

REPORT NUMBER: NCAP-MGA-2012-041

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

**GENERAL MOTORS LLC
2012 Chevrolet Silverado 2500 4WD Crew Cab
NHTSA No.: MC0112**

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



Test Date: December 19, 2011

Final Report Date: February 10, 2012

FINAL REPORT

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

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Approval Date: February 10, 2012

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

1. Report No. NCAP-MGA-2012-041		2. Government Accession No.		3. Recipient's Catalog No.																																																			
4. Title and Subtitle Final Report of New Car Assessment Program Frontal Impact Testing of 2012 Chevrolet Silverado 2500 4WD Crew Cab, NHTSA No.: MC0112				5. Report Date February 10, 2012																																																			
				6. Performing Organization Code MGA																																																			
7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer				8. Performing Organization Report No. NCAP-MGA-2012-041																																																			
				10. Work Unit No.																																																			
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105				11. Contract or Grant No. DTNH22-06-D-00028																																																			
				13. Type of Report and Period Covered Final Test Report December 19 to February 10, 2012																																																			
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590				14. Sponsoring Agency Code NVS-111																																																			
				15. Supplementary Notes																																																			
16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2012 Chevrolet Silverado 2500 4WD Crew Cab in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on December 19, 2011. The impact velocity was 56.2 km/h and the ambient temperature at the barrier face at the time of impact was 21.3°C. The target vehicle post-test maximum crush was 677 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="margin: 10px auto; 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>575</td> <td>336</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>30</td> <td>19</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.38</td> <td>0.70</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1853</td> <td>1284</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>259</td> <td>568</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>3233</td> <td>1009</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>3004</td> <td>2092</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	575	336	Maximum Chest Compression	mm	63	52	30	19	Nij	N/A	1	1	0.38	0.70	Neck Tension	N	4170	2620	1853	1284	Neck Compression	N	4000	2520	259	568	Left Femur Force	N	10008	6805	3233	1009	Right Femur Force	N	10008	6805	3004	2092
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19. Security Classification of Report Unclassified		20. Security Classification of Page Unclassified		21. No. of Pages 162																																																			
				22. Price																																																			

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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 Standards Frontal NCAP Laboratory Test Procedure.

SUMMARY

A load cell barrier was impacted by a 2012 Chevrolet Silverado 2500 4WD Crew Cab at a velocity of 56.2 kph. The test was performed at MGA Research Corporation on December 19, 2011. 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 also on the driver and passenger's lap and shoulder belts 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 instrumentation calibration data, are found in Appendix C of this report.

The 228 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 677 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head and chest contacted the airbag. The driver's head also contacted the headrest, seat back and seatbelt. The driver's knees contacted the knee bolster. The passenger's visible contact points were as follows: The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest and seat back. The passenger's knees contacted the glovebox.

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	575	0.38	1853	259	42	30	3233	3004
Passenger (5 th)	336	0.70	1284	568	48	19	1009	2092

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 X after 115 msec.
- Driver Chest Y after 115 msec.
- Driver Chest Z after 115 msec.
- Driver Chest XR after 115 msec.
- Driver Chest YR after 115 msec.
- Driver Chest ZR after 115 msec.
- Right Brake Caliper X
- Barrier 5-12

Load Cell 9-3 is questionable after 126 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: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
Test Date: 12/19/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MC0112	Traction Control System (TCS)	Yes
Model Year	2012	Auto-Leveling System	No
Make	Chevrolet	Automatic Door Locks (ADLs)	Yes
Model	Silverado 2500	Power Window Auto-Reverse	No
Body Style	Crew Cab	Other Optional Feature	N/A
VIN	1GC1KXCG4CF101804	Driver Front Airbag	Yes
Body Color	Blue Granite Metallic	Driver Curtain Airbag	No
Odometer (km/mi)	285 / 177	Driver Head/Torso Airbag	No
Engine Displacement (L)	6.0	Driver Torso Airbag	No
Type/No. Cylinders	8	Driver Torso/Pelvis Airbag	No
Engine Placement	Longitudinal	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	6	Pass. Curtain Airbag	No
Overdrive	Yes	Pass. Front Airbag	Yes
Final Drive	4WD	Pass. Torso Airbag	No
Roof Rack	No	Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	No	Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Pass. Seat Belt Pretensioner	Yes
Power Seats	Yes - Driver Seat Only	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Pass. Load Limiter	Yes
All-Wheel Drive (AWD)	4WD	Other Safety Restraint	N/A
Does owner's manual provide instructions to turn off automatic door locks?			No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (kg)	4491
Date of Manufacture	08/11	GAWR Front (kg)	2177
Vehicle Type	Truck	GAWR Rear (kg)	2812

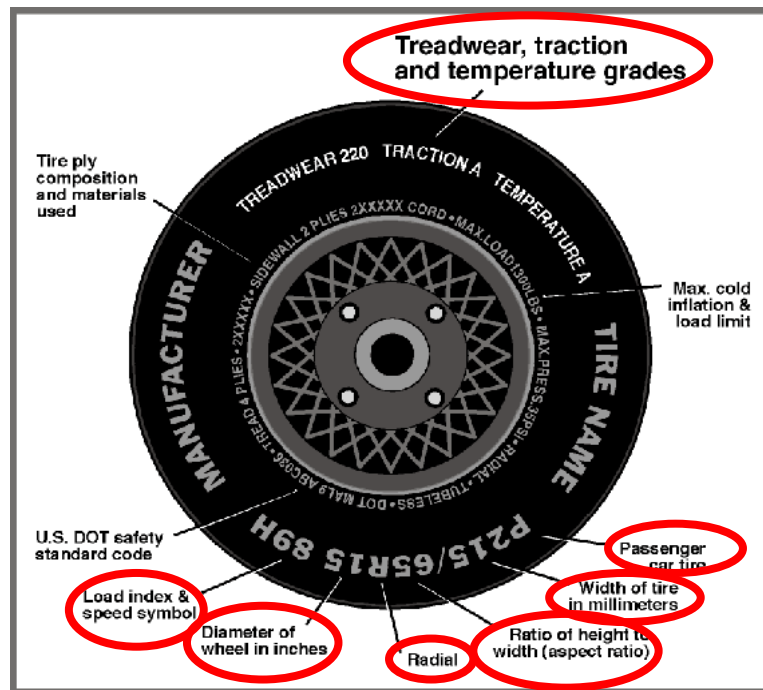
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Split Bench	Bench		
Designated Seating Capacity (DSC)	3	3		6
Capacity Weight (VCW) (kg)				1345
Cargo Weight (RCLW) (kg)				937

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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	420	480
Recommended Tire Size	LT265/70R18E	LT265/70R18E

TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	550	550
Tire Size on Vehicle	LT265/70R18	LT265/70R18
Tire Manufacturer	Michelin	Michelin
Tire Name	LTX A/T2	LTX A/T2
Tire Type	Light Truck	Light Truck
Tire Width	265	265
Aspect Ratio	70	70
Radial	Yes	Yes
Wheel Diameter	18	18
Load Index/Speed Symbol	124/121R	124/121R
Treadwear		
Traction Grade		
Temperature Grade		
Tire Material	Rubber	Rubber

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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
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NHTSA No.: MC0112
 Test Date: 12/19/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	914.0	669.5		92.1	759.3	
Right	kg	860.9	646.9		903.6	736.6	
Ratio	%	57.4	42.6		55.5	44.5	
Totals	kg	1774.9	1316.4	3091.3	1865.7	1495.9	3361.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	3091.3
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Vehicle Target Weight (TVTW)	kg	3367.9

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	1015	1027	1088	1108	1817
As Tested	mm	1009	1023	1078	1093	1898
Post Test	mm	954	988	1076	1089	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	4266
Total Vehicle Length at Left Side	mm	6170
Total Vehicle Length at Centerline	mm	6577
Total Vehicle Length at Right Side	mm	6170
Weight of Ballast in Cargo Area	kg	103.4
Weight of Vehicle Components Removed	kg	0.0
Amount of Stoddard Solvent in Fuel Tank	L	121.9

List of components removed: None

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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	6577
2	Total Width	2004
3	Bumper Top Height	774
4	Bumper Bottom Height	578
5	Longitudinal Member Top Height	702
6	Distance between Longitudinal Members	740
7	Longitudinal Member Width	86
8	Engine Top Height	1320
9	Engine Bottom Height	375
10	Engine and Gearbox Width	1385
11	Front Bumper-Engine Distance	613
12	Front Shock Absorber Fixing Height	750
13	Bonnet Leading Edge Height	1162
14	Front Shock Absorber Fixing Width	25
15	Front Bumper – Front Axle Distance	982
16	Front Axle – A-Pillar Distance	518
17	A-Pillar – B-Pillar Distance	1260
18	B-Pillar – Rear Axle Distance	2500
19	B-Pillar – C-Pillar Distance	964
20	Roof Sill Bottom Height	1816
21	Roof Sill Top Height	1911
22	Floor Sill Bottom Height	506
23	Floor Sill Top Height	608

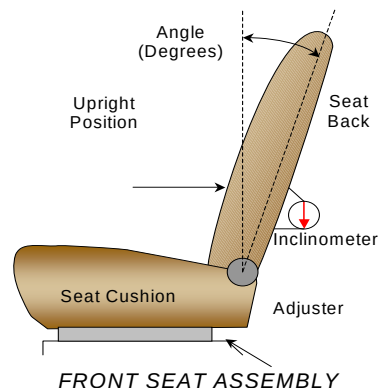
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer's design angle. For the passenger seat back, seat back is adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.



SEAT BACK ANGLE	Degrees
Driver Seat Back Angle	8.1° on headrest post
Passenger Seat Back Angle	8.3° on headrest post

SEAT FORE/AFT POSITIONS

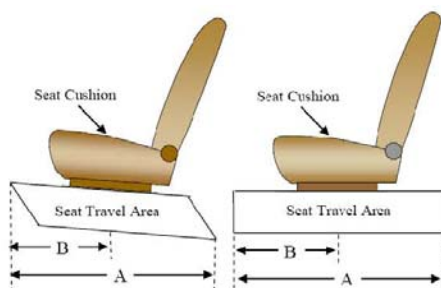
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	292 mm	146 mm (1 st as 0)
Passenger Seat	22 detents	0 detent (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.

	Total # of Positions	Placed in Position #
Driver Seat	5 (1 st as 1)	0 (uppermost as 0)
Passenger Seat	5 (1 st as 1)	0 (uppermost as 0)



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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

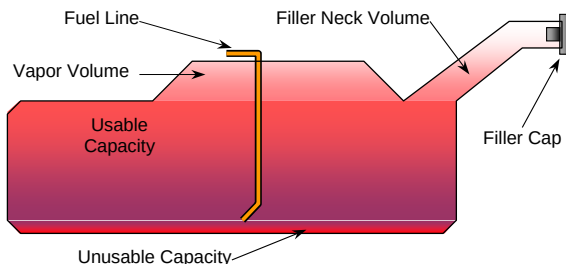
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	131.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	120.4 to 123.1
Actual Amount of Solvent used	121.9
1/3 of Usable Capacity	43.7

FUEL PUMP

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

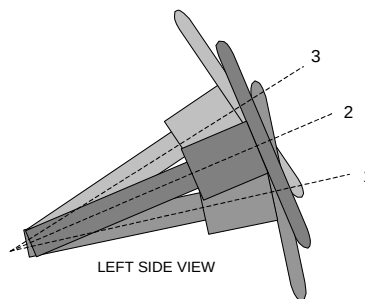
The vehicle is equipped with an electric fuel pump. The pump will run when engine is running. Also, it will run briefly when ignition key is turned to the "on" position without starting the engine. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

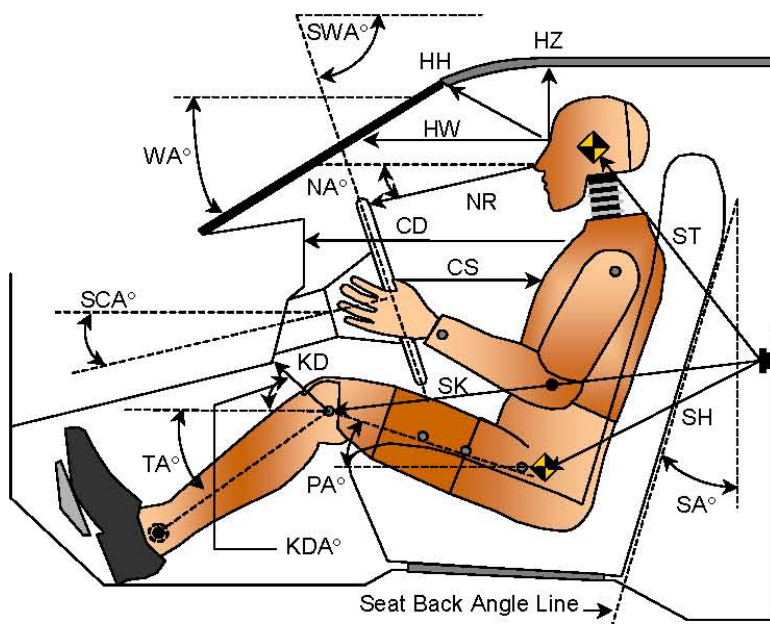
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	58.4	
Geometric Center – Position 2	68.4	
Uppermost – Position 3	78.4	
Telescoping Steering Wheel Travel		
Test Position	68.4	

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
Test Date: 12/19/2011



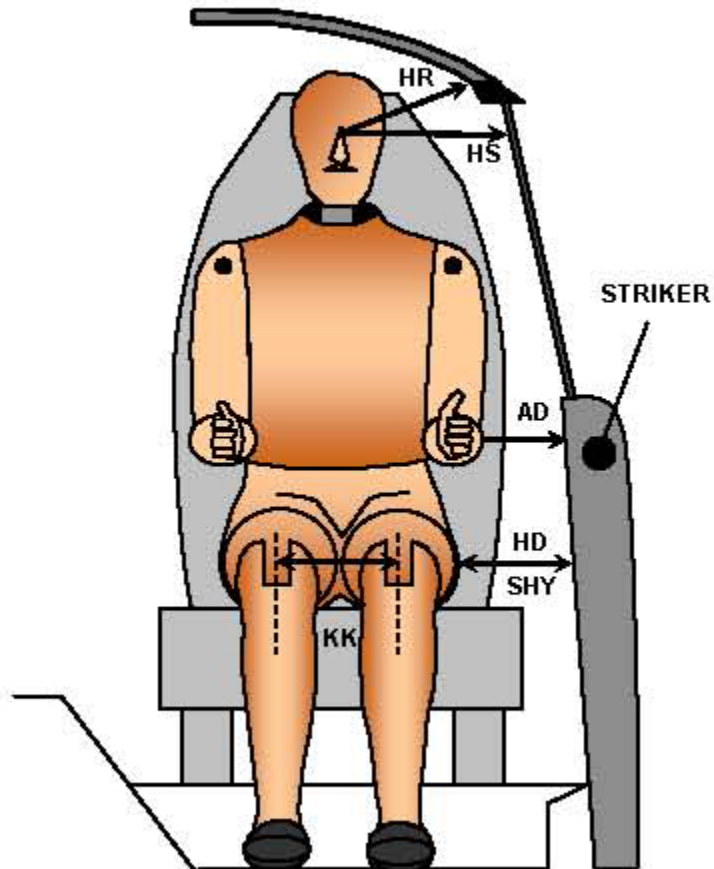
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 351		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		33.1		
SWA°	Steering Wheel Angle		68.4		
SCA°	Steering Column Angle		21.6		
SA°	Seat Back Angle (on headrest post)		8.1		8.3
HZ	Head to Roof (Z)	245	90	309	90
HH	Head to Header	428	20.5	414	34.9
HW	Head to Windshield	681	0	731	0
NR	Nose to Rim	677	12.4		
CD	Chest to Dash	512		430	
CS	Chest to Steering Hub	312	9.7		
RA	Rim to Abdomen	188	0		
KDL	Left Knee to Dash	149	32.5	104	29.1
KDR	Right Knee to Dash	137	29.8	109	30.5
PA°	Pelvic Angle		22.4		21.8
TA°	Tibia Angle		47.3		56.5
SK	Striker to Knee	717	84.1	790	89.4
ST	Striker to Head	671	16.3	605	29.8
SH	Striker to H-Point	342	95.0	420	90.8

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



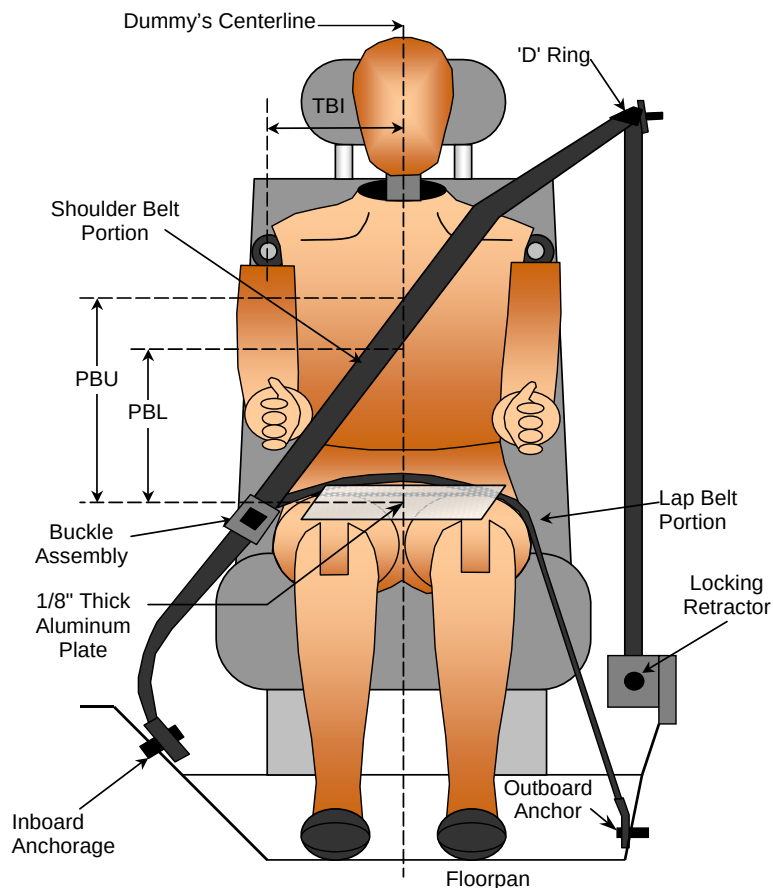
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 351	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	142	98
HD	H-Point to Door	146	175
HR	Head to Side Header	210	278
HS	Head to Side Window	324	338
KK	Knee to Knee	310	230
SHY	Striker to H-Point (Y Direction)	285	331
AA	Ankle to Ankle	265	158

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	370	340
PBL - Top surface of reference to belt lower edge	mm	295	255

BELT LENGTH DATA

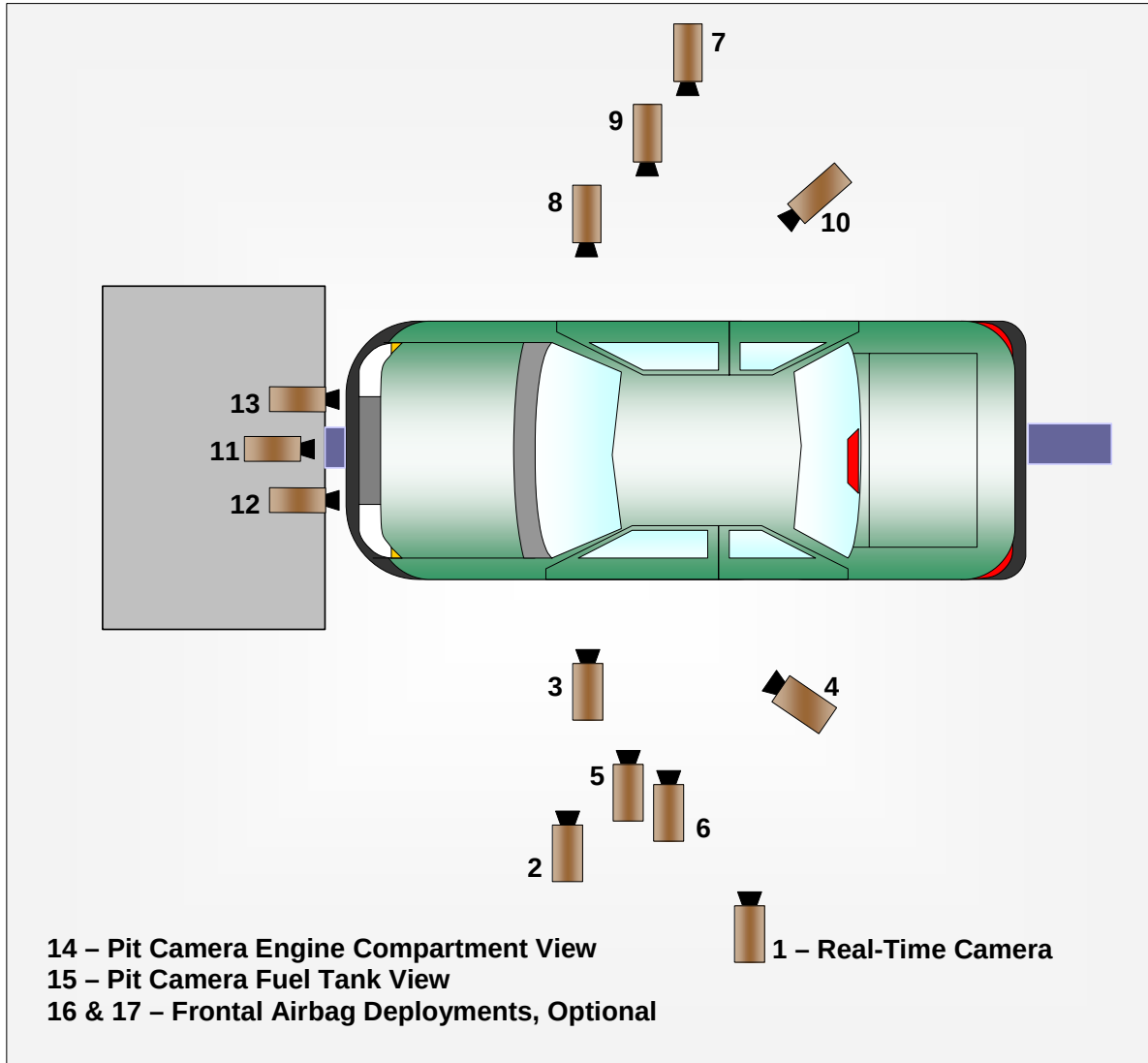
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	855	910
Lap Belt Length as measured on ATD	mm	590	565
Remainder of belt on reel	mm	1675	1625
Total Belt Length for Continuous Webbing Systems	mm	3120	3100

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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
Test Date: 12/19/2011

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1630	-7020	-1830	35	1000
3	Left Front Half	1200	-5620	-1450	24	1000
4	Left Angle	6180	-4990	-1930	50	1000
5	Steering Column - Top	450	-5630	-1230	24	1000
6	Steering Column - Bottom	430	-5590	-830	24	1000
7	Right Overall	3030	5970	-1090	20	1000
8	Passenger Close-Up	1840	7010	-1850	35	1000
9	Right Front Half	1570	5970	-1400	24	1000
10	Right Angle	6210	4900	-1970	50	1000
11	Windshield	-130	0	-2810	20	1000
12	Driver Windshield	-250	-450	-2030	12.5	1000
13	Passenger Windshield	-250	450	-2030	12.5	1000
14	Pit Front	1310	0	3150	24	1000
15	Pit Rear	3030	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

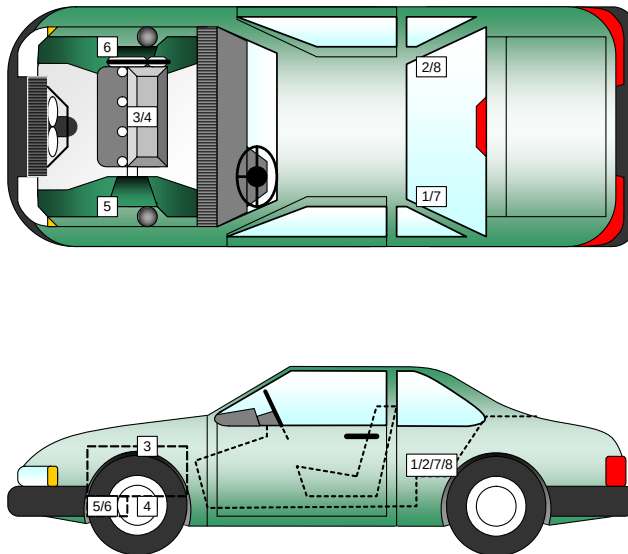
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	3498	-420	-718
2	Right Rear Accelerometer – X Direction	3502	420	-734
3	Engine Top X	5591	0	-1193
4	Engine Bottom X	5235	0	-375
5	Left Brake Caliper X	5412	-752	-290
6	Right Brake Caliper X	5412	752	-290
7	Left Rear Accelerometer Redundant – X Direction	3498	-420	-718
8	Right Rear Accelerometer Redundant – X Direction	3502	420	-734

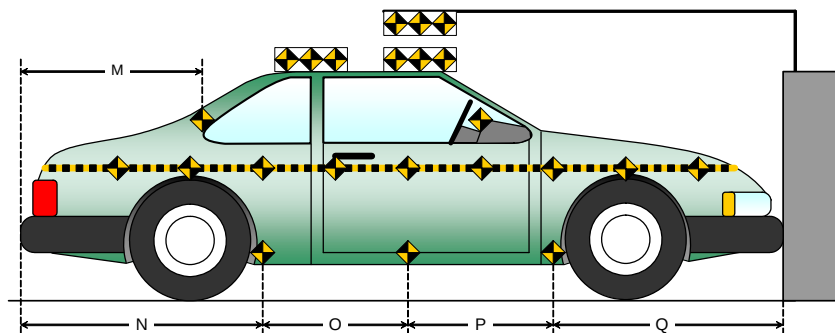
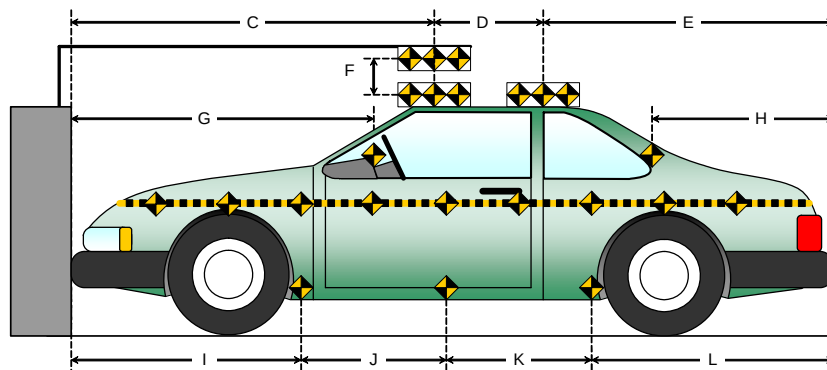
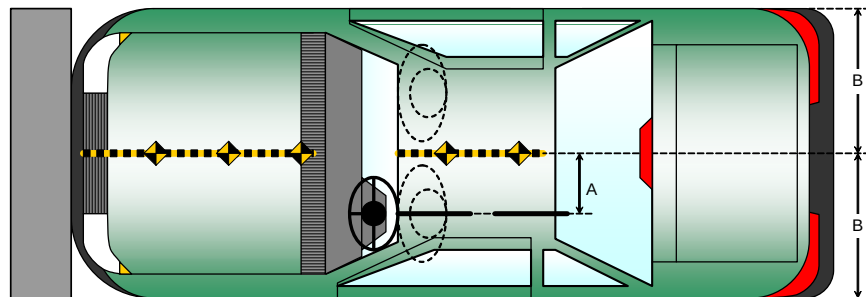
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

Item	Value (mm)
A	306
B	1002
C	2535
D	672
E	3370
F	34
G	
H	2865
I	1512
J	1110
K	1110
L	2845
M	2865
N	2845
O	1110
P	1110
Q	1512

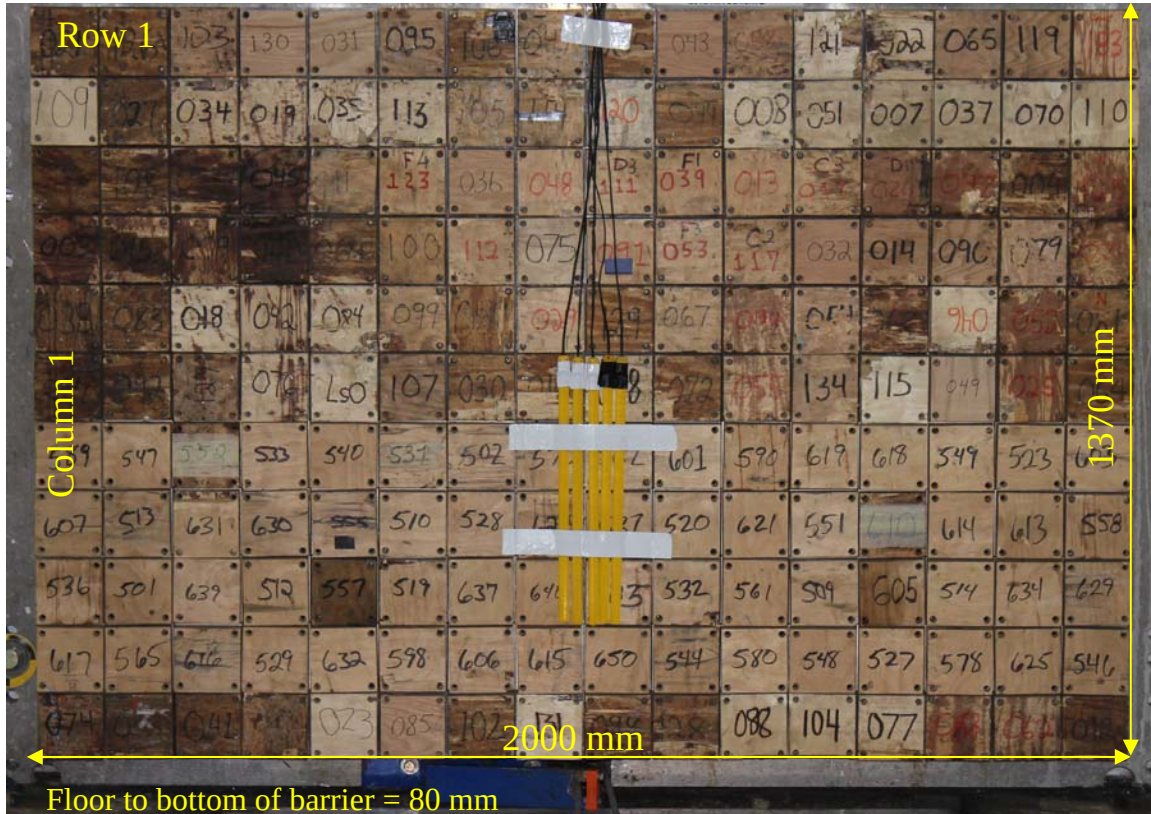


DATA SHEET NO. 9 **LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

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

Load Cells are 121 mm x 121 mm with a 7 mm gap in between each load cell.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
Test Date: 12/19/2011

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	128
Total	228

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: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
Test Date: 12/19/2011

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	IIII 50% / 351	IIII 5% / 634
Head Contact	Airbag, Headrest, Seat Back, Seat Belt	Airbag, Headrest, Seat Back
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)	5	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	332
Center	mm	355
Right Side	mm	375
Average	mm	354

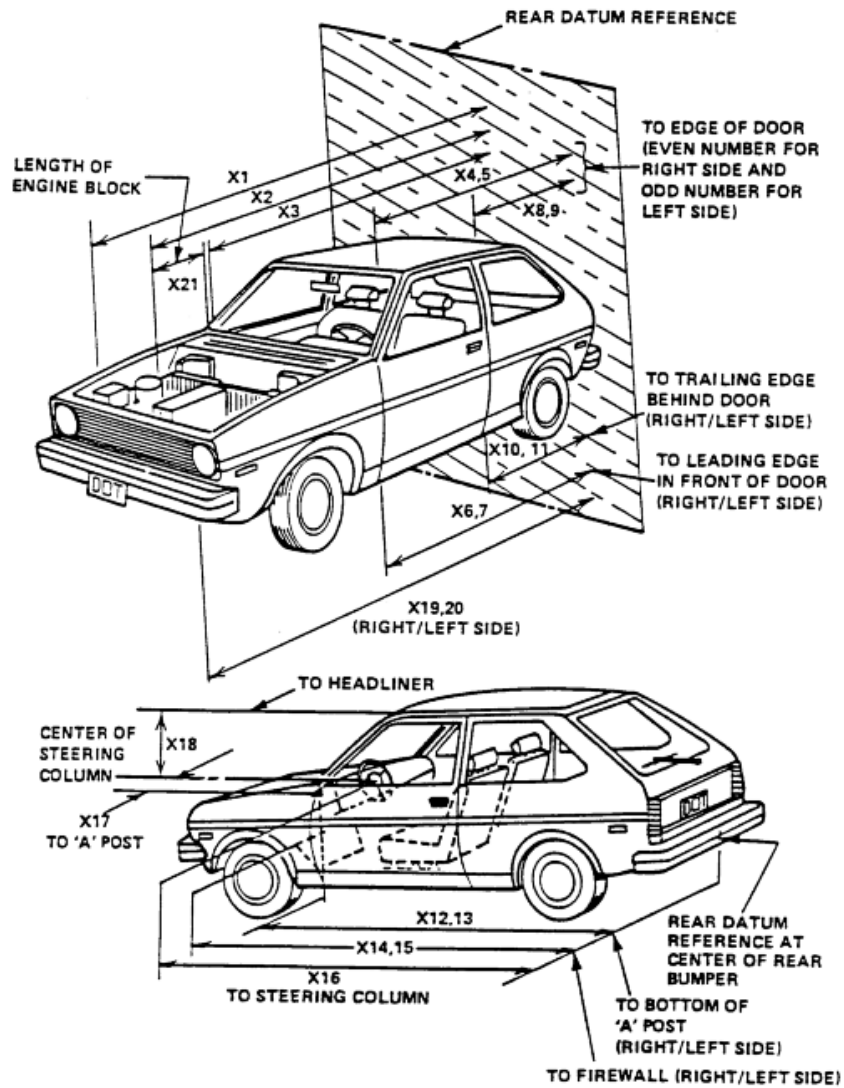
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	6577	5900	677
2	RSOV to Front of Engine	mm	5798	5615	183
3	RSOV to Firewall	mm	5400	5398	2
4	RSOV to Upper Leading Edge of Right Door	mm	4961	4961	0
5	RSOV to Upper Leading Edge of Left Door	mm	4964	4960	4
6	RSOV to Lower Leading Edge of Right Door	mm	4935	4933	2
7	RSOV to Lower Leading Edge of Left Door	mm	4940	4938	2
8	RSOV to Upper Trailing Edge of Right Door	mm	3800	3797	3
9	RSOV to Upper Trailing Edge of Left Door	mm	3808	3802	6
10	RSOV to Lower Trailing Edge of Right Door	mm	3795	3790	5
11	RSOV to Lower Trailing Edge of Left Door	mm	3794	3790	4
12	RSOV to Bottom of "A" Post of Right Side	mm	4964	4962	2
13	RSOV to Bottom of "A" Post of Left Side	mm	4976	4975	1
14	RSOV to Firewall, Right Side	mm	5288	5285	3
15	RSOV to Firewall, Left Side	mm	5312	5318	3
16	RSOV to Steering Column	mm	4509	4522	-13
17	Center of Steering Column to "A" Post	mm	402	382	20
18	Center of Steering Column to Headliner	mm	465	445	20
19	RSOV to Right Side of Front Bumper	mm	6170	5927	243
20	RSOV to Left Side of Front Bumper	mm	6170	5938	232
21	Length of Engine Block	mm	570	570	0
RD	RSOV to Right Side of Dash Panel	mm	4698	4698	0
CD	RSOV to Center of Dash Panel	mm	4660	4645	15
LD	RSOV to Left Side of Dash Panel	mm	4713	4713	0

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

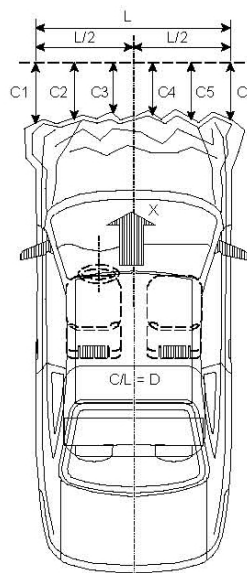
NHTSA No.: MC0112
Test Date: 12/19/2011

VEHICLE INFORMATION

VIN: 1GC1KXCG4CF101804 Wheelbase (mm): 4266
Vehicle Size Category: Truck Test Weight (kg): 3361.6

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.2
Velocity Change (km/h): 66.6
Time of Separation (msec): 136.9



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 2316
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	6170	5938	232
C2	Crush zone 2 at left side	mm	6455	5922	533
C3	Crush zone 3 at left side	mm	6534	5926	608
C4	Crush zone 4 at right side	mm	6534	5924	610
C5	Crush zone 5 at right side	mm	6455	5920	535
C6	Crush zone 6 at right side	mm	6170	5927	243
L	C1 TO C6	mm	2316	2312	4

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
Test Program: NCAP Frontal Barrier Impact Test

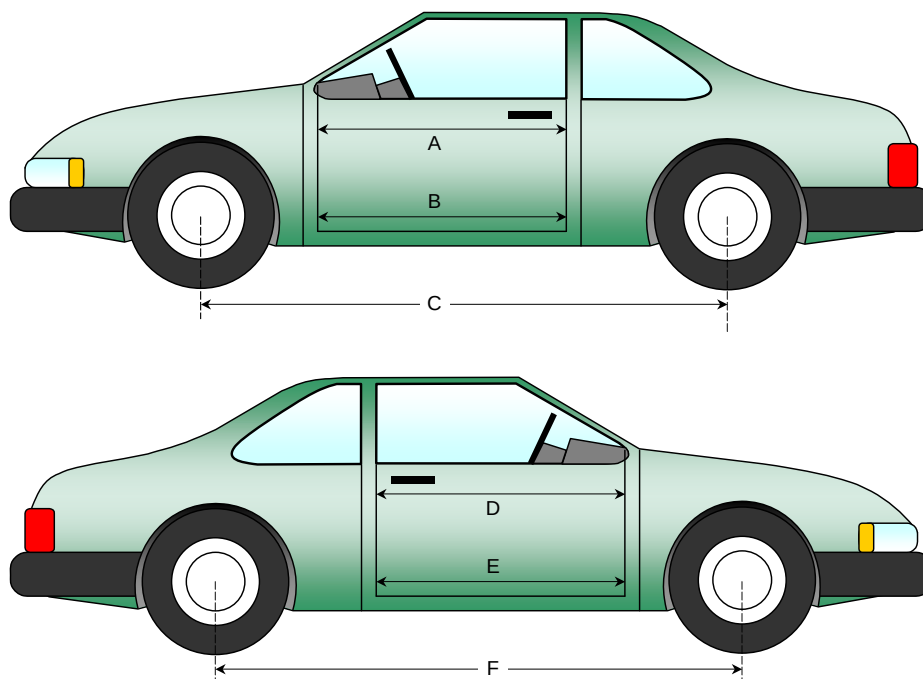
NHTSA No.: MC0112
Test Date: 12/19/2011

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1110	1108	2
B	Left Side Lower	mm	1102	1100	2
D	Right Side Upper	mm	1110	1108	2
E	Right Side Lower	mm	1102	1102	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	4266	4166	100
C CF	Right Side Wheelbase	mm	4266	4172	94



