

REPORT NUMBER: SINCAP-MGA-2011-073

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Moving Deformable Barrier Side Impact Test**

**GENERAL MOTORS LLC
2011 Buick Lucerne CX 4-Dr Sedan
NHTSA No.: GB0101**

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



Test Date: February 24, 2011

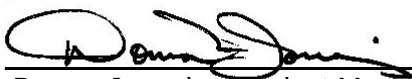
Final Report Date: March 30, 2011

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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15. Supplementary Notes																																															
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact 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 Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on February 24, 2011. The impact velocity of the Moving Deformable Barrier (MDB) was 62.1 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 target vehicle post-test maximum crush was 318 mm at level 3. The test vehicle's performance was as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th colspan="3">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>193</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>42</td> </tr> <tr> <td>Combined Abdominal Force</td> <td>N</td> <td>2500</td> <td>2234</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>2527</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th colspan="3">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>410</td> </tr> <tr> <td>Lower Spine (T12) Resultant Acceleration</td> <td>G</td> <td>82</td> <td>79</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>4845</td> </tr> </tbody> </table>					Driver ATD (ES-2re)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	193	Maximum Thorax Rib Deflection	mm	44	42	Combined Abdominal Force	N	2500	2234	Pubic Symphysis Force	N	6000	2527		Passenger ATD (SID-IIs)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	410	Lower Spine (T12) Resultant Acceleration	G	82	79	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	4845
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17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re 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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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Seat Adjustment, Fuel System, and Steering Wheel Data	7
3	Dummy Longitudinal Clearance Dimensions	9
4	Dummy Lateral Clearance Dimensions	10
5	Camera Locations and Data	11
6	Vehicle Accelerometer Locations	12
7	Moving Deformable Barrier Accelerometer Locations	13
8	Test Vehicle Summary of Results	14
9	Moving Deformable Barrier Summary of Results	15
10	Post-Test Observations	16
11	Vehicle Profile Measurements	17
12	Vehicle Exterior Crush Measurements	18
13	Vehicle Damage Profile Distances	21
14	Exterior Static Crush for Impactor Face	22
15	FMVSS 301 Fuel System Integrity Post-Impact Data	23
16	Dummy/Vehicle Temperature Stabilization Data	24
<u>Appendix</u>		
A	Photographs	A
B	Dummy Response Data	B
C	Dummy Calibration and Performance Verification Data	C

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier 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 Laboratory Test Procedure dated January 2010.

SUMMARY

A 2011 Buick Lucerne CX 4-Dr Sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.1 km/h (38.6 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin, on February 24, 2011. Pretest and post test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS NCAP Side Laboratory Test Procedure dated January 2010. The side impact event was documented by eleven (11) cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

- Head CG Triaxial Accelerometers
- Thorax Rib 1 to Rib 3 Displacement Potentiometers
- Abdomen Forward, Middle, and Rear Load Cells
- Lower Spine Triaxial Accelerometers
- Pubic Load Cell

PASSENGER ATD (SID-IIs)

- 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

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	193
Maximum Thorax Rib Deflection	mm	44	42
Combined Abdominal Force	N	2500	2234
Pubic Symphysis Force	N	6000	2527

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	410
Lower Spine (T12) Resultant Acceleration	G	82	79
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	4845

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 Rear Sill Y
- Left Lower B-Post Y after 10 msec.
- Left Mid B-Post Y after 10 msec.
- Left Lower A-Post Y after 20 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 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. GB0101
 Test Date: 2/24/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	GB0101	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	1G4HA5EM9BU132478	Driver Head/Torso Airbag	No
Body Color	Quicksilver Metallic	Driver Torso Airbag	Yes
Delivery Date	2/04/2011	Driver Torso/Pelvis Airbag	No
Odometer (mi)	74	Driver Pelvis Airbag	No
Odometer (km)	119	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	01/11	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							

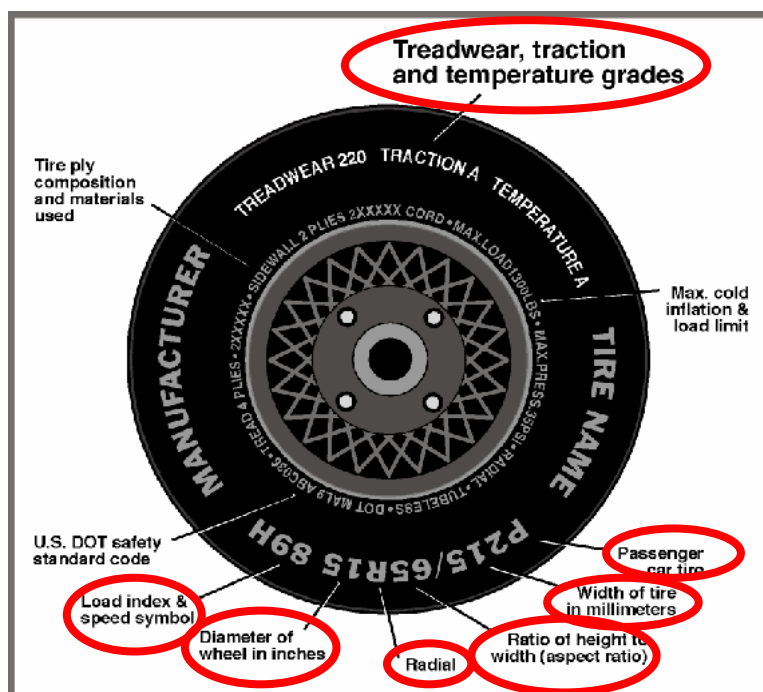
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

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

NHTSA No. GB0101
 Test Date: 2/24/2011

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

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 MDB Impact Test

NHTSA No. GB0101
 Test Date: 2/24/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	527.5	326.6		556.1	434.1		565.6	424.6	
Right	kg	535.7	332.9		537.1	396.0		537.1	404.6	
Ratio	%	61.7	38.3		56.8	43.2		57.1	42.9	
Totals	kg	1063.2	659.5	1722.7	1093.2	830.1	1923.3	1102.7	829.2	1931.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1722.7	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	80	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1932.0	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	735	747	747	750	
As Tested (Fully Loaded $\pm$ 10mm at each wheel well)	mm	738	744	738	740	1268

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2937
Total Vehicle Length at Left Side	mm	4150
Total Vehicle Length at Centerline	mm	5190
Total Vehicle Length at Right Side	mm	4150
Weight of Ballast in Cargo Area	kg	66.2
Weight of Vehicle Components Removed	kg	0.0
Amount of Stoddard Solvent in Fuel Tank	L	65.1

Vehicle components removed to meet target vehicle test weight: Right tail light, right side mirror, right side floor mats, spare tire, jack & tools, trunk floor and carpet.

TEST VEHICLE VERTICAL IMPACT POINT DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	508
Actual Impact Point Aft of Front Axle	mm	494

DATA SHEET NO. 2

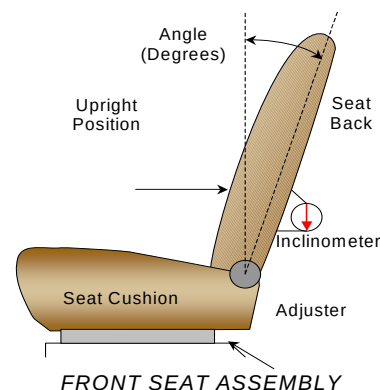
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

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

NHTSA No. GB0101
Test Date: 2/24/2011

NOMINAL DESIGN RIDING POSITION

The driver seatback is positioned to the manufacturer's designated angle. The procedure is as follows: Set seat back angle at 12.6° rearward on headrest post relative to the door sill. The right front passenger seatback is set to match the driver seatback. The left rear passenger seat back is fixed.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	12.3° on headrest post
Passenger with Seated Dummy	15.8° on front of seat back

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	269 mm	135 mm (forward-most as 0)
Rear Seat	Fixed	Fixed

Describe method: For the driver seat track, using only the controls that primarily move the seat in the fore-aft direction, the seat was moved to the full rear position and marked. The seat was then moved to the foremost position and marked. The seat was then placed in the mid point of travel and marked. The left rear passenger seat track was fixed.

SEAT BELT UPPER ANCHORAGES

	Total # of Positions	Placed in Position #
Driver Seat	4 detents (1 st as 1)	0 detent (uppermost as 0)
Rear Seat	Fixed	Fixed

Describe method: The driver seat anchorage was set in the uppermost detent and the left rear passenger seat anchorage was fixed.

DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

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

NHTSA No. GB0101
 Test Date: 2/24/2011

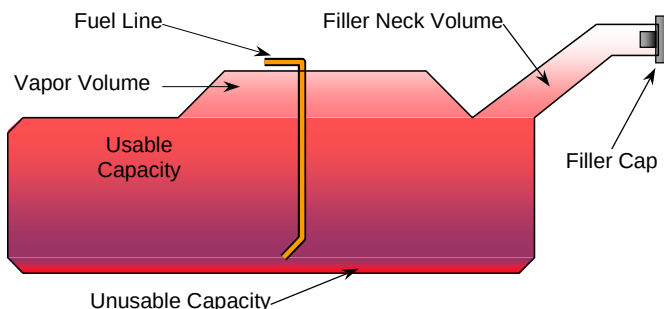
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional" Tank	
Usable Capacity Used for FMVSS 301	64.4 to 65.8
Actual Amount of Solvent used	65.1

FUEL PUMP

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

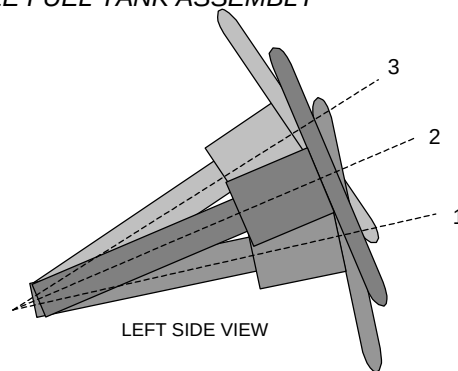
The test vehicle is equipped with an electric fuel pump. At key-on, the pump will run for 2-3 sec as a priming sequence. The pump will then turn off and will run continuously again once the vehicle's engine is started. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

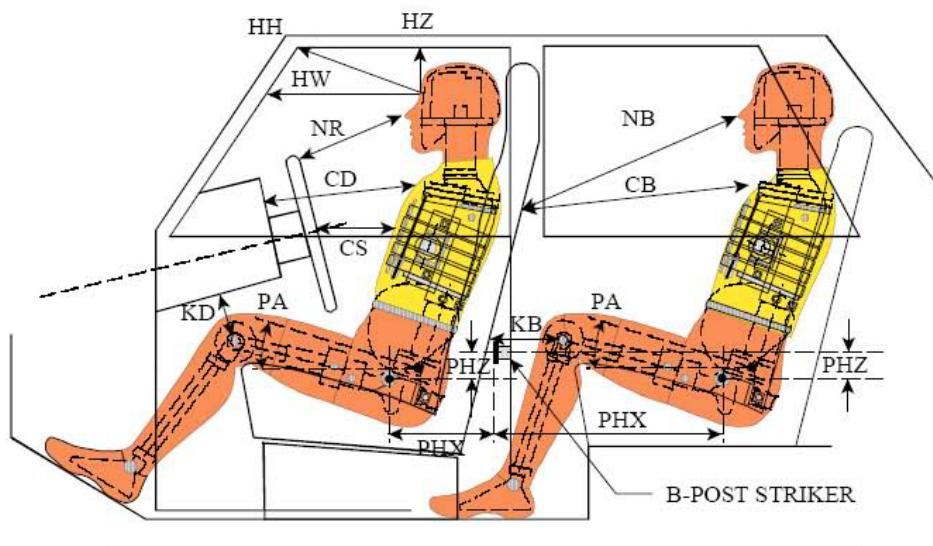
	Detent	Fore/Aft Position (mm)
Lowermost - Position 1	81.2	
Geometric Center – Position 2	71.2	
Uppermost – Position 3	61.2	
Telescoping Steering Wheel Travel		
Test Position	71.2	

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

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

NHTSA No. GB0101
 Test Date: 2/24/2011



LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

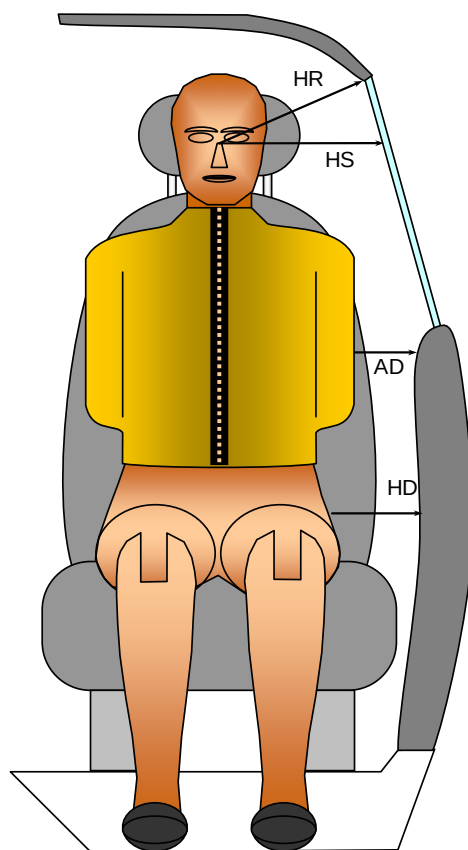
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 306	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	444	15.3		
HW		Head to Windshield	708	0		
HZ	HZ	Head to Roof	180	90	235	90
NR	NB	Nose to Rim/Seat Back	460	10.6	632	11.1
CD	CB	Chest to Dash/Seat Back	564	14.1	591	10.7
CS		Chest to Steering Wheel	367	2.6		
KDL	KBL	Left Knee to Dash/Seat Back	167	34.6	316	19.4
KDR	KBR	Right Knee to Dash/Seat Back	150	31.7	319	19.2
PA	PA	Pelvic Angle		28.8		22.3
PHX	PHX	H-Point to Striker (X-Axis)	172	0	220	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	132	90	231	90
SA	SA	Seat Back Angle		12.3		Fixed

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

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

NHTSA No. GB0101
 Test Date: 2/24/2011



FRONT VIEW OF DUMMY

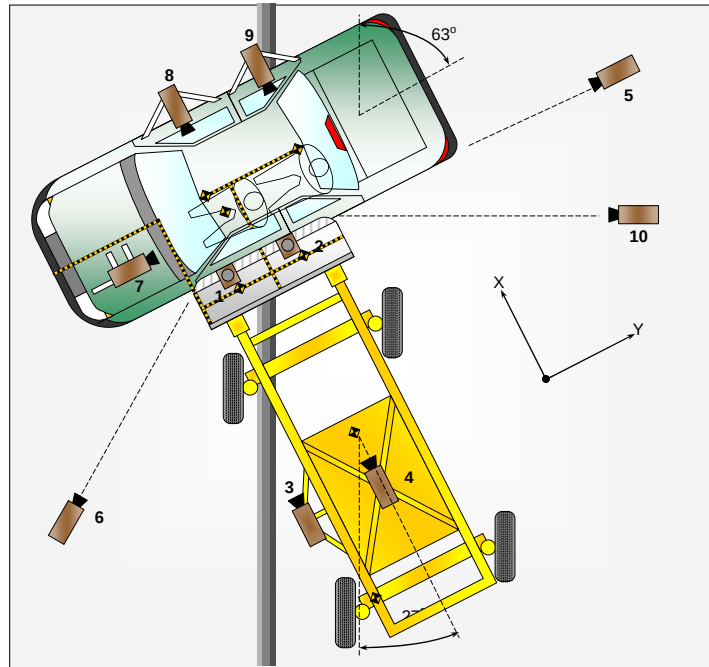
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 306
HR	Head to Side Header	mm	174	217
HS	Head to Side Window	mm	336	361
AD	Arm to Door	mm	96	170
HD	H-Point to Door	mm	160	188

DATA SHEET NO. 5 **CAMERA LOCATIONS AND DATA**

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

NHTSA No. GB0101
 Test Date: 2/24/2011



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Angle	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Overhead Overall	-110	0	-5050	88.7	14	1000
2	Overhead Close-up	260	1150	-5050	83.2	50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	40	4860	-1180	6.3	24	1000
6	Left Front	3230	-4170	-1210	5.5	24	1000
7	Driver Front (OB)					16	1000
8	Driver Side (OB)					8	1000
9	Passenger Side (OB)					8	1000
10	Real Time Left Rear						30
11	Real Time Inrun						30

