

REPORT NUMBER: NCAP-MGA-2011-071

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

**TOYOTA MOTOR CORPORATION
2011 Scion tC 3-Dr Liftback
NHTSA No.: YB5103**

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



Test Date: February 22, 2011

Final Report Date: March 19, 2011

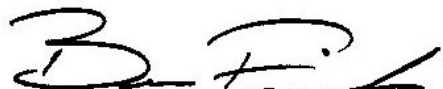
FINAL REPORT

**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: March 19, 2011

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2011 Scion tC 3-Dr Liftback 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 February 22, 2011. The impact velocity was 56.4 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 364 mm located to the right of the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>271</td> <td>299</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>19</td> <td>10</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.29</td> <td>0.47</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1359</td> <td>1095</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>90</td> <td>447</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>1769</td> <td>2288</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2320</td> <td>2539</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	299	Maximum Chest Compression	mm	63	52	19	10	Nij	N/A	1	1	0.29	0.47	Neck Tension	N	4170	2620	1359	1095	Neck Compression	N	4000	2520	90	447	Left Femur Force	N	10008	6805	1769	2288	Right Femur Force	N	10008	6805	2320	2539
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-06-D-00028. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact was conducted in accordance with the Office of Crashworthiness Standard's NCAP Frontal Laboratory Test Procedure dated January 2010.

SUMMARY

A load cell barrier was impacted by a 2011 Scion tC 3-Dr Liftback at a velocity of 56.4 kph. The test was performed at MGA Research Corporation on February 22, 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 on the driver's lap and shoulder belts and the passenger's lap belt to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 036) 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 227 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 364 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 airbag. The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the knee airbag.

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	56.0	71.0	19	0.29	1359	90	1769	2320
Passenger (5 th)	299	56.8	71.8	10	0.47	1095	447	2288	2539

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

TEST NOTES

There was no valid data collected for:

Left Rear Seat Crossmember X after 15 msec.

Right Rear Seat Crossmember Z after 15 msec.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	YB5103	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Scion	Power Steering	Yes
Model	tC	Driver Front Airbag	Yes
Body Style	3-Dr Hatchback	Driver Curtain Airbag	Yes
VIN	JTKJF5C78B3014425	Driver Head/Torso Airbag	No
Body Color	Cement	Driver Torso Airbag	No
Delivery Date	2/11/2011	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	4	Driver Pelvis Airbag	No
Odometer (km)	6	Driver Knee Airbag	Yes
Dealer	Jack Safro Scion	Pass. Front Airbag	Yes
Transmission	Automatic	Pass. Curtain Airbag	Yes
Final Drive	Front	Pass. Head/Torso Airbag	No
Type/No. Cylinders	4	Pass. Torso Airbag	No
Engine Displacement (L)	2.5	Pass. Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Pass. Pelvis Airbag	No
Roof Rack	No	Pass. Knee Airbag	Yes
Sunroof/T-Top	Yes	Pretensioners	Yes
Tinted Glass	No	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Other	
Does owner's manual provide instructions to turn off automatic door locks?	Yes		

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	1882
Date of Manufacture	11/10	GAWR Front (kg)	1150
		GAWR Rear (kg)	950

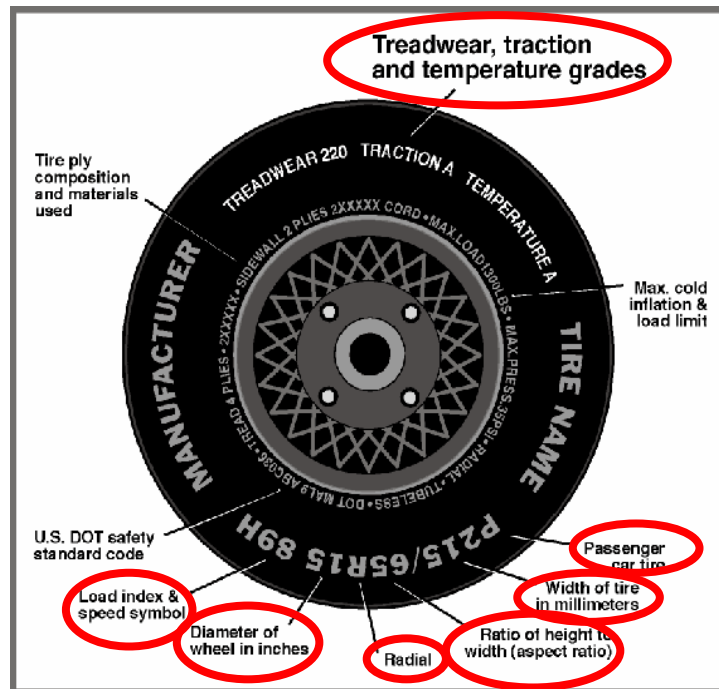
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				388
Cargo Weight (RCLW) (kg)				48

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	210
Recommended Tire Size	P225/45R18	P225/45R18
Tire Size on Vehicle	P225/45R18	P225/45R18
Tire Manufacturer	Toyo	Toyo
Tire Model	PROXES	PROXES
Treadwear	300	300
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	91W	91W
Tire Material	Rubber	Rubber
DOT Safety Code Right	N3J7	N3J7
DOT Safety Code Left	N3J7	N3J7

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	460.4	259.9		499.9	326.6	
Right	kg	435.5	263.5		458.1	317.5	
Ratio	%	63.1	36.9		59.8	40.2	
Totals	kg	895.9	523.4	1419.3	958.0	644.1	1602.1

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1419.3
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	48
Calculated Target Vehicle Target Weight (TVTW)	kg	1607.9

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	692	695	705	715	996
As Tested	mm	681	688	678	688	1085
Post Test	mm	668	667	686	680	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2700
Total Vehicle Length at Left Side	mm	4310
Total Vehicle Length at Centerline	mm	4420
Total Vehicle Length at Right Side	mm	4310
Weight of Ballast in Cargo Area	kg	25.4
Weight of Vehicle Components Removed	kg	20.0
Amount of Stoddard Solvent in Fuel Tank	L	51.0

List of components removed to meet test weight: Spare tire, jack & tools, right tail light.

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4420
2	Total Width	1730
3	Bumper Top Height	550
4	Bumper Bottom Height	435
5	Longitudinal Member Top Height	538
6	Distance between Longitudinal Members	920
7	Longitudinal Member Width	70
8	Engine Top Height	868
9	Engine Bottom Height	165
10	Engine and Gearbox Width	800
11	Front Bumper-Engine Distance	490
12	Front Shock Absorber Fixing Height	896
13	Bonnet Leading Edge Height	737
14	Front Shock Absorber Fixing Width	1172
15	Front Bumper – Front Axle Distance	910
16	Front Axle – A-Pillar Distance	435
17	A-Pillar – B-Pillar Distance	1350
18	B-Pillar – Rear Axle Distance	939
19	B-Pillar – C-Pillar Distance	530
20	Roof Sill Bottom Height	1260
21	Roof Sill Top Height	1385
22	Floor Sill bottom Height	214
23	Floor Sill Top Height	382

DATA SHEET NO. 2

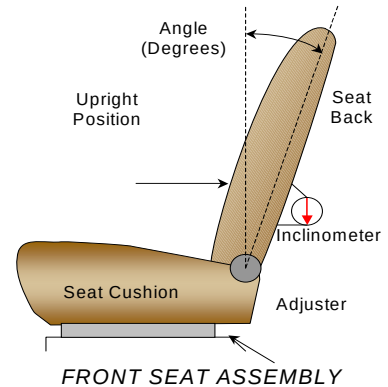
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

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



SEAT BACK ANGLE	Degrees
Driver Seat Back Angle	3.5° on headrest post
Passenger Seat Back Angle	0.6° on headrest post

SEAT FORE/AFT POSITIONS

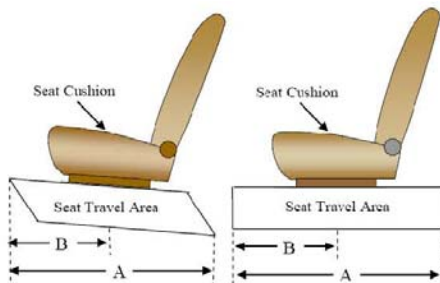
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	24 detents (1 st as 0)	10 th detent (forward-most as 0)
Passenger Seat	26 detents (1 st as 0)	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.

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	Fixed	
Passenger Seat	Fixed	



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

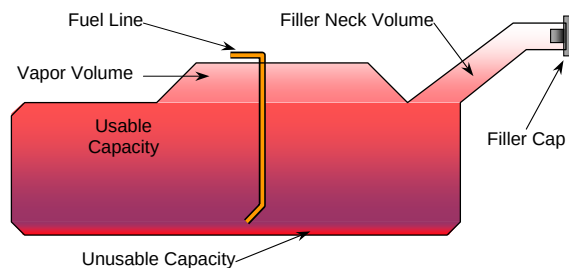
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	55.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	50.6 to 51.7
Actual Amount of Solvent used	51.1
1/3 of Usable Capacity	18.3

FUEL PUMP

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

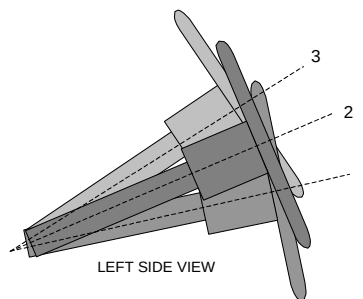
The vehicle is equipped with an electric fuel pump. The pump is activated when the ignition is turned on. The fuel pipe is on the left side.



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

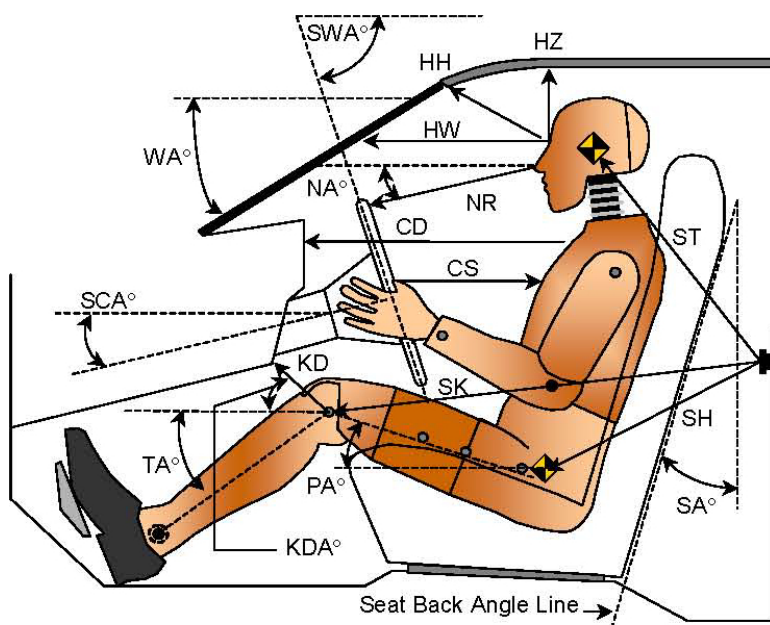
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	71.6	188
Geometric Center – Position 2	70.1	168
Uppermost – Position 3	68.6	148
Telescoping Steering Wheel Travel		40
Test Position	70.1	168

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

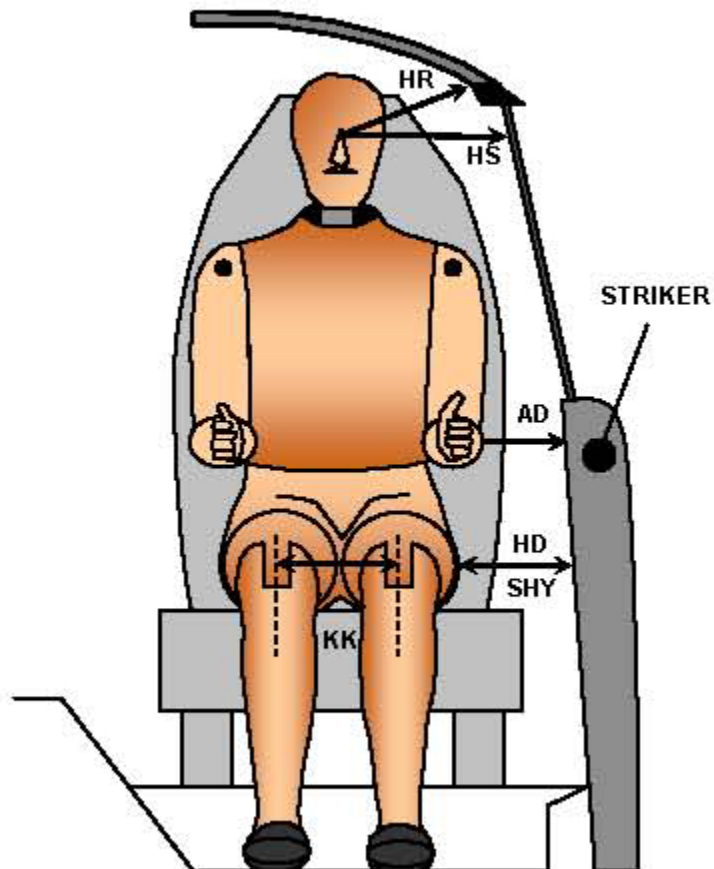


Code	Measurement Description	Driver S/N 036		Passenger S/N 138	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		24.1		
SWA	Steering Wheel Angle		70.1		
SCA	Steering Column Angle		19.9		
SA	Seat Back Angle		3.5		0.6
HZ	Head to Roof (Z)	179	90	194	90
HH	Head to Header	434	13.9	330	38.0
HW	Head to Windshield	694	0	657	0
NR	Nose to Rim	364	9.8		
CD	Chest to Dash	488		389	
CS	Chest to Steering Hub	292	5.6		
RA	Rim to Abdomen	198	0		
KDL	Left Knee to Dash	215	23.6	136	15.1
KDR	Right Knee to Dash	179	24.8	144	14.6
PA	Pelvic Angle		24.4		22.3
TA	Tibia Angle		43.3		45.1
SK	Striker to Knee	832	98.5	925	96.9
ST	Striker to Head	509	36.9	498	58.2
SH	Striker to H-Point	519	122.8	647	109.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011



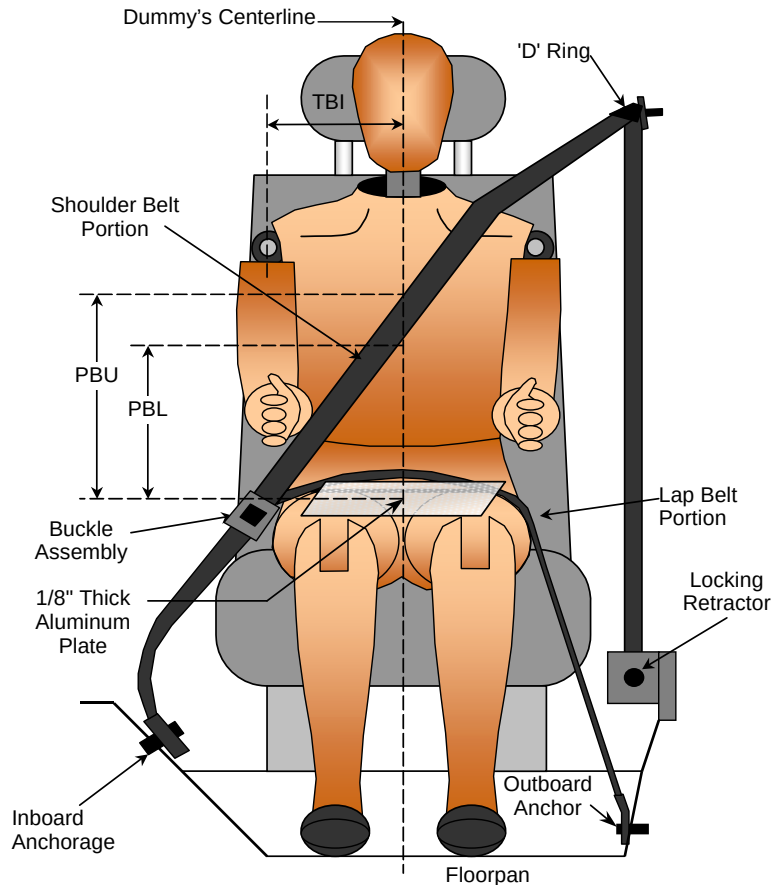
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 138
		Length (mm)	
AD	Arm to Door	128	99
HD	H-Point to Door	152	185
HR	Head to Side Header	222	247
HS	Head to Side Window	320	368
KK	Knee to Knee	345	216
SHY	Striker to H-Point (Y Direction)	310	332
AA	Ankle to Ankle	346	201

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	340	325
PBL - Top surface of reference to belt lower edge	mm	260	235

BELT LENGTH DATA

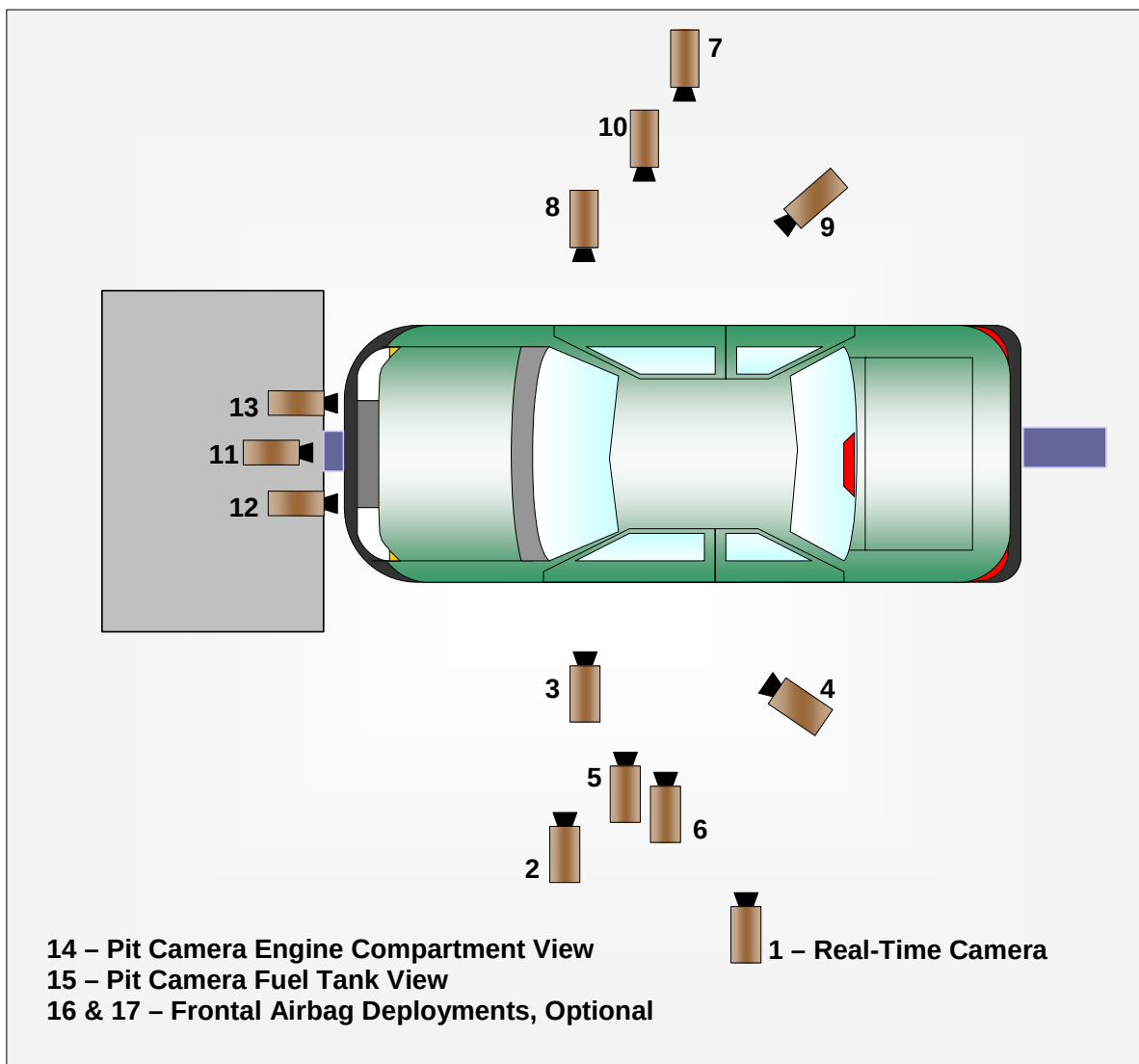
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	990	1110
Lap Belt Length as measured on ATD	mm	825	930
Remainder of belt on reel	mm	1585	1390
Total Belt Length for Continuous Webbing Systems	mm	3400	3430

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
Test Date: 2/22/2011

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

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	1120	-4880	-1080	24	1000
3	Driver Close-Up	1340	-6390	-1840	35	1000
4	Driver Angle	5520	-4820	-1850	50	1000
5	Steering Column Top	680	-4800	-1220	24	1000
6	Steering Column Bottom	660	-4780	-850	24	1000
7	Right Overall	2140	6420	-1080	20	1000
8	Passenger Close-Up	1410	6530	-1800	35	1000
9	Passenger Angle	5630	4800	-1880	50	1000
10	Right Front Half	1200	4940	-1110	24	1000
11	Windshield	-260	0	-2860	24	1000
12	Top Driver	-20	-470	-2030	12.5	1000
13	Top Passenger	-20	470	-2030	12.5	1000
14	Pit Front	1120	0	3150	24	1000
15	Pit Rear	3150	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

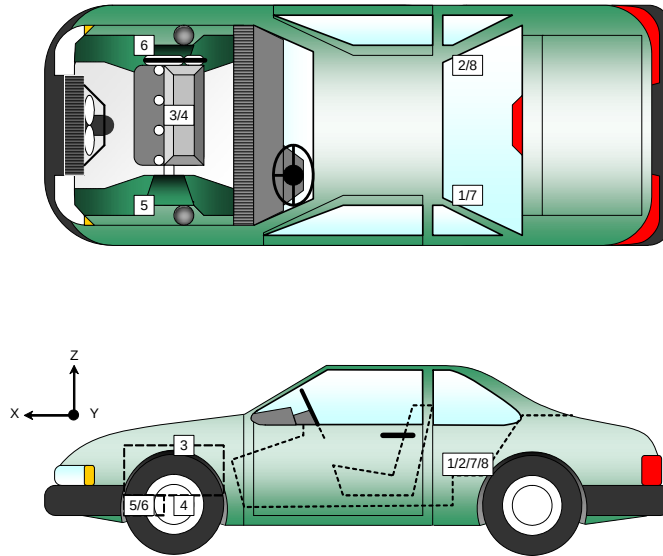
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1716	-355	-250
2	Right Rear X-Member X	1716	355	-250
3	Engine Top X	3708	-90	-836
4	Engine Bottom X	3748	0	-288
5	Left Brake Caliper X	3653	-658	-280
6	Right Brake Caliper X	3653	658	-280
7	Left Rear X-Member Z	1716	-355	-250
8	Right Rear X-Member Z	1716	355	-250

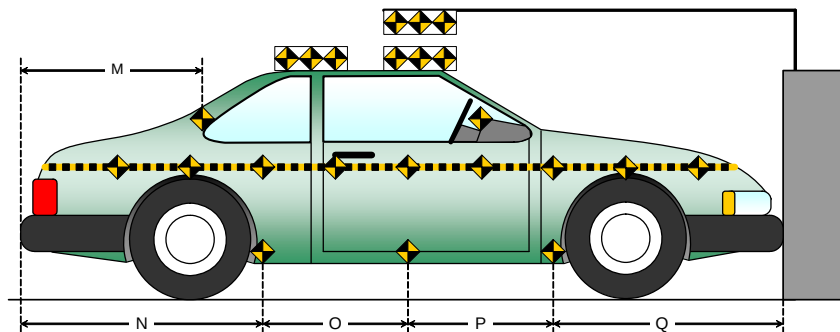
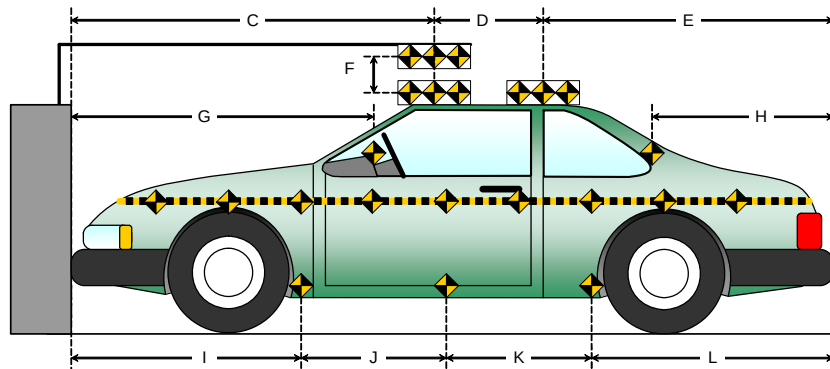
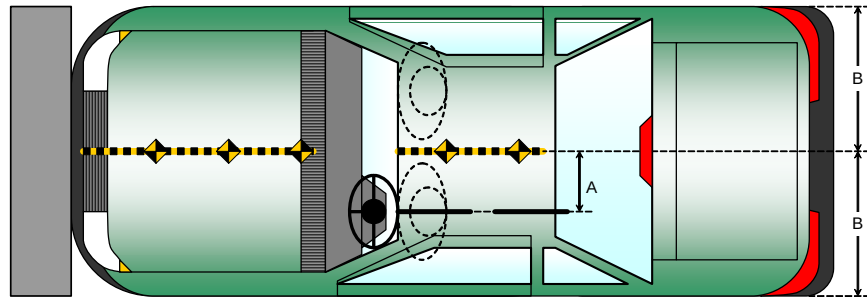
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

Item	Value (mm)
A	230
B	865
C	2345
D	558
E	1517
F	220
G	
H	1106
I	1332
J	927
K	927
L	1234
M	1106
N	1234
O	927
P	927
Q	1332



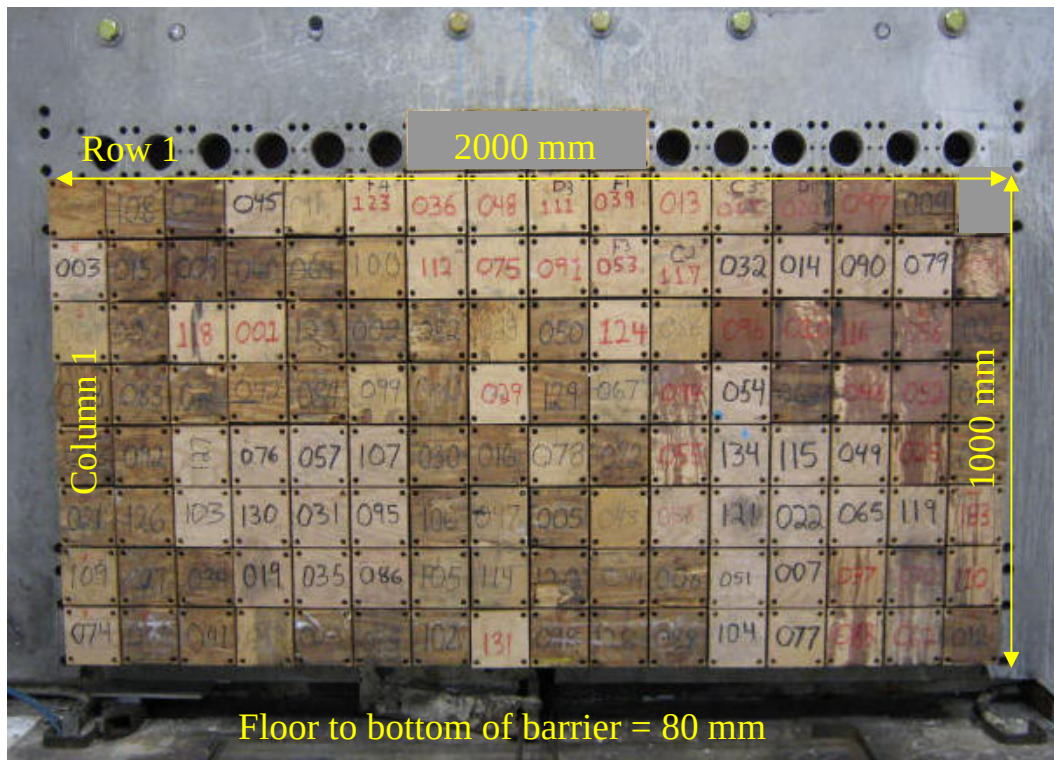
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

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

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

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
Test Date: 2/22/2011

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	127
Total	227

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 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 036	HIII 5% / 138
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	Airbag	Airbag
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

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	2325
Center	mm	2297
Right Side	mm	2332
Average	mm	2318

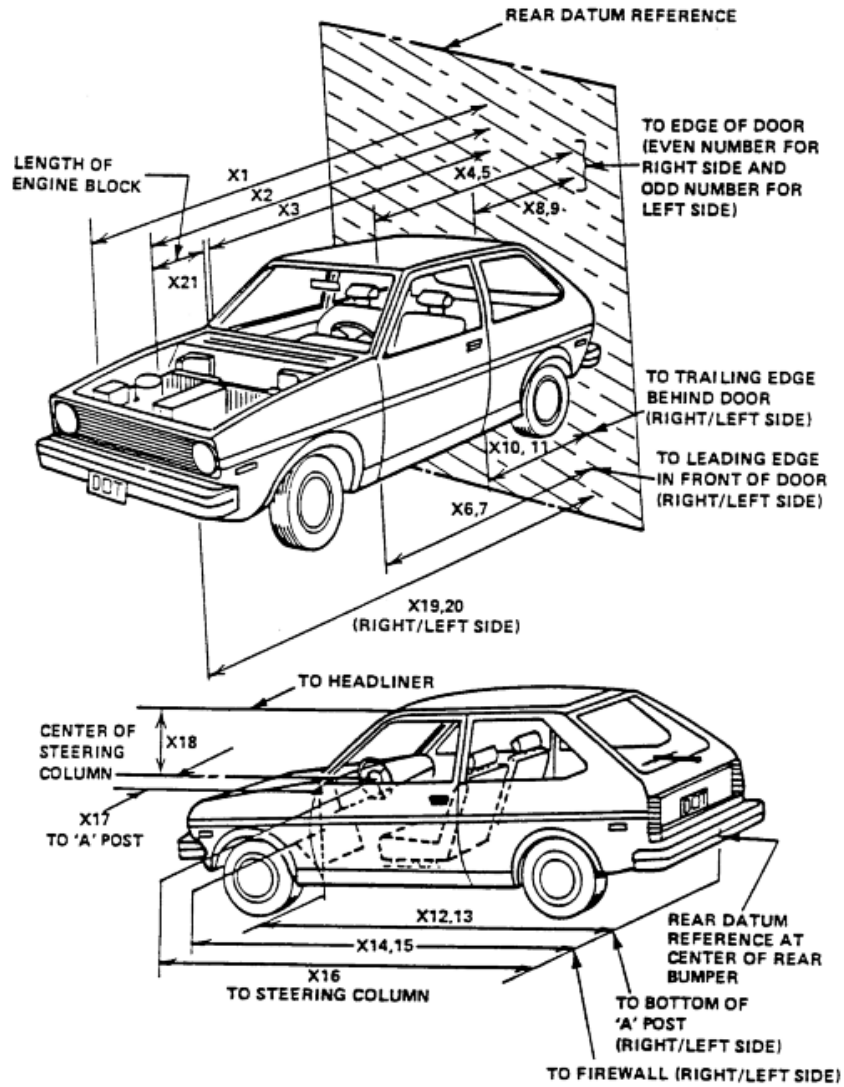
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4420	4061	359
2	RSOV to Front of Engine	mm	3993	3640	353
3	RSOV to Firewall	mm	3443	3405	38
4	RSOV to Upper Leading Edge of Right Door	mm	3025	3045	-20
5	RSOV to Upper Leading Edge of Left Door	mm	3025	3020	5
6	RSOV to Lower Leading Edge of Right Door	mm	2986	2991	-5
7	RSOV to Lower Leading Edge of Left Door	mm	2986	2979	7
8	RSOV to Upper Trailing Edge of Right Door	mm	1744	1749	-5
9	RSOV to Upper Trailing Edge of Left Door	mm	1745	1737	8
10	RSOV to Lower Trailing Edge of Right Door	mm	1747	1752	-5
11	RSOV to Lower Trailing Edge of Left Door	mm	1746	1734	12
12	RSOV to Bottom of "A" Post of Right Side	mm	3018	3016	2
13	RSOV to Bottom of "A" Post of Left Side	mm	3015	3010	5
14	RSOV to Firewall, Right Side	mm	3389	3365	24
15	RSOV to Firewall, Left Side	mm	3389	3365	24
16	RSOV to Steering Column	mm	2535	2579	-44
17	Center of Steering Column to "A" Post	mm	370	395	-25
18	Center of Steering Column to Headliner	mm	385	420	-35
19	RSOV to Right Side of Front Bumper	mm	4310	4028	282
20	RSOV to Left Side of Front Bumper	mm	4310	4006	304
21	Length of Engine Block	mm	545	545	0
RD	RSOV to Right Side of Dash Panel	mm	2782	2786	-4
CD	RSOV to Center of Dash Panel	mm	2782	2762	20
LD	RSOV to Left Side of Dash Panel	mm	2763	2760	3

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

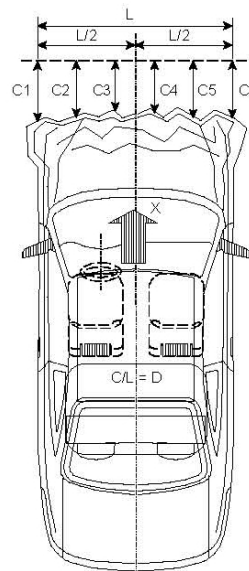
NHTSA No.: YB5103
 Test Date: 2/22/2011

VEHICLE INFORMATION

VIN: JTKJF5C78B3014425 Wheelbase (mm): 2700
 Vehicle Size Category: 3-Dr Hatchback Test Weight (kg): 1602.1

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): 56.4
 Velocity Change (km/h): 62.2
 Time of Separation (msec): 73.3



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1240
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4310	4006	304
C2	Crush zone 2 at left side	mm	4379	4030	349
C3	Crush zone 3 at left side	mm	4400	4053	347
C4	Crush zone 4 at right side	mm	4400	4036	364
C5	Crush zone 5 at right side	mm	4379	4040	339
C6	Crush zone 6 at right side	mm	4310	4028	282
L	C1 TO C6	mm	1240	1233	7

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

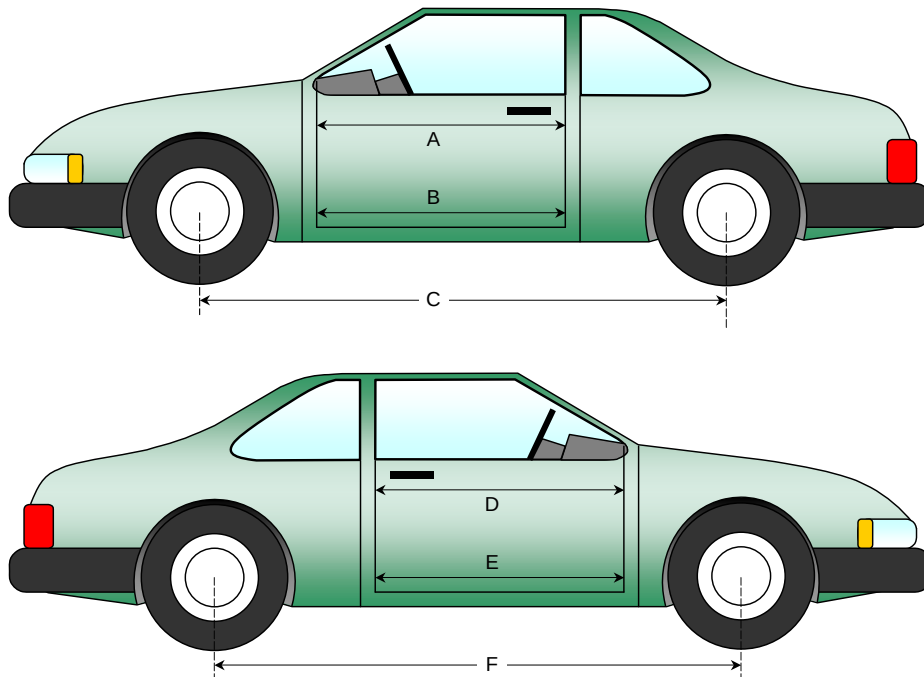
NHTSA No.: YB5103
 Test Date: 2/22/2011

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1212	1212	0
B	Left Side Lower	mm	1184	1184	0
D	Right Side Upper	mm	1212	1215	-3
E	Right Side Lower	mm	1184	1184	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2700	2675	25
F	Right Side Wheelbase	mm	2700	2675	25



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

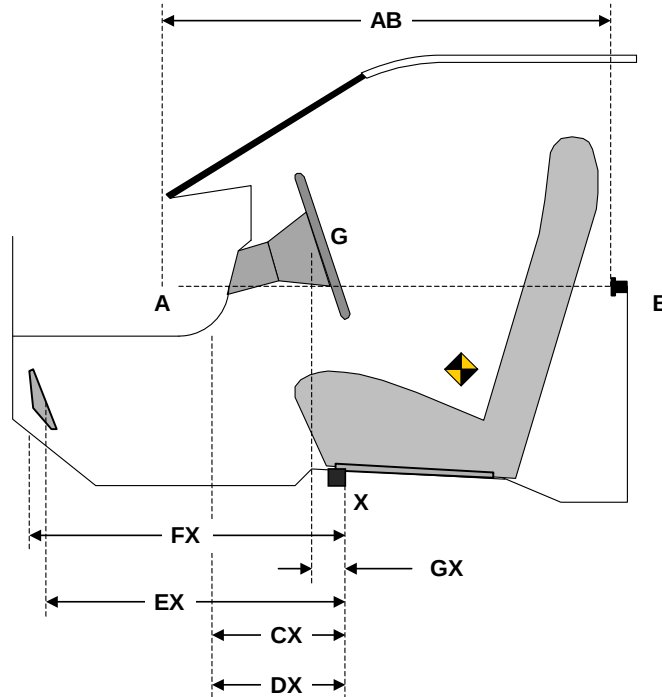
Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	1032	1032	0
CX	Left Knee Bolster to X	mm	275	300	-25
DX	Right Knee Bolster to X	mm	262	301	-39
EX	Brake Pedal to X	mm	546	556	-10
FX	Foot Rest to X	mm	621	610	11
GX	Center of Steering Column Wheel Hub to X	mm	13	86	-73

X = Front of Seat Track (stationary)

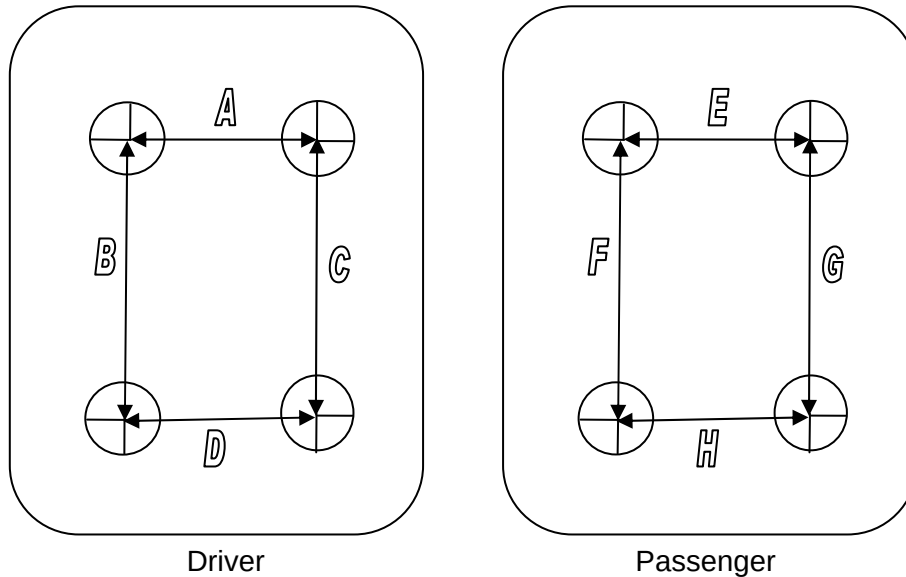


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	400	400	0
B	mm	400	400	0
C	mm	400	400	0
D	mm	387	387	0
E	mm	400	400	0
F	mm	400	400	0
G	mm	400	400	0
H	mm	400	400	0

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

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

Windshield Mounting Details:

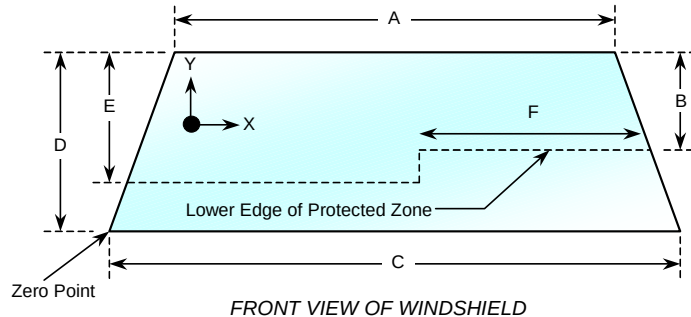
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2030	2030	100
Right Side	2030	2030	100
Total	4060	4060	100



Item	Units	Value
A	mm	1134
B	mm	338
C	mm	1476
D	mm	725
E	mm	395
F	mm	463

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 Scion tC 3-Dr Liftback</u>	NHTSA No.:	<u>YB5103</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>2/22/2011</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time:	<u>12:52 pm</u>	Temperature:	<u>21° C</u>
------------	-----------------	--------------	--------------

