

REPORT NUMBER: NCAP-MGA-2011-017

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

**GENERAL MOTORS LLC
2011 Chevrolet Tahoe LS 4WD
NHTSA No.: MB0120**

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



Test Date: September 3, 2010

Final Report Date: October 1, 2010

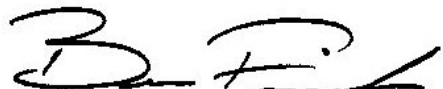
FINAL REPORT

**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 1, 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

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2011 Chevrolet Tahoe LS 4WD 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 3, 2010. The impact velocity was 56.5 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 698 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>137</td> <td>172</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>22</td> <td>13</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.26</td> <td>0.37</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1218</td> <td>963</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>850</td> <td>686</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2513</td> <td>1964</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>3088</td> <td>2498</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	137	172	Maximum Chest Compression	mm	63	52	22	13	Nij	N/A	1	1	0.26	0.37	Neck Tension	N	4170	2620	1218	963	Neck Compression	N	4000	2520	850	686	Left Femur Force	N	10008	6805	2513	1964	Right Femur Force	N	10008	6805	3088	2498
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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 Chevrolet Tahoe LS 4WD at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on September 3, 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 698 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)	137	82.9	97.9	22	0.26	1218	850	2513	3088
Passenger (5 th)	172	127.4	142.4	13	0.37	963	686	1964	2498

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 Chest Y after 120 msec.

- Driver Chest Z after 120 msec.

- Driver Right Ankle Z

- Driver Chest X Redundant after 120 msec.

- Driver Chest Y Redundant after 120 msec.

- Driver Chest Z Redundant after 120 msec.

- Left Brake Caliper X after 30 msec.

- Right Brake Caliper X after 30 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 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0120	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	Yes
Make	Chevrolet	Power Steering	Yes
Model	Tahoe	Driver Front Airbag	Yes
Body Style	MPV	Driver Curtain Airbag	Yes
VIN	1GNSKAE09BR102761	Driver Head/Torso Airbag	No
Body Color	Sheer Silver Metallic	Driver Torso Airbag	No
Delivery Date	8/02/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	34	Driver Pelvis Airbag	No
Odometer (km)	55	Driver Knee Airbag	No
Dealer	Ray Auto Group	Pass. Front Airbag	Yes
Transmission	Automatic	Pass. Curtain Airbag	Yes
Final Drive	4WD	Pass. Head/Torso Airbag	No
Type/No. Cylinders	8	Pass. Torso Airbag	No
Engine Displacement (L)	5.3	Pass. Torso/Pelvis Airbag	Yes
Engine Placement	Longitudinal	Pass. Pelvis Airbag	No
Roof Rack	Yes	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)	3311
Date of Manufacture	07/10	GAWR Front (kg)	1633
		GAWR Rear (kg)	1860

VEHICLE SEATING AND WEIGHT CAPACITY DATA

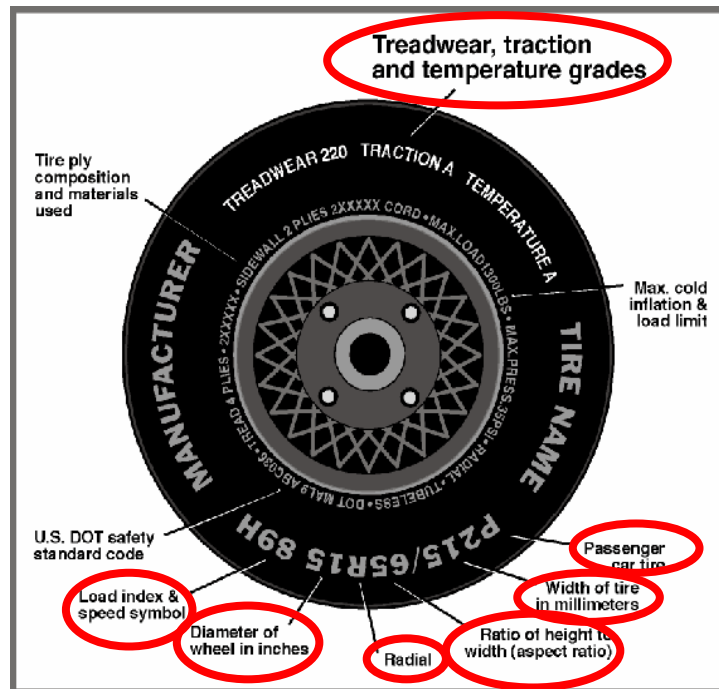
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	60/40 Bench	Bench	
Designated Seating Capacity (DSC)	2	3	3	8
Capacity Weight (VCW) (kg)				716
Cargo Weight (RCLW) (kg)				136

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
Test Date: 9/03/2010



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	220
Recommended Tire Size	P265/70R17	P265/70R17
Tire Size on Vehicle	P265/70R17	P265/70R17
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Wrangler HP	Wrangler HP
Treadwear	340	340
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	113S	113S
Tire Material	Rubber	Rubber
DOT Safety Code Right	ABT6 FOCR	ABT6 FOCR
DOT Safety Code Left	ABT6 FOCR	ABT6 FOCR

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

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	659.5	643.6		714.0	742.6	
Right	kg	681.3	596.9		687.6	706.7	
Ratio	%	51.9	48.1		49.2	50.8	
Totals	kg	1340.8	1240.5	2581.3	1401.6	1449.3	2850.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2581.3
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	2857.9

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	897	914	966	964	1429
As Tested	mm	891	904	929	943	1500
Post Test	mm	915	938	946	932	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2950
Total Vehicle Length at Left Side	mm	4976
Total Vehicle Length at Centerline	mm	5099
Total Vehicle Length at Right Side	mm	4976
Weight of Ballast in Cargo Area	kg	162.8
Weight of Vehicle Components Removed	kg	28.4
Amount of Stoddard Solvent in Fuel Tank	L	91.5

List of components removed to meet test weight: Right rear tail light, third row seat and brackets, trunk carpet and padding and plastic cover.

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

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	5099
2	Total Width	2000
3	Bumper Top Height	650
4	Bumper Bottom Height	490
5	Longitudinal Member Top Height	600
6	Distance between Longitudinal Members	720
7	Longitudinal Member Width	150
8	Engine Top Height	1158
9	Engine Bottom Height	340
10	Engine and Gearbox Width	1250
11	Front Bumper-Engine Distance	595
12	Front Shock Absorber Fixing Height	755
13	Bonnet Leading Edge Height	1040
14	Front Shock Absorber Fixing Width	120
15	Front Bumper – Front Axle Distance	1010
16	Front Axle – A-Pillar Distance	625
17	A-Pillar – B-Pillar Distance	1212
18	B-Pillar – Rear Axle Distance	533
19	B-Pillar – C-Pillar Distance	964
20	Roof Sill Bottom Height	1722
21	Roof Sill Top Height	1825
22	Floor Sill bottom Height	413
23	Floor Sill Top Height	520

DATA SHEET NO. 2

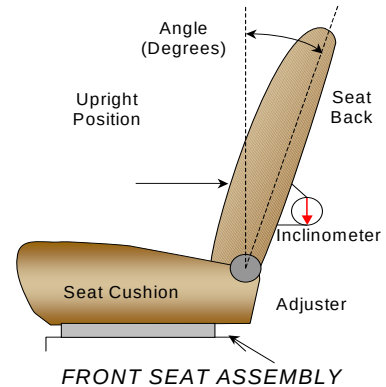
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

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	7.5° on headrest post
Passenger Seat Back Angle	4.0° on headrest post

SEAT FORE/AFT POSITIONS

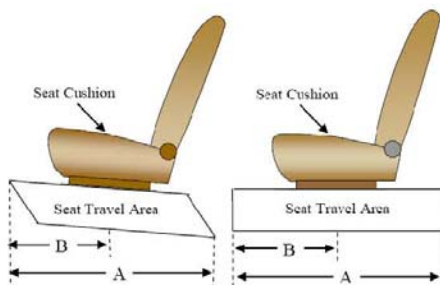
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	280 mm	140 mm (forward-most as 0)
Passenger Seat	212 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	0 (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 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

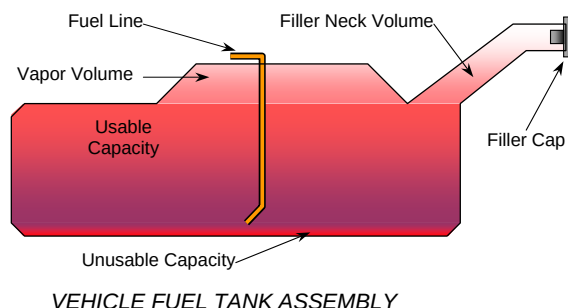
NHTSA No.: MB0120
 Test Date: 9/03/2010

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	98.4
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	90.5 to 92.5
Actual Amount of Solvent used	91.5
1/3 of Usable Capacity	32.8

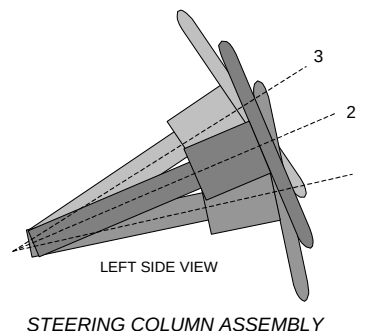
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. Pump will run when engine is running. Also, it will run briefly when ignition key is turned to the "on" position without starting the engine. 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.



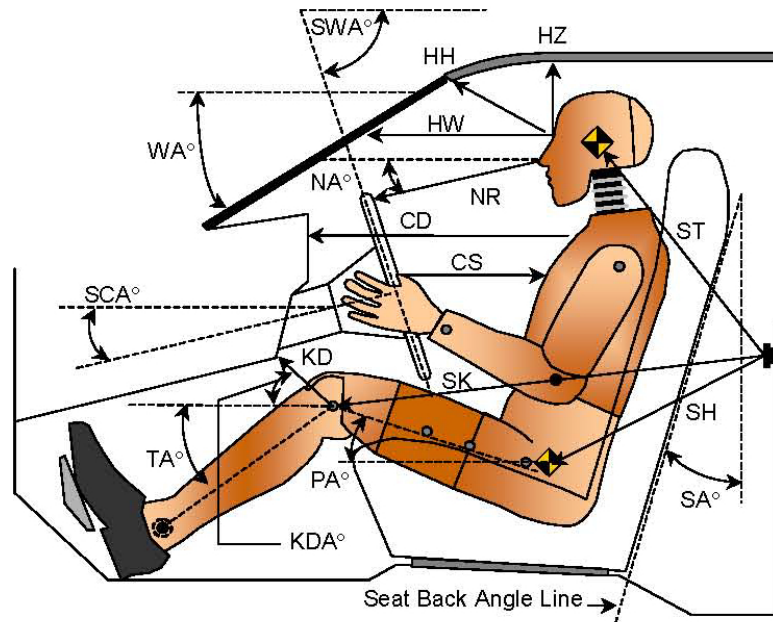
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	79.0	
Geometric Center – Position 2	69.0	
Uppermost – Position 3	59.0	
Telescoping Steering Wheel Travel		
Test Position	69.0	

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

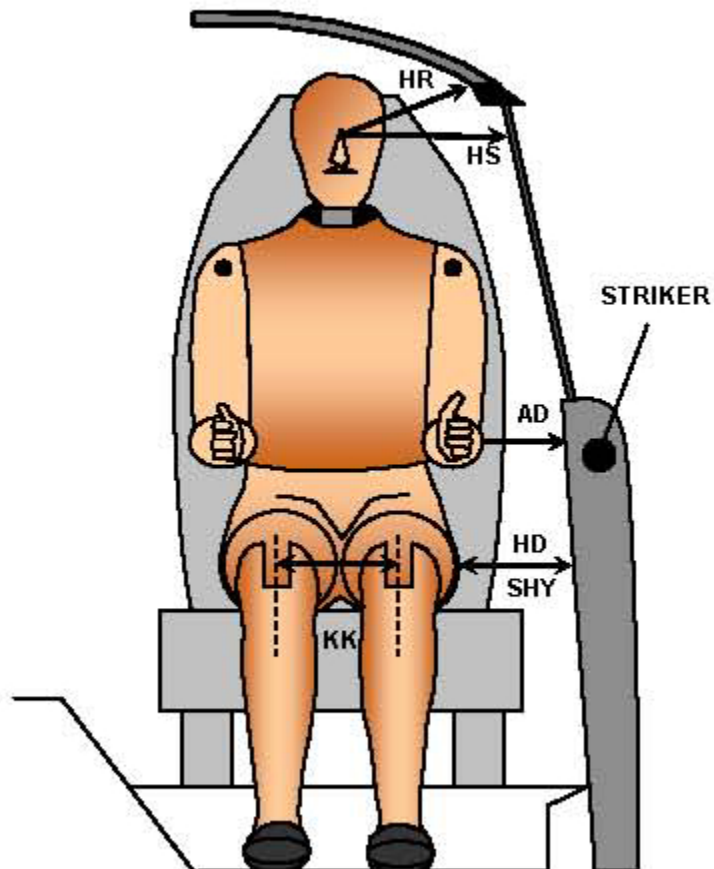


Code	Measurement Description	Driver S/N 351		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		33.0		
SWA	Steering Wheel Angle		69.0		
SCA	Steering Column Angle		21.0		
SA	Seat Back Angle (headrest bezel)		7.5		4.0
HZ	Head to Roof (Z)	243	90	272	90
HH	Head to Header	430	22.6	379	31.4
HW	Head to Windshield	674	0	676	0
NR	Nose to Rim	376	12.0		
CD	Chest to Dash	506		399	
CS	Chest to Steering Hub	314	5.1		
RA	Rim to Abdomen	188	0		
KDL	Left Knee to Dash	154	31.1	103	39.7
KDR	Right Knee to Dash	121	33.8	104	34.0
PA	Pelvic Angle		22.5		18.3
TA	Tibia Angle		48.3		52.8
SK	Striker to Knee	713	84.6	790	86.3
ST	Striker to Head	664	17.6	649	38.5
SH	Striker to H-Point	321	96.3	460	93.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

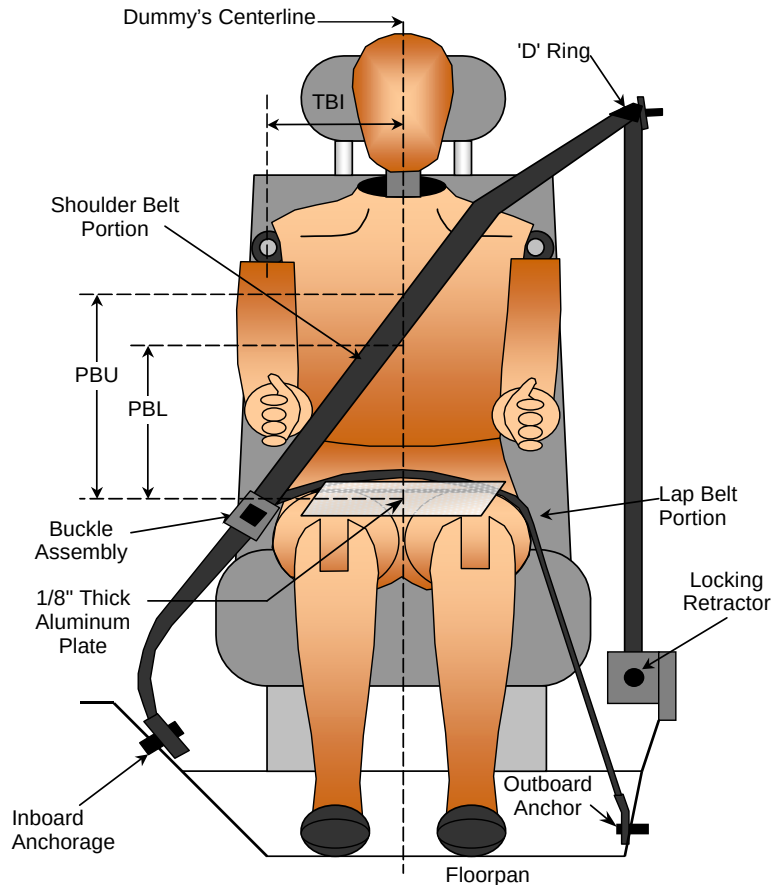


Code	Measurement Description	Driver S/N 351	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	132	106
HD	H-Point to Door	143	184
HR	Head to Side Header	216	284
HS	Head to Side Window	330	362
KK	Knee to Knee	315	213
SHY	Striker to H-Point (Y Direction)	275	310
AA	Ankle to Ankle	295	172

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

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	365	300
PBL - To surface of reference to belt lower edge	mm	280	215

BELT LENGTH DATA

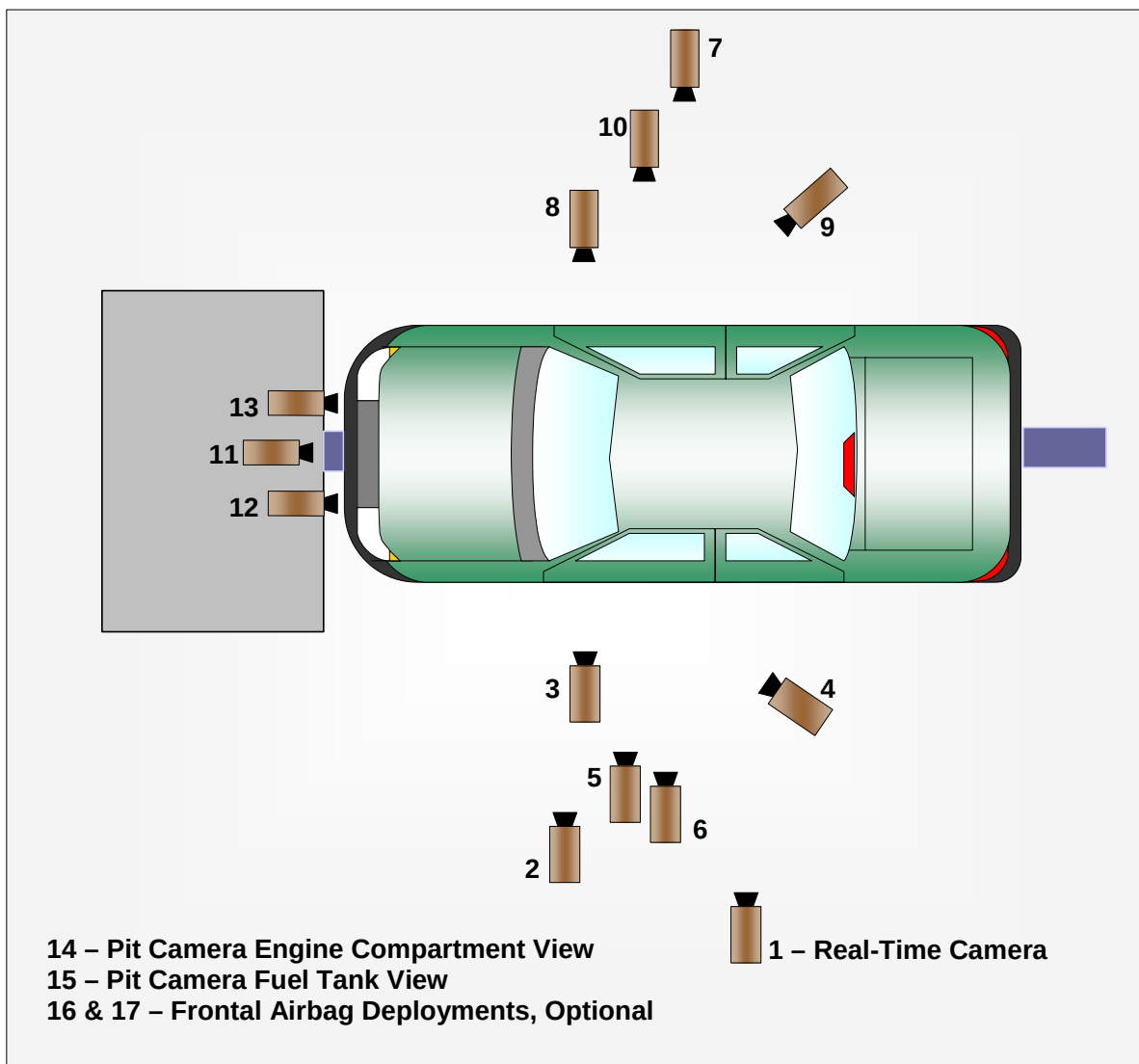
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	860	900
Lap Belt Length as measured on ATD	mm	590	580
Remainder of belt of reel	mm	1690	1620
Total Belt Length for Continuous Webbing Systems	mm	3140	3100

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

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
Test Date: 9/03/2010

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

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	1230	-5410	-1180	24	1000
3	Driver Close-Up	1580	-6470	-1760	35	1000
4	Driver Angle	5510	-4760	-1870	50	1000
5	Steering Column Top	890	-5390	-1290	25	1000
6	Steering Column Bottom	860	-5420	-880	25	1000
7	Right Overall	2340	7140	-1170	20	1000
8	Passenger Close-Up	1660	6560	-1700	35	1000
9	Passenger Angle	5580	4660	-1890	50	1000
10	Right Front Half	1210	5500	-1260	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	3230	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

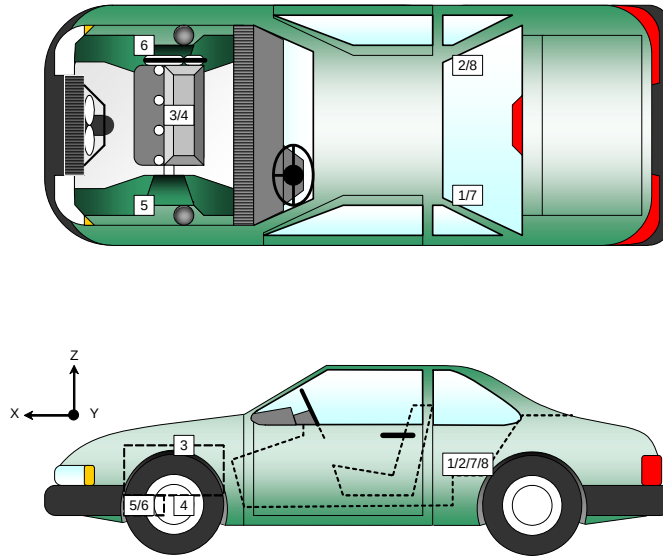
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	2120	-510	-610
2	Right Rear X-Member X	2110	470	-610
3	Engine Top X	4020	0	-1150
4	Engine Bottom X	3802	0	-330
5	Left Brake Caliper X	3930	-750	-285
6	Right Brake Caliper X	3930	750	-285
7	Left Rear X-Member Z	2120	-510	-610
8	Right Rear X-Member Z	2110	470	-610

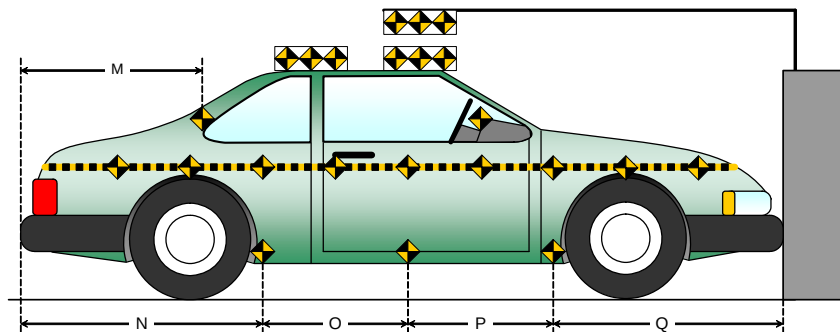
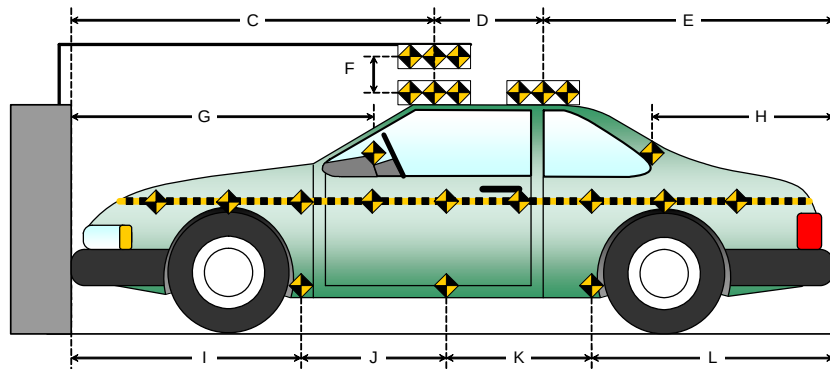
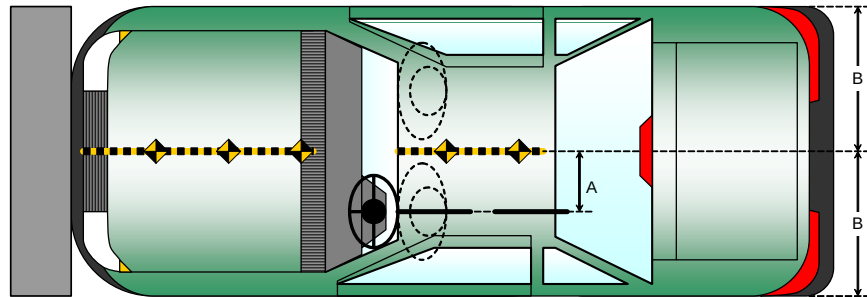
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

Item	Value (mm)
A	465
B	993
C	2474
D	648
E	1977
F	89
G	
H	1451
I	1485
J	963
K	960
L	1691
M	1141
N	1689
O	960
P	965
Q	1485



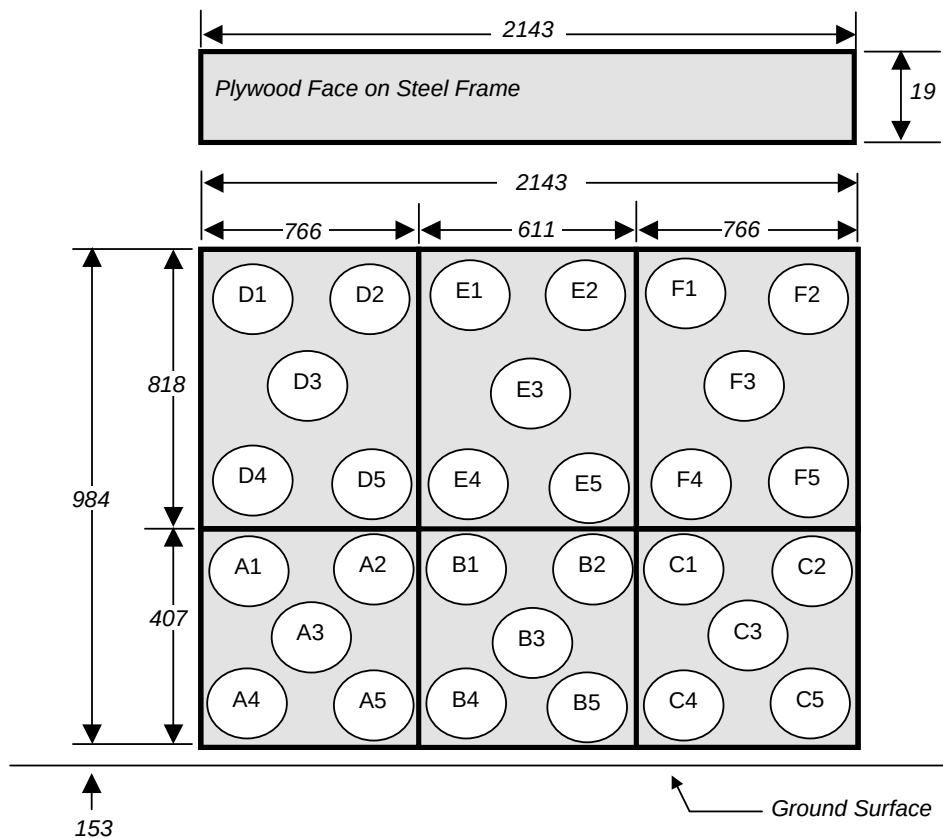
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

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 Chevrolet Tahoe LS 4WD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
Test Date: 9/03/2010

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 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

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	Cracked
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	870
Center	mm	875
Right Side	mm	900
Average	mm	882

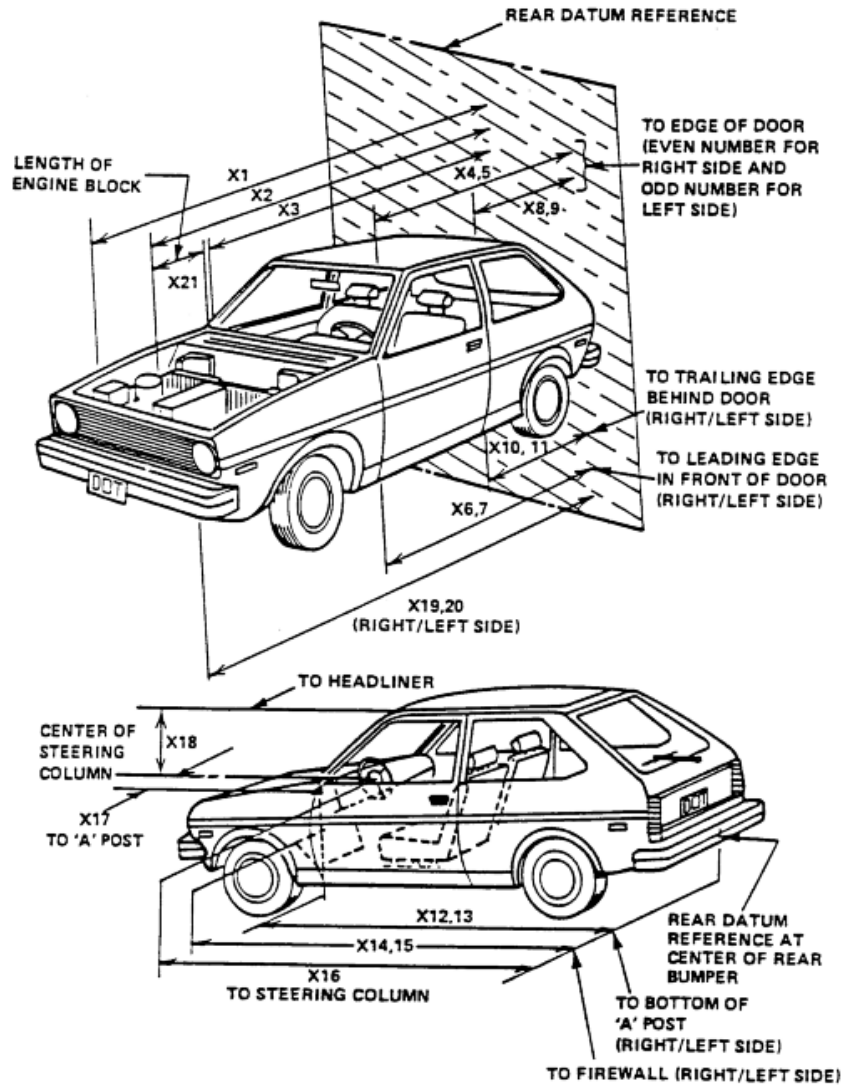
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5099	4430	669
2	RSOV to Front of Engine	mm	4312	4185	127
3	RSOV to Firewall	mm	3910	3816	94
4	RSOV to Upper Leading Edge of Right Door	mm	3518	3508	10
5	RSOV to Upper Leading Edge of Left Door	mm	3514	3514	0
6	RSOV to Lower Leading Edge of Right Door	mm	3490	3476	14
7	RSOV to Lower Leading Edge of Left Door	mm	3490	3474	16
8	RSOV to Upper Trailing Edge of Right Door	mm	2370	2368	2
9	RSOV to Upper Trailing Edge of Left Door	mm	2365	2364	1
10	RSOV to Lower Trailing Edge of Right Door	mm	2347	2336	11
11	RSOV to Lower Trailing Edge of Left Door	mm	2347	2334	13
12	RSOV to Bottom of "A" Post of Right Side	mm	3494	3471	23
13	RSOV to Bottom of "A" Post of Left Side	mm	3494	3485	9
14	RSOV to Firewall, Right Side	mm	3864	3737	127
15	RSOV to Firewall, Left Side	mm	3855	3842	13
16	RSOV to Steering Column	mm	3035	3086	-51
17	Center of Steering Column to "A" Post	mm	395	396	-1
18	Center of Steering Column to Headliner	mm	461	474	-13
19	RSOV to Right Side of Front Bumper	mm	4976	4308	668
20	RSOV to Left Side of Front Bumper	mm	4976	4332	644
21	Length of Engine Block	mm	580	580	0
RD	RSOV to Right Side of Dash Panel	mm	3320	3312	8
CD	RSOV to Center of Dash Panel	mm	3309	3299	10
LD	RSOV to Left Side of Dash Panel	mm	3320	3320	0

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

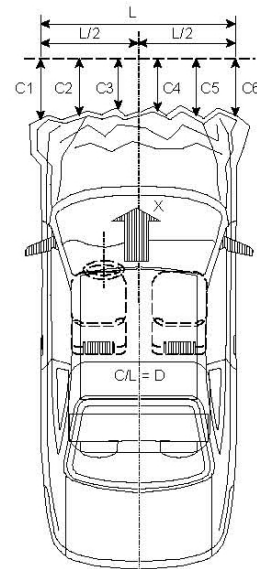
NHTSA No.: MB0120
 Test Date: 9/03/2010

VEHICLE INFORMATION

VIN: 1GNSKAE09BR102761 Wheelbase (mm): 2950
 Vehicle Size Category: MPV Test Weight (kg): 2850.9

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): 56.5
 Velocity Change (km/h): 66.0
 Time of Separation (msec): 154.7



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1440
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4976	4332	644
C2	Crush zone 2 at left side	mm	5052	4389	663
C3	Crush zone 3 at left side	mm	5084	4389	695
C4	Crush zone 4 at right side	mm	5084	4386	698
C5	Crush zone 5 at right side	mm	5051	4385	666
C6	Crush zone 6 at right side	mm	4975	4308	667
L	C1 TO C6	mm	1440	1191	249

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

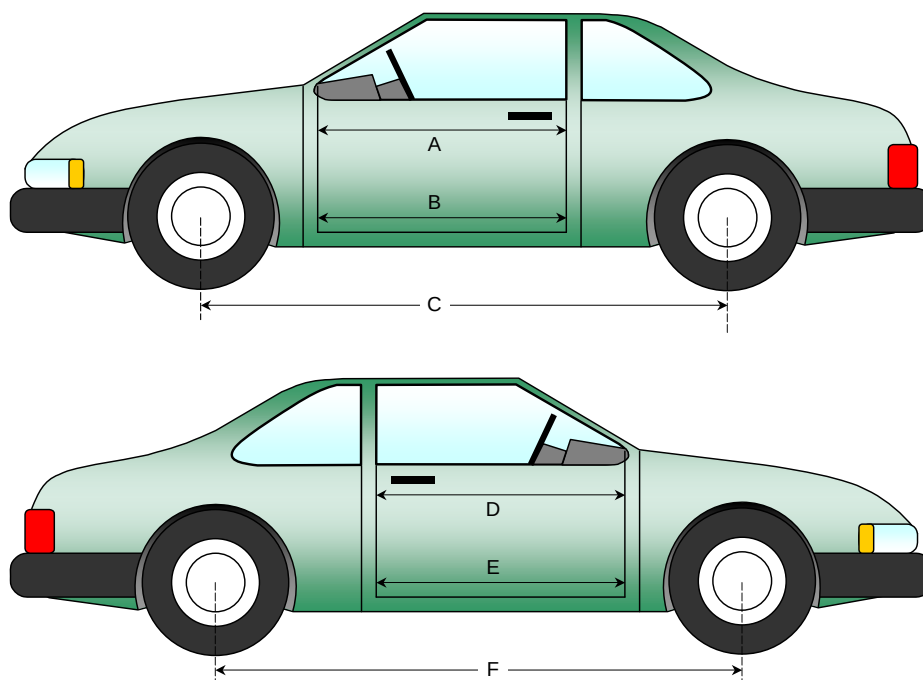
NHTSA No.: MB0120
 Test Date: 9/03/2010

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1105	1090	25
B	Left Side Lower	mm	1105	1100	5
D	Right Side Upper	mm	1115	1100	15
E	Right Side Lower	mm	1105	1105	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2950	2855	95
F	Right Side Wheelbase	mm	2950	2785	165



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

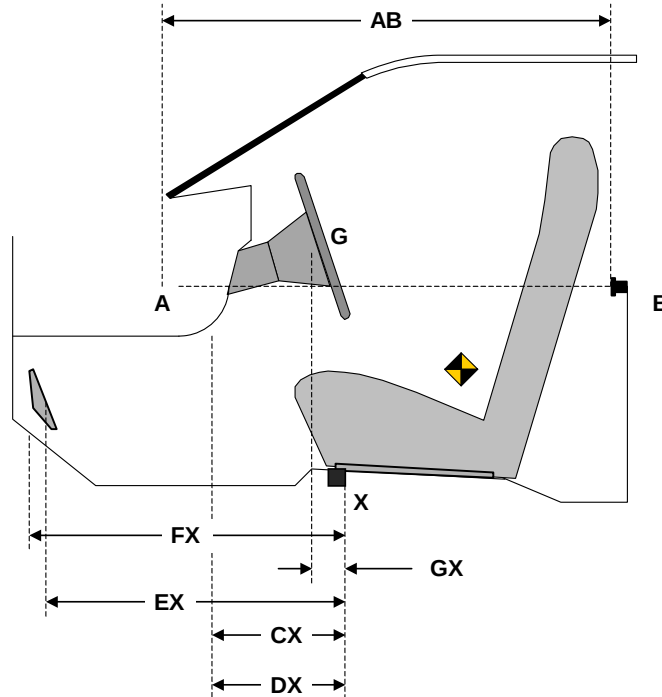
Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	805	805	0
CX	Left Knee Bolster to X	mm	315	272	43
DX	Right Knee Bolster to X	mm	305	263	42
EX	Brake Pedal to X	mm	590	510	80
FX	Foot Rest to X	mm	729	642	87
GX	Center of Steering Column Wheel Hub to X	mm	110	80	30

X = Front of Seat Track (stationary)

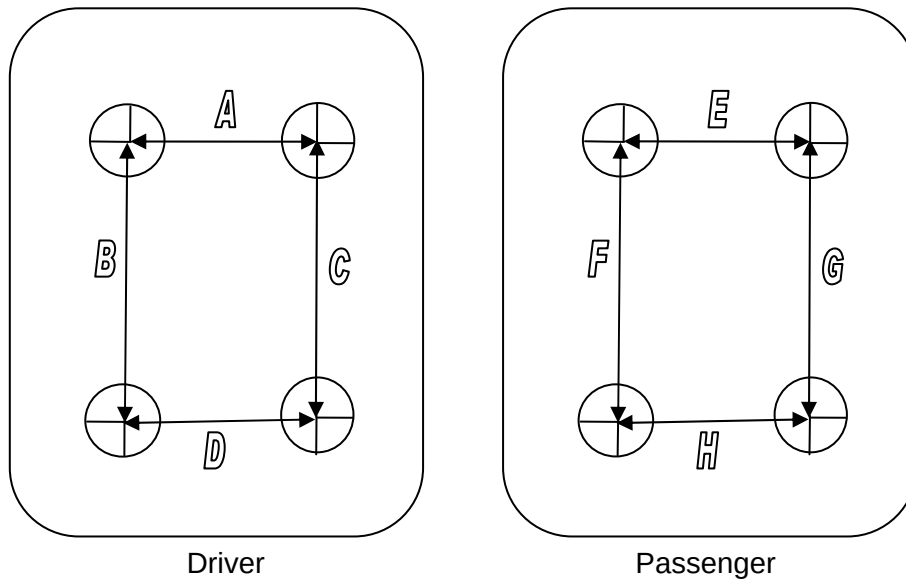


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	150	148	2
B	mm	150	150	0
C	mm	160	160	0
D	mm	150	150	0
E	mm	150	147	3
F	mm	150	150	0
G	mm	160	160	0
H	mm	150	148	2

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

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

Windshield Mounting Details:

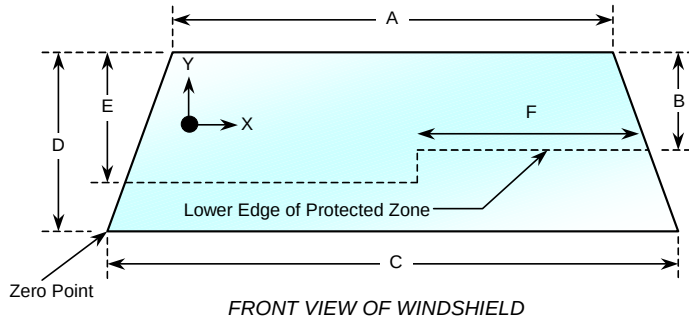
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2301	2301	100
Right Side	2301	2301	100
Total	4602	4602	100



Item	Units	Value
A	mm	1378
B	mm	490
C	mm	1738
D	mm	743
E	mm	490
F	mm	510

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 Chevrolet Tahoe LS 4WD</u>	NHTSA No.:	<u>MB0120</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>9/03/2010</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time:	<u>10:43 am</u>	Temperature:	<u>21° C</u>
------------	-----------------	--------------	--------------