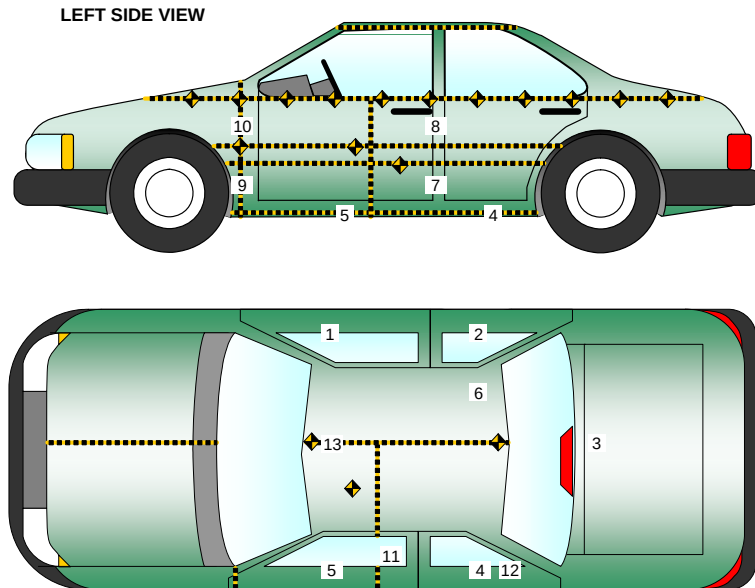
Reference: Impact Point projected to Ground
 +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

* All measurements accurate to ± 6 mm

**DATA SHEET NO. 6
VEHICLE ACCELEROMETER LOCATIONS**

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

NHTSA No. GB0101
Test Date: 2/24/2011



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2922	763	-223
2	Right Sill at Rear Seat	1936	763	-214
3	Rear Floorpan Above Axle	945	-30	-535
4	Left Sill at Rear Door	1944	-763	-223
5	Left Sill at Front Door	2979	-763	-220
6	Rt. Rear Occ. Compartment	2087	360	-230
7	Left Lower B-Post	2400	-746	-535
8	Left Middle B-Post	2400	-749	-779
9	Left Lower A-Post	3498	-715	-540
10	Left Middle A-Post	3562	-847	-764
11	Front Seat Track	2568	-655	-550
12	Rear Seat Track or Structure			
13	Vehicle CG	2802	-423	-202

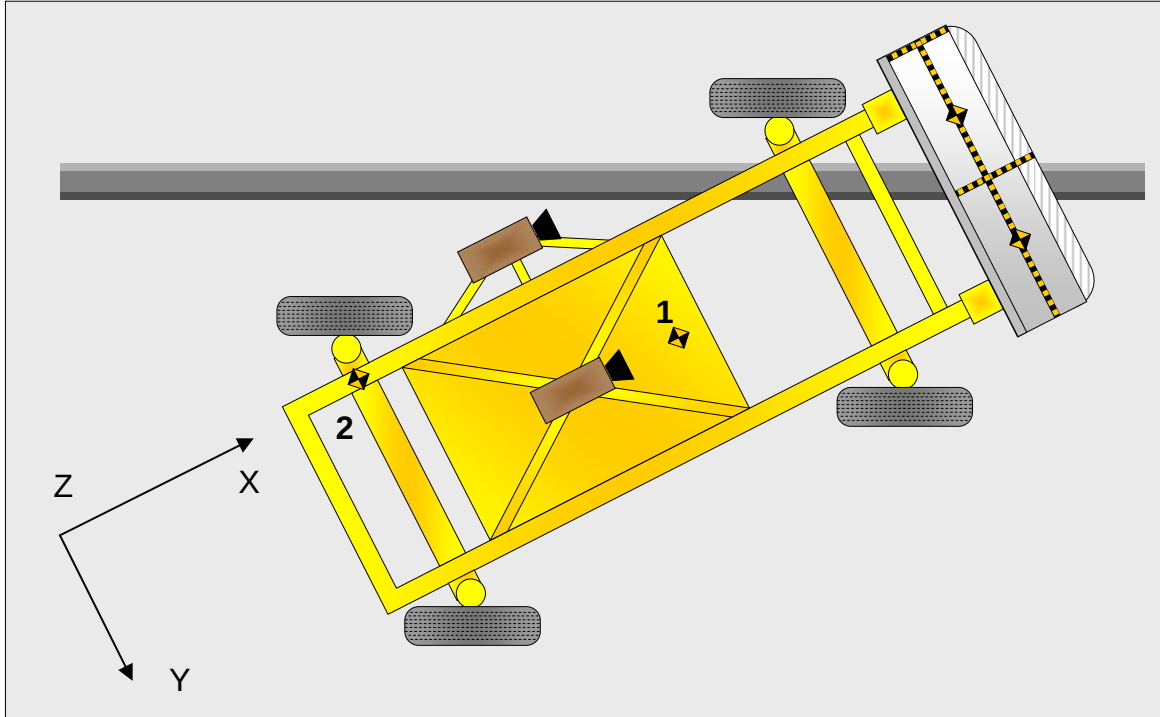
Reference: X – Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS

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

NHTSA No. GB0101
Test Date: 2/24/2011



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	MDB CG	-1105	0	-330
2	MDB Rear	-2580	-650	-625

Reference: X - MDB Face (+ forward)
Y - MDB Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
TEST VEHICLE SUMMARY OF RESULTS

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

NHTSA No. GB0101
 Test Date: 2/24/2011

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	80	236
2	Occupant H-Point	mm	311	513
3	Mid Door	mm	318	610
4	Window Sill	mm	300	922
5	Window Top	mm	89	1401
	Maximum Penetration	mm	318	

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	21
MDB Accelerometers	5
Total No. of Contact Switches	8
Monitoring Channels	4
Total	70

CAMERA COVERAGE

High-Speed Vehicle Onboard	3
High-Speed Offboard	4
High-Speed MDB Onboard	2
Real-Time Stationary	1
Real-Time Panning	1
Total	11

DATA SHEET NO. 9**MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS**

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

NHTSA No. GB0101
 Test Date: 2/24/2011

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheelbase of Framework Carriage	2592
CG Location aft of Front Axle	1129

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	411.8	281.6	
Right	kg	356.8	311.3	
Ratio	%	56.5	43.5	
Totals	kg	768.6	592.9	1361.5

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.1
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.0
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.7

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Right	182
B	Top of Bumper	533	800	Left	94
C	Mid-Level	686	800	Left	89
D	Top of Stack	813	800	Left	116

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

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

NHTSA No. GB0101
 Test Date: 2/24/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Driver (ES-2re)	Passenger (SID-IIs)
Dummy Type / Serial No.	ES-2re / 032	SID-IIs / 306
Head Contact	Curtain Airbag, Headrest, Side Header	Curtain Airbag, Center Headrest, Side Header
Upper Torso Contact	Side Airbag	Curtain Airbag
Lower Torso Contact	Side Airbag, Door Panel	Door Panel
Left Knee Contact	Door Panel	Door Panel
Right Knee Contact	Left Knee	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 and Left Rear 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	

MDB LEFT EDGE IMPACT POINT DATA

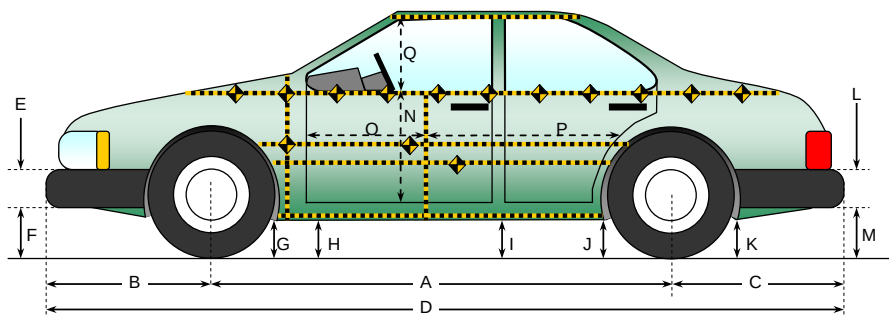
Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	14 forward
Vertical Offset	mm	+/-20	5 down

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

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

NHTSA No. GB0101
 Test Date: 2/24/2011



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

LEFT SIDE VIEW

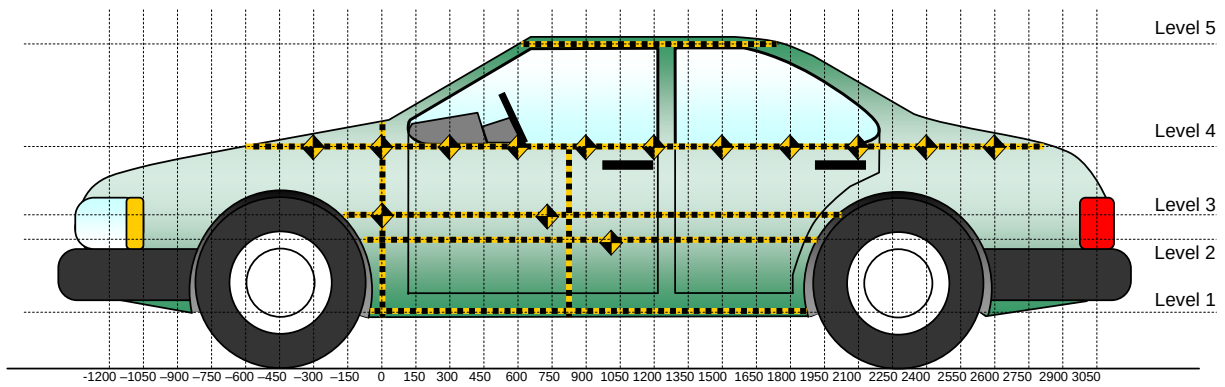
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2937	2920	17
B	Front Axle to FSOV	1116	1099	17
C	Rear Axle to RSOV	1137	1155	-18
D	Total Length at Centerline	5190	5174	16
E	Front Bumper Thickness	110	110	0
F	Front Bumper Bottom to Ground	318	335	-17
G	Sill Height at Front Wheel Well	188	191	-3
H	Sill Height at Front Door Leading Edge	195	217	-22
I	Sill Height at B Pillar	193	204	-11
J1	Sill Height at Rear Wheel Well	168	173	-5
J2	Pinch Weld Height at Rear Wheel Well	170	175	-5
K	Sill Height Aft of Rear Wheel Well	283	226	57
L	Rear Bumper Thickness	110	110	0
M	Rear Bumper Bottom to Ground	310	299	11
N	Sill Height to Window Bottom Sill	735	610	125
O	Front Door Leading Edge to Impact CL	877	858	19
P	Rear Door Trailing Edge to Impact CL	1198	1094	104
Q	Front Window Opening	465	440	25
R	Right Side Length	4150	4154	-4
S	Left Side Length	4150	4102	48
T	Vehicle Width at B Post	1849	1614	235

DATA SHEET NO. 12 **VEHICLE EXTERIOR CRUSH MEASUREMENTS**

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

NHTSA No. GB0101
 Test Date: 2/24/2011



All Measurements Shown in mm

LEFT SIDE VIEW

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	236
2	Mid Door	513
3	Occupant H-Point	610
4	Window Sill	922
5	Window Top	1401

DATA SHEET NO. 12 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

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

NHTSA No. GB0101
 Test Date: 2/24/2011

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-450				279					297					18	
-300				266					290					24	
-150		175	176	256			254	260	290			79	84	34	
0	225	181	178	249		243	321	314	285		18	140	136	36	
150	226	180	176	242		292	404	380	330		66	224	204	88	
300	225	180	175	238		294	442	424	364		69	262	249	126	
450	225	180	173	234		297	452	433	394		72	272	260	160	
600	225	180	169	231		300	450	435	409		75	270	266	178	
750	224	181	170	227	520	303	464	442	432	565	79	283	272	205	45
900	224	180	170	224	516	304	475	447	447	573	80	295	277	223	56
1050	225	180	171	222	514	304	482	449	435	583	79	302	278	213	69
1200	226	183	175	224	515	304	492	462	478	591	78	309	287	254	76
1350	226	186	177	223	513	302	497	473	523	598	76	311	296	300	85
1500	230	188	181	224	513	299	498	487	505	602	69	310	306	281	89
1650	233	191	186	226	515	296	492	504	491	587	63	301	318	265	72
1800	236	194	190	228	517	295	447	465	487	571	59	253	275	259	54
1950	237	190	189	230	523	280	325	355	407	562	43	135	166	177	39
2100				233					307					74	
2250				239					292					53	
2400				244					282					38	
2550				250					278					28	
2700				259					279					20	
2850				272					285					13	
3000				288					287					-1	
3150				312					314					2	

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

MAXIMUM CRUSH DATA

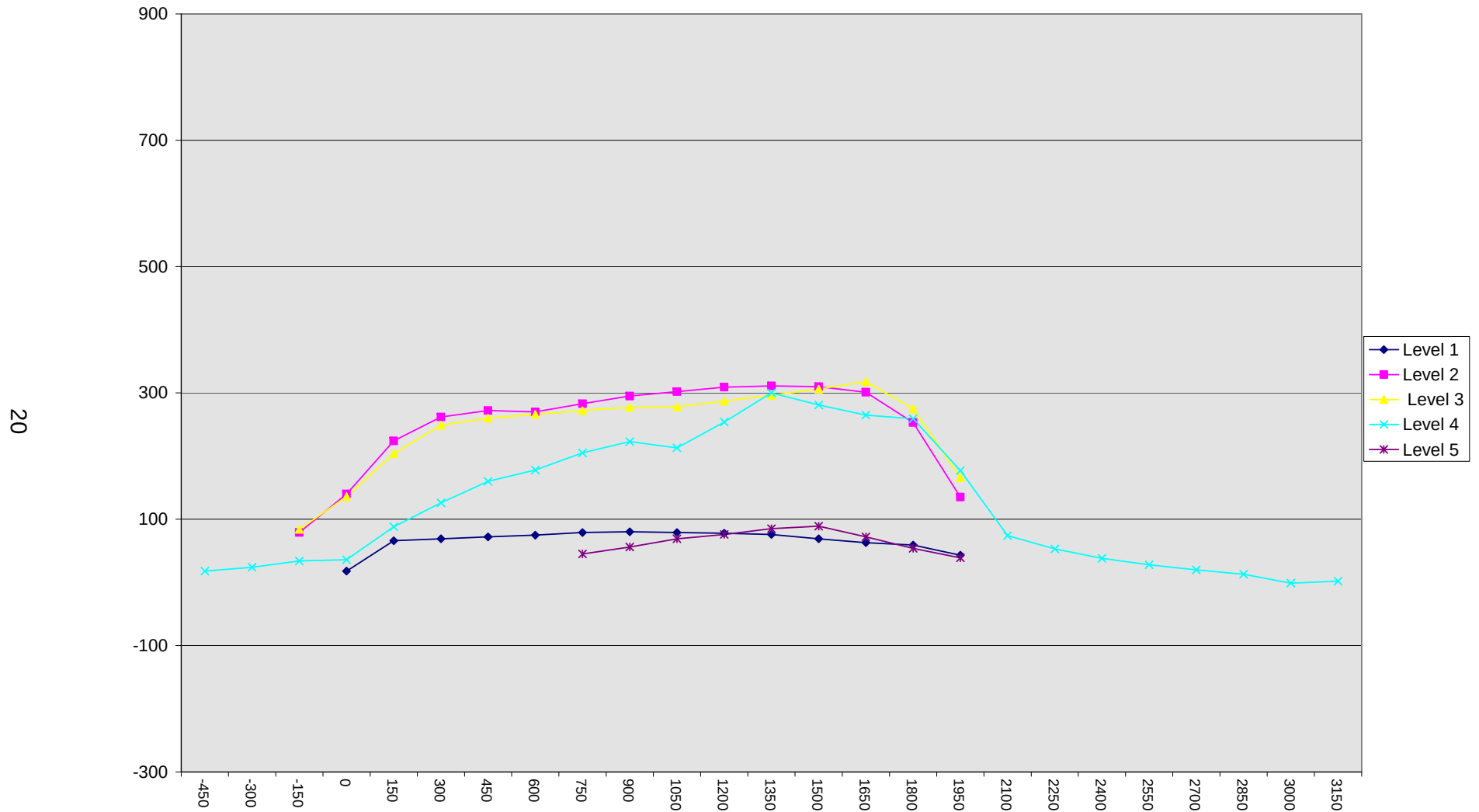
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	80	311	318	300	89
Distance From Impact (mm)	900	1350	1650	1350	1500

