

REPORT NUMBER: SPNCAP-MGA-2011-074

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Side Impact Pole Test**

**GENERAL MOTORS LLC
2011 Buick Lucerne CX 4-Dr Sedan
NHTSA No.: GB0100**

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



Test Date: February 25, 2011

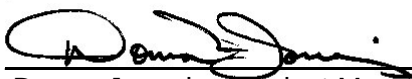
Final Report Date: March 30, 2011

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 DTNH22-09-D-00124.

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Approved by: 
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Approval Date: March 30, 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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4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole Testing of a 2011 Buick Lucerne CX 4-Dr Sedan NHTSA No.: GB0100		5. Report Date March 30, 2011																					
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7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer		8. Performing Organization Report No. SPNCAP-MGA-2011-074																					
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15. Supplementary Notes																							
16. Abstract A 32.2 km/h (20 mph), 75° oblique impact NCAP Side Pole Test was conducted on the subject 2011 Buick Lucerne CX 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on February 25, 2011. The impact velocity was 32.3 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The test vehicle post-test maximum crush was 451 mm at level 3. The test vehicle's performance was as follows: <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th></th> <th colspan="3" style="text-align: center;">Driver ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">519</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td style="text-align: center;">Gs</td> <td style="text-align: center;">82</td> <td style="text-align: center;">62</td> </tr> <tr> <td>Combined Acetabular and Iliac Pelvic Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">4053</td> </tr> </tbody> </table>					Driver ATD (SID-IIs)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	519	Resultant Lower Spine Acceleration	Gs	82	62	Combined Acetabular and Iliac Pelvic Force	N	5525	4053
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Combined Acetabular and Iliac Pelvic Force	N	5525	4053																				
The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.																							
17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Adm. Technical Reference Division 1200 New Jersey Ave, SE Washington, D.C. 20590																					
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SECTION 1
TEST PURPOSE AND PROCEDURE

This side impact test is part of the MY 2011 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2011 Buick Lucerne CX 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated January 2010.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2011 Buick Lucerne CX 4-Dr Sedan. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.3 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on February 25, 2011. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS NCAP Side Pole Laboratory Test Procedure dated January 2010. Camera locations and other pertinent camera information are included in this report.

The Part 572V (SID-IIs) dummy was instrumented accordingly:

Head CG Triaxial Accelerometers
 Thorax Upper, Middle, and Lower Rib Displacement Potentiometers
 Abdomen Upper and Lower Rib Displacement Potentiometers
 Lower Spine Triaxial Accelerometers
 Iliac Load Cell
 Acetabulum Load Cell

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report.

The following table summarizes the results of the test:

DUMMY INJURY VALUES

Dummy	HIC (36ms)	Resultant Lower Spine Acceleration	Pelvic Force (N)	
SID-IIs 5 th Percentile Female	519	62	Iliac Wing	1441
			Acetabular	2872
			Sum	4053

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Rear (Passenger) P4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	No		No	
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	

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

GENERAL COMMENTS

There was no valid data collected for:

Left B-Post @ Sill Y after 10 msec.

Driver Seat Track Y after 60 msec.

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

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	GB0100	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Buick	Power Steering	Yes
Model	Lucerne	Driver Front Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	1G4HA5EM7BU130812	Driver Head/Torso Airbag	No
Body Color	Sand Beige Metallic	Driver Torso Airbag	Yes
Delivery Date	2/04/2011	Driver Torso/Pelvis Airbag	No
Odometer (mi)	107	Driver Pelvis Airbag	No
Odometer (km)	172	Driver Knee Airbag	No
Dealer	Boucher Fleet Group	Rear Pass. Front Airbag	No
Transmission	Automatic	Rear Pass. Curtain Airbag	Yes
Final Drive	Front	Rear Pass. Head/Torso Airbag	No
Type/No. Cylinders	6	Rear Pass. Torso Airbag	No
Engine Displacement (L)	3.9	Rear Pass. Torso/Pelvis Airbag	No
Engine Placement	Lateral	Rear Pass. Pelvis Airbag	No
Roof Rack	No	Rear 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	Power Seats	Yes
Does owner's manual provide instruction to turn off automatic door locks?			No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (kg)	2235
Date of Manufacture	12/10	GAWR Front (kg)	1204
		GAWR Rear (kg)	1031

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	3	3		6	
Capacity Weight (VCW) (kg)				488	(A)
DSC x 68.04 kg				408	(B)
Cargo Weight (RCLW) (kg)				80	(A-B)

VEHICLE SEAT TYPE

Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/Lever	
Rear or Second Row			X		X		
Third Row Seat							

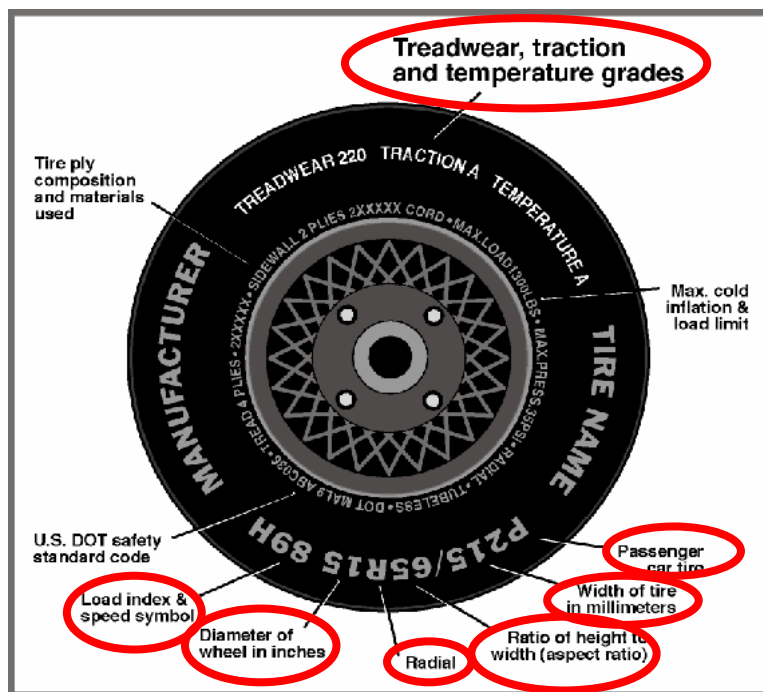
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	210	210
Recommended Tire Size	P235/55R17	P235/55R17
Tire Size on Vehicle	P235/55R17	P235/55R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Energy	Energy
Treadwear	400	400
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	98H	98H
Tire Material	Rubber	Rubber
DOT Safety Code Right	B9JJ ENXX	B9JJ ENXX
DOT Safety Code Left	B9JJ ENXX	B9JJ ENXX

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	523.5	336.1		524.8	410.0		540.7	400.5	
Right	kg	542.5	335.7		530.7	398.3		541.6	386.9	
Ratio	%	61.3	38.7		56.6	43.4		57.9	42.1	
Totals	kg	1066.0	671.8	1737.8	1055.5	808.3	1863.8	1082.3	787.4	1869.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1737.8	(A)
Actual Weight of 1 P572V ATD (SID-IIs) ATD Used	kg	52.2	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	80	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1870.0	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	As Delivered	As Tested	Fully Loaded
Driver Door Sill Angle (front-to-rear)*	deg	-0.4	-0.1	0.0
Front Passenger Sill Angle (front-to-rear)*	deg	-0.4	-0.1	-0.1
Front Bumper Angle (left-to-right)**	deg	0.0	-0.1	-0.1
Rear Bumper Angle (left-to-right)**	deg	0.2	-0.1	-0.1
Vehicle CG (Aft of Front Axle)	mm	1135	1274	1237
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	8	2	5

*Front up is positive ** Left up is positive

GENERAL VEHICLE TEST DATA

Measurement Description	Units	Value
Weight of Ballast in Cargo Area	kg	39.9
Weight of Vehicle Components Removed	kg	25.9

Vehicle components removed to meet target vehicle test weight: Right tail light, right side mirror, spare tire, jack & tools, engine cover.

TEST VEHICLE IMPACT POINT DATA

Measurement Parameter	Units	Value
Vertical Impact Reference Line (Aft of Front Axle)	mm	1140
Actual Impact Point (Aft of Front Axle)	mm	1133
Impact Point Difference (- forward / + rearward)	mm	-7

DATA SHEET NO. 2

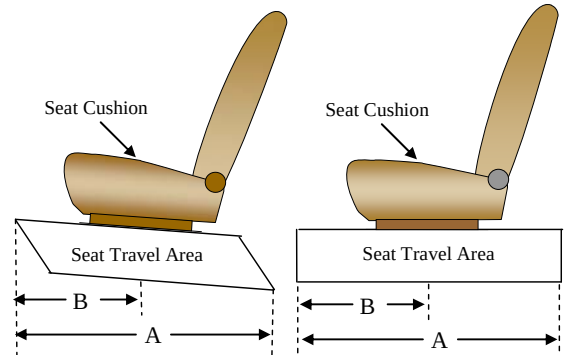
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011

SEAT FORE/AFT POSITIONS

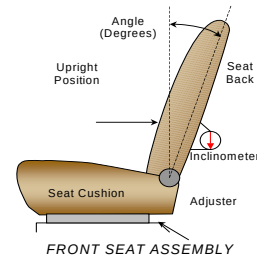
The driver seat was a power fore/aft adjustable seat with power height/angle adjustment. The seat travel was set as specified in Appendix B of the TP dated January 2010. The right front passenger seat was set to match the driver seat. The rear passenger seats were fixed.



SEAT FORE/AFT POSITIONING	Total Fore/Aft Travel	Placed in Detent # or Position
Driver Seat	269 mm	0 (forward-most as 0)
Front Passenger Seat	269 mm	0 (forward-most as 0)
Rear Seat – Struck Side		Fixed
Rear Seat – Non-Struck Side		Fixed

SEAT BACK ANGLE POSITION

The seat back was set as specified in Appendix B of the TP dated January 2010. The seat back angle measurement was made relative to the door sill on the headrest post.



SEAT BACK ANGLE	Degrees	Detents
Driver Seat Back Angle with Seated Dummy	-1.7	2 nd detent (first locking as 0)
Front Passenger Seat Back Angle	-1.4	2 nd detent (first locking as 0)
Struck Side Rear Seat Back Angle		Fixed
Non-Struck Side Rear Passenger Seat Back Angle		Fixed

SEAT BELT UPPER ANCHORAGE

The driver seat belt upper anchorage was set at the manufacturer's specified placement in Form 1.

SEAT BELT UPPER ANCHORAGES	Total # of Positions	Placed in Position #
Driver Seat	4 detents (1 st as 1)	0 (uppermost as 0)

DATA SHEET NO. 2 (CONTINUED)

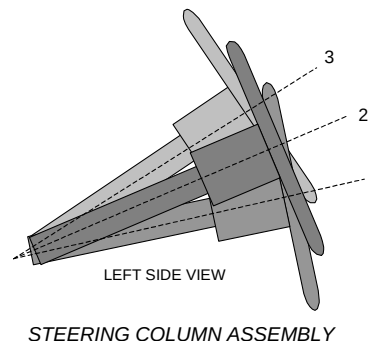
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011

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.

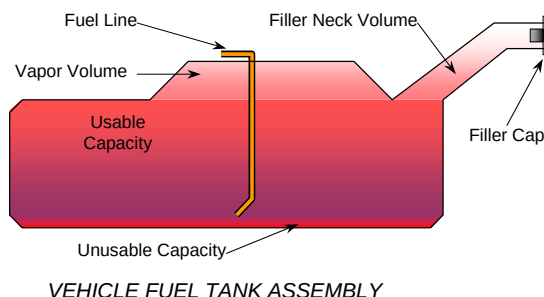


STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	80.2	
Geometric Center – Position 2	70.2	
Uppermost – Position 3	60.2	
Telescoping Steering Wheel Travel		
Test Position	70.2	

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. At key-on, the pump will run for 2-3 sec as a priming sequence. The pump will then turn off and will run continuously again once the vehicle's engine is started. The fuel pipe is on the left side.



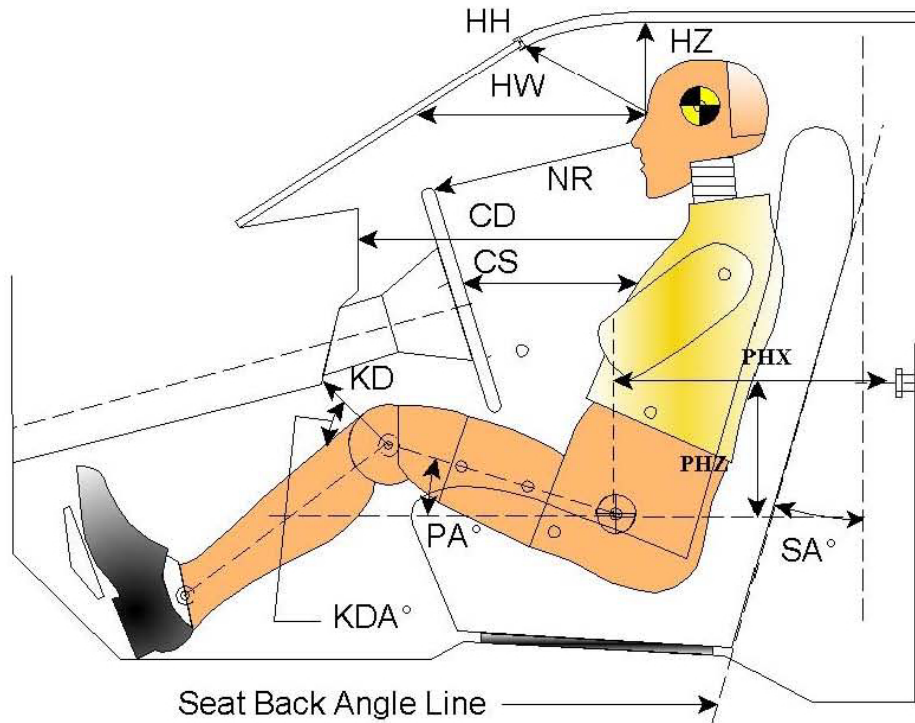
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard" Tank	70.0
Usable Capacity of "Optional" Tank	
Usable Capacity of Standard Tank as Specified in Owner's Manual	70.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
92-94% of Usable Capacity	64.4 to 65.8
Actual Amount of Solvent Used	65.1
1/3 of Usable Capacity	23.3

.DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011

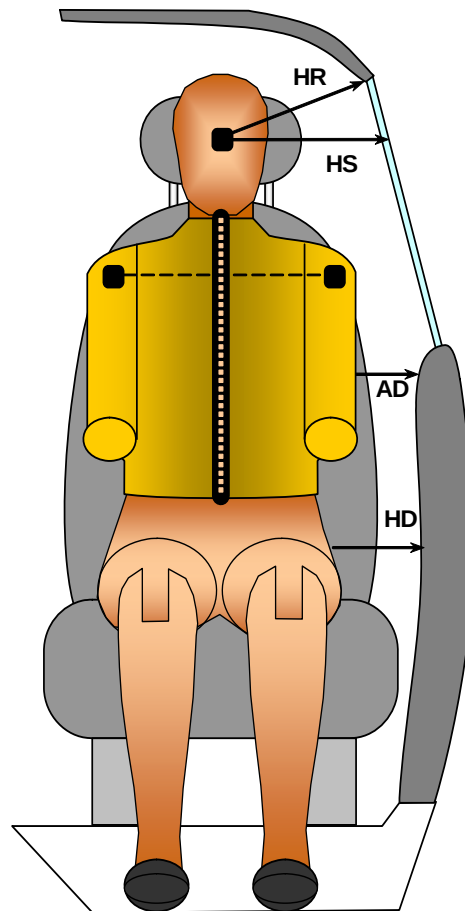


Code	Measurement Description	Driver S/N 296	
		Length (mm)	Angle (°)
HH	Head to Header	234	
HW	Head to Windshield	544	
HZ	Head to Roof	167	
NR	Nose to Rim	202	
CD	Chest to Dash	387	
CS	Chest to Steering Wheel	157	
KDL/KDAL	Left Knee to Dash	65	37.4
KDR/KDAR	Right Knee to Dash	61	38.1
PA	Pelvic Angle		20.0
PHX	H-Point to Striker (X-Axis)	337	
PHZ	H-Point to Striker (Z-Axis)	104	
SA	Seat Back Angle		-1.7

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011



FRONT VIEW OF DUMMY

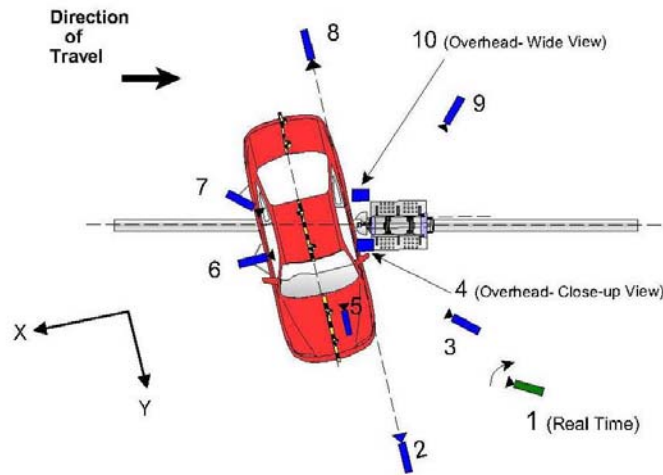
Code	Measurement Description	Driver S/N 296
		Length (mm)
HR	Head to Side Header	200
HS	Head to Side Window	379
AD	Arm to Door	196
HD	H-Point to Door	231

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011



Reference: (from Point of Impact for X and Y; from Ground for Z):
 +X = Forward of Impact, + Y = Right of Impact, +Z = Down

Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X*	Y*	Z*		
1	Real-Time Pan View					30
2	Front Ground Level	30	5280	-1690	24	1000
3	Impact Side 45° Forward	-2280	3910	-1710	20	1000
4	Overhead Closeup	30	0	-4520	50	1000
5	Onboard – Driver Front				16	1000
6	Onboard – Driver Side				8	1000
7	Onboard – Driver Rear				8	1000
8	Rear Ground Level	30	-5740	-1680	24	1000
9	Impact Side 45° Rearward	-3700	-3150	-1700	20	1000
10	Overhead Wide View	250	0	-4610	14	1000
11	Real-Time Dummy Front View					30

* All measurements accurate to ± 6 mm

Note: Vehicle was at a 15° angle to the rigid pole.

INSTRUMENTATION

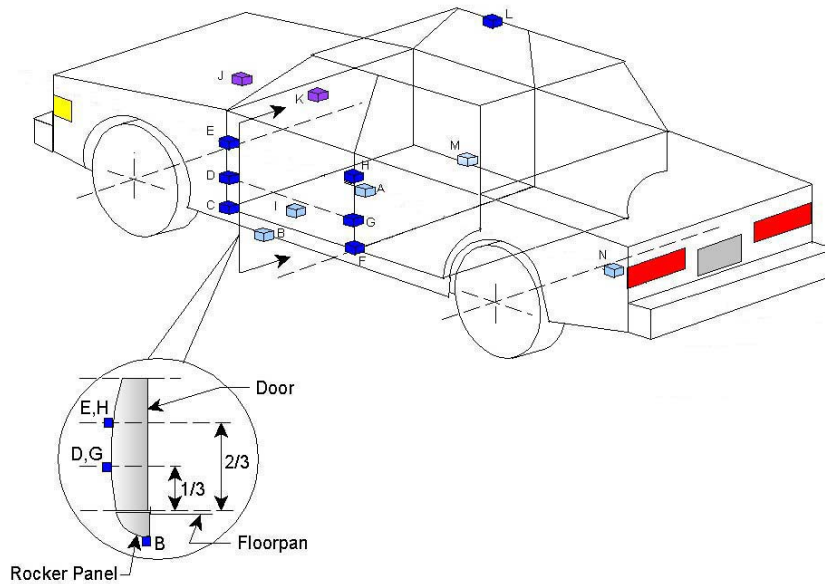
	Number of Channels
Driver Dummy	16
Vehicle Structure	21
Pole Load Cells – Not used	8
Contact Switches	3
Airbag Timing	2
Total No. of Data Channels	50

DATA SHEET NO. 6

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
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NHTSA No. GB0100
 Test Date: 2/25/2011



	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
A	Vehicle CG	2828	430	-205
	Vehicle CG Sensor	2858	430	-205
B	Left Floor Sill	3145	-773	-205
C	A Pillar Sill	3530	-773	-200
D	A Pillar Low	3560	-690	-505
E	A Pillar Mid	3560	-848	-762
F	B Pillar Sill	2423	-773	-220
G	B Pillar Low	2358	-730	-635
H	B Pillar Mid	2388	-730	-805
I	Driver Seat	2568	-655	-550
L	Engine Top	4291	0	-854
J	Firewall	4026	0	-873
K	Right Roof	2431	575	-1470
M	Right Floor Sill	2431	773	-215
N	Rear Floorpan	836	25	-505

Reference: From Point of Impact for X and Y; from Ground for Z):
 +X = Forward of Vehicle, + Y = Right of Vehicle, +Z = Down

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
Test Date: 2/25/2011



254 mm Diameter Rigid Pole

The pole was not instrumented.

Load Cell Locations	
ID	Height From Ground (m)
1	
2	
3	
4	
5	
6	
7	
8	

DATA SHEET NO. 8

POST-TEST OBSERVATIONS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan

NHTSA No. GB0100

Test Program: NCAP Side Pole Impact Test

Test Date: 2/25/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Driver
Dummy Type / Serial No.	SID-IIs / 296
Head Contact	Curtain Airbag, Headrest
Upper Torso Contact	Side Airbag
Lower Torso Contact	Door Panel
Left Knee Contact	Door Panel
Right Knee Contact	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Doors	Remained closed and jammed shut	Remained closed and jammed shut
Right Side Doors	Remained closed and operational	Remained closed and operational
Hatch and Other Doors	Remained closed and operational	Remained closed and operational
Seat Movement	0	0
Seat Back Failure	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Left Front Window Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Left Rear (Passenger) P4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	No		No	
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	

VEHICLE SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset from Vertical Impact Reference Line	mm	+/- 38	7
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.3
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.5

DATA SHEET NO. 9

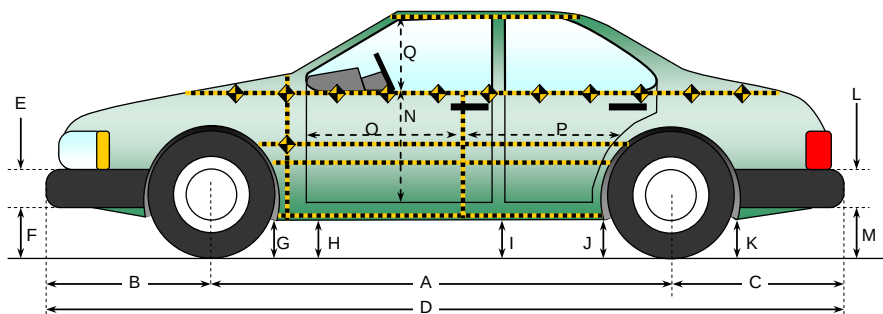
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan

NHTSA No. GB0100

Test Program: NCAP Side Pole Impact Test

Test Date: 2/25/2011



All measurements in (mm) with tolerance of ± 3 mm

LEFT SIDE VIEW

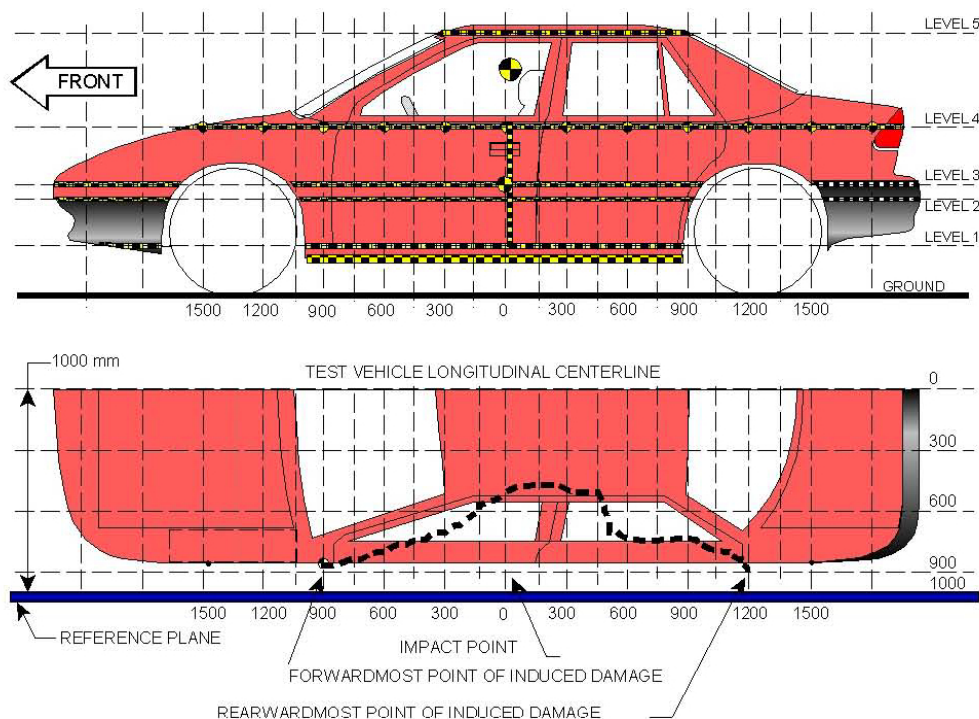
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2937	2790	147
B	Front Axle to FSOV	1116	1119	-3
C	Rear Axle to RSOV	1137	1132	5
D1	Total Vehicle Length at Left Side	4150	3972	178
D2	Total Vehicle Length at Centerline	5190	5041	149
D3	Total Vehicle Length at Right Side	4150	4180	-30
E	Front Bumper Thickness	110	110	0
F	Front Bumper Bottom to Ground	237	232	5
G	Sill Height at Front Wheel Well	196	180	16
H	Sill Height at Front Door Leading Edge	193	191	2
I	Sill Height at B Pillar	193	206	-13
J1	Sill Height at Rear Wheel Well	184	224	-40
J2	Pinch Weld Height at Rear Wheel Well	185	222	-37
K	Sill Height Aft of Rear Wheel Well	250	276	-26
L	Rear Bumper Thickness	110	110	0
M	Rear Bumper Bottom to Ground	288	294	-6
N	Sill Height to Window Bottom Sill	718	720	-2
O	Front Door Leading Edge to Impact CL	643	621	22
P	Rear Door Trailing Edge to Impact CL	1434	1400	34
Q	Front Window Opening	455	365	90
R	Right Side Length	4150	4180	-30
S	Left Side Length	4150	3972	178
T	Vehicle Width at B Post	1849	1642	207

DATA SHEET NO. 10 **VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
 Test Date: 2/25/2011



NOTE: The measurements are taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.

Level	Measurement Description	Height Above Ground (mm)
1	Sill Top	253
2	Mid Door	550
3	Occupant H-Point	631
4	Window Sill	944
5	Window Top	1400

DATA SHEET NO. 10 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan

NHTSA No. GB0100

Test Program: NCAP Side Pole Impact Test

Test Date: 2/25/2011

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1200				285					278					-7	
-1050				272					271					-1	
-900				262					256					-6	
-750		177	175	251			195	188	244			18	13	-7	
-600	228	178	175	246		281	221	211	262		53	43	36	16	
-525	228	178	175	245		315	261	257	285		87	83	82	40	
-450	227	178	174	244		351	309	306	308		124	131	132	64	
-375	227	177	172	242		386	356	356	355		159	179	184	113	
-300	228	177	172	239		414	402	400	401		186	225	228	162	
-225	227	177	170	237		459	453	444	452		232	276	274	215	
-150	226	177	170	235		513	506	507	511		287	329	337	276	
-75	227	177	170	234	515	560	560	559	567	645	333	383	389	333	130
0	225	177	169	232	511	613	602	606	612	705	388	425	437	380	194
75	225	178	168	230	510	611	620	619	626	703	386	442	451	396	193
150	225	178	168	228	509	563	588	598	604	701	338	410	430	376	192
225	225	179	169	227	507	511	542	544	549	691	286	363	375	322	184
300	224	179	169	225	508	463	478	483	496	679	239	299	314	271	171
375	225	179	170	227	507	421	418	414	447	660	196	239	244	220	153
450	227	179	170	225	506	394	383	372	422	648	167	204	202	197	142
525	226	181	173	225	507	362	342	339	405	628	136	161	166	180	121
600	227	182	173	227	505	347	333	329	396	623	120	151	156	169	118
750	229	185	175	228	505	304	297	293	361	596	75	112	118	133	91
900	233	187	177	229	505	269	267	264	334	575	36	80	87	105	70
1050	235	190	181	230	507	236	238	233	303	554	1	48	52	73	47
1200	238	193	188	232	514	202	206	205	273	540	-36	13	17	41	26
1350	240	188	188	235	521	172	168	176	246	537	-68	-20	-12	11	16
1500				237					218					-19	
1650				243					258					15	
1800				246					267					21	
1950				254					269					15	
2100				264					273					9	
2250				277					284					7	
2400				295					300					5	

NOTE: The measurements are taken along the vertical impact reference line.
Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
Test Date: 2/25/2011

MAXIMUM CRUSH DATA

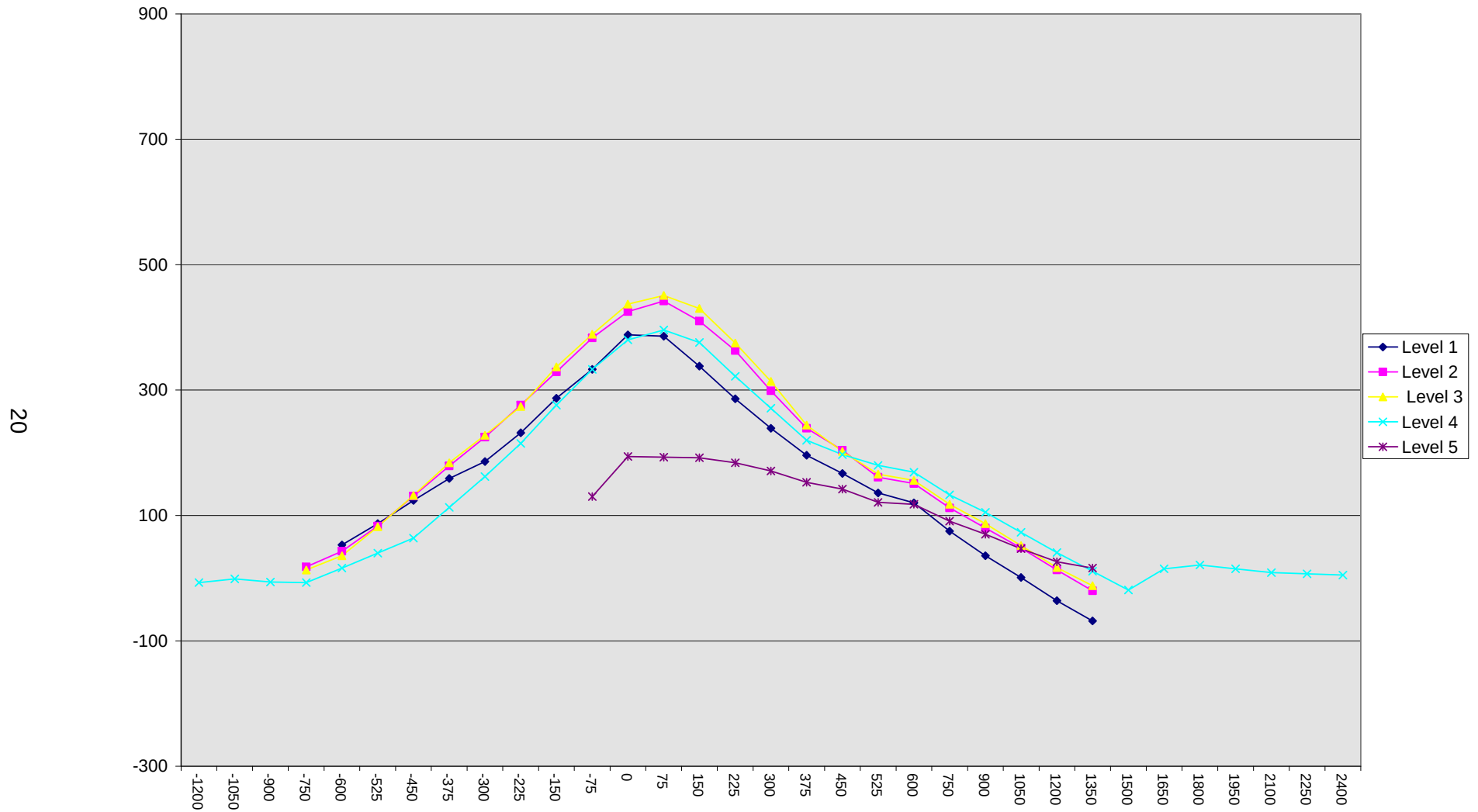
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	388	442	451	396	194
Distance From Impact (mm)	0	75	75	75	0

Note: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to test based on an estimated impact point. The final distance to impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy's head.

DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
Test Date: 2/25/2011



DATA SHEET NO. 11

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan

NHTSA No. GB0100

Test Program: NCAP Side Pole Impact Test

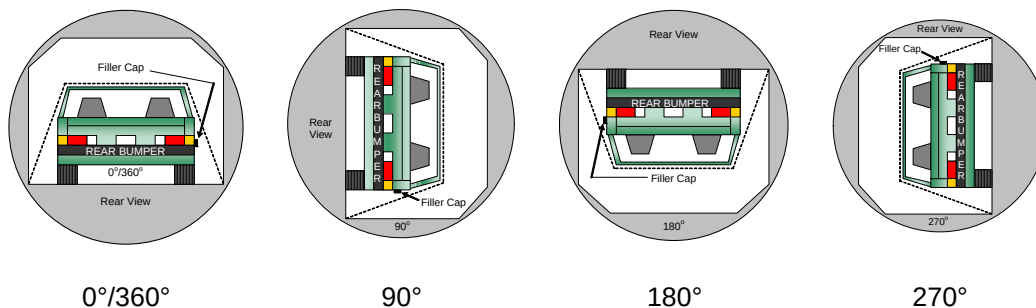
Test Date: 2/25/2011

Test Time: 10:56 am

Temperature: 21° C

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

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	114	300	414
90° to 180°	110	300	410
180° to 270°	104	300	404
270° to 360°	116	300	416

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

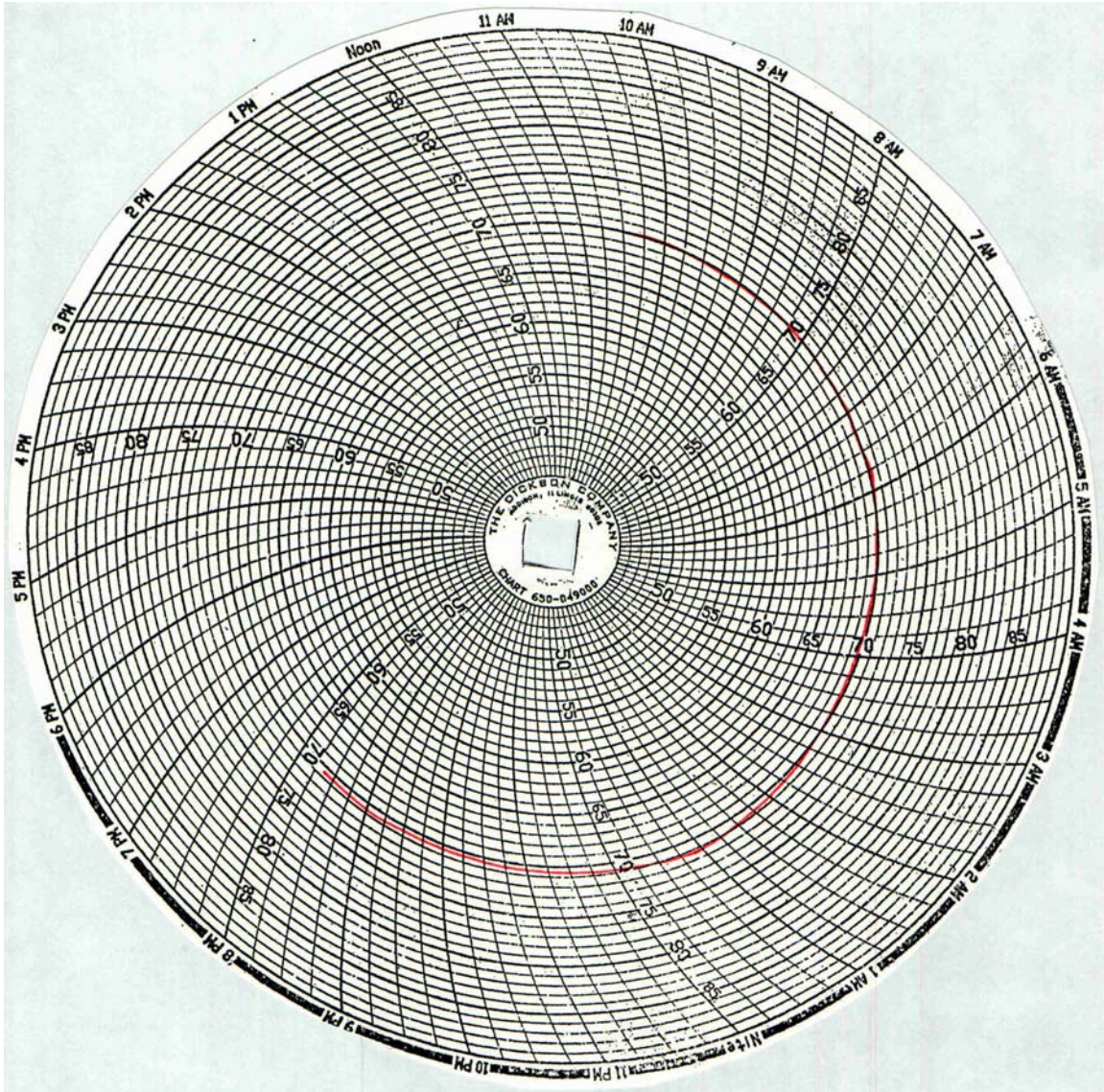
Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 12

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No. GB0100
Test Date: 2/25/2011



APPENDIX A
PHOTOGRAPHS

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As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle

