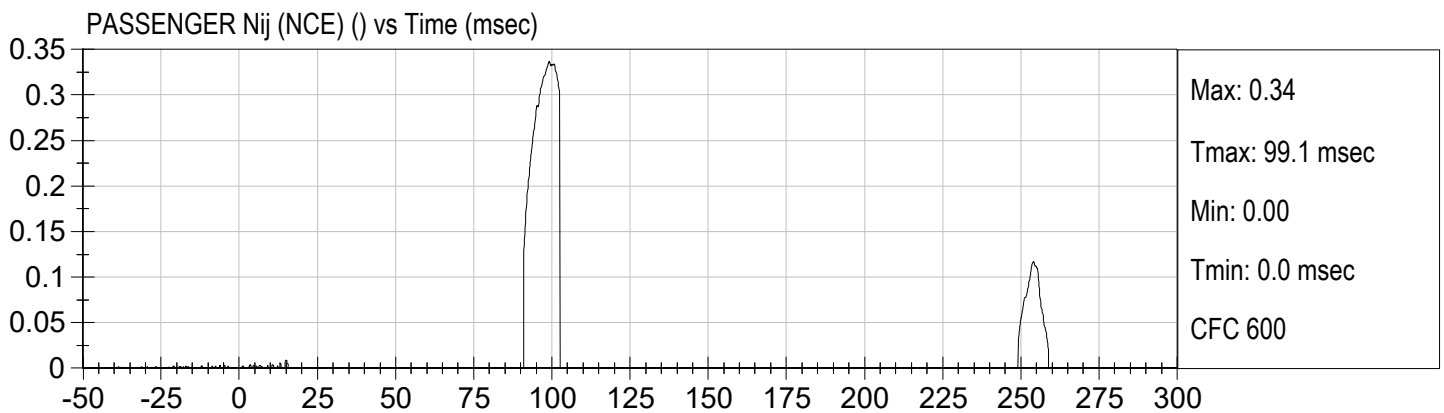
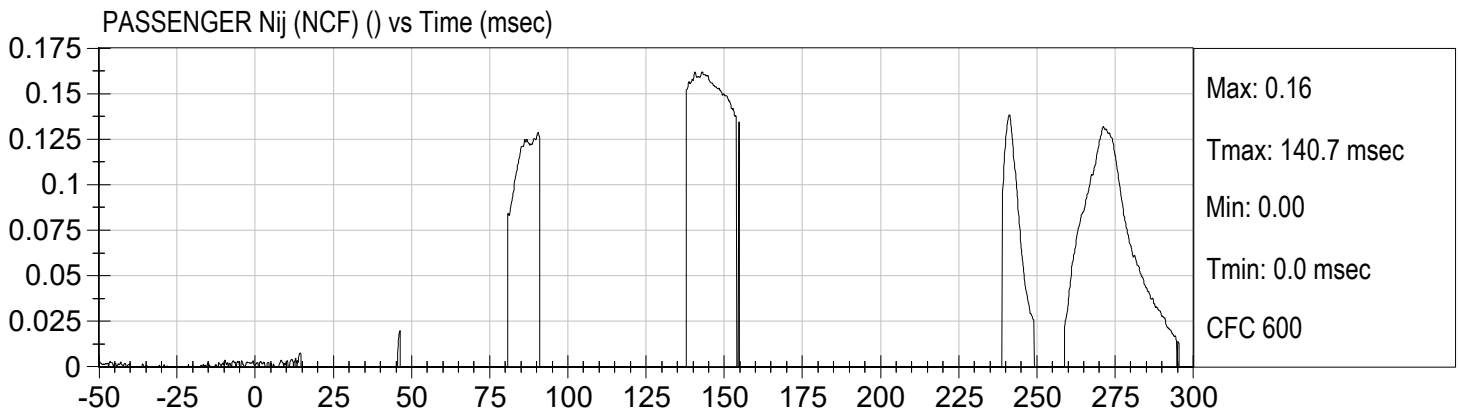
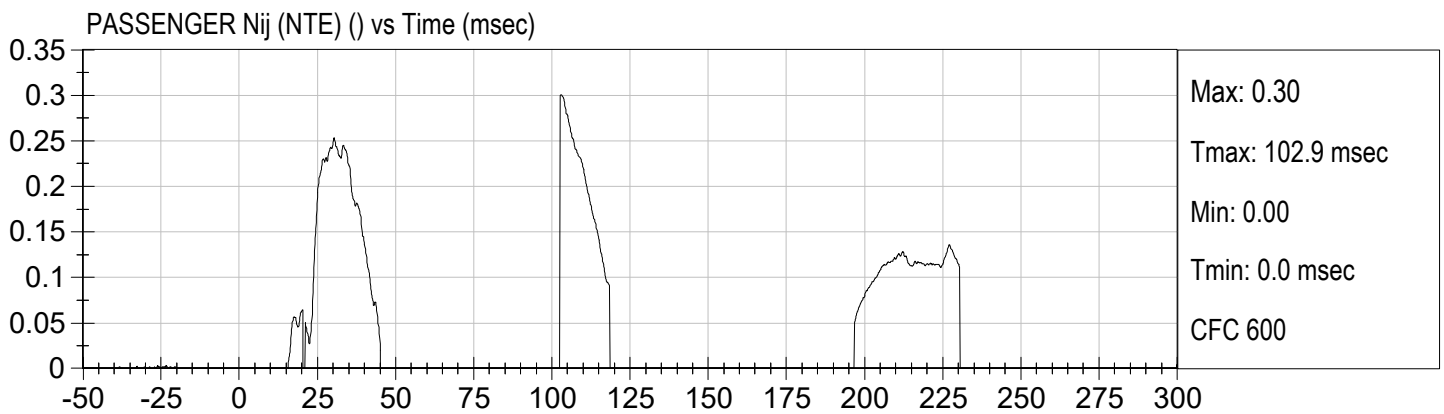
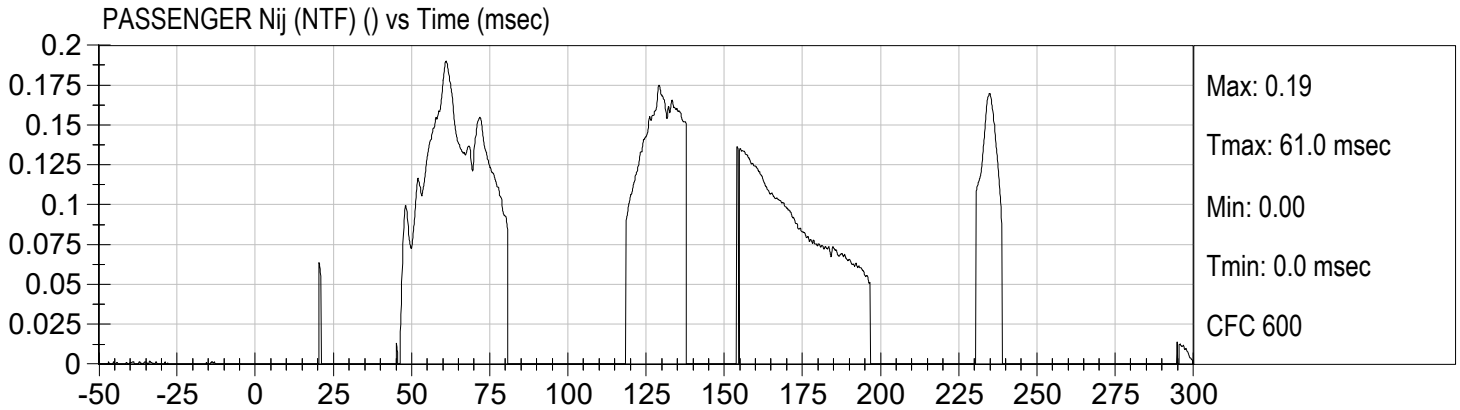


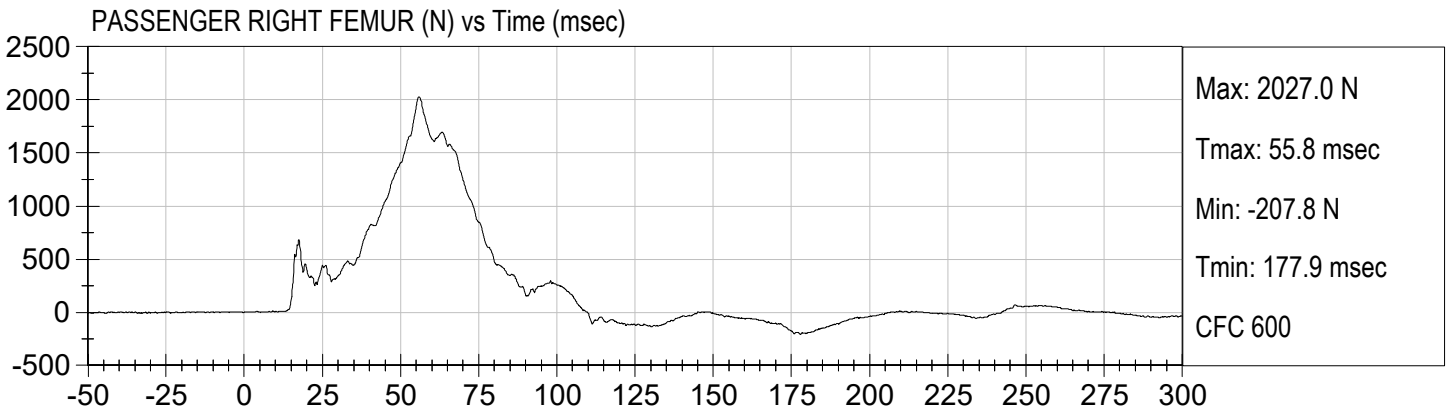












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH 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: D190321

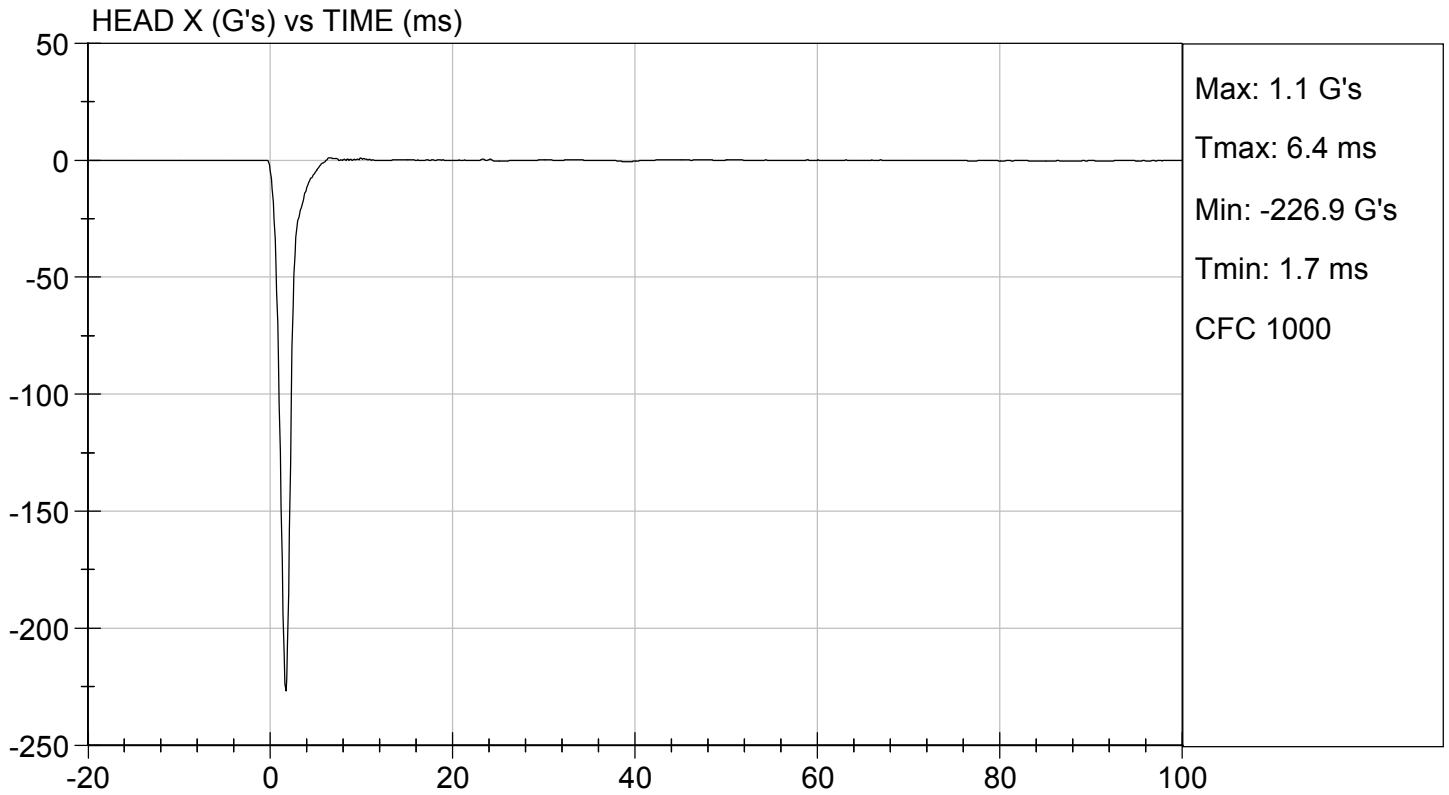
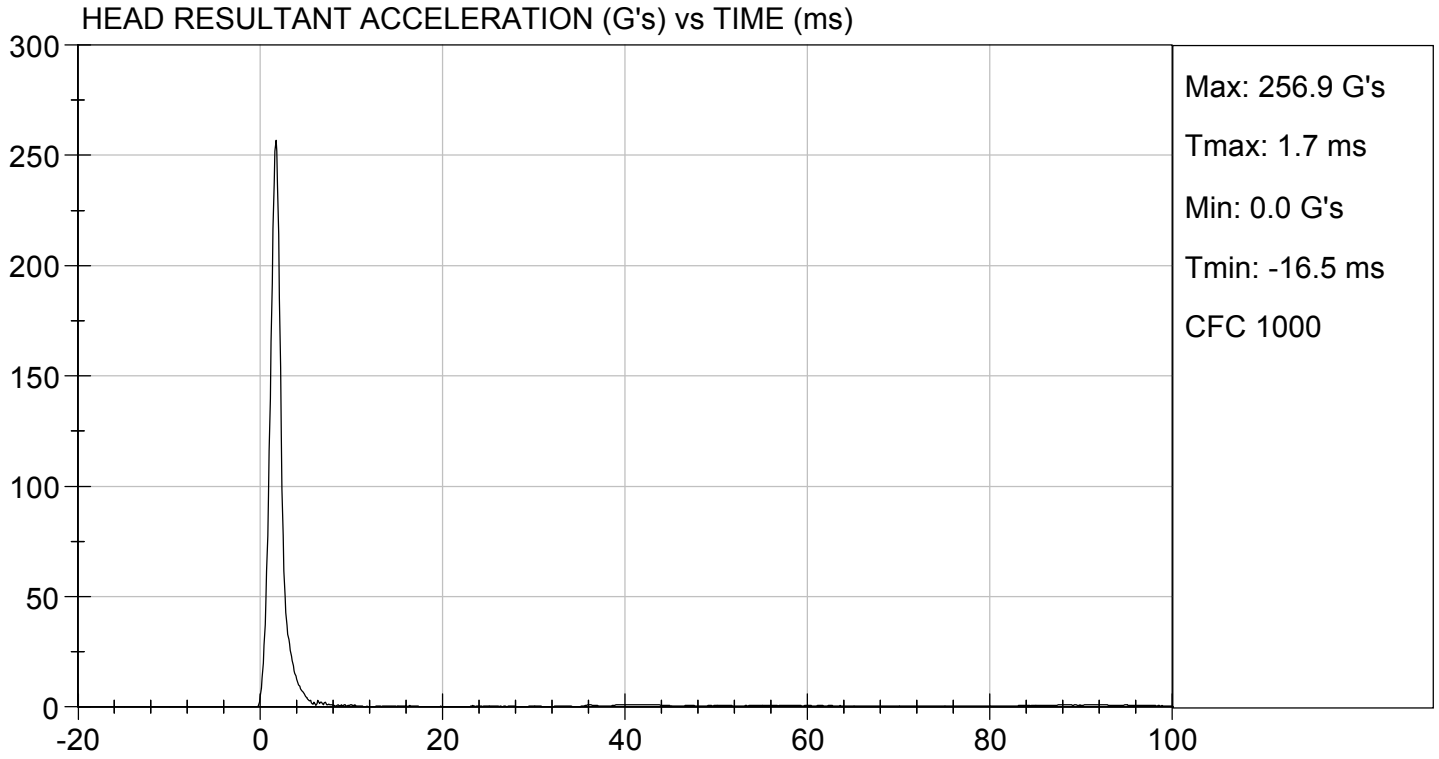
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	225 to 275	257	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-9.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

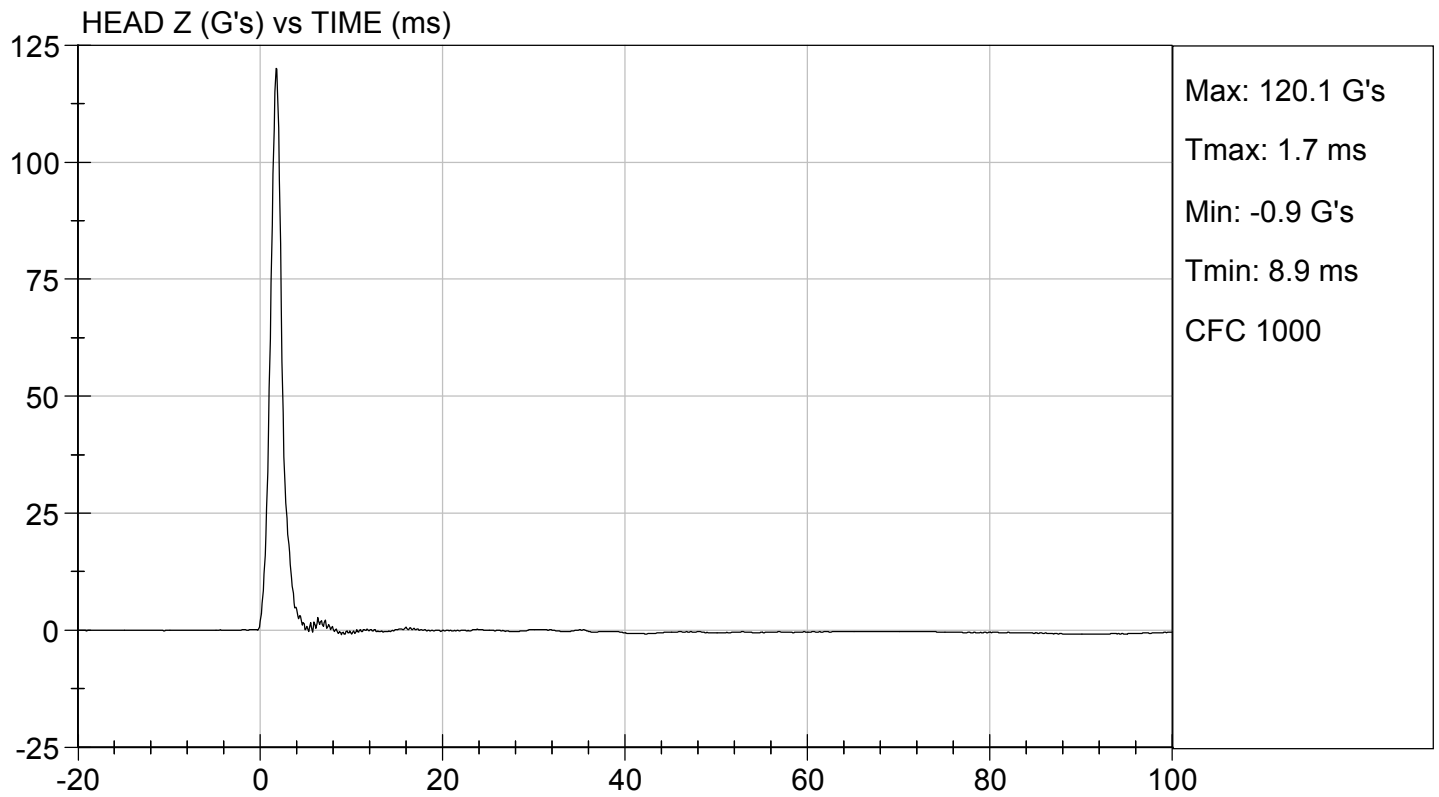
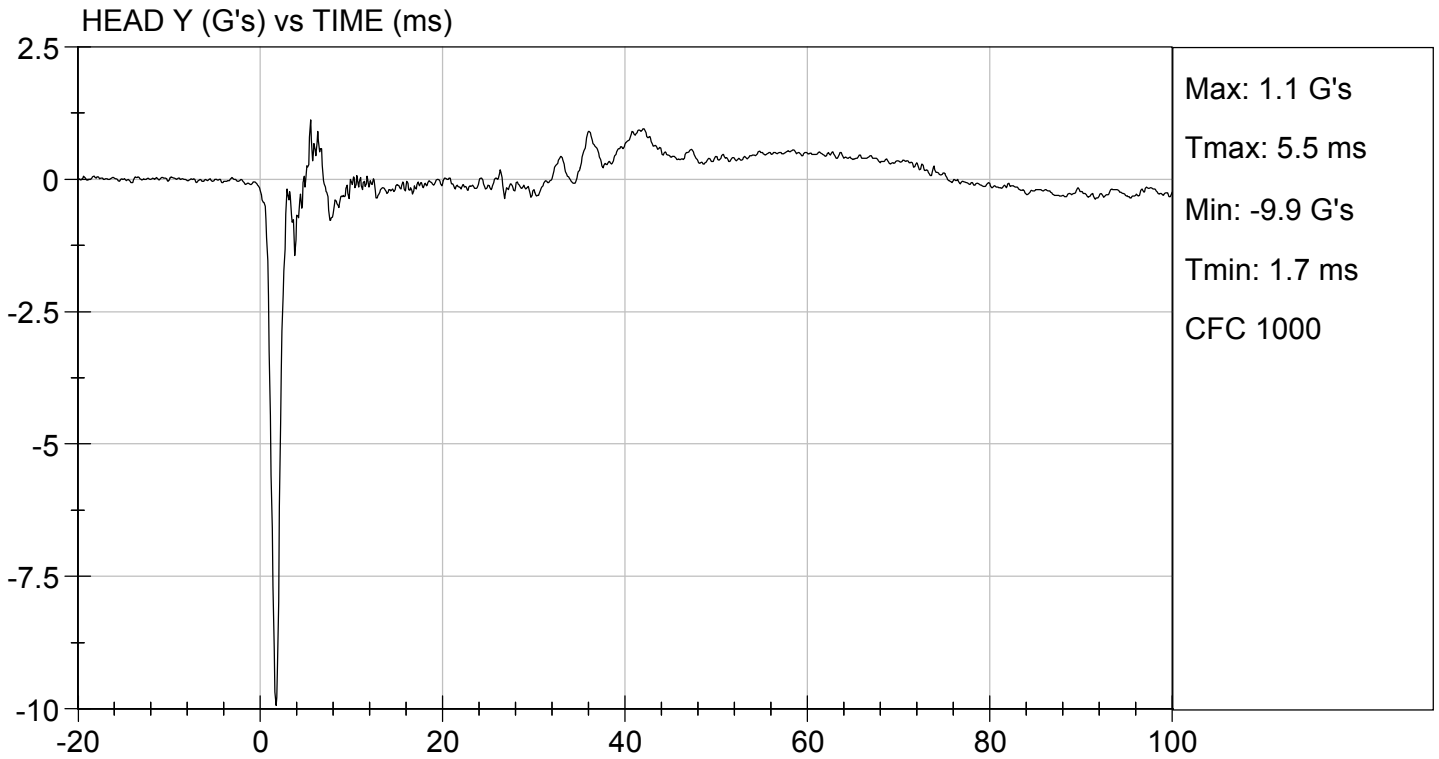
Jacob D Taylor
 Laboratory Technician

01/24/2019

Test Date

Robert Schaefer
 Approved By



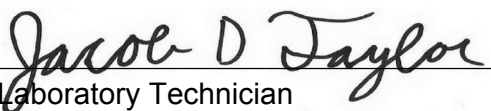


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

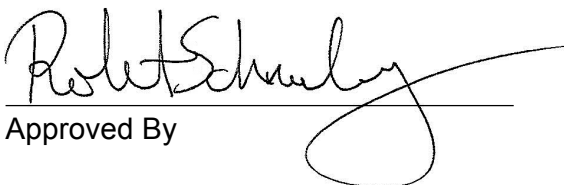
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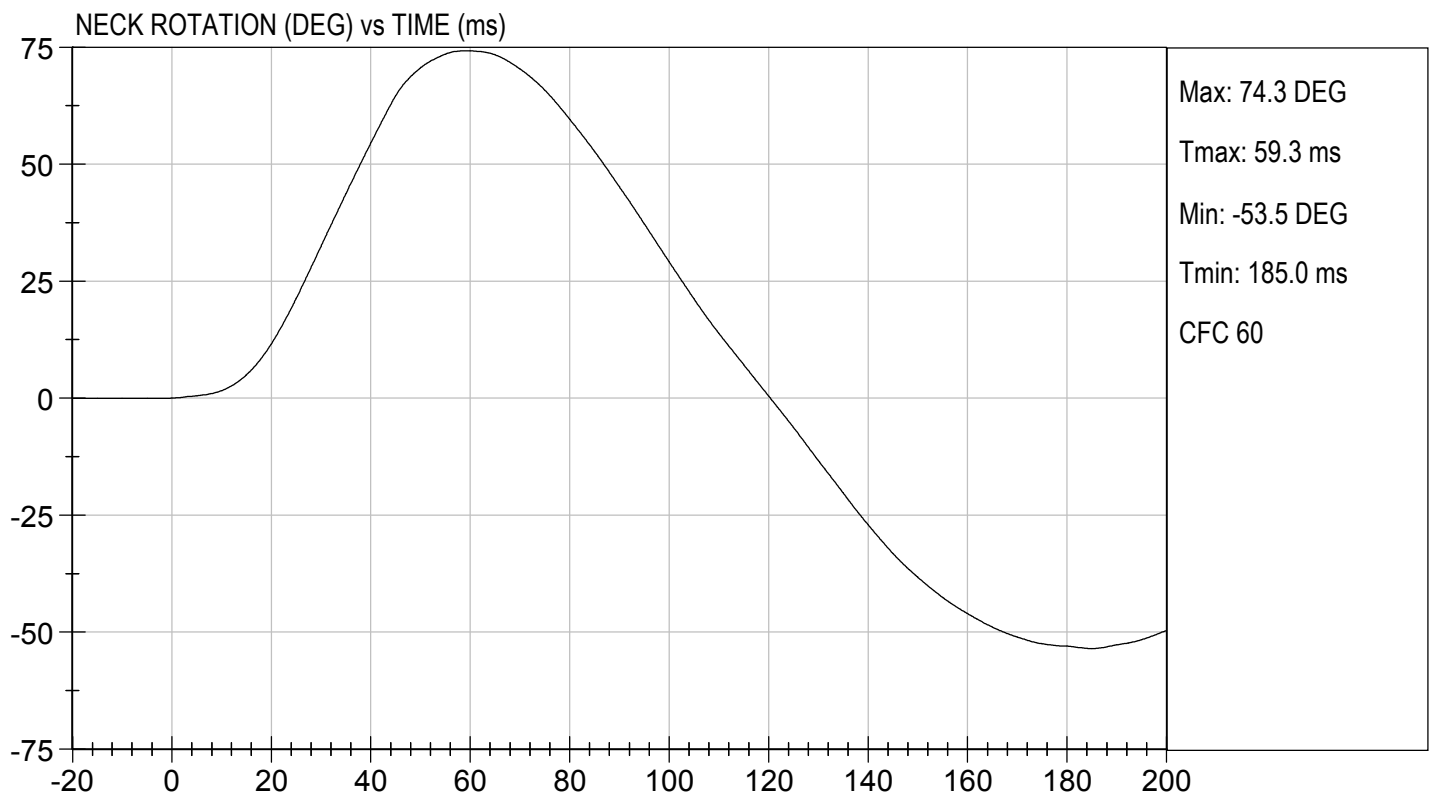
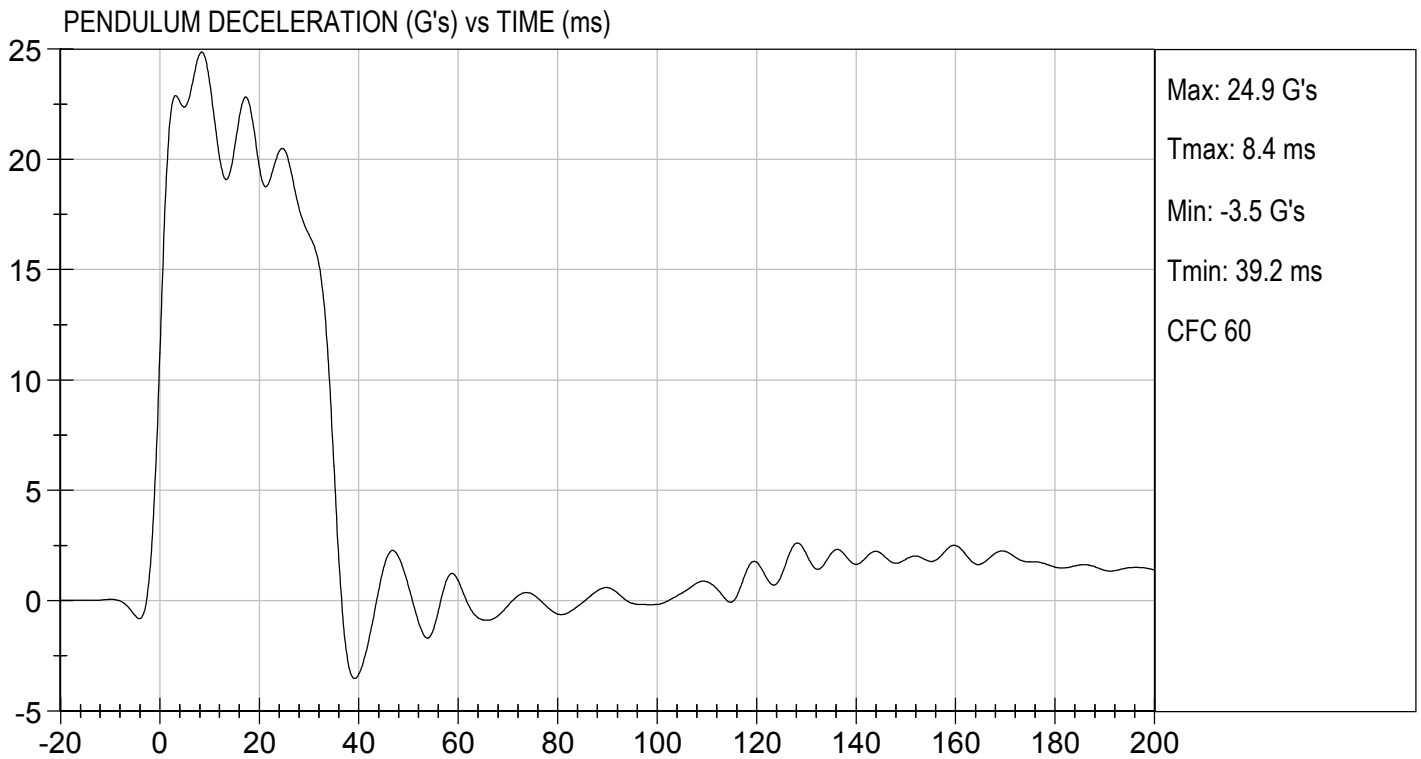
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	21	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.13	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.51	Pass
	20 ms	G's	17.60 to 22.60	19.65	Pass
	30 ms	G's	12.50 to 18.50	16.58	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.3	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	74.3	Pass
	Time	ms	57.0 to 64.0	59.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	120.5	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.3	Pass
	Time	ms	47.0 to 58.0	48.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.1	Pass
Overall Test Results					Pass