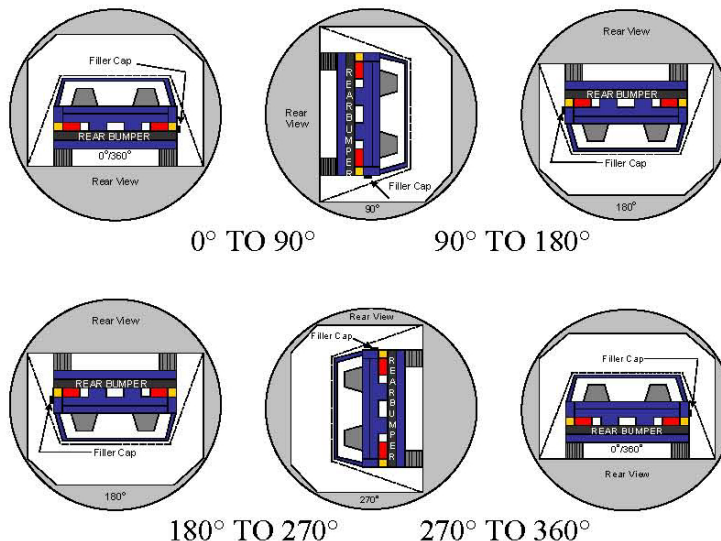
- | | |
|---|--------------|
| A. From impact until vehicle motion ceases:
(Maximum Allowable = 1 ounce) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 ounces) | <u>None</u> |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz./minute) | <u>None</u>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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Scion tC 3-Dr Liftback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
 Test Date: 2/22/2011

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°	115	300	415
90° to 180°	111	300	411
180° to 270°	104	300	404
270° to 360°	110	300	410

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

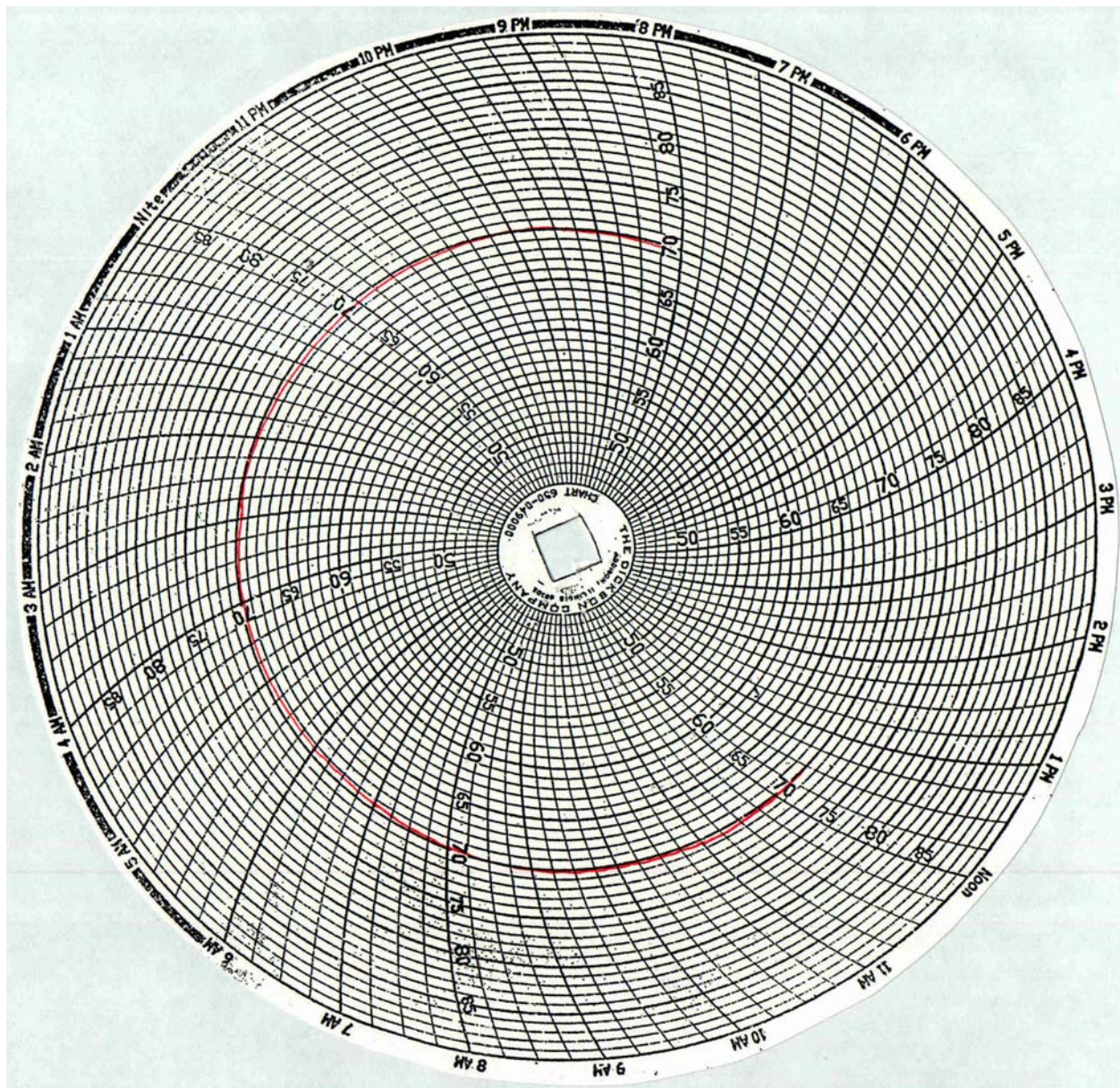
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Scion tC 3-Dr Liftback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: YB5103
Test Date: 2/22/2011



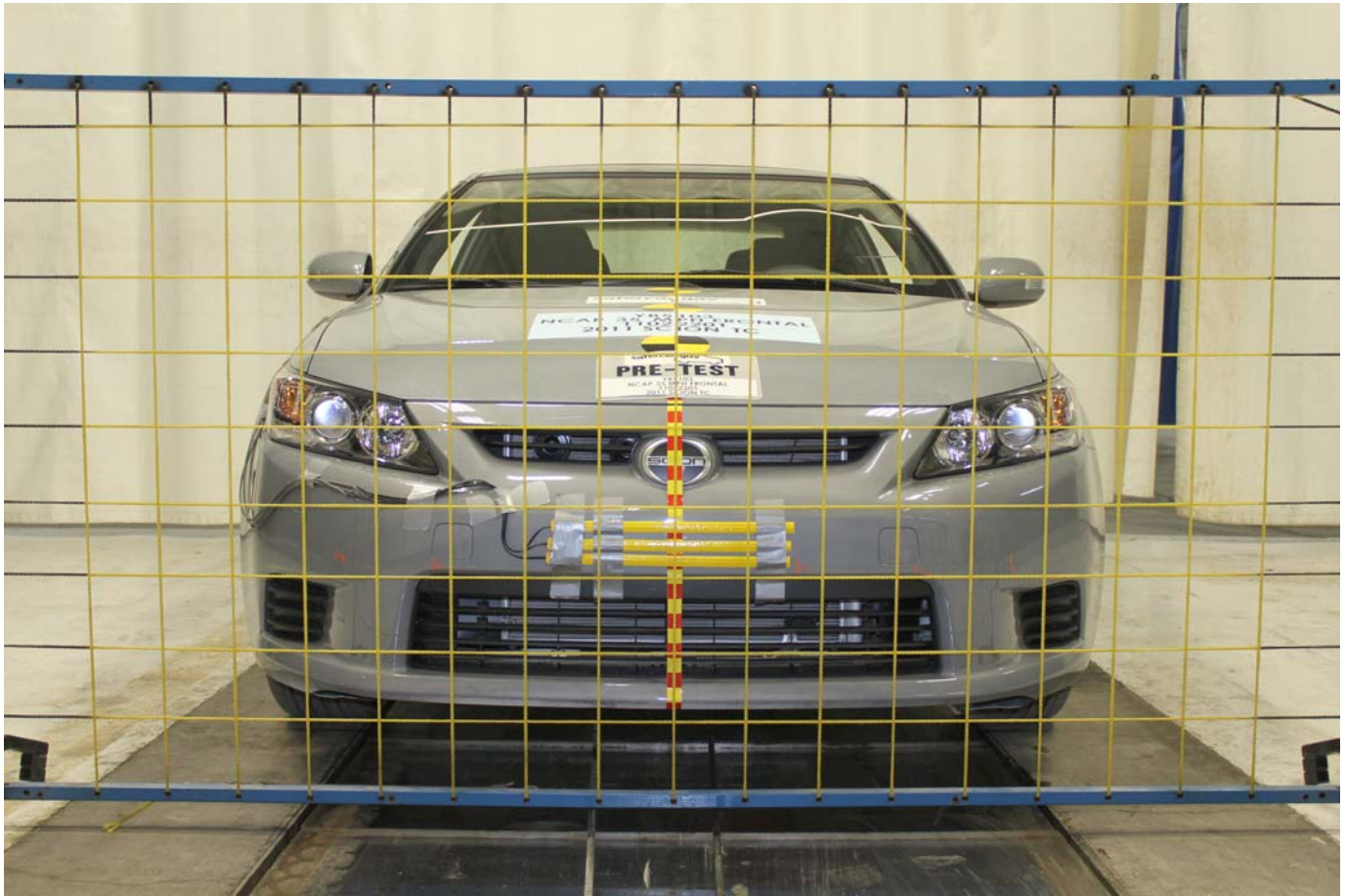
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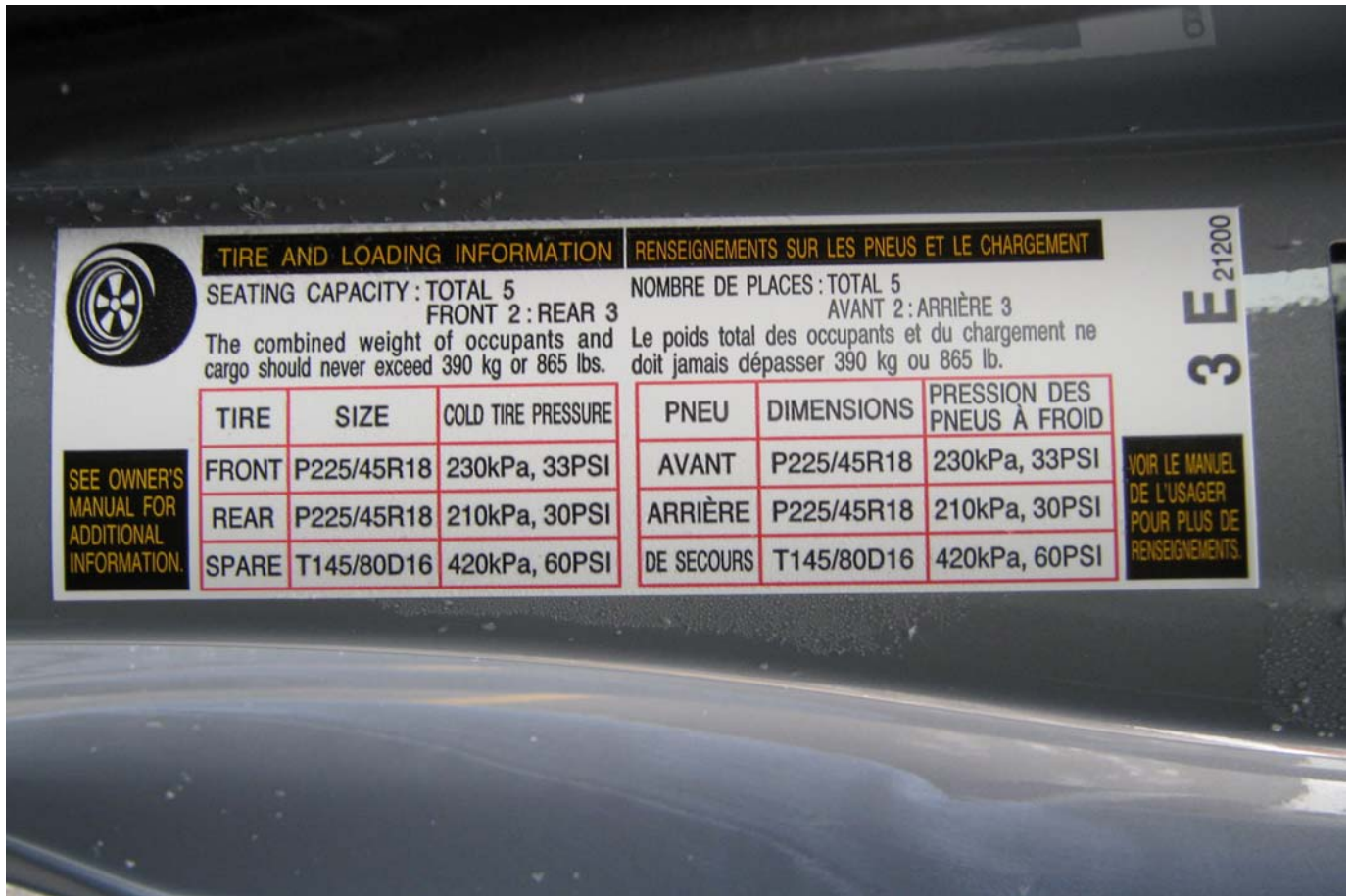
Load Cell Location



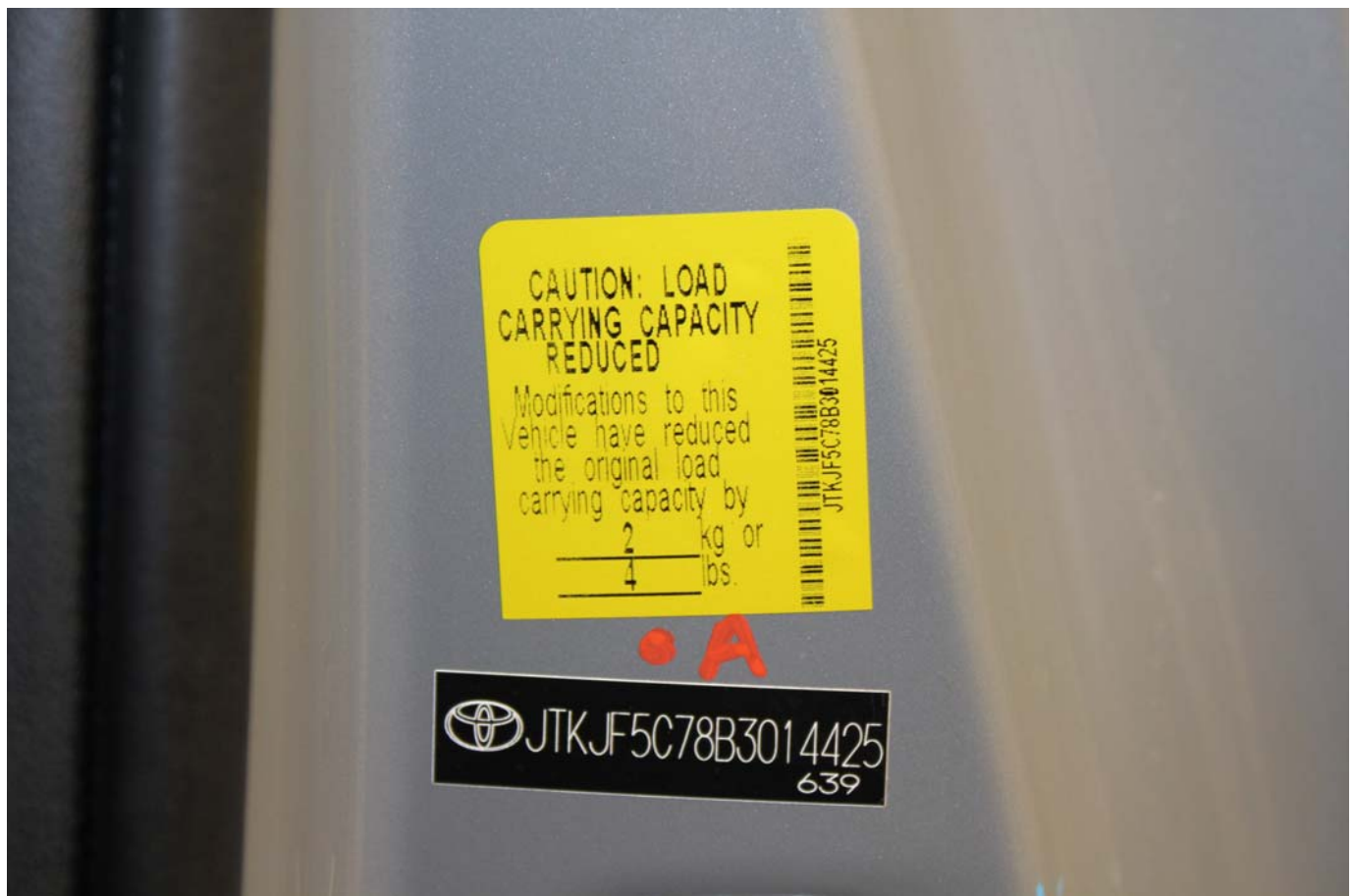
Load Cell Wall



Manufacturer's Label



Tire Placard



Vehicle's Load Carrying Capacity Reduced Label



Right Front Three-Quarter View, As Received



Left Rear Three-Quarter View, As Received



Pre-Test Front View



Post-Test Front View



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



Post-Test Left Side View



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



Post-Test Right Side View



Pre-Test Right Front Three-Quarter View



Post-Test Right Front Three-Quarter View



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



Post-Test Left Rear Three-Quarter View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



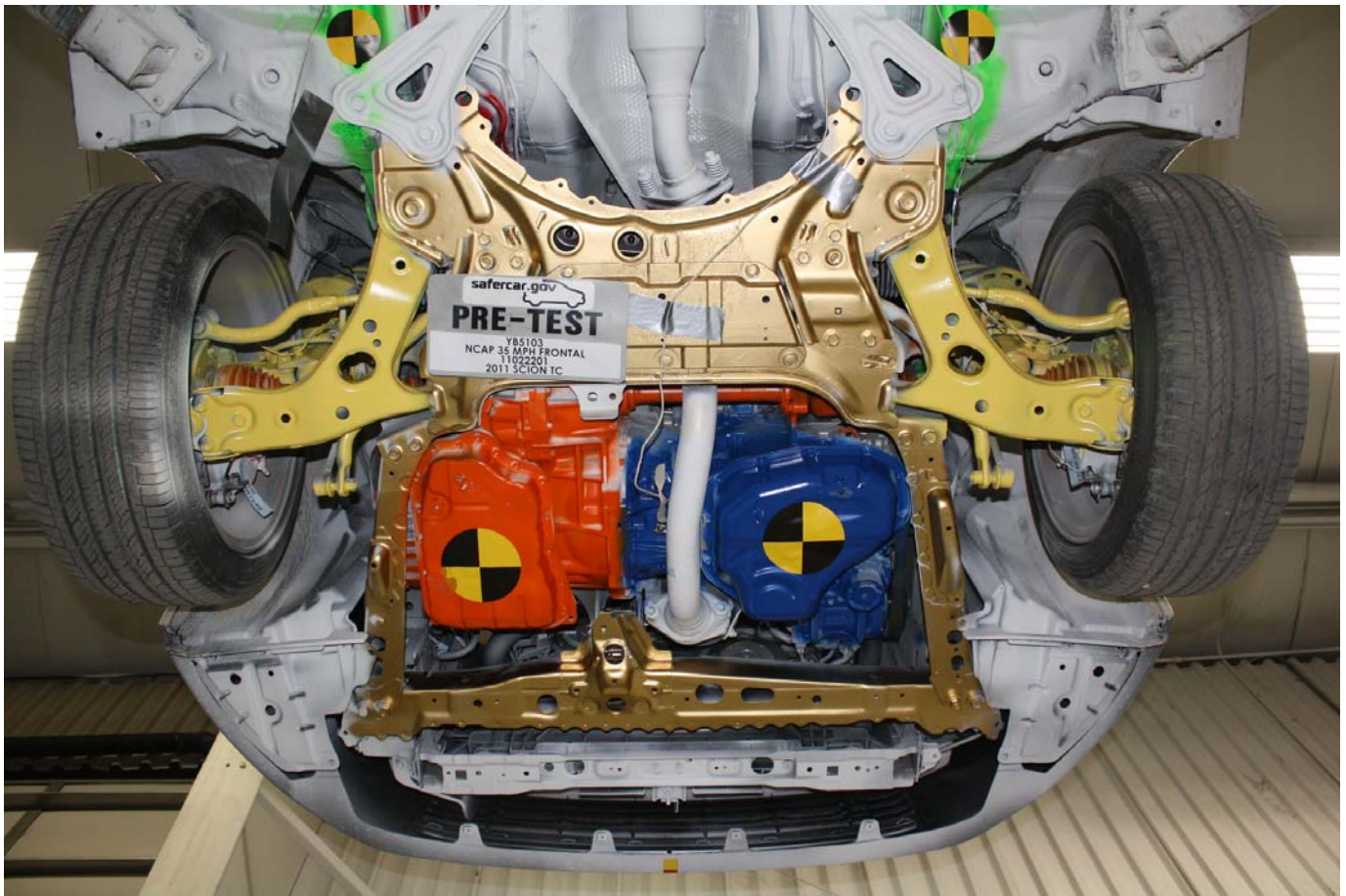
Post-Test Engine Compartment View



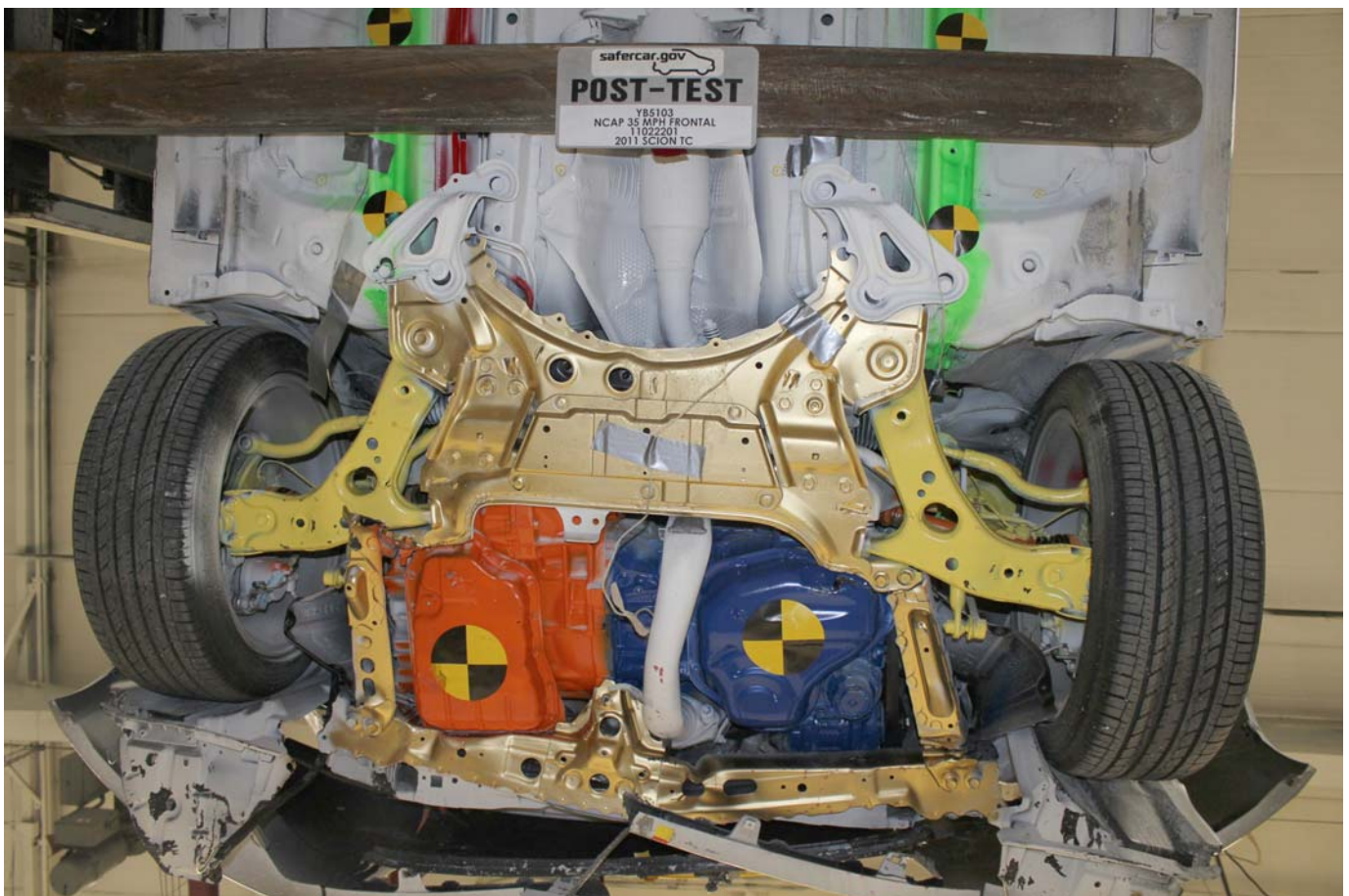
Pre-Test Fuel Cap View



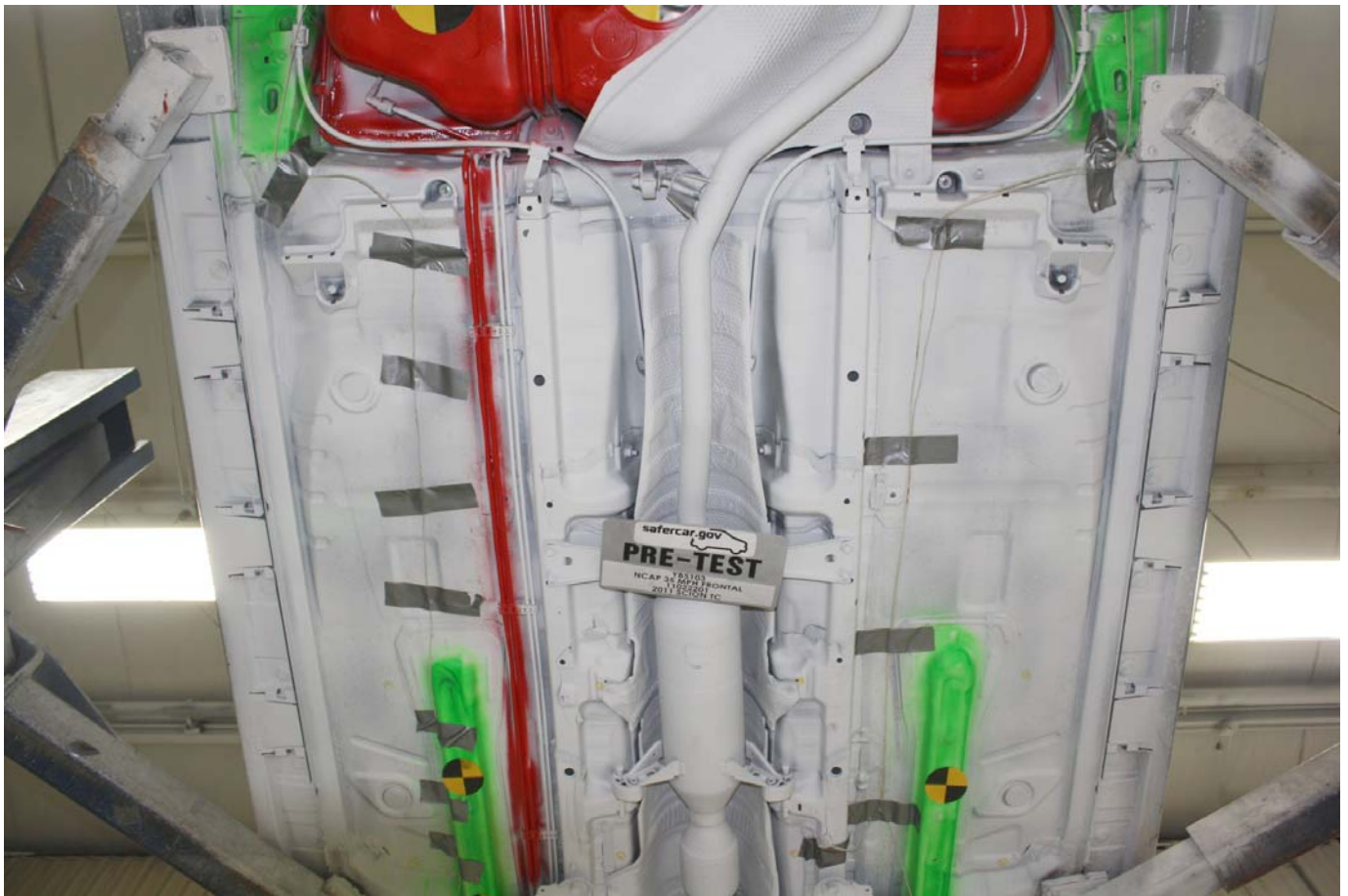
Post-Test Fuel Cap View



Pre-Test Front Underbody View



Post-Test Front Underbody View



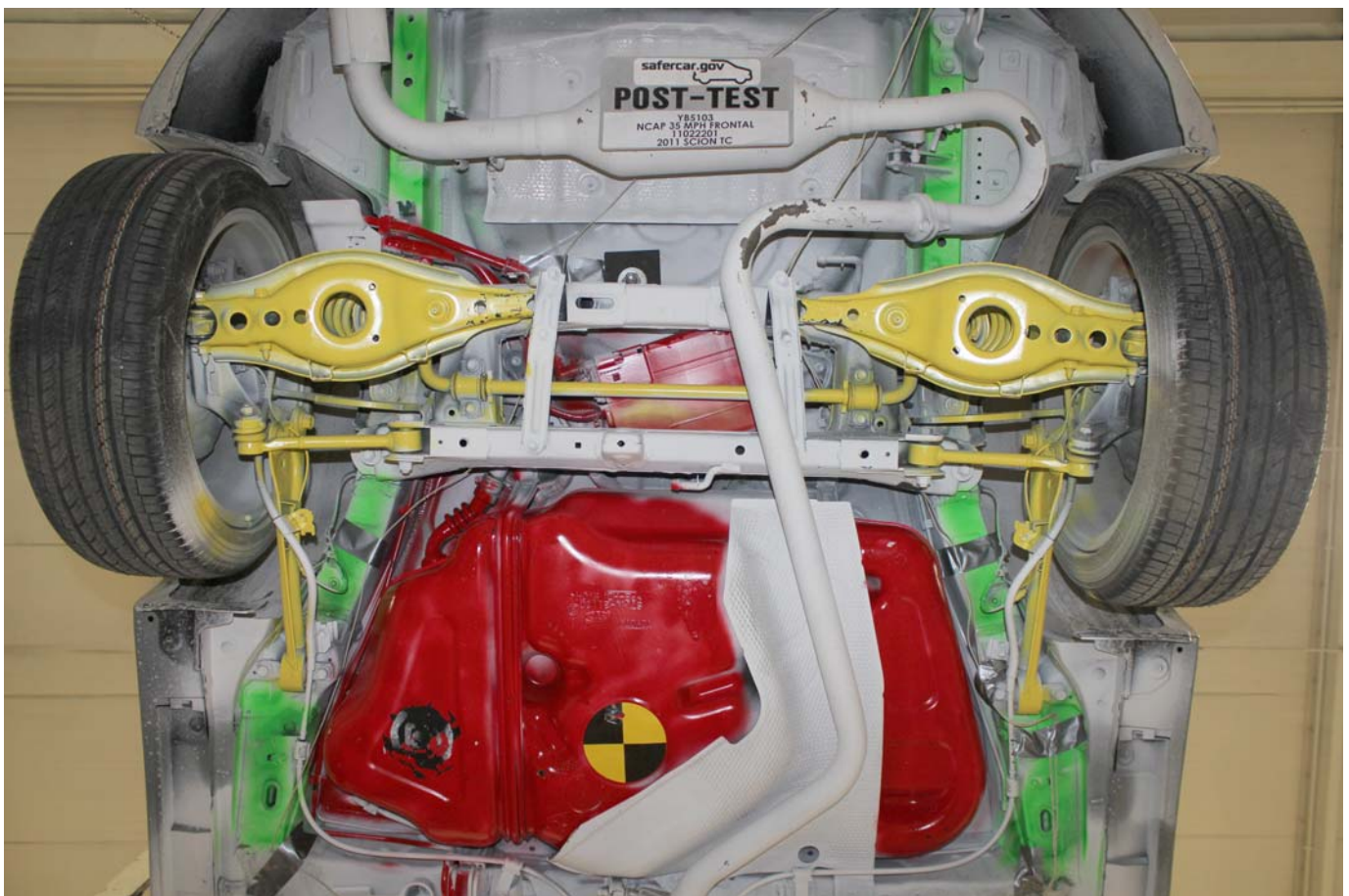
Pre-Test Mid Underbody View



Post-Test Mid Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



Post-Test Driver Dummy Window View



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



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



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test Driver Dummy Feet



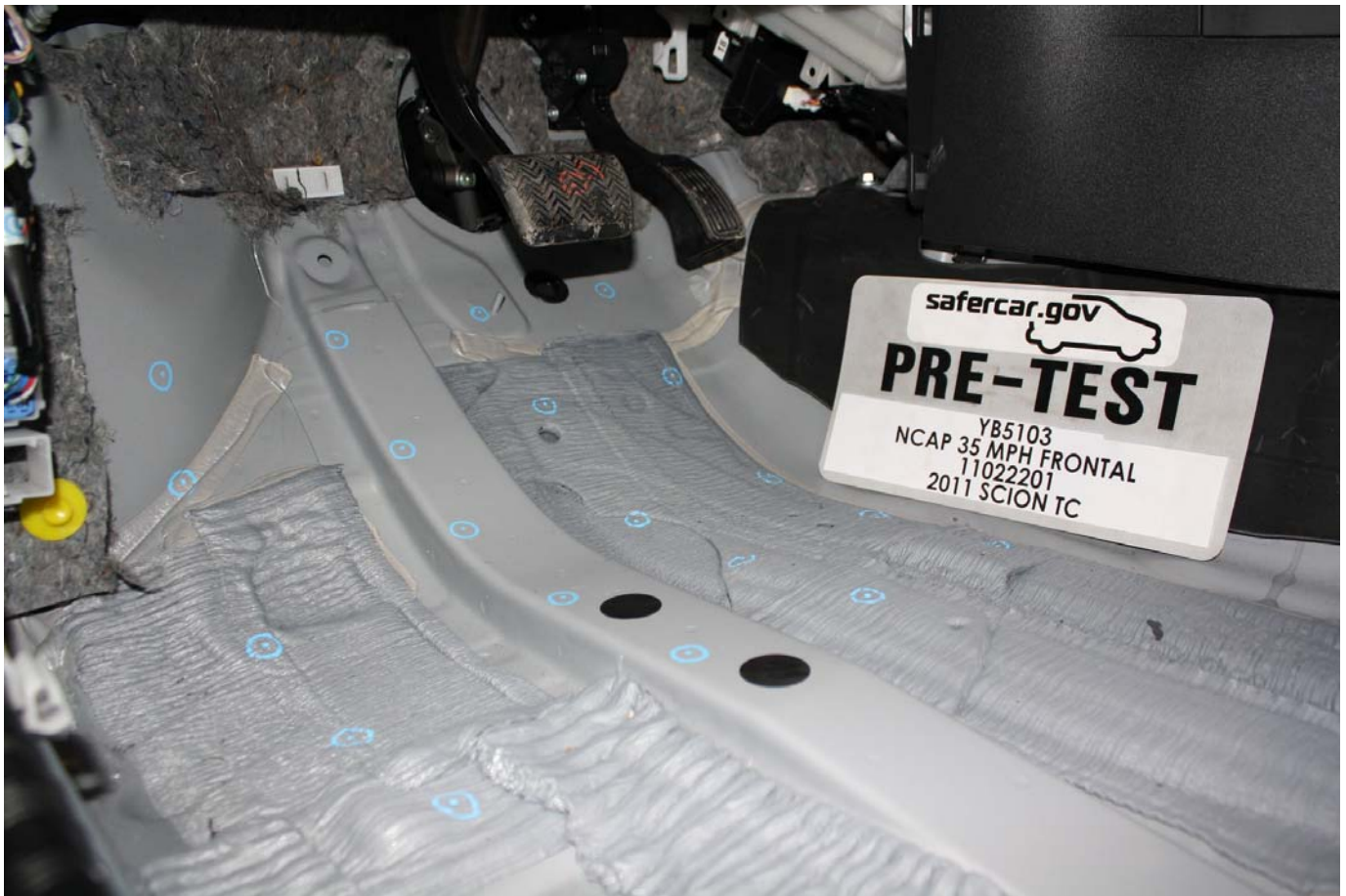
Post-Test Driver Dummy Feet



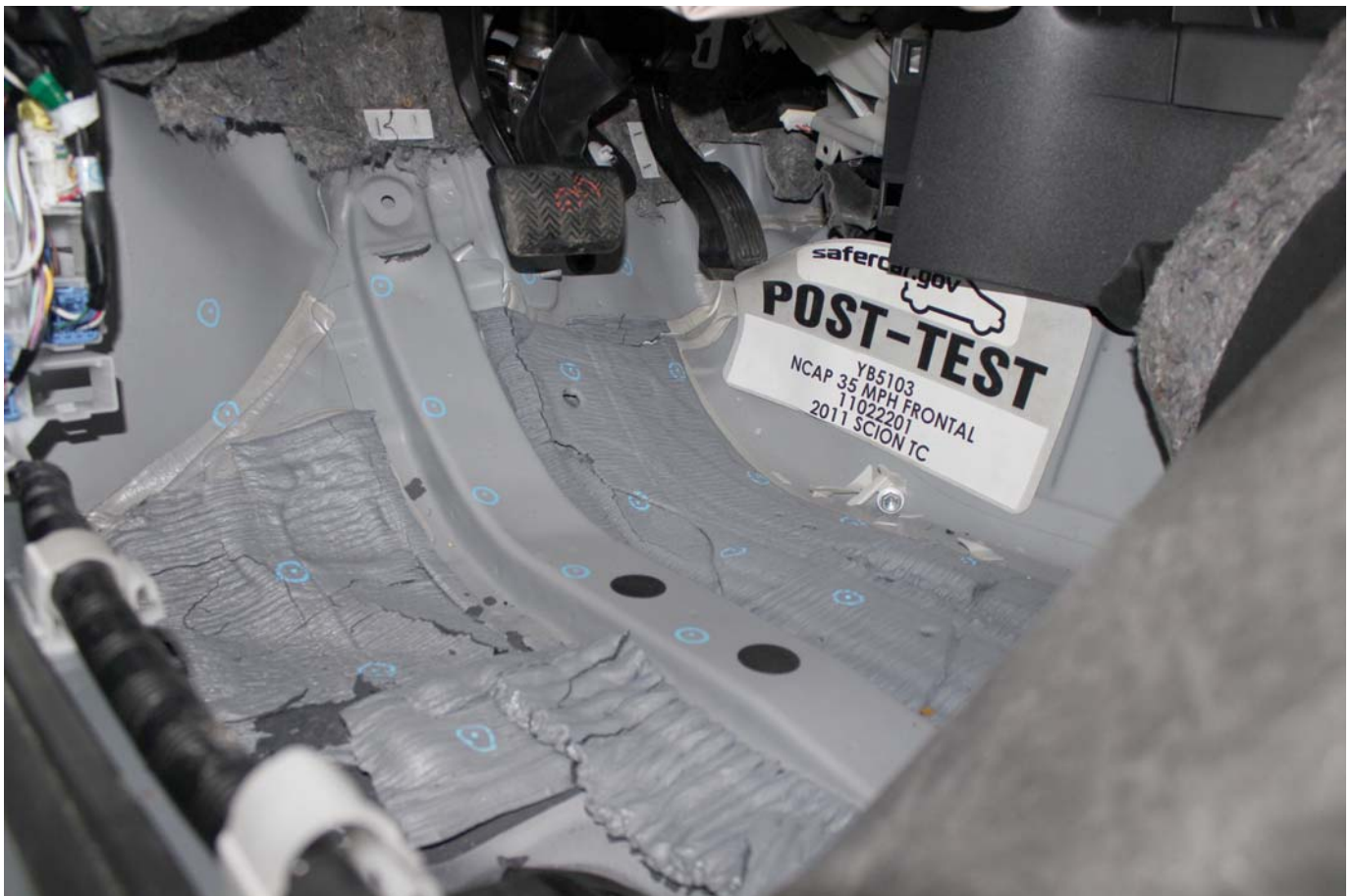
Pre-Test Driver's Side Knee Bolster (without dummy)



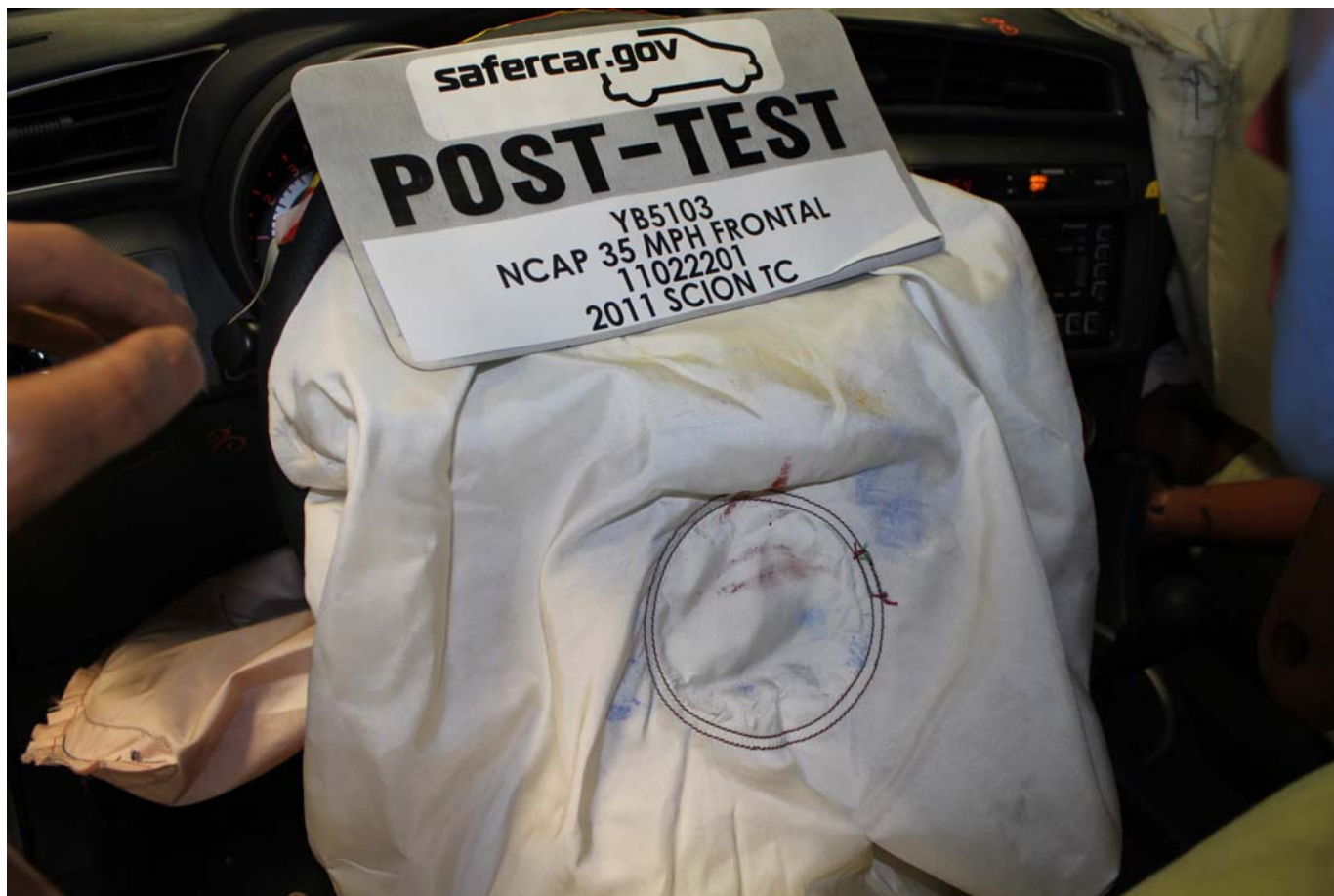
Post-Test Driver's Side Knee Bolster (without dummy)



