

REPORT NUMBER: NCAP-MGA-2011-014

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

**CHRYSLER GROUP LLC
2011 Jeep Grand Cherokee Laredo 4X4
NHTSA No.: MB0311**

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



Test Date: August 26, 2010

Final Report Date: October 4, 2010

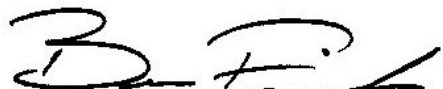
FINAL REPORT

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-D-00028.

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Approval Date: October 4, 2010

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. <i>Abstract</i> A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2011 Jeep Grand Cherokee Laredo 4X4 in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure for the generation of consumer information on vehicle frontal crash protection. 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 August 26, 2010. The impact velocity was 56.3 km/h and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 521 mm located to the right of 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>102</td> <td>295</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>28</td> <td>16</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.20</td> <td>0.24</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>829</td> <td>414</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>181</td> <td>456</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2504</td> <td>2553</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2035</td> <td>3025</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	102	295	Maximum Chest Compression	mm	63	52	28	16	Nij	N/A	1	1	0.20	0.24	Neck Tension	N	4170	2620	829	414	Neck Compression	N	4000	2520	181	456	Left Femur Force	N	10008	6805	2504	2553	Right Femur Force	N	10008	6805	2035	3025
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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 DTNH22-06-D-00028. 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 Standard's NCAP Frontal Laboratory Test Procedure dated January 2010.

SUMMARY

A load cell barrier was impacted by a 2011 Jeep Grand Cherokee Laredo 4X4 at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on August 26, 2010. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two 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 on the driver's lap and shoulder belts and the passenger's lap belt to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with verification data, are found in Appendix C of this report.

The 102 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest displacement, neck, and femur 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 521 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's head and chest contacted the airbag. The driver's head also contacted headrest. The driver's knees contacted the knee bolster. 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	T ¹	T ²	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50 th)	102	62.5	77.5	28	0.20	829	181	2504	2035
Passenger (5 th)	295	72.0	87.0	16	0.24	414	456	2553	3025

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

TEST NOTES

There was no valid data collected for:

Driver Pelvis X after 80 msec.

Left Rear Seat Crossmember X after 70 msec.

Right Rear Seat Crossmember X after 70 msec.

Bottom of Engine X after 90 msec.

Left Rear Seat Crossmember Z after 70 msec.

Right Rear Seat Crossmember Z after 70 msec.

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: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0311	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	Yes
Make	Jeep	Power Steering	Yes
Model	Grand Cherokee Laredo	Driver Front Airbag	Yes
Body Style	MPV	Driver Curtain Airbag	Yes
VIN	1J4RR4GG2BC509137	Driver Head/Torso Airbag	No
Body Color	Blackberry Pearl Coat	Driver Torso Airbag	No
Delivery Date	7/28/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	152	Driver Pelvis Airbag	No
Odometer (km)	245	Driver Knee Airbag	No
Dealer	Boucher Fleet Group	Pass. Front Airbag	Yes
Transmission	Automatic	Pass. Curtain Airbag	Yes
Final Drive	4WD	Pass. Head/Torso Airbag	No
Type/No. Cylinders	6	Pass. Torso Airbag	No
Engine Displacement (L)	3.6	Pass. Torso/Pelvis Airbag	Yes
Engine Placement	Longitudinal	Pass. Pelvis Airbag	No
Roof Rack	No	Pass. Knee Airbag	No
Sunroof/T-Top	No	Pretensioners	Yes
Tinted Glass	No	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Other	
Does owner's manual provide instructions to turn off automatic door locks?	Yes		

DATA FROM CERTIFICATION LABEL

Manufactured By	Chrysler Group LLC	GVWR (kg)	2949
Date of Manufacture	6-10	GAWR Front (kg)	1452
		GAWR Rear (kg)	1679

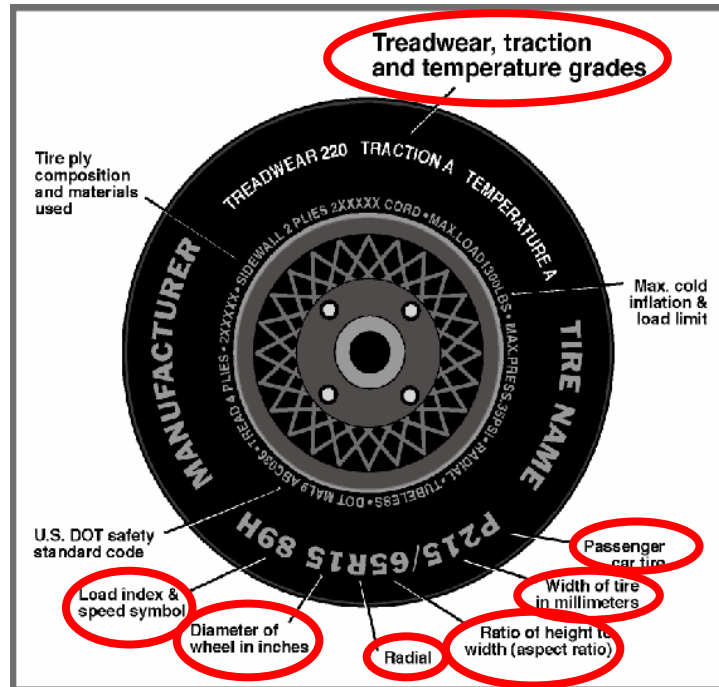
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	60/40 Folding Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				476
Cargo Weight (RCLW) (kg)				136

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

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	P245/70R17	P245/70R17
Tire Size on Vehicle	P245/70R17	P245/70R17
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Fortera HL	Fortera HL
Treadwear	540	540
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	4	4
Load Index & Speed Symbol	108T	108T
Tire Material	Rubber	Rubber
DOT Safety Code Right	4B83 JD1R 1710	4B83 JD1R 1710
DOT Safety Code Left	4B83 JD1R 1710	4B83 JD1R 1710

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

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4 NHTSA No.: MB0311
 Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/26/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	554.3	518.9		589.7	626.0	
Right	kg	548.4	515.3		564.3	627.8	
Ratio	%	51.6	48.4		47.9	52.1	
Totals	kg	1102.7	1034.2	2136.9	1154.0	1253.8	2407.8

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2136.9
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Target Vehicle Target Weight (TVTW)	kg	2413.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	841	834	886	888	1409
As Tested	mm	834	839	860	856	1516
Post Test	mm	807	901	814	905	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	Mm	2912
Total Vehicle Length at Left Side	mm	4585
Total Vehicle Length at Centerline	mm	4766
Total Vehicle Length at Right Side	mm	4585
Weight of Ballast in Cargo Area	kg	154.2
Weight of Vehicle Components Removed	kg	51.2
Amount of Stoddard Solvent in Fuel Tank	L	86.7

List of components removed to meet test weight: Spare tire, tools, trunk carpet, right rear taillight, floor mats, rear trunk trim.

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

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4766
2	Total Width	1944
3	Bumper Top Height	580
4	Bumper Bottom Height	490
5	Longitudinal Member Top Height	580
6	Distance between Longitudinal Members	786
7	Longitudinal Member Width	81
8	Engine Top Height	1095
9	Engine Bottom Height	289
10	Engine and Gearbox Width	1450
11	Front Bumper-Engine Distance	450
12	Front Shock Absorber Fixing Height	1026
13	Bonnet Leading Edge Height	1012
14	Front Shock Absorber Fixing Width	56
15	Front Bumper – Front Axle Distance	860
16	Front Axle – A-Pillar Distance	575
17	A-Pillar – B-Pillar Distance	1180
18	B-Pillar – Rear Axle Distance	1175
19	B-Pillar – C-Pillar Distance	616
20	Roof Sill Bottom Height	1676
21	Roof Sill Top Height	1700
22	Floor Sill bottom Height	410
23	Floor Sill Top Height	465

DATA SHEET NO. 2

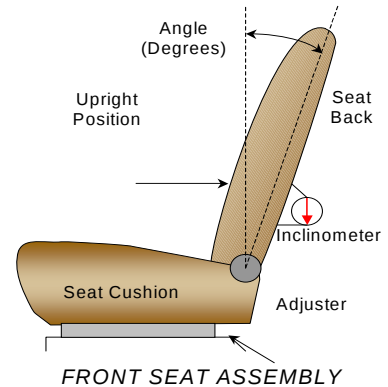
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

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 Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.



SEAT BACK ANGLE	Degrees
Driver Seat Back Angle	14.0° on headrest post
Passenger Seat Back Angle	10.5° on headrest post

SEAT FORE/AFT POSITIONS

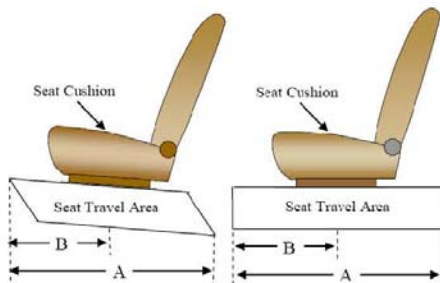
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	325 mm	163 mm (forward-most as 0)
Passenger Seat	280 mm	0 mm (forward-most as 0)

SEAT BELT UPPER ANCHORAGES

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

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	5	2 (uppermost as 0)
Passenger Seat	5	0 (uppermost as 0)



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

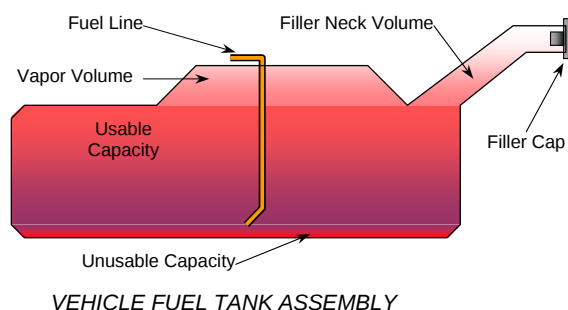
NHTSA No.: MB0311
 Test Date: 8/26/2010

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	93.5
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	86.0 to 87.9
Actual Amount of Solvent used	86.7
1/3 of Usable Capacity	31.2

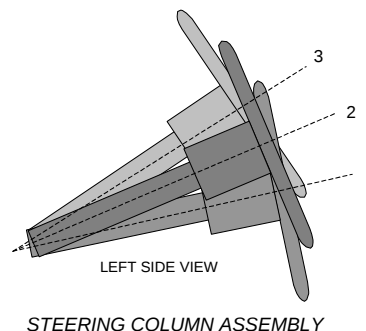
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. The fuel pump starts pumping fuel when the key is in the "ON" position. The fuel filler pipe is located on the left 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.



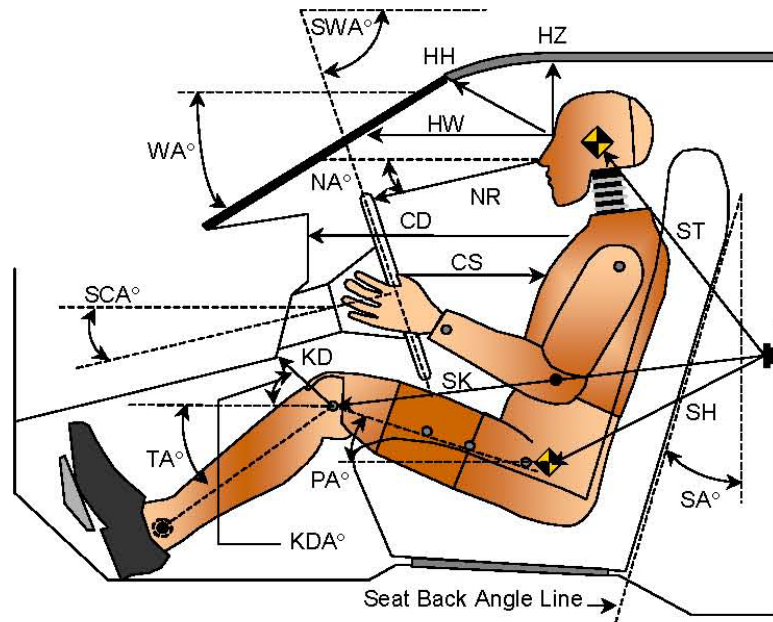
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	69.8	250
Geometric Center – Position 2	67.6	220
Uppermost – Position 3	65.4	190
Telescoping Steering Wheel Travel		60
Test Position	67.6	220

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

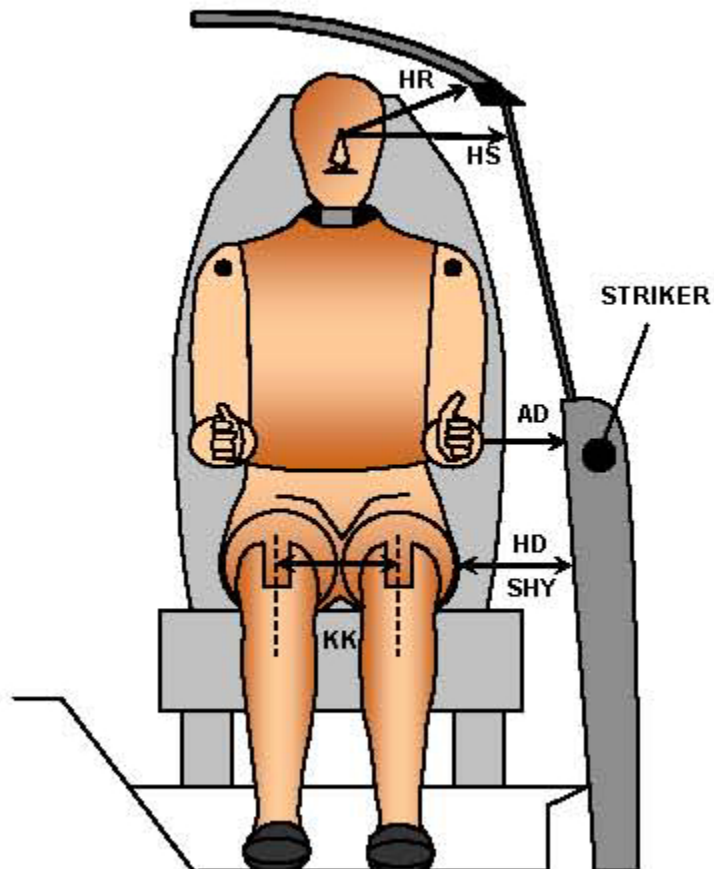


Code	Measurement Description	Driver S/N 351		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		29.0		
SWA	Steering Wheel Angle		67.6		
SCA	Steering Column Angle		22.4		
SA	Seat Back Angle (headrest bezel)		14.0		10.5
HZ	Head to Roof (Z)	216	90	206	90
HH	Head to Header	410	19.8	319	37.1
HW	Head to Windshield	680	0	646	0
NR	Nose to Rim	395	11.0		
CD	Chest to Dash	534		396	
CS	Chest to Steering Hub	309	1.0		
RA	Rim to Abdomen	198	0		
KDL	Left Knee to Dash	197	30.7	90	33.1
KDR	Right Knee to Dash	158	29.4	105	32.4
PA	Pelvic Angle		24.7		21.7
TA	Tibia Angle		44.1		61.0
SK	Striker to Knee	573	91.0	682	92.5
ST	Striker to Head	551	11.3	557	24.8
SH	Striker to H-Point	227	122.1	343	113.1

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

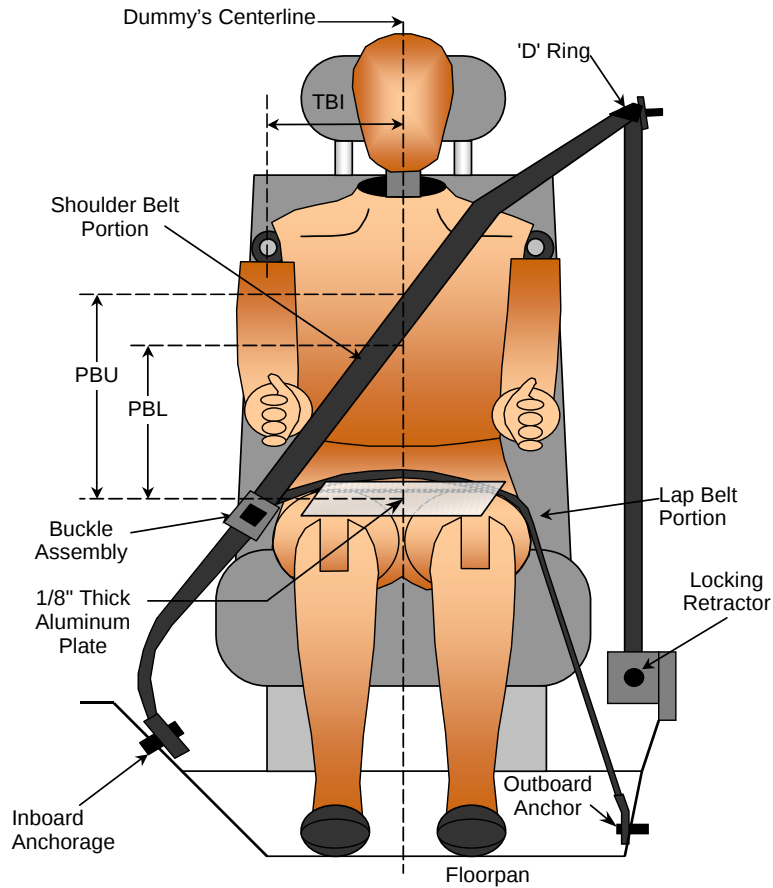


Code	Measurement Description	Driver S/N 351	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	120	120
HD	H-Point to Door	168	189
HR	Head to Side Header	238	261
HS	Head to Side Window	342	379
KK	Knee to Knee	325	210
SHY	Striker to H-Point (Y Direction)	297	320
AA	Ankle to Ankle	310	175

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

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	345	295
PBL - To surface of reference to belt lower edge	mm	270	200

BELT LENGTH DATA

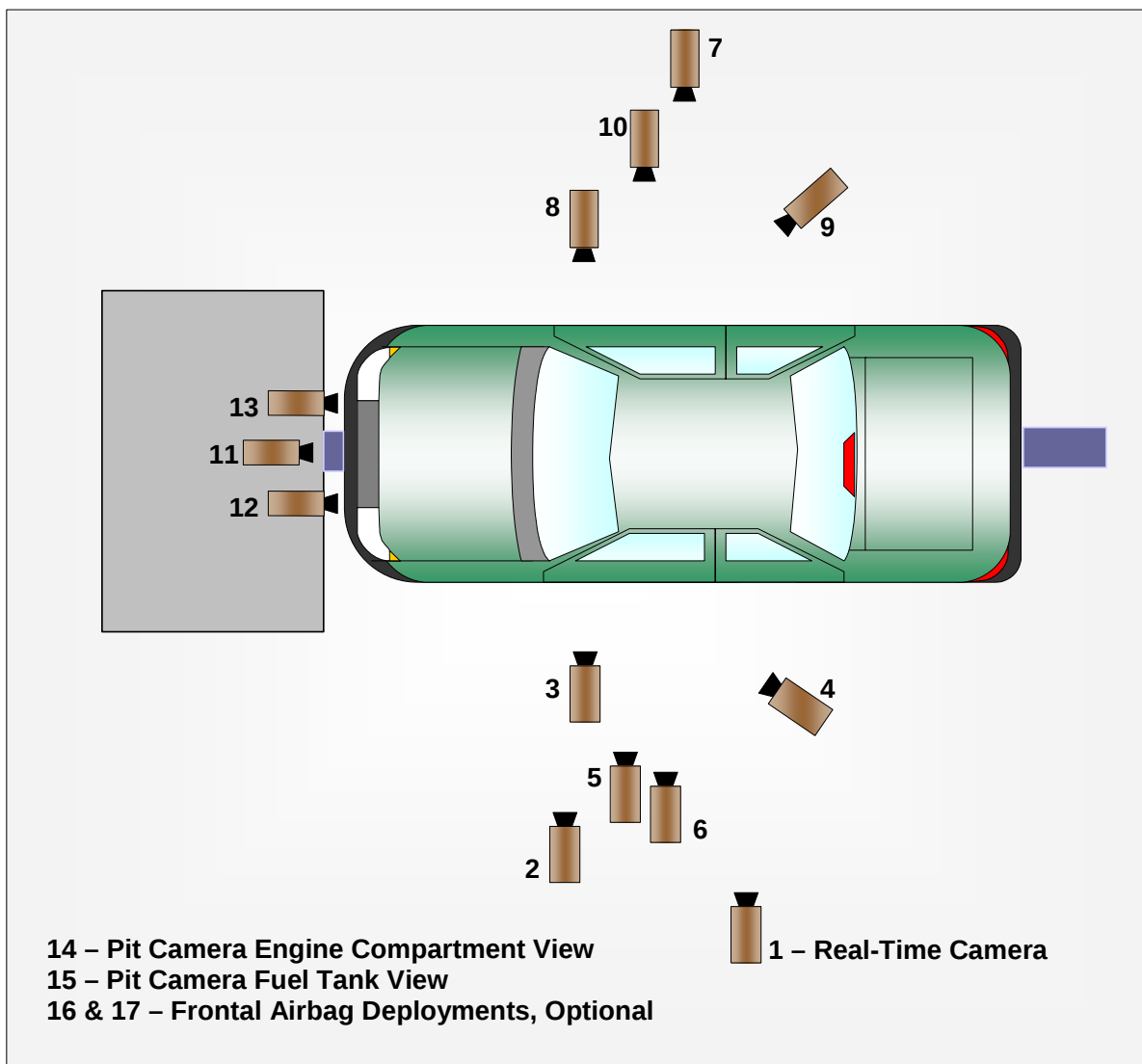
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	890	945
Lap Belt Length as measured on ATD	mm	580	585
Remainder of belt of reel	mm	1440	1300
Total Belt Length for Continuous Webbing Systems	mm	2910	2830

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

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
Test Date: 8/26/2010

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Side View					30
2	Left Front Half	1220	-5110	-1110	24	1000
3	Driver Close-Up	1380	-6140	-1780	35	1000
4	Driver Angle	5510	-4860	-1870	50	1000
5	Steering Column Top	710	-5390	-1290	25	1000
6	Steering Column Bottom	690	-5420	-880	25	1000
7	Right Overall	2000	6310	-1180	20	1000
8	Passenger Close-Up	1440	6210	-1750	35	1000
9	Passenger Angle	5570	4780	-1940	50	1000
10	Right Front Half	1250	5080	-1210	24	1000
11	Windshield	-260	0	-2860	24	1000
12	Top Driver	-30	-360	-2270	16	1000
13	Top Passenger	-30	360	-2270	16	1000
14	Pit Front	1190	0	3150	24	1000
15	Pit Rear	3270	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

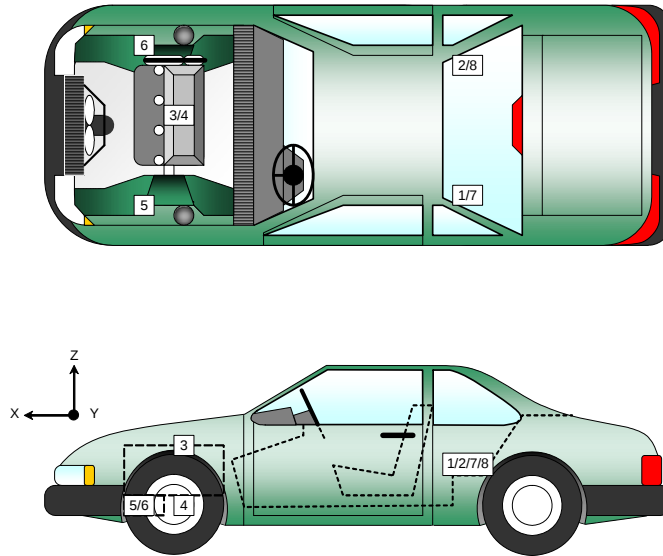
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1902	-410	-498
2	Right Rear X-Member X	1902	410	-498
3	Engine Top X	3908	0	-1106
4	Engine Bottom X	3753	0	-284
5	Left Brake Caliper X	3863	-727	-282
6	Right Brake Caliper X	3863	727	-282
7	Left Rear X-Member Z	1902	-410	-498
8	Right Rear X-Member Z	1902	410	-498

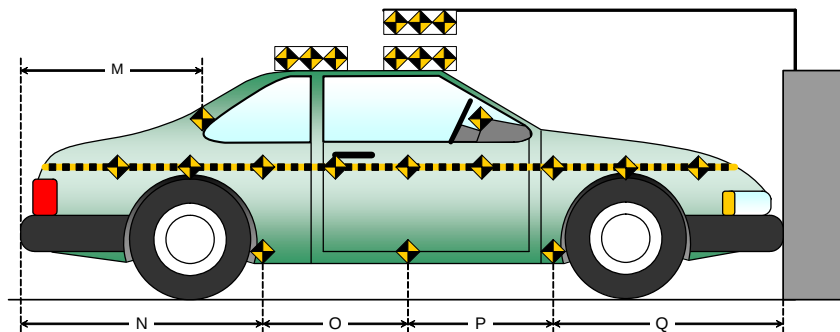
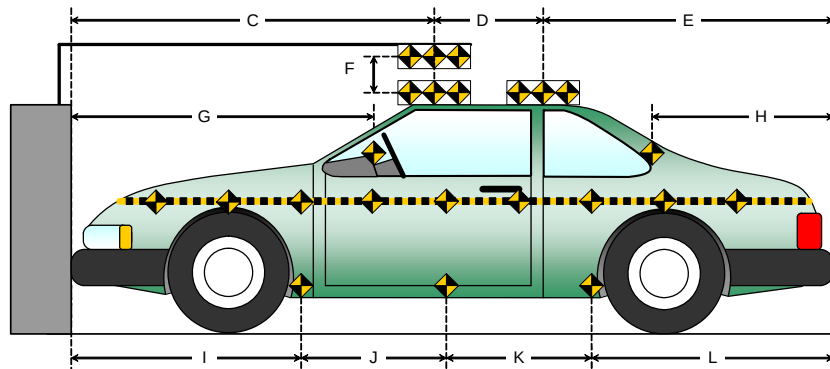
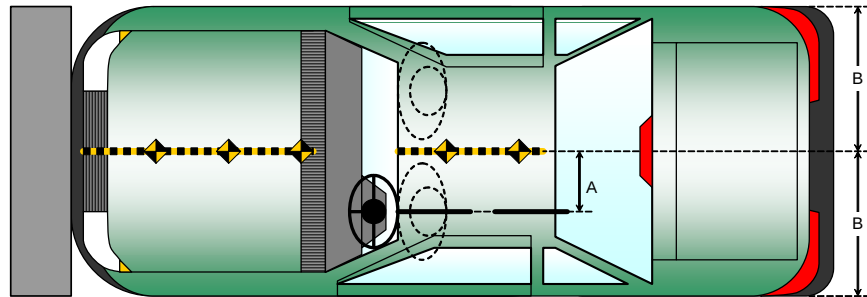
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

Item	Value (mm)
A	415
B	972
C	2450
D	660
E	1656
F	135
G	
H	1429
I	1455
J	898
K	893
L	1520
M	1427
N	1520
O	893
P	897
Q	1456



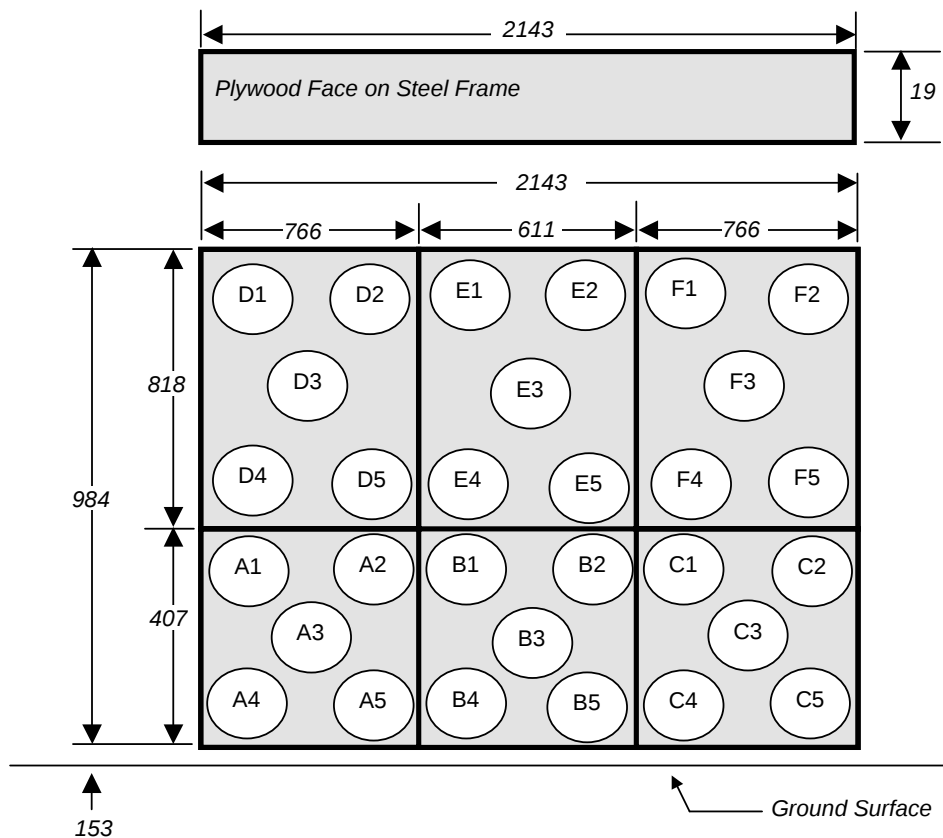
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

30 Load Cell Rigid Barrier Load Cell Locations on Fixed Barrier



Group 4 D1-D5	Group 5 E1-E5	Group 6 F1-F5
Group 1 A1-A5	Group 2 B1-B5	Group 3 C1-C5

6 Groups of 5 Load Cells Each

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
Test Date: 8/26/2010

INSTRUMENTATION

Driver Dummy Data Channels	44
Passenger Dummy Data Channels	44
Vehicle Structure Accelerometers	8
Barrier Channels	6
Total	102

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: 2011 Jeep Grand Cherokee Laredo 4X4NHTSA No.: MB0311Test Program: NCAP Frontal Barrier Impact TestTest Date: 8/26/2010**TEST DUMMY INFORMATION AND CONTACT**

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 634
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	Airbag	Airbag
Left Knee Contact	Knee Bolster	Glovebox
Right Knee Contact	Knee Bolster	Glovebox

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	605
Center	mm	605
Right Side	mm	595
Average	mm	602

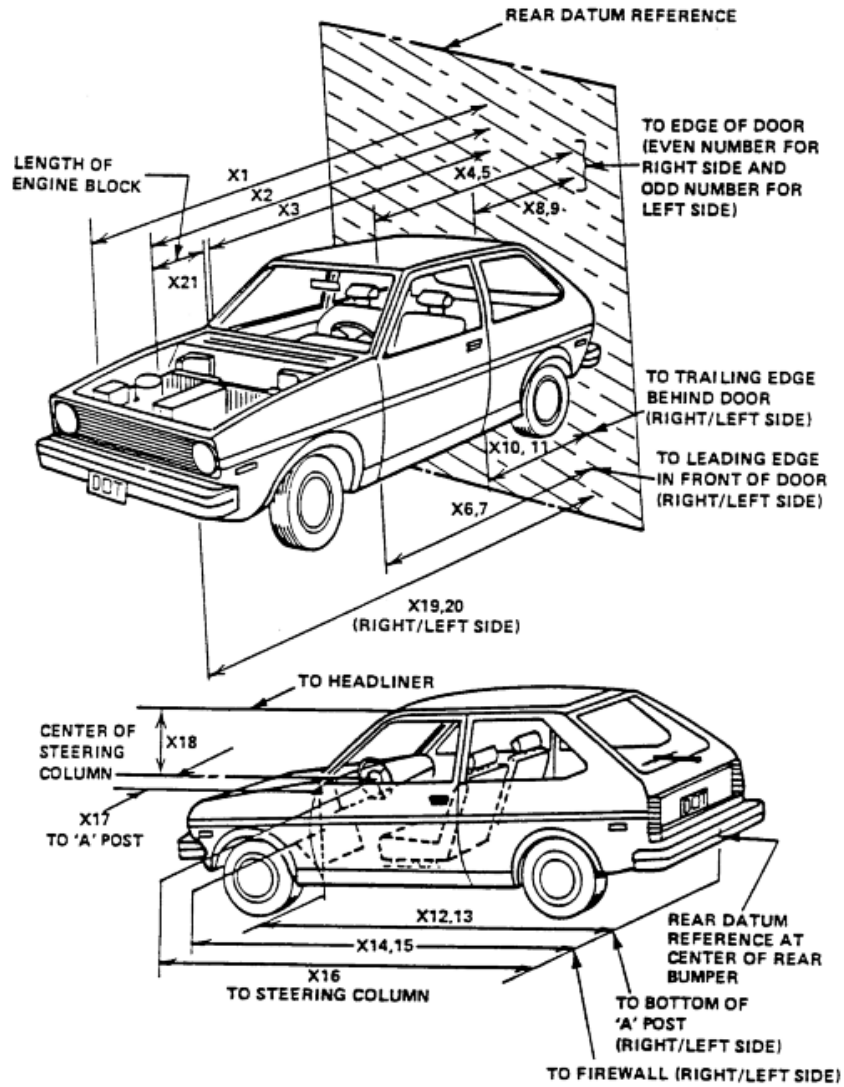
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Knee Airbag	No		No	
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12 **VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4766	4288	478
2	RSOV to Front of Engine	mm	4100	3927	173
3	RSOV to Firewall	mm	3754	3699	55
4	RSOV to Upper Leading Edge of Right Door	mm	3250	3250	0
5	RSOV to Upper Leading Edge of Left Door	mm	3250	3252	-2
6	RSOV to Lower Leading Edge of Right Door	mm	3236	3236	0
7	RSOV to Lower Leading Edge of Left Door	mm	3236	3228	8
8	RSOV to Upper Trailing Edge of Right Door	mm	2150	2150	0
9	RSOV to Upper Trailing Edge of Left Door	mm	2150	2145	5
10	RSOV to Lower Trailing Edge of Right Door	mm	2167	2167	0
11	RSOV to Lower Trailing Edge of Left Door	mm	2169	2165	4
12	RSOV to Bottom of "A" Post of Right Side	mm	3132	3132	0
13	RSOV to Bottom of "A" Post of Left Side	mm	3132	3132	0
14	RSOV to Firewall, Right Side	mm	3739	3721	18
15	RSOV to Firewall, Left Side	mm	3739	3719	20
16	RSOV to Steering Column	mm	2766	2768	-2
17	Center of Steering Column to "A" Post	mm	372	371	1
18	Center of Steering Column to Headliner	mm	412	415	-3
19	RSOV to Right Side of Front Bumper	mm	4585	4263	322
20	RSOV to Left Side of Front Bumper	mm	4585	4226	359
21	Length of Engine Block	mm	564	564	0
RD	RSOV to Right Side of Dash Panel	mm	3039	3039	0
CD	RSOV to Center of Dash Panel	mm	2980	2980	0
LD	RSOV to Left Side of Dash Panel	mm	3050	3042	8

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

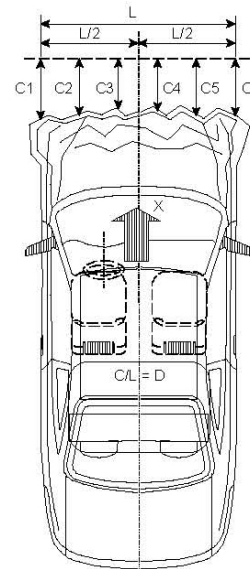
Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4 NHTSA No.: MB0311
 Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/26/2010

VEHICLE INFORMATION

VIN: 1J4RR4GG2BC509137 Wheelbase (mm): 2912
 Vehicle Size Category: MPV Test Weight (kg): 2407.8

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): 56.3
 Velocity Change (km/h): 61.8
 Time of Separation (msec): 98.0



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1580
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4585	4226	359
C2	Crush zone 2 at left side	mm	4695	4212	483
C3	Crush zone 3 at left side	mm	4755	4238	517
C4	Crush zone 4 at right side	mm	4755	4234	521
C5	Crush zone 5 at right side	mm	4695	4222	473
C6	Crush zone 6 at right side	mm	4585	4263	322
L	C1 TO C6	mm	1580	1570	10

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

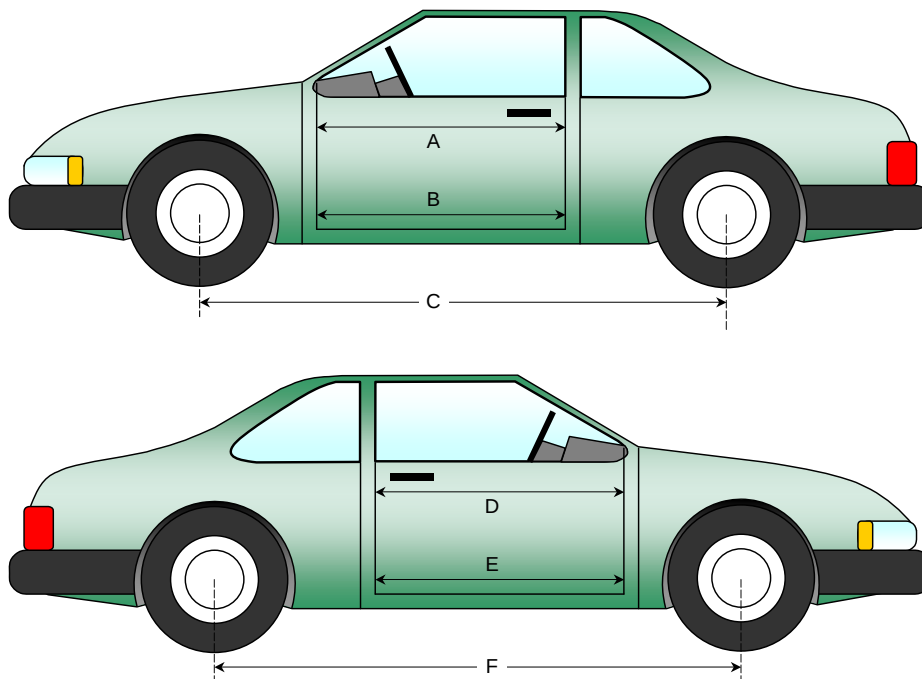
NHTSA No.: MB0311
 Test Date: 8/26/2010

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	974	974	0
B	Left Side Lower	mm	902	902	0
D	Right Side Upper	mm	974	974	0
E	Right Side Lower	mm	904	902	2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2912	2802	110
F	Right Side Wheelbase	mm	2912	2802	110



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

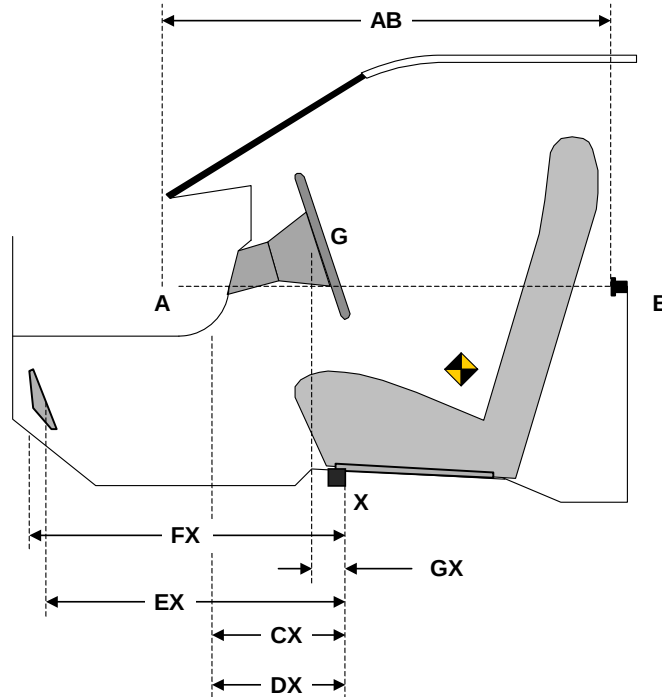
Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	799	799	0
CX	Left Knee Bolster to X	mm	318	330	-12
DX	Right Knee Bolster to X	mm	308	342	-34
EX	Brake Pedal to X	mm	524	524	0
FX	Foot Rest to X	mm	590	585	5
GX	Center of Steering Column Wheel Hub to X	mm	50	85	-35

X = Front of Seat Track (stationary)

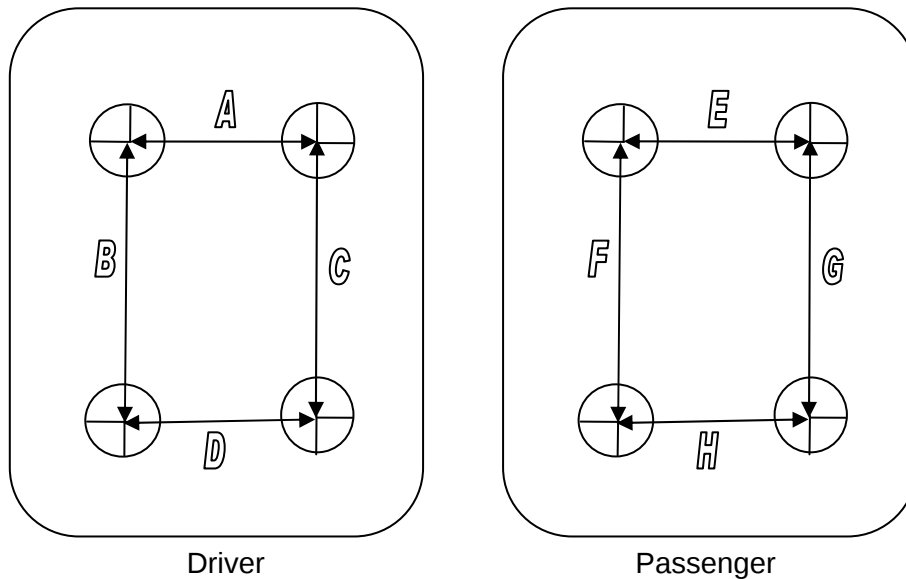


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	100	96	4
B	mm	100	90	10
C	mm	100	97	3
D	mm	100	97	3
E	mm	100	100	0
F	mm	100	98	2
G	mm	100	97	3
H	mm	100	100	0

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

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

Windshield Mounting Details:

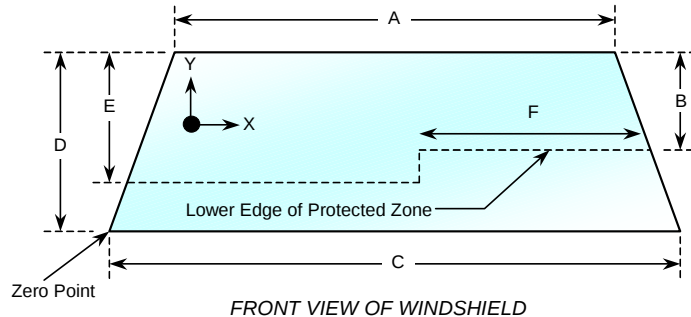
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pretest 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°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2252	2252	100
Right Side	2252	2252	100
Total	4504	4504	100



Item	Units	Value
A	mm	1325
B	mm	466
C	mm	1523
D	mm	828
E	mm	520
F	mm	514

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, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4 NHTSA No.: MB0311
Test Program: NCAP Frontal Barrier Impact Test Test Date: 8/26/2010

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time: 10:43 am Temperature: 21° C