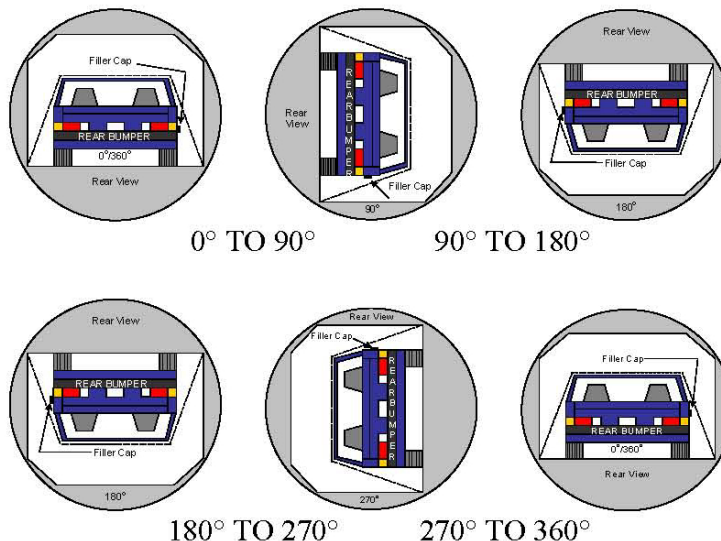
- | | |
|---|--------------|
| A. From impact until vehicle motion ceases:
(Maximum Allowable = 1 ounce) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 ounces) | <u>None</u> |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>None</u>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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
 Test Date: 9/03/2010

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°	107	300	407
90° to 180°	110	300	410
180° to 270°	111	300	411
270° to 360°	111	300	411

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

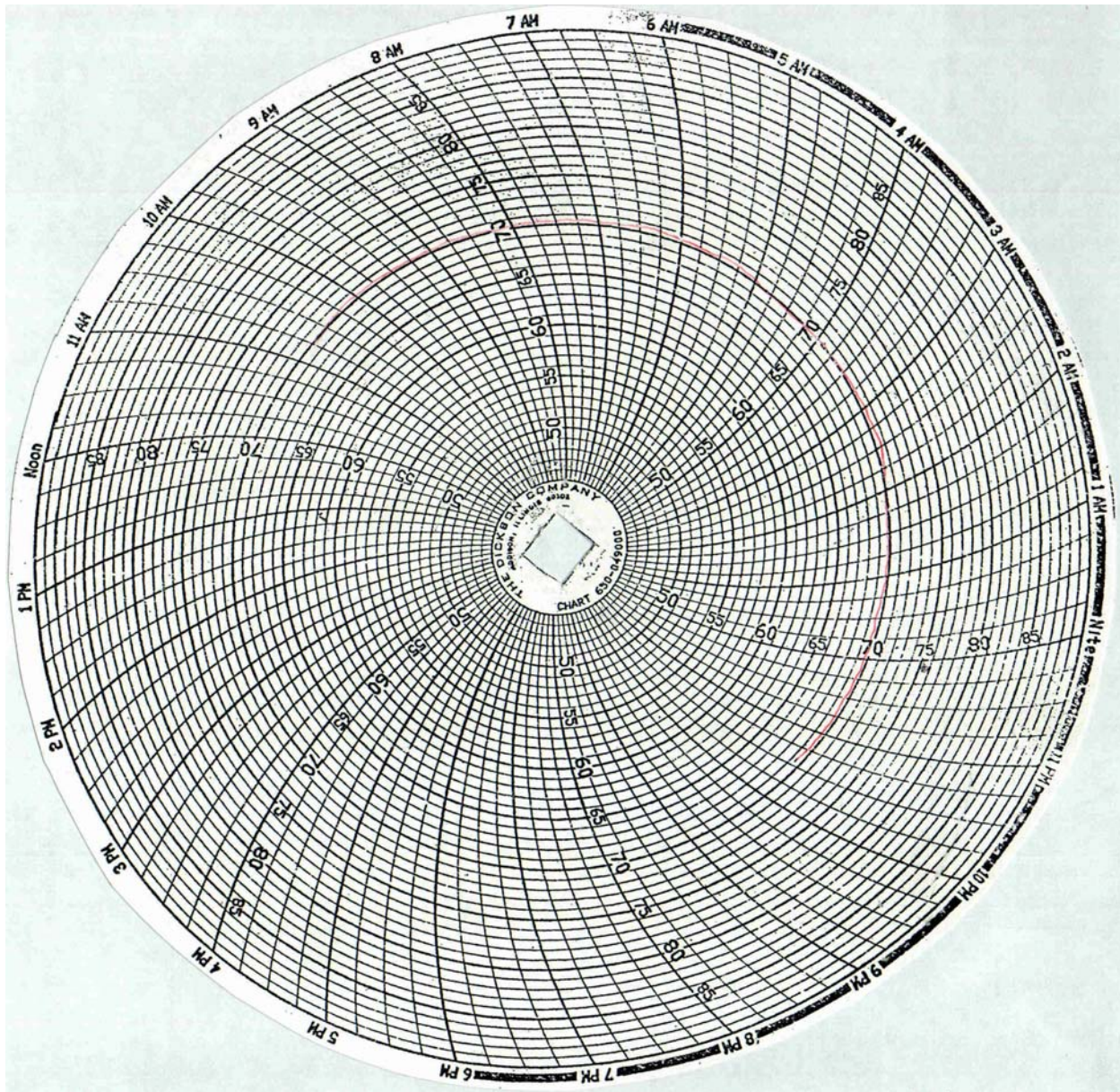
Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Chevrolet Tahoe LS 4WD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0120
Test Date: 9/03/2010



APPENDIX A
PHOTOGRAPHS

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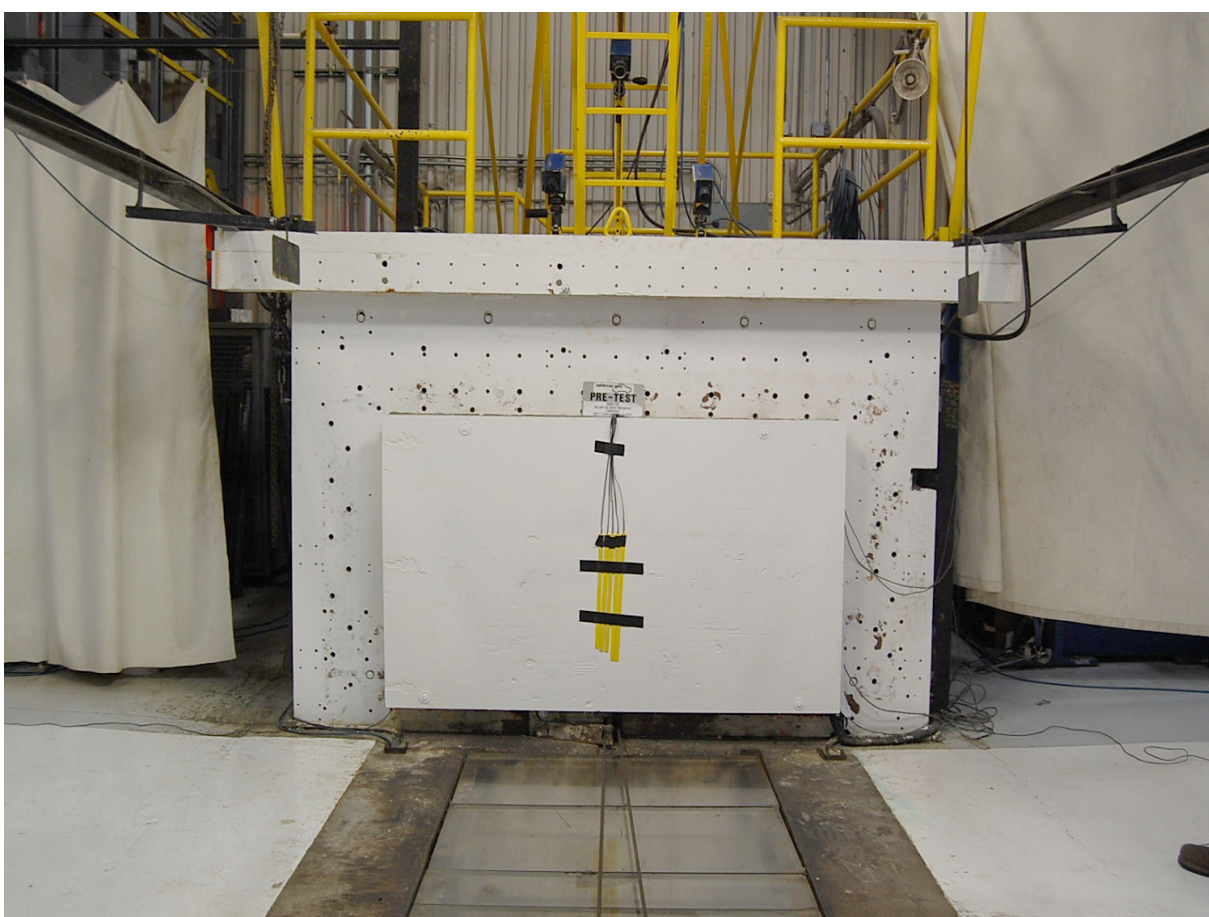
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Load Cell Location



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



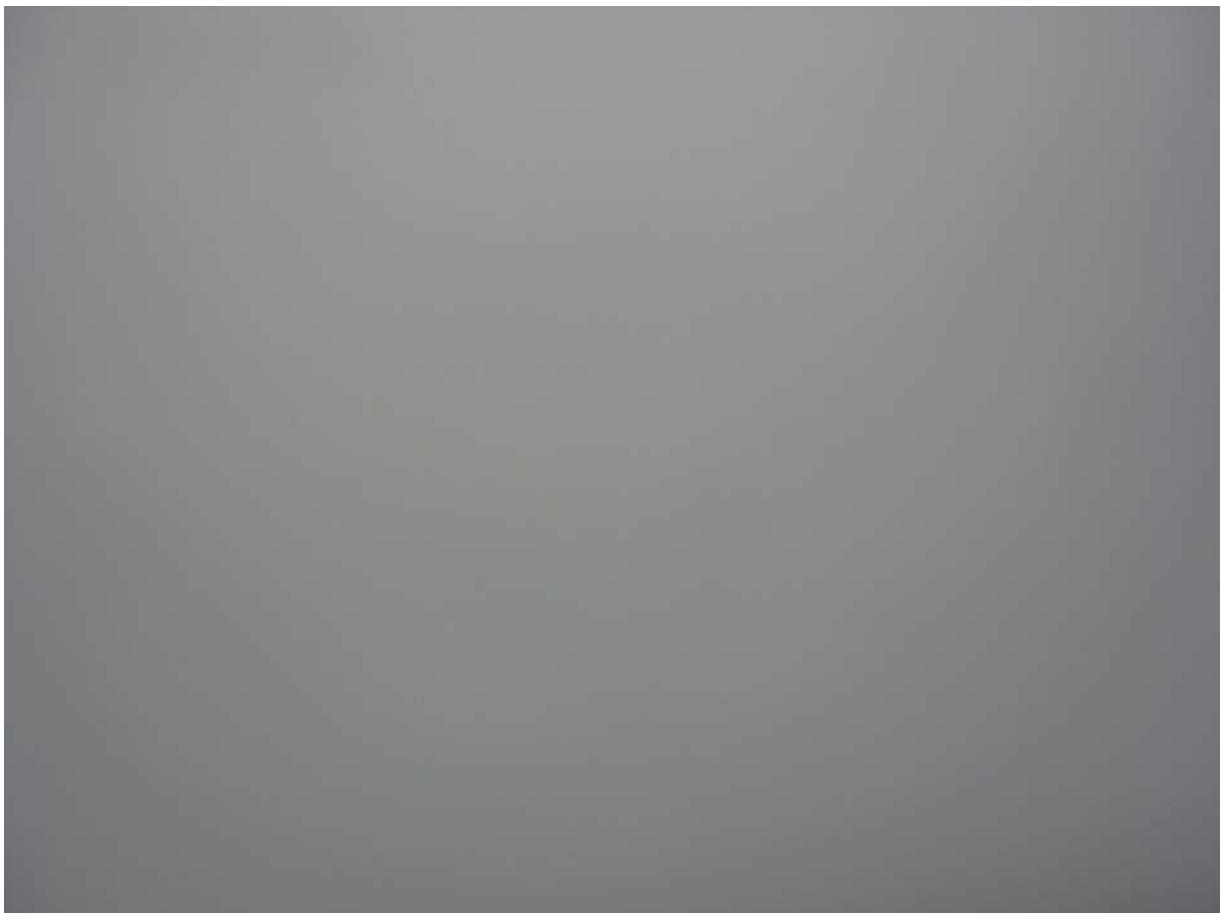
Pre-Test Left Side View (with vehicle at barrier)



Post-Test Left Side View



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



Post-Test Right Side View (photo not available)



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



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



Pre-Test Left Rear $\frac{3}{4}$ View (with vehicle at barrier)



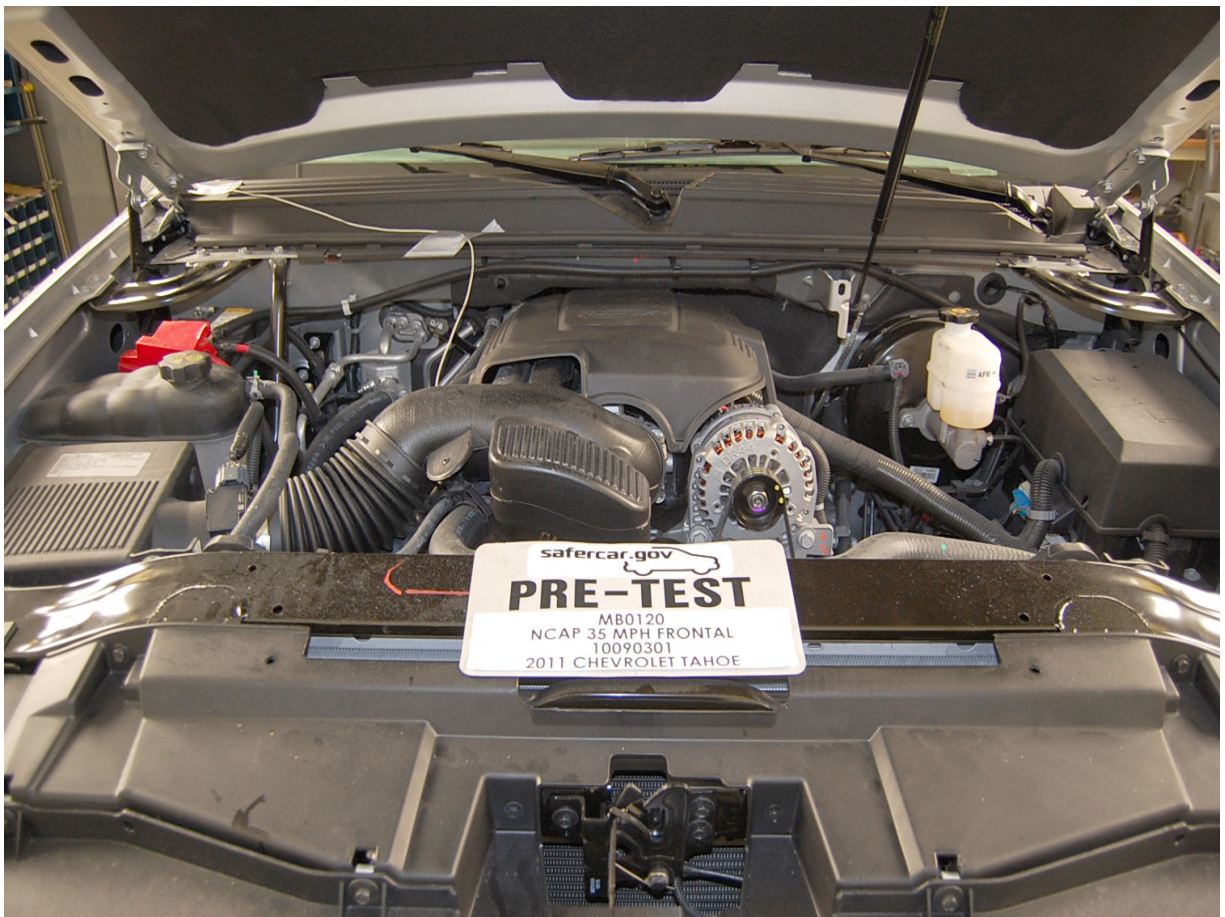
Post-Test Left Rear $\frac{3}{4}$ View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



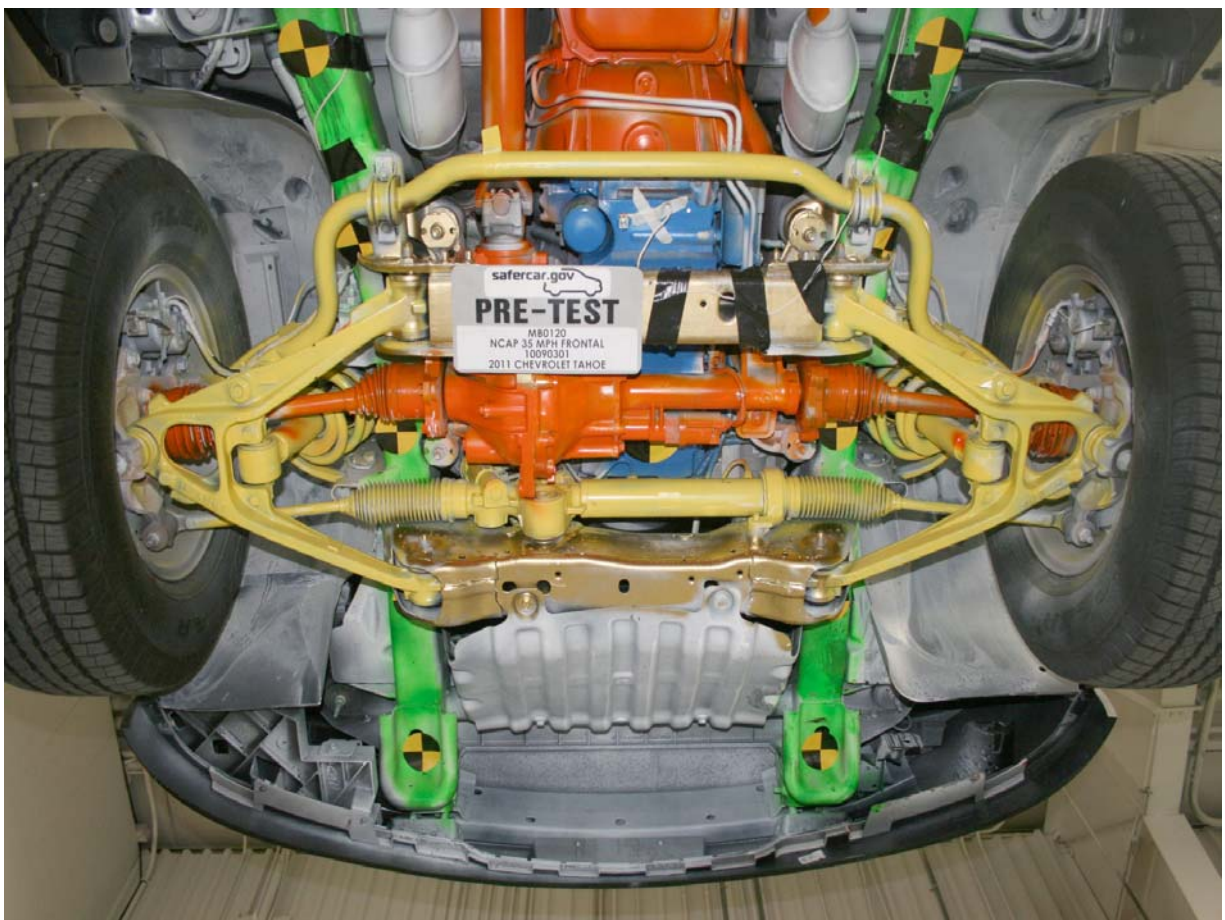
Post-Test Engine Compartment View



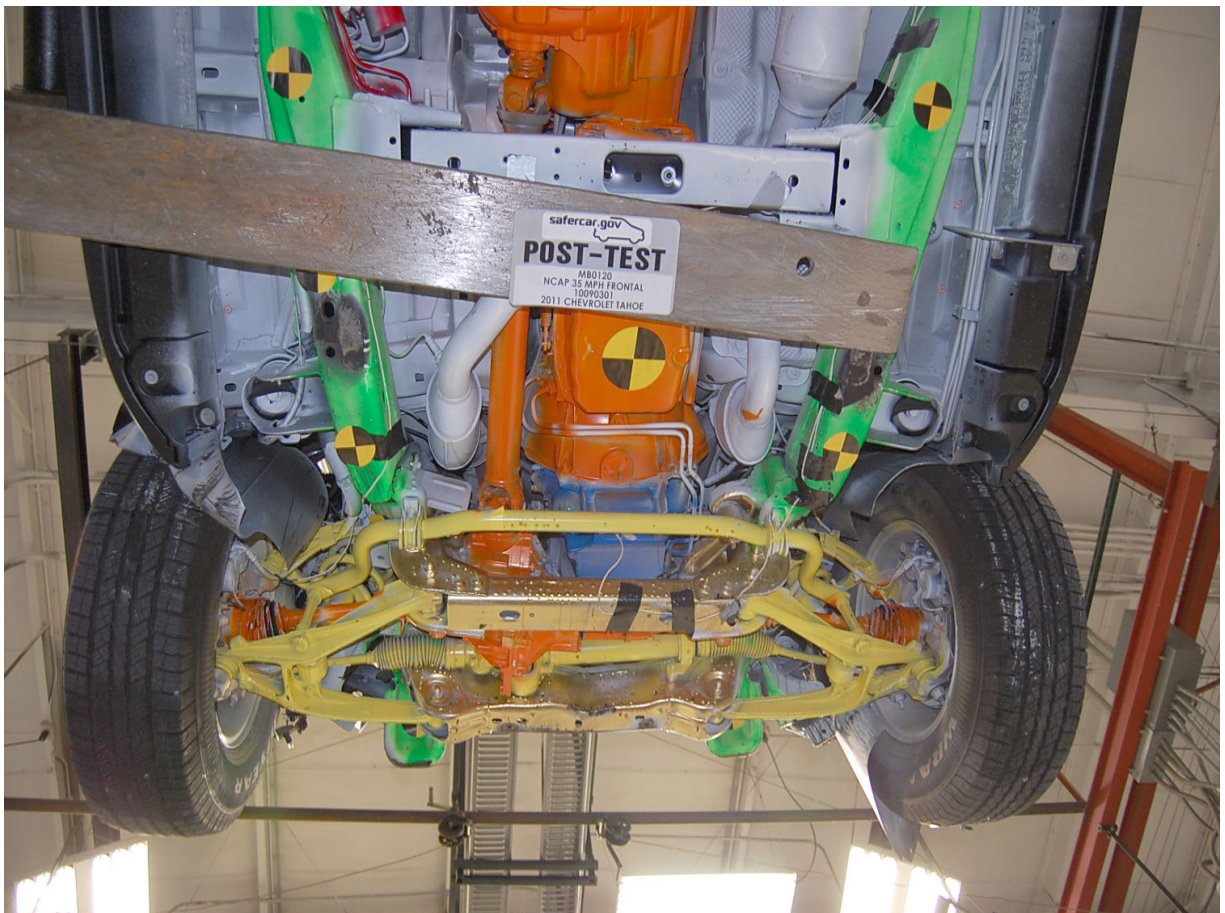
Pre-Test Fuel Cap View



Post-Test Fuel Cap View



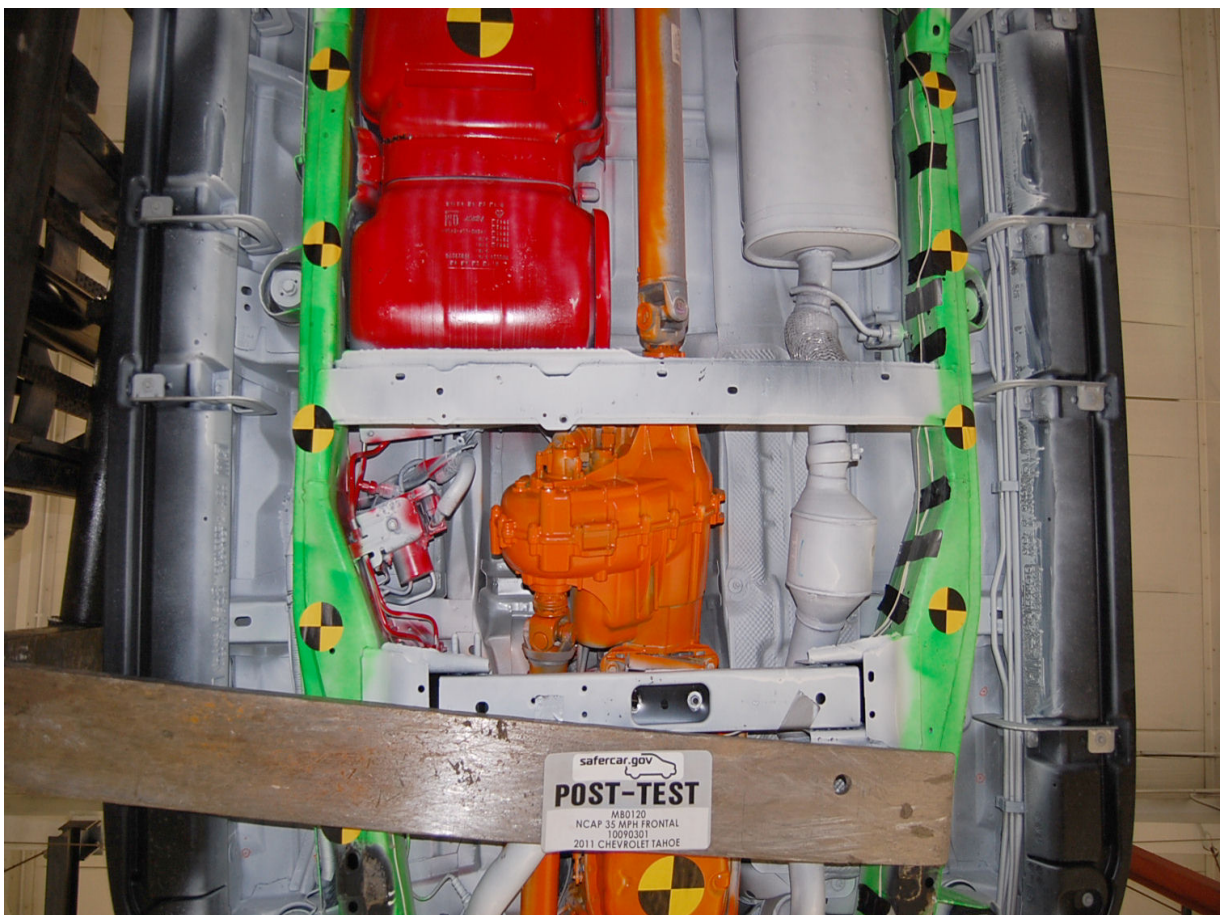
Pre-Test Front Underbody View



Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



Post-Test Mid Front Underbody View



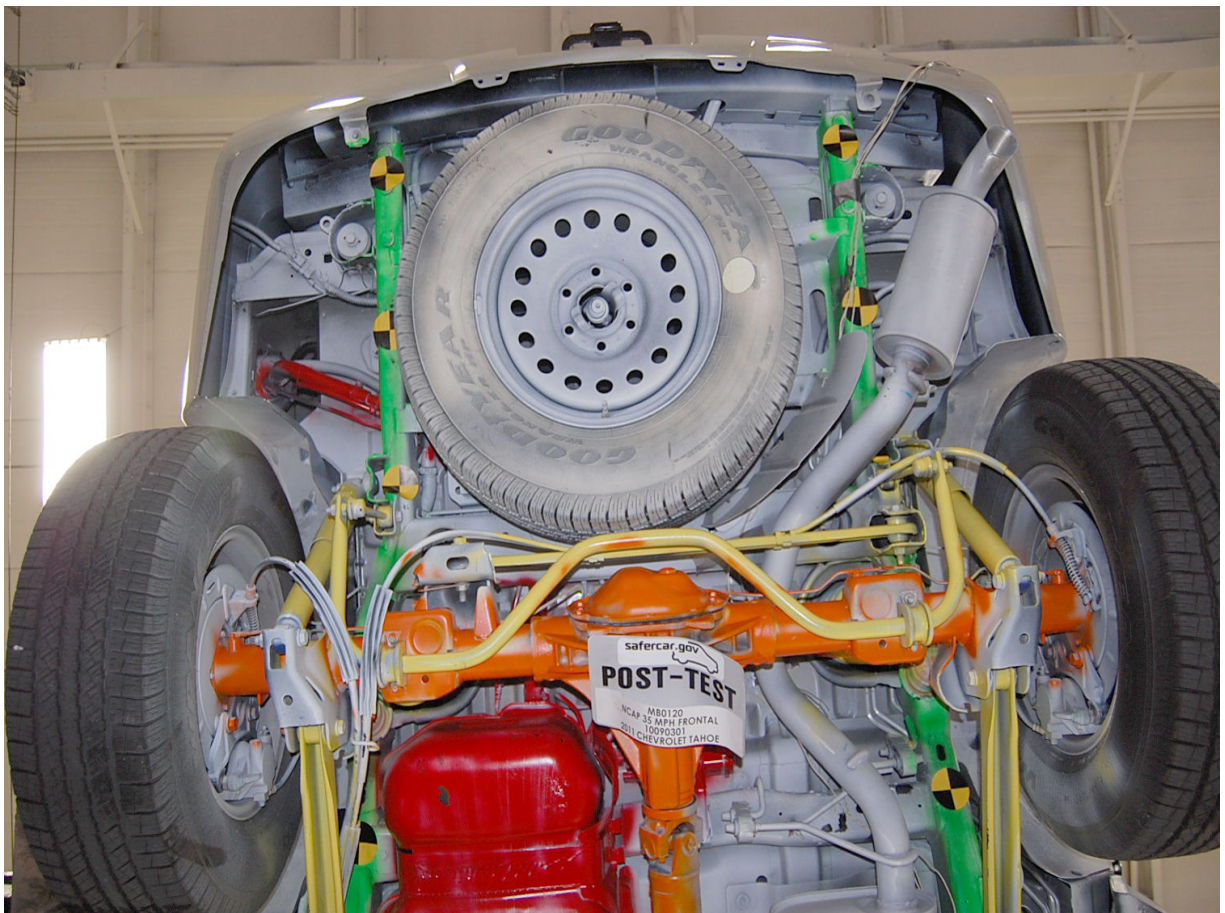
Pre-Test Mid Rear Underbody View



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



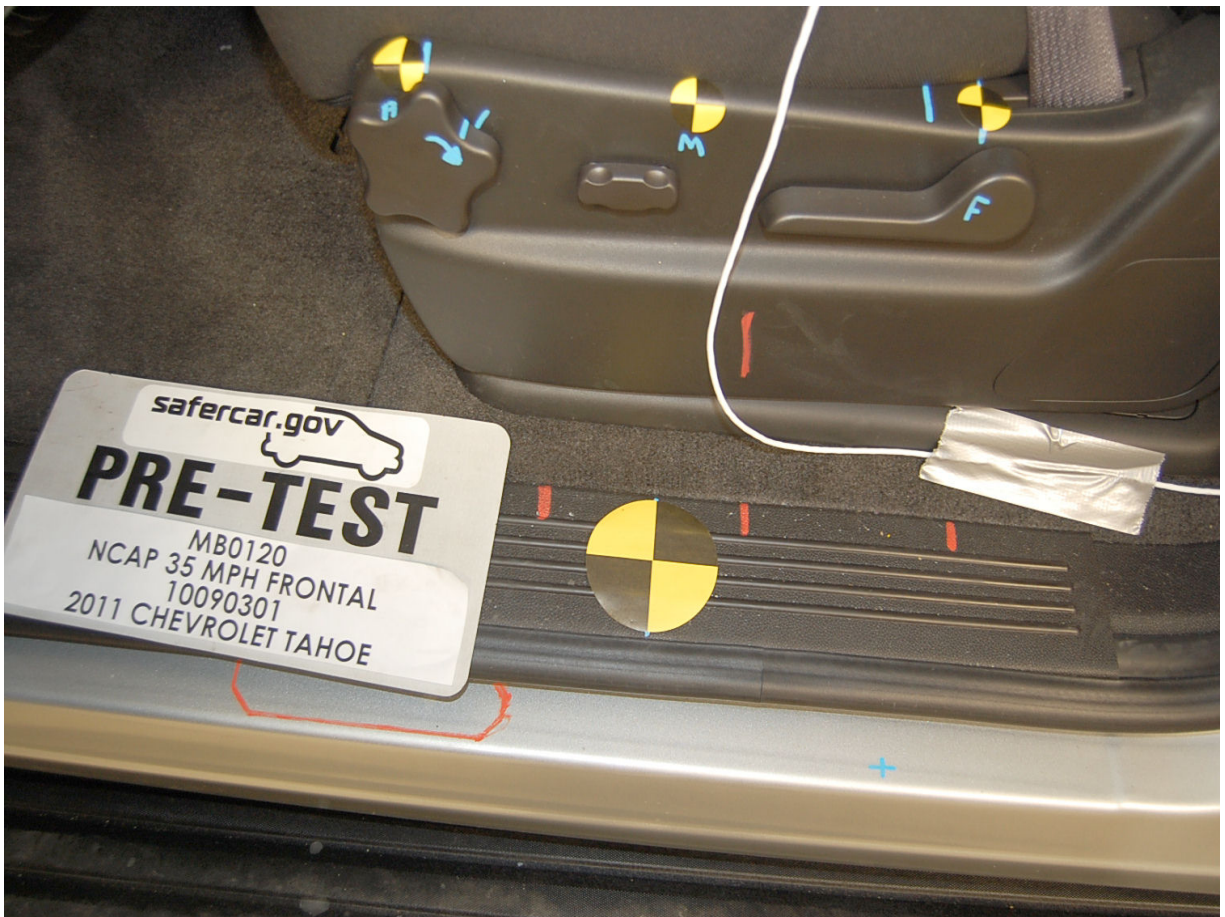
Post-Test Driver Dummy Window View



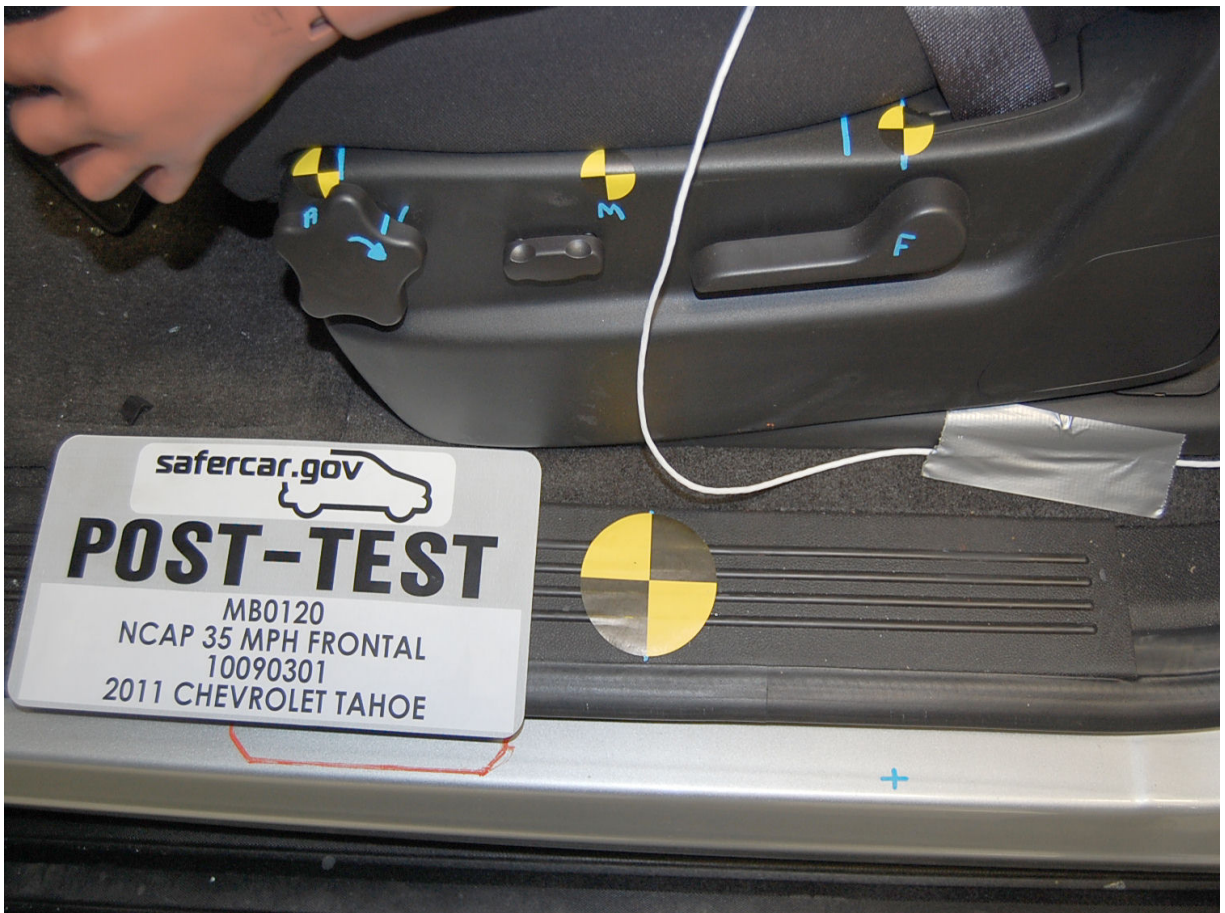
Pre-Test Driver Dummy and Vehicle Interior (Door Open)



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



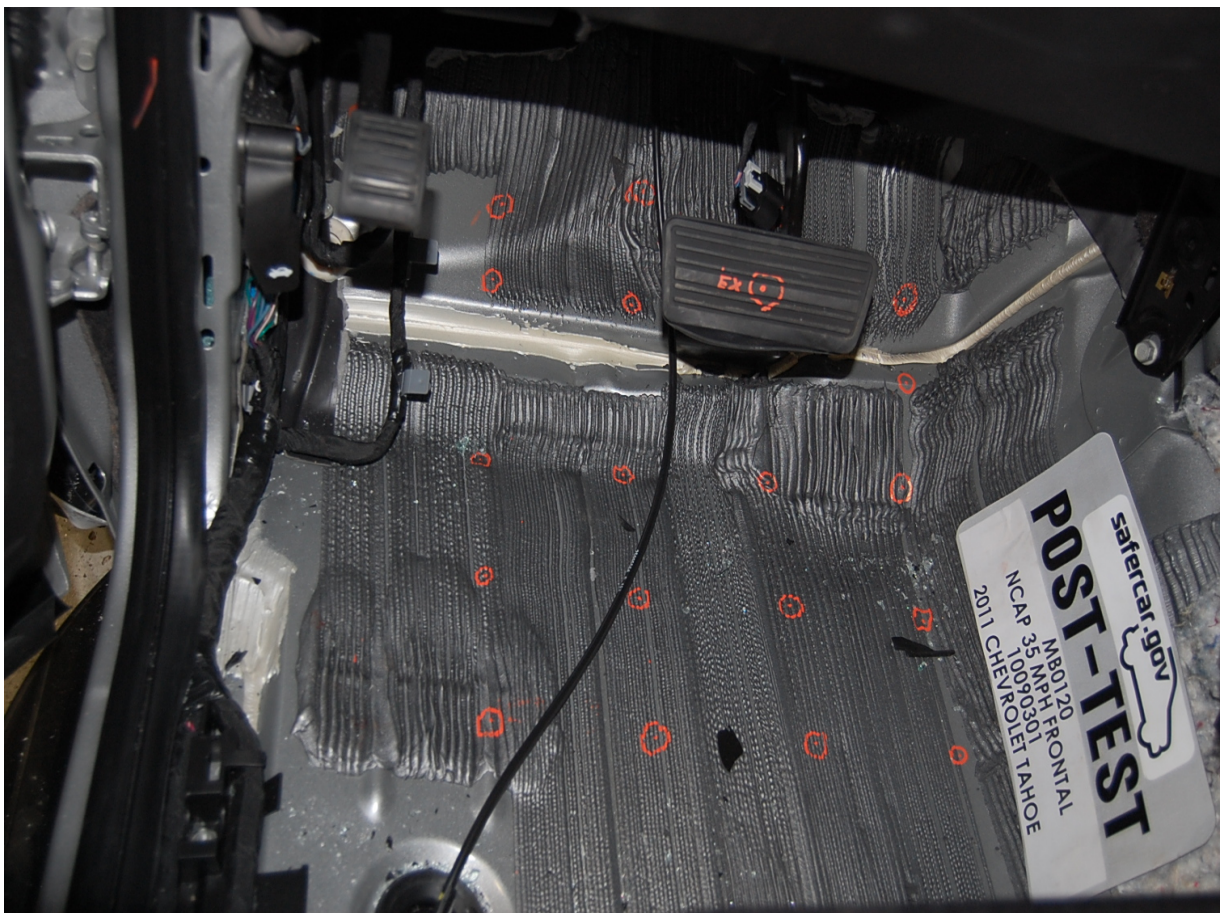
Pre-Test Driver's Side Knee Bolster (without dummy)



