

REPORT NUMBER: NCAP-MGA-2013-022

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

**AUDI AG
2013 Audi A4 AWD 4-Dr Sedan
NHTSA No.: MD5800**

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



Test Date: October 15, 2012

Final Report Date: November 15, 2012

FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NVS-111
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590**

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Approval Date: November 15, 2012

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: _____

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2013 Audi A4 AWD 4-Dr Sedan 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), 301, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on October 15, 2012. The impact velocity was 56.2 km/h and the ambient temperature at the barrier face at the time of impact was 21.1°C. The target vehicle post-test maximum crush was 575 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>104</td> <td>252</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>25</td> <td>14</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.28</td> <td>0.35</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>889</td> <td>639</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>70</td> <td>286</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>570</td> <td>499</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>1195</td> <td>925</td> </tr> </tbody> </table>						Measurement Description	Units	Threshold		Driver ATD	Passenger ATD	50 th	5 th	Head Injury Criteria (HIC ₁₅)	N/A	700	700	104	252	Maximum Chest Compression	mm	63	52	25	14	Nij	N/A	1	1	0.28	0.35	Neck Tension	N	4170	2620	889	639	Neck Compression	N	4000	2520	70	286	Left Femur Force	N	10008	6805	570	499	Right Femur Force	N	10008	6805	1195	925
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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 2013 Audi A4 AWD 4-Dr Sedan at a velocity of 56.2 km/h. The test was performed at MGA Research Corporation on October 15, 2012. Pre-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. Seat belt load cells were also installed on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 036) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 240 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier, and 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 575 mm 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 and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bolster and steering column. The passenger's visible contact points were as follows: The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	104	0.28	889	70	38	25	570	1195
Passenger (5 th)	252	0.35	639	286	37	14	499	925

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

TEST NOTES

Right Rear Crossmember Xr has no valid data after 90 ms.
Barrier 5-1 has questionable 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: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MD5800	Traction Control System (TCS)	Yes
Model Year	2013	Power Steering	Yes
Make	Audi	Power Window Auto-Reverse	Yes
Model	A4	Driver Frontal Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	WAUBFAFLXDN009891	Driver Head/Torso Airbag	No
Body Color	Ice Silver Metallic	Driver Torso Airbag	No
Odometer (km/mi)	158 / 98	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.0	Driver Pelvis Airbag	No
Type/No. Cylinders	4	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	All-Wheel Drive	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	GVWR (kg)	2225
Date of Manufacture	0612	GAWR Front (kg)	1130
		GAWR Rear (kg)	1155

VEHICLE SEATING AND WEIGHT CAPACITY DATA

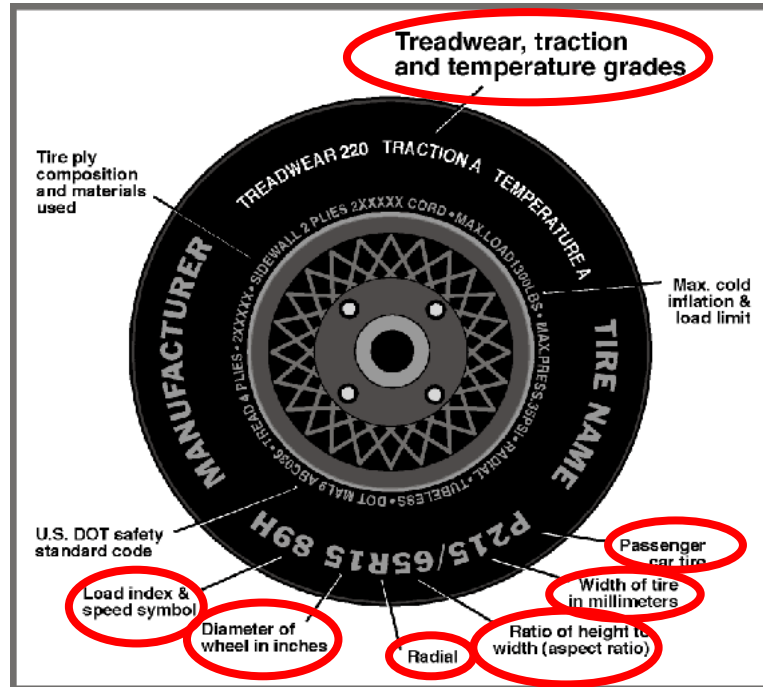
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				480
Cargo Weight (RCLW) (kg)				140

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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
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NHTSA No.: MD5800
 Test Date: 10/15/2012

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P245/45R17	P245/45R17
Tire Size on Vehicle	P245/45R17	P245/45R17
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Tour Season	Tour Season
Treadwear	400	400
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	6	6
Load Index/Speed Symbol	95H	95H
Tire Material	Rubber	Rubber
DOT Safety Code Left	XT CB J887	XT CB J887
DOT Safety Code Right	XT CB J887	XT CB J887

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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
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NHTSA No.: MD5800
 Test Date: 10/15/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	462.2	369.7		494.4	474.9	
Right	kg	467.7	371.0		501.7	473.6	
Ratio	%	55.7	44.3		51.2	48.8	
Totals	kg	929.9	740.7	1670.6	996.1	948.5	1944.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1670.6
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	140
Calculated Vehicle Target Weight (TVTW)	kg	1951.2

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	699	692	700	700	1243
As Tested	mm	692	689	665	666	1368
Post Test	mm	725	729	674	653	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2804
Total Vehicle Length at Left Side	mm	4552
Total Vehicle Length at Centerline	mm	4708
Total Vehicle Length at Right Side	mm	4552
Weight of Ballast in Cargo Area	kg	136.1
Weight of Vehicle Components Removed	kg	23.1
Amount of Stoddard Solvent in Fuel Tank	L	56.7

List of components removed to meet test weight: Right taillight, jack and tool kit, spare tire and cover, trunk carpet, trunk trim, rear floor mats, and rear seat center armrest.

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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4708
2	Total Width	1818
3	Bumper Top Height	533
4	Bumper Bottom Height	406
5	Longitudinal Member Top Height	534
6	Distance between Longitudinal Members	790
7	Longitudinal Member Width	87
8	Engine Top Height	817
9	Engine Bottom Height	185
10	Engine and Gearbox Width	995
11	Front Bumper-Engine Distance	260
12	Front Shock Absorber Fixing Height	854
13	Bonnet Leading Edge Height	720
14	Front Shock Absorber Fixing Width	848
15	Front Bumper – Front Axle Distance	843
16	Front Axle – A-Pillar Distance	430
17	A-Pillar – B-Pillar Distance	1220
18	B-Pillar – Rear Axle Distance	1170
19	B-Pillar – C-Pillar Distance	750
20	Roof Sill Bottom Height	1282
21	Roof Sill Top Height	1440
22	Floor Sill Bottom Height	190
23	Floor Sill Top Height	336

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

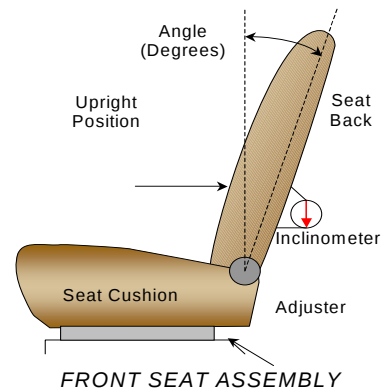
Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

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 September 2012.

	Degrees
Driver Seat Back Angle	16.6° on headrest post
Passenger Seat Back Angle	14.2° on headrest post



SEAT FORE/AFT POSITIONS

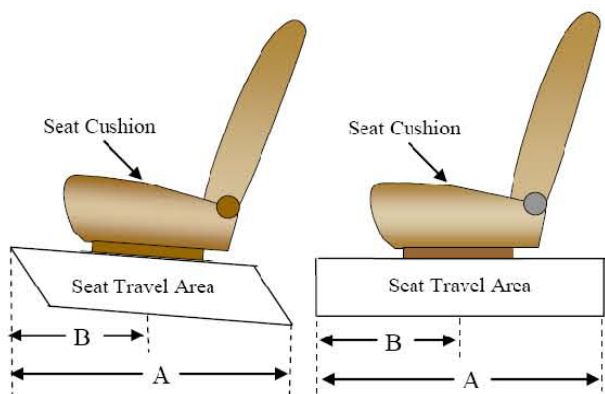
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated September 2012.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	302 mm	151 mm (foremost as 0)
Passenger Seat	250 mm	0 mm (foremost as 0)

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 (uppermost as 0)
Passenger Seat	4 (1 st as 1)	1 (uppermost as 0)



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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

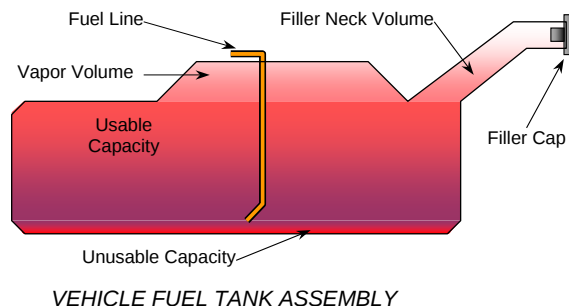
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	61.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	56.1 to 57.3
Actual Amount of Solvent used	56.7
1/3 of Usable Capacity	20.3

FUEL PUMP

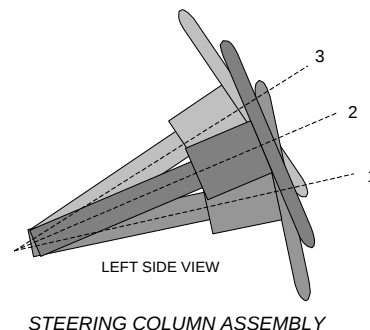
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. At ignition "on" the pump will work for a short time to put pressure to the system. If the engine is started the pumps work normally. The fuel pipe is on the right side.



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.



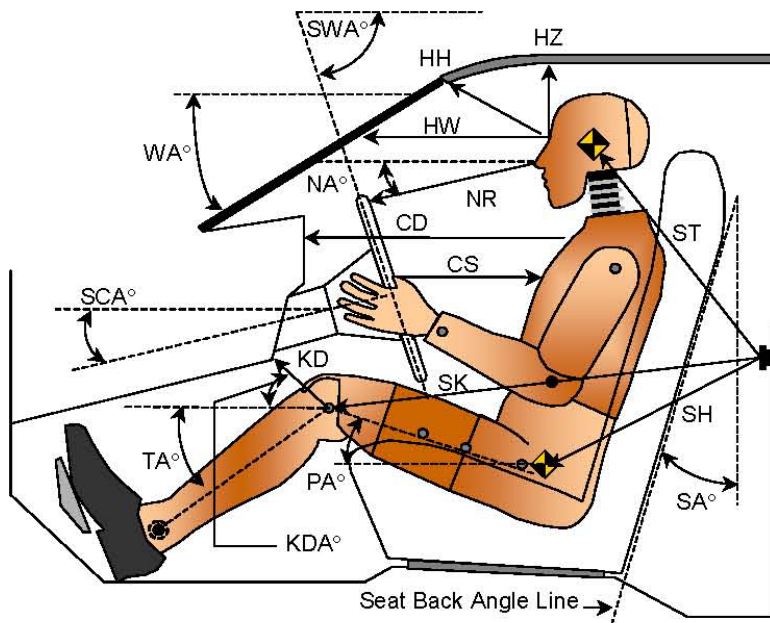
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.7	160
Geometric Center Position 2	68.0	130
Uppermost Position 3	65.3	100
Telescoping Steering Wheel Travel		60
Test Position	68.0	130

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012



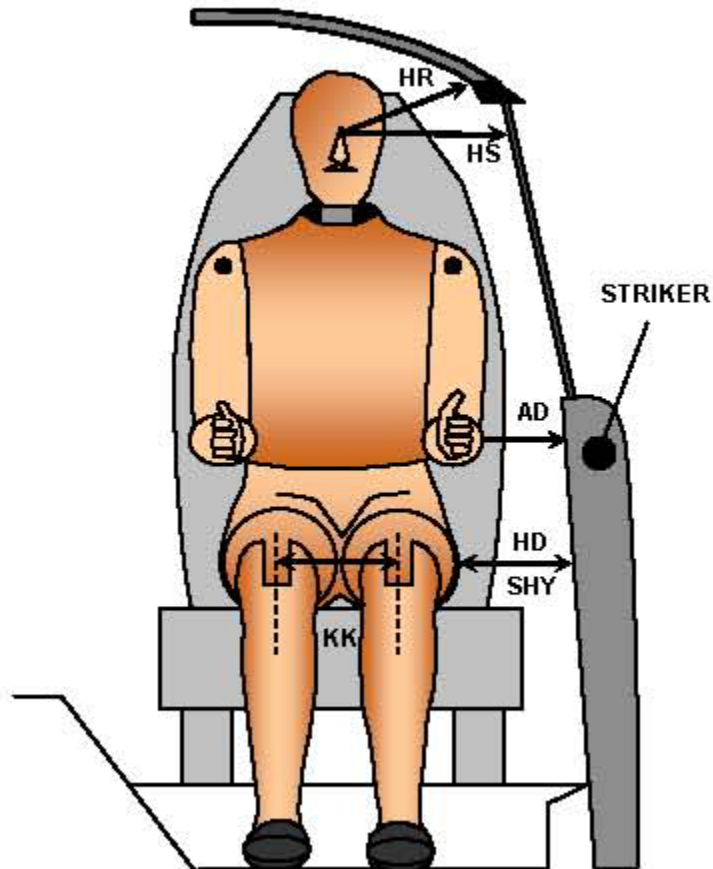
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 036		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.6		
SWA°	Steering Wheel Angle		68.0		
SCA°	Steering Column Angle		22.0		
SA°	Seat Back Angle (on headrest post)		16.6		14.2
HZ	Head to Roof (Z)	180	90	195	90
HH	Head to Header	328	27.3	271	42.6
HW	Head to Windshield	655	0	628	0
NR	Nose to Rim	378	7.8		
CD	Chest to Dash	518		403	
CS	Chest to Steering Hub	311	5.9		
RA	Rim to Abdomen	211	0		
KDL	Left Knee to Dash	215	32.3	122	36.3
KDR	Right Knee to Dash	204	29.9	118	35.7
PA°	Pelvic Angle		23.6		20.7
TA°	Tibia Angle		37.1		48.3
SK	Striker to Knee	493	97.3	590	97.5
ST	Striker to Head	459	7.8	416	15.2
SH	Striker to H-Point	233	145.6	304	114.8

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012



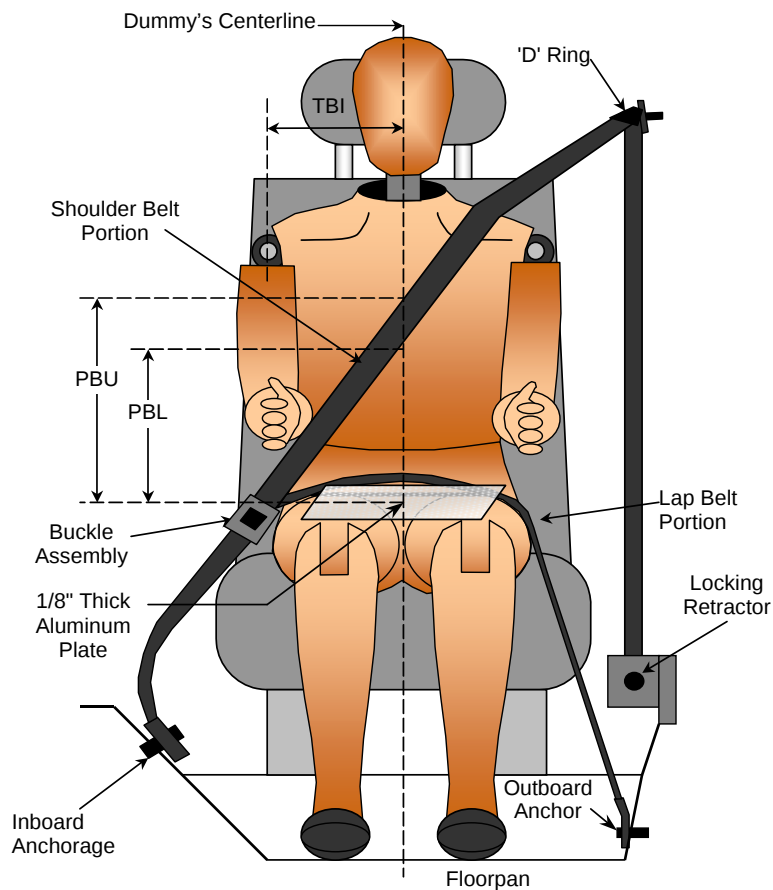
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	138	160
HD	H-Point to Door	157	243
HR	Head to Side Header	209	235
HS	Head to Side Window	328	358
KK	Knee to Knee	345	225
SHY	Striker to H-Point (Y Direction)	265	293
AA	Ankle to Ankle	340	175

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	320
PBL - Top surface of reference to belt lower edge	mm	285	210

BELT LENGTH DATA

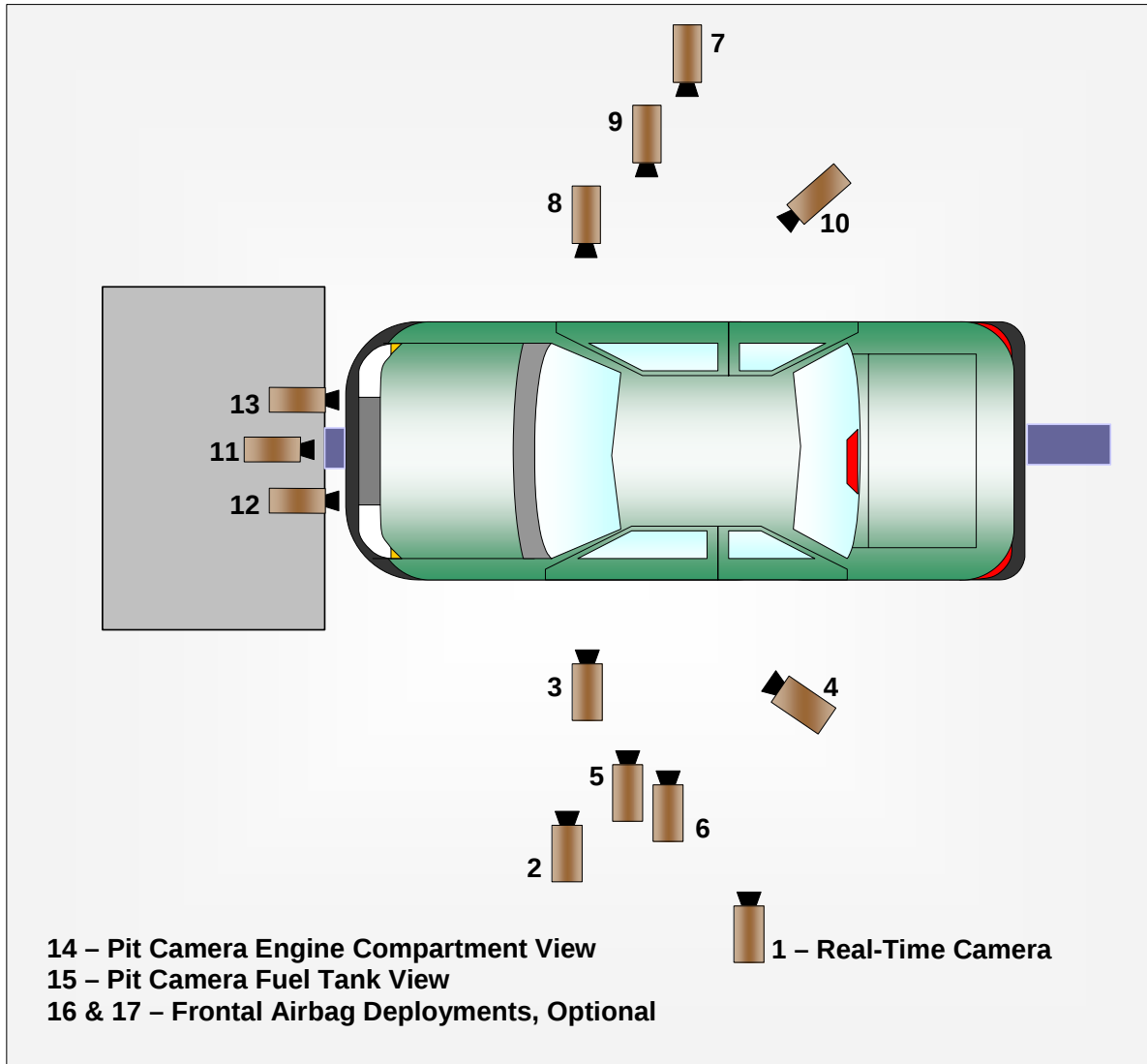
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	800	820
Lap Belt Length as measured on ATD	mm	495	510
Remainder of belt on reel	mm	1905	1870
Total Belt Length for Continuous Webbing Systems	mm	3200	3200

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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1430	-6790	-1940	35	1000
3	Left Front Half	1020	-4780	-1360	24	1000
4	Left Angle	5480	-5080	-2060	50	1000
5	Steering Column - Top	370	-4740	-1240	24	1000
6	Steering Column - Bottom	350	-4710	-840	24	1000
7	Right Overall	2020	6430	-1350	20	1000
8	Passenger Close-Up	1630	6630	-1990	35	1000
9	Right Front Half	1220	5040	-1360	24	1000
10	Right Angle	5790	5100	-2070	50	1000
11	Windshield	-260	0	-2860	20	1000
12	Driver Windshield	-30	-360	-2270	8.5	1000
13	Passenger Windshield	-30	360	-2270	8.5	1000
14	Pit Front	900	0	3150	24	1000
15	Pit Rear	3060	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

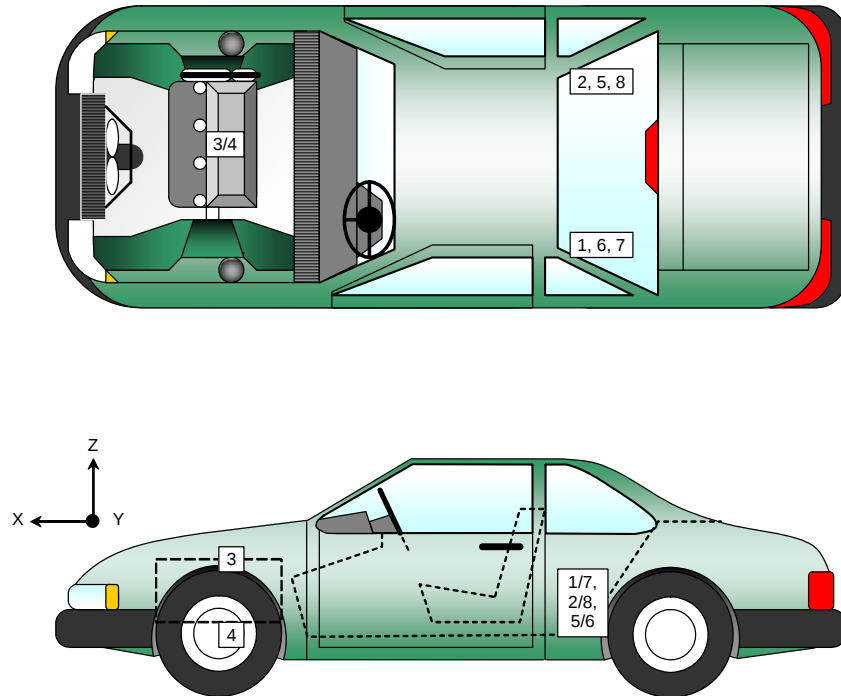
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1940	-420	-173
2	Right Rear Accelerometer – X Direction	1940	420	-169
3	Engine Top X	4320	-35	-789
4	Engine Bottom X	4219	0	-190
5	Left Rear Accelerometer – Z Direction	1940	-420	-173
6	Right Rear Accelerometer – Z Direction	1940	420	-169
7	Left Rear Accelerometer Redundant – X Direction	1940	-420	-173
8	Right Rear Accelerometer Redundant – X Direction	1940	420	-169

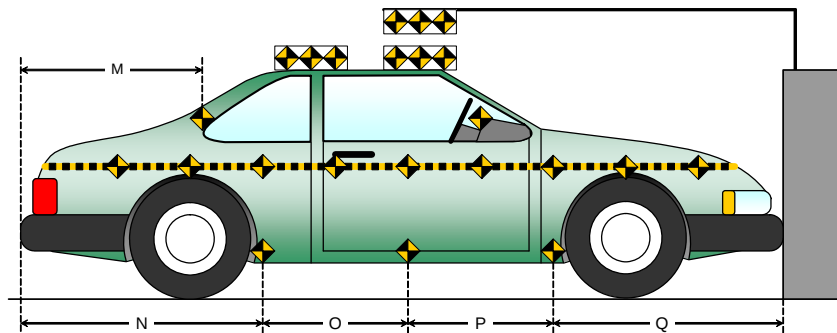
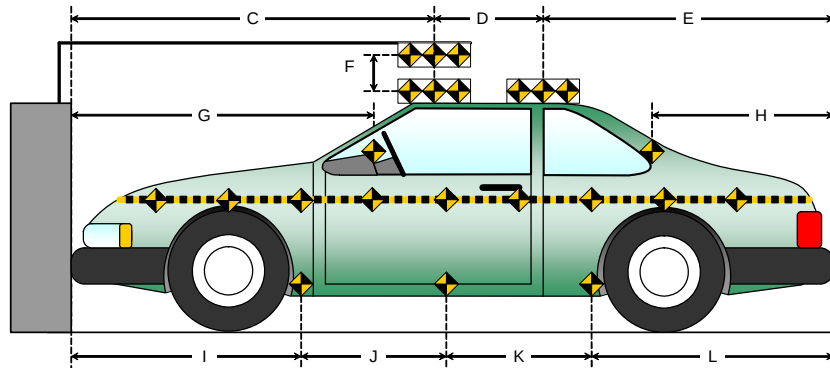
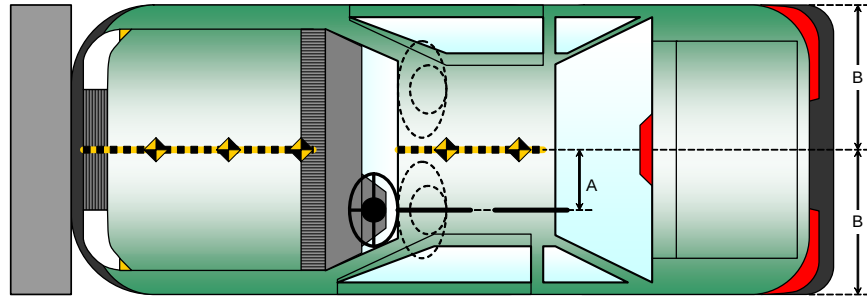
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

Item	Value (mm)
A	375
B	909
C	2390
D	670
E	1648
F	229
G	
H	916
I	1285
J	980
K	980
L	1463
M	919
N	1463
O	980
P	980
Q	1285



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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

Advanced Research Load Cell Barrier

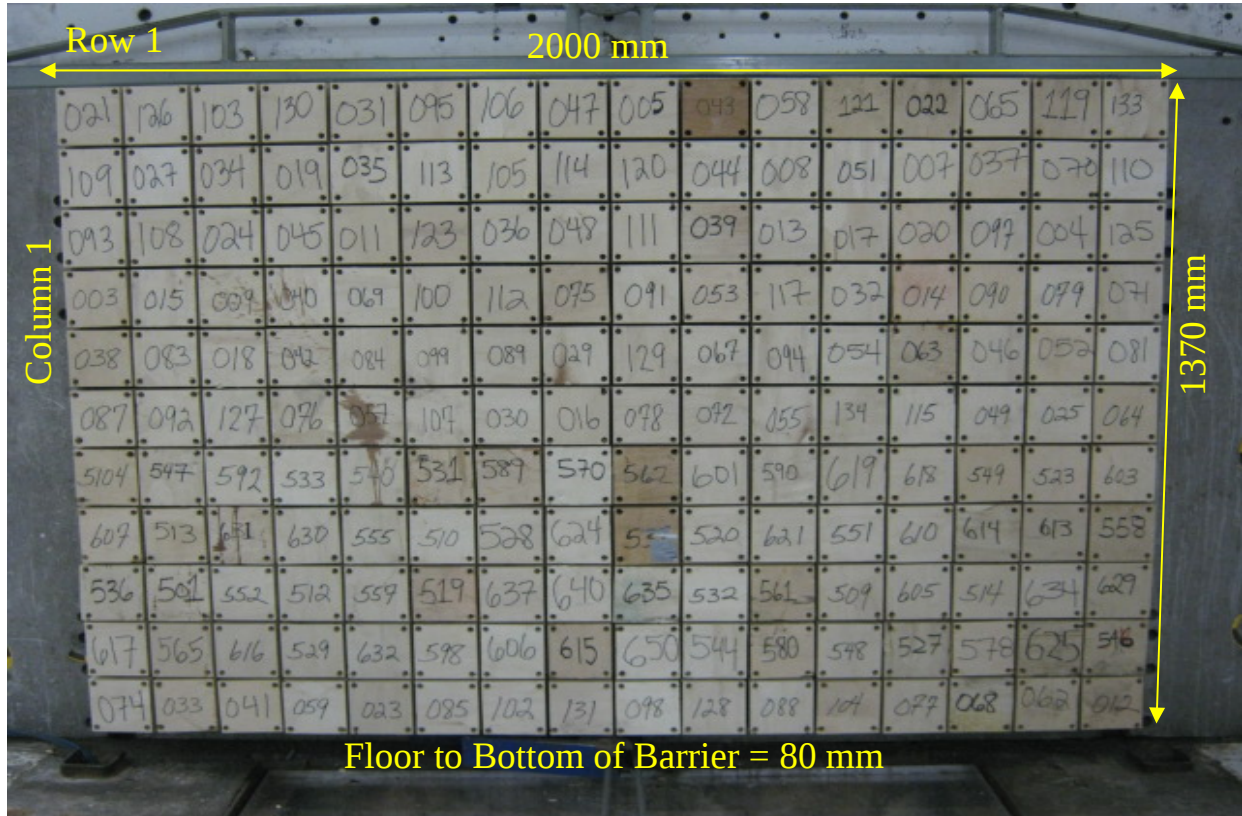


Photo for Reference Only

Centerline															
1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16
3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15	11-16

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: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012

INSTRUMENTATION

Driver Dummy Data Channels	52
Passenger Dummy Data Channels	52
Vehicle Structure Accelerometers	8
Barrier Channels	128
Total	240

CAMERA COVERAGE

High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time	2
Total	16

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

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIIL 50% / 036	HIIL 5% / 634
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster, Steering Column	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

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	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	2850
Center	mm	2810
Right Side	mm	2920
Average	mm	2860

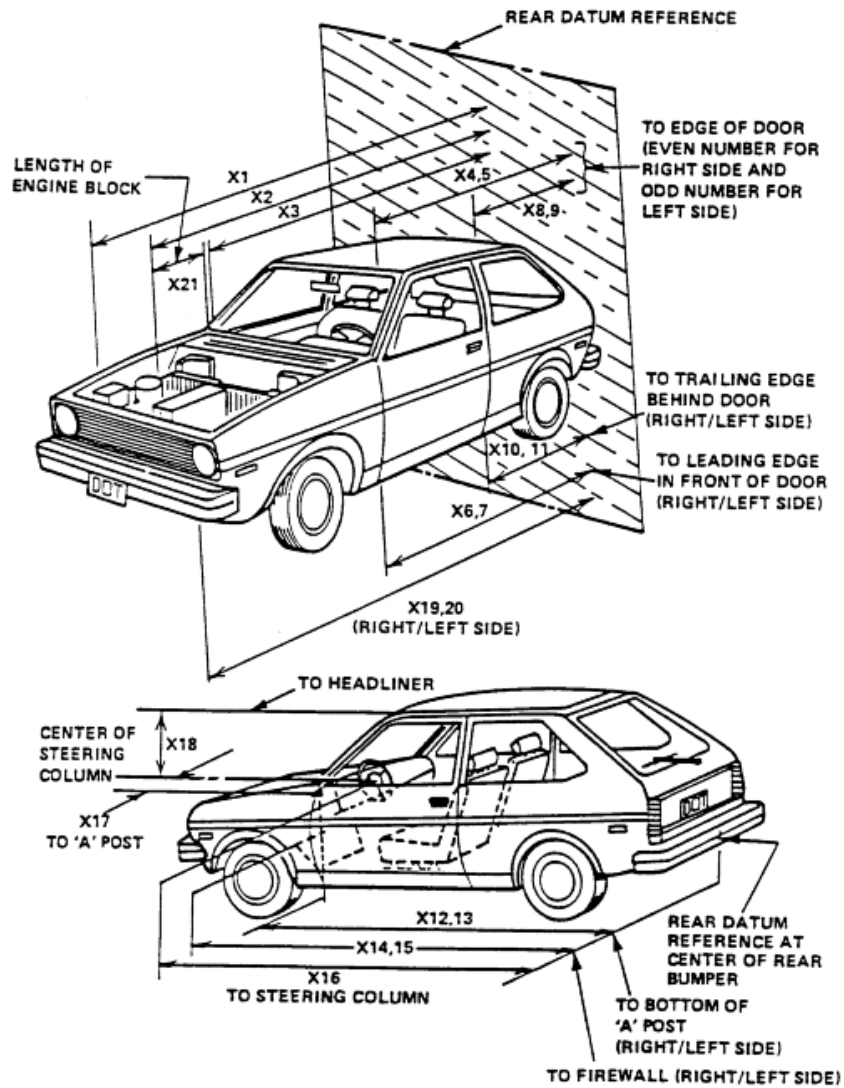
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Right Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
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	
Other	No		No	

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4708	4133	575
2	RSOV to Front of Engine	mm	4265	4020	245
3	RSOV to Firewall	mm	3706	3656	50
4	RSOV to Upper Leading Edge of Right Door	mm	3181	3181	0
5	RSOV to Upper Leading Edge of Left Door	mm	3181	3180	1
6	RSOV to Lower Leading Edge of Right Door	mm	3196	3196	0
7	RSOV to Lower Leading Edge of Left Door	mm	3196	3196	0
8	RSOV to Upper Trailing Edge of Right Door	mm	2108	2107	1
9	RSOV to Upper Trailing Edge of Left Door	mm	2108	2108	0
10	RSOV to Lower Trailing Edge of Right Door	mm	2167	2166	1
11	RSOV to Lower Trailing Edge of Left Door	mm	2167	2166	1
12	RSOV to Bottom of "A" Post of Right Side	mm	3235	3233	2
13	RSOV to Bottom of "A" Post of Left Side	mm	3235	3233	2
14	RSOV to Firewall, Right Side	mm	3688	3642	46
15	RSOV to Firewall, Left Side	mm	3690	3667	23
16	RSOV to Steering Column	mm	2705	2724	-19
17	Center of Steering Column to "A" Post	mm	392	423	-31
18	Center of Steering Column to Headliner	mm	382	427	-45
19	RSOV to Right Side of Front Bumper	mm	4552	4105	447
20	RSOV to Left Side of Front Bumper	mm	4552	4201	351
21	Length of Engine Block	mm	886	886	0
RD	RSOV to Right Side of Dash Panel	mm	2832	2832	0
CD	RSOV to Center of Dash Panel	mm	2924	2924	0
LD	RSOV to Left Side of Dash Panel	mm	2865	2868	-3

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012

VEHICLE INFORMATION

VIN: WAUBFAFLXDN009891 Wheelbase (mm): 2804
Vehicle Size Category: Passenger Test Weight (kg): 1944.6

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

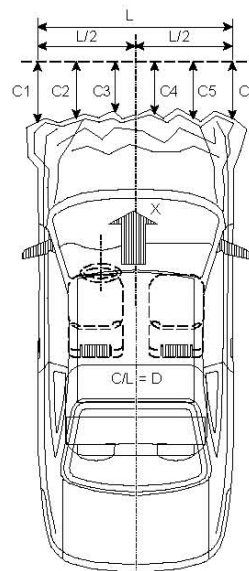
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.2

Velocity Change (km/h): 64.7

Time of Separation (msec): 116.5



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1248

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4552	4201	351
C2	Crush zone 2 at left side	mm	4626	4131	495
C3	Crush zone 3 at left side	mm	4656	4121	535
C4	Crush zone 4 at right side	mm	4656	4121	535
C5	Crush zone 5 at right side	mm	4626	4103	523
C6	Crush zone 6 at right side	mm	4552	4105	447
L	C1 TO C6	mm	1248	1220	28

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

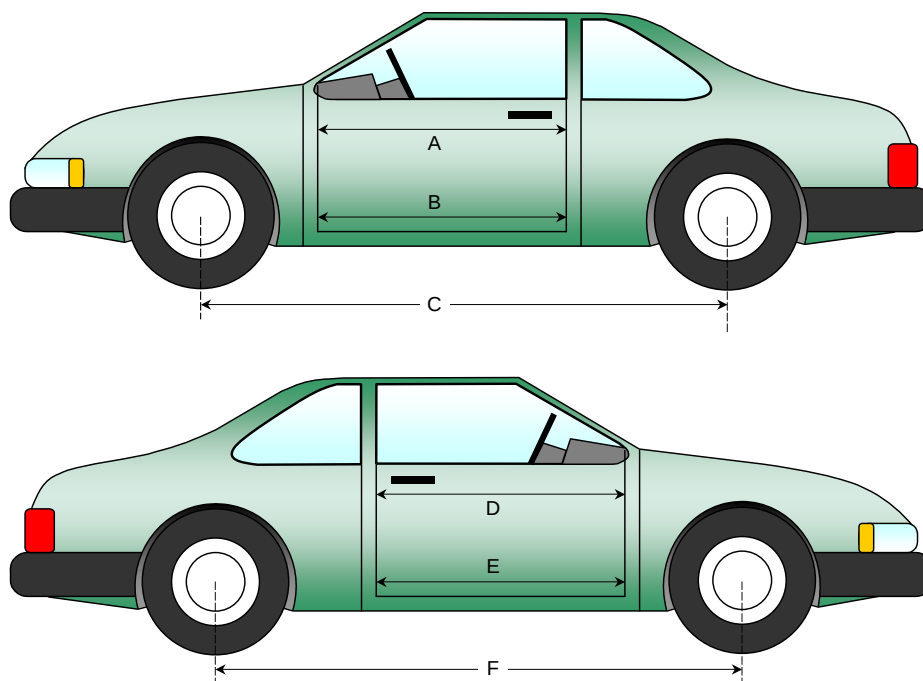
NHTSA No.: MD5800
Test Date: 10/15/2012

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	922	922	0
B	Left Side Lower	mm	811	811	0
D	Right Side Upper	mm	922	922	0
E	Right Side Lower	mm	811	811	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2804	2733	71
F	Right Side Wheelbase	mm	2804	2756	48



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

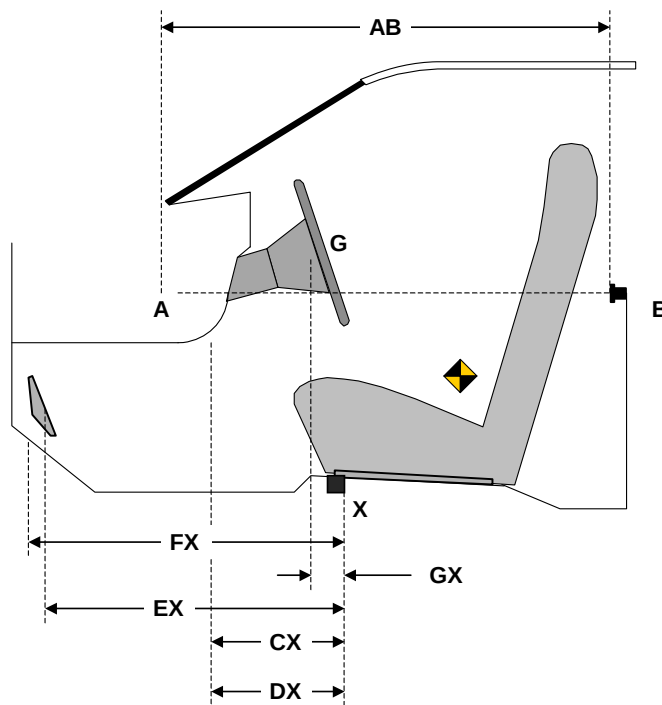
Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	753	753	0
CX	Left Knee Bolster to X	mm	336	342	-6
DX	Right Knee Bolster to X	mm	349	345	4
EX	Brake Pedal to X	mm	621	616	5
FX	Foot Rest to X	mm	646	636	10
GX	Center of Steering Column Wheel Hub to X	mm	77	132	-55

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: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

Windshield Mounting Details:

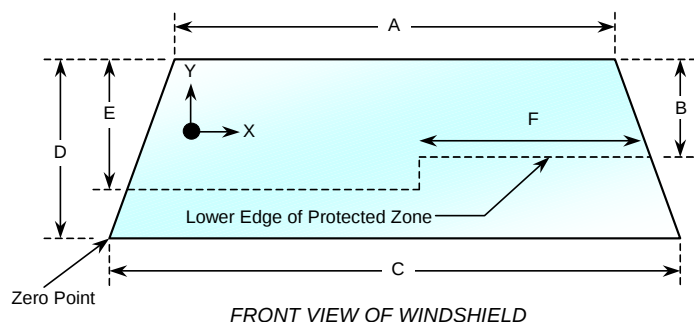
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.1°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2102	2102	100
Right Side	2102	2102	100
Total	4204	4204	100



Item	Units	Value
A	mm	1160
B	mm	360
C	mm	1484
D	mm	780
E	mm	474
F	mm	492

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: 2013 Audi A4 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
Test Date: 10/15/2012

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.1°C Test Time: 2:36 p.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

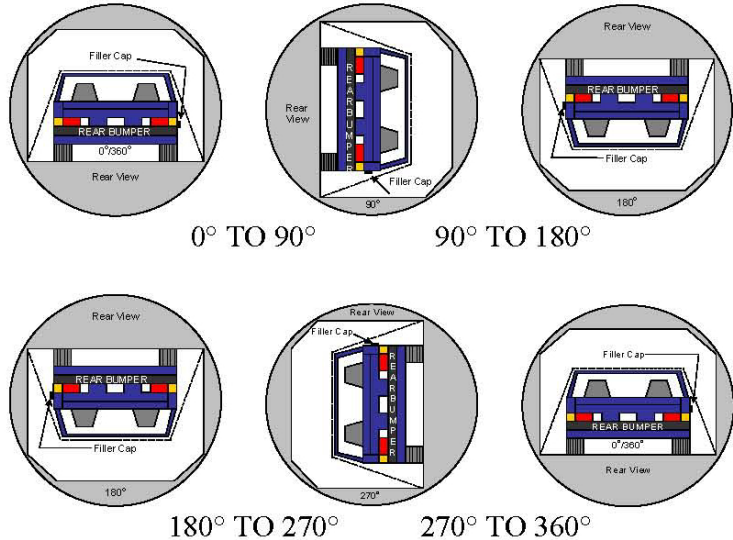
DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012

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°	112	300	412
90° to 180°	110	300	410
180° to 270°	108	300	408
270° to 360°	110	300	410

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

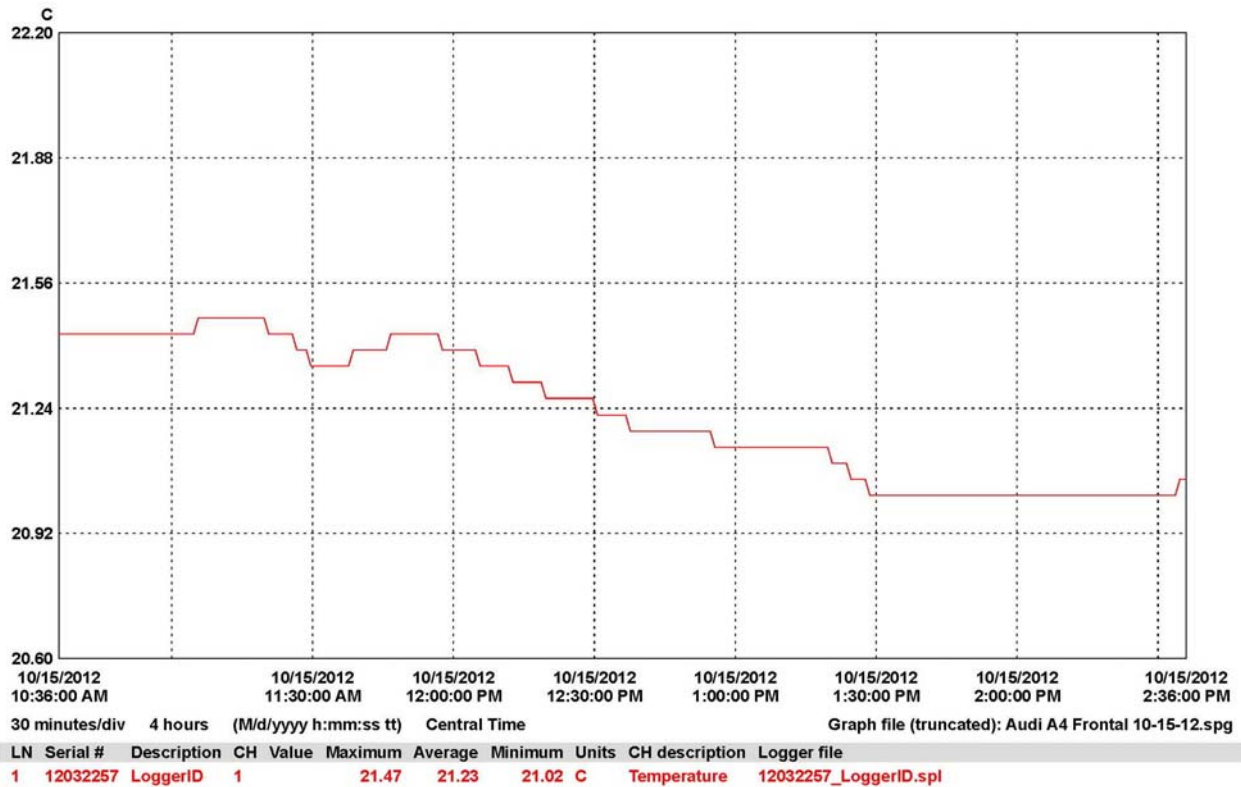
SOLVENT SPILLAGE LOCATION TABLE

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: 2013 Audi A4 AWD 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MD5800
 Test Date: 10/15/2012