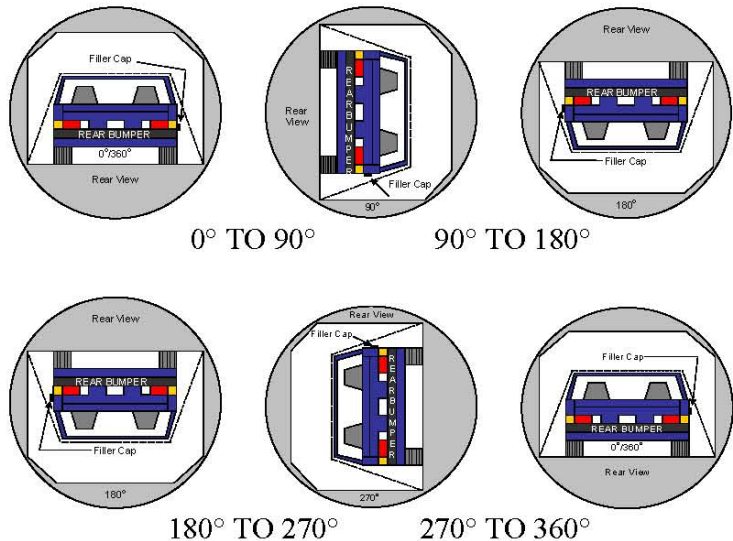
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: None
(Maximum allowable = 5 ounces)
- C. For the following 25 minutes: None
(Maximum allowable = 1 oz./minute)
- D. Spillage Details: None

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
 Test Date: 8/26/2010

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°	110	300	410
90° to 180°	113	300	413
180° to 270°	105	300	405
270° to 360°	113	300	413

FMVSS 301 ROLLOVER 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

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

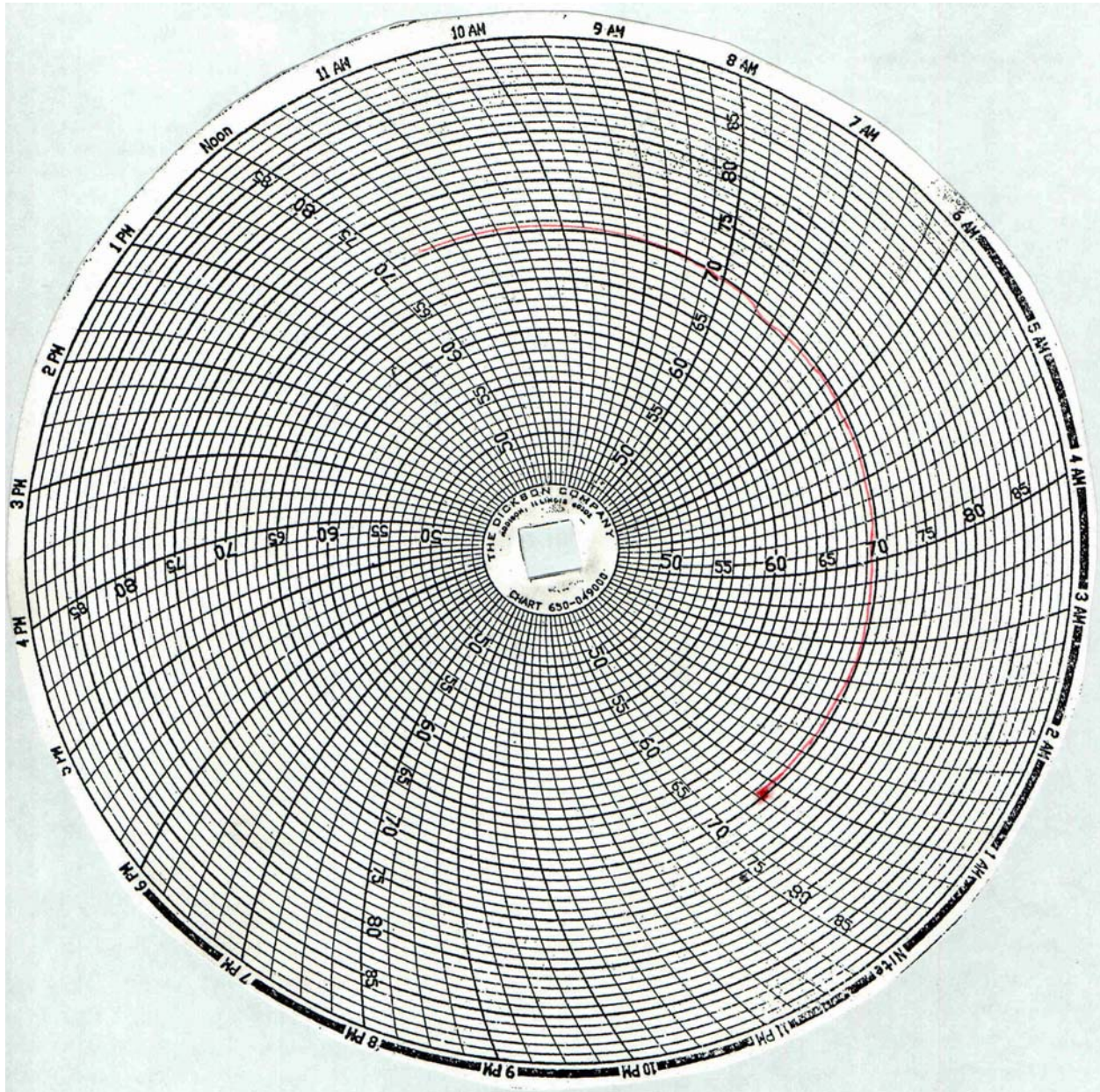
Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Jeep Grand Cherokee Laredo 4X4
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0311
Test Date: 8/26/2010



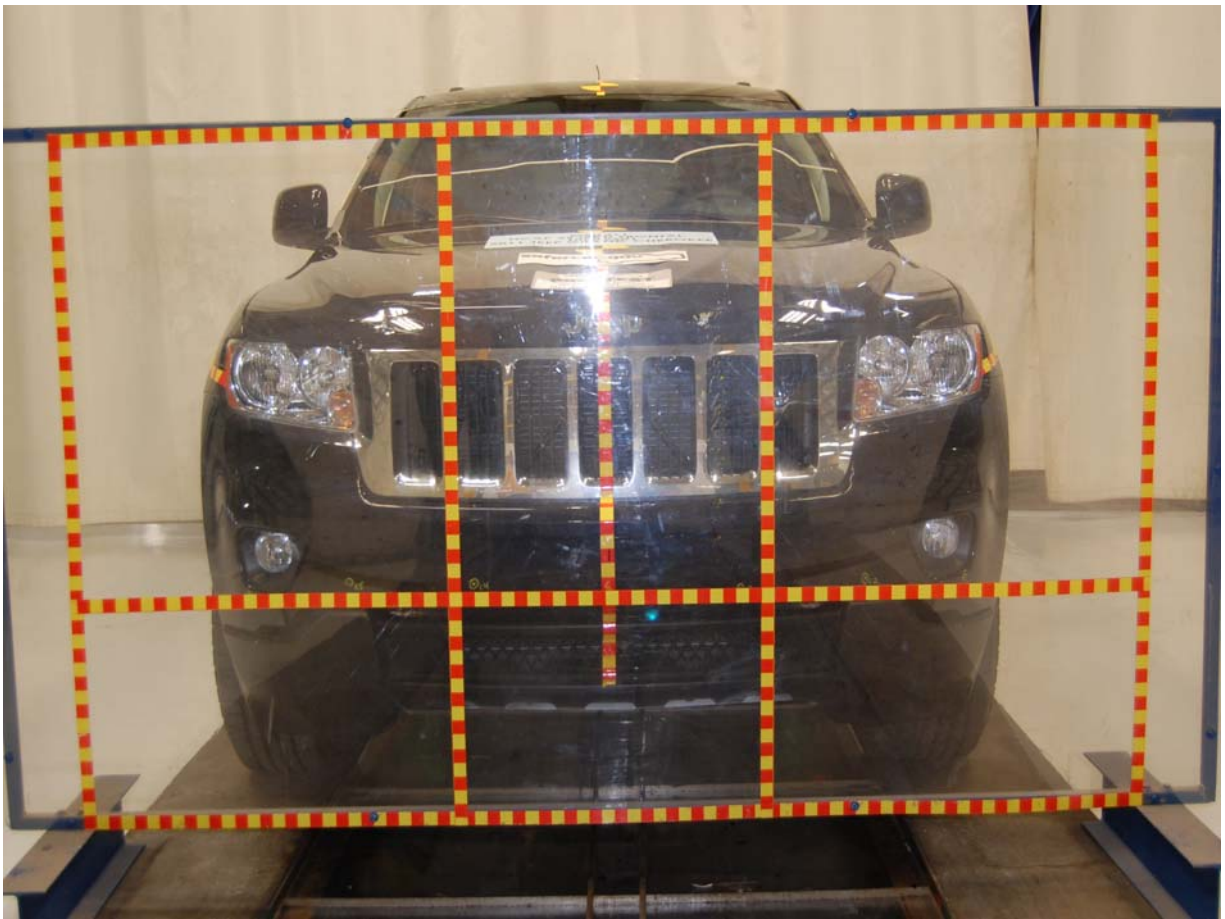
APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

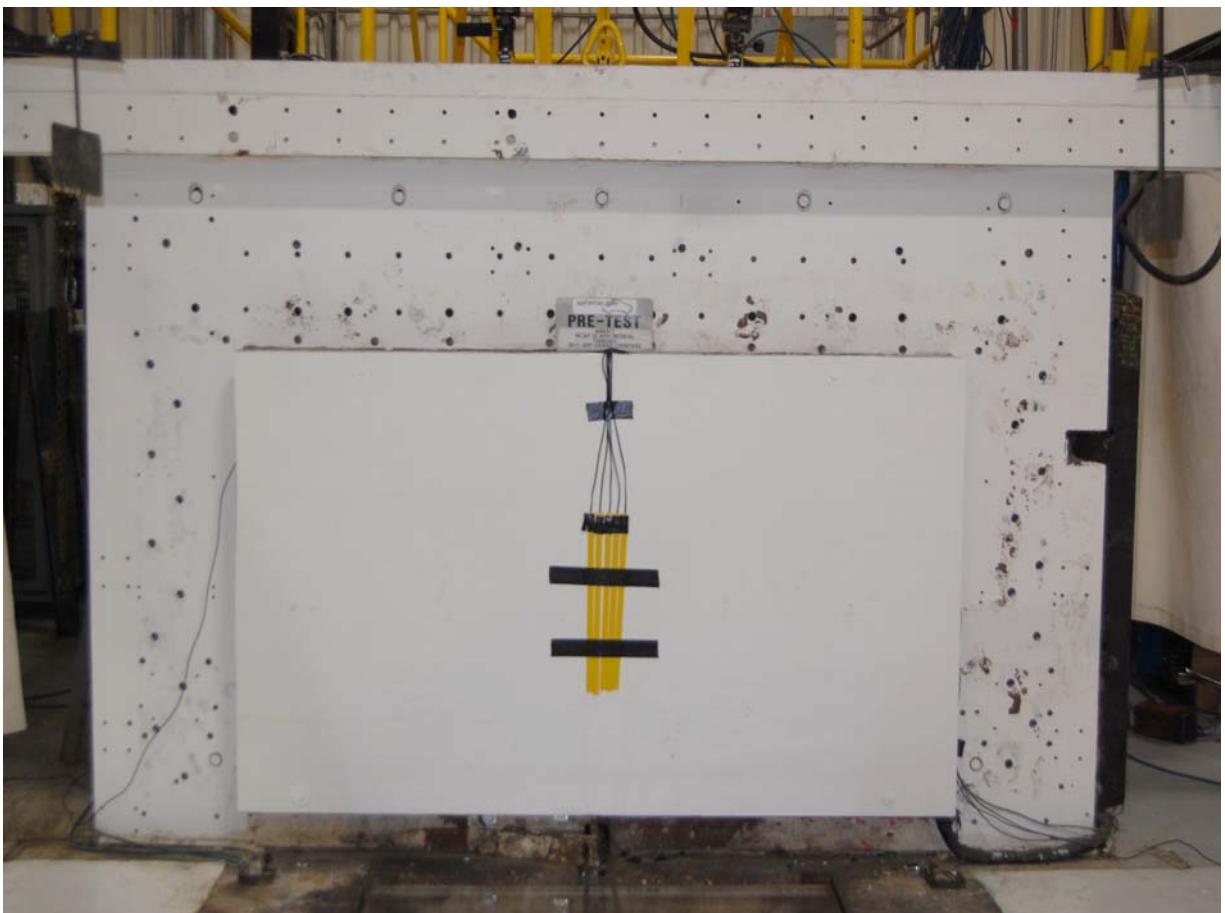
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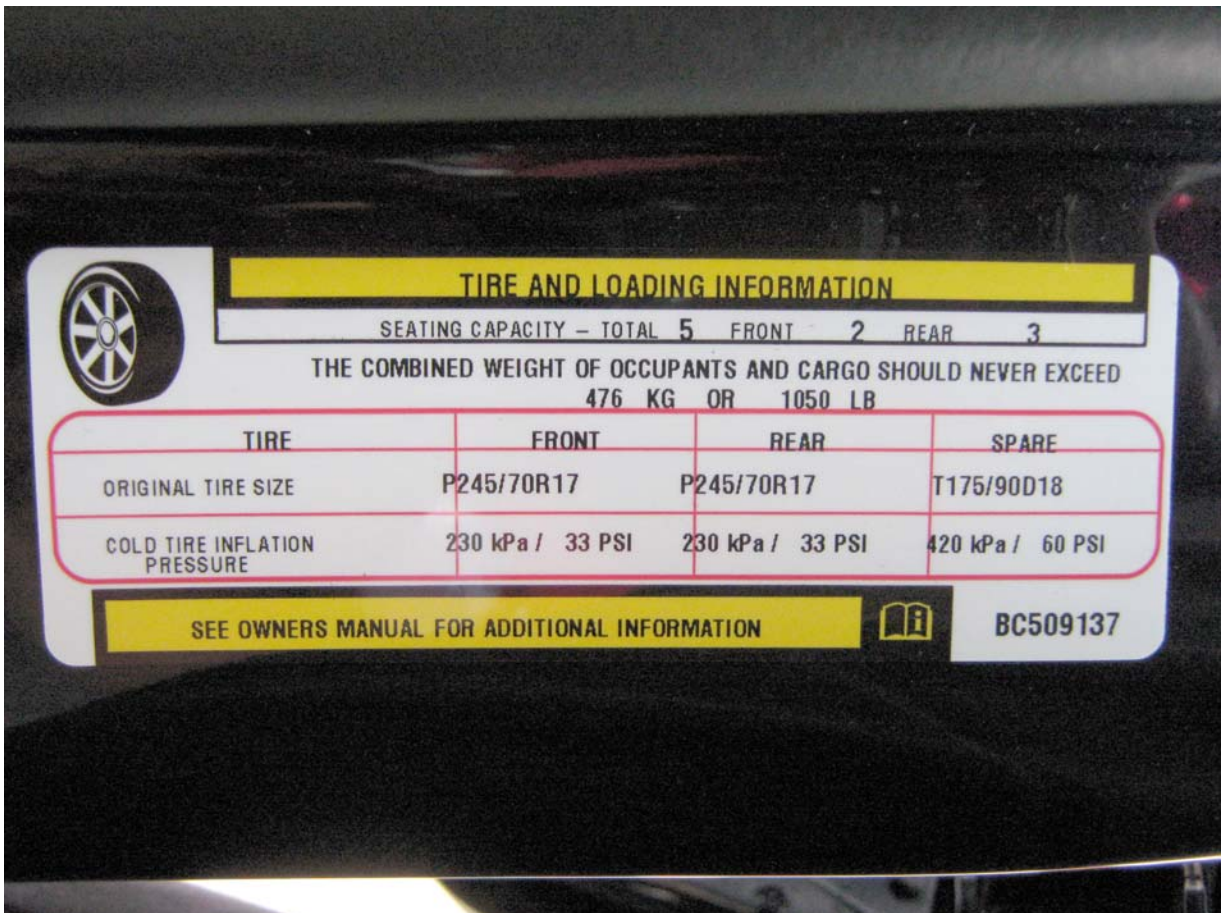
Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



Right Front Three-Quarter View, As Received



Left Rear Three-Quarter View, As Received



Pre-Test Front View



Post-Test Front View



Pre-Test Left Side View



Post-Test Left Side View



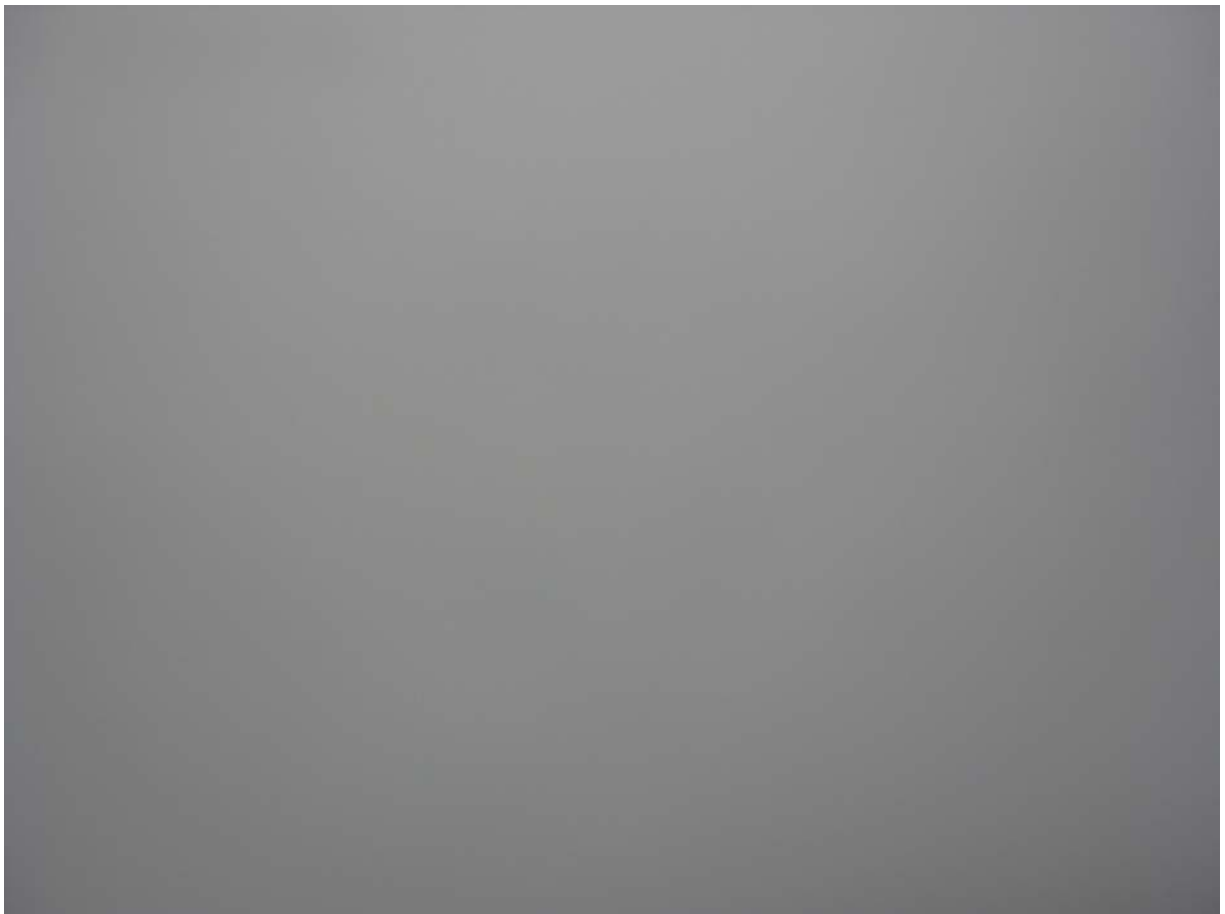
Pre-Test Right Side View



Post-Test Right Side View



Pre-Test Right Front $\frac{3}{4}$ View



Post-Test Right Front $\frac{3}{4}$ View (photo not available)



Pre-Test Left Rear $\frac{3}{4}$ View



Post-Test Left Rear $\frac{3}{4}$ View



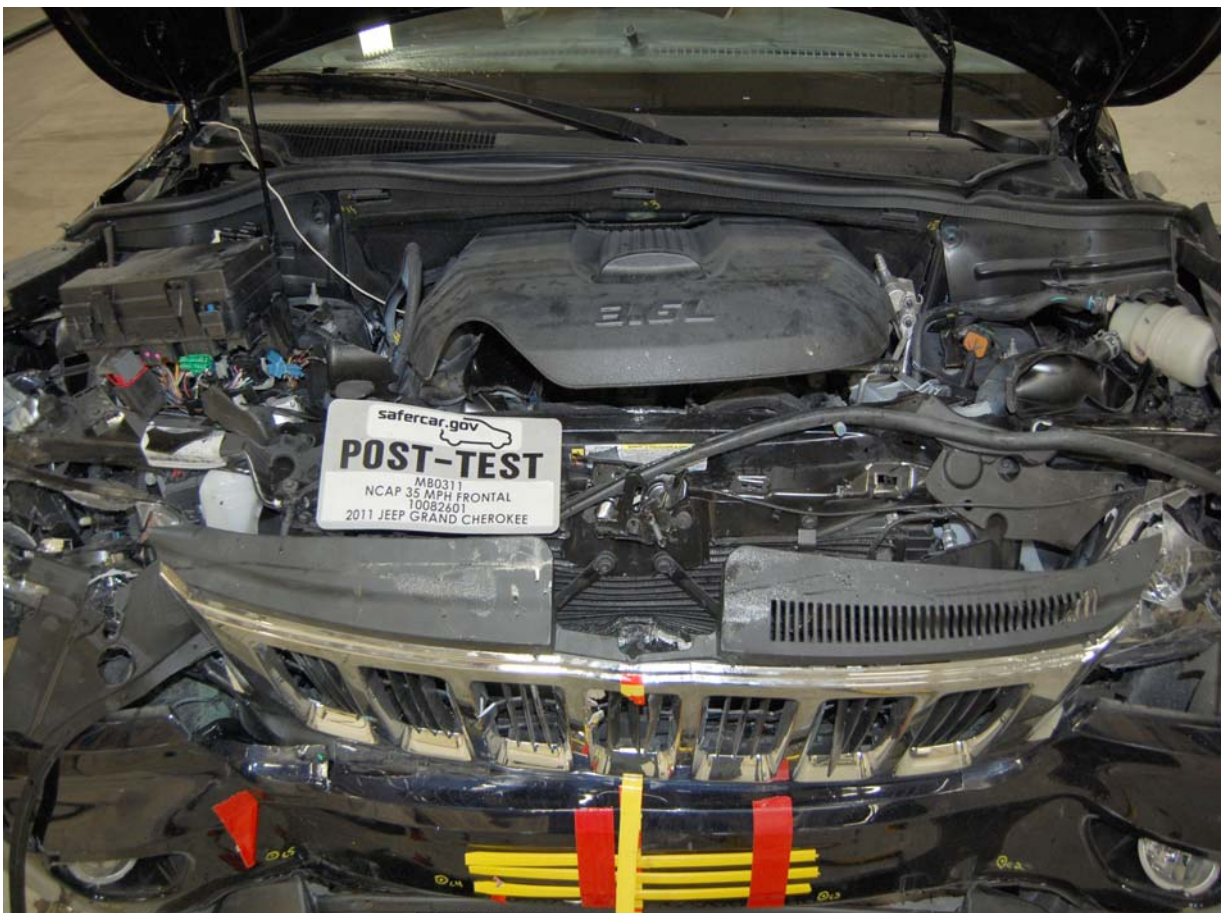
Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



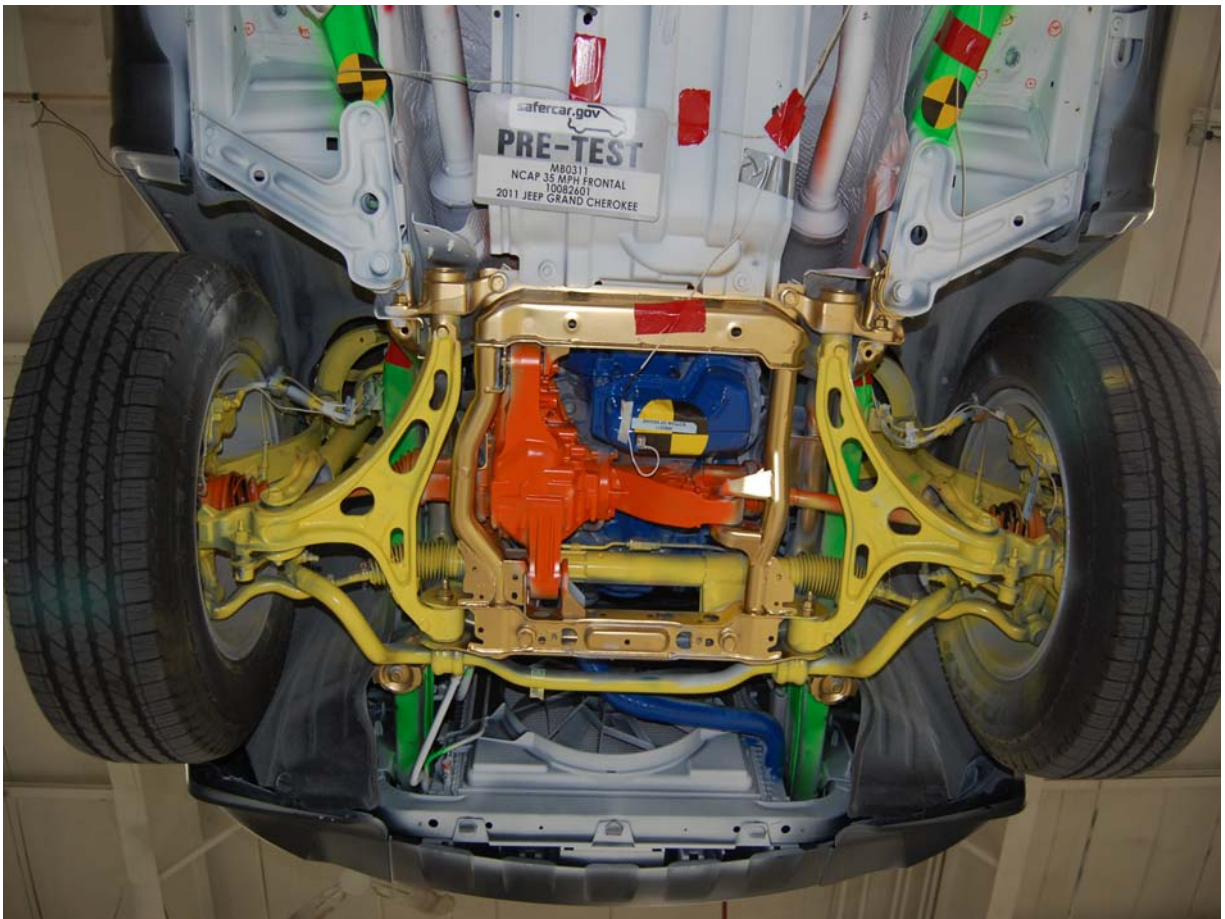
Post-Test Engine Compartment View



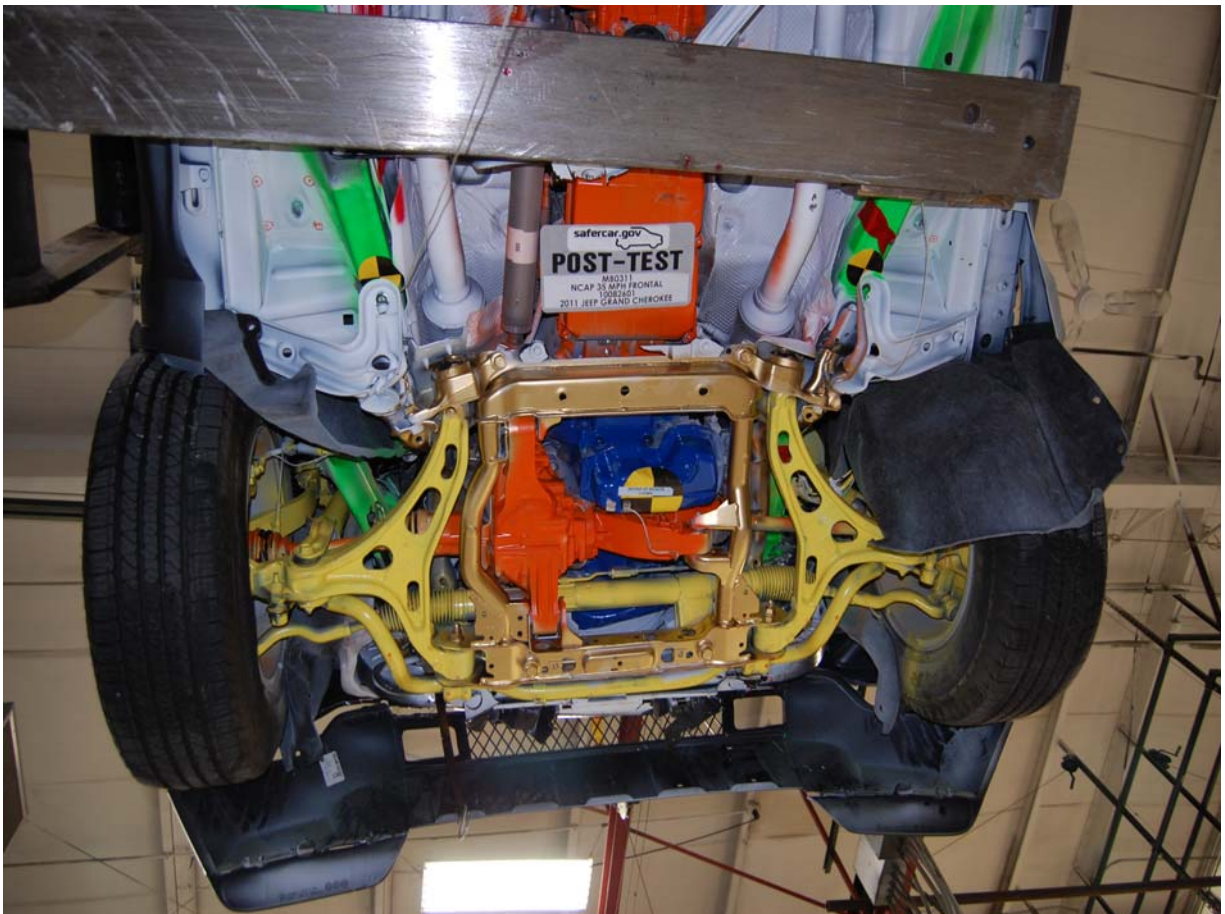
Pre-Test Fuel Cap View



Post-Test Fuel Cap View



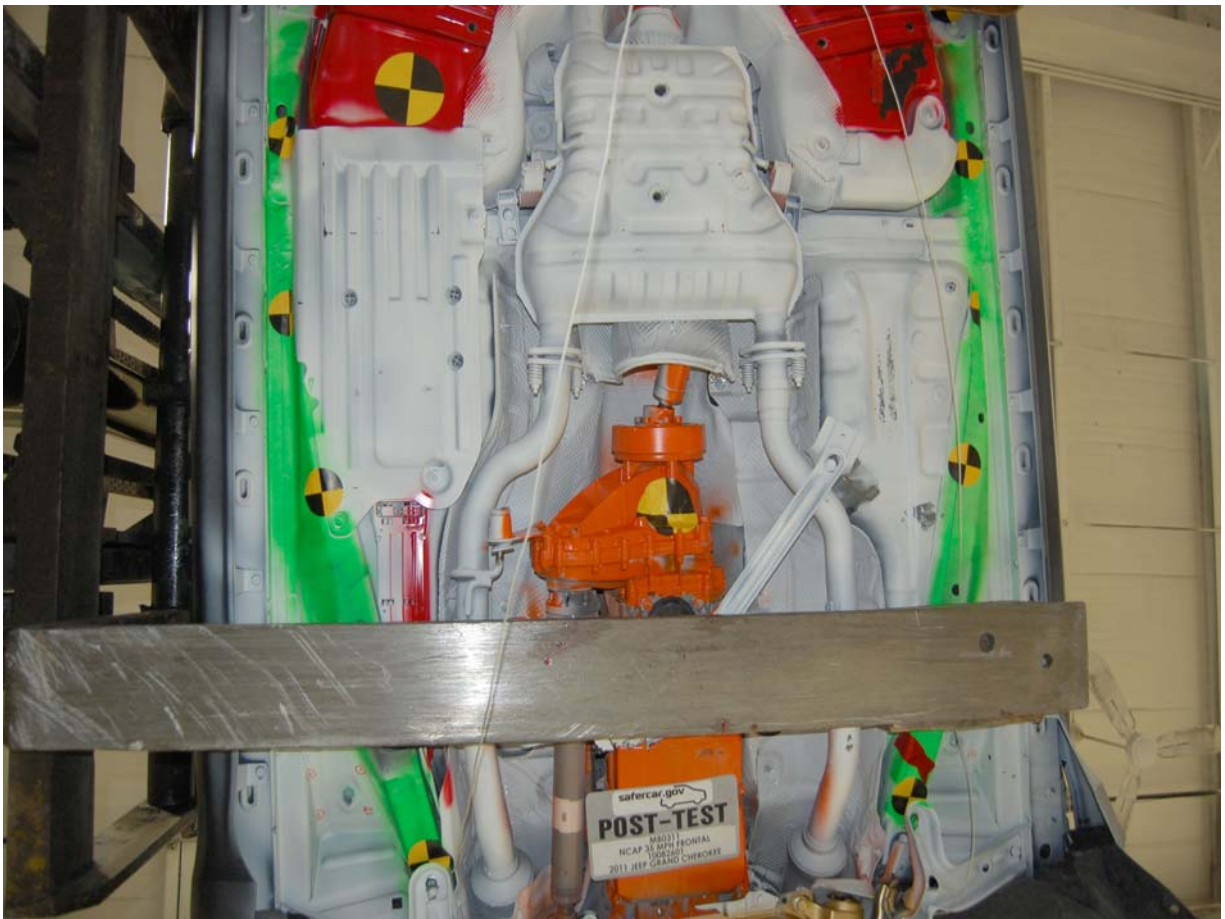
Pre-Test Front Underbody View



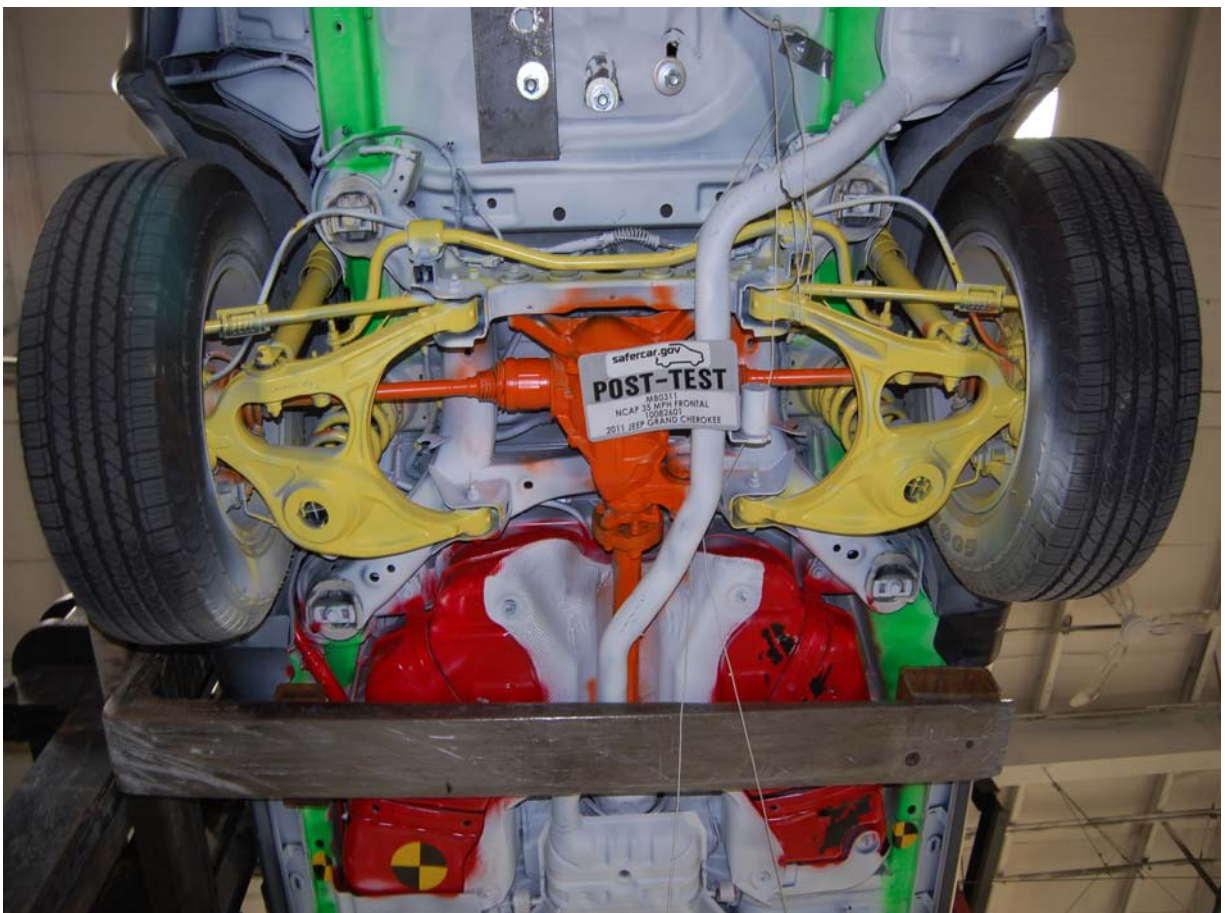
Post-Test Front Underbody View



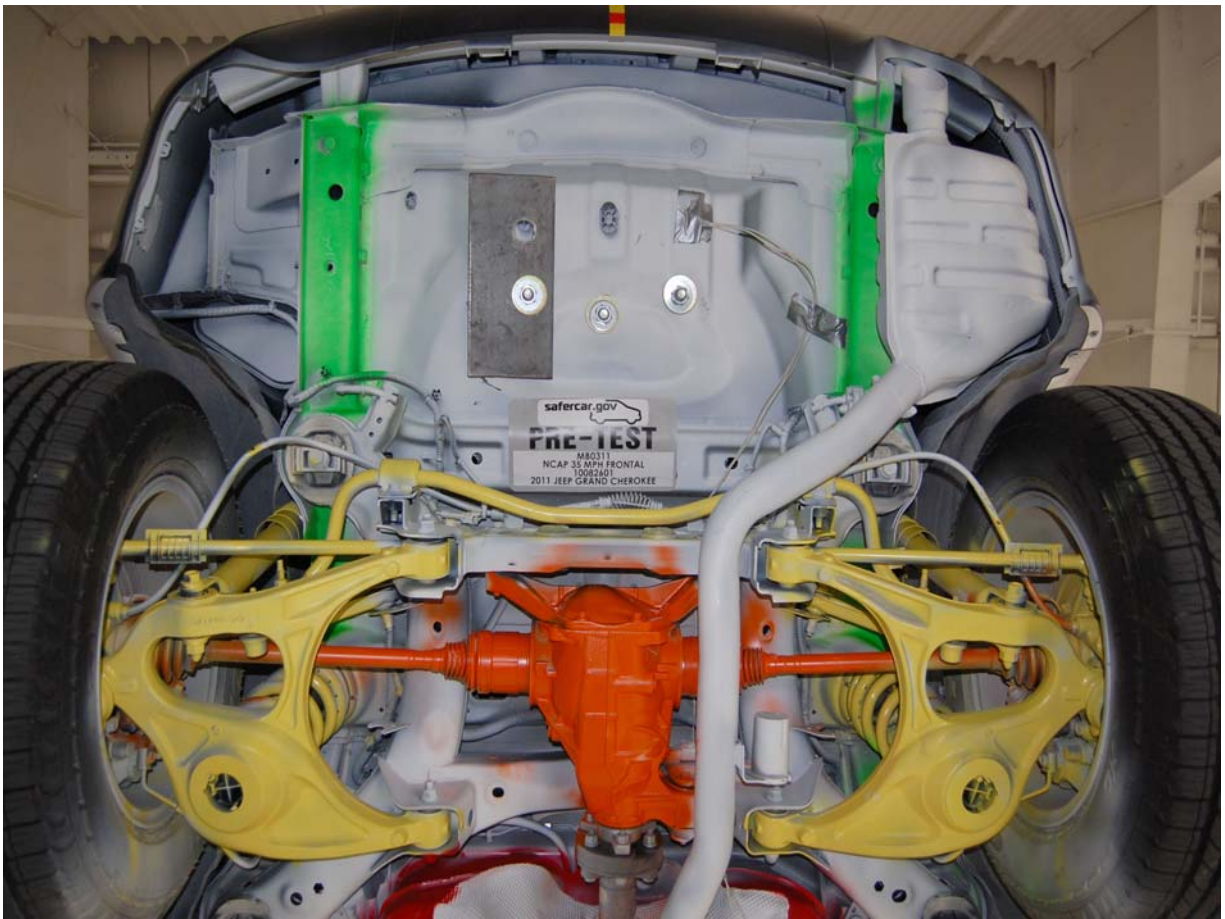
Pre-Test Mid Underbody View



Post-Test Mid Front 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 Driver Dummy Feet



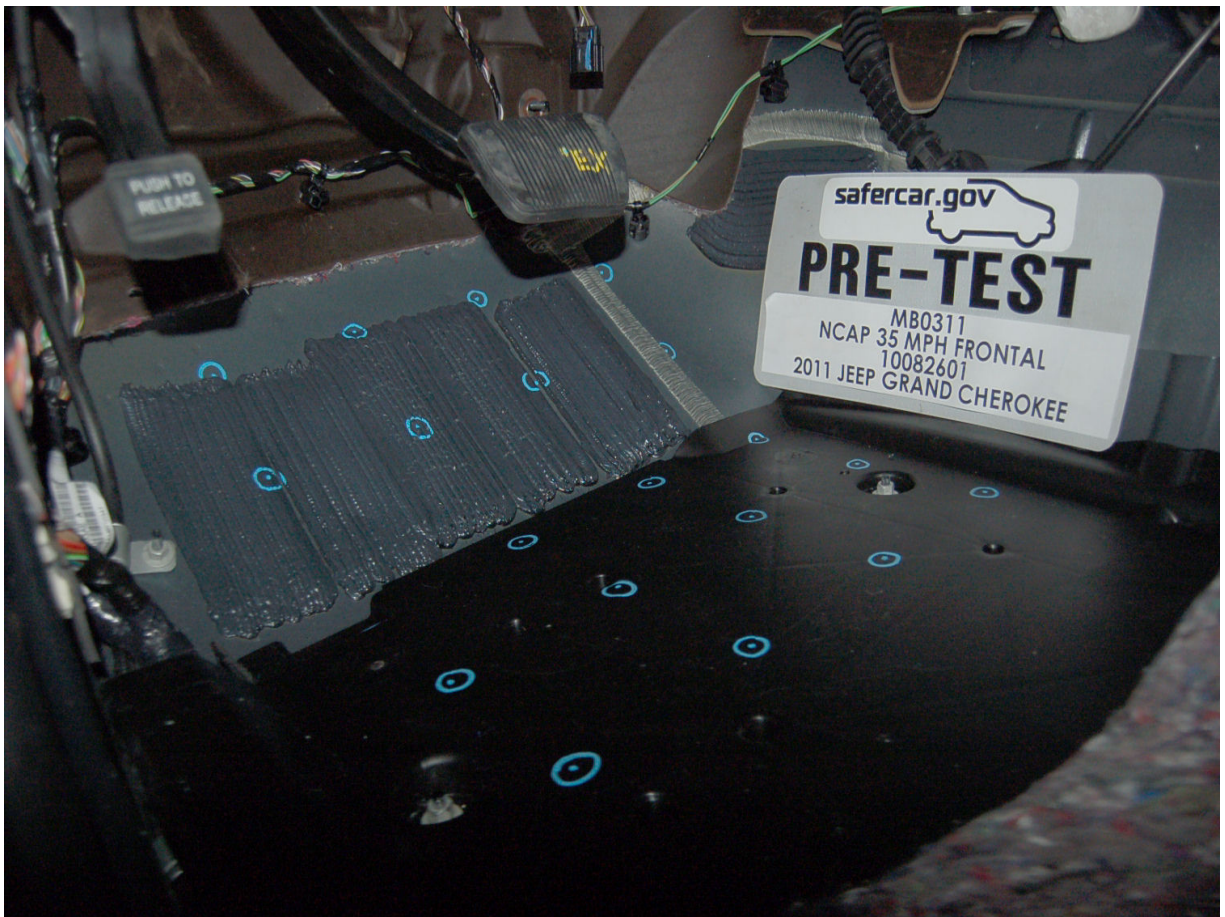
Post-Test Driver Dummy Feet



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 Contact with Headrest



Post-Test Driver Dummy Contact with Knee Bolster



Post-Test Driver Dummy Contact with Airbag



Pre-Test View of Steering Column Shear Capsule



Post-Test View of Steering Column Shear Capsule



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 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)