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



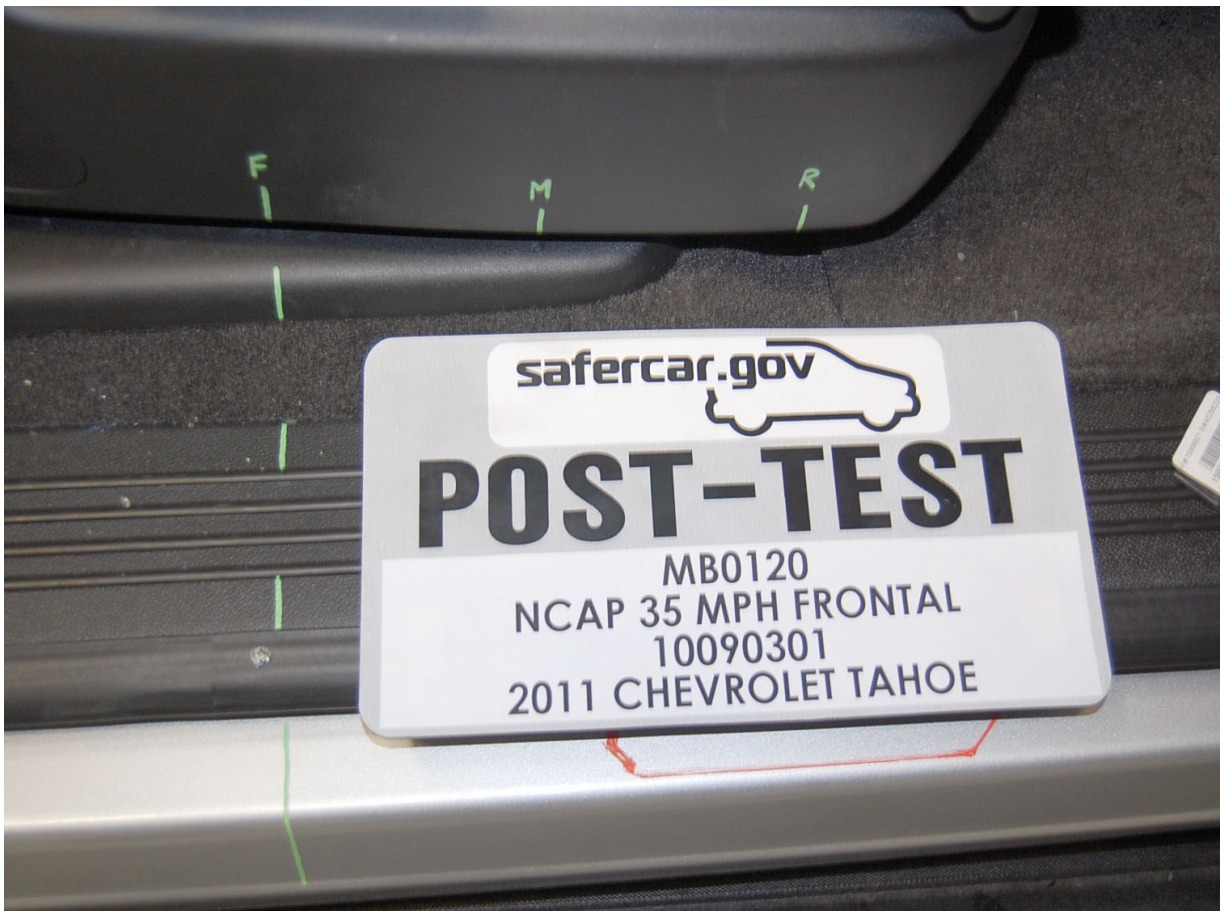
Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



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)



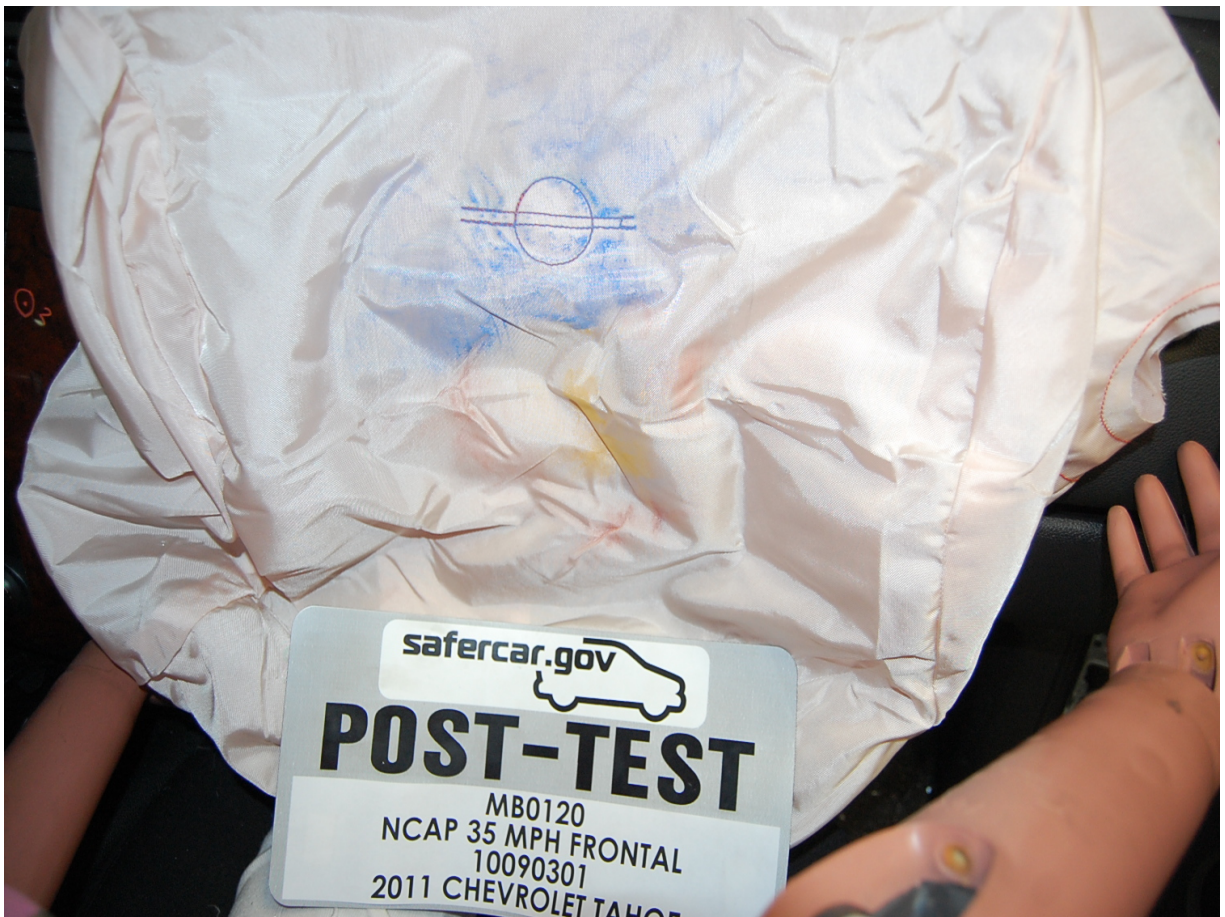
Post-Test Passenger's Side Knee Bolster (without dummy)



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



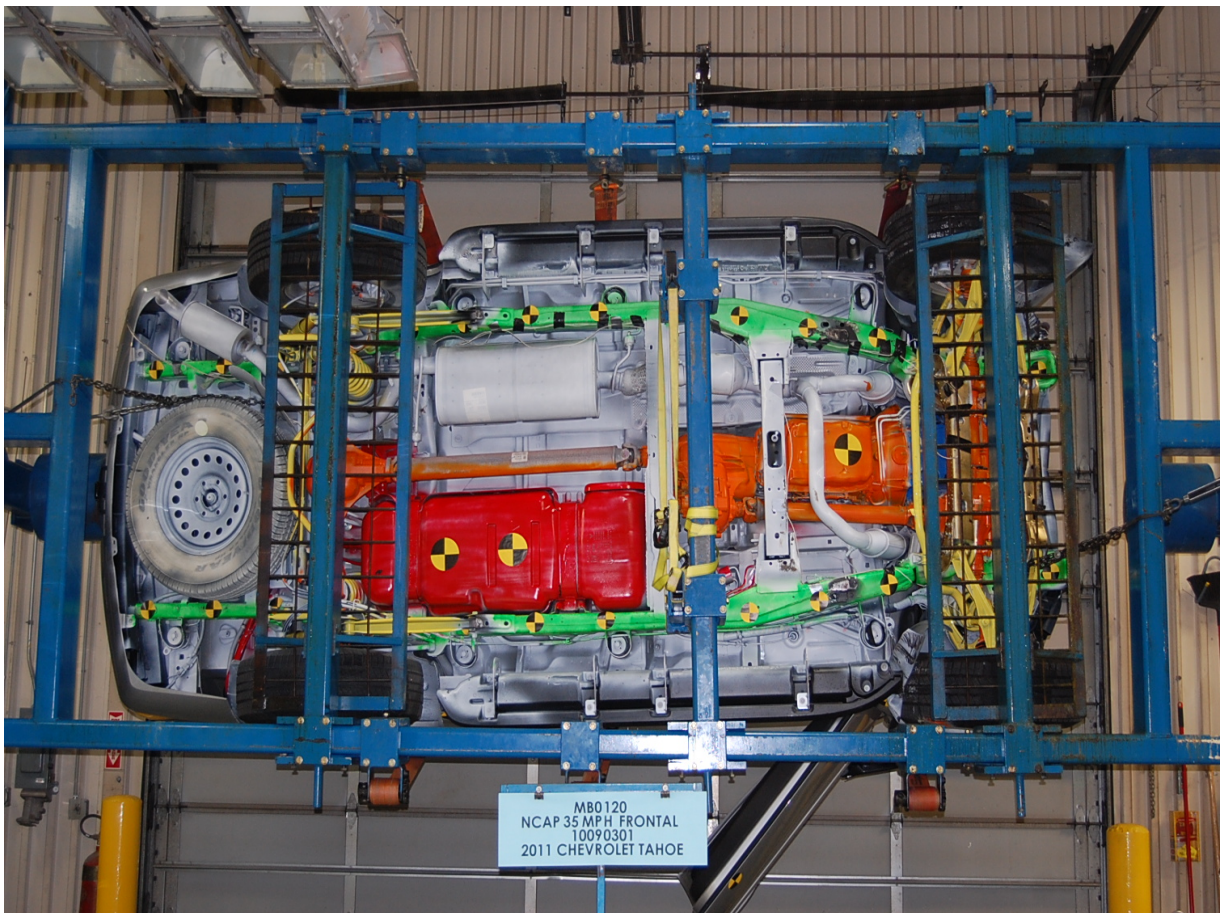
Post-Test Stoddard Solvent Spillage Location (photo not applicable)



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



CHEVROLET

2011 TAHOE 4WD LS

EXTERIOR: SHEER SILVER METALLIC
INTERIOR: EBONY

VORTEC 5.3L V8 SFI ENGINE
6-SPEED AUTOMATIC TRANSMISSION

STANDARD EQUIPMENT

ITEMS FEATURED 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

MECHANICAL

- ENGINE 5.3L VORTEC V8 WITH ACTIVE FUEL MANAGEMENT & FLEX-FUEL CAPABILITY
- TRANSMISSION, 6 SPEED AUTO
- PREM. SMOOTH RIDE SUSPENSION
- AUTOTRAC SINGLE SPEED TRANSFER CASE

SAFETY & SECURITY

- AIR BAGS, DUAL FRONTAL
- HEAD CURTAIN SIDE AIR BAGS, ALL SEATING ROWS
- SEAT MOUNTED SIDE IMPACT AIR BAGS, DRIVER & FRONT PASS
- PASSENGER SENSING SYSTEM
- 6 MTHS UNSTAR DIRECTIONS &

- CONNECTIONS WITH AUTOMATIC CRASH RESPONSE AND TURN-BY-TURN NAVIGATION (ASK DEALER ABOUT GEOGRAPHIC COVERAGE)
- ANTILOCK BRAKE SYSTEM, 4 WHEEL DISC
- STABILITRAK-STABILITY CONTROL W/TRACTION CONTROL SYSTEM
- RR DOOR CHILD SECURITY LOCKS
- PWR DOOR LOCKS, PROGRAMMABLE
- PWR WINDOWS-DRIVER EXPRESS ON
- REMOTE KEYLESS ENTRY
- TIRE PRESSURE MONITOR SYSTEM

INTERIOR

- SEATS, FRONT BUCKET, CLOTH
- 6-WAY PWR DRIVER/FRONT PASS SEAT
- 2ND ROW 60/40 BENCH, CLOTH
- 3-PASSENGER, 3RD ROW SEAT
- REAR AUDIO SOUND SYSTEM CTRLS
- MANUAL TRI-ZONE AIR COND
- AM/FM STEREO WITH CD PLAYER
- USB PORT

- BLUETOOTH FOR PHONE
- XM RADIO - SERVICE SUBSCRIPTION SOLD SEPARATELY BY SIRIUS/XM AFTER 3 MONTHS
- CRUISE CONTROL
- FLOOR MATS, 1ST & 2ND ROW
- VISOR MIRRORS, LIGHTED
- DRIVER INFORMATION CENTER

EXTERIOR

- ASSIST STEPS
- TRAILERING RECEIVER/CONNECTOR
- 17" ALUMINUM WHEELS
- UNDERBODY MOUNTED SPARE TIRE
- LUGGAGE RACK - SIDE RAILS
- WICKROSS BARS
- REAR WINDOW DEFOGGER & WIPER
- LIFTGATE/LIFTGLASS
- SOLAR-RAY DEEP TINTED GLASS
- AUTOMATIC HEADLAMPS
- POWER HEATED OUTSIDE MIRRORS

OPTIONS & PRICING

Visit us at www.chevy.com

MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE \$41,630.00

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

FRONT LICENSE PLATE MOUNT 15.00
GVW RATING - 7,300 LBS INC.
REAR AXLE 3.08 RATIO INC.

TOTAL OPTIONS \$15.00
TOTAL VEHICLE & OPTIONS \$41,645.00
DESTINATION CHARGE 950.00

TOTAL VEHICLE PRICE* \$42,595.00

EPA Fuel Economy Estimates

GASOLINE
CITY MPG

15

Expected range for most drivers
12 to 18 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
\$2,293

based on 15,000 miles at
\$2.80 per gallon of GASOLINE

Combined Gasoline
Fuel Economy

This Vehicle

17

10 32
At 80% E85

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

AC6



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

GOVERNMENT SAFETY RATINGS

Frontal Crash Driver Not Rated
Passenger Not Rated

Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

Side Crash Front seat Not Rated
Rear seat Not Rated

Star ratings based on the risk of injury in a side impact.

Rollover ★ ★ ★

Star ratings based on the risk of rollover in a single vehicle crash.

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

Source: National Highway Traffic Safety Administration (NHTSA).

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

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 65%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 31%

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

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

This label has been applied to the vehicle by the manufacturer. Do not remove prior to delivery to the dealer. The dealer is responsible for the manufacturer's recommended maintenance schedule. Do not use any unauthorized parts, accessories, or modifications. Do not alter the vehicle's original state or function.

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GM Label 79000_0018 - 06/27/2009

OVERSEA IMPORT SALES CODE E
SALES MODEL CODE CHN74
DEALER NO 25102
ARLINGTON, TX U.S.A.

VIN 1GNSKAE09BR102761
DEALER TO WHOM DELIVERED
ERIKS CHEVROLET, INC.
PO BOX 2169
KOKOMO, IN 46904-2169

CE
1A29400354

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

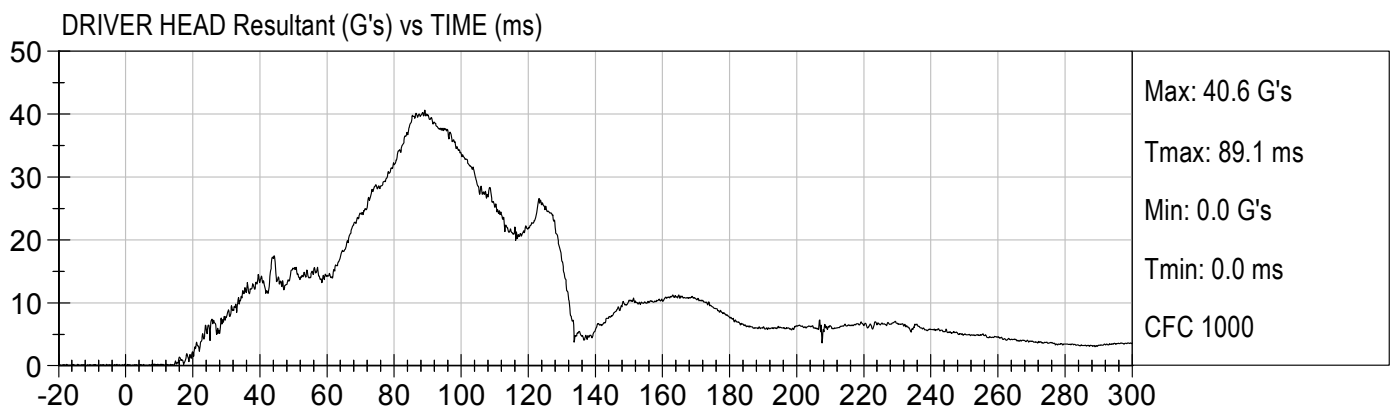
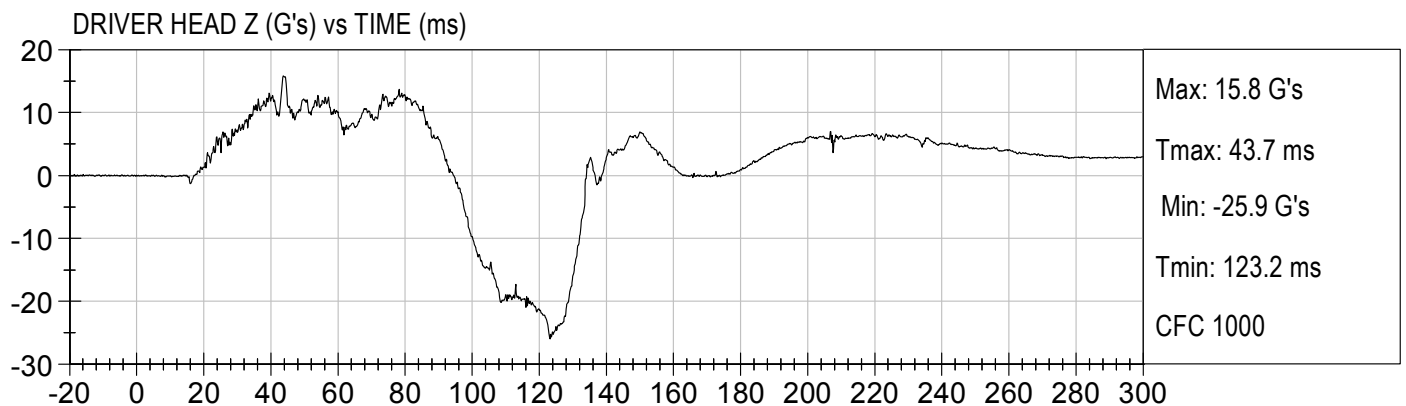
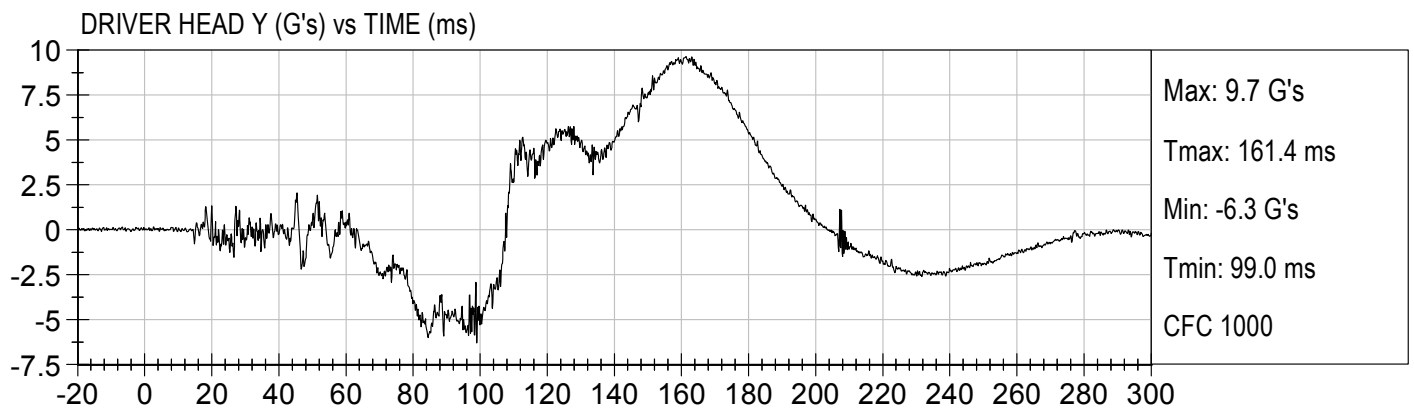
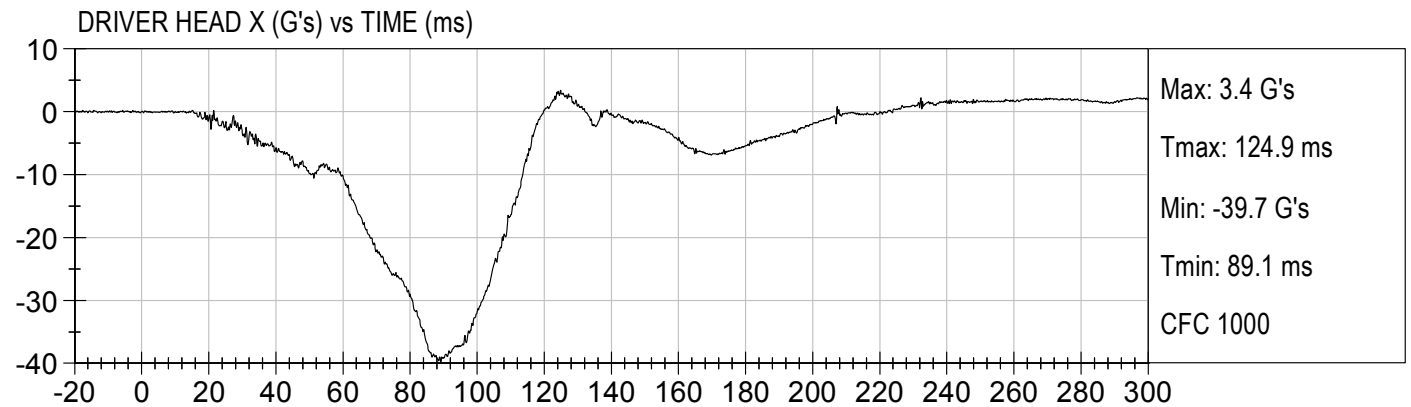
Driver Left Upper Tibia Force Z

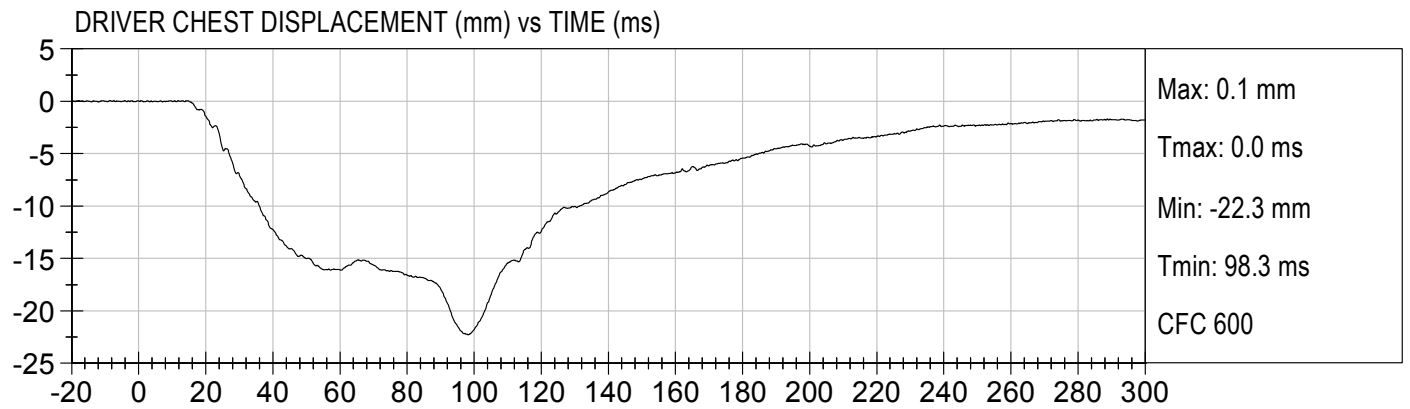
Driver Left Lower Tibia Moment X

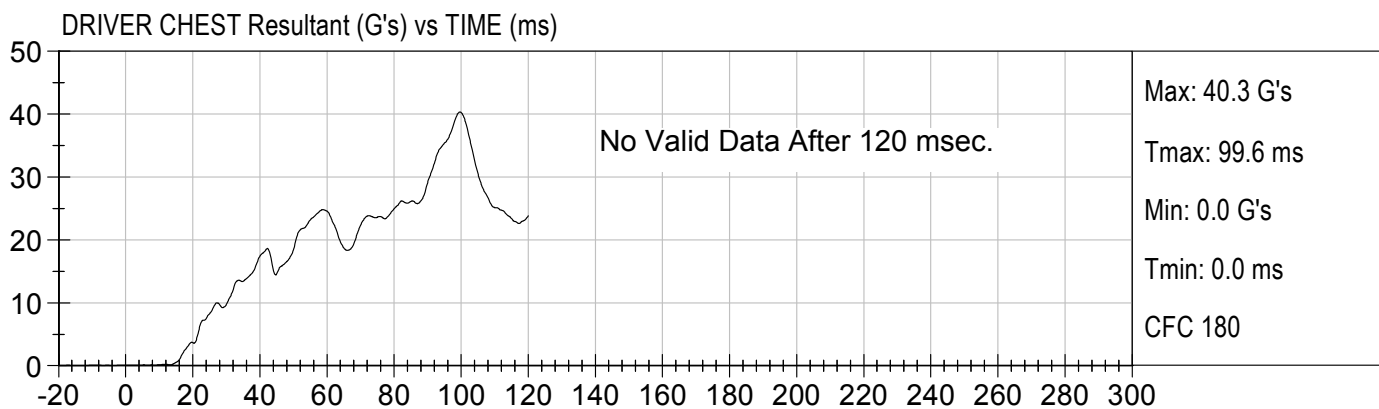
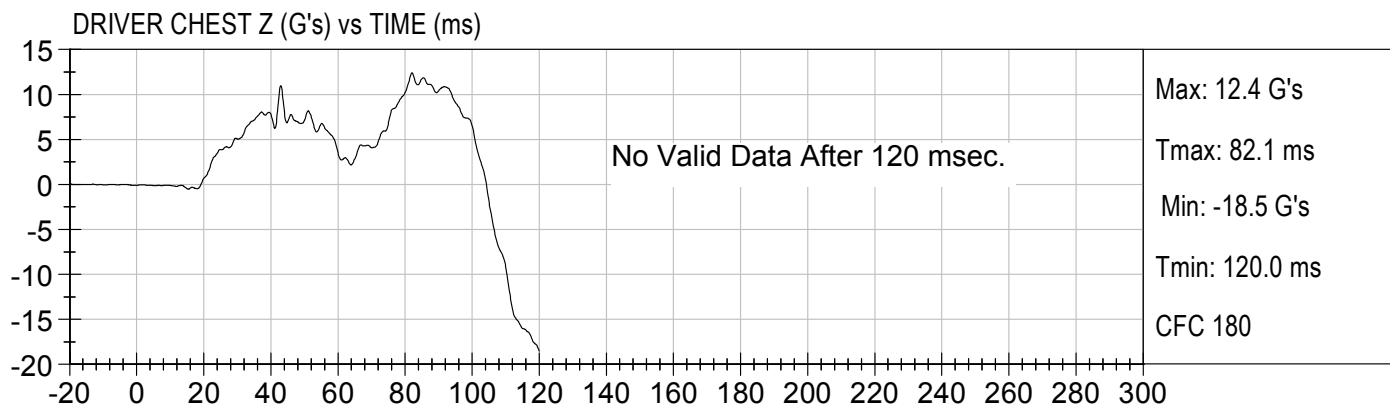
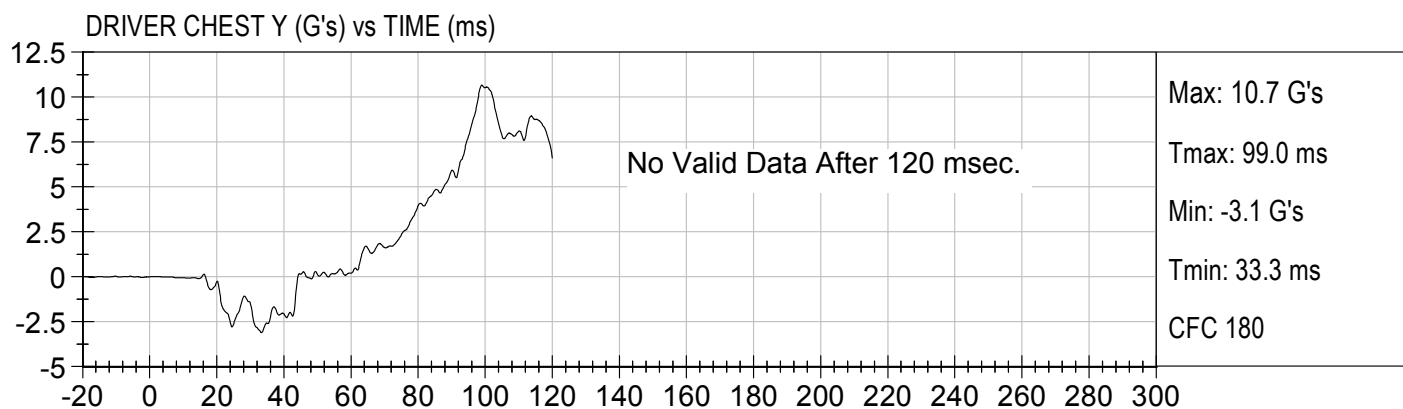
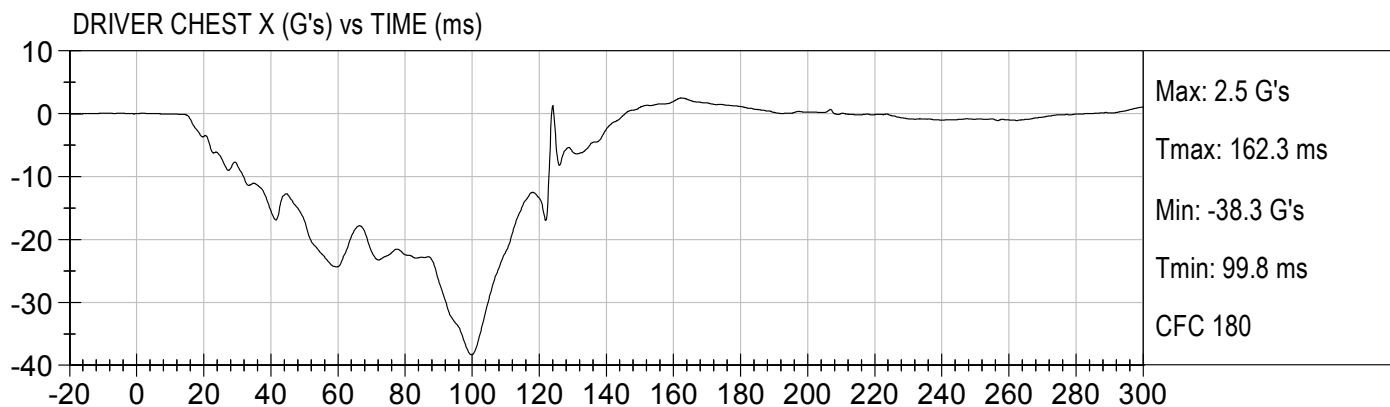
Driver Left Lower Tibia Moment Y

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
Barrier Force – Upper Left
Barrier Force – Upper Center
Barrier Force – Upper Right
Barrier Force – Lower Left
Barrier Force – Lower Center
Barrier Force – Lower Right

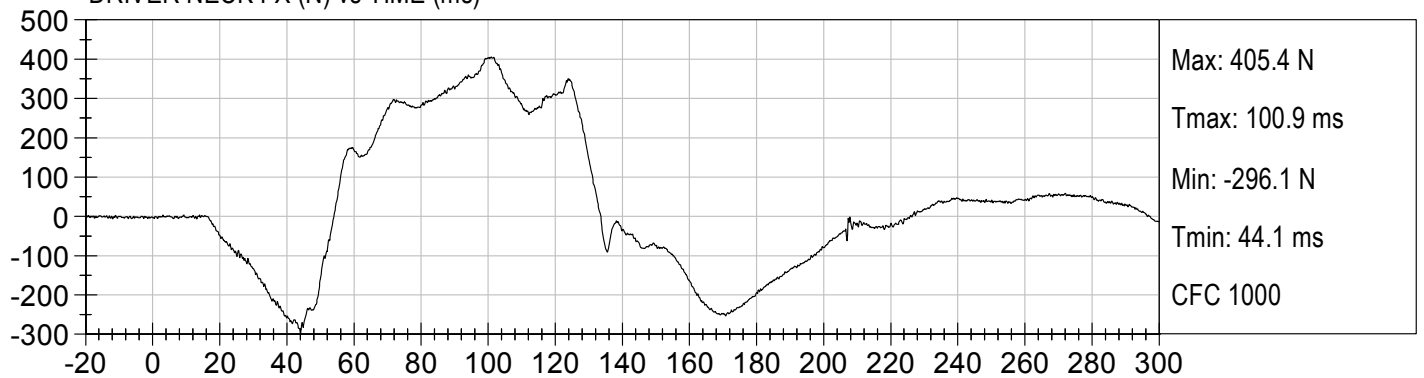




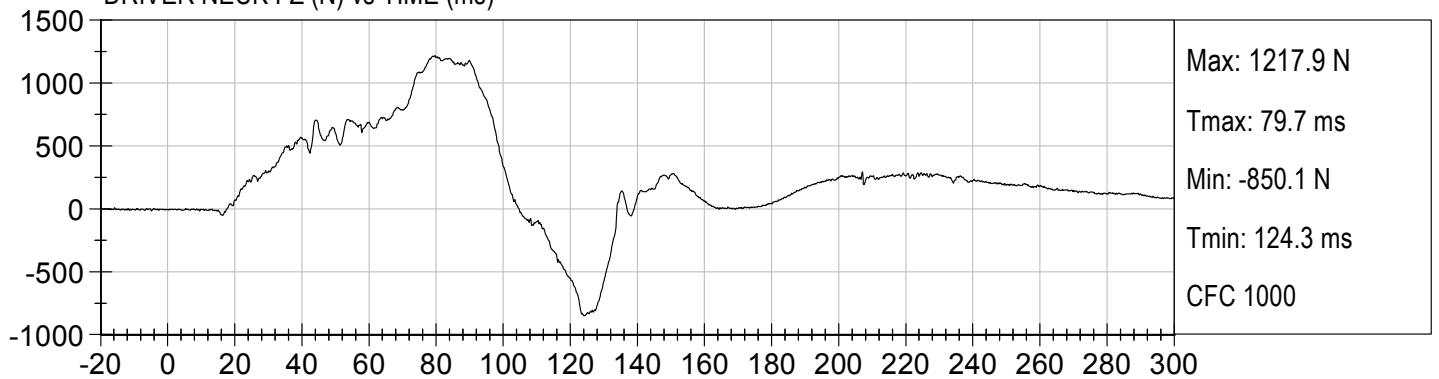




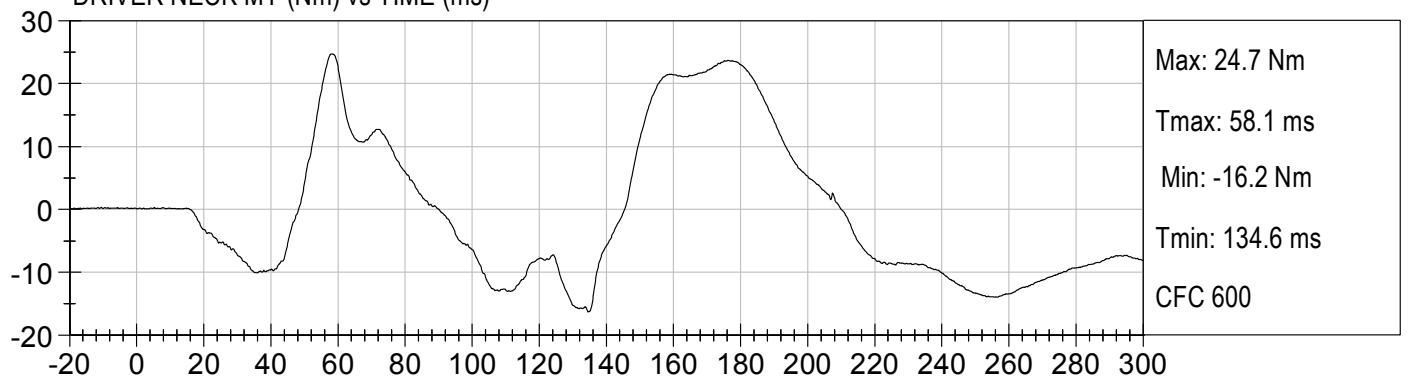
DRIVER NECK FX (N) vs TIME (ms)

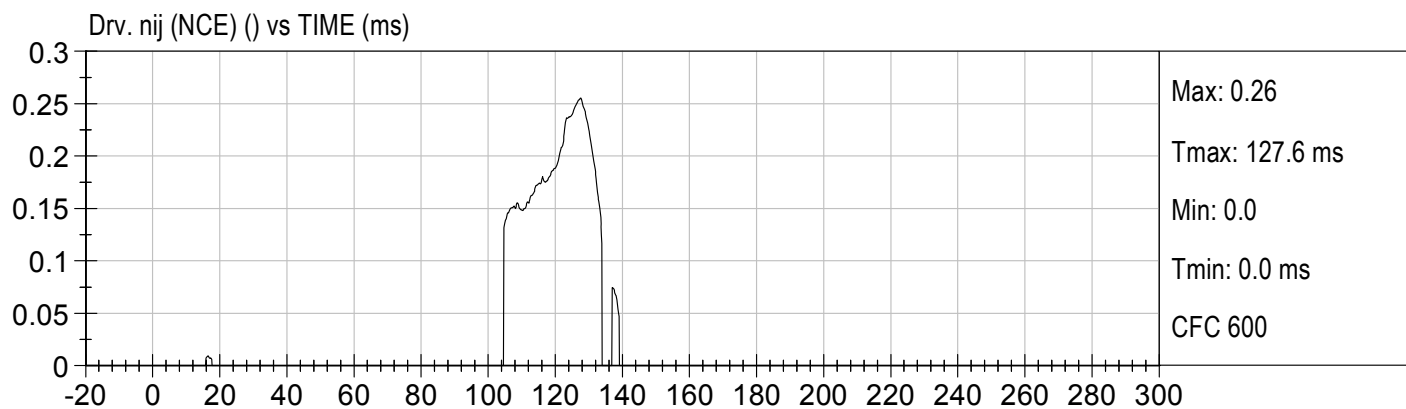
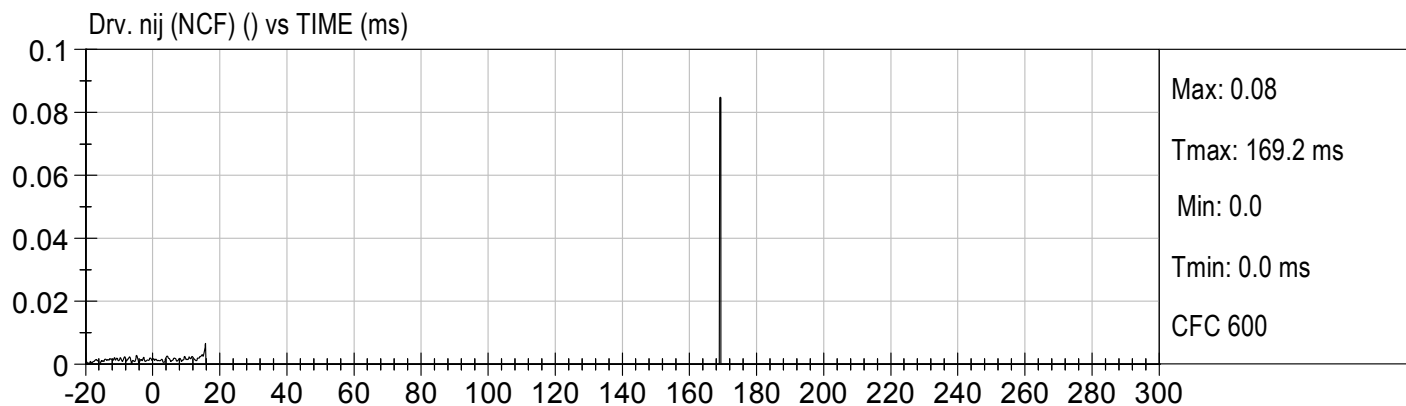
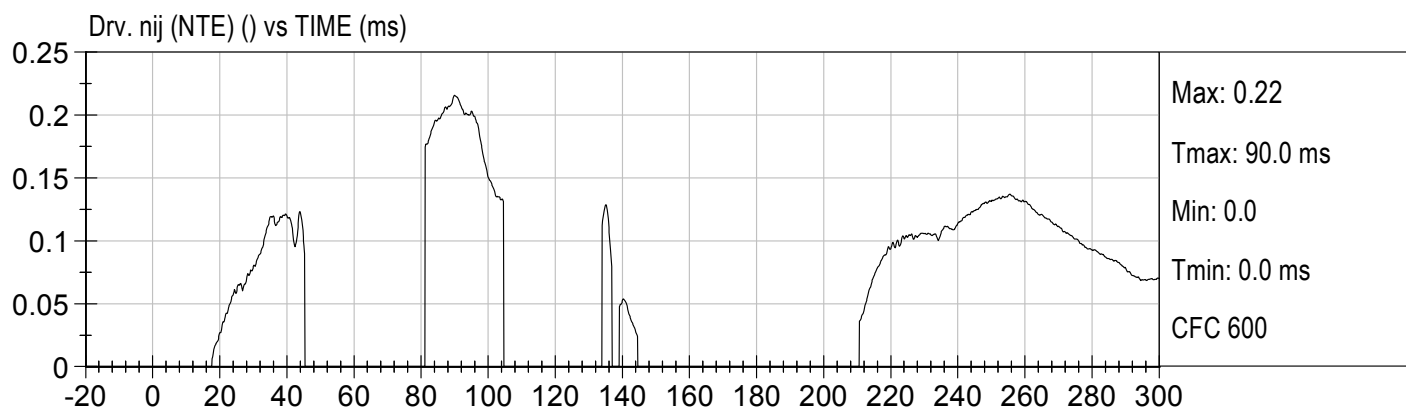
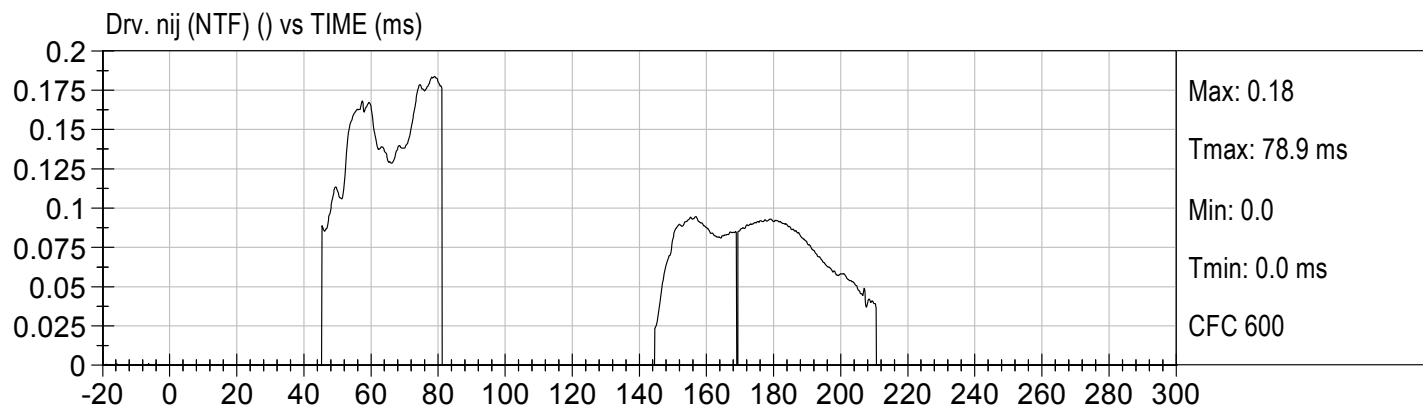