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

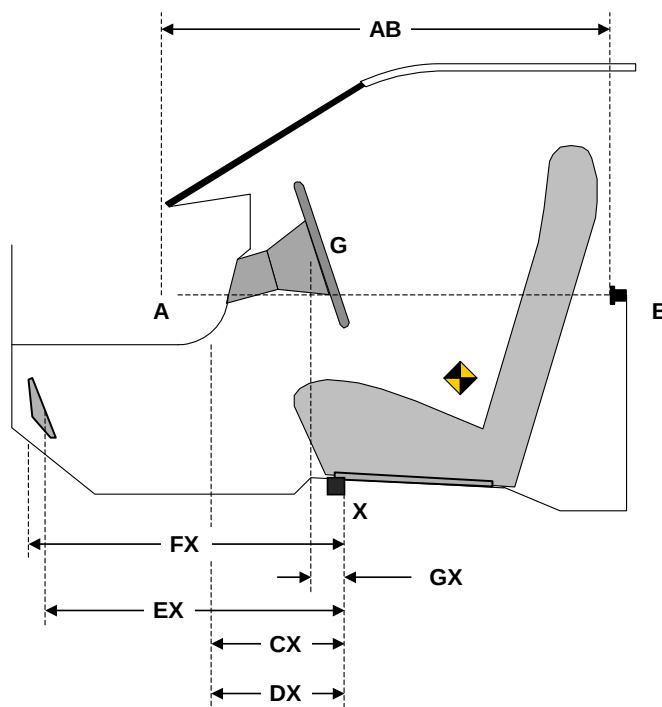
Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	814	814	0
CX	Left Knee Bolster to X	mm	350	370	-20
DX	Right Knee Bolster to X	mm	345	364	-19
EX	Brake Pedal to X	mm	592	575	17
FX	Foot Rest to X	mm	713	685	28
GX	Center of Steering Column Wheel Hub to X	mm	119	142	-23

X = Front of Seat Track (stationary)

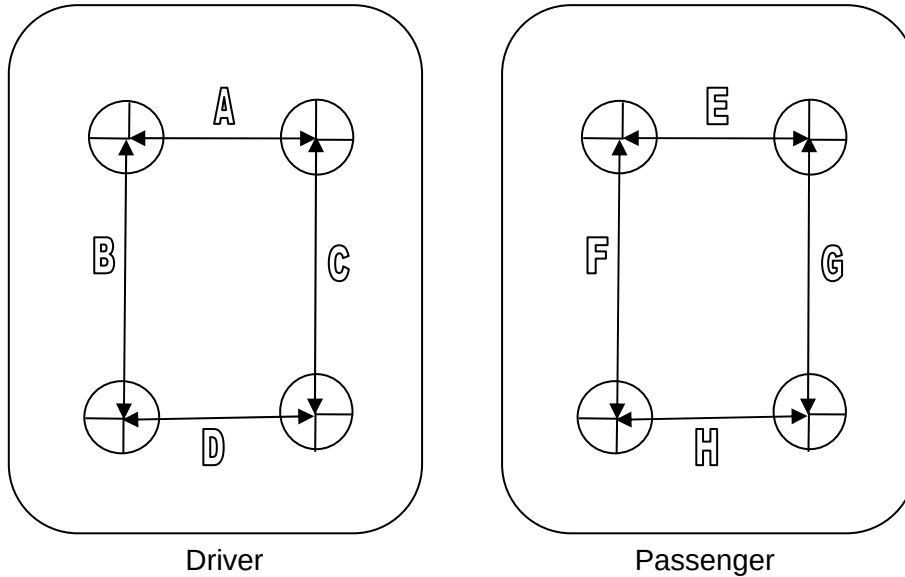


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	200	200	0
B	mm	300	300	0
C	mm	300	300	0
D	mm	200	200	0
E	mm	200	200	0
F	mm	300	300	0
G	mm	300	300	0
H	mm	200	200	0

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

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

Windshield Mounting Details:

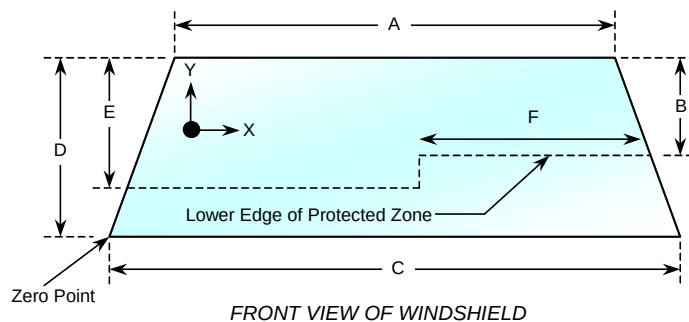
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.3°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2289	2289	100
Right Side	2289	2289	100
Total	4578	4578	100



Item	Units	Value
A	mm	1378
B	mm	419
C	mm	1716
D	mm	742
E	mm	476
F	mm	506

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>2012 Chevrolet Silverado 2500 4WD Crew Cab</u>	NHTSA No.:	<u>MC0112</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>12/19/2011</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time: 9:44 am

Temperature: 21.3° C

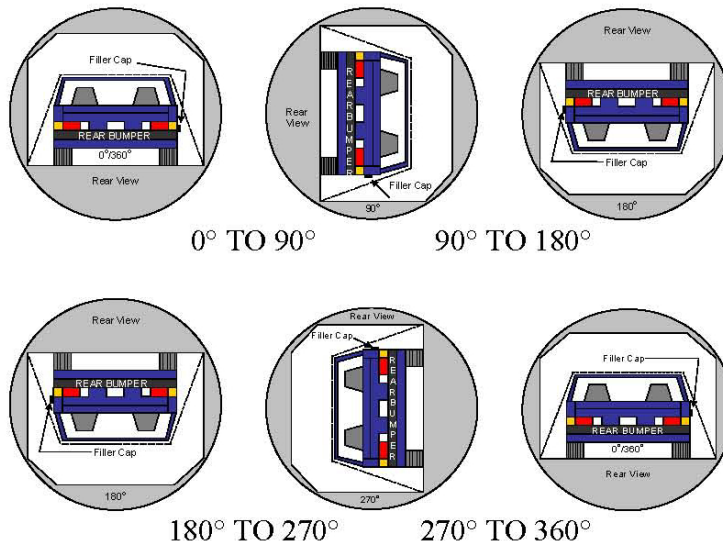
- | | |
|---|--------------|
| A. From impact until vehicle motion ceases:
(Maximum Allowable = 1 ounce) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 ounces) | <u>None</u> |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>None</u>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

DATA SHEET NO. 16 **FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011

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°	163	300	463
90° to 180°	147	300	447
180° to 270°	145	300	445
270° to 360°	160	300	460

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

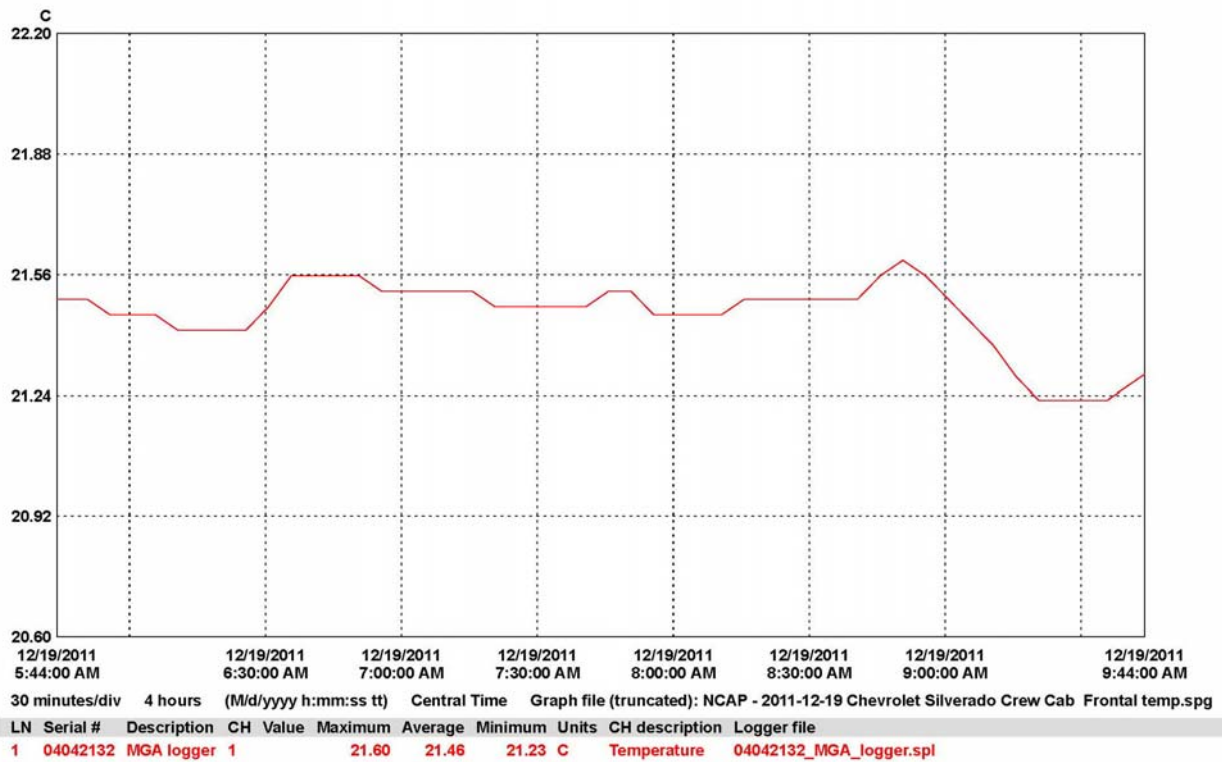
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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: 2012 Chevrolet Silverado 2500 4WD Crew Cab
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MC0112
 Test Date: 12/19/2011



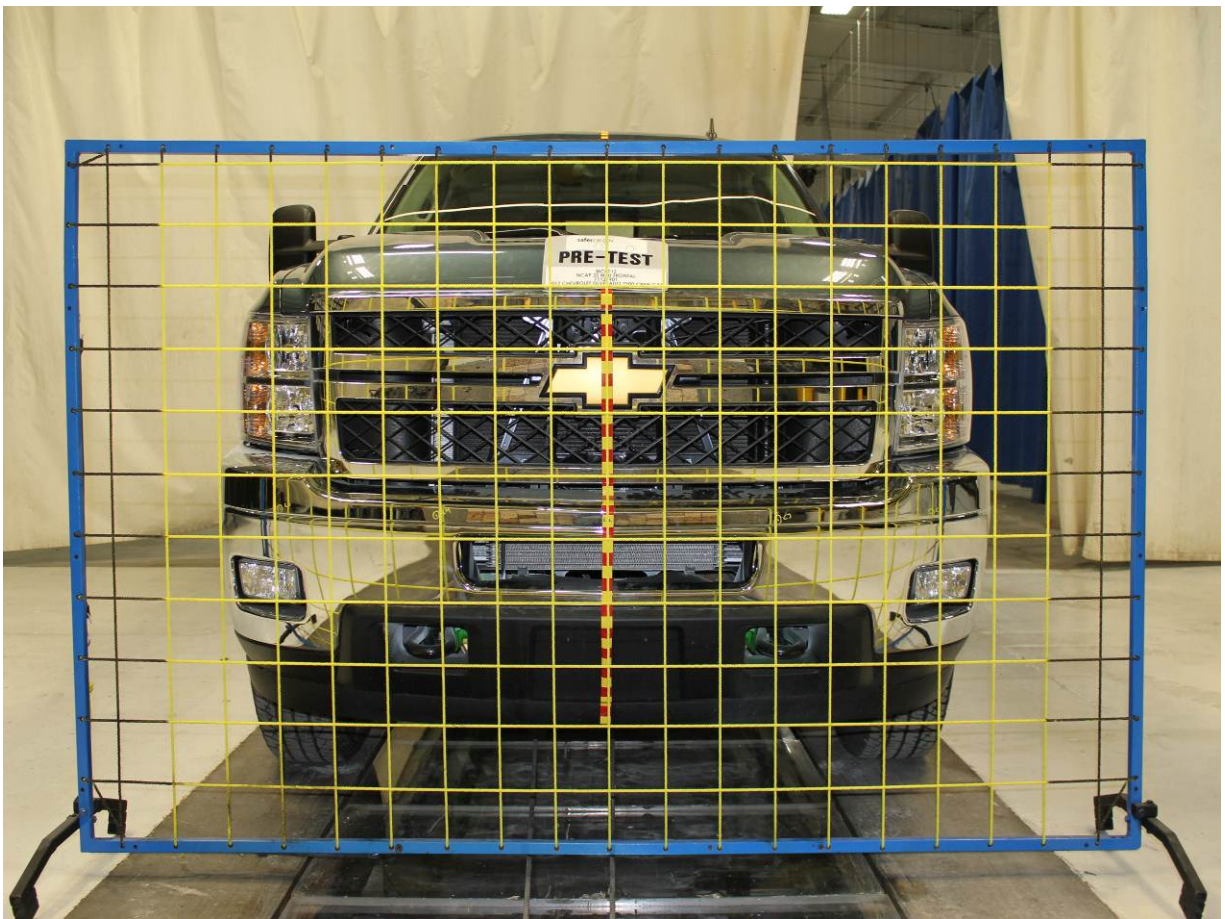
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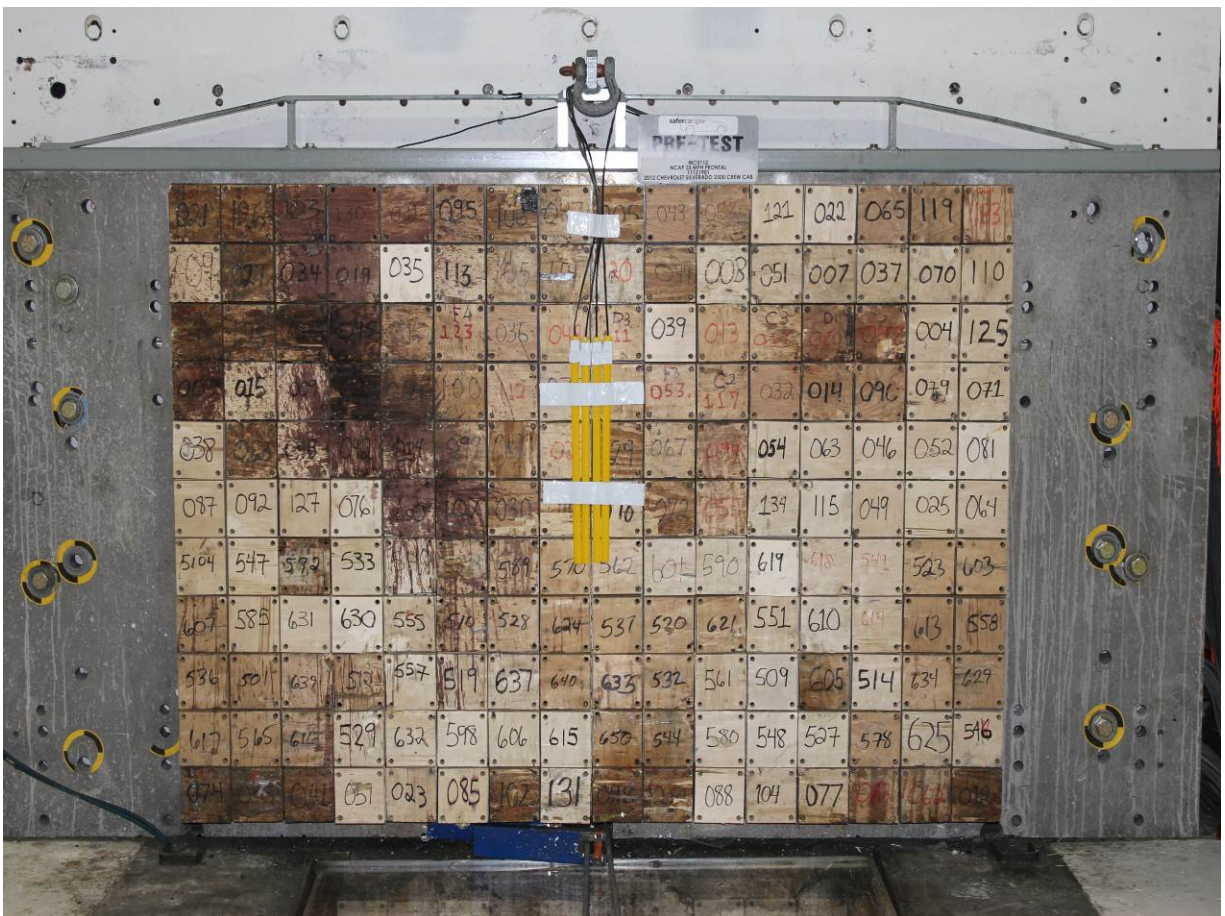
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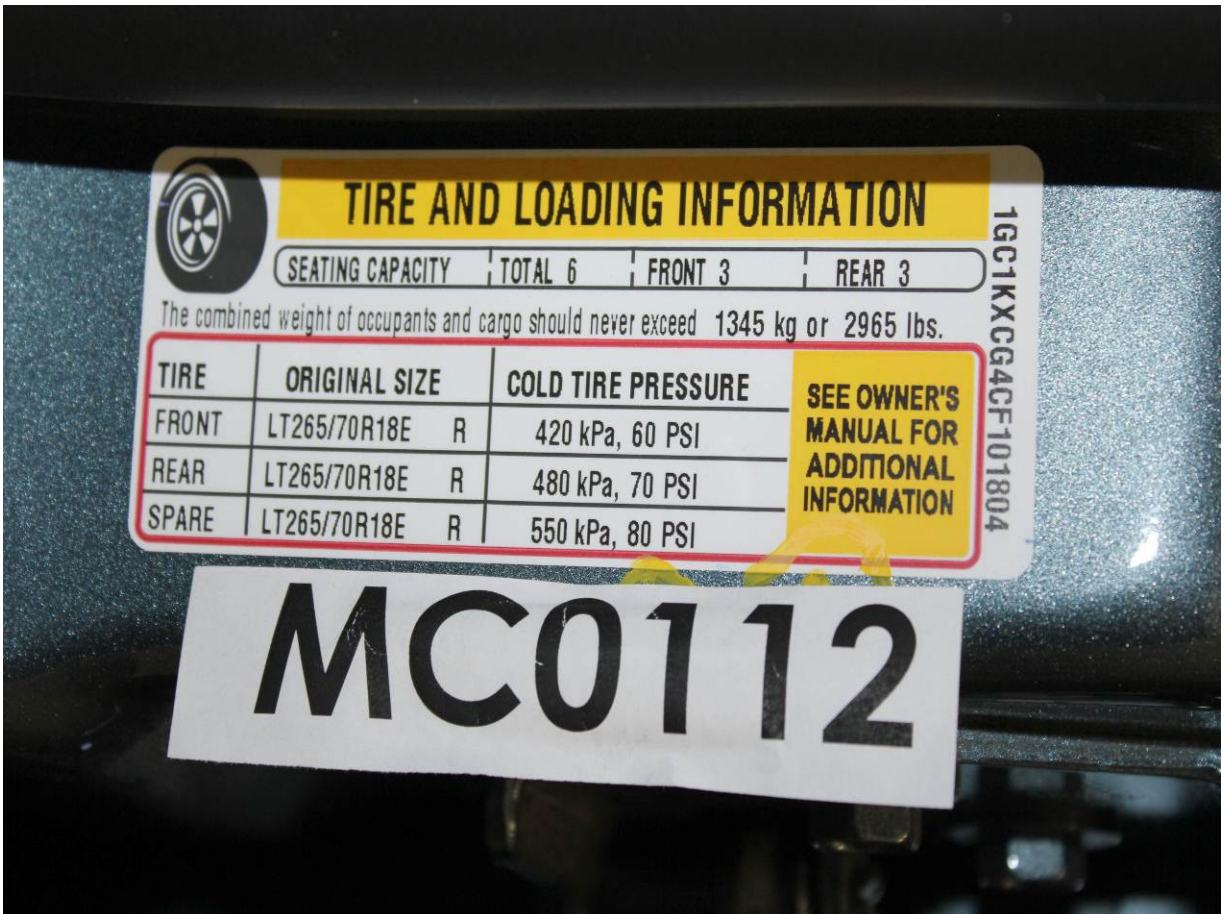
Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



2012 Chevrolet Silverado Frontal As Delivered



Left Rear Three-Quarter View, As Received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left View of Test Vehicle



Post-Test Left View of Test Vehicle



Pre-Test Right View of Test Vehicle



Post-Test Right View of Test Vehicle



Pre-Test Right Front Three-Quarter View



Post-Test Right Front Three-Quarter View



Pre-Test Left Rear Three-Quarter View



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 Filler Cap View



Post-Test Fuel Filler Cap View



Pre-Test Front Underbody View



Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



Post-Test Mid Front Underbody View



Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View



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



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



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



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



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



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



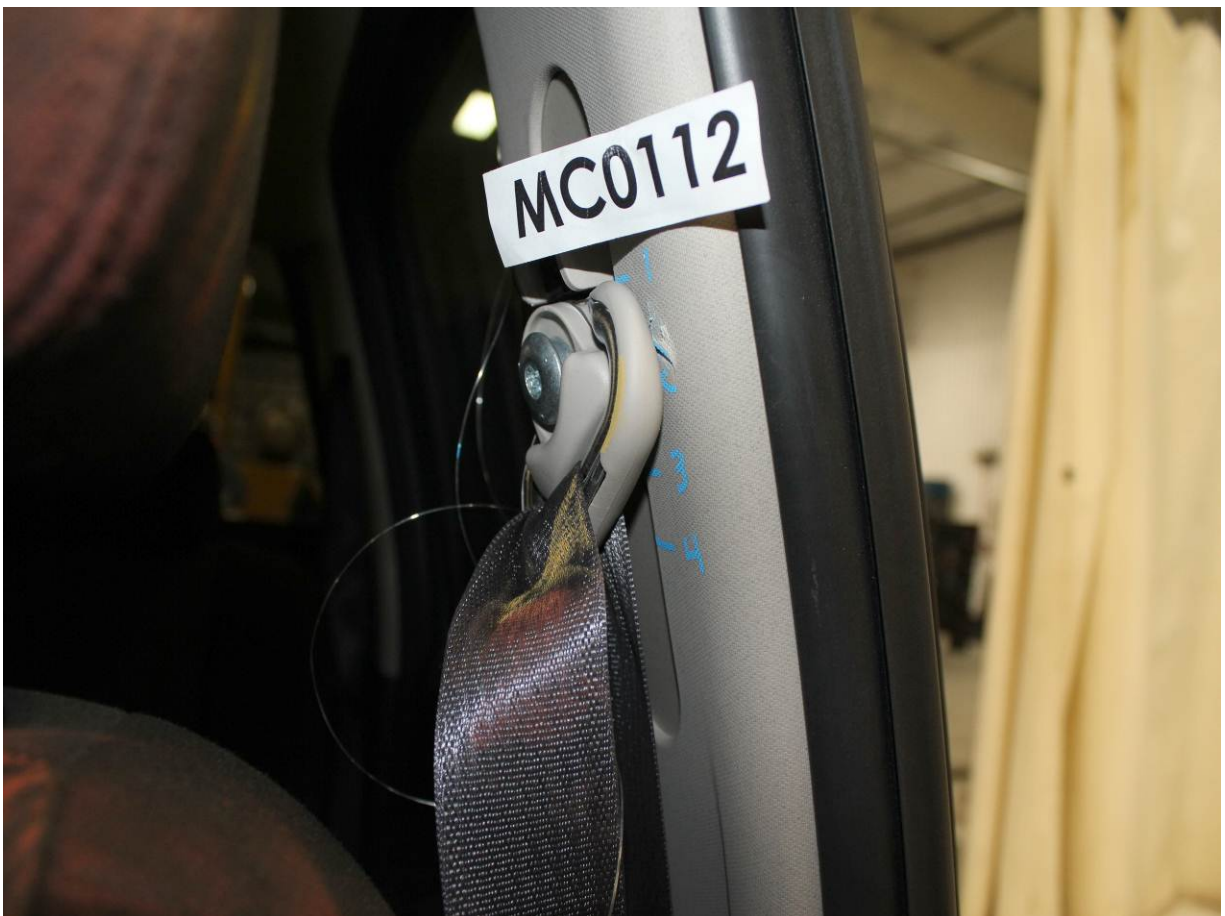
Post-Test Driver Dummy Face



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest/Seat Back



Post-Test Driver Dummy Contact with Seat Belt



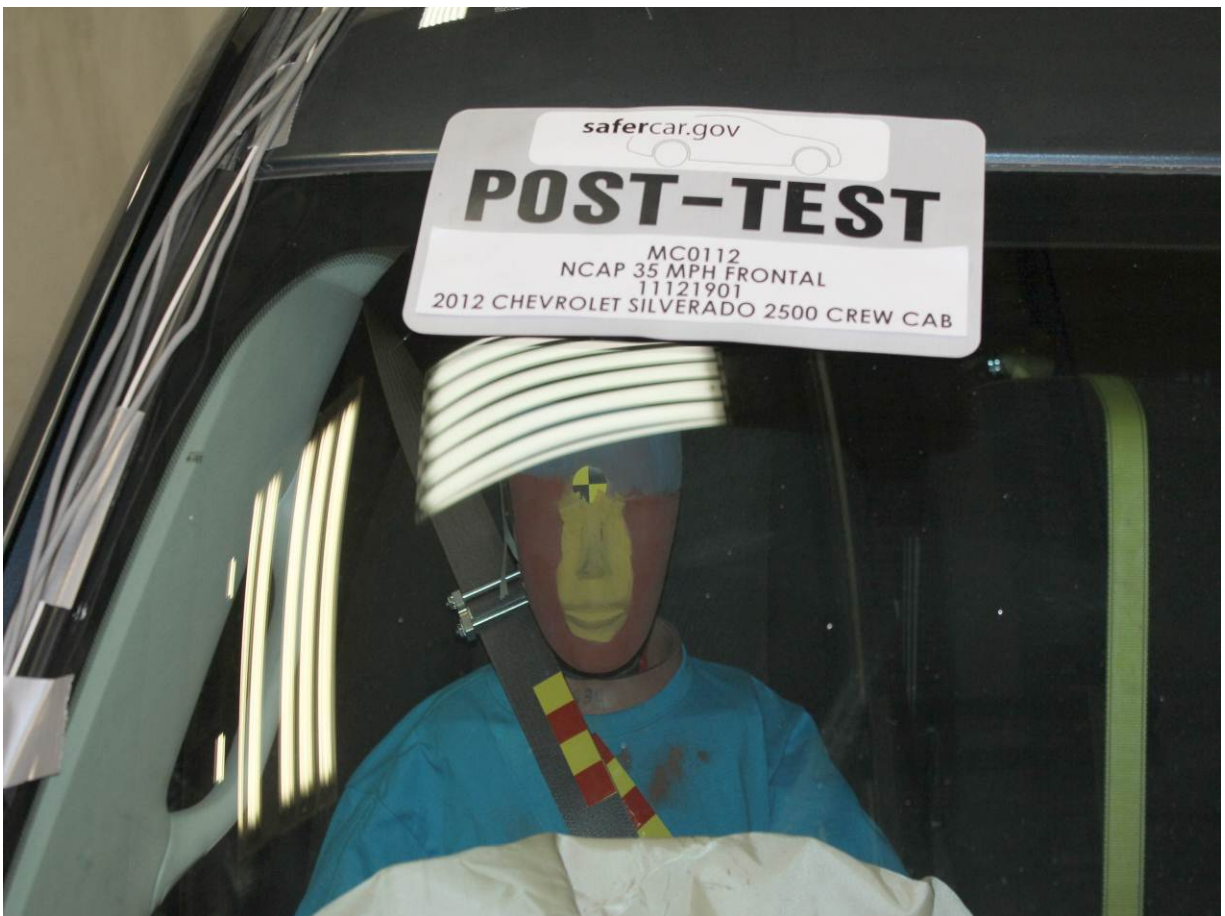
Pre-Test View of the Steering Wheel



Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



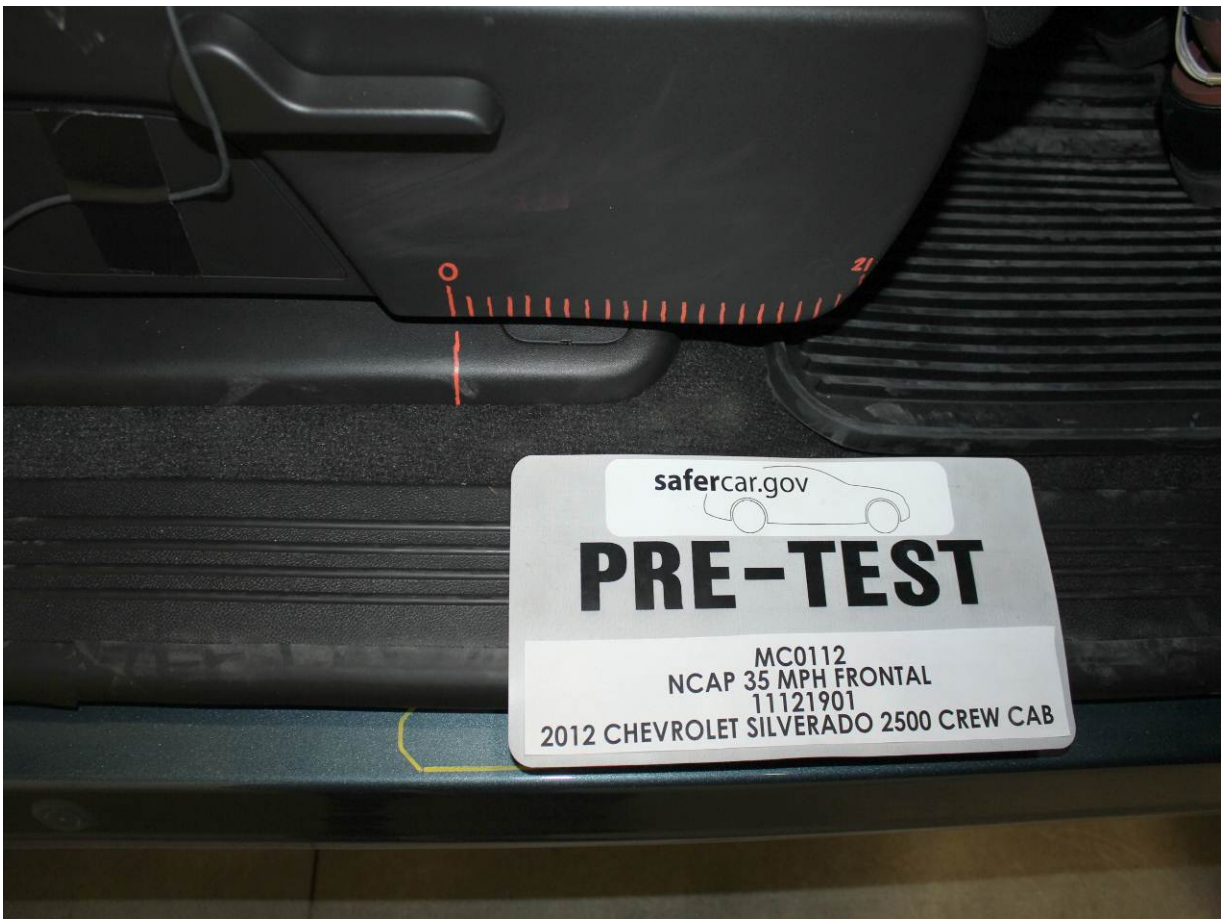
Post-Test Passenger Dummy Window View



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



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



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test 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



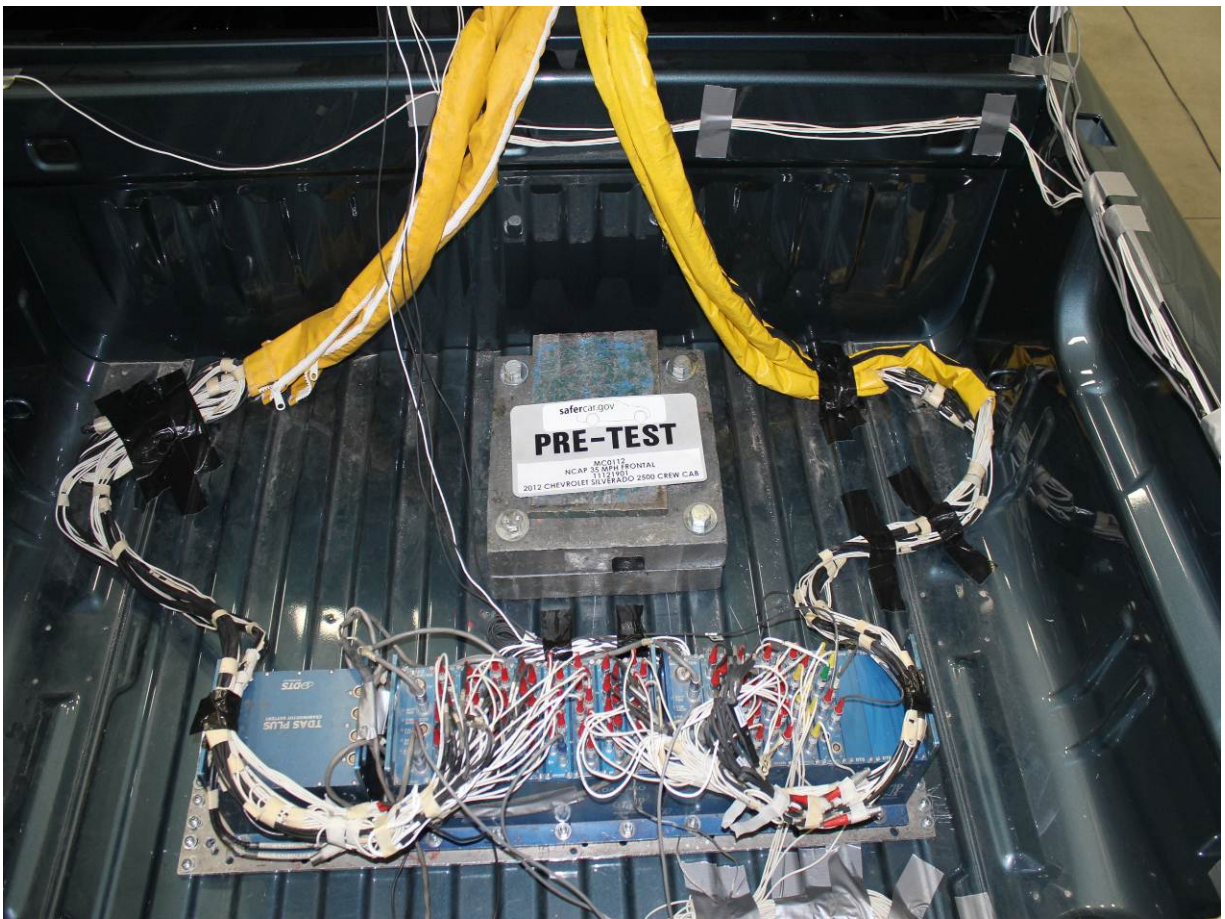
Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



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



2012 Chevrolet Silverado Frontal Impact Event



2012 SILVERADO 2500 4WD LT CREW CAB

EXTERIOR: BLUE GRANITE METALLIC
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EPA Fuel Economy Estimates

CITY MPG

Expected range for most drivers
XX to XX MPG

NOT APPLICABLE TO THIS VEHICLE

HIGHWAY MPG

Expected range for most drivers
XX to XX MPG

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

GOVERNMENT SAFETY RATINGS

Frontal Crash	Driver Passenger	Not Rated
Side Crash	Front seat Rear seat	Not Rated
Rollover	★★★★★	

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.

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

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).

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DEALER'S OFFER: SALES CODE G

SALES MODEL CODE 00000

DEALER H.O. #000

FINAL ASSEMBLY: PONTIAC

VIN: 1GCKK0G40F101804

DEALER TO WHOM ORDERED: BROOKHEAD CHEVROLET-PONTIAC-BUICK, L.L.C.