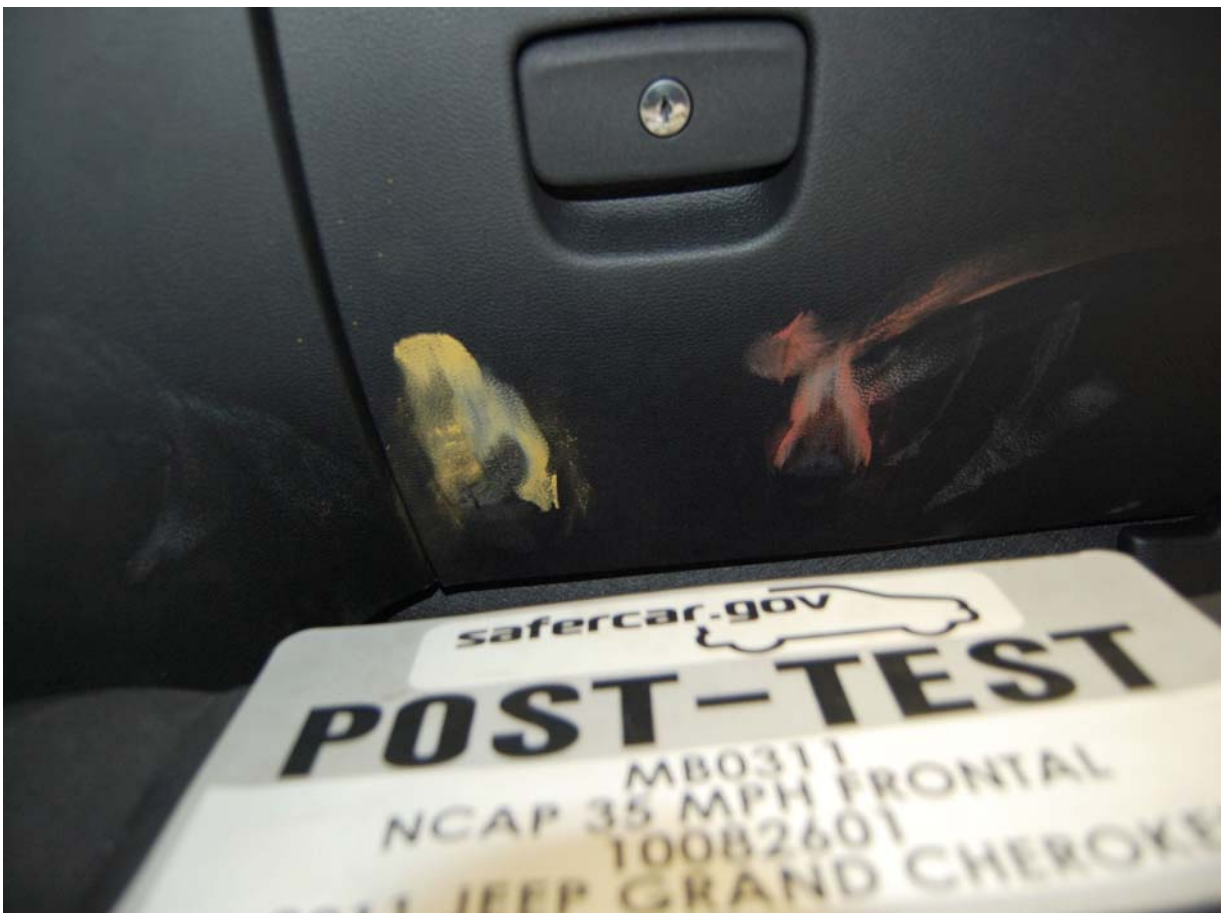
Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Contact with Headrest



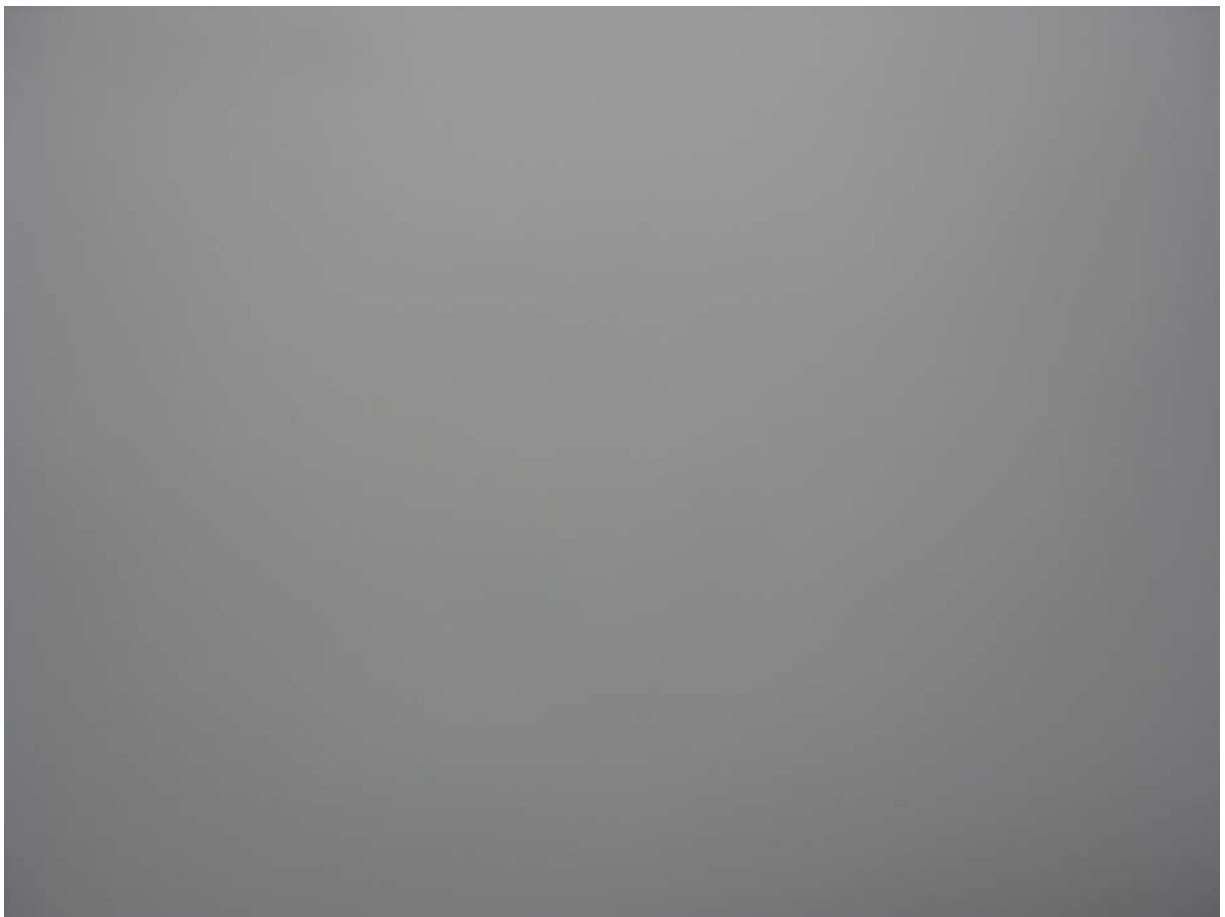
Post-Test Passenger Dummy Contact with Knee Bolster



Post-Test Passenger Dummy Contact with Airbag



Ballast Installed in Vehicle



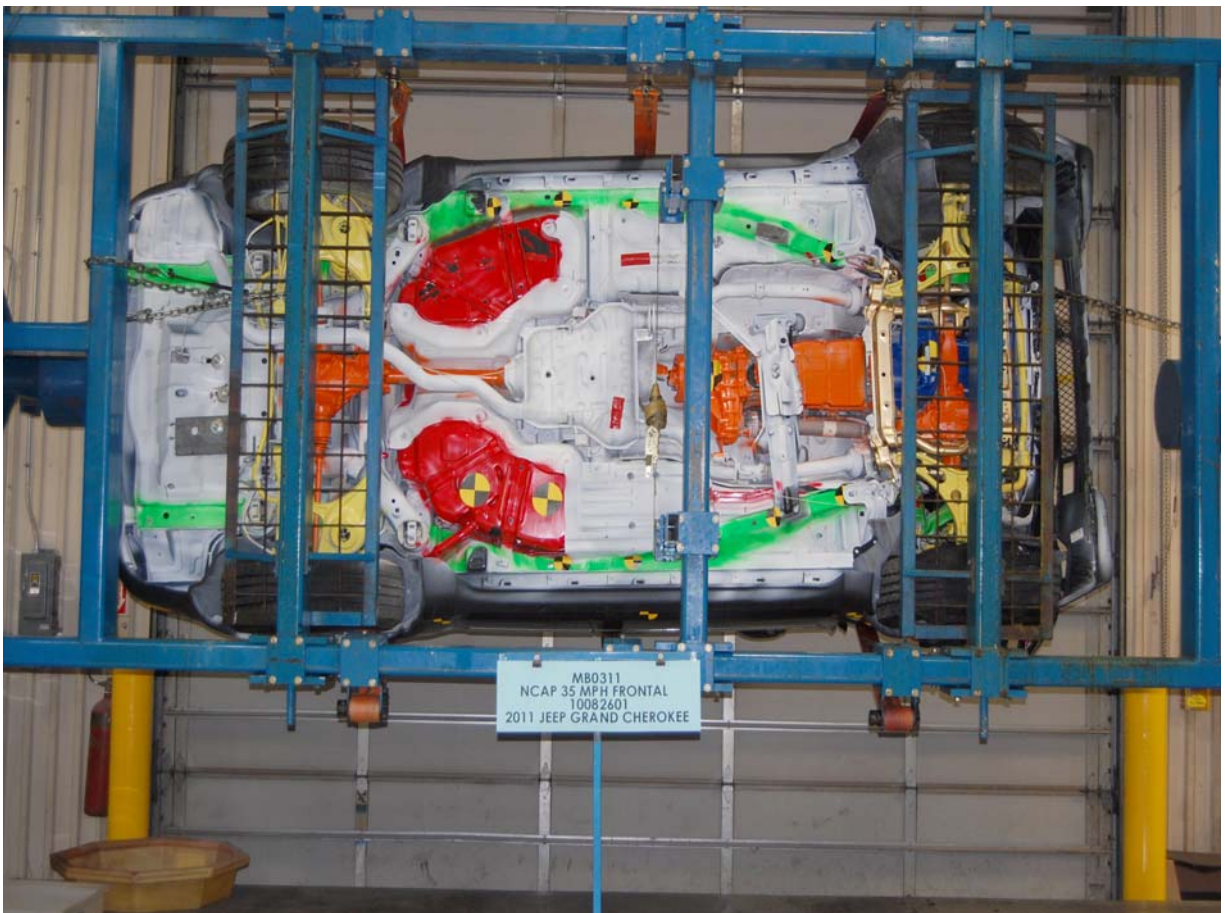
Post-Test Stoddard Solvent Spillage Location View (Not Applicable)



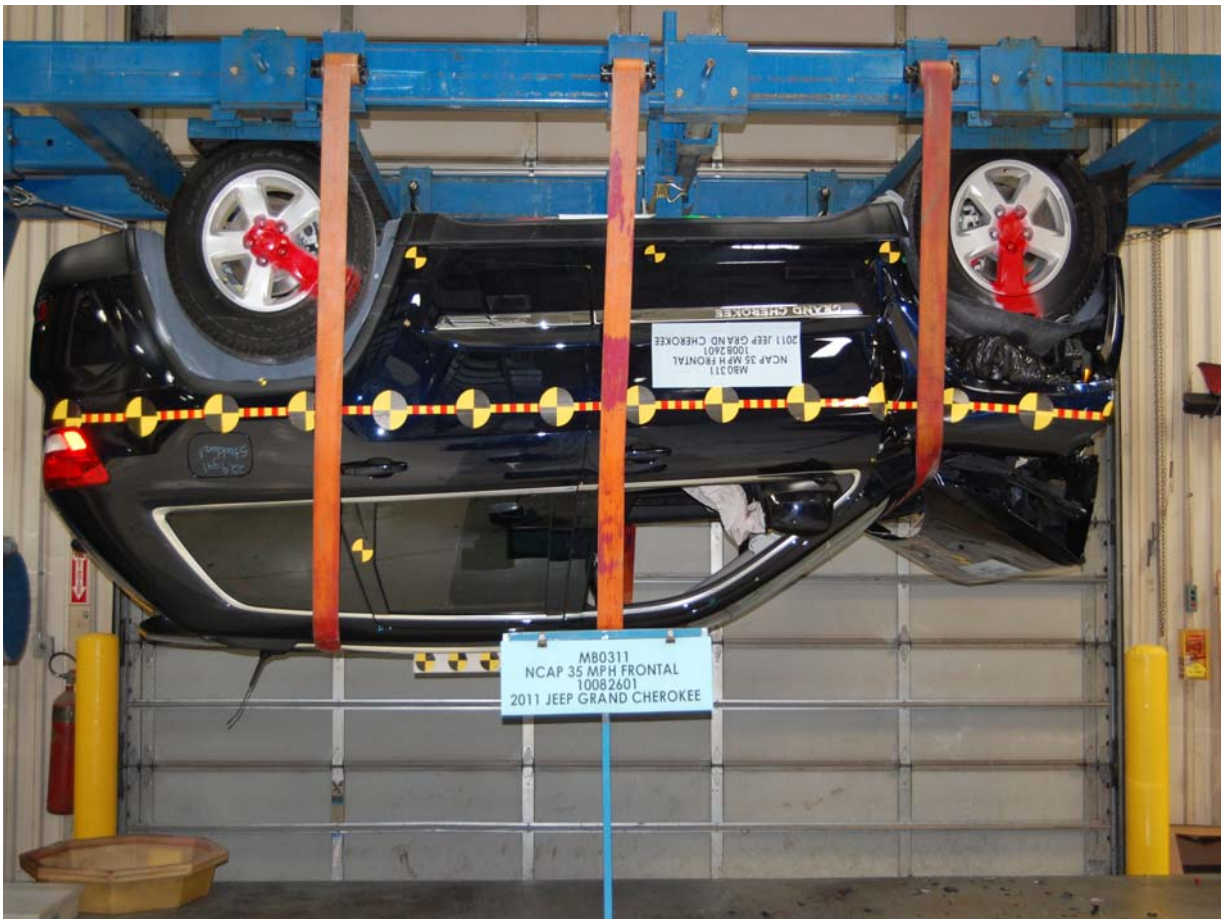
Post-Test Speed Trap Read-Out



Vehicle at 0 Degrees on Static Rollover Device (Photo Not Available)



Vehicle at 90 Degrees on Static Rollover Device



Vehicle at 180 Degrees on Static Rollover Device



Vehicle at 270 Degrees on Static Rollover Device



Vehicle at 360 Degrees on Static Rollover Device



Vehicle Impact

2011 MODEL YEAR **Jeep® GRAND CHEROKEE LAREDO 4X4**

For more information visit: www.jeep.com
 or call 1-877-IAM-JEEP

Chrysler Group LLC

THIS VEHICLE IS MANUFACTURED TO MEET SPECIFIC UNITED STATES REQUIREMENTS. THIS VEHICLE IS NOT MANUFACTURED FOR SALE OR REGISTRATION OUTSIDE OF THE UNITED STATES.

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THIS MODEL INCLUDING DEALER PREPARATION

Base Price: **\$32,215**

JEEP GRAND CHEROKEE LAREDO 4X4
 Exterior Color: Blackberry Pearl Coat Exterior Paint
 Interior Color: Black Interior Color
 Interior: Cloth Bucket Seats with Adjustable Head Restraints
 Engine: 3.6-Liter V6 VTI Pentastar Engine
 Transmission: 5-Speed Automatic Transmission

STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)

FUNCTIONAL/SAFETY FEATURES

Quadra-Trac I 4WD System
 Advanced Multistage Front Airbags
 Supplemental Side-Curtain Front and Rear Airbags
 Supplemental Front Seat Side Airbags
 LATCH-Ready Child Seat Anchor System
 Electronic Stability Control
 Anti-lock 4-Wheel Disc Brakes
 Keyless Enter-N-Go
 Hill Start Assist
 Trailer Sway Damping
 Speed Control

INTERIOR FEATURES

Power 8-Way Driver's Seat
 Power 4-Way Driver Lumbar Adjust
 Front Passenger Forward Fold Flat Seat
 Rear 60/40 Folding and Reclining Seat
 Air Cond w/ Dual Zone Temp Control & Air Filtering
 Electronic Vehicle Info Center w/ Reconfig Display
 (2) 12-Volt Auxiliary Power Outlets
 Premium Insulation Group
 SIRIUS Satellite Radio

For More Information, Call 1-888-539-7474

1-Year SIRIUS Radio Service
 Media Center 130 CD/MP3 Radio
 6 Speakers
 Audio Jack Input for Mobile Devices
 Power Windows w/ Front One-Touch Up & Down Feature
 Leather-Wrapped Steering Wheel with Audio Controls
 Tilt / Telescope Steering Column
 Front and Rear LED Lighting

Assembly Point/Port of Entry: DETROIT, MICHIGAN, U.S.A.
 VIN: 1J4-RR4G2BC-509137



SHIP TO: 60109 50
 FRANK BOUCHER CHRYSLER, DODGE,
 4001 MILTON AVE
 JANSVILLE FL 32846-9643
 THE LABEL IS ADDED TO THIS VEHICLE TO COMPLY WITH FEDERAL LAW. THE LABEL CANNOT BE REMOVED
 OR ALTERED PRIOR TO DELIVERY TO THE ULTIMATE PURCHASER.
 * STATE AND/OR LOCAL TAXES IF ANY, LICENSE AND TITLE FEES AND DEALER SUPPLIED AND
 INSTALLED EQUIPMENT ARE NOT INCLUDED IN THIS PRICE. SUGGESTION, IF ANY,
 IS BASED ON PRICE OF OPTIONS IF PURCHASED SEPARATELY.

Removable / Rechargeable Flashlight
 Illuminated Cup Holders
 Premium Front & Rear Floor Mats with Logo

EXTERIOR FEATURES

17-Inch x 8.0-Inch Aluminum Painted Wheels
 P245/70R17 BSW On/Off-Road Tires
 Automatic On/Off Headlamps
 Laminated Front Door Glass
 Power Heated Exterior Mirrors w/ Manual Fold-Away
 Fog Lamps
 Liftgate Flipper Glass
 Bright Side Roof Rails

OPTIONAL EQUIPMENT

Blackberry Pearl Coat Exterior Paint
Laredo E with 3.6L V6 Engine Package
 Flex Fuel Vehicle

DESTINATION CHARGE

\$780

TOTAL PRICE: * \$33,220

WARRANTY COVERAGE

5-year or 100,000-mile Powertrain Limited Warranty.
 3-year or 36,000-mile Basic Limited Warranty.
 24-hour towing assistance; certain restrictions apply.
 Ask Dealer for a copy of the limited warranties or
 see your owner's manual for details.

**5 Year/100,000 MILE
 POWERTRAIN WARRANTY**

EPA Fuel Economy Estimates

These estimates reflect new EPA methods beginning with 2008 models.



See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

GOVERNMENT SAFETY RATINGS

This vehicle has not been rated by the government for frontal crash, side crash or rollover risk.
 Source: National Highway Traffic Safety Administration (NHTSA).

www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
 U.S./CANADIAN PARTS CONTENT: 77 %
 NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE:
 FINAL ASSEMBLY POINT:
 DETROIT, MICHIGAN, U.S.A.

COUNTRY OF ORIGIN:
 ENGINE: UNITED STATES
 TRANSMISSION: UNITED STATES

APPENDIX B
DUMMY RESPONSE DATA

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

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

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 Shoulder Belt Force

Driver Lap Belt Force

Driver Left Upper Tibia Moment X

Driver Left Upper Tibia Moment Y

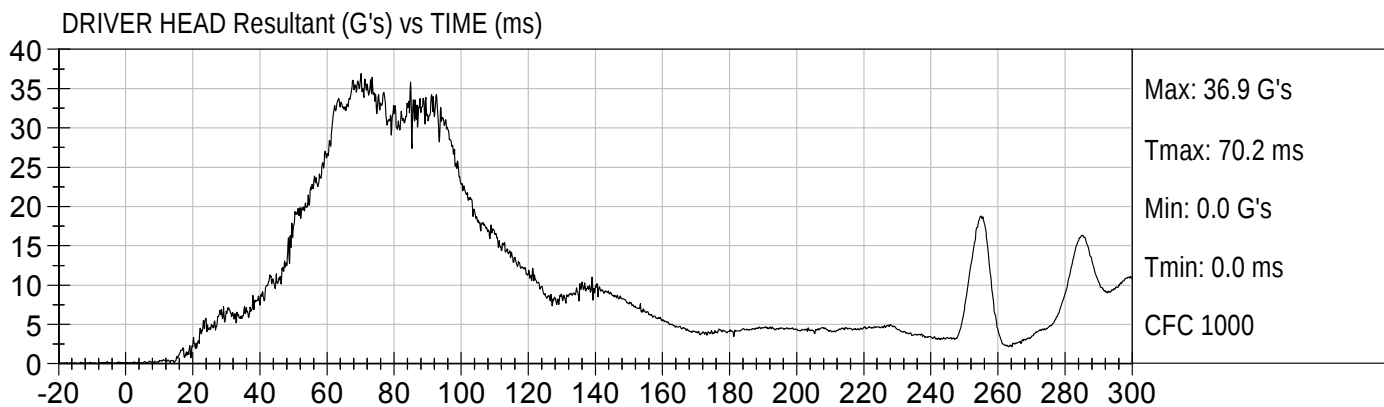
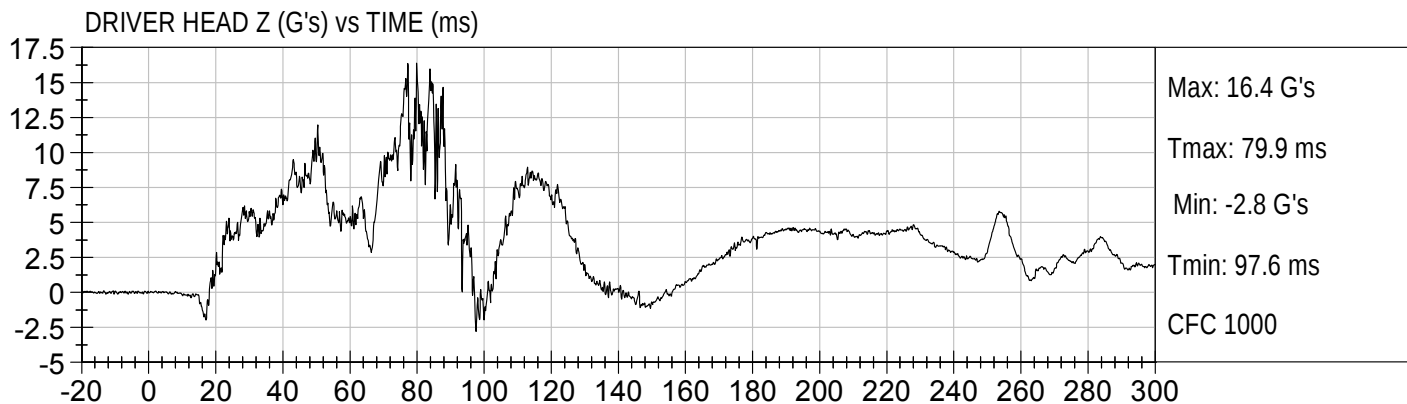
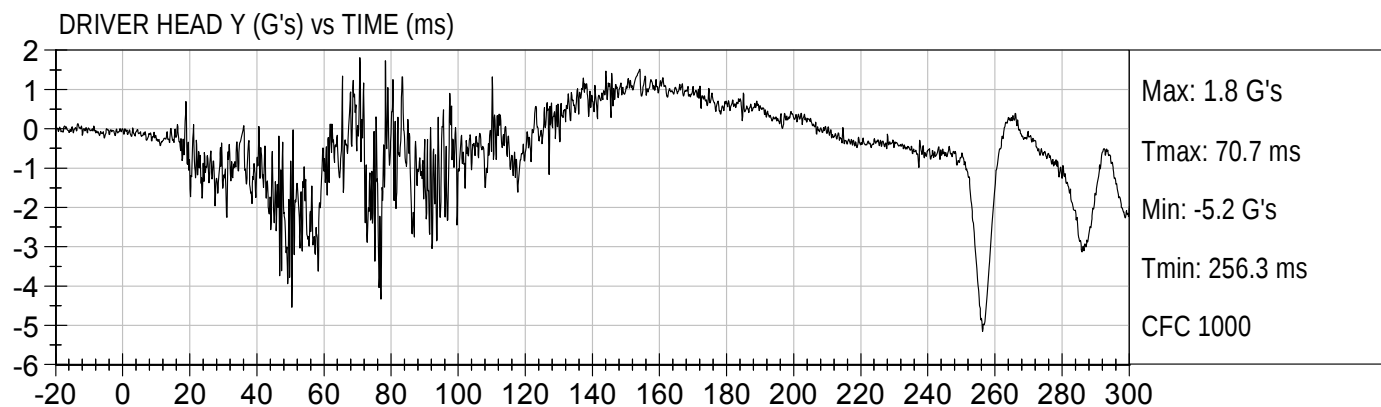
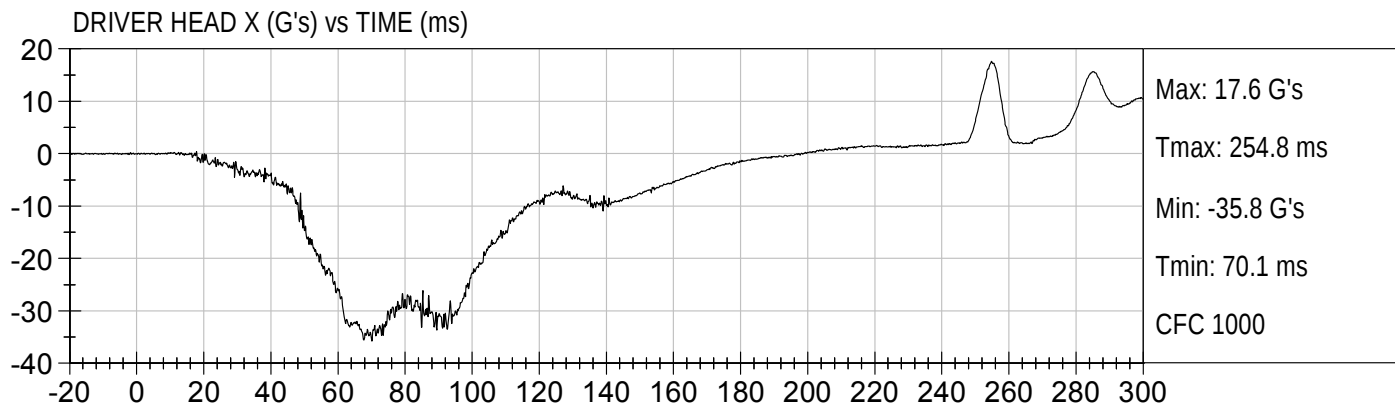
Driver Left Upper Tibia Force Z

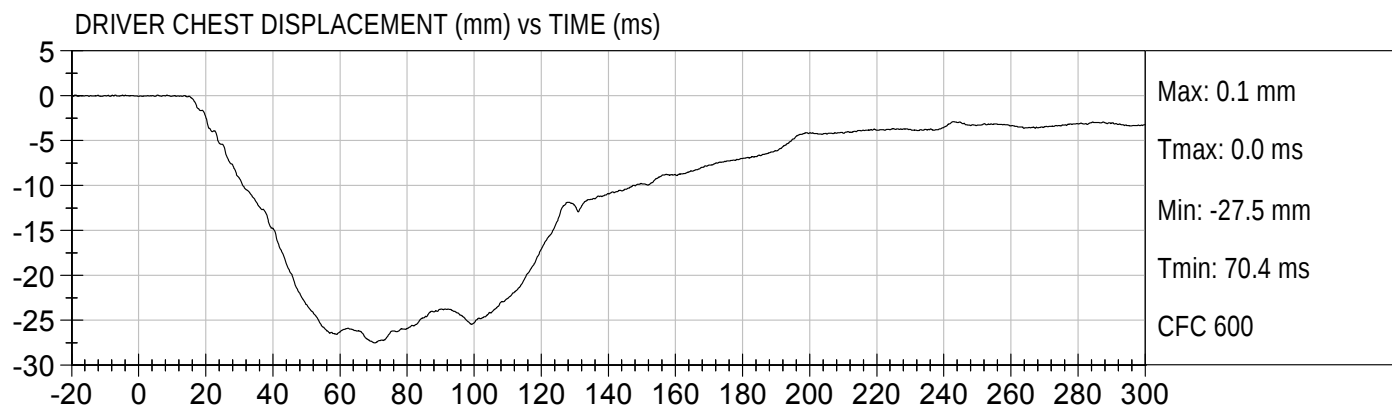
Driver Left Lower Tibia Moment X

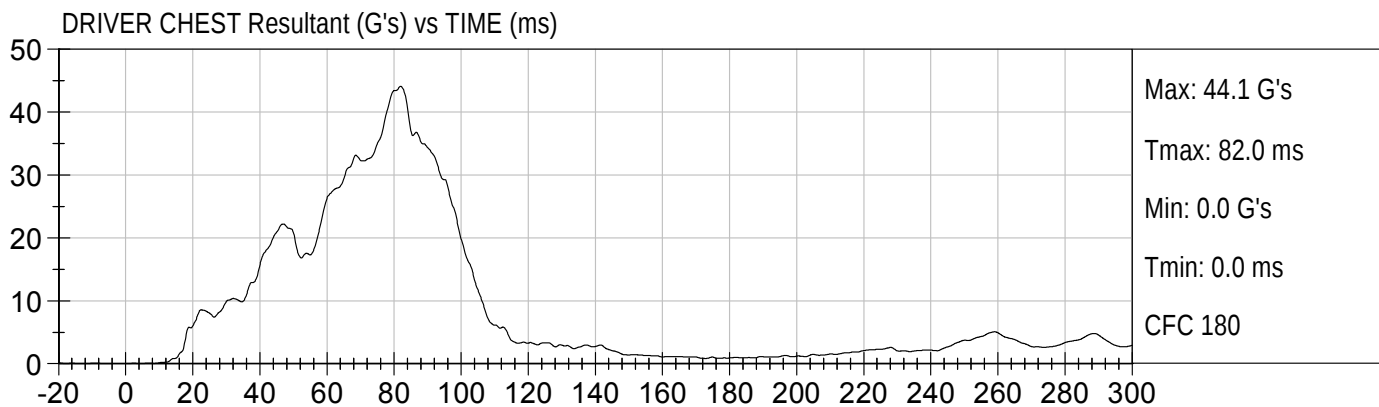
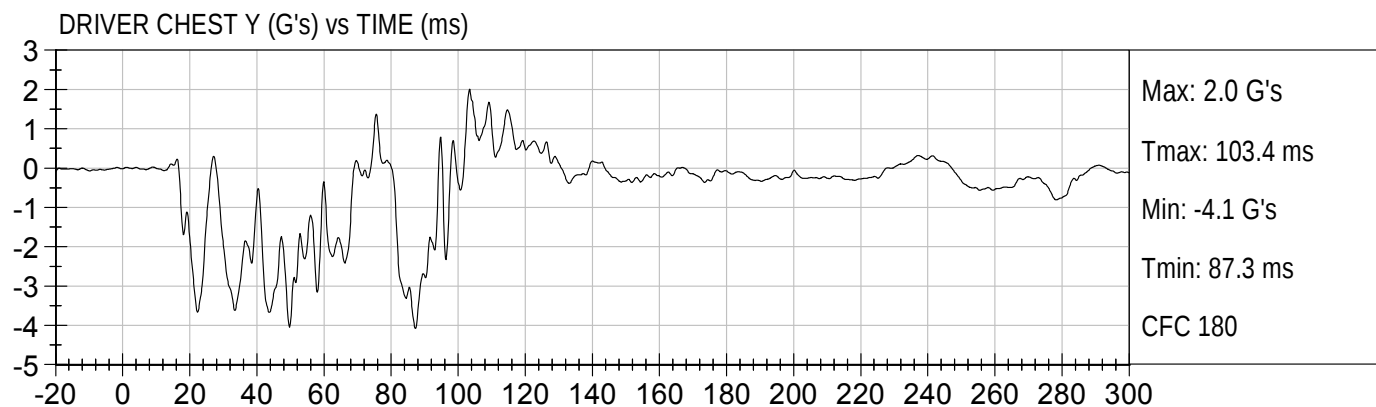
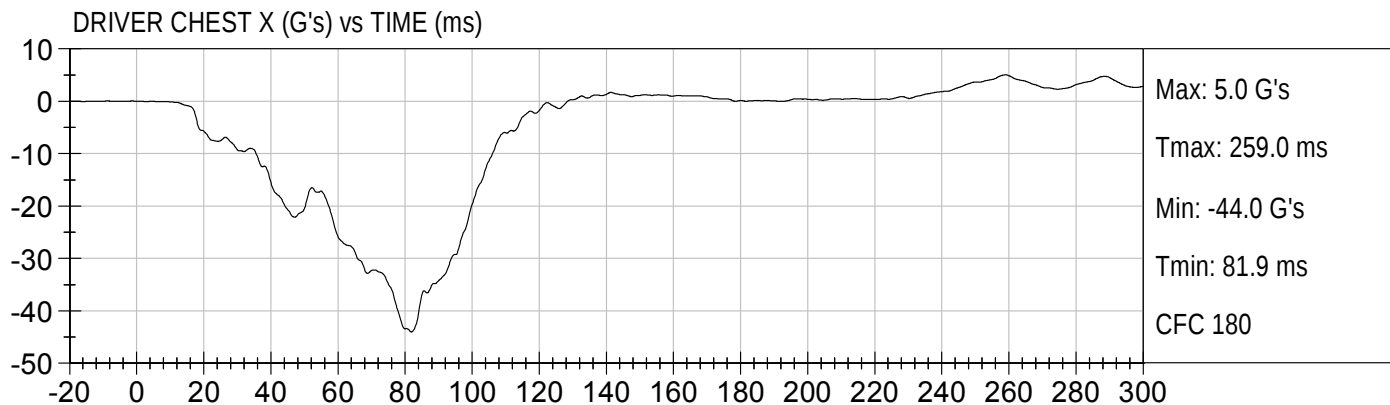
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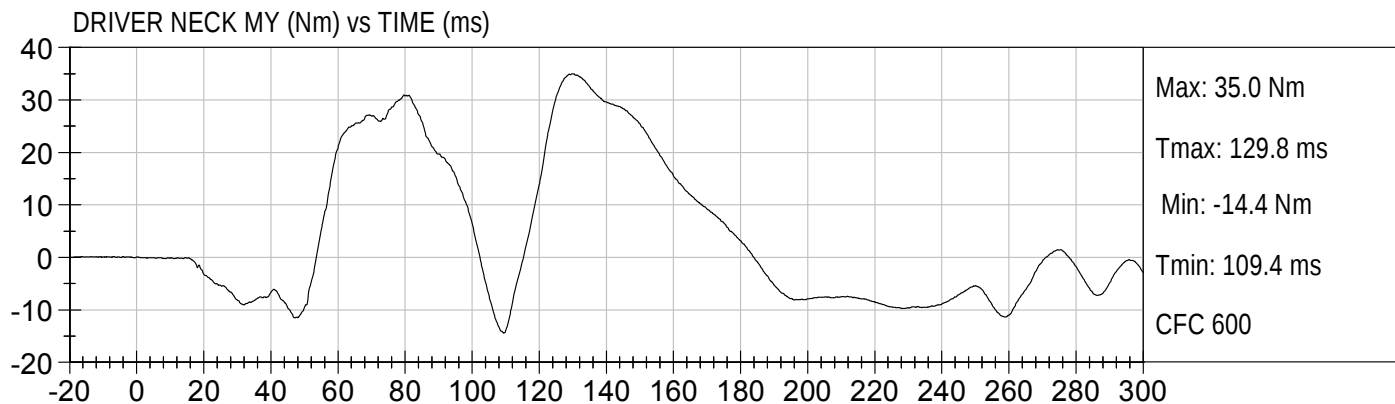
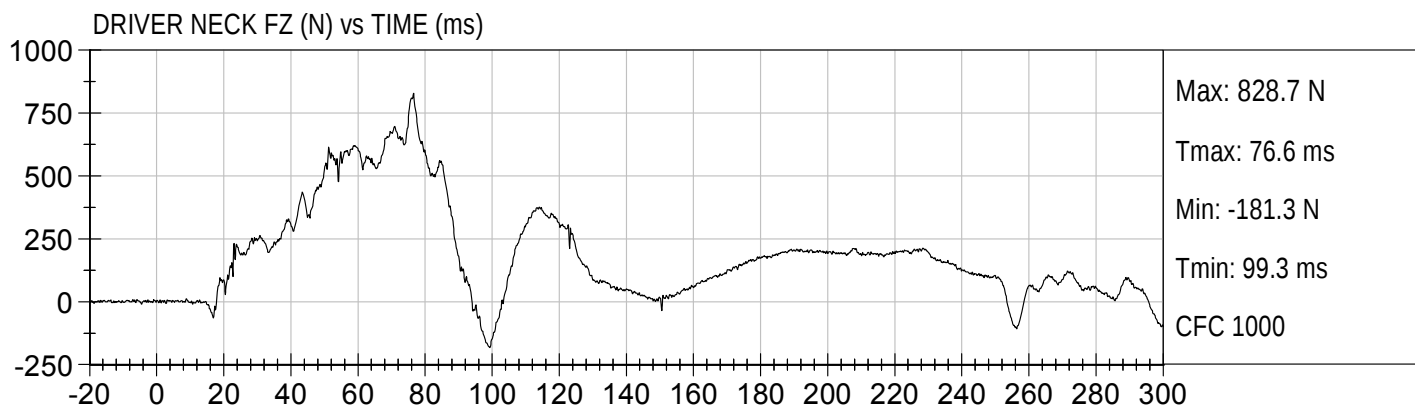
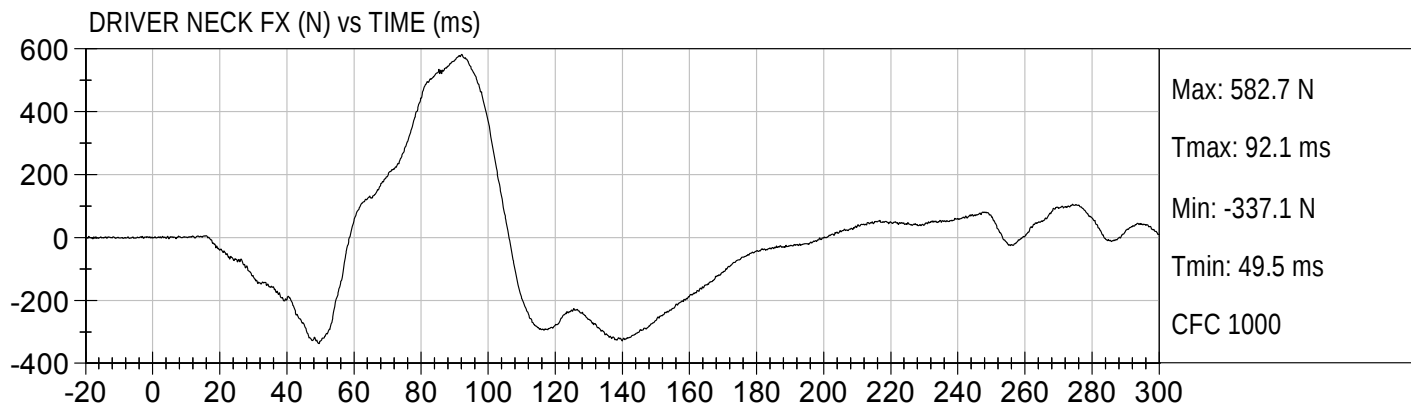
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
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 Lap Belt Force
Passenger Shoulder Belt Force – not installed
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X