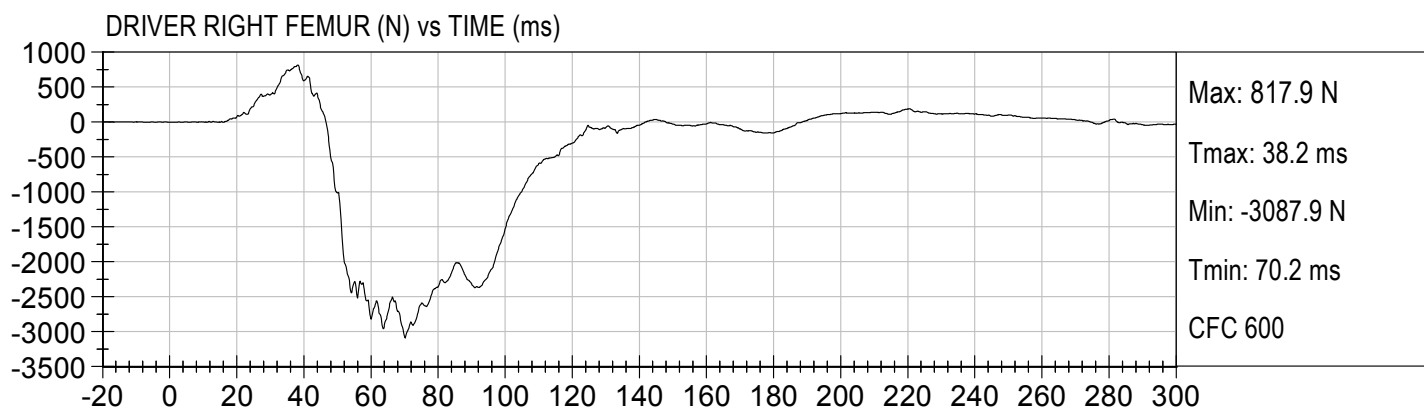
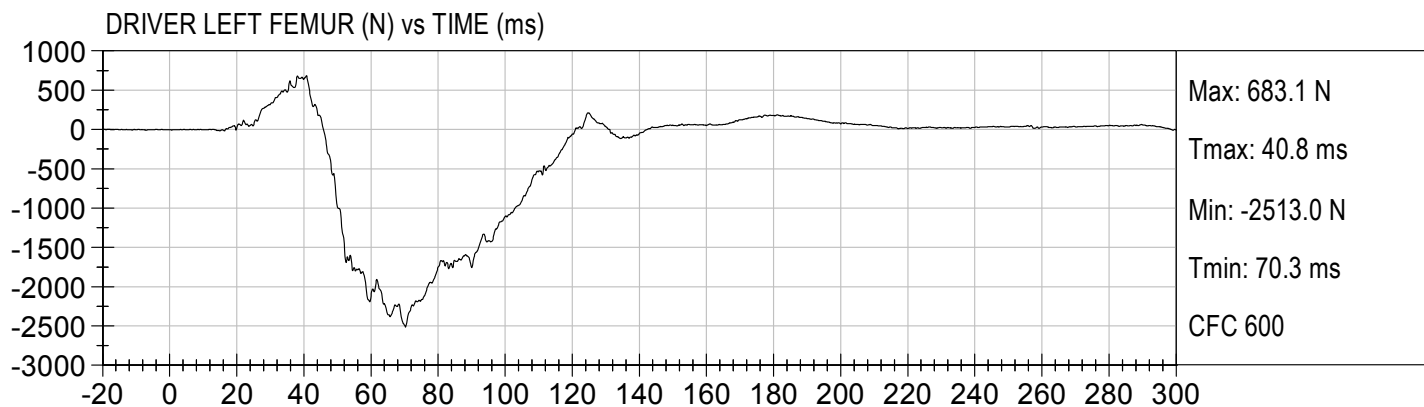
DRIVER NECK FZ (N) vs TIME (ms)



DRIVER NECK MY (Nm) vs TIME (ms)

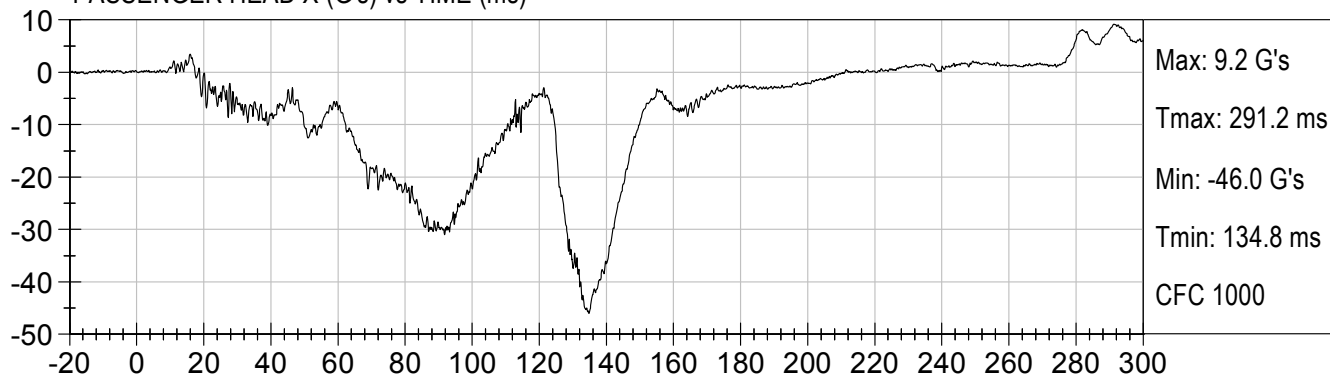




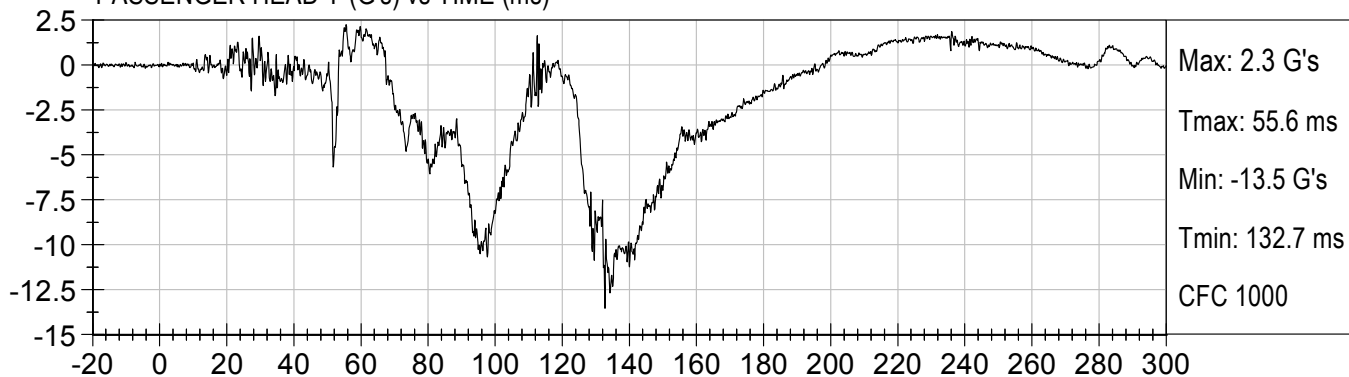




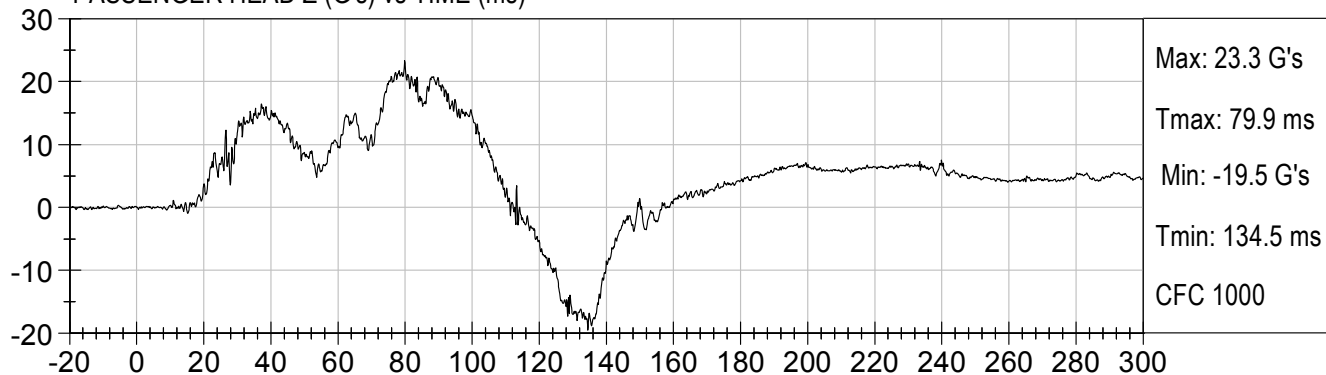
PASSENGER HEAD X (G's) vs TIME (ms)



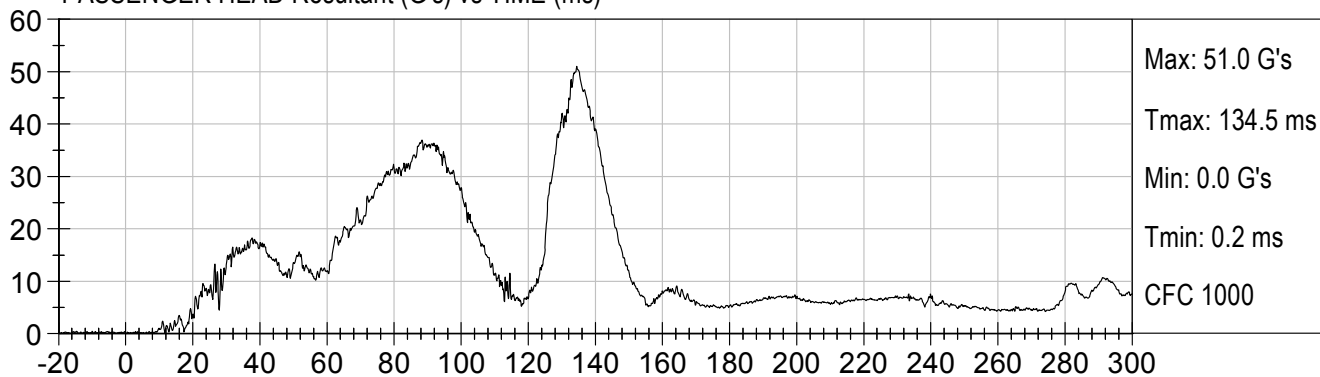
PASSENGER HEAD Y (G's) vs TIME (ms)

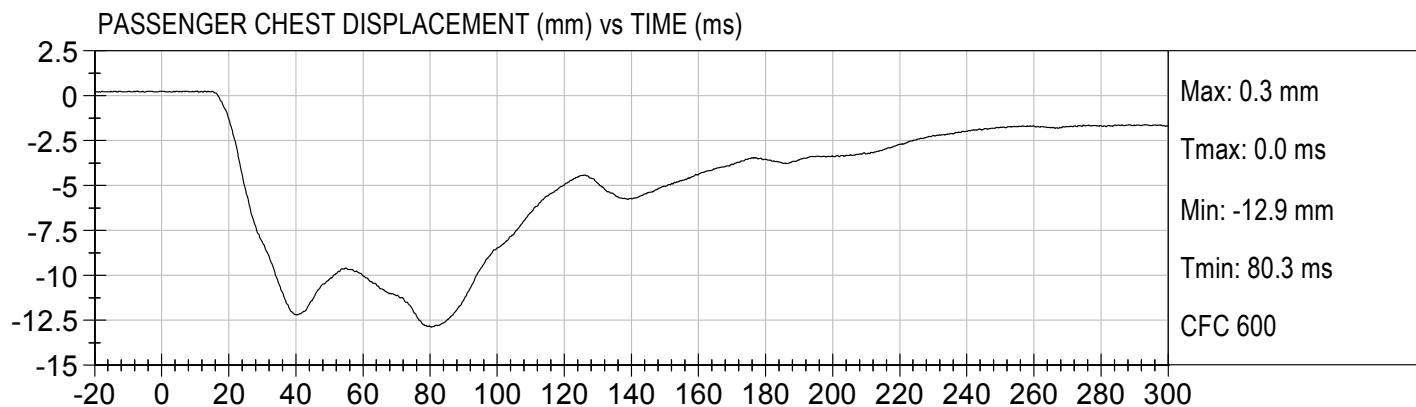


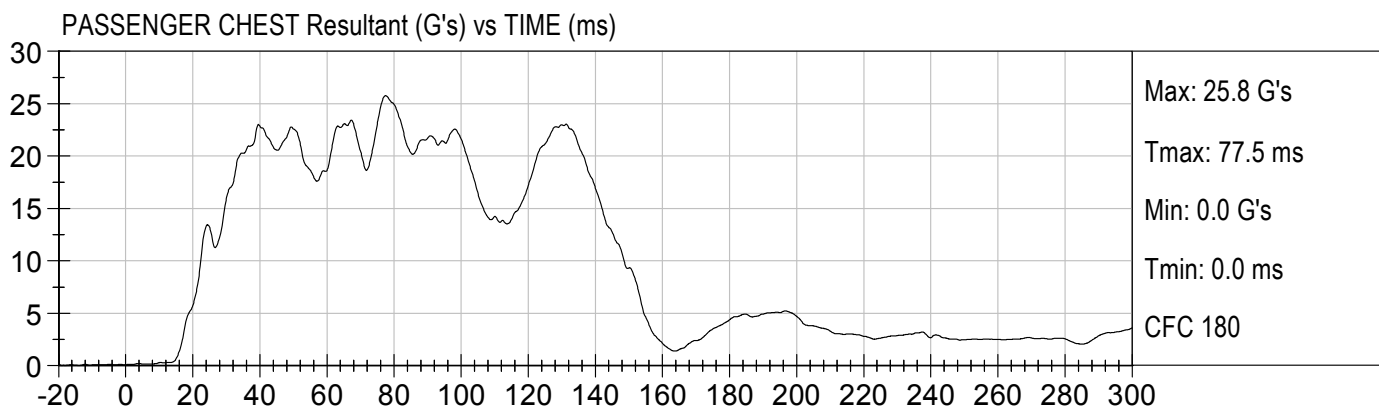
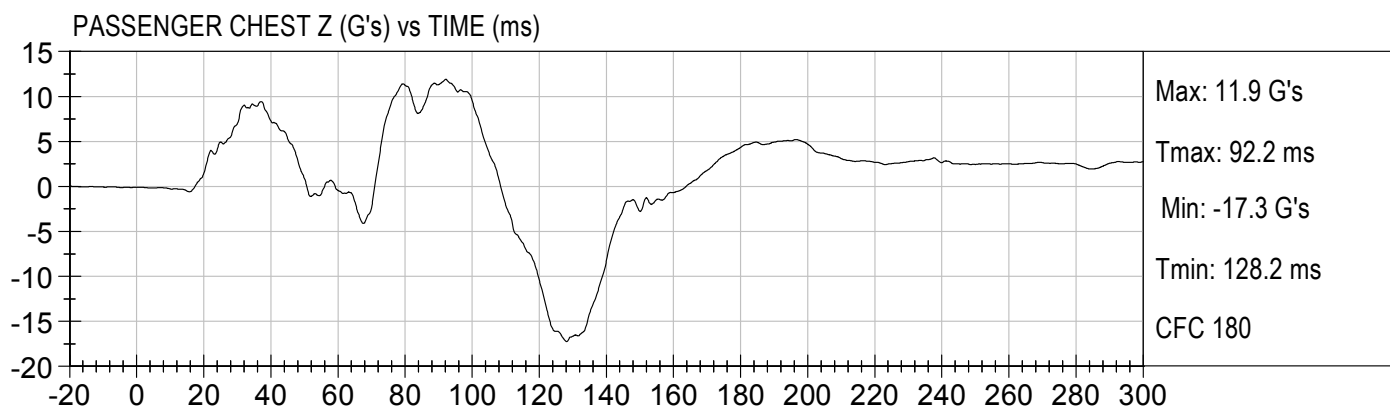
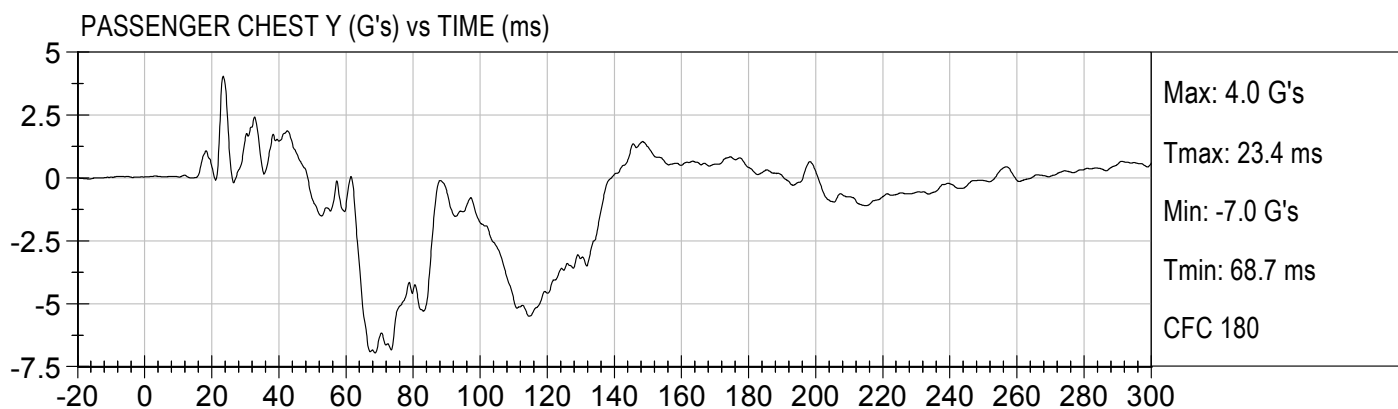
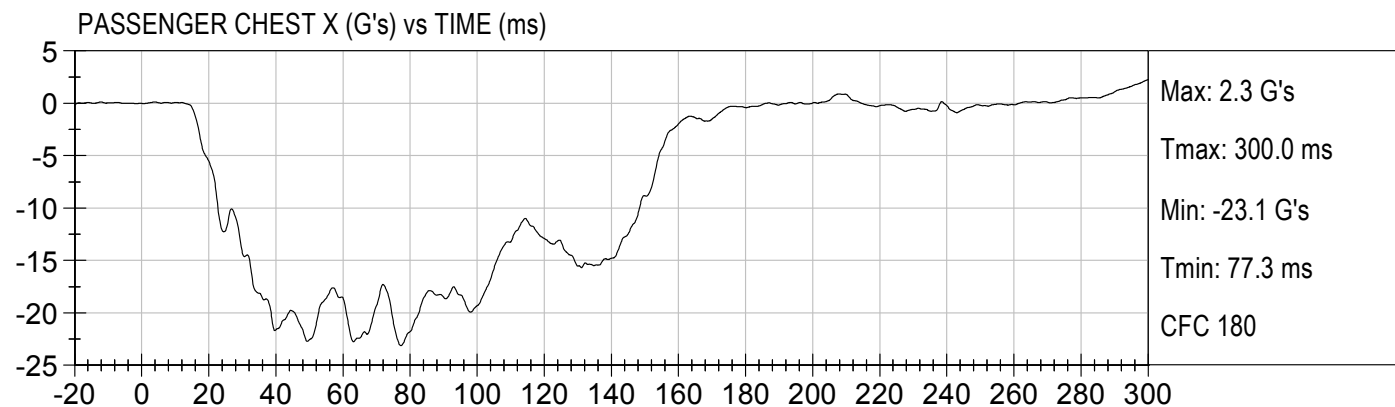
PASSENGER HEAD Z (G's) vs TIME (ms)



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

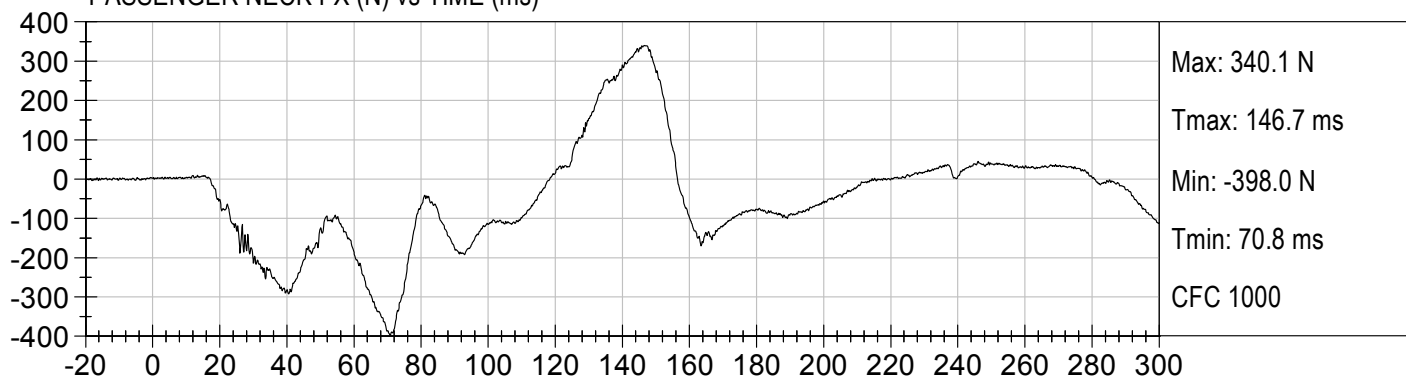




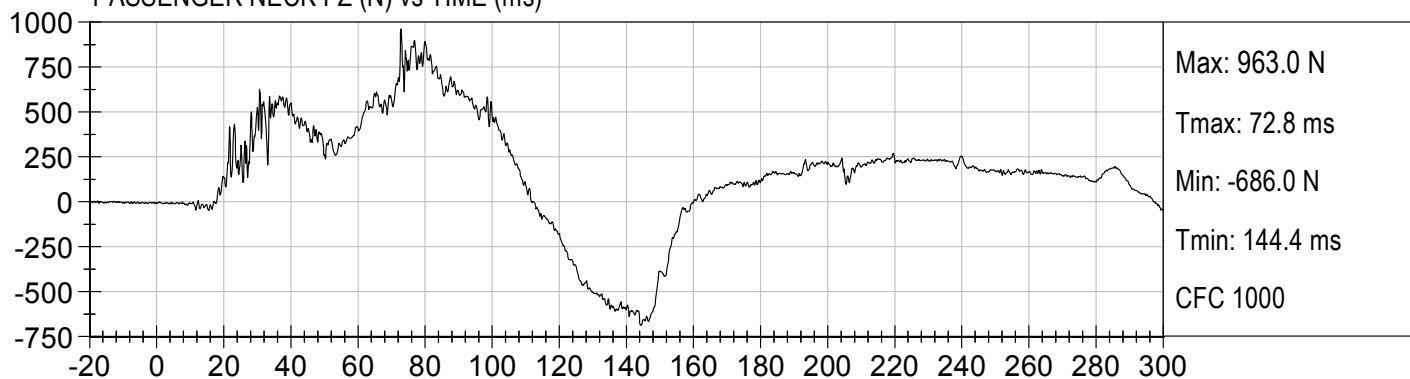




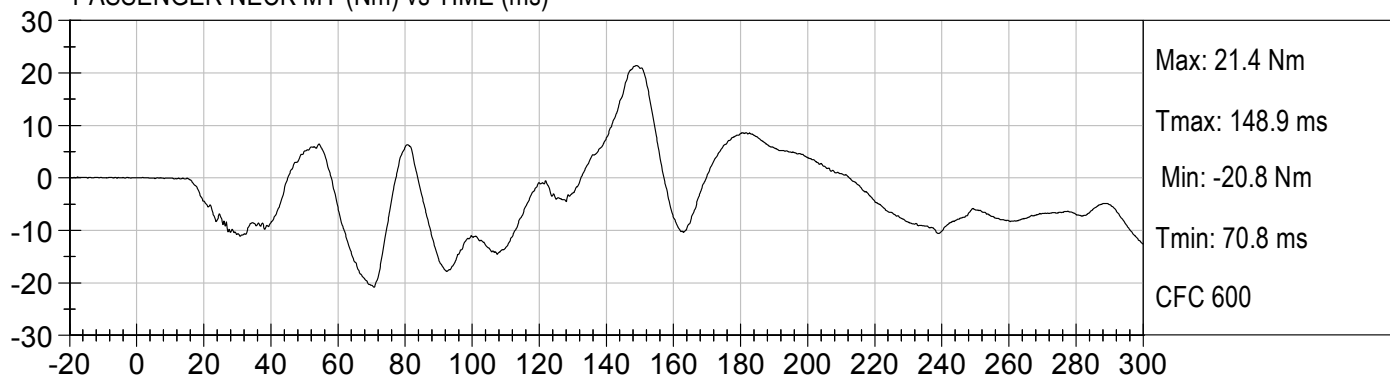
PASSENGER NECK FX (N) vs TIME (ms)

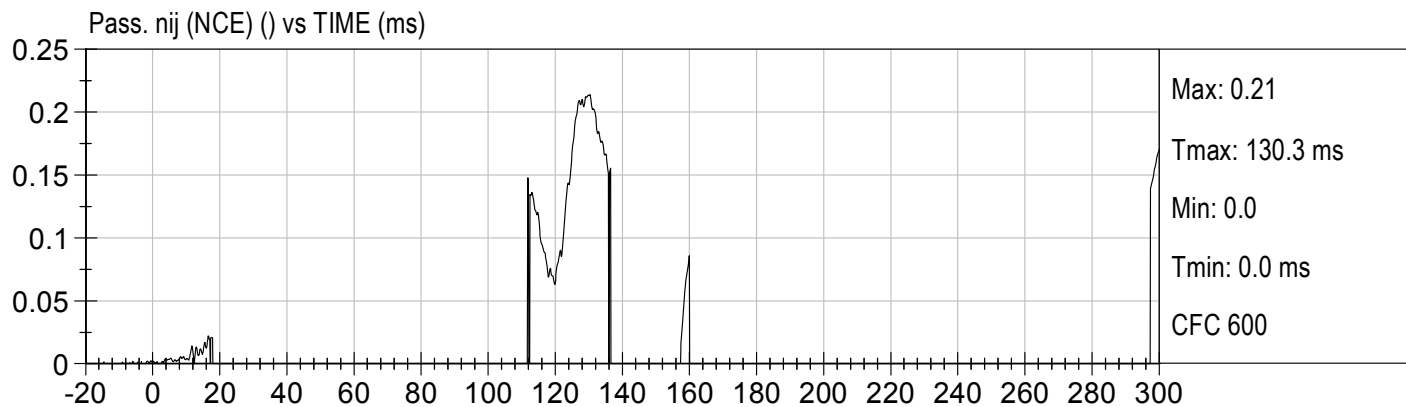
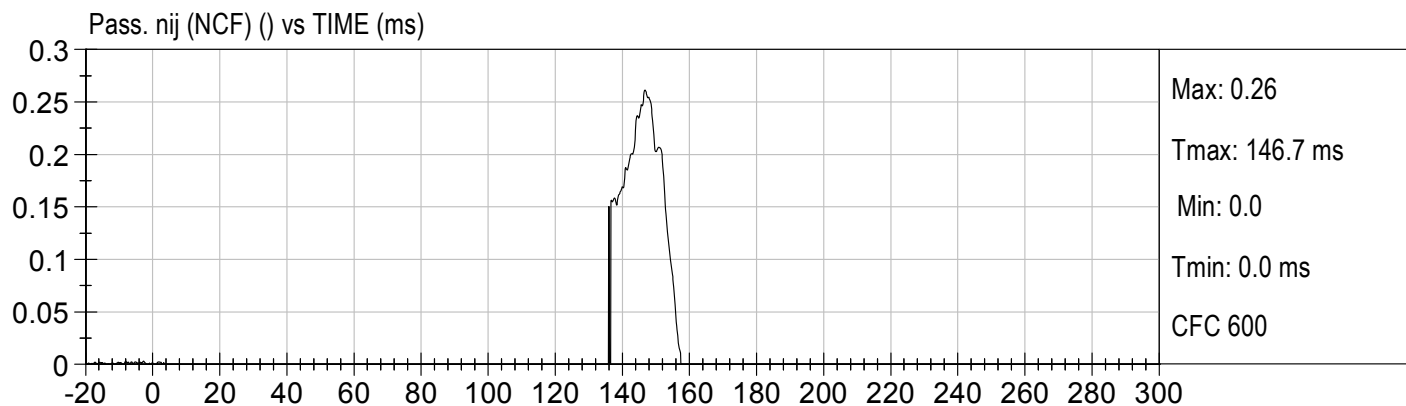
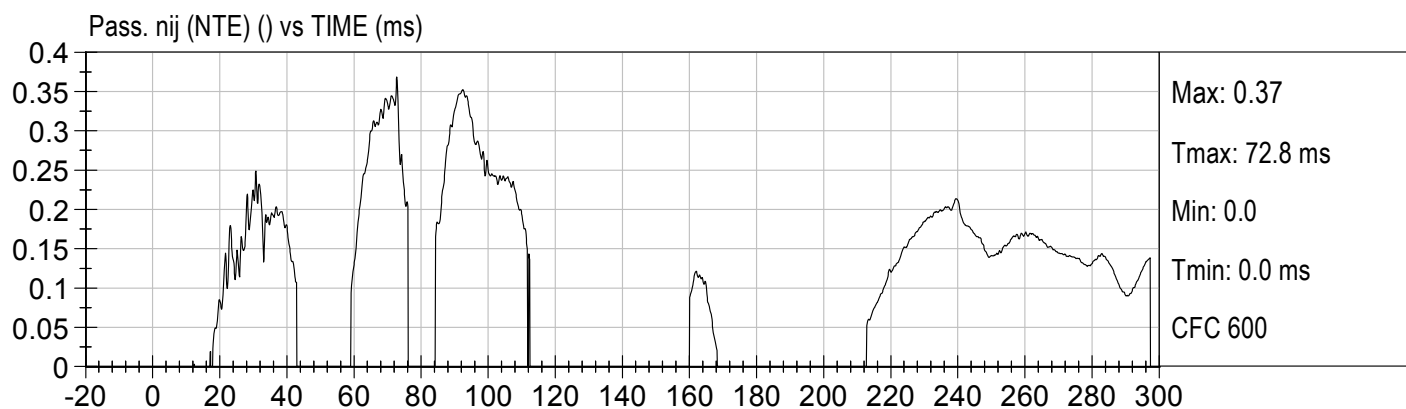


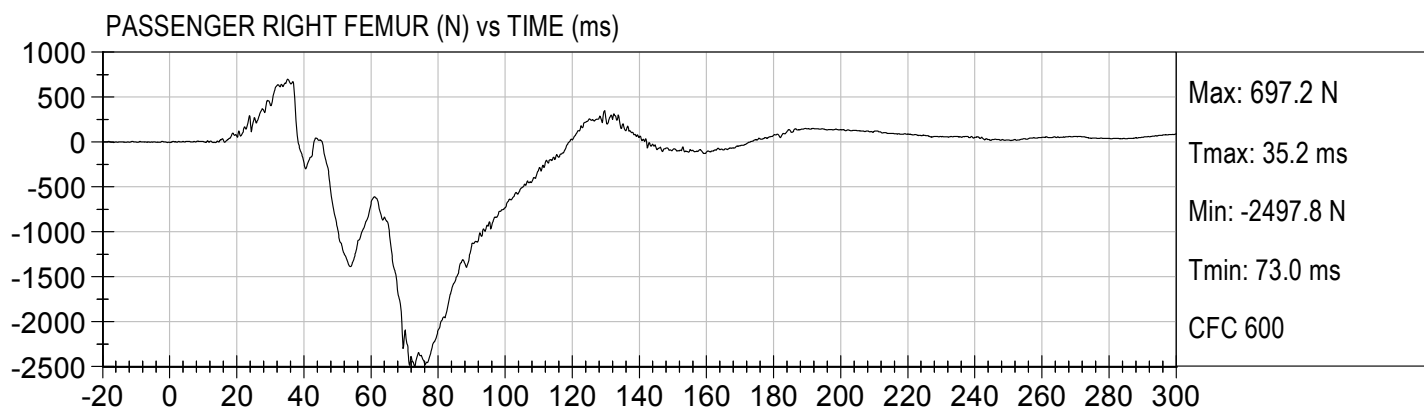
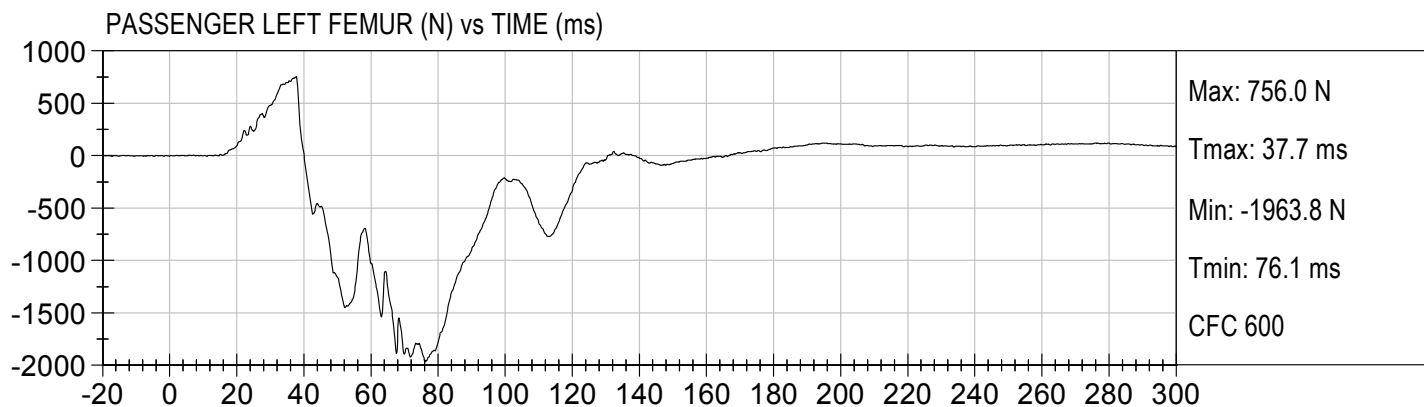
PASSENGER NECK FZ (N) vs TIME (ms)



PASSENGER NECK MY (Nm) vs TIME (ms)







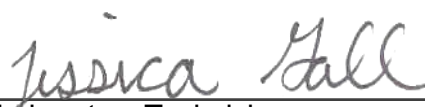
APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 351

Test ID: D102821

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Peak Resultant Acceleration	G's	225 - 275	249	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

8/31/10
Test Date

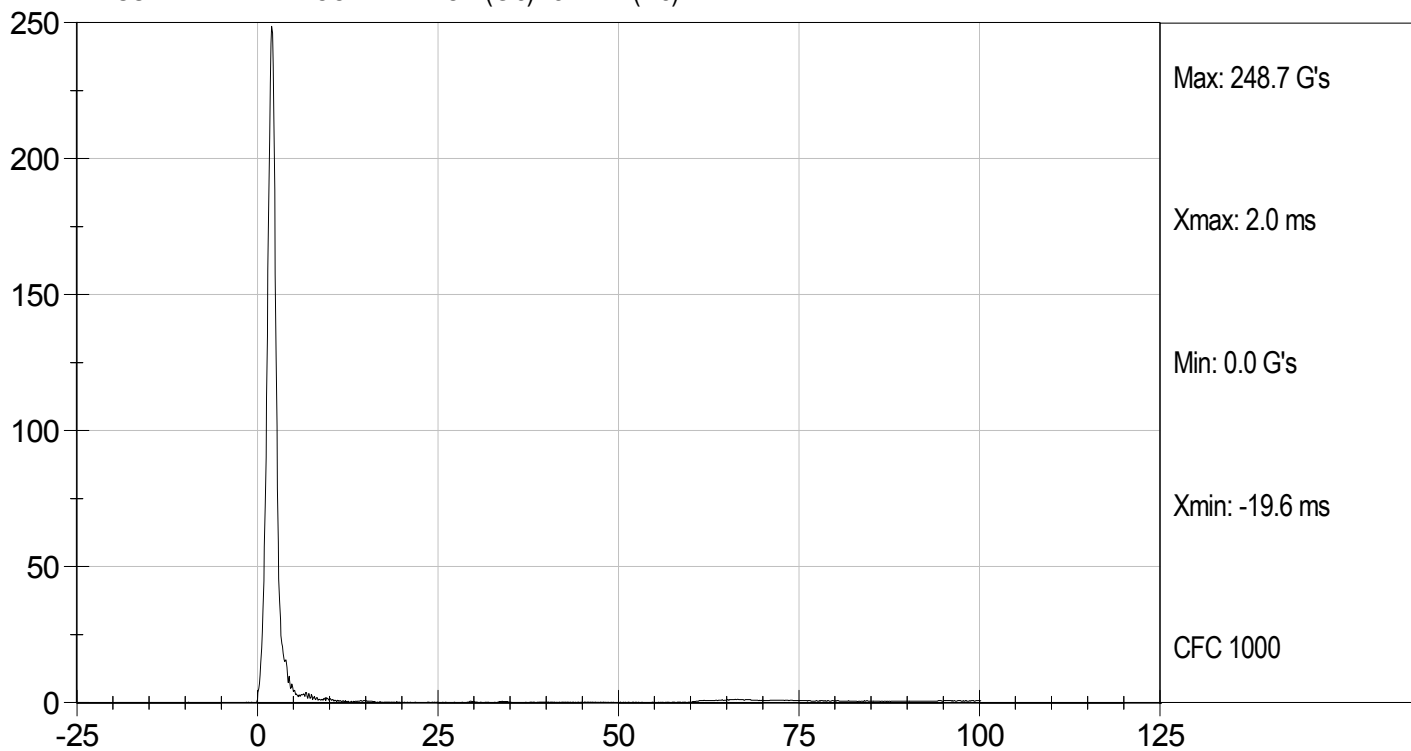

Approved By



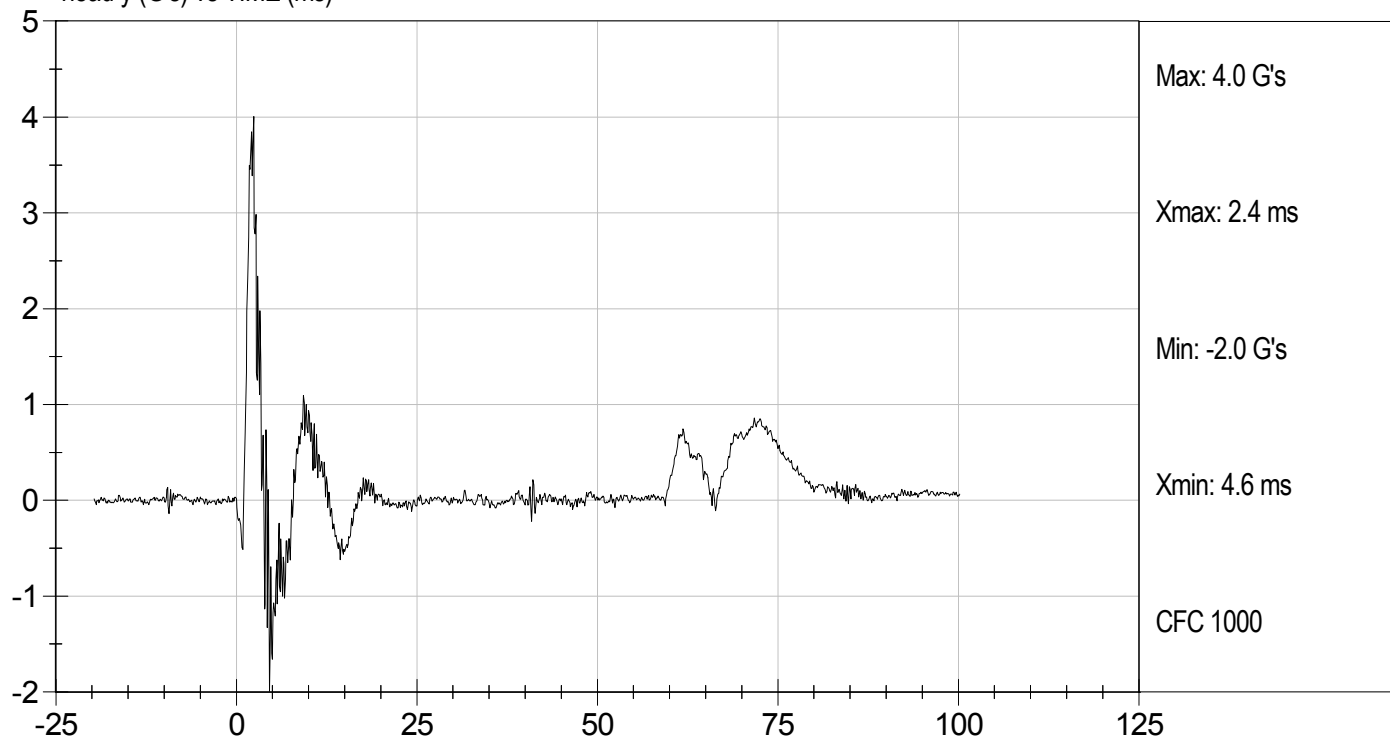
Test Desc: Head Drop
Component ID: D102821