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APPENDIX B

DUMMY RESPONSE DATA TRACES

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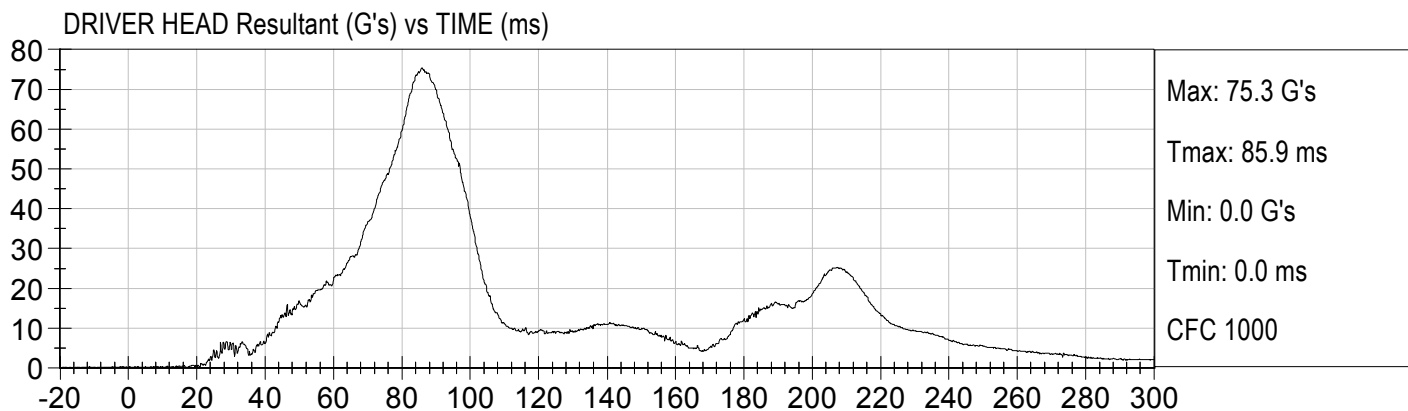
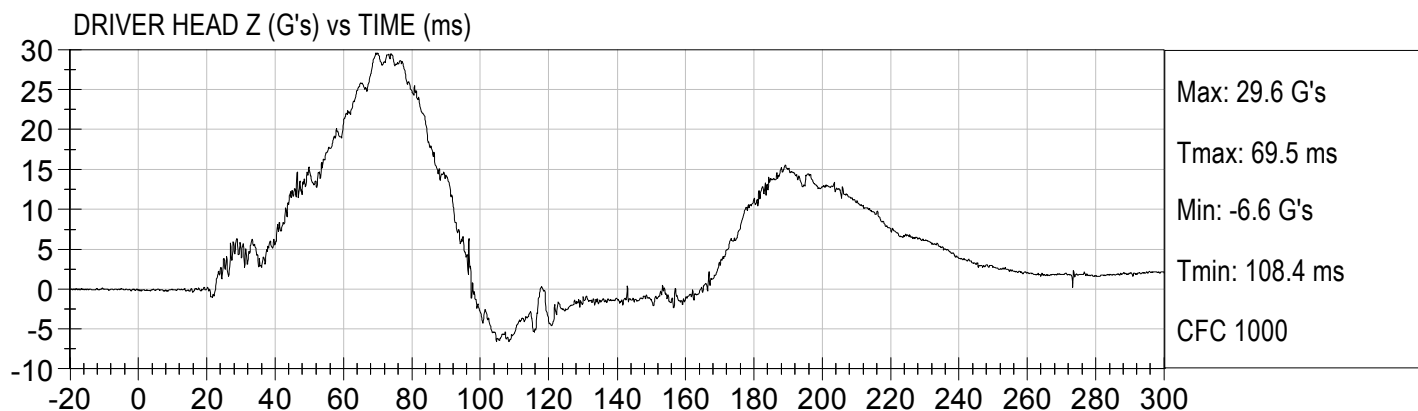
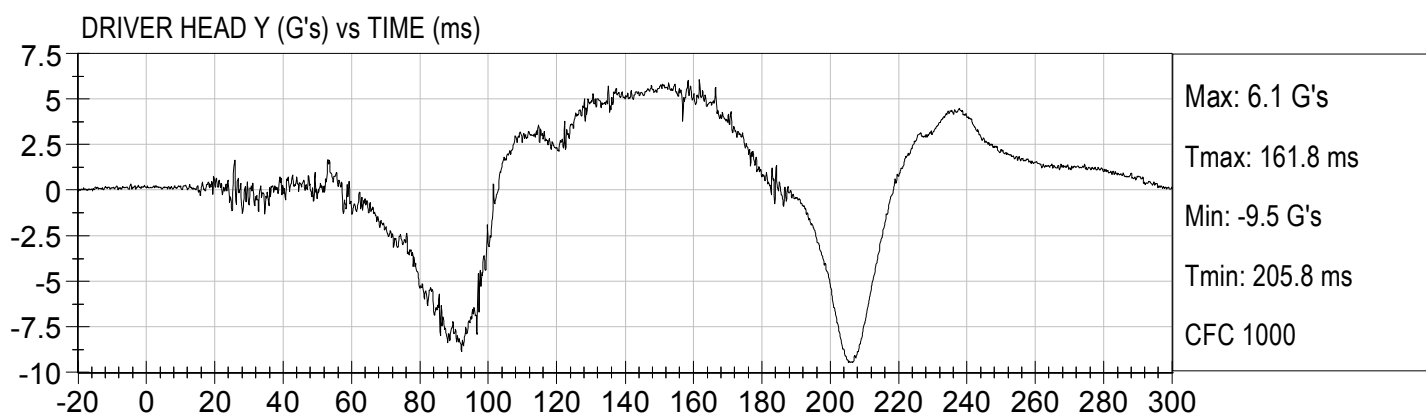
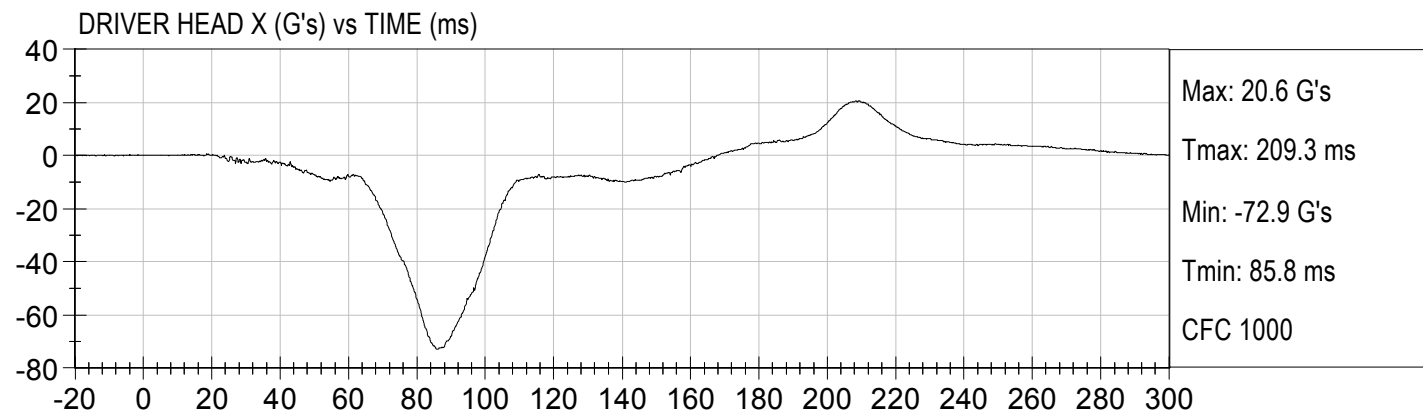
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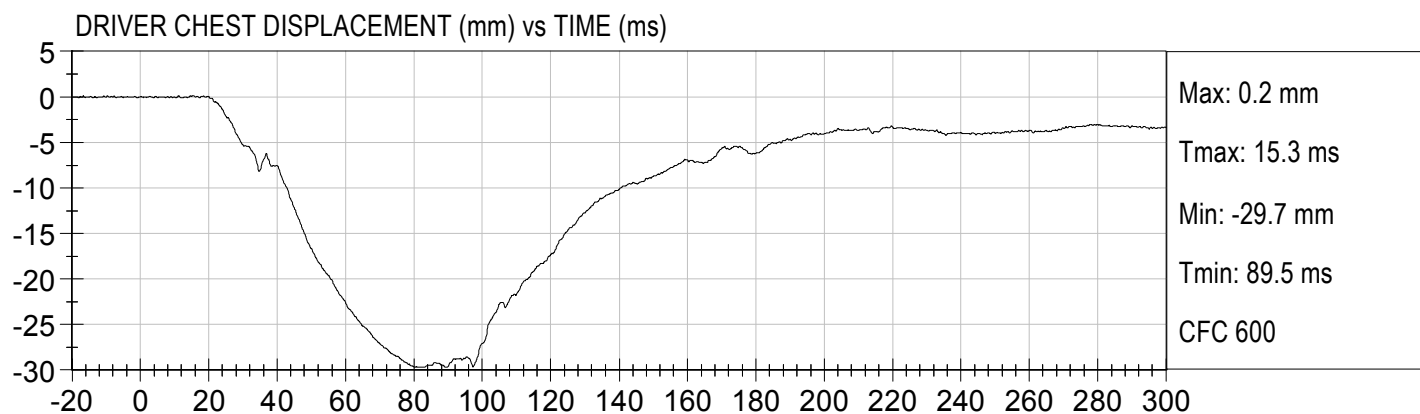
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

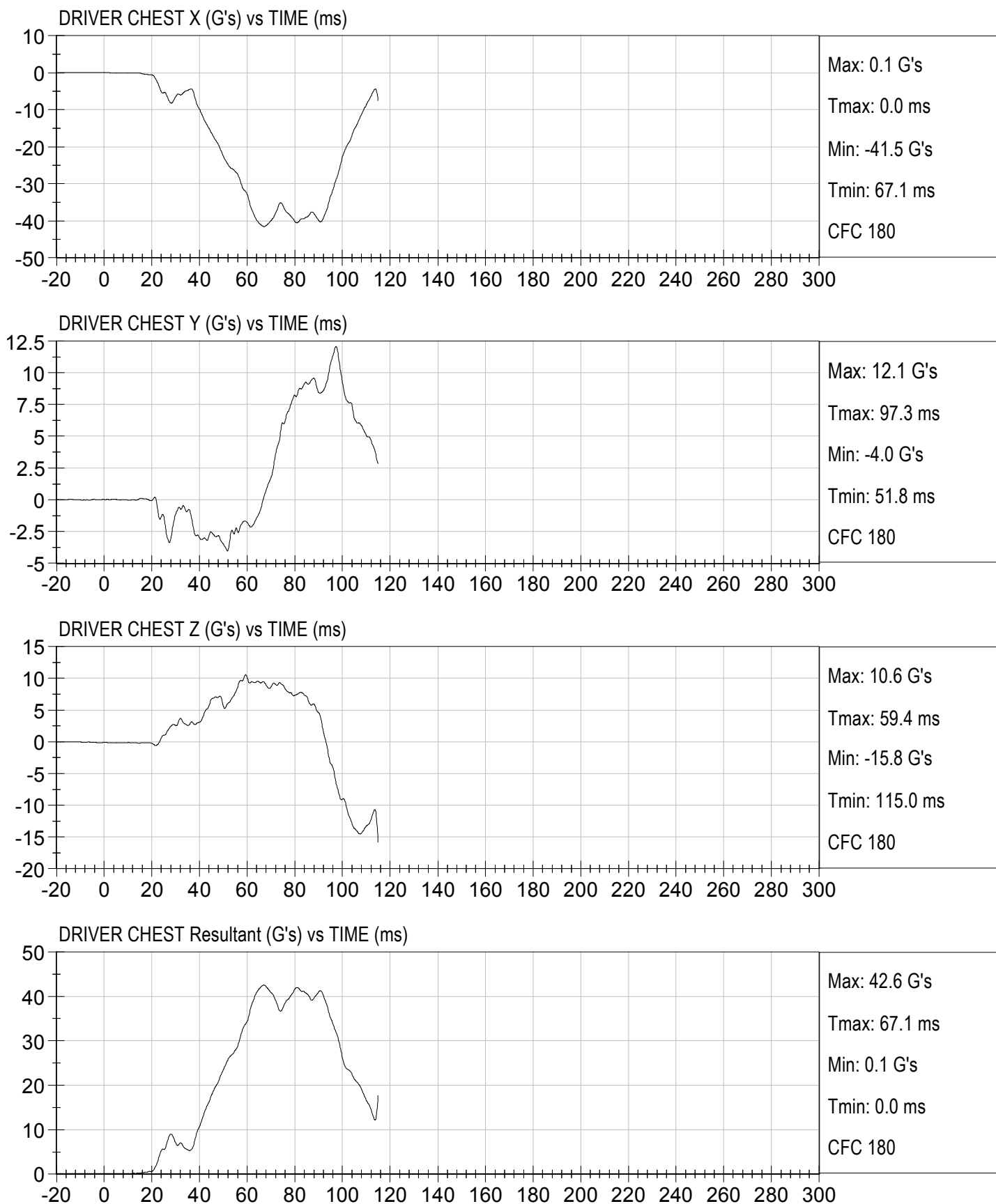
Driver Head X Redundant
 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
 Driver Left Femur Redundant
 Driver Right Femur Redundant
 Driver Left Upper Tibia Moment X
 Driver Left Upper Tibia Moment Y
 Driver Left Upper Tibia Force Z
 Driver Left Lower Tibia Moment X

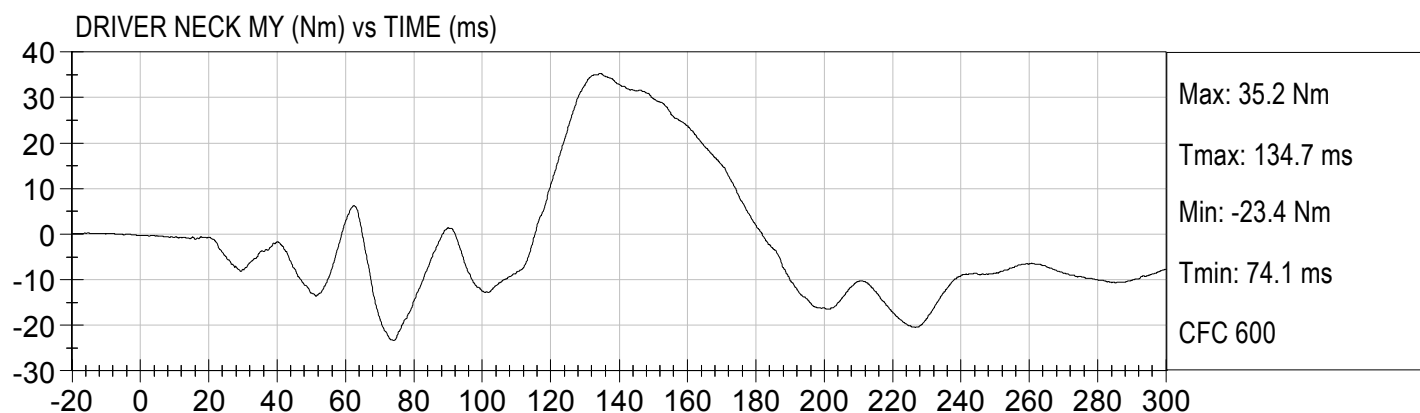
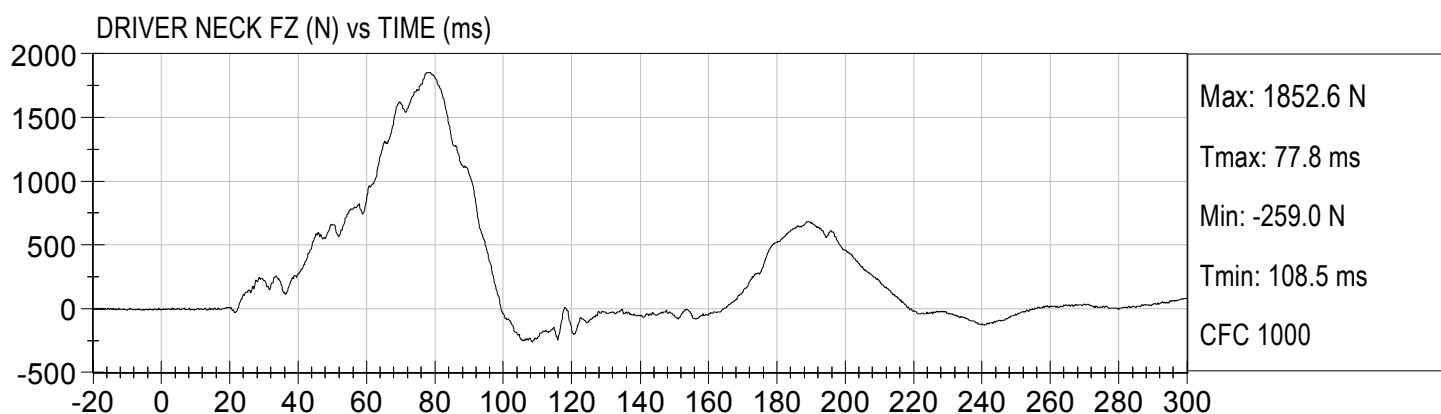
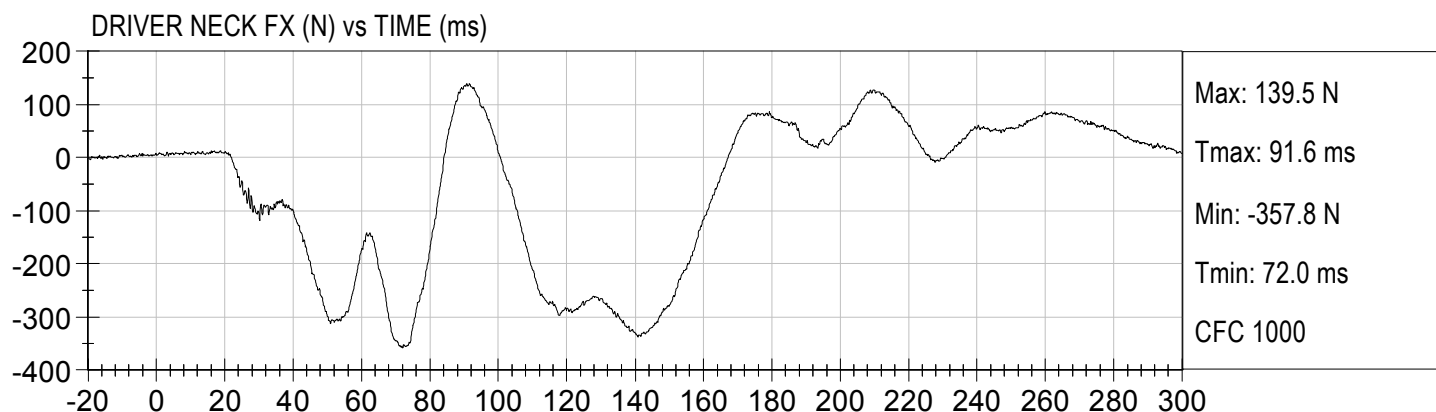
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Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot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

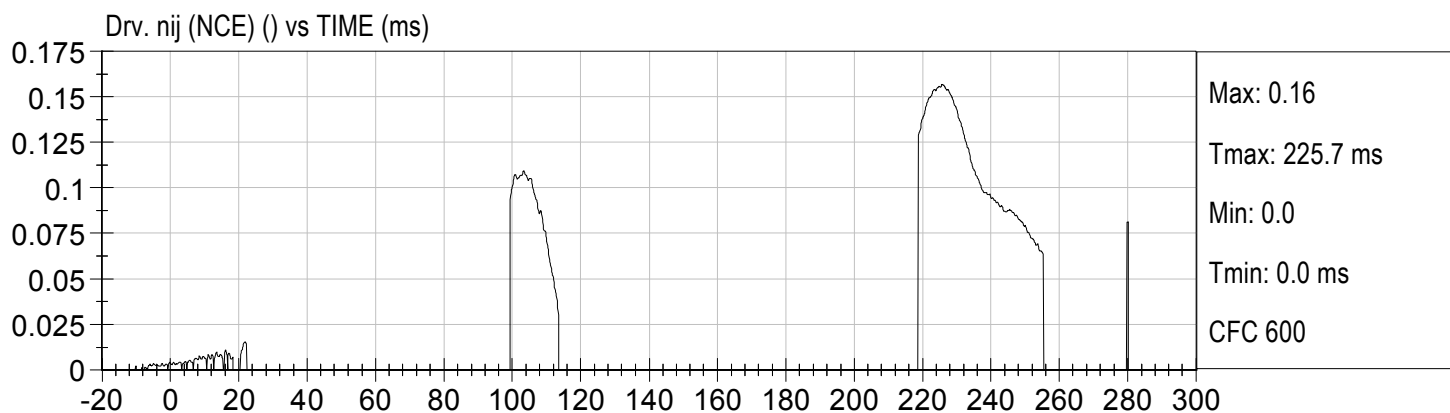
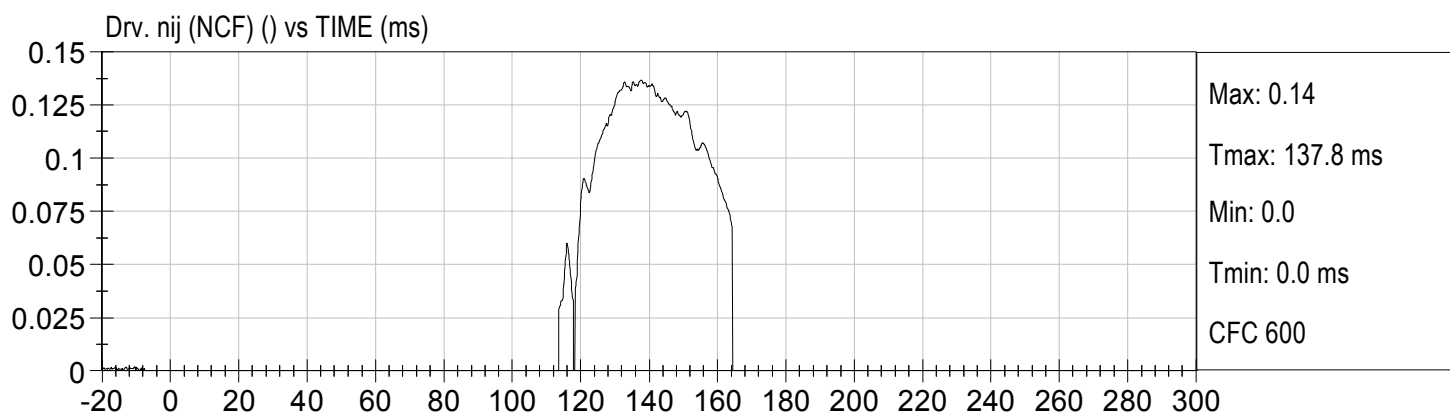
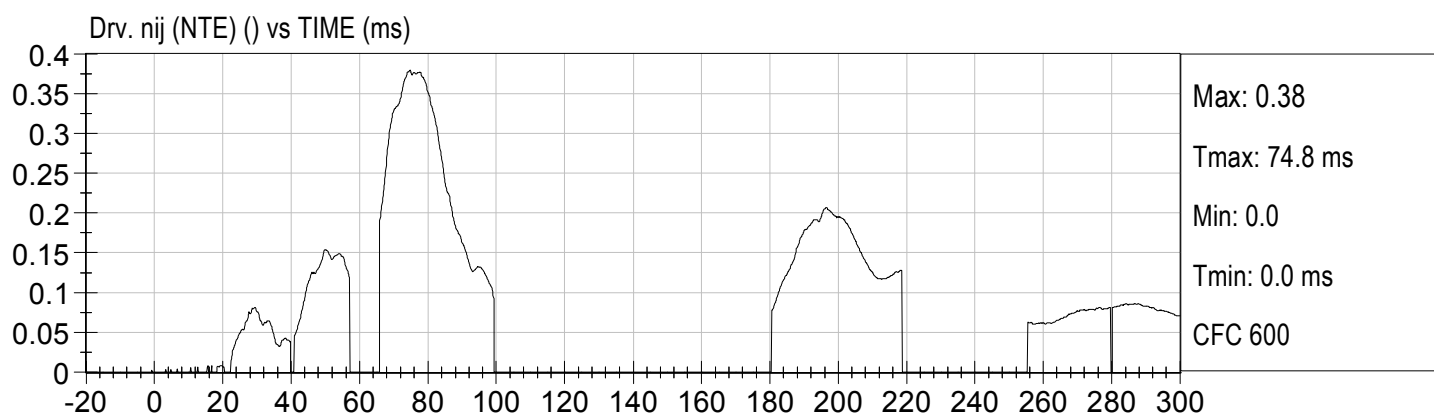
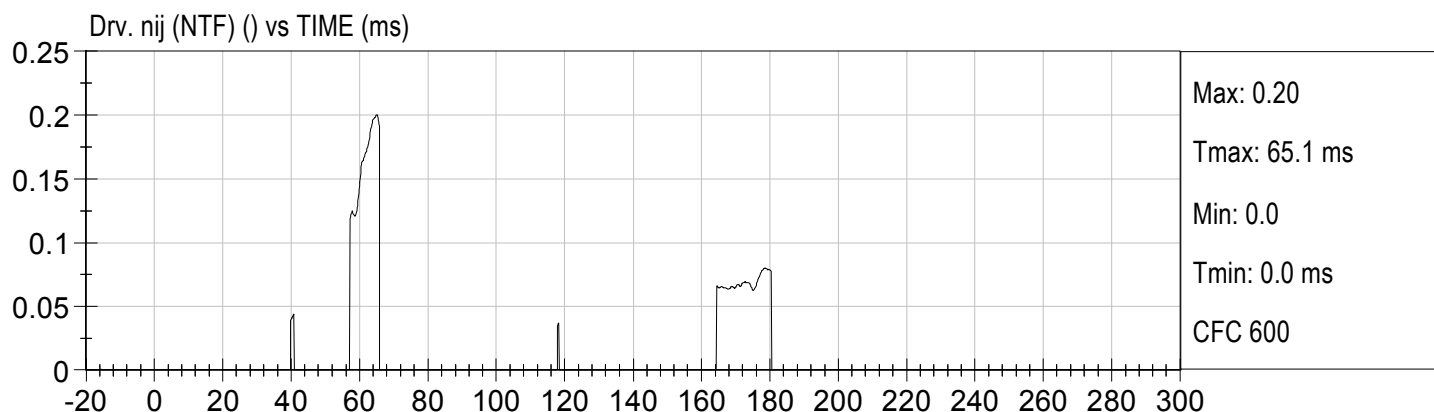
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Lap Belt Force
Passenger Shoulder Belt Force
Left Rear Seat Crossmember X
Right Rear Seat Crossmember X
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr
Advanced Research Load Cell Barrier – 128 channels

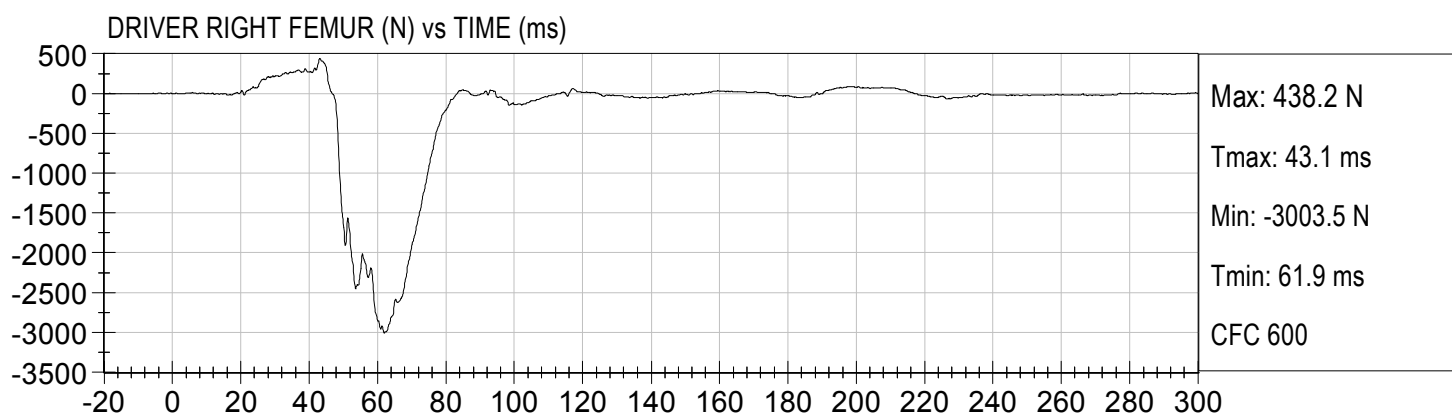
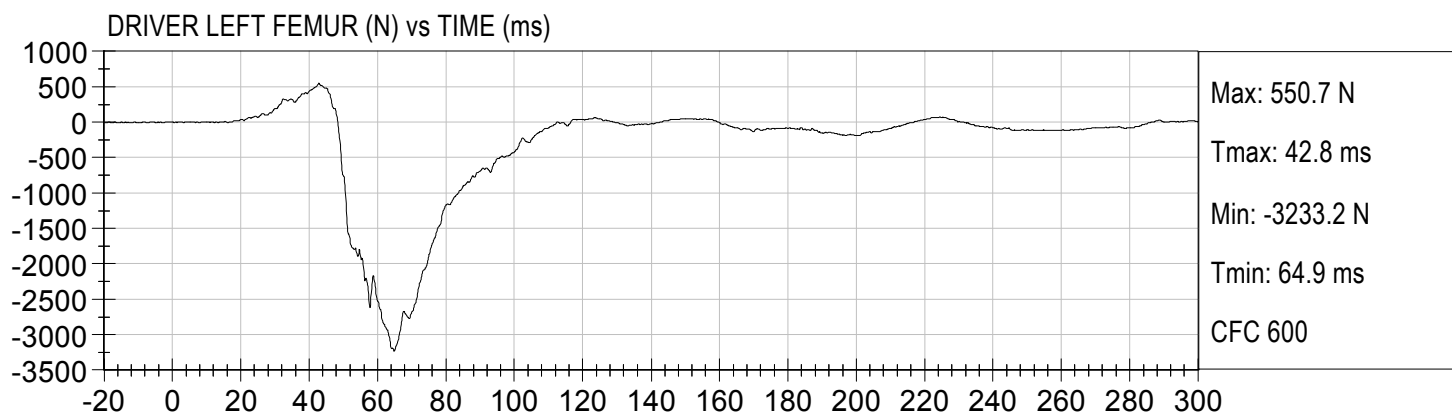


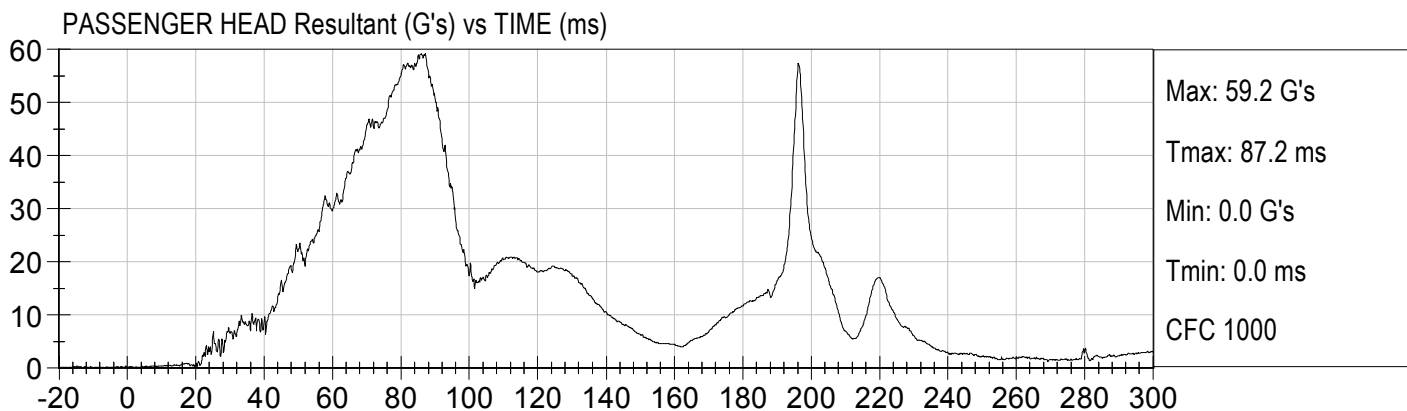
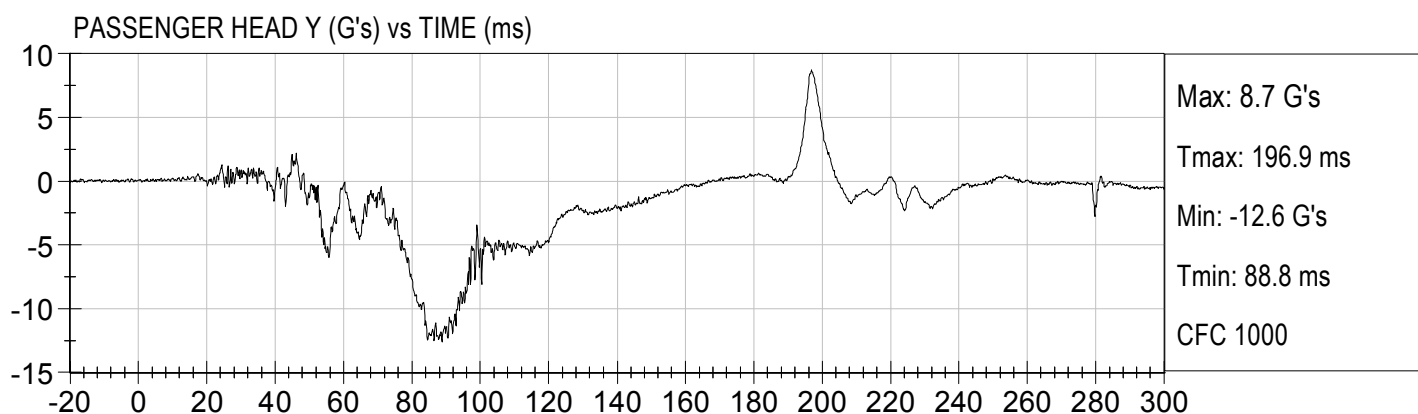
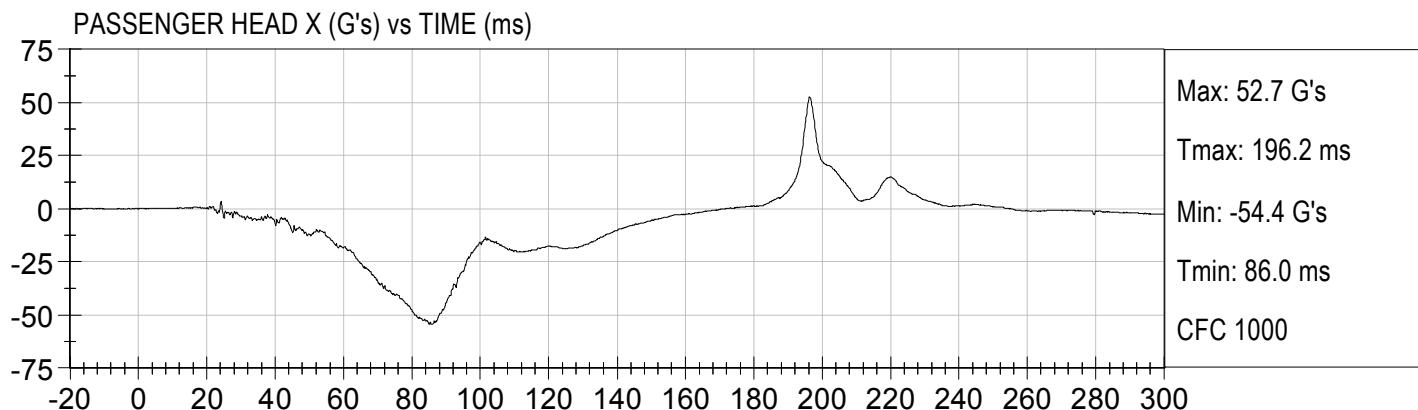


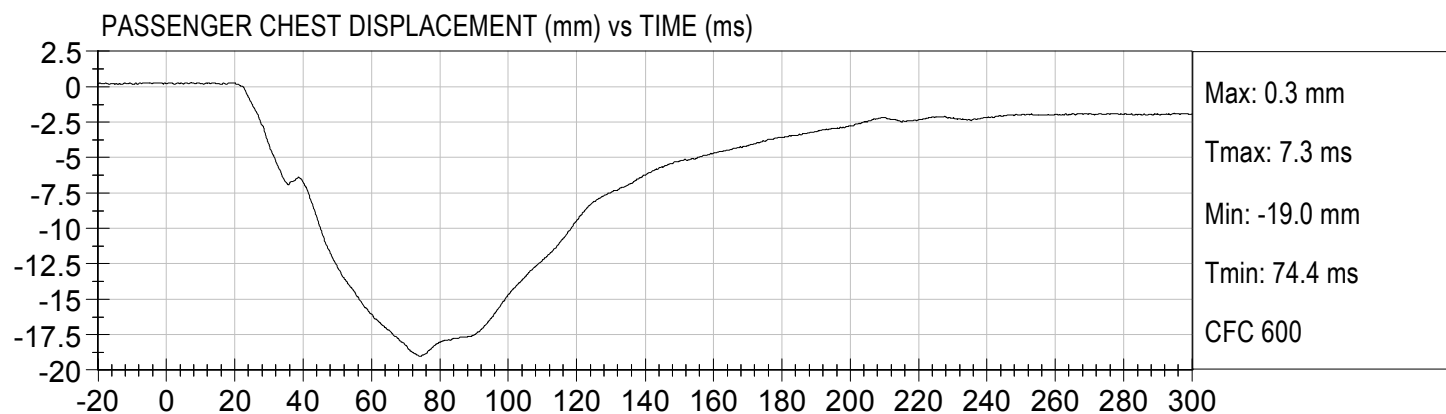


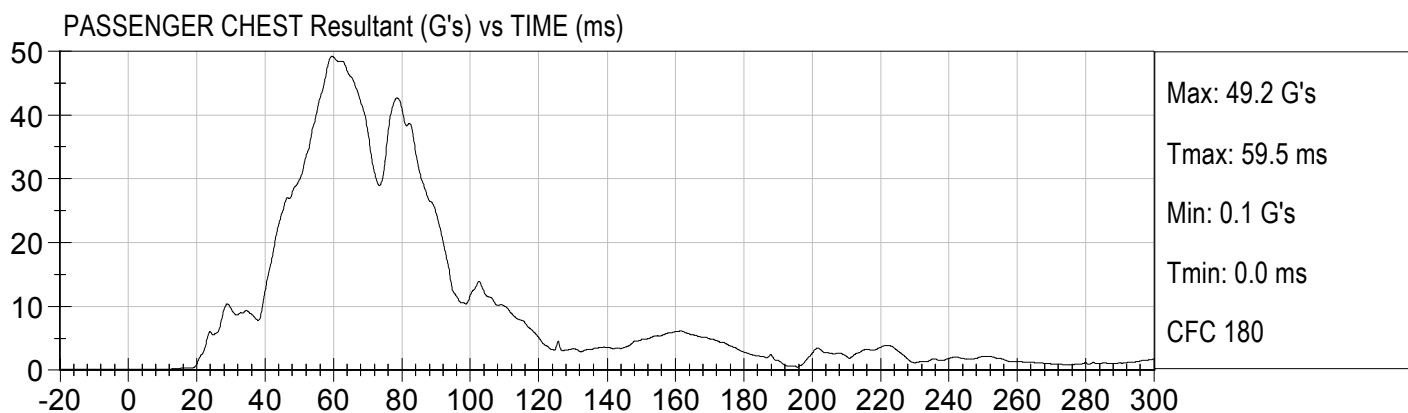
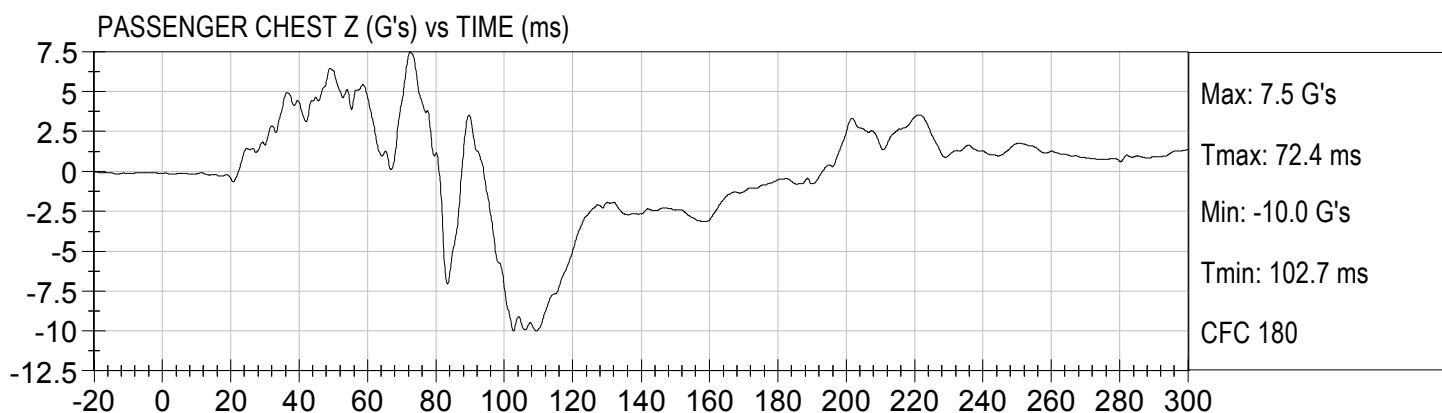
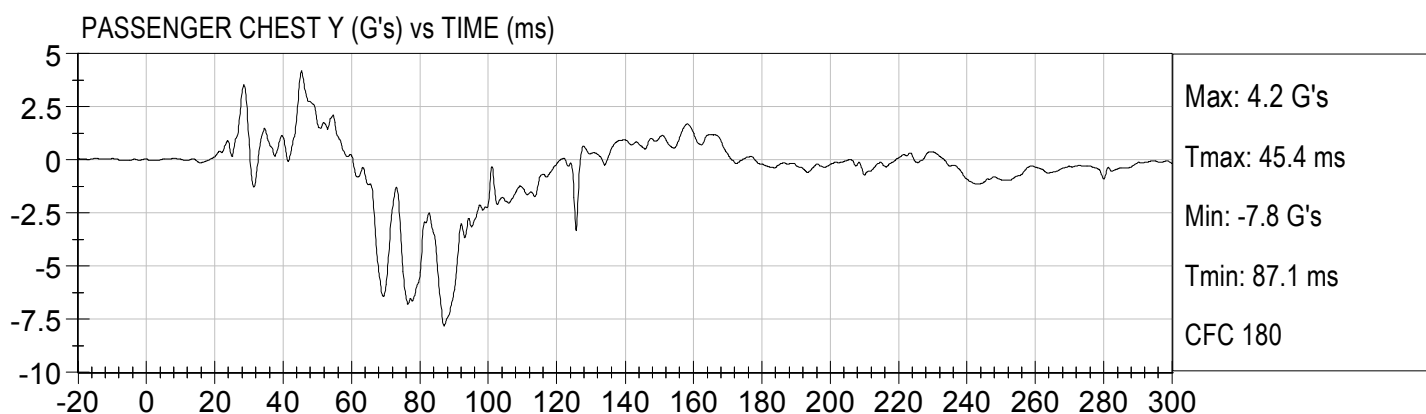
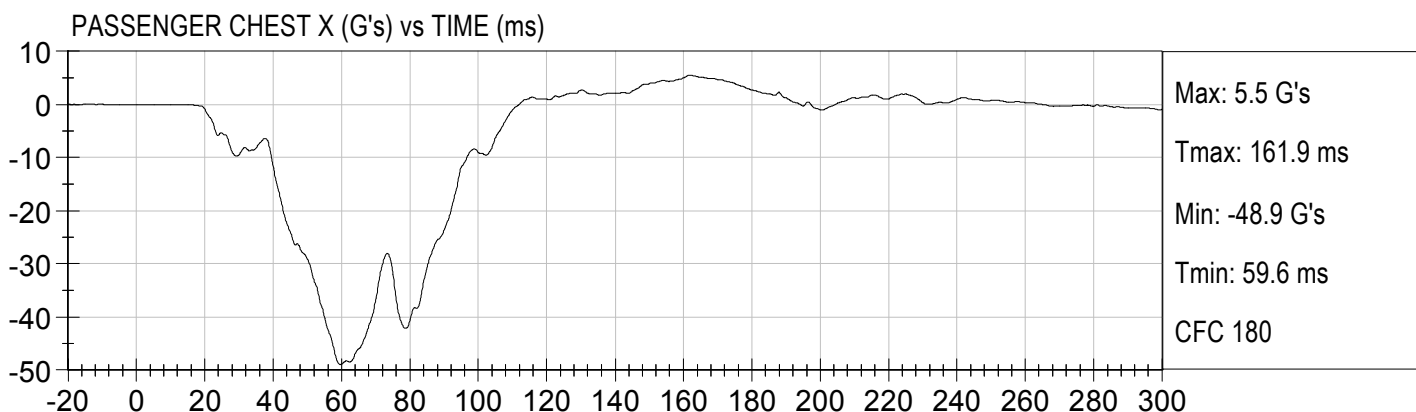