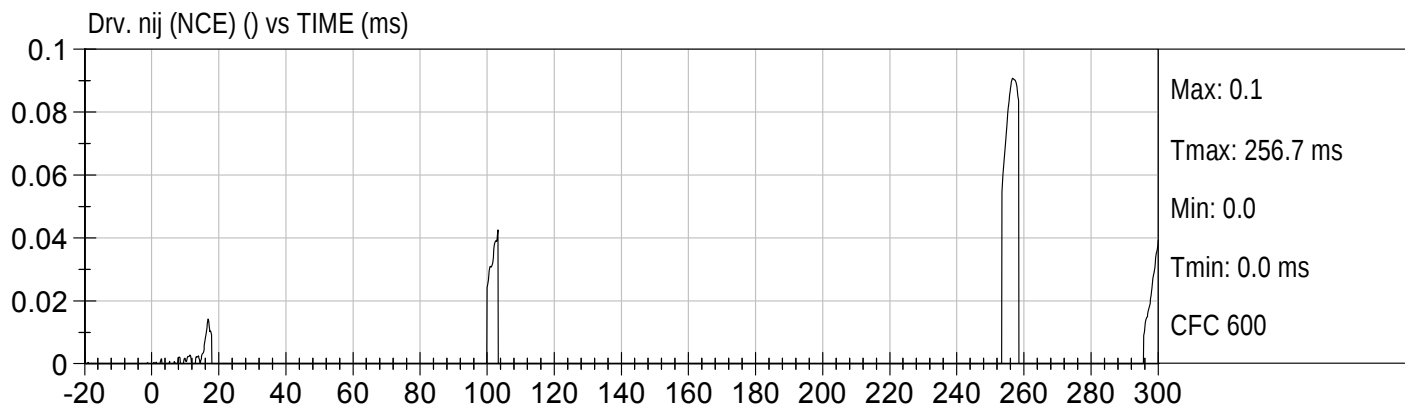
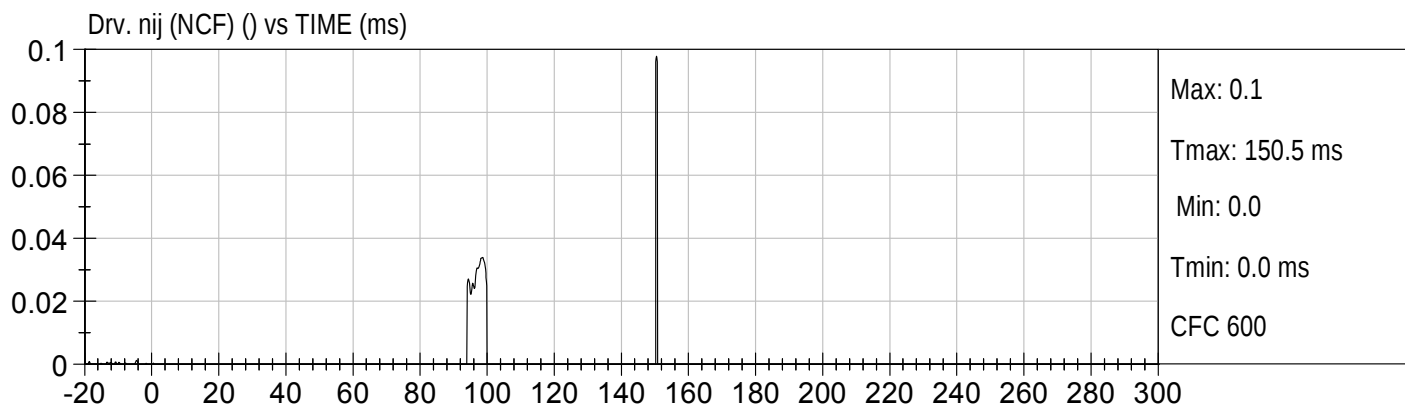
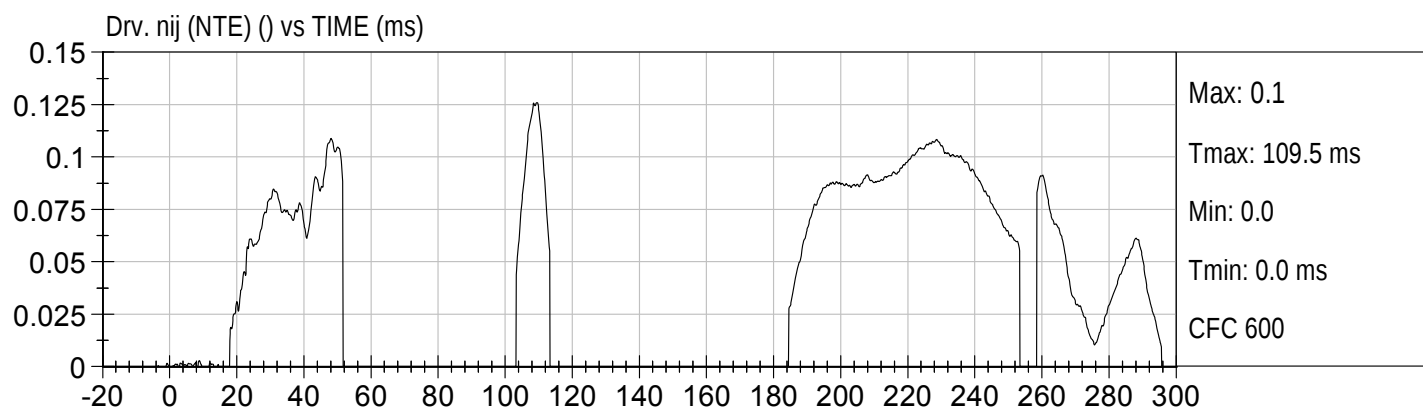
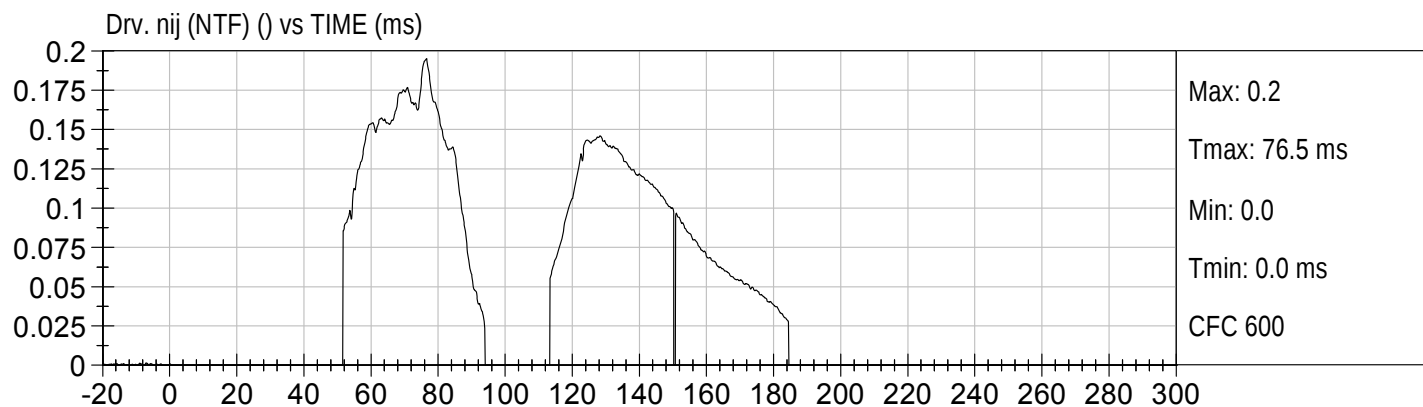
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger 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
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Barrier Force – Upper Left
Barrier Force – Upper Center
Barrier Force – Upper Right
Barrier Force – Lower Left
Barrier Force – Lower Center
Barrier Force – Lower Right

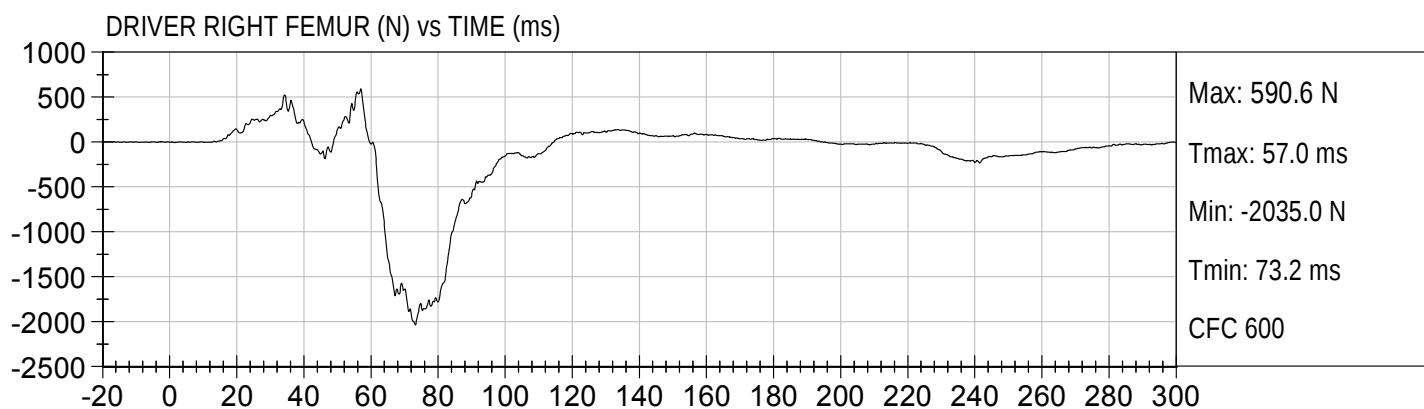
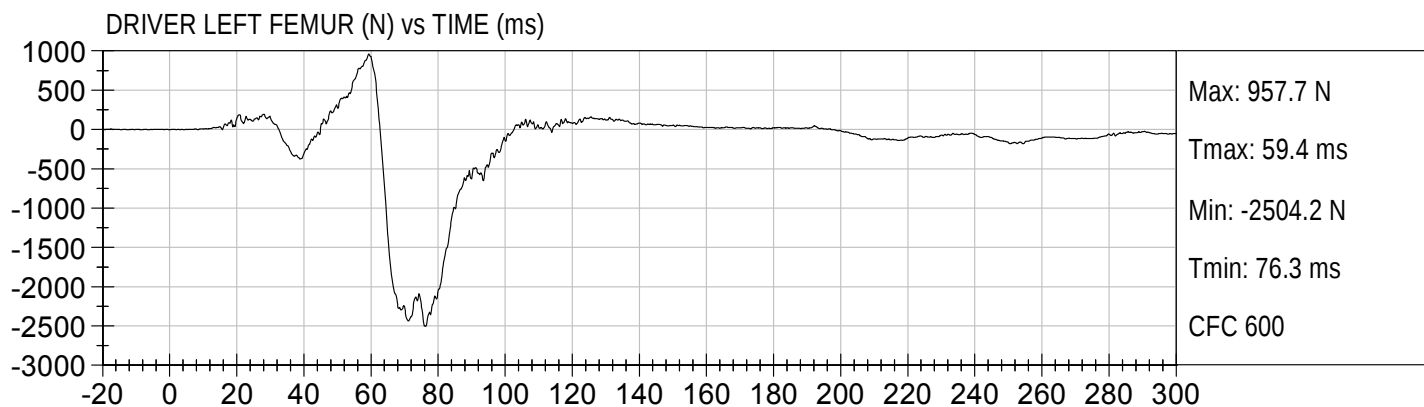






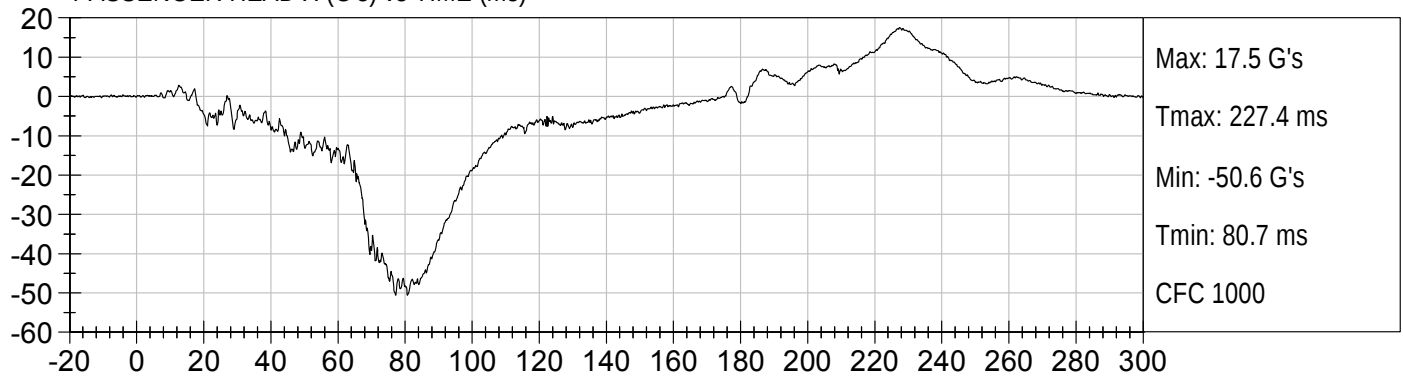




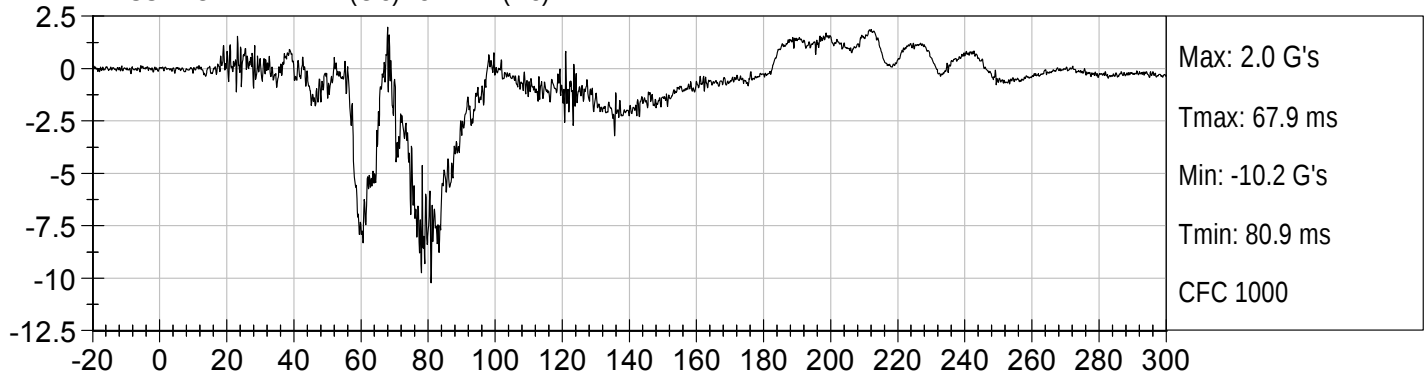




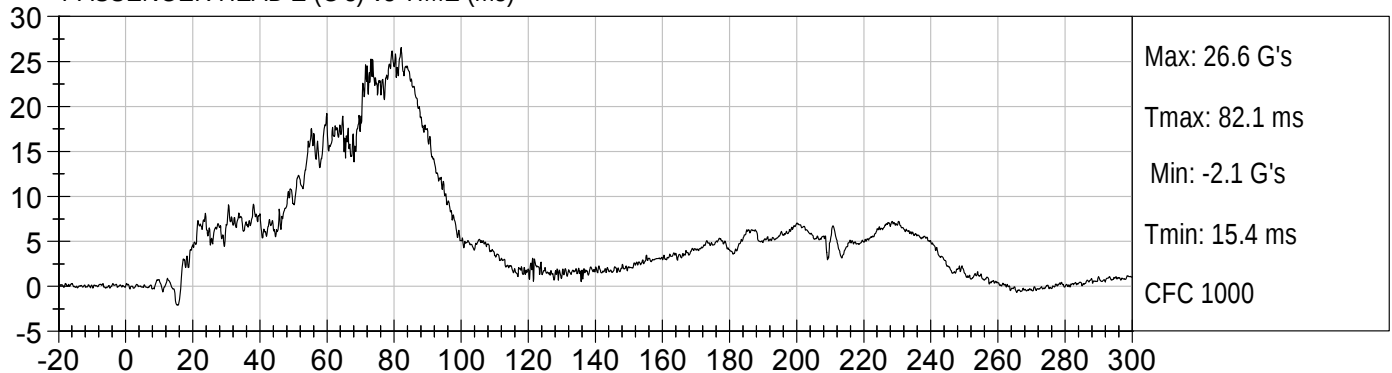
PASSENGER HEAD X (G's) vs TIME (ms)



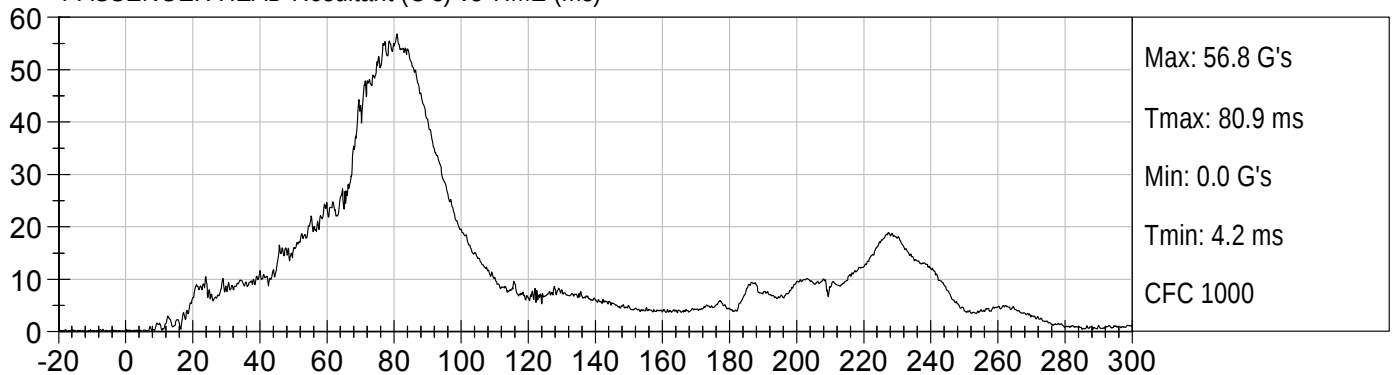
PASSENGER HEAD Y (G's) vs TIME (ms)

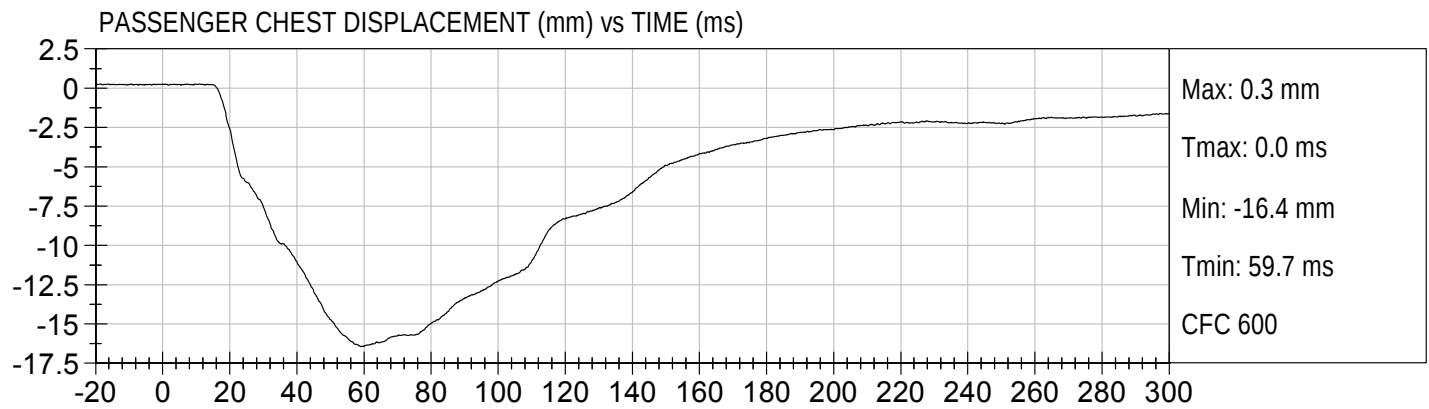


PASSENGER HEAD Z (G's) vs TIME (ms)



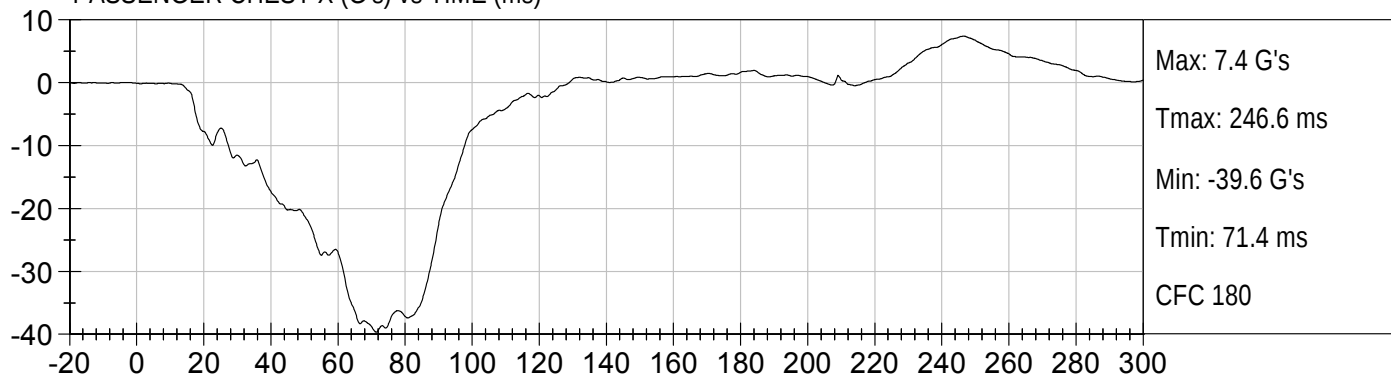
PASSENGER HEAD Resultant (G's) vs TIME (ms)



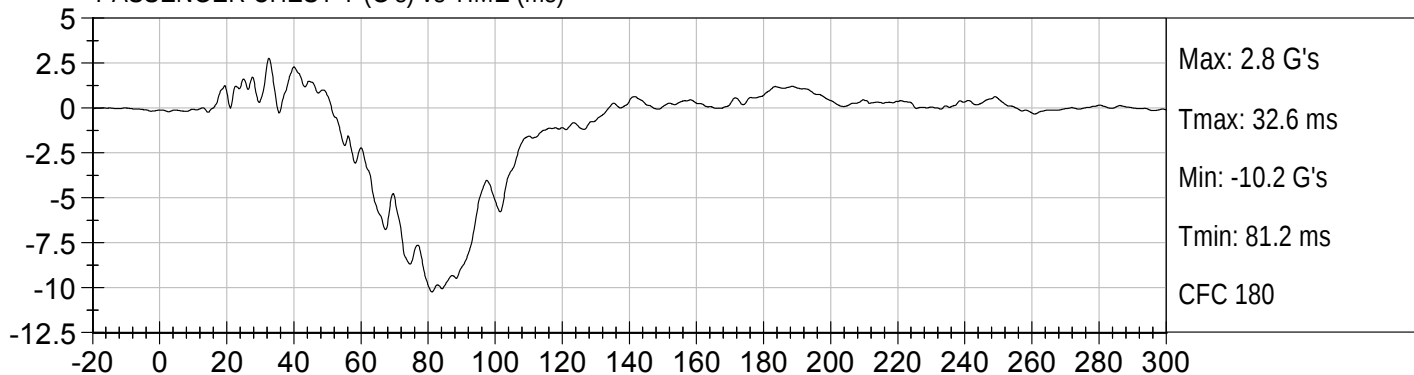




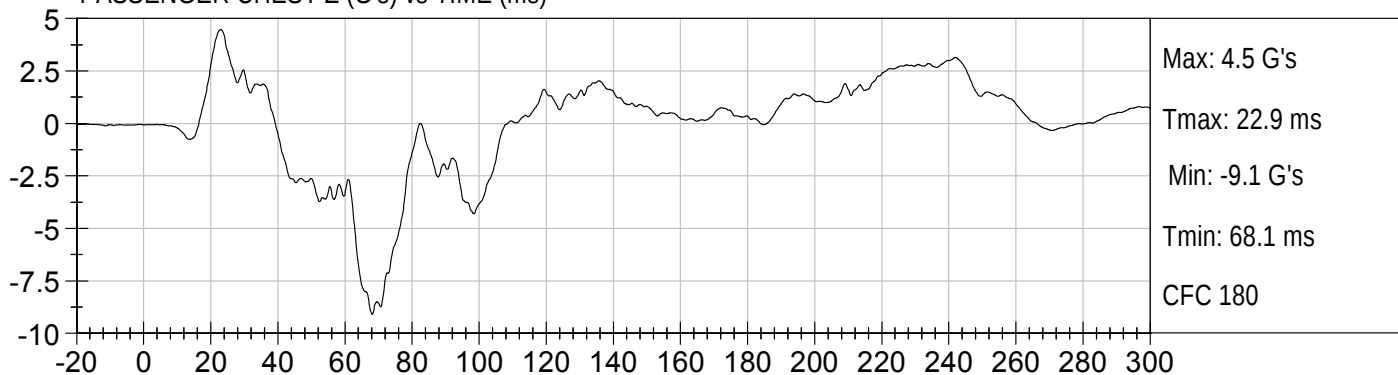
PASSENGER CHEST X (G's) vs TIME (ms)



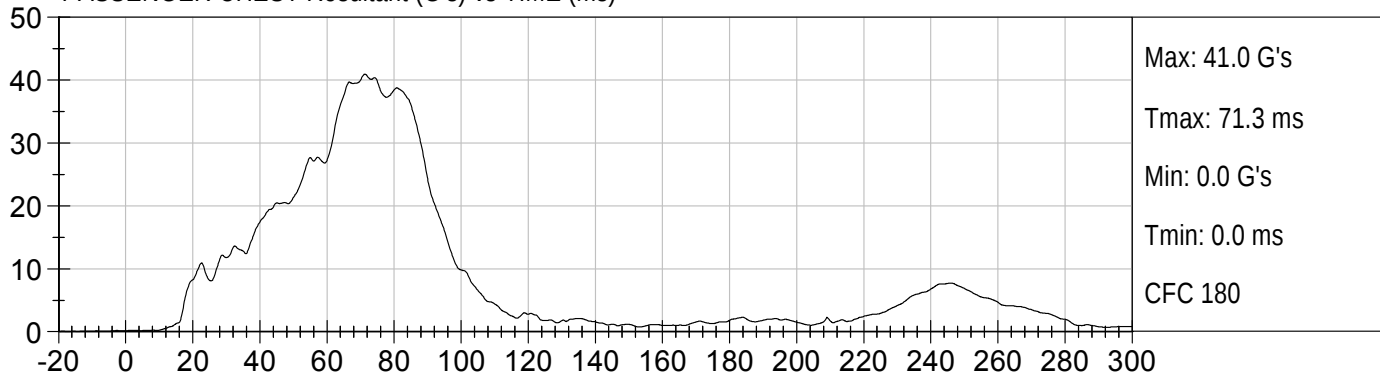
PASSENGER CHEST Y (G's) vs TIME (ms)

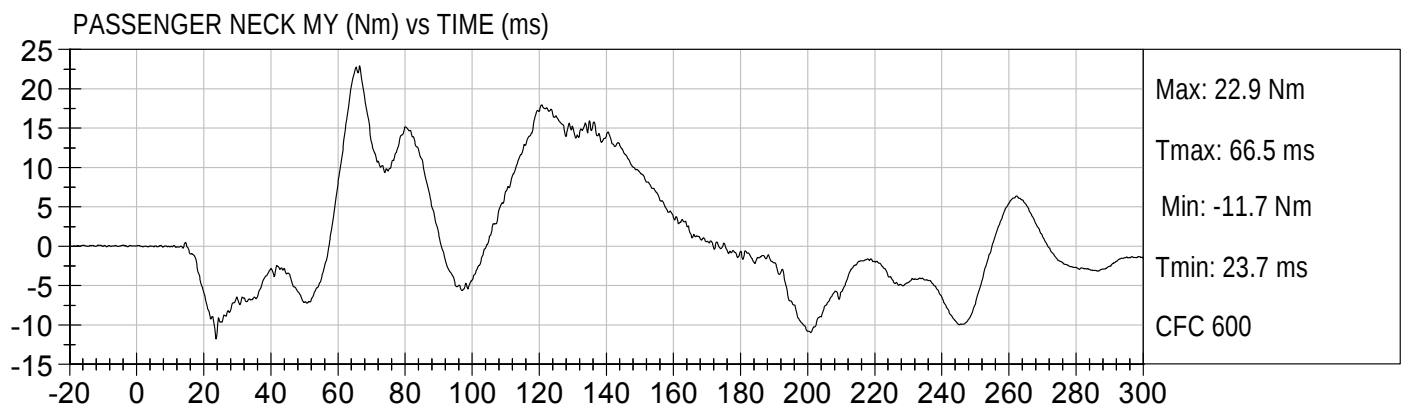
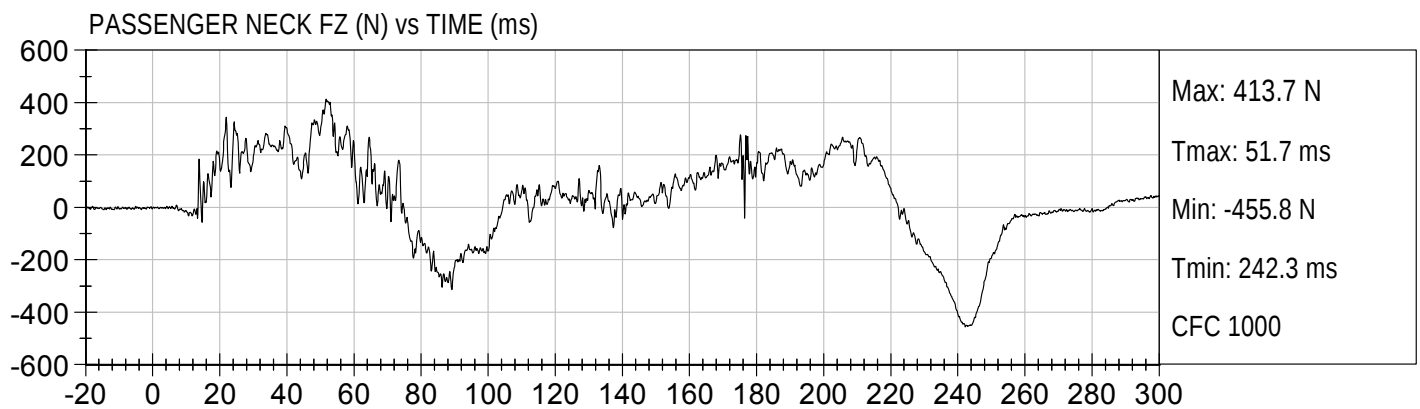
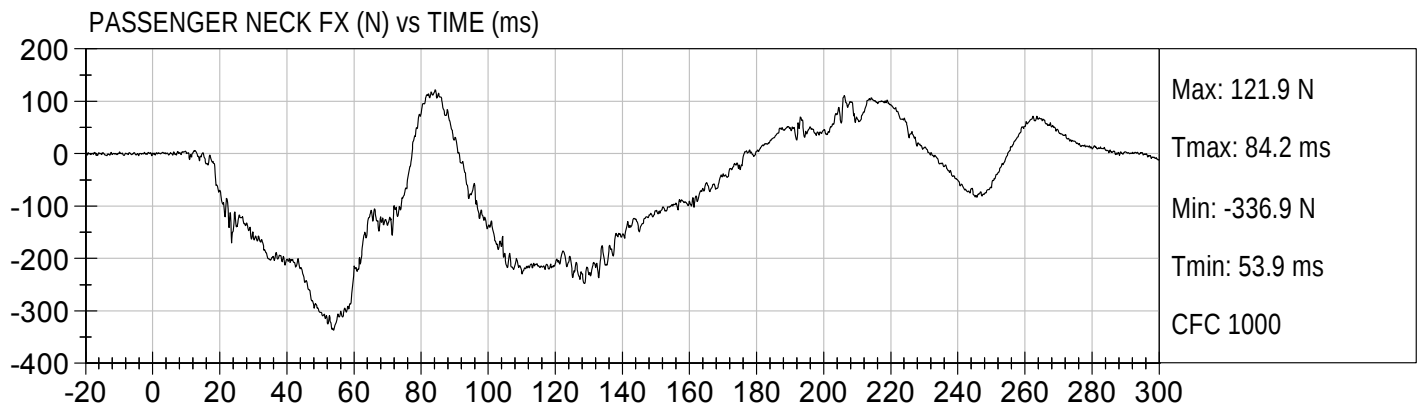


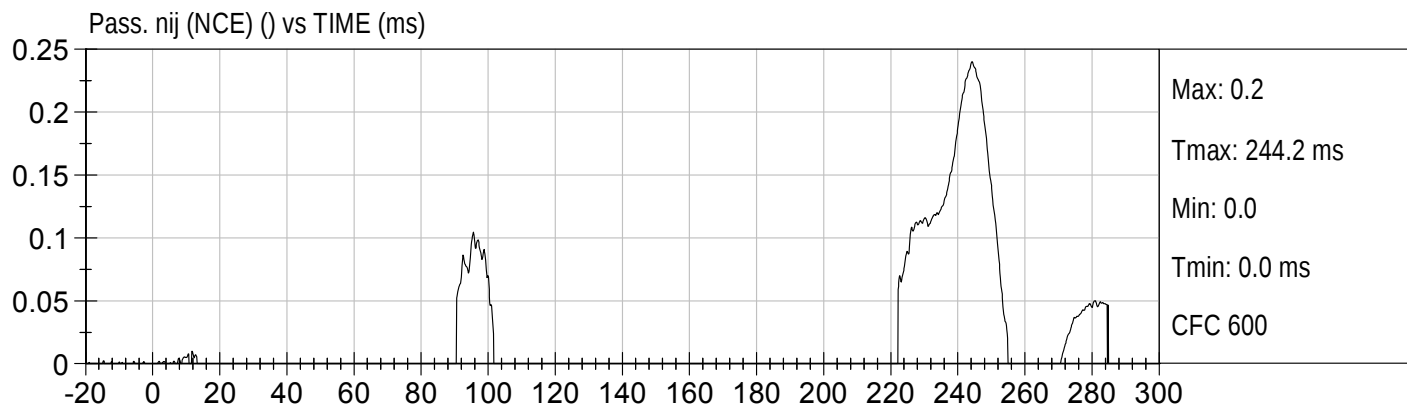
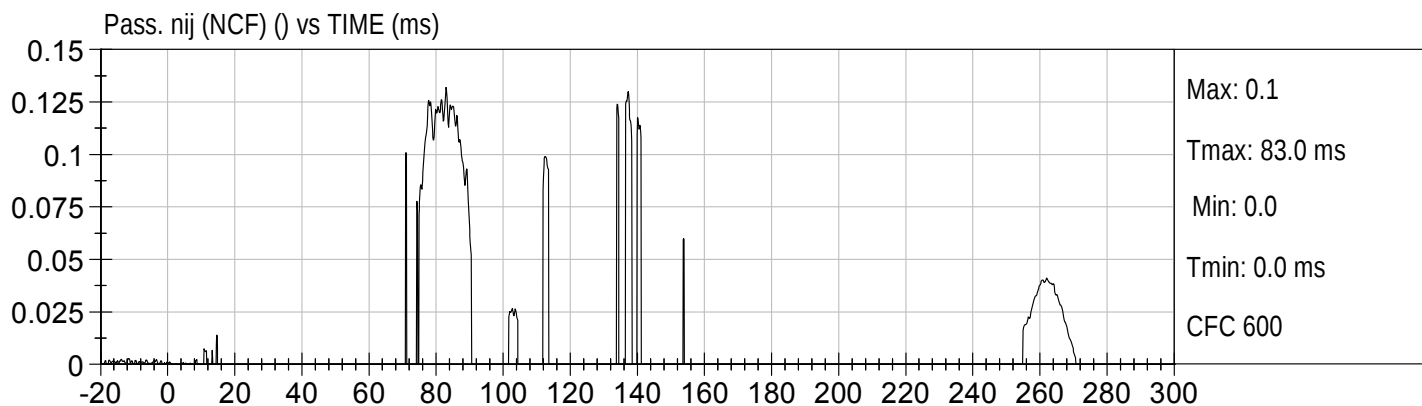
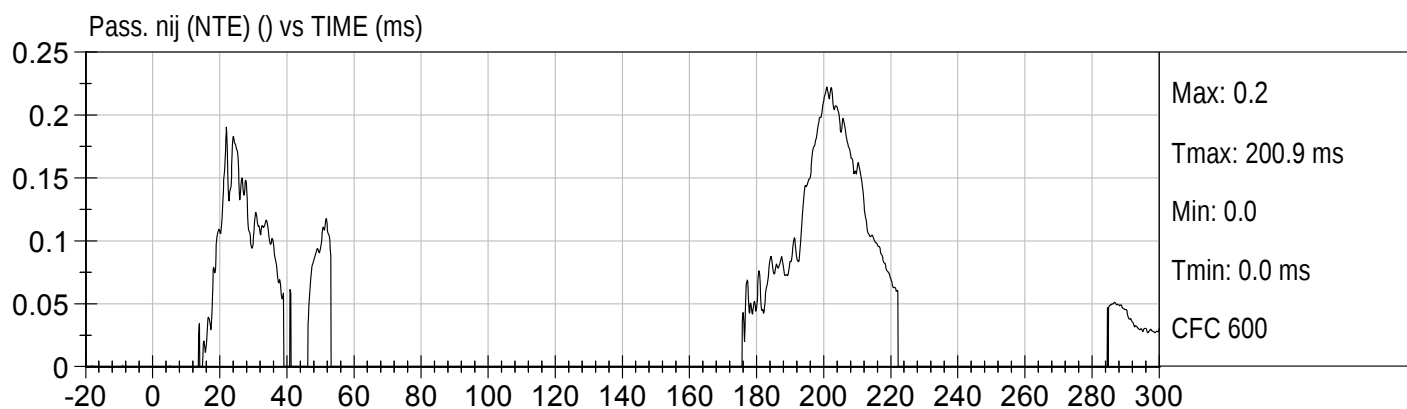
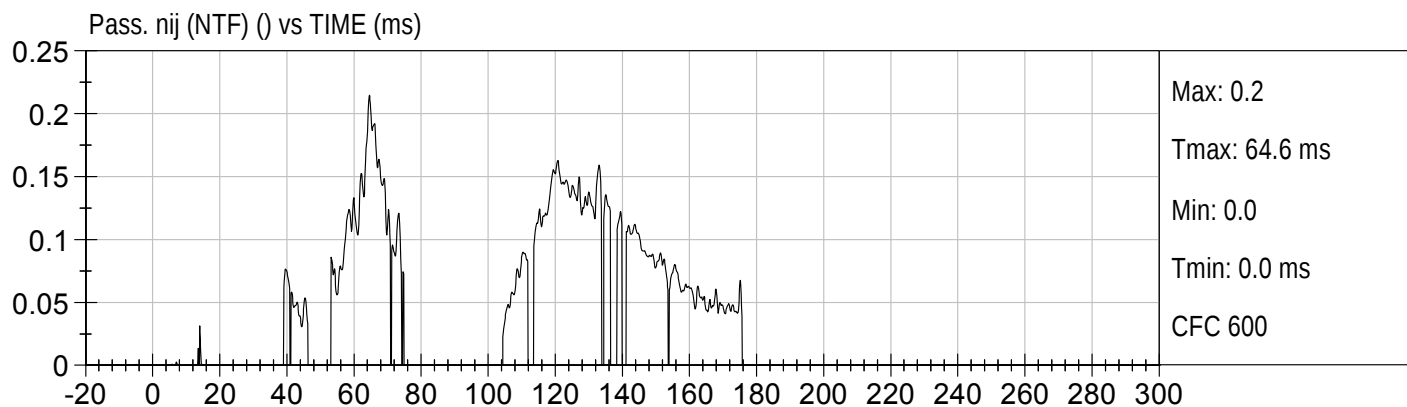
PASSENGER CHEST Z (G's) vs TIME (ms)

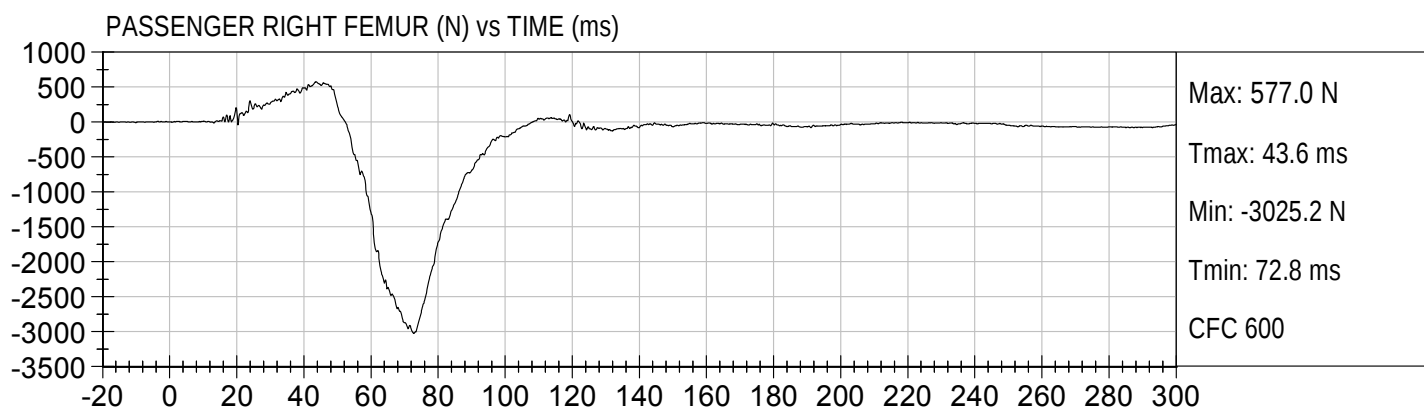
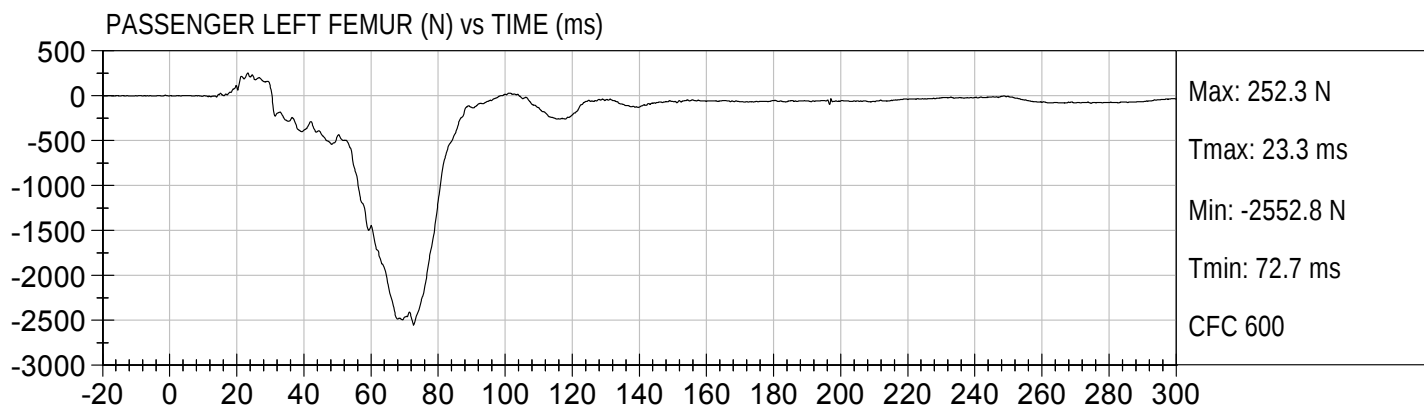


PASSENGER CHEST Resultant (G's) vs TIME (ms)









APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 351

Test ID: D102661

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Peak Resultant Acceleration	G's	225 - 275	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