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

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

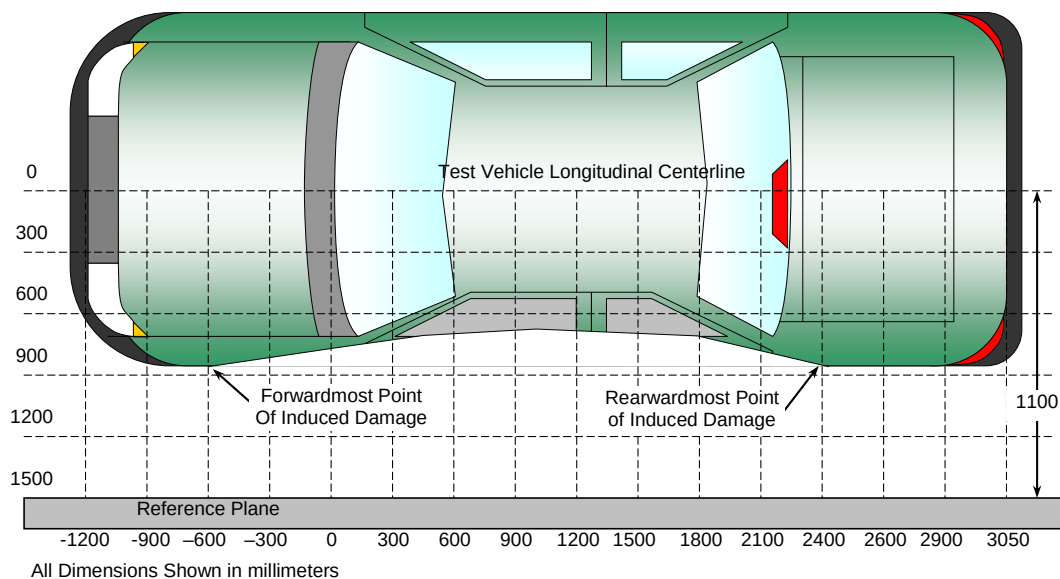
NHTSA No. GB0101
Test Date: 2/24/2011



DATA SHEET NO. 13
VEHICLE DAMAGE PROFILE DISTANCES

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

NHTSA No. GB0101
 Test Date: 2/24/2011



TOP VIEW

DAMAGE PROFILE DISTANCES

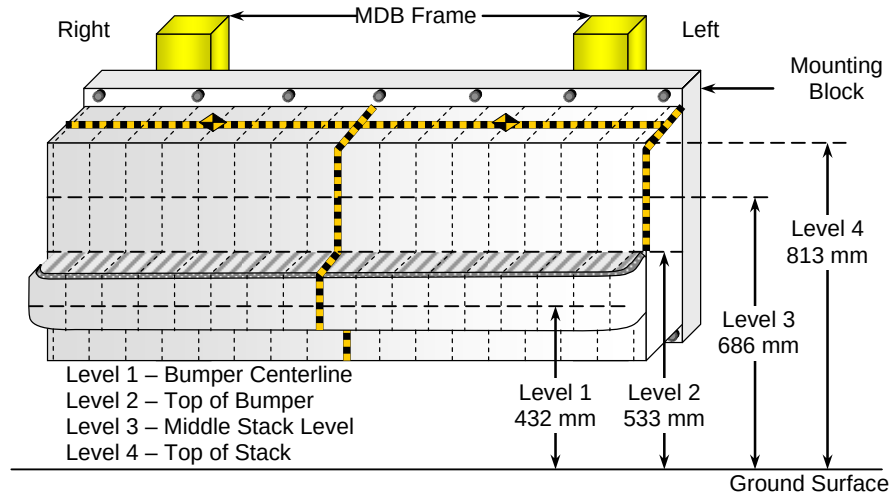
DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	3150	4	312	314	2
2	2450	4	245	275	30
3	1720	3	190	514	324
4	970	2	180	482	302
5	225	2	180	455	275
6	-450	4	279	297	18

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

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

NHTSA No. GB0101
 Test Date: 2/24/2011



FRONT VIEW

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	27	9	-6	-12	-3	13	43	47	41	26	19	23	31	39	53	73	116
3	40	8	6	8	11	16	39	48	30	17	15	15	18	25	34	57	89
2	63	59	63	63	62	62	59	69	64	66	71	77	80	83	86	89	94
1	182	172	167	169	168	176	174	165	168	162	163	161	158	161	160	165	172

DATA SHEET NO. 15

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

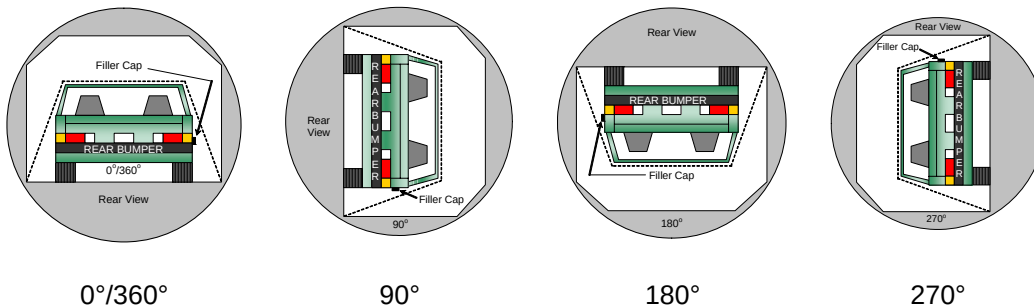
Test Vehicle: 2011 Buick Lucerne CX 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. GB0101
 Test Date: 2/24/2011

Test Time: 11:00 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°	111	300	411
90° to 180°	110	300	410
180° to 270°	104	300	404
270° to 360°	114	300	414

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

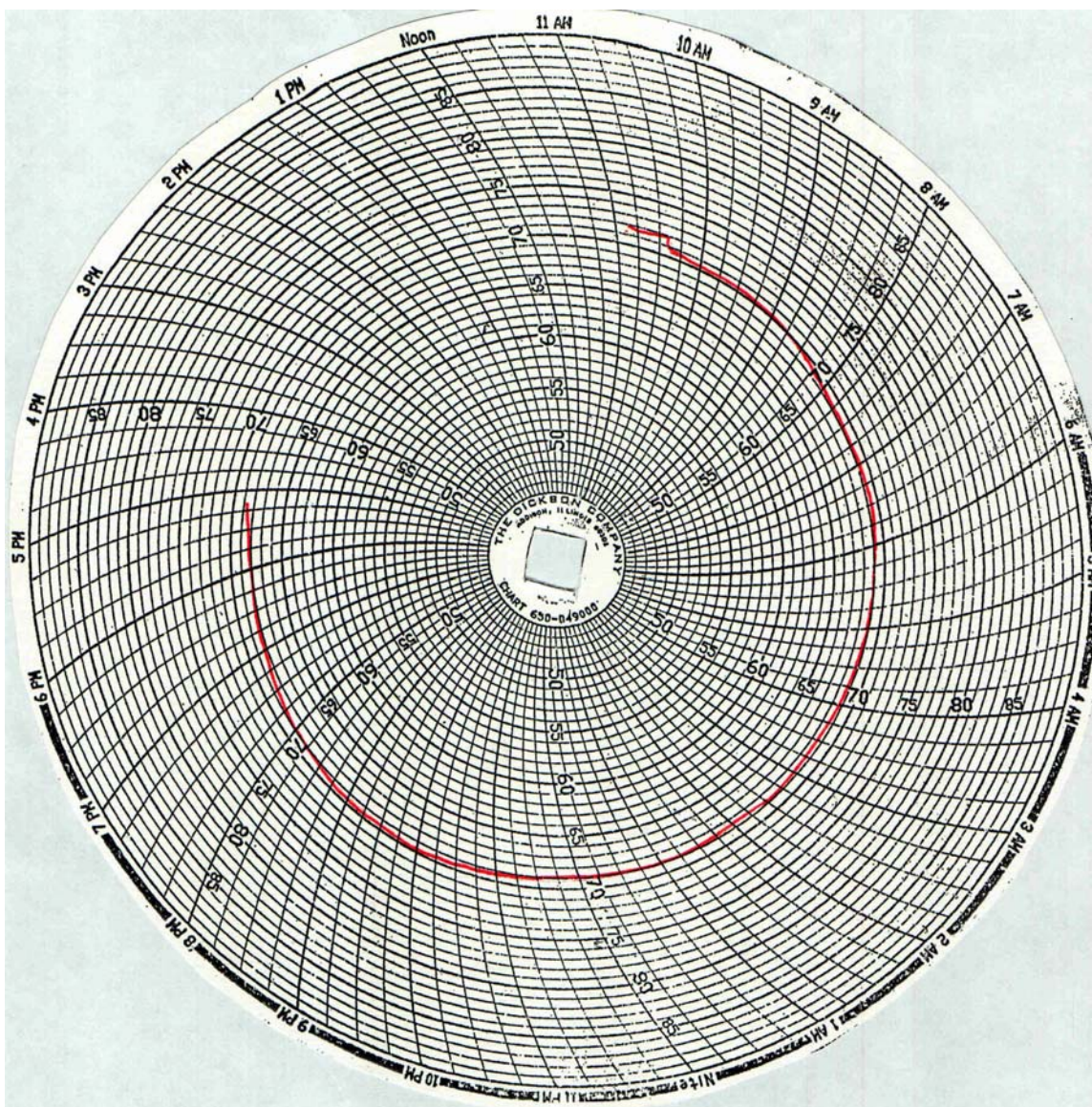
Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 16

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

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

NHTSA No. GB0101
Test Date: 2/24/2011



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 1.	As Delivered Right Front Three-Quarter View of Test Vehicle	A-1
Photo No. 2.	As Delivered Left Rear Three-Quarter View of Test Vehicle	A-1
Photo No. 3.	Pre-Test Frontal View of Test Vehicle	A-2
Photo No. 4.	Post-Test Frontal View of Test Vehicle	A-2
Photo No. 5.	Pre-Test Left Three-Quarter Front View of Test Vehicle	A-3
Photo No. 6.	Post-Test Left Three-Quarter Front View of Test Vehicle	A-3
Photo No. 7.	Pre-Test Left Side View of Test Vehicle	A-4
Photo No. 8.	Post-Test Left Side View of Test Vehicle	A-4
Photo No. 9.	Pre-Test Left Three-Quarter Rear View of Test Vehicle	A-5
Photo No. 10.	Post-Test Left Three-Quarter Rear View of Test Vehicle	A-5
Photo No. 11.	Pre-Test Rear View of Test Vehicle	A-6
Photo No. 12.	Post-Test Rear View of Test Vehicle	A-6
Photo No. 13.	Pre-Test Right Side View of Test Vehicle	A-7
Photo No. 14.	Post-Test Right Side View of Test Vehicle	A-7
Photo No. 15.	Pre-Test Overhead View of Test Vehicle with MDB Positioned Against Side of Test Vehicle	A-8
Photo No. 16.	Post-Test Overhead View of Test Vehicle and MDB	A-8
Photo No. 17.	Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle	A-9
Photo No. 18.	Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle	A-9
Photo No. 19.	Pre-Test Close-Up View of Impact Point Target	A-10
Photo No. 20.	Post-Test Close-Up View of Impact Point Target	A-10
Photo No. 21.	Pre-Test Left Front Door Latch Close-Up	A-11
Photo No. 22.	Post-Test Left Front Door Latch Close-Up	A-11
Photo No. 23.	Pre-Test Left Rear Door Latch Close-Up	A-12

		<u>Page No.</u>
Photo No. 24.	Post-Test Left Rear Door Latch Close-Up	A-12
Photo No. 25.	Pre-Test Front Close-Up View of Driver Dummy	A-13
Photo No. 26.	Post-Test Front Close-Up View of Driver Dummy	A-13
Photo No. 27.	Pre-Test Left Side View of Driver Dummy Showing Belt, Chalking, and Contact Switches	A-14
Photo No. 28.	Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View	A-15
Photo No. 29.	Post-Test Left Side View of Driver Dummy Shoulder and Door Top View	A-15
Photo No. 30.	Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning	A-16
Photo No. 31.	Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint	A-16
Photo No. 32.	Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning	A-17
Photo No. 33.	Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan	A-17
Photo No. 34.	Pre-Test Placement of Driver Dummy's Feet	A-18
Photo No. 35.	Pre-Test View of Belt Anchorage for Driver Dummy	A-18
Photo No. 36.	Pre-Test Left Side View of Steering Wheel	A-19
Photo No. 37.	Pre-Test View of Parking Brake	A-19
Photo No. 38.	Pre-Test Close-Up Left Side View of Driver Seat Track	A-20
Photo No. 39.	Pre-Test Close-Up Left Side View of Driver Seat Back	A-20
Photo No. 40.	Pre-Test Close-Up View of Driver Seat Back or Head Restraint	A-21
Photo No. 41.	Pre-Test Driver Dummy and Door Clearance View	A-22
Photo No. 42.	Post-Test Driver Dummy and Door Clearance View	A-22
Photo No. 43.	Pre-Test Right Side View of Front Seat of Occupant Compartment	A-23
Photo No. 44.	Post-Test Right Side View of Front Seat of Occupant Compartment	A-23
Photo No. 45.	Pre-Test Driver Inner Door Panel View	A-24
Photo No. 46.	Post-Test Driver Inner Door Panel View Showing Driver Dummy Contact Locations	A-24
Photo No. 47.	Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View	A-25

		<u>Page No.</u>
Photo No. 48.	Post-Test Driver Dummy Close-up Head Contact with Side Airbag View	A-25
Photo No. 49.	Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View	A-26
Photo No. 50.	Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View	A-26
Photo No. 51.	Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View	A-27
Photo No. 52.	Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View	A-27
Photo No. 53.	Pre-Test Left Side View of Passenger Dummy Showing Belt, Chalking, and Contact Switches	A-28
Photo No. 54.	Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	A-29
Photo No. 55.	Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	A-29
Photo No. 56.	Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning	A-30
Photo No. 57.	Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint	A-30
Photo No. 58.	Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning	A-31
Photo No. 59.	Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan	A-31
Photo No. 60.	Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket	A-32
Photo No. 61.	Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level	A-32
Photo No. 62.	Pre-Test Placement of Rear Passenger Dummy's Feet	A-33
Photo No. 63.	Pre-Test View of Belt Anchorage for Rear Passenger Dummy	A-33
Photo No. 64.	Pre-Test Close-Up Left Side View of Rear Passenger Seat Track	A-34
Photo No. 65.	Pre-Test Close-Up Left Side View of Rear Passenger Seat Back	A-34
Photo No. 66.	Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint	A-35
Photo No. 67.	Pre-Test Rear Passenger Dummy and Door Clearance View	A-36
Photo No. 68.	Post-Test Rear Passenger Dummy and Door Clearance View	A-36
Photo No. 69.	Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	A-37
Photo No. 70.	Post-Test Right Side View of Rear Passenger Dummy Seat and Rear Seat Occupant Compartment	A-37
Photo No. 71.	Pre-Test Passenger Inner Door Panel View	A-38

		<u>Page No.</u>
Photo No. 72.	Post-Test Rear Passenger Inner Door Panel View Showing Dummy Contact Locations	A-38
Photo No. 73.	Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View	A-39
Photo No. 74.	Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View	A-39
Photo No. 75.	Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View	A-40
Photo No. 76.	Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View	A-41
Photo No. 77.	Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View	A-41
Photo No. 78.	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View	A-42
Photo No. 79.	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View	A-42
Photo No. 80.	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	A-43
Photo No. 81.	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	A-43
Photo No. 82.	Pre-Test Front View of MDB Impactor Face	A-44
Photo No. 83.	Post-Test Front View of MDB Impactor Face	A-44
Photo No. 84.	Pre-Test Top View of MDB Impactor Face	A-45
Photo No. 85.	Post-Test Top View of MDB Impactor Face	A-45
Photo No. 86.	Pre-Test Left Side View of MDB Impactor Face	A-46
Photo No. 87.	Post-Test Left Side View of MDB Impactor Face	A-46
Photo No. 88.	Pre-Test Right Side View of MDB Impactor Face	A-47
Photo No. 89.	Post-Test Right Side View of MDB Impactor Face	A-47
Photo No. 90.	Close-Up View of Vehicle's Certification Label	A-48
Photo No. 91.	Close-Up View of Vehicle's Tire Information Placard or Label	A-48
Photo No. 92.	Pre-Test Ballast View	A-49
Photo No. 93.	Post-Test Primary and Redundant Speed Trap Read-Out	A-49
Photo No. 94.	FMVSS No. 301/305 Rollover 0 Degrees	A-50
Photo No. 95.	FMVSS No. 301/305 Rollover 90 Degrees	A-50

		<u>Page No.</u>
Photo No. 96.	FMVSS No. 301/305 Rollover 180 Degrees	A-51
Photo No. 97.	FMVSS No. 301/305 Rollover 270 Degrees	A-51
Photo No. 98.	FMVSS No. 301/305 Rollover 360 Degrees	A-52
Photo No. 99.	Impact Event	A-52
Photo No. 100.	Monroney Label	A-53
Photo No. 101.	Head Restraint Use and Adjustment Information from Vehicle Manual	A-54
Photo No. 102.	Head Restraint Use and Adjustment Information from Vehicle Manual	A-55



As Delivered Right Front Three-Quarter View of Test Vehicle



As Delivered Left Rear Three-Quarter View of Test Vehicle



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Left Three-Quarter Front View of Test Vehicle



Post-Test Left Three-Quarter Front View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Left Three-Quarter Rear View of Test Vehicle