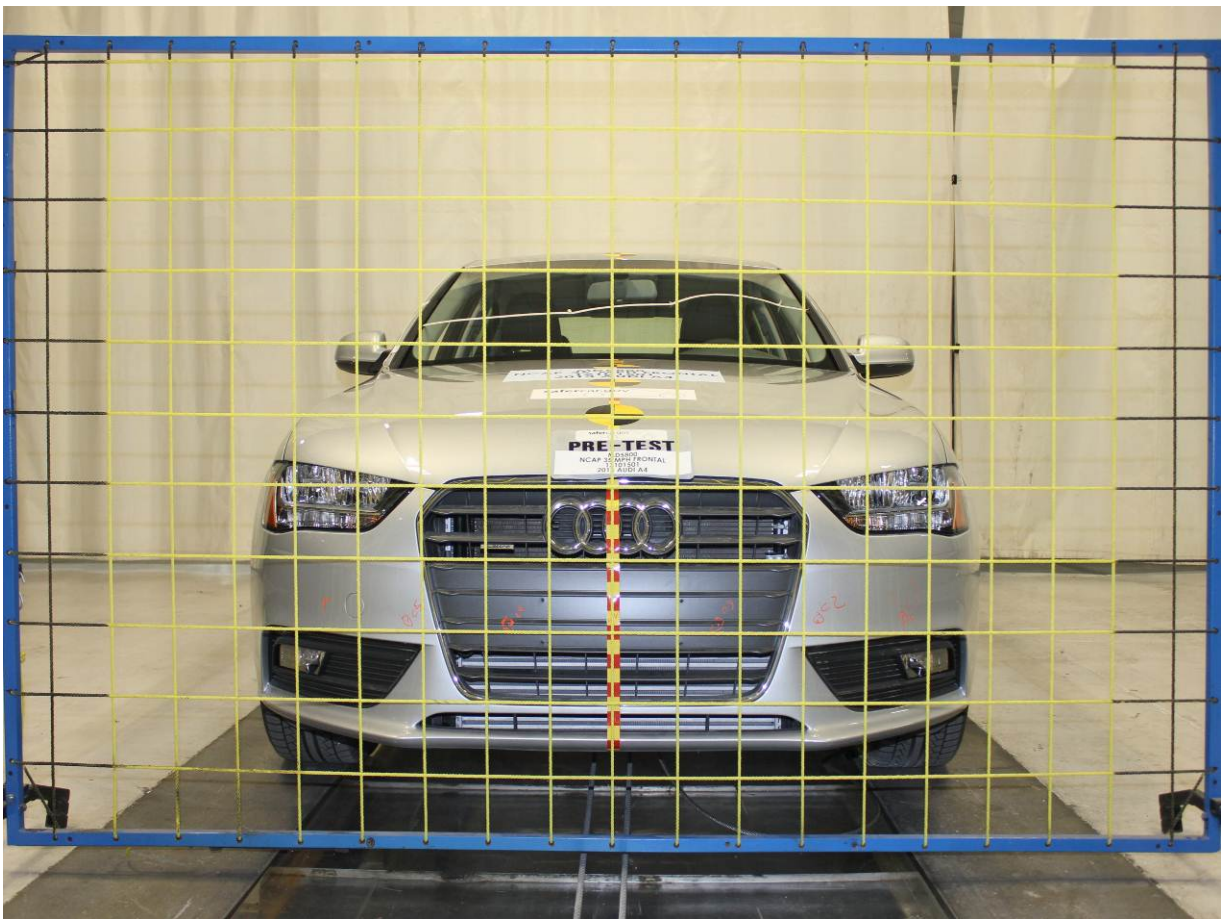
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PHOTOGRAPHS

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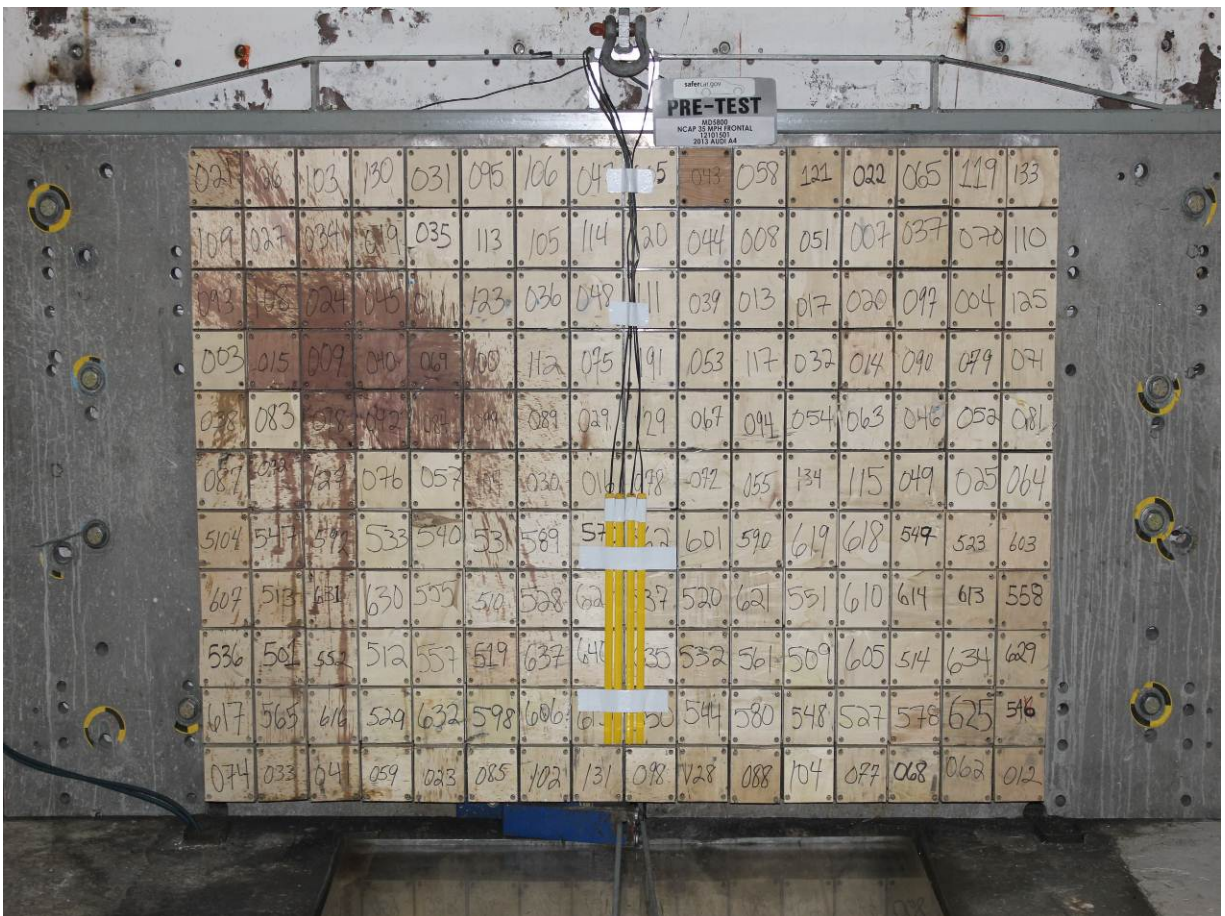
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Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



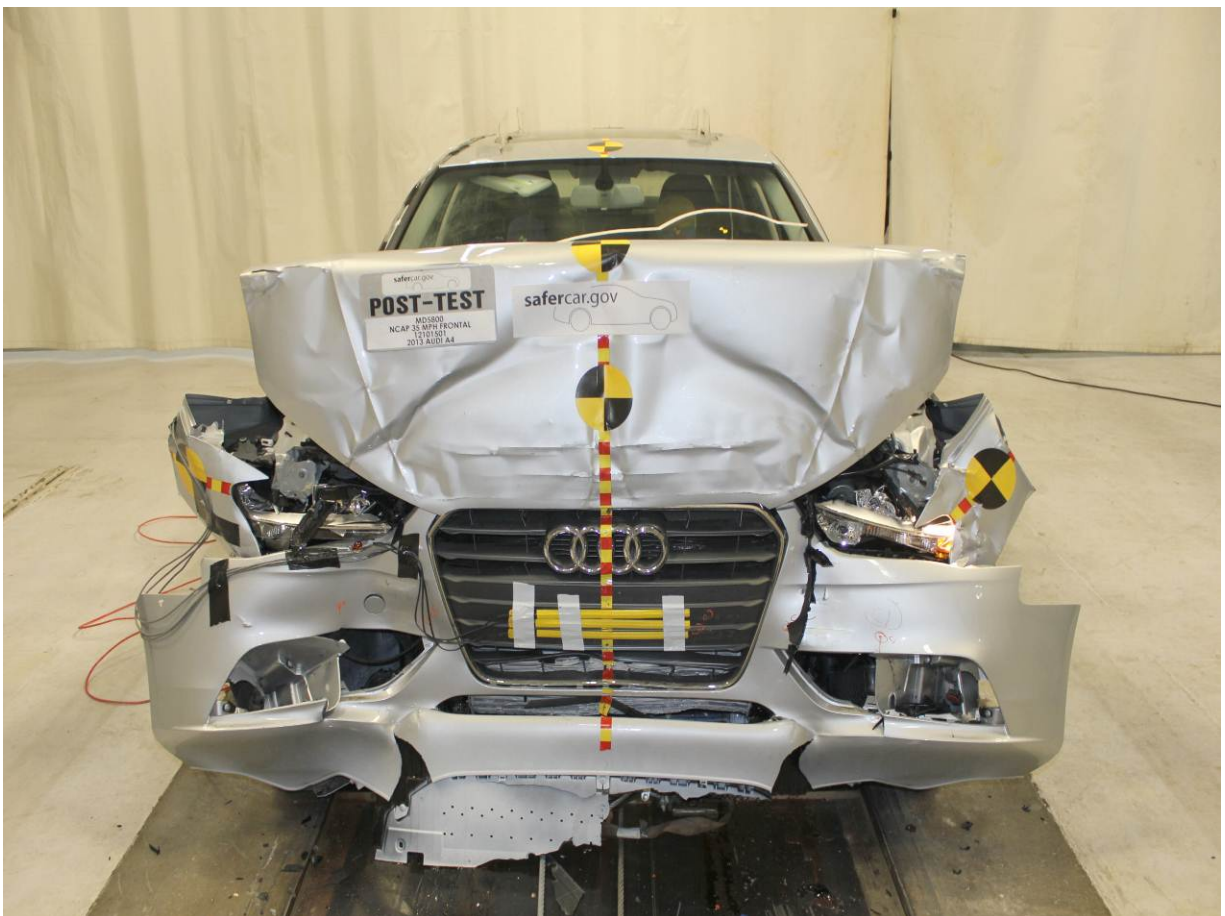
2013 Audi A4 AWD Frontal As Delivered



Left Rear 3-4 View, As Received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left View of Test Vehicle



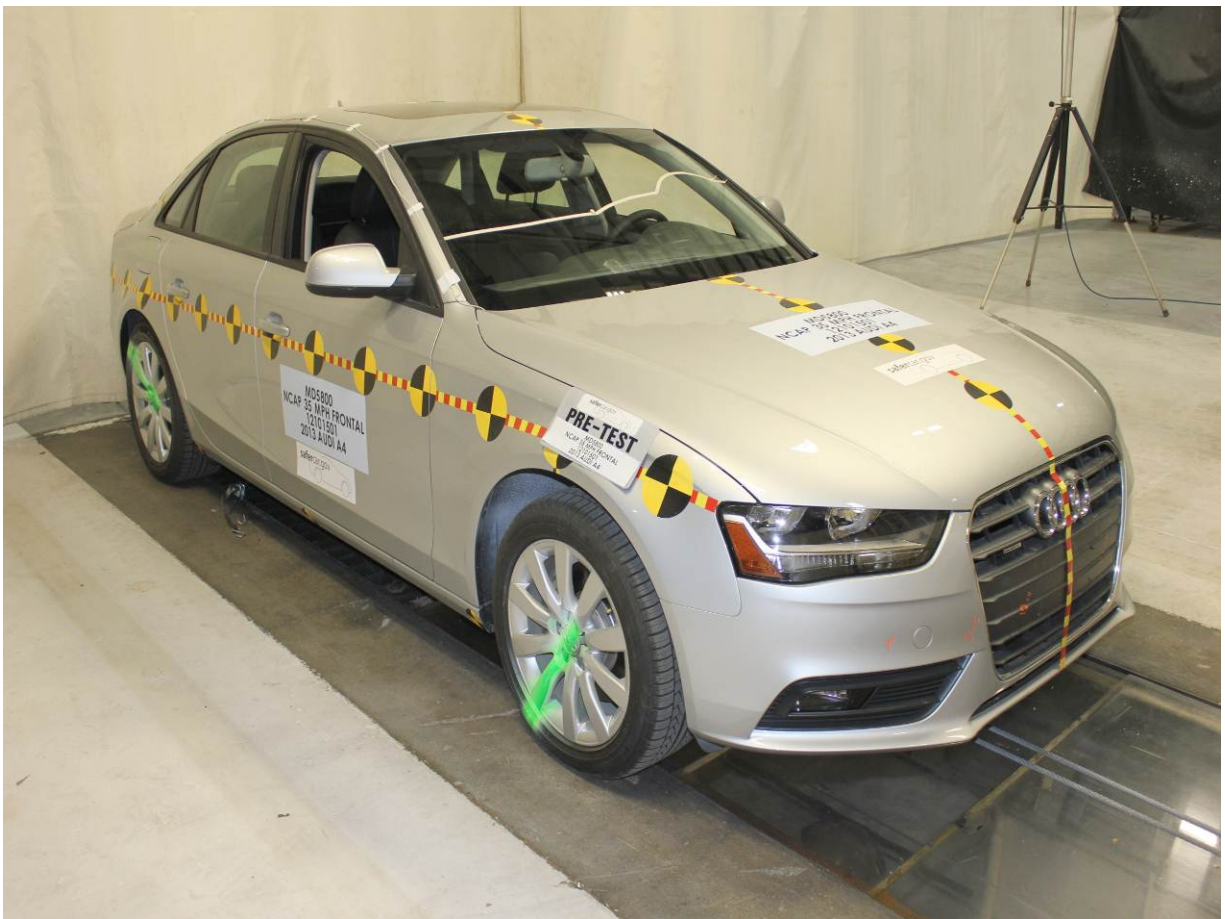
Post-Test Left View of Test Vehicle



Pre-Test Right View of Test Vehicle



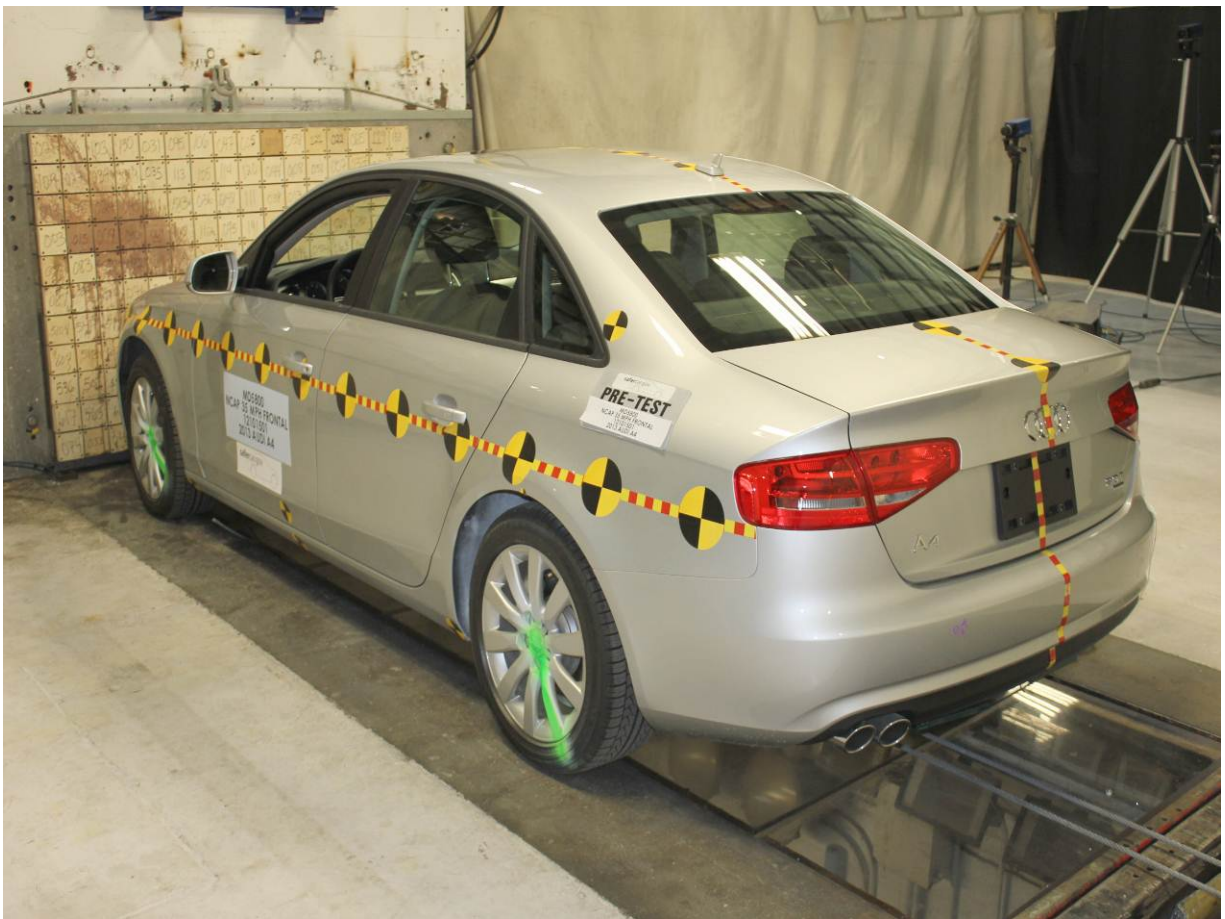
Post-Test Right View of Test Vehicle



Pre-Test Right Front 3-4 View



Post-Test Right Front 3-4 View



Pre-Test Left Rear 3-4 View



Post-Test Left Rear 3-4 View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



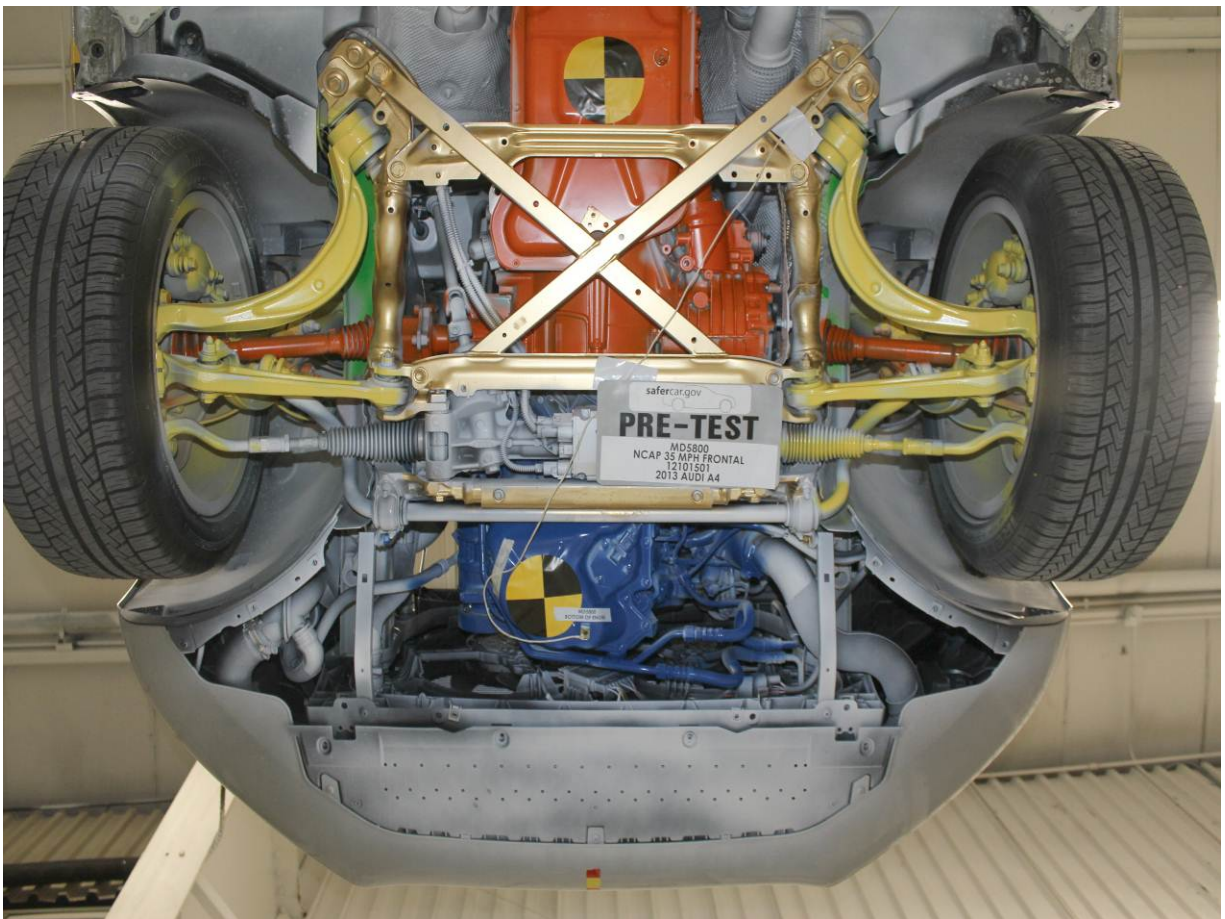
Post-Test Engine Compartment View



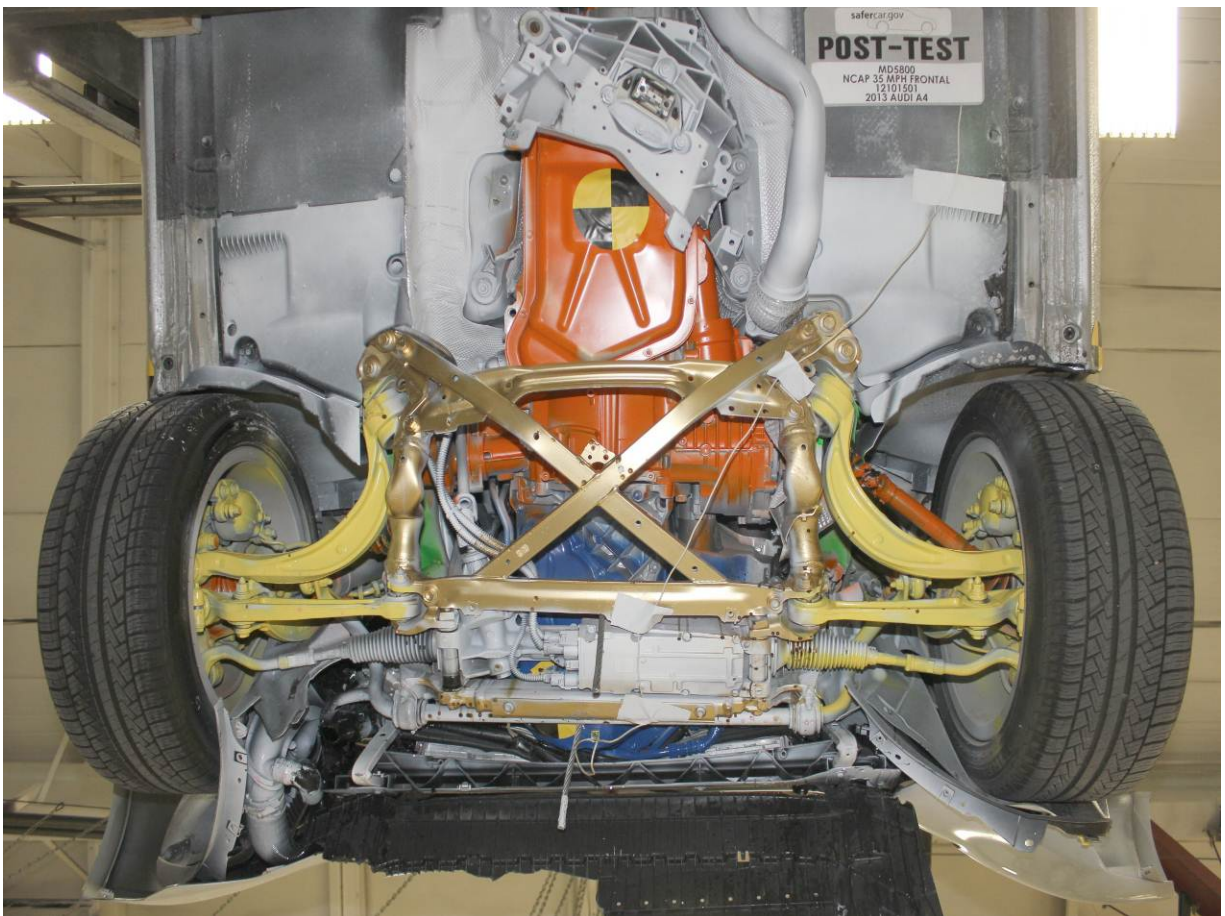
Pre-Test Fuel Filler Cap View



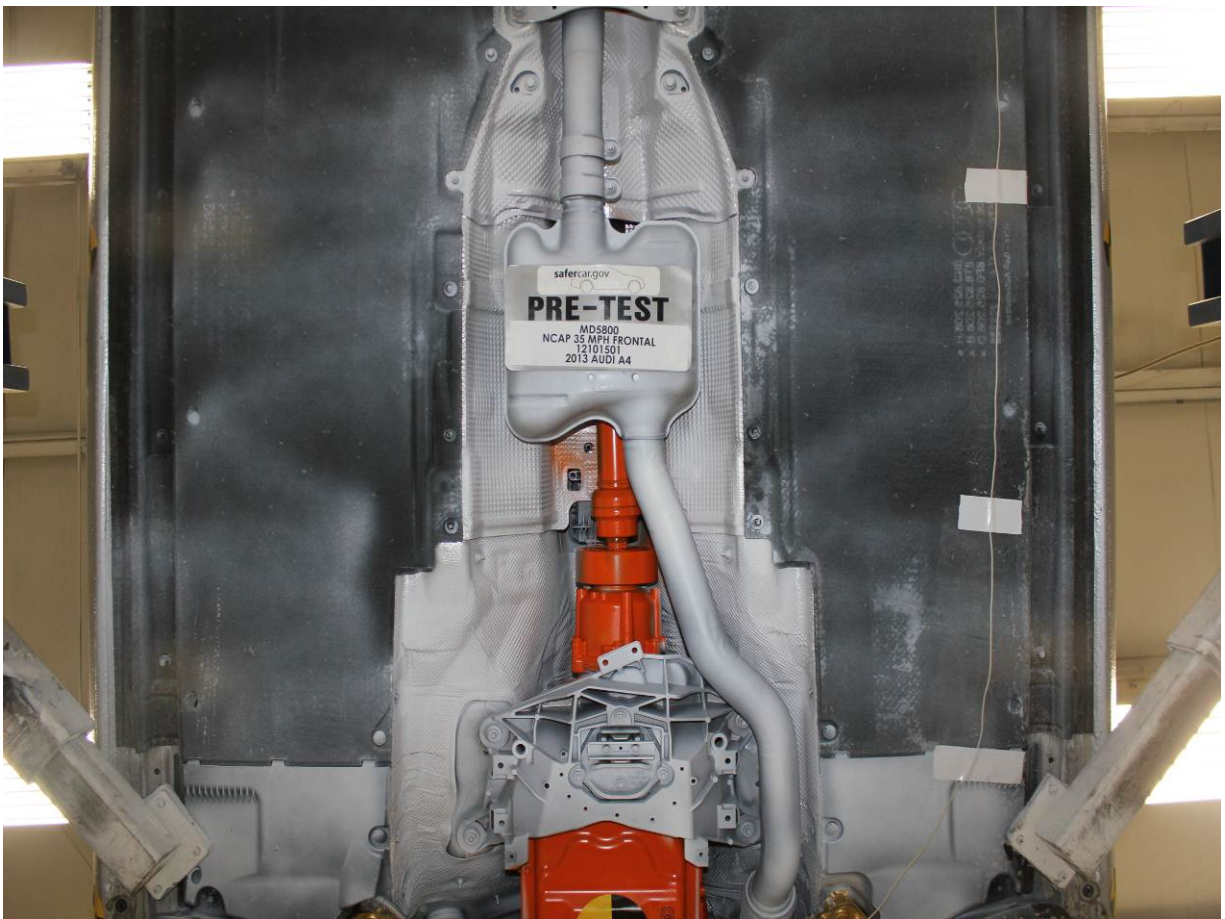
Post-Test Fuel Filler Cap View



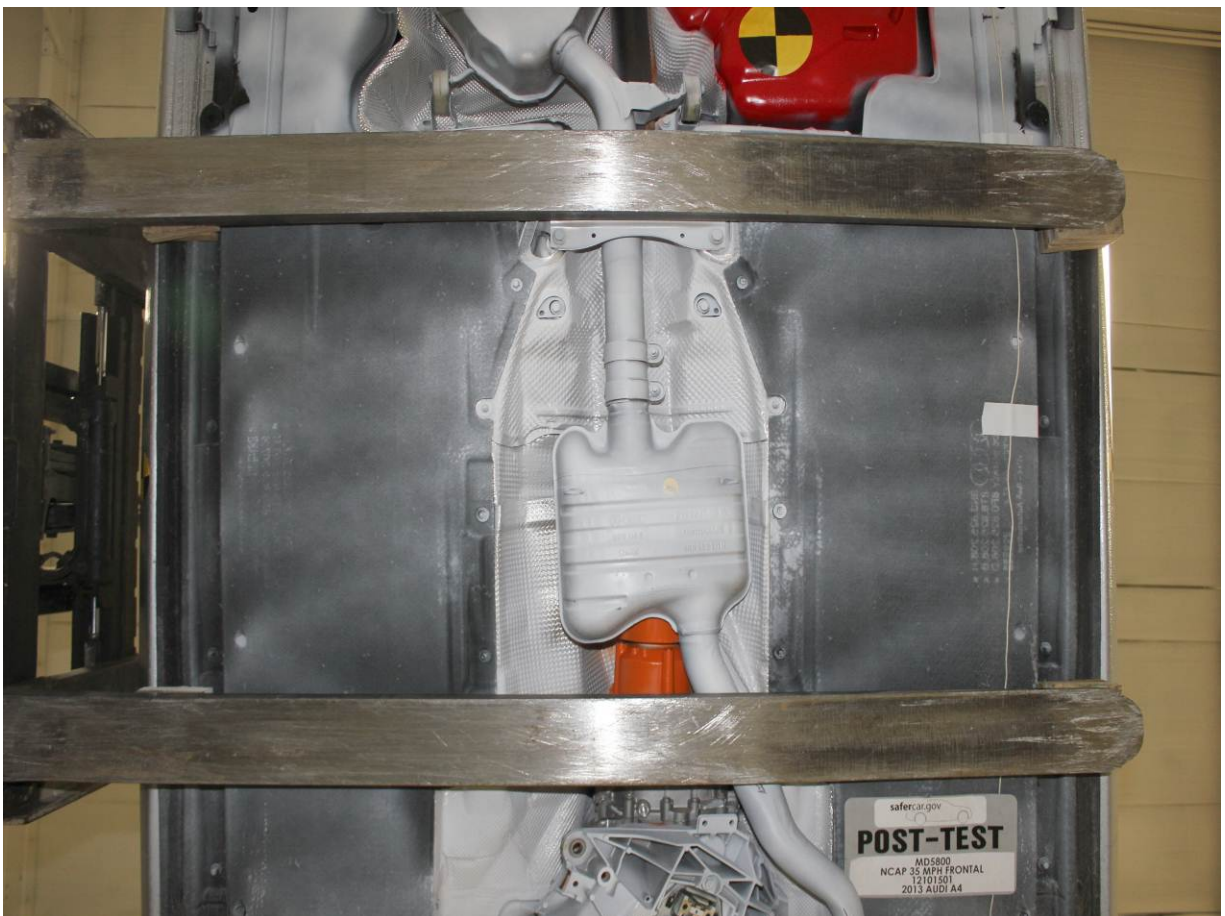
Pre-Test Front Underbody View



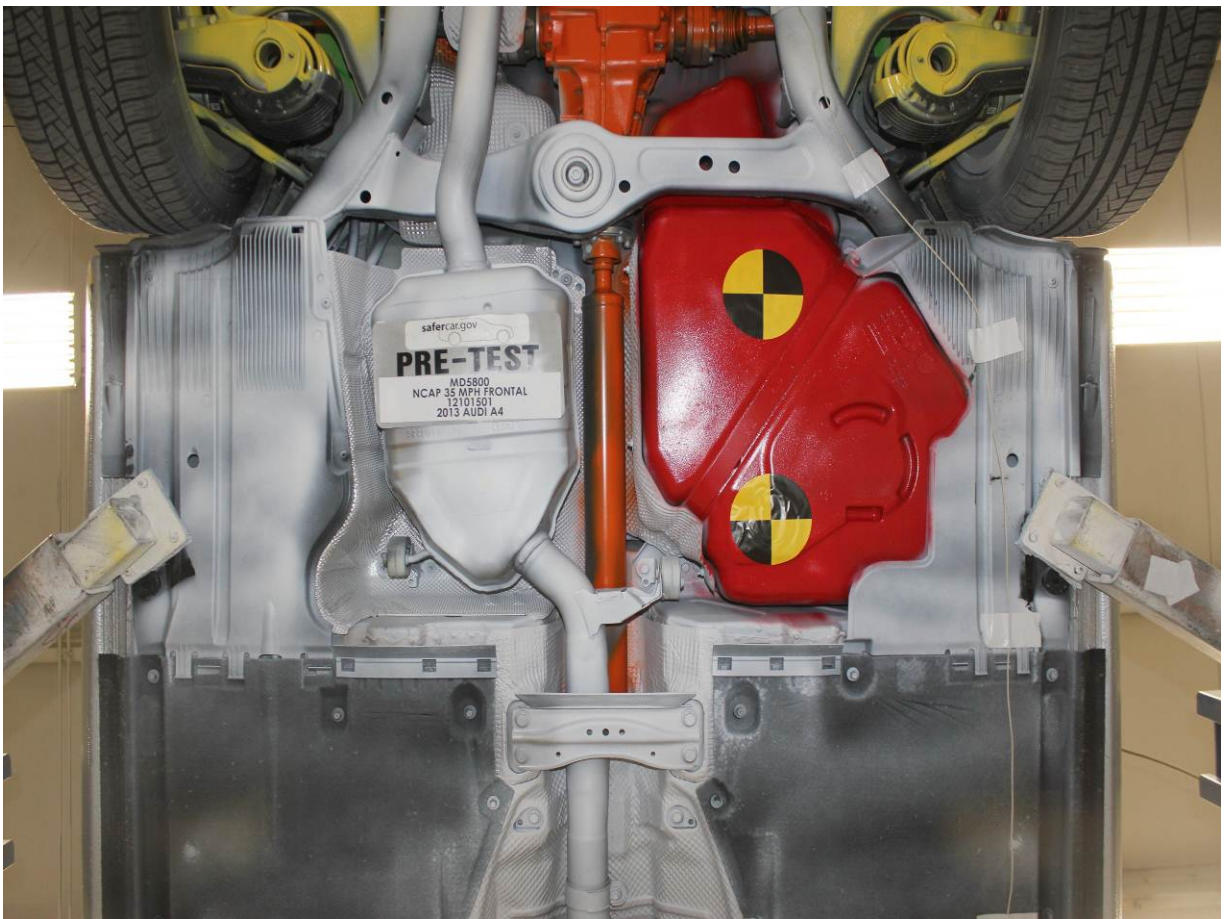
Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



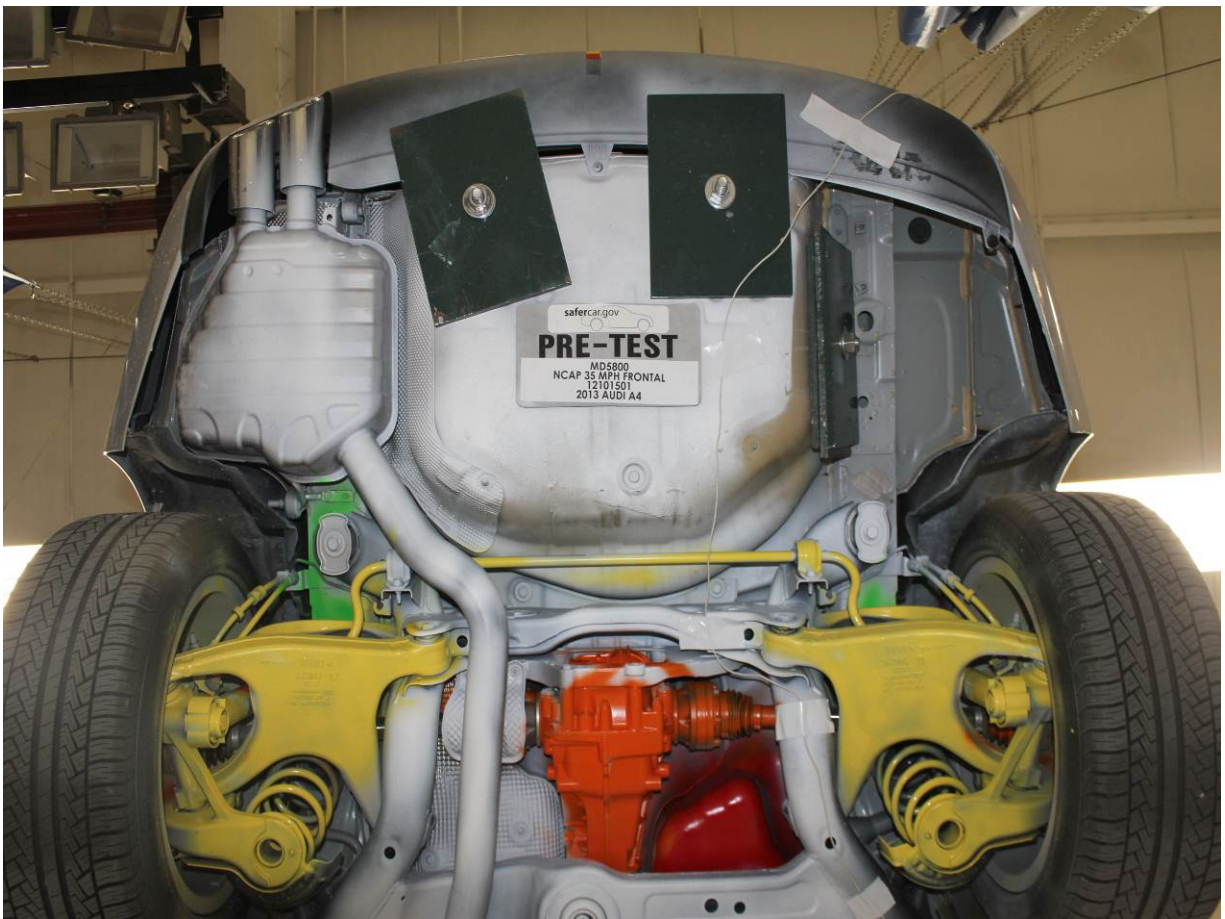
Post-Test Mid Front Underbody View



Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



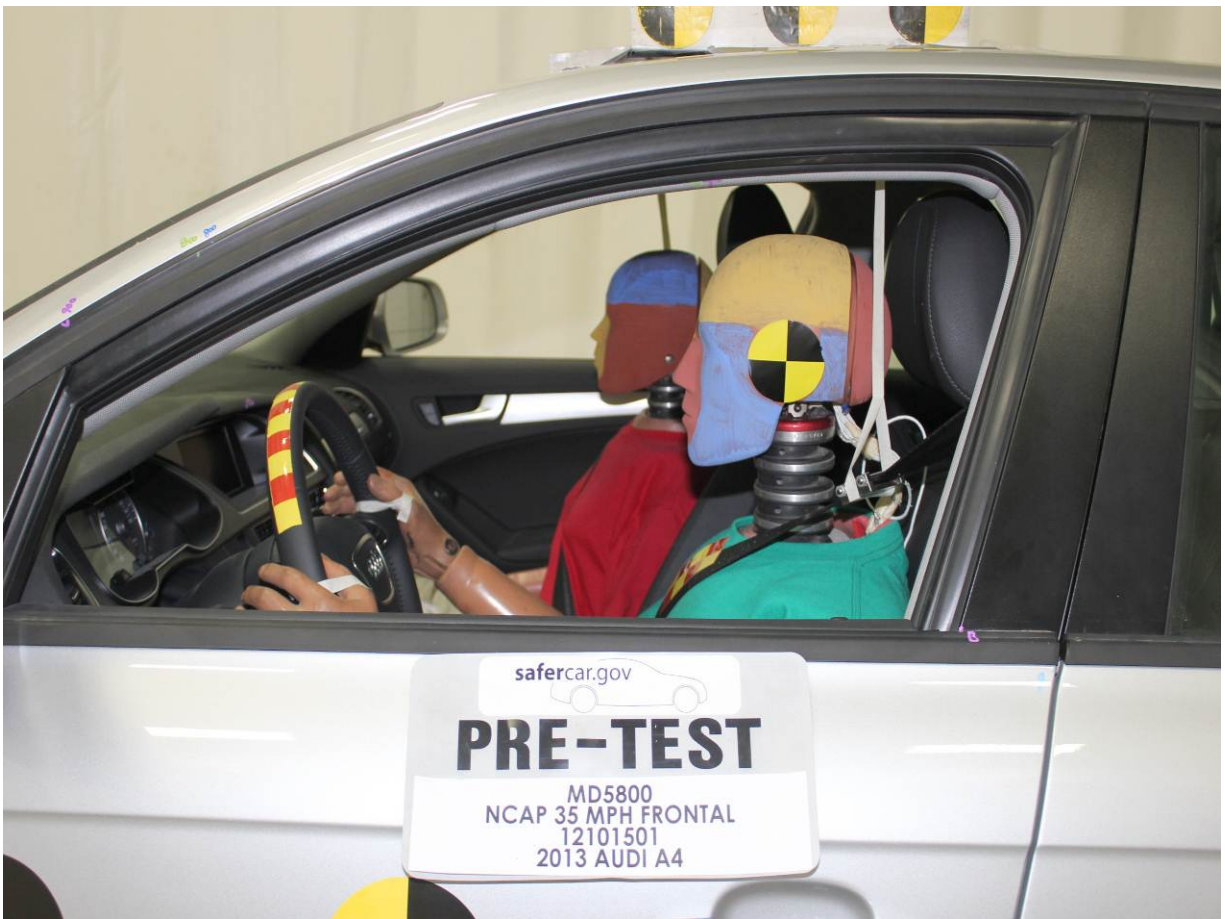
Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View



Pre-Test Driver Dummy and Vehicle Interior (Door Open)



Post-Test Driver Dummy and Vehicle Interior (Door Open)



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Driver Dummy



Post-Test View of Belt Anchorage for Driver Dummy



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



Pre-Test Driver's Side Knee Bolster (without dummy)



Post-Test Driver's Side Knee Bolster (without dummy)



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



Post-Test Driver Dummy Face



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Bolster



Post-Test Driver Dummy Contact with Steering Column



Pre-Test View of the Steering Wheel



Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



Post-Test Passenger Dummy and Vehicle Interior (Door Open)



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test View of Belt Anchorage for Passenger Dummy



Post-Test View of Belt Anchorage for Passenger Dummy



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



Pre-Test Passenger's Side Knee Bolster (without dummy)



Post-Test Passenger's Side Knee Bolster (without dummy)