PHOTOGRAPH NOT AVAILABLE

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



Pre-Test Rear View of Test Vehicle



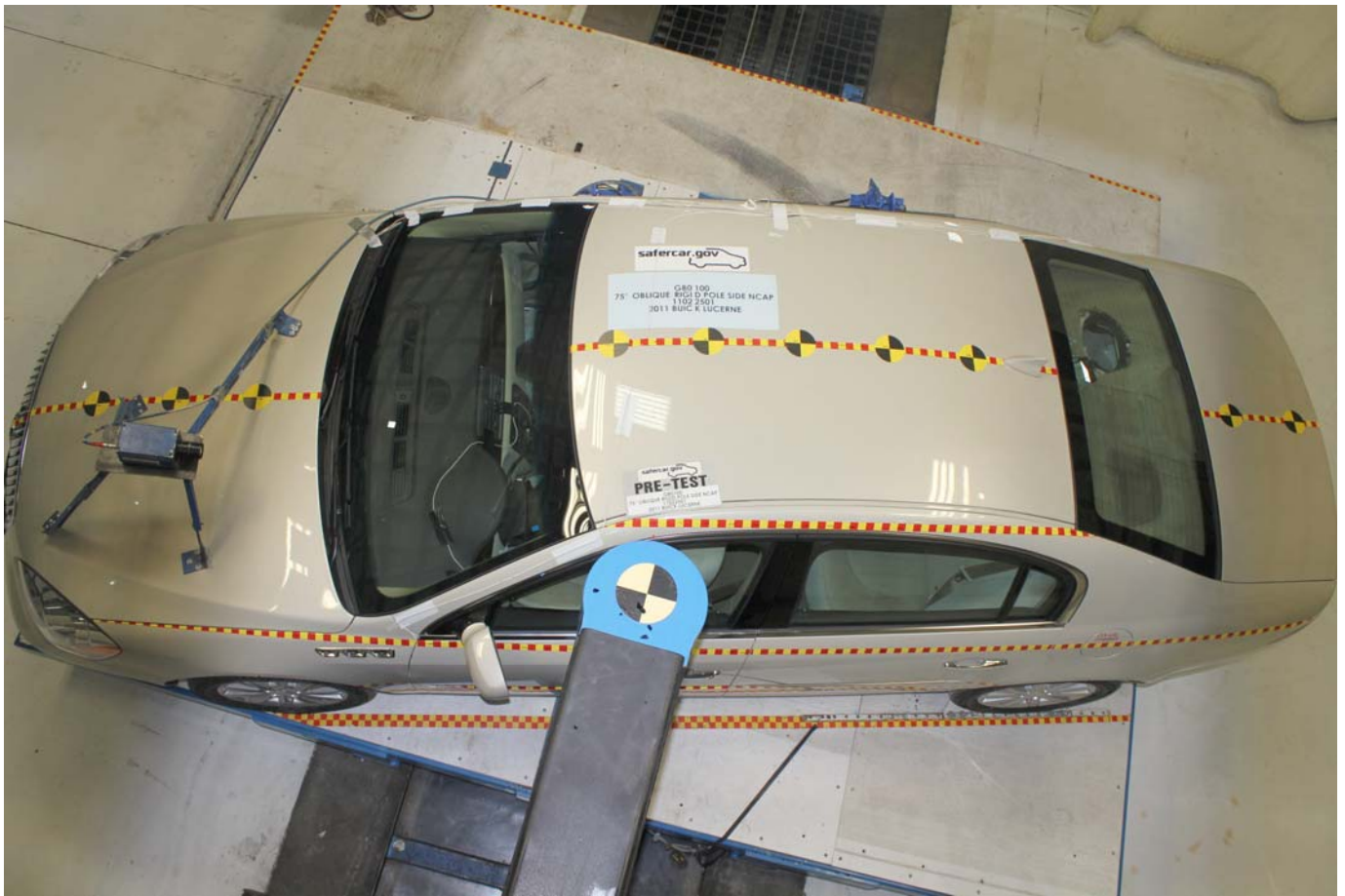
Post-Test Rear View of Test Vehicle



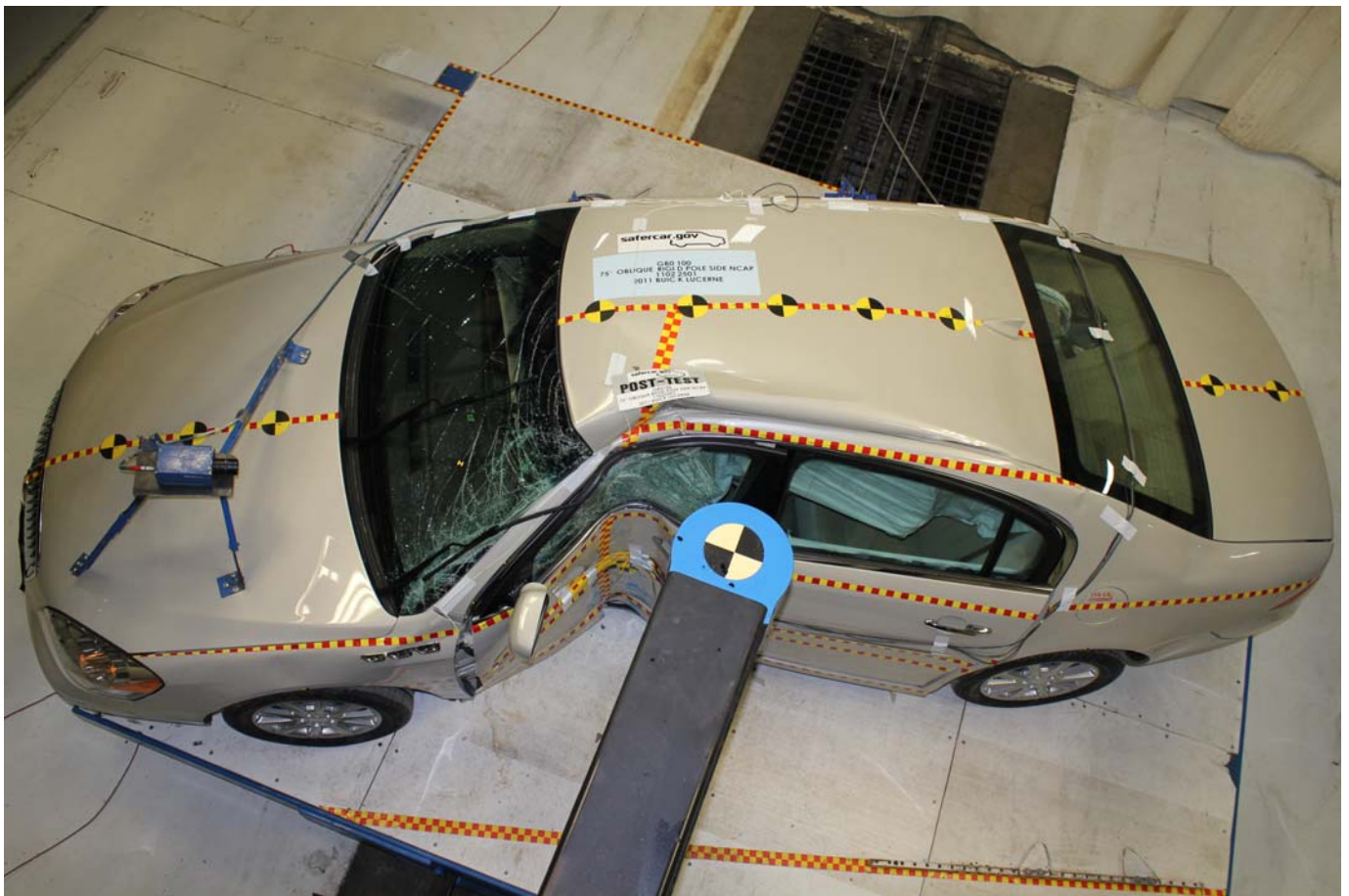
Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Vehicle and Pole



Post-Test Overhead View of Test Vehicle and Pole



Pre-Test Left Side View of Pole Positioned Against Side of Vehicle



Pre-Test Right Side View of Pole Positioned Against Side of Vehicle



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target Showing Impact Location



Pre-Test Front Close-Up View of Dummy (through front window)



Post-Test Front Close-Up View of Dummy (through front window)



Pre-Test Left Side View of Dummy Showing Belts, Chalking, and Contact Switches (Door Open)



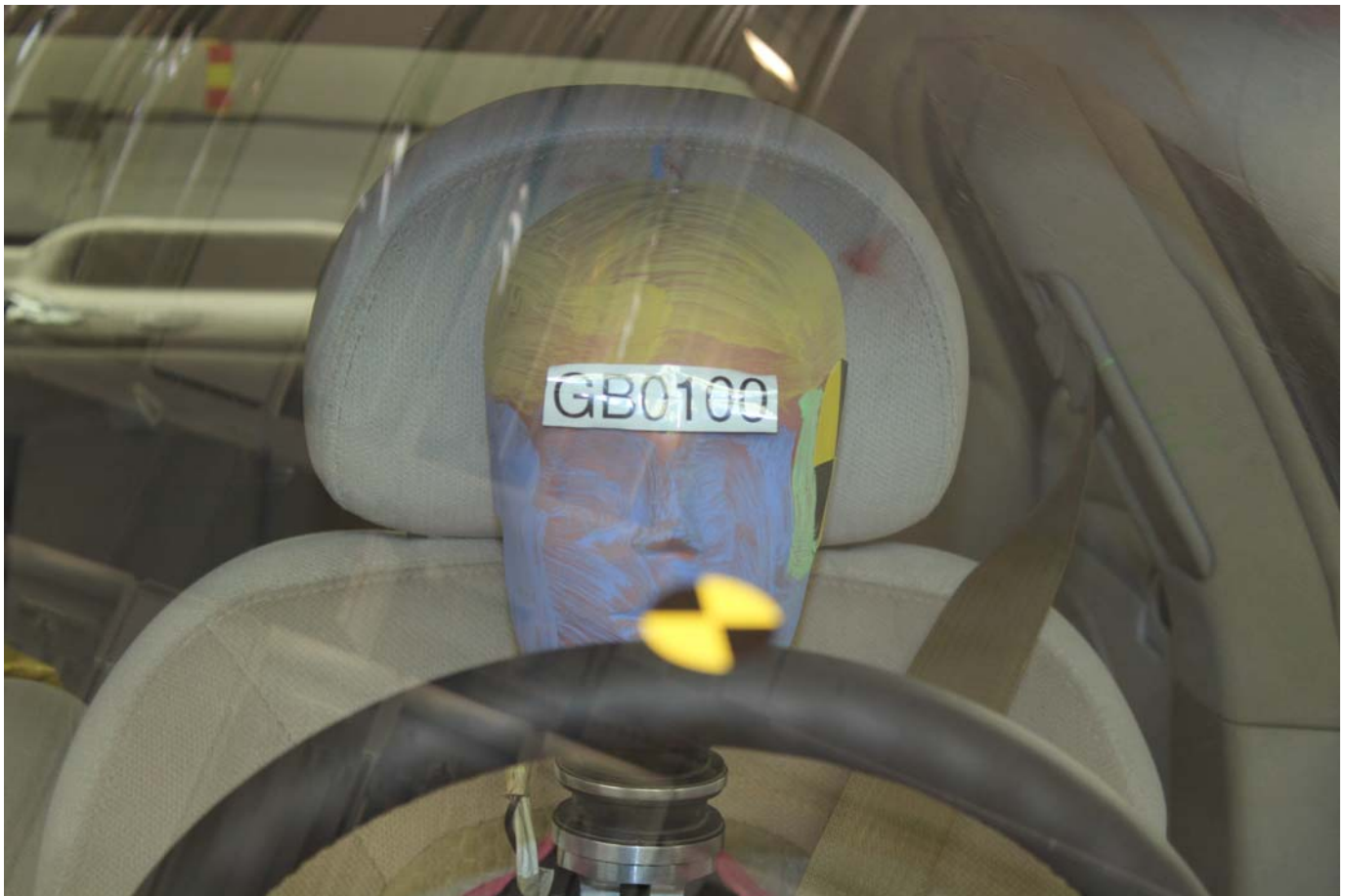
Pre-Test Left Side View of Dummy Shoulder and Door Top View



Post-Test Left Side View of Dummy Shoulder and Door Top View



Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



Pre-Test Frontal View of Dummy Head and Shoulders in Relation to Head Restraint



Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Dummy Thighs on Seat Pan



Pre-Test View of Dummy's Neck Showing Position of Adjustable Neck Bracket



Pre-Test View of Dummy's Head Showing Dummy's Head is Level



Pre-Test Placement of Dummy's Feet



Pre-Test View of Belt Anchorage for Dummy to Show Position



Pre-Test Left Side View of Steering Wheel to Show Position



Pre-Test View of Parking Brake



Pre-Test Close-Up Left Side View of Driver Seat Track Showing Test Position



Pre-Test Close-Up Left Side View of Driver Seat Back Showing Test Position



Pre-Test Close-Up View of Driver Seat Back or Head Restraint Showing Seat Back Test Position



Pre-Test Dummy and Door Clearance View



Post-Test Dummy and Door Clearance View



Pre-Test Right Side View of Dummy and Front Seat Occupant Compartment



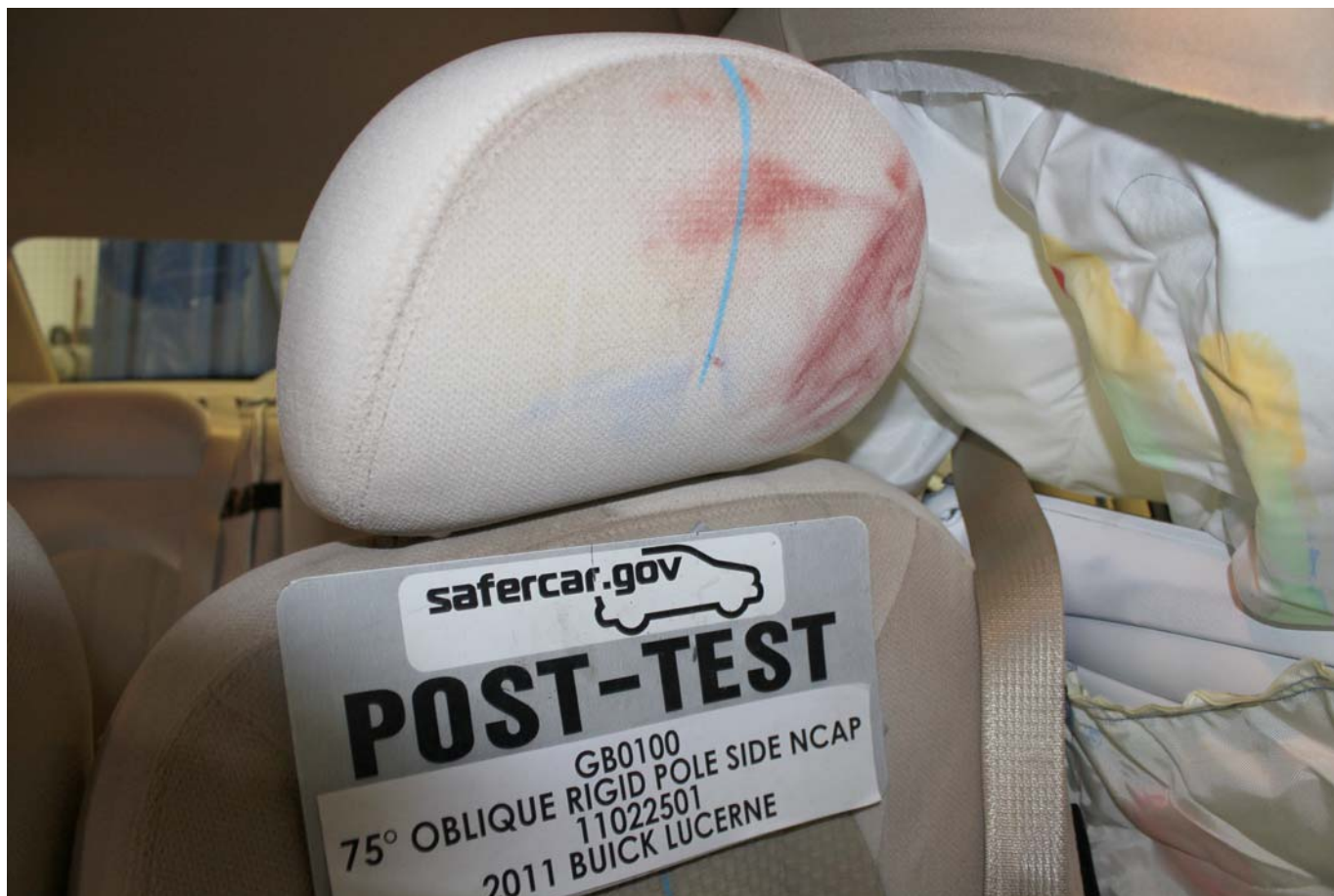
Post-Test Right Side View of Dummy and Front Seat Occupant Compartment



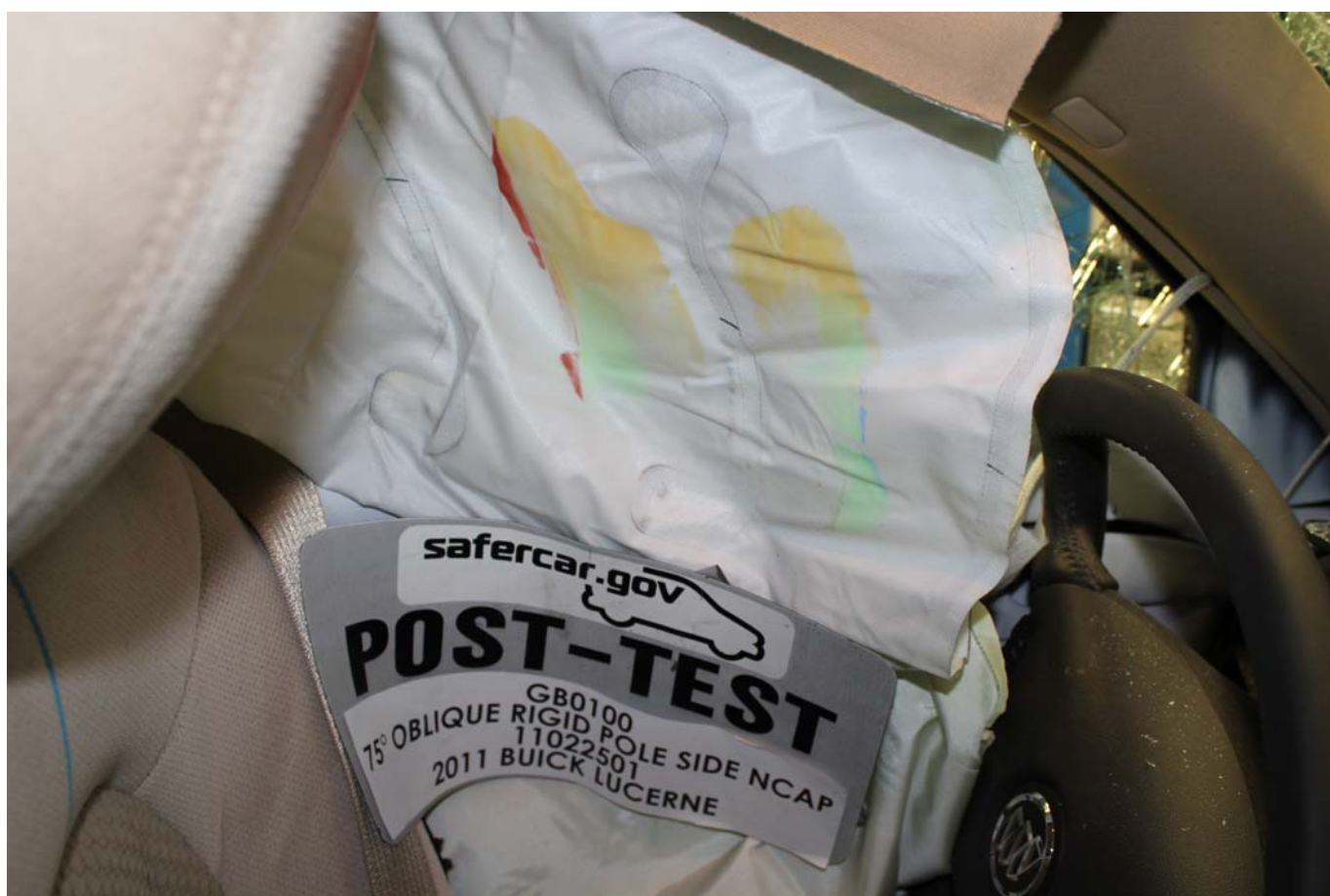
Pre-Test Inner Driver Door Panel View



Post-Test Inner Driver Door Panel View Showing Dummy Contact Location



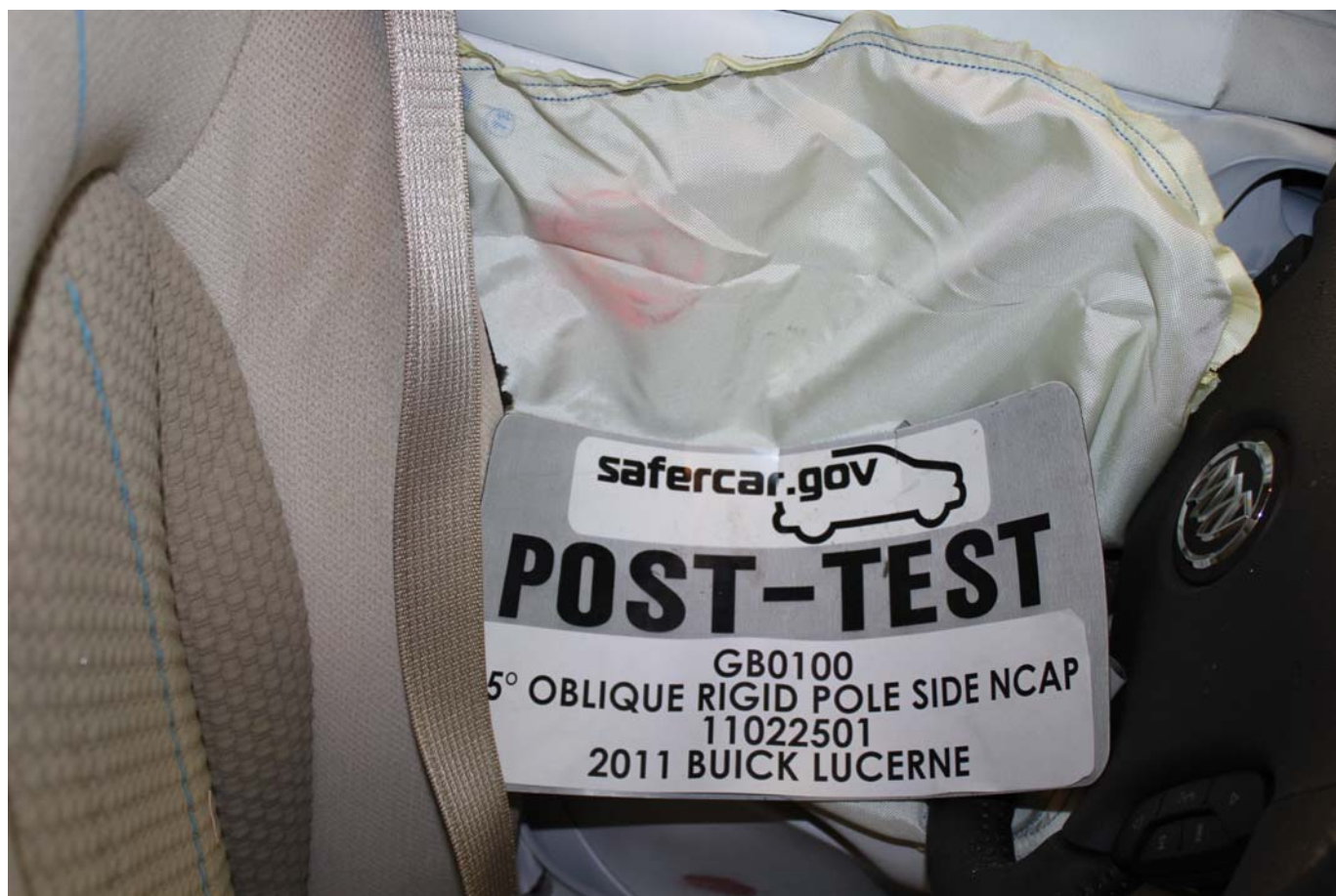
Post-Test Dummy Close-Up Head Contact with Vehicle Interior View



Post-Test Dummy Close-Up Head Contact with Side Airbag View

PHOTOGRAPH NOT APPLICABLE

Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View



Post-Test Dummy Close-Up Torso Contact with Side Airbag View



Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View



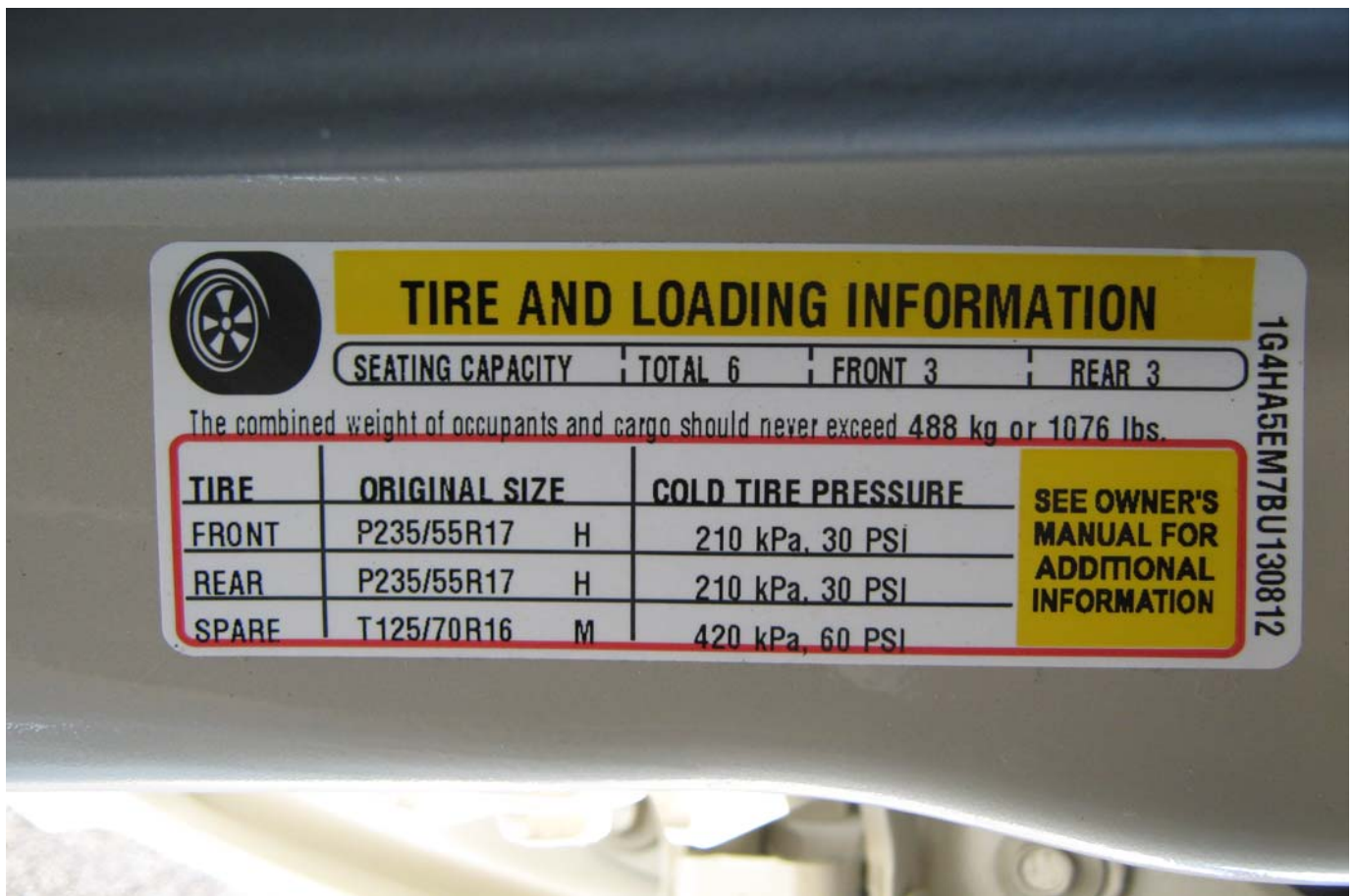
Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Close-Up View of Vehicle's Certification Label



Close-Up View of Vehicle's Tire Information Placard or Label



Pre-Test Pole Barrier Front View

PHOTOGRAPH NOT AVAILABLE

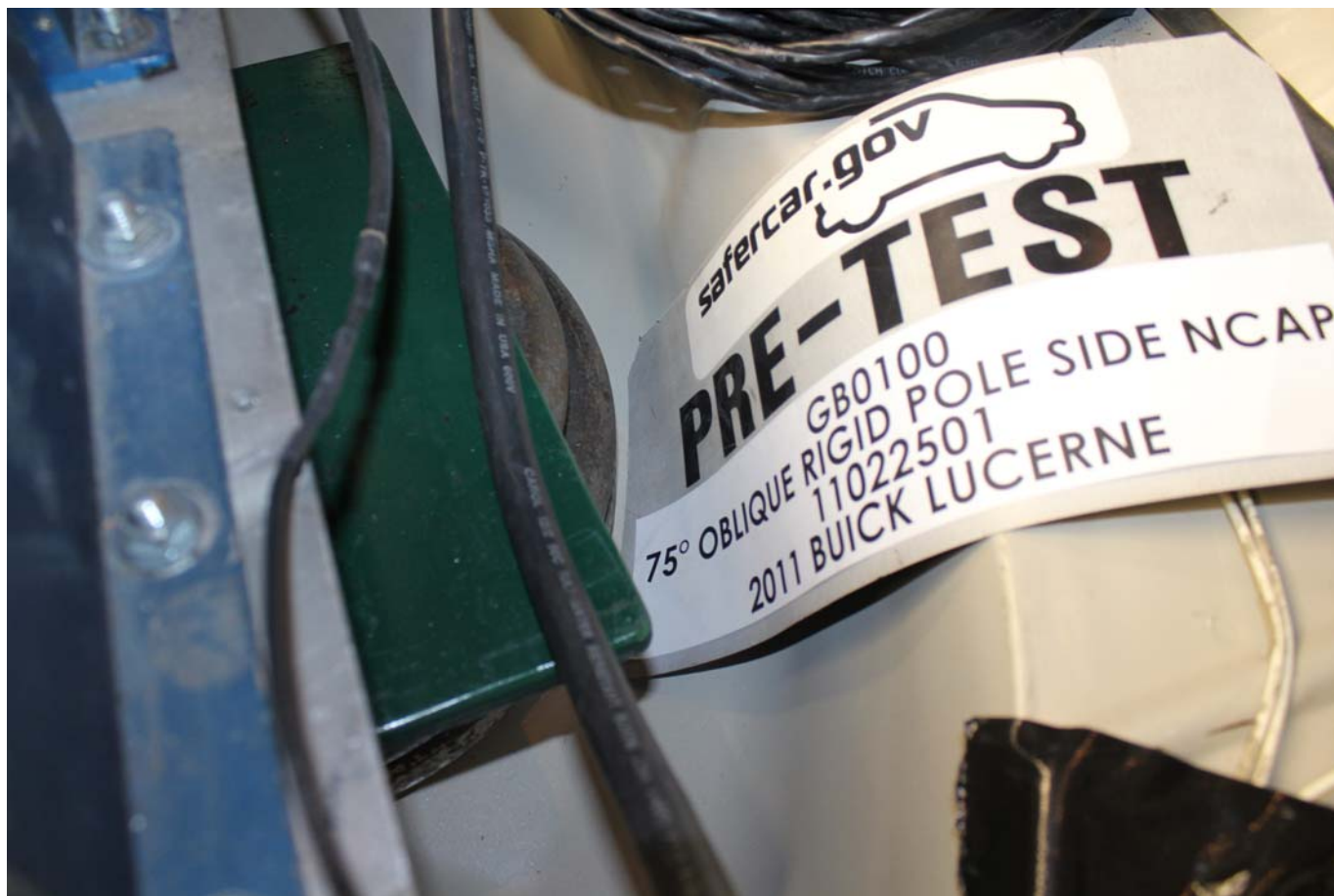
Post-Test Pole Barrier Front View



Pre-Test Pole Barrier Side View

PHOTOGRAPH NOT AVAILABLE

Post-Test Pole Barrier Side View



Pre-Test Ballast View



Post-Test Primary and Redundant Speed Trap Read-Out



FMVSS No. 301/305 Rollover 0 Degrees



FMVSS No. 301/305 Rollover 90 Degrees



FMVSS No. 301/305 Rollover 180 Degrees



FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees



Impact Event



2011 LUCERNE CX

EXTERIOR: SAND BEIGE METALLIC
INTERIOR: COCOA/CASHMERE

ENGINE, 3.9L V6 SFI FLEX-FUEL
TRANSMISSION, 4 SPEED AUTOMATIC

Visit us at www.buick.com

STANDARD EQUIPMENT

ITEMS LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN

- 5 YEAR / 100,000 MILE POWERTRAIN LIMITED WARRANTY SEE DEALER FOR DETAILS
- 4 YEAR / 50,000 MILE BUMPER-TO-BUMPER WARRANTY SEE DEALER FOR DETAILS

MECHANICAL

- ENGINE, 3.9L V6 WITH FLEX-FUEL CAPABILITY
- TRANSMISSION, 4 SPD AUTOMATIC
- ANTILOCK BRAKE SYSTEM, 4 WHEEL DISC
- POWER RACK & PINION STEERING
- 4 WHEEL IND SUSPENSION SYSTEM
- TRACTION CONTROL
- STABILITRAK-STABILITY CONTROL
- LOAD LEVEL CONTROL, AUTOMATIC

SAFETY

- AIRBAGS, FRONT, SIDE THORAX

- W/ PASSENGER SENSING, HEAD CURTAIN SIDE AIRBAG, ALL OUTBOARD SEATING POSITIONS
- REAR CHILD-SEAT LATCH ANCHORS
- REMOTE KEYLESS ENTRY EXT RANGE
- THEFT DETERRENT SYSTEM
- TIRE PRESSURE MONITOR
- 6 MTHS ONSTAR DIRECTIONS & CONNECTIONS WITH AUTOMATIC CRASH RESPONSE AND TURN-BY-TURN NAVIGATION (ASK DEALER ABOUT GEOGRAPHIC COVERAGE)

- EXTERIOR
 - POWER HEATED OUTSIDE MIRRORS, DRIVER SIDE AUTO DIMMING
 - SOLAR-RAY LIGHT-TINTED GLASS
 - 17" ALUM. PREMIUM PAINTED WHLS
 - FOG LAMPS
 - CHROME GRILL
- INTERIOR
 - BUICK QUIETTUNING
 - SEATS, FRONT BUCKET, CLOTH

- PWR SEAT ADJUST, DRIVER & FRONT PASSENGER, 6 WAY
- LEATHER WRAP STEERING WHEEL W/ RADIO AND CRUISE CONTROLS
- POWER DOOR LOCKS, POWER WINDOWS
- DRIVER INFO CENTER W/COMPASS
- AM/FM STEREO, CD PLAYER
- XM RADIO - SERVICE SUBSCRIPTION SOLD SEPARATELY BY SIRIUS/XM AFTER 3 MONTHS
- INTERIOR LIGHTING
- INSIDE REARVIEW MIRROR, WITH AUTO DIMMING
- VISOR MIRRORS, LIGHTED
- REAR WINDOW DEFOGGER
- AIR PARTICULATE FILTER
- FLOOR MATS, FRONT/REAR
- COMPACT SPARE TIRE

OPTIONS & PRICING

MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE	\$29,730.00
OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)	
SEATS, 6 PASSENGER, FRONT 40/20/40 SPLIT	295.00
TOTAL OPTIONS	
TOTAL VEHICLE & OPTIONS	\$30,025.00
DESTINATION CHARGE	765.00
TOTAL VEHICLE PRICE*	\$30,790.00

EPA Fuel Economy Estimates

GASOLINE
CITY MPG

17

Expected range
for most drivers
14 to 20 MPG

*Fuel economy when
operating on E85 will
yield different values
than gasoline. See Fuel
Economy Guide for
more information.

FLEXIBLE FUEL VEHICLE!
GASOLINE - ETHANOL (E85)

Estimated
Annual Fuel Cost
\$2,142

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

Combined GASOLINE
Fuel Economy
This Vehicle

21

ALL LARGE CARS

GASOLINE
HIGHWAY MPG

27

Expected range
for most drivers
22 to 32 MPG

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

AF9

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



GOVERNMENT SAFETY RATINGS

Frontal Crash ★★★★★
Driver ★★★★★
Passenger ★★★★★

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

Source: National Highway Traffic Safety Administration (NHTSA).

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

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 76%

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

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

This label has been applied
after the vehicle has been
ultimate purchaser. Includes
Pre-Delivery Service. Does not
include dealer prep and
accessories not listed above.
local taxes or license fees.

ORDER NO. SHOWN SALES CODE E
SALES MODEL CODE 4P2P
VIN 1G4HAE7B130812

DEALER TO WHOM DELIVERED
REICHERT CHEVROLET, OLDSMOBILE, PONTIAC &
PO BOX 77
WOODSTOCK, IL 60098-0071

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GM/EL, PHOD, 0118 - 06/21/2009

DC
1000954960

Head Restraints

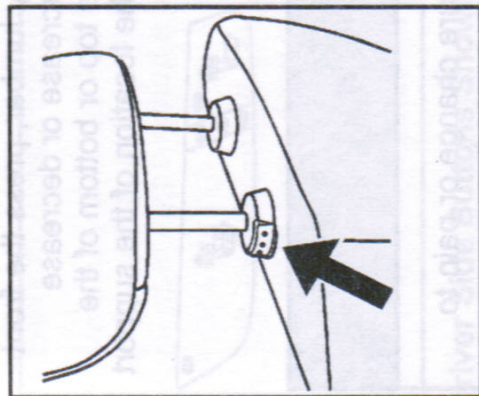
The front seats have adjustable head restraints in the outboard seating positions.

WARNING:

With head restraints that are not installed and adjusted properly, there is a greater chance that occupants will suffer a neck/spinal injury in a crash. Do not drive until the head restraints for all occupants are installed and adjusted properly.



Adjust the head restraint so that the top of the restraint is at the same height as the top of the occupant's head. This position reduces the chance of a neck injury in a crash.



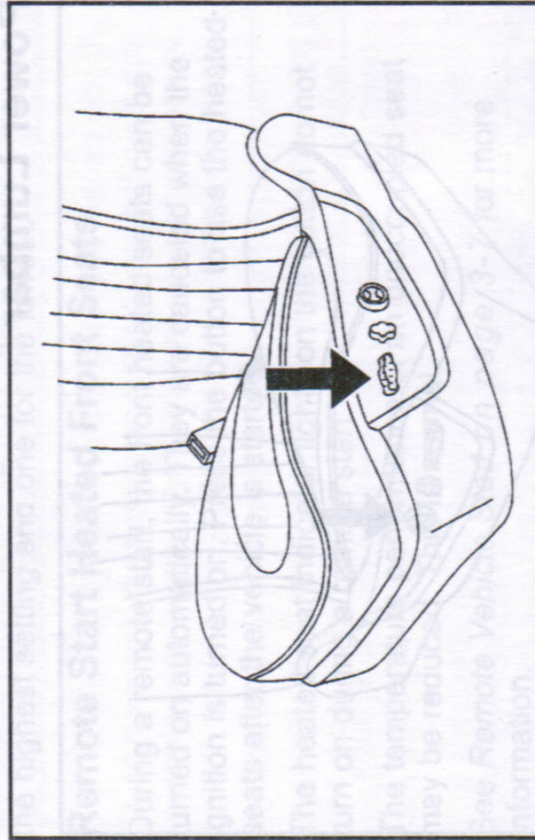
Pull the head restraint up to raise it. To lower the head restraint, press the button, located on the top of the seatback, and push the restraint down.

Push down on the head restraint after the button is released to make sure that it is locked in place.

The head restraints are not designed to be removed.

Front Seats

Power Seats



To adjust a power seat:

- Move the seat forward or rearward by sliding the control forward or rearward.
- Raise or lower the front or rear part of the seat cushion by moving the front or rear of the control up or down.
- Raise or lower the entire seat by moving the entire control up or down.

