

REPORT NUMBER: NCAP-MGA-2011-006

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

**KIA MOTORS MANUFACTURING GEORGIA, INC.
2011 Kia Sorento LX AWD
NHTSA No.: MB0503**

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



Test Date: July 28, 2010

Final Report Date: August 19, 2010

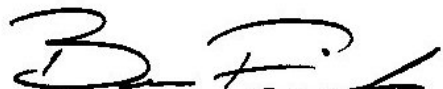
FINAL REPORT

**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: August 19, 2010

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on the subject 2011 Kia Sorento LX AWD 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 July 28, 2010. The impact velocity was 56.3 km/h and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 535 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>271</td> <td>381</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>18</td> <td>10</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.3</td> <td>0.6</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1327</td> <td>901</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>47</td> <td>265</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>3347</td> <td>1582</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2079</td> <td>732</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	271	381	Maximum Chest Compression	mm	63	52	18	10	Nij	N/A	1	1	0.3	0.6	Neck Tension	N	4170	2620	1327	901	Neck Compression	N	4000	2520	47	265	Left Femur Force	N	10008	6805	3347	1582	Right Femur Force	N	10008	6805	2079	732
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Seat Adjustment, Fuel System, and Steering Wheel Data	8
3	Dummy Longitudinal Clearance Dimensions	10
4	Dummy Lateral Clearance Dimensions	11
5	Seat Belt Positioning Data	12
6	High-Speed Camera Locations and Data	13
7	Vehicle Accelerometer Data	15
8	Photographic Reference Target Locations	16
9	Load Cell Locations on Fixed Barrier	17
10	Test Vehicle Summary of Results	18
11	Post-Test Observations	19
12	Vehicle Profile Measurements	20
13	Accident Investigation Division Data	22
14	Vehicle Intrusion Measurements	23
15	Summary of FMVSS 212, 219 (Partial), and 301 Data	26
16	FMVSS 301 Static Rollover Results	28
17	Dummy/Vehicle Temperature Stabilization Data	29
<u>Appendix</u>		
A	Photographs	A
B	Dummy Response Data	B
C	Dummy Calibration and Performance Verification Data	C

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 Kia Sorento LX AWD at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on July 28, 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 belt 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. 138) were calibrated previous to this test. Certification details, along with verification data, are found in Appendix C of this report.

The 101 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 535 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 the headrest. The driver's knees contacted the knee bolster. The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC ₁₅	T ¹	T ²	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50 th)	271	69.4	84.4	18	0.3	1327	47	3347	2079
Passenger (5 th)	381	70.4	85.4	10	0.6	901	265	1582	732

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

TEST NOTES

None

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 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0503	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	Yes
Make	Kia	Power Steering	Yes
Model	Sorento	Driver Front Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	5XYKTC A19BG054791	Driver Head/Torso Airbag	No
Body Color	Spicy Red	Driver Torso Airbag	No
Delivery Date	7/12/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	175	Driver Pelvis Airbag	No
Odometer (km)	282	Driver Knee Airbag	No
Dealer	Boucher Fleet Group	Pass. Front Airbag	Yes
Transmission	Automatic	Pass. Curtain Airbag	Yes
Final Drive	AWD	Pass. Head/Torso Airbag	No
Type/No. Cylinders	4	Pass. Torso Airbag	No
Engine Displacement (L)	2.4	Pass. Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Pass. Pelvis Airbag	No
Roof Rack	No	Pass. Knee Airbag	No
Sunroof/T-Top	No	Pretensioners	Yes
Tinted Glass	Yes	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	No
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?	N/A		

DATA FROM CERTIFICATION LABEL

Manufactured By	Kia Motors Manufacturing Georgia, Inc.	GVWR (kg)	2250
Date of Manufacture	APR/28/10	GAWR Front (kg)	1350
		GAWR Rear (kg)	1450

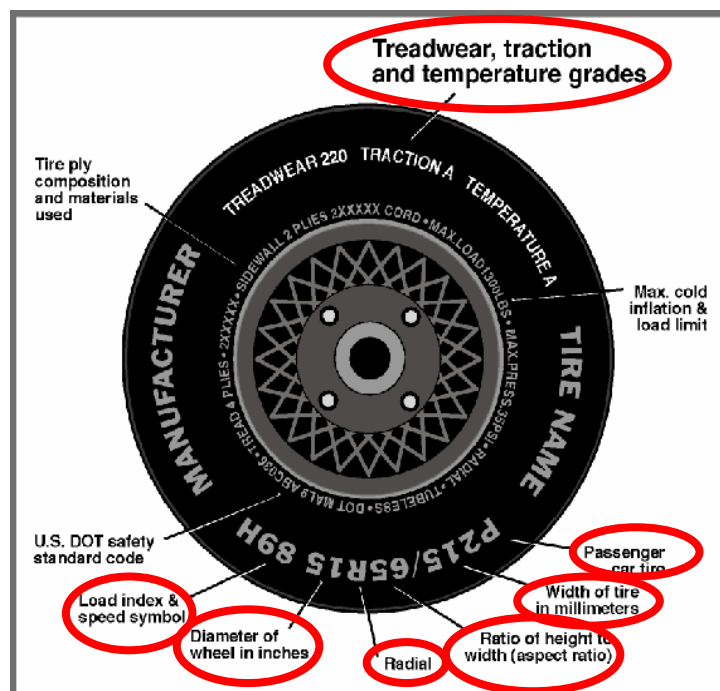
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	60/40 Split-Folding		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				420
Cargo Weight (RCLW) (kg)				80

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

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P235/65R17	P235/65R17
Tire Size on Vehicle	P235/65R17	P235/65R17
Tire Manufacturer	Kumho	Kumho
Tire Model	Solus KL21	Solus KL21
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 poly	2 poly
Tire Plies Body	2 steel / 2 poly / 1 nylon	2 steel / 2 poly / 1 nylon
Load Index & Speed Symbol	103T	103T
Tire Material	Rubber	Rubber
DOT Safety Code Right	H2B9 YPL9 1110	H2B9 YPL9 1110
DOT Safety Code Left	H2B9 YPL9 1110	H2B9 YPL9 1110

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

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	493.5	376.5		518.9	465.4	
Right	kg	480.4	367.9		522.1	427.3	
Ratio	%	56.7	43.3		53.8	46.2	
Totals	kg	973.9	744.4	1718.3	1041.0	892.7	1933.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1718.3
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	80
Calculated Target Vehicle Target Weight (TVTW)	kg	1938.9

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	796	800	795	803	1171
As Tested	mm	788	790	771	775	1248
Post Test	mm	775	801	765	786	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2704
Total Vehicle Length at Left Side	mm	3832
Total Vehicle Length at Centerline	mm	4681
Total Vehicle Length at Right Side	mm	3832
Weight of Ballast in Cargo Area	kg	58.5
Weight of Vehicle Components Removed	kg	17.2
Amount of Stoddard Solvent in Fuel Tank	L	62.8

List of components removed to meet test weight: Right rear tail light, cargo area carpet, jack & tools, and cargo compartment.

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

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4681
2	Total Width	1858
3	Bumper Top Height	548
4	Bumper Bottom Height	458
5	Longitudinal Member Top Height	615
6	Distance between Longitudinal Members	918
7	Longitudinal Member Width	75
8	Engine Top Height	930
9	Engine Bottom Height	246
10	Engine and Gearbox Width	790
11	Front Bumper-Engine Distance	455
12	Front Shock Absorber Fixing Height	1016
13	Bonnet Leading Edge Height	972
14	Front Shock Absorber Fixing Width	1164
15	Front Bumper – Front Axle Distance	885
16	Front Axle – A-Pillar Distance	473
17	A-Pillar – B-Pillar Distance	1084
18	B-Pillar – Rear Axle Distance	1148
19	B-Pillar – C-Pillar Distance	698
20	Roof Sill Bottom Height	1539
21	Roof Sill Top Height	1665
22	Floor Sill bottom Height	273
23	Floor Sill Top Height	433

DATA SHEET NO. 2

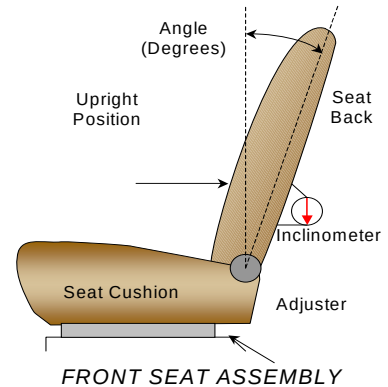
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

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	-0.7° on headrest post
Passenger Seat Back Angle	-0.7° on headrest post

SEAT FORE/AFT POSITIONS

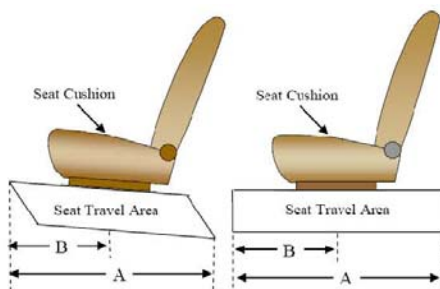
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	24 detents	11 th detent (forward-most as 0)
Passenger Seat	22 detents	0 detent (Full Forward)

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	3	0 (uppermost as 0)
Passenger Seat	3	2 (uppermost as 0)



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

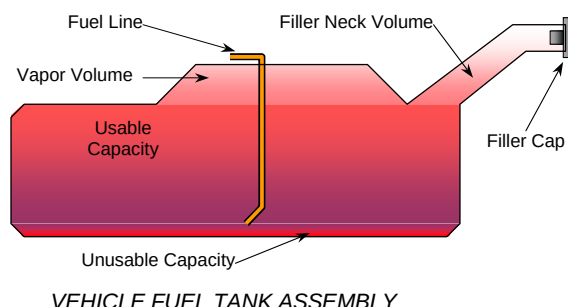
NHTSA No.: MB0503
 Test Date: 7/28/2010

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	68.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	62.6 to 63.9
Actual Amount of Solvent used	62.8
1/3 of Usable Capacity	22.6

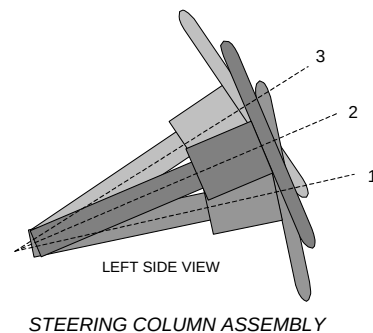
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. Fuel pump will operate when the key is in the "ON" position. The fuel filler pipe is located on the left side.



STEERING COLUMN ADJUSTMENT

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



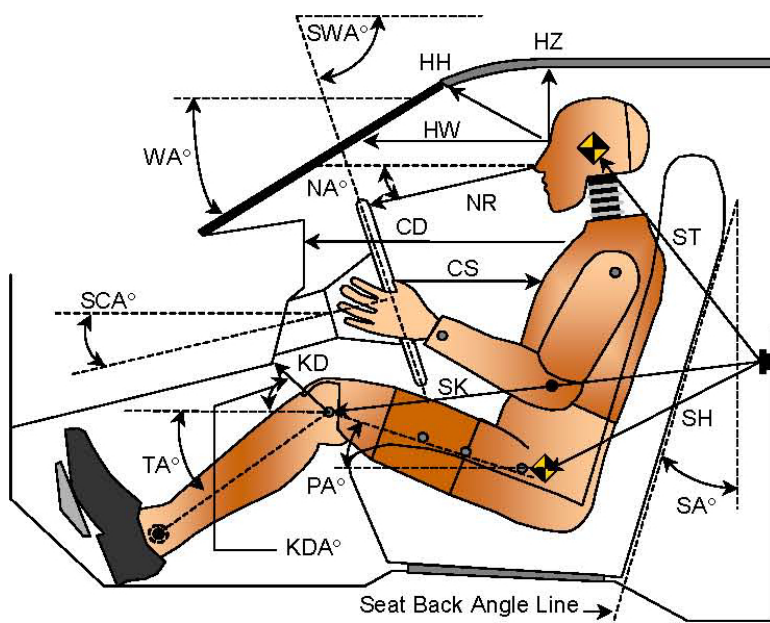
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	61.0	85
Geometric Center – Position 2	63.2	104
Uppermost – Position 3	65.4	123
Telescoping Steering Wheel Travel		38
Test Position	63.2	104

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

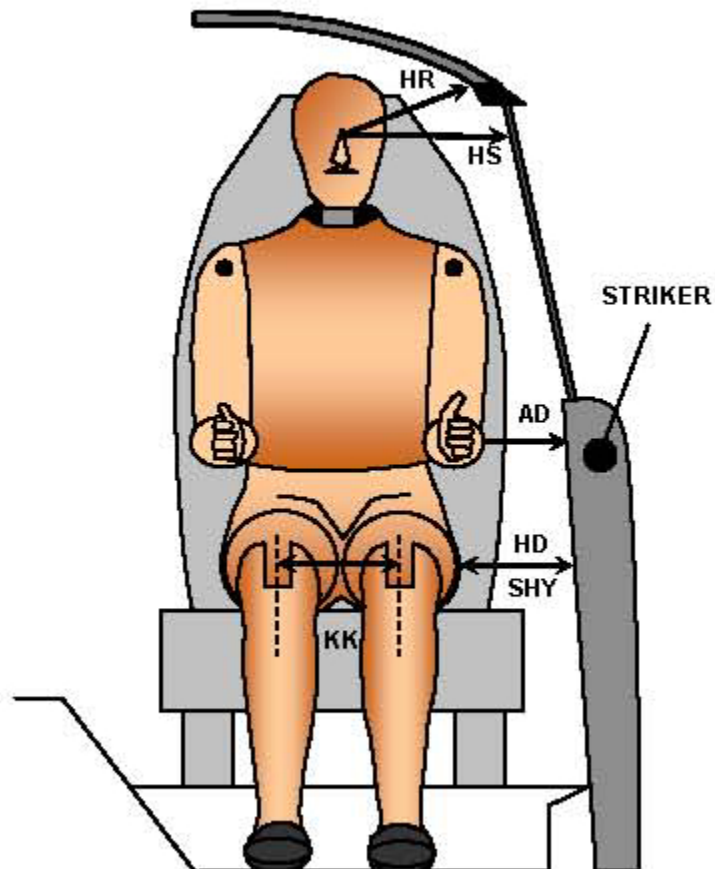


Code	Measurement Description	Driver S/N 351		Passenger S/N 138	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		29.9		
SWA	Steering Wheel Angle		63.2		
SCA	Steering Column Angle		26.8		
SA	Seat Back Angle (headrest post)		-0.7		-0.7
HZ	Head to Roof (Z)	190	90	245	90
HH	Head to Header	329	24.1	324	41.9
HW	Head to Windshield	613	0	642	0
NR	Nose to Rim	408	14.5		
CD	Chest to Dash	526		424	
CS	Chest to Steering Hub	308	7.6		
RA	Rim to Abdomen	177	0		
KDL	Left Knee to Dash	155	30.9	110	36.8
KDR	Right Knee to Dash	115	24.2	114	32.5
PA	Pelvic Angle		23.4		18.5
TA	Tibia Angle		49.5		52.1
SK	Striker to Knee	620	101.7	685	100.7
ST	Striker to Head	465	12.8	418	31.1
SH	Striker to H-Point	291	132.7	390	119.5

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010



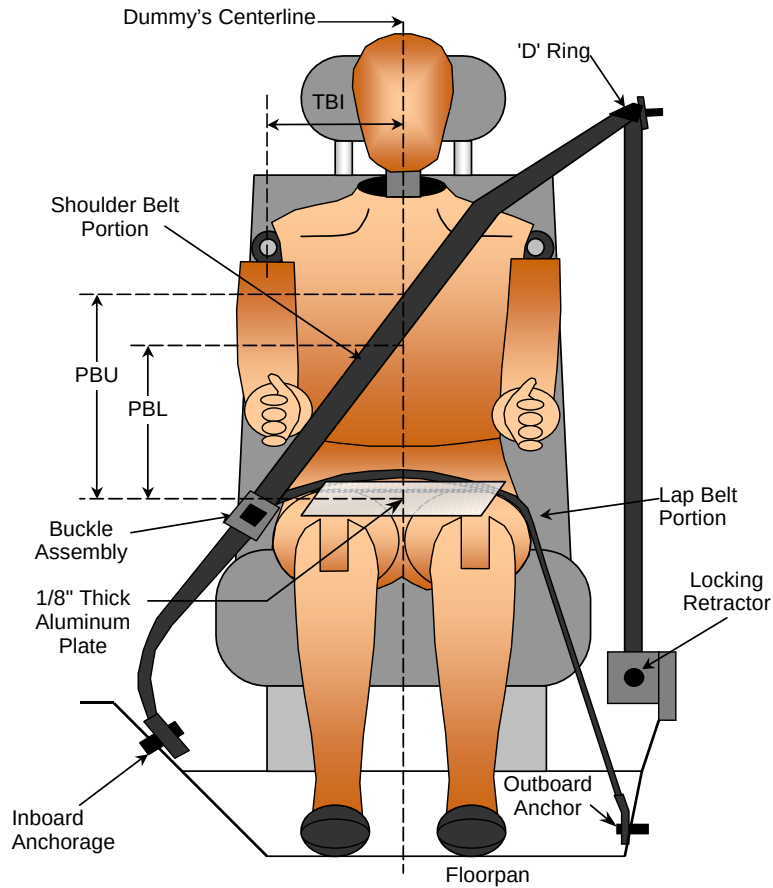
Code	Measurement Description	Driver S/N 351	Passenger S/N 138
		Length (mm)	
AD	Arm to Door	135	96
HD	H-Point to Door	160	189
HR	Head to Side Header	248	299
HS	Head to Side Window	330	362
KK	Knee to Knee	330	210
SHY	Striker to H-Point (Y Direction)	290	310
AA	Ankle to Ankle	339	180

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	360	300
PBL - To surface of reference to belt lower edge	mm	290	210

BELT LENGTH DATA

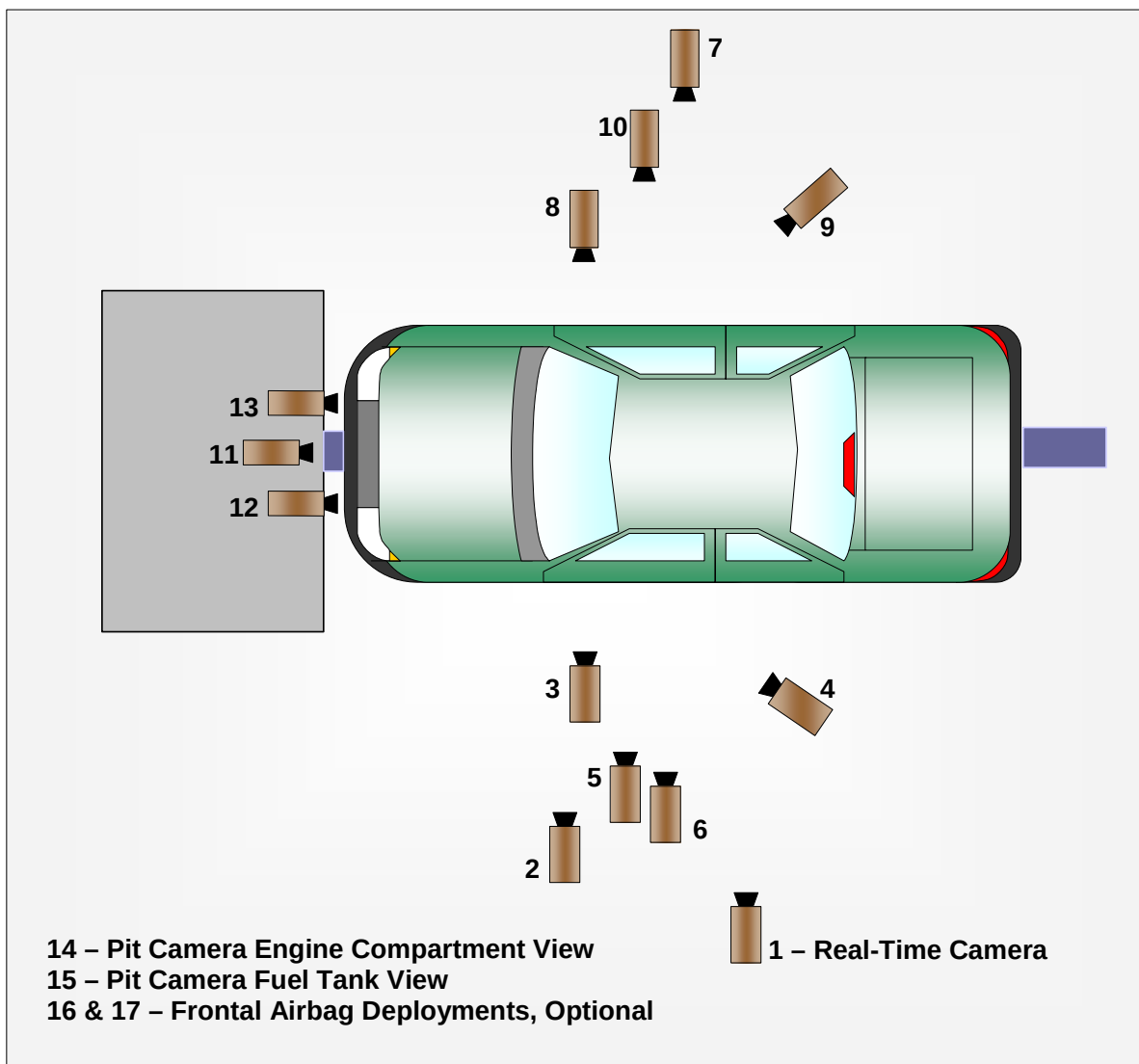
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	870	900
Lap Belt Length as measured on ATD	mm	660	850
Reminder of belt of reel	mm	875	860
Total Belt Length for Continuous Webbing Systems	mm	2405	2610

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

Test Vehicle: 2011 Kia Sorento LX AWD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
Test Date: 7/28/2010

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

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	1200	-5070	-1140	24	1000
3	Driver Close-Up	1400	-6120	-1720	35	1000
4	Driver Angle	5460	-4710	-2000	50	1000
5	Steering Column Top	740	-5350	-1240	25	1000
6	Steering Column Bottom	710	-5380	-860	25	1000
7	Right Overall	2040	6350	-1080	20	1000
8	Passenger Close-Up	1540	6180	-1650	35	1000
9	Passenger Angle	5530	4680	-2040	50	1000
10	Right Front Half	1230	4980	-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	1160	0	3150	24	1000
15	Pit Rear	3250	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

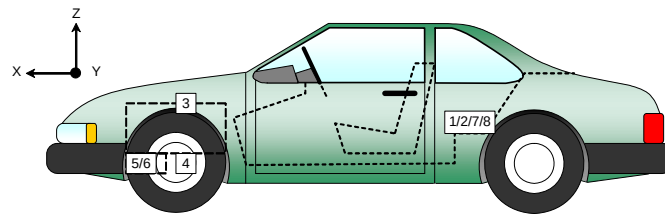
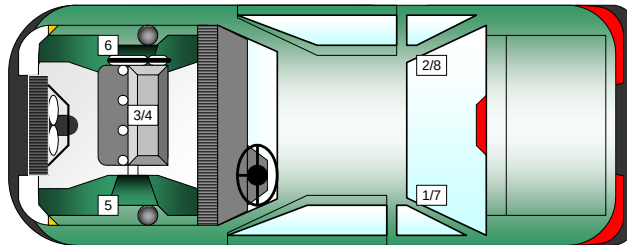
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010



ACCELEROMETER LOCATION				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Left Rear X-Member X	1951	-407	-447
2	Right Rear X-Member X	1951	407	-447
3	Engine Top X	3920	0	-924
4	Engine Bottom X	3959	0	-352
5	Left Brake Caliper X	3585	-730	-313
6	Right Brake Caliper X	3585	730	-313
7	Left Rear X-Member Z	1951	-407	-447
8	Right Rear X-Member Z	1951	407	-447

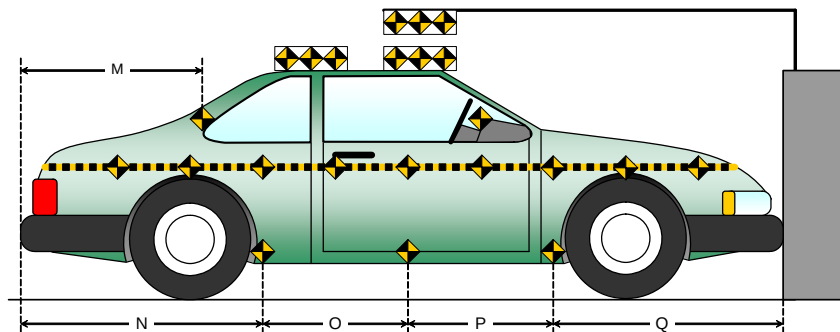
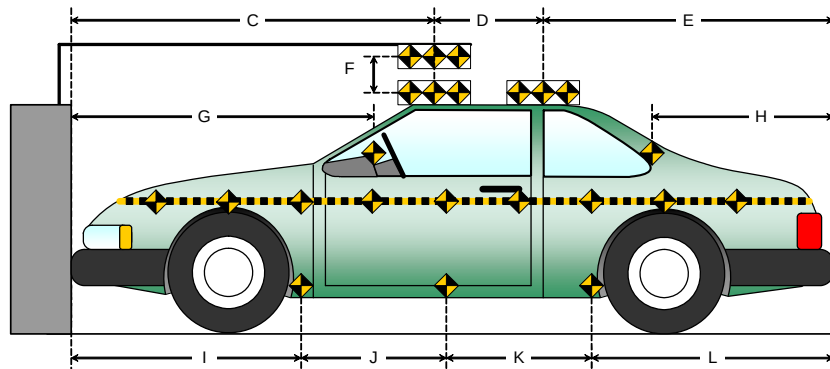
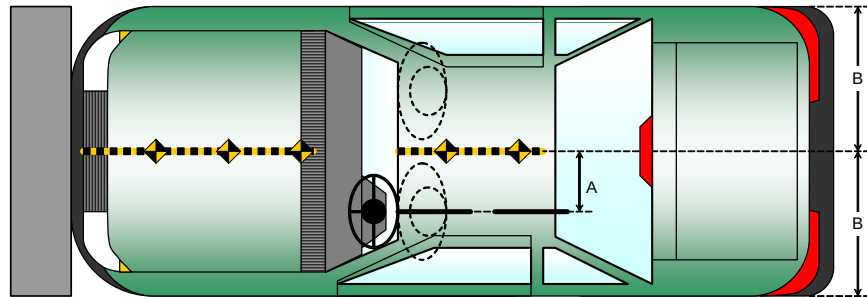
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

Item	Value (mm)
A	410
B	929
C	2330
D	660
E	1691
F	124
G	
H	710
I	1440
J	895
K	886
L	1460
M	725
N	1467
O	884
P	895
Q	1435



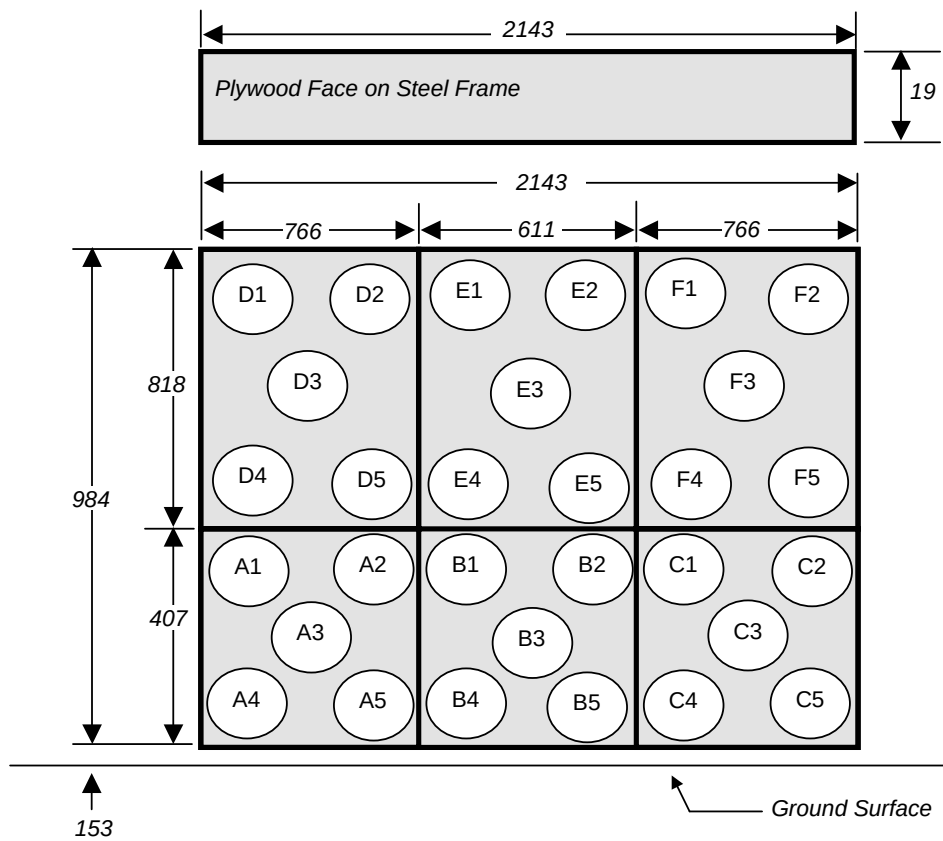
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

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 Kia Sorento LX AWD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
Test Date: 7/28/2010

INSTRUMENTATION

Driver Dummy Data Channels	44
Passenger Dummy Data Channels	43
Vehicle Structure Accelerometers	8
Barrier Channels	6
Total	101

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 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 138
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 unlocked	Doors were unlocked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1309
Center	mm	1163
Right Side	mm	1148
Average	mm	1207

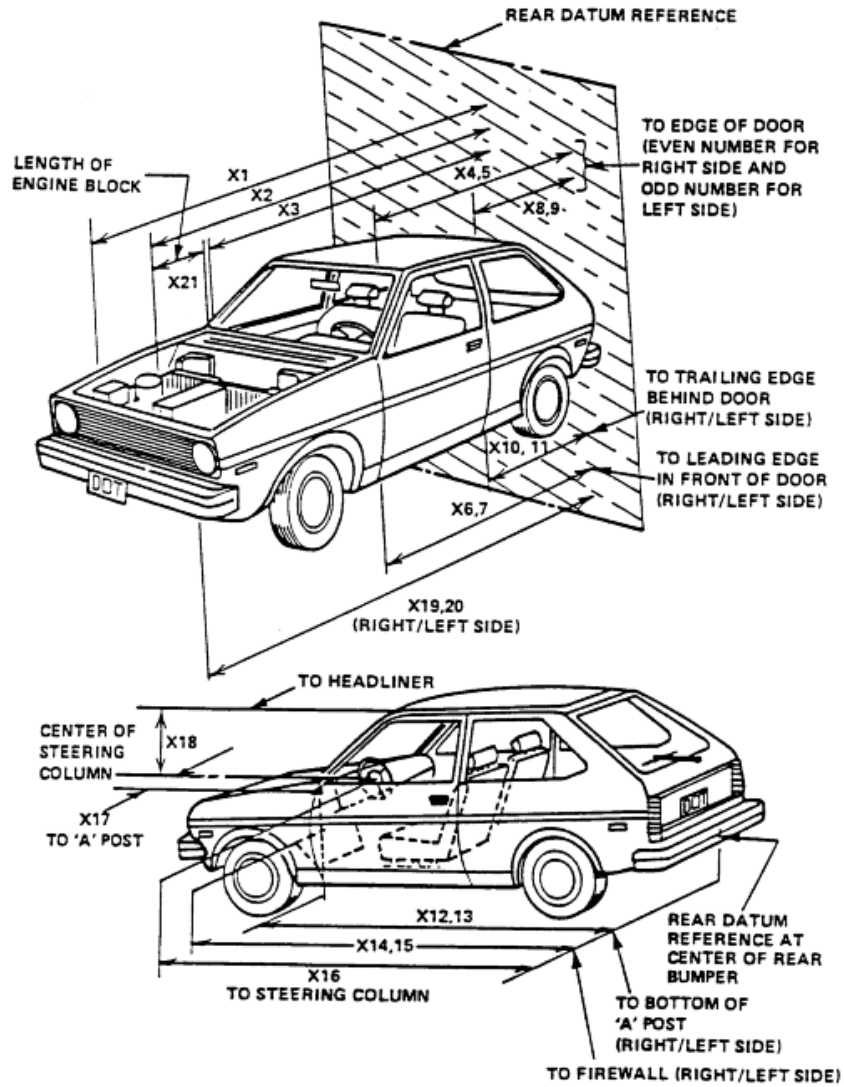
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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 Airbag	Yes	No	Yes	No
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

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

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4681	4146	535
2	RSOV to Front of Engine	mm	4165	3924	241
3	RSOV to Firewall	mm	3622	3592	30
4	RSOV to Upper Leading Edge of Right Door	mm	3197	3191	6
5	RSOV to Upper Leading Edge of Left Door	mm	3212	3208	4
6	RSOV to Lower Leading Edge of Right Door	mm	3181	3167	14
7	RSOV to Lower Leading Edge of Left Door	mm	3170	3165	5
8	RSOV to Upper Trailing Edge of Right Door	mm	2140	2140	0
9	RSOV to Upper Trailing Edge of Left Door	mm	2148	2144	4
10	RSOV to Lower Trailing Edge of Right Door	mm	2169	2158	11
11	RSOV to Lower Trailing Edge of Left Door	mm	2164	2161	3
12	RSOV to Bottom of "A" Post of Right Side	mm	3169	3165	4
13	RSOV to Bottom of "A" Post of Left Side	mm	3164	3162	2
14	RSOV to Firewall, Right Side	mm	3663	3478	185
15	RSOV to Firewall, Left Side	mm	3663	3494	169
16	RSOV to Steering Column	mm	2745	2809	-64
17	Center of Steering Column to "A" Post	mm	379	375	4
18	Center of Steering Column to Headliner	mm	433	433	0
19	RSOV to Right Side of Front Bumper	mm	4520	4044	476
20	RSOV to Left Side of Front Bumper	mm	4520	4050	470
21	Length of Engine Block	mm	525	525	0
RD	RSOV to Right Side of Dash Panel	mm	2974	2969	5
CD	RSOV to Center of Dash Panel	mm	2952	2948	4
LD	RSOV to Left Side of Dash Panel	mm	2975	2970	5

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

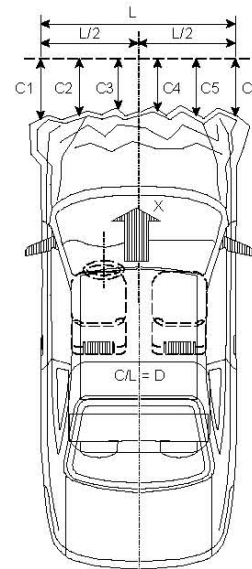
NHTSA No.: MB0503
 Test Date: 7/28/2010

VEHICLE INFORMATION

VIN: 5XYKTCA19BG054791 Wheelbase (mm): 2704
 Vehicle Size Category: MPV Test Weight (kg): 1933.7

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 16
 Cal. Procedure/Interval: MGA procedure / 6 month
 Integration Algorithm: Trapezoidal Linearity: > 99%
 Impact Velocity (km/h): 56.3
 Velocity Change (km/h): 61.5
 Time of Separation (msec): 96.3



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1276
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4520	4050	470
C2	Crush zone 2 at left side	mm	4602	4084	518
C3	Crush zone 3 at left side	mm	4638	4104	534
C4	Crush zone 4 at right side	mm	4638	4120	518
C5	Crush zone 5 at right side	mm	4602	4104	498
C6	Crush zone 6 at right side	mm	4520	4044	476
L	C1 TO C6	mm	1276	1279	-3

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

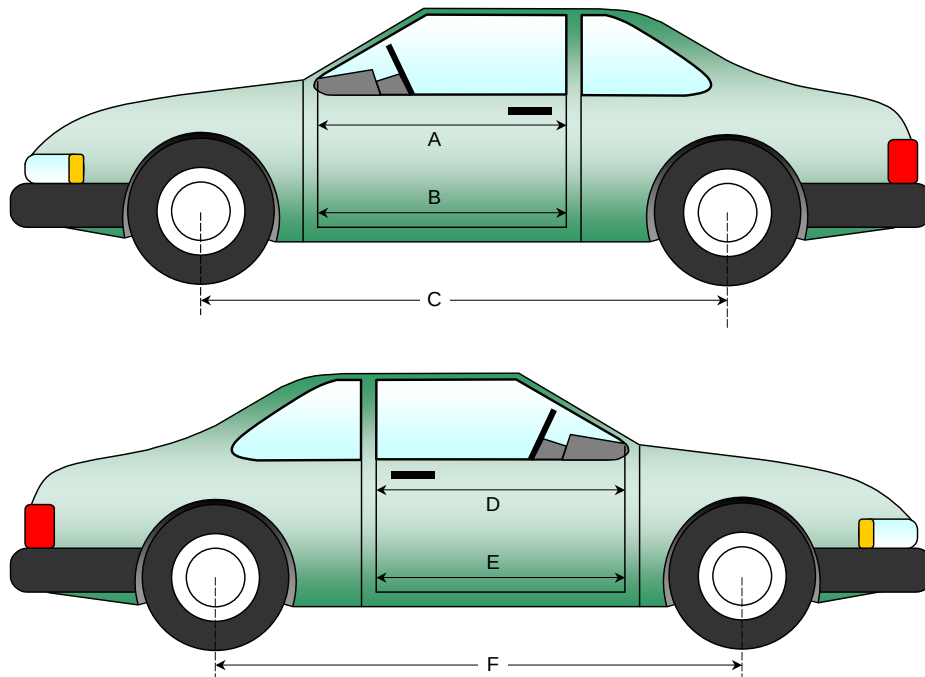
NHTSA No.: MB0503
 Test Date: 7/28/2010

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	945	945	0
B	Left Side Lower	mm	870	869	1
D	Right Side Upper	mm	945	945	0
E	Right Side Lower	mm	870	870	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2704	2643	61
F	Right Side Wheelbase	mm	2704	2633	71



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

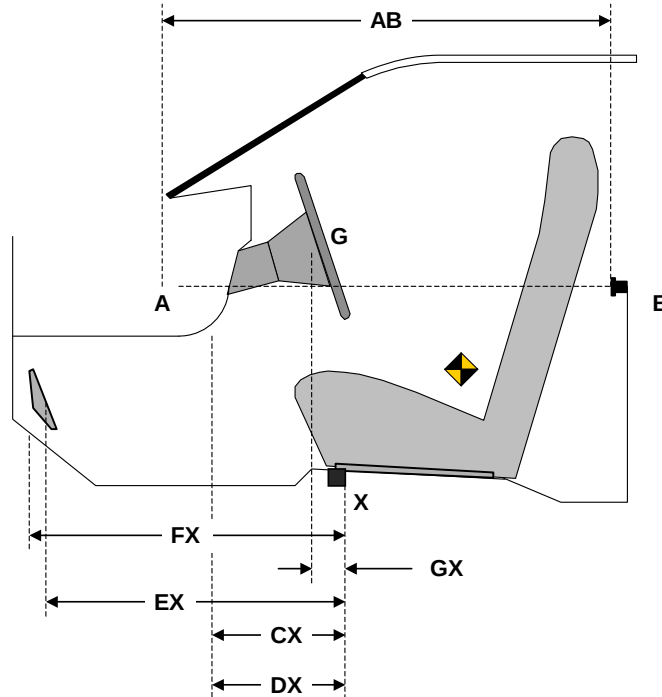
Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	788	788	0
CX	Left Knee Bolster to X	mm	240	249	-9
DX	Right Knee Bolster to X	mm	250	255	-5
EX	Brake Pedal to X	mm	522	533	-11
FX	Foot Rest to X	mm	531	523	8
GX	Center of Steering Column Wheel Hub to X	mm	55	103	-48

X = Front of Seat Track (stationary)

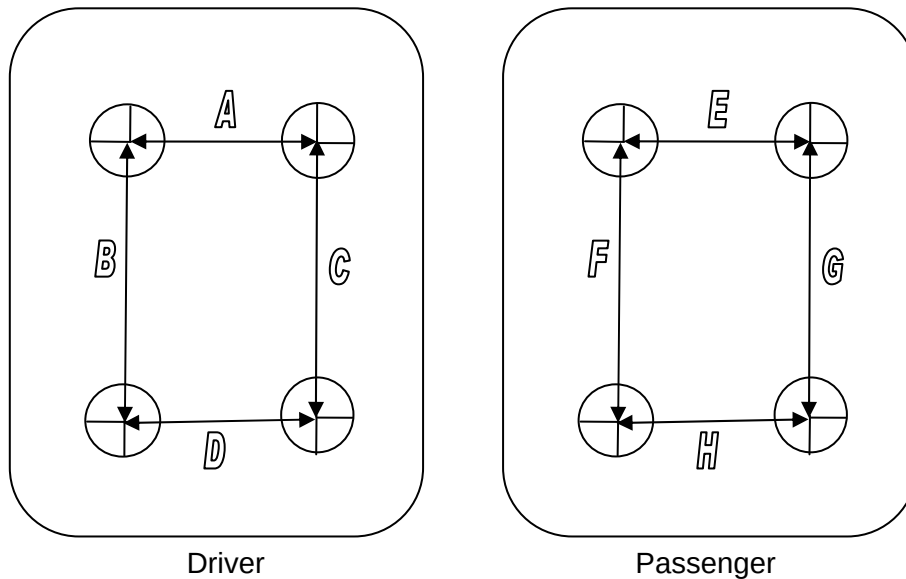


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	354	354	0
B	mm	354	354	0
C	mm	354	354	0
D	mm	354	354	0
E	mm	354	354	0
F	mm	354	354	0
G	mm	354	354	0
H	mm	354	354	0

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

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

Windshield Mounting Details:

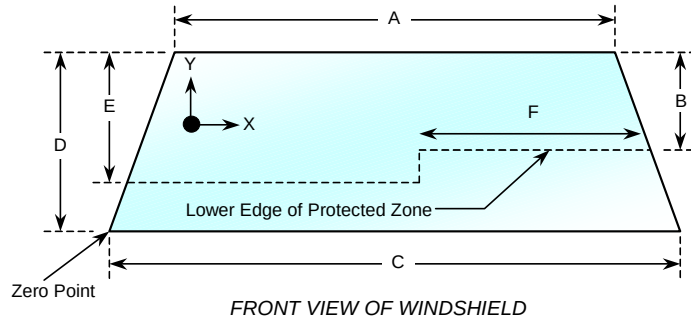
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2138	2138	100
Right Side	2138	2138	100
Total	4276	4276	100



Item	Units	Value
A	mm	1198
B	mm	540
C	mm	1518
D	mm	780
E	mm	535
F	mm	497

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 Kia Sorento LX AWD</u>	NHTSA No.:	<u>MB0503</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>7/28/2010</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time:	<u>10:51 am</u>	Temperature:	<u>21° C</u>
------------	-----------------	--------------	--------------

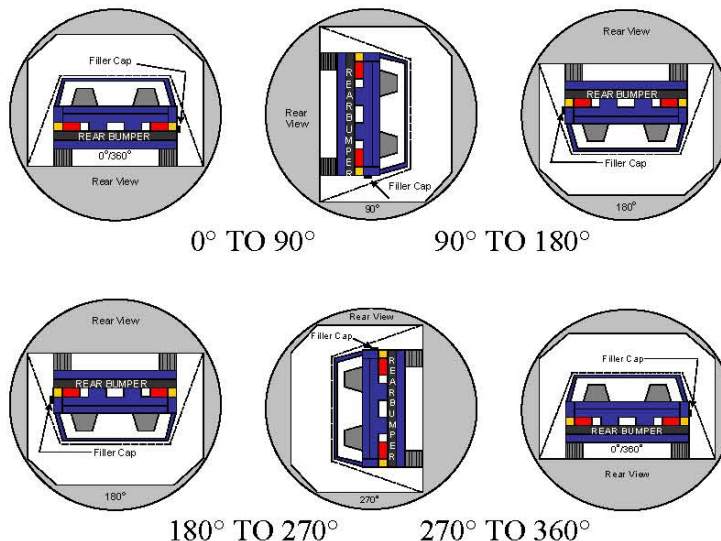
- | | |
|---|--------------|
| A. From impact until vehicle motion ceases:
(Maximum Allowable = 1 ounce) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 ounces) | <u>None</u> |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>None</u>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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Kia Sorento LX AWD
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
 Test Date: 7/28/2010

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°	126	300	426
90° to 180°	113	300	413
180° to 270°	108	300	408
270° to 360°	118	300	418

