

REPORT NUMBER: NCAP-MGA-2011-023

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

**GENERAL MOTORS LLC
2011 Buick Lucerne CX 4-Dr Sedan
NHTSA No.: MB0108**

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



Test Date: September 20, 2010

Final Report Date: October 28, 2010

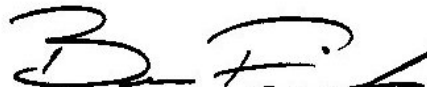
FINAL REPORT

**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 28, 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. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2011 Buick Lucerne CX 4-Dr Sedan 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 September 20, 2010. The impact velocity was 56.6 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 653 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <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>93</td> <td>312</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>25</td> <td>16</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.19</td> <td>0.31</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>769</td> <td>715</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>52</td> <td>425</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2146</td> <td>2100</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>3127</td> <td>1841</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	93	312	Maximum Chest Compression	mm	63	52	25	16	Nij	N/A	1	1	0.19	0.31	Neck Tension	N	4170	2620	769	715	Neck Compression	N	4000	2520	52	425	Left Femur Force	N	10008	6805	2146	2100	Right Femur Force	N	10008	6805	3127	1841
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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 Buick Lucerne CX 4-Dr Sedan at a velocity of 56.6 kph. The test was performed at MGA Research Corporation on September 20, 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 223 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 653 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 glovebox.

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)	93	79.2	94.2	25	0.19	769	52	2146	3127
Passenger (5 th)	312	79.7	94.7	16	0.31	715	425	2100	1841

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

TEST NOTES

There was no valid data collected for:
Bottom of Engine X after 30 msec.
Right Brake Caliper X after 50 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 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0108	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Buick	Power Steering	Yes
Model	Lucerne	Driver Front Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	1G4HA5EM0BU102575	Driver Head/Torso Airbag	No
Body Color	Cyber Gray Metallic	Driver Torso Airbag	Yes
Delivery Date	8/30/2010	Driver Torso/Pelvis Airbag	No
Odometer (mi)	3	Driver Pelvis Airbag	No
Odometer (km)	5	Driver Knee Airbag	No
Dealer	Mike Haggerty Buick	Pass. Front Airbag	Yes
Transmission	Automatic	Pass. Curtain Airbag	Yes
Final Drive	Front	Pass. Head/Torso Airbag	No
Type/No. Cylinders	6	Pass. Torso Airbag	Yes
Engine Displacement (L)	3.9	Pass. Torso/Pelvis Airbag	No
Engine Placement	Lateral	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?	No		

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (kg)	2221
Date of Manufacture	06/10	GAWR Front (kg)	1207
		GAWR Rear (kg)	1014

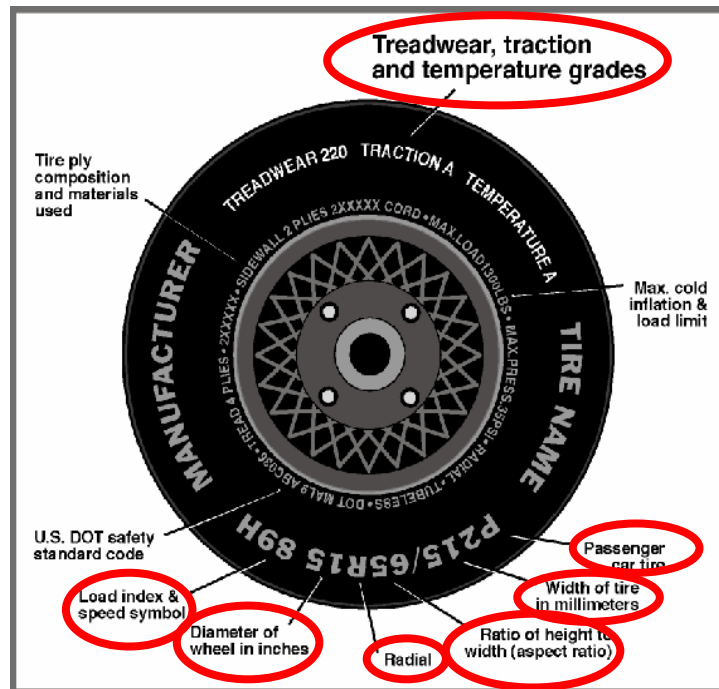
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	40/20/40 Split	Bench		
Designated Seating Capacity (DSC)	3	3		6
Capacity Weight (VCW) (kg)				488
Cargo Weight (RCLW) (kg)				80

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

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	210	210
Recommended Tire Size	P235/55R17	P235/55R17
Tire Size on Vehicle	P235/55R17	P235/55R17
Tire Manufacturer	Michelin	Michelin
Tire Model	ENERGY	ENERGY
Treadwear	400	400
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	98H	98H
Tire Material	Rubber	Rubber
DOT Safety Code Right	B9JJ ENXX	B9JJ ENXX
DOT Safety Code Left	B9JJ ENXX	B9JJ ENXX

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

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	522.1	324.8		551.6	418.2	
Right	kg	534.3	323.4		543.8	405.1	
Ratio	%	62.0	38.0		57.1	42.9	
Totals	kg	1056.4	648.2	1704.6	1095.4	823.3	1918.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1704.6
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	80
Calculated Target Vehicle Target Weight (TVTW)	kg	1925.2

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	739	736	764	759	1117
As Tested	mm	726	729	711	714	1260
Post Test	mm	832	827	737	698	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2937
Total Vehicle Length at Left Side	mm	4968
Total Vehicle Length at Centerline	mm	5190
Total Vehicle Length at Right Side	mm	4968
Weight of Ballast in Cargo Area	kg	52.2
Weight of Vehicle Components Removed	kg	7.3
Amount of Stoddard Solvent in Fuel Tank	L	65.1

List of components removed to meet test weight: Right tail light, air compressor for tires.

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

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	5190
2	Total Width	1849
3	Bumper Top Height	550
4	Bumper Bottom Height	434
5	Longitudinal Member Top Height	539
6	Distance between Longitudinal Members	925
7	Longitudinal Member Width	80
8	Engine Top Height	884
9	Engine Bottom Height	198
10	Engine and Gearbox Width	690
11	Front Bumper-Engine Distance	670
12	Front Shock Absorber Fixing Height	905
13	Bonnet Leading Edge Height	759
14	Front Shock Absorber Fixing Width	1234
15	Front Bumper – Front Axle Distance	1087
16	Front Axle – A-Pillar Distance	480
17	A-Pillar – B-Pillar Distance	1176
18	B-Pillar – Rear Axle Distance	1225
19	B-Pillar – C-Pillar Distance	820
20	Roof Sill Bottom Height	1248
21	Roof Sill Top Height	1451
22	Floor Sill bottom Height	141
23	Floor Sill Top Height	412

DATA SHEET NO. 2

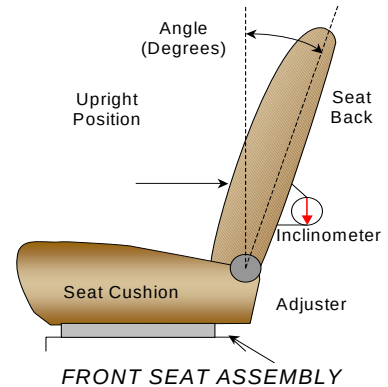
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

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	24.0° on seat back frame
Passenger Seat Back Angle	17.6° on seat back frame

SEAT FORE/AFT POSITIONS

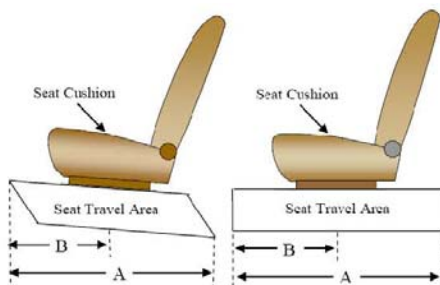
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	330 mm	165 mm (forward-most as 0)
Passenger Seat	274 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	4	0 (uppermost as 0)
Passenger Seat	4	0 (uppermost as 0)



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

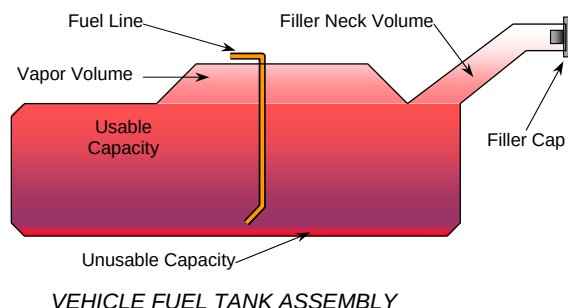
NHTSA No.: MB0108
 Test Date: 9/20/2010

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	64.4 to 65.8
Actual Amount of Solvent used	65.1
1/3 of Usable Capacity	23.3

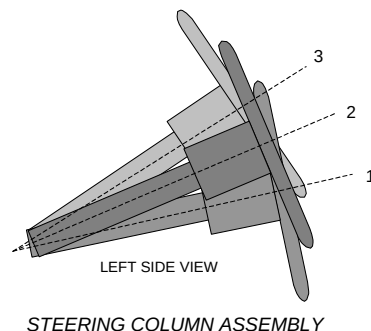
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. At key-on, the pump will run for 2-3 sec as a priming sequence. The pump will then turn off and will run continuously again once the vehicles engine is started. 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.



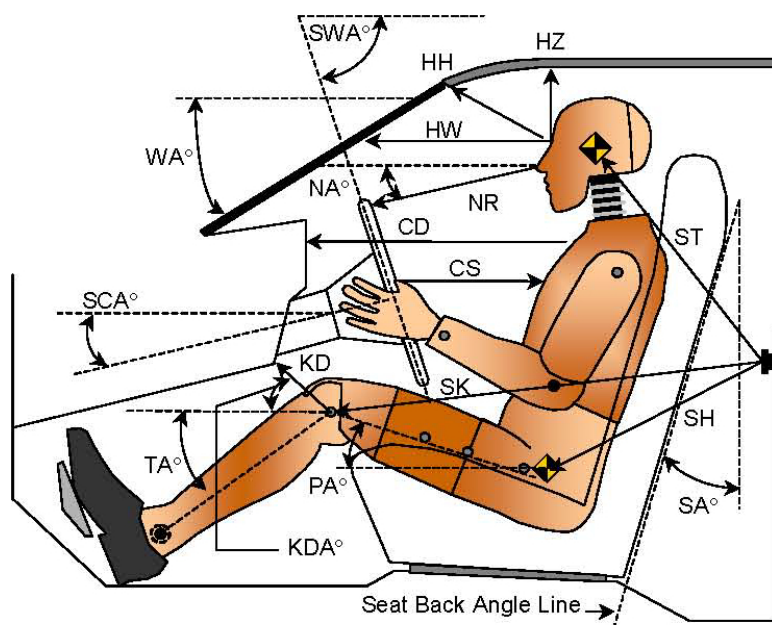
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	80.4	
Geometric Center – Position 2	70.4	
Uppermost – Position 3	60.4	
Telescoping Steering Wheel Travel		
Test Position	70.4	

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

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

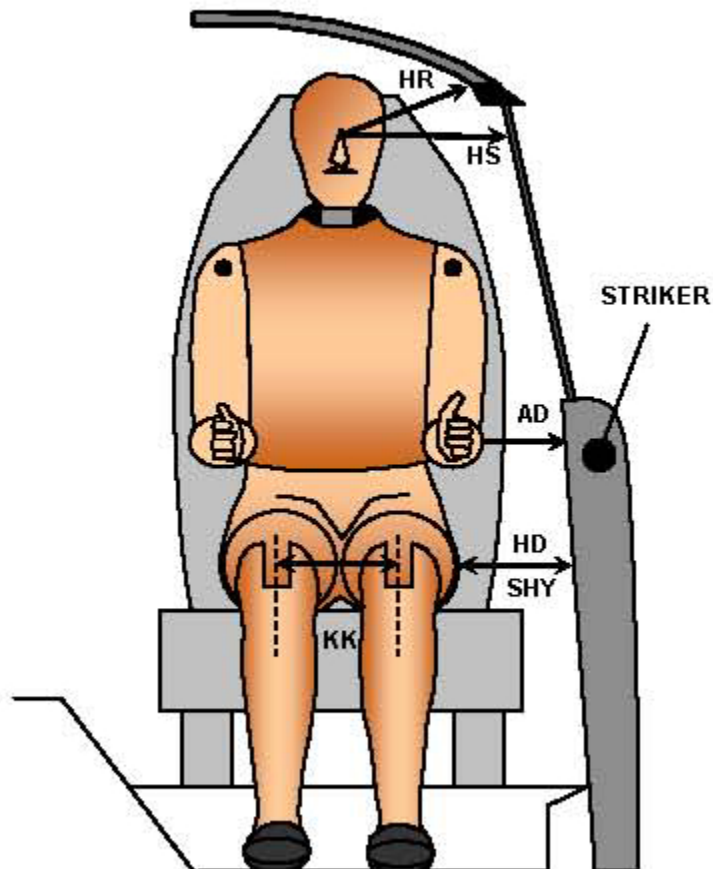


Code	Measurement Description	Driver S/N 351		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		27.5		
SWA	Steering Wheel Angle		70.4		
SCA	Steering Column Angle		19.6		
SA	Seat Back Angle (headrest bezel)		24.0		17.6
HZ	Head to Roof (Z)	186	90	193	90
HH	Head to Header	391	20.4	286	40.8
HW	Head to Windshield	716	0	643	0
NR	Nose to Rim	396	7.3		
CD	Chest to Dash	537		381	
CS	Chest to Steering Hub	326	2.2		
RA	Rim to Abdomen	217	0		
KDL	Left Knee to Dash	174	40.8	84	48.4
KDR	Right Knee to Dash	151	36.7	88	46.1
PA	Pelvic Angle		23.9		21.6
TA	Tibia Angle		35.1		42.5
SK	Striker to Knee	557	94.8	691	93.4
ST	Striker to Head	502	4.8	490	23.6
SH	Striker to H-Point	215	134.1	357	101.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010



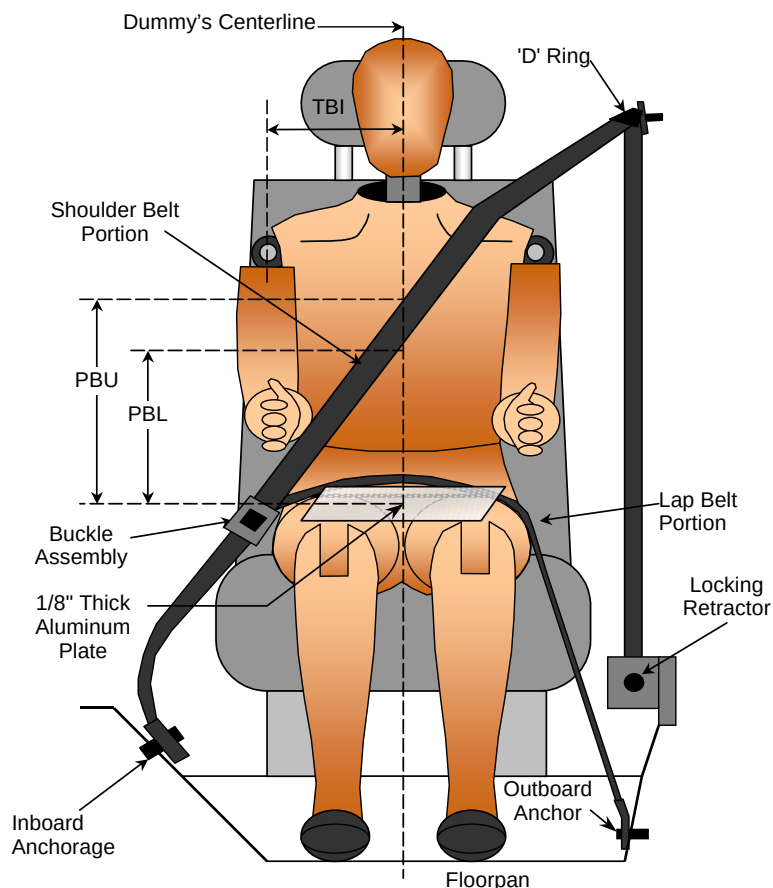
Code	Measurement Description	Driver S/N 351	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	153	108
HD	H-Point to Door	183	244
HR	Head to Side Header	193	227
HS	Head to Side Window	345	374
KK	Knee to Knee	310	222
SHY	Striker to H-Point (Y Direction)	315	335
AA	Ankle to Ankle	305	148

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	285
PBL - To surface of reference to belt lower edge	mm	285	200

BELT LENGTH DATA

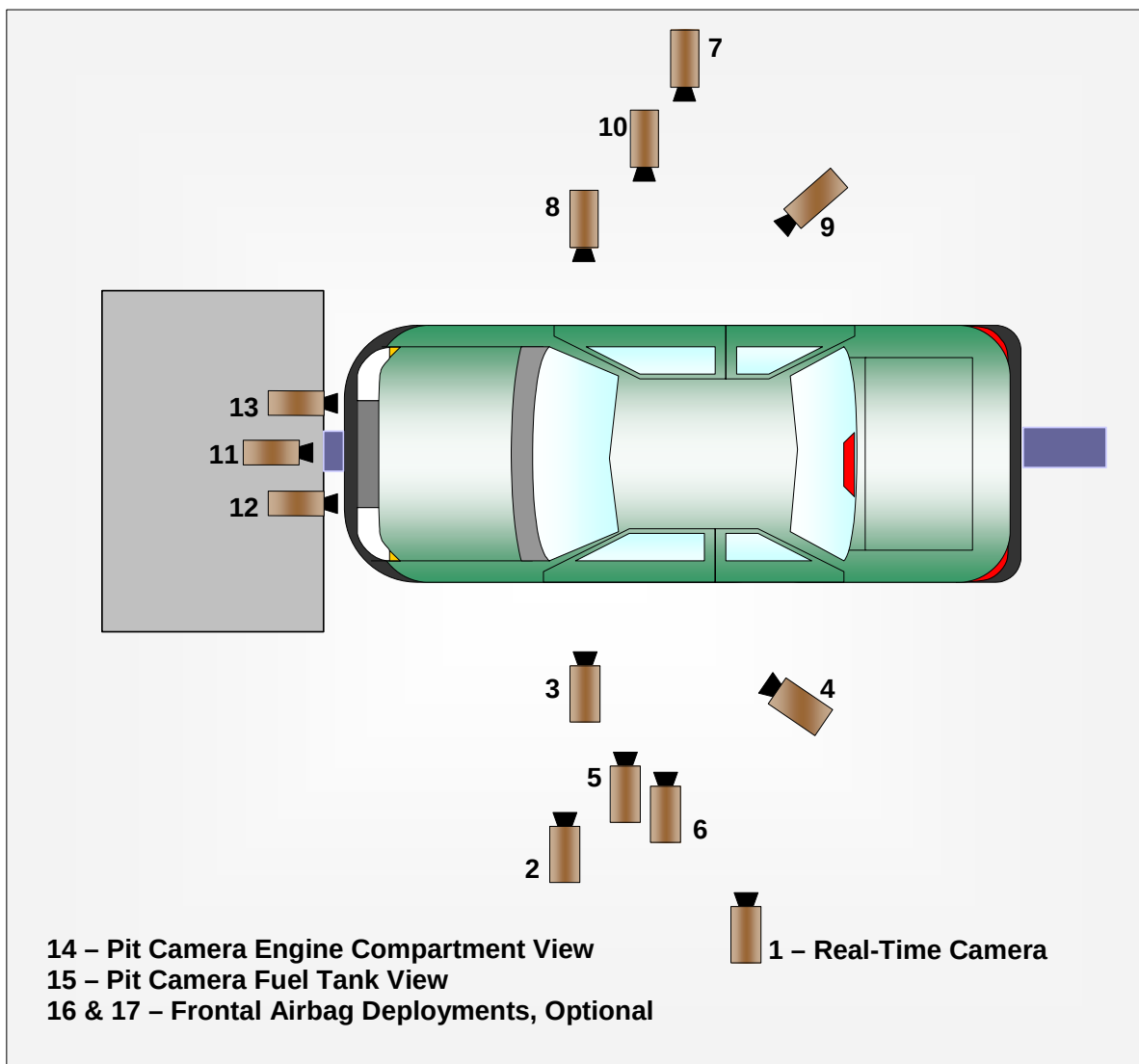
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	830	945
Lap Belt Length as measured on ATD	mm	620	600
Remainder of belt of reel	mm	1770	1645
Total Belt Length for Continuous Webbing Systems	mm	3220	3190

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

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
Test Date: 9/20/2010

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

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	1170	-4970	-1270	24	1000
3	Driver Close-Up	1560	-6290	-1760	35	1000
4	Driver Angle	5570	-4780	-1910	50	1000
5	Steering Column Top	630	-5110	-1250	25	1000
6	Steering Column Bottom	590	-5100	-850	25	1000
7	Right Overall	2260	6690	-1110	20	1000
8	Passenger Close-Up	1630	6430	-1740	35	1000
9	Passenger Angle	5510	4820	-1920	50	1000
10	Right Front Half	1230	5110	-1190	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	1180	0	3150	24	1000
15	Pit Rear	3210	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

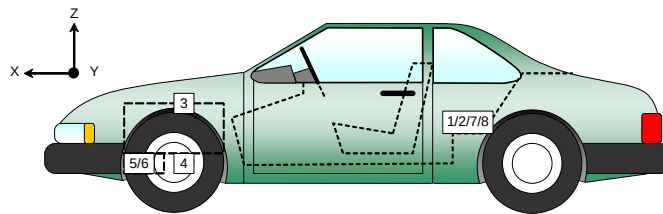
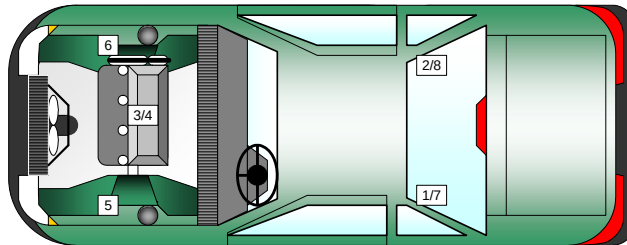
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	2071	-371	-270
2	Right Rear X-Member X	2071	371	-270
3	Engine Top X	4431	0	-782
4	Engine Bottom X	4313	0	-198
5	Left Brake Caliper X	4207	-698	-245
6	Right Brake Caliper X	4207	698	-245
7	Left Rear X-Member Z	2071	-371	-270
8	Right Rear X-Member Z	2071	371	-270

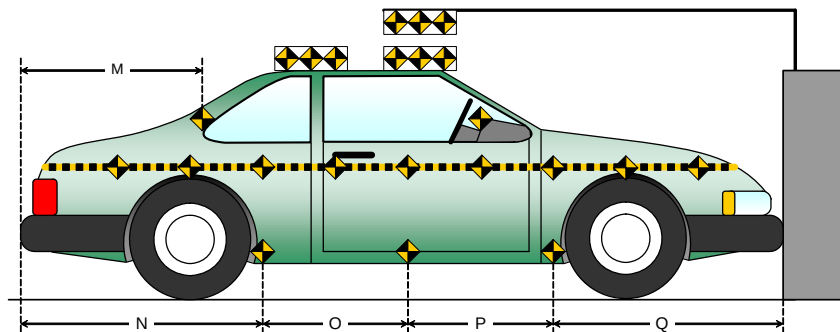
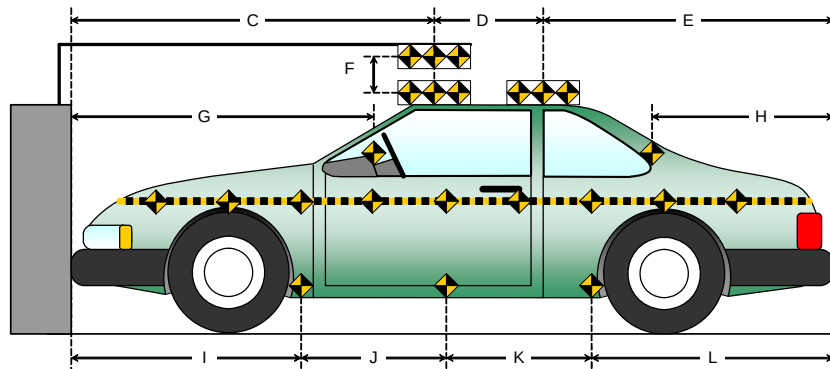
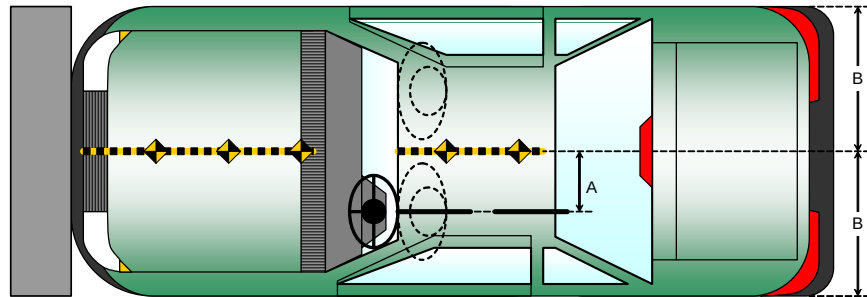
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

Item	Value (mm)
A	375
B	925
C	2630
D	670
E	1890
F	65
G	
H	1314
I	1579
J	997
K	997
L	1617
M	1314
N	1615
O	998
P	998
Q	1579



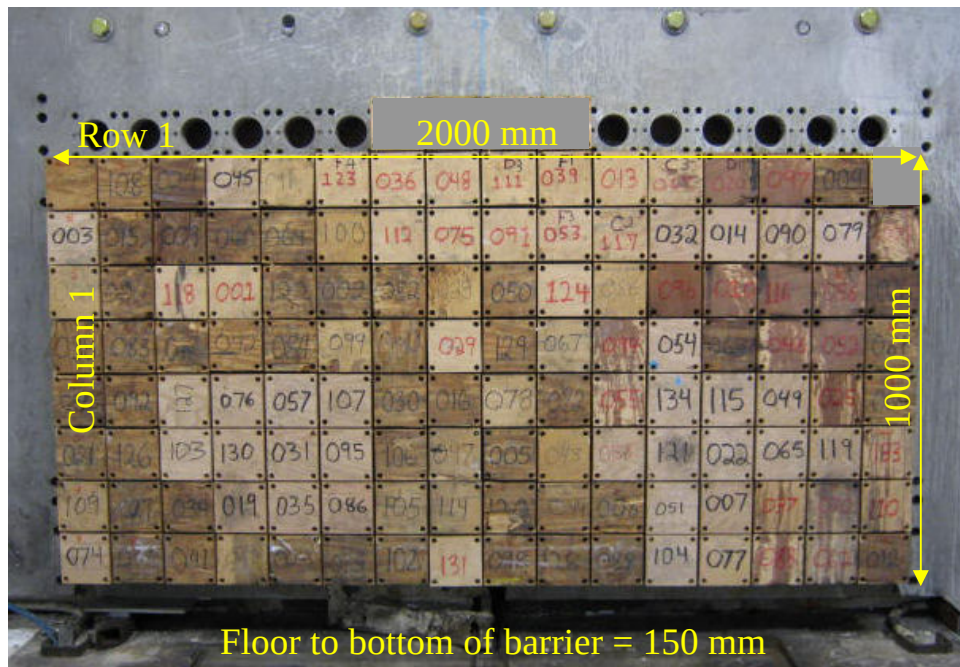
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

Advanced Research Load Cell Barrier



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

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: 2011 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
Test Date: 9/20/2010

INSTRUMENTATION

Driver Dummy Data Channels	44
Passenger Dummy Data Channels	44
Vehicle Structure Accelerometers	8
Barrier Channels	127
Total	223

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 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

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

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	550
Center	mm	562
Right Side	mm	584
Average	mm	565

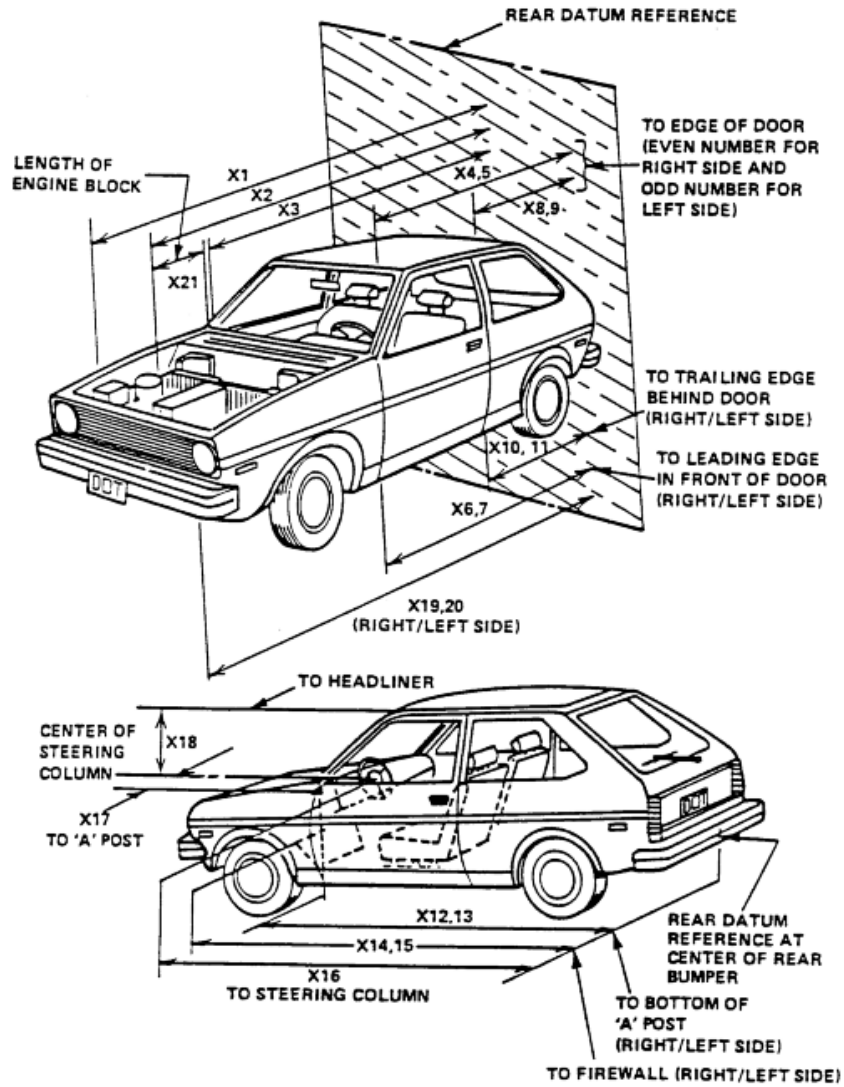
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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 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 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5190	4537	653
2	RSOV to Front of Engine	mm	4499	4380	119
3	RSOV to Firewall	mm	4000	3977	23
4	RSOV to Upper Leading Edge of Right Door	mm	3522	3500	22
5	RSOV to Upper Leading Edge of Left Door	mm	3522	3502	20
6	RSOV to Lower Leading Edge of Right Door	mm	3518	3517	1
7	RSOV to Lower Leading Edge of Left Door	mm	3515	3515	0
8	RSOV to Upper Trailing Edge of Right Door	mm	2429	2409	20
9	RSOV to Upper Trailing Edge of Left Door	mm	2429	2412	17
10	RSOV to Lower Trailing Edge of Right Door	mm	2418	2422	-4
11	RSOV to Lower Trailing Edge of Left Door	mm	2414	2418	-4
12	RSOV to Bottom of "A" Post of Right Side	mm	3514	3514	0
13	RSOV to Bottom of "A" Post of Left Side	mm	3521	3520	1
14	RSOV to Firewall, Right Side	mm	4000	3965	35
15	RSOV to Firewall, Left Side	mm	4000	3974	26
16	RSOV to Steering Column	mm	3085	3072	13
17	Center of Steering Column to "A" Post	mm	327	395	-68
18	Center of Steering Column to Headliner	mm	385	470	-85
19	RSOV to Right Side of Front Bumper	mm	4968	4488	480
20	RSOV to Left Side of Front Bumper	mm	4968	4568	400
21	Length of Engine Block	mm	460	460	0
RD	RSOV to Right Side of Dash Panel	mm	3246	3233	13
CD	RSOV to Center of Dash Panel	mm	3261	3250	11
LD	RSOV to Left Side of Dash Panel	mm	3246	3237	9

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

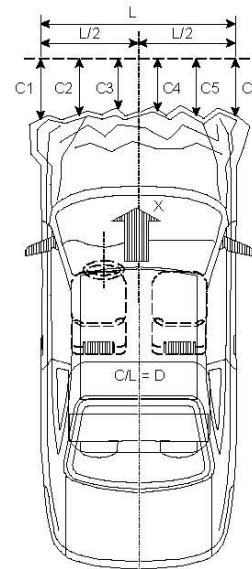
NHTSA No.: MB0108
 Test Date: 9/20/2010

VEHICLE INFORMATION

VIN: 1G4HA5EM0BU102575 Wheelbase (mm): 2937
 Vehicle Size Category: Sedan Test Weight (kg): 1918.7

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): 56.6
 Velocity Change (km/h): 64.6
 Time of Separation (msec): 118



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1606
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4968	4568	400
C2	Crush zone 2 at left side	mm	5085	4525	560
C3	Crush zone 3 at left side	mm	5129	4530	599
C4	Crush zone 4 at right side	mm	5129	4515	614
C5	Crush zone 5 at right side	mm	5085	4524	561
C6	Crush zone 6 at right side	mm	4968	4488	480
L	C1 TO C6	mm	1606	1590	16

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

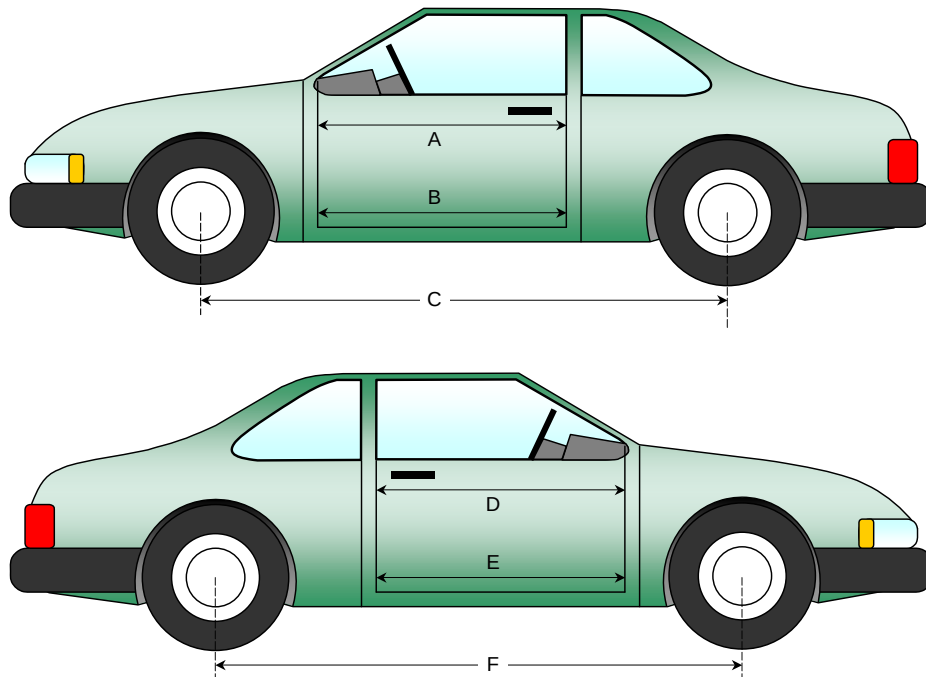
NHTSA No.: MB0108
 Test Date: 9/20/2010

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	966	966	0
B	Left Side Lower	mm	960	960	0
D	Right Side Upper	mm	971	971	0
E	Right Side Lower	mm	931	931	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2937	2900	37
F	Right Side Wheelbase	mm	2937	2825	112



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

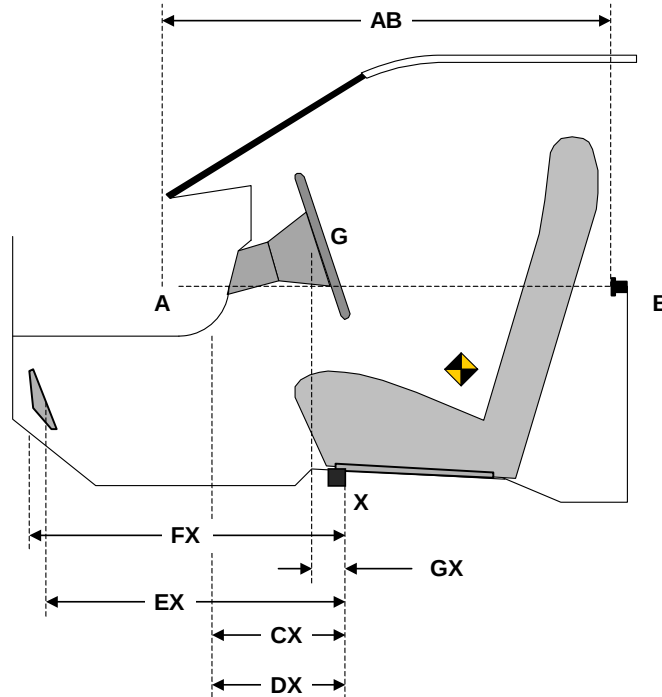
Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	786	786	0
CX	Left Knee Bolster to X	mm	229	210	19
DX	Right Knee Bolster to X	mm	234	225	9
EX	Brake Pedal to X	mm	578	560	18
FX	Foot Rest to X	mm	586	576	10
GX	Center of Steering Column Wheel Hub to X	mm	69	42	27

X = Front of Seat Track (stationary)

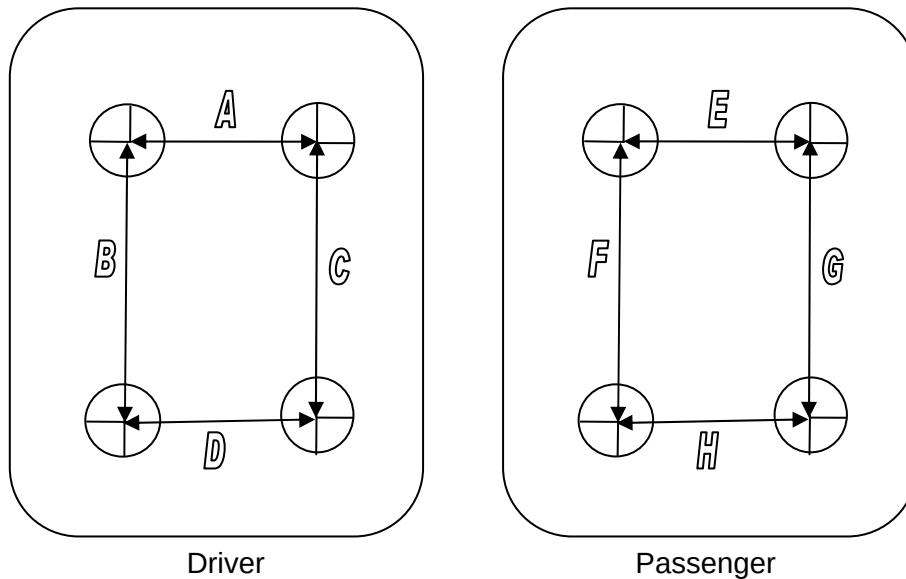


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	150	150	0
B	mm	150	150	0
C	mm	150	150	0
D	mm	150	150	0
E	mm	150	150	0
F	mm	150	150	0
G	mm	150	150	0
H	mm	150	150	0

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

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

Windshield Mounting Details:

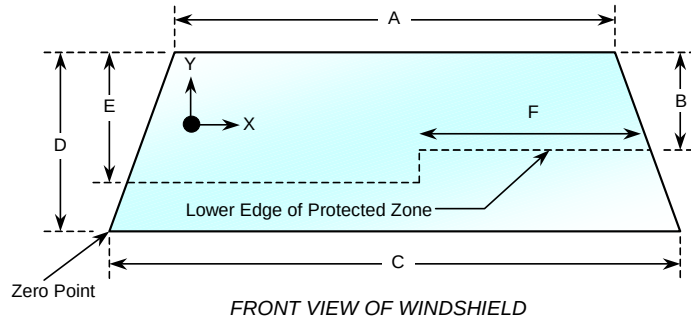
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2244	2244	100
Right Side	2244	2244	100
Total	4488	4488	100



Item	Units	Value
A	mm	1204
B	mm	457
C	mm	1564
D	mm	860
E	mm	518
F	mm	530

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:	<u>2011 Buick Lucerne CX 4-Dr Sedan</u>	NHTSA No.:	<u>MB0108</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>9/20/2010</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time:	<u>10:31 am</u>	Temperature:	<u>21° C</u>
------------	-----------------	--------------	--------------

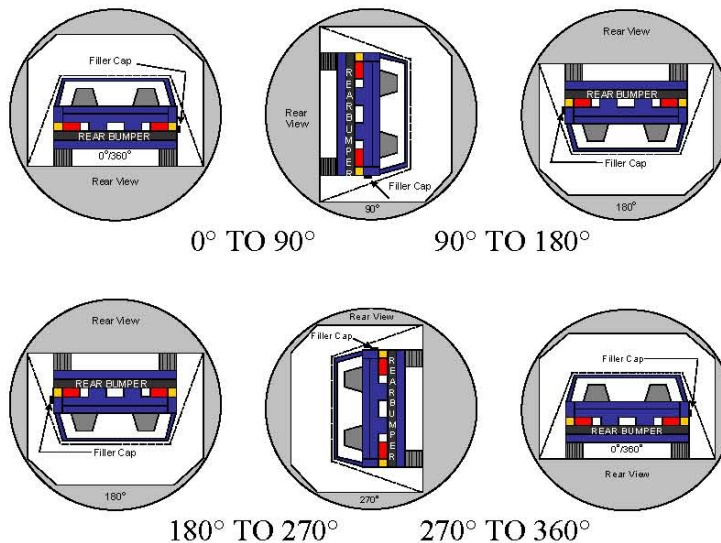
- | | |
|---|--------------|
| A. From impact until vehicle motion ceases:
(Maximum Allowable = 1 ounce) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 ounces) | <u>None</u> |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>None</u>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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
 Test Date: 9/20/2010

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°	111	300	411
90° to 180°	110	300	410
180° to 270°	103	300	403
270° to 360°	115	300	415

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

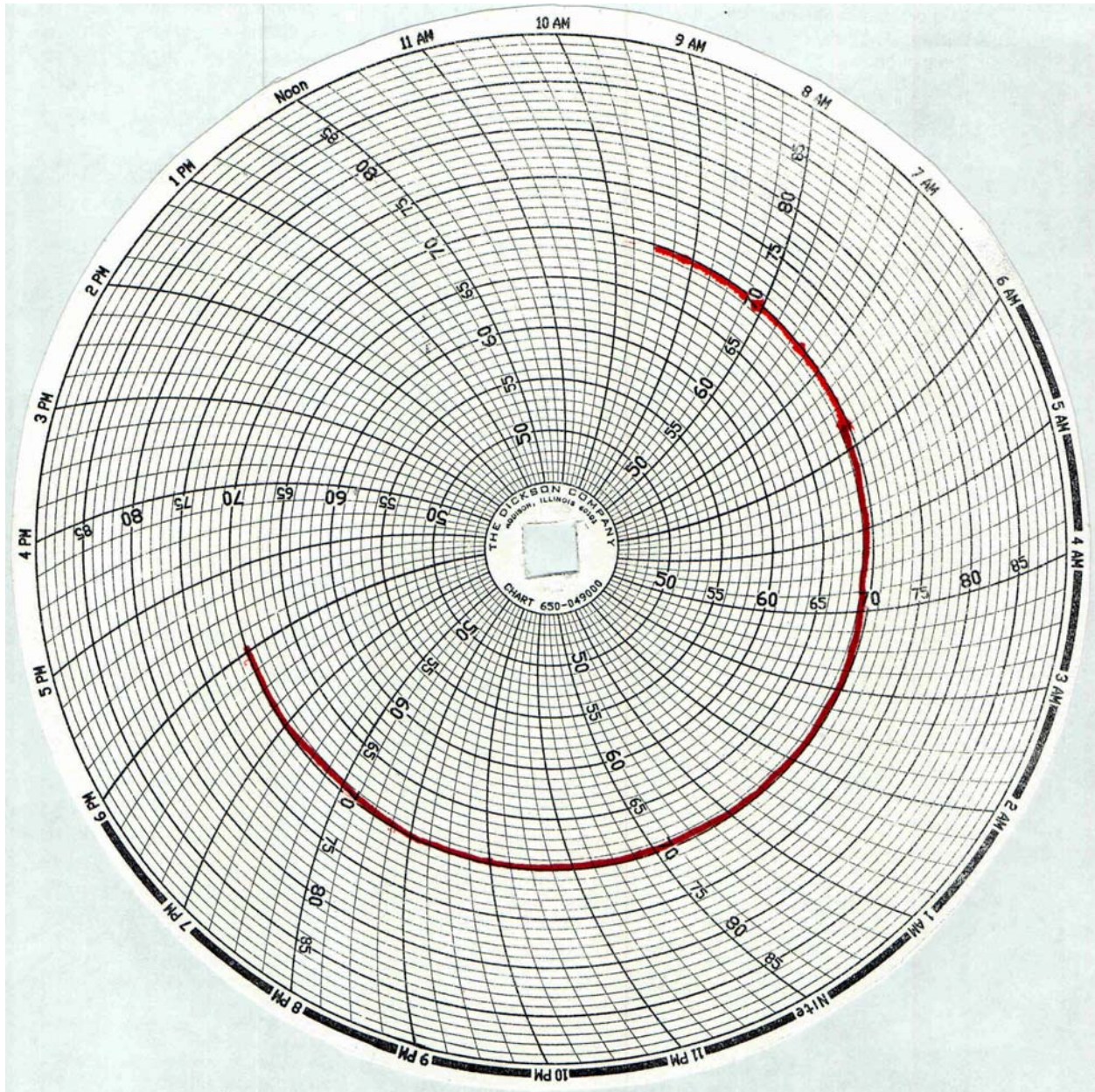
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0108
Test Date: 9/20/2010



