

REPORT NUMBER: NCAP-MGA-2011-061

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

**FORD MOTOR COMPANY
2011 Ford Fusion Hybrid 4-Dr Sedan
NHTSA No.: MB0224**

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



Test Date: January 17, 2011

Final Report Date: February 15, 2011

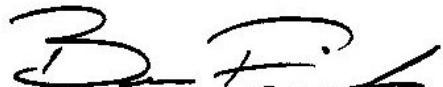
FINAL REPORT

**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: February 15, 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: _____

Technical Report Documentation Page

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2011 Ford Fusion Hybrid 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure for the generation of consumer information on vehicle frontal crash protection. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, 305, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on January 17, 2011. The impact velocity was 56.5 km/h and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 595 mm located at the vehicle's centerline. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>171</td> <td>256</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>23</td> <td>13</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.39</td> <td>0.29</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1748</td> <td>790</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>282</td> <td>318</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2607</td> <td>3767</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>6801</td> <td>2520</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	171	256	Maximum Chest Compression	mm	63	52	23	13	Nij	N/A	1	1	0.39	0.29	Neck Tension	N	4170	2620	1748	790	Neck Compression	N	4000	2520	282	318	Left Femur Force	N	10008	6805	2607	3767	Right Femur Force	N	10008	6805	6801	2520
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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 Ford Fusion Hybrid 4-Dr Sedan at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on January 17, 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. 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 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 595 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 glovebox.

The occupant data is summarized below:

ATD position	HIC ₁₅	T ¹	T ²	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50 th)	171	72.7	87.7	23	0.39	1748	282	2607	6801
Passenger (5 th)	256	68.6	83.6	13	0.29	790	318	3767	2520

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

TEST NOTES

There was no valid data collected for:

- Driver Pelvis X after 70 msec
- Driver Right Upper Tibia FZ after 70 msec
- Driver Right Upper Tibia MX after 70 msec
- Driver Right Upper Tibia MY after 70 msec
- Driver Left Foot Z – Front after 70 msec
- Driver Chest X Redundant after 70 msec
- Driver Chest Y Redundant after 70 msec
- Passenger Pelvis X after 70 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 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0224	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Ford	Power Steering	Yes
Model	Fusion Hybrid	Driver Front Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	3FADP0L33BR152849	Driver Head/Torso Airbag	No
Body Color	Sterling Gray Metallic	Driver Torso Airbag	No
Delivery Date	12/21/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	187	Driver Pelvis Airbag	No
Odometer (km)	301	Driver Knee Airbag	Yes
Dealer	Boucher Fleet Group	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	No
Sunroof/T-Top	No	Pretensioners	Yes
Tinted Glass	No	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Other	
Does owner's manual provide instructions to turn off automatic door locks?	Yes		

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company	GVWR (kg)	2132
Date of Manufacture	09/10	GAWR Front (kg)	1130
		GAWR Rear (kg)	1002

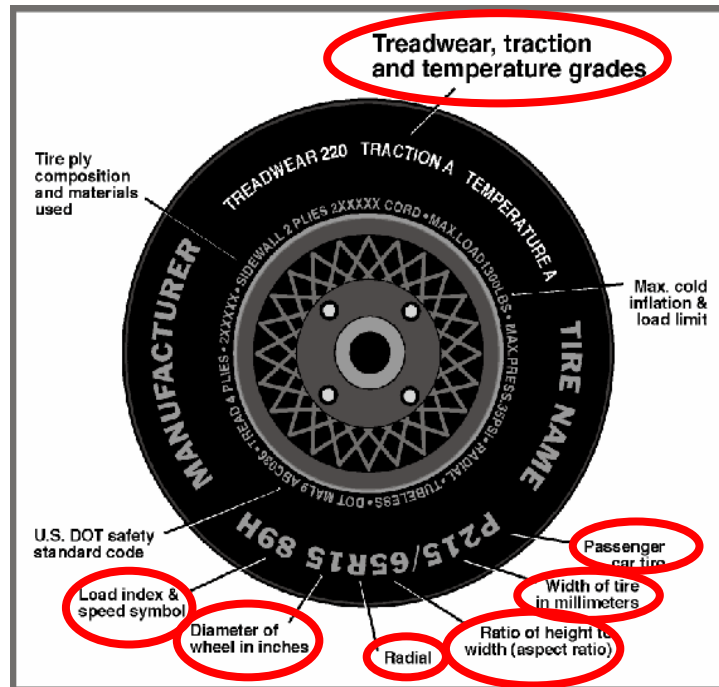
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				385
Cargo Weight (RCLW) (kg)				45

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

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P225/50R17	P225/50R17
Tire Size on Vehicle	P225/50R17	P225/50R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Energy	Energy
Treadwear	440	440
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	93V	93V
Tire Material	Rubber	Rubber
DOT Safety Code Right	B90A NNHX	B90A NNHX
DOT Safety Code Left	B90A NNHX	B90A NNHX

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

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	522.5	341.1		558.8	411.9	
Right	kg	489.5	337.9		503.0	396.0	
Ratio	%	59.8	40.2		56.8	43.2	
Totals	kg	1012.0	679.0	1691.0	1061.8	807.9	1869.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1691.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Target Vehicle Target Weight (TVTW)	kg	1876.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	708	714	700	710	1096
As Tested	mm	706	712	677	683	1180
Post Test	mm	693	732	669	678	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2730
Total Vehicle Length at Left Side	mm	4703
Total Vehicle Length at Centerline	mm	4860
Total Vehicle Length at Right Side	mm	4703
Weight of Ballast in Cargo Area	kg	31.8
Weight of Vehicle Components Removed	kg	20.0
Amount of Stoddard Solvent in Fuel Tank	L	61.6

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

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

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4860
2	Total Width	1817
3	Bumper Top Height	502
4	Bumper Bottom Height	410
5	Longitudinal Member Top Height	350
6	Distance between Longitudinal Members	940
7	Longitudinal Member Width	75
8	Engine Top Height	821
9	Engine Bottom Height	202
10	Engine and Gearbox Width	684
11	Front Bumper-Engine Distance	430
12	Front Shock Absorber Fixing Height	900
13	Bonnet Leading Edge Height	754
14	Front Shock Absorber Fixing Width	1000
15	Front Bumper – Front Axle Distance	1020
16	Front Axle – A-Pillar Distance	453
17	A-Pillar – B-Pillar Distance	1120
18	B-Pillar – Rear Axle Distance	1172
19	B-Pillar – C-Pillar Distance	725
20	Roof Sill Bottom Height	1305
21	Roof Sill Top Height	1424
22	Floor Sill bottom Height	210
23	Floor Sill Top Height	350

DATA SHEET 1A
ELECTRIC VEHICLE PARAMETER DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

Type of Electric Vehicle (Electric/Hybrid):	Hybrid
Propulsion Battery Type:	NiMH Traction Battery System
Nominal Voltage (V):	230
Physical Location of Automatic Propulsion Battery Disconnect:	Interior of Traction Battery System
Auxiliary Battery Type:	N/A

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED DATA)

Electrolyte Fluid Type:	Alkaline
Electrolyte Fluid Specific Gravity:	1.3 grams/cc
Electrolyte Kinematic Viscosity (centistokes):	1.75
Electrolyte Fluid Color:	Clear Liquid
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable):	Air
Location of Battery Modules:	X Inside Passenger Compartment
	Outside Passenger Compartment

MEASURE AND RECORD BATTERY STATE OF CHARGE

	Maximum State of Charge recommended by manufacturer:	290-320 V
	Test Voltage (>95% of Maximum State of Charge):	4.56 V
	Test Voltage (Within Normal Operating Voltage Range):	4.56 V

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

Details of Vehicle Chassis Ground Point(s) & Locations(s)	Bolt stud outboard of battery terminals; unpainted 13 mm nut
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PROPULSION BATTERY SYSTEM

Details of Propulsion Battery Components	1. Service Disconnect 2. Forced Air Cooling System
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DATA SHEET NO. 2

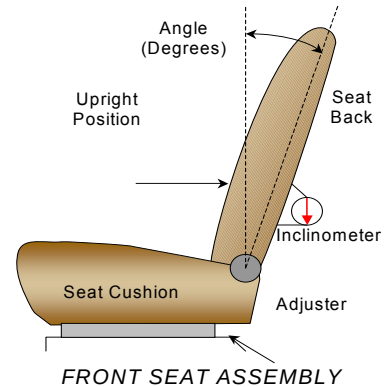
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

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	11.4° on headrest post
Passenger Seat Back Angle	11.5° on headrest post

SEAT FORE/AFT POSITIONS

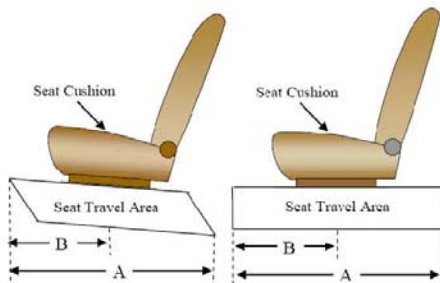
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

SEAT FORE/AFT POSITIONS	Total Fore/Aft Travel	Placed in Position #
Driver Seat	296 mm	148 mm (forward-most as 0)
Passenger Seat	227 mm	0 mm (forward-most as 0)

SEAT BELT UPPER ANCHORAGES

The seat belt upper anchorages are positioned following the manufacturer's specified position as listed in Form 1.

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	4	0 (uppermost as 0)
Passenger Seat	4	0 (uppermost as 0)



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

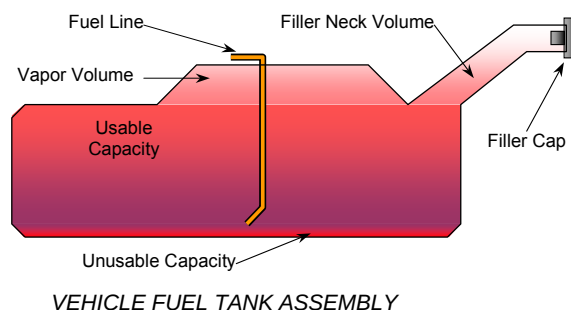
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	66.2
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	60.9 to 62.2
Actual Amount of Solvent used	61.6
1/3 of Usable Capacity	22.1

FUEL PUMP

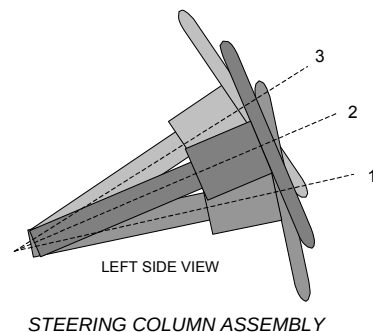
Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

The vehicle is equipped with an electric fuel pump. The electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following ignition actuation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. Also, a fuel pump shut-off switch is provided, designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is 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.



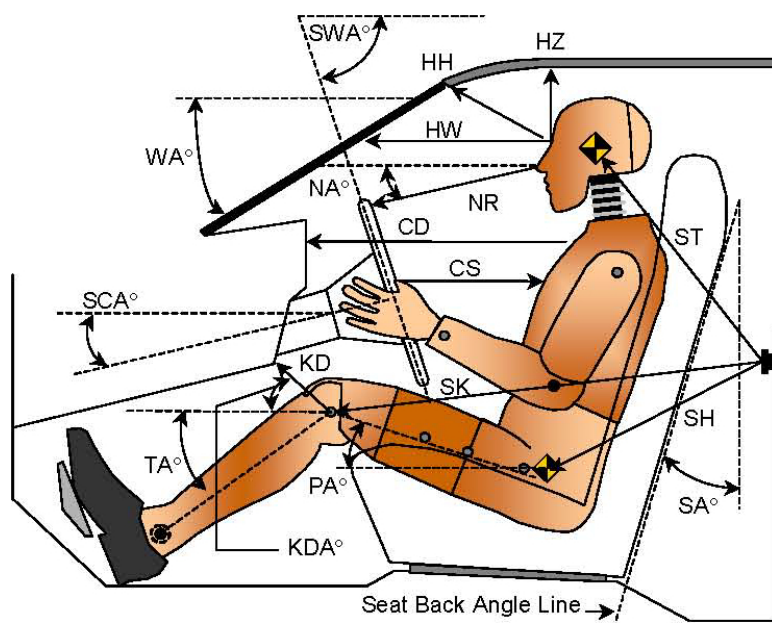
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	70.4	272
Geometric Center – Position 2	67.5	257
Uppermost – Position 3	64.6	242
Telescoping Steering Wheel Travel		30
Test Position	67.5	257

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

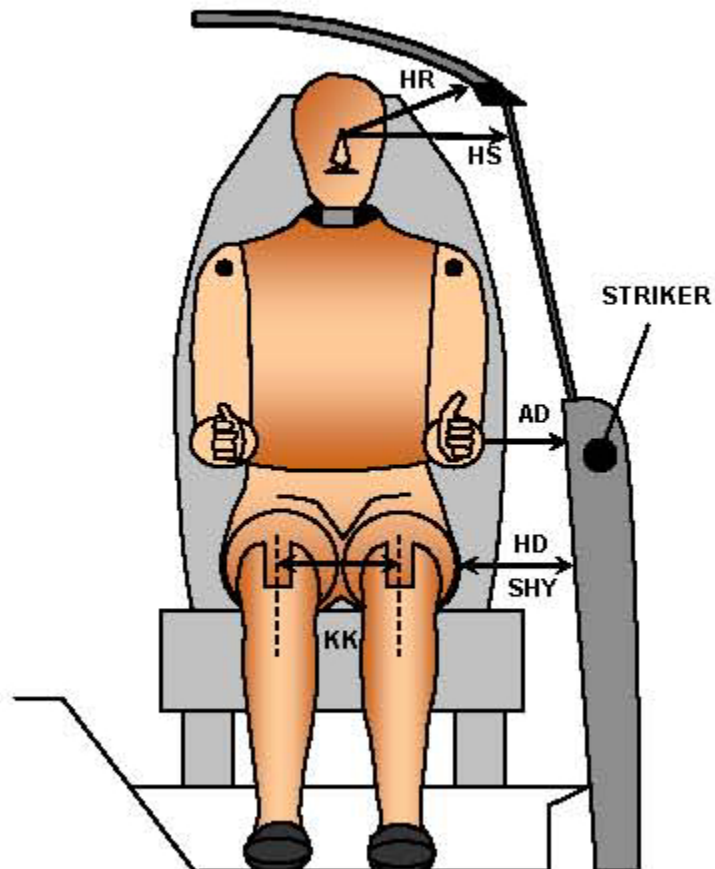


Code	Measurement Description	Driver S/N 351		Passenger S/N 138	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		26.8		
SWA	Steering Wheel Angle		67.5		
SCA	Steering Column Angle		22.5		
SA	Seat Back Angle		11.4		11.5
HZ	Head to Roof (Z)	165	90	192	90
HH	Head to Header	316	25.1	274	42.2
HW	Head to Windshield	598	0	610	0
NR	Nose to Rim	353	9.7		
CD	Chest to Dash	518		437	
CS	Chest to Steering Hub	289	6.1		
RA	Rim to Abdomen	162	0		
KDL	Left Knee to Dash	164	20.3	121	30.4
KDR	Right Knee to Dash	134	31.2	121	27.6
PA	Pelvic Angle		23.9		18.9
TA	Tibia Angle		45.6		45.7
SK	Striker to Knee	558	90.1	626	91.2
ST	Striker to Head	517	7.3	473	19.3
SH	Striker to H-Point	248	131.0	324	109.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011



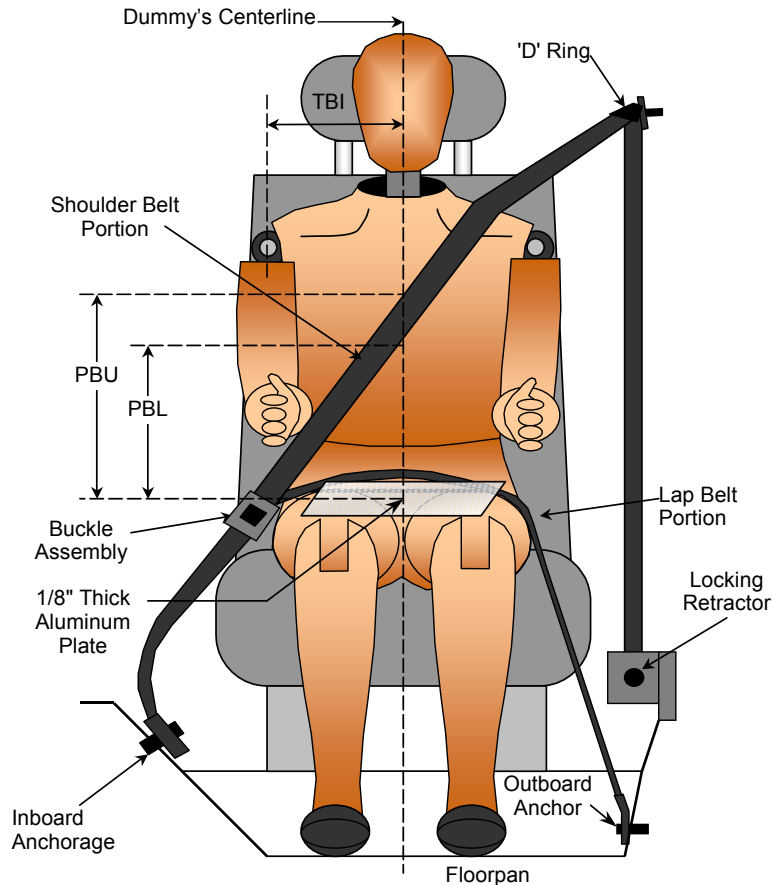
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 351	Passenger S/N 138
		Length (mm)	
AD	Arm to Door	138	92
HD	H-Point to Door	151	171
HR	Head to Side Header	207	232
HS	Head to Side Window	330	356
KK	Knee to Knee	348	214
SHY	Striker to H-Point (Y Direction)	290	312
AA	Ankle to Ankle	375	186

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	350	340
PBL - To surface of reference to belt lower edge	mm	275	250

BELT LENGTH DATA

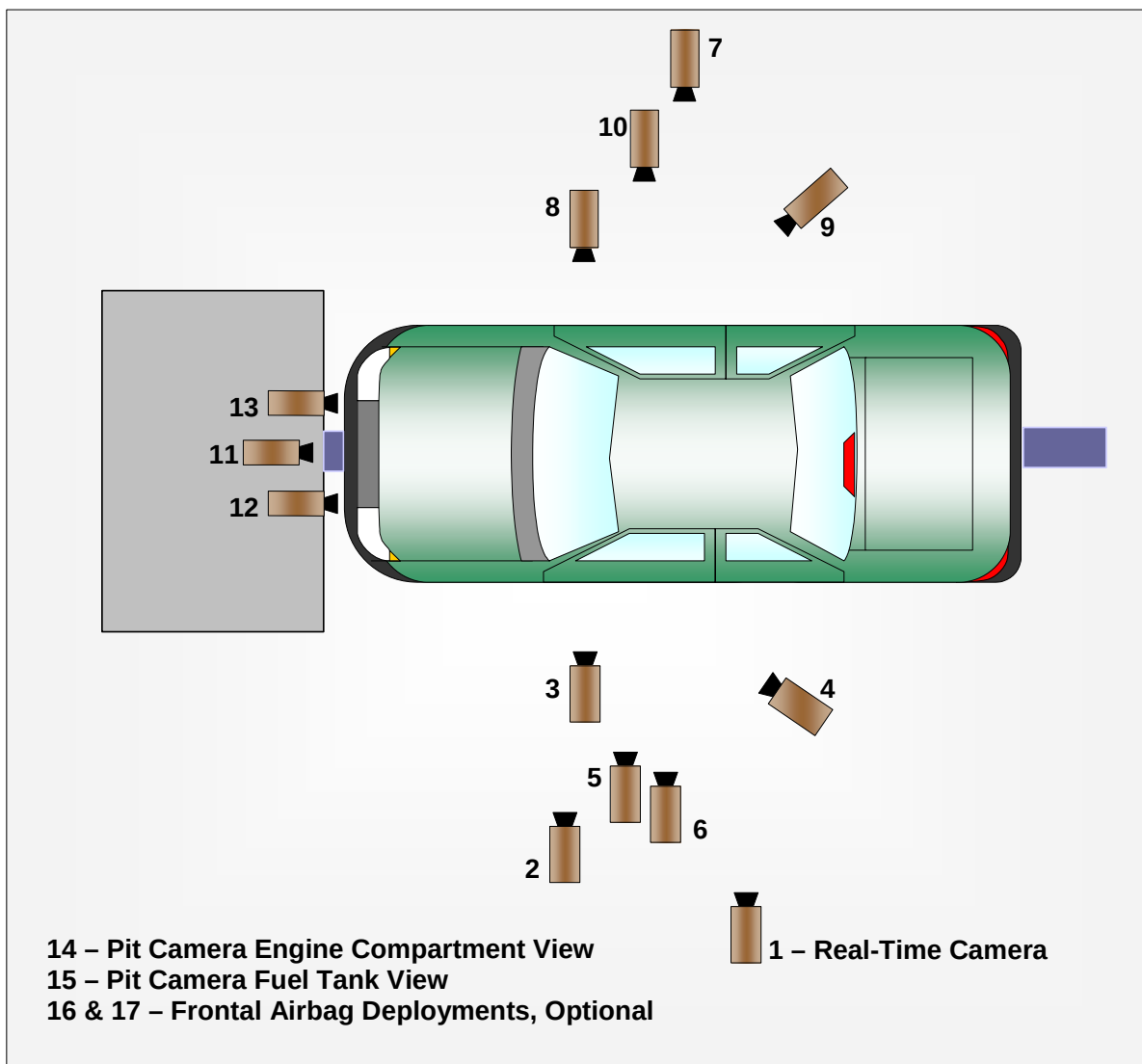
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	830	880
Lap Belt Length as measured on ATD	mm	800	580
Remainder of belt of reel	mm	1600	1840
Total Belt Length for Continuous Webbing Systems	mm	3230	3300

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

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
Test Date: 1/17/2011

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

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	1360	-5120	-1290	24	1000
3	Driver Close-Up	1710	-6330	-1570	35	1000
4	Driver Angle	5490	-4870	-1990	50	1000
5	Steering Column Top	870	-5160	-1250	24	1000
6	Steering Column Bottom	850	-5140	-870	24	1000
7	Right Overall	2260	6380	-1320	20	1000
8	Passenger Close-Up	1730	6340	-1580	35	1000
9	Passenger Angle	5480	4910	-1940	50	1000
10	Right Front Half	1350	5110	-1310	24	1000
11	Windshield	-260	0	-2860	24	1000
12	Top Driver	-20	-310	-2270	12	1000
13	Top Passenger	-20	310	-2270	12	1000
14	Pit Front	1330	0	3150	24	1000
15	Pit Rear	3320	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

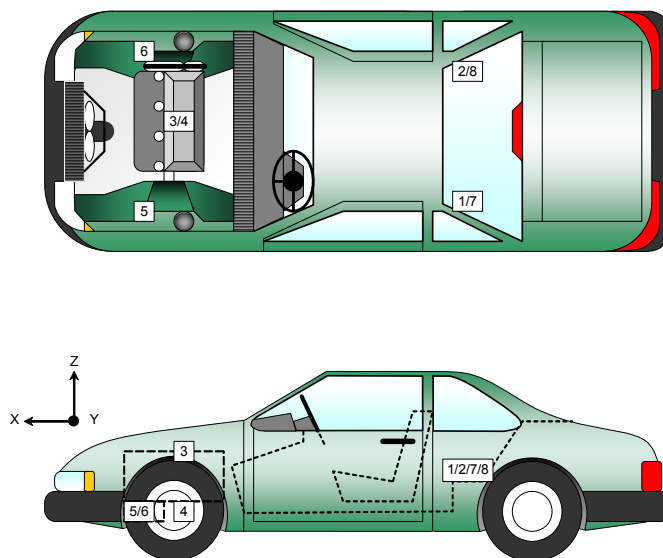
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1896	-310	-240
2	Right Rear X-Member X	1896	310	-240
3	Engine Top X	3929	0	-838
4	Engine Bottom X	4144	0	-302
5	Left Brake Caliper X	3953	-685	-260
6	Right Brake Caliper X	3953	685	-260
7	Left Rear X-Member Z	1896	-310	-240
8	Right Rear X-Member Z	1896	310	-240

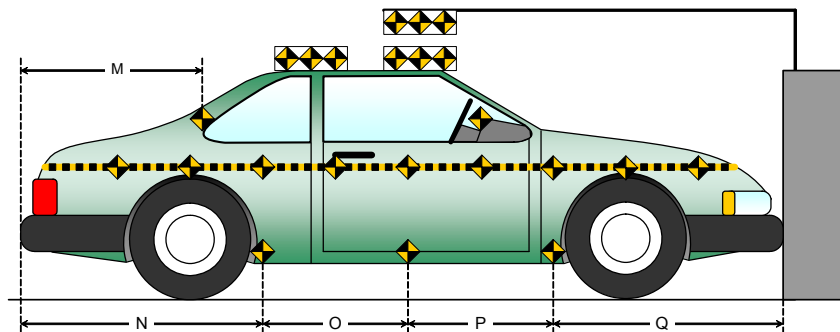
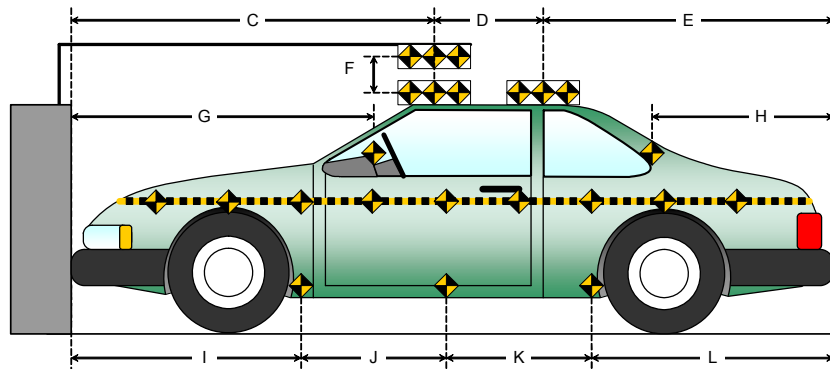
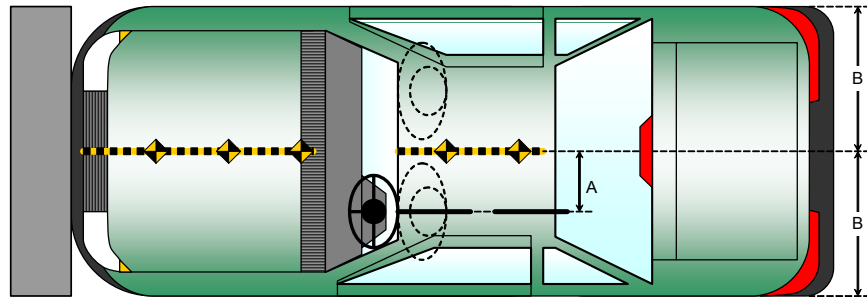
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

Item	Value (mm)
A	360
B	908
C	2400
D	660
E	1800
F	135
G	
H	1218
I	1461
J	920
K	920
L	1559
M	1218
N	1559
O	920
P	920
Q	1461



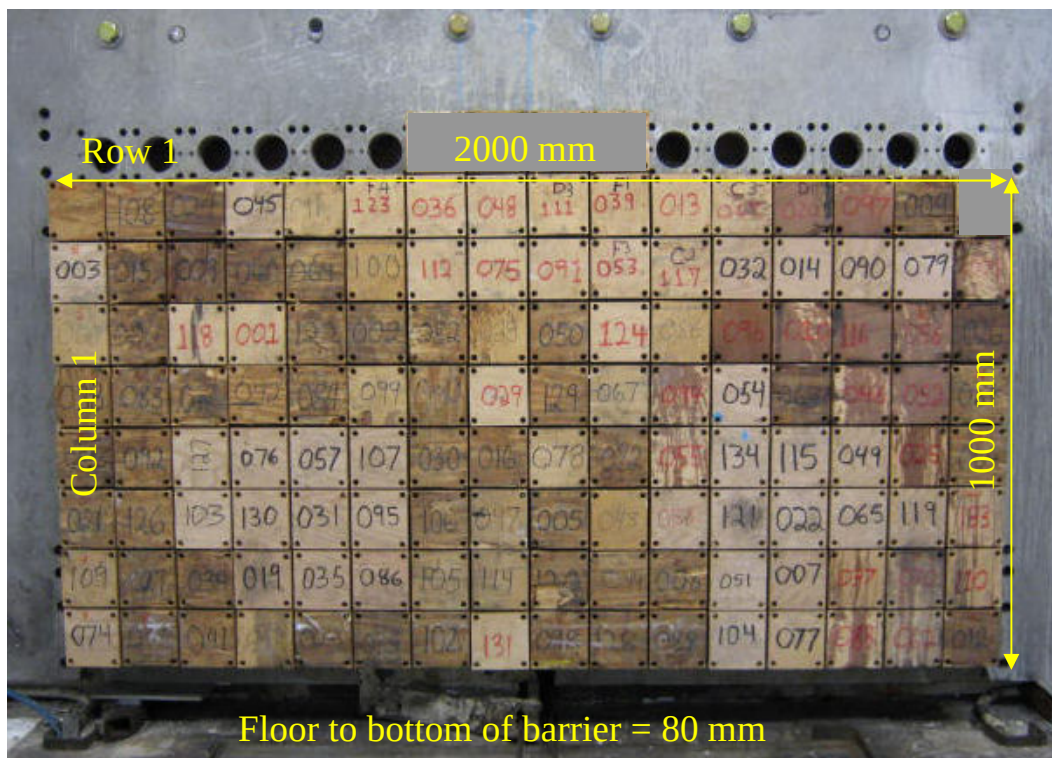
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

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 Ford Fusion Hybrid 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
Test Date: 1/17/2011

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 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

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	Airbag	Airbag
Left Knee Contact	Knee Airbag	Glovebox
Right Knee Contact	Knee Airbag	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	705
Center	mm	590
Right Side	mm	685
Average	mm	660

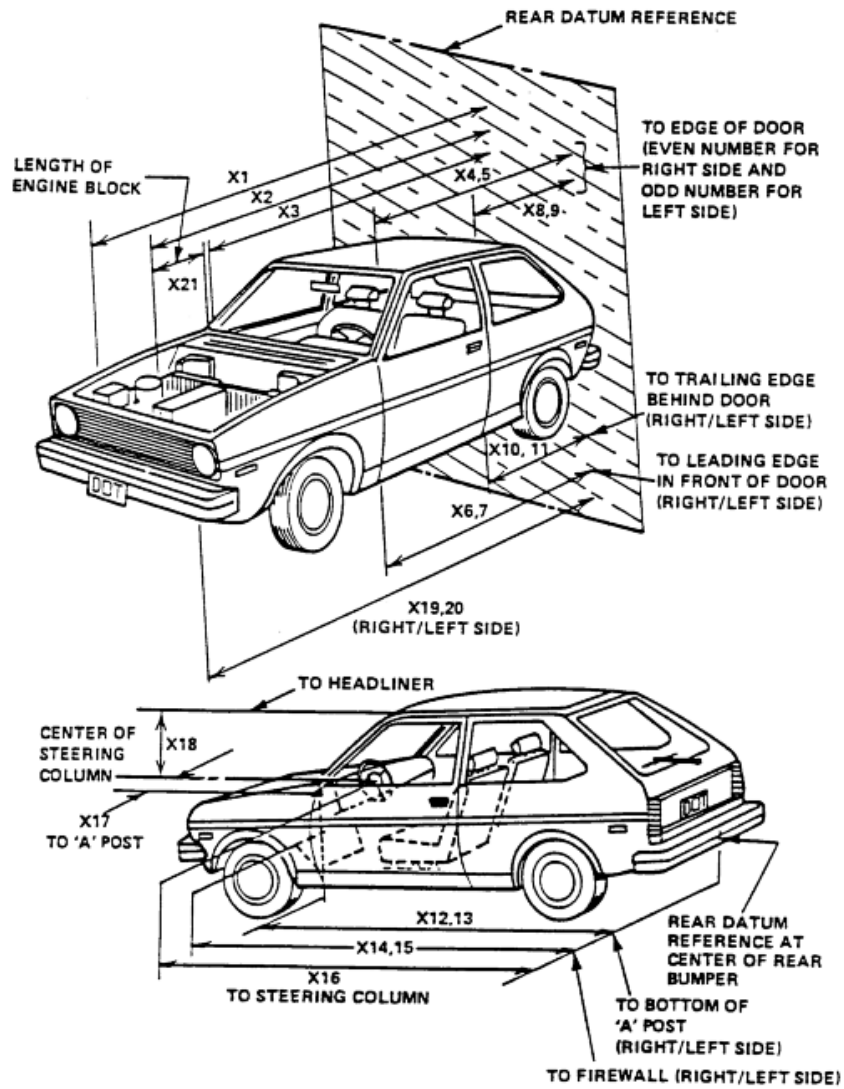
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Knee Airbag	Yes	Yes	No	
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
Test Date: 1/17/2011



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4860	4265	595
2	RSOV to Front of Engine	mm	4272	4079	193
3	RSOV to Firewall	mm	3635	3606	29
4	RSOV to Upper Leading Edge of Right Door	mm	3317	3327	-10
5	RSOV to Upper Leading Edge of Left Door	mm	3317	3330	-13
6	RSOV to Lower Leading Edge of Right Door	mm	3310	3302	8
7	RSOV to Lower Leading Edge of Left Door	mm	3310	3299	11
8	RSOV to Upper Trailing Edge of Right Door	mm	2208	2215	-7
9	RSOV to Upper Trailing Edge of Left Door	mm	2208	2218	-10
10	RSOV to Lower Trailing Edge of Right Door	mm	2242	2235	7
11	RSOV to Lower Trailing Edge of Left Door	mm	2242	2228	14
12	RSOV to Bottom of "A" Post of Right Side	mm	3335	3324	11
13	RSOV to Bottom of "A" Post of Left Side	mm	3335	3340	-5
14	RSOV to Firewall, Right Side	mm	3692	3645	47
15	RSOV to Firewall, Left Side	mm	3687	3579	108
16	RSOV to Steering Column	mm	2815	2801	14
17	Center of Steering Column to "A" Post	mm	345	395	-50
18	Center of Steering Column to Headliner	mm	404	495	-91
19	RSOV to Right Side of Front Bumper	mm	4703	4280	423
20	RSOV to Left Side of Front Bumper	mm	4703	4270	433
21	Length of Engine Block	mm	459	459	0
RD	RSOV to Right Side of Dash Panel	mm	3035	3034	1
CD	RSOV to Center of Dash Panel	mm	3035	3042	-7
LD	RSOV to Left Side of Dash Panel	mm	3052	3031	21

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

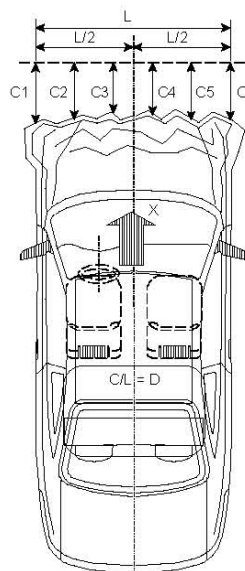
NHTSA No.: MB0224
 Test Date: 1/17/2011

VEHICLE INFORMATION

VIN: 3FADP0L33BR152849 Wheelbase (mm): 2730
 Vehicle Size Category: Sedan Test Weight (kg): 1869.7

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): 56.5
 Velocity Change (km/h): 64.2
 Time of Separation (msec): 100.4



CRUSH PROFILE

Collision Deformation Classification: Frontal
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1112
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4703	4270	433
C2	Crush zone 2 at left side	mm	4766	4260	506
C3	Crush zone 3 at left side	mm	4794	4258	536
C4	Crush zone 4 at right side	mm	4794	4266	528
C5	Crush zone 5 at right side	mm	4766	4271	495
C6	Crush zone 6 at right side	mm	4703	4280	423
L	C1 TO C6	mm	1112	1070	42

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

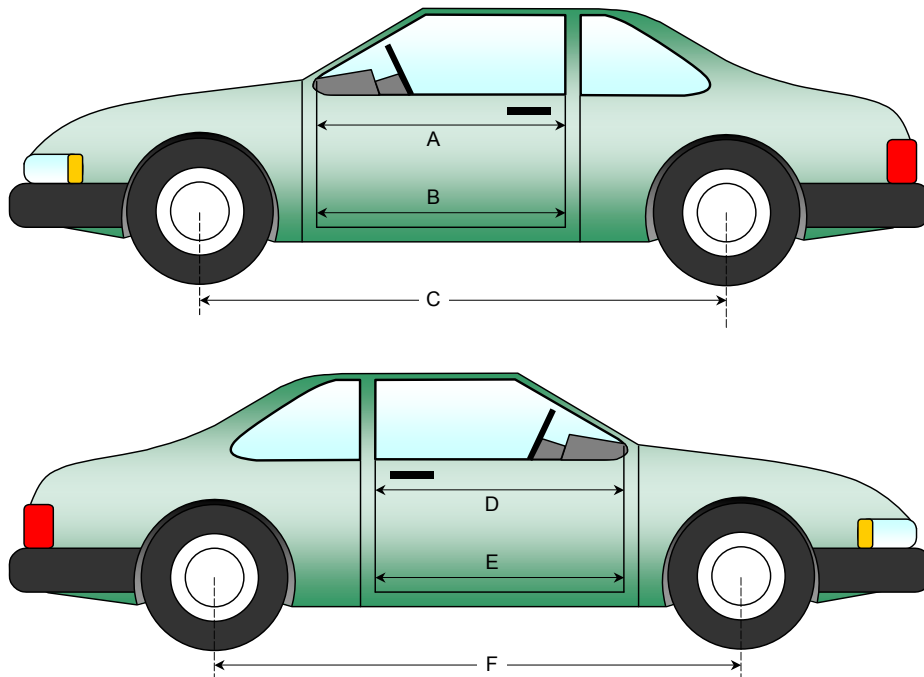
NHTSA No.: MB0224
 Test Date: 1/17/2011

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	991	990	1
B	Left Side Lower	mm	937	940	-3
D	Right Side Upper	mm	991	991	0
E	Right Side Lower	mm	937	940	-3

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2730	2710	20
F	Right Side Wheelbase	mm	2730	2716	14



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

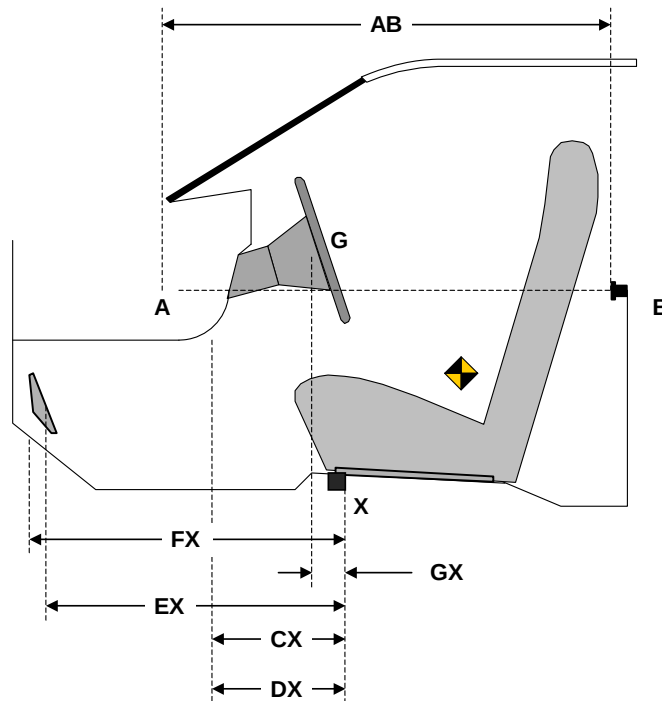
Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	775	770	5
CX	Left Knee Bolster to X	mm	276	276	0
DX	Right Knee Bolster to X	mm	253	221	32
EX	Brake Pedal to X	mm	580	587	-7
FX	Foot Rest to X	mm	620	628	-8
GX	Center of Steering Column Wheel Hub to X	mm	72	92	-20

X = Front of Seat Track (stationary)

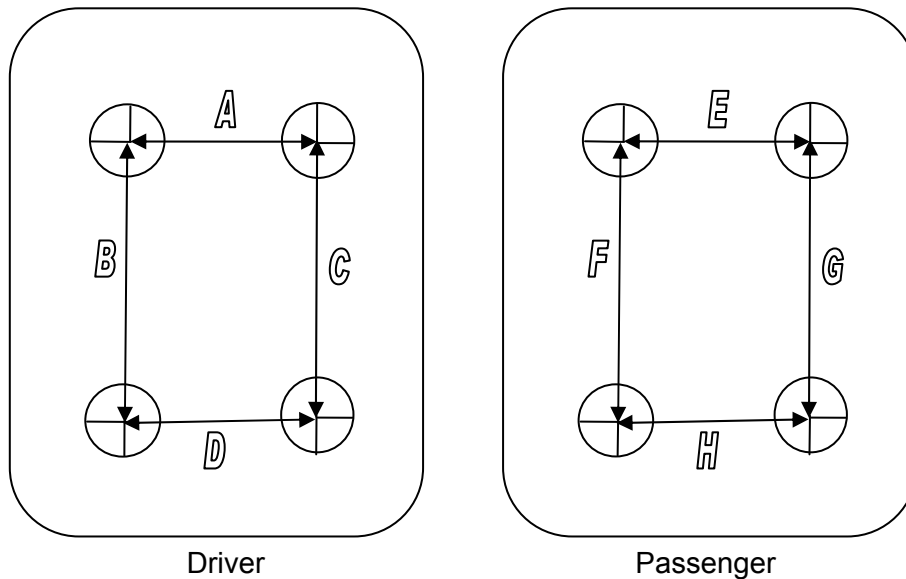


DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011



TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	300	294	6
B	mm	300	290	10
C	mm	300	300	0
D	mm	300	304	-4
E	mm	300	290	10
F	mm	300	288	12
G	mm	300	291	9
H	mm	300	291	9

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

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

Windshield Mounting Details:

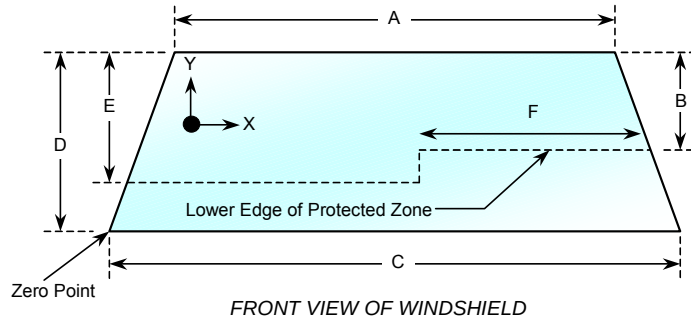
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2181	2181	100
Right Side	2181	2181	100
Total	4362	4362	100



Item	Units	Value
A	mm	1146
B	mm	487
C	mm	1510
D	mm	853
E	mm	558
F	mm	510

AREA OF PROTECTED ZONE FAILURES - NONE

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

X	Y

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component. **None**

X	Y

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

Test Vehicle:	<u>2011 Ford Fusion Hybrid 4-Dr Sedan</u>	NHTSA No.:	<u>MB0224</u>
Test Program:	<u>NCAP Frontal Barrier Impact Test</u>	Test Date:	<u>1/17/2011</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time:	<u>10:03 am</u>	Temperature:	<u>21° C</u>
------------	-----------------	--------------	--------------

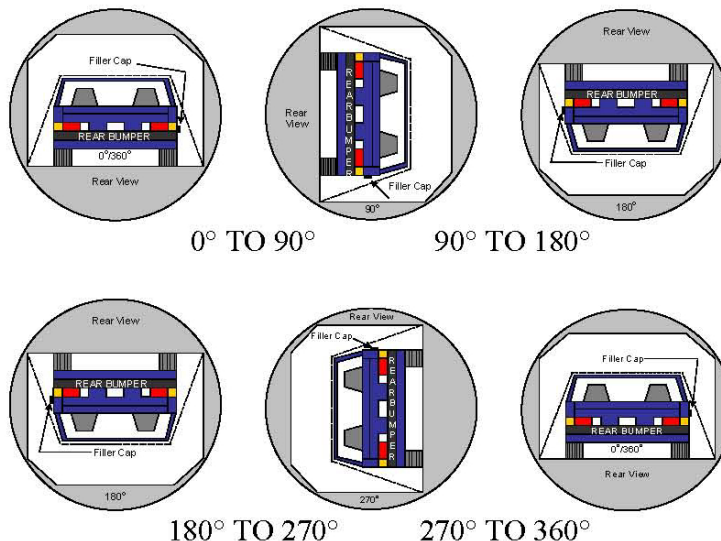
- | | |
|---|--------------|
| A. From impact until vehicle motion ceases:
(Maximum Allowable = 1 ounce) | <u>0</u> oz. |
| B. For the 5 minute period after motion ceases:
(Maximum allowable = 5 ounces) | <u>None</u> |
| C. For the following 25 minutes:
(Maximum allowable = 1 oz/minute) | <u>None</u>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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