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

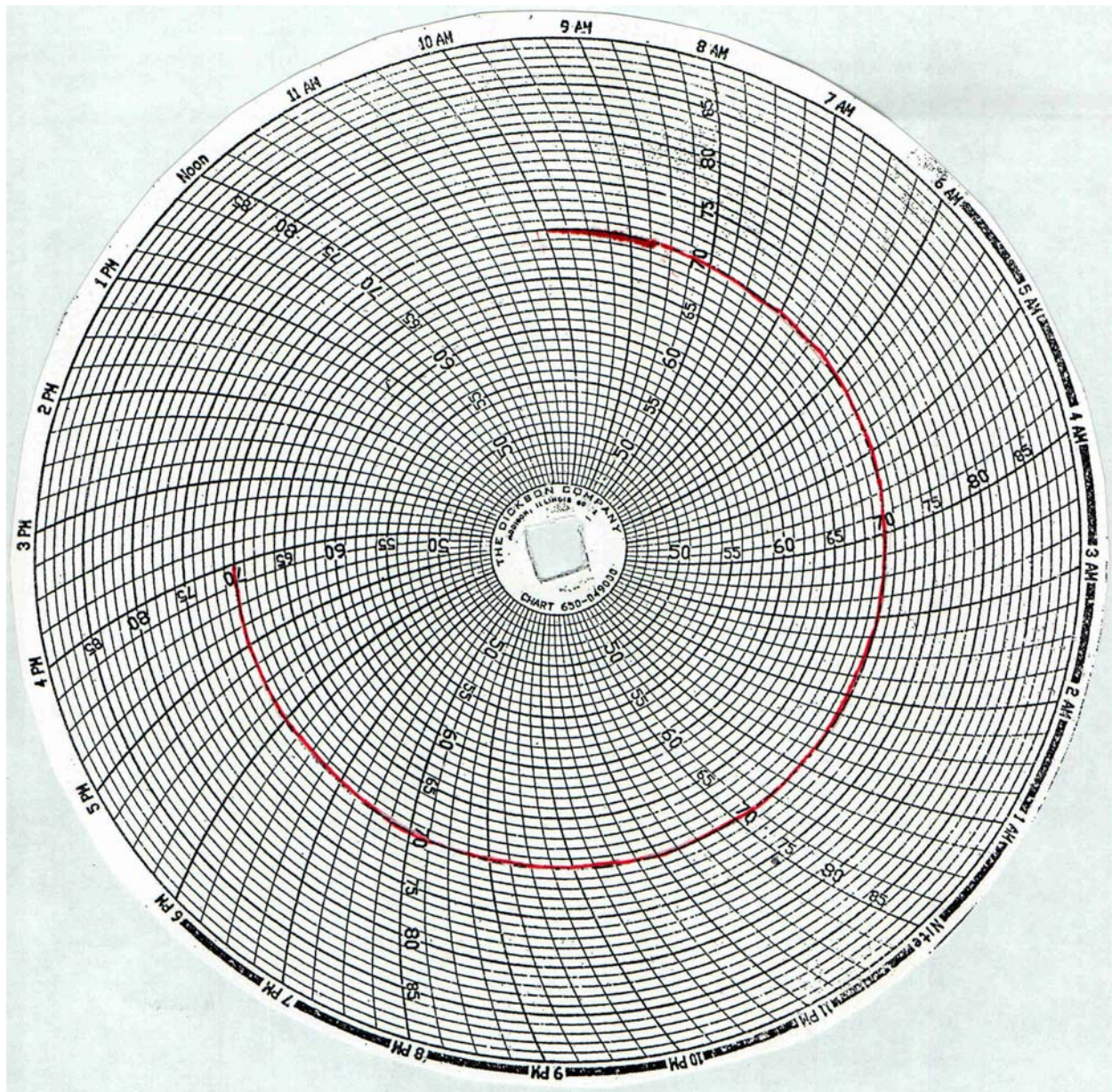
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Kia Sorento LX AWD
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0503
Test Date: 7/28/2010



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

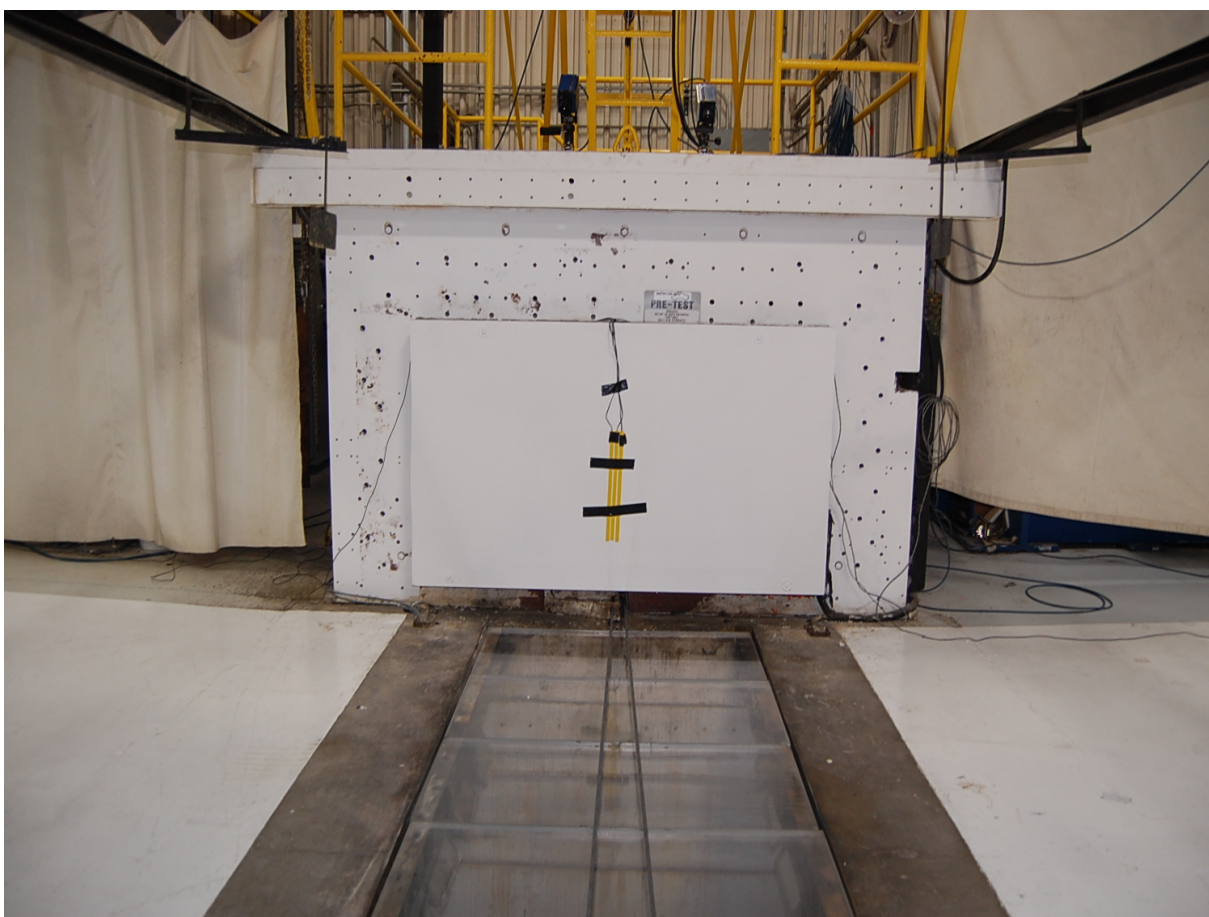
		<u>Page No.</u>
Photo No. 1.	Load Cell Location	A-1
Photo No. 2.	Load Cell Wall	A-1
Photo No. 3.	Manufacturer's Label	A-2
Photo No. 4.	Tire Placard	A-2
Photo No. 5.	Right Front Three-Quarter View, As Received	A-3
Photo No. 6.	Left Rear Three-Quarter View, As Received	A-3
Photo No. 7.	Pre-Test Front View	A-4
Photo No. 8.	Post-Test Front View	A-4
Photo No. 9.	Pre-Test Left Side View (with vehicle at barrier)	A-5
Photo No. 10.	Post-Test Left Side View	A-5
Photo No. 11.	Pre-Test Right Side View (with vehicle at barrier)	A-6
Photo No. 12.	Post-Test Right Side View	A-6
Photo No. 13.	Pre-Test Right Front $\frac{3}{4}$ View	A-7
Photo No. 14.	Post-Test Right Front $\frac{3}{4}$ View	A-7
Photo No. 15.	Pre-Test Left Rear $\frac{3}{4}$ View (with vehicle at barrier)	A-8
Photo No. 16.	Post-Test Left Rear $\frac{3}{4}$ View	A-8
Photo No. 17.	Pre-Test Windshield View	A-9
Photo No. 18.	Post-Test Windshield View	A-9
Photo No. 19.	Pre-Test Engine Compartment View	A-10
Photo No. 20.	Post-Test Engine Compartment View	A-10
Photo No. 21.	Pre-Test Fuel Cap View	A-11
Photo No. 22.	Post-Test Fuel Cap View	A-11
Photo No. 23.	Pre-Test Front Underbody View	A-12
Photo No. 24.	Post-Test Front Underbody View	A-12
Photo No. 25.	Pre-Test Mid Underbody View	A-13
Photo No. 26.	Post-Test Mid Front Underbody View	A-14
Photo No. 27.	Post-Test Mid Rear Underbody View	A-14

		<u>Page No.</u>
Photo No. 28.	Pre-Test Rear Underbody View	A-15
Photo No. 29.	Post-Test Rear Underbody View	A-15
Photo No. 30.	Pre-Test Dummy Cable Routing	A-16
Photo No. 31.	Post-Test Dummy Cable Routing	A-16
Photo No. 32.	Pre-Test Driver Dummy Front View	A-17
Photo No. 33.	Post-Test Driver Dummy Front View	A-17
Photo No. 34.	Pre-Test Driver Dummy Window View	A-18
Photo No. 35.	Post-Test Driver Dummy Window View	A-18
Photo No. 36.	Pre-Test Driver Dummy and Vehicle Interior (Door Open)	A-19
Photo No. 37.	Post-Test Driver Dummy and Vehicle Interior (Door Open)	A-19
Photo No. 38.	Pre-Test Driver's Seat Fore-Aft Markings	A-20
Photo No. 39.	Post-Test Driver's Seat Fore-Aft Markings	A-20
Photo No. 40.	Pre-Test Driver Dummy Feet	A-21
Photo No. 41.	Post-Test Driver Dummy Feet	A-21
Photo No. 42.	Pre-Test Driver's Side Knee Bolster	A-22
Photo No. 43.	Post-Test Driver's Side Knee Bolster	A-22
Photo No. 44.	Pre-Test Driver's Side Floorpan	A-23
Photo No. 45.	Post-Test Driver's Side Floorpan	A-23
Photo No. 46.	Post-Test Driver Dummy Contact with Airbag	A-24
Photo No. 47.	Post-Test Driver Dummy Contact with Headrest	A-25
Photo No. 48.	Post-Test Driver Dummy Contact with Knee Bolster	A-25
Photo No. 49.	Pre-Test View of Steering Column Shear Capsule	A-26
Photo No. 50.	Post-Test View of Steering Column Shear Capsule	A-26
Photo No. 51.	Pre-Test Passenger Dummy Front View	A-27
Photo No. 52.	Post-Test Passenger Dummy Front View	A-27
Photo No. 53.	Pre-Test Passenger Dummy Window View	A-28
Photo No. 54.	Post-Test Passenger Dummy Window View	A-28
Photo No. 55.	Pre-Test Passenger Dummy and Vehicle Interior (Door Open)	A-29

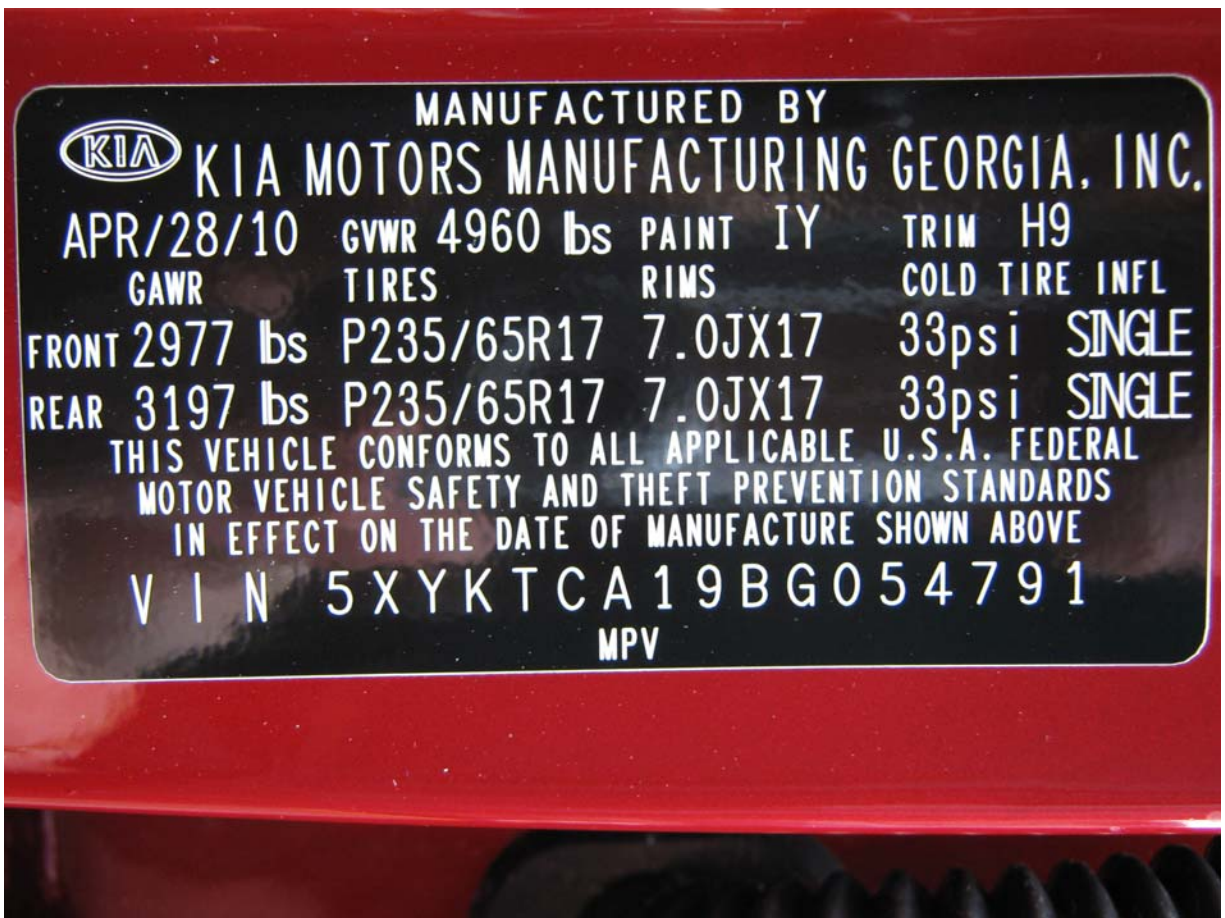
		<u>Page No.</u>
Photo No. 56.	Post-Test Passenger Dummy and Vehicle Interior (Door Open)	A-29
Photo No. 57.	Pre-Test Passenger's Seat Fore-Aft Markings	A-30
Photo No. 58.	Post-Test Passenger's Seat Fore-Aft Markings	A-30
Photo No. 59.	Pre-Test Passenger Dummy Feet	A-31
Photo No. 60.	Post-Test Passenger Dummy Feet	A-31
Photo No. 61.	Pre-Test Passenger's Side Knee Bolster	A-32
Photo No. 62.	Post-Test Passenger's Side Knee Bolster	A-32
Photo No. 63.	Pre-Test Passenger's Side Floorpan	A-33
Photo No. 64.	Post-Test Passenger's Side Floorpan	A-33
Photo No. 65.	Post-Test Passenger Dummy Contact with Airbag	A-34
Photo No. 66.	Post-Test Passenger Dummy Contact with Headrest	A-35
Photo No. 67.	Post-Test Passenger Dummy Contact with Glovebox	A-35
Photo No. 68.	Ballast Installed in Vehicle	A-36
Photo No. 69.	Post-Test Stoddard Solvent Spillage Location, if required	A-36
Photo No. 70.	Post-Test Speed Trap Read-Out	A-37
Photo No. 71.	Vehicle at 0 Degrees on Static Rollover Device	A-37
Photo No. 72.	Vehicle at 90 Degrees on Static Rollover Device	A-38
Photo No. 73.	Vehicle at 180 Degrees on Static Rollover Device	A-38
Photo No. 74.	Vehicle at 270 Degrees on Static Rollover Device	A-39
Photo No. 75.	Vehicle at 360 Degrees on Static Rollover Device	A-39
Photo No. 76.	Vehicle Impact	A-40
Photo No. 77.	Monroney Label	A-41



Load Cell Location



Load Cell Wall



Manufacturer's Label



Tire Placard



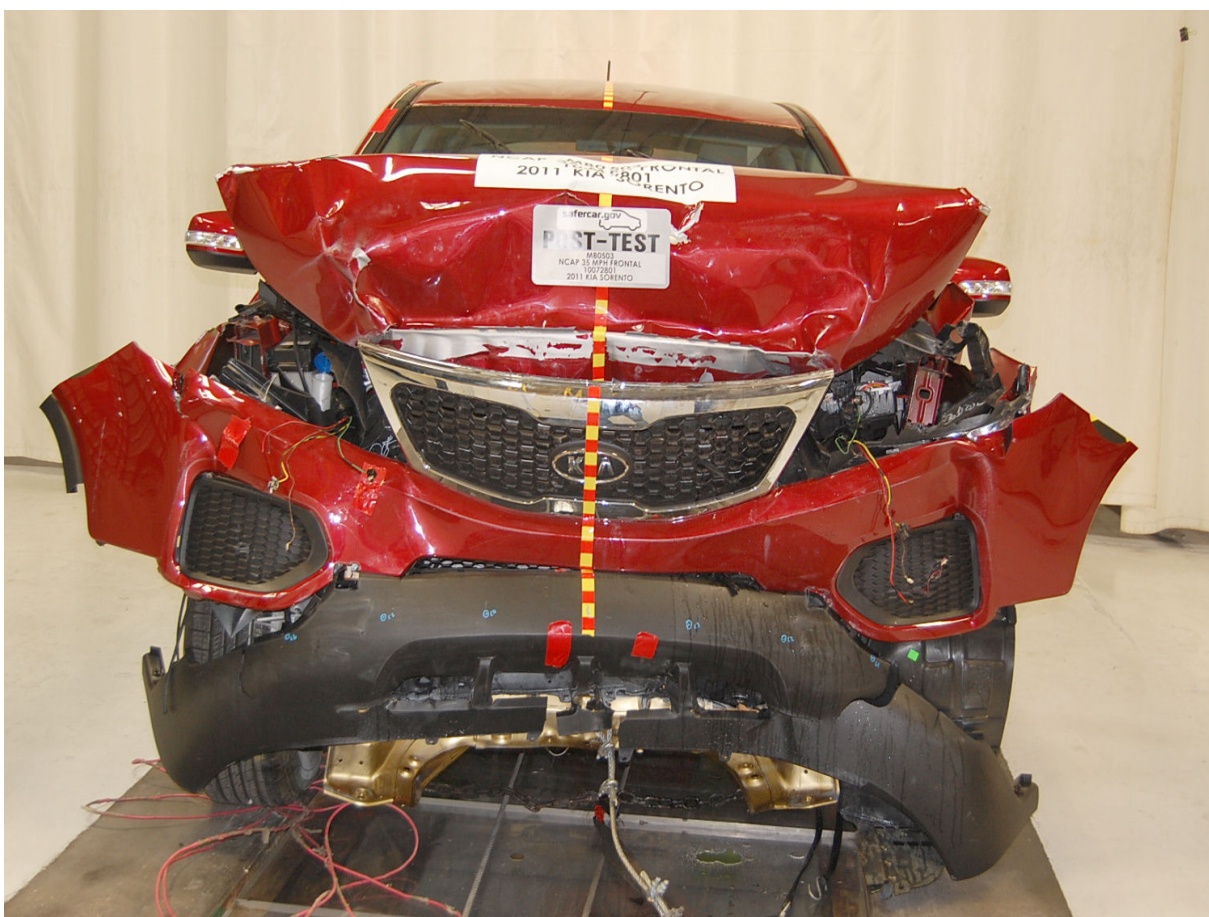
Right Front Three-Quarter View, As Received



Left Rear Three-Quarter View, As Received



Pre-Test Front View



Post-Test Front View



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



Post-Test Left Side View



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



Post-Test Right Side View



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



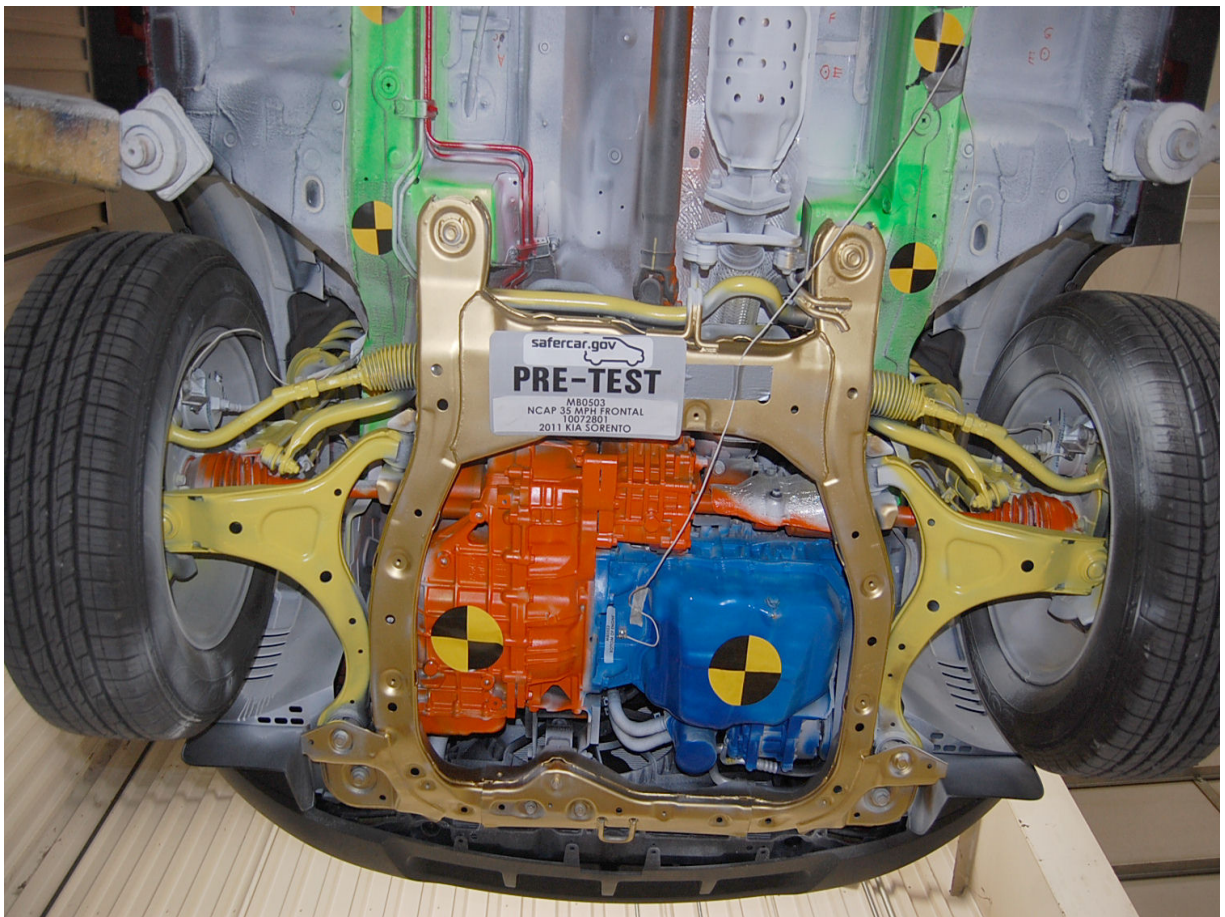
Post-Test Engine Compartment View



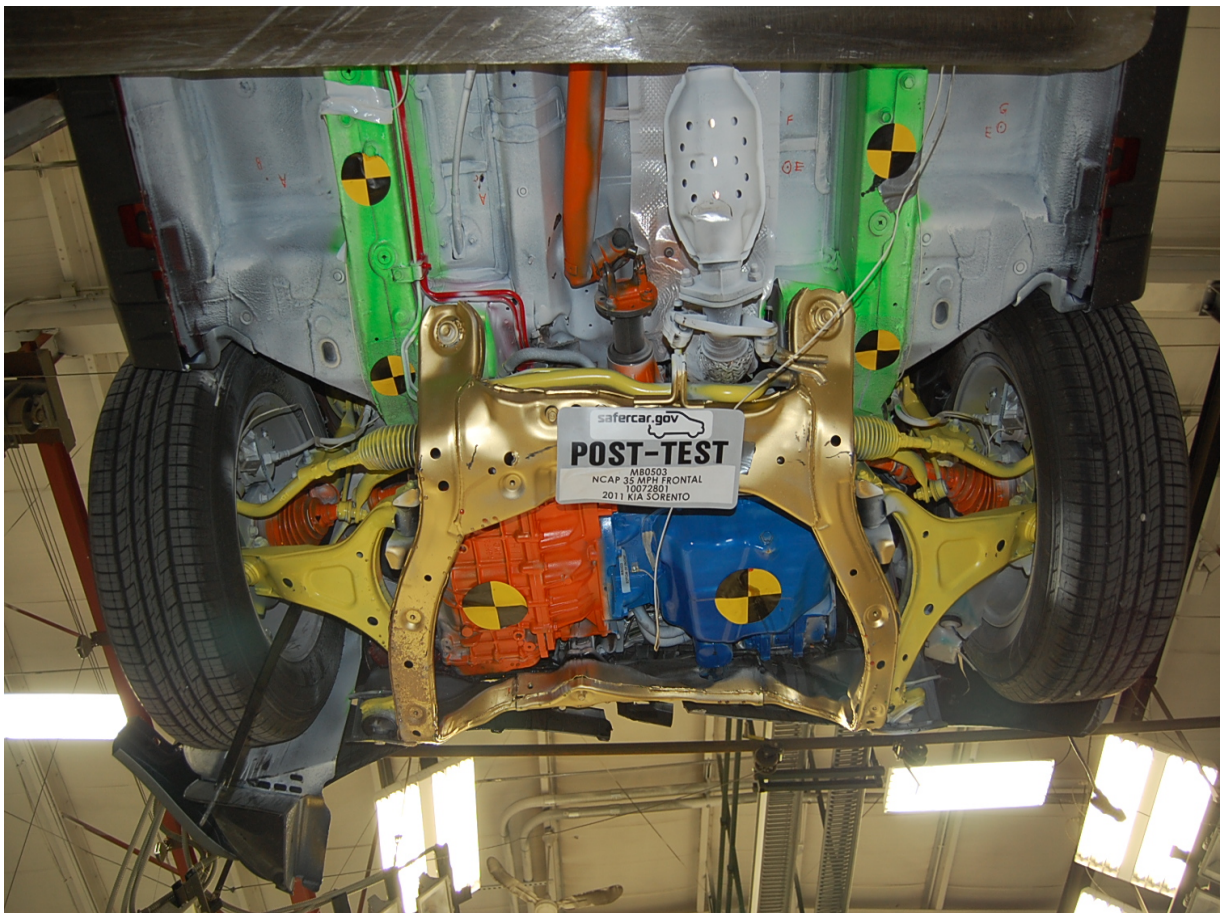
Pre-Test Fuel Cap View



Post-Test Fuel Cap View



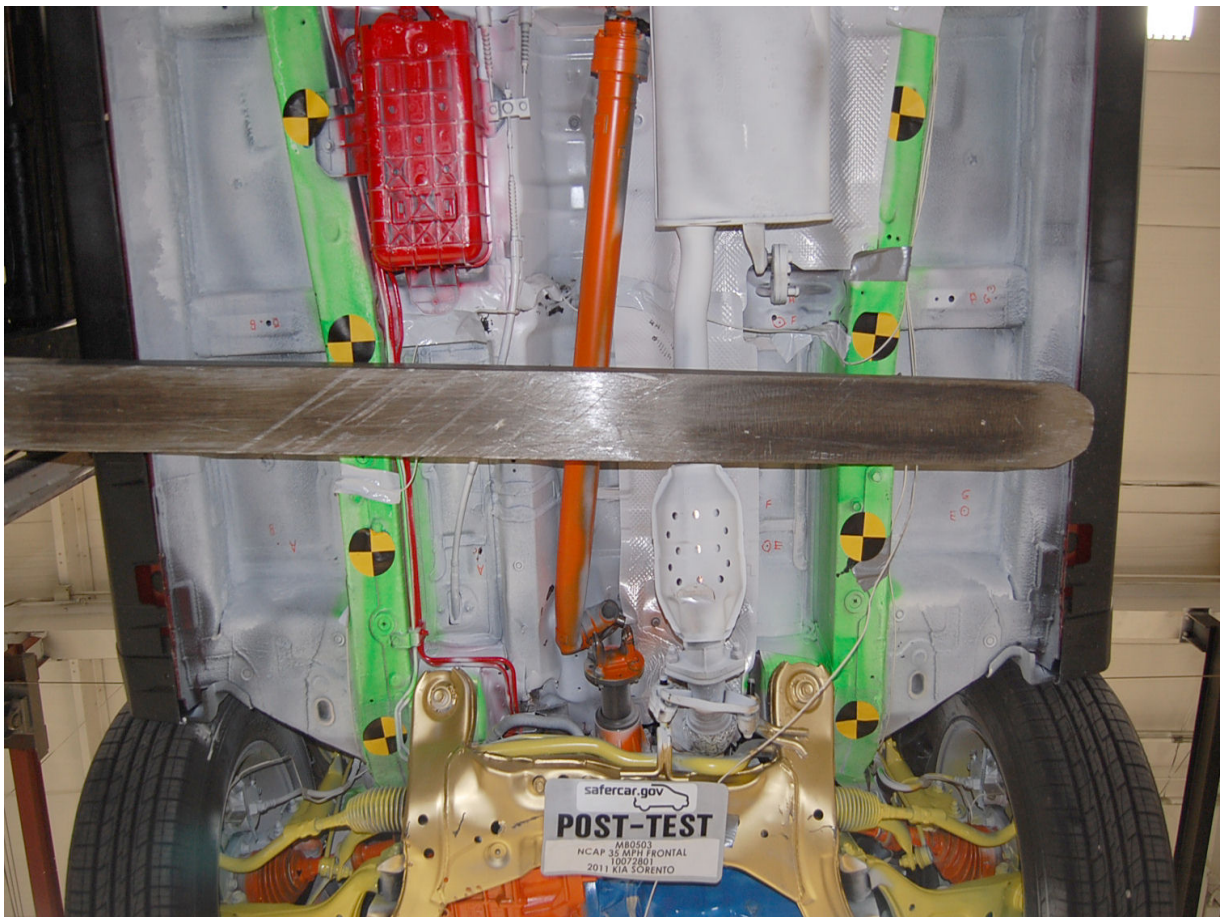
Pre-Test Front Underbody View



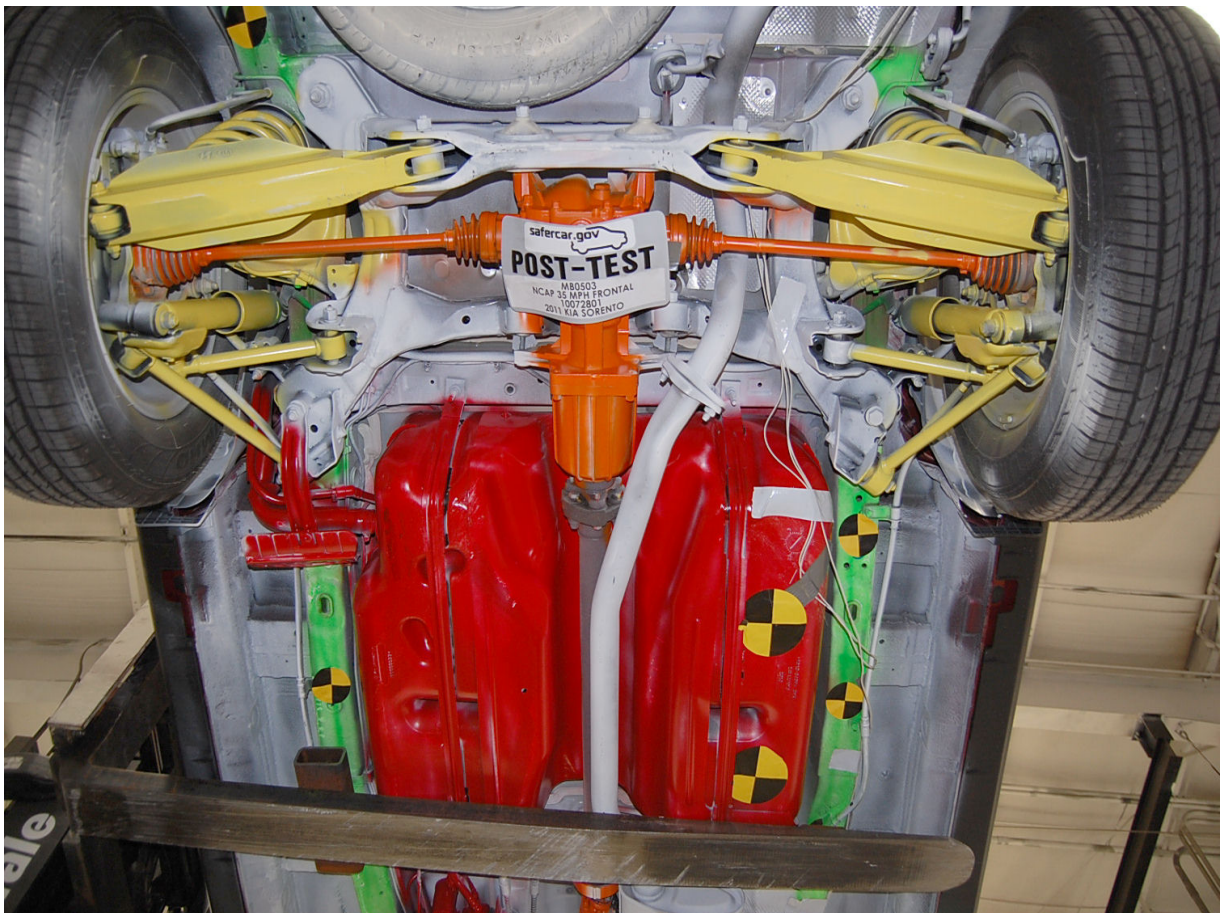
Post-Test Front Underbody View



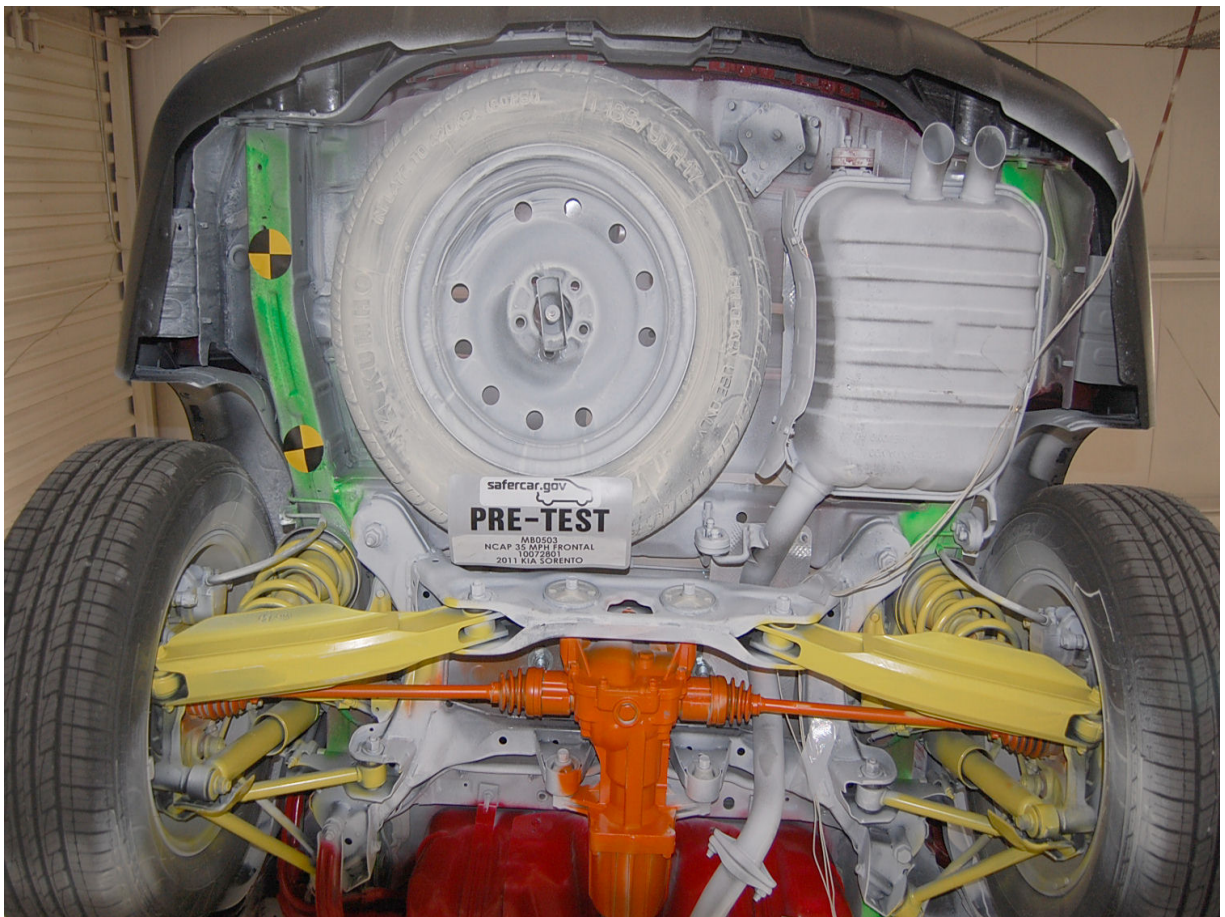
Pre-Test Mid Underbody View



Post-Test Mid Front Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



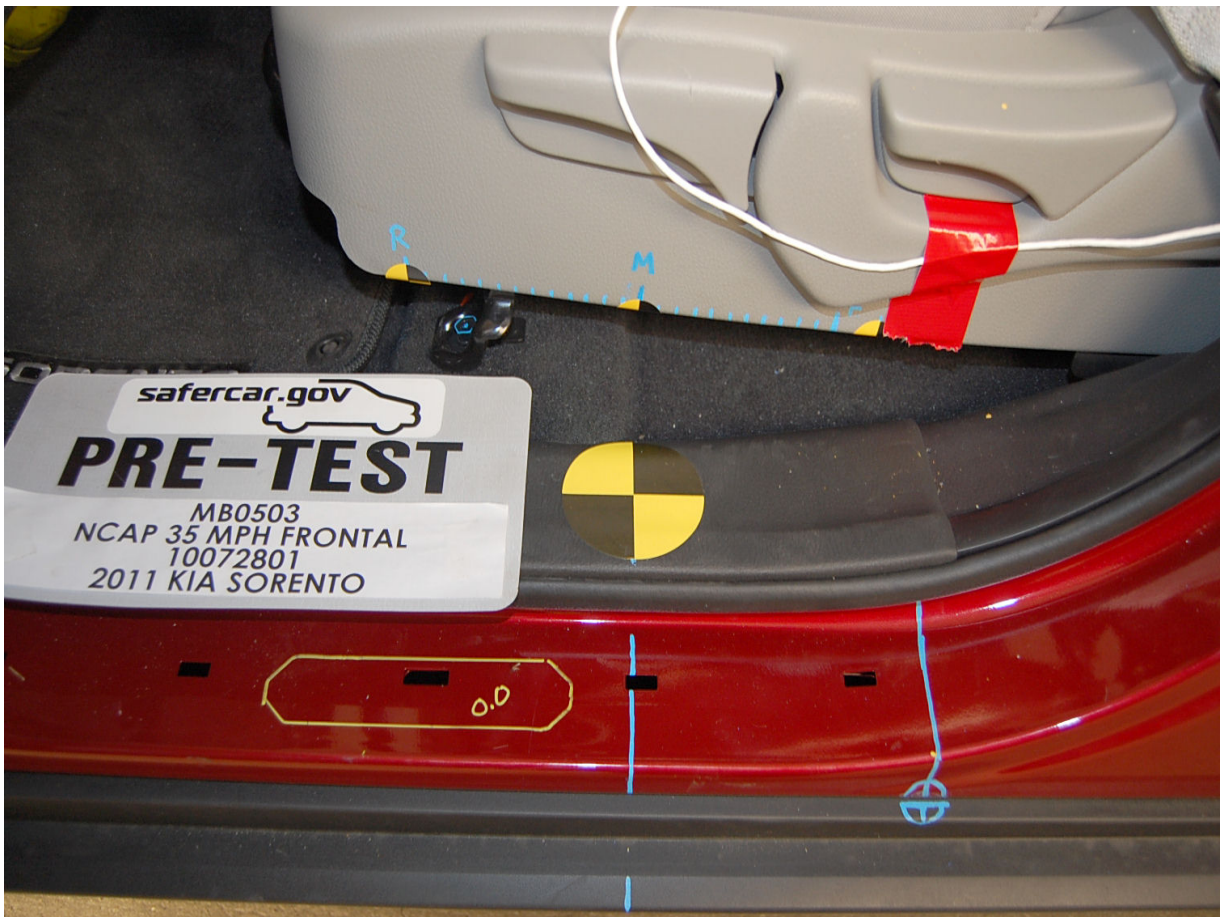
Post-Test Driver Dummy Window View



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



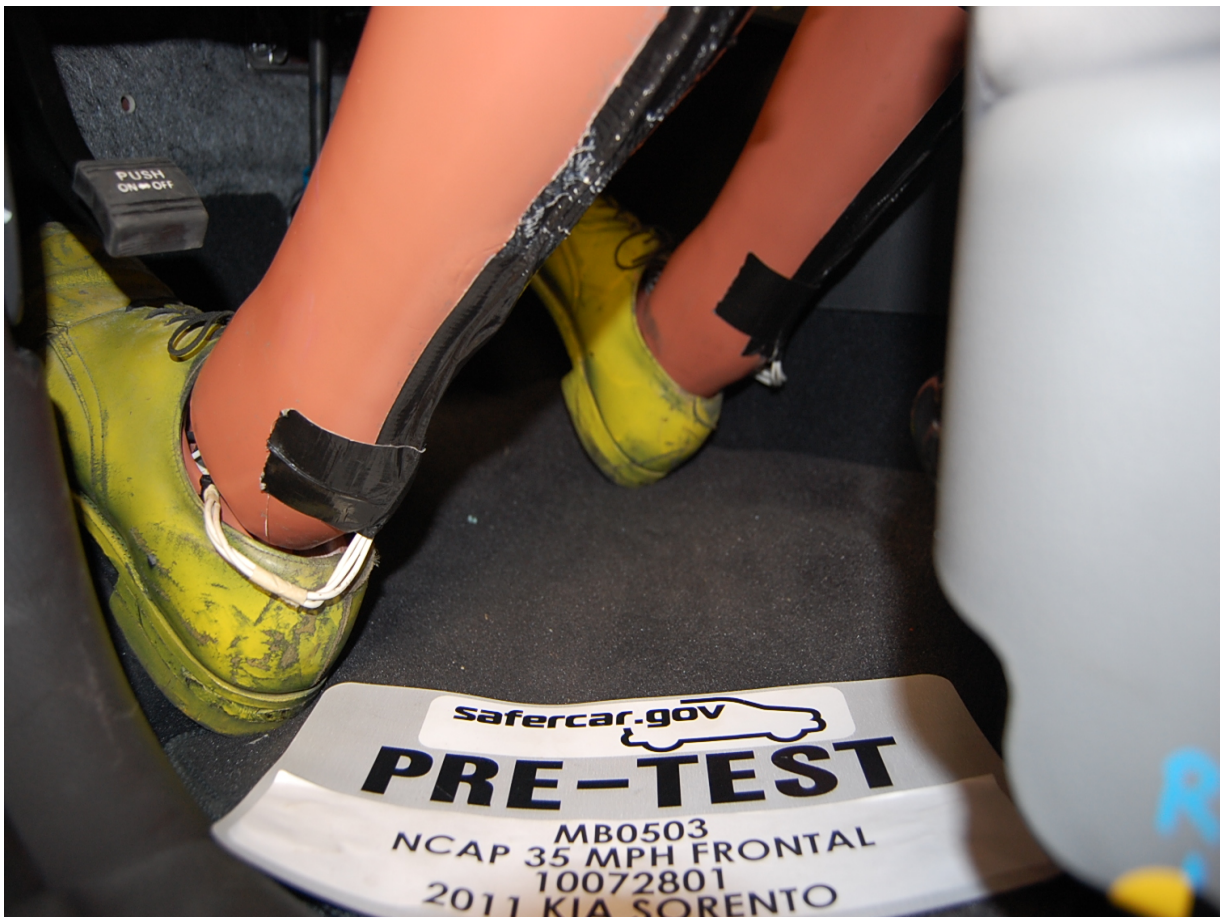
Post-Test Driver Dummy and Vehicle Interior (Door Open)