Pre-Test Passenger's Side Floorpan



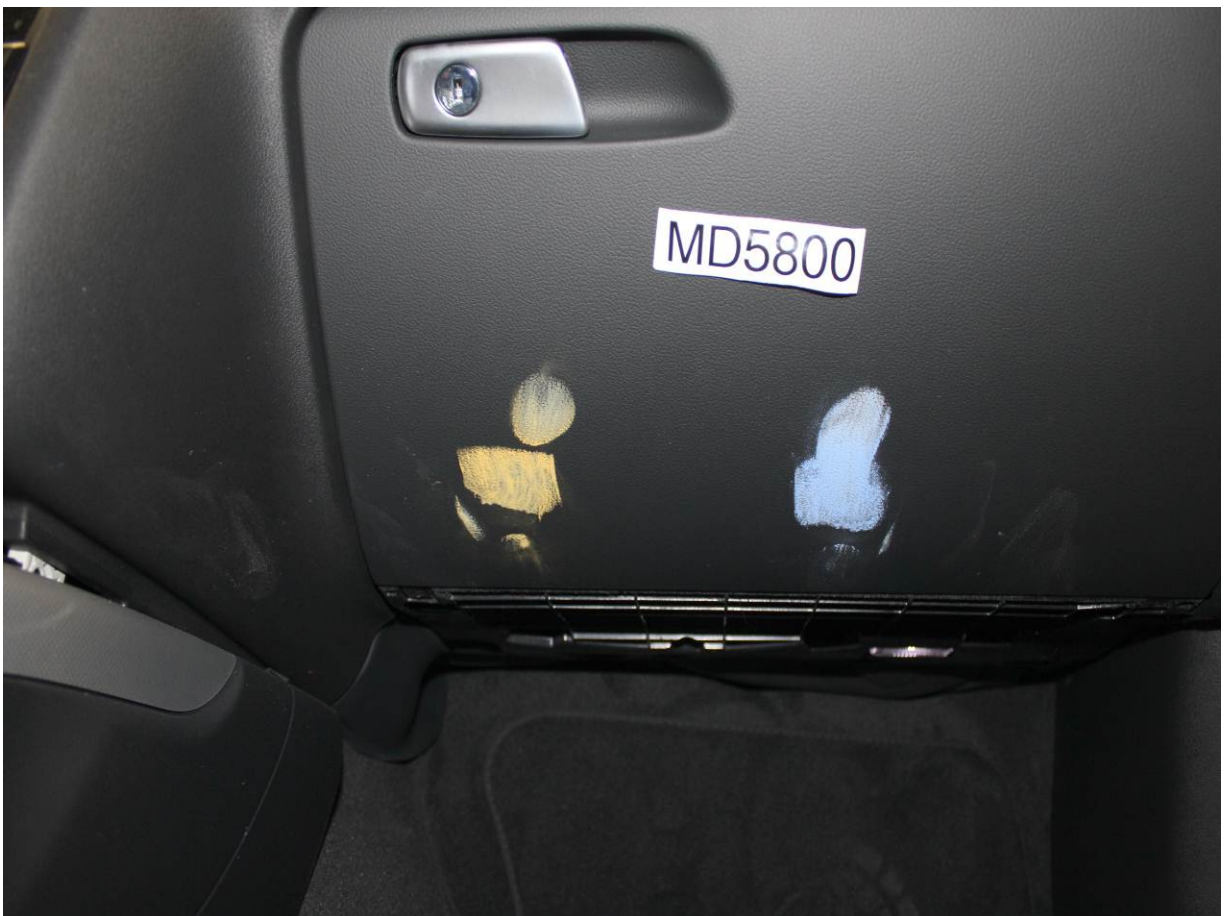
Post-Test Passenger's Side Floorpan



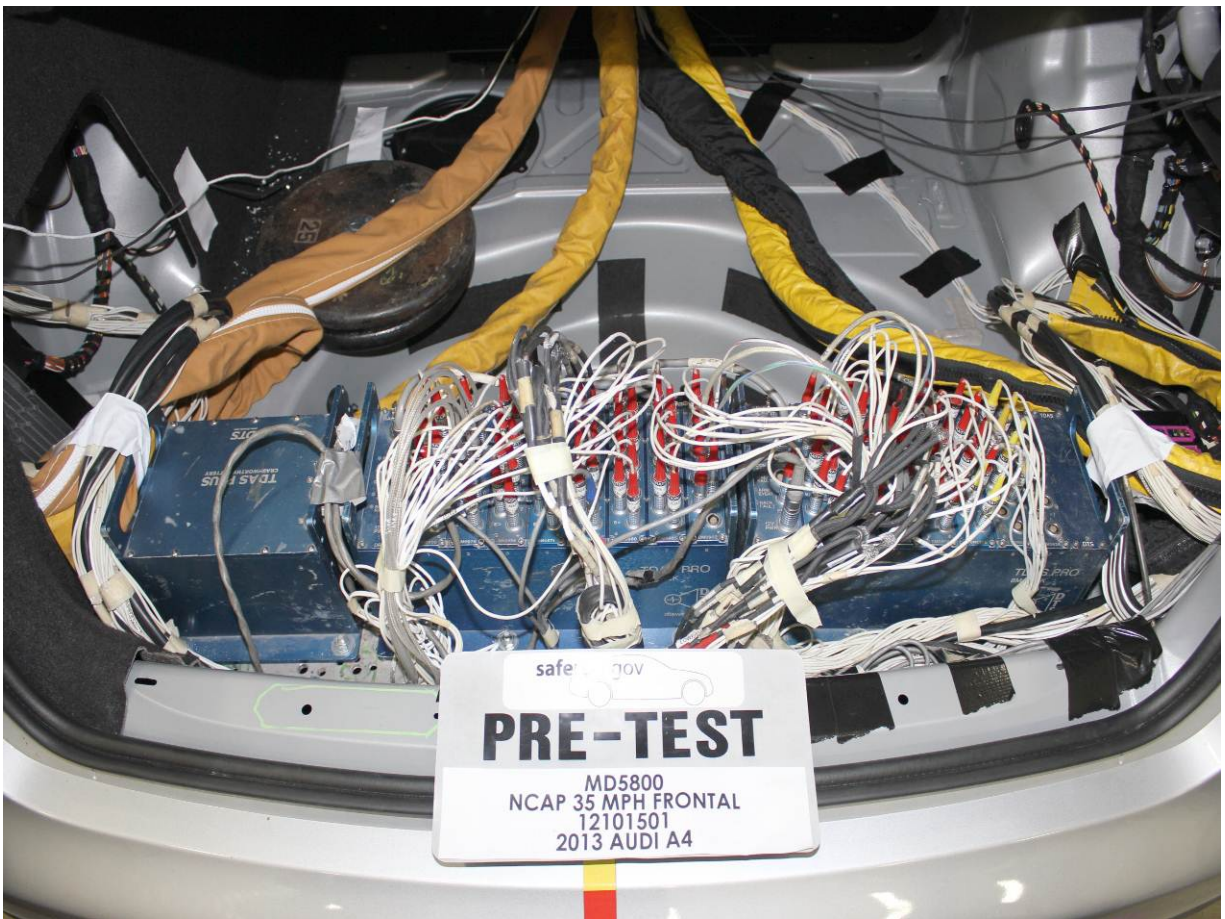
Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glove Box



Ballast Installed in Vehicle



Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



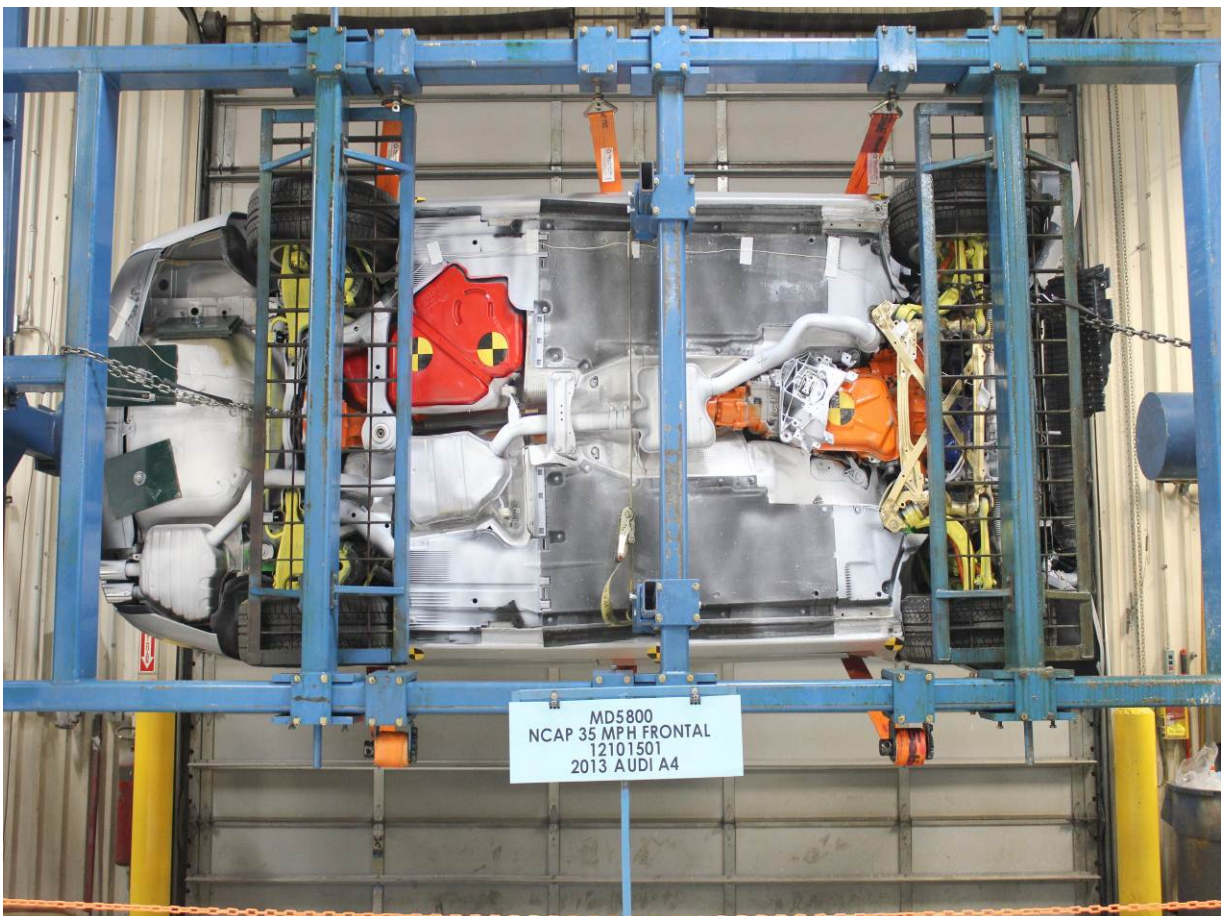
Vehicle at 0° on Static Rollover Device



Vehicle at 90° on Static Rollover Device



Vehicle at 180° on Static Rollover Device



Vehicle at 270° on Static Rollover Device



Vehicle at 360° on Static Rollover Device



2013 Audi A4 AWD Frontal Impact Event

2013 Audi A4 2.0T quattro tiptronic



STANDARD EQUIPMENT (unless replaced by options)

TECHNICAL

- 2.0L turbocharged I4 engine (211hp / 258lb-ft of torque) with FSI® direct injection
- Eight-speed tiptronic® transmission with sport and manual shift modes
- quattro® permanent all-wheel-drive with 40/60 torque split
- 17" 10-spoke Star-design wheels, 245/45 all-season tires
- ABS (Anti-lock brake system) with brake assist
- ESC (Electronic Stability Control)
- Electromechanical speed-sensitive power steering
- Dynamic five-link front suspension
- Dynamic trapezoidal-link rear axle, fully independent
- Spare cover spare tire

COMFORT/CONVENIENCE

- Power glass sunroof with sunshade
- Halogen headlights with front and rear fog lights
- Rain and light sensor
- Heated, power exterior mirrors
- Leather seating surfaces
- Twelve-way power driver seat and eight-way power passenger seat
- Fixed rear seatback
- Automatic climate control
- Audi concert radio with Audi premium sound
- AM/FM/SAT/100 audio with SD card reader and aux-in
- SIRIUS® Satellite Radio (with 3-month complimentary subscription)
- Aluminum Tigris® alloy

SAFETY/SECURITY

- Driver single adaptive airbag and front passenger advanced two-stage air bag supplemental restraint system
- Driver and front passenger seat mounted side airbag supplemental restraints
- Sideguard® curtain airbags
- Anti-theft vehicle alarm system and ignition immobilizer
- Front 3-point safety belts with automatic pretensioners and load limiters, rear 3-point safety belts with automatic pretensioners
- Lower Anchors and Tethers for Children (LATCH) in rear

WARRANTY/MAINTENANCE

- 4-Year/50,000 mile (whichever occurs first) new vehicle limited warranty*
- 12-Year limited warranty against corrosion perforation*
- 12-Month/5,000 mile (whichever occurs first) NO CHARGE first scheduled maintenance
- 4-Year Roadside Assistance coverage provided by a third party supplier

*Please refer to the 2013 Audi Warranty Manual for complete coverage information

MANUFACTURER'S SUGGESTED RETAIL PRICE

2013 Audi A4 2.0T quattro tiptronic	\$34,600.00
Ice Silver metallic	\$475.00
Black interior	Included
Convenience package-	\$1,100.00
Audi music interface w/ iPod® cable	
Garage door opener (HomeLink®)	
Preparation for mobile phone (Bluetooth®)	
Heated front seats	\$450.00
Polished exhaust tips	\$140.00

MODEL: 8K252A

VIN: WAU8FAFLJDN009891

DEALER: 402F10
AUDI MILWAUKEE
2400 S. 108TH STREET
MILWAUKEE, WI 53227
Port of Entry: HOUSTON

SHIP TO: 402F10
AUDI MILWAUKEE
2400 S. 108TH STREET
MILWAUKEE, WI 53227
COMM NUM: 224451
Transportation Method: TRUCK

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score

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

Frontal Crash	Driver Passenger	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	★★★★	

Based on the risk of injury in a side impact.

Rollover	★★★★
----------	------

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

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA).

www.safercar.gov or 1-888-327-4235

EPA DOT Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy

24 MPG

combined city/hwy

20 city

30 highway

4.2 gallons per 100 miles

Compact Cars range from 14 to 60 MPG. The best vehicle rates 112 MPG.

You save \$600

in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$2,200

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

6

Smog Rating (tailpipe only)

5

This vehicle emits 374 grams of CO₂ per mile. The best emits 204 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 23 MPG and costs \$11,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.25 per gallon. MPG is miles per 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: NECKARSULM, GERMANY
MAJOR SOURCES OF FOREIGN PARTS CONTENT: GERMANY: 75%	COUNTRY OF ORIGIN: HUNGARY
	TRANSMISSION: GERMANY

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

Monroney Label

APPENDIX B
DUMMY RESPONSE DATA TRACES

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The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

Driver 9 Axis Head CG X Redundant
 Driver 9 Axis Head CG Y Redundant
 Driver 9 Axis Head CG Z Redundant
 Driver 9 Axis Head X Arm Y
 Driver 9 Axis Head X Arm Z
 Driver 9 Axis Head Y Arm X
 Driver 9 Axis Head Y Arm Z
 Driver 9 Axis Head Z Arm X
 Driver 9 Axis Head Z Arm Y
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Left Femur Redundant
 Driver Right Femur Redundant

Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
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 9 Axis Head CG X Redundant
Passenger 9 Axis Head CG Y Redundant
Passenger 9 Axis Head CG Z Redundant
Passenger 9 Axis Head X Arm Y
Passenger 9 Axis Head X Arm Z
Passenger 9 Axis Head Y Arm X
Passenger 9 Axis Head Y Arm Z
Passenger 9 Axis Head Z Arm X
Passenger 9 Axis Head Z Arm Y
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
Passenger Pelvis Z
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
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

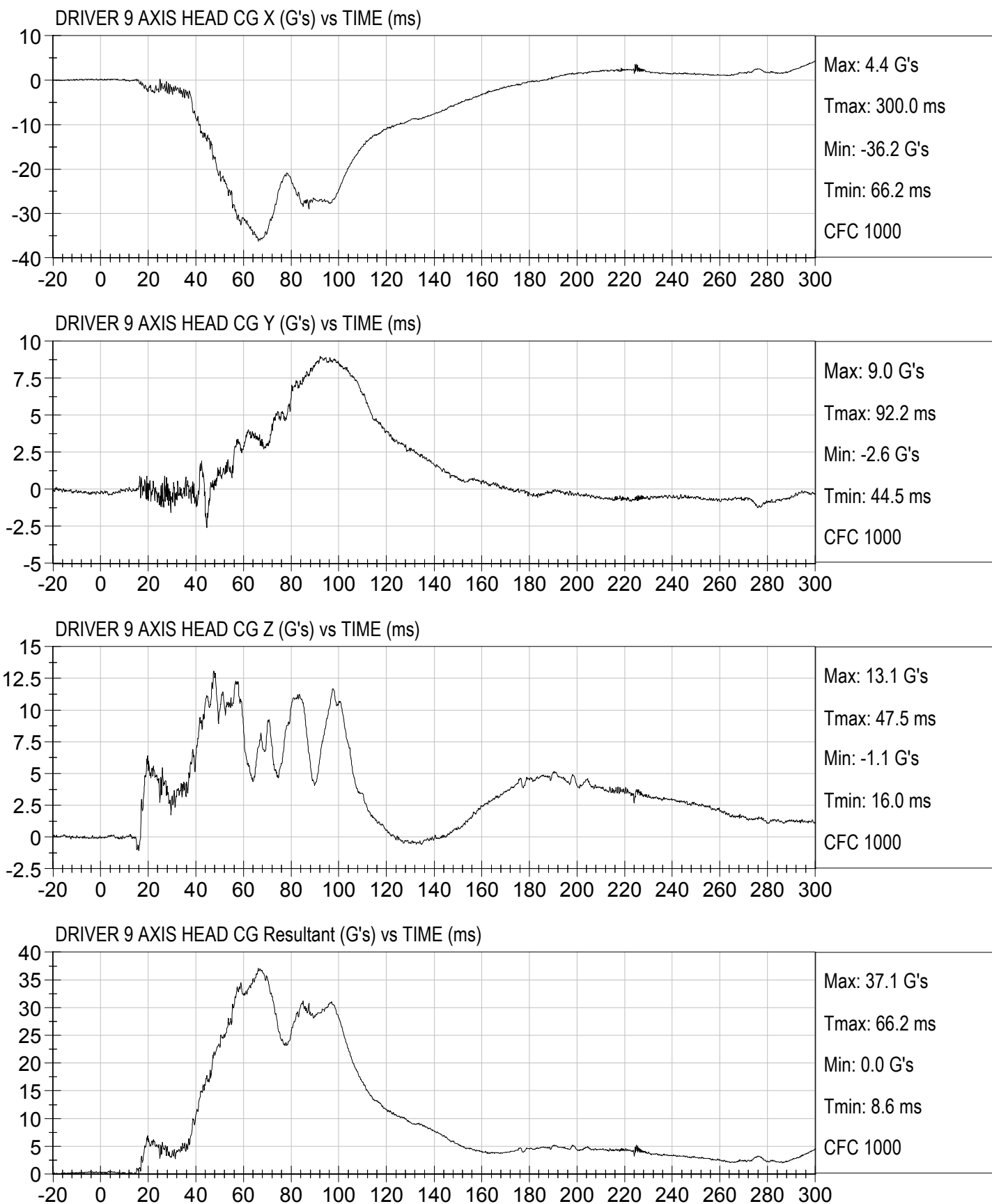
Left Rear Seat Crossmember Z

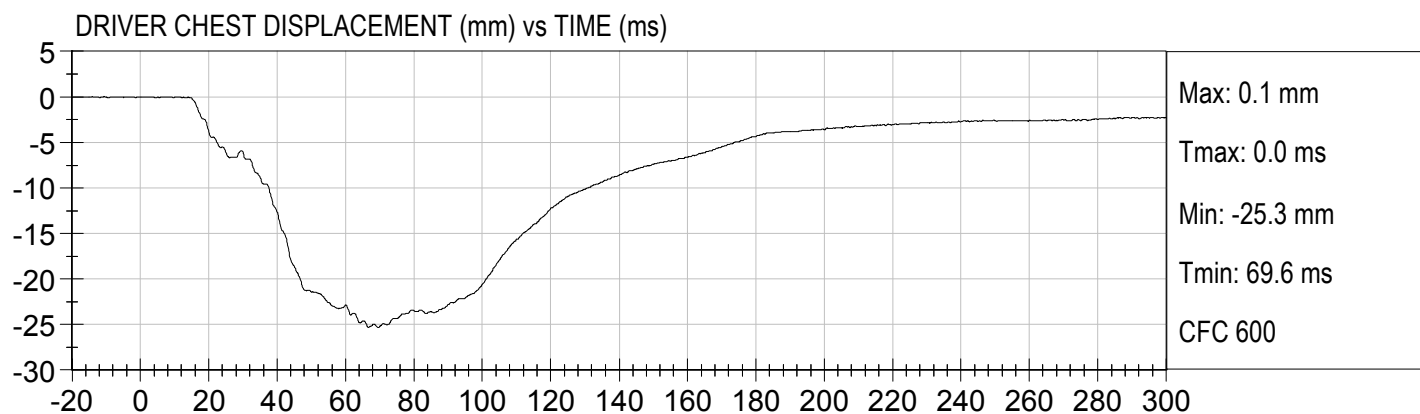
Right Rear Seat Crossmember Z

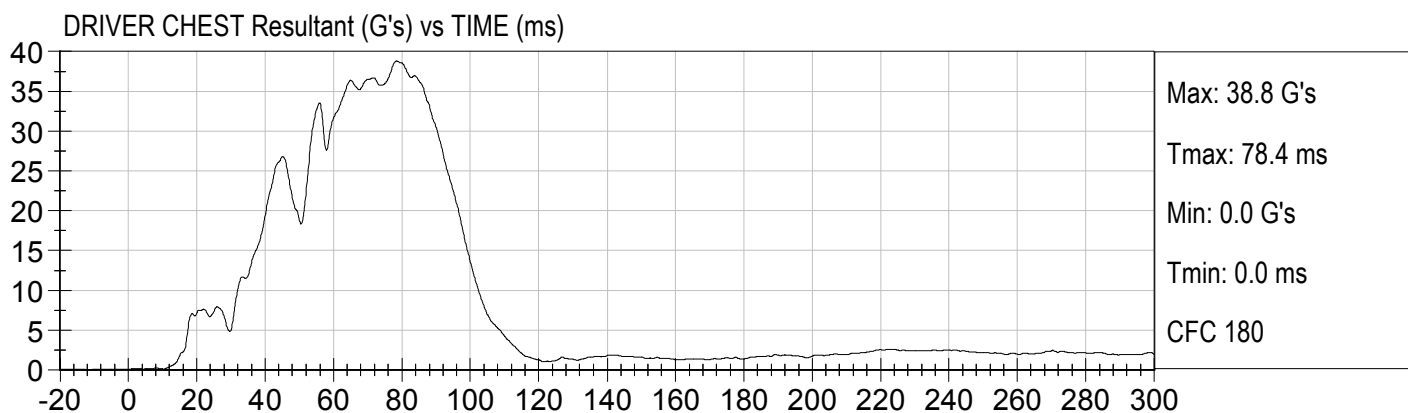
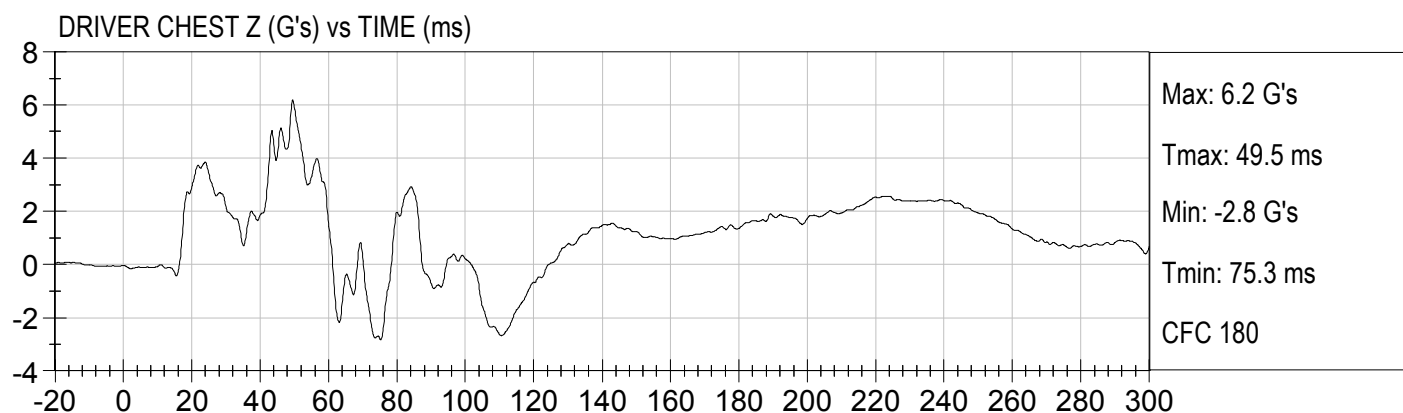
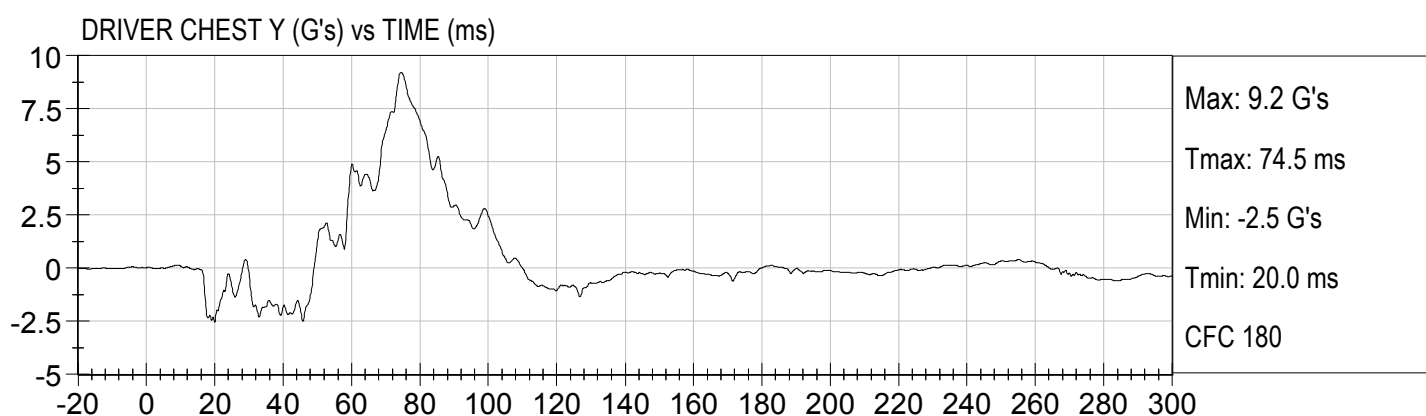
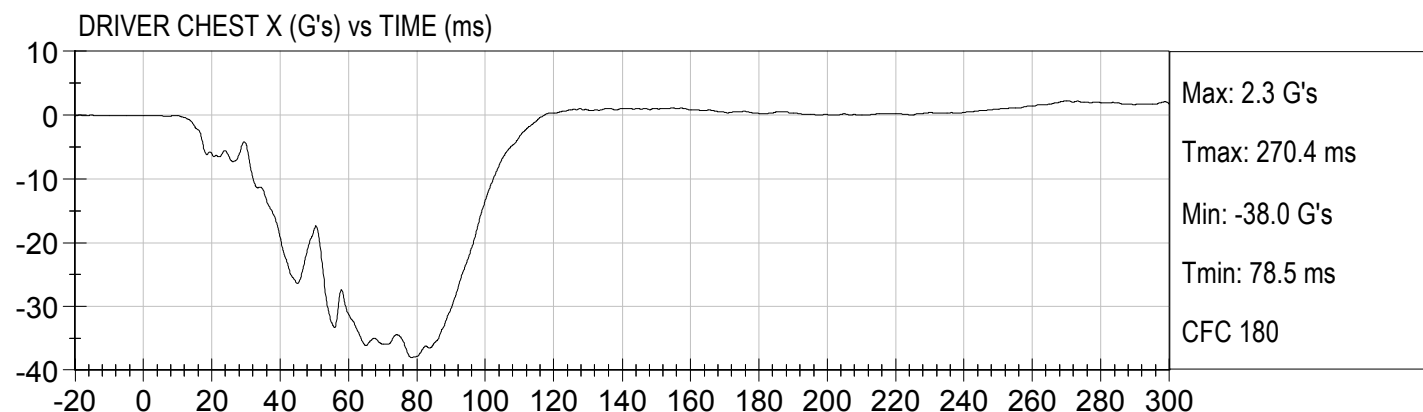
Left Rear Seat Crossmember Xr

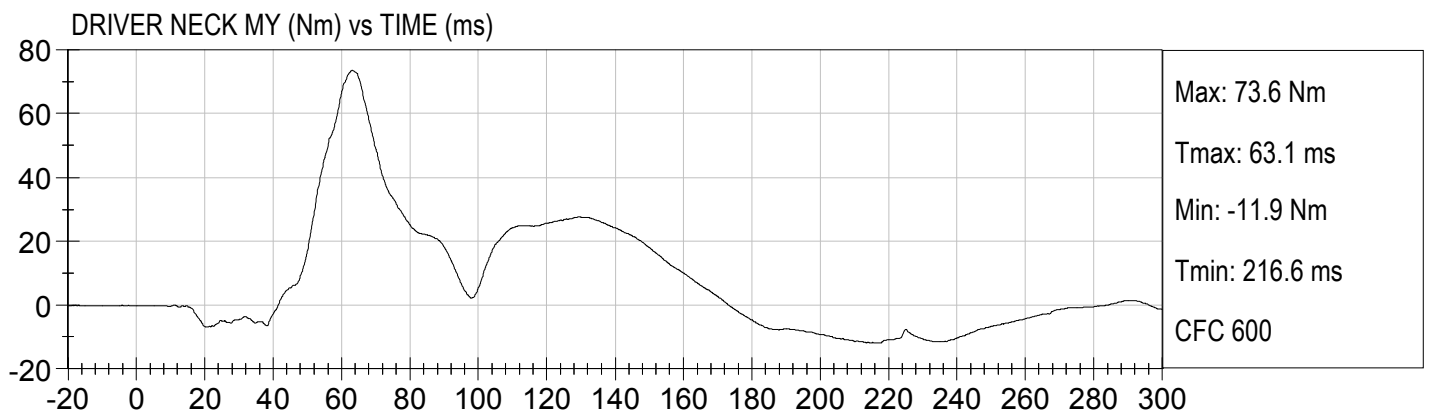
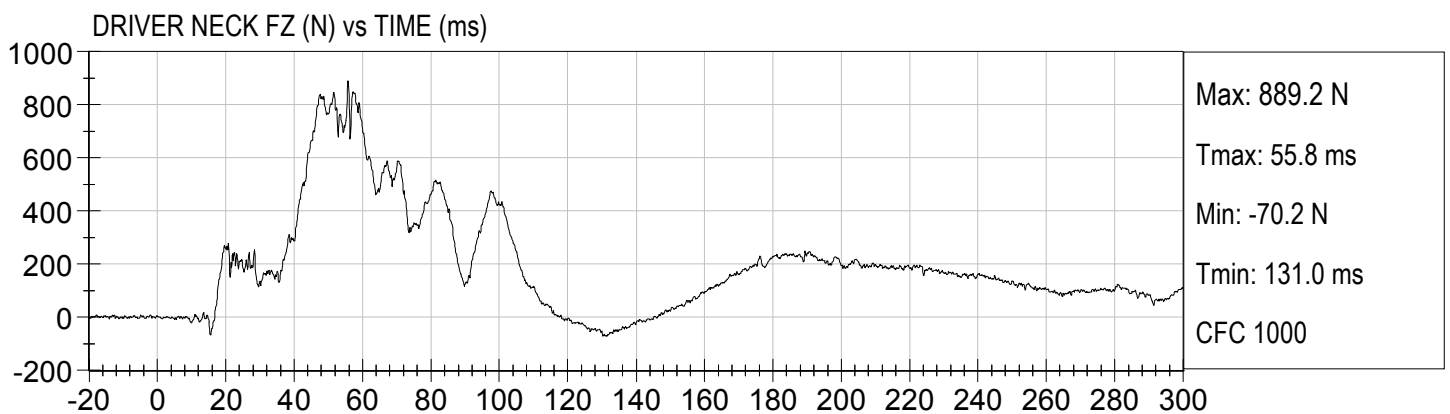
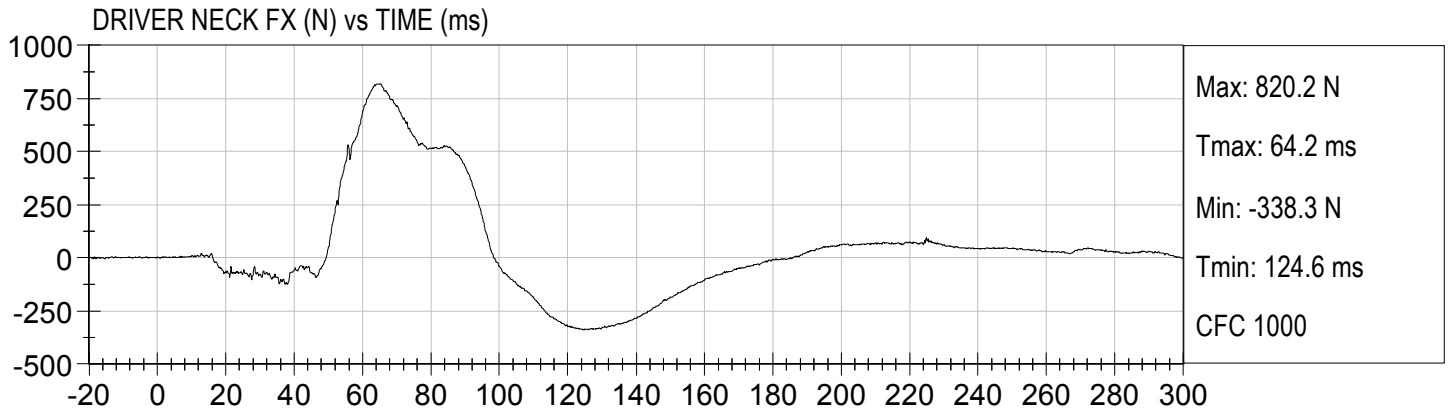
Right Rear Seat Crossmember Xr

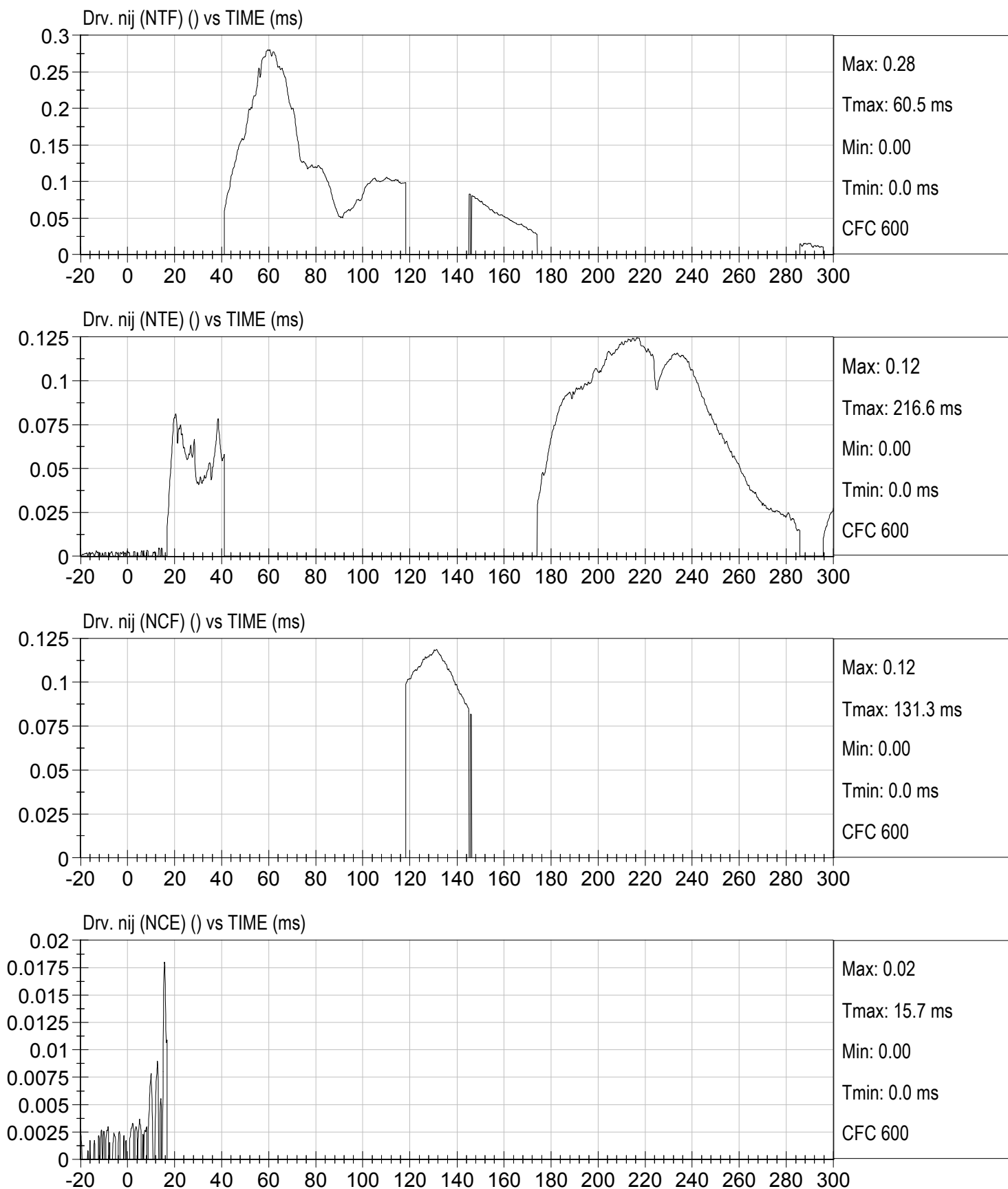
Advanced Research Load Cell Barrier – 128 channels

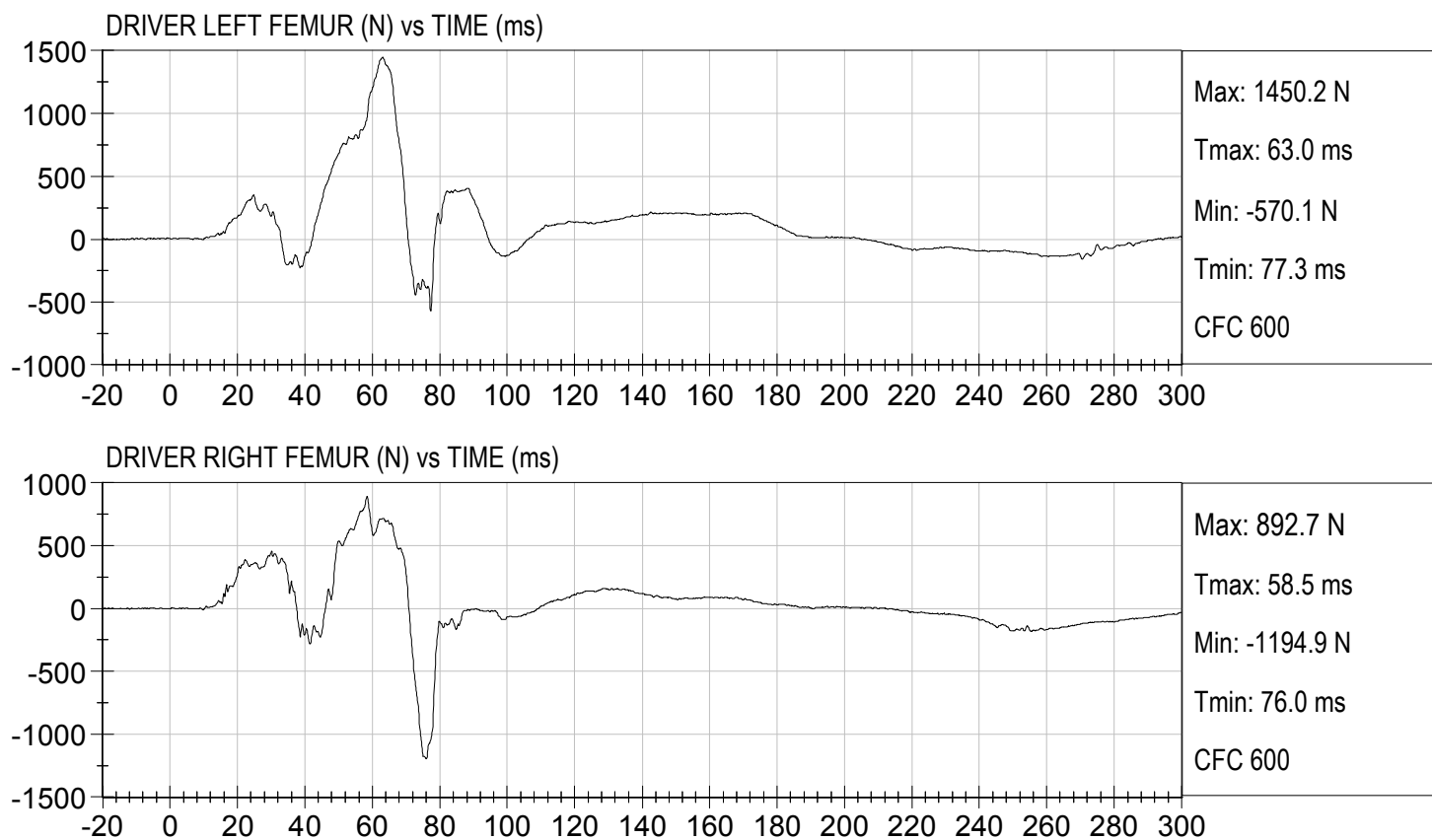


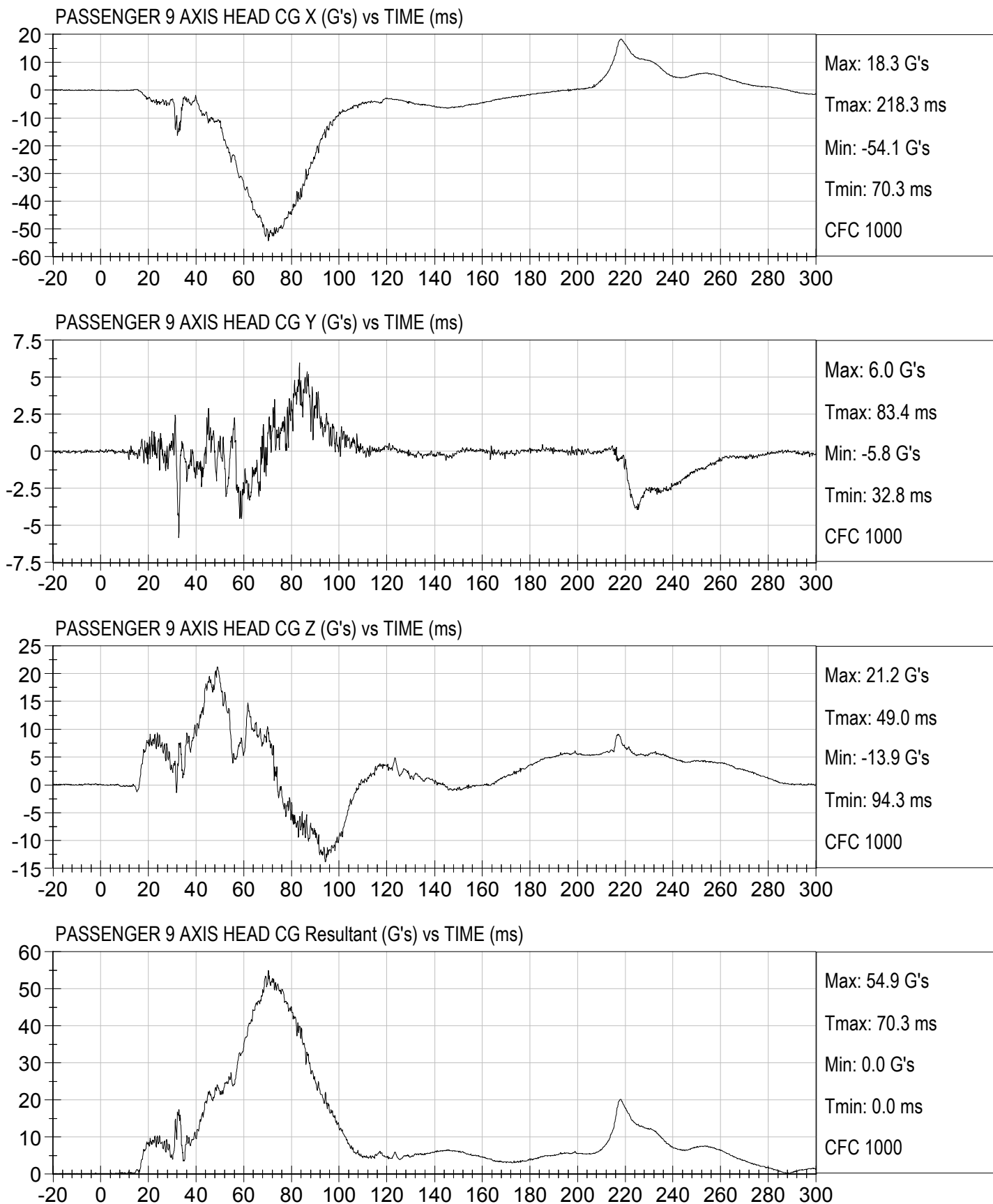


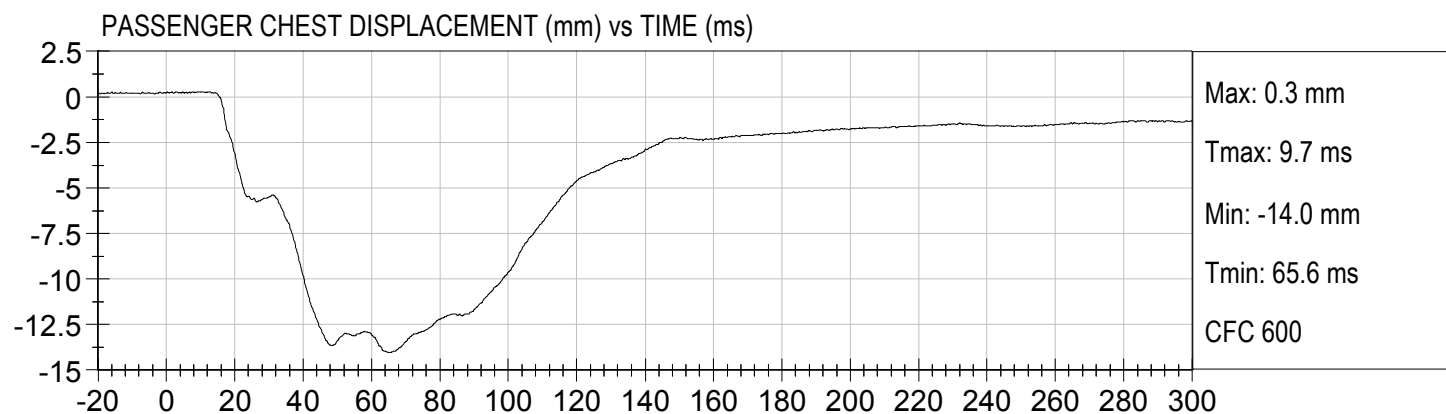


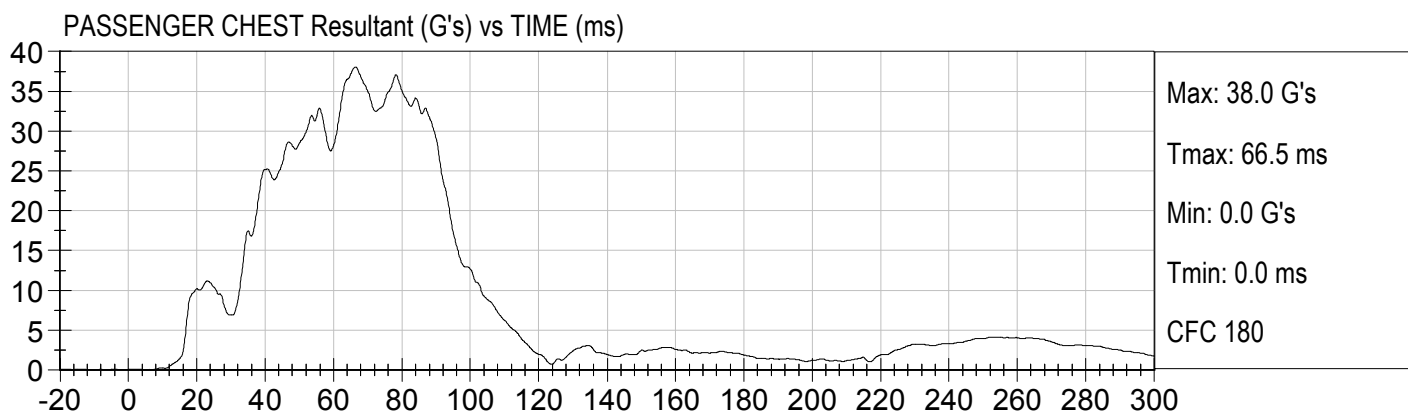
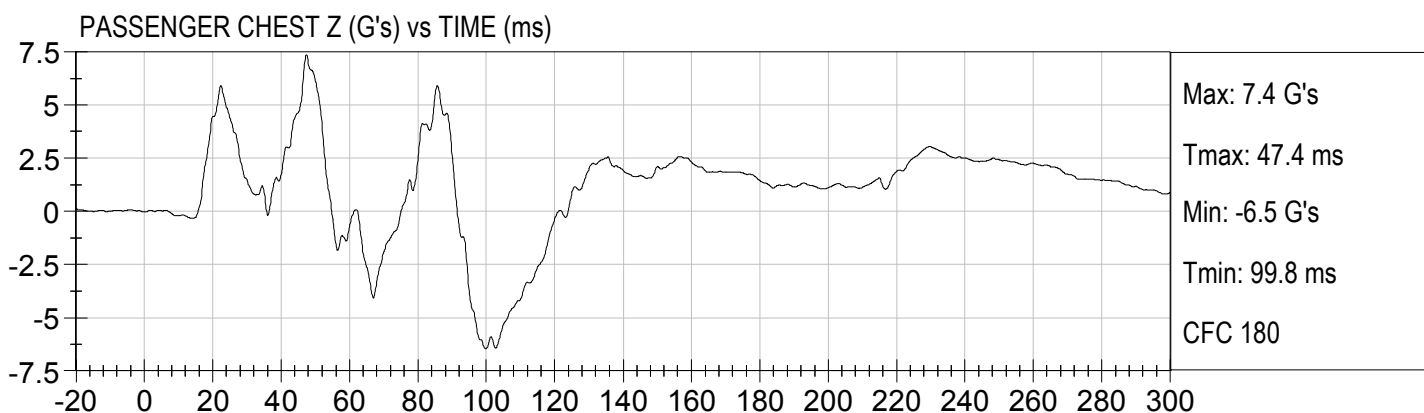
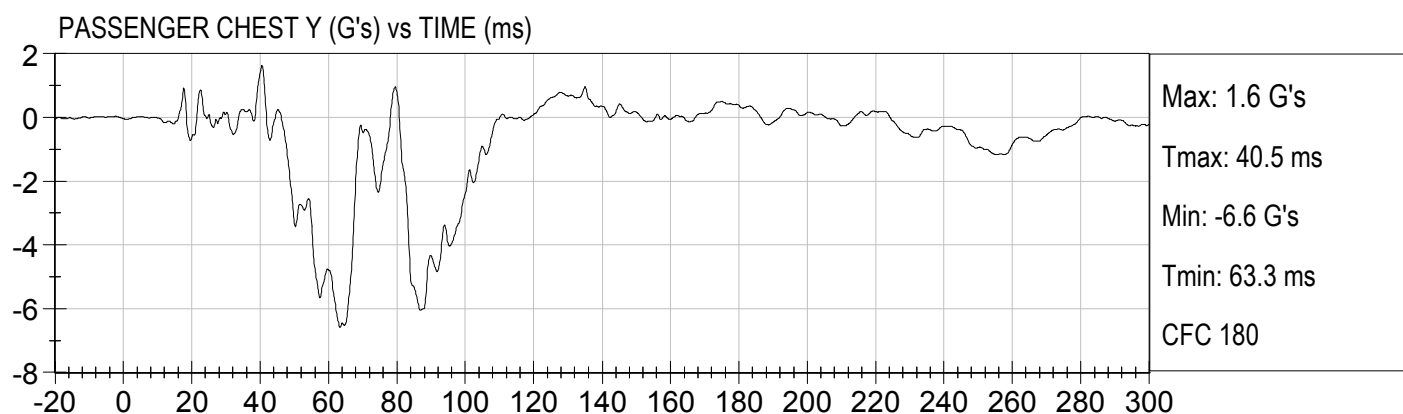
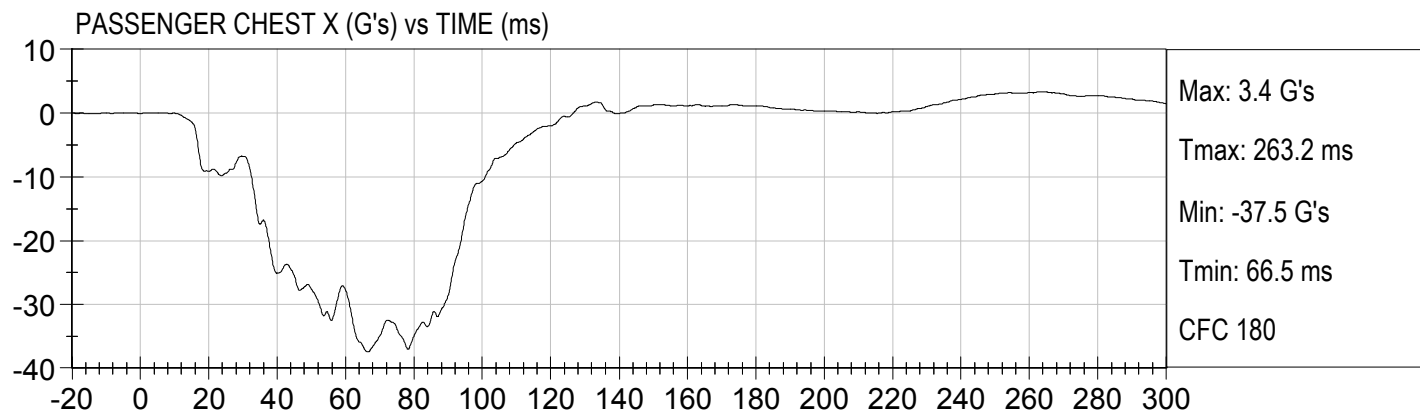