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

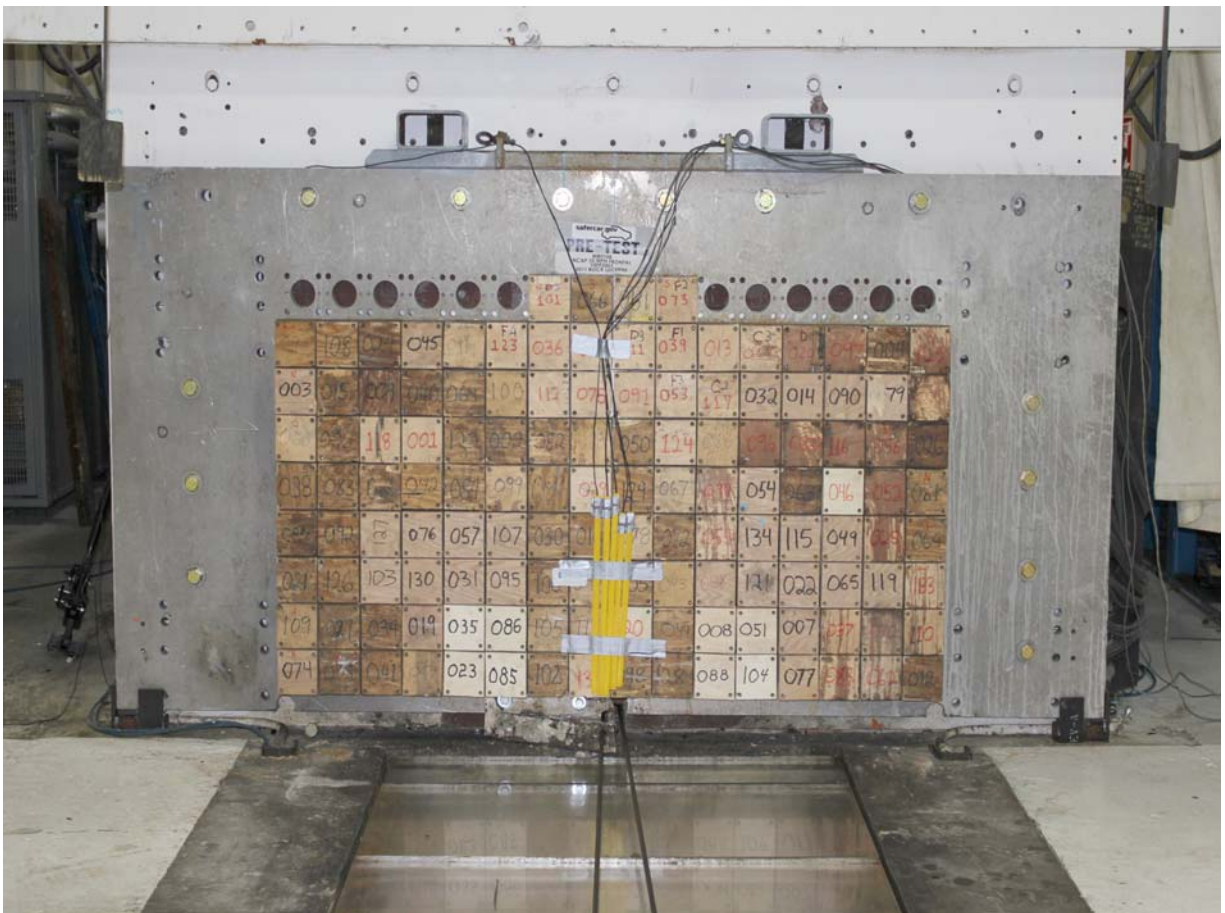
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Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



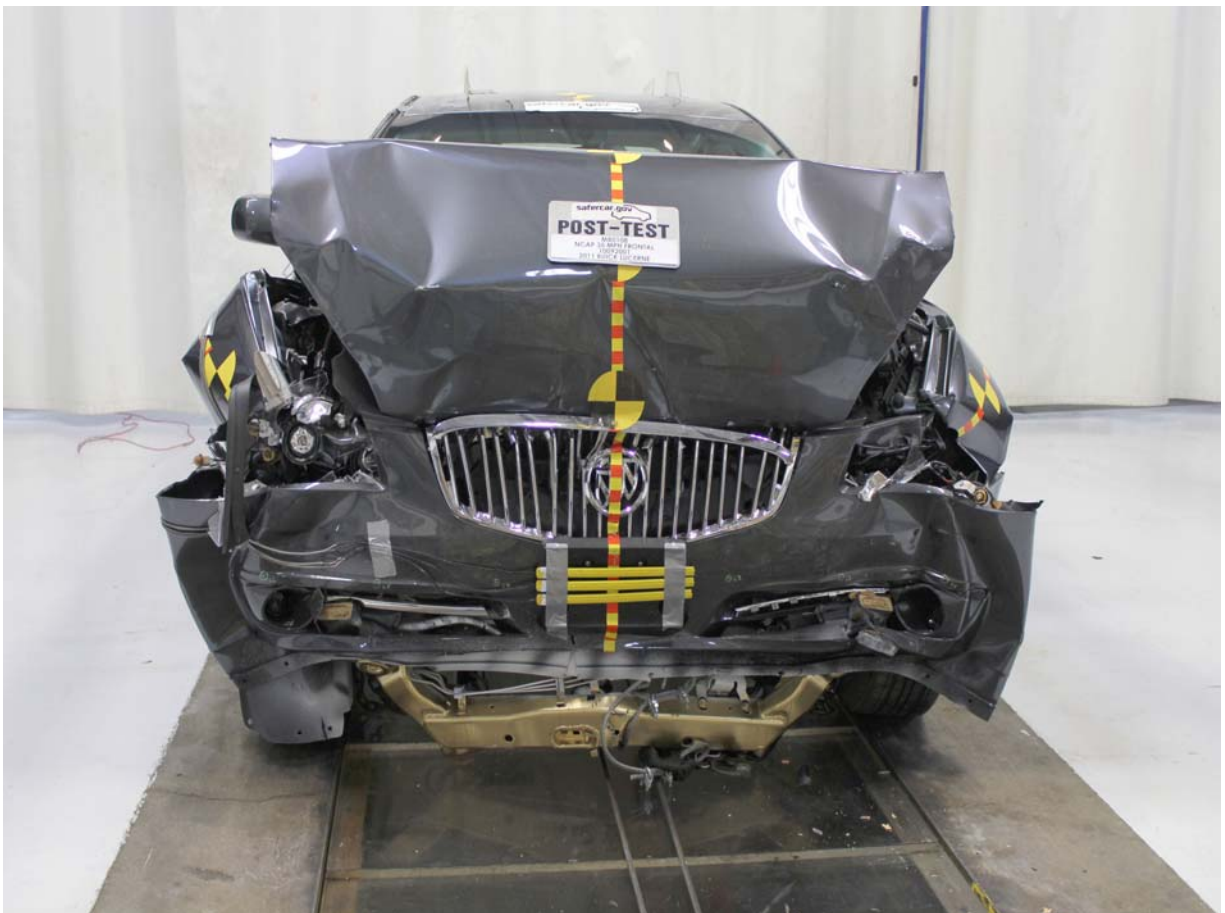
Right Front Three-Quarter View, As Received



Left Rear Three-Quarter View, As Received



Pre-Test Front View



Post-Test Front View



Pre-Test Left Side View (with vehicle at barrier)



Post-Test Left Side View



Pre-Test Right Side View (with vehicle at barrier)



Post-Test Right Side View



Pre-Test Right Front Three-Quarter View



Post-Test Right Front Three-Quarter View



Pre-Test Left Rear Three-Quarter View (with vehicle at barrier)



Post-Test Left Rear Three-Quarter View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



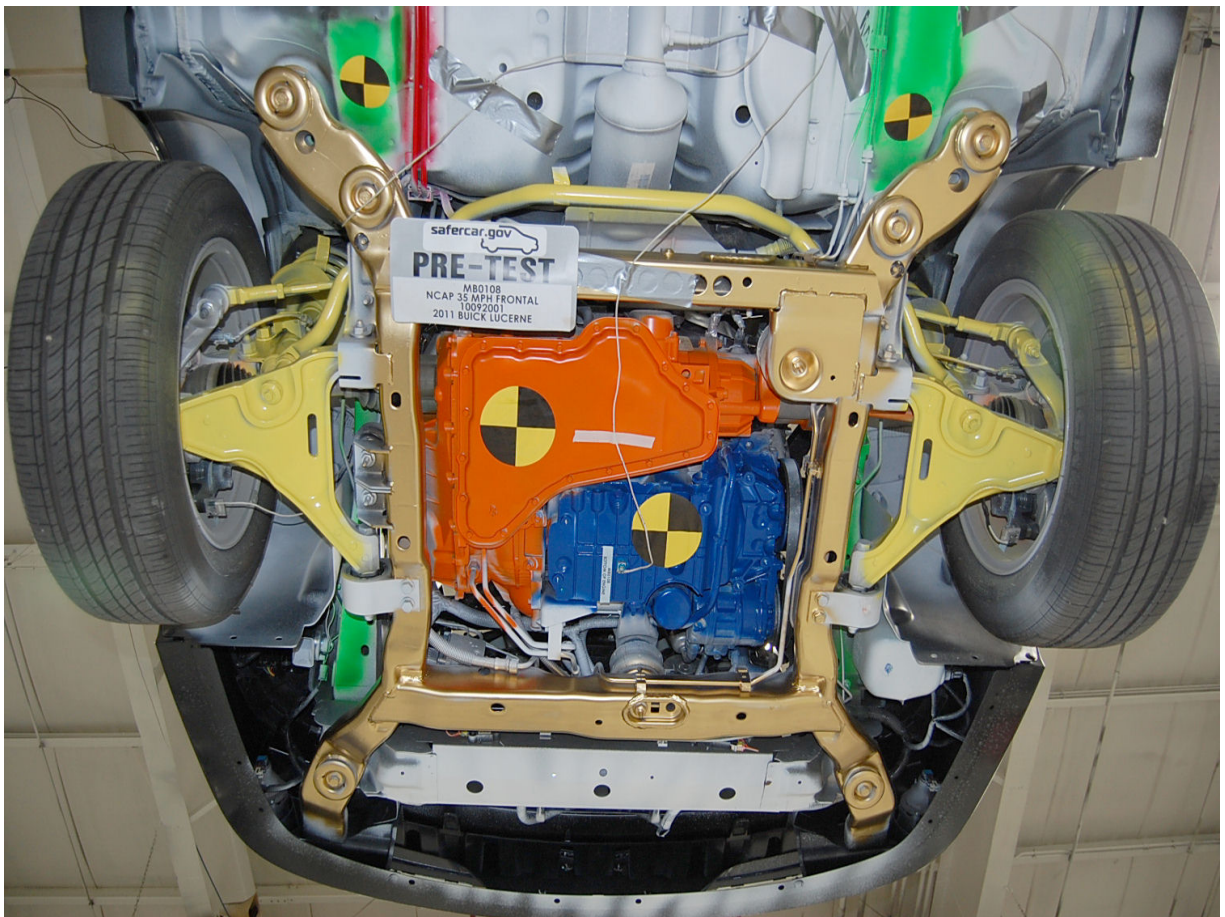
Post-Test Engine Compartment View



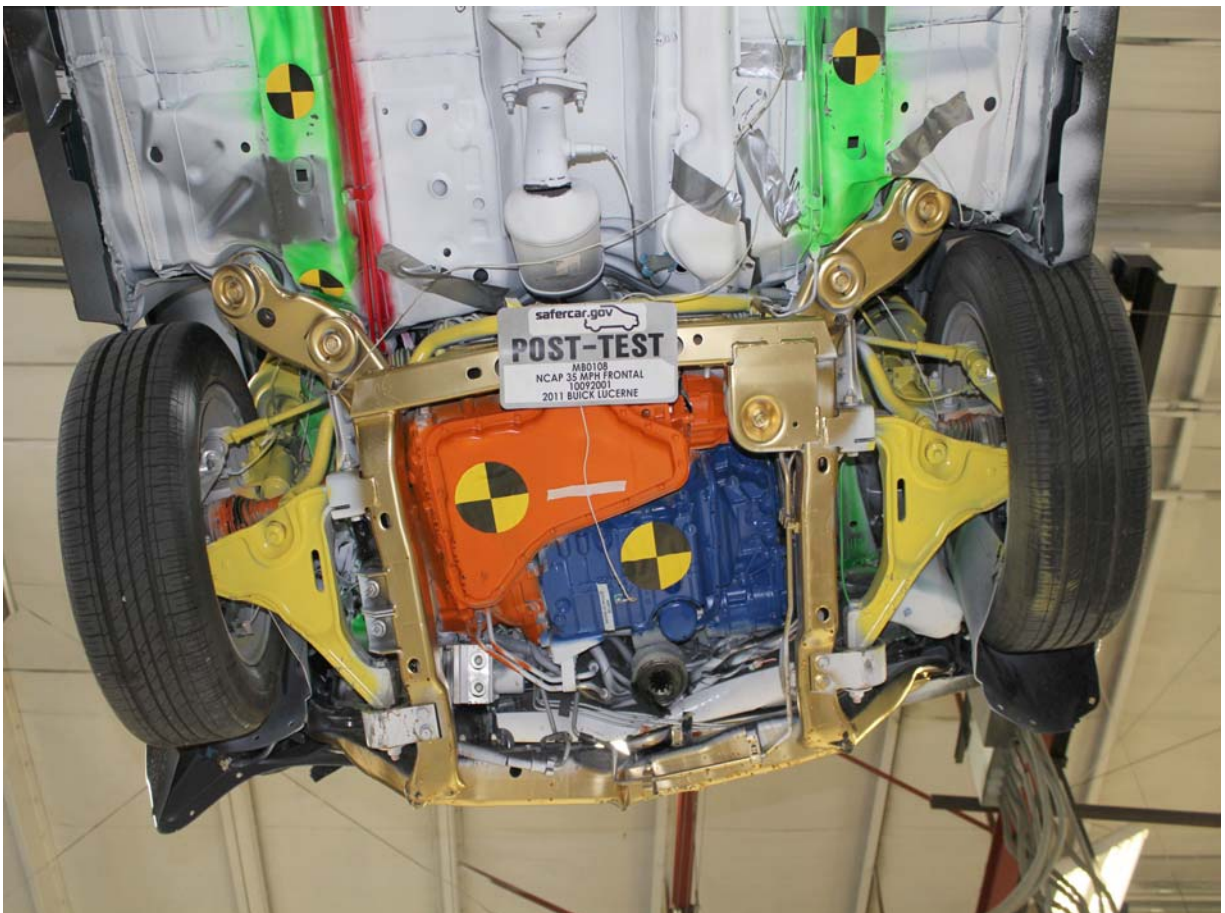
Pre-Test Fuel Cap View



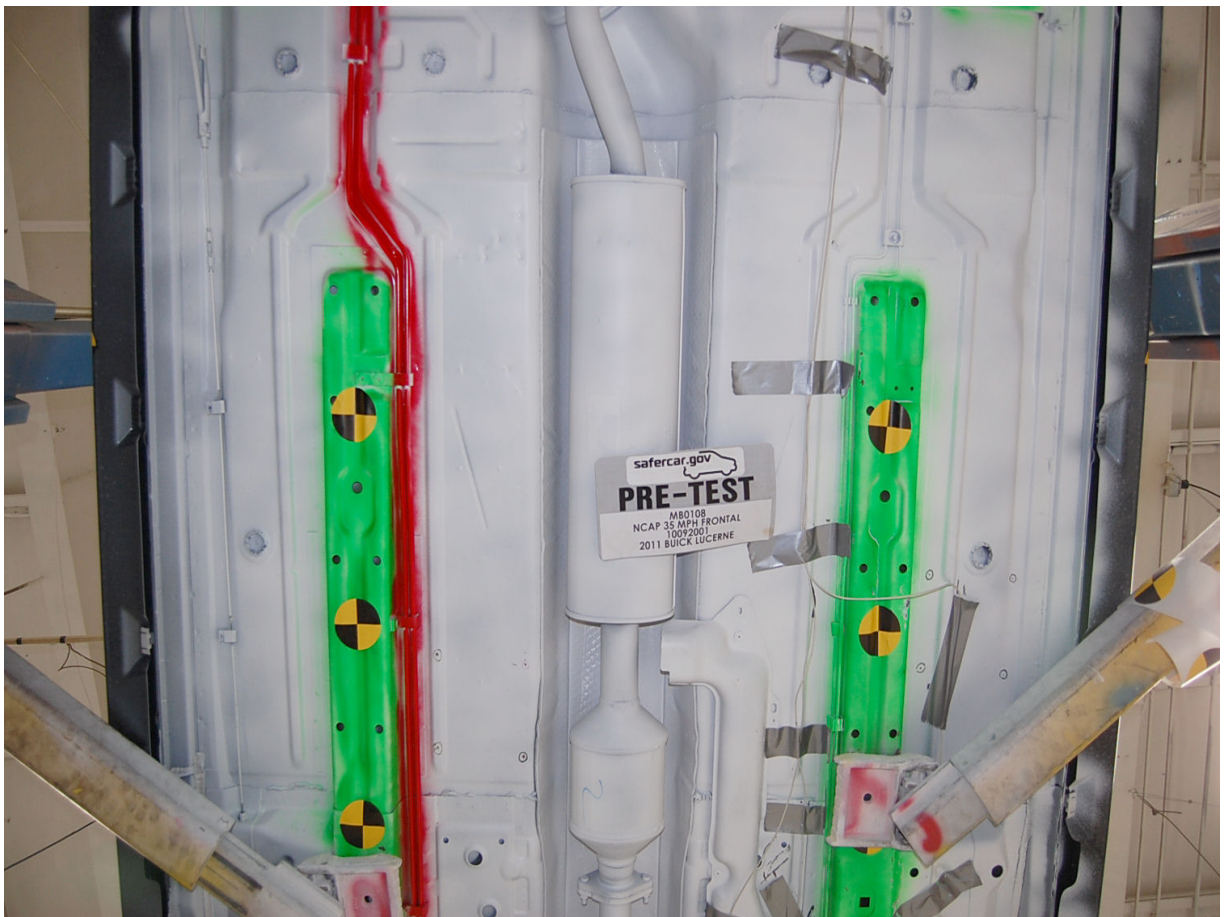
Post-Test Fuel Cap View



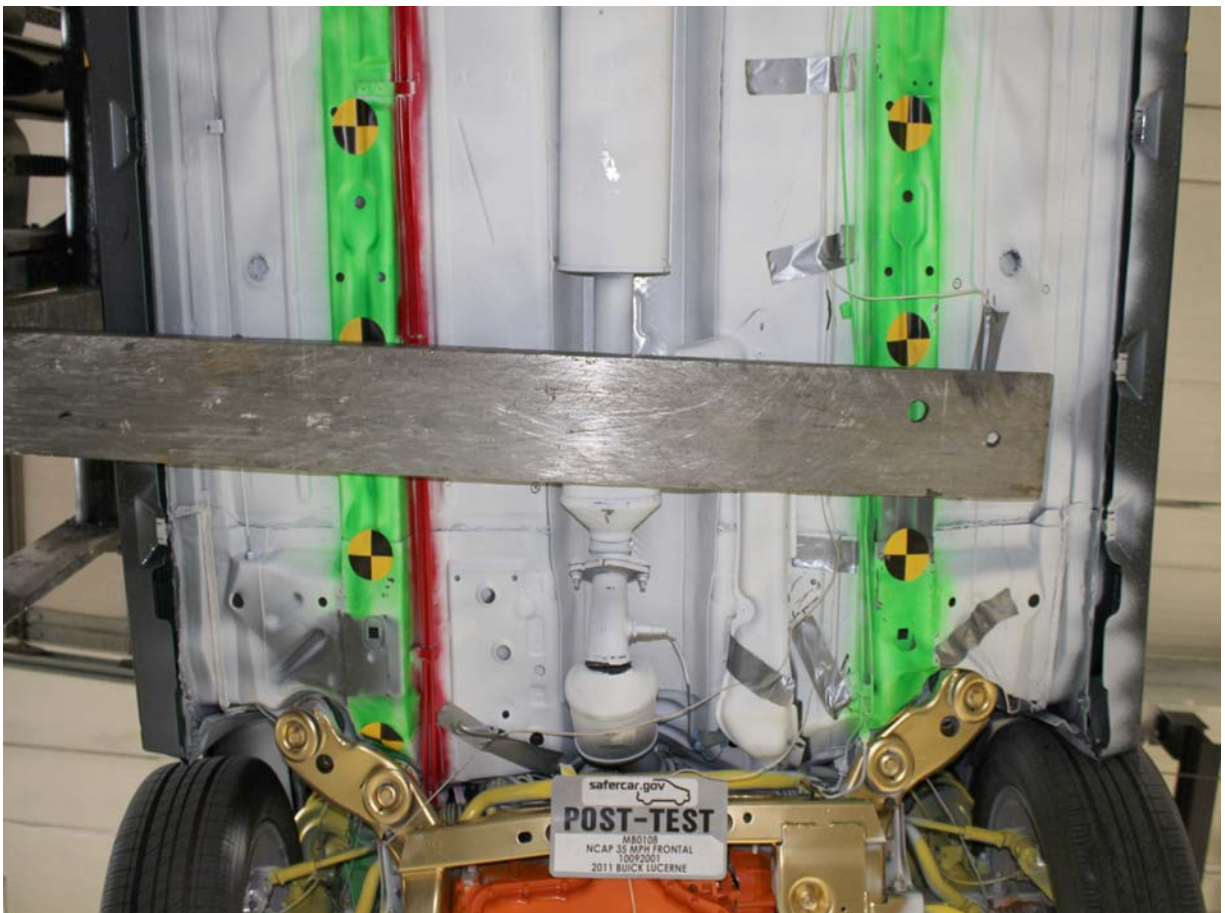
Pre-Test Front Underbody View



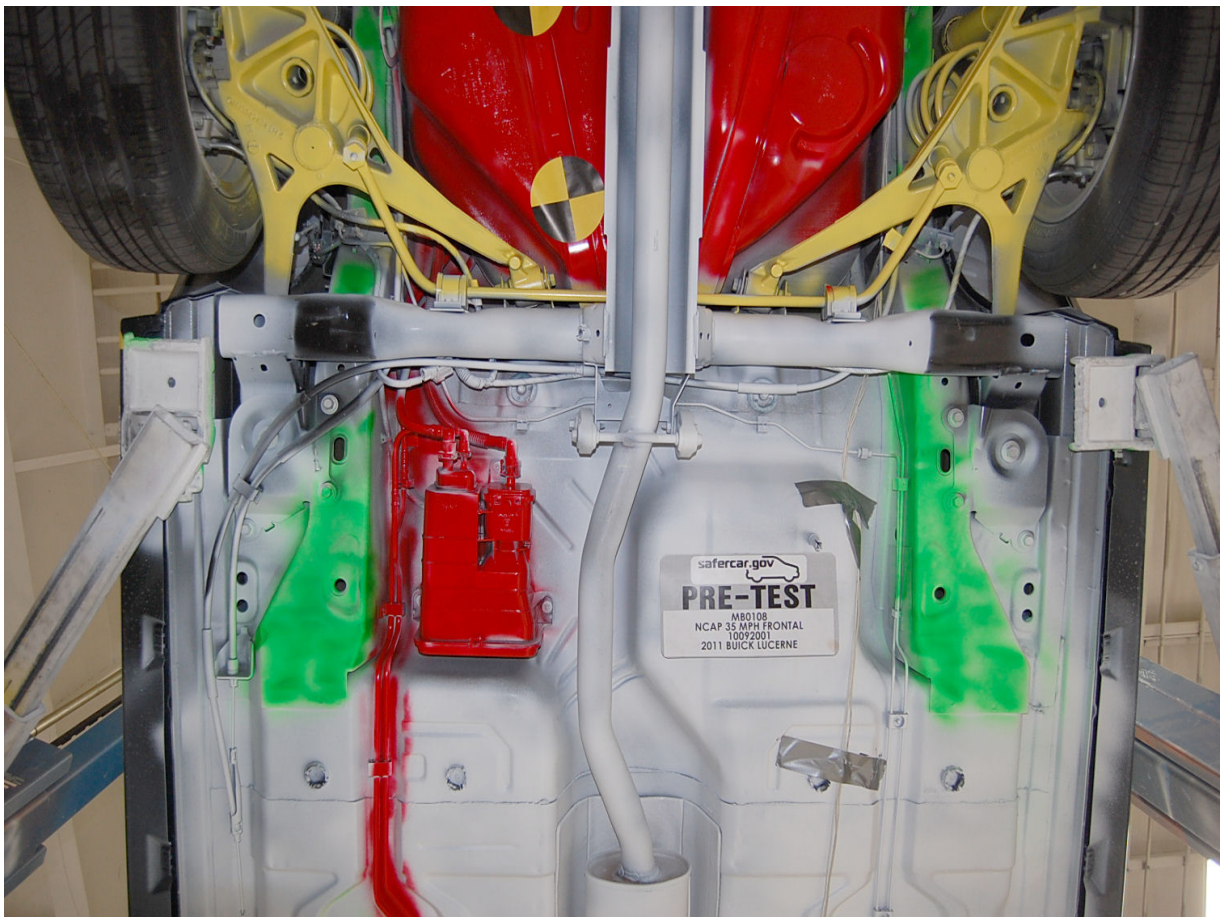
Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



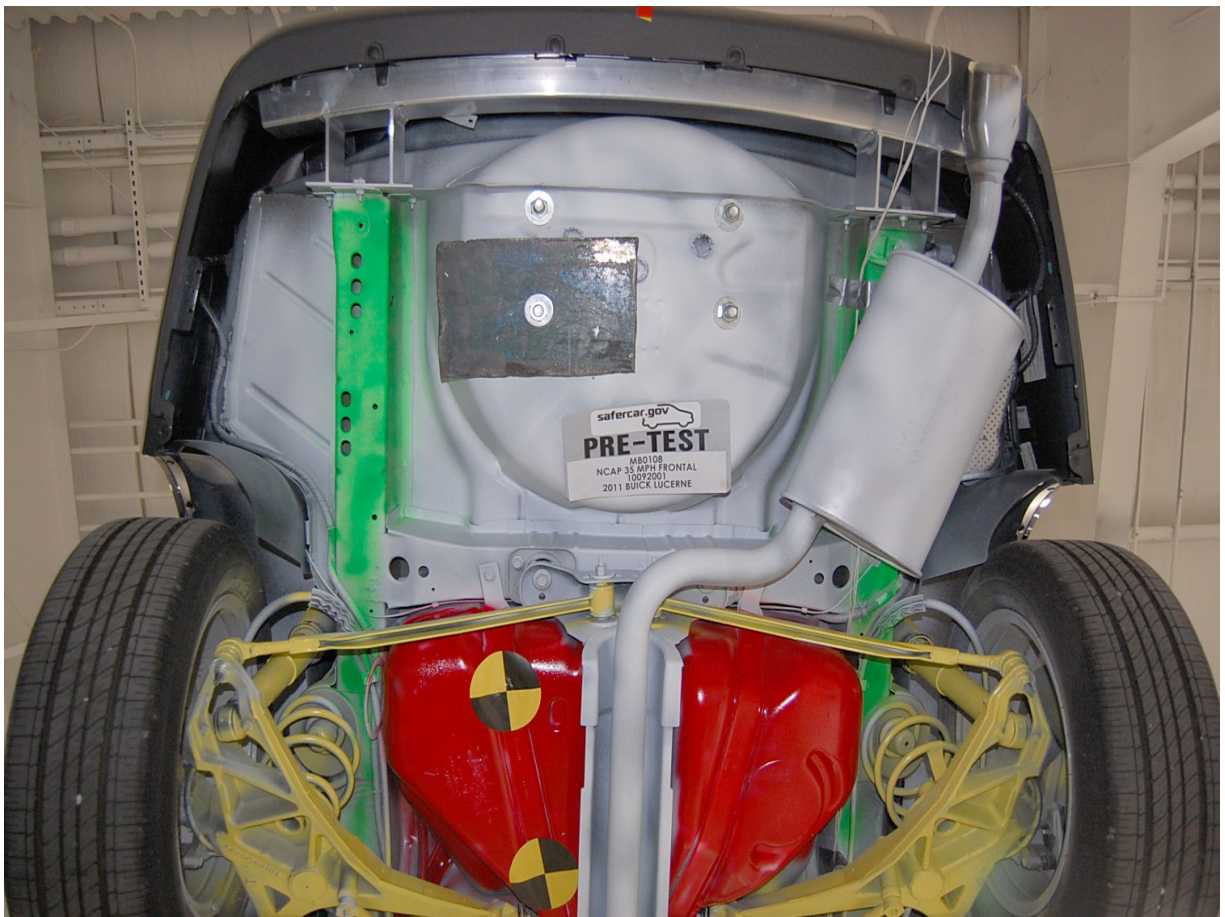
Post-Test Mid Front Underbody View



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



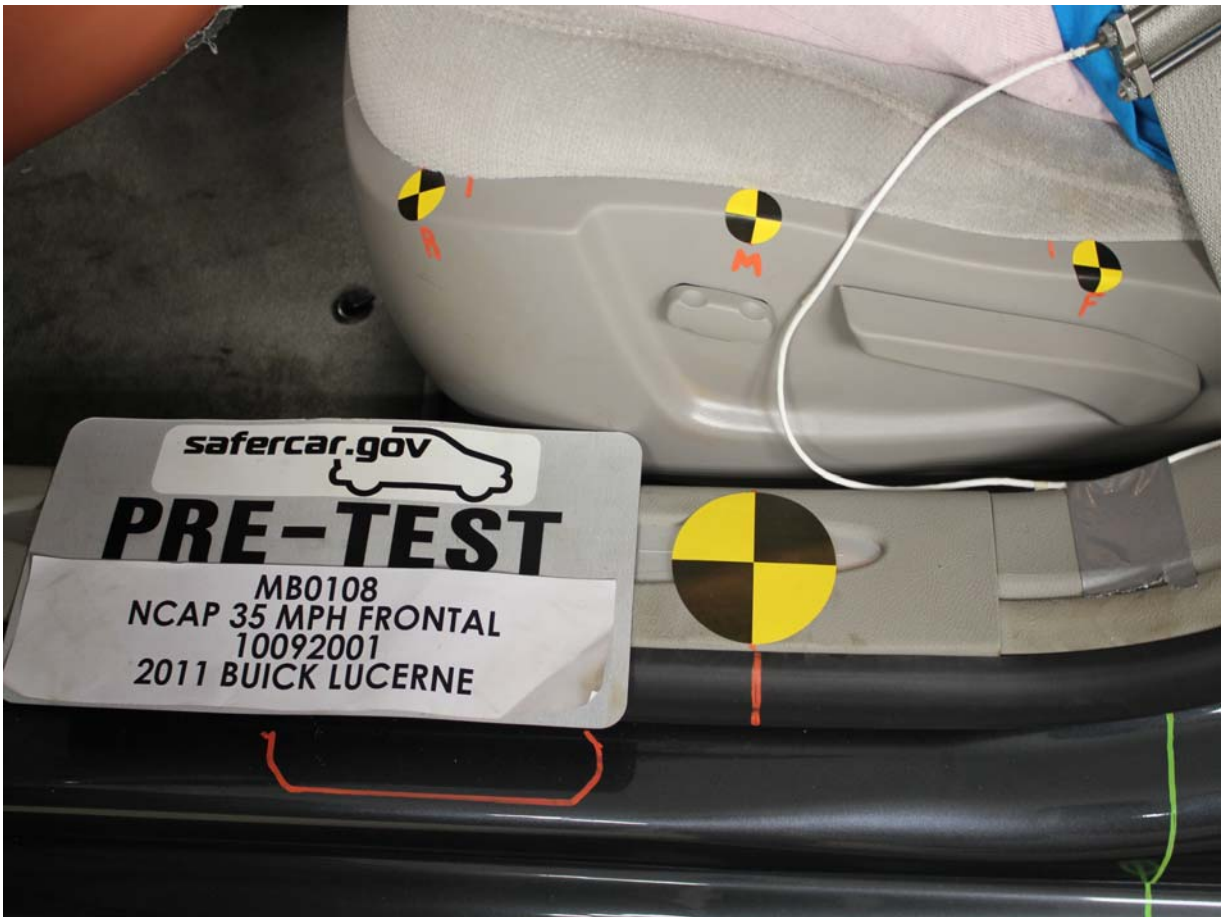
Post-Test Driver Dummy Window View



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



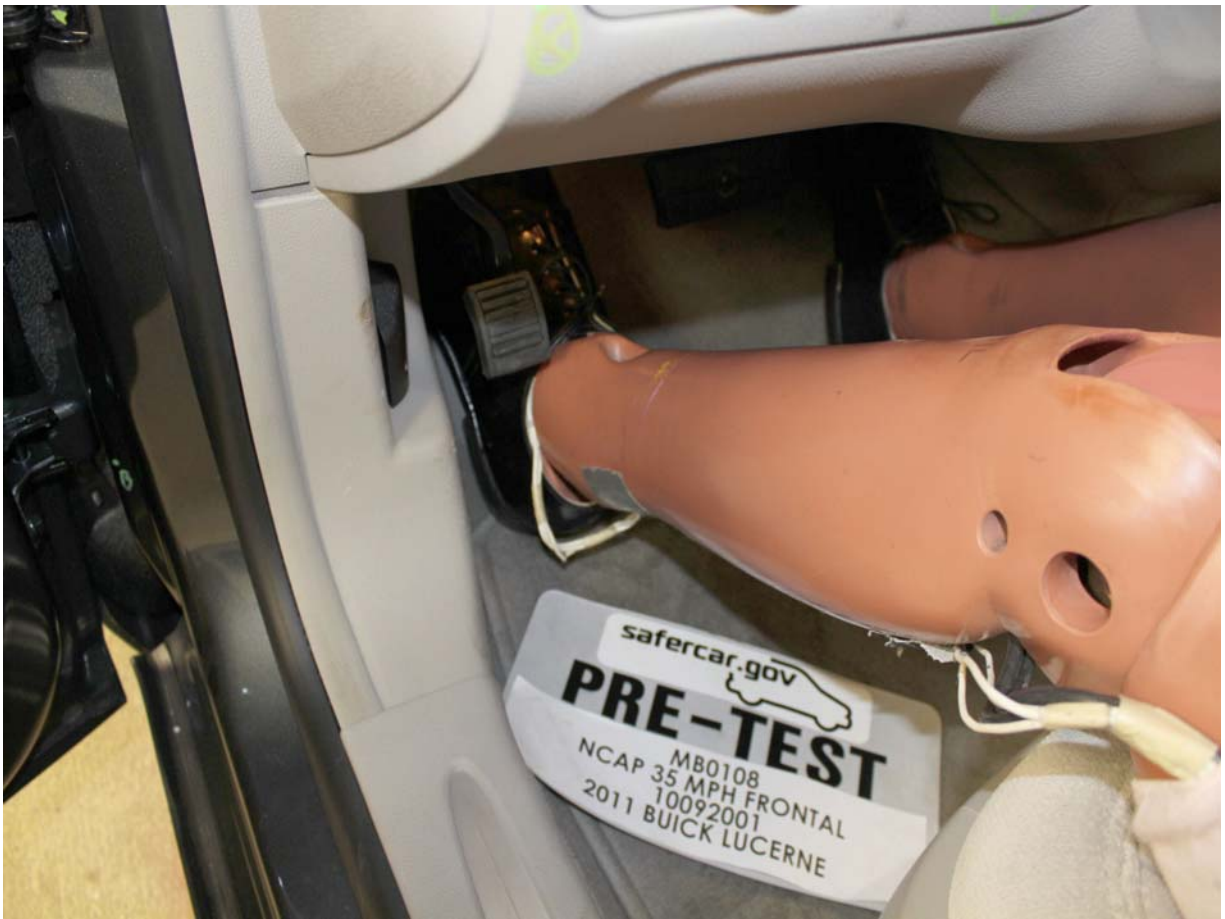
Post-Test Driver Dummy and Vehicle Interior (Door Open)



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test Driver Dummy Feet



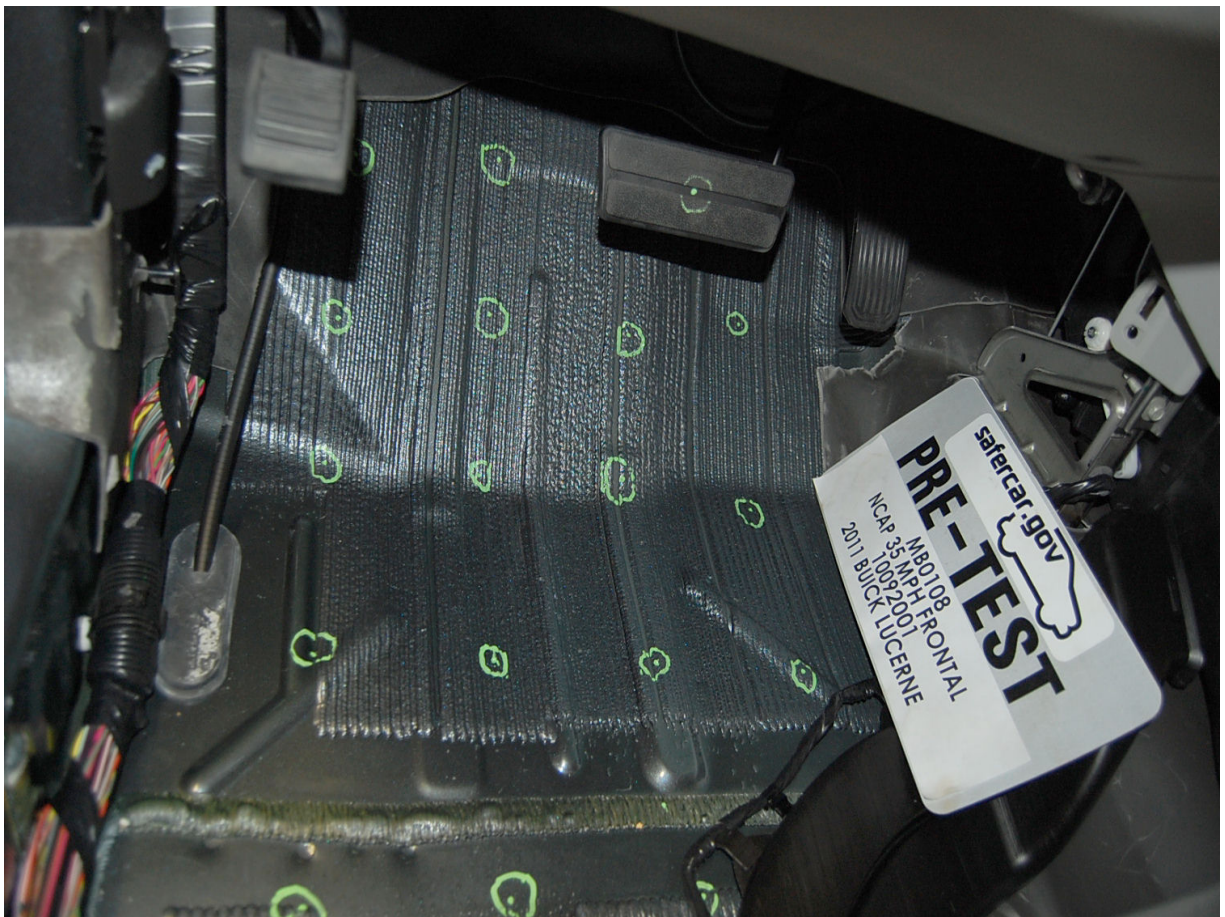
Post-Test Driver Dummy Feet



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 Airbag



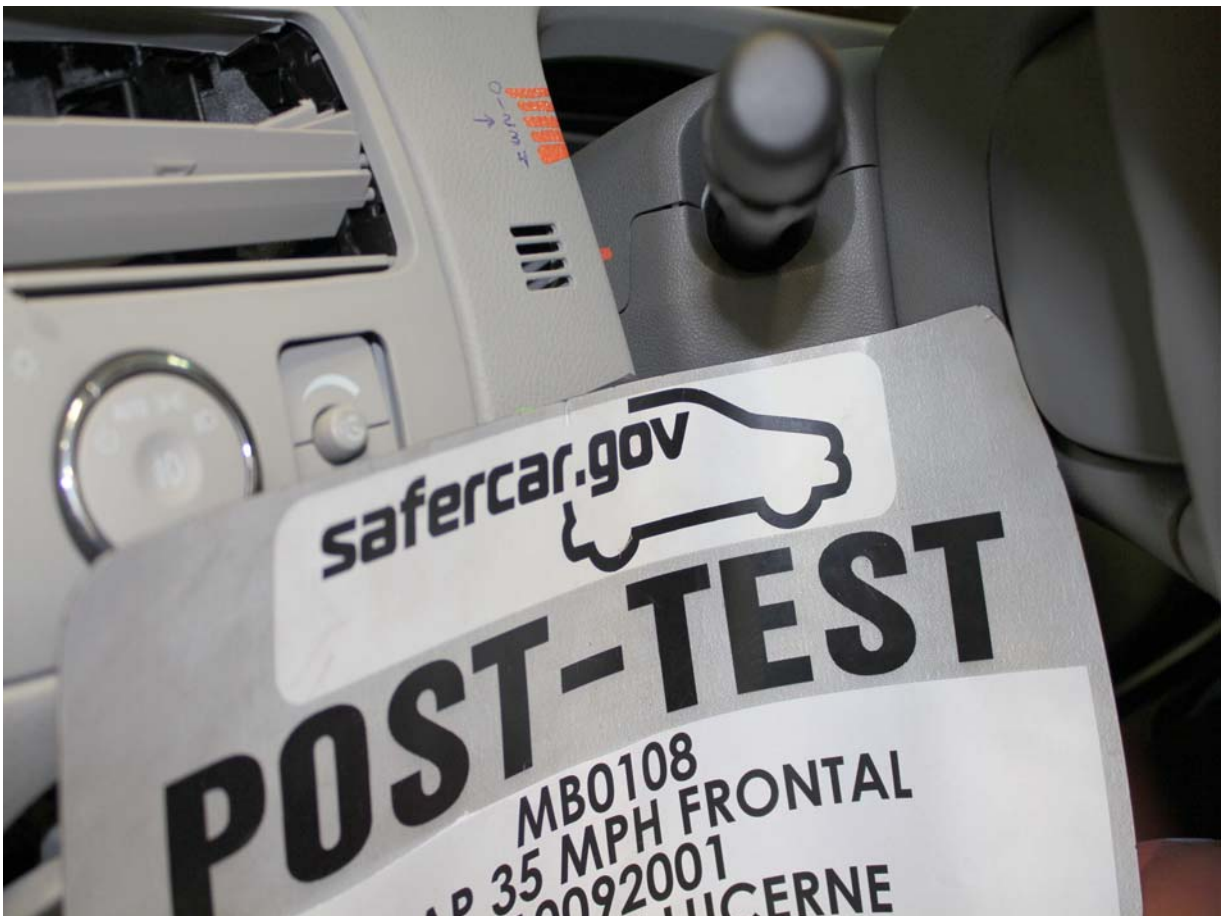
Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Bolster