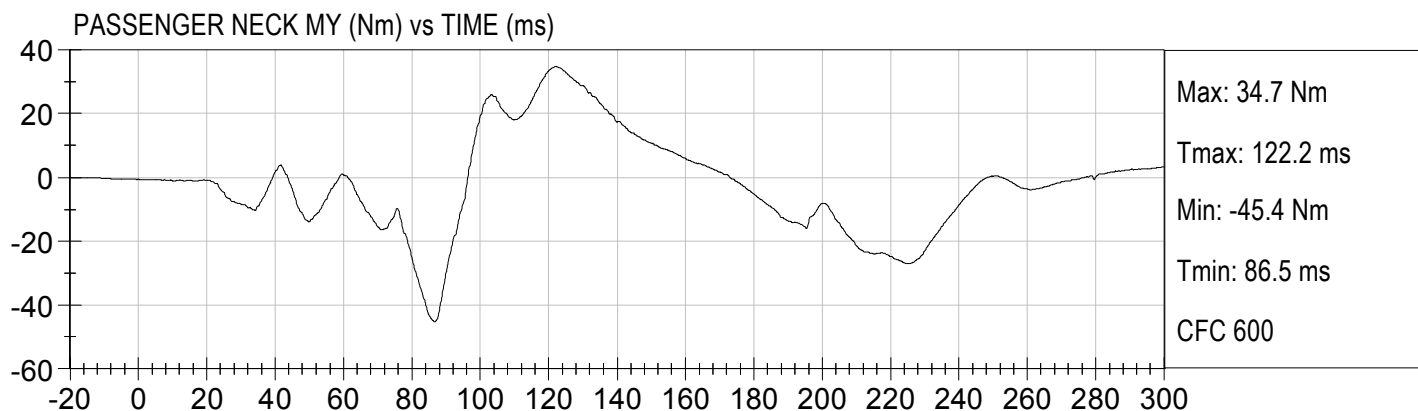
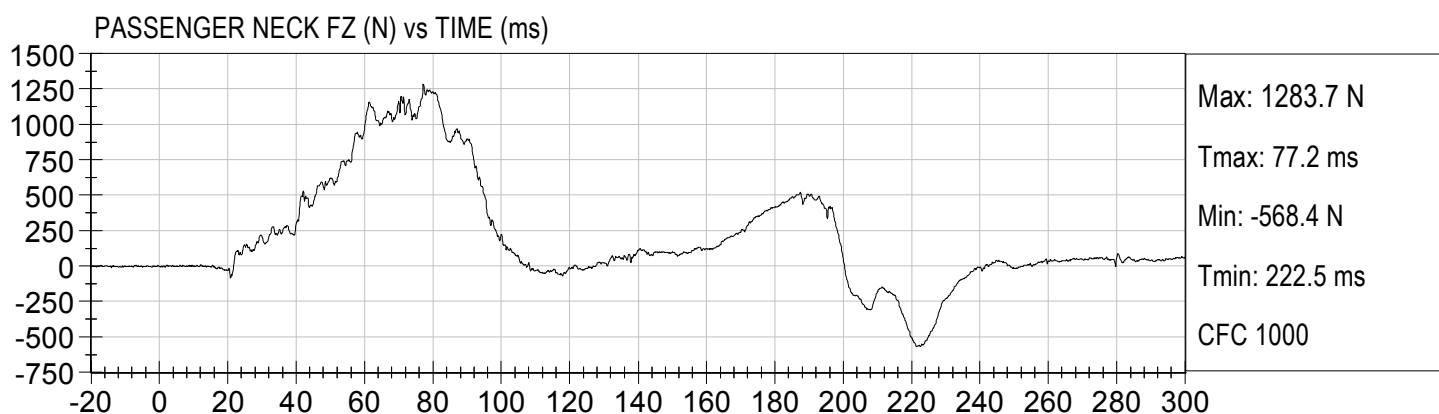
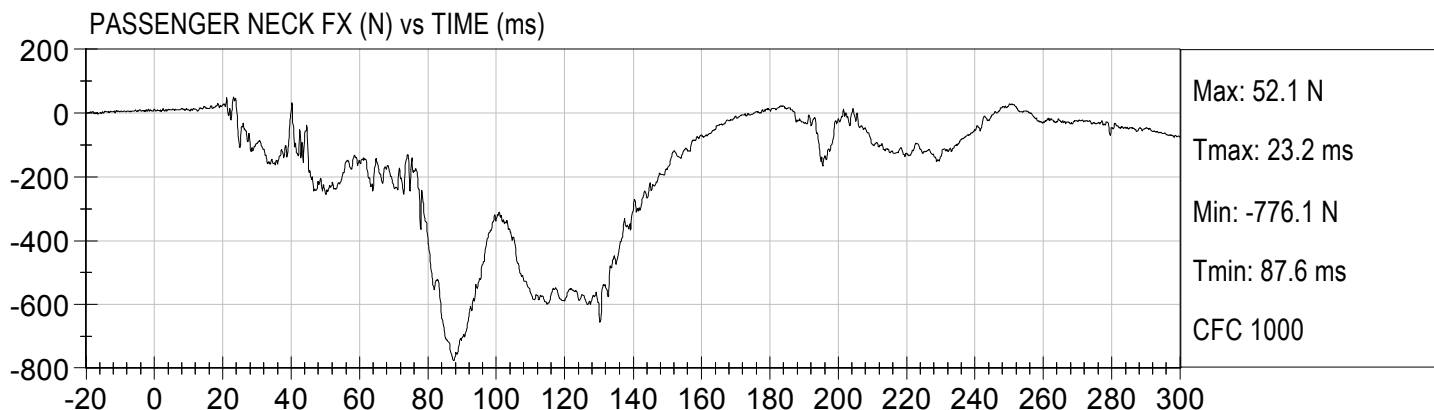


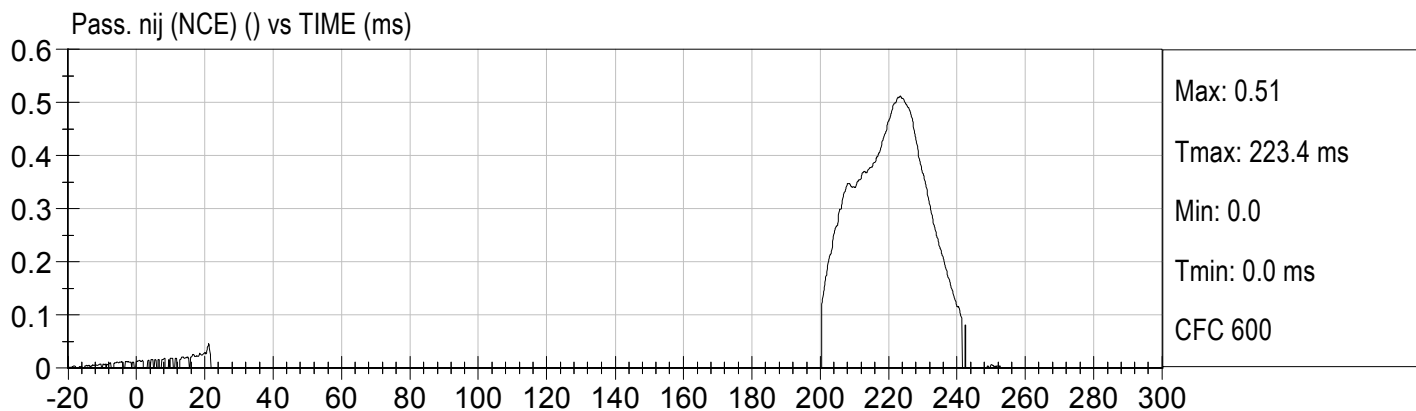
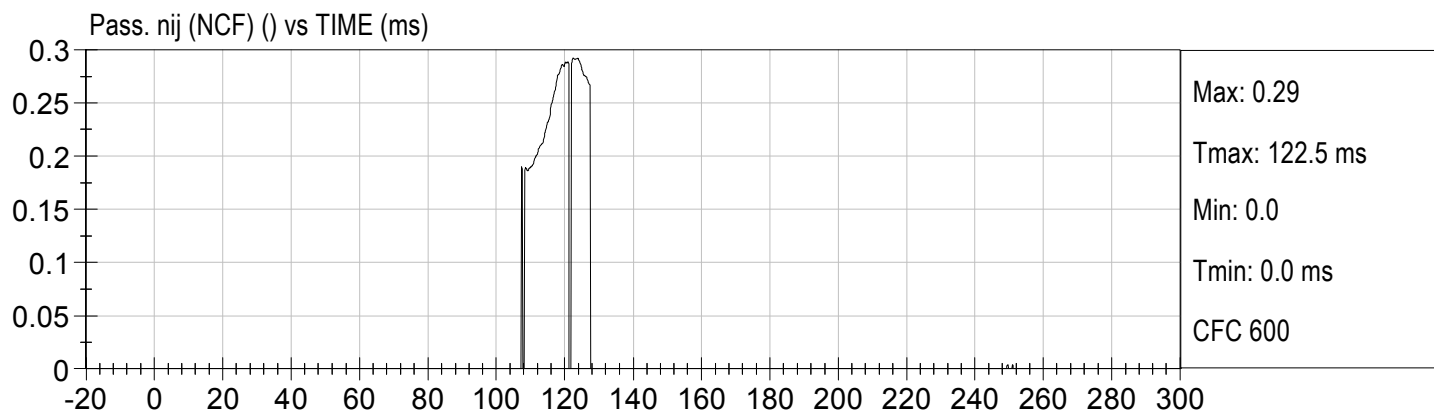
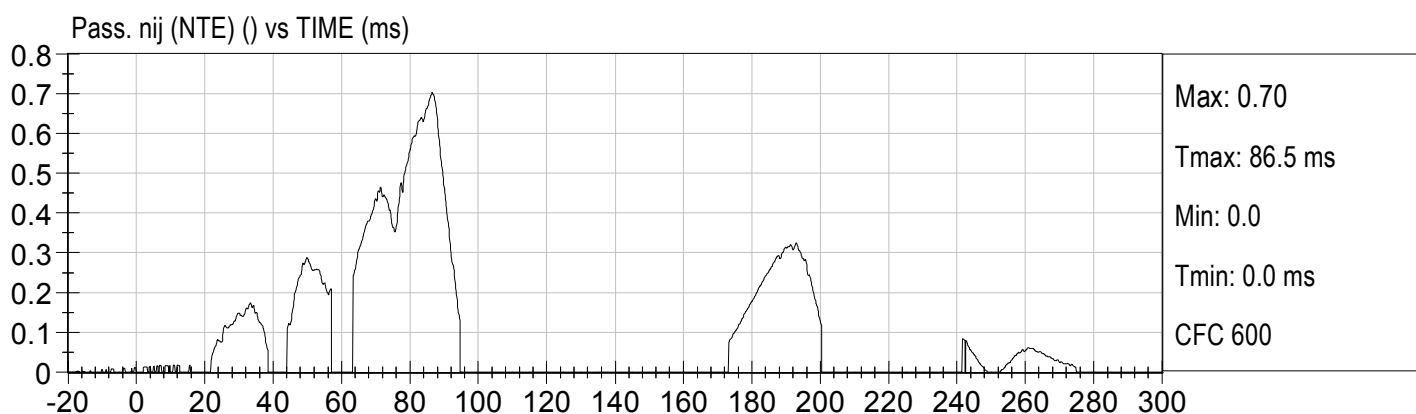
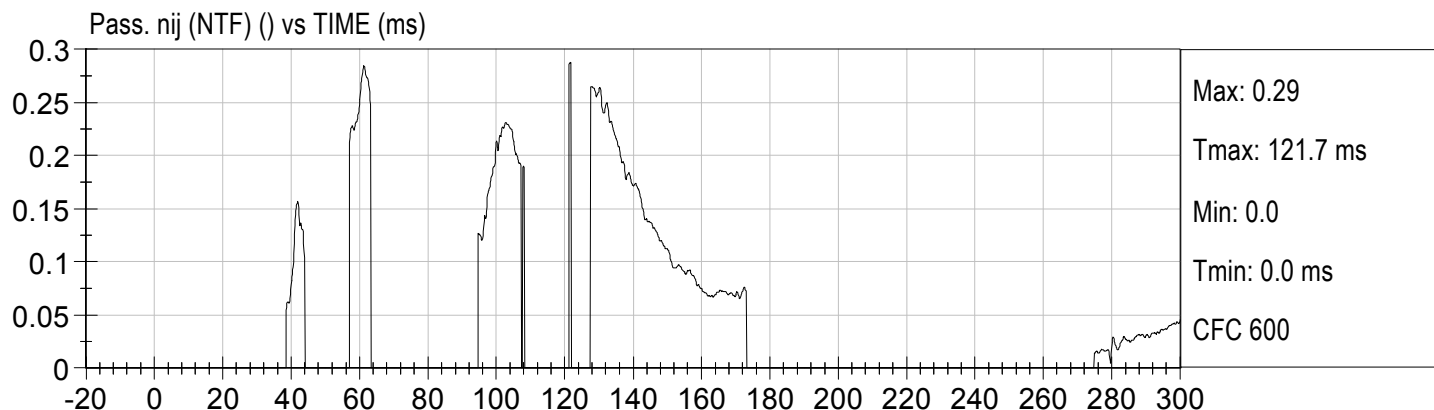


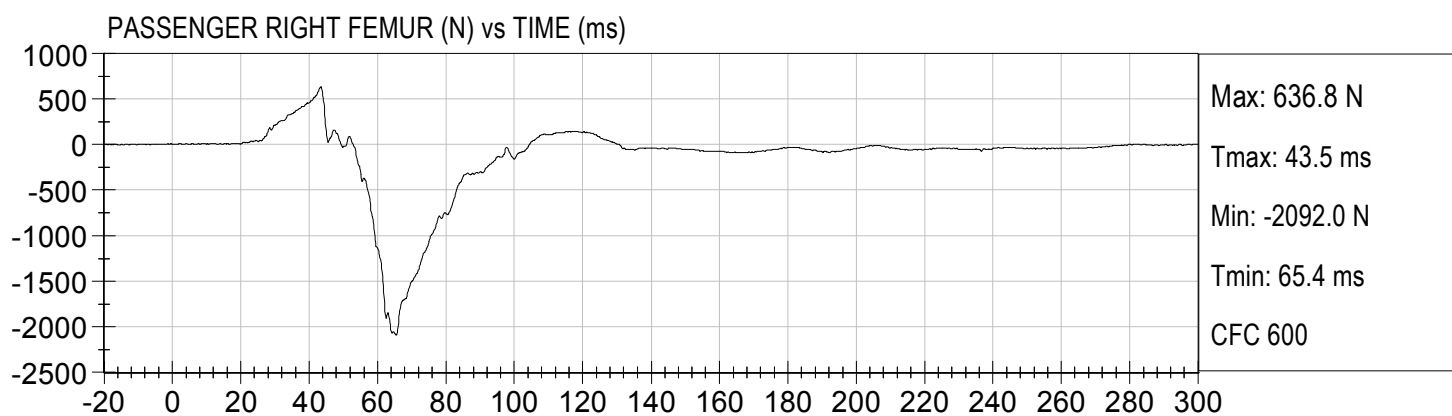
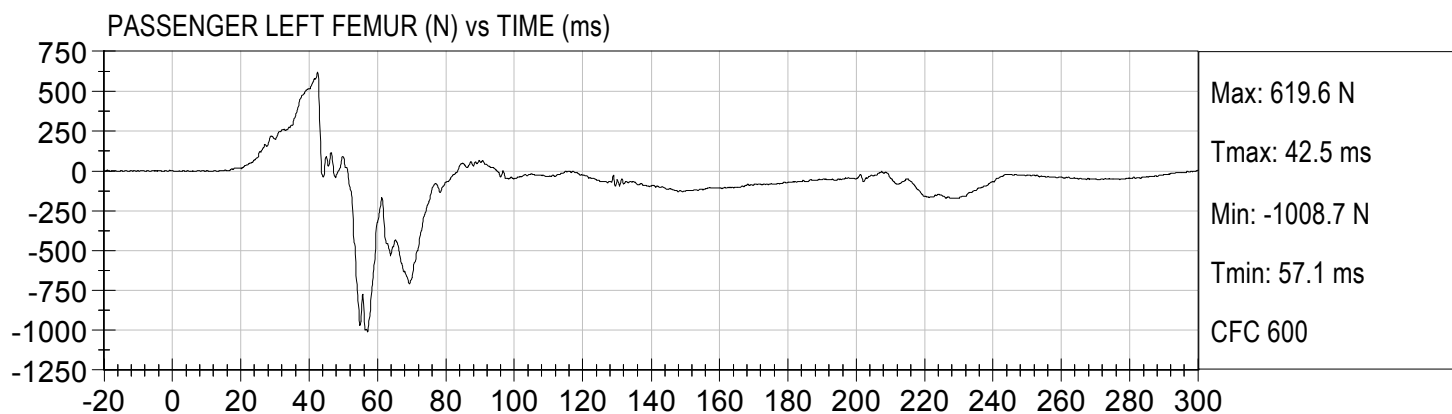












APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 351

HYBRID III, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.8
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.4
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.0
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.8
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	13.0-13.6	13.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.0
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	17.8-18.8	18.8

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	39.2
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.7
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

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

ATD Serial No: 351

Test ID: D114241

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	225 - 275	272	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

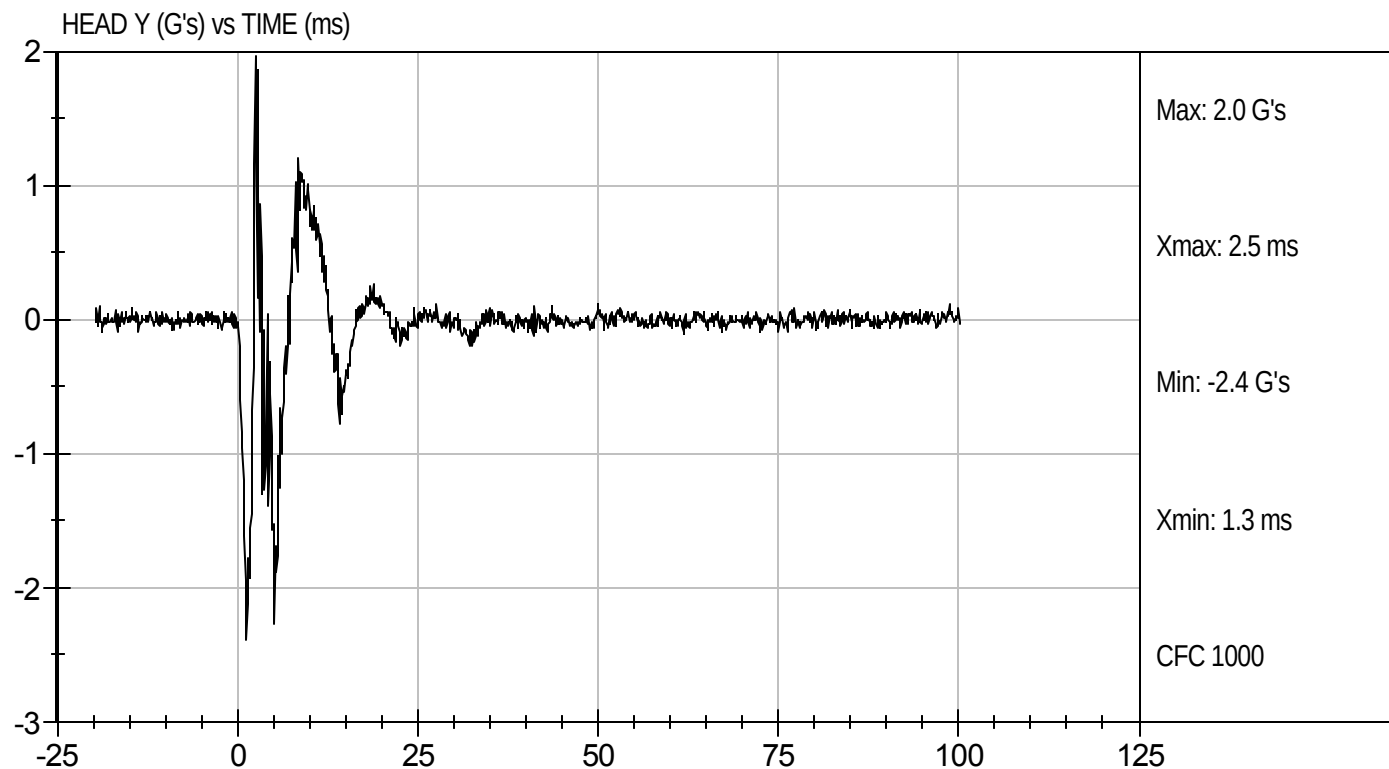
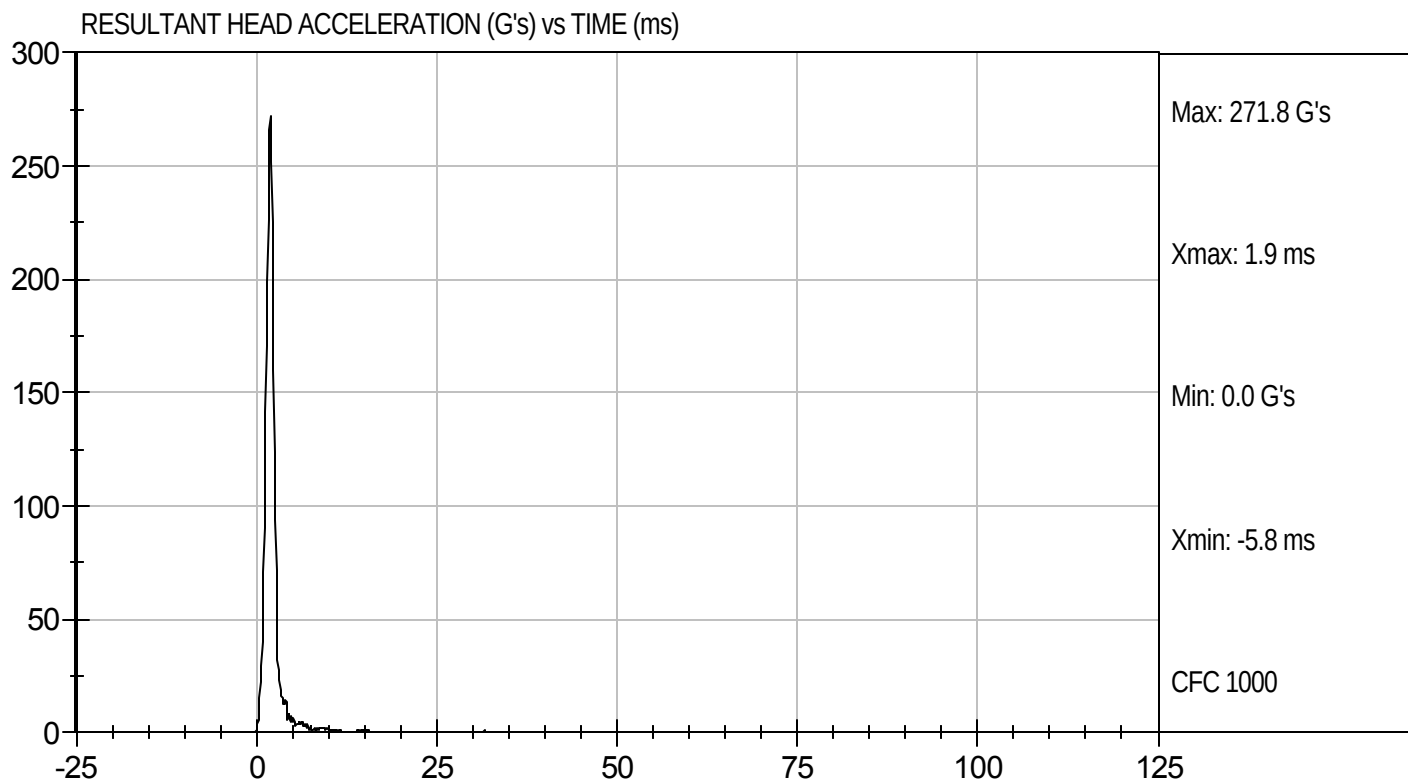
12/16/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D114241

Test Date: 12/16/11
Velocity: 0 ft/s, 0 m/s



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

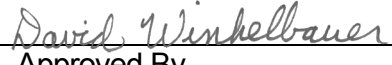
ATD Serial No: 351

Test I.D: D114242

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	20	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.90	Pass
	20 ms	G's	17.60 to 22.60	19.29	Pass
	30 ms	G's	12.50 to 18.50	14.57	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.2	Pass
	Time	ms	57.0 to 64.0	58.3	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	95.4	Pass
	Time	ms	47.0 to 58.0	47.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	101.8	Pass
Overall Test Results					Pass


Laboratory Technician

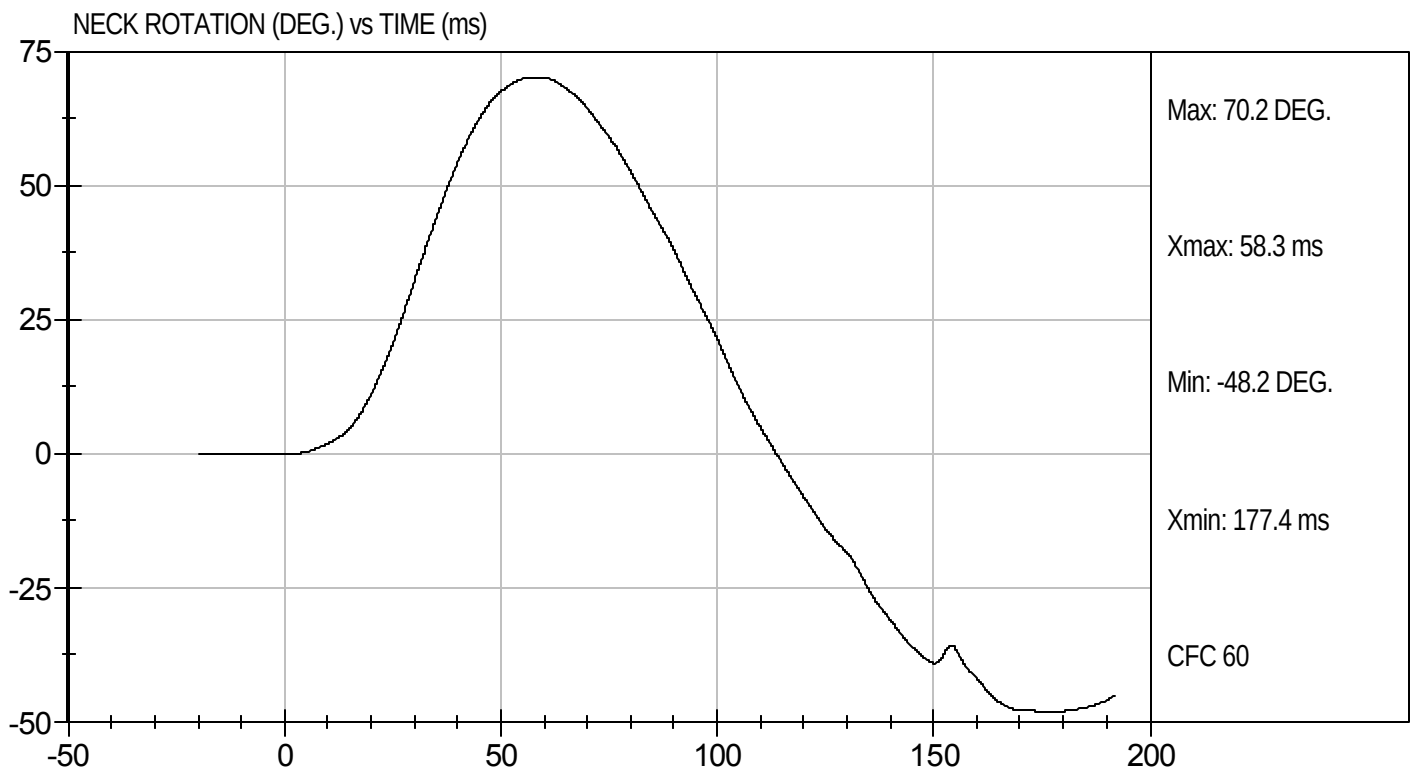
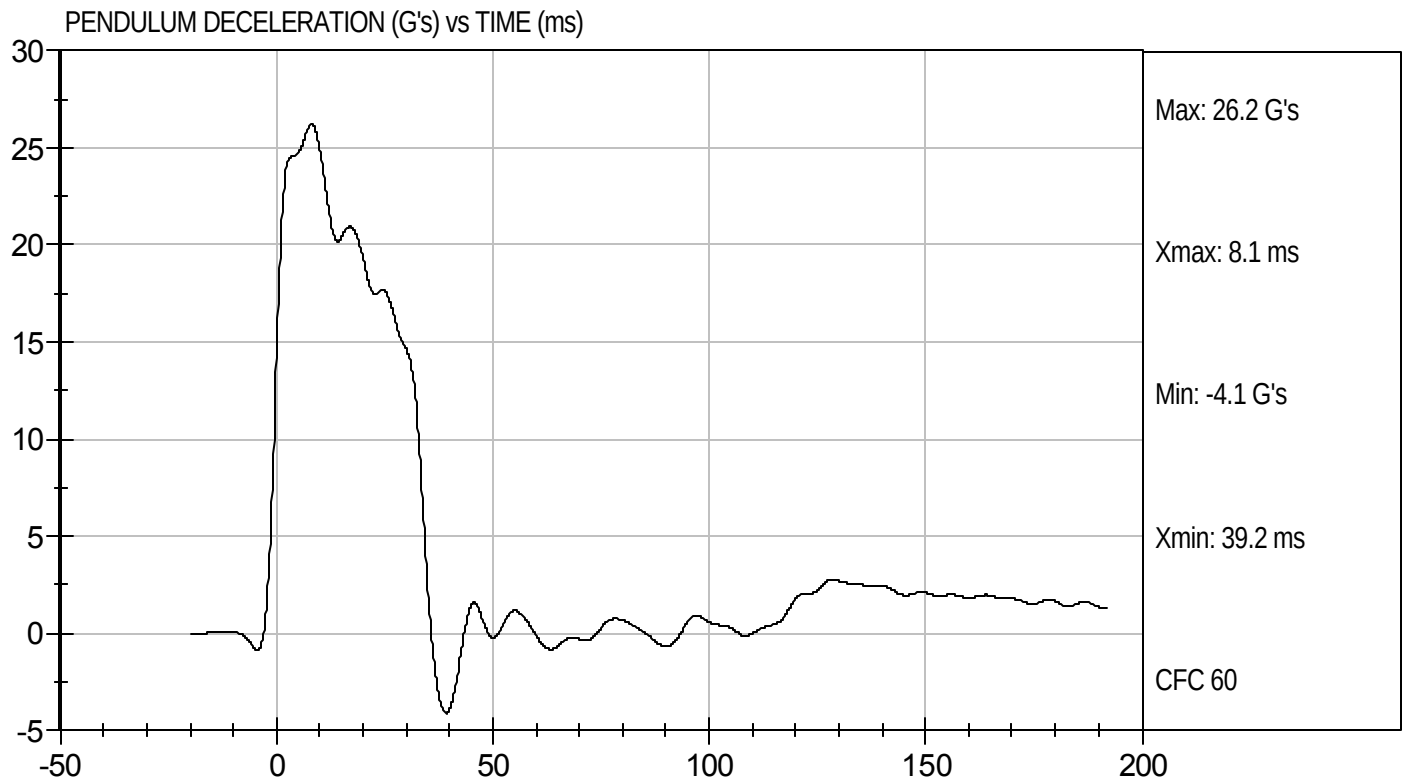
12/16/11
Test Date


Approved By



Test Desc: Neck Flexion
Component ID: D114242

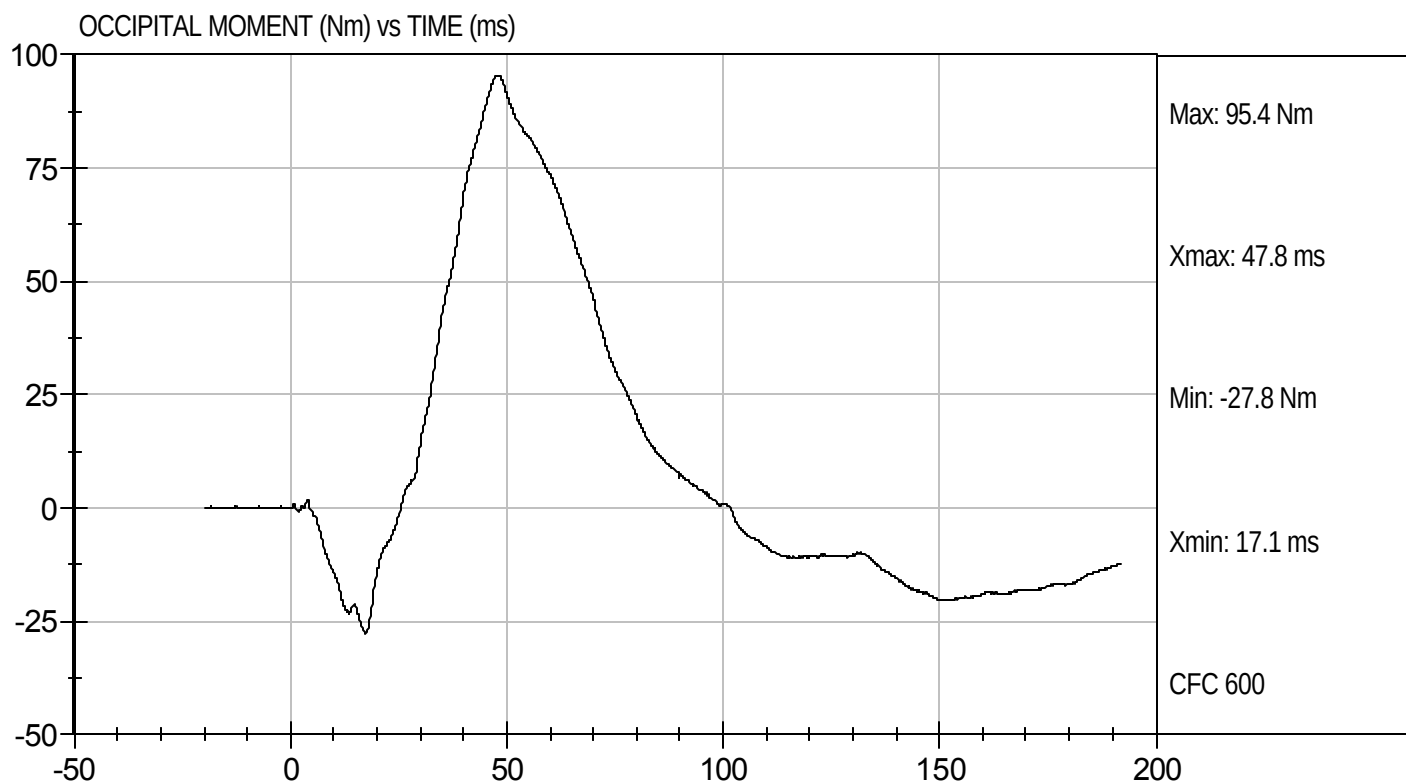
Test Date: 12/16/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D114242

Test Date: 12/16/11
Velocity: 23.15 ft/s, 7.06 m/s



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

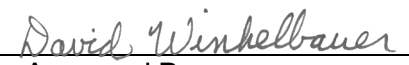
ATD Serial No: 351

Test I.D.: D114243

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	20	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.34	Pass
	20 ms	G's	14.00 to 19.00	16.76	Pass
	30 ms	G's	11.00 to 16.00	13.25	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.5	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	96.4	Pass
	Time	ms	72.0 to 82.0	77.6	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	70.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.4	Pass
Overall Test Results					Pass