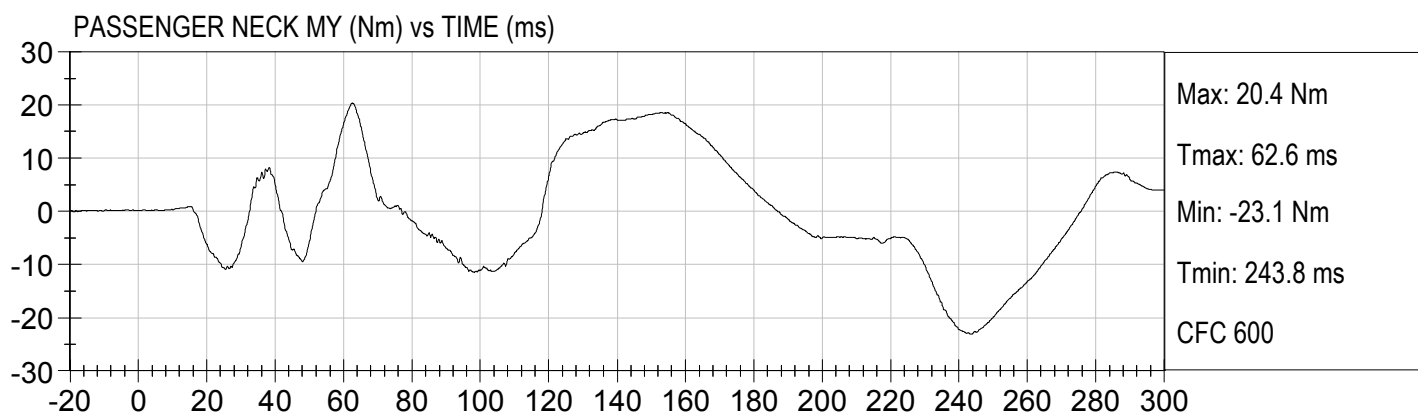
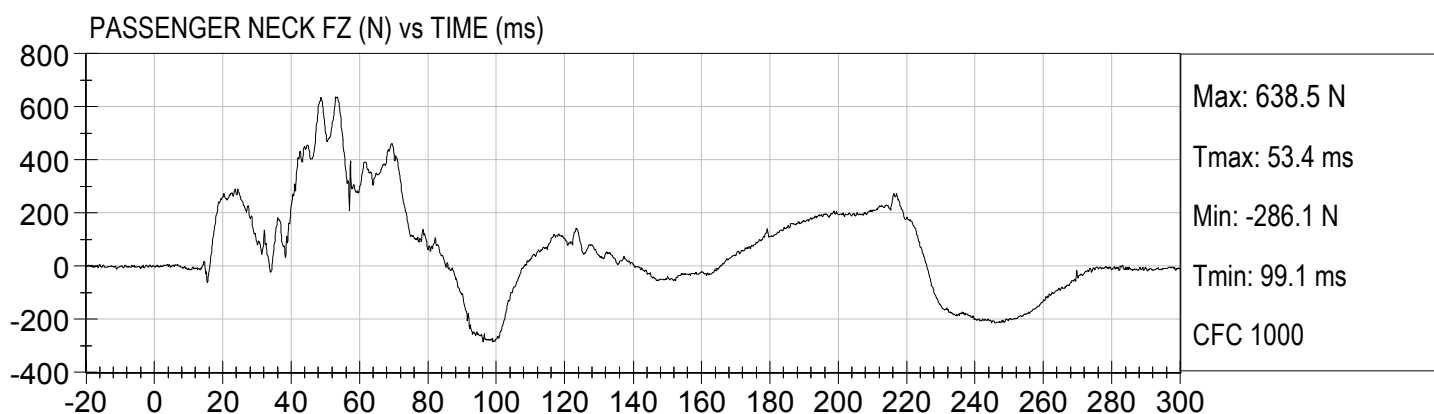
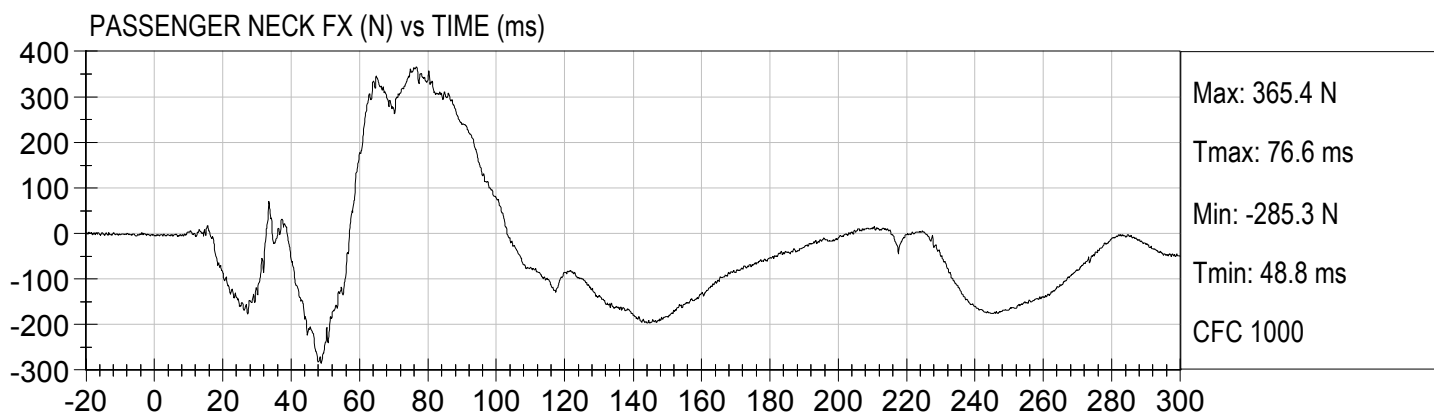


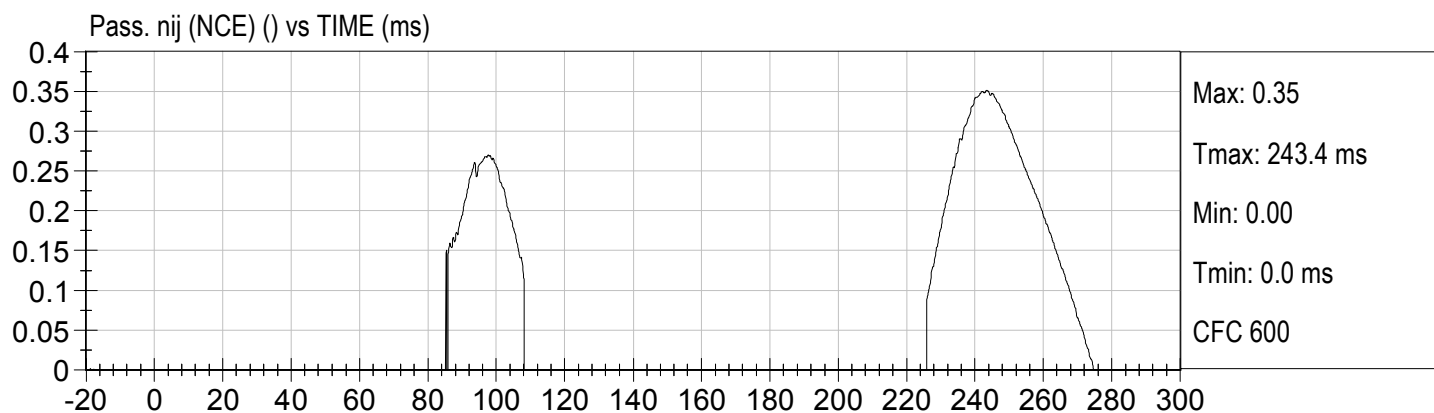
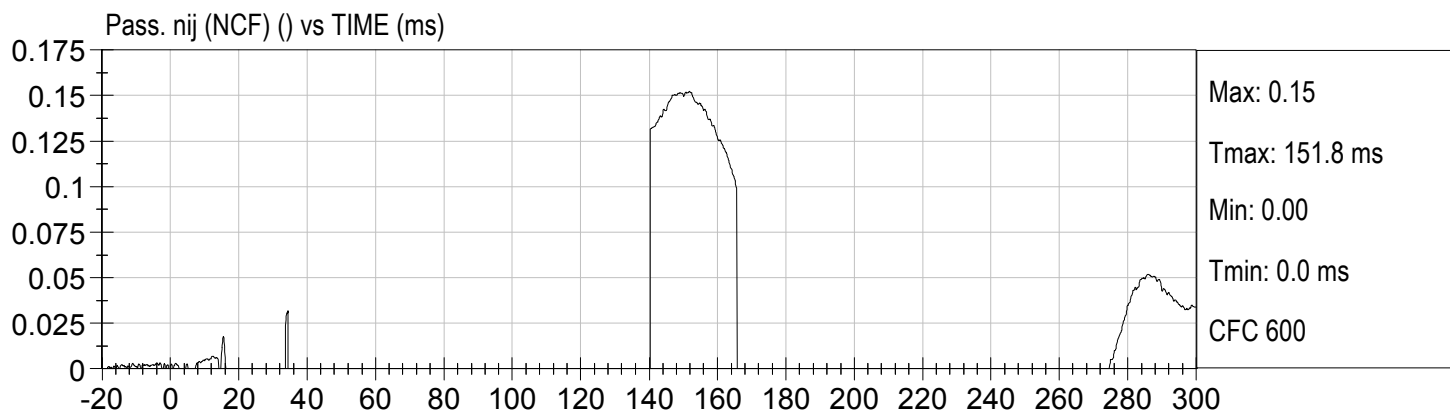
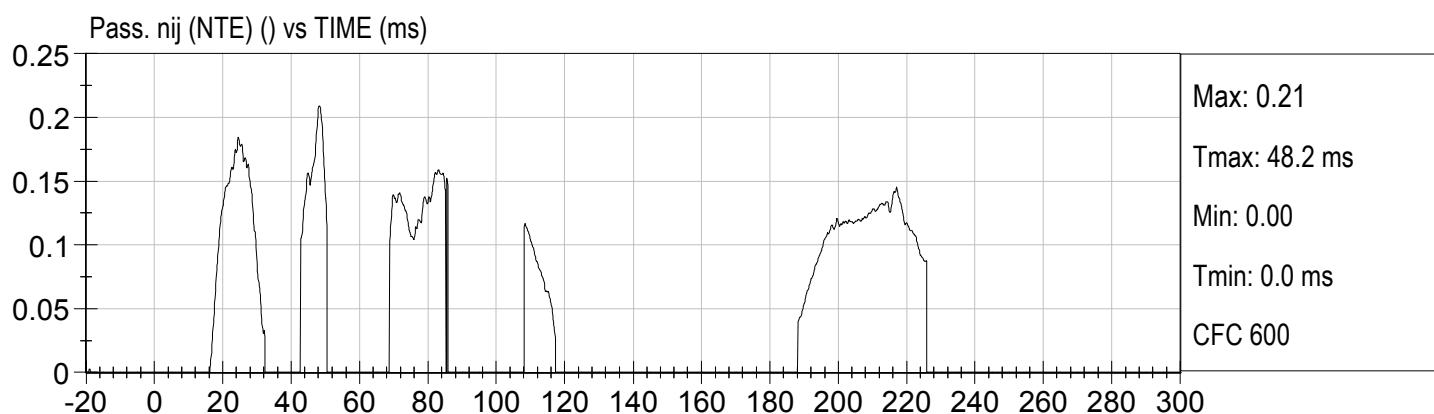
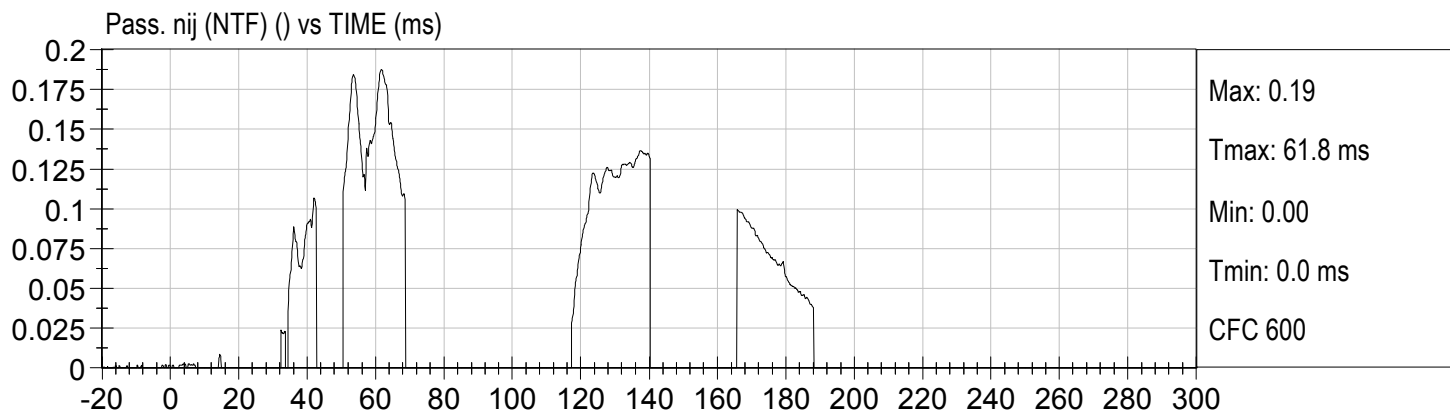


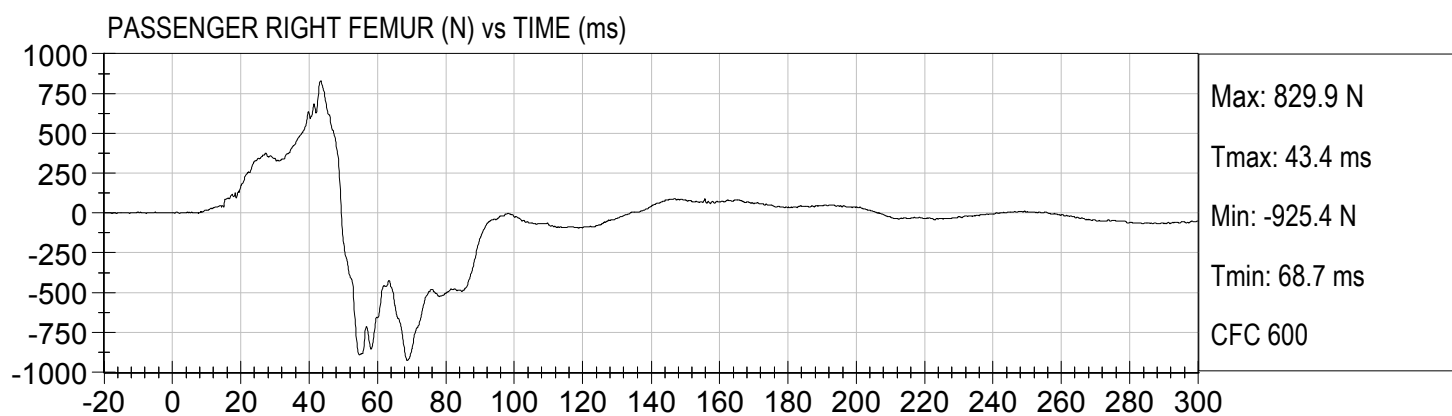
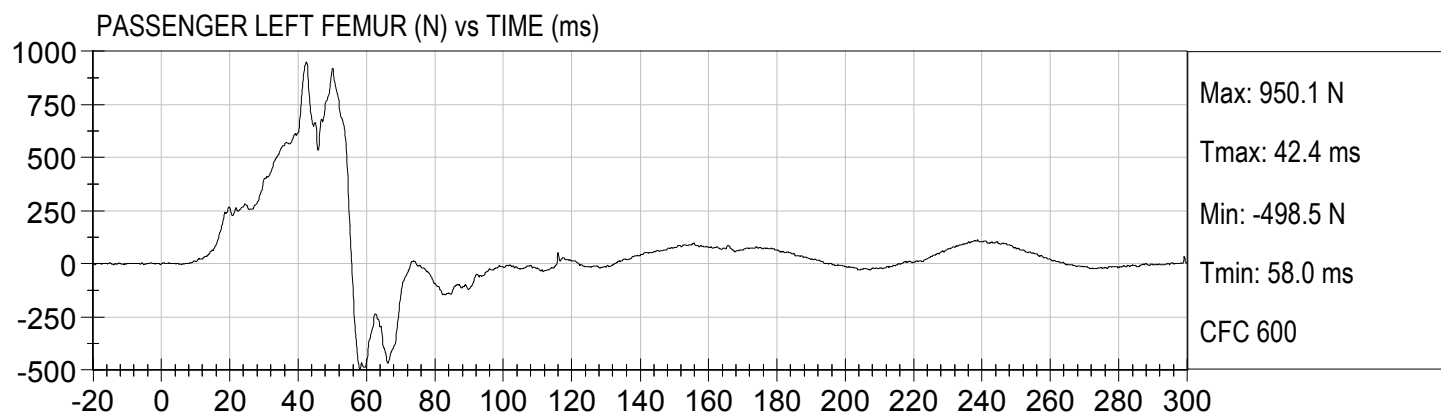












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 036

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	34.7
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	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.8
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.5
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
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	13.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.9
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	17.3
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	17.9

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	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.4
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.4
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	34.0
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: 036

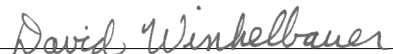
Test ID: D123861

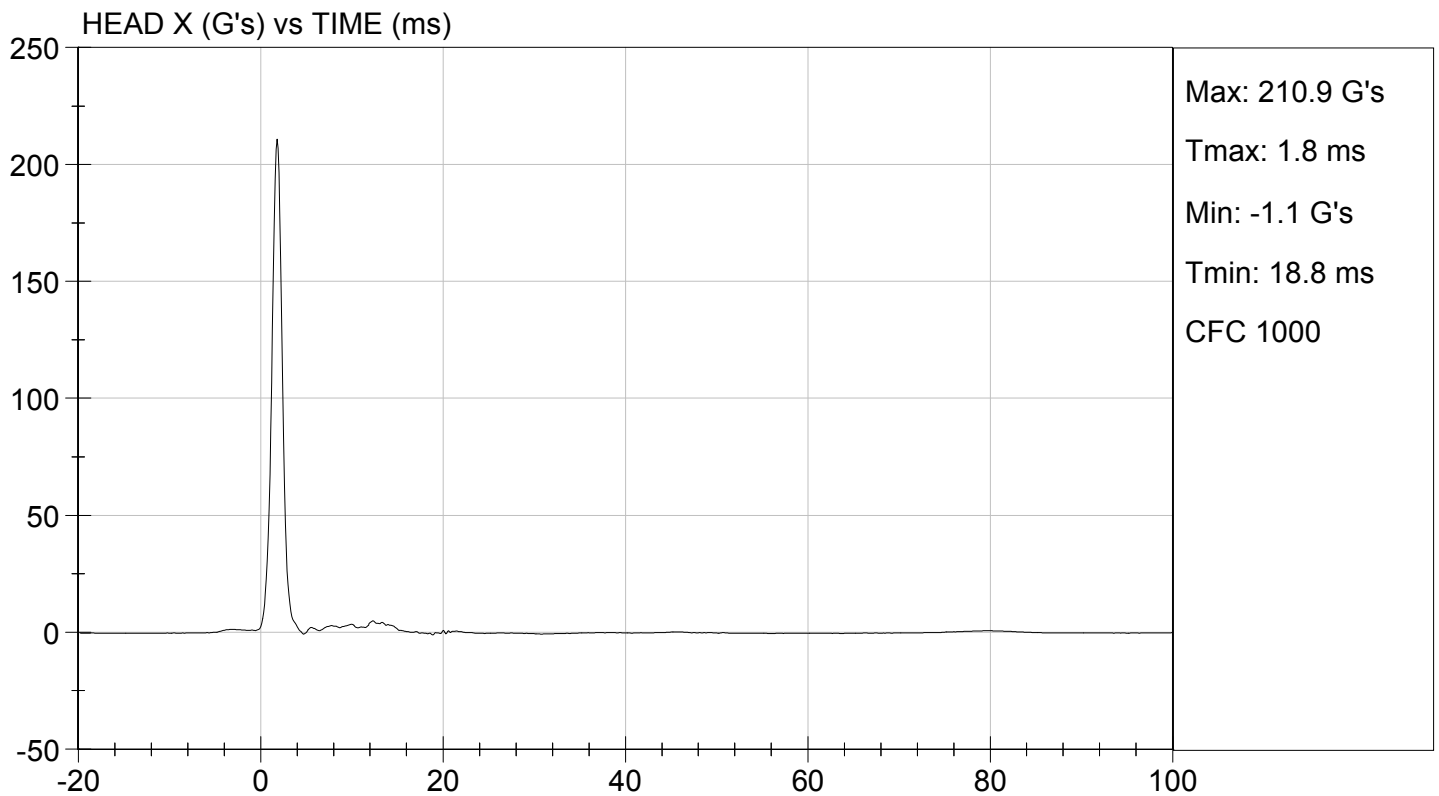
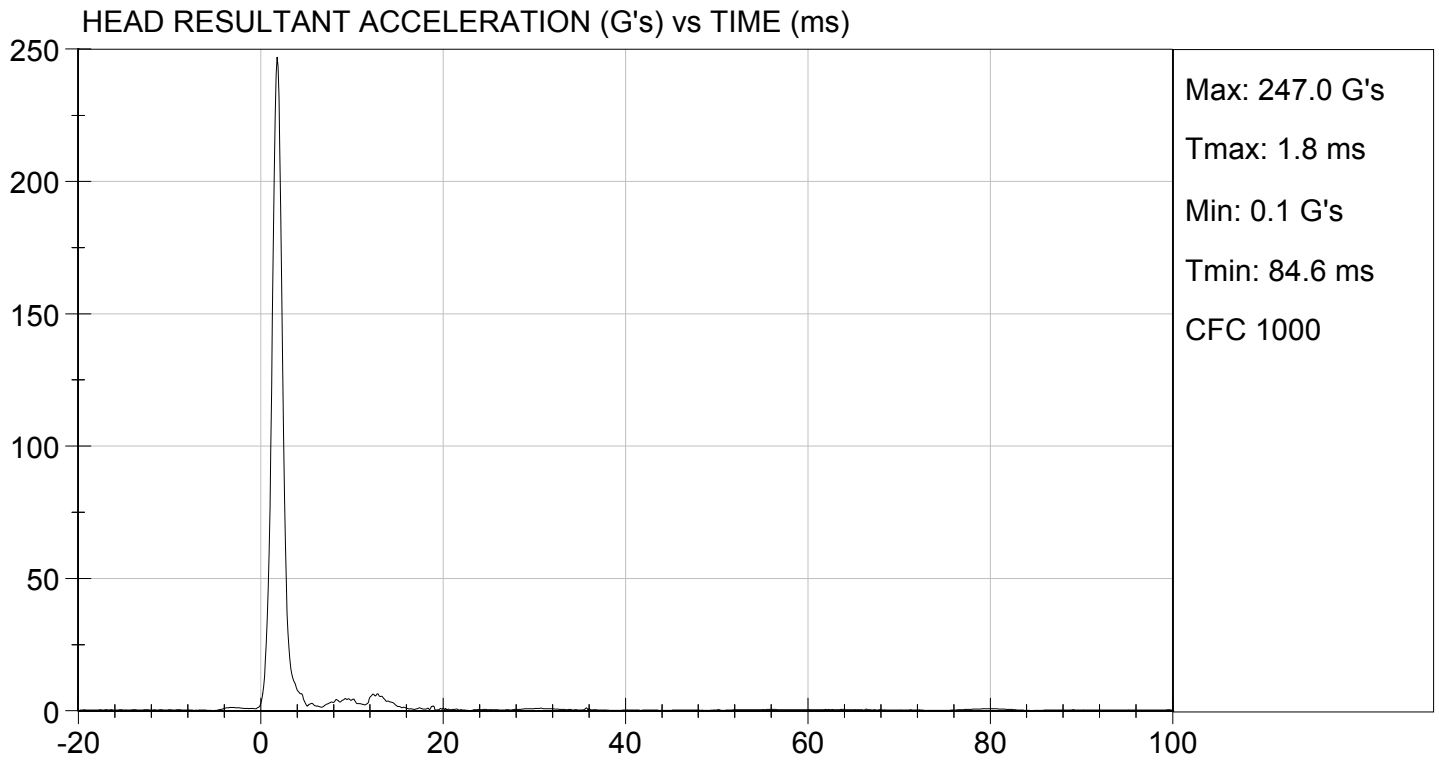
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	225 to 275	247	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-3.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

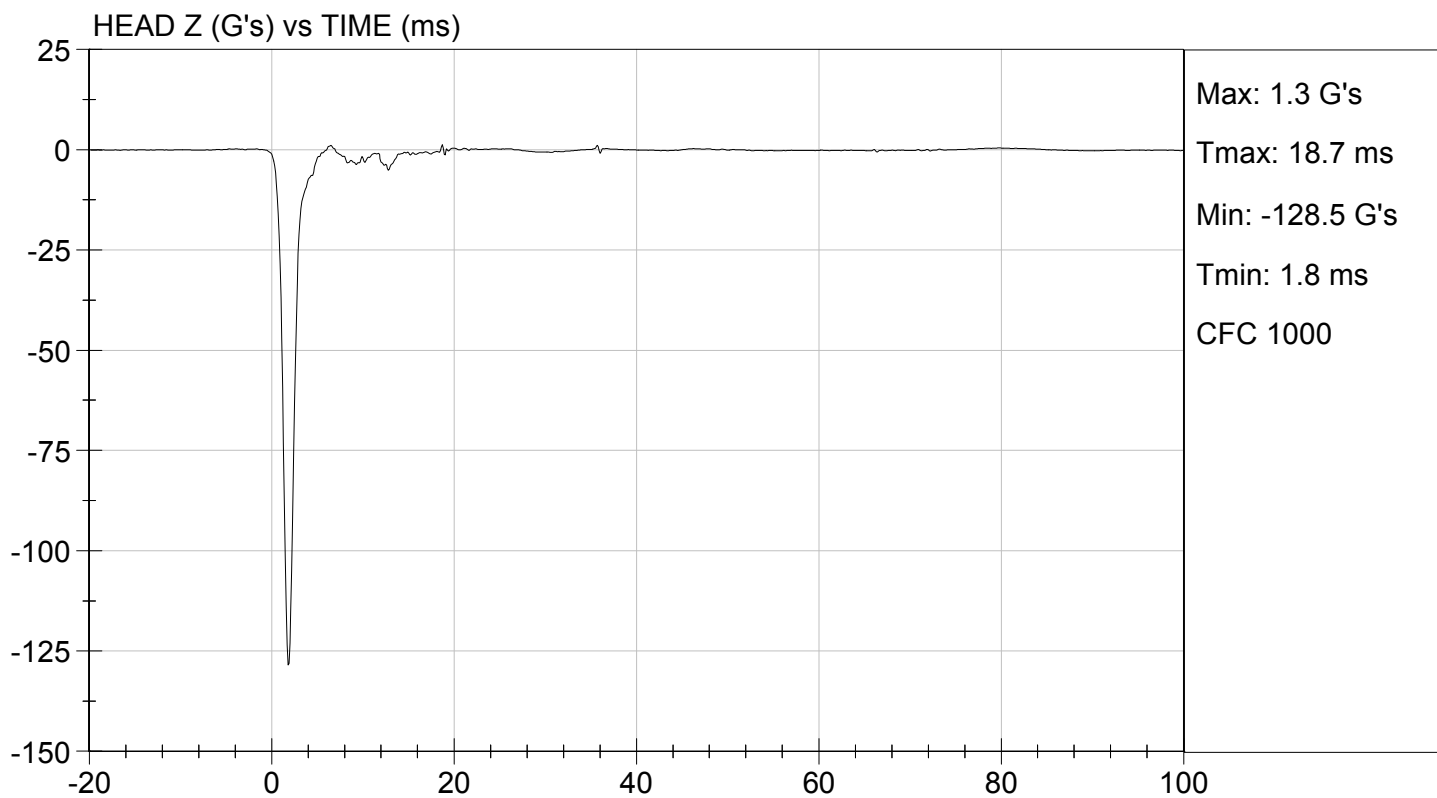
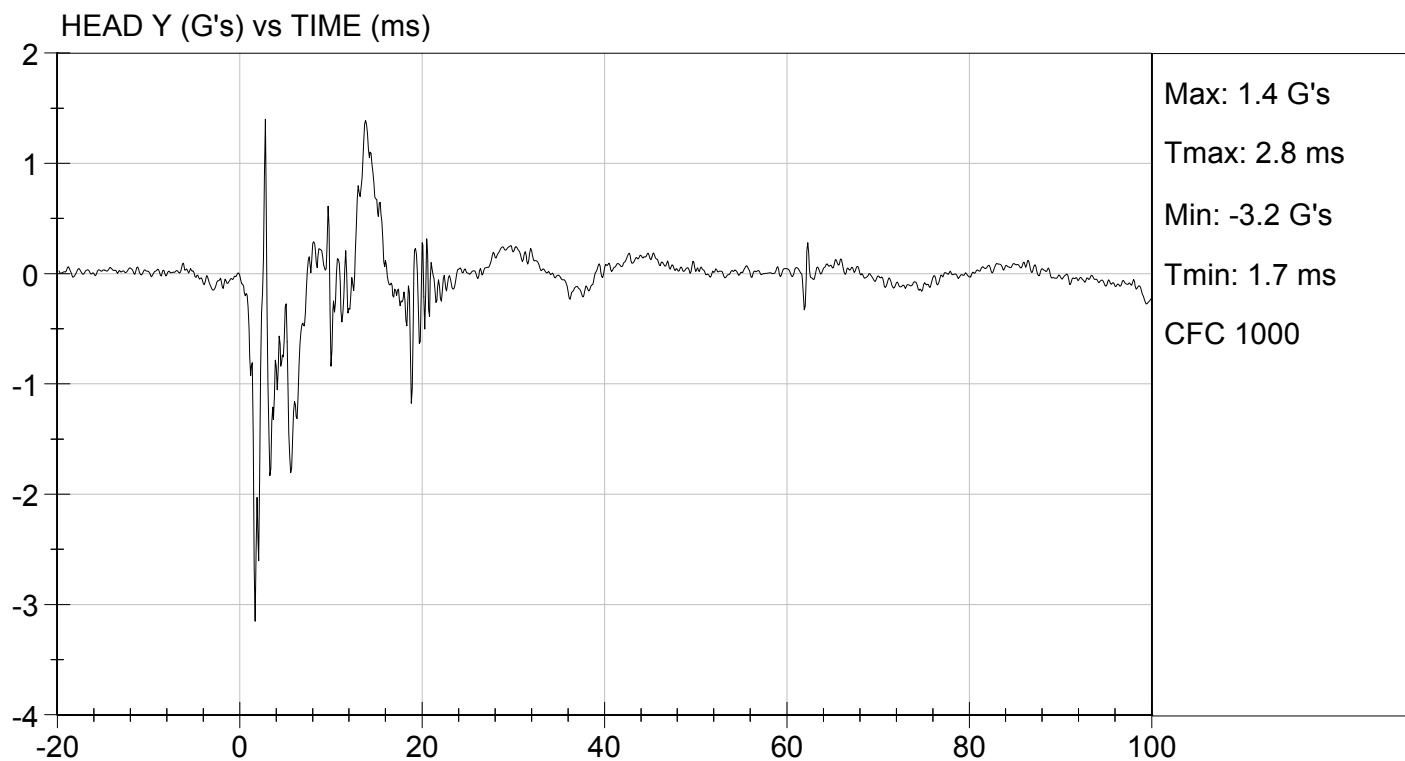

Laboratory Technician

10/10/2012

Test Date


Approved By





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

ATD Serial No: 036

Test I.D: D123862

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.80	Pass
	20 ms	G's	17.60 to 22.60	18.46	Pass
	30 ms	G's	12.50 to 18.50	16.50	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.8	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.5	Pass
	Time	ms	57.0 to 64.0	59.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.3	Pass
	Time	ms	47.0 to 58.0	48.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.9	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

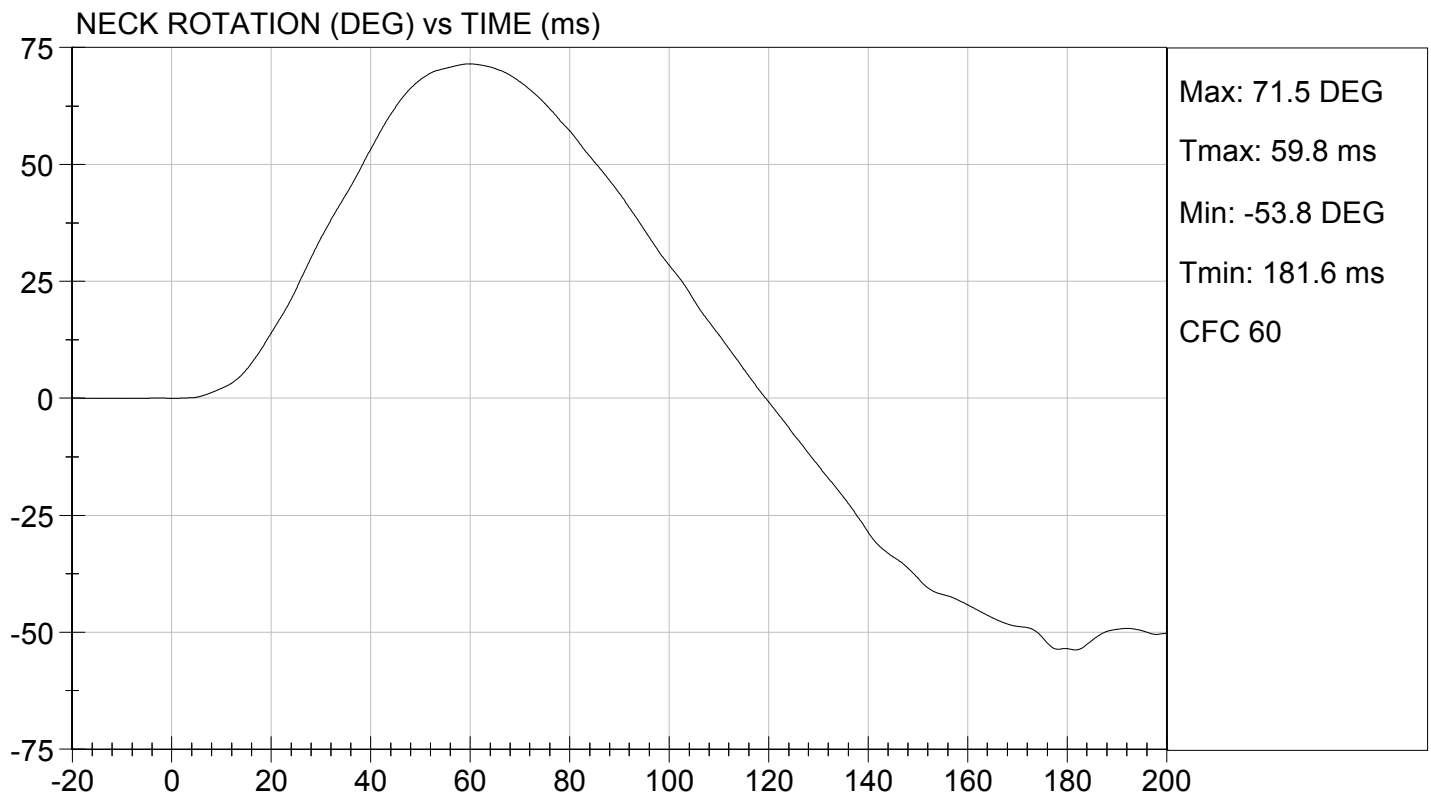
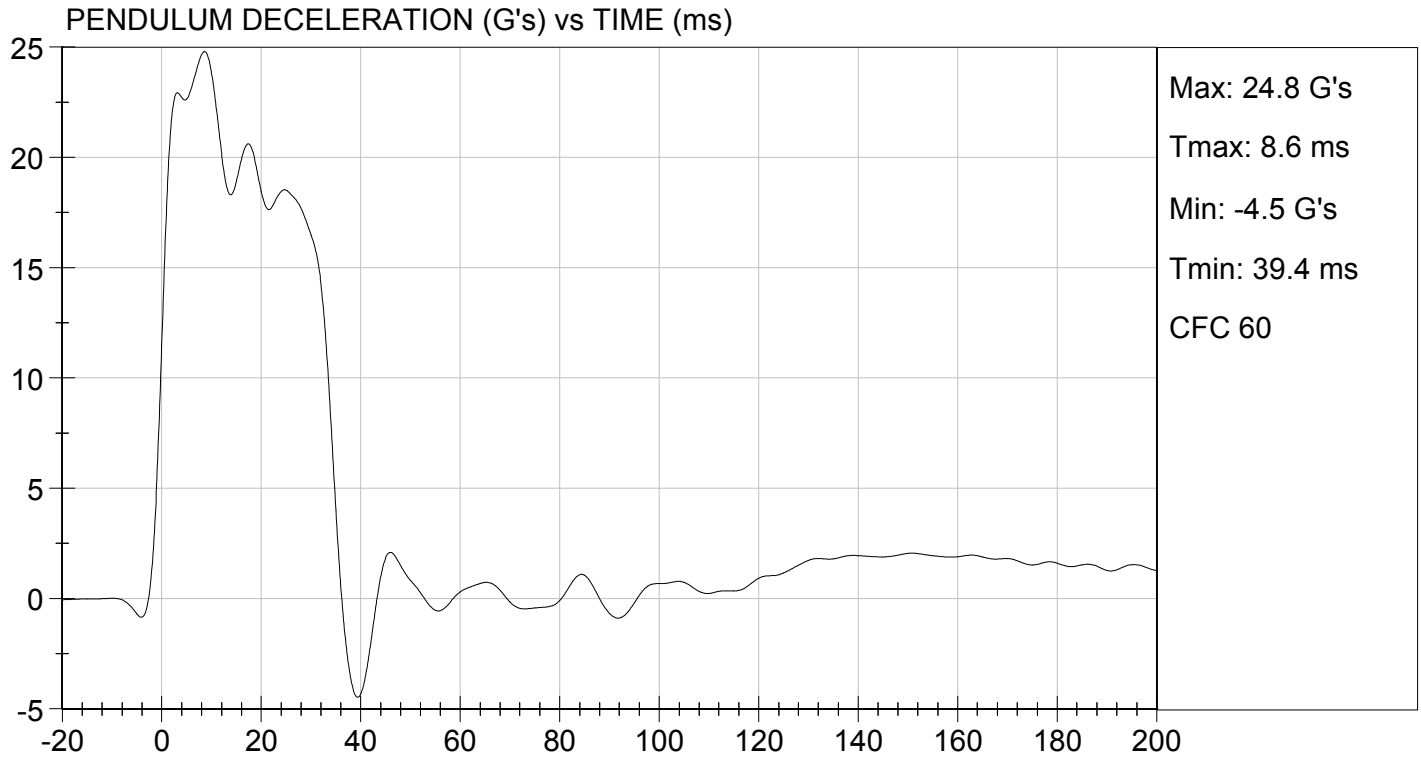
10/11/2012
Test Date