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



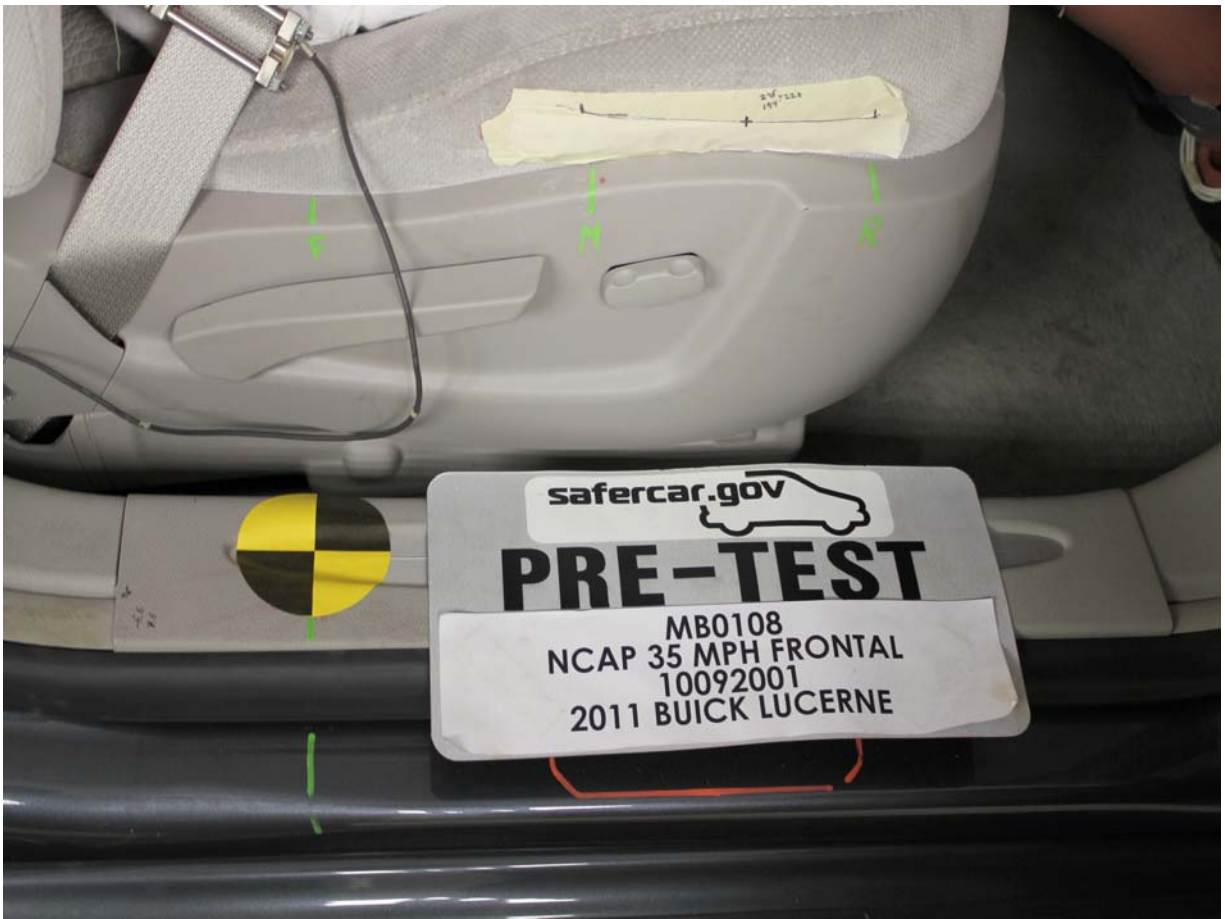
Post-Test Passenger Dummy Window View



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



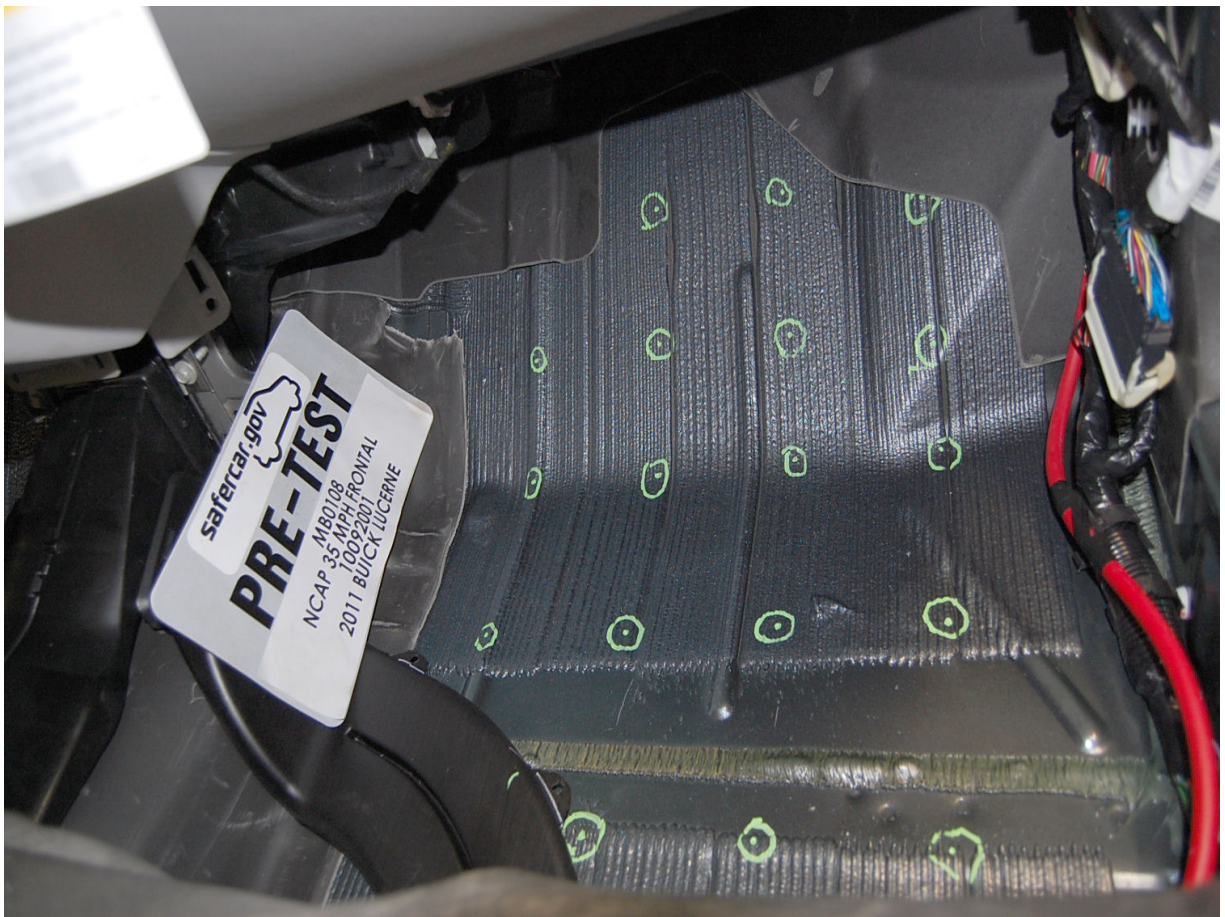
Post-Test Passenger Dummy Feet



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 Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glovebox



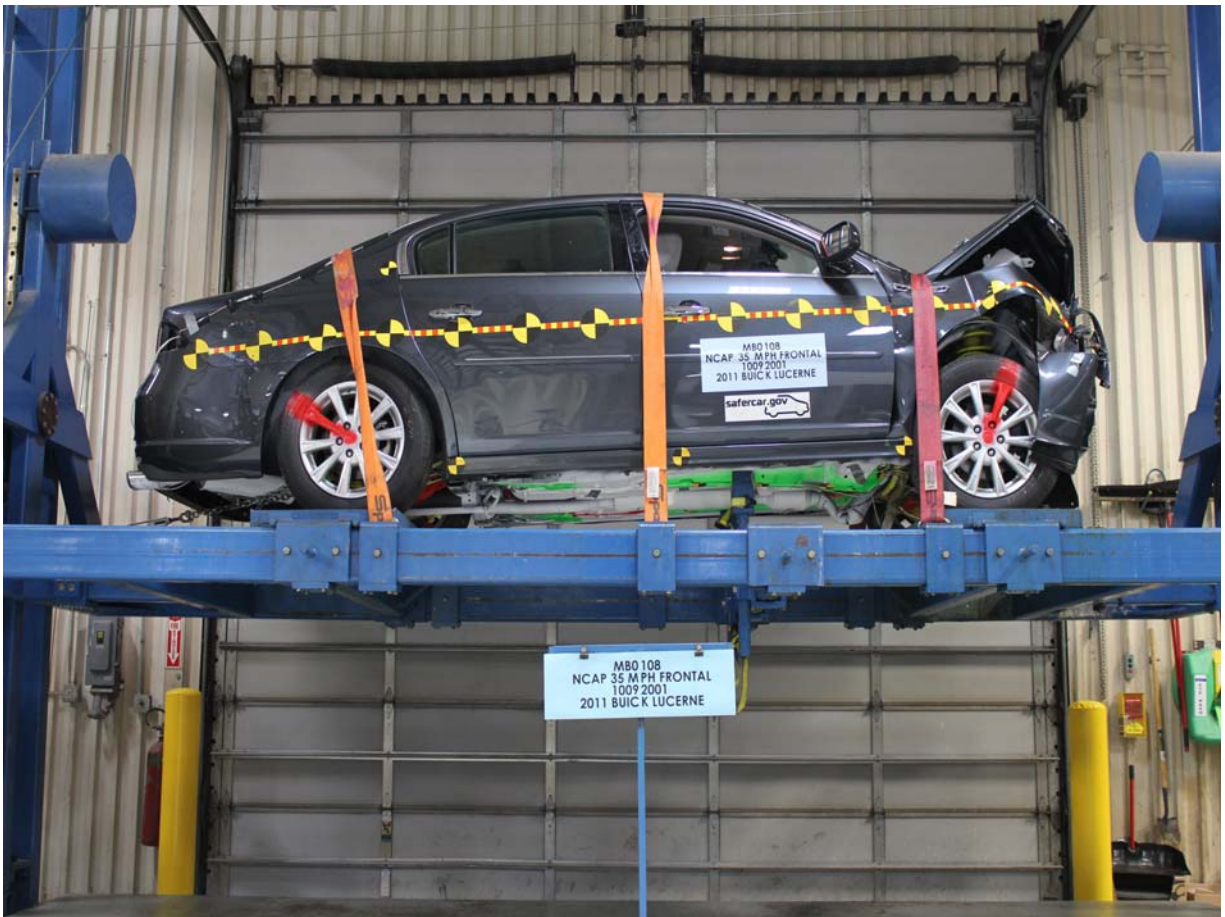
Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

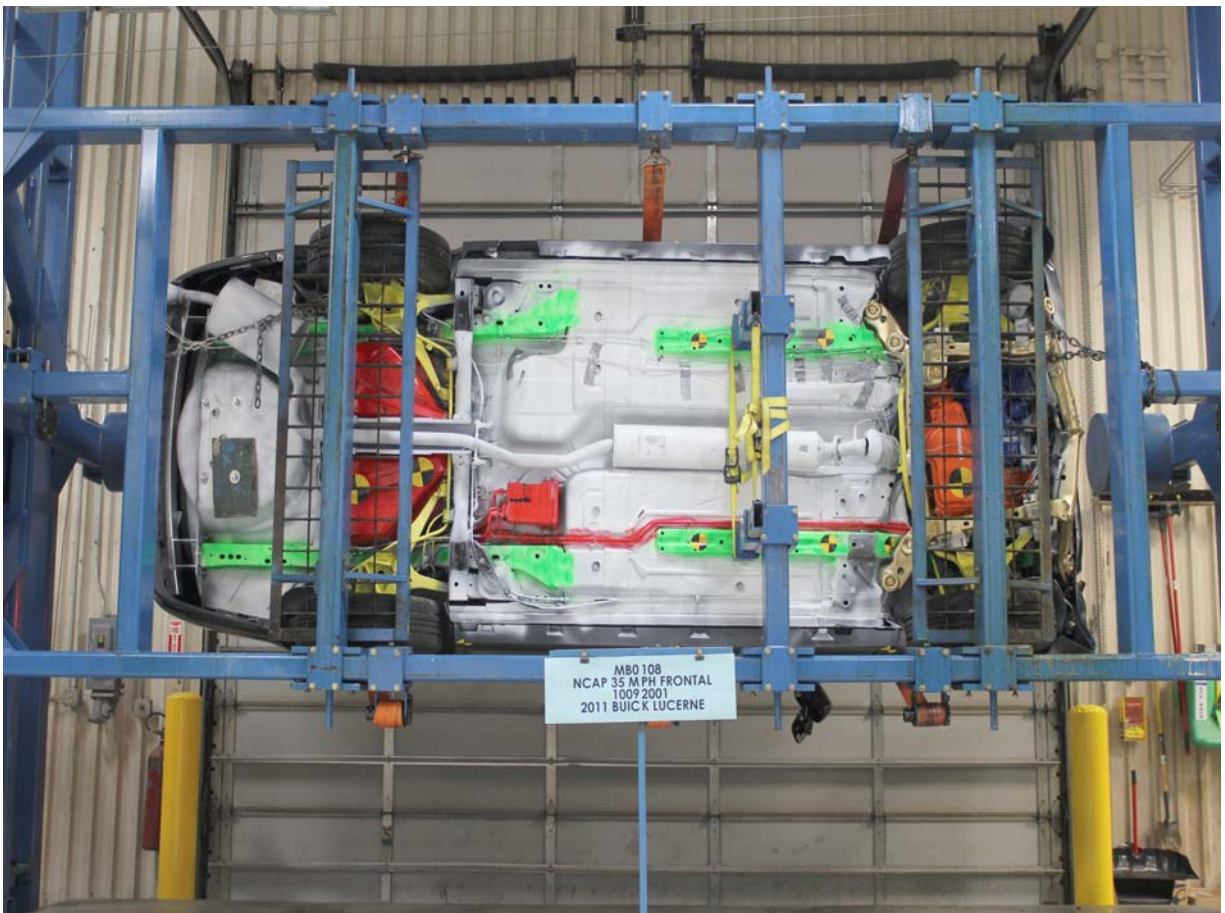
Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



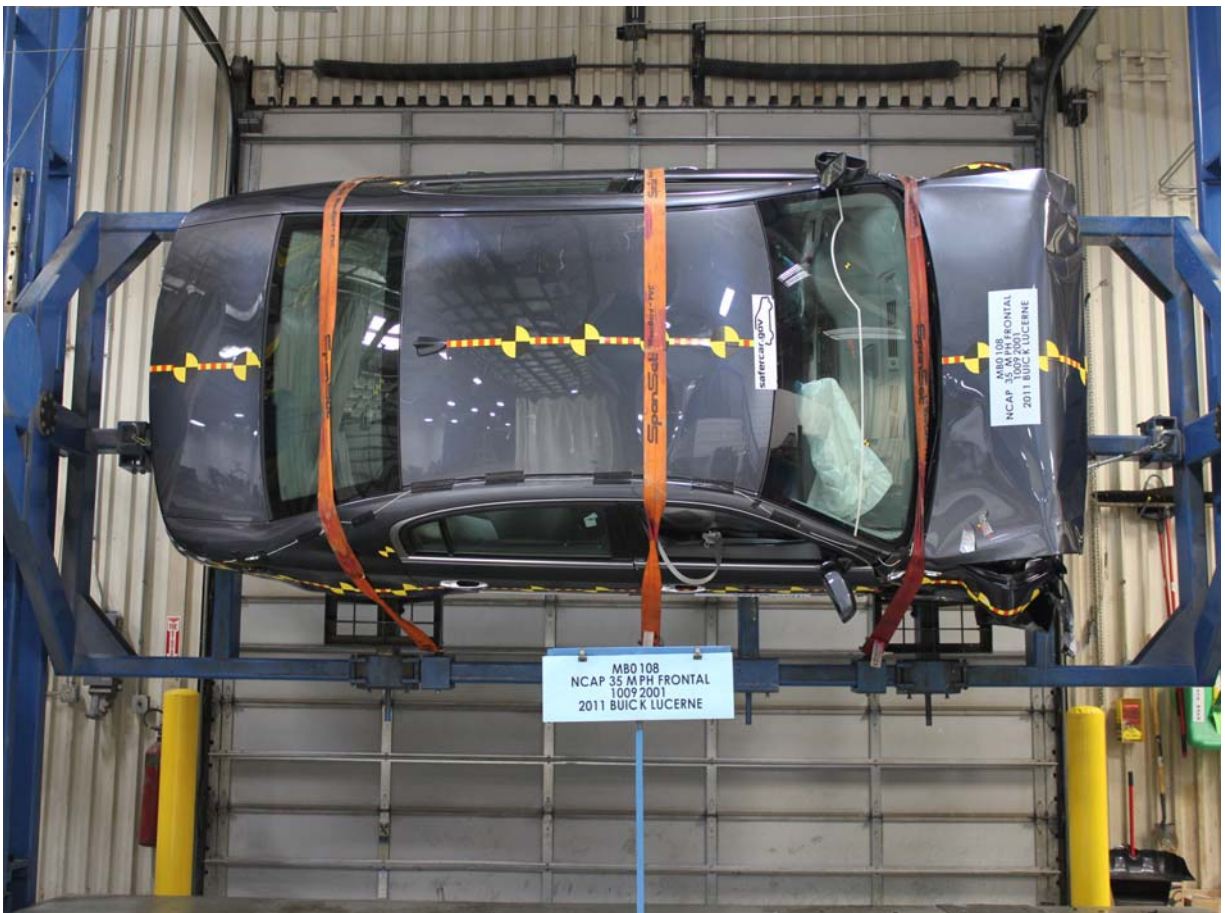
Vehicle at 0 Degrees on Static Rollover Device



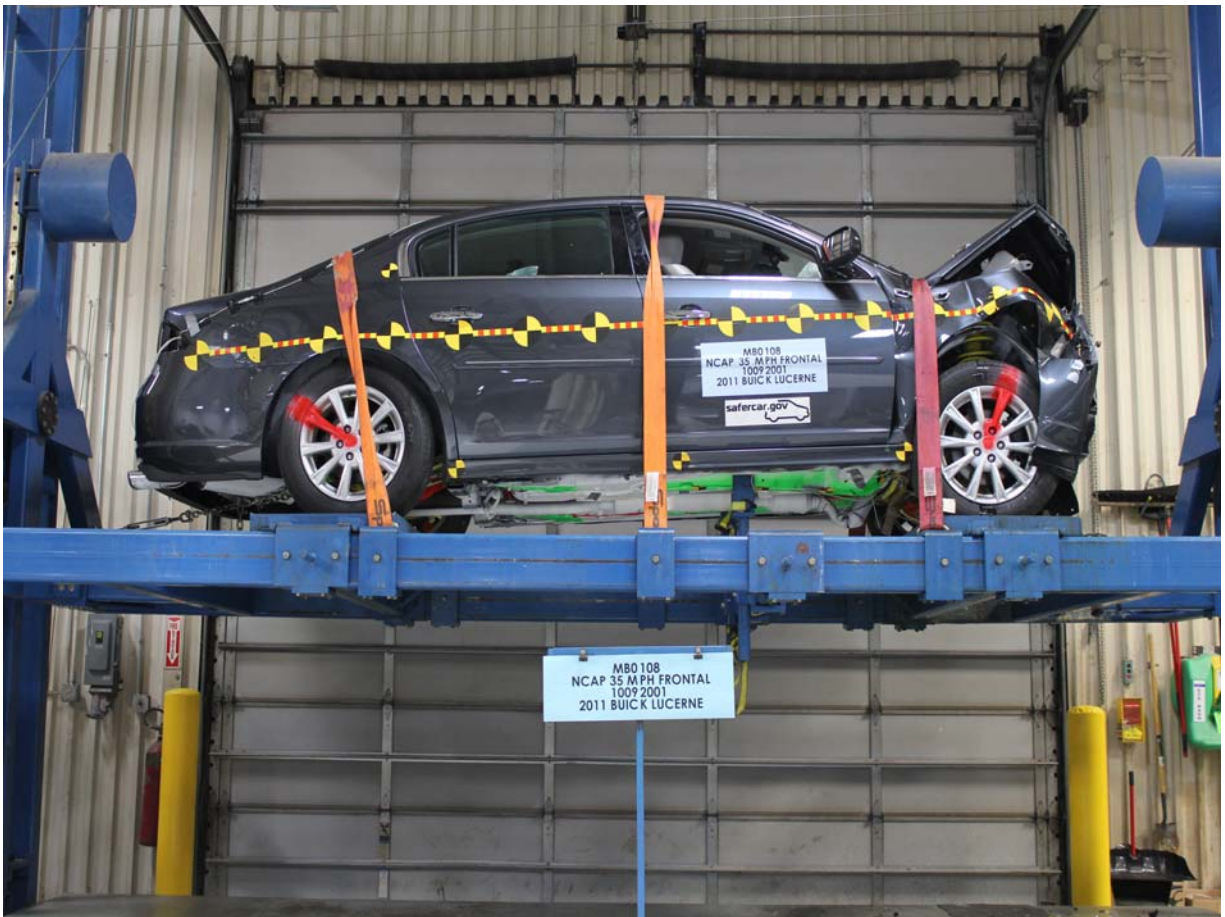
Vehicle at 90 Degrees on Static Rollover Device



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 LUCERNE CX

EXTERIOR: CYBER GRAY METALLIC
INTERIOR: TITANIUM

ENGINE, 3.9L V6 SFI FLEX-FUEL
TRANSMISSION, 4 SPEED AUTOMATIC

STANDARD EQUIPMENT

ITEMS LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN

- 5 YEAR / 100,000 MILE POWERTRAIN LIMITED WARRANTY SEE DEALER FOR DETAILS
- 4 YEAR / 50,000 MILE BUMPER-TO-BUMPER WARRANTY SEE DEALER FOR DETAILS

MECHANICAL

- ENGINE, 3.9L V6 WITH FLEX-FUEL CAPABILITY
- TRANSMISSION, 4 SPD AUTOMATIC
- ANTILOCK BRAKE SYSTEM, 4 WHEEL DISC
- POWER RACK & PINION STEERING
- 4 WHEEL IND. SUSPENSION SYSTEM
- TRACTION CONTROL
- STABILITRAK-STABILITY CONTROL
- LOAD LEVEL CONTROL, AUTOMATIC

SAFETY

- AIRBAGS, FRONT, SIDE THORAX

EXTERIOR

- W/ PASSENGER SENSING, HEAD CURTAIN SIDE AIRBAG, ALL OUTBOARD SEATING POSITIONS
- REAR CHILD-SEAT LATCH ANCHORS
- REMOTE KEYLESS ENTRY EXT RANGE
- THEFT DETERRENT SYSTEM
- TIRE PRESSURE MONITOR
- 6 MTHS ONSTAR DIRECTIONS & CONNECTIONS WITH AUTOMATIC CRASH RESPONSE AND TURN-BY-TURN NAVIGATION (ASK DEALER ABOUT GEOGRAPHIC COVERAGE)

INTERIOR

- POWER HEATED OUTSIDE MIRRORS, DRIVER SIDE AUTO DIMMING
- SOLAR-RAY LIGHT-TINTED GLASS
- 17" ALUM PREMIUM PAINTED WHEELS
- FOG LAMPS
- CHROME GRILL

EXTERIOR

- PWR SEAT ADJUST, DRIVER & FRONT PASSENGER, 6 WAY
- LEATHER WRAP STEERING WHEEL
- W/ RADIO AND CRUISE CONTROLS
- POWER DOOR LOCKS POWER WINDOWS
- DRIVER INFO CENTER W/COMPASS
- A/M/FM STEREO, CD PLAYER
- XM RADIO - SERVICE SUBSCRIPTION SOLD SEPARATELY BY XM/AT&T AFTER 3 MONTHS
- INTERIOR LIGHTING
- INSIDE REARVIEW MIRROR, WITH AUTO DIMMING
- VISOR MIRRORS, LIGHTED
- REAR WINDOW DEFOGGER
- AIR PARTICULATE FILTER
- FLOOR MATS, FRONT/REAR

OPTIONS & PRICING

MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE \$29,730.00

Visit us at www.buick.com

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

- SEATS, 6 PASSENGER, 295.00
- FRONT 40/20/40 SPLIT, -100.00
- TIRE SEALANT AND INFLATOR KIT

TOTAL OPTIONS \$195.00
TOTAL VEHICLE & OPTIONS \$29,925.00
DESTINATION CHARGE 765.00

TOTAL VEHICLE PRICE* \$30,690.00

EPA Fuel Economy Estimates

GASOLINE
CITY MPG

17

Expected range
for most drivers
14 to 20 MPG

*Fuel economy when
operating on E85 will
yield different values
than gasoline. See Fuel
Economy Guide for
more information.

FLEXIBLE FUEL VEHICLE*
GASOLINE - ETHANOL(E85)

Estimated
Annual Fuel Cost
\$1,856

based on 15,000 miles at
\$2.60 per gallon of GASOLINE

Combined GASOLINE
Fuel Economy
This Vehicle

21

13 25
AT LARGE CARS

GASOLINE
HIGHWAY MPG

27

Expected range
for most drivers
22 to 32 MPG

Your actual
mileage will vary
depending on how you
drive and maintain
your vehicle.

AF9



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).

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 76%

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

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

This label has been applied
pursuant to Federal law. Do not
remove prior to delivery to the
customer. This label is the property
of the manufacturer and must be
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any other purpose. It is not to be
reproduced or copied. It is not to
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ORDER NO N00KTP SALES CODE E

SALES MODEL CODE #P9B

FINAL ASSEMBLY:

DETROIT, MI U.S.A.

VIN 1G4HAEM0BU102575

DEALER TO WHOM DELIVERED

MIKE HAGGERTY BUICK GMC, INC.

9301 SOUTH CICERO AVE

OAK LAWN, IL 60453-2517

DC
1000925107

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

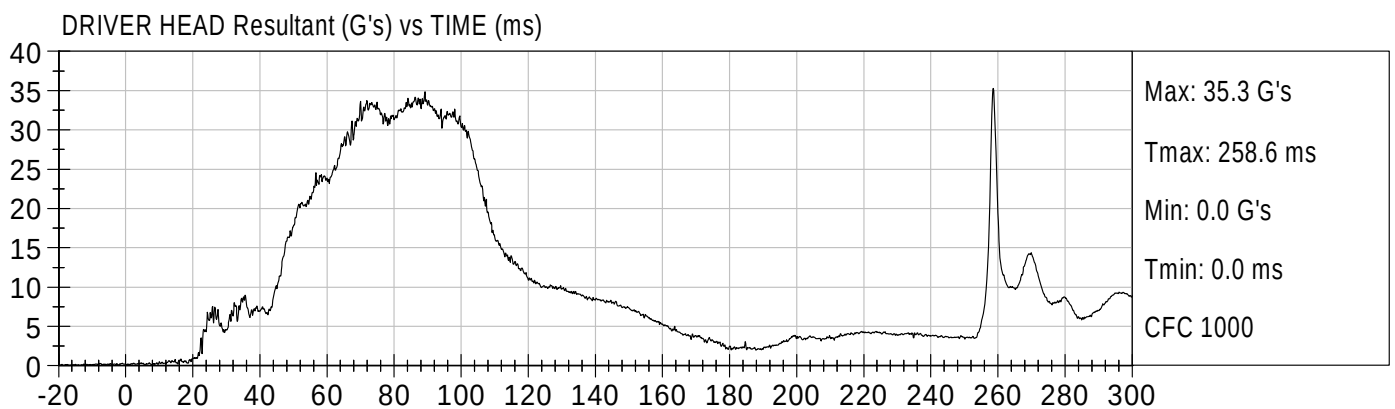
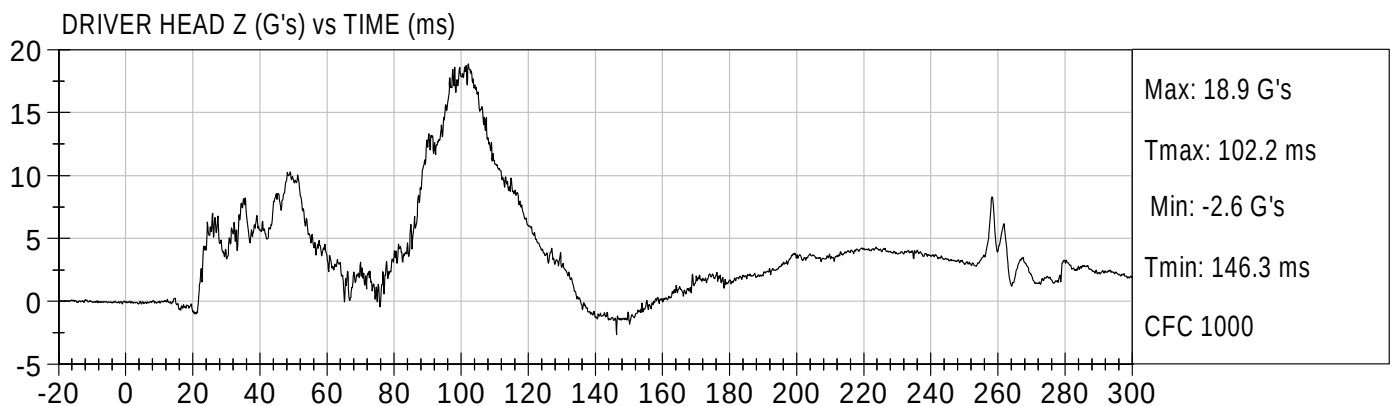
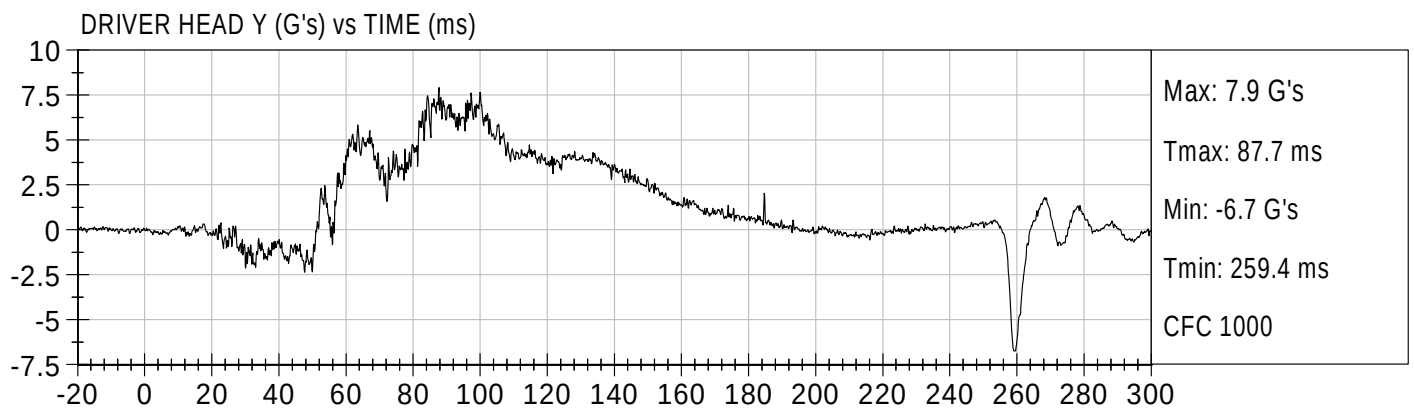
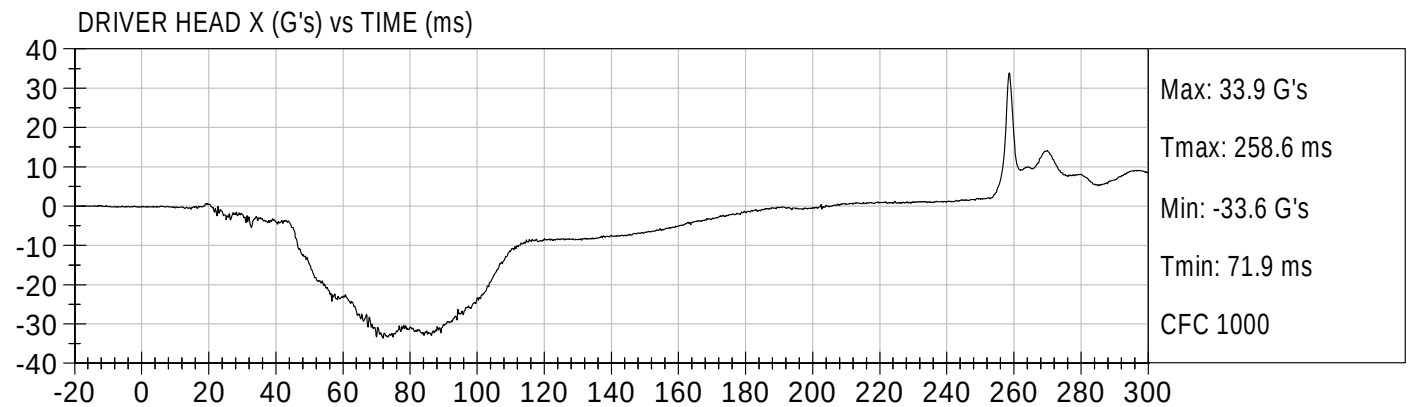
Driver Left Upper Tibia Force Z

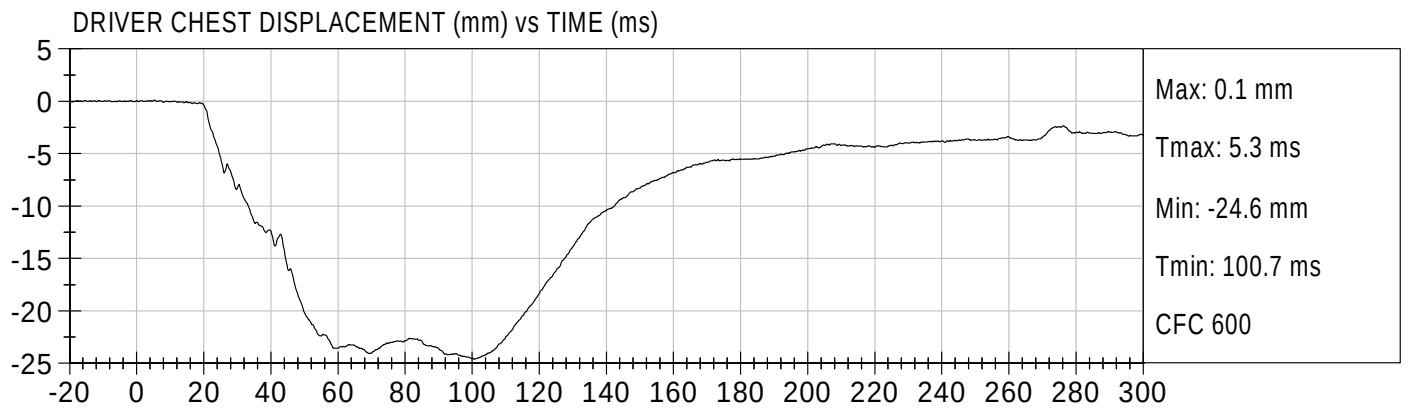
Driver Left Lower Tibia Moment X

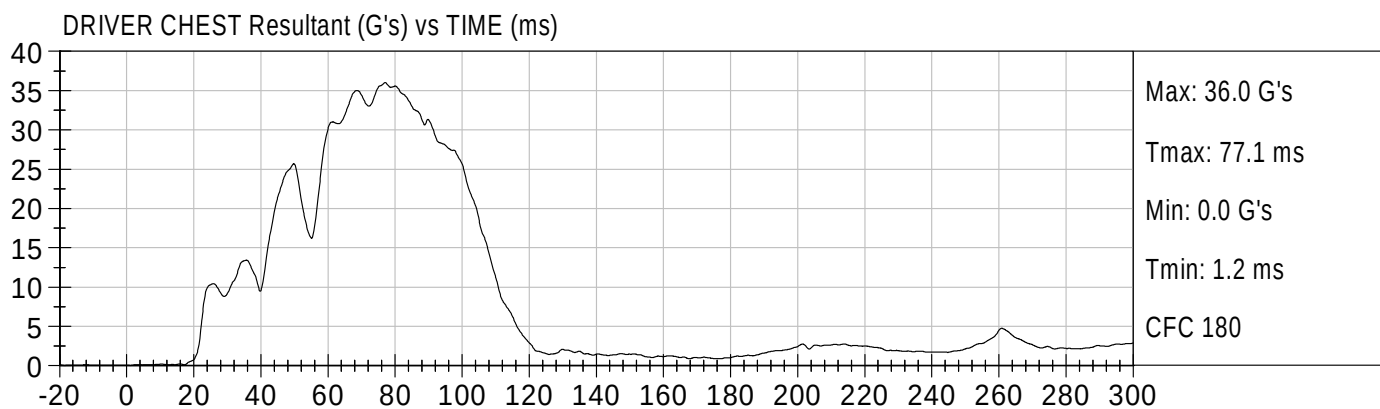
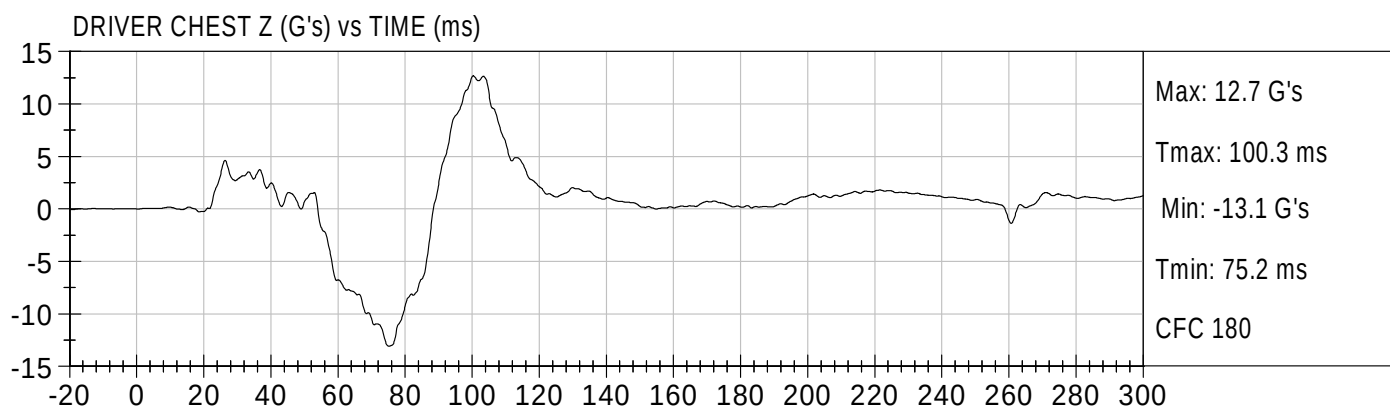
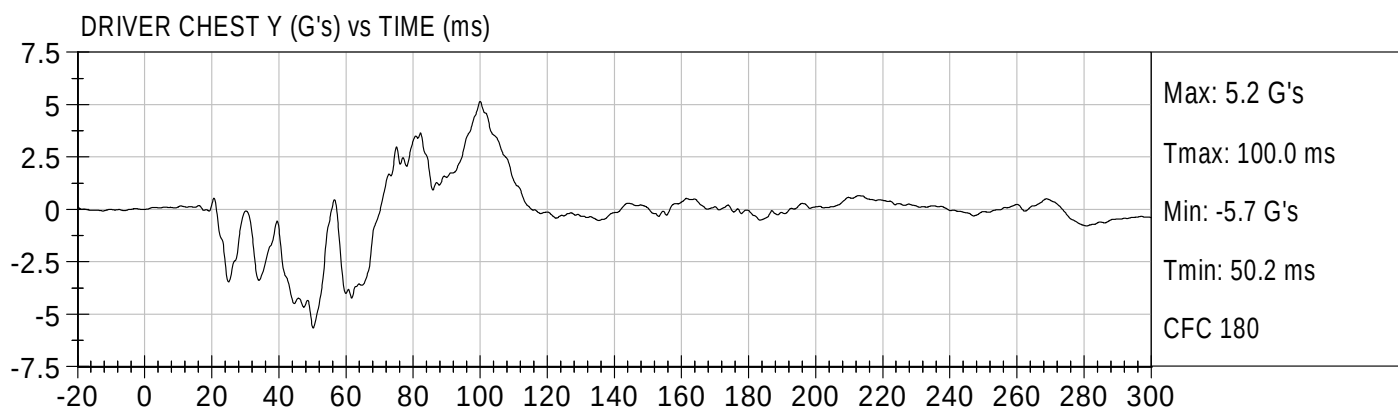
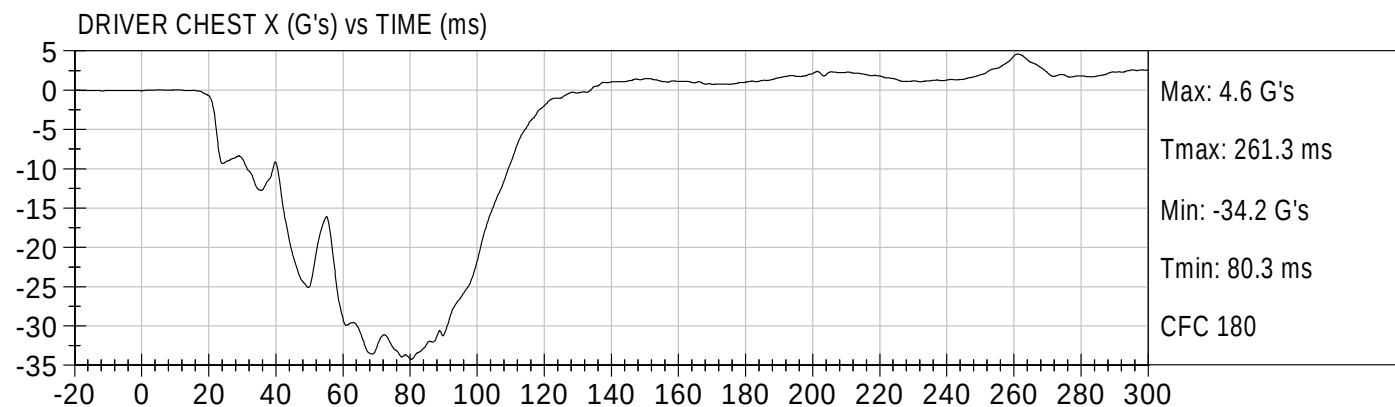
Driver Left Lower Tibia Moment Y