APPENDIX B
DUMMY RESPONSE DATA

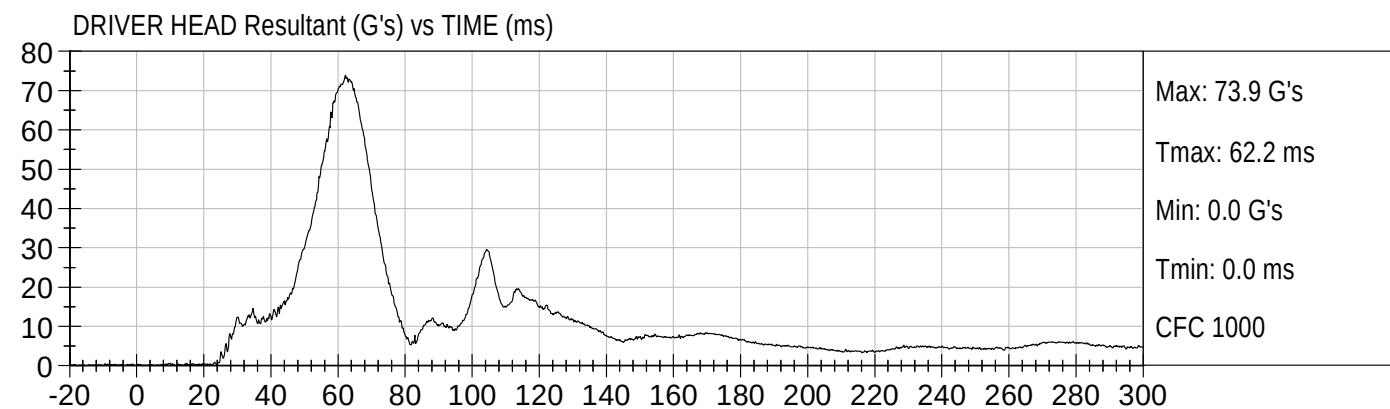
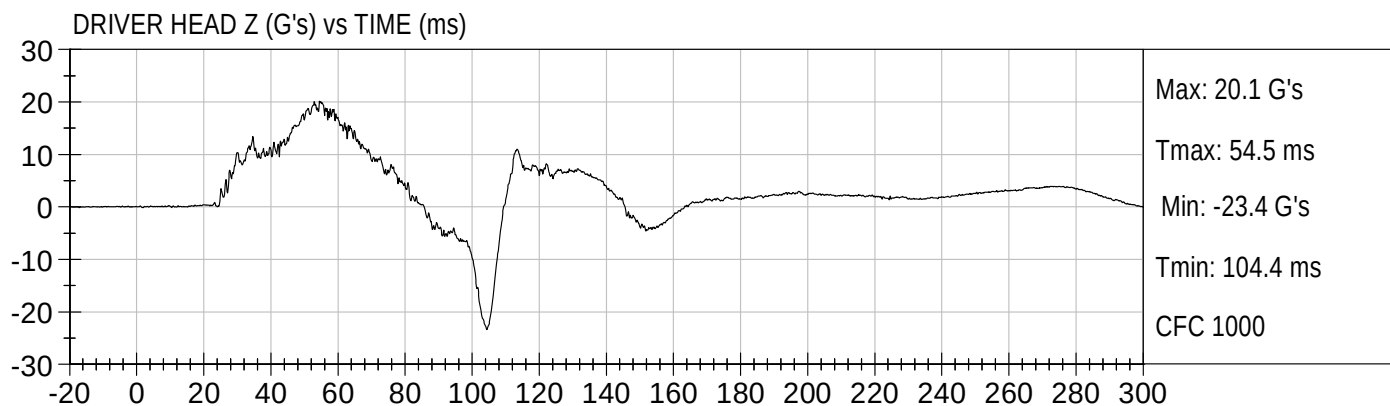
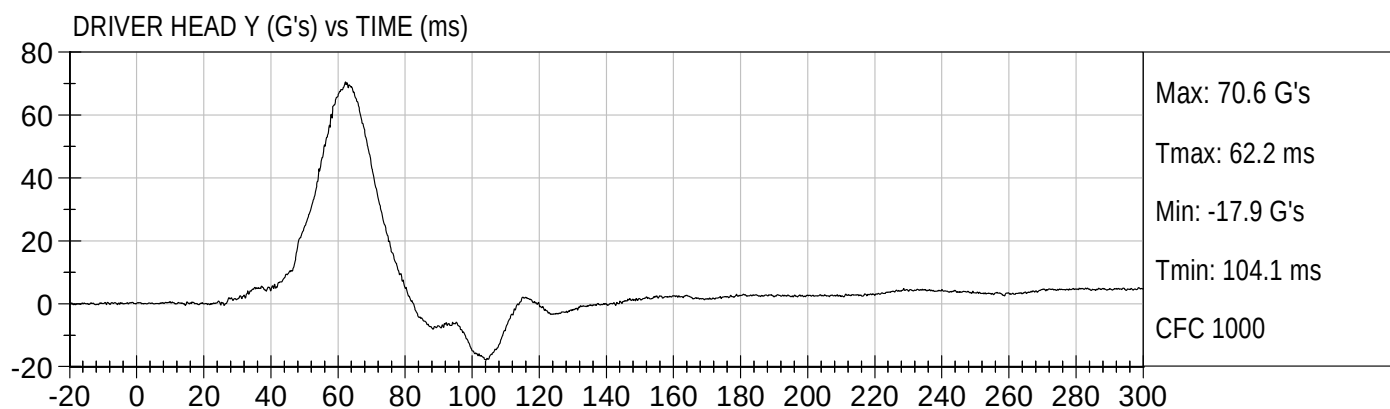
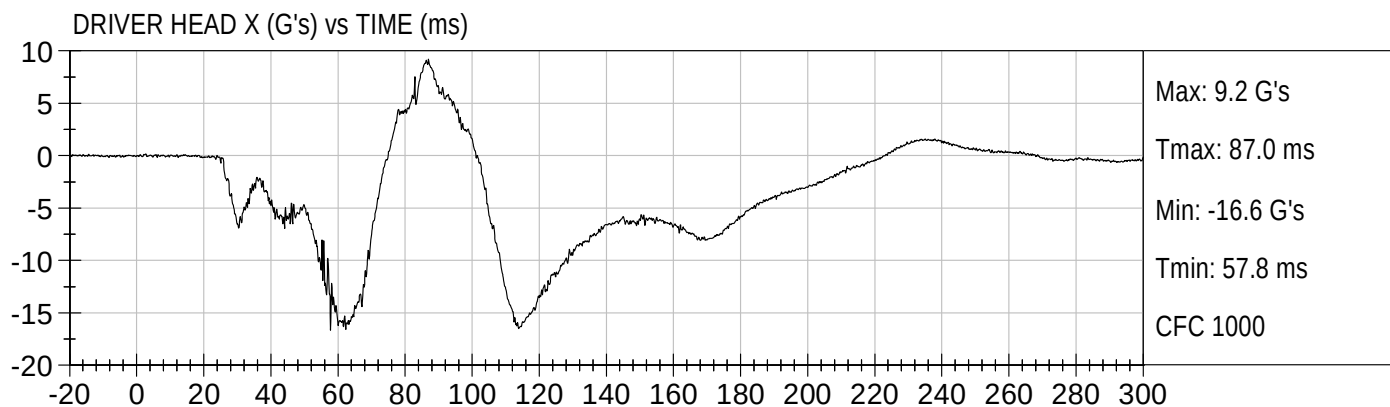
TABLE OF DATA PLOTS

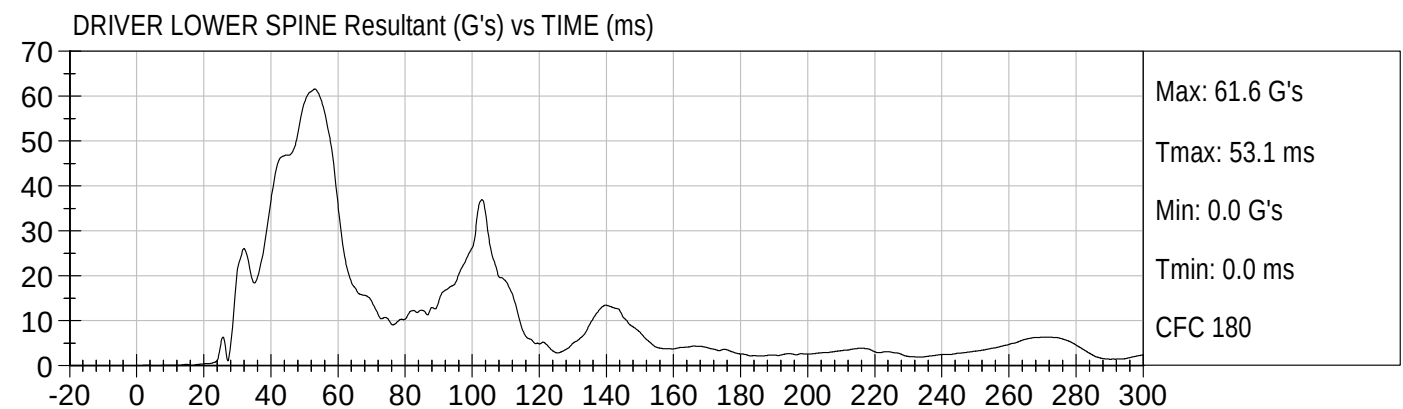
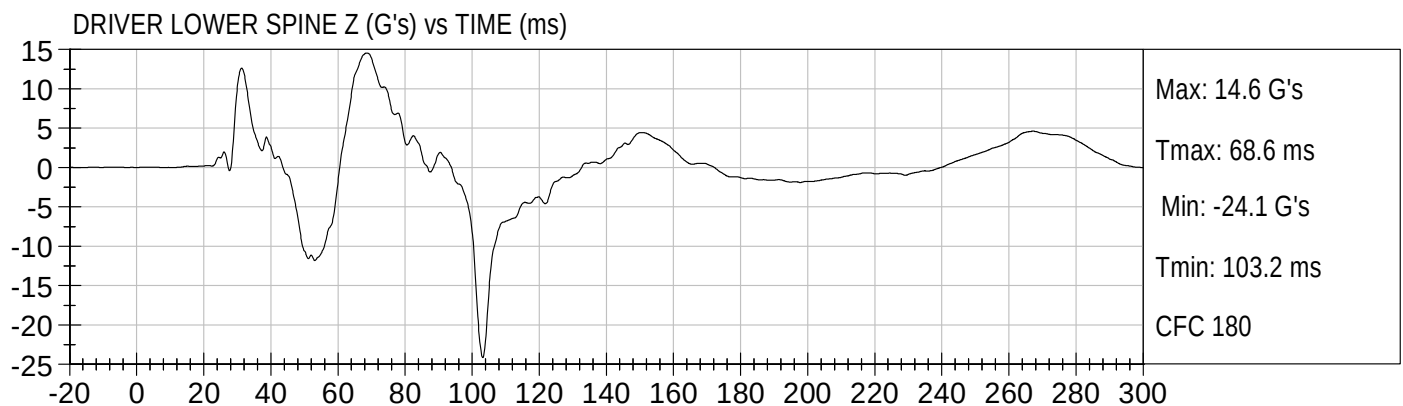
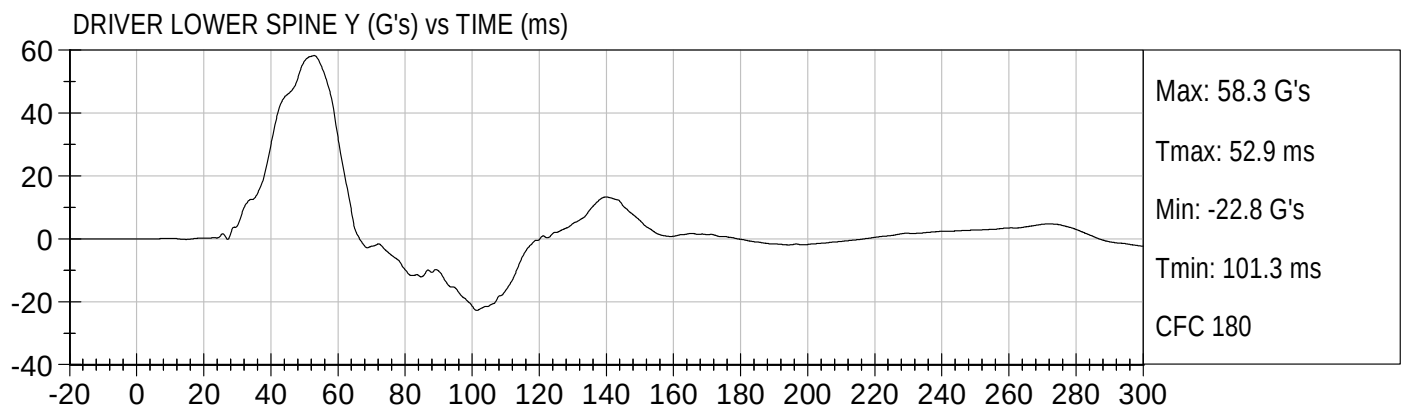
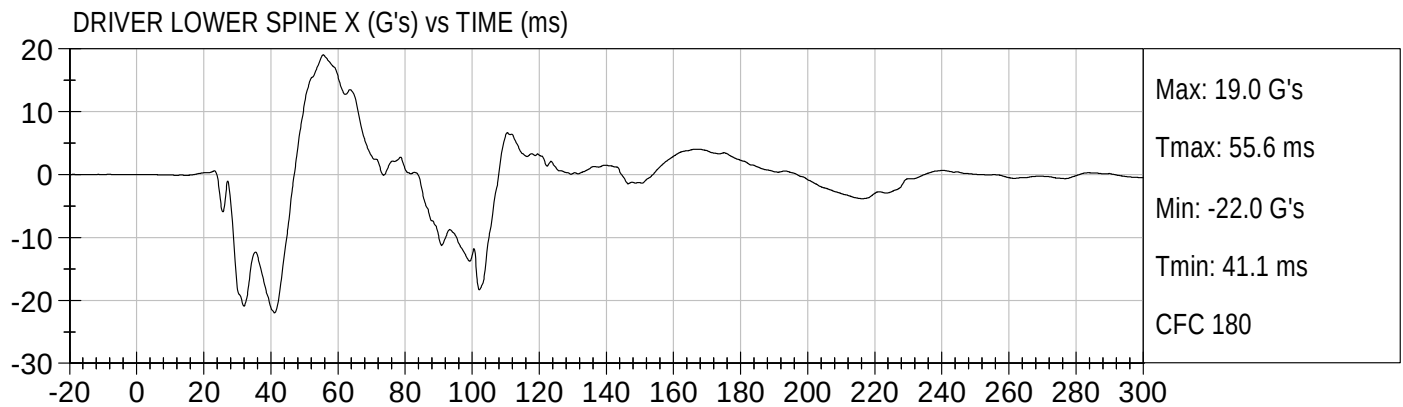
		<u>Page No.</u>
List of Data Plots Provided in the Test Report		
Figure No. 1.	Driver Head Acceleration (X) Primary vs. Time	B-1
Figure No. 2.	Driver Head Acceleration (Y) Primary vs. Time	B-1
Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
Figure No. 4.	Driver Head Resultant Primary Acceleration vs. Time	B-1
Figure No. 5.	Driver Lower Spine T12 Acceleration (X) vs. Time	B-2
Figure No. 6.	Driver Lower Spine T12 Acceleration (Y) vs. Time	B-2
Figure No. 7.	Driver Lower Spine T12 Acceleration (Z) vs. Time	B-2
Figure No. 8.	Driver Lower Spine T12 Resultant Acceleration vs. Time	B-2
Figure No. 9.	Driver Iliac Wing Force on Impact Side (Y) vs. Time	B-3
Figure No. 10.	Driver Acetabulum Force on Impact Side (Y) vs. Time	B-3
Figure No. 11.	Driver Total Pelvis Force on Impact Side (Y) vs. Time	B-3

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 Acceleration (X) Redundant
Driver Head Acceleration (Y) Redundant
Driver Head Acceleration (Z) Redundant
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection (Y)
Driver Shoulder Contact Switch – Not Installed
Driver Torso Contact Switch – Not Installed
Driver Pelvis Contact Switch – Not Installed
Vehicle CG Acceleration (X)
Vehicle CG Acceleration (Y)
Vehicle CG Acceleration (Z)
Vehicle CG Angular Rate About X (Roll)

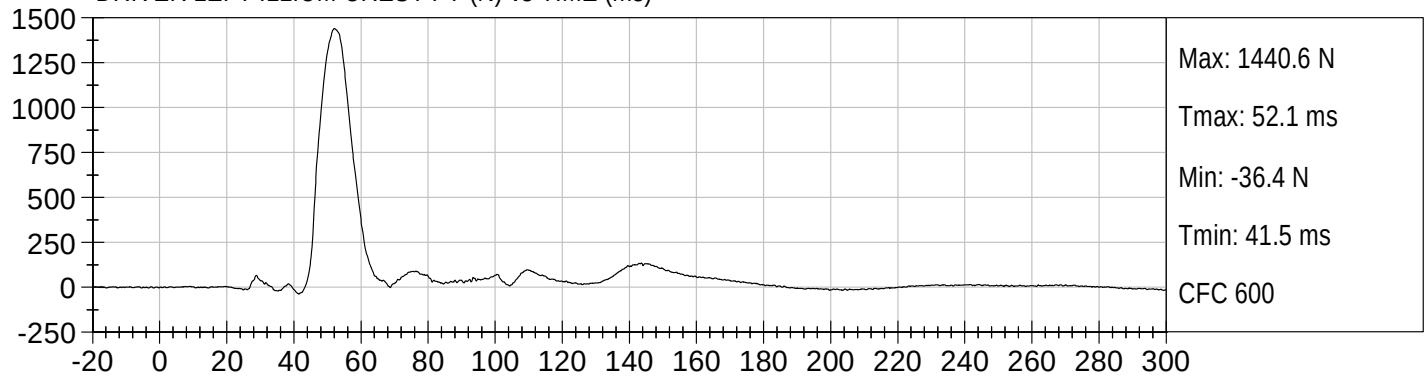
Vehicle CG Angular Rate About Y (Pitch)
Vehicle CG Angular Rate About Z (Yaw)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (Y)
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy H-Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)
Driver Side Airbag Timing
Driver Side Curtain Airbag Timing – Not Installed
Load Cell Pole Barrier #1 Force (Y) – Not used
Load Cell Pole Barrier #2 Force (Y) – Not used
Load Cell Pole Barrier #3 Force (Y) – Not used
Load Cell Pole Barrier #4 Force (Y) – Not used
Load Cell Pole Barrier #5 Force (Y) – Not used
Load Cell Pole Barrier #6 Force (Y) – Not used
Load Cell Pole Barrier #7 Force (Y) – Not used
Load Cell Pole Barrier #8 Force (Y) – Not used



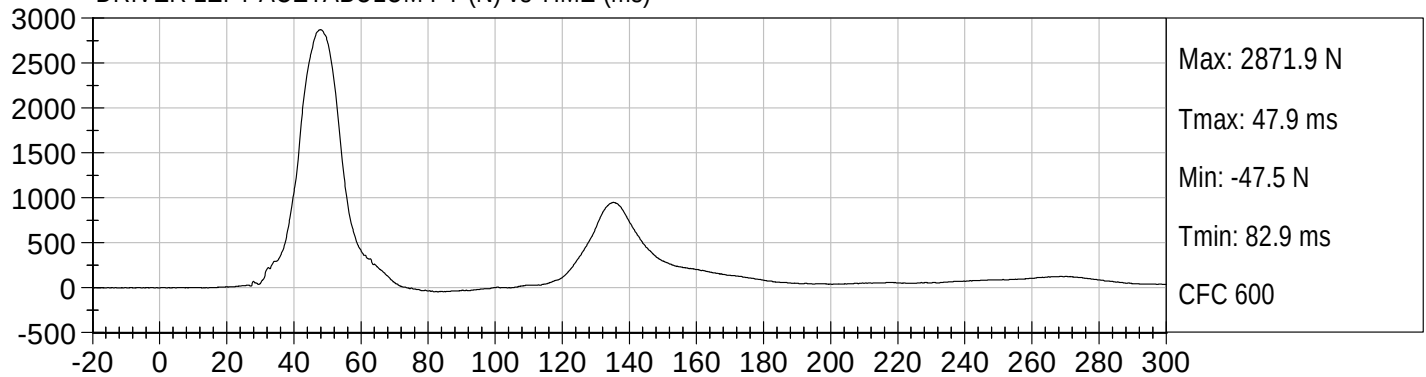




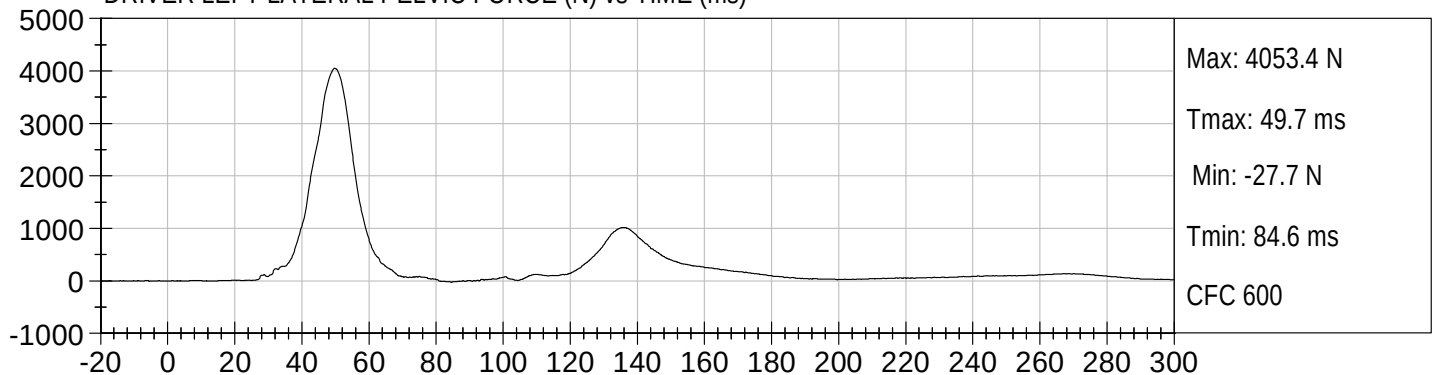
DRIVER LEFT ILLIUM CREST FY (N) vs TIME (ms)



DRIVER LEFT ACETABULUM FY (N) vs TIME (ms)



DRIVER LEFT LATERAL PELVIC FORCE (N) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11631

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	115 to 137	121	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.9	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

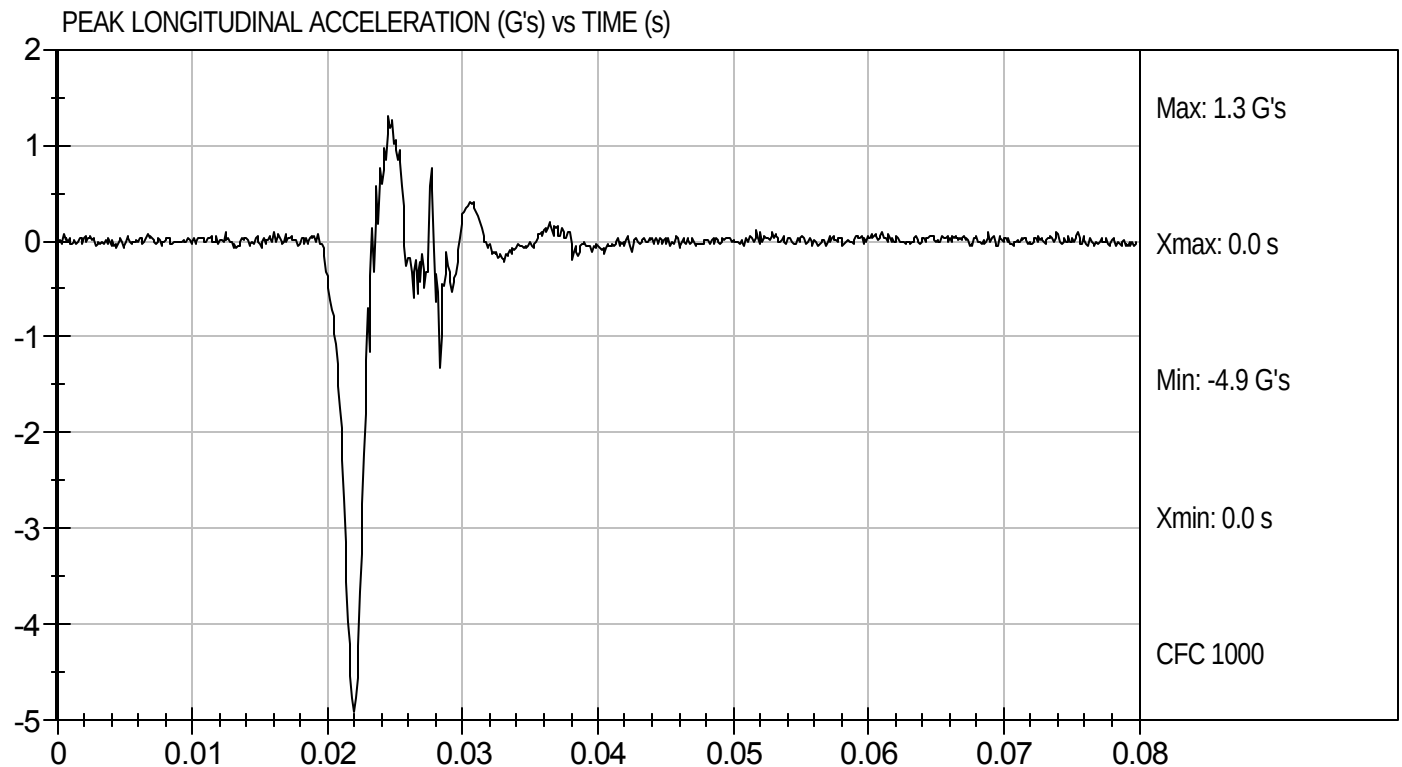
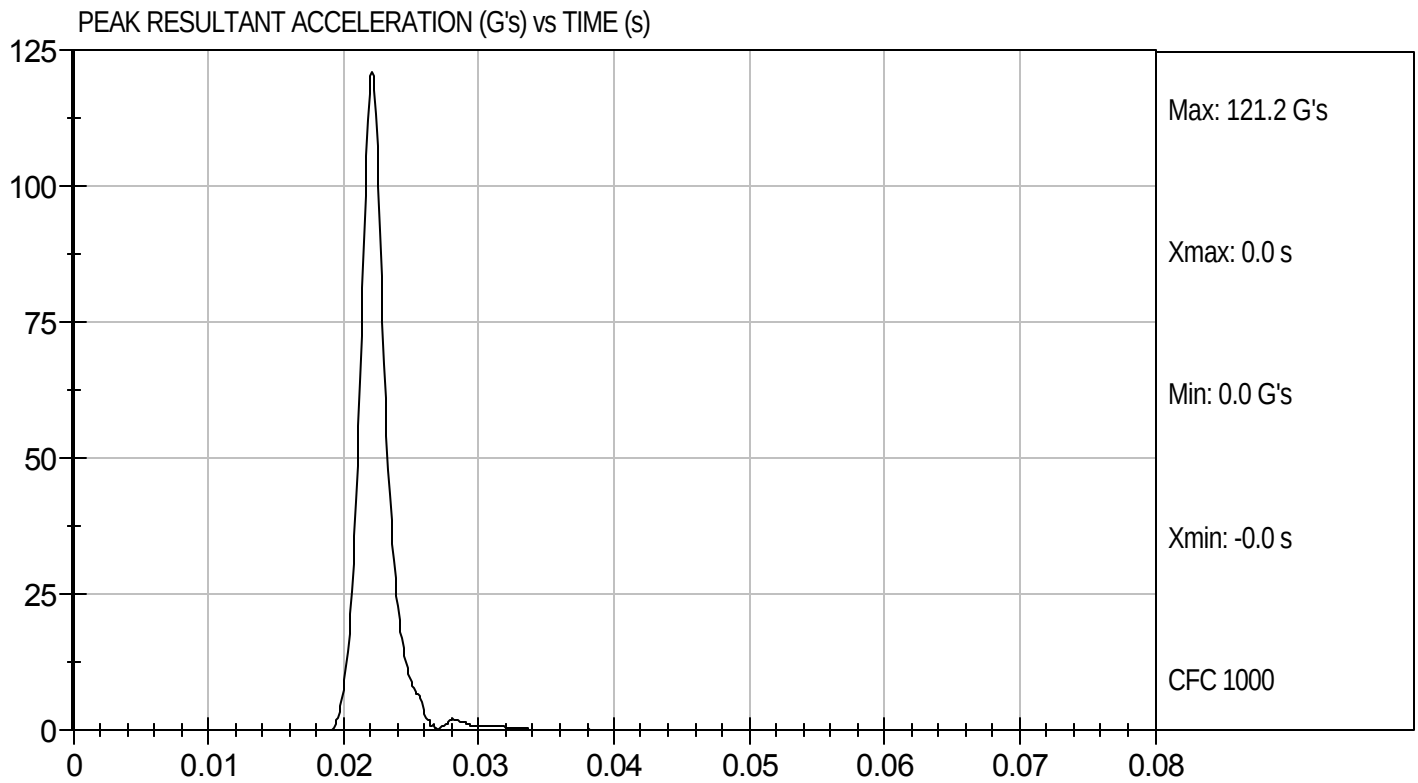
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11631

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

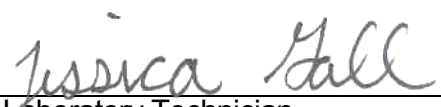


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D.: D11632

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.0	Pass
Humidity		%	10 to 70	20	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.41	Pass
	15 ms	m/s	3.30 to 4.10	3.42	Pass
	20 ms	m/s	4.40 to 5.40	4.60	Pass
	25 ms	m/s	5.40 to 6.10	5.53	Pass
	25-100 ms	m/s	5.50 to 6.20	5.58	Pass
Maximum D-Plane Rotation		deg	71 to 81	74	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	65	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-37	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	123	Pass
Overall Test Results				Pass	


 Laboratory Technician

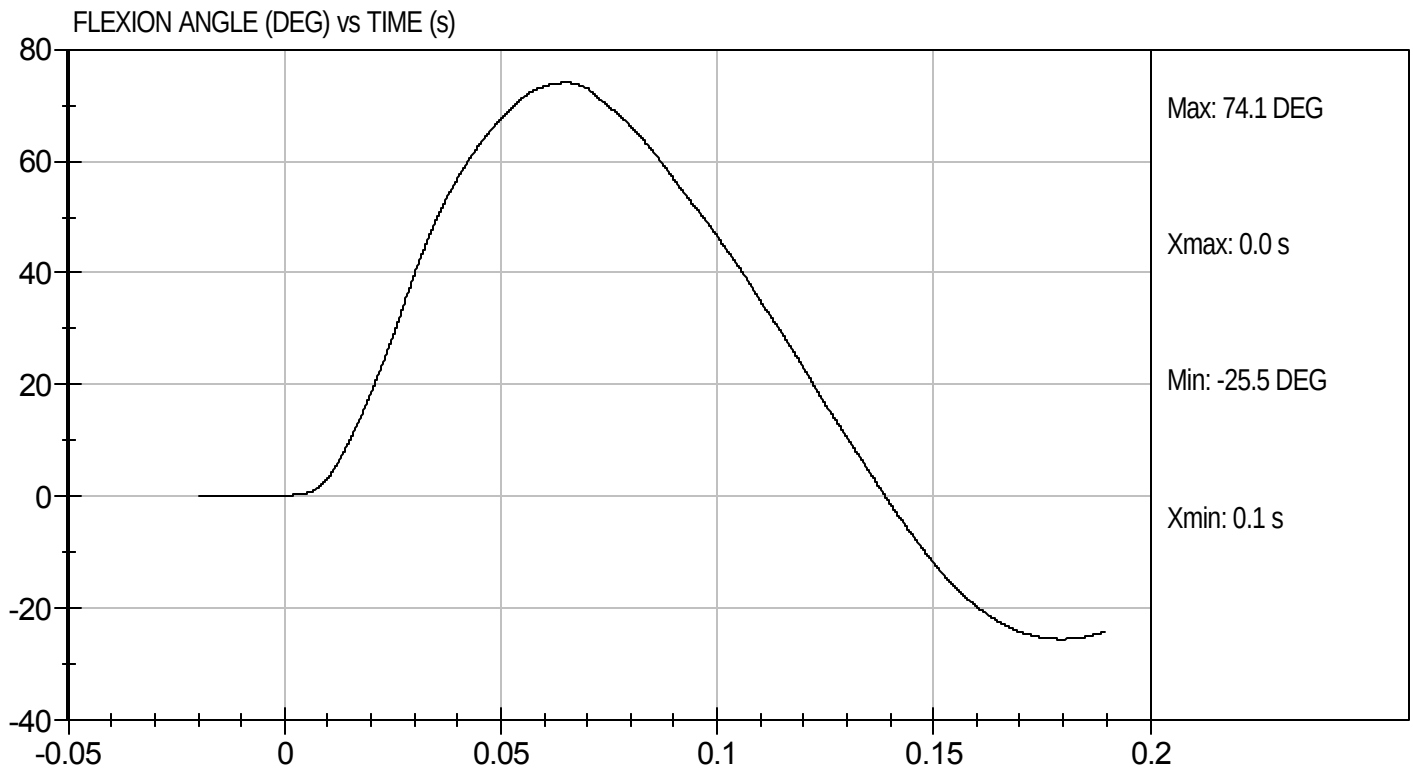
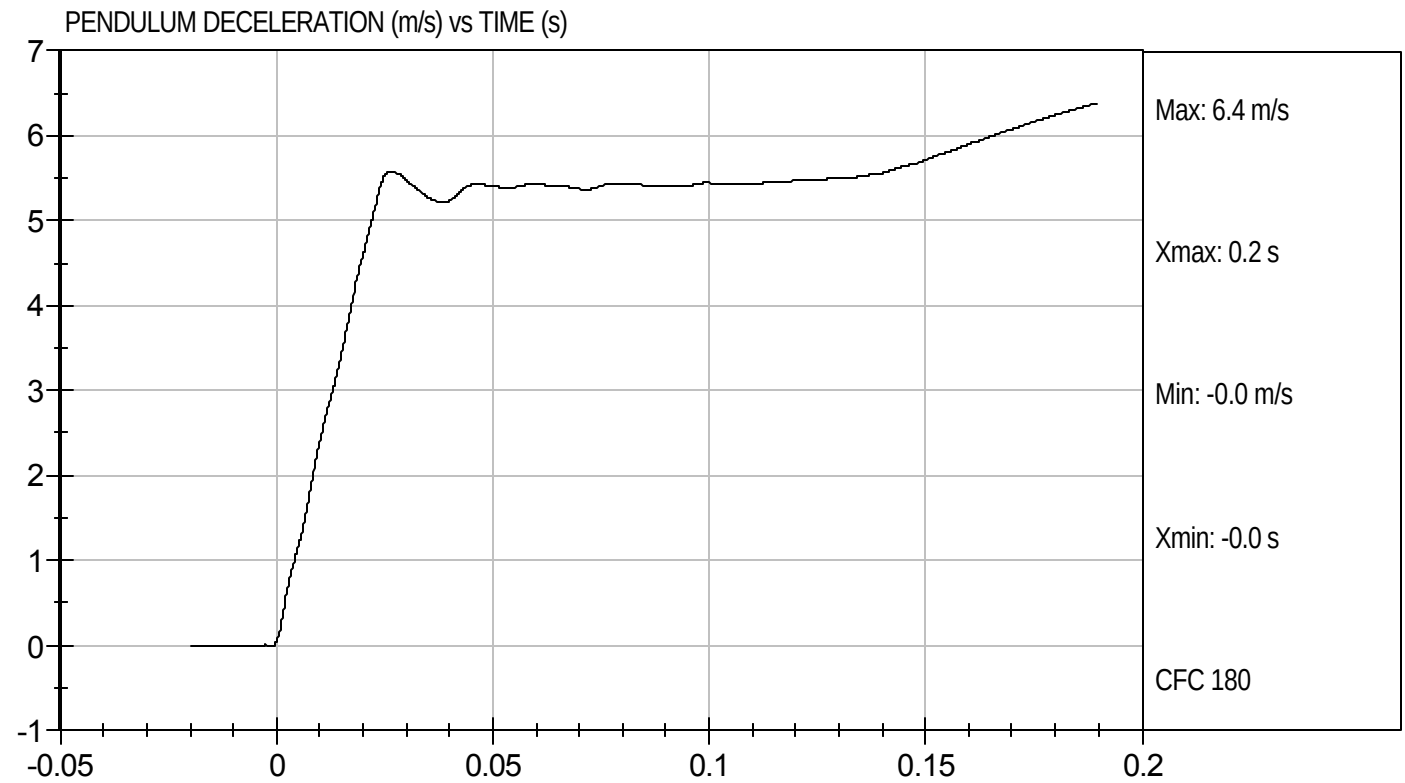
2/22/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11632

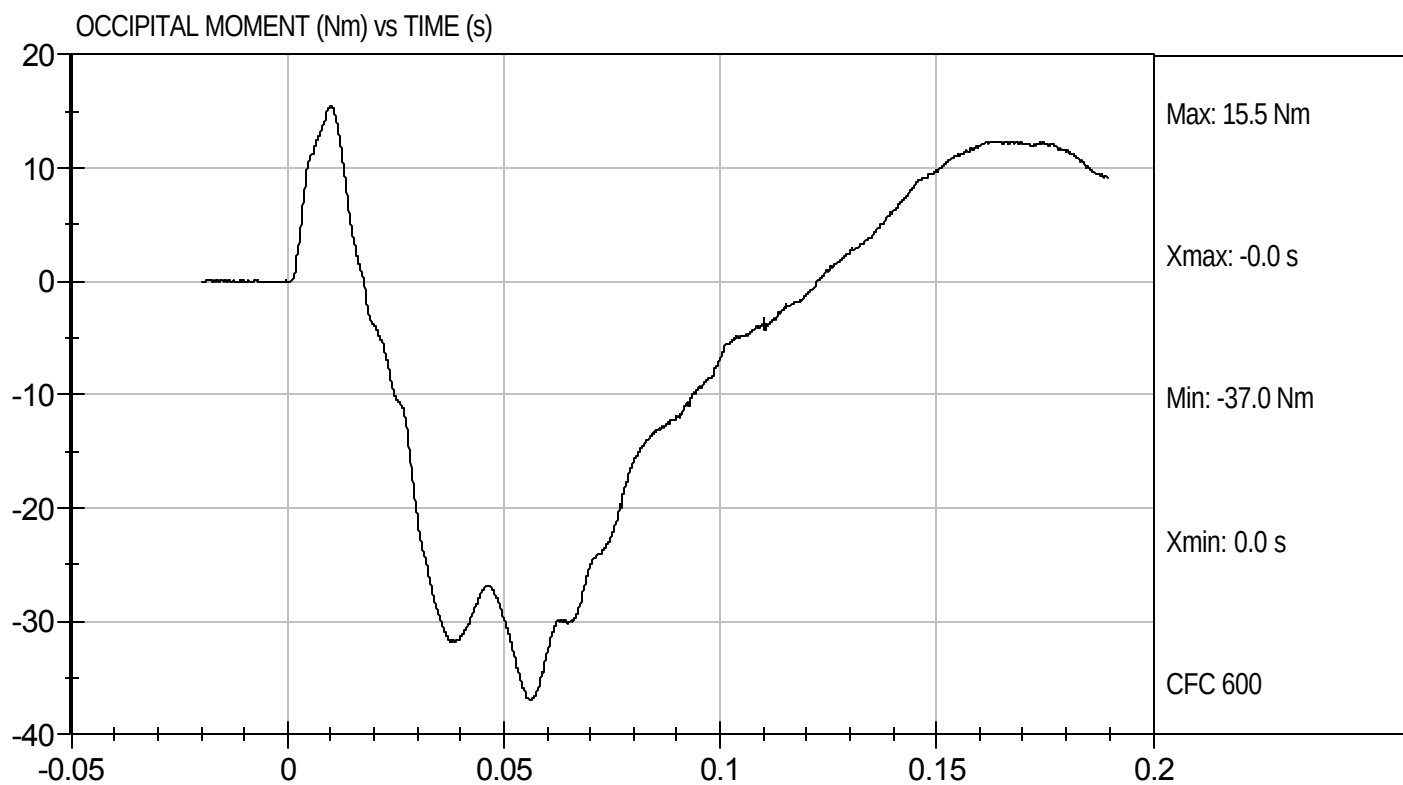
Test Date: 2/22/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D11632