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Airbag



Pre-Test View of Steering Column Shear Capsule



Post-Test View of Steering Column Shear Capsule



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



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



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



Pre-Test Passenger's Seat Fore-Aft Markings



Post-Test Passenger's Seat Fore-Aft Markings



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



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



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



Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Knee Airbag



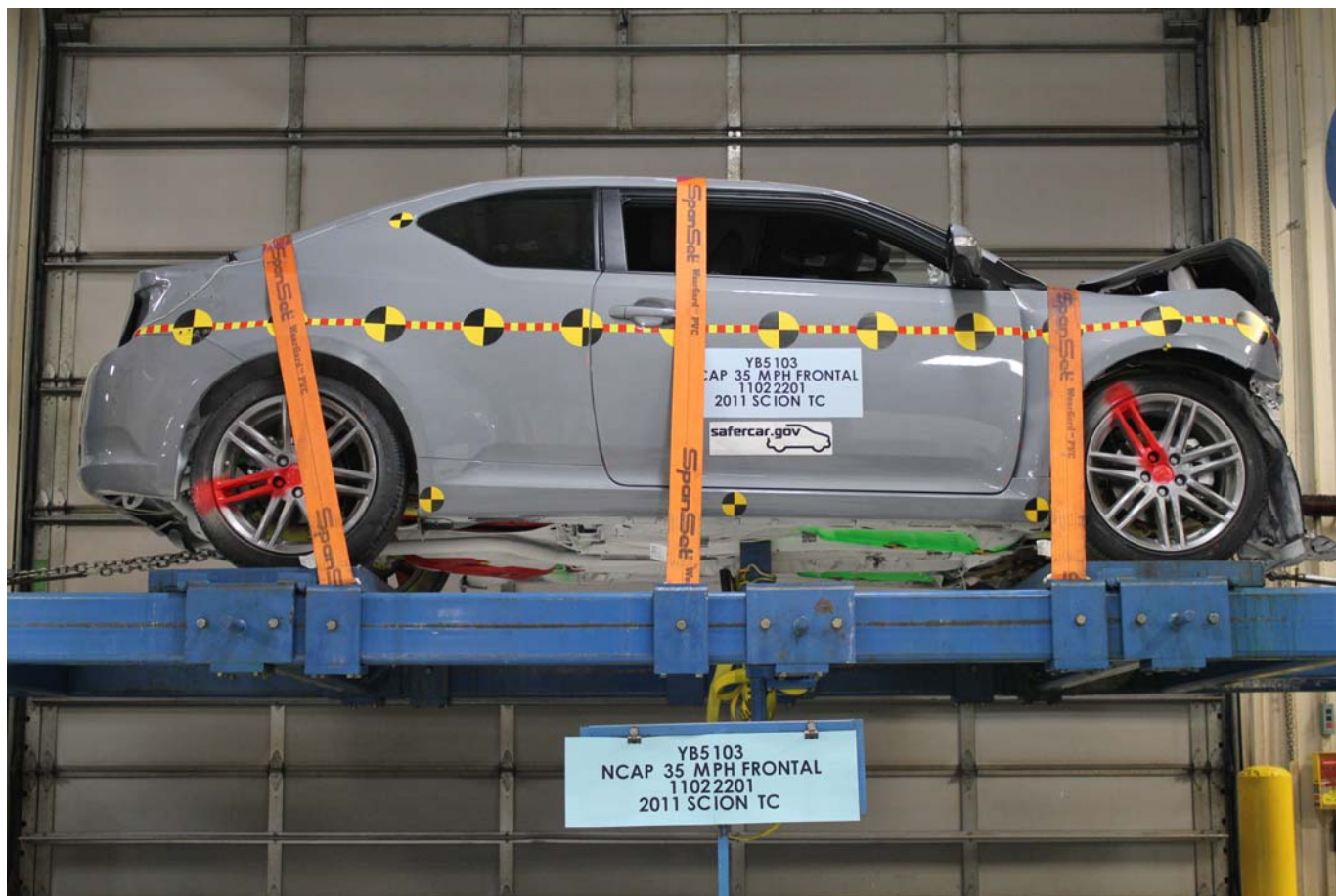
Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

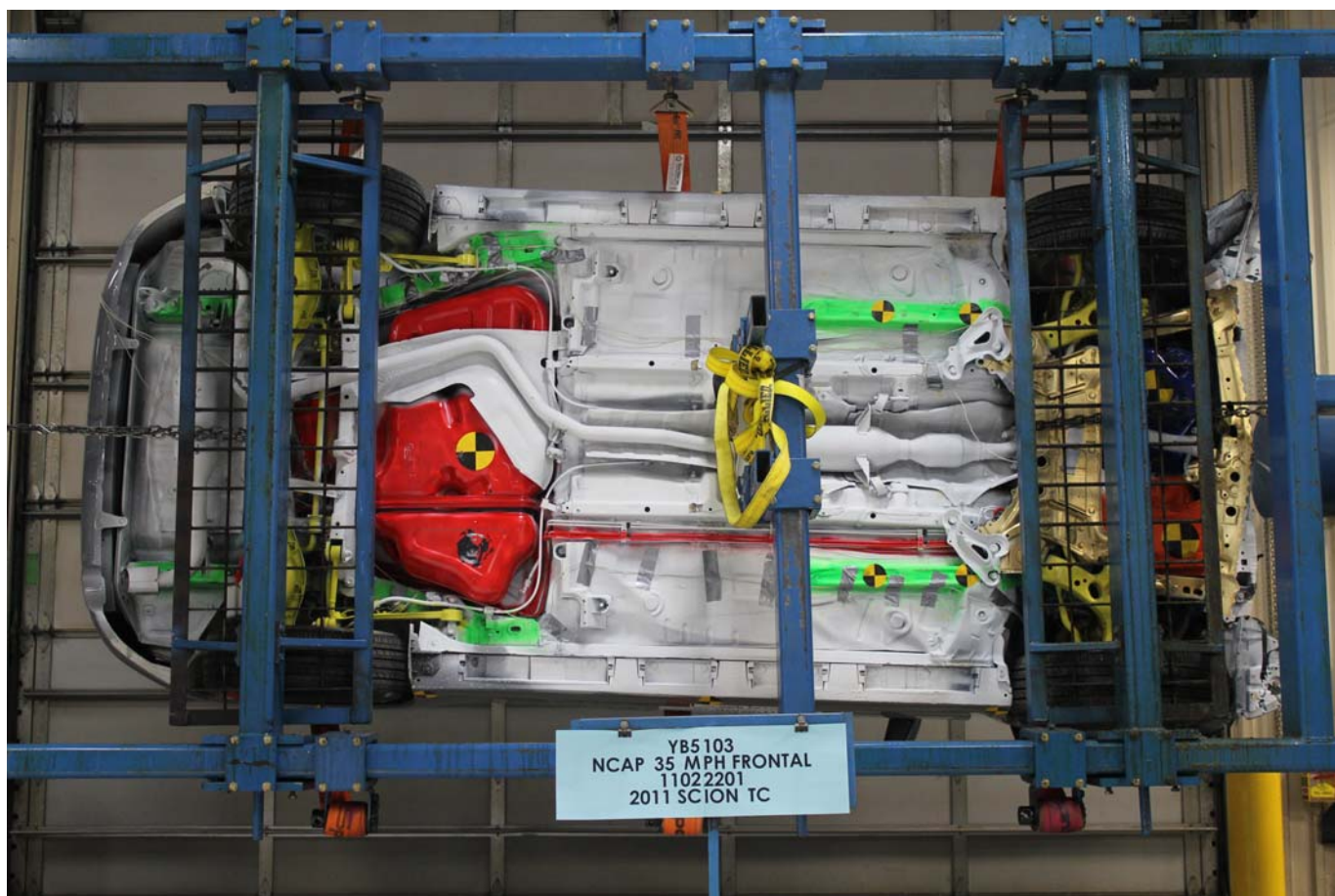
Post-Test Stoddard Solvent Spillage Location View



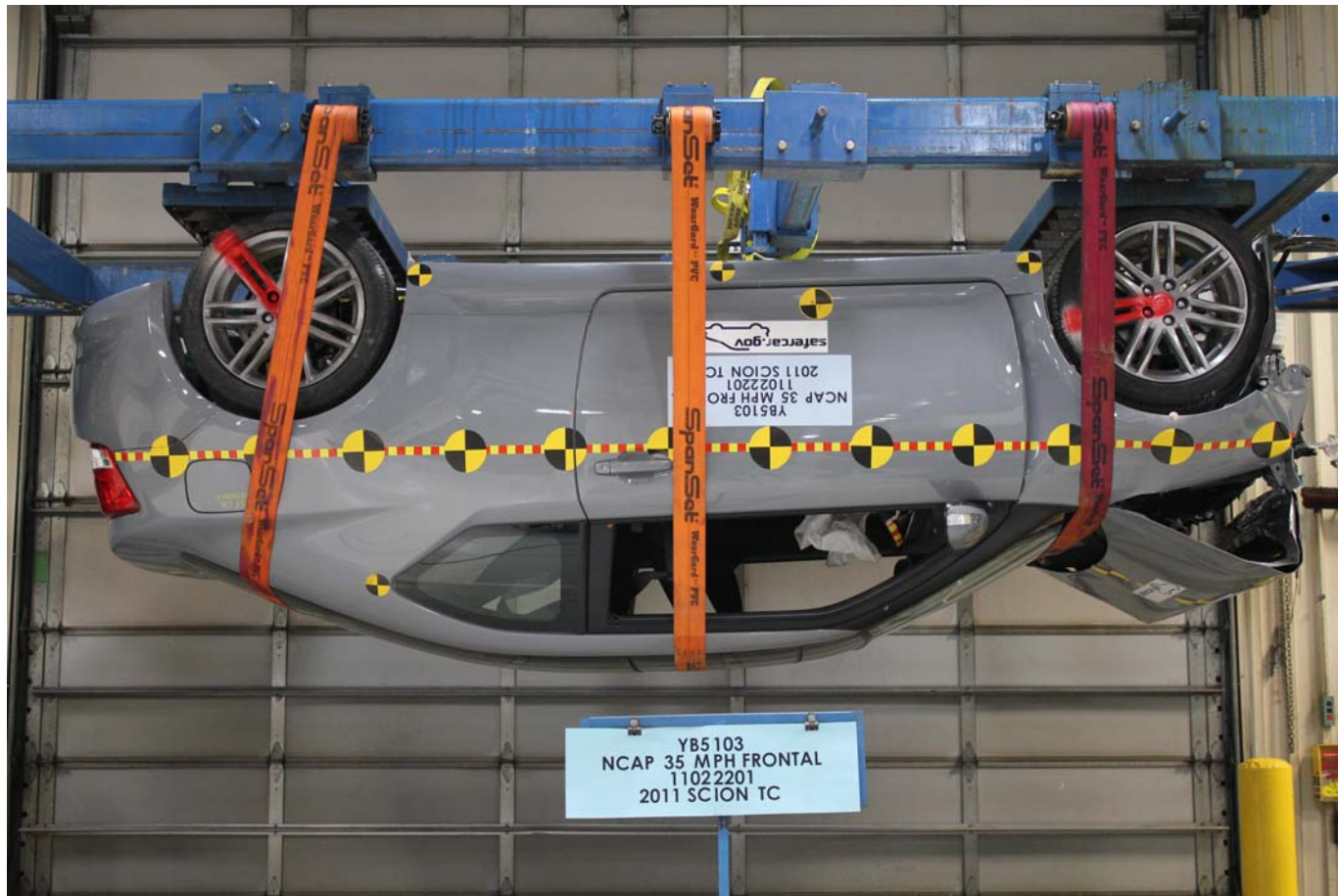
Post-Test Speed Trap Read-Out



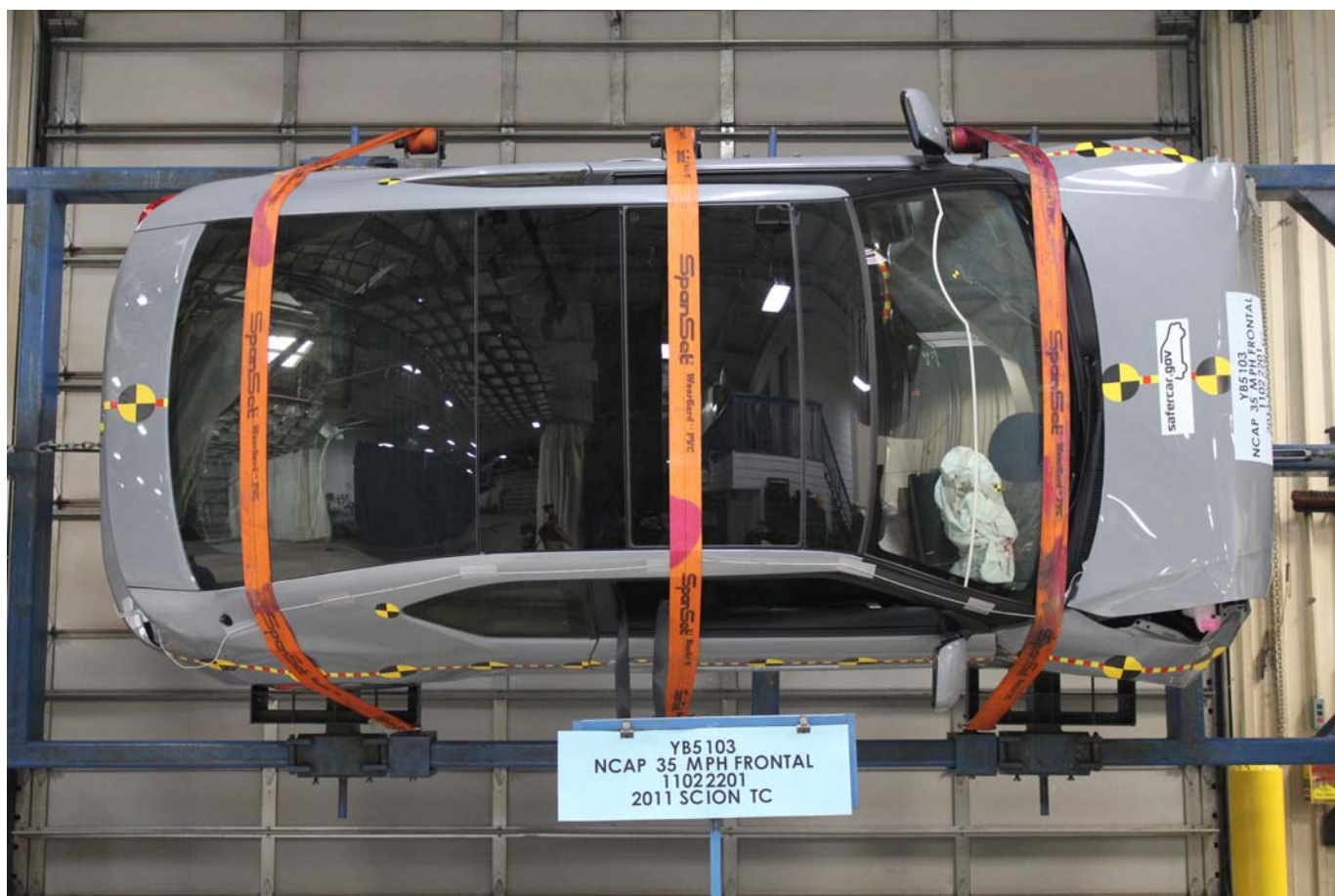
Vehicle at 0 Degrees on Static Rollover Device



Vehicle at 90 Degrees on Static Rollover Device



Vehicle at 180 Degrees on Static Rollover Device



Vehicle at 270 Degrees on Static Rollover Device



Vehicle at 360 Degrees on Static Rollover Device



Vehicle Impact

APPENDIX B
DUMMY RESPONSE DATA

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

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Upper Neck Force Y

Driver Upper Neck Moment X

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Left Femur Redundant

Driver Right Femur Redundant

Driver Shoulder Belt Force

Driver Lap Belt Force

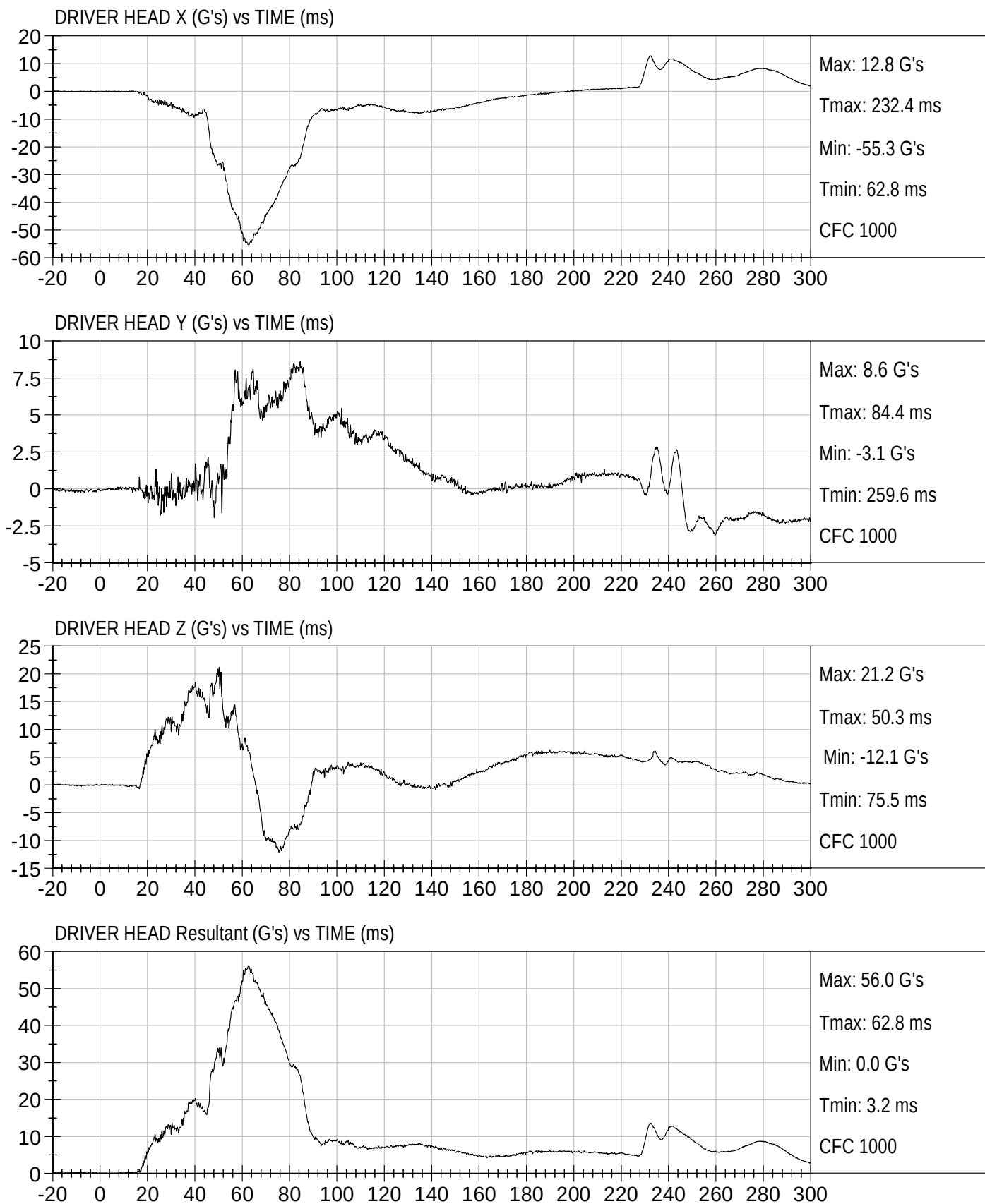
Driver Left Upper Tibia Moment X

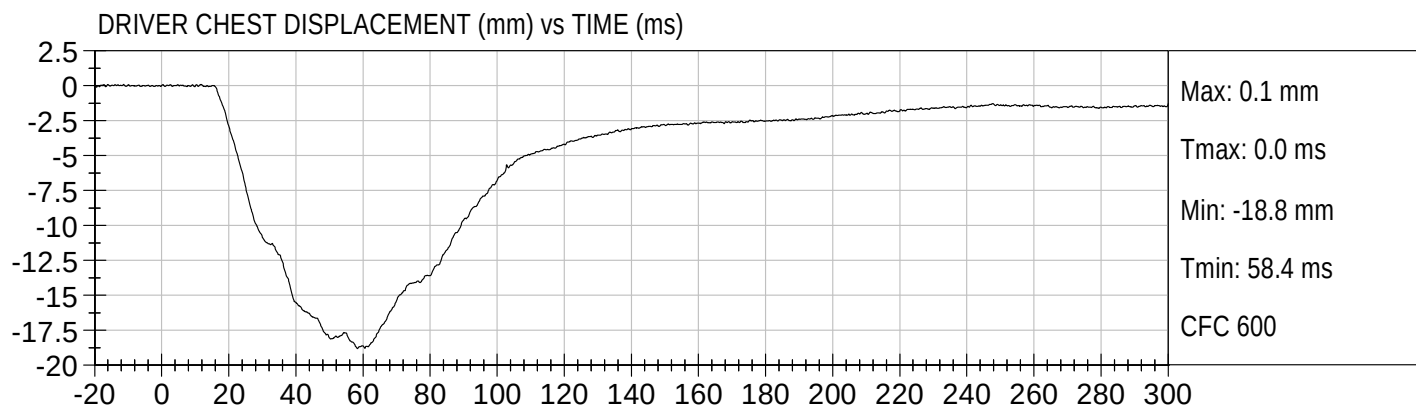
Driver Left Upper Tibia Moment Y

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 Left Femur Redundant
Passenger Right Femur Redundant
Passenger Lap Belt Force
Passenger Shoulder Belt Force – not installed

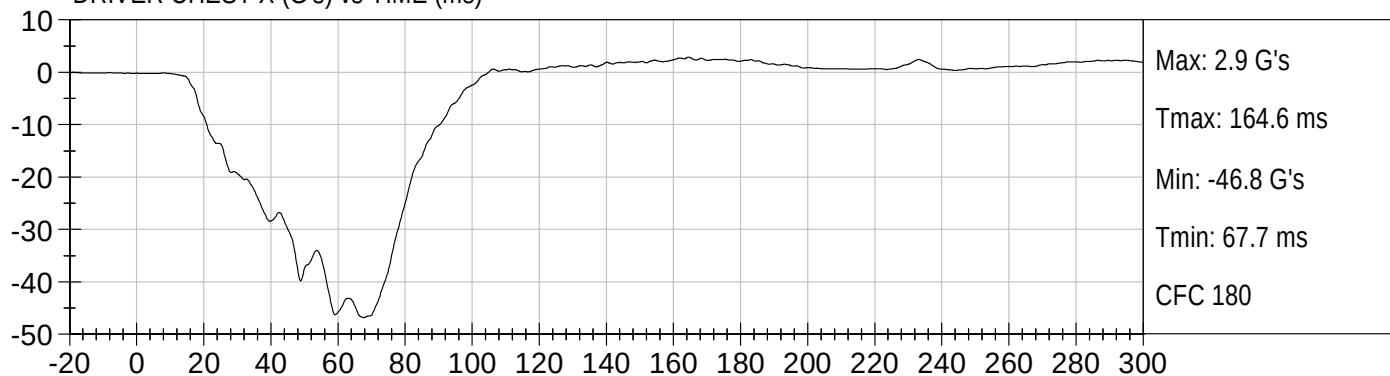
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Advanced Research Load Cell Barrier – 127 channels



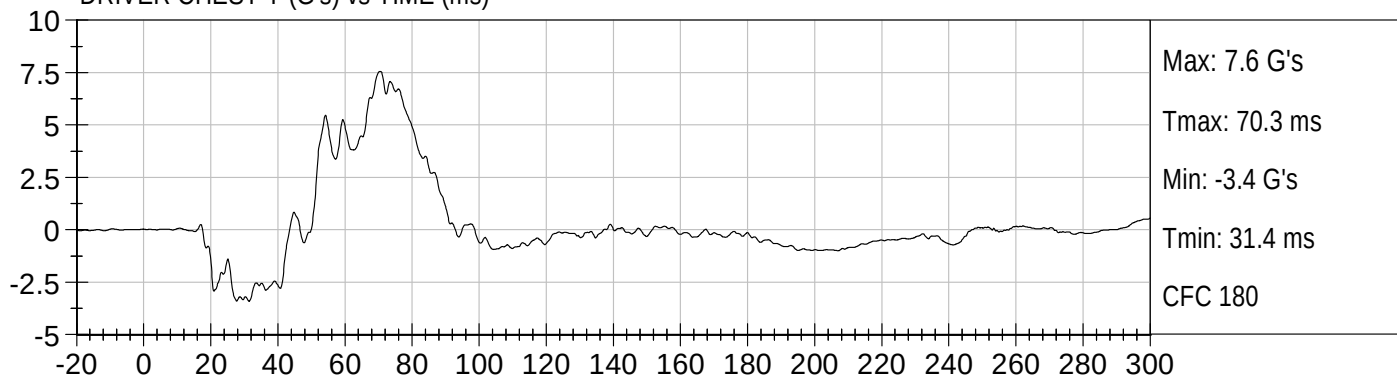




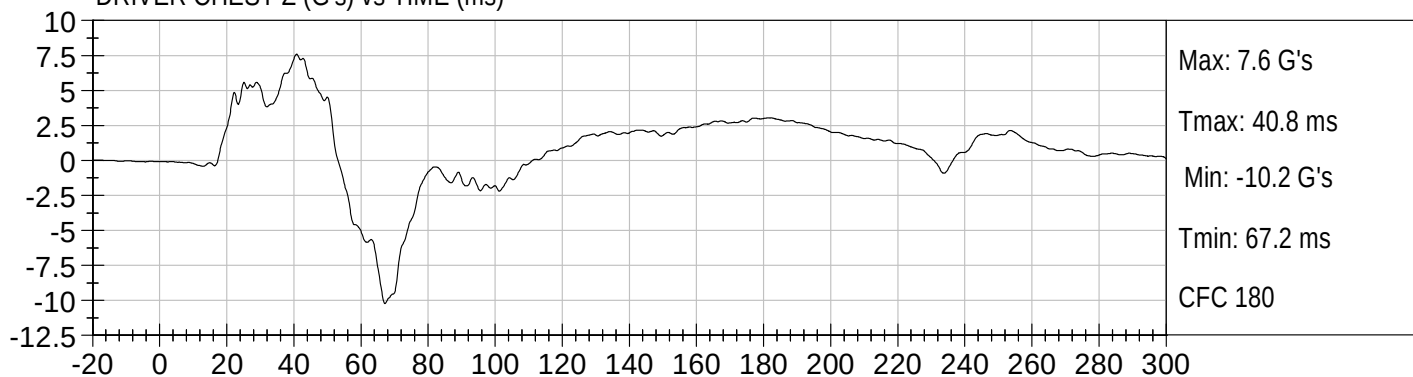
DRIVER CHEST X (G's) vs TIME (ms)



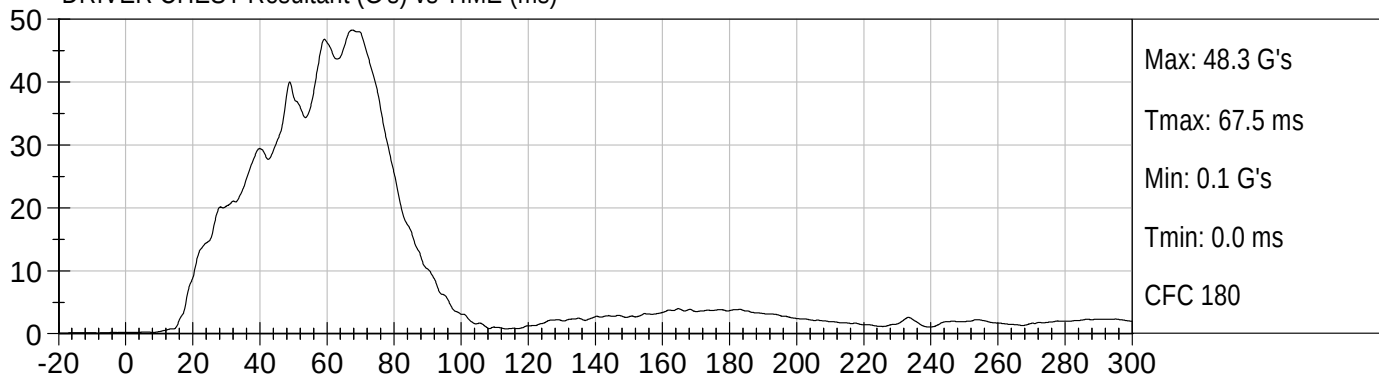
DRIVER CHEST Y (G's) vs TIME (ms)

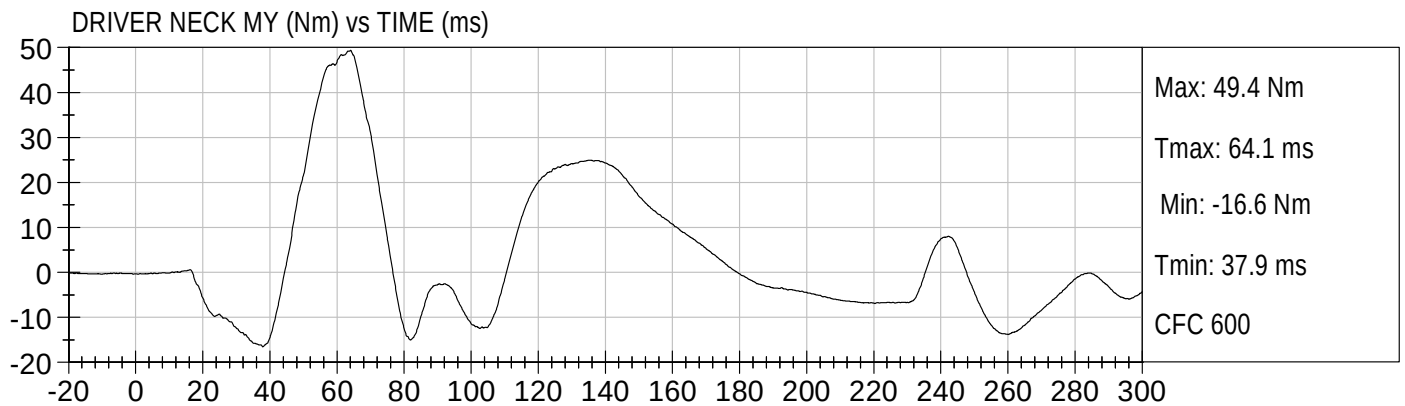
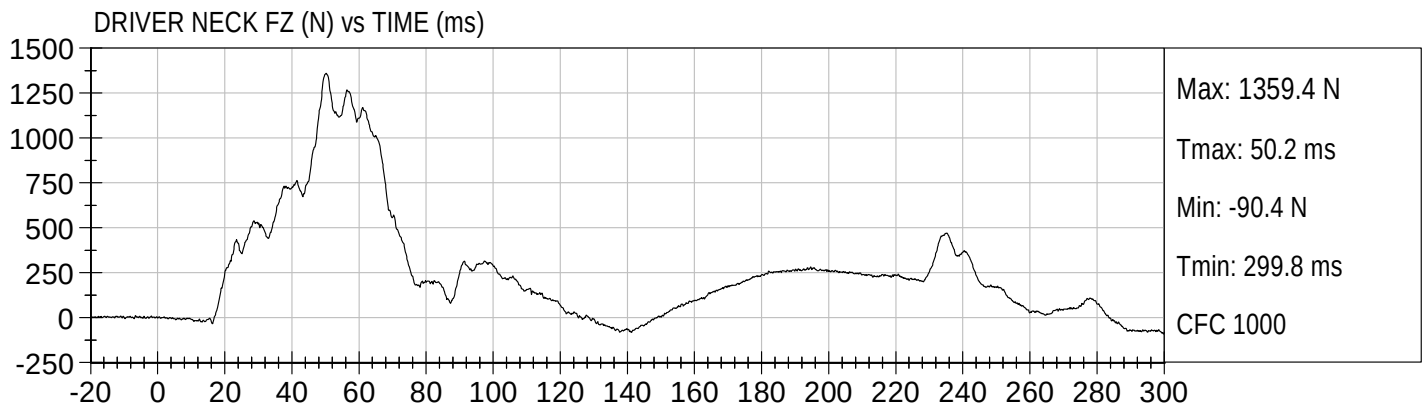
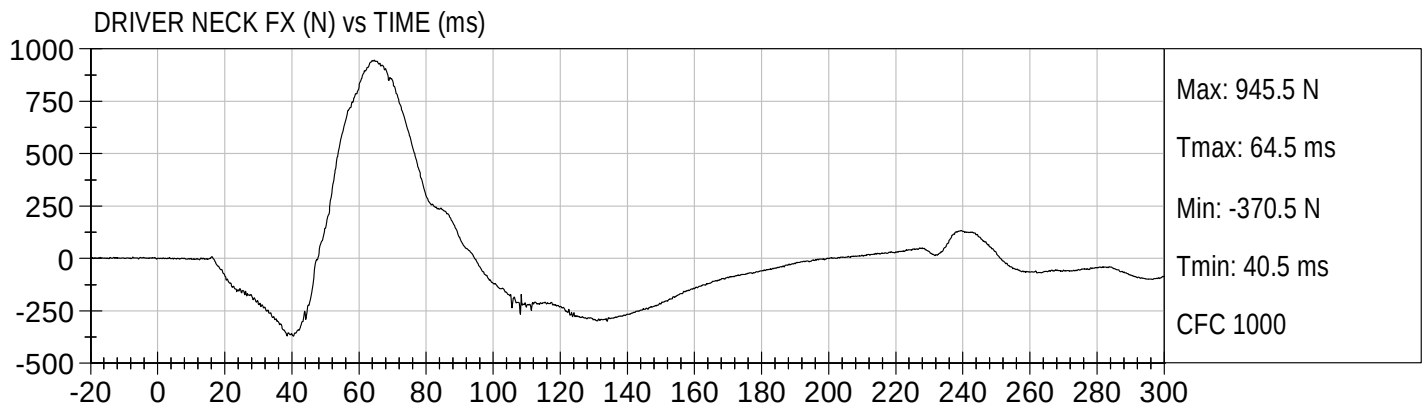


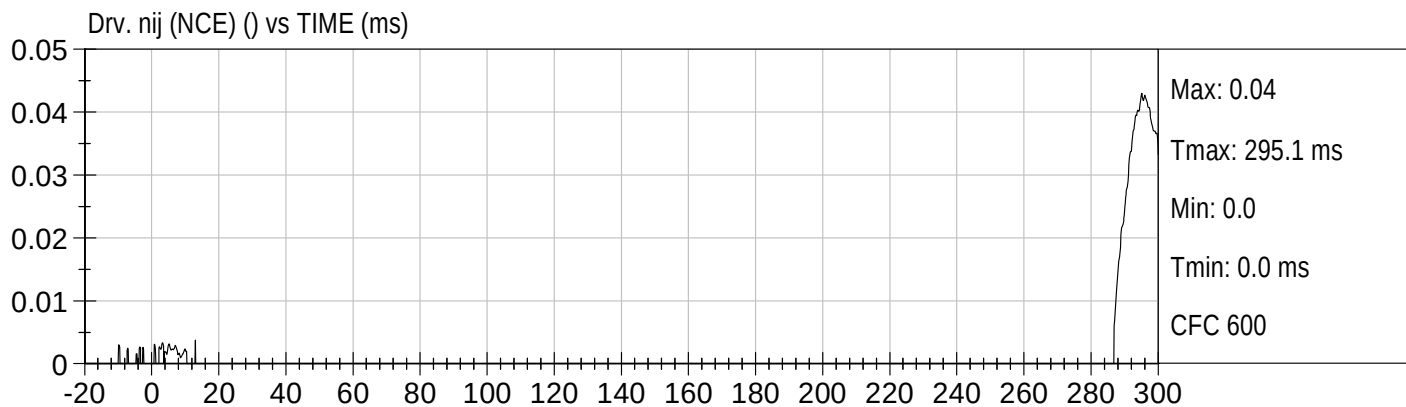
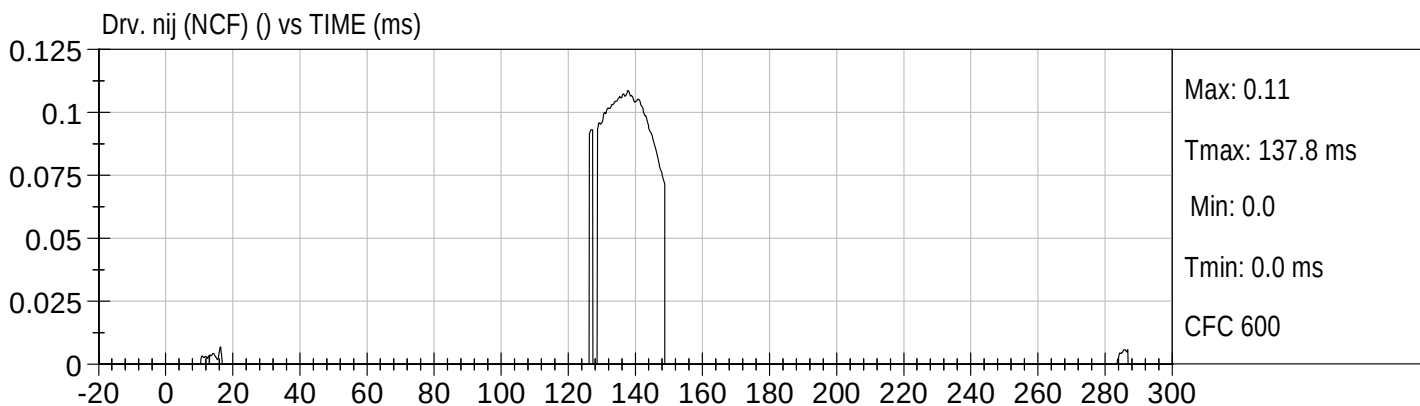
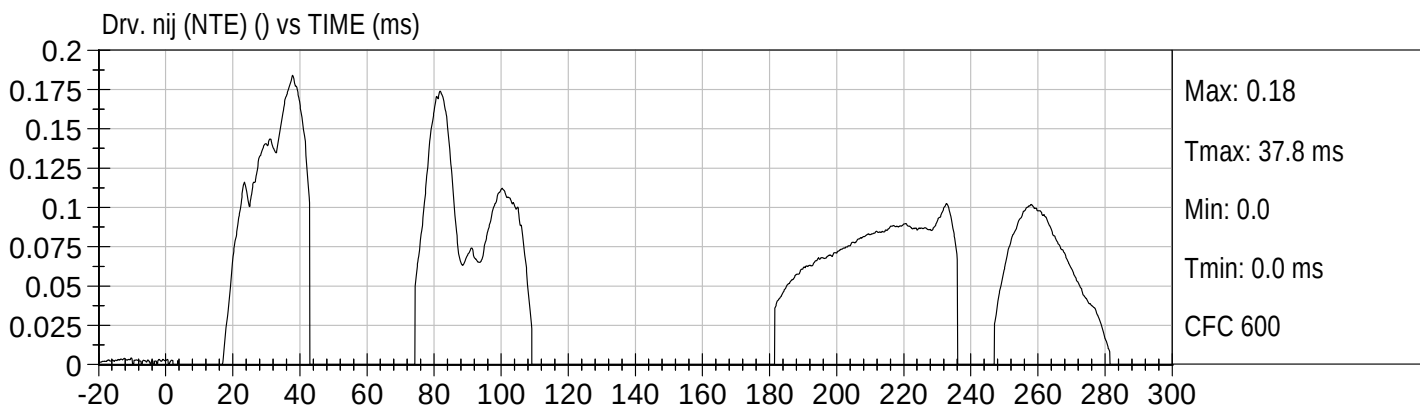
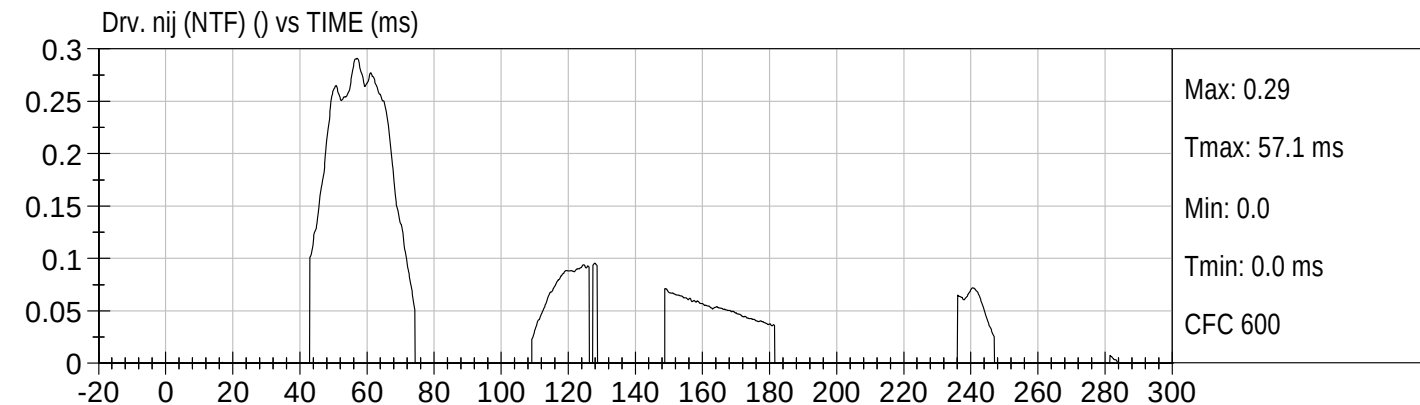
DRIVER CHEST Z (G's) vs TIME (ms)