David Winkelbauer
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

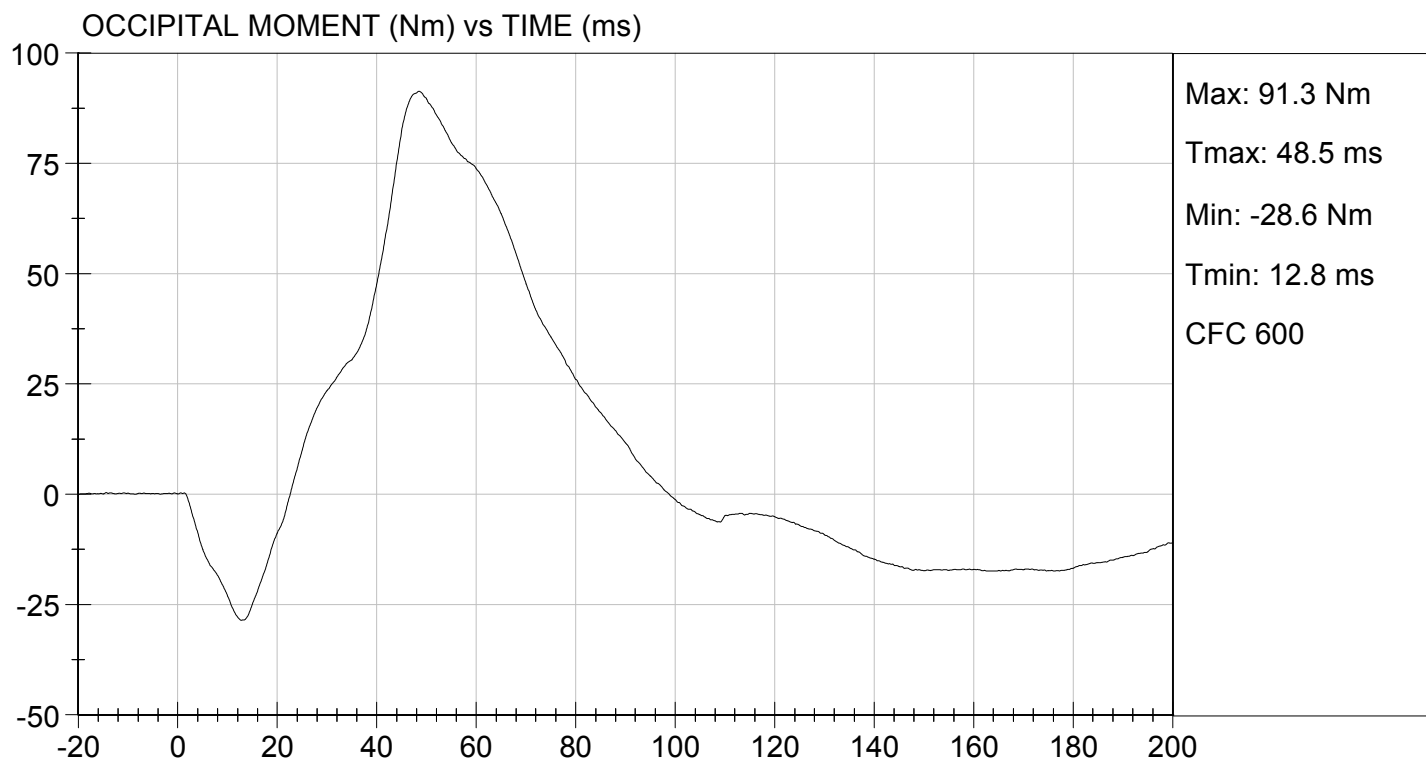
TEST DATE: 10/11/2012
TEST #: D123862





TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 10/11/2012
TEST #: D123862



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

ATD Serial No: 036

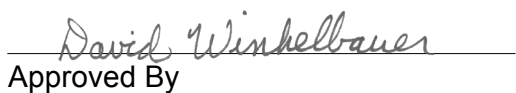
Test I.D: D123863

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.72	Pass
	20 ms	G's	14.00 to 19.00	17.97	Pass
	30 ms	G's	11.00 to 16.00	14.49	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.1	Pass
	Time	ms	72.0 to 82.0	76.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	162.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-68.6	Pass
	Time	ms	65.0 to 79.0	69.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	145.2	Pass
Overall Test Results					Pass


Laboratory Technician

10/11/2012

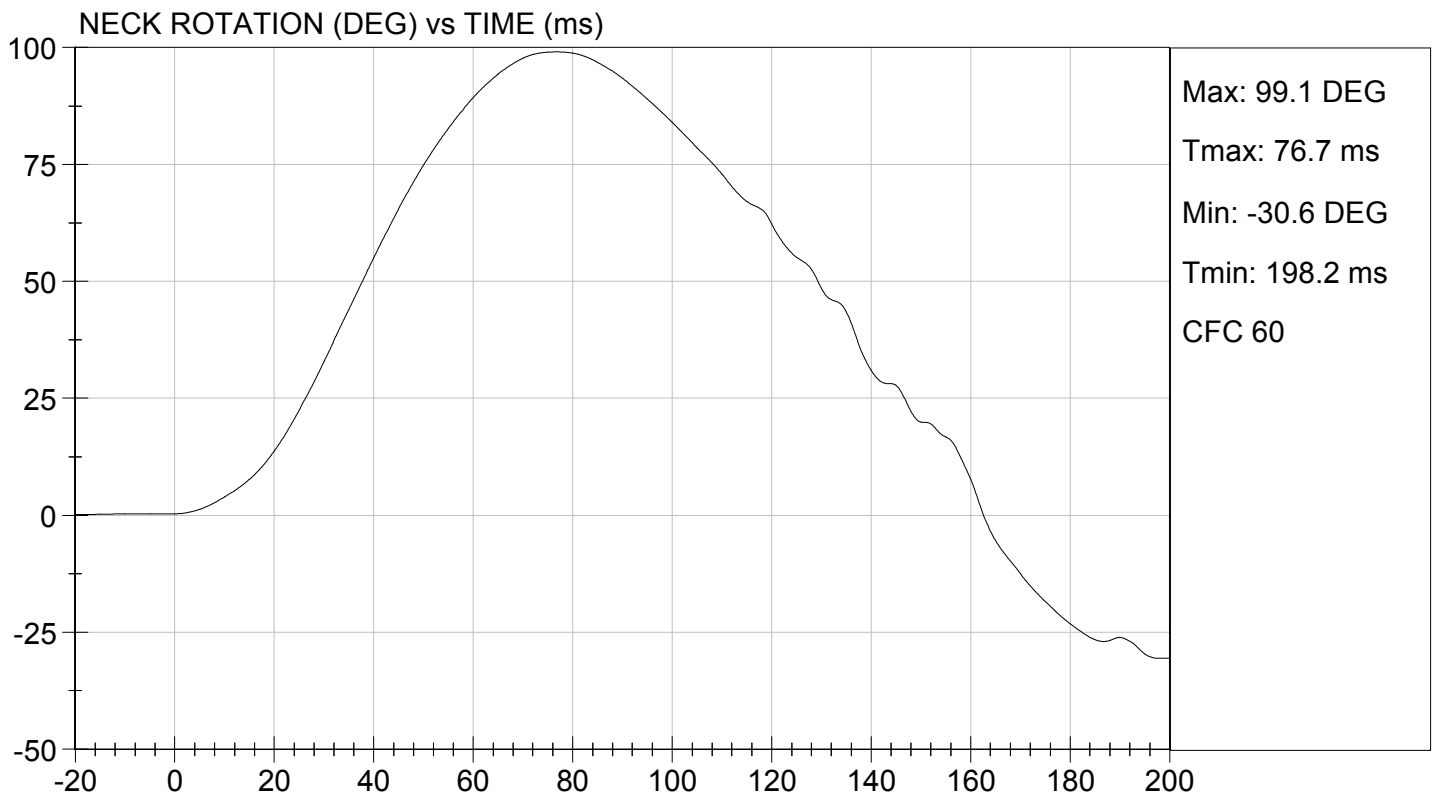
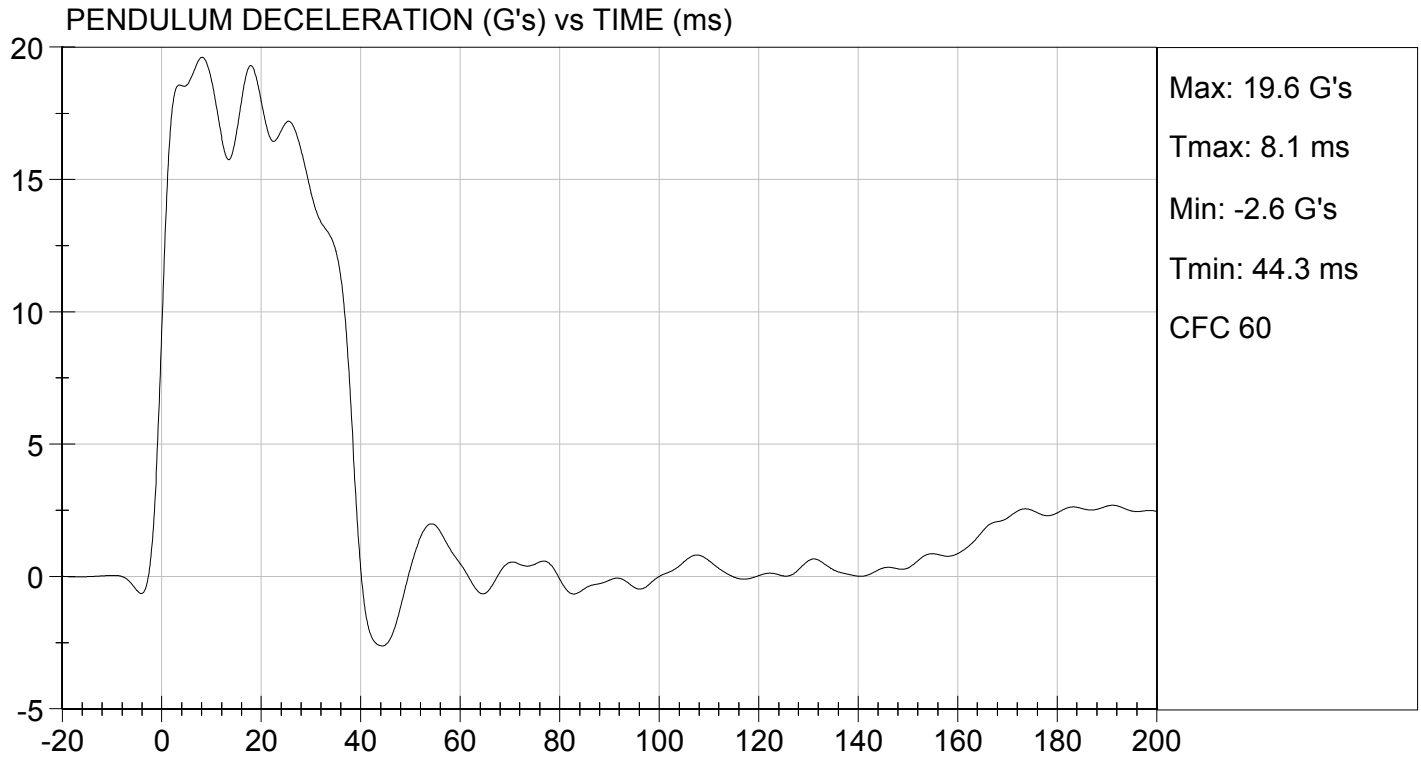
Test Date


Approved By



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

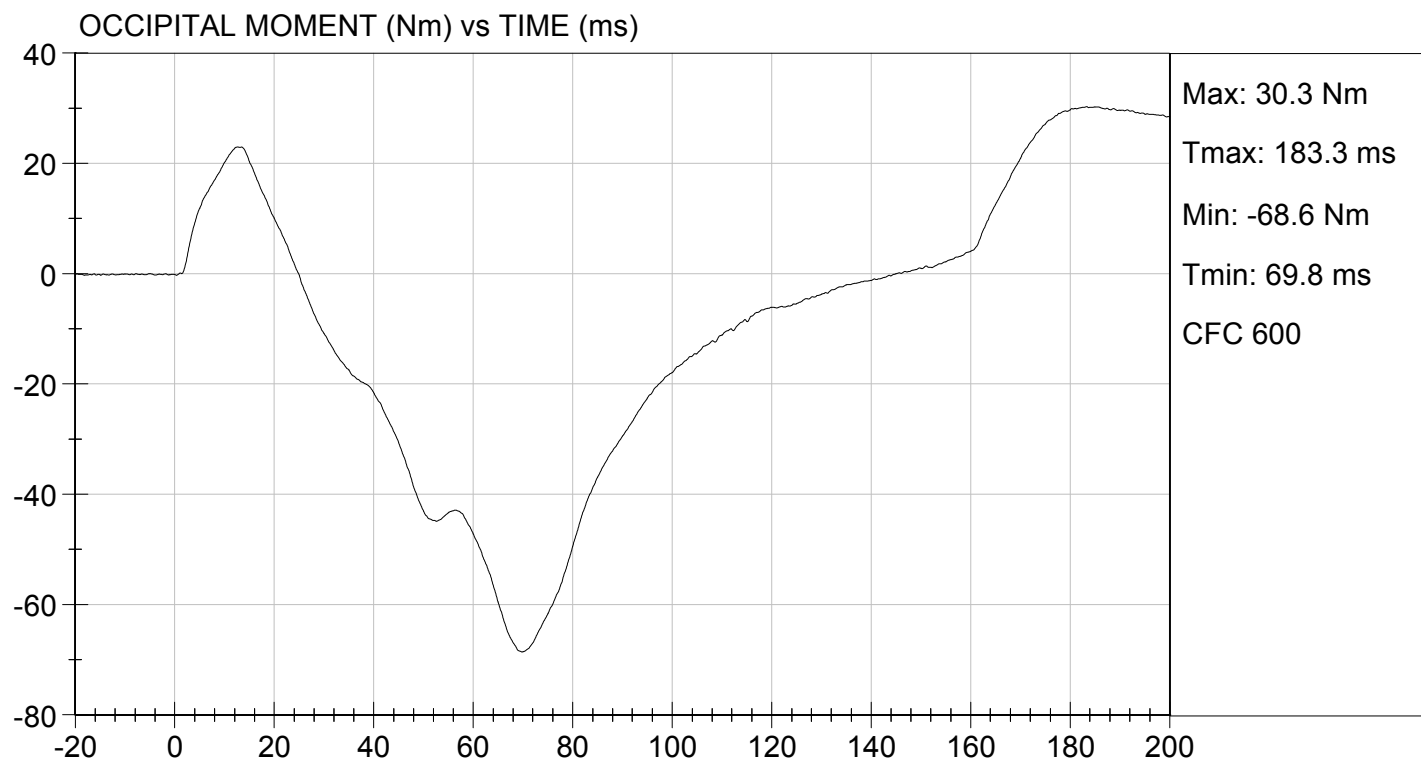
TEST DATE: 10/11/2012
TEST #: D123863





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

TEST DATE: 10/11/2012
TEST #: D123863



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

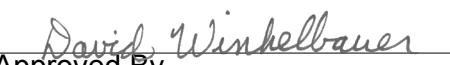
ATD Serial No: 036

Test I.D: D123864

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,348	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.93	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

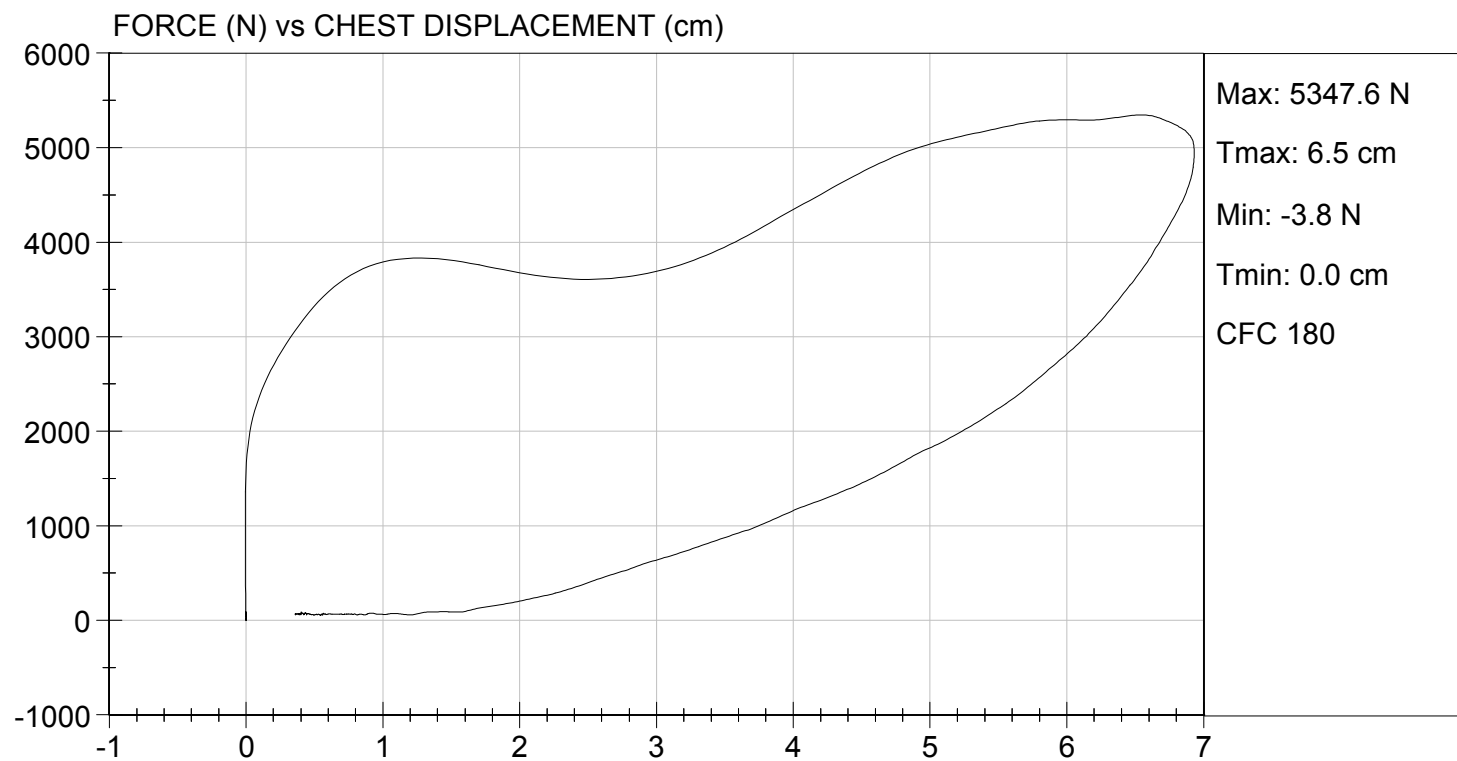
10/11/2012
Test Date


Approved By



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

TEST DATE: 10/11/2012
TEST #: D123864



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

ATD Serial No: 036

Test I.D: D123865

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	4,896	Pass
Overall Test Results				Pass


Laboratory Technician

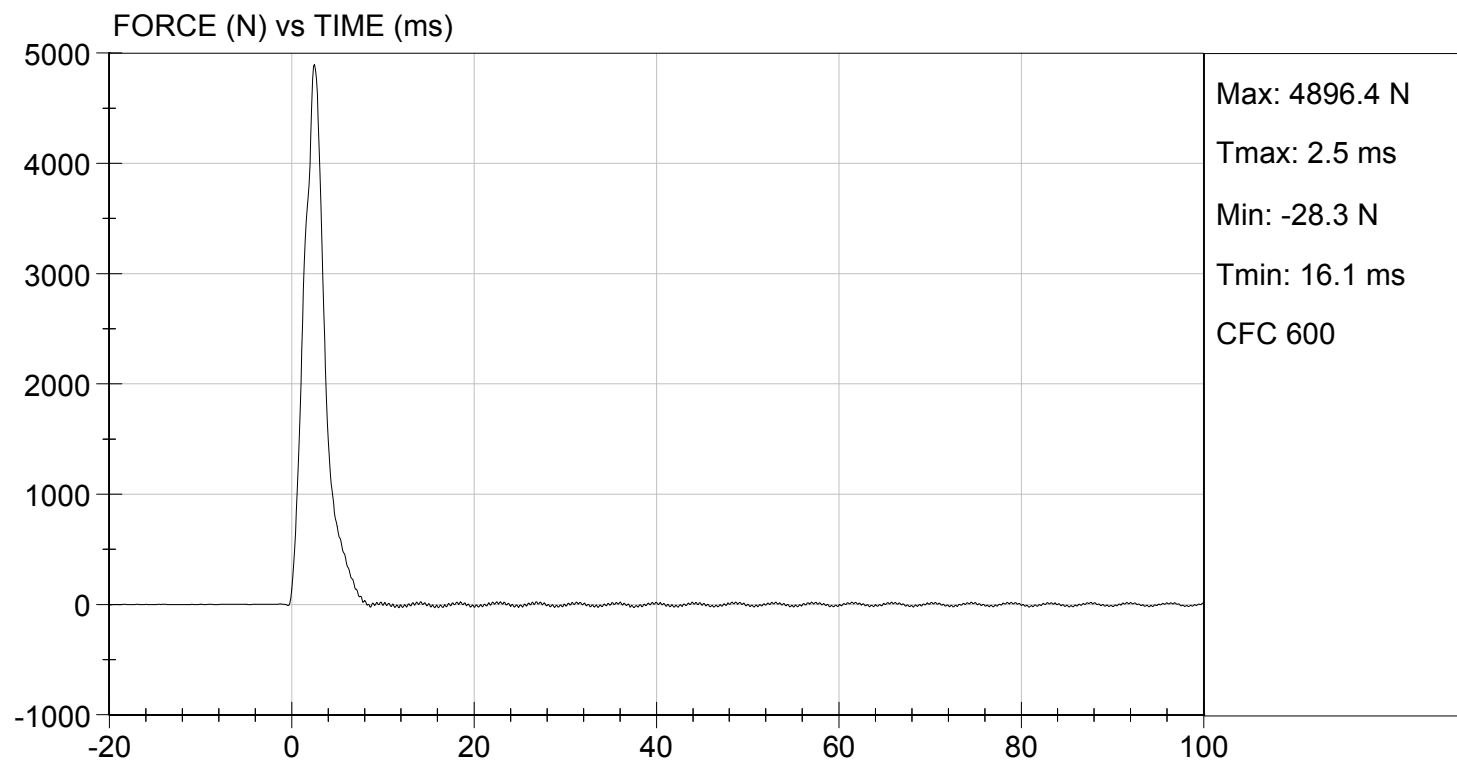
10/11/2012
Test Date


Approved By



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

TEST DATE: 10/11/2012
TEST #: D123865



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

ATD Serial No: 036

Test I.D: D123866

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,661	Pass
Overall Test Results				Pass


Laboratory Technician

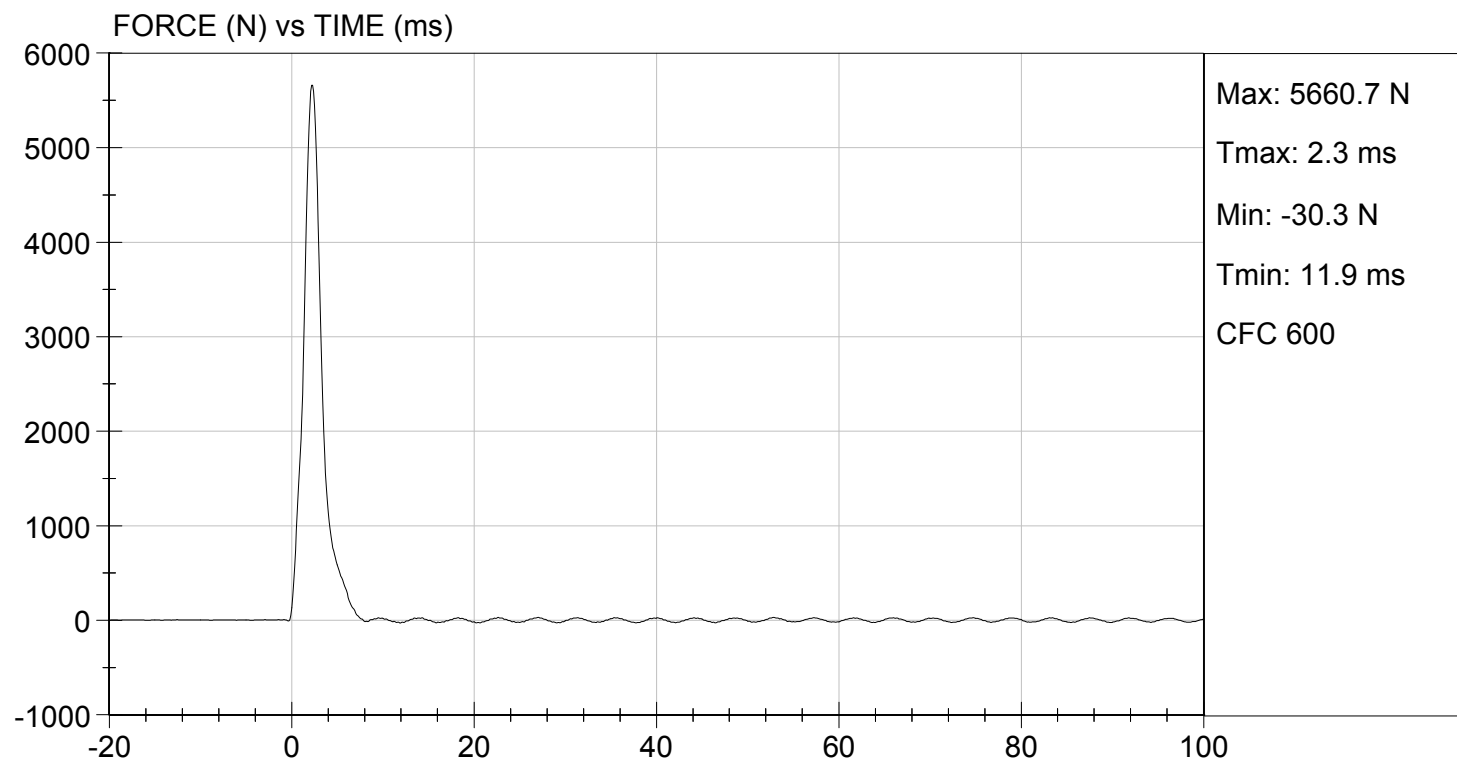
10/11/2012
Test Date


Approved By



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

TEST DATE: 10/11/2012
TEST #: D123866



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

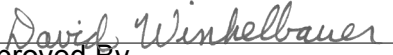
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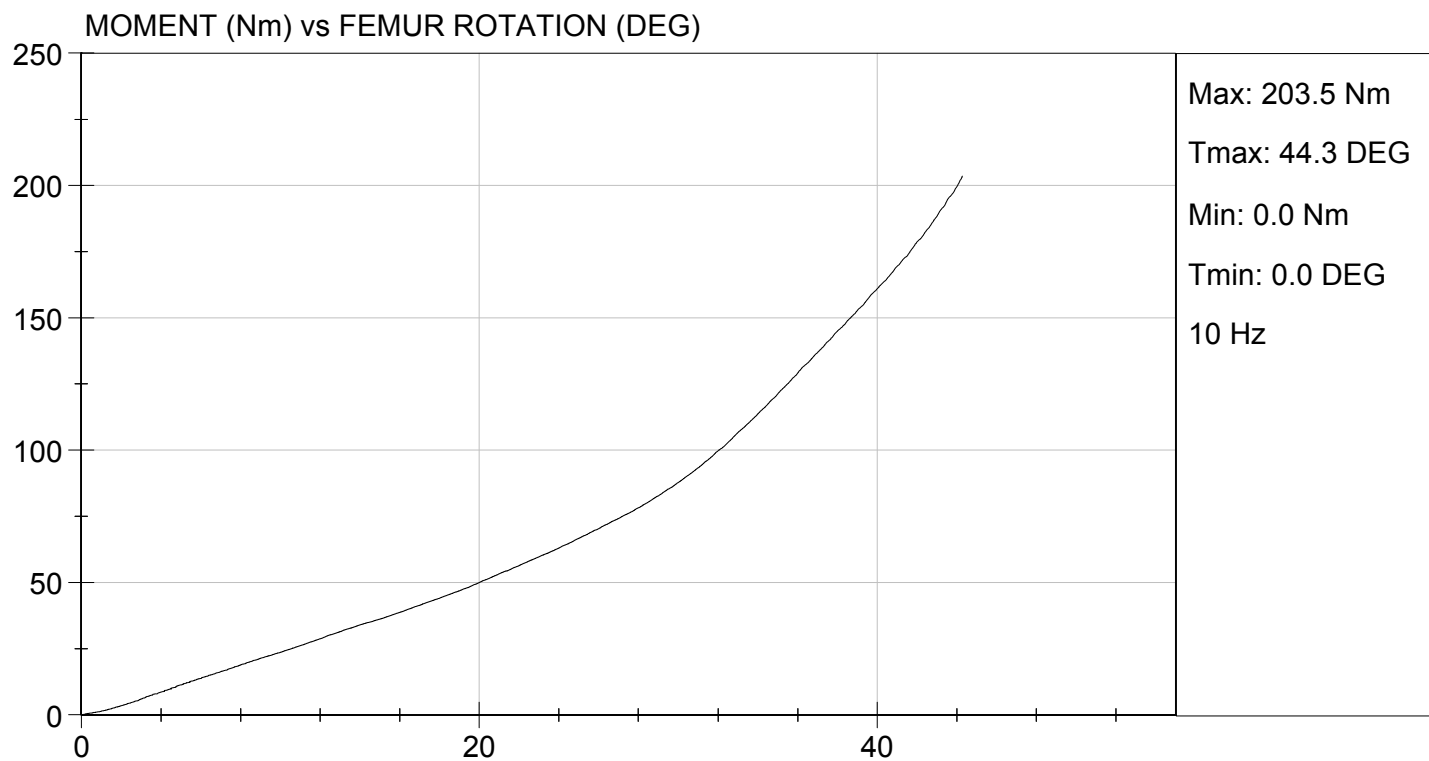
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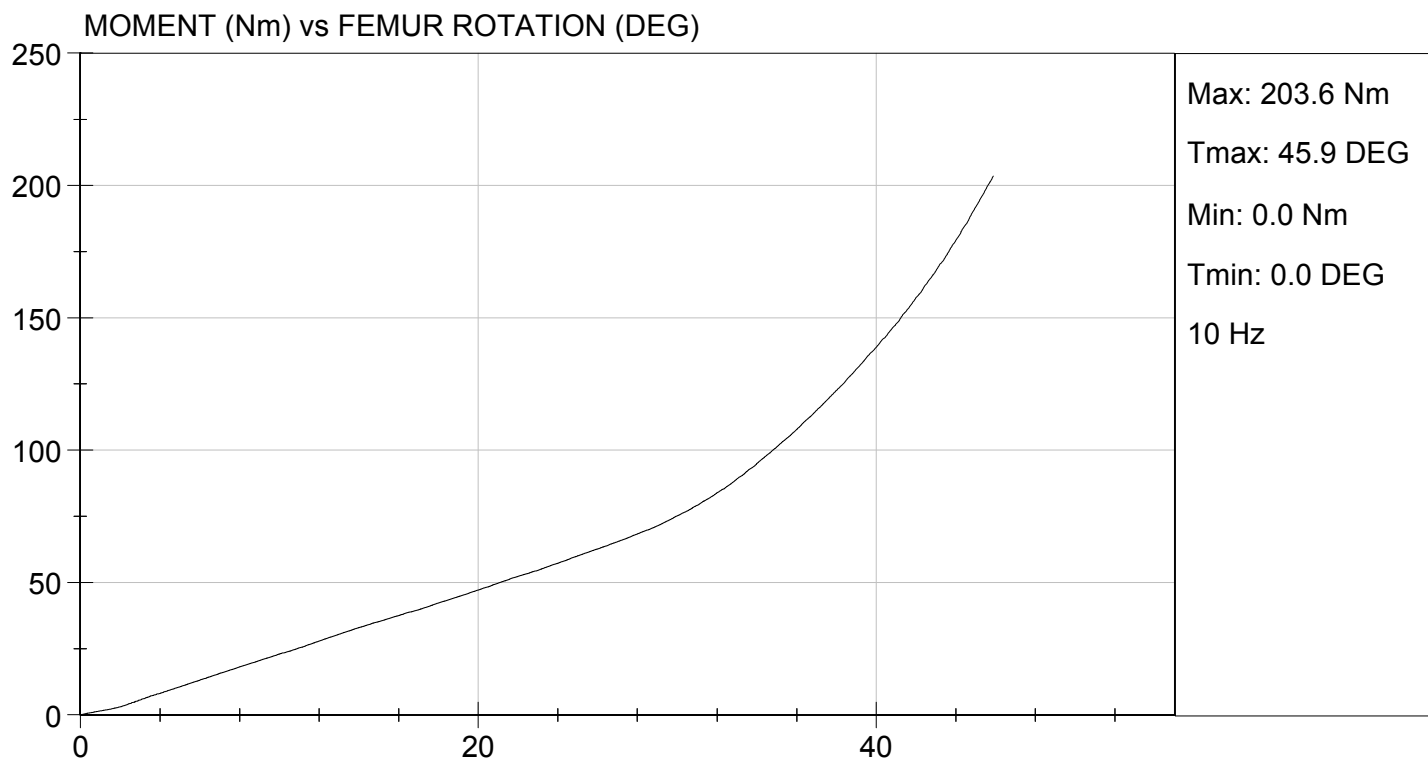
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	22	22	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	87.8	75.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.3	45.9	Pass
Overall Test Results					Pass


Laboratory Technician

10/10/2012
Test Date


Approved By





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

ATD Serial No: 036

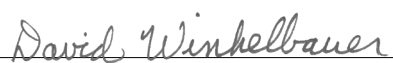
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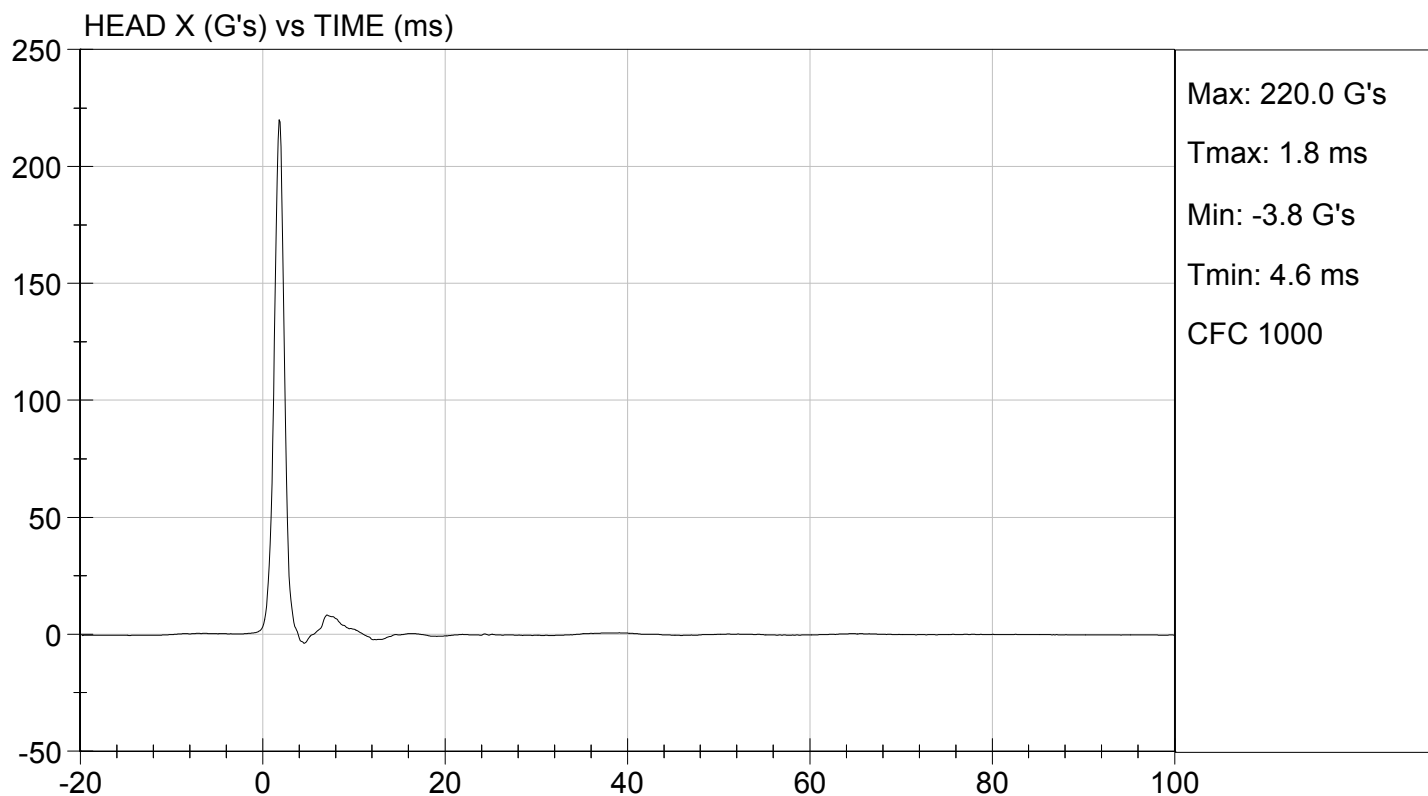
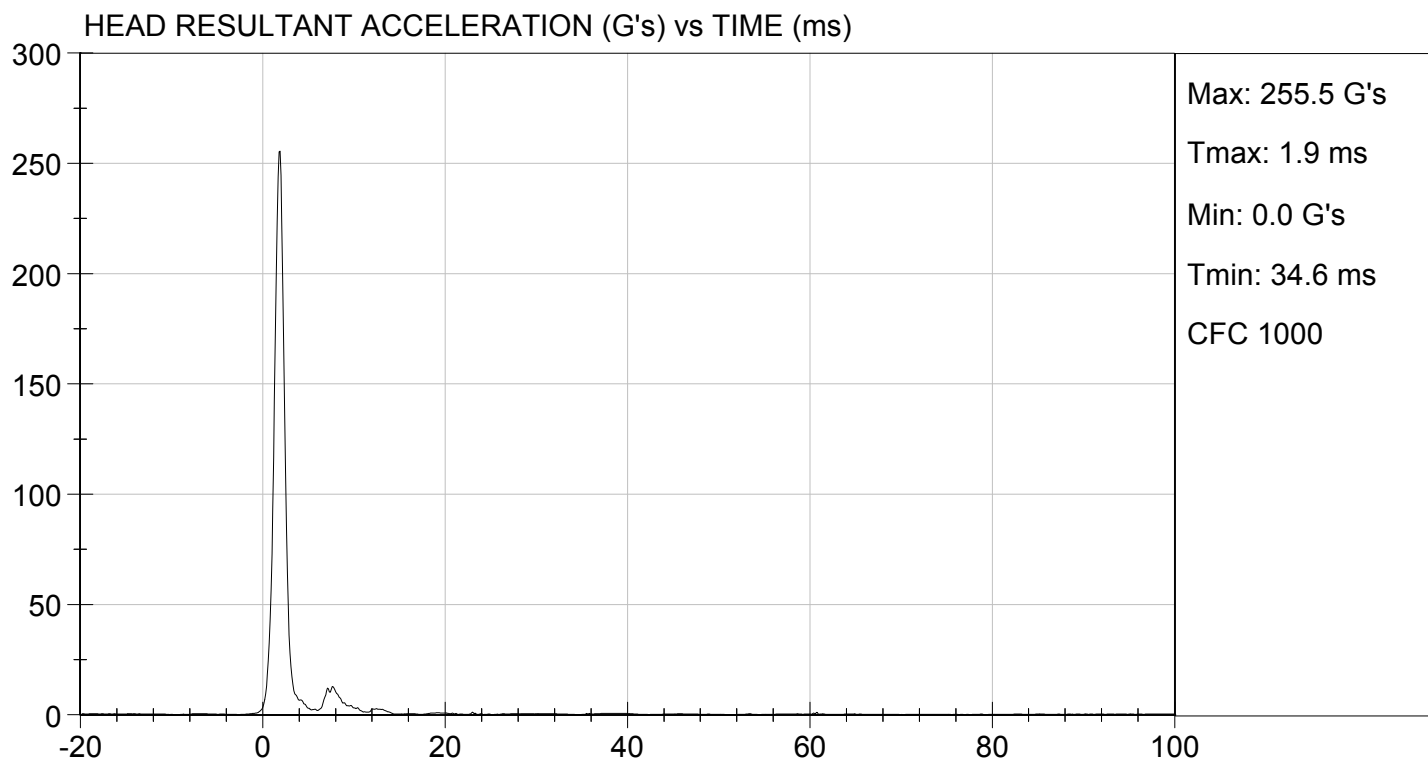
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Peak Resultant Acceleration	G's	225 to 275	256	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

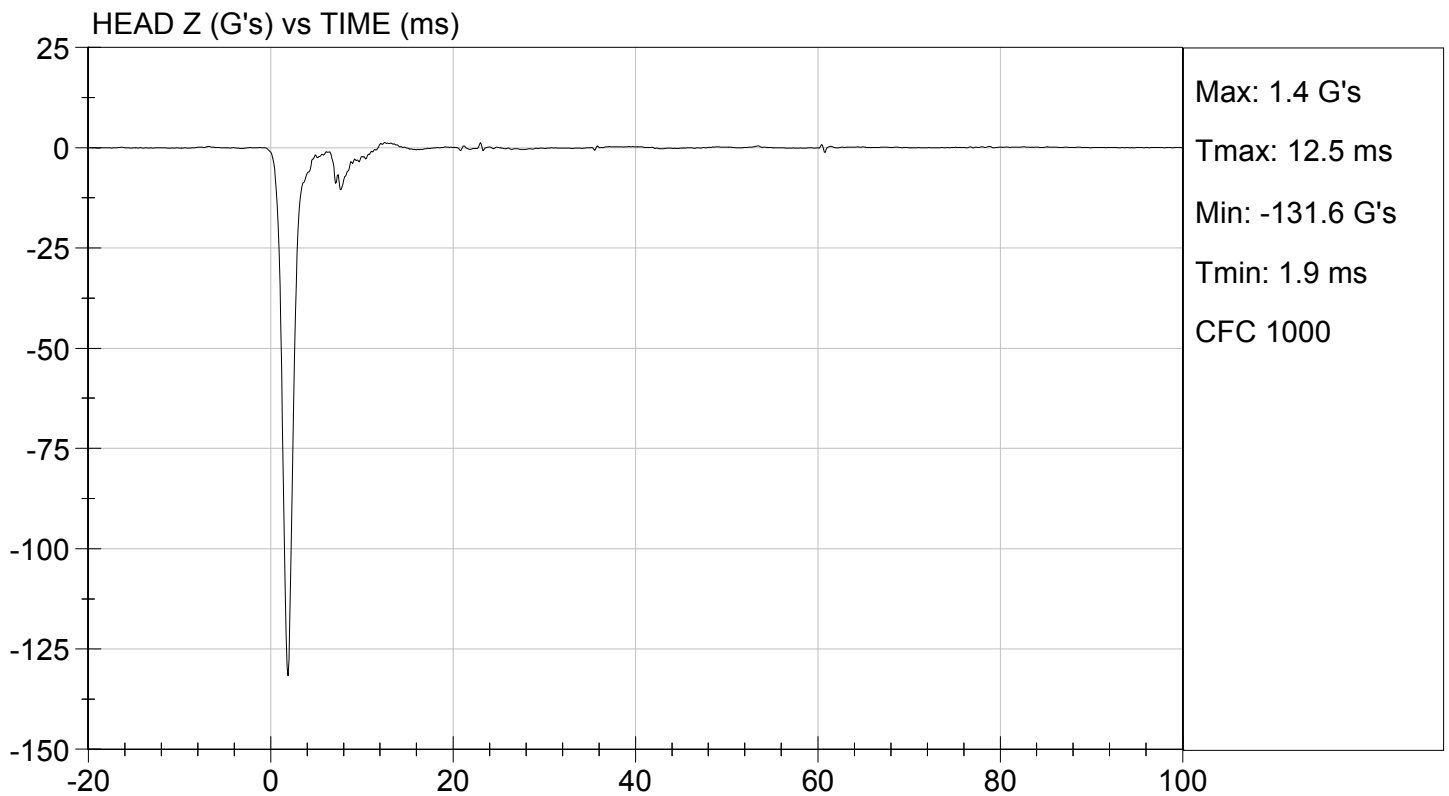
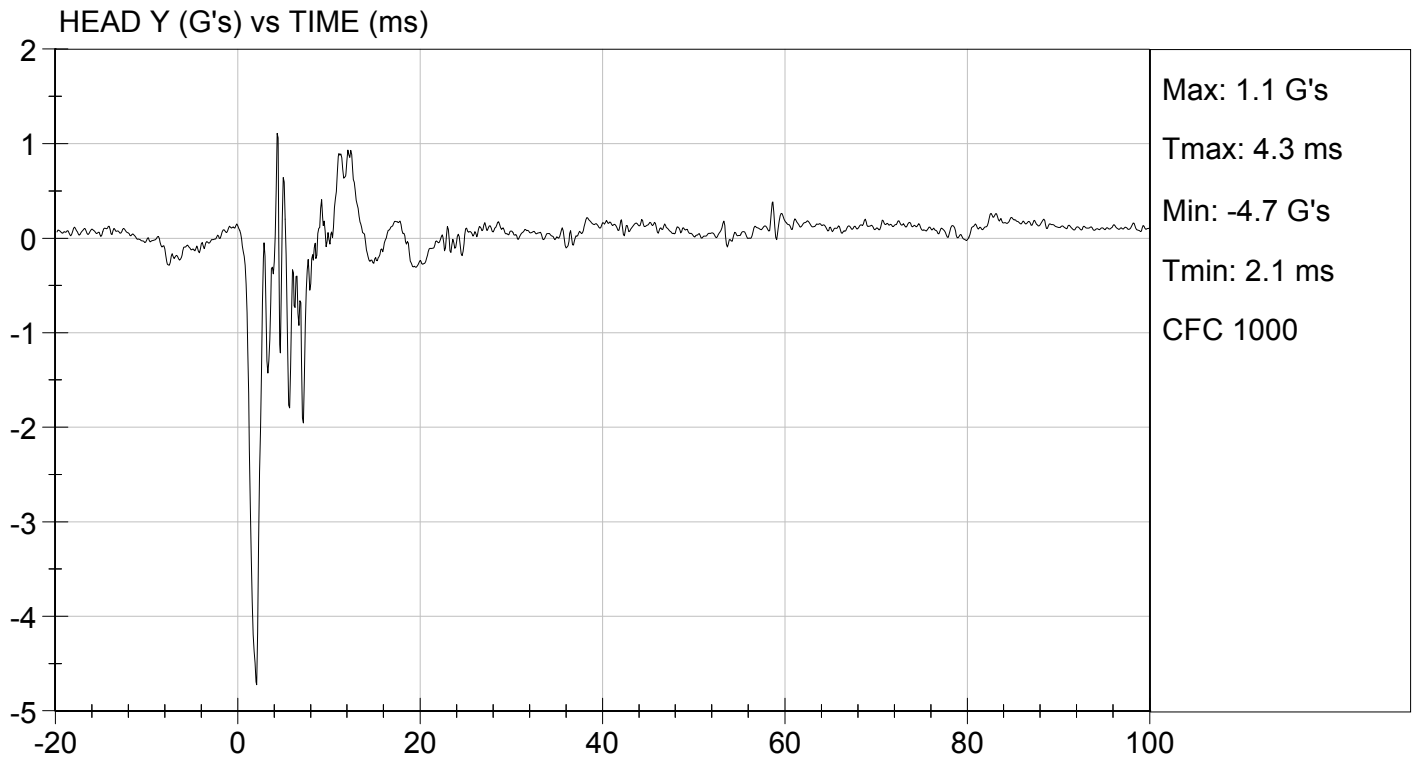