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°	124	300	424
90° to 180°	115	300	415
180° to 270°	110	300	410
270° to 360°	122	300	422

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

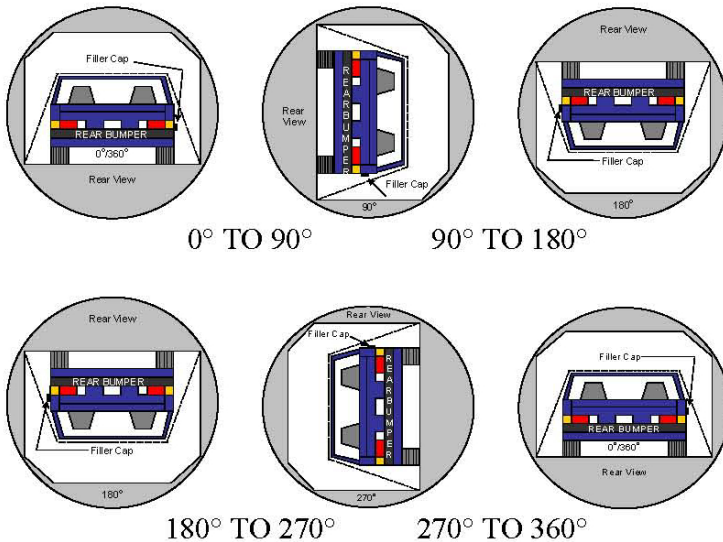
Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET 16A

FMVSS 305 STATIC ROLLOVER RESULTS FOR ELECTRIC-POWERED VEHICLES

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011



4. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
5. The position hold time at each position is 300 seconds (minimum).
6. Details of electrolyte spillage: **None**

ELECTROLYTE COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	124	300	424
90° to 180°	115	300	415
180° to 270°	110	300	410
270° to 360°	122	300	422

FMVSS 305 ELECTROLYTE SPILLAGE LOCATION TABLE (units in liters)

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

Total Spillage: 0 L

	Yes	No
Is the total spillage of propulsion battery electrolyte greater than 5.0 Liters?		X
Is propulsion battery electrolyte spillage visible in the passenger compartment?		X

DATA SHEET 16A (CONTINUED)

FMVSS 305 STATIC ROLLOVER RESULTS FOR ELECTRIC-POWERED VEHICLES

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

VOLTMETER INFORMATION

Make:	Fluke
Model:	11
Serial Number:	68541895
Internal Impedance Value (MΩ):	>10 MΩ < 100 pF
Nominal Propulsion Battery Voltage (Vb) (V):	230

ELECTRICAL ISOLATION MEASUREMENT

V1 =	0.003	V	90°	Time:	2	Minutes	10	s
V1 =	0.001	V	180°	Time:	2	Minutes	9	s
V1 =	0.003	V	270°	Time:	1	Minutes	59	s
V1 =	0.001	V	360°	Time:	2	Minutes	13	s
V2 =	0.000	V	90°	Time:	2	Minutes	32	s
V2 =	0.000	V	180°	Time:	2	Minutes	26	s
V2 =	0.004	V	270°	Time:	2	Minutes	15	s
V2 =	0.000	V	360°	Time:	2	Minutes	31	s
V1' =	0.000	V	90°	Time:	2	Minutes	21	s
V1' =	0.000	V	180°	Time:	2	Minutes	14	s
V1' =	0.000	V	270°	Time:	2	Minutes	4	s
V1' =	0.000	V	360°	Time:	2	Minutes	20	s
V2' =	0.000	V	90°	Time:	2	Minutes	41	s
V2' =	0.000	V	180°	Time:	2	Minutes	34	s
V2' =	0.000	V	270°	Time:	2	Minutes	22	s
V2' =	0.000	V	360°	Time:	2	Minutes	37	s

DATA SHEET 16A (CONTINUED)

FMVSS 305 STATIC ROLLOVER RESULTS FOR ELECTRIC-POWERED VEHICLES

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

ELECTRICAL ISOLATION CALCULATION

Note: If measured voltage is zero and results in a division by zero, record "Zero Volts". This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$								
R _{i1} =	Zero Volts	Ω	90°	Time:	2	Minutes	10	s
R _{i1} =	Zero Volts	Ω	180°	Time:	2	Minutes	9	s
R _{i1} =	Zero Volts	Ω	270°	Time:	1	Minutes	59	s
R _{i1} =	Zero Volts	Ω	360°	Time:	2	Minutes	13	s
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$								
R _{i2} =	Zero Volts	Ω	90°	Time:	2	Minutes	32	s
R _{i2} =	Zero Volts	Ω	180°	Time:	2	Minutes	26	s
R _{i2} =	Zero Volts	Ω	270°	Time:	2	Minutes	15	s
R _{i2} =	Zero Volts	Ω	360°	Time:	2	Minutes	31	s
R _i = The lesser of R _{i1} and R _{i2}								
R _i =	Zero Volts	Ω	90°	Time:	2	Minutes	48	s
R _i =	Zero Volts	Ω	180°	Time:	2	Minutes	42	s
R _i =	Zero Volts	Ω	270°	Time:	2	Minutes	29	s
R _i =	Zero Volts	Ω	360°	Time:	2	Minutes	46	s
R _i /V _b = Electrical Isolation Value/Nominal Battery Voltage								
Minimum Electrical Isolation Value is 500 Ω/V								
R _i /V _b =	Zero Volts	Ω/V	90°	Time:	2	Minutes	48	s
R _i /V _b =	Zero Volts	Ω/V	180°	Time:	2	Minutes	42	s
R _i /V _b =	Zero Volts	Ω/V	270°	Time:	2	Minutes	29	s
R _i /V _b =	Zero Volts	Ω/V	360°	Time:	2	Minutes	46	s

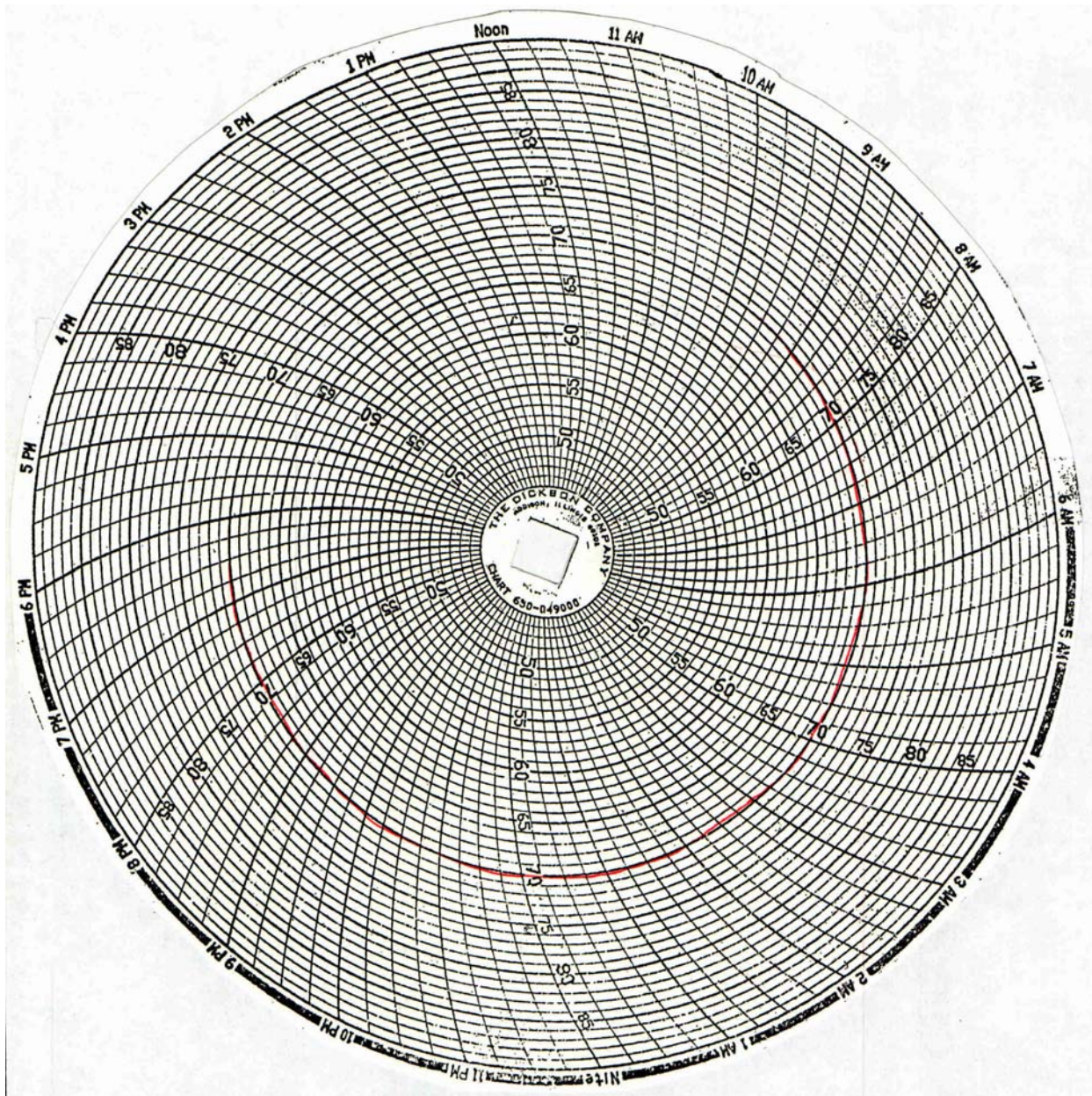
	Yes	No, Fail
Is the measured Electrical Isolation Value $\geq$ 500 Ω/V?	X	

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
Test Date: 1/17/2011



DATA SHEET 18

PRE-IMPACT ELECTRIC ISOLATION MEASUREMENTS AND CALCULATIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
Test Date: 1/17/2011

VOLTMETER INFORMATION

Make:	Fluke
Model:	11
Serial Number:	68541895
Internal Impedance Value (M Ω):	>10 M Ω < 100 pF
Resolution (V):	0.001
Last Calibration Date:	7/16/2010

PROPULSION BATTERY VOLTAGE

Measurement shall be made with propulsion battery connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (Propulsion motor(s) activated) position.

If voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.

Vb (V):	4.56
---------	------

PROPULSION BATTERY TO VEHICLE CHASSIS

Vehicle chassis point(s) determined and supplied to contractor by COTR.

V1 (V):	3.91
V2 (V):	0

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

The known resistance Ro (in ohms) should be approximately 500 times the normal operating voltage of the vehicle (in volts) per SAE J1766.

Ro (Ω):	158 K Ω
------------------	----------------

DATA SHEET 18 (CONTINUED)

PRE-IMPACT ELECTRIC ISOLATION MEASUREMENTS AND CALCULATIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

ELECTRICAL ISOLATION MEASUREMENT

Note: If measured voltage is zero and results in a division by zero, record "Zero Volts". This "zero voltage" condition is considered as being compliant.

V1' (V):	0.001 V
$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$	
Ri1 (Ω):	Zero Volts
V2' (V):	0.000 V
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$	
Ri2 (Ω):	Zero Volts
Ri = The lesser of Ri1 and Ri2	
Ri Pre-Test ((Ω):	Zero Volts
Ri/Vb (Ω/V):	Zero Volts (Electrical Isolation Value)
Minimum Electrical Isolation Value is 500 Ω/V	

	Yes	No, Fail
Is the measured Electrical Isolation Value $\geq$ 500 Ω/V?	X	

DATA SHEET 19

POST-IMPACT ELECTRIC ISOLATION MEASUREMENTS AND CALCULATIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
 Test Date: 1/17/2011

VOLTMETER INFORMATION

Make:	Fluke
Model:	11
Serial Number:	68541895
Internal Impedance Value (MΩ):	>10 MΩ < 100 pF
Nominal Propulsion Battery Voltage (Vb) (V):	230

PROPULSION BATTERY VOLTAGE

NOTE: Record V1, V2, V1', V2' voltage measurements immediately after the impacted vehicle comes to rest.

V1 =	0.900	V	Impact Time:	0	Minutes	30	s
V2 =	0.090	V	Impact Time:	0	Minutes	30	s
V1' =	0.010	V	Impact Time:	0	Minutes	30	s
V2' =	0.010	V	Impact Time:	0	Minutes	30	s

ELECTRICAL ISOLATION MEASUREMENT

Note: If measured voltage is zero and results in a division by zero, record "Zero Volts". This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$							
Ri1 =	Zero Volts	Ω	Impact Time:	0	Minutes	30	s
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$							
Ri2 =	Zero Volts	Ω	Impact Time:	0	Minutes	30	s
Ri = The lesser of Ri1 and Ri2							
Ri =	Zero Volts	Ω	Impact Time:	0	Minutes	30	s
Ri/Vb = electrical Isolation Value/Nominal Battery Voltage							
Minimum Electrical Value is 500 Ω/V							
Ri/Vb =	Zero Volts	Ω/V	Impact Time:	0	Minutes	30	s

	Yes	No, Fail
Is the measured Electrical Isolation Value $\geq$ 500 Ω/V?	X	

DATA SHEET 19 (CONTINUED)

POST-IMPACT ELECTRIC ISOLATION MEASUREMENTS AND CALCULATIONS

Test Vehicle: 2011 Ford Fusion Hybrid 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: MB0224
Test Date: 1/17/2011

PROPULSION BATTERY SYSTEM COMPONENTS

Describe Propulsion Battery Module movement within the passenger compartment [Supply photographs as appropriate]:
No Movement

	Yes	No
Has the Propulsion Battery Module moved within the passenger compartment?		X

Describe intrusion of an outside Propulsion Battery Component into the passenger compartment [Supply photographs as appropriate]:
Not Applicable

	Yes	No
Has an outside Propulsion Battery Component intruded into the passenger compartment?		X

	Yes	No
Is propulsion battery electrolyte spillage visible in the passenger compartment?		X

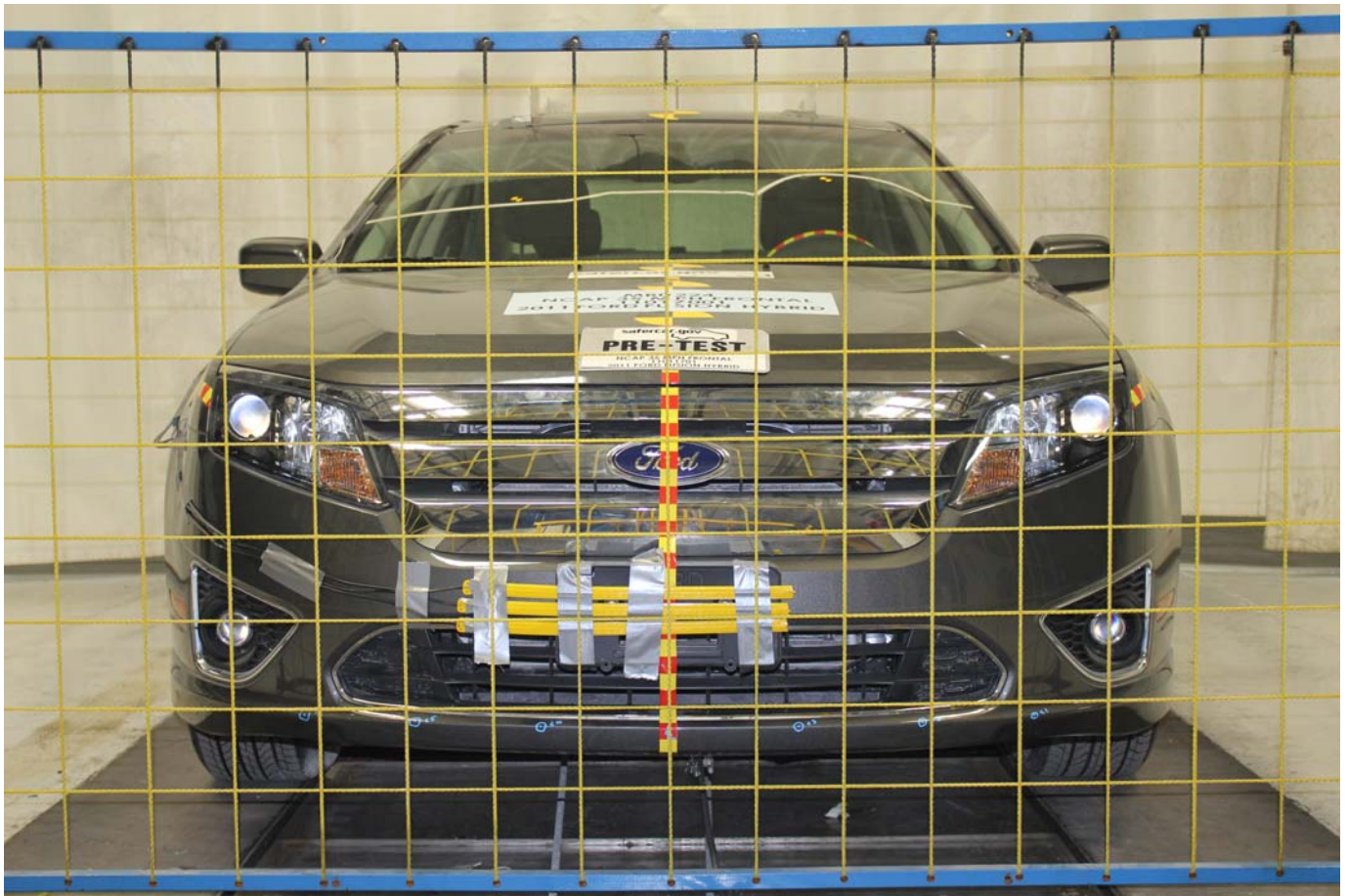
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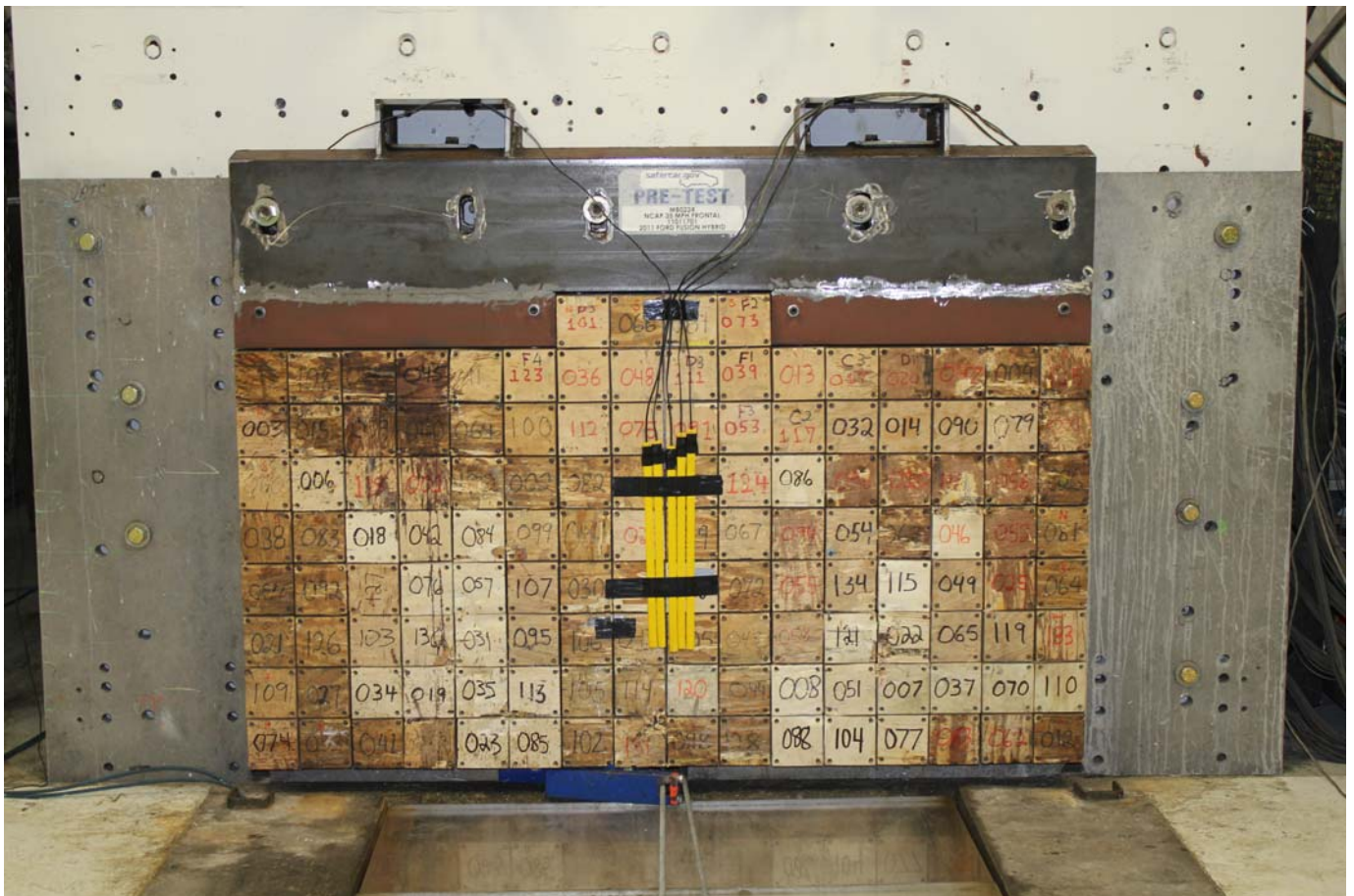
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Load Cell Location



Load Cell Wall

MFD. BY FORD MOTOR CO.

DATE: 09/10 GVWR: 2132KG/4701LB
 FRONT GAWR: 1130KG/2492LB REAR GAWR: 1002KG/2209LB
 THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR
 VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS
 IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: 3FADP0L33BR152849 TYPE: Passenger Car
 MAXIMUM LOAD = OCCUPANTS + LUGGAGE = 385KG/ 850LB
 OCCUPANTS = 5 TOTAL; 2 FRONT, 3 REAR

TIRE (FR): P225/50R17 93V RIMS (FR): 17X7.5J
 (RR): P225/50R17 93V (RR): 17X7.5J
 PRESSURE (FR): 230 kPa/ 33 PSI COLD (RR): 230 kPa/ 33 PSI COLD



3FADP0L33BR152849

TRAILER TOWING - SEE OWNER GUIDE
 EXT PNT: UJ RC: 41 DSO: F0059 R0047
 INT TR TP/PS R AXLE TR SPR TW B 25 H DD44 CMC 5U5A-5420472-AA

TIRE

SEATING CAPACITY

The combined weight and cargo should never exceed:

TIRE	SIZE
FRONT	P225/50R17 93V
REAR	P225/50R17 93V
SPARE	T145/80D16 105M

5U5A-1532-AA (TLU)

Manufacturer's Label

TIRE AND LOADING INFORMATION

SEATING CAPACITY TOTAL : 5 FRONT: 2 REAR: 3

The combined weight of occupants and cargo should never exceed : **385 kg or 850 lbs.**

TIRE	SIZE	COLD TIRE PRESSURE
FRONT	P225/50R17 93V	230 KPA, 33 PSI
REAR	P225/50R17 93V	230 KPA, 33 PSI
SPARE	T145/80D16 105M	415 KPA, 60 PSI

SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION

5U5A-1532-AA (TLU)

3FADP0L33BR152849



Tire Placard



Right Front Three-Quarter View, As Received



Left Rear Three-Quarter View, As Received



Pre-Test Front View



Post-Test Front View



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



Post-Test Left Side View



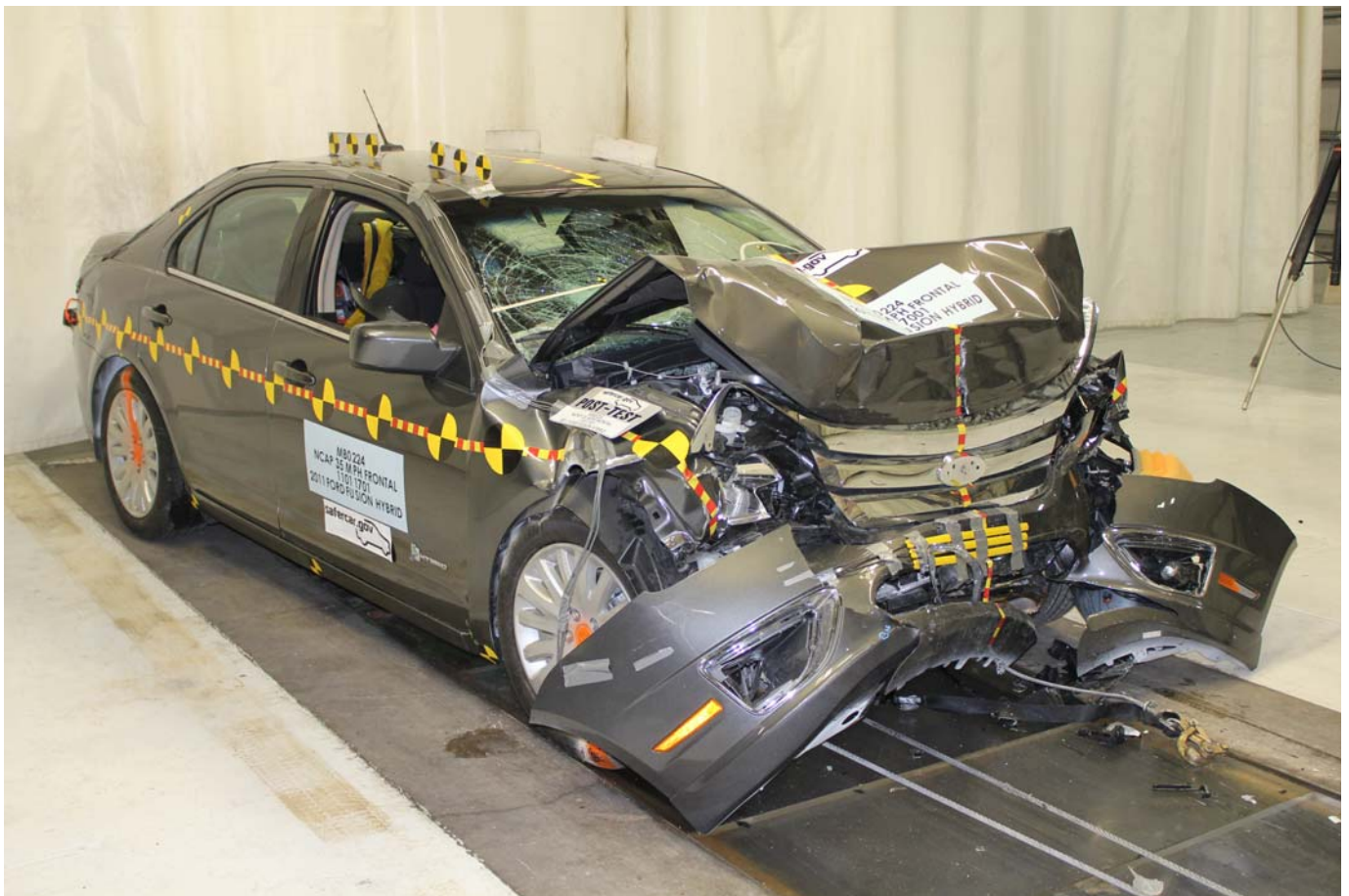
Pre-Test Right Side View (with vehicle at barrier)



Post-Test Right Side View



Pre-Test Right Front Three-Quarter View



Post-Test Right Front Three-Quarter View



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



Post-Test Left Rear Three-Quarter View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



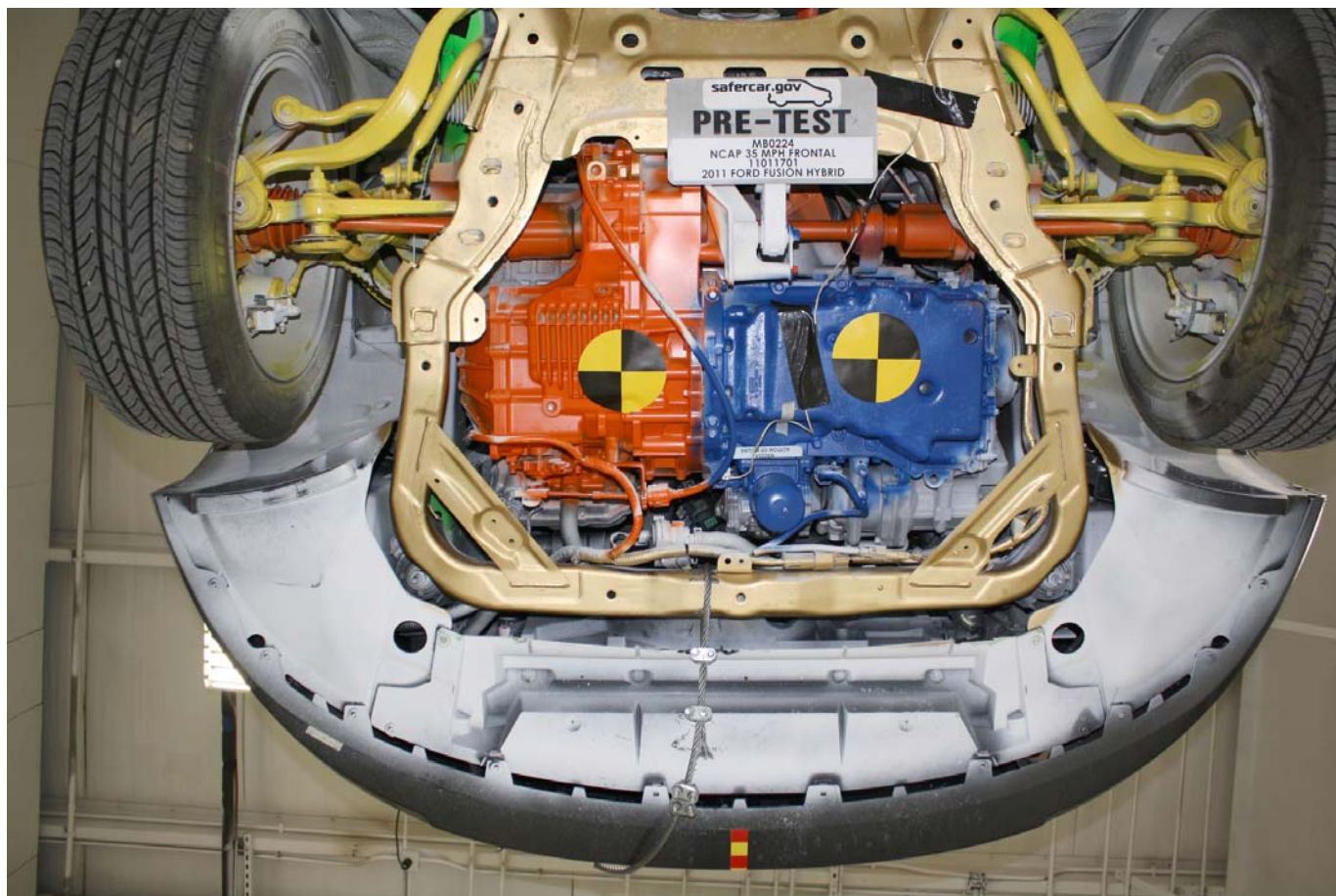
Post-Test Engine Compartment View



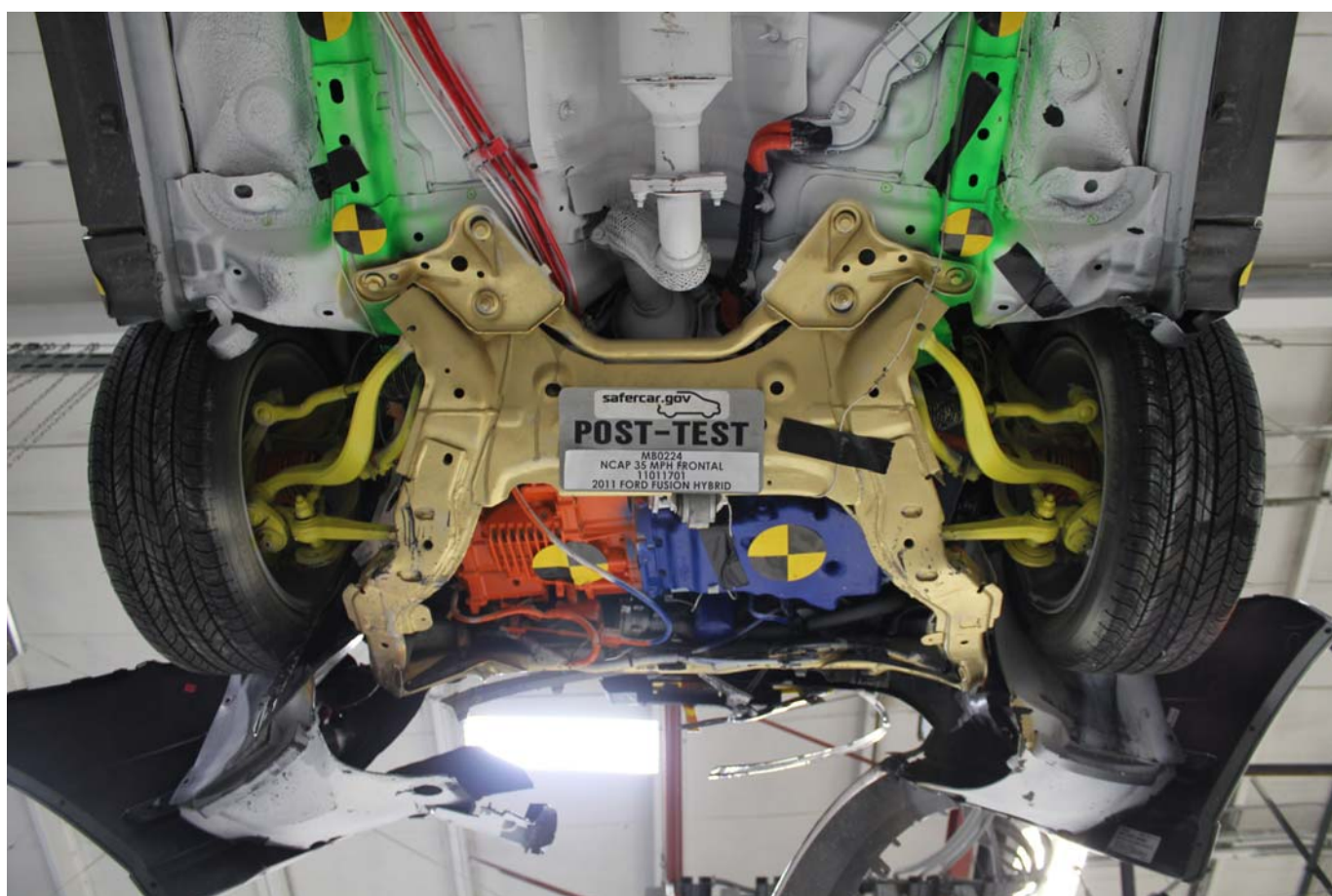
Pre-Test Fuel Cap View



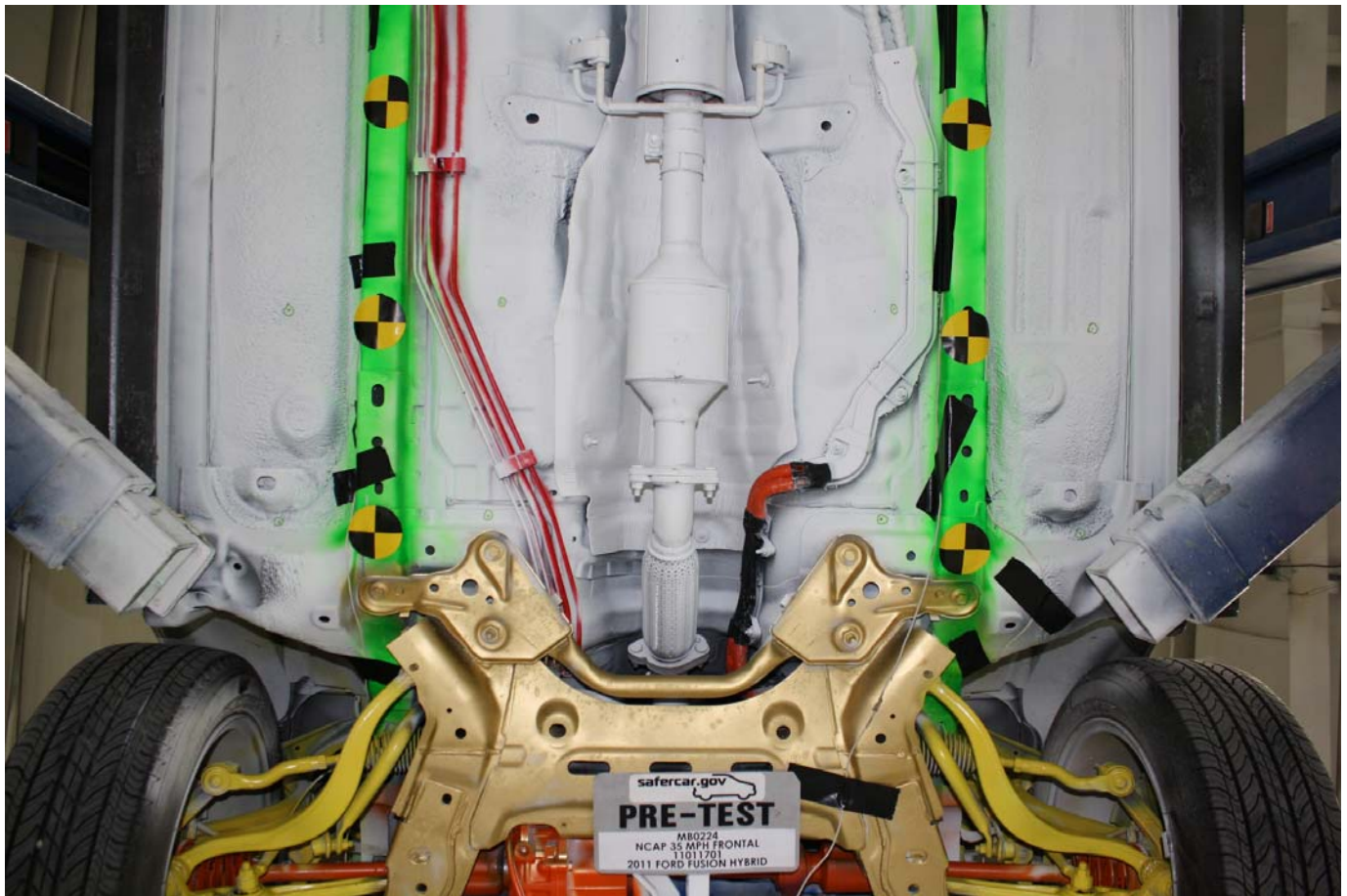
Post-Test Fuel Cap View



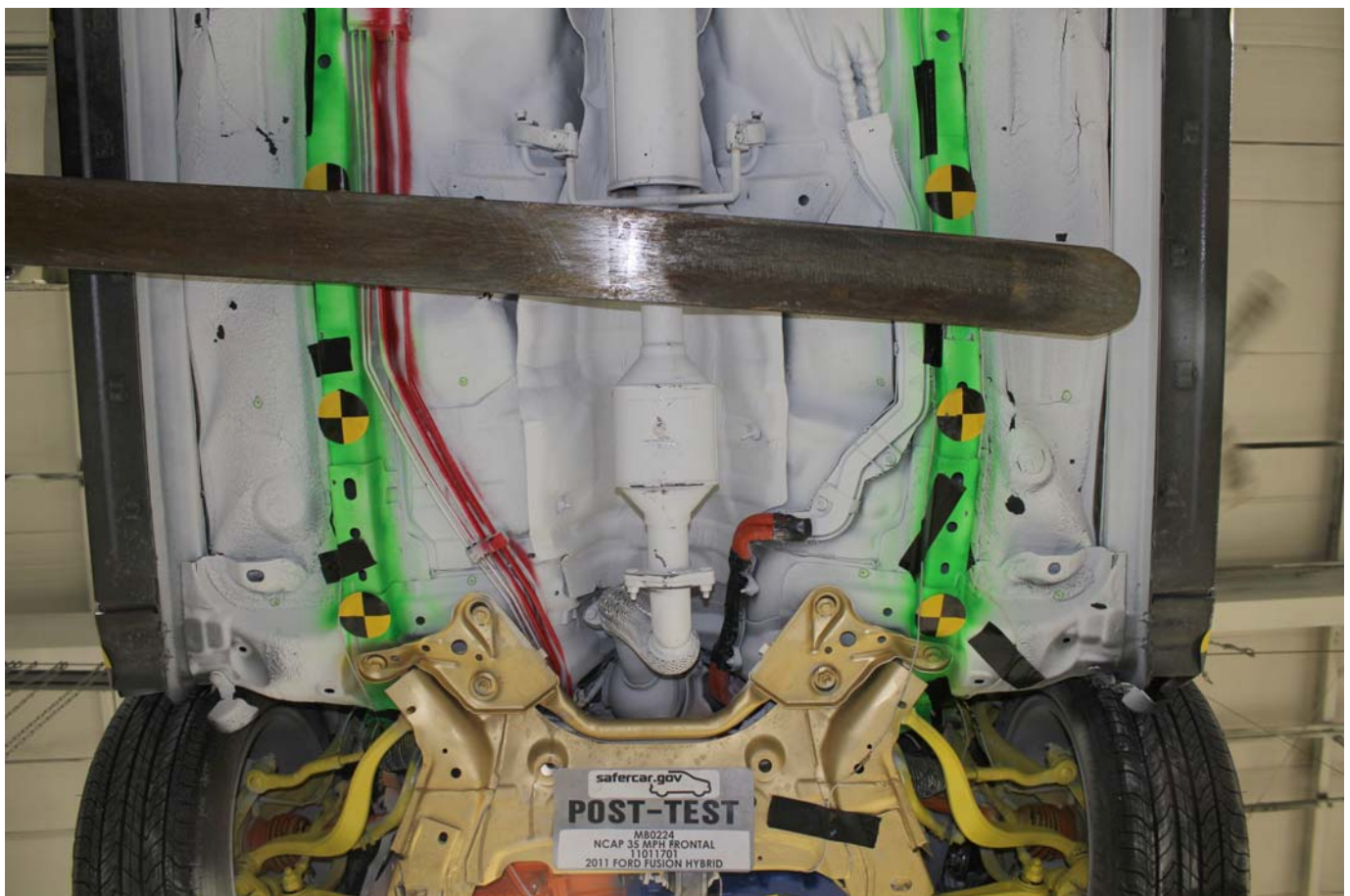
Pre-Test Front Underbody View



Post-Test Front Underbody View



Pre-Test Mid Front Underbody View



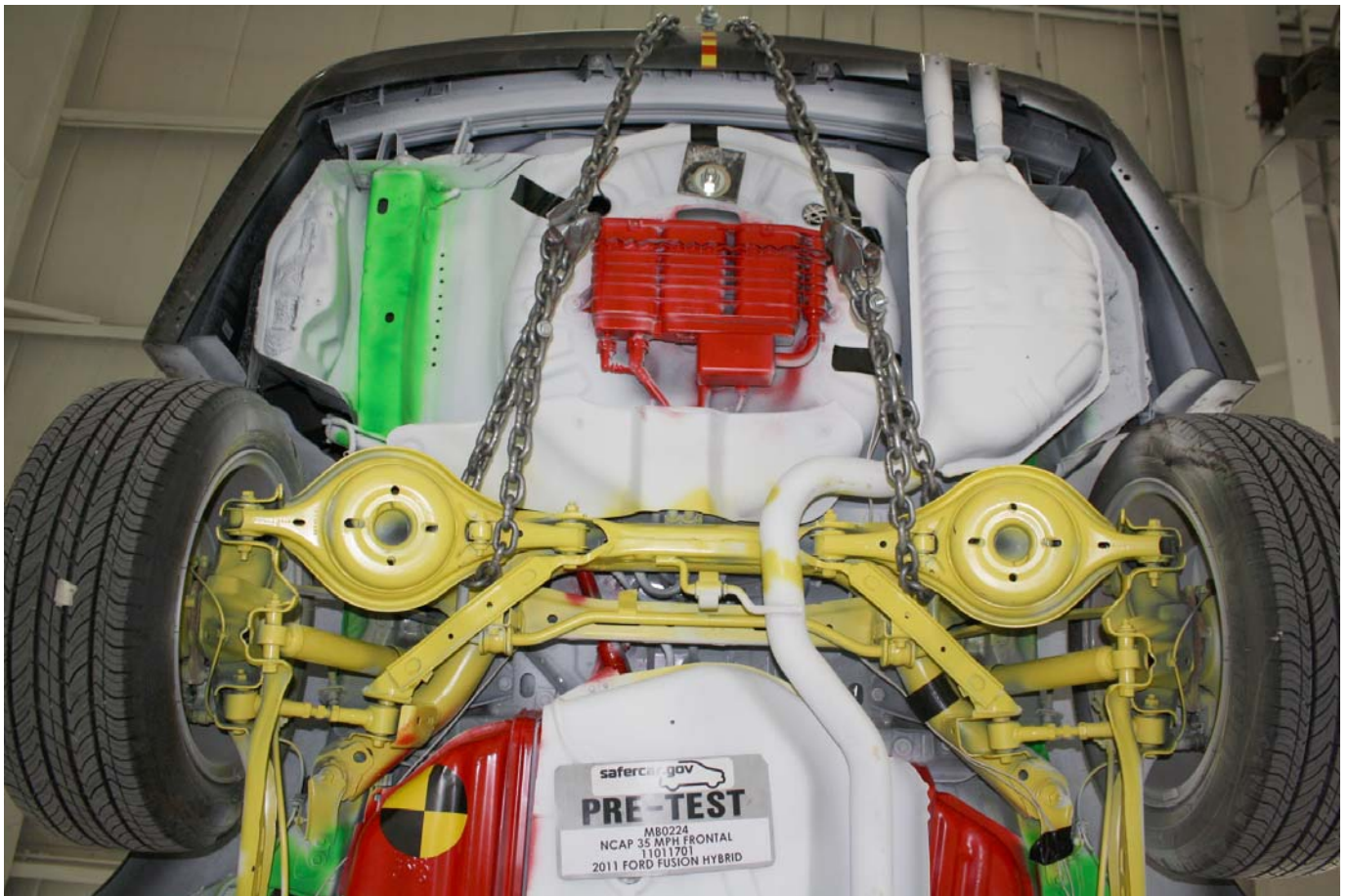
Post-Test Mid Front Underbody View



Pre-Test Mid Rear Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Dummy Cable Routing