 Laboratory Technician

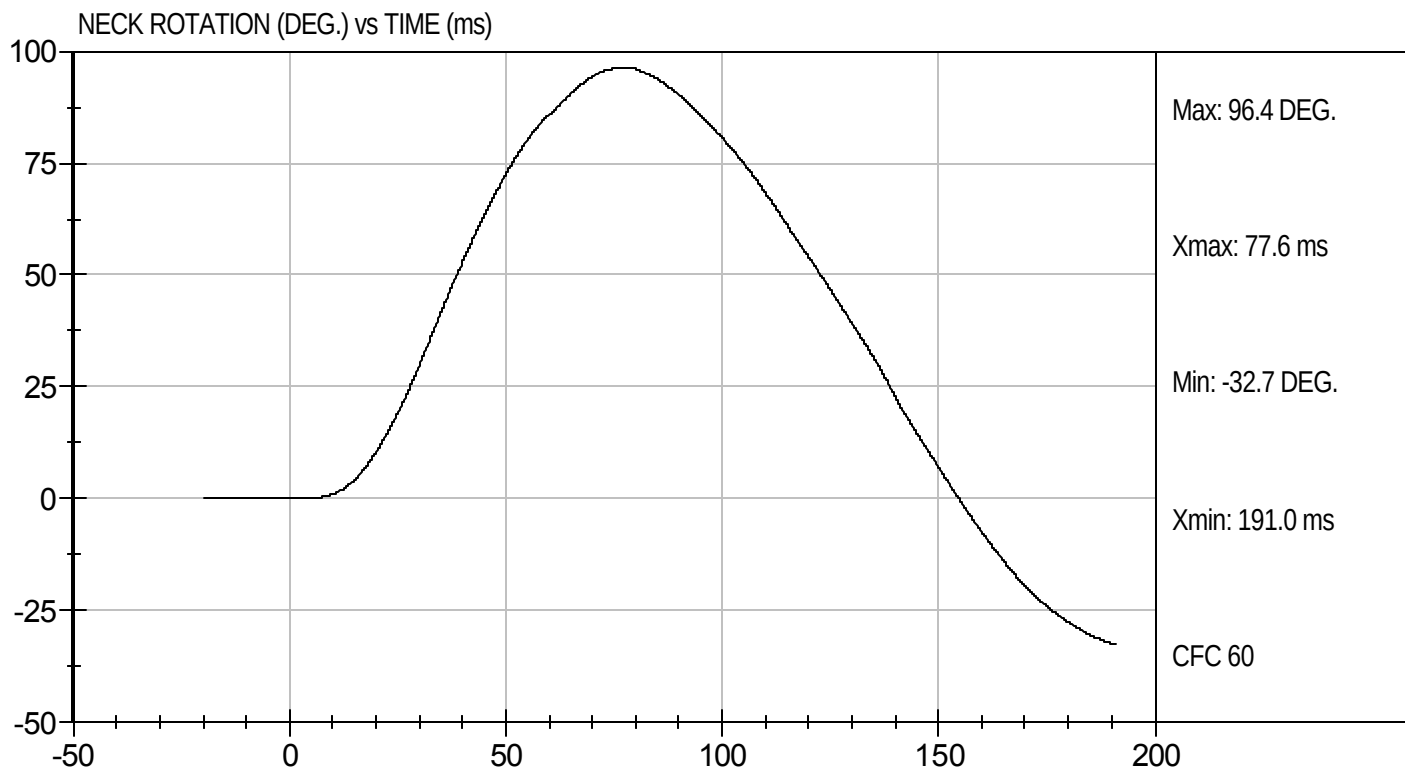
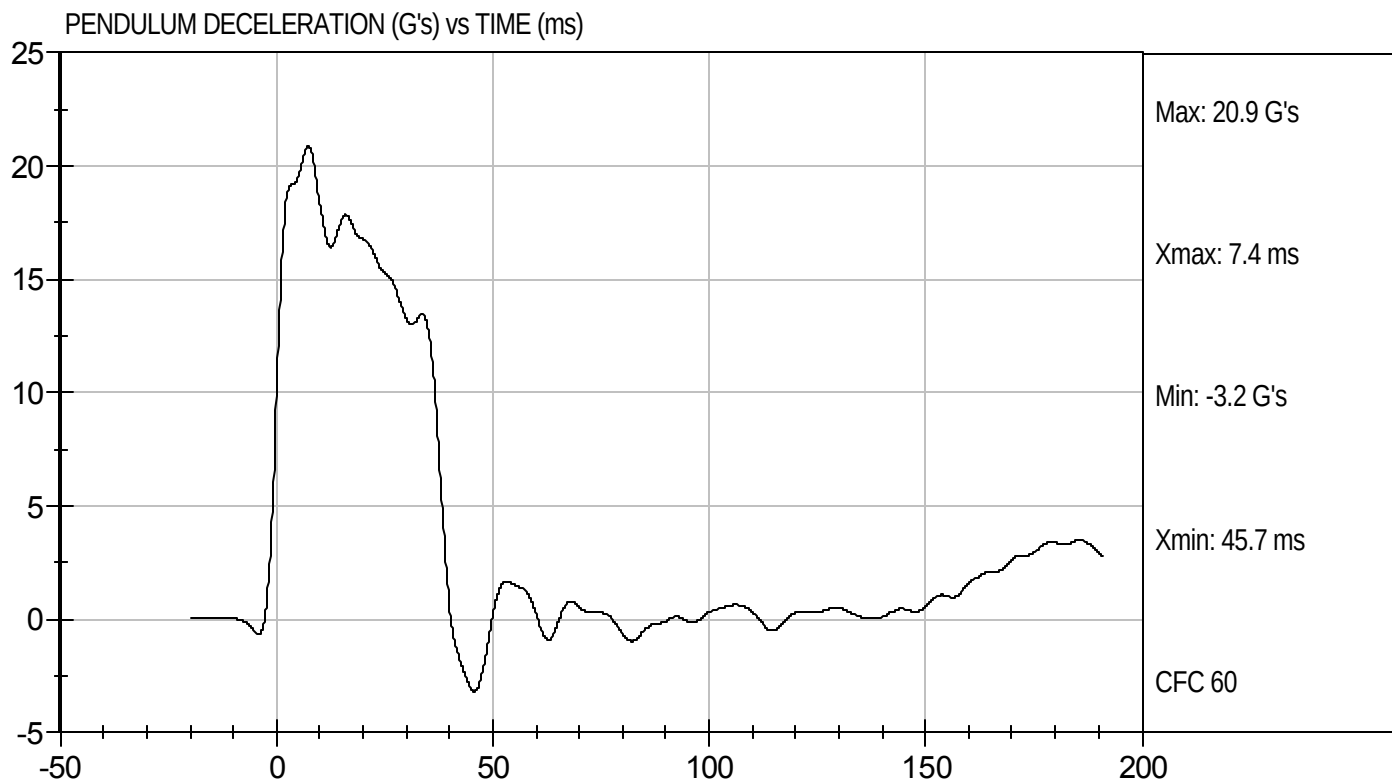
12/16/11
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D114243

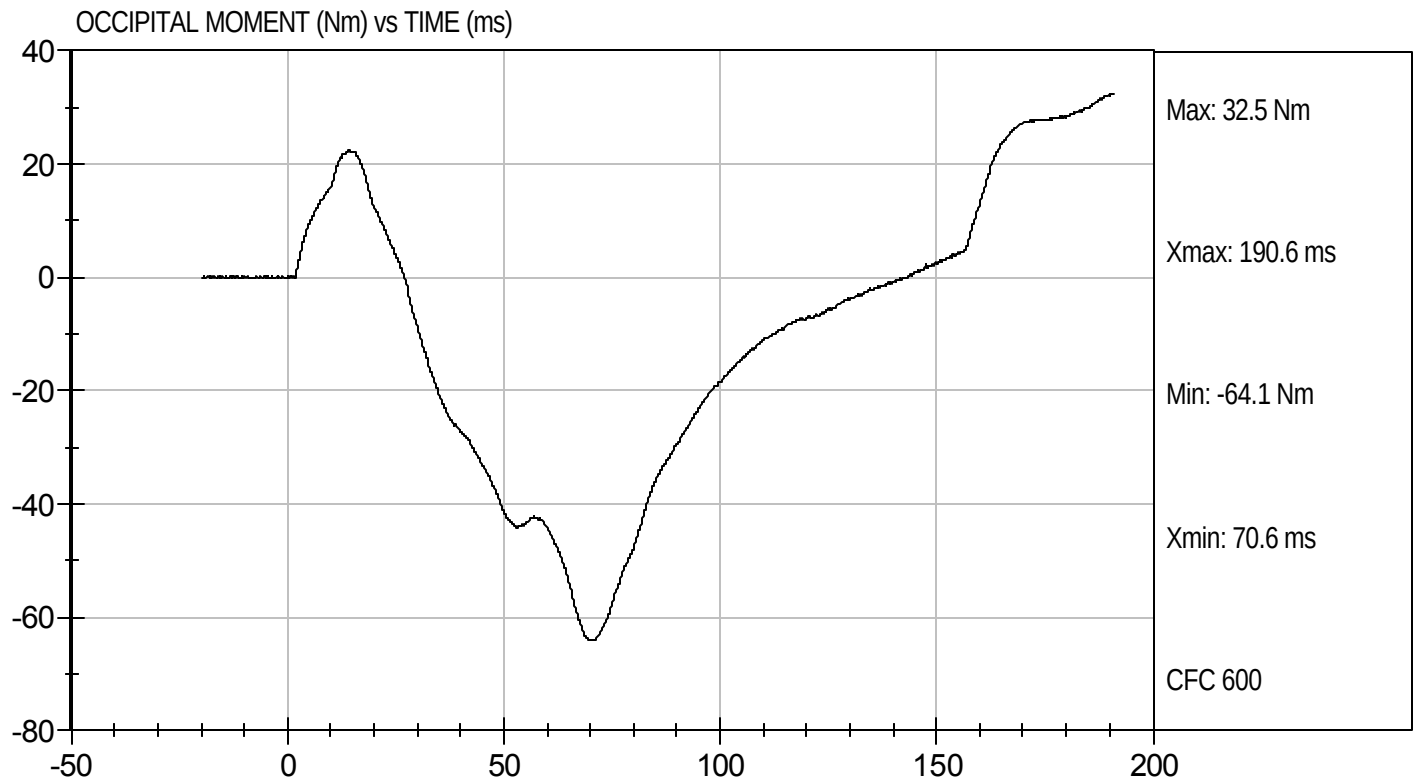
Test Date: 12/16/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D114243

Test Date: 12/16/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

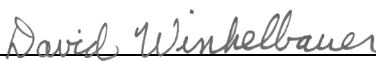
ATD Serial No: 351

Test I.D: D114244

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	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,306	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.56	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

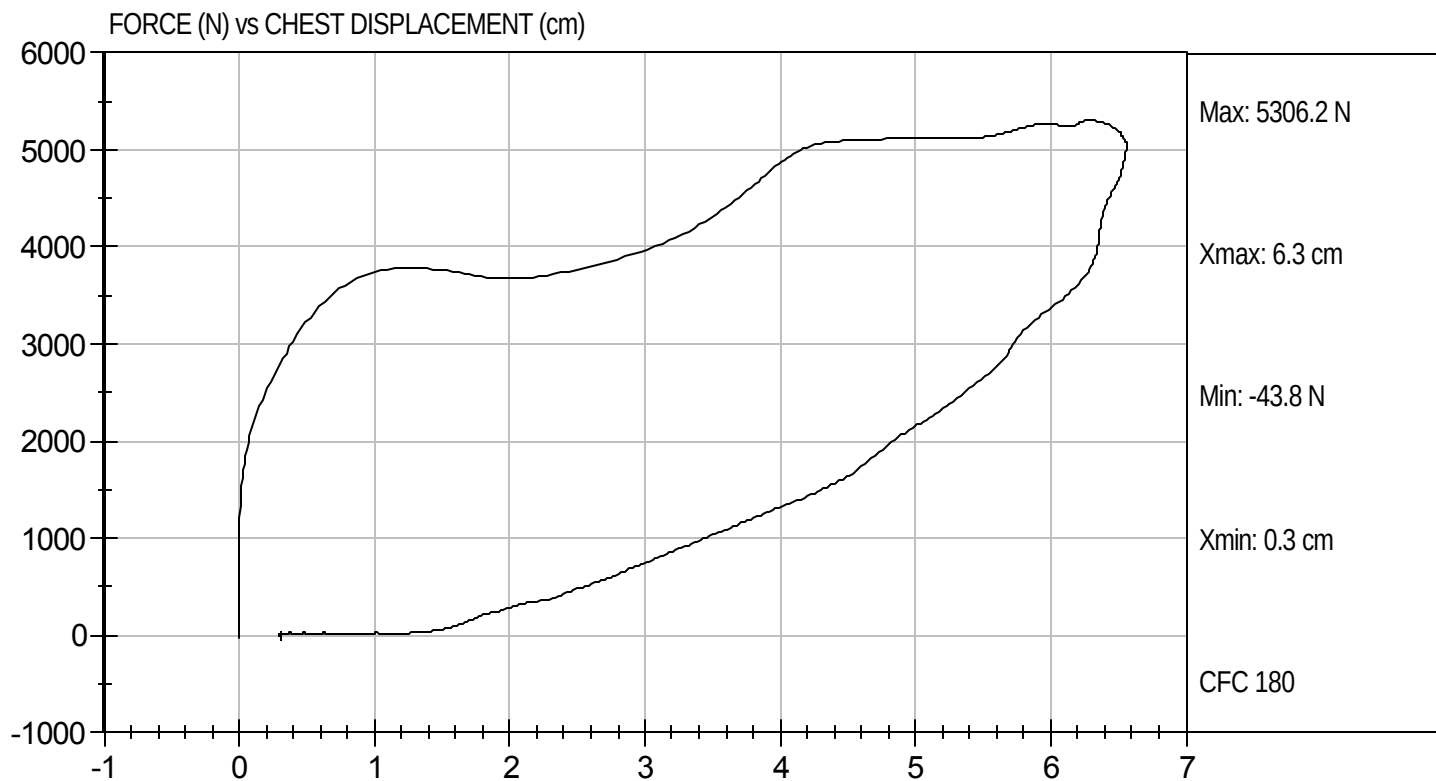
12/16/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D114244

Test Date: 12/16/11
Velocity: 22.22 ft/s, 6.77 m/s

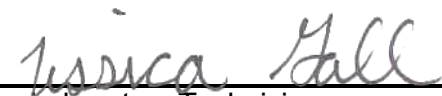


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

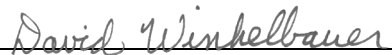
ATD Serial No: 351

Test I.D: D114245

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	20	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,298	Pass
Overall Test Results				Pass


Laboratory Technician

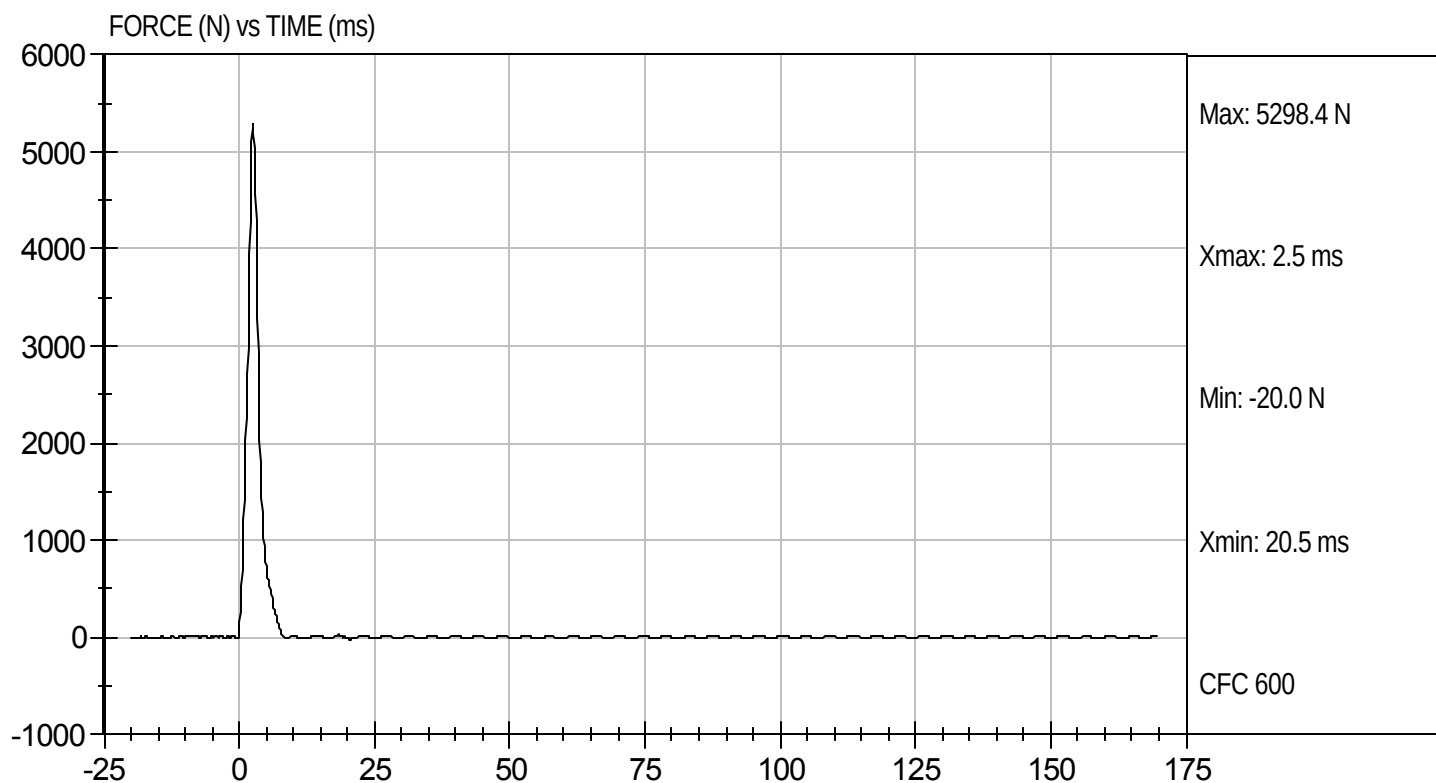
12/16/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D114245

Test Date: 12/16/11
Velocity: 6.89 ft/s, 2.10 m/s



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

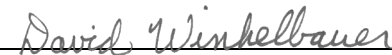
ATD Serial No: 351

Test I.D: D114246

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	20	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,076	Pass
Overall Test Results				Pass


Laboratory Technician

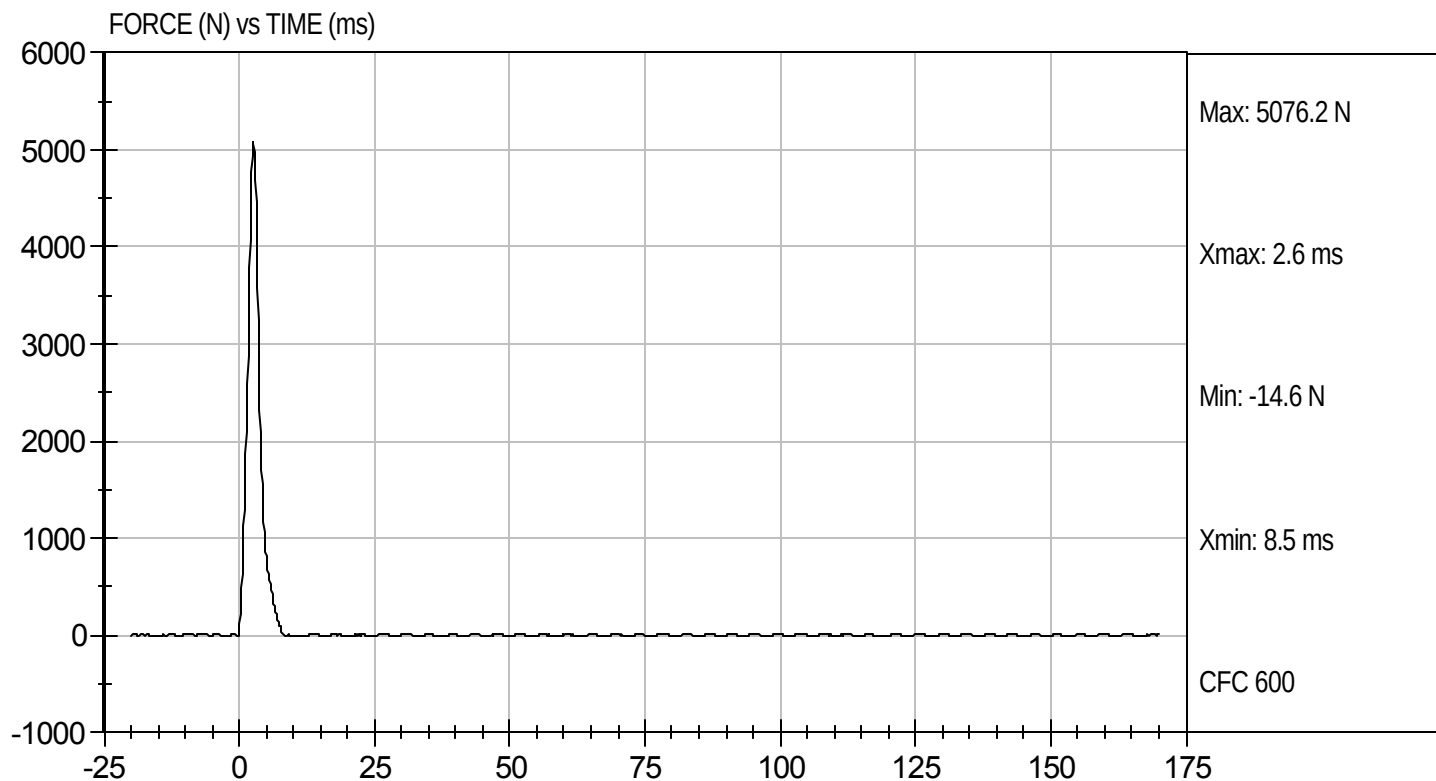
12/16/11
Test Date


Approved By



Test Desc: Left Knee
Component ID: D114246

Test Date: 12/16/11
Velocity: 6.92 ft/s, 2.11 m/s



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

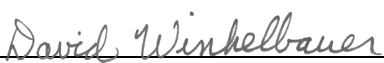
ATD Serial No: 351

Test I.D: D114240

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	21	Pass
Rotation Rate	deg/s	5.0 -10.0	5.7	5.7	Pass
30 Degrees	Nm	94.9 Nm Max	60.9	59.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	43.0	42.2	Pass
Overall Test Results					Pass


 Laboratory Technician

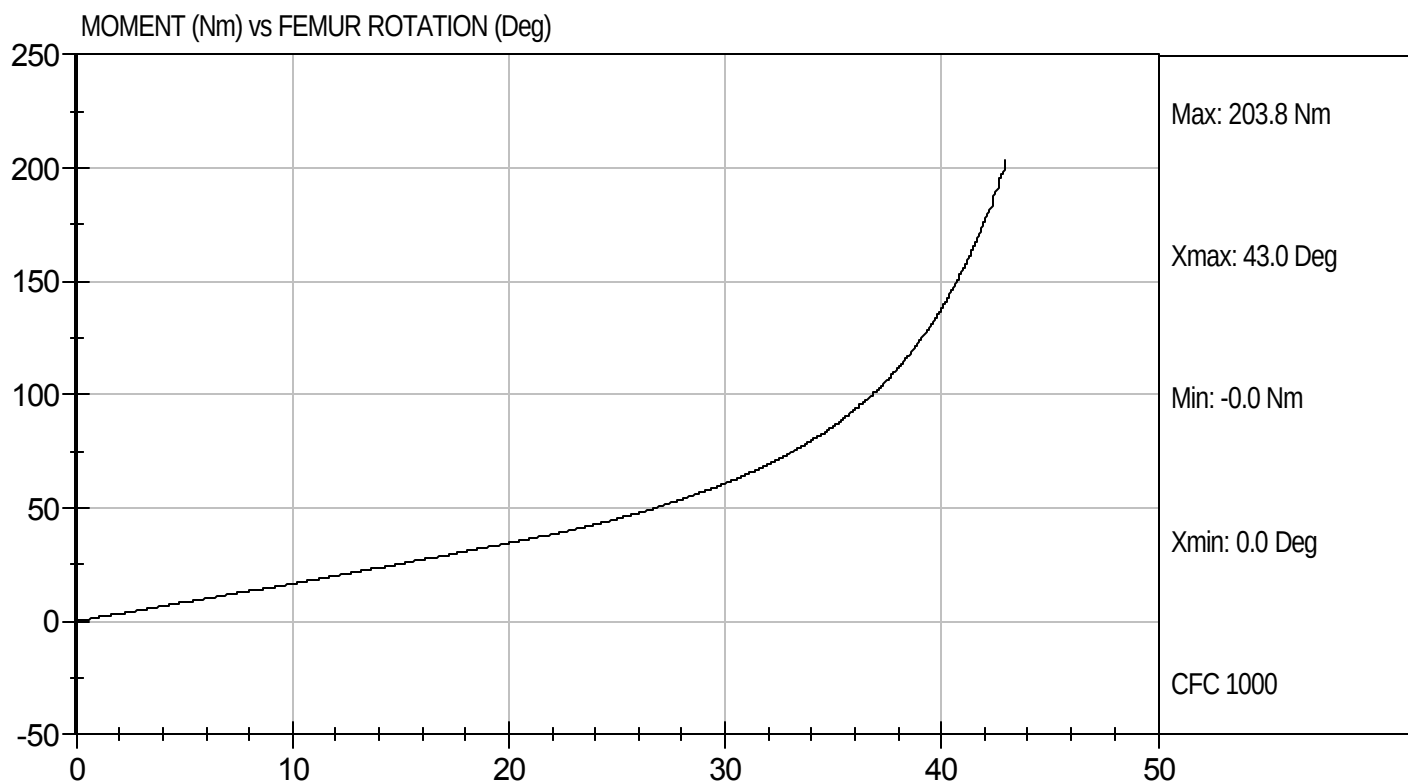
12/16/11
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D114249

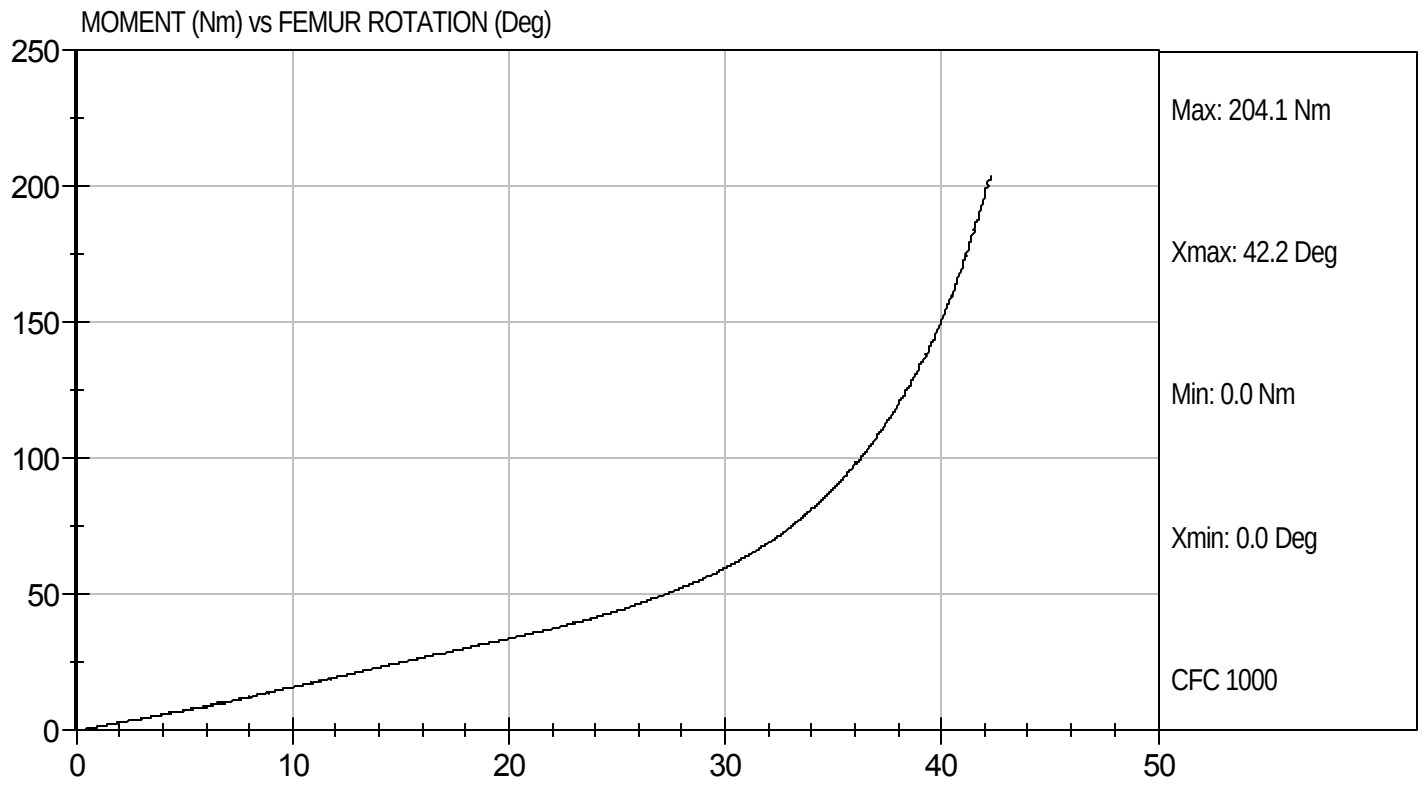
Test Date: 12/16/11
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D114240

Test Date: 12/16/11
Velocity: 0 ft/s, 0.00 m/s



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

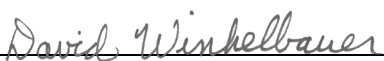
ATD Serial No: 351

Test ID: D114271

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	225 - 275	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

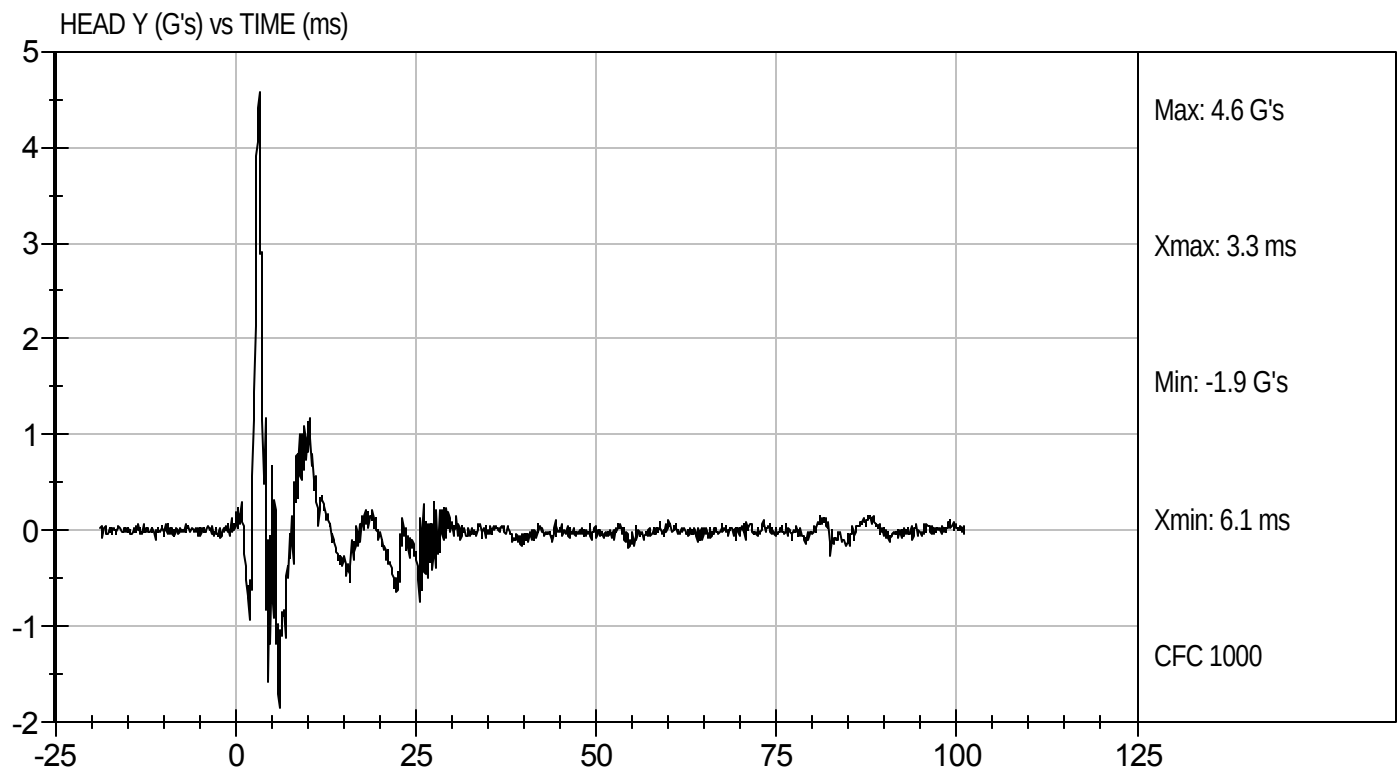
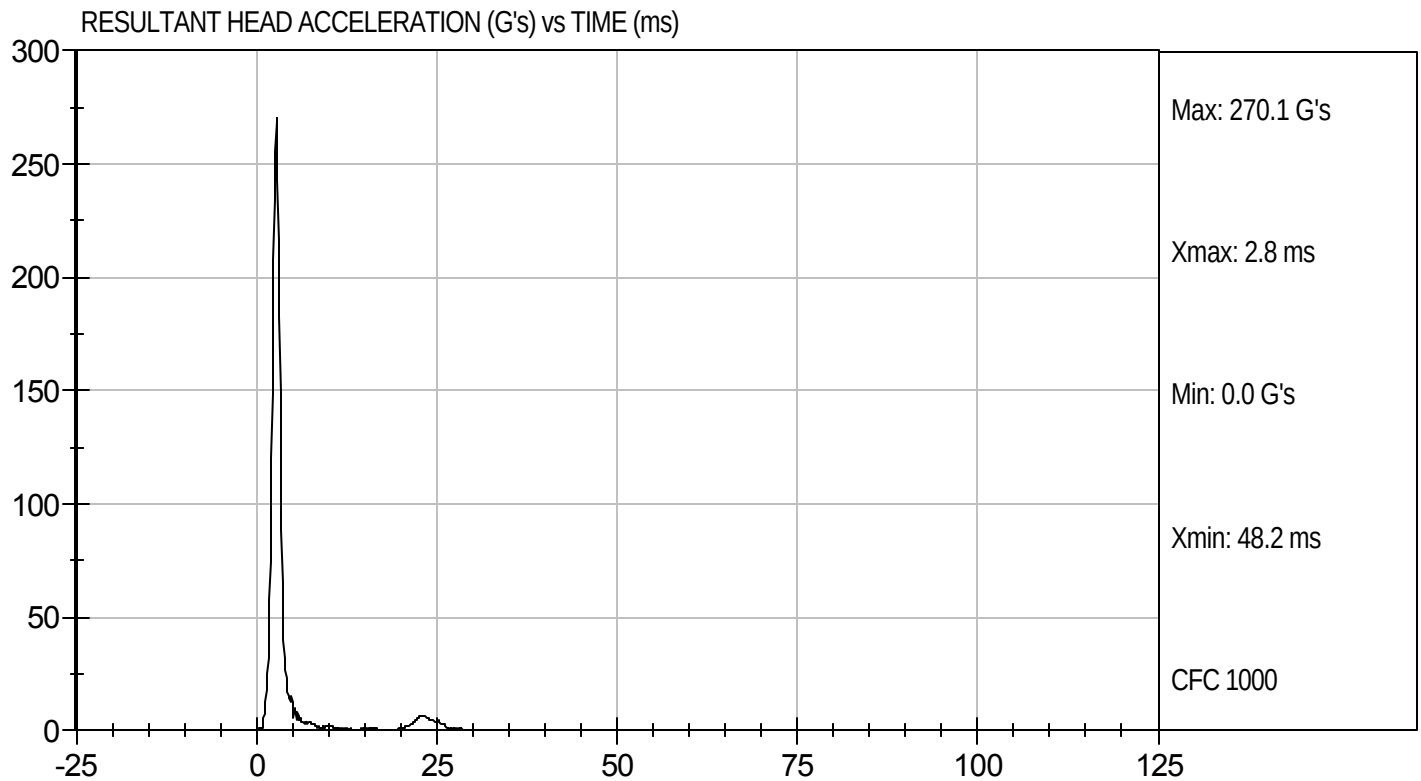
12/19/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D114271

Test Date: 12/19/11
Velocity: 0 ft/s, 0 m/s



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

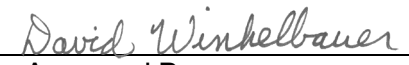
ATD Serial No: 351

Test I.D: D114272

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.87	Pass
	20 ms	G's	17.60 to 22.60	17.72	Pass
	30 ms	G's	12.50 to 18.50	13.08	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	66.2	Pass
	Time	ms	57.0 to 64.0	59.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	114.6	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	91.5	Pass
	Time	ms	47.0 to 58.0	54.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	102.6	Pass
Overall Test Results					Pass