Laboratory Technician

10/15/2012

Test Date


Approved By





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

ATD Serial No: 036

Test I.D: D123922

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	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	27.49	Pass
	20 ms	G's	17.60 to 22.60	19.46	Pass
	30 ms	G's	12.50 to 18.50	18.20	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	18.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.9	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	64.3	Pass
	Time	ms	57.0 to 64.0	57.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	118.4	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.3	Pass
	Time	ms	47.0 to 58.0	47.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.1	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

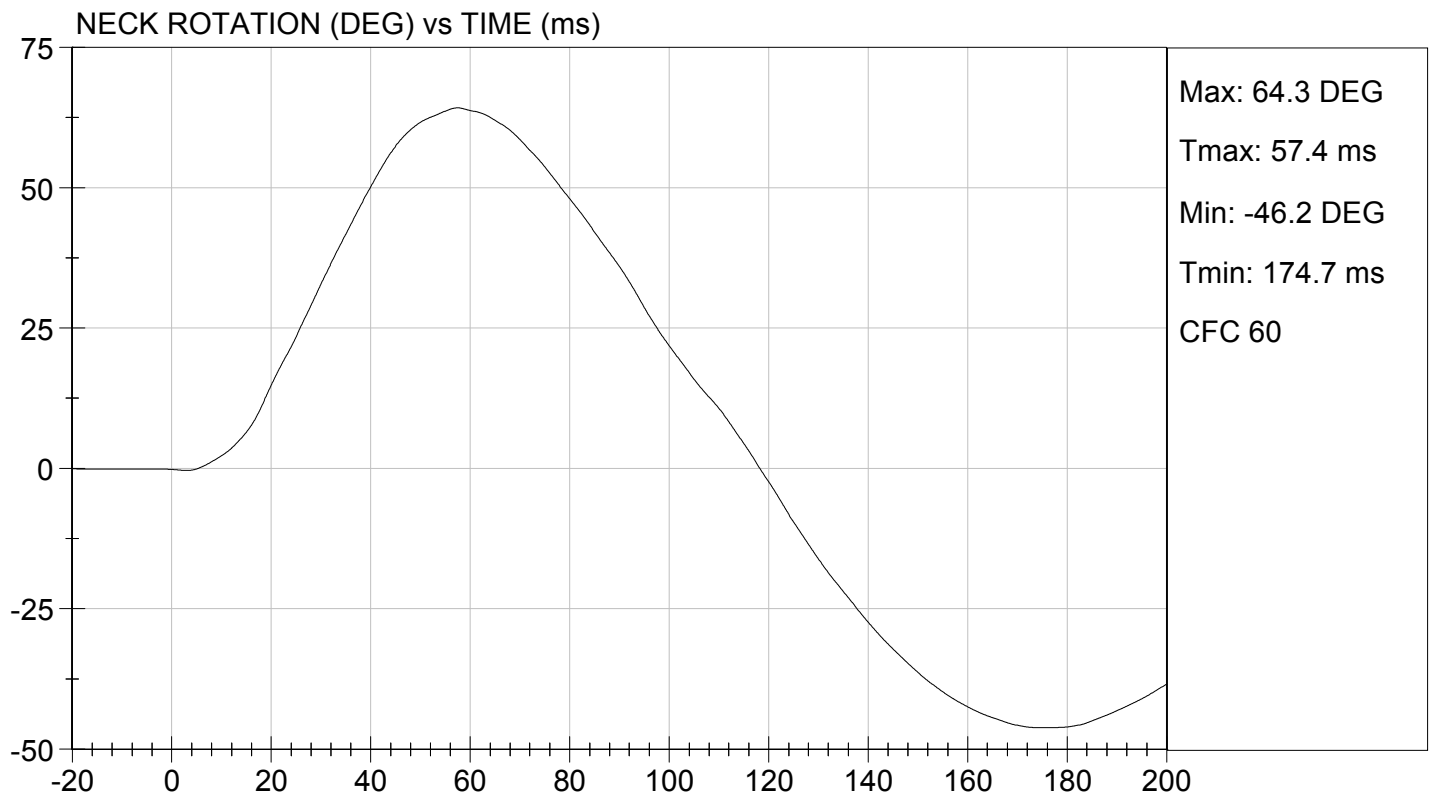
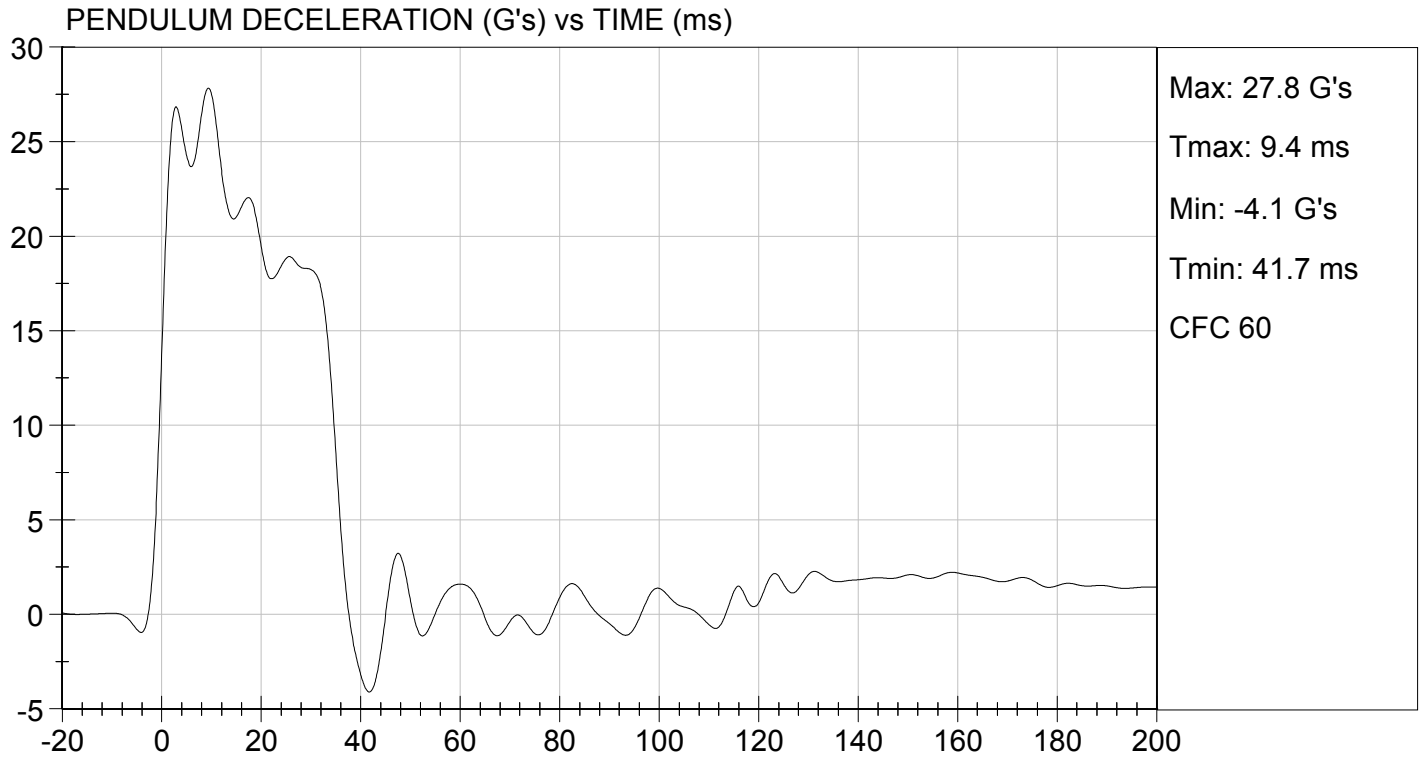
10/15/2012
Test Date

David Winkelbauer
Approved By



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

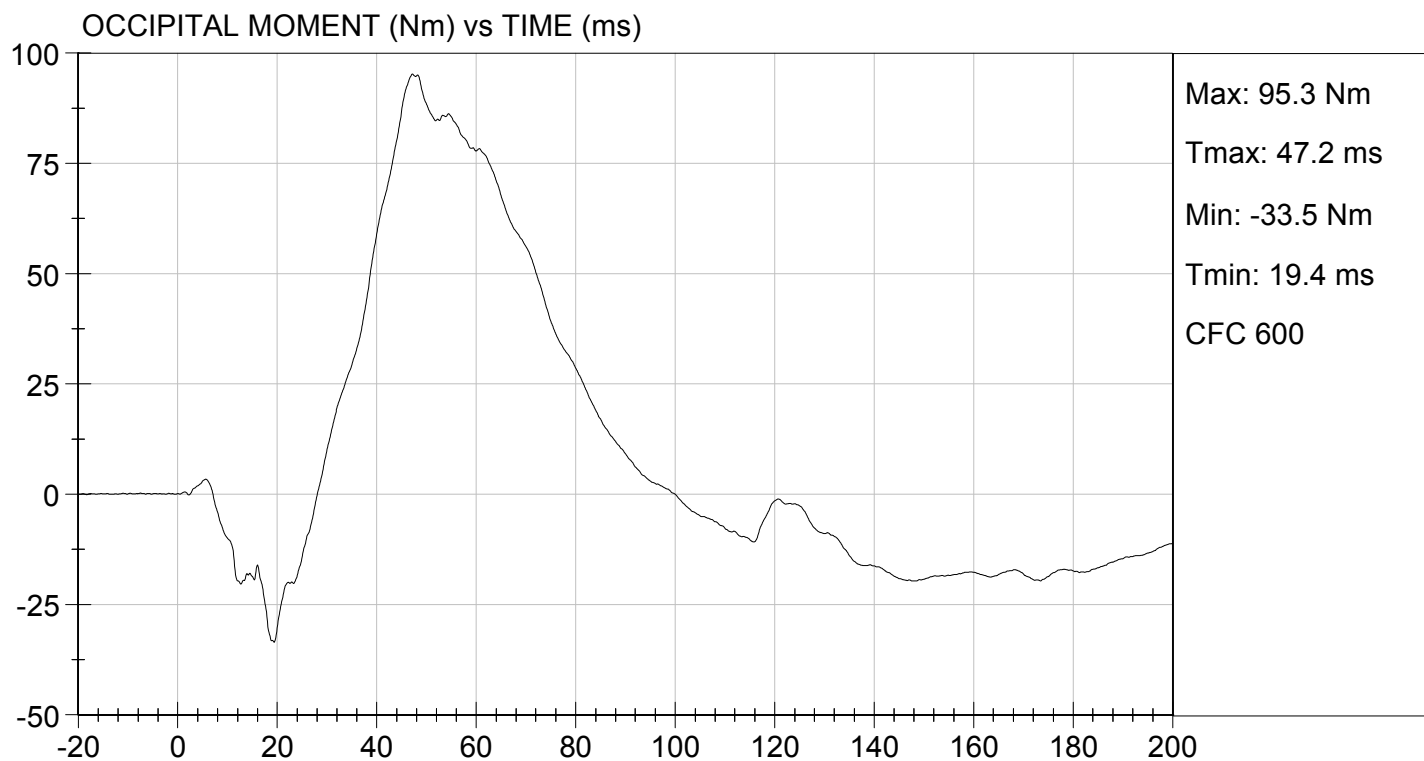
TEST DATE: 10/15/2012
TEST #: D123922





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

TEST DATE: 10/15/2012
TEST #: D123922



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

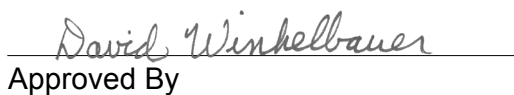
ATD Serial No: 036

Test I.D: D123923

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	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.42	Pass
	20 ms	G's	14.00 to 19.00	16.25	Pass
	30 ms	G's	11.00 to 16.00	13.47	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.6	Pass
	Time	ms	72.0 to 82.0	78.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	160.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-62.9	Pass
	Time	ms	65.0 to 79.0	71.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.0	Pass
Overall Test Results					Pass


Laboratory Technician

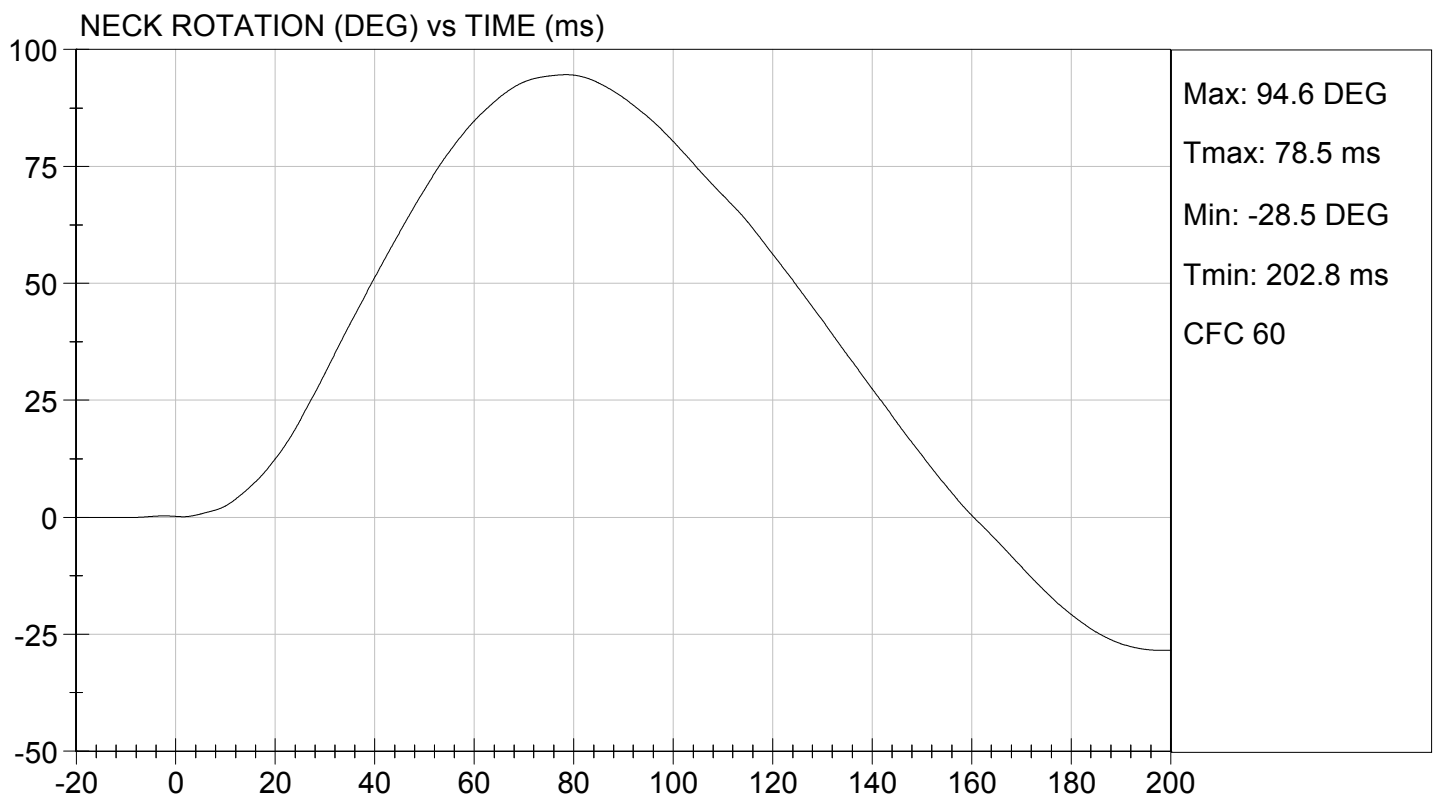
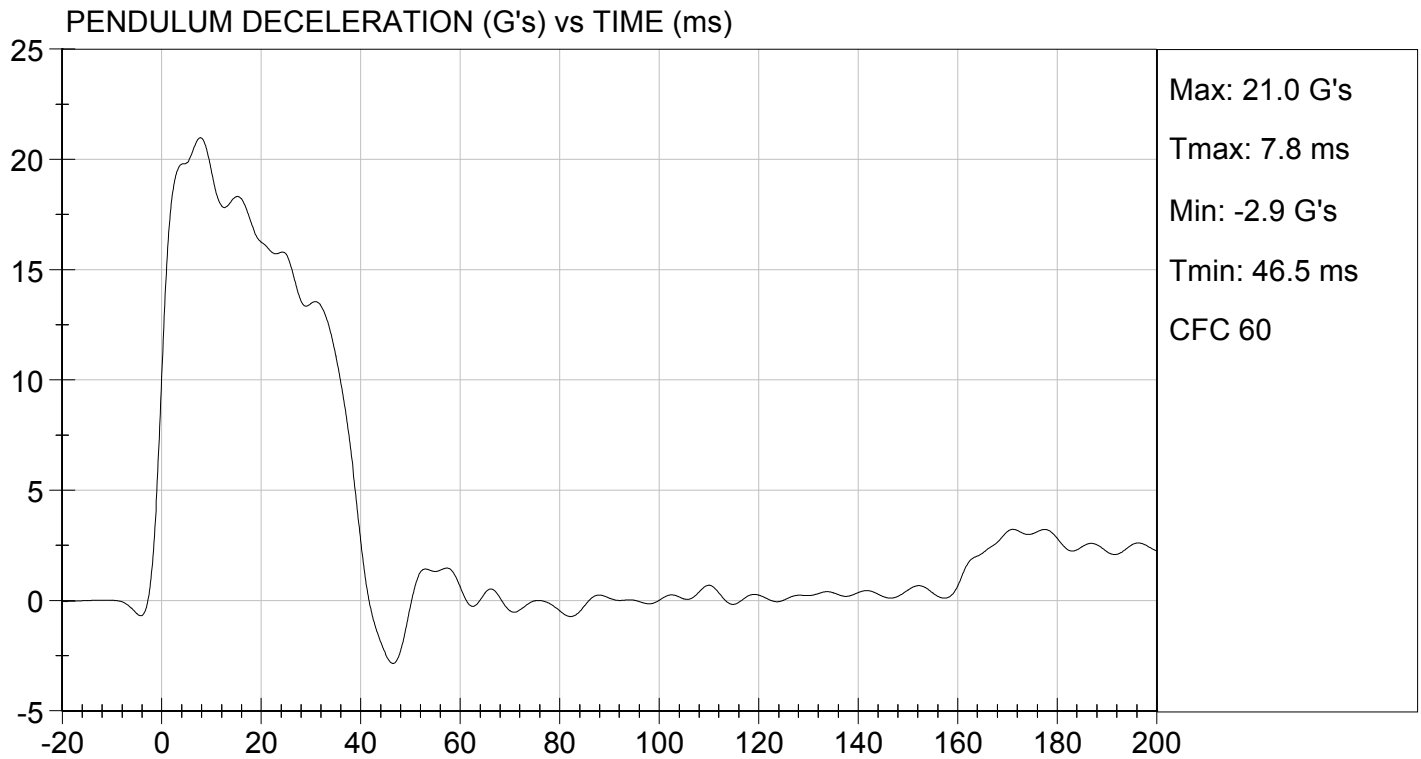
10/15/2012
Test Date


Approved By



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

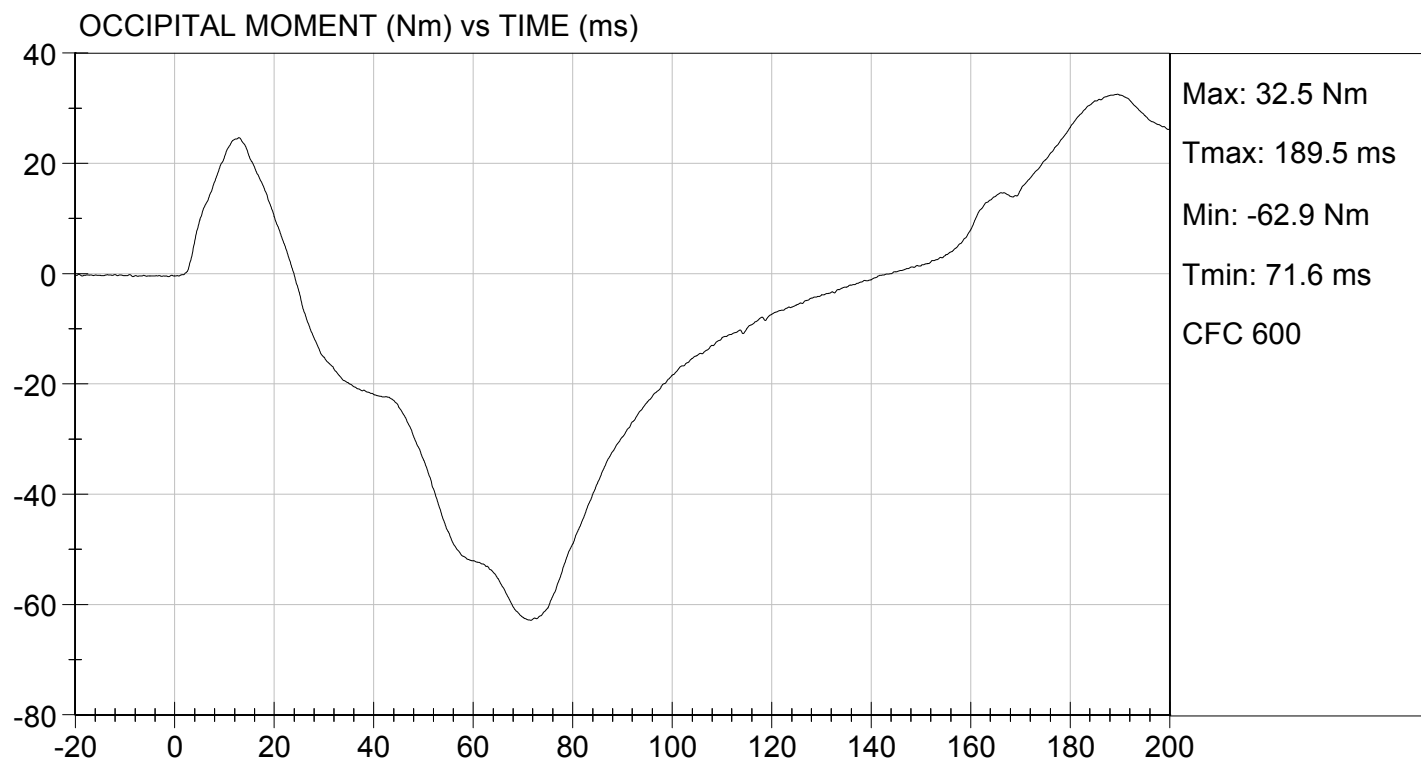
TEST DATE: 10/15/2012
TEST #: D123923





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

TEST DATE: 10/15/2012
TEST #: D123923

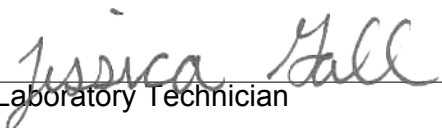


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

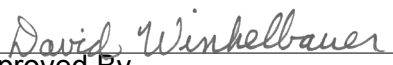
ATD Serial No: 036

Test I.D: D123924

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,824	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.89	Pass
Internal Hysteresis	%	69 to 85	70	Pass
			Overall Test Results	Pass


Laboratory Technician

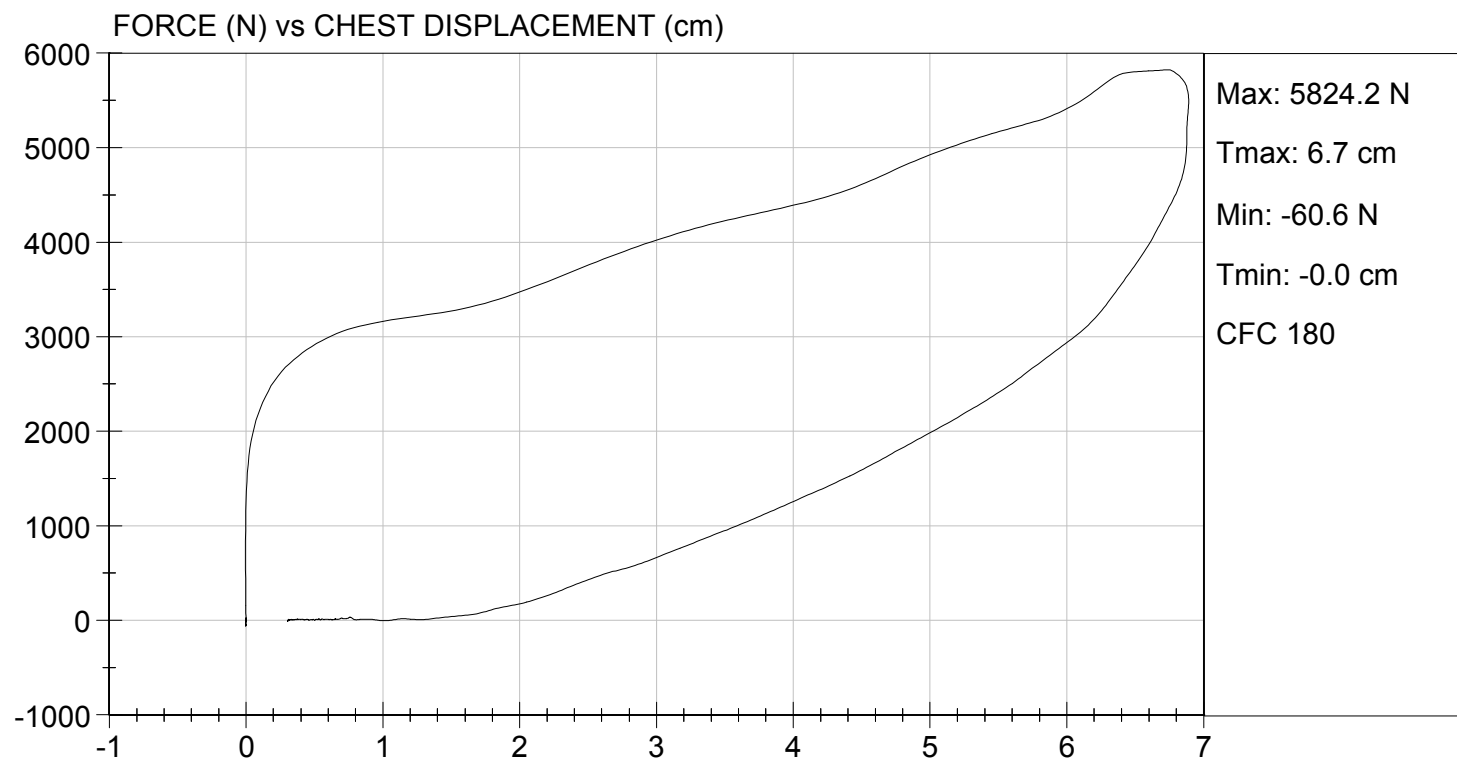
10/16/2012
Test Date


Approved By



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

TEST DATE: 10/16/2012
TEST #: D123924



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

ATD Serial No: 036

Test I.D: D123925

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,919	Pass
Overall Test Results				Pass


Laboratory Technician

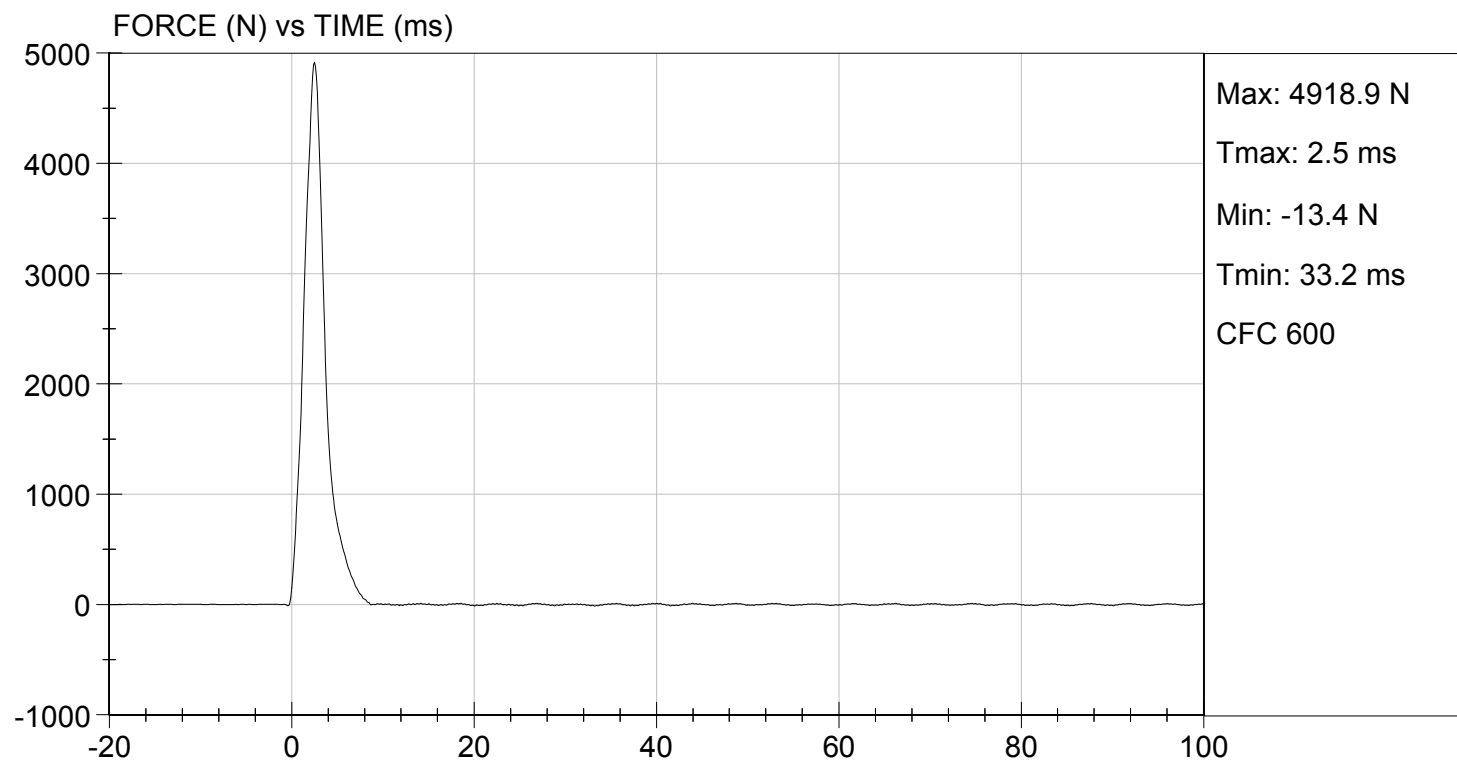
10/15/2012
Test Date


Approved By



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

TEST DATE: 10/15/2012
TEST #: D123925

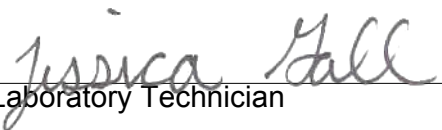


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D123926

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,025	Pass
Overall Test Results				Pass


Laboratory Technician

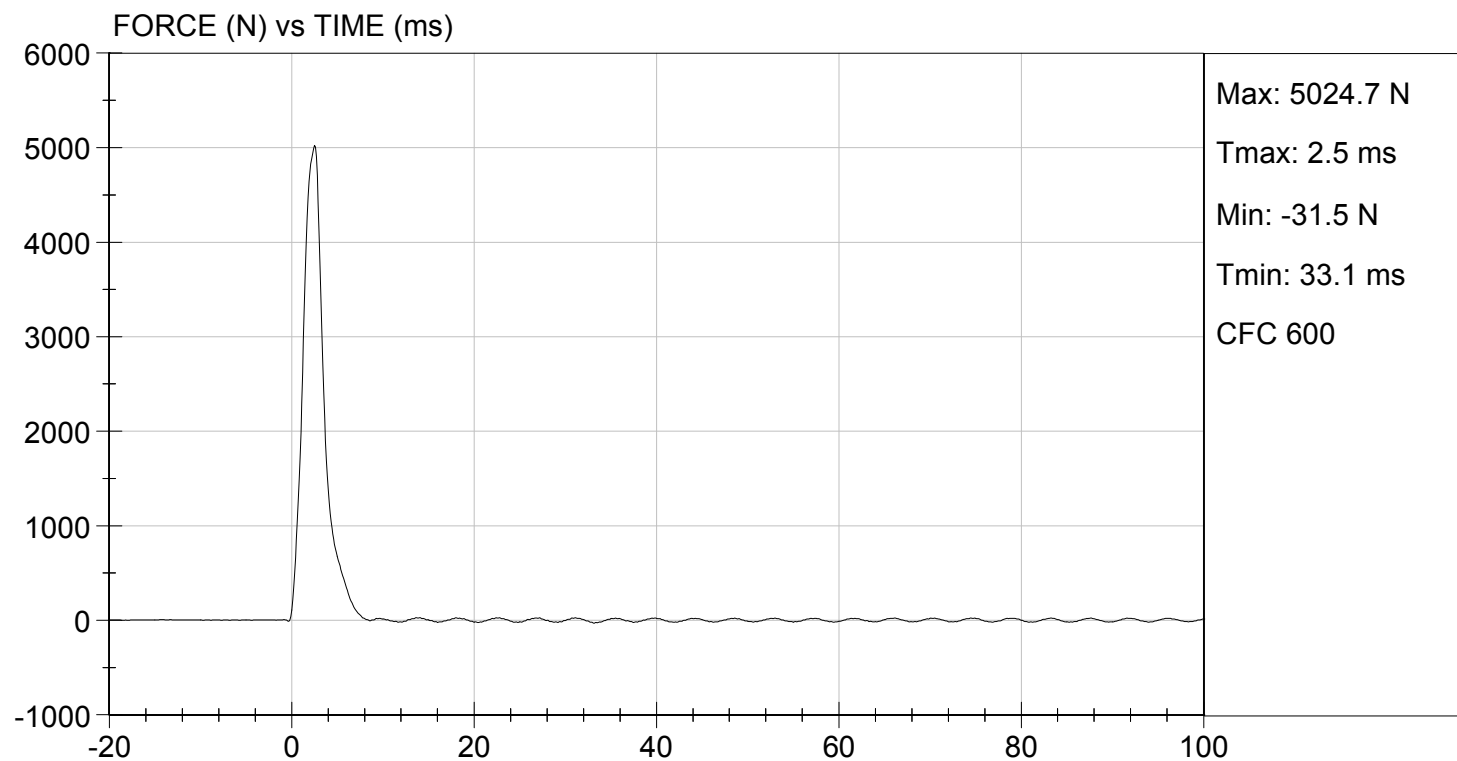
10/15/2012
Test Date


Approved By



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

TEST DATE: 10/15/2012
TEST #: D123926



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

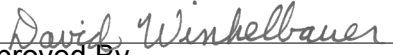
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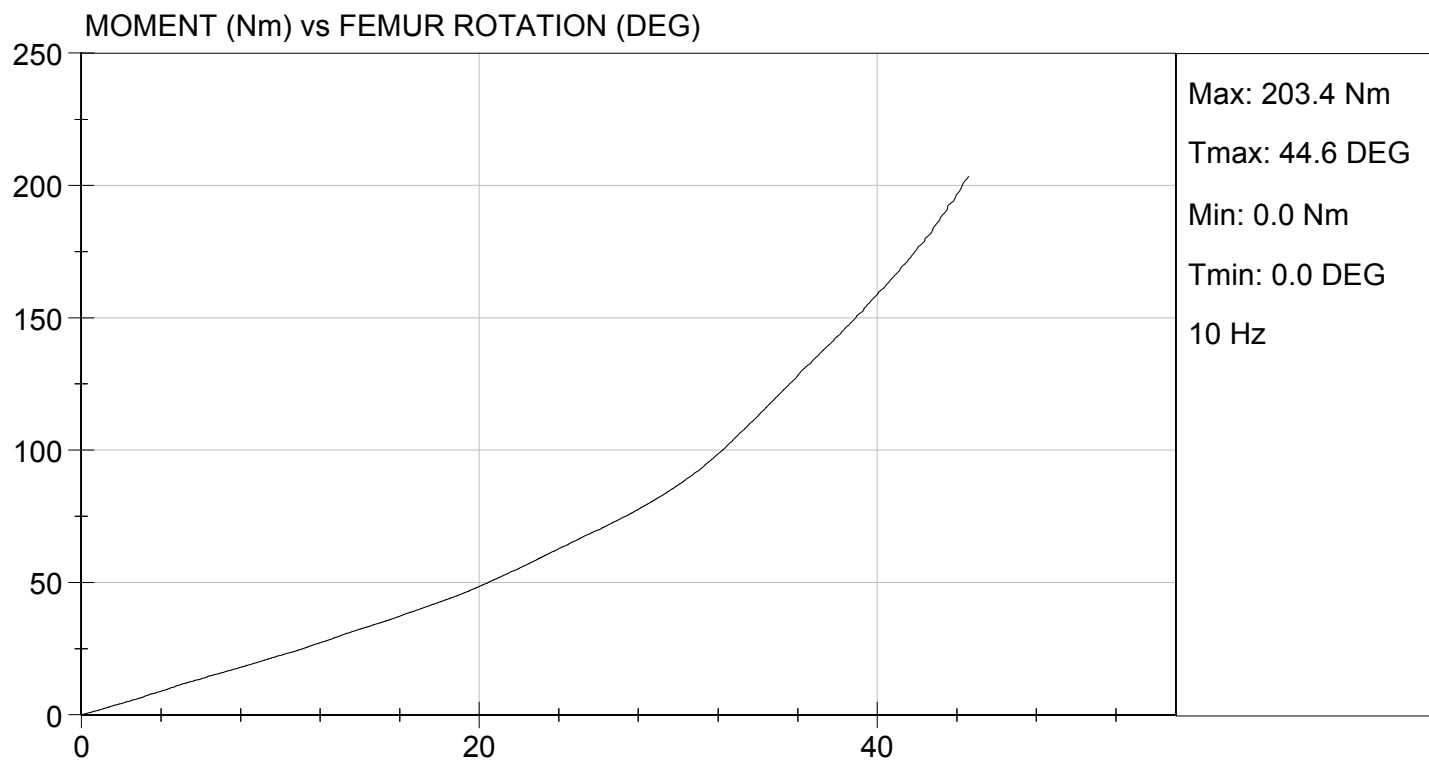
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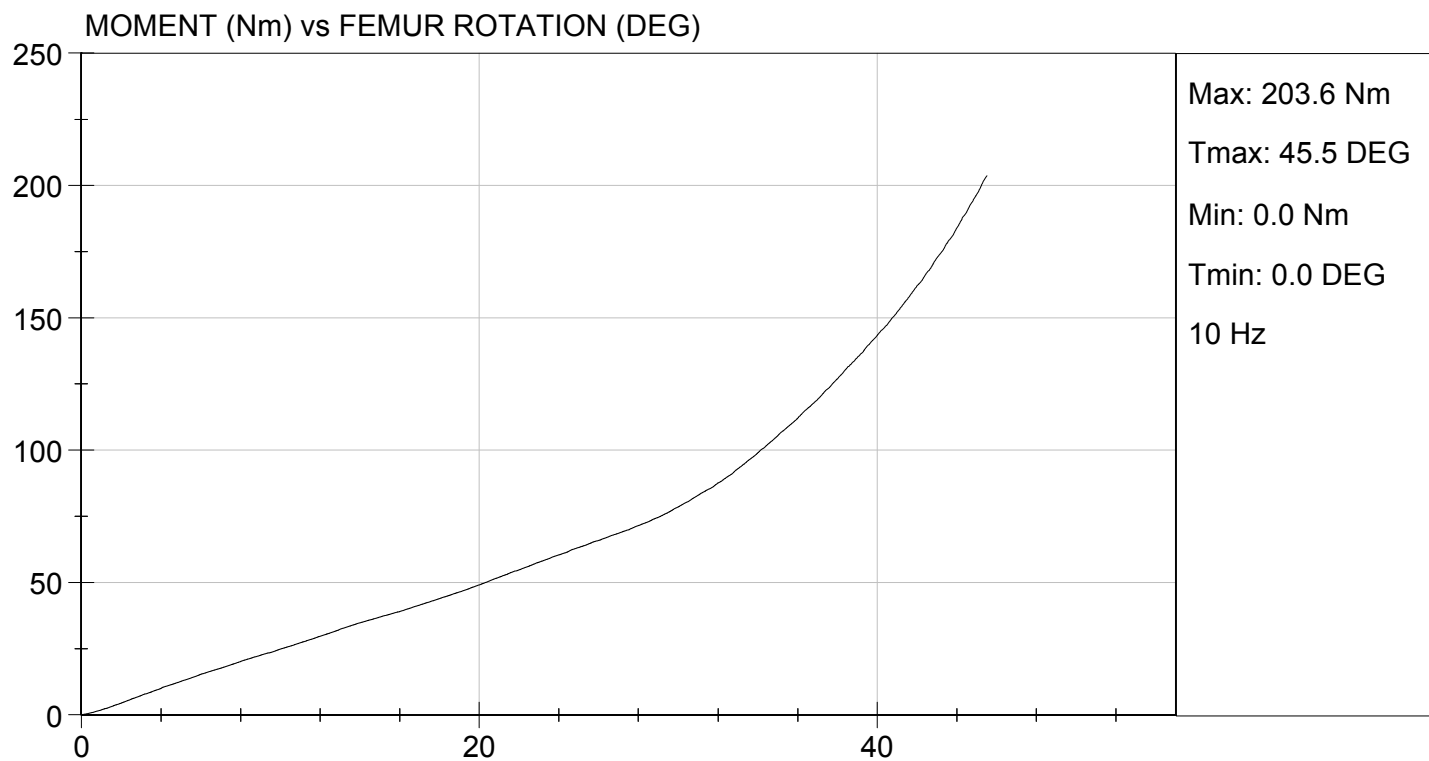
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	35	35	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.2	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	86.9	78.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.6	45.5	Pass
Overall Test Results					Pass


Laboratory Technician

10/15/2012
Test Date


Approved By





Hybrid III, 5th External Measurements
SN: 634

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	784.6
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	79.2
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	253.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	277.8
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	541.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.4
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	428.6

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	139.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	355.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	90.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	540.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	868.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.8
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D123731