8/19/10
Test Date

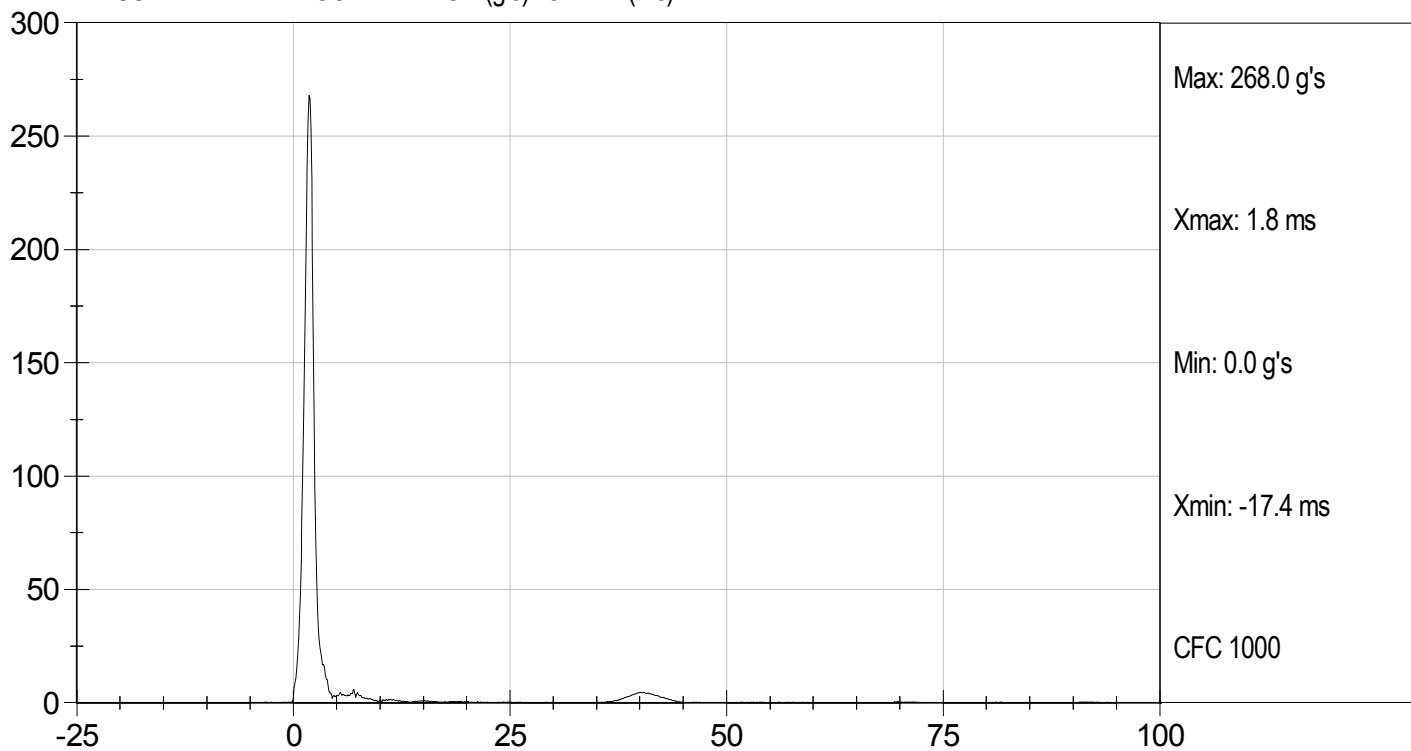

Approved By



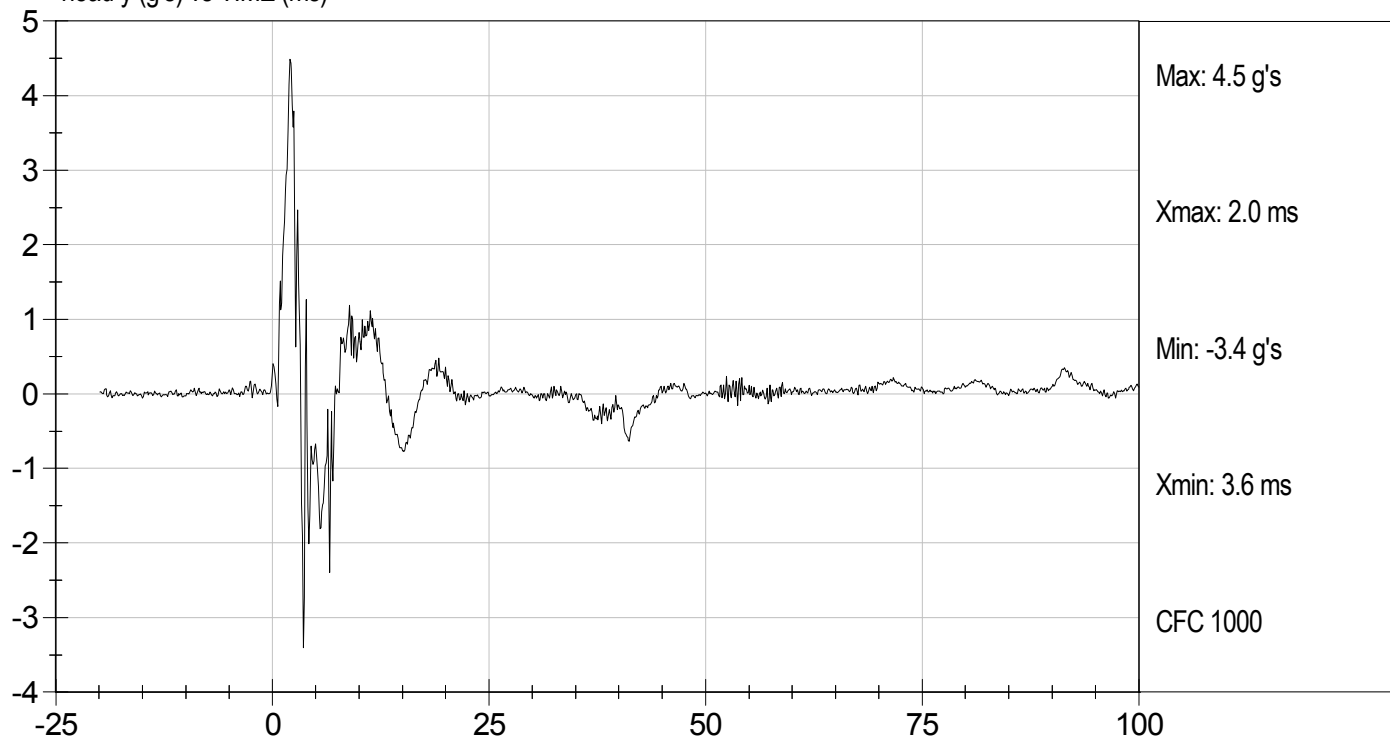
Test Desc: Head Drop
Component ID: D102661

Test Date: 8/19/10
Velocity: 0 ft/s, 0.00 m/s

RESULTANT HEAD ACCELERATION (g's) vs TIME (ms)



head y (g's) vs TIME (ms)



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

ATD Serial No: 351

Test I.D: D102662

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.87	Pass
	20 ms	G's	17.60 to 22.60	19.14	Pass
	30 ms	G's	12.50 to 18.50	15.25	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.22	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	66.8	Pass
	Time	ms	57.0 to 64.0	57.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.9	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	94.4	Pass
	Time	ms	47.0 to 58.0	48.6	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.3	Pass
Overall Test Results					Pass


 Laboratory Technician

8/19/10
 Test Date

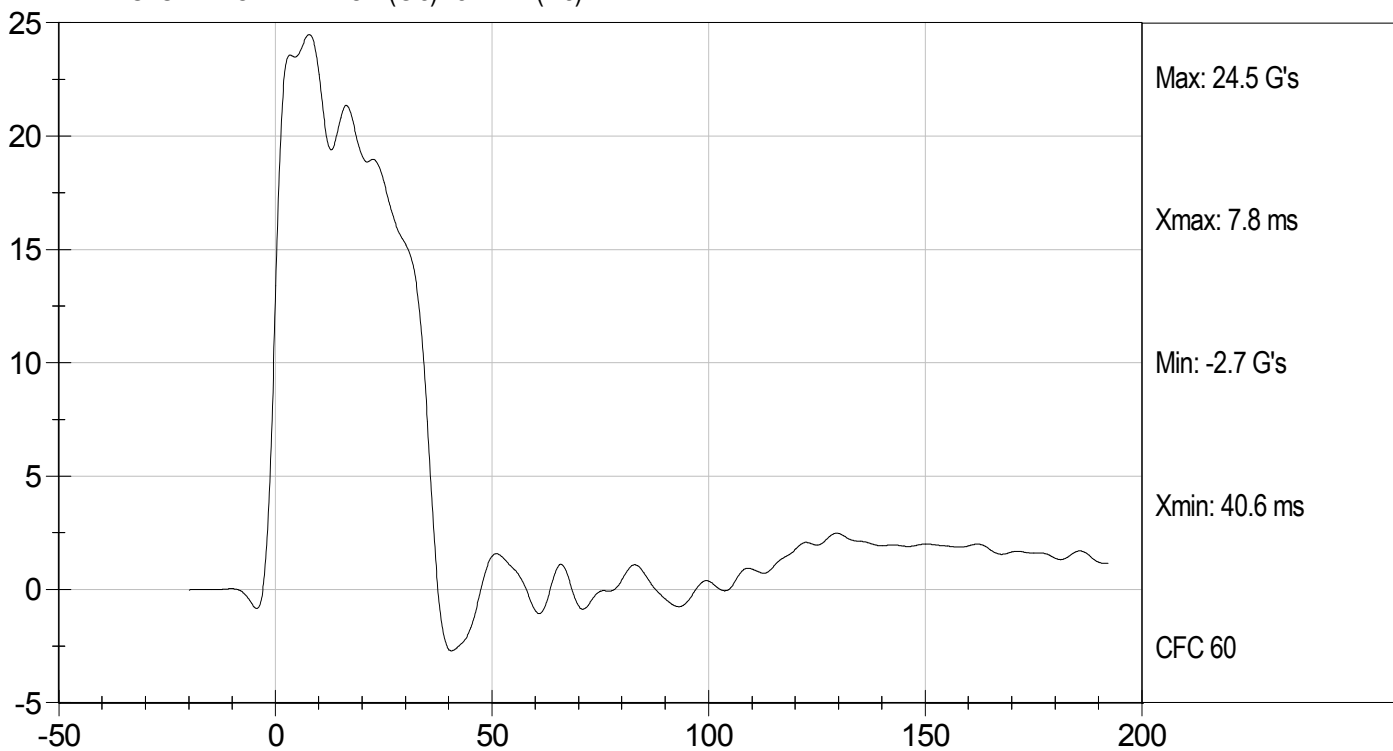

 Approved By



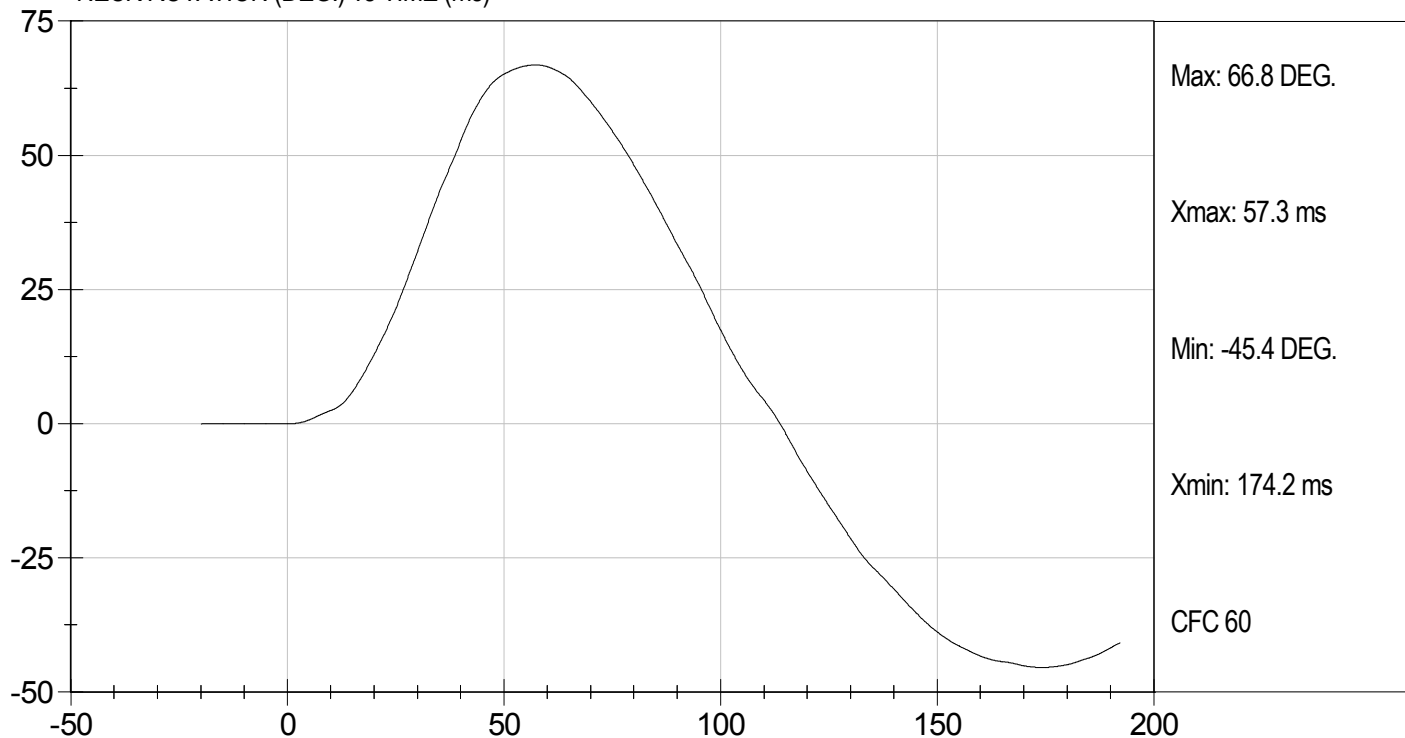
Test Desc: Neck Flexion
Component ID: D102662

Test Date: 8/19/10
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM DECELERATION (G's) vs TIME (ms)



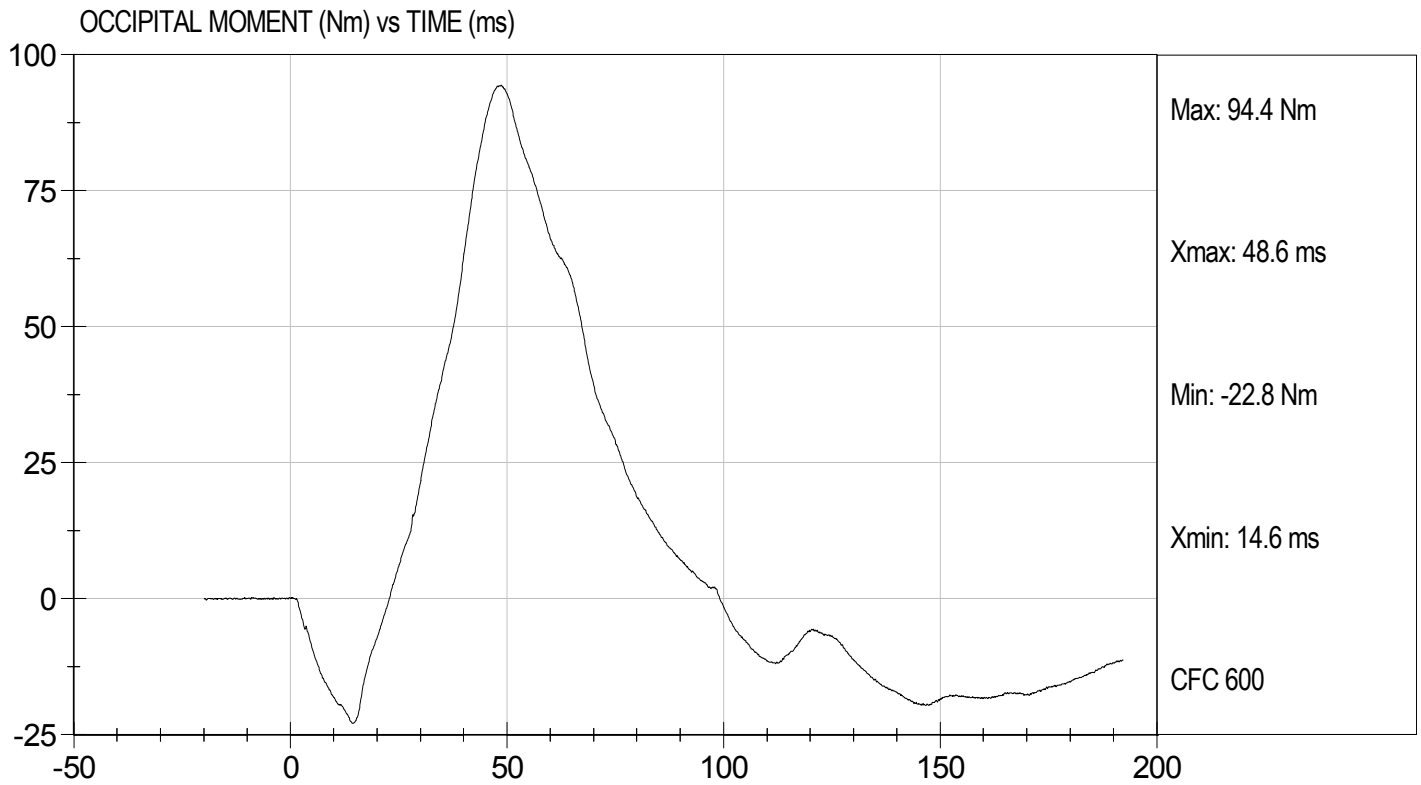
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D102662

Test Date: 8/19/10
Velocity: 23.15 ft/s, 7.06 m/s



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

ATD Serial No: 351

Test I.D: D102663

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.95	Pass
	20 ms	G's	14.00 to 19.00	18.41	Pass
	30 ms	G's	11.00 to 16.00	13.48	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.13	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.1	Pass
	Time	ms	72.0 to 82.0	73.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	153.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.8	Pass
	Time	ms	65.0 to 79.0	69.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	141.5	Pass
Overall Test Results					Pass


 Laboratory Technician

8/19/10
 Test Date

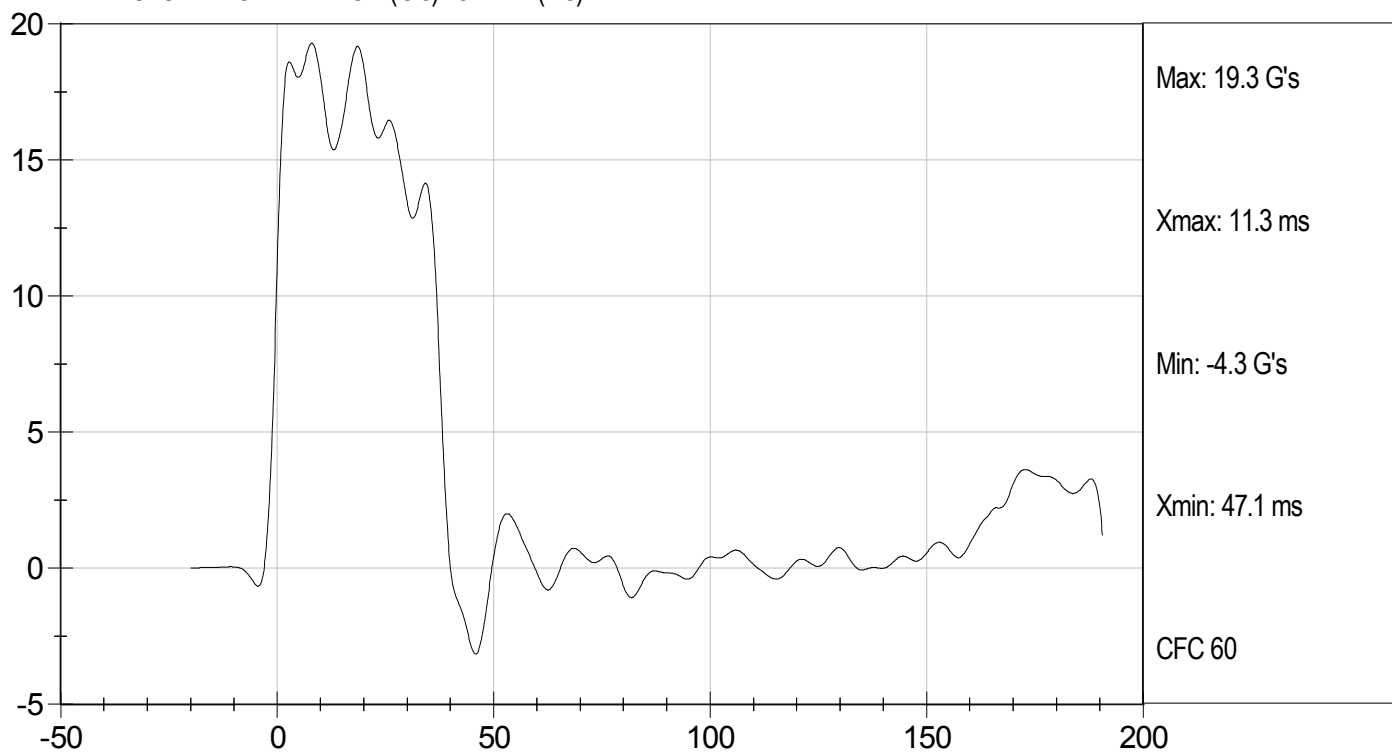

 Approved By



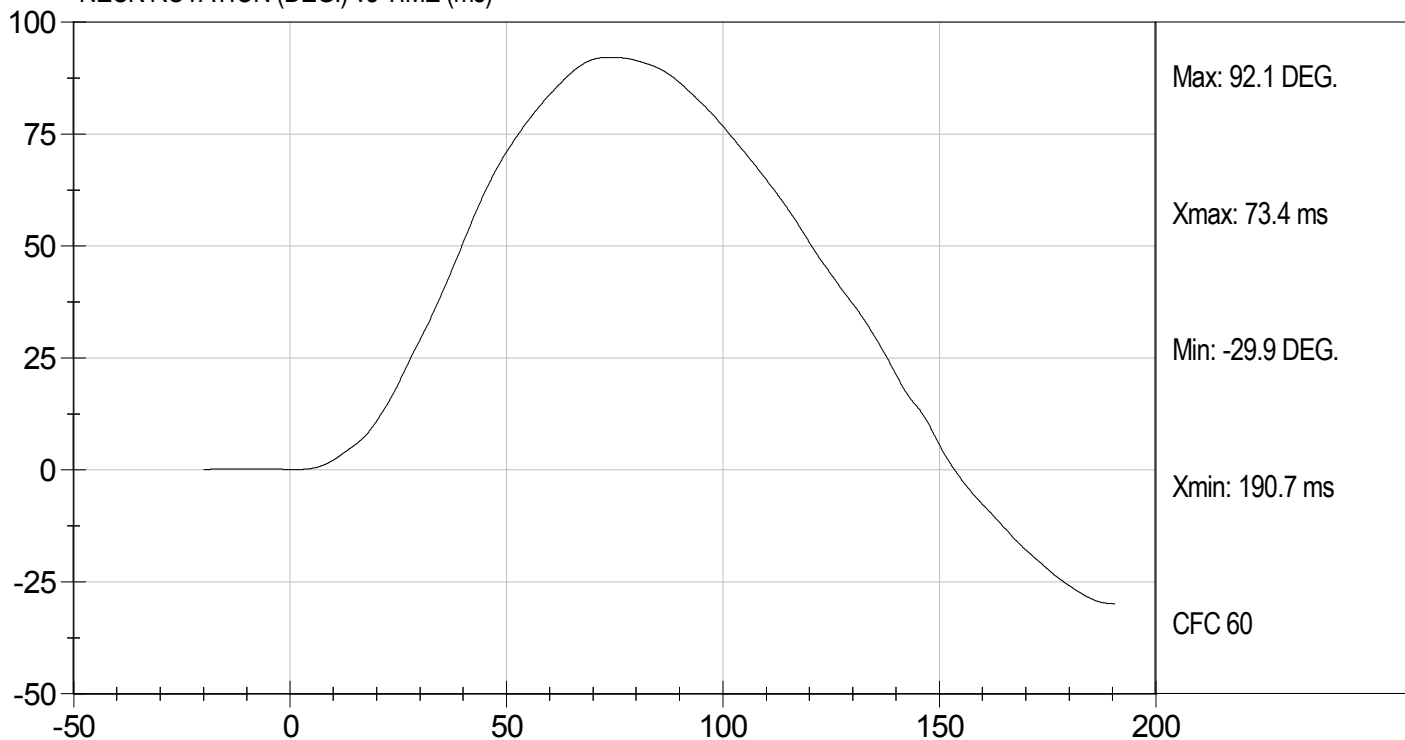
Test Desc: Neck Extension
Component ID: D102663

Test Date: 8/19/10
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (G's) vs TIME (ms)



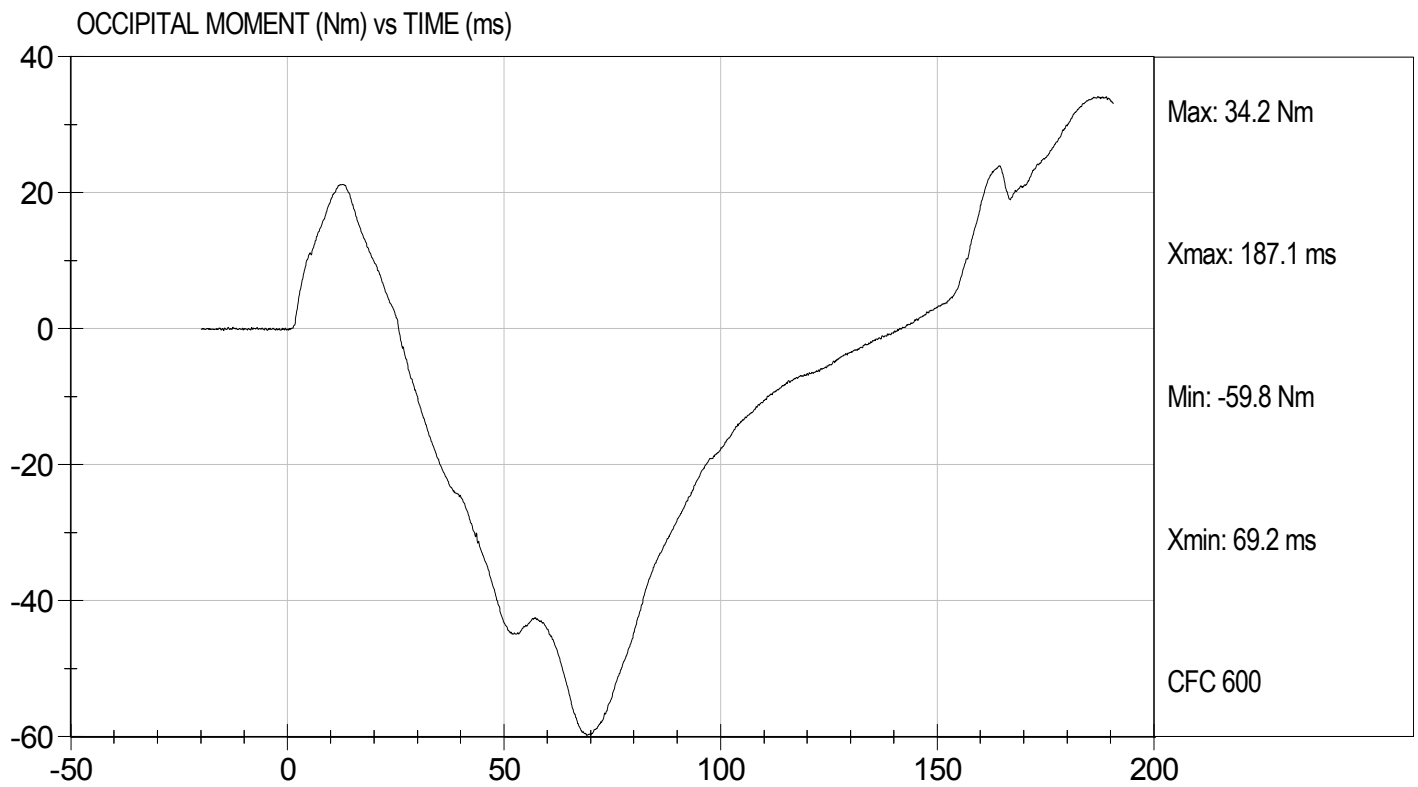
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Component ID: D102663

Test Date: 8/19/10
Velocity: 20.08 ft/s, 6.12 m/s

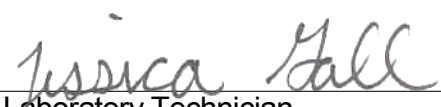


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102664

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	53	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,428	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.57	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results			Pass	


Laboratory Technician

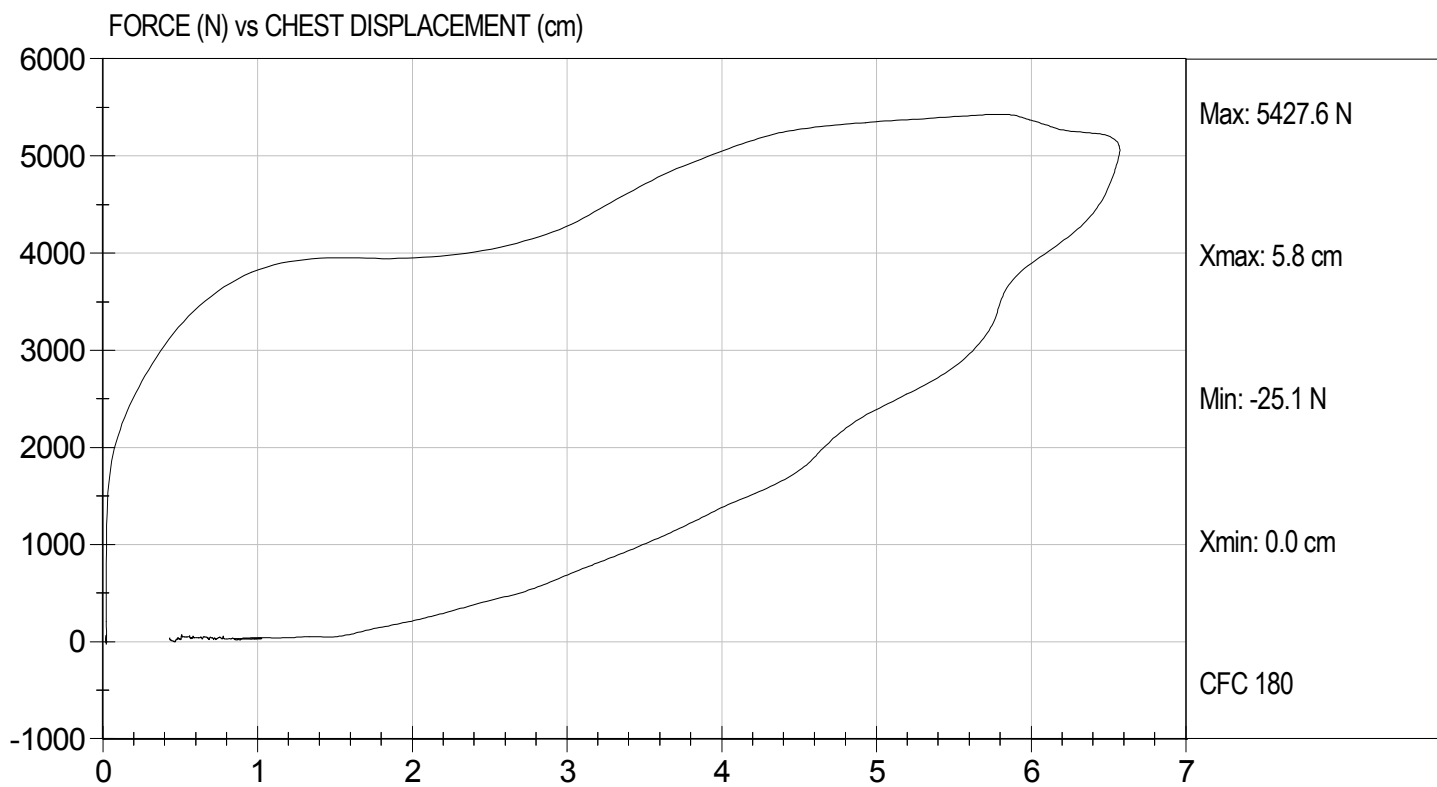
8/19/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102664

Test Date: 8/19/10
Velocity: 21.9 ft/s, 6.68 m/s



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

ATD Serial No: 351

Test I.D: D102665

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,492	Pass
			Overall Test Results	Pass

Jessica Galt
Laboratory Technician

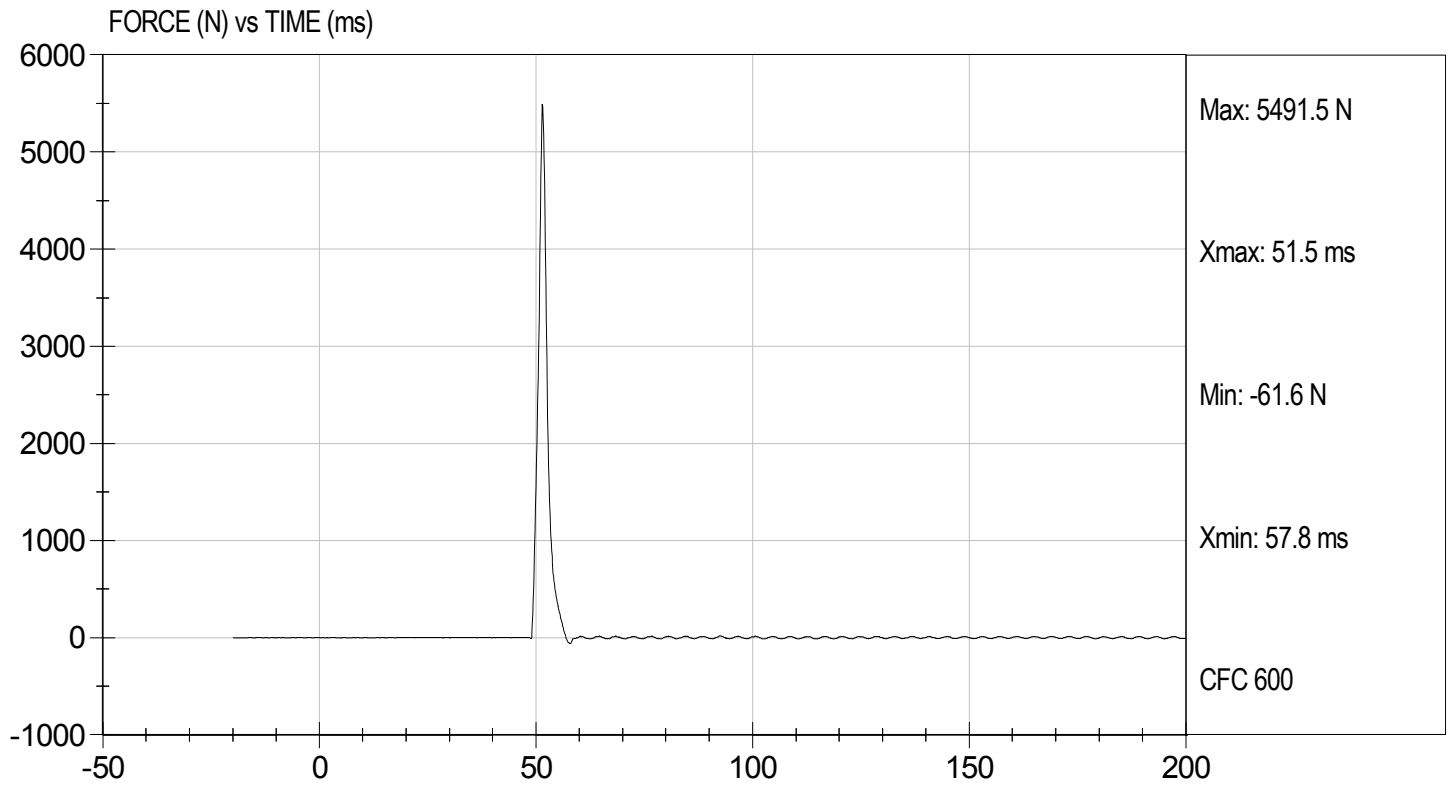
8/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D102665

Test Date: 8/16/10
Velocity: 6.9 ft/s, 2.10 m/s

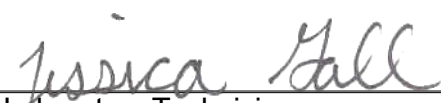


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102666

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,464	Pass
Overall Test Results				Pass


Laboratory Technician

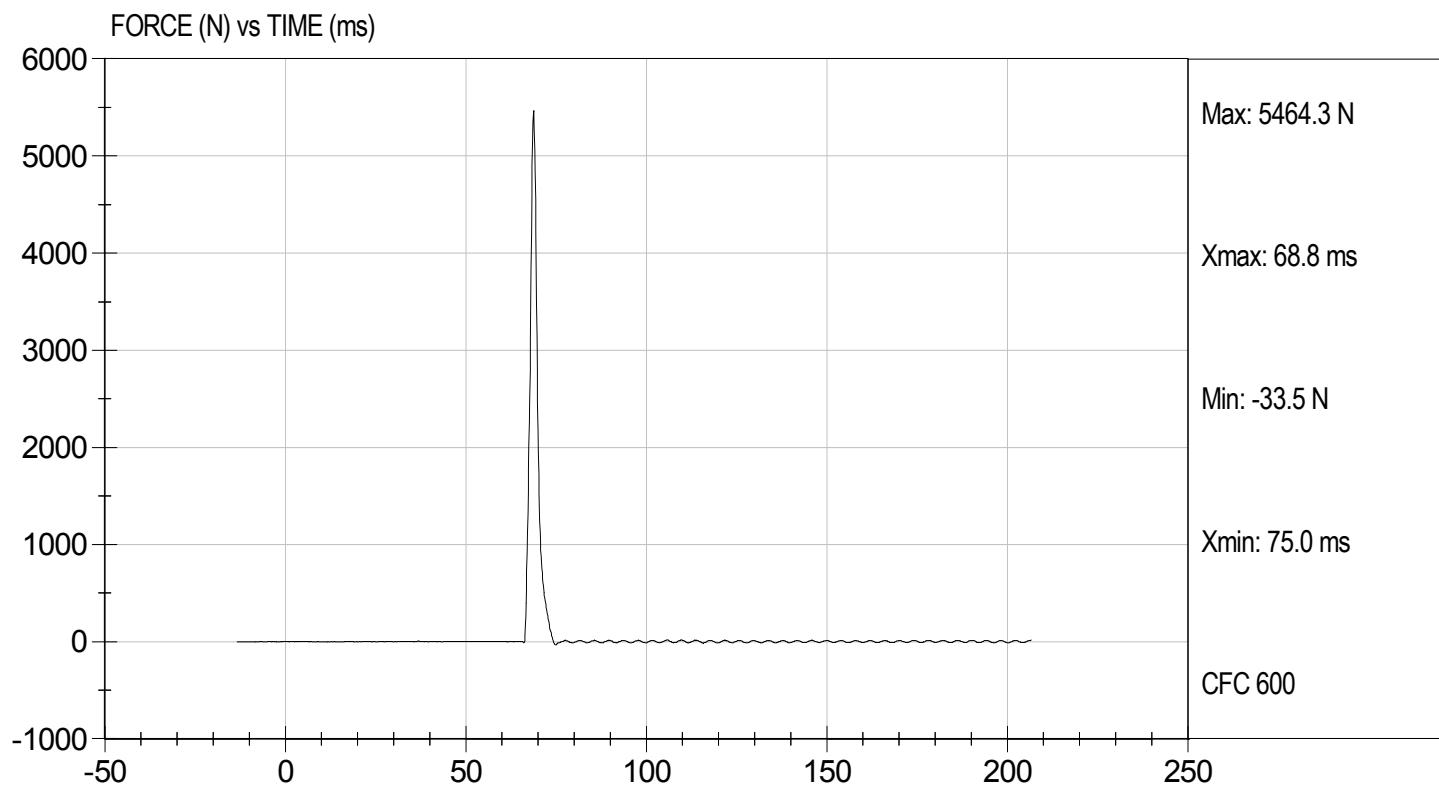
8/19/10
Test Date


Approved By



Test Desc: Left Knee
Component ID: D102666

Test Date: 8/19/10
Velocity: 6.8 ft/s, 2.07 m/s



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

ATD Serial No: 351

Test I.D: D102660

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	52	52	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.4	57.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	45	46	Pass
Overall Test Results					Pass


 Laboratory Technician

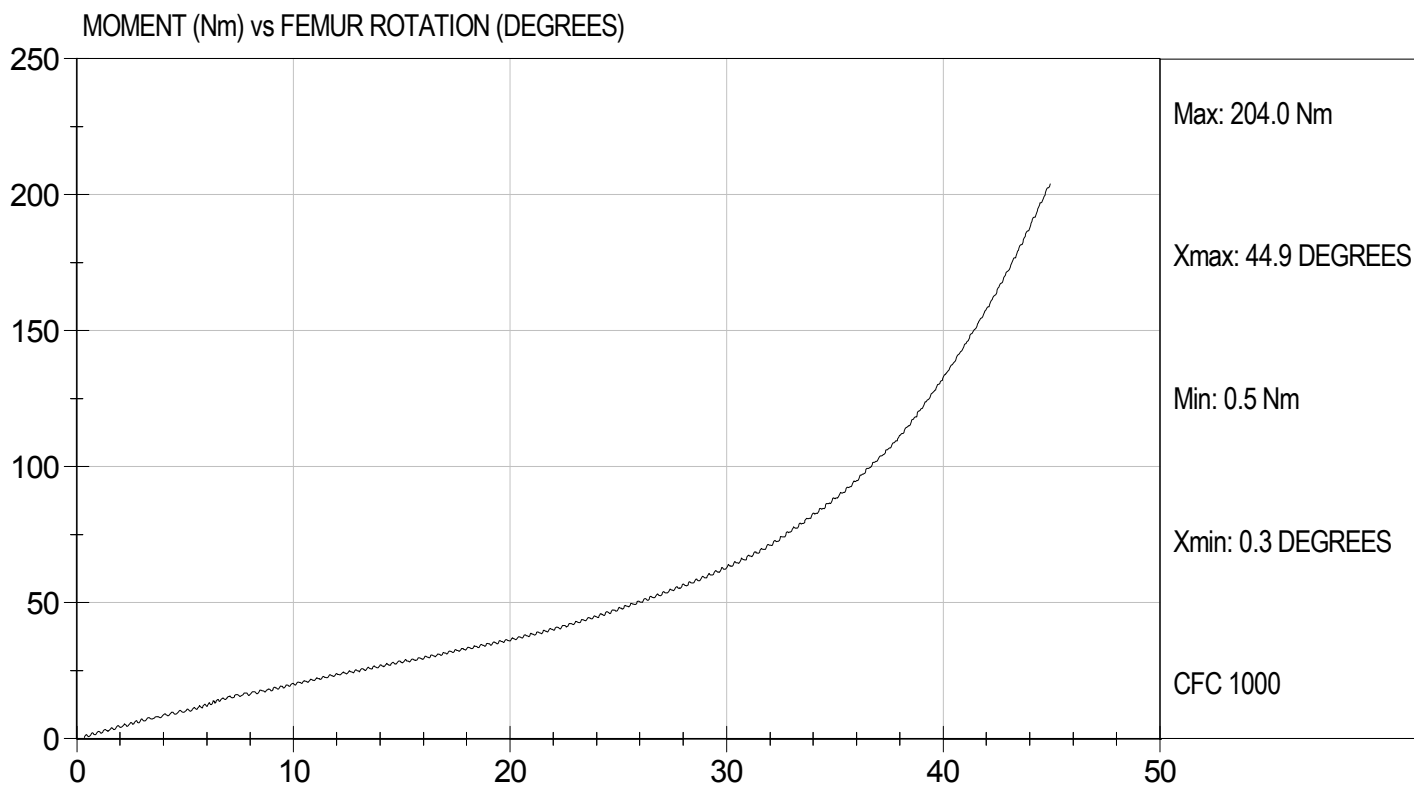
8/19/10
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D102669