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



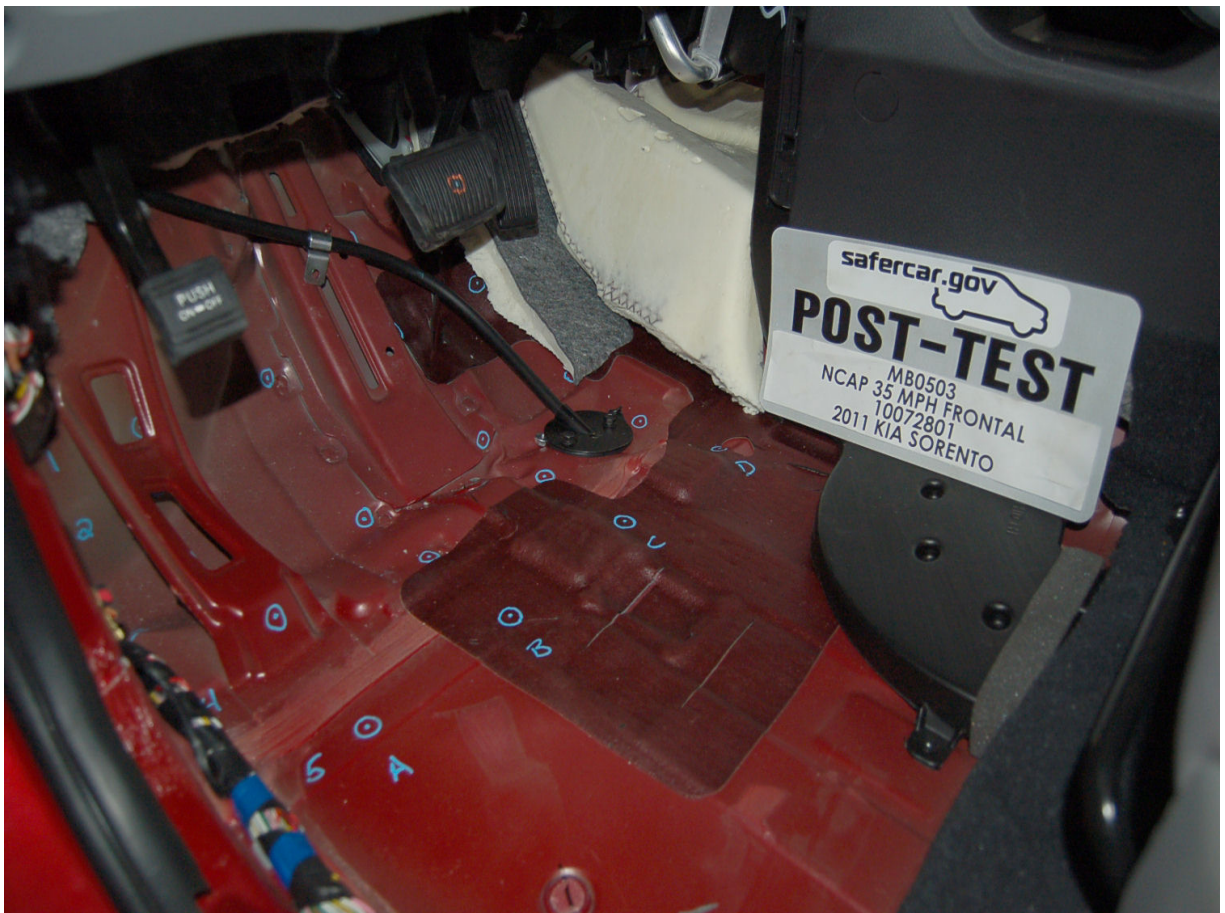
Pre-Test Driver's Side Knee Bolster



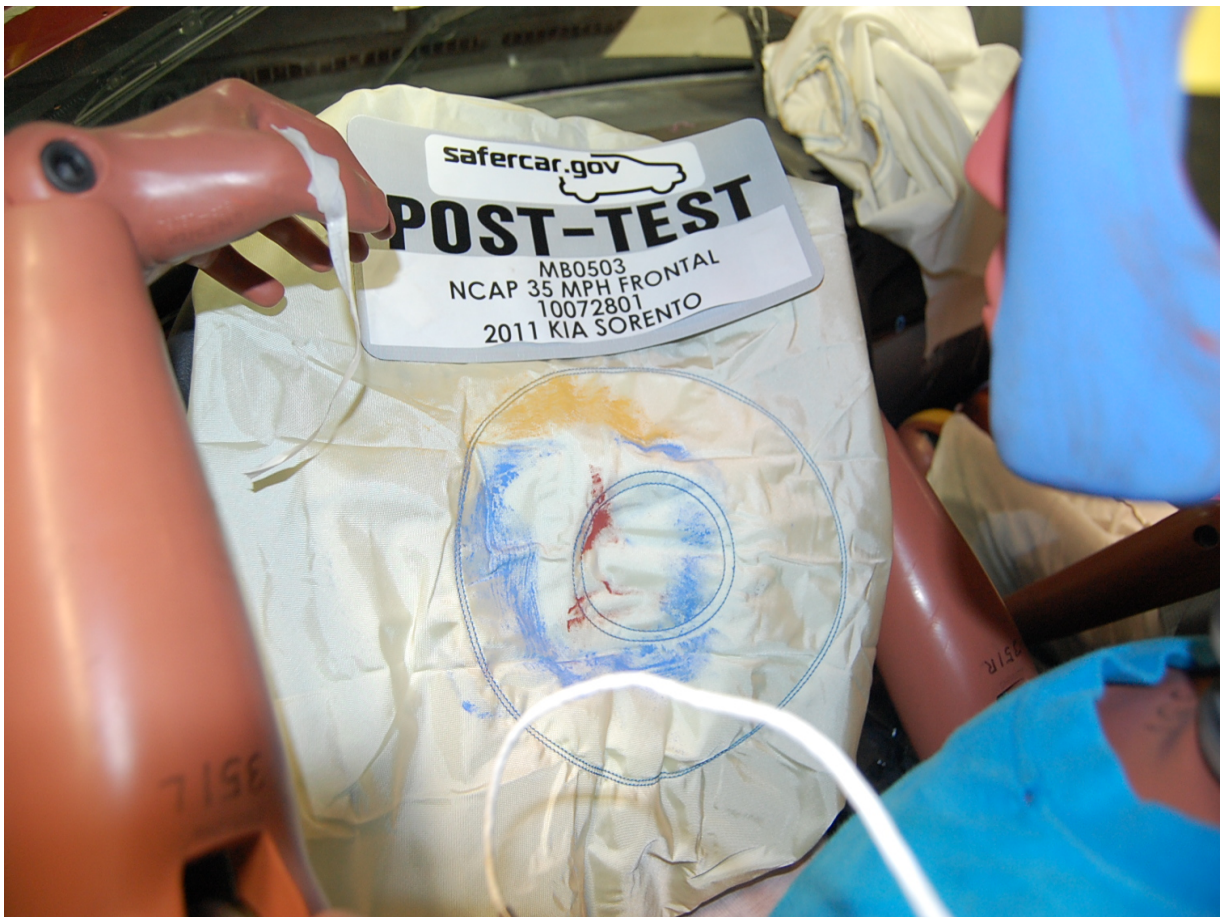
Post-Test Driver's Side Knee Bolster



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



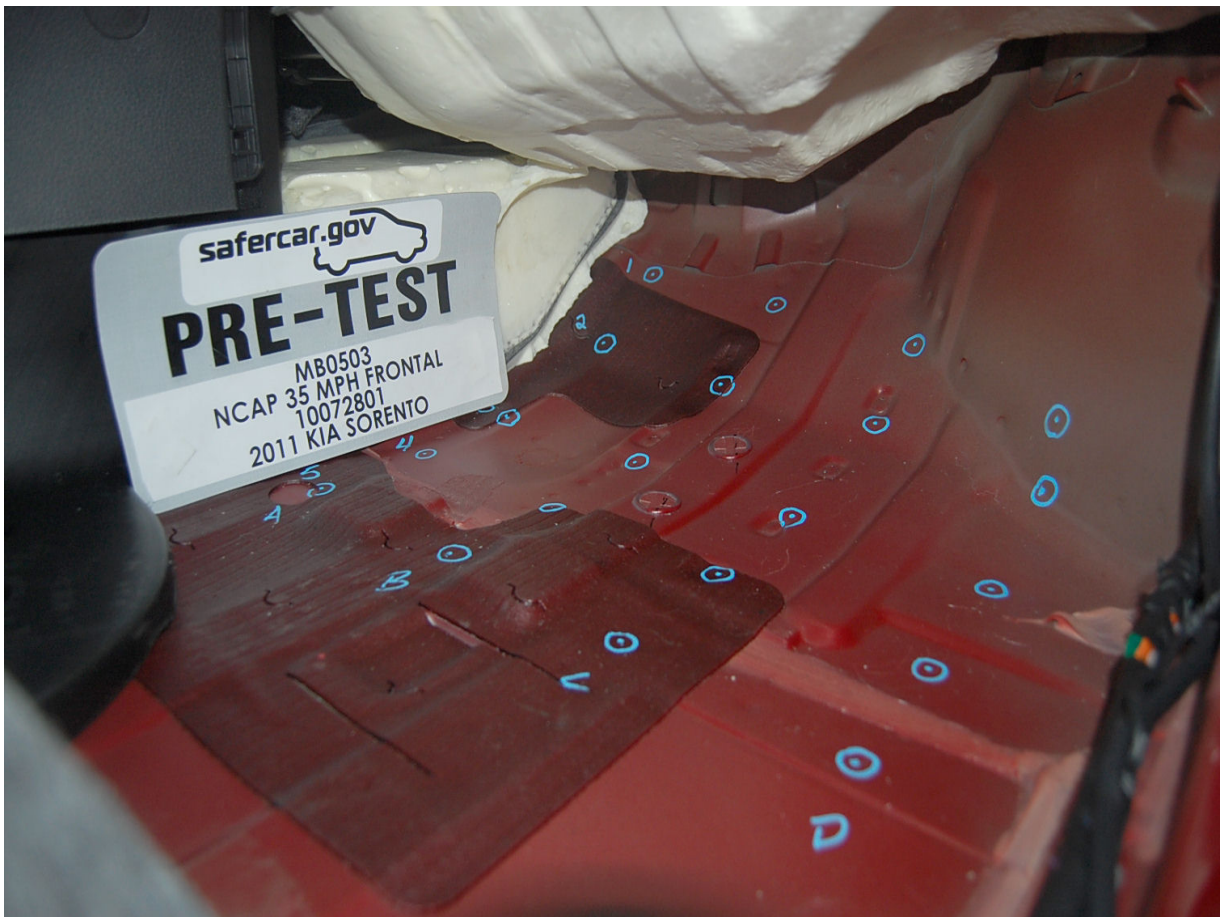
Post-Test Passenger Dummy Feet



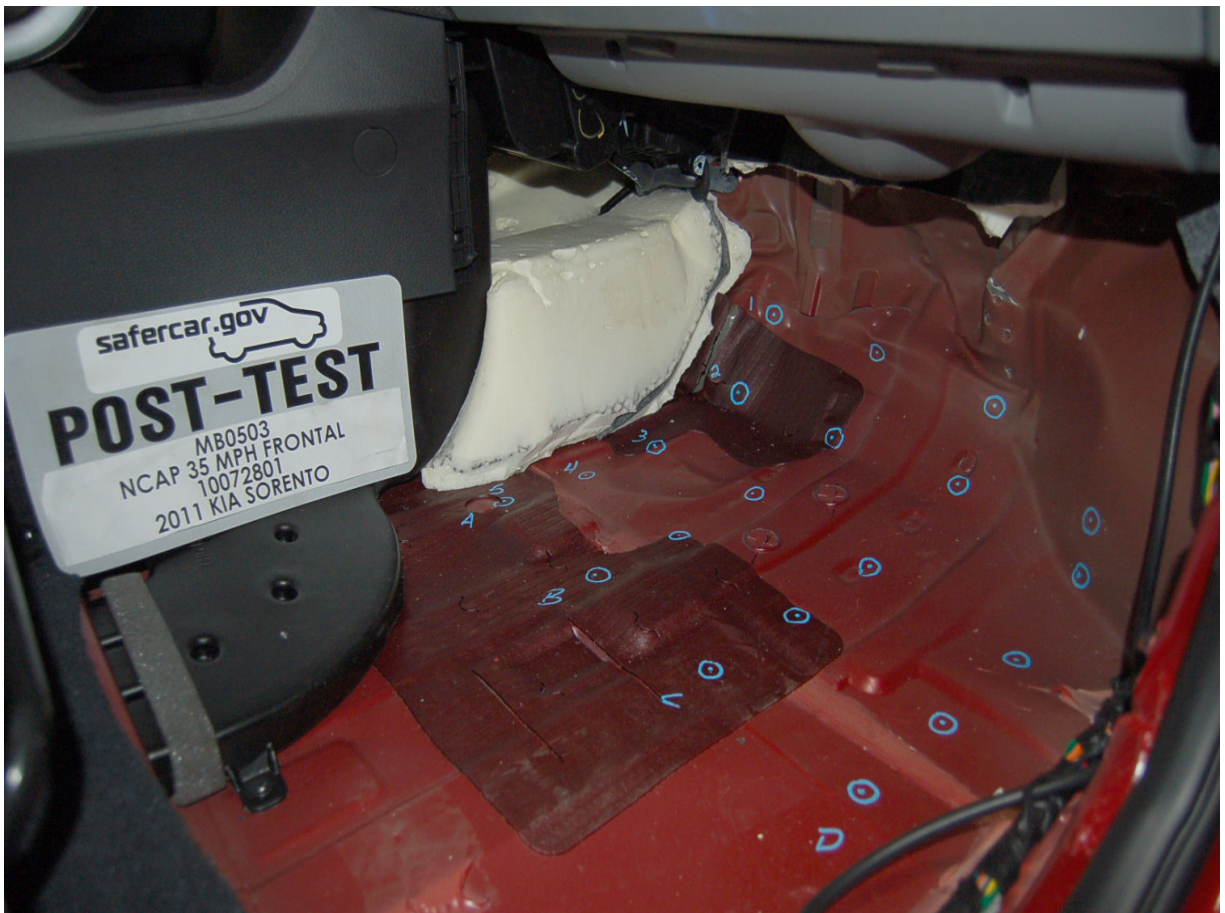
Pre-Test Passenger's Side Knee Bolster



Post-Test Passenger's Side Knee Bolster



Pre-Test Passenger's Side Floorpan



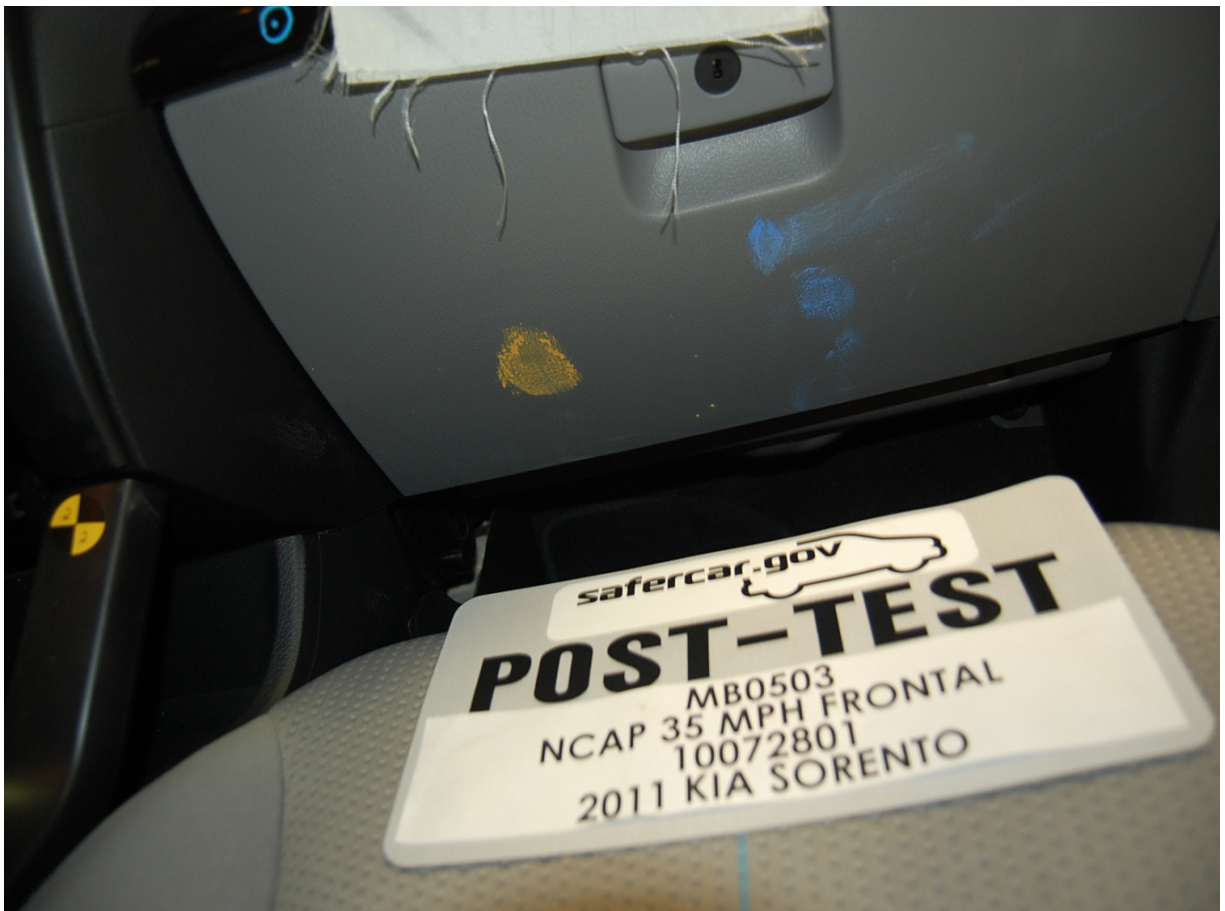
Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Contact with Airbag



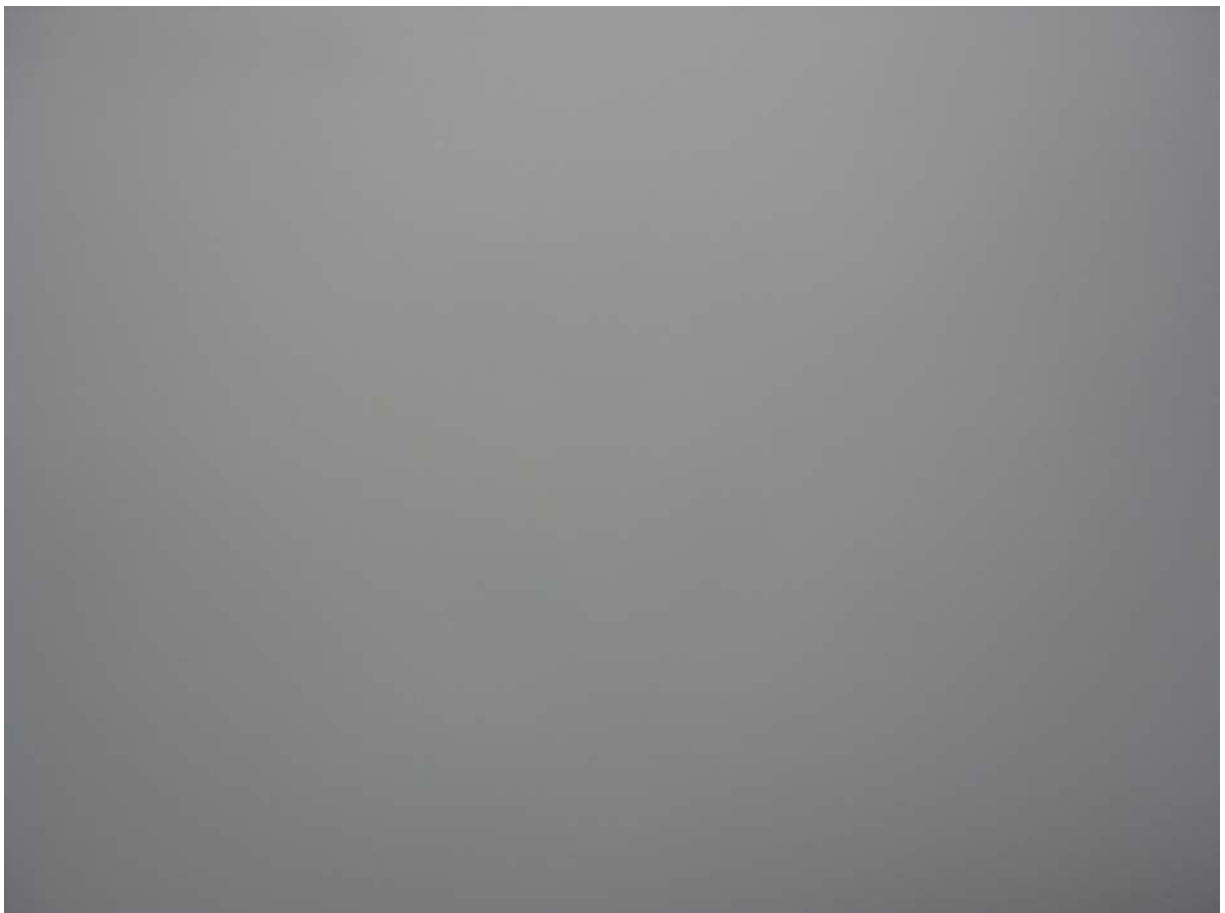
Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glovebox



Ballast Installed in Vehicle



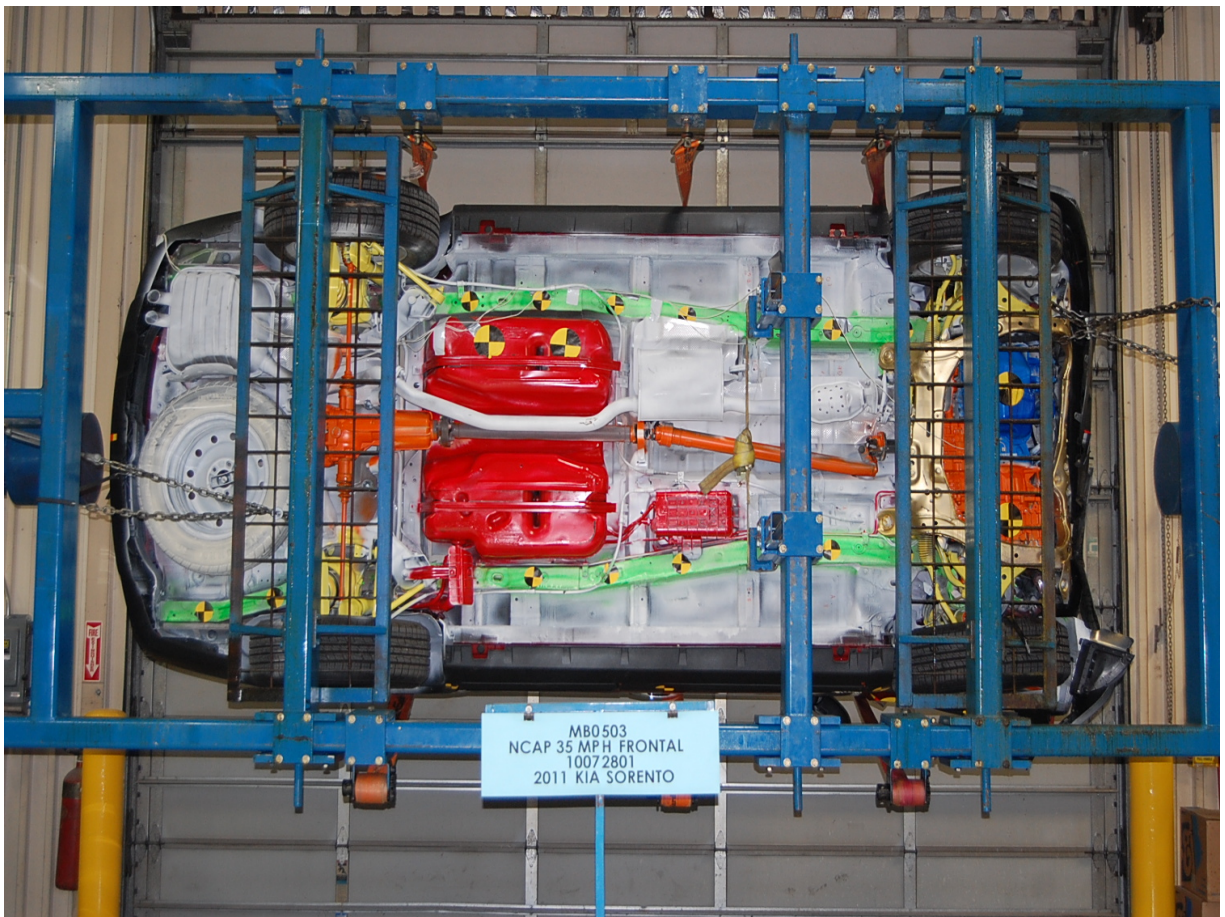
Post-Test Stoddard Solvent Spillage Location, if required



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

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Page No.

List of Data Plots Provided in the Test Report

Figure No. 1.	Driver Head X Acceleration vs. Time	B-1
Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Driver Chest Displacement vs. Time	B-2
Figure No. 6.	Driver Chest X Acceleration vs. Time	B-3
Figure No. 7.	Driver Chest Y Acceleration vs. Time	B-3
Figure No. 8.	Driver Chest Z Acceleration vs. Time	B-3
Figure No. 9.	Driver Chest Resultant Acceleration vs. Time	B-3
Figure No. 10.	Driver Neck Force X vs. Time	B-4
Figure No. 11.	Driver Neck Force Z vs. Time	B-4
Figure No. 12.	Driver Neck Moment Y vs. Time	B-4
Figure No. 13.	Driver Nij (NTF) vs. Time	B-5
Figure No. 14.	Driver Nij (NTE) vs. Time	B-5
Figure No. 15.	Driver Nij (NCF) vs. Time	B-5
Figure No. 16.	Driver Nij (NCE) vs. Time	B-5
Figure No. 17.	Driver Left Femur Force vs. Time	B-6
Figure No. 18.	Driver Right Femur Force vs. Time	B-6
Figure No. 19.	Passenger Head X Acceleration vs. Time	B-7
Figure No. 20.	Passenger Head Y Acceleration vs. Time	B-7
Figure No. 21.	Passenger Head Z Acceleration vs. Time	B-7
Figure No. 22.	Passenger Head Resultant Acceleration vs. Time	B-7
Figure No. 23.	Passenger Chest Displacement vs. Time	B-8
Figure No. 24.	Passenger Chest X Acceleration vs. Time	B-9
Figure No. 25.	Passenger Chest Y Acceleration vs. Time	B-9
Figure No. 26.	Passenger Chest Z Acceleration vs. Time	B-9
Figure No. 27.	Passenger Chest Resultant Z Acceleration vs. Time	B-9

	<u>Page No.</u>
Figure No. 28. Passenger Neck Force X vs. Time	B-10
Figure No. 29. Passenger Neck Force Z vs. Time	B-10
Figure No. 30. Passenger Neck Moment Y vs. Time	B-10
Figure No. 31. Passenger Nij (NTF) vs. Time	B-11
Figure No. 32. Passenger Nij (NTE) vs. Time	B-11
Figure No. 33. Passenger Nij (NCF) vs. Time	B-11
Figure No. 34. Passenger Nij (NCE) vs. Time	B-11
Figure No. 35. Passenger Left Femur Force vs. Time	B-12
Figure No. 36. Passenger Right Femur Force vs. Time	B-12

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

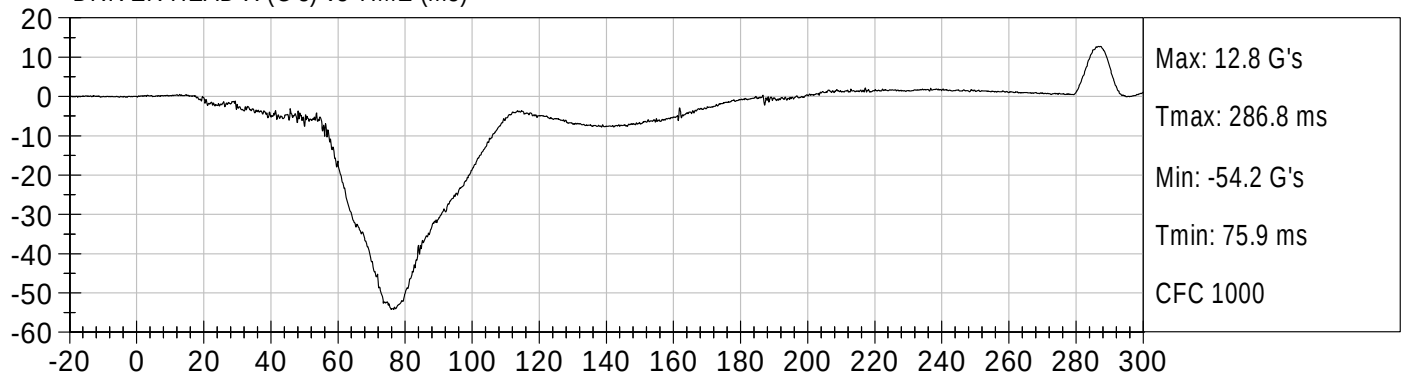
Driver Left Lower Tibia Moment Y

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 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

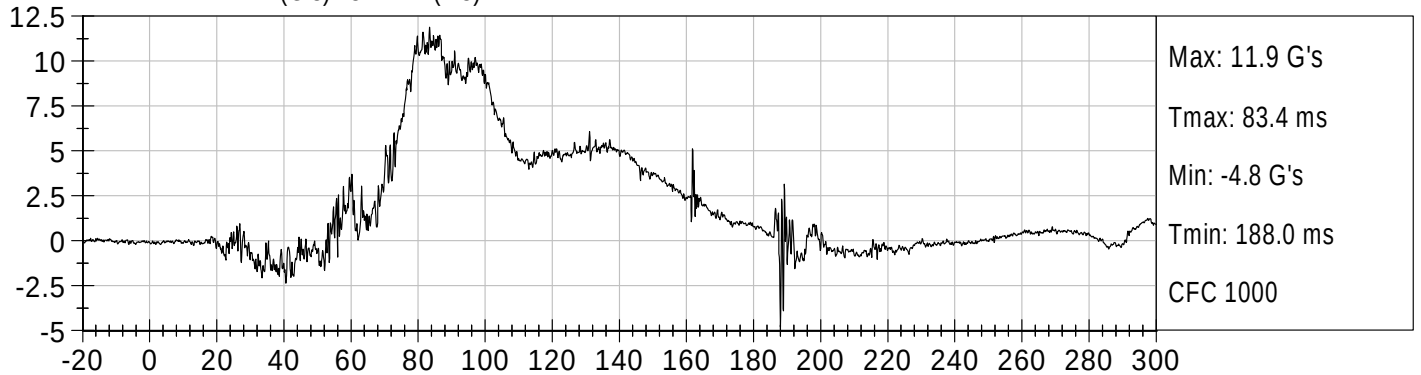
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot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



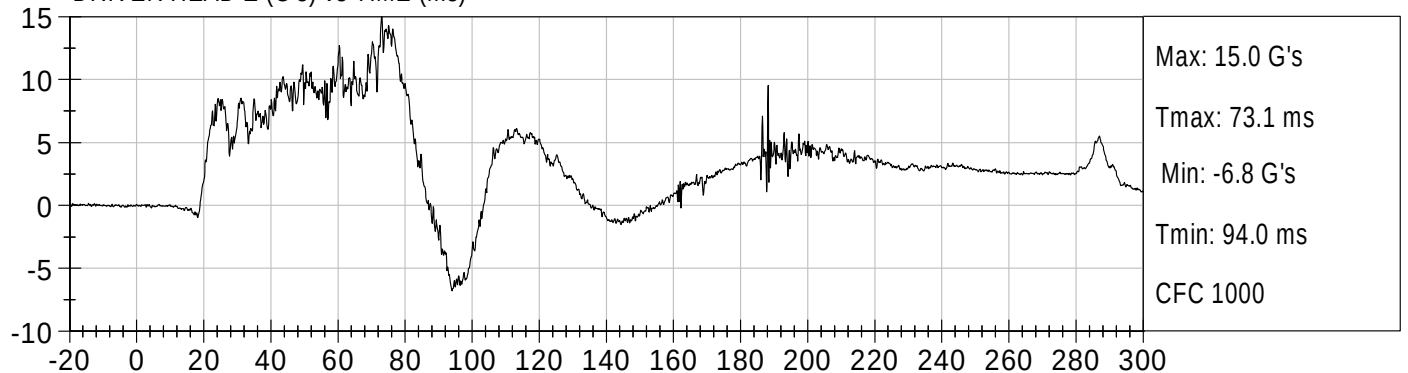
DRIVER HEAD X (G's) vs TIME (ms)



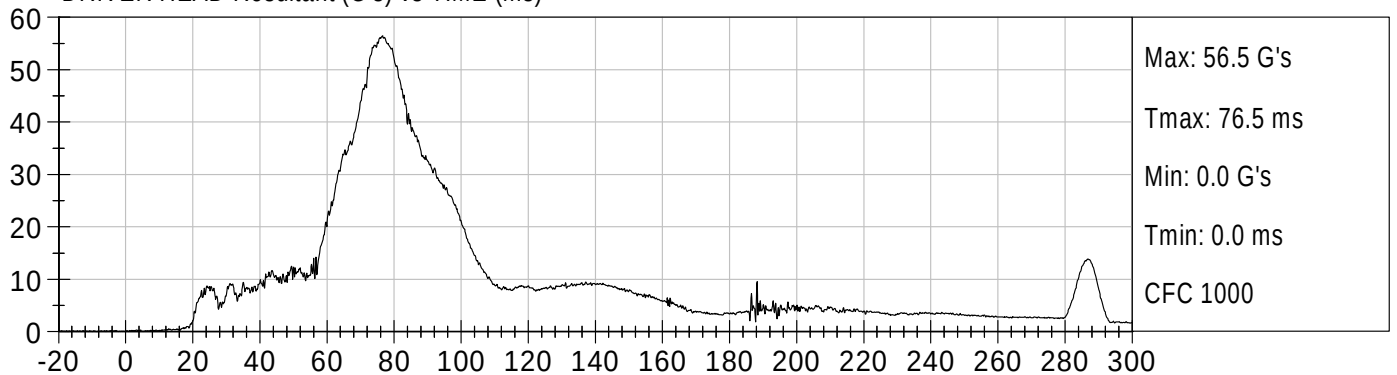
DRIVER HEAD Y (G's) vs TIME (ms)

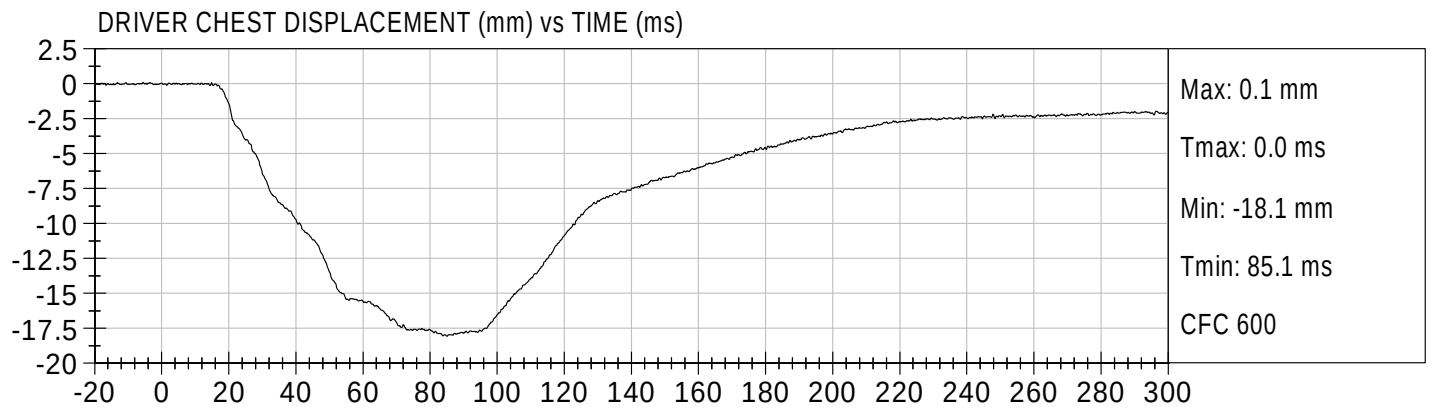


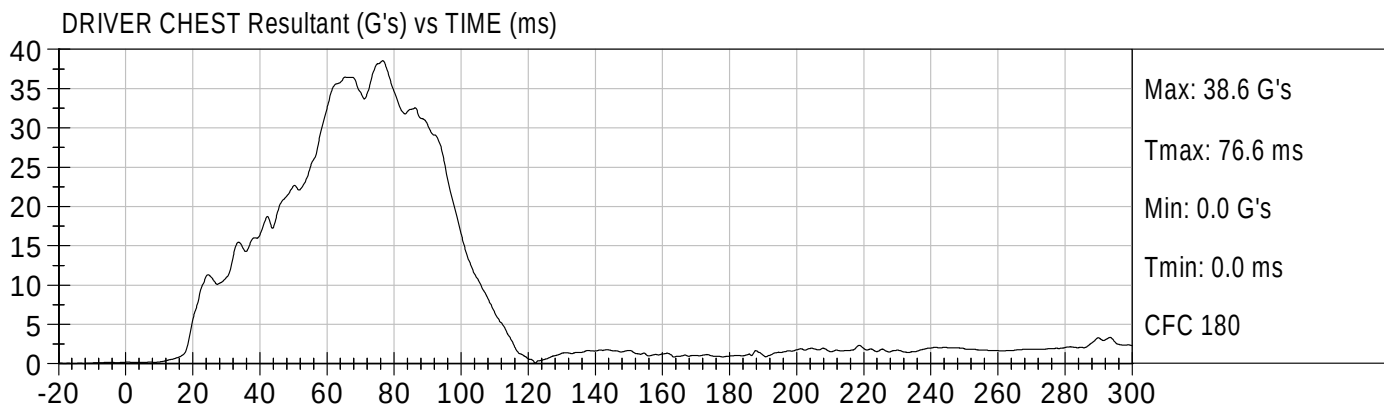
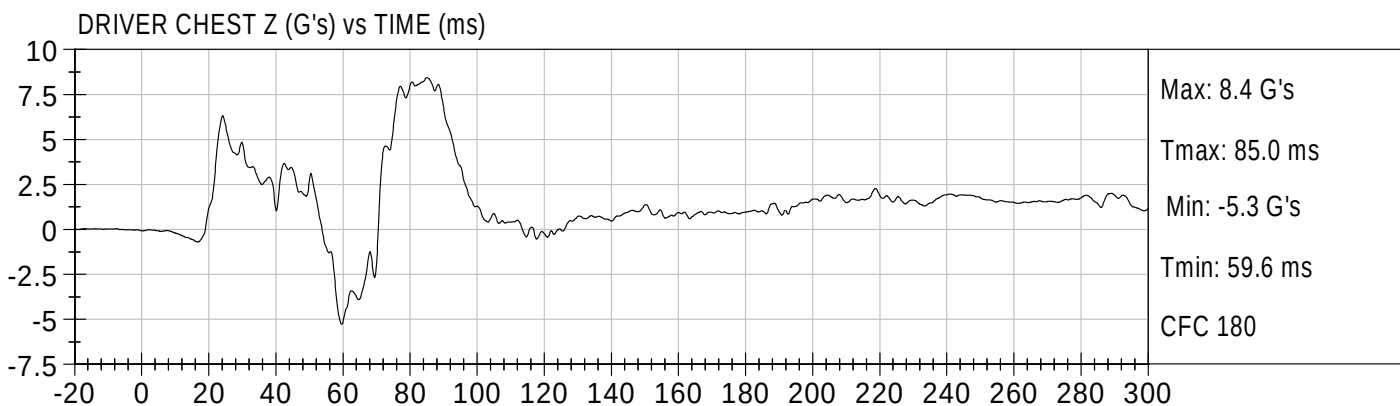
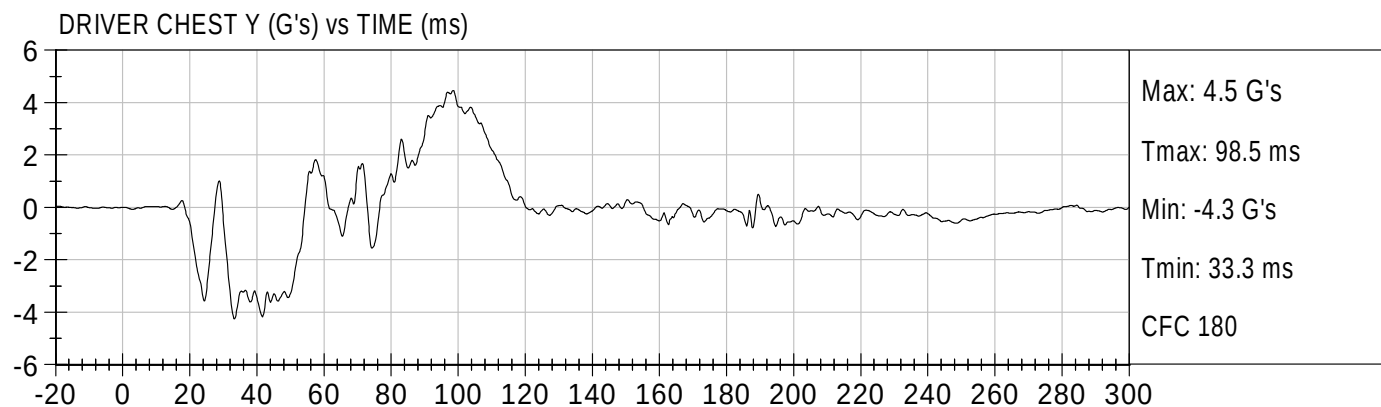
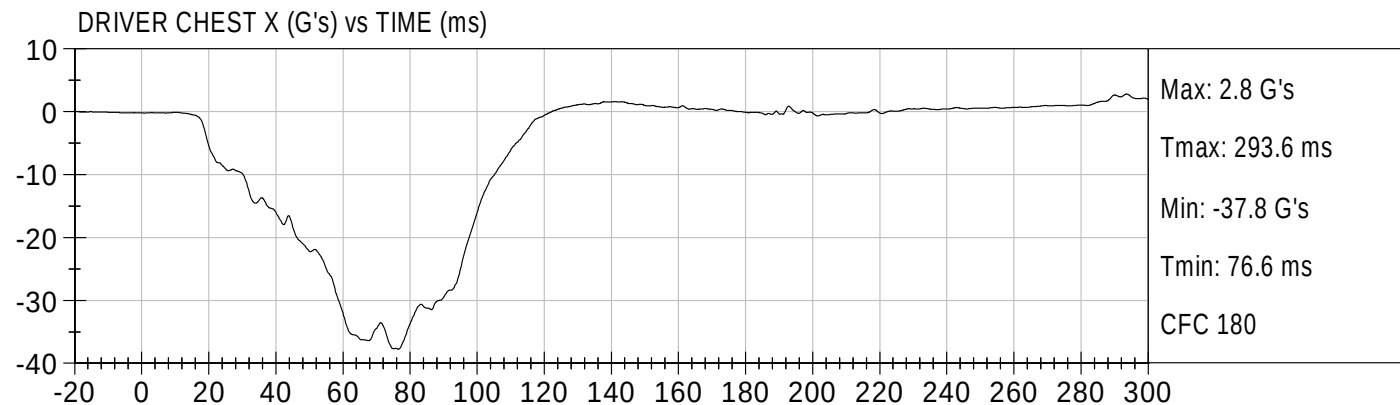
DRIVER HEAD Z (G's) vs TIME (ms)