Test Date: 2/22/11
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-11s BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11633

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

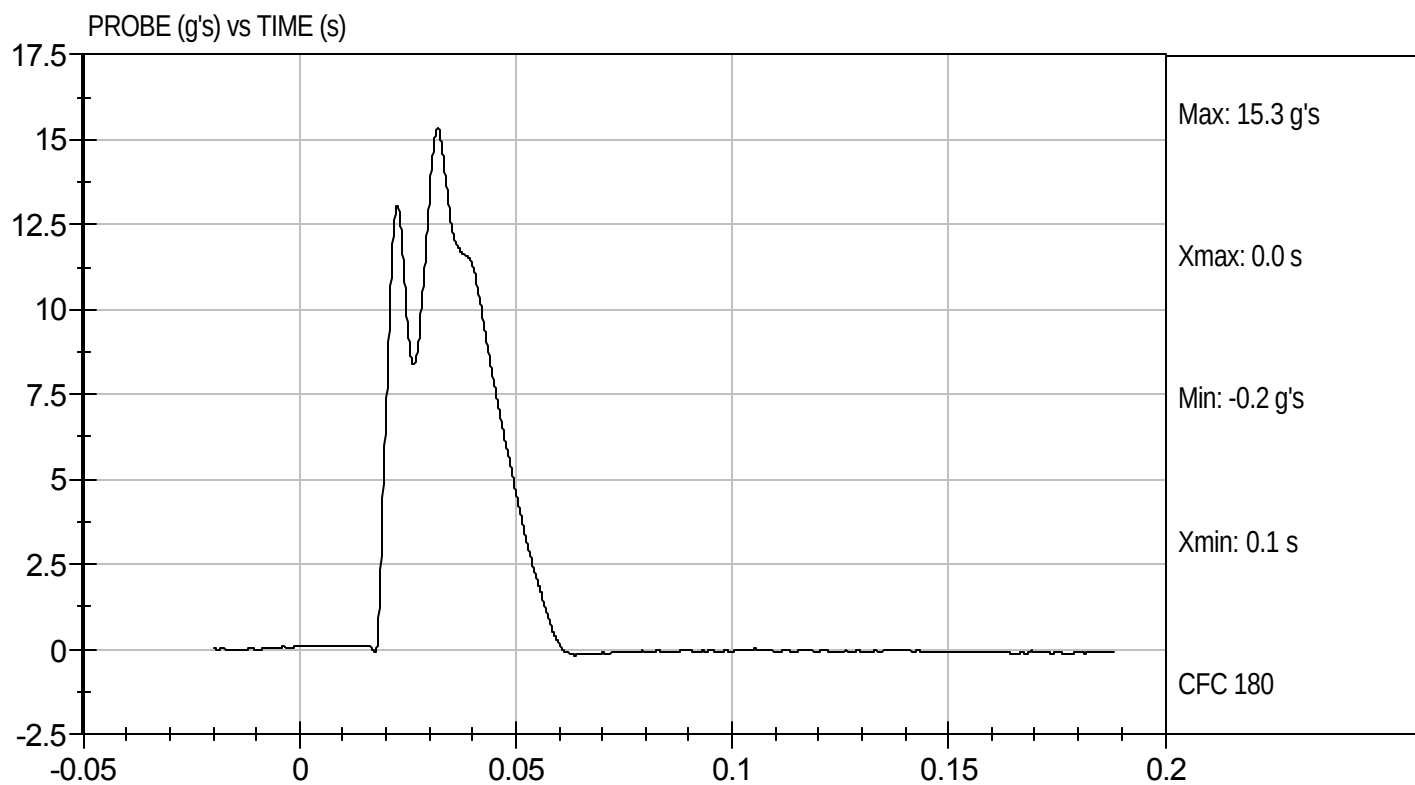
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Shoulder Impact
Component ID: D11633

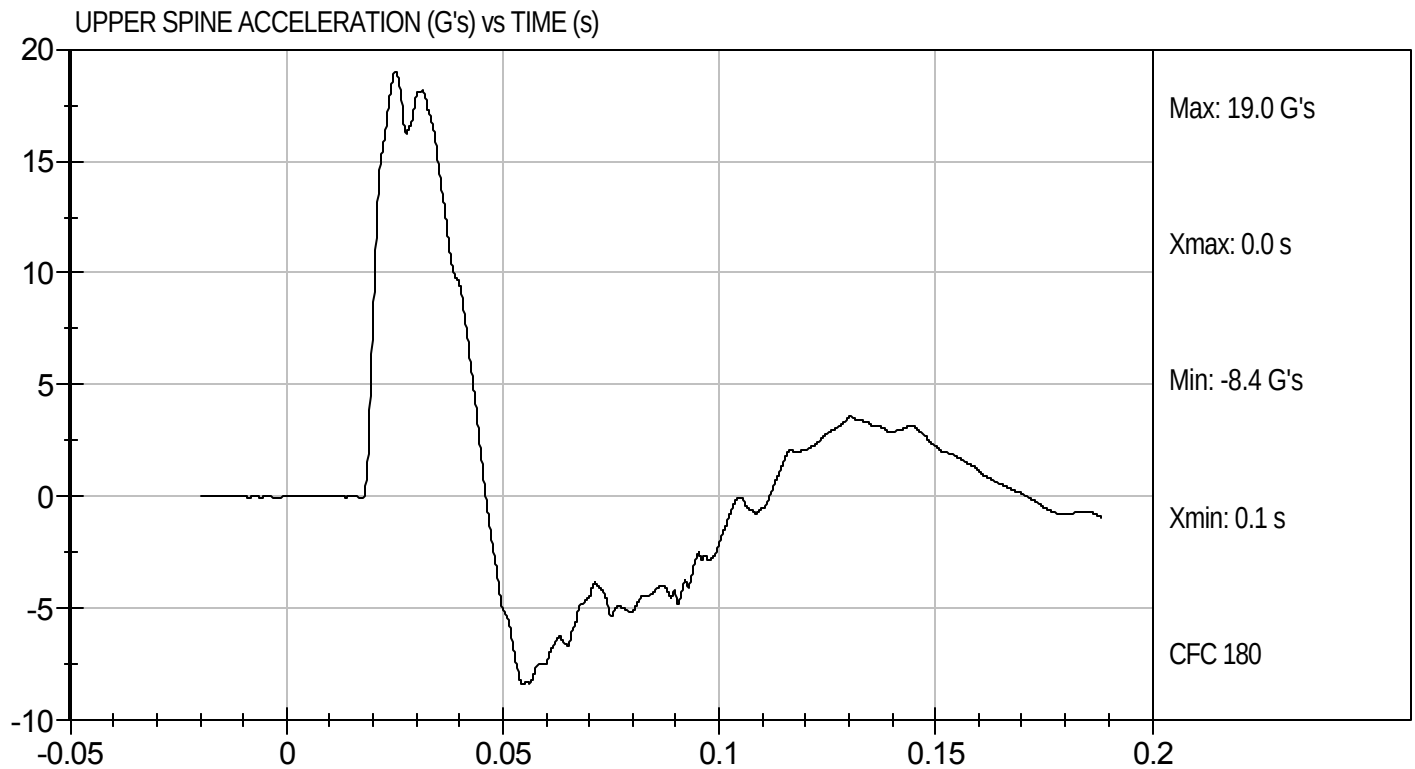
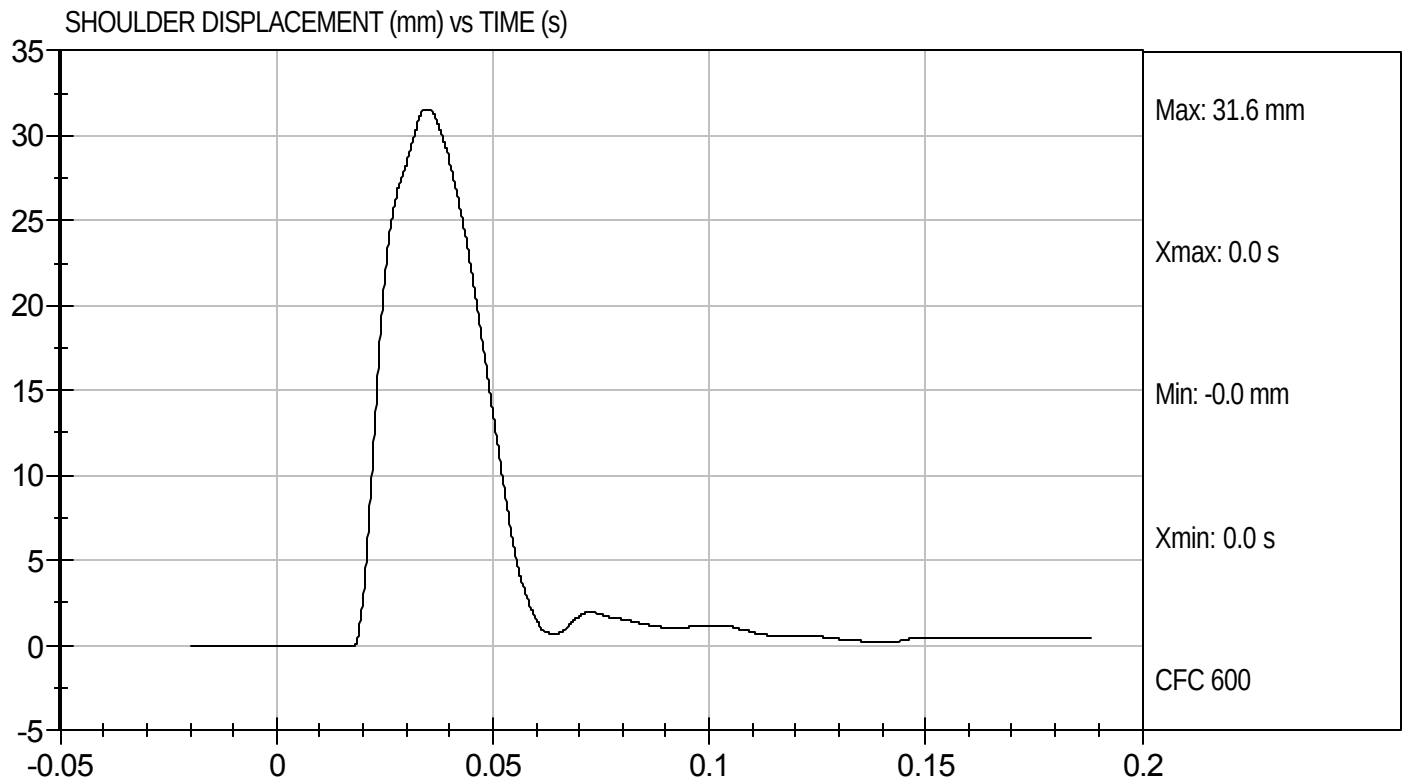
Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D11633

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

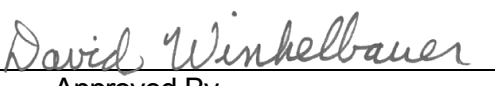
ATD Serial No: 296

Test I.D: D11634

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	35	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results			Pass	


Laboratory Technician

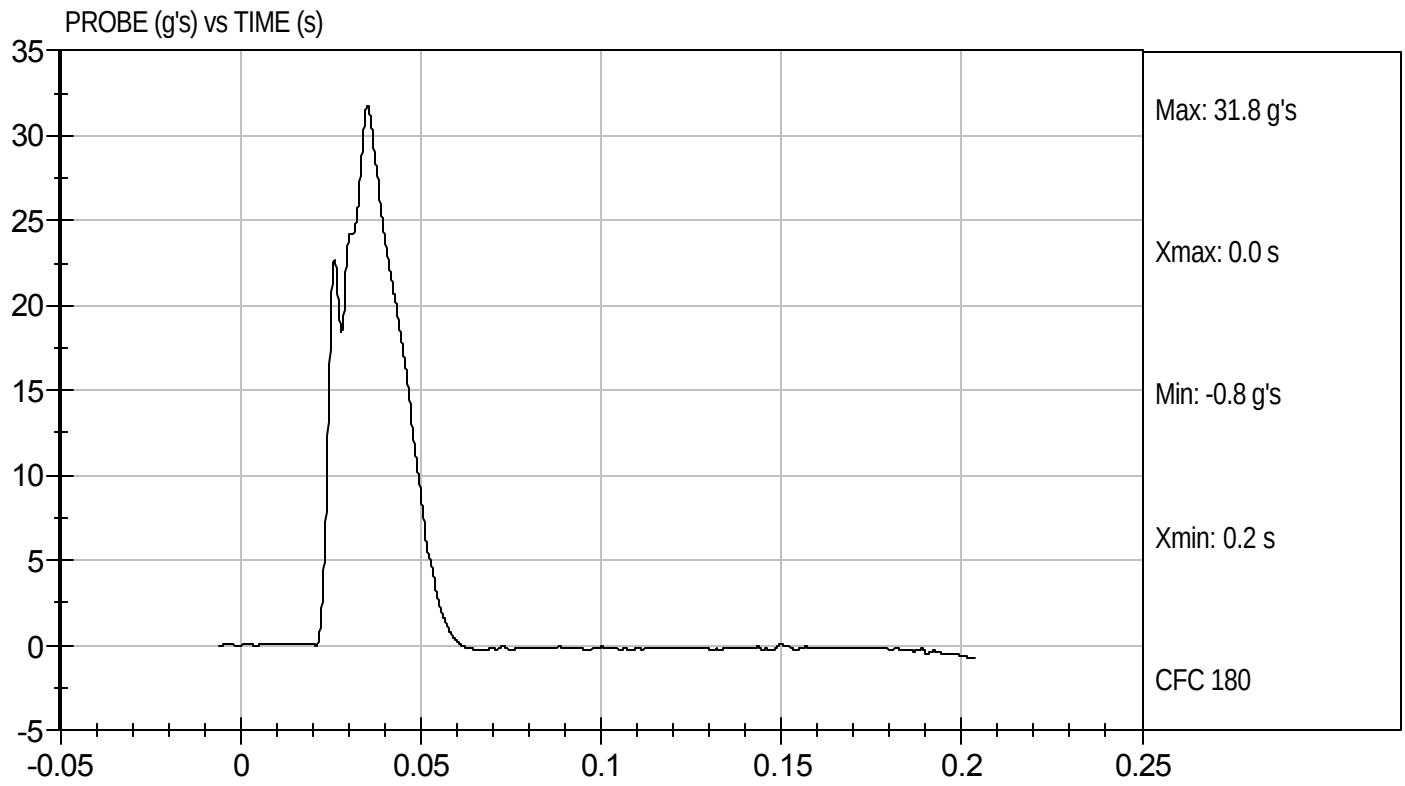
2/22/11
Test Date


Approved By



Test Desc: Thorax With Arm
Component ID: D11634

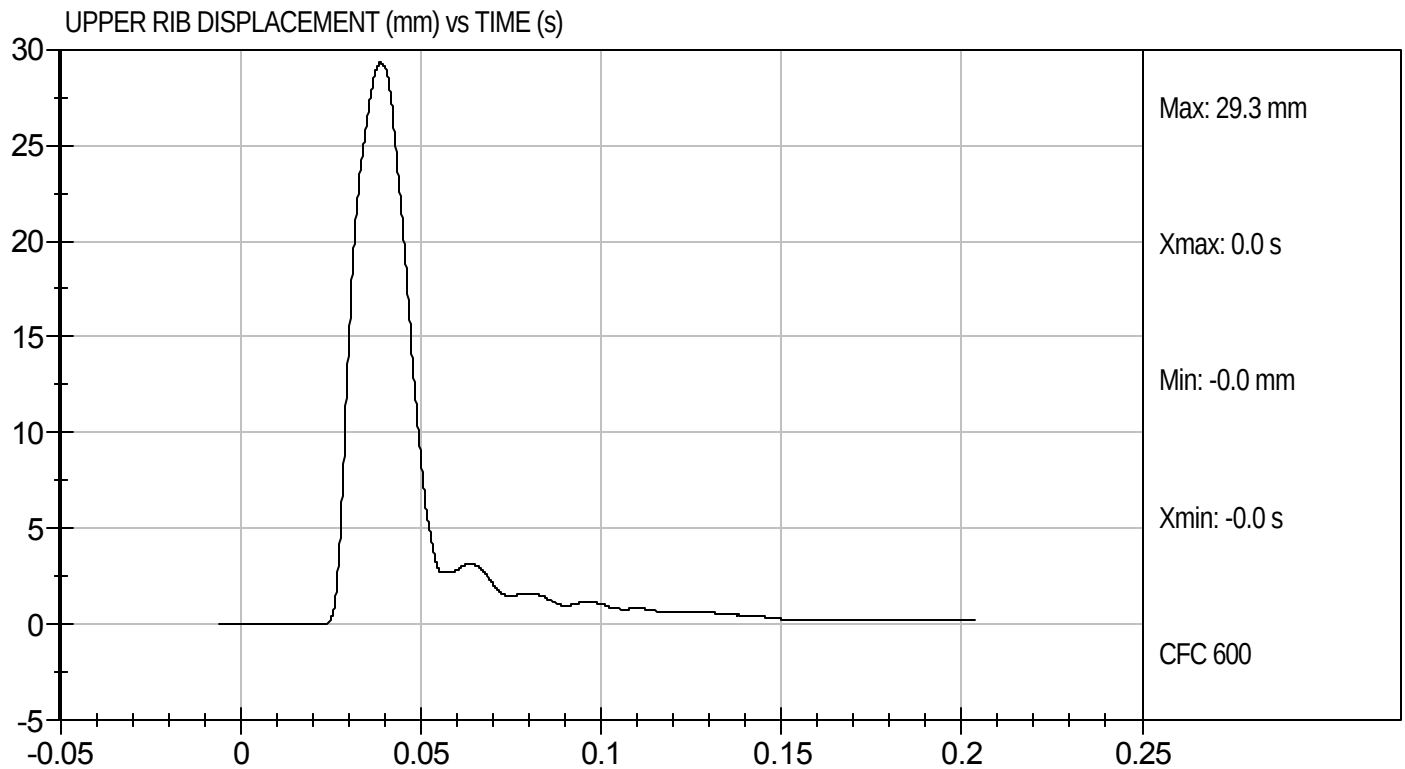
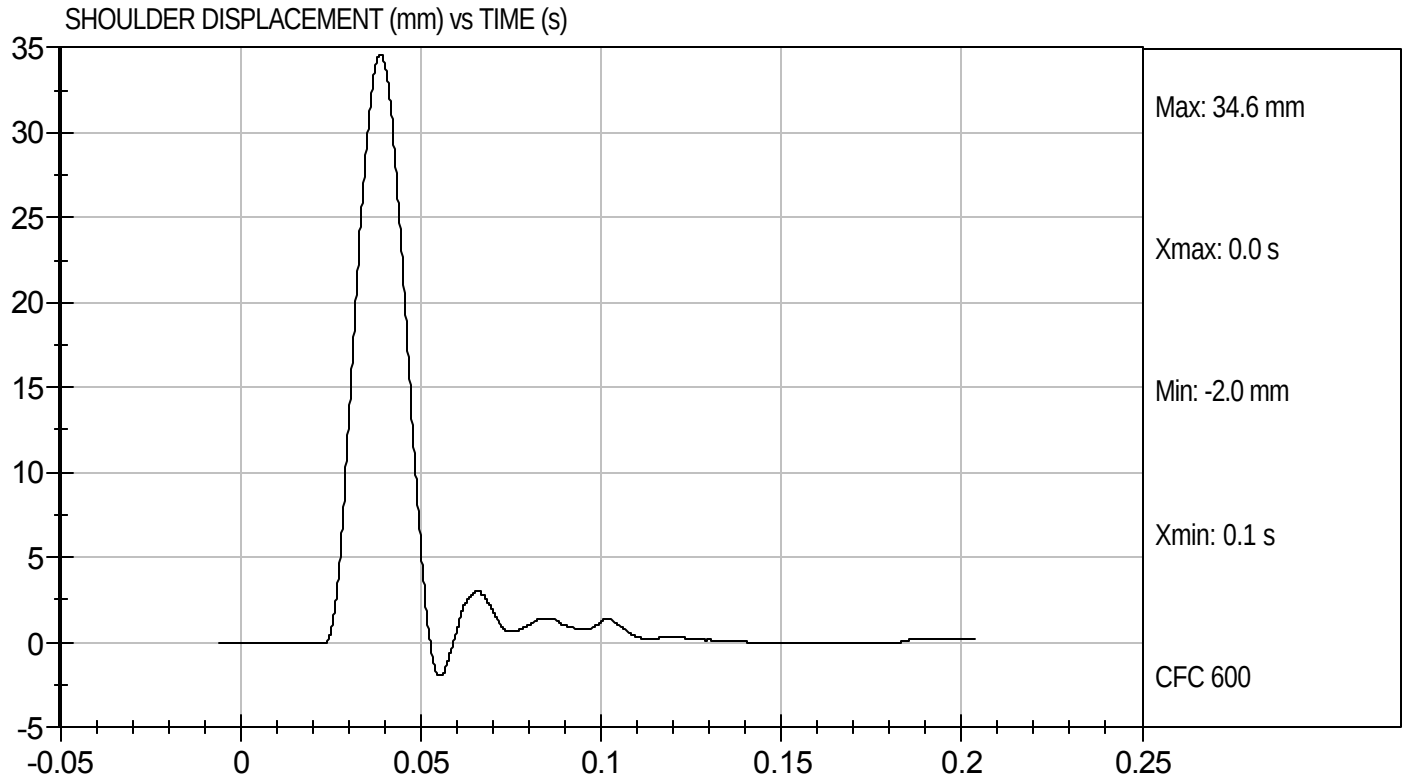
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11634

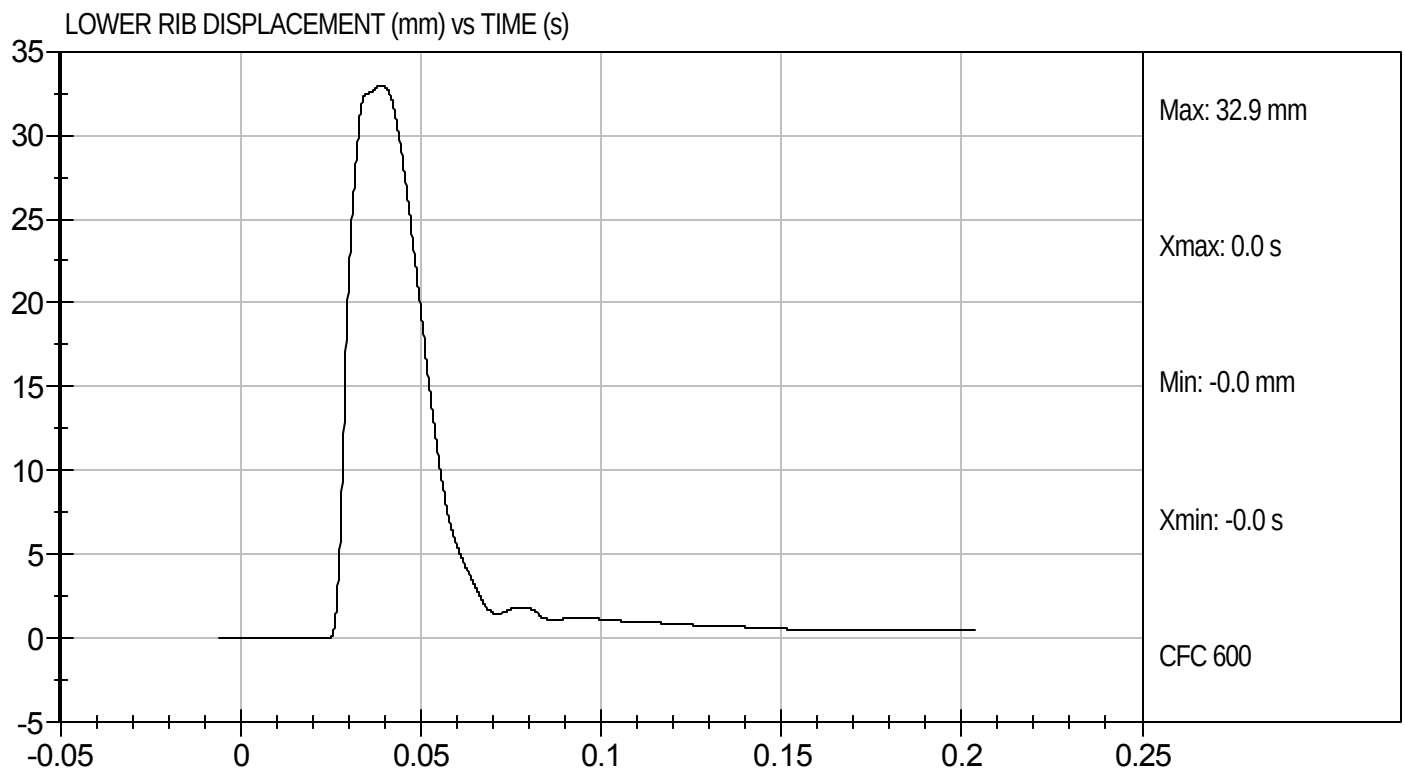
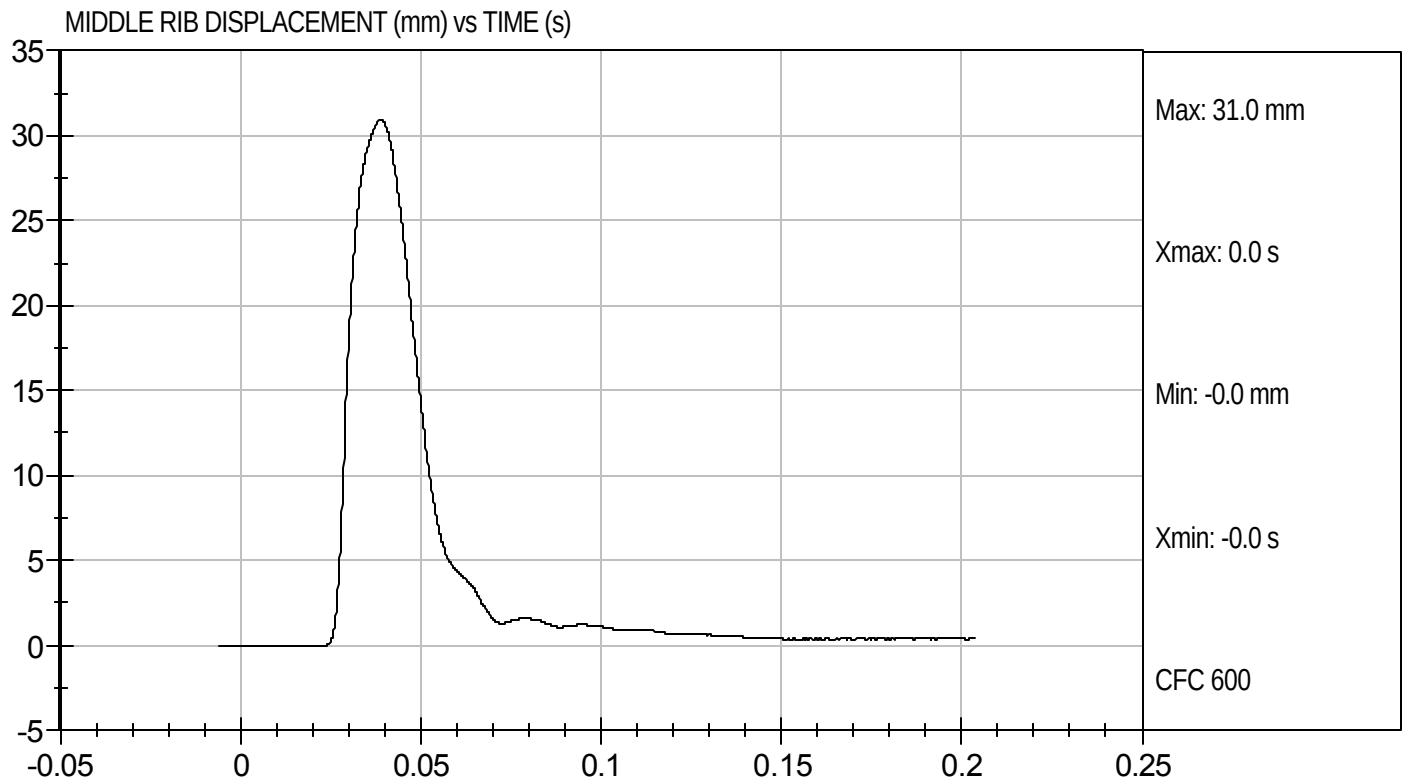
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11634

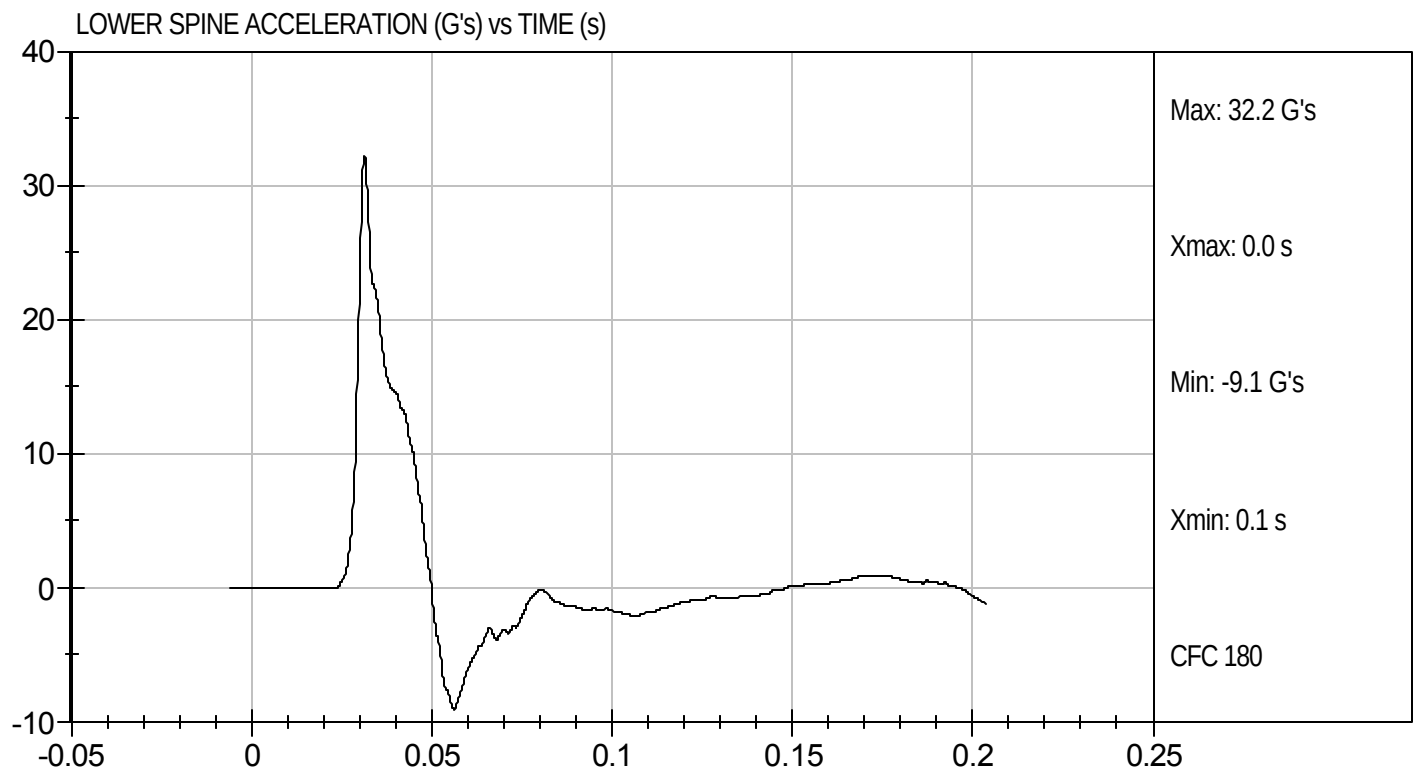
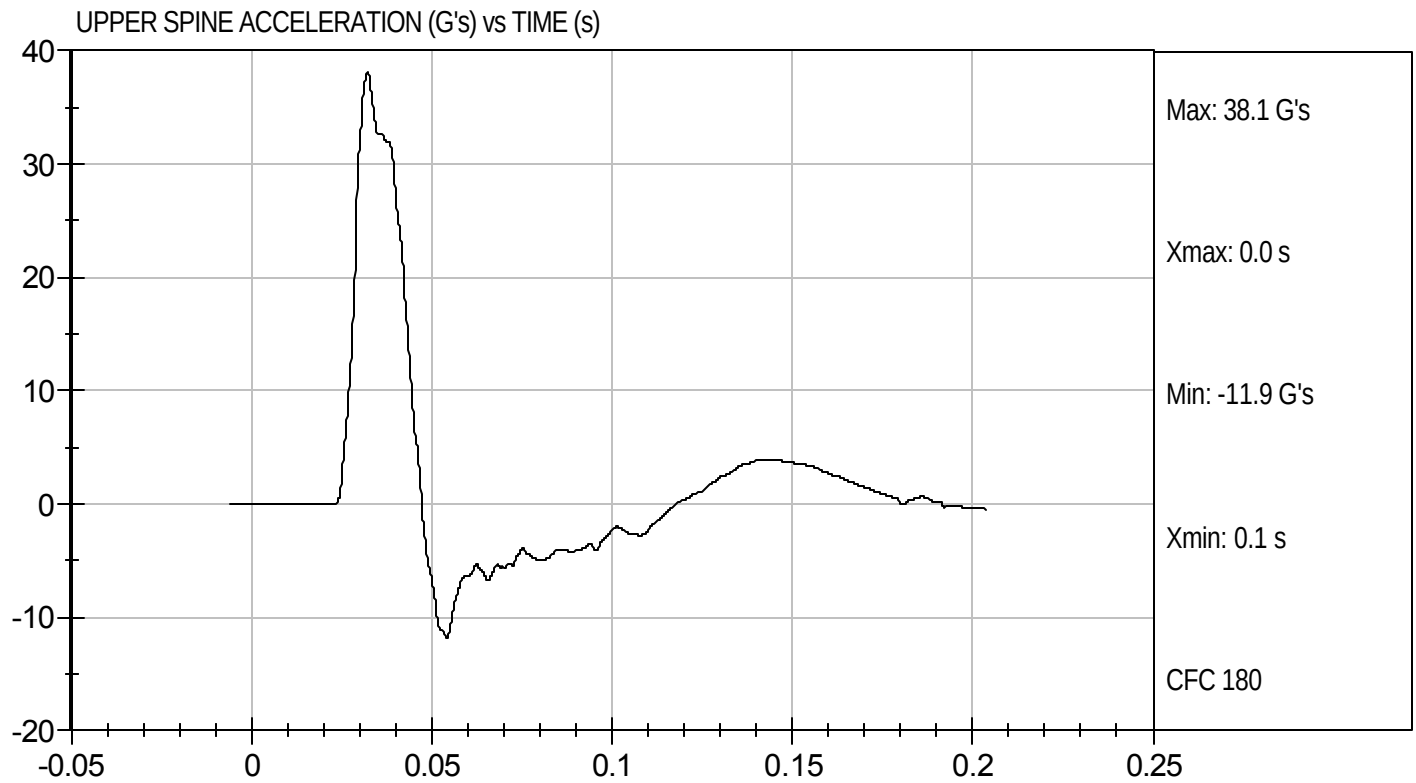
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11634

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



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11635

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	37	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass


Laboratory Technician

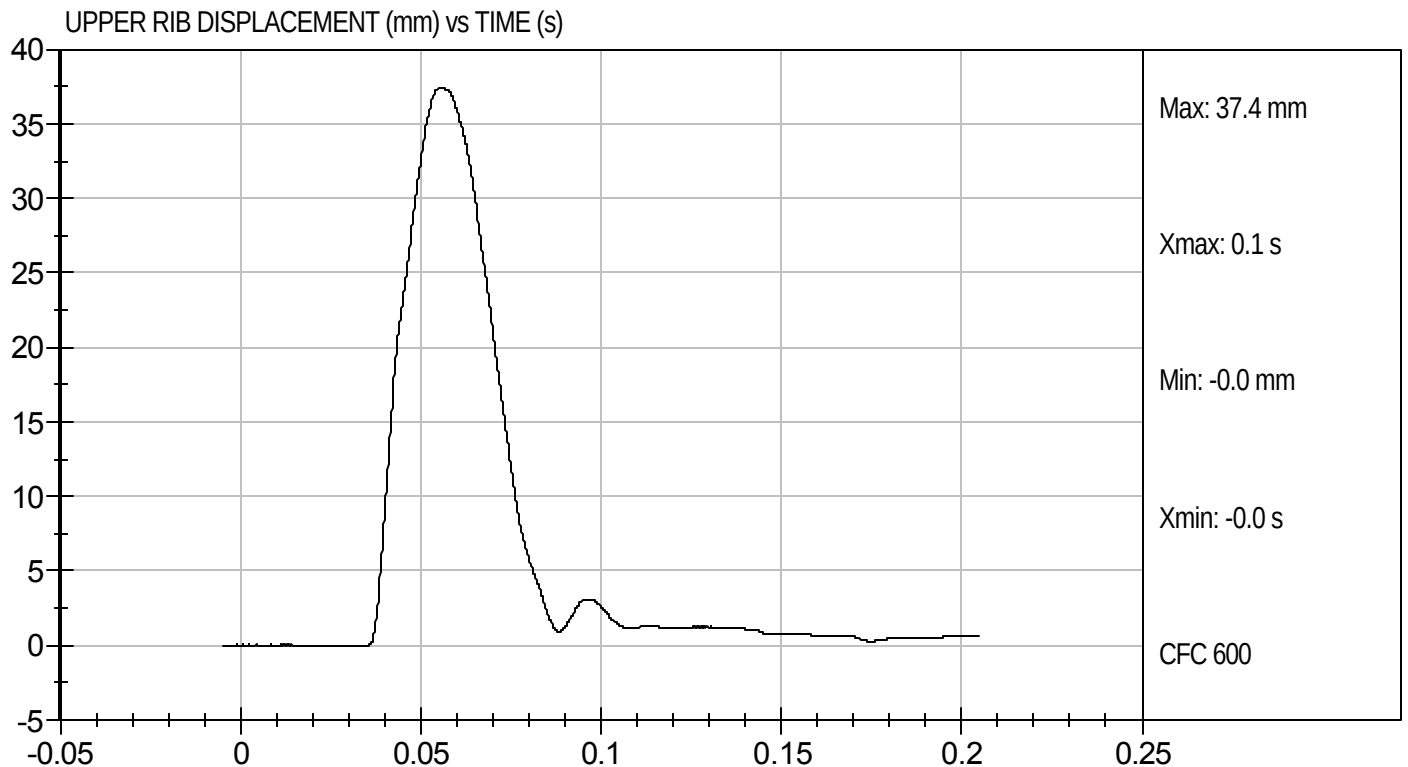
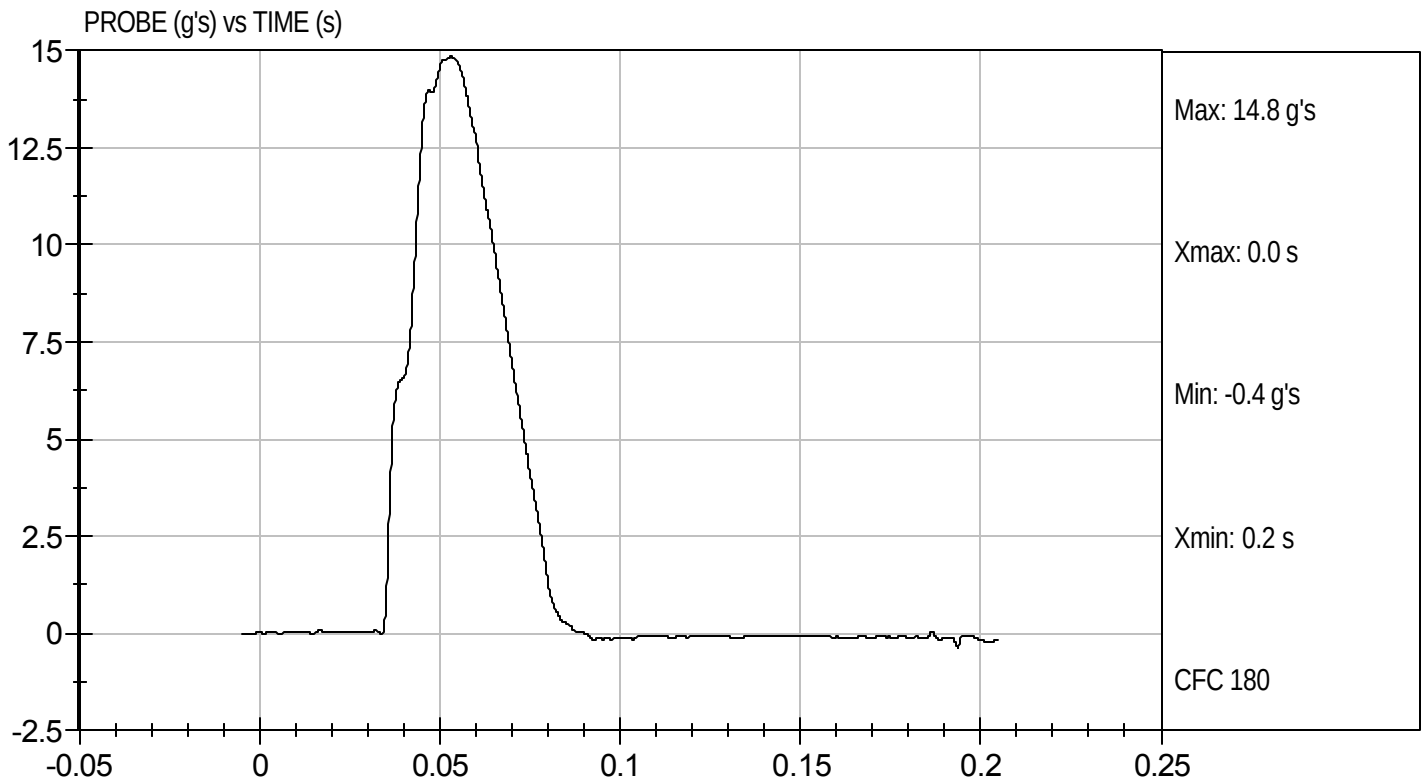
2/22/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D11635