Post-Test Dummy Cable Routing



Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



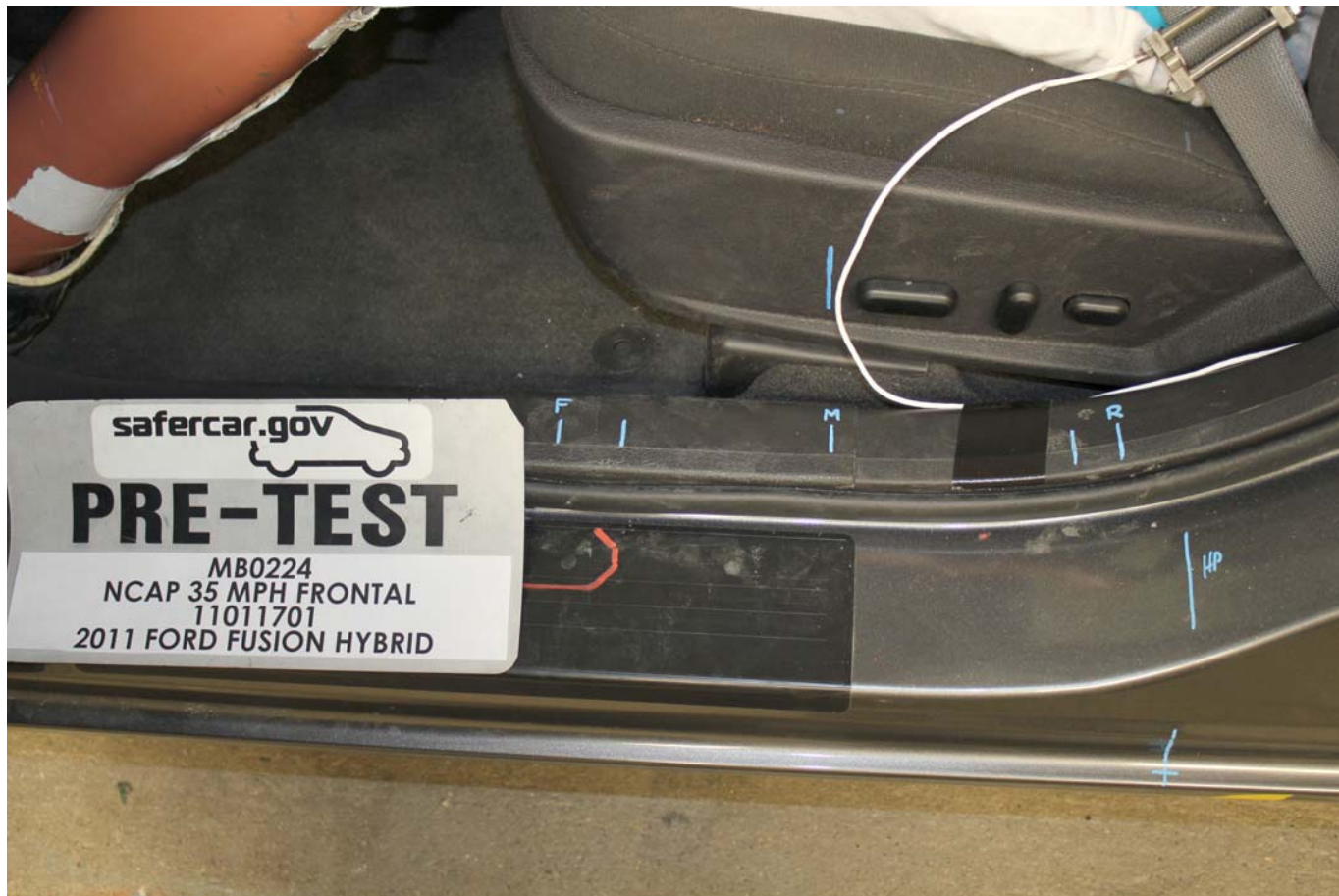
Post-Test Driver Dummy Window View



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



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



Pre-Test Driver's Seat Fore-Aft Markings



Post-Test Driver's Seat Fore-Aft Markings



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



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



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



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan



Post-Test Driver Dummy Contact with Airbag



Post-Test Driver Dummy Contact with Headrest



Post-Test Driver Dummy Contact with Knee Airbag



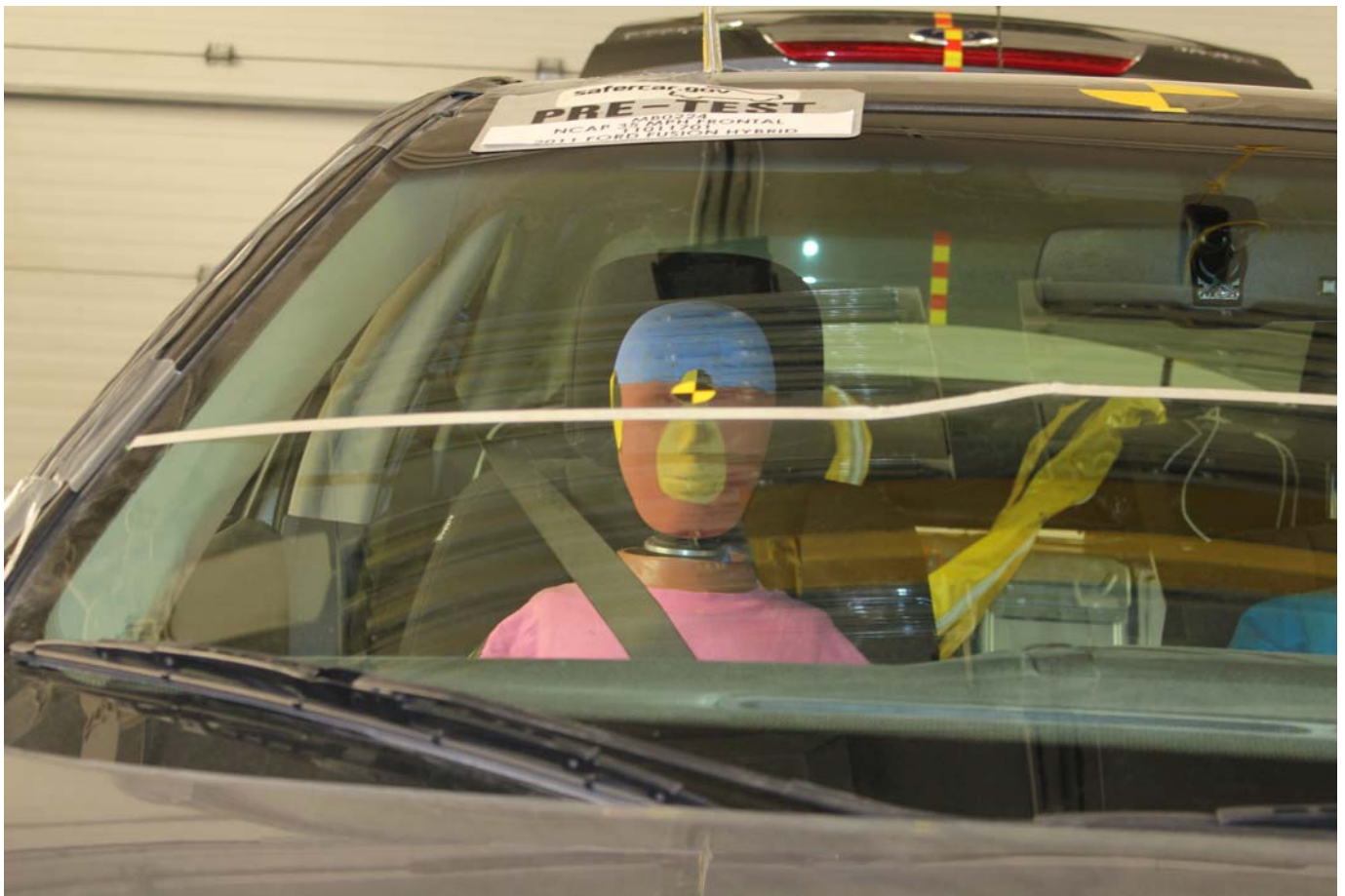
Post-Test Driver Dummy Contact with Knee Airbag



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)



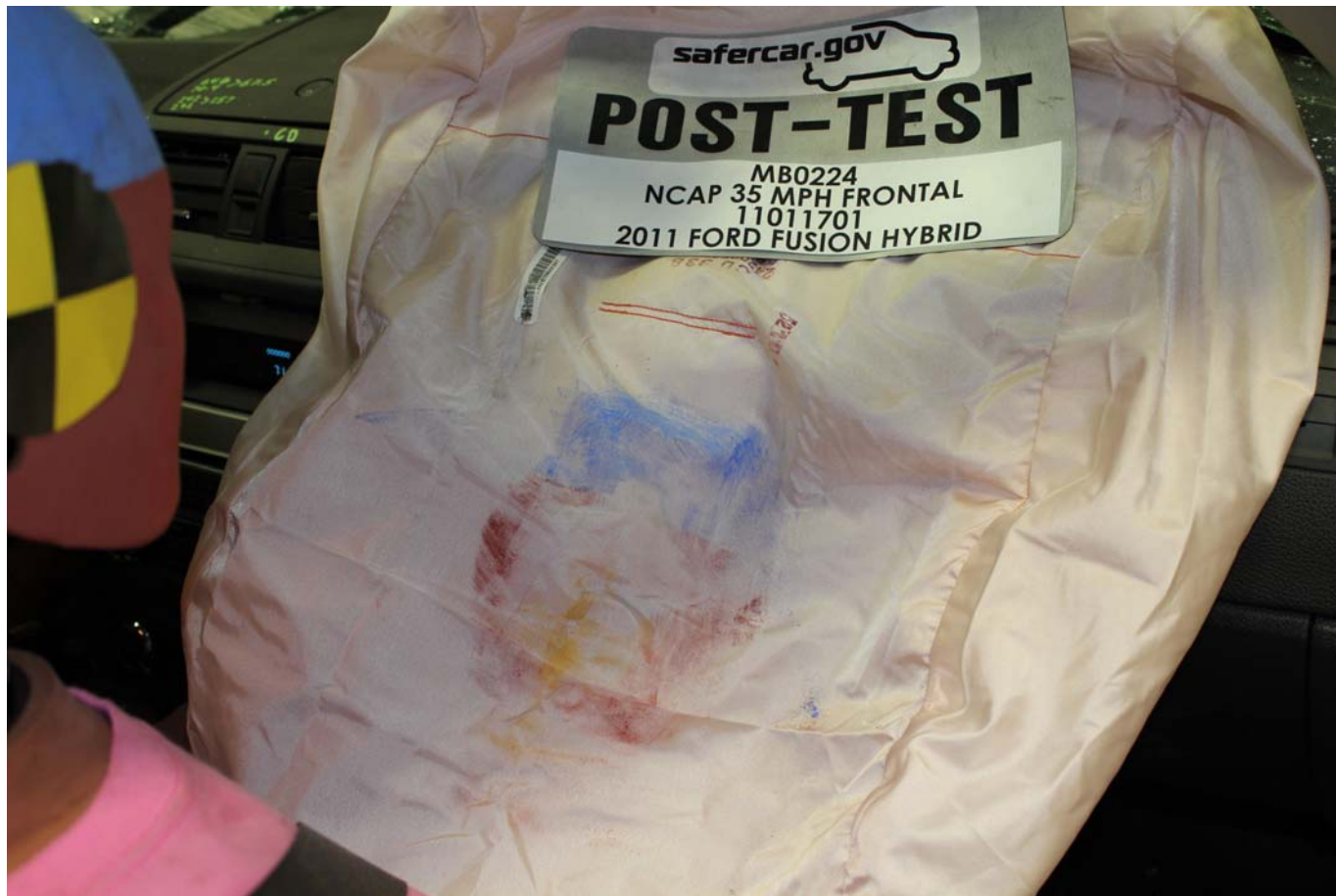
Post-Test Passenger's Side Knee Bolster (without dummy)



Pre-Test Passenger's Side Floorpan



Post-Test Passenger's Side Floorpan



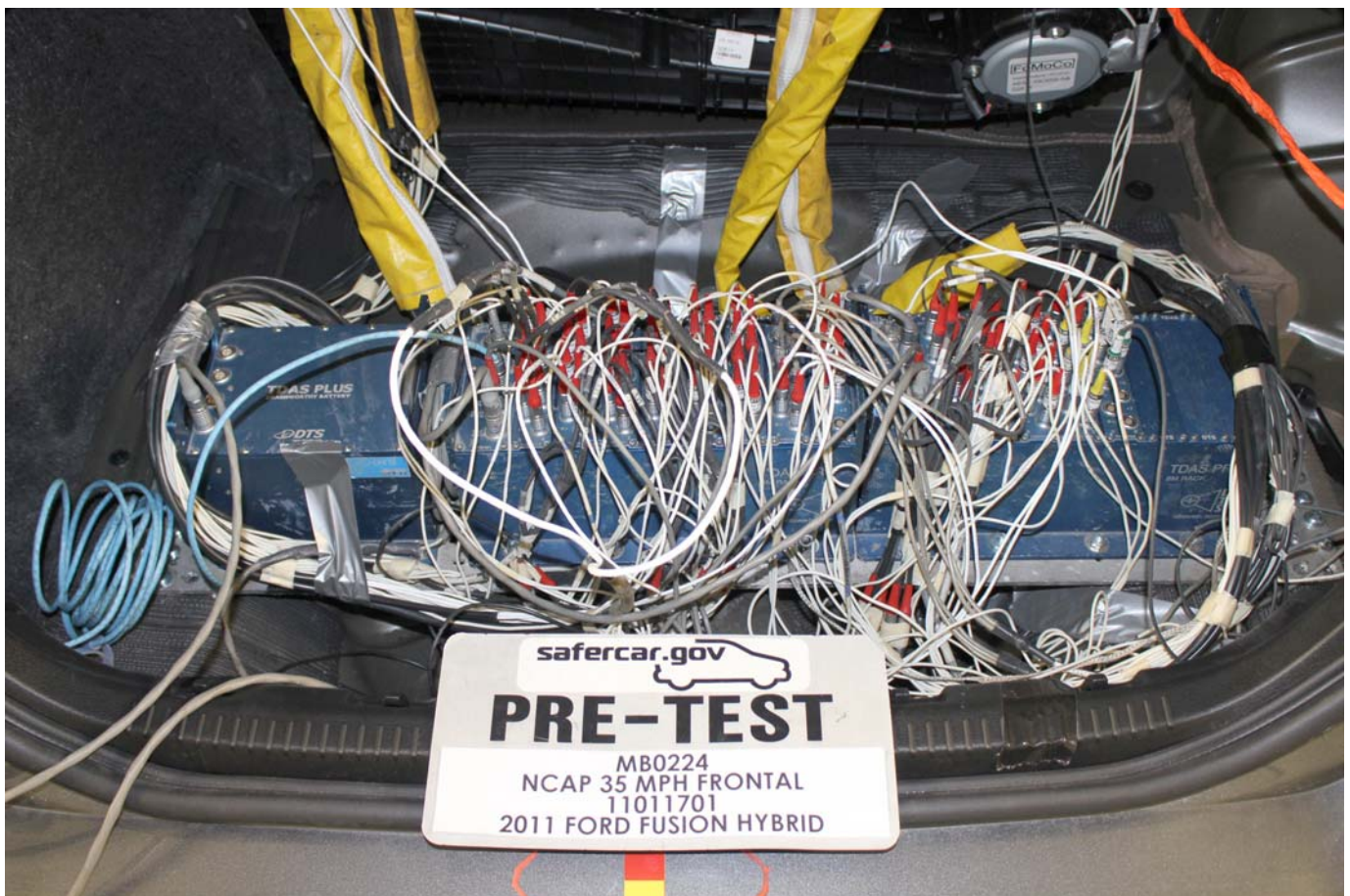
Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glovebox



Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

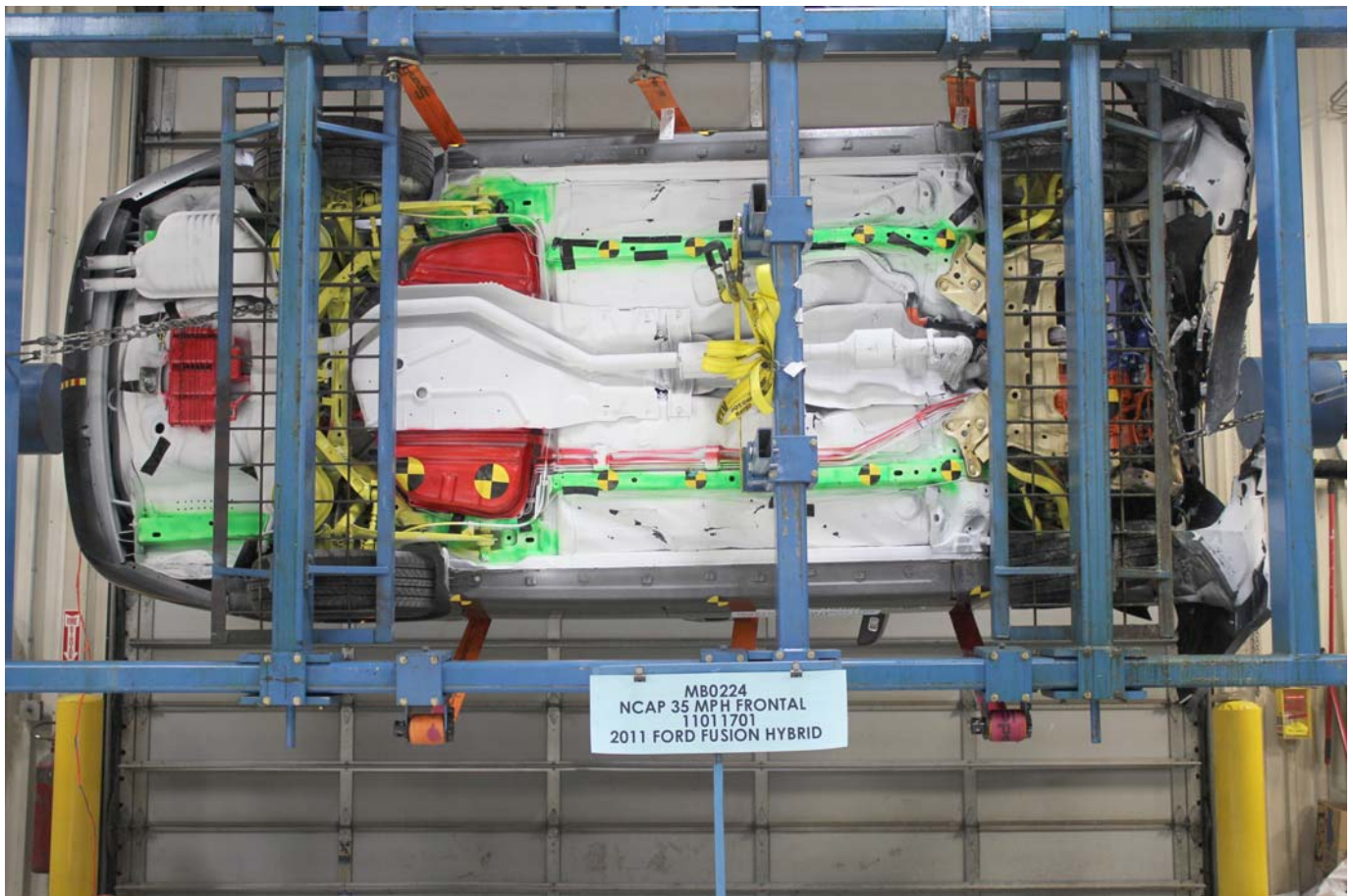
Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



Vehicle at 0 Degrees on Static Rollover Device



Vehicle at 90 Degrees on Static Rollover Device



Vehicle at 180 Degrees on Static Rollover Device



Vehicle at 270 Degrees on Static Rollover Device



Vehicle at 360 Degrees on Static Rollover Device



Vehicle Impact

VEHICLE DESCRIPTION

FUSION HYBRID

2011 FUSION HYBRID
5-PASSENGER
2.5L I4 HEV ENGINE
E-CVT AUTO TRANSMISSION

BR 152849

EXTERIOR
STERLING GRAY METALLIC
INTERIOR
DK CHARCOAL CLOTH SEATS

www.fordvehicles.com

STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE

- EXTERIOR
 - 17" ALUMINUM WHEELS
 - AUTO HEADLAMPS
 - BLIND SPOT MIRRORS
 - EASYFUEL CAPLESS FILLER
 - KEYLESS ENTRY KEYPAD
 - POWER, HEATED MIRRORS
- INTERIOR
 - TOUCH UP/DOWN DR/PASS WIN
 - LOWAY PMR DR SEAT W/LUMBAR
 - AM/FM CD/MP3/SAT CAPABLE
 - W/ AUDIO INPUT JACK
 - DUAL-ZONE ELECTRONIC
 - AUTO CLIMATE CONTROL
 - ECO-FRIENDLY CLOTH SEATING
 - ELECTROCHROMIC MIRROR
 - LEATHER WRAPPED STR WHEEL
 - W/CRUISE & AUDIO CONTROLS
 - POWER WINDOWS & LOCKS

- SYNC VOICE ACTIVATED SYS
- SAFARI SAT NAVI/AK&HI
- FUNCTIONAL
- 4-MIL DISC BRAKES W/ ABS
- DRIVER FRONT PASSENGER
- GLOBAL OPEN CONTROLS
- MYKEY
- REGENERATIVE BRAKING SYS
- TRACTION CONTROL
- UNIVERSAL GARAGE DOOR OPENER
- SAFETY/SECURITY
- ADVANCETRAC ESC
- LOCKOUT LATCH SAFETY SYSTEM
- SECURITY PASS ANTITHEFT
- TIRE PRESSURE MONITOR SYS
- SIDE AIR BAGS/CURTAINS
- WARRANTY
- 3YR/36,000 BUMPER / BUMPER
- 5YR/60,000 POWERTRAIN

EPA Fuel Economy Estimates

CITY MPG

41

Expected range
for most drivers
34 to 48 MPG

HIGHWAY MPG

36

Expected range
for most drivers
29 to 43 MPG

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

Estimated
Annual Fuel Cost
\$1,152

based on 15,000 miles
at \$3.00 per gallon

Combined Fuel Economy
This Vehicle

39

12 50

All Midsize Cars



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

SOLD TO 41E 304 Percaro Ford 6001 Washington Avenue Racine WI 53406		ONE RWK6 41E 304	DEALER NO. 41E 304	METHOD OF TRANSP. RAIL ITEM #: 41-0029 OT 2
SHIP TO IF OTHER THAN SOLD TO		TWO	3FADP0L33BR152849	
SHIP THROUGH	FINAL ASSEMBLY POINT HERMOSILLO	AJ202 N RA 2X 115 000819 09 20 10		

EXTENDED SERVICE PLAN
Ford Extended Service Plan is the only service contract backed by Ford and honored at all Ford and Lincoln Mercury Dealers. Ask your dealer for prices and additional details or see our website at www.ford-esp.com.

PRICE INFORMATION

STANDARD VEHICLE PRICE \$28,100.00

INCLUDED ON THIS VEHICLE
RAPID SPEC 500A

OPTIONAL EQUIPMENT
FRONT LICENSE PLATE BRACKET
HEATER, ENGINE BLOCK
50 STATE EMISSIONS
TOTAL OPTIONS

NO CHARGE
NO CHARGE
NO CHARGE

TOTAL VEHICLE & OPTIONS
DESTINATION & DELIVERY

28,100.00
725.00

Manufacturer's
Suggested Retail Price

This vehicle qualifies for auto insurance discounts, call
1-866-367-3131 or visit www.fordautoinsurance.com for
Ford Motor Company
Insurance Services
availability in your state.

TOTAL MSRP

\$28,825.00

GOVERNMENT SAFETY RATINGS

Frontal
Crash Driver Not Rated
Passenger Not Rated

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

Side
Crash Front seat To Be Rated
Rear seat To Be Rated

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

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

Star ratings range from 1 to 5 stars (★ ★ ★ ★ ★), with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA).

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

APPENDIX B
DUMMY RESPONSE DATA

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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 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

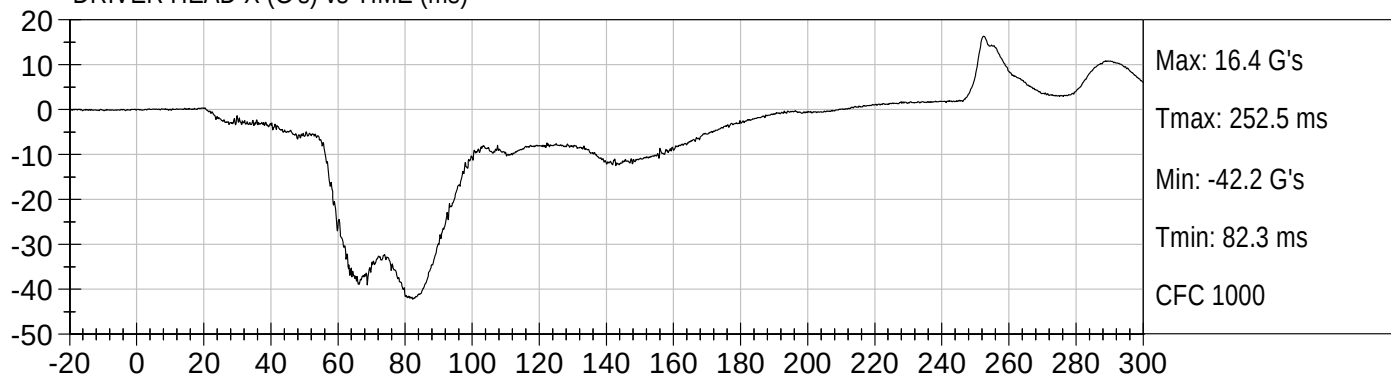
Driver Left Upper Tibia Force Z

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

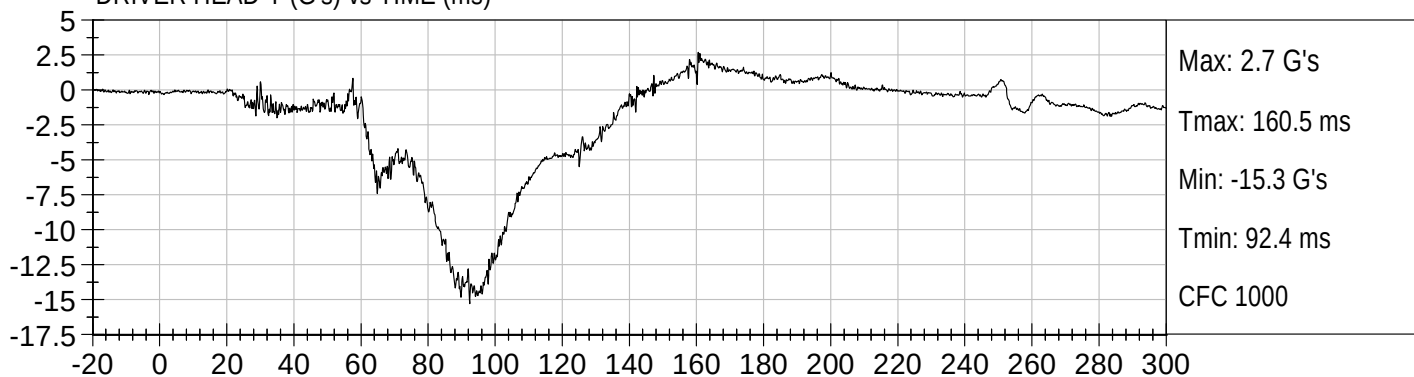
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right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



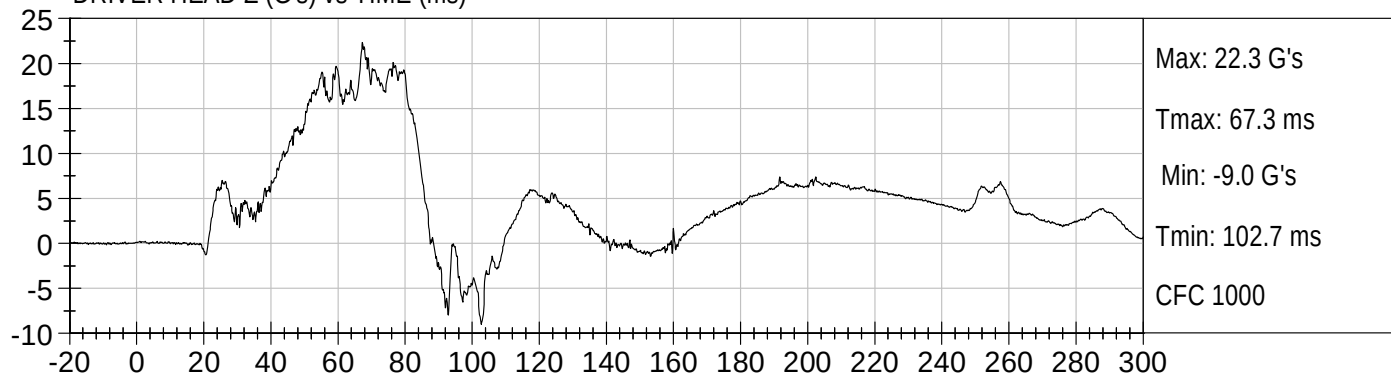
DRIVER HEAD X (G's) vs TIME (ms)



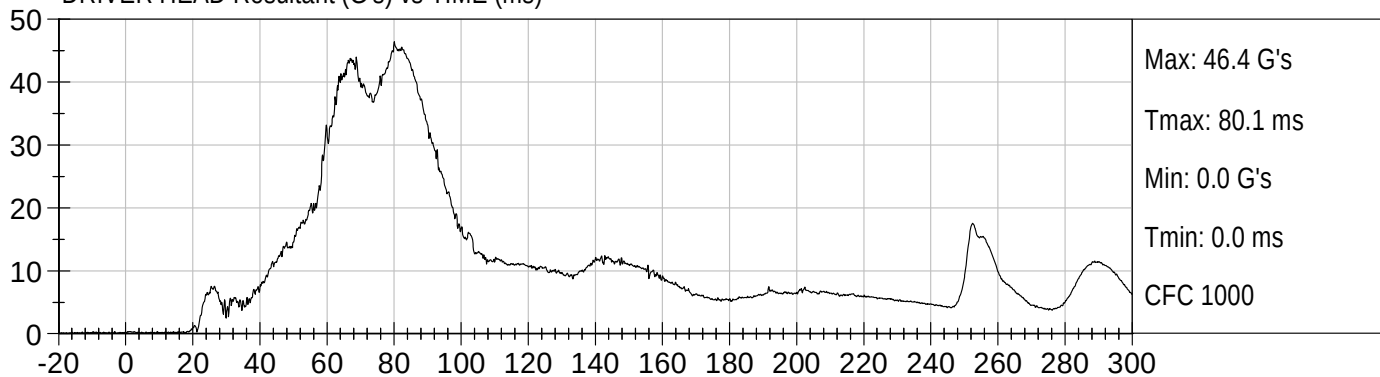
DRIVER HEAD Y (G's) vs TIME (ms)

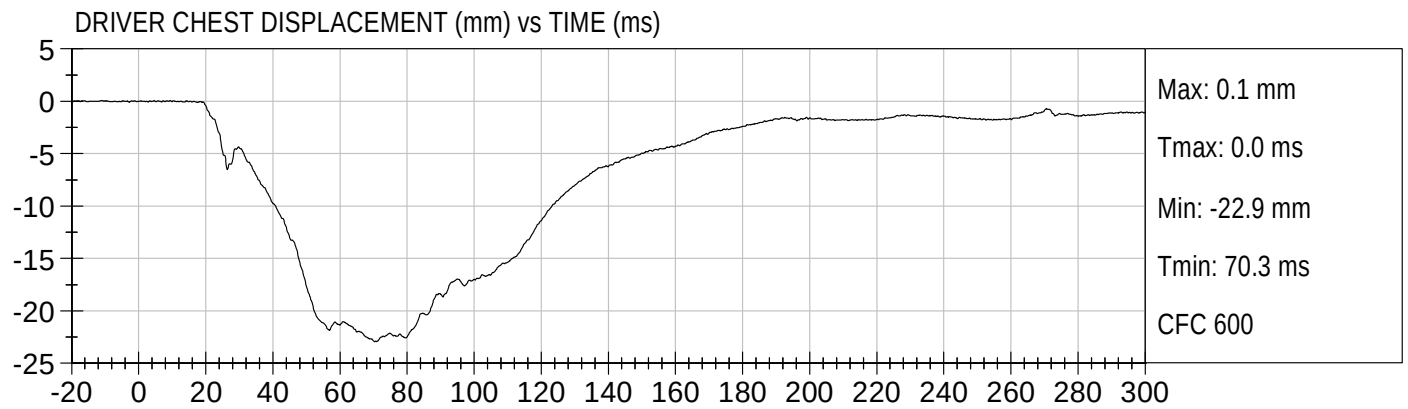


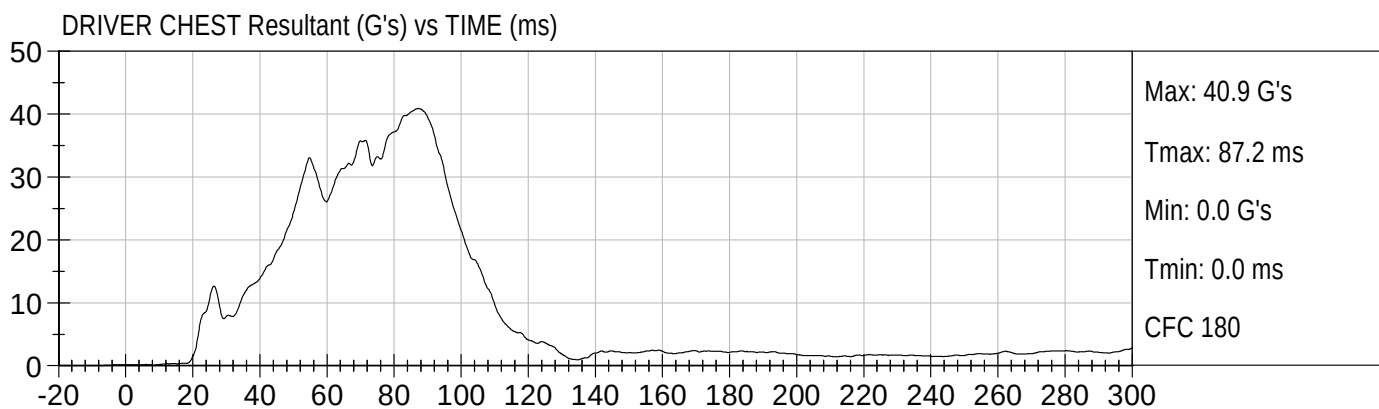
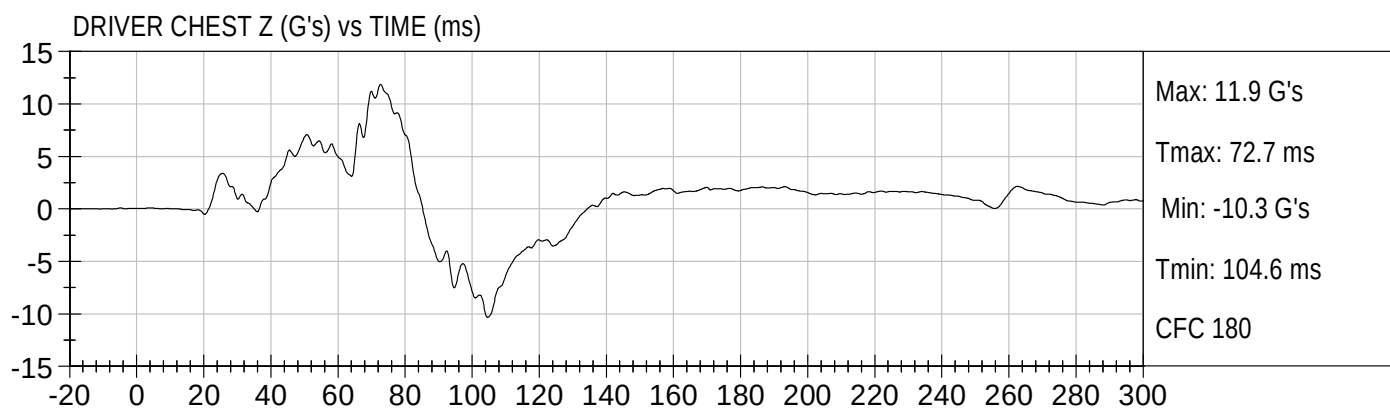
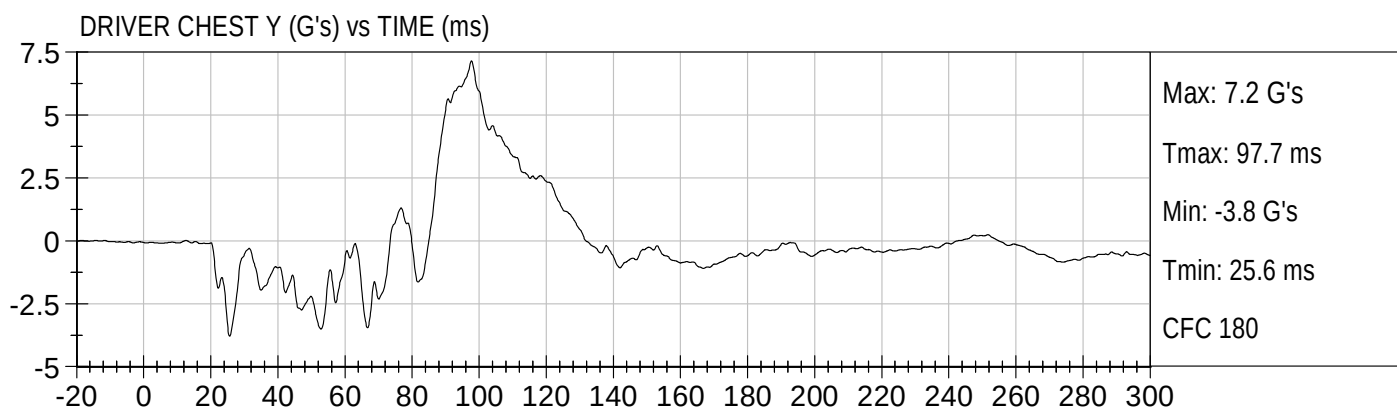
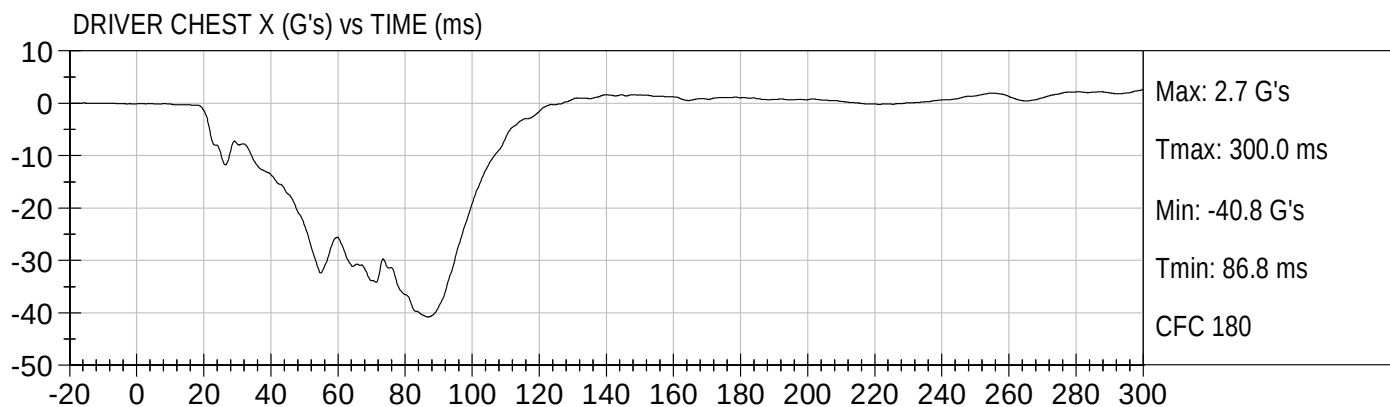
DRIVER HEAD Z (G's) vs TIME (ms)