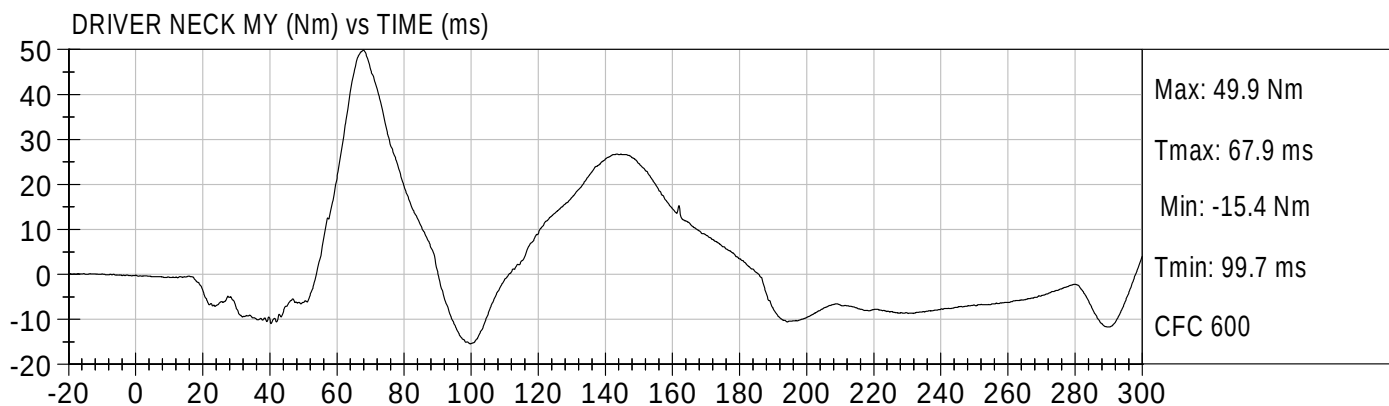
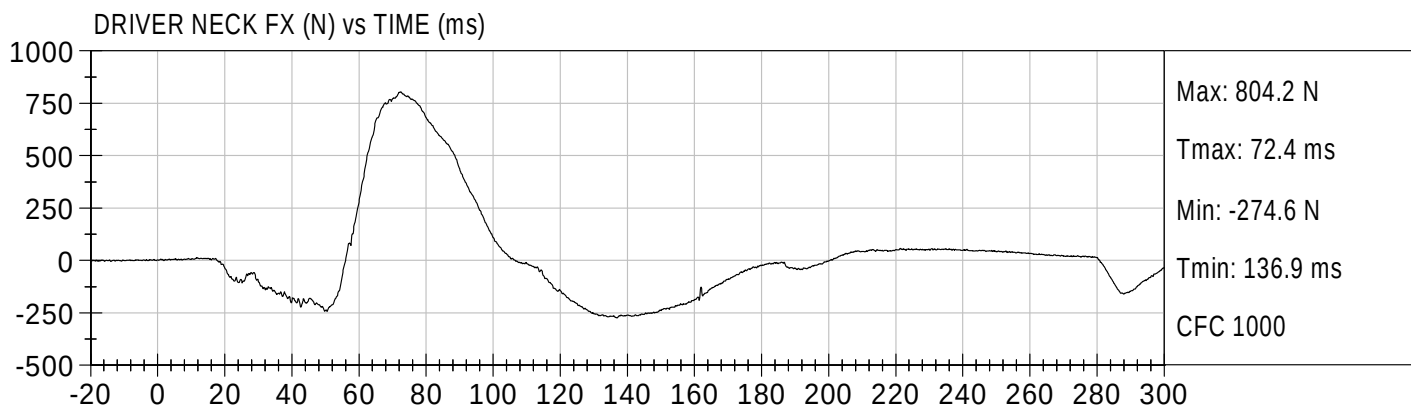


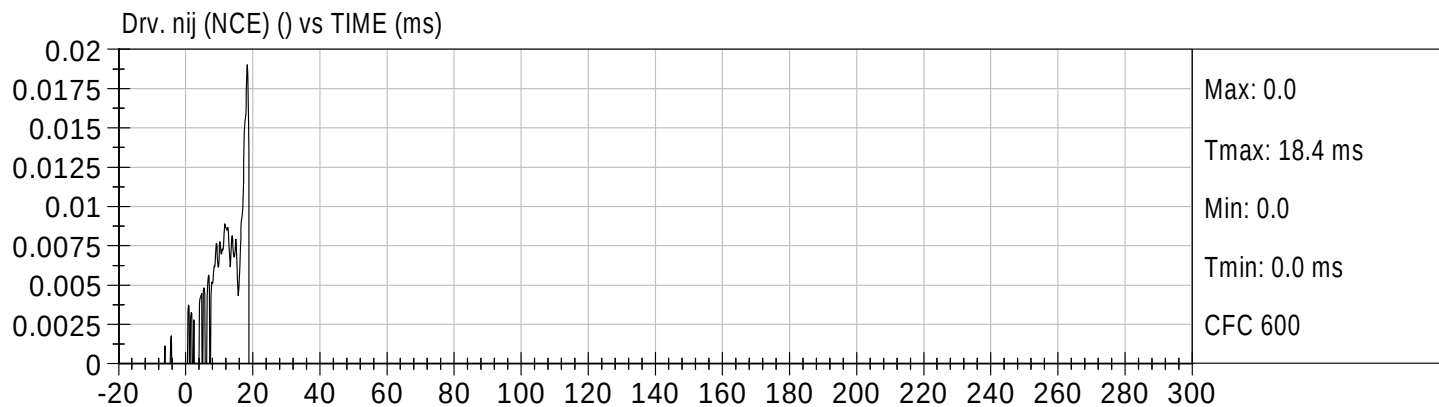
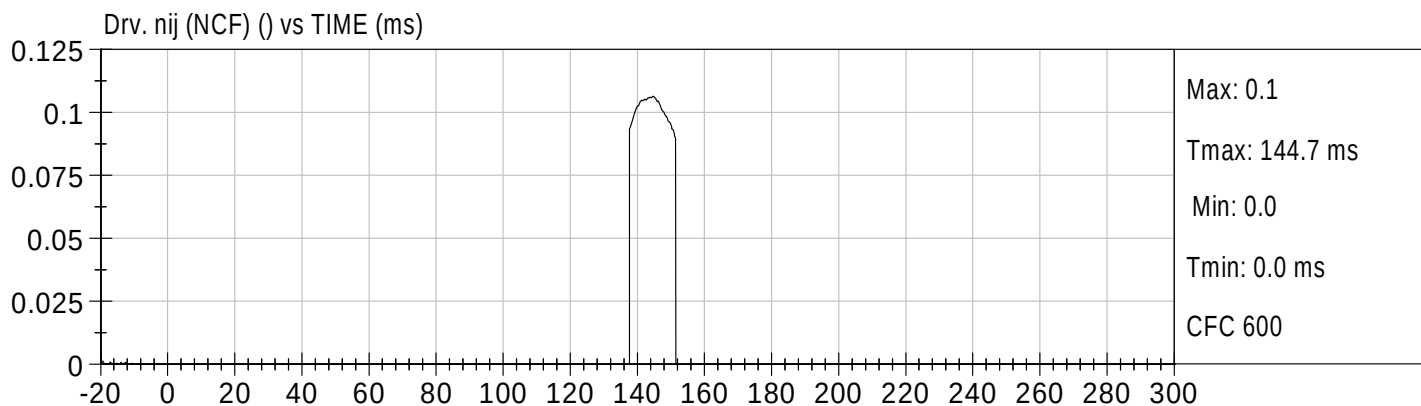
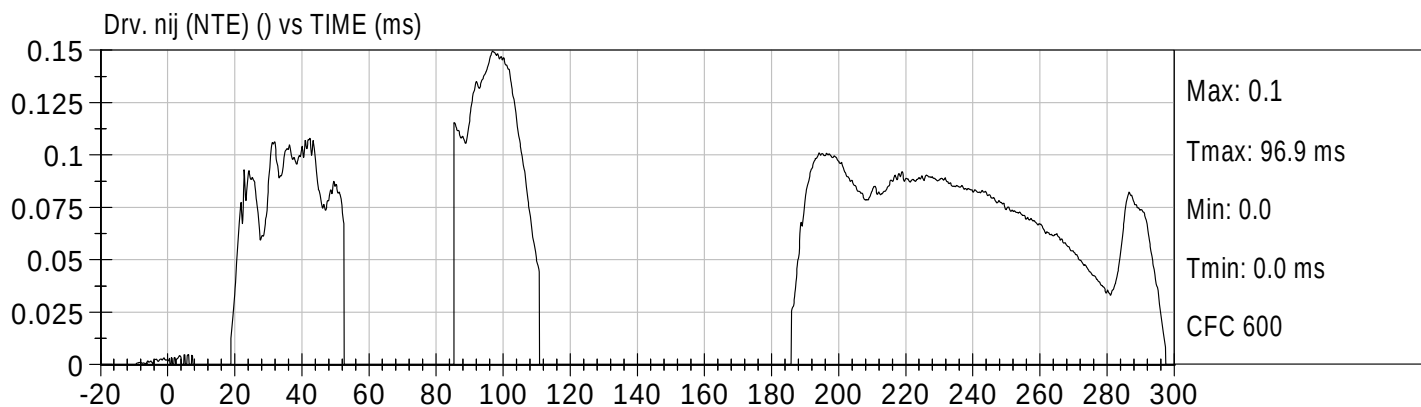
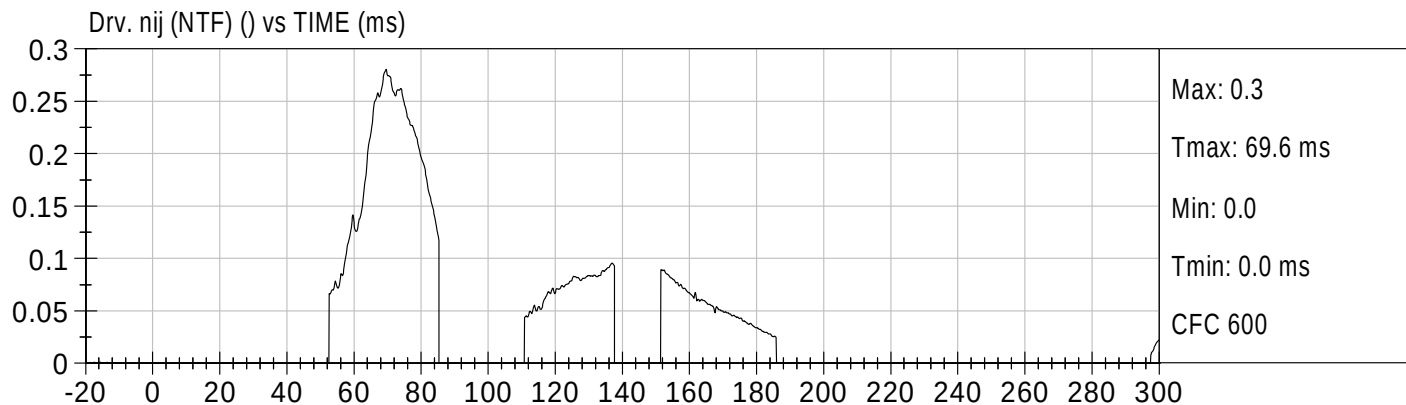
DRIVER HEAD Resultant (G's) vs TIME (ms)

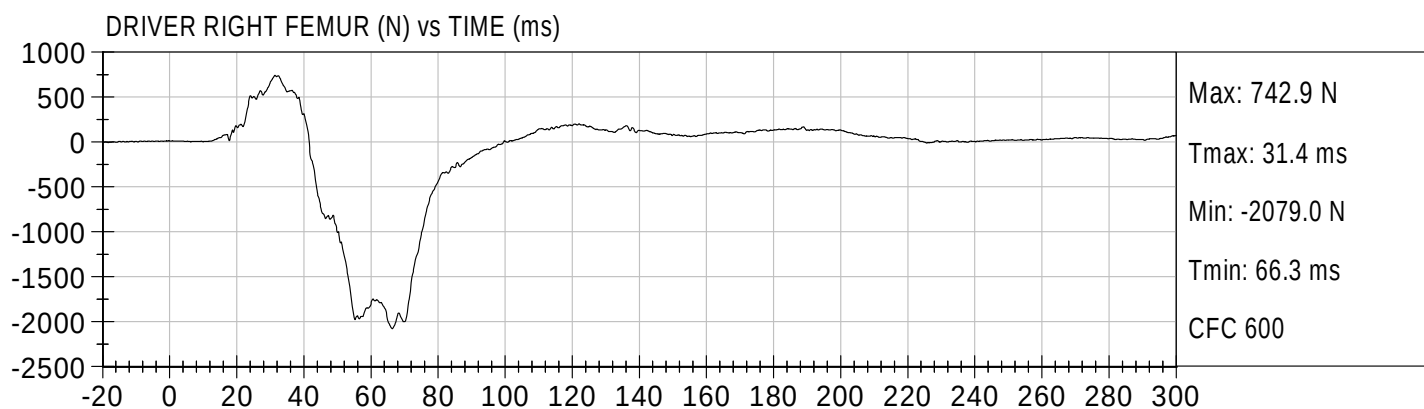
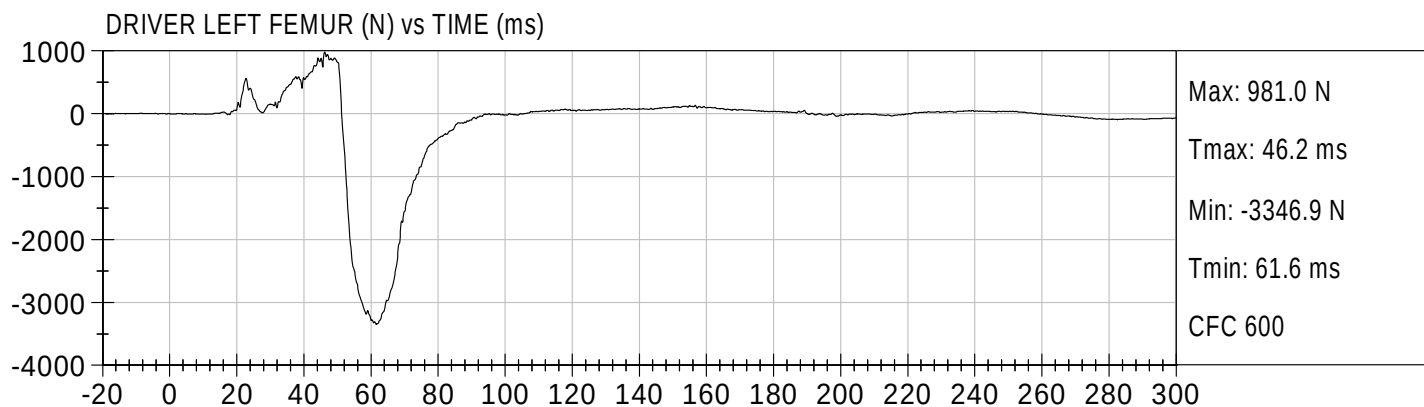


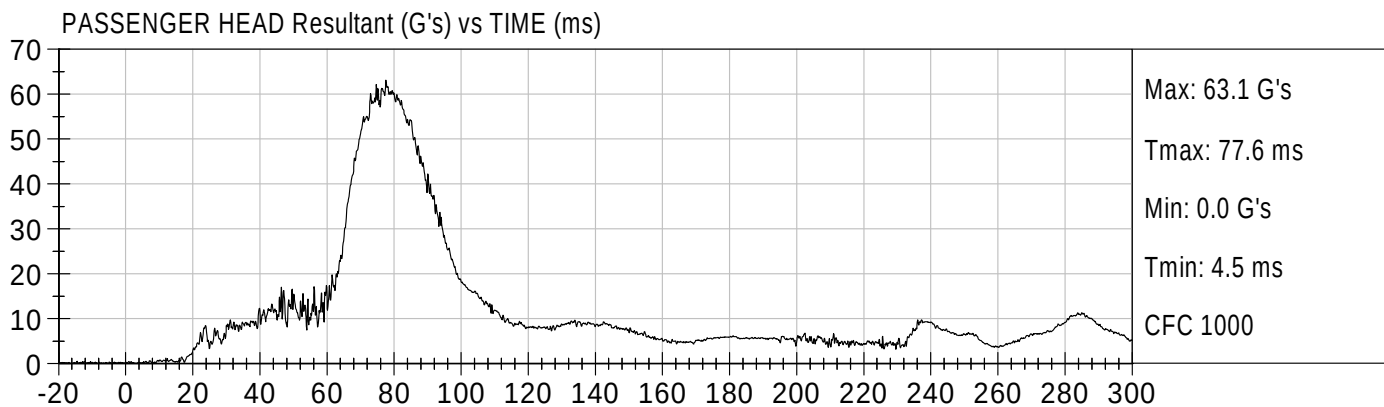
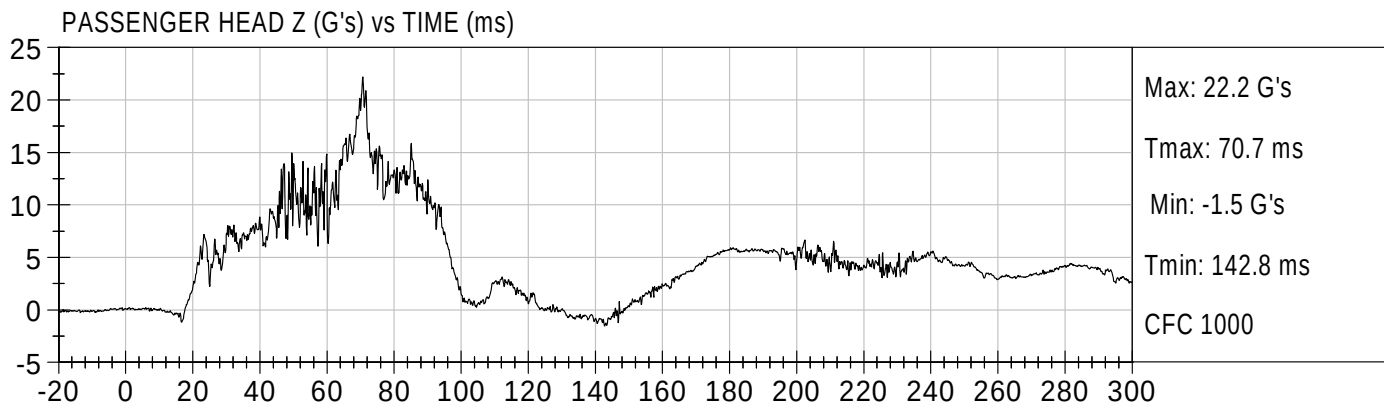
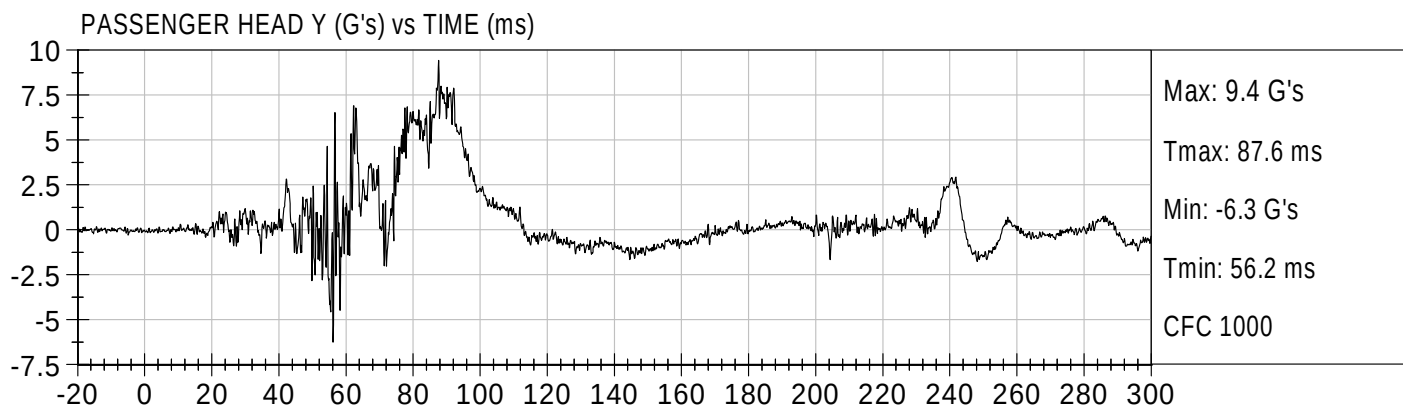
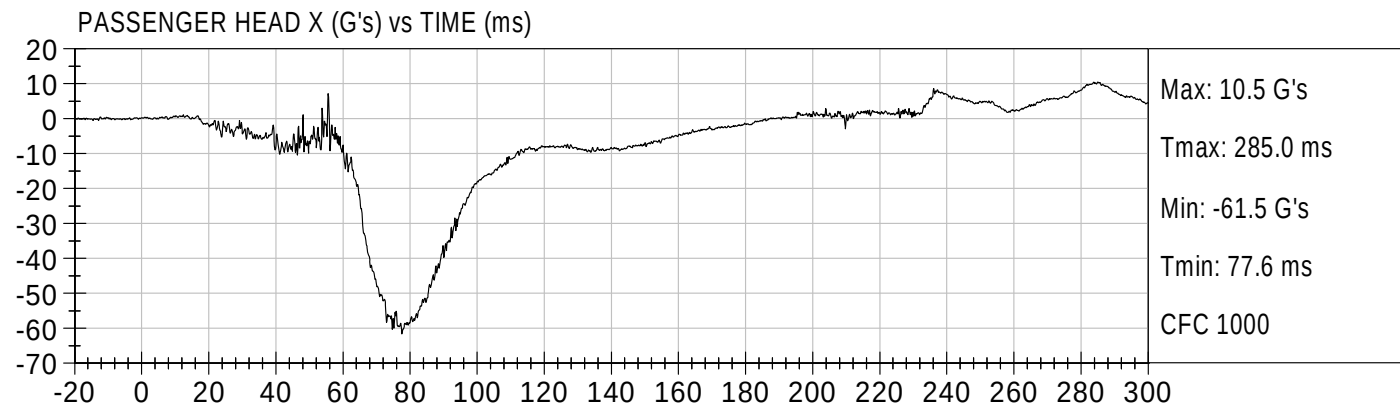


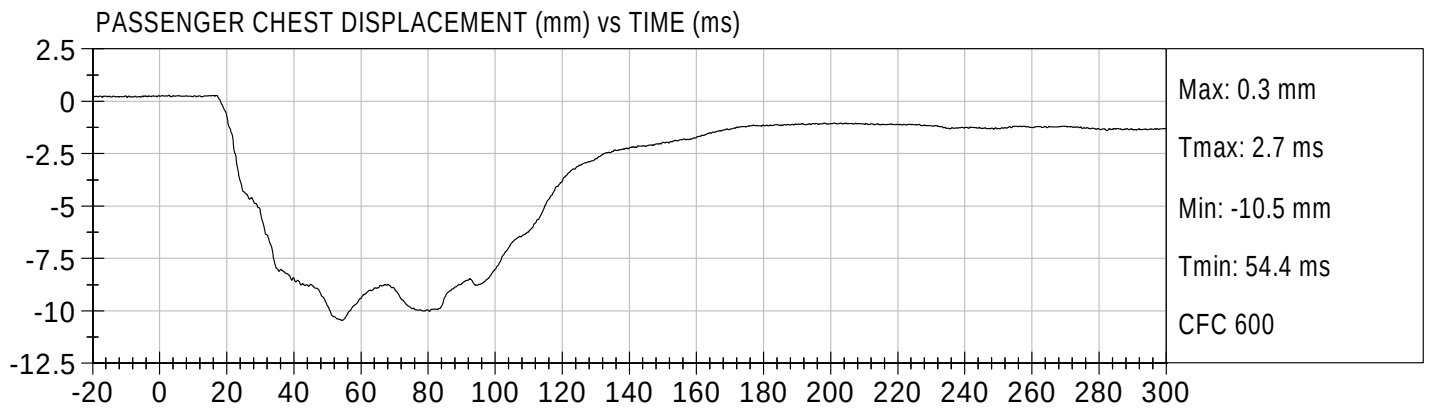


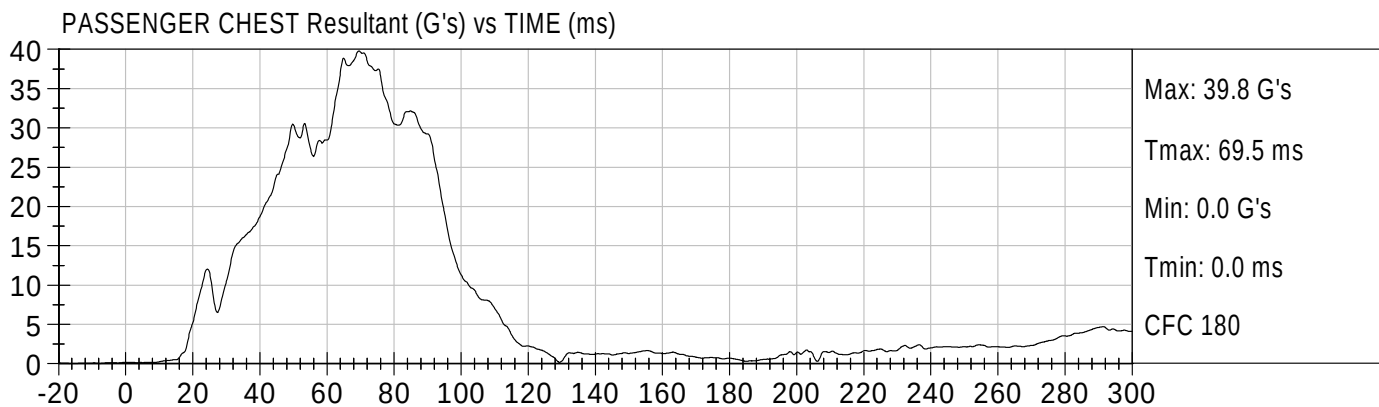
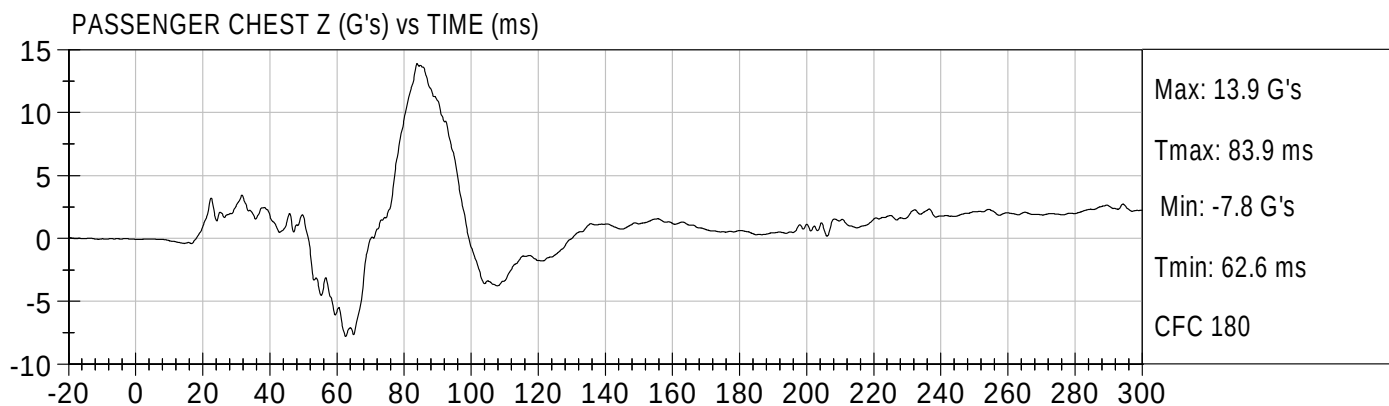
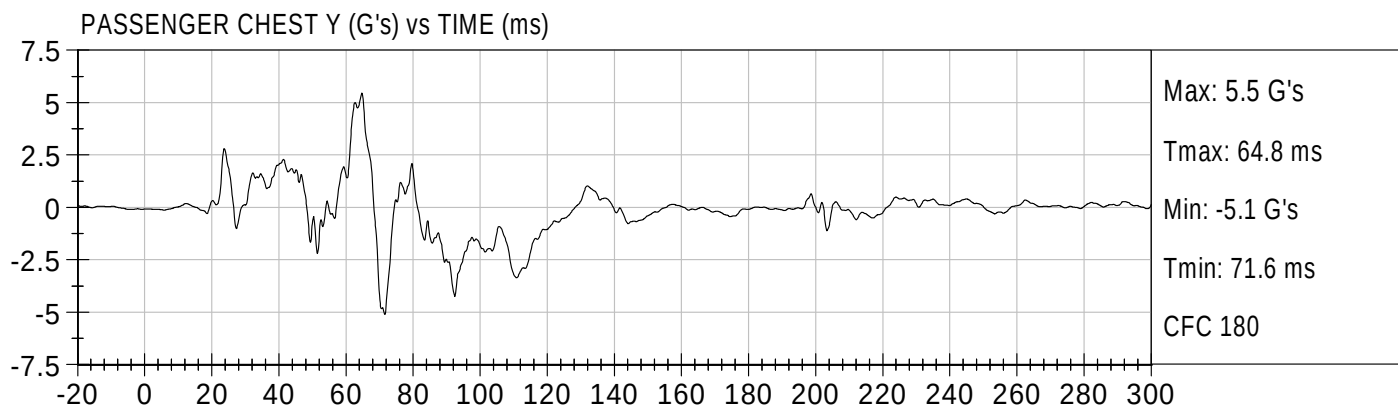
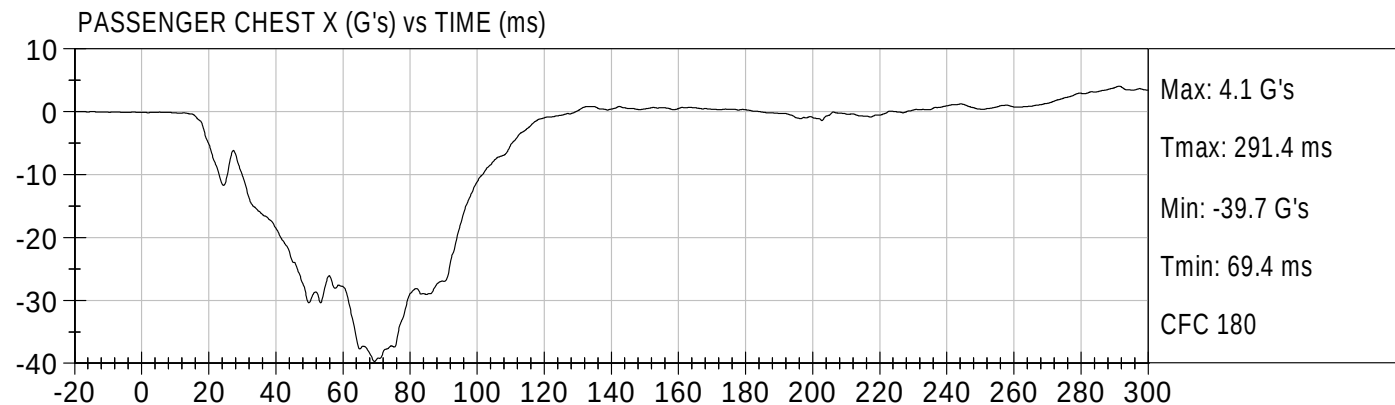


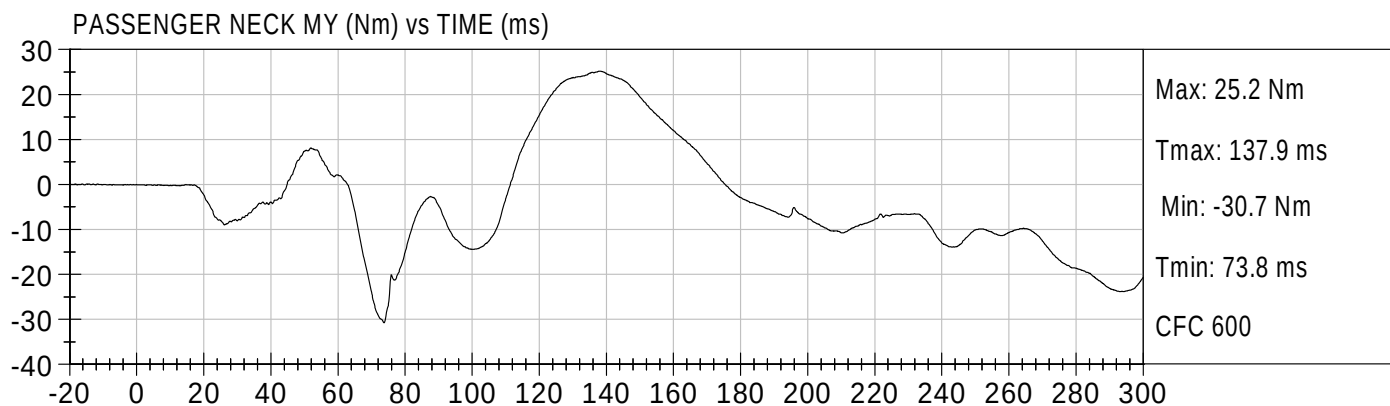
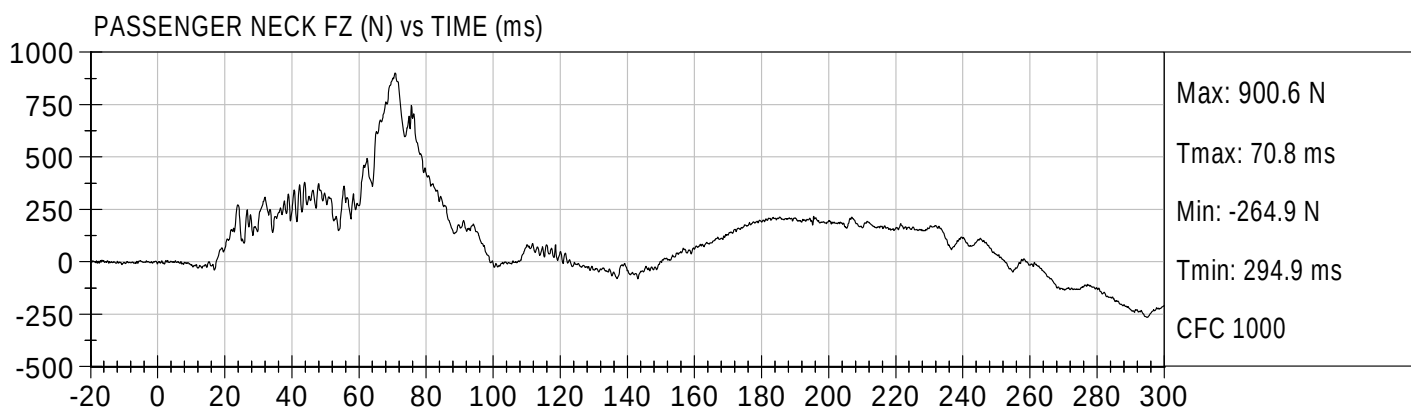
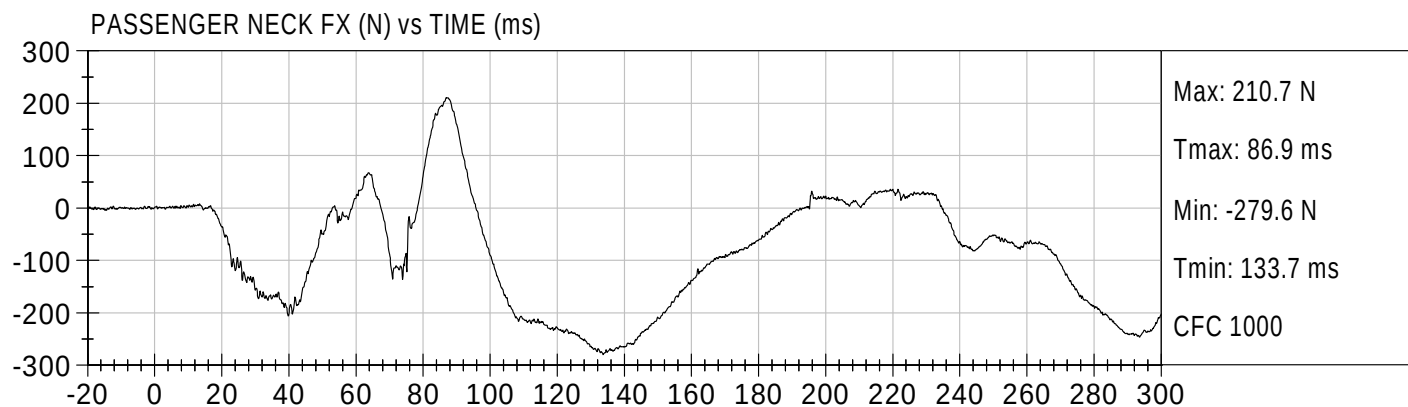






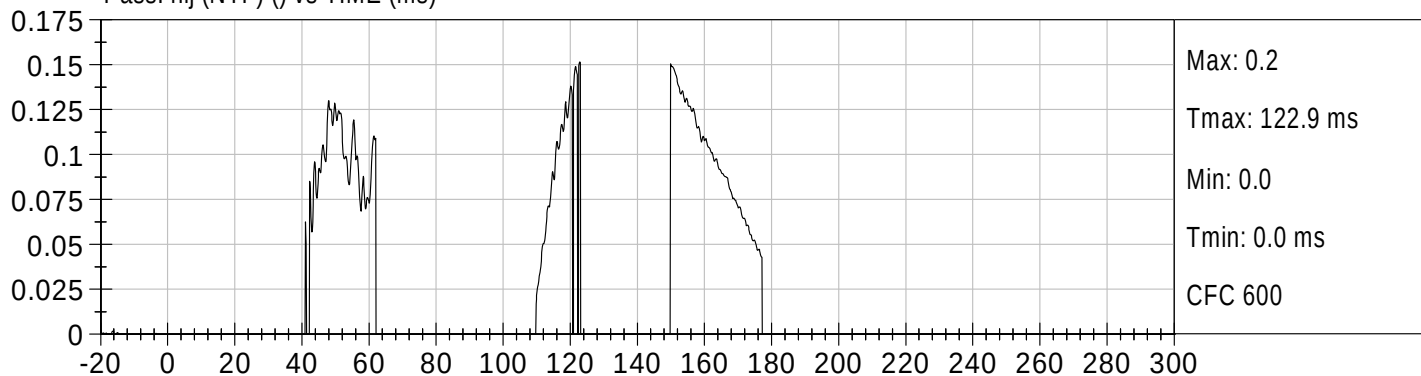




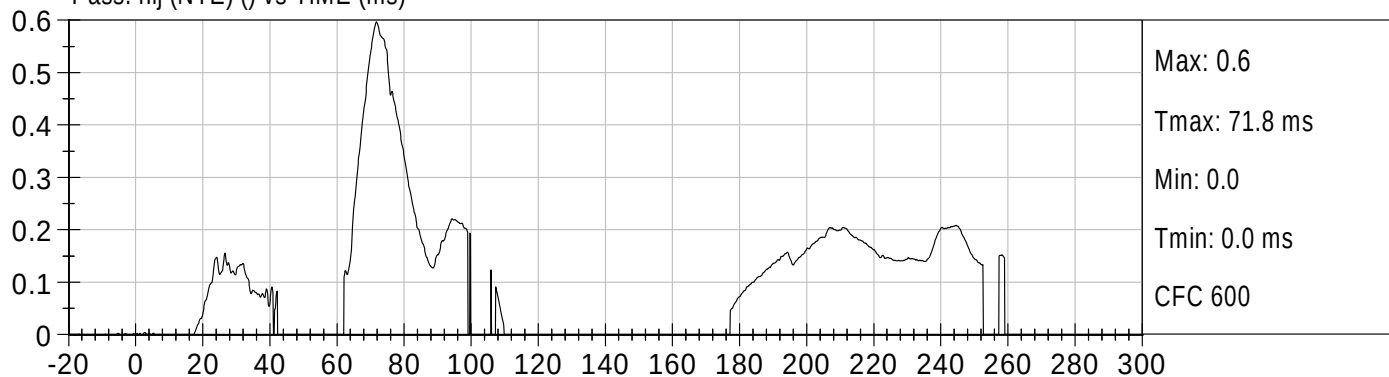




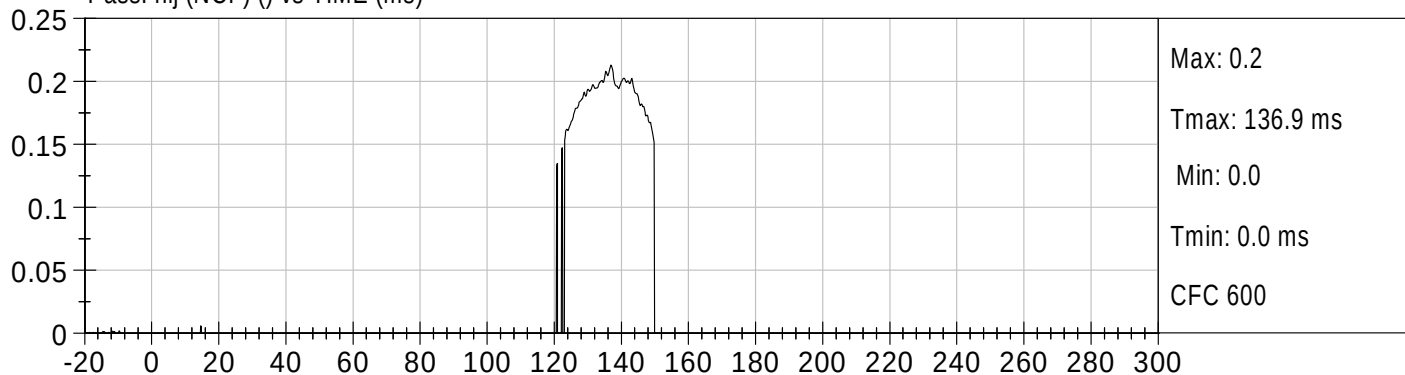
Pass. nij (NTF) () vs TIME (ms)



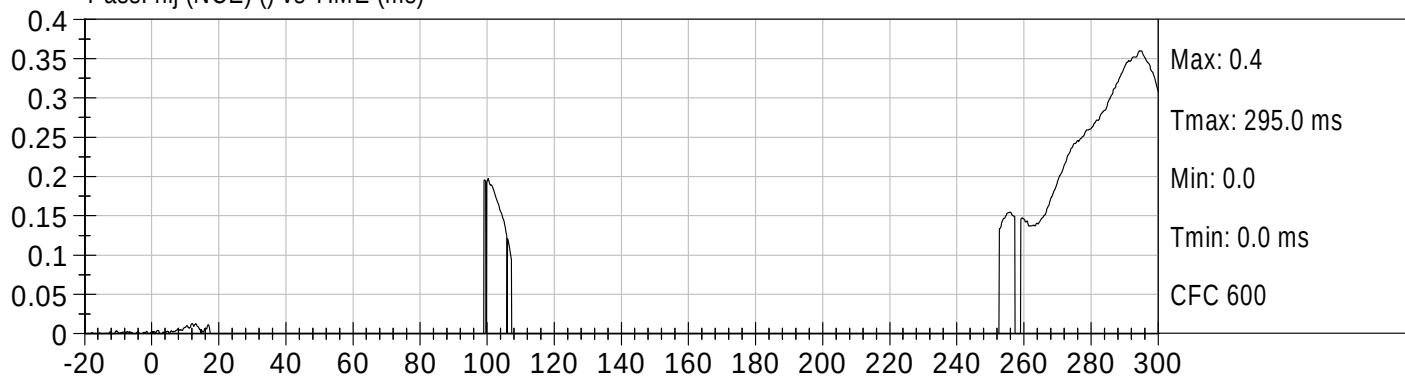
Pass. nij (NTE) () vs TIME (ms)