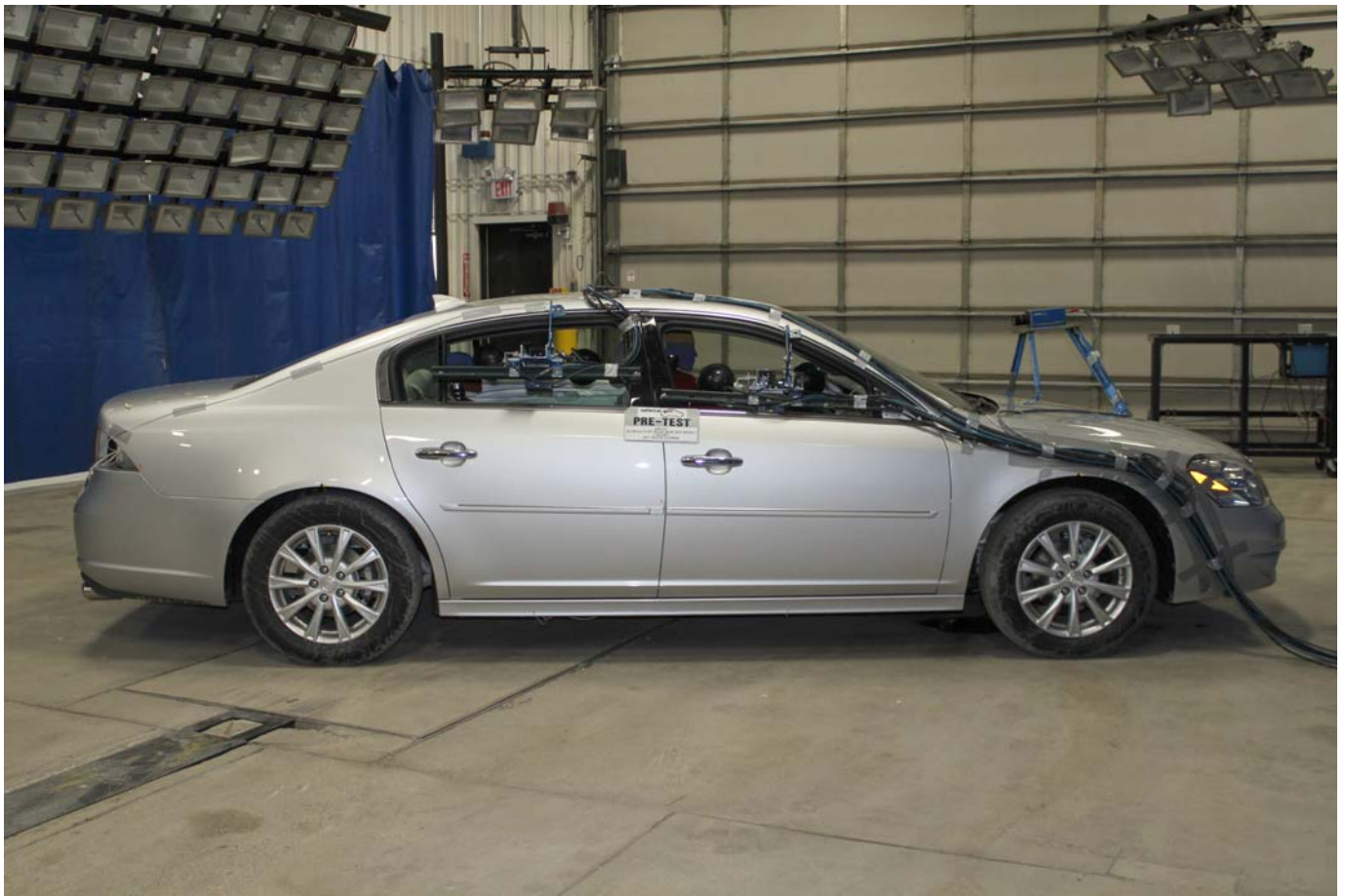
Post-Test Left Three-Quarter Rear View of Test Vehicle



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



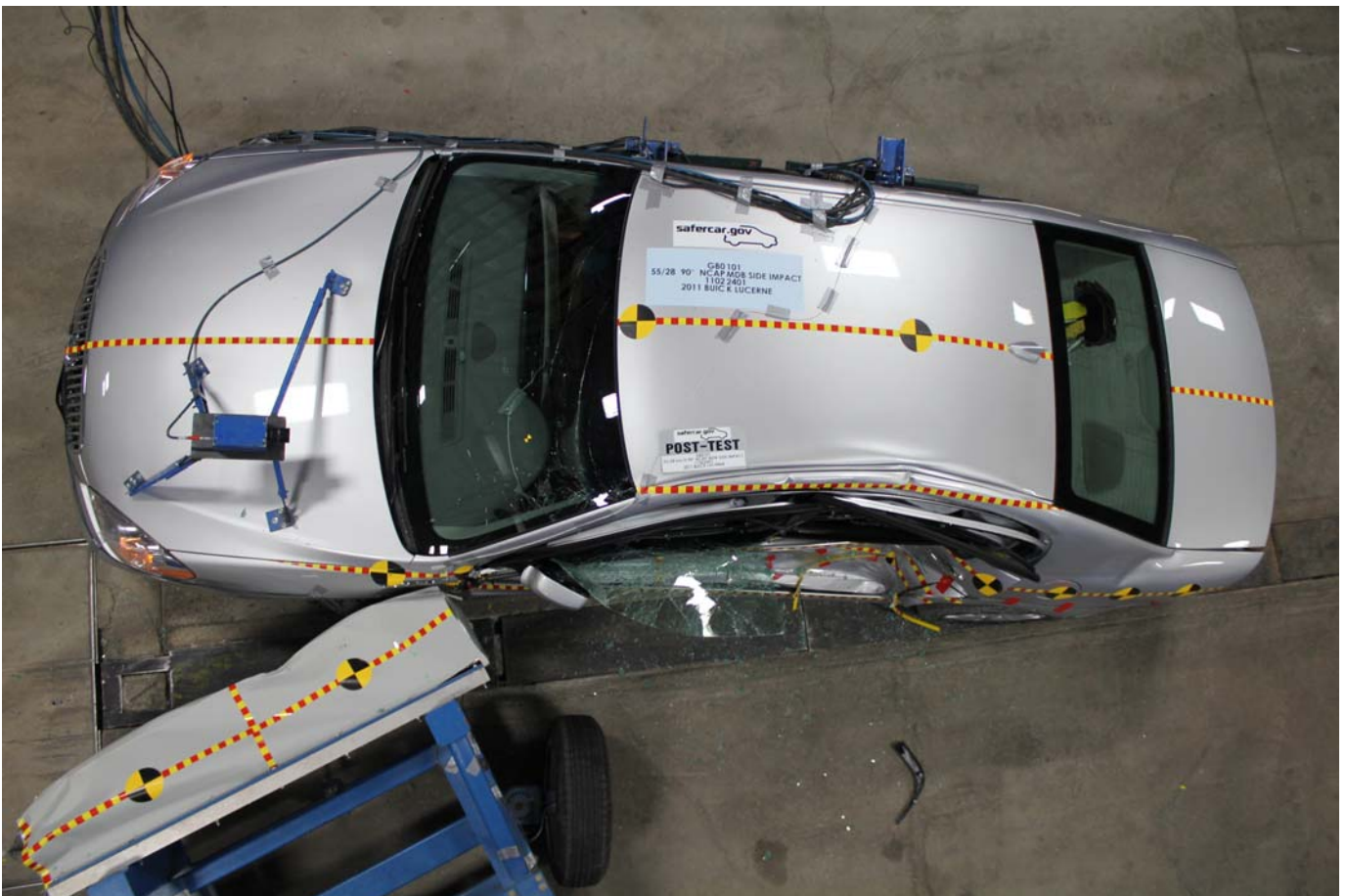
Pre-Test Right Side View of Test Vehicle



Post-Test Right Side View of Test Vehicle



Pre-Test Overhead View of Test Vehicle with MDB Positioned Against Side of Test Vehicle



Post-Test Overhead View of Test Vehicle and MDB



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



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



Pre-Test Close-Up View of Impact Point Target



Post-Test Close-Up View of Impact Point Target



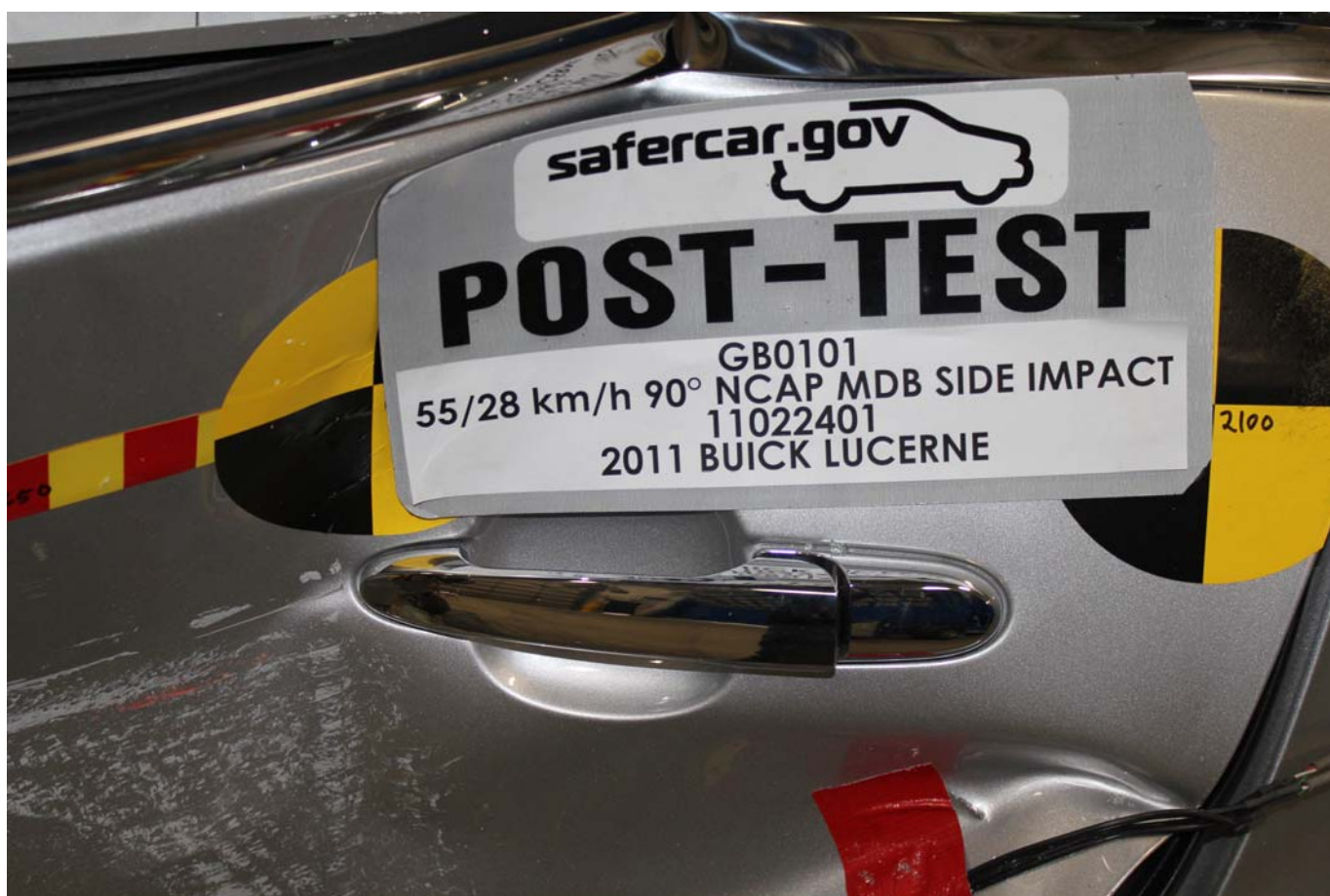
Pre-Test Left Front Door Latch Close-Up



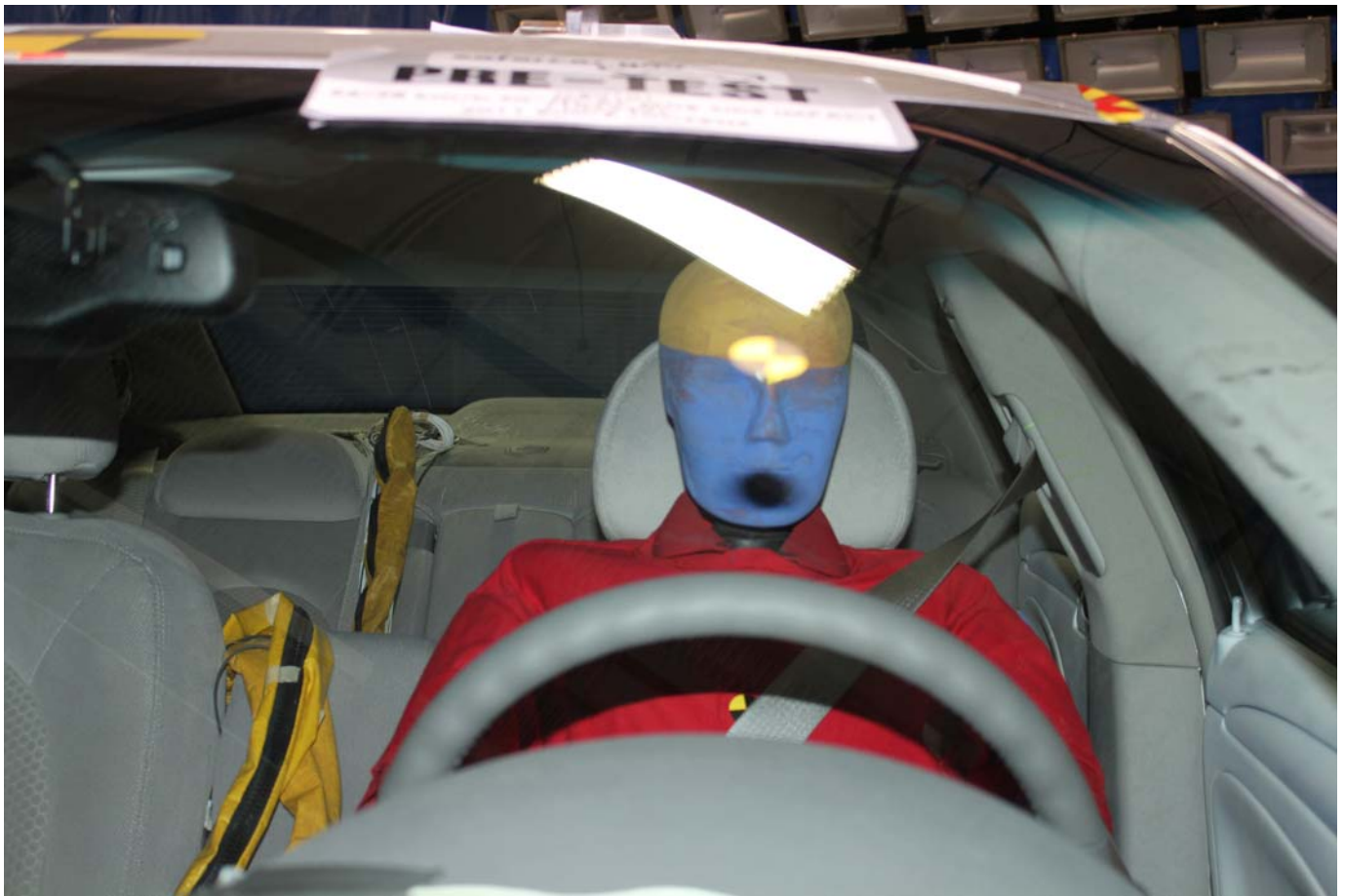
Post-Test Left Front Door Latch Close-Up



Pre-Test Left Rear Door Latch Close-Up



Post-Test Left Rear Door Latch Close-Up



Pre-Test Front Close-Up View of Driver Dummy



Post-Test Front Close-Up View of Driver Dummy



Pre-Test Left Side View of Driver Dummy Showing Belt, Chalking, and Contact Switches



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



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



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



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



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



Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Pre-Test Placement of Driver Dummy's Feet