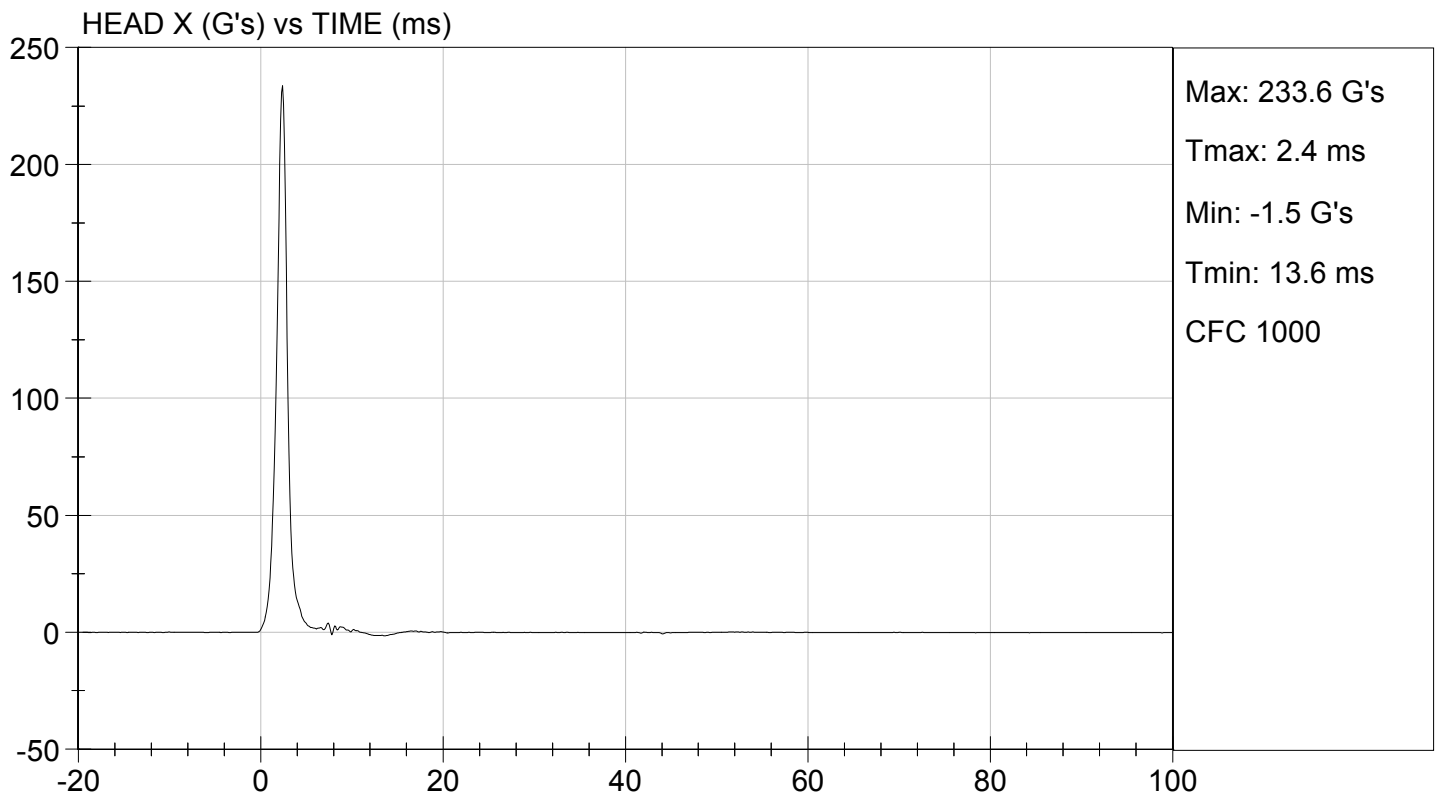
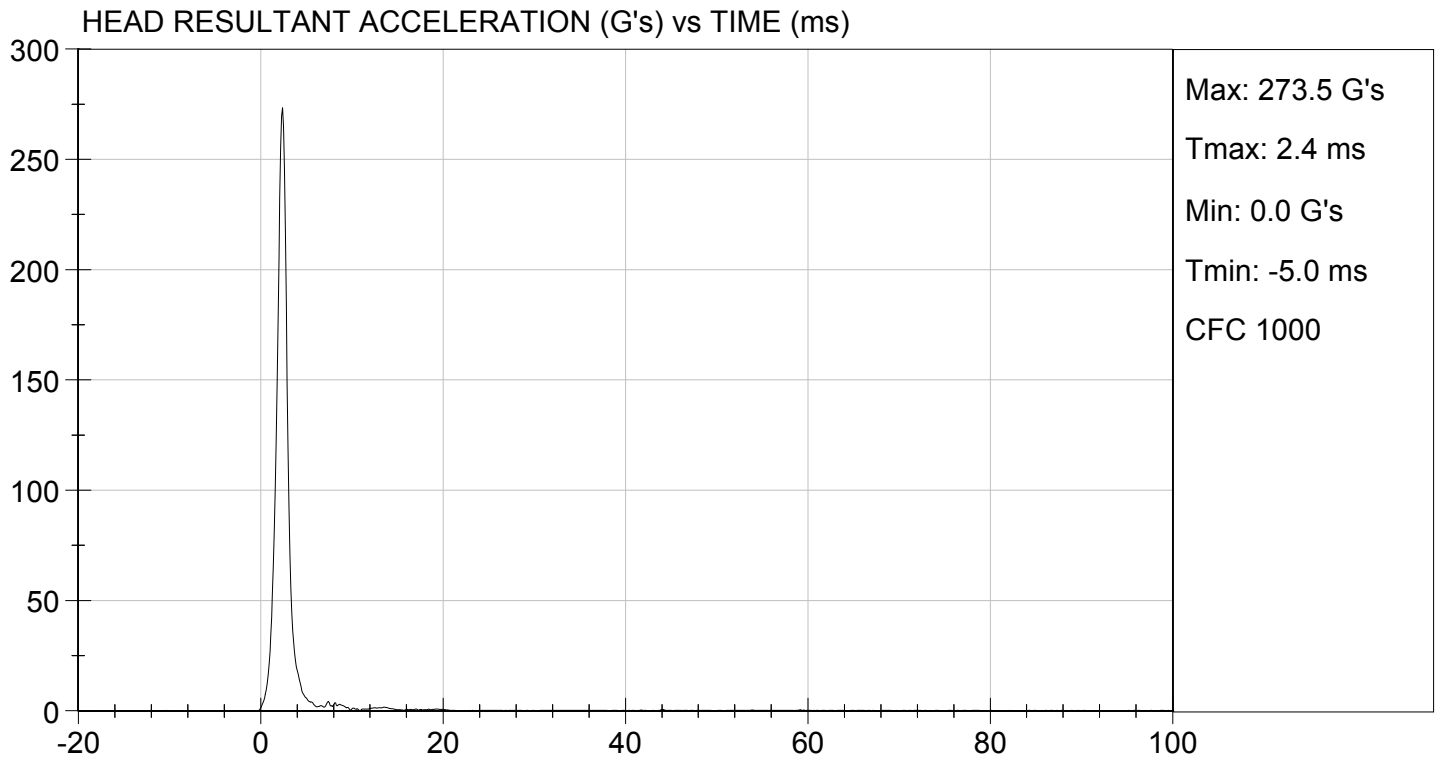
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Peak Resultant Acceleration	G's	250 to 300	274	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

10/03/2012

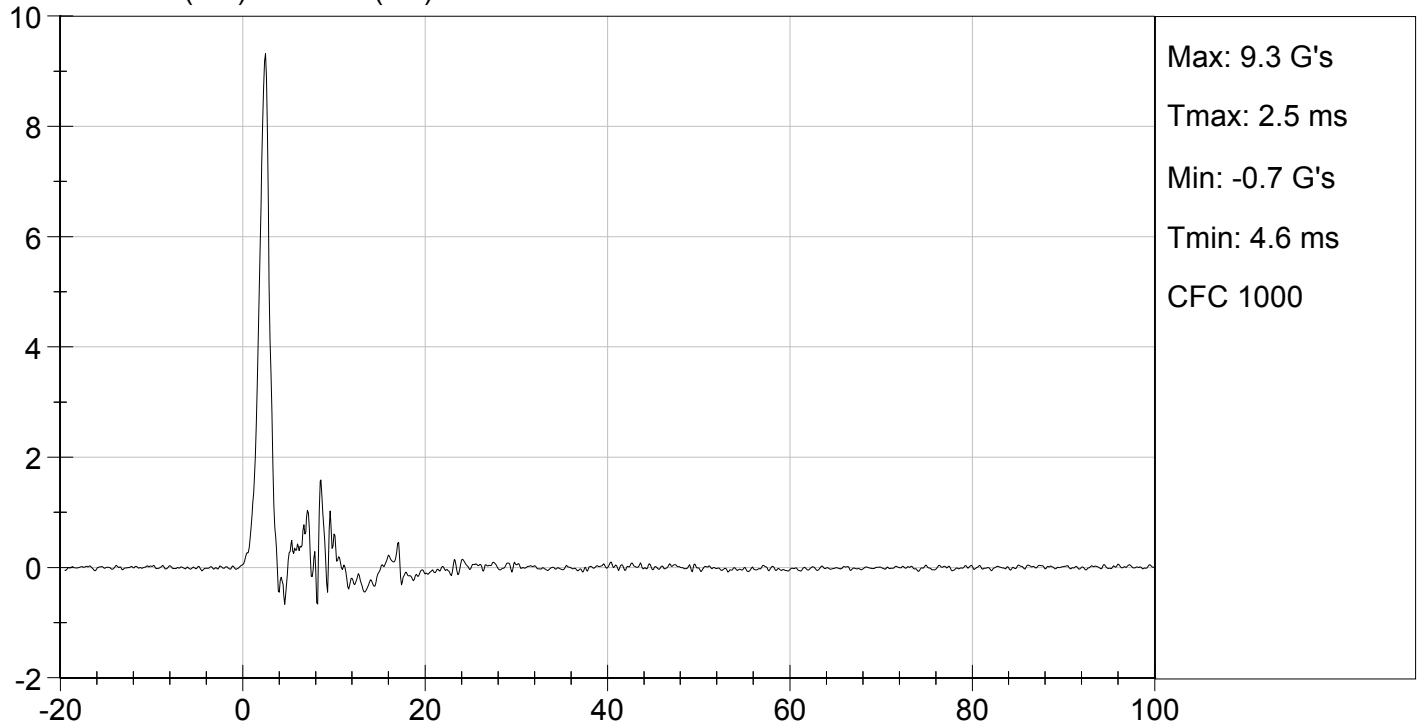
Test Date


Approved By

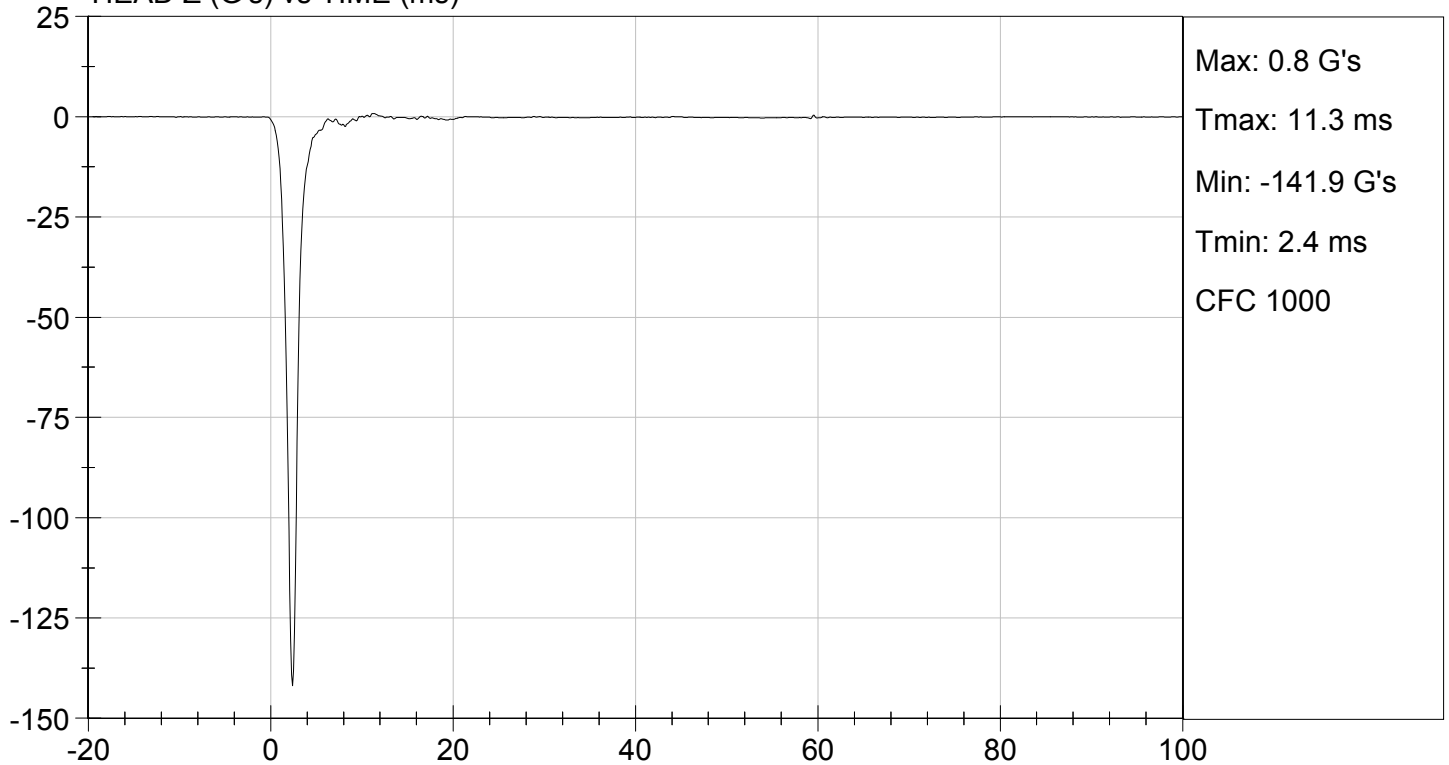




HEAD Y (G's) vs TIME (ms)



HEAD Z (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634Test I.D.: D123732

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	5.9	Pass
D Plane Rotation	Max	deg	77 to 91	85	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results				Pass	

Jessica Gall
Laboratory Technician

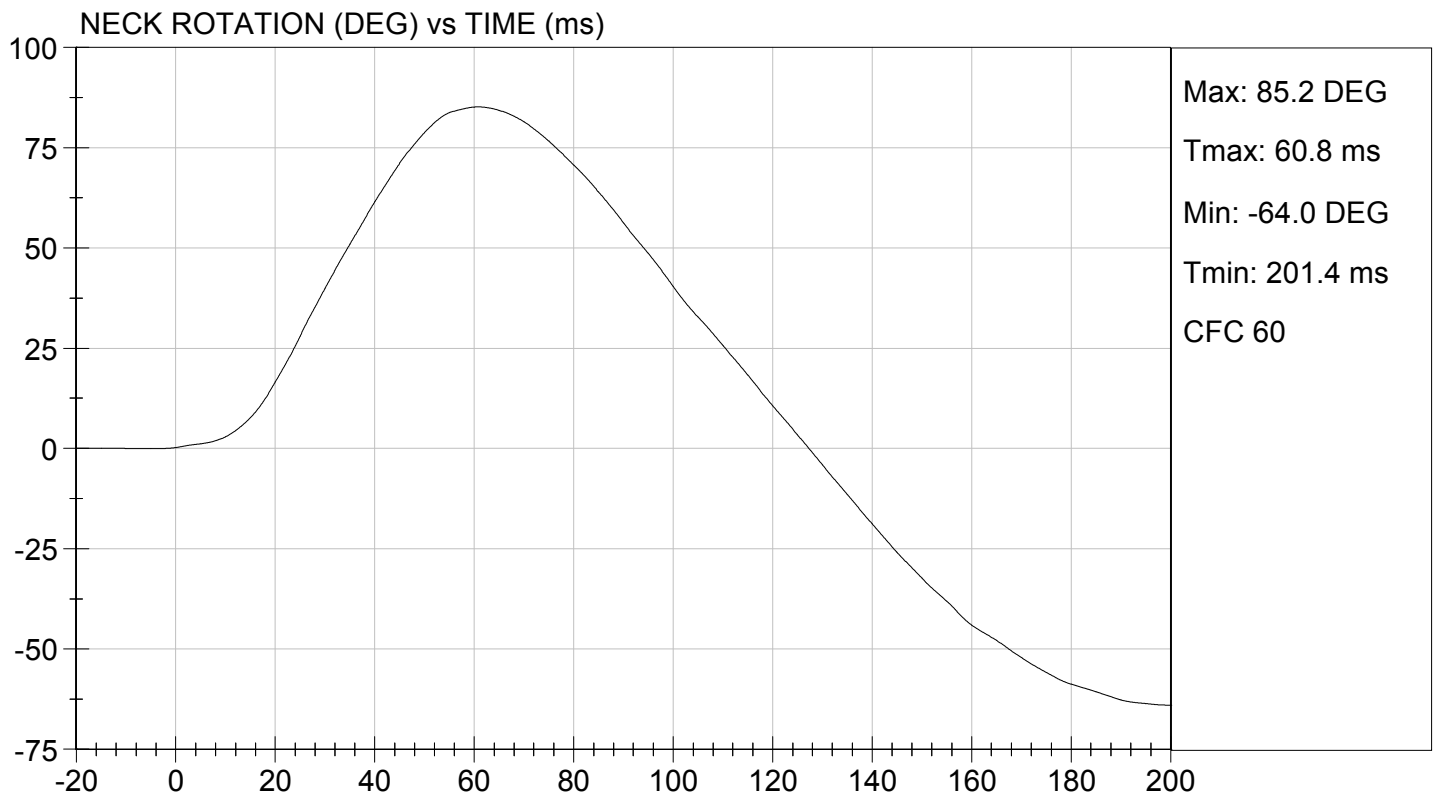
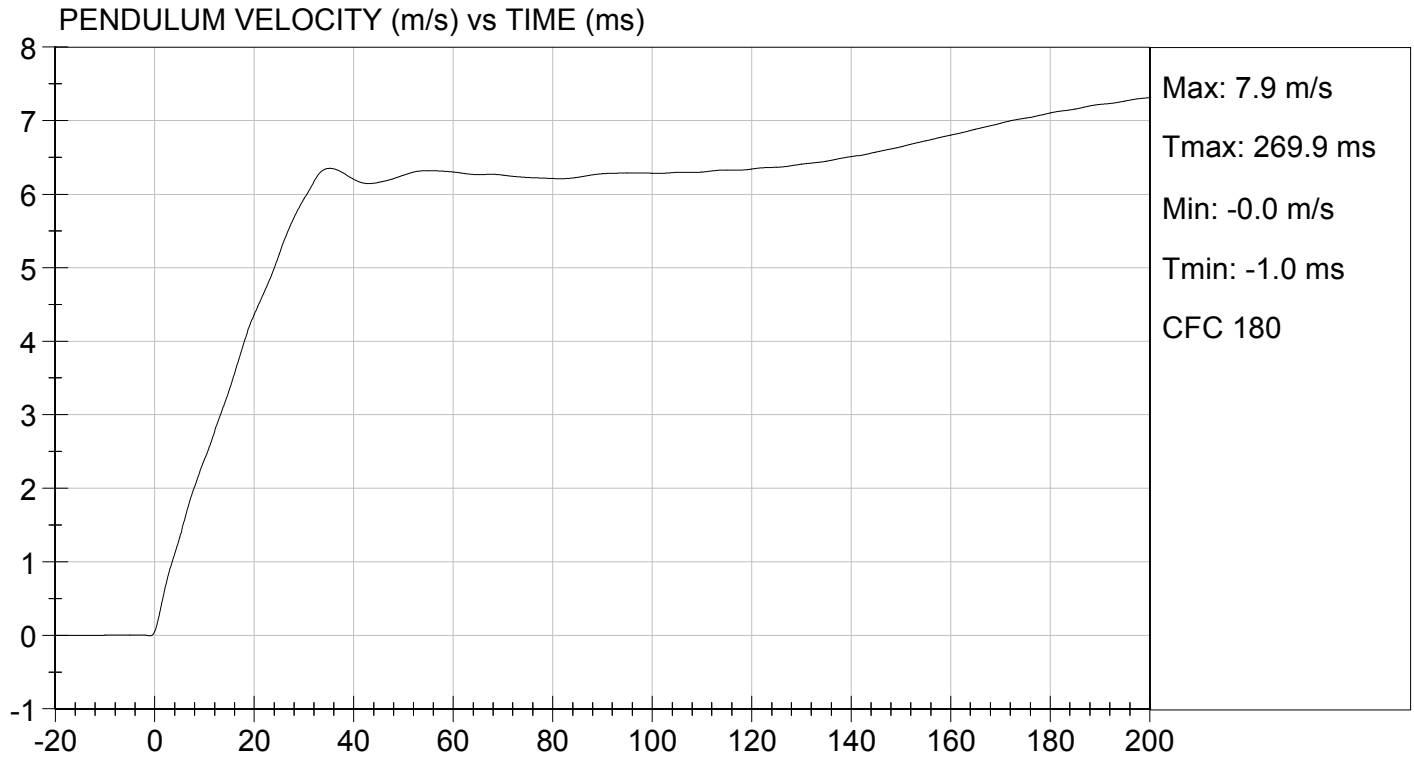
10/03/2012
Test Date

David Winkelbauer
Approved By



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

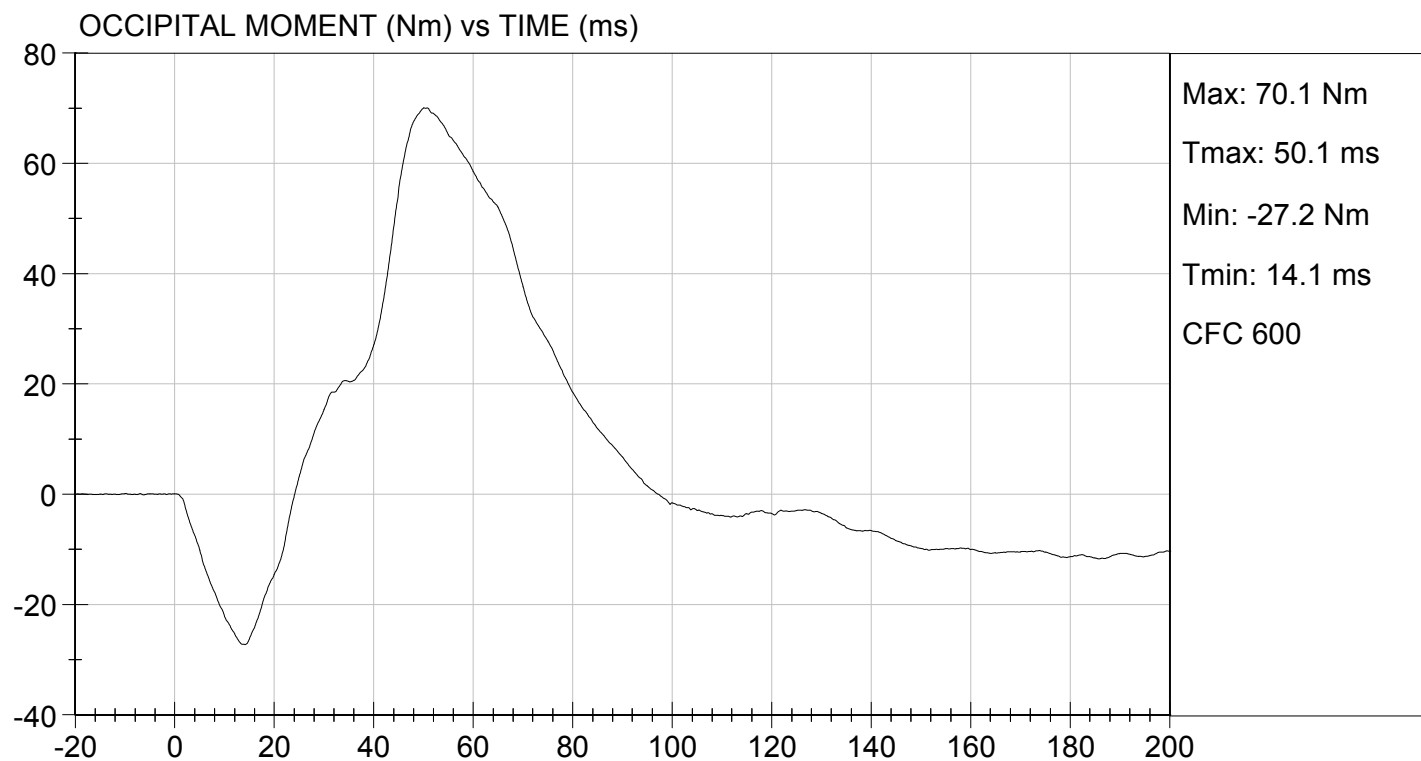
TEST DATE: 10/03/2012
TEST #: D123732





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

TEST DATE: 10/03/2012
TEST #: D123732



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

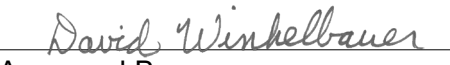
ATD Serial No: 634

Test I.D: D123733

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	95	Pass
Overall Results					Pass


Laboratory Technician

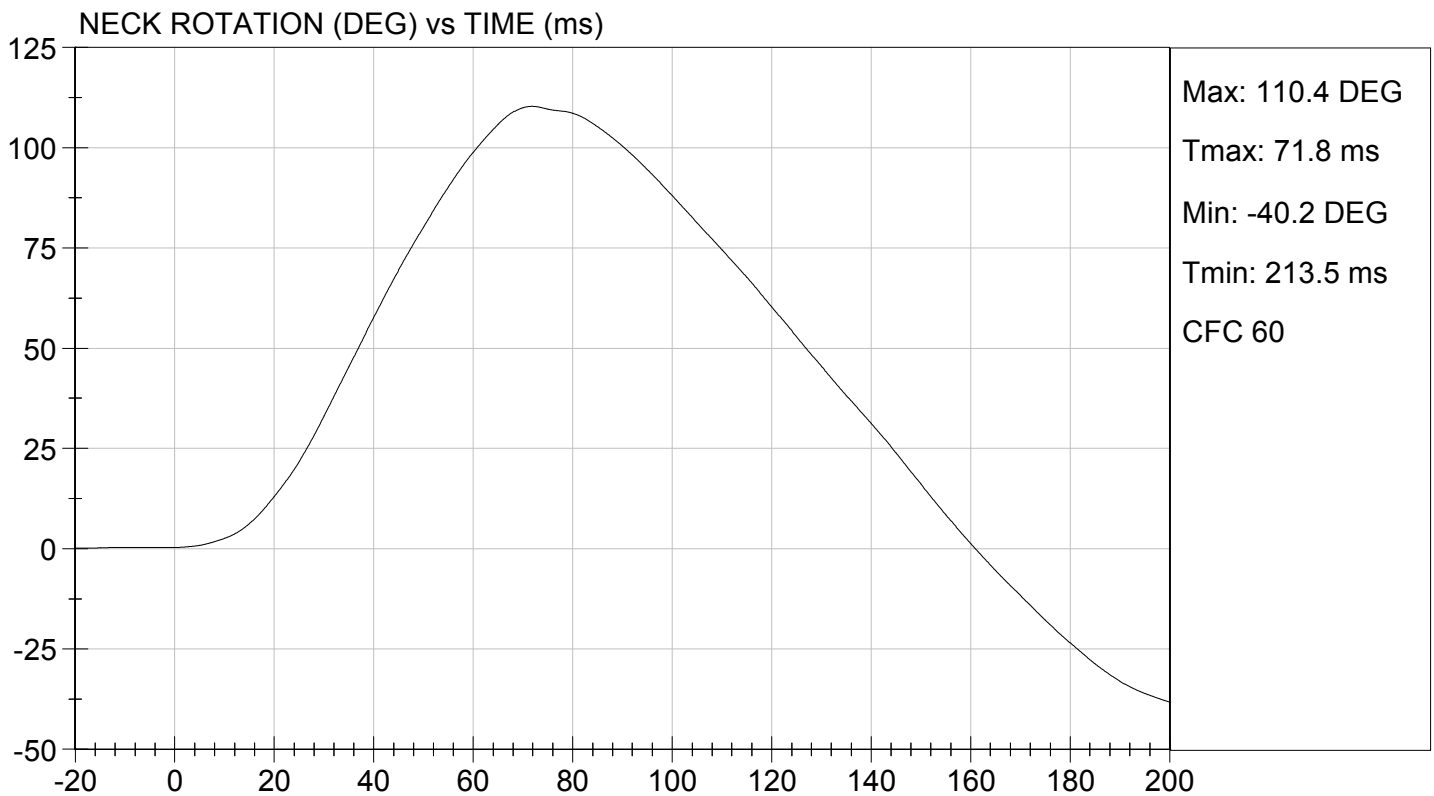
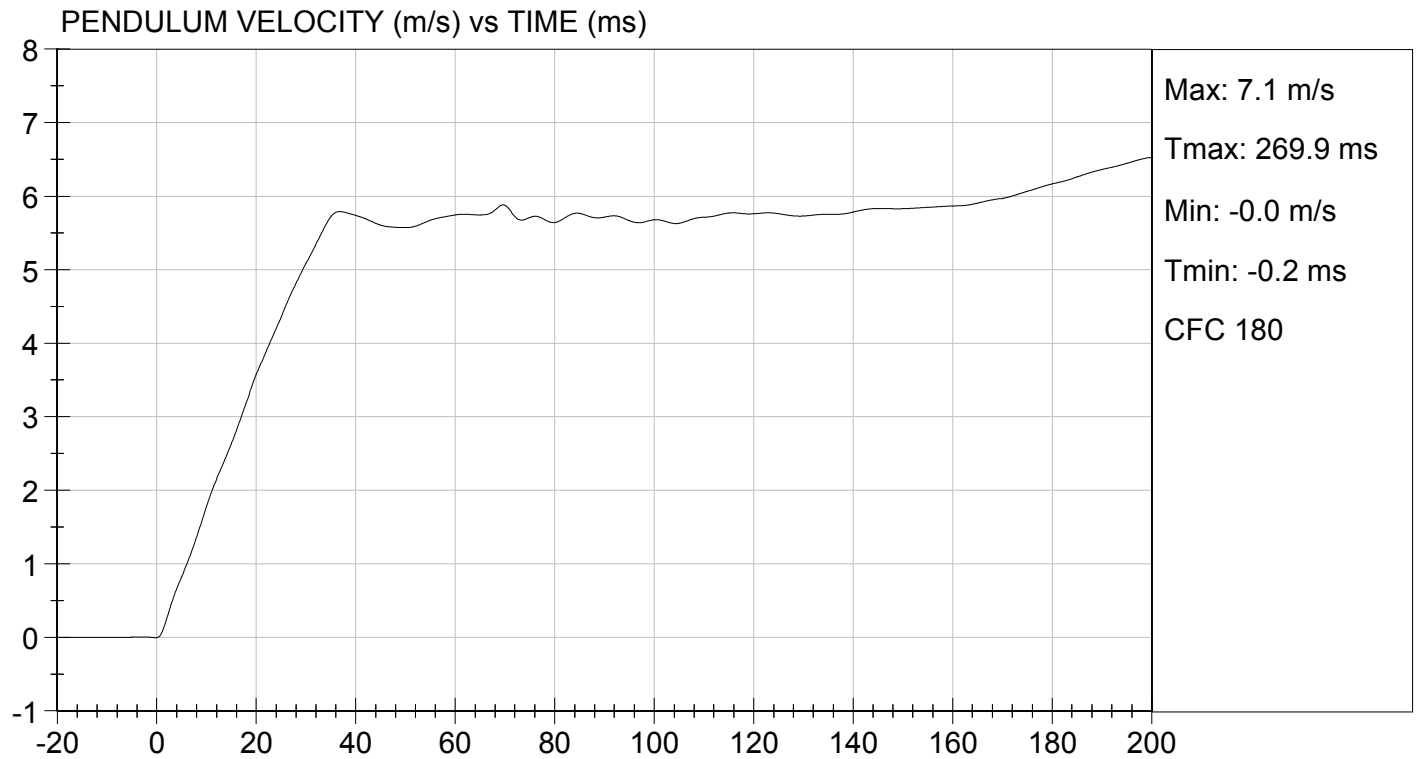
10/03/2012
Test Date


Approved By



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

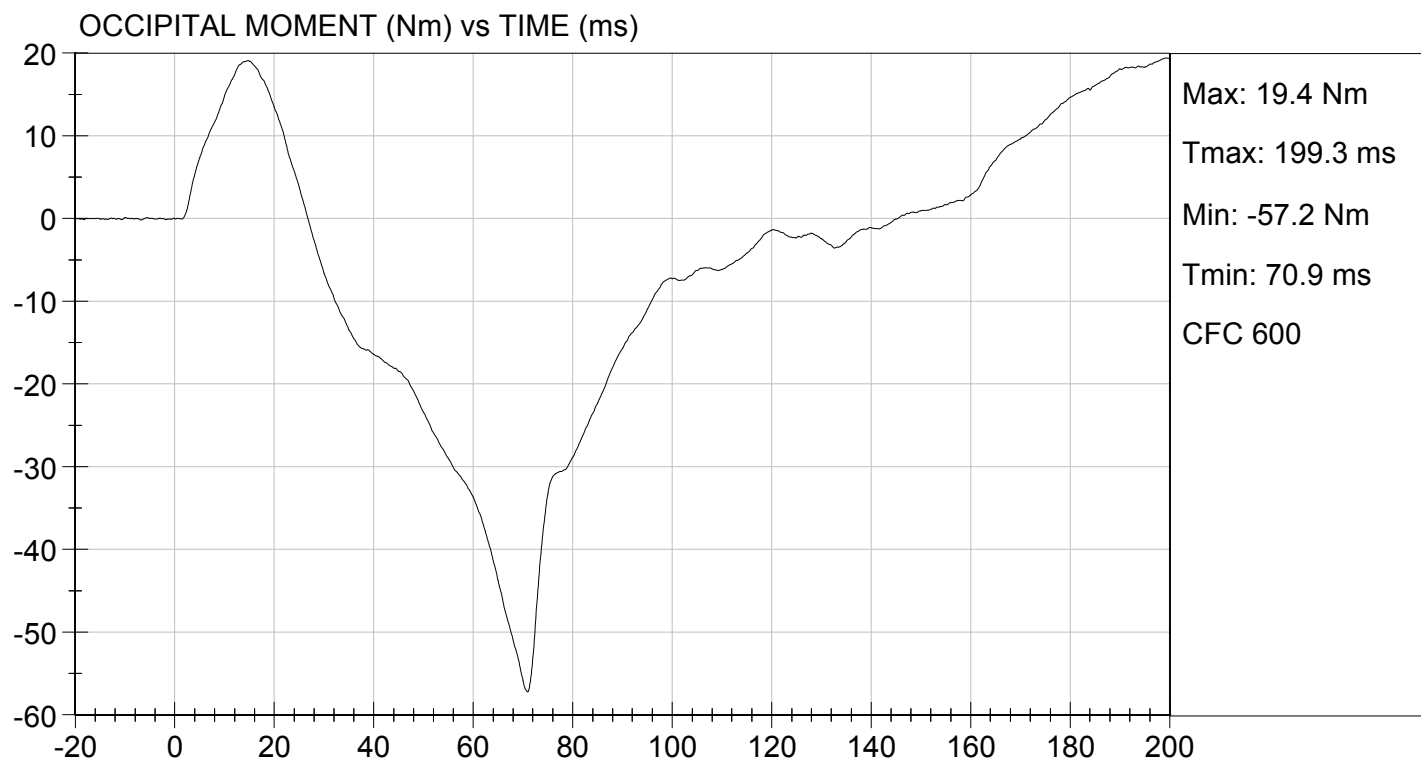
TEST DATE: 10/03/2012
TEST #: D123733





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

TEST DATE: 10/03/2012
TEST #: D123733

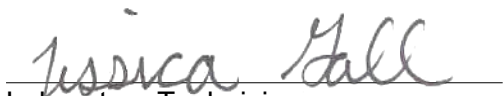


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

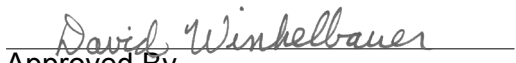
Test I.D: D123734

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.1	Pass
Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4030	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4151	Pass
Overall Test Results				Pass


Laboratory Technician

10/03/2012

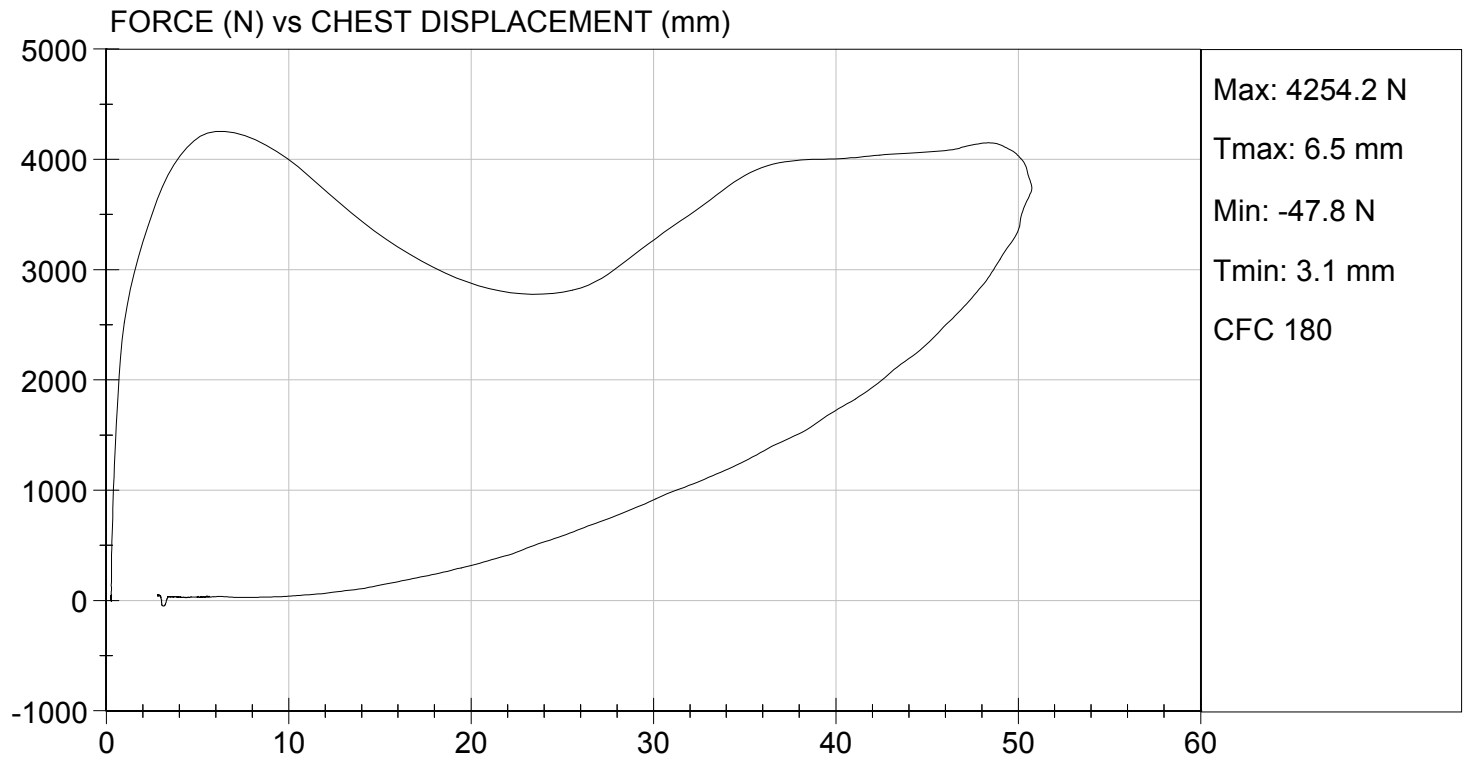
Test Date


Approved By



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

TEST DATE: 10/03/2012
TEST #: D123734



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123735

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3603	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

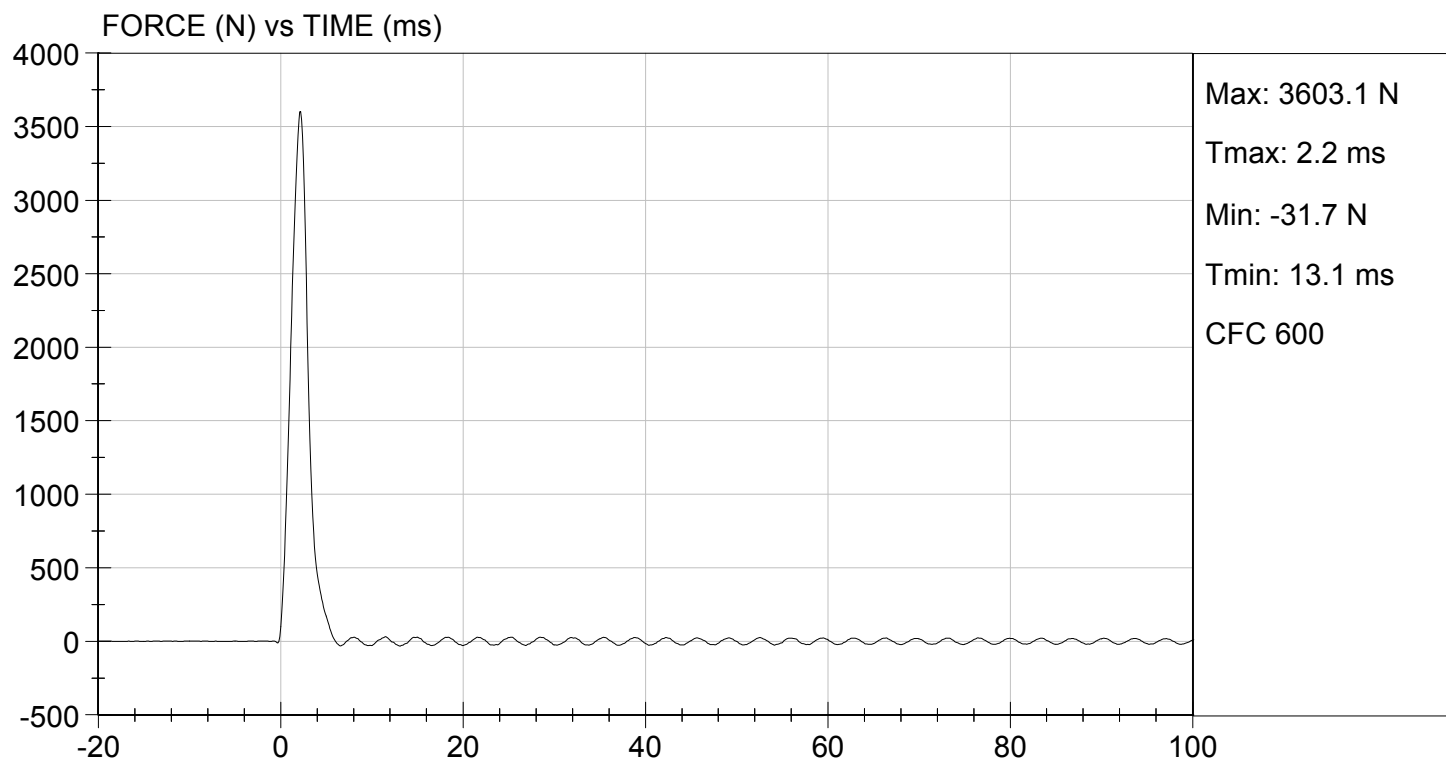
10/03/2012
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 10/03/2012
TEST #: D123735



MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D123736

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3752	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

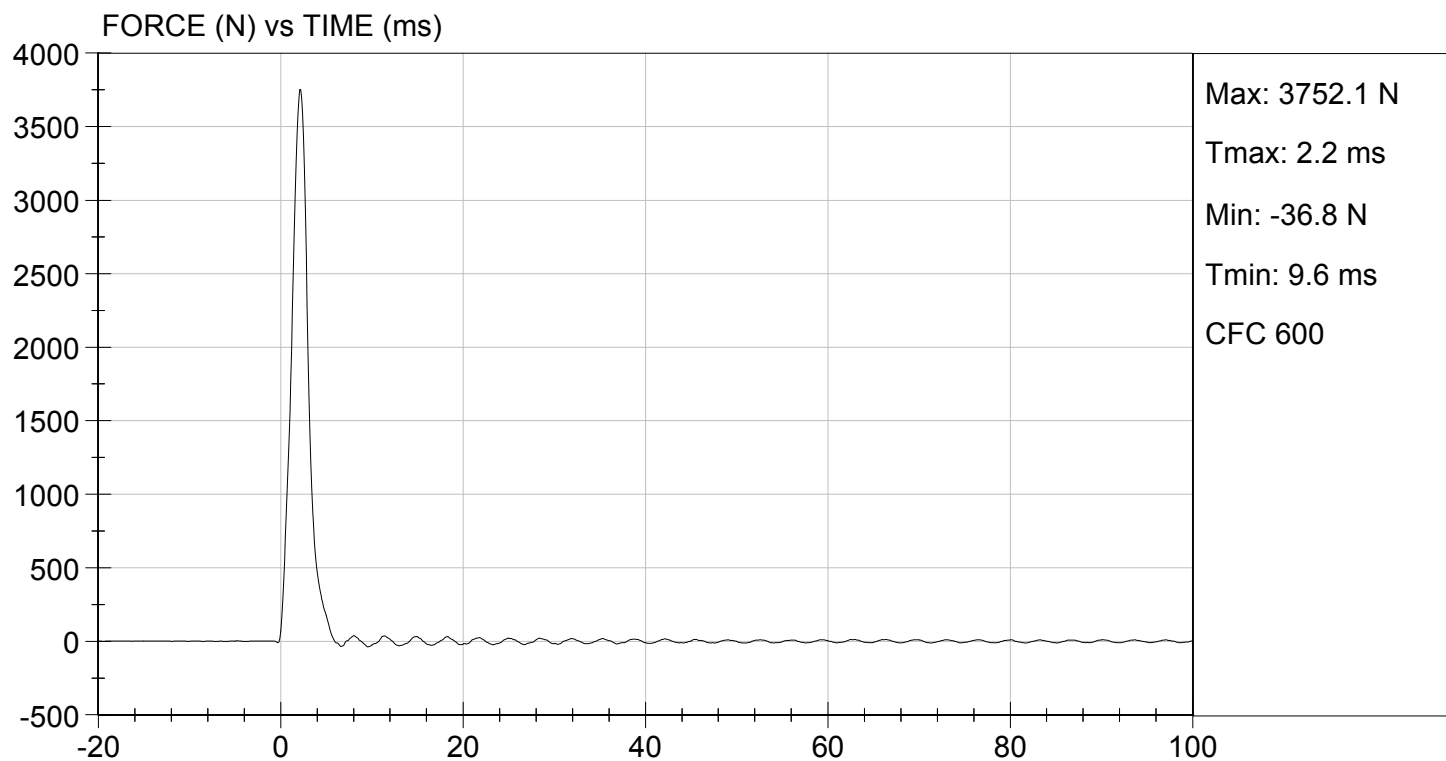
10/03/2012
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 10/03/2012
TEST #: D123736



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123737

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	376	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.0	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