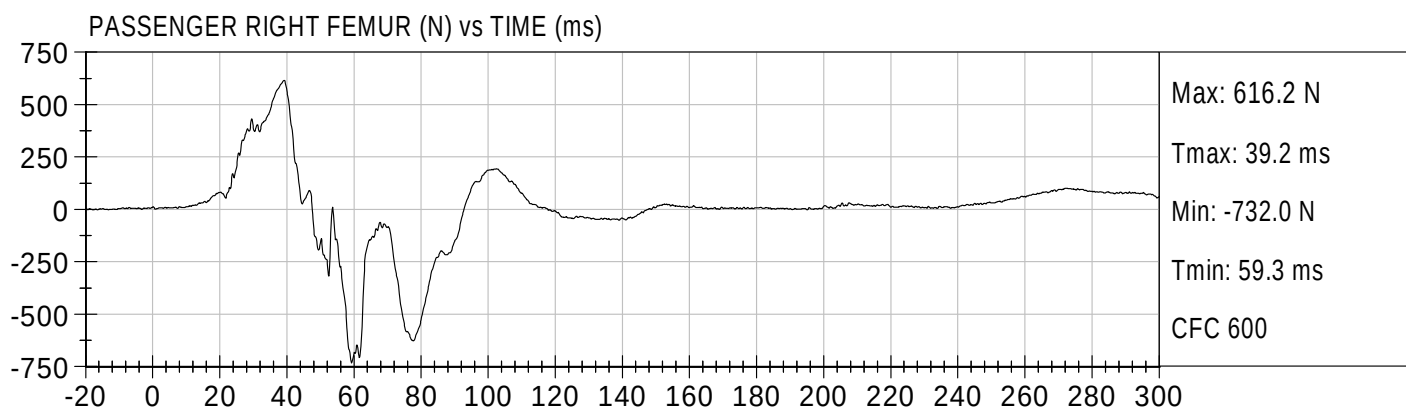
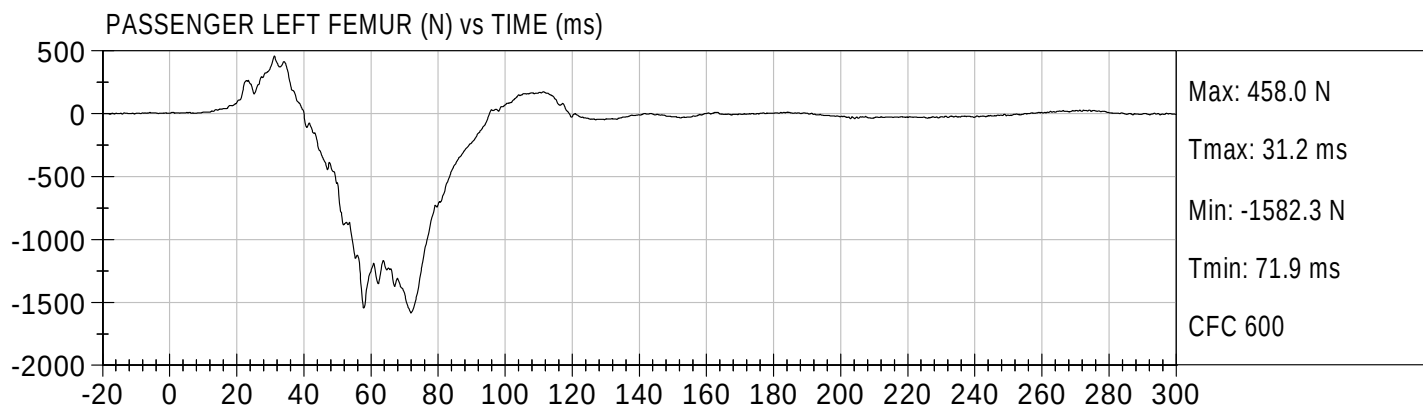


Pass. nij (NCF) () vs TIME (ms)



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





APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 351

Test ID: D101761

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Peak Resultant Acceleration	G's	225 - 275	274	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

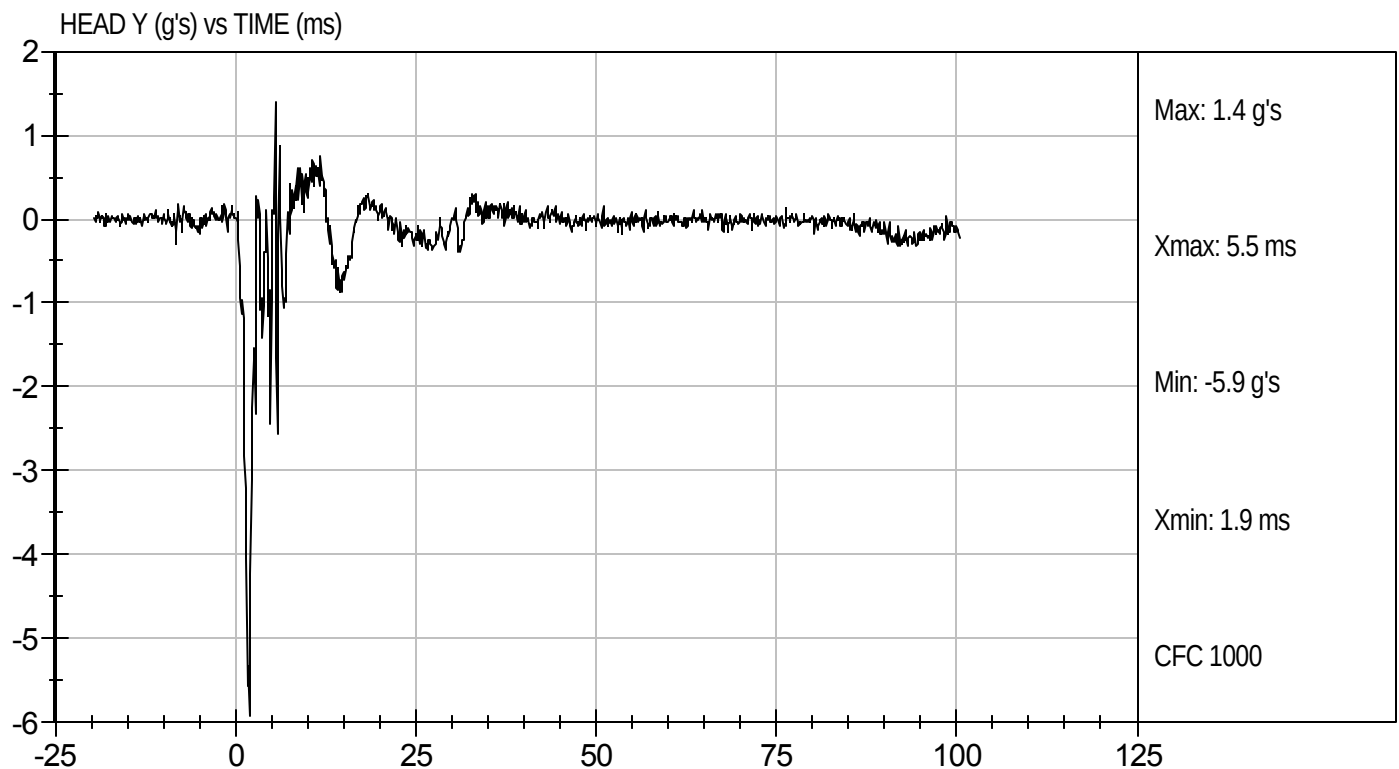
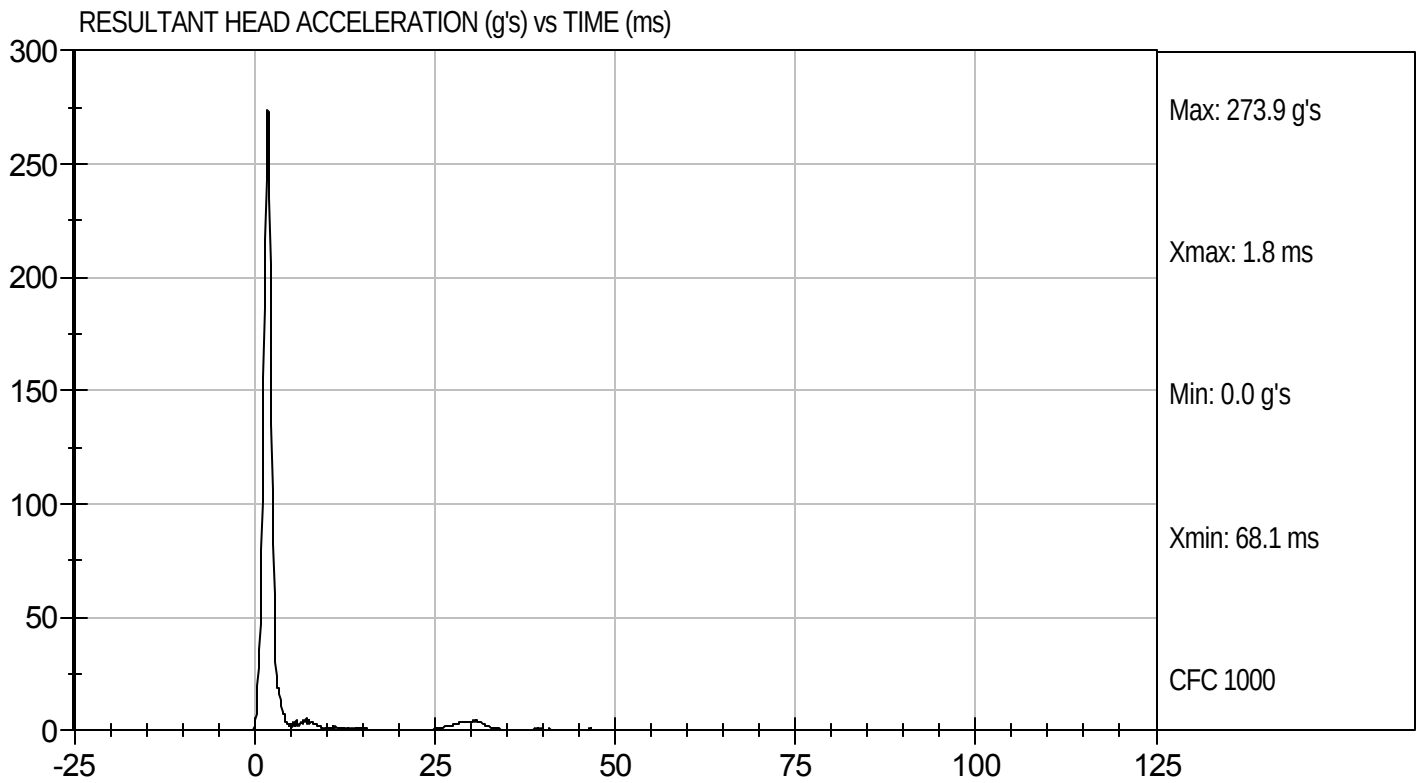
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D101761

Test Date: 6/9/10
Velocity: 0 ft/s, 0.00 m/s

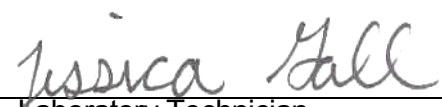


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D101762

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	57	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	26.41	Pass
	20 ms	G's	17.60 to 22.60	19.75	Pass
	30 ms	G's	12.50 to 18.50	16.95	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	16.85	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	66.9	Pass
	Time	ms	57.0 to 64.0	57.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.0	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	106.1	Pass
	Time	ms	47.0 to 58.0	47.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.4	Pass
Overall Test Results					Pass


 Laboratory Technician

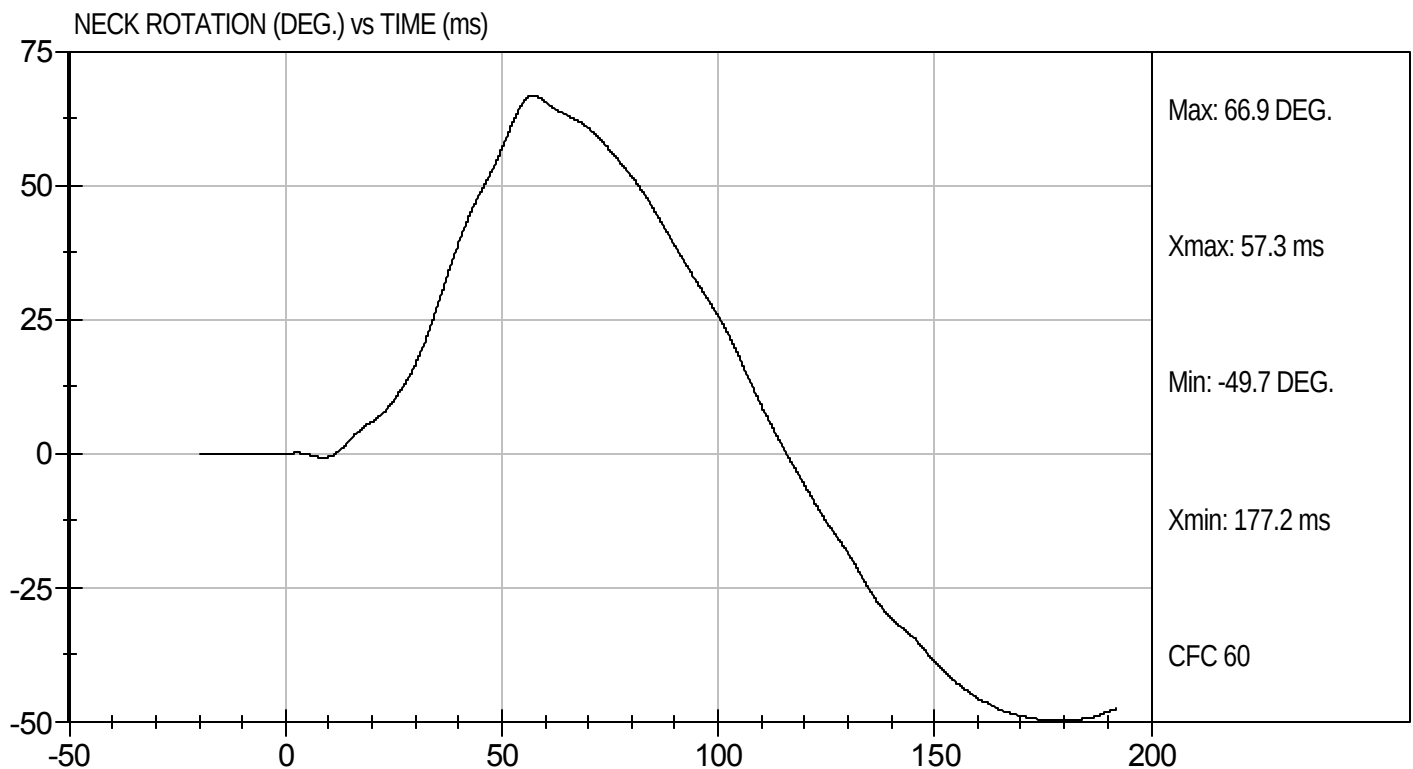
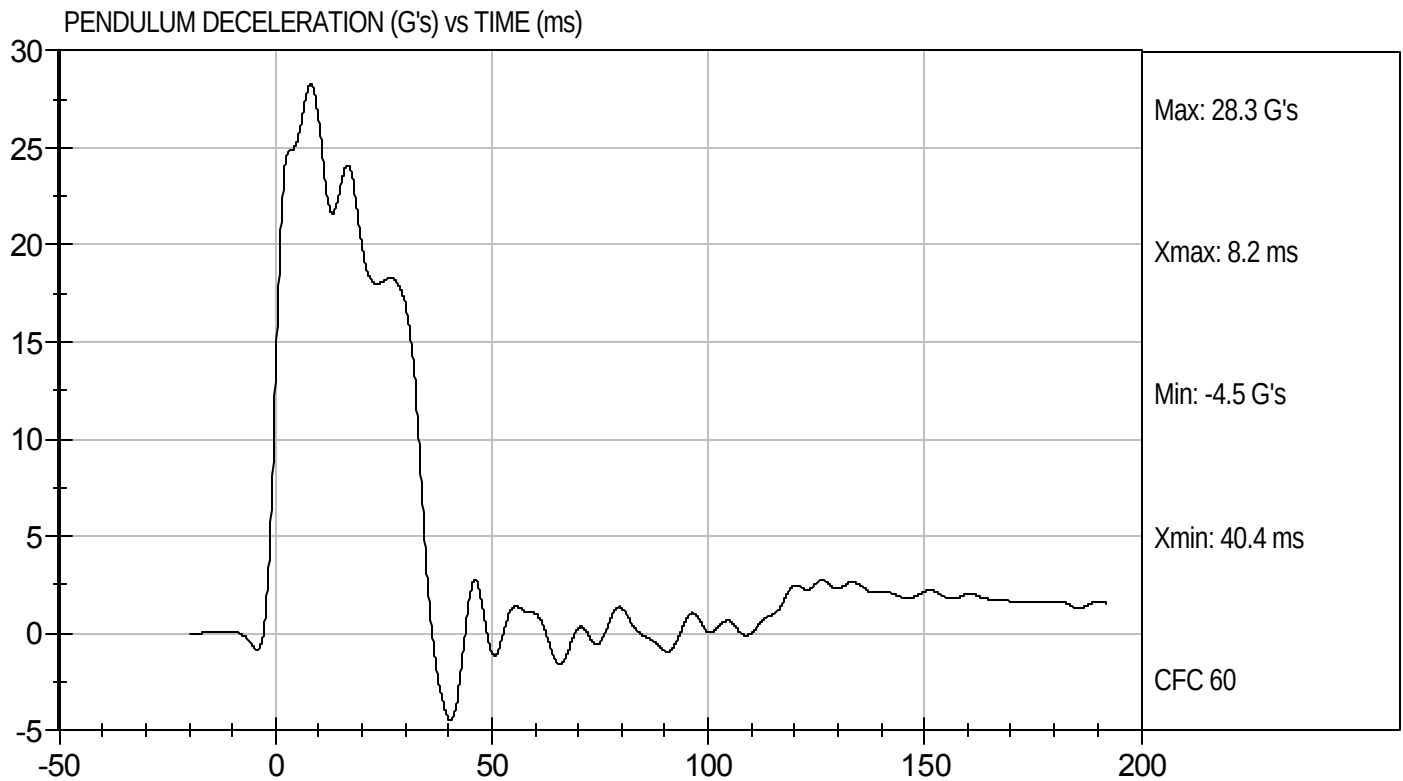
6/9/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D101762

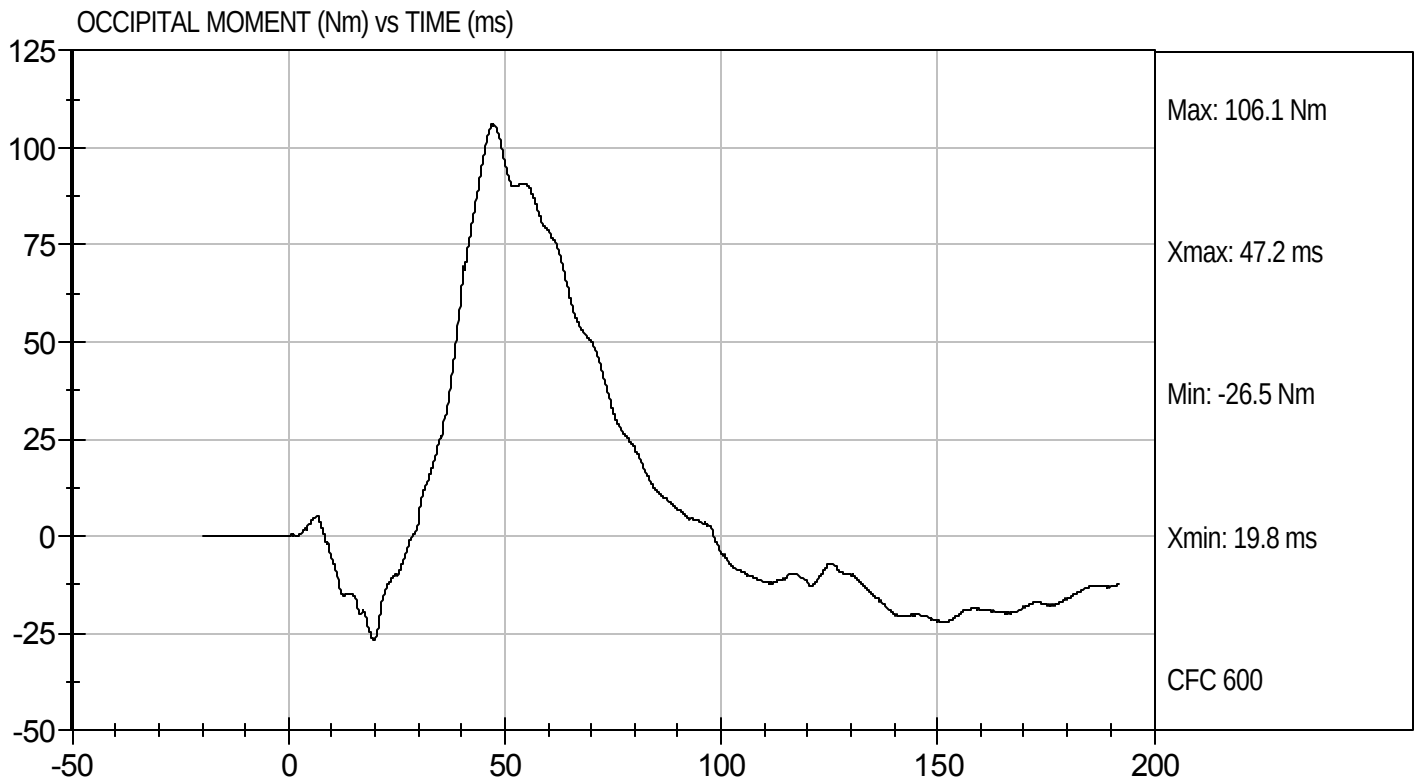
Test Date: 6/9/10
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D101762

Test Date: 6/9/10
Velocity: 23.15 ft/s, 7.06 m/s

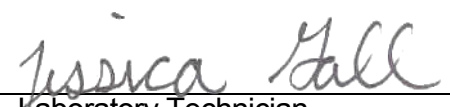


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D101763

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	57	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.70	Pass
	20 ms	G's	14.00 to 19.00	18.07	Pass
	30 ms	G's	11.00 to 16.00	14.40	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.33	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.5	Pass
	Time	ms	72.0 to 82.0	73.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	153.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-65.6	Pass
	Time	ms	65.0 to 79.0	67.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	137.3	Pass
Overall Test Results					Pass


 Laboratory Technician

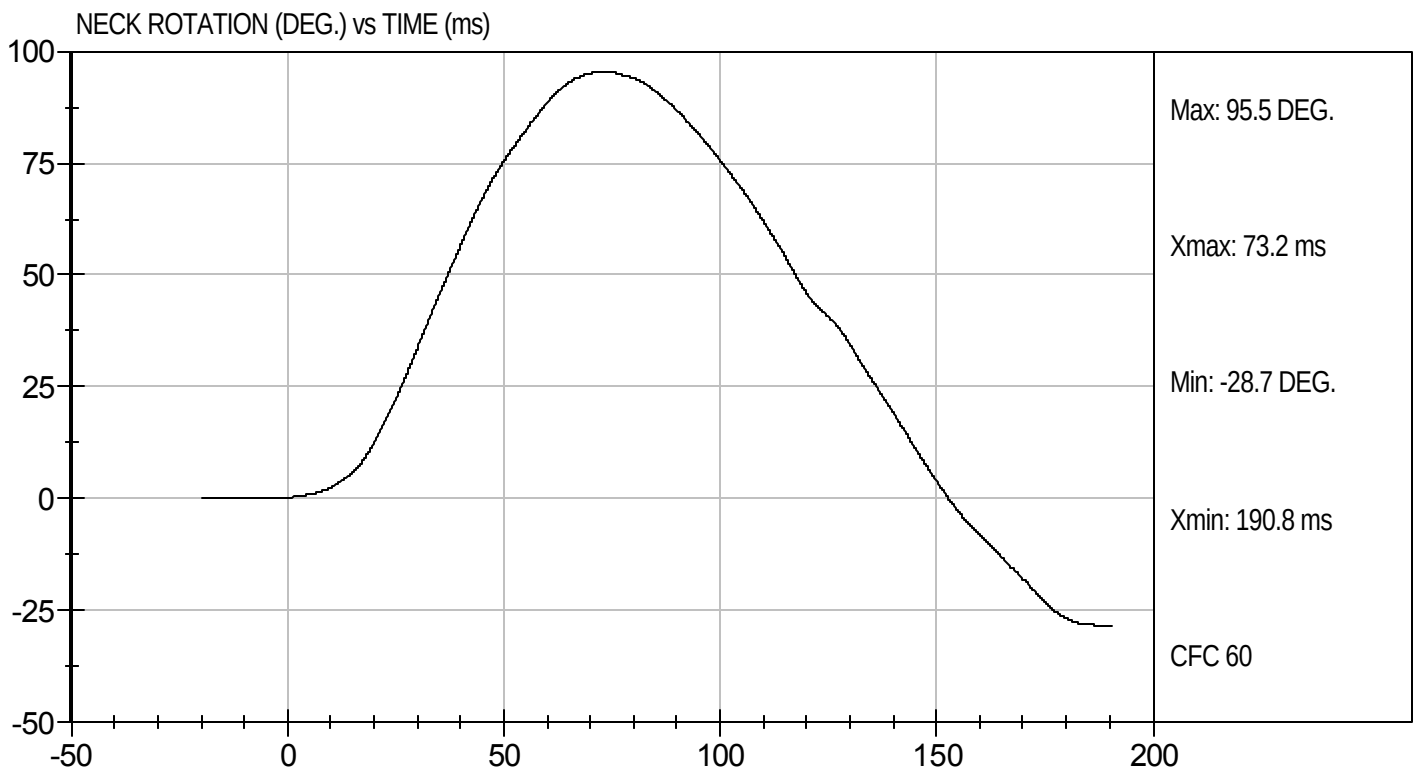
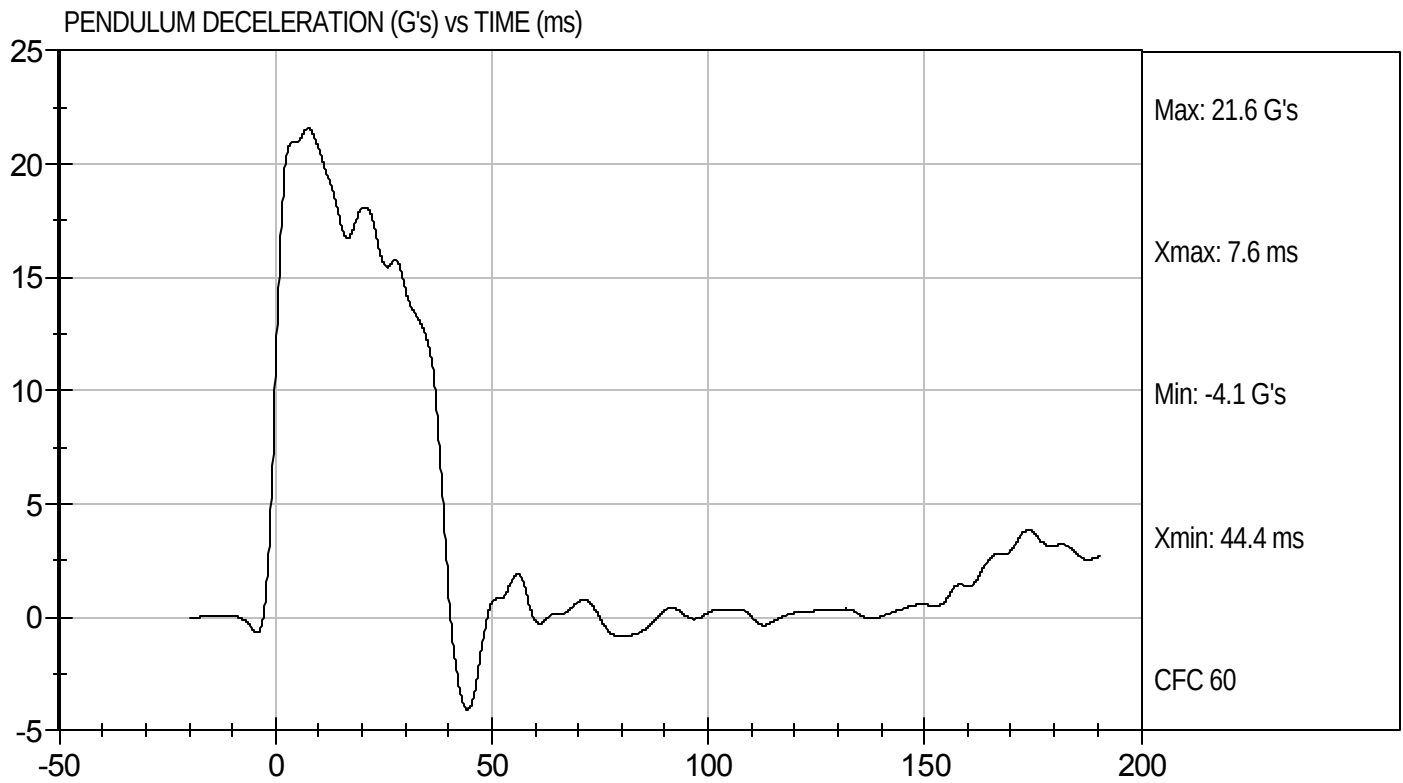
6/9/10
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D101763

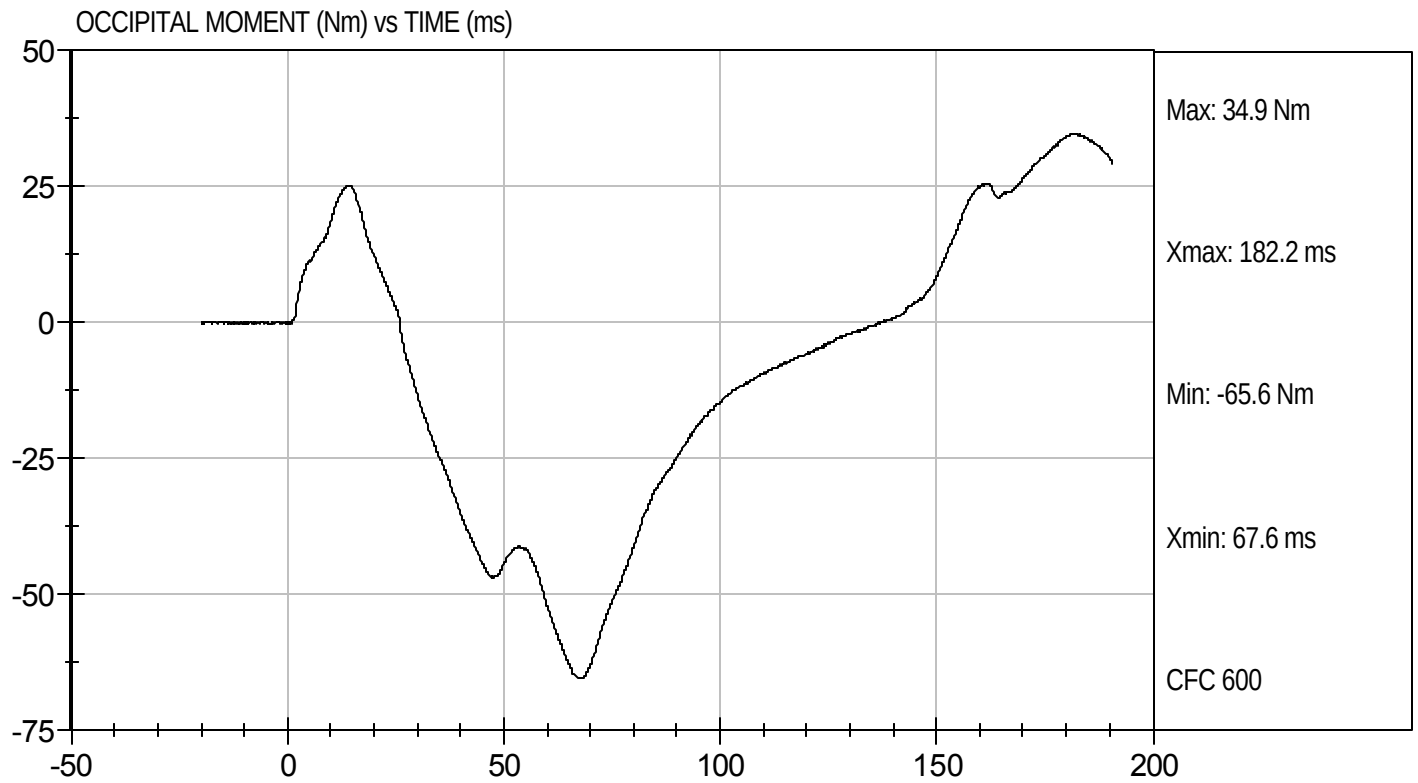
Test Date: 6/9/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D101763

Test Date: 6/9/10
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: D101764

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	52	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,235	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

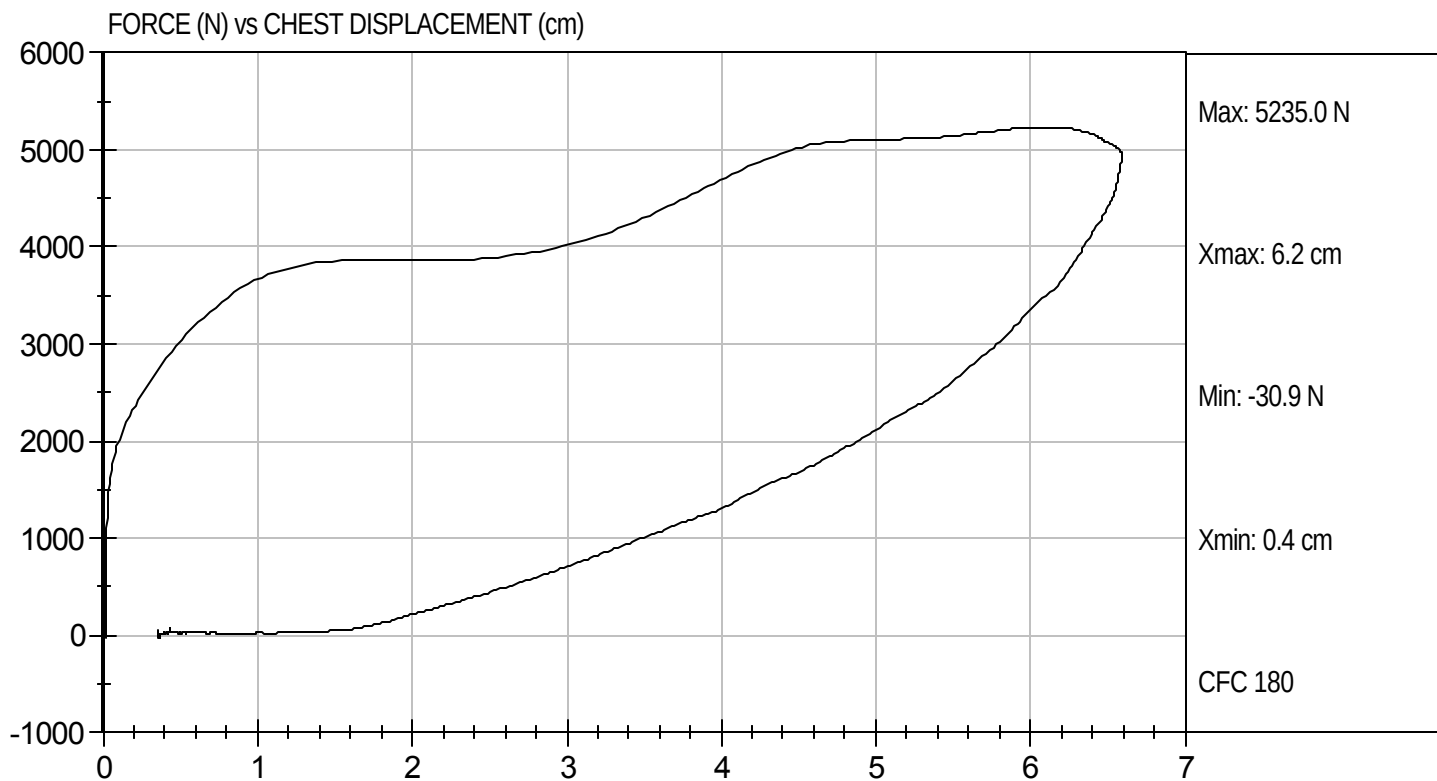
6/9/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D101764

Test Date: 6/9/10
Velocity: 21.9 ft/s, 6.68 m/s



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

ATD Serial No: 351

Test I.D: D101765

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	57	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,137	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

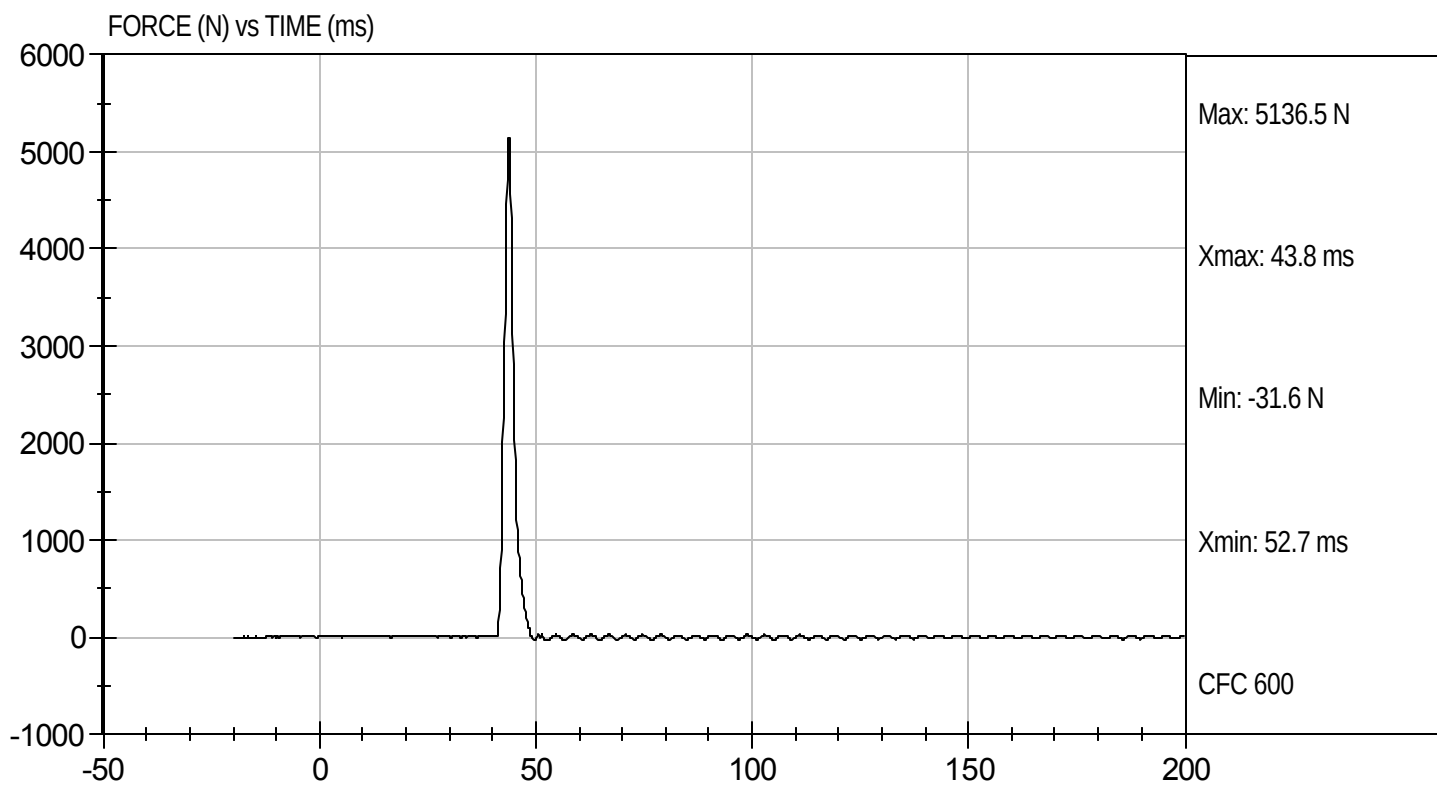
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D101765

Test Date: 6/9/10
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: D101766

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	57	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	4,845	Pass
Overall Test Results				Pass


Laboratory Technician

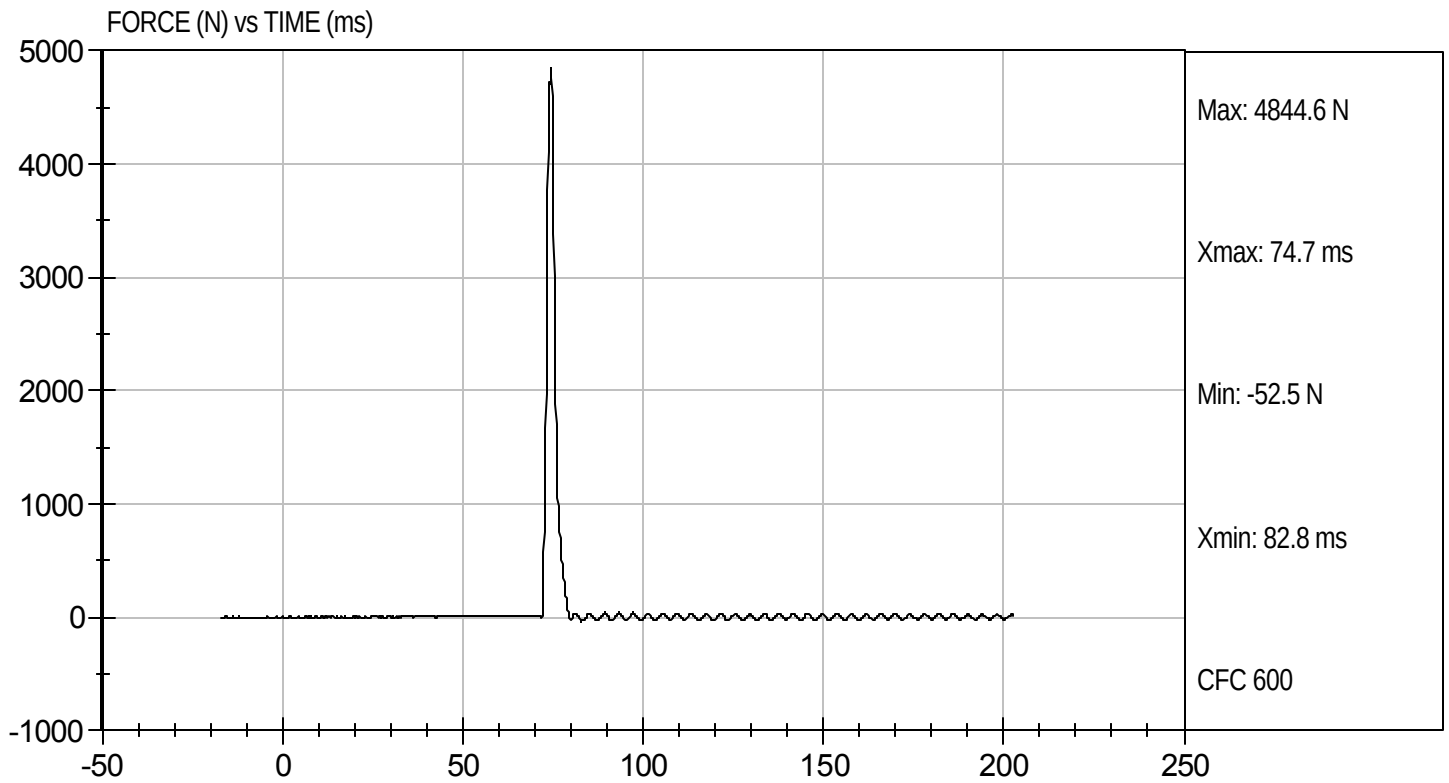
6/9/10
Test Date


Approved By



Test Desc: Left Knee
Component ID: D101766

Test Date: 6/9/10
Velocity: 6.86 ft/s, 2.09 m/s



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

ATD Serial No: 351

Test I.D: D101760

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	54	54	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.9	67.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	43	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