Pre-Test View of Belt Anchorage for Driver Dummy



Pre-Test Left Side View of Steering Wheel



Pre-Test View of Parking Brake



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



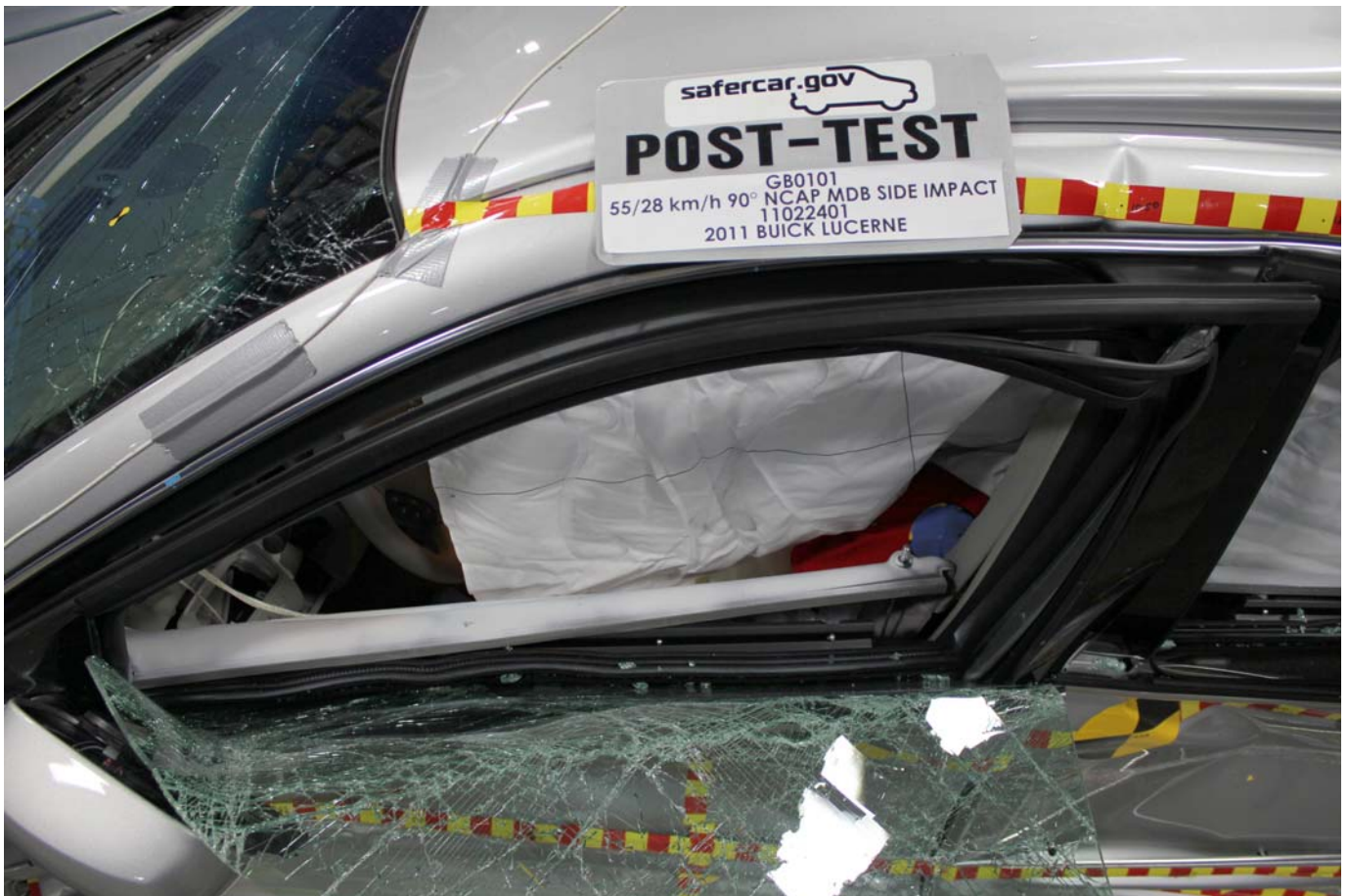
Pre-Test Close-Up Left Side View of Driver Seat Back



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



Pre-Test Driver Dummy and Door Clearance View



Post-Test Driver Dummy and Door Clearance View



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



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



Pre-Test Driver Inner Door Panel View



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



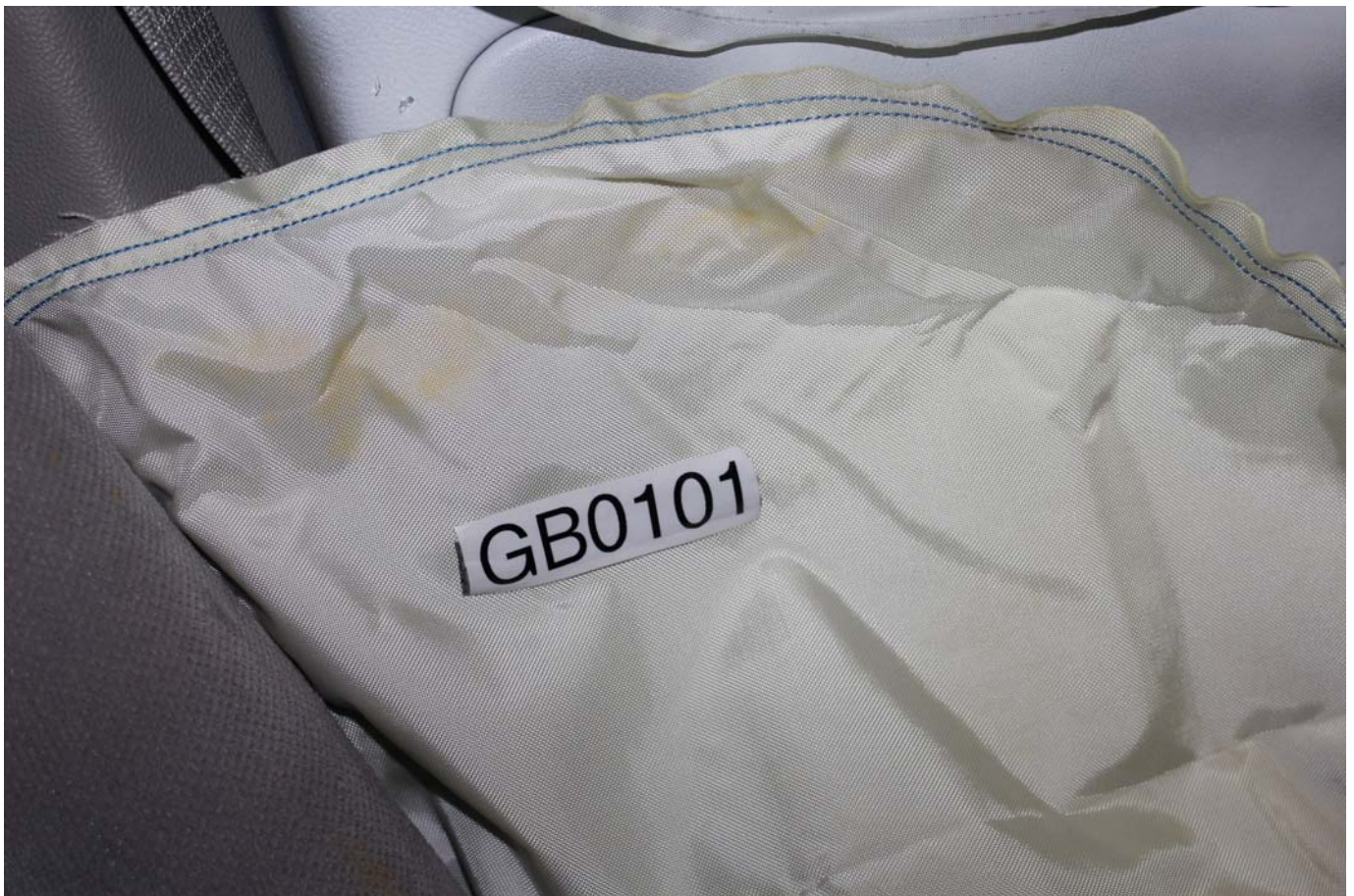
Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Head Contact with Side Airbag View

PHOTOGRAPH NOT APPLICABLE

Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View



Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View



Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View



Pre-Test Left Side View of Passenger Dummy Showing Belt, Chalking, and Contact Switches



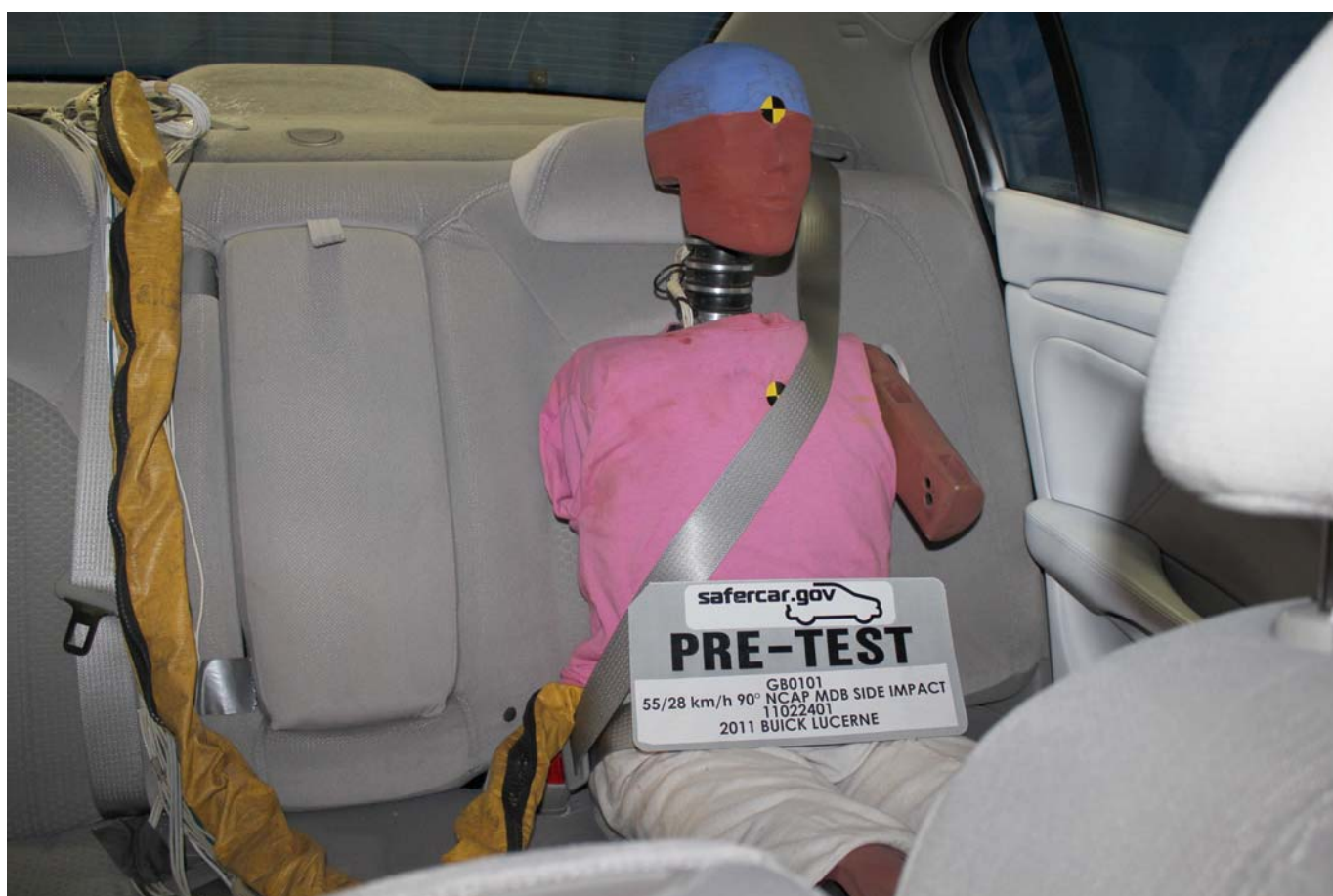
Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



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



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



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



Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



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



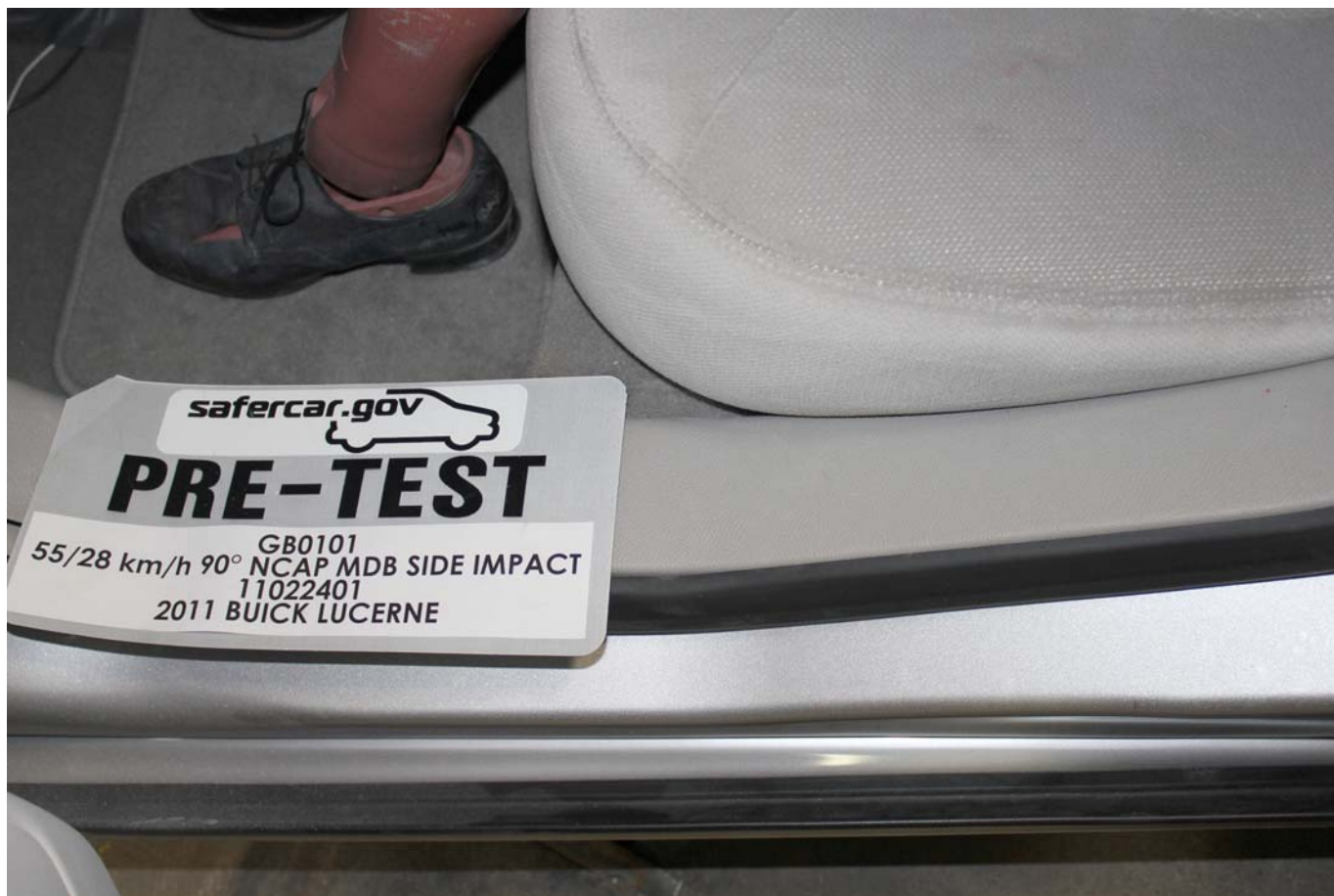
Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Pre-Test Placement of Rear Passenger Dummy's Feet



Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint



Pre-Test Rear Passenger Dummy and Door Clearance View



Post-Test Rear Passenger Dummy and Door Clearance View



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



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



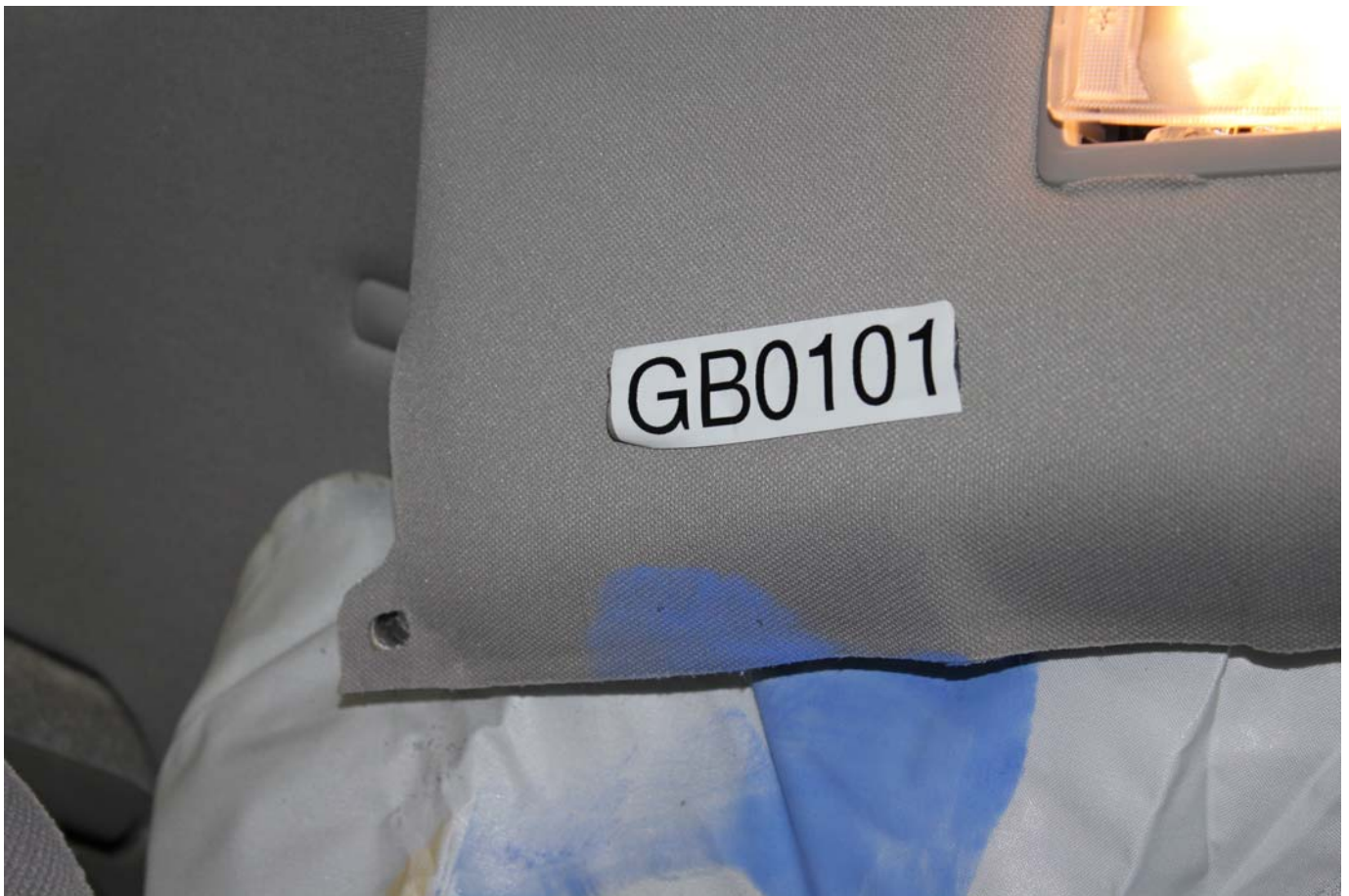
Pre-Test Passenger Inner Door Panel View



Post-Test Rear Passenger Inner Door Panel View Showing Dummy Contact Locations



Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View



Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

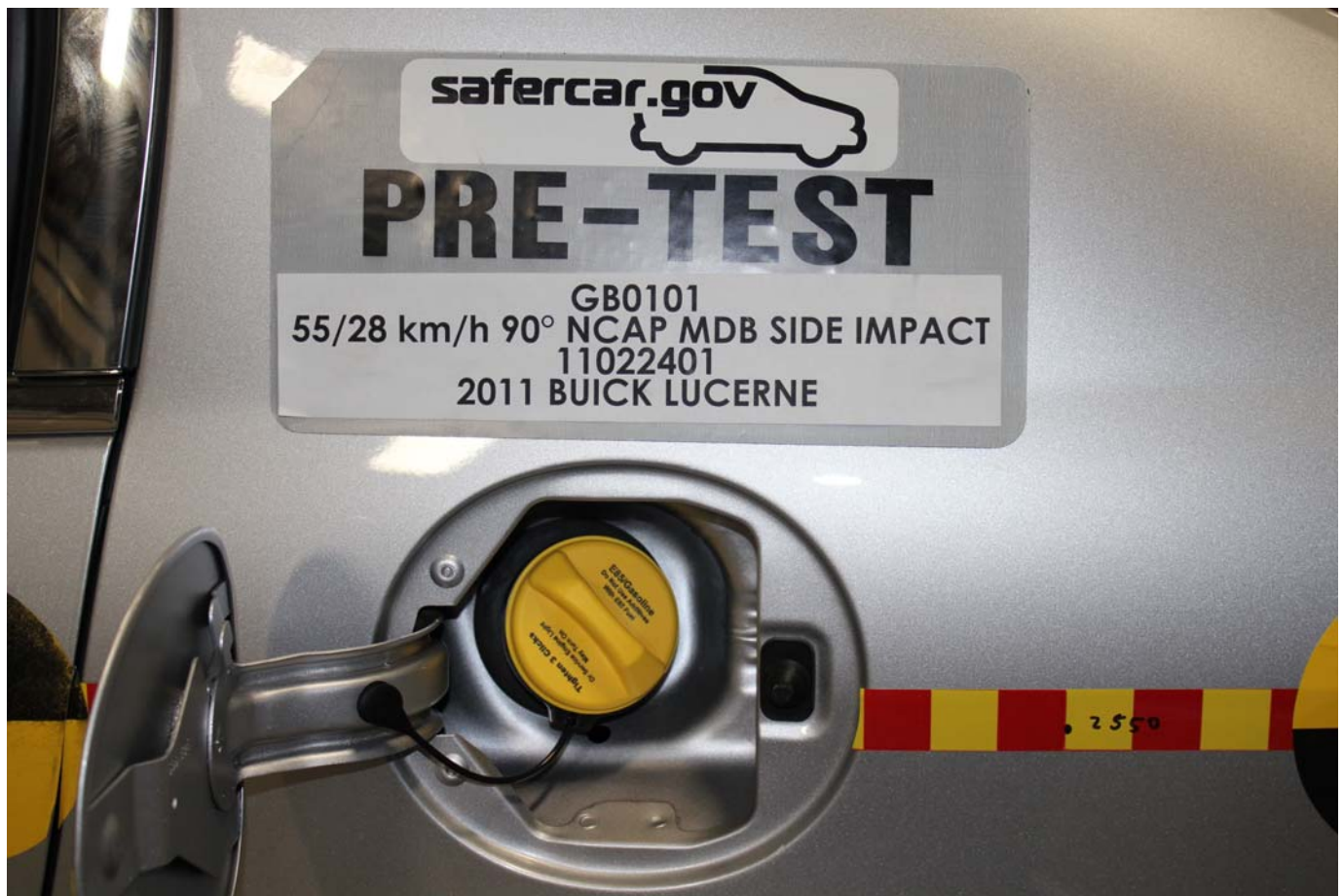
Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View

PHOTOGRAPH NOT AVAILABLE

Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View



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



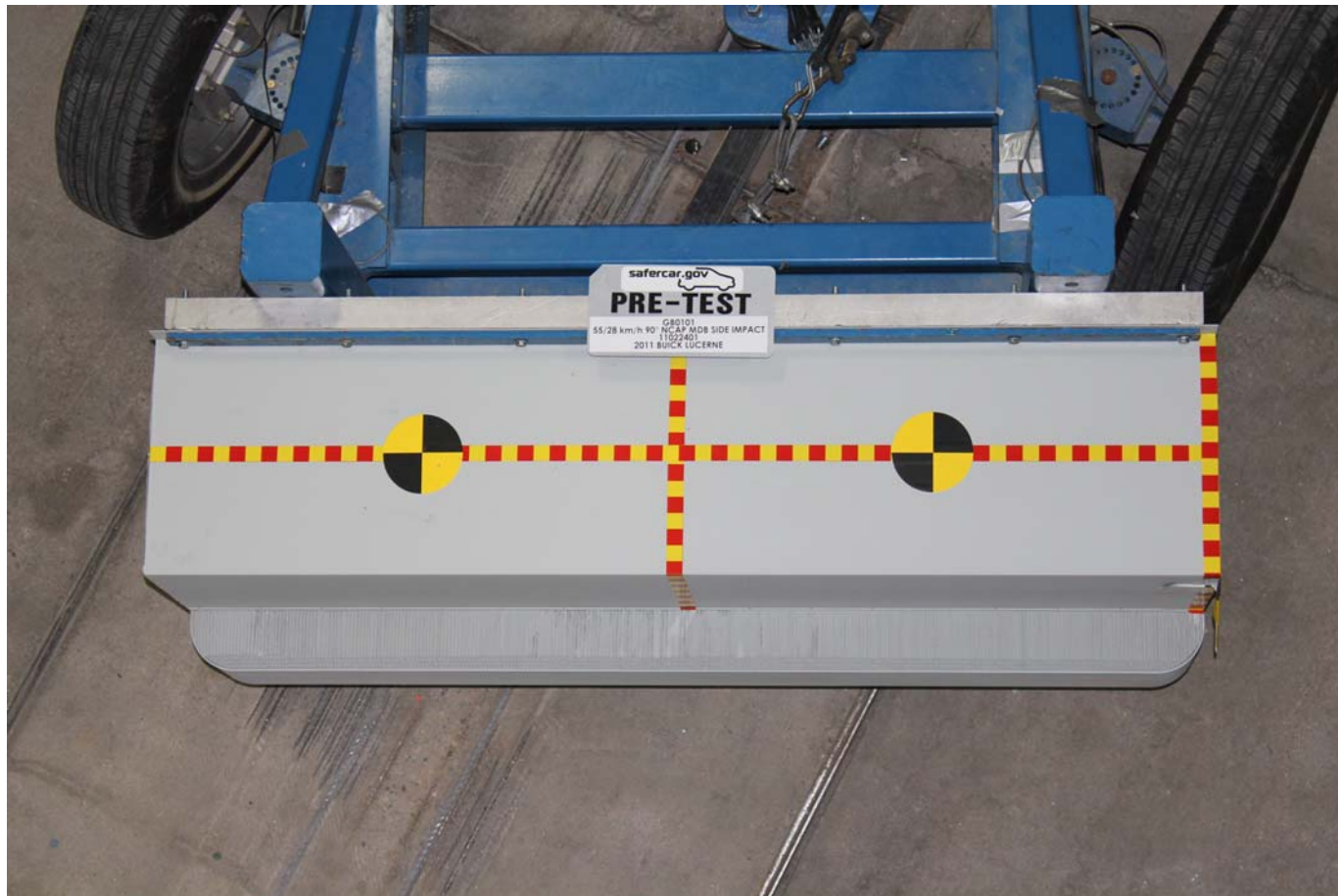
Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Pre-Test Front View of MDB Impactor Face



Post-Test Front View of MDB Impactor Face



Pre-Test Top View of MDB Impactor Face



Post-Test Top View of MDB Impactor Face



Pre-Test Left Side View of MDB Impactor Face



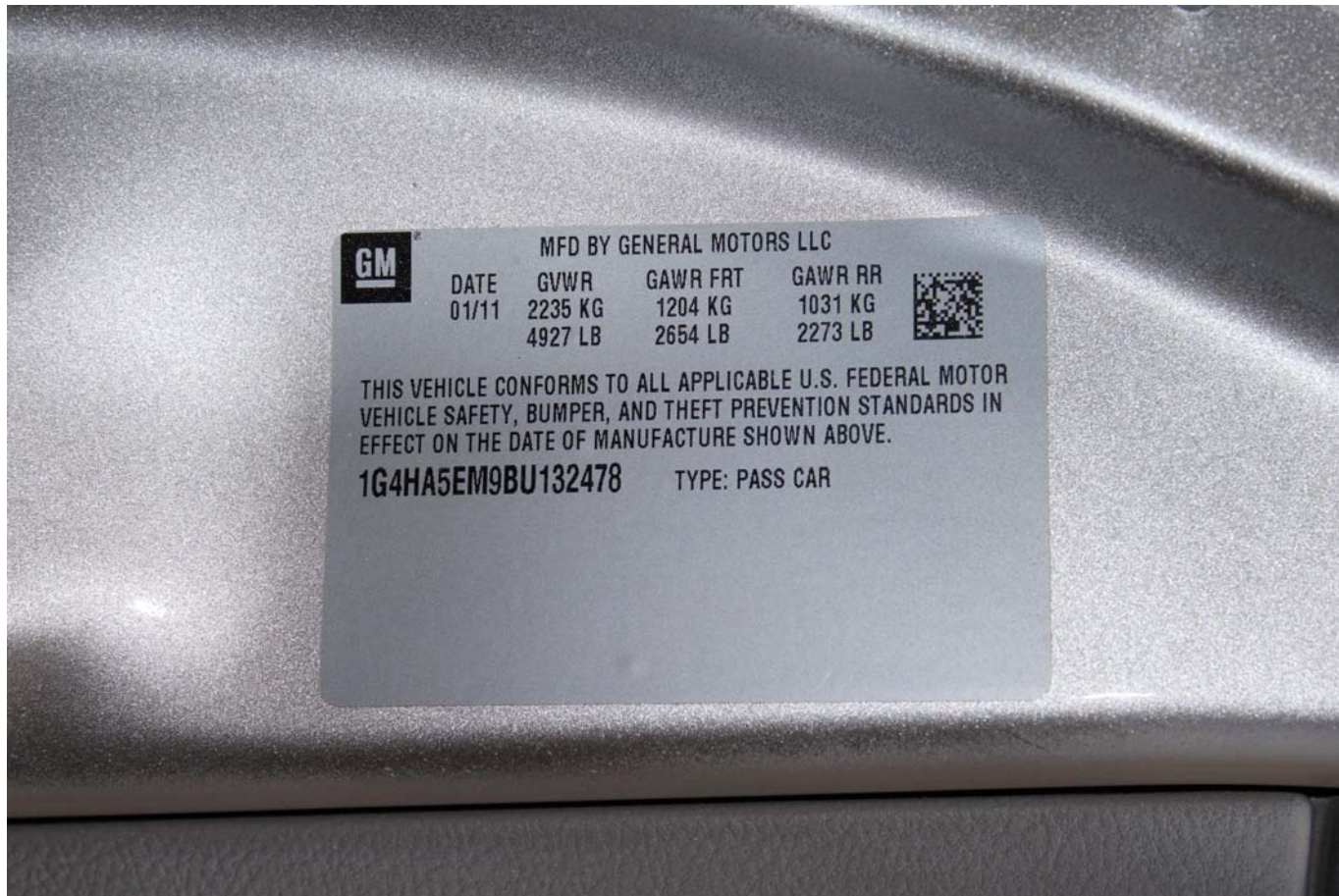
Post-Test Left Side View of MDB Impactor Face



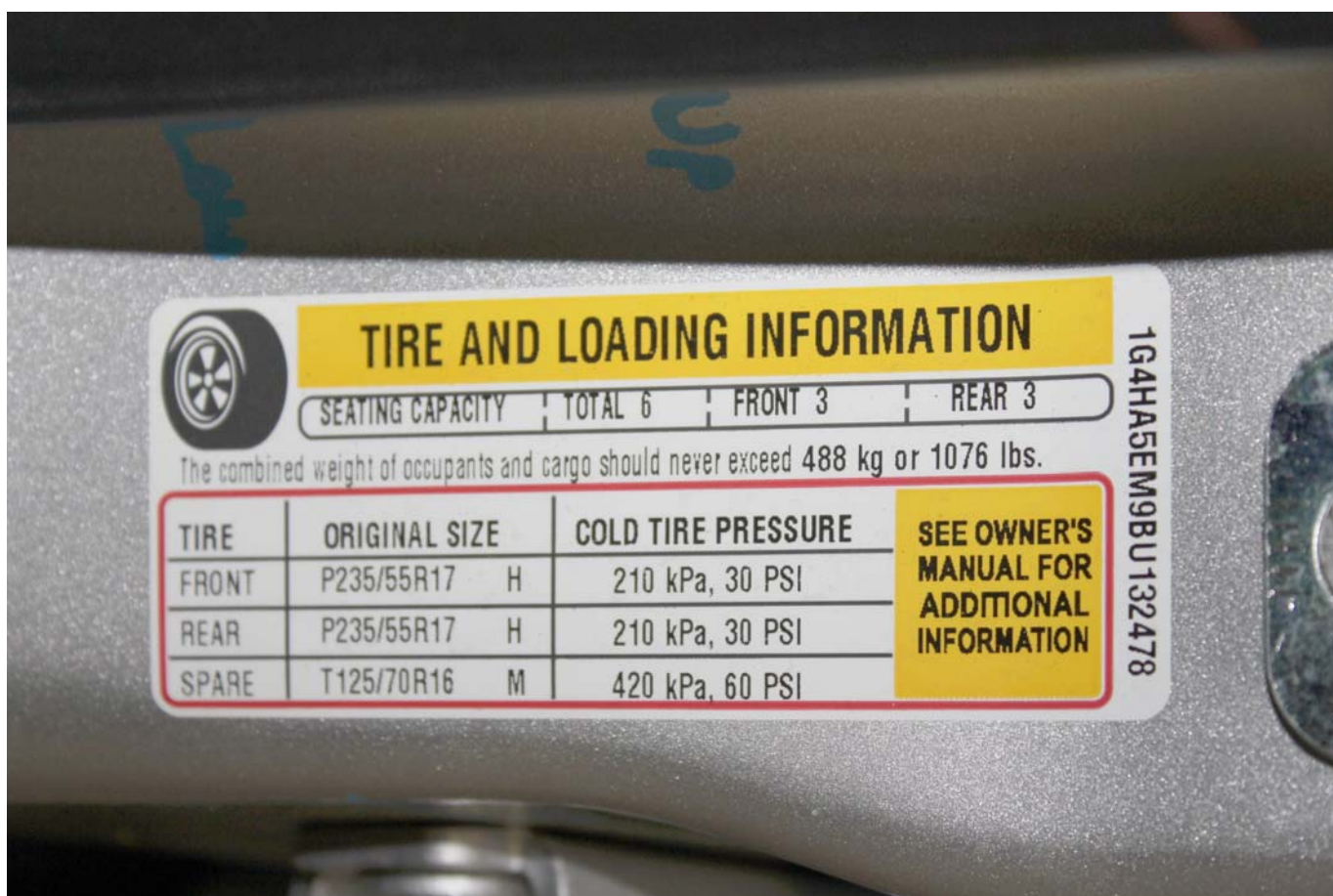
Pre-Test Right Side View of MDB Impactor Face