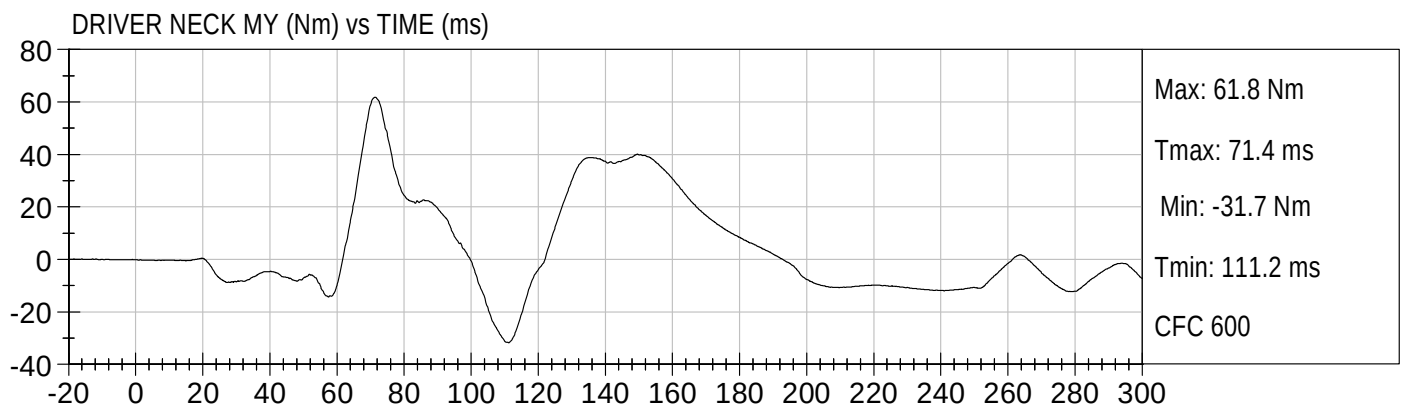
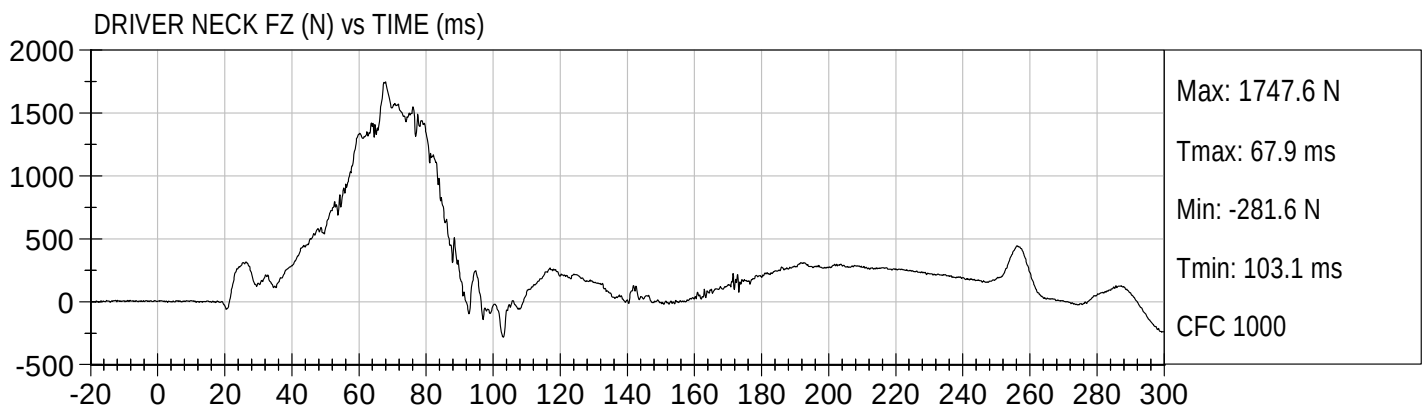
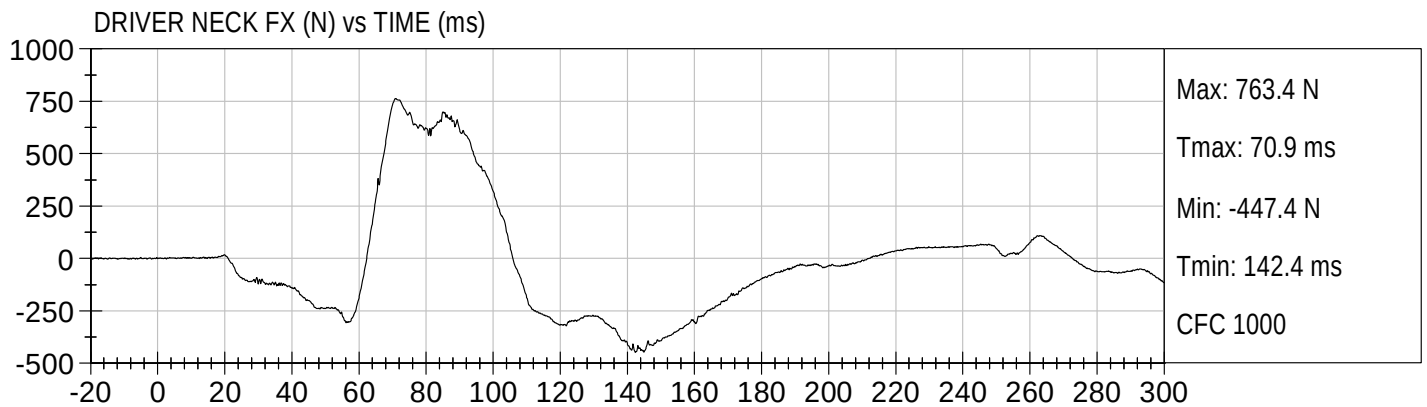


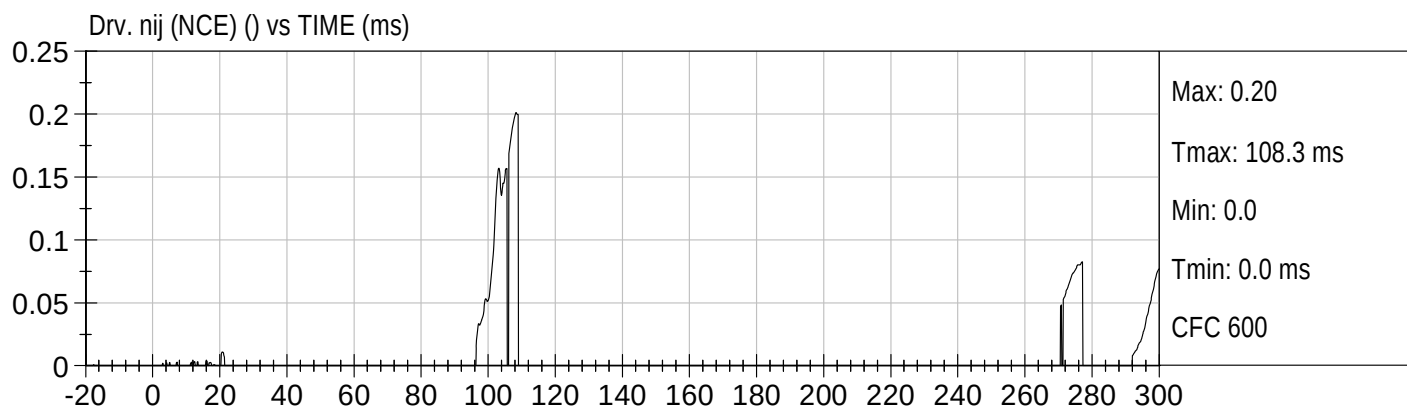
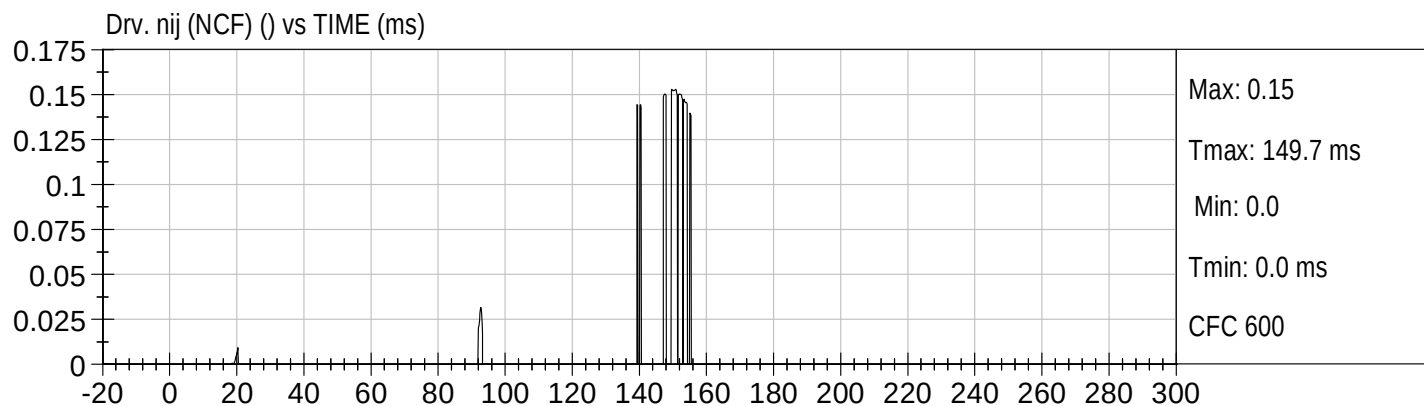
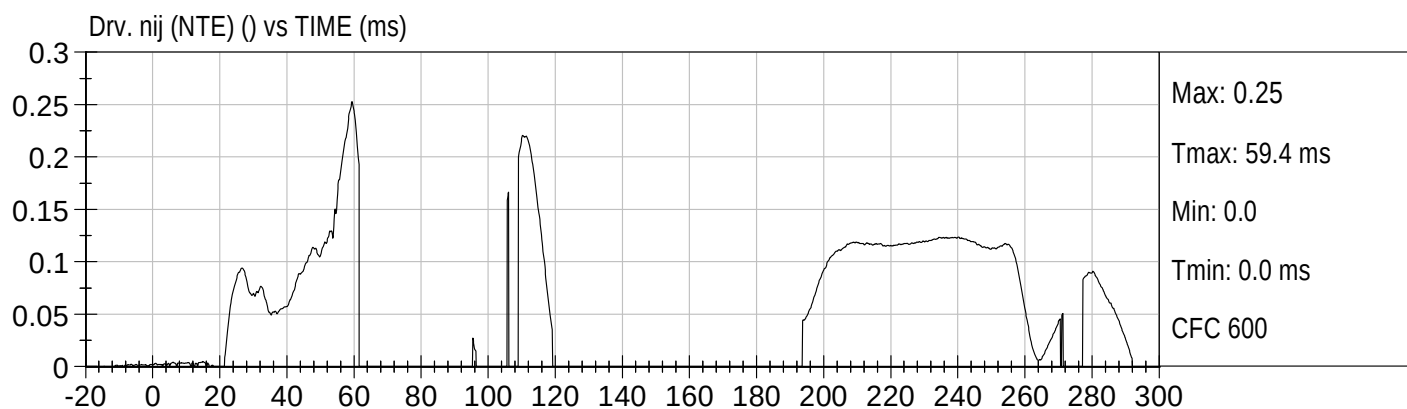
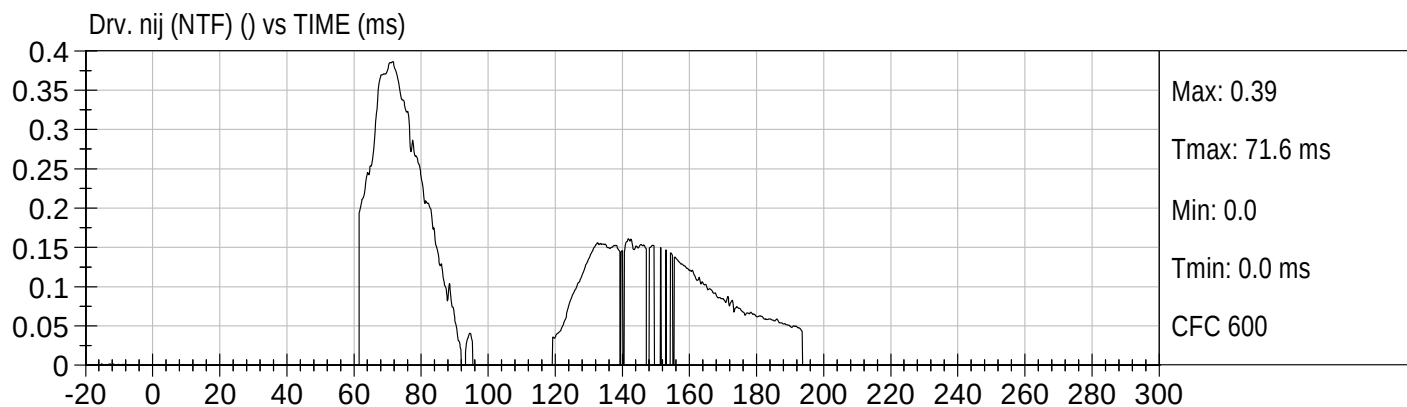
DRIVER HEAD Resultant (G's) vs TIME (ms)

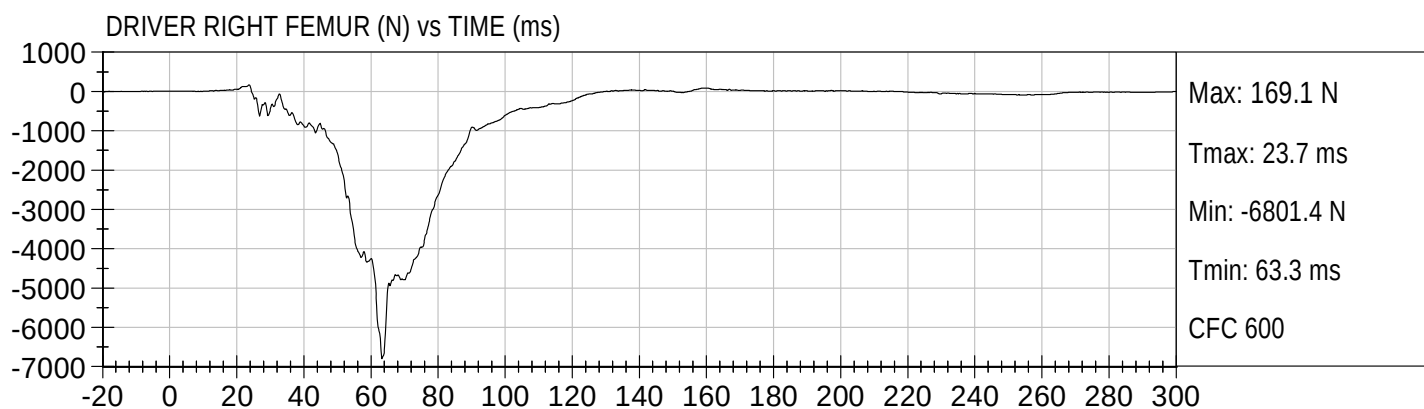
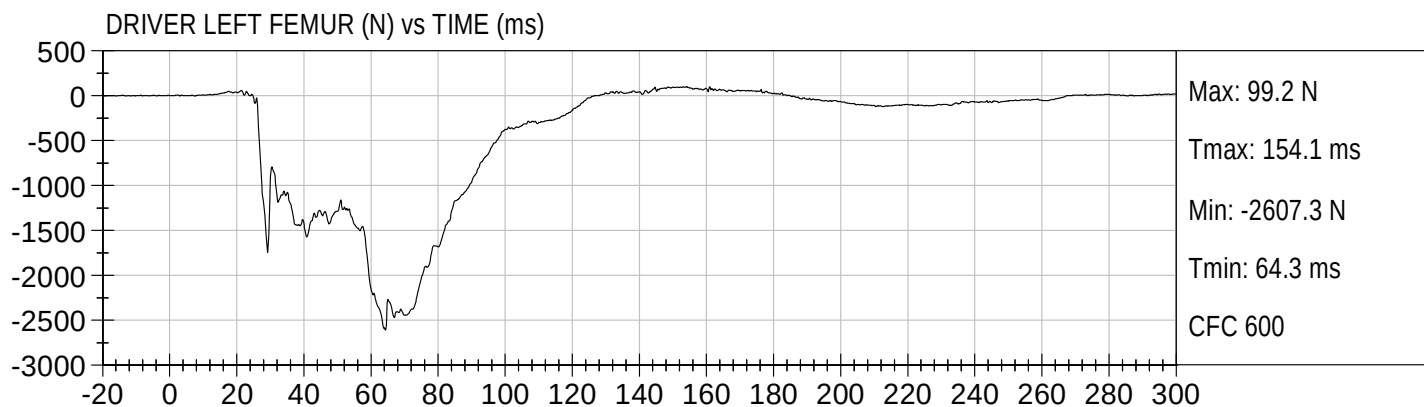


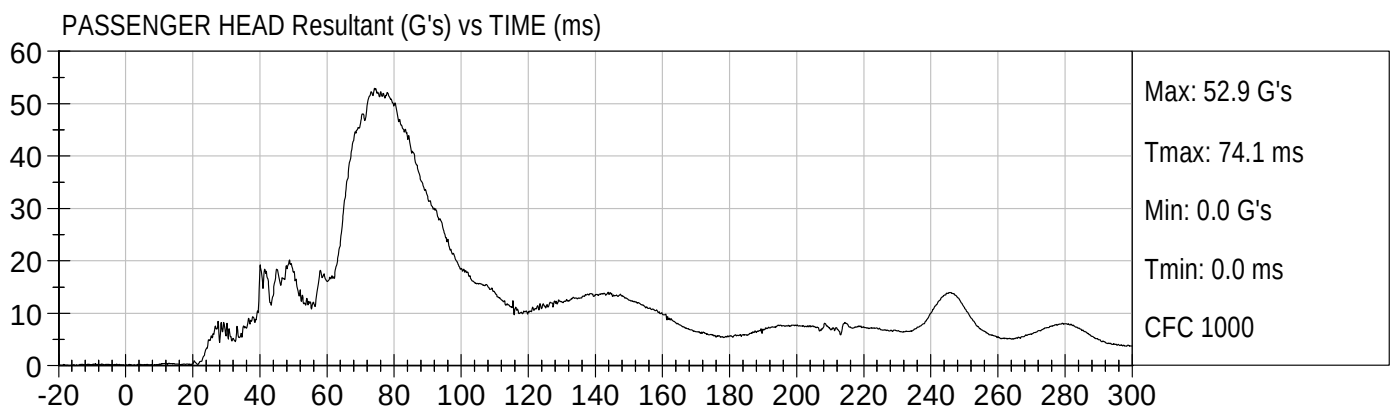
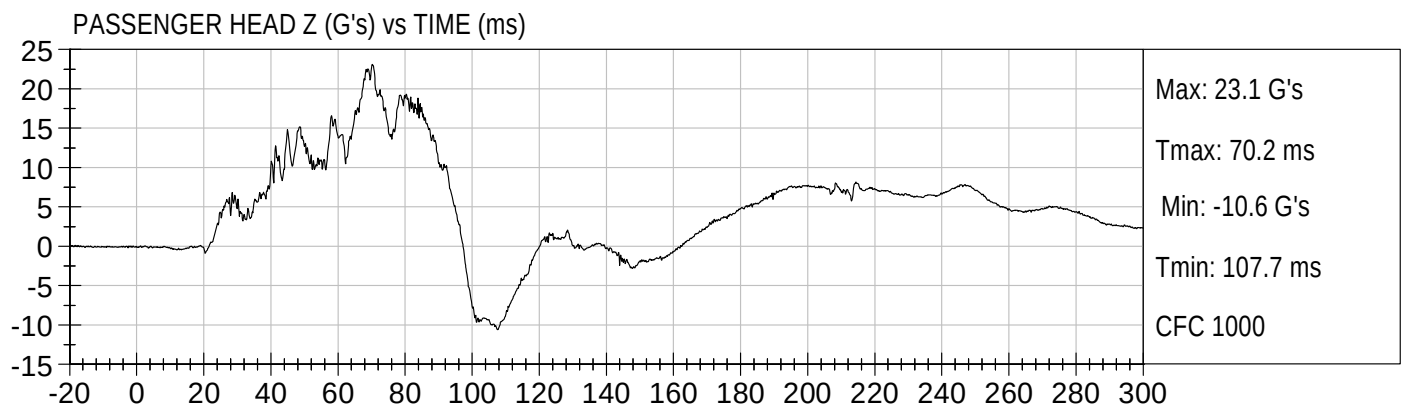
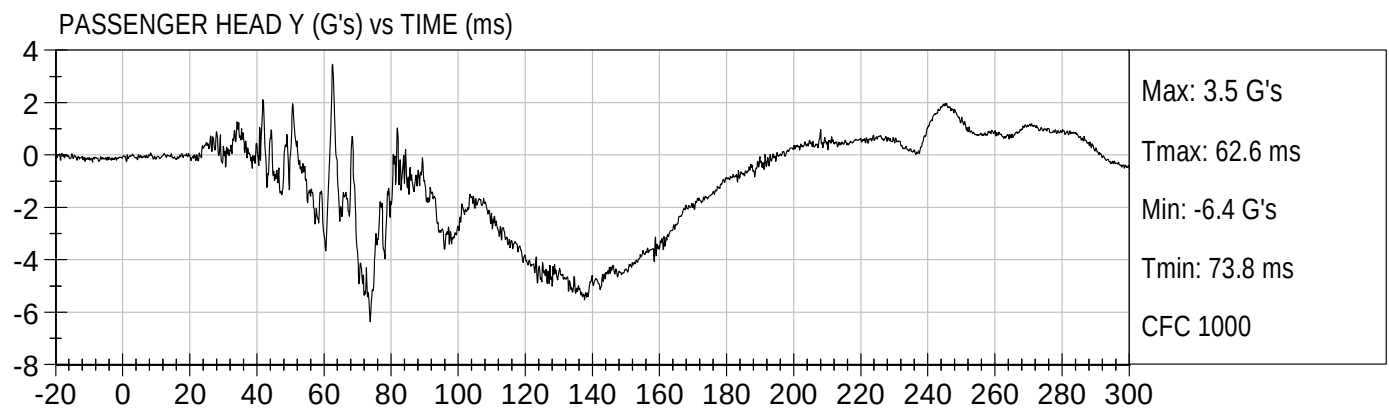
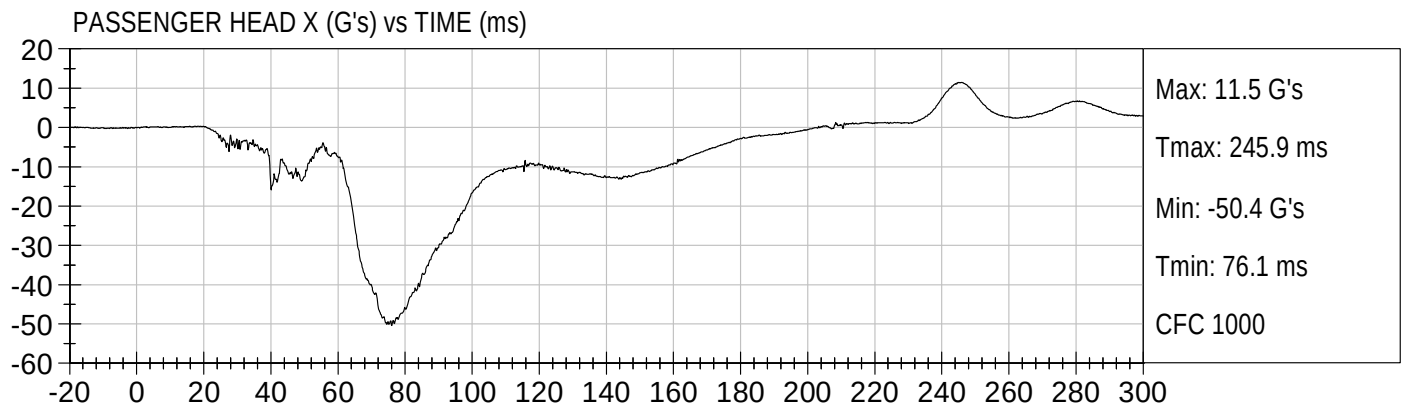


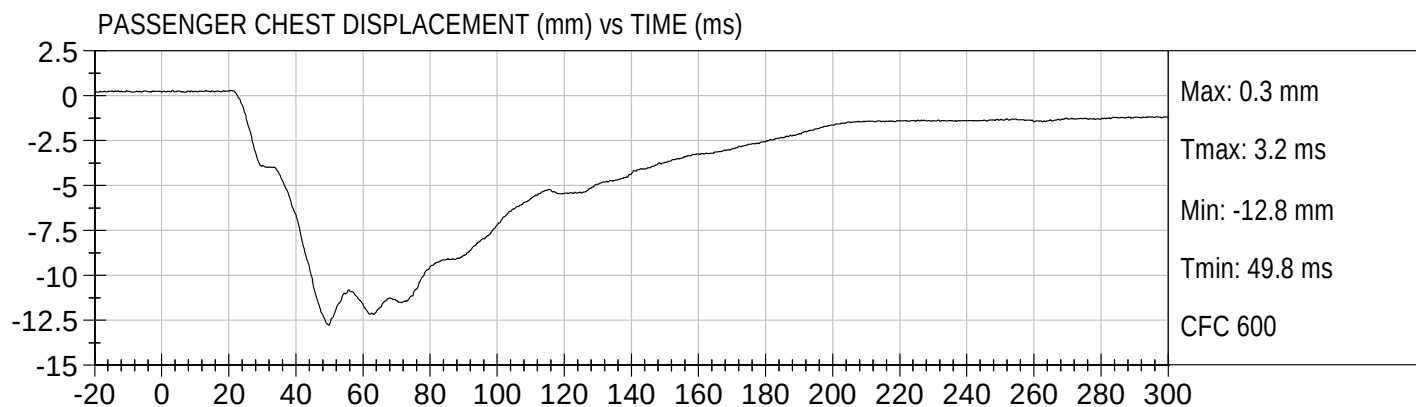


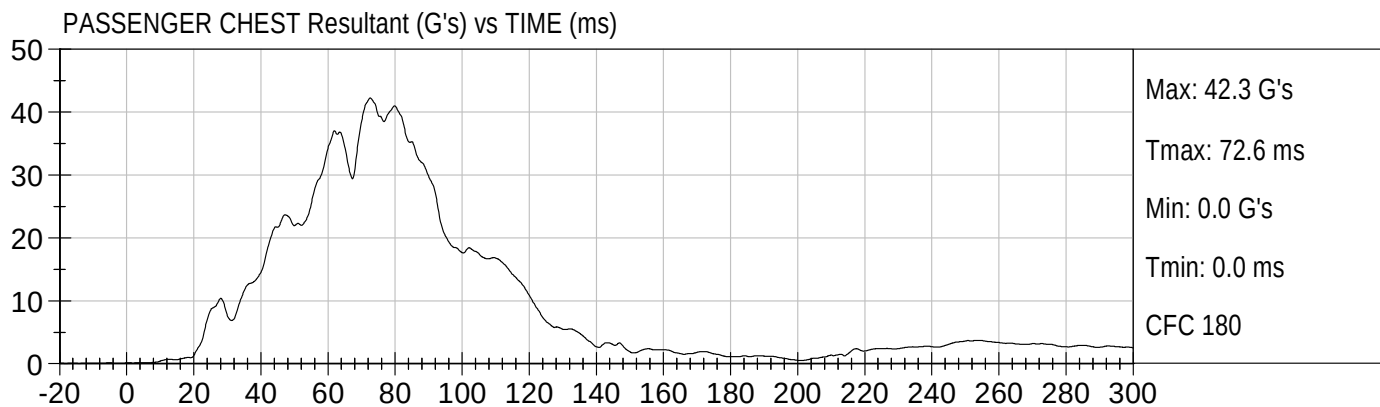
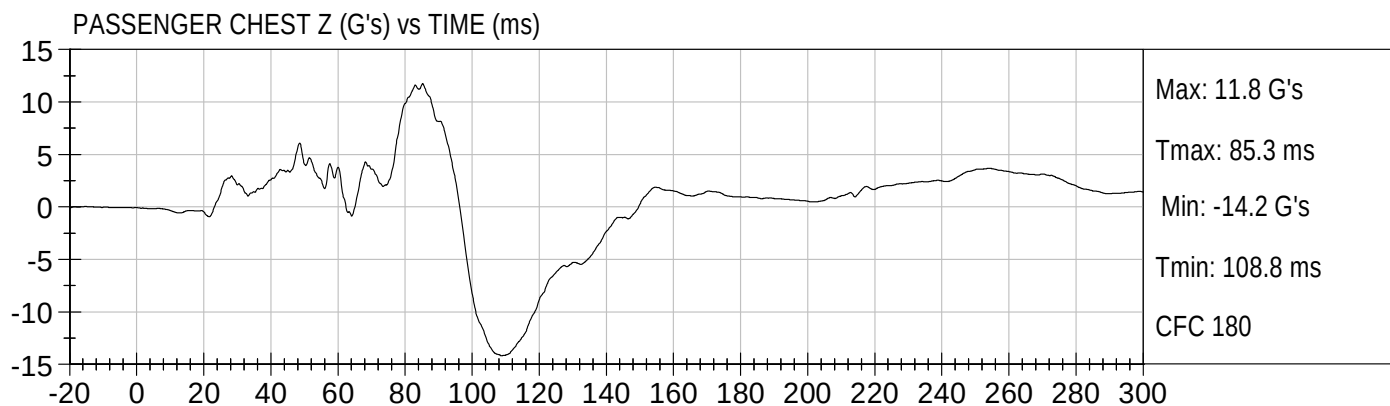
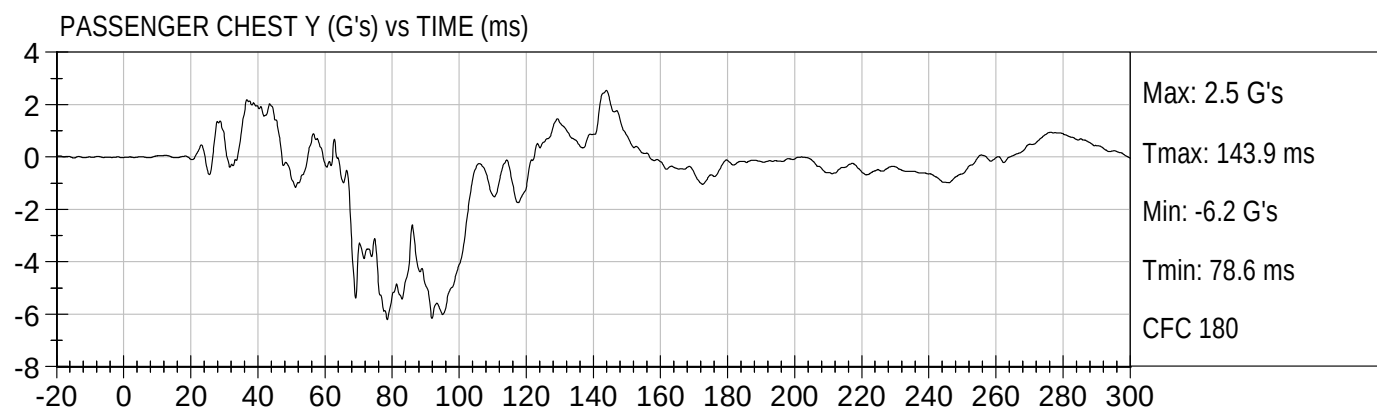
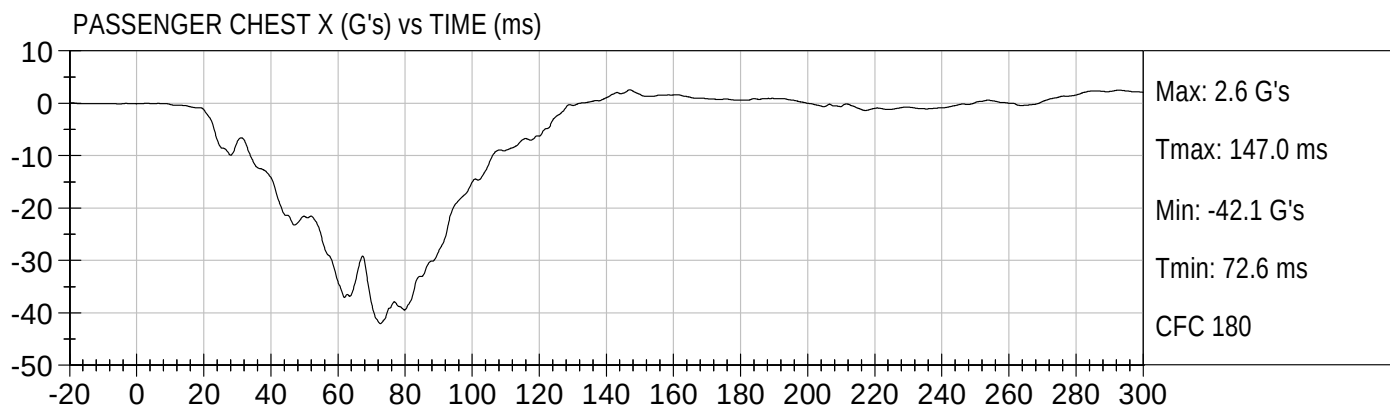


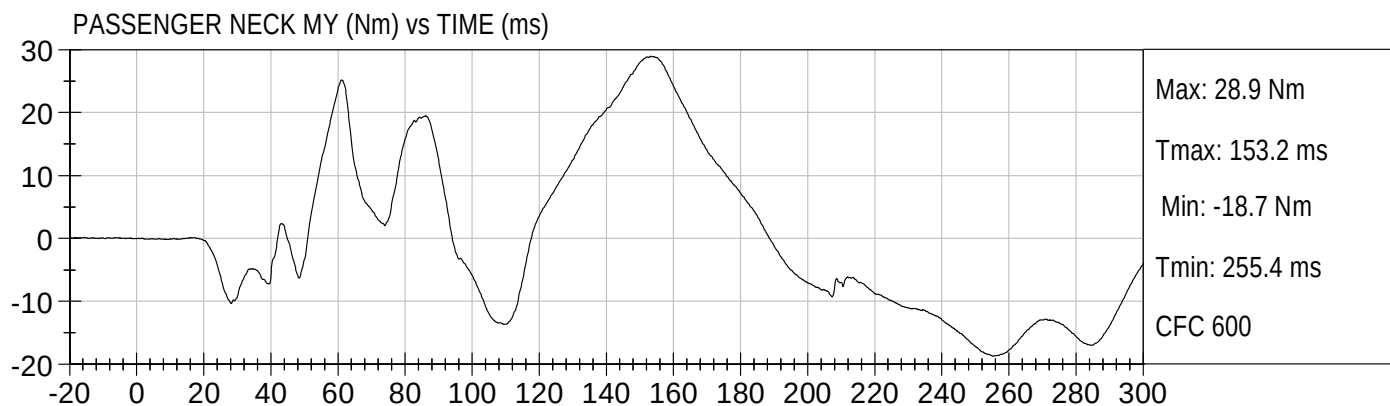
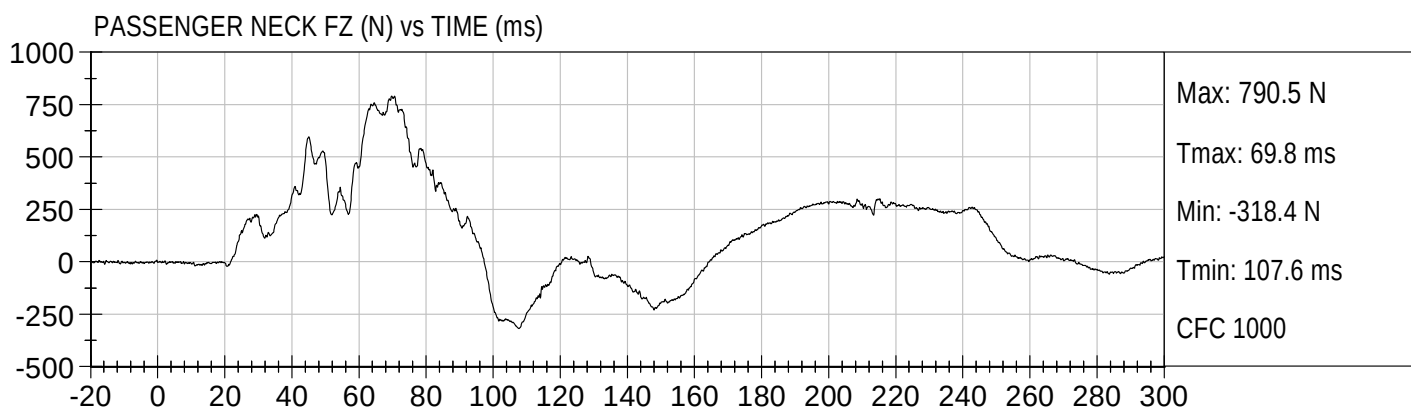
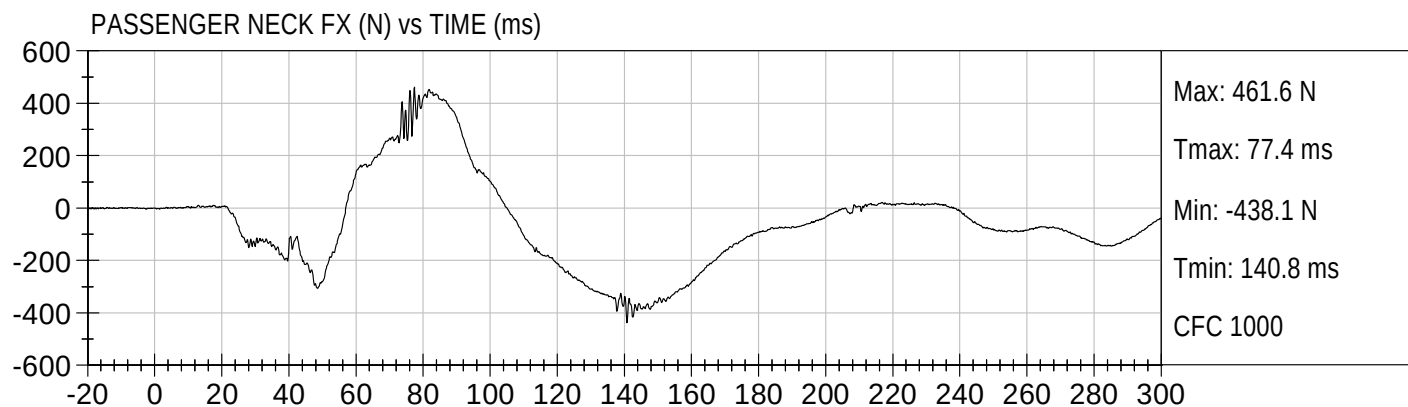


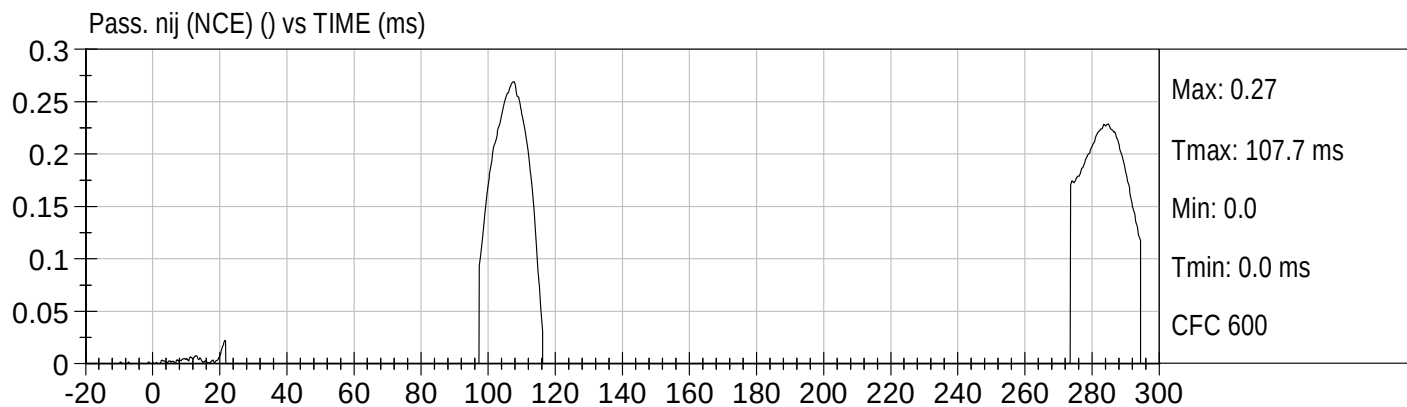
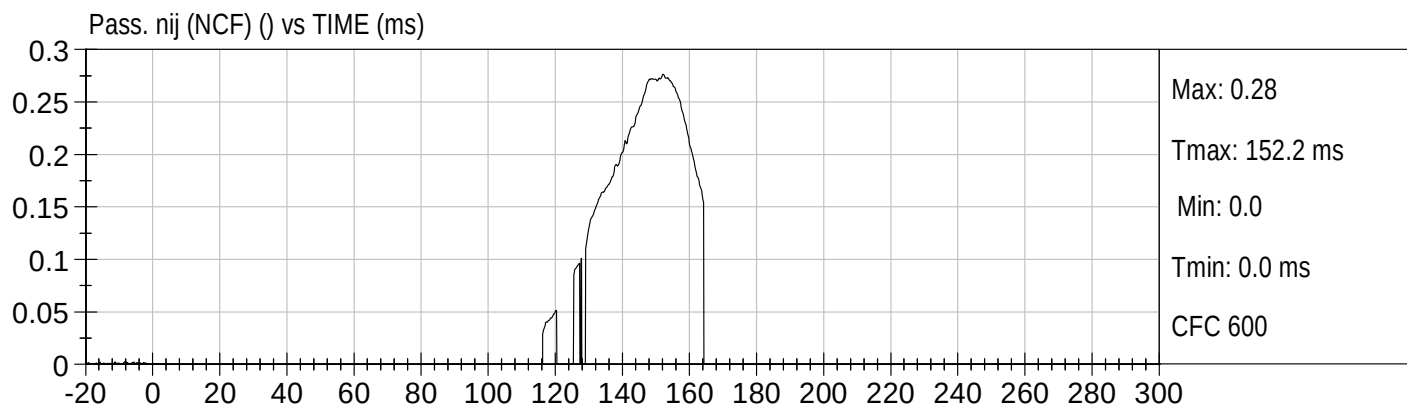
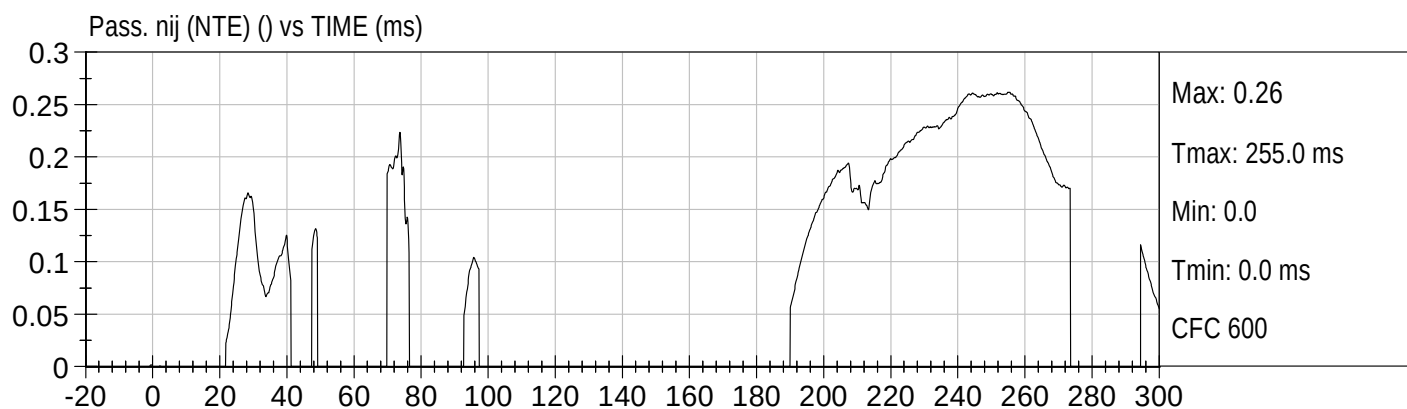
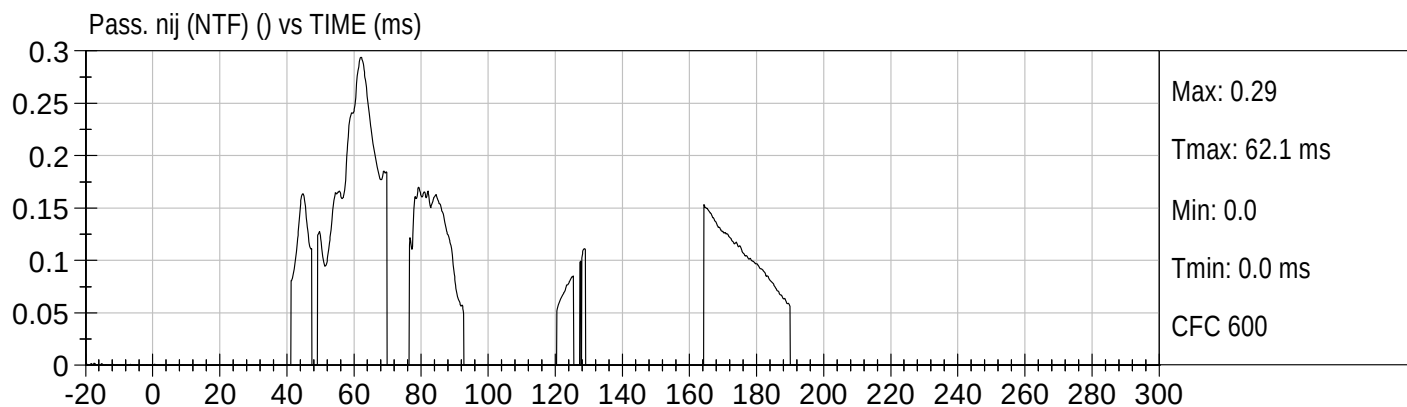