10/03/2012

Test Date

David Winkelbauer
Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

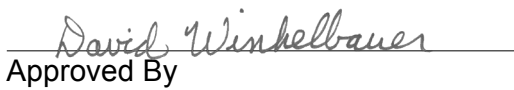
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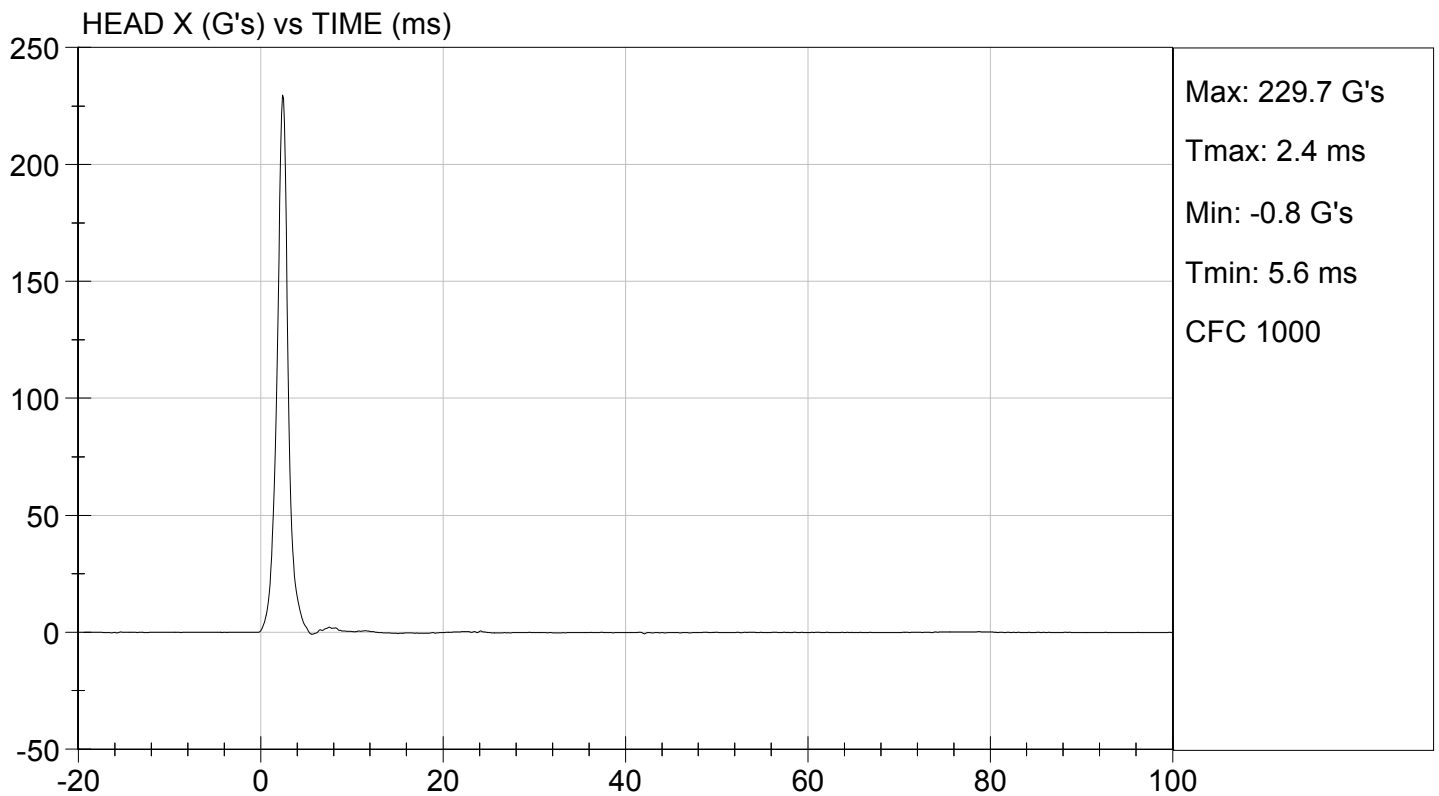
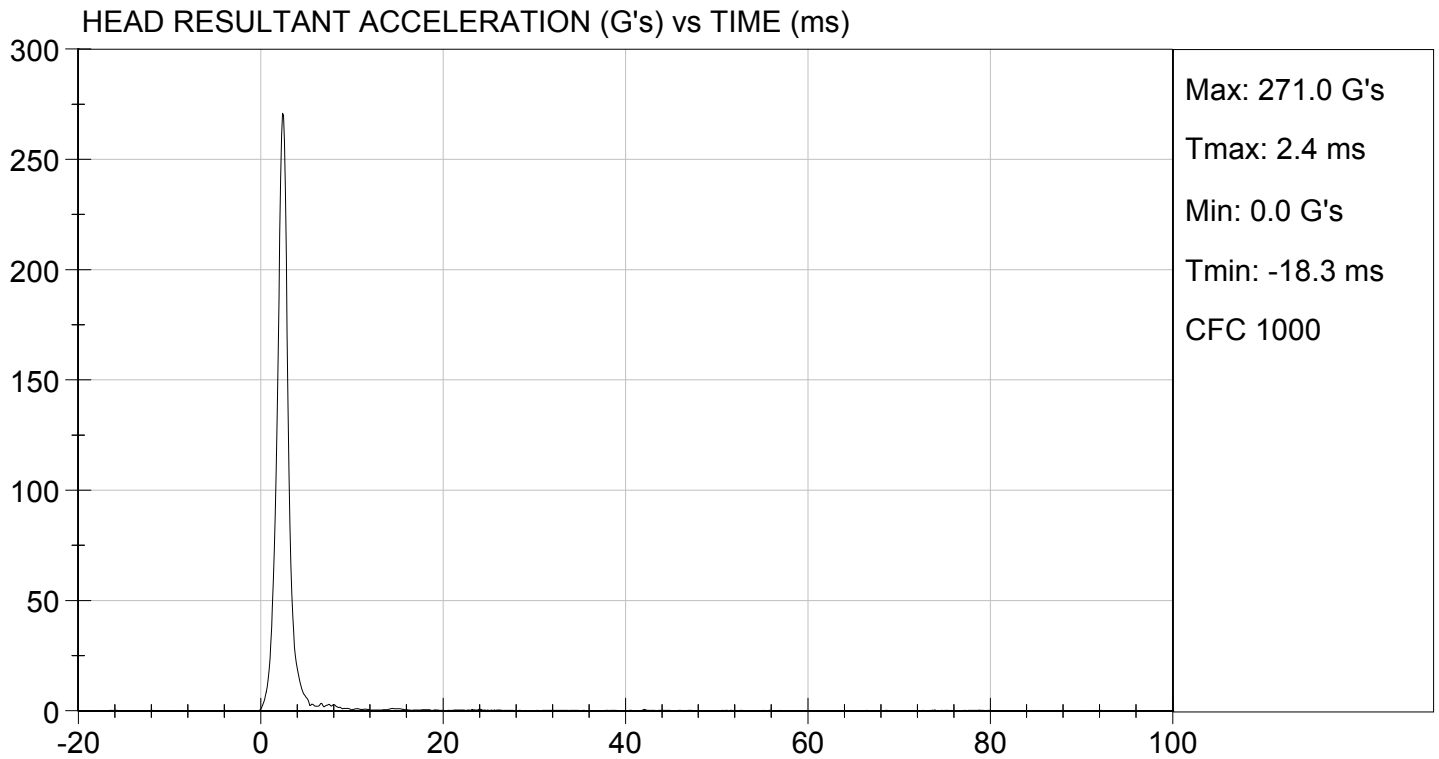
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Peak Resultant Acceleration	G's	250 to 300	271	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

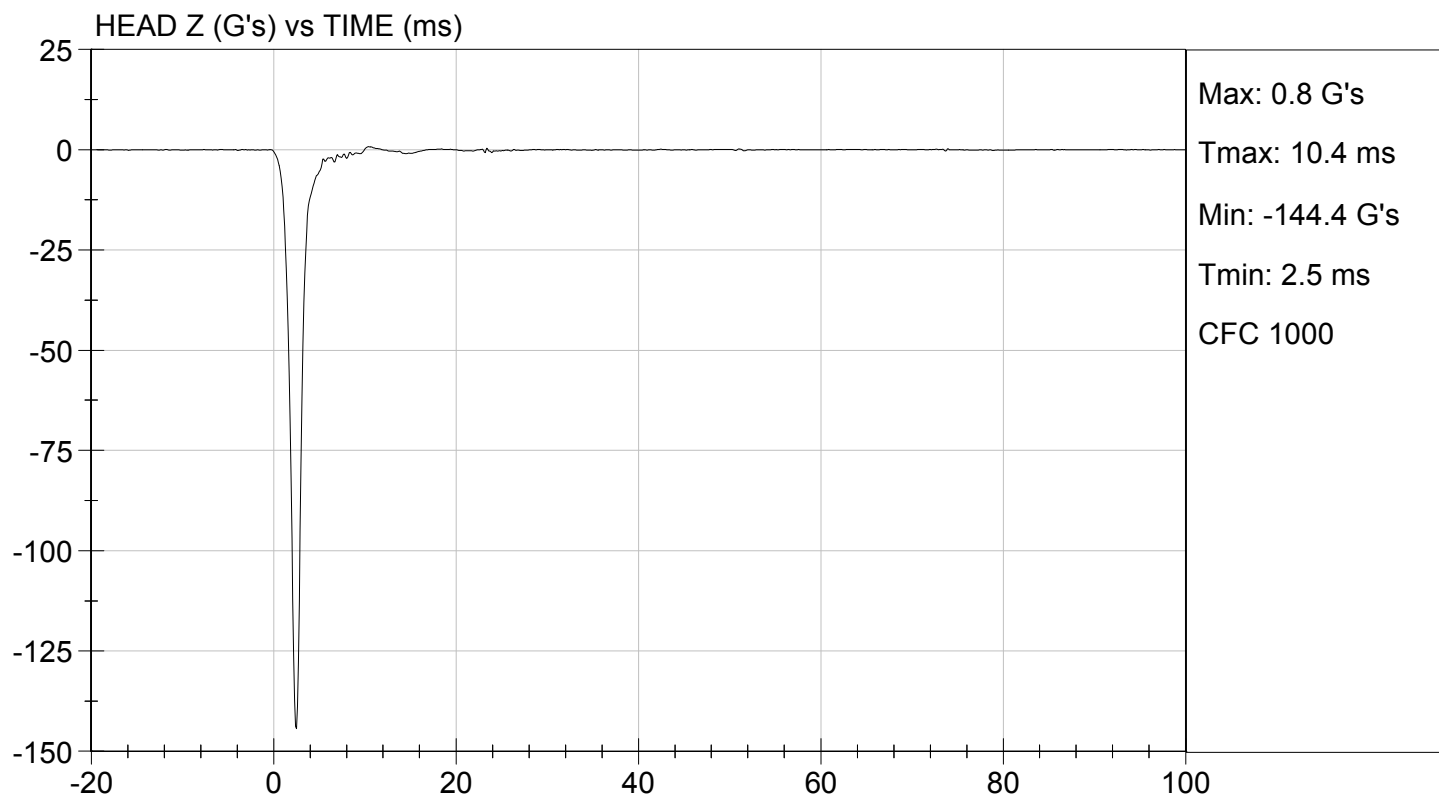
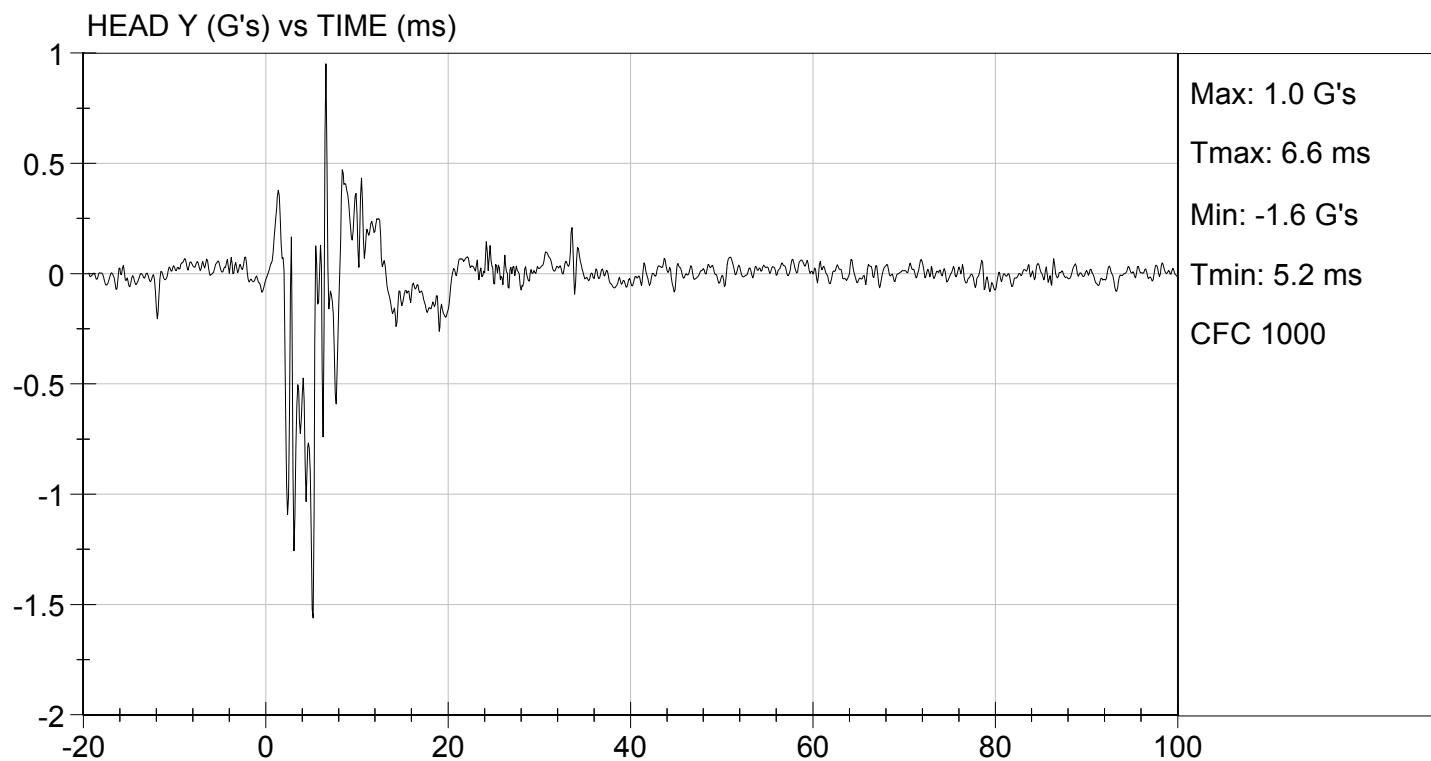

Laboratory Technician

10/15/2012

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123932

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	37	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	89	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	73	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
Overall Results					Pass

Jessica Gall
 Laboratory Technician

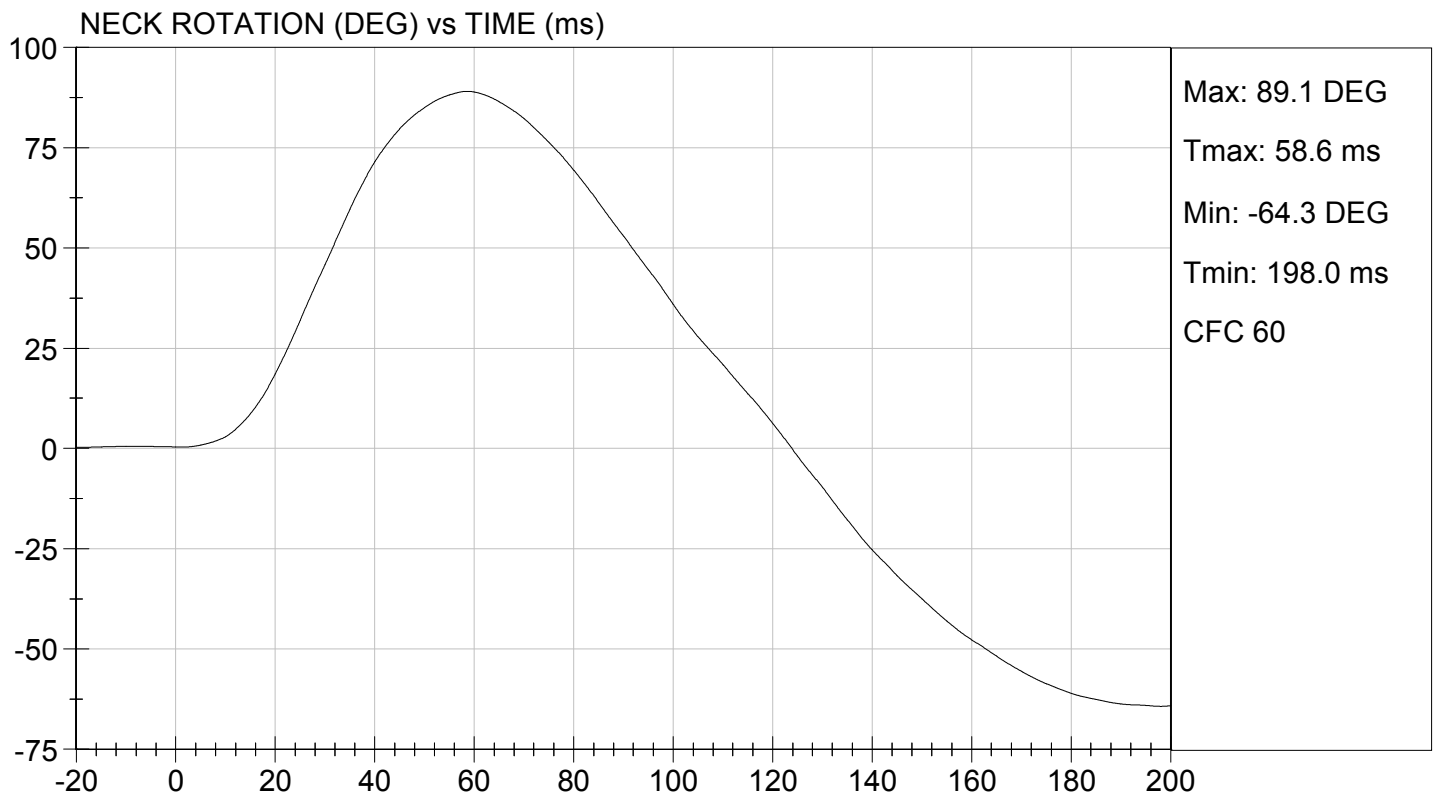
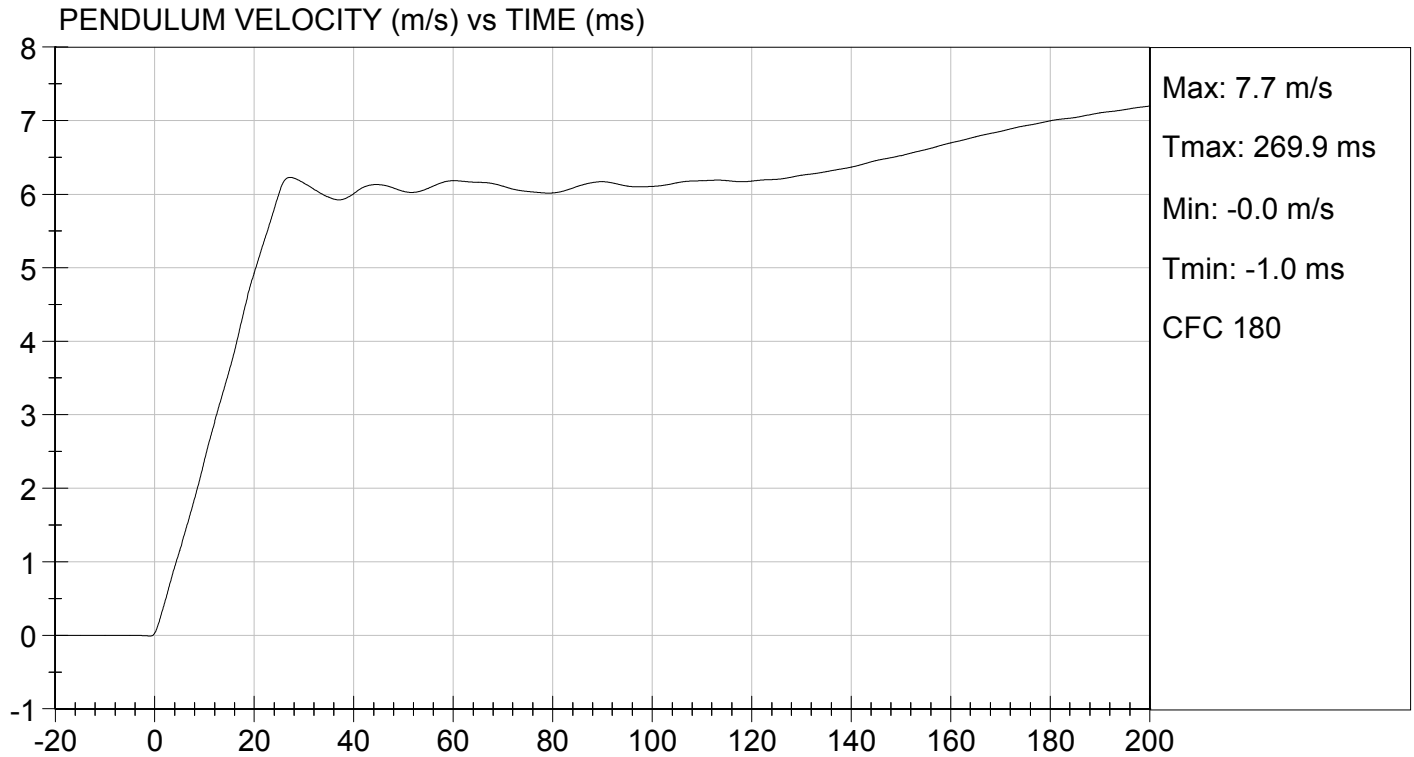
10/16/2012
 Test Date

David Winkelbauer
 Approved By



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

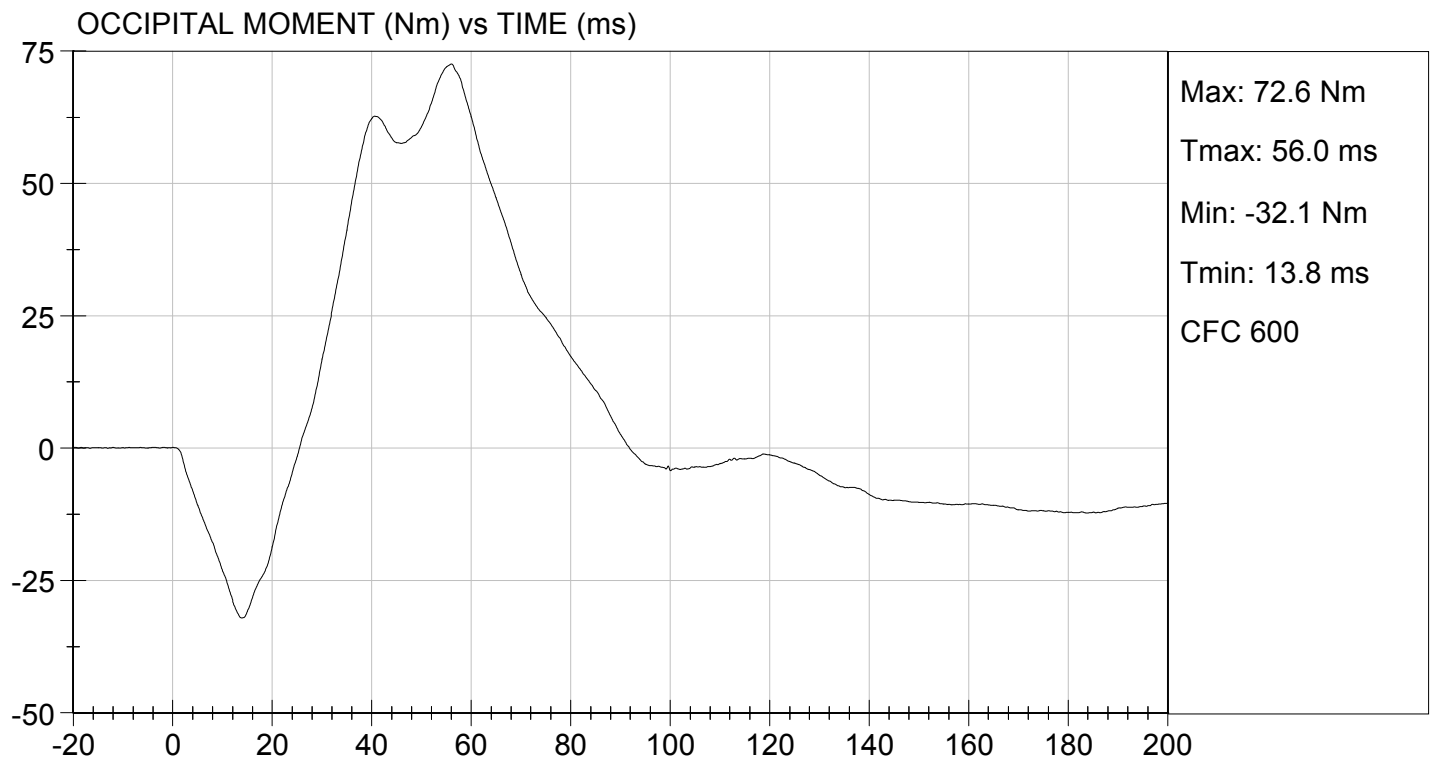
TEST DATE: 10/16/2012
TEST #: D123932





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

TEST DATE: 10/16/2012
TEST #: D123932



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123933

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	37	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-63	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	94	Pass
Overall Results					Pass

Jessica Gall
Laboratory Technician

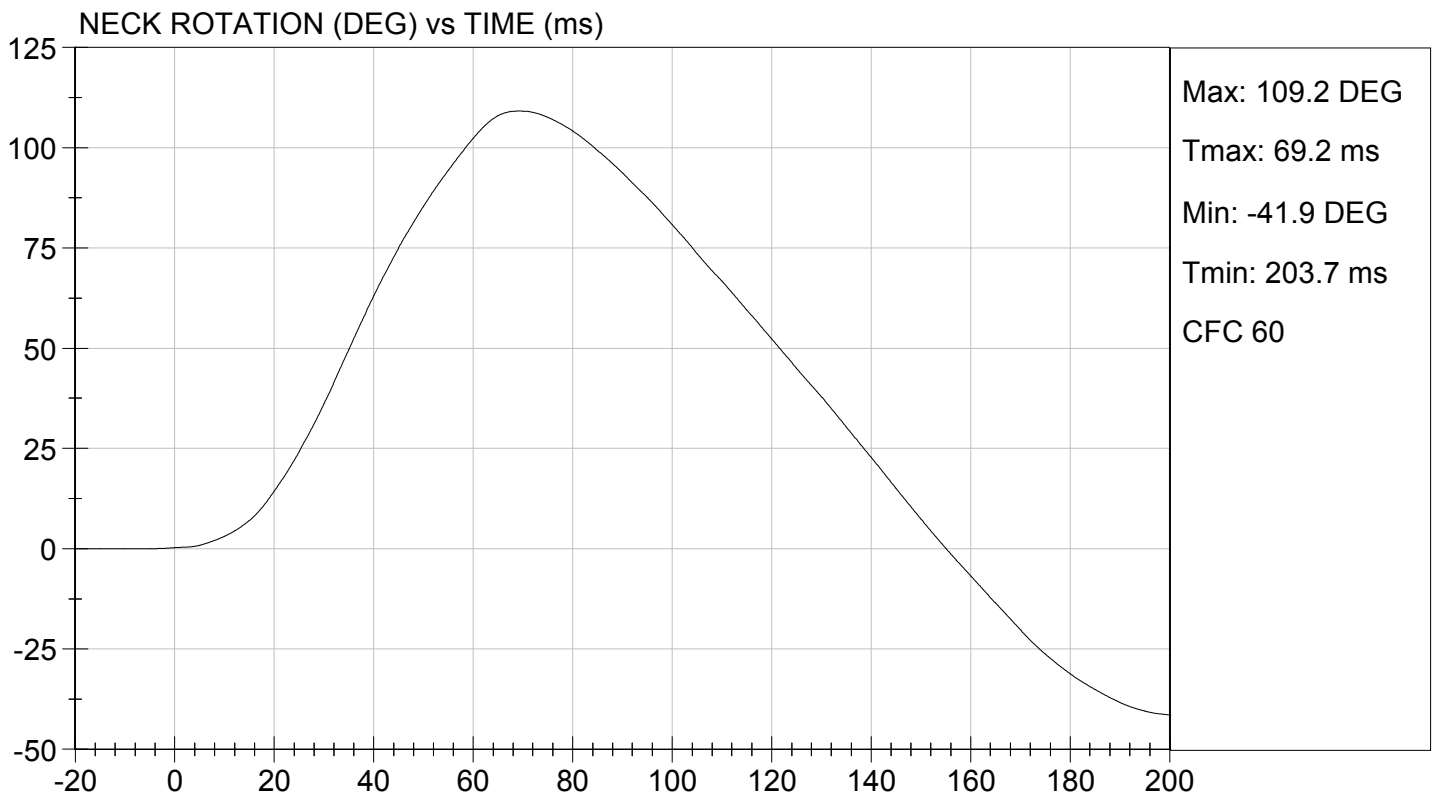
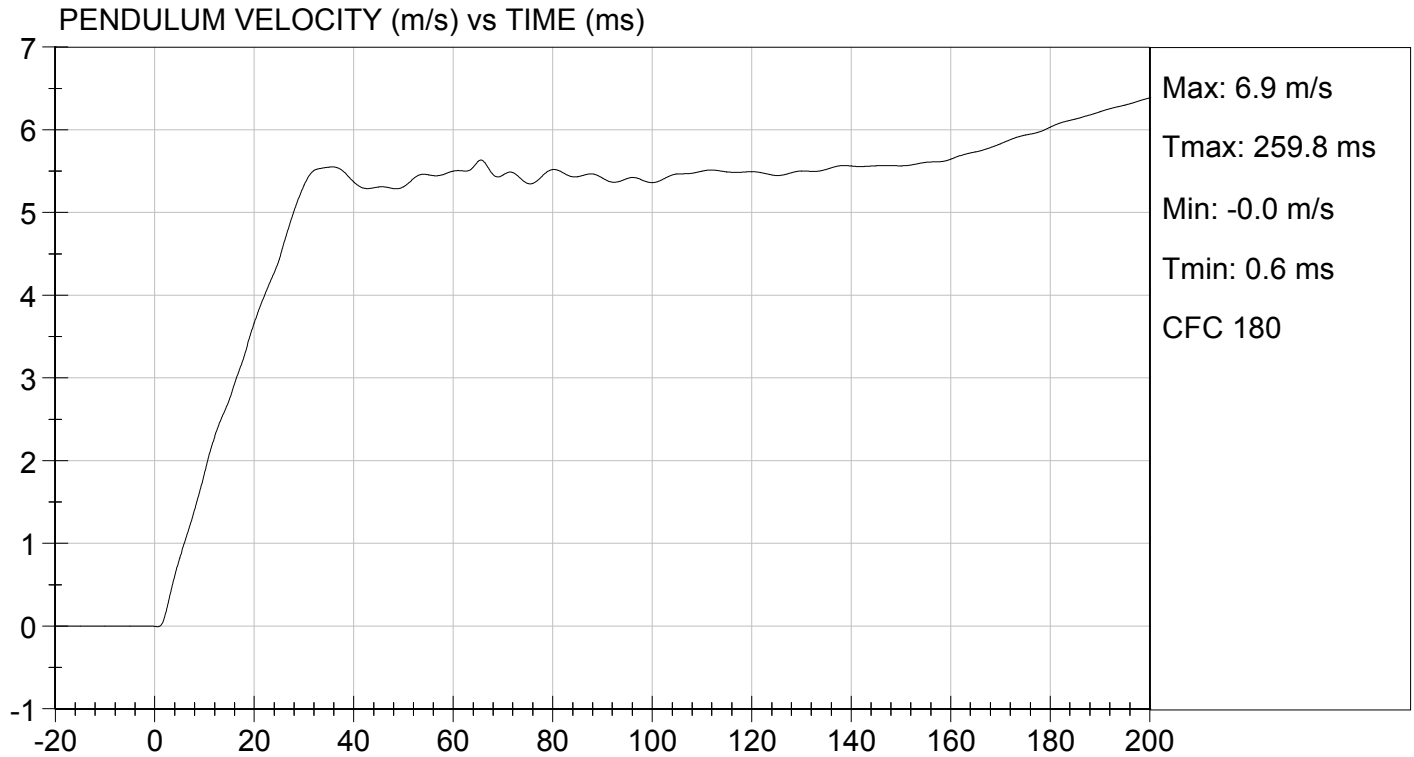
10/16/2012
Test Date

David Winkelbauer
Approved By



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

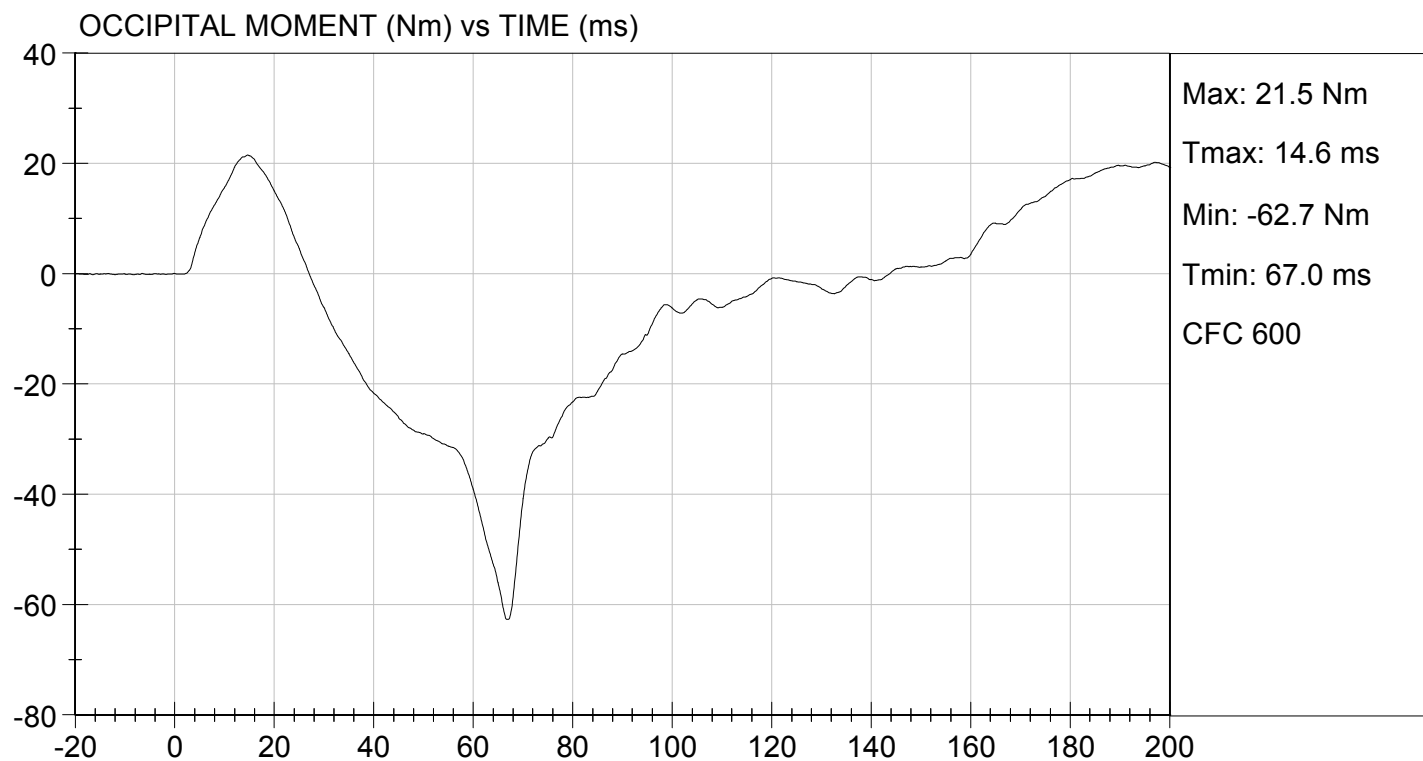
TEST DATE: 10/16/2012
TEST #: D123933





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

TEST DATE: 10/16/2012
TEST #: D123933

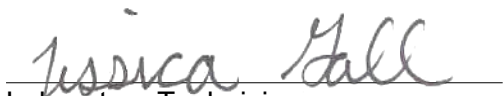


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

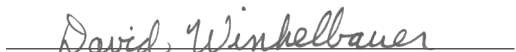
Test I.D: D123934

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4111	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4245	Pass
Overall Test Results				Pass


Laboratory Technician

10/16/2012

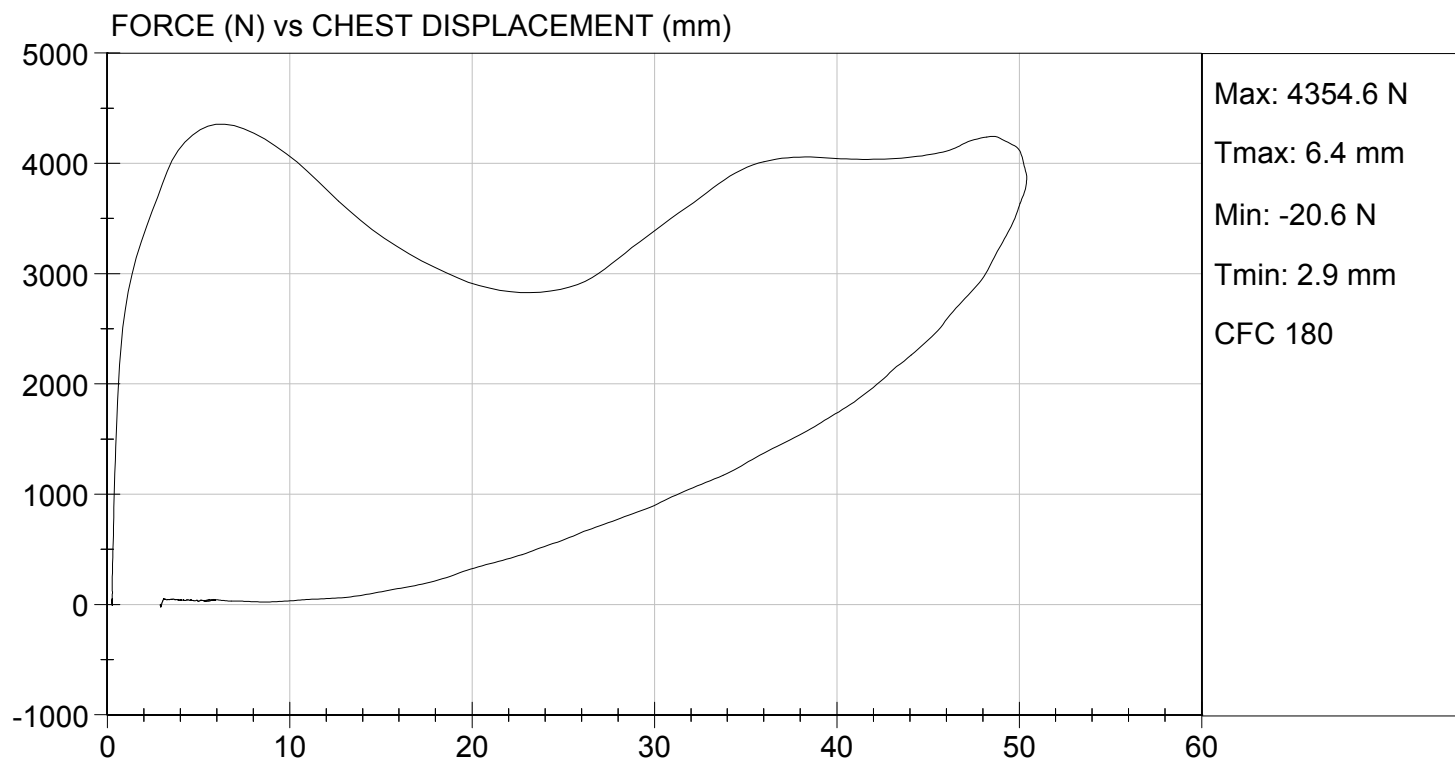
Test Date


Approved By



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

TEST DATE: 10/16/2012
TEST #: D123934



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D123935

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3589	Pass
Overall Test Results				Pass


Laboratory Technician

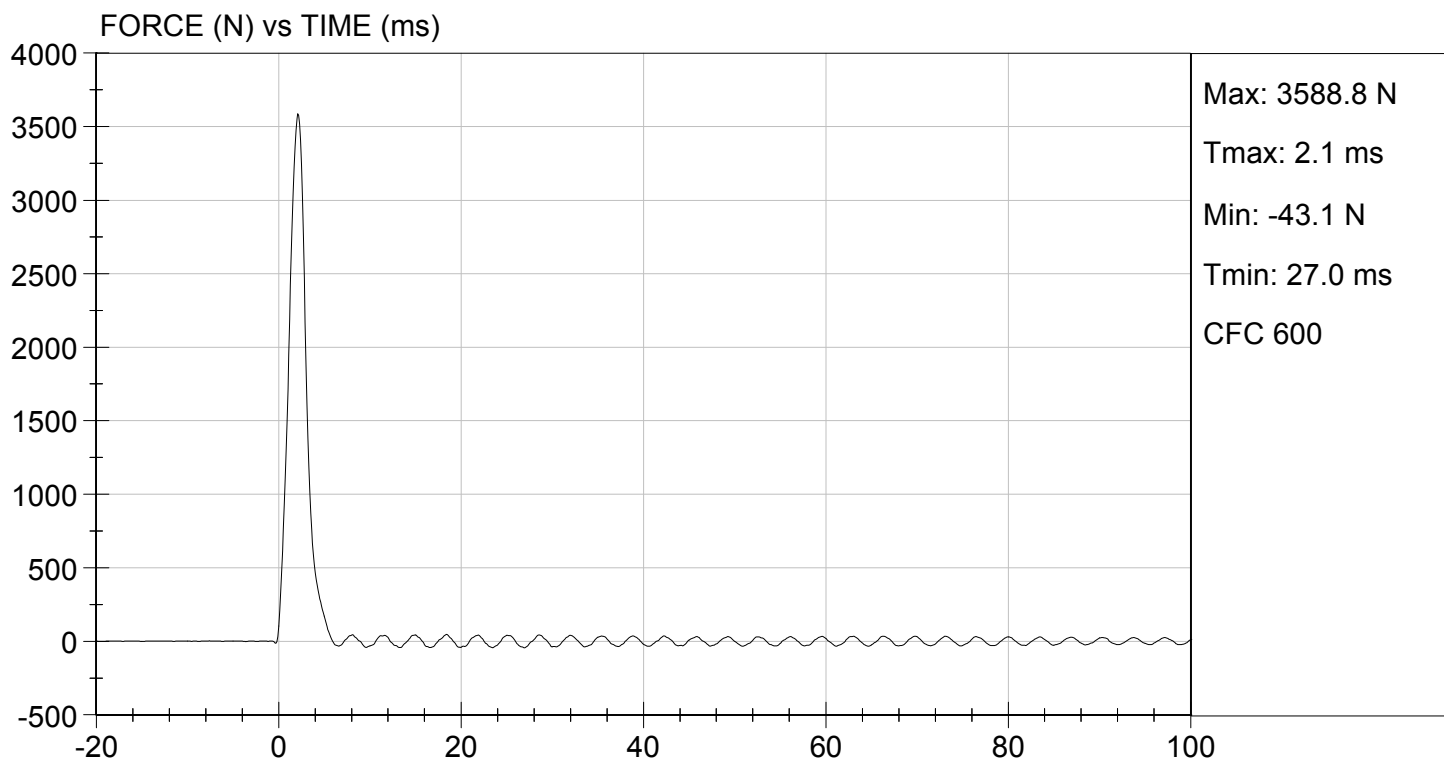
10/15/2012
Test Date


Approved By



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

TEST DATE: 10/15/2012
TEST #: D123935



MGA RESEARCH CORPORATION

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

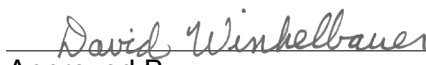
ATD Serial No: 634

Test I.D: D123936

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3763	Pass
Overall Test Results				Pass


Laboratory Technician

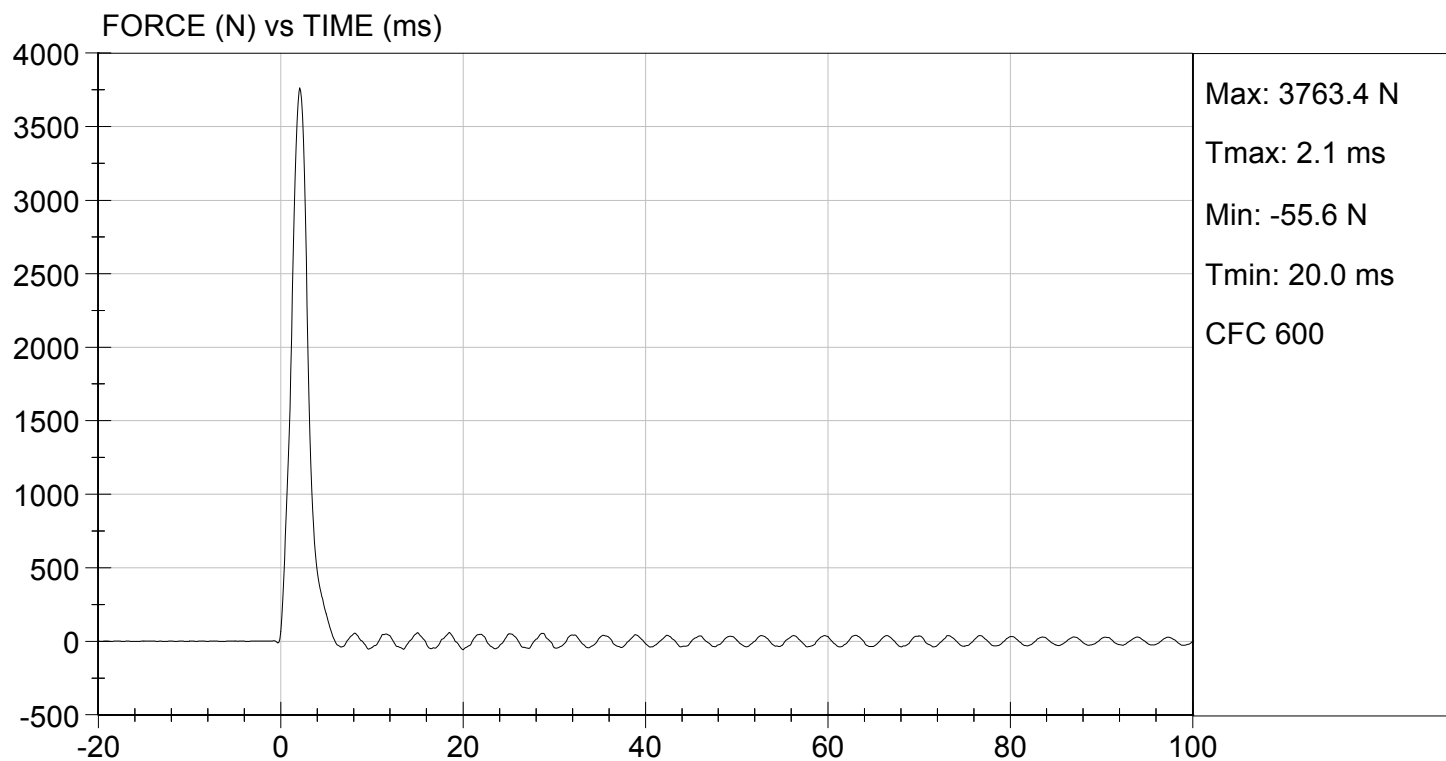
10/15/2012
Test Date


Approved By



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

TEST DATE: 10/15/2012
TEST #: D123936



MGA RESEARCH CORPORATION

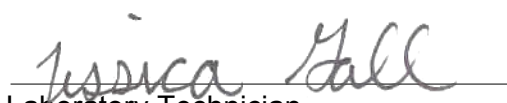
TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

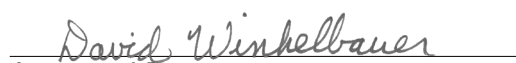
Test I.D: D123937

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	382	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result			Pass	


Laboratory Technician

10/15/2012

Test Date


Approved By