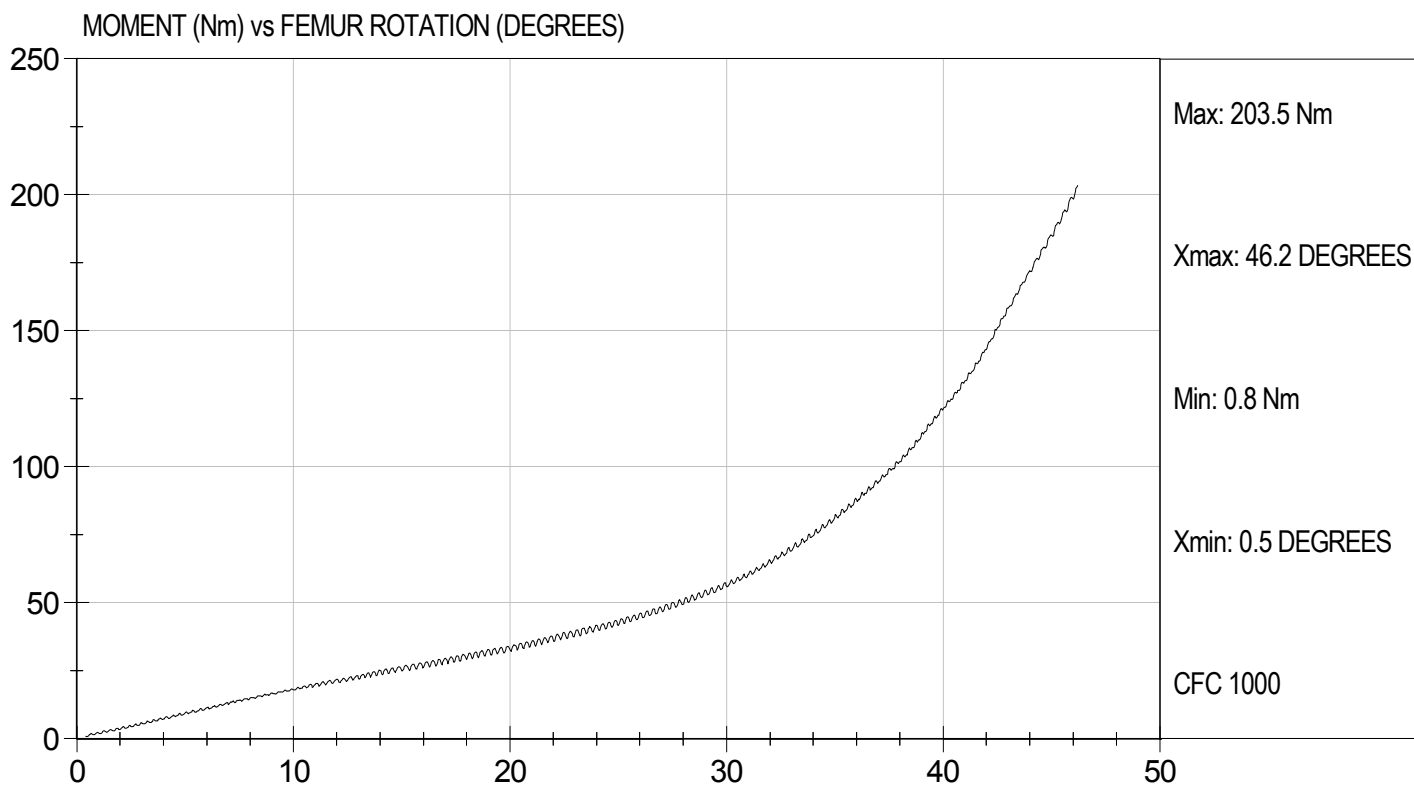
Test Date: 8/19/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D102660

Test Date: 8/19/10
Velocity: 0 ft/s, 0.00 m/s

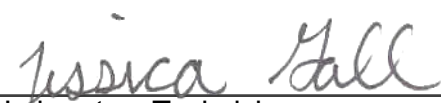


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test ID: D102781

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	225 - 275	248	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-12.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

8/27/10
Test Date

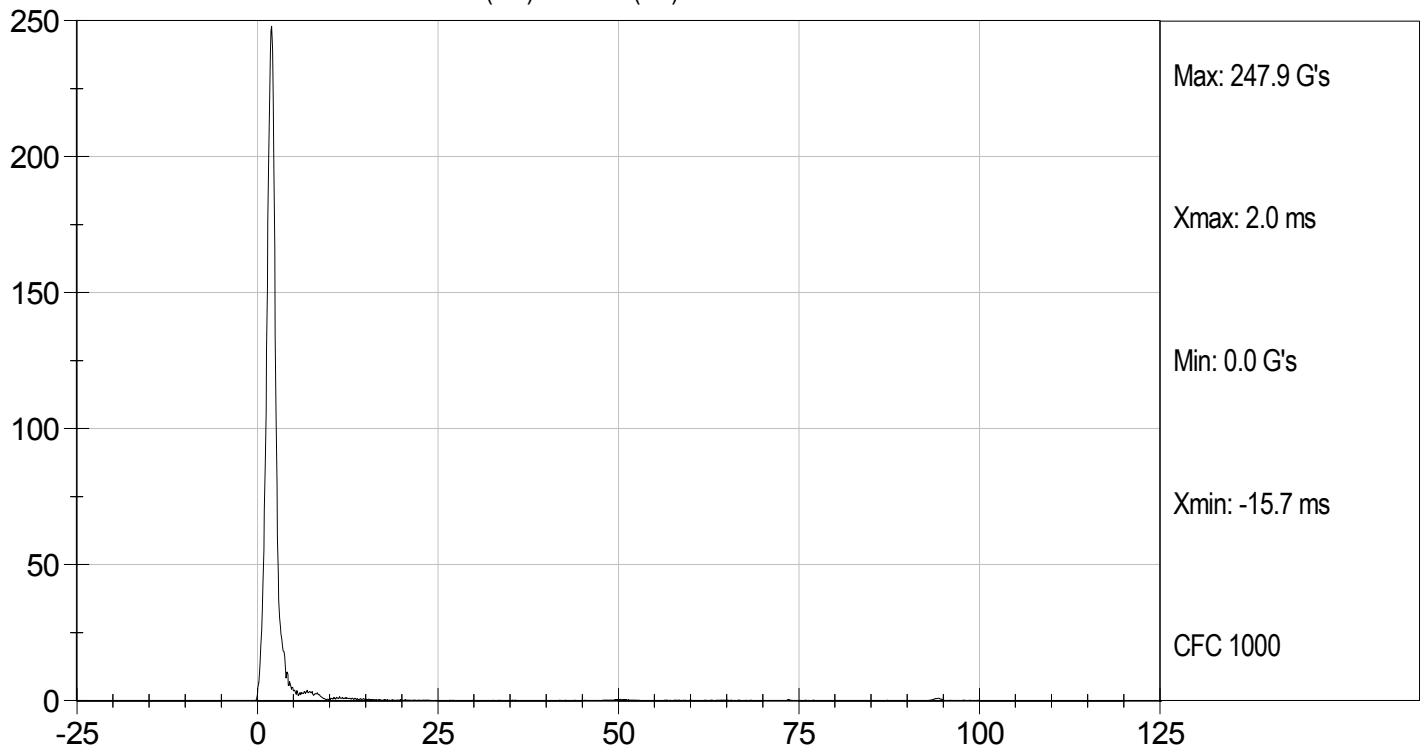

Approved By



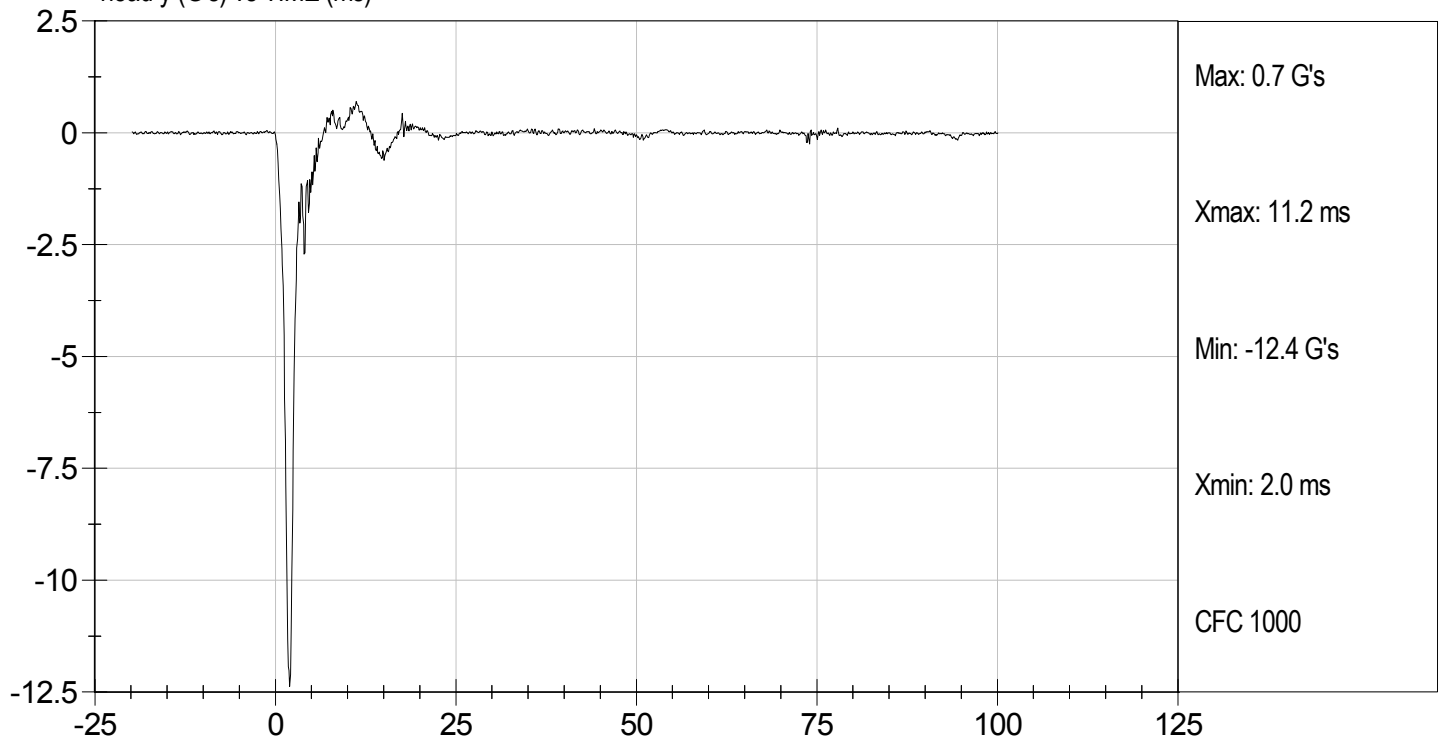
Test Desc: Head Drop
Component ID: D102781

Test Date: 8/27/10
Velocity: 0 ft/s, 0.00 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (ms)



head y (G's) vs TIME (ms)



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

ATD Serial No: 351

Test I.D: D102782

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	46	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.30	Pass
	20 ms	G's	17.60 to 22.60	19.71	Pass
	30 ms	G's	12.50 to 18.50	15.23	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.21	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	67.6	Pass
	Time	ms	57.0 to 64.0	58.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.8	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	90.0	Pass
	Time	ms	47.0 to 58.0	47.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.3	Pass
Overall Test Results					Pass


 Laboratory Technician

8/26/10
 Test Date

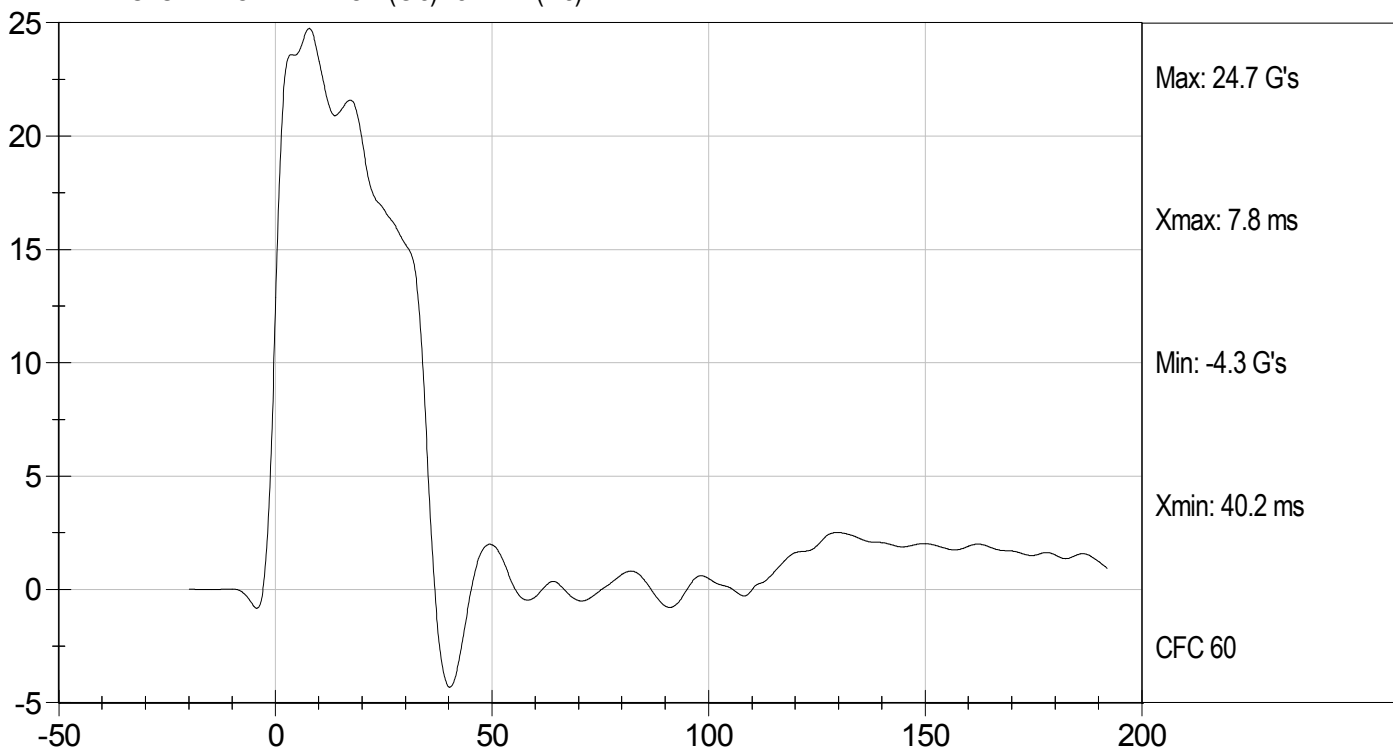

 Approved By



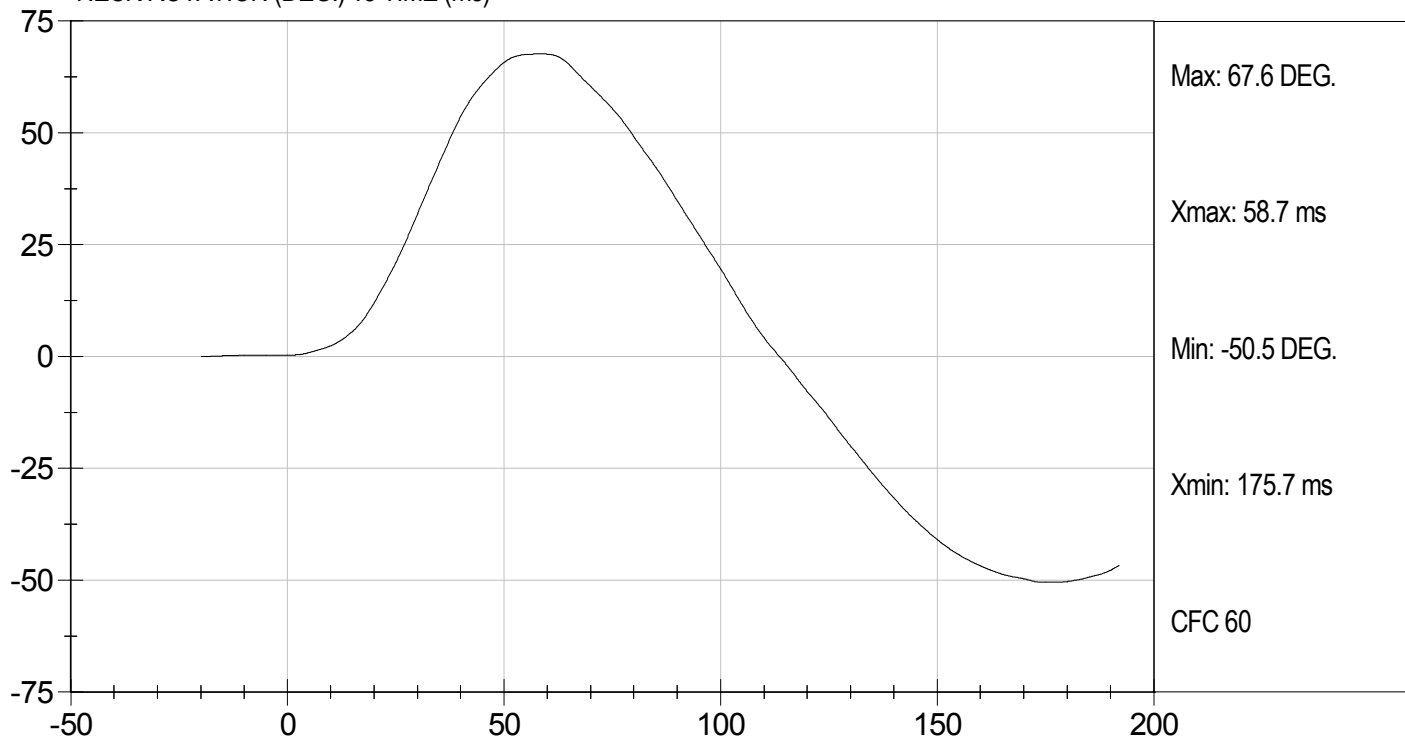
Test Desc: Neck Flexion
Component ID: D102782

Test Date: 8/26/10
Velocity: 22.83 ft/s, 6.96 m/s

PENDULUM DECELERATION (G's) vs TIME (ms)



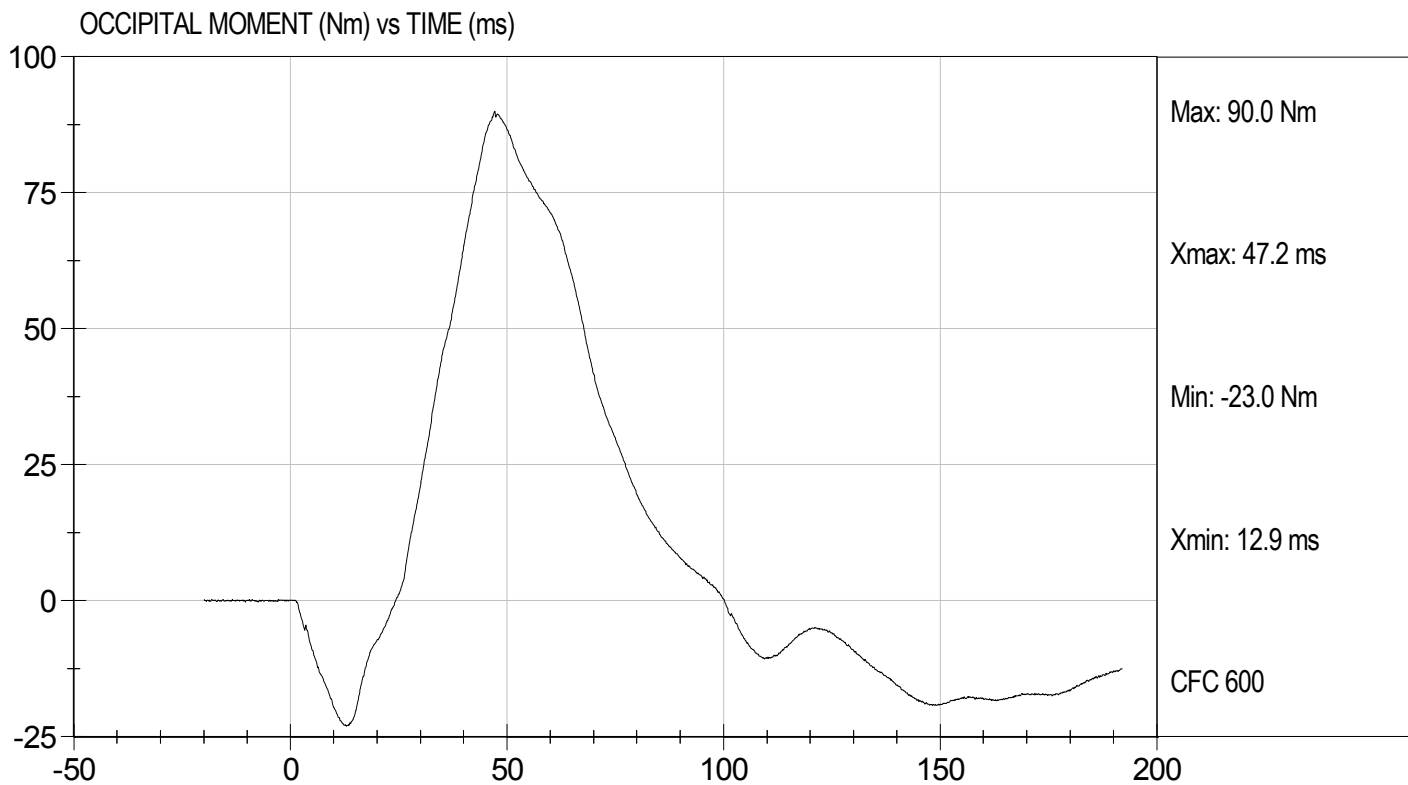
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D102782

Test Date: 8/26/10
Velocity: 22.83 ft/s, 6.96 m/s

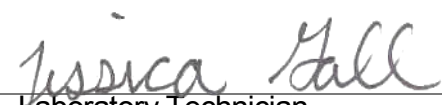


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102783

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	46	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.67	Pass
	20 ms	G's	14.00 to 19.00	18.10	Pass
	30 ms	G's	11.00 to 16.00	15.97	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	15.89	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.0	Pass
	Time	ms	72.0 to 82.0	75.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	151.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.4	Pass
	Time	ms	65.0 to 79.0	68.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	139.3	Pass
Overall Test Results					Pass


 Laboratory Technician

8/26/10
 Test Date

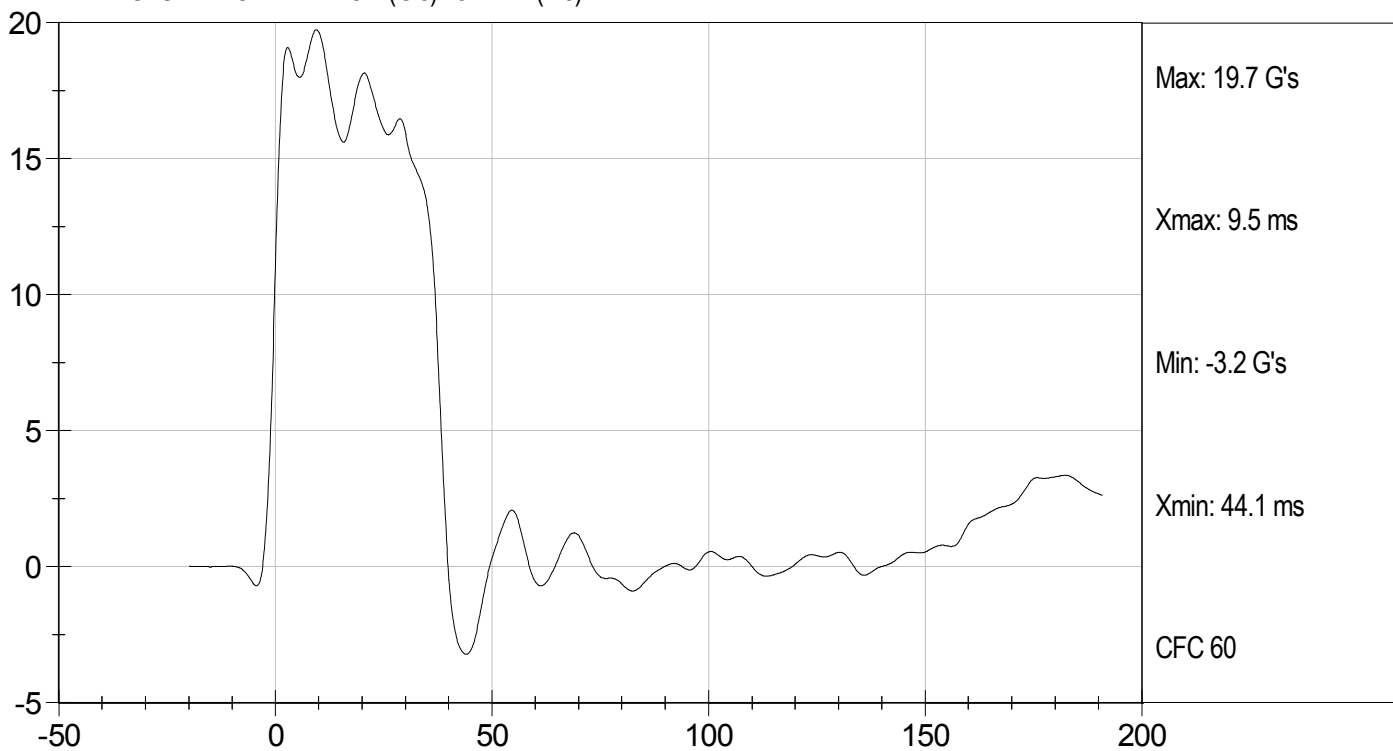

 Approved By



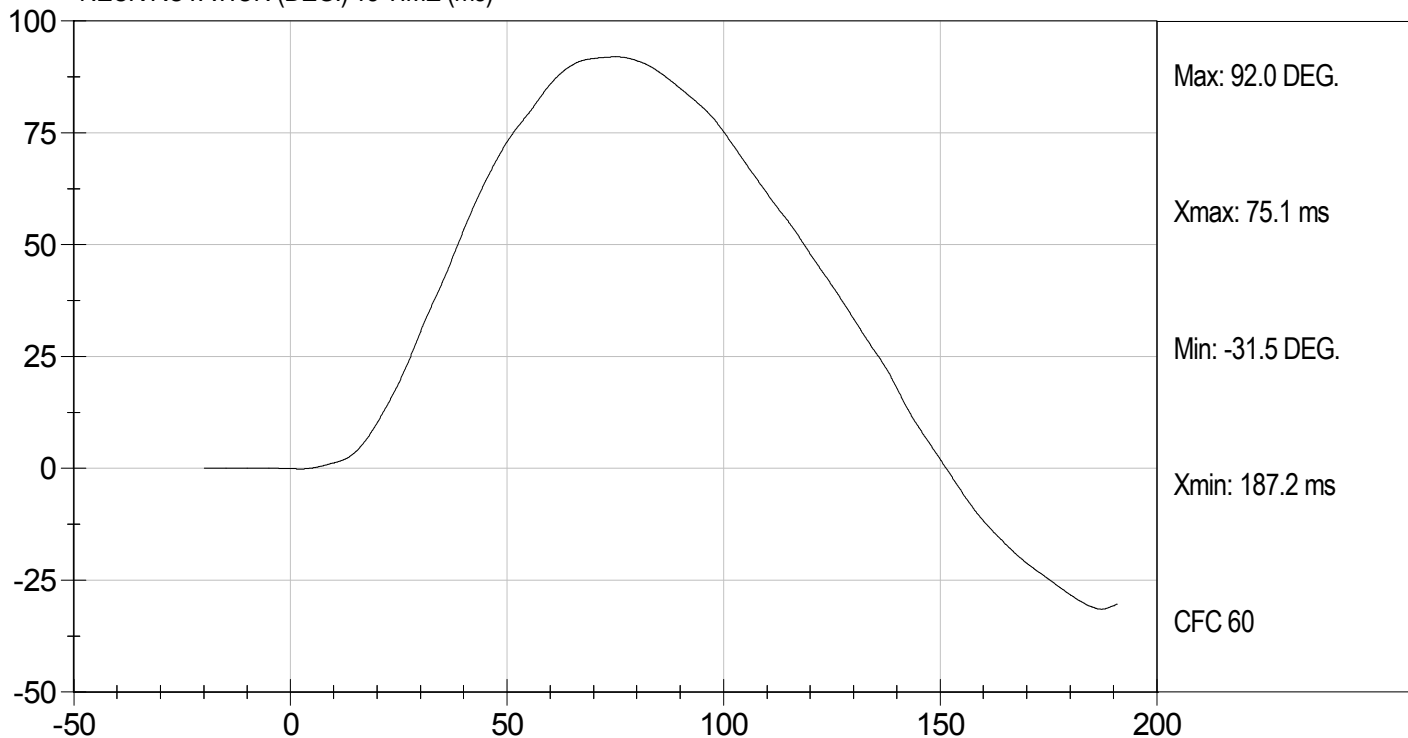
Test Desc: Neck Extension
Component ID: D102783

Test Date: 8/26/10
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (G's) vs TIME (ms)



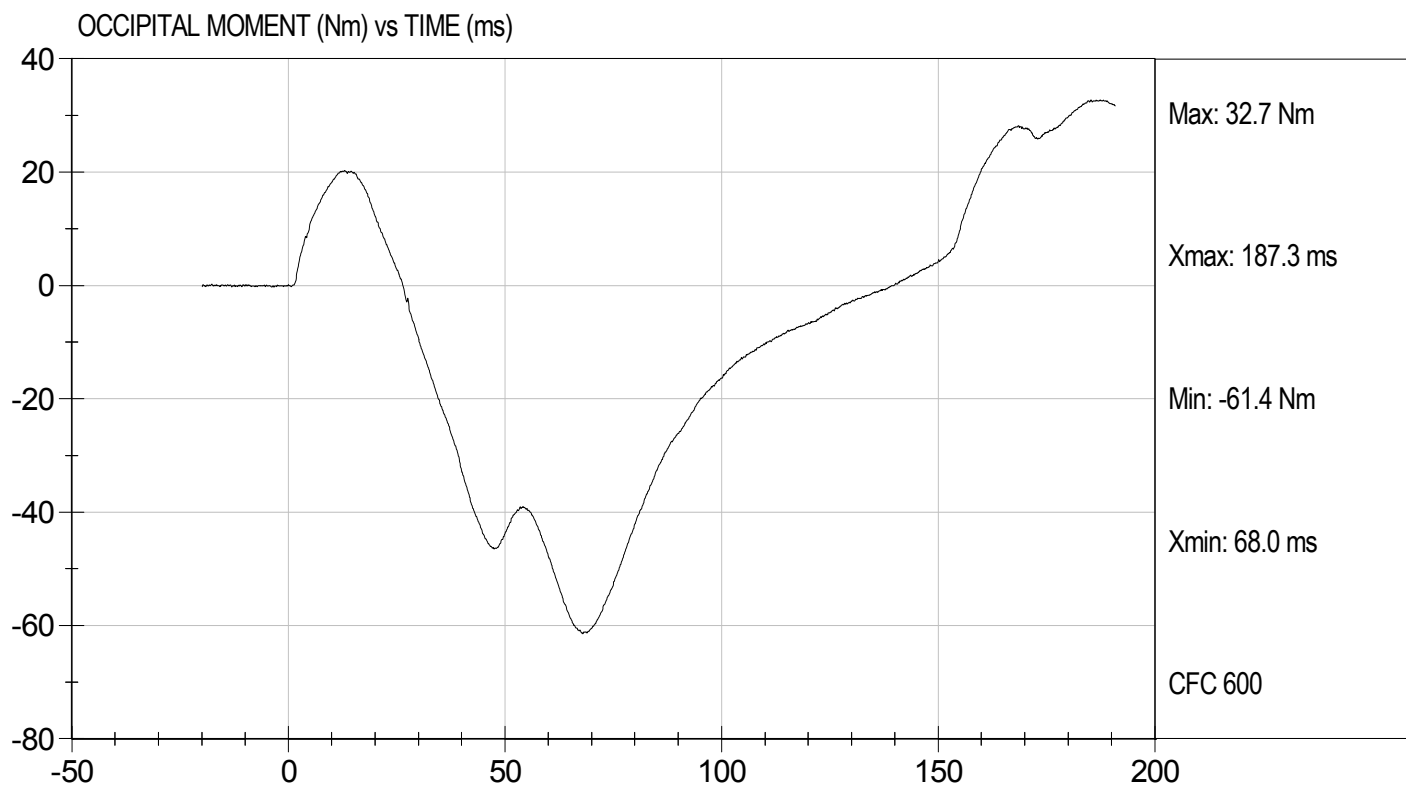
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Component ID: D102783

Test Date: 8/26/10
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102784

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,443	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.44	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass


Laboratory Technician

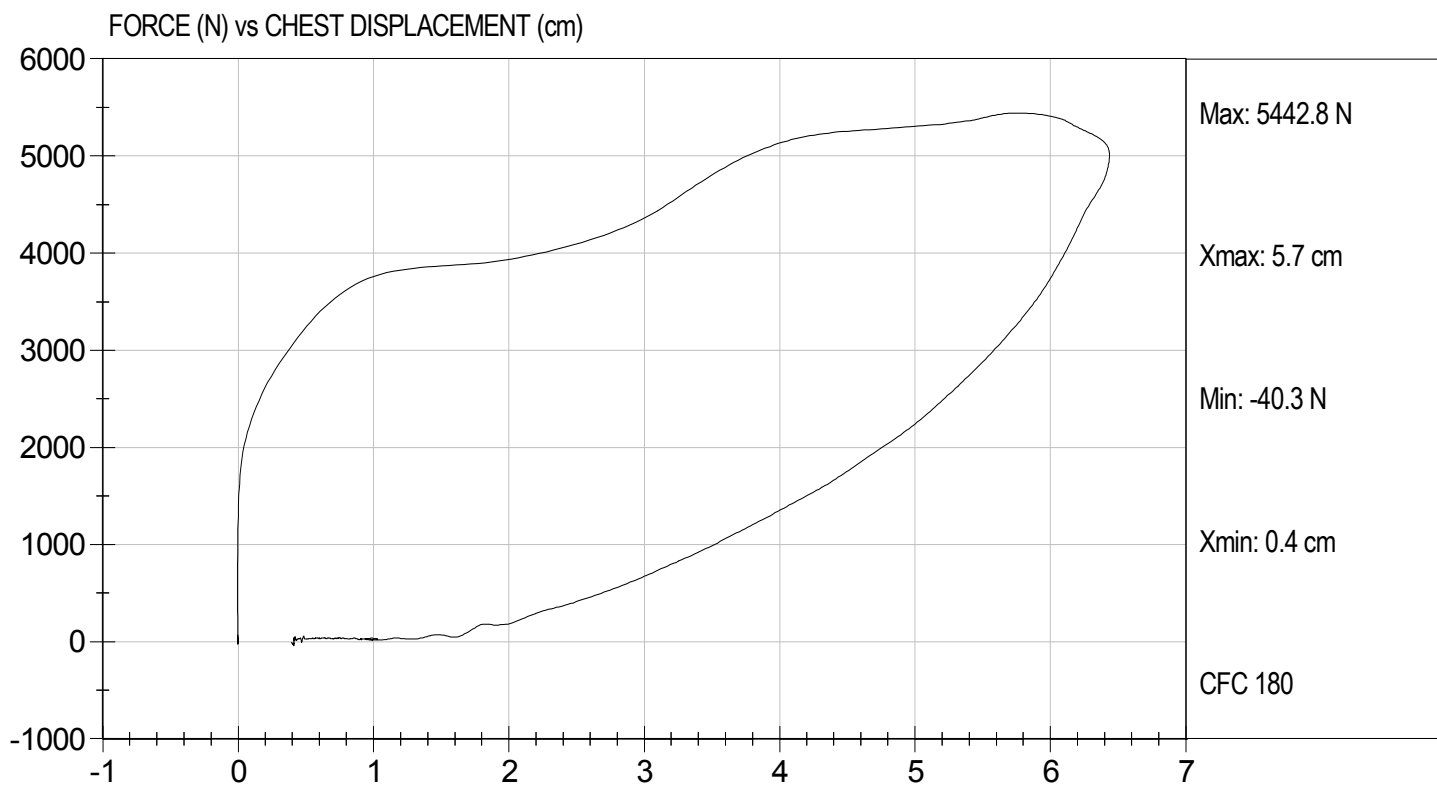
8/30/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102784

Test Date: 8/30/10
Velocity: 22.22 ft/s, 6.77 m/s

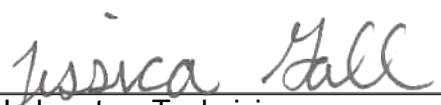


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102785

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,253	Pass
Overall Test Results				Pass


Laboratory Technician

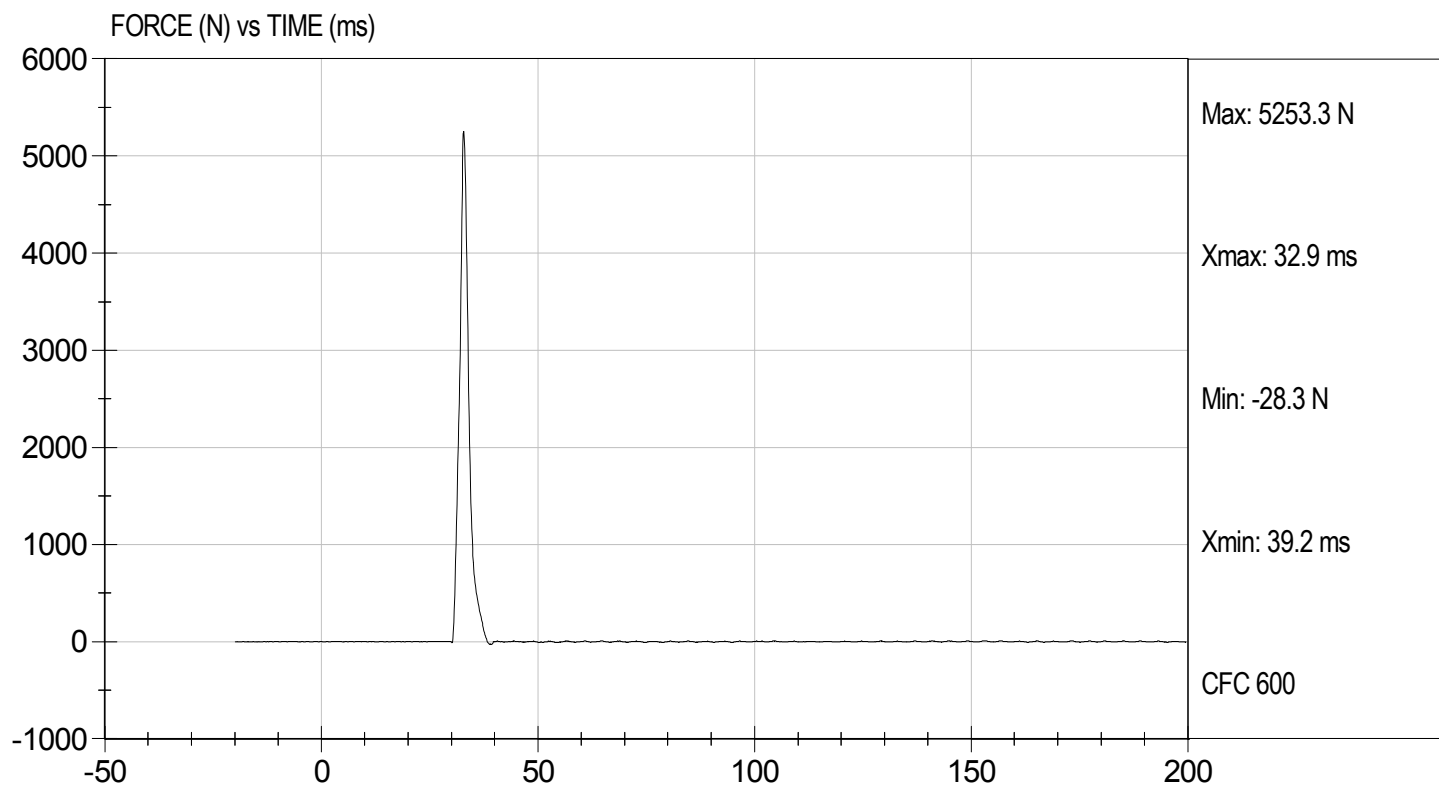
8/30/10
Test Date


Approved By



Test Desc: Right Knee
Component ID: D102785

Test Date: 8/30/10
Velocity: 6.83 ft/s, 2.08 m/s



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

ATD Serial No: 351

Test I.D: D102786

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,279	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

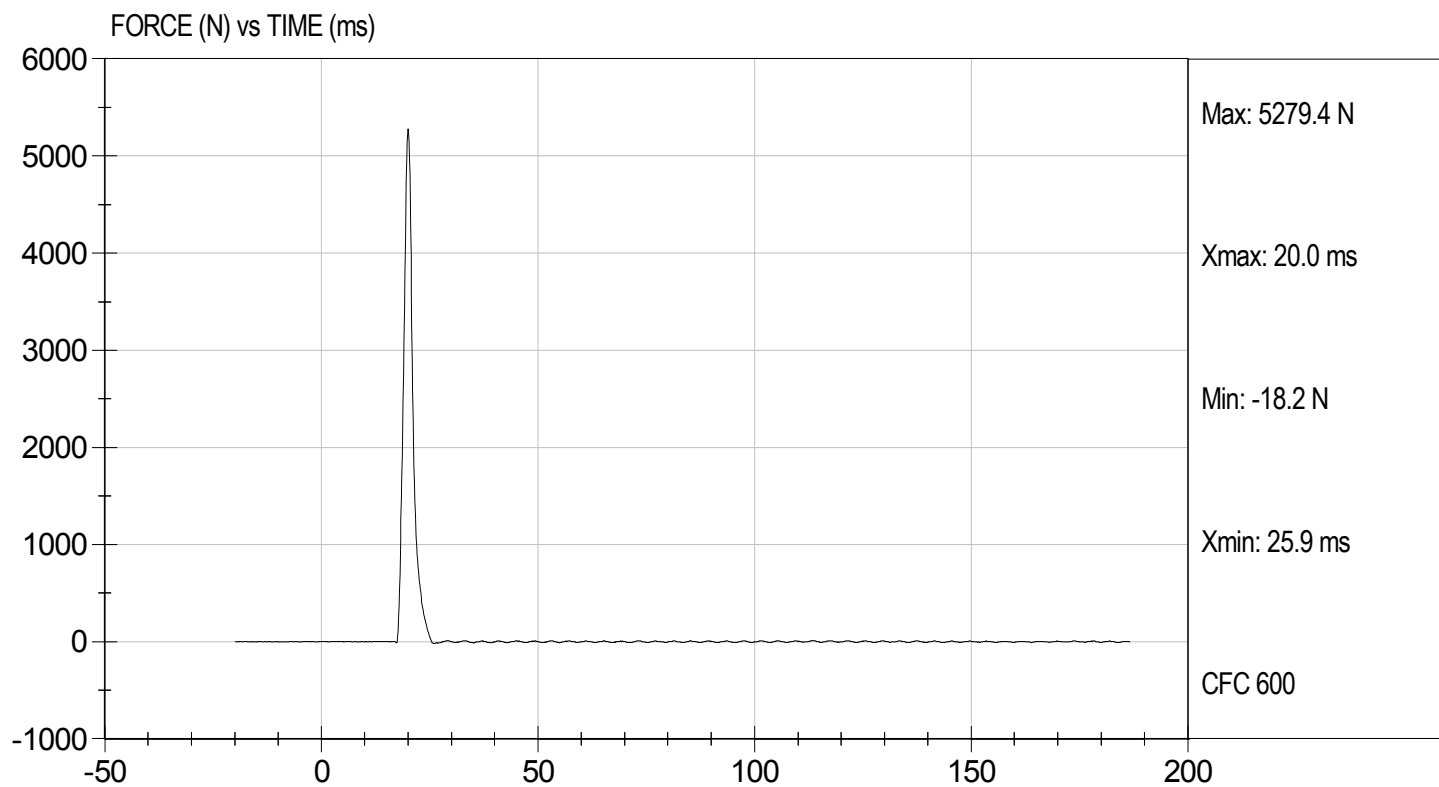
8/30/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D102786

Test Date: 8/30/10
Velocity: 6.80 ft/s, 2.07 m/s



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

ATD Serial No: 351

Test I.D: D102780

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	47	47	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	52.1	49.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	46	47	Pass
Overall Test Results					Pass