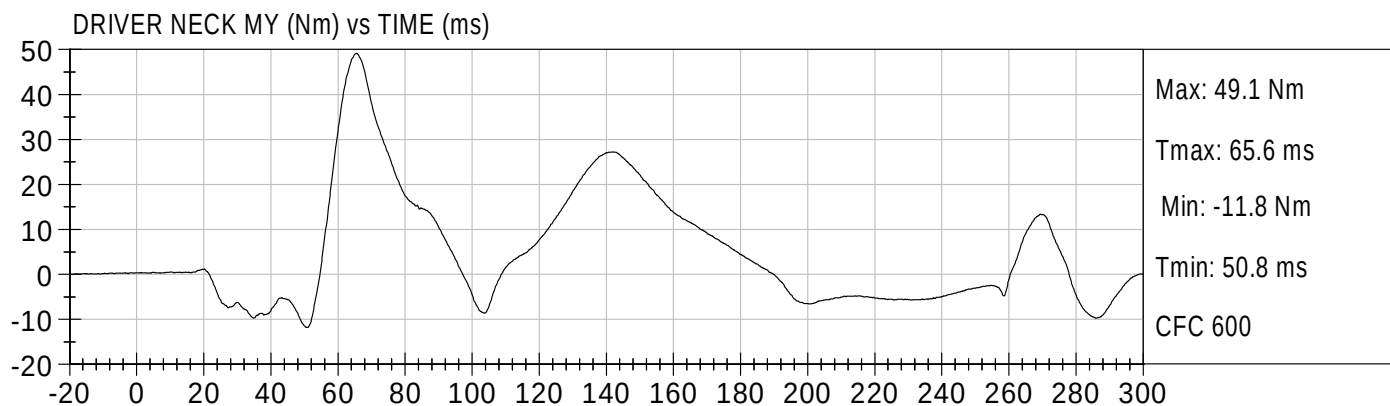
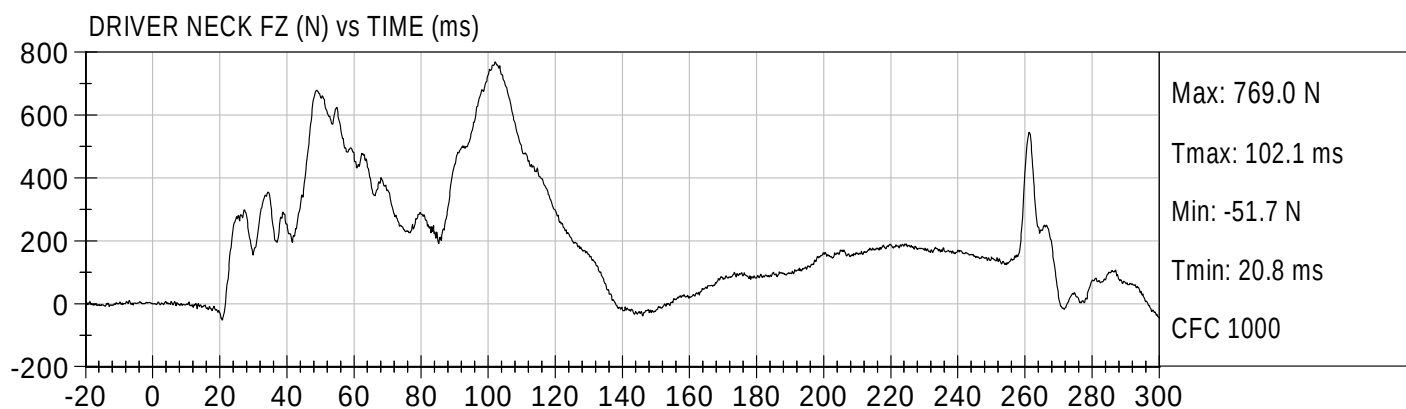
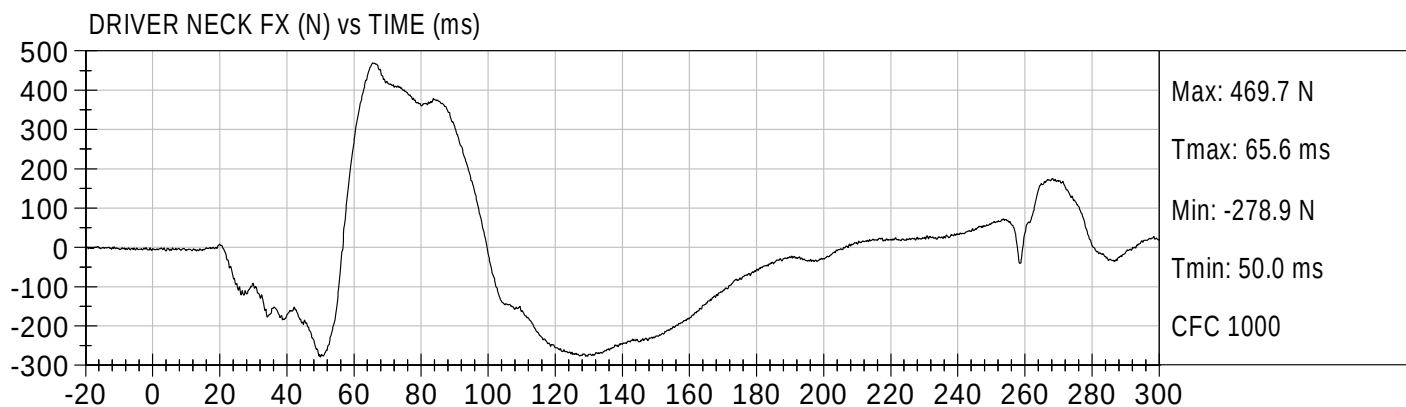
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
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

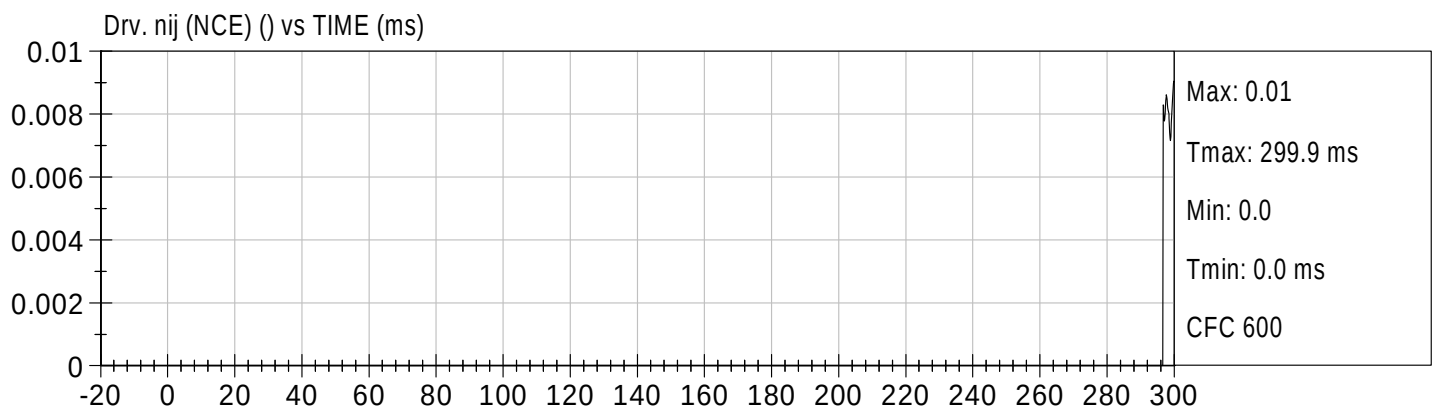
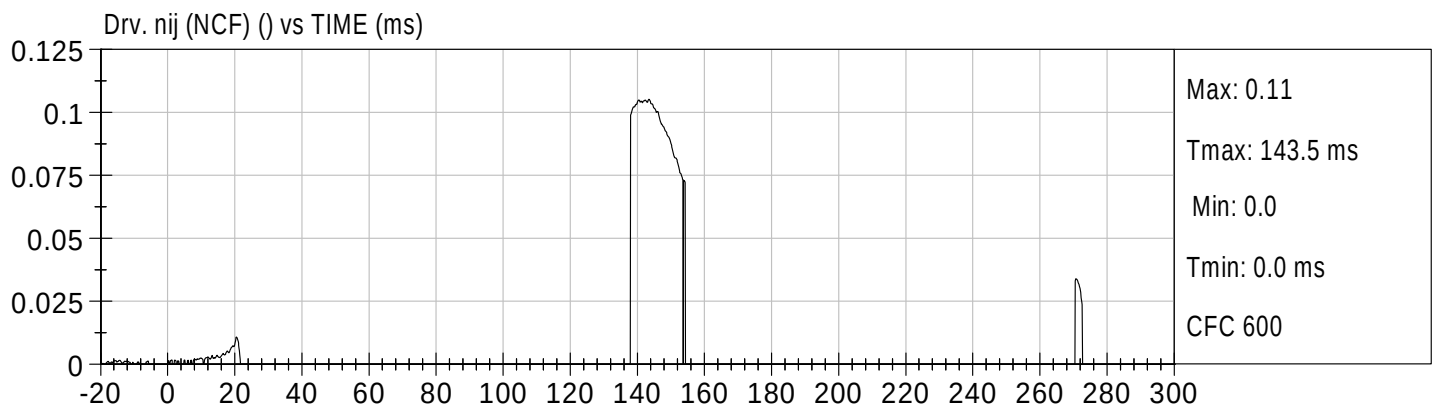
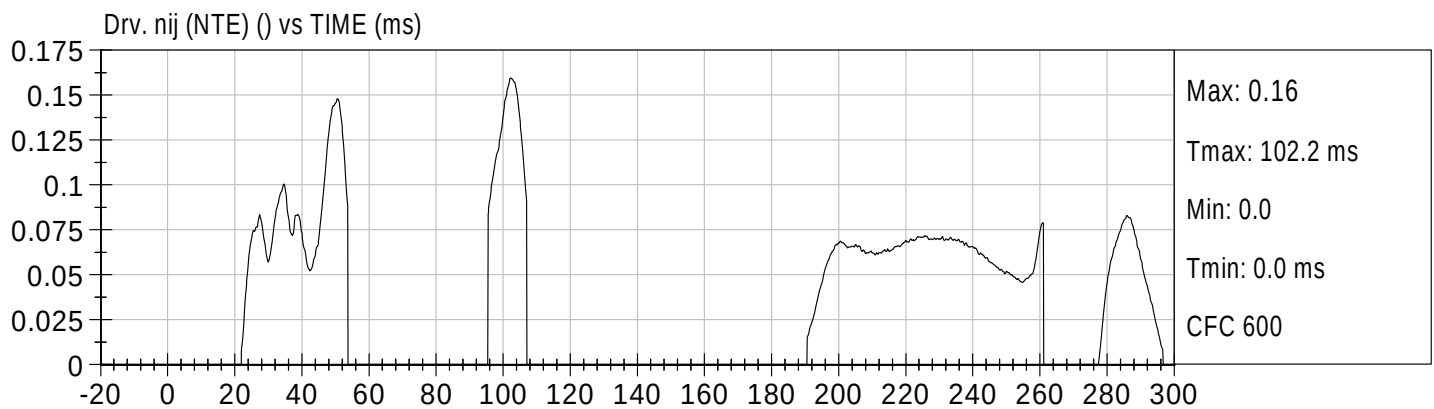
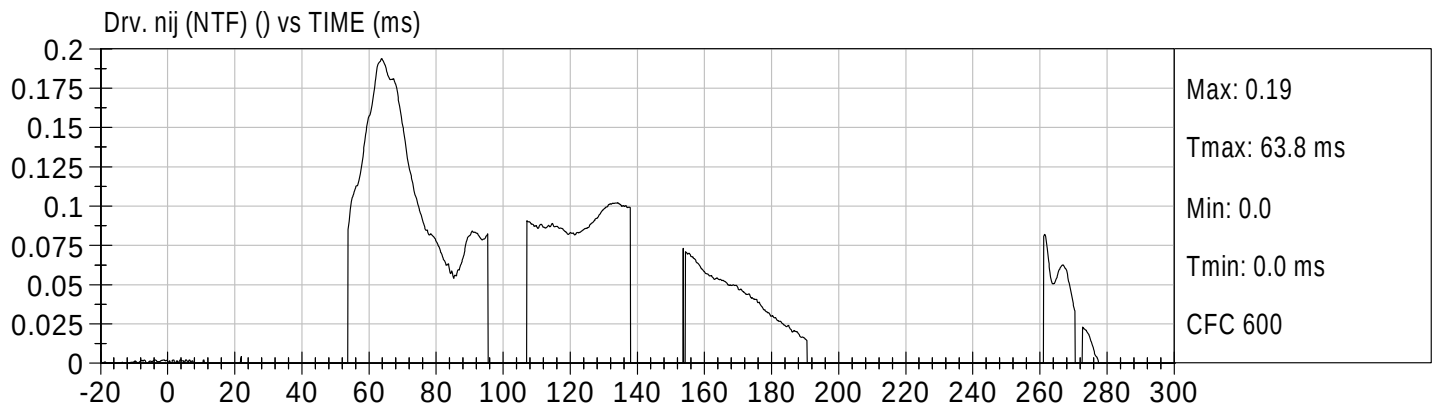
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger 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
Advanced Research Load Cell Barrier – 127 channels

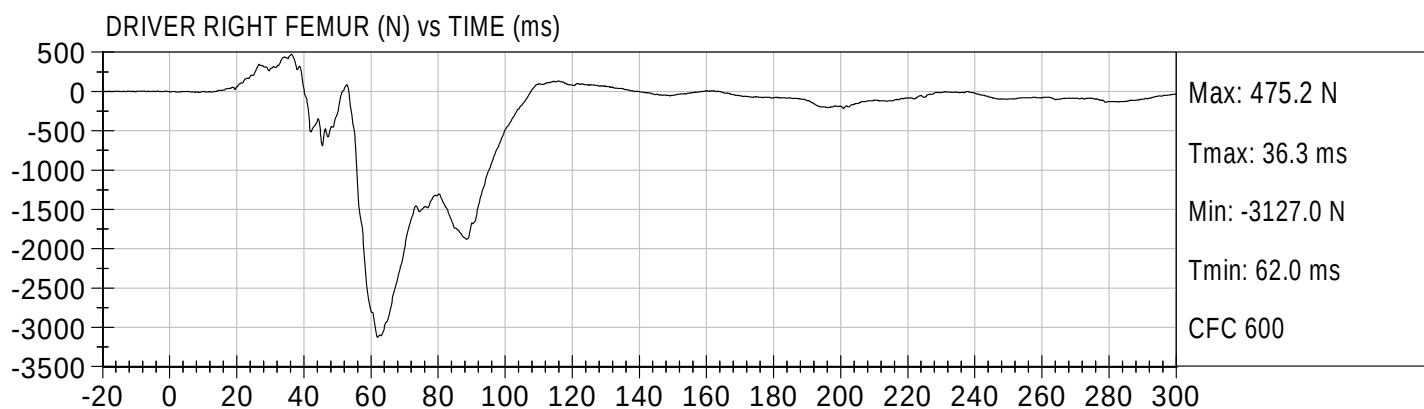
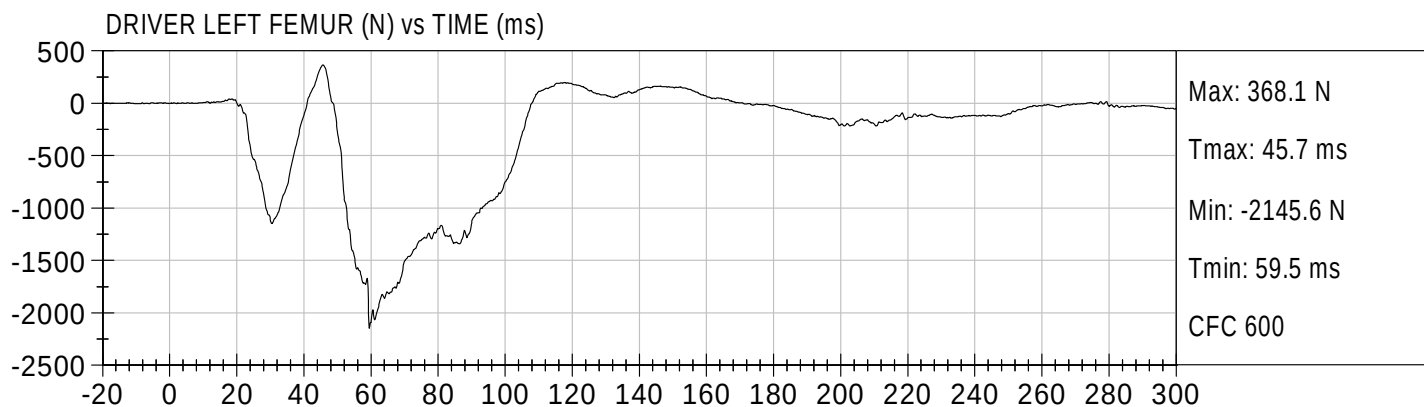






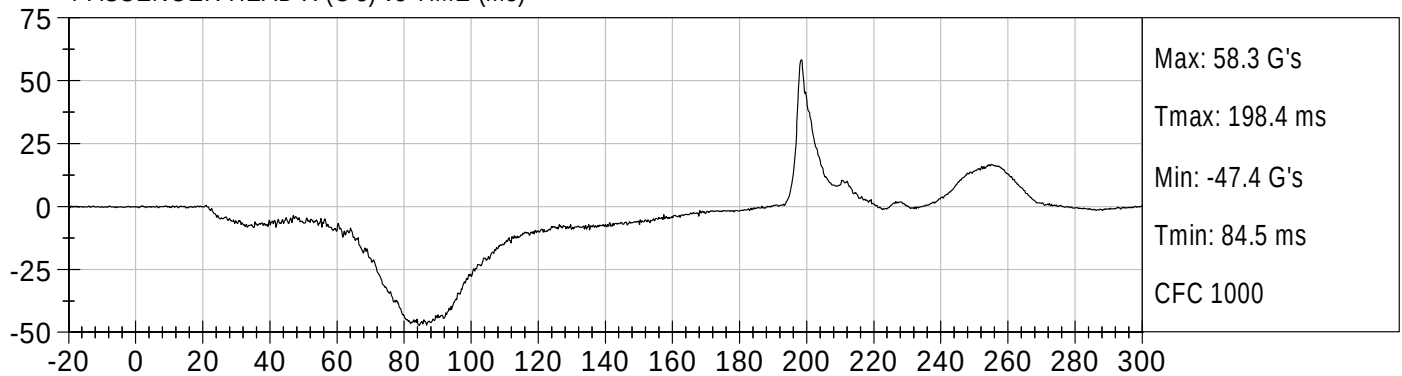




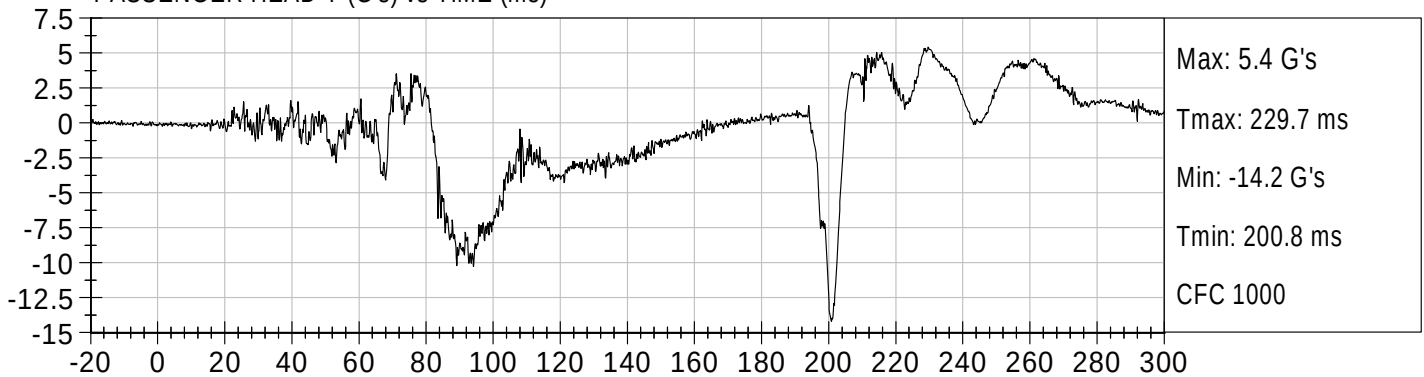




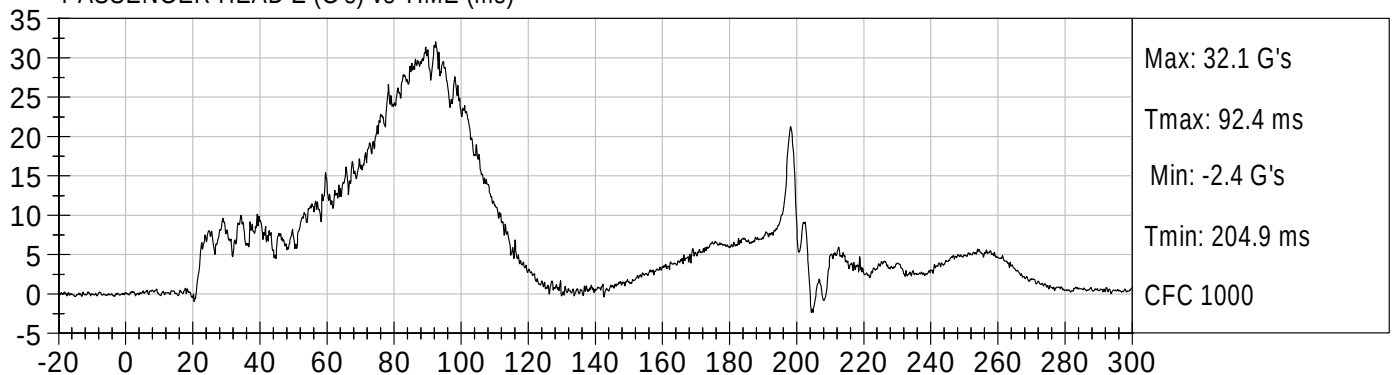
PASSENGER HEAD X (G's) vs TIME (ms)



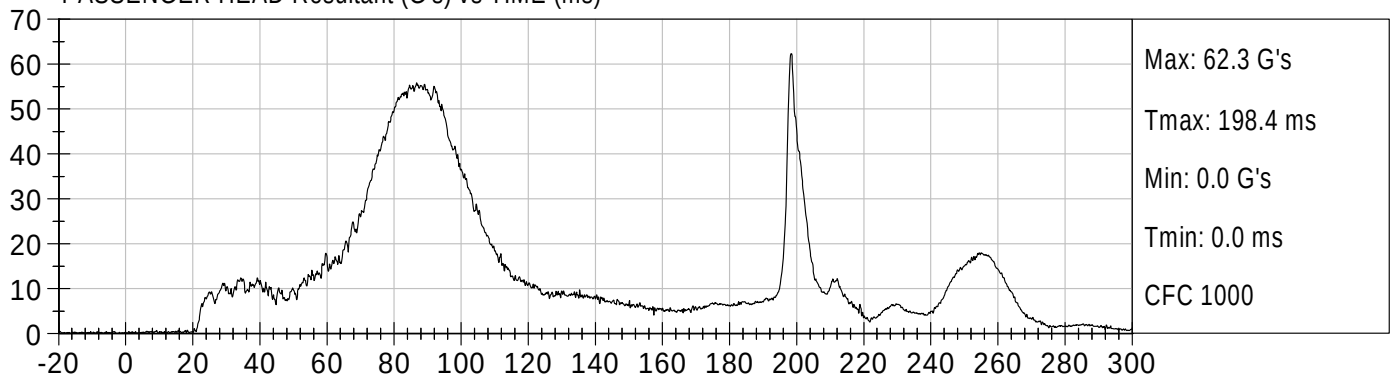
PASSENGER HEAD Y (G's) vs TIME (ms)

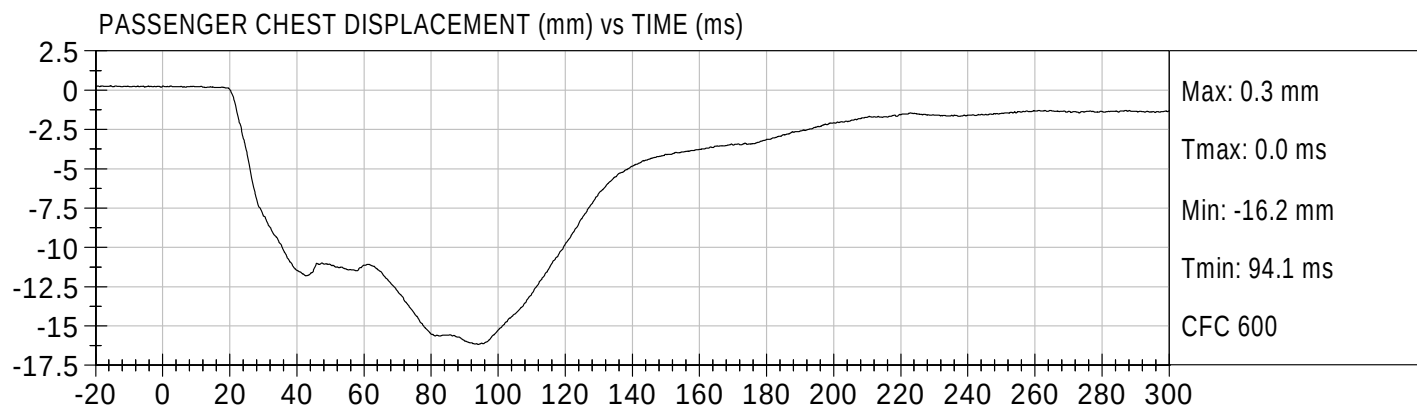


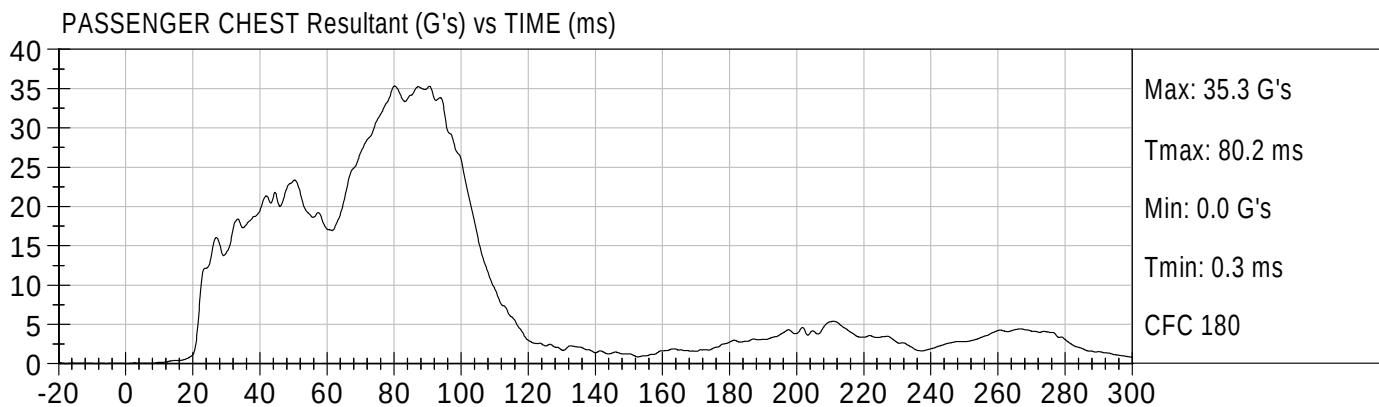
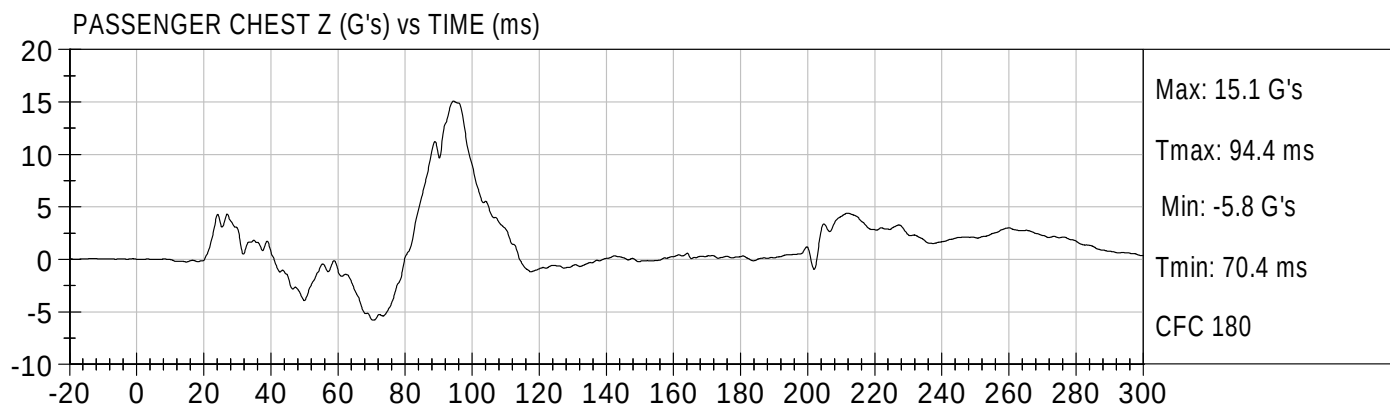
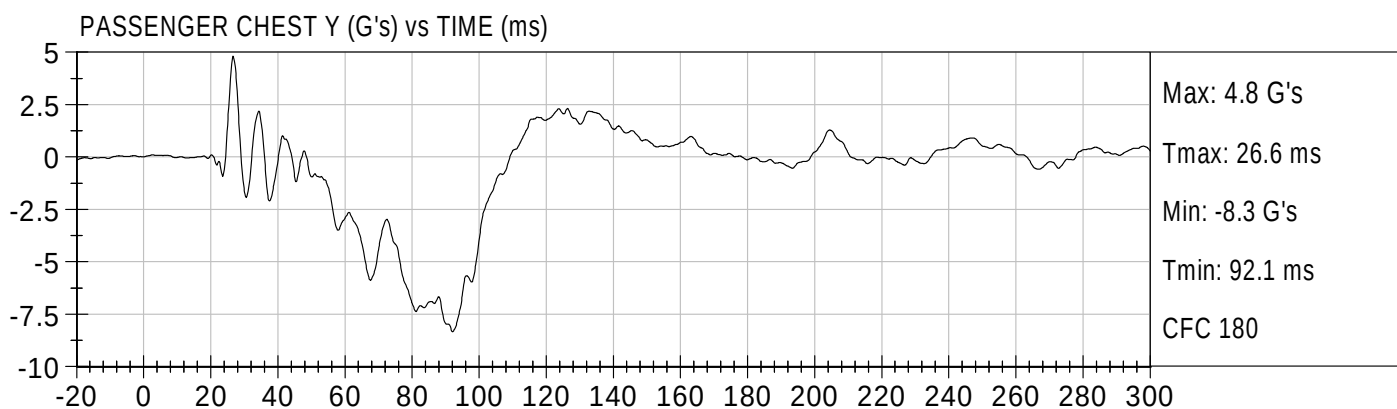
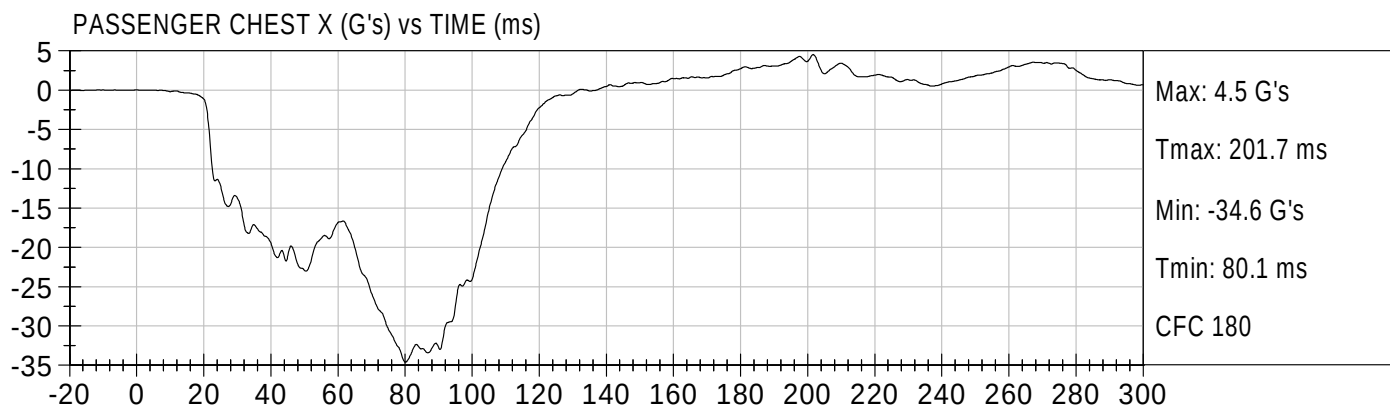
PASSENGER HEAD Z (G's) vs TIME (ms)

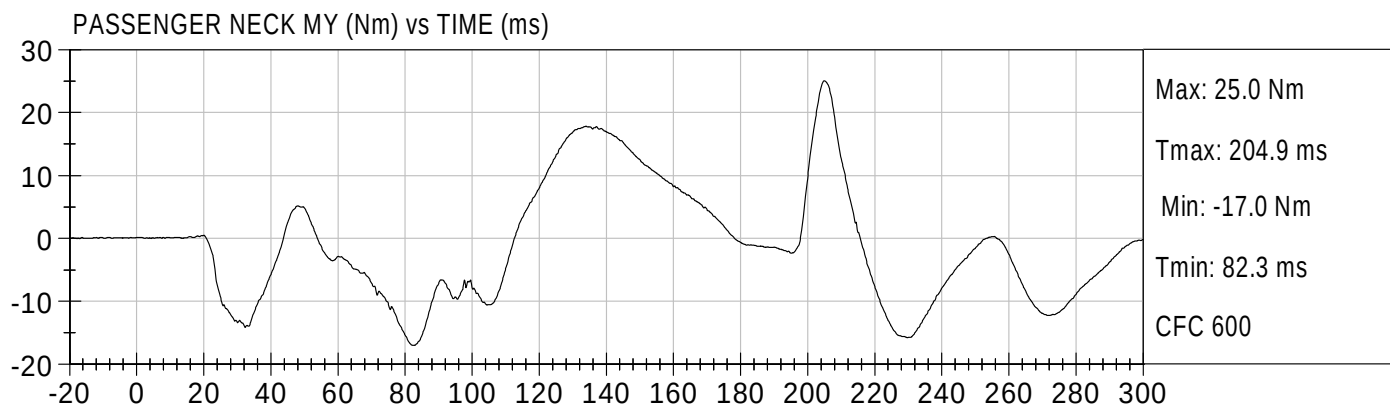
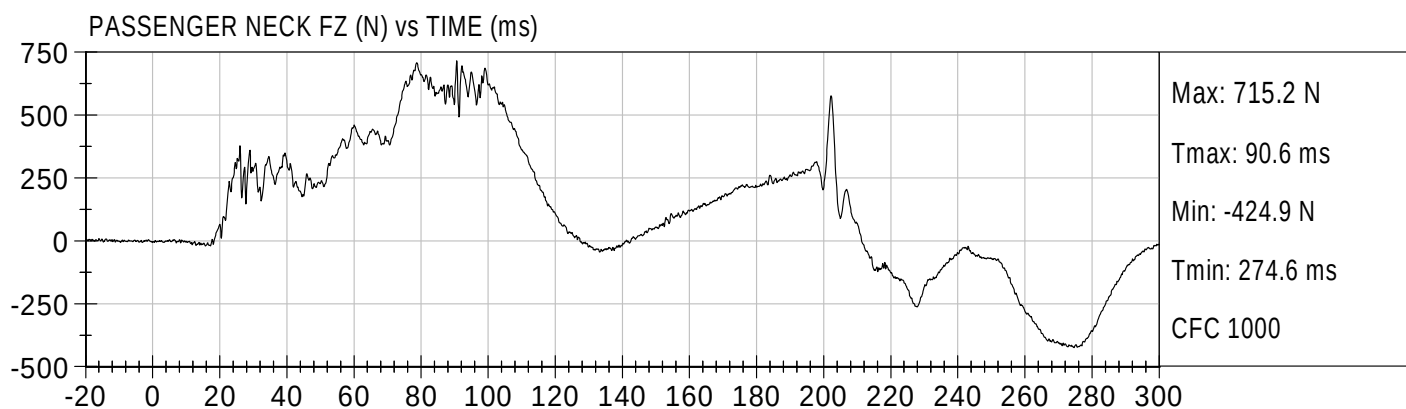
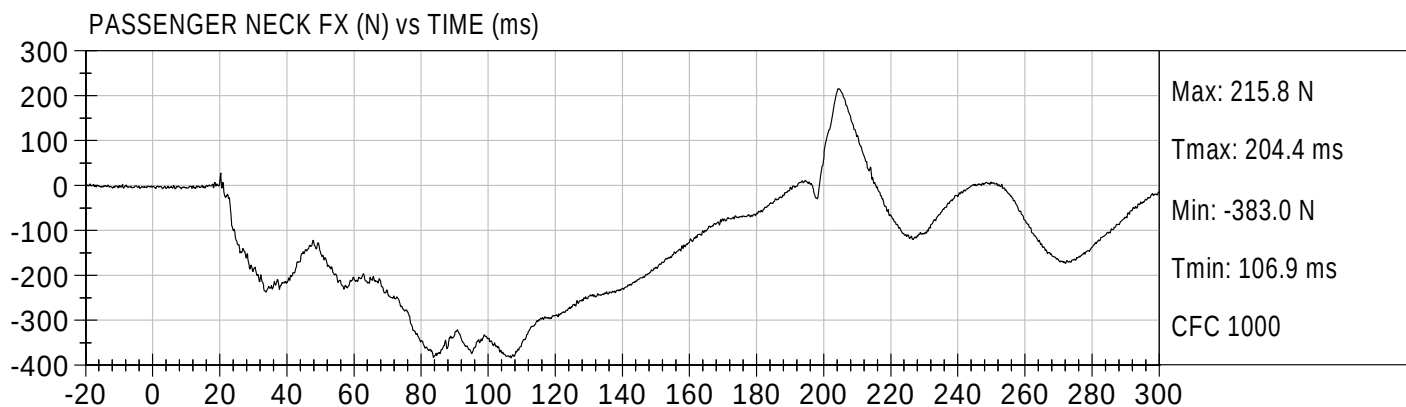


PASSENGER HEAD Resultant (G's) vs TIME (ms)



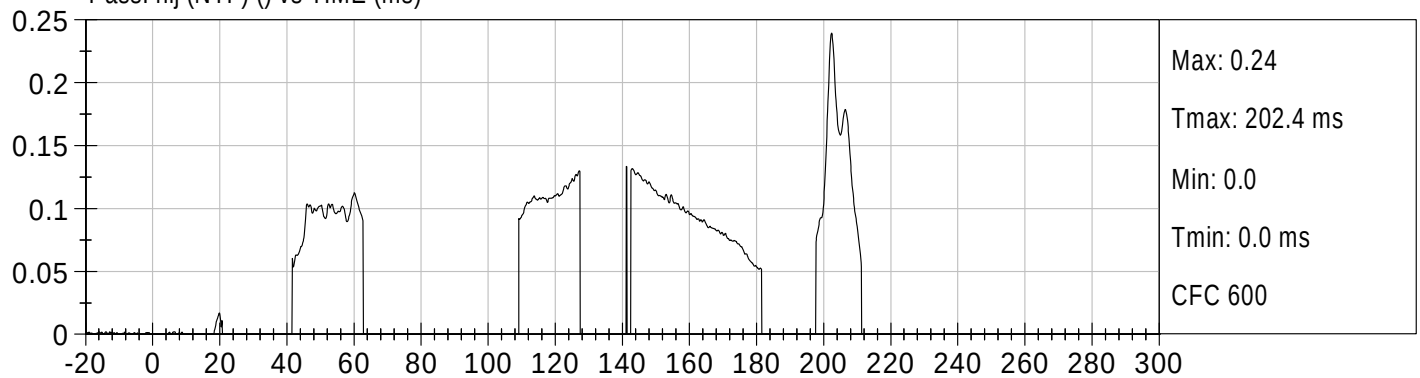




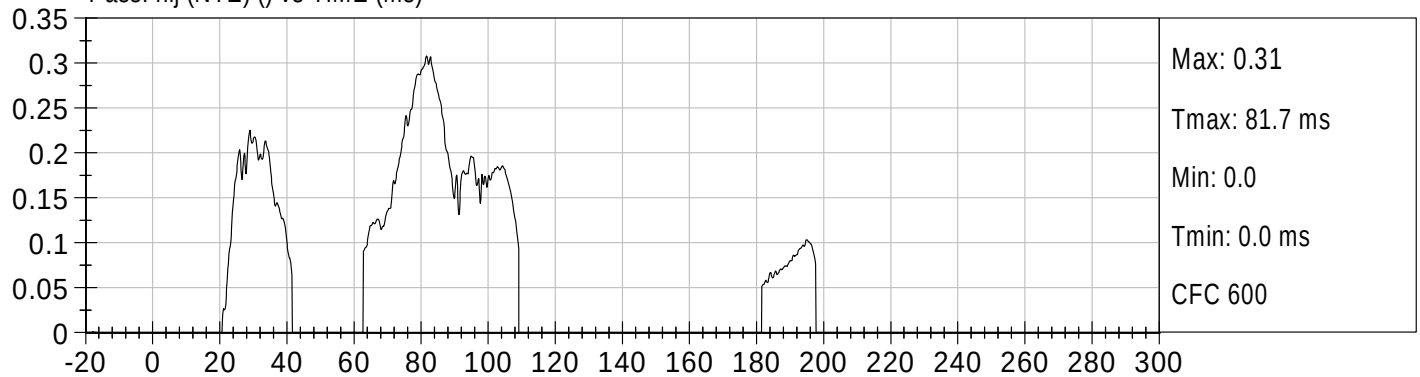




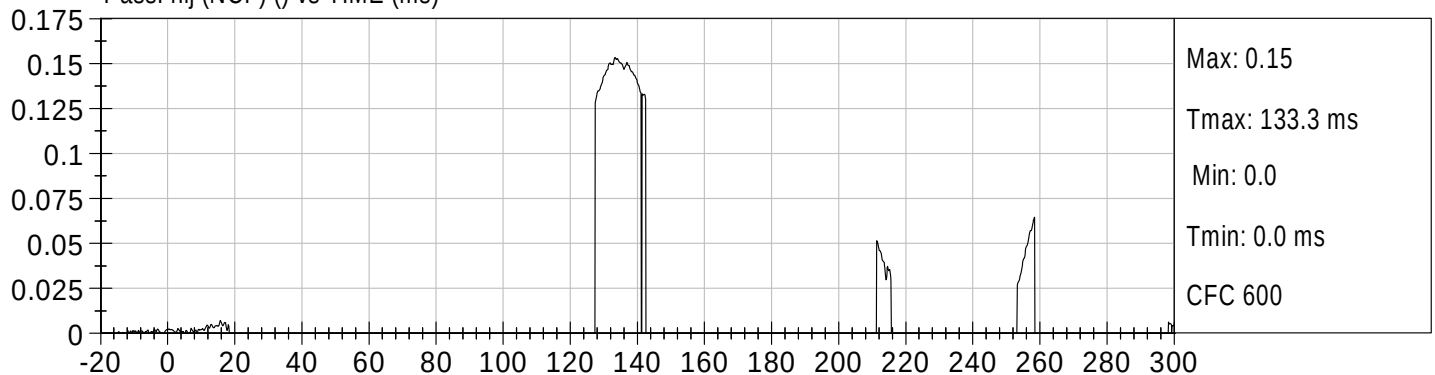
Pass. nij (NTF) () vs TIME (ms)



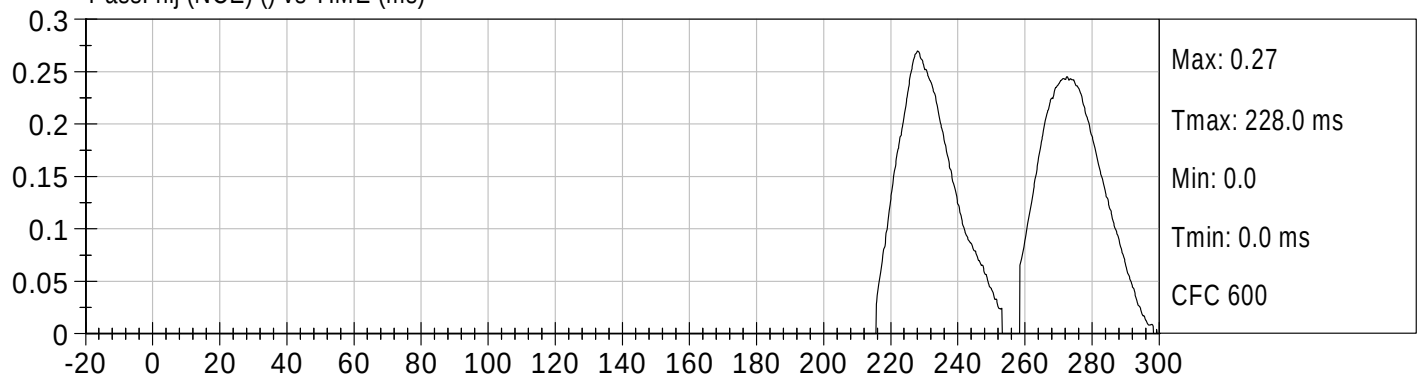
Pass. nij (NTE) () vs TIME (ms)