Test Date: 8/31/10
Velocity: 0 ft/s, 0.00 m/s

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



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

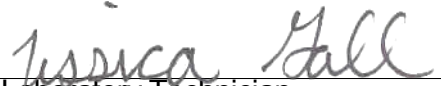


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102822

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
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.82	Pass
	20 ms	G's	17.60 to 22.60	19.38	Pass
	30 ms	G's	12.50 to 18.50	14.57	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.51	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.0	Pass
	Time	ms	57.0 to 64.0	57.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	95.8	Pass
	Time	ms	47.0 to 58.0	47.7	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.0	Pass
Overall Test Results					Pass


 Laboratory Technician

8/31/10
 Test Date

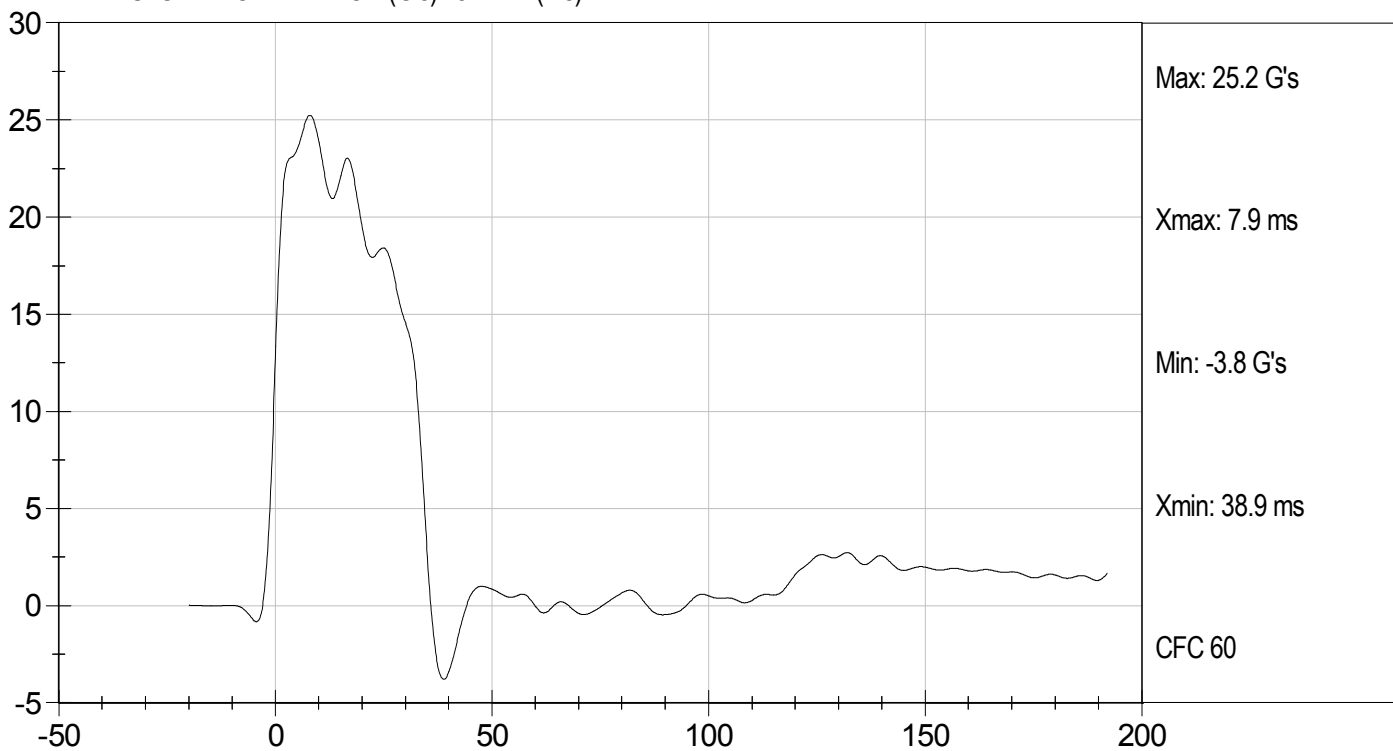

 Approved By



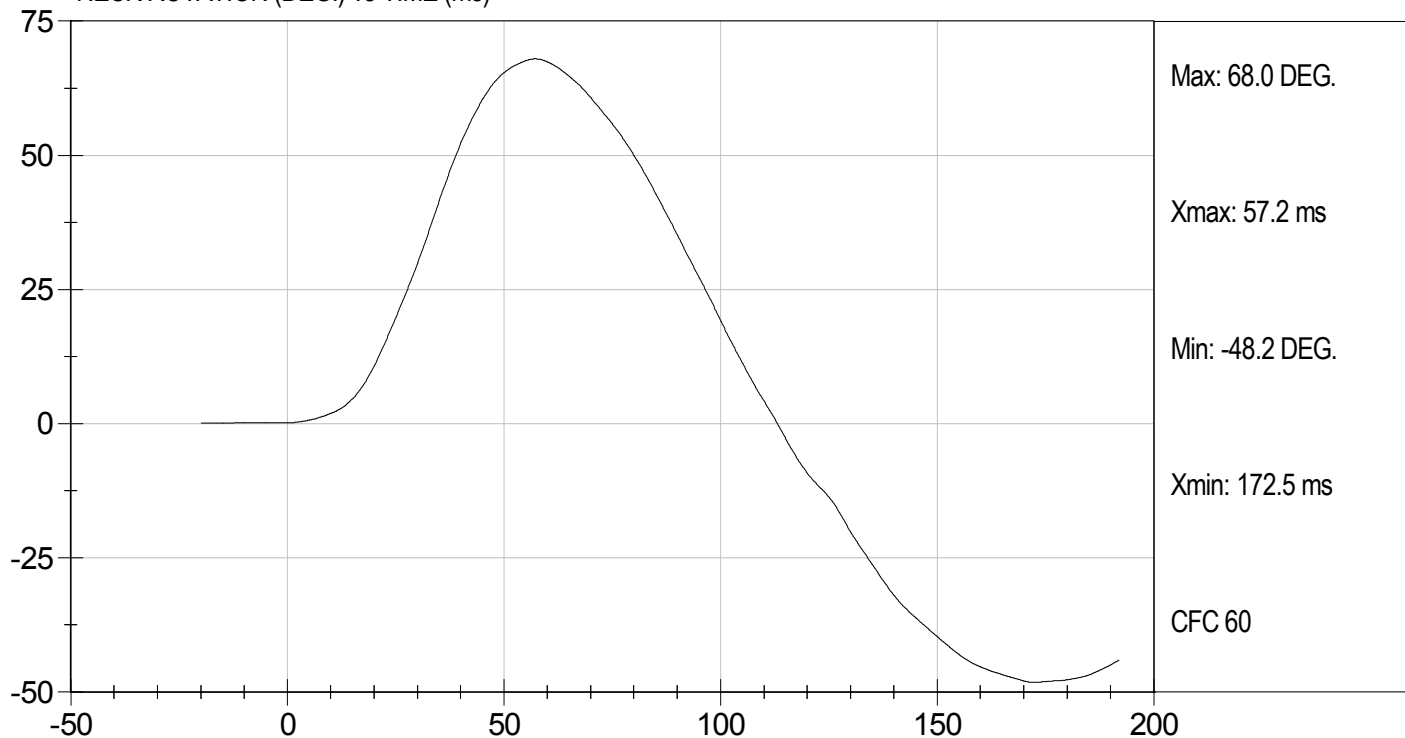
Test Desc: Neck Flexion
Component ID: D102822

Test Date: 8/31/10
Velocity: 22.83 ft/s, 6.96 m/s

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



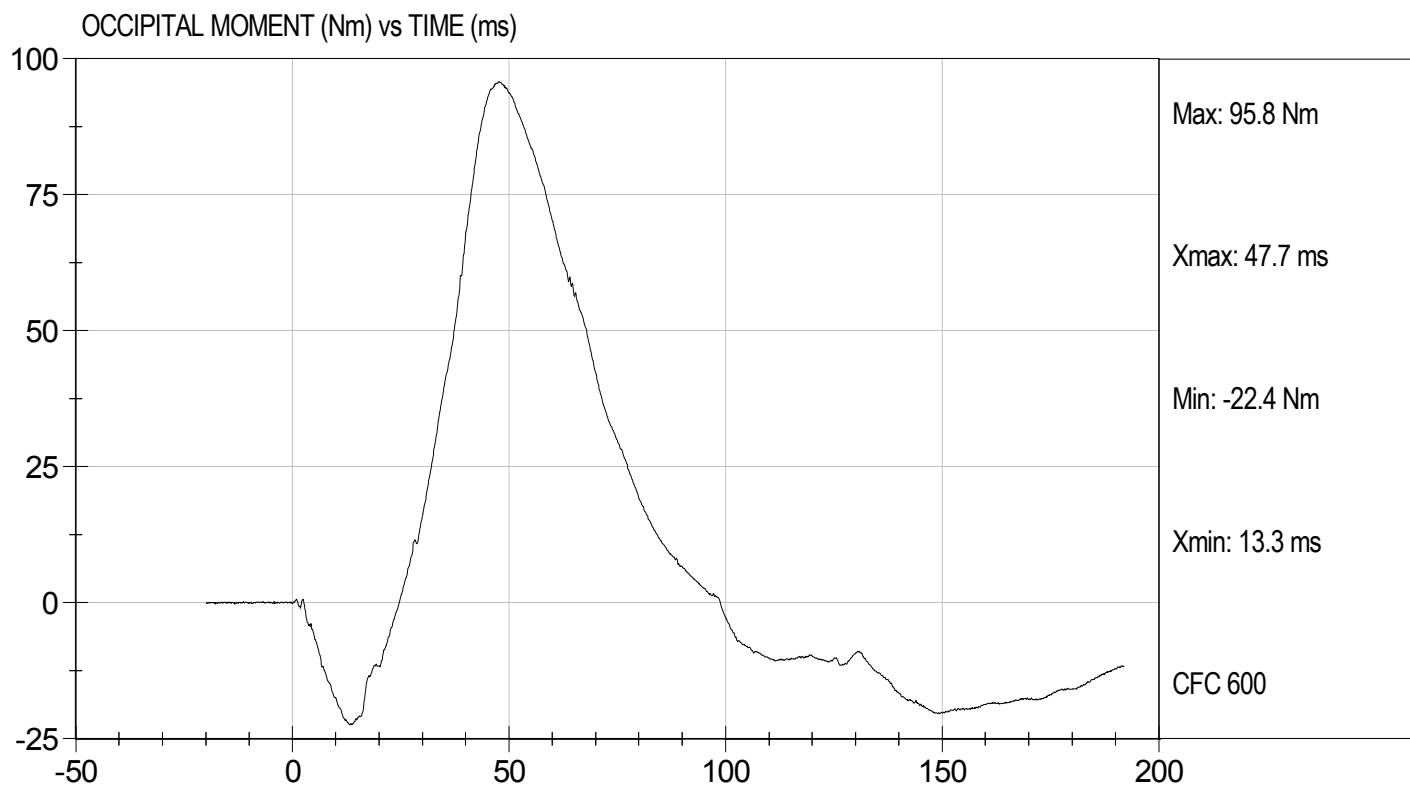
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D102822

Test Date: 8/31/10
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: D102823

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
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.51	Pass
	20 ms	G's	14.00 to 19.00	16.74	Pass
	30 ms	G's	11.00 to 16.00	15.82	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	15.76	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.9	Pass
	Time	ms	72.0 to 82.0	72.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	153.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.6	Pass
	Time	ms	65.0 to 79.0	68.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	139.9	Pass
Overall Test Results					Pass


 Laboratory Technician

8/31/10
 Test Date

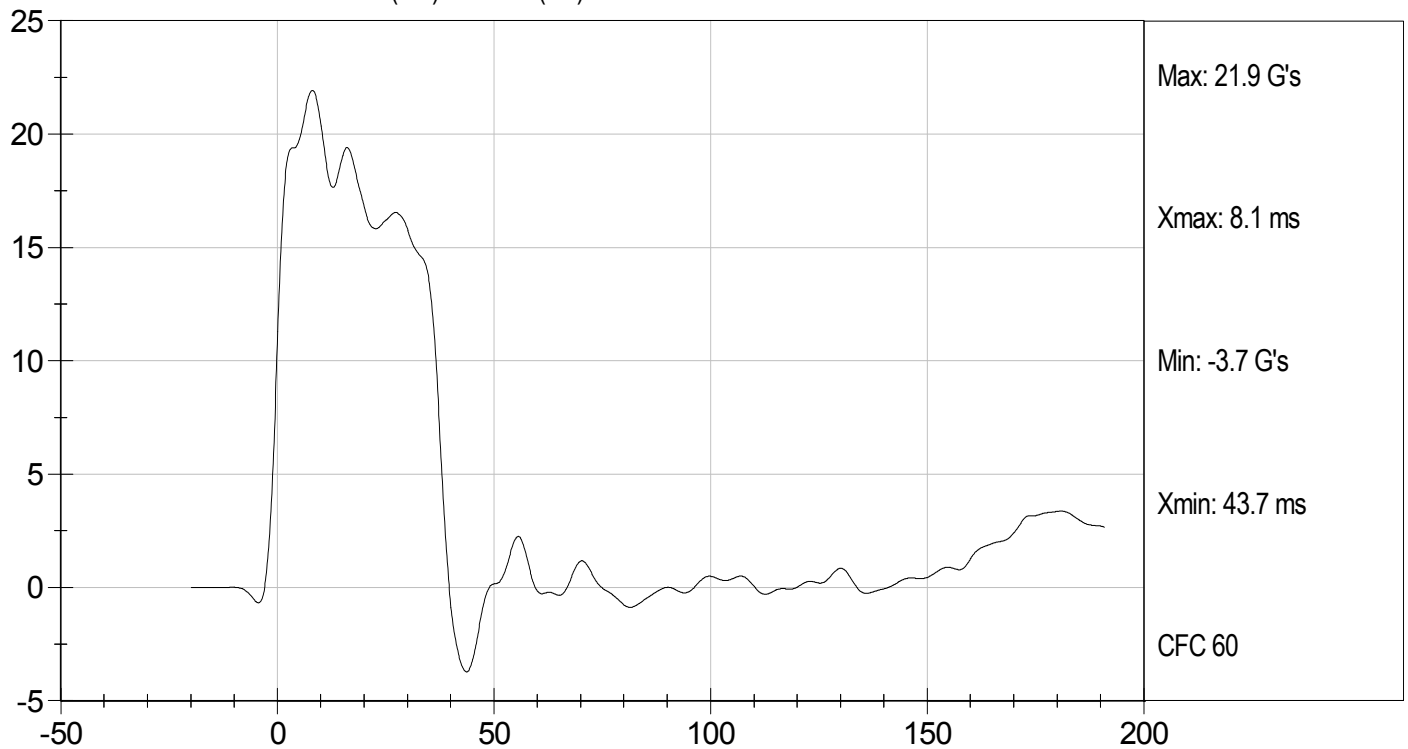

 Approved By



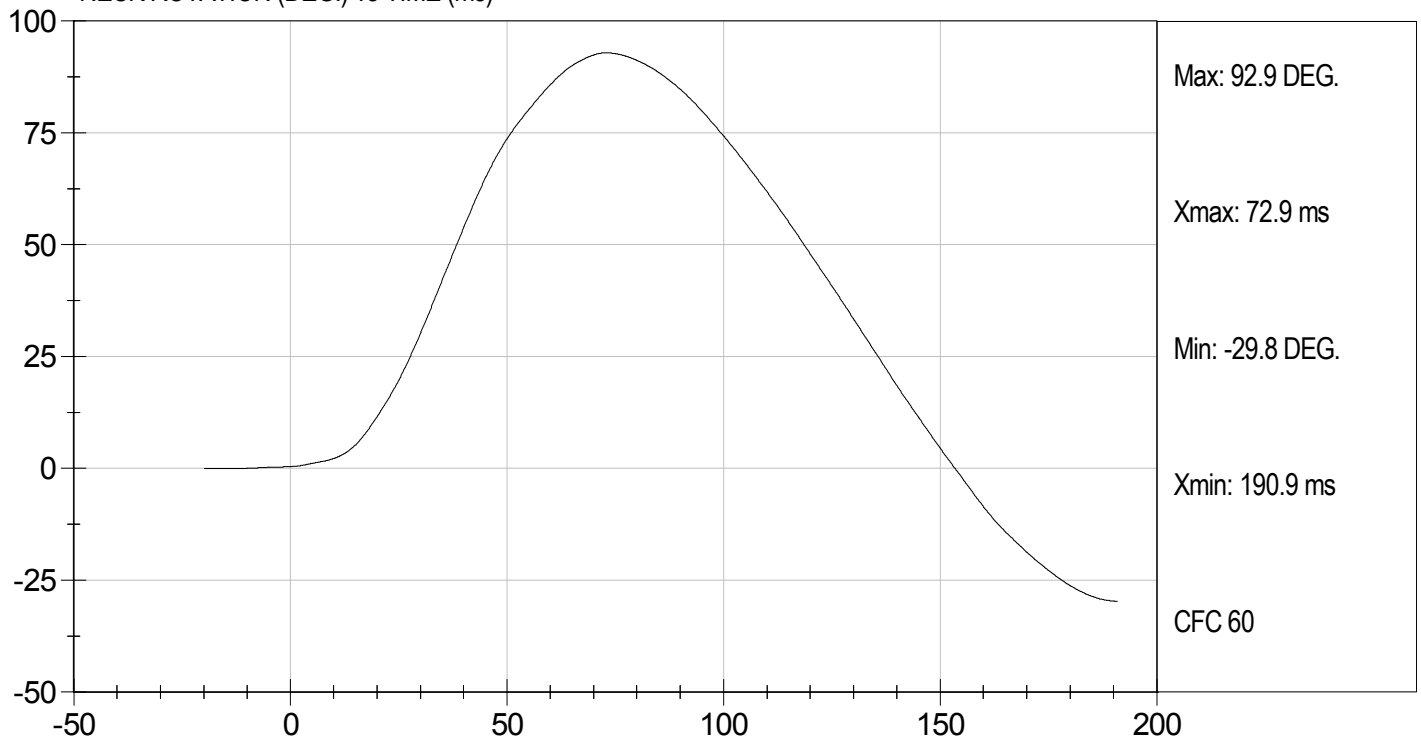
Test Desc: Neck Extension
Component ID: D102823

Test Date: 8/31/10
Velocity: 20.08 ft/s, 6.12 m/s

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



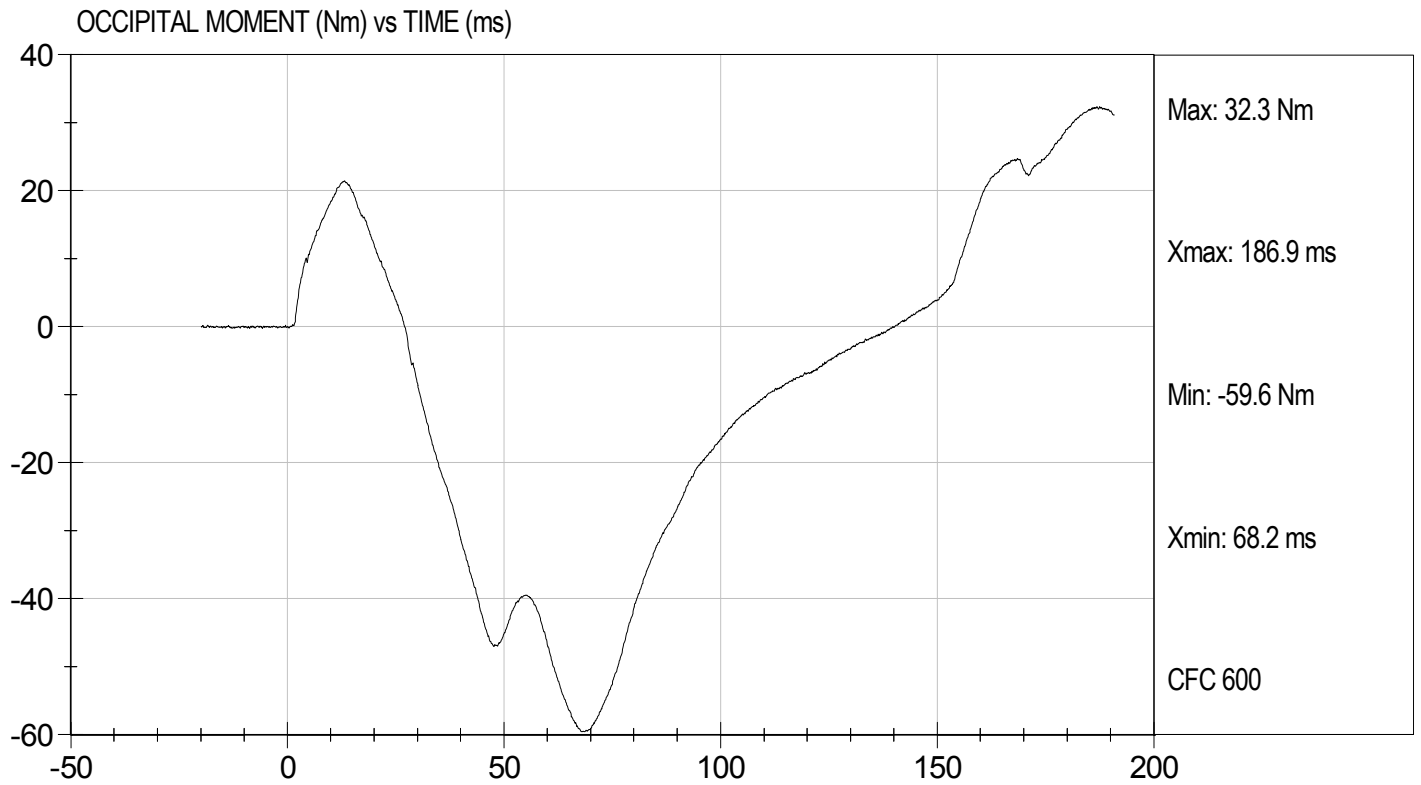
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Component ID: D102823

Test Date: 8/31/10
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: D102824

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	5,283	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.66	Pass
Internal Hysteresis	%	69 to 85	70	Pass
			Overall Test Results	Pass


Laboratory Technician

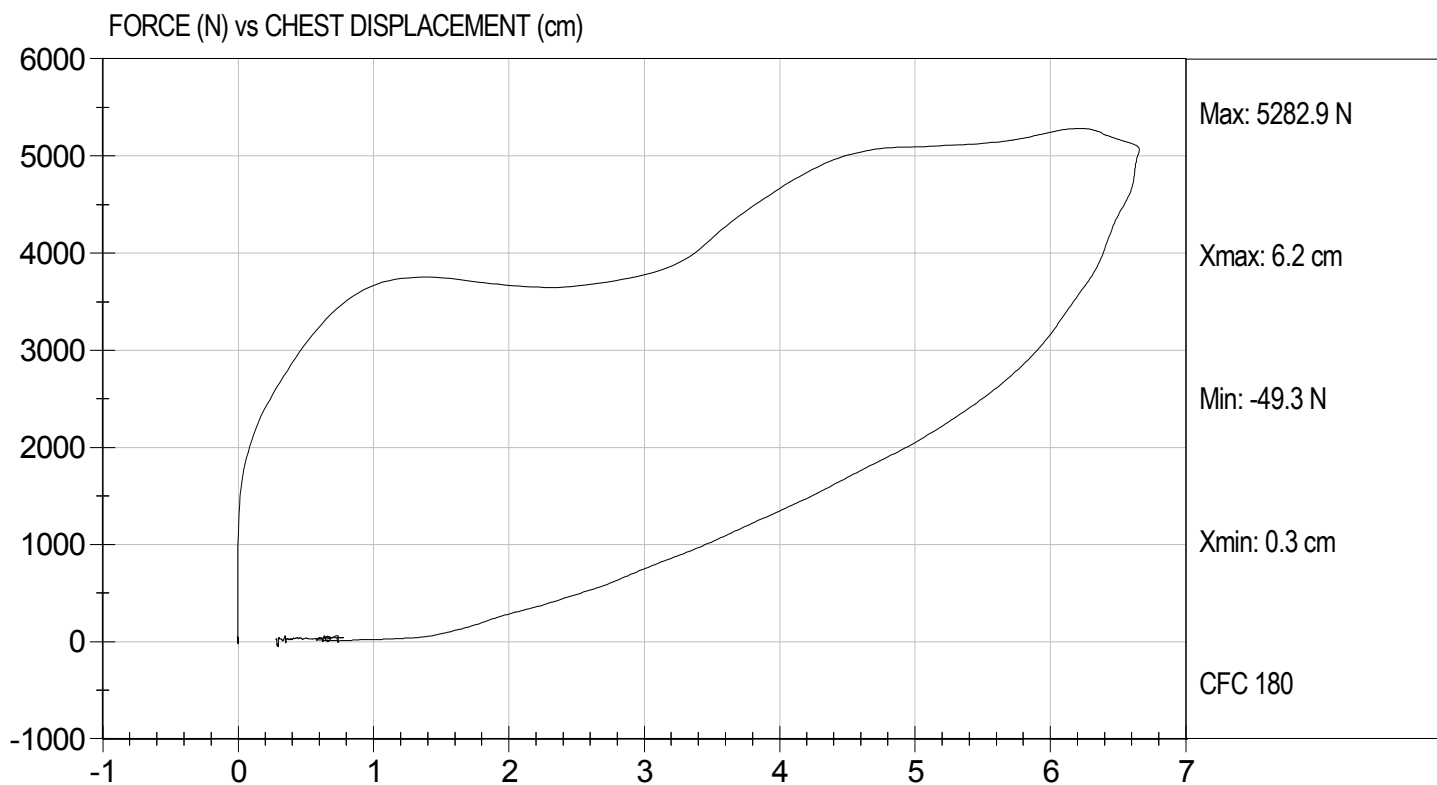
8/31/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102824

Test Date: 8/31/10
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: D102825

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,087	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

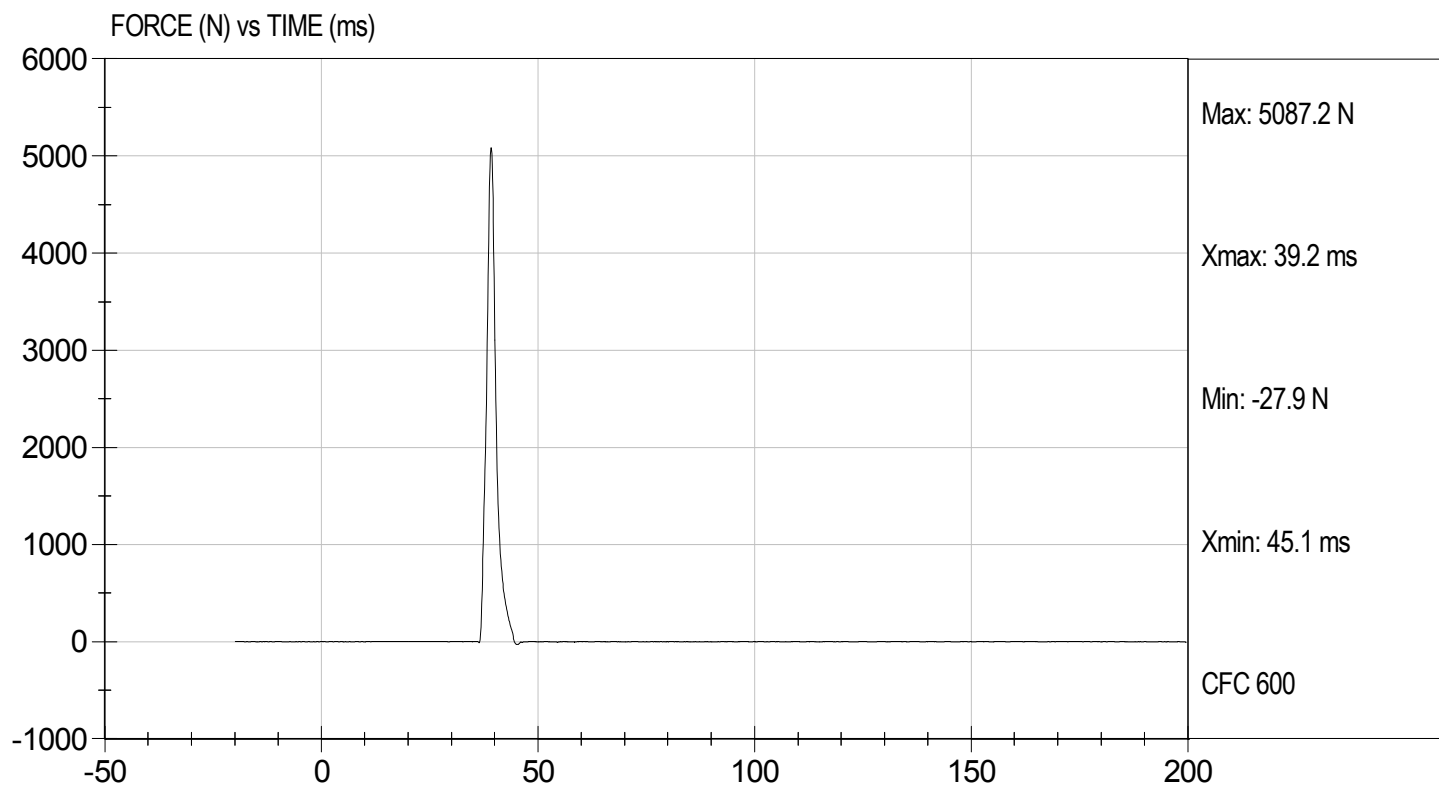
8/31/10
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D102825

Test Date: 8/31/10
Velocity: 6.92 ft/s, 2.11 m/s

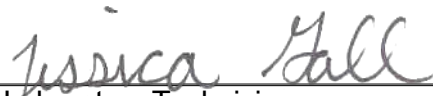


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102826

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,180	Pass
			Overall Test Results	Pass


Laboratory Technician

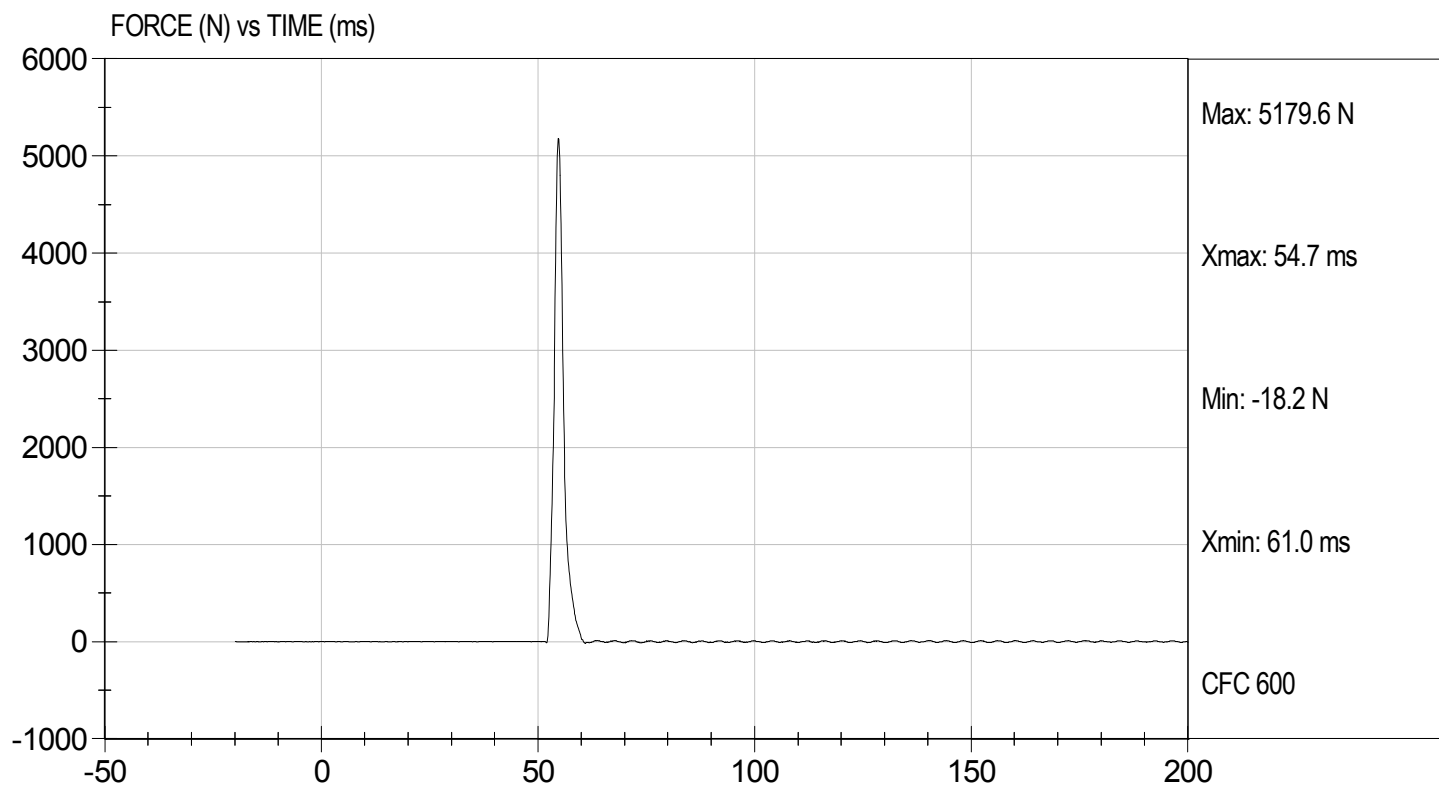
8/31/10
Test Date


Approved By



Test Desc: Left Knee
Component ID: D102826

Test Date: 8/31/10
Velocity: 6.92 ft/s, 2.11 m/s



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

ATD Serial No: 351

Test I.D: D102820

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.7	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	49	49	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	55.9	64.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	45	47	Pass
Overall Test Results					Pass


Laboratory Technician

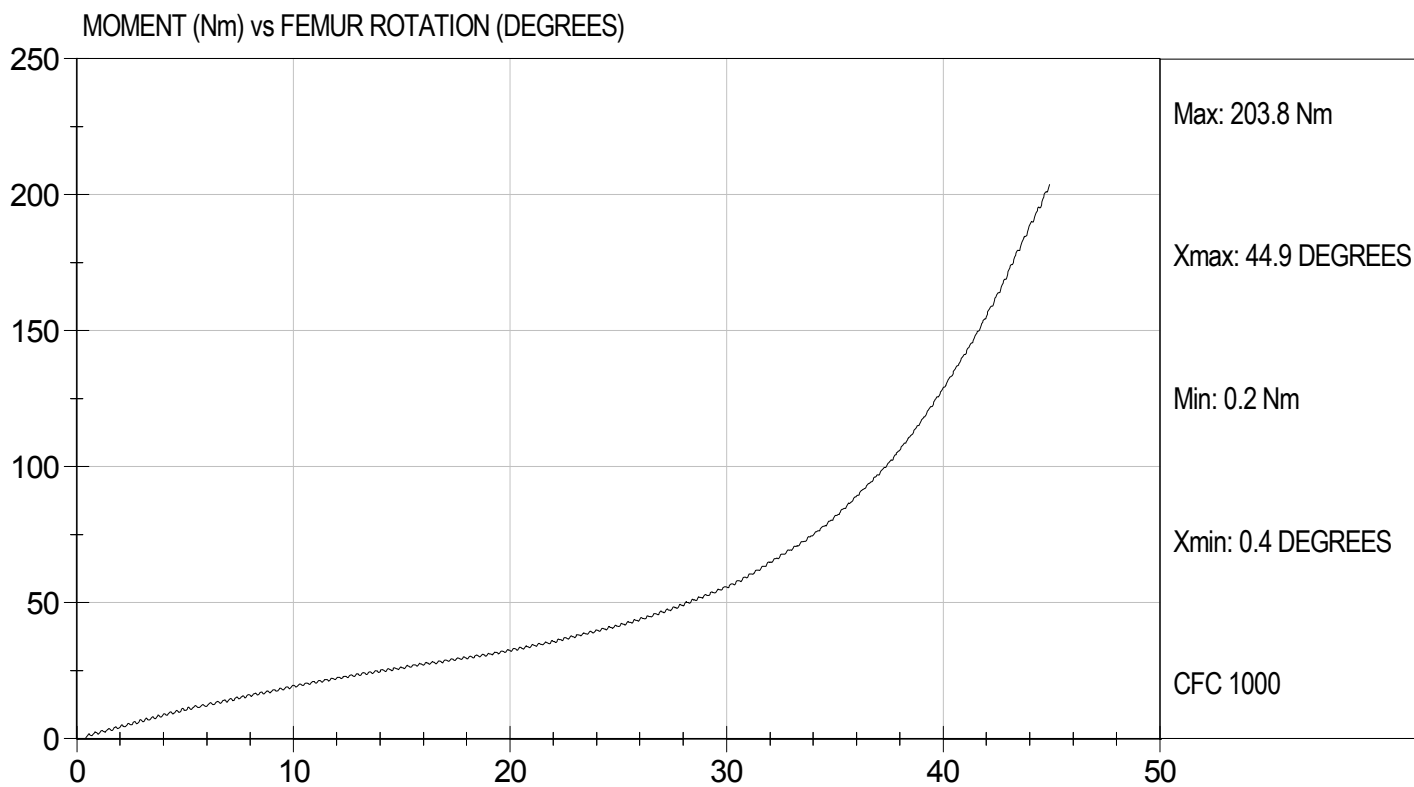
9/1/10
Test Date


Approved By



Test Desc: Hip Femur Flexion
Component ID: D102829

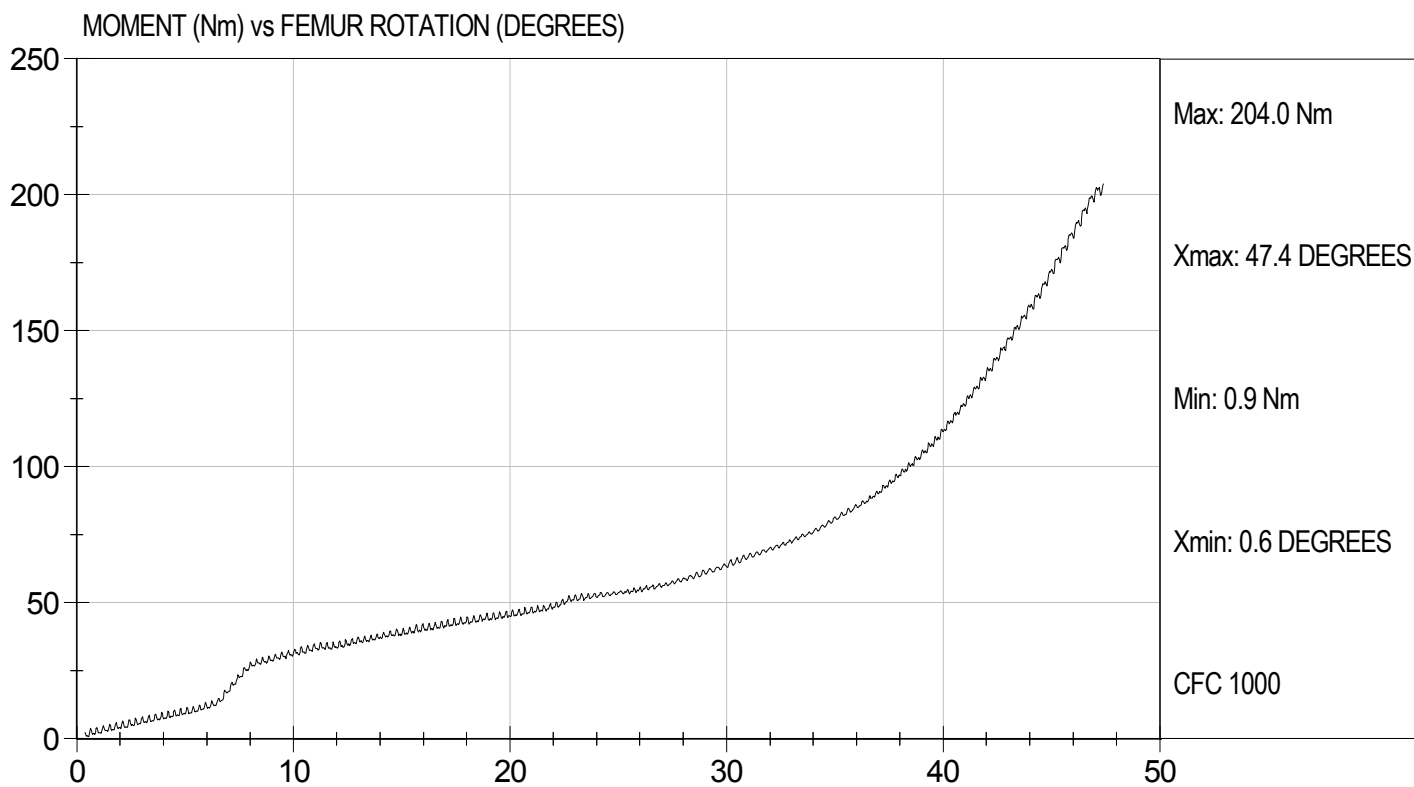
Test Date: 9/1/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D102820