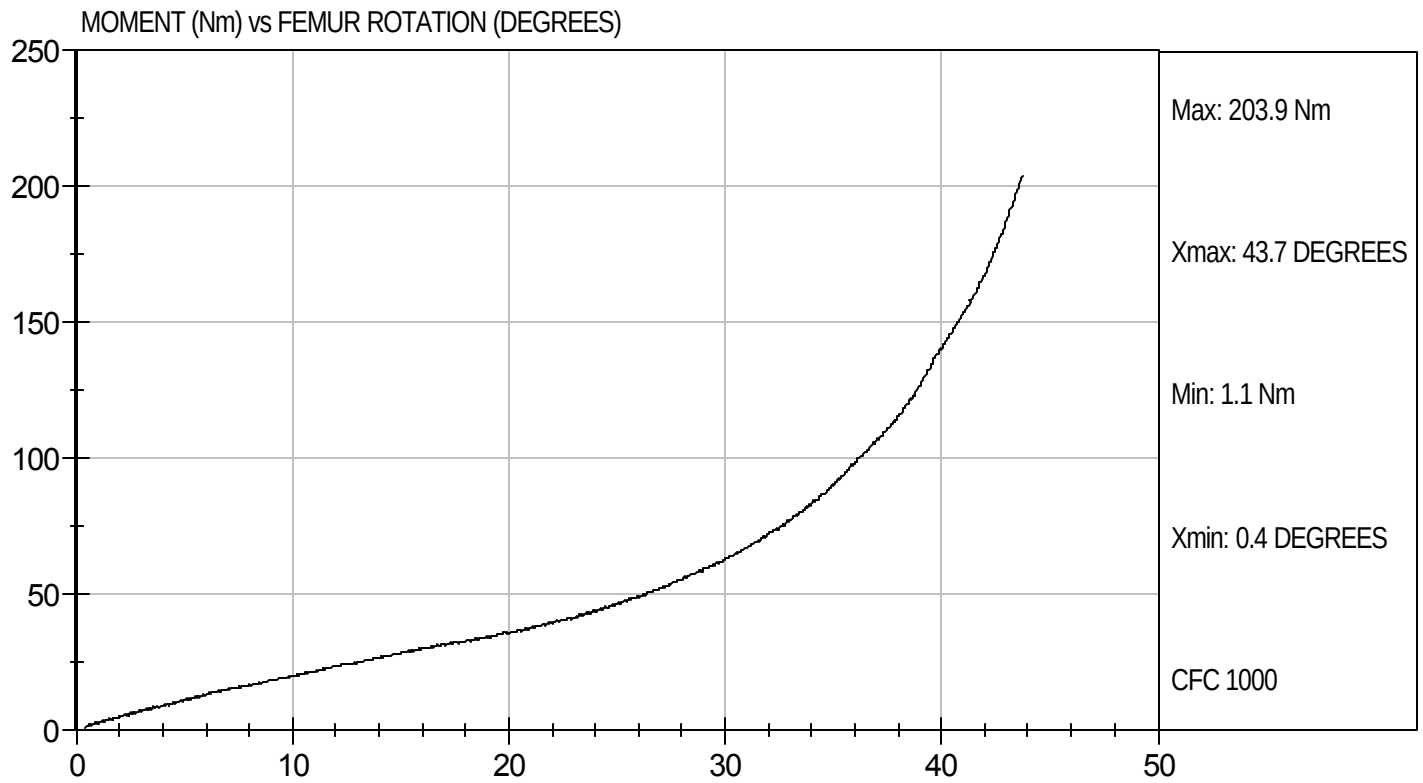
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D101769

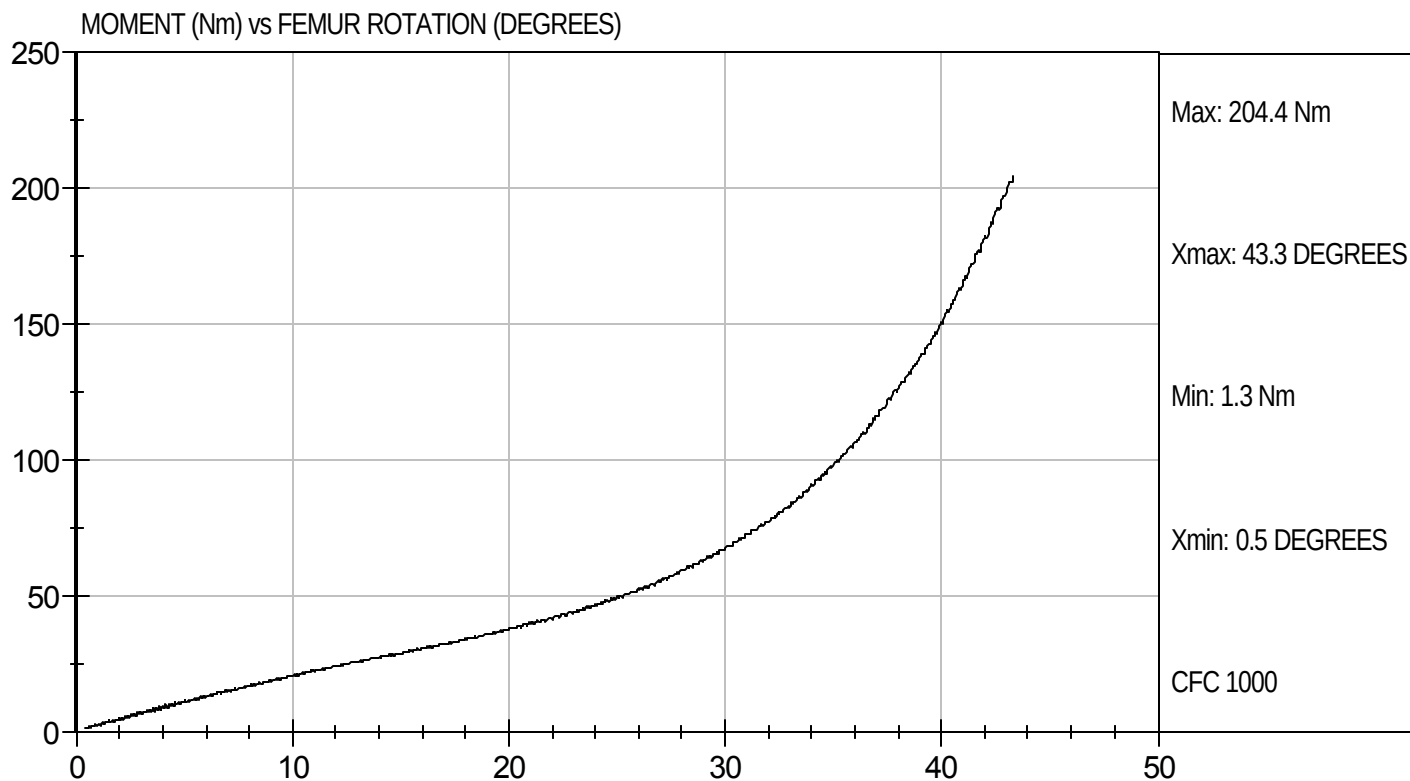
Test Date: 6/9/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D101760

Test Date: 6/9/10
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: D102441

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	225 - 275	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-8.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

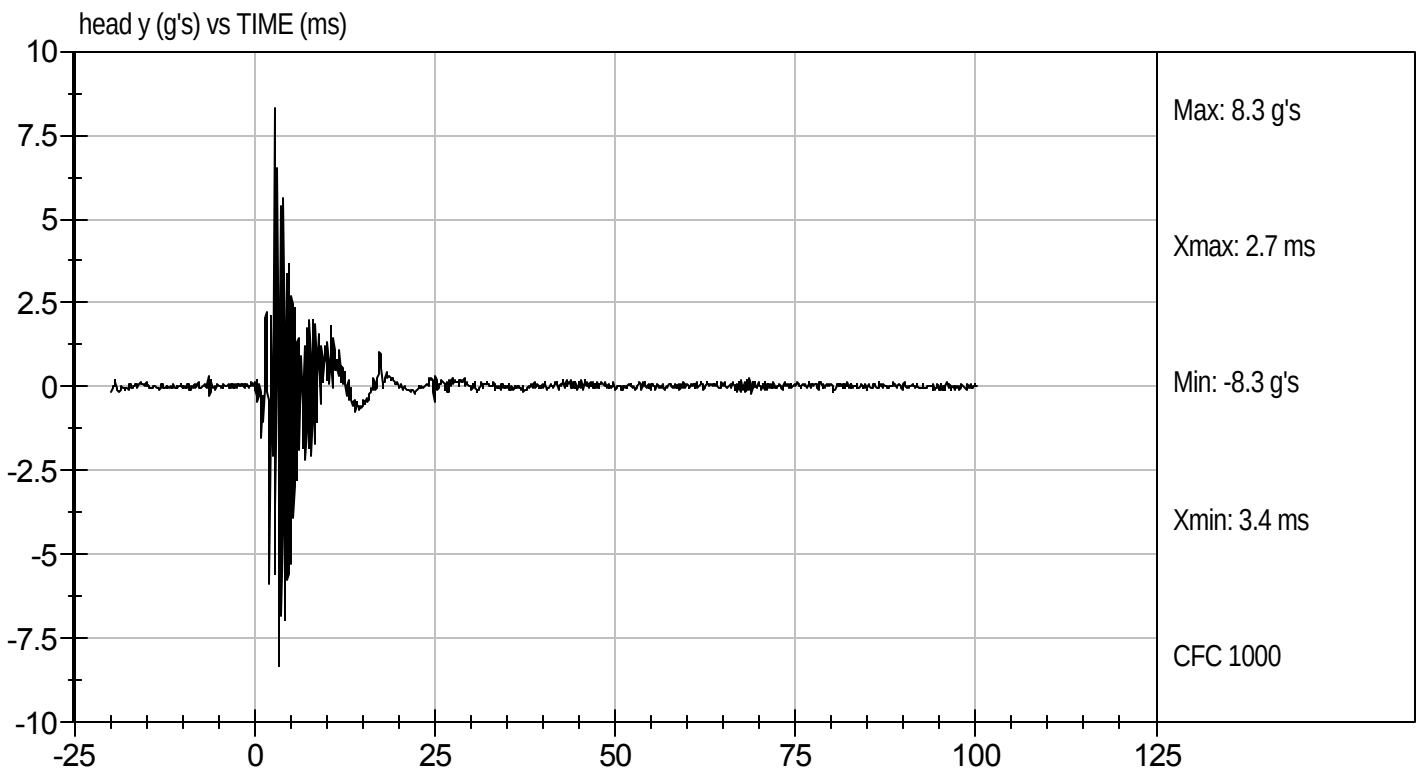
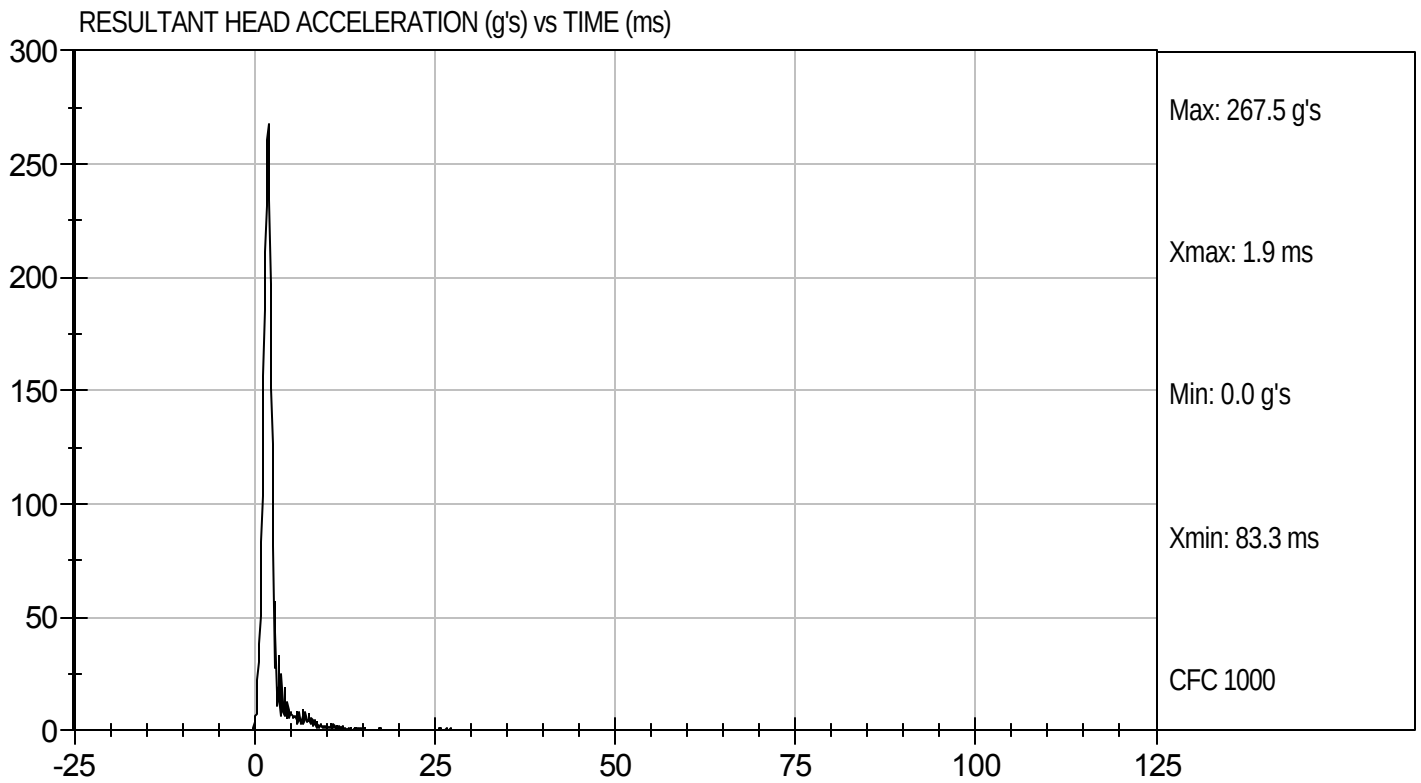
7/28/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D102441

Test Date: 7/28/10
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: D102442

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.15	Pass
	20 ms	G's	17.60 to 22.60	19.98	Pass
	30 ms	G's	12.50 to 18.50	15.25	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.15	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	67.6	Pass
	Time	ms	57.0 to 64.0	58.0	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	99.1	Pass
	Time	ms	47.0 to 58.0	47.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.5	Pass
Overall Test Results					Pass


 Laboratory Technician

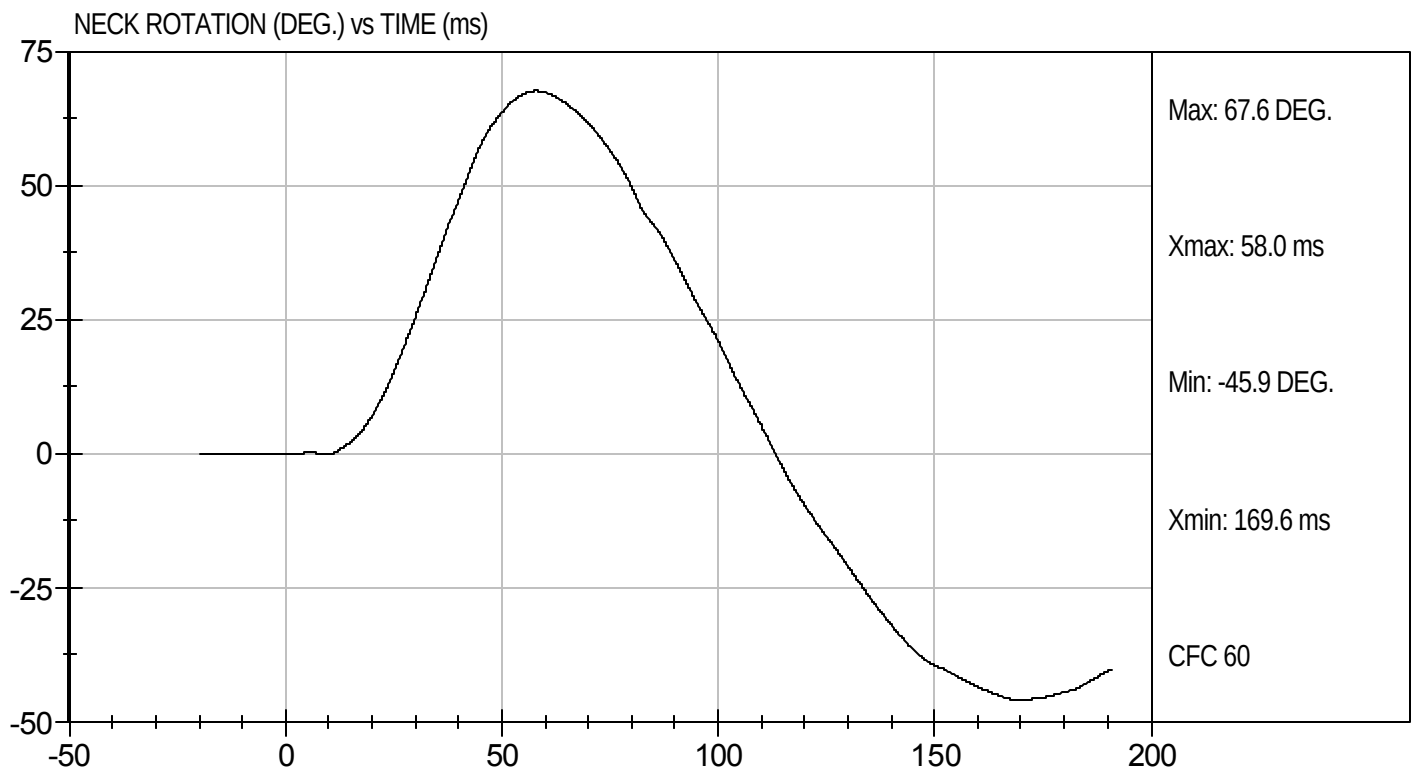
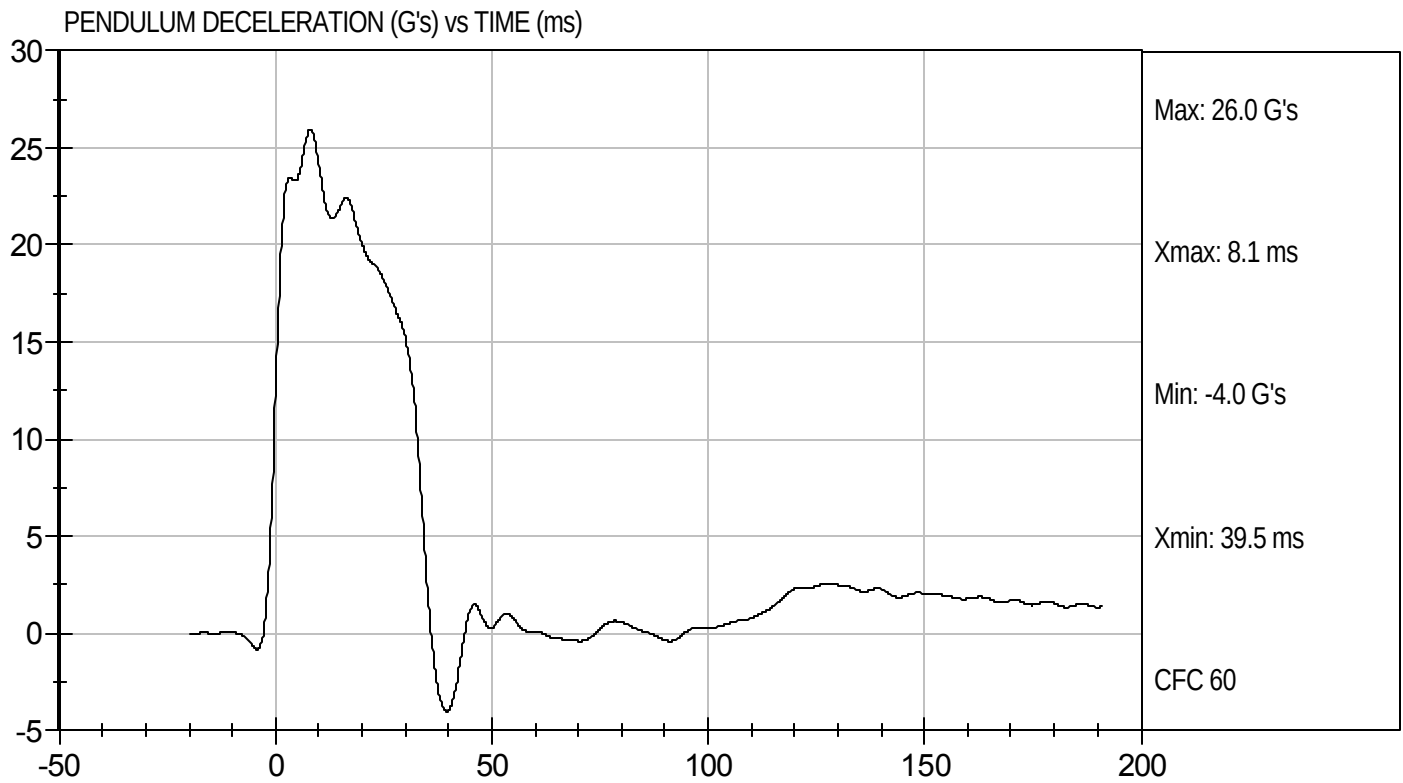
7/29/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D102442

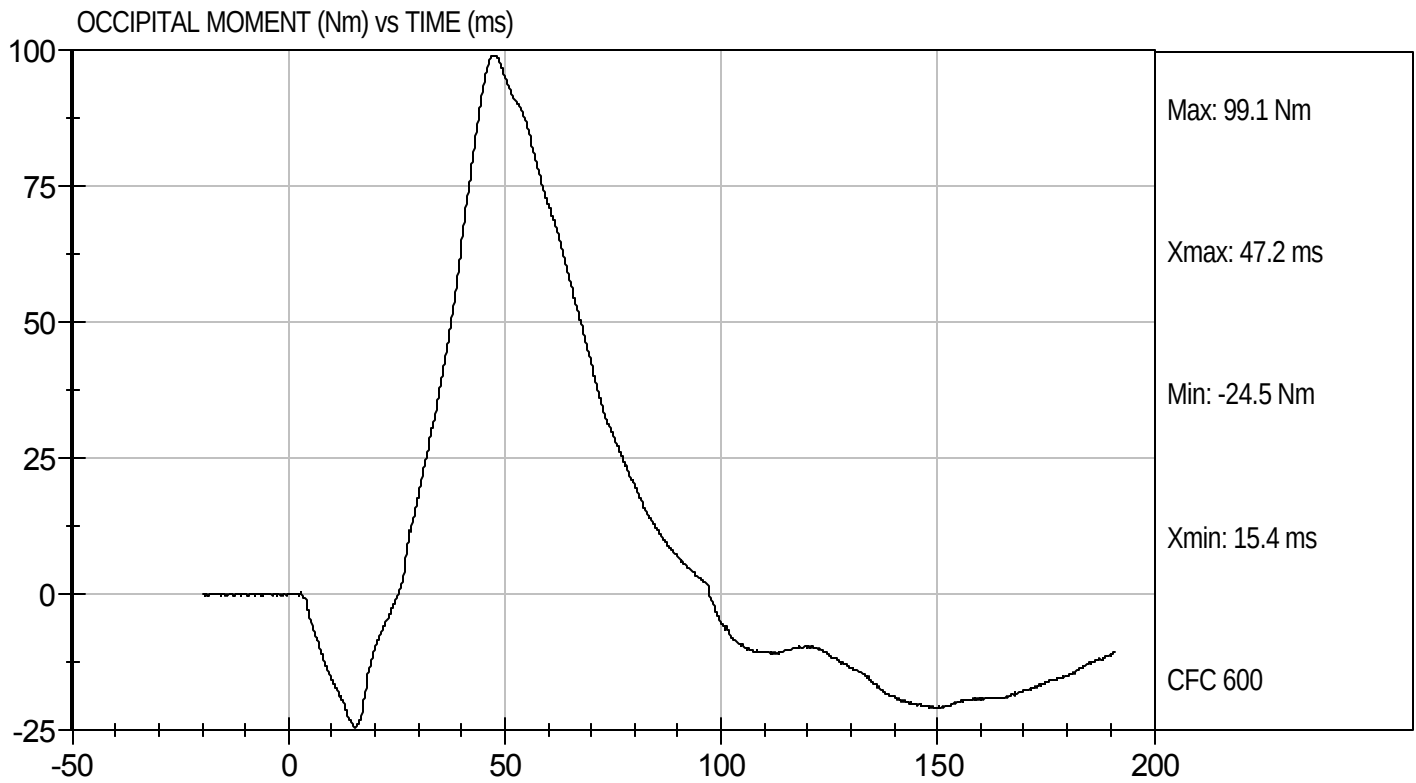
Test Date: 7/29/10
Velocity: 22.83 ft/s, 6.96 m/s





Test Desc: Neck Flexion
Component ID: D102442

Test Date: 7/29/10
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: D102443

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.57	Pass
	20 ms	G's	14.00 to 19.00	16.08	Pass
	30 ms	G's	11.00 to 16.00	14.02	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.93	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	91.2	Pass
	Time	ms	72.0 to 82.0	72.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	148.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-64.9	Pass
	Time	ms	65.0 to 79.0	68.3	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	137.2	Pass
Overall Test Results					Pass


 Laboratory Technician

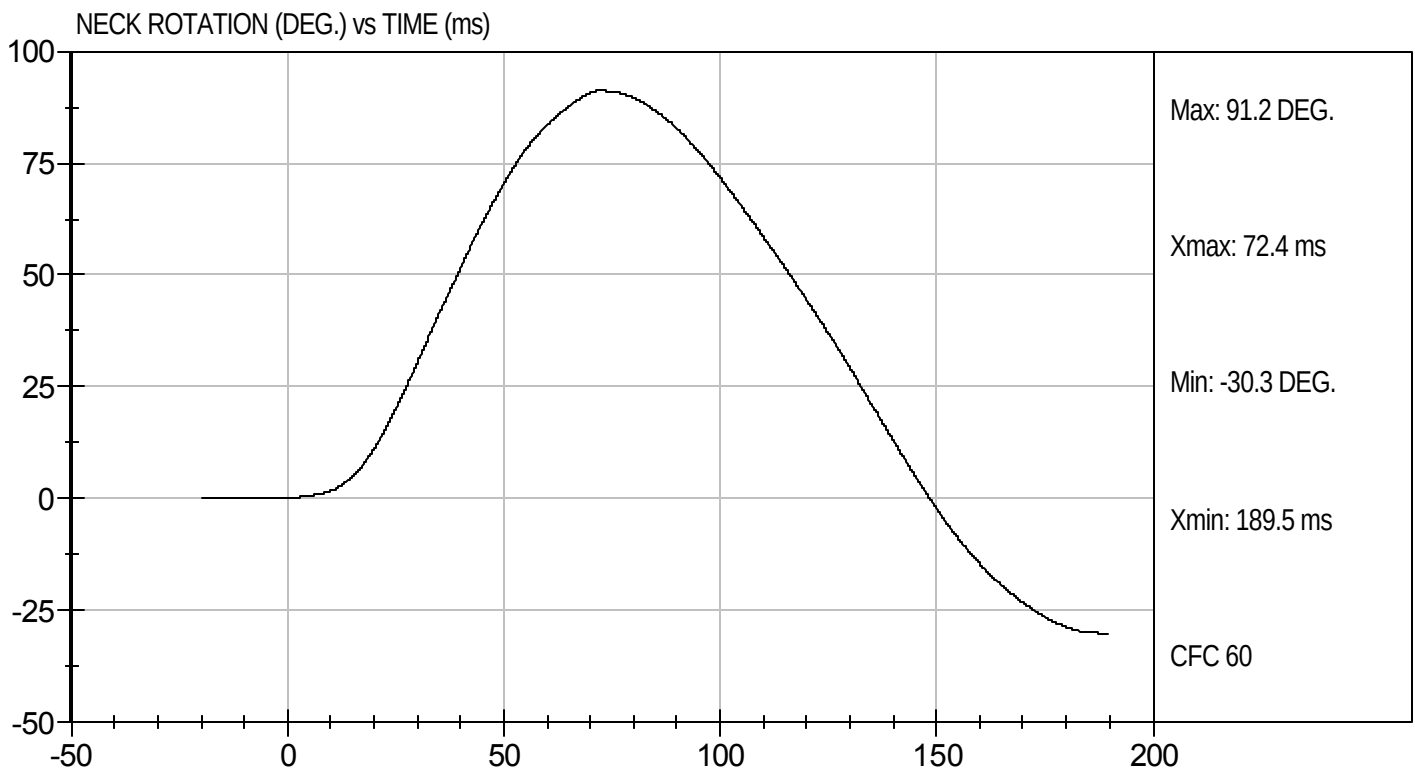
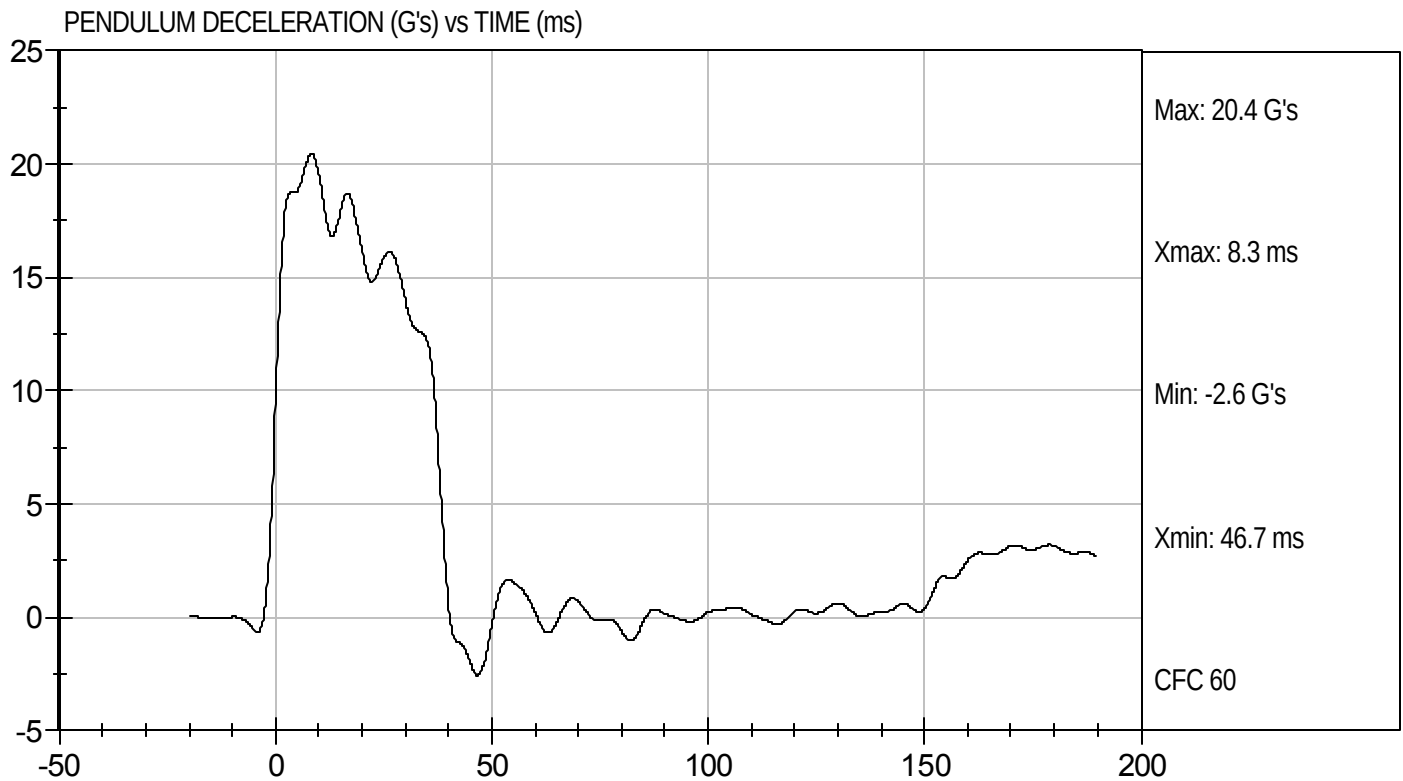
7/29/10
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D102443

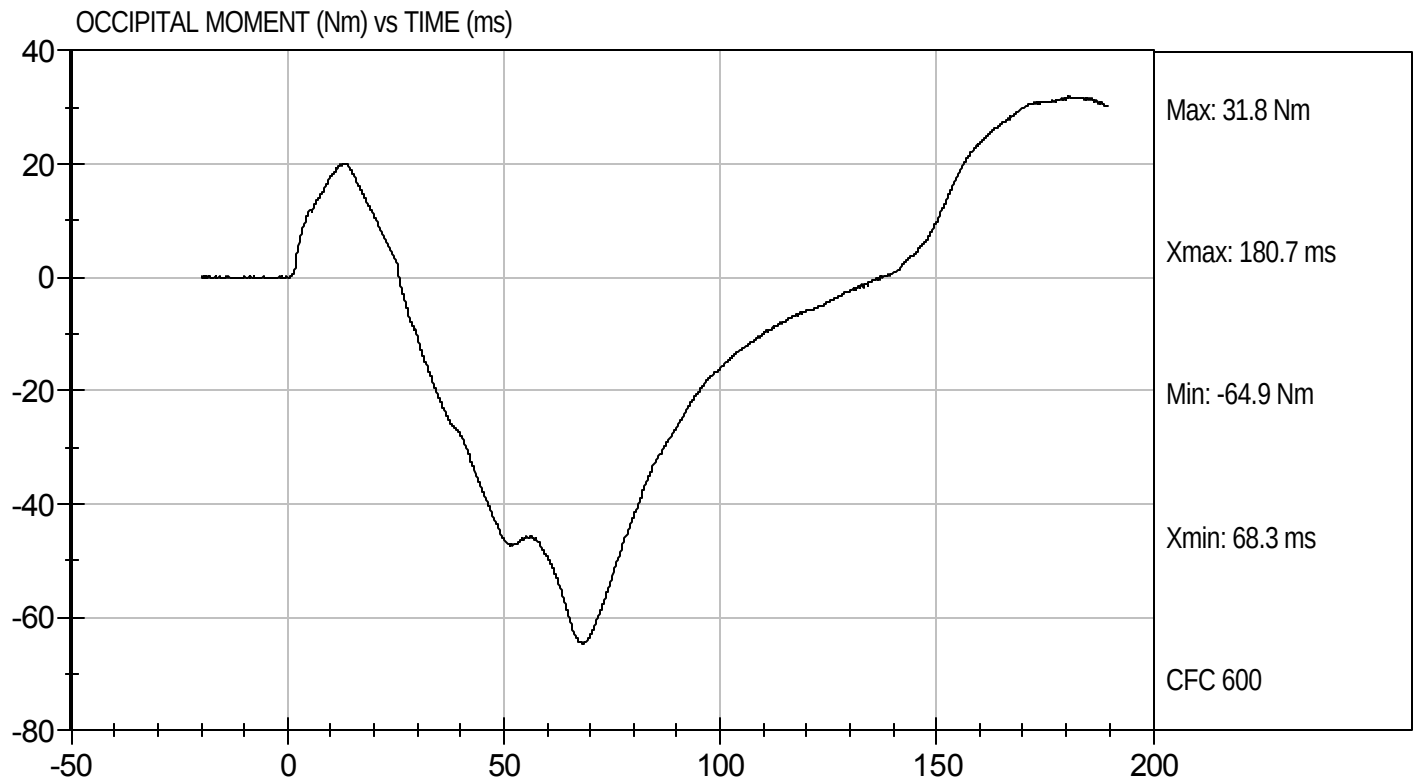
Test Date: 7/29/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D102443

Test Date: 7/29/10
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: D102444

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,454	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.46	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results				Pass


Laboratory Technician

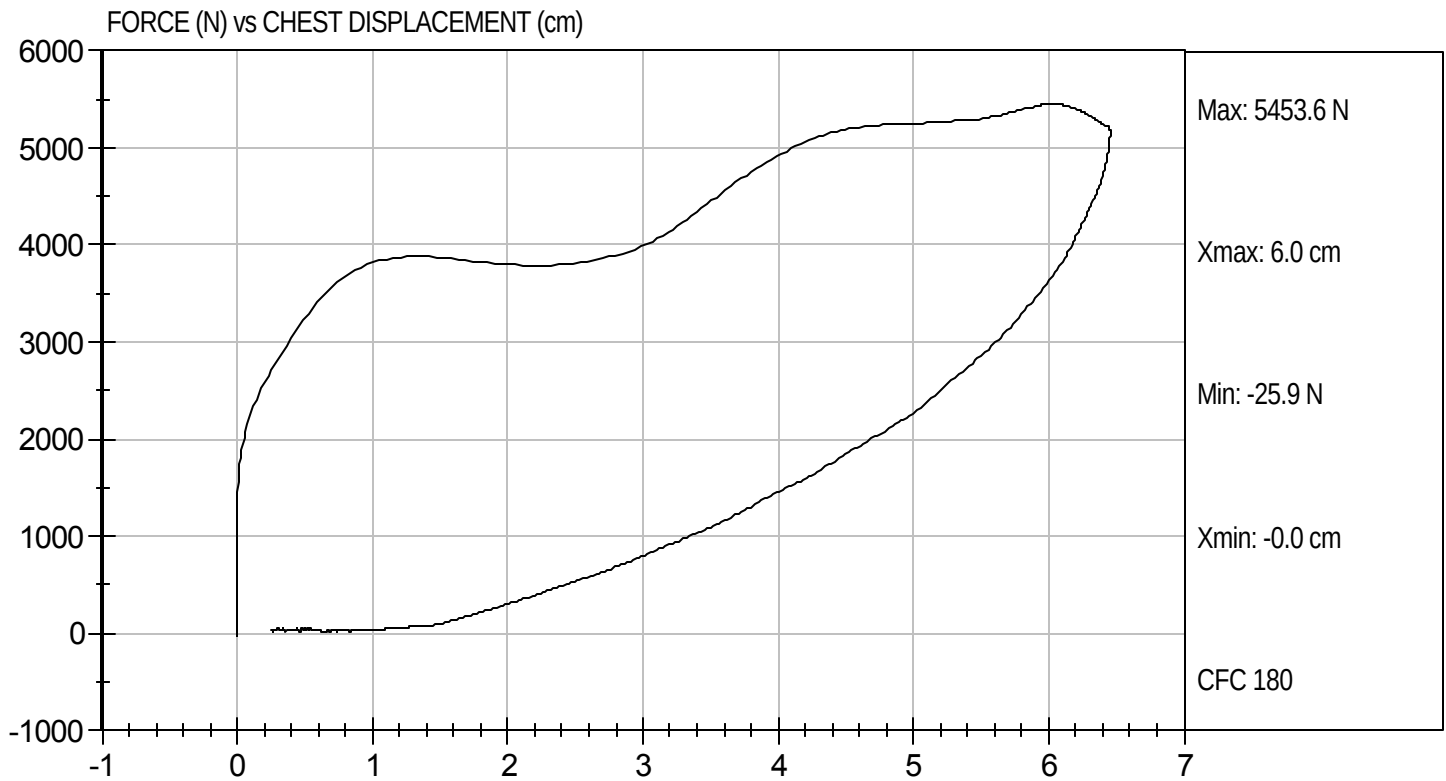
7/29/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102444

Test Date: 7/29/10
Velocity: 22.22 ft/s, 6.77 m/s

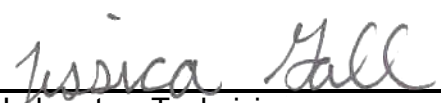


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102445

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,581	Pass
Overall Test Results				Pass



Laboratory Technician

7/28/10

Test Date

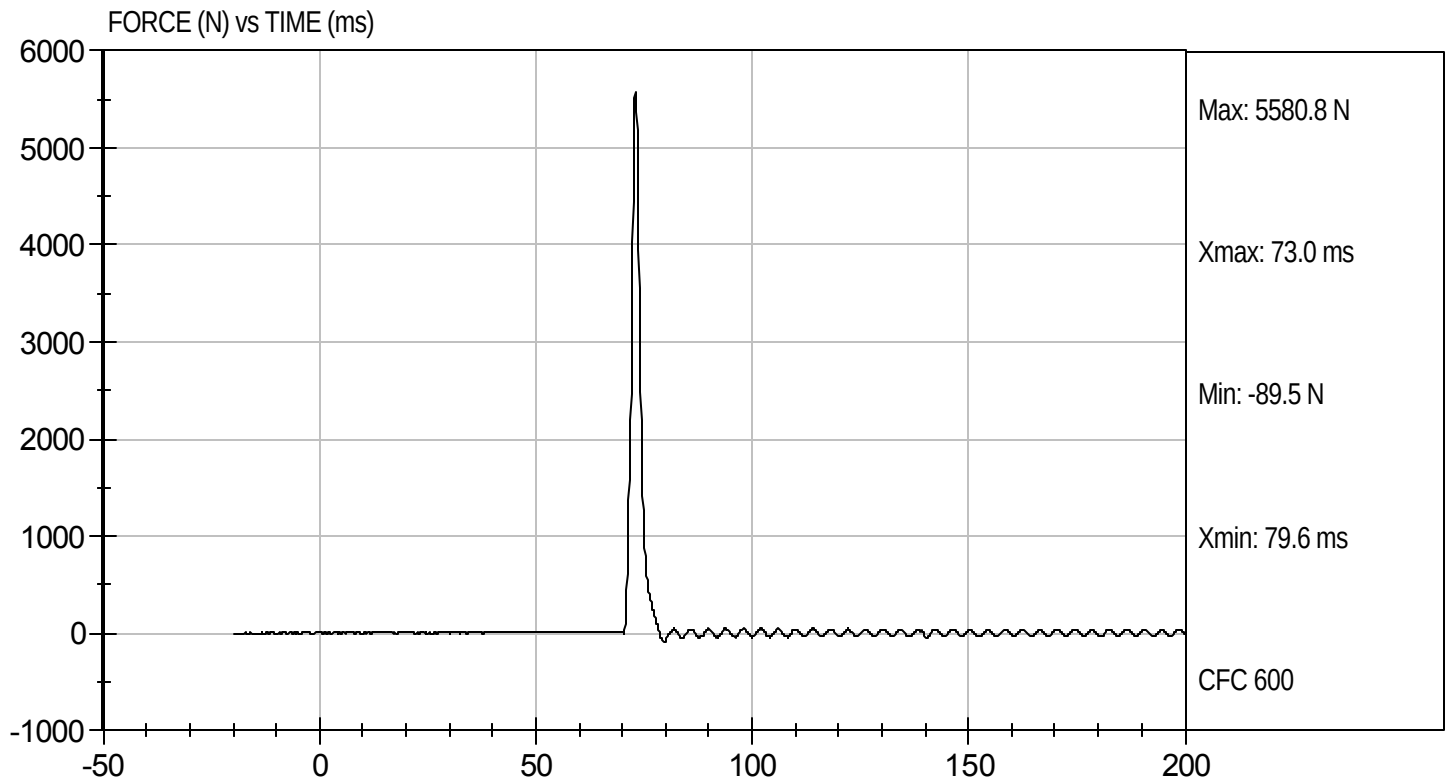


Approved By



Test Desc: Right Knee
Component ID: D102445

Test Date: 7/28/10
Velocity: 6.83 ft/s, 2.08 m/s

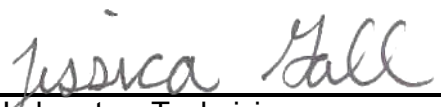


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D102446

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,701	Pass
Overall Test Results				Pass