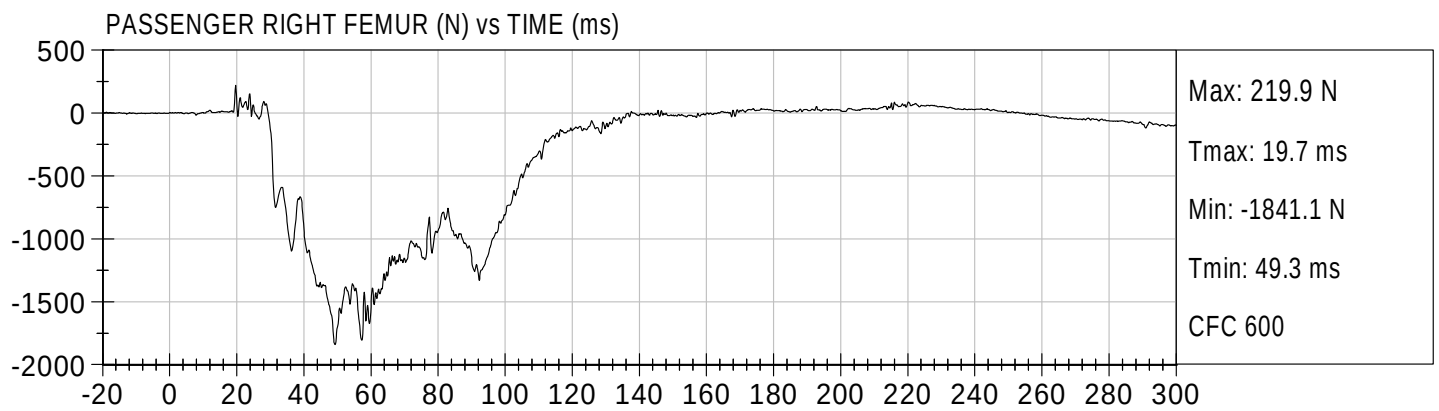
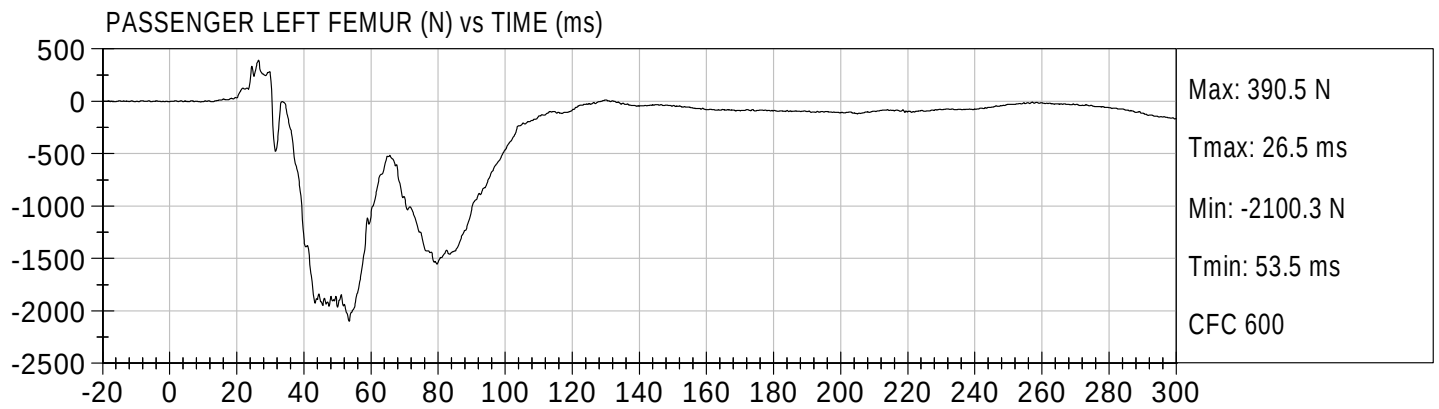


Pass. nij (NCF) () vs TIME (ms)



Pass. nij (NCE) () 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: D103071

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Peak Resultant Acceleration	G's	225 - 275	264	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

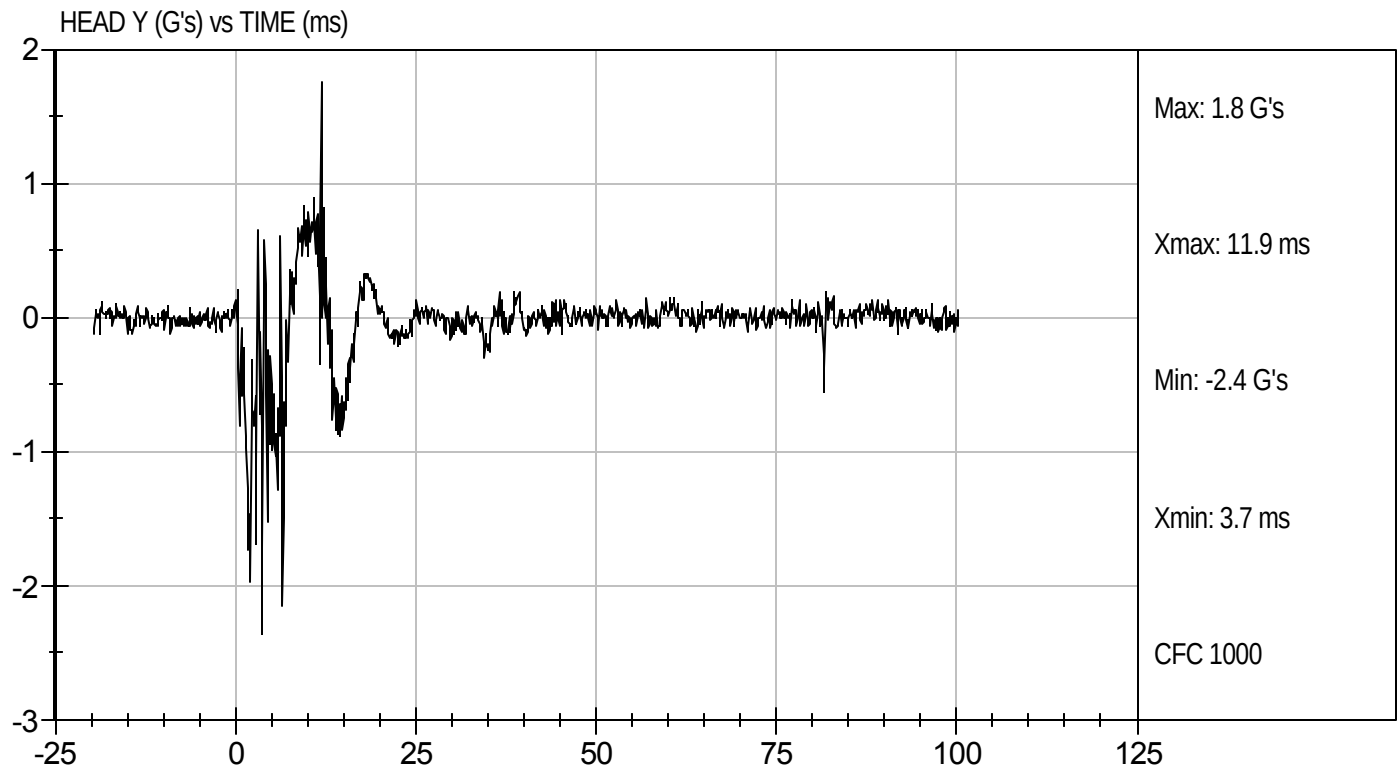
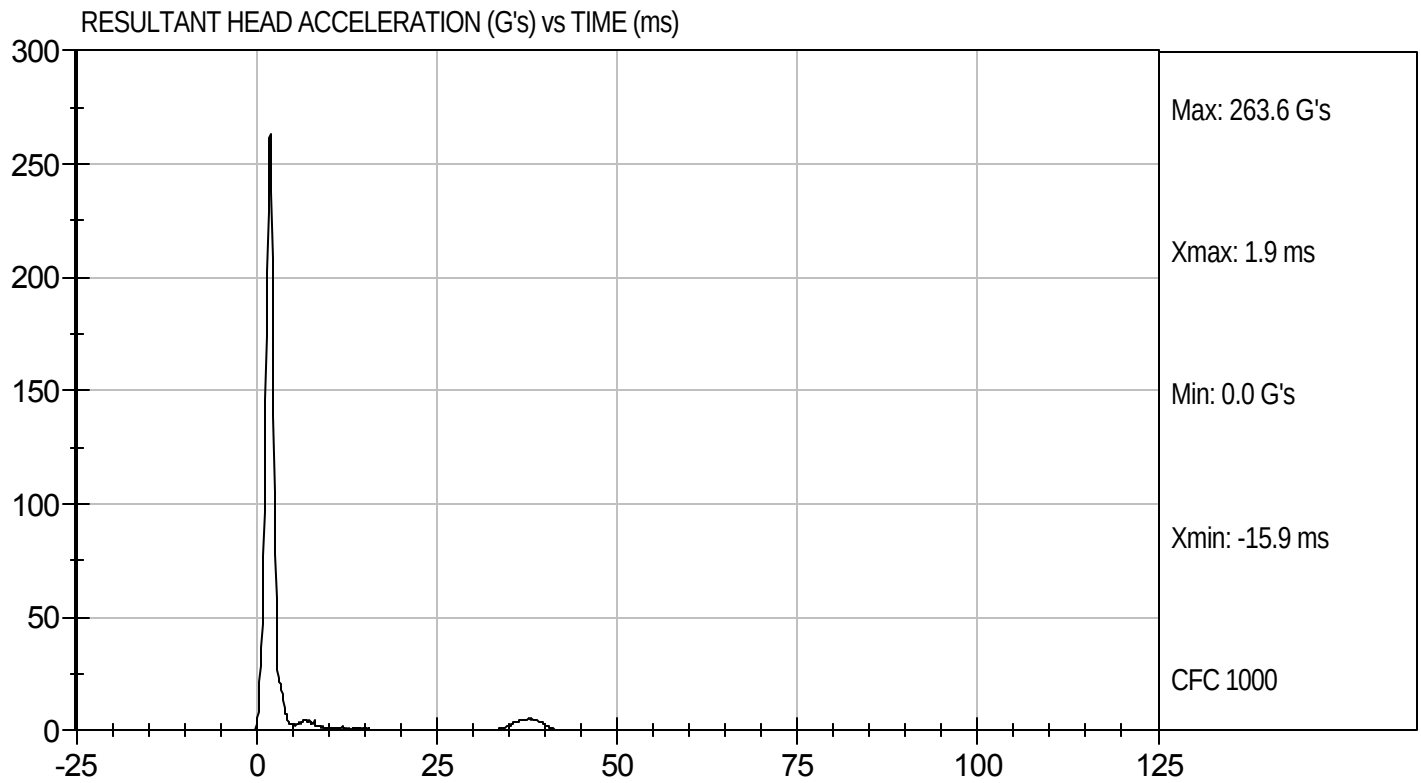
9/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D103071

Test Date: 9/16/10
Velocity: 0 ft/s, 0.00 m/s

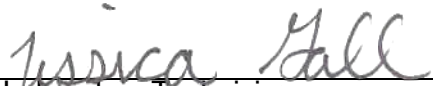


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D103072

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	52	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	25.52	Pass
	20 ms	G's	17.60 to 22.60	18.98	Pass
	30 ms	G's	12.50 to 18.50	14.54	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.67	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	66.7	Pass
	Time	ms	57.0 to 64.0	57.5	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	94.4	Pass
	Time	ms	47.0 to 58.0	49.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.3	Pass
Overall Test Results					Pass


 Laboratory Technician

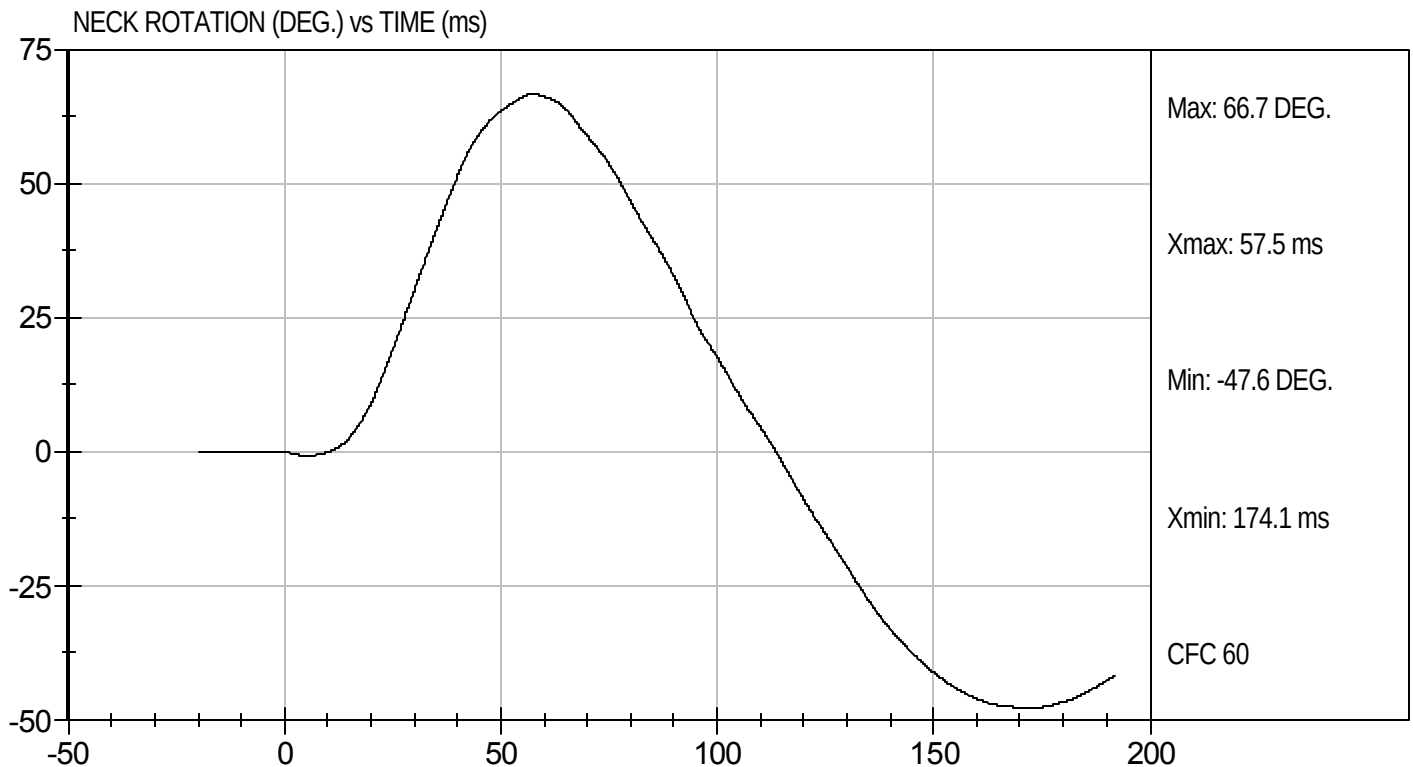
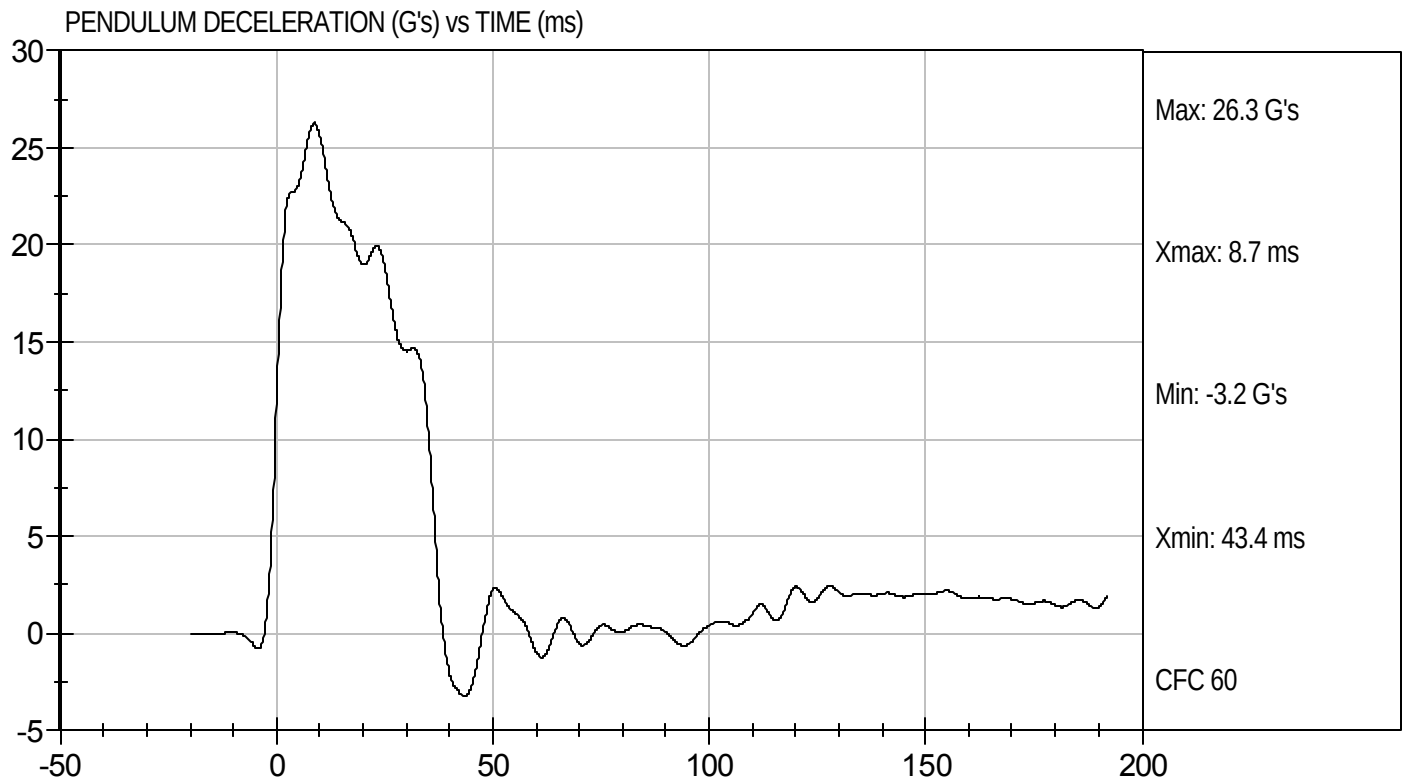
9/16/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D103072

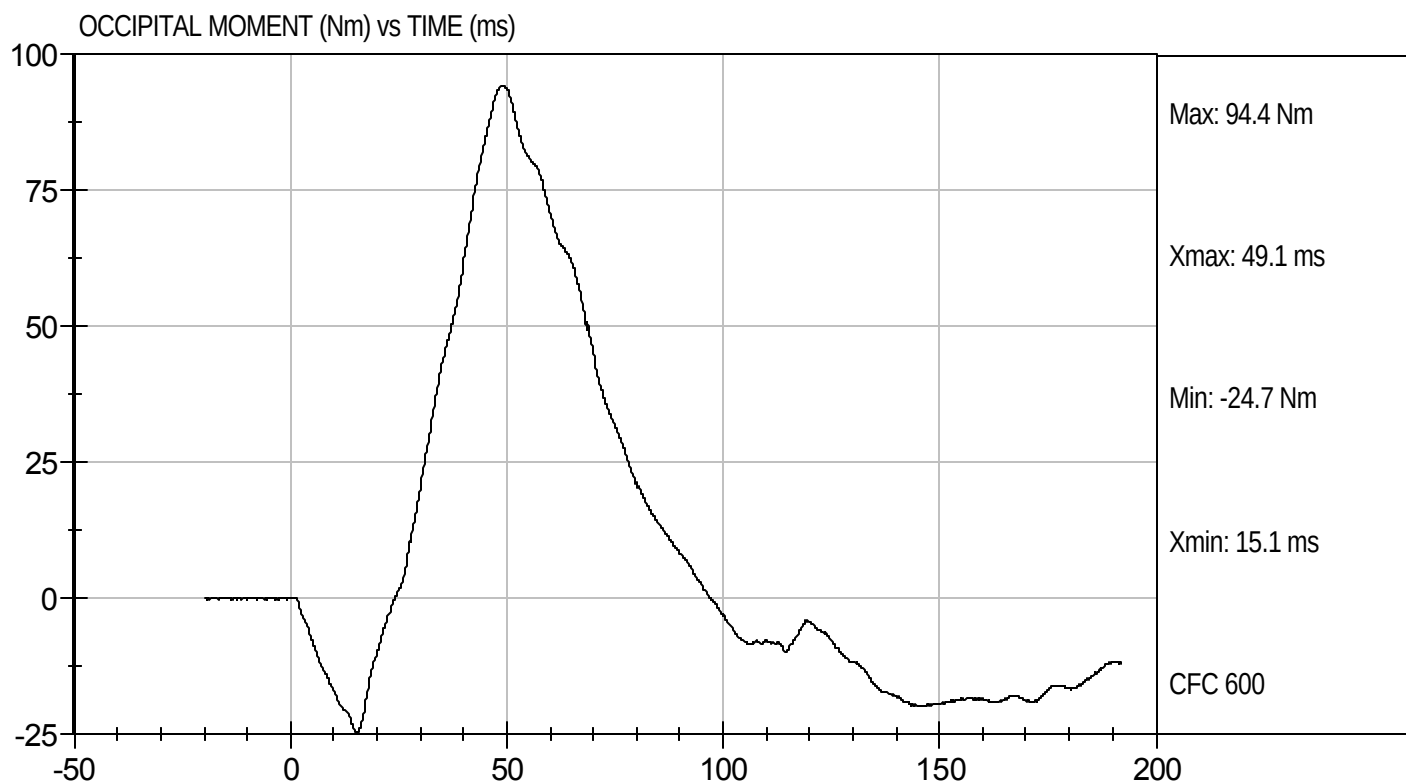
Test Date: 9/16/10
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D103072

Test Date: 9/16/10
Velocity: 23.15 ft/s, 7.06 m/s

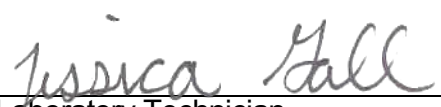


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D.: D103073

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	52	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.60	Pass
	20 ms	G's	14.00 to 19.00	16.37	Pass
	30 ms	G's	11.00 to 16.00	13.40	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.25	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	96.7	Pass
	Time	ms	72.0 to 82.0	74.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	154.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-64.1	Pass
	Time	ms	65.0 to 79.0	69.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	141.5	Pass
Overall Test Results					Pass


 Laboratory Technician

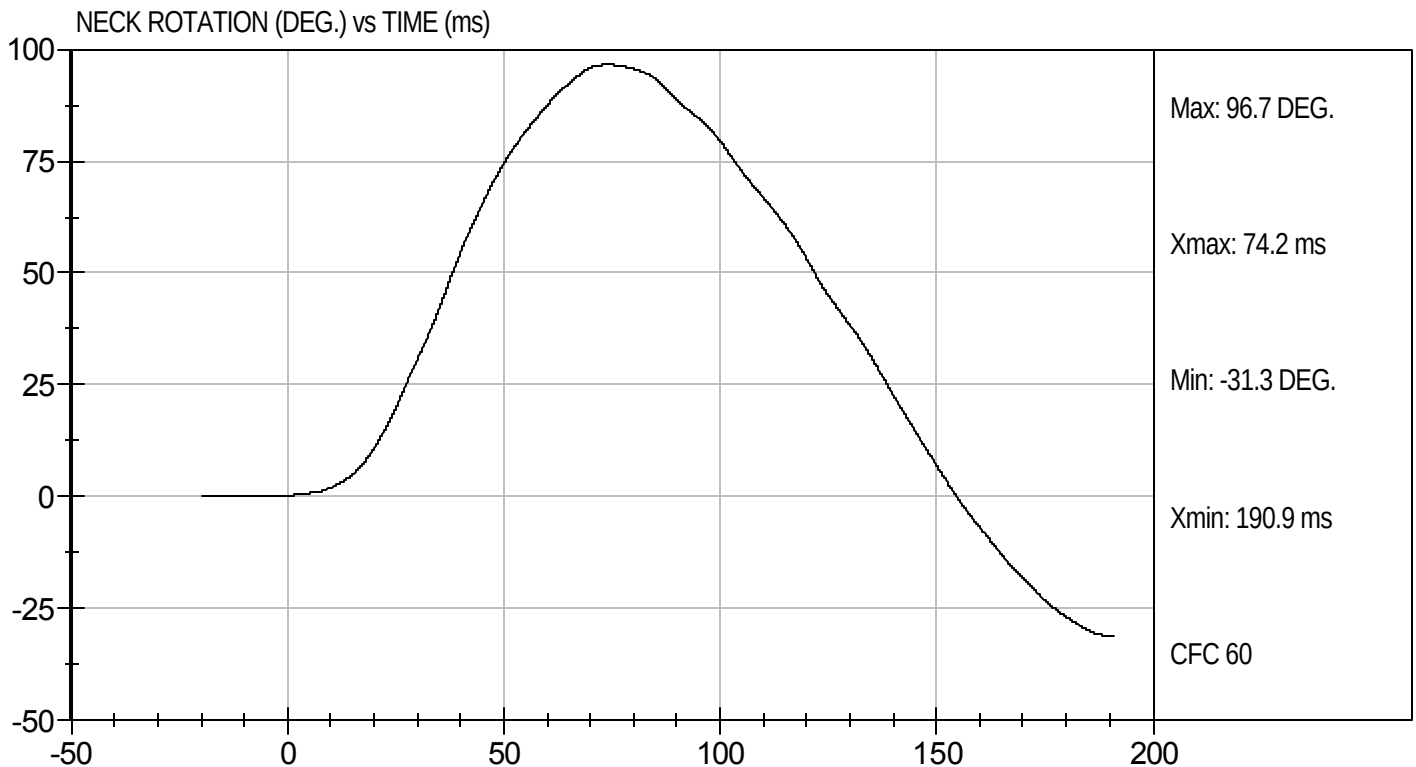
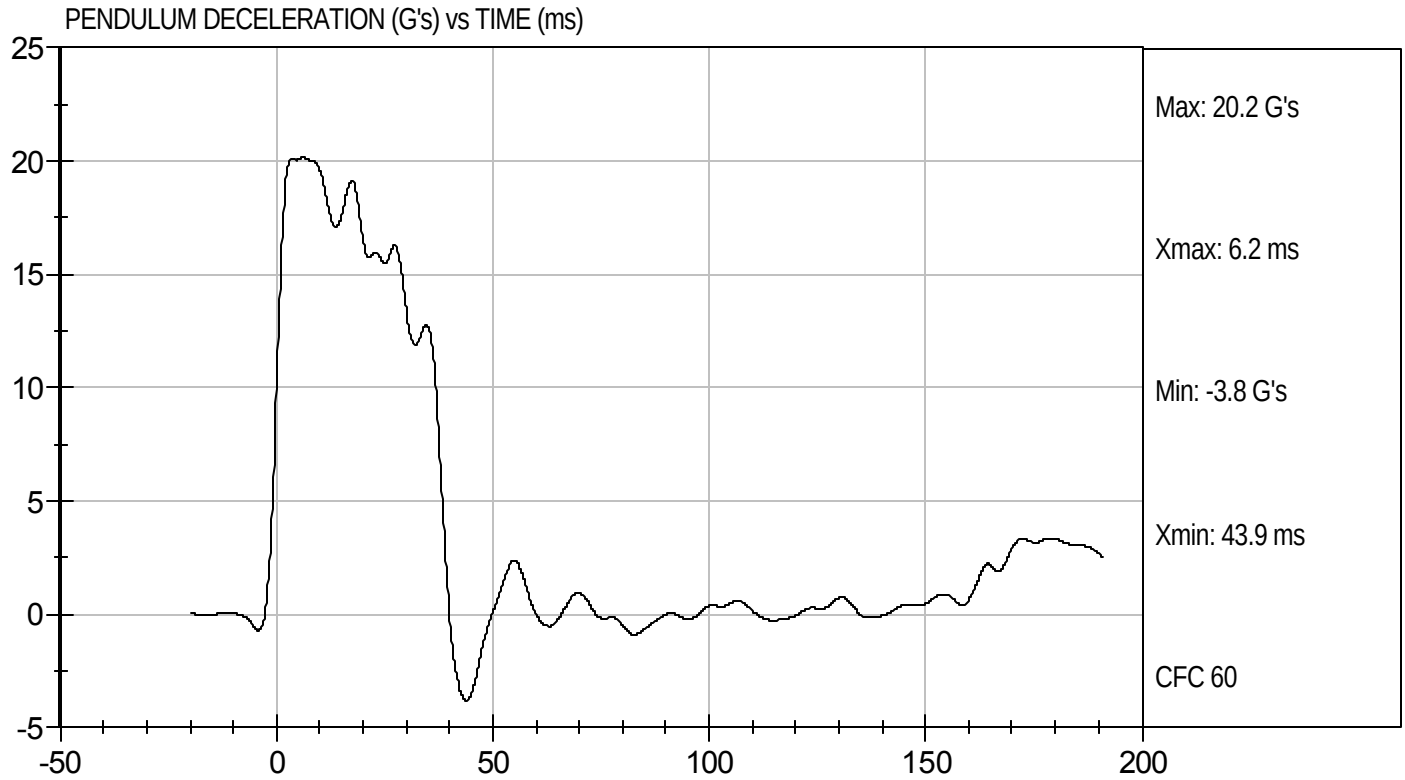
9/16/10
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D103073

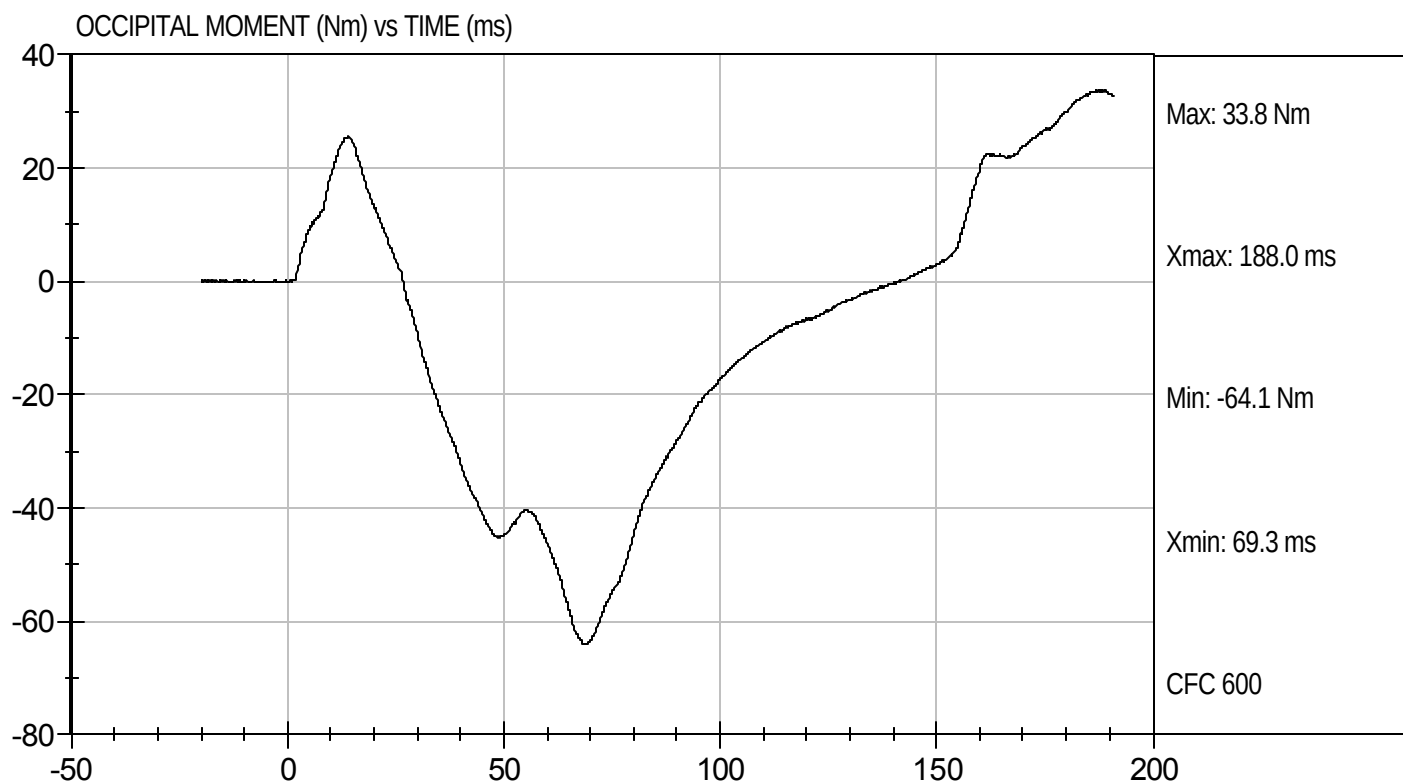
Test Date: 9/16/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D103073

Test Date: 9/16/10
Velocity: 20.08 ft/s, 6.12 m/s

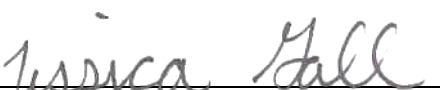


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D103074

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	49	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,370	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.38	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

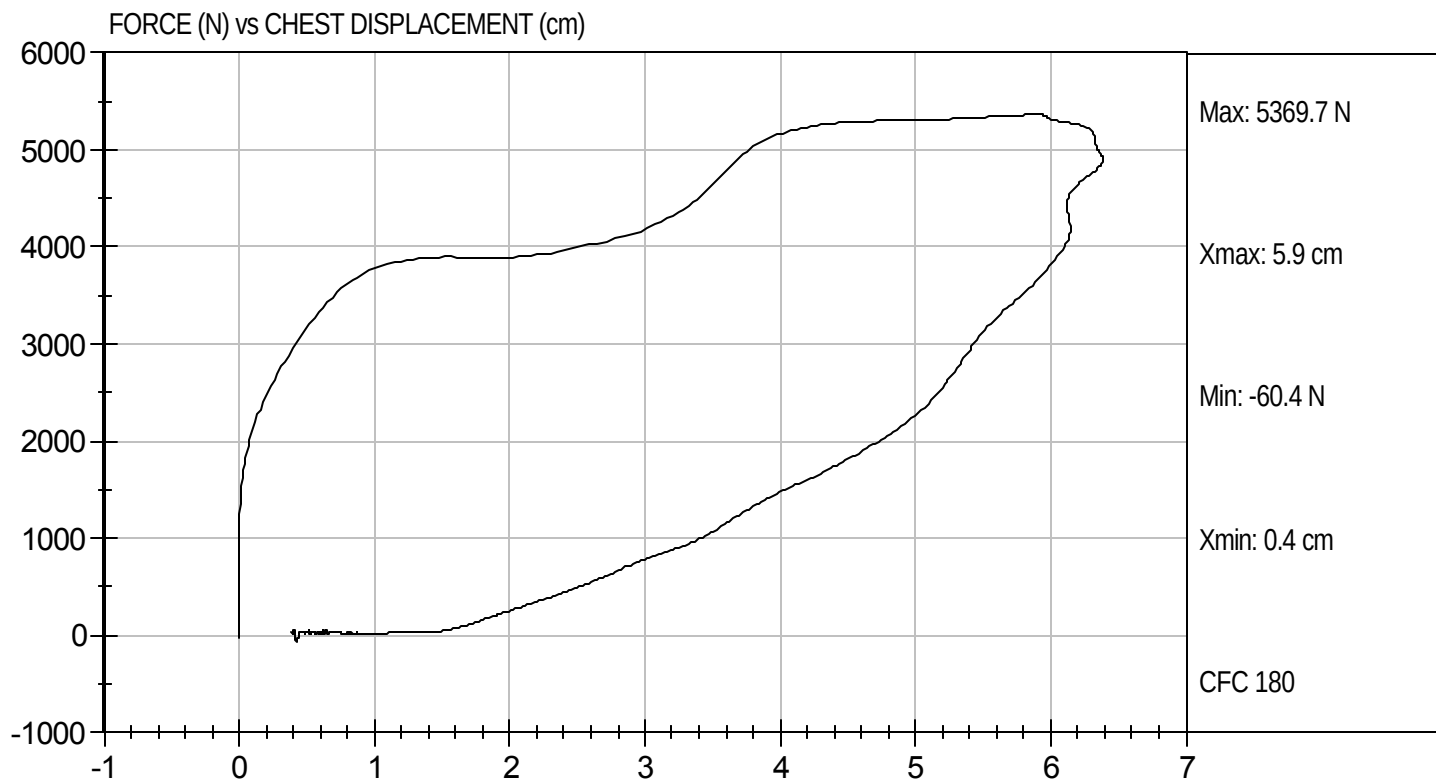
9/17/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D103074

Test Date: 9/17/10
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: D103075

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	49	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,157	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

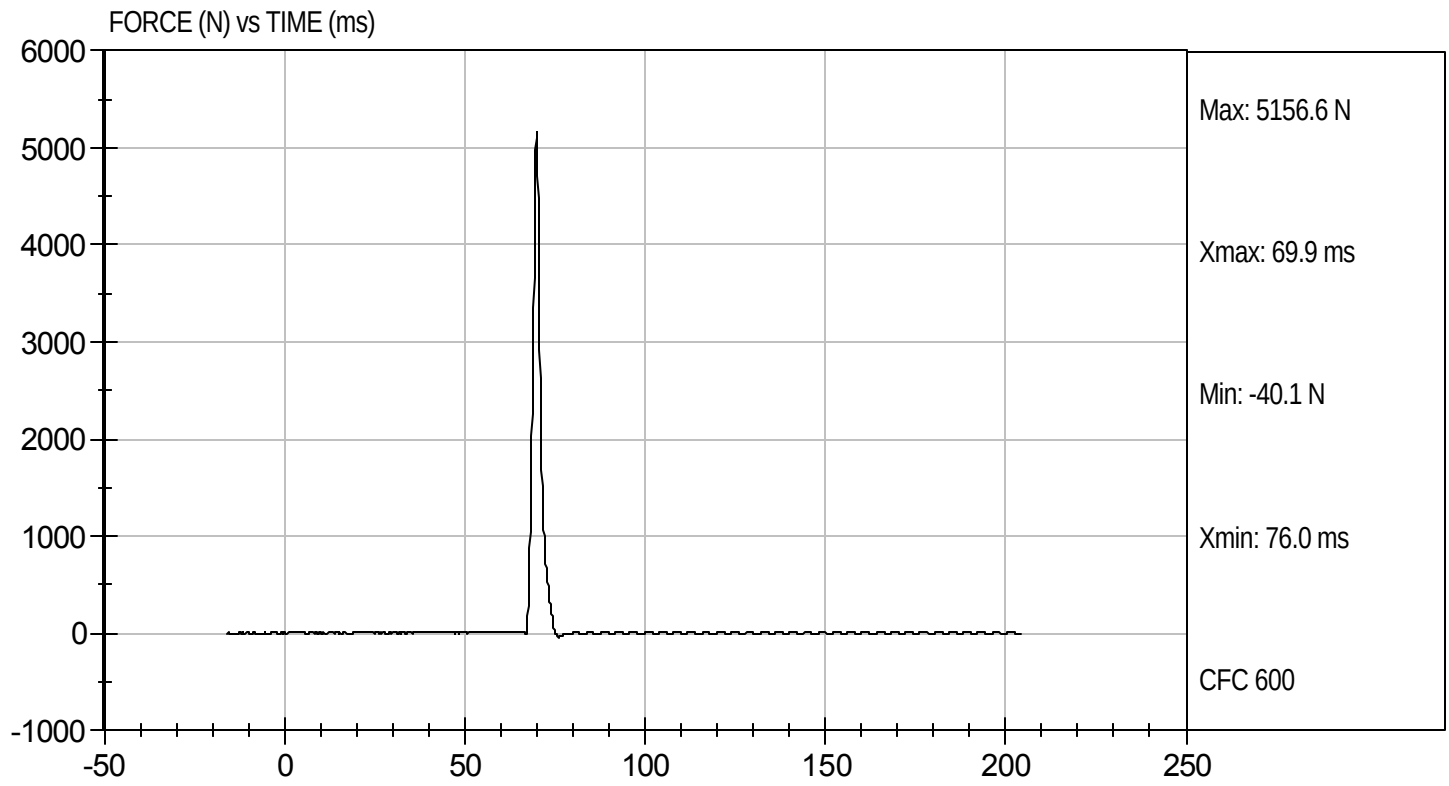
9/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D103075

Test Date: 9/16/10
Velocity: 6.80 ft/s, 2.07 m/s



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

ATD Serial No: 351

Test I.D: D103076

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	49	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,182	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

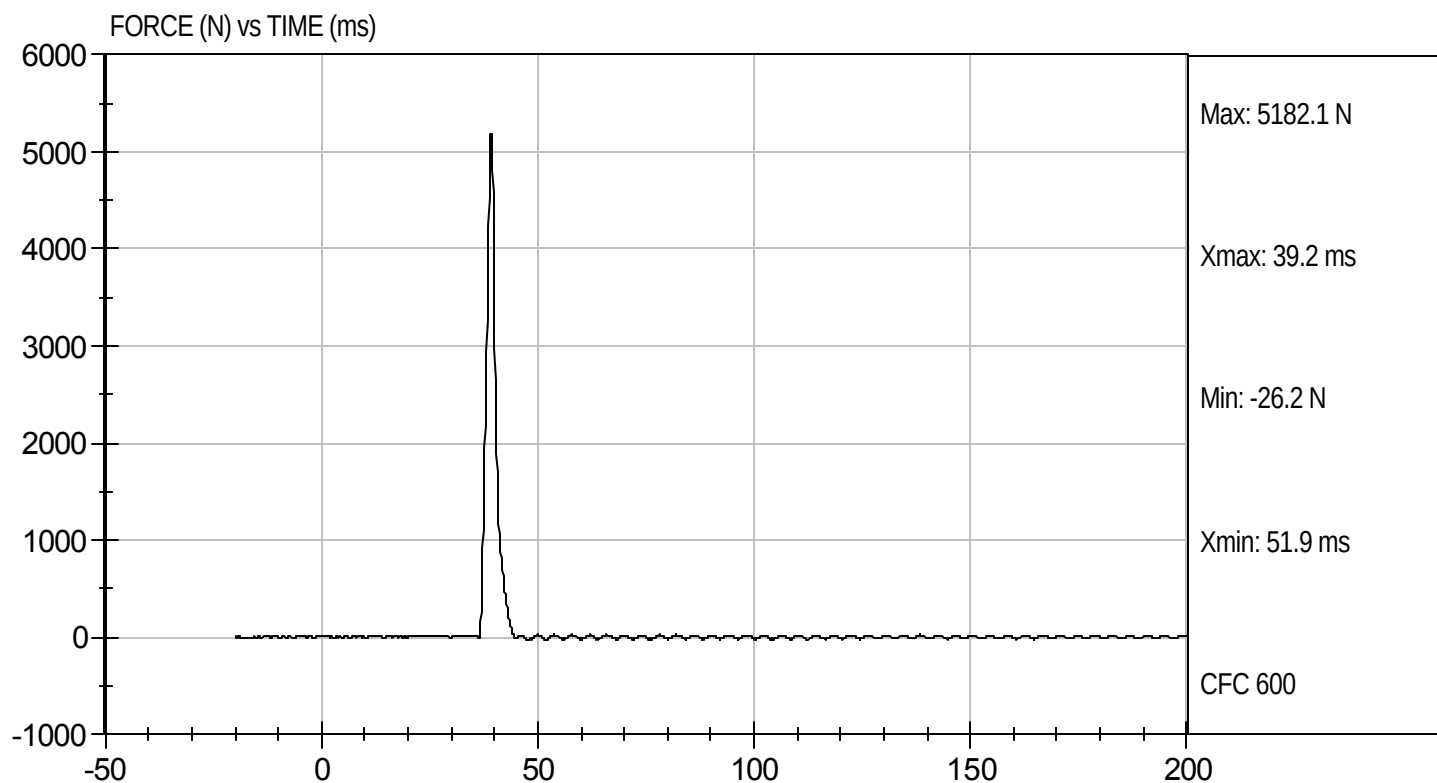
9/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D103076

Test Date: 9/16/10
Velocity: 6.83 ft/s, 2.08 m/s



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

ATD Serial No: 351

Test I.D: D103070

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.8	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	50	50	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	55.6	44.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	47	48	Pass
Overall Test Results					Pass