Test Date: 9/1/10
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: D102891

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	225 - 275	258	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

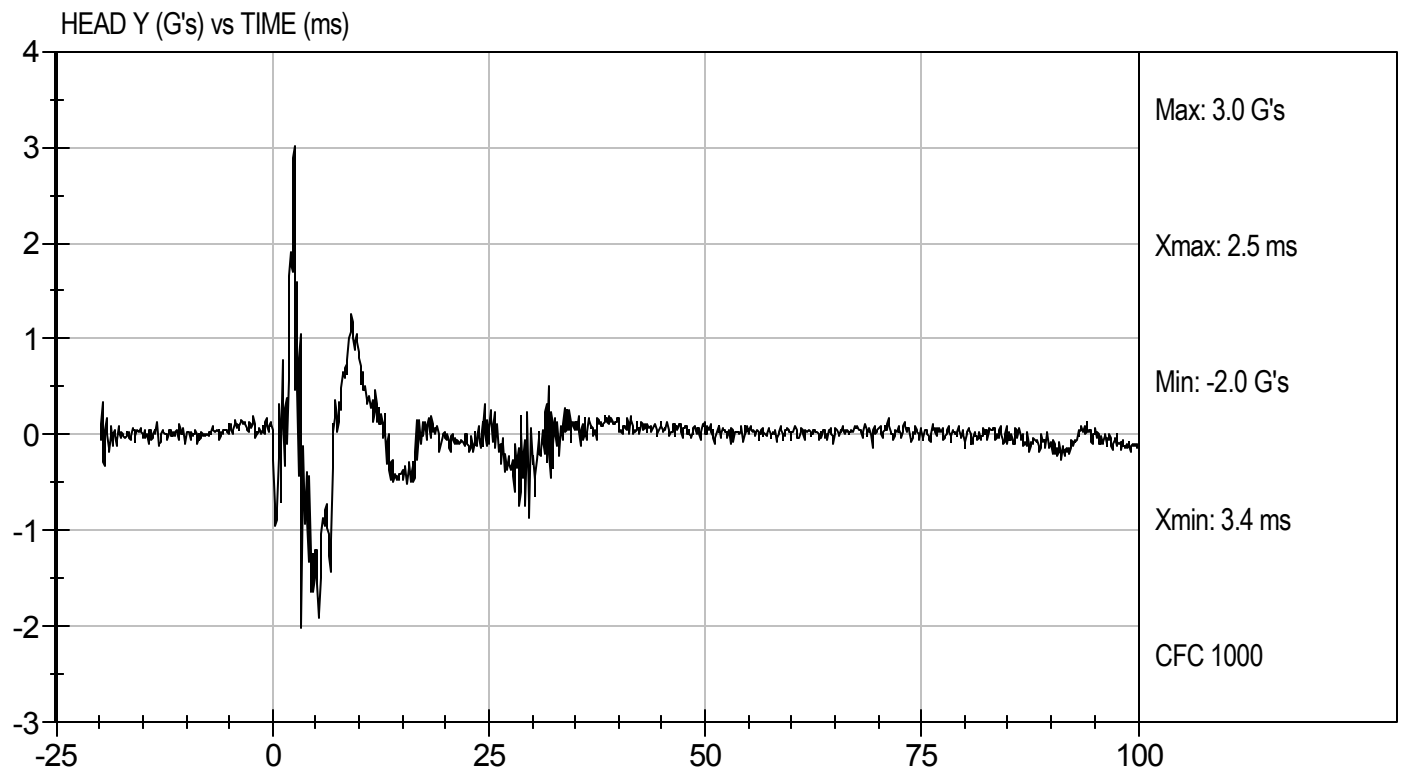
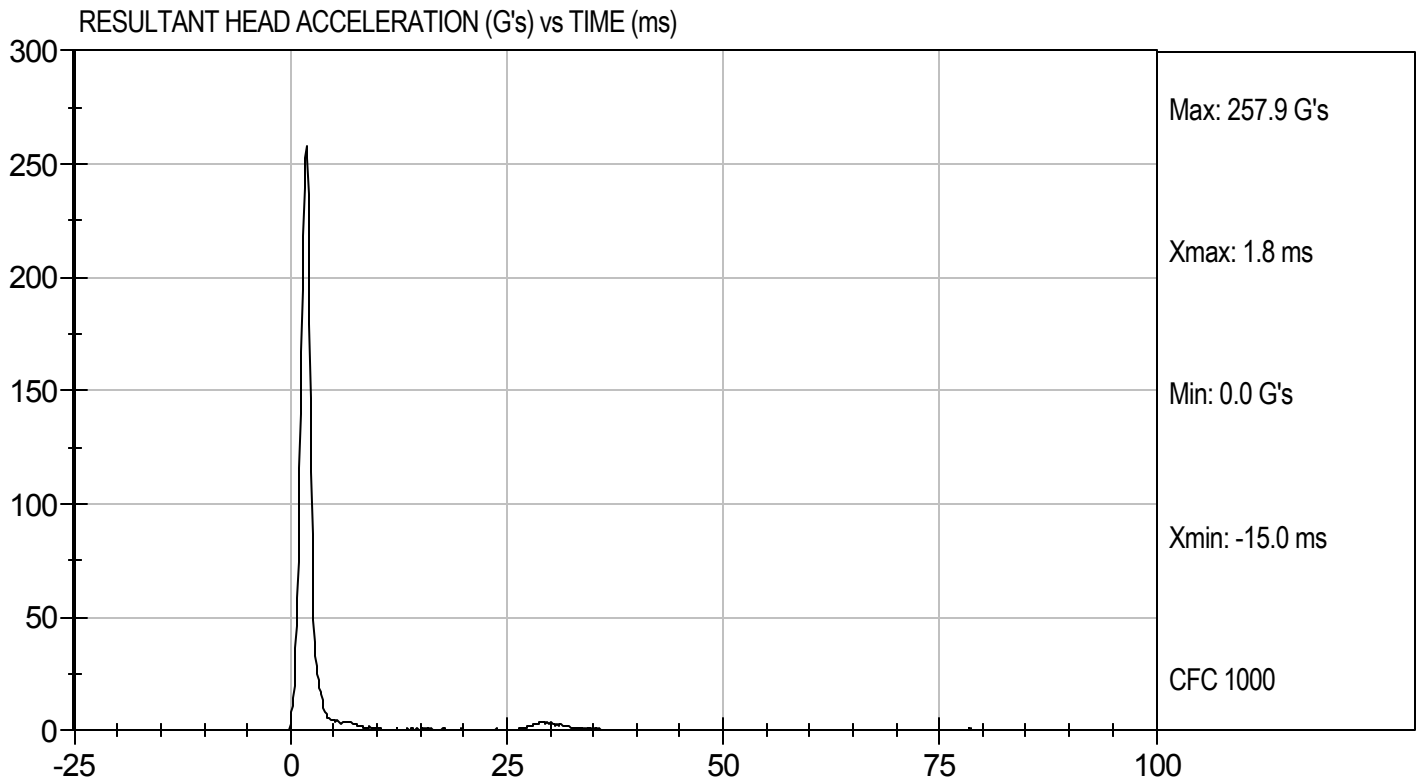
9/7/10
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D102891

Test Date: 9/7/10
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: D102892

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.88	Pass
	20 ms	G's	17.60 to 22.60	19.36	Pass
	30 ms	G's	12.50 to 18.50	14.82	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.75	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	67.6	Pass
	Time	ms	57.0 to 64.0	57.8	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	95.9	Pass
	Time	ms	47.0 to 58.0	47.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.6	Pass
Overall Test Results					Pass


 Laboratory Technician

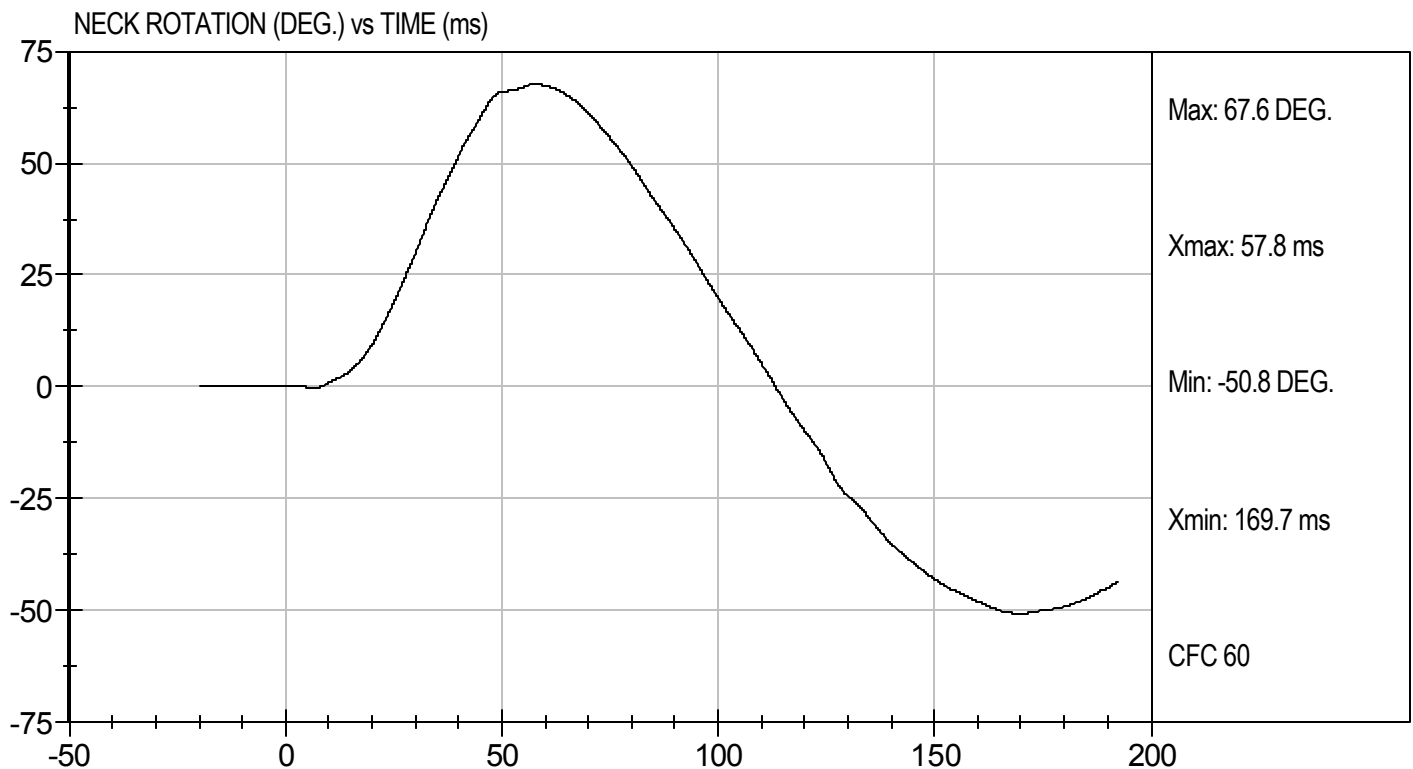
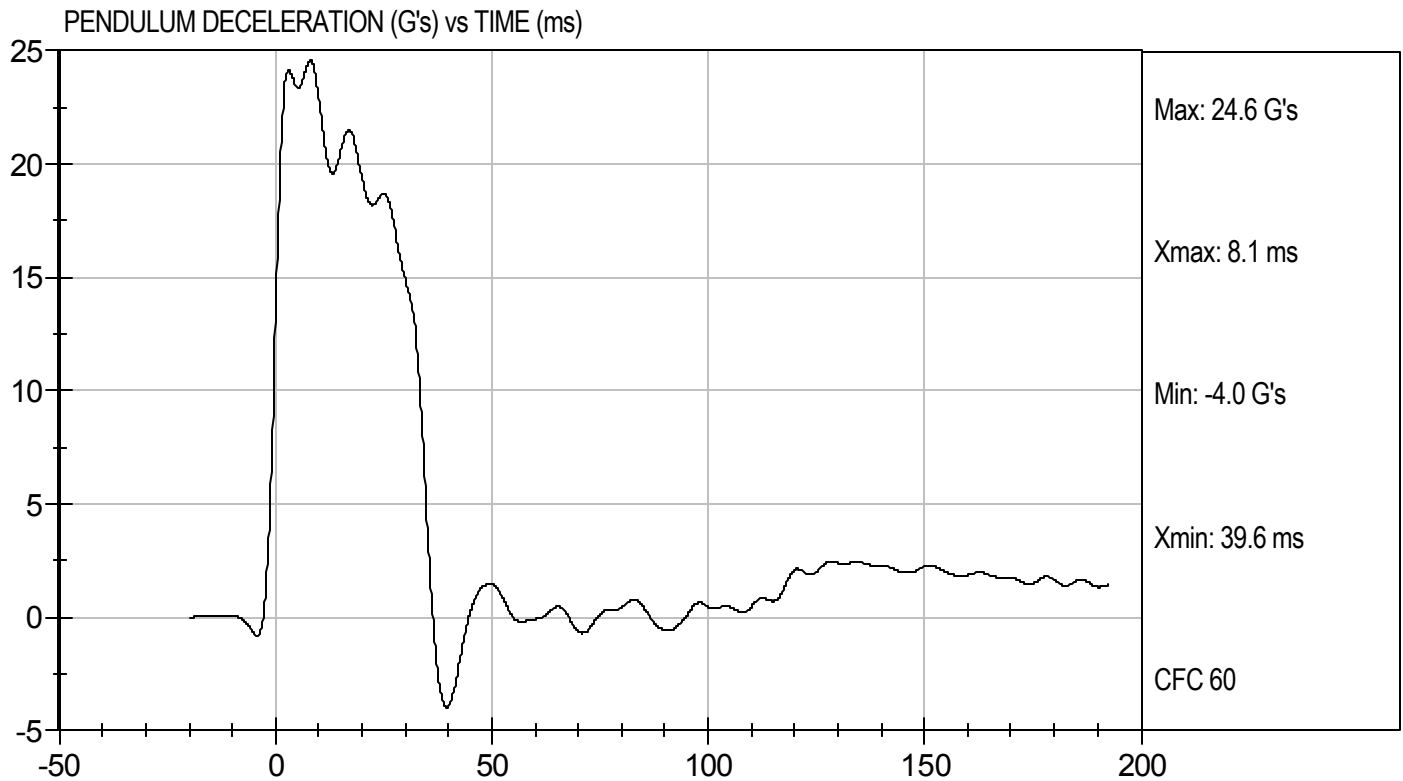
9/7/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D102892

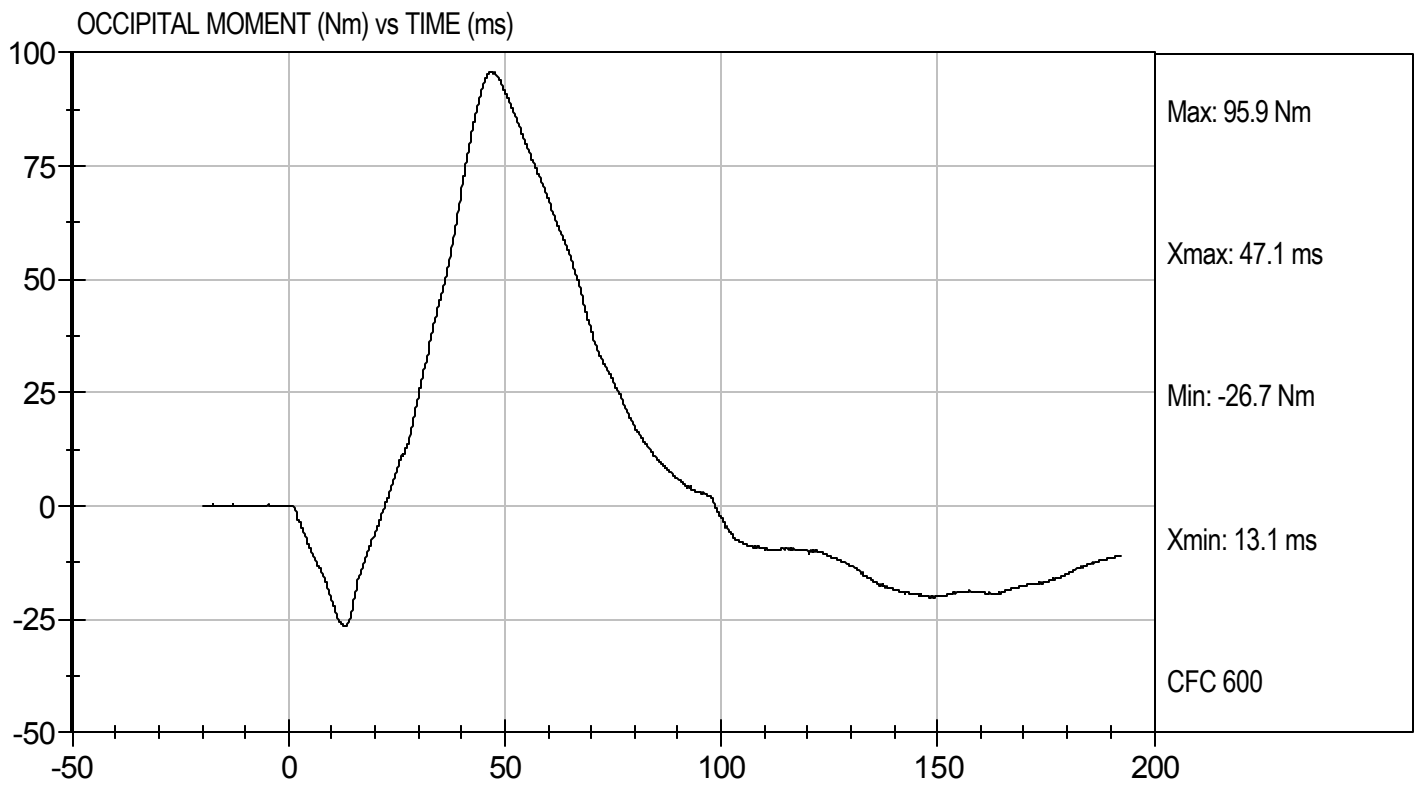
Test Date: 9/7/10
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D102892

Test Date: 9/7/10
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: D102893

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.04	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.32	Pass
	20 ms	G's	14.00 to 19.00	15.44	Pass
	30 ms	G's	11.00 to 16.00	12.70	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.72	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	90.1	Pass
	Time	ms	72.0 to 82.0	74.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	153.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-57.9	Pass
	Time	ms	65.0 to 79.0	69.9	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	139.7	Pass
Overall Test Results					Pass


 Laboratory Technician

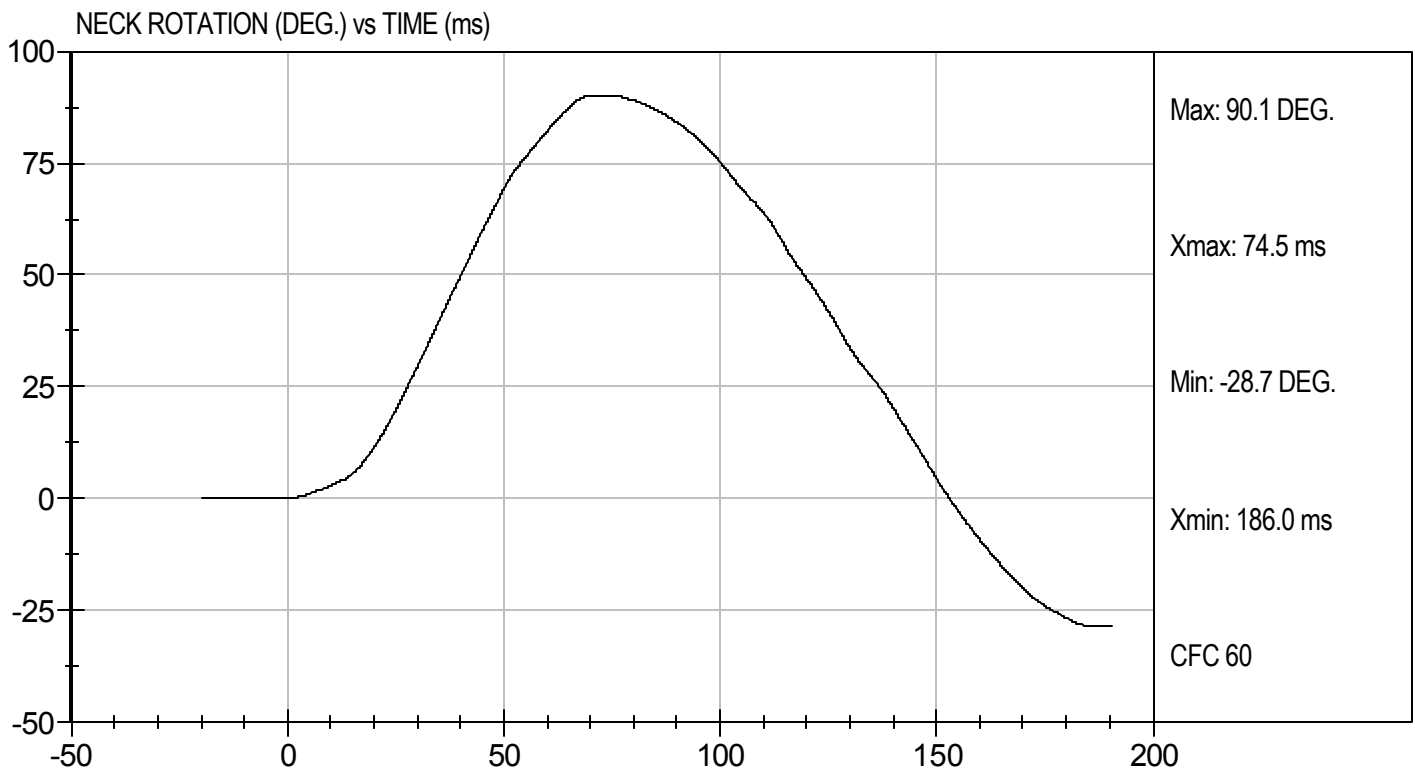
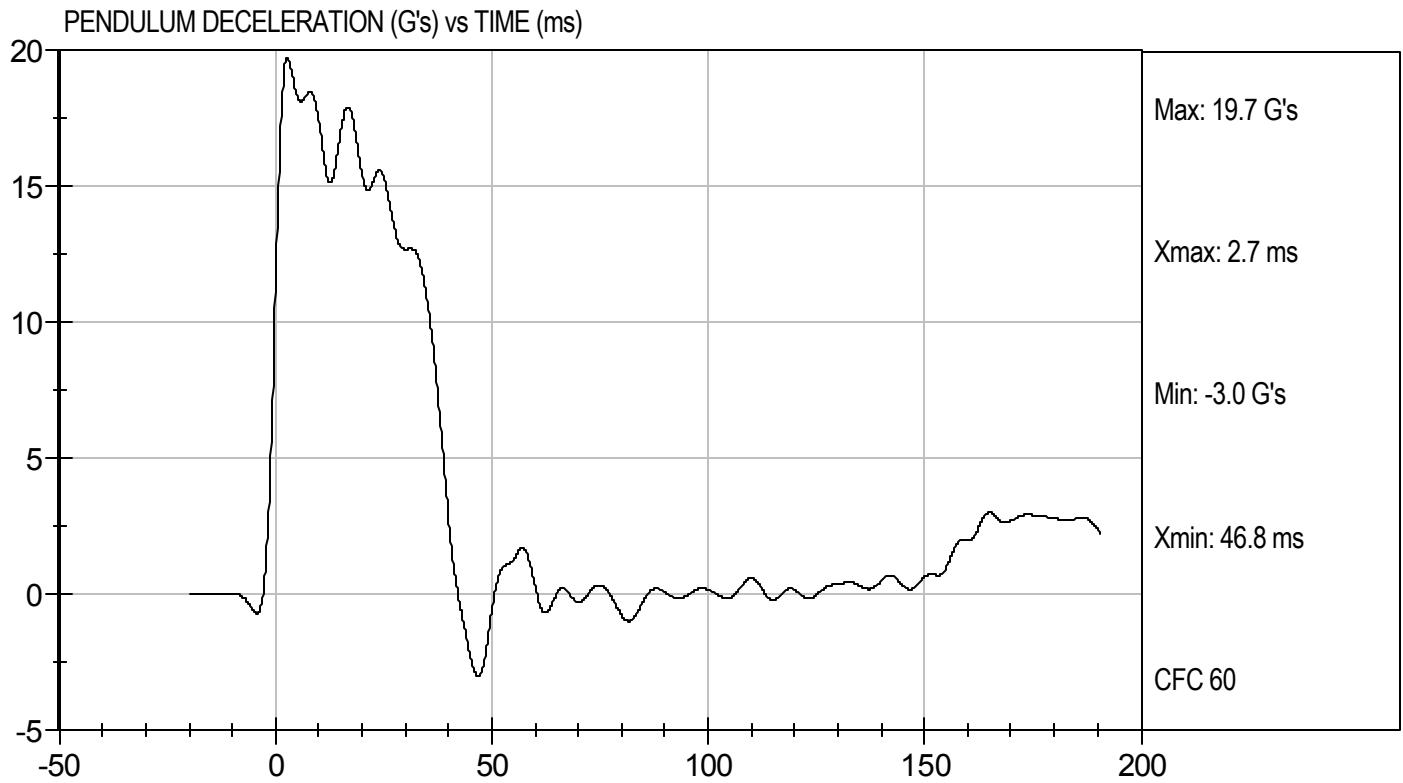
9/7/10
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D102893

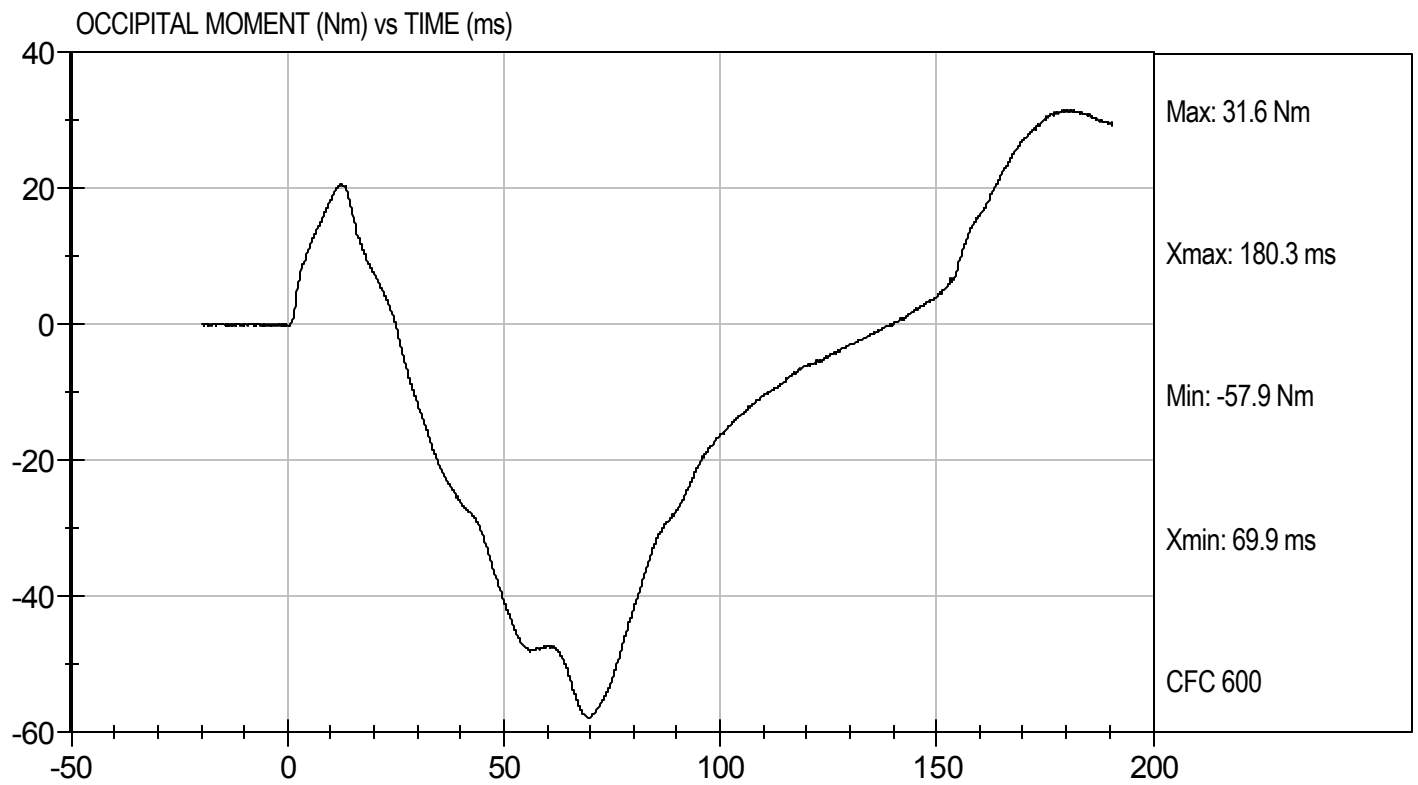
Test Date: 9/7/10
Velocity: 19.8 ft/s, 6.04 m/s





Test Desc: Neck Extension
Component ID: D102893

Test Date: 9/7/10
Velocity: 19.8 ft/s, 6.04 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102894

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,357	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.36	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results			Pass	


Laboratory Technician

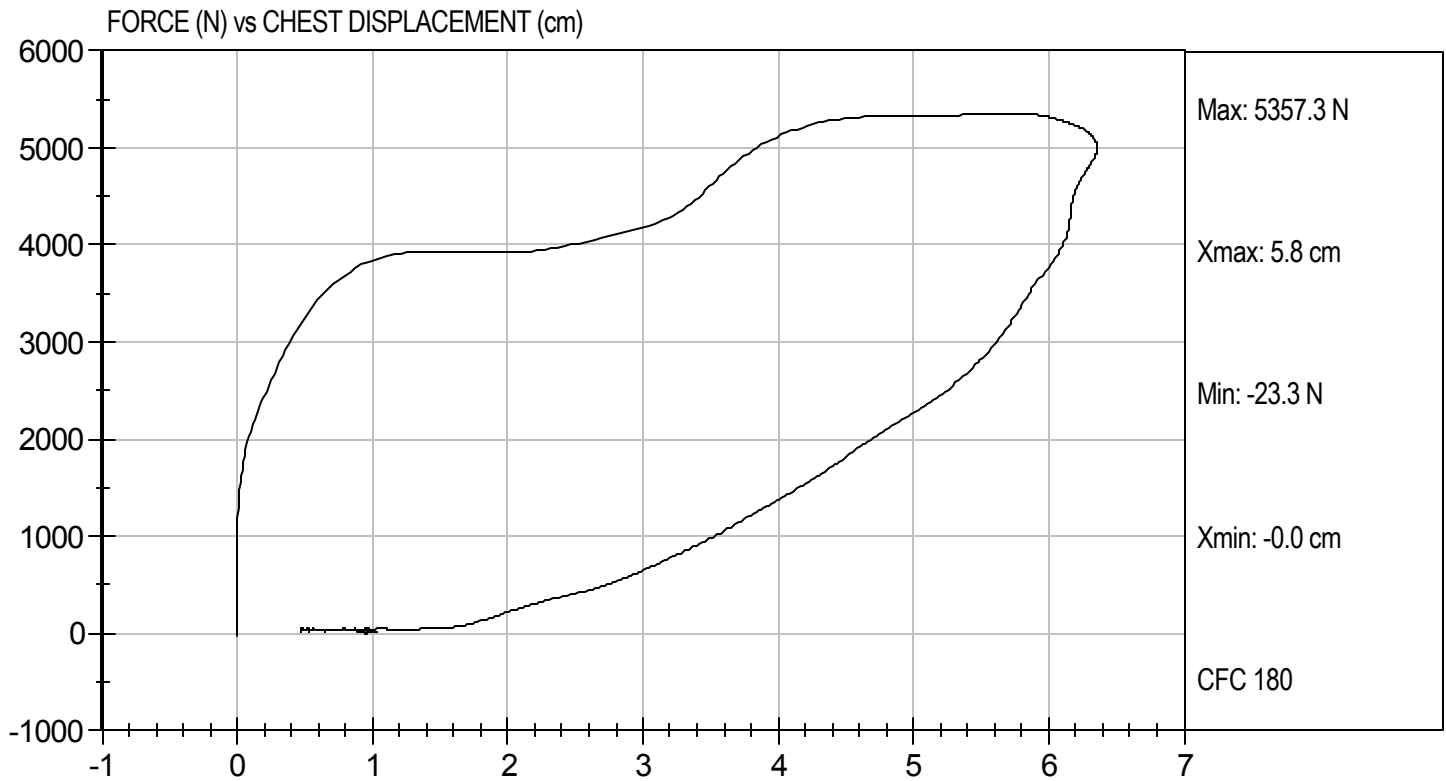
9/8/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102894

Test Date: 9/8/10
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: D102895

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,580	Pass
Overall Test Results				Pass



Laboratory Technician

9/7/10

Test Date

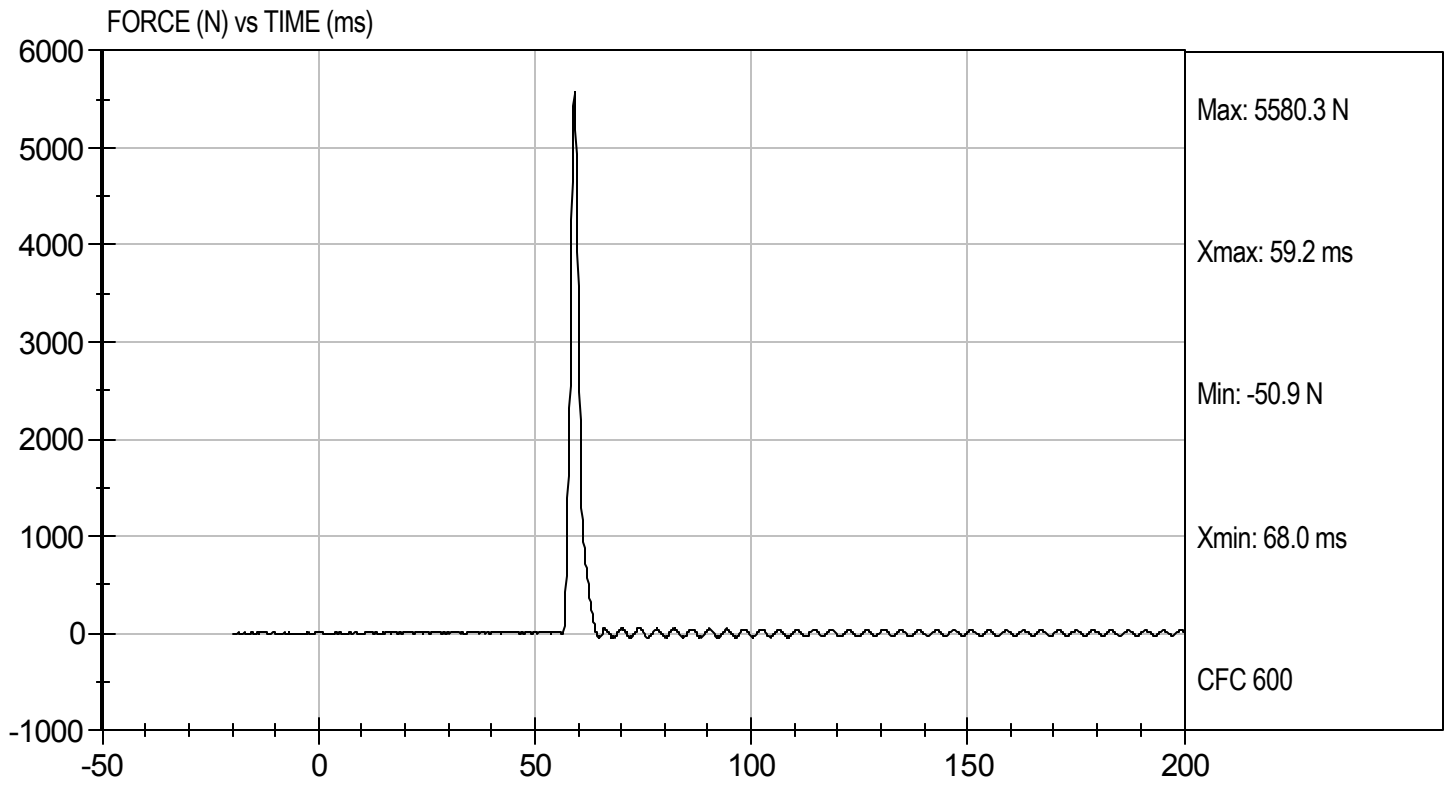


Approved By



Test Desc: Right Knee
Component ID: D102895

Test Date: 9/7/10
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: D102896

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,215	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

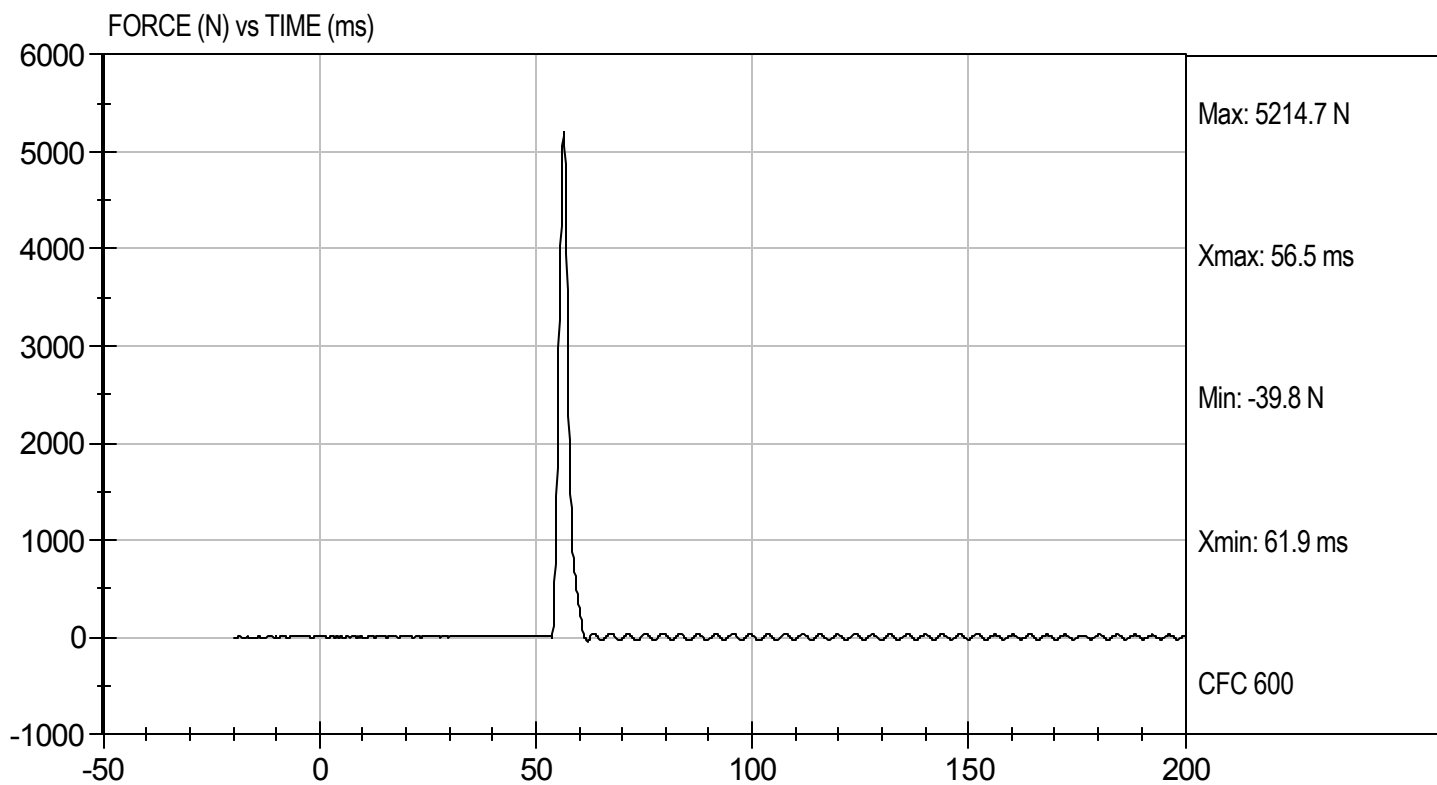
9/7/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D102896

Test Date: 9/7/10
Velocity: 6.88 ft/s, 2.10 m/s



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

ATD Serial No: 351

Test I.D: D102890

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.8	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	46	46	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.7	52.9	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	45	47	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