 Laboratory Technician

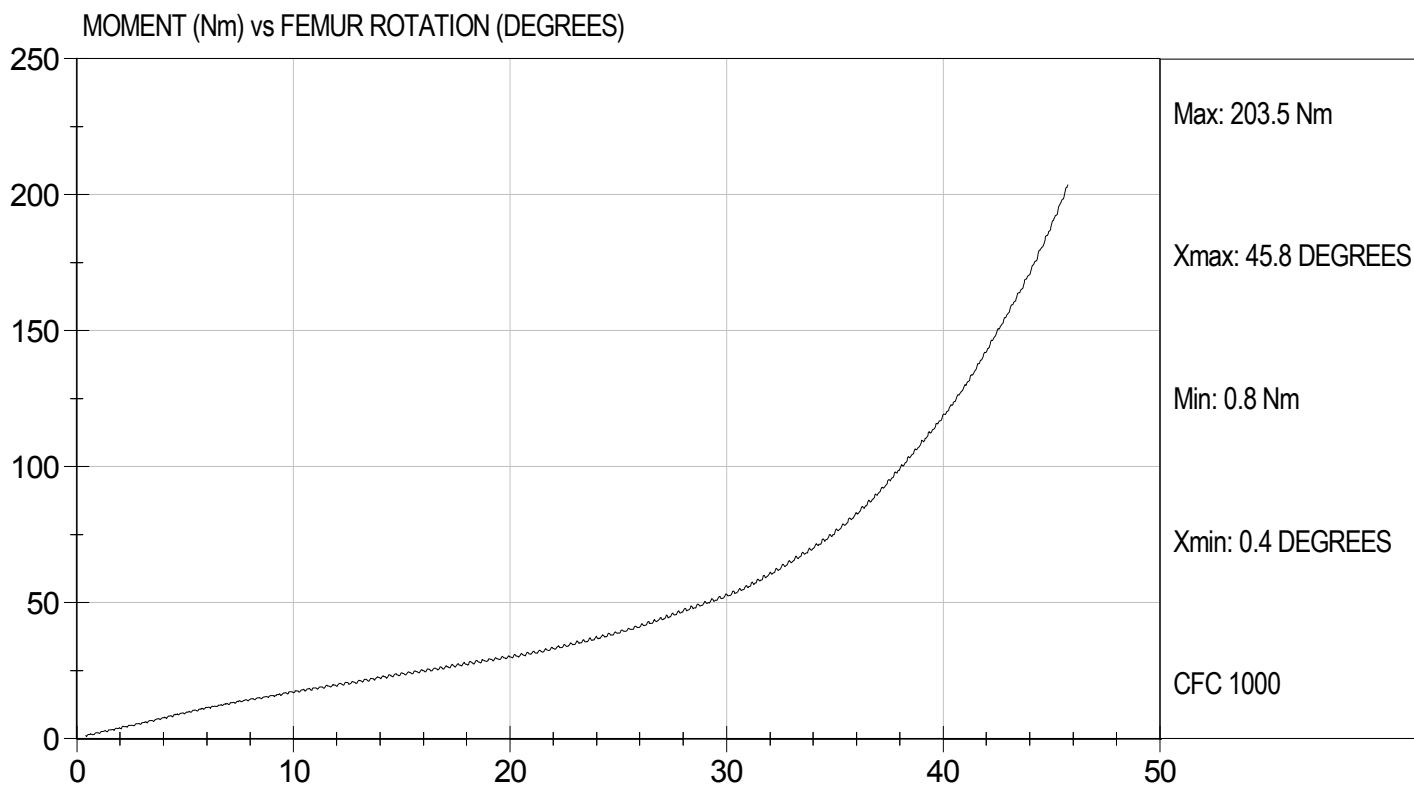
8/27/10
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D102789

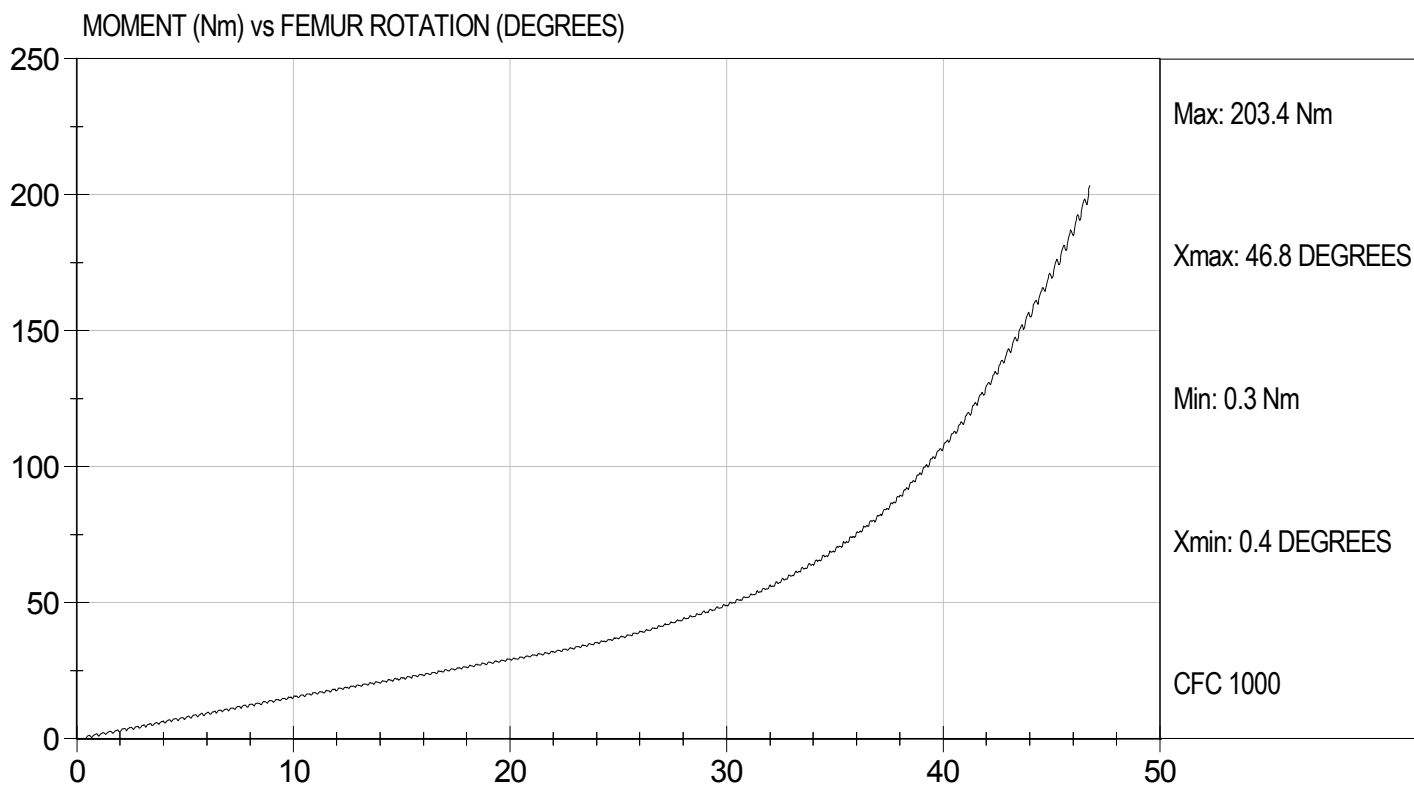
Test Date: 8/27/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D102780

Test Date: 8/27/10
Velocity: 0 ft/s, 0.00 m/s

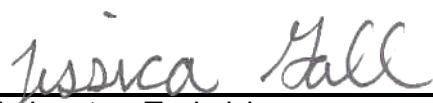


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D102481

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
Peak Resultant Acceleration	G's	250 to 300	273	Pass
Peak Lateral Acceleration	G's	+/- 15	-2.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

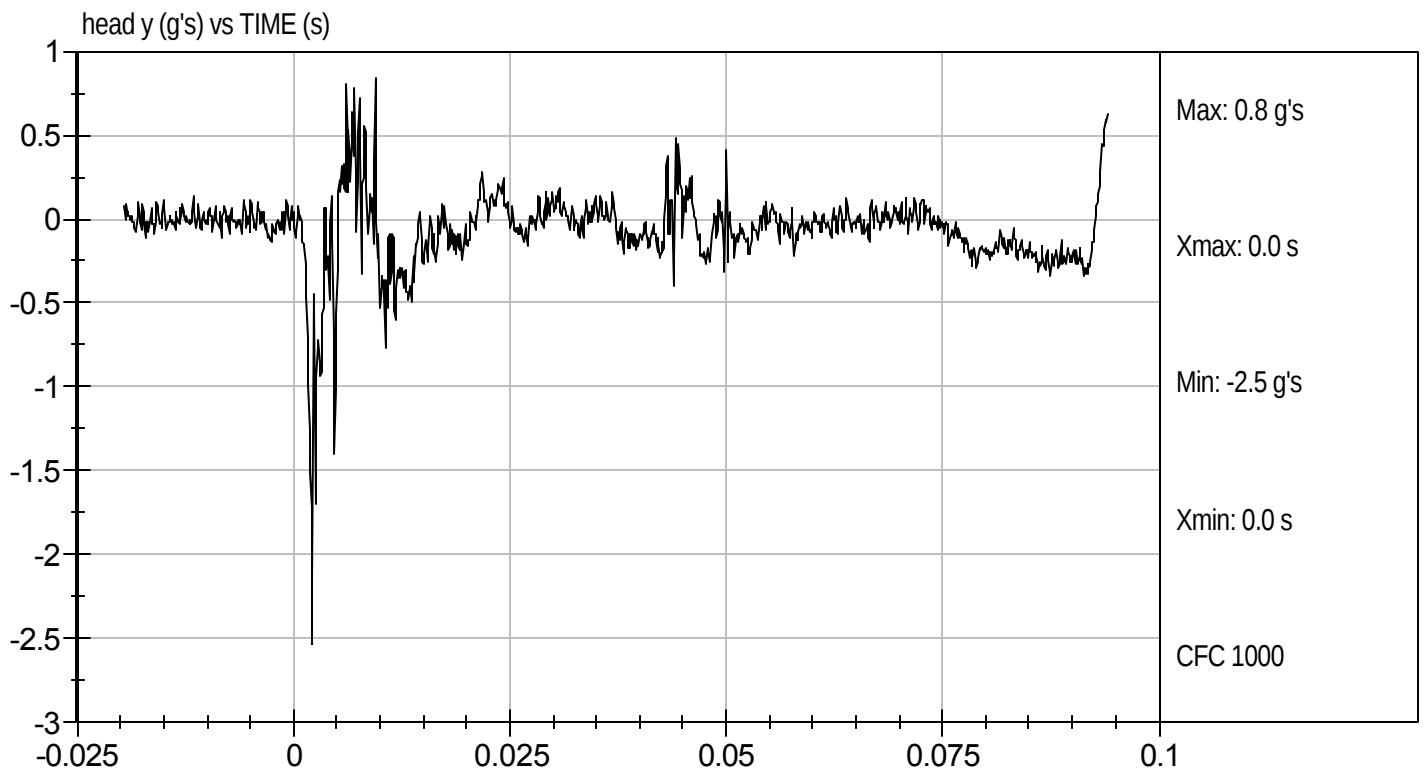
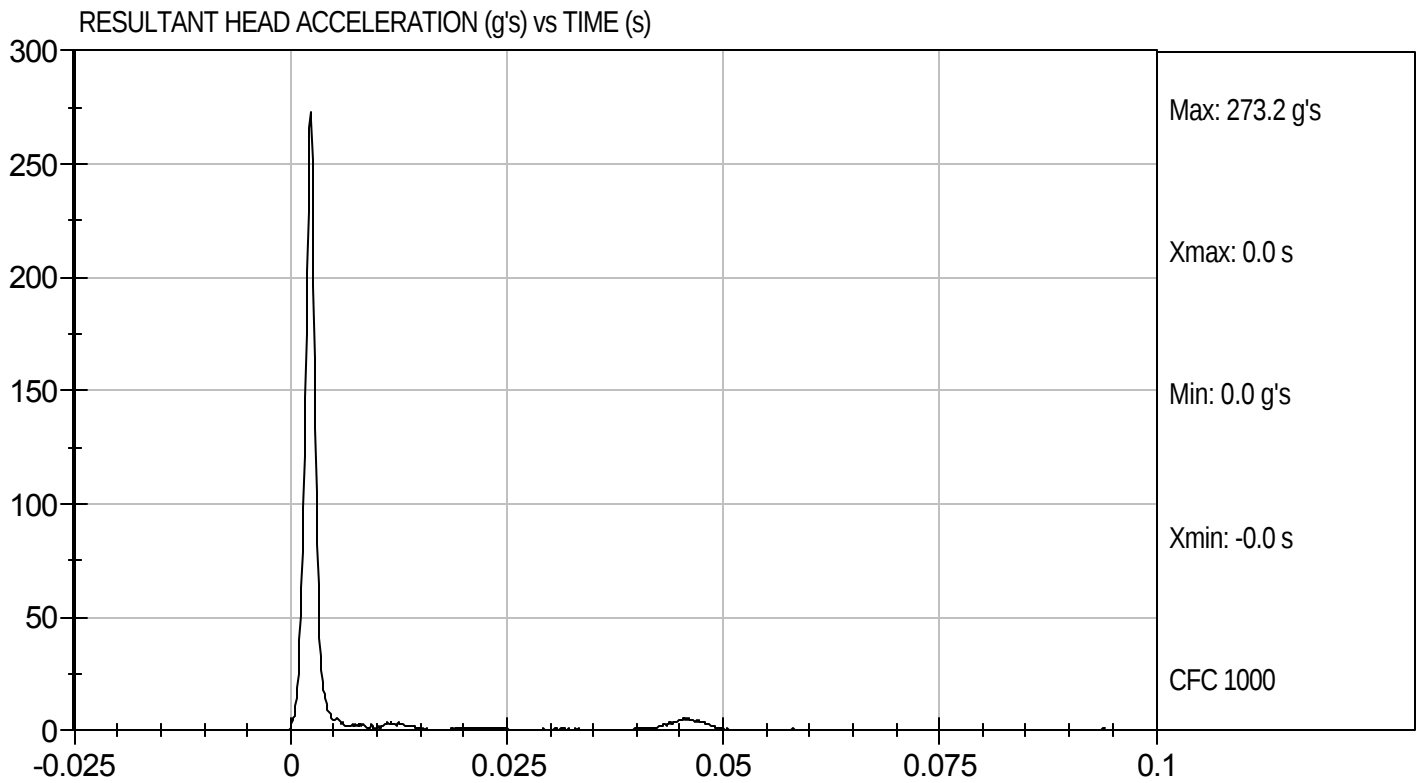
8/2/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D102481

Test Date: 8/2/10
Velocity: 0 ft/s, 0.00 m/s

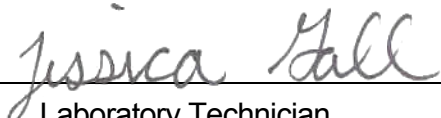


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102482

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	47	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.8	Pass
	30 ms	m/s	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results				Pass	


 Laboratory Technician

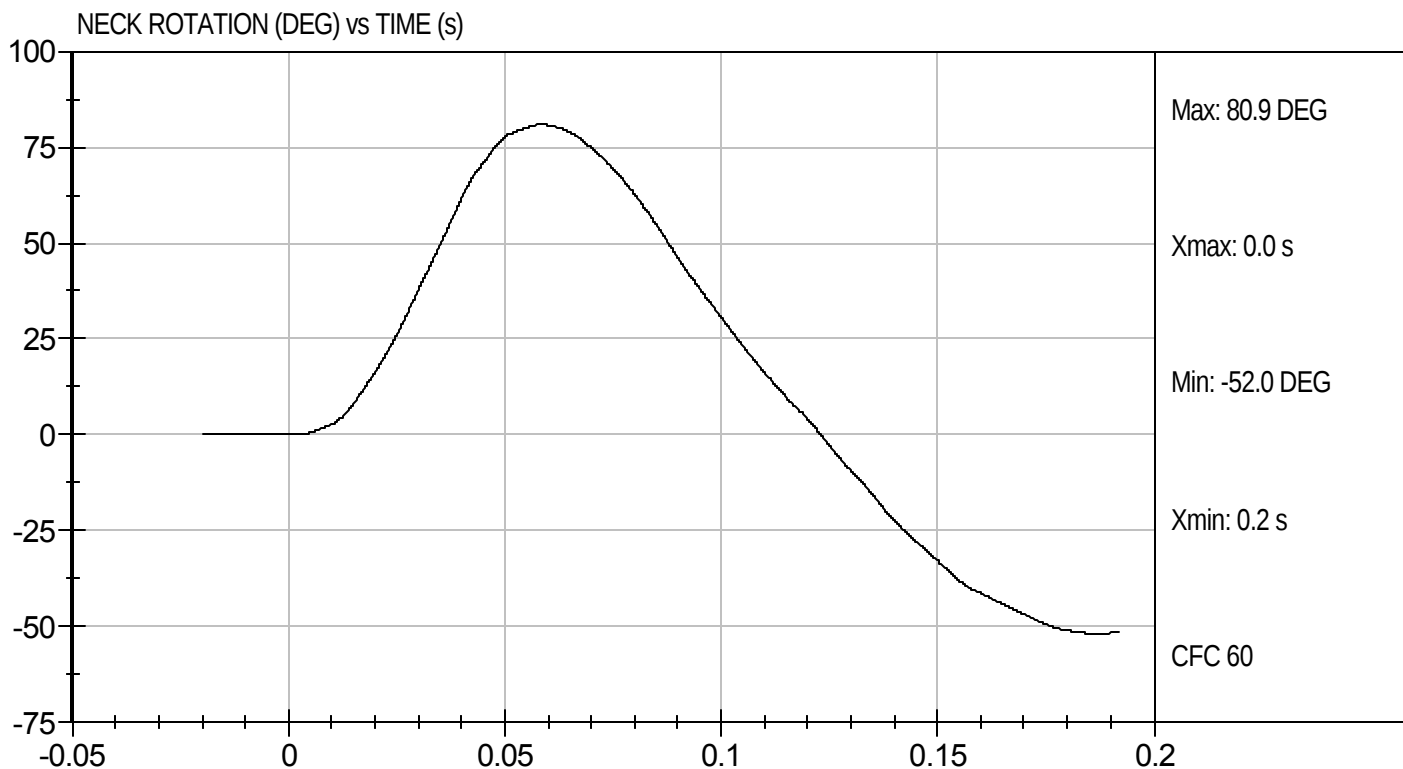
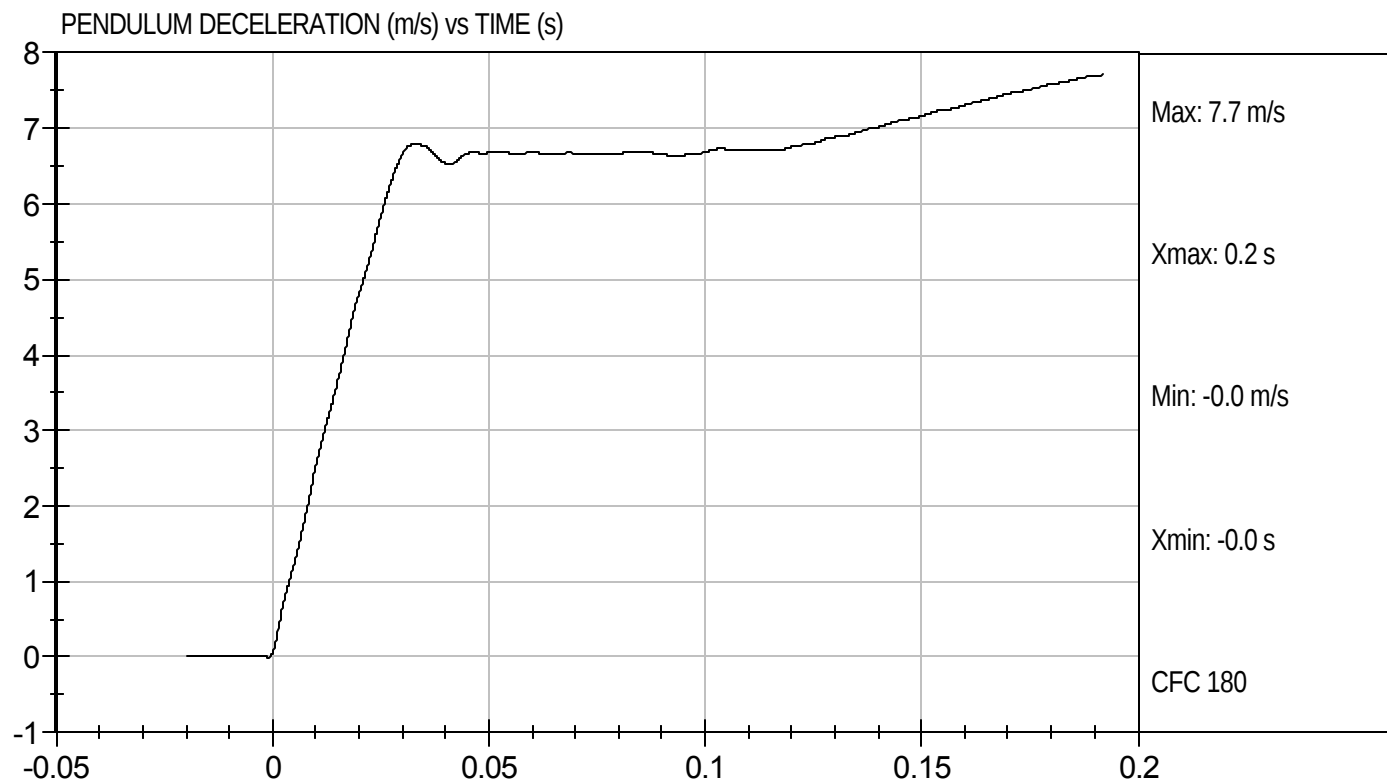
7/30/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D102482

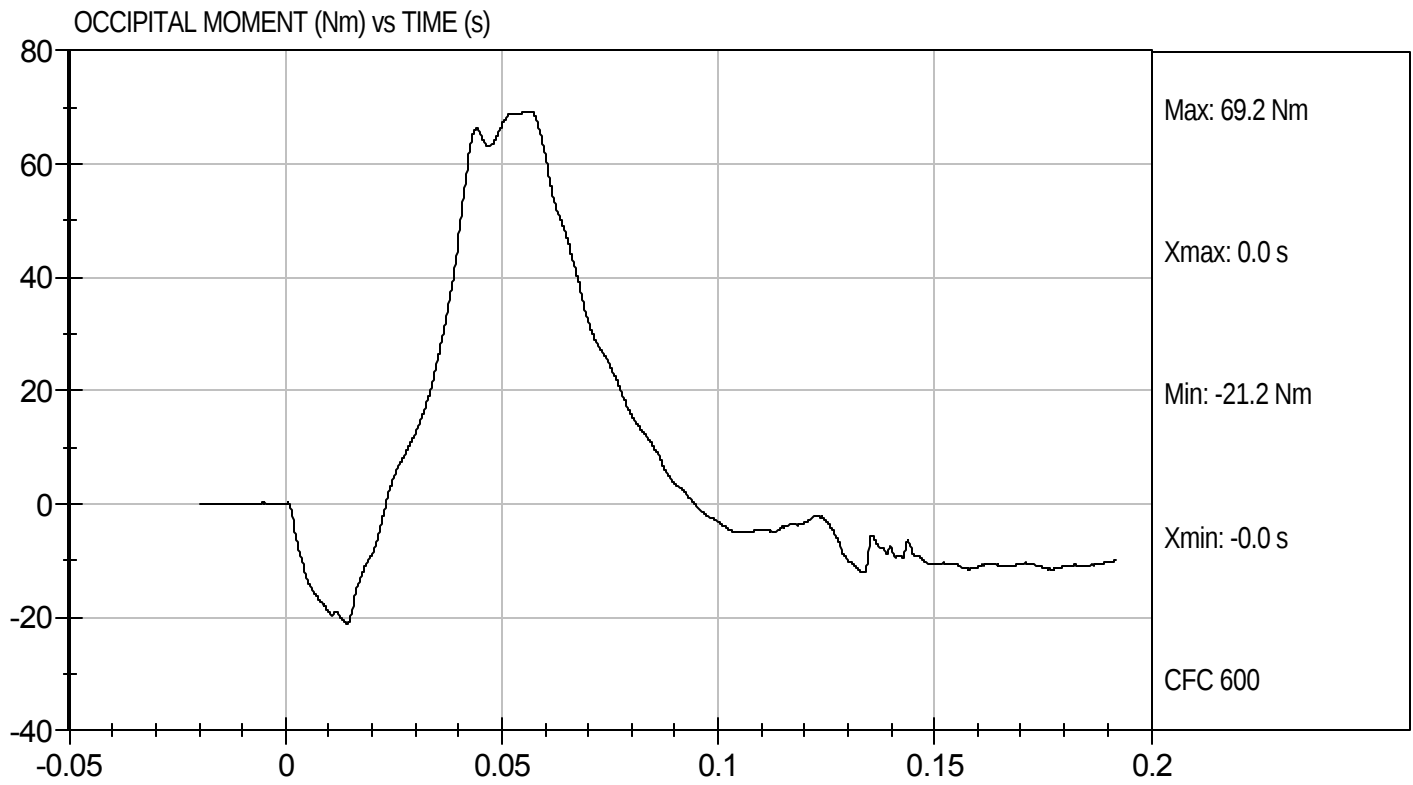
Test Date: 7/30/10
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D102482

Test Date: 7/30/10
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102483

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	47	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	101	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	99	Pass
Overall Results					Pass

Jessica Gall
Laboratory Technician

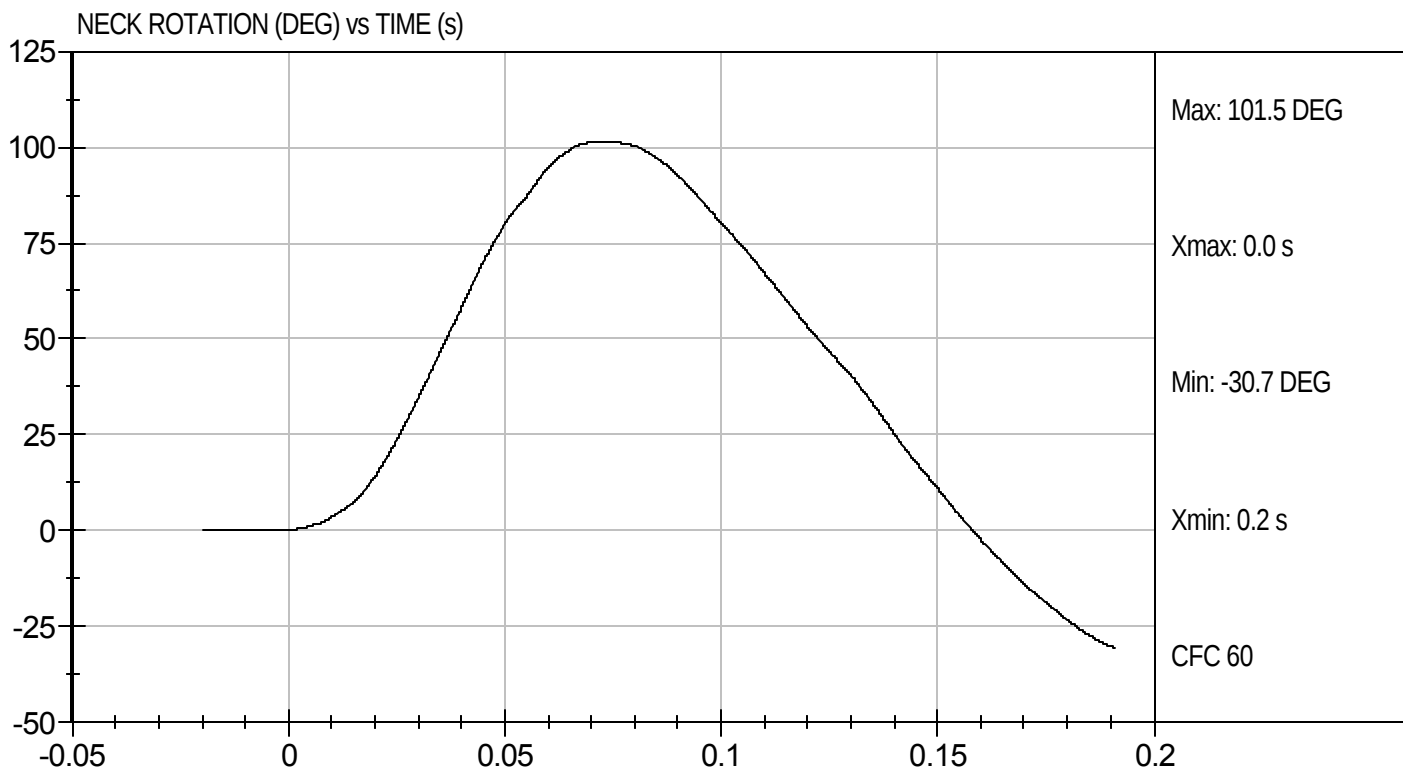
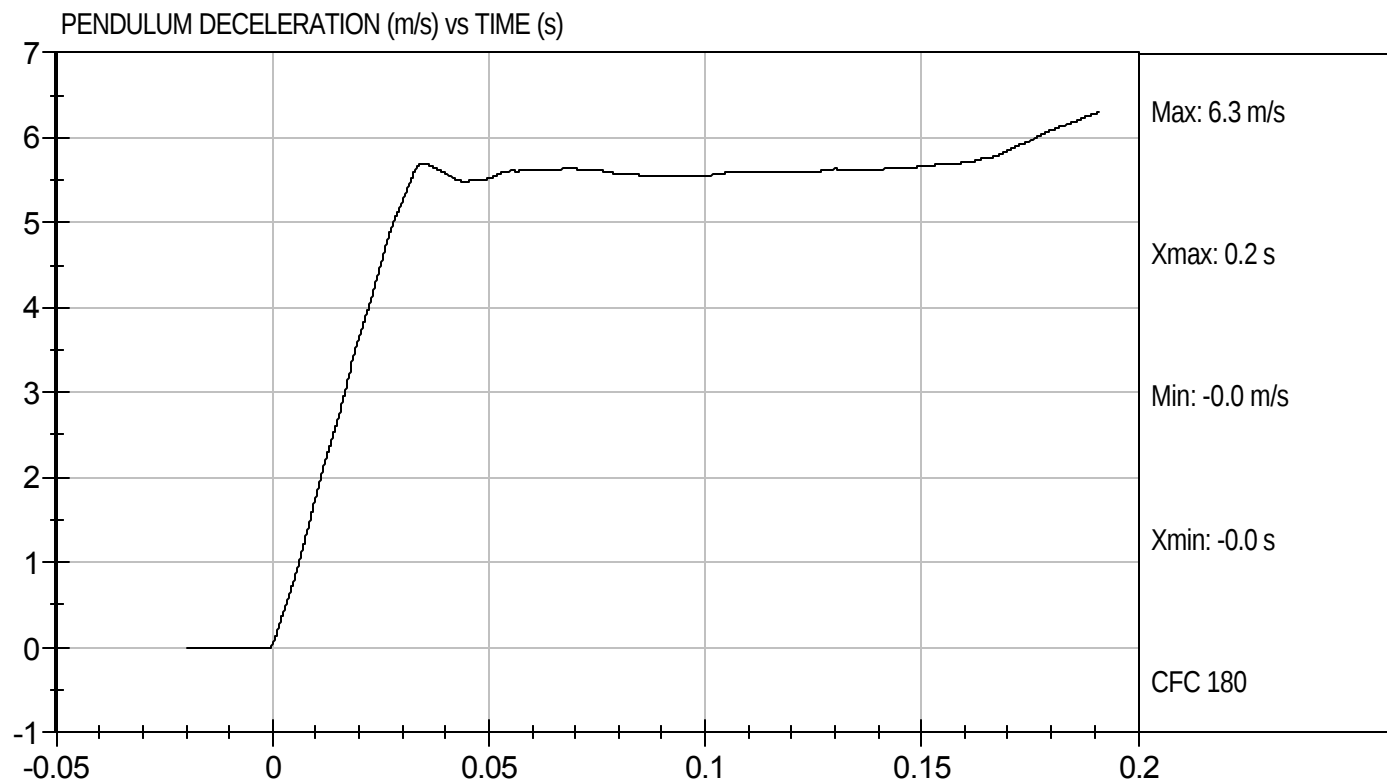
7/30/10
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D102483

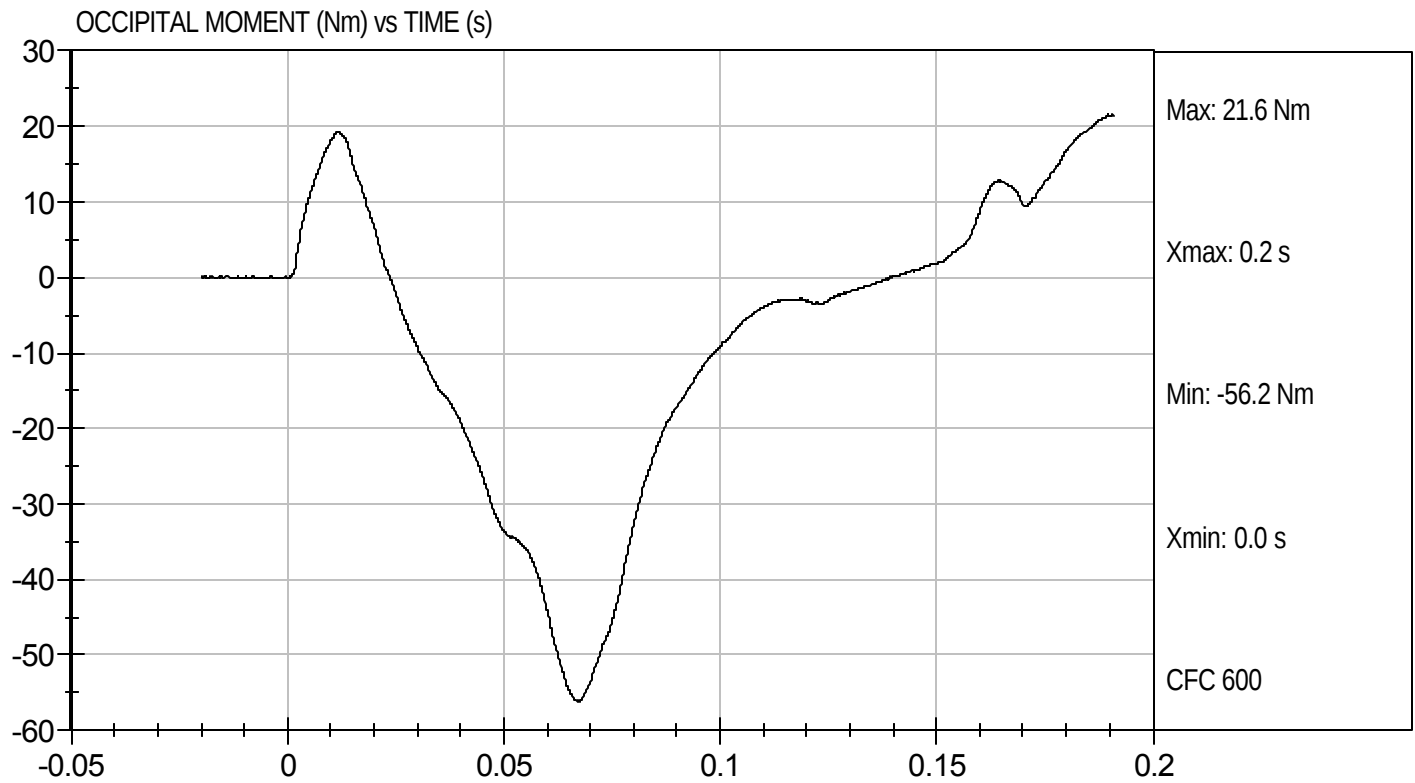
Test Date: 7/30/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D102483

Test Date: 7/30/10
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102484

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Relative Humidity	%	10 to 70	49	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.14	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4033	Pass
			Overall Test Results	Pass


 Laboratory Technician

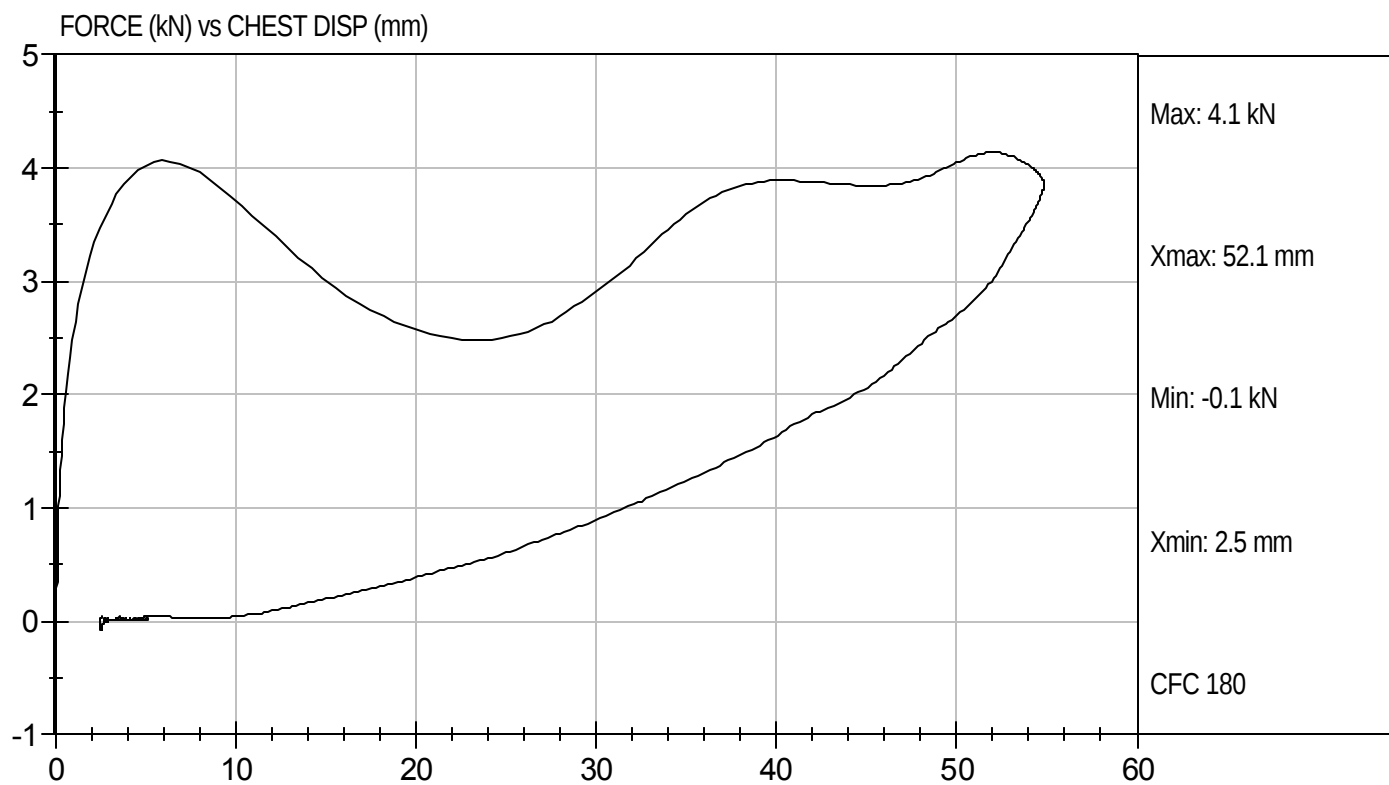
8/2/10
 Test Date


 Approved By



Test Desc: Thorax Impact
Component ID: D102484

Test Date: 8/2/10
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 634

Test I.D: D102485

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.70	Pass
Overall Test Results				Pass


Laboratory Technician

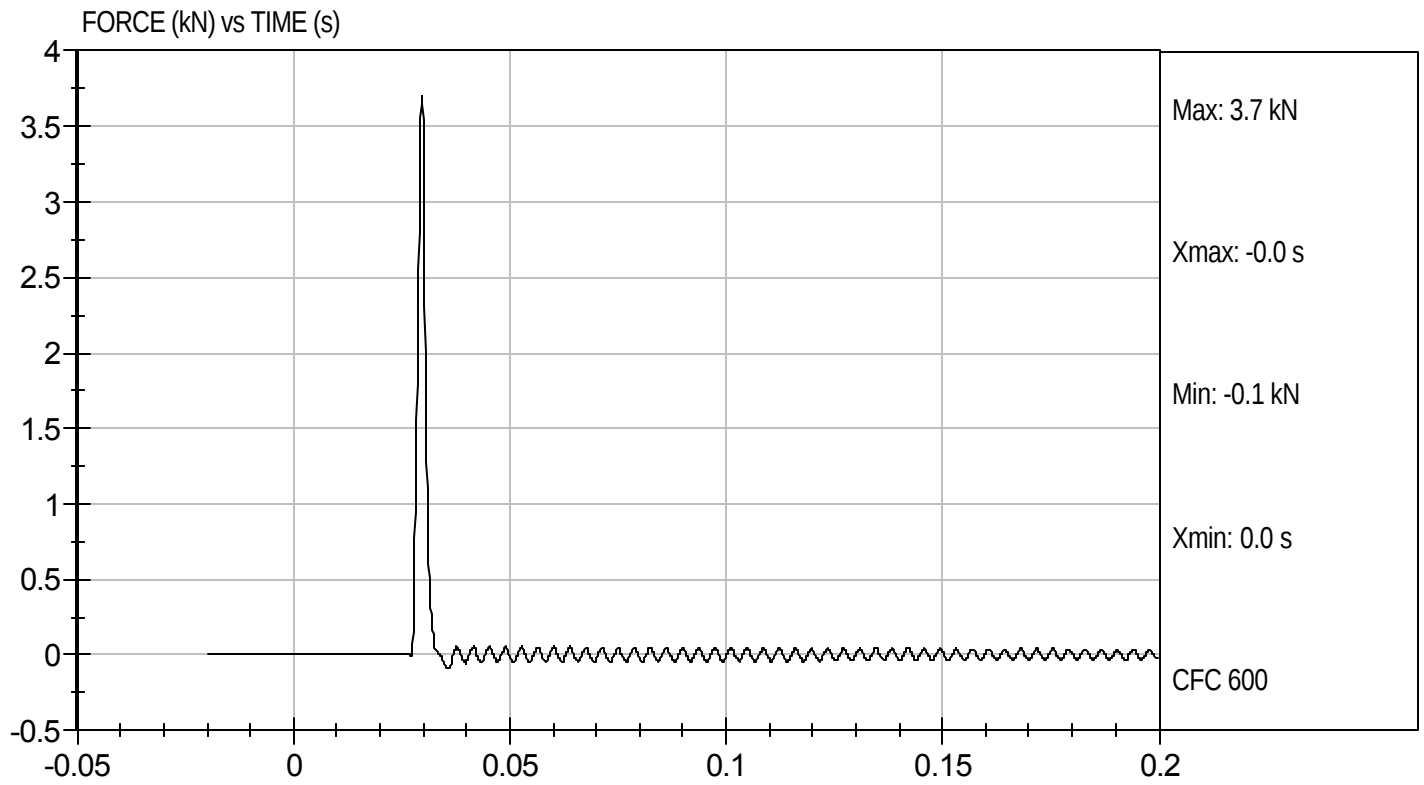
7/30/10
Test Date


Approved By



Test Desc: Right Knee
Component ID: D102485

Test Date: 7/30/10
Velocity: 6.86 ft/s, 2.09 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102486

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.92	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