Laboratory Technician

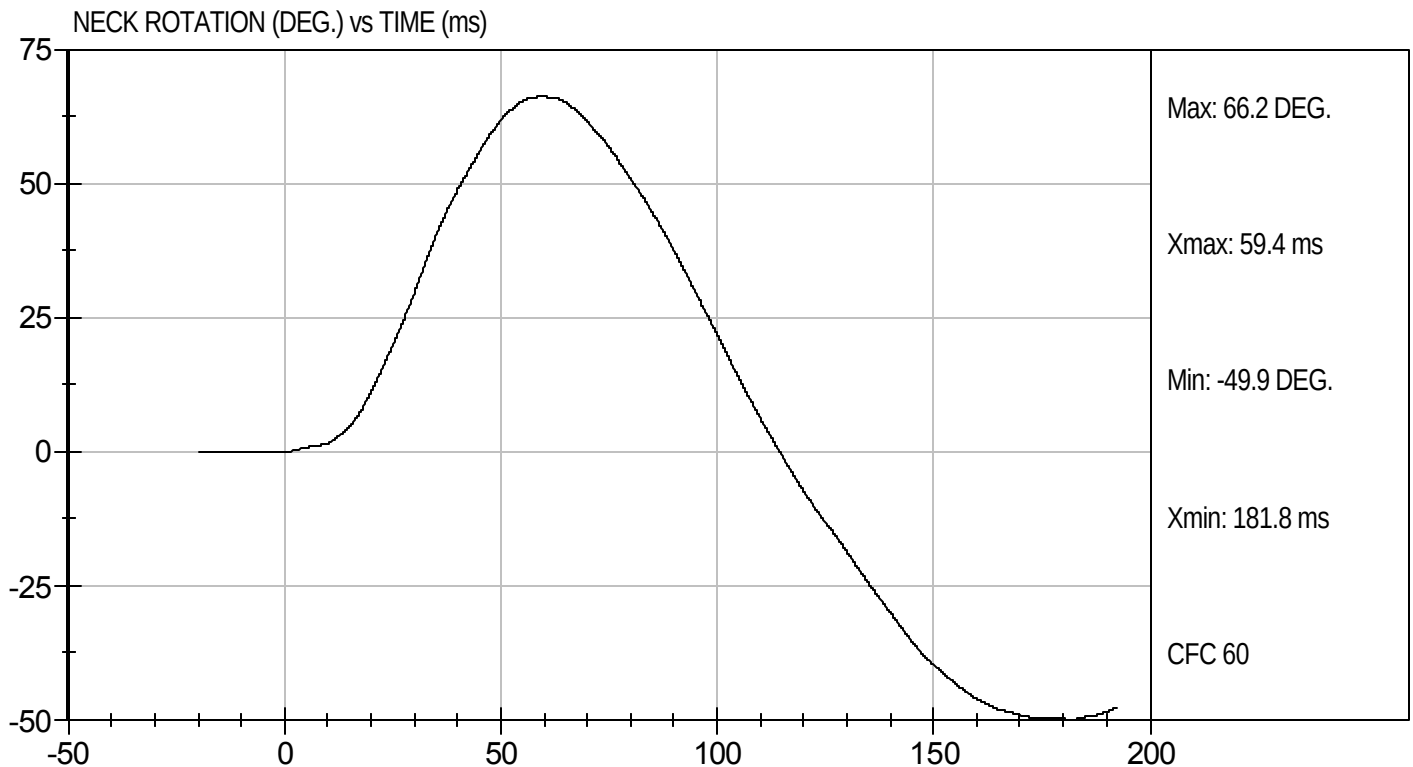
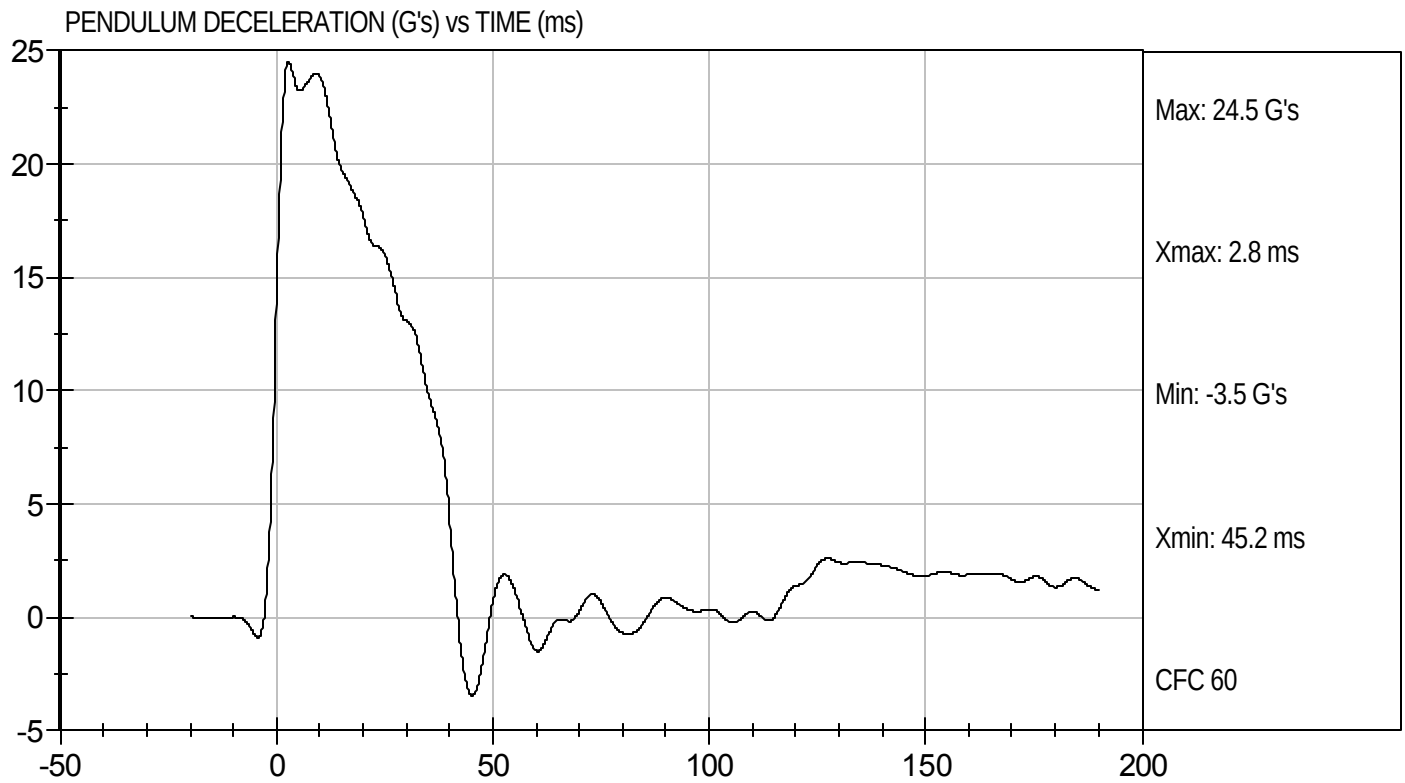
12/19/11
Test Date


Approved By



Test Desc: Neck Flexion
Component ID: D114272

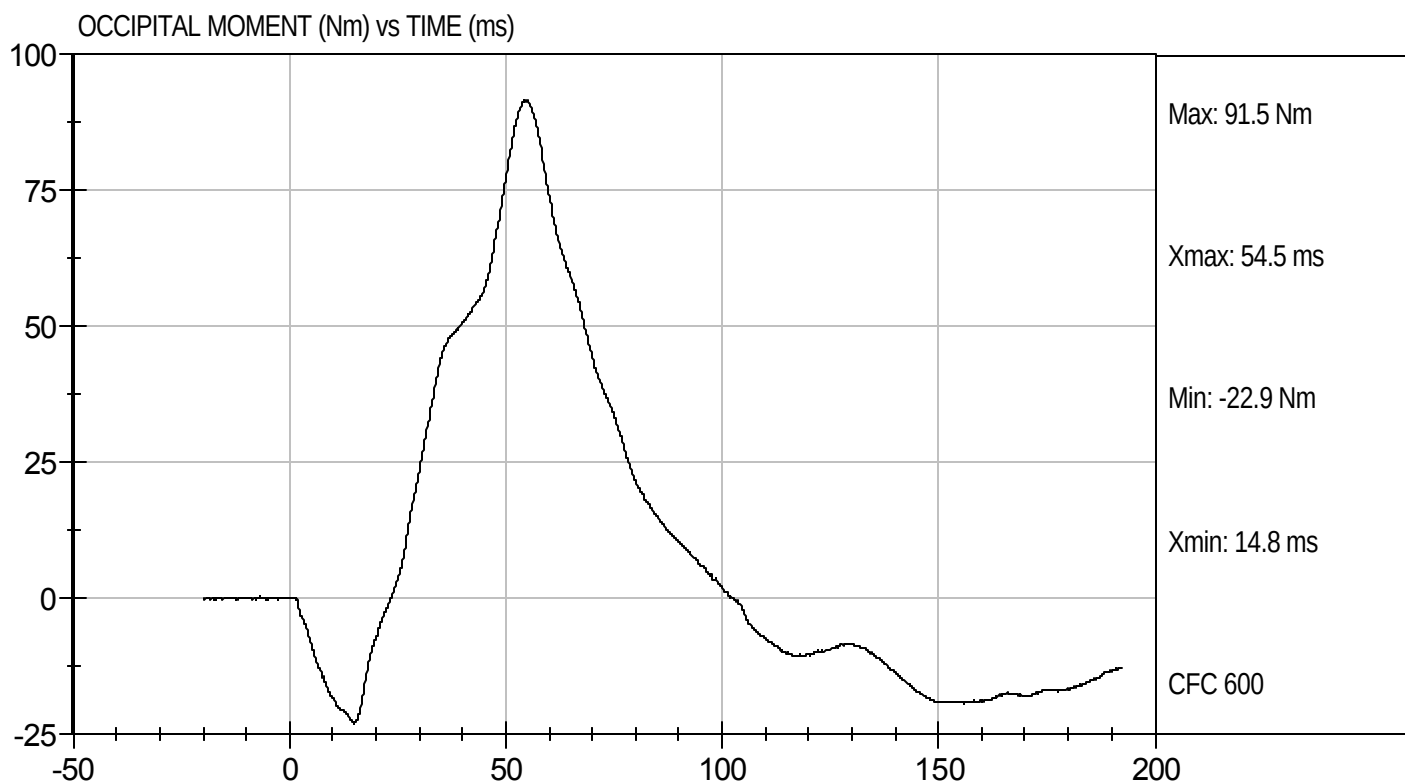
Test Date: 12/19/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D114272

Test Date: 12/19/11
Velocity: 23.15 ft/s, 7.06 m/s



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

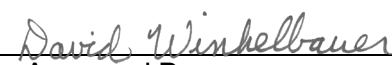
ATD Serial No: 351

Test I.D.: D114273

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.20	Pass
	20 ms	G's	14.00 to 19.00	14.19	Pass
	30 ms	G's	11.00 to 16.00	12.45	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.9	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	97.2	Pass
	Time	ms	72.0 to 82.0	78.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.9	Pass
	Time	ms	65.0 to 79.0	71.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.9	Pass
Overall Test Results					Pass


 Laboratory Technician

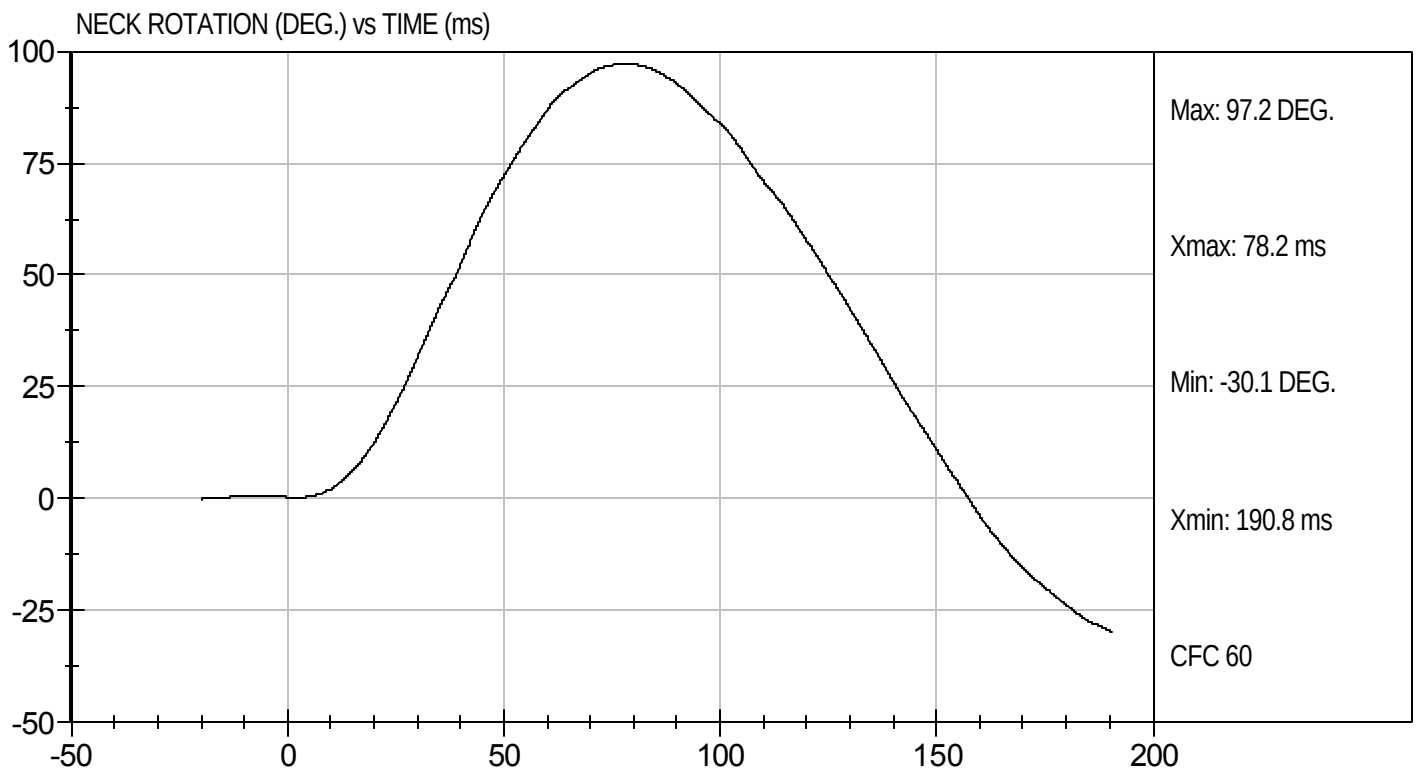
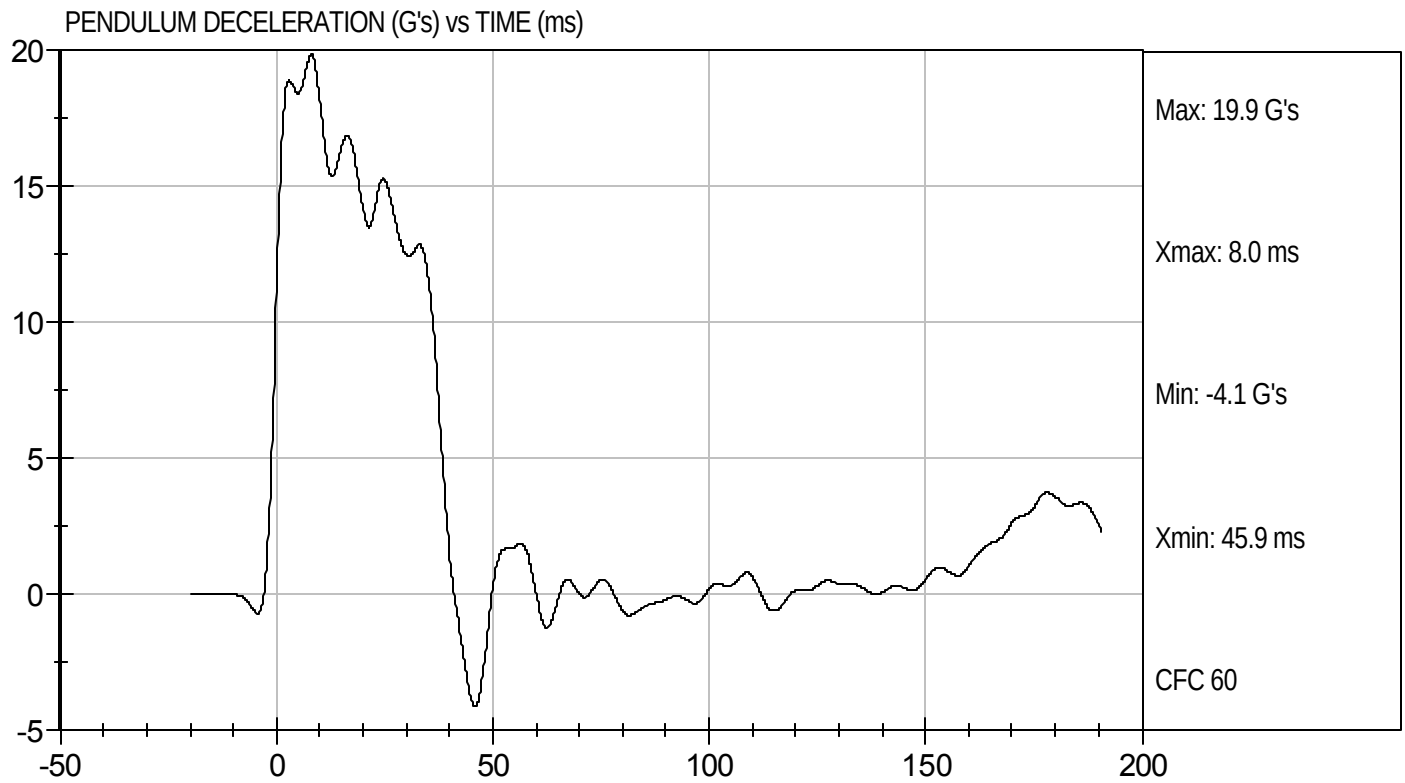
12/19/11
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D114273

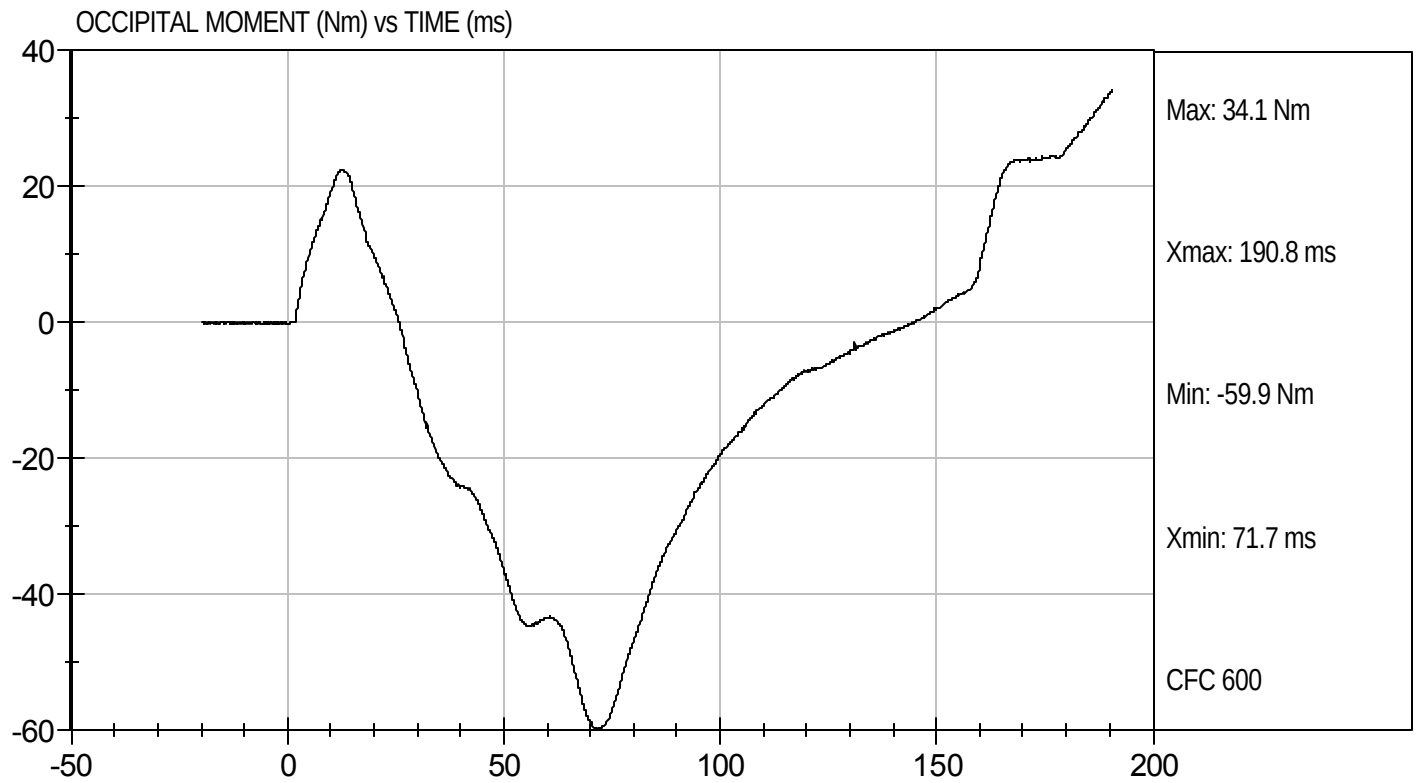
Test Date: 12/19/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D114273

Test Date: 12/19/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

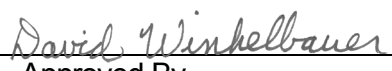
ATD Serial No: 351

Test I.D: D114274

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	28	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,299	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.59	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

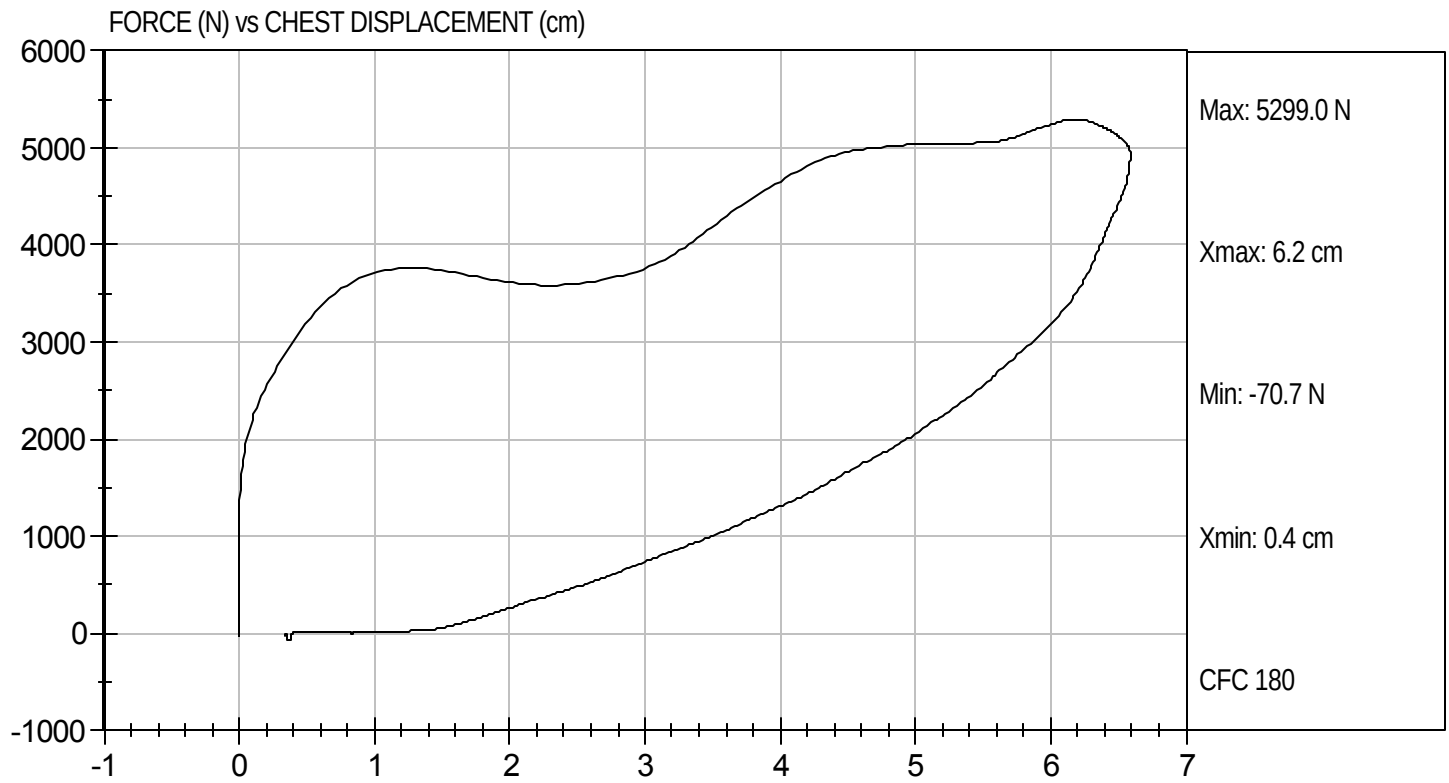
12/19/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D114274

Test Date: 12/19/11
Velocity: 21.9 ft/s, 6.68 m/s

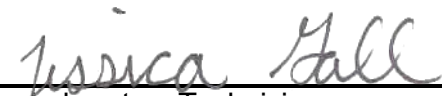


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

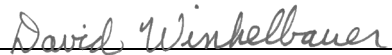
ATD Serial No: 351

Test I.D: D114275

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	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,920	Pass
Overall Test Results				Pass


Laboratory Technician

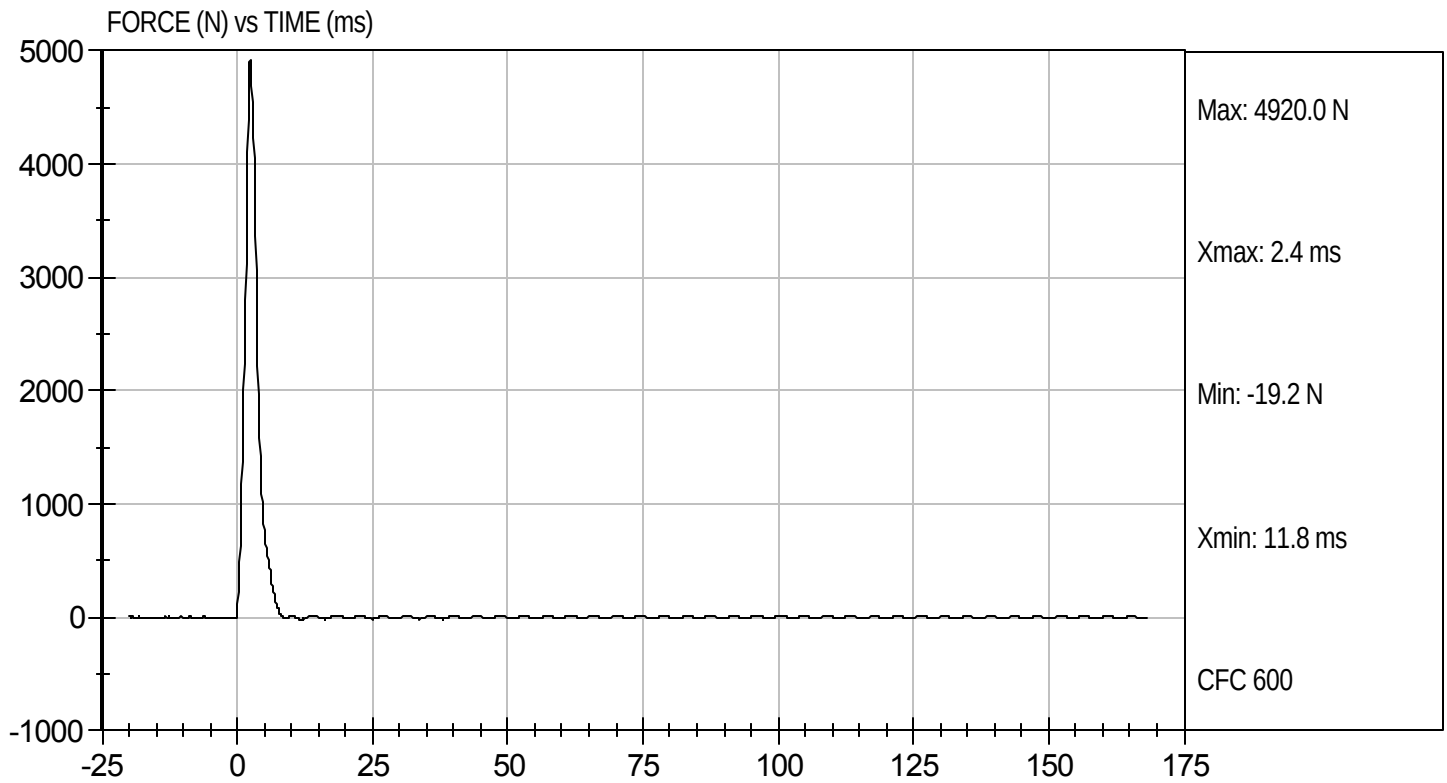
12/19/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D114275

Test Date: 12/19/11
Velocity: 6.92 ft/s, 2.11 m/s

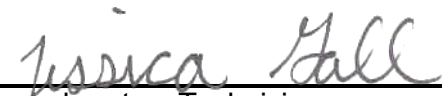


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

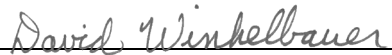
ATD Serial No: 351

Test I.D: D114276

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	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,938	Pass
Overall Test Results				Pass


Laboratory Technician

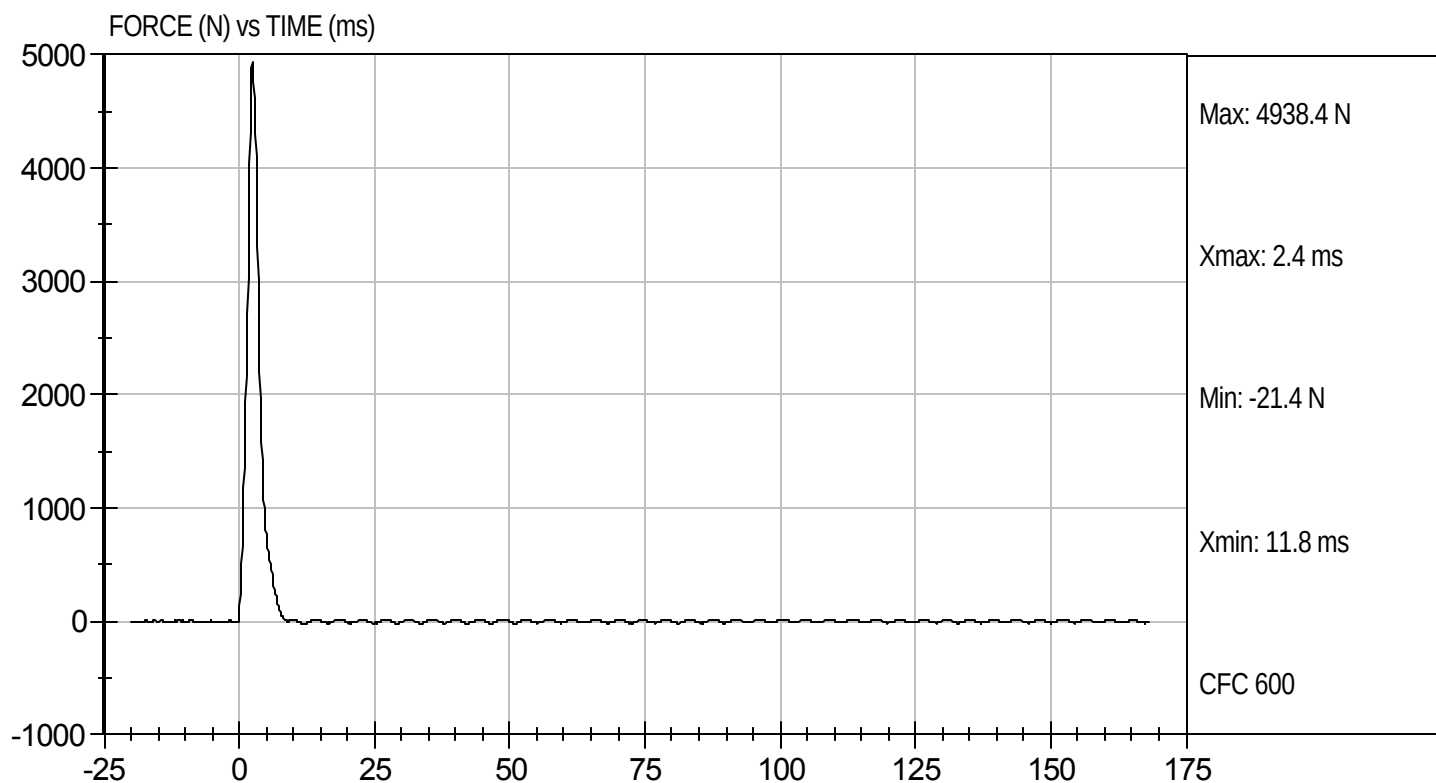
12/19/11
Test Date


Approved By



Test Desc: Left Knee
Component ID: D114276

Test Date: 12/19/11
Velocity: 6.89 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: D114270

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	28	28	Pass
Rotation Rate	deg/s	5.0 -10.0	5.7	5.7	Pass
30 Degrees	Nm	94.9 Nm Max	60.2	59.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	43.2	42.3	Pass
Overall Test Results					Pass


 Laboratory Technician

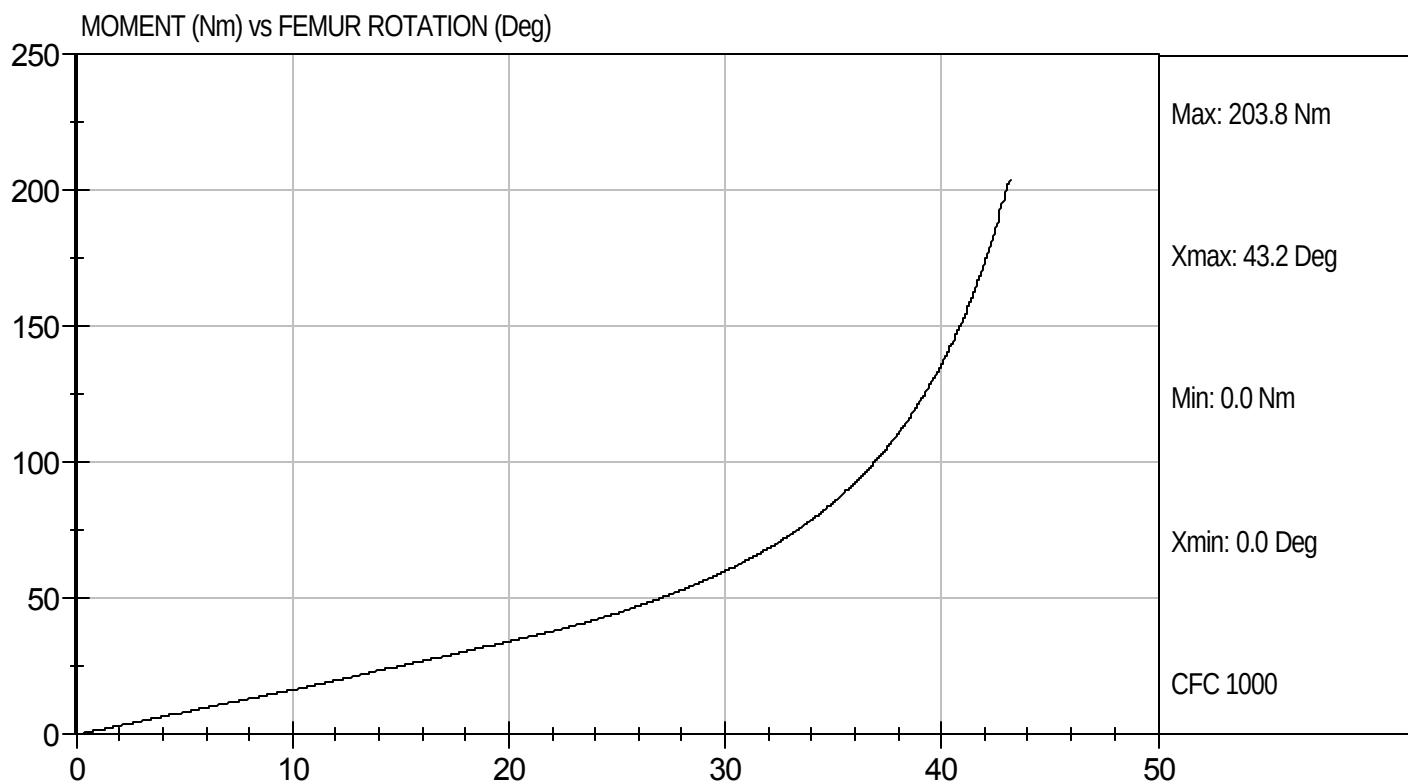
12/19/11
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D114279

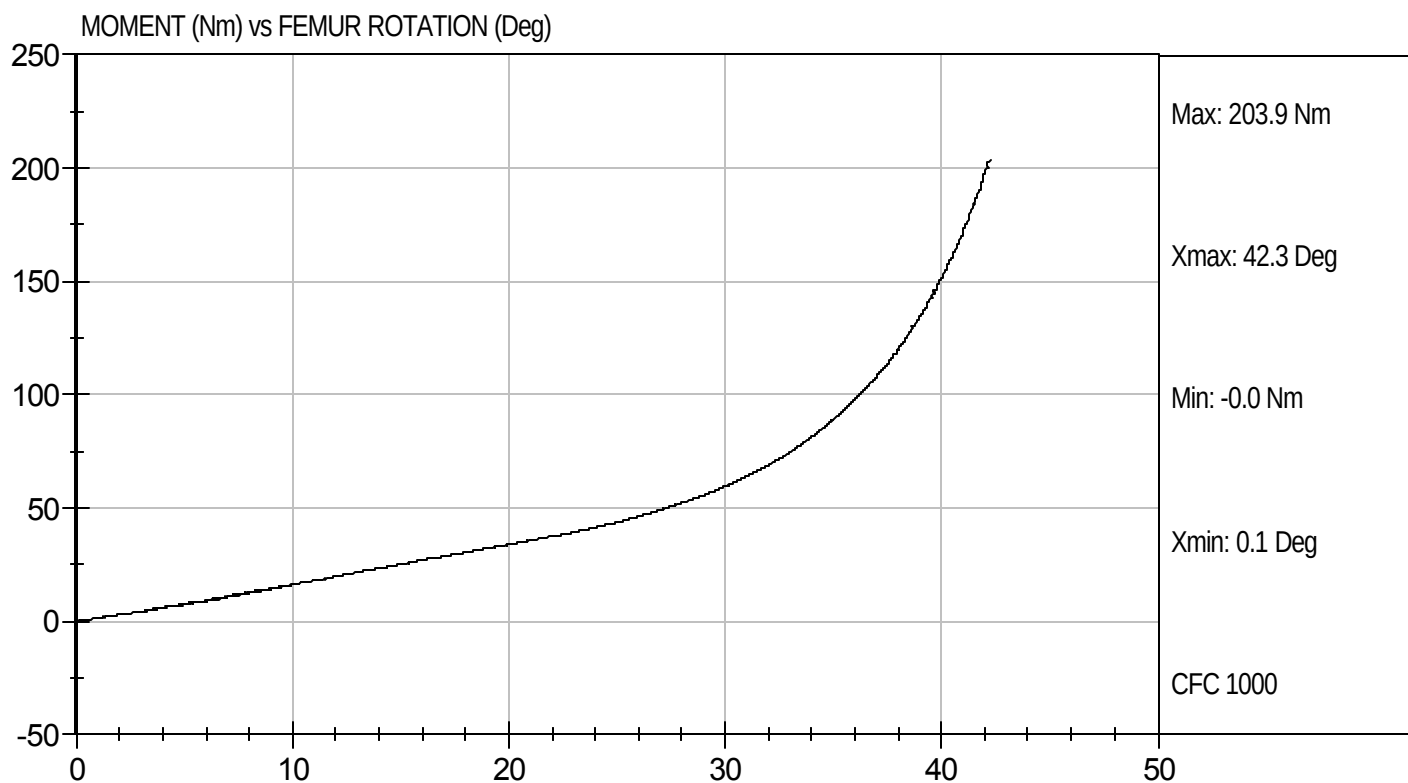
Test Date: 12/19/11
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D114270

Test Date: 12/19/11
Velocity: 0 ft/s, 0.00 m/s



Hybrid III, 5th External Measurements
SN: 634

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

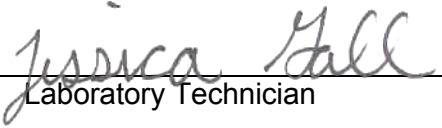
HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)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

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

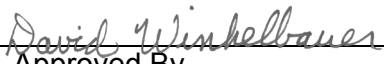
ATD Serial No: 634

Test ID: D114251

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	250 to 300	270	Pass
Peak Lateral Acceleration	G's	+/- 15	-3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