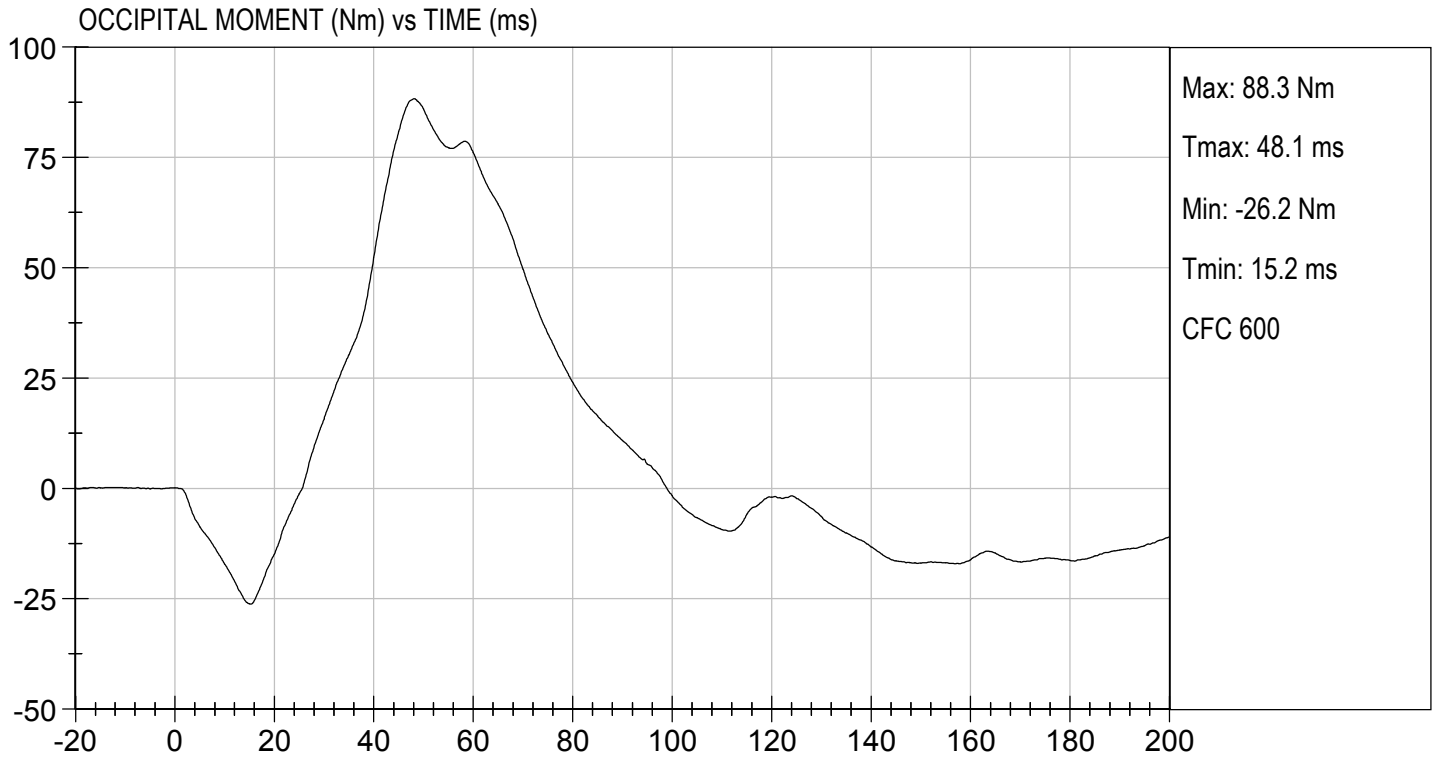

 Laboratory Technician

01/24/2019

Test Date


 Approved By





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

ATD Serial No: 351

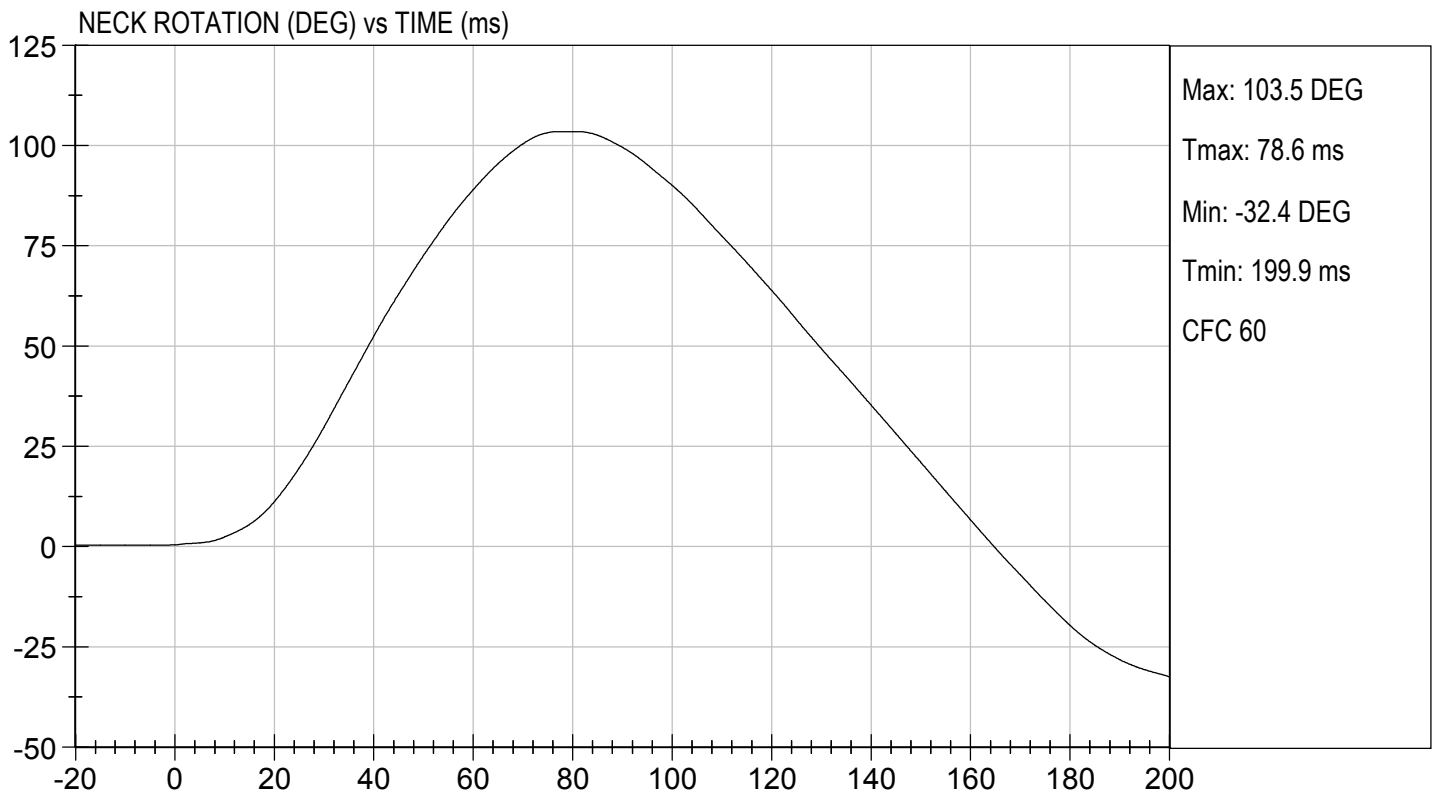
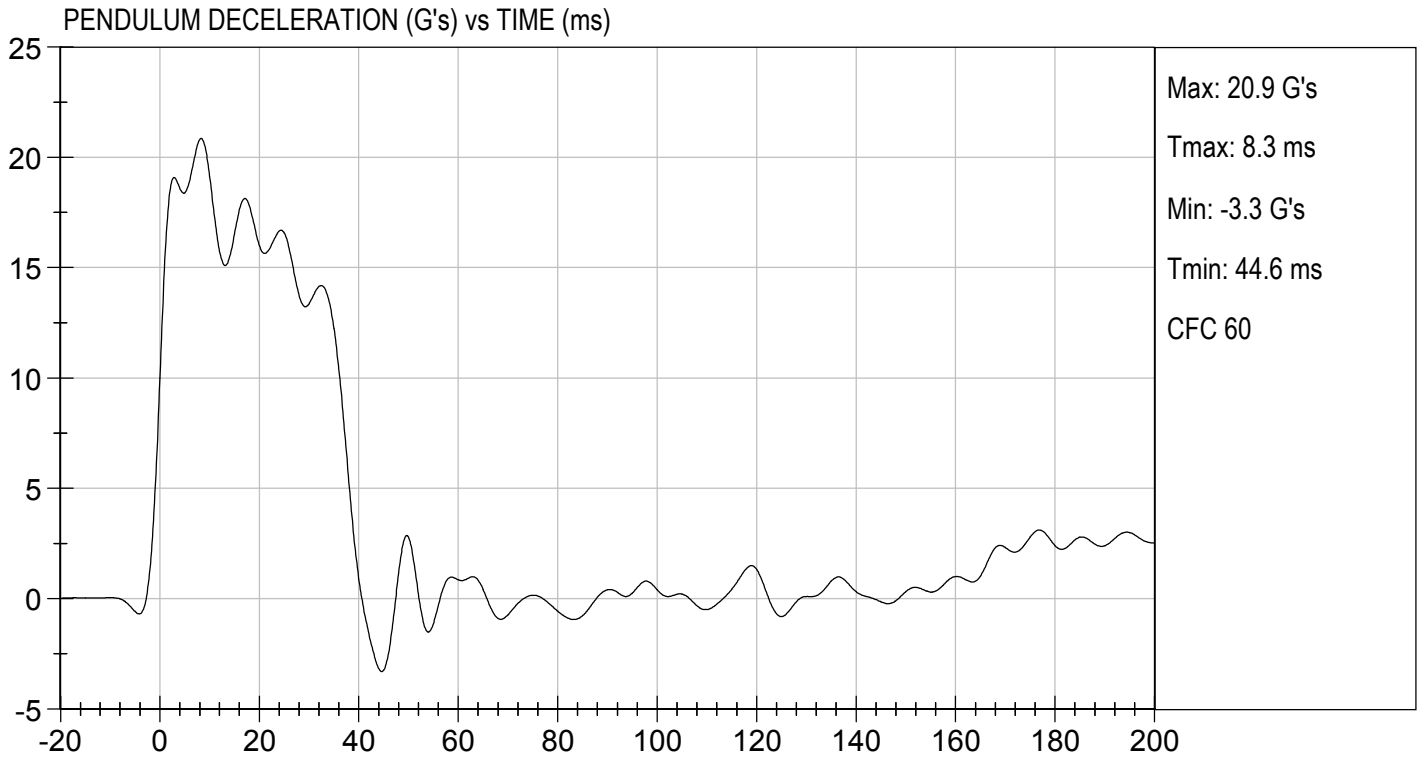
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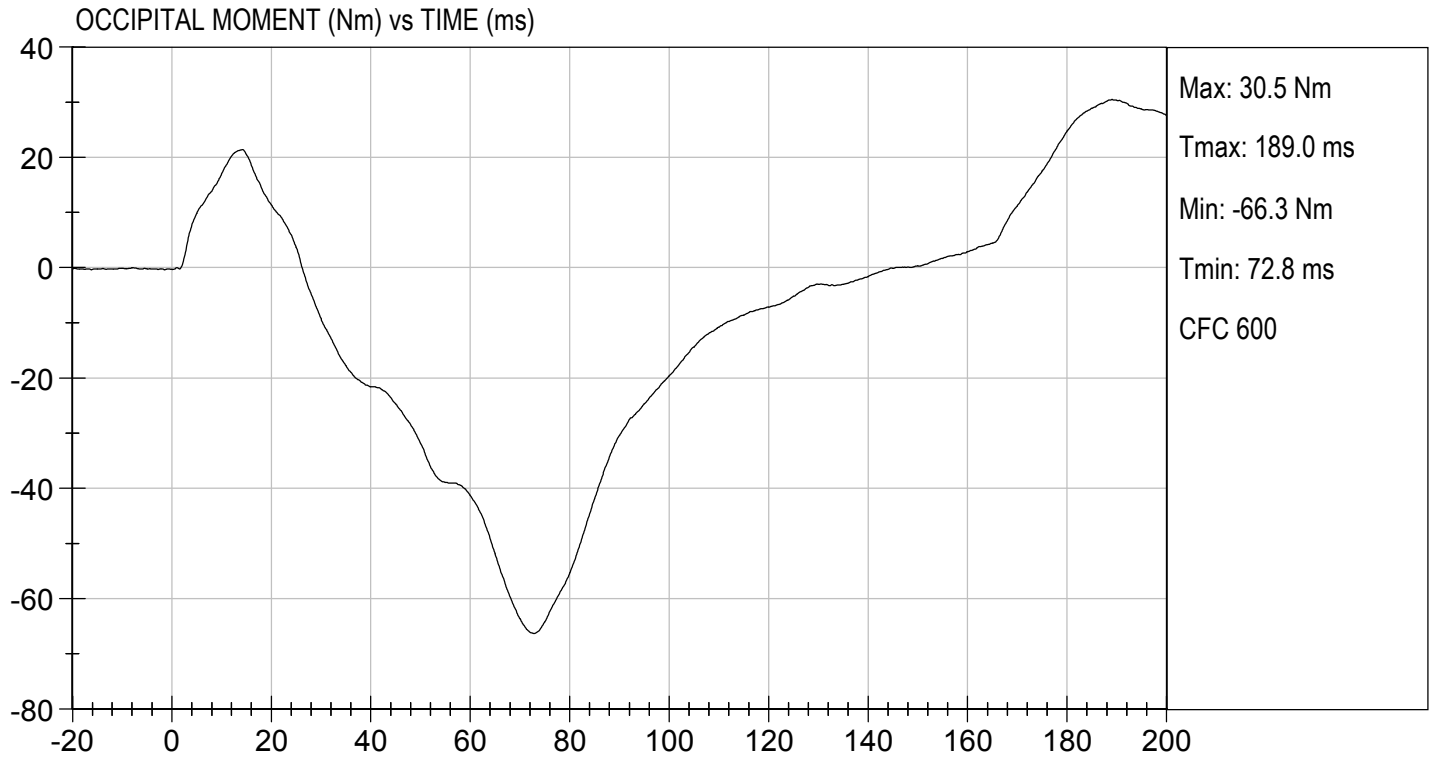
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	12	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.15	Pass
	20 ms	G's	14.00 to 19.00	16.00	Pass
	30 ms	G's	11.00 to 16.00	13.37	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	103.5	Pass
	Time	ms	72.0 to 82.0	78.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	164.9	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-66.3	Pass
	Time	ms	65.0 to 79.0	72.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	145.7	Pass
Overall Test Results					Pass

Jacob D Taylor
 Laboratory Technician

01/28/2019
 Test Date

Robert Schaub
 Approved By





MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

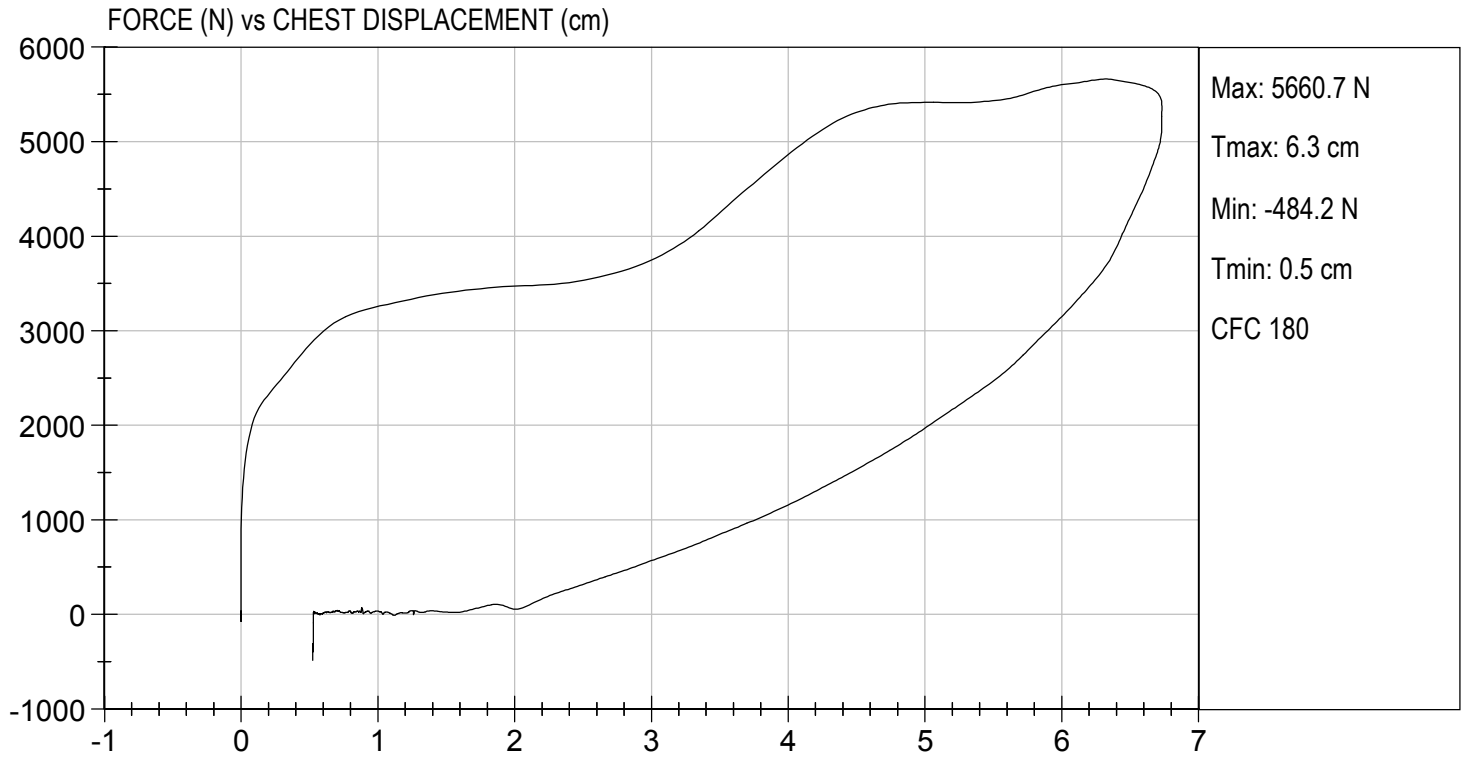
Test I.D: D190324

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	21	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,661	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.73	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass

Jacob D Taylor
 Laboratory Technician

01/24/2019
 Test Date

Robert Schaub
 Approved By

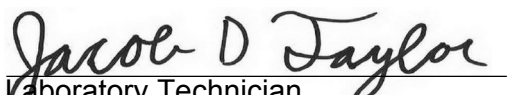


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

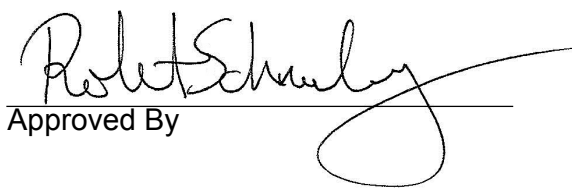
ATD Serial No: 351

Test I.D: D190325

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,641	Pass
Overall Test Results				Pass


 Laboratory Technician

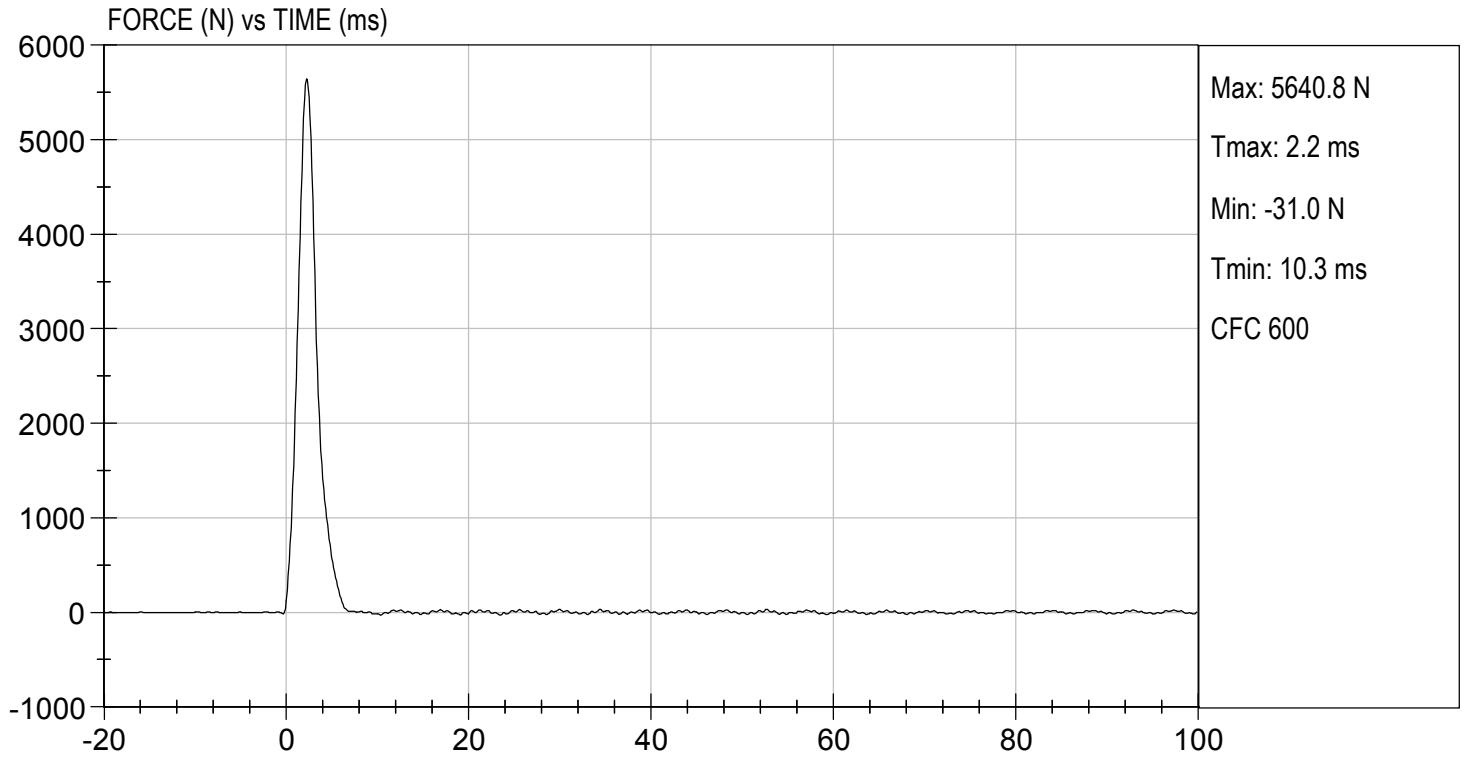
01/24/2019
 Test Date


 Approved By



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

TEST DATE: 01/24/2019
TEST #: D190325




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

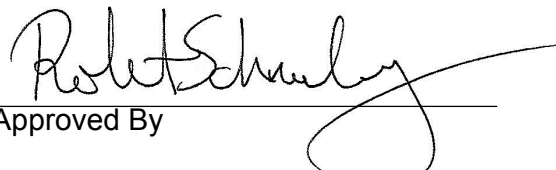
ATD Serial No: 351

Test I.D: D190326

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,674	Pass
Overall Test Results				Pass