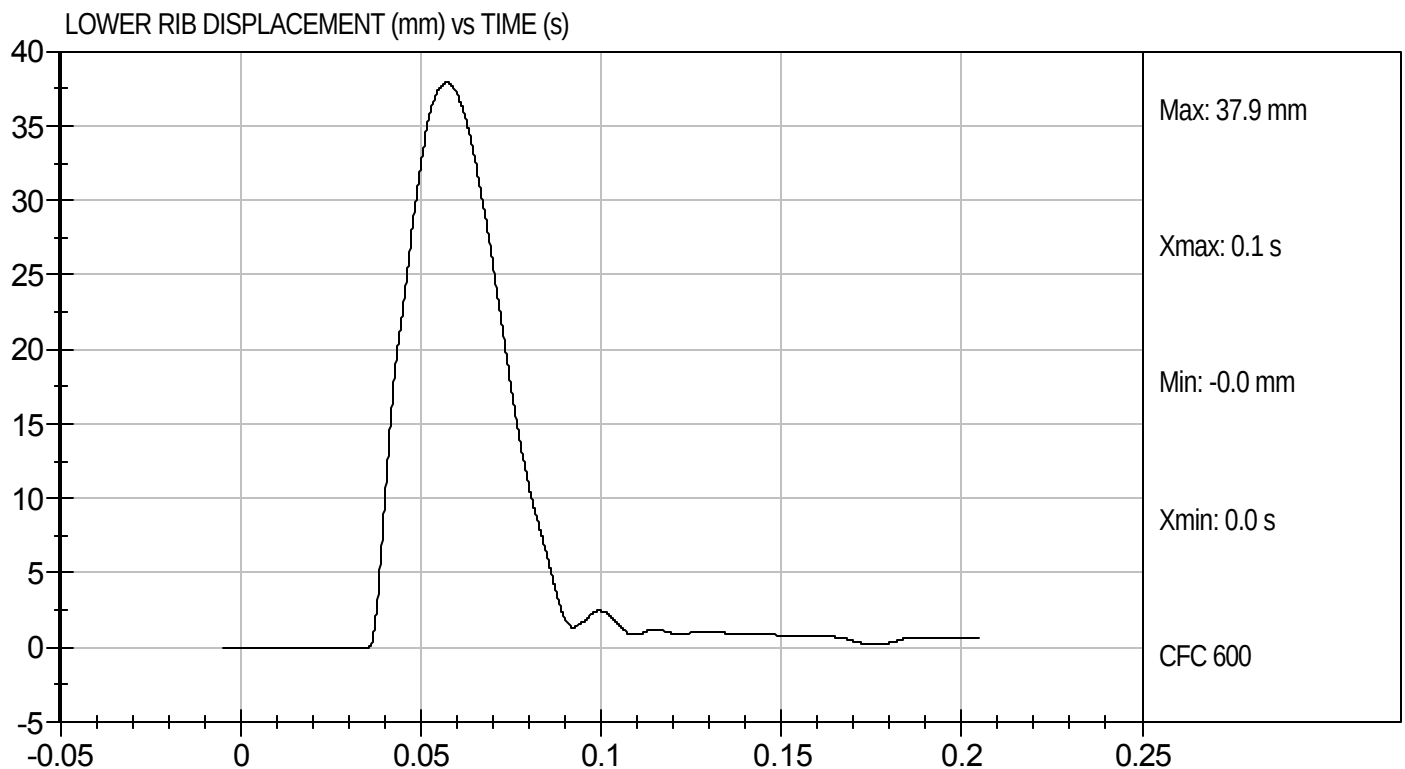
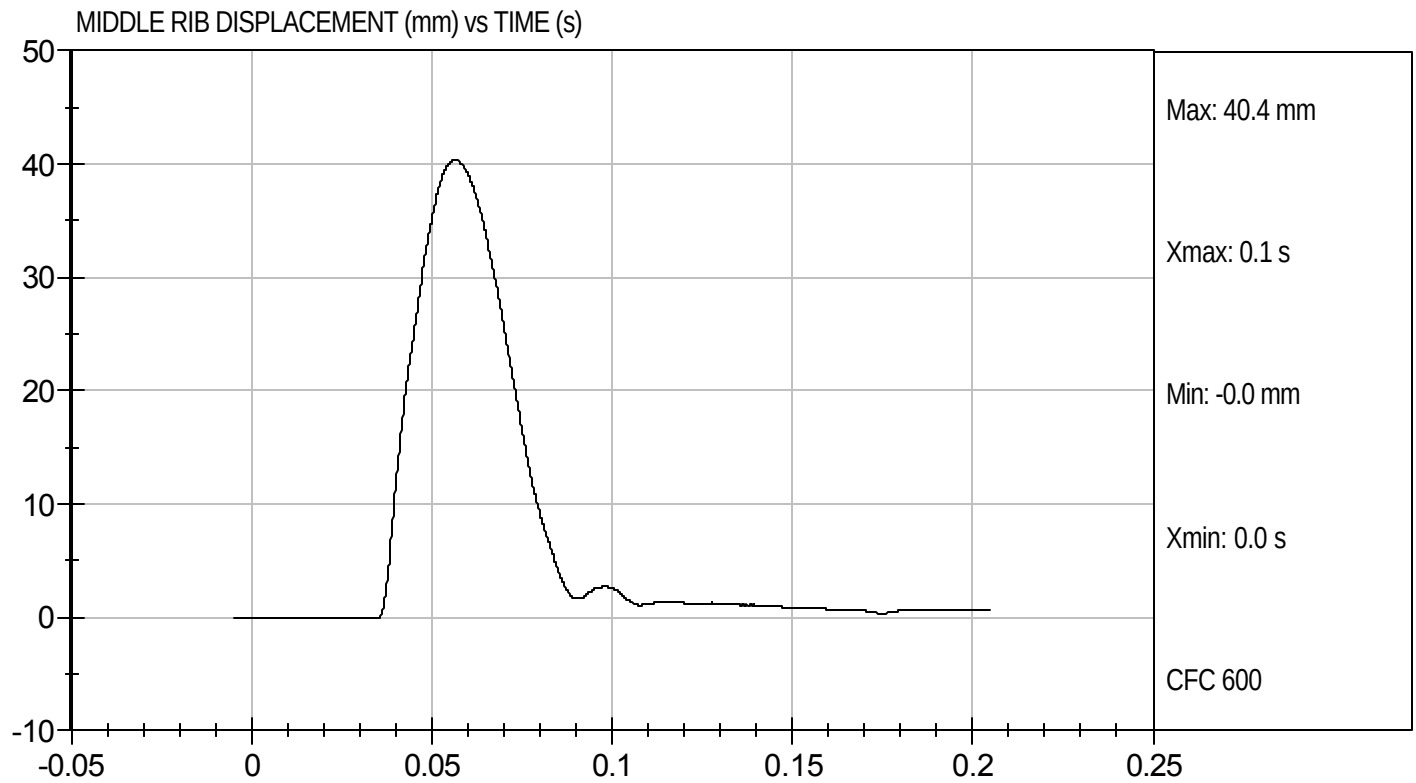
Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D11635

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

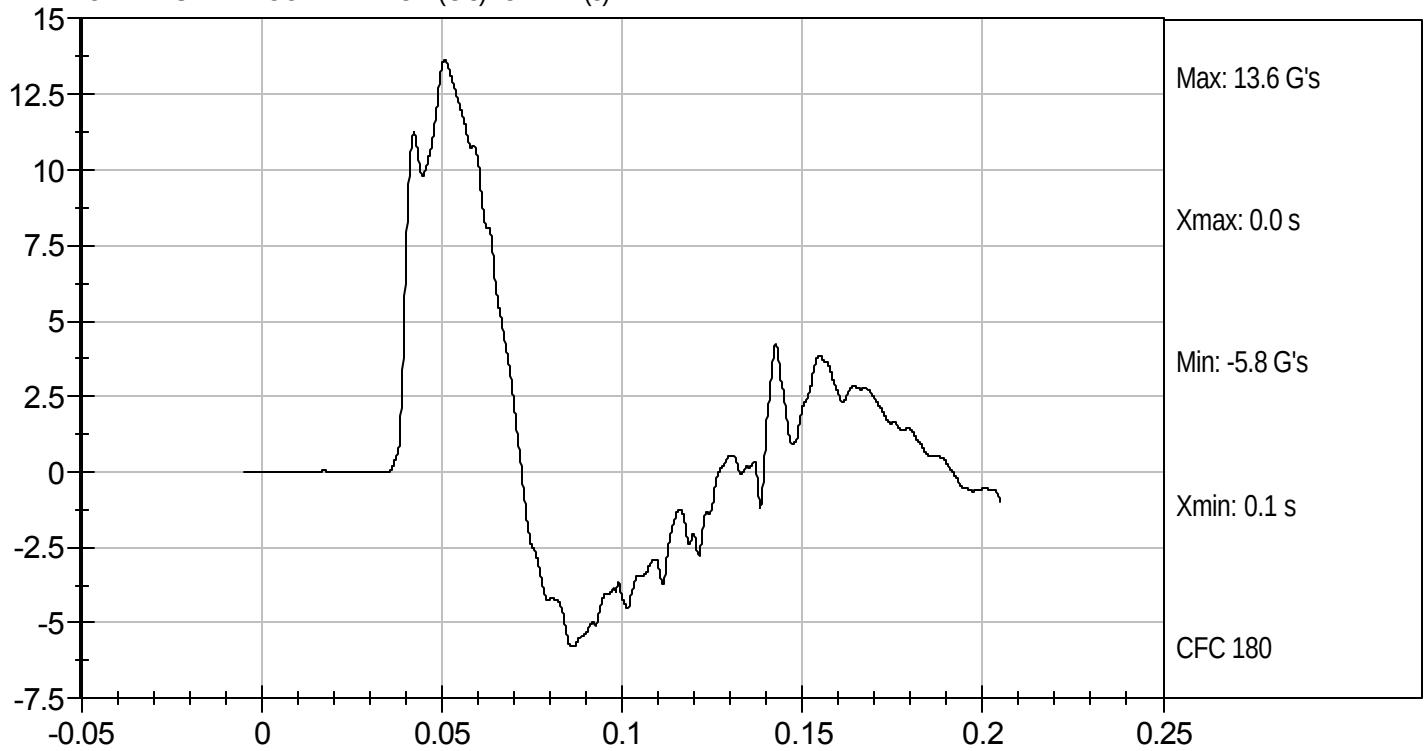




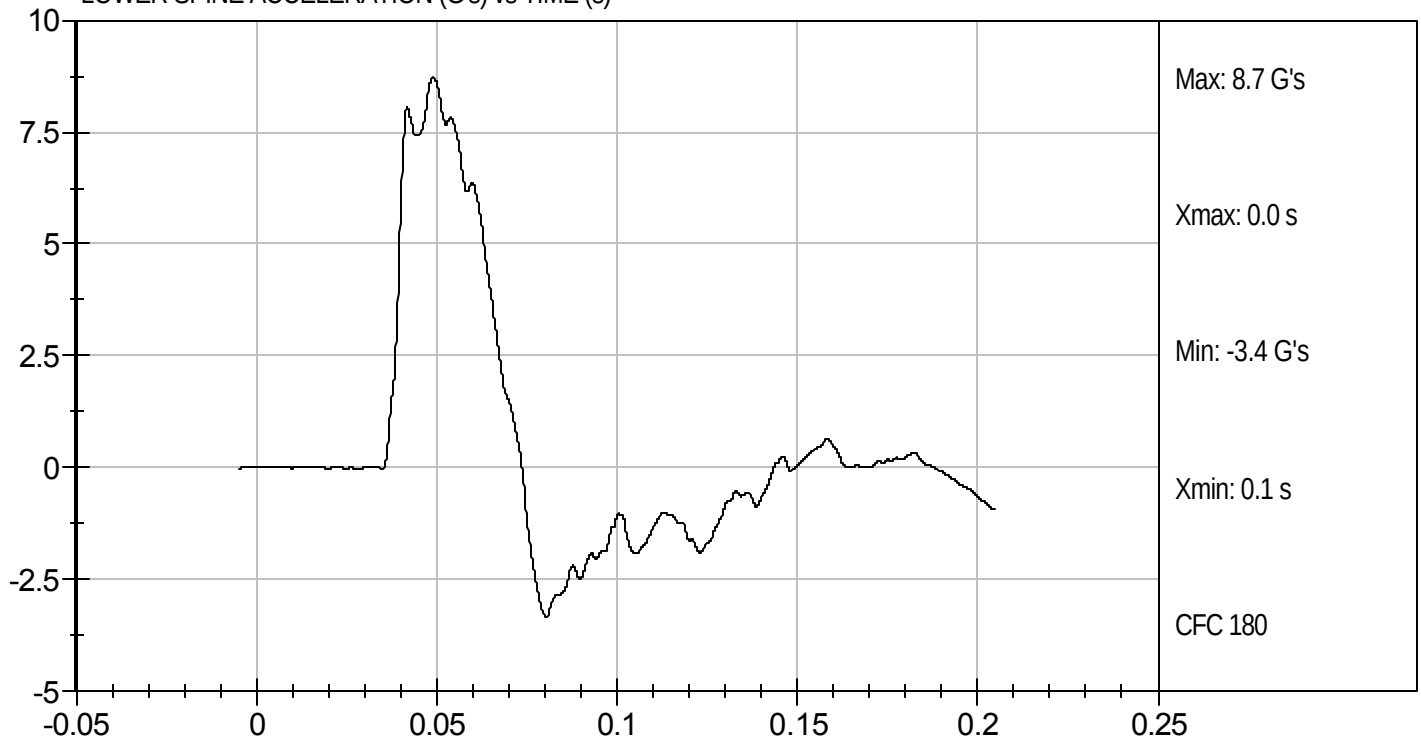
Test Desc: Thorax Without Arm
Component ID: D11635

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

UPPER SPINE ACCELERATION (G's) vs TIME (s)



LOWER SPINE ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11636

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	40	Pass
Lower Rib Displacement	mm	33 to 44	36	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
			Overall Test Results	Pass


Laboratory Technician

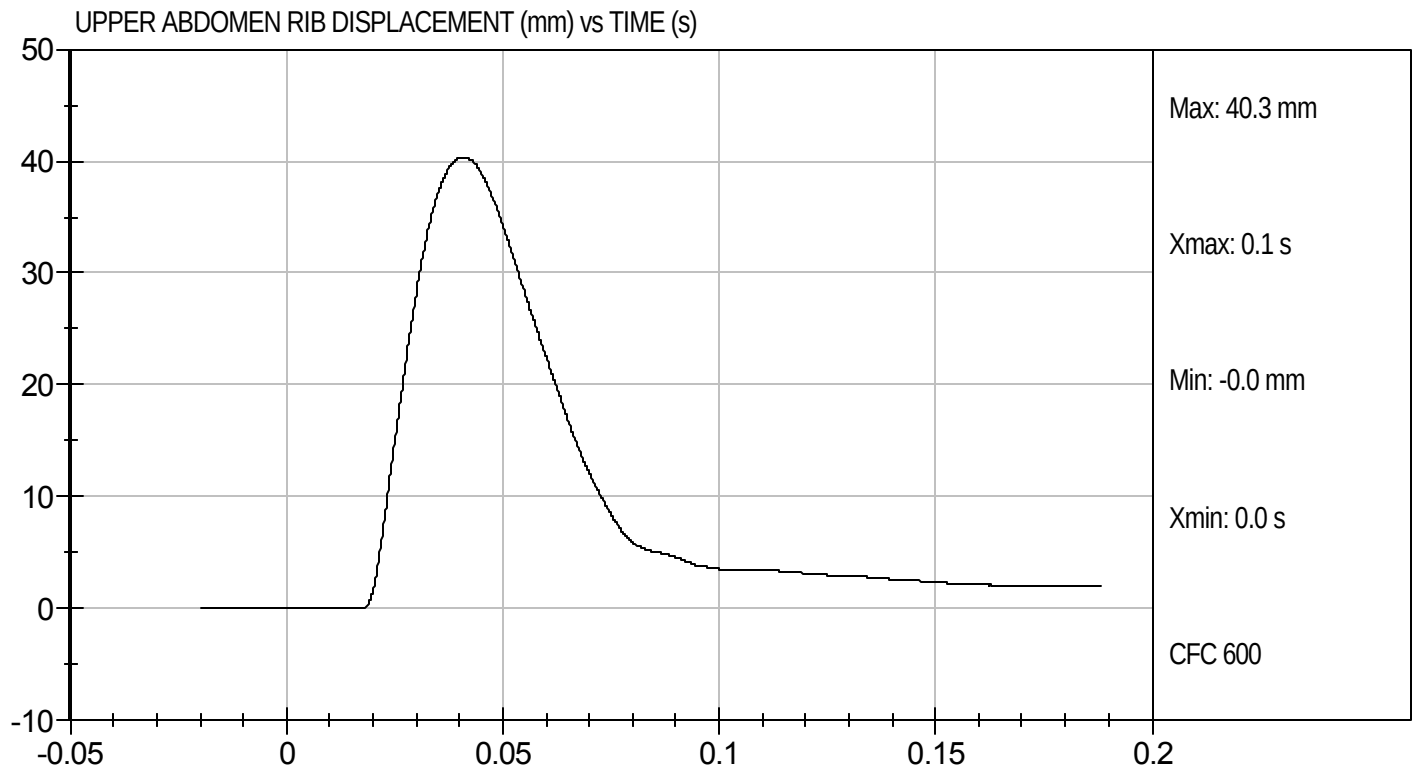
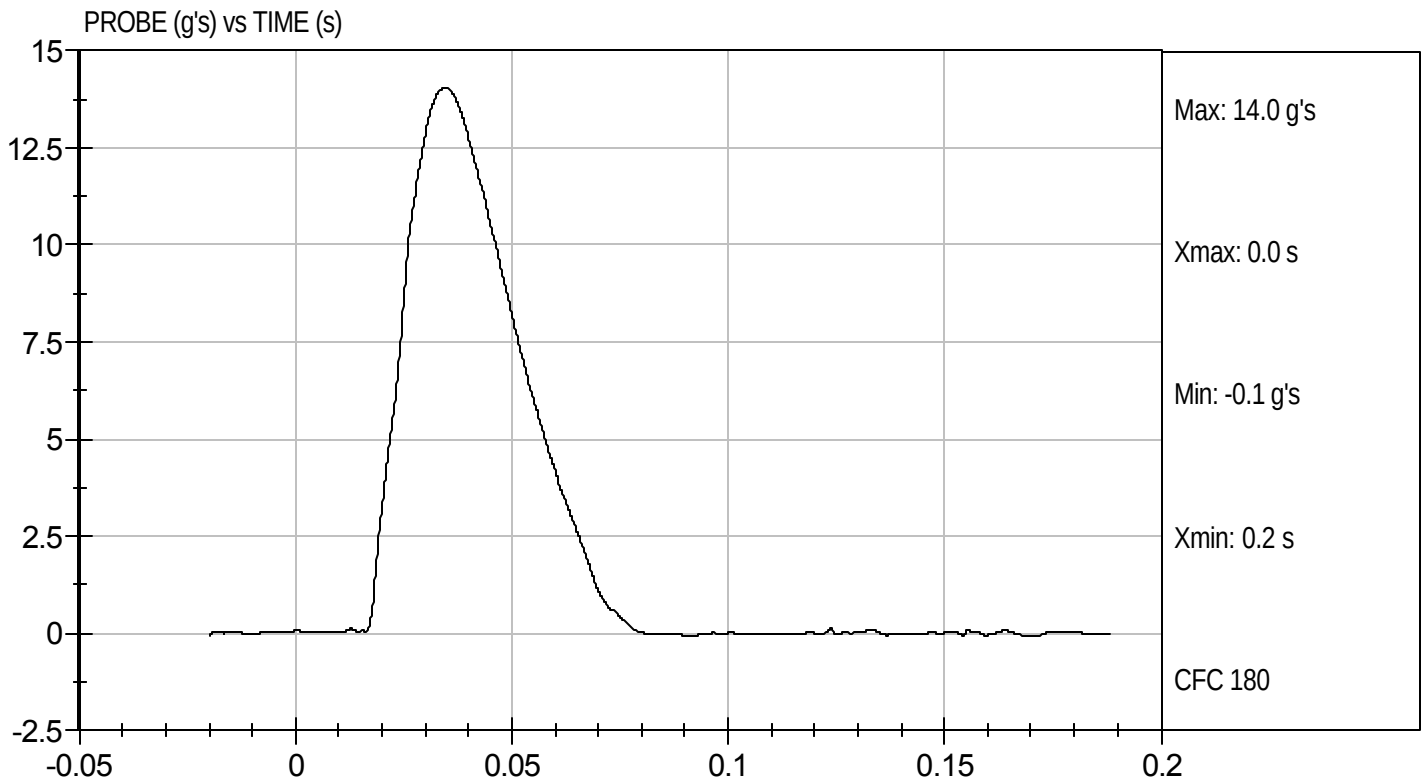
2/22/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D11636

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

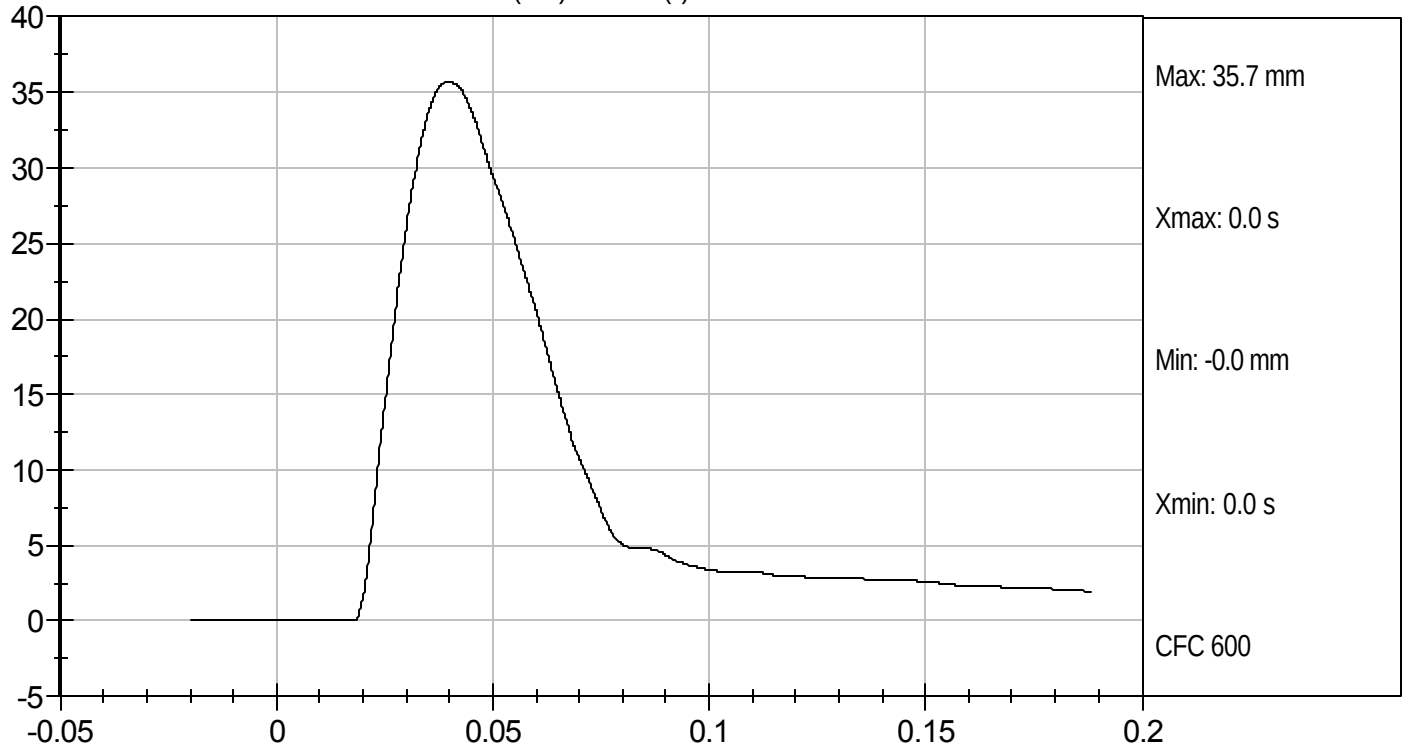




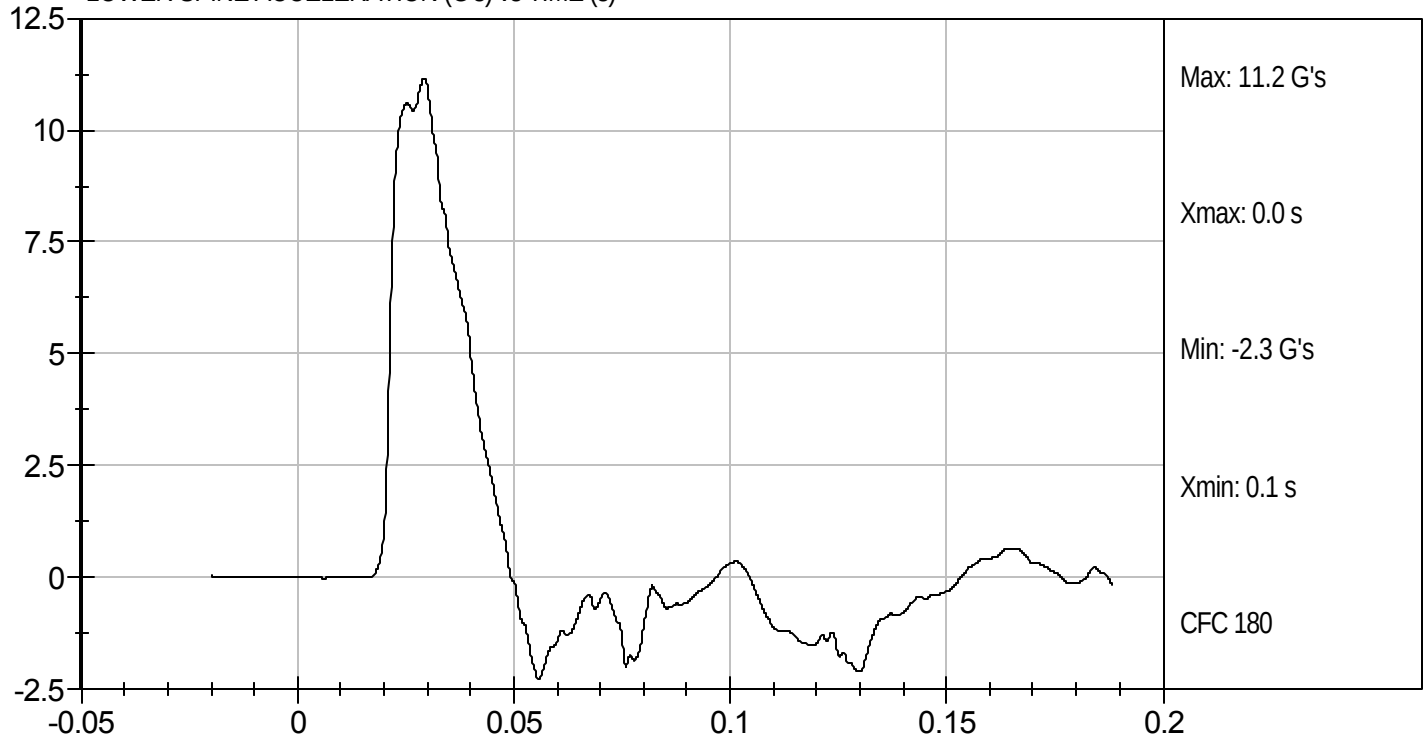
Test Desc: Abdomen Impact
Component ID: D11636

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (s)



LOWER SPINE ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11637

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	4249	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

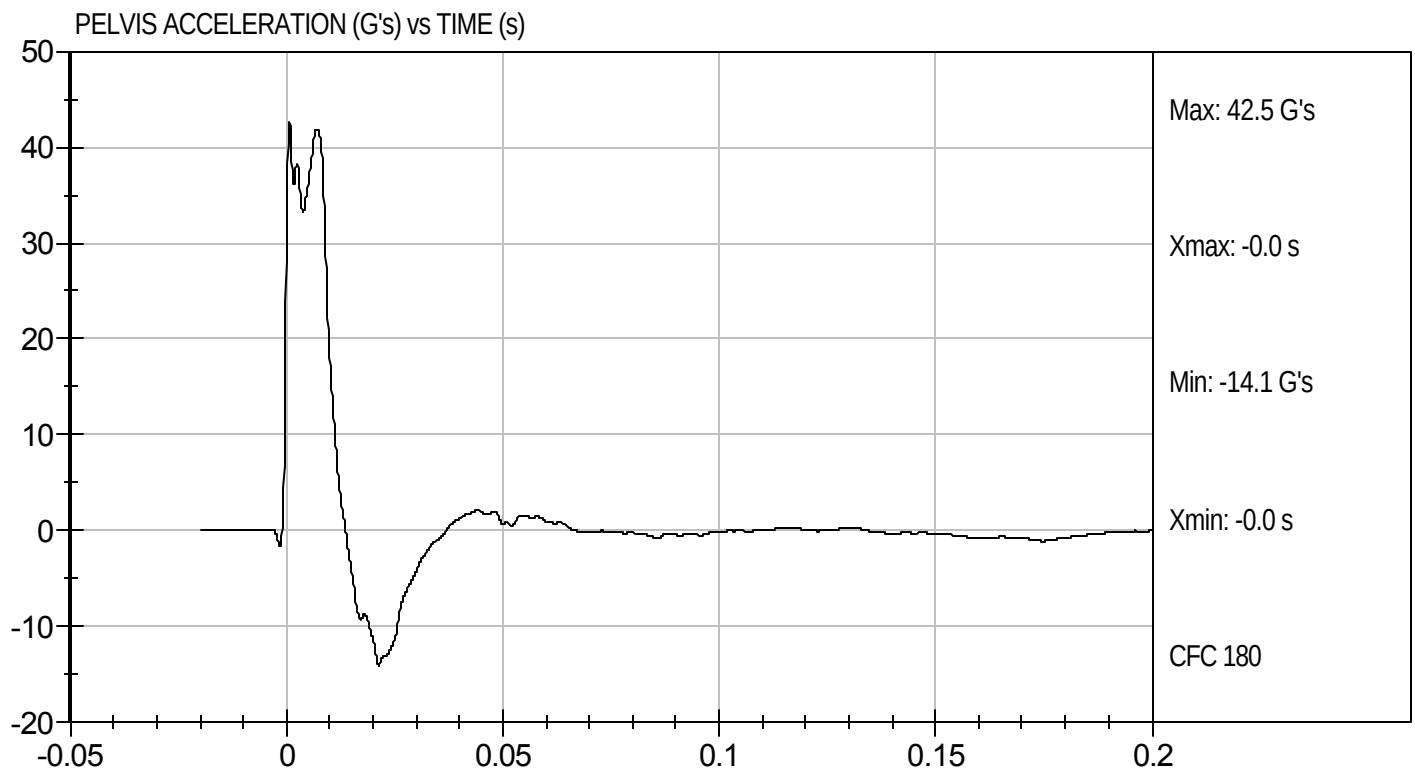
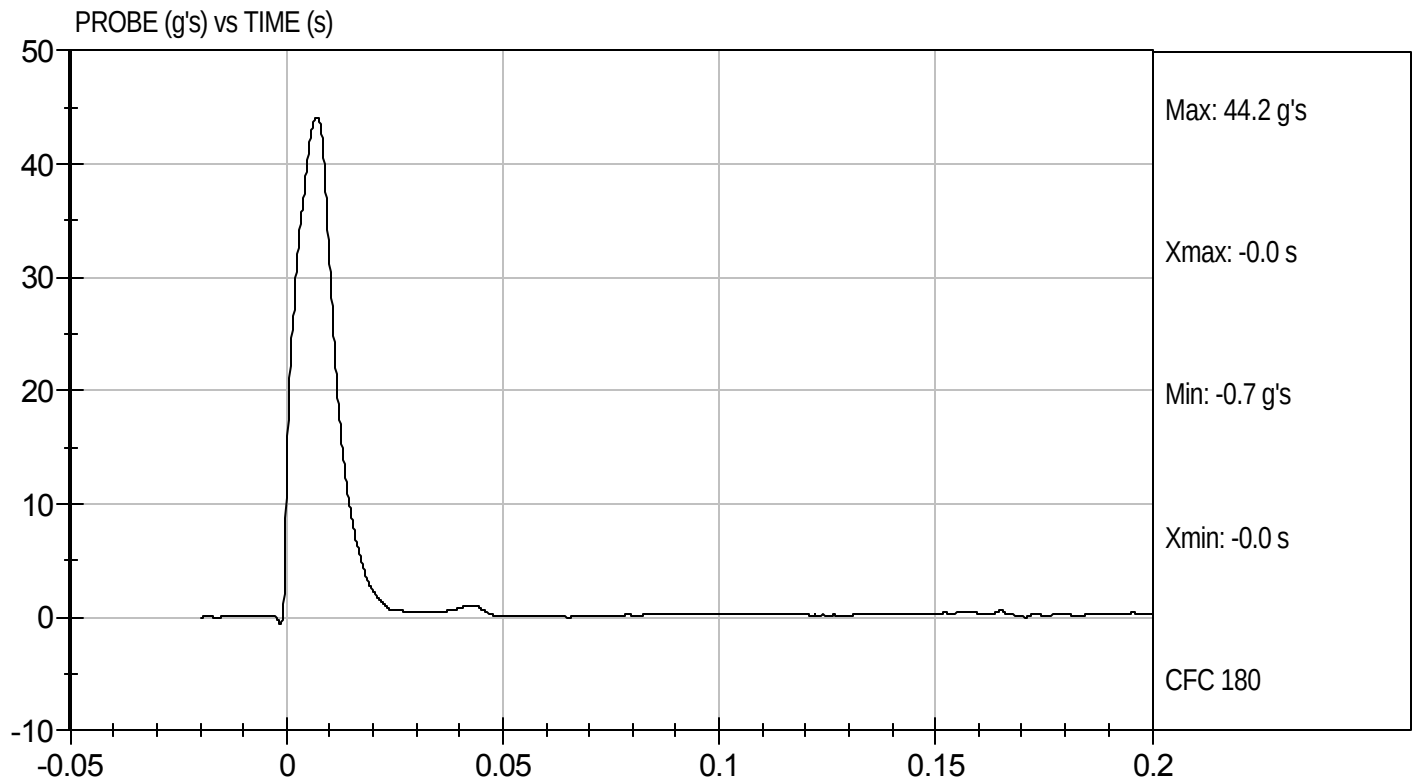
2/22/11
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D11637

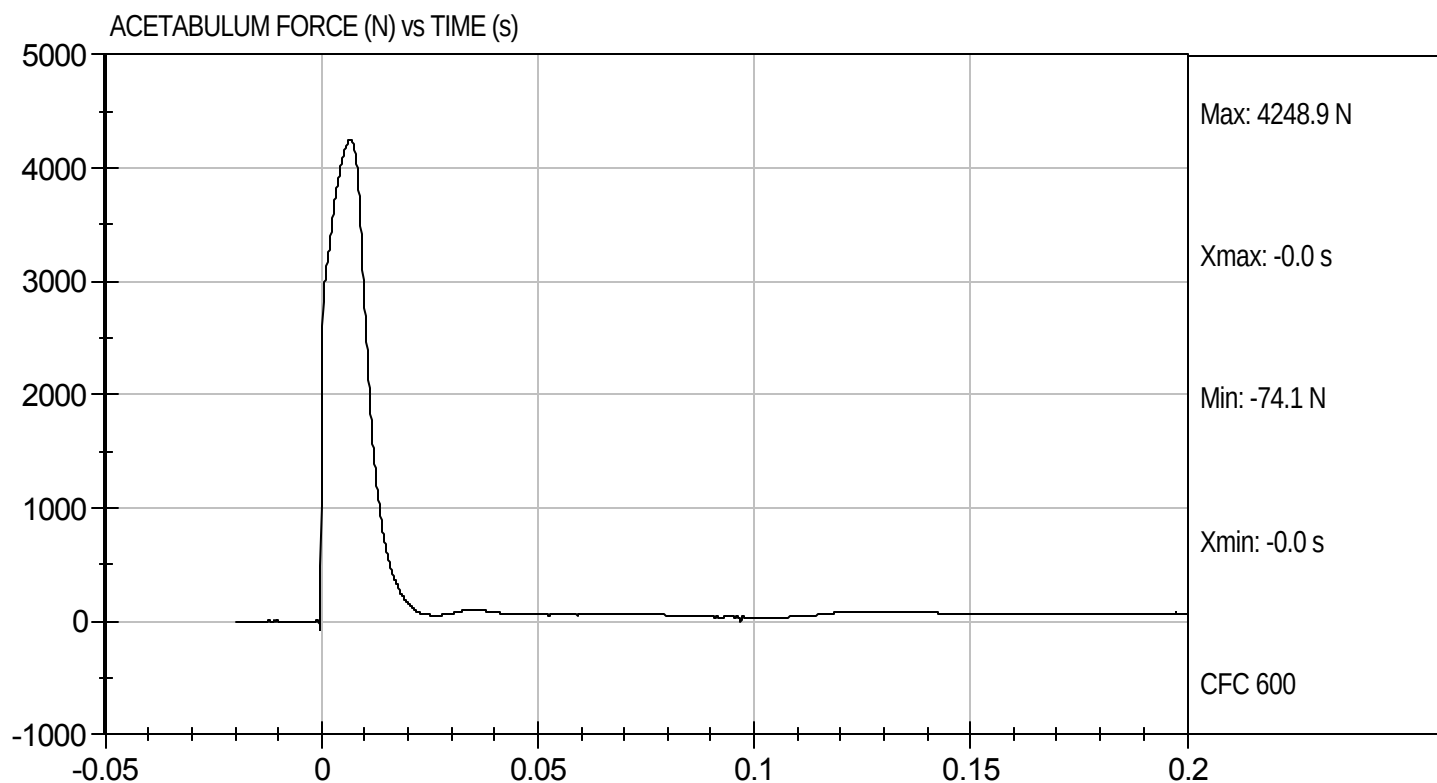
Test Date: 2/22/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D11637