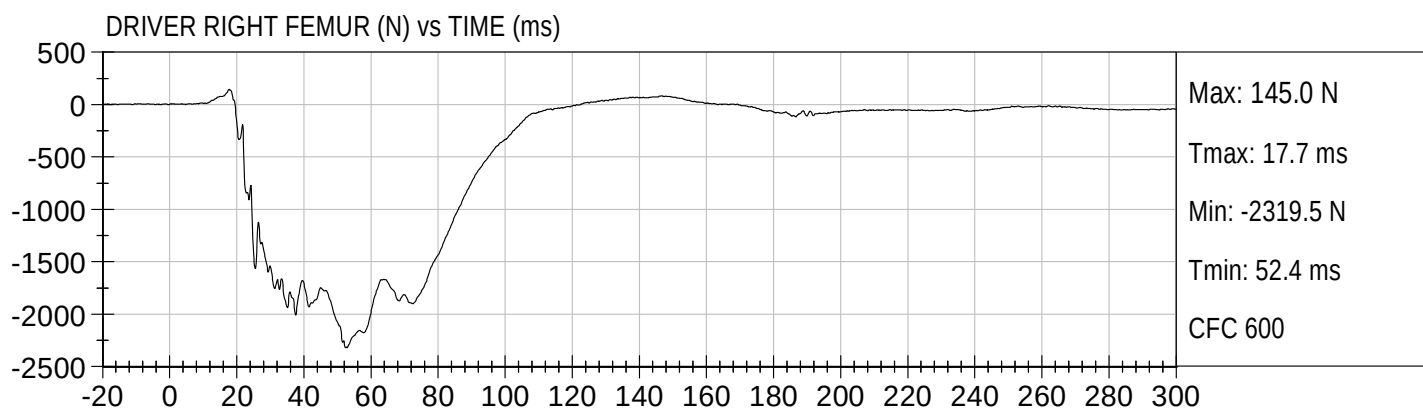
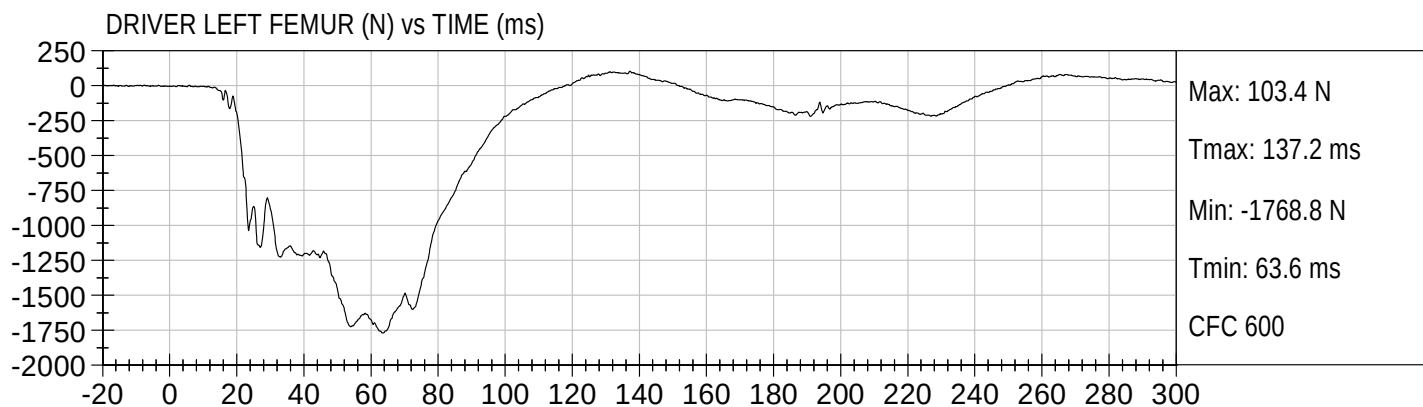


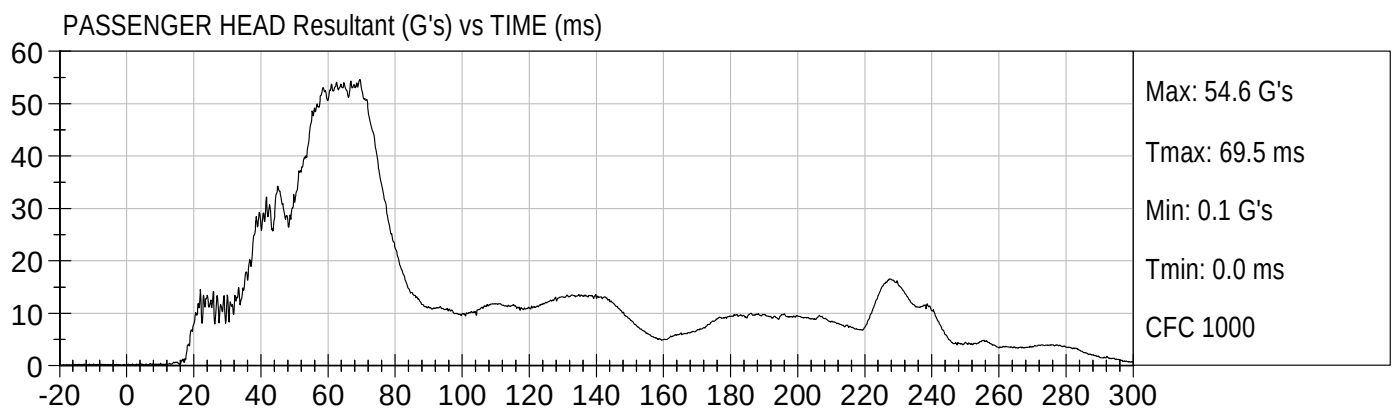
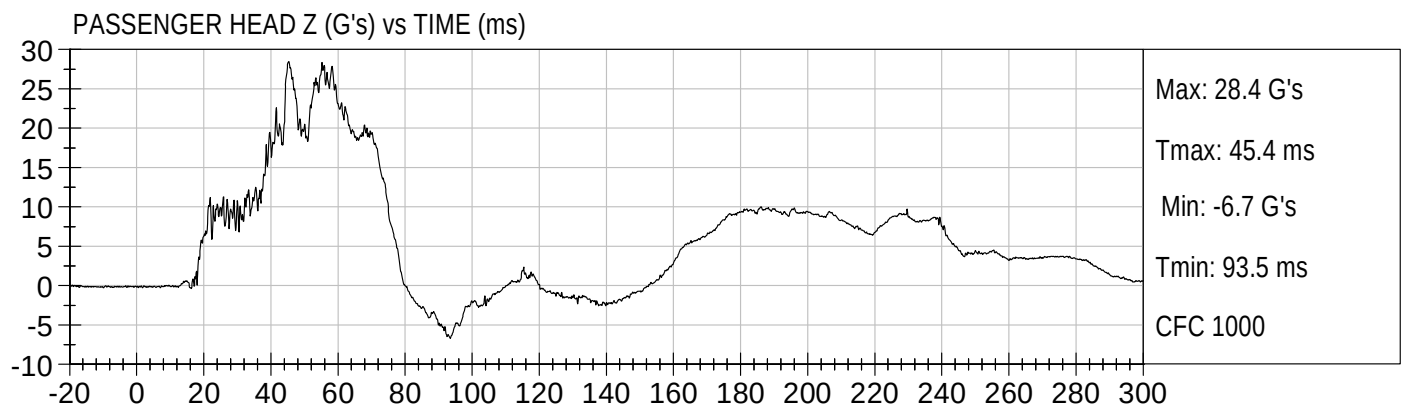
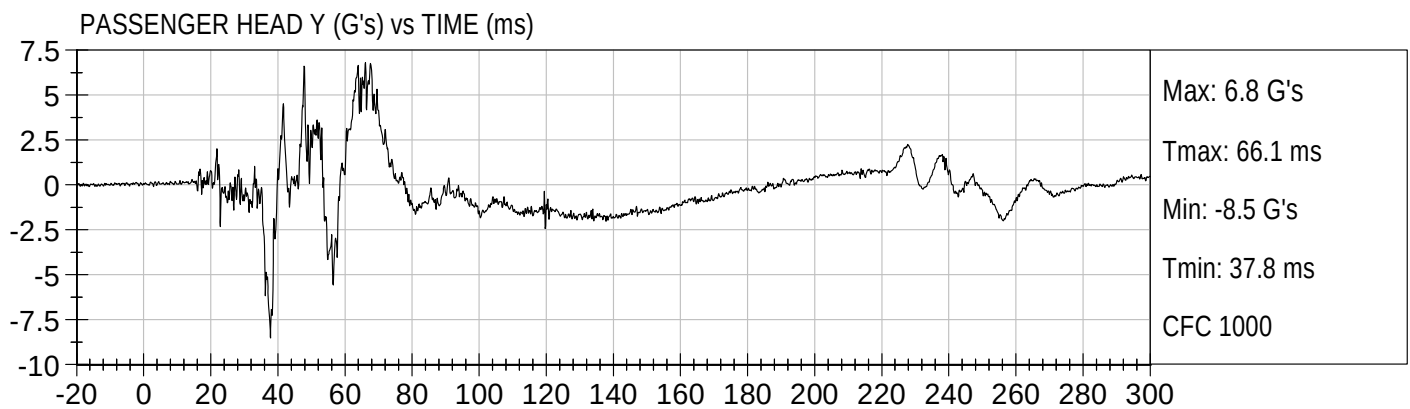
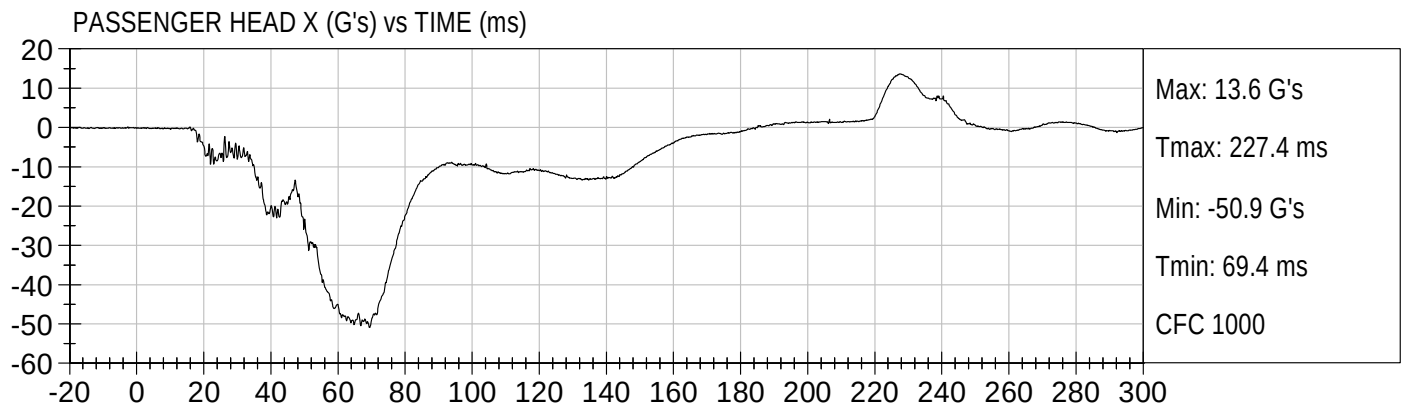
DRIVER CHEST Resultant (G's) vs TIME (ms)

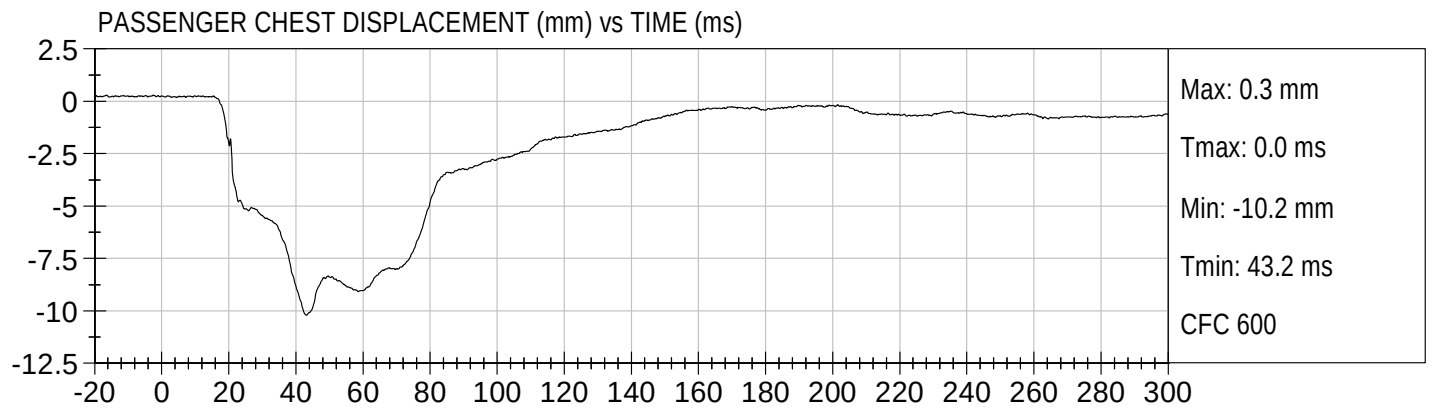


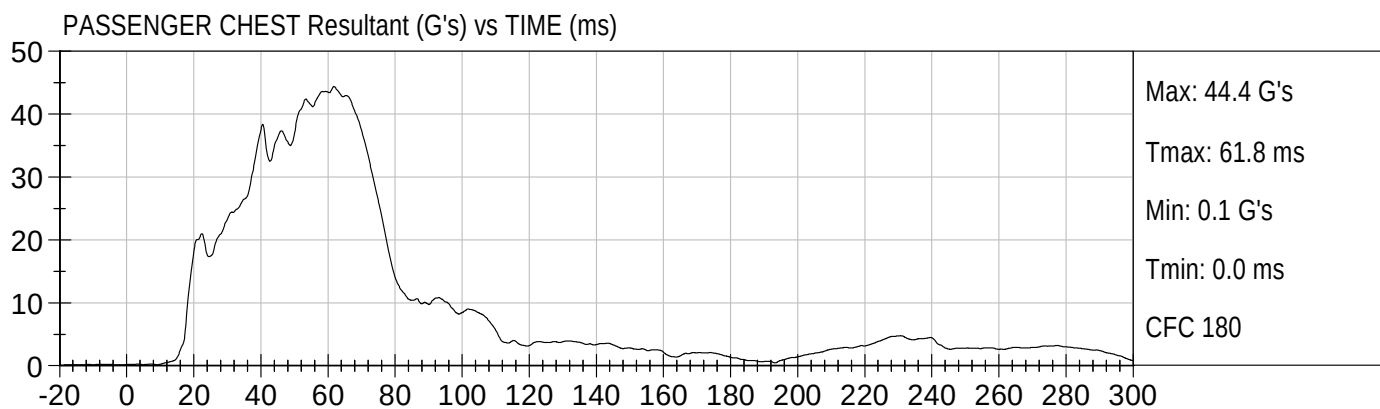
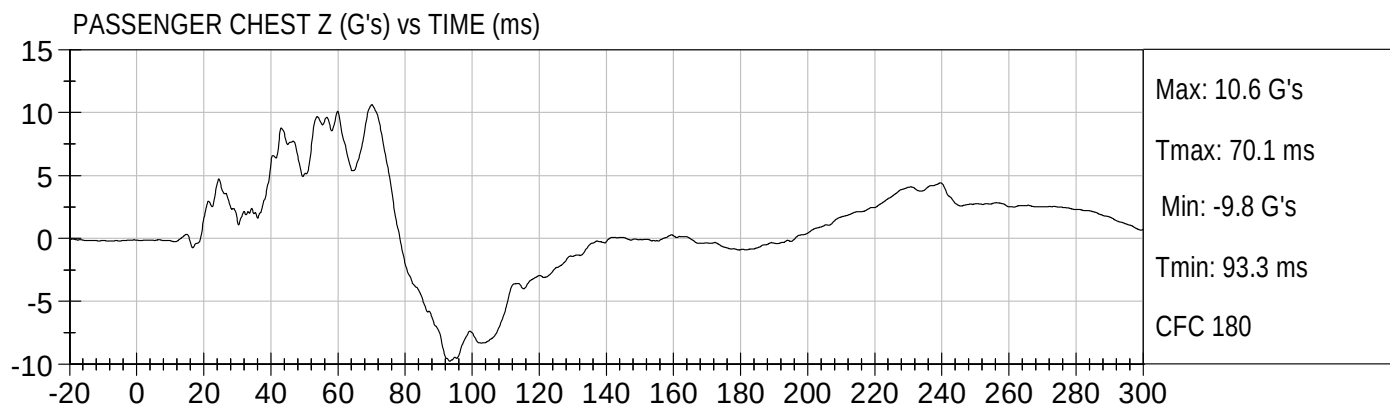
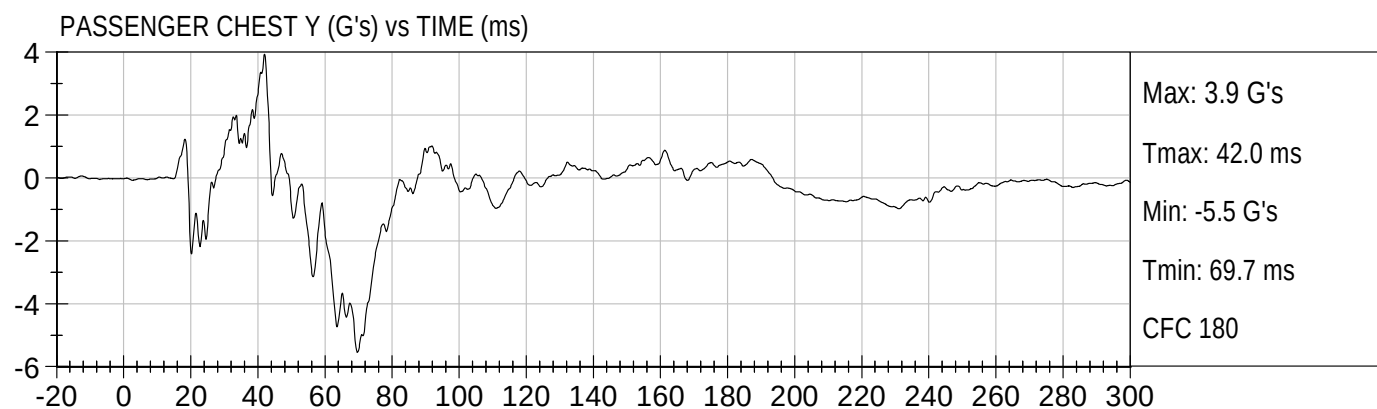
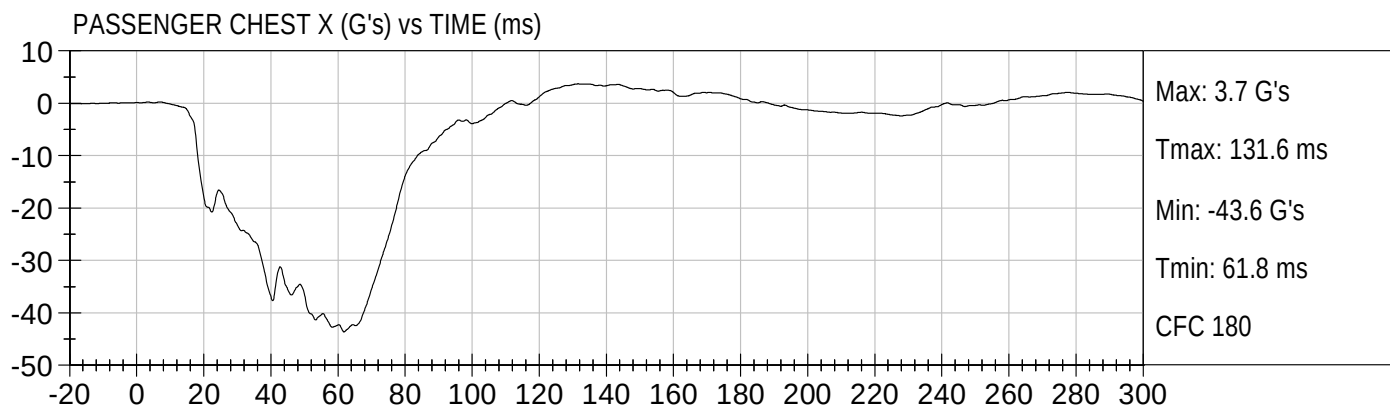






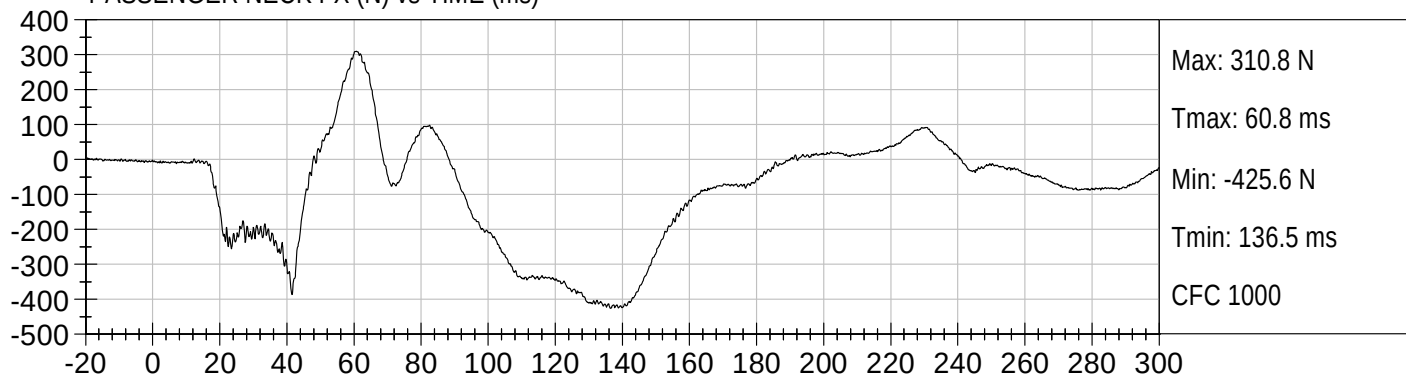




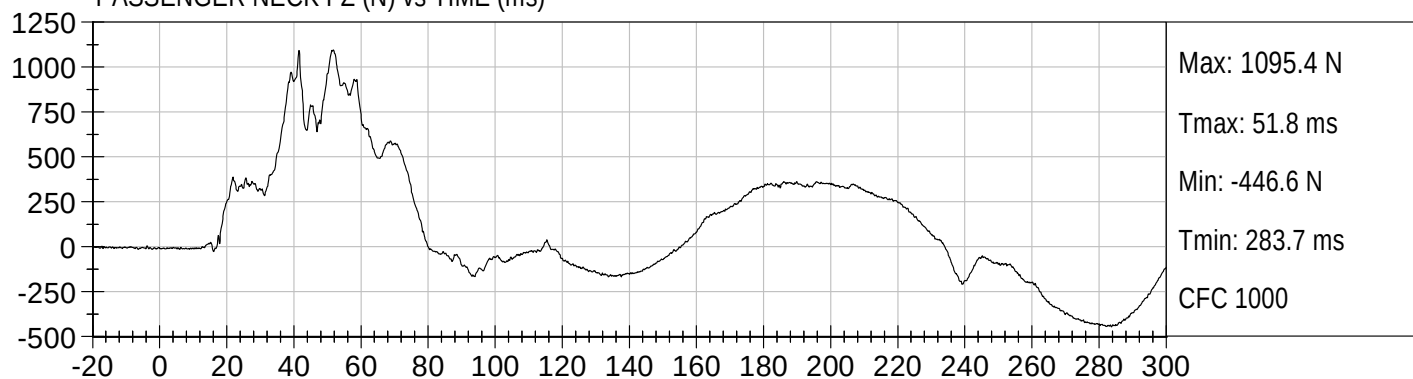




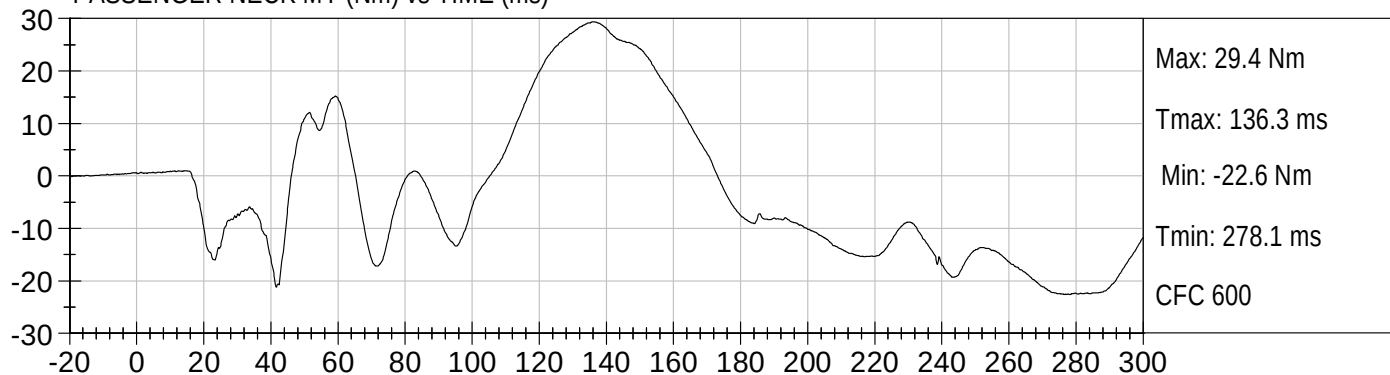
PASSENGER NECK FX (N) vs TIME (ms)

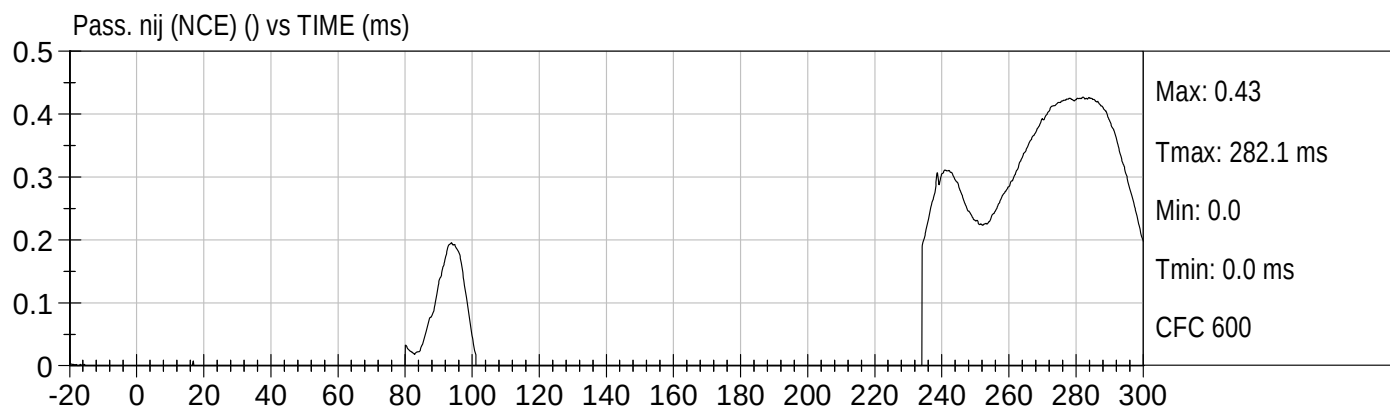
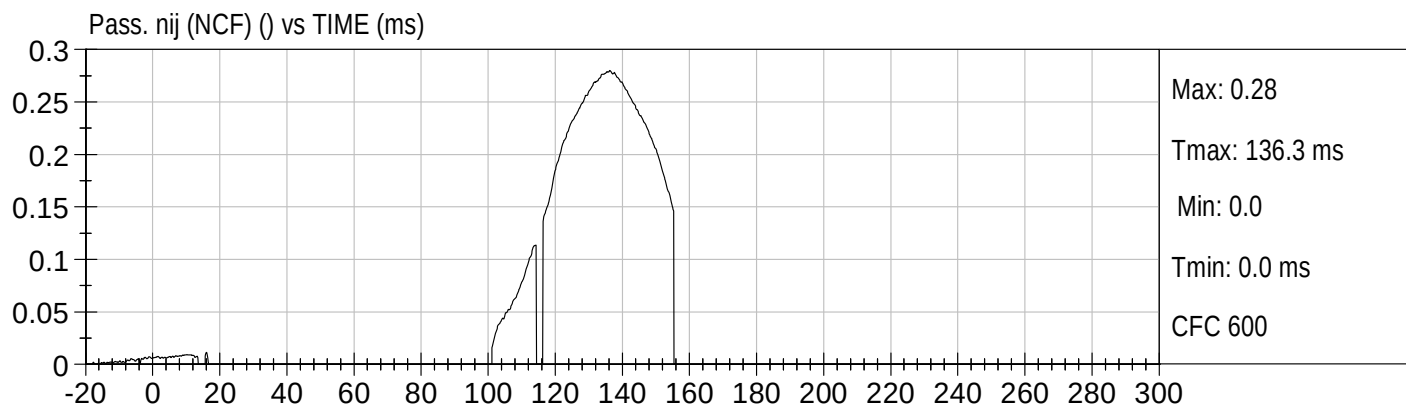
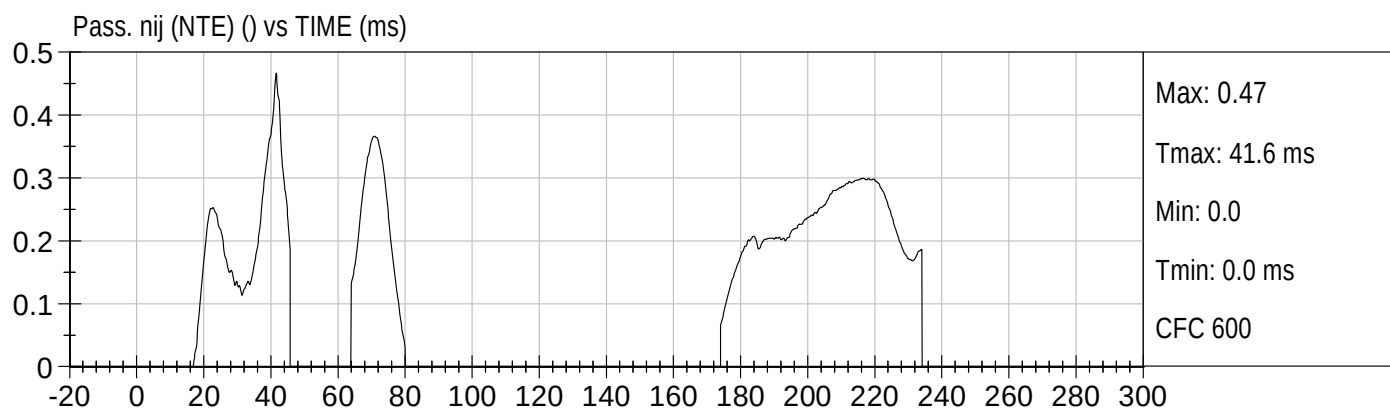
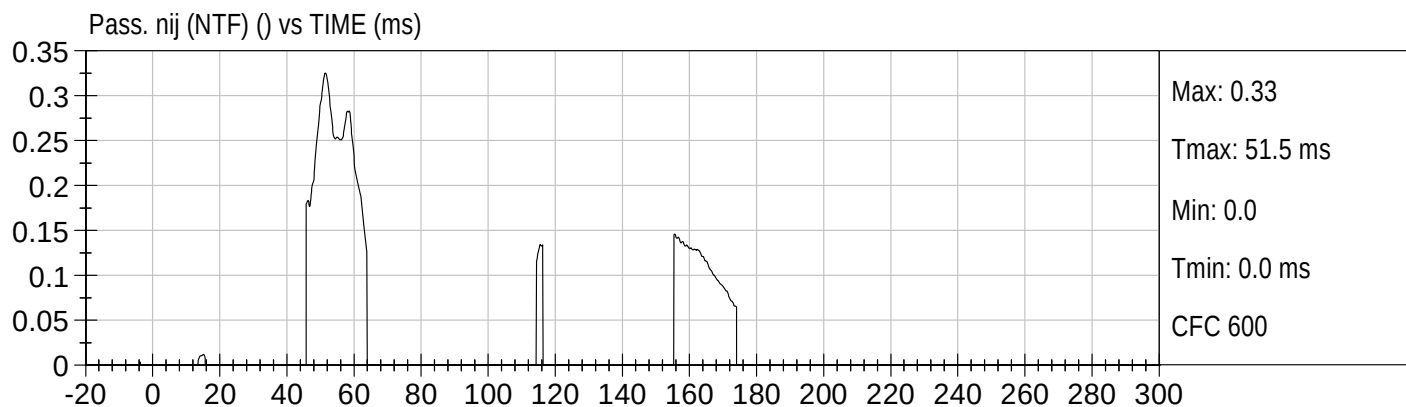


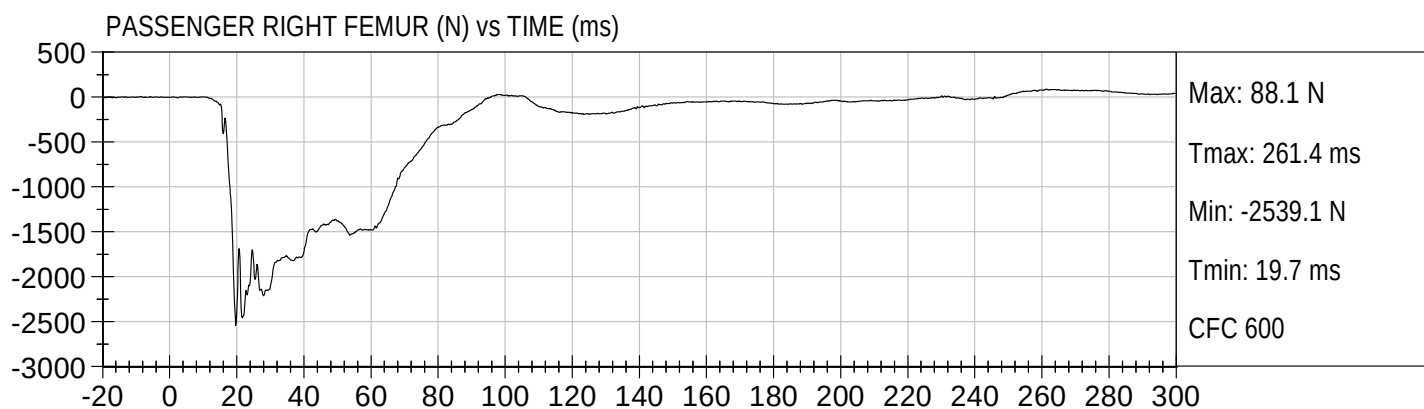
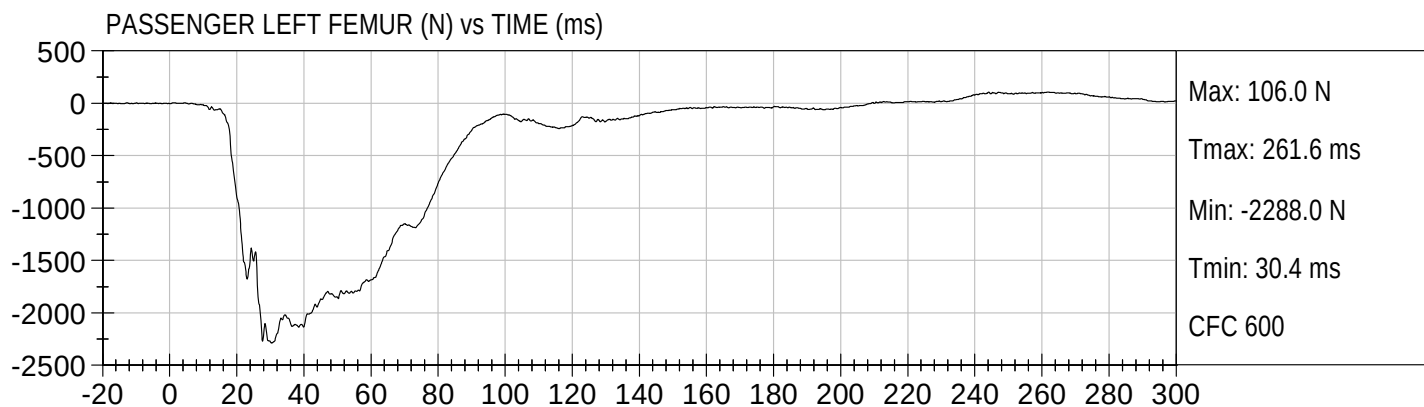
PASSENGER NECK FZ (N) vs TIME (ms)



PASSENGER NECK MY (Nm) vs TIME (ms)







APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 036

Test ID: D11571

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	225 - 275	230	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

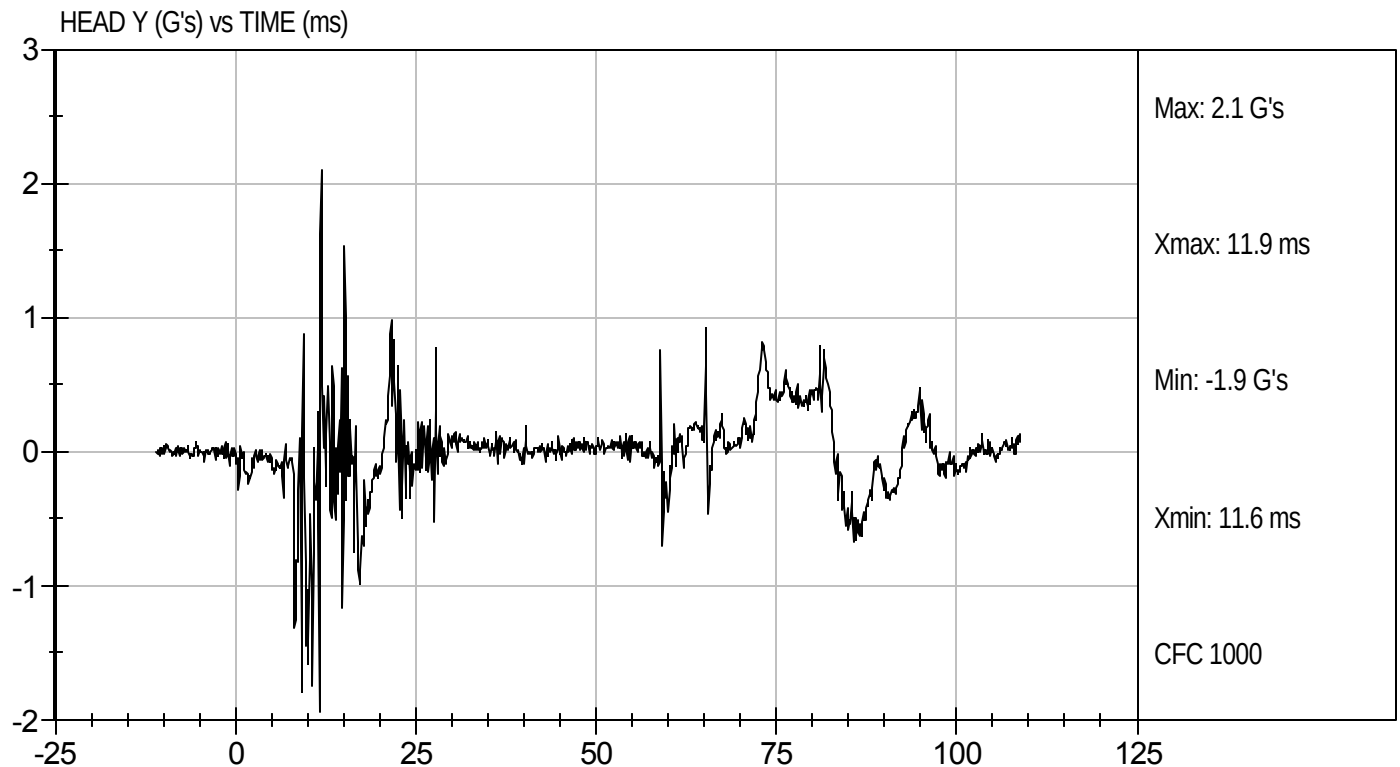
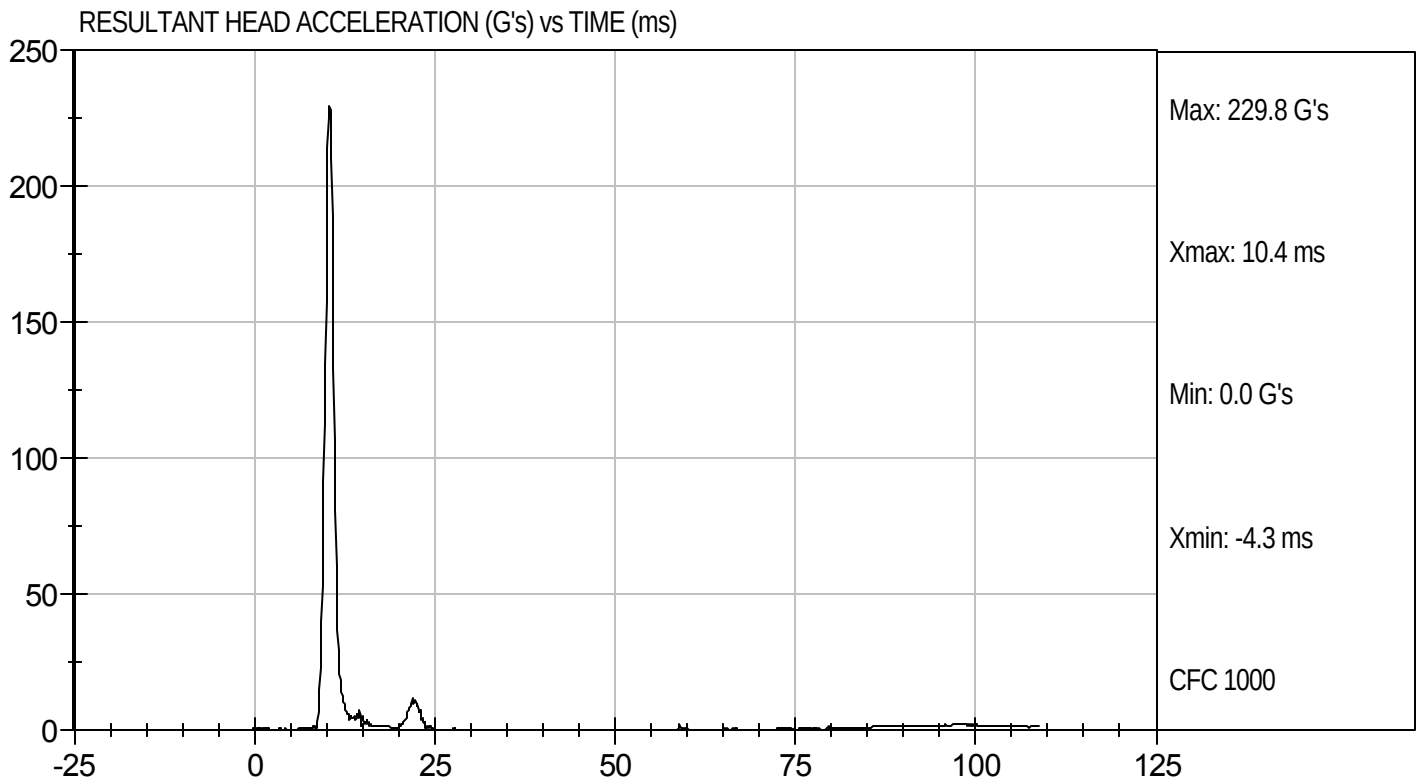
2/16/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11571