Laboratory Technician

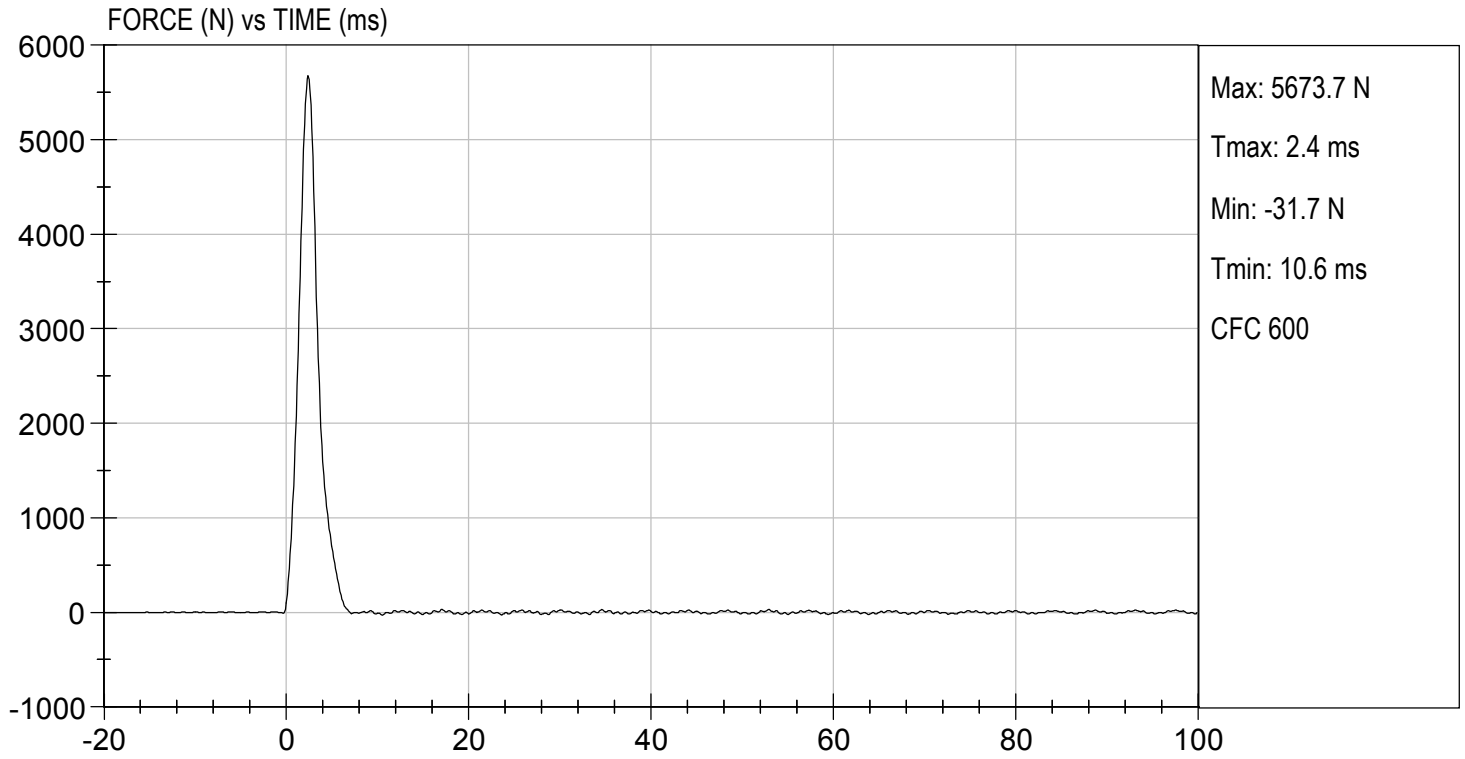
01/24/2019
Test Date


Approved By



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

TEST DATE: 01/24/2019
TEST #: D190326



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

ATD Serial No: 351

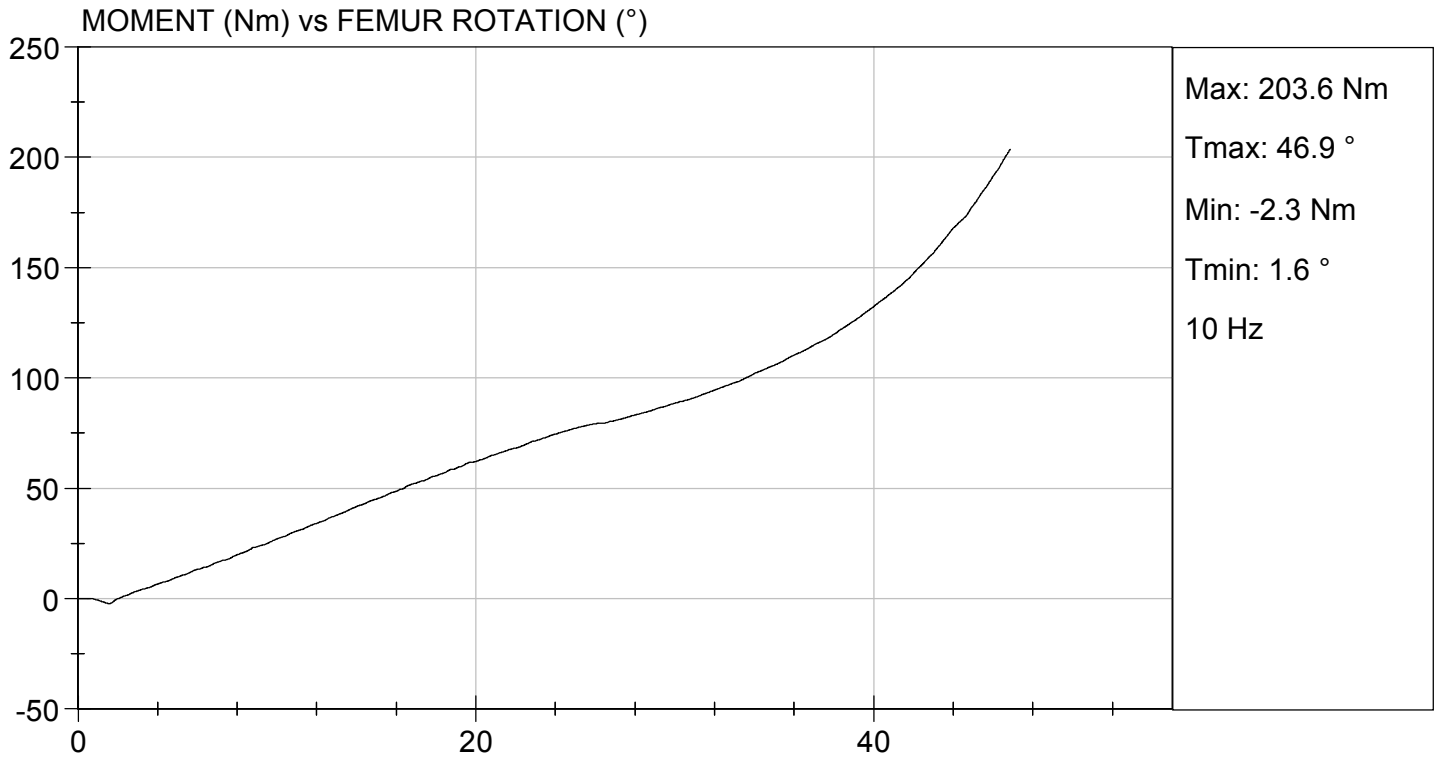
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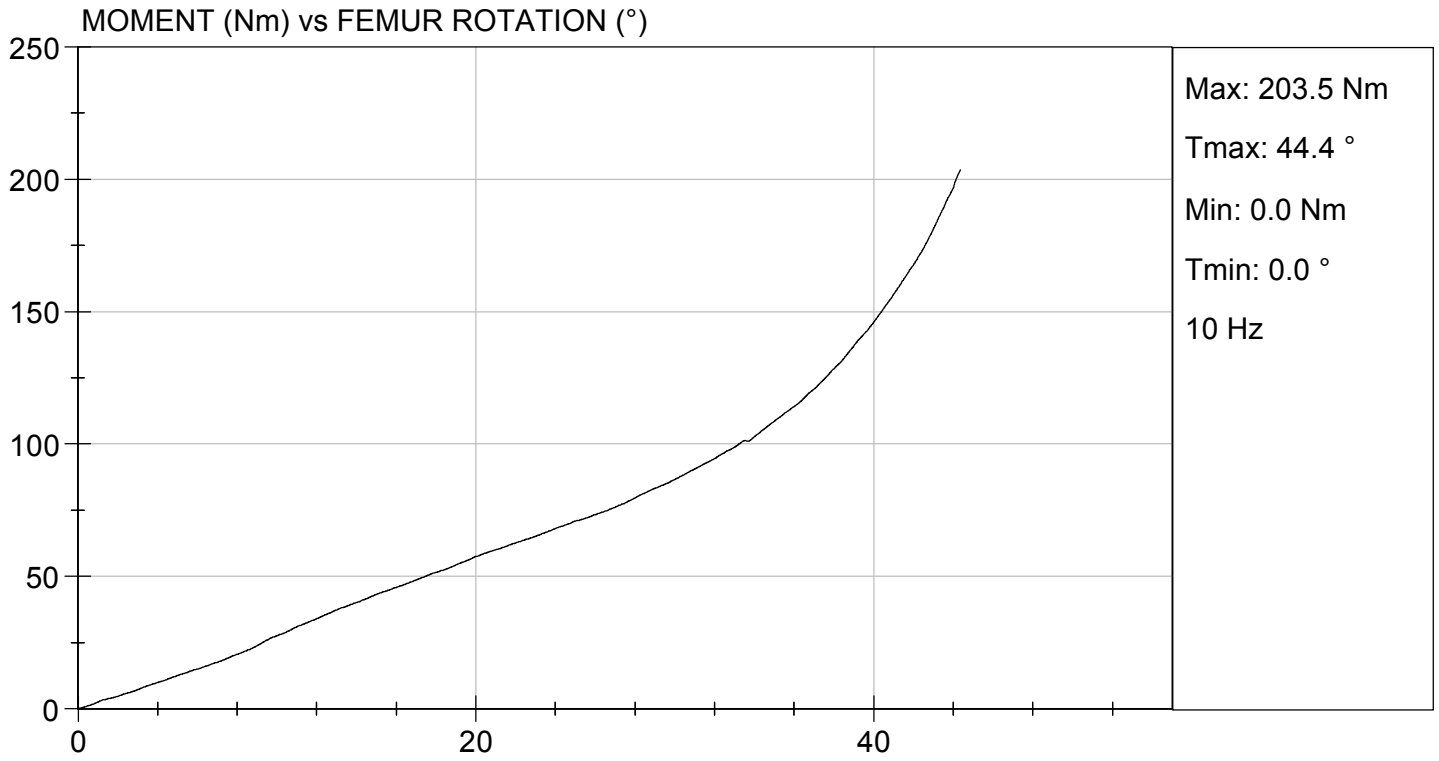
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	21	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	88.5	86.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	46.9	44.4	Pass
Overall Test Results					Pass

Jacob D Taylor
 Laboratory Technician

01/24/2019
 Test Date

Robert Schaub
 Approved By





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

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

ATD Serial No: 351

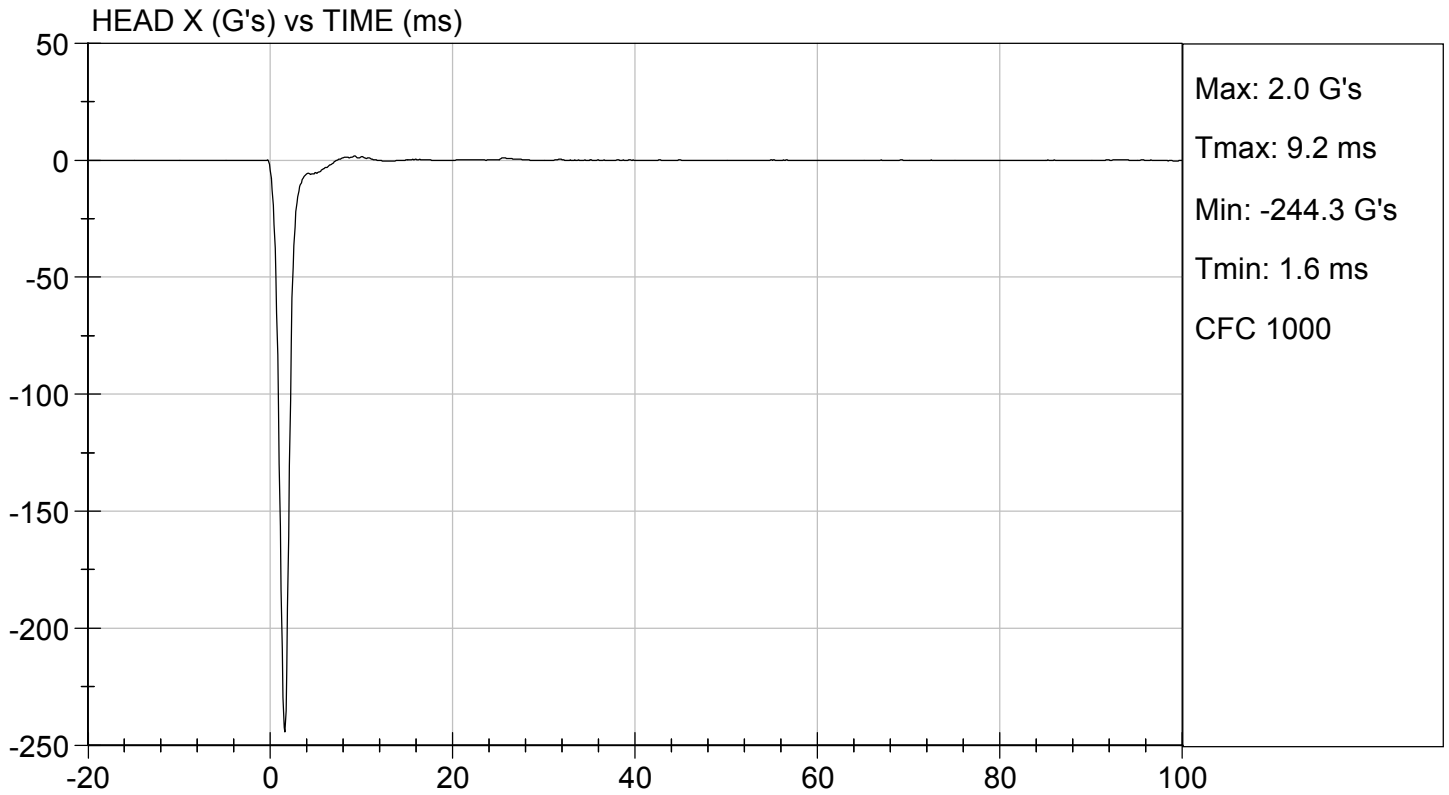
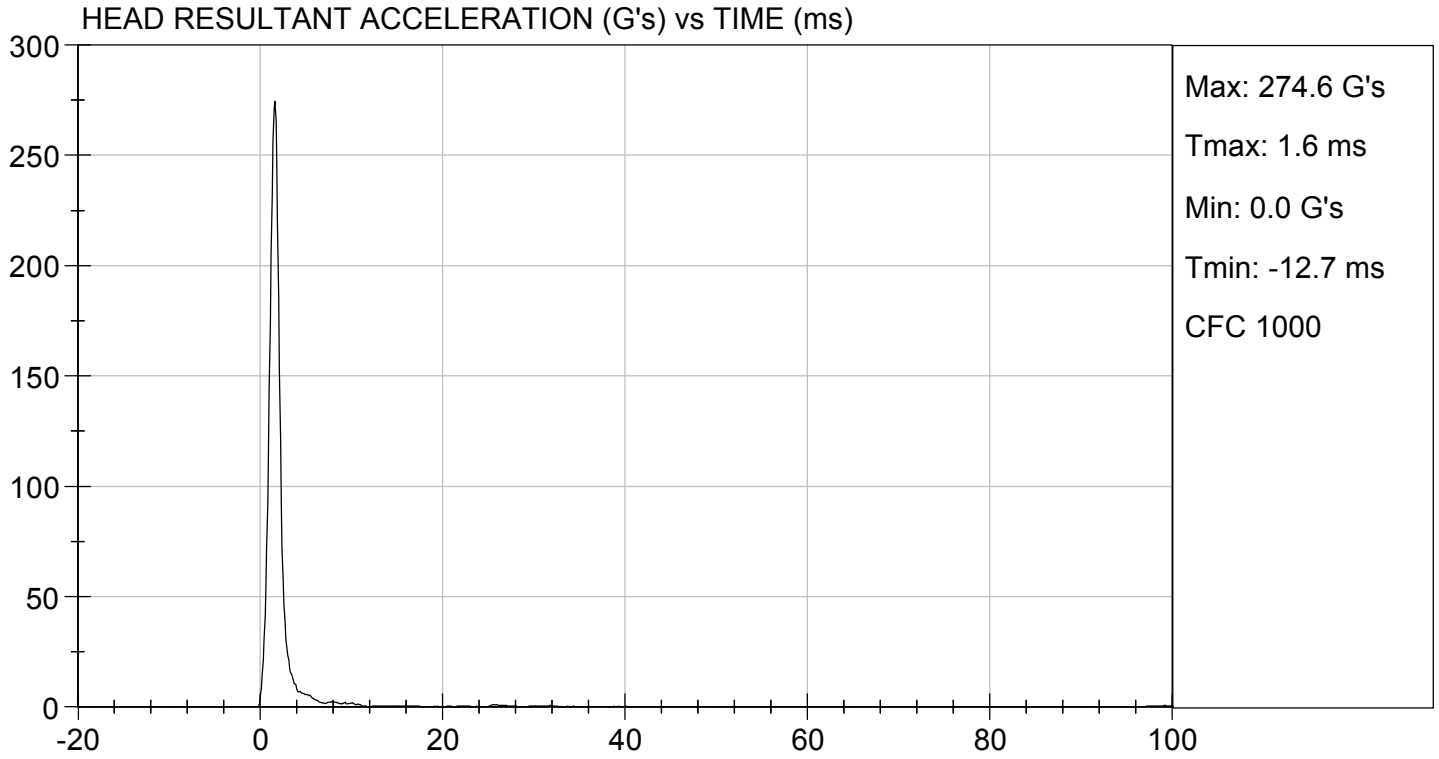
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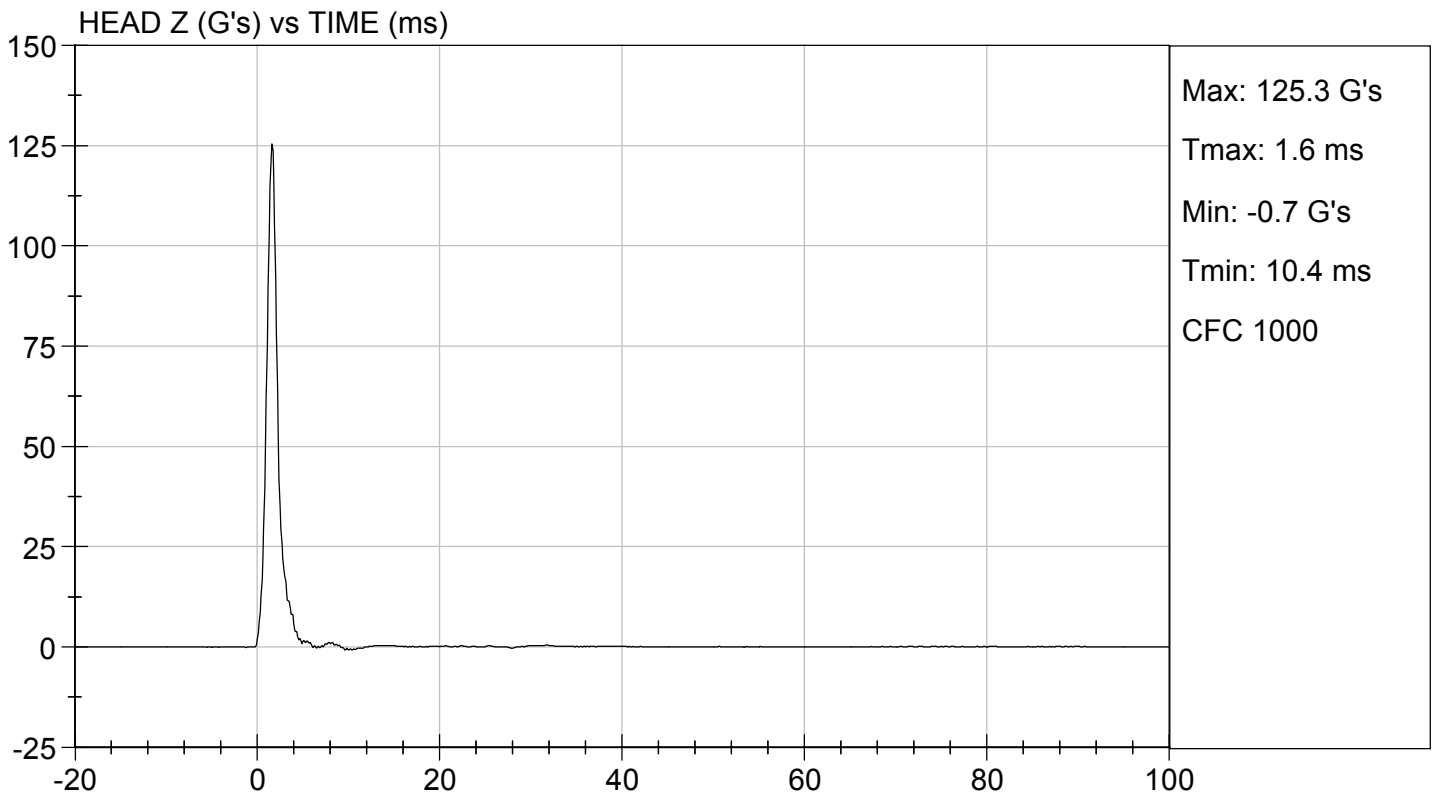
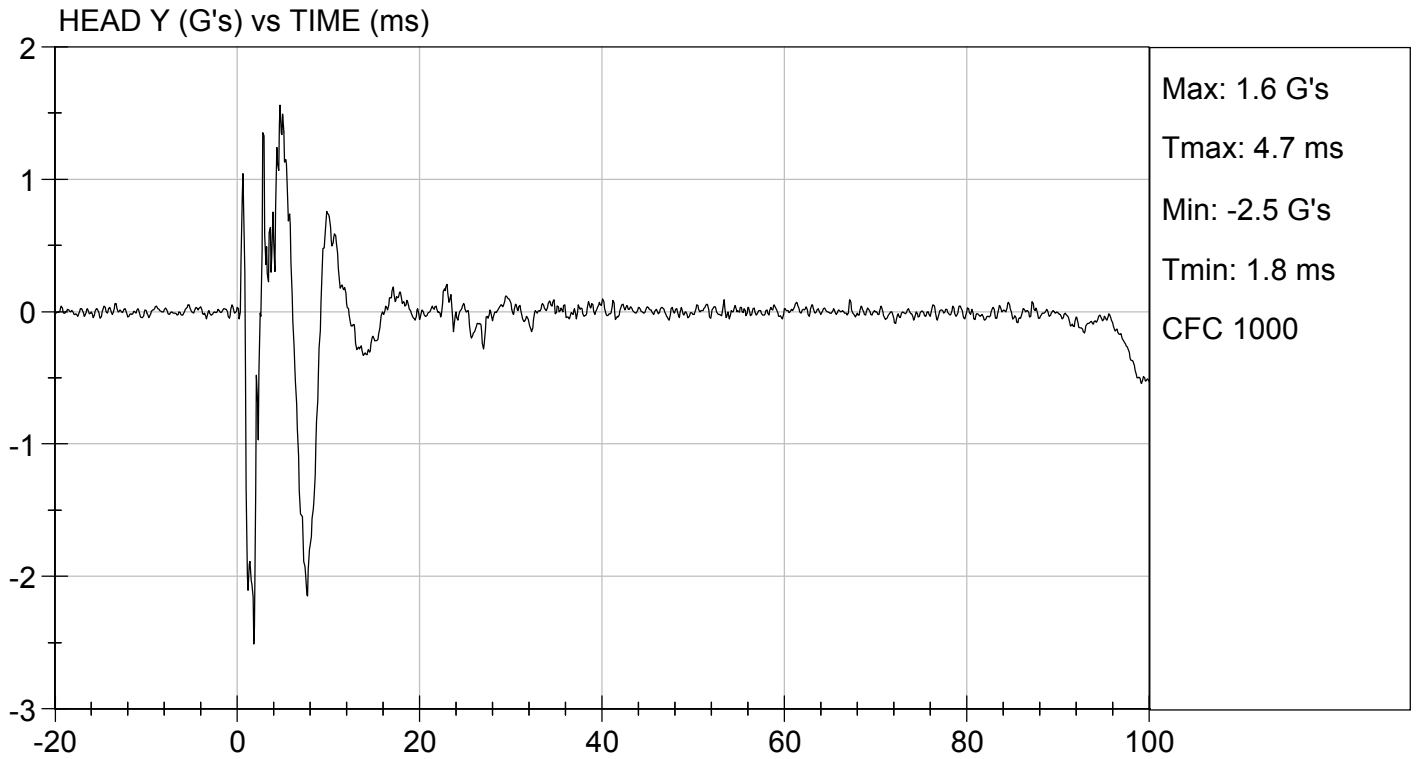
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Peak Resultant Acceleration	G's	225 to 275	275	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Danielle Redinlaugh
Laboratory Technician

01/30/2019
Test Date

Robert Schaubert
Approved By



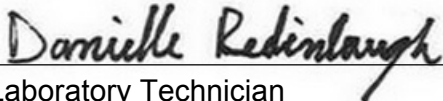


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

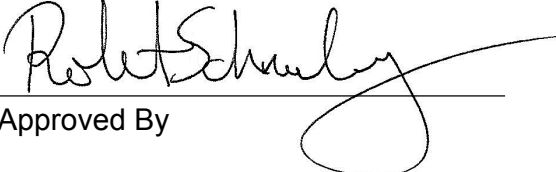
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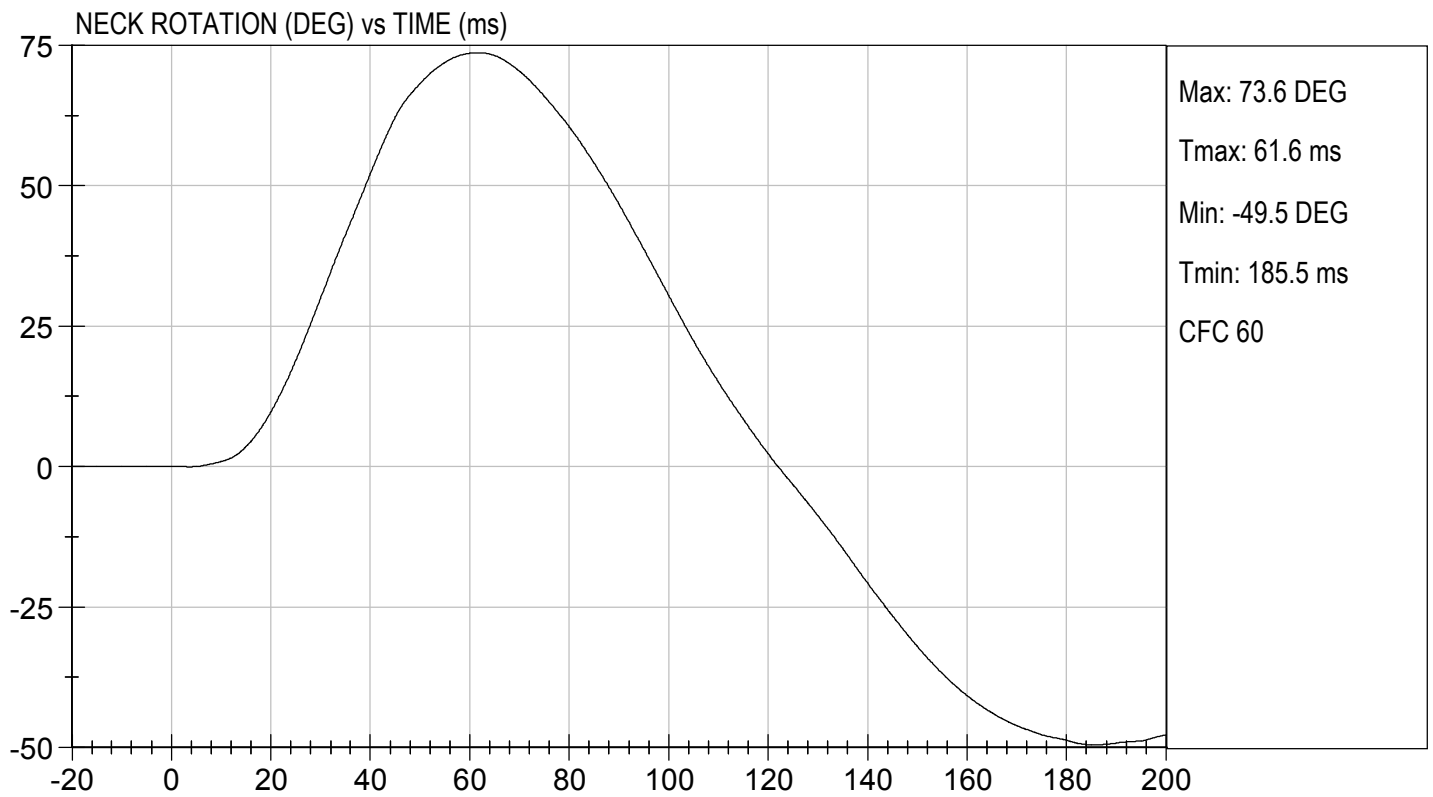
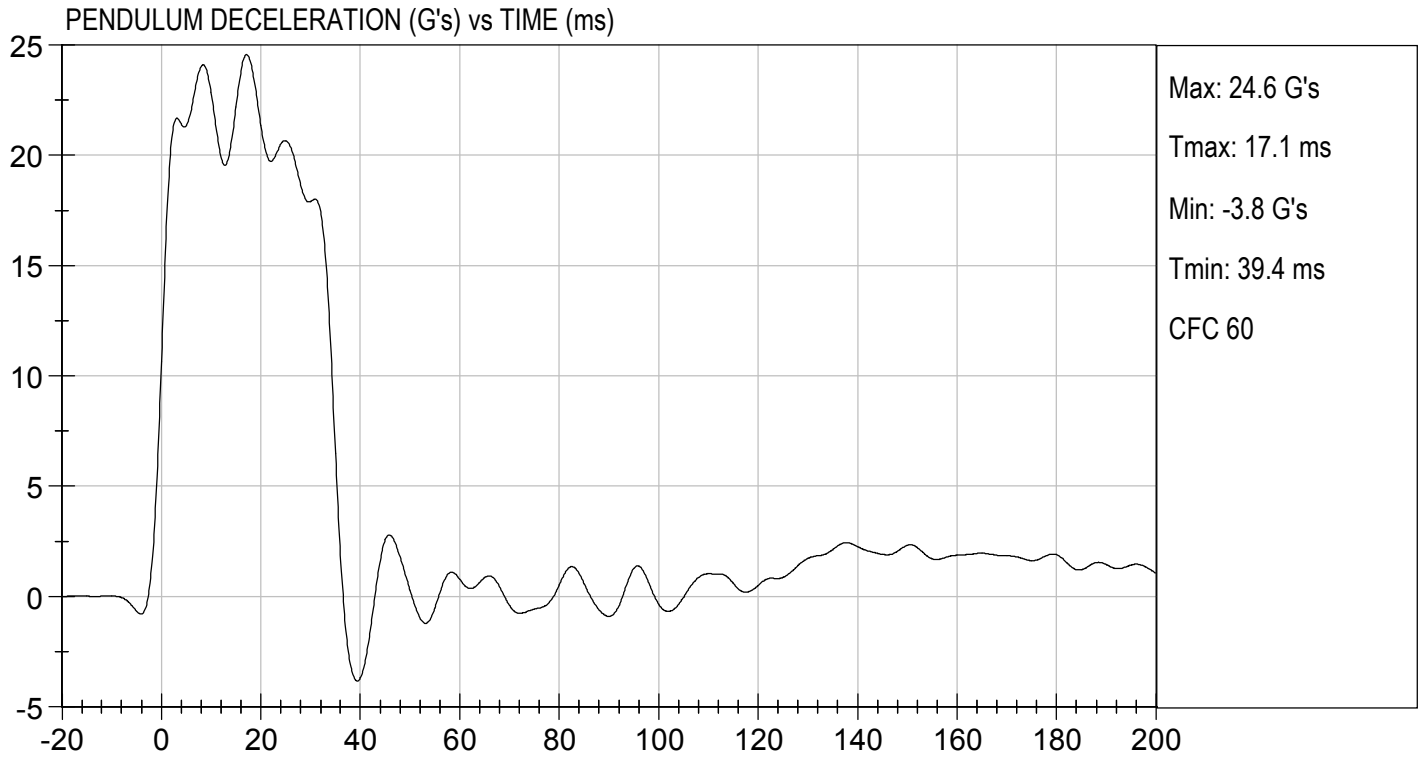
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.84	Pass
	20 ms	G's	17.60 to 22.60	21.35	Pass
	30 ms	G's	12.50 to 18.50	17.90	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	18.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.4	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	73.6	Pass
	Time	ms	57.0 to 64.0	61.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	122.1	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.4	Pass
	Time	ms	47.0 to 58.0	48.0	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.9	Pass
Overall Test Results					Pass