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



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11638

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	22	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	37	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4478	Pass
Overall Test Results			Pass	


Laboratory Technician

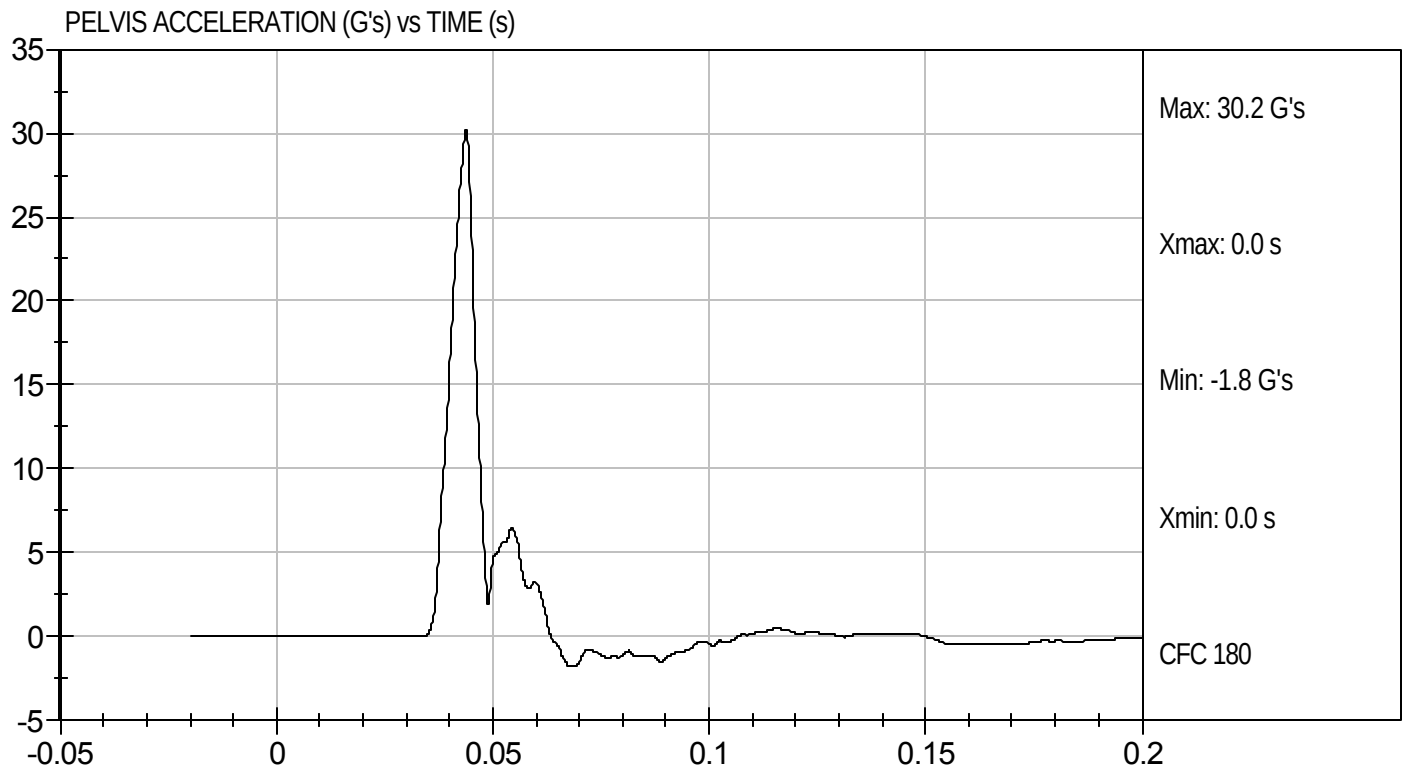
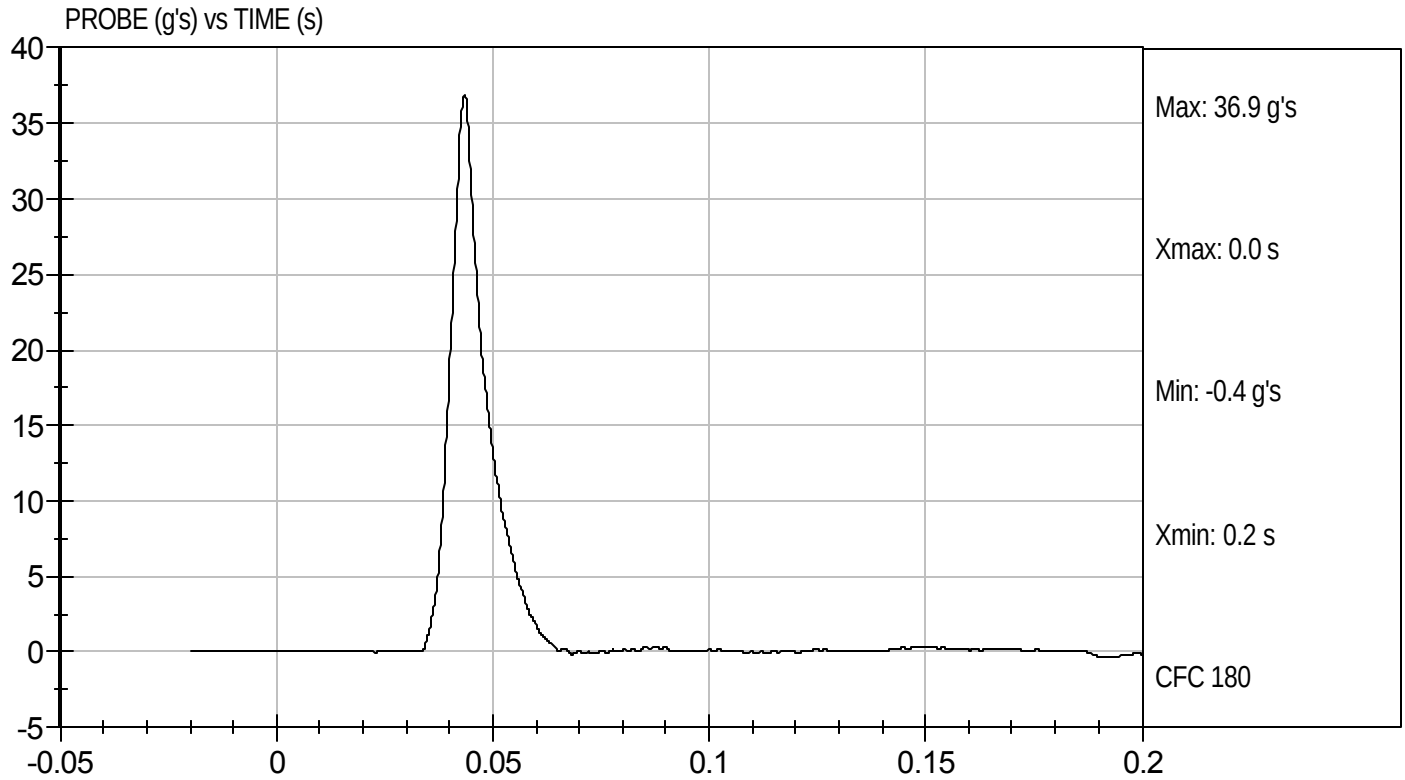
2/22/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D11638

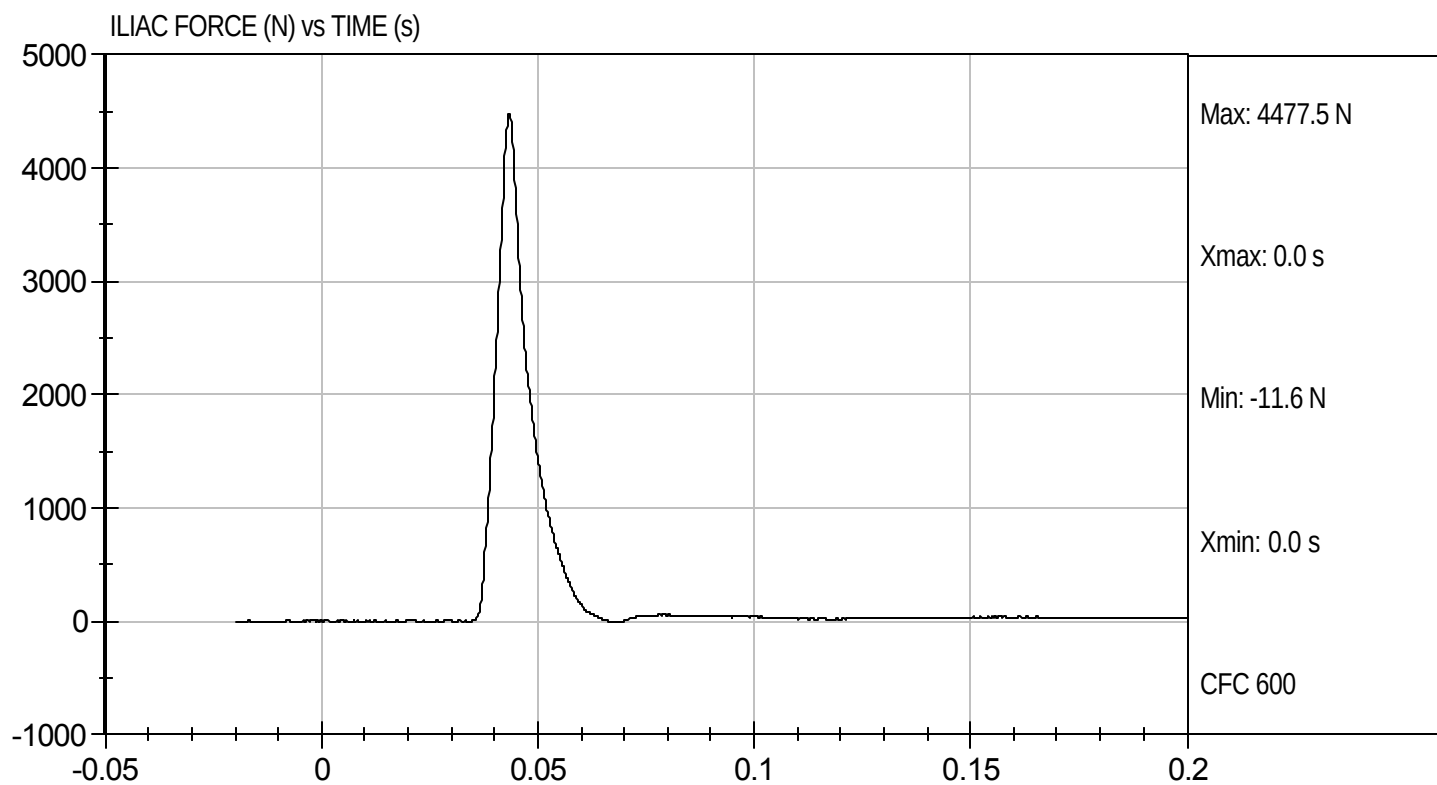
Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D11638

Test Date: 2/22/11
Velocity: 14.36 ft/s, 4.38 m/s

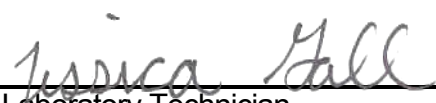


MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11731

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Peak Resultant Acceleration	G's	115 to 137	117	Pass
Peak Lateral Acceleration	G's	+/- 15	-4.1	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

2/25/11

Test Date

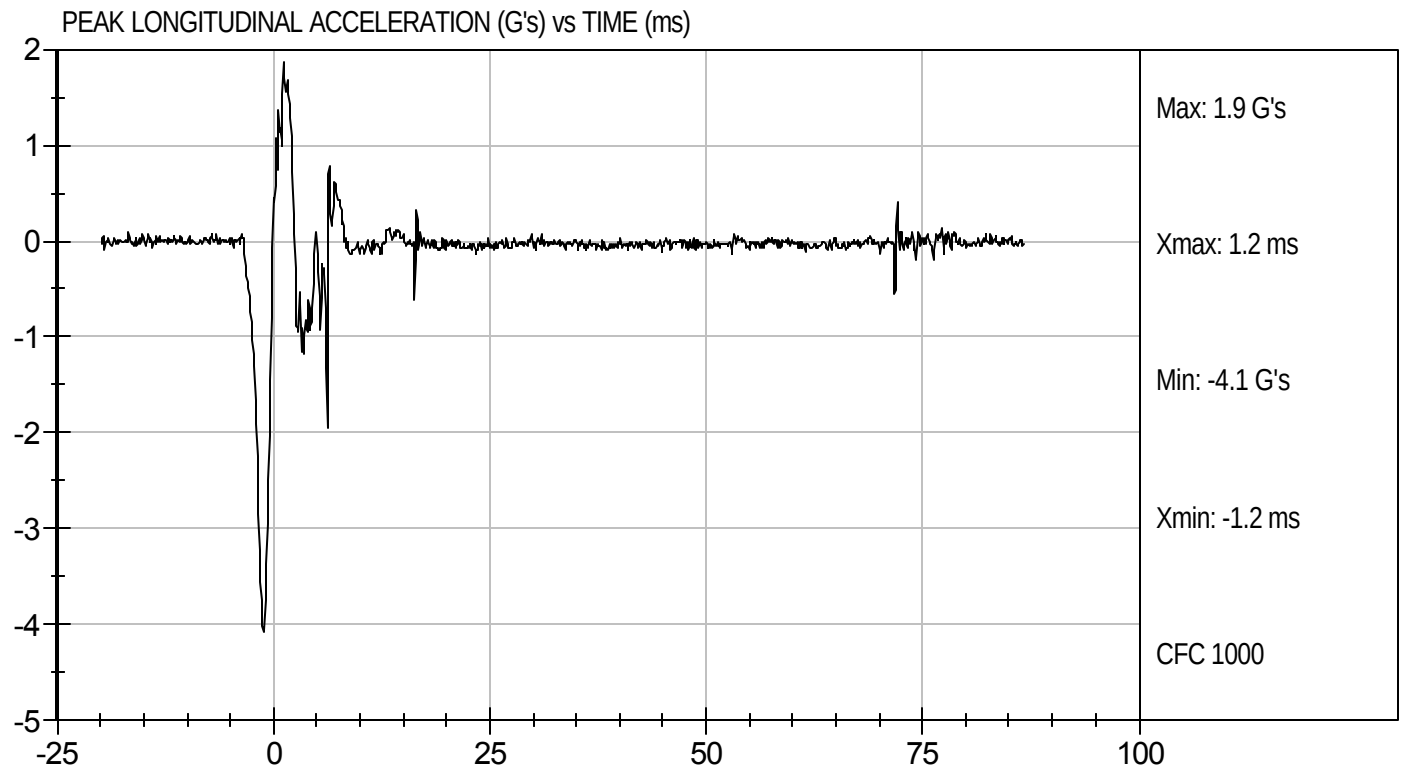
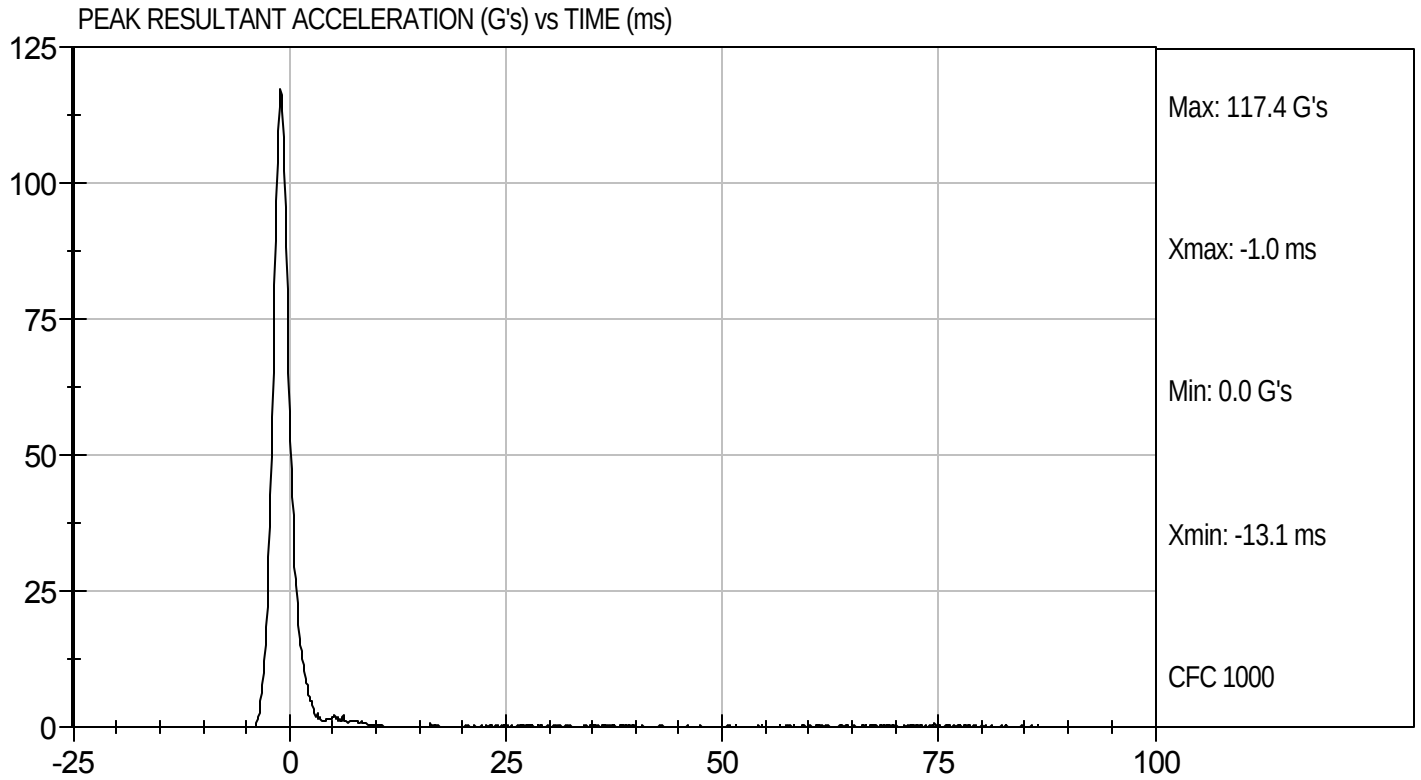


Approved By



Test Desc: Head Drop
Component ID: D11731

Test Date: 2/25/11
Velocity: 0 ft/s, 0 m/s

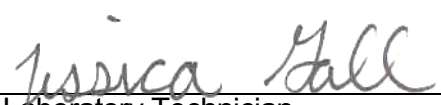


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D.: D11732

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.2	Pass
Humidity		%	10 to 70	23	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.46	Pass
	15 ms	m/s	3.30 to 4.10	3.48	Pass
	20 ms	m/s	4.40 to 5.40	4.61	Pass
	25 ms	m/s	5.40 to 6.10	5.49	Pass
	25-100 ms	m/s	5.50 to 6.20	5.52	Pass
Maximum D-Plane Rotation		deg	71 to 81	75	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	63	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	120	Pass
Overall Test Results				Pass	


 Laboratory Technician

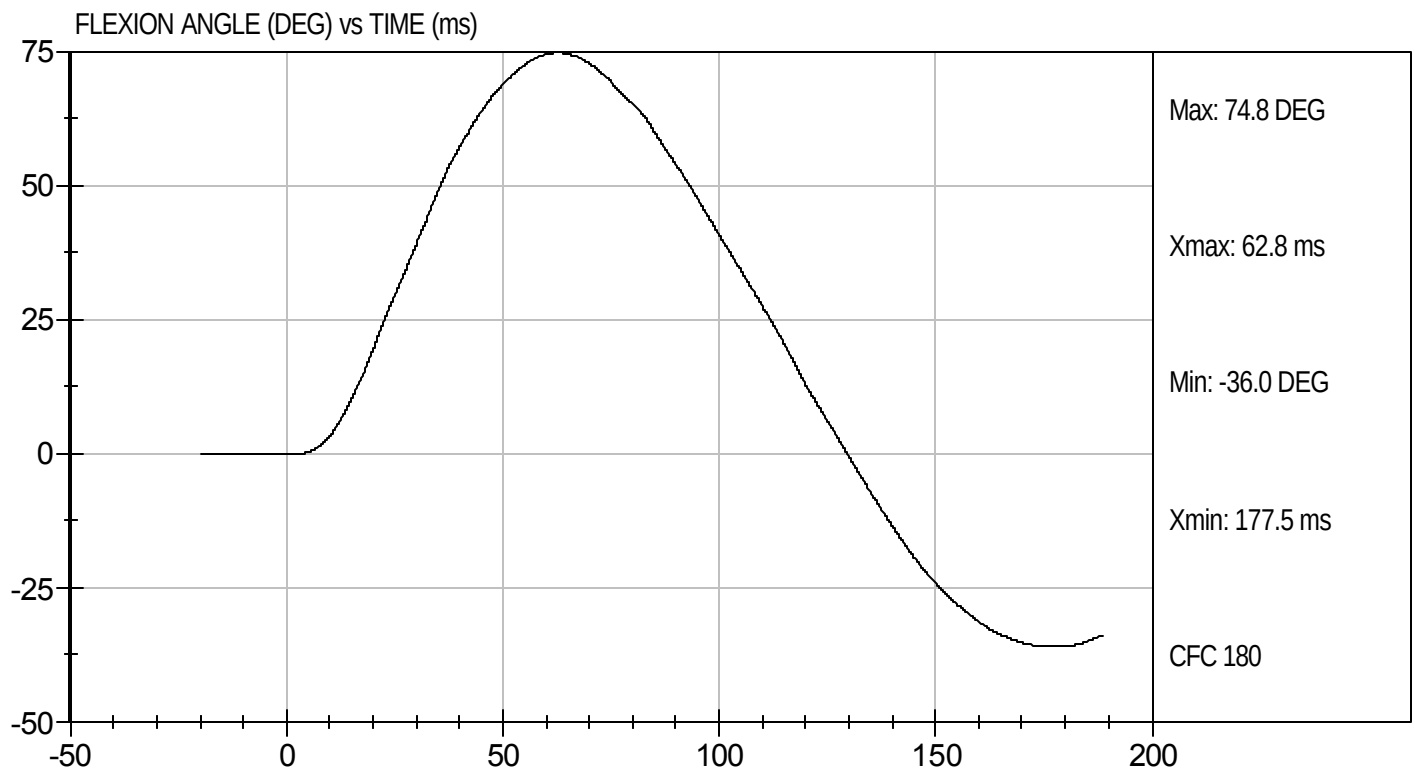
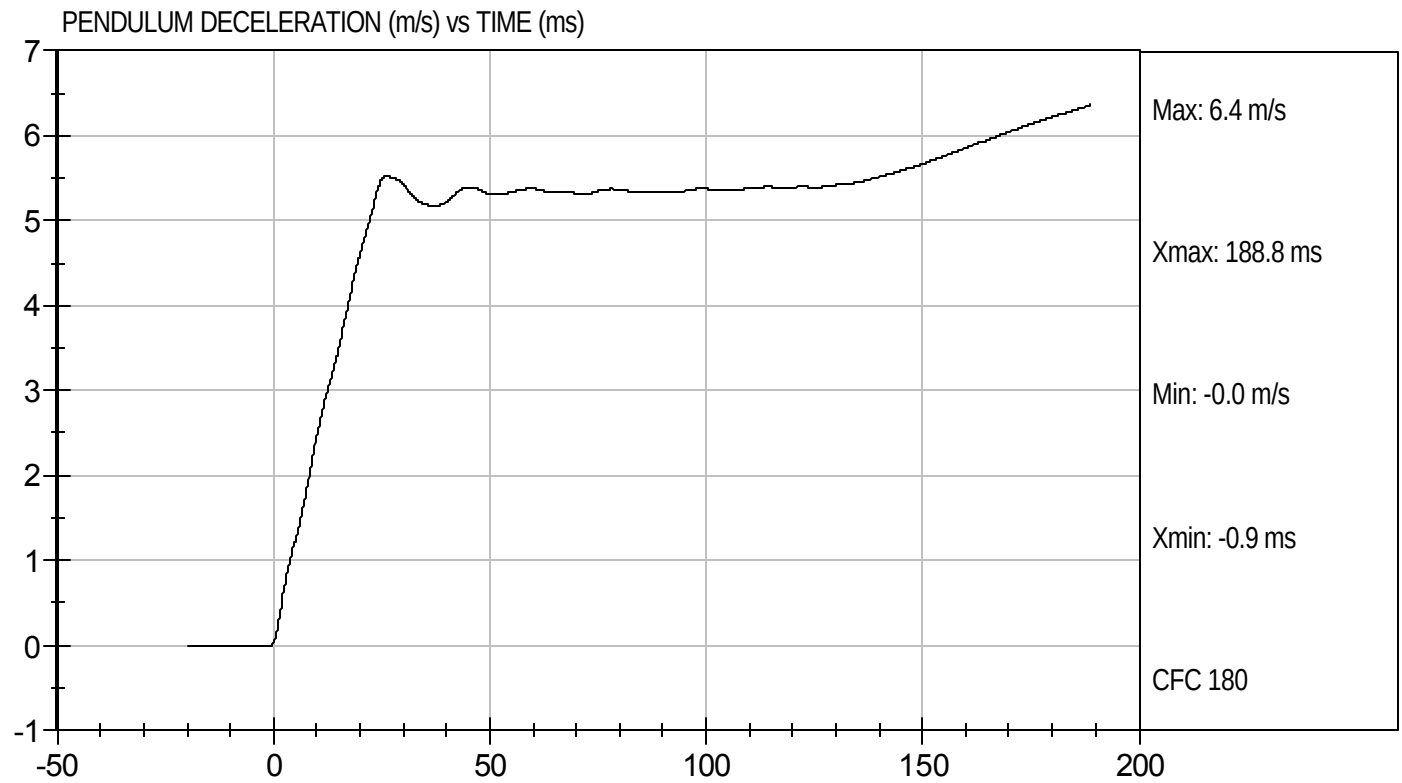
2/25/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11732

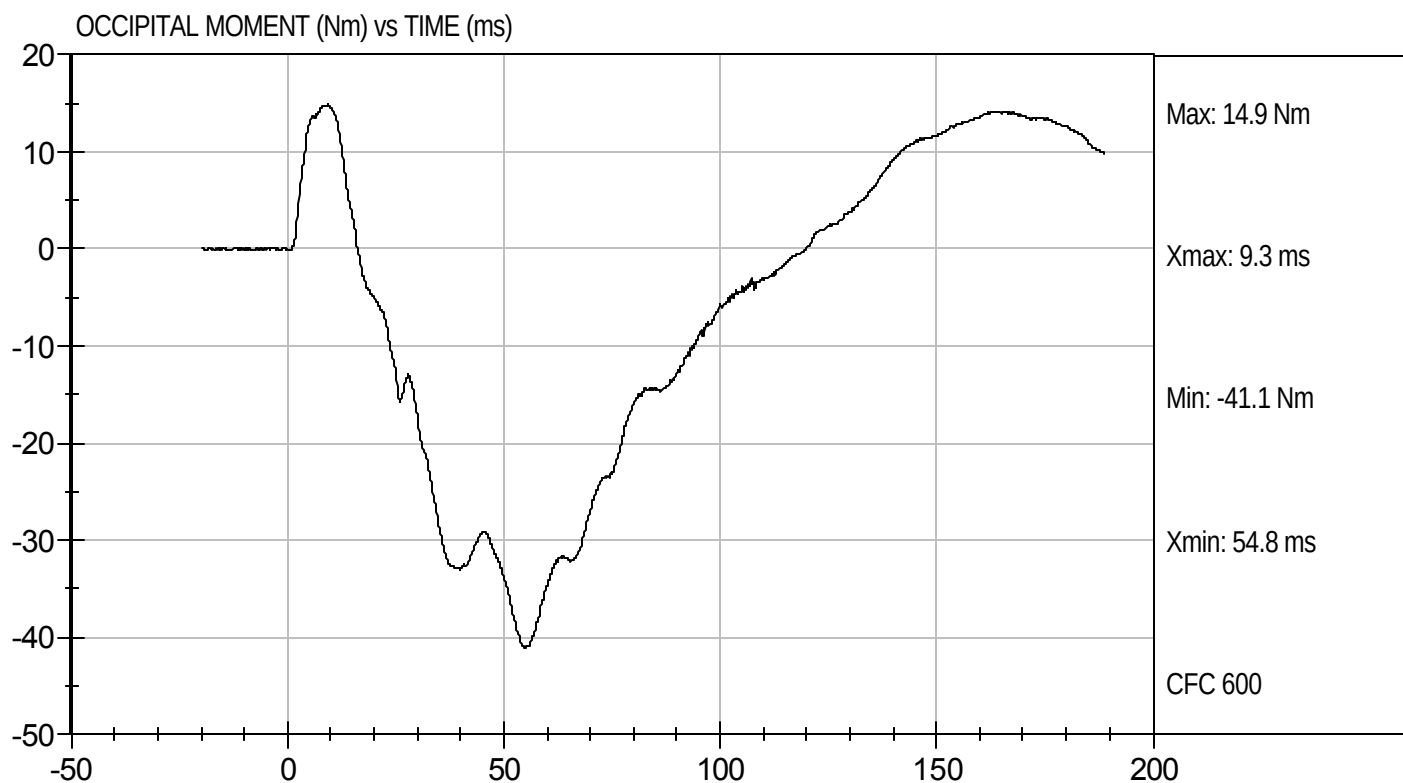
Test Date: 2/25/11
Velocity: 18.31 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D11732

Test Date: 2/25/11
Velocity: 18.31 ft/s, 5.58 m/s

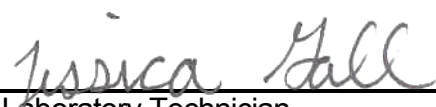


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D11733

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	33	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

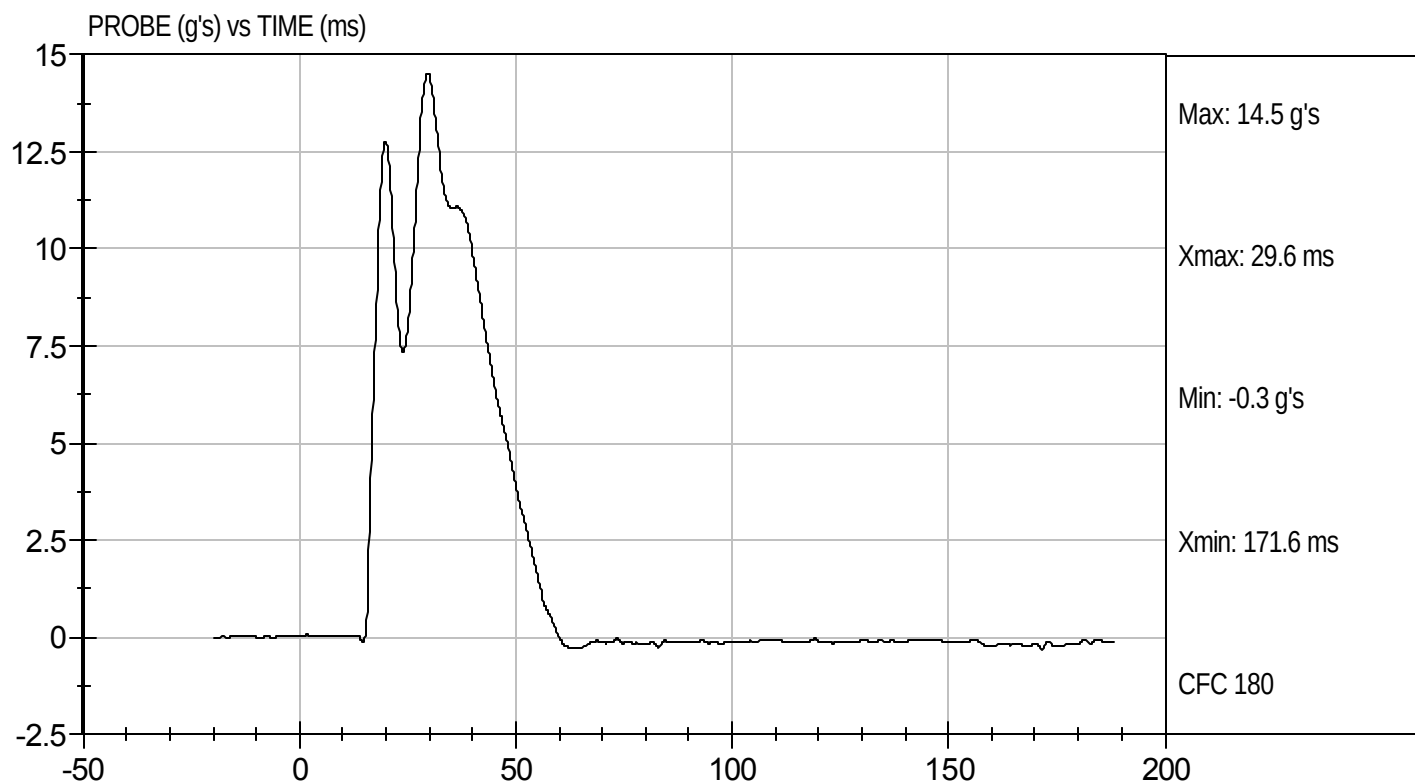
2/25/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11733

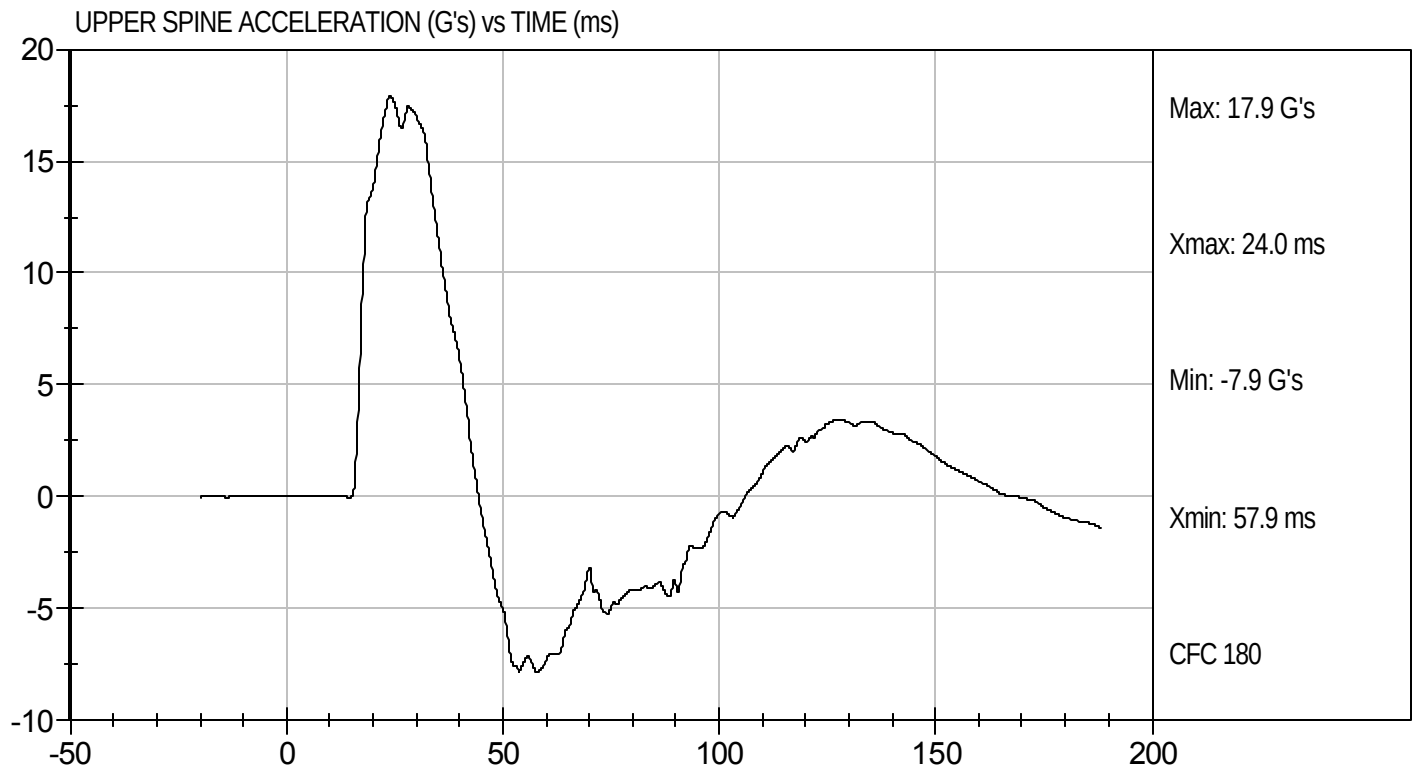
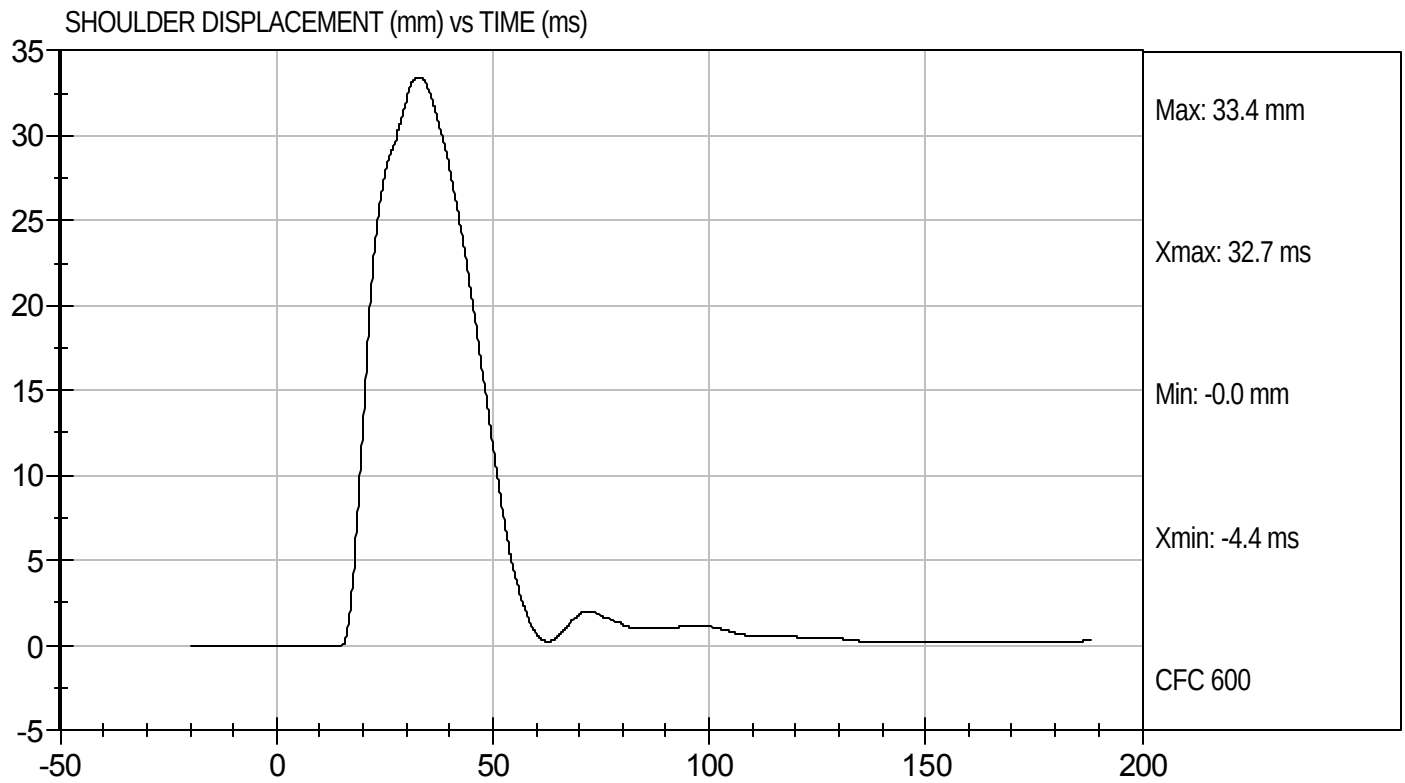
Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D11733