12/16/11
Test Date

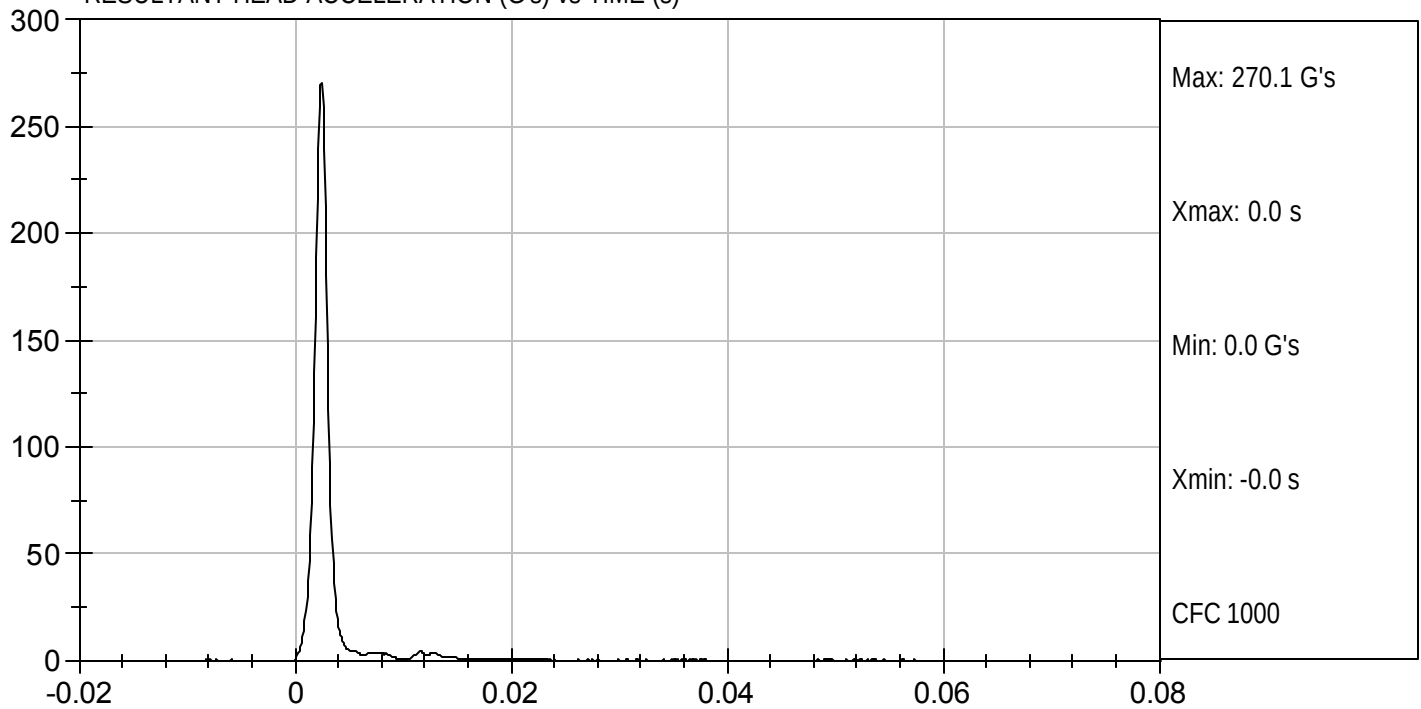

Approved By



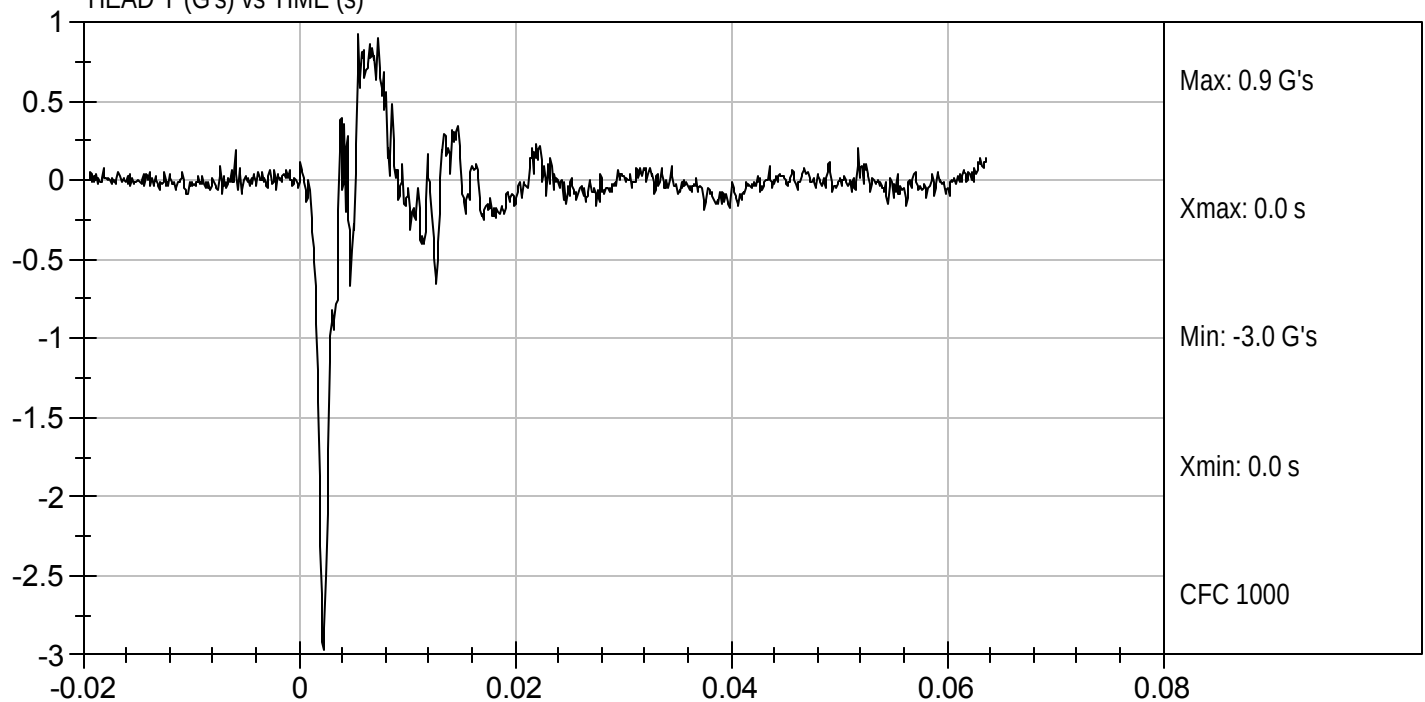
Test Desc: Head Drop
Component ID: D114251

Test Date: 12/16/11
Velocity: 0 ft/s, 0 m/s

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



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

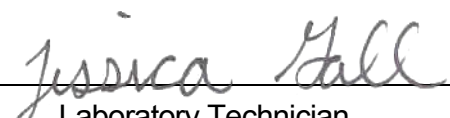


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D114252

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Pulse	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	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	79	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	85	Pass
Overall Results				Pass	


 Laboratory Technician

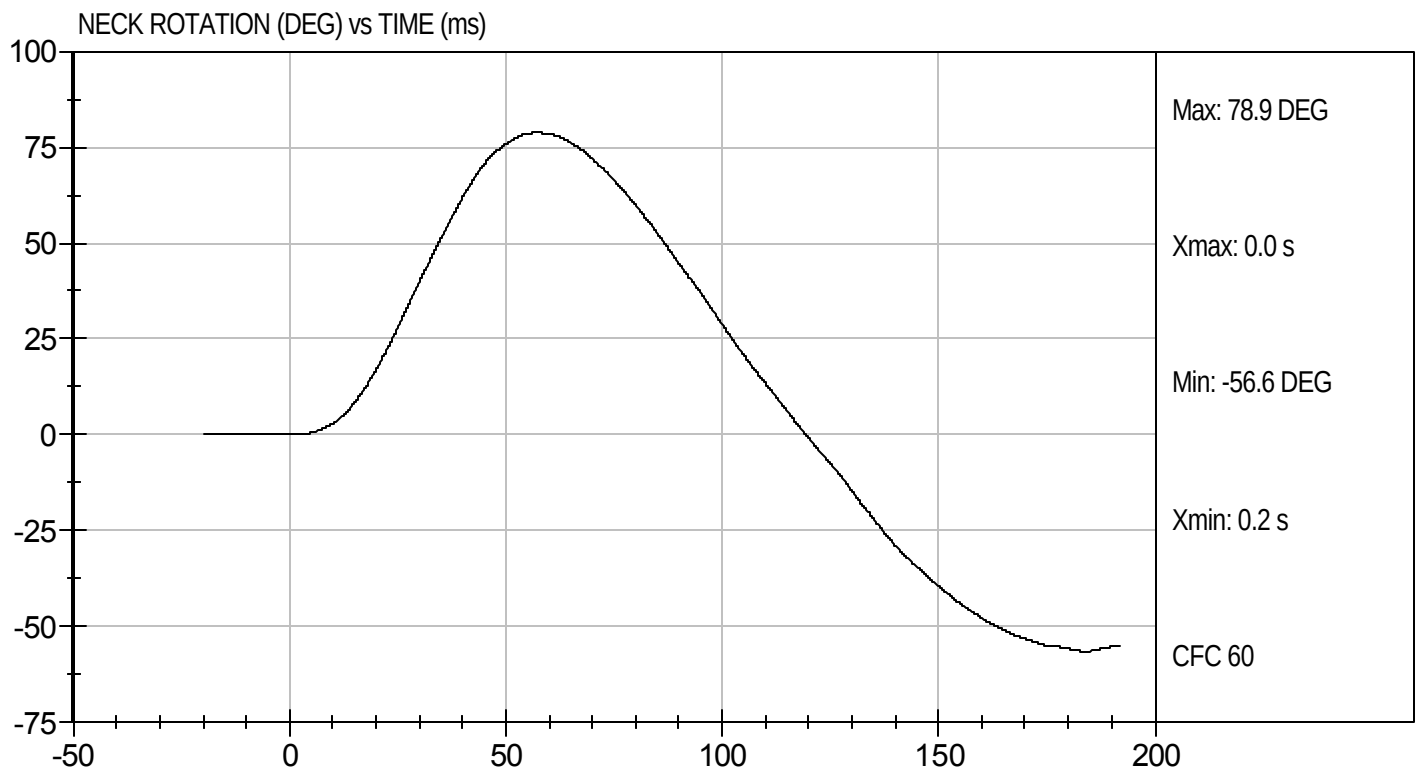
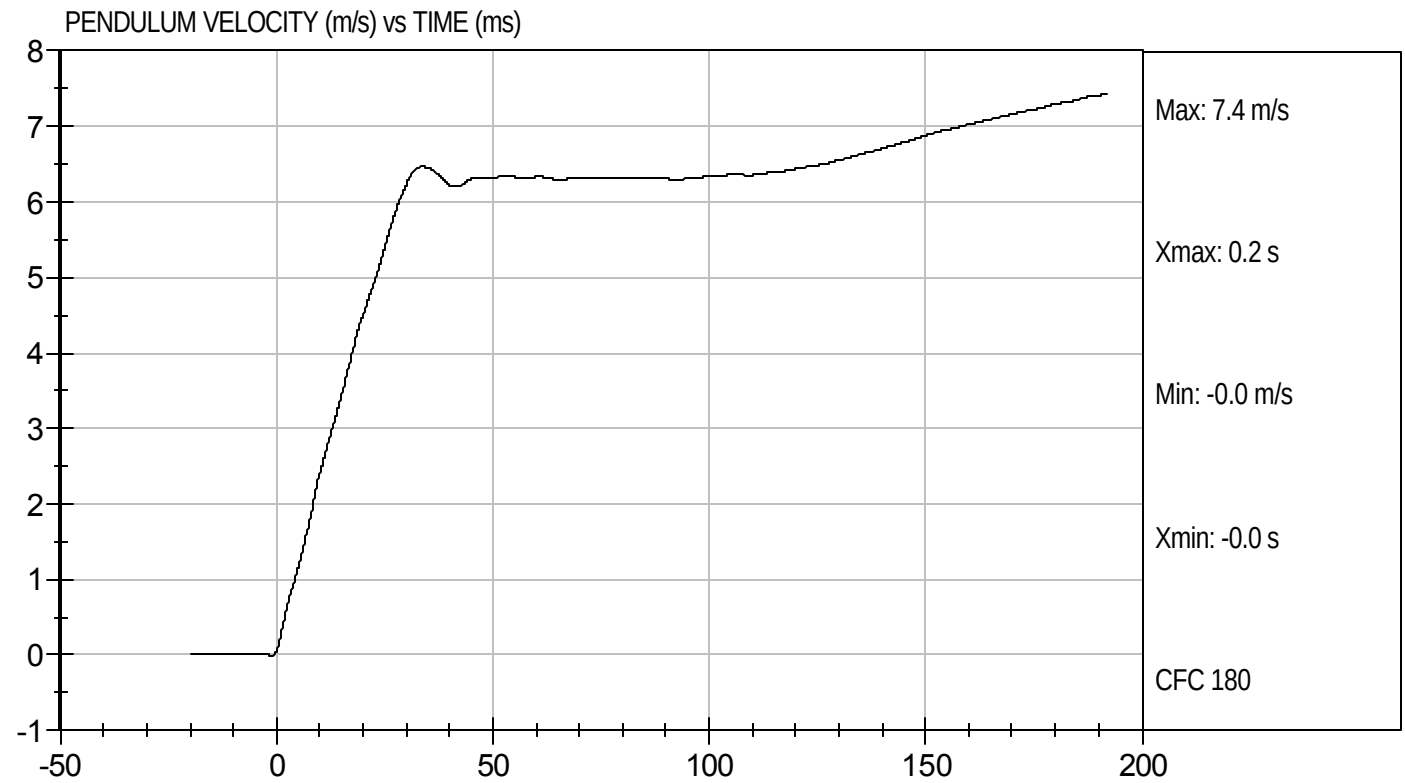
12/16/11
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D114252

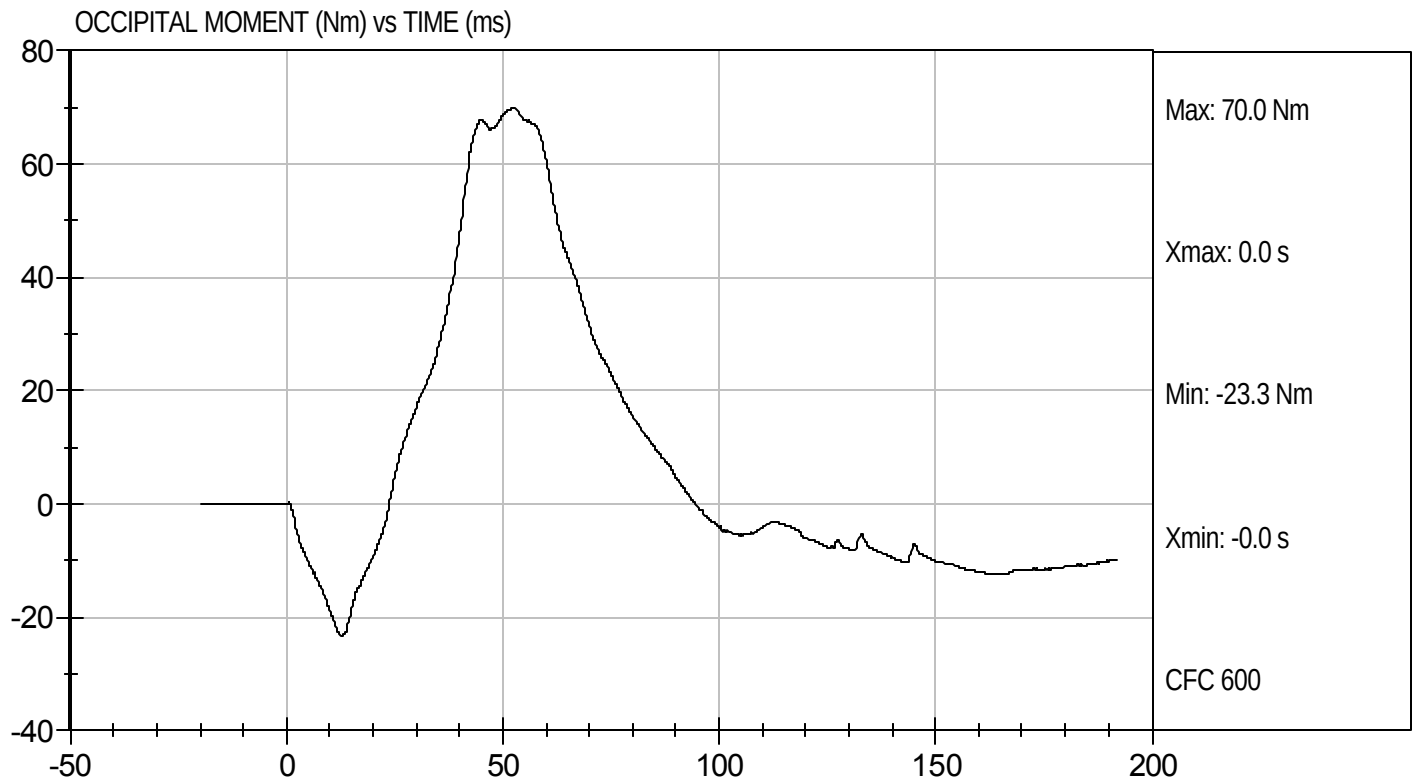
Test Date: 12/16/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D114252

Test Date: 12/16/11
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

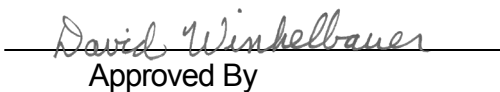
ATD Serial No: 634Test I.D: D114253

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	20	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Pulse	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.0	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
Overall Results					Pass


 Laboratory Technician

12/16/11

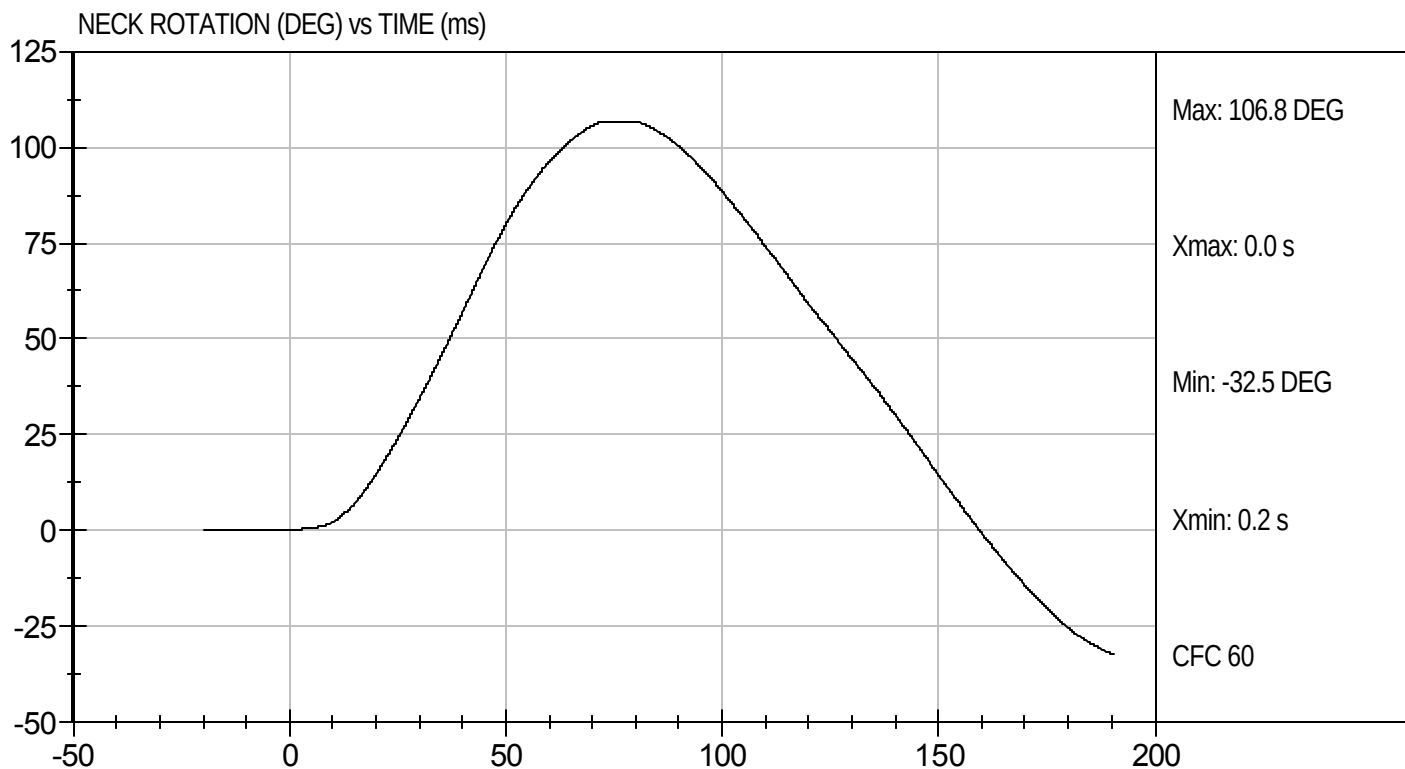
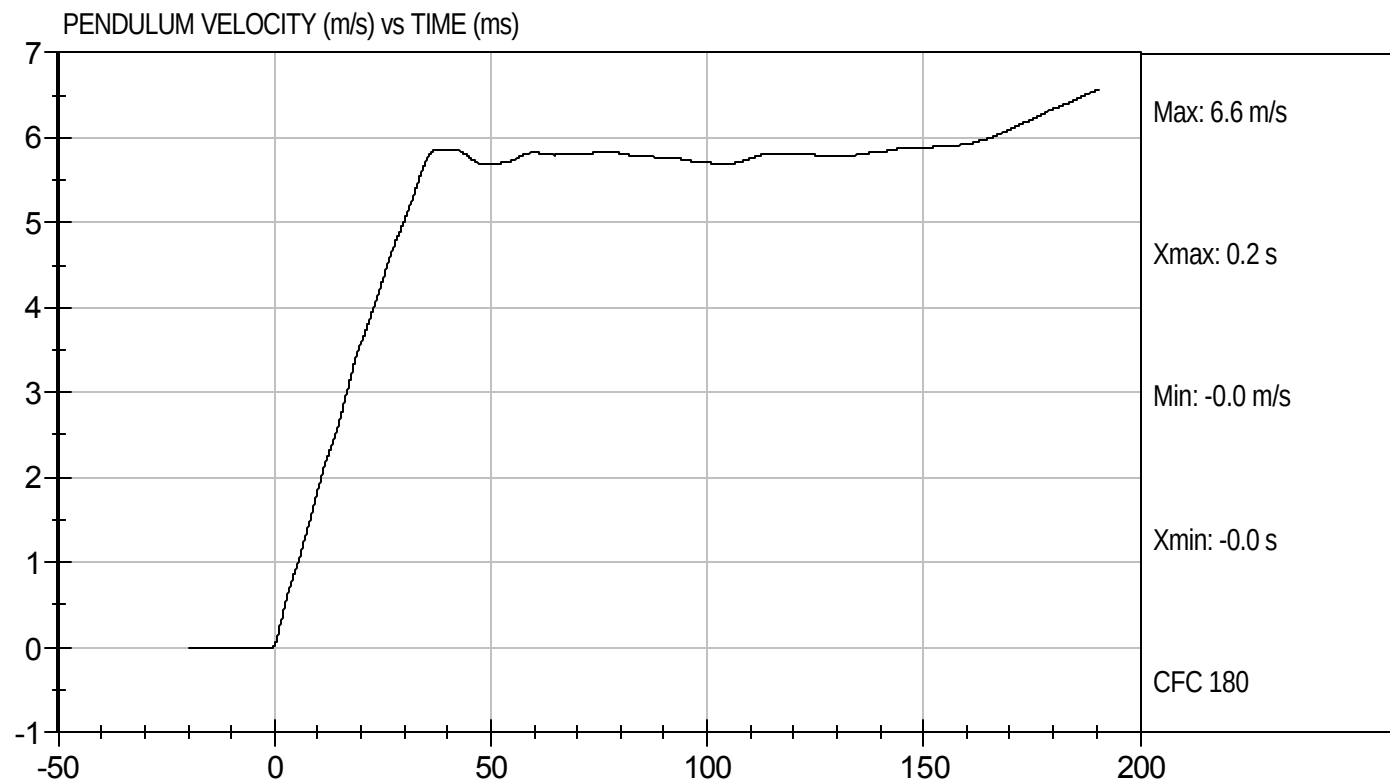
Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D114253

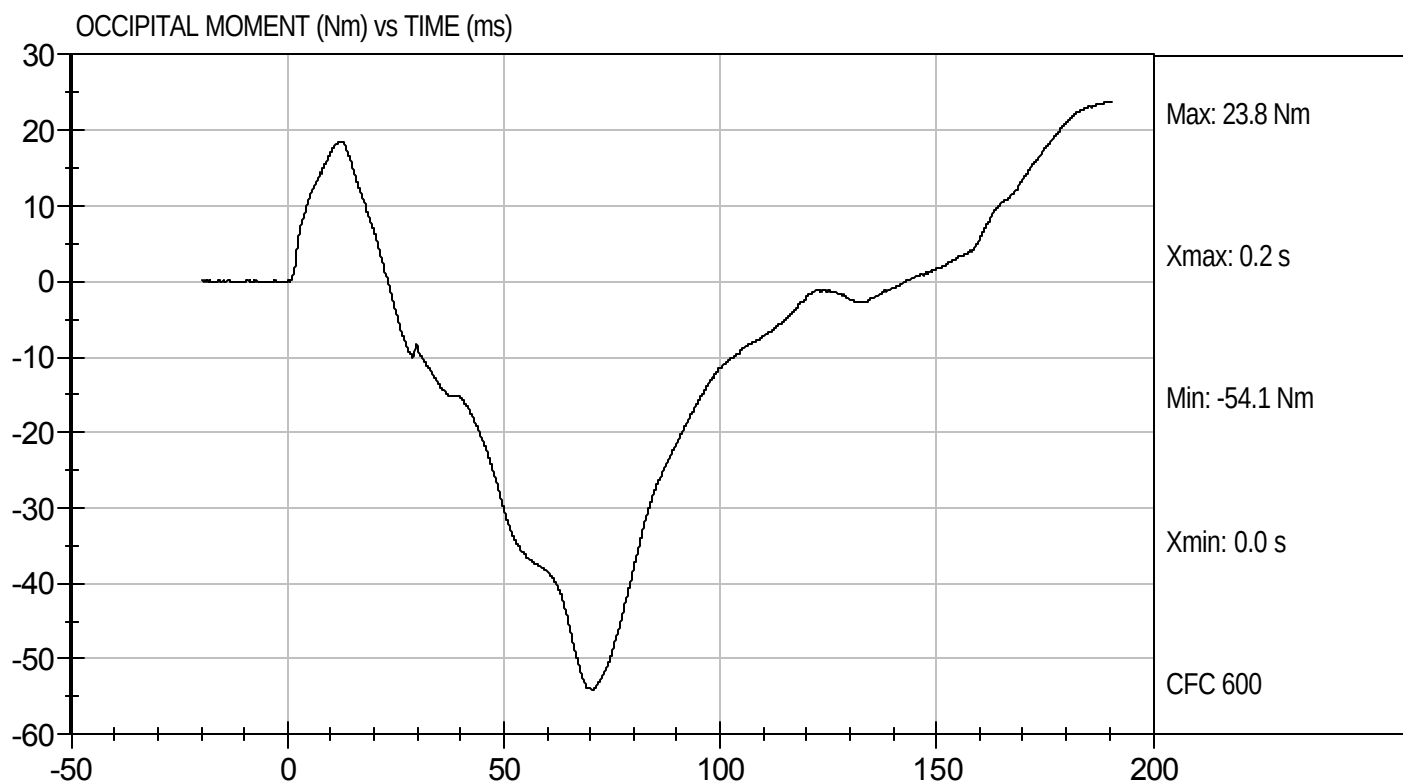
Test Date: 12/16/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D114253

Test Date: 12/16/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

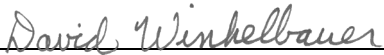
ATD Serial No: 634

Test I.D: D114254

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.29	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4293	Pass
Overall Test Results				Pass


Laboratory Technician

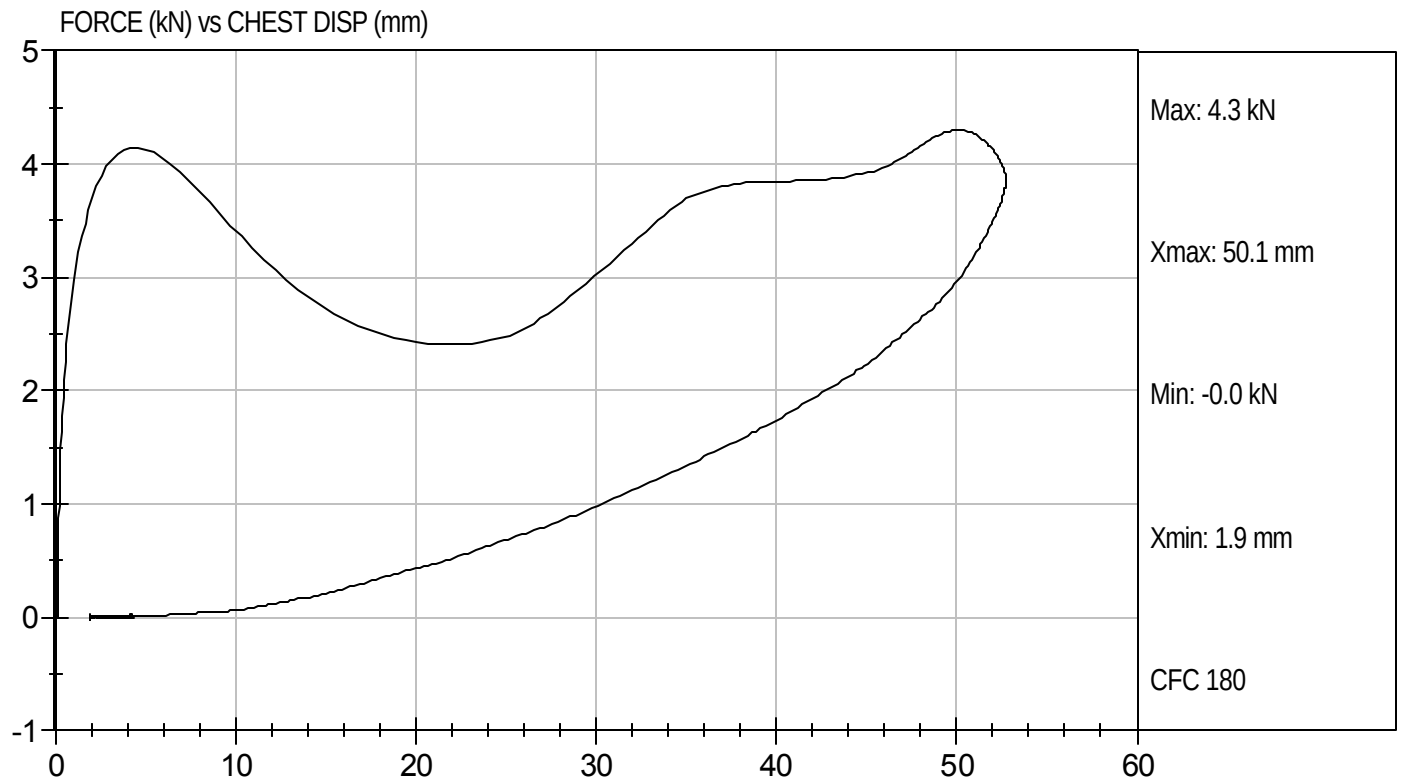
12/16/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D114254

Test Date: 12/16/11
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: D114255

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	20	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.74	Pass
Overall Test Results				Pass


Laboratory Technician

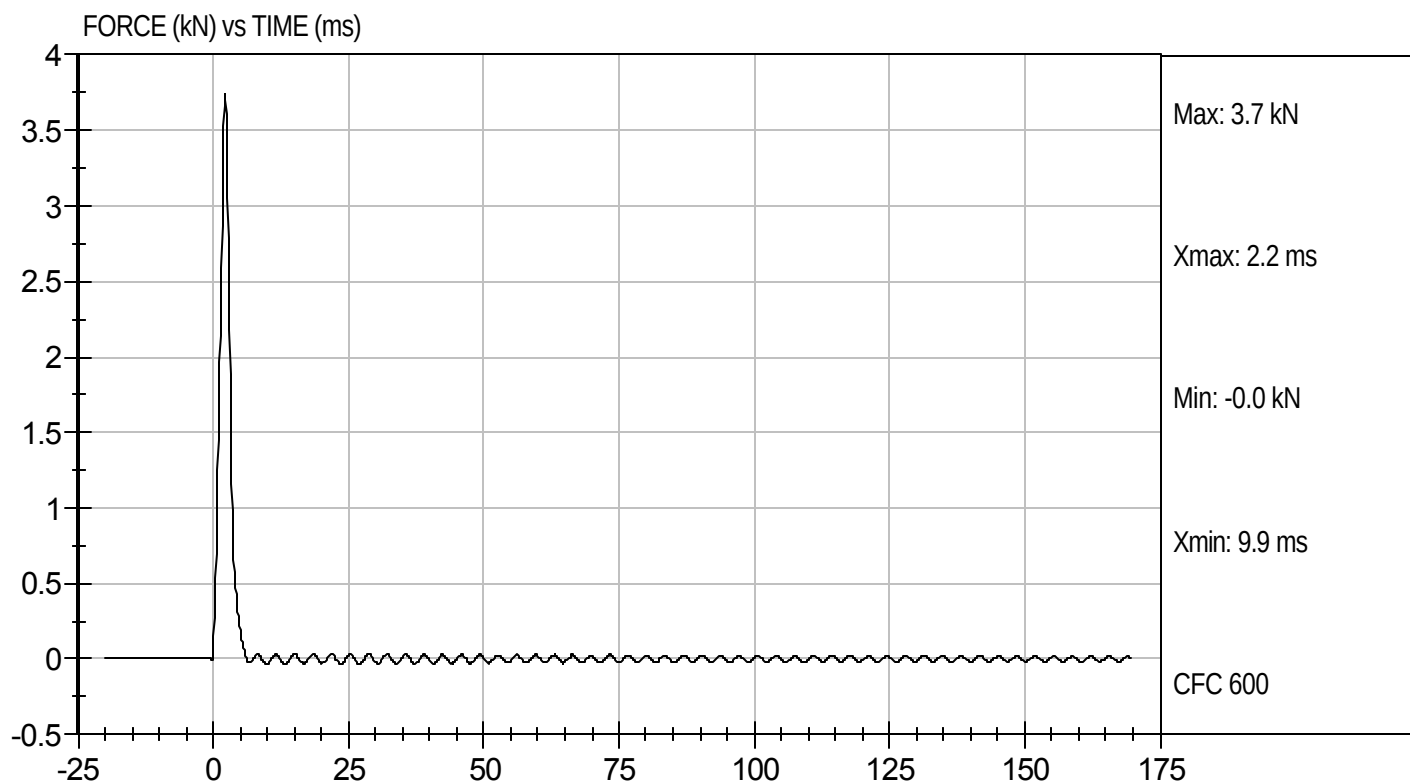
12/16/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D114255

Test Date: 12/16/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

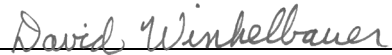
Test I.D: D114256

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	20	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.64	Pass
Overall Test Results				Pass


Laboratory Technician

12/16/11

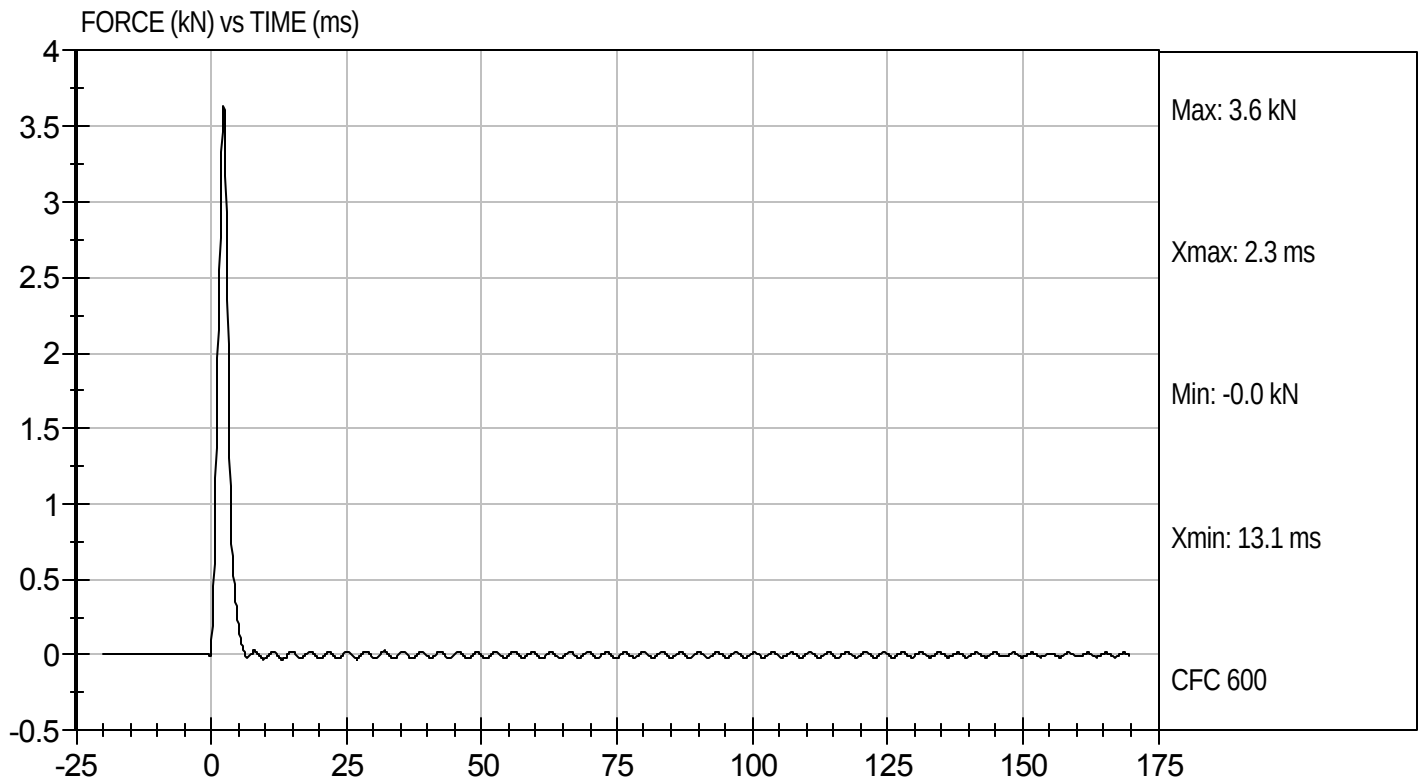
Test Date


Approved By



Test Desc: Left Knee
Component ID: D114256

Test Date: 12/16/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

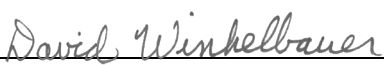
ATD Serial No: 634

Test I.D: D114257

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	358	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

12/16/11
Test Date

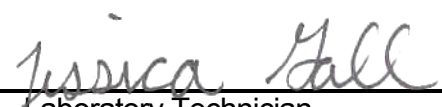

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MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

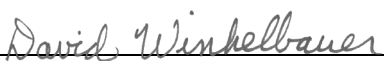
ATD Serial No: 634

Test ID: D114281

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	28	Pass
Peak Resultant Acceleration	G's	250 to 300	277	Pass
Peak Lateral Acceleration	G's	+/- 15	-12.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