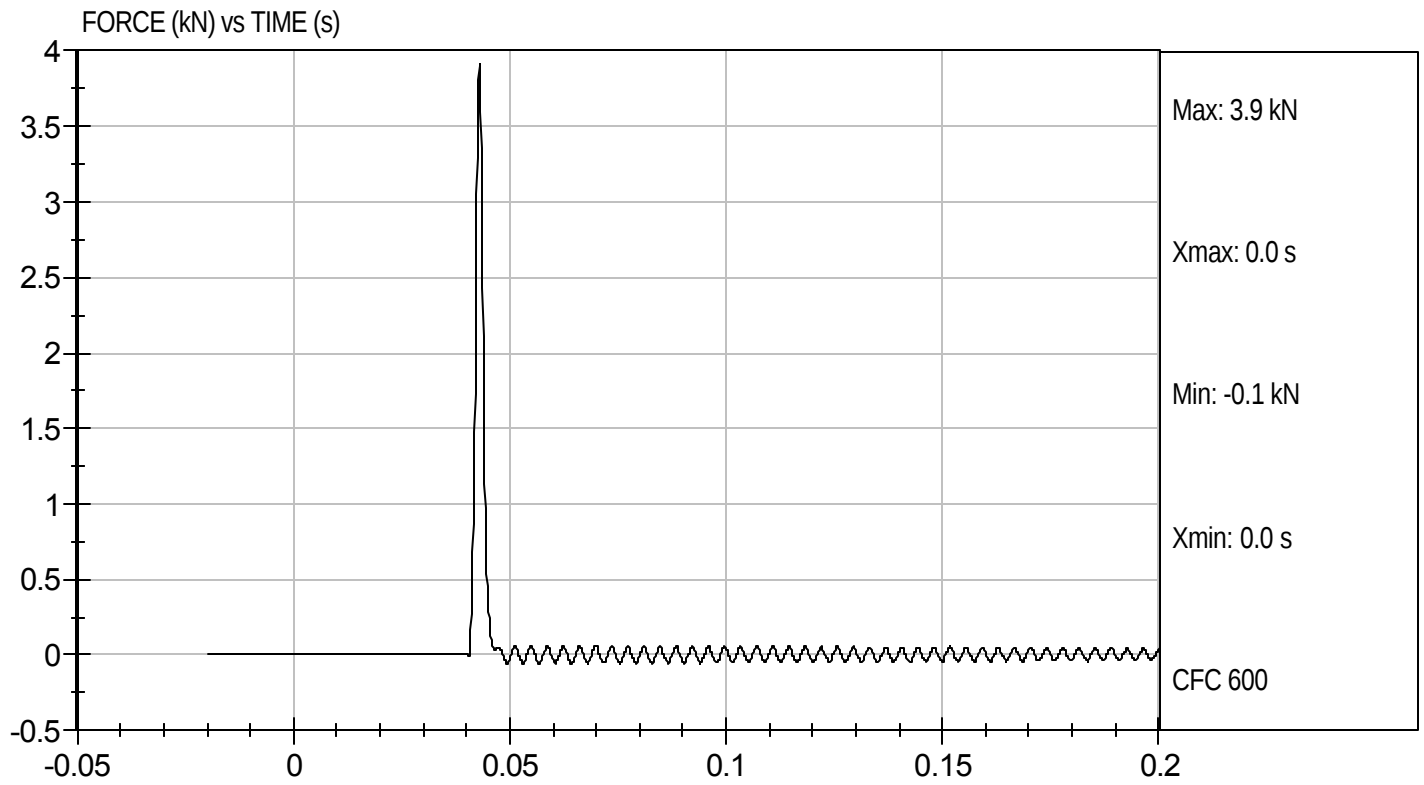
7/30/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D102486

Test Date: 7/30/10
Velocity: 6.97 ft/s, 2.12 m/s

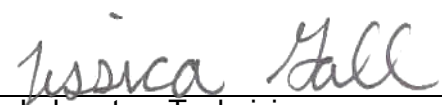


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102487

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	47	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	386	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

8/2/10
Test Date


Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D102791

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	47	Pass
Peak Resultant Acceleration	G's	250 to 300	271	Pass
Peak Lateral Acceleration	G's	+/- 15	-2.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

8/27/10
Test Date

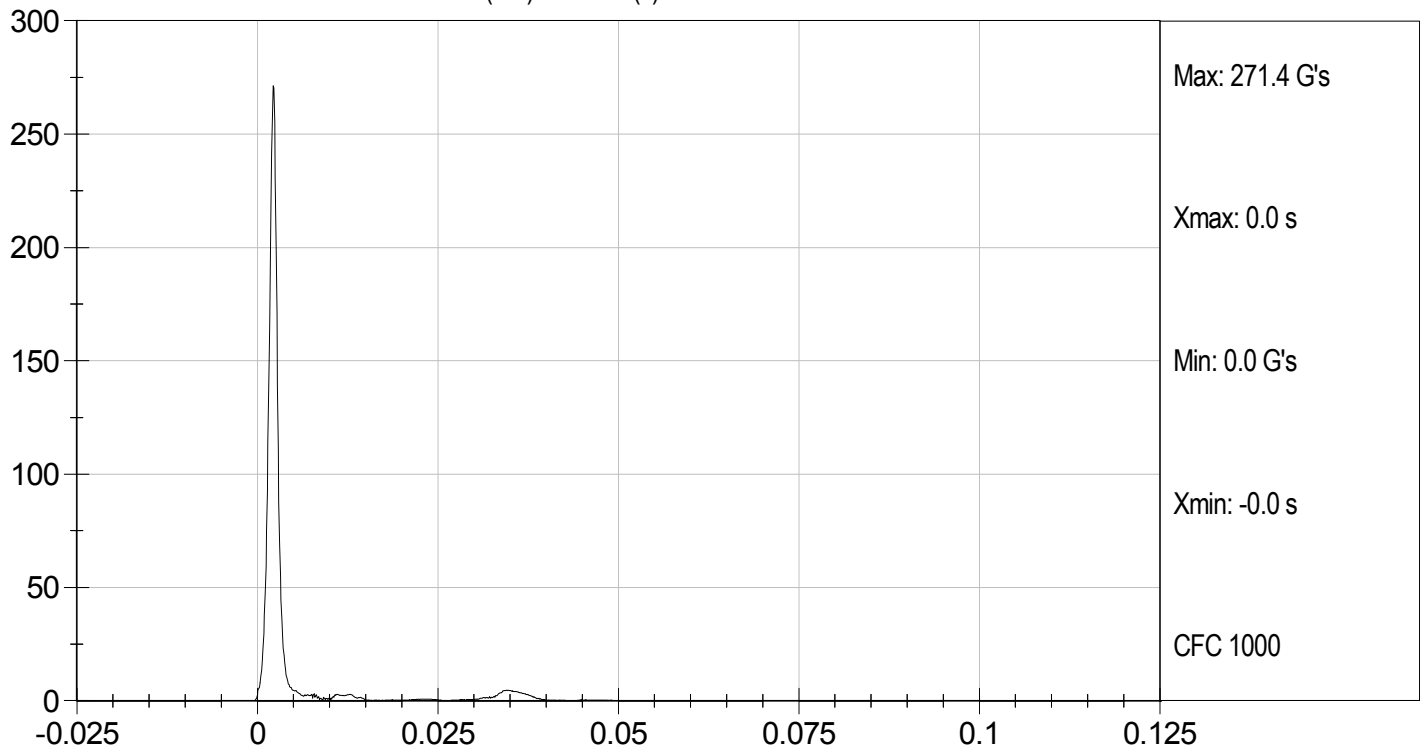
David Winkelbauer
Approved By



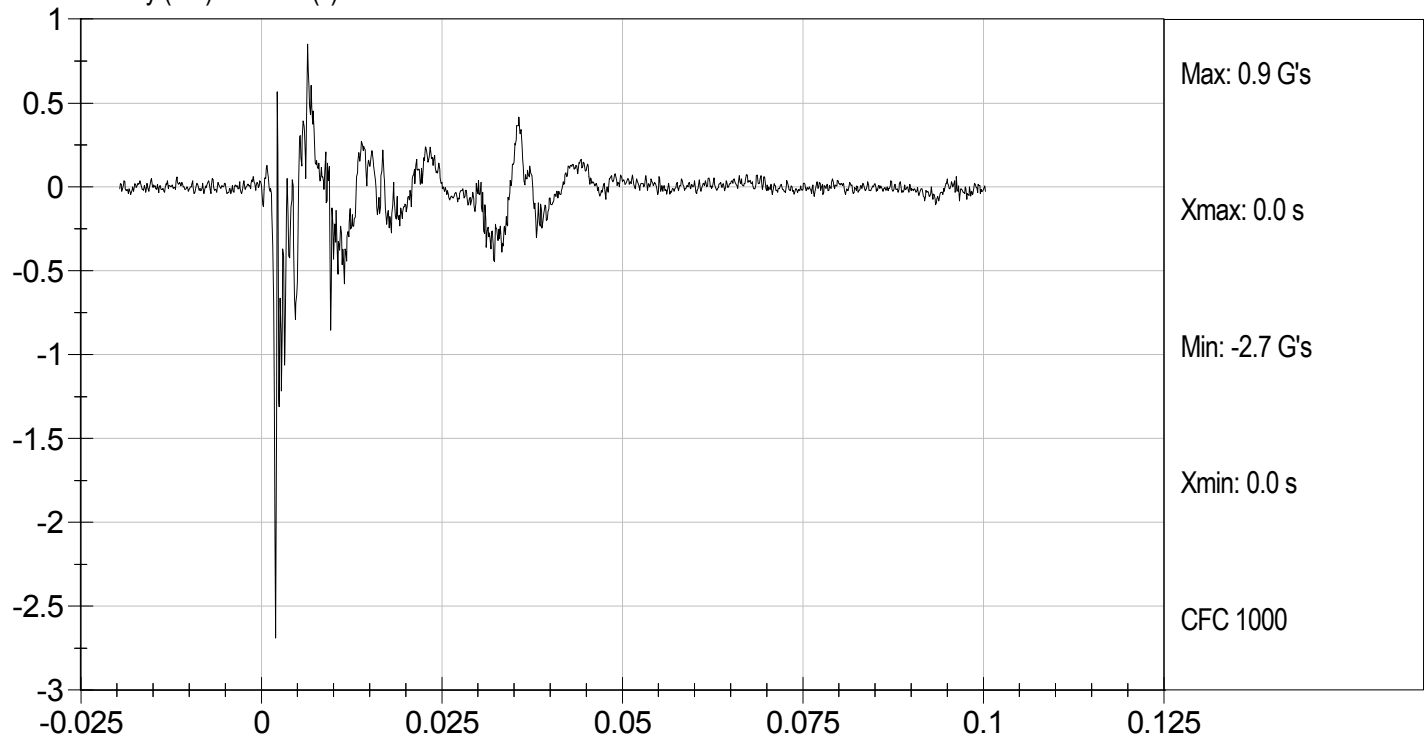
Test Desc: Head Drop
Component ID: D102791

Test Date: 8/27/10
Velocity: 0 ft/s, 0.00 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (s)



head y (G's) vs TIME (s)

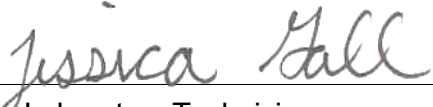


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102792

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	54	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass


 Laboratory Technician

8/30/10
 Test Date

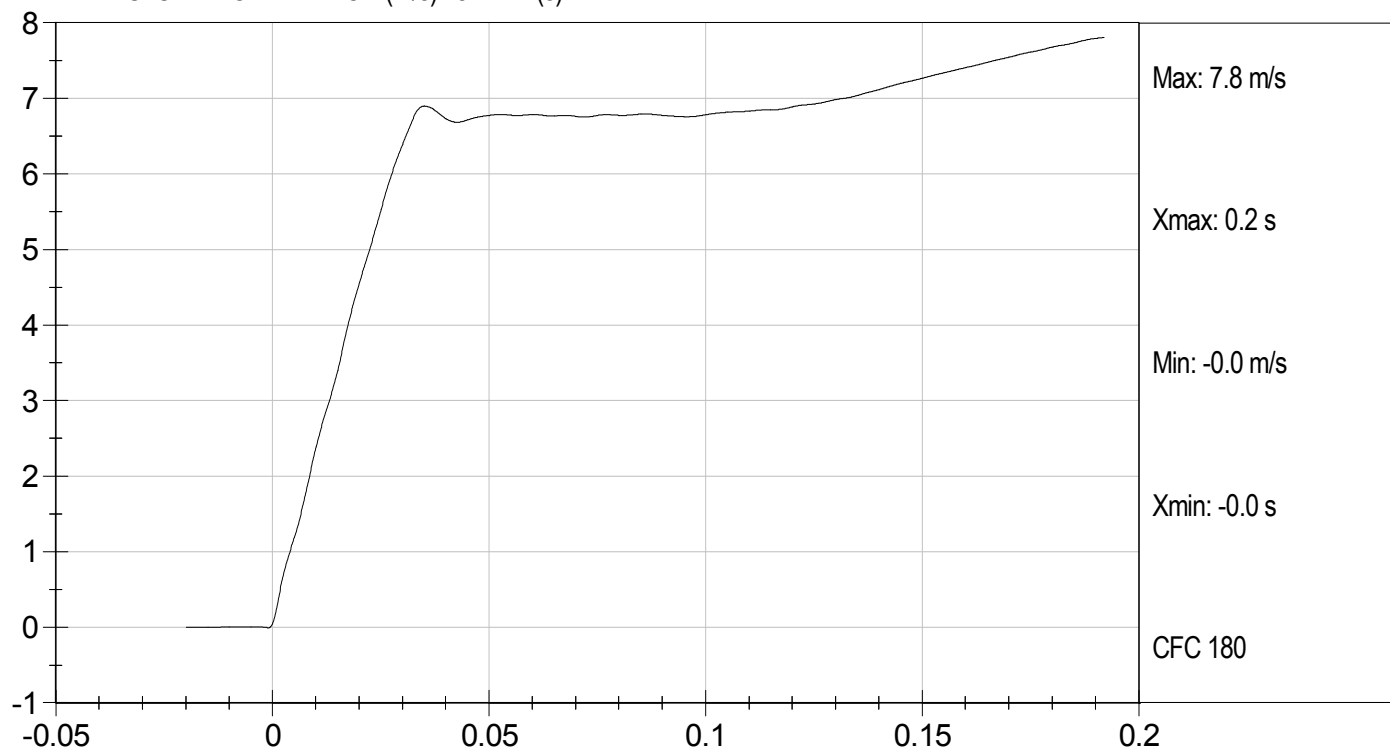

 Approved By



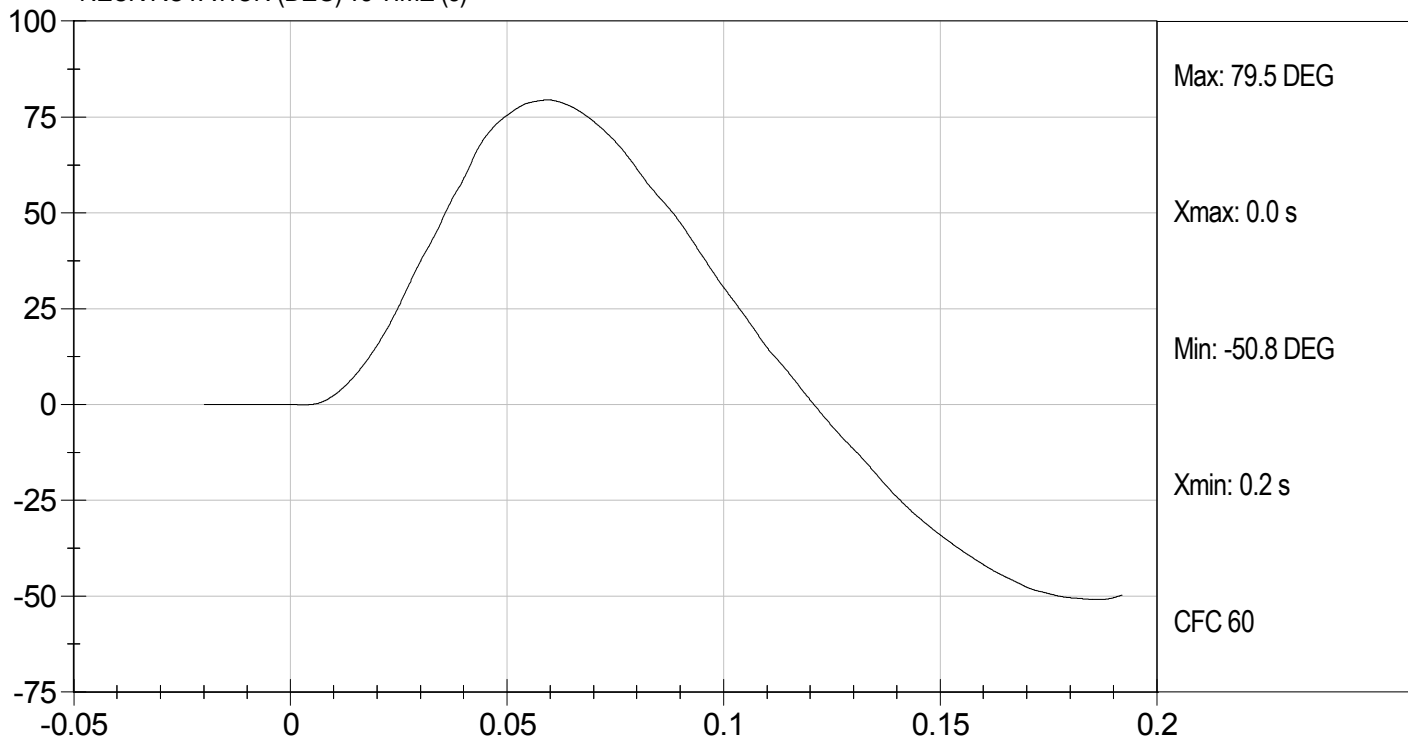
Test Desc: Neck Flexion
Component ID: D102792

Test Date: 8/30/10
Velocity: 23.1 ft/s, 7.04 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



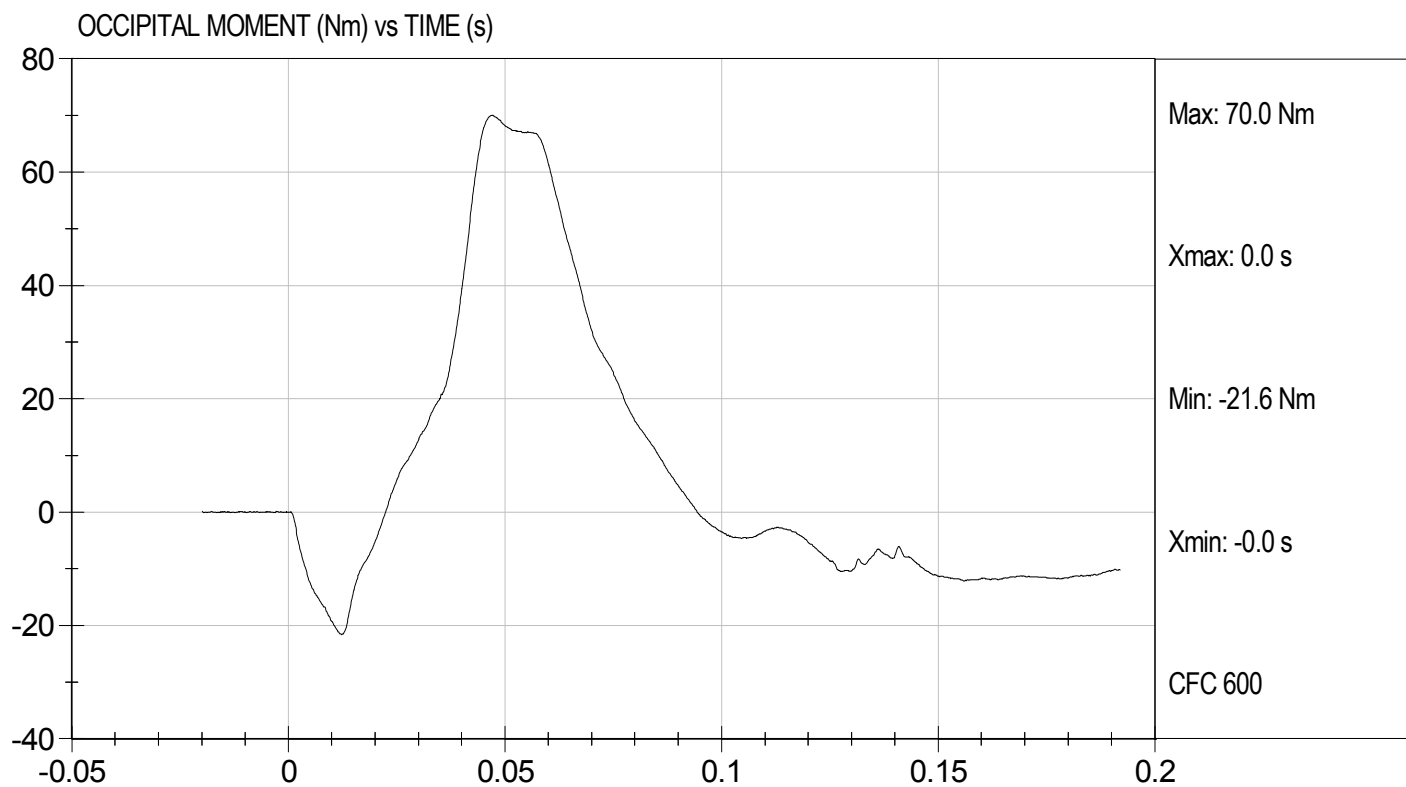
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D102792

Test Date: 8/30/10
Velocity: 23.1 ft/s, 7.04 m/s

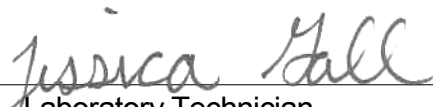


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102793

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	54	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.04	Pass
Pendulum Deceleration	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	101	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	99	Pass
Overall Results					Pass


 Laboratory Technician

8/30/10
 Test Date

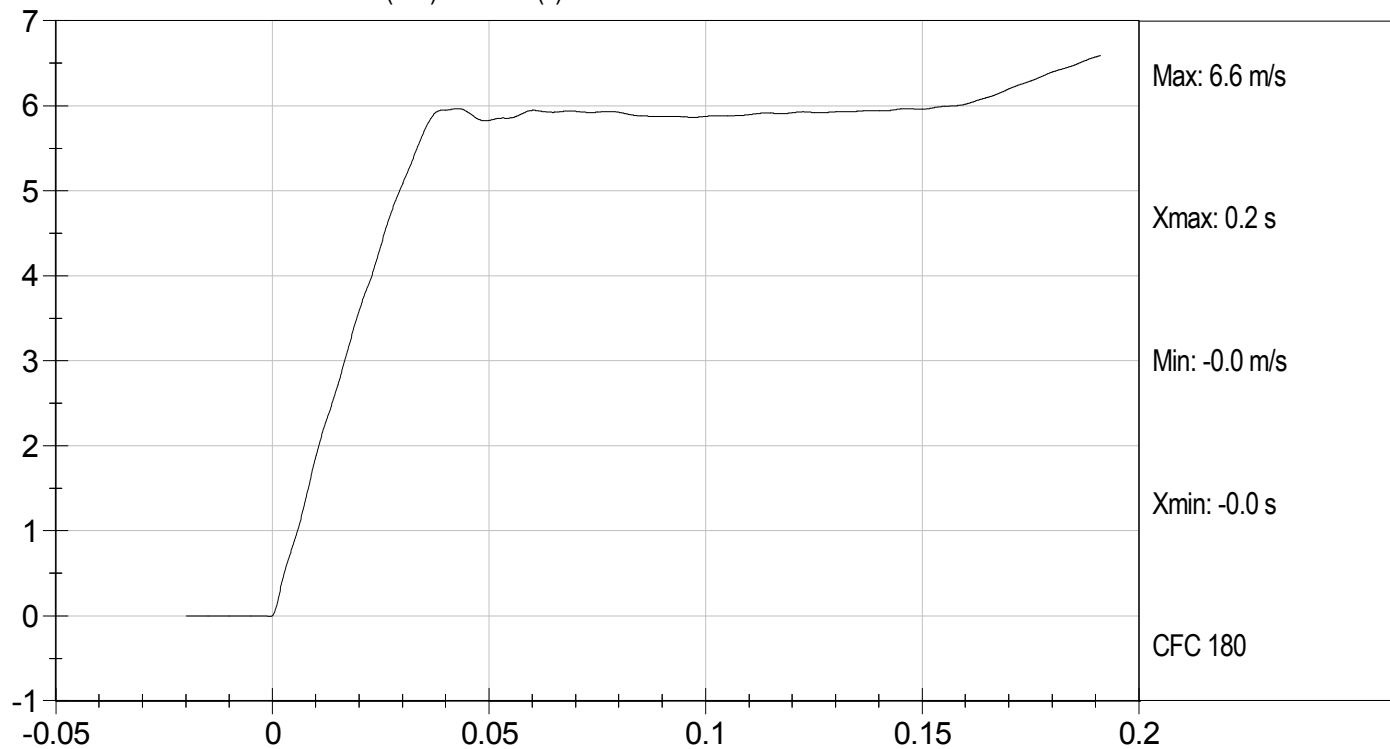

 Approved By



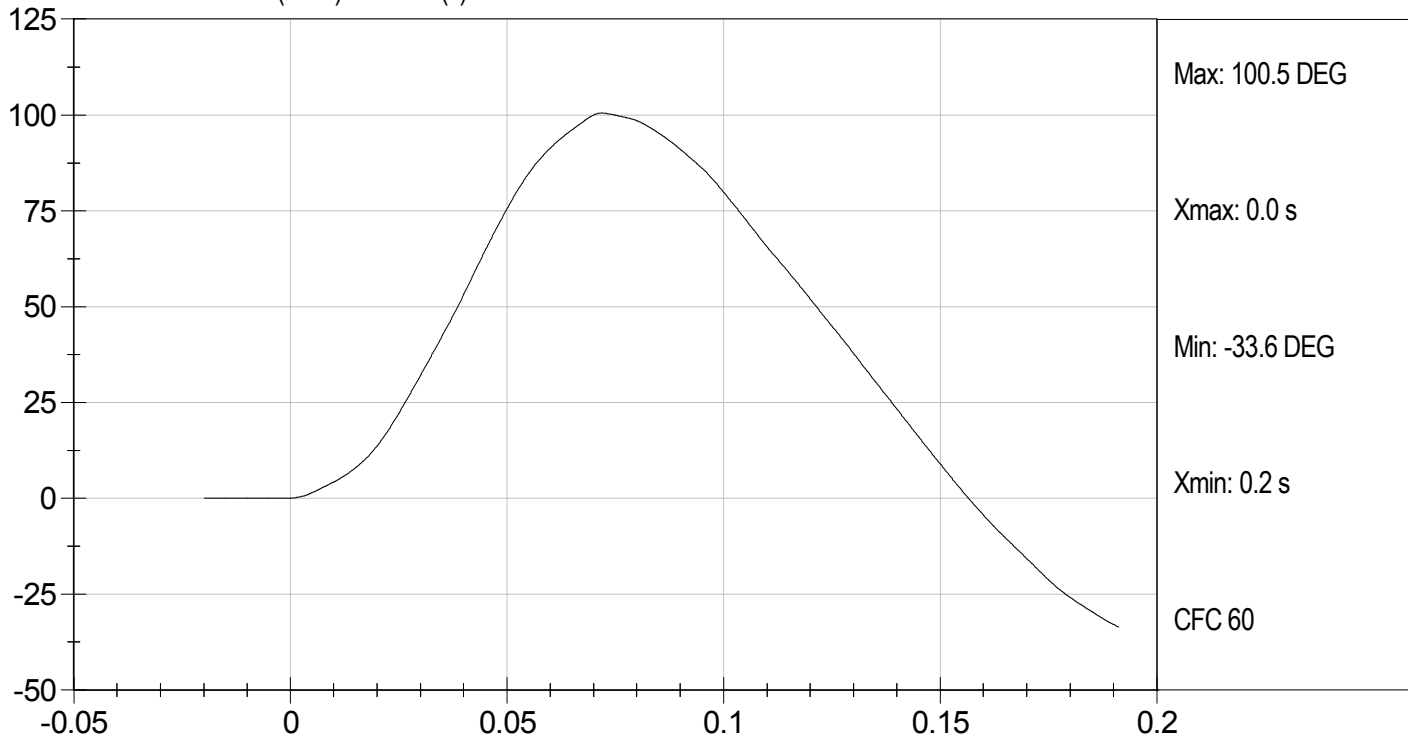
Test Desc: Neck Extension
Component ID: D102793

Test Date: 8/30/10
Velocity: 19.8 ft/s, 6.04 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)



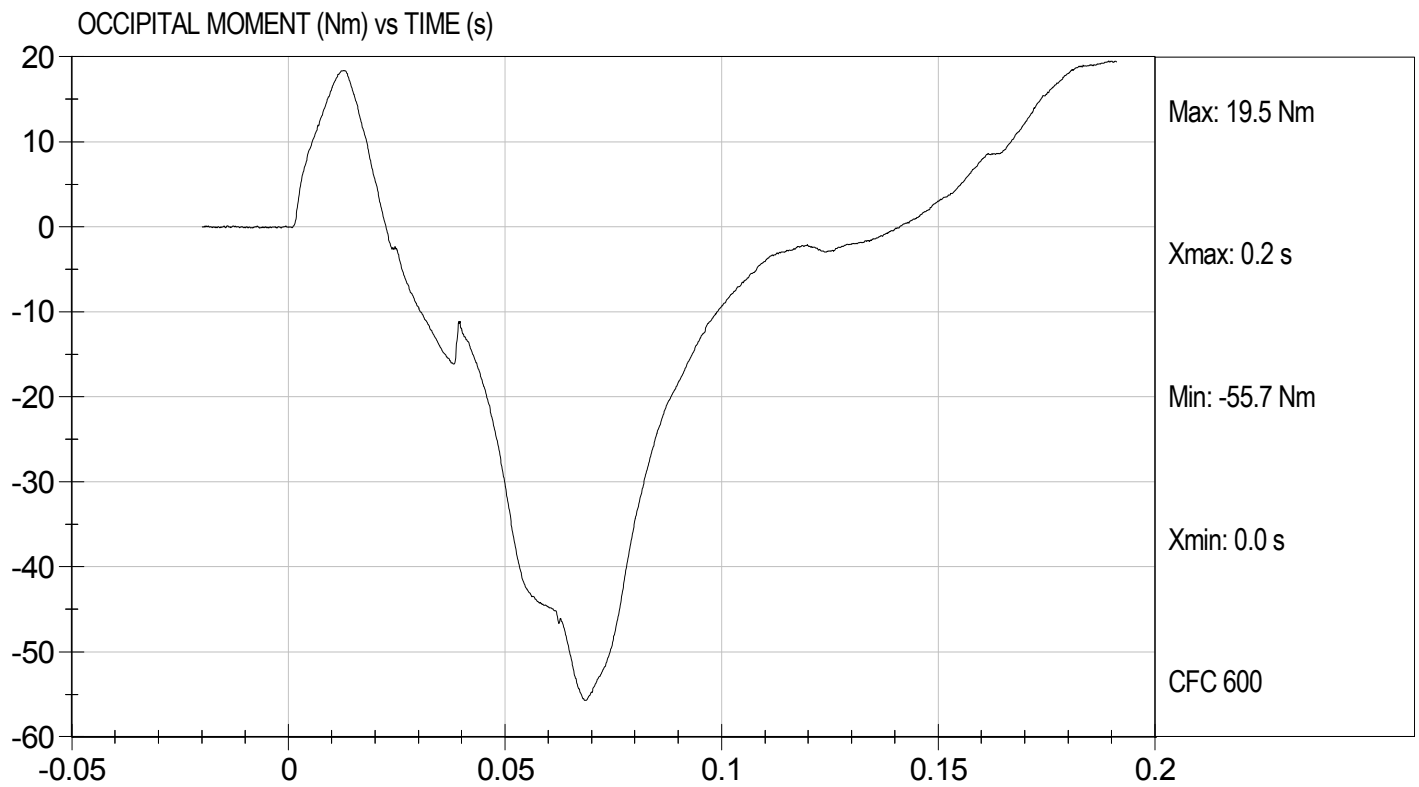
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Extension
Component ID: D102793

Test Date: 8/30/10
Velocity: 19.8 ft/s, 6.04 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102794

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	51	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	kN	3.9 to 4.4	4.26	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4193	Pass
Overall Test Results				Pass


Laboratory Technician

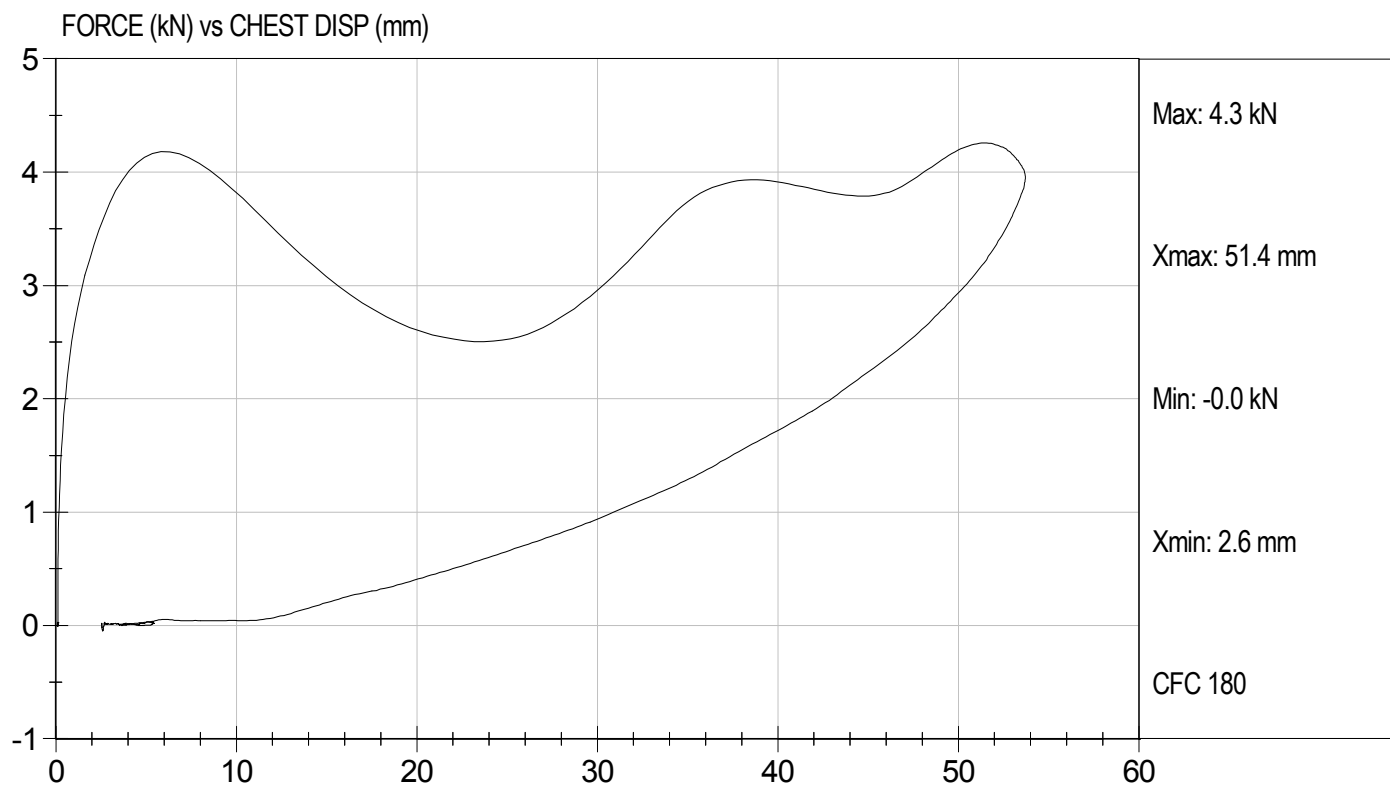
8/30/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102794

Test Date: 8/30/10
Velocity: 22.22 ft/s, 6.77 m/s



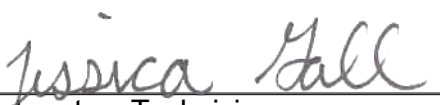
MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D102795

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.54	Pass
Overall Test Results				Pass


Laboratory Technician

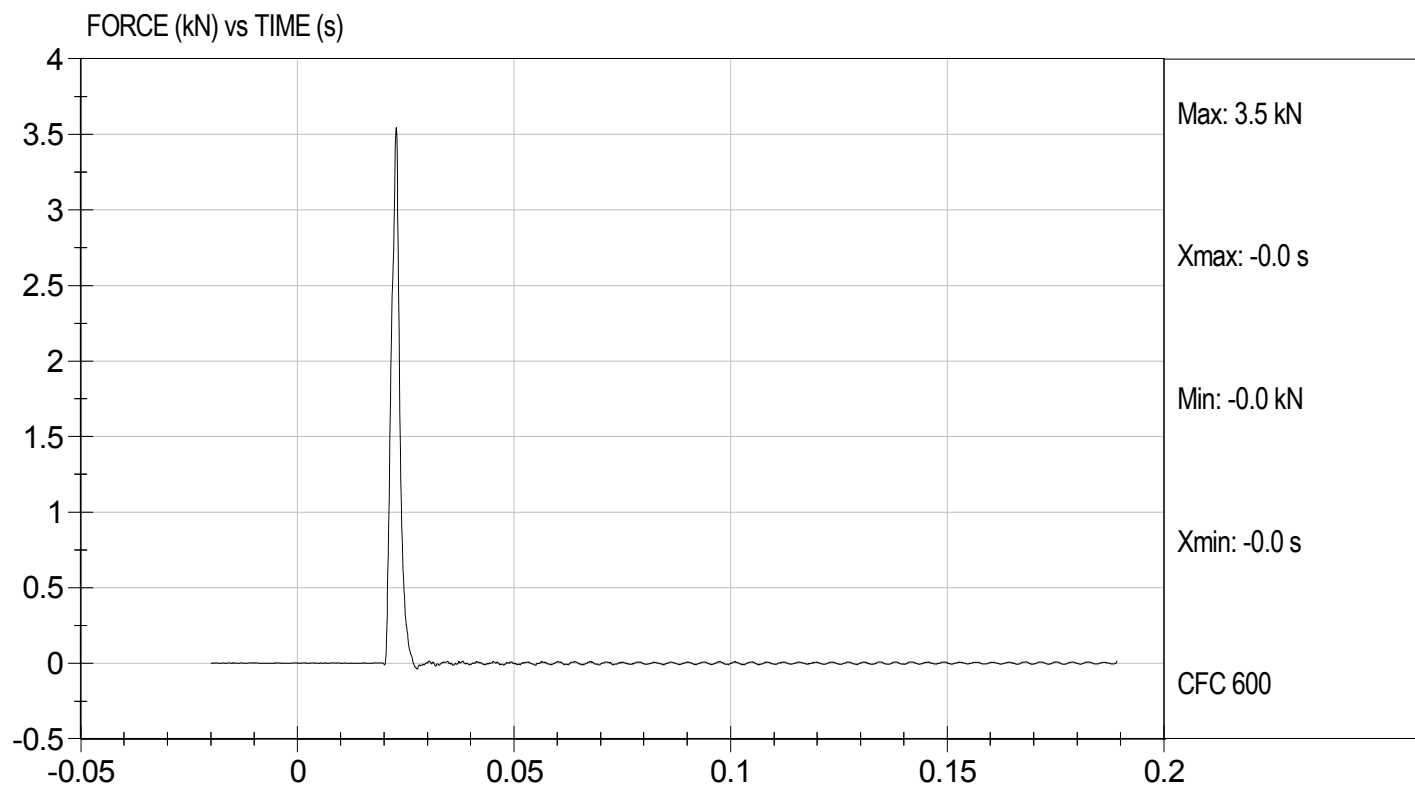
8/30/10
Test Date


Approved By



Test Desc: Left Knee
Component ID: D102795

Test Date: 8/30/10
Velocity: 6.89 ft/s, 2.10 m/s



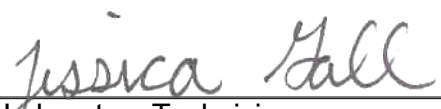
MGA RESEARCH CORPORATION

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

ATD Serial No: 634

Test I.D: D102796

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.85	Pass
Overall Test Results			Pass	


Laboratory Technician

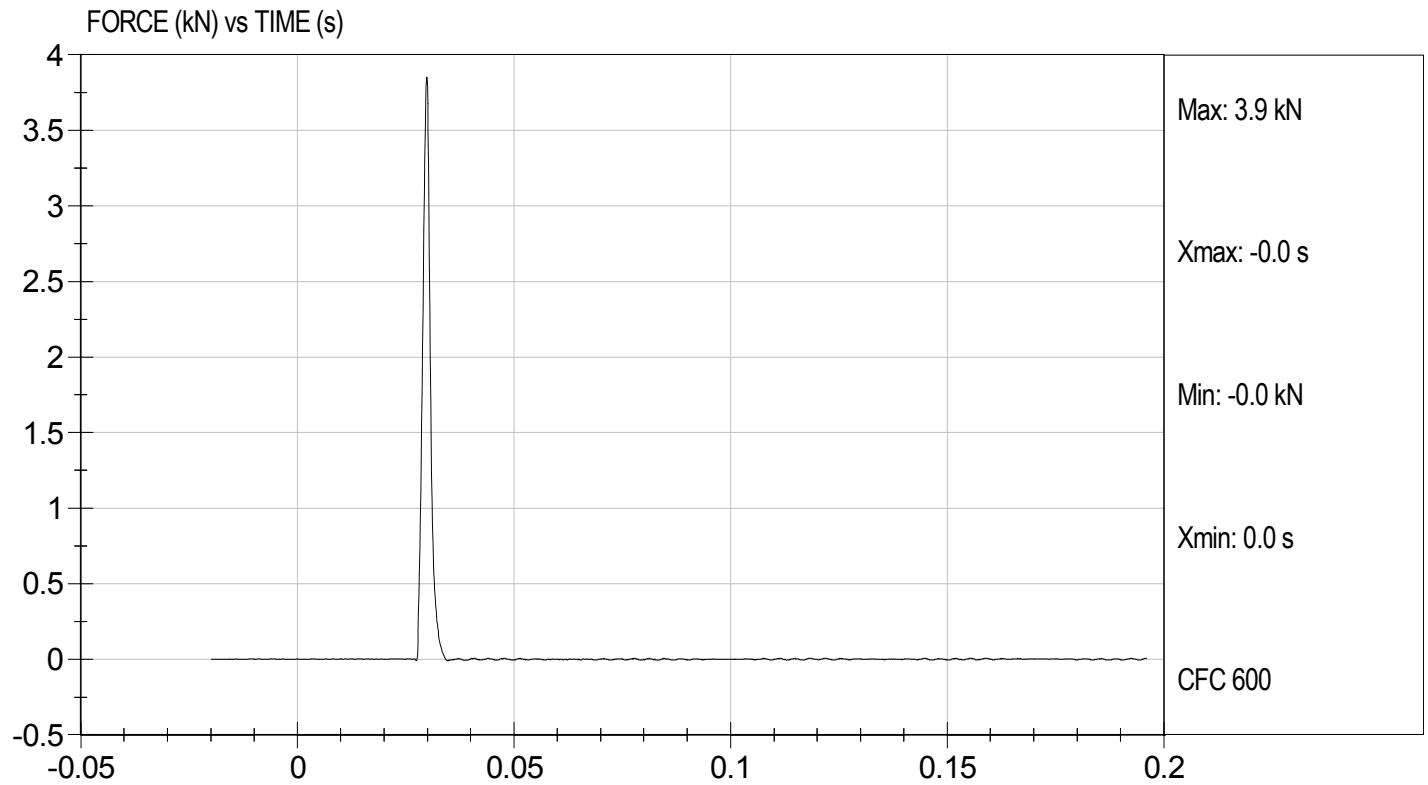
8/30/10
Test Date


Approved By



Test Desc: Left Knee
Component ID: D102796

Test Date: 8/30/10
Velocity: 6.86 ft/s, 2.09 m/s

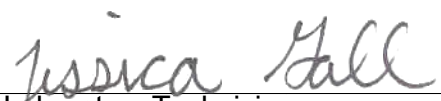


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102797

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	56	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	373	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result			Pass	


Laboratory Technician

8/30/10
Test Date


Approved By