Test Date: 2/16/11
Velocity: 0 ft/s, 0.00 m/s

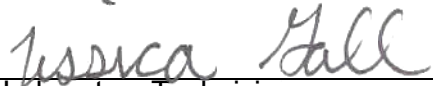


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D11572

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	34	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.14	Pass
	20 ms	G's	17.60 to 22.60	18.43	Pass
	30 ms	G's	12.50 to 18.50	12.57	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.3	Pass
	Time	ms	57.0 to 64.0	58.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	118.9	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	98.1	Pass
	Time	ms	47.0 to 58.0	51.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.3	Pass
Overall Test Results					Pass


 Laboratory Technician

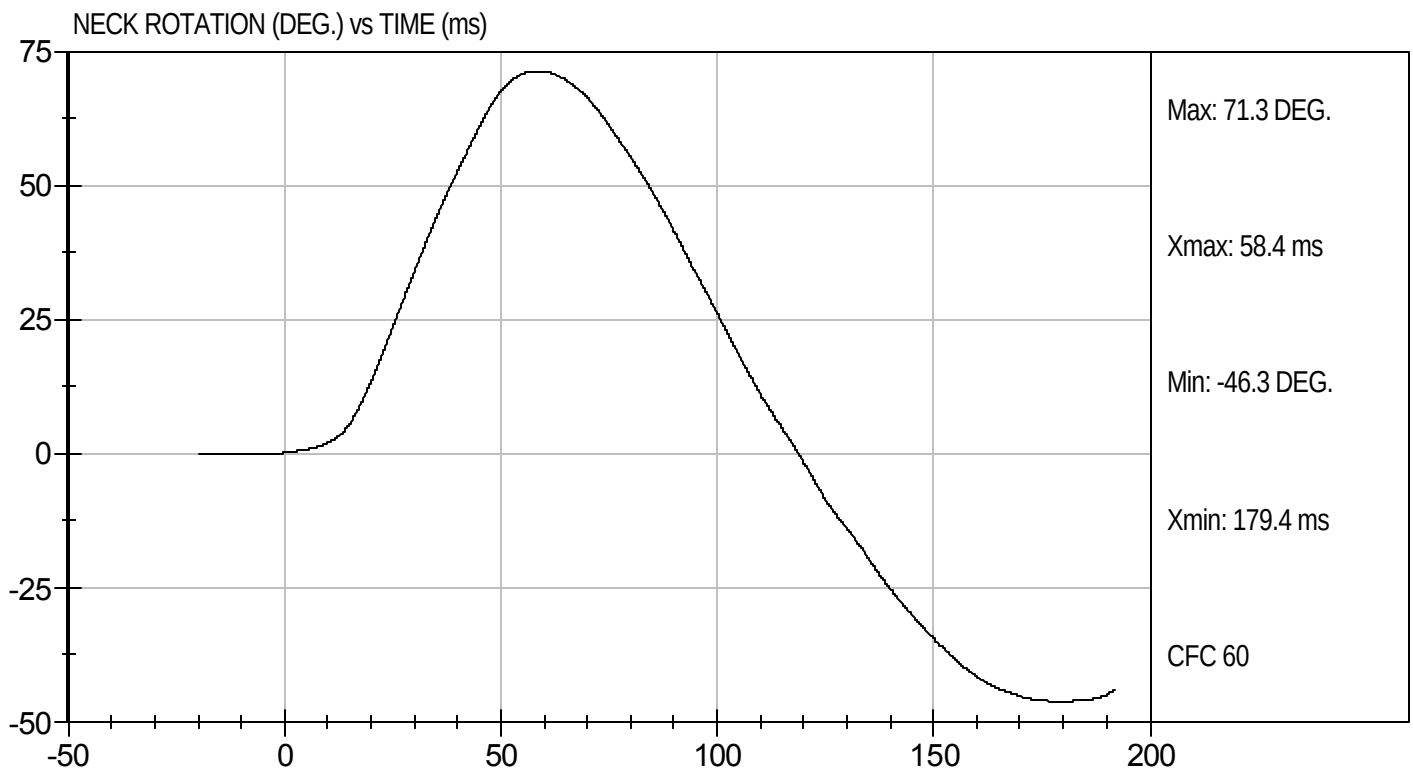
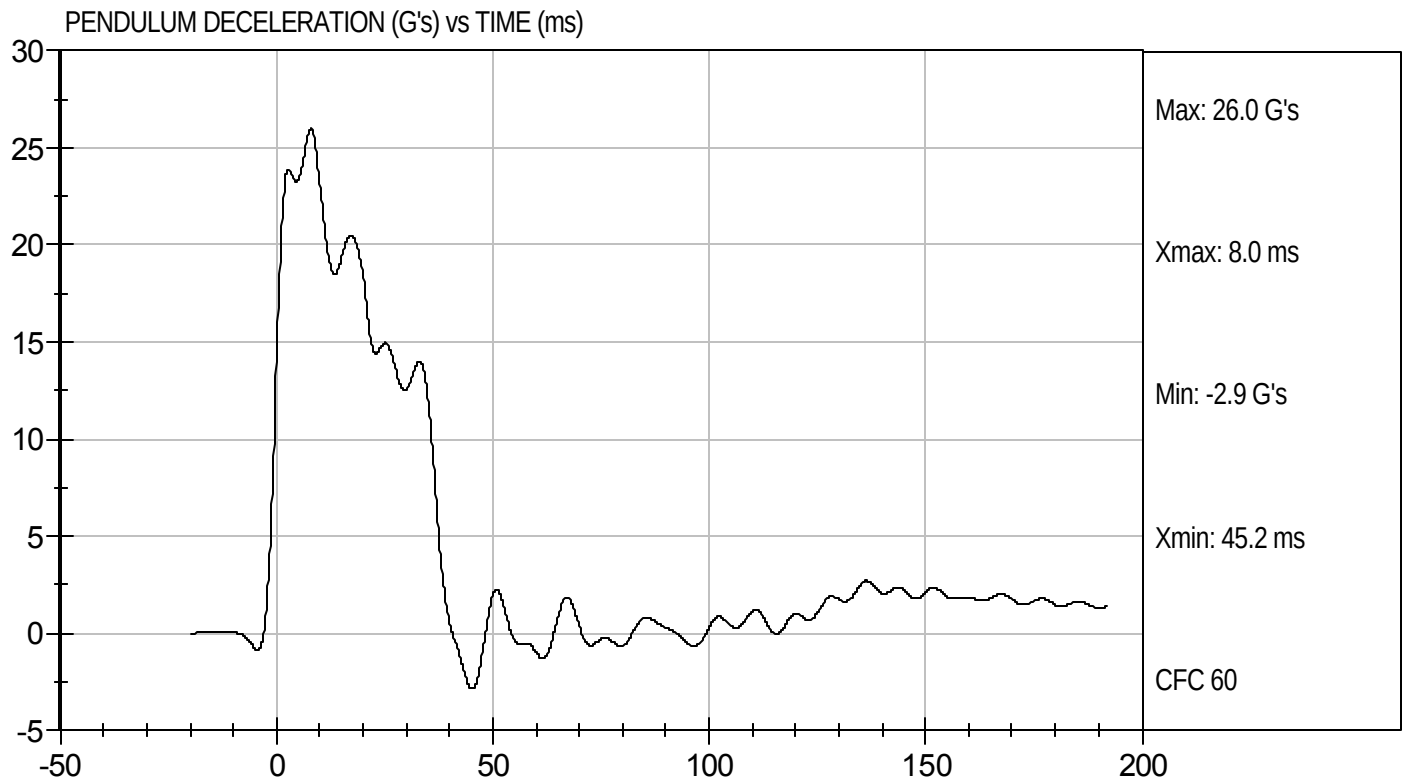
2/16/11
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D11572

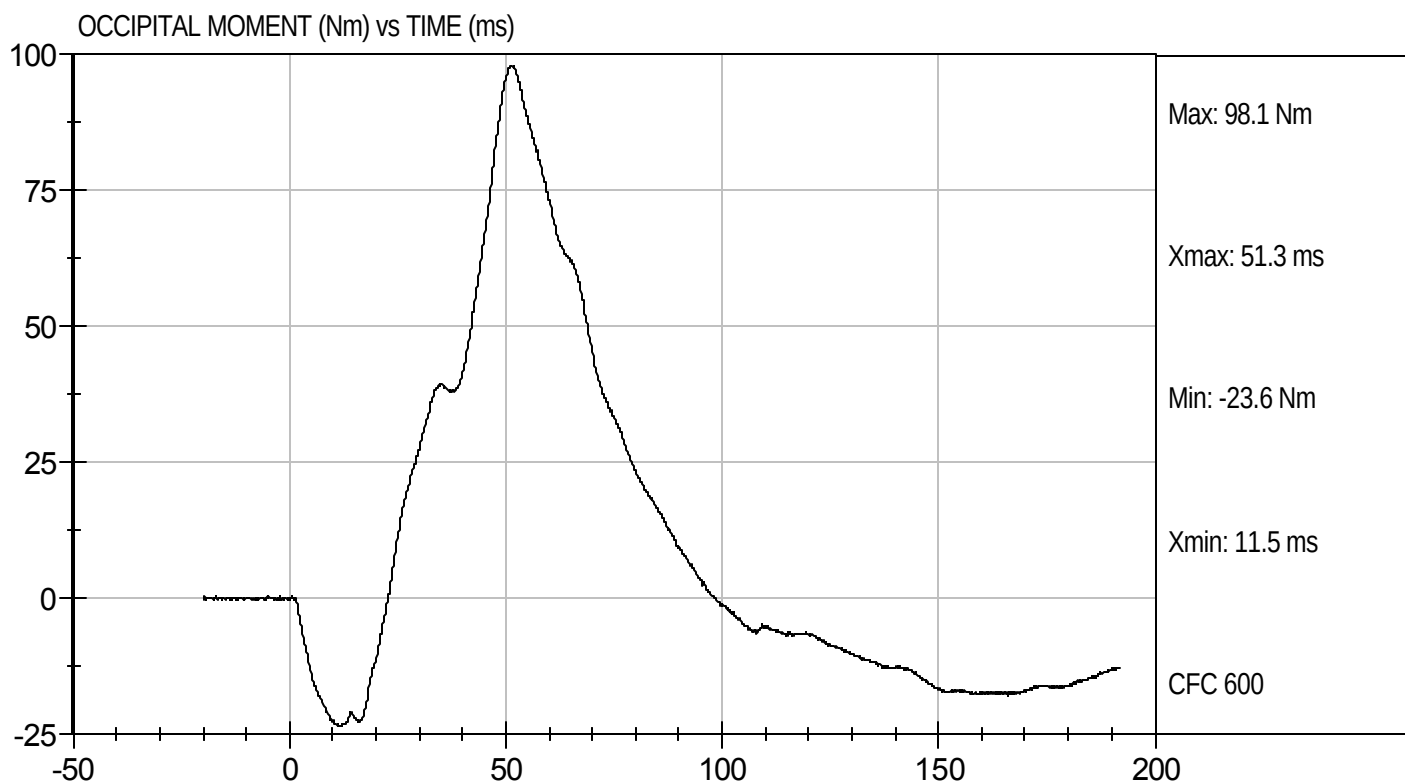
Test Date: 2/16/11
Velocity: 22.83 ft/s, 6.96 m/s





Test Desc: Neck Flexion
Component ID: D11572

Test Date: 2/16/11
Velocity: 22.83 ft/s, 6.96 m/s

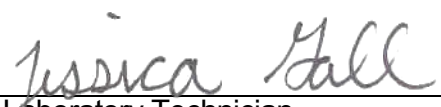


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D.: D11573

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.16	Pass
	20 ms	G's	14.00 to 19.00	17.44	Pass
	30 ms	G's	11.00 to 16.00	14.45	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.8	Pass
	Time	ms	72.0 to 82.0	75.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	155.9	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-71.4	Pass
	Time	ms	65.0 to 79.0	68.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.2	Pass
Overall Test Results					Pass


 Laboratory Technician

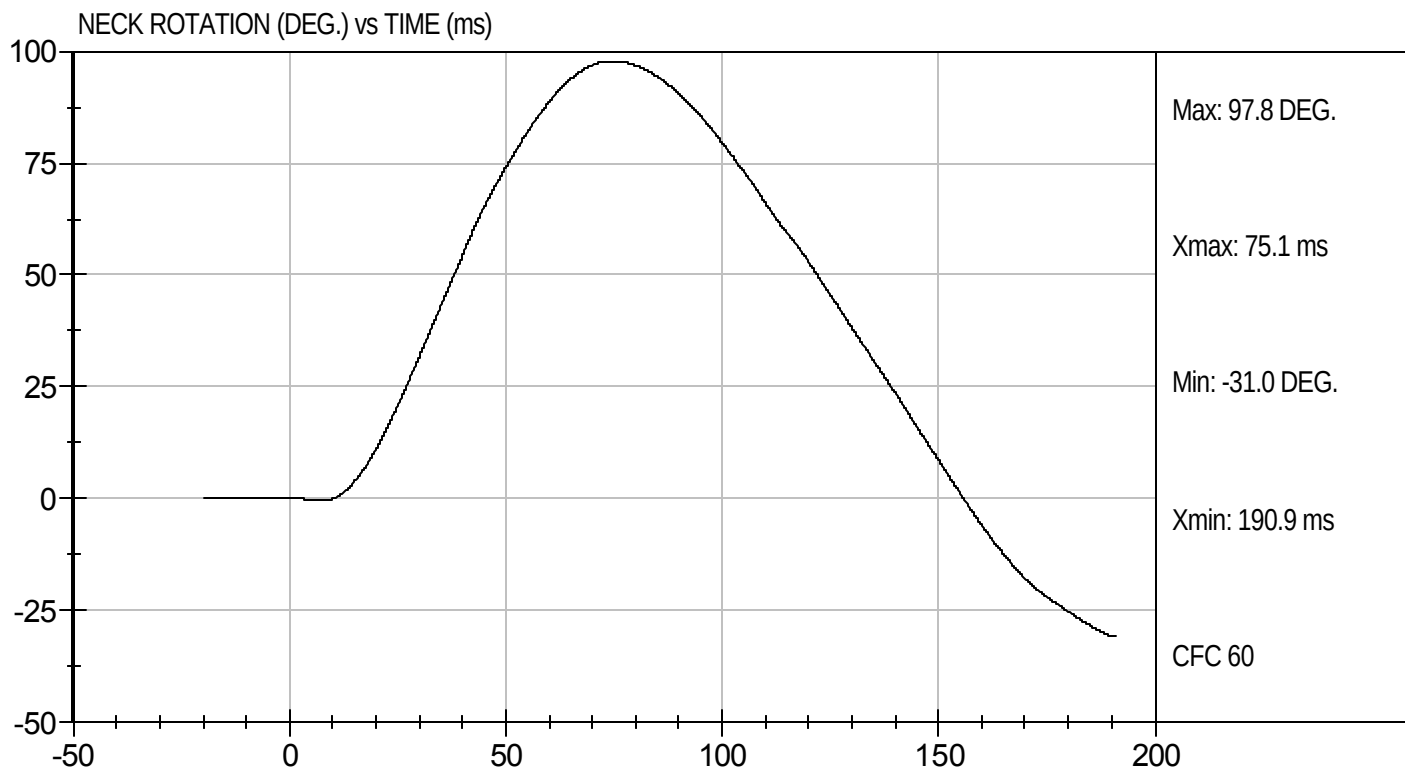
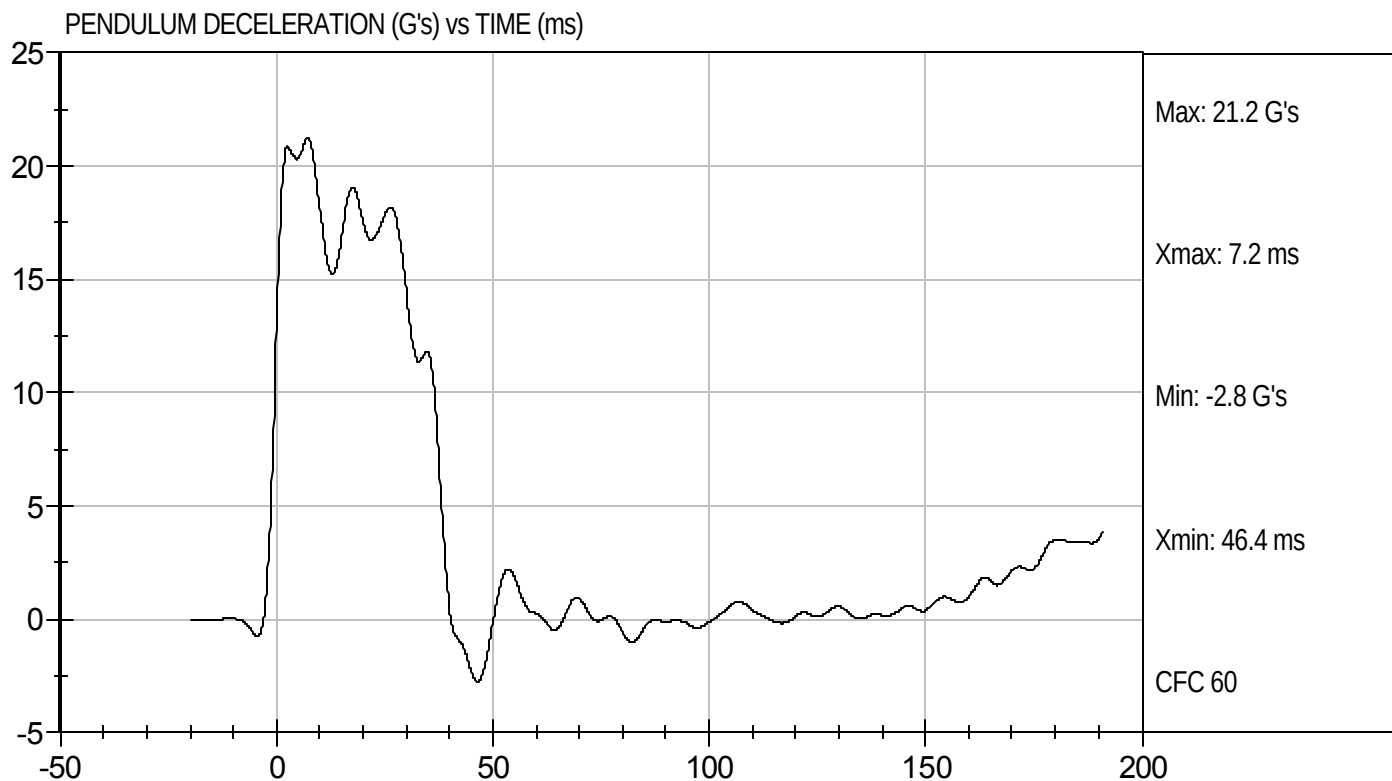
2/16/11
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D11573

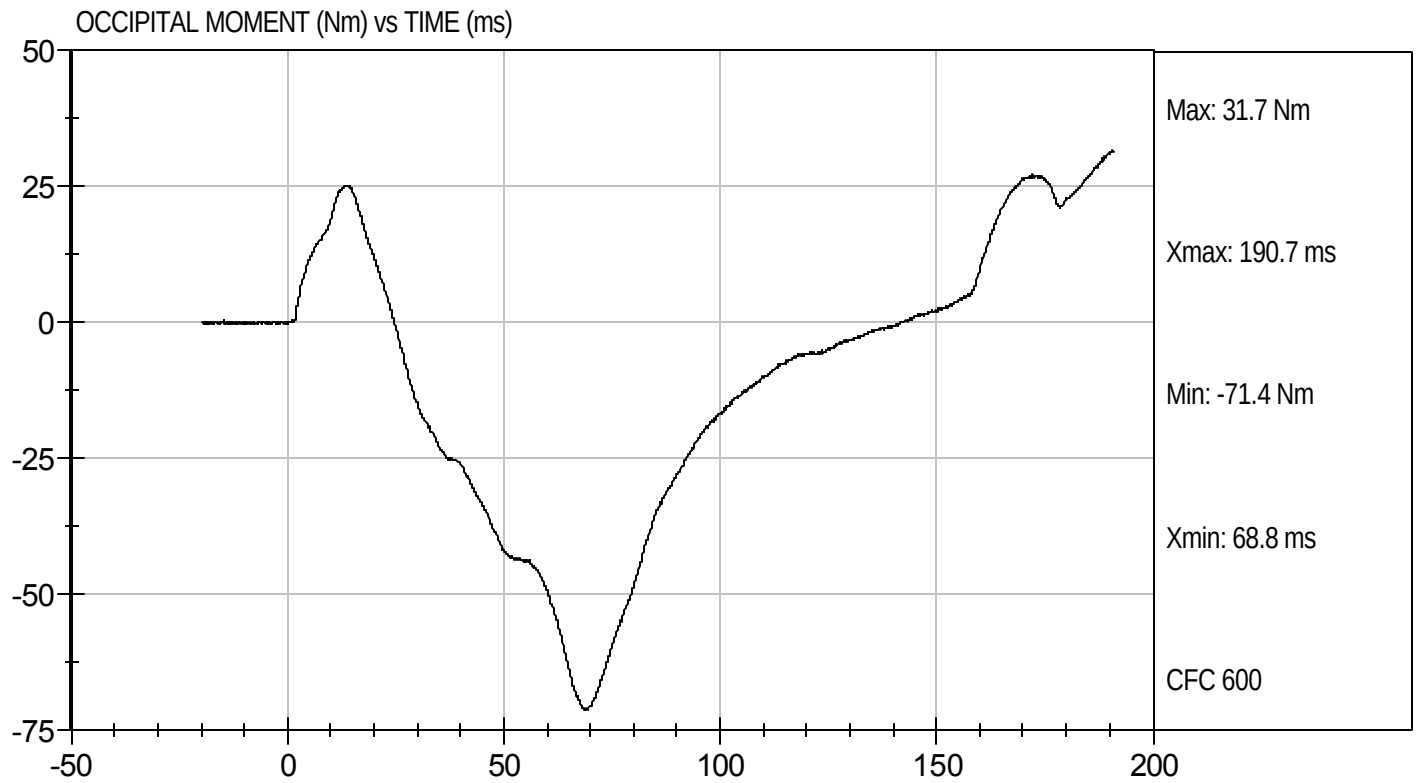
Test Date: 2/16/11
Velocity: 20.10 ft/s, 6.13 m/s





Test Desc: Neck Extension
Component ID: D11573

Test Date: 2/16/11
Velocity: 20.10 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D11574

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,509	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.46	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Overall Test Results			Pass	


Laboratory Technician

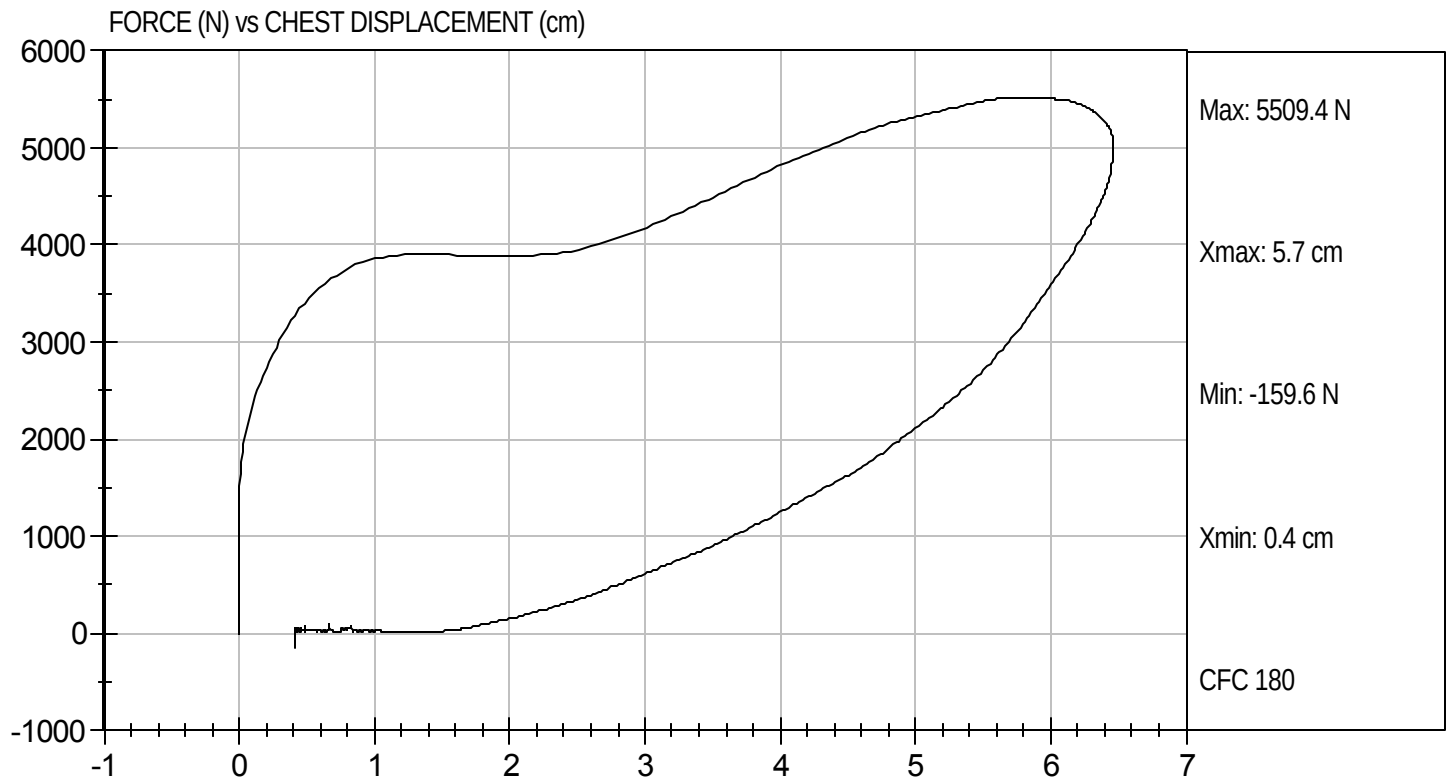
2/16/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11574

Test Date: 2/16/11
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 036

Test I.D: D11575

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,180	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

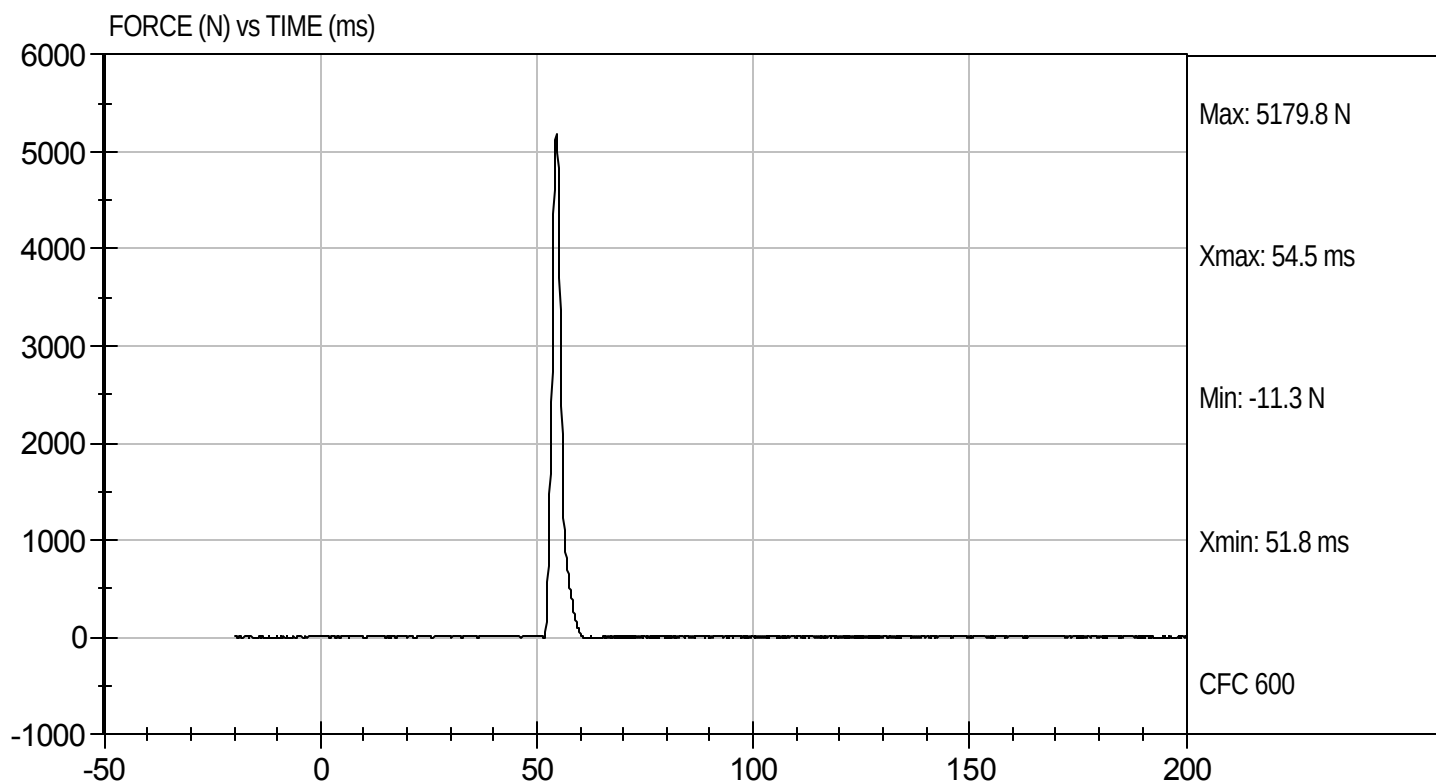
2/16/11
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D11575

Test Date: 2/16/11
Velocity: 6.94 ft/s, 2.12 m/s



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

ATD Serial No: 036

Test I.D: D11576

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,610	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

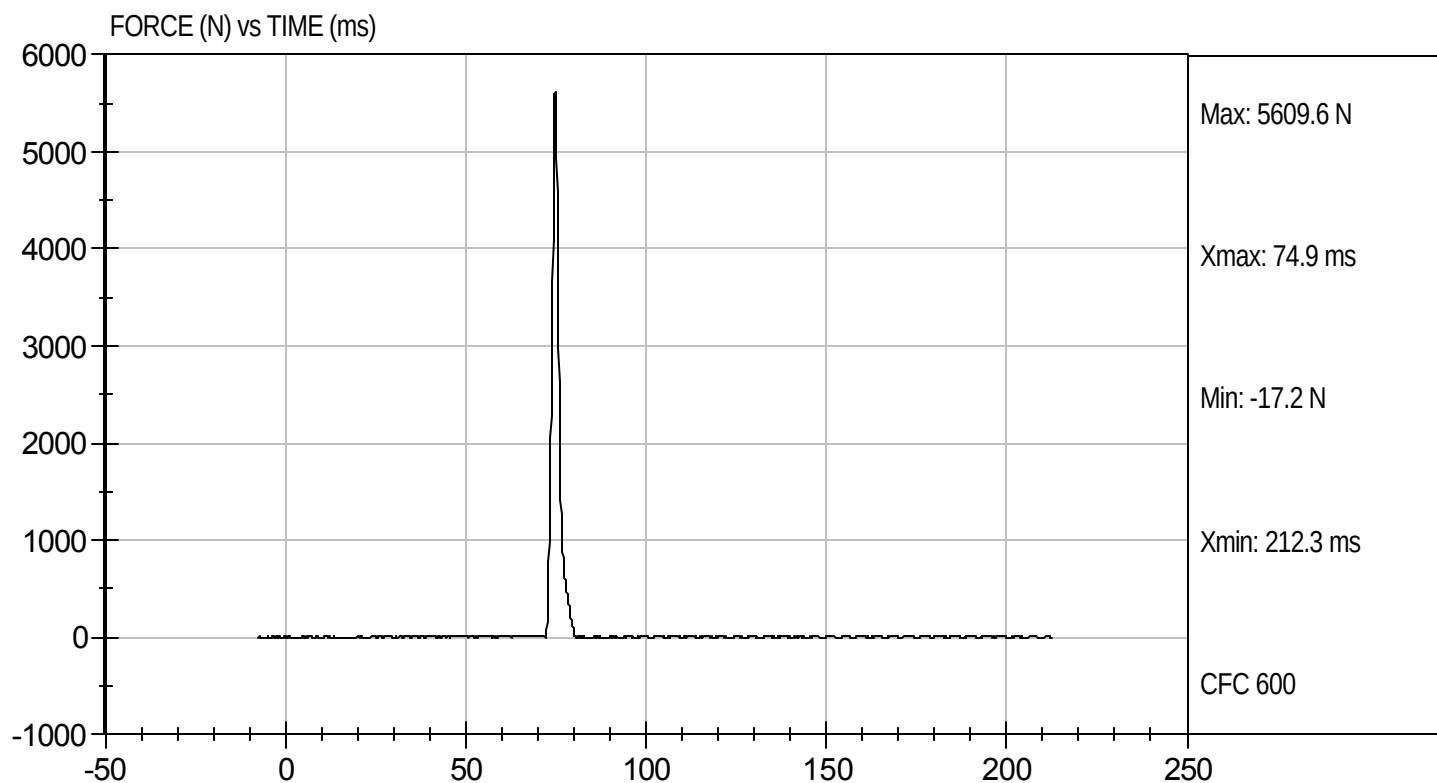
2/16/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11576

Test Date: 2/16/11
Velocity: 6.97 ft/s, 2.12 m/s



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

ATD Serial No: 036

Test I.D: D11570

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	32	32	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	62.2	50.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	48	49	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

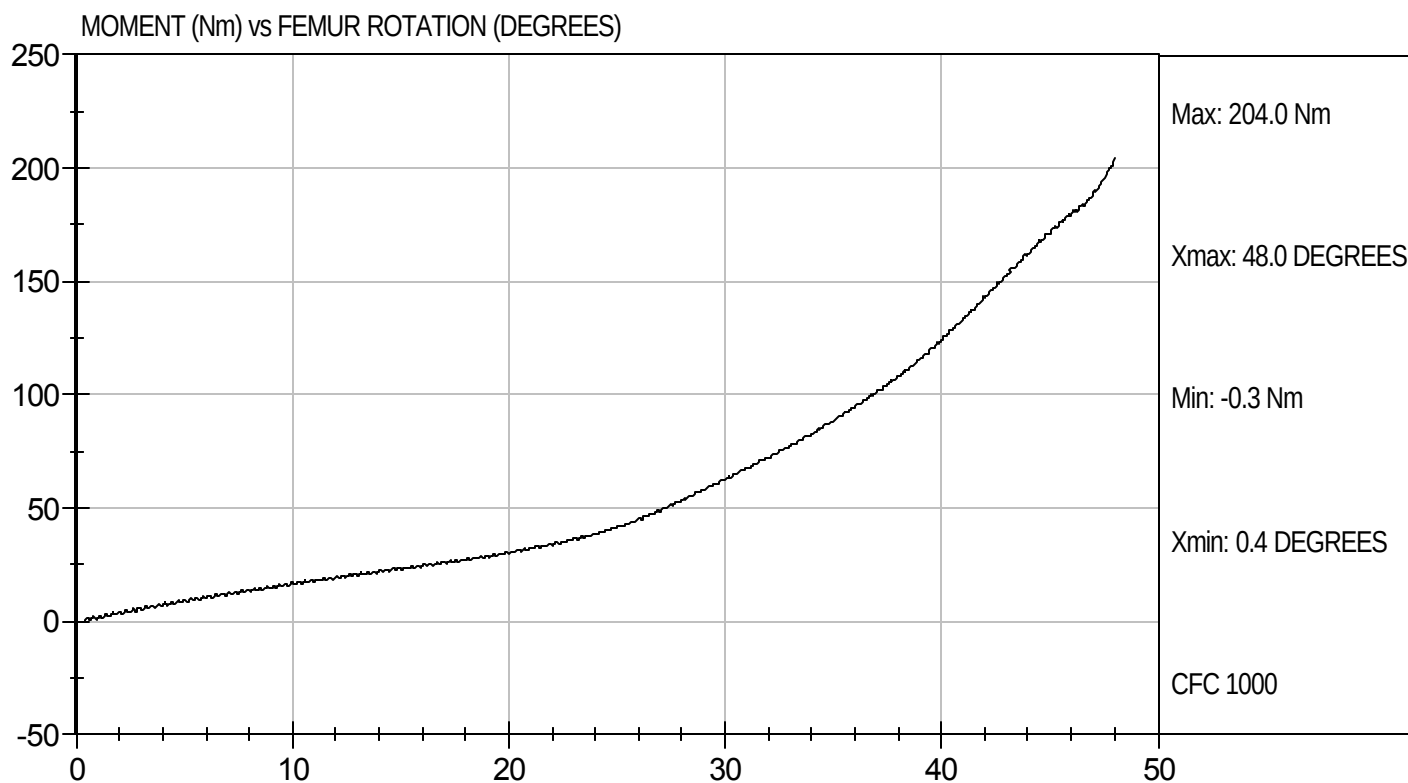
2/16/11
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D11579

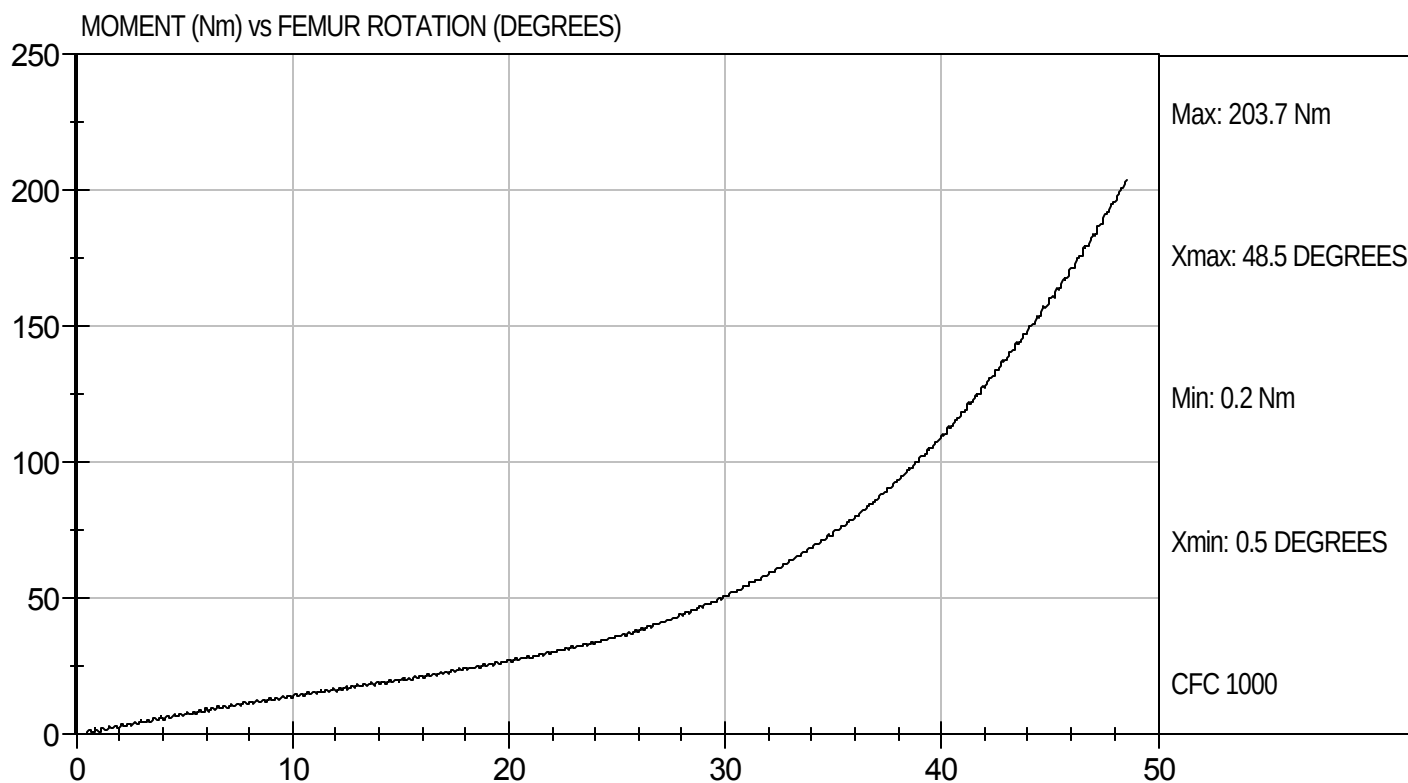
Test Date: 2/16/11
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D11570

Test Date: 2/16/11
Velocity: 0 ft/s, 0.00 m/s



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

ATD Serial No: 036

Test ID: D11641

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	225 - 275	231	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