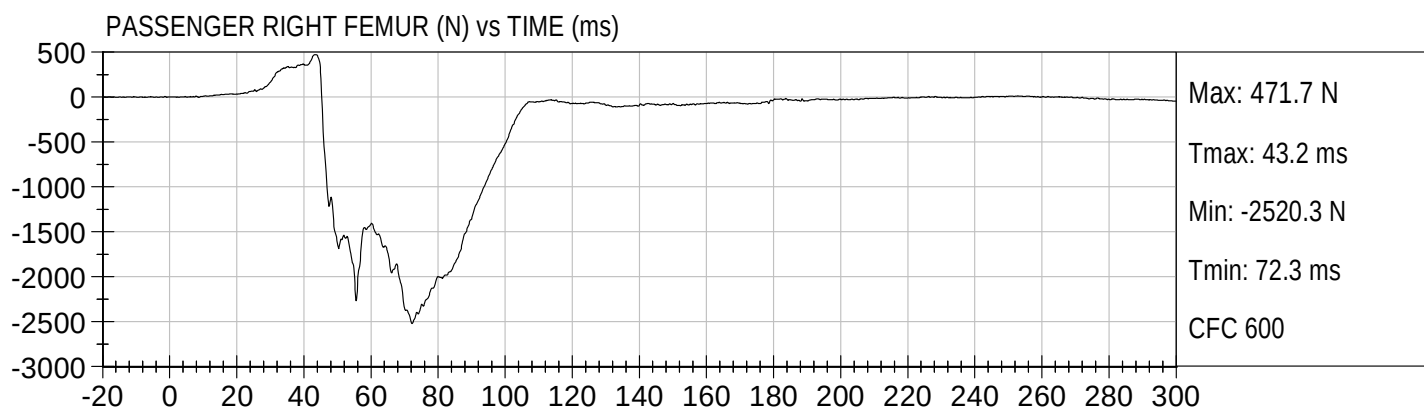
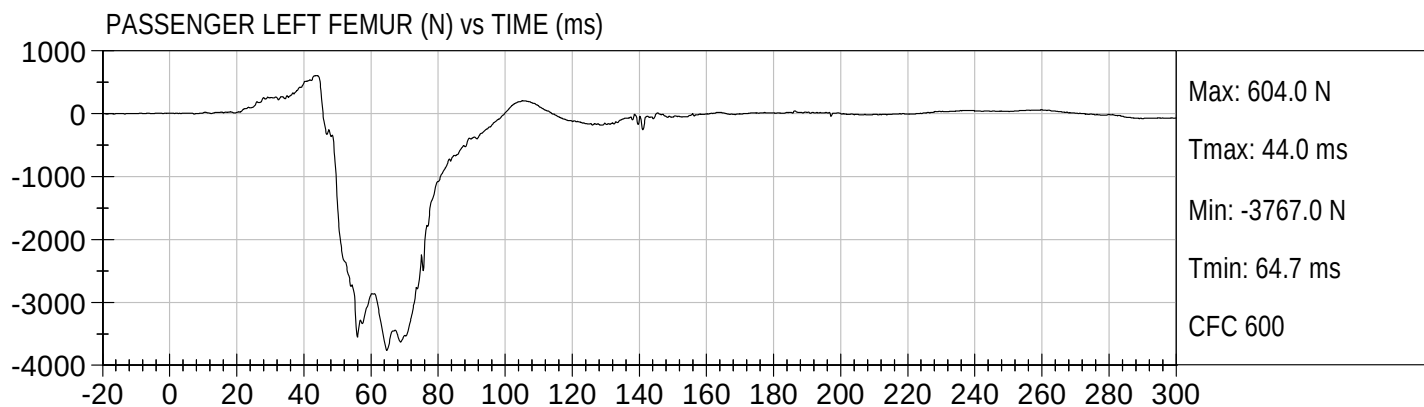












APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 351

Test ID: D11091

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	225 - 275	259	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

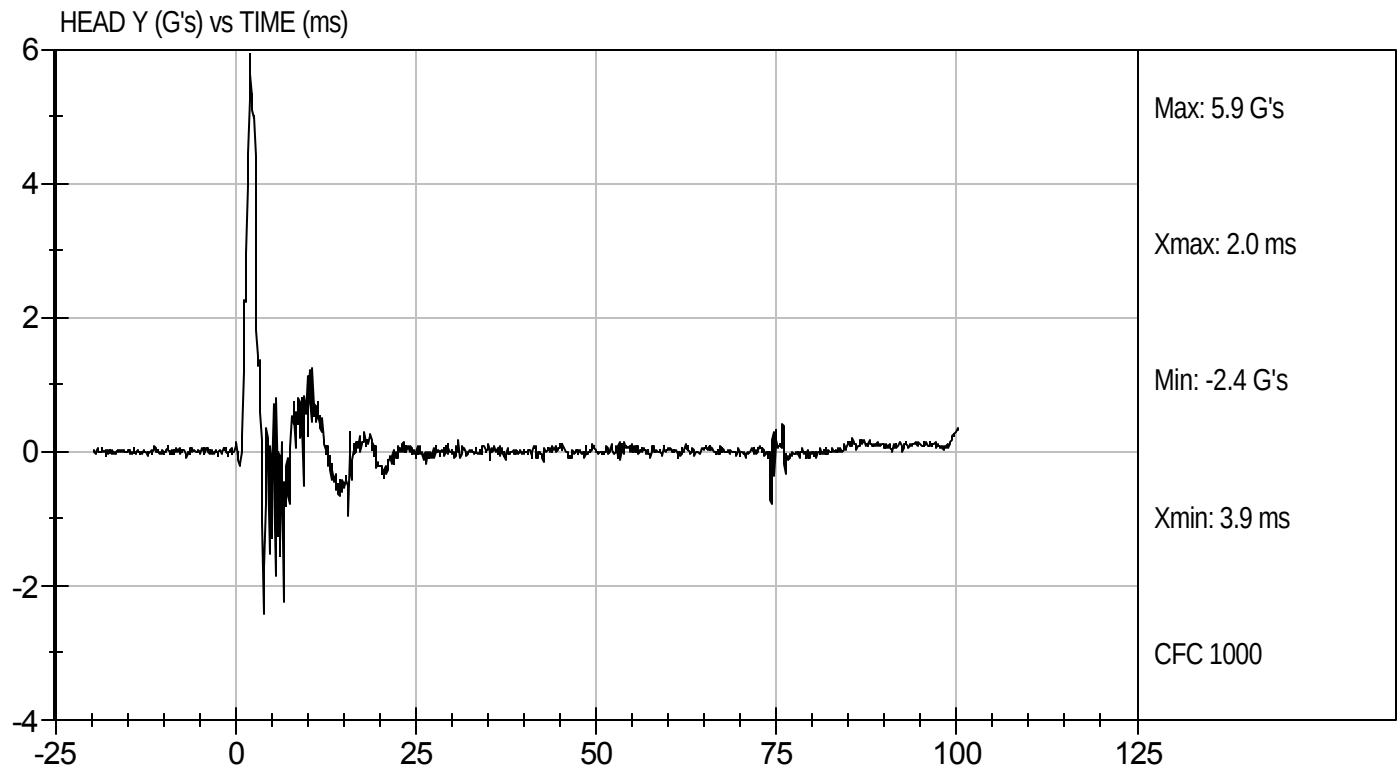
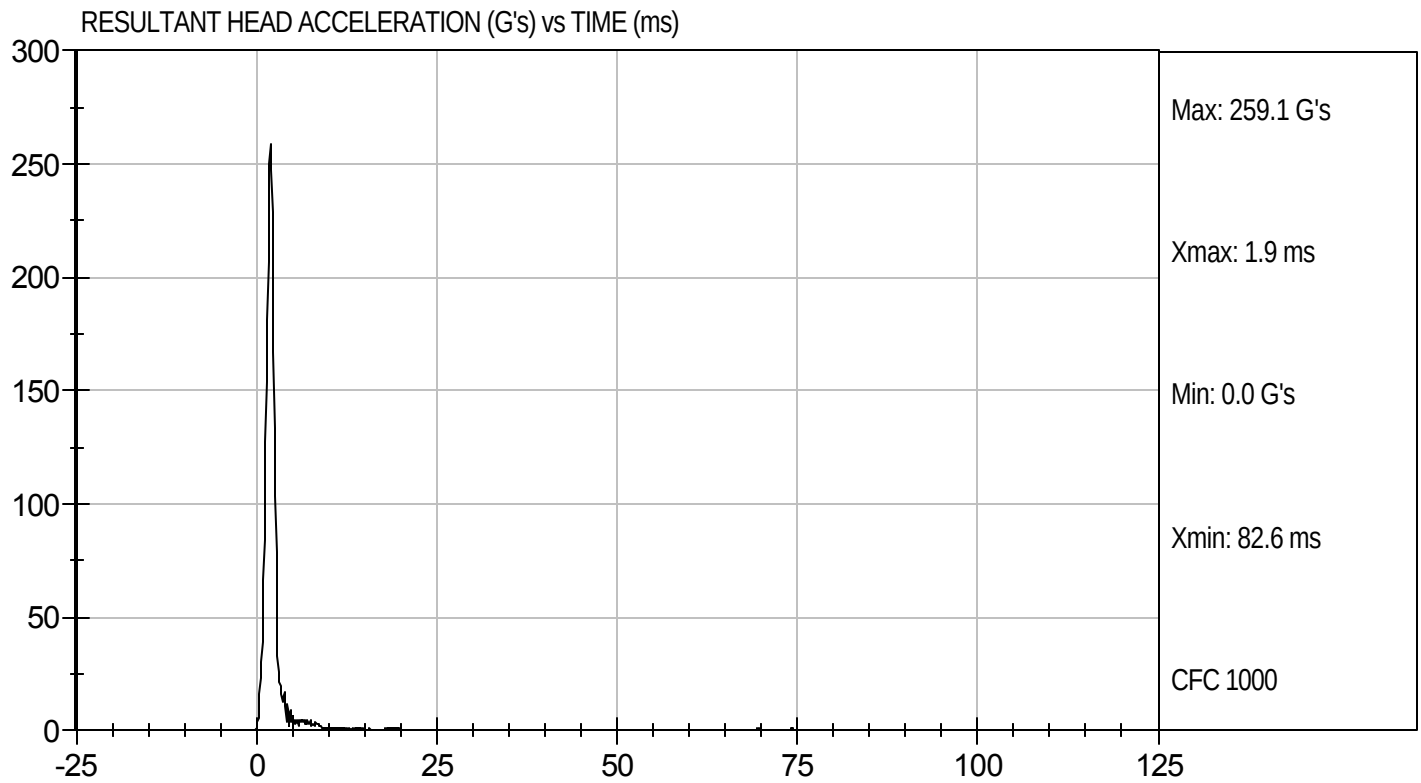
1/5/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11091

Test Date: 1/5/11
Velocity: 0 ft/s, 0.00 m/s

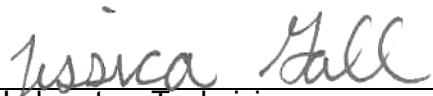


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D.: D11092

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.35	Pass
	20 ms	G's	17.60 to 22.60	19.21	Pass
	30 ms	G's	12.50 to 18.50	13.12	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.6	Pass
	Time	ms	57.0 to 64.0	59.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	113.0	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	96.1	Pass
	Time	ms	47.0 to 58.0	51.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.5	Pass
Overall Test Results					Pass


 Laboratory Technician

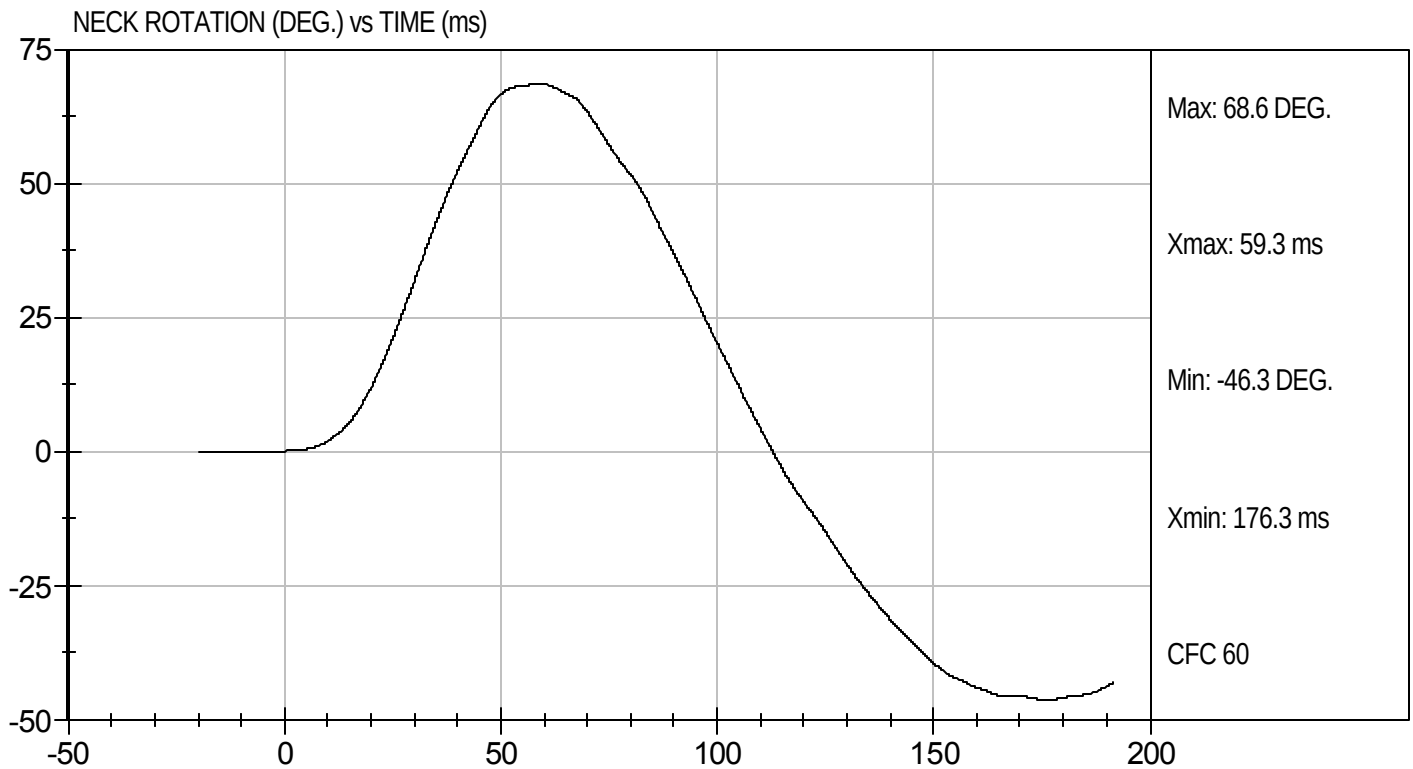
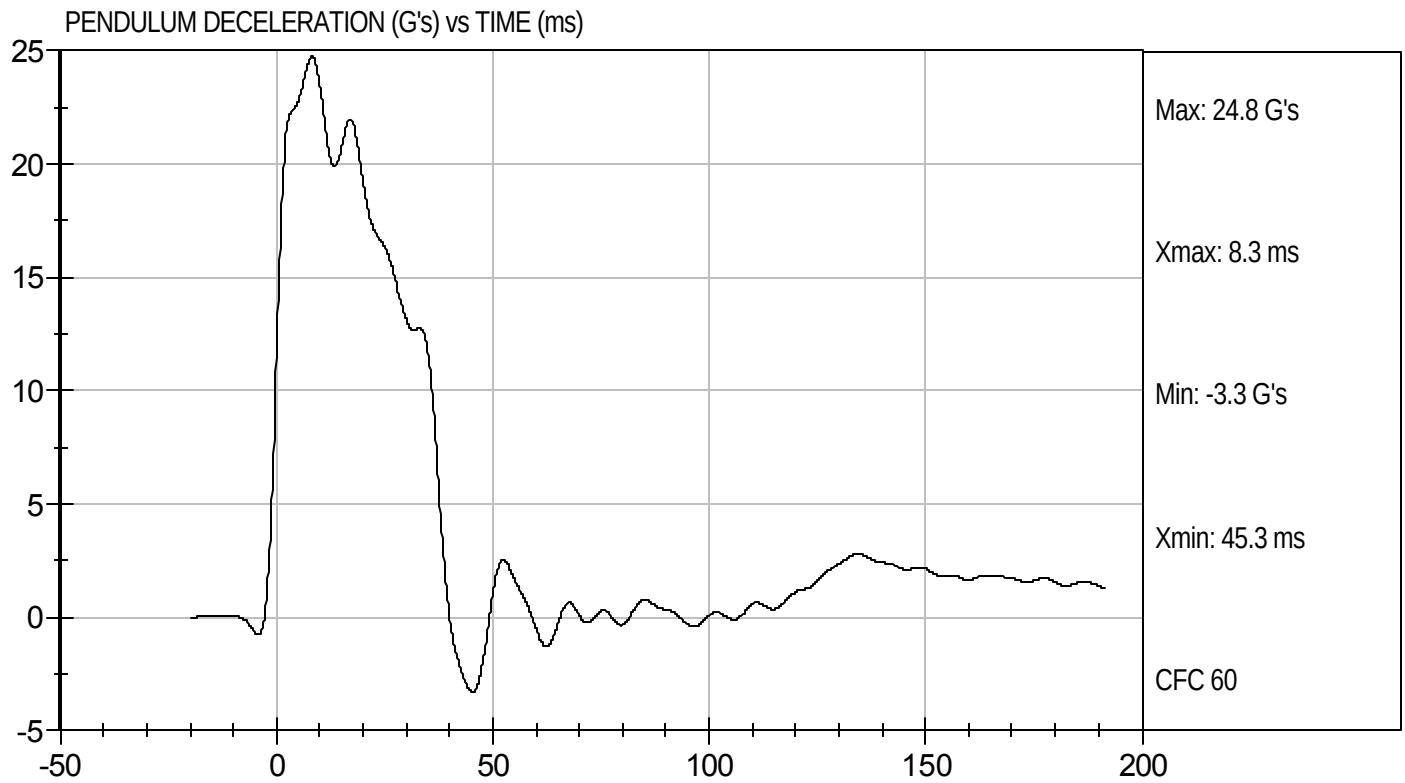
1/6/11
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D11092

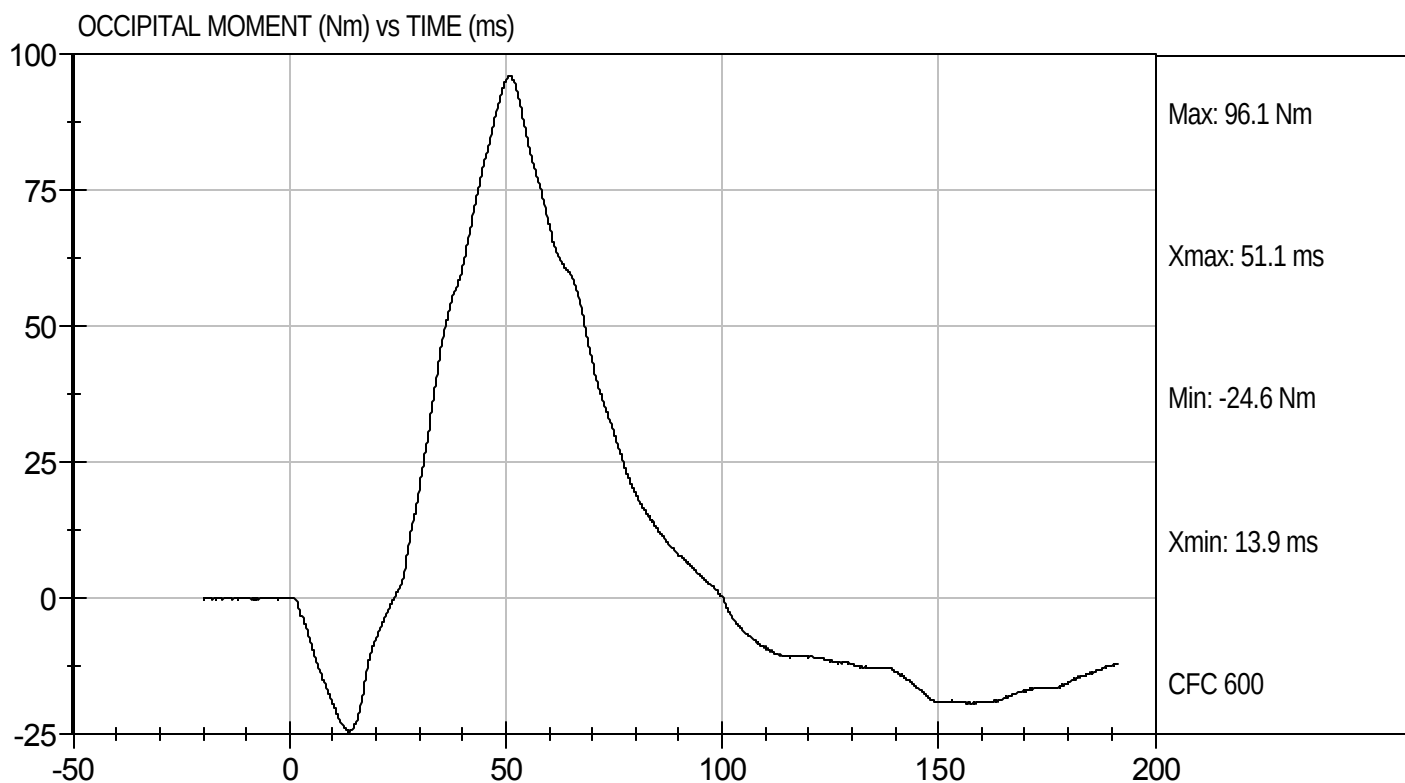
Test Date: 1/6/11
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D11092

Test Date: 1/6/11
Velocity: 23.15 ft/s, 7.06 m/s

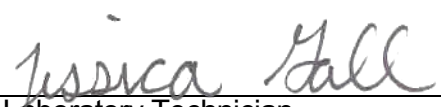


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D.: D11093

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.40	Pass
	20 ms	G's	14.00 to 19.00	16.45	Pass
	30 ms	G's	11.00 to 16.00	13.11	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.4	Pass
	Time	ms	72.0 to 82.0	77.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	158.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-63.6	Pass
	Time	ms	65.0 to 79.0	71.9	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.1	Pass
Overall Test Results					Pass


Laboratory Technician

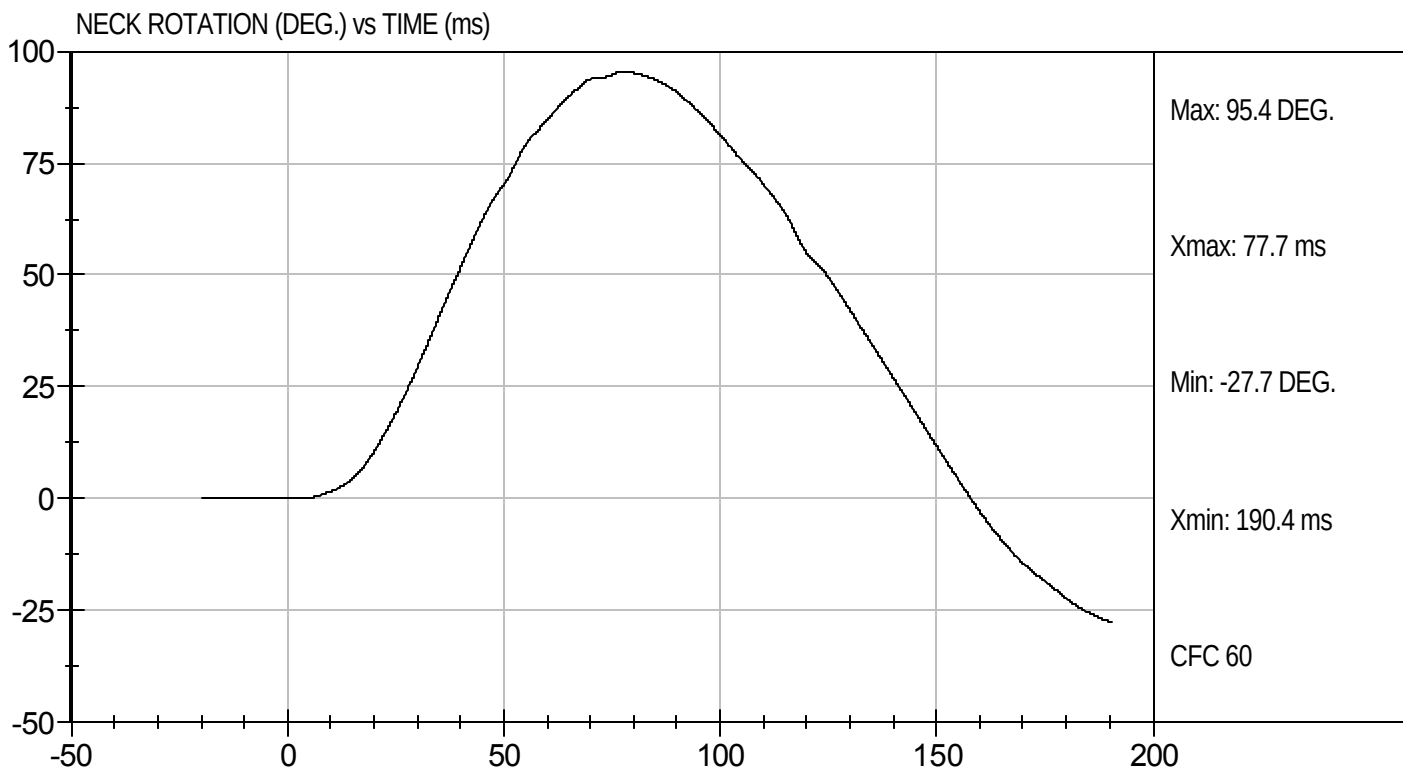
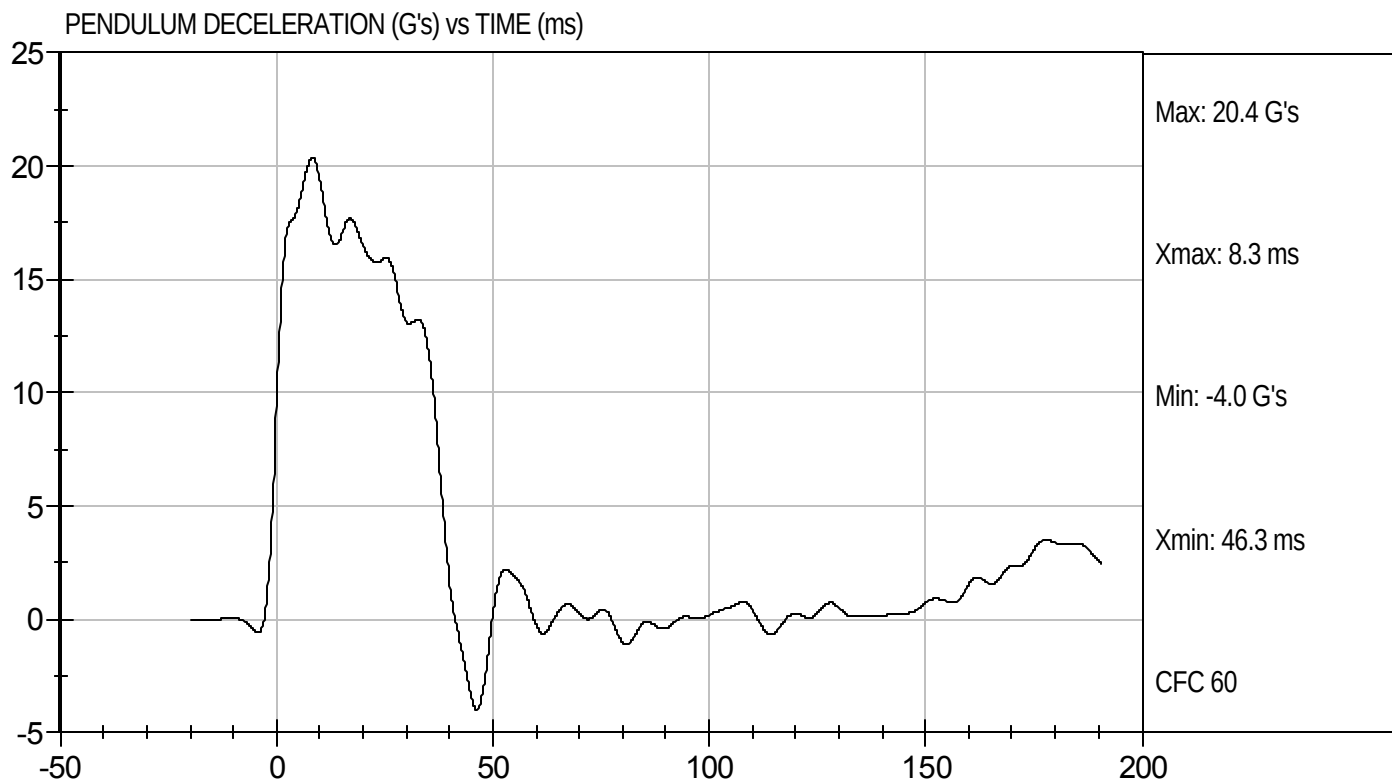
1/6/11
Test Date


Approved By



Test Desc: Neck Extension
Component ID: D11093

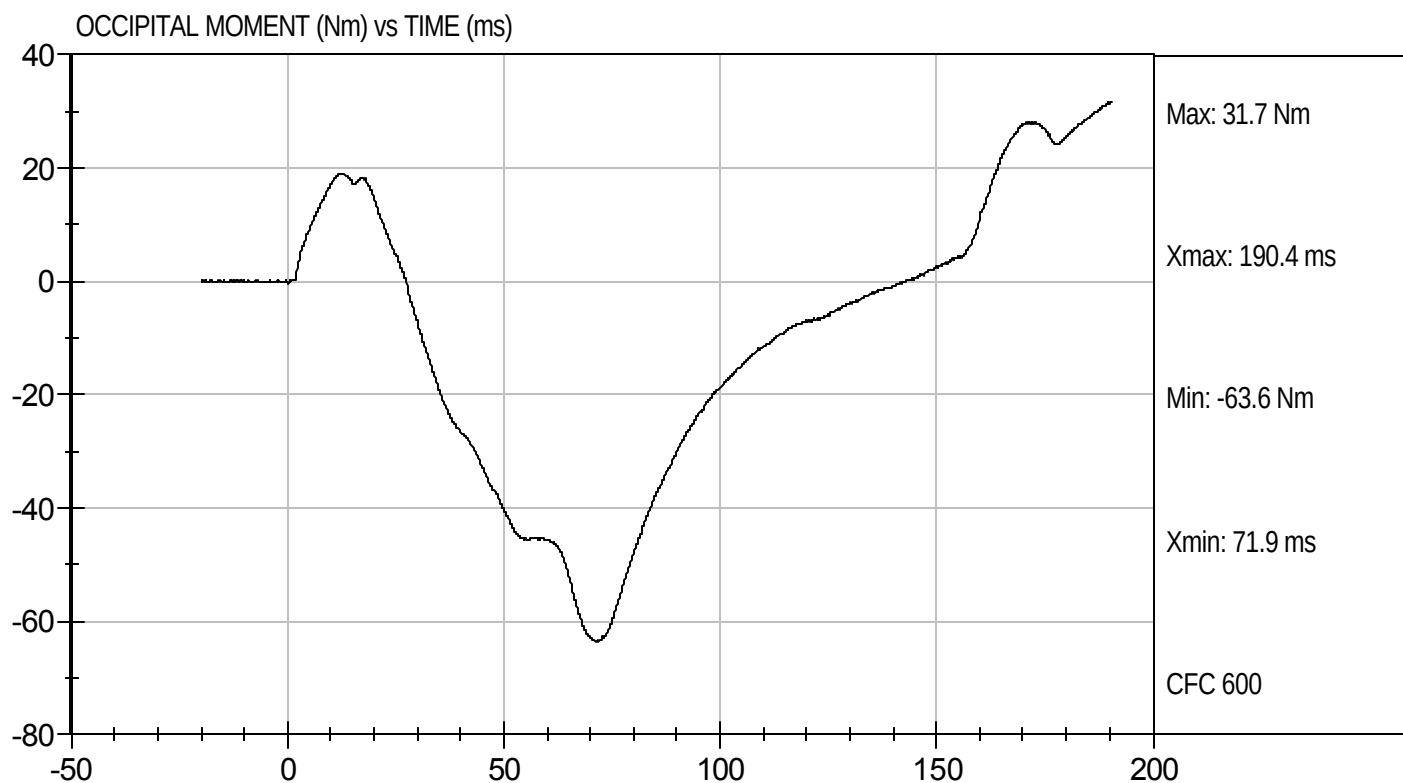
Test Date: 1/6/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D11093

Test Date: 1/6/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D11094

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,303	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.36	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

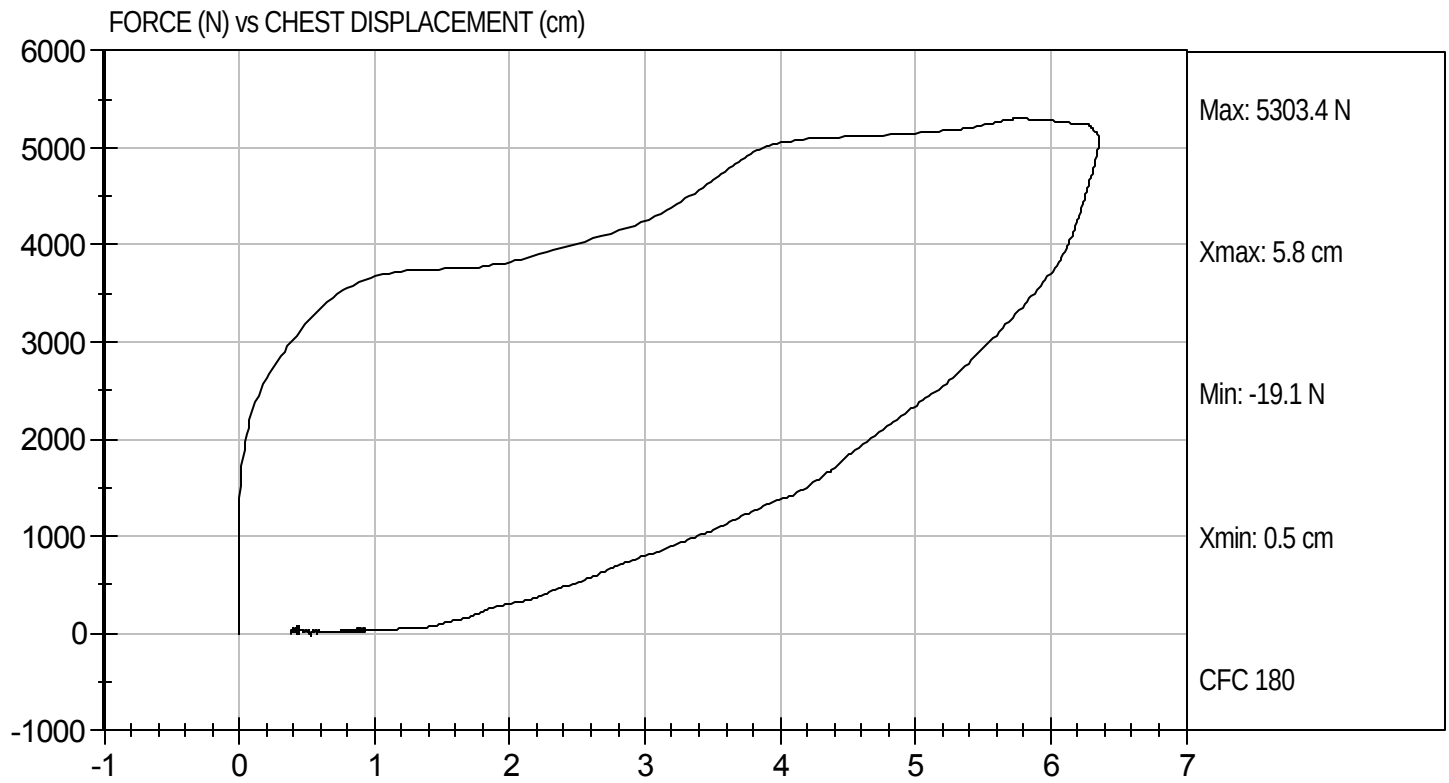
1/6/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11094

Test Date: 1/6/11
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 351

Test I.D: D11095

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	Newtons	4715 to 5782	5,334	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

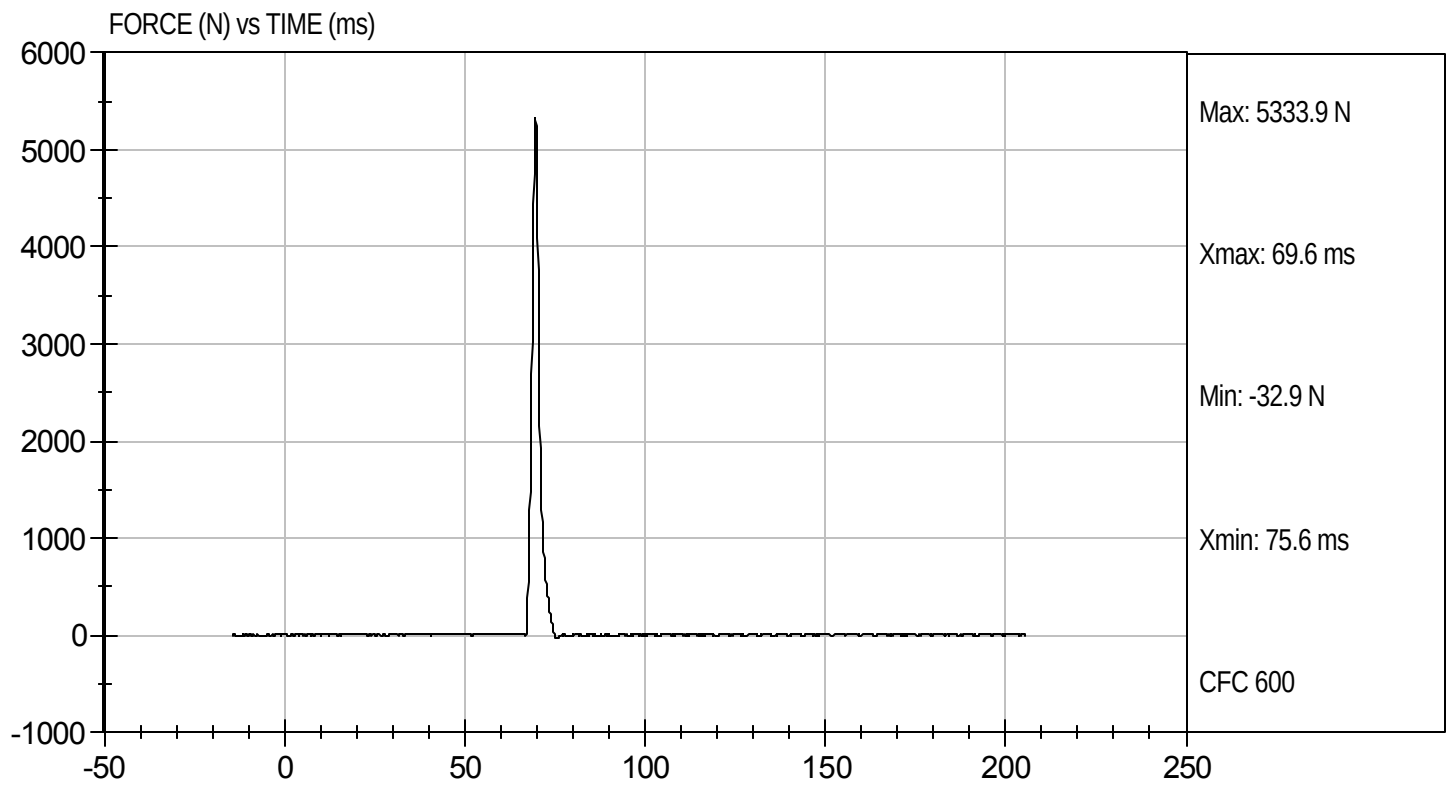
1/5/11
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D11095

Test Date: 1/5/11
Velocity: 6.99 ft/s, 2.13 m/s



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

ATD Serial No: 351

Test I.D: D11096

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,583	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

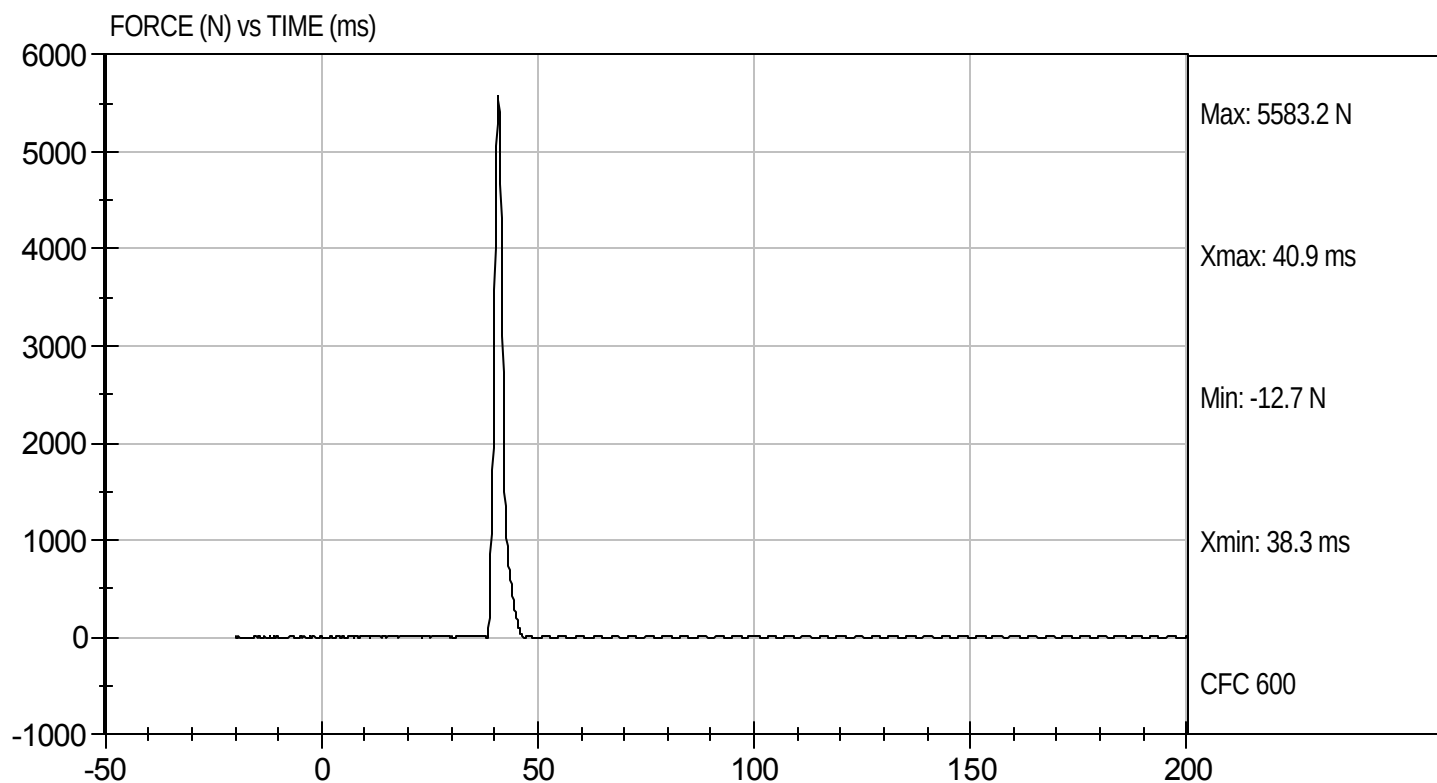
1/5/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11096

Test Date: 1/5/11
Velocity: 6.94 ft/s, 2.12 m/s

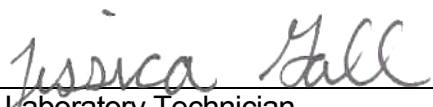


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D11090

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	18	18	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	47.6	45.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	47	48	Pass
Overall Test Results					Pass