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11734

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	30 to 36	31	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	30	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	36	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	36	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

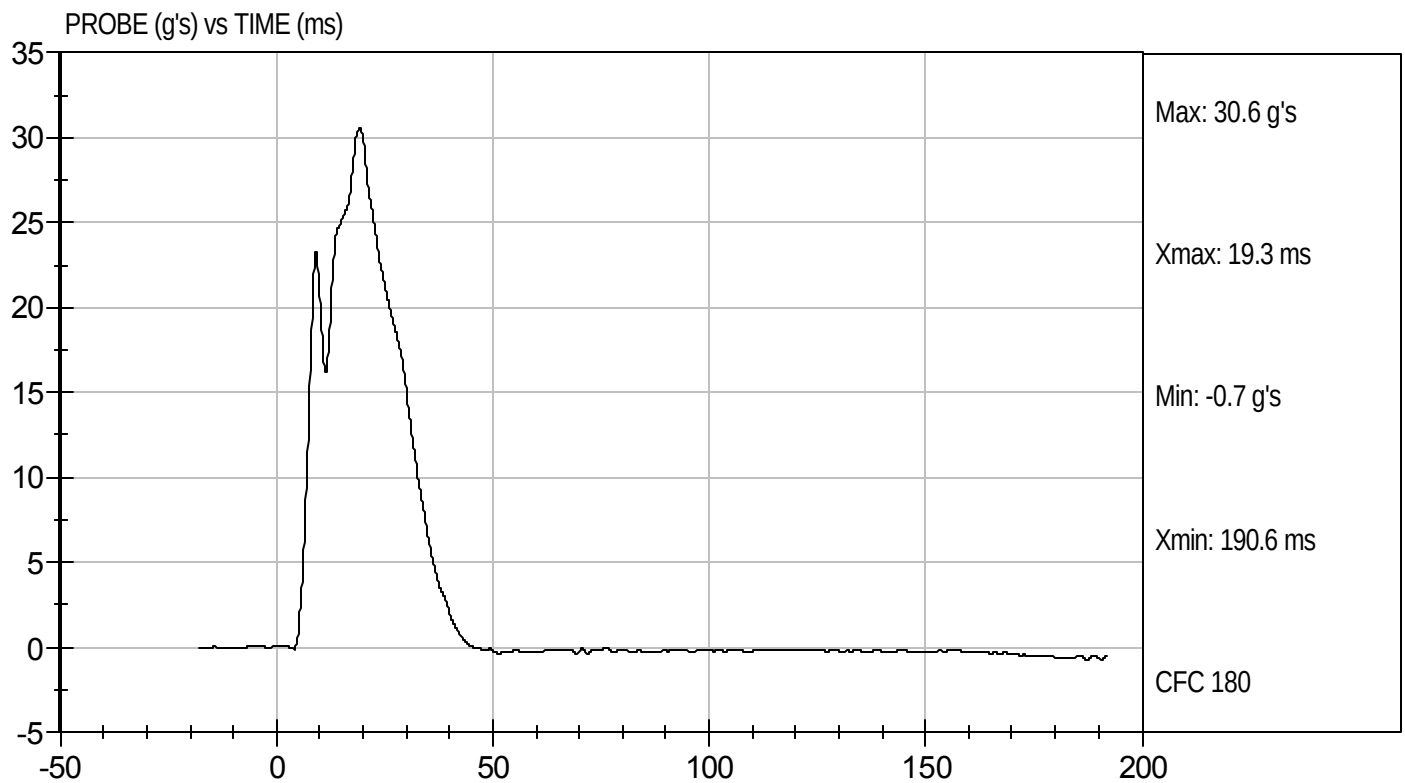
2/25/11
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax With Arm
Component ID: D11734

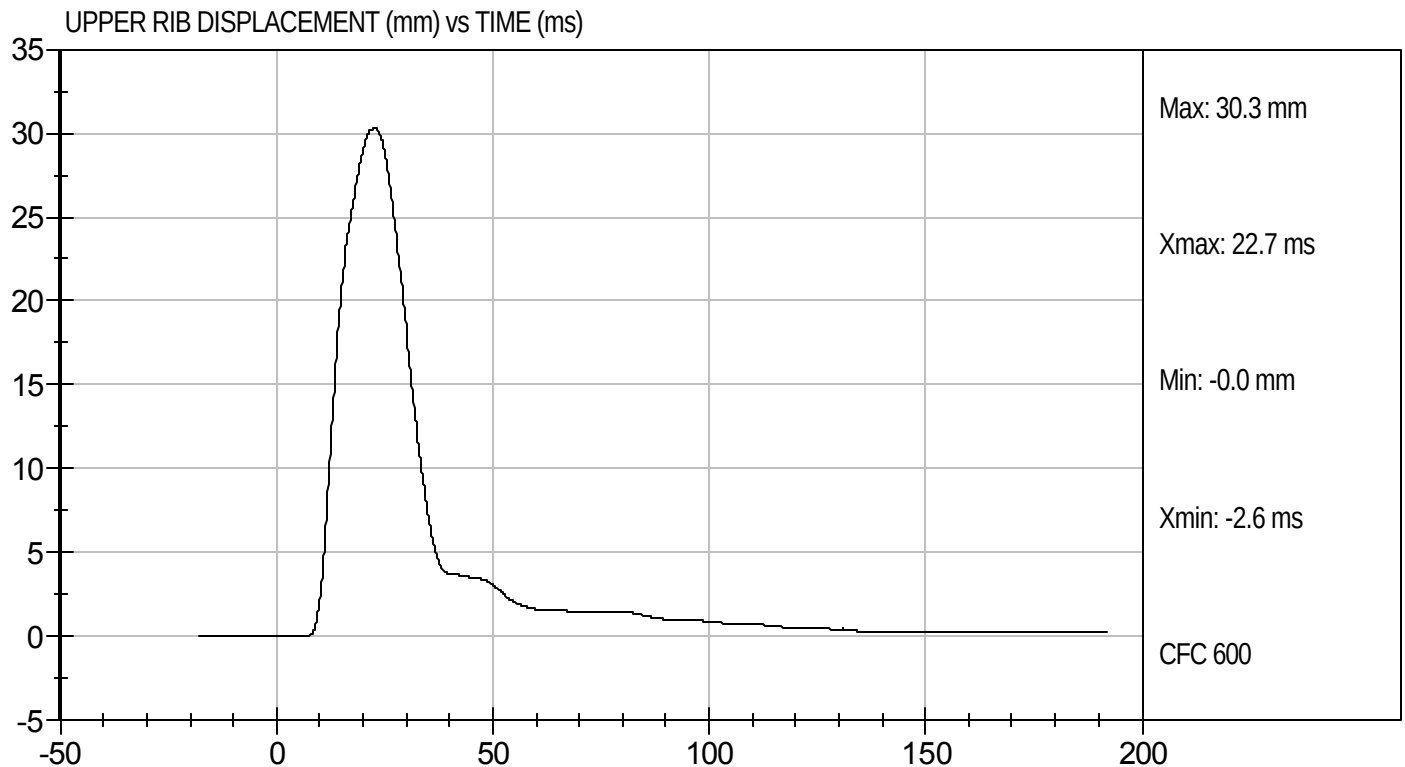
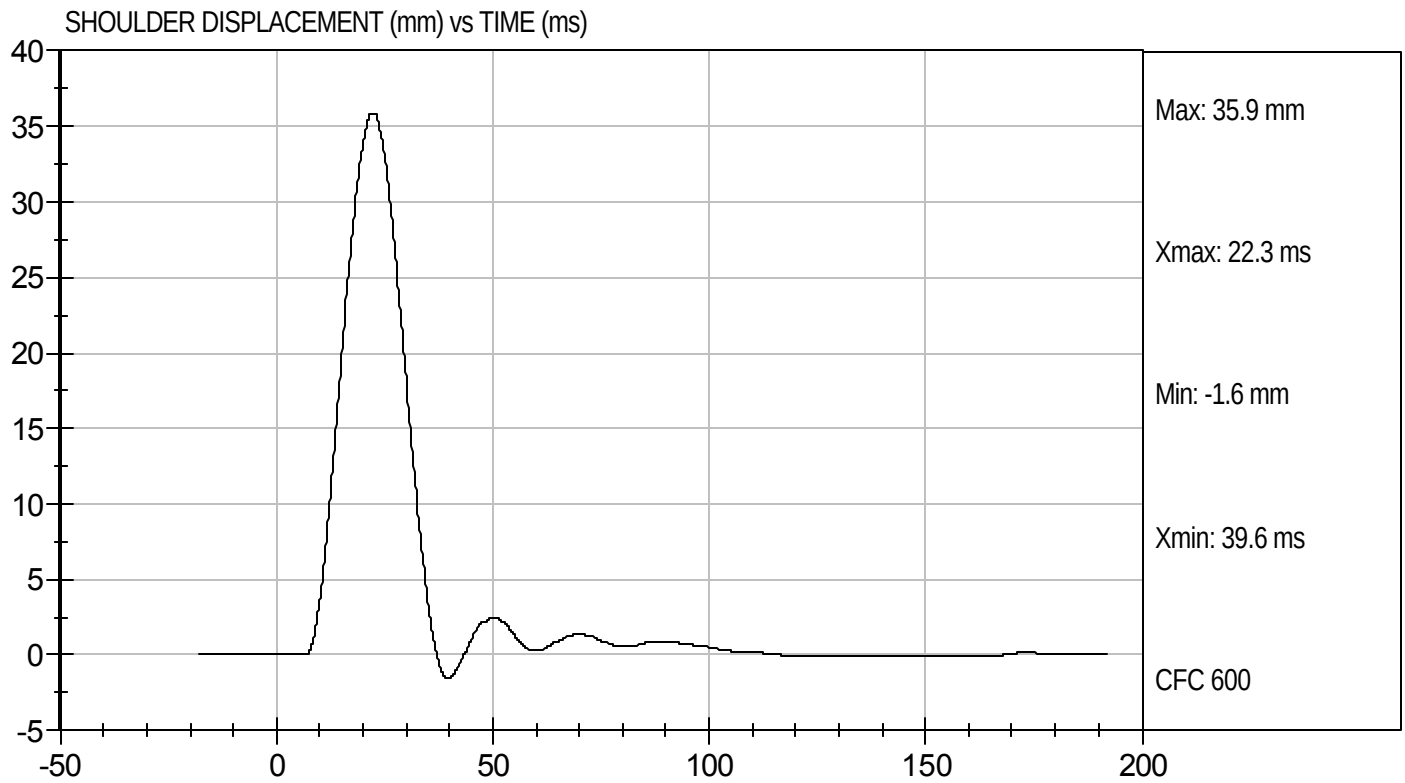
Test Date: 2/25/11
Velocity: 21.93 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D11734

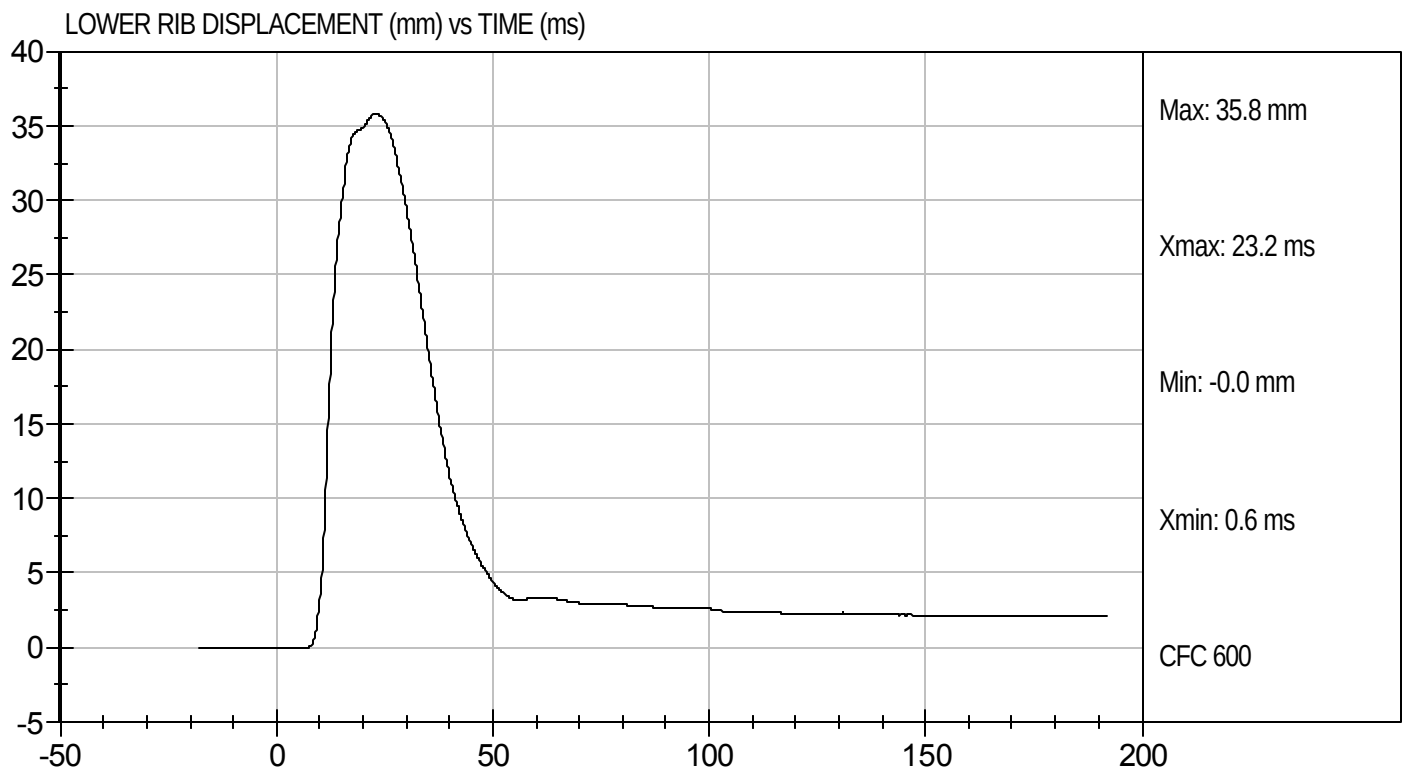
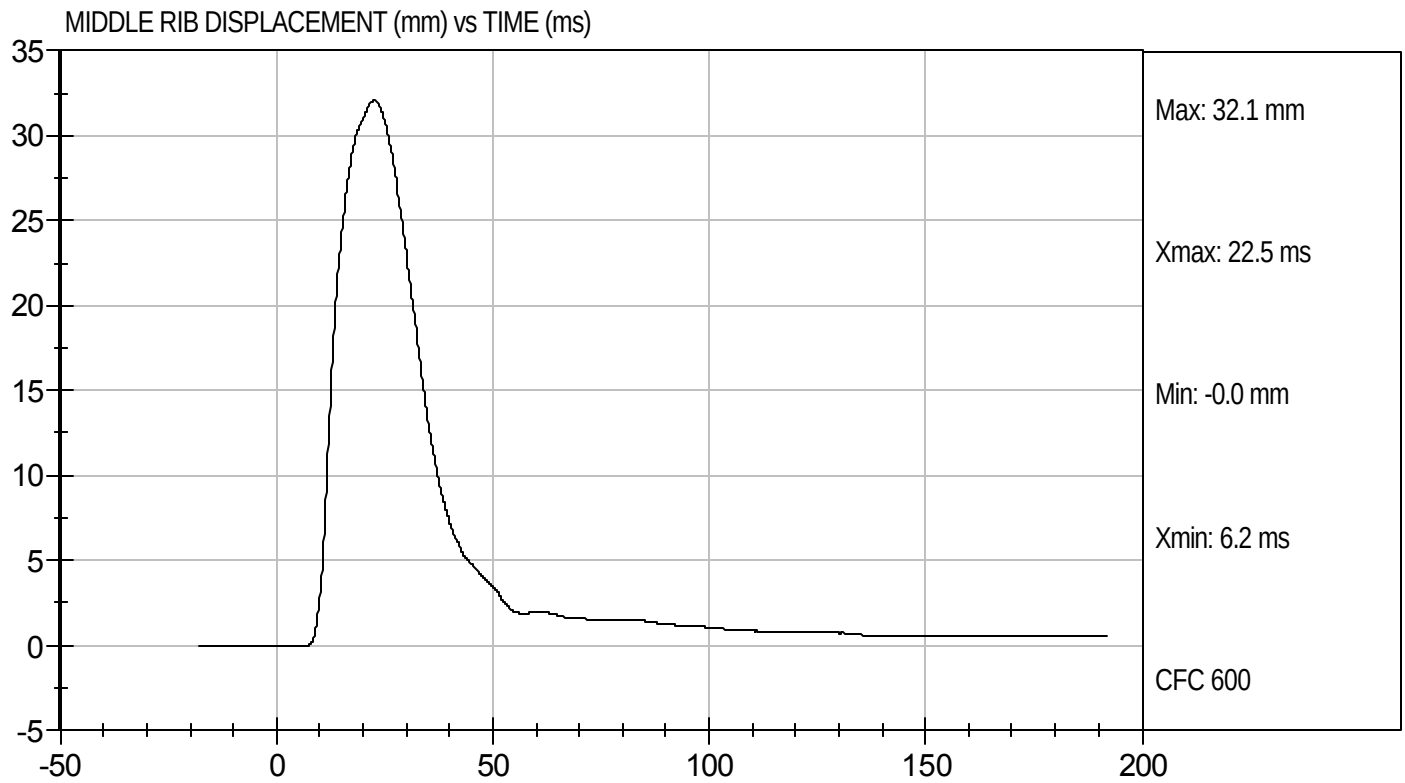
Test Date: 2/25/11
Velocity: 21.93 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D11734

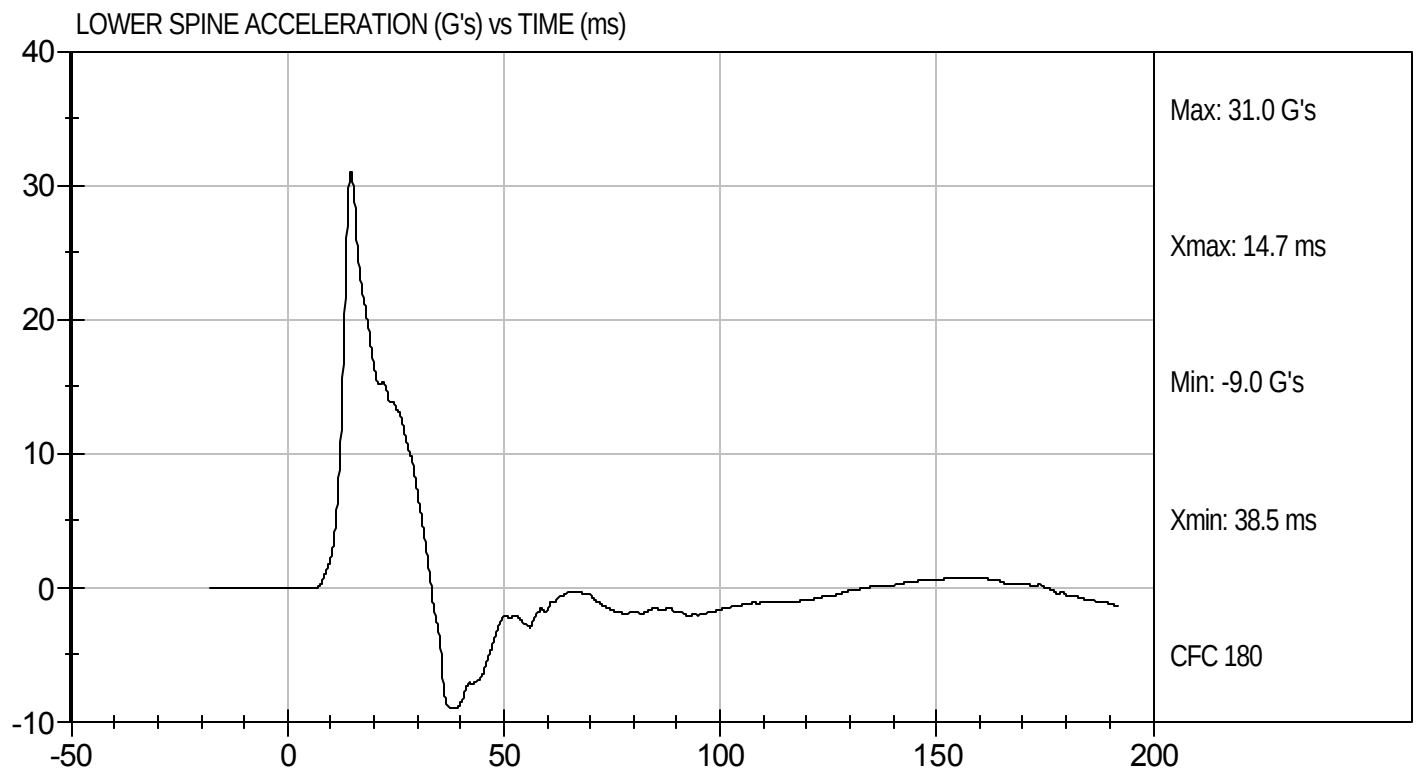
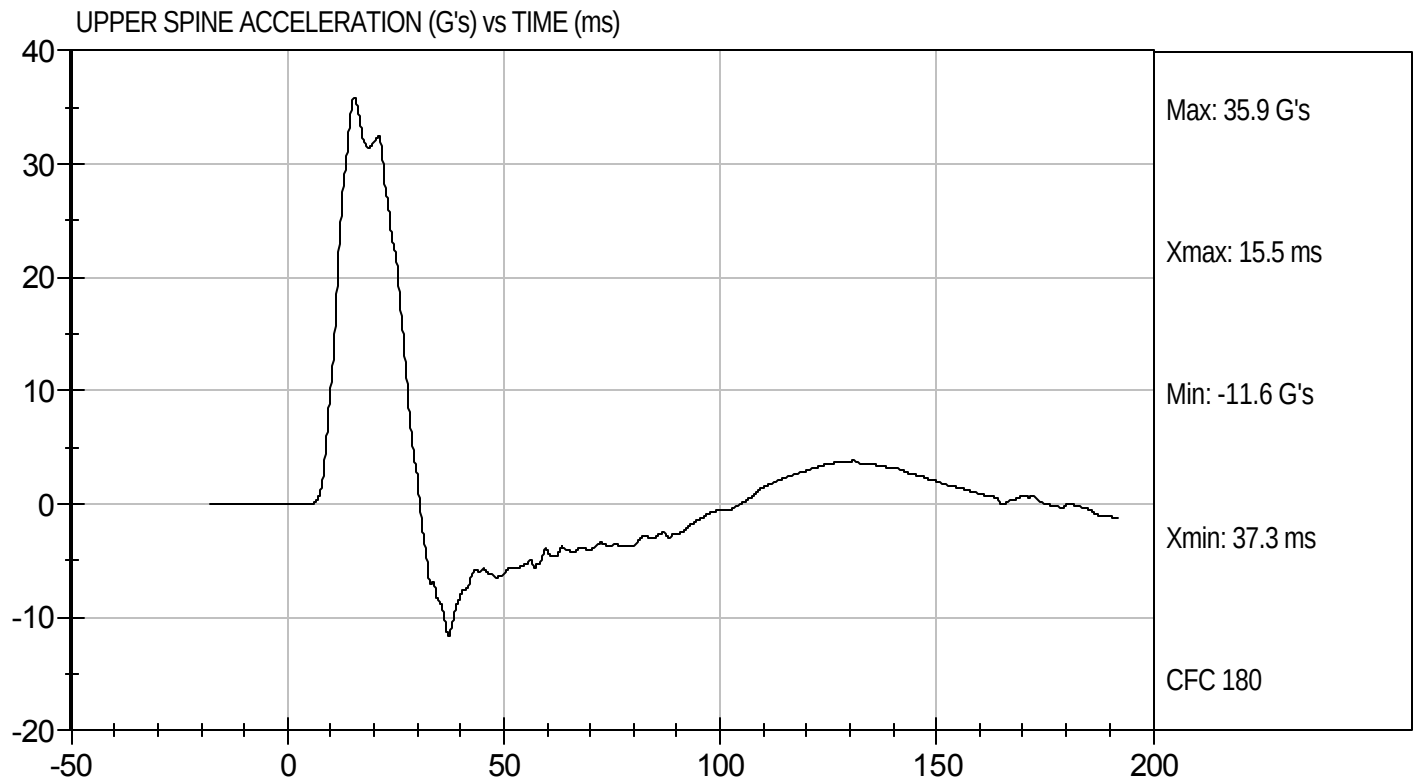
Test Date: 2/25/11
Velocity: 21.93 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D11734

Test Date: 2/25/11
Velocity: 21.93 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11735

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	19	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	40	Pass
Middle Rib Displacement	mm	39 to 45	43	Pass
Lower Rib Displacement	mm	35 to 43	41	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
Overall Test Results			Pass	


 Laboratory Technician

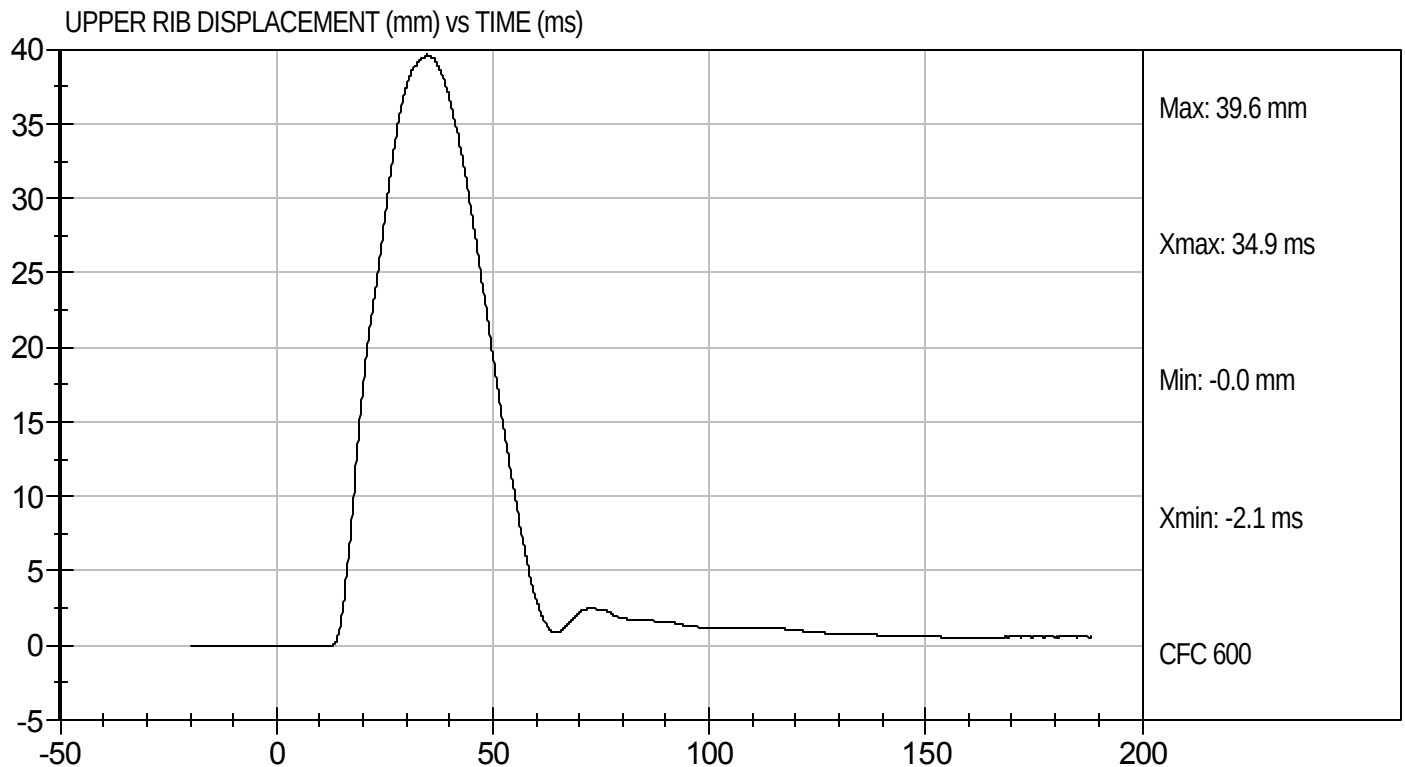
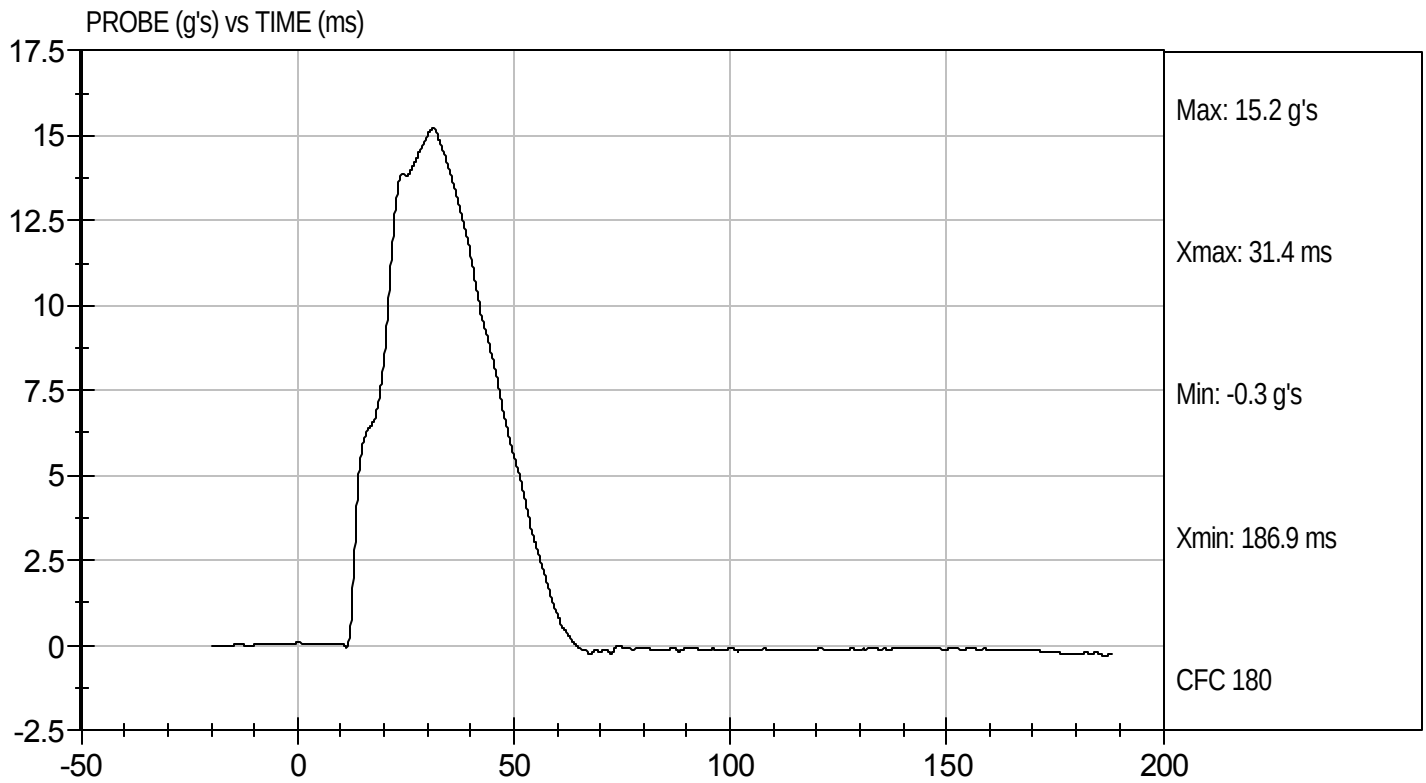
2/25/11
 Test Date


 Approved By



Test Desc: Thorax Without Arm
Component ID: D11735

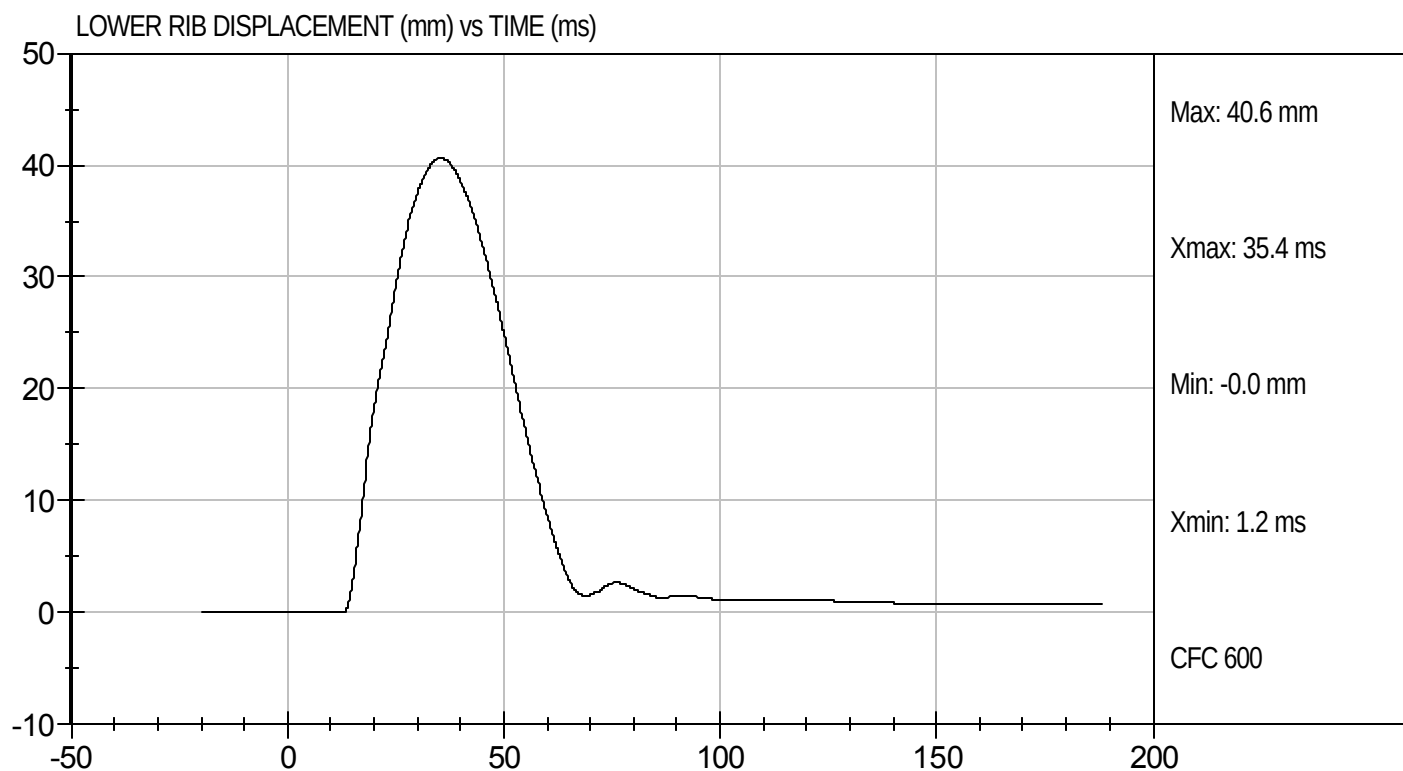
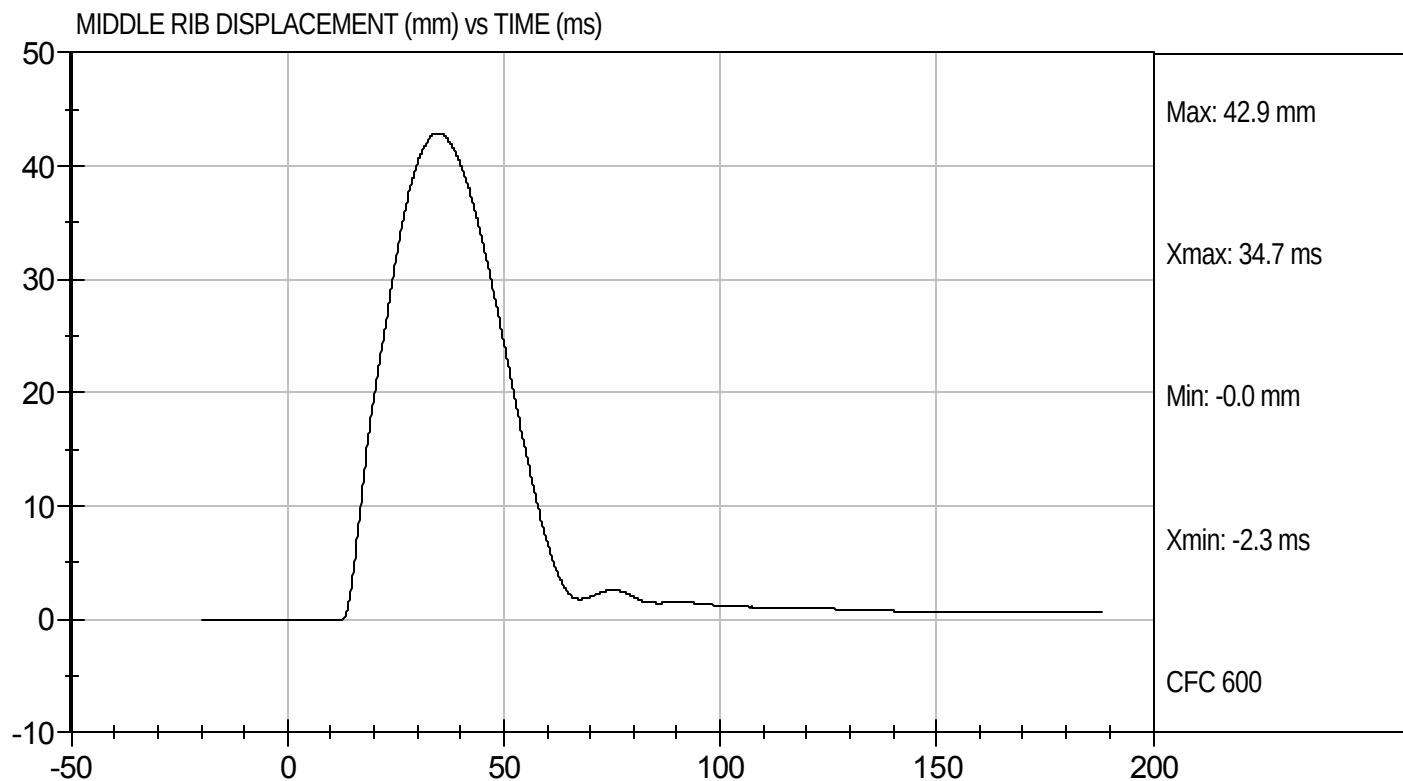
Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D11735