 Laboratory Technician

01/30/2019

Test Date

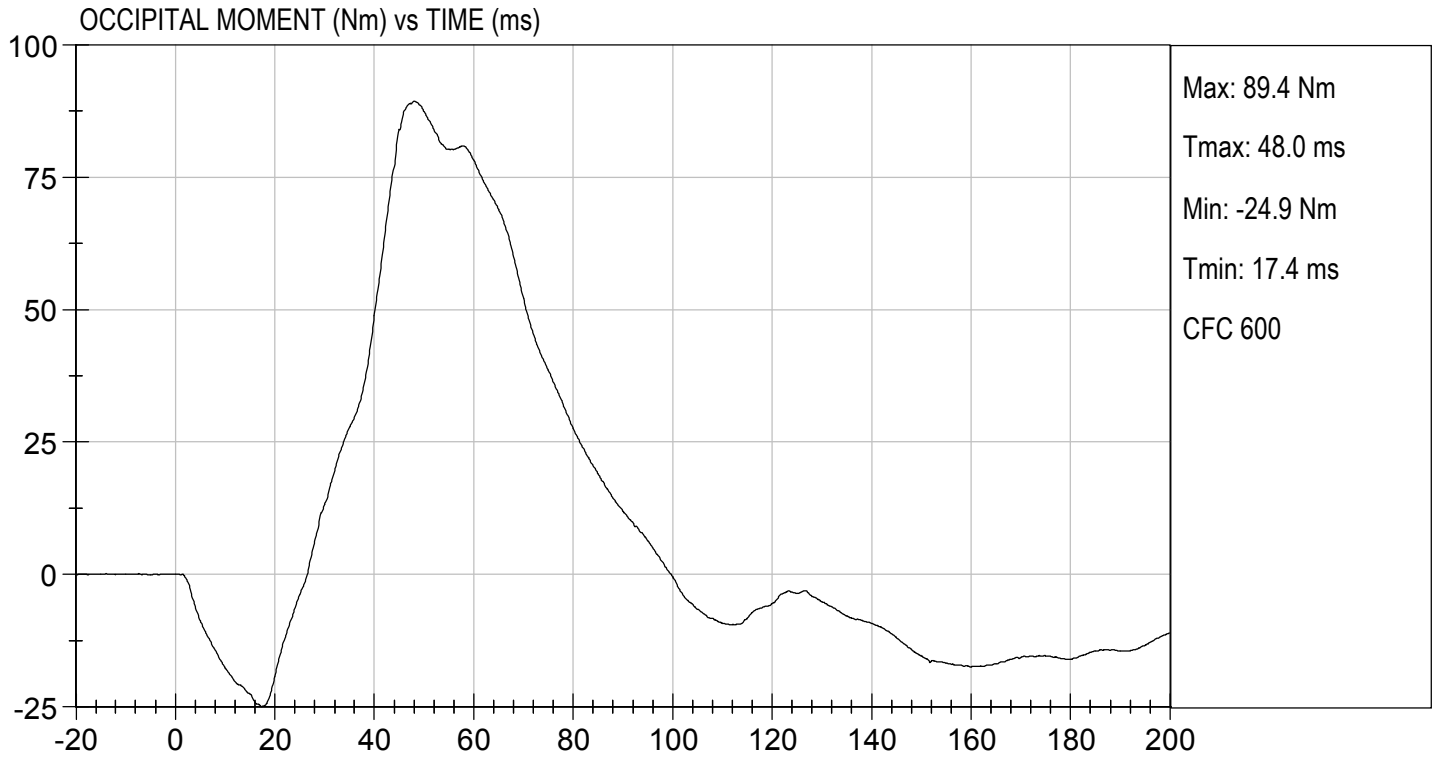

 Approved By





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

TEST DATE: 01/30/2019
TEST #: D190382

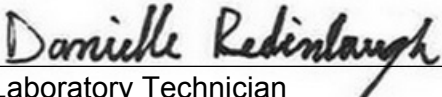


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

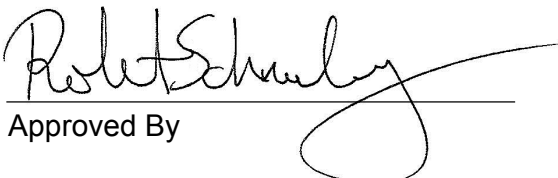
Test I.D.: D190383

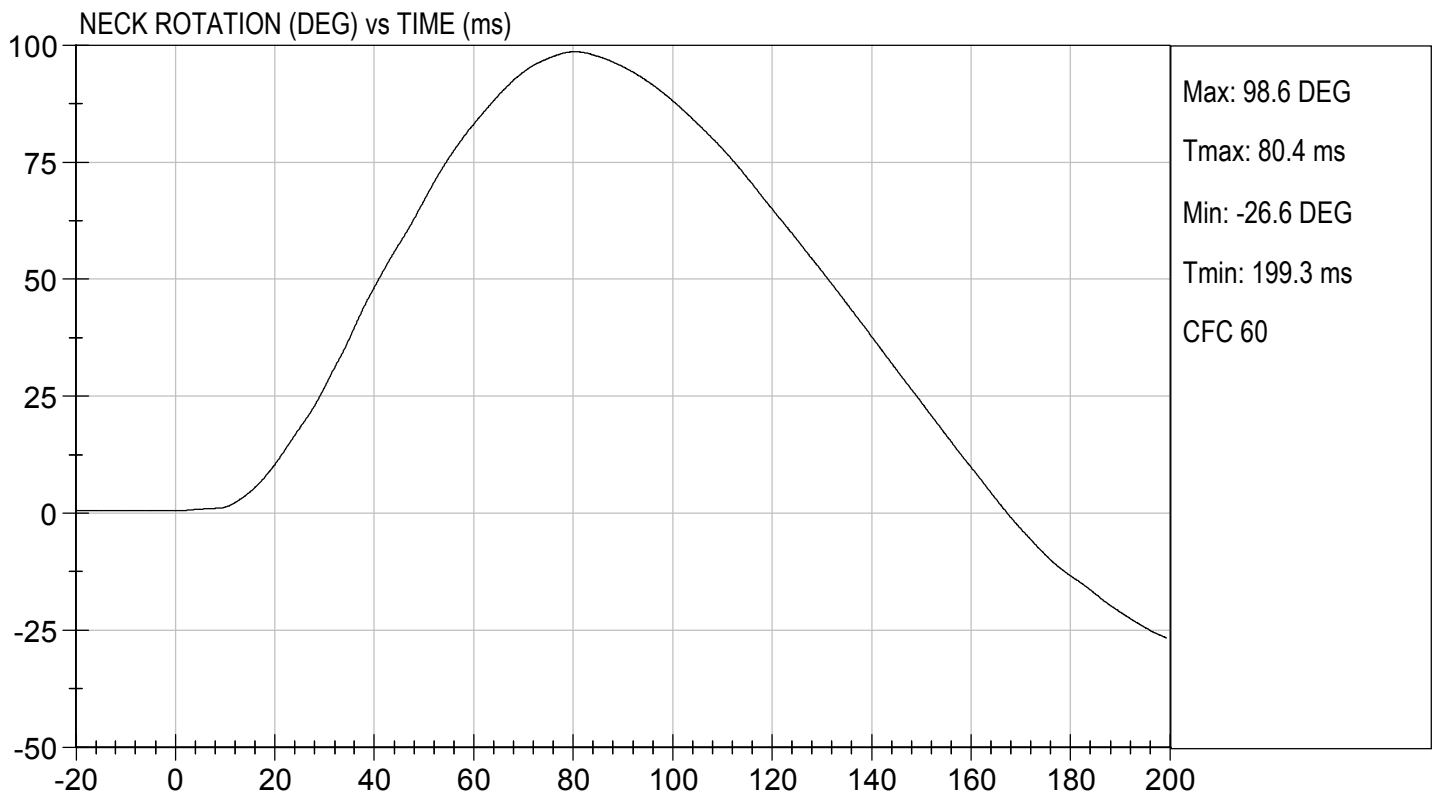
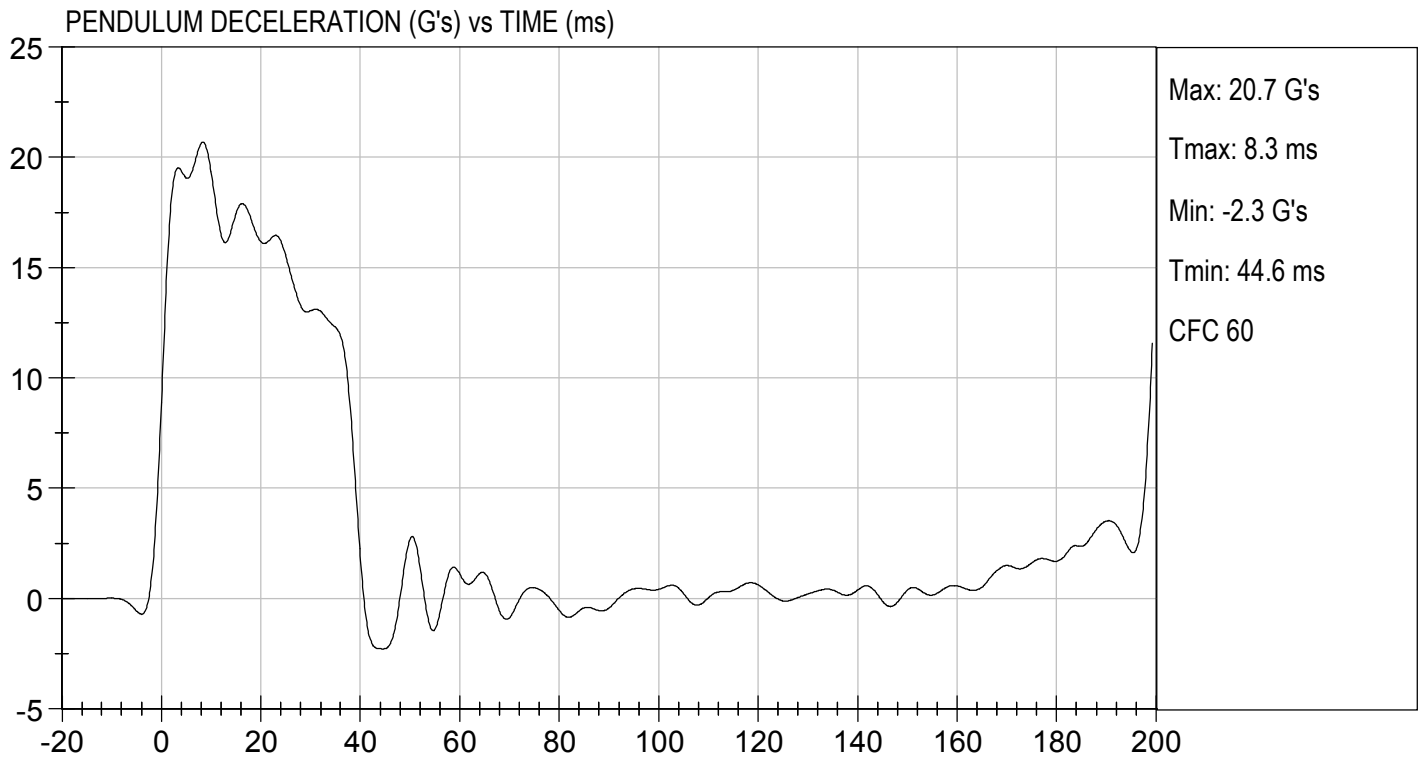
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.20	Pass
	20 ms	G's	14.00 to 19.00	16.16	Pass
	30 ms	G's	11.00 to 16.00	13.05	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.6	Pass
	Time	ms	72.0 to 82.0	80.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	167.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.4	Pass
	Time	ms	65.0 to 79.0	70.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	147.9	Pass
Overall Test Results					Pass

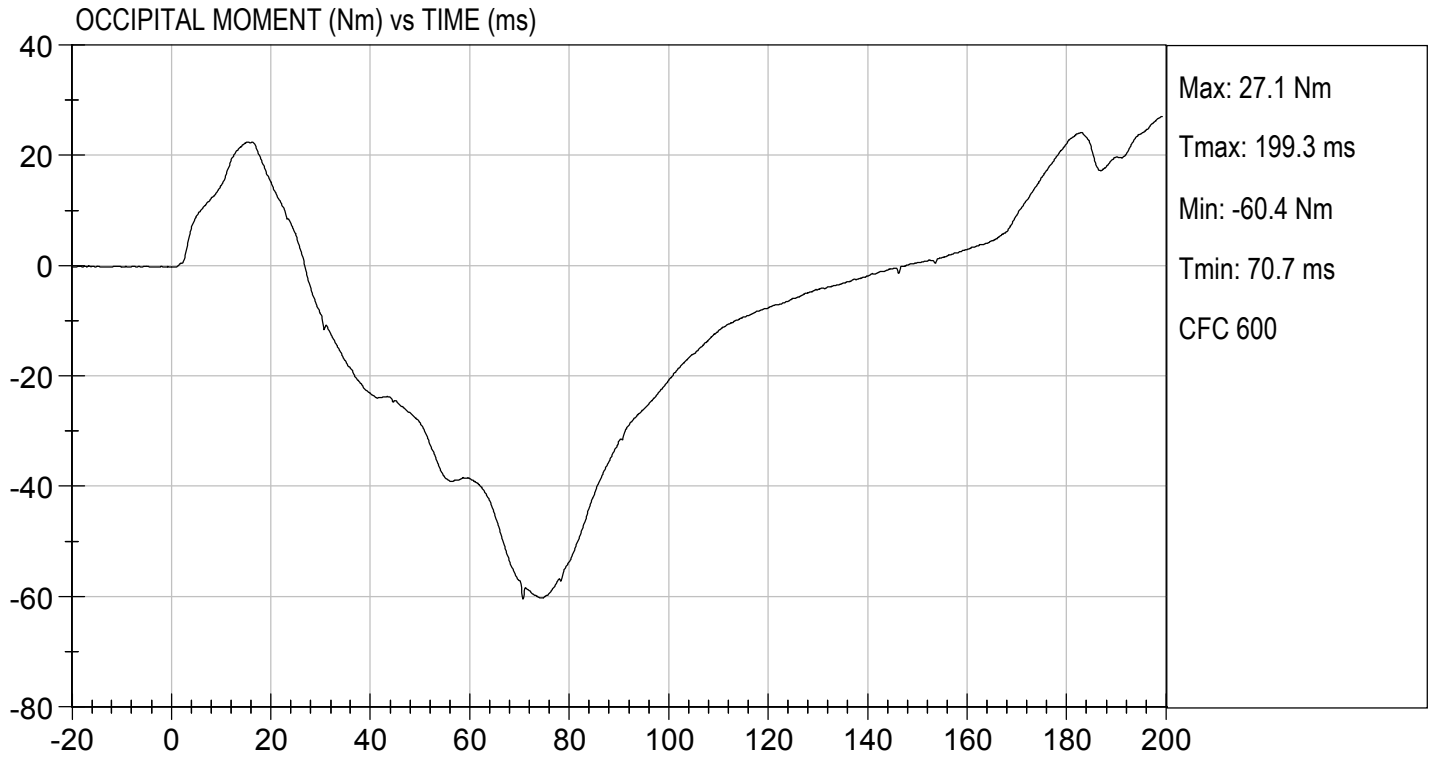

 Laboratory Technician

01/30/2019

Test Date


 Approved By





MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

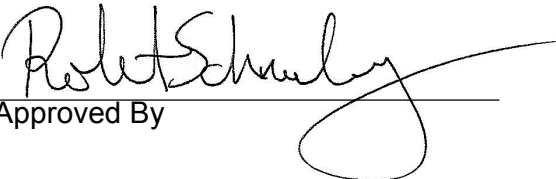
ATD Serial No: 351

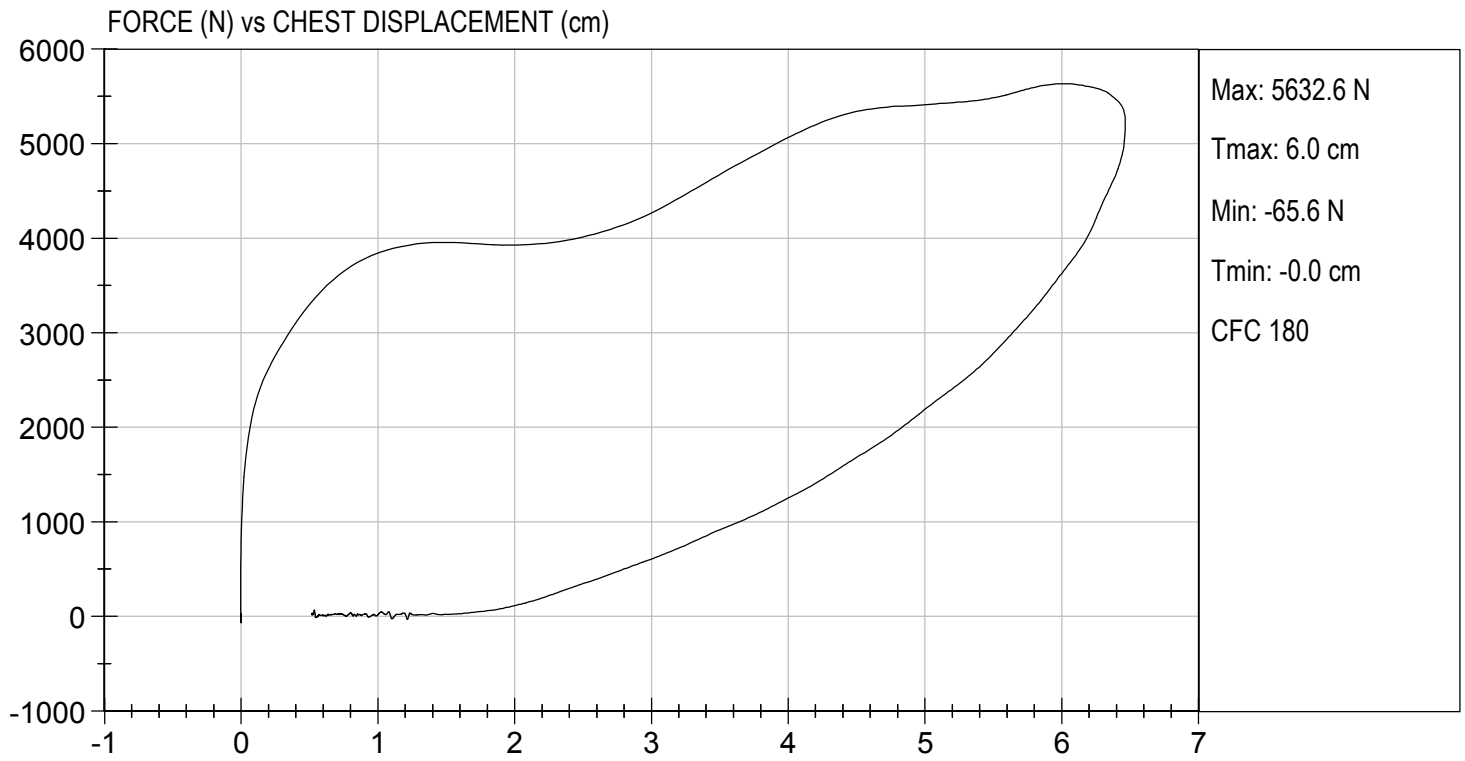
Test I.D: D190384

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	18	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,633	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.46	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Overall Test Results				Pass


 Laboratory Technician

01/30/2019
 Test Date


 Approved By



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

ATD Serial No: 351

Test I.D: D190385

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	17	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	4,909	Pass
Overall Test Results				Pass

Danielle Redinlaugh
 Laboratory Technician

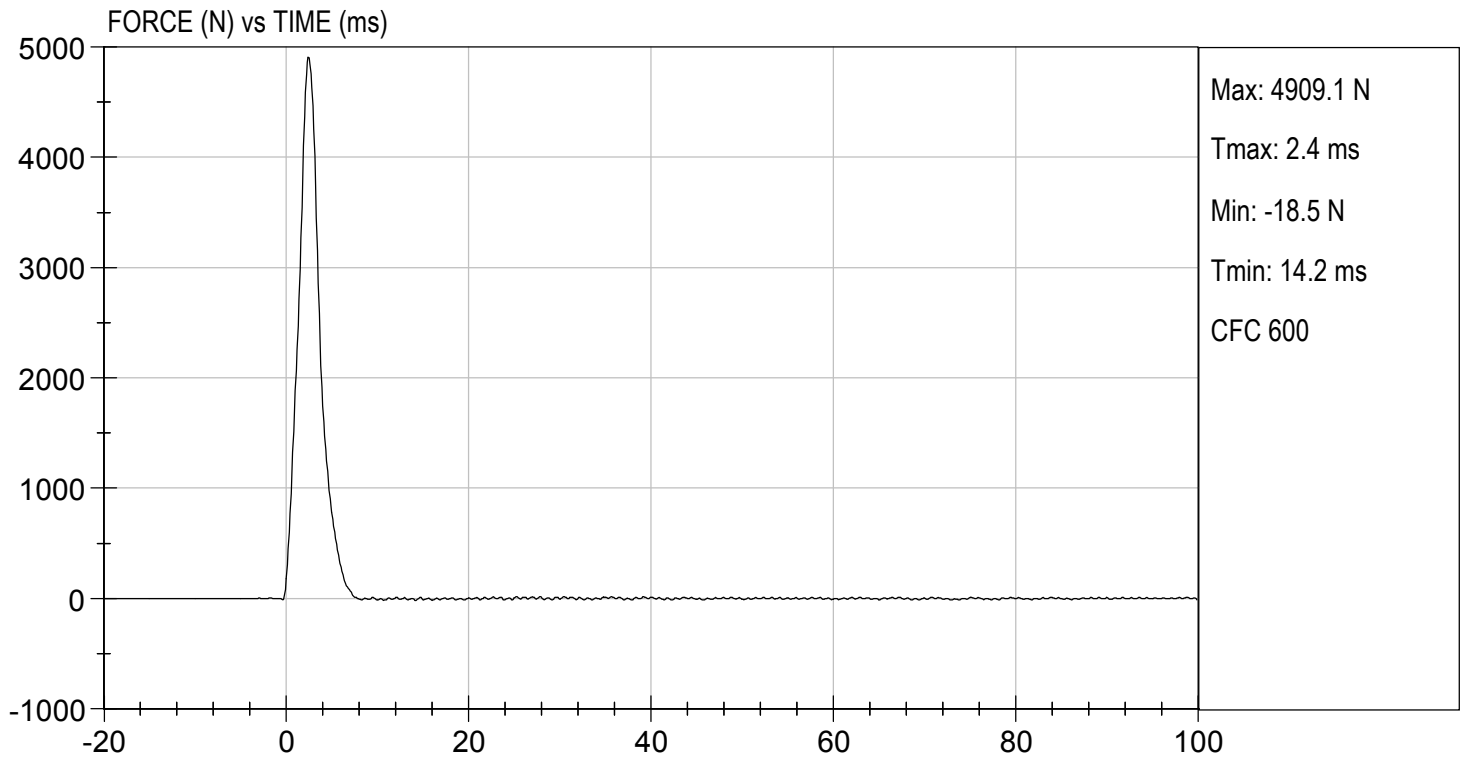
01/30/2019
 Test Date

Robert Schaefer
 Approved By



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

TEST DATE: 01/30/2019
TEST #: D190385




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

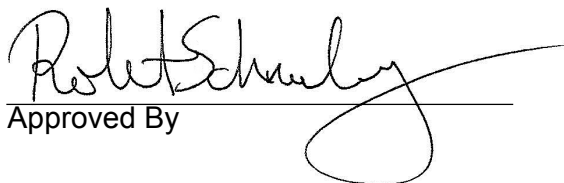
ATD Serial No: 351

Test I.D: D190386

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	17	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,299	Pass
Overall Test Results				Pass