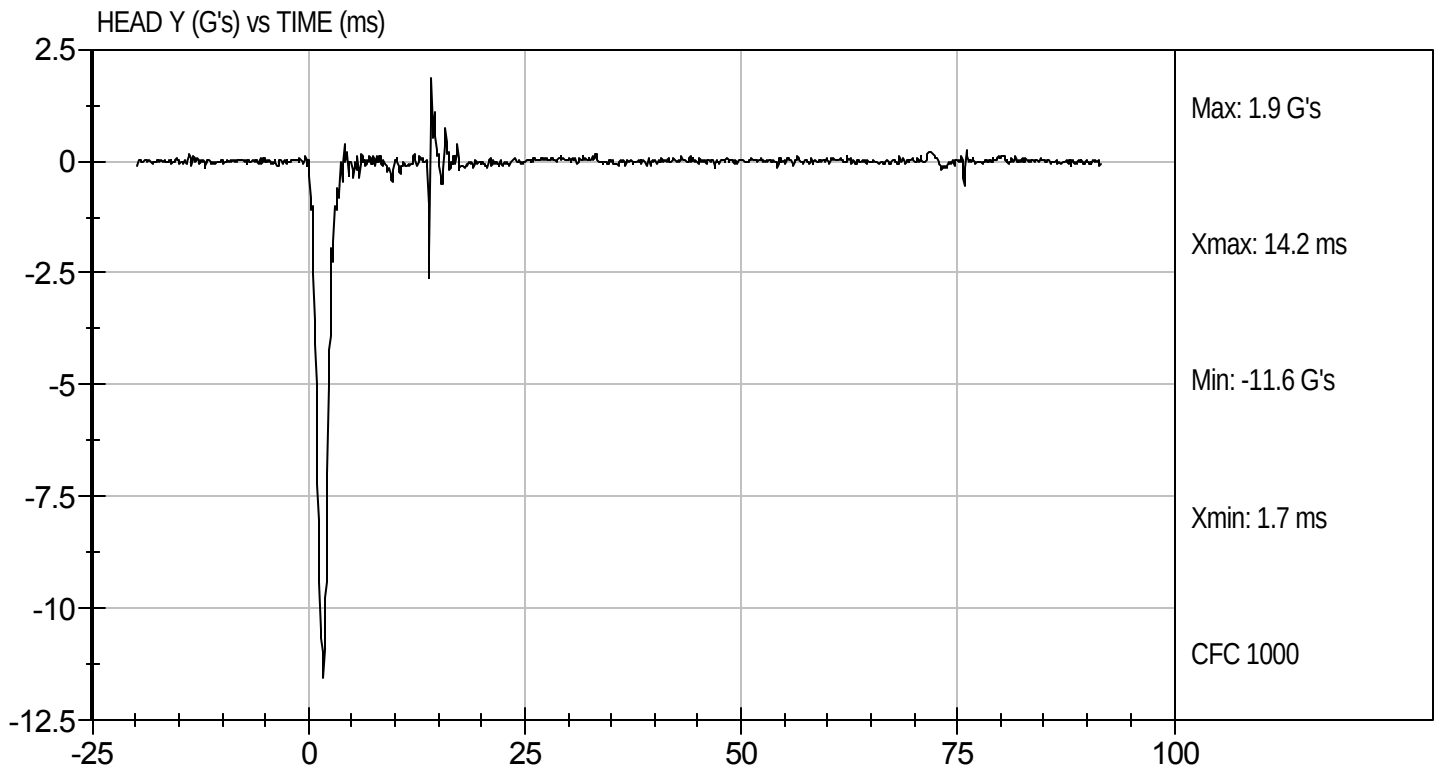
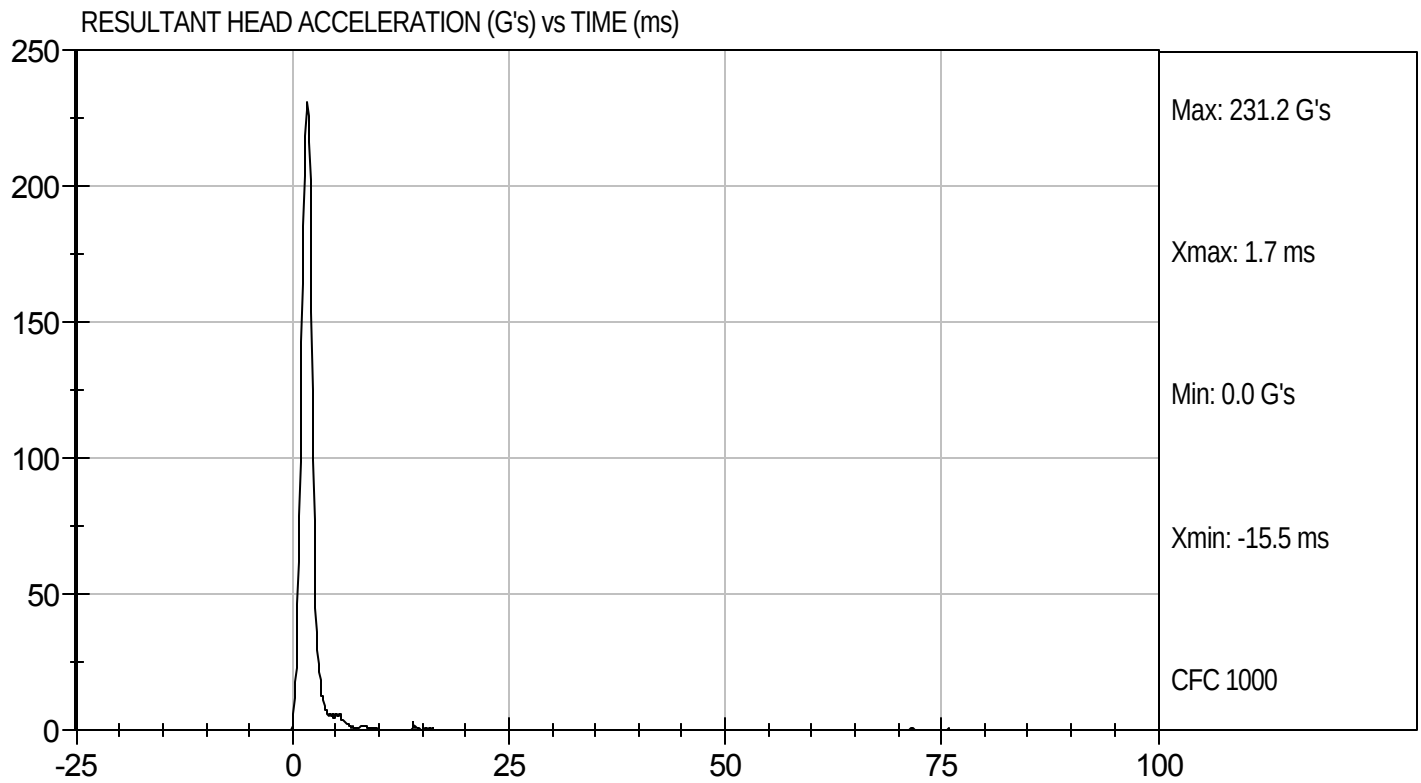
2/22/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D11641

Test Date: 2/22/11
Velocity: 0 ft/s, 0.00 m/s

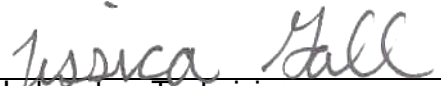


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D11642

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.30	Pass
	20 ms	G's	17.60 to 22.60	17.85	Pass
	30 ms	G's	12.50 to 18.50	13.18	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.5	Pass
	Time	ms	57.0 to 64.0	57.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.7	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	94.0	Pass
	Time	ms	47.0 to 58.0	49.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.0	Pass
Overall Test Results					Pass


 Laboratory Technician

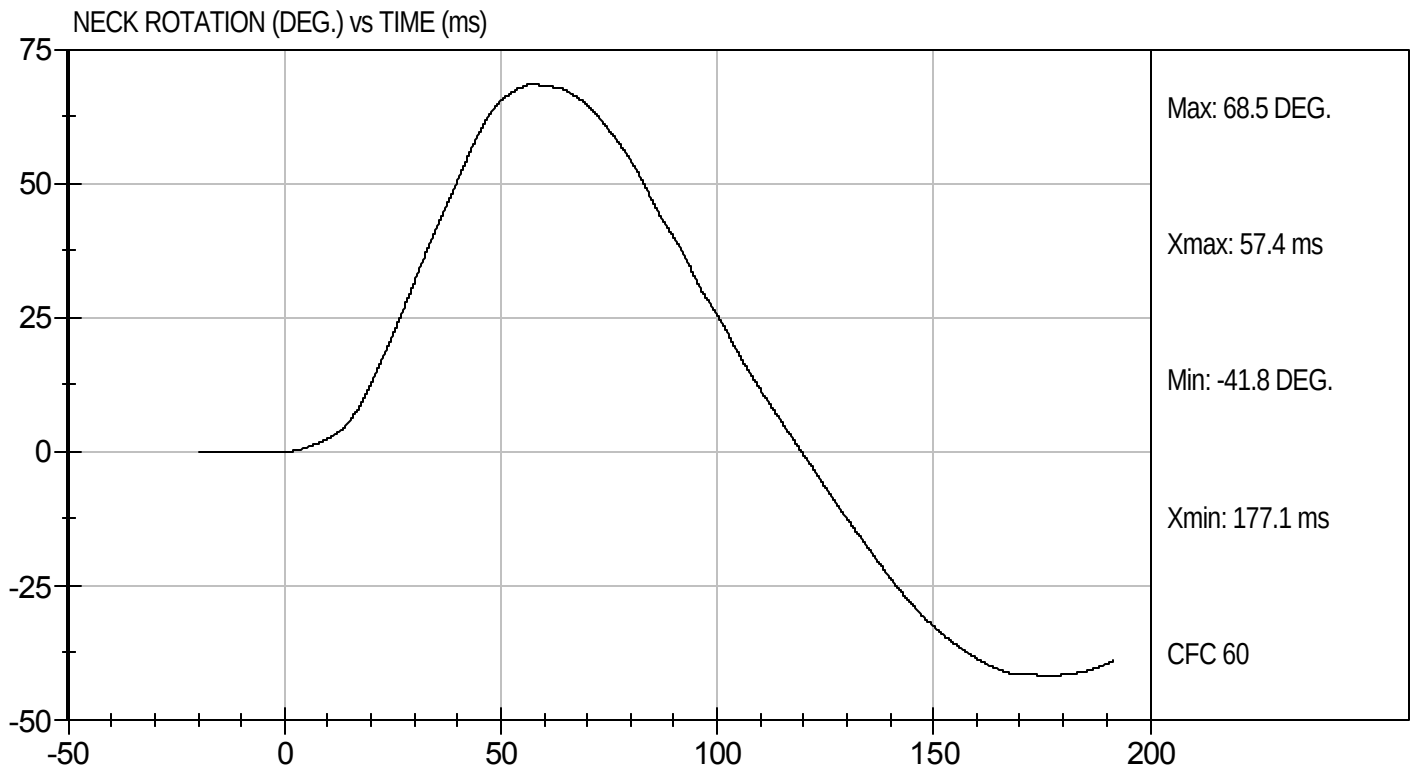
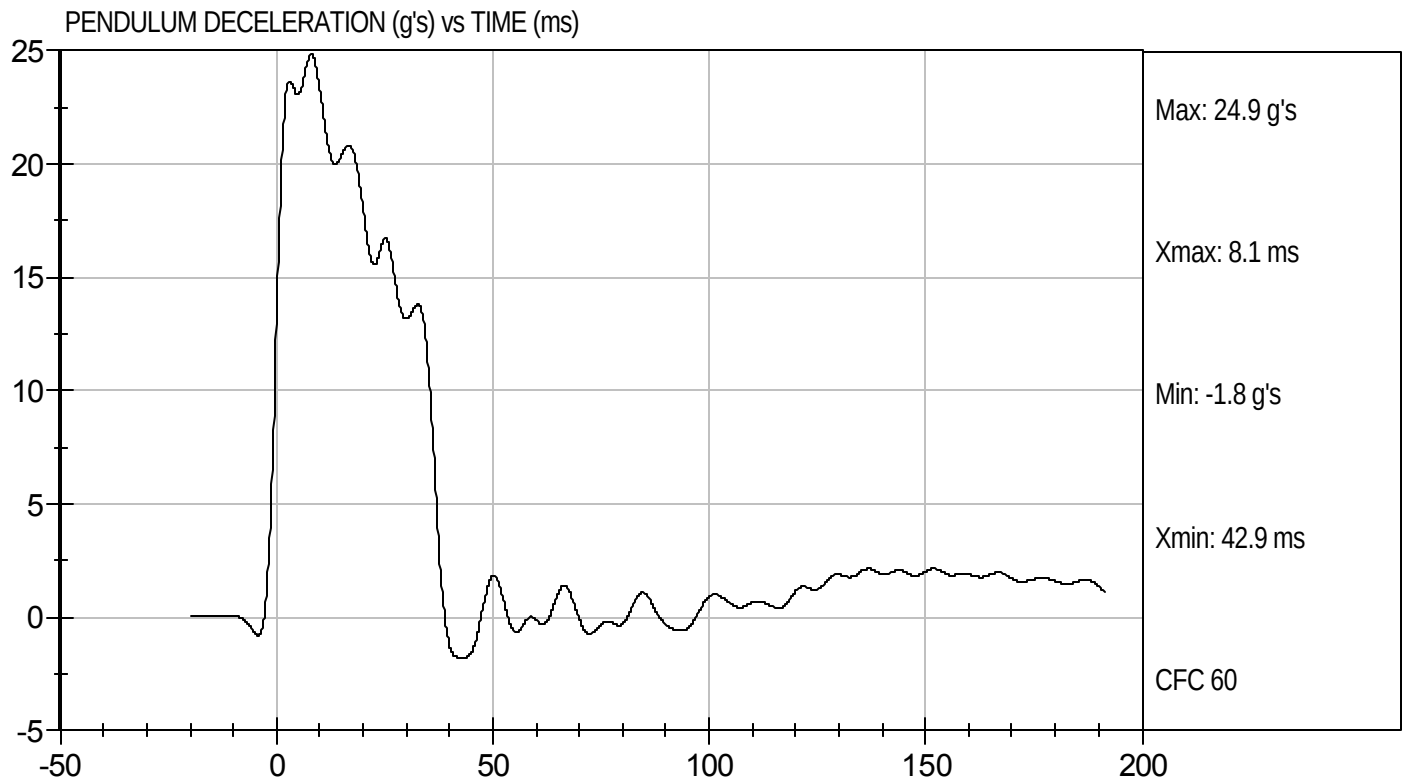
2/23/11
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D11642

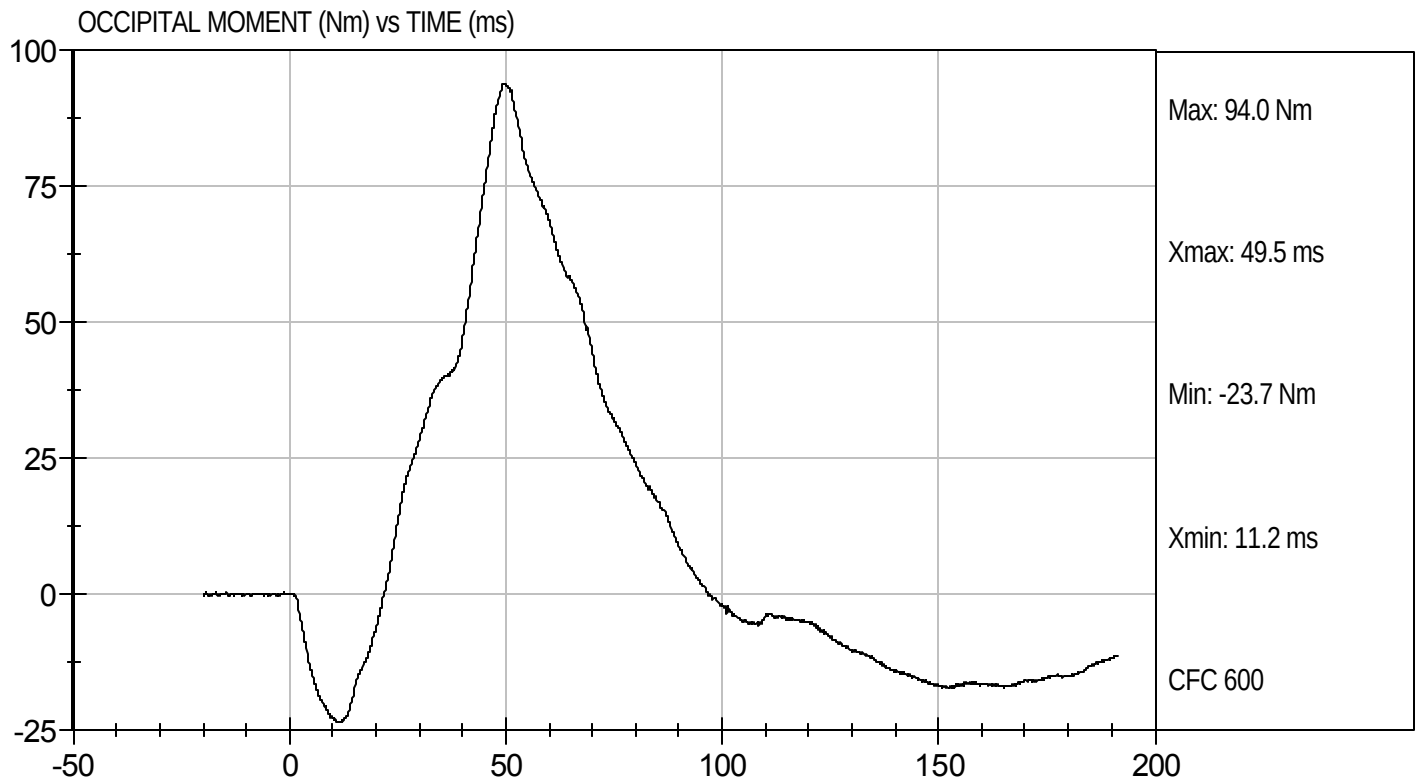
Test Date: 2/23/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D11642

Test Date: 2/23/11
Velocity: 23.15 ft/s, 7.06 m/s

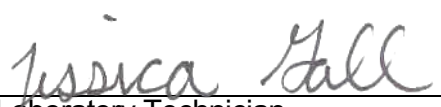


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D.: D11643

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	22	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.39	Pass
	20 ms	G's	14.00 to 19.00	16.43	Pass
	30 ms	G's	11.00 to 16.00	13.31	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.82	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.1	Pass
	Time	ms	72.0 to 82.0	73.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	153.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-67.1	Pass
	Time	ms	65.0 to 79.0	67.5	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	138.1	Pass
Overall Test Results					Pass


 Laboratory Technician

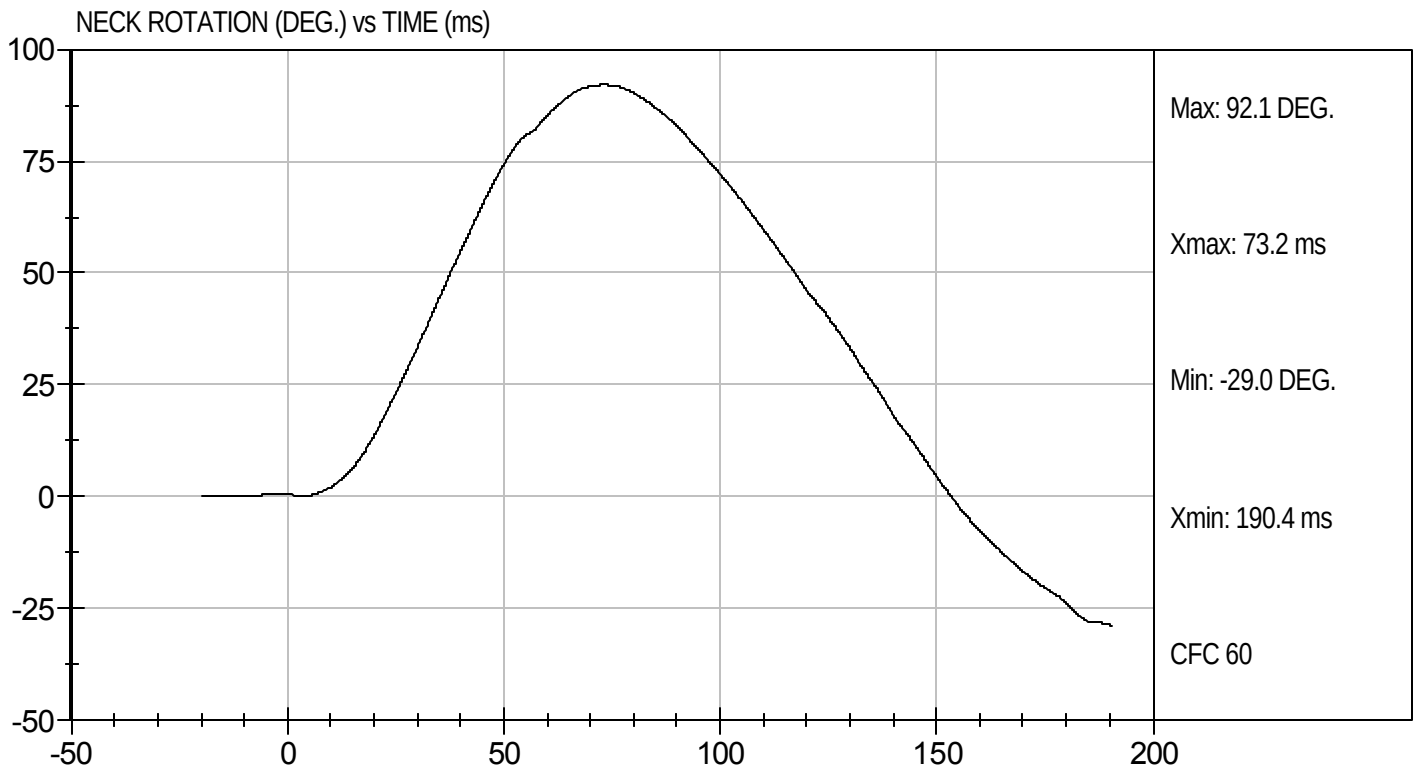
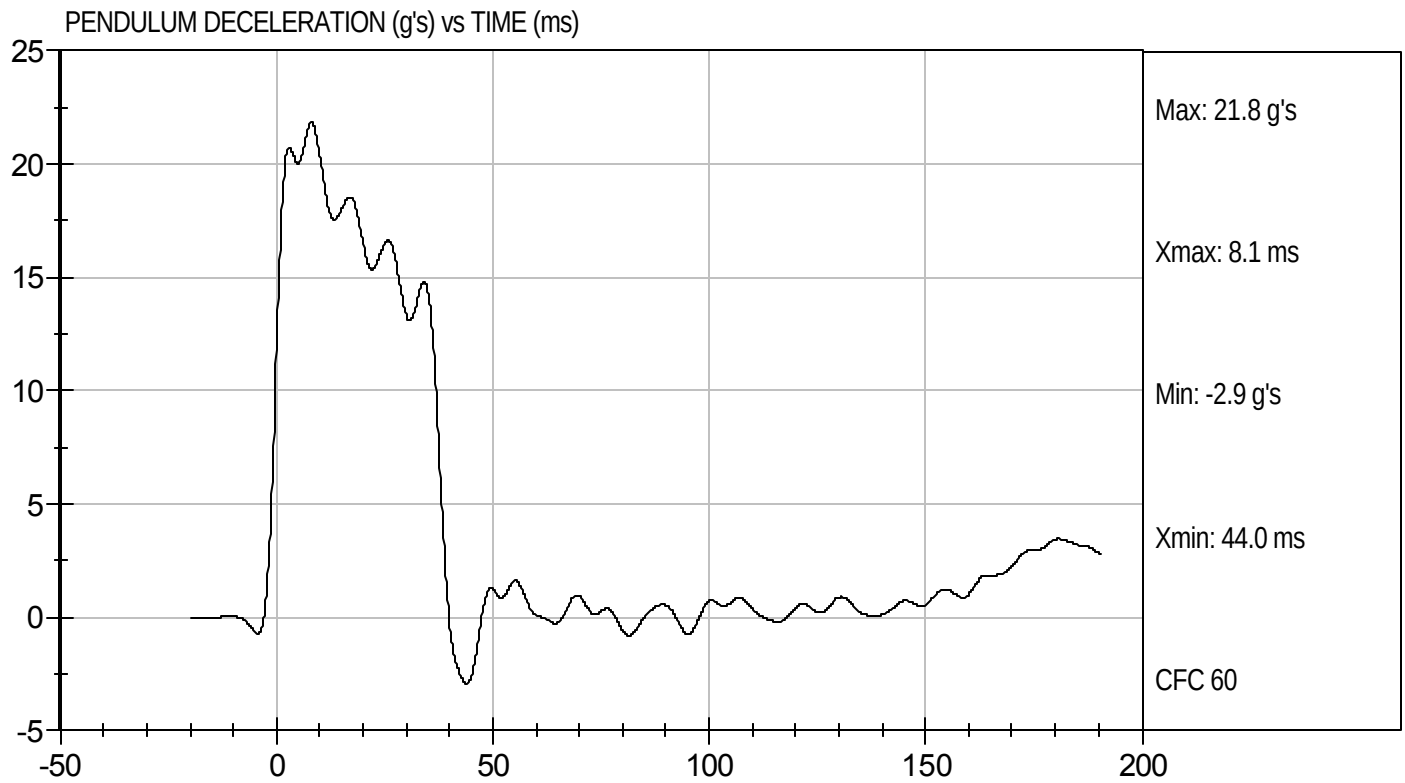
2/23/11
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D11643

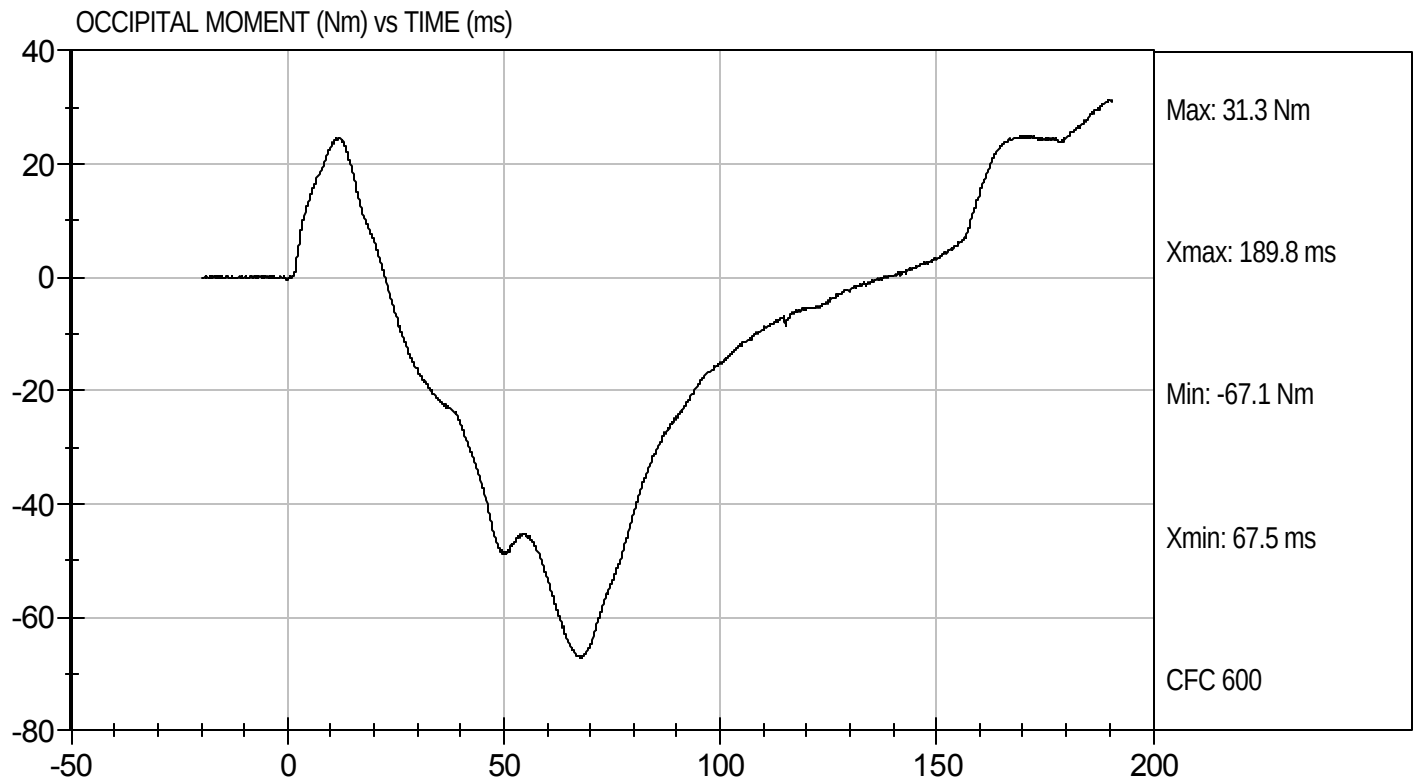
Test Date: 2/23/11
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D11643

Test Date: 2/23/11
Velocity: 20.20 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D11644

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,514	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.40	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Overall Test Results				Pass


Laboratory Technician

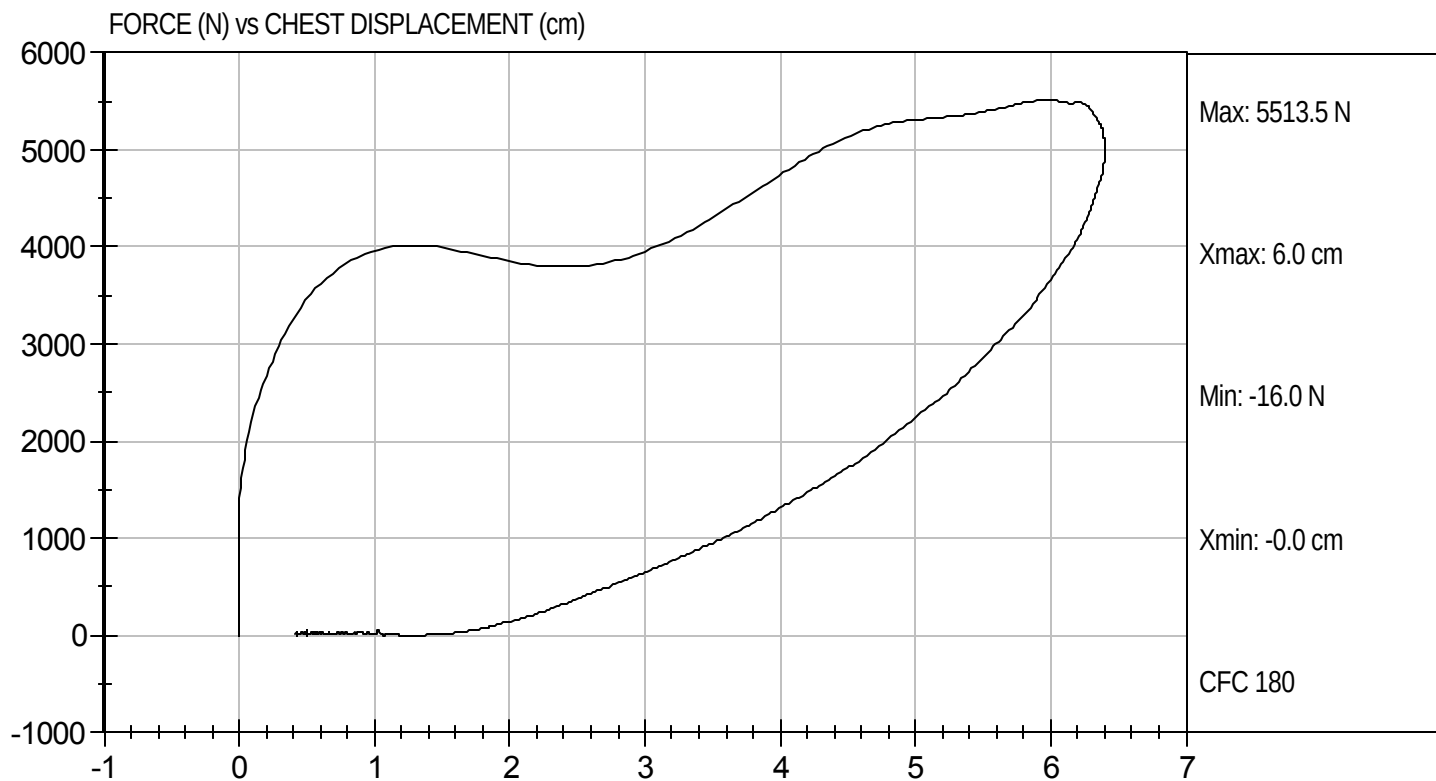
2/23/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11644

Test Date: 2/23/11
Velocity: 22.2 ft/s, 6.77 m/s

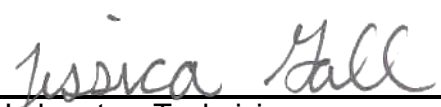


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D11645

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	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,012	Pass
Overall Test Results				Pass


Laboratory Technician

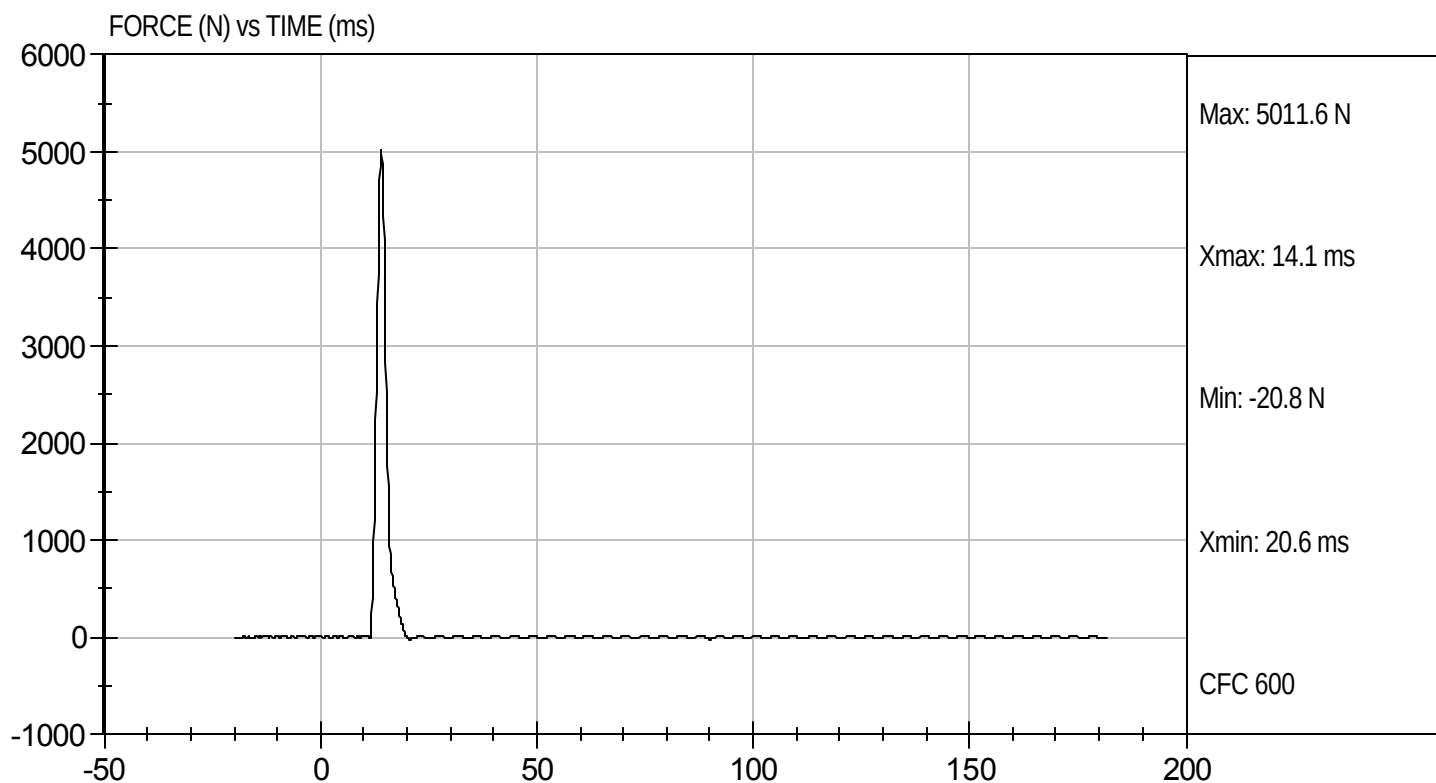
2/22/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D11645

Test Date: 2/22/11
Velocity: 6.94 ft/s, 2.12 m/s



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

ATD Serial No: 036

Test I.D: D11646

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	23	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,640	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

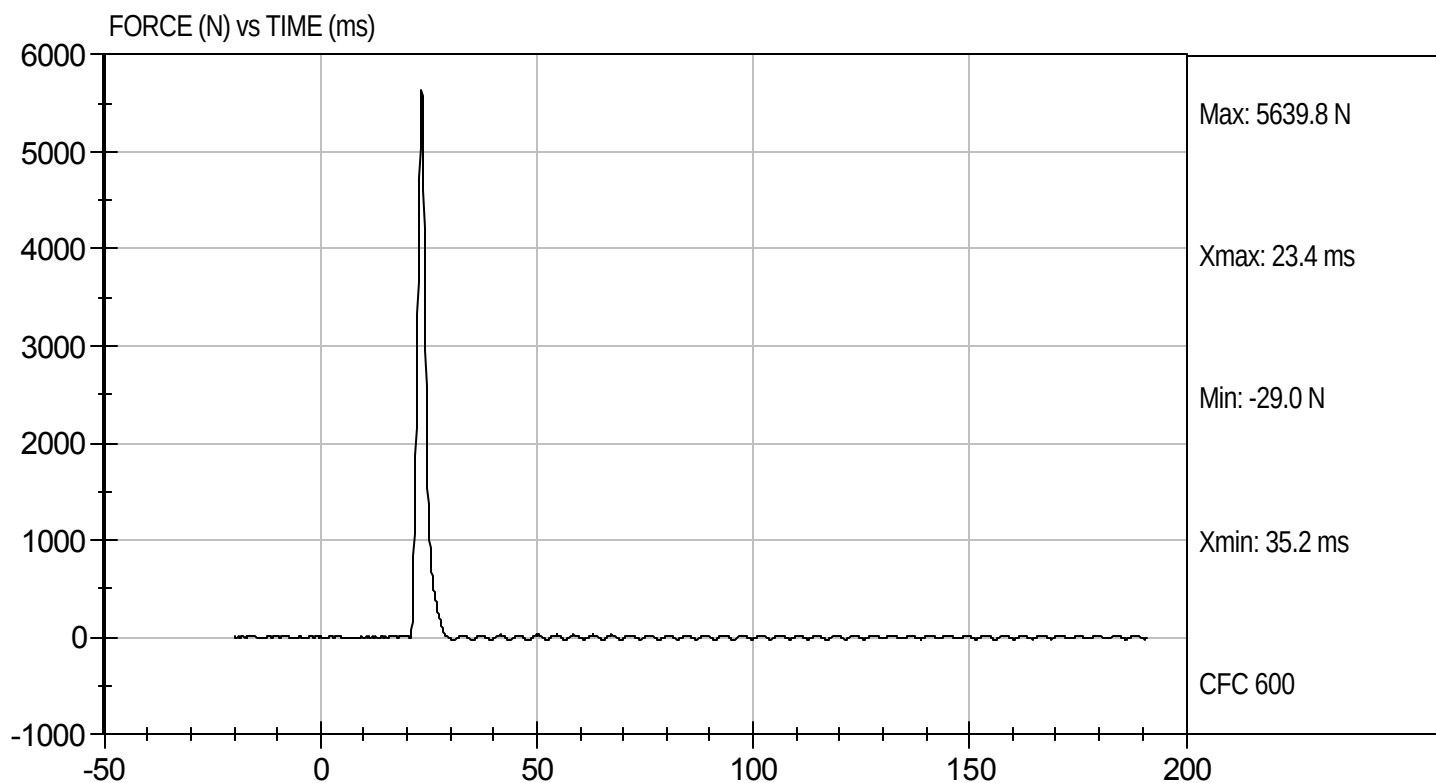
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11646

Test Date: 2/22/11
Velocity: 6.91 ft/s, 2.11 m/s



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

ATD Serial No: 036

Test I.D: D11640

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.9	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	21	21	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	63.5	52.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	48	48	Pass
Overall Test Results					Pass


 Laboratory Technician

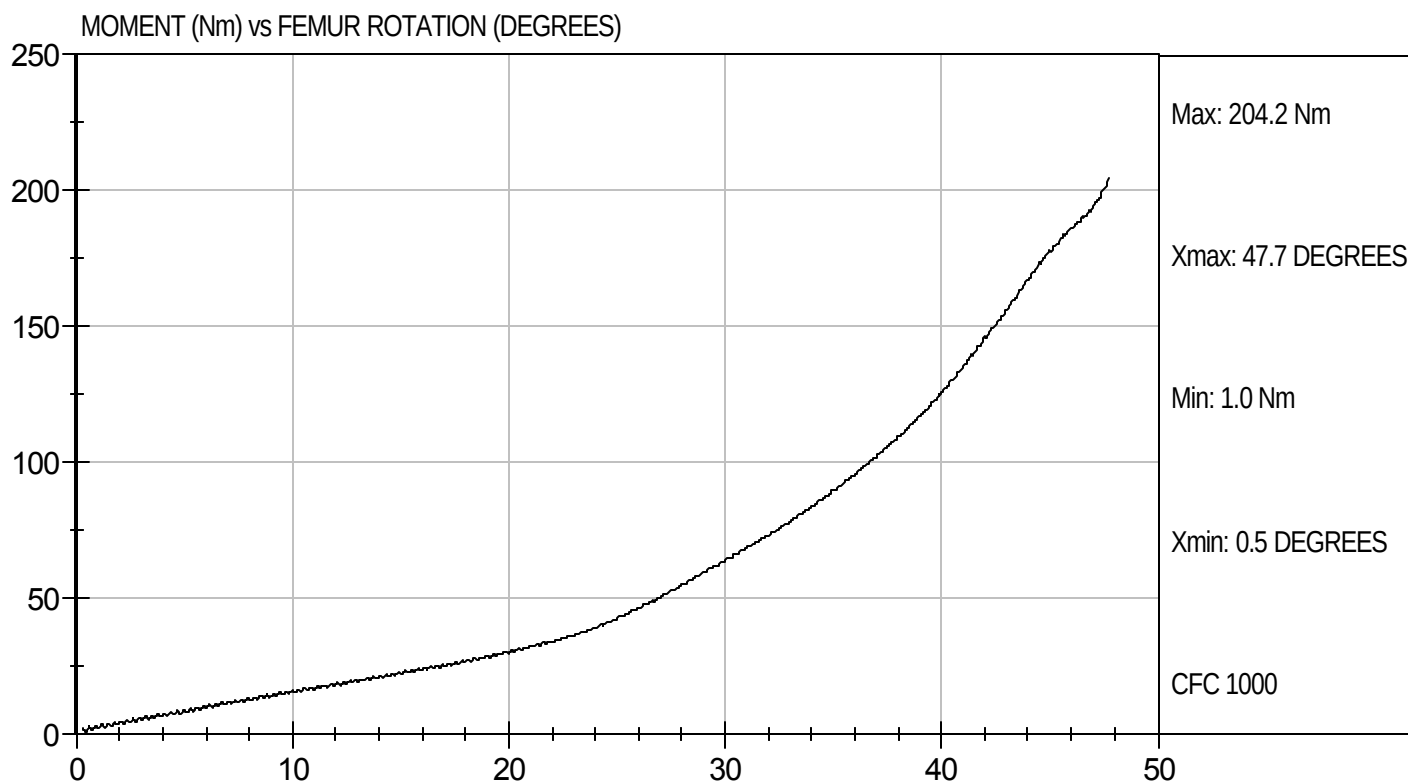
2/22/11
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D11649