 Laboratory Technician

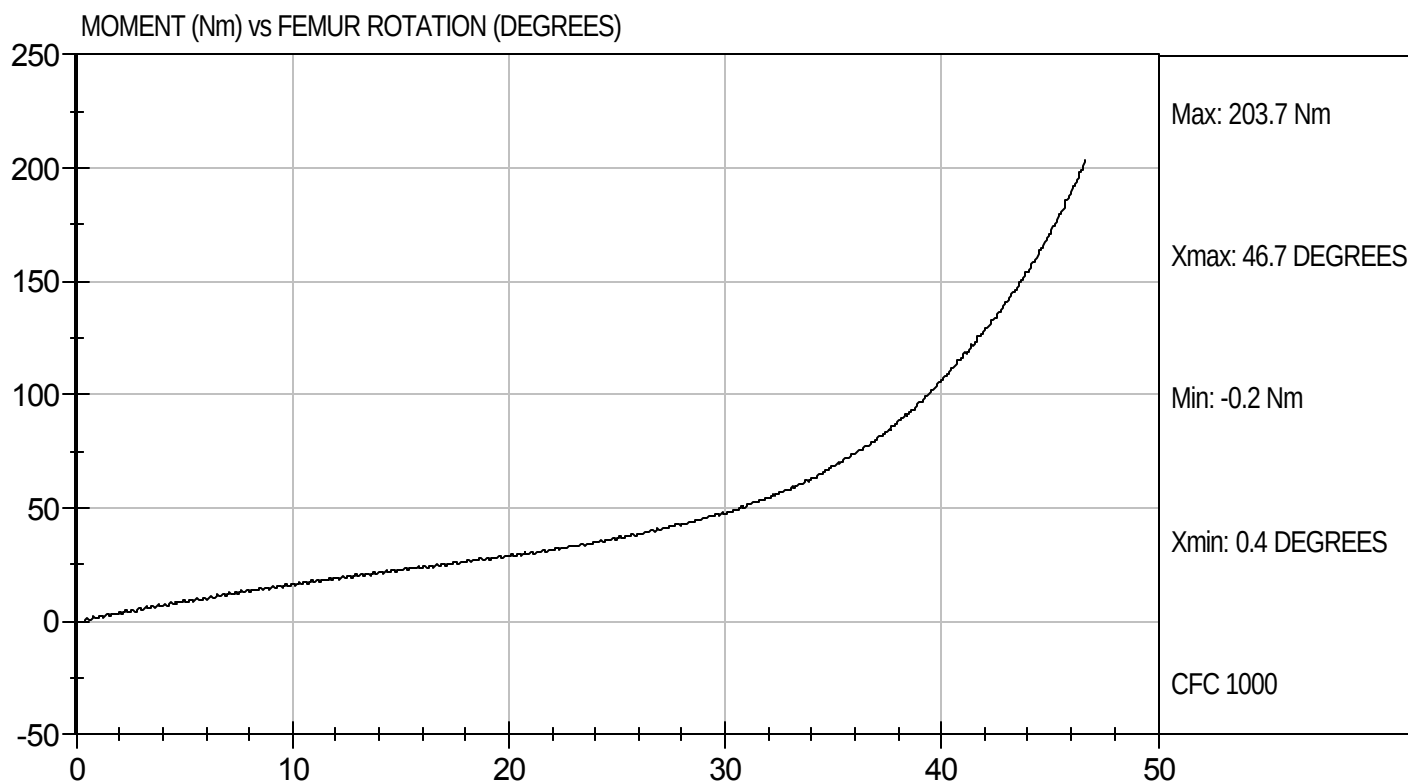
1/6/11
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D11099

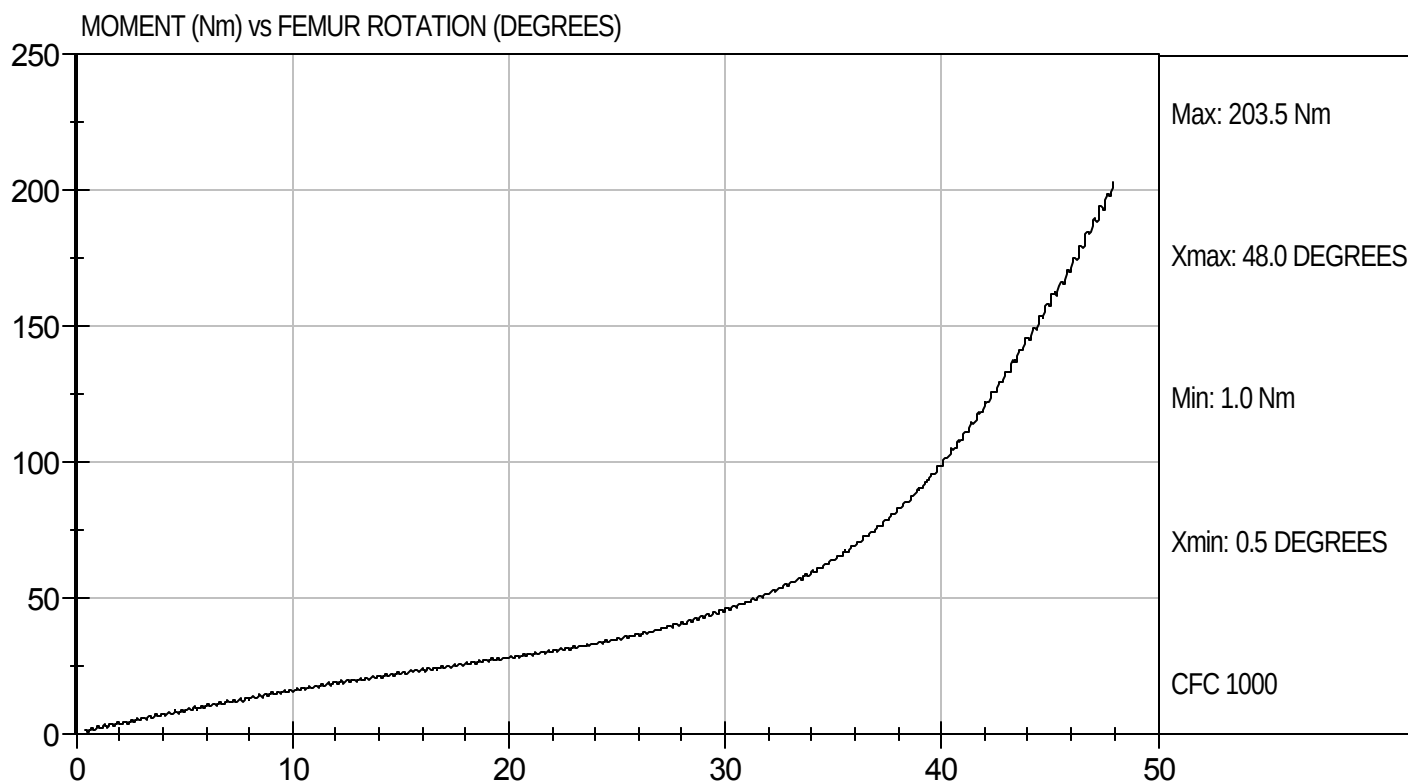
Test Date: 1/6/11
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D11090

Test Date: 1/6/11
Velocity: 0 ft/s, 0.00 m/s

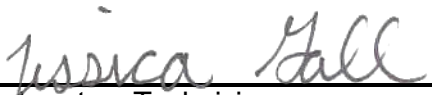


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test ID: D11201

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	225 - 275	262	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-8.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

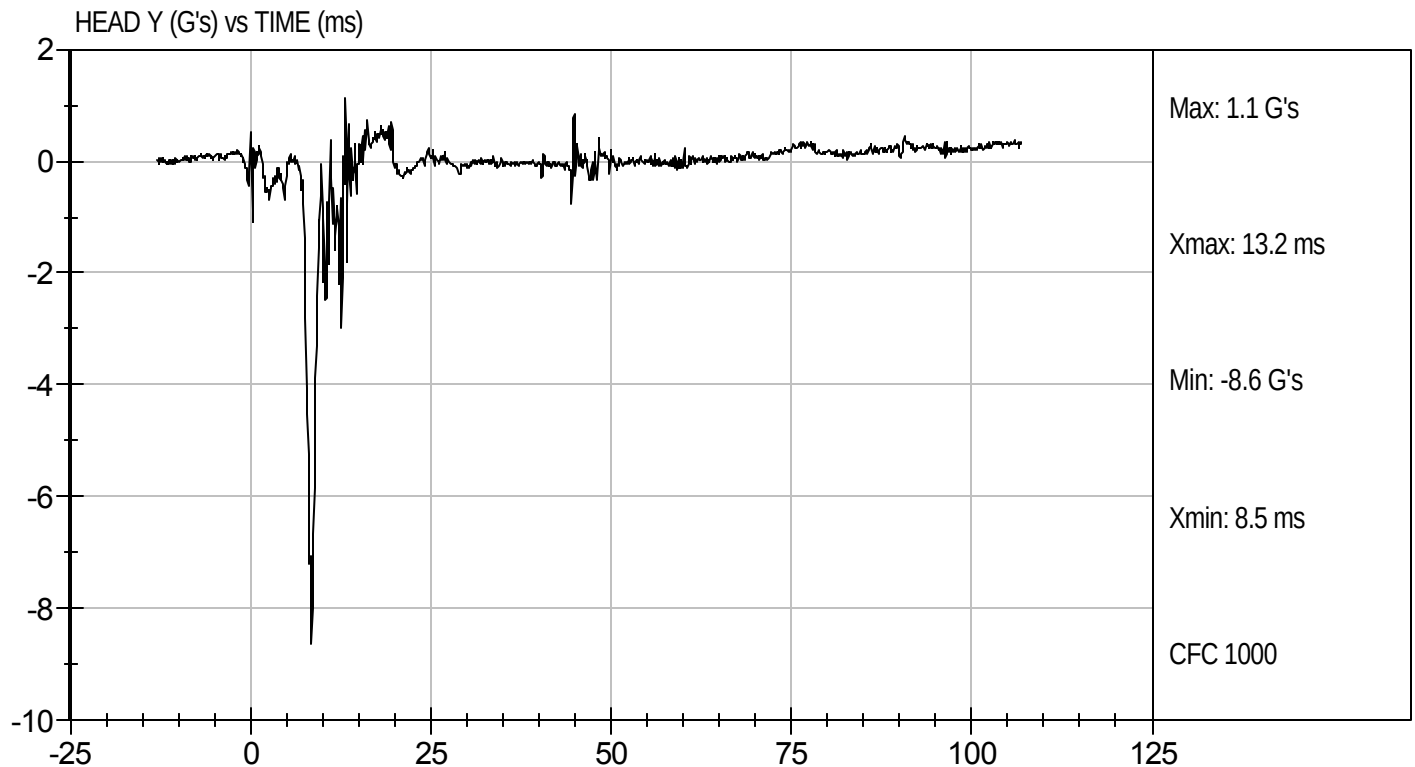
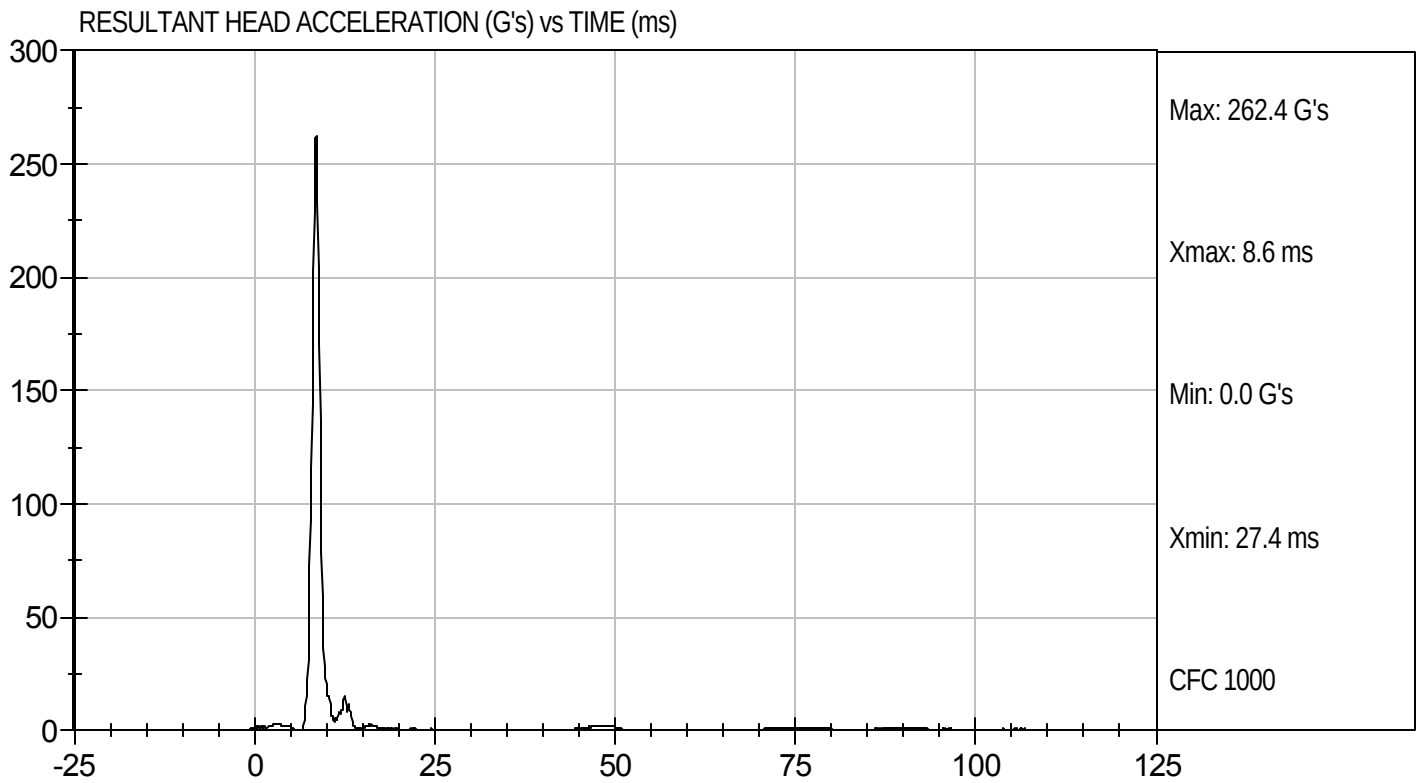
1/17/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D11201

Test Date: 1/17/11
Velocity: 0 ft/s, 0.00 m/s

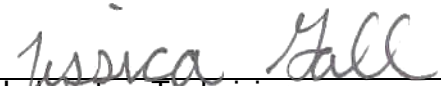


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D11202

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	22	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.04	Pass
	20 ms	G's	17.60 to 22.60	17.98	Pass
	30 ms	G's	12.50 to 18.50	13.46	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	69.7	Pass
	Time	ms	57.0 to 64.0	60.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	96.8	Pass
	Time	ms	47.0 to 58.0	50.5	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.4	Pass
Overall Test Results					Pass


 Laboratory Technician

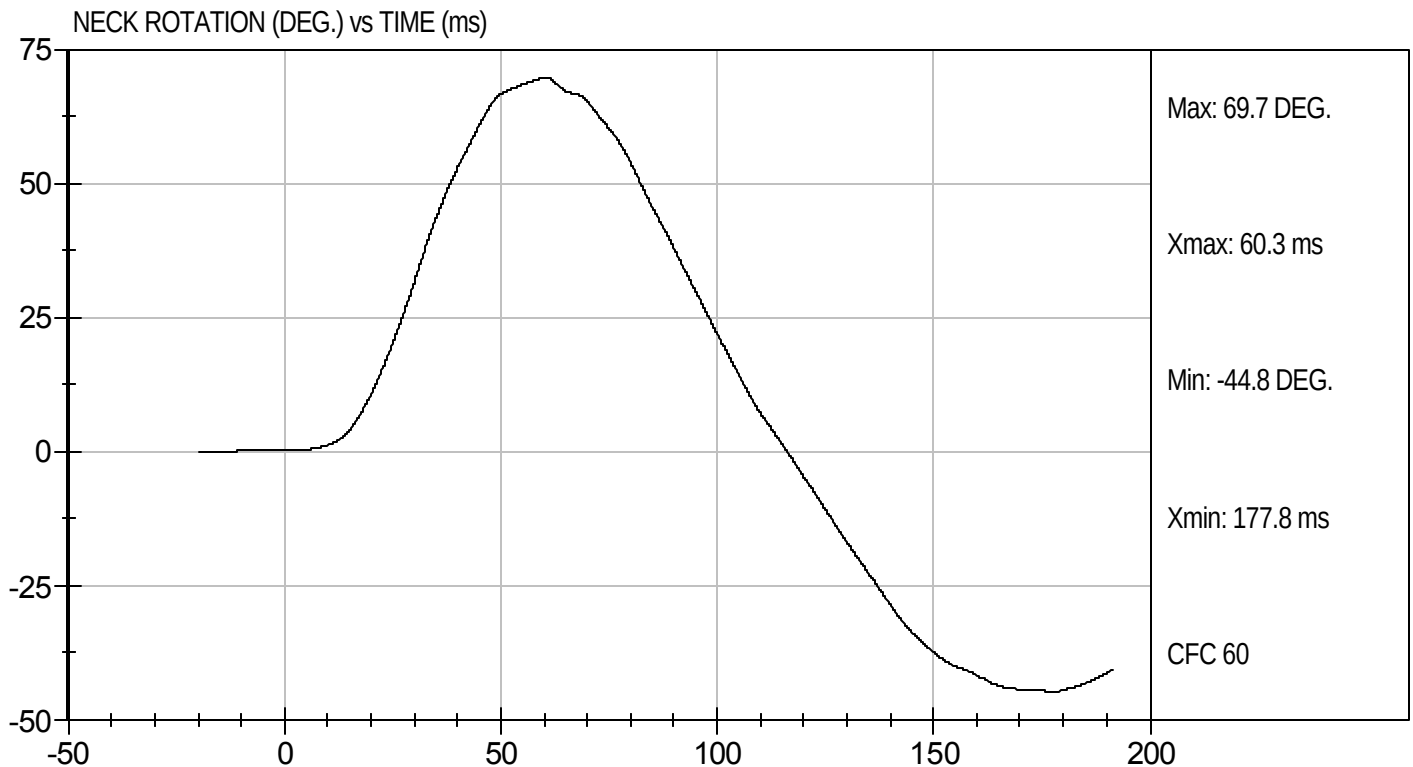
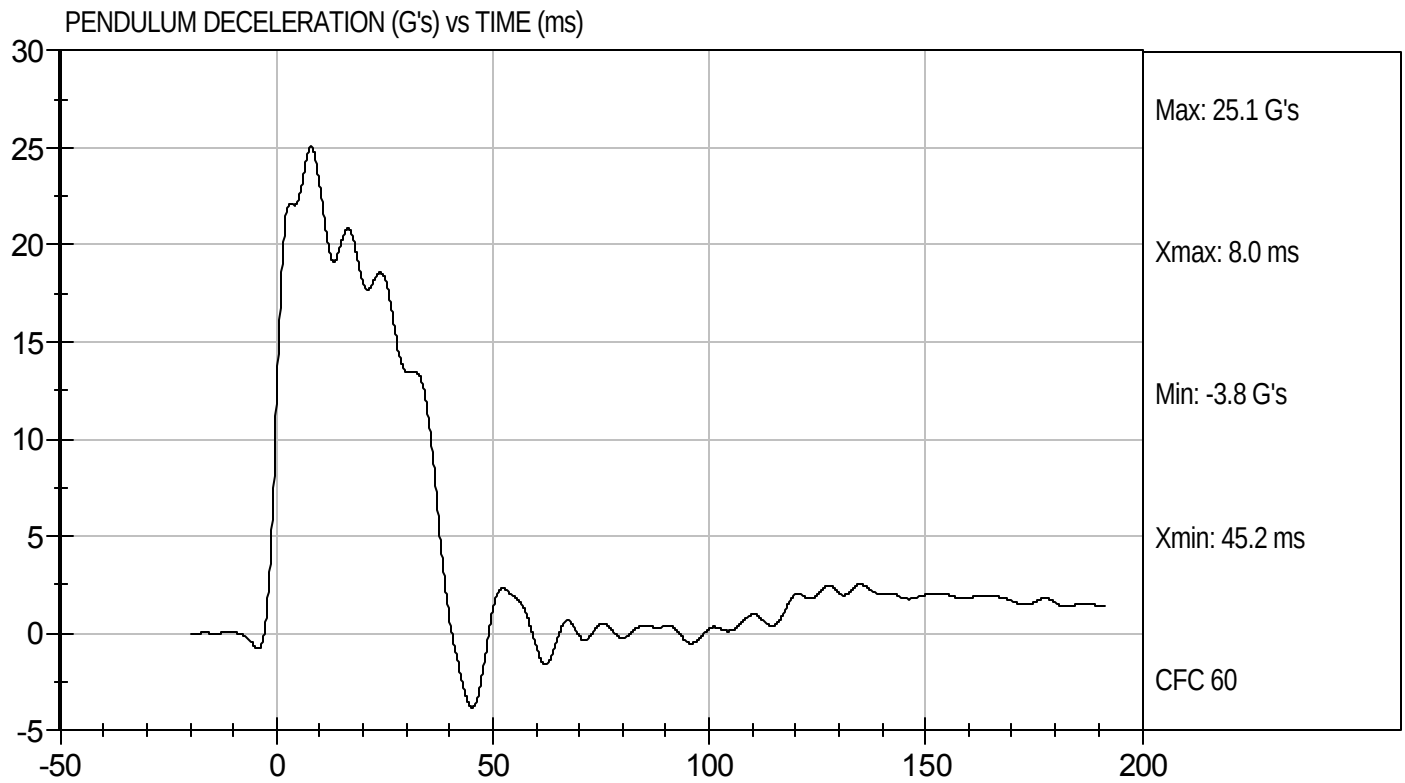
1/17/11
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D11202

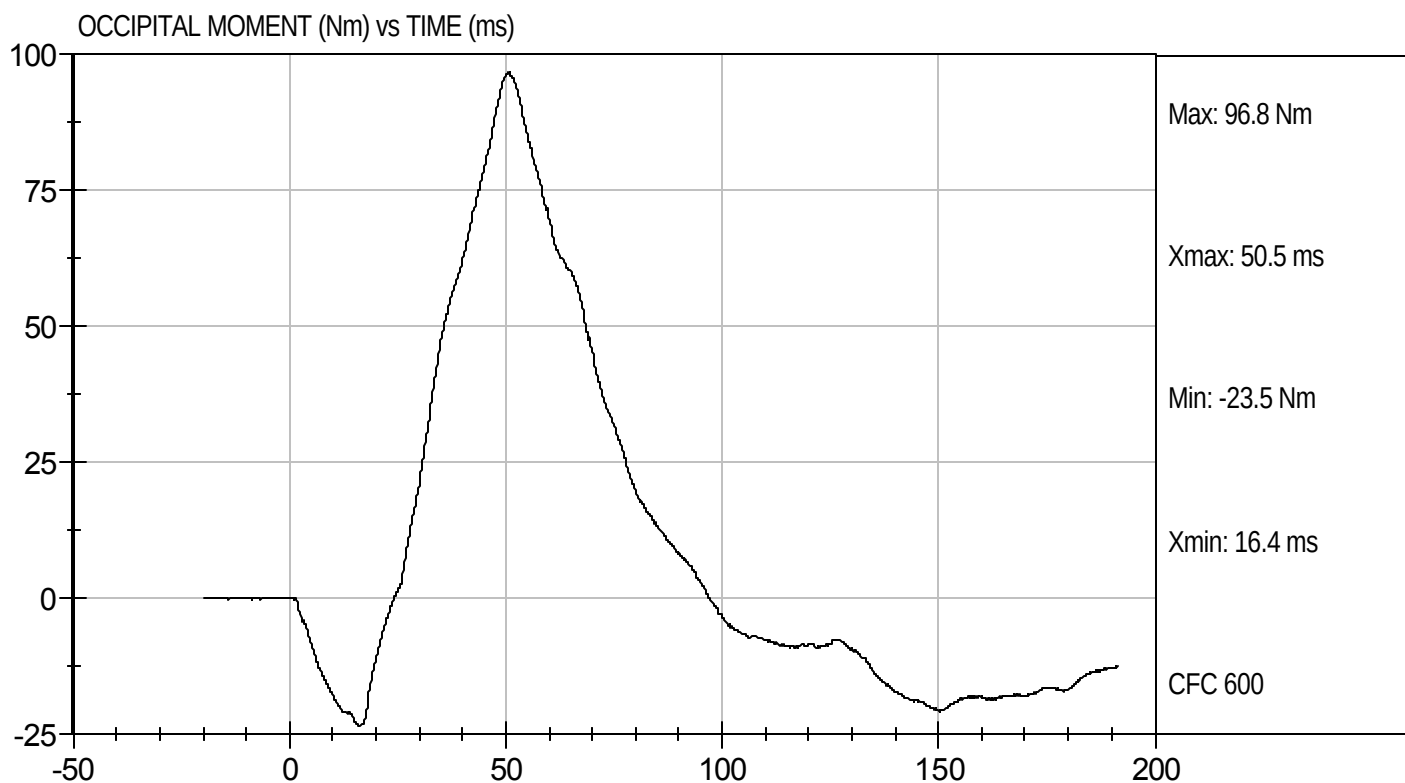
Test Date: 1/17/11
Velocity: 22.83 ft/s, 6.96 m/s





Test Desc: Neck Flexion
Component ID: D11202

Test Date: 1/17/11
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.: D11203

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	22	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.42	Pass
	20 ms	G's	14.00 to 19.00	16.74	Pass
	30 ms	G's	11.00 to 16.00	14.28	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.2	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	95.3	Pass
	Time	ms	72.0 to 82.0	75.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	156.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-66.7	Pass
	Time	ms	65.0 to 79.0	70.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	141.9	Pass
Overall Test Results					Pass


 Laboratory Technician

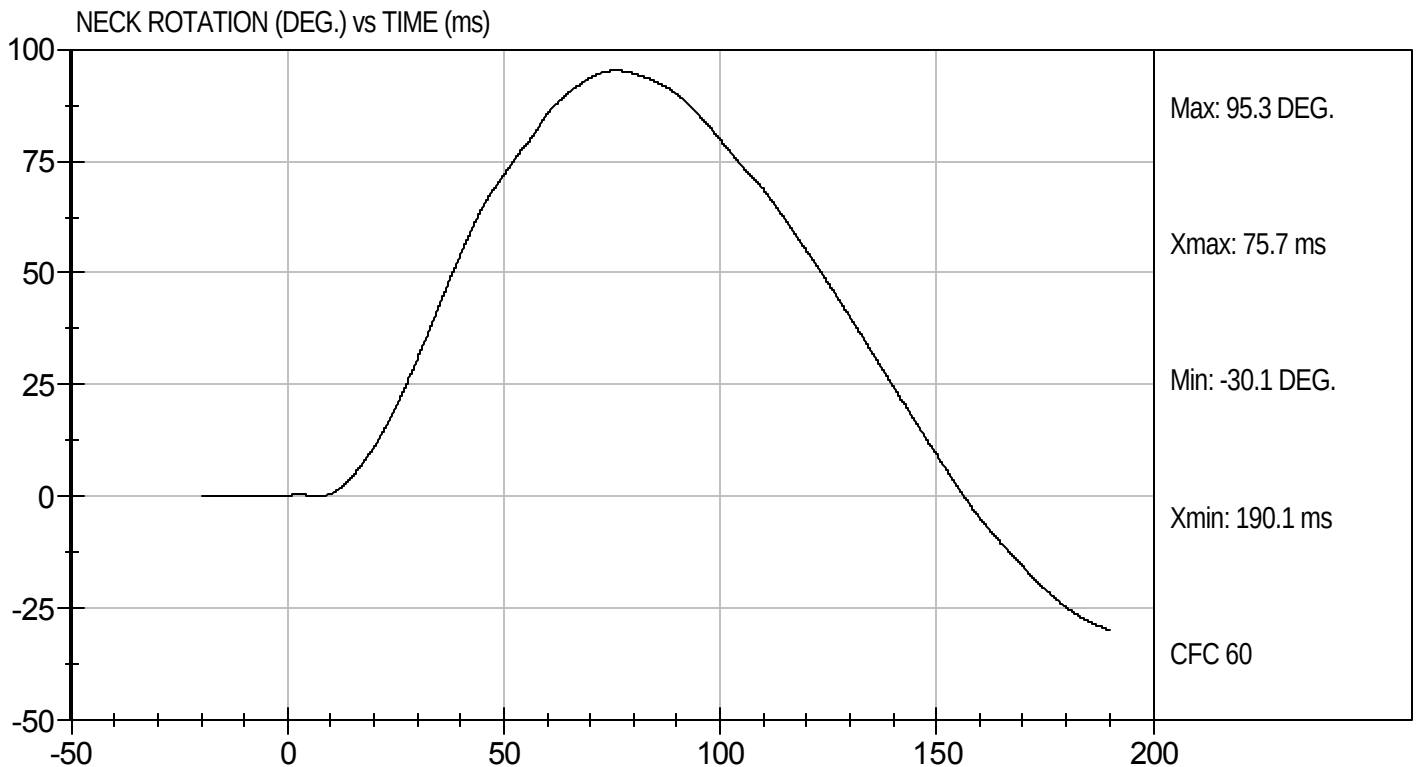
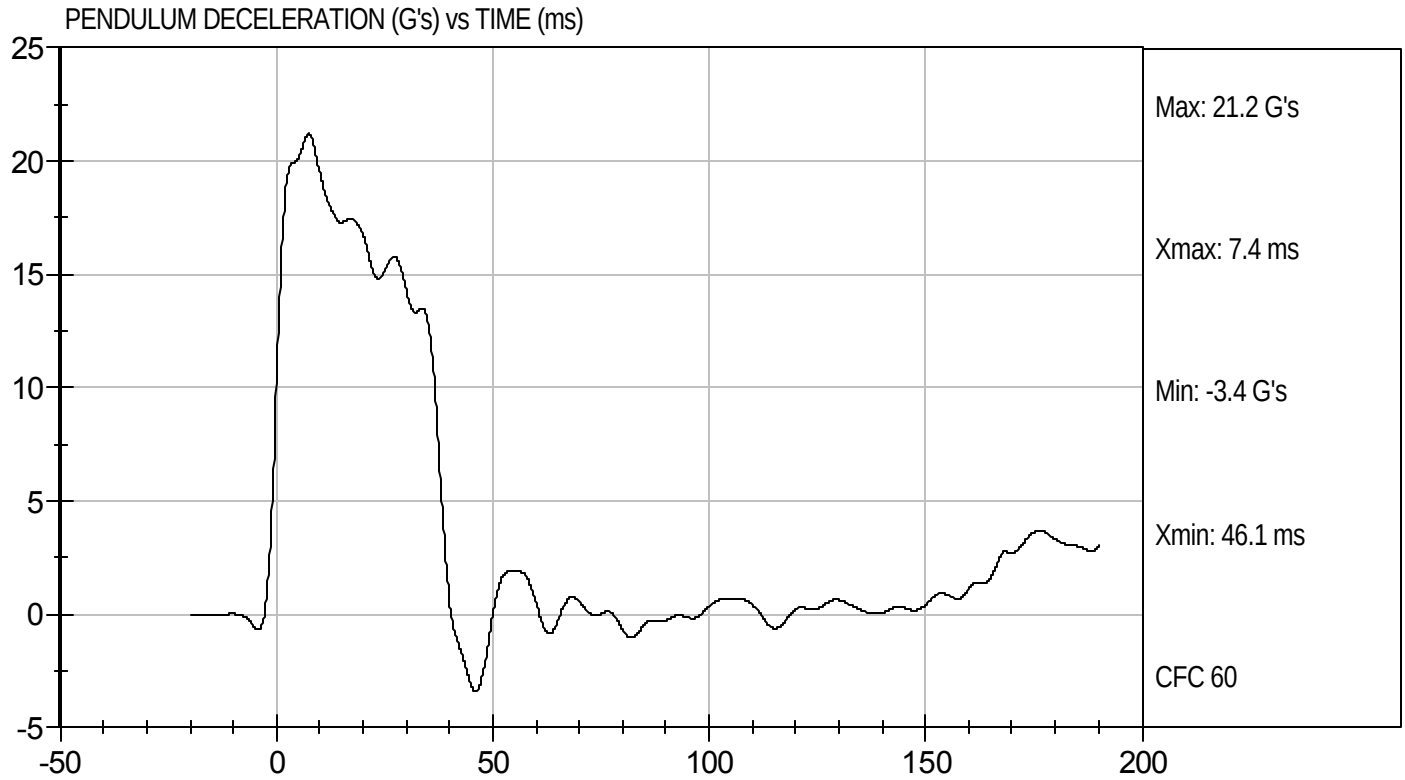
1/17/11
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D11203

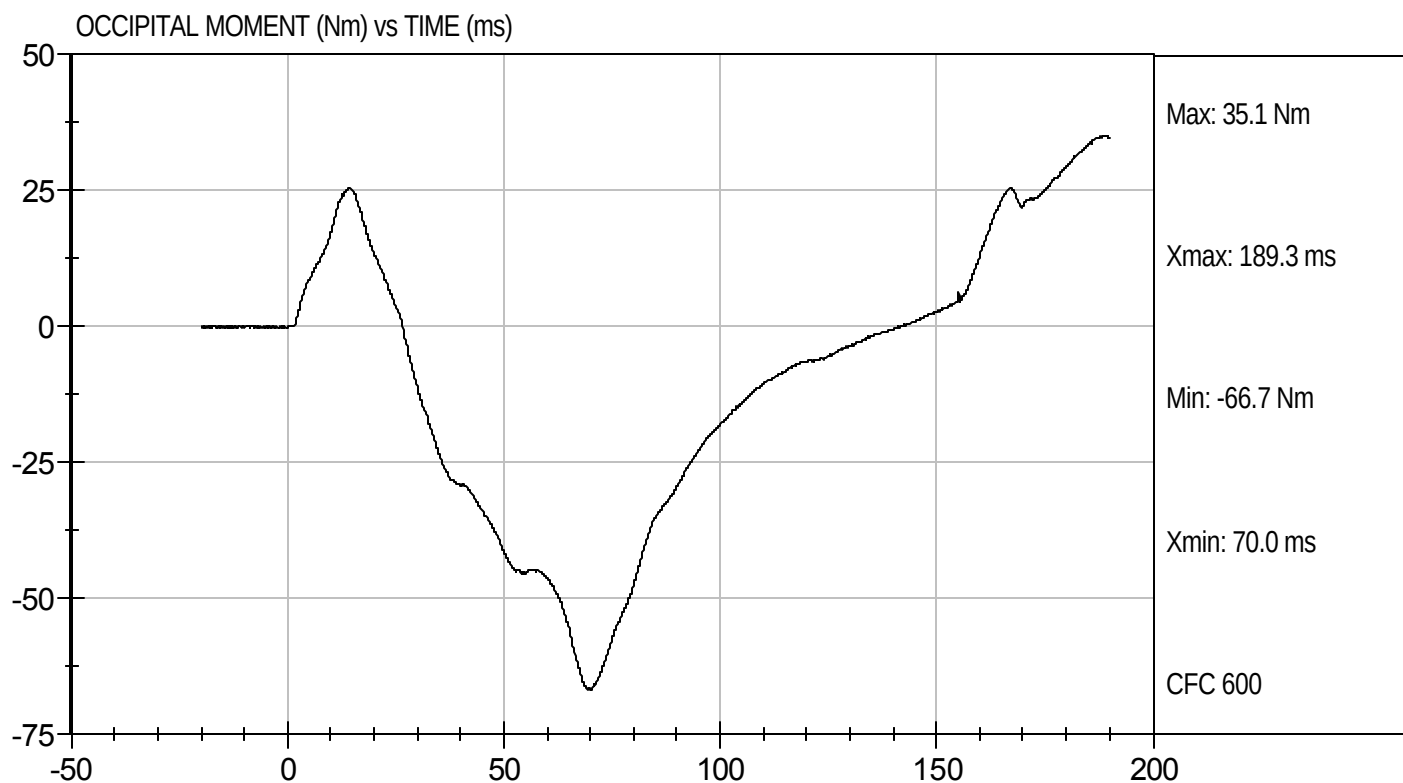
Test Date: 1/17/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D11203

Test Date: 1/17/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test I.D: D11204

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,227	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.40	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

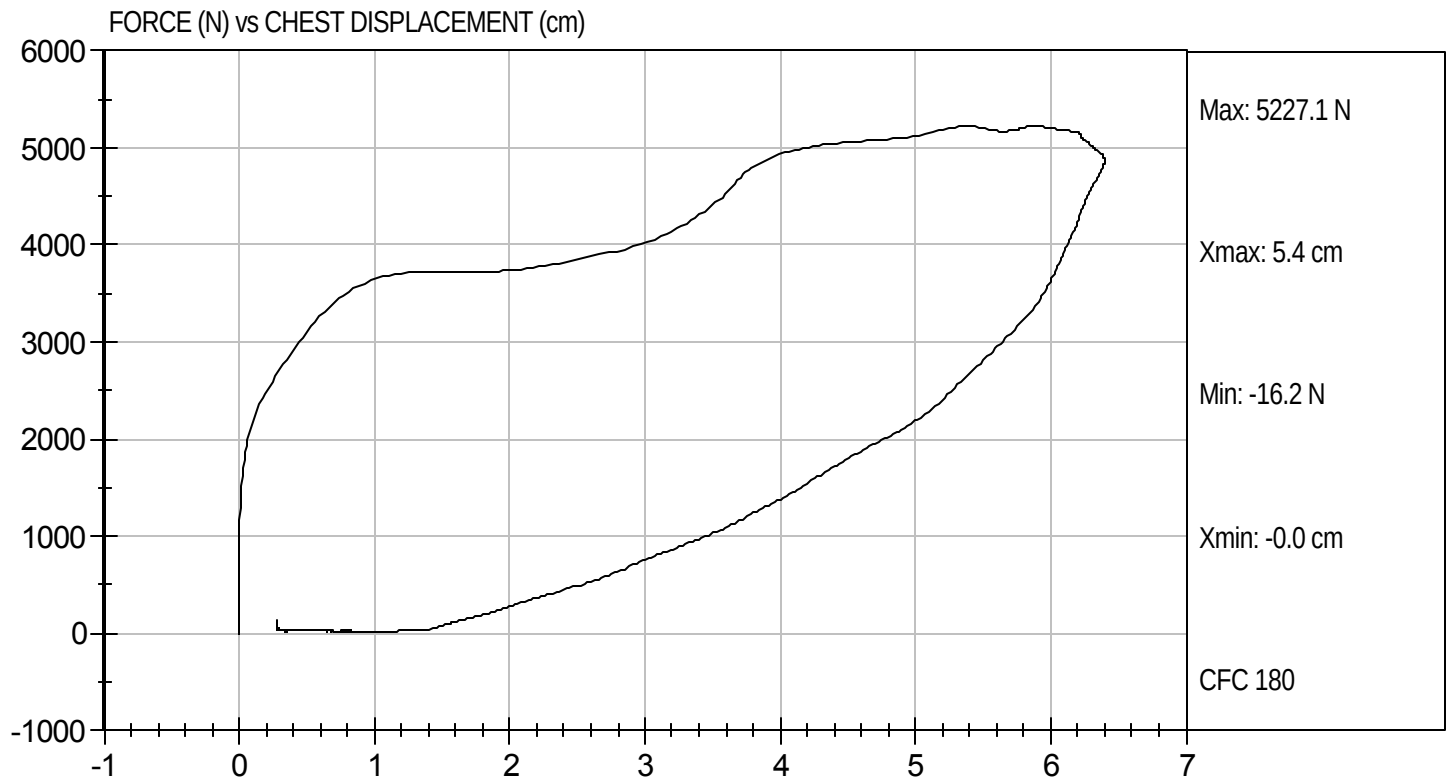
1/18/11
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Impact
Component ID: D11204

Test Date: 1/18/11
Velocity: 21.65 ft/s, 6.60 m/s



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

ATD Serial No: 351

Test I.D: D11205

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	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,542	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

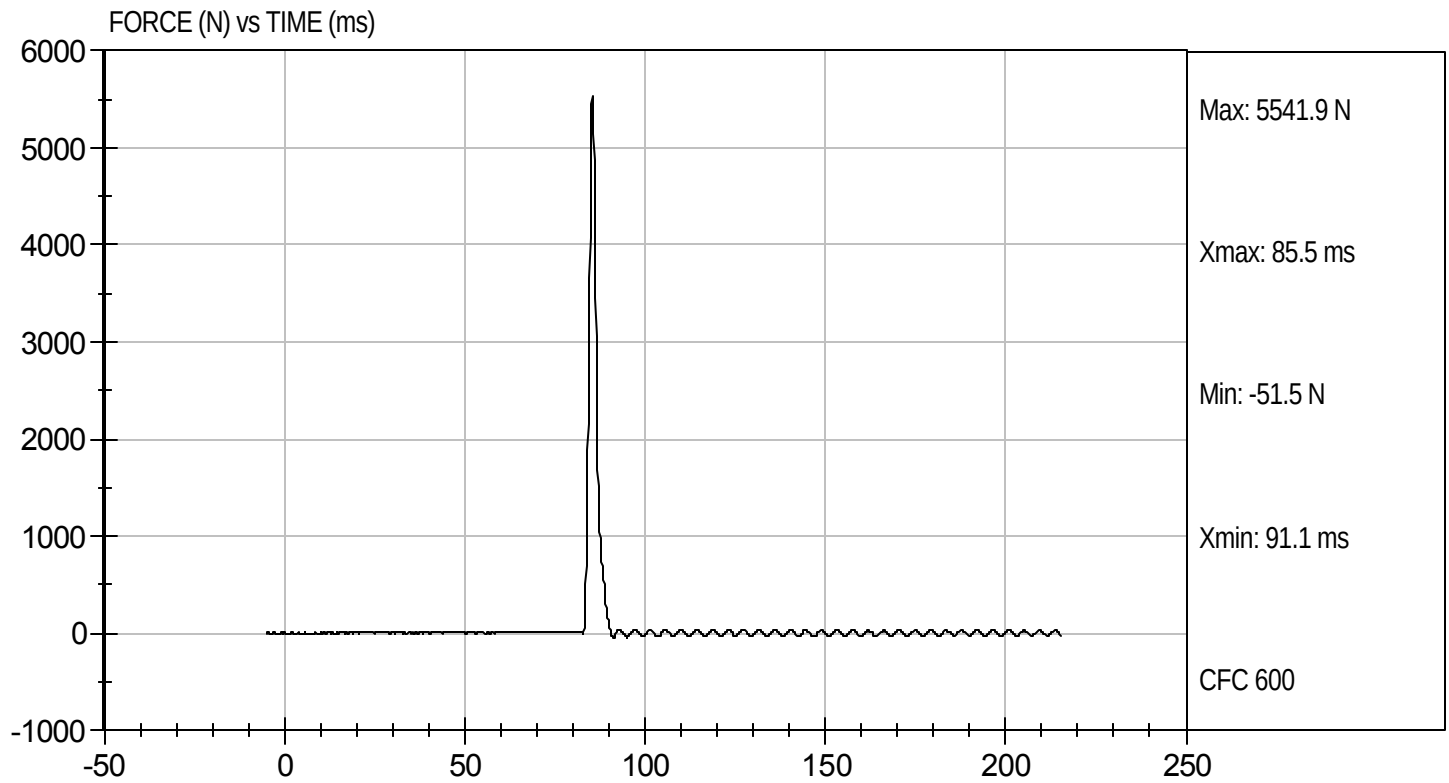
1/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D11205

Test Date: 1/17/11
Velocity: 6.92 ft/s, 2.11 m/s



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

ATD Serial No: 351

Test I.D: D11206

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	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,335	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

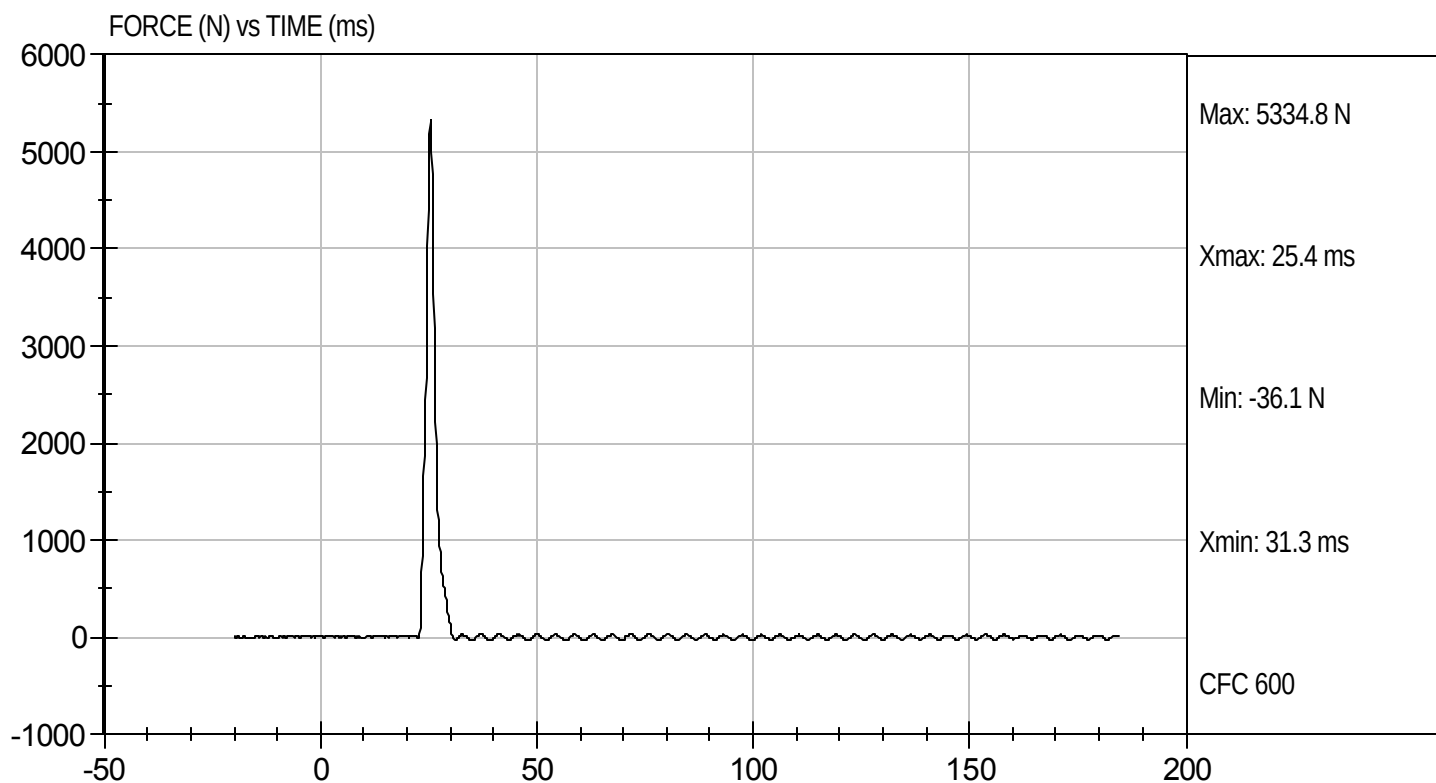
1/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11206