 Laboratory Technician

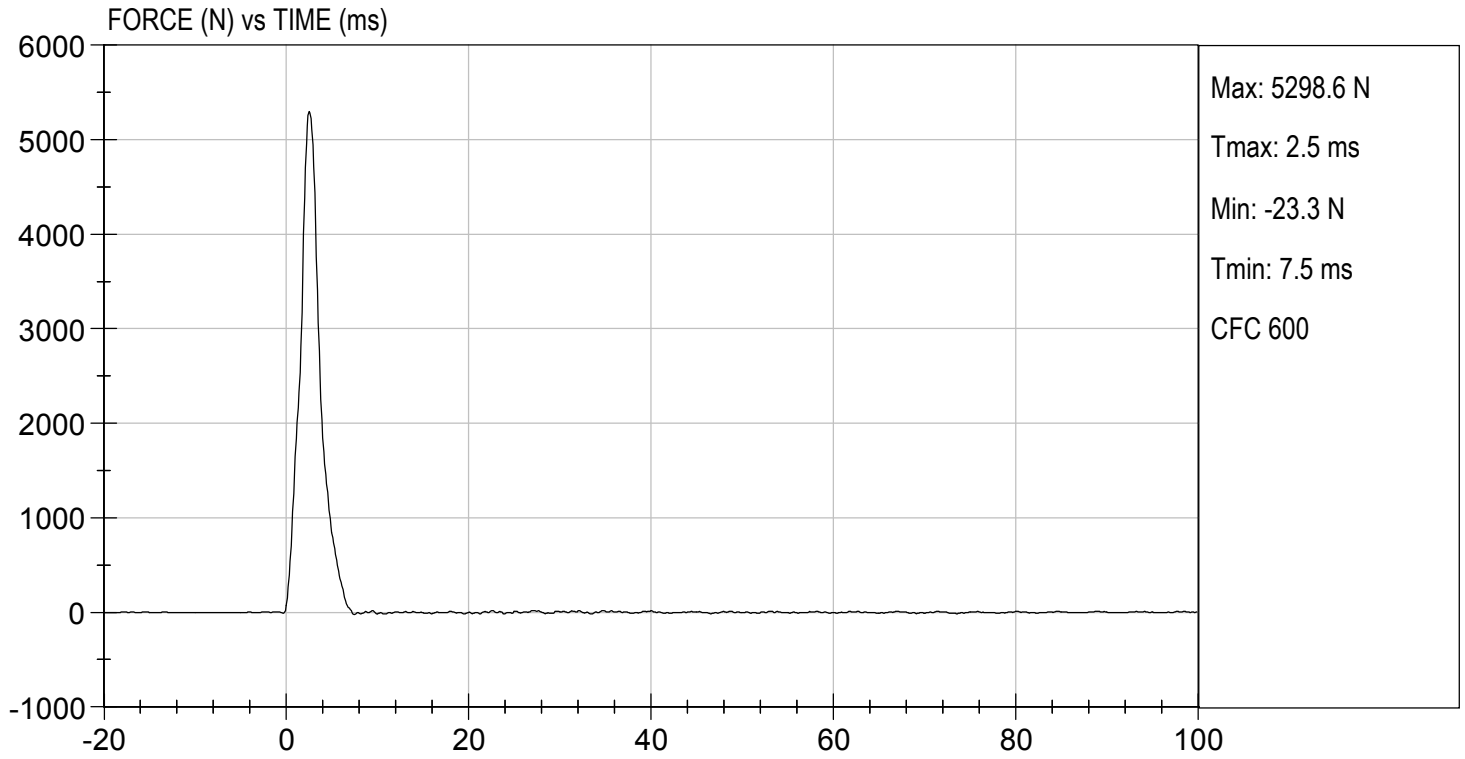
01/30/2019
 Test Date


 Approved By



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

TEST DATE: 01/30/2019
TEST #: D190386



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

ATD Serial No: 351

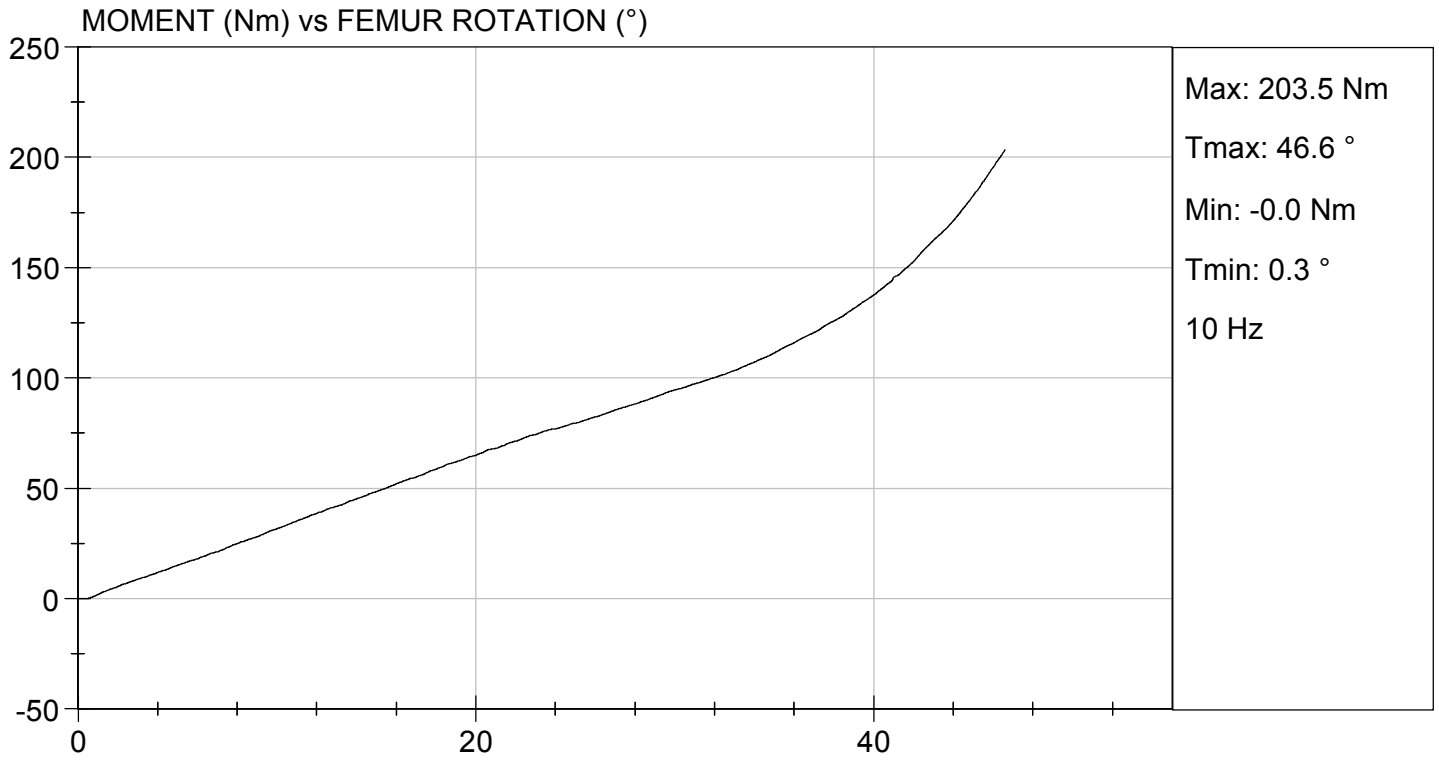
Test I.D: D190380

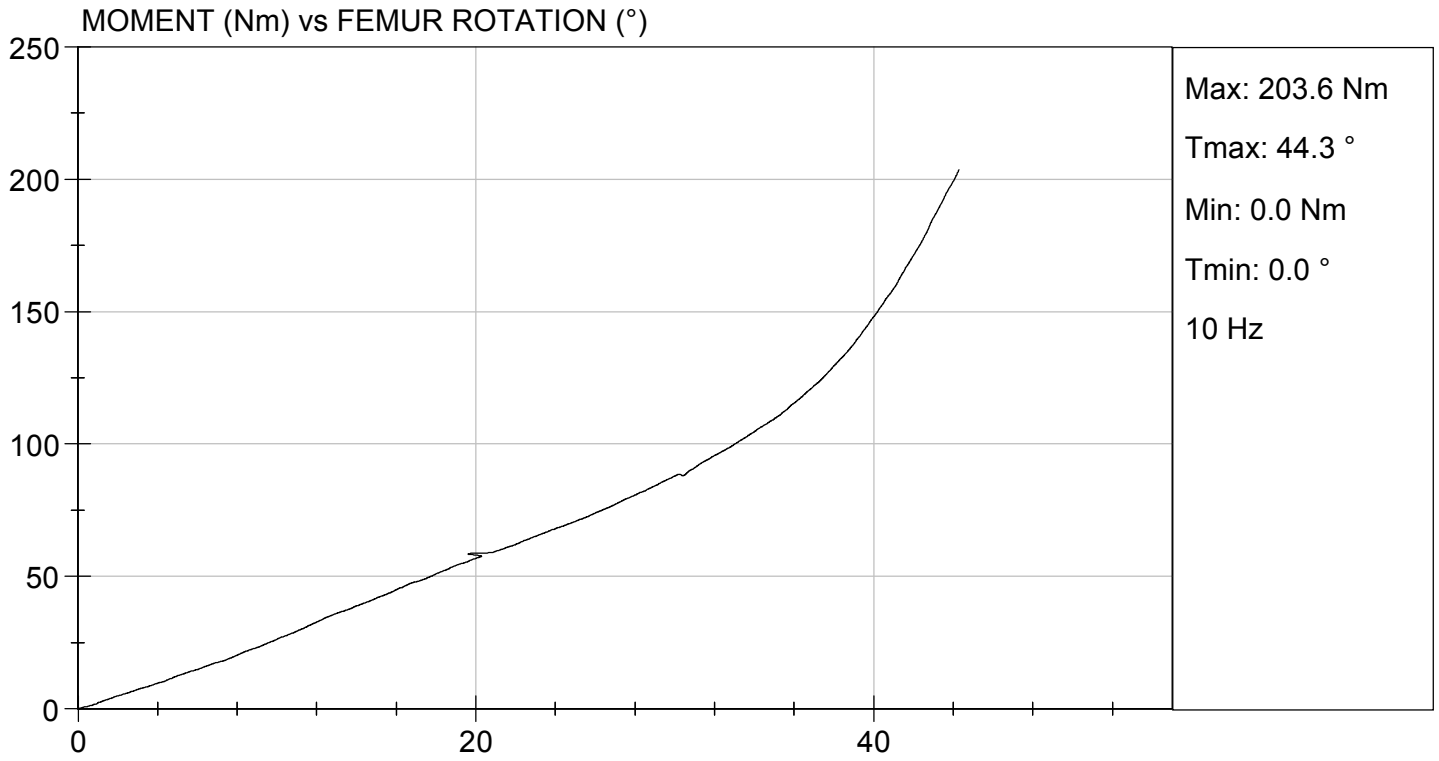
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	15	15	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	94.6	87.9	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	46.6	44.3	Pass
Overall Test Results					Pass

Danielle Redinlaugh
Laboratory Technician

01/30/2019
Test Date

Robert Schaefer
Approved By





CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: 138

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	785.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	456.8
C	H-POINT HEIGHT	Reference	81.3-86.3	84.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	249.6
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	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	201.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	526.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398.0


N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	430.5
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	184.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	472.6
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	184.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	307.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	546.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	875.1
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785.4
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**

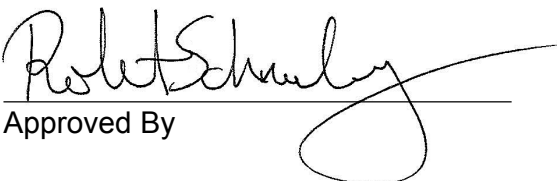
ATD Serial No: 138

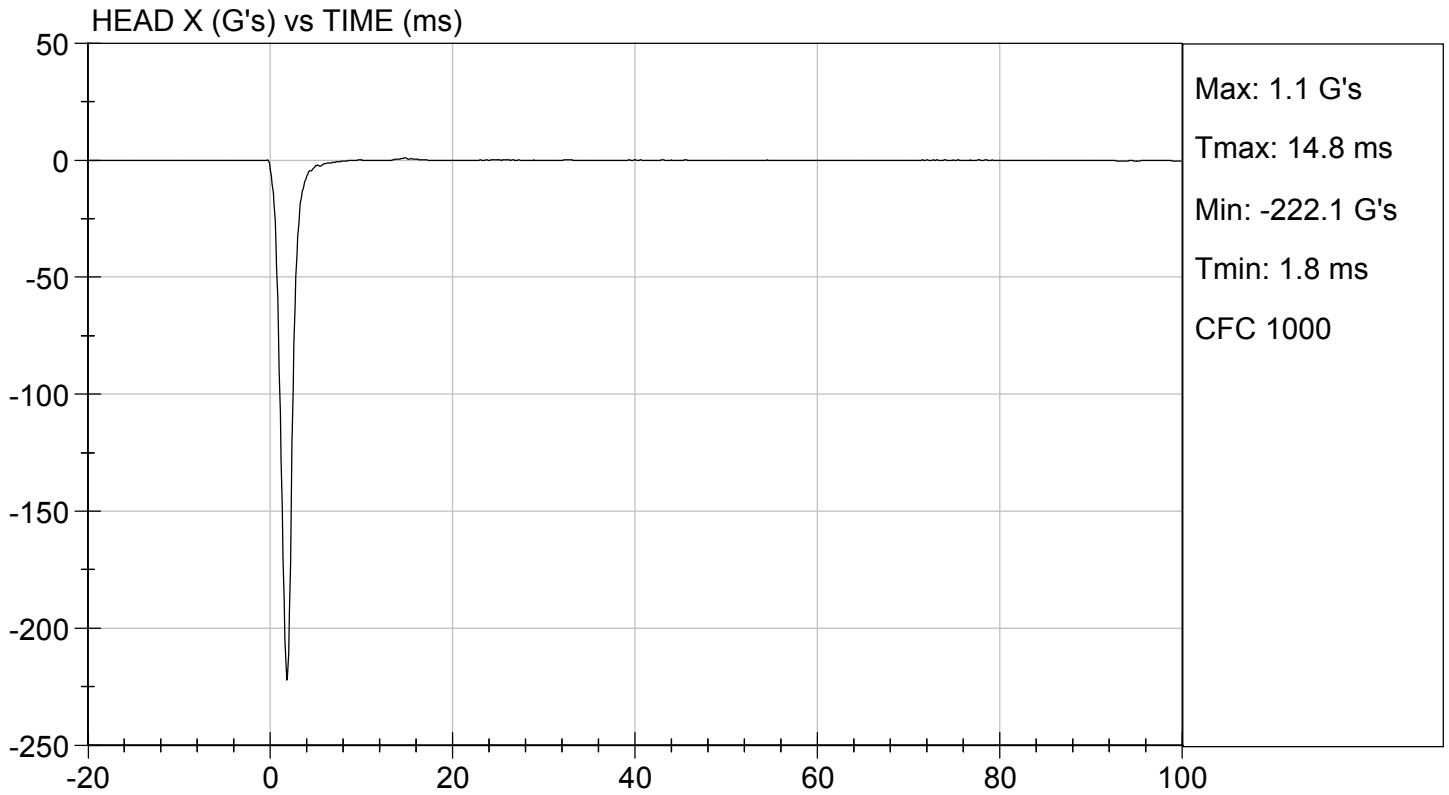
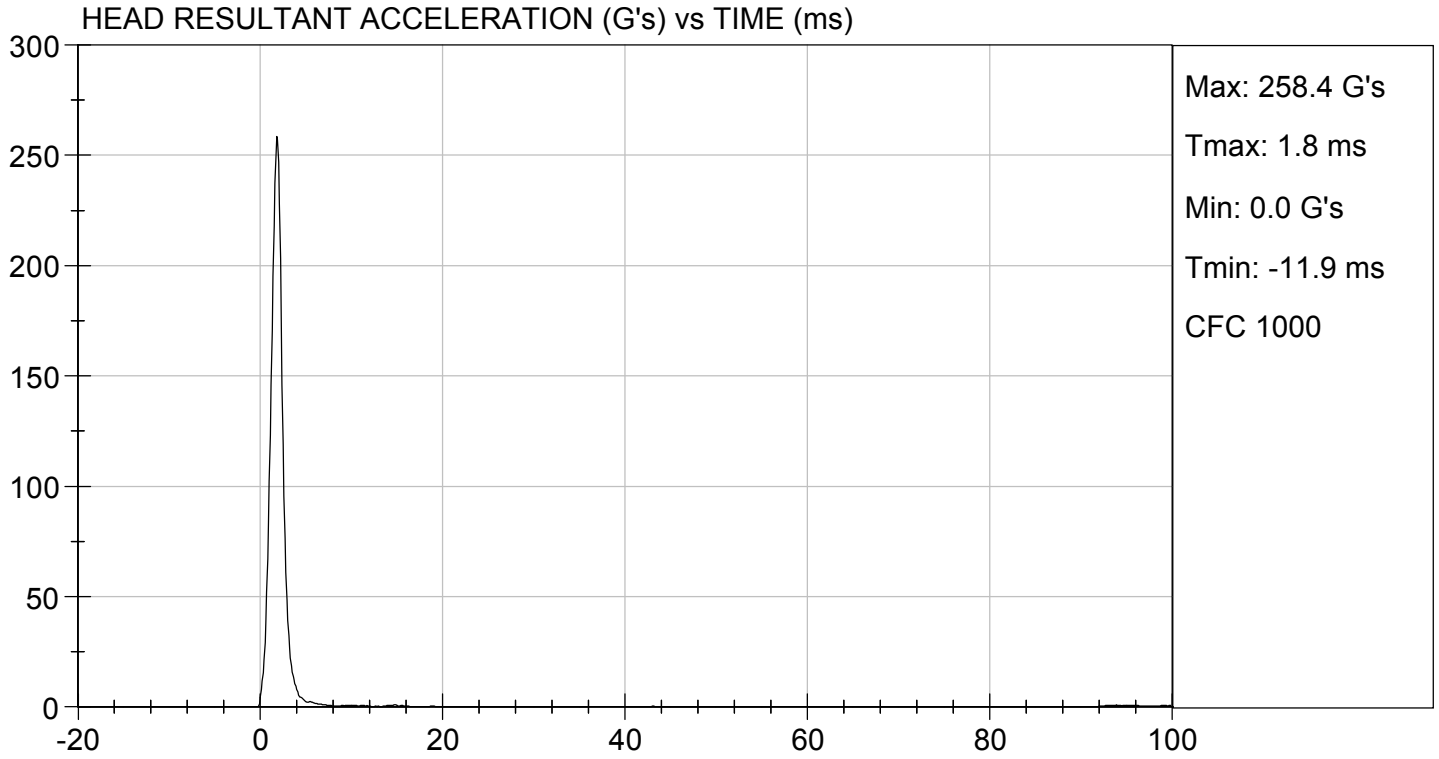
Test ID: D190331

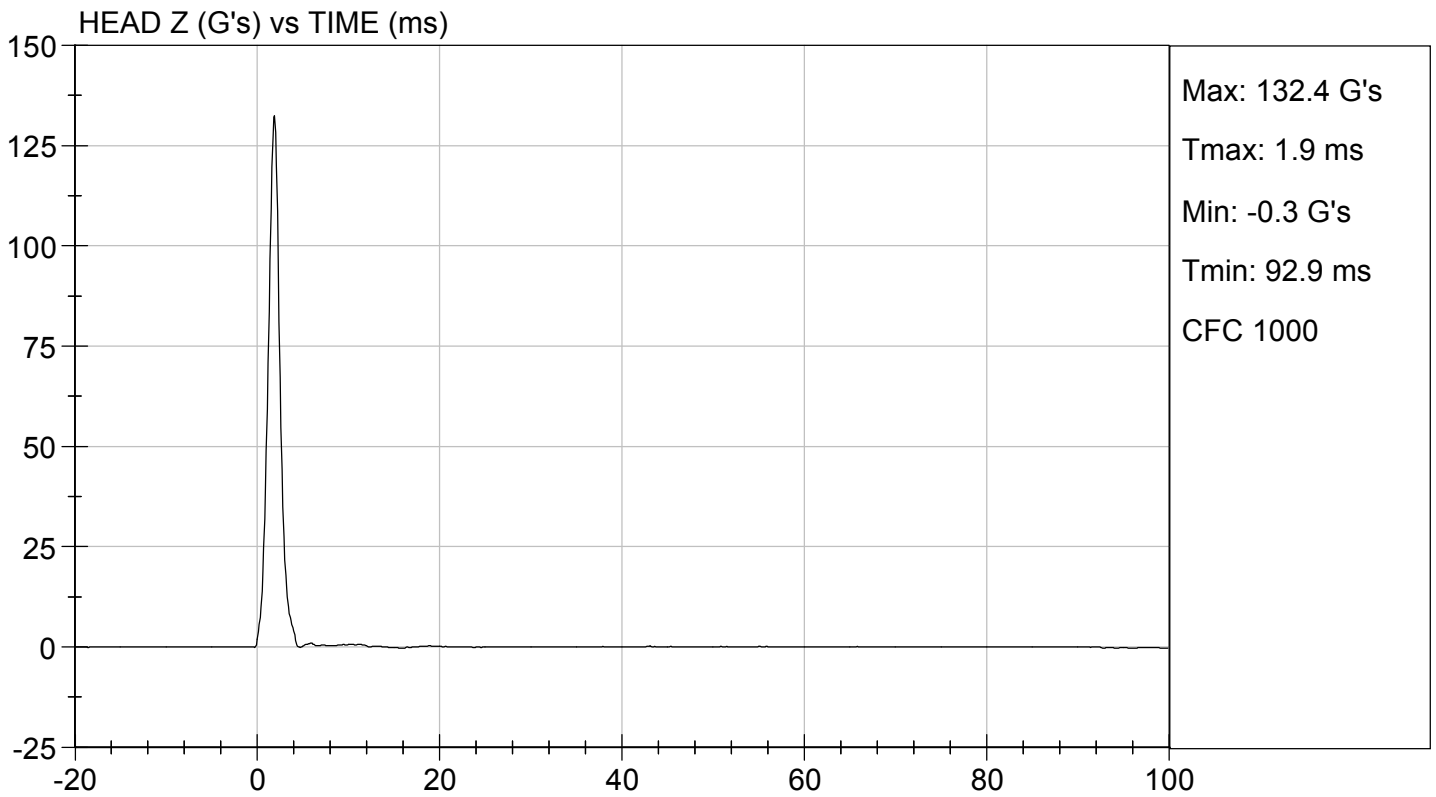
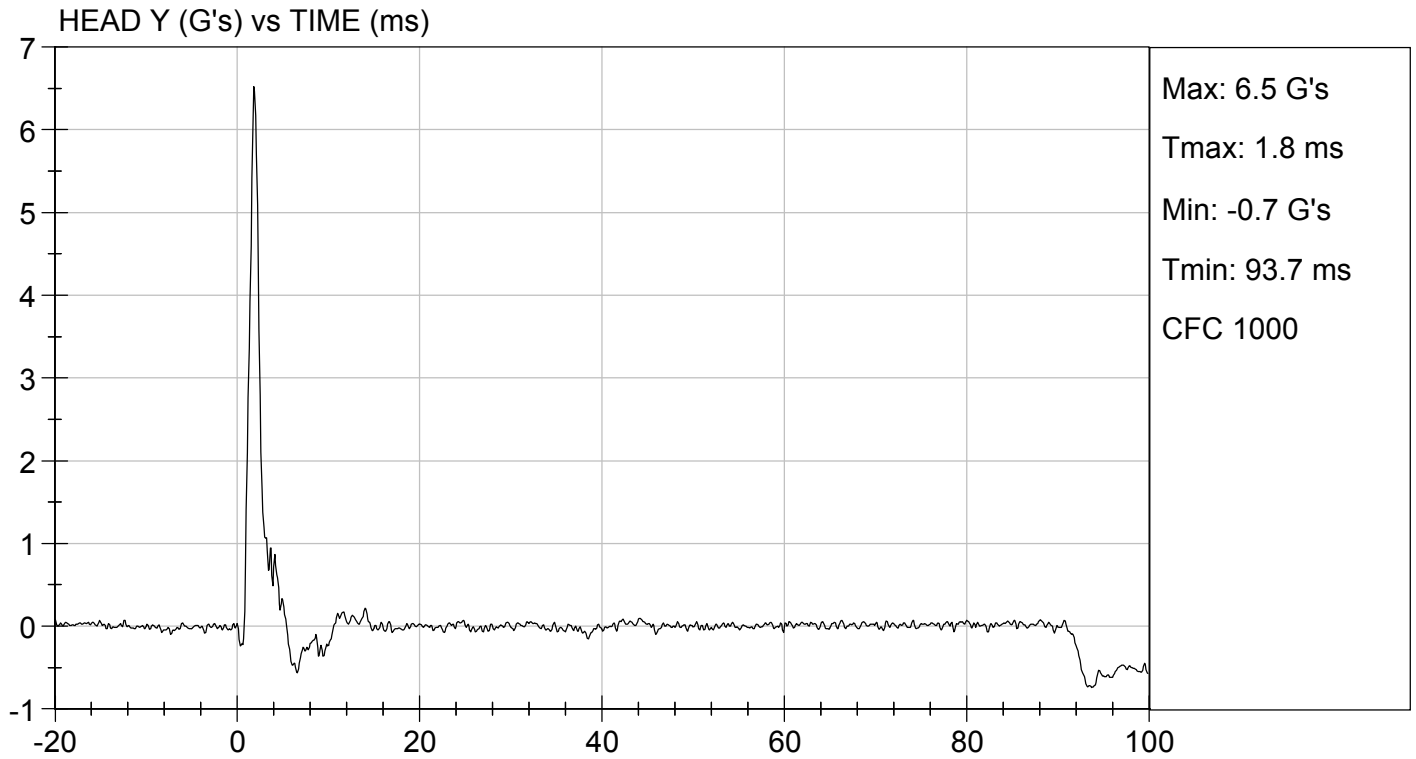
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	250 to 300	258	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	6.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

01/24/2019
Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D.: D190332

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	16	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.1	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	84	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass

Danielle Redinlaugh

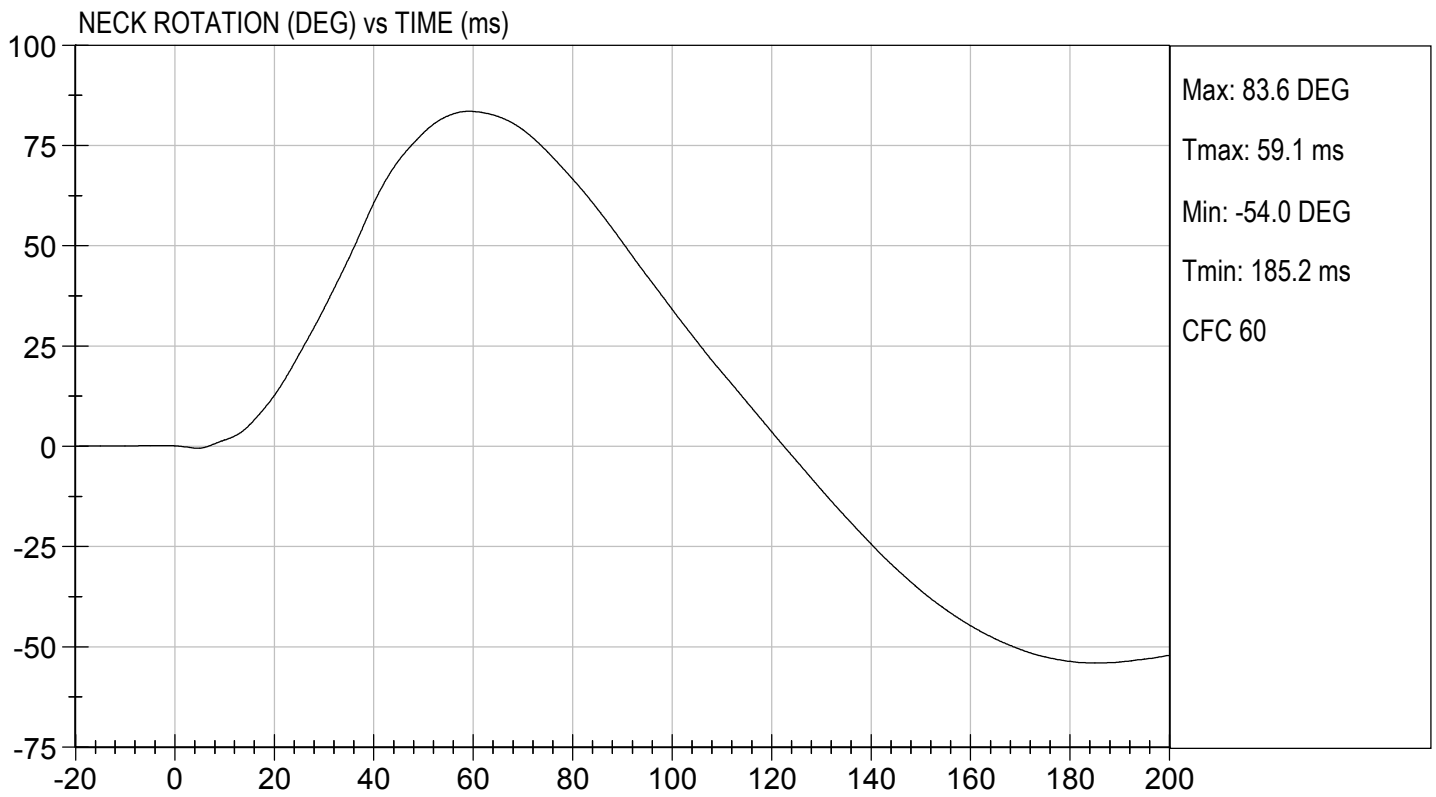
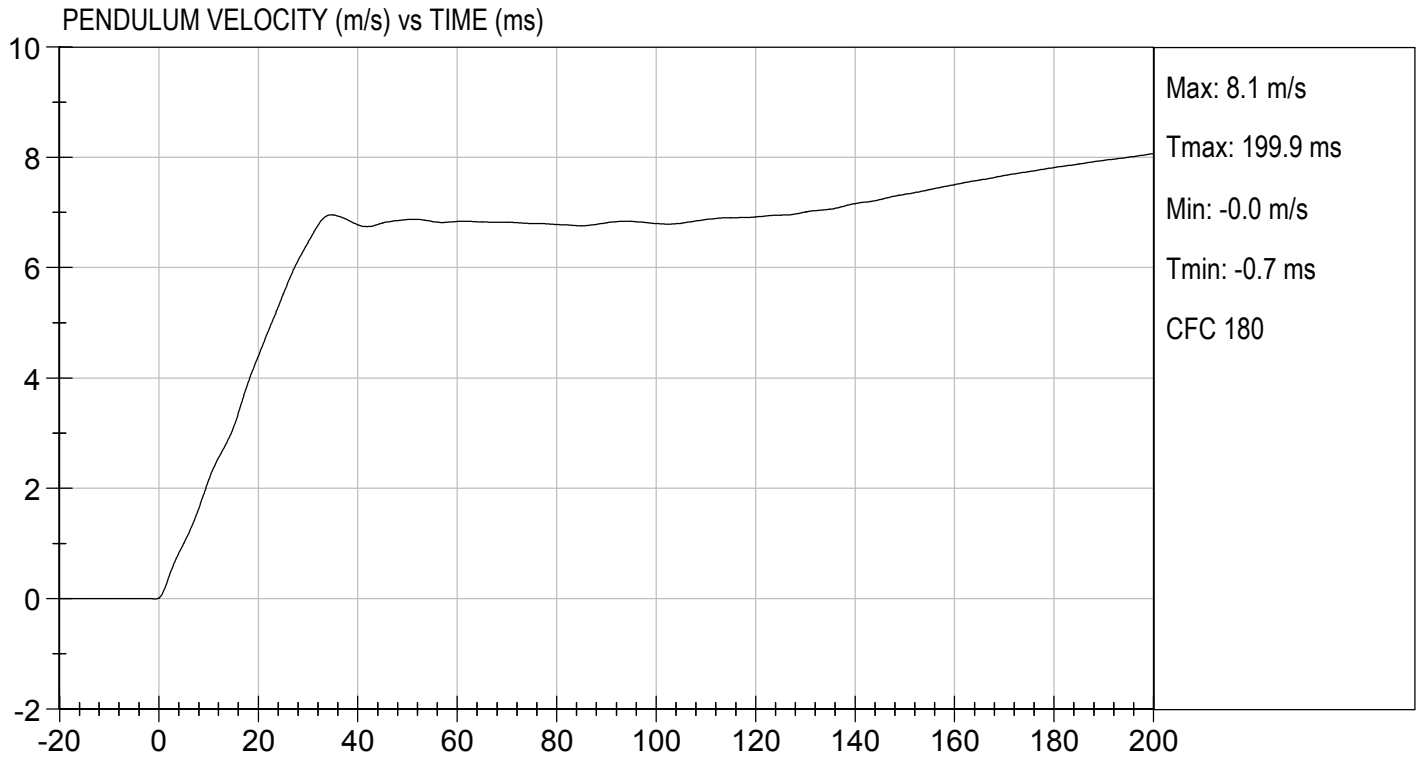
 Laboratory Technician