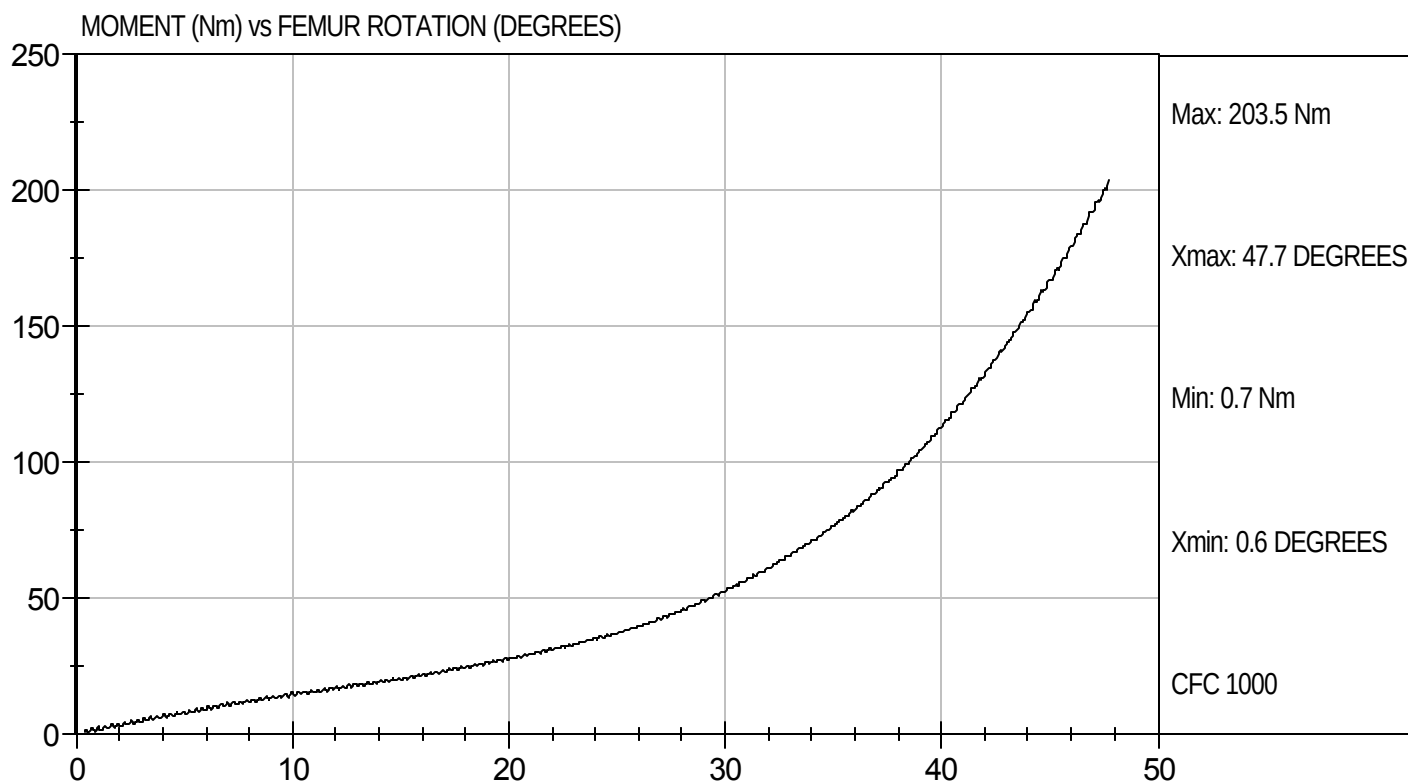
Test Date: 2/22/11
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D11640

Test Date: 2/22/11
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D11581

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	250 to 300	274	Pass
Peak Lateral Acceleration	G's	+/- 15	-10.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

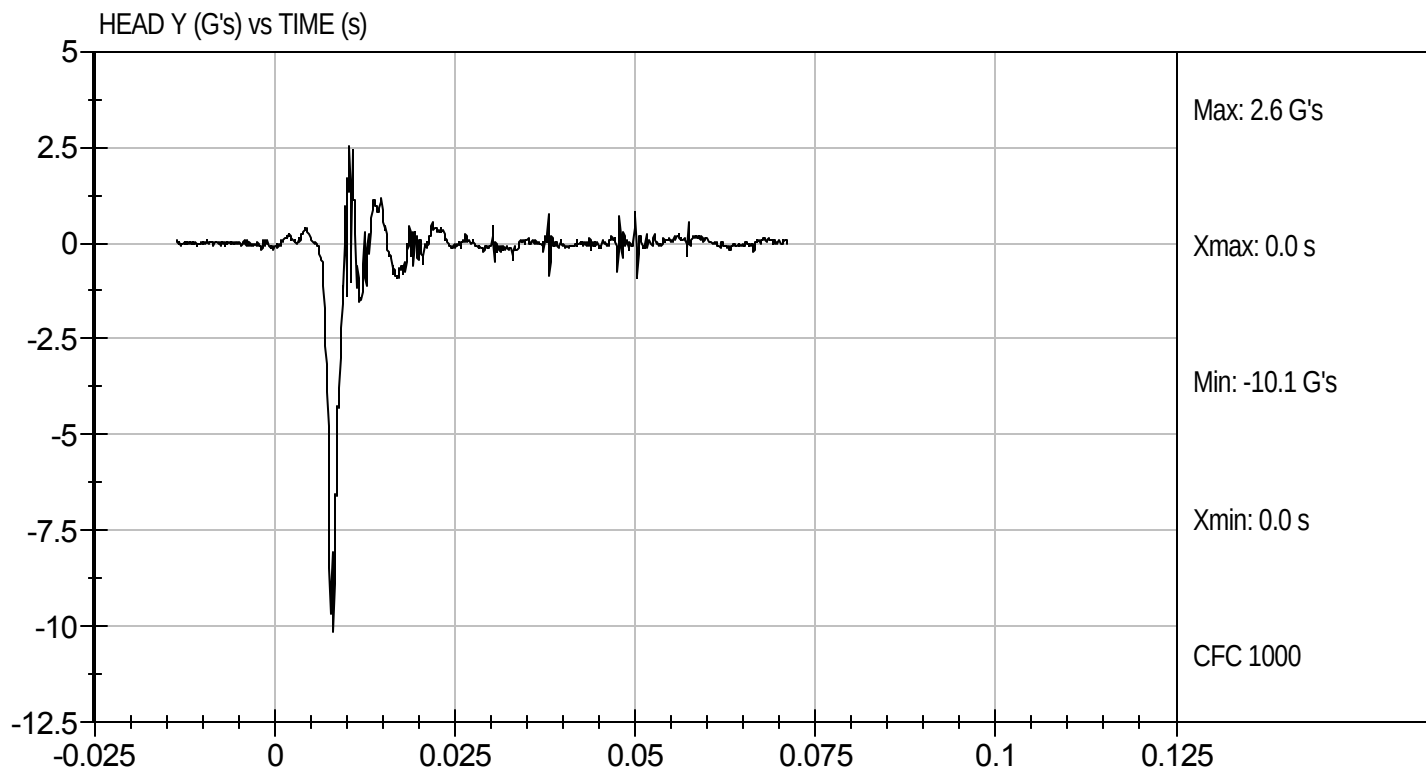
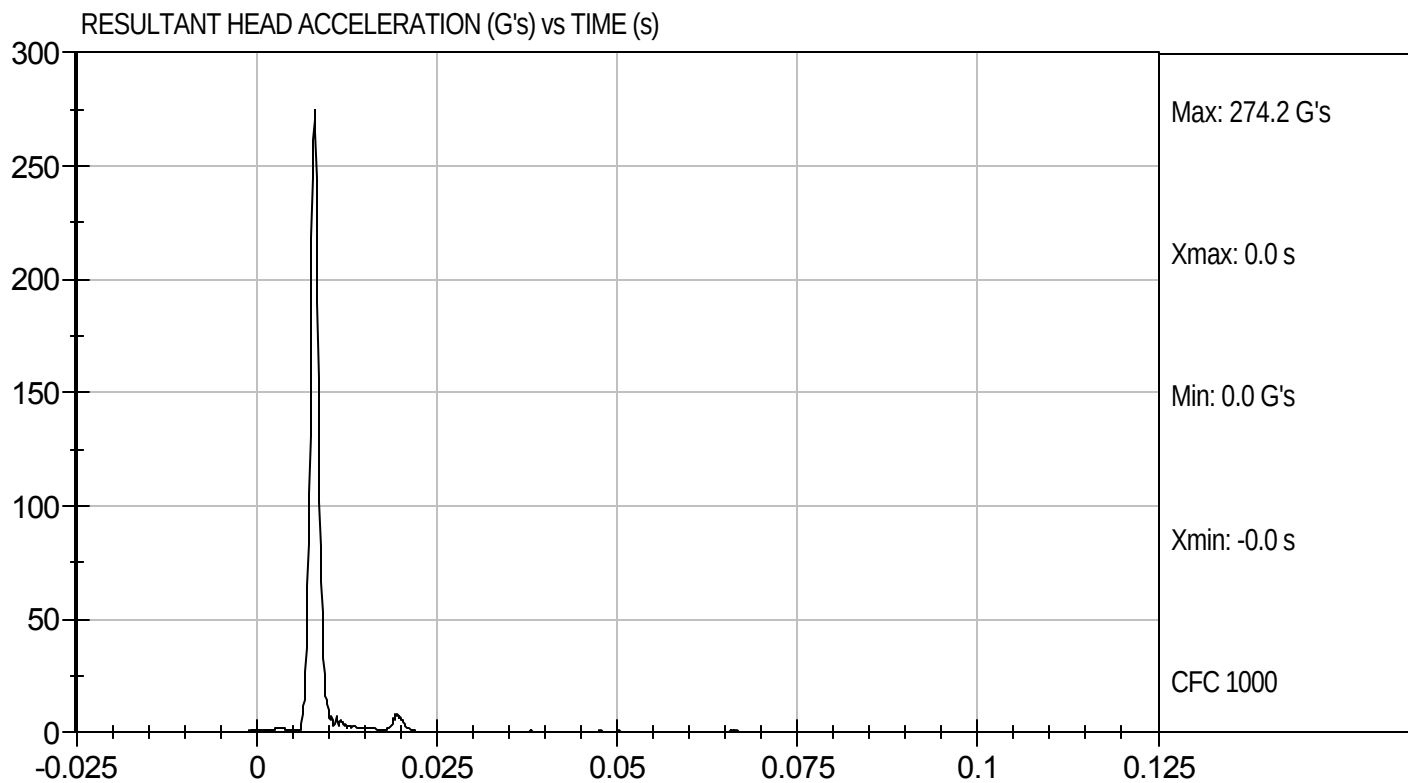
2/16/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D11581

Test Date: 2/16/11
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11582

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	35	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.3	Pass
	30 ms	m/s	5.8 to 7.0	5.8	Pass
D Plane Rotation	Max	deg	77 to 91	77	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	77	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
Overall Results				Pass	

Jessica Hall
Laboratory Technician

2/16/11
Test Date

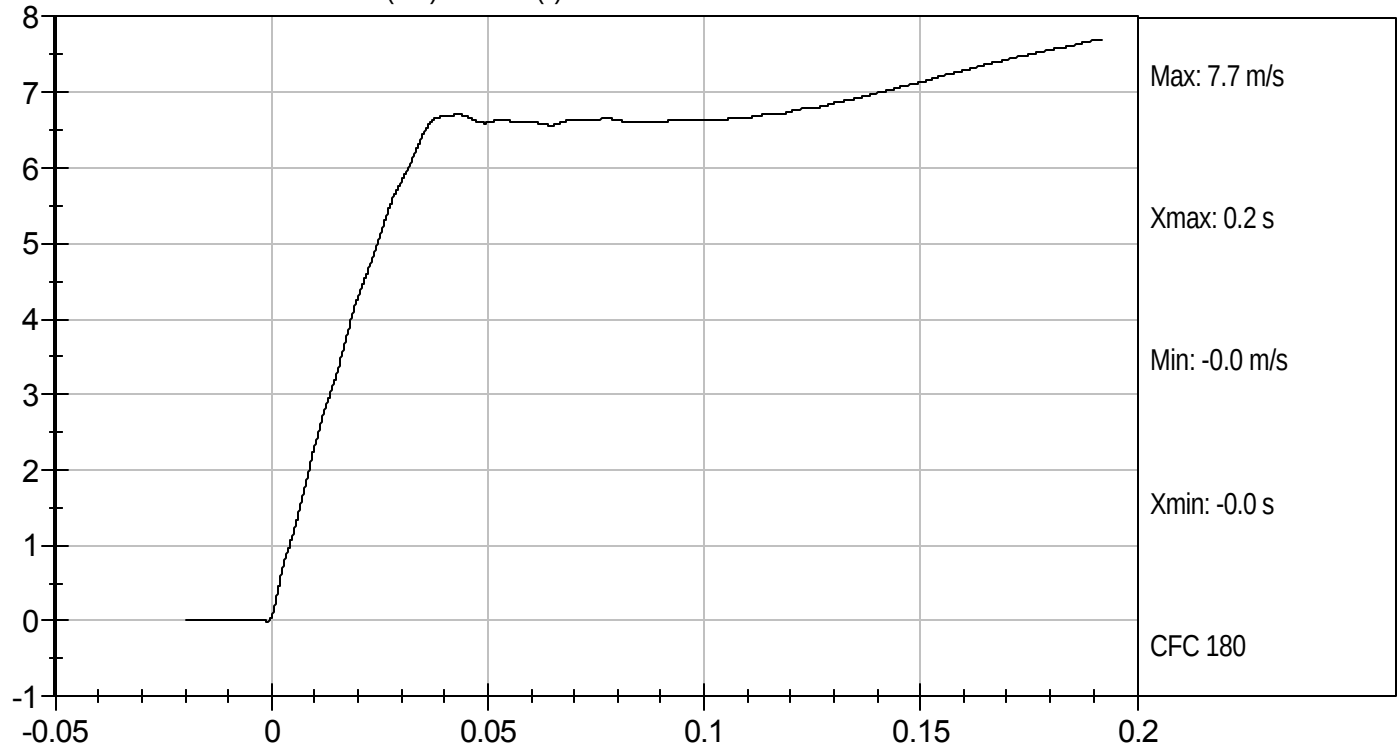
David Winkelbauer
Approved By



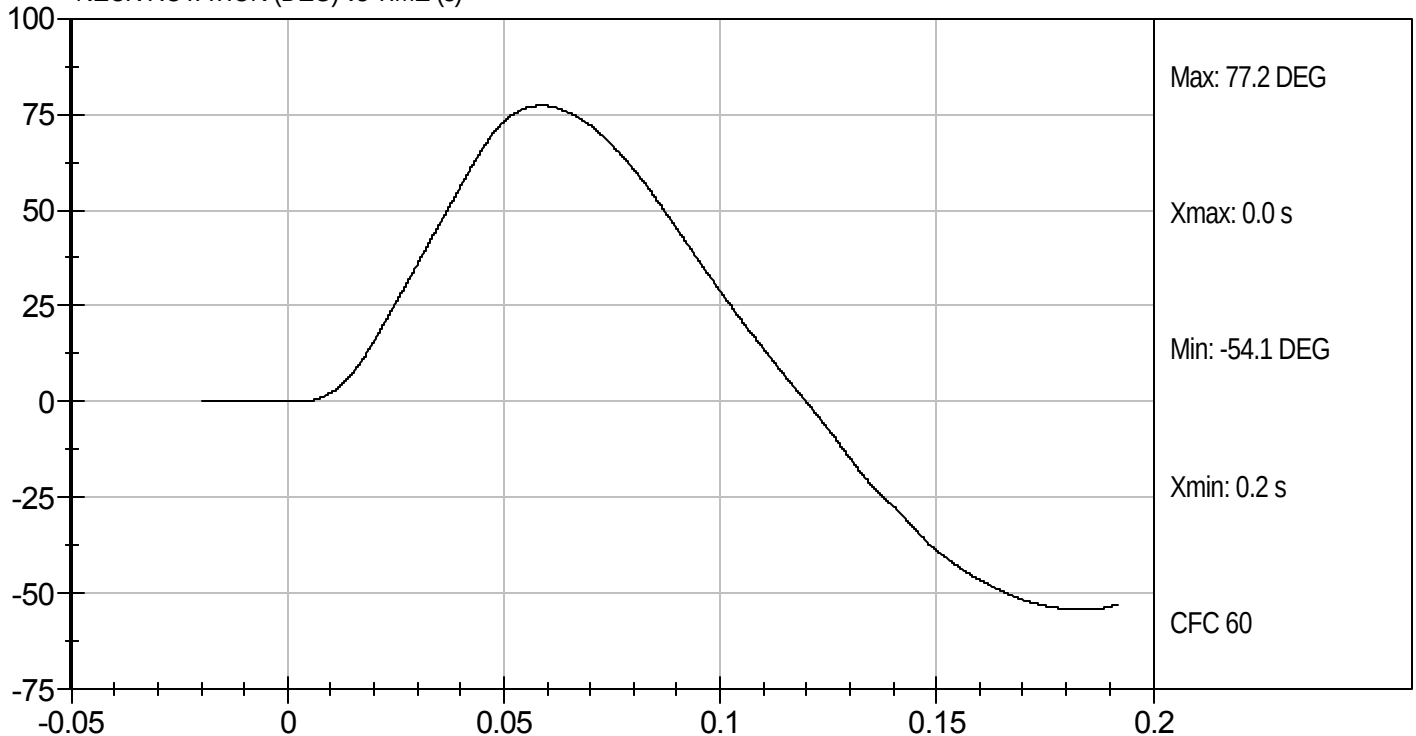
Test Desc: Neck Flexion
Component ID: D11582

Test Date: 2/16/11
Velocity: 23.15 ft/s, 7.06 m/s

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



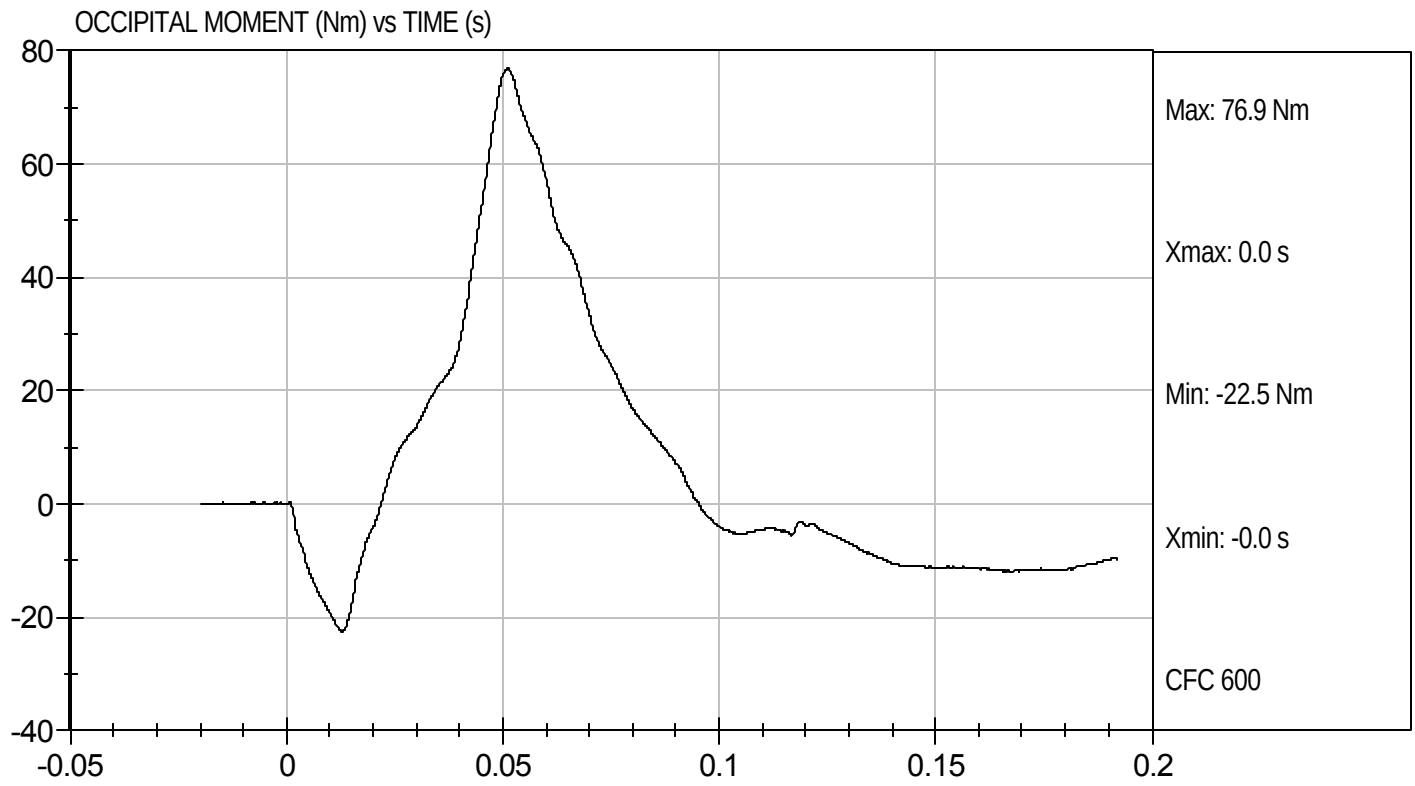
NECK ROTATION (DEG) vs TIME (s)





Test Desc: Neck Flexion
Component ID: D11582

Test Date: 2/16/11
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138Test I.D: D11583

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.8	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	101	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	102	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

2/17/11

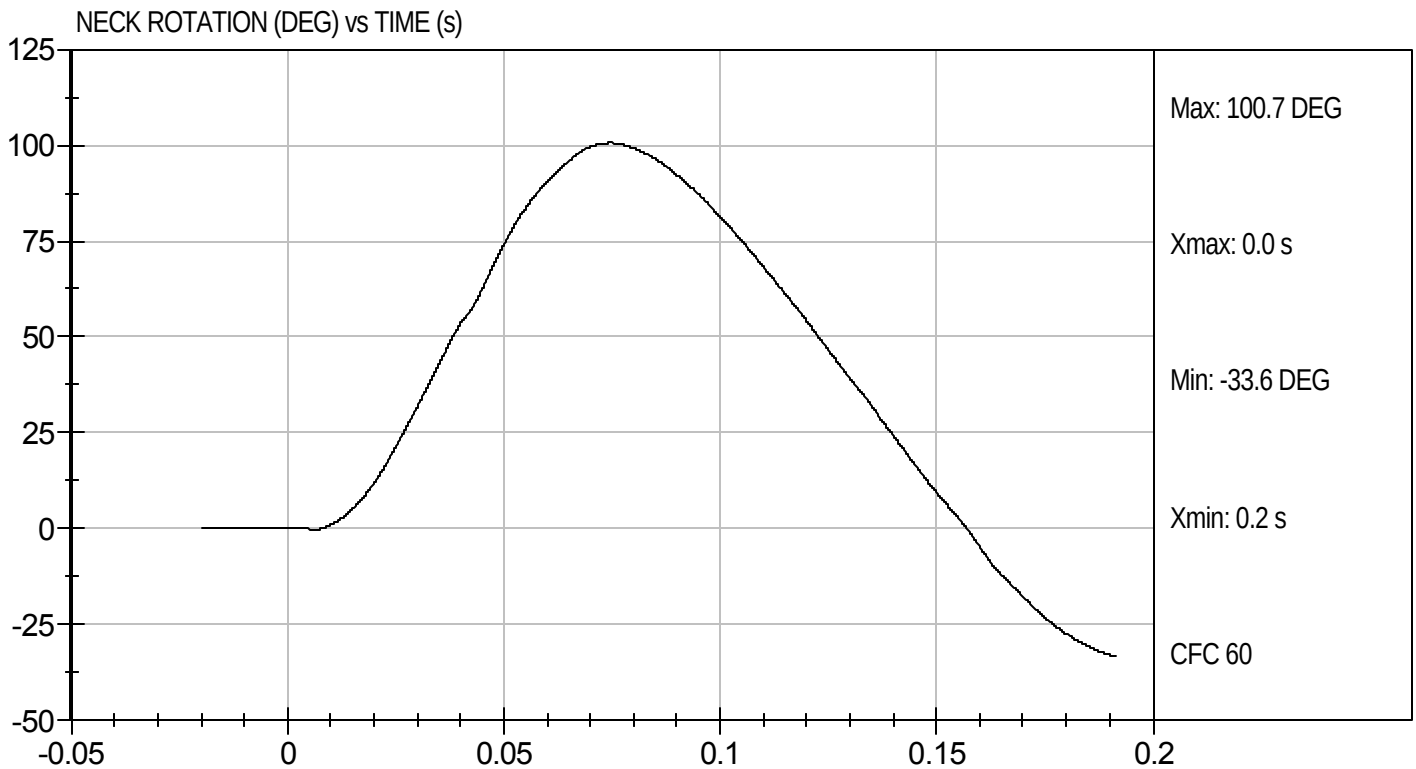
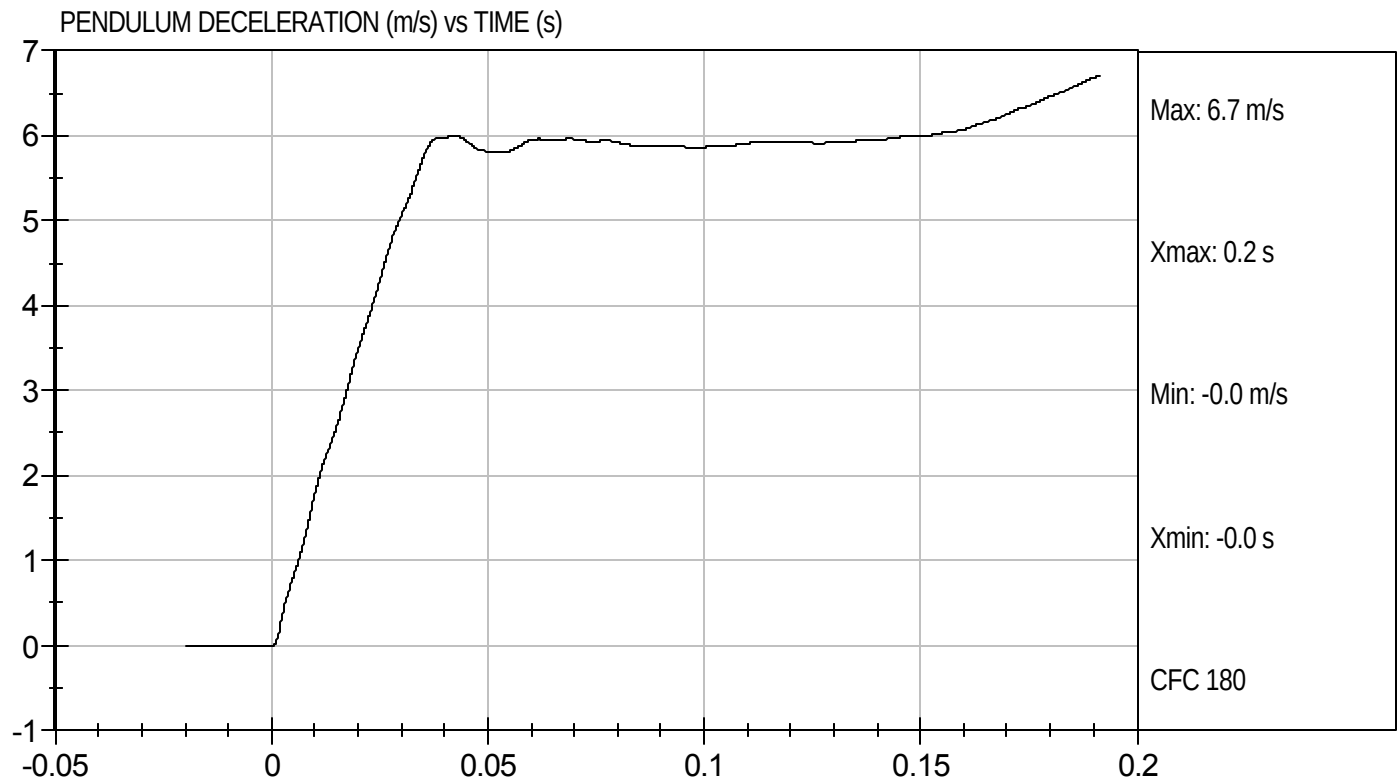
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D11583

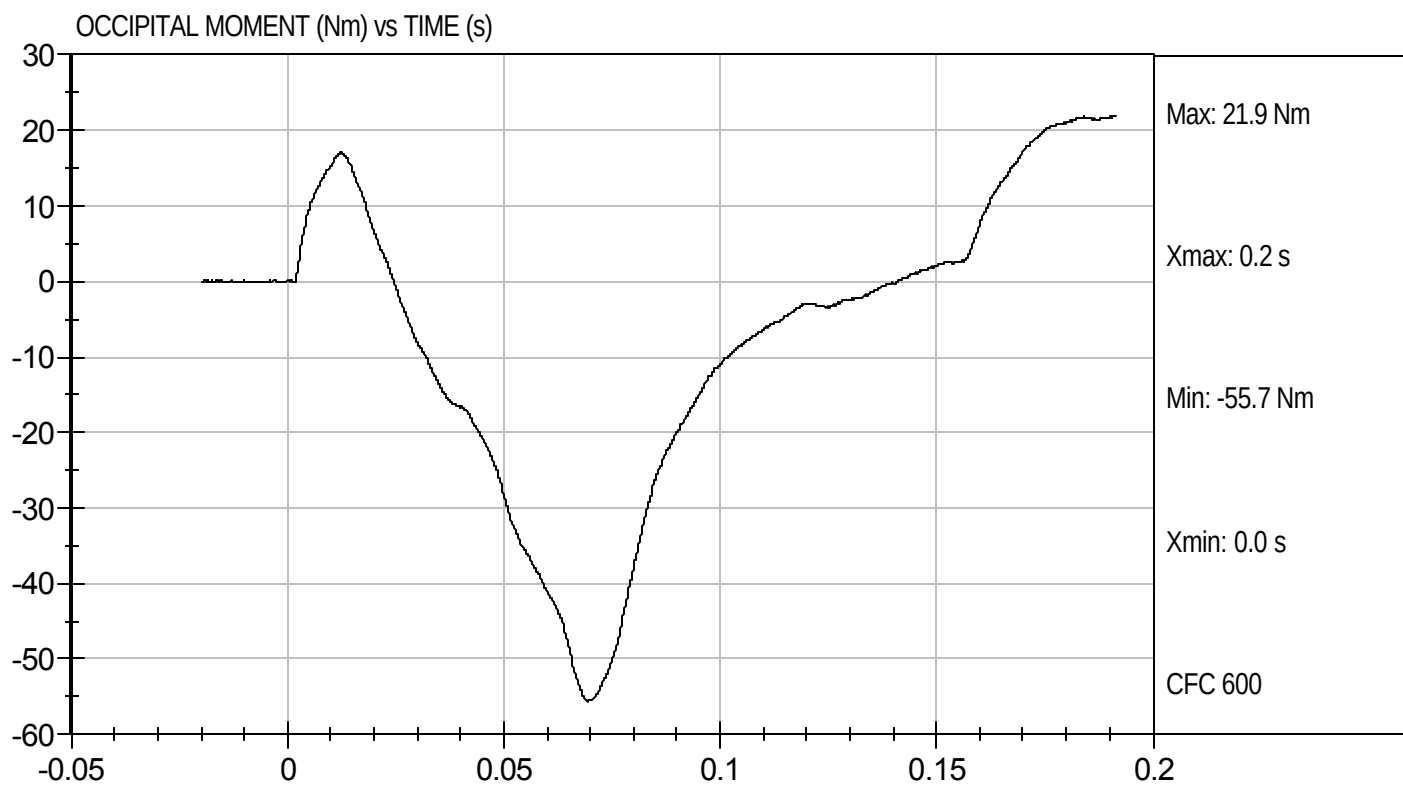
Test Date: 2/17/11
Velocity: 20.2 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D11583

Test Date: 2/17/11
Velocity: 20.2 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11584

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Relative Humidity	%	10 to 70	37	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	4.1	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4117	Pass
Overall Test Results				Pass


Laboratory Technician

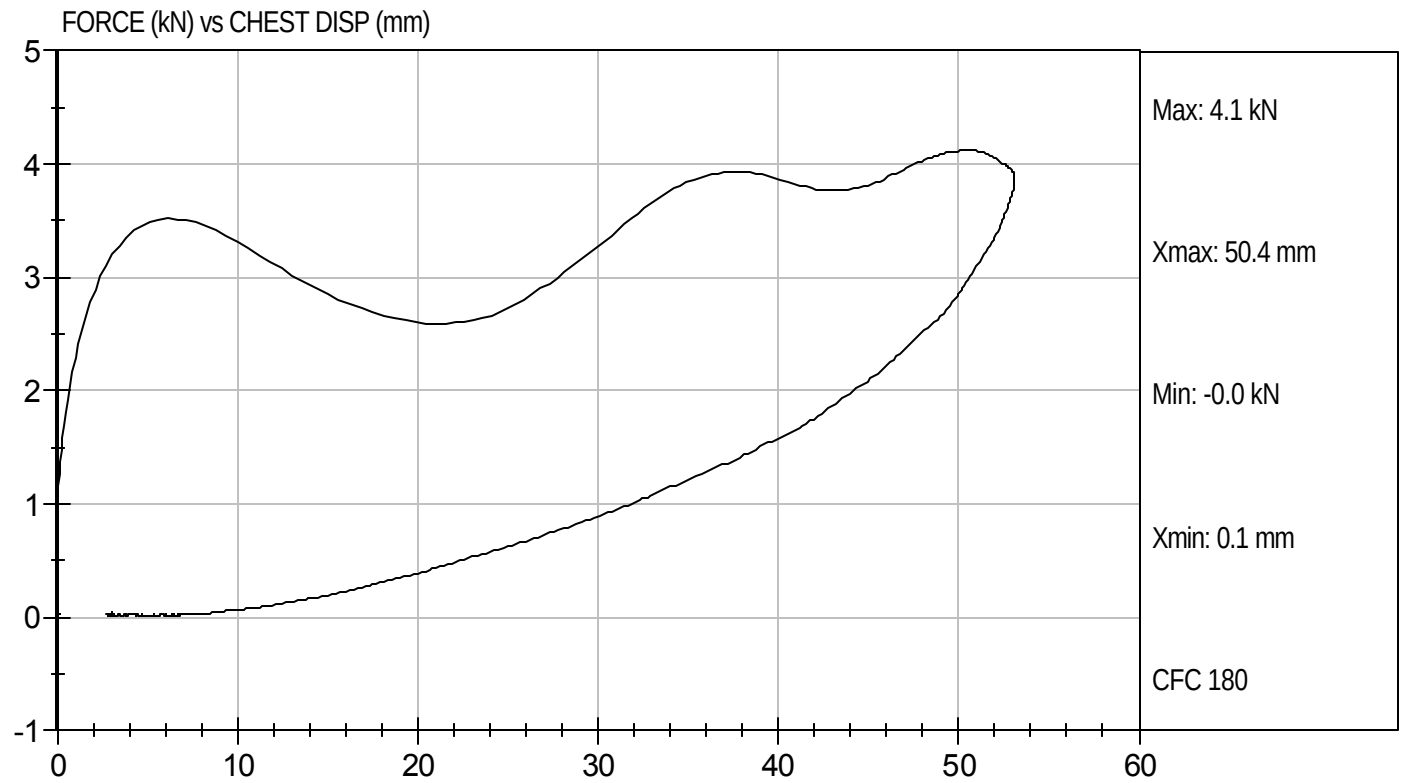
2/17/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11584

Test Date: 2/17/11
Velocity: 22.22 ft/s, 6.77 m/s

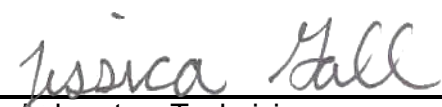


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11585

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.51	Pass
Overall Test Results				Pass


Laboratory Technician

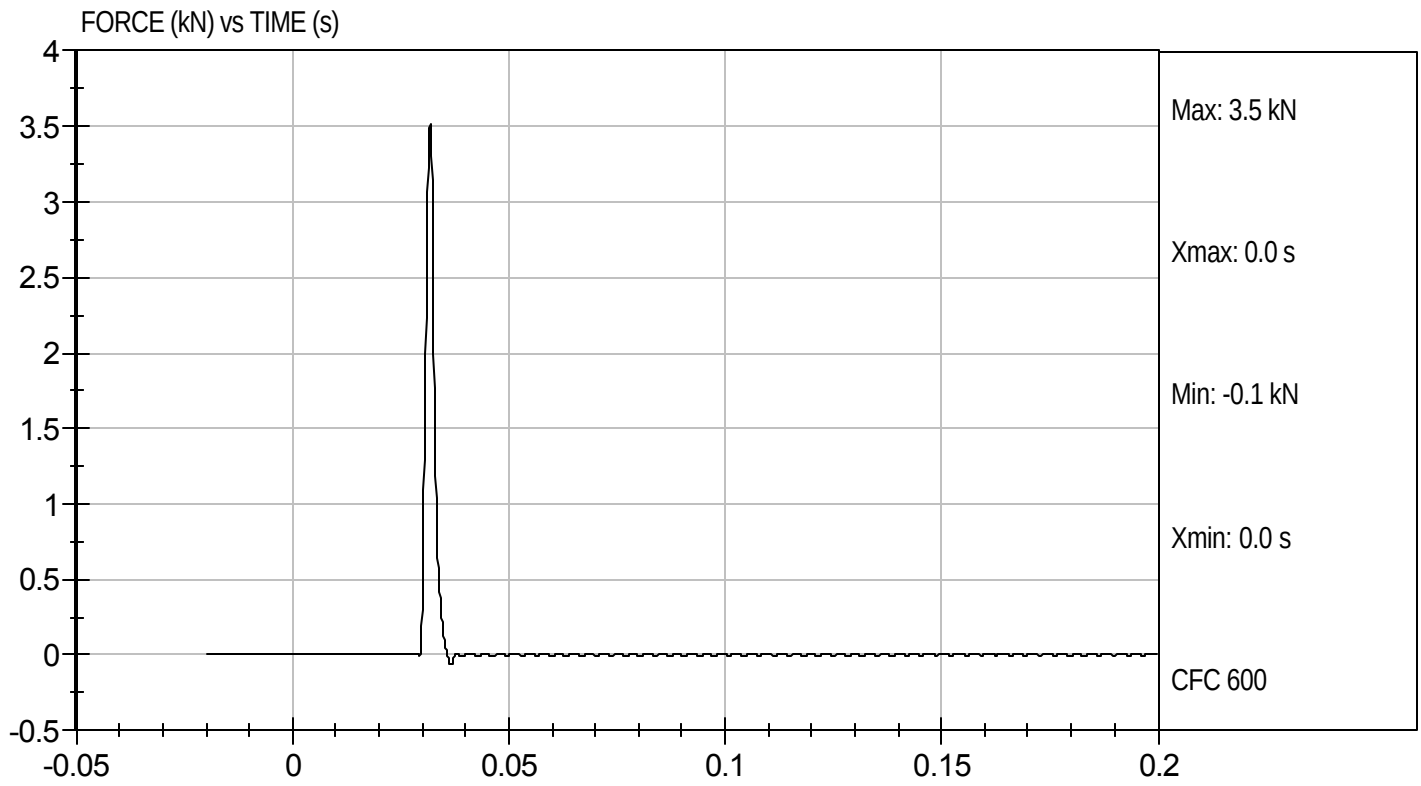
2/17/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D11585

Test Date: 2/17/11
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: D11586

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.51	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