Post-Test Right Side View of MDB Impactor Face



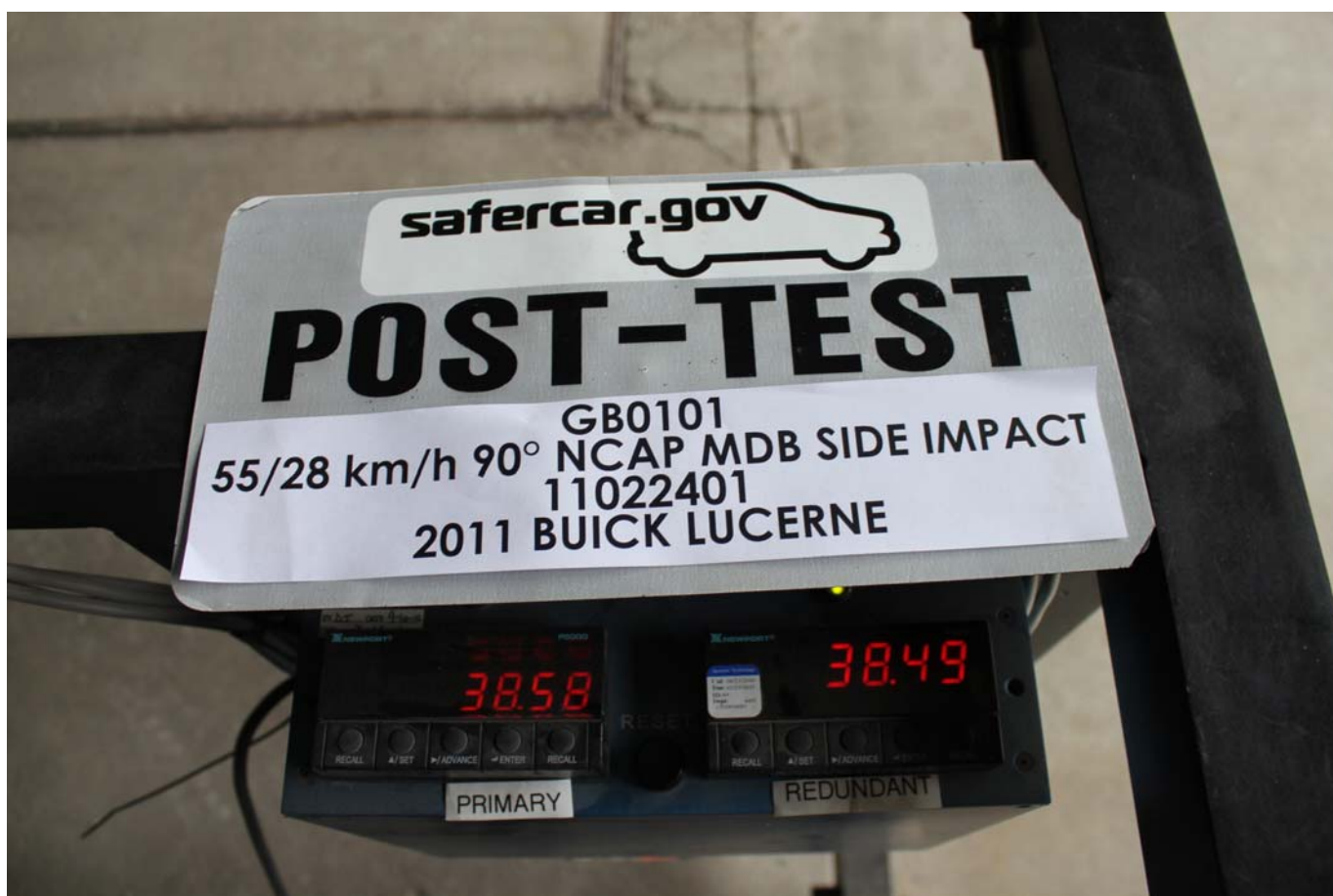
Close-Up View of Vehicle's Certification Label



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



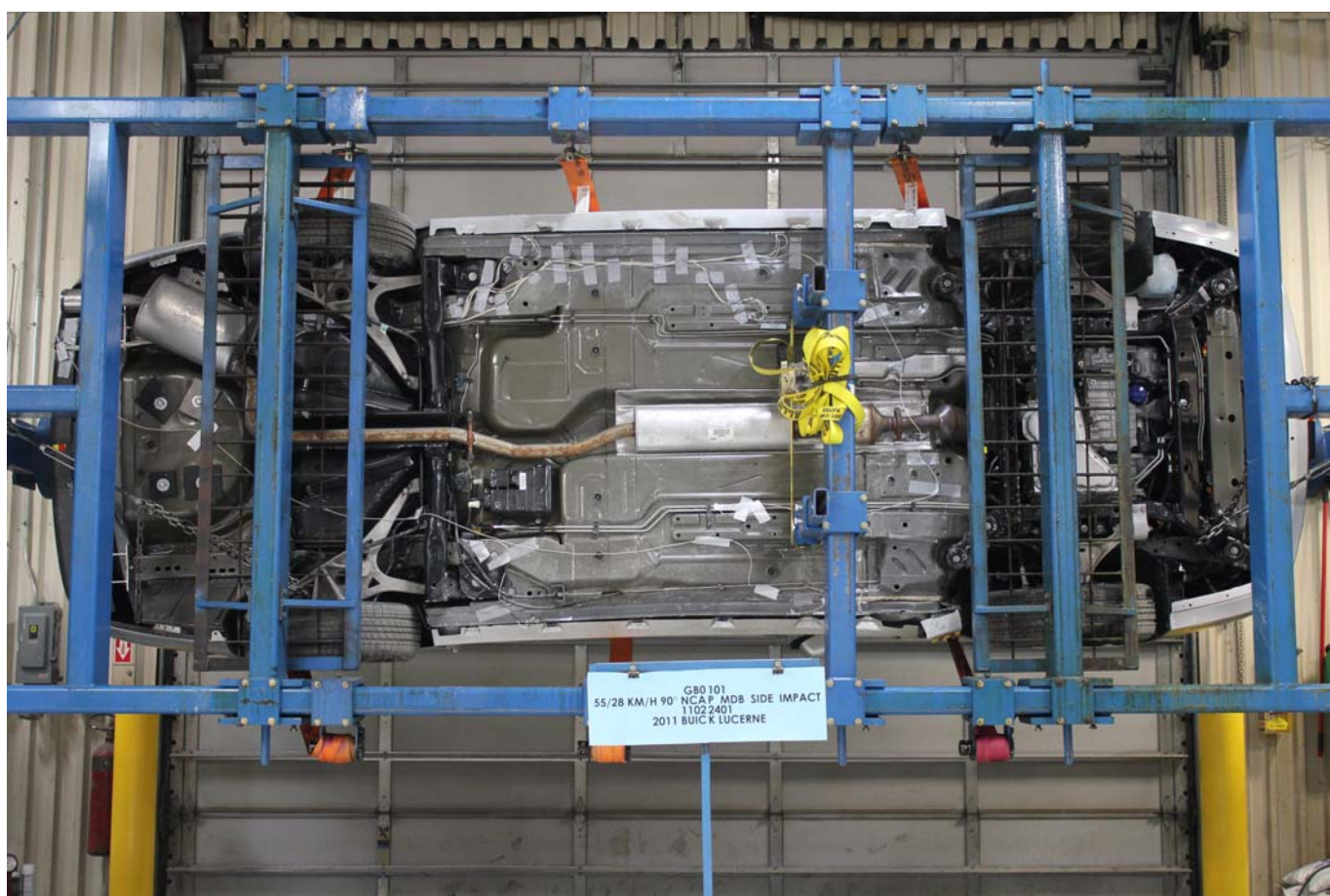
Pre-Test Ballast View



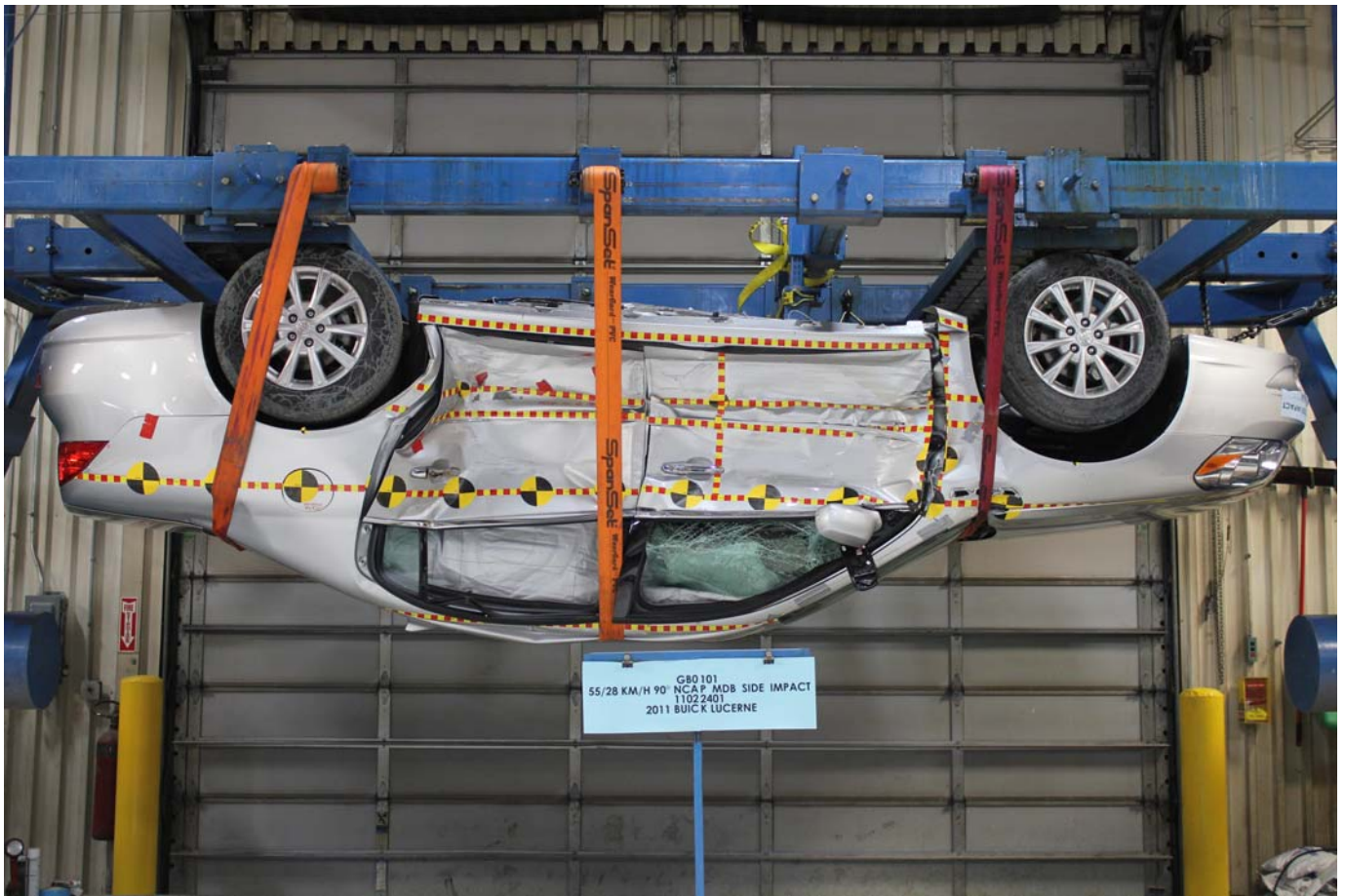
Post-Test Primary and Redundant Speed Trap Read-Out



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



EXTERIOR: QUICKSILVER METALLIC
INTERIOR: TITANIUM

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

EPA Fuel Economy Estimates



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



This label has been applied pursuant to Federal law - Do not remove prior to delivery to the ultimate purchaser. *Includes Manufacturer's Recommended Pre-Delivery Service. Does not include dealer installed options and accessories not listed above, local taxes or license fees.

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GMLBL_PROD_0018 - 08/21/2009

ORDER NO PGMWQK SALES CODE E
SALES MODEL CODE 4HP69
DEALER NO 43740
FINAL ASSEMBLY:
DETROIT MI U.S.A.

WIN 1G4HA5EM9BU132478
DEALER TO WHOM DELIVERED
SOMMER'S INC.
PO BOX 37
MEQUON, WI 53092-0037

DC
1000956926

Head Restraints

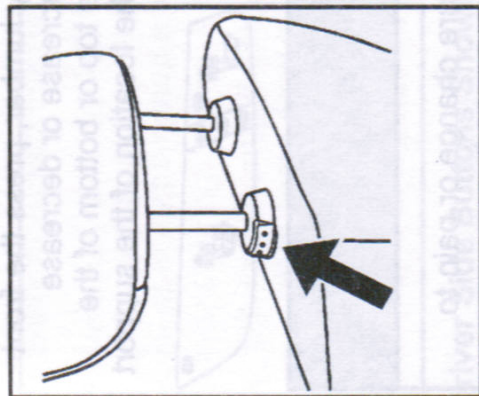
The front seats have adjustable head restraints in the outboard seating positions.

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.



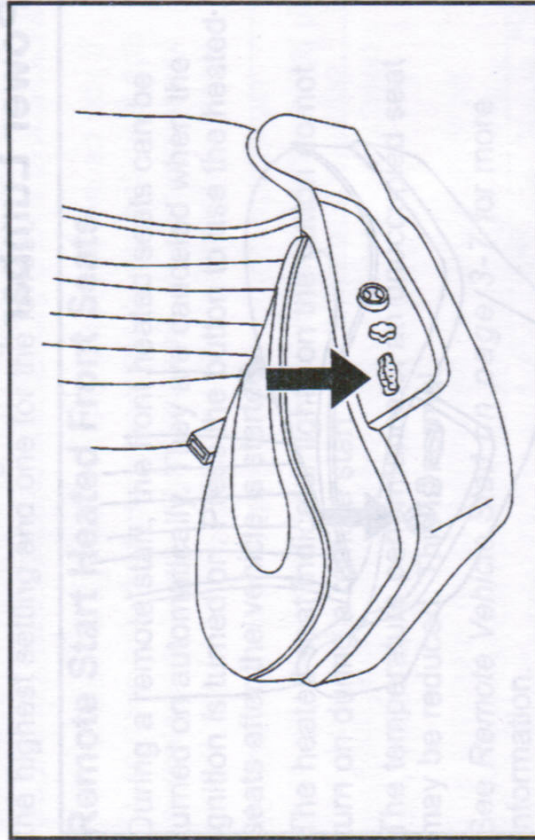
Pull the head restraint up to raise it. To lower the head restraint, press the button, located on the top of the seatback, and push the restraint down.