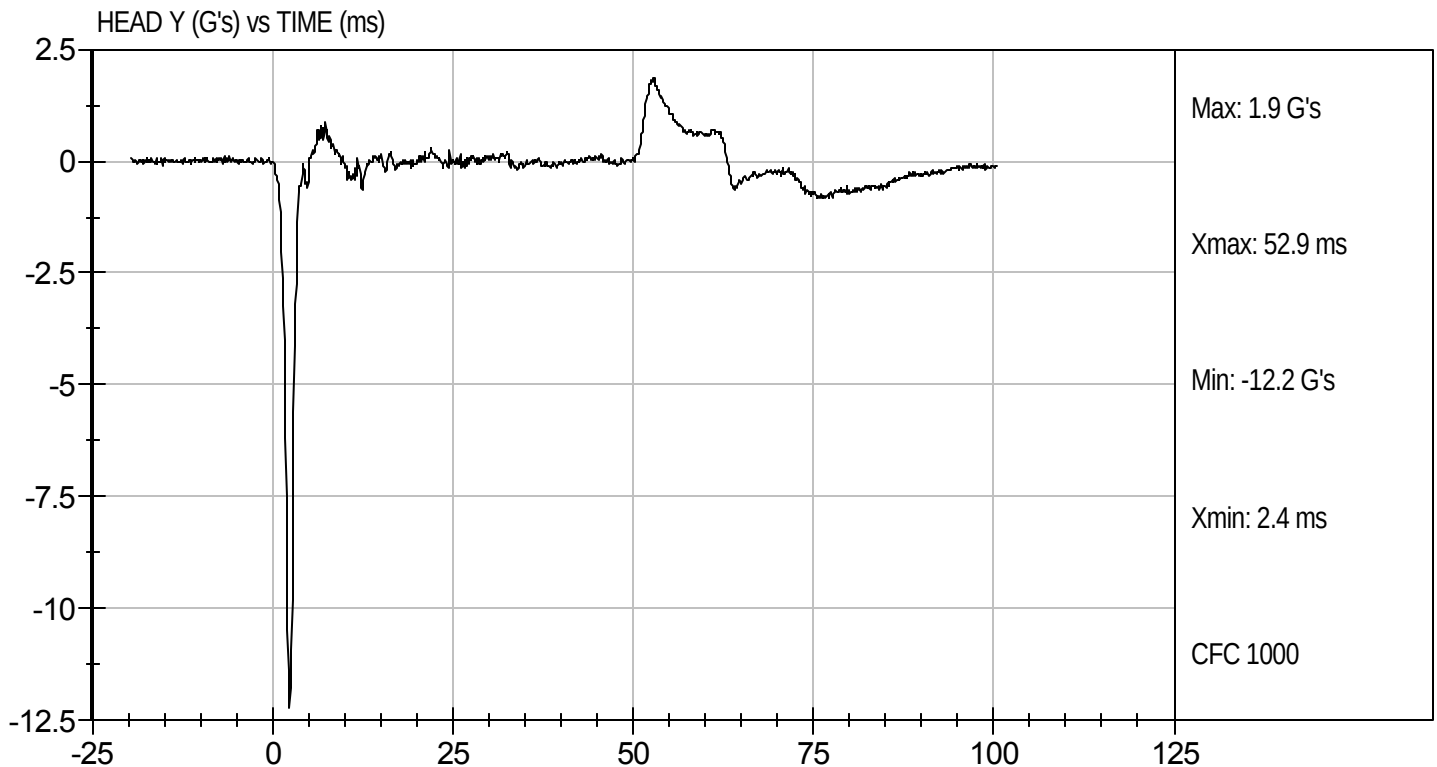
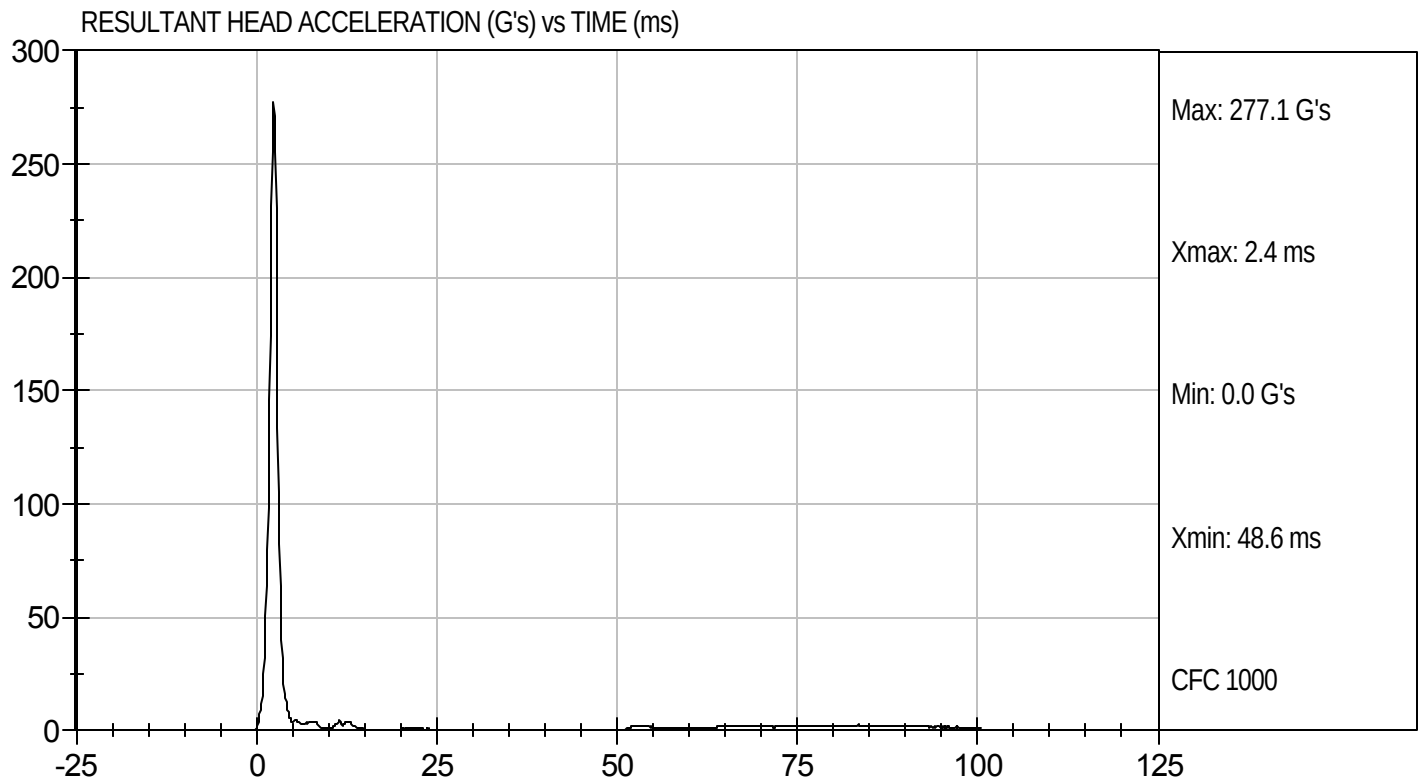
12/19/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D114281

Test Date: 12/19/11
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D114282

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	27	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Pulse	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.2	Pass
	30 ms	m/s	5.8 to 7.0	5.8	Pass
D Plane Rotation	Max	deg	77 to 91	78	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	88	Pass
Overall Results					Pass


Laboratory Technician

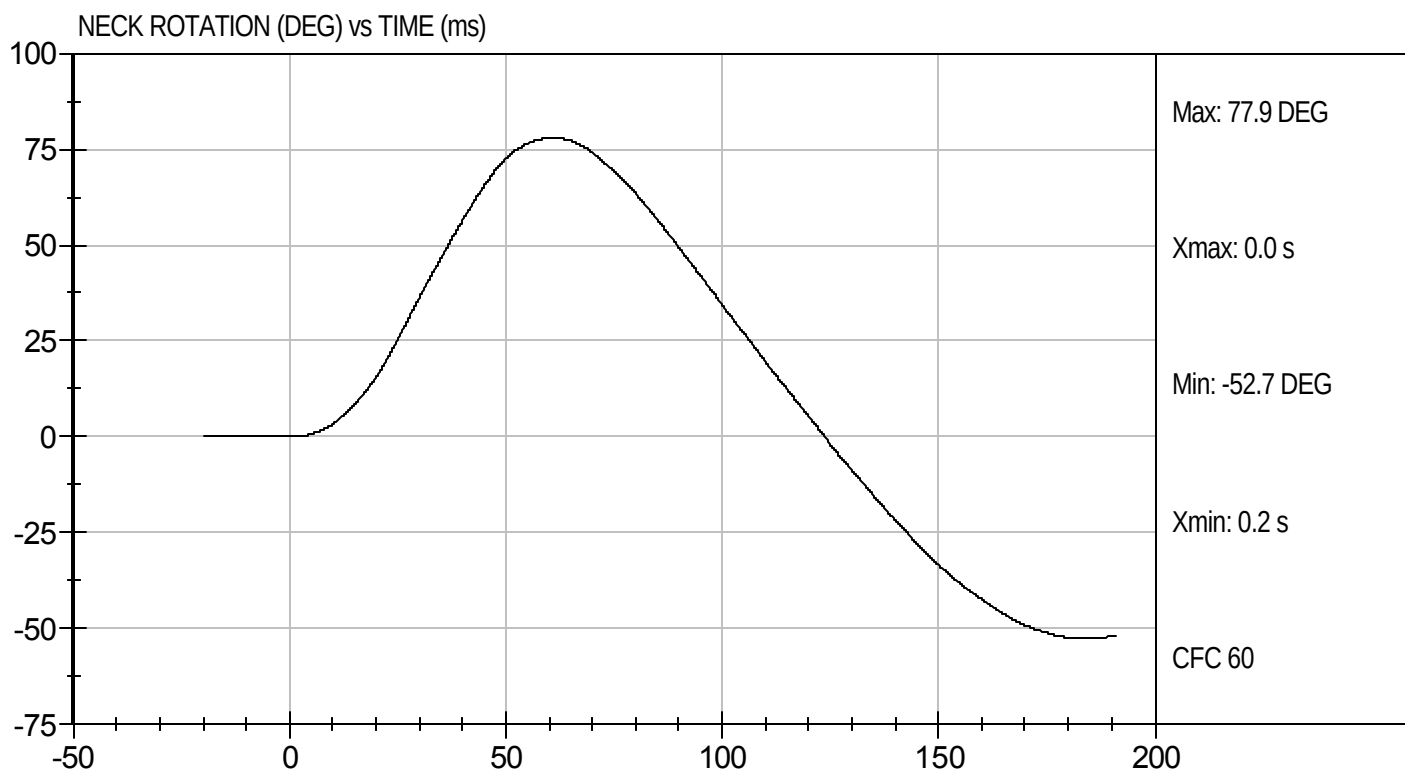
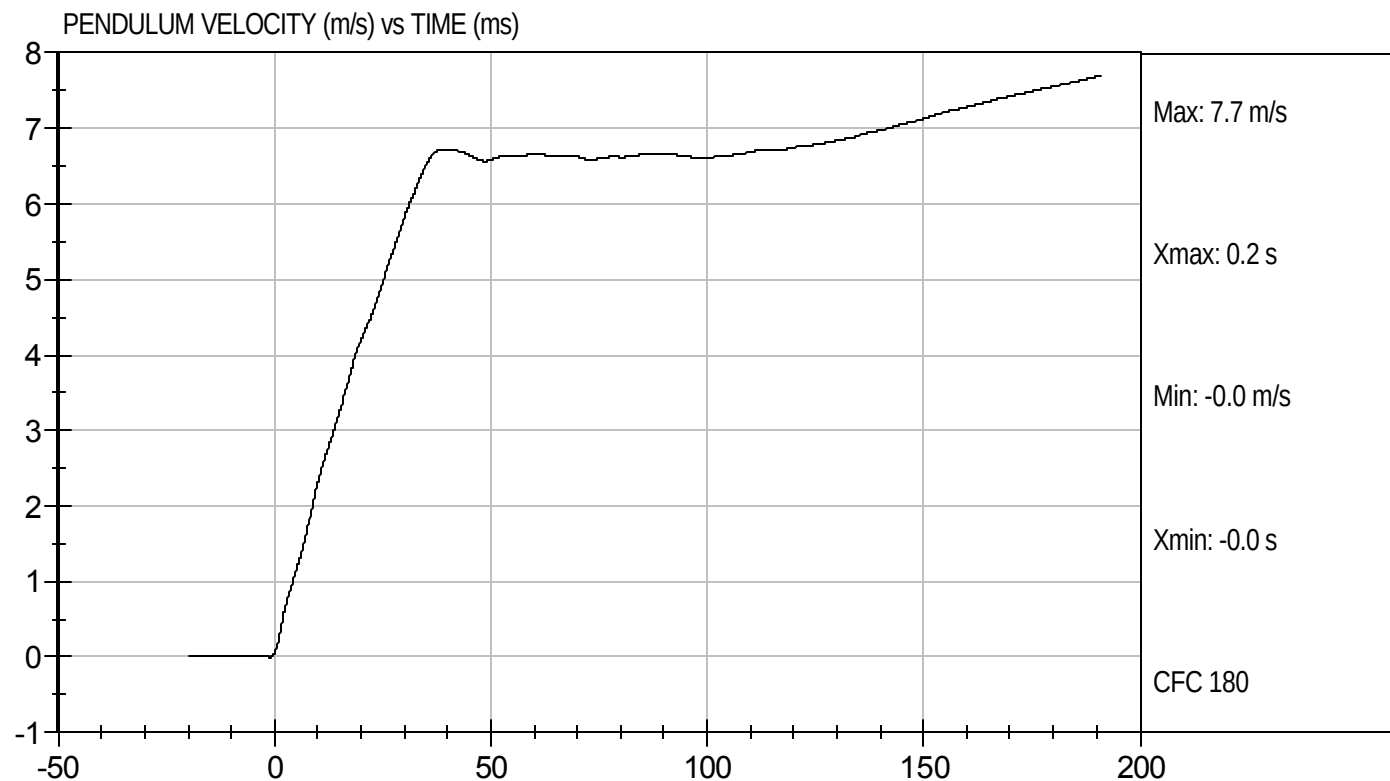
12/19/11
Test Date


Approved By



Test Desc: Neck Flexion
Component ID: D114282

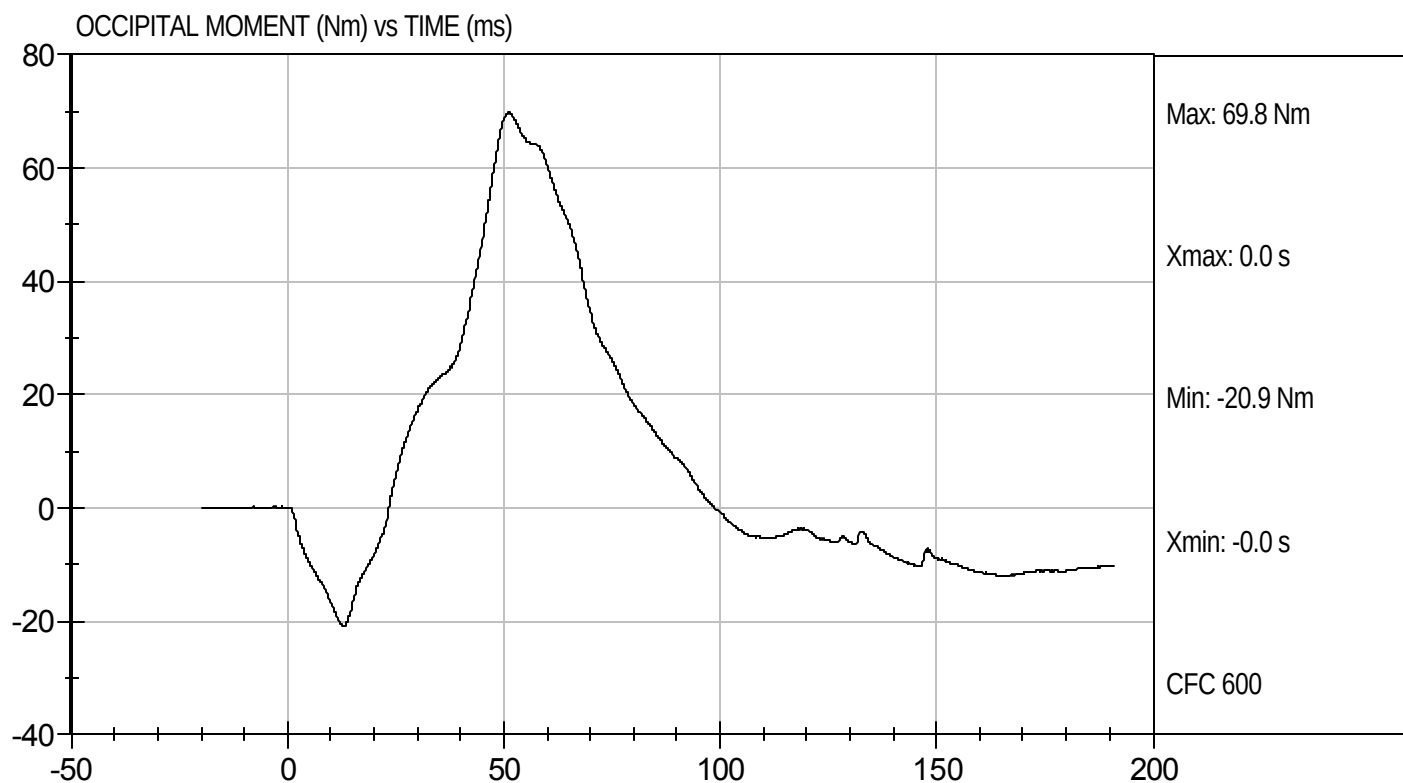
Test Date: 12/19/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D114282

Test Date: 12/19/11
Velocity: 23.15 ft/s, 7.06 m/s



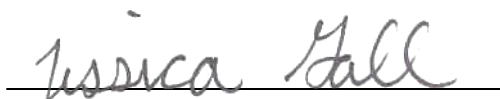
MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

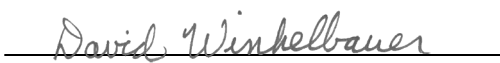
ATD Serial No: 634Test I.D: D114283

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	27	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Pulse	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	109	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	104	Pass
Overall Results					Pass


 Laboratory Technician

12/19/11

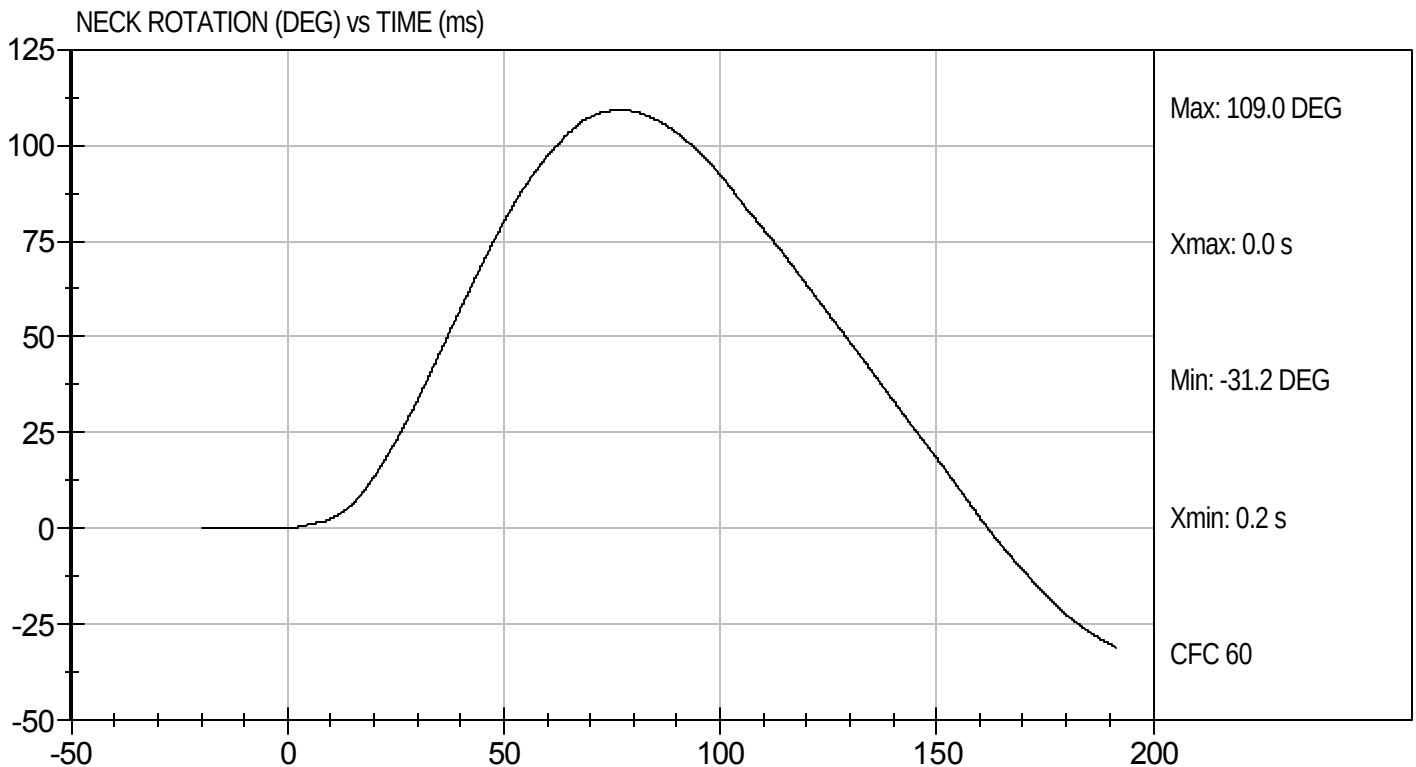
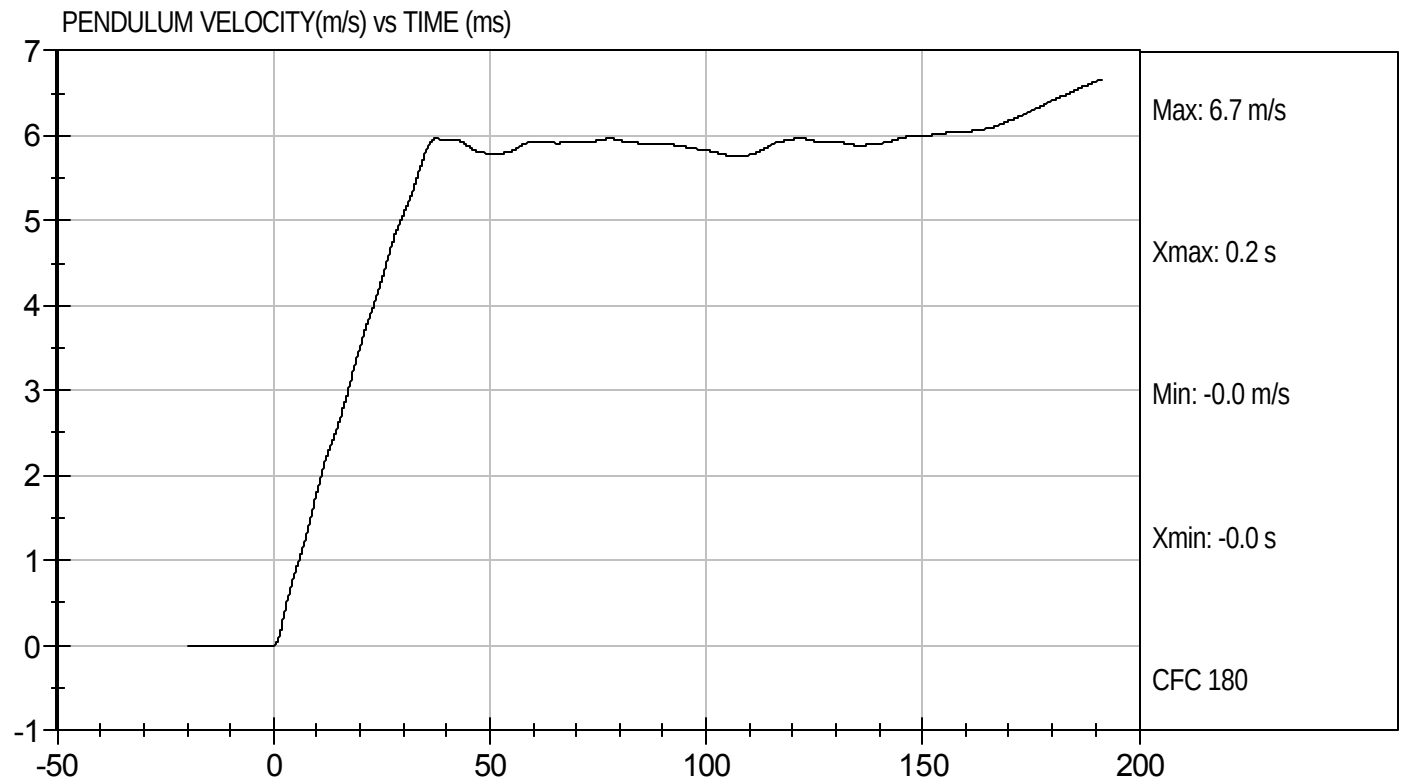
Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D114283

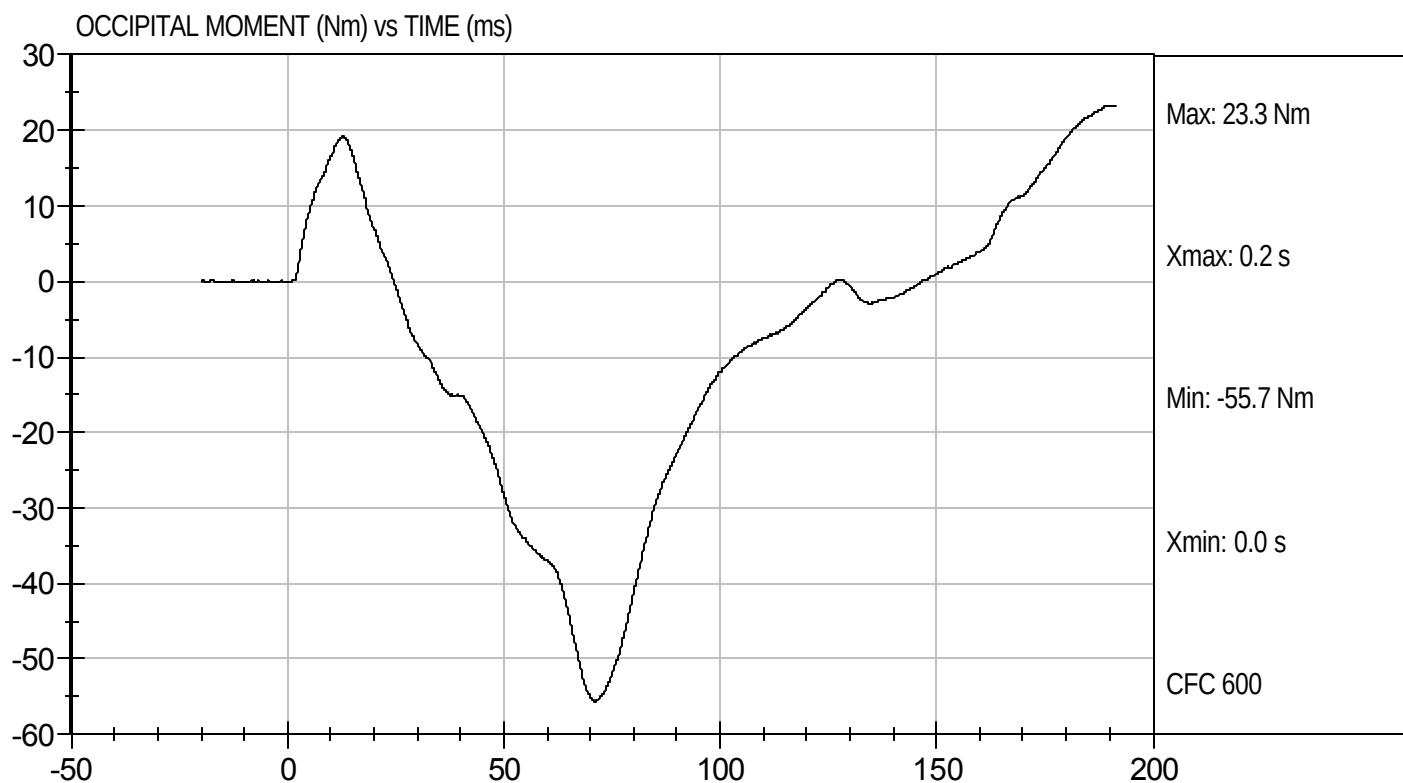
Test Date: 12/19/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D114283

Test Date: 12/19/11
Velocity: 20.08 ft/s, 6.12 m/s

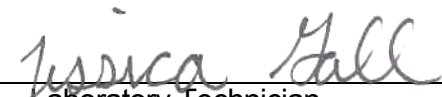


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

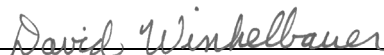
ATD Serial No: 634

Test I.D: D114284

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.30	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4270	Pass
			Overall Test Results	Pass


Laboratory Technician

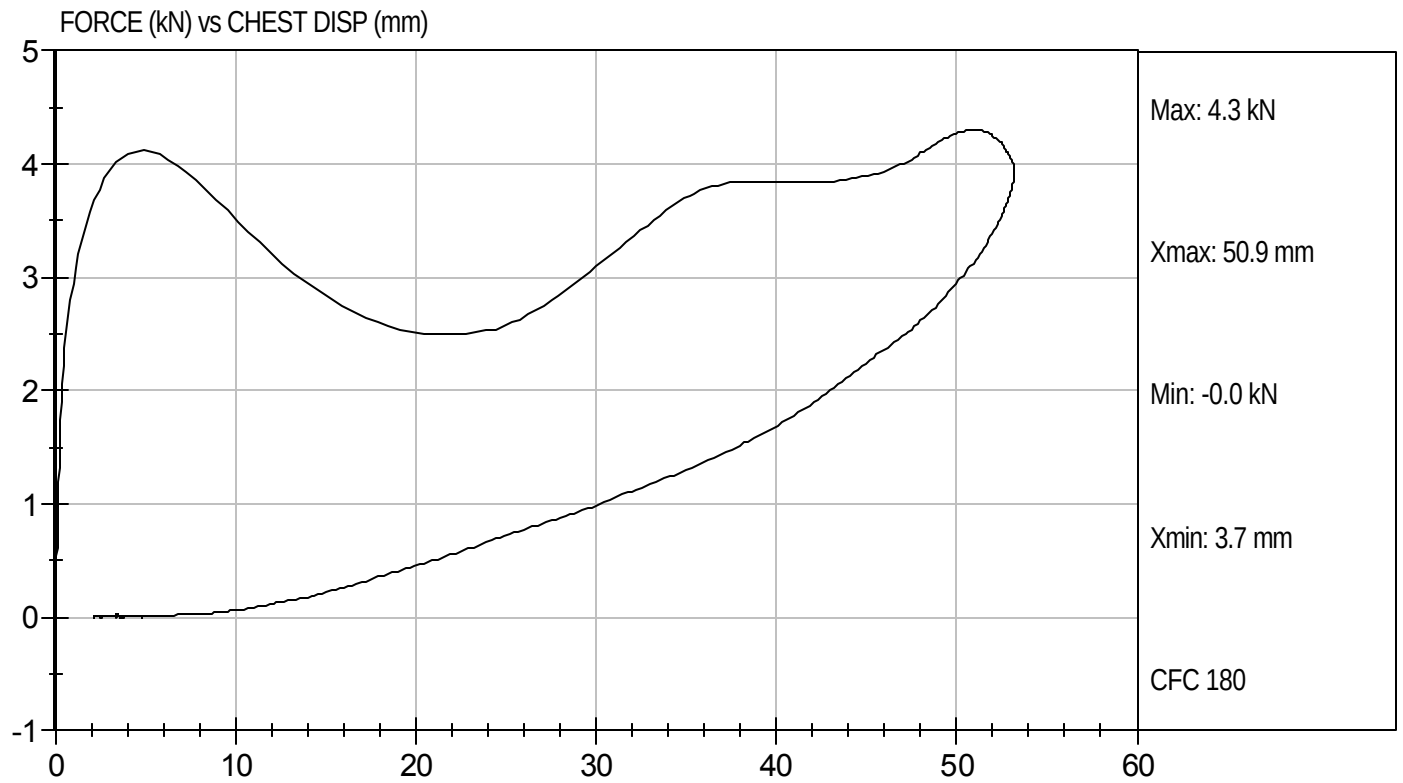
12/19/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D114284

Test Date: 12/19/11
Velocity: 21.93 ft/s, 6.68 m/s

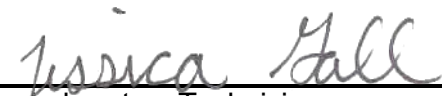


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

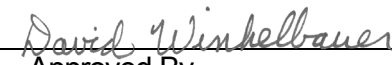
ATD Serial No: 634

Test I.D: D114285

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.52	Pass
Overall Test Results				Pass


Laboratory Technician

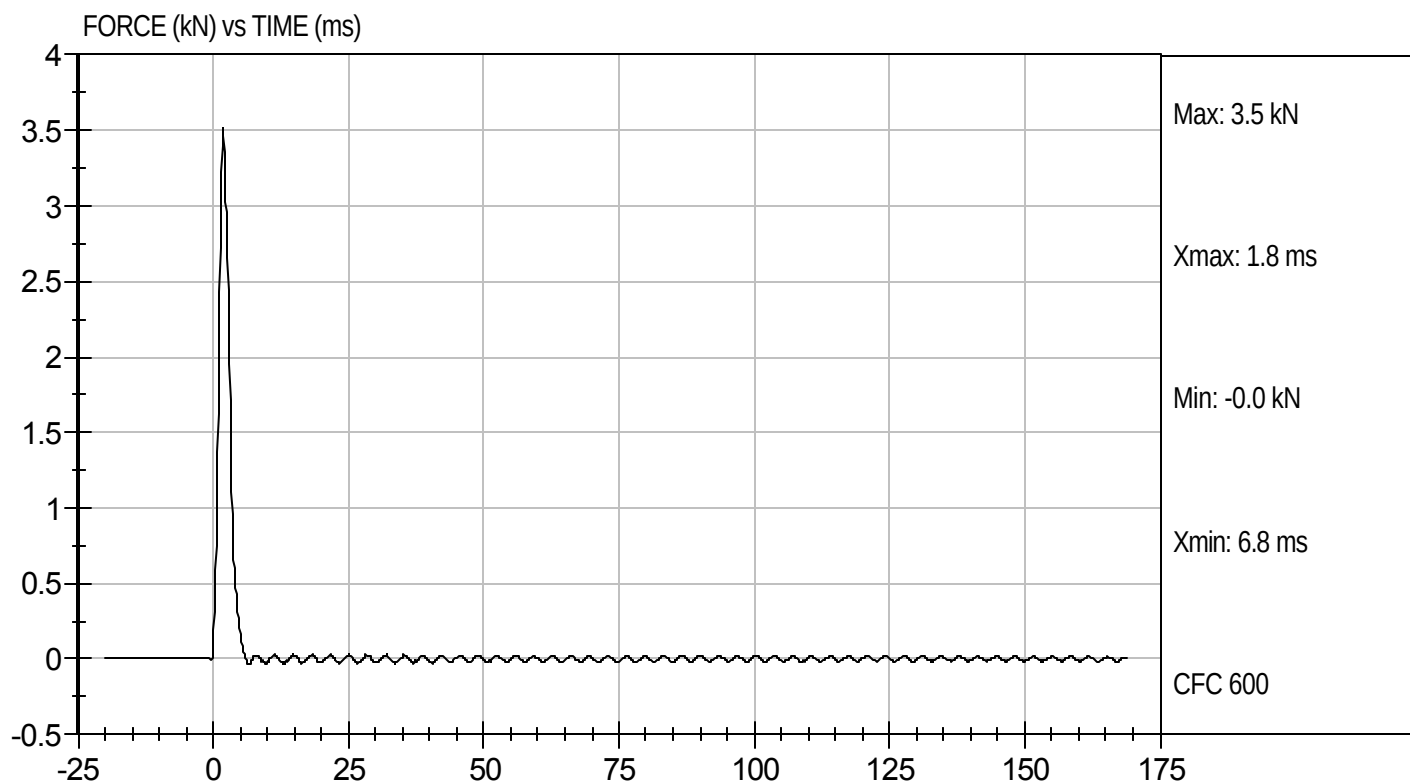
12/19/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D114285

Test Date: 12/19/11
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634

Test I.D: D114286

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.74	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

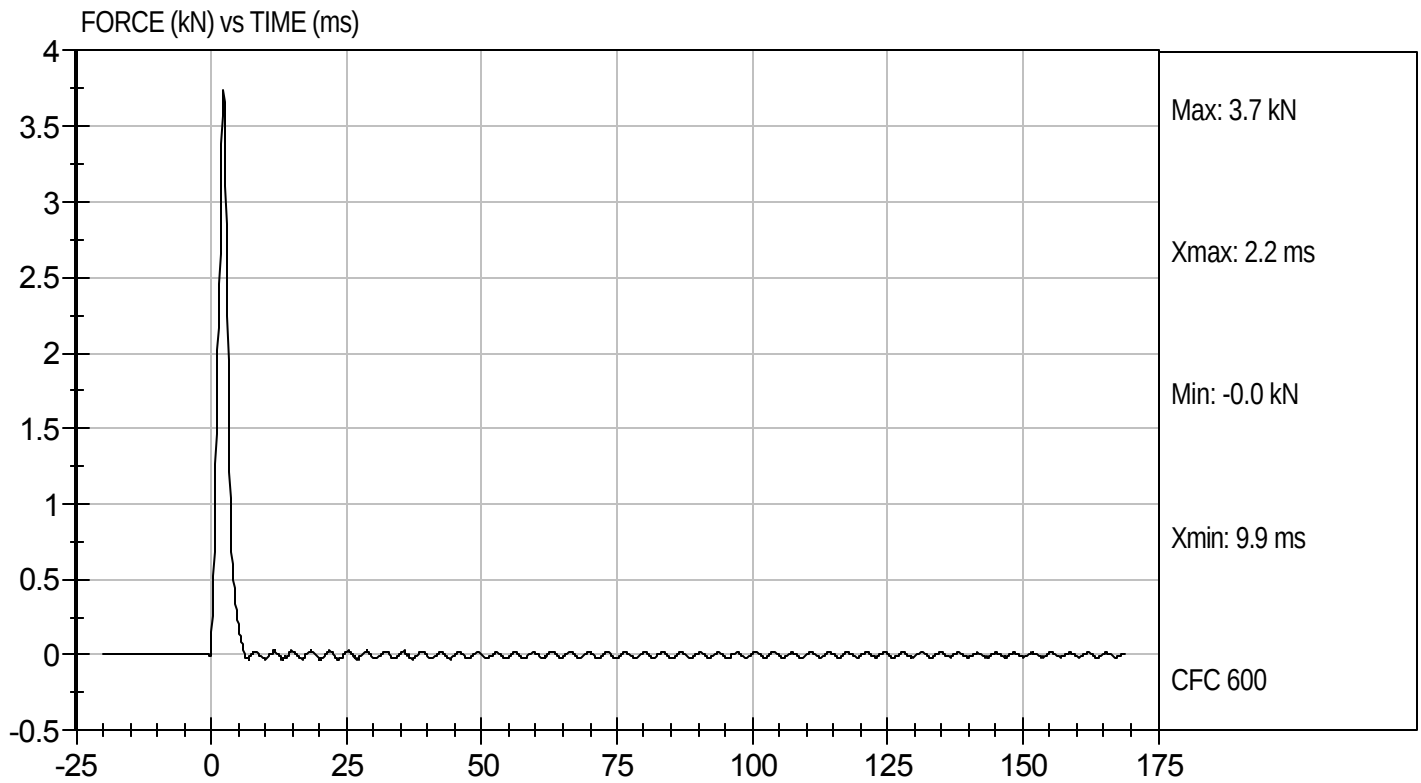
12/19/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D114286

Test Date: 12/19/11
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

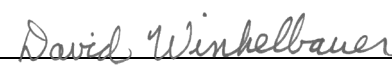
ATD Serial No: 634Test I.D: D114287

Tested Parameter	Units	Specification	Result	Pass/Fail
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Laboratory Relative Humidity	%	10 to 70	28	Pass
Initial Angle	deg	0 to 20	15	Pass
Return Angle	deg	+/- 8	7	Pass
Force at 45 deg	N	320 to 390	371	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

12/19/11

Test Date


Approved By