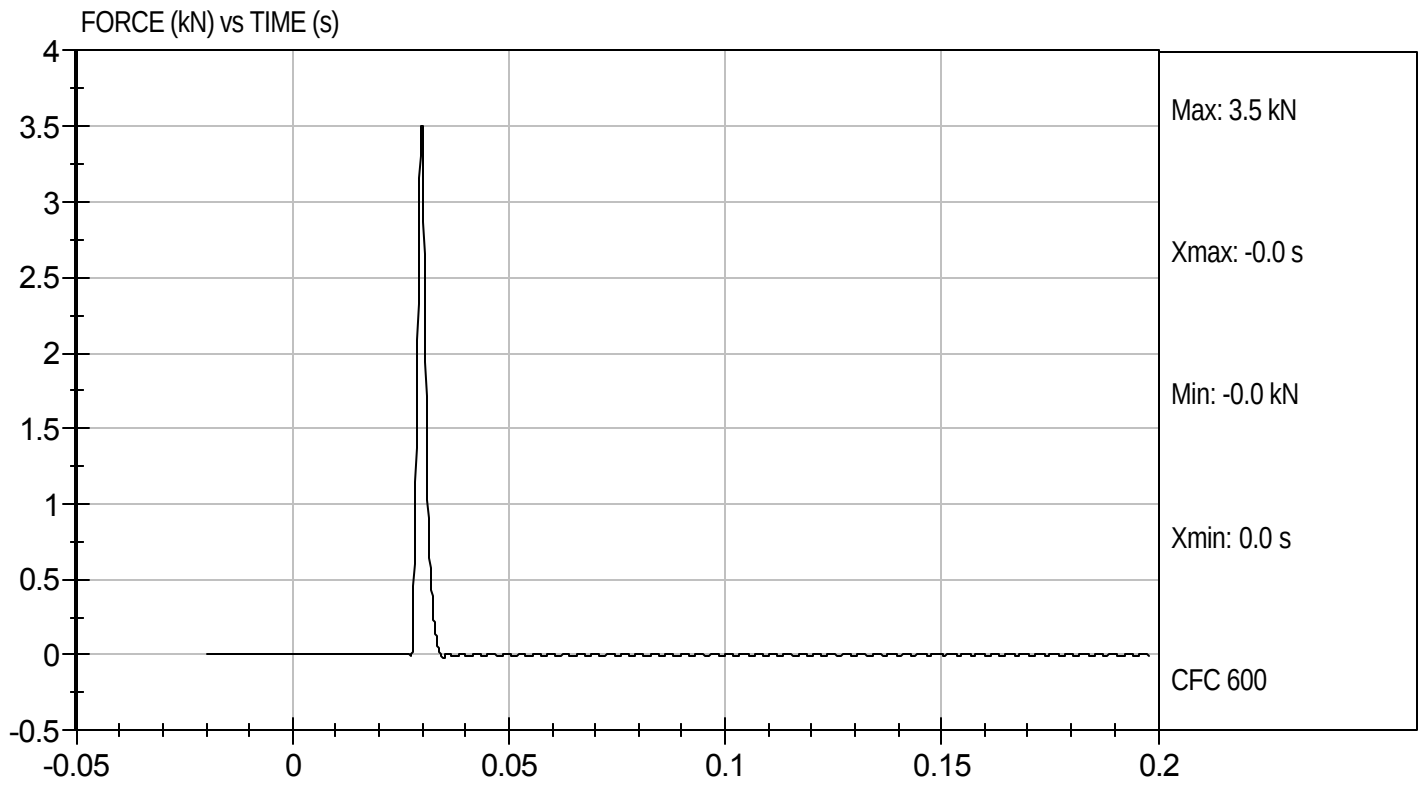
2/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11586

Test Date: 2/17/11
Velocity: 6.97 ft/s, 2.12 m/s

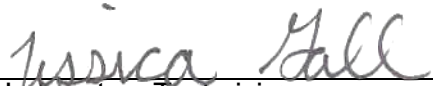


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11587

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	330	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

2/16/11
Test Date


Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D11651

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	250 to 300	260	Pass
Peak Lateral Acceleration	G's	+/- 15	-13.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

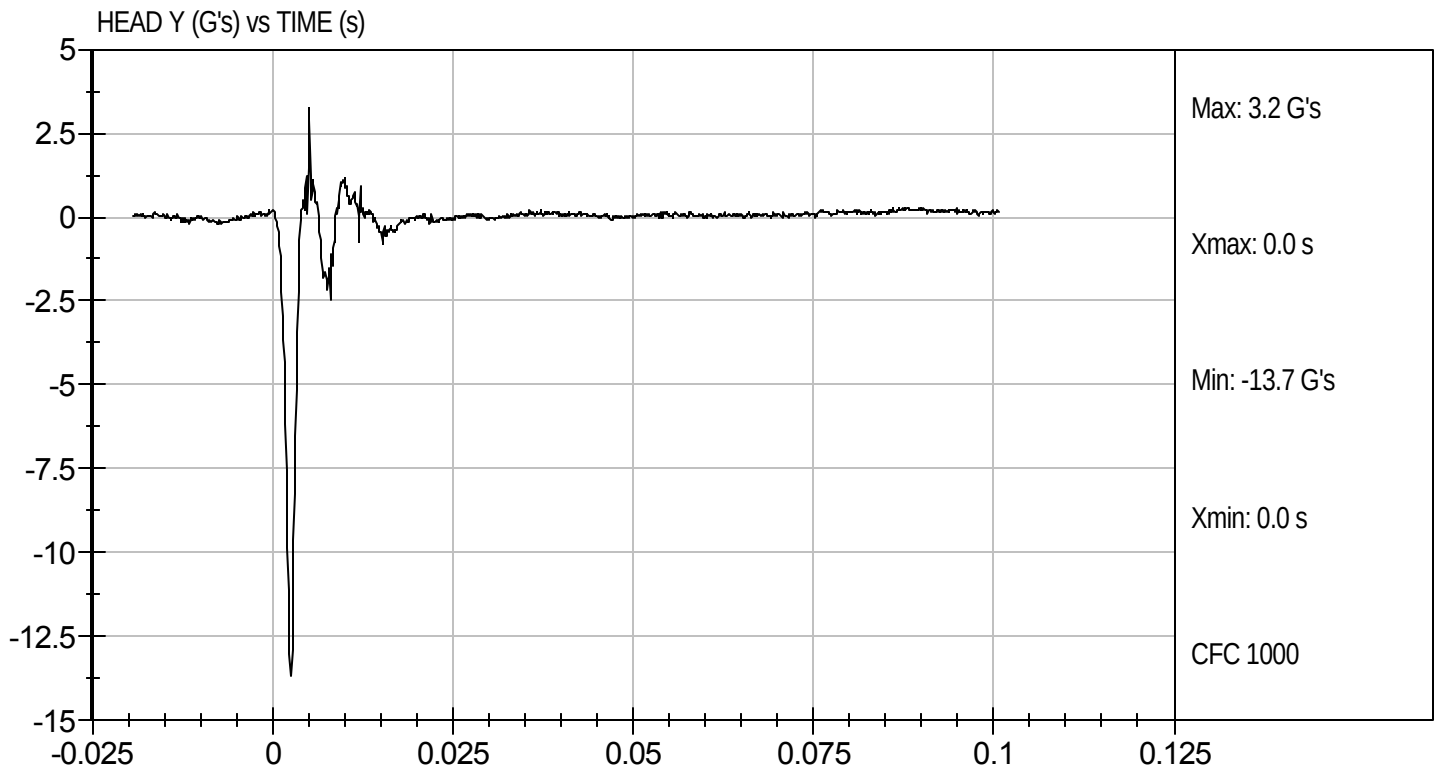
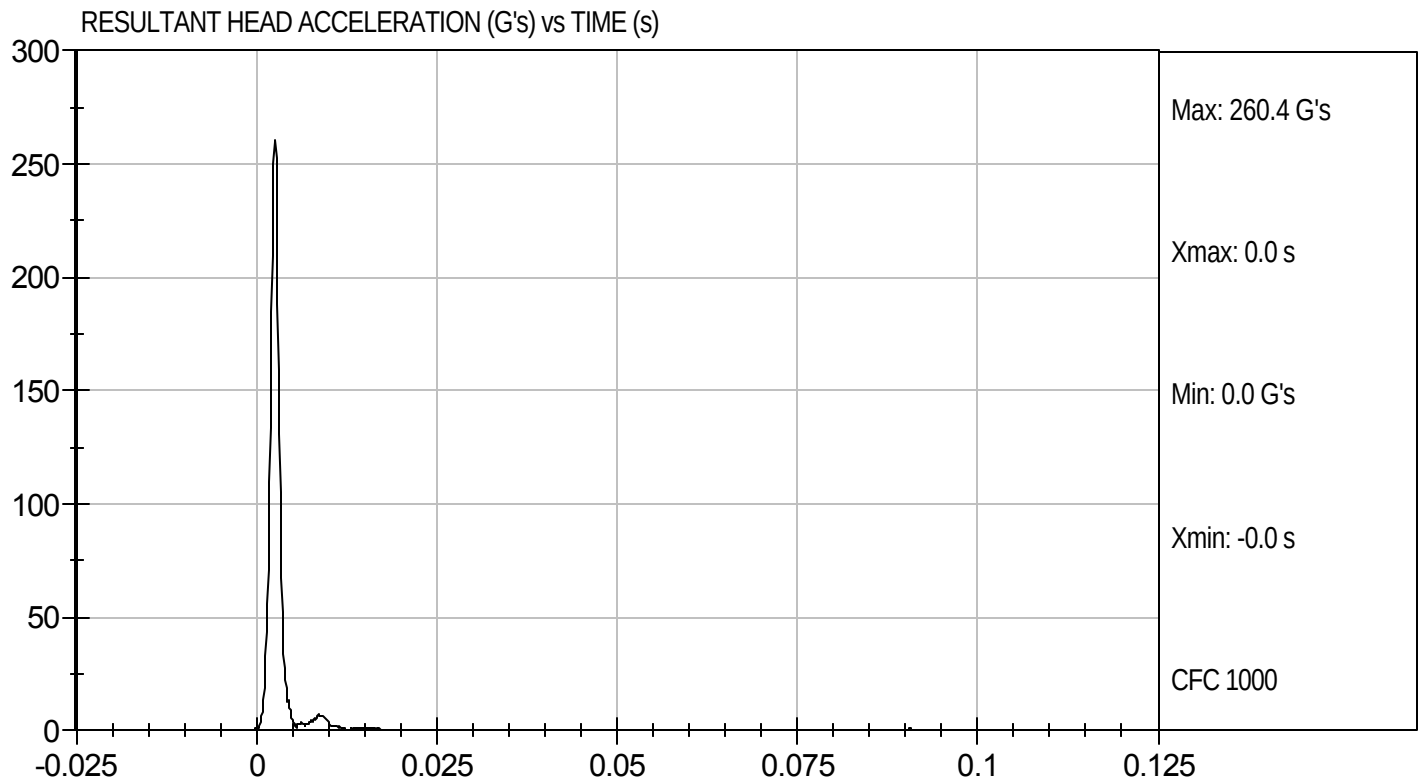
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11651

Test Date: 2/22/11
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D.: D11652

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	77	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	77	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

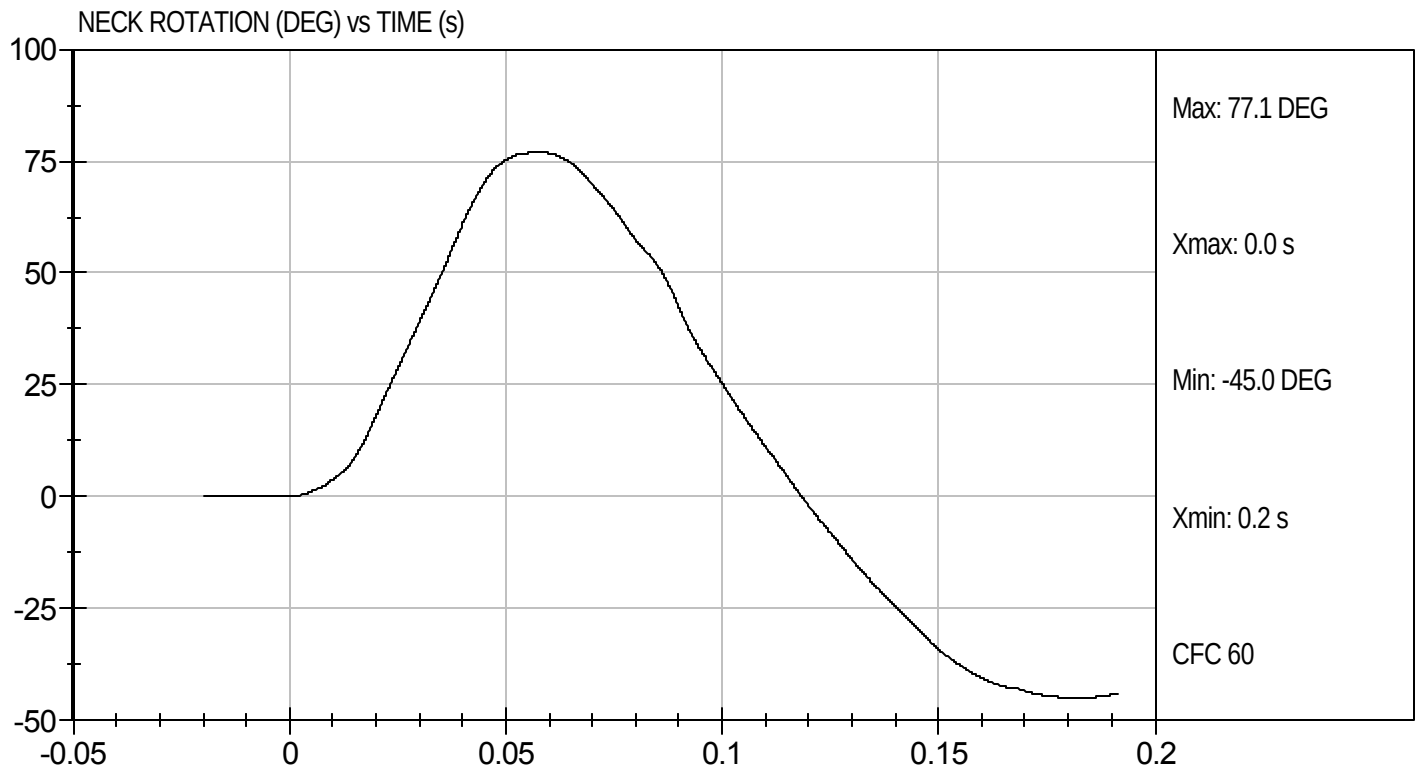
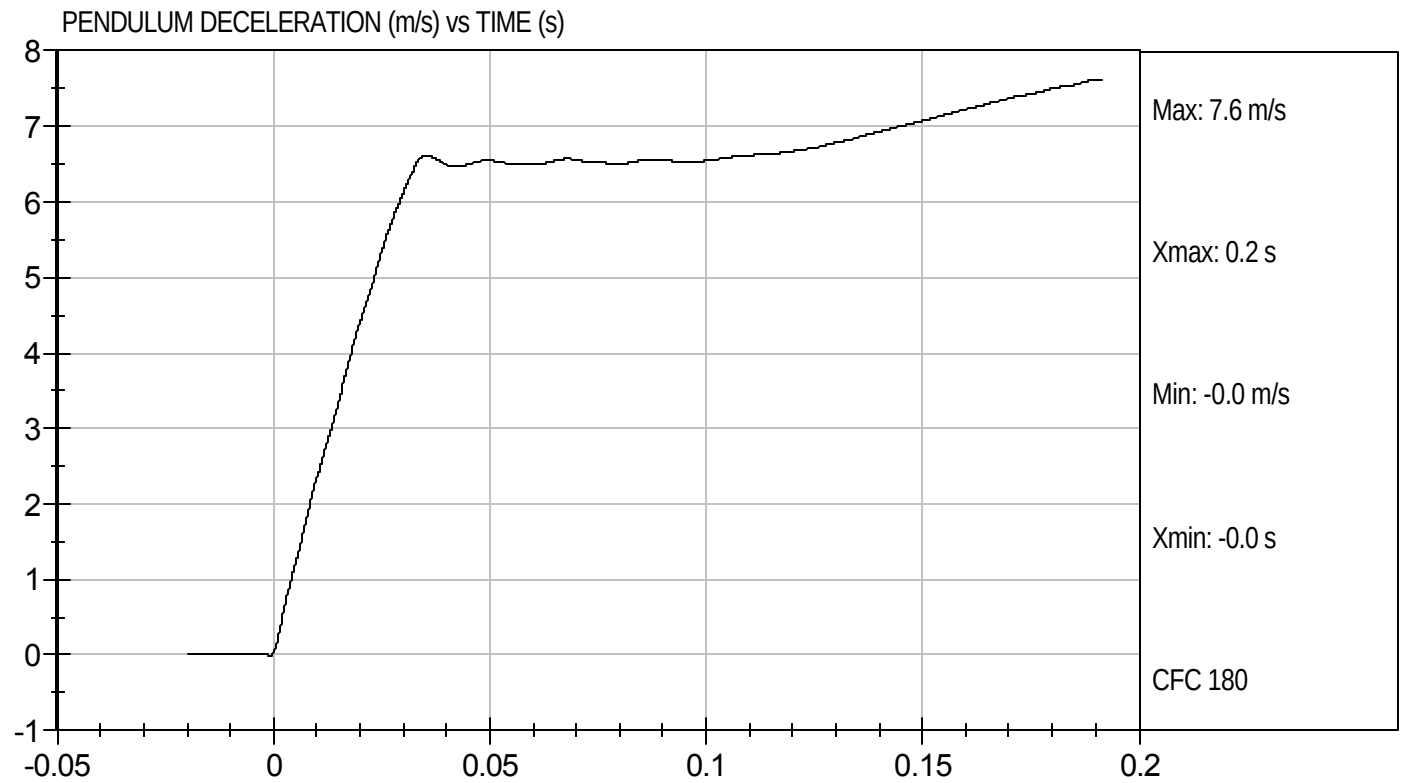
2/23/11
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Flexion
Component ID: D11652

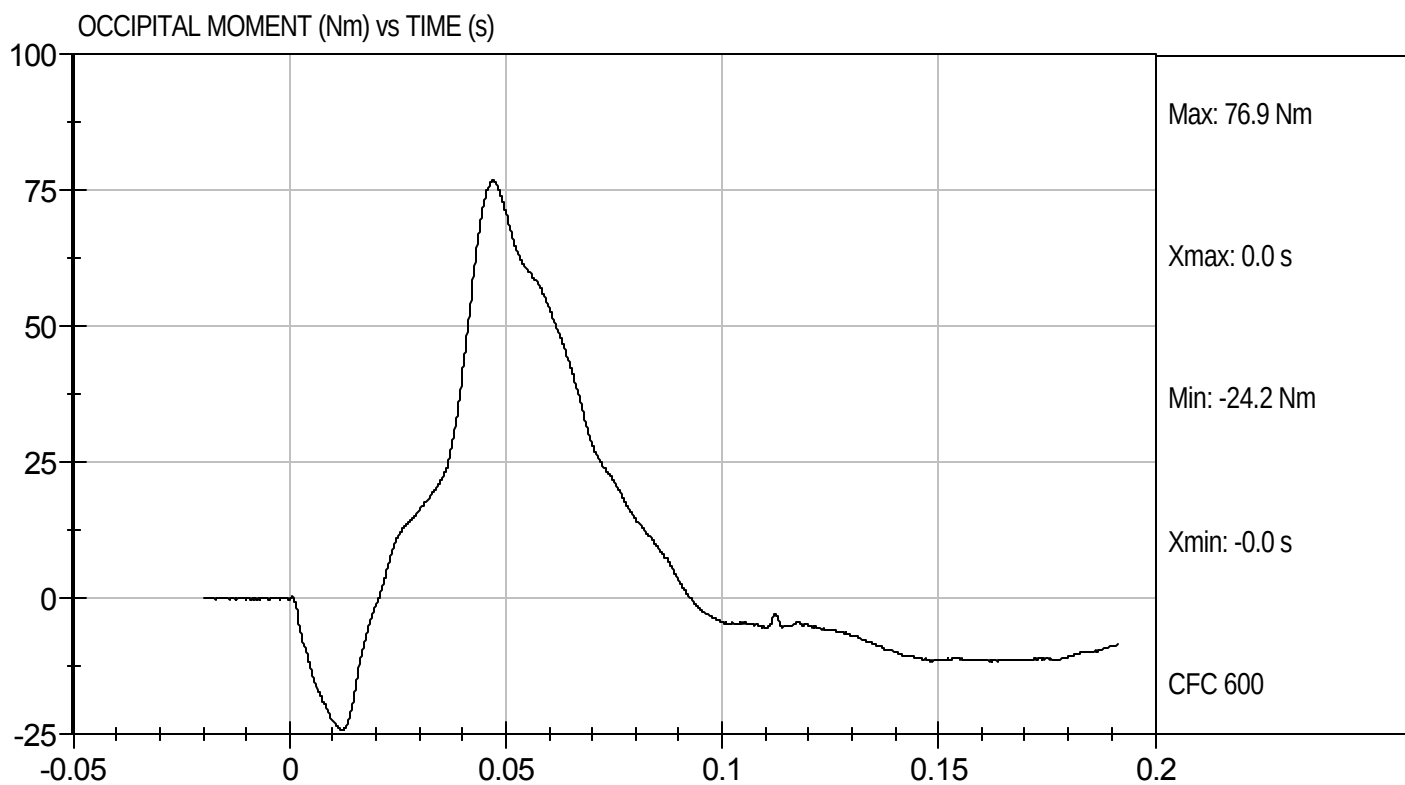
Test Date: 2/23/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D11652

Test Date: 2/23/11
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138Test I.D: D11653

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	20	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	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	102	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	98	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

2/23/11

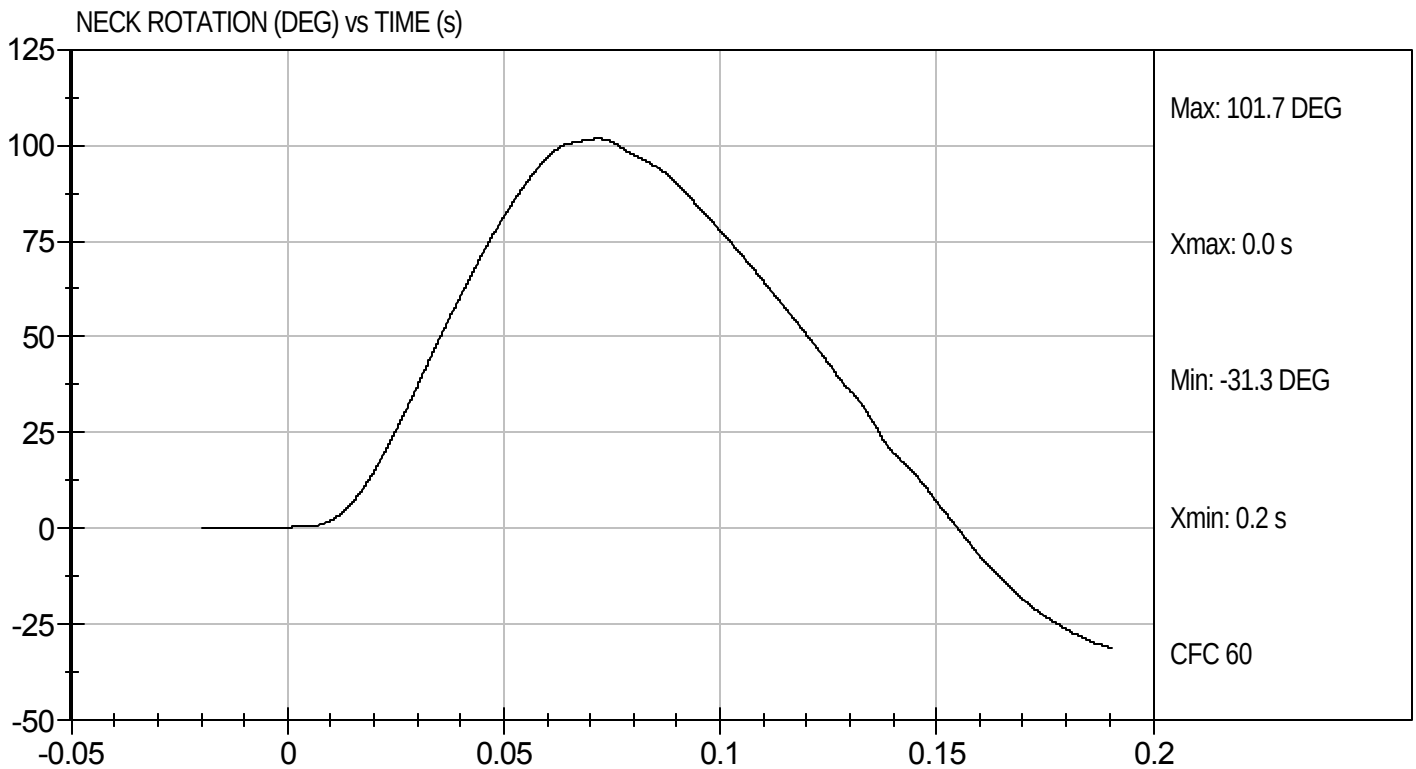
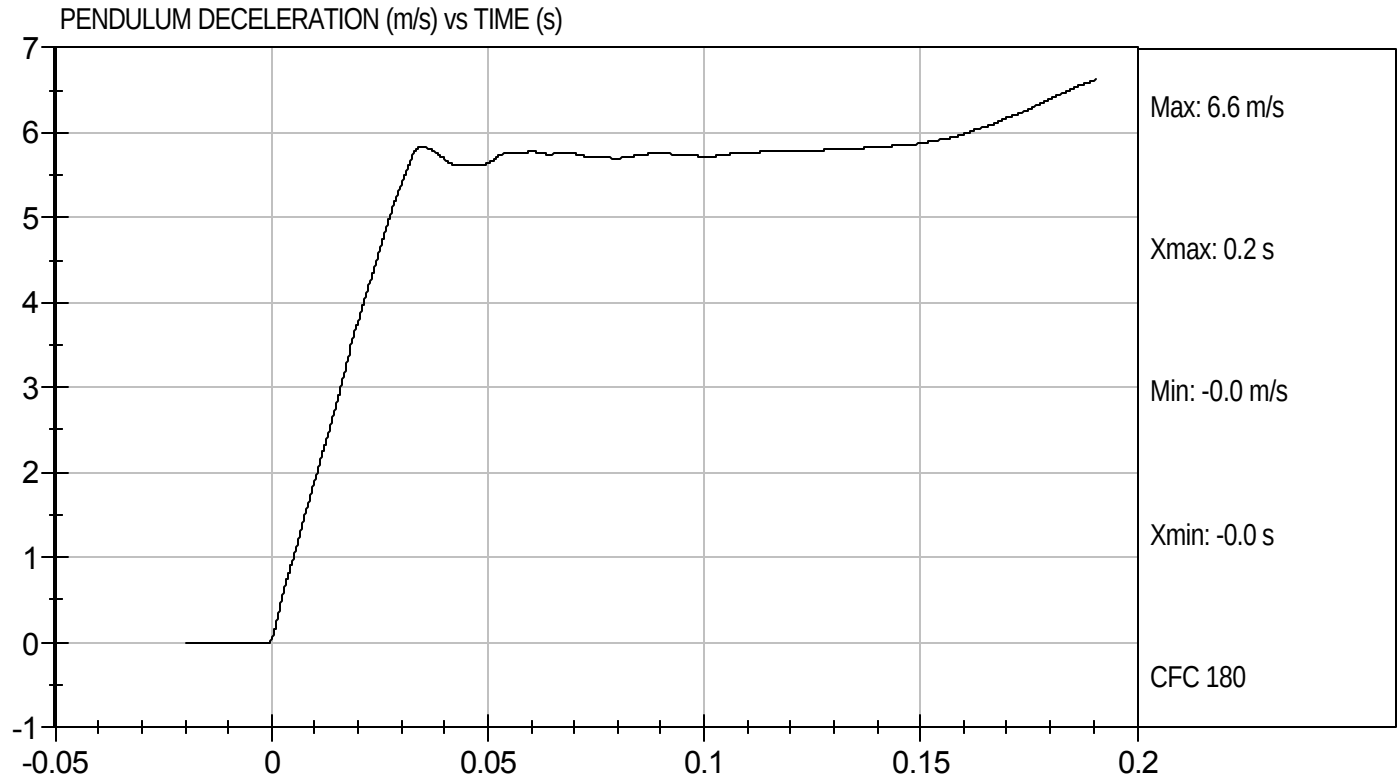
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D11653

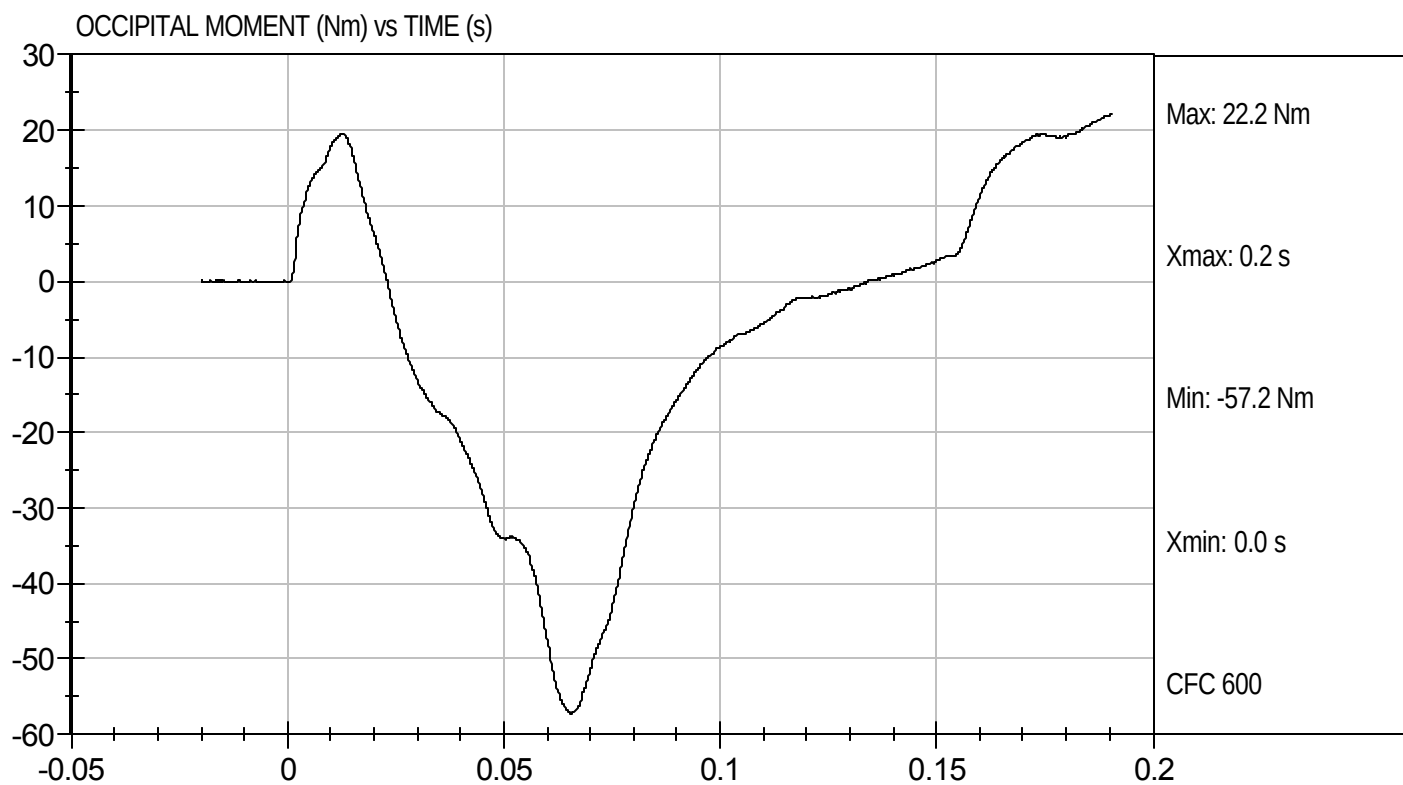
Test Date: 2/23/11
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D11653

Test Date: 2/23/11
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: D11654

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.2	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4255	Pass
Overall Test Results				Pass


Laboratory Technician

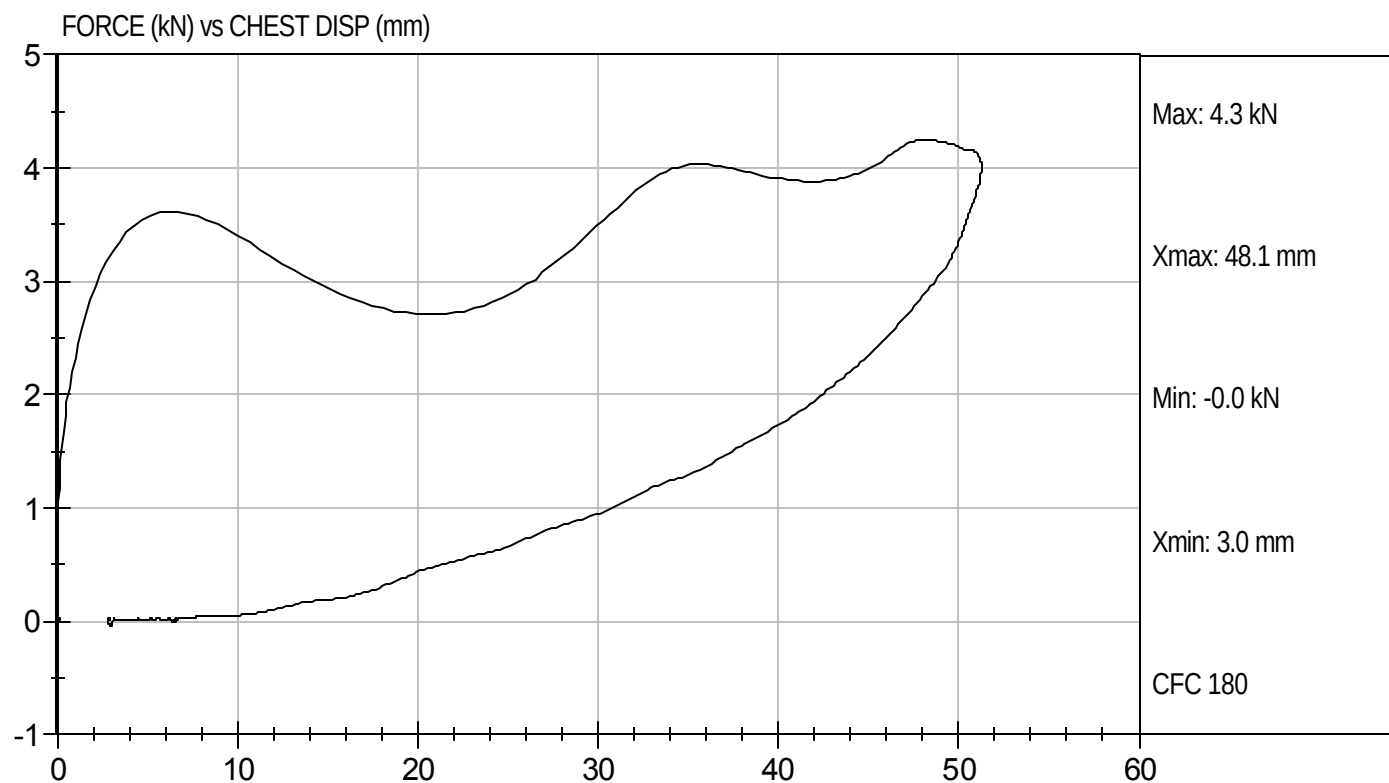
2/22/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11654

Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s

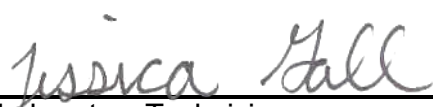


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11655

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	kN	3.45 to 4.06	3.54	Pass
Overall Test Results				Pass


Laboratory Technician

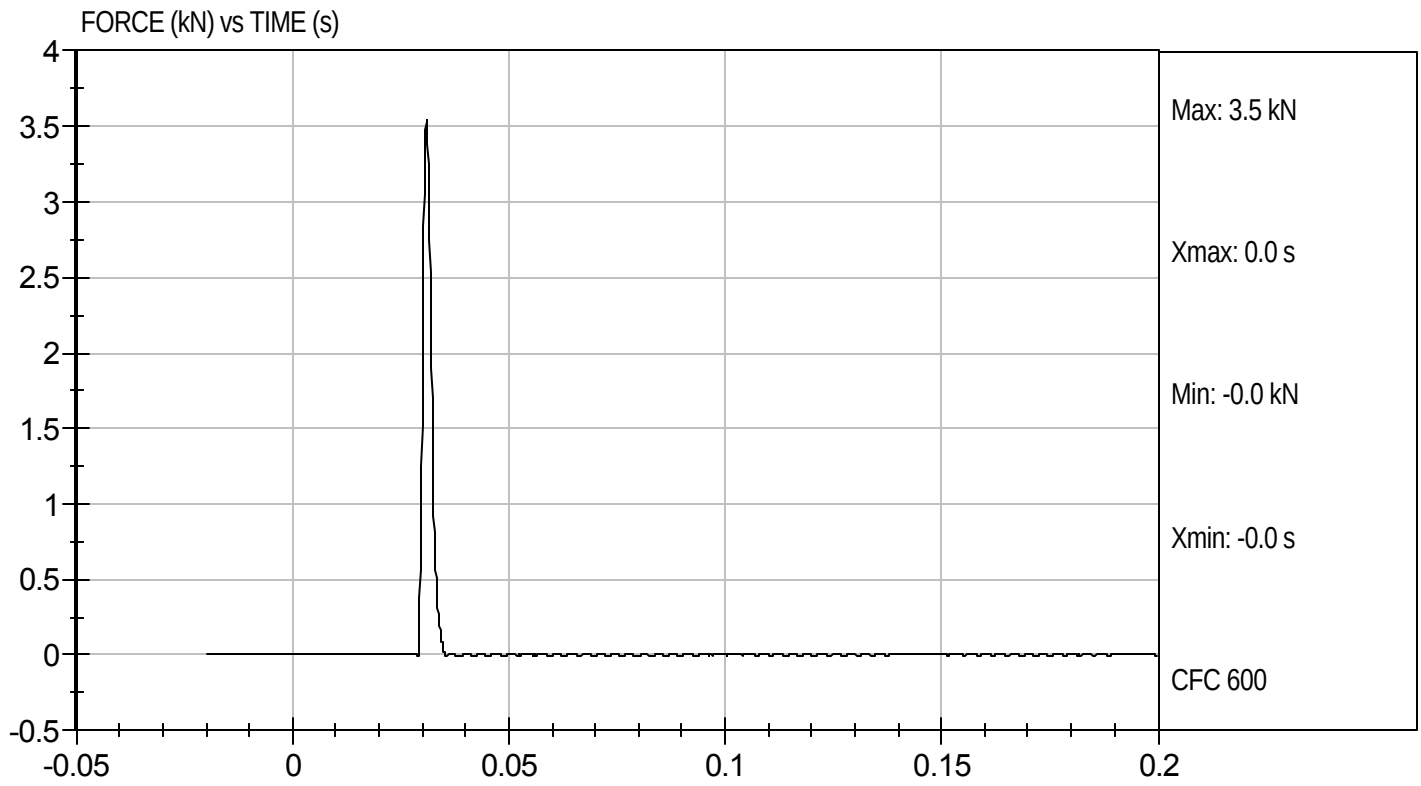
2/22/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D11655

Test Date: 2/22/11
Velocity: 6.99 ft/s, 2.13 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11656

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	kN	3.45 to 4.06	3.51	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

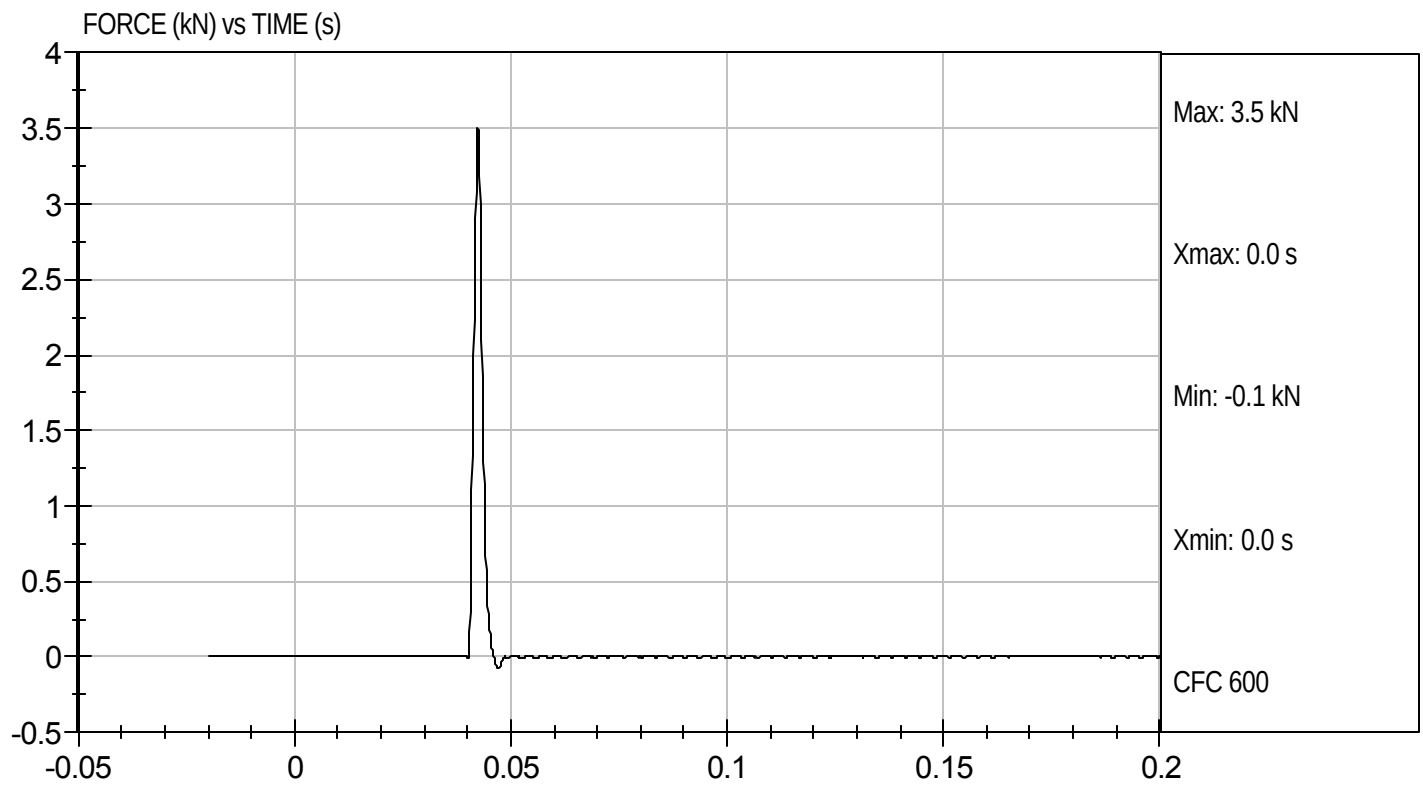
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11656

Test Date: 2/22/11
Velocity: 6.8 ft/s, 2.07 m/s



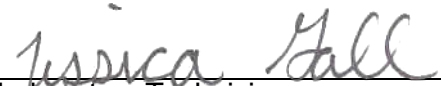
MGA RESEARCH CORPORATION

**TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 138

Test I.D: D11657

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	341	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

2/22/11
Test Date


Approved By