Jessica Galt
Laboratory Technician

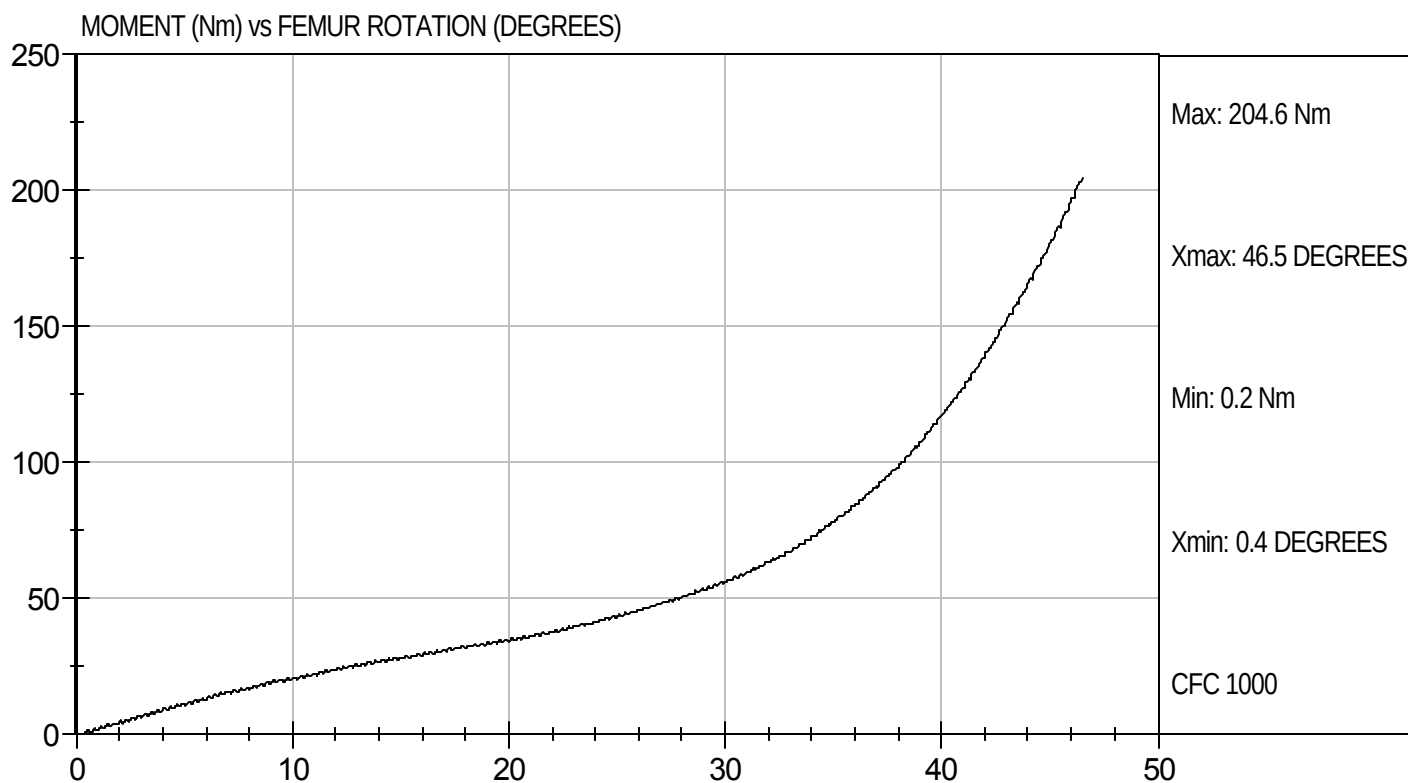
9/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D103079

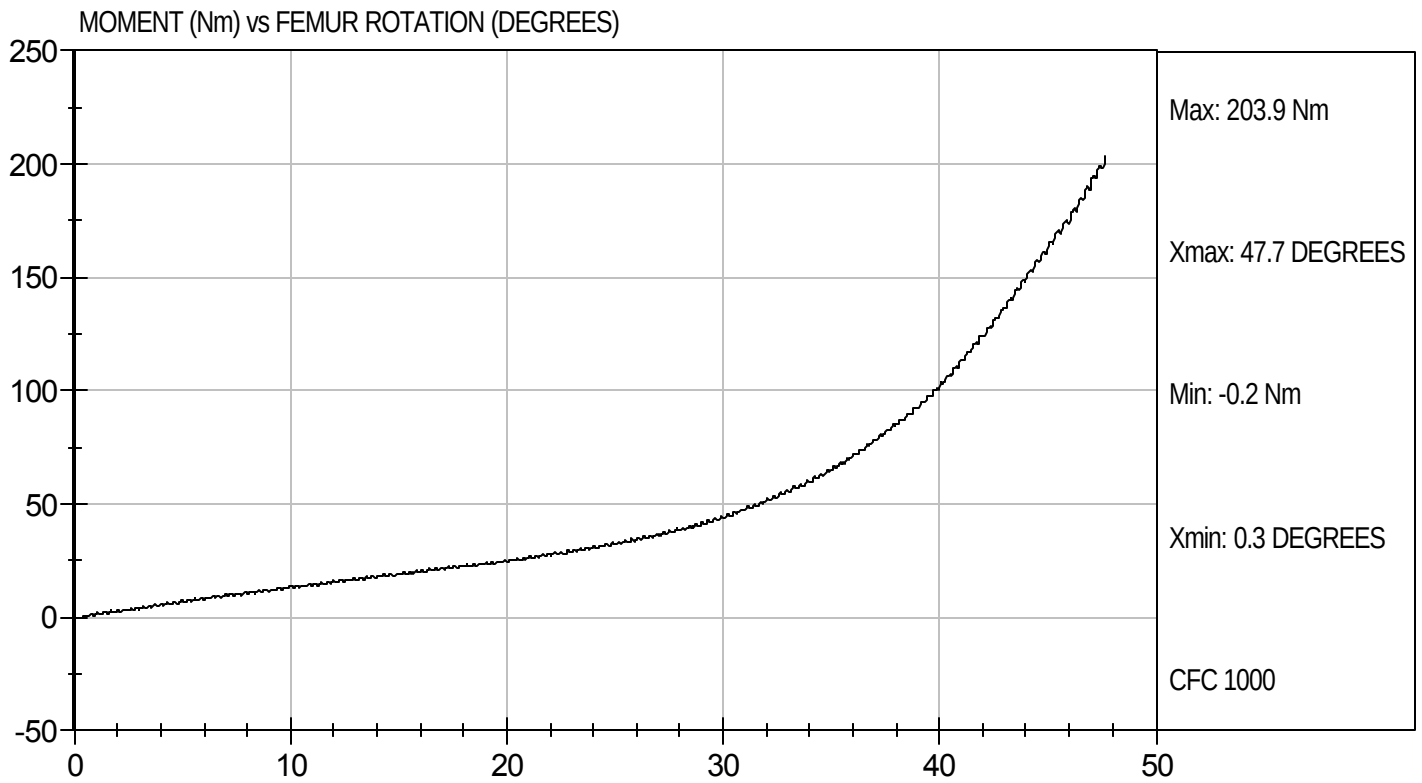
Test Date: 9/16/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D103070

Test Date: 9/16/10
Velocity: 0 ft/s, 0.00 m/s

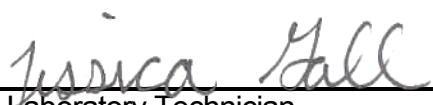


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test ID: D103131

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	225 - 275	259	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass



Laboratory Technician

9/20/10
Test Date

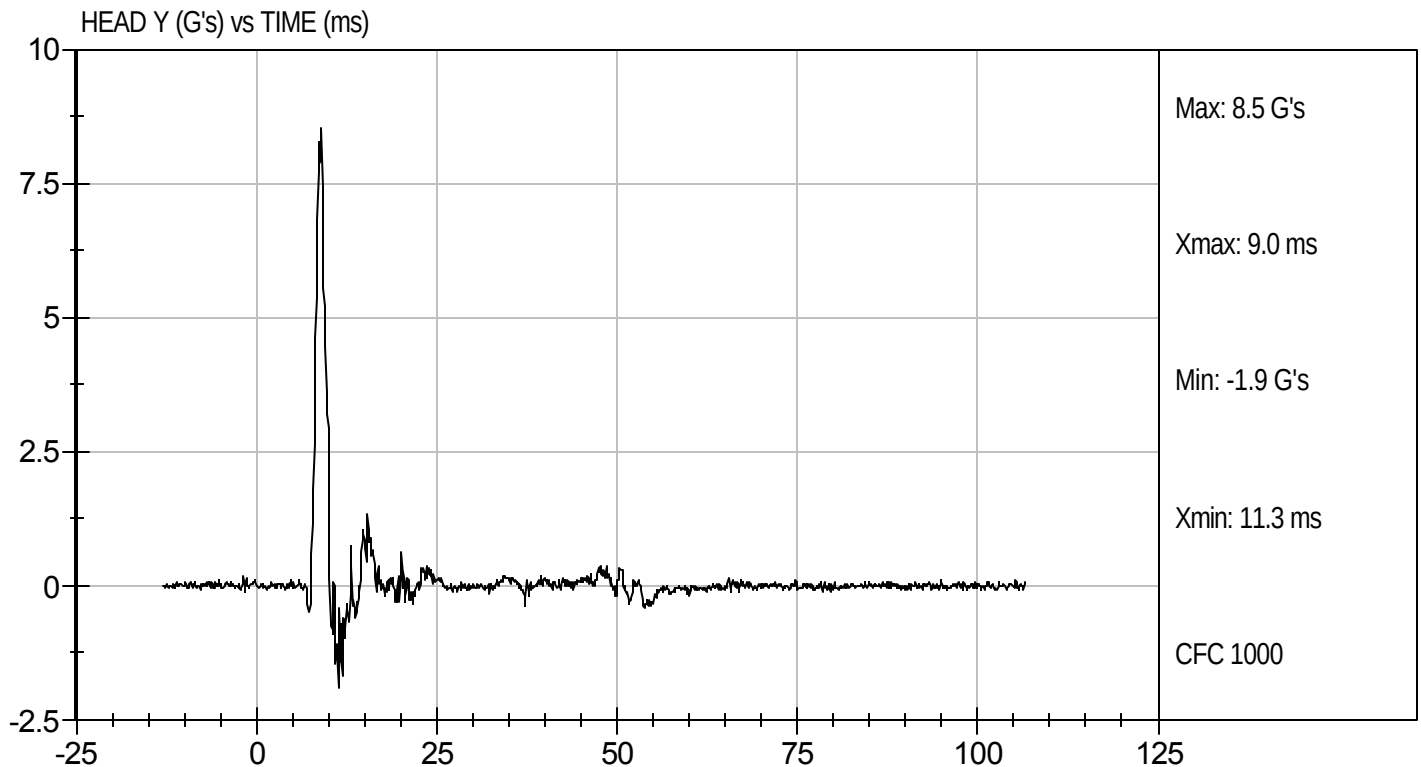
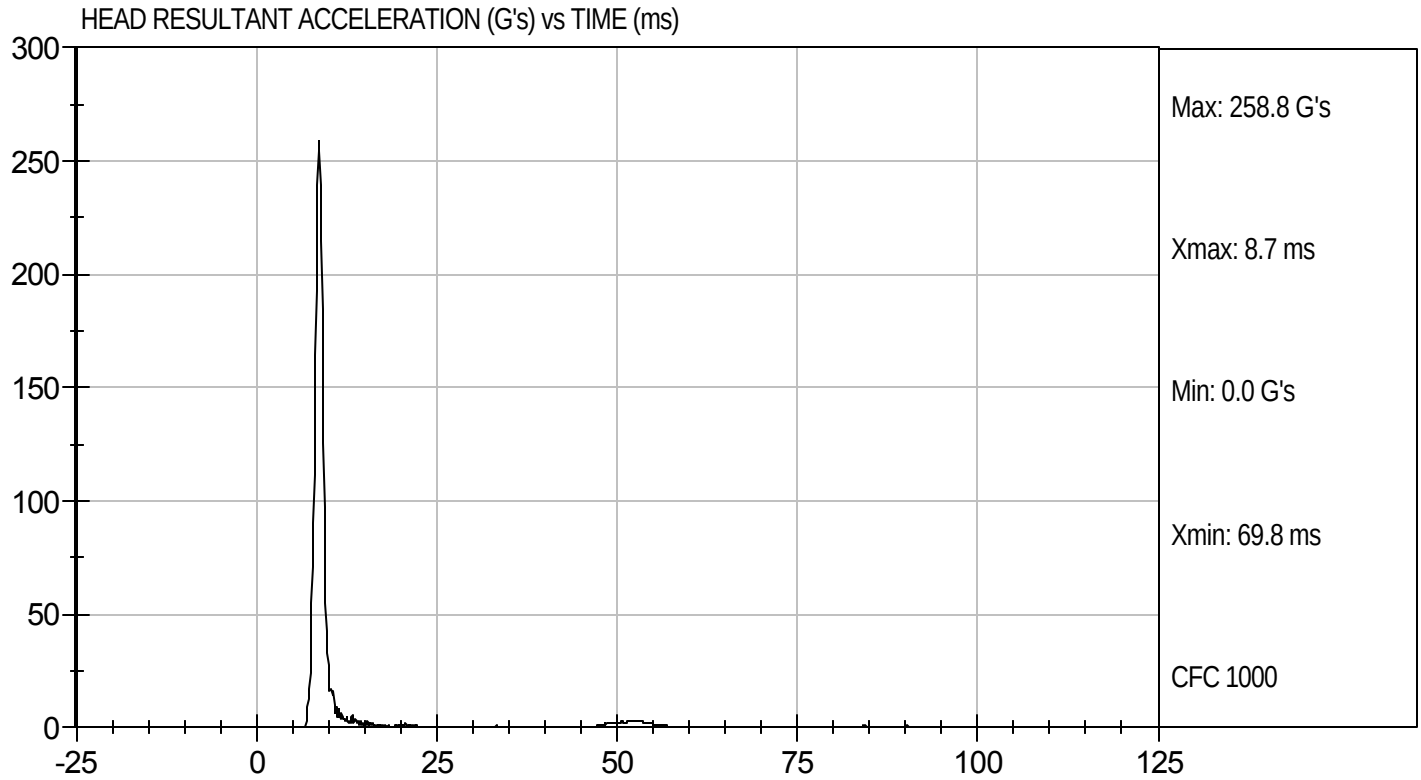


Approved By



Test Desc: Head Drop
Component ID: D103131

Test Date: 9/20/10
Velocity: 0 ft/s, 0.00 m/s

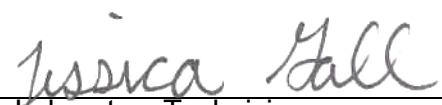


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D.: D103132

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	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.18	Pass
	20 ms	G's	17.60 to 22.60	19.27	Pass
	30 ms	G's	12.50 to 18.50	13.39	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.36	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	40.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	65.3	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	113.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.7	Pass
	Time	ms	47.0 to 58.0	52.9	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	101.5	Pass
Overall Test Results					Pass


 Laboratory Technician

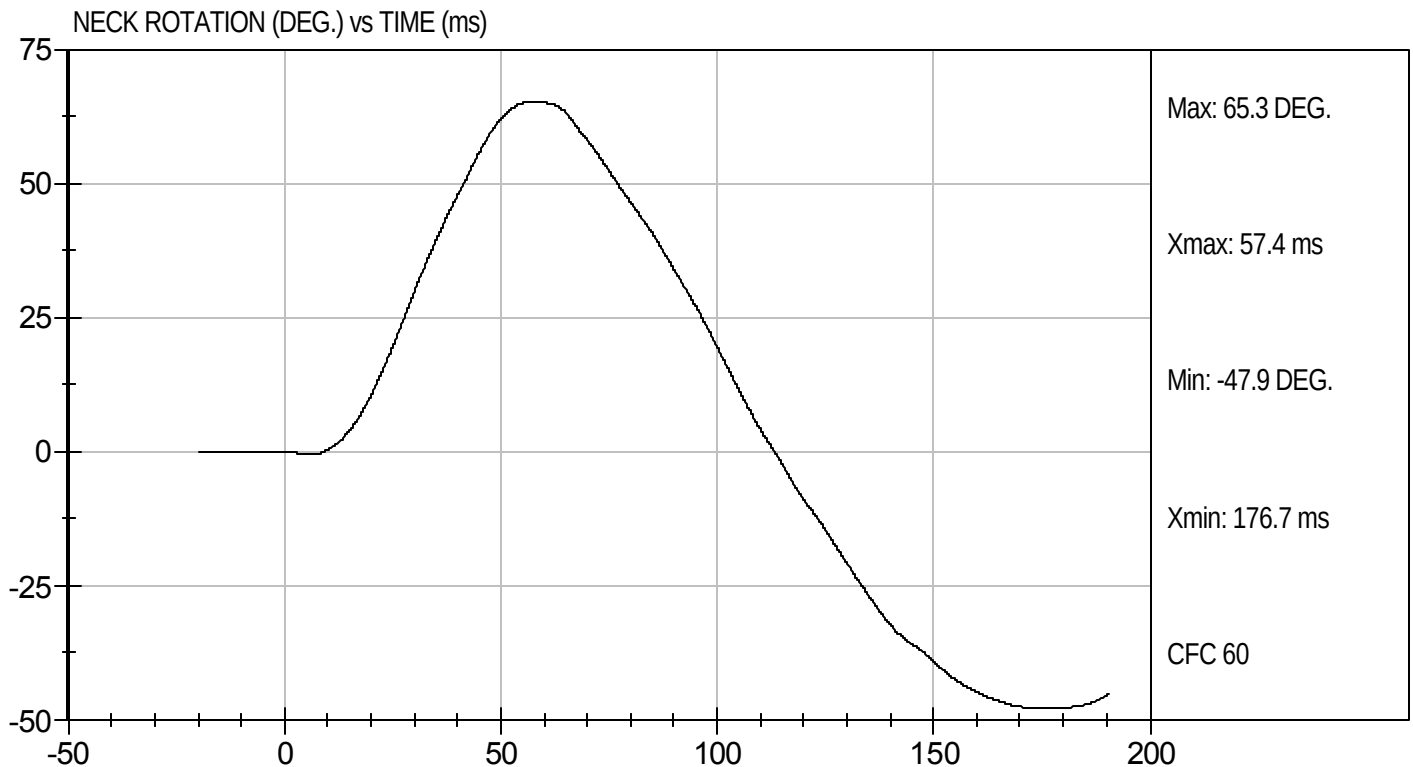
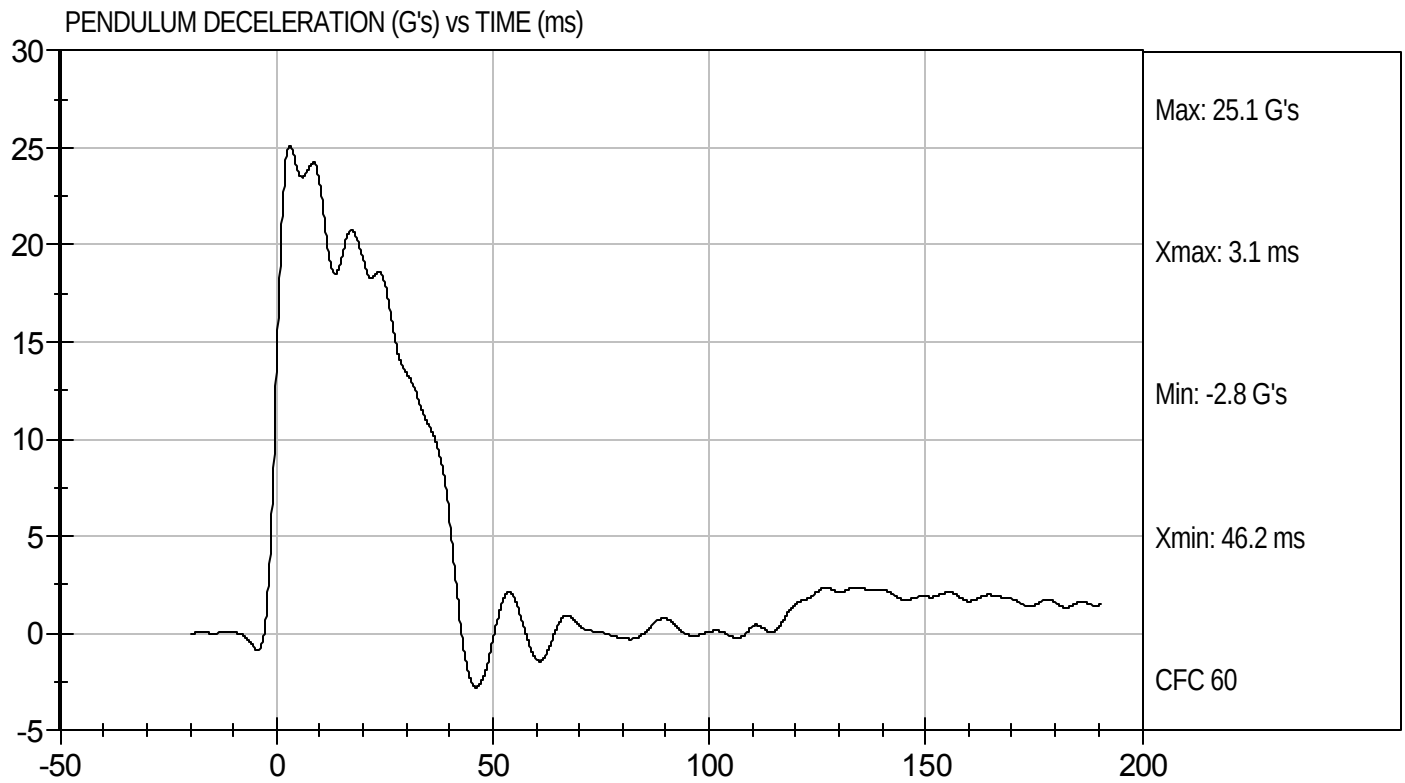
9/20/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D103132

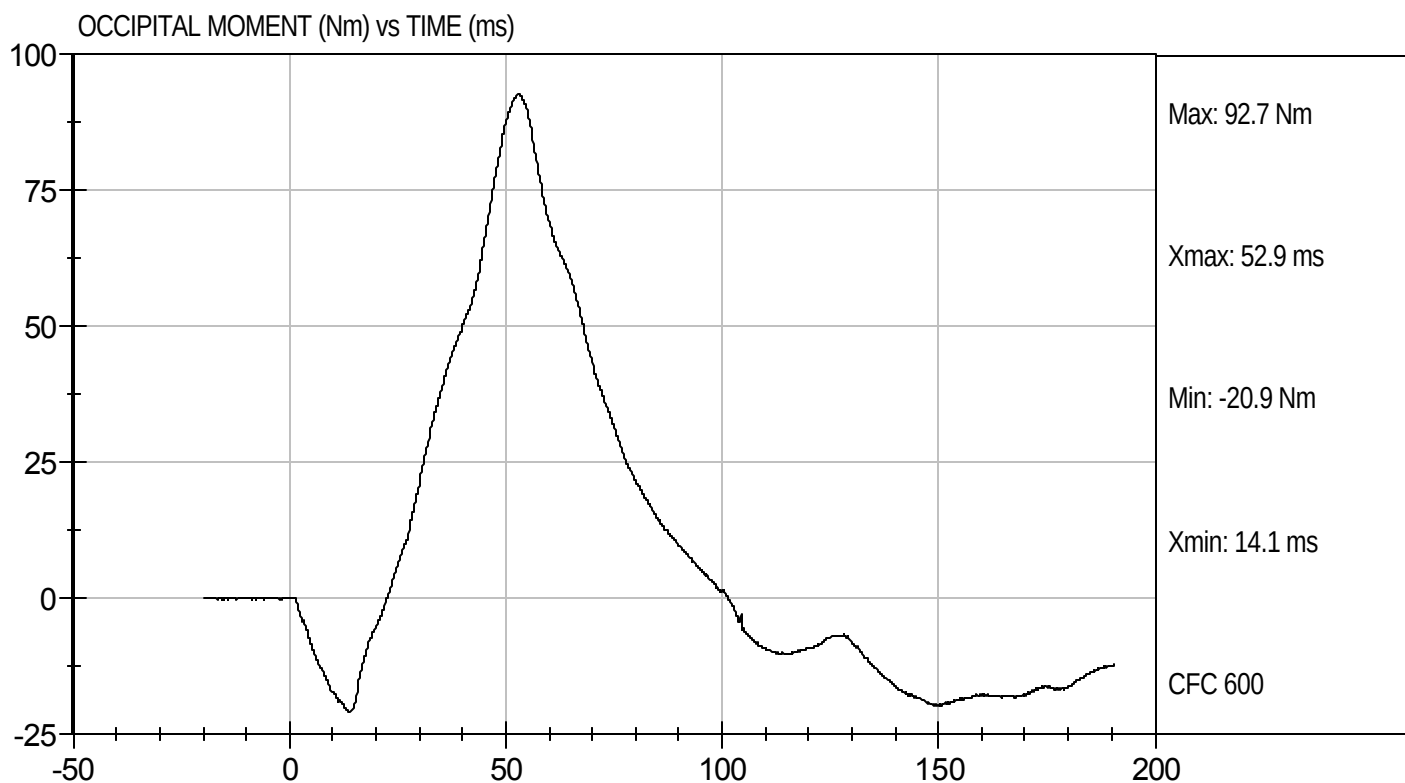
Test Date: 9/20/10
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D103132

Test Date: 9/20/10
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.: D103133

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	58	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.33	Pass
	20 ms	G's	14.00 to 19.00	15.68	Pass
	30 ms	G's	11.00 to 16.00	11.88	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.21	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	93.4	Pass
	Time	ms	72.0 to 82.0	76.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-56.5	Pass
	Time	ms	65.0 to 79.0	69.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.2	Pass
Overall Test Results					Pass


 Laboratory Technician

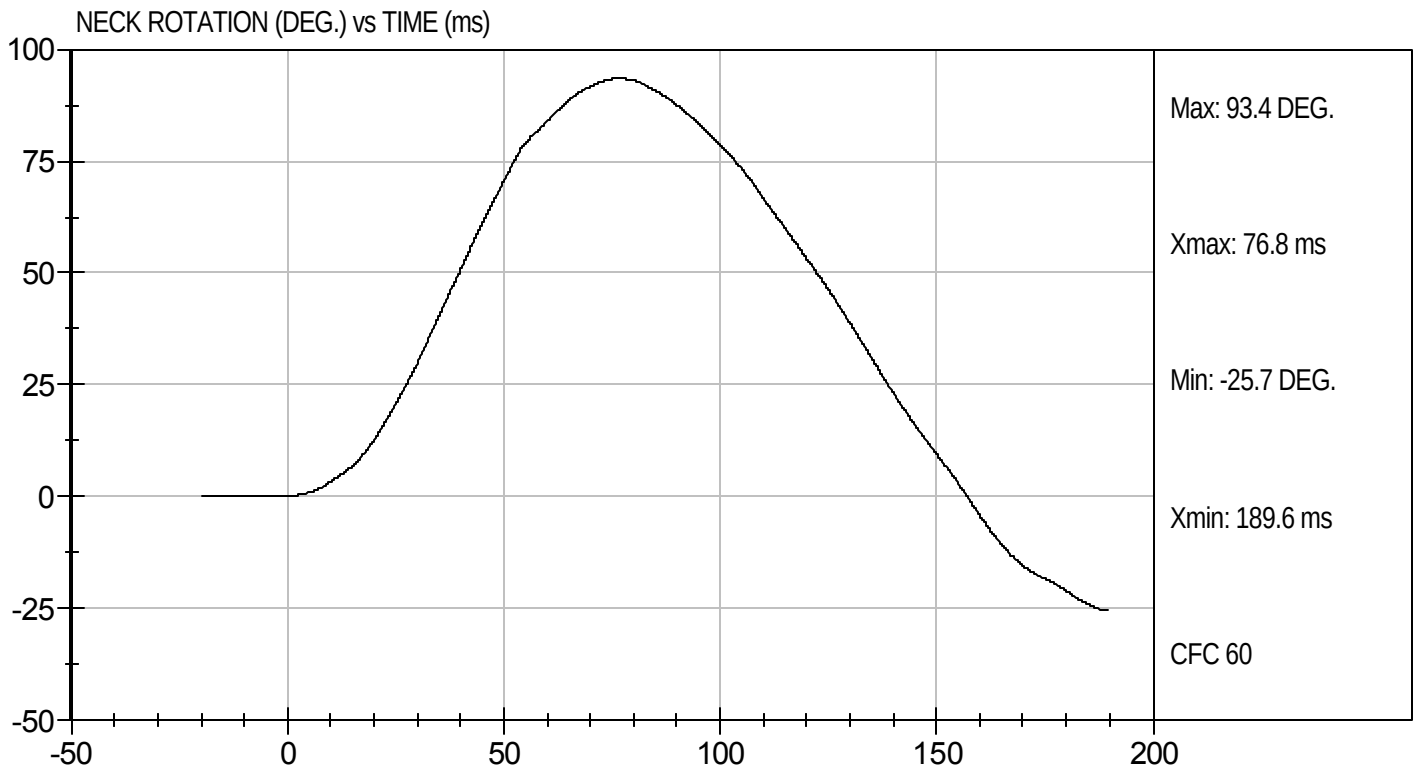
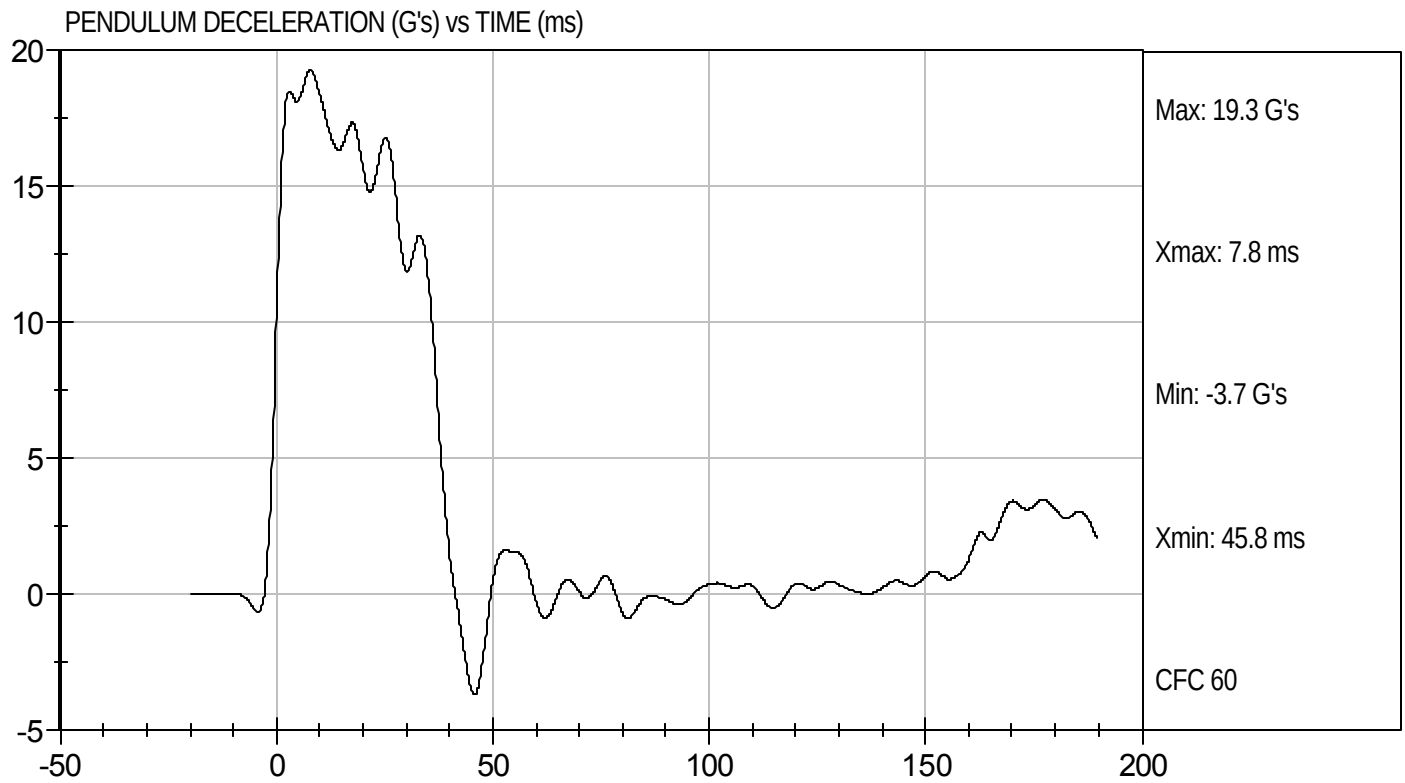
9/21/10
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D103133

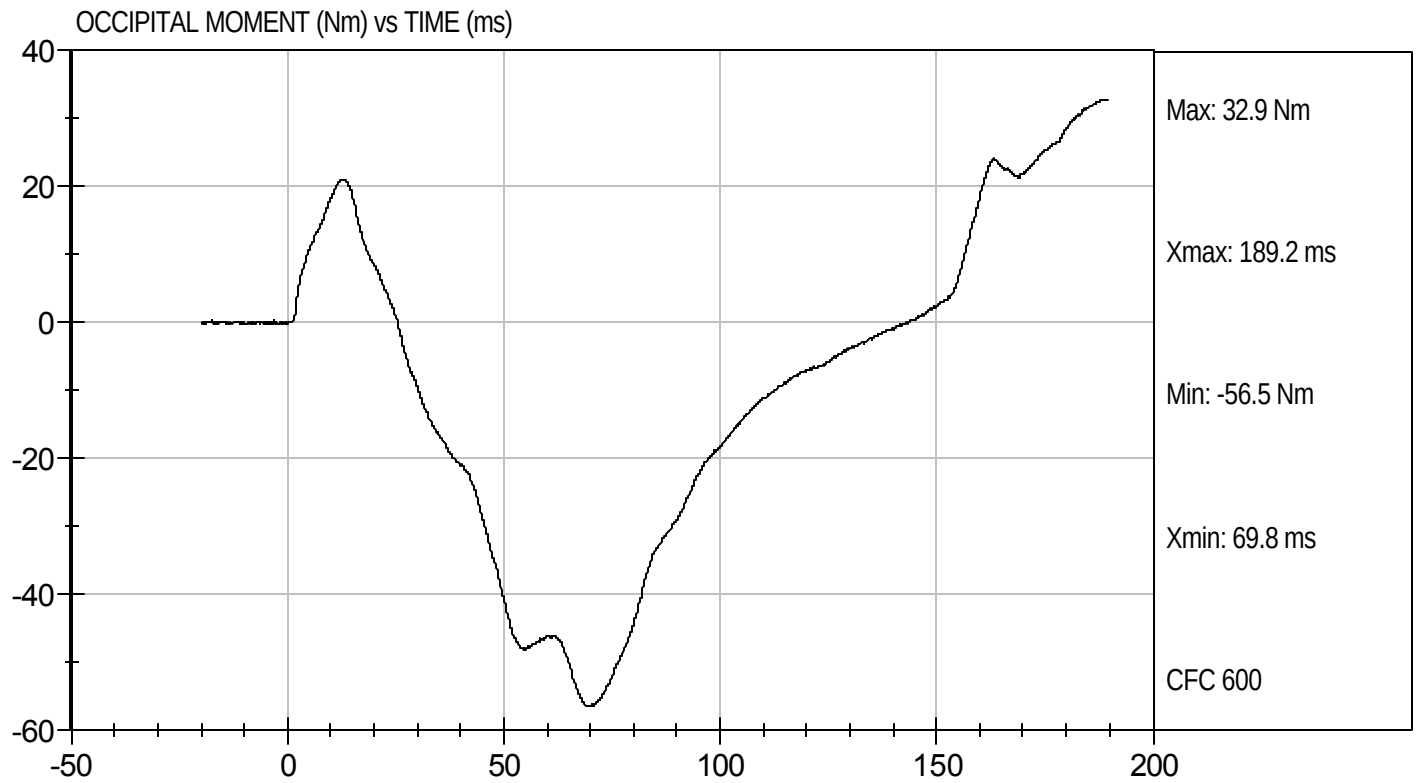
Test Date: 9/21/10
Velocity: 19.84 ft/s, 6.05 m/s





Test Desc: Neck Extension
Component ID: D103133

Test Date: 9/21/10
Velocity: 19.84 ft/s, 6.05 m/s

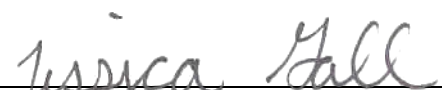


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D103134

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,278	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.37	Pass
Internal Hysteresis	%	69 to 85	72	Pass
			Overall Test Results	Pass


Laboratory Technician

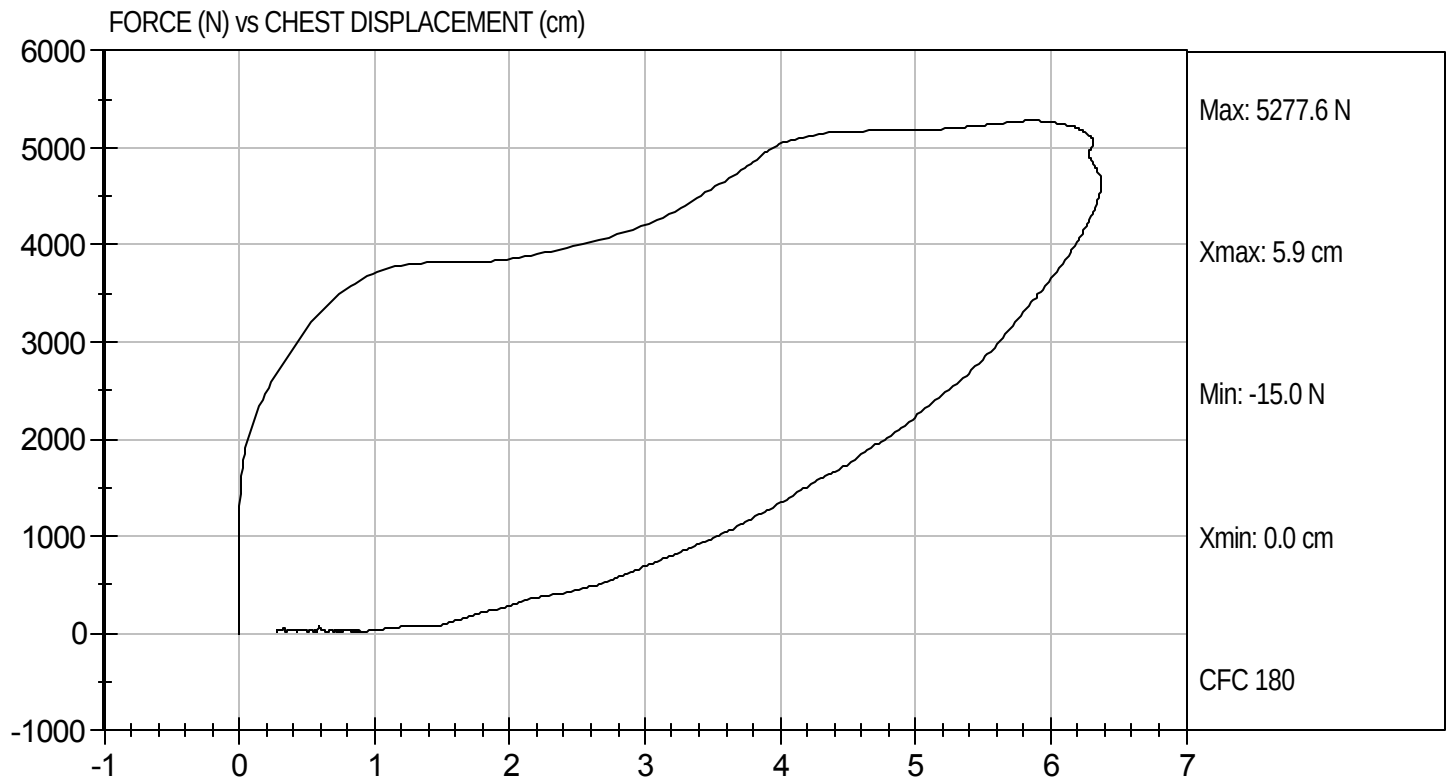
9/21/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D103134

Test Date: 9/21/10
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: D103135

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,574	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

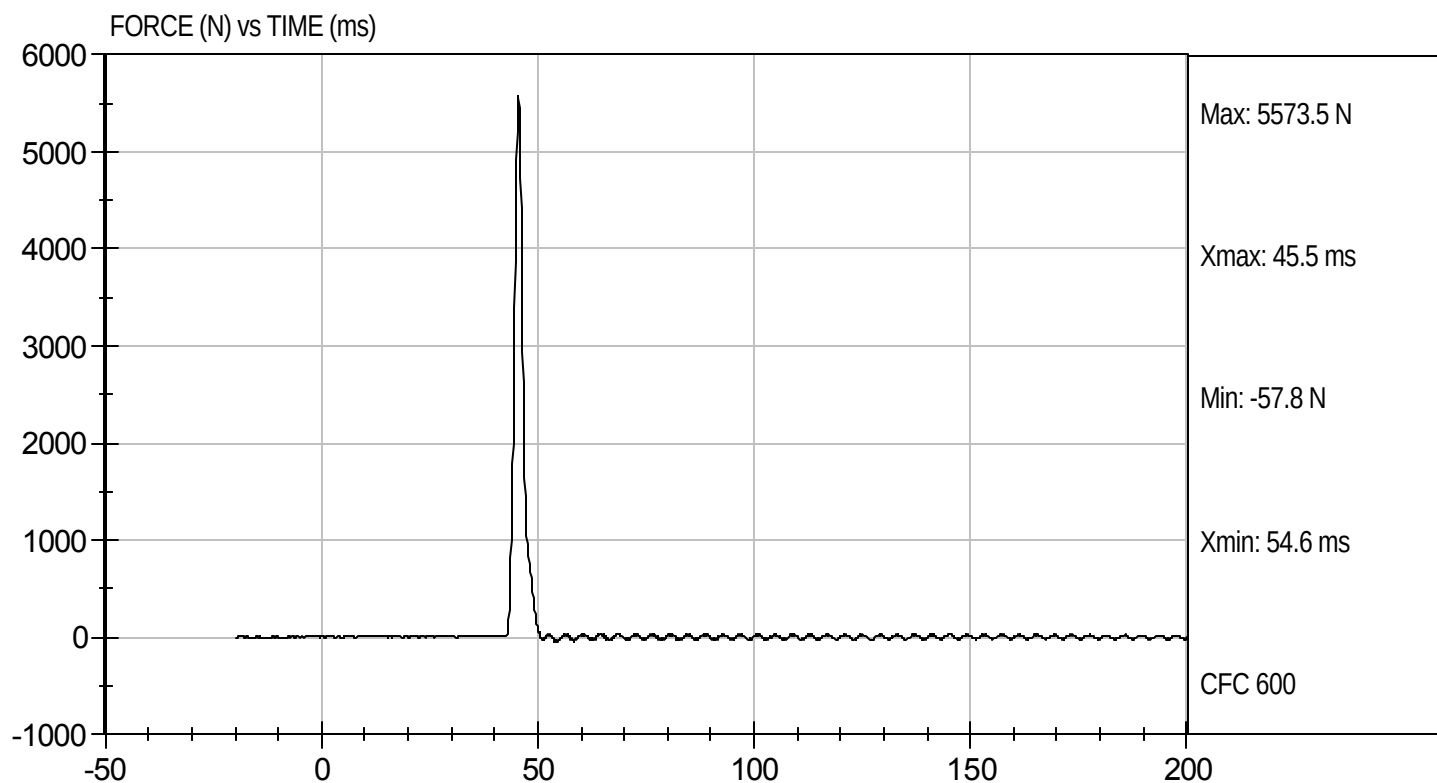
9/21/10
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D103135

Test Date: 9/21/10
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: D103136

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,649	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