Laboratory Technician

7/28/10

Test Date

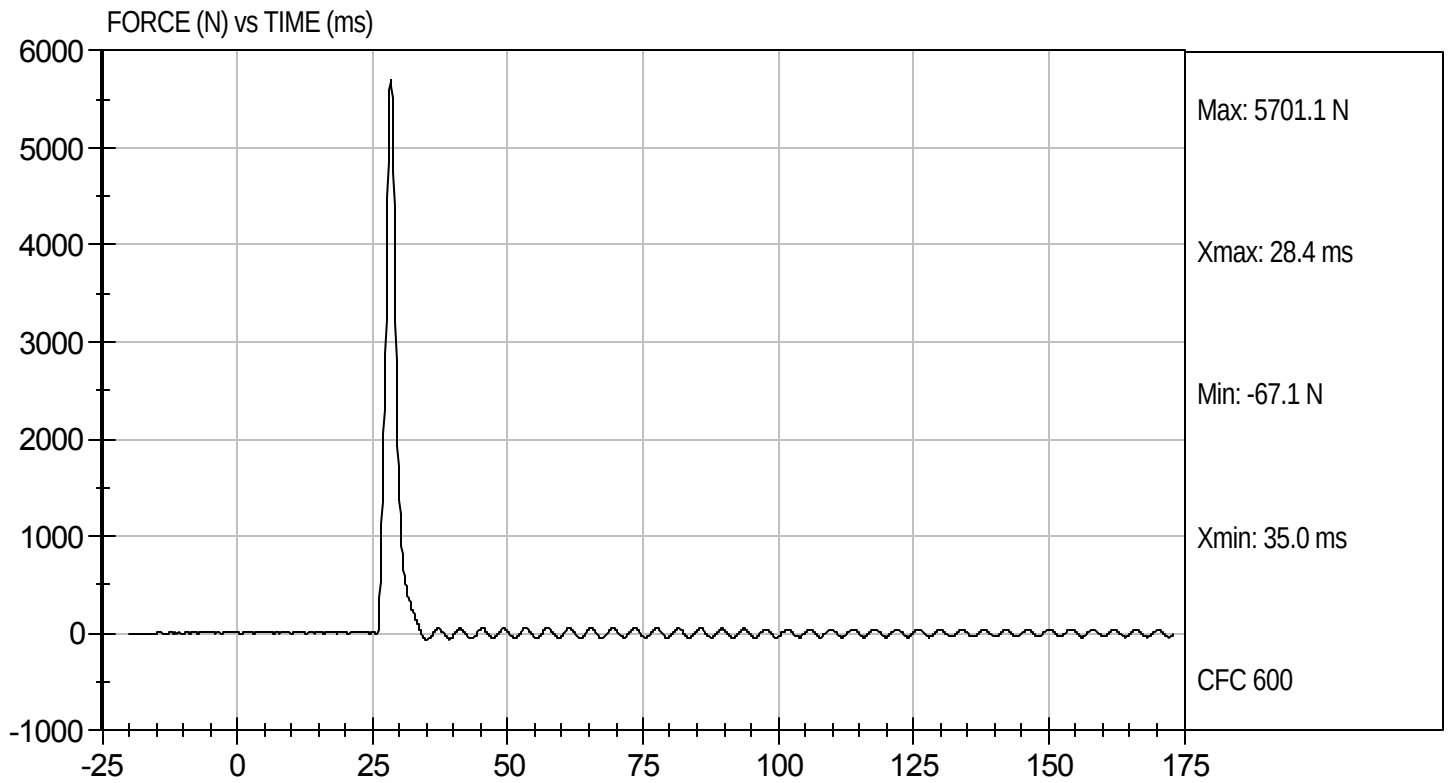


Approved By



Test Desc: Left Knee
Component ID: D102446

Test Date: 7/28/10
Velocity: 6.97 ft/s, 2.12 m/s



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

ATD Serial No: 351

Test I.D: D102440

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	46	46	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	57.6	64.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	45	45	Pass
Overall Test Results					Pass

Jessica Gall
Laboratory Technician

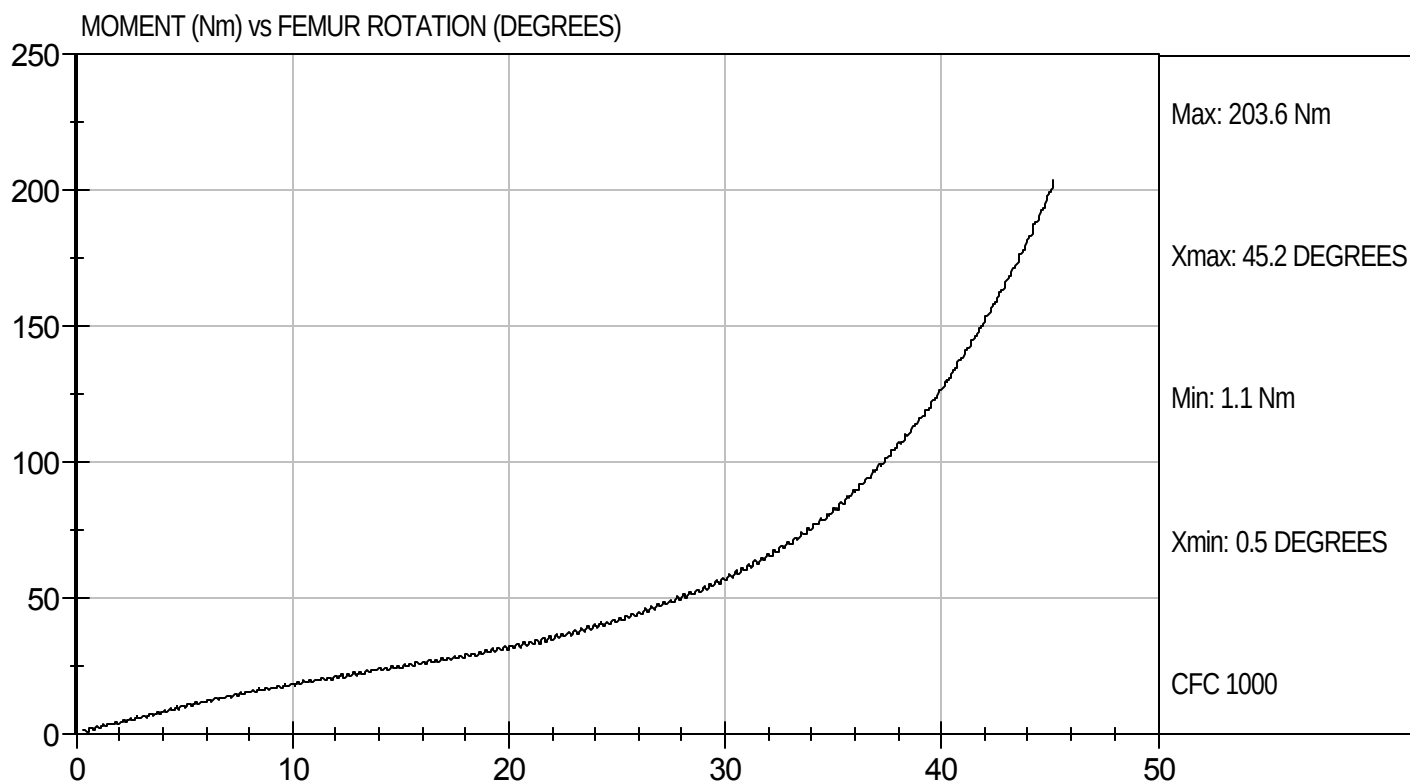
7/29/10
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D102449

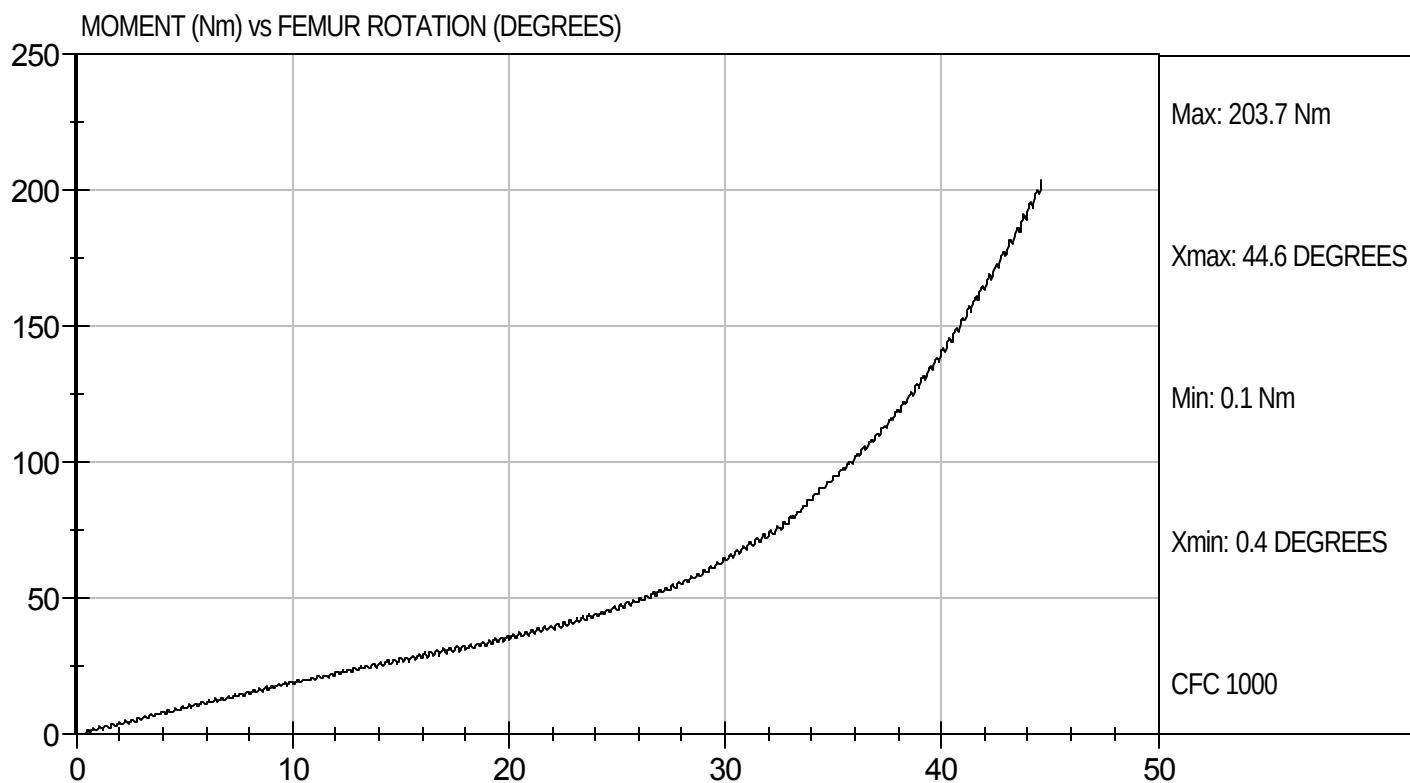
Test Date: 7/29/10
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D102440

Test Date: 7/29/10
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D101751

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Peak Resultant Acceleration	G's	250 to 300	254	Pass
Peak Lateral Acceleration	G's	+/- 15	-7.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

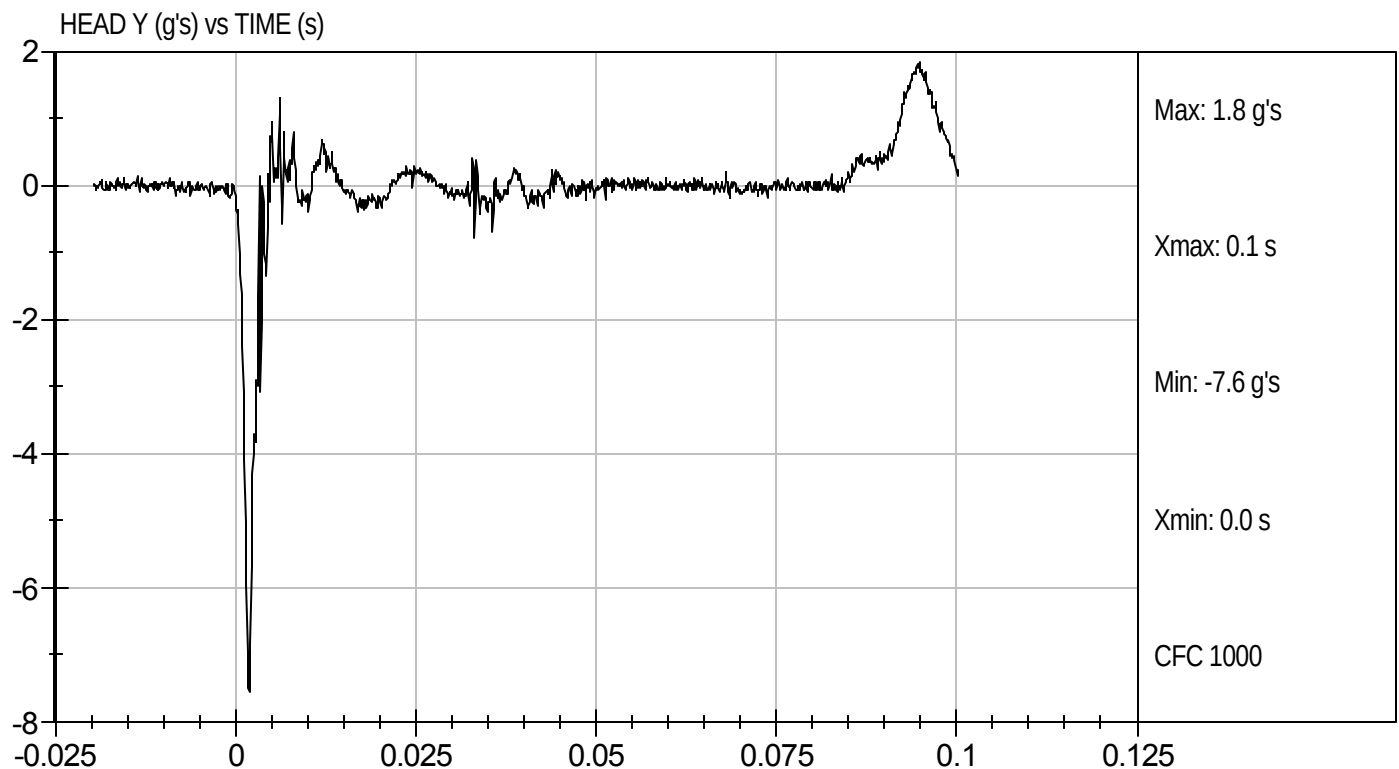
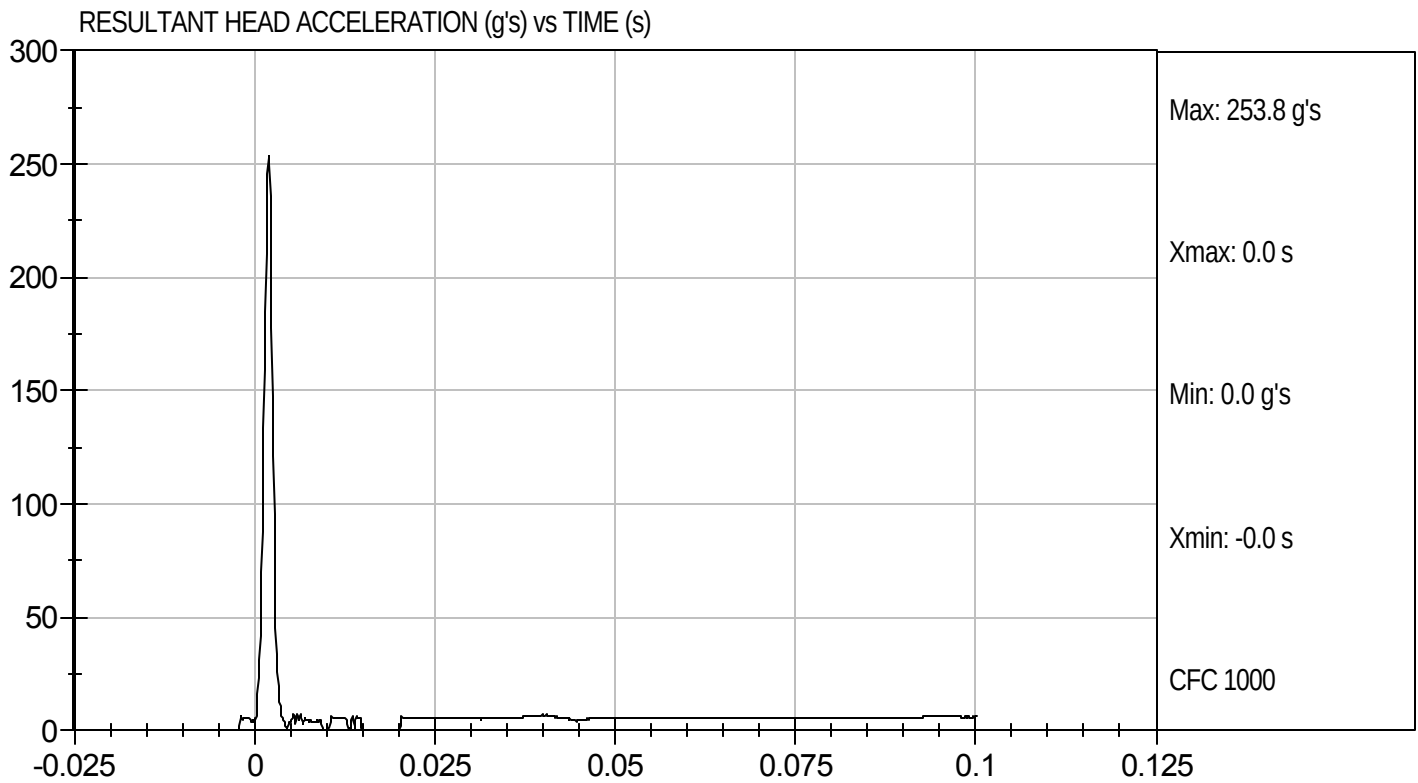
6/9/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D101751

Test Date: 6/9/10
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D101752

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	57	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.8	Pass
	30 ms	m/s	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	78	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	78	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	83	Pass
Overall Results				Pass	


Laboratory Technician

6/9/10
Test Date

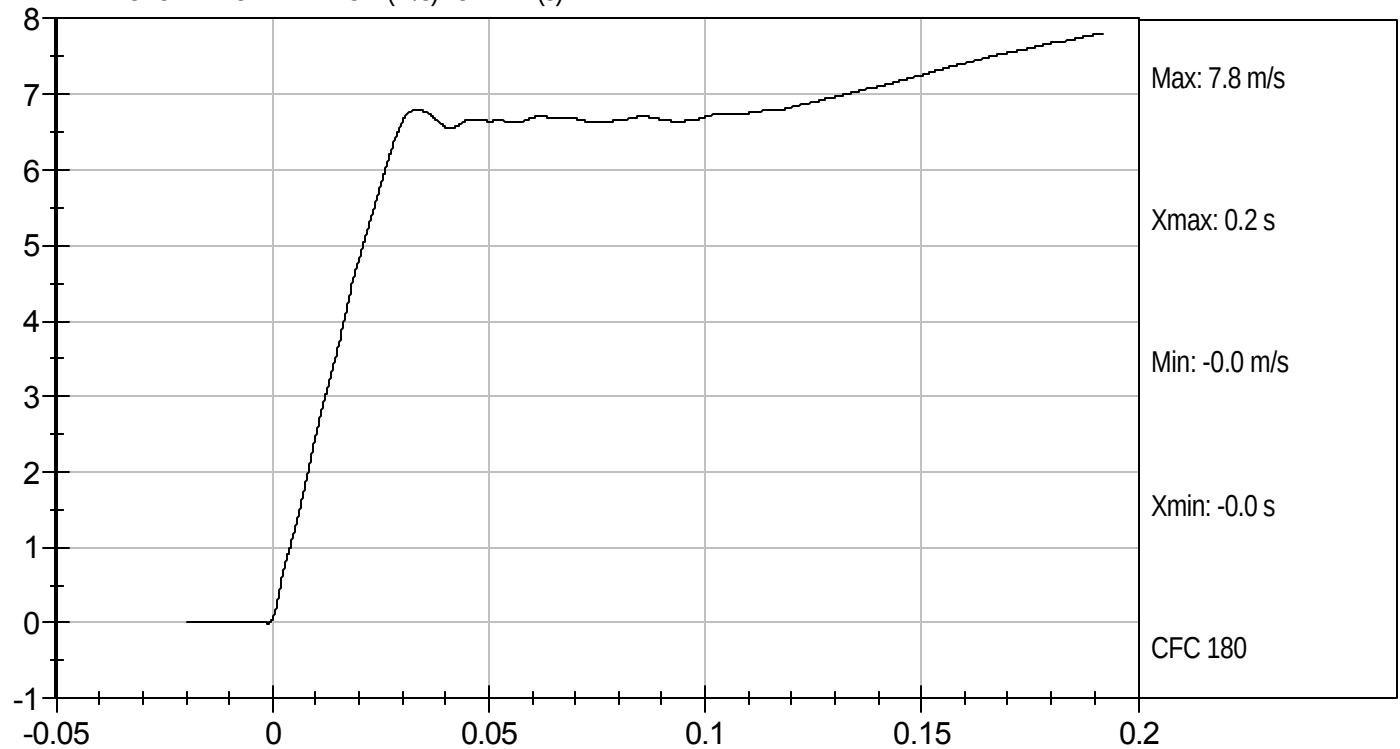

Approved By



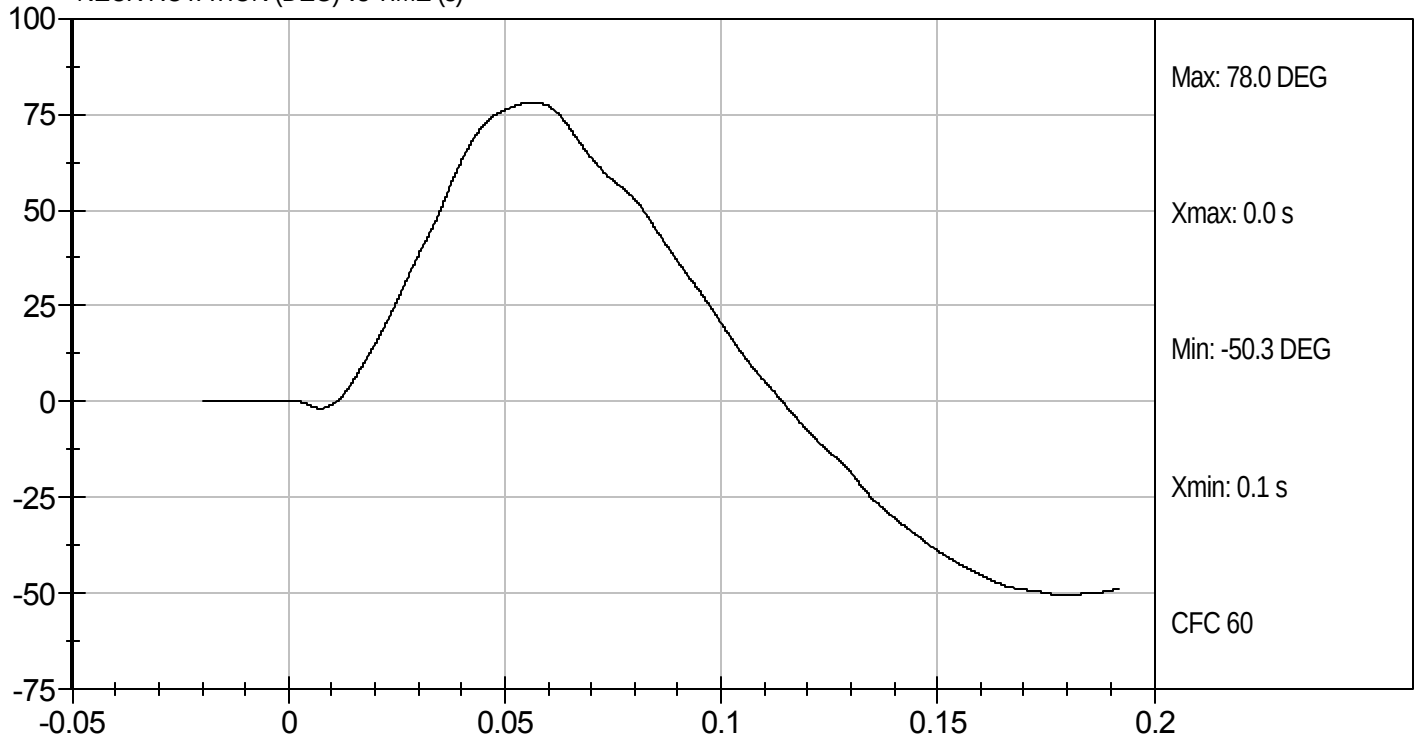
Test Desc: Neck Flexion
Component ID: D101752

Test Date: 6/9/10
Velocity: 23.15 ft/s, 7.06 m/s

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



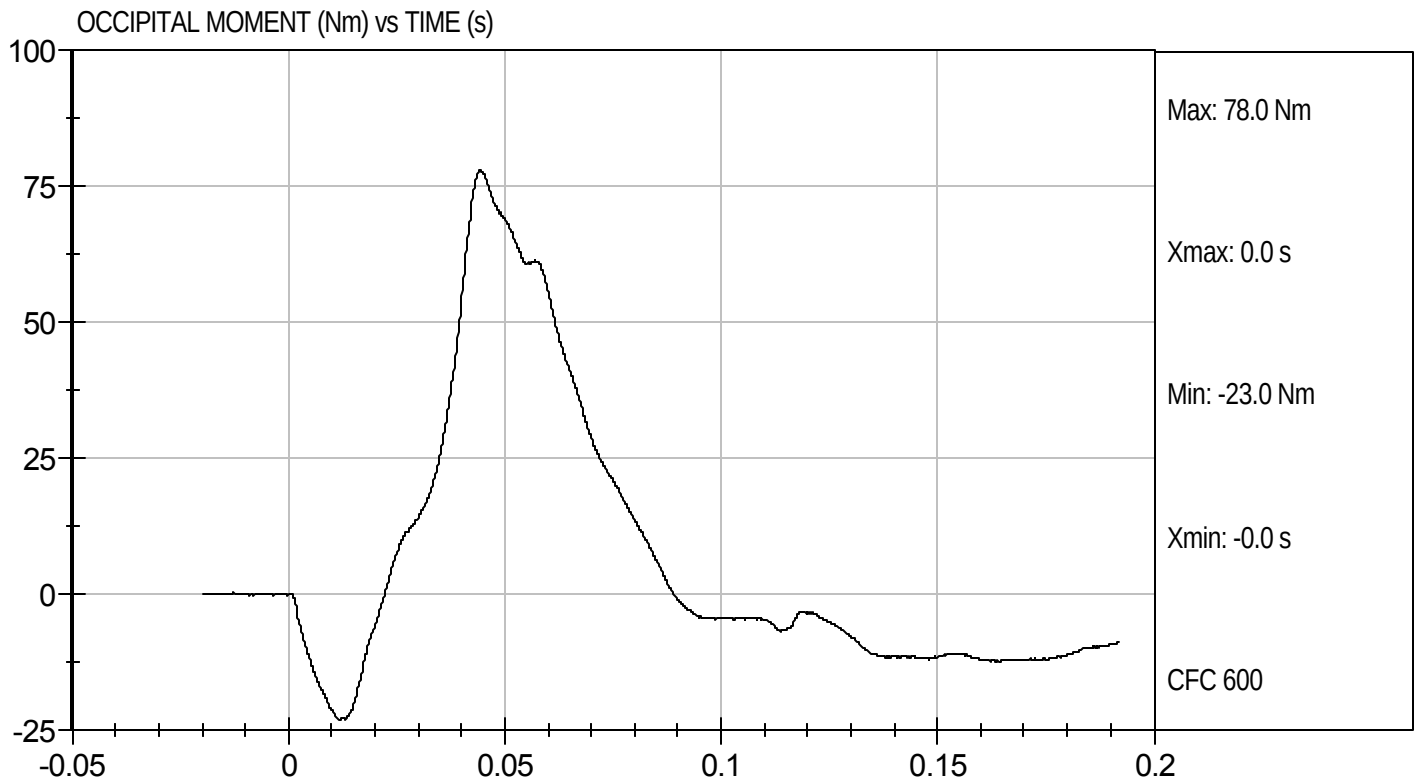
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D101752

Test Date: 6/9/10
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D101753

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	57	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	102	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	102	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

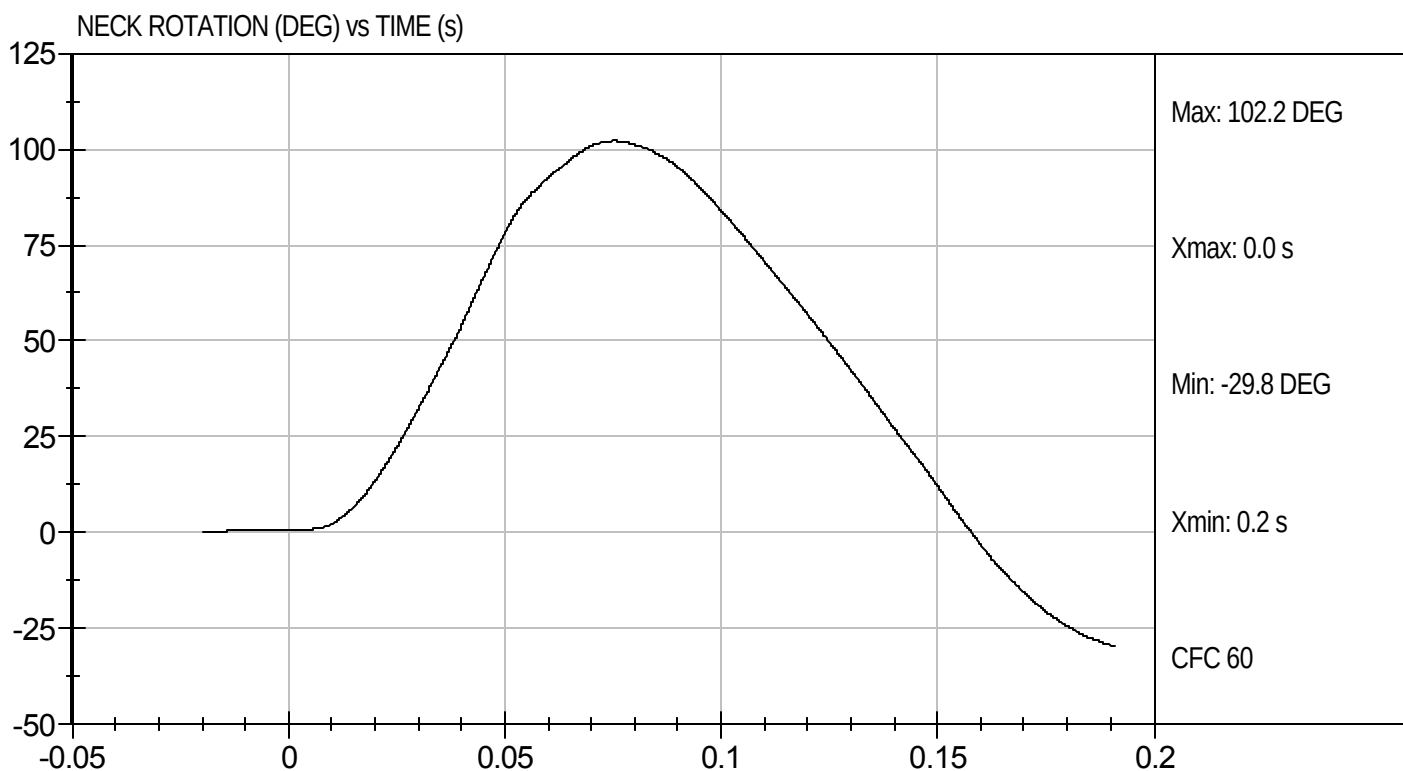
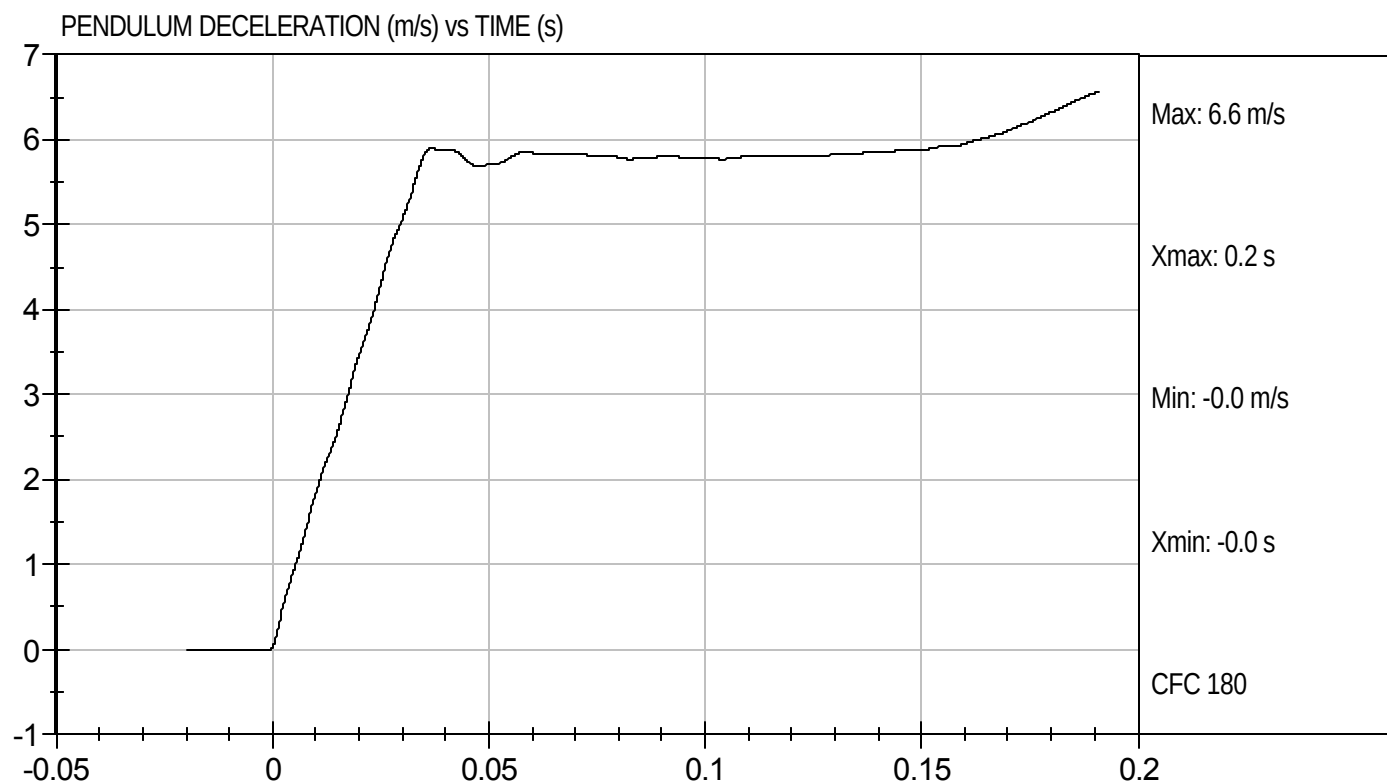
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D101753

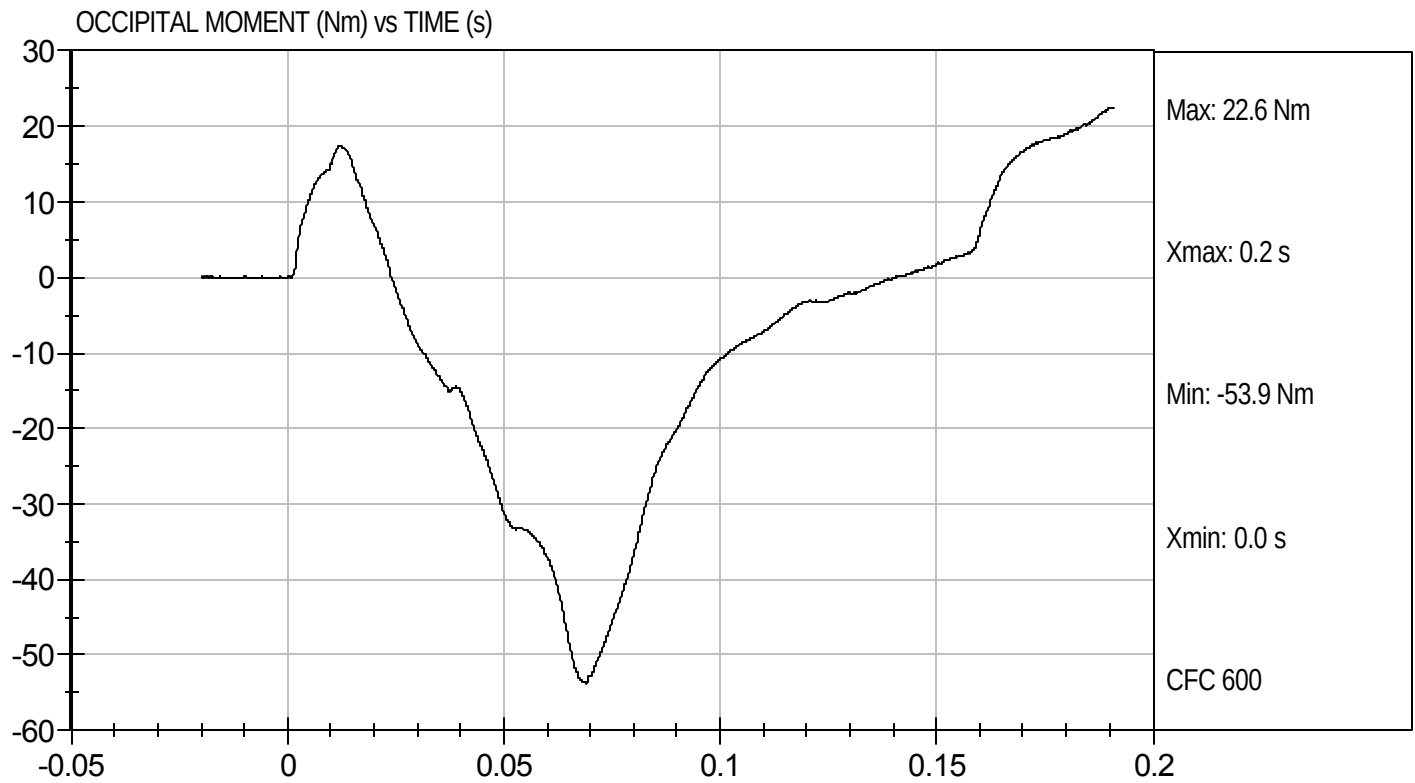
Test Date: 6/9/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D101753

Test Date: 6/9/10
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D101754

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	6.59 to 6.83	6.69	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.07	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4002	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

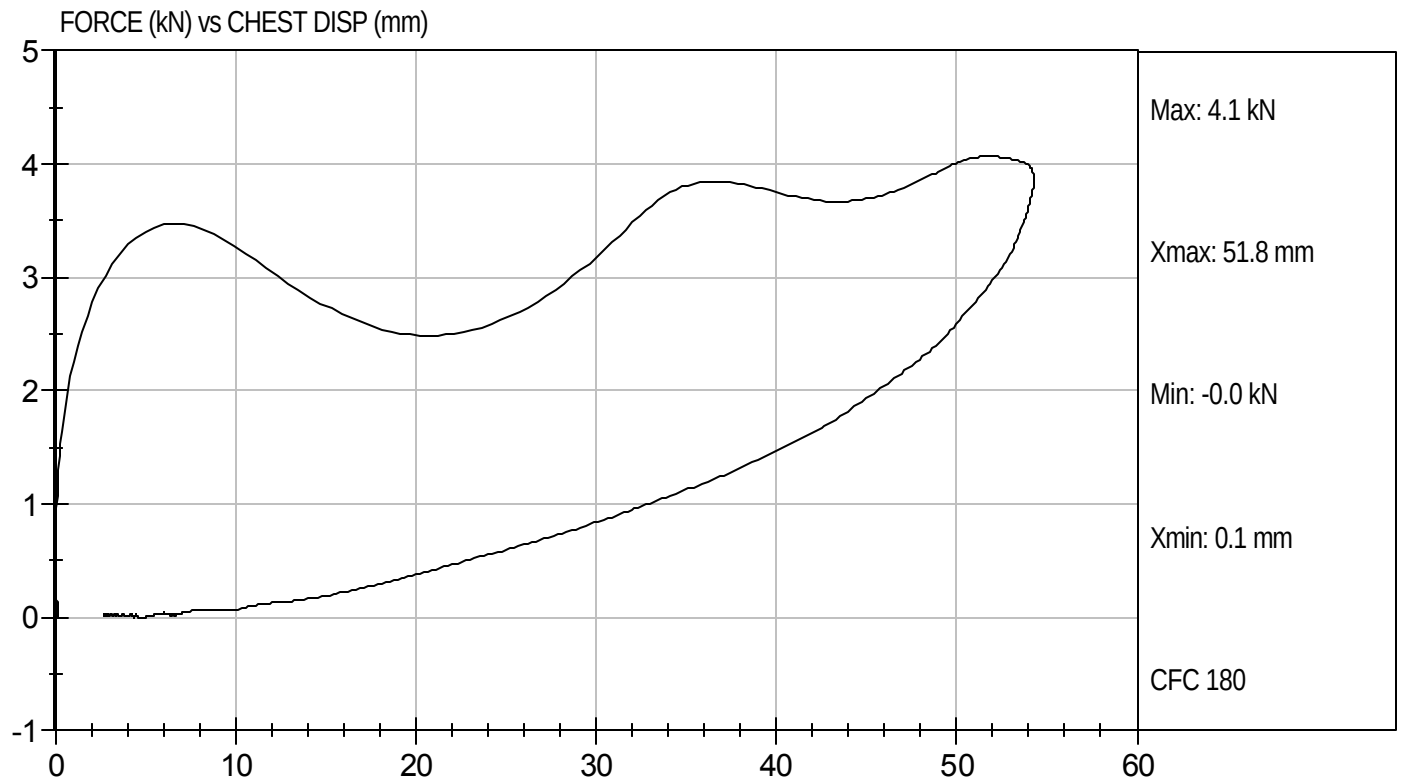
6/8/10
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Flexion
Component ID: D101754

Test Date: 6/8/10
Velocity: 21.96 ft/s, 6.69 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D101755

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	57	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	kN	3.45 to 4.06	3.56	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

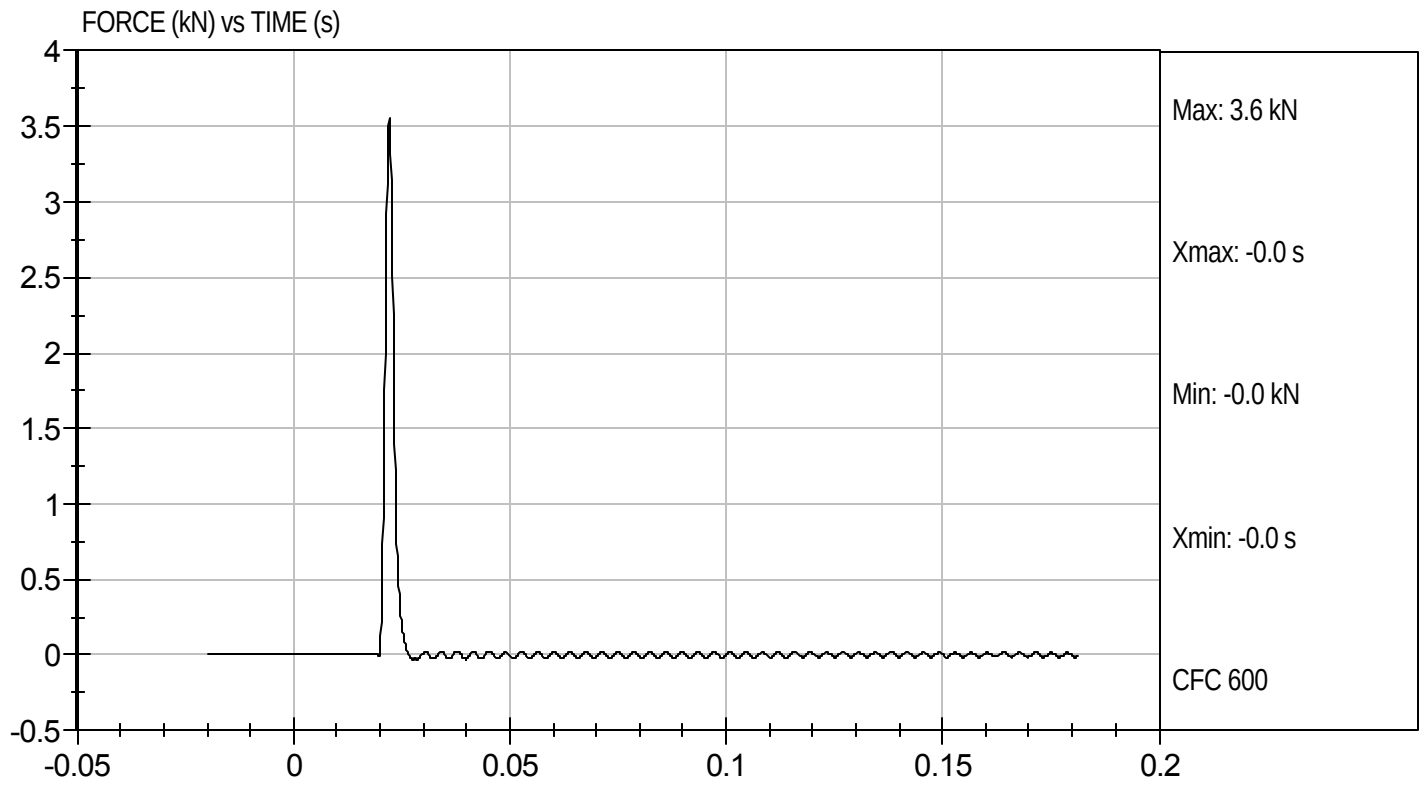
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D101755