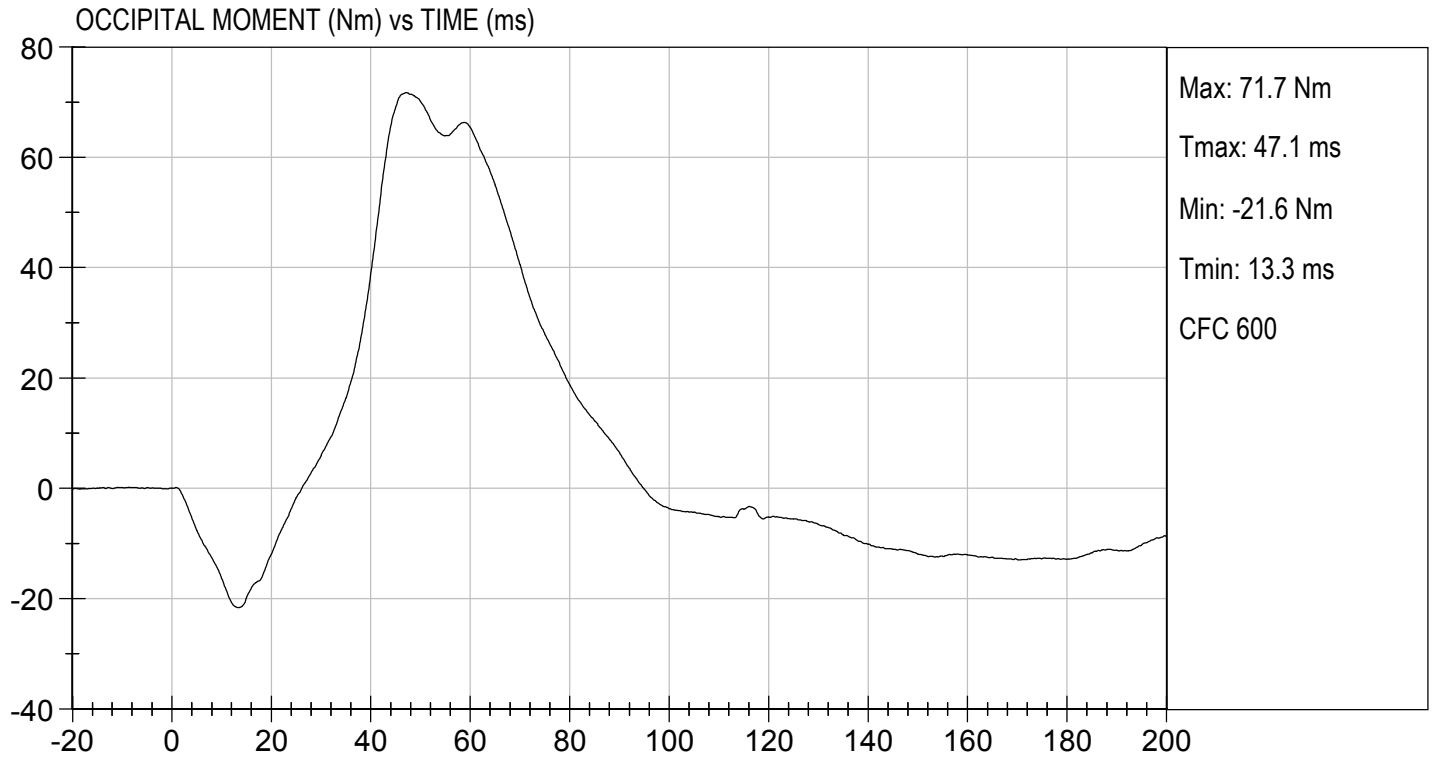
01/28/2019

 Test Date

Robert Schaub

 Approved By



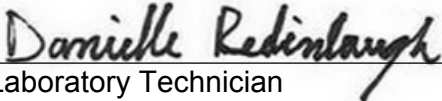


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

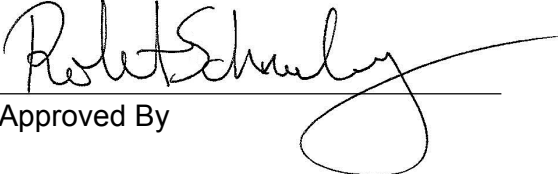
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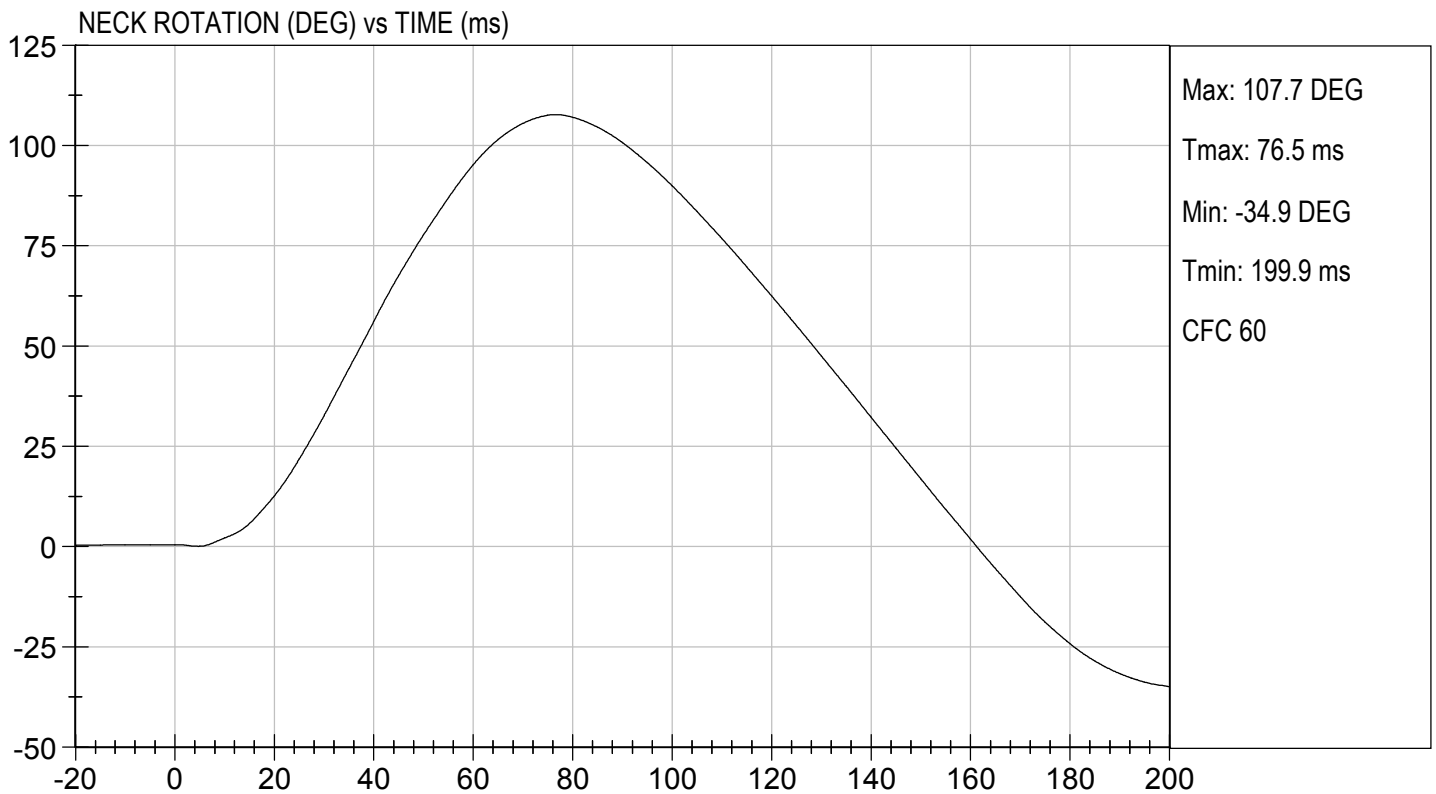
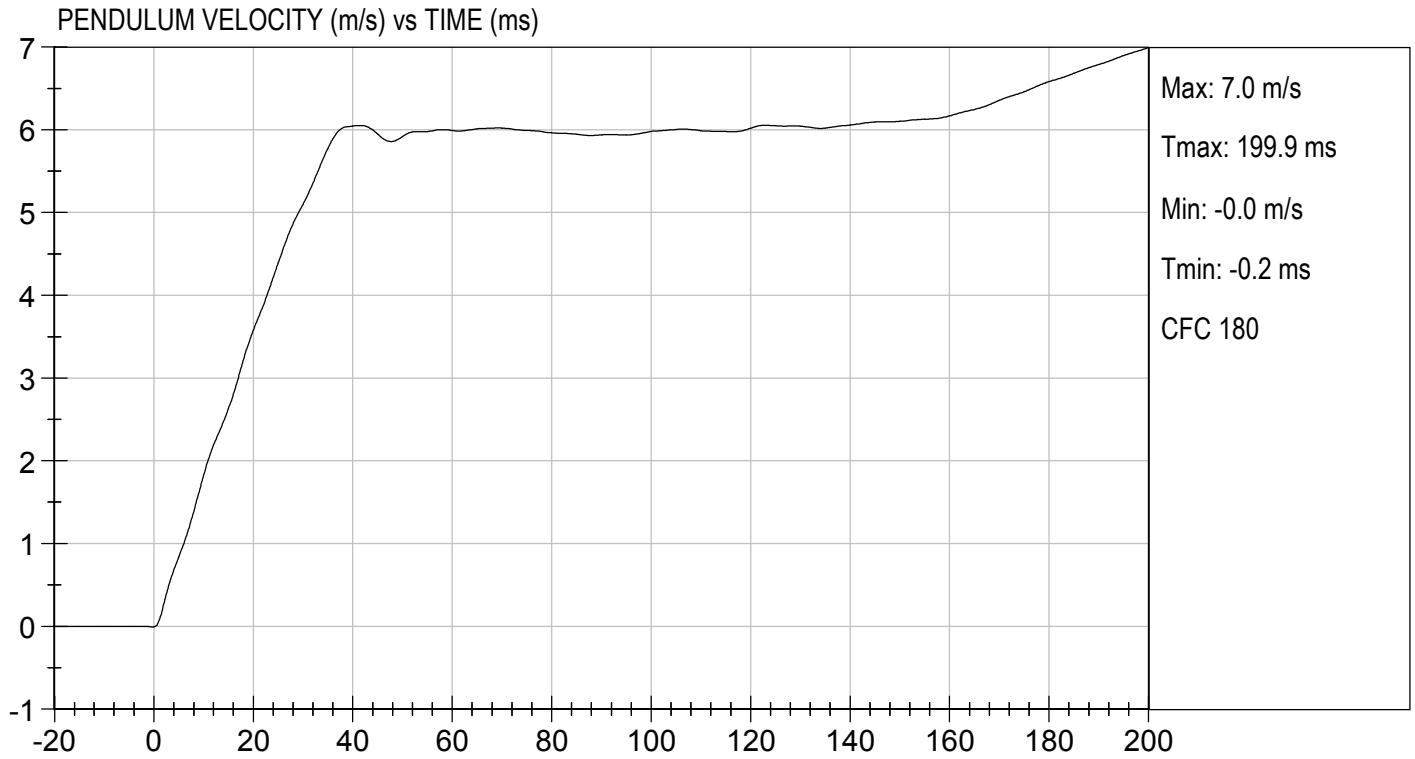
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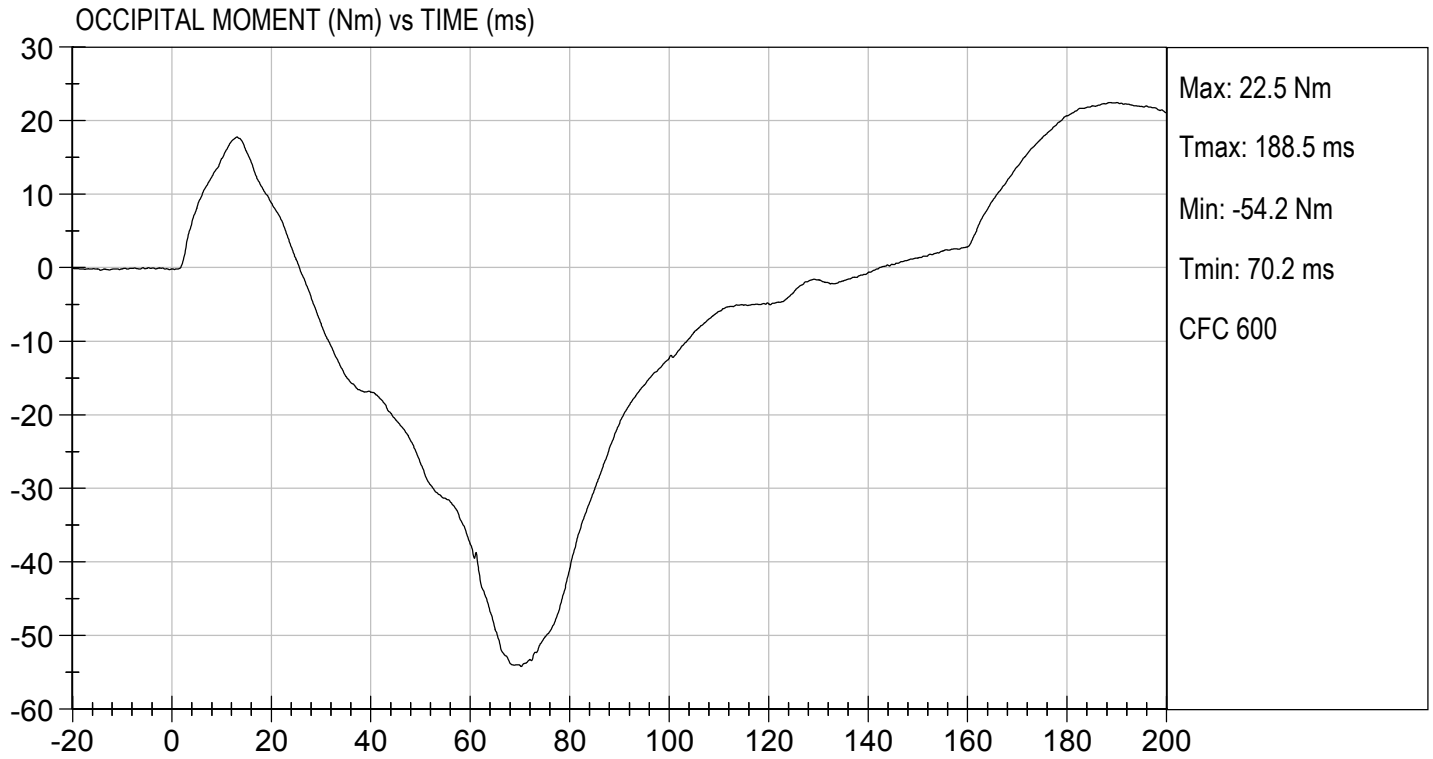
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	16	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
Overall Results					Pass


 Laboratory Technician

01/28/2019
 Test Date


 Approved By



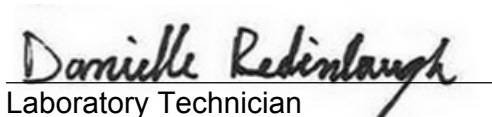


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

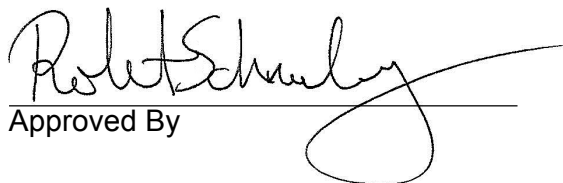
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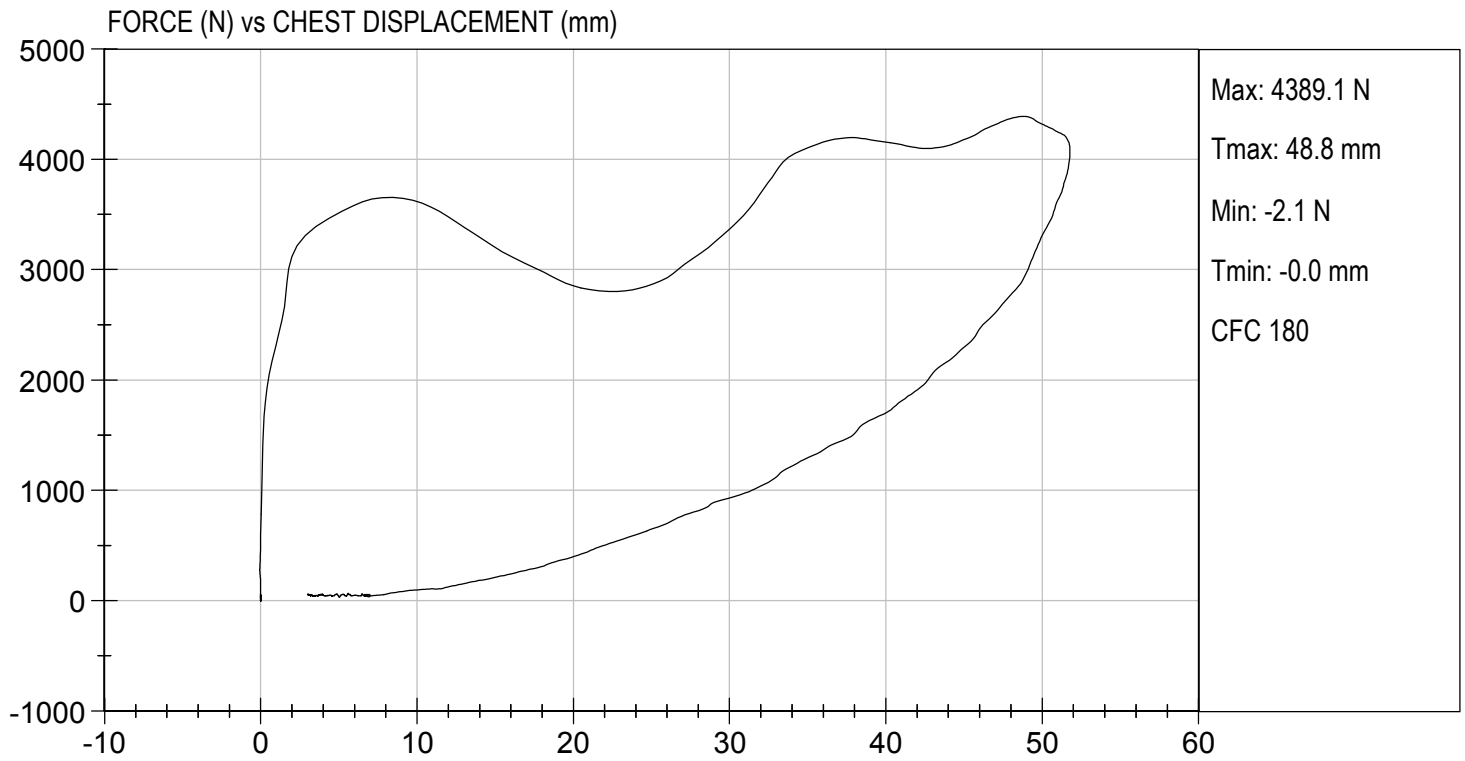
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21	Pass
Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4312	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4389	Pass
Overall Test Results				Pass


 Laboratory Technician

01/28/2019

Test Date


 Approved By



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

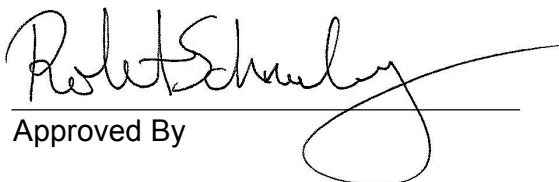
ATD Serial No: 138

Test I.D: D190335

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3676	Pass
Overall Test Results				Pass


Laboratory Technician

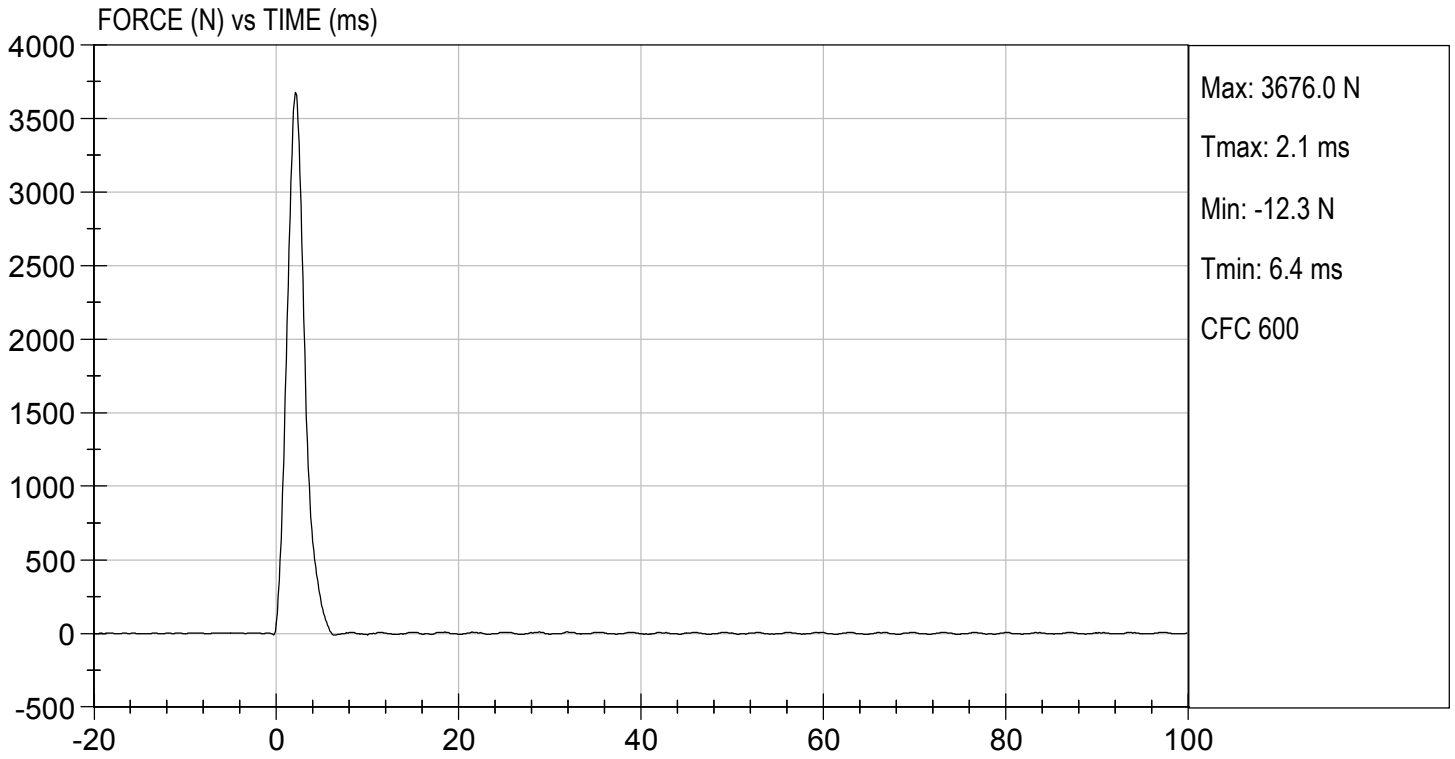
01/24/2019
Test Date


Approved By



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

TEST DATE: 01/24/2019
TEST #: D190335



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

ATD Serial No: 138

Test I.D: D190336

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3925	Pass
Overall Test Results				Pass

Danielle Redinlaugh
Laboratory Technician

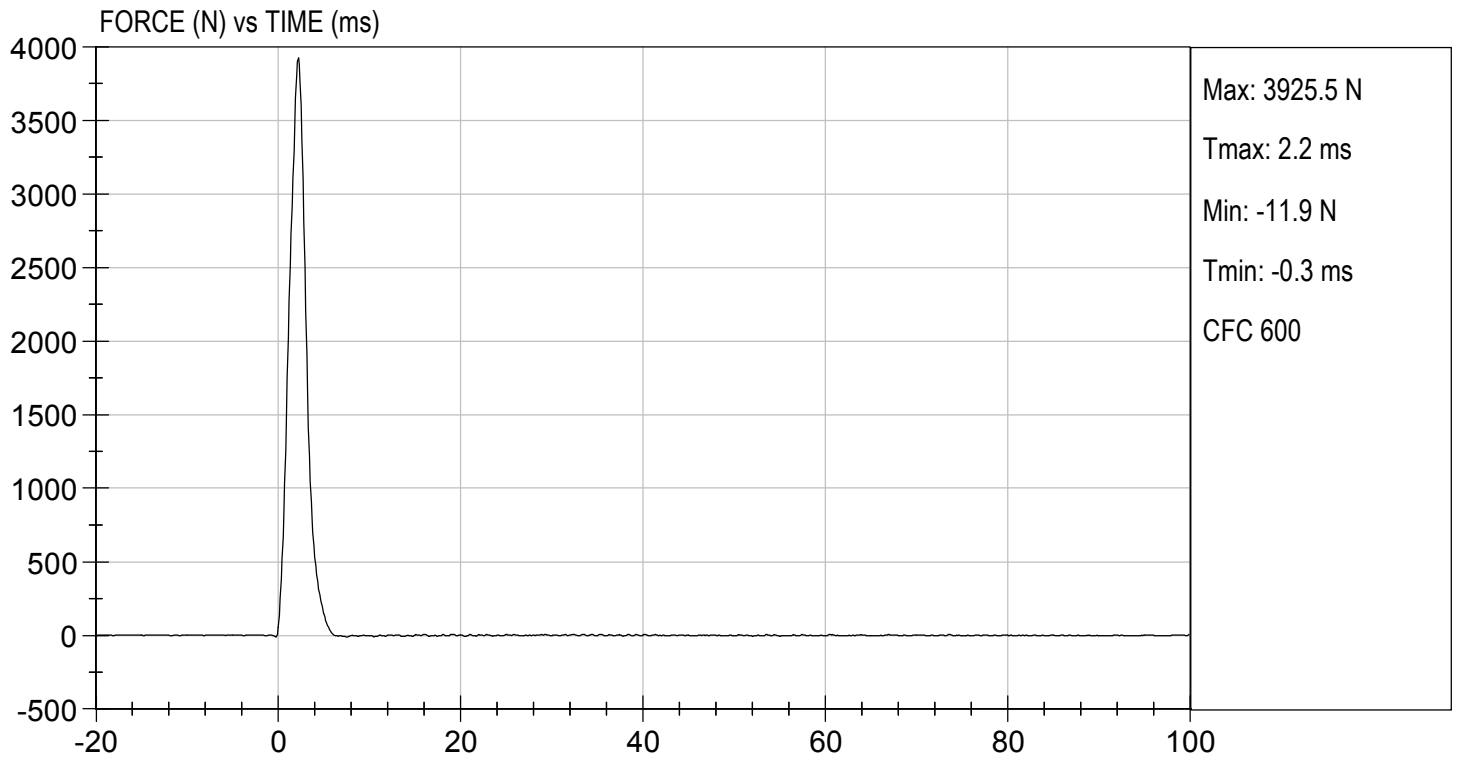
01/24/2019
Test Date

Robert Schaefer
Approved By



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

TEST DATE: 01/24/2019
TEST #: D190336

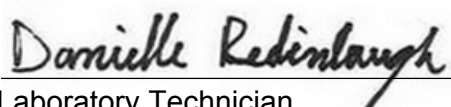


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D190337

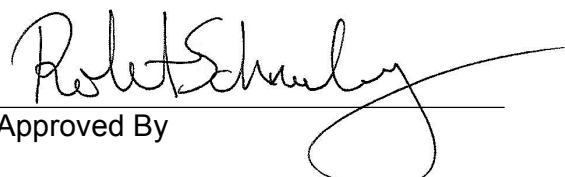
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	2	Pass
Force at 45 deg	N	320 to 390	352	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result				Pass