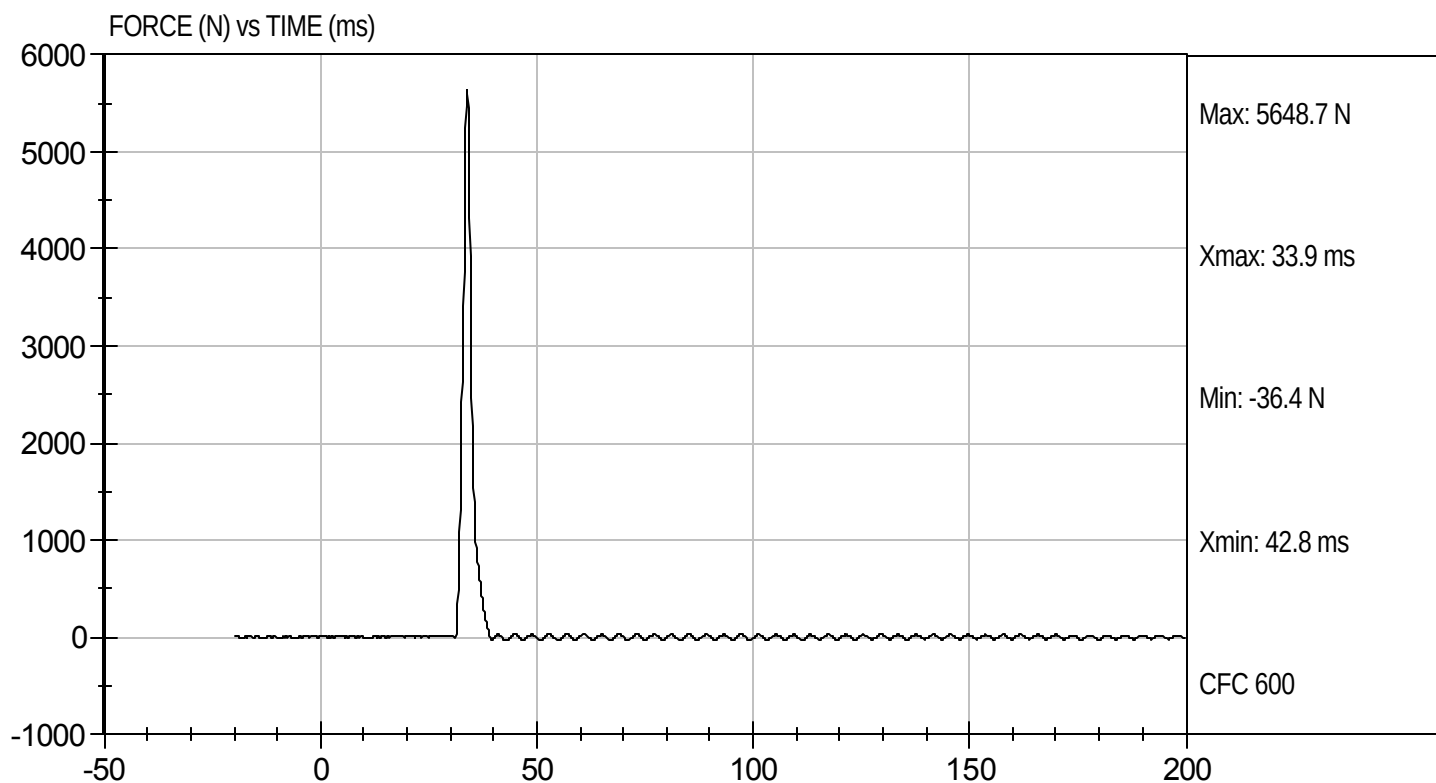
9/21/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D103136

Test Date: 9/21/10
Velocity: 6.85 ft/s, 2.09 m/s

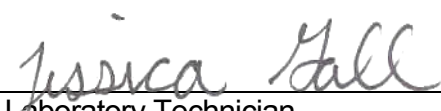


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D103130

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	54	54	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	58.3	47.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	46	48	Pass
Overall Test Results					Pass


 Laboratory Technician

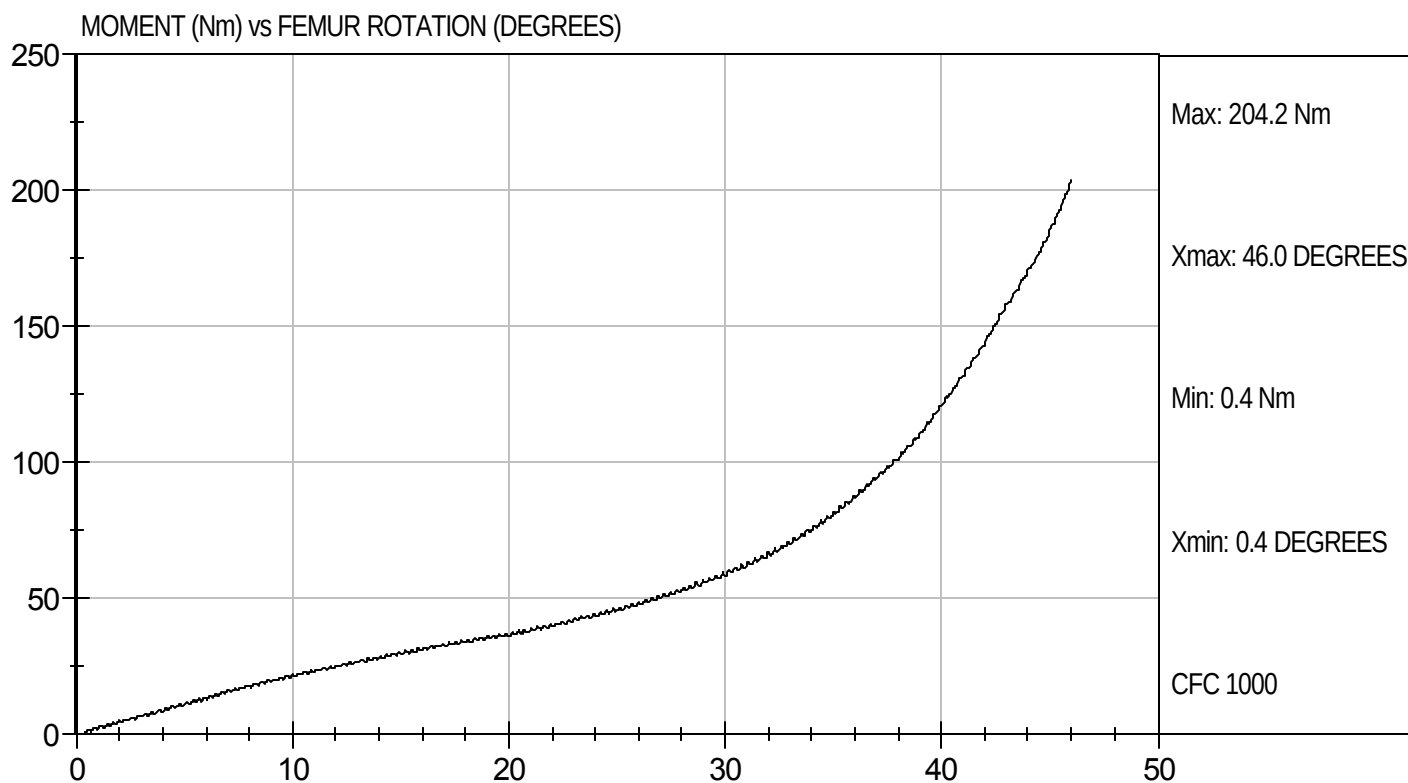
9/21/10
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D103139

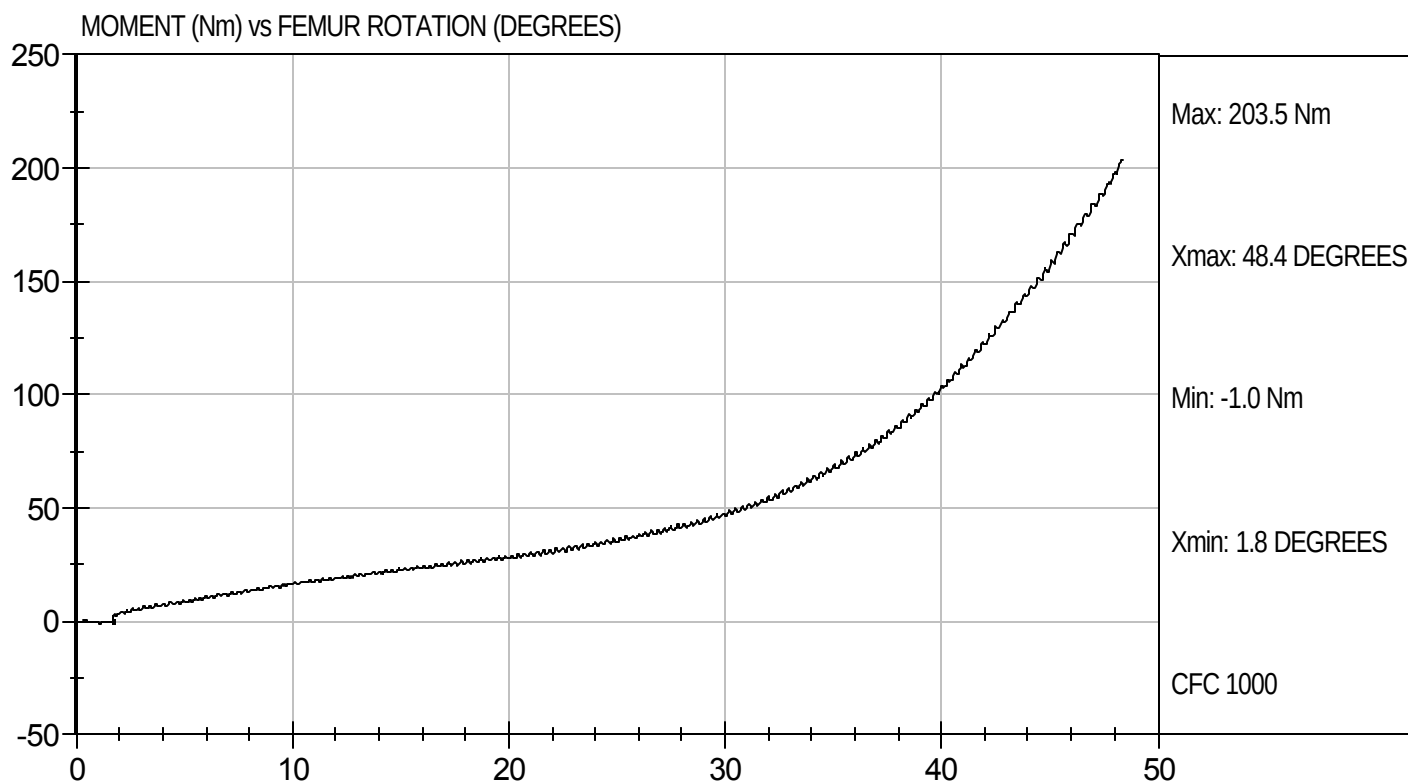
Test Date: 9/21/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D103130

Test Date: 9/21/10
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D103081

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	48	Pass
Peak Resultant Acceleration	G's	250 to 300	287	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

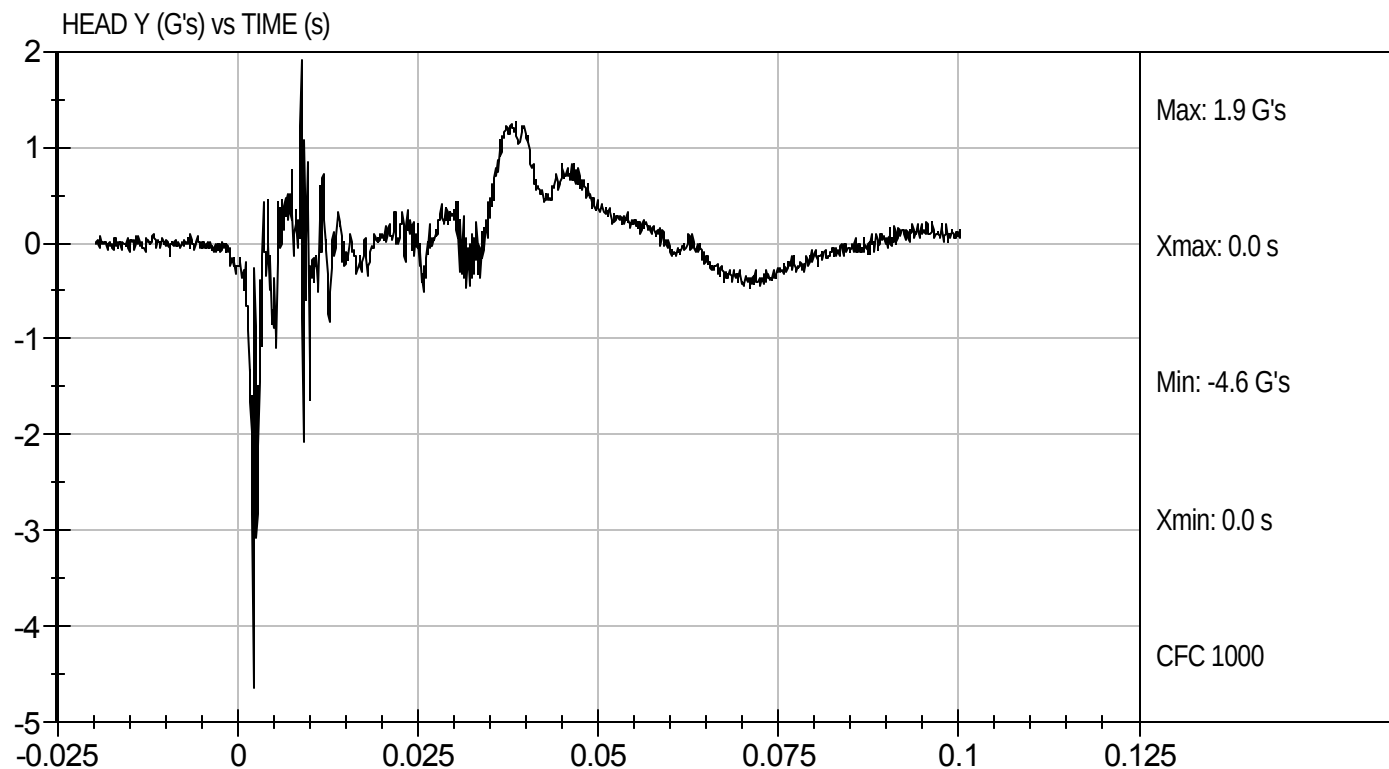
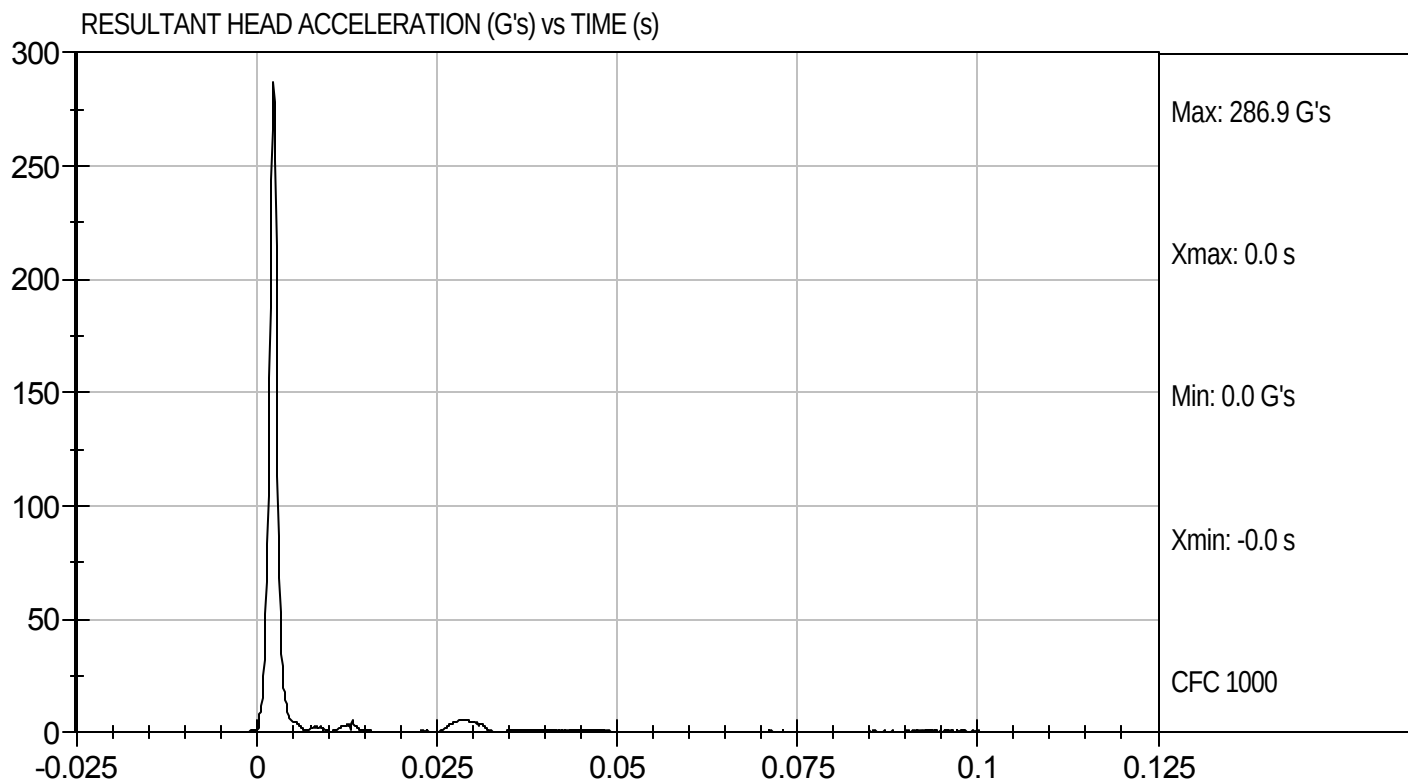
9/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D103081

Test Date: 9/16/10
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: D103082

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	49	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.6	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	91	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

9/16/10
Test Date

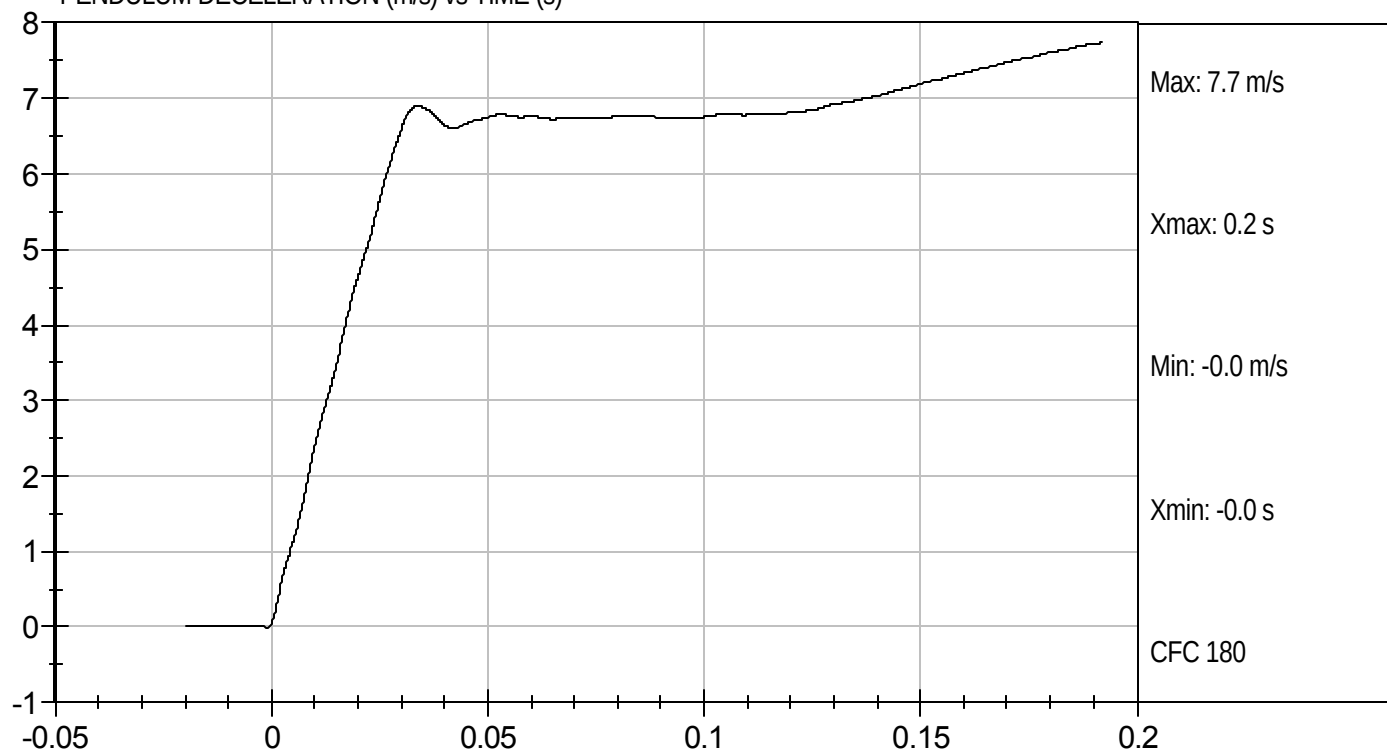
David Winkelbauer
Approved By



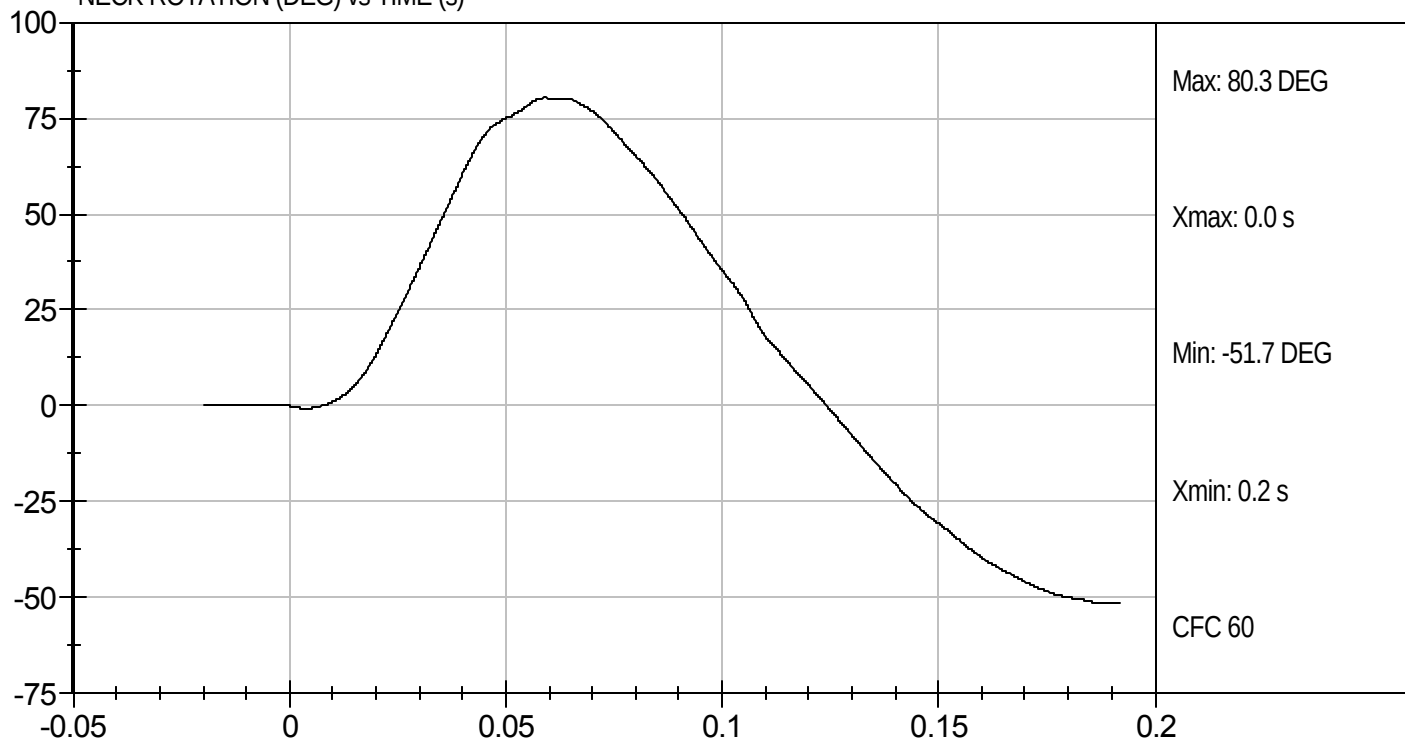
Test Desc: Neck Flexion
Component ID: D103082

Test Date: 9/16/10
Velocity: 23.15 ft/s, 7.06 m/s

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



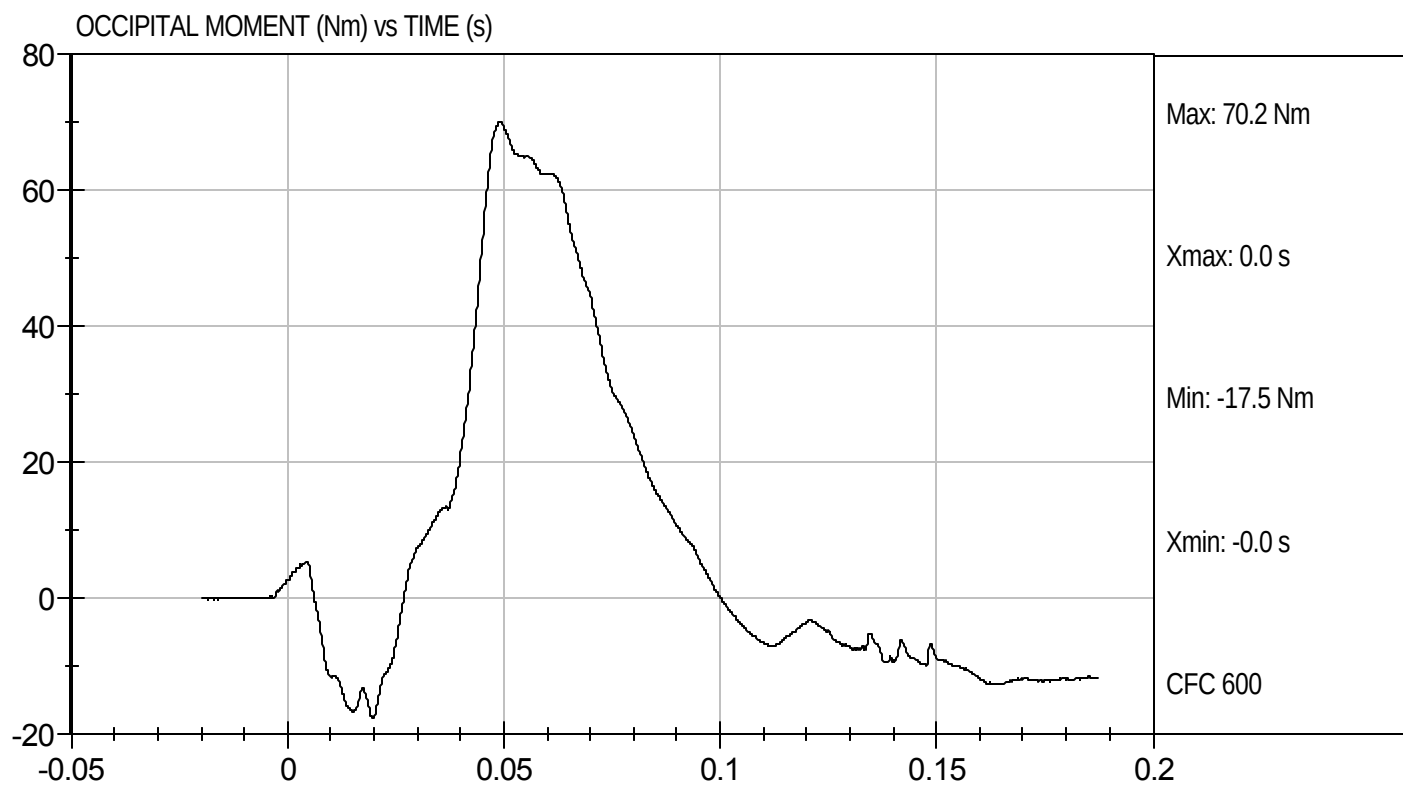
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D103082

Test Date: 9/16/10
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634Test I.D: D103083

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	49	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	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	103	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	98	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

9/16/10

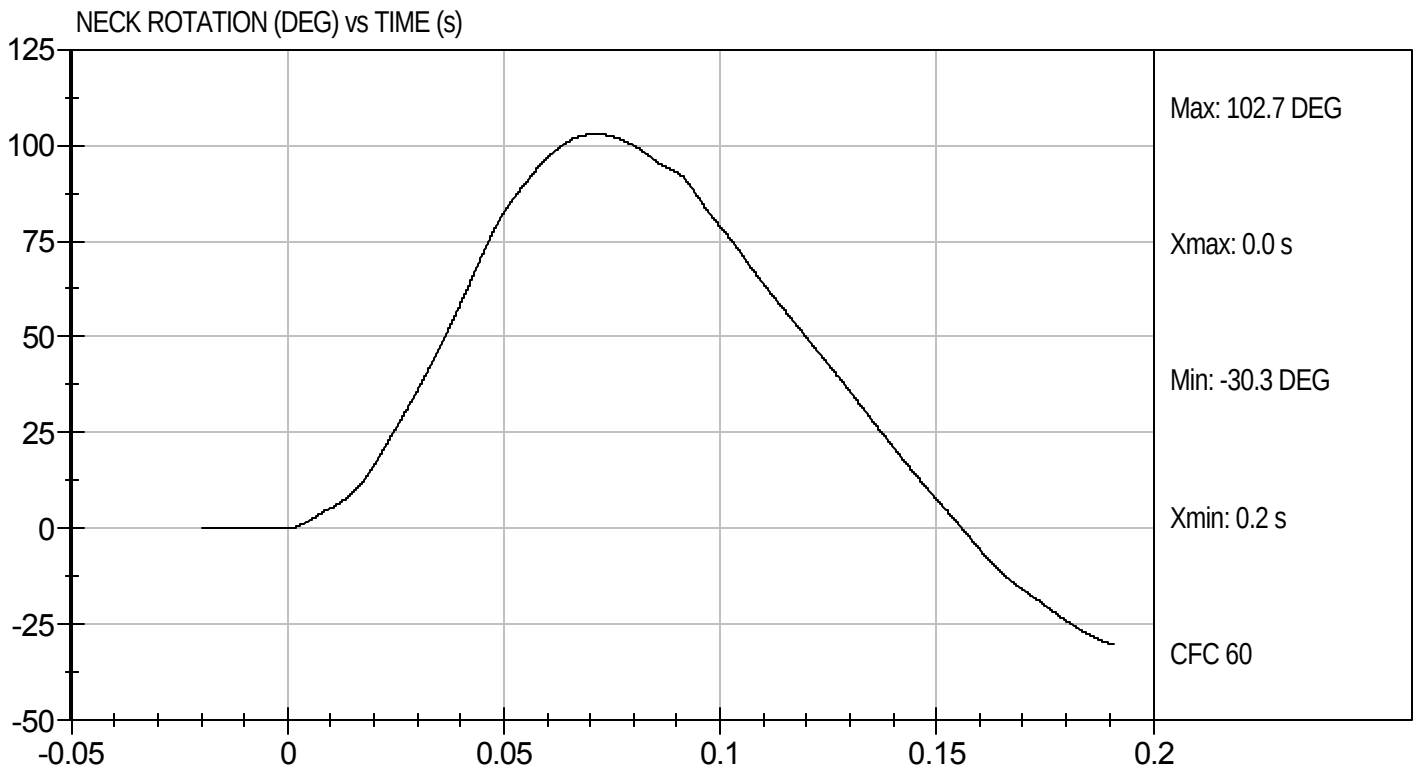
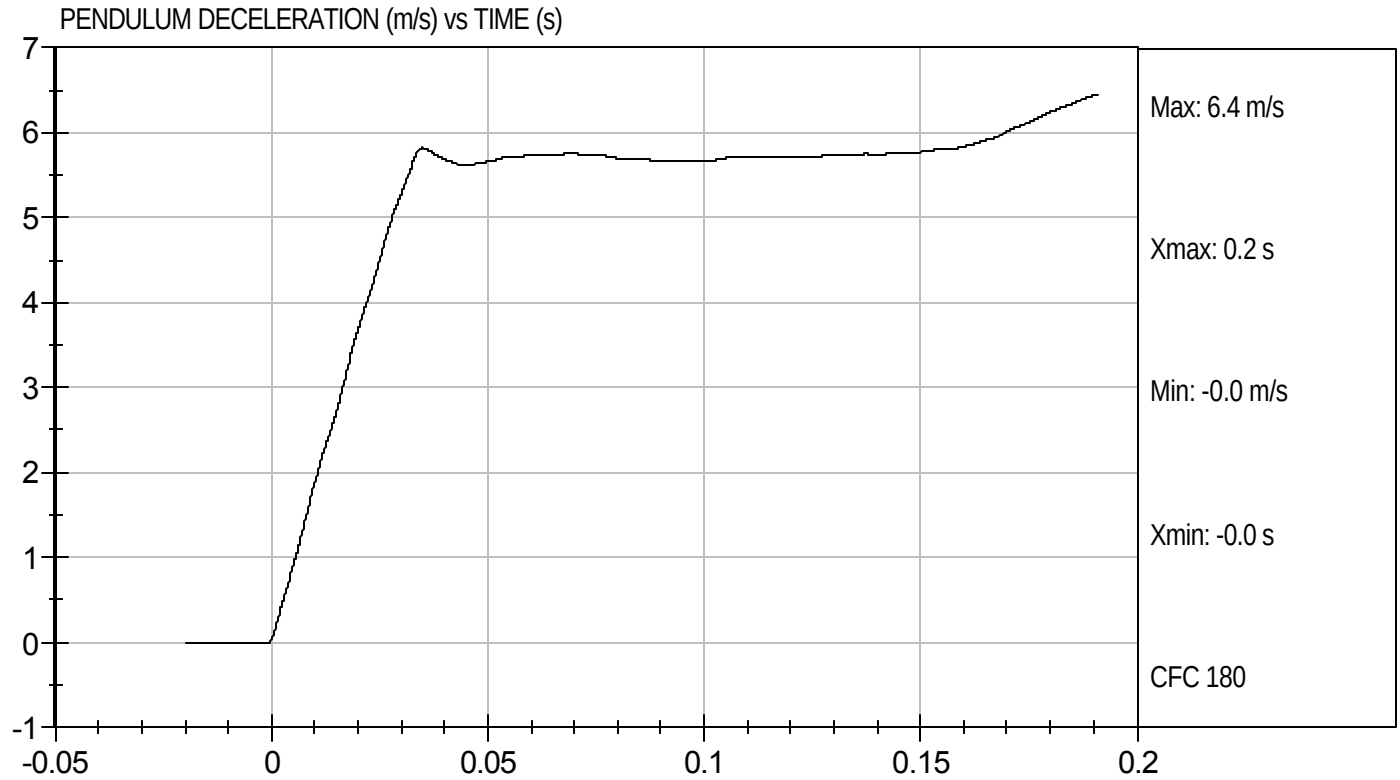
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D103083

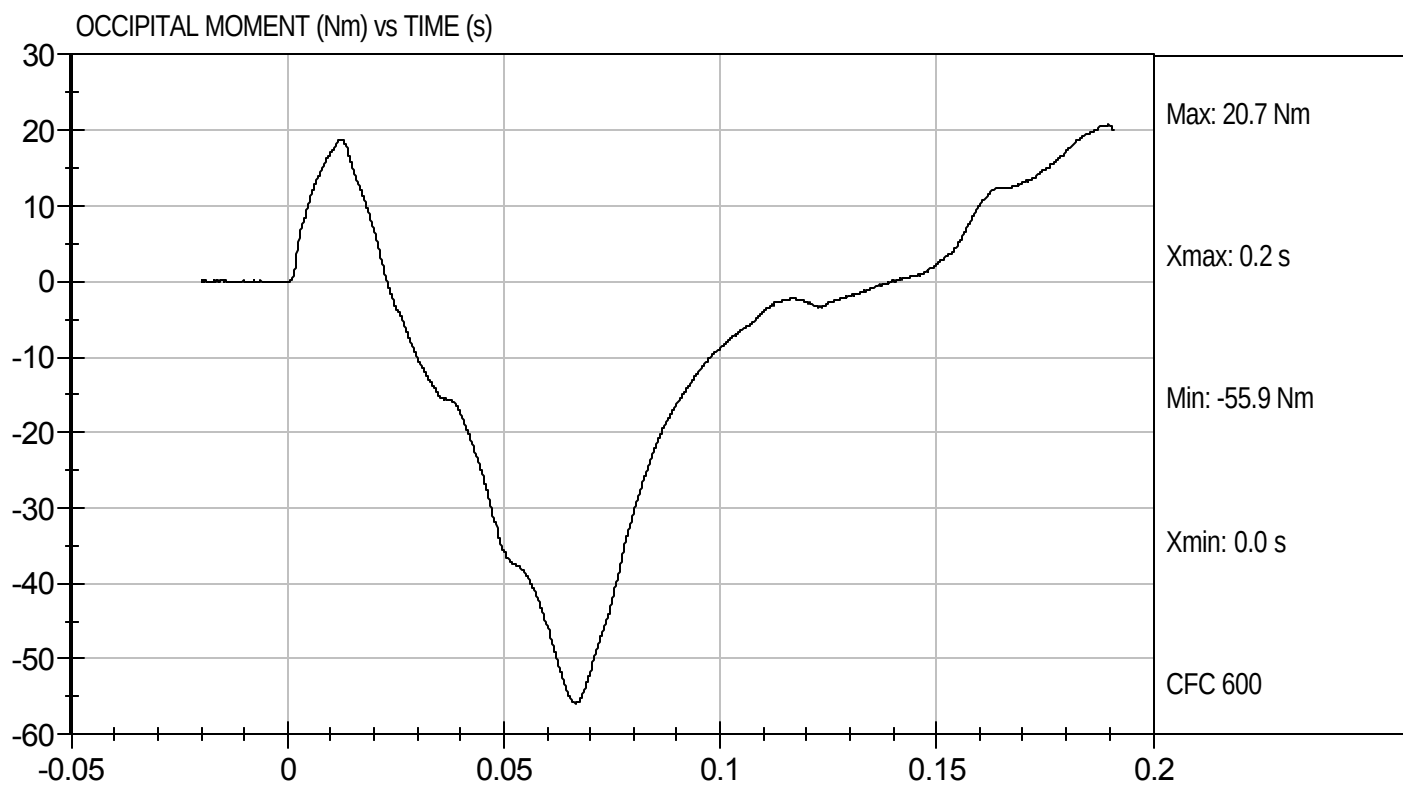
Test Date: 9/16/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D103083

Test Date: 9/16/10
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: D103084

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	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	51	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.3	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4438	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

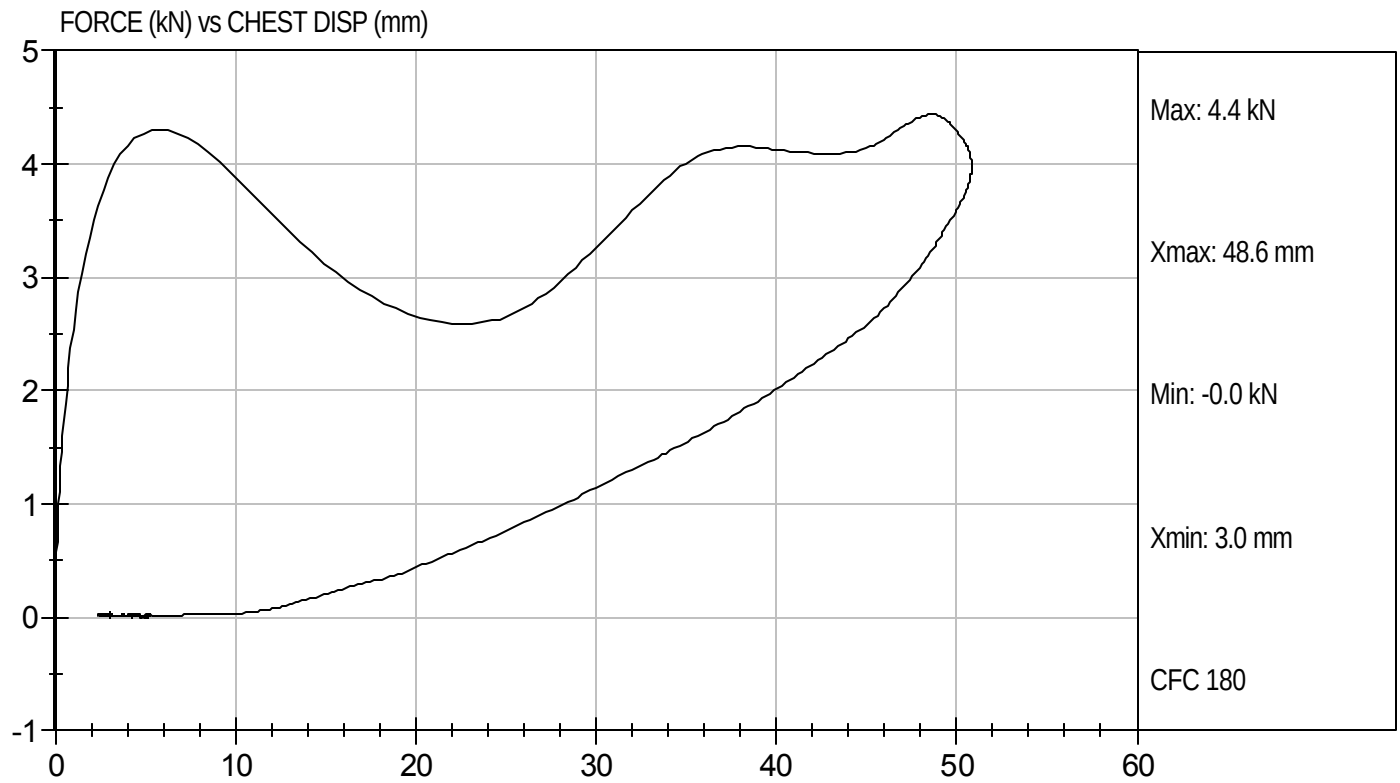
9/17/10
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Impact
Component ID: D103084

Test Date: 9/17/10
Velocity: 22.2 ft/s, 6.77 m/s

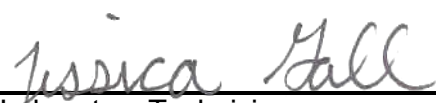


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103085

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	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.89	Pass
Overall Test Results				Pass


Laboratory Technician

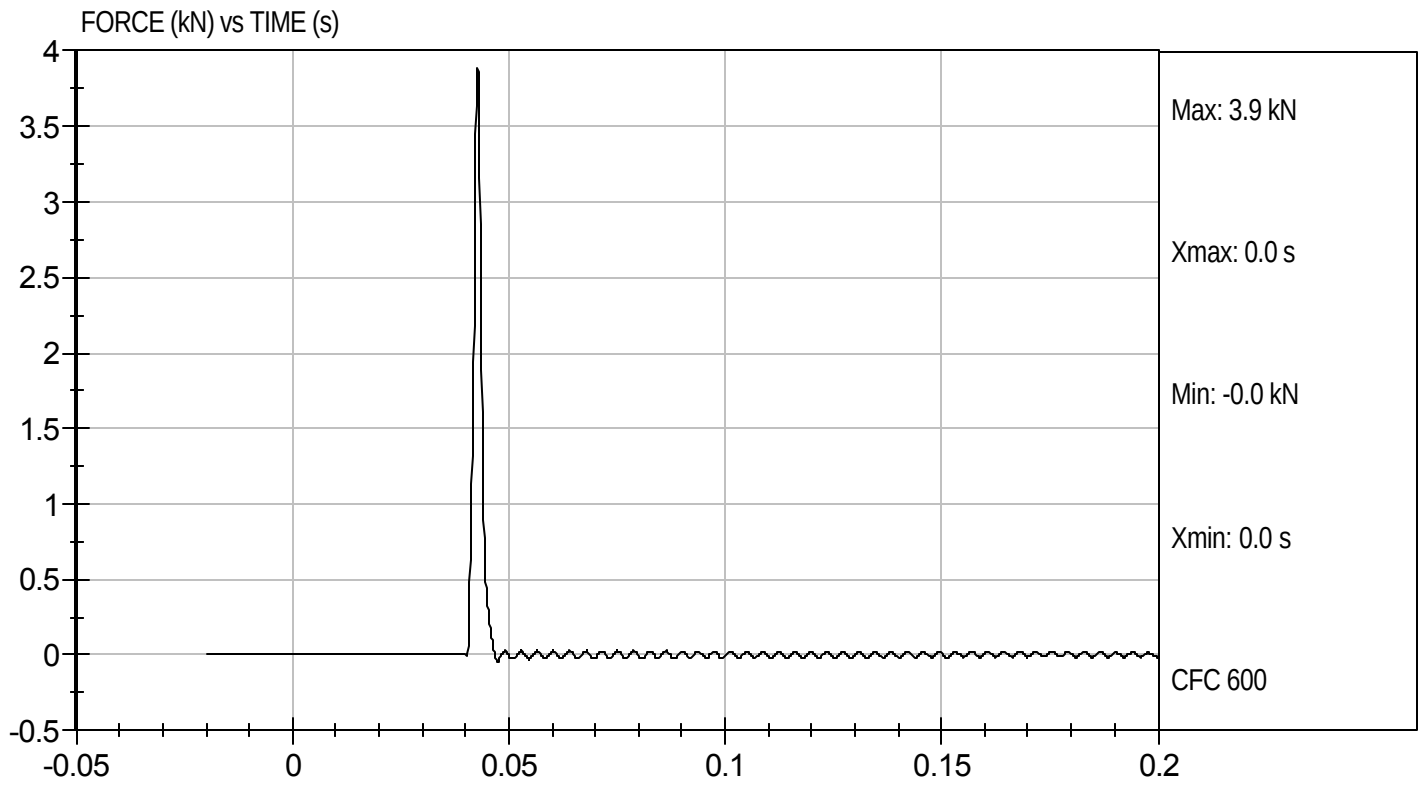
9/16/10
Test Date


Approved By



Test Desc: Right Knee
Component ID: D103085

Test Date: 9/16/10
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103086

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	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.50	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