Test Date: 6/9/10
Velocity: 6.8 ft/s, 2.07 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D101756

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	57	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	kN	3.45 to 4.06	3.63	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

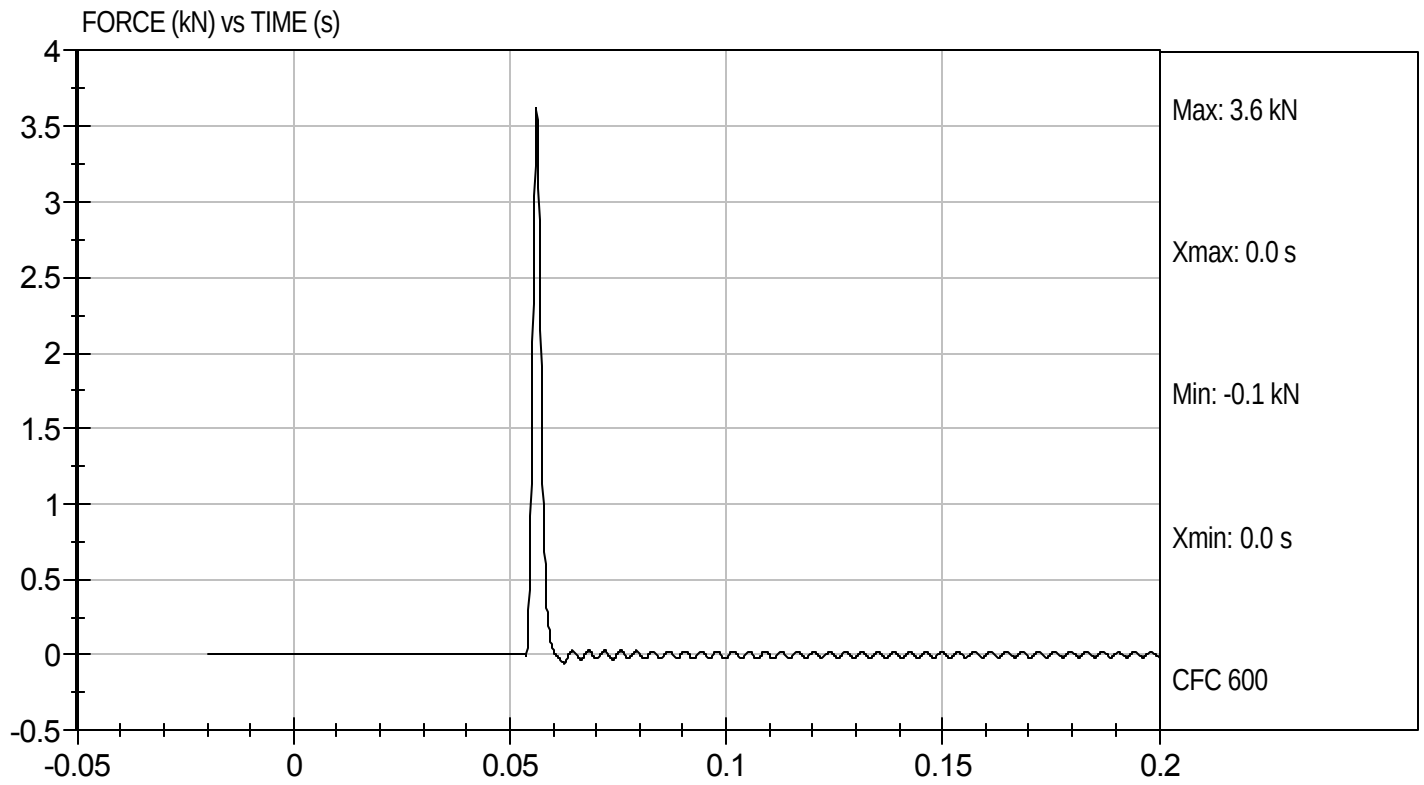
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D101756

Test Date: 6/9/10
Velocity: 6.97 ft/s, 2.13 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138Test I.D: D101757

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	57	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	344	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass

Jessica Hall
Laboratory Technician

6/9/10
Test Date

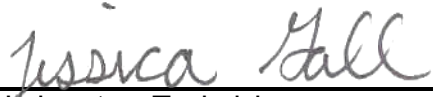
David Winkelbauer
Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

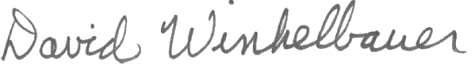
ATD Serial No: 138

Test ID: D102431

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	250 to 300	271	Pass
Peak Lateral Acceleration	G's	+/- 15	-2.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

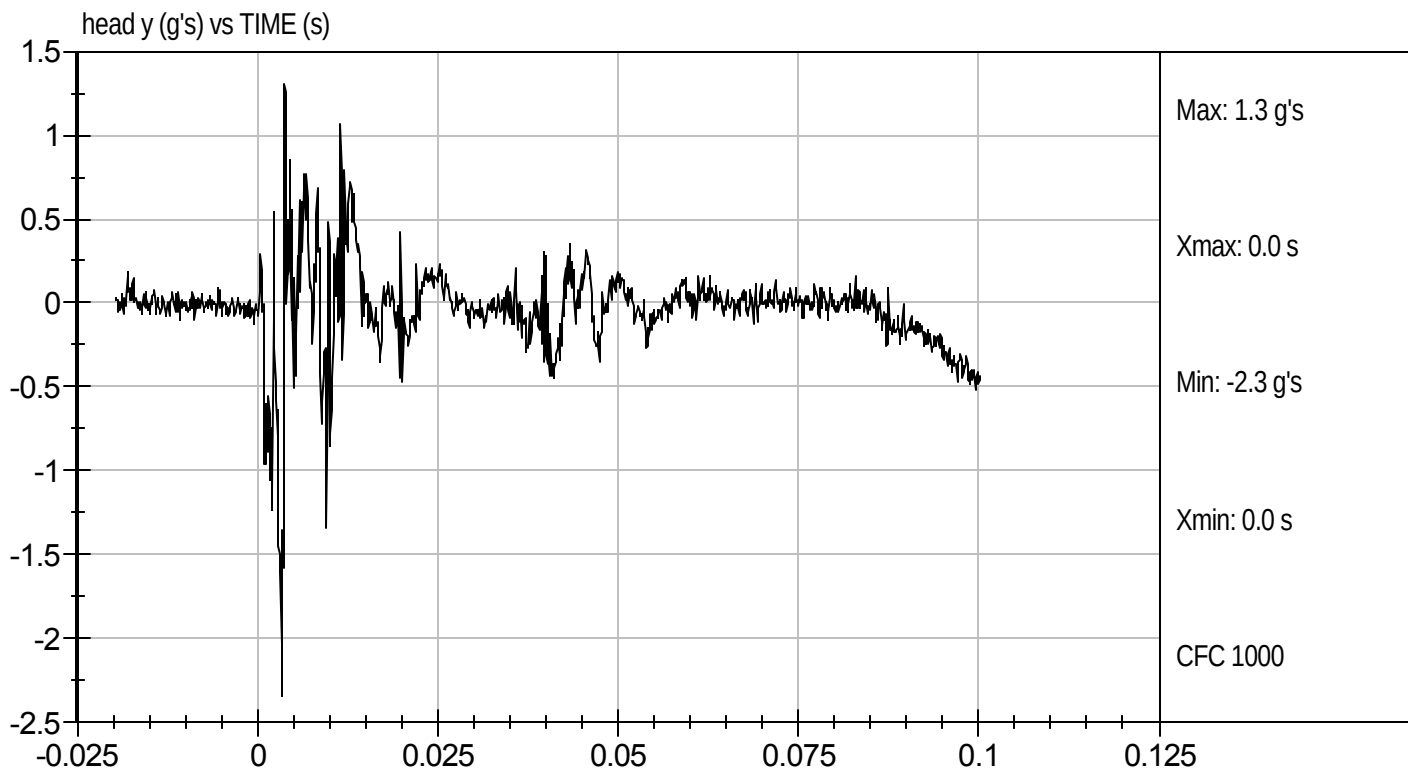
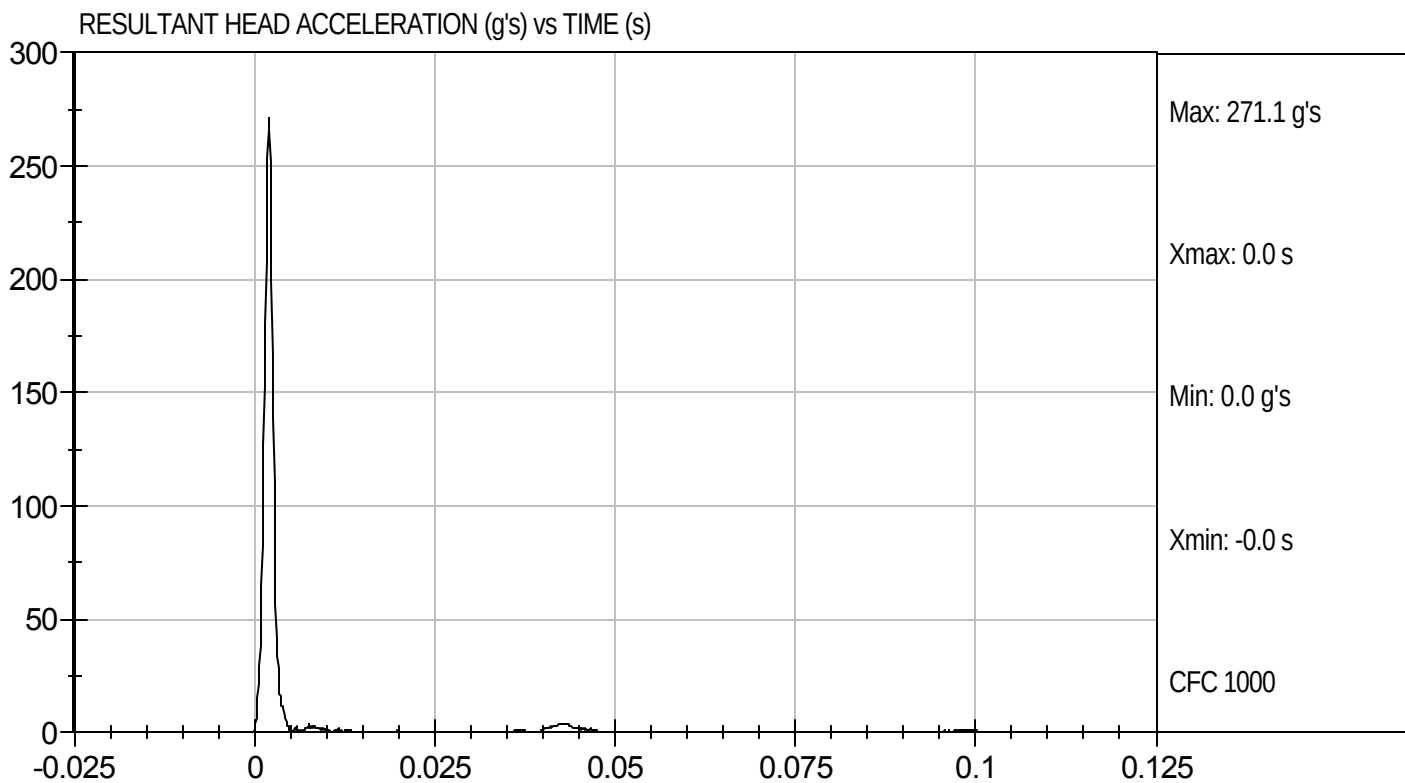
7/28/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D102431

Test Date: 7/28/10
Velocity: 0 ft/s, 0 m/s

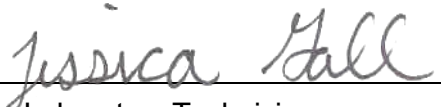


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D102432

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	77	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results				Pass	


 Laboratory Technician

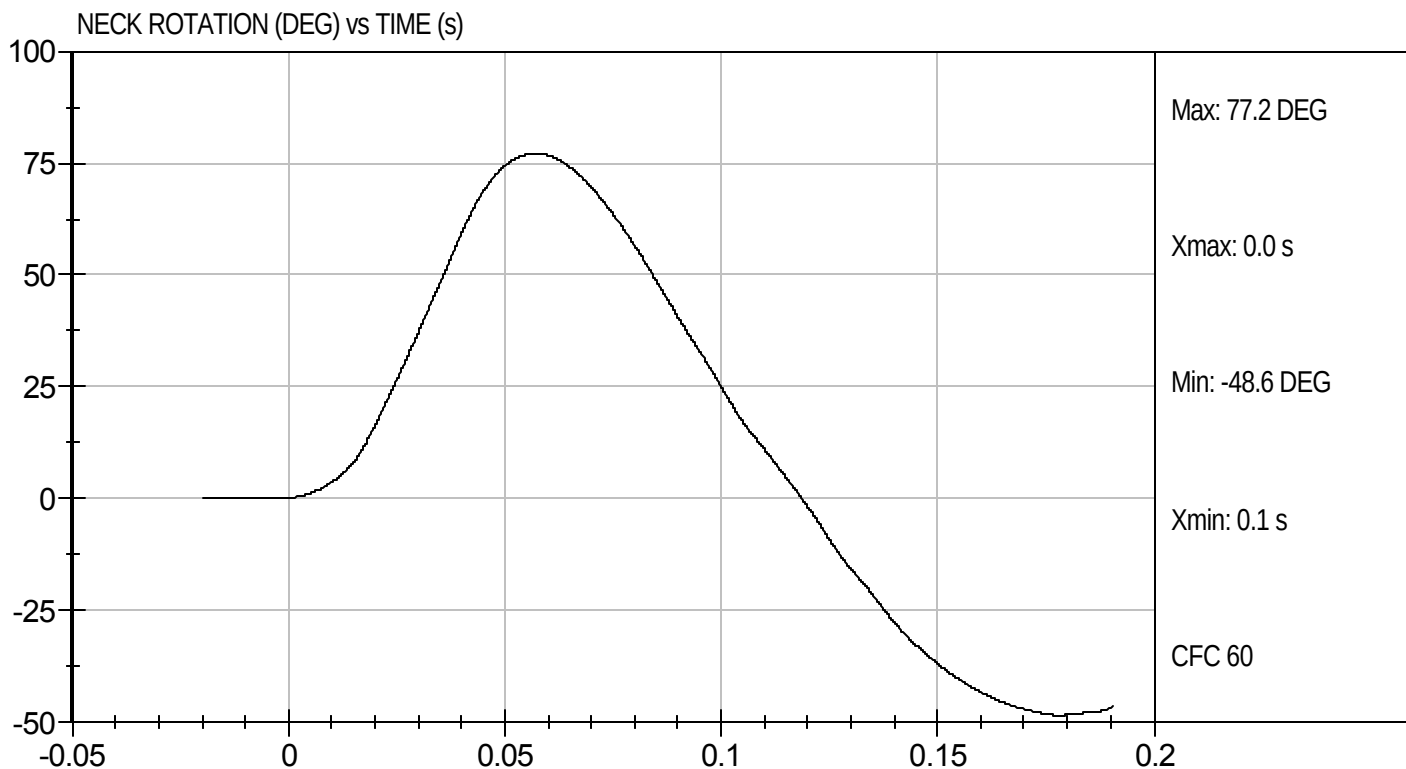
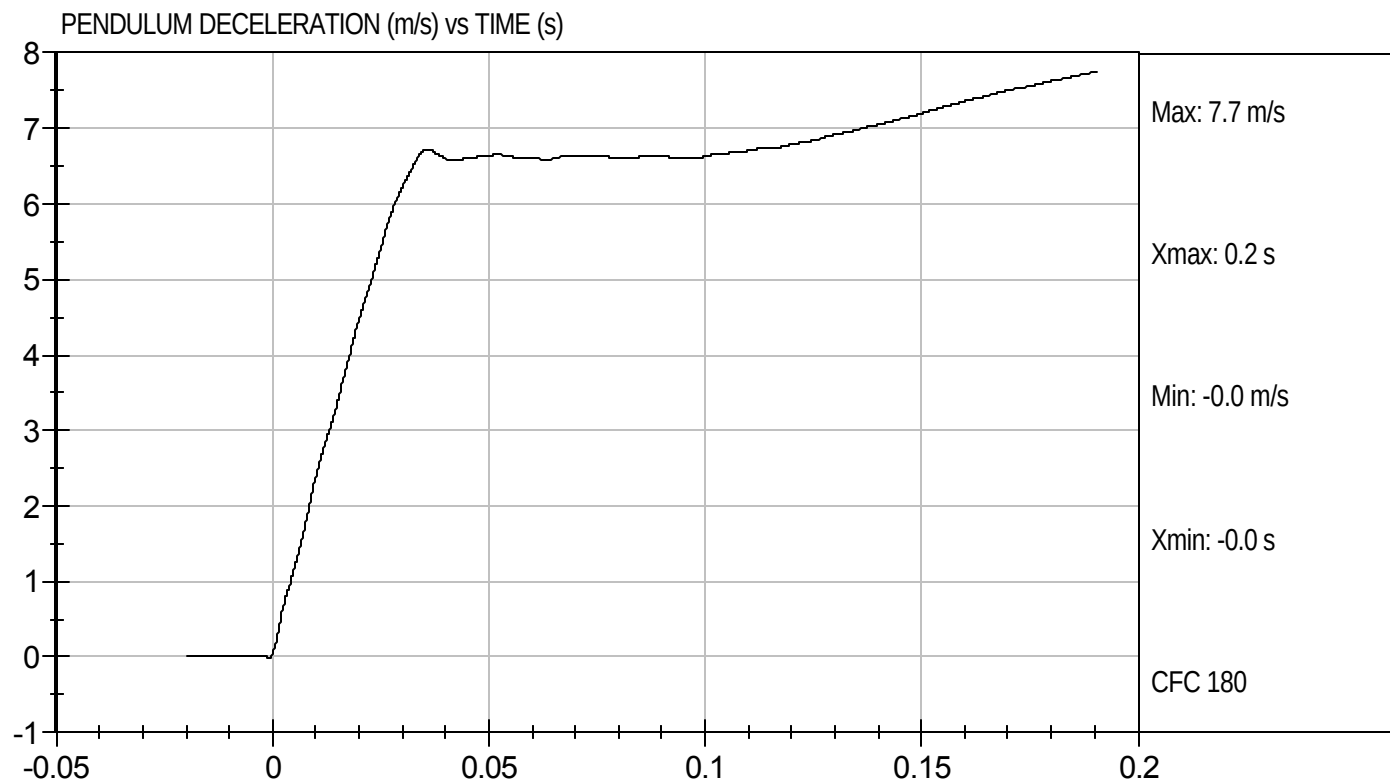
7/29/10
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D102432

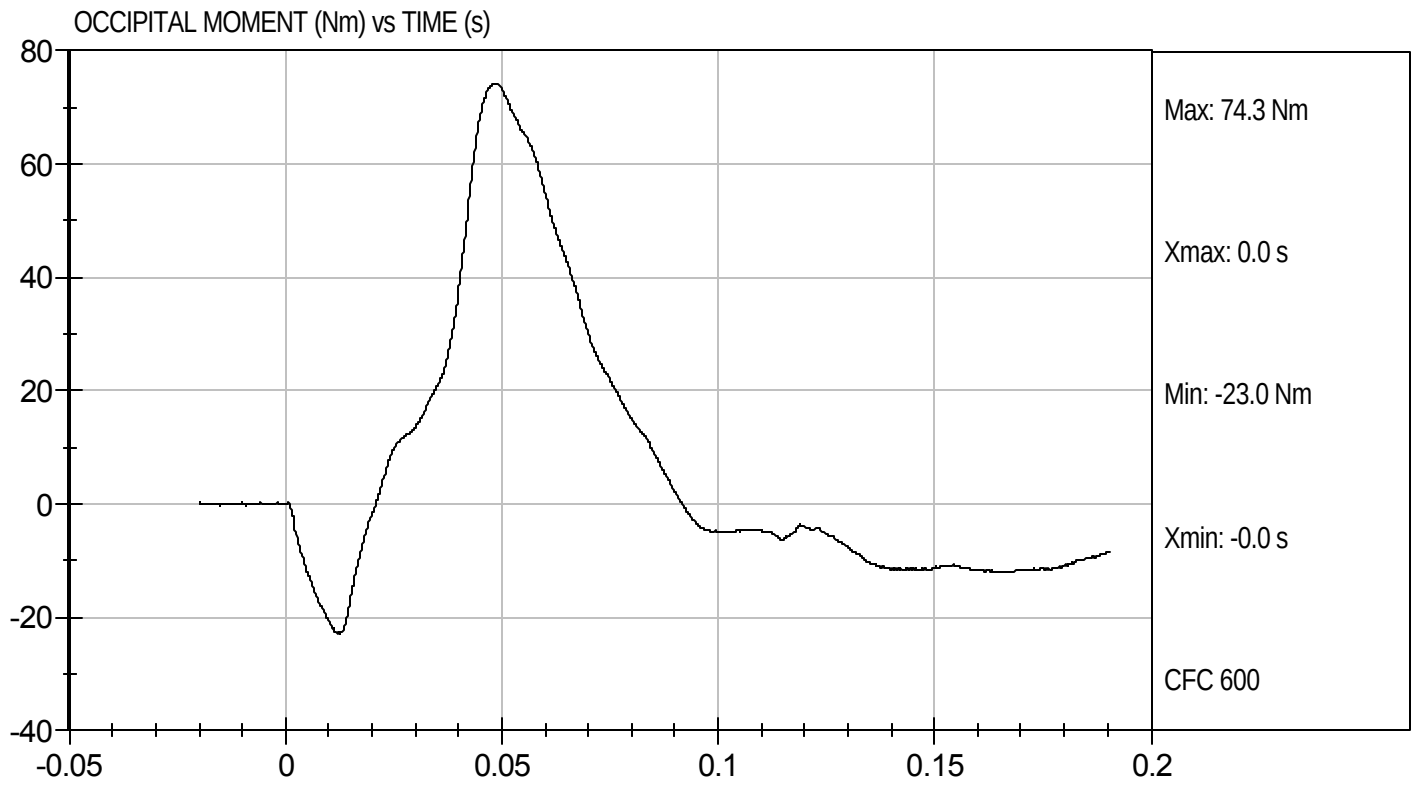
Test Date: 7/29/10
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D102432

Test Date: 7/29/10
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D102433

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	48	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.8	Pass
	30 ms	m/s	4.6 to 5.6	5.5	Pass
D Plane Rotation	Max	deg	99 to 114	103	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-59	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	97	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

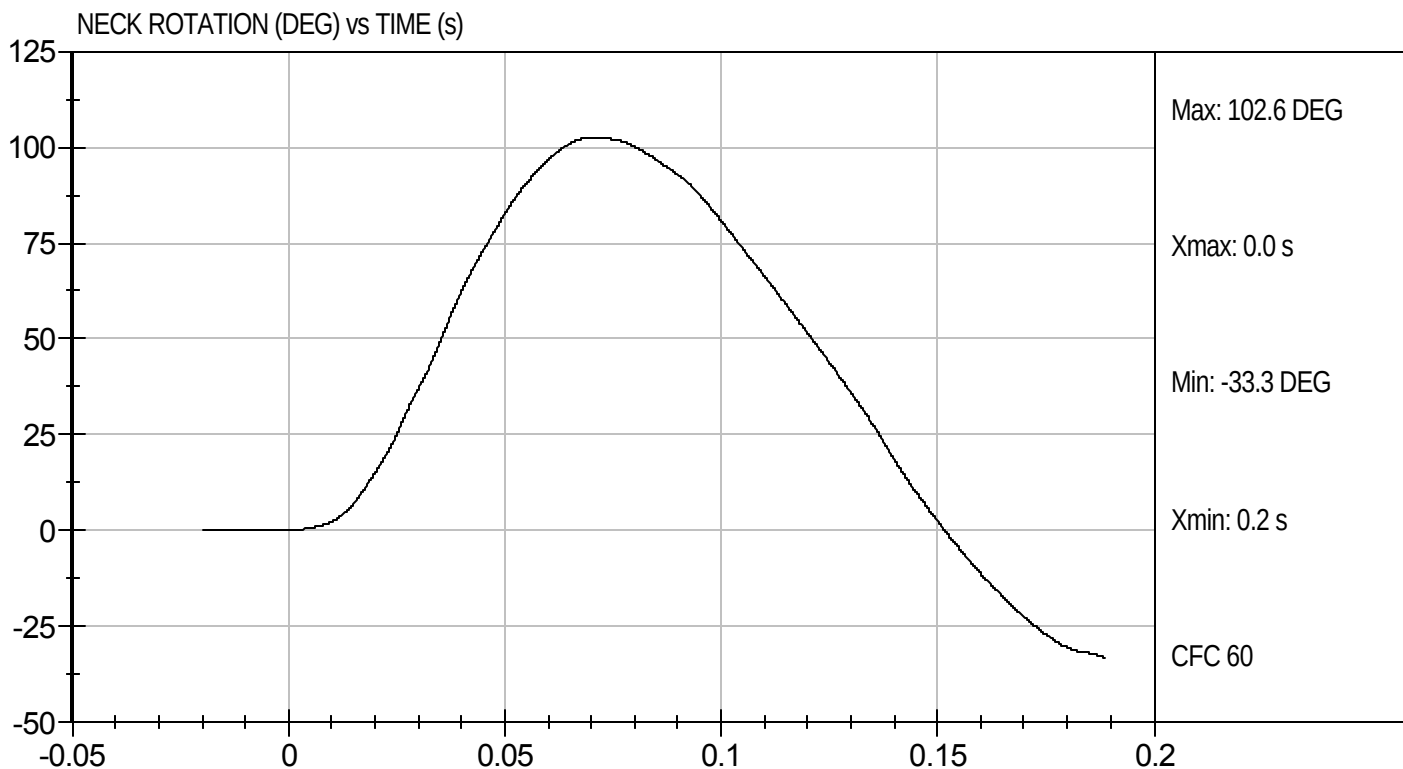
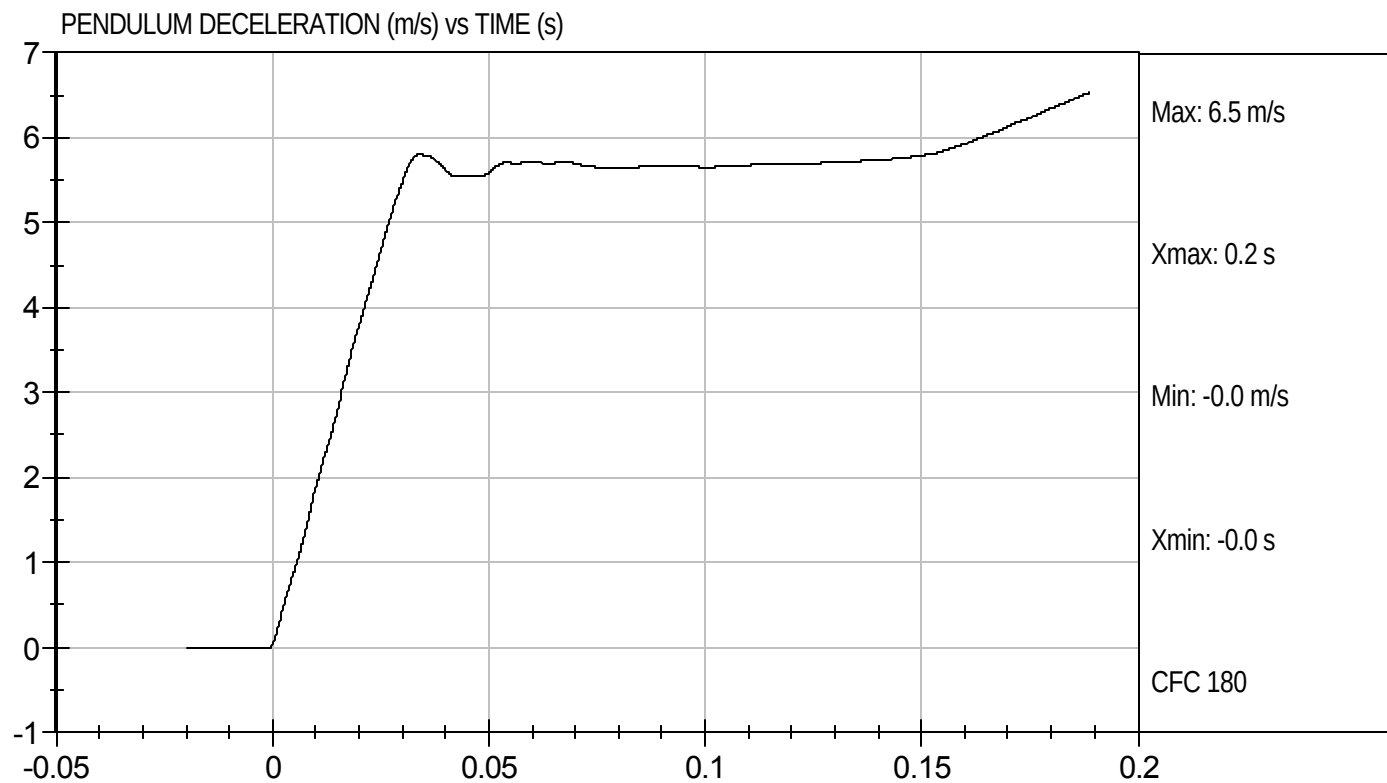
7/29/10
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D102433

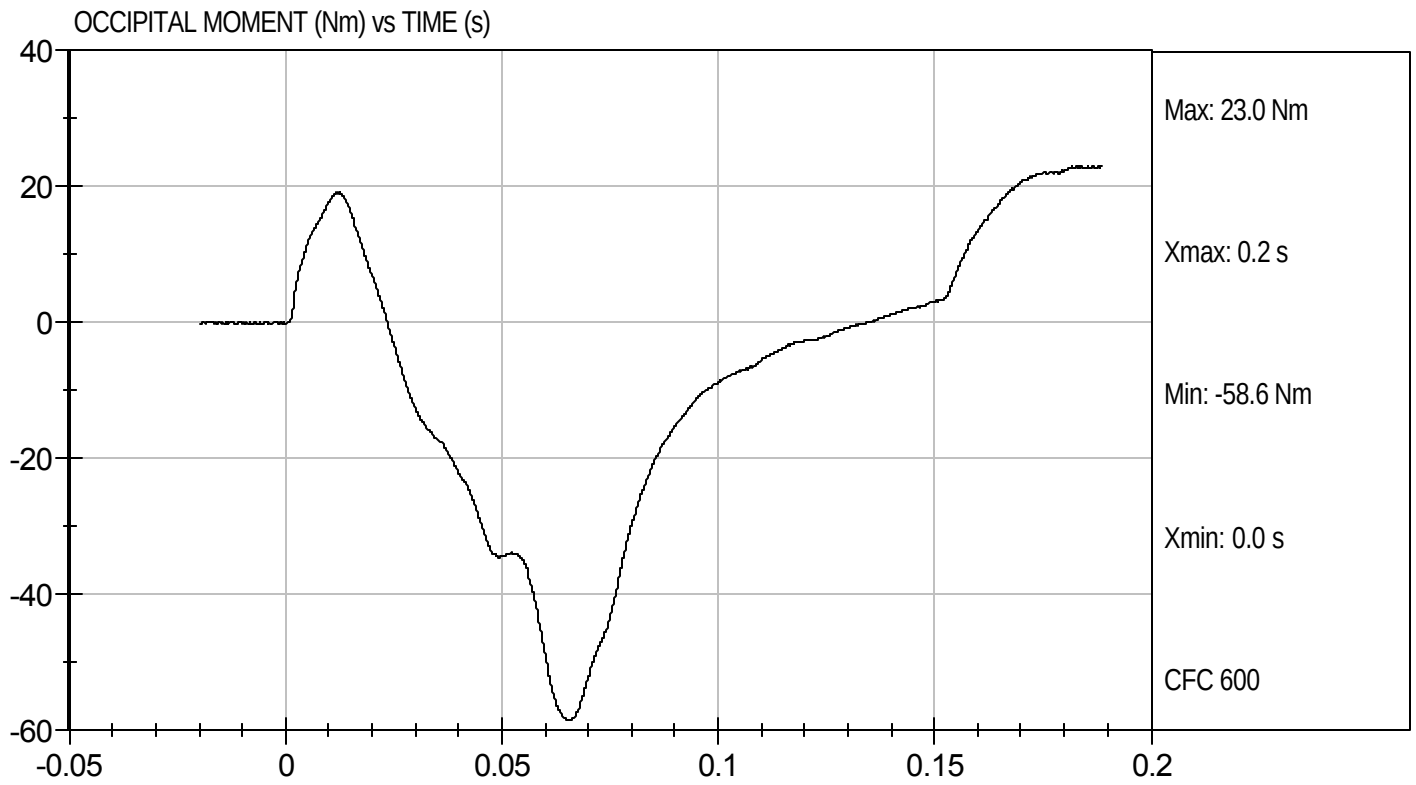
Test Date: 7/29/10
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D102433

Test Date: 7/29/10
Velocity: 20.20 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D102434

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	47	Pass
Probe Speed	m/s	6.59 to 6.83	6.60	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.09	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4086	Pass
Overall Test Results				Pass


Laboratory Technician

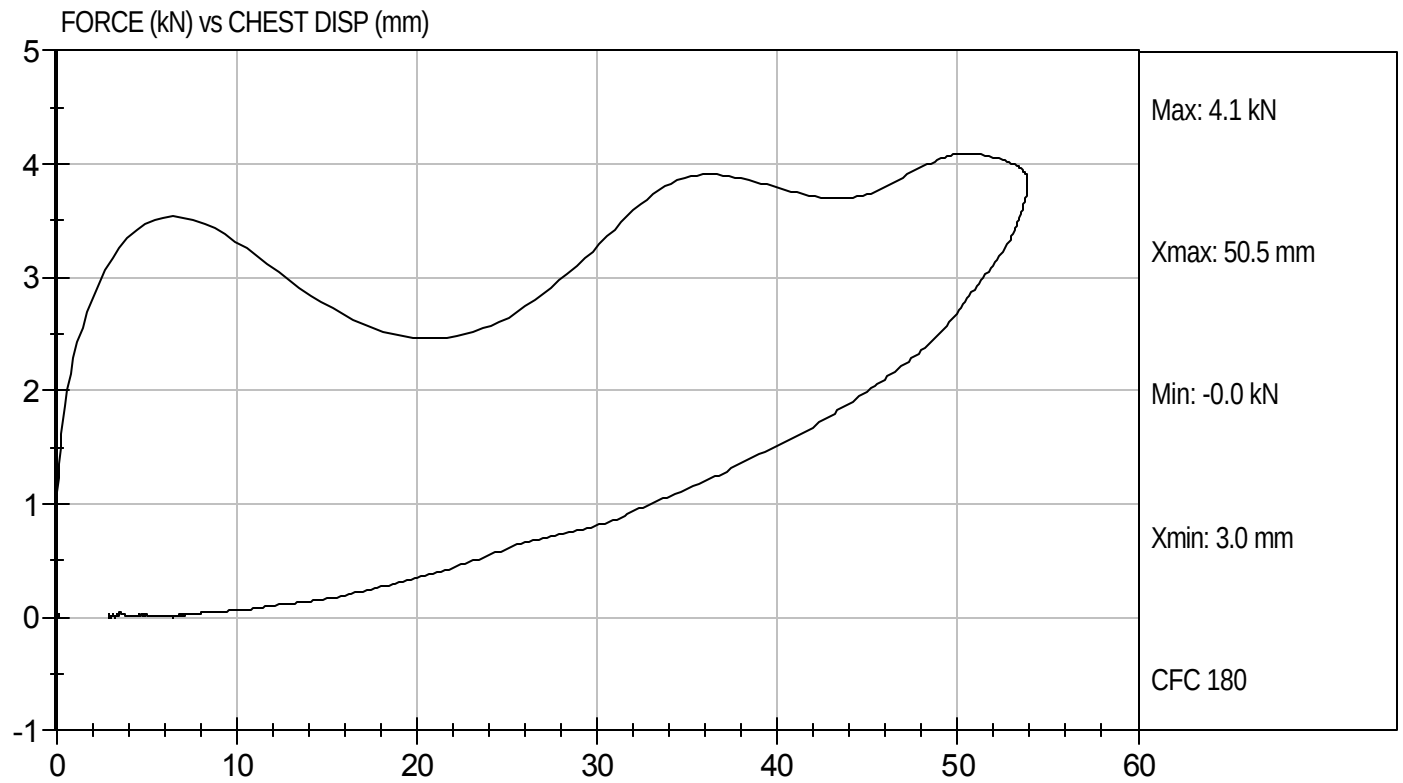
7/29/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102434

Test Date: 7/29/10
Velocity: 21.65 ft/s, 6.60 m/s

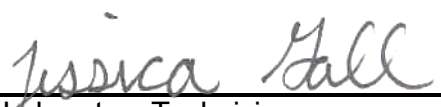


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D102435

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.68	Pass
Overall Test Results				Pass


Laboratory Technician

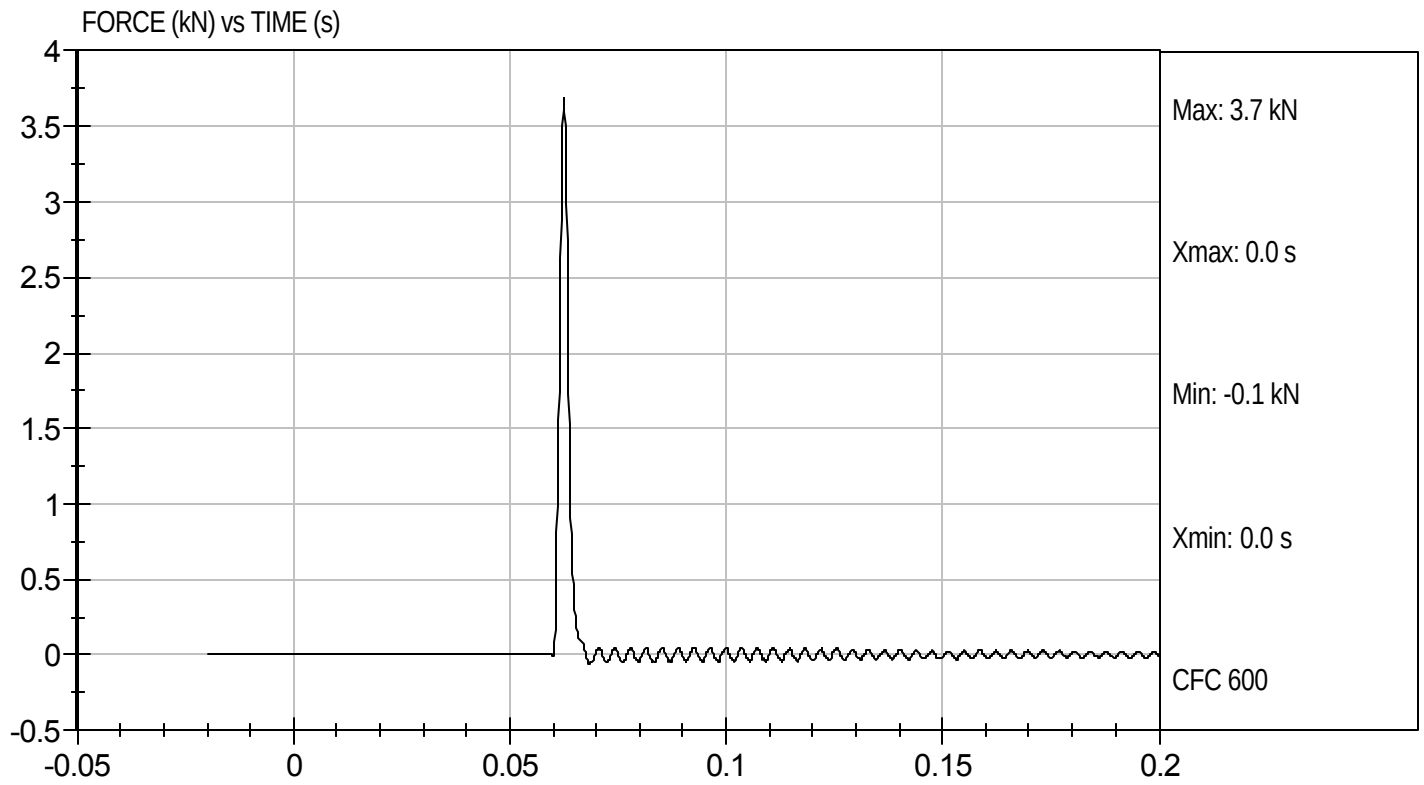
7/28/10
Test Date


Approved By



Test Desc: Right Knee
Component ID: D102435

Test Date: 7/28/10
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D102436

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.79	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

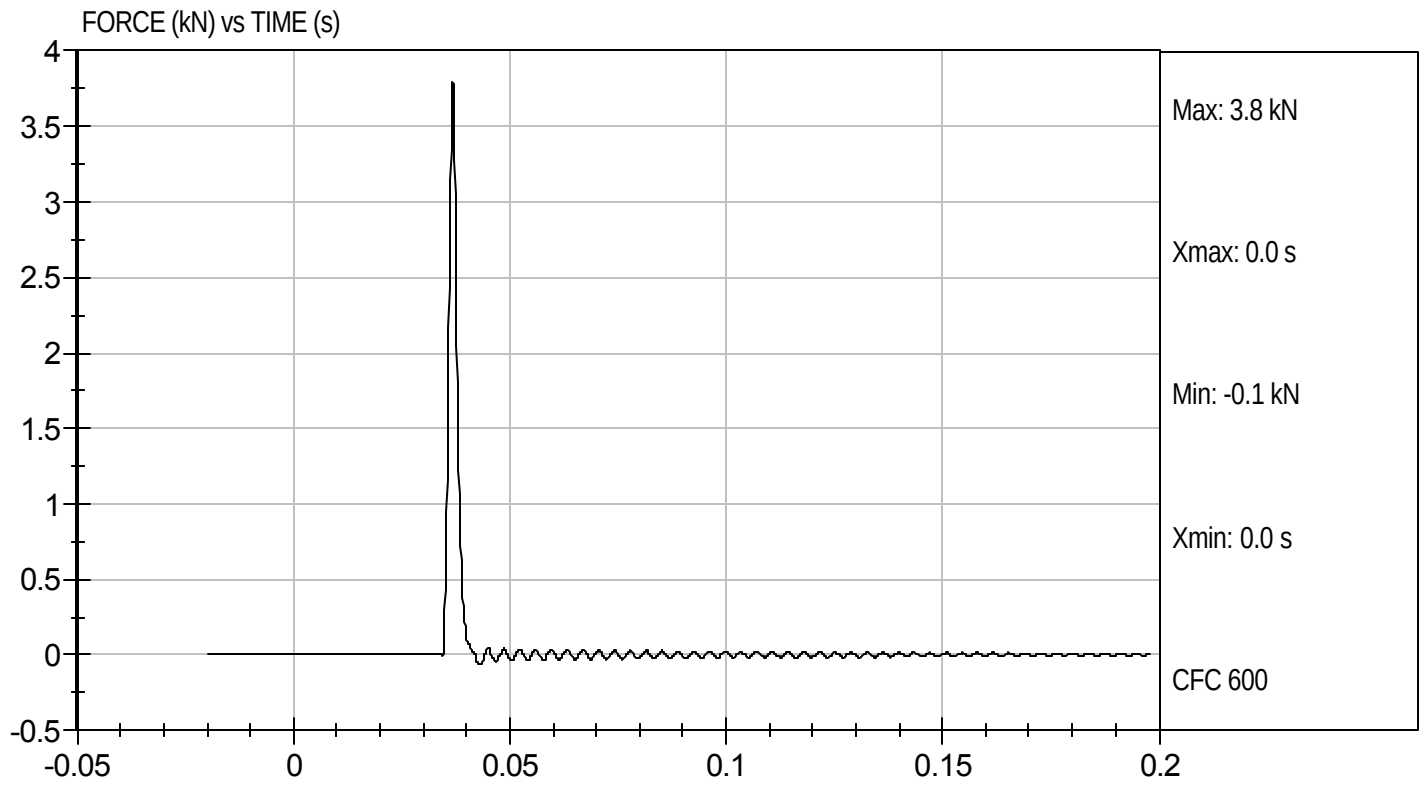
7/28/10
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D102436

Test Date: 7/28/10
Velocity: 6.97 ft/s, 2.12 m/s

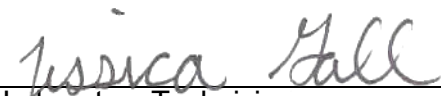


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D102437

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	47	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	361	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

7/29/10
Test Date


Approved By