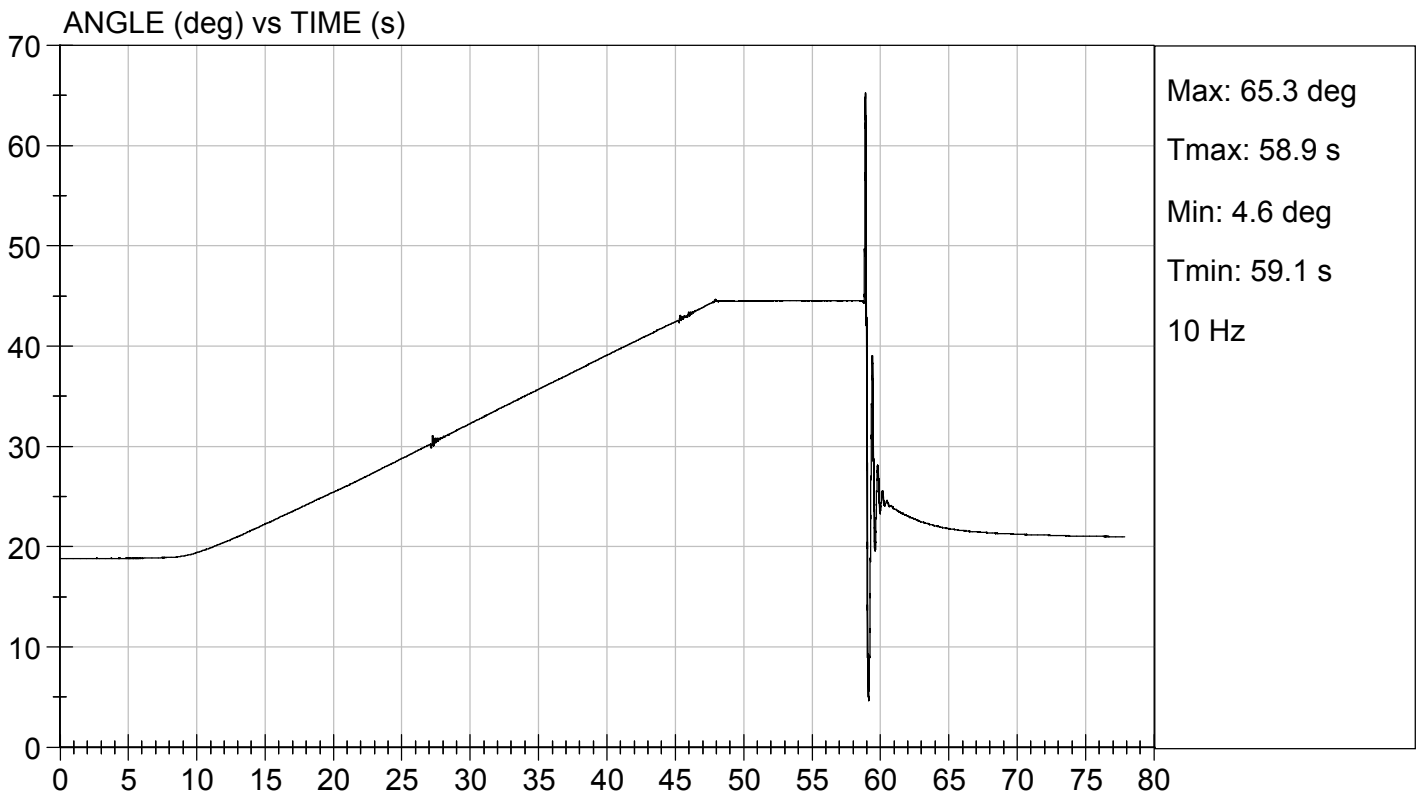
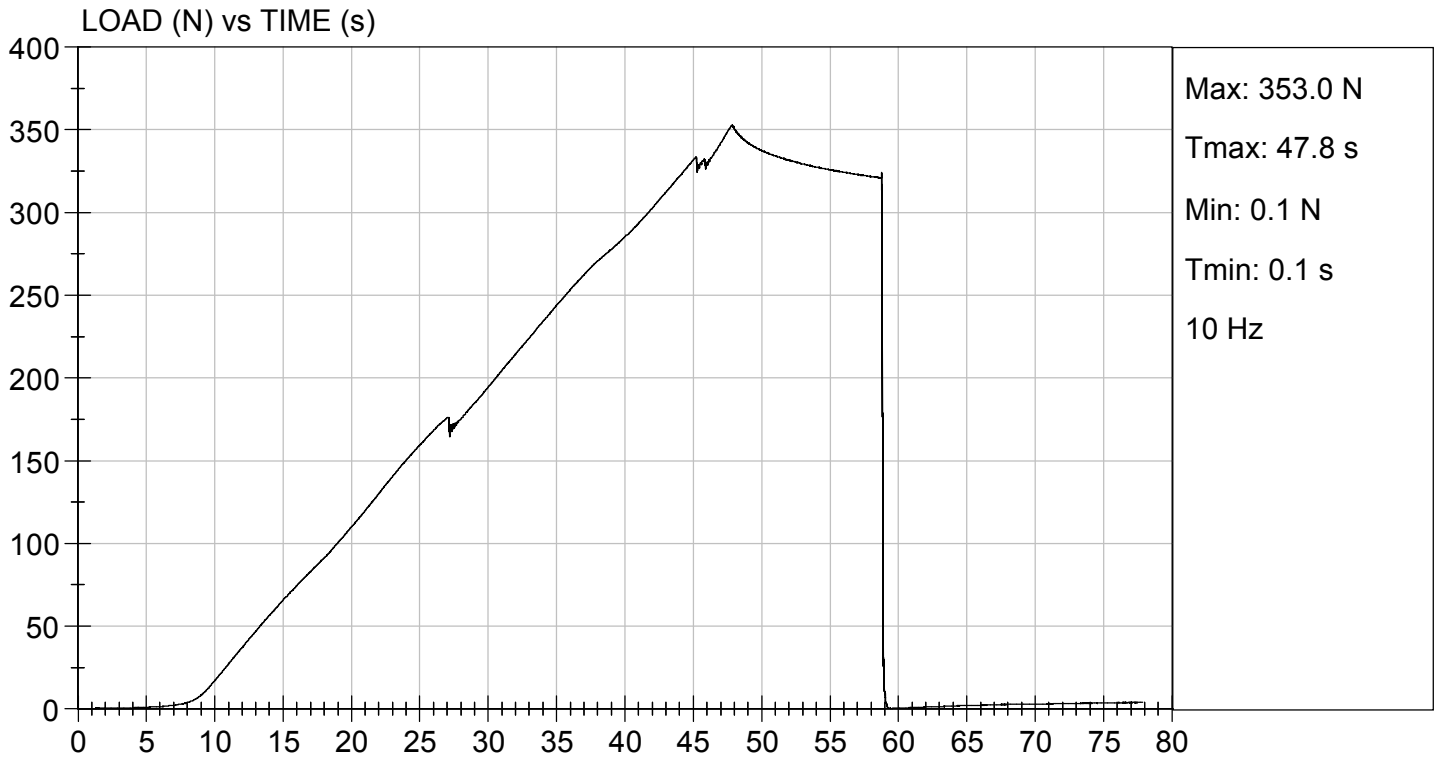
 Laboratory Technician

01/28/2019

 Test Date



 Approved By



CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

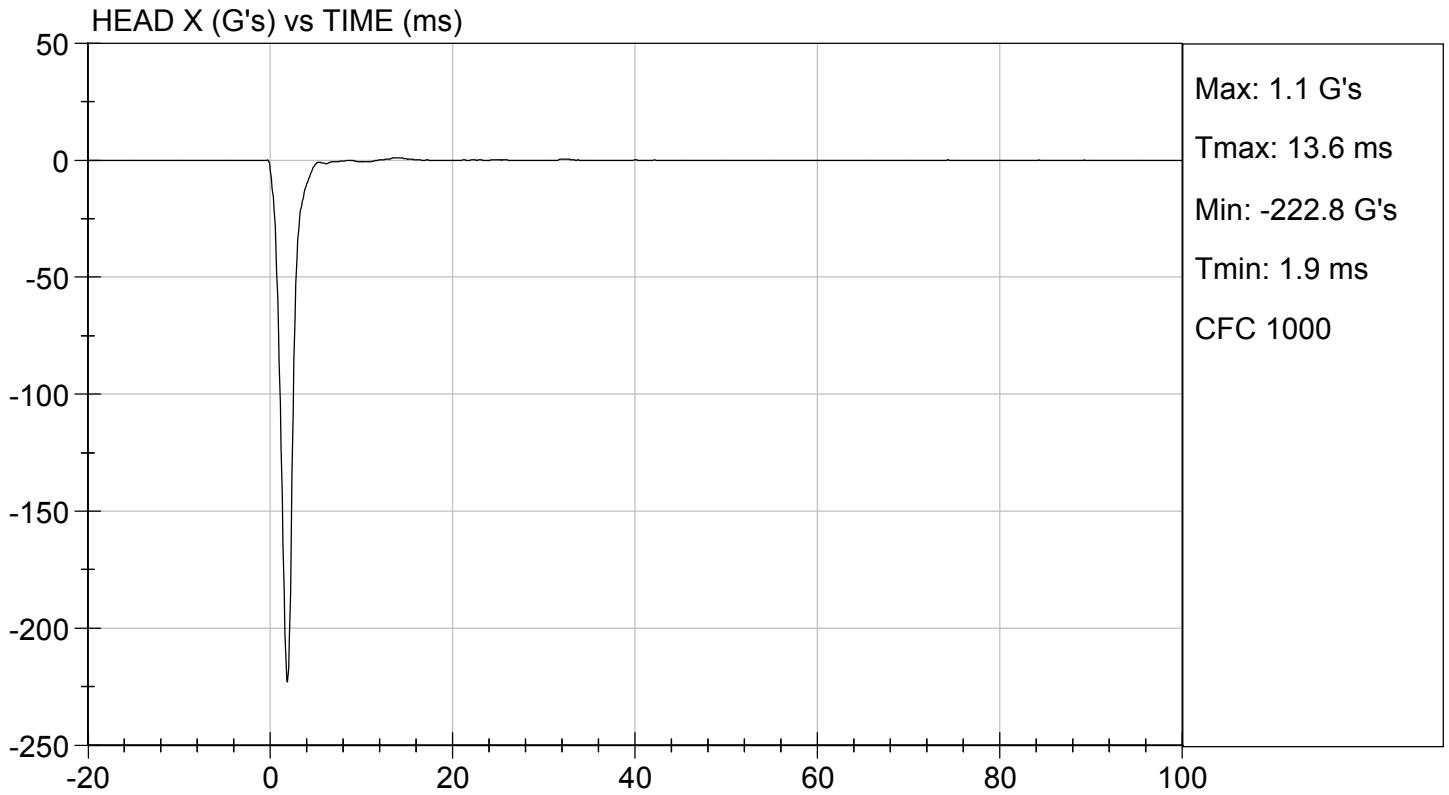
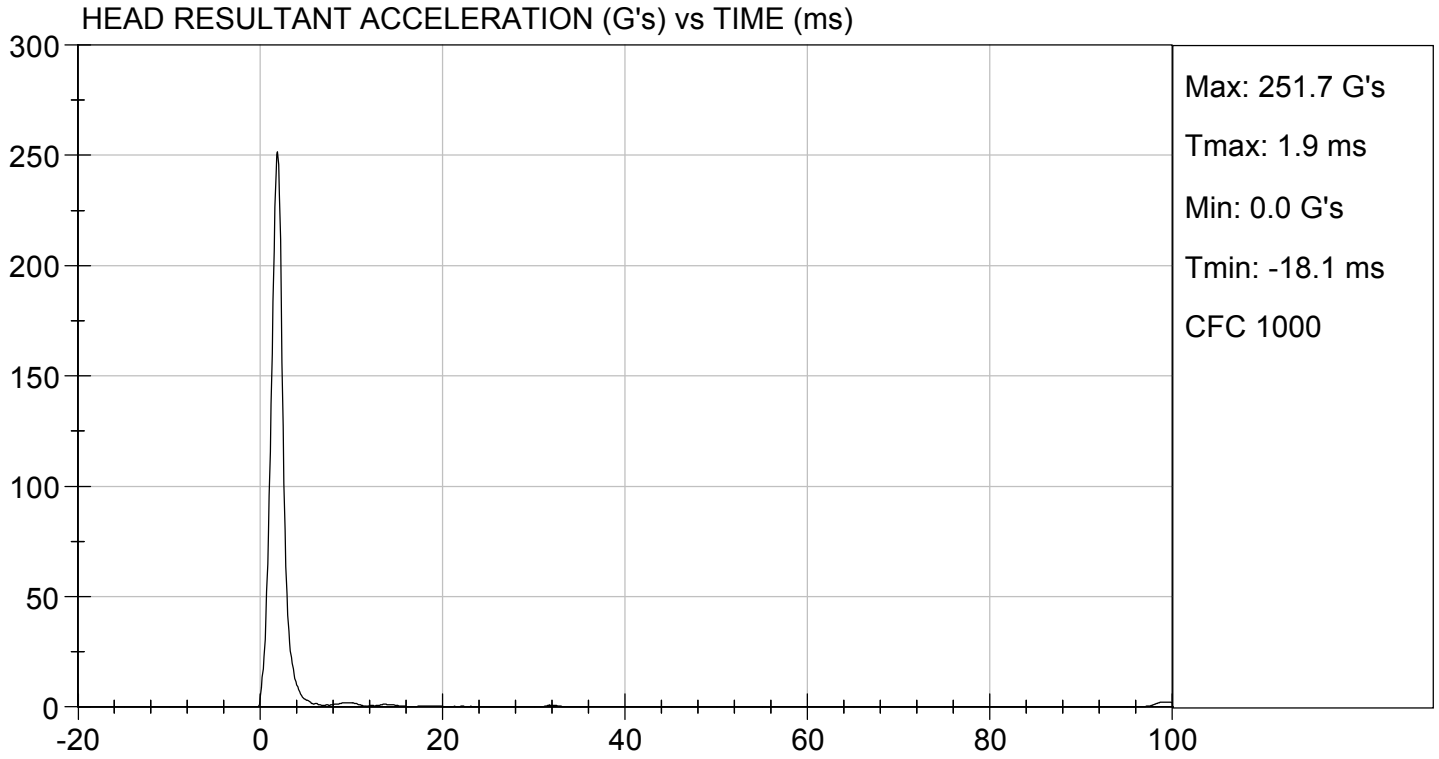
Test ID: D190371

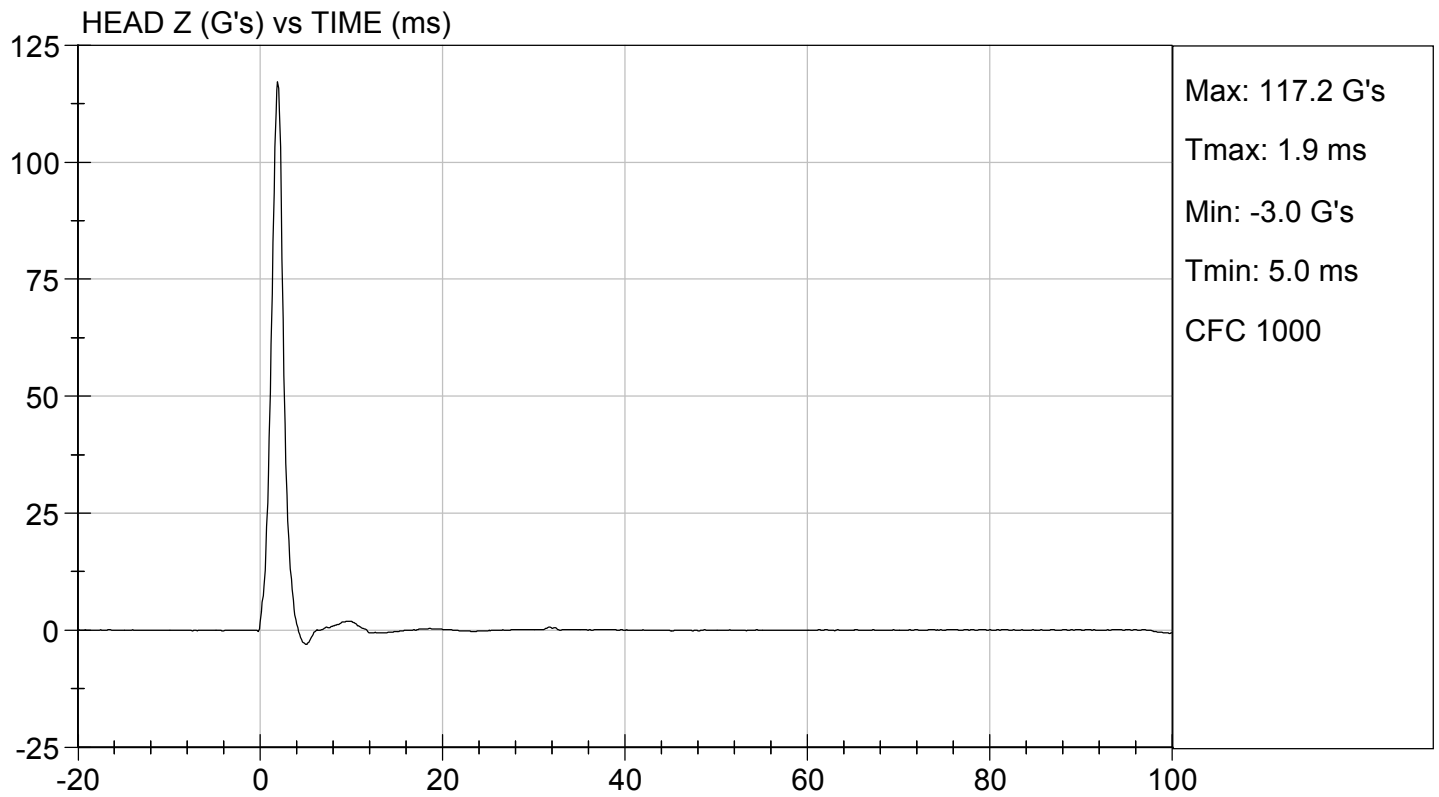
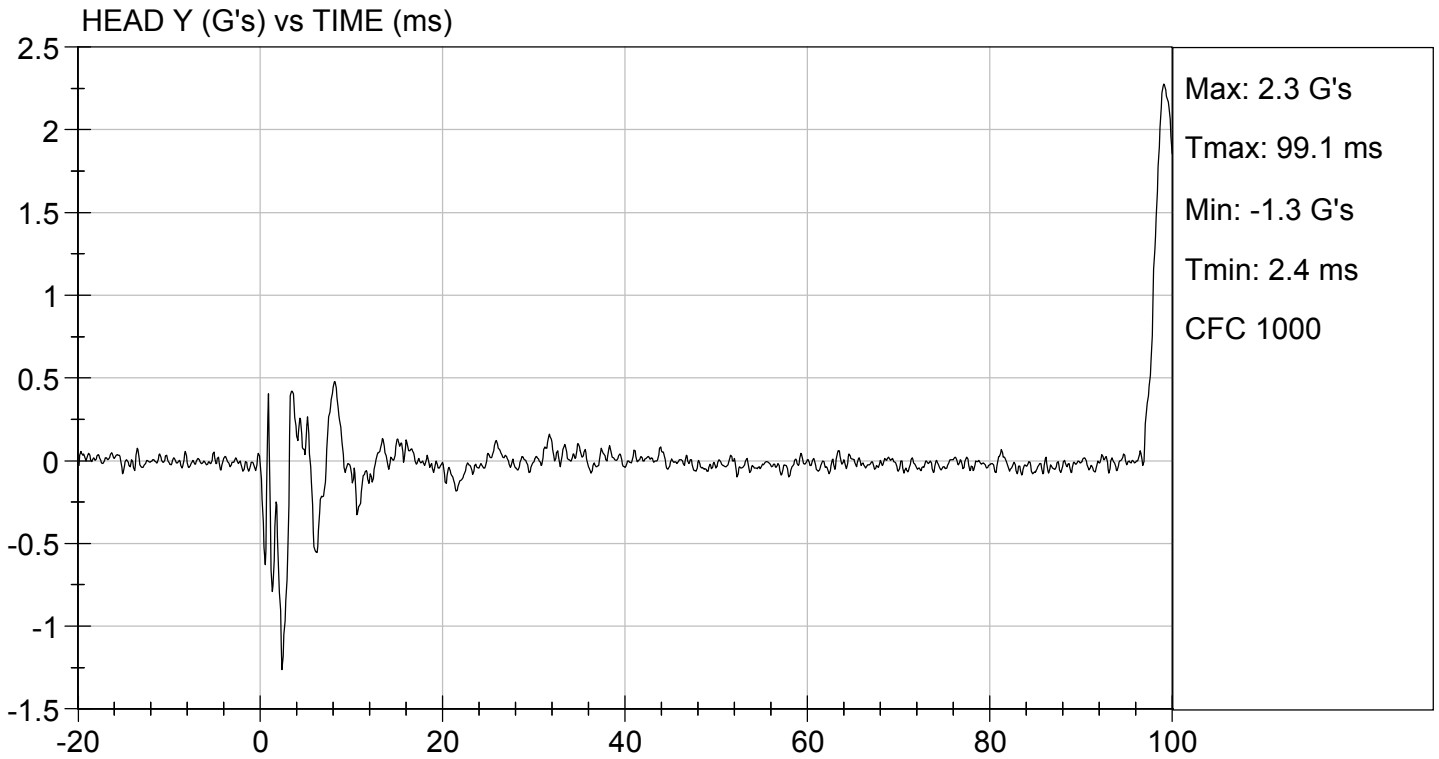
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Peak Resultant Acceleration	G's	250 to 300	252	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jacob D Taylor
 Laboratory Technician

01/29/2019
 Test Date

Robert Schaub
 Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

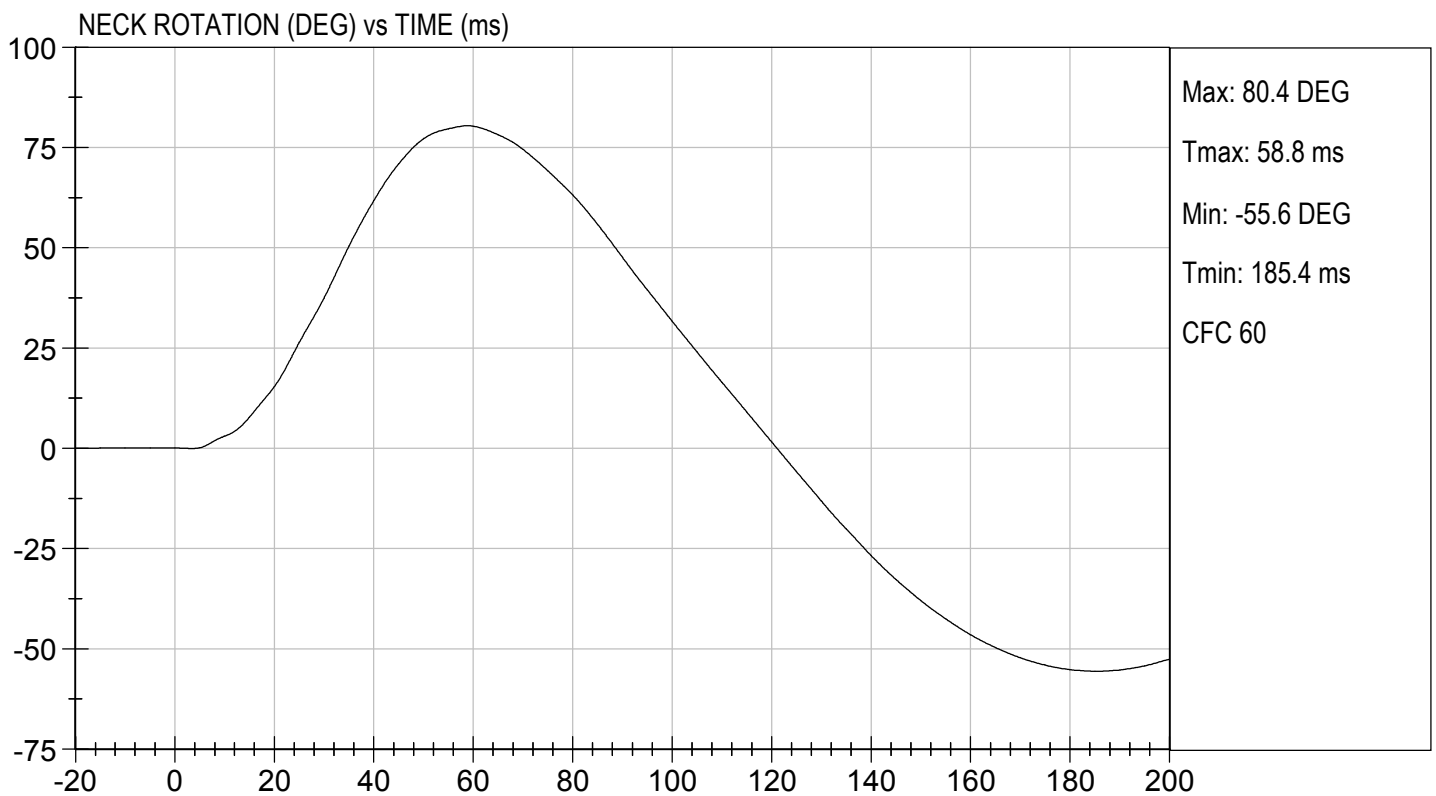
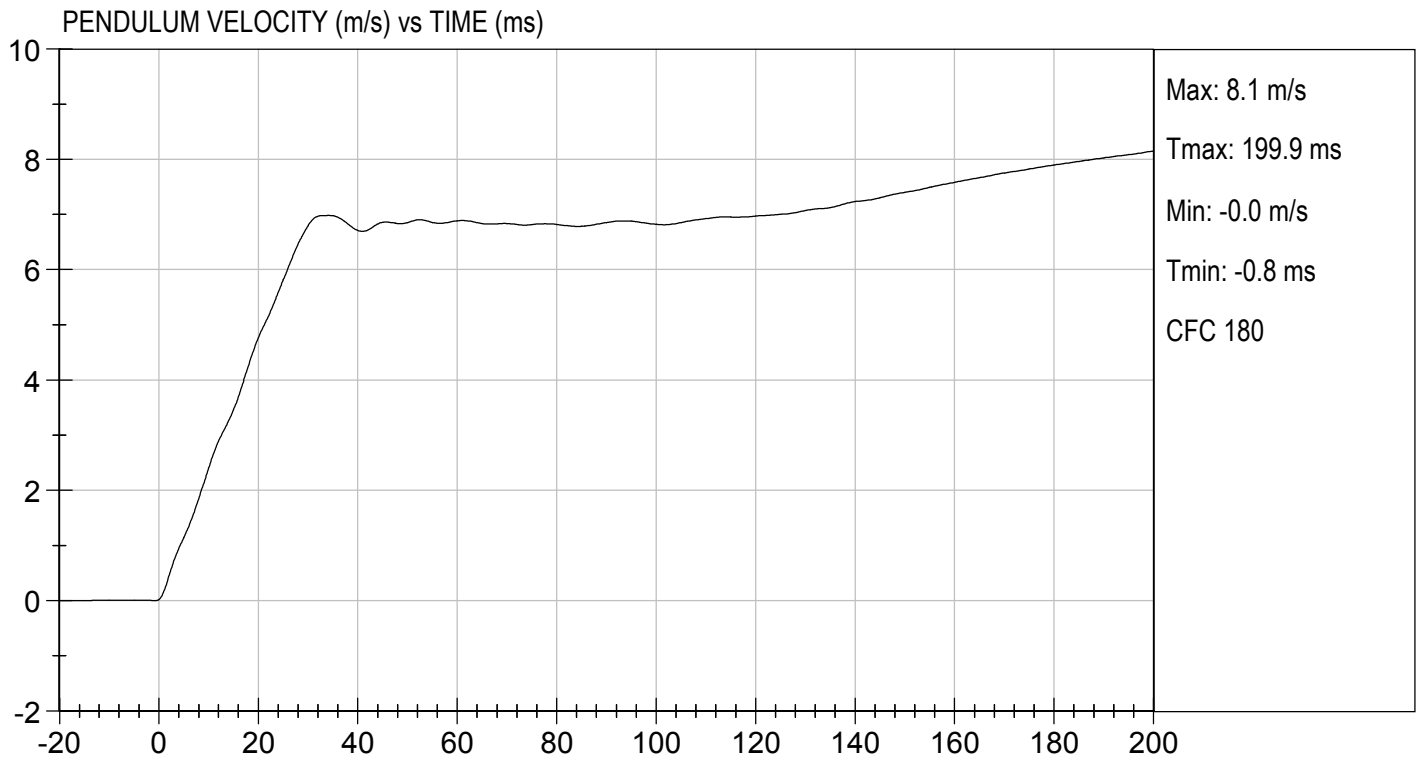
Test I.D.: D190372

Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21	Pass	
Laboratory Relative Humidity	%	10 to 70	15	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	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	80	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	82	Pass	
Overall Results				Pass	

Jacob D Taylor
 Laboratory Technician

01/30/2019
 Test Date

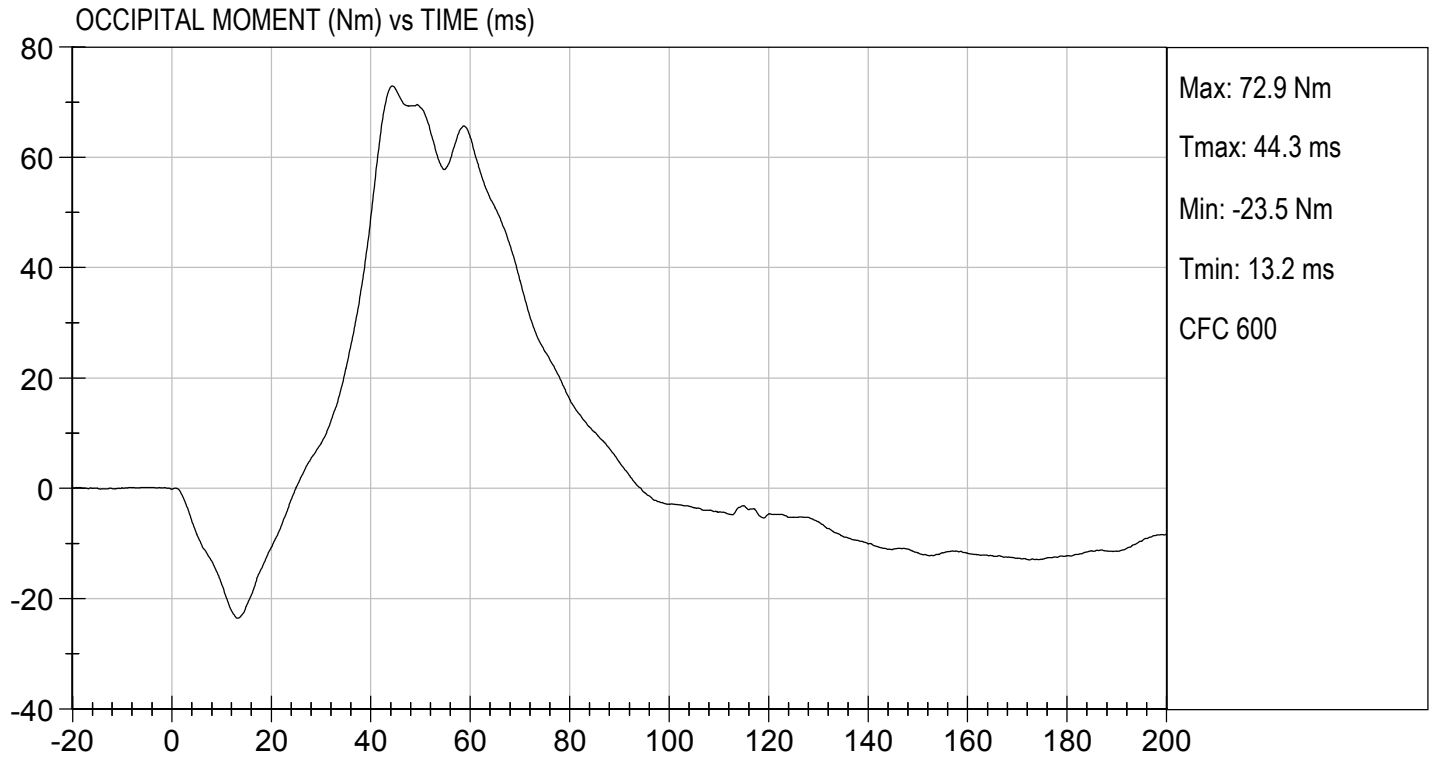
Robert Schaubert
 Approved By





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

TEST DATE: 01/30/2019
TEST #: D190372

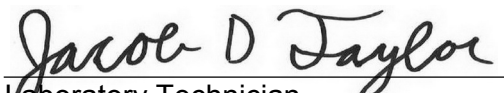


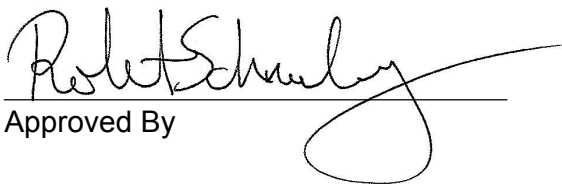
MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

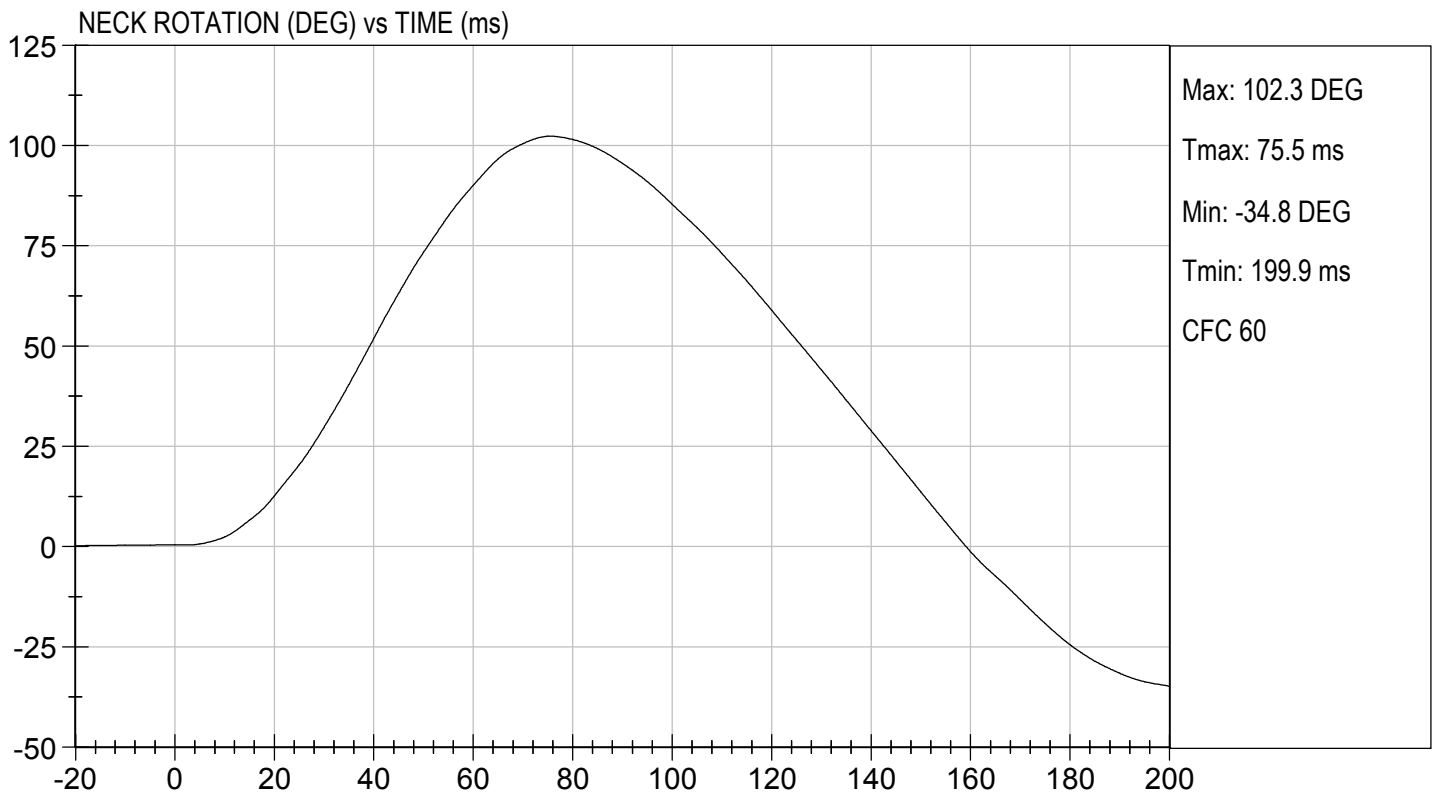
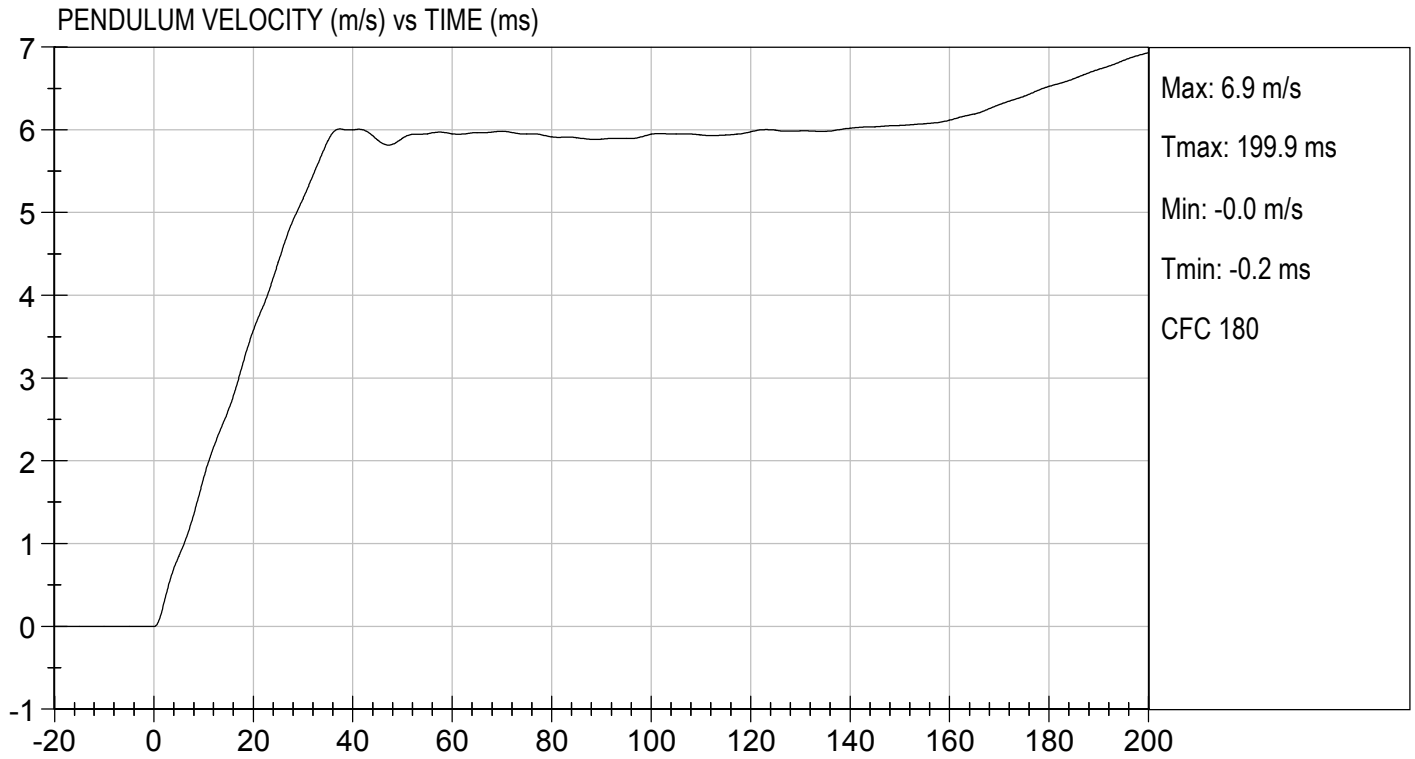
Test I.D: D190373

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity		%	10 to 70	15	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	102	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


 Laboratory Technician


 Approved By

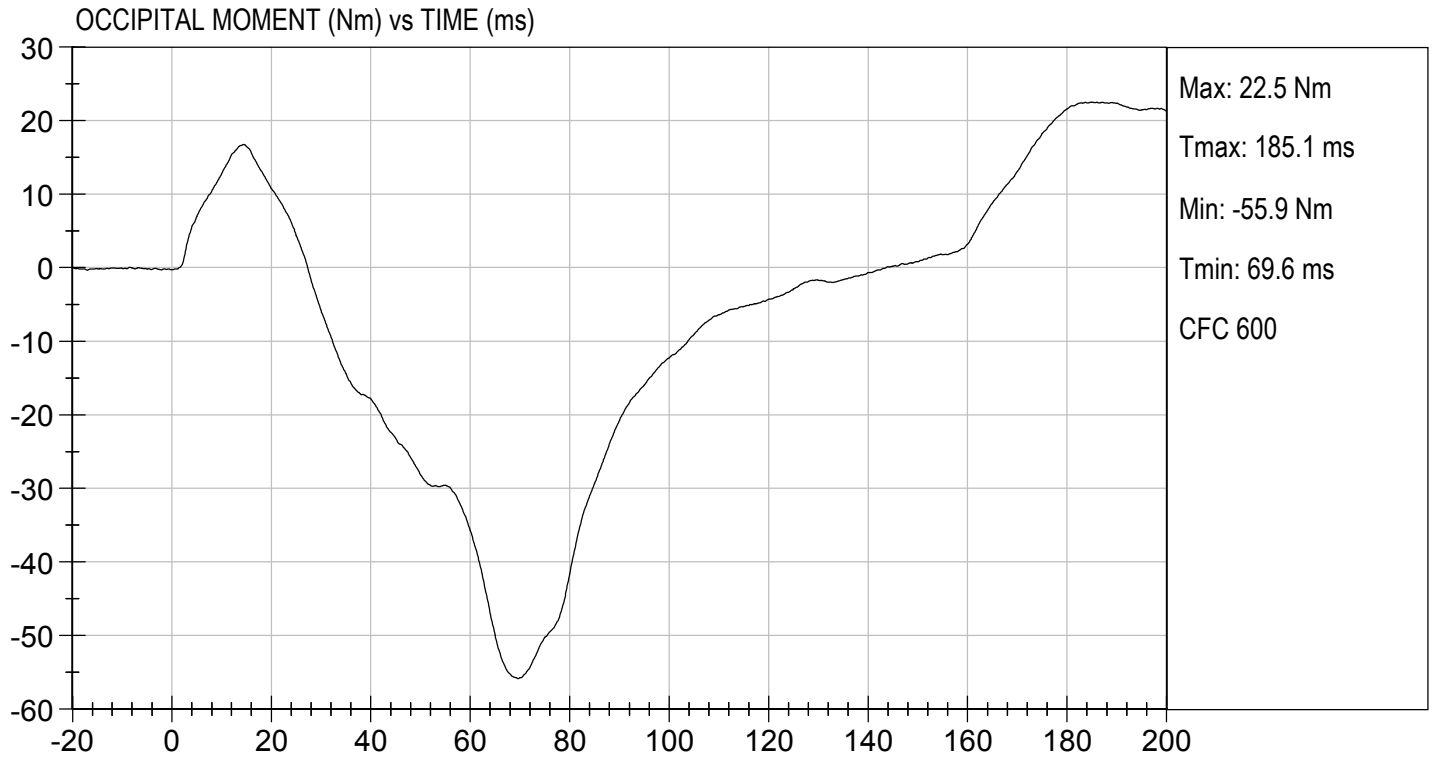
01/30/2019
 Test Date





TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 01/30/2019
TEST #: D190373



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D190374

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	17	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4399	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4398	Pass
Overall Test Results				Pass

Jacob D Taylor
 Laboratory Technician

01/29/2019

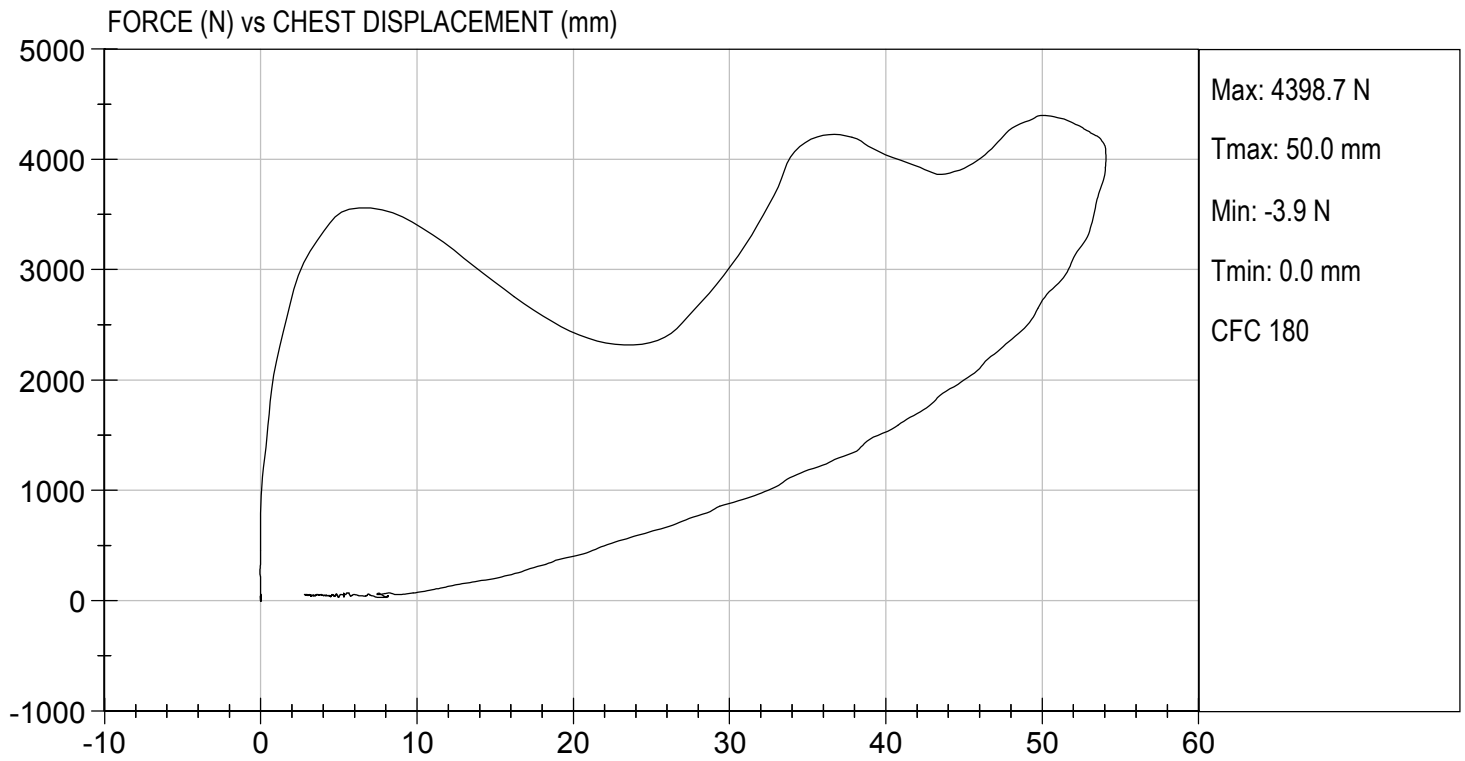
Test Date

Robert Schaub
 Approved By



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

TEST DATE: 01/29/2019
TEST #: D190374

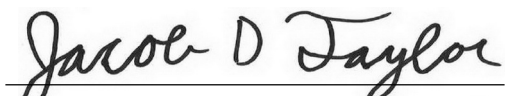


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

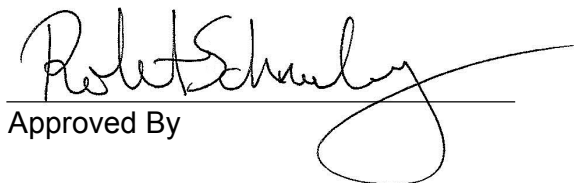
ATD Serial No: 138

Test I.D: D190375

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	17	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3764	Pass
Overall Test Results				Pass


Laboratory Technician

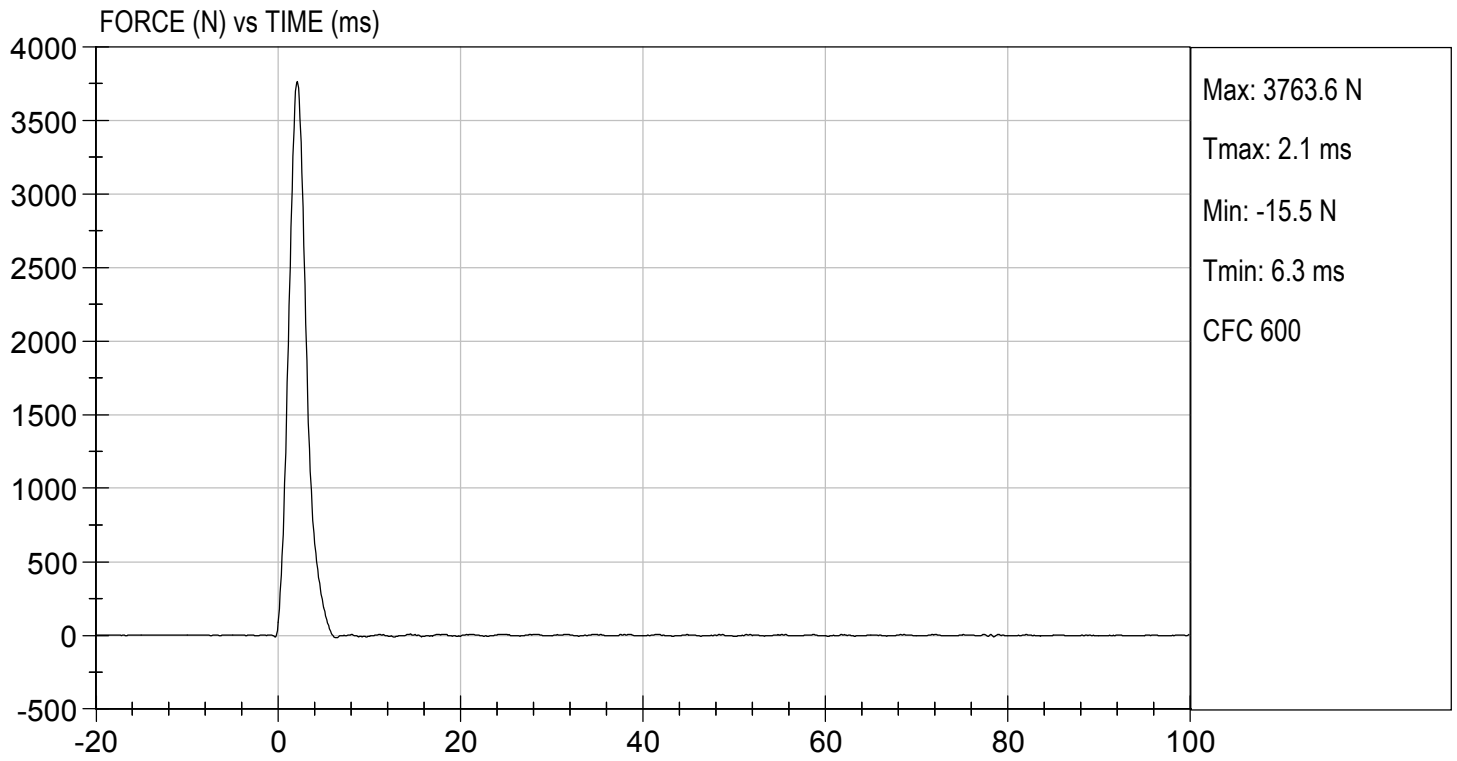
01/29/2019
Test Date


Approved By



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

TEST DATE: 01/29/2019
TEST #: D190375



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

ATD Serial No: 138

Test I.D: D190376

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	17	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3726	Pass
Overall Test Results				Pass

Jacob D Taylor
Laboratory Technician

01/29/2019

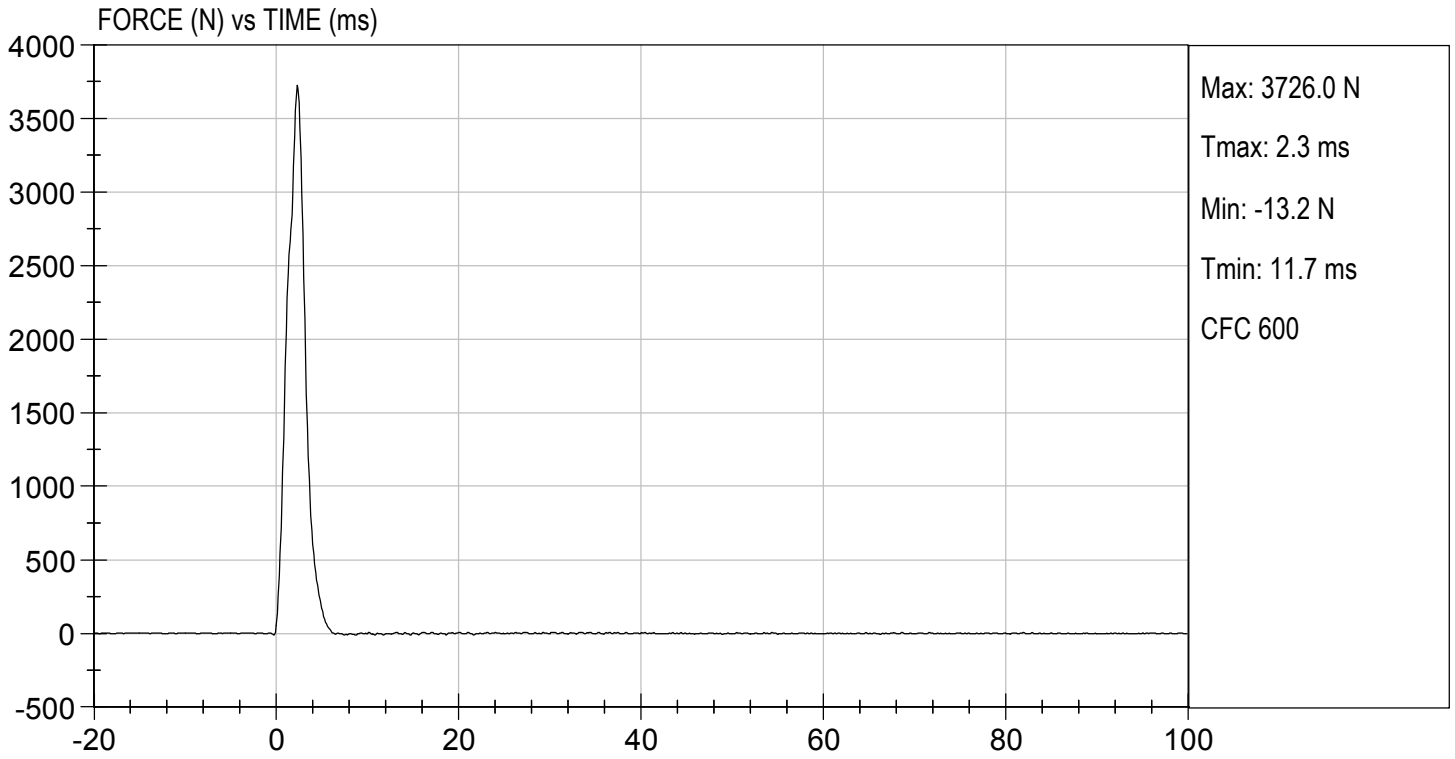
Test Date

Robert Schaefer
Approved By



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

TEST DATE: 01/29/2019
TEST #: D190376



MGA RESEARCH CORPORATION

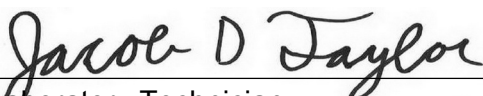
TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

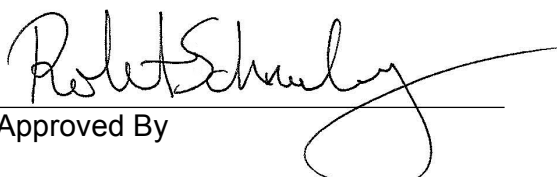
Test I.D: D190377

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	17	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	358	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

01/29/2019

Test Date


Approved By