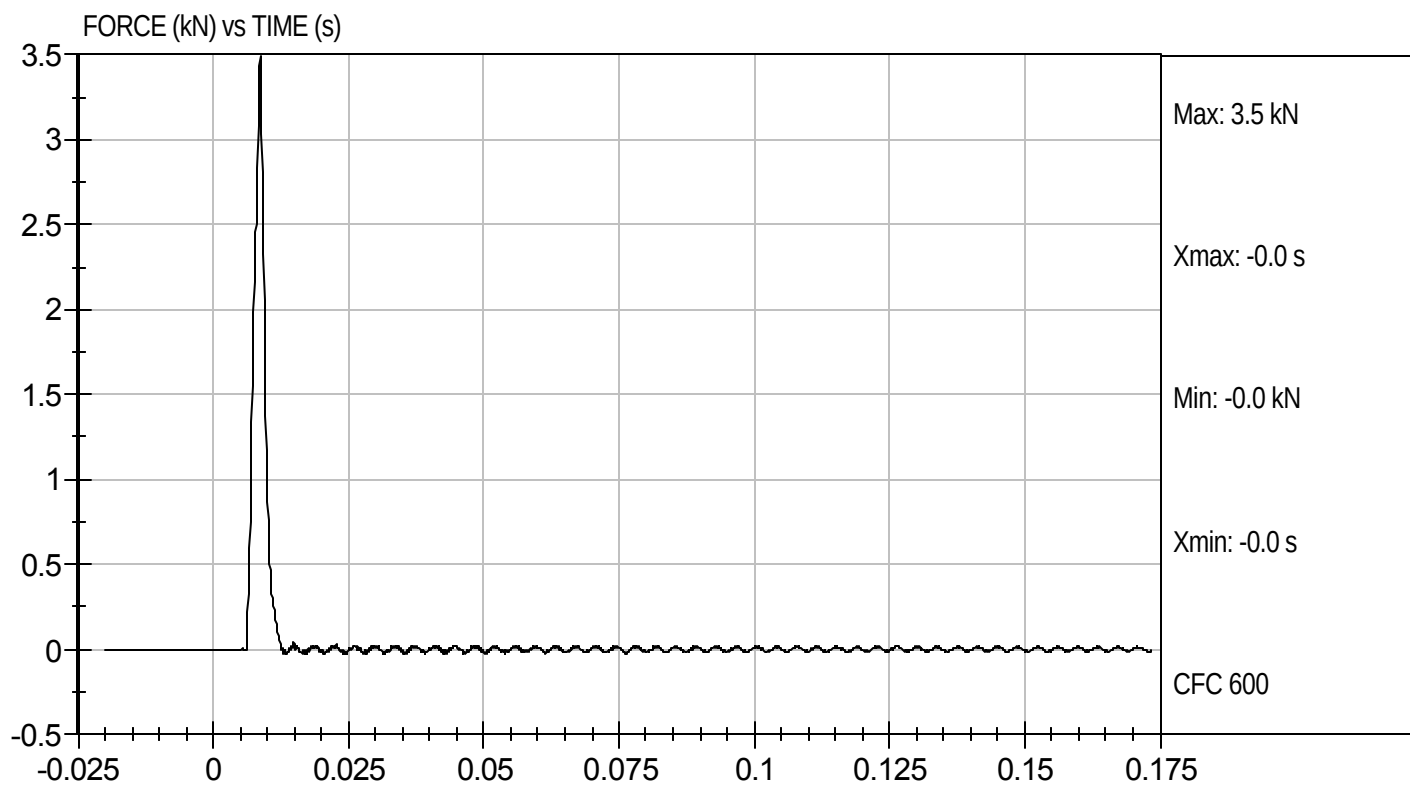
9/16/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D103086

Test Date: 9/16/10
Velocity: 6.89 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103087

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	49	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	367	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

9/16/10
Test Date

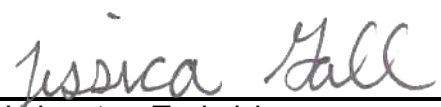

Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D103141

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	55	Pass
Peak Resultant Acceleration	G's	250 to 300	285	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

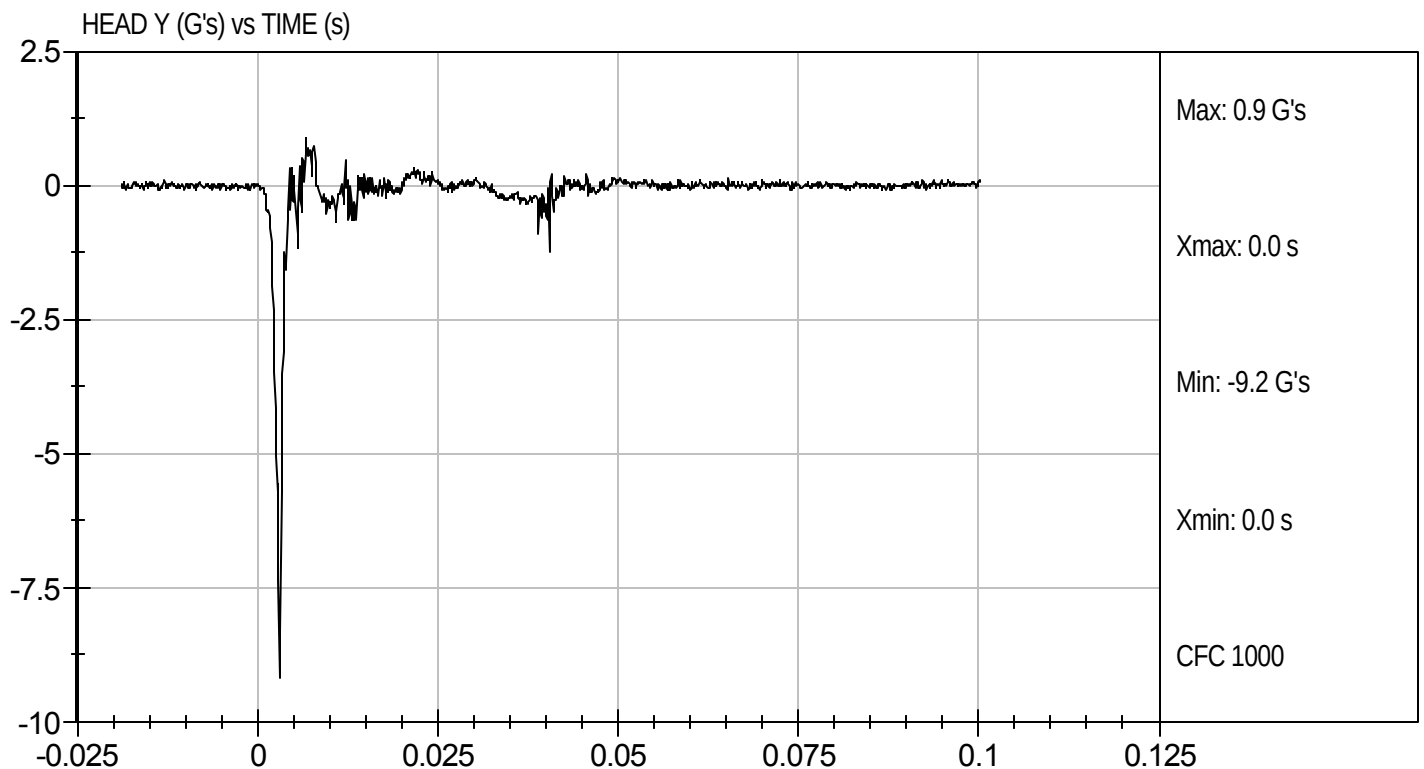
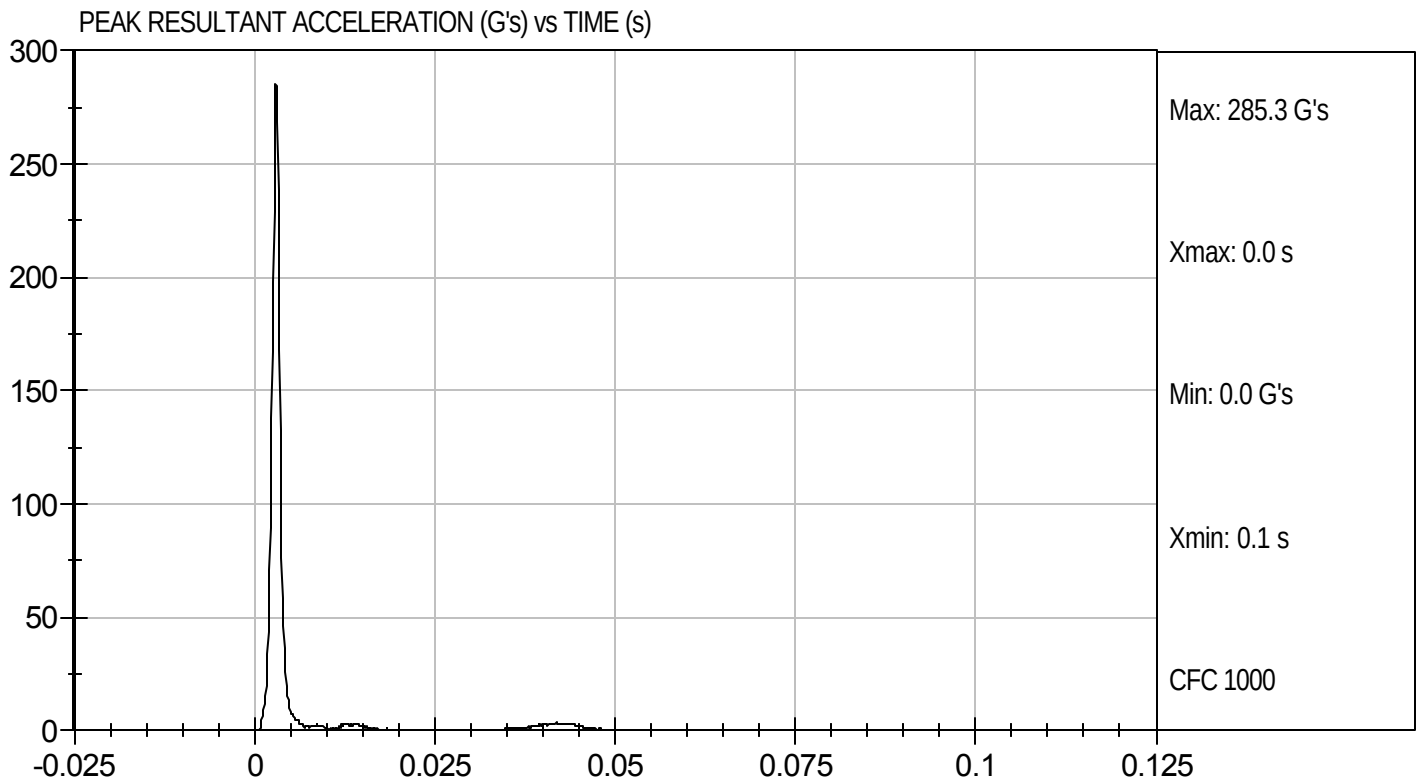
9/20/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D103141

Test Date: 9/20/10
Velocity: 0 ft/s, 0.00 m/s

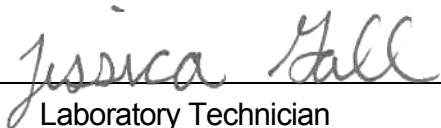


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103142

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	58	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	81	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

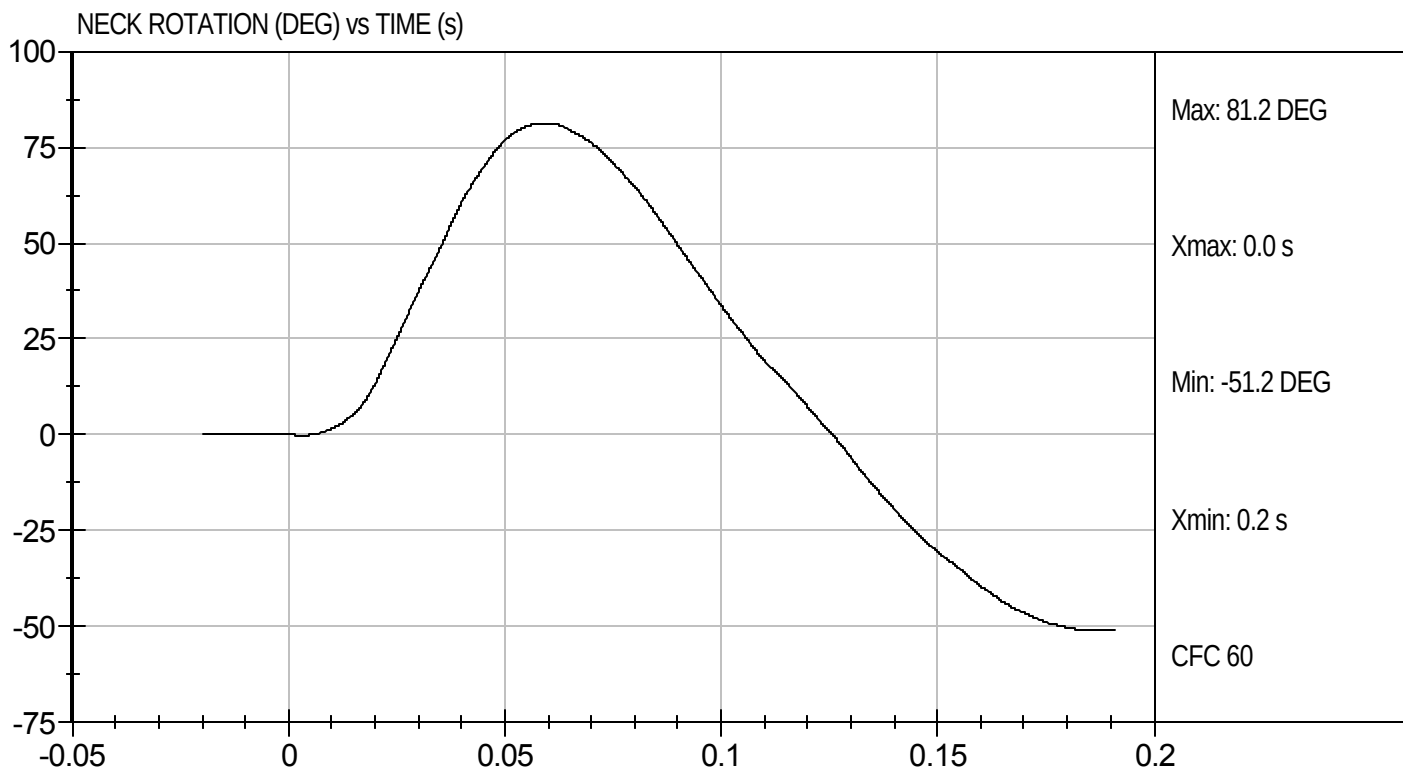
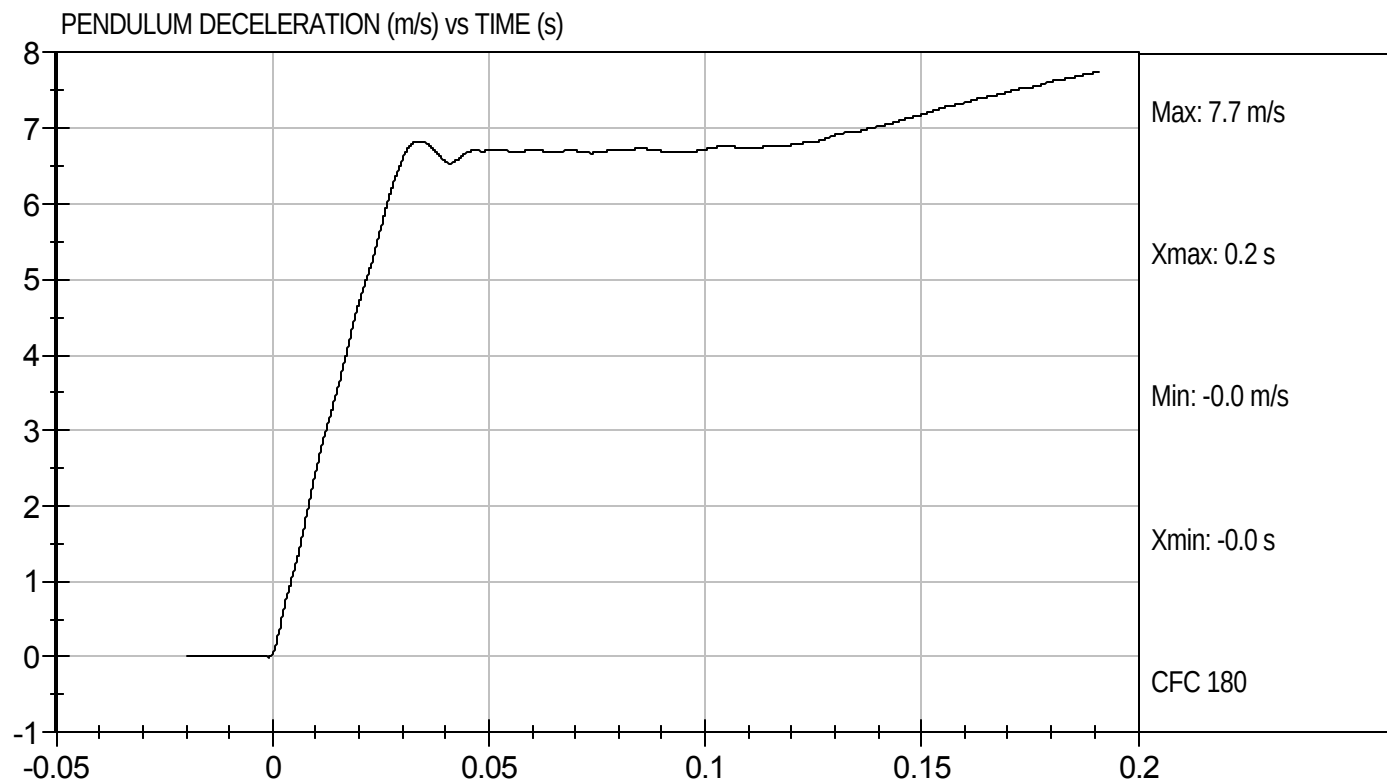
9/21/10
Test Date


Approved By



Test Desc: Neck Flexion
Component ID: D103142

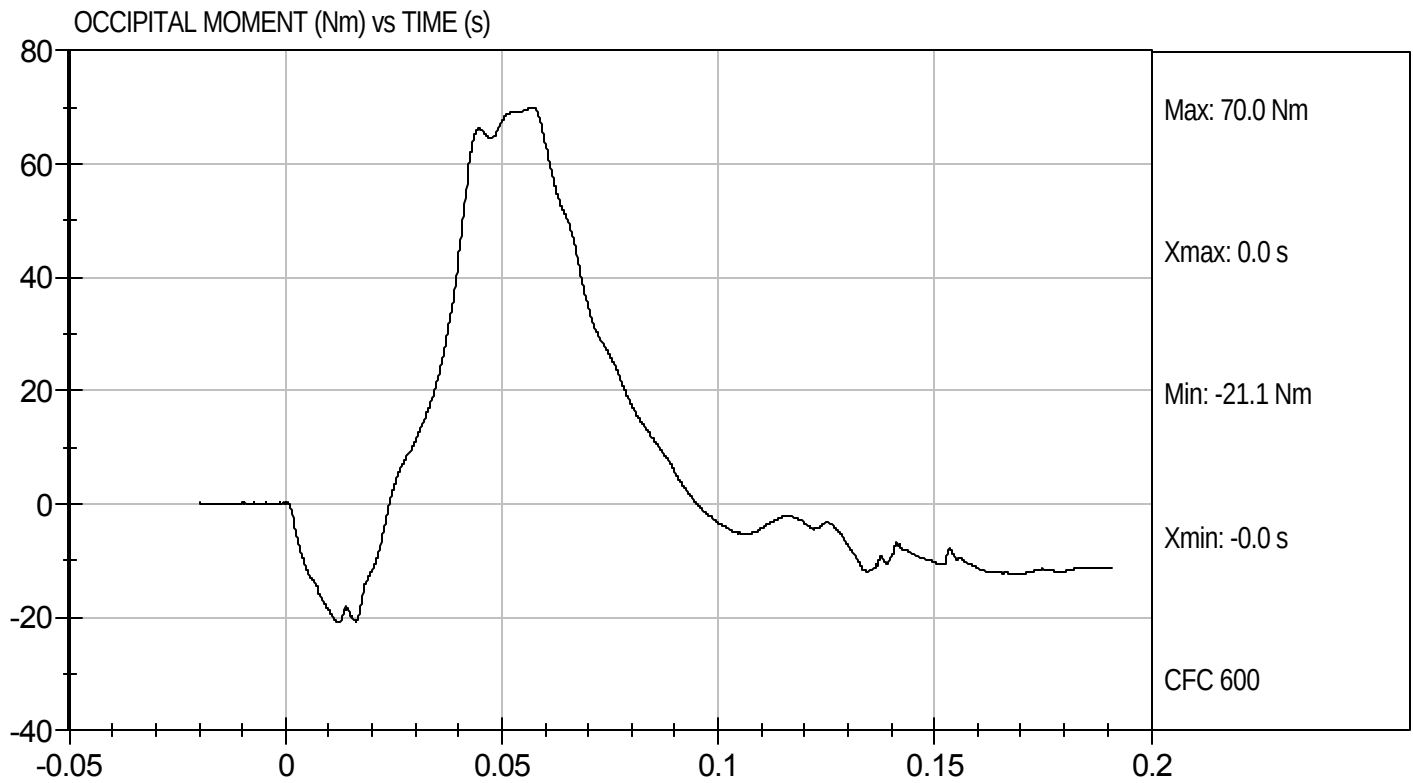
Test Date: 9/21/10
Velocity: 23.1 ft/s, 7.04 m/s





Test Desc: Neck Flexion
Component ID: D103142

Test Date: 9/21/10
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: D103143

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	58	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.8	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	99	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-58	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	97	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

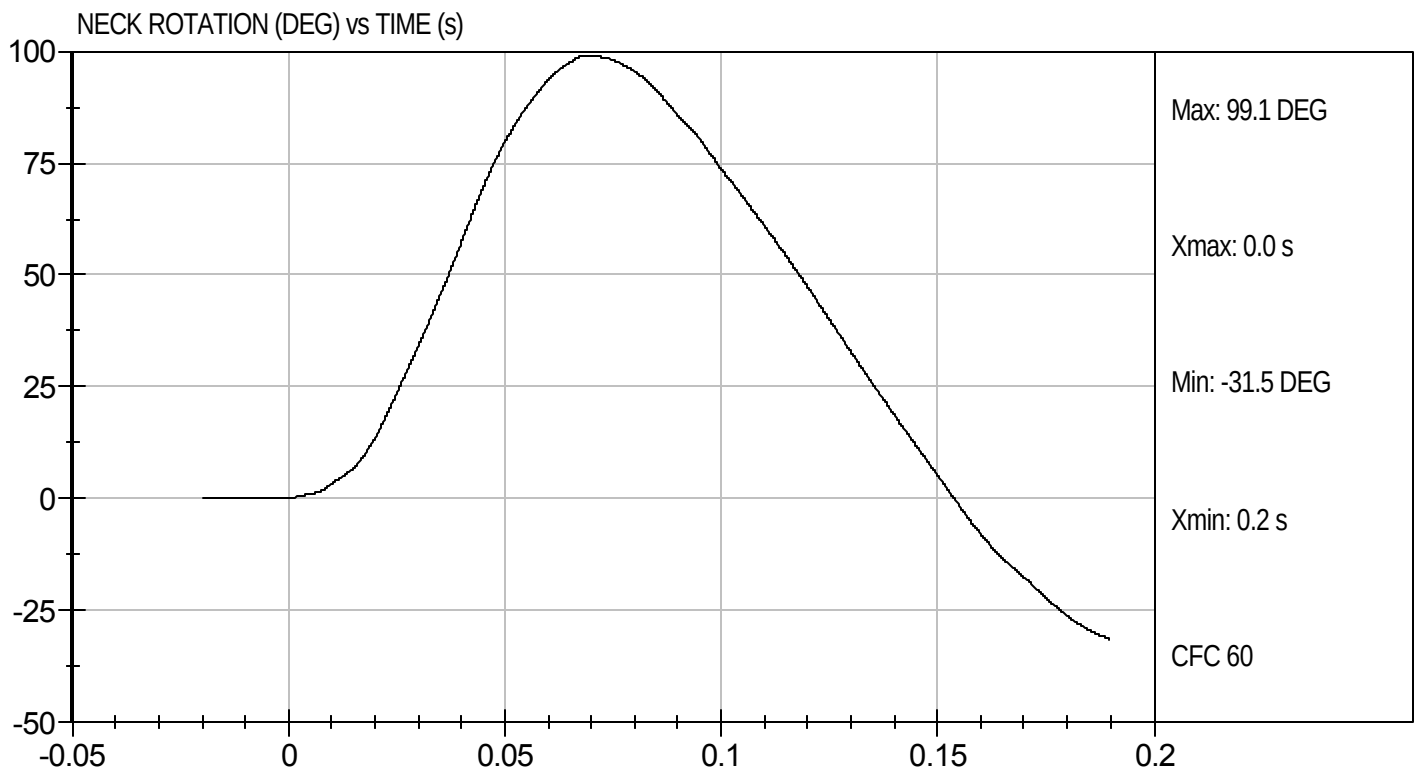
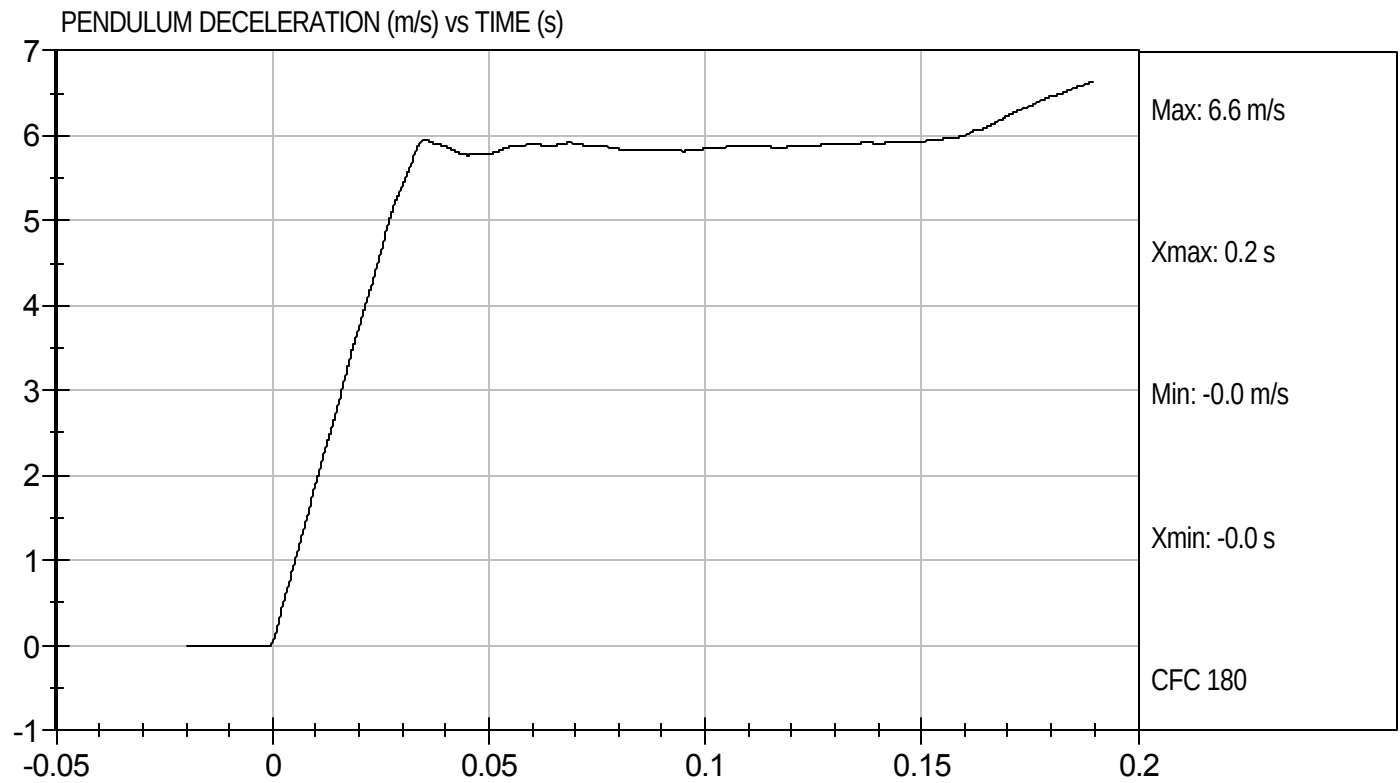
9/21/10
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D103143

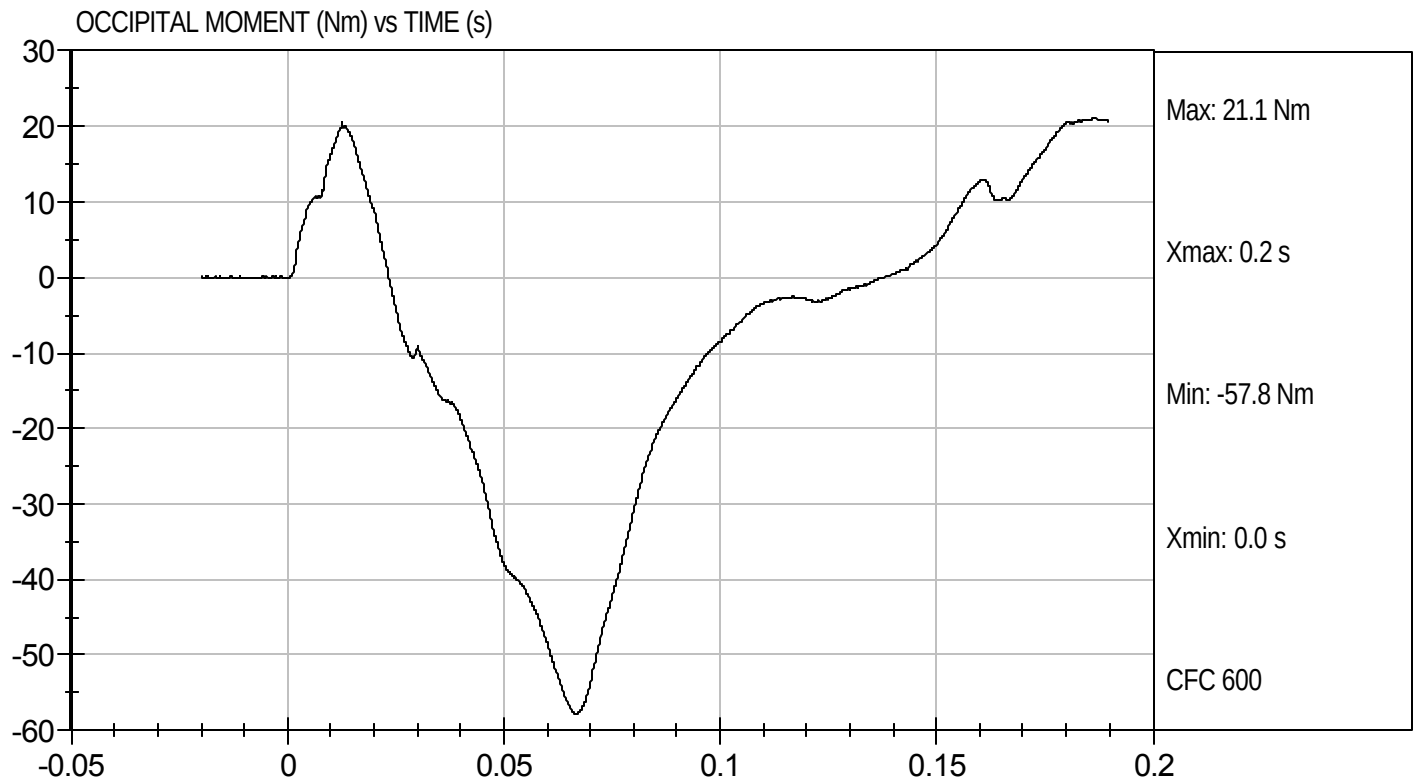
Test Date: 9/21/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D103143

Test Date: 9/21/10
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: D103144

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	53	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.33	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4334	Pass
			Overall Test Results	Pass


Laboratory Technician

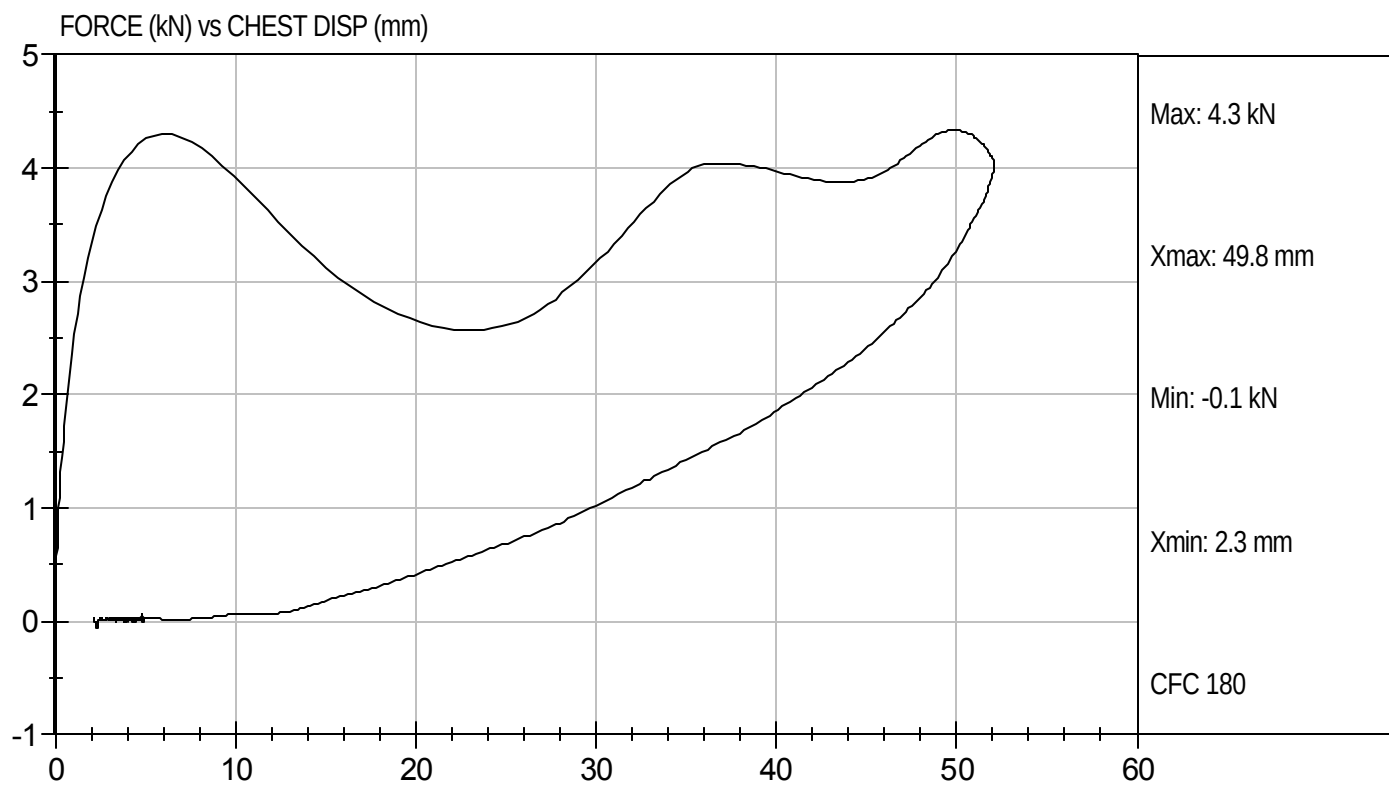
9/21/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D103144

Test Date: 9/21/10
Velocity: 22.22 ft/s, 6.77 m/s

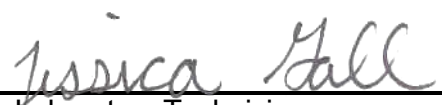


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103145

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Probe Speed	m/s	2.07 to 2.13	2.08	Pass
Maximum Force	kN	3.45 to 4.06	3.80	Pass
Overall Test Results				Pass


Laboratory Technician

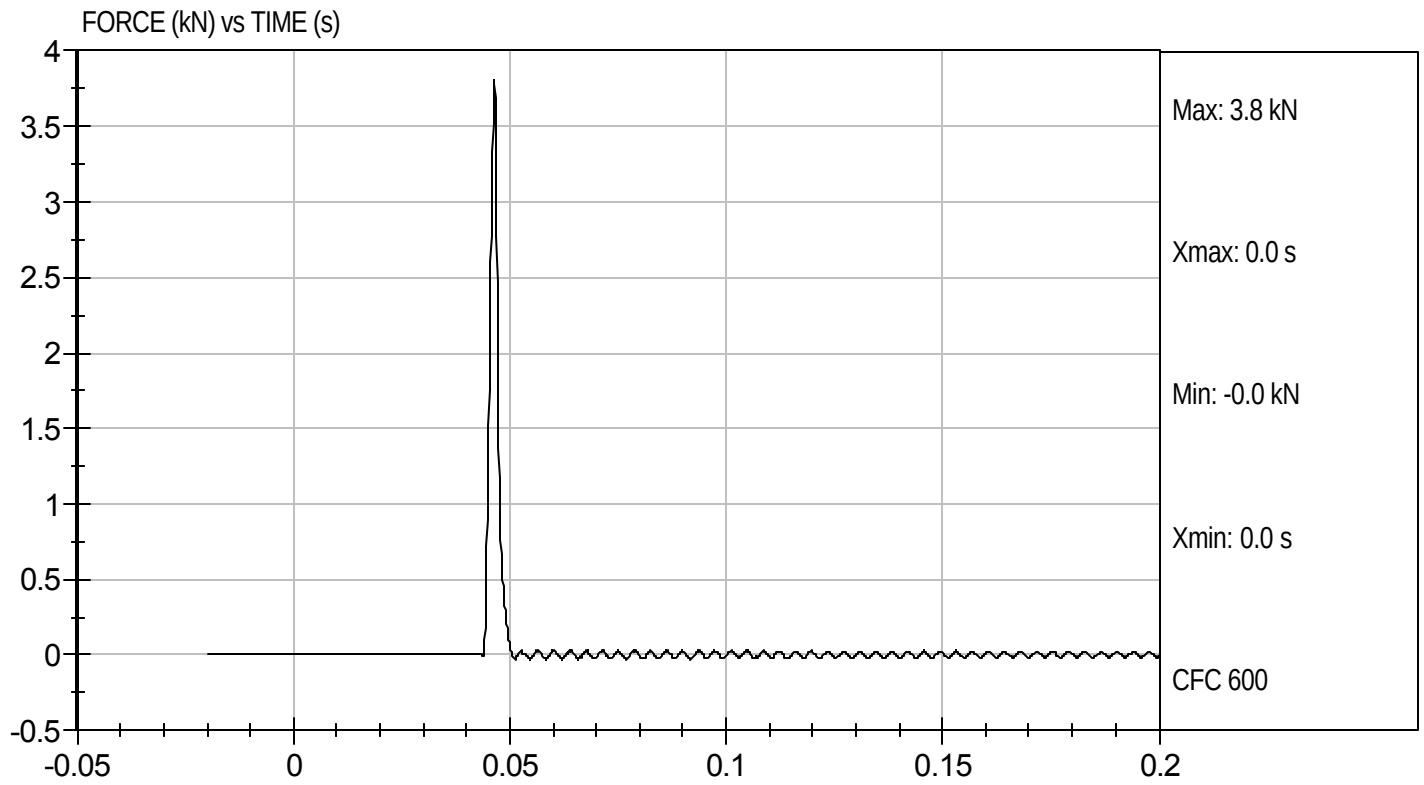
9/21/10
Test Date


Approved By



Test Desc: Right Knee
Component ID: D103145

Test Date: 9/21/10
Velocity: 6.83 ft/s, 2.08 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103146

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	kN	3.45 to 4.06	4.03	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

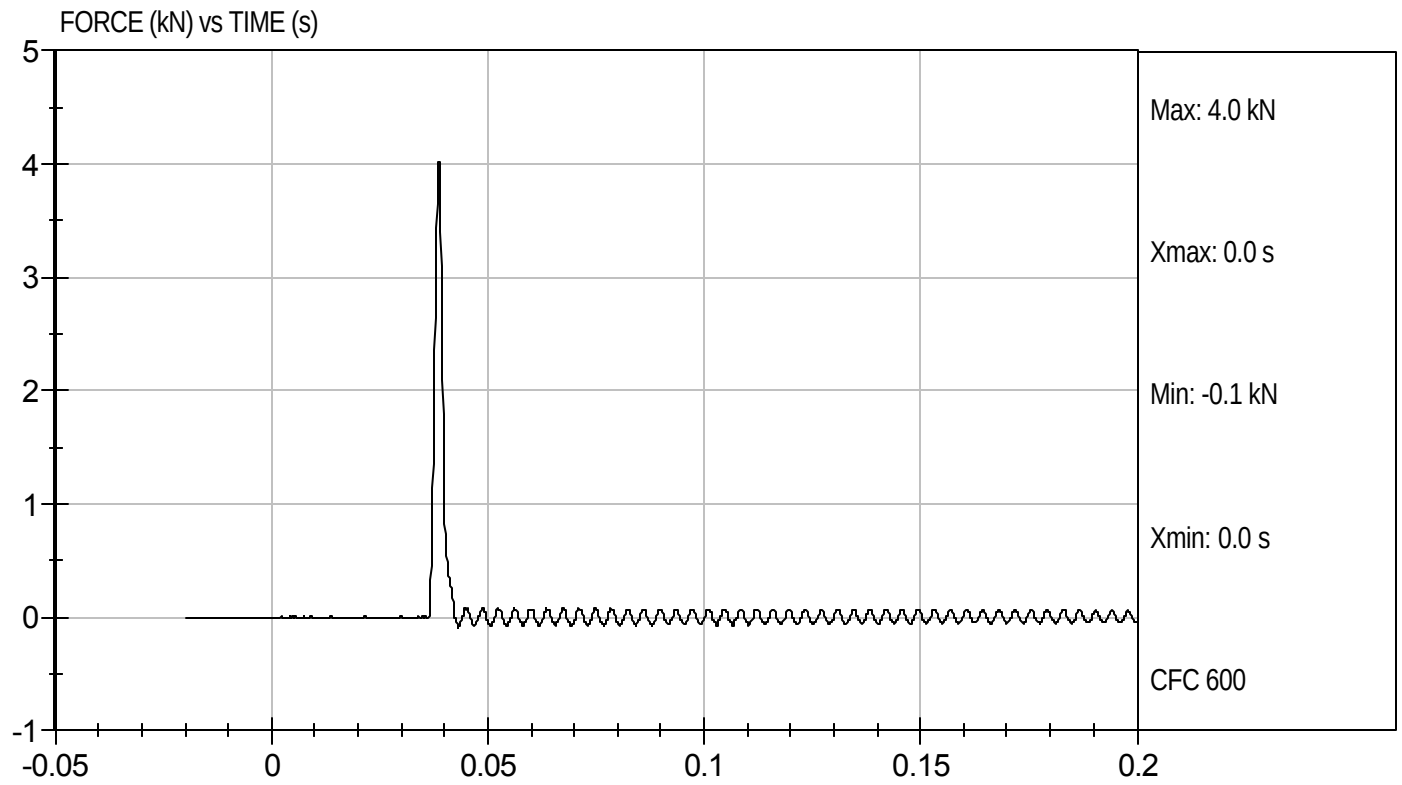
9/21/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D103146

Test Date: 9/21/10
Velocity: 6.802 ft/s, 2.07 m/s



MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D103147

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	55	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	7	Pass
Force at 45 deg	N	320 to 390	338	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

9/21/10
Test Date

David Winkelbauer
Approved By