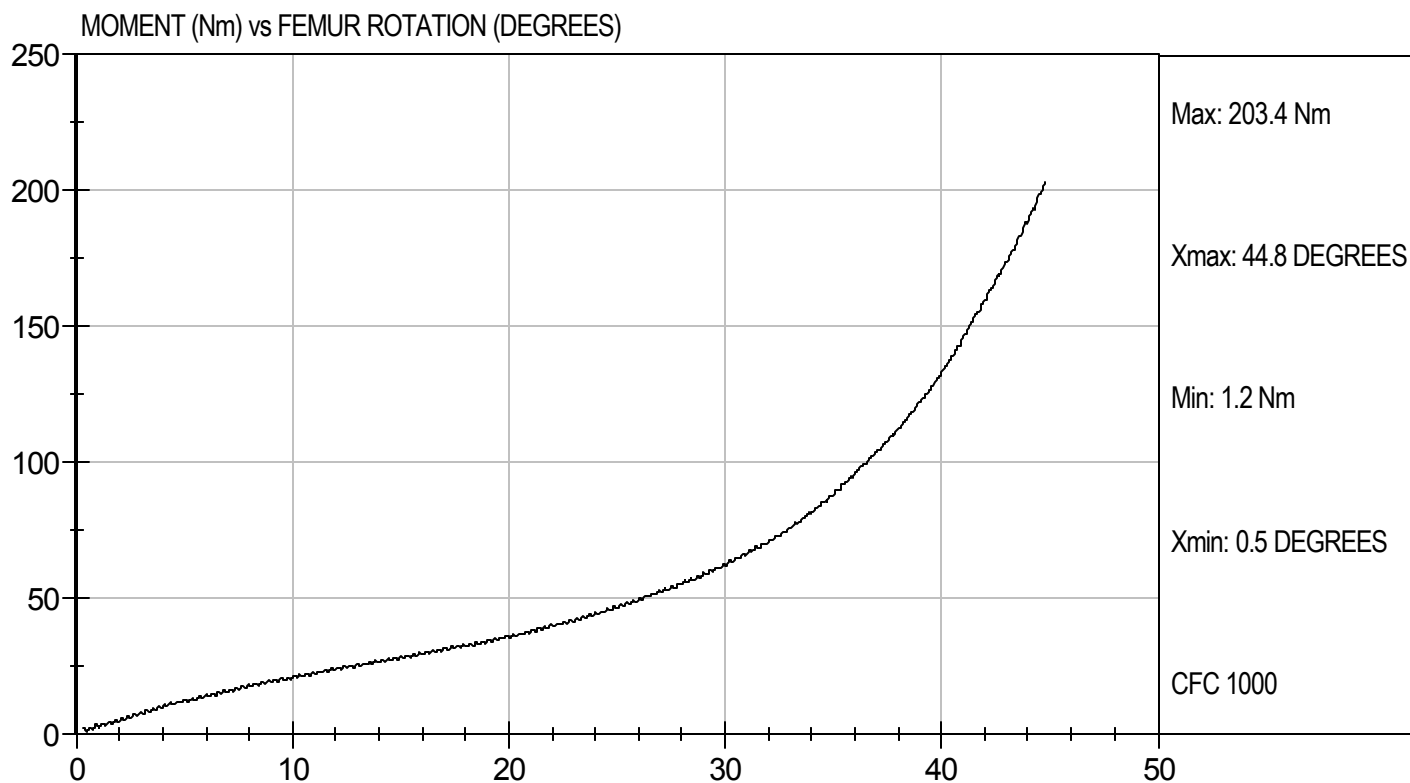
9/7/10
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D102899

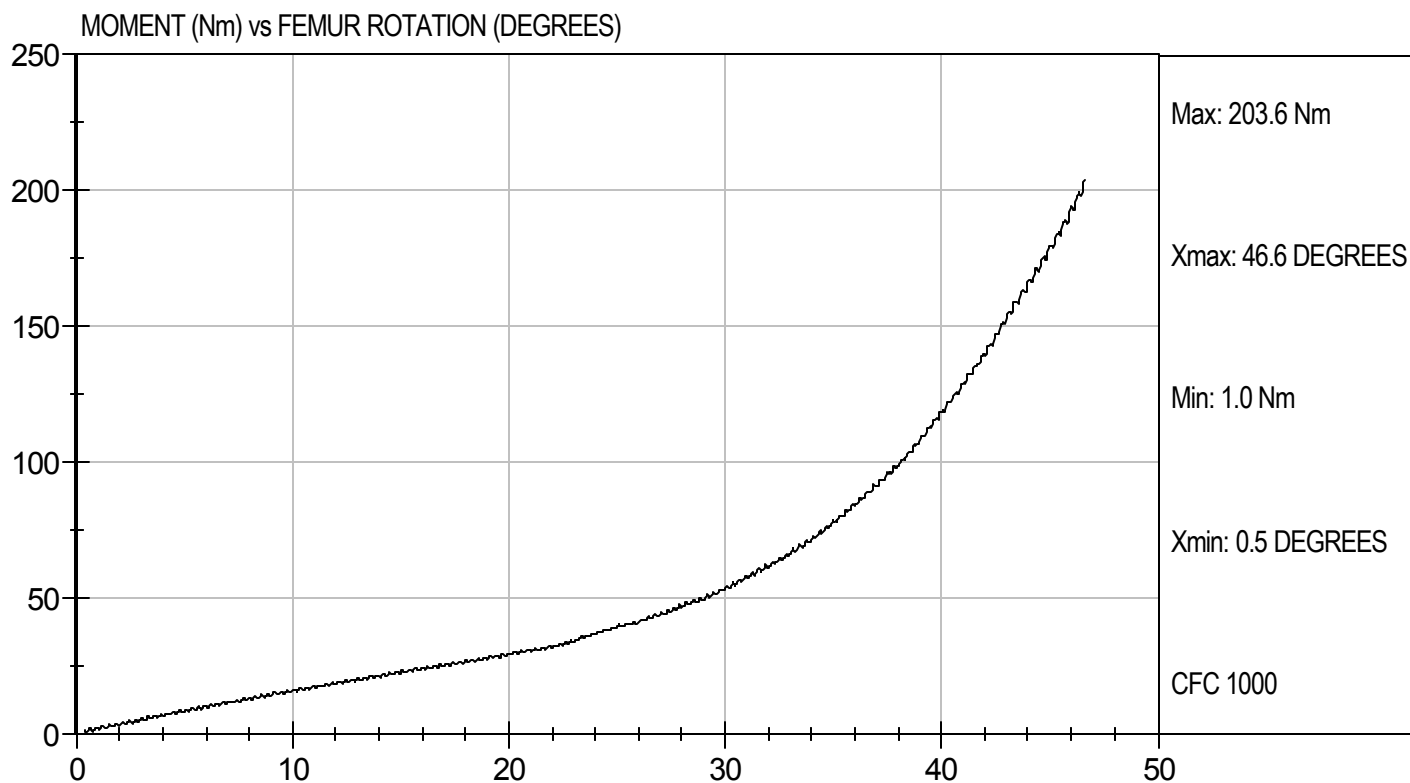
Test Date: 18/16/21
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D102890

Test Date: 9/7/10
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: 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

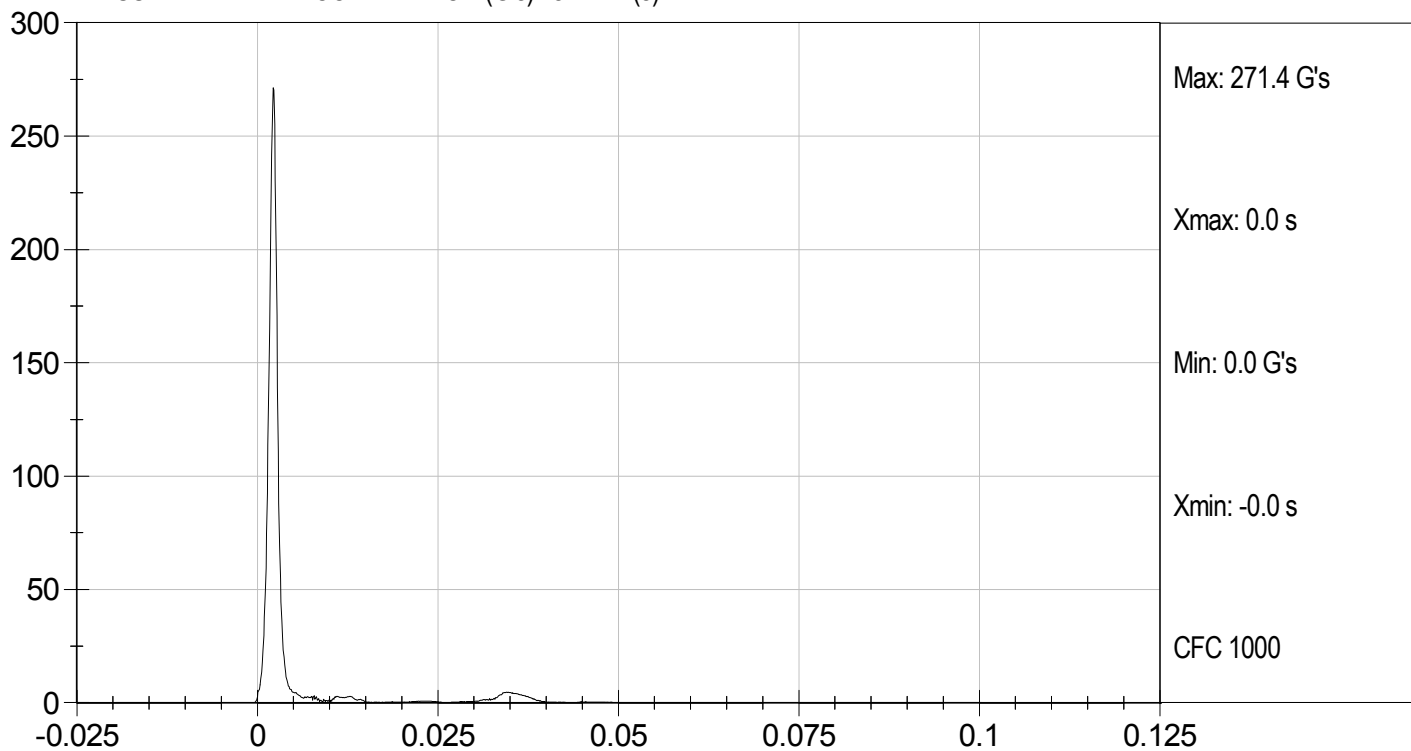
David Winkelbauer
Approved By



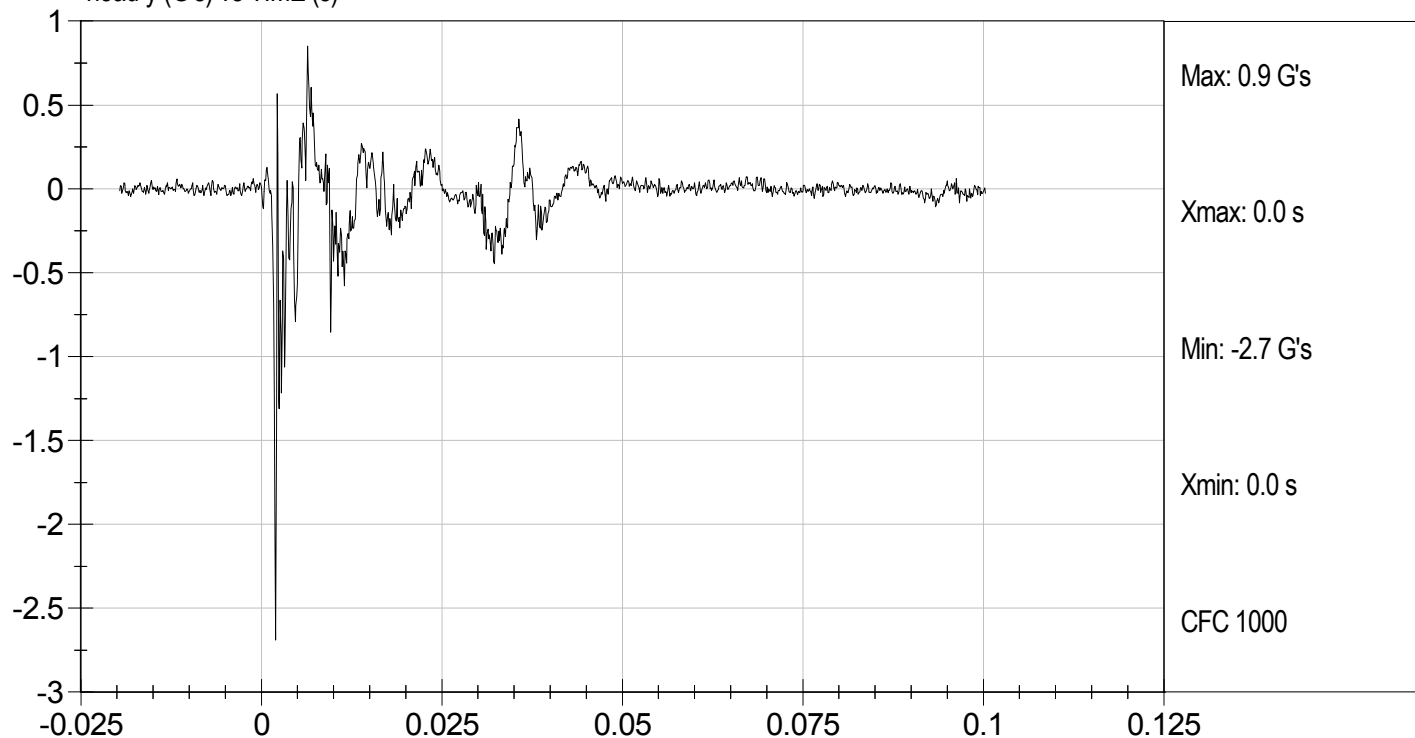
Test Desc: Head Drop
Component ID: D102791

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)

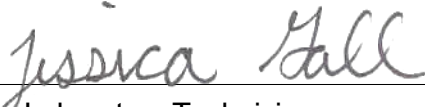


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

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

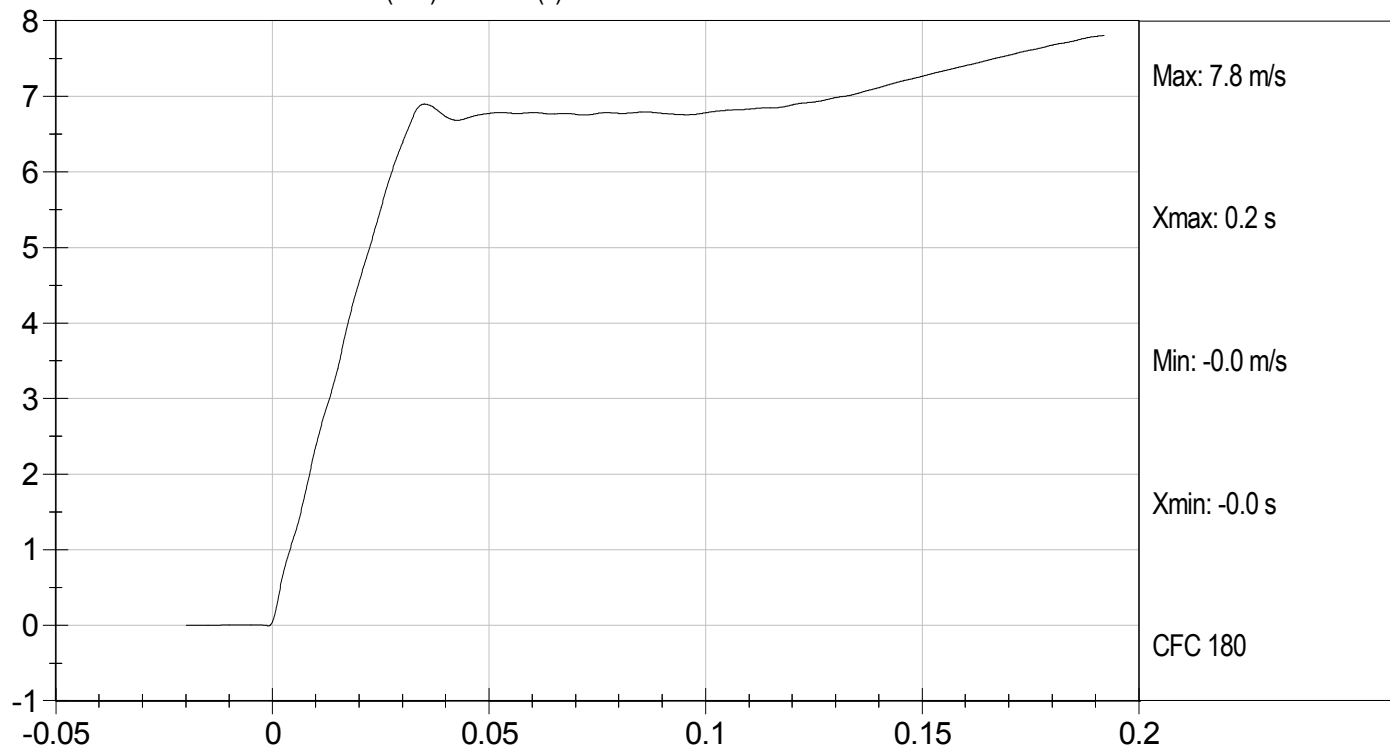

 Approved By



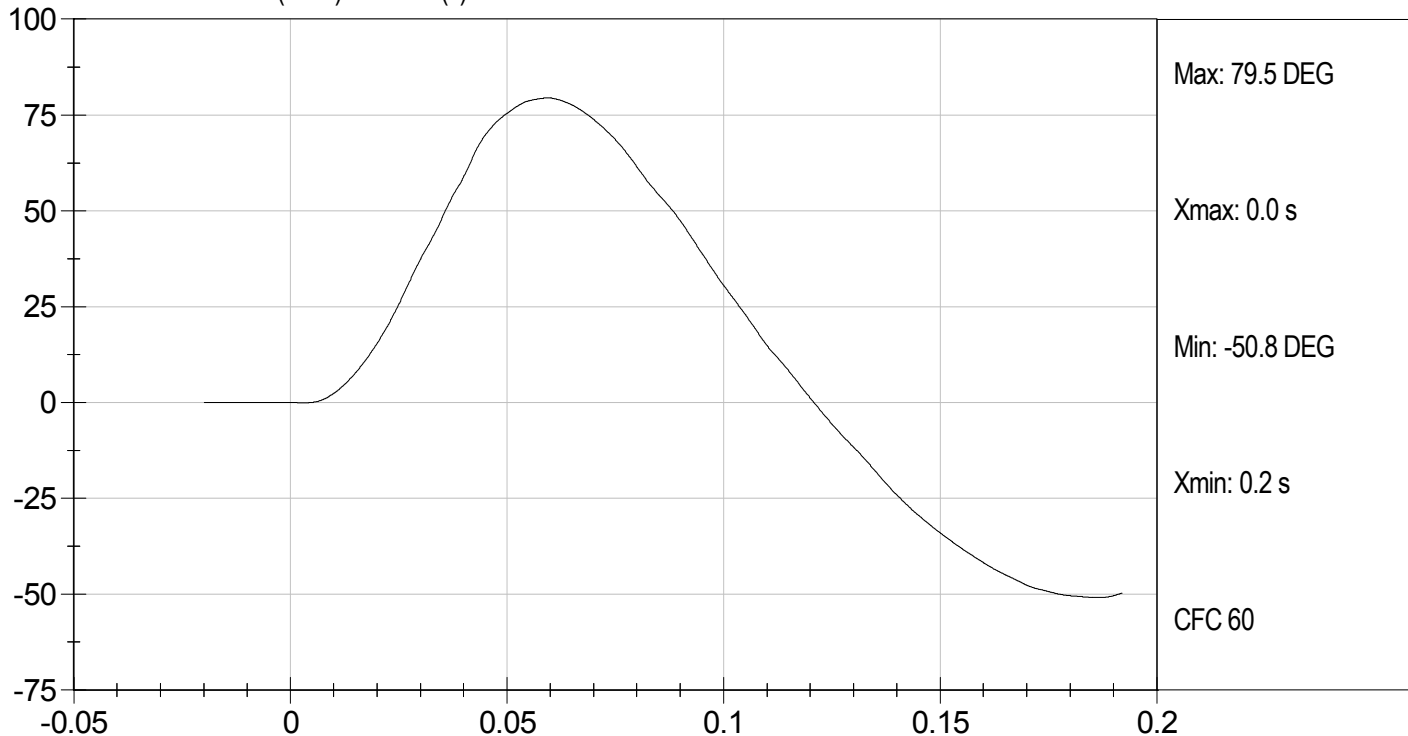
Test Desc: Neck Flexion
Component ID: D102792

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

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



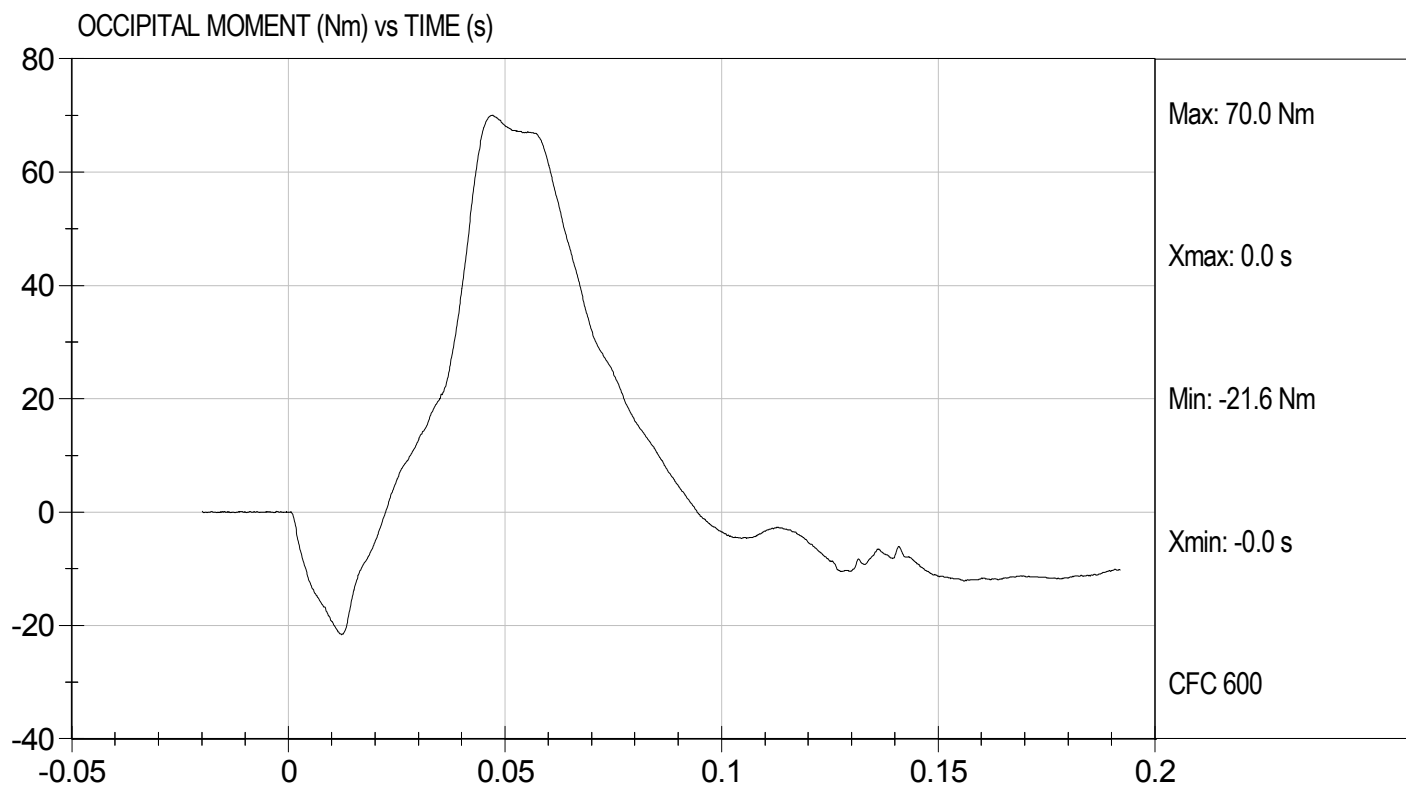
NECK ROTATION (DEG) vs TIME (s)





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

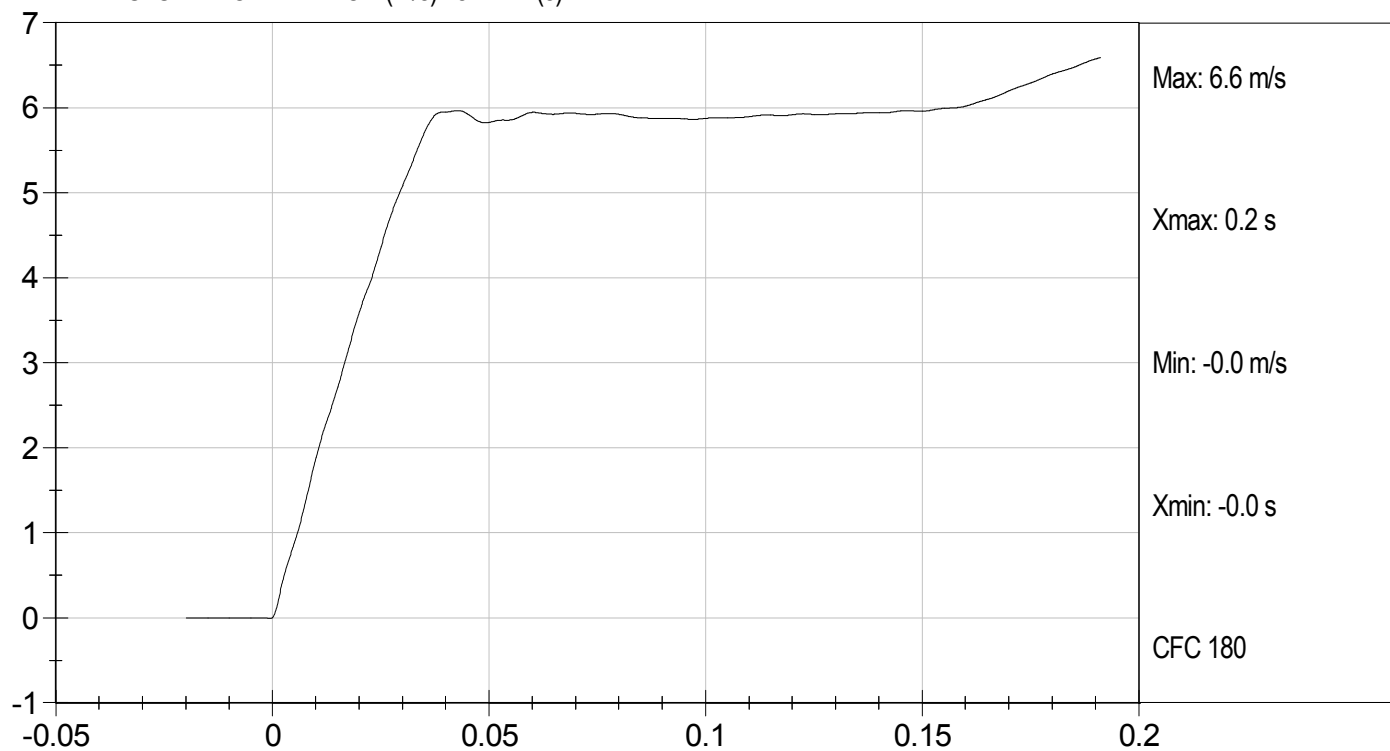

 Approved By



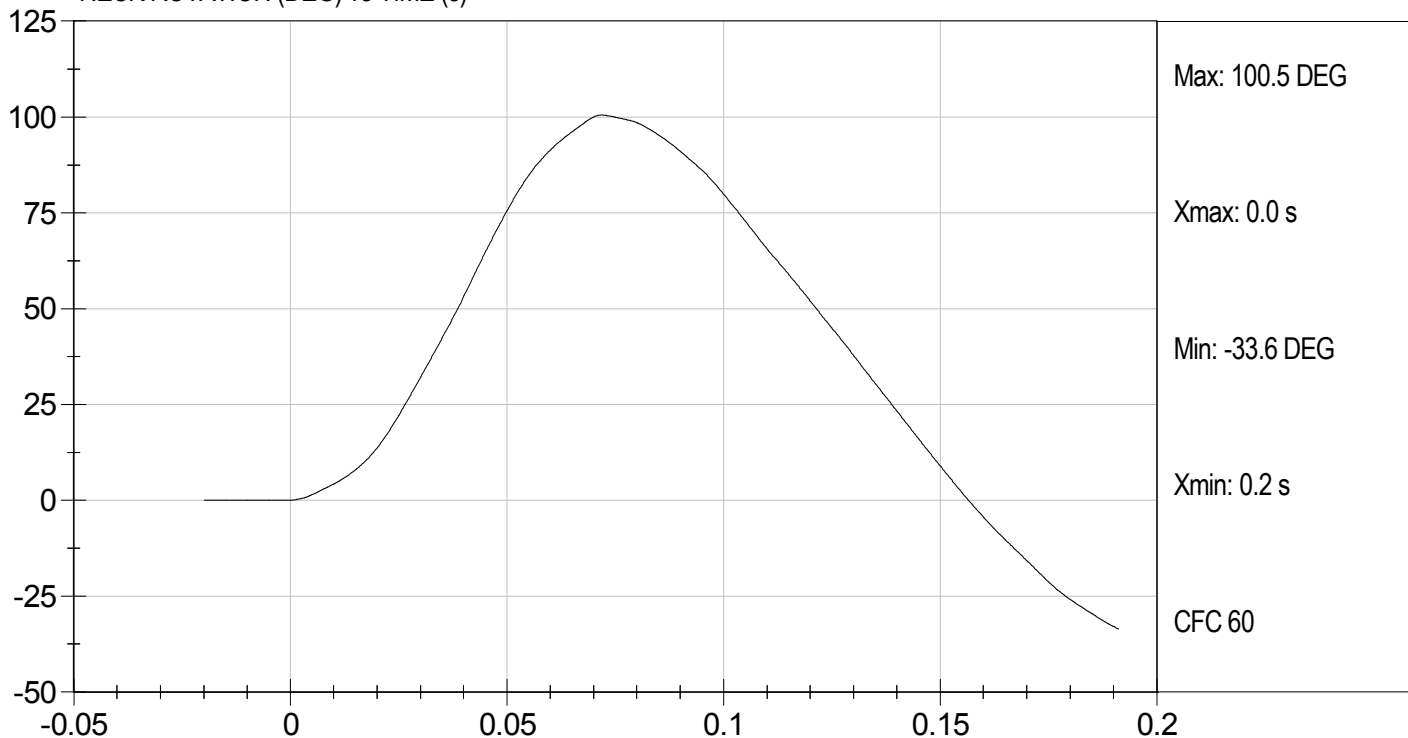
Test Desc: Neck Extension
Component ID: D102793

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

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



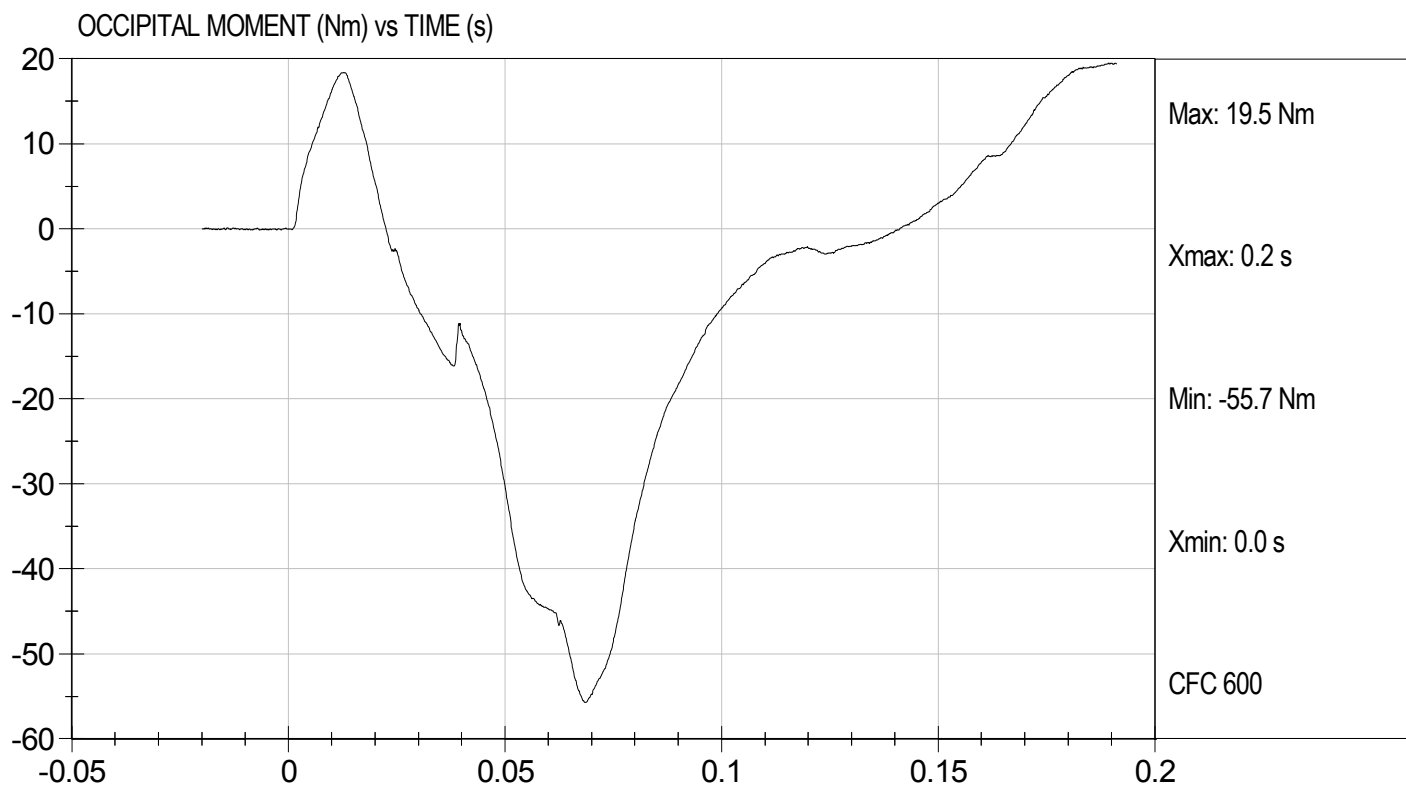
NECK ROTATION (DEG) vs TIME (s)





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

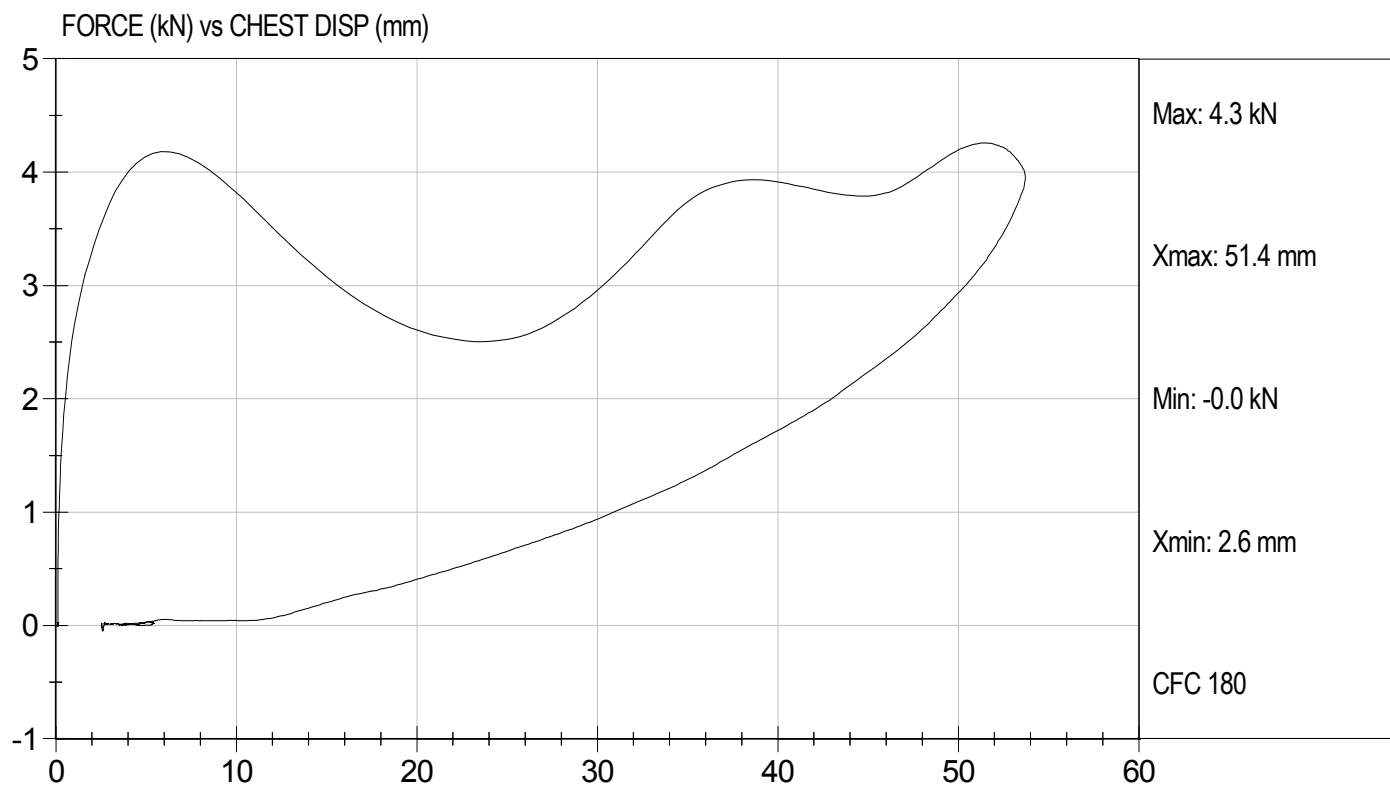
8/30/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102794

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

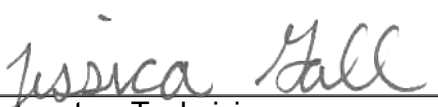


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

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

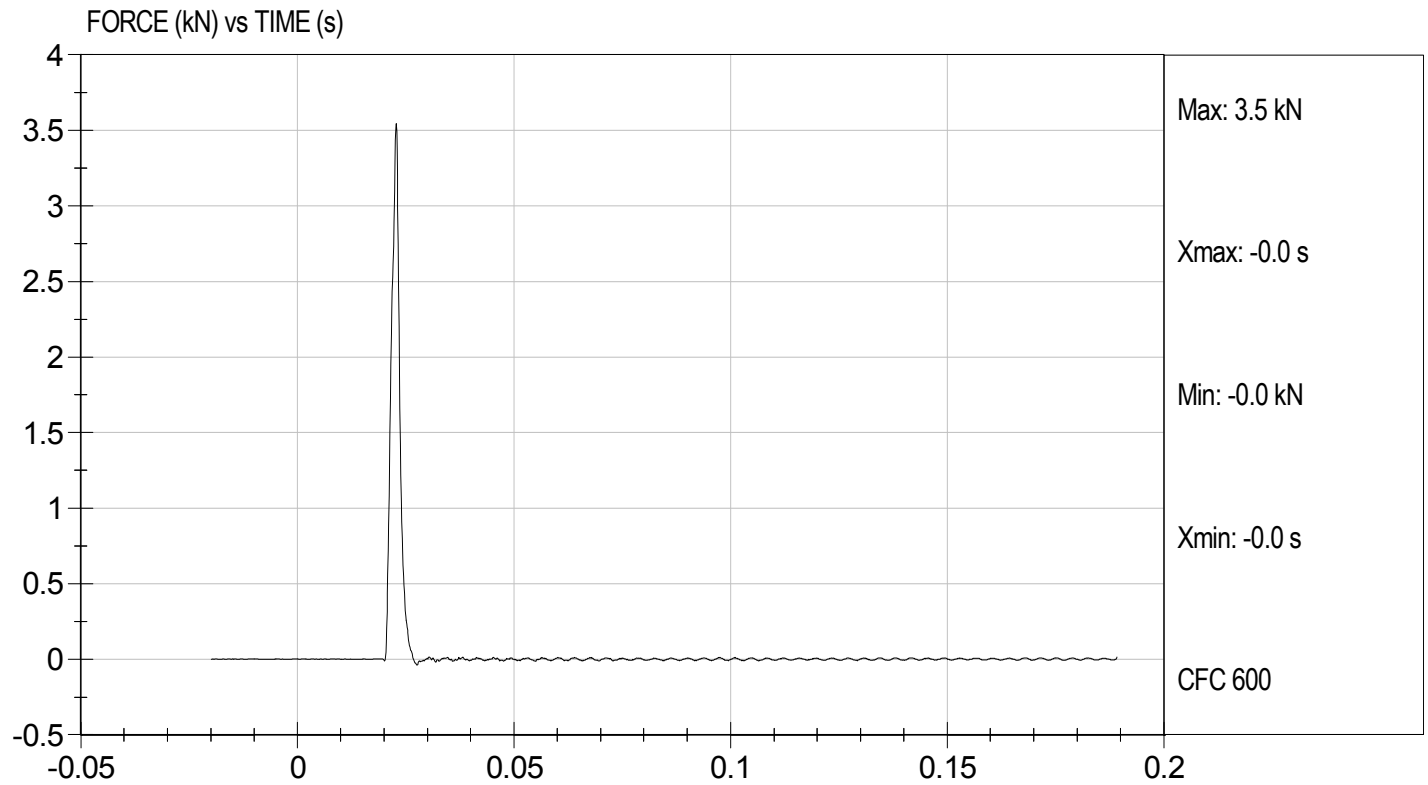
8/30/10
Test Date


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

Jessica Hall
Laboratory Technician

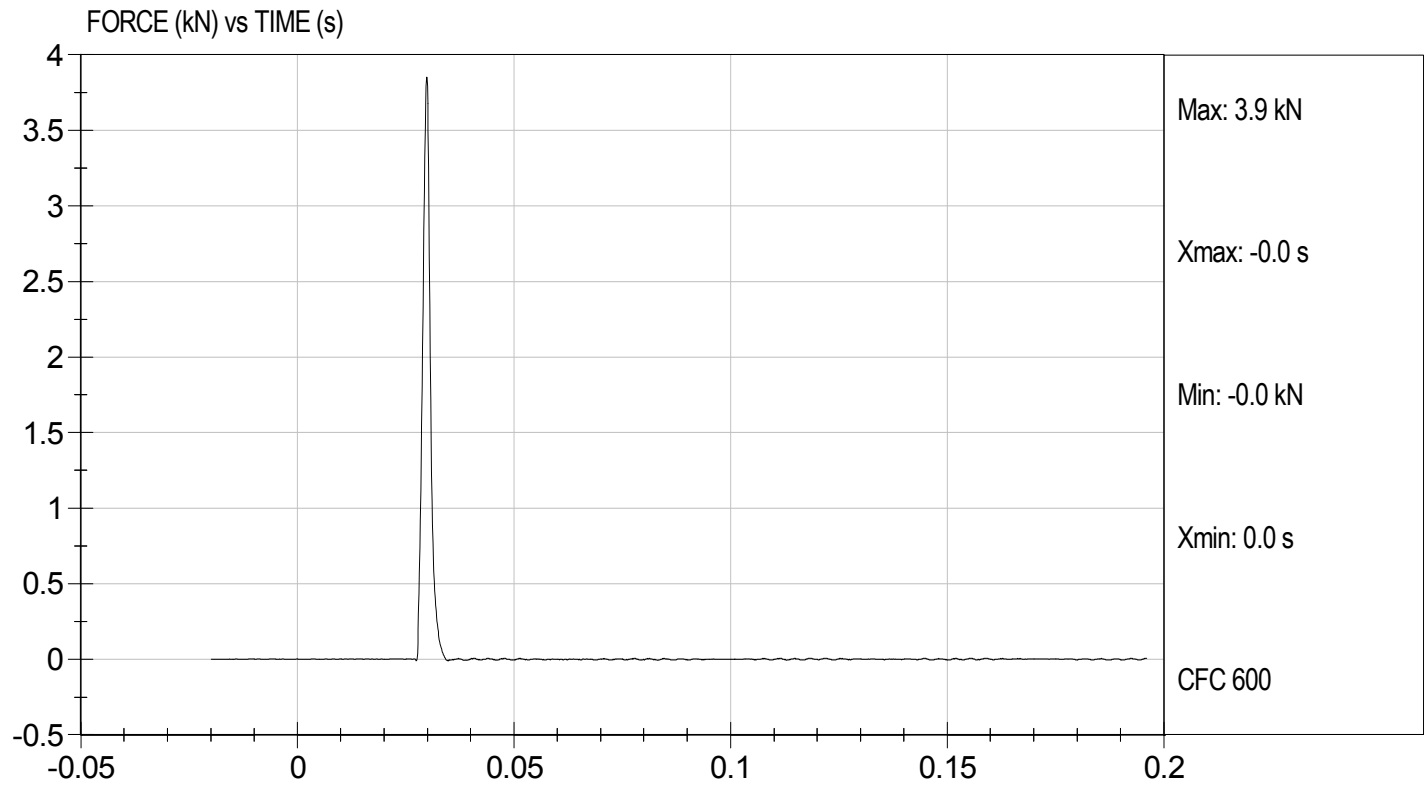
8/30/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D102796