Test Date: 1/17/11
Velocity: 6.94 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: D11200

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	24	24	Pass
Rotation Rate	deg/s	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	49.4	45.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	47	48	Pass
Overall Test Results					Pass

Jessica Galt
Laboratory Technician

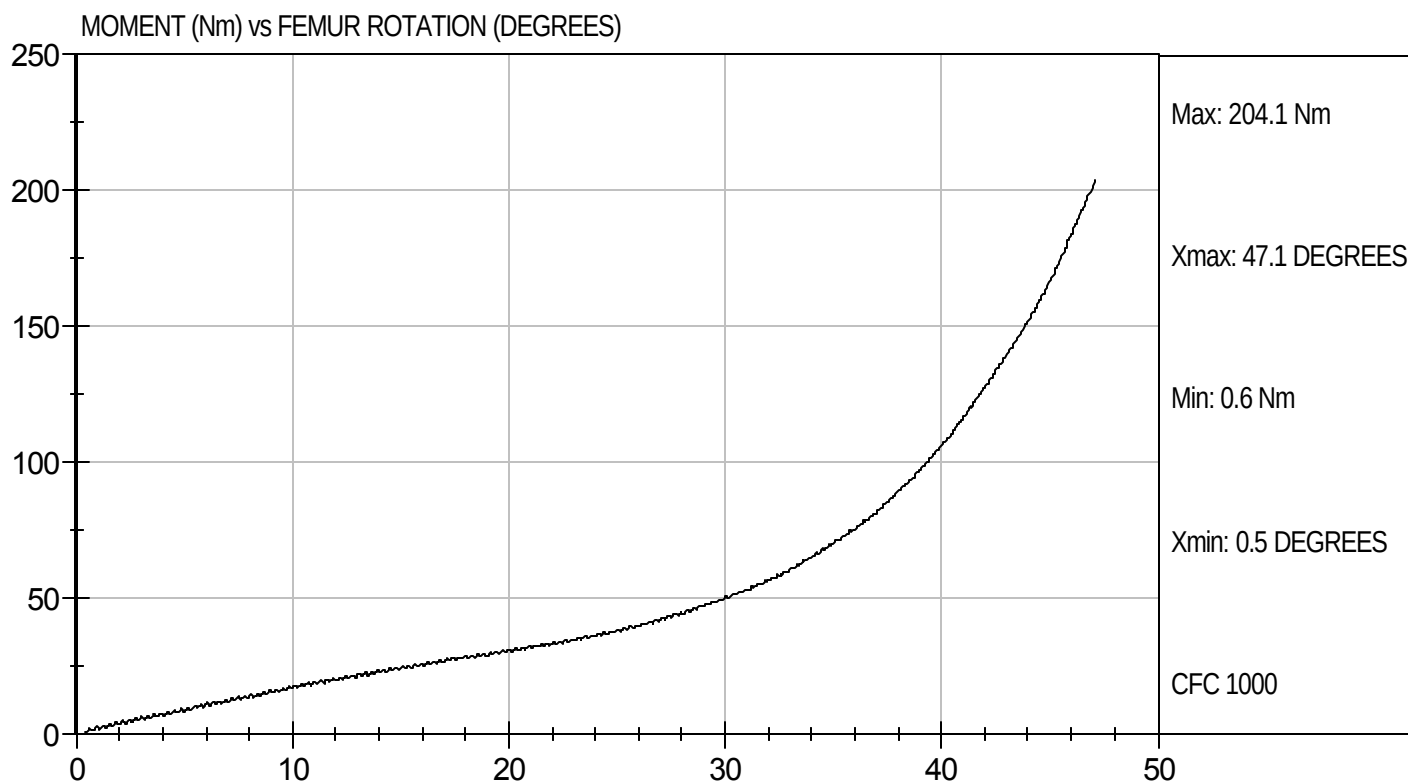
1/18/11
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D11209

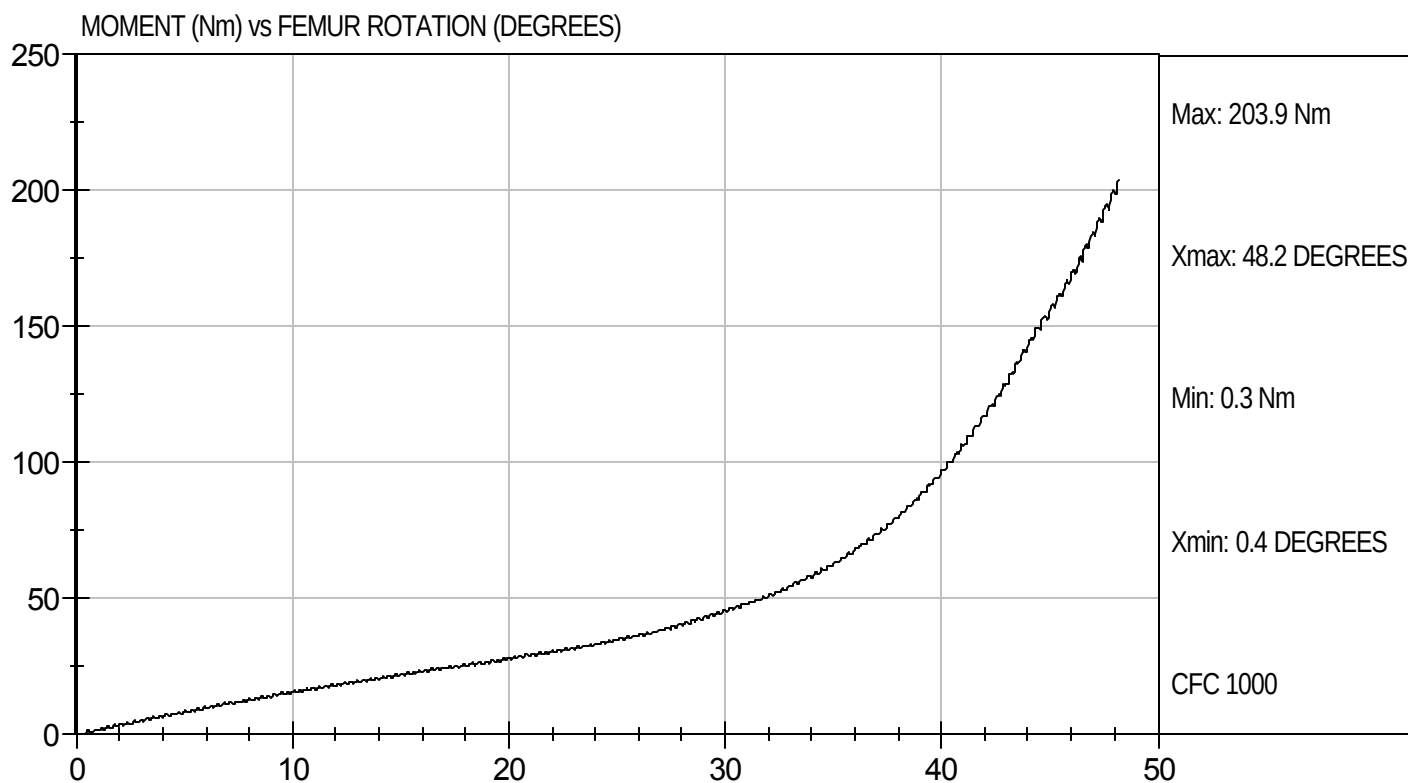
Test Date: 1/18/11
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D11200

Test Date: 1/18/11
Velocity: 0 ft/s, 0.00 m/s

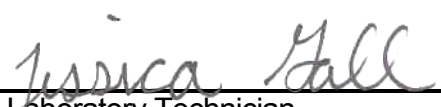


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D11081

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	250 to 300	253	Pass
Peak Lateral Acceleration	G's	+/- 15	9.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

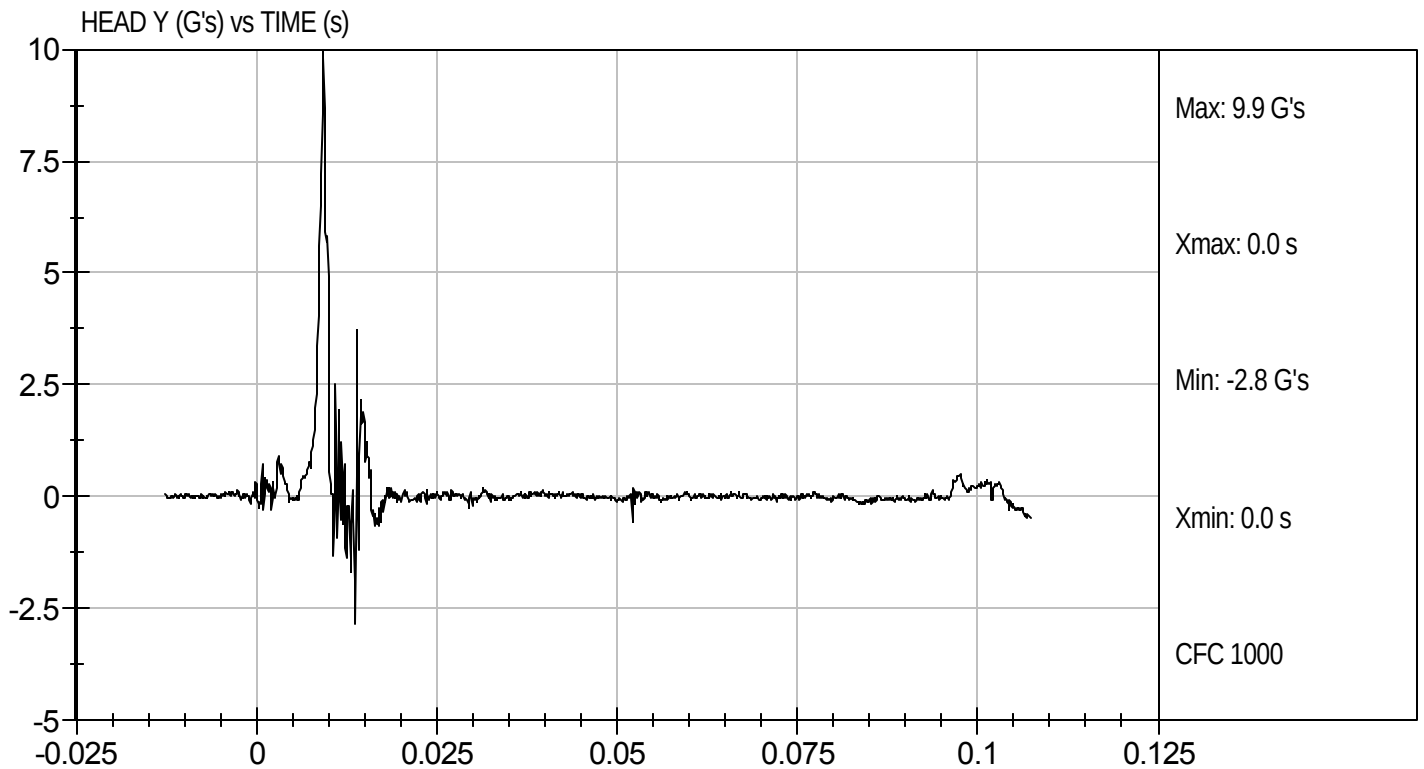
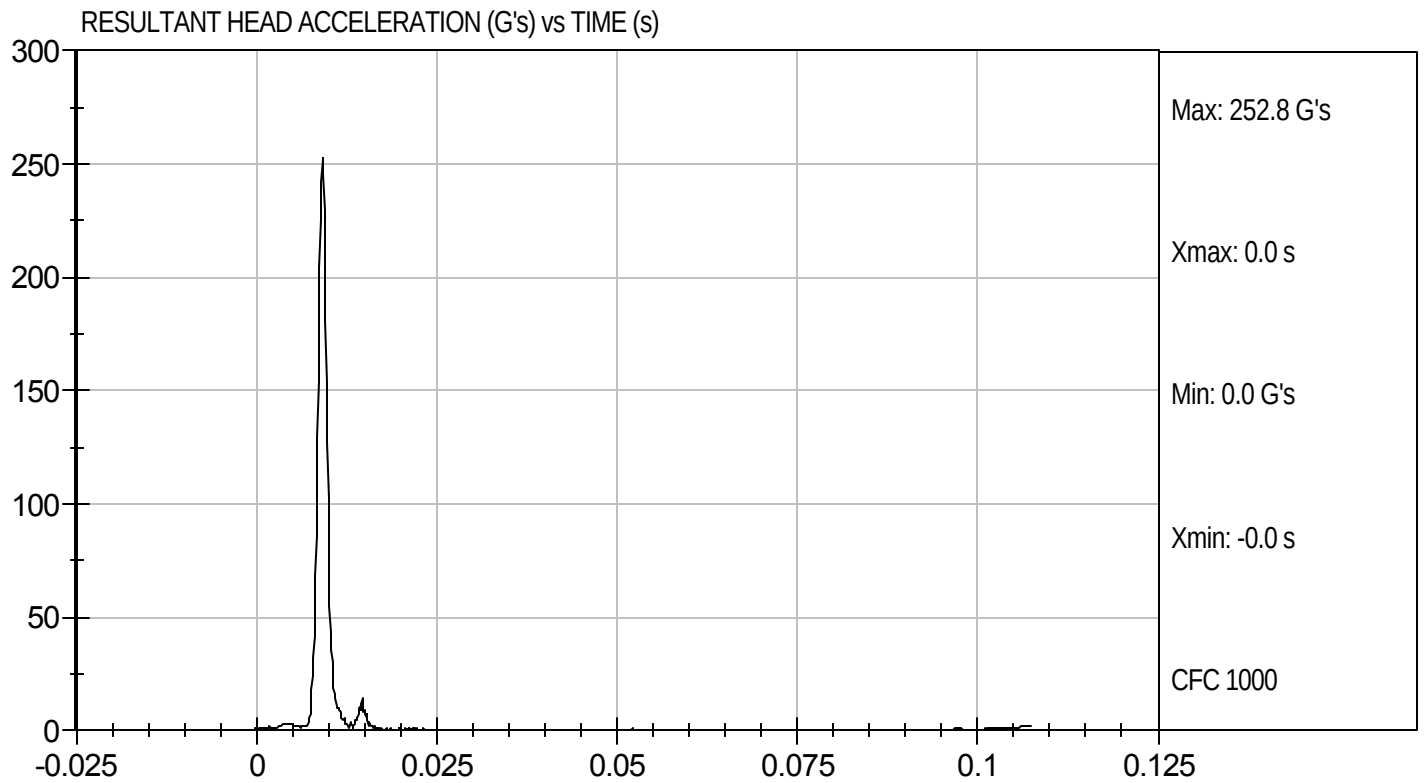
1/5/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D11081

Test Date: 1/5/11
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11082

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.95	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	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	80	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

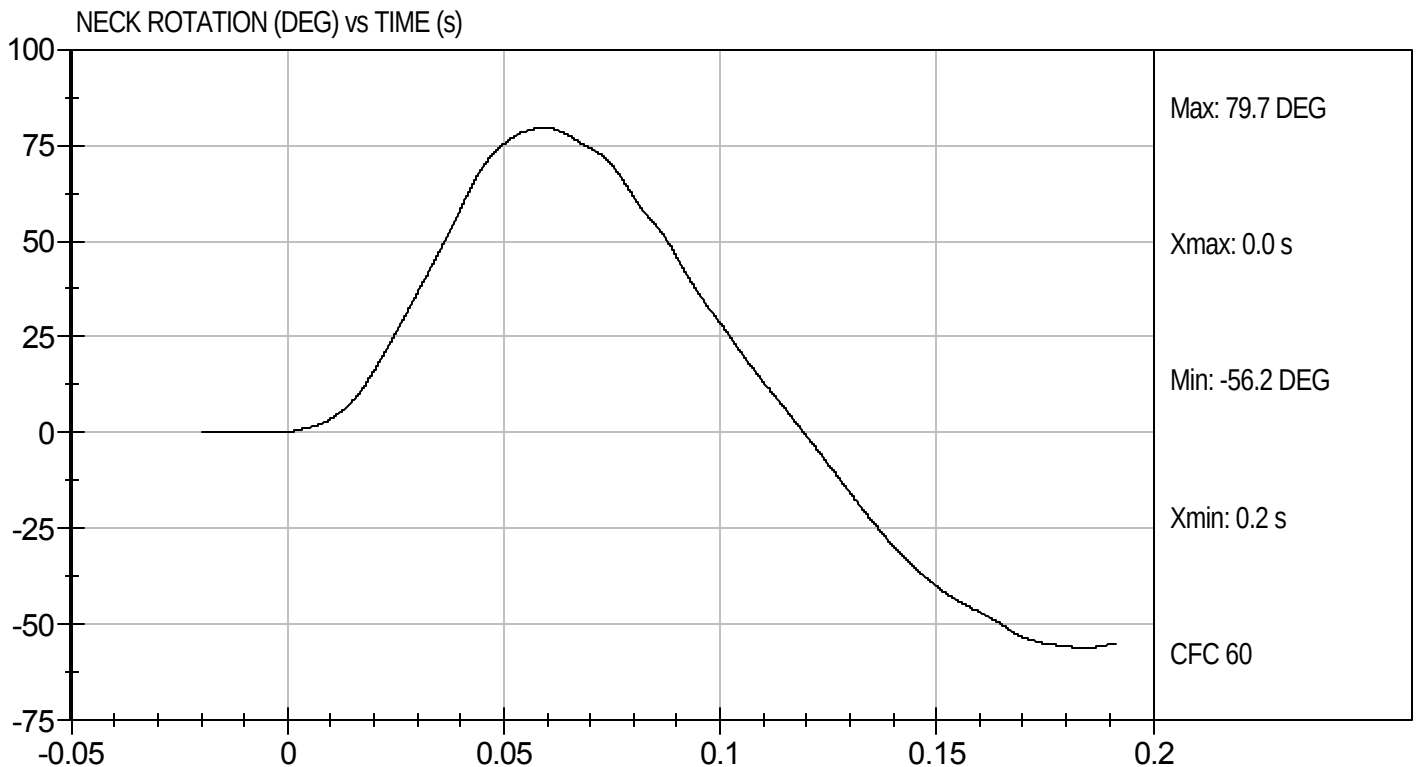
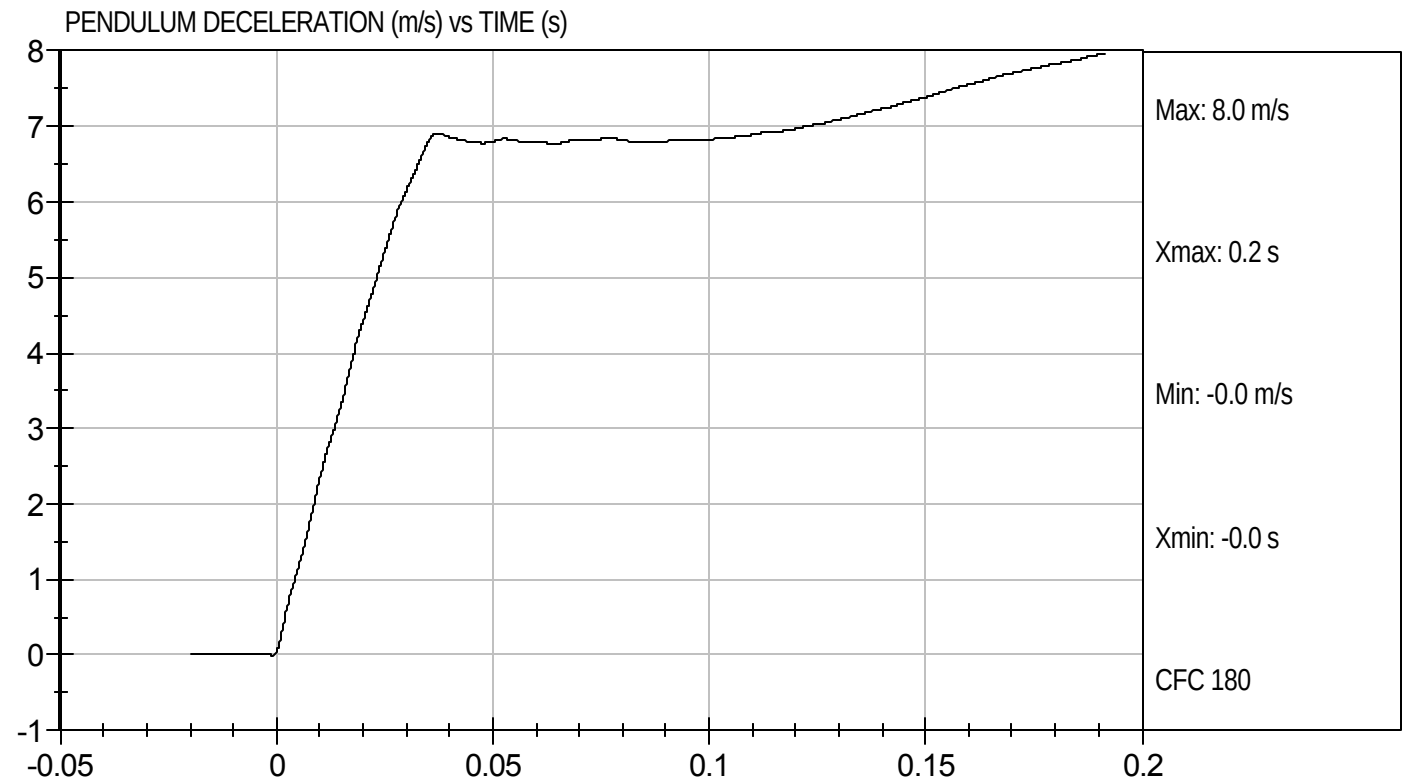
1/6/11
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Flexion
Component ID: D11082

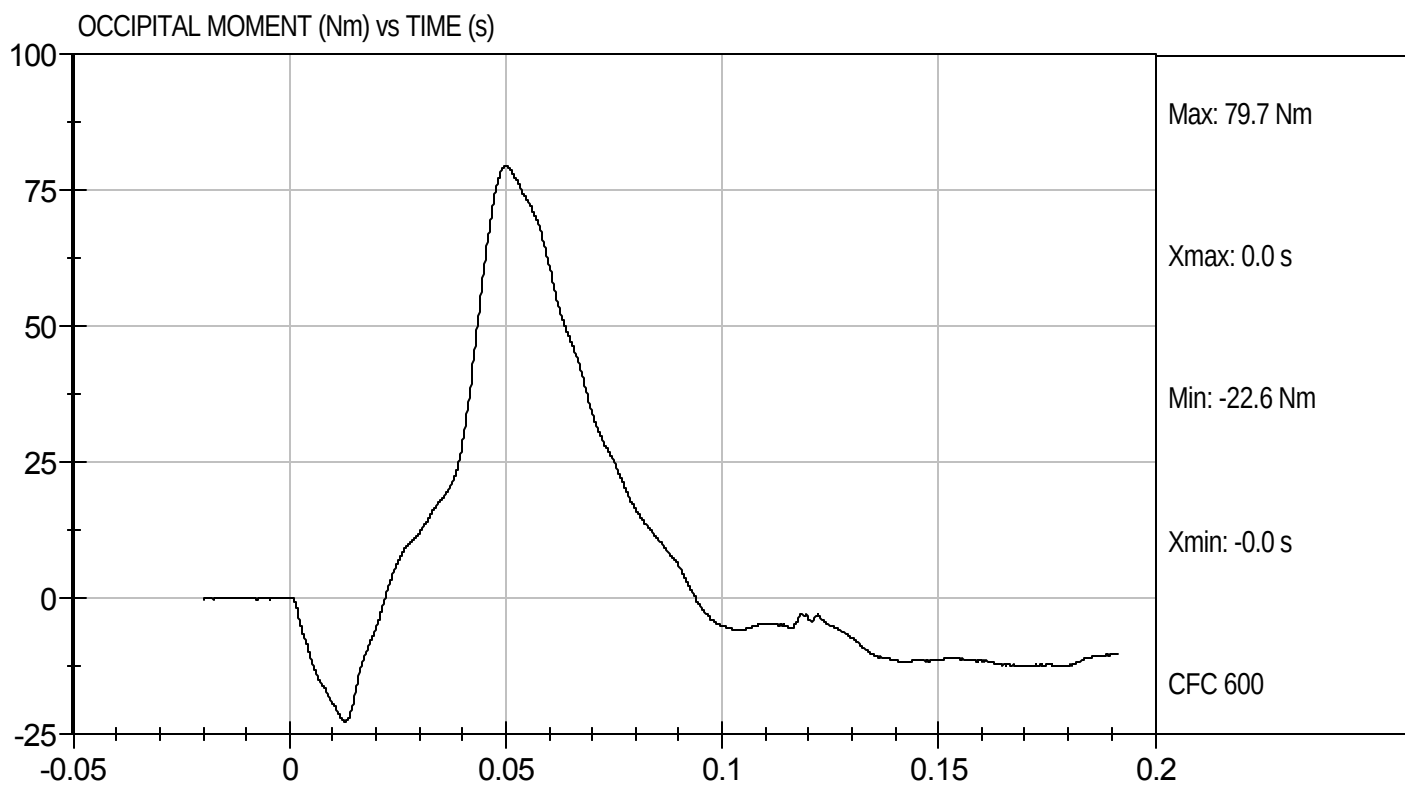
Test Date: 1/6/11
Velocity: 22.8 ft/s, 6.95 m/s





Test Desc: Neck Flexion
Component ID: D11082

Test Date: 1/6/11
Velocity: 22.8 ft/s, 6.95 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138Test I.D: D11083

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	105	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-61	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	99	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

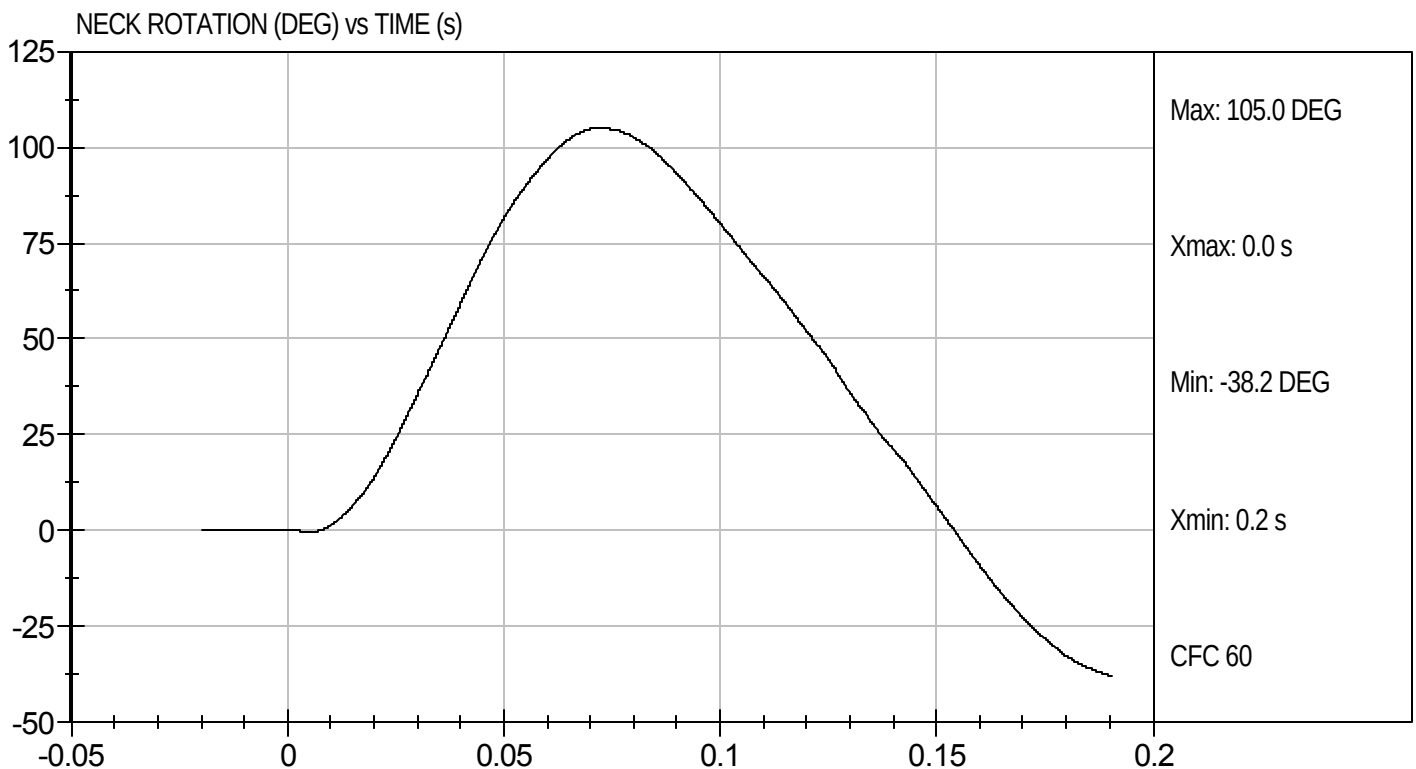
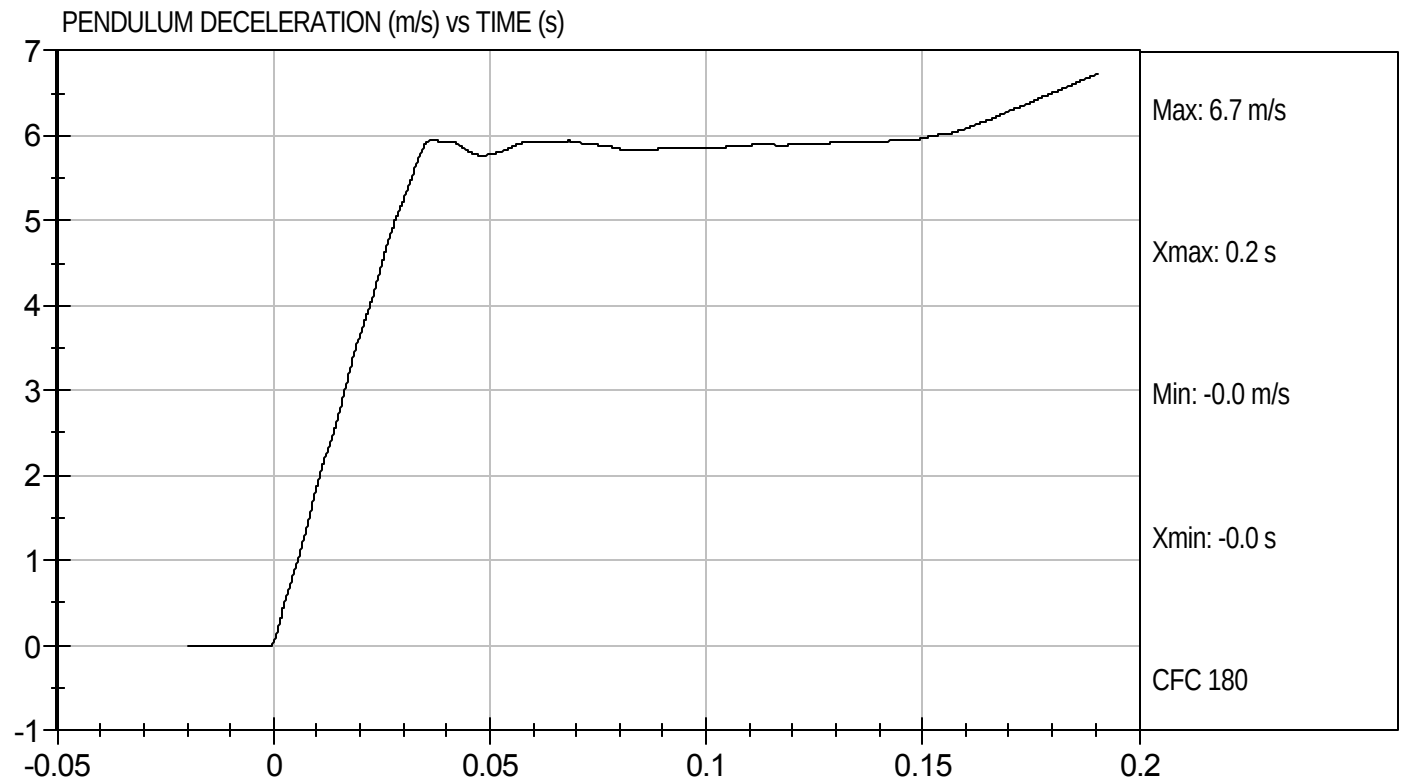
1/6/11
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D11083

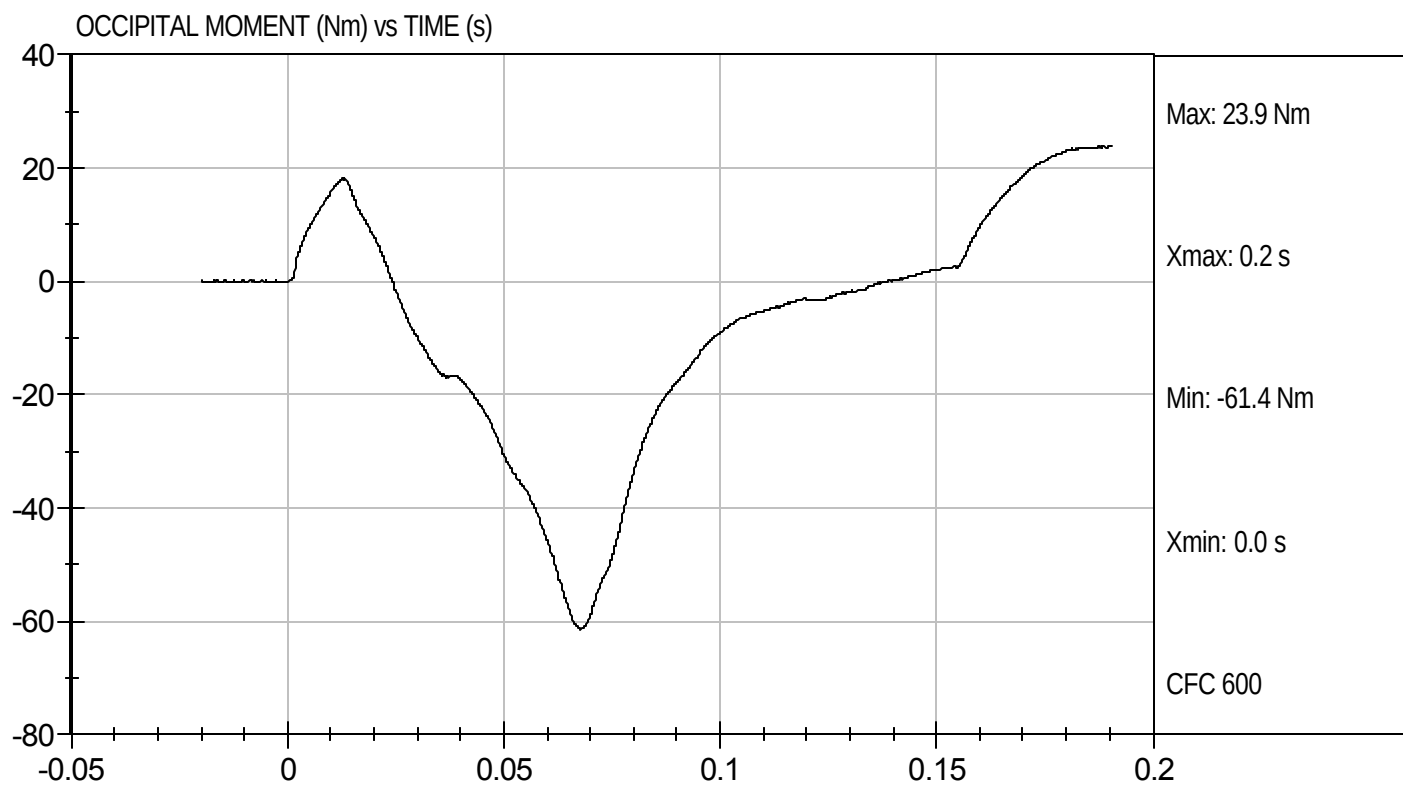
Test Date: 1/6/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D11083

Test Date: 1/6/11
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: D11084

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	19	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	4.22	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4217	Pass
			Overall Test Results	Pass


Laboratory Technician

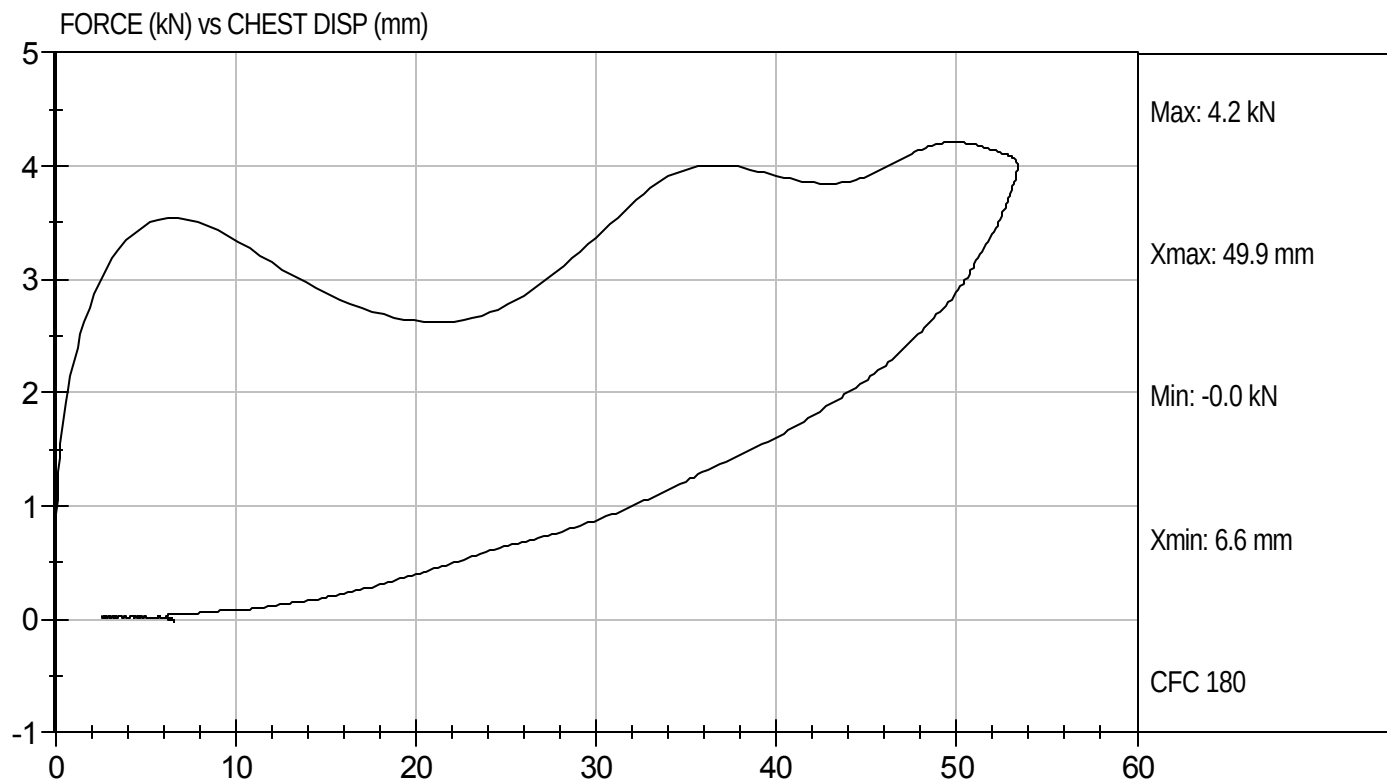
1/6/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11084

Test Date: 1/6/11
Velocity: 22.22 ft/s, 6.77 m/s

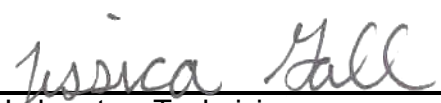


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11085

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	kN	3.45 to 4.06	3.59	Pass
Overall Test Results				Pass


Laboratory Technician

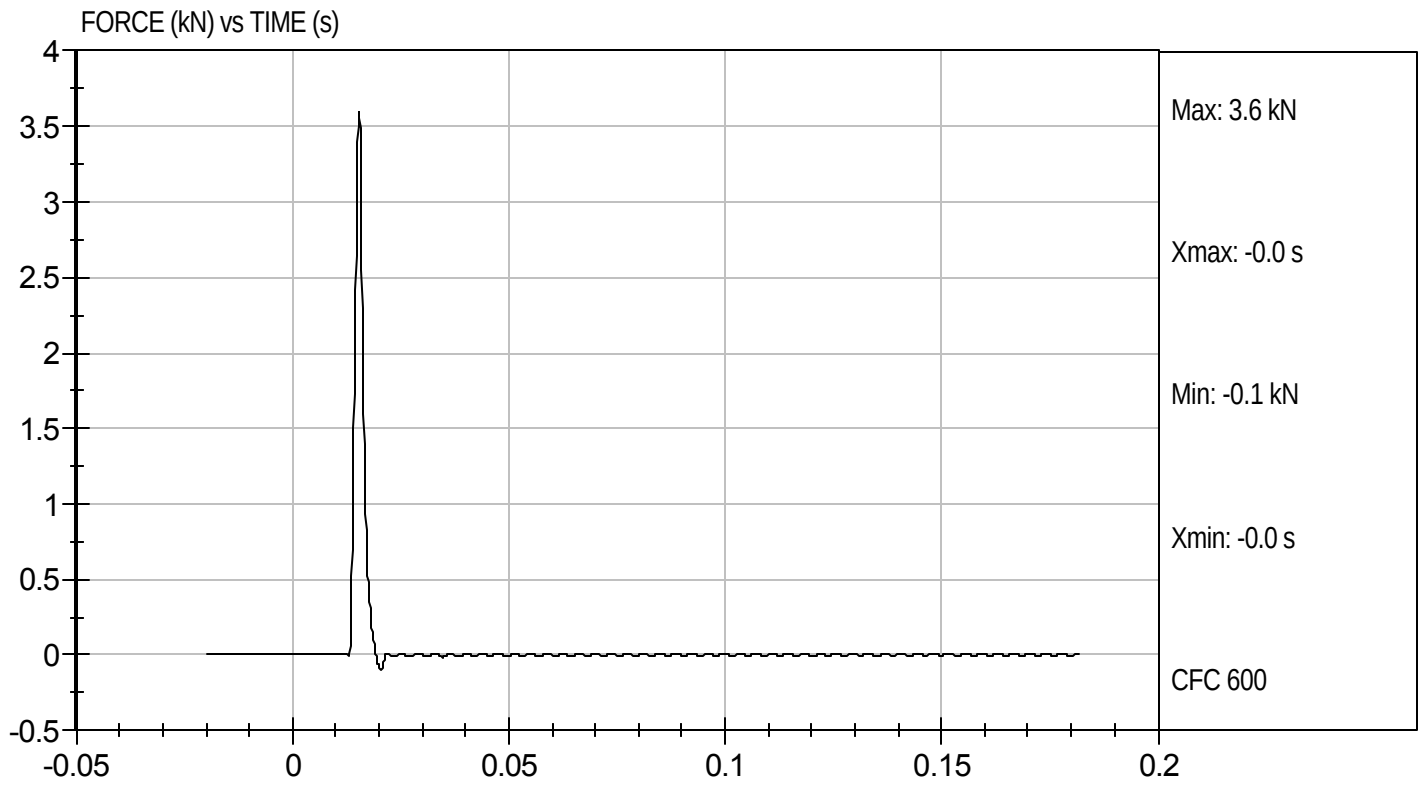
1/5/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D11085