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
Driver & Passenger Dummy Instrumentation Plots
FILTERED DATA

<u>No.</u>	<u>Description</u>	<u>Page No.</u>
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 Acceleration Primary vs. Time	B-1
Figure No. 5.	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 6.	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 7.	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 8.	Driver Thorax Rib Deflection Maximum vs. Time	B-2
Figure No. 9.	Driver Anterior Abdomen Force (Y) vs. Time	B-3
Figure No. 10.	Driver Middle Abdomen Force (Y) vs. Time	B-3
Figure No. 11.	Driver Posterior Abdomen Force (Y) vs. Time	B-3
Figure No. 12.	Driver Total Abdominal Force (Y) vs. Time	B-3
Figure No. 13.	Driver Pubic Symphysis Force (Y) vs. Time	B-4
Figure No. 14.	Passenger Head Acceleration (X) Primary vs. Time	B-5
Figure No. 15.	Passenger Head Acceleration (Y) Primary vs. Time	B-5
Figure No. 16.	Passenger Head Acceleration (Z) Primary vs. Time	B-5
Figure No. 17.	Passenger Head Resultant Acceleration Primary vs. Time	B-5
Figure No. 18.	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-6
Figure No. 19.	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
Figure No. 20.	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
Figure No. 21.	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
Figure No. 22.	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
Figure No. 23.	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
Figure No. 24.	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.nhtsa.dot.gov

Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Shoulder Contact Switch – Not Installed
Driver Torso Contact Switch – Not Installed
Driver Pelvis Contact Switch – Not Installed
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)
Passenger Shoulder Contact Switch – Not Installed
Passenger Torso Contact Switch – Not Installed
Passenger Pelvis Contact Switch – Not Installed

Vehicle Instrumentation Data

Driver Side Airbag Timing
Driver Side Curtain Airbag Timing (not installed)
Passenger Side Airbag Timing (not installed)
Passenger Side Curtain Airbag Timing (not installed)
Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Track Acceleration (Y)
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)

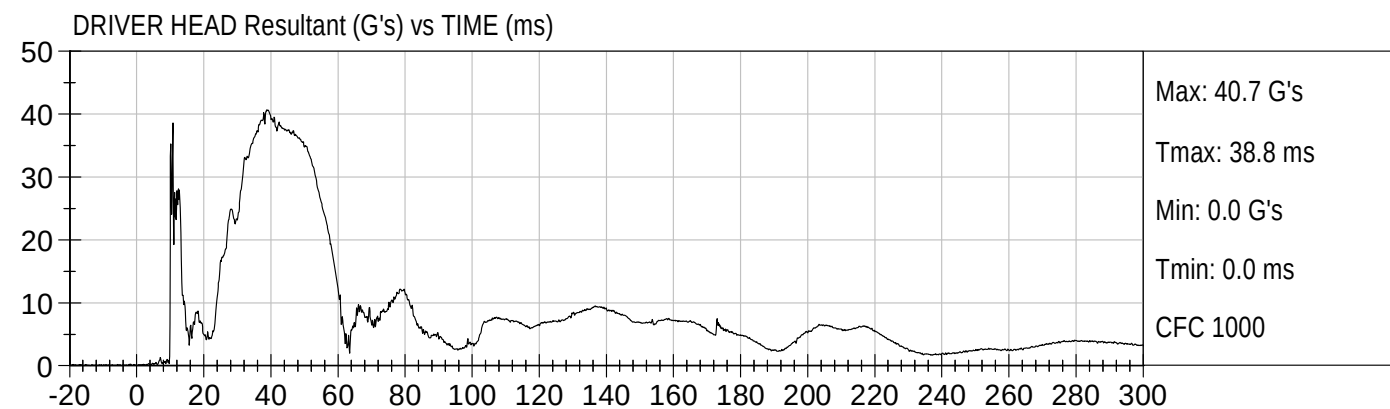
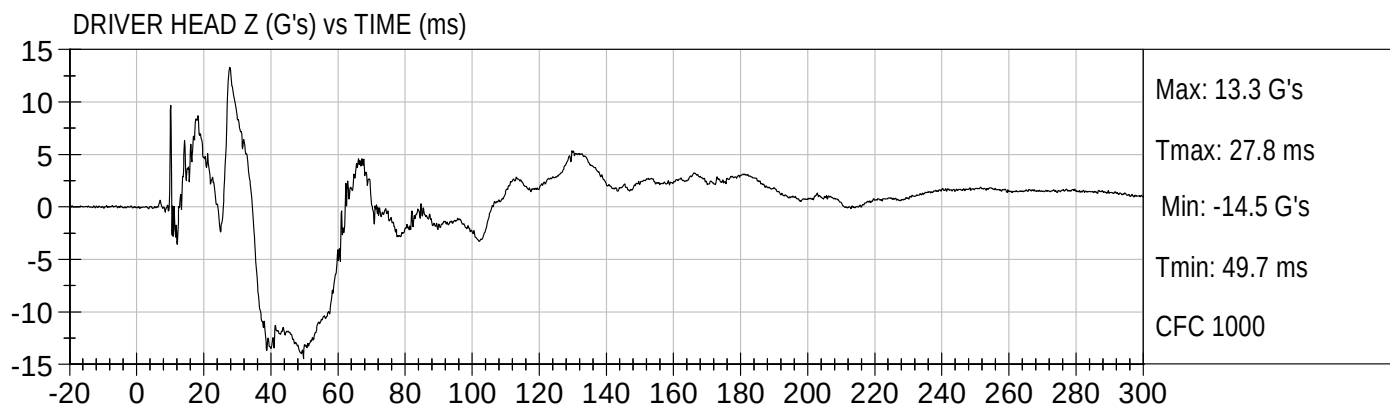
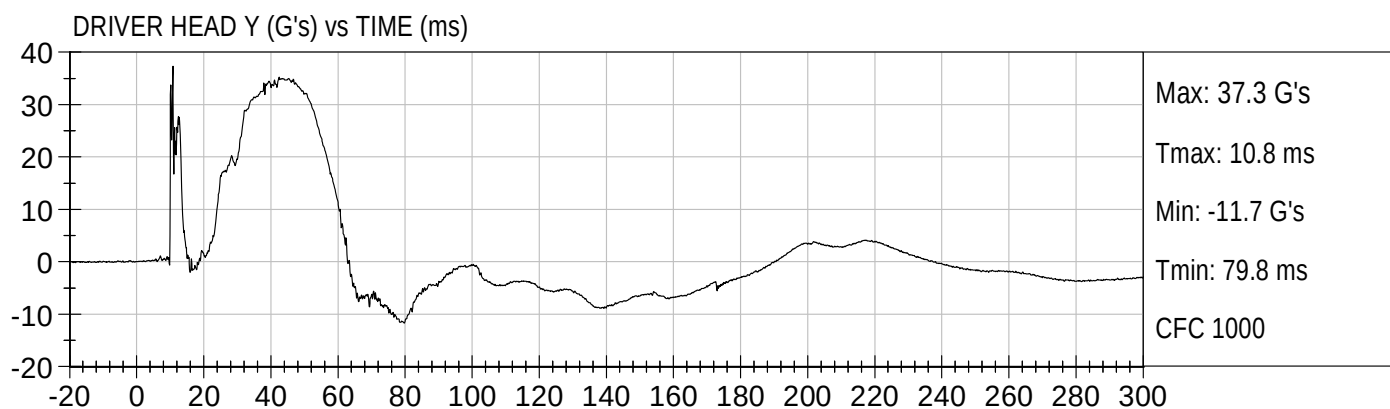
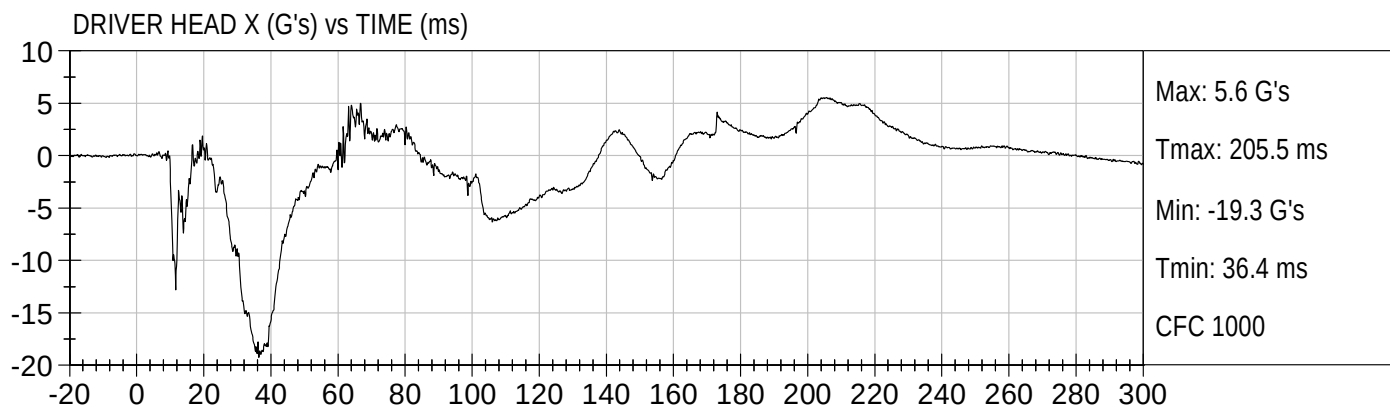
MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch



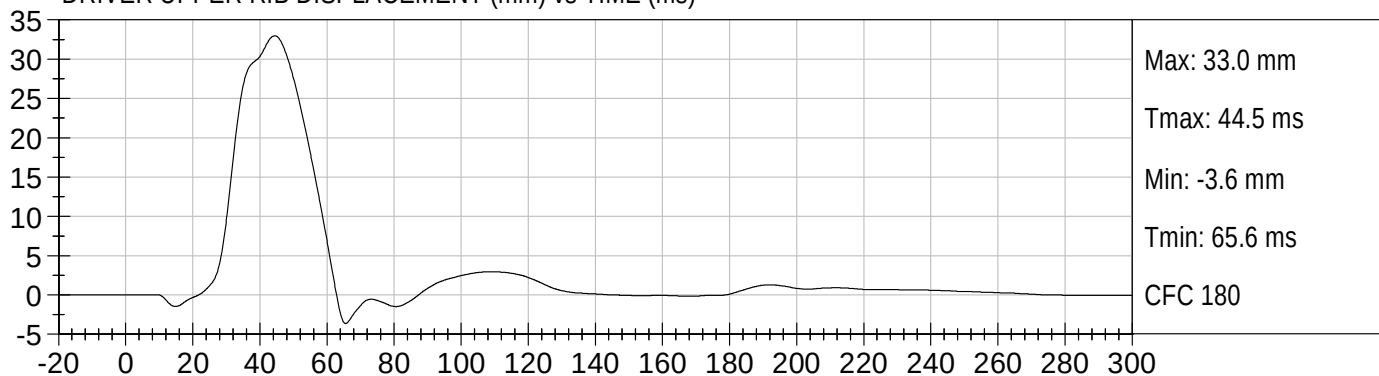
55/28 km/h 90° NCAP MDB Side Impact
2011 Buick Lucerne - GB0101

Test Date: 02/24/2011
Speed: 38.6 mph (62.1 km/h)

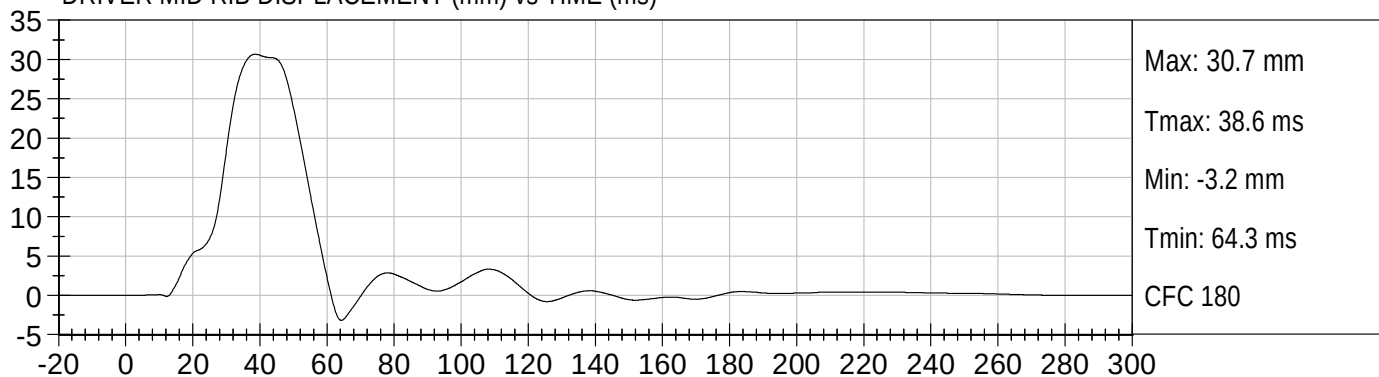




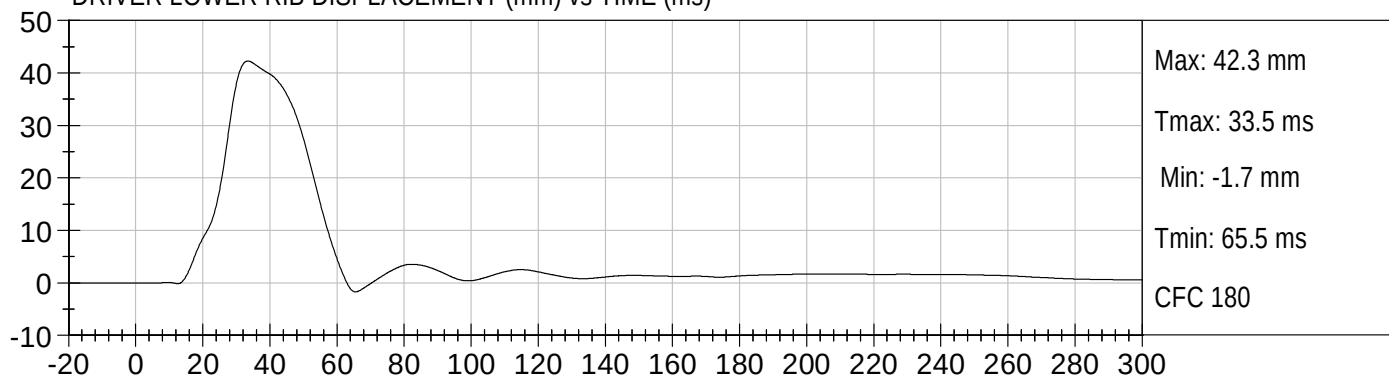
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



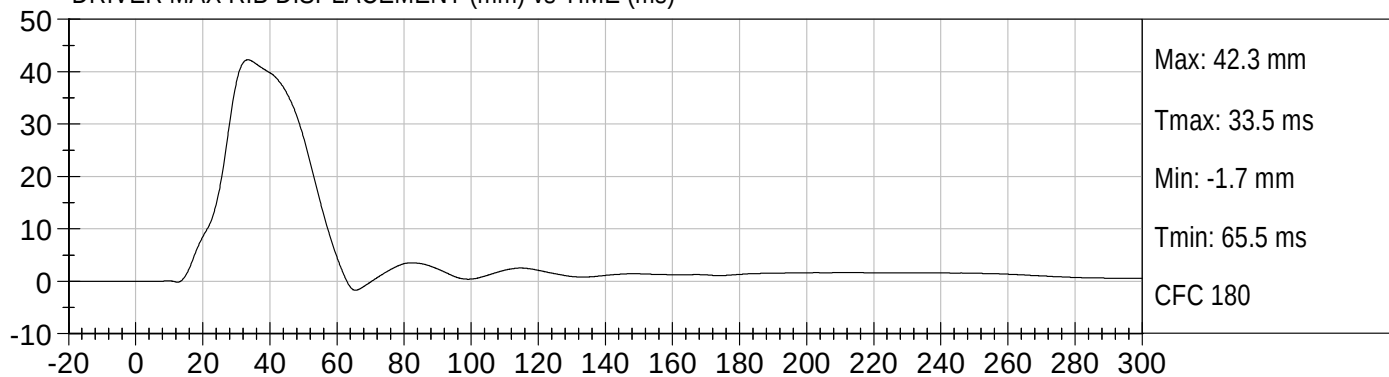
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



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



DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)

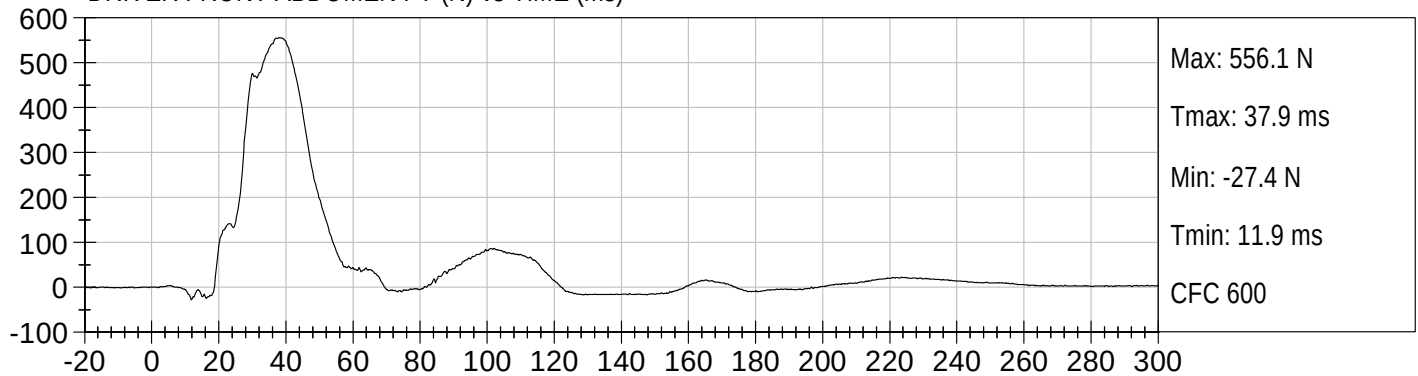