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

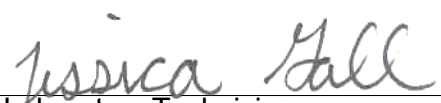


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

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

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test ID: D102901

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	250 to 300	287	Pass
Peak Lateral Acceleration	G's	+/- 15	-13.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

9/7/10
Test Date

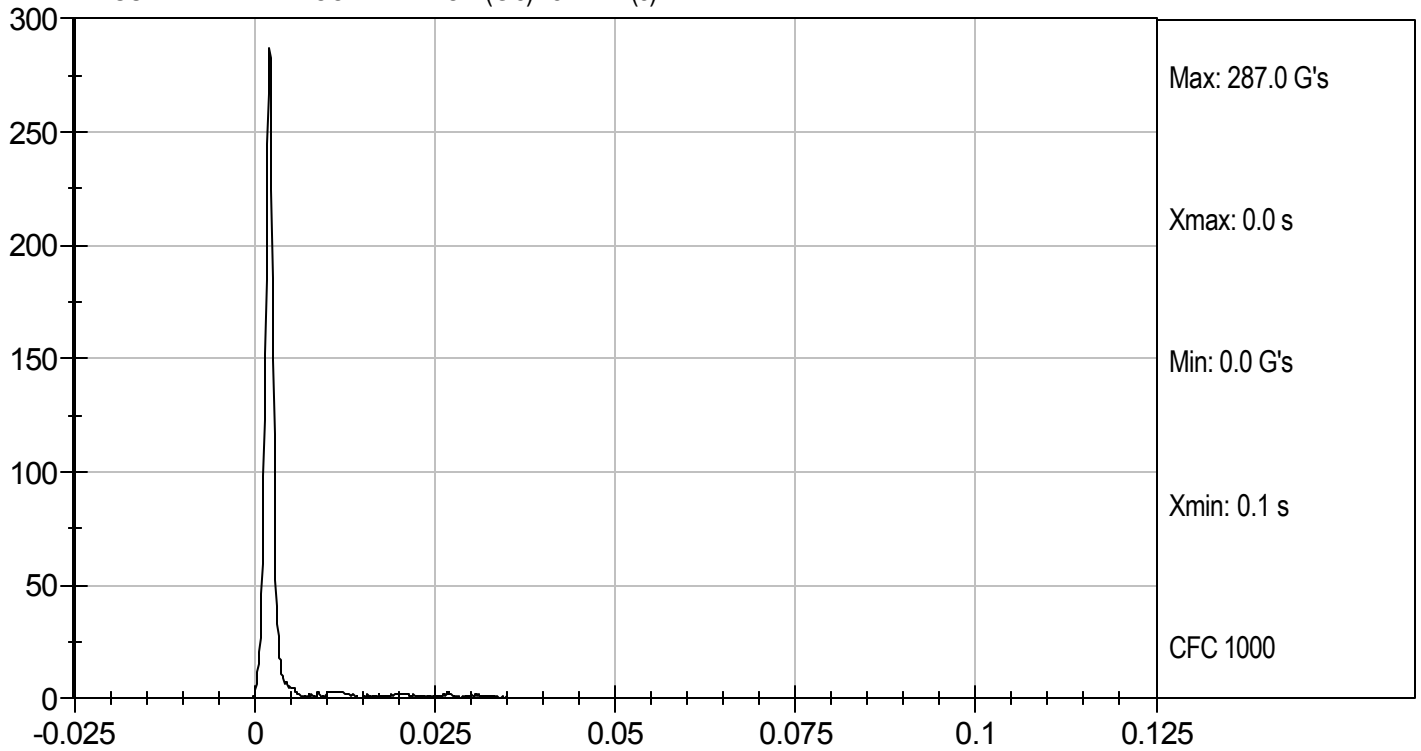

Approved By



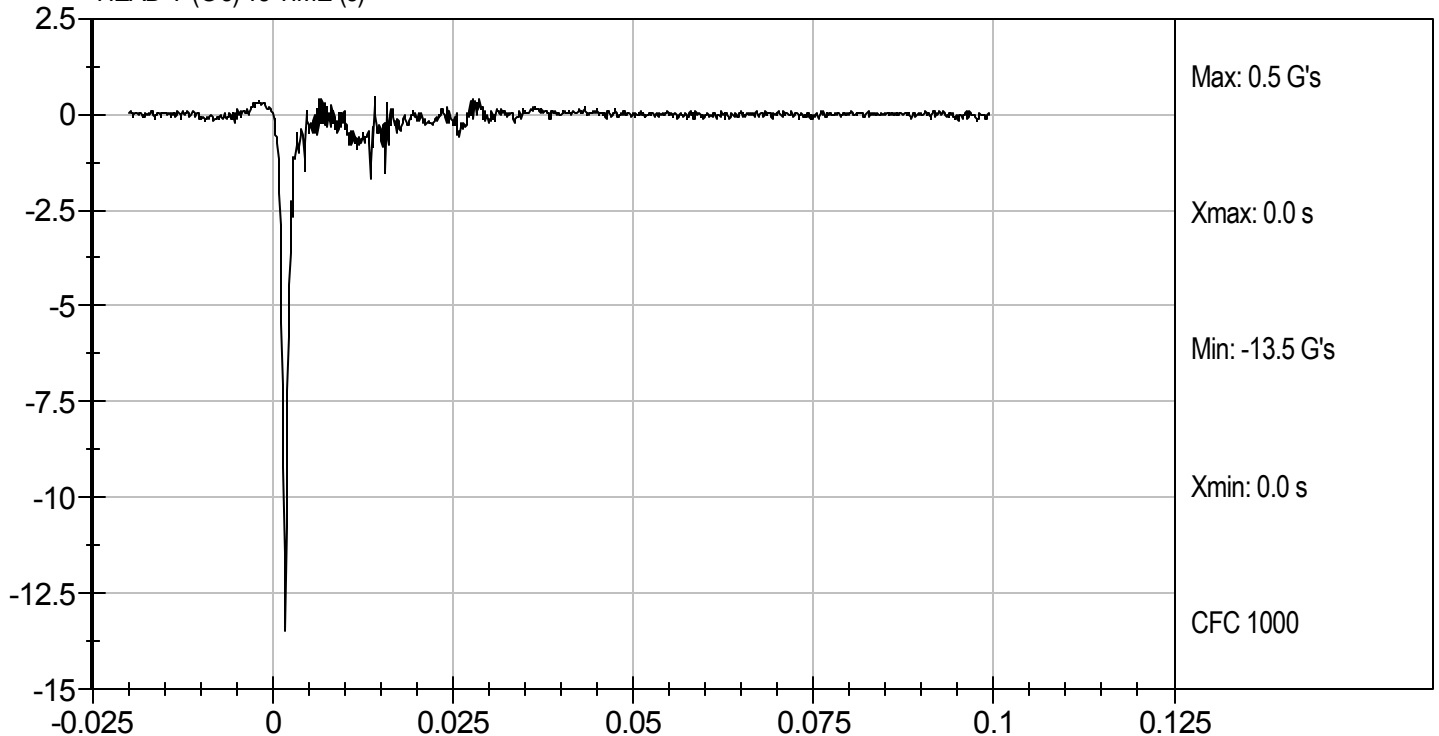
Test Desc: Head Drop
Component ID: D102901

Test Date: 9/7/10
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: D102902

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	50	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	79	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	

Jessica Hall
Laboratory Technician

9/7/10
Test Date

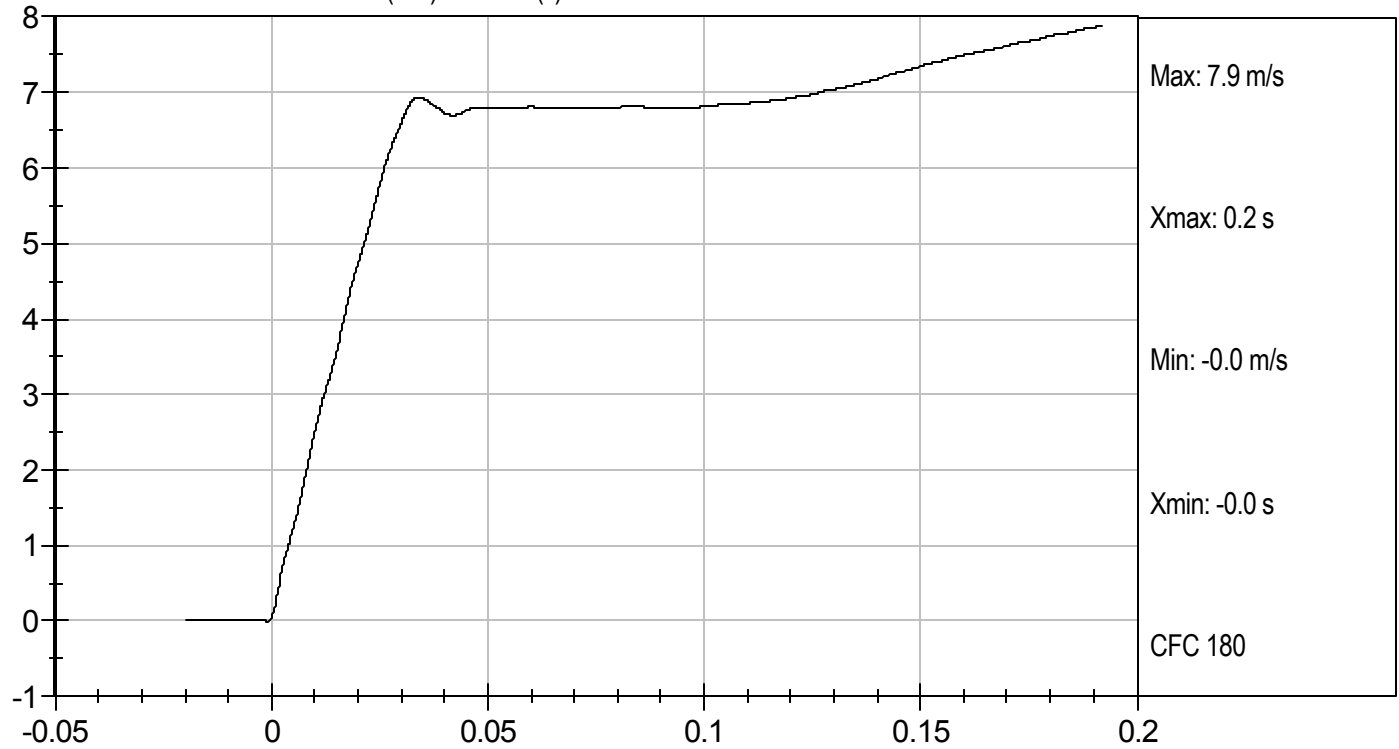
David Winkelbauer
Approved By



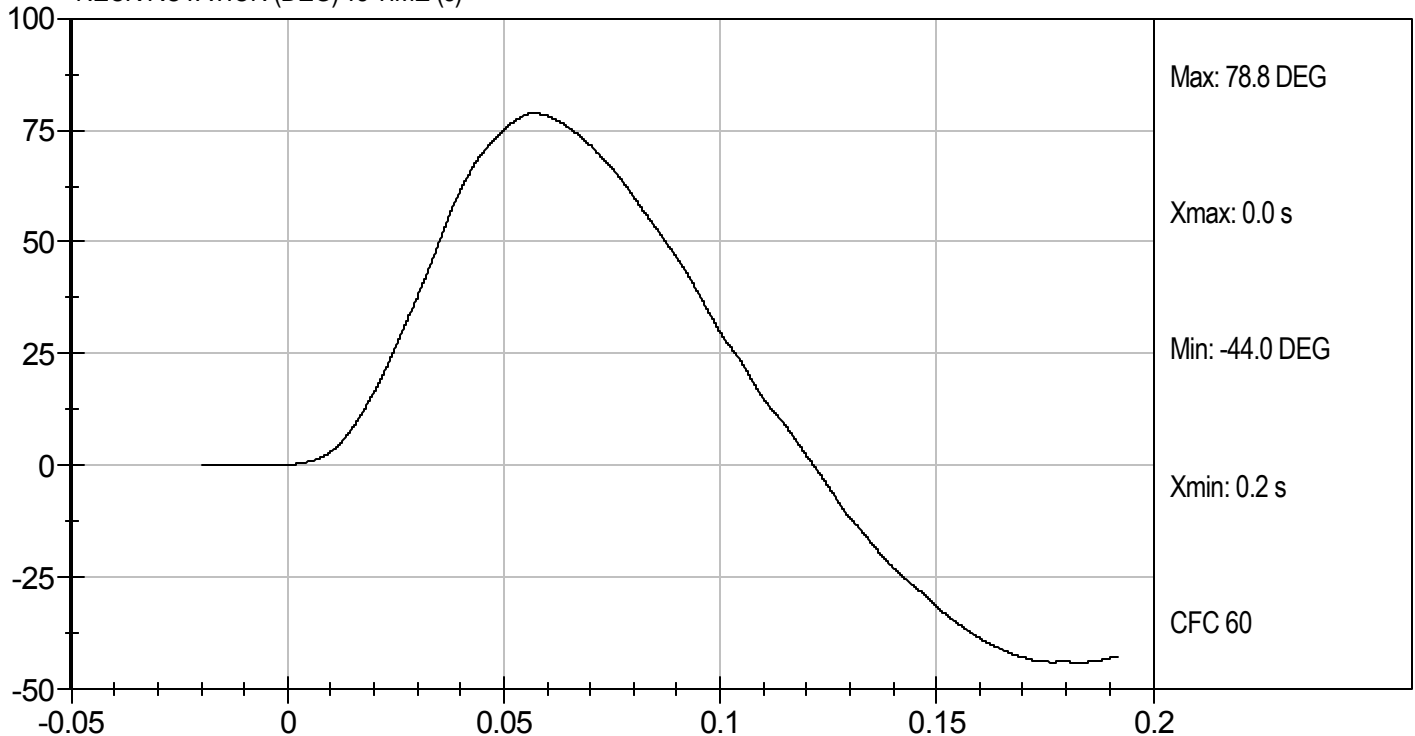
Test Desc: Neck Flexion
Component ID: D102902

Test Date: 9/7/10
Velocity: 23.1 ft/s, 7.04 m/s

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



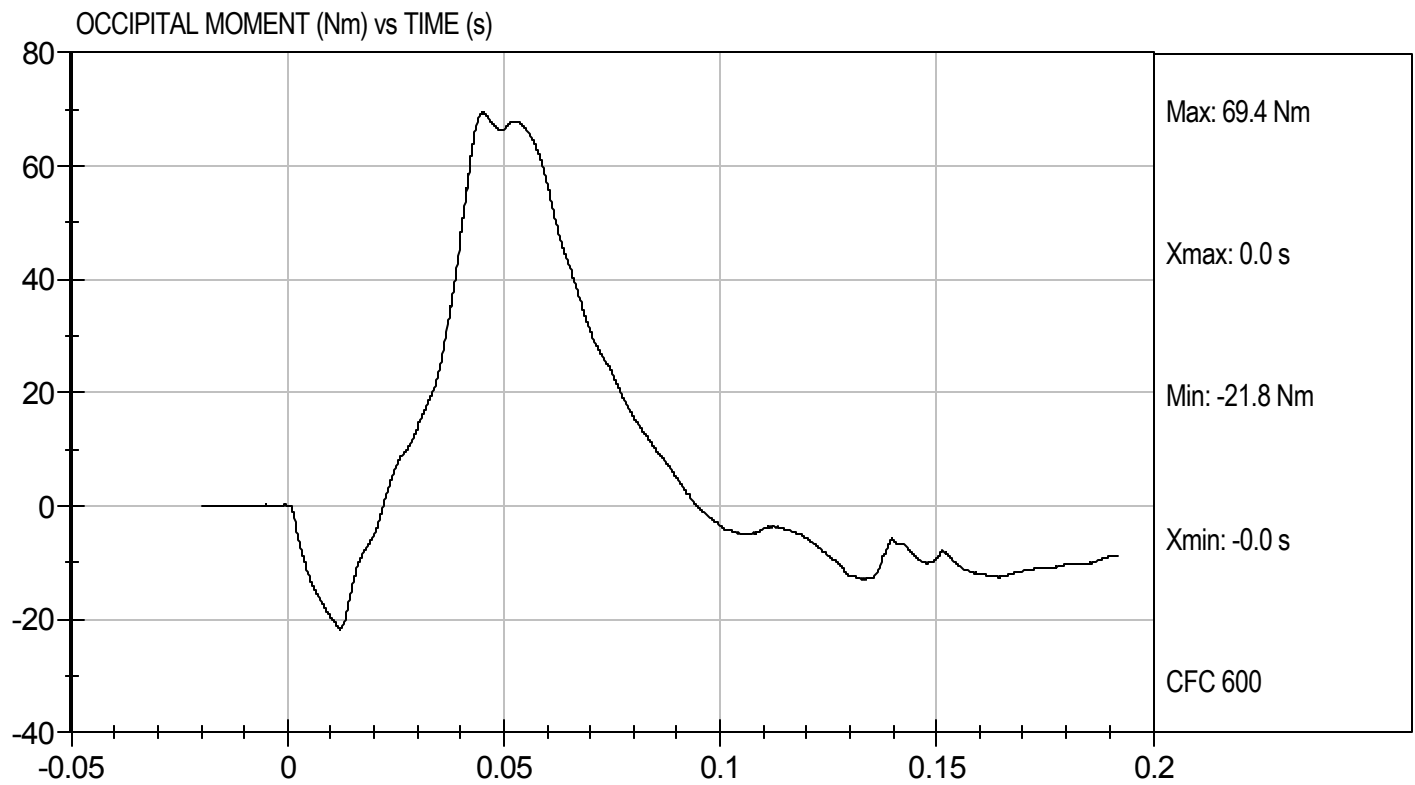
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D102902

Test Date: 9/7/10
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: D102903

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	50	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.10	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	101	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	98	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

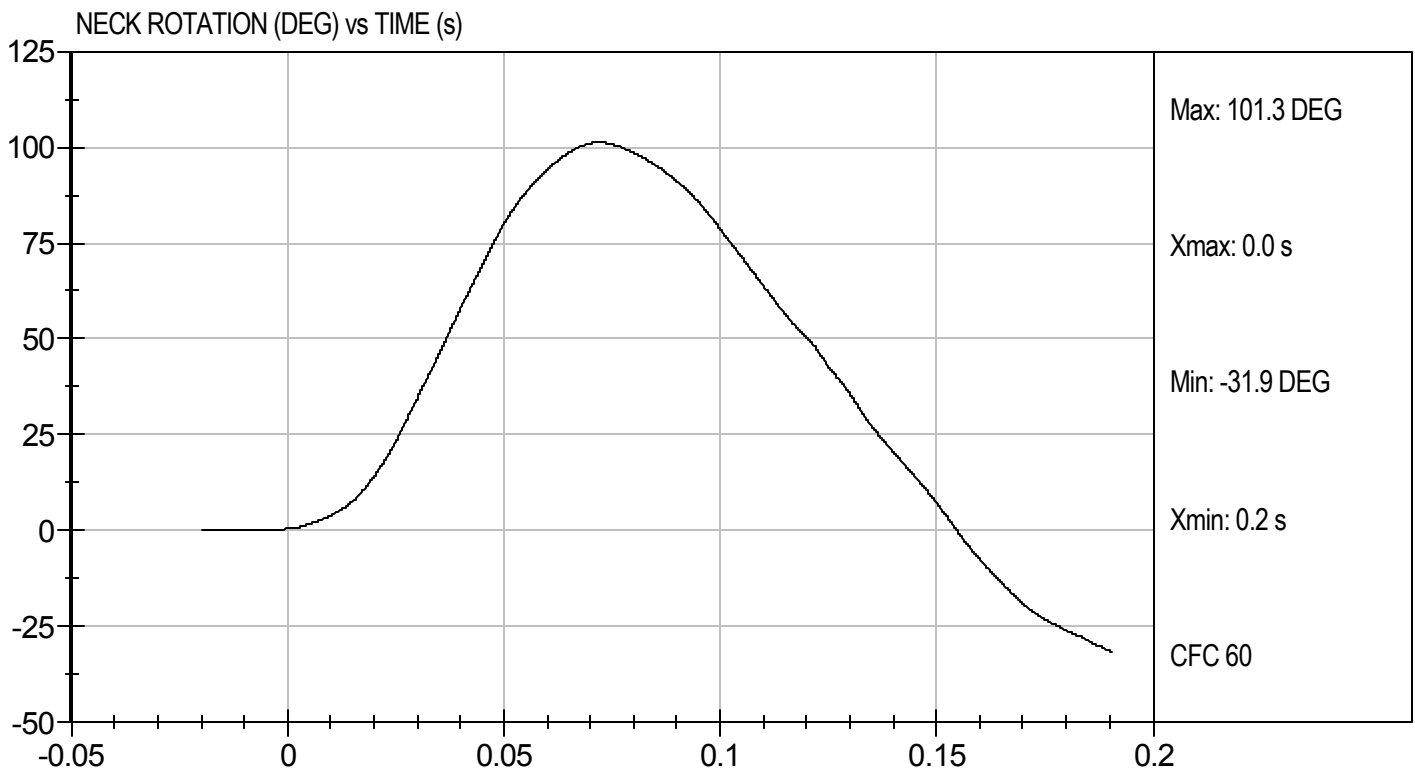
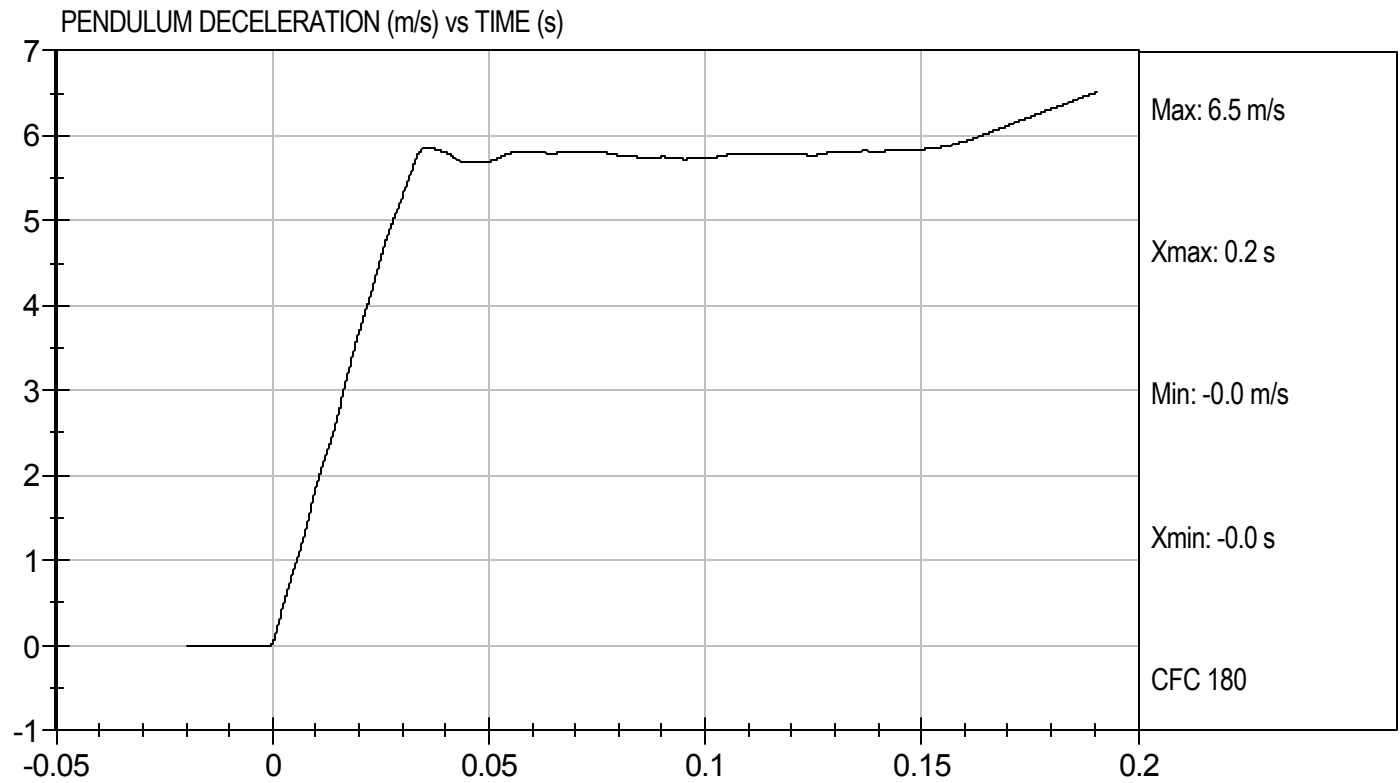
9/7/10
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D102903

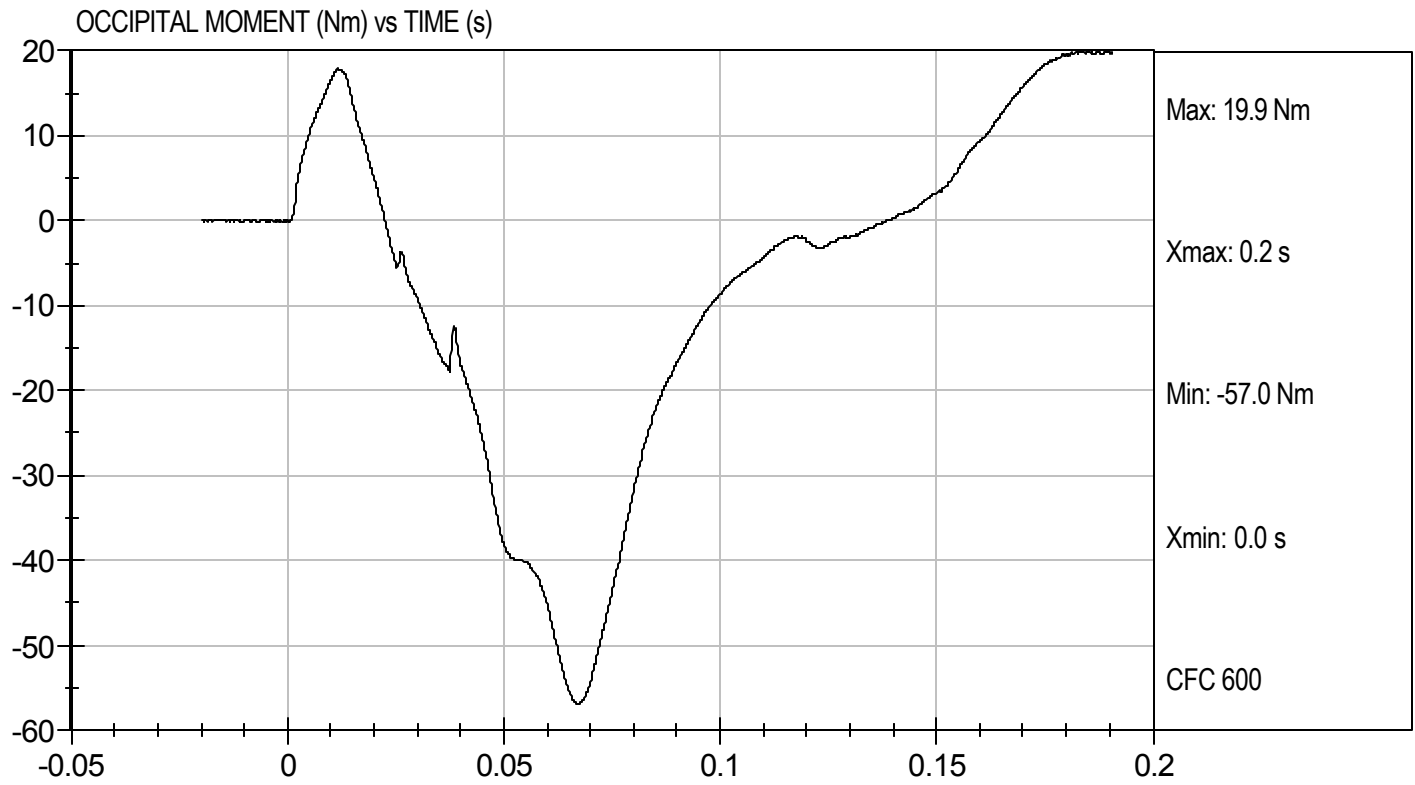
Test Date: 9/7/10
Velocity: 20.0 ft/s, 6.10 m/s





Test Desc: Neck Extension
Component ID: D102903

Test Date: 9/7/10
Velocity: 20.0 ft/s, 6.10 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102904

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Relative Humidity	%	10 to 70	47	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	4.32	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4213	Pass
			Overall Test Results	Pass

Jessica Gall
Laboratory Technician

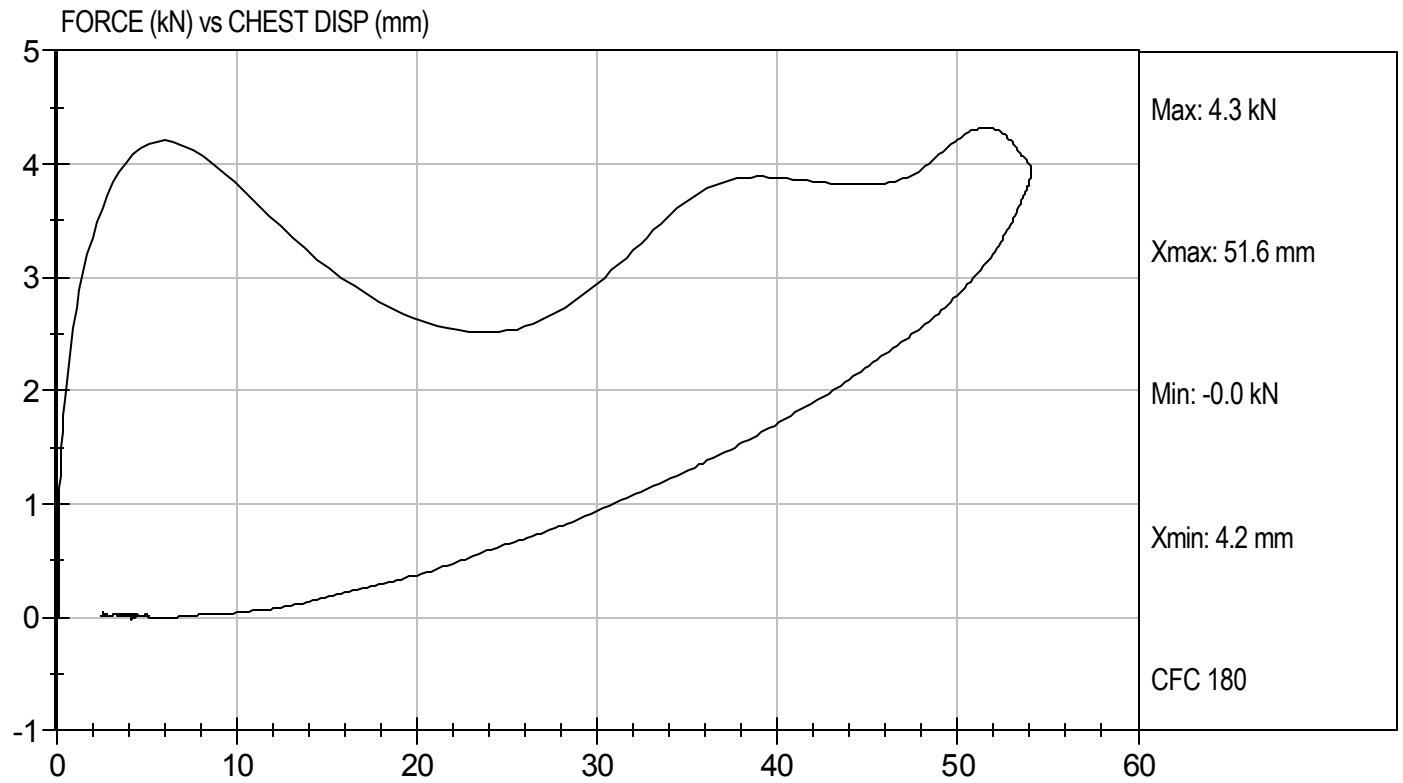
9/8/10
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Impact
Component ID: D102904

Test Date: 9/8/10
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: D102905

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	kN	3.45 to 4.06	3.79	Pass
Overall Test Results				Pass


Laboratory Technician

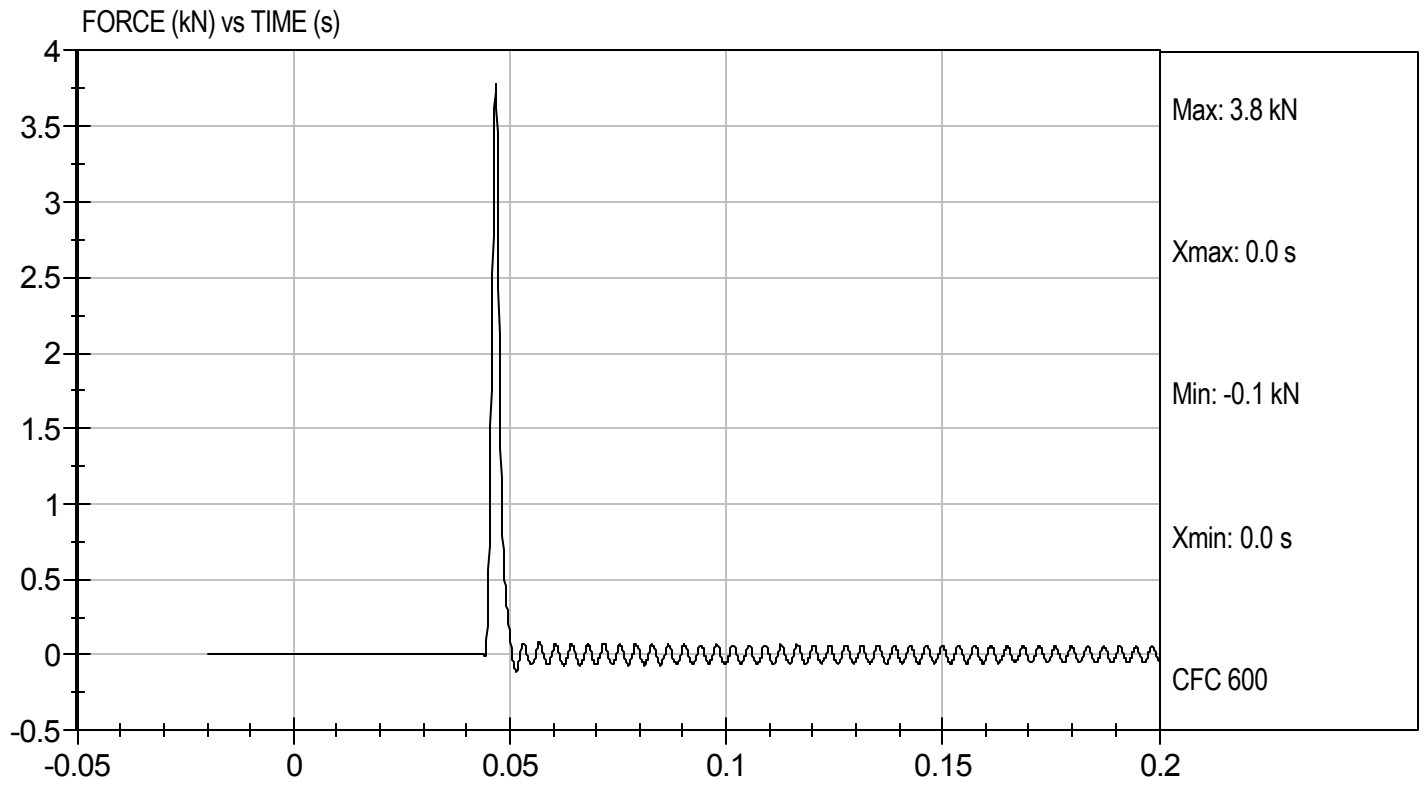
9/7/10
Test Date


Approved By



Test Desc: Right Knee
Component ID: D102905

Test Date: 9/7/10
Velocity: 6.88 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102906

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.99	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

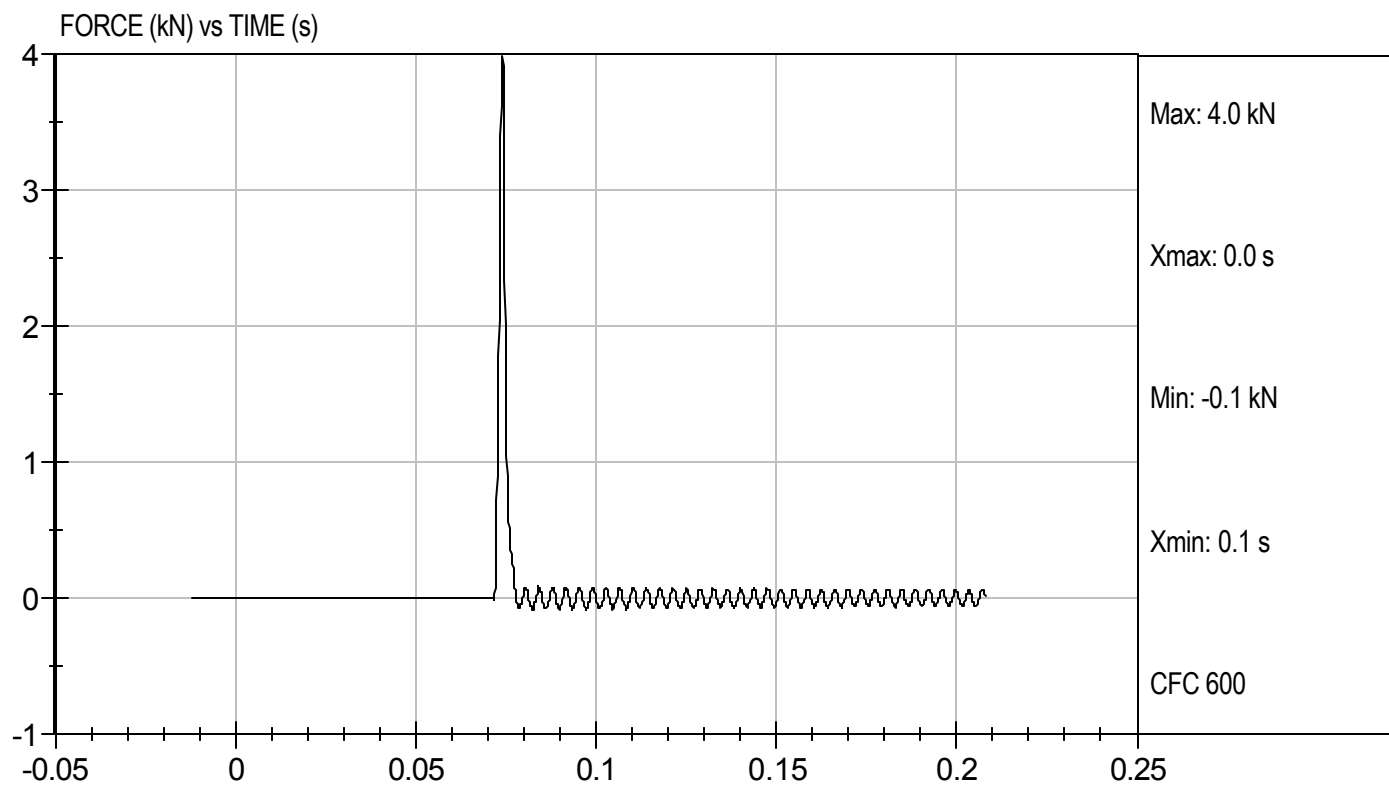
9/7/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D102906

Test Date: 9/7/10
Velocity: 6.91 ft/s, 2.11 m/s

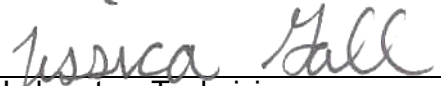


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D102907

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	374	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

9/7/10
Test Date


Approved By