Test Date: 1/5/11
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: D11086

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	kN	3.45 to 4.06	3.67	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

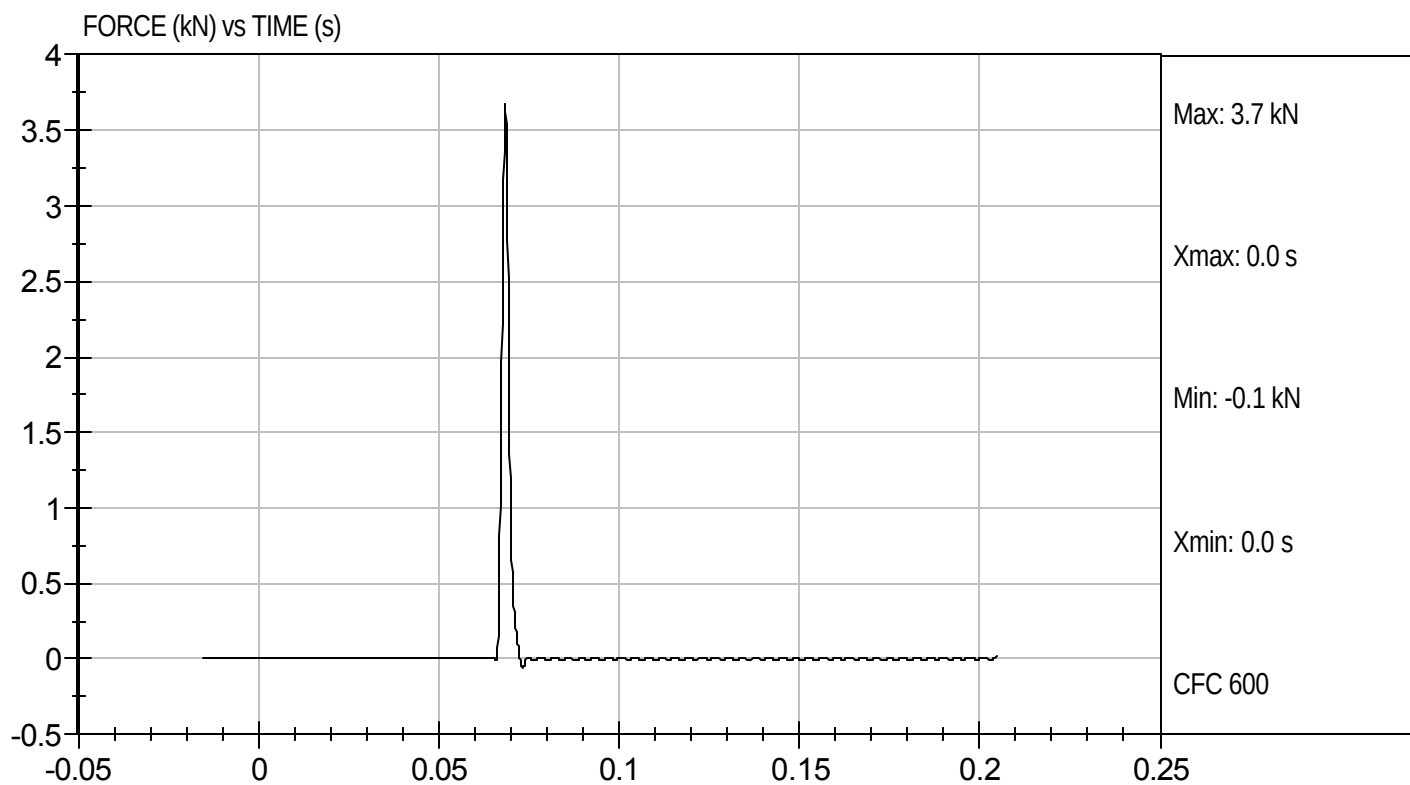
1/5/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11086

Test Date: 1/5/11
Velocity: 6.99 ft/s, 2.13 m/s

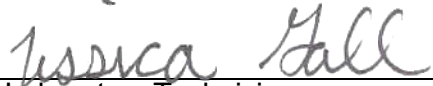


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

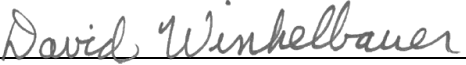
ATD Serial No: 138

Test I.D: D11087

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	348	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

1/6/11
Test Date


Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D11191

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	253	Pass
Peak Lateral Acceleration	G's	+/- 15	-6.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

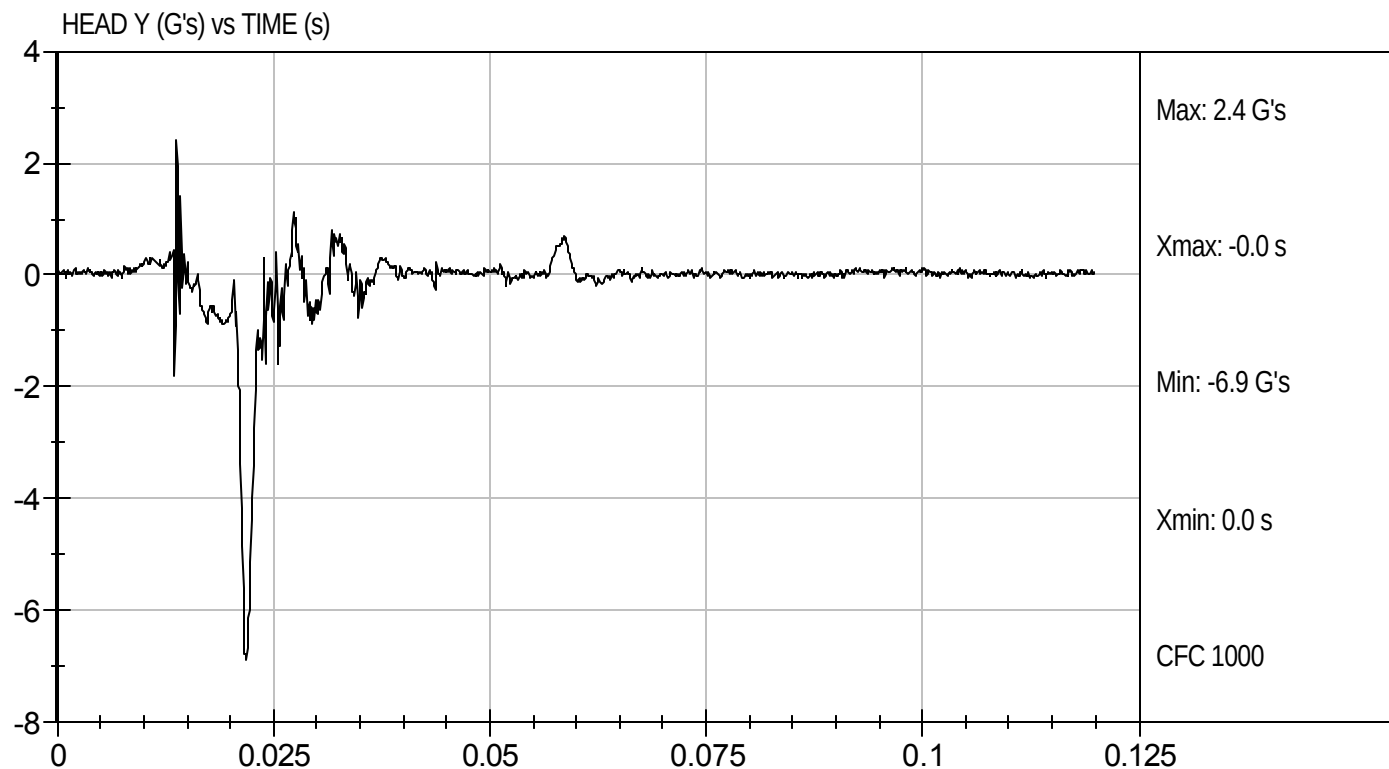
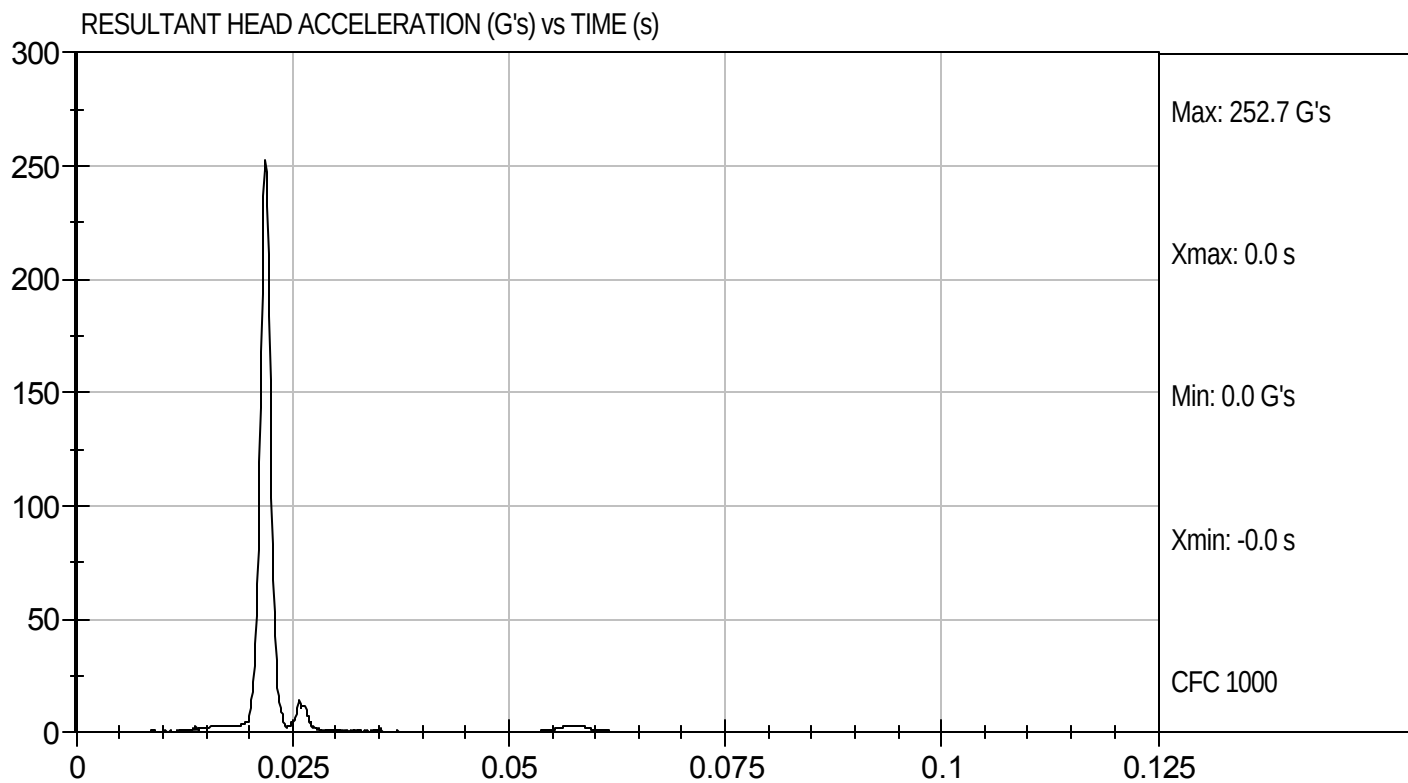
1/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11191

Test Date: 1/17/11
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D.: D11192

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	22	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	77	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	79	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	82	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

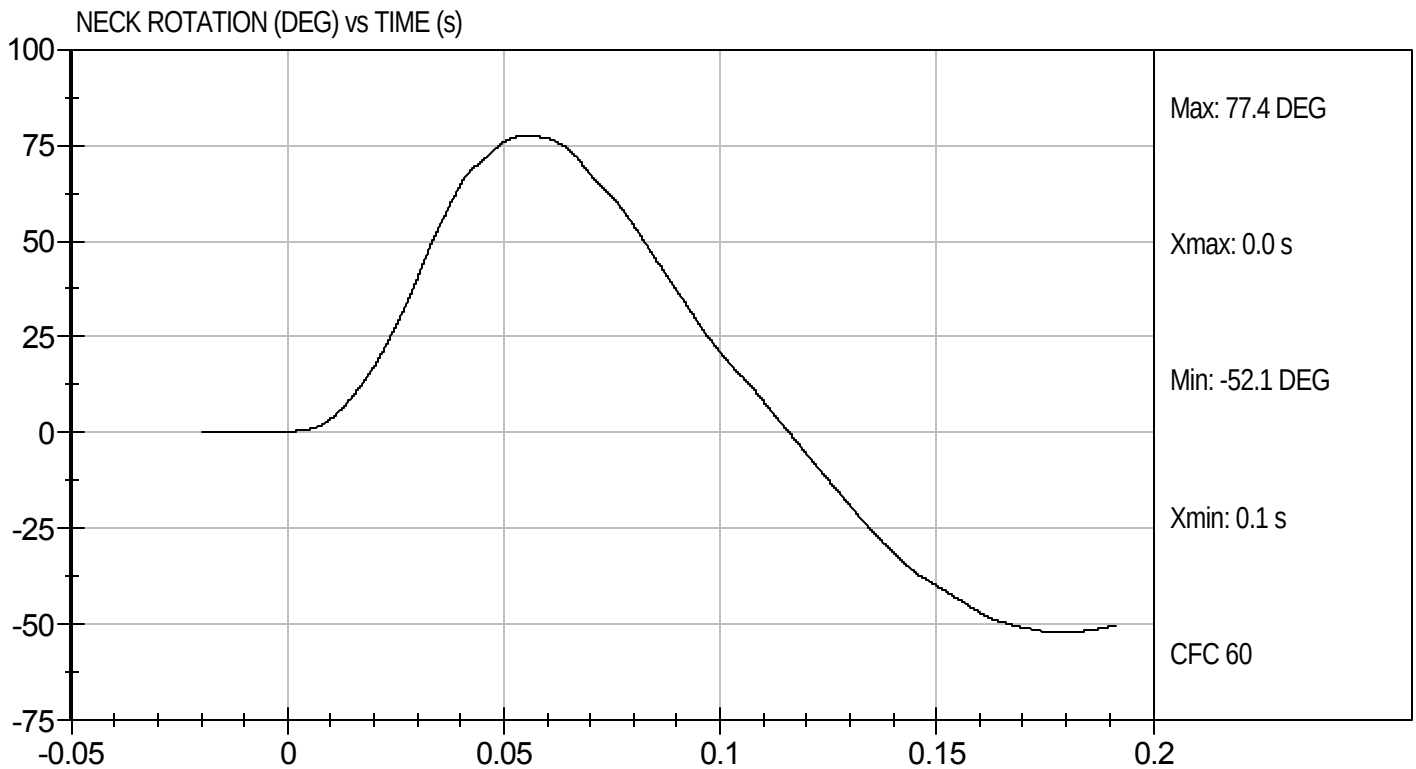
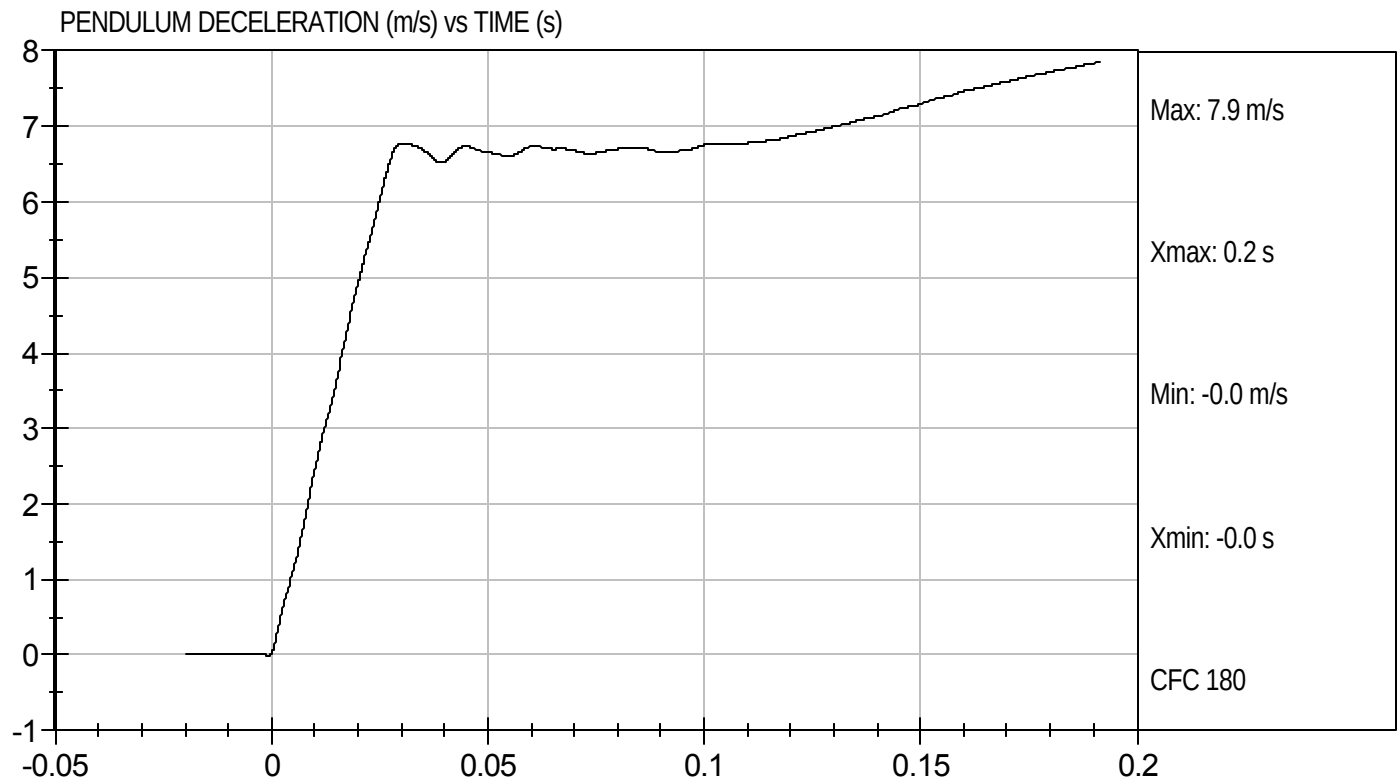
1/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Flexion
Component ID: D11192

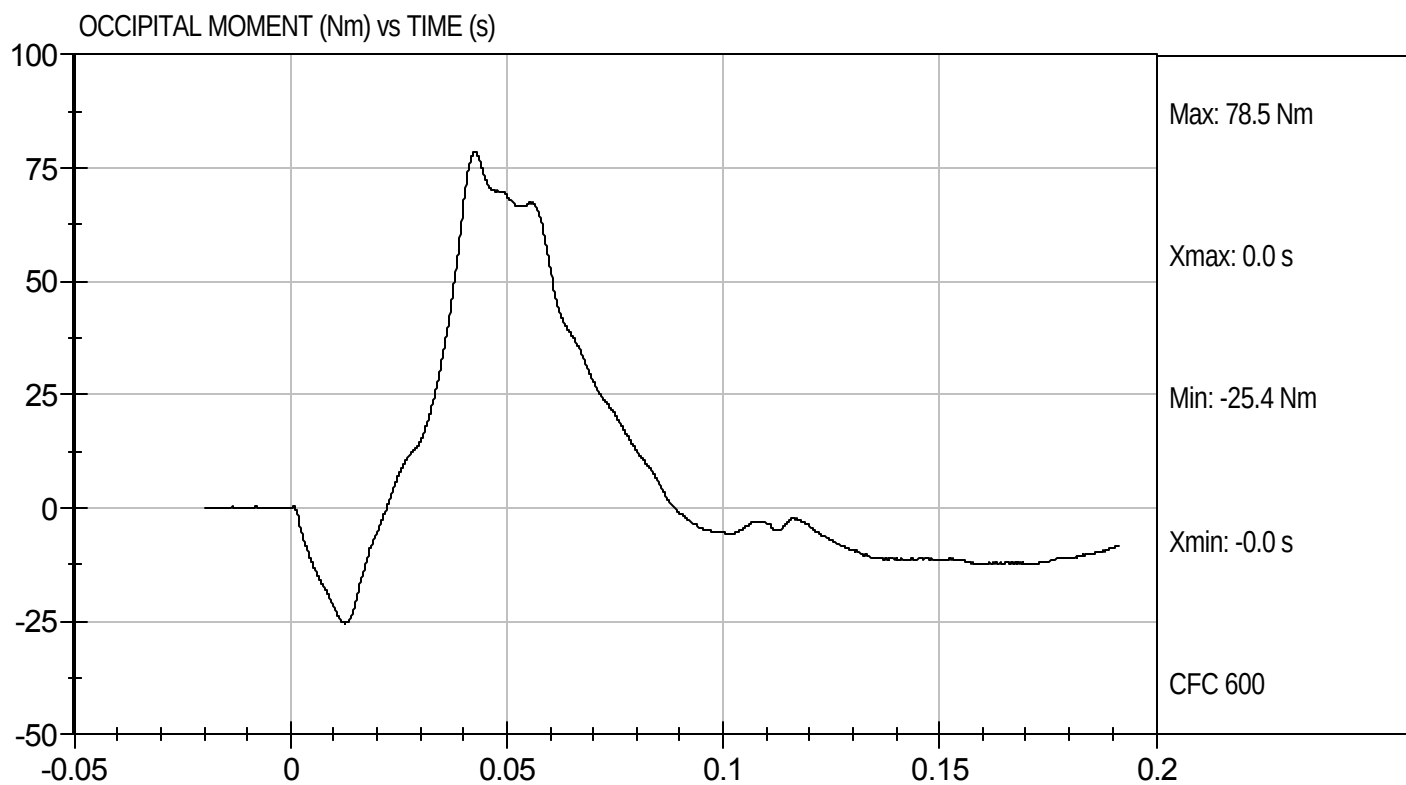
Test Date: 1/17/11
Velocity: 22.83 ft/s, 6.96 m/s





Test Desc: Neck Flexion
Component ID: D11192

Test Date: 1/17/11
Velocity: 22.83 ft/s, 6.96 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11193

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	22	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	103	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	100	Pass
Overall Results					Pass

Jessica Hall
Laboratory Technician

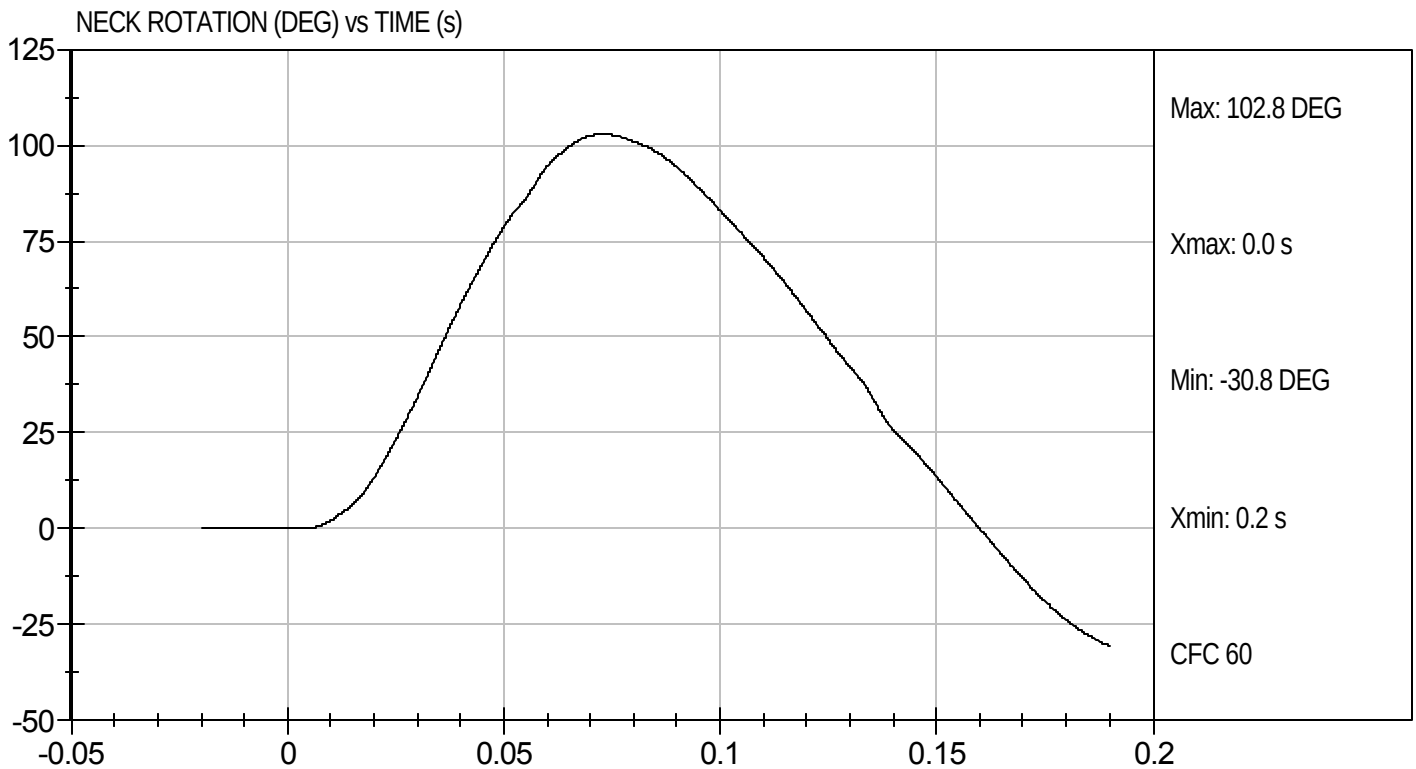
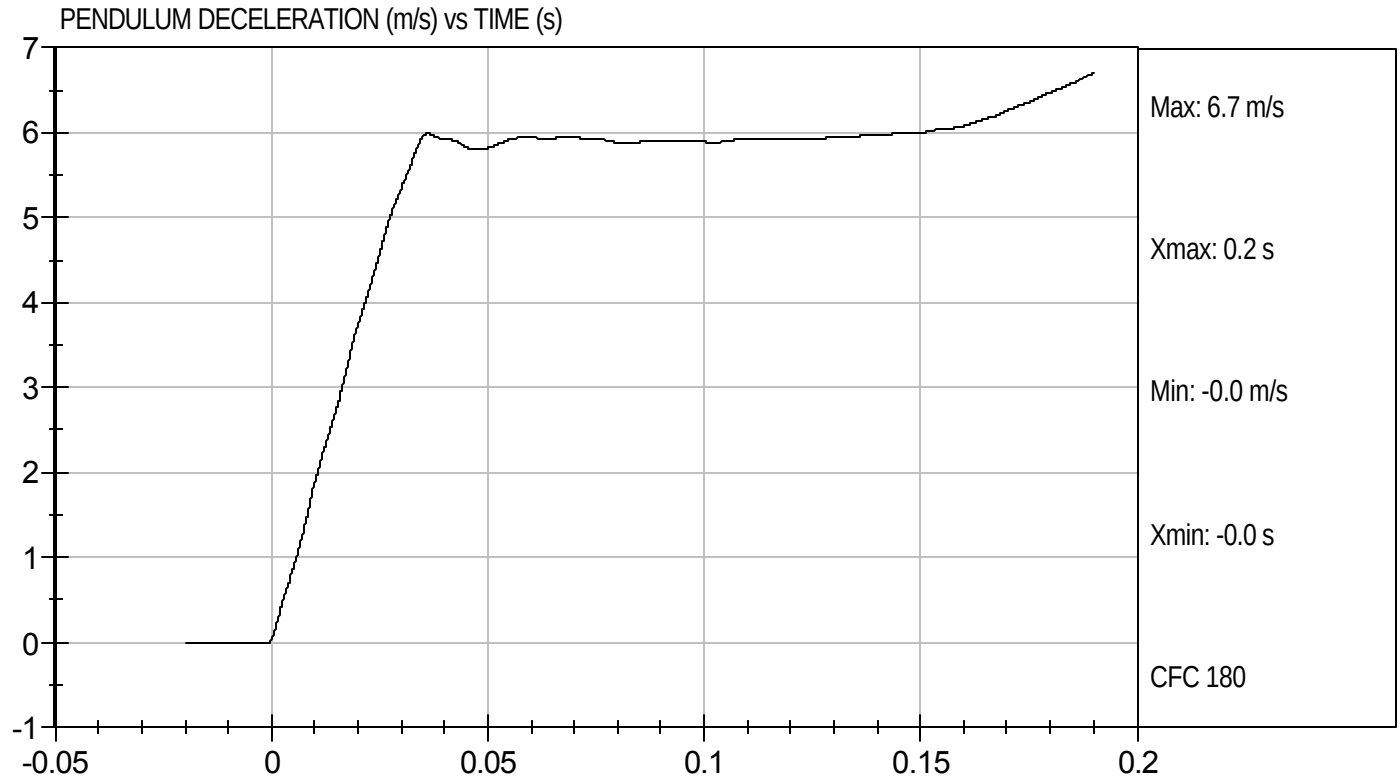
1/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Neck Extension
Component ID: D11193

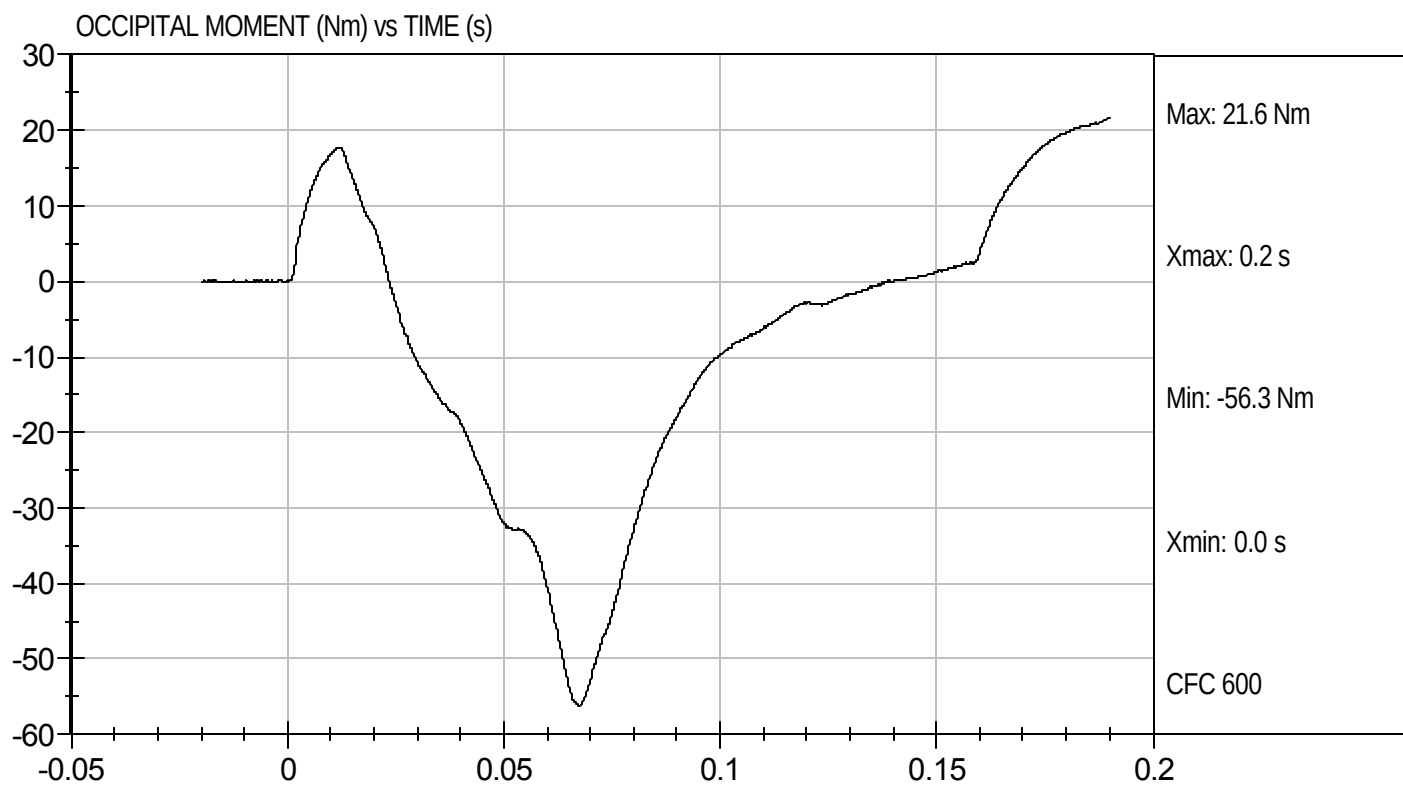
Test Date: 1/17/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Neck Extension
Component ID: D11193

Test Date: 1/17/11
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: D11194

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	23	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	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4031	Pass
			Overall Test Results	Pass


Laboratory Technician

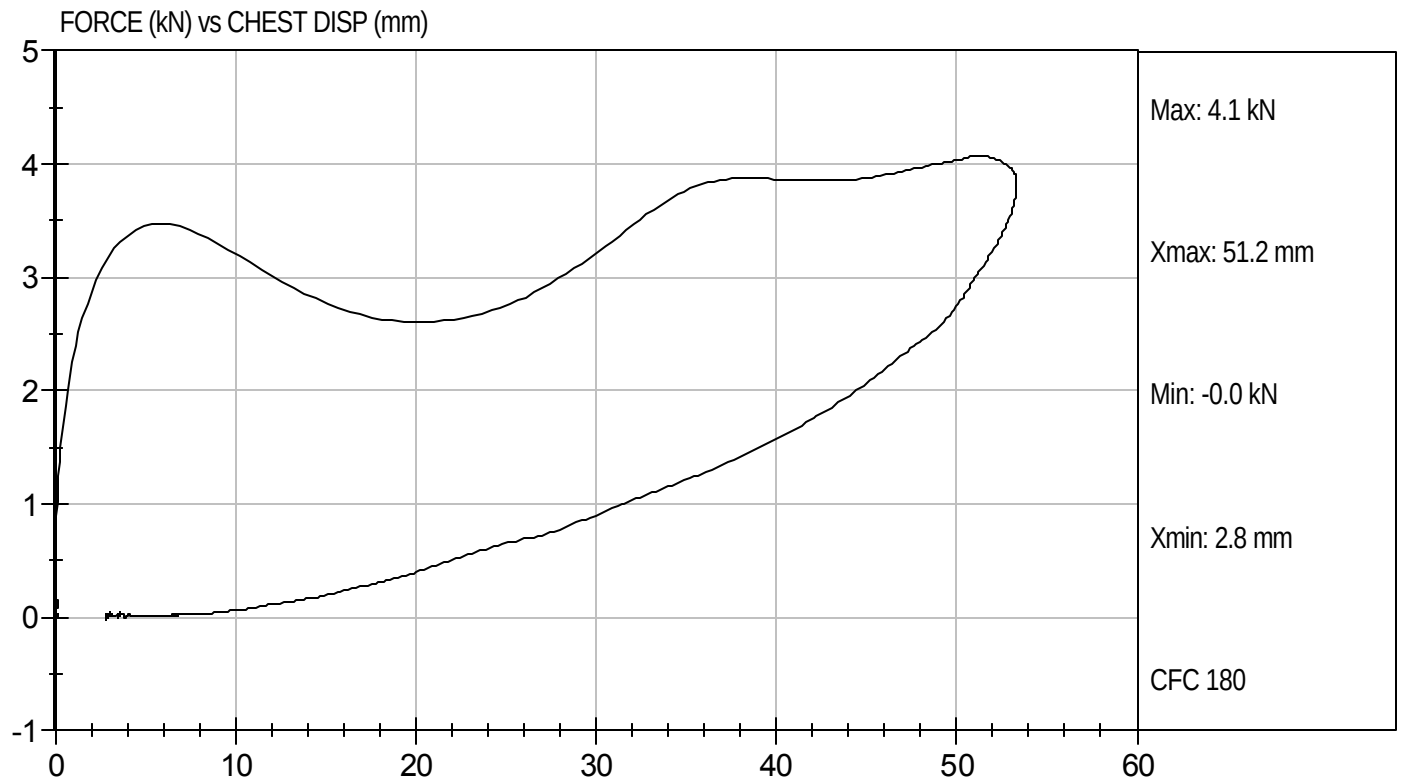
1/17/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11194

Test Date: 1/17/11
Velocity: 22.22 ft/s, 6.77 m/s

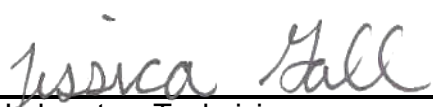


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11195

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	22	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

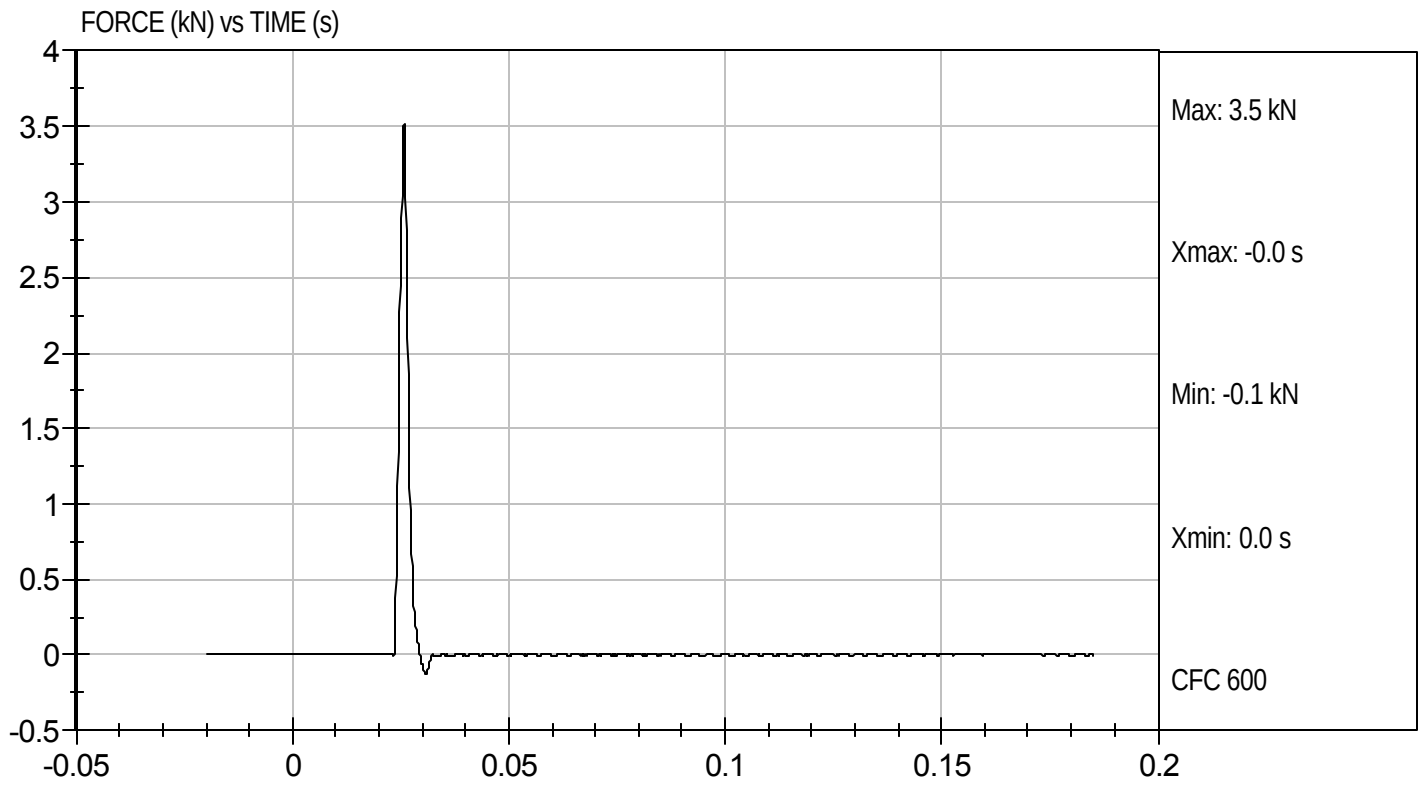
1/17/11
Test Date


Approved By



Test Desc: Right Knee
Component ID: D11195

Test Date: 1/17/11
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: D11196

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	22	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	kN	3.45 to 4.06	3.70	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

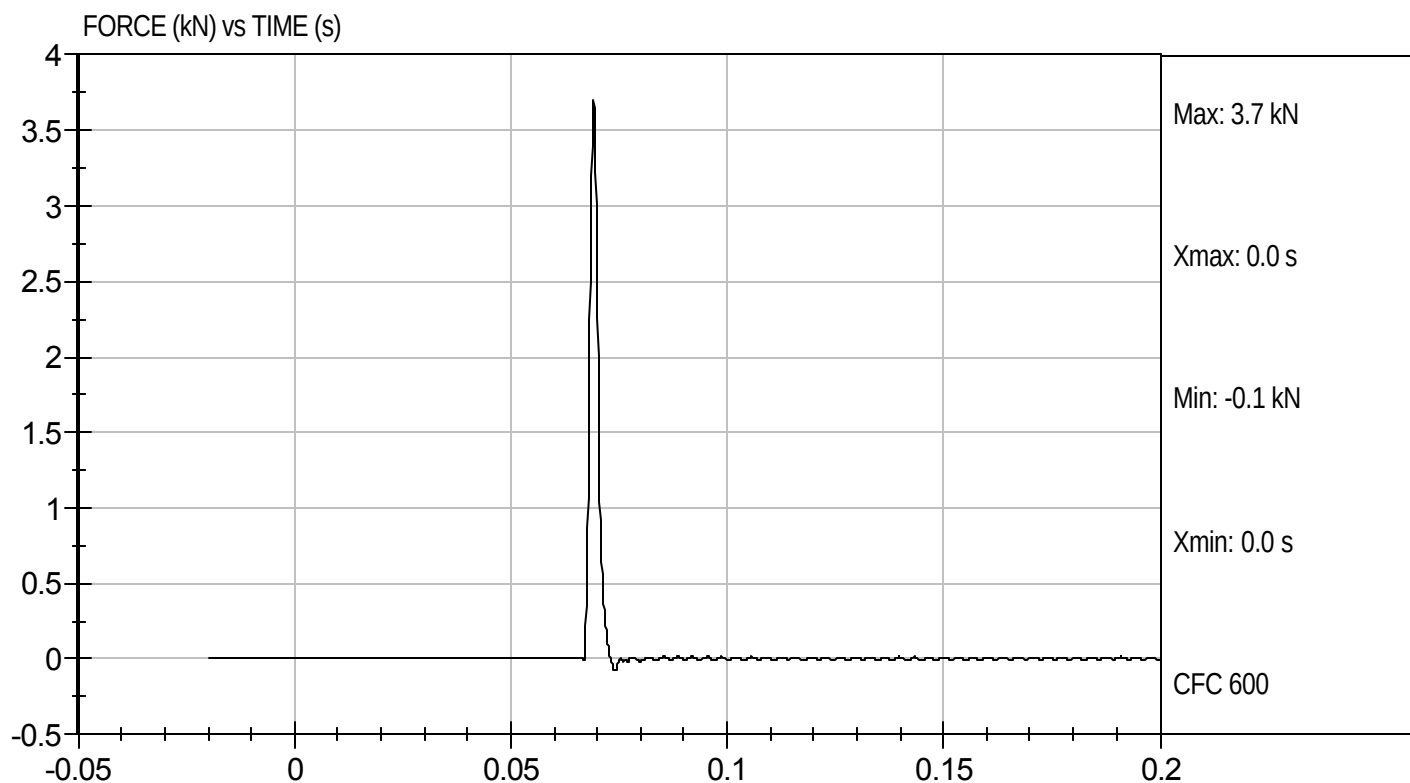
1/17/11
Test Date

David Winkelbauer
Approved By



Test Desc: Left Knee
Component ID: D11196

Test Date: 1/17/11
Velocity: 6.86 ft/s, 2.09 m/s

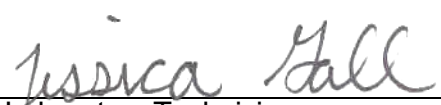


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D11197

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	22	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	339	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
Overall Result				Pass


Laboratory Technician

1/17/11
Test Date


Approved By