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s

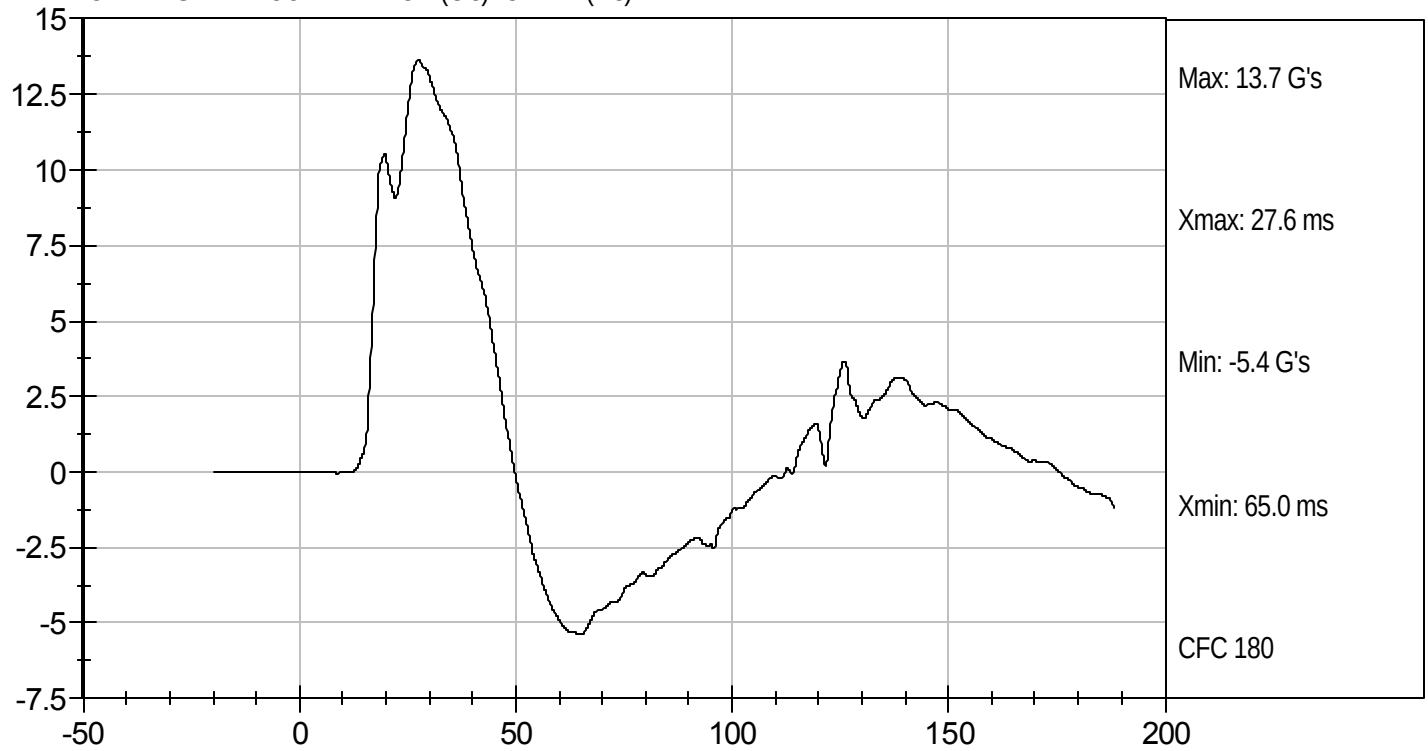




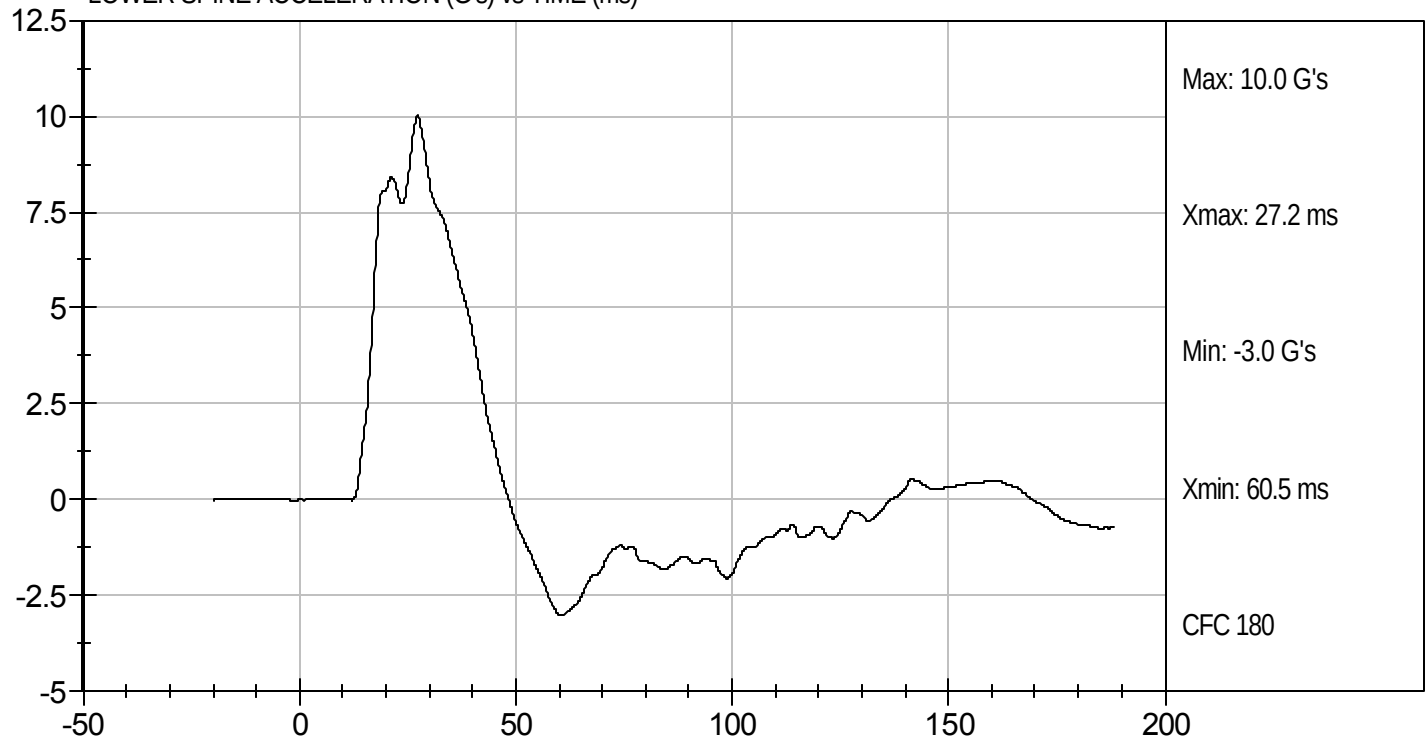
Test Desc: Thorax Without Arm
Component ID: D11735

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s

UPPER SPINE ACCELERATION (G's) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11736

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	20	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	13	Pass
Upper Rib Displacement	mm	36 to 47	43	Pass
Lower Rib Displacement	mm	33 to 44	37	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

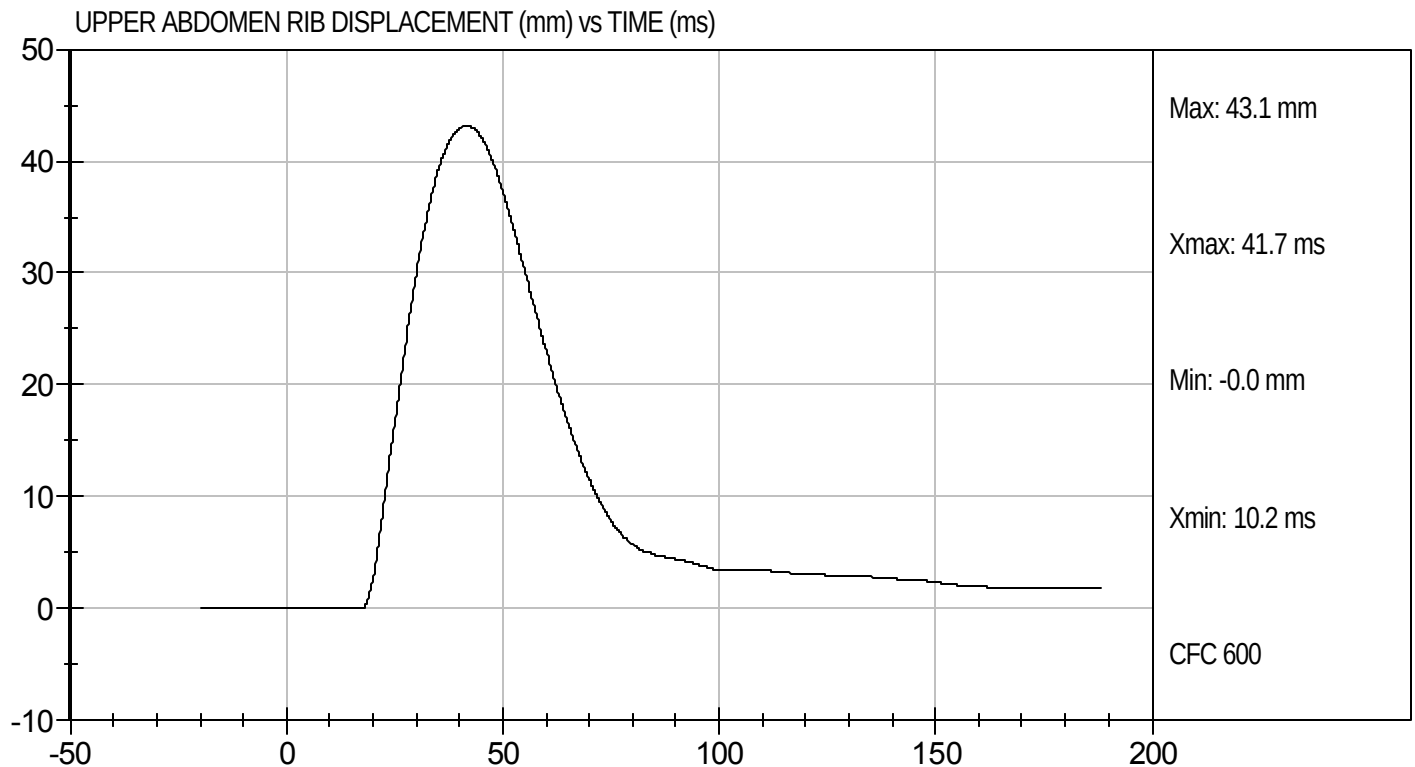
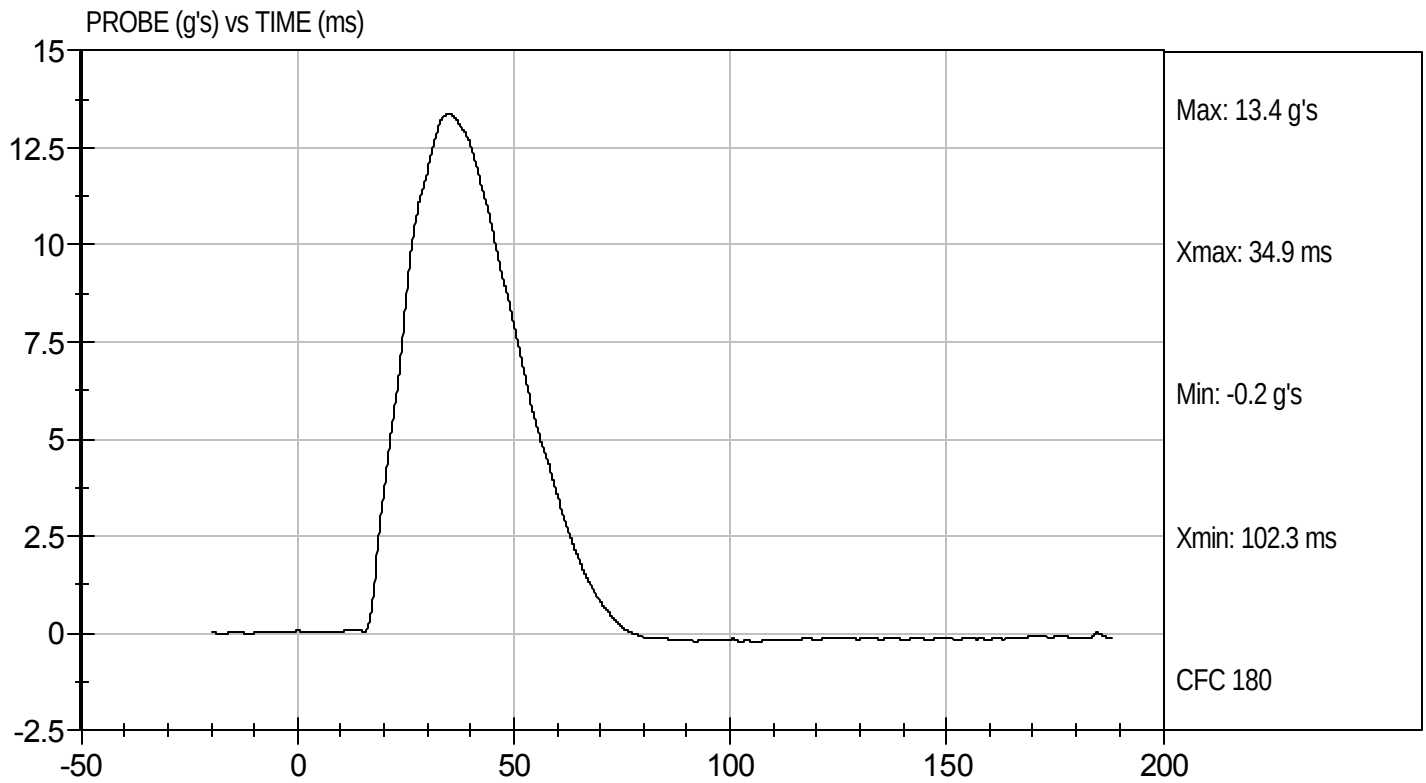
2/25/11
Test Date

David Winkelbauer
Approved By



Test Desc: Abdomen Impact
Component ID: D11736

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s

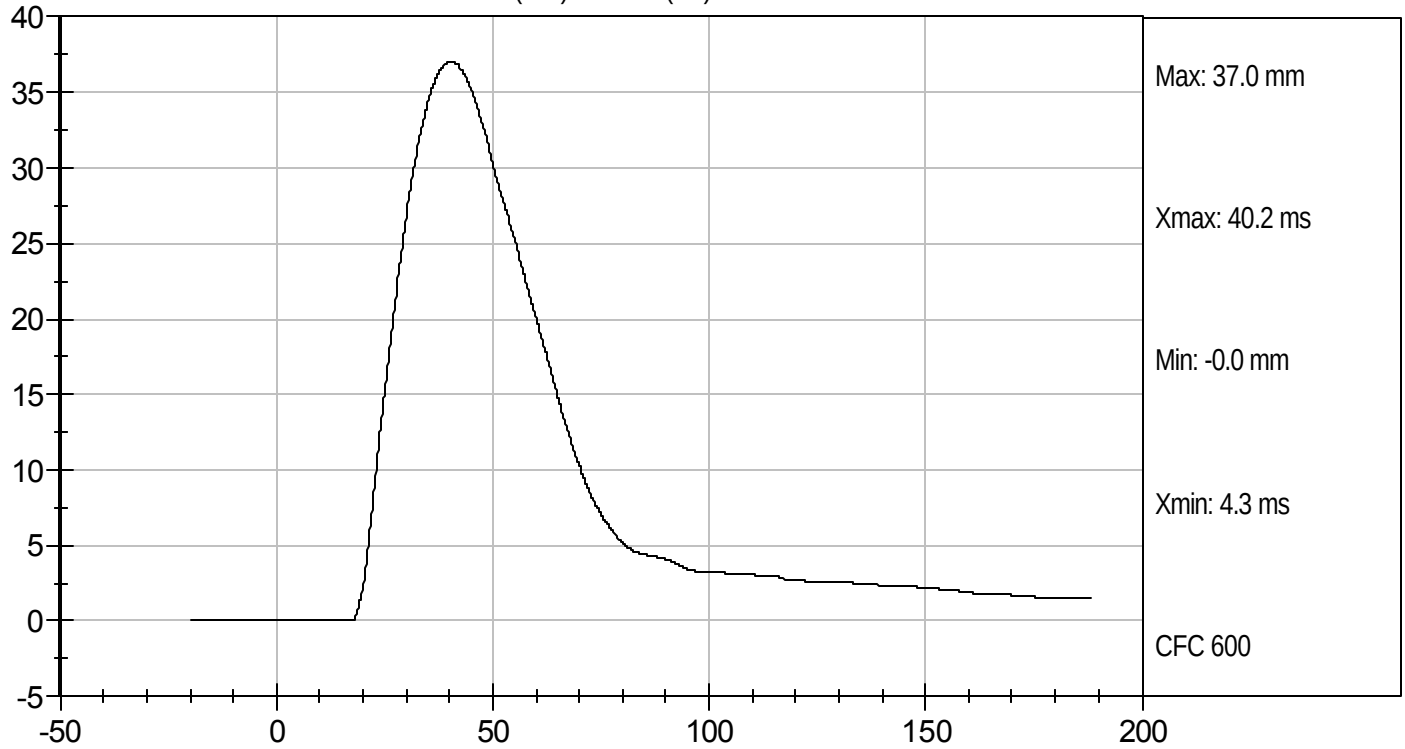




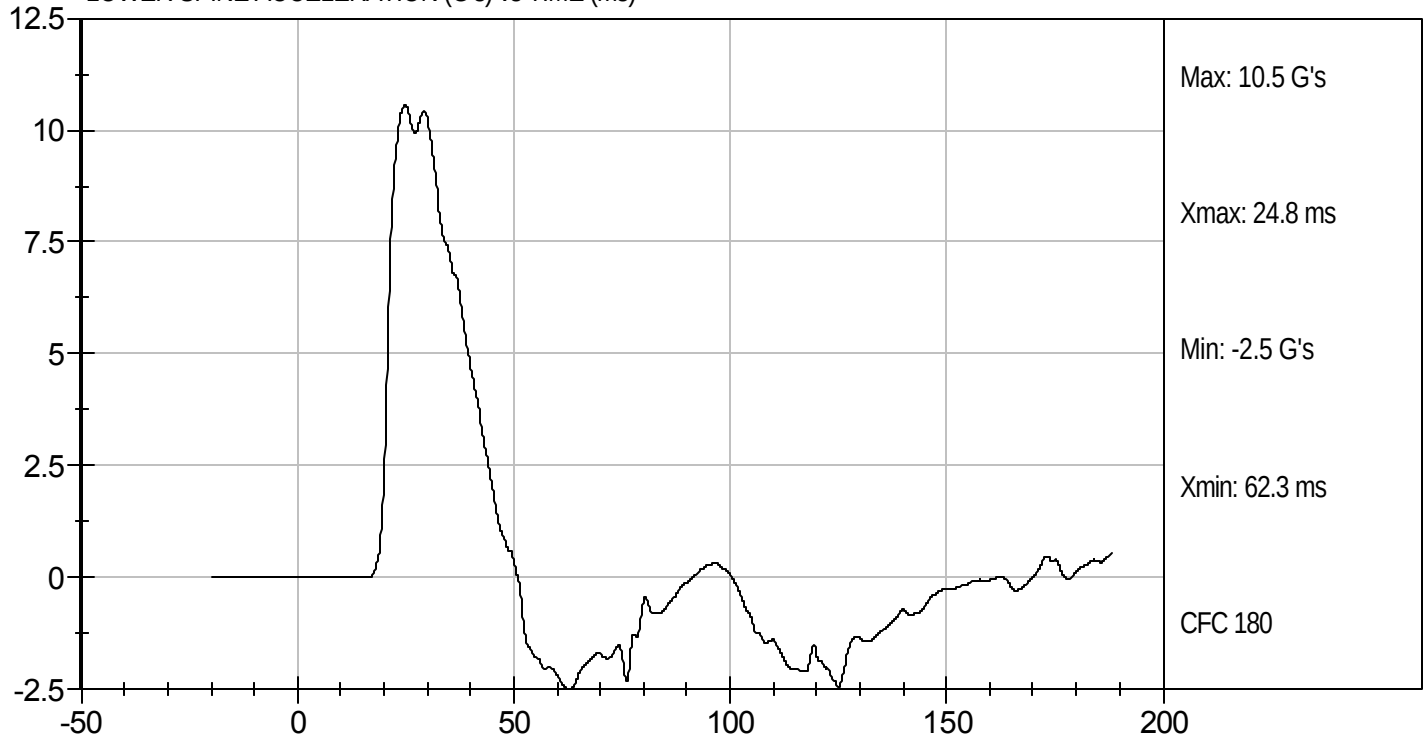
Test Desc: Abdomen Impact
Component ID: D11736

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)

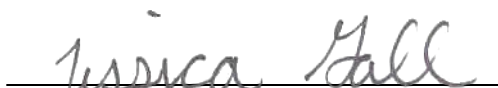


MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11737

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	20	Pass
Impact Velocity	m/s	6.60 to 6.80	6.71	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	41	Pass
Peak Acetabulum Force	N	3600 to 4300	4220	Pass
Overall Test Results				Pass


Laboratory Technician

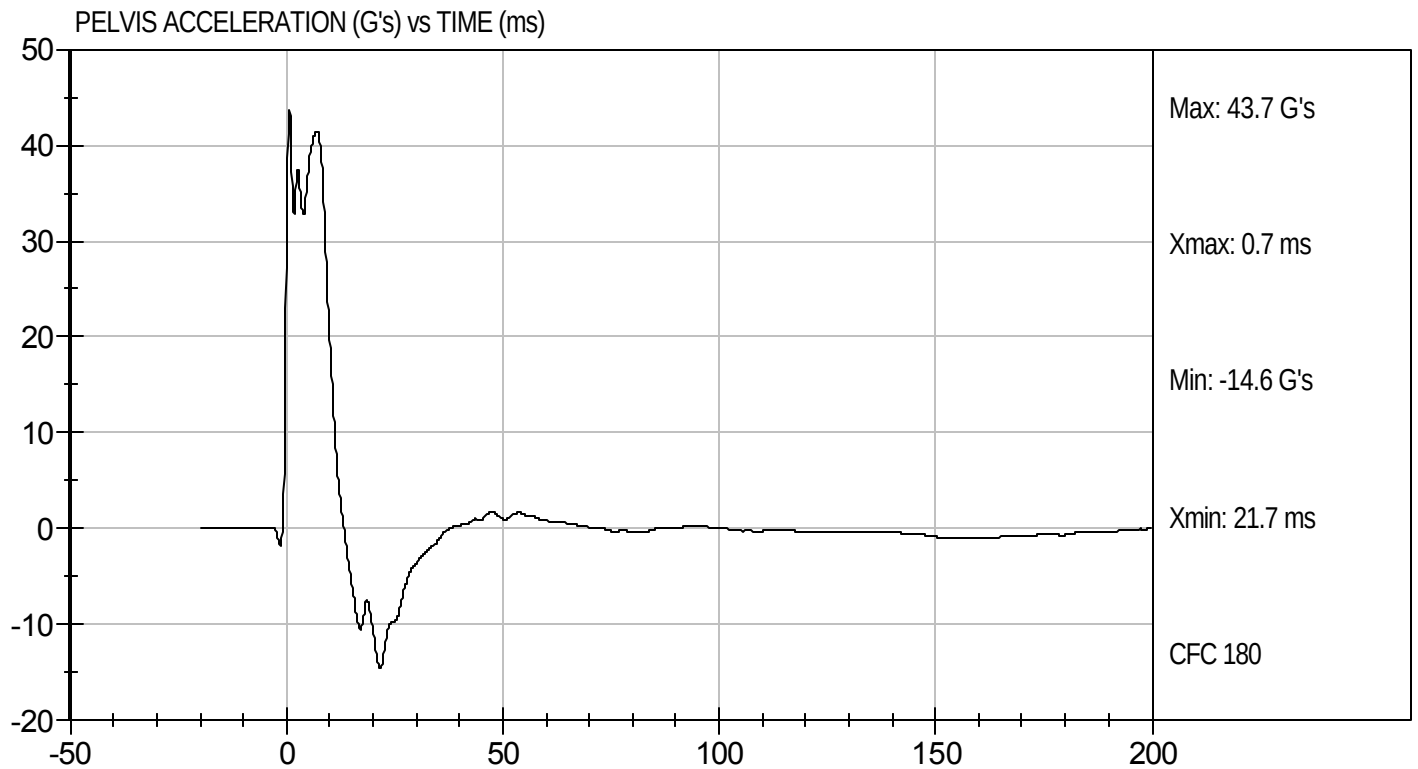
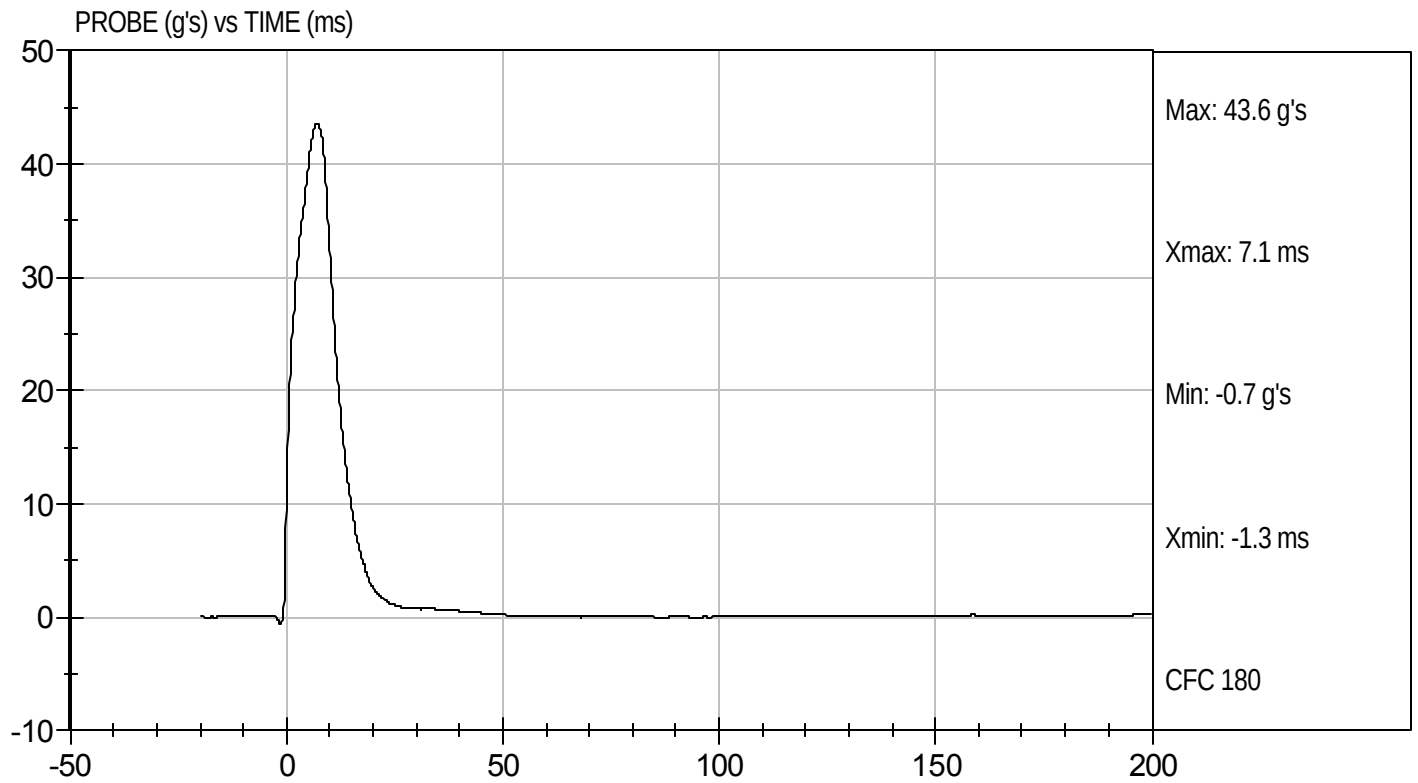
2/25/11
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D11737

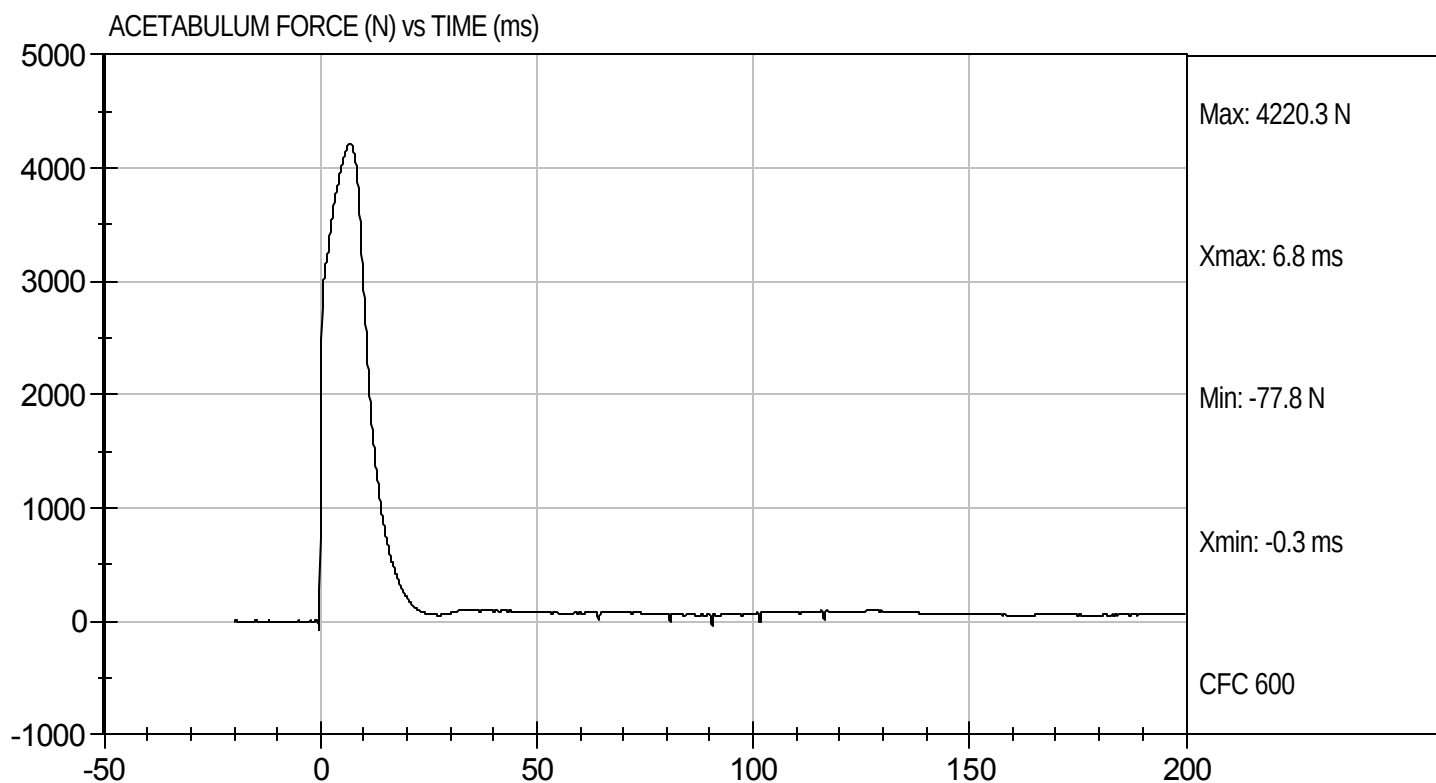
Test Date: 2/25/11
Velocity: 22.00 ft/s, 6.71 m/s





Test Desc: Pelvis Impact
Component ID: D11737

Test Date: 2/25/11
Velocity: 22.00 ft/s, 6.71 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D11738

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	29	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	32	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4790	Pass
Overall Test Results			Pass	


Laboratory Technician

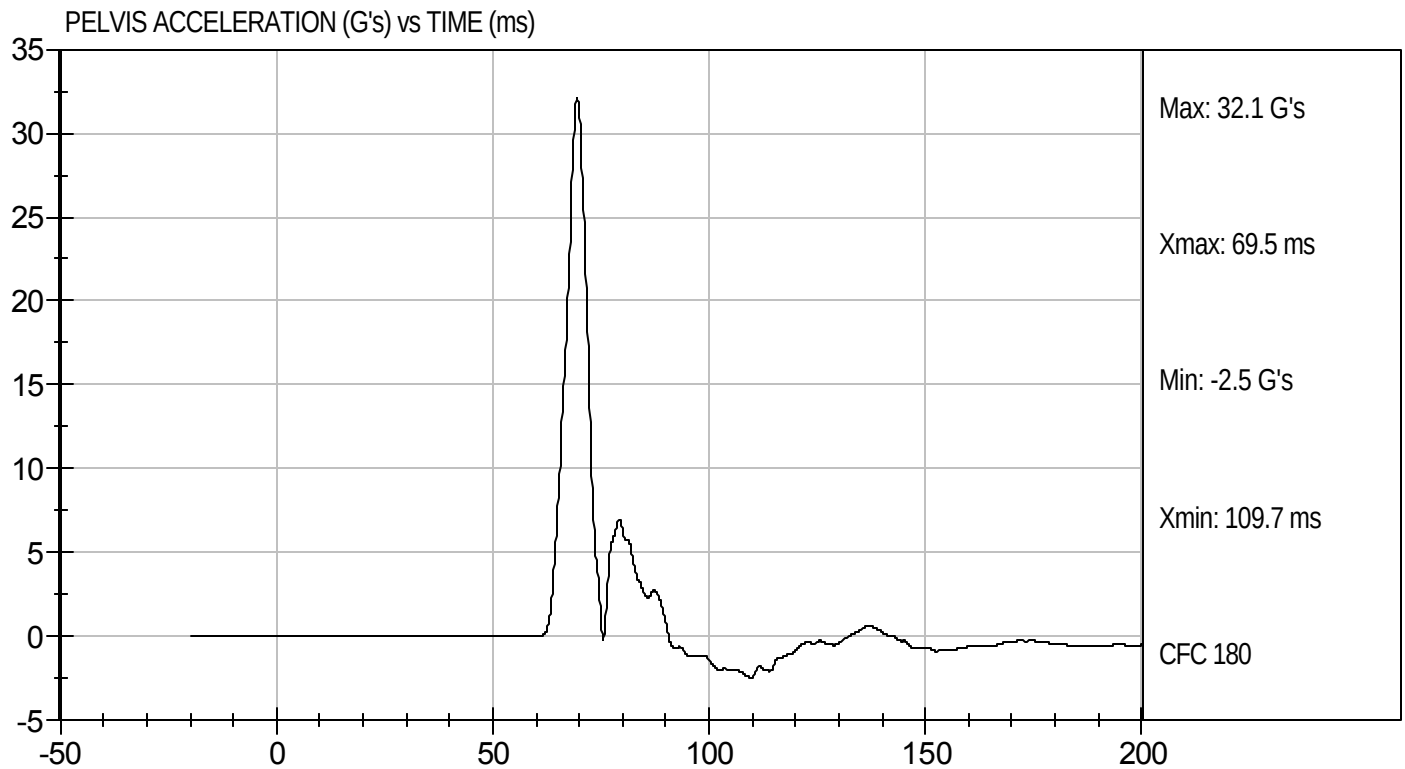
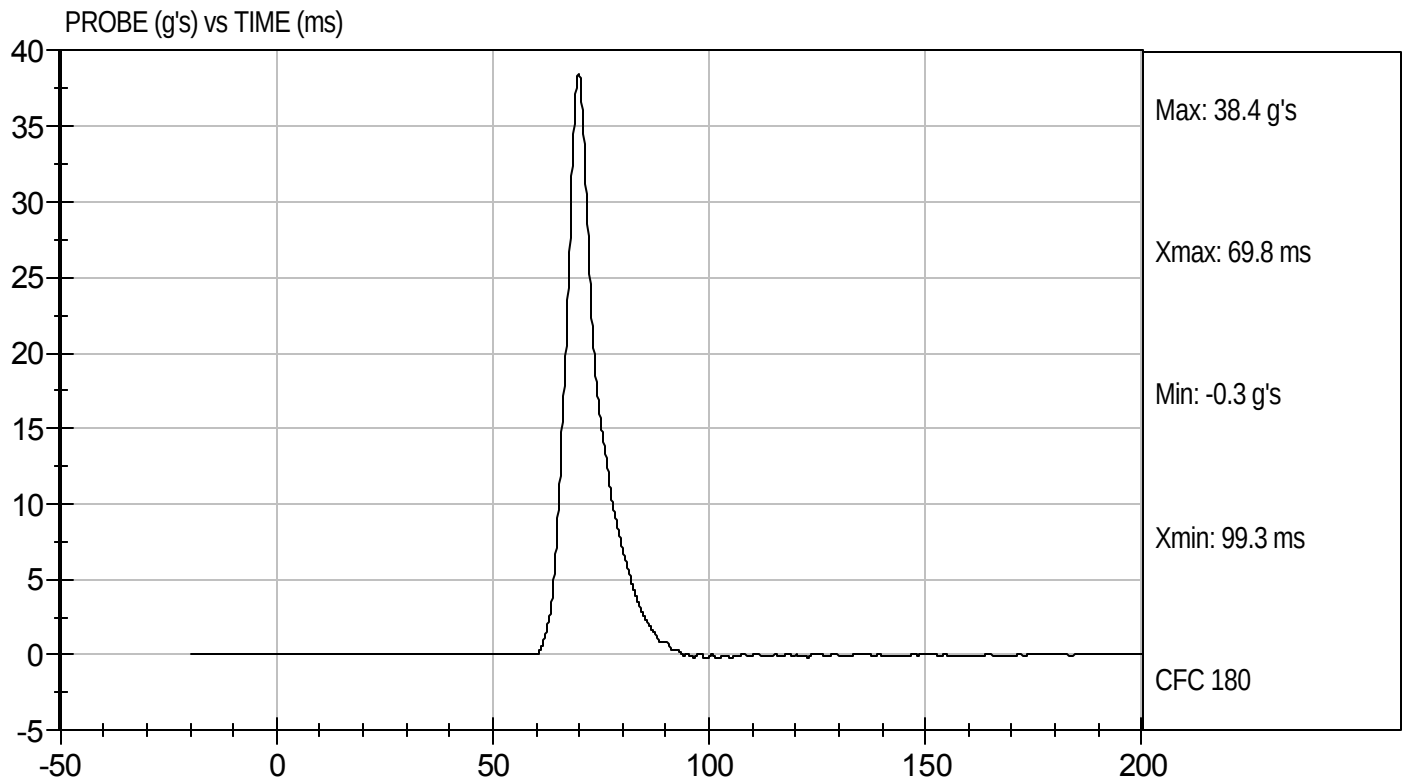
2/25/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D11738

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D11738

Test Date: 2/25/11
Velocity: 14.37 ft/s, 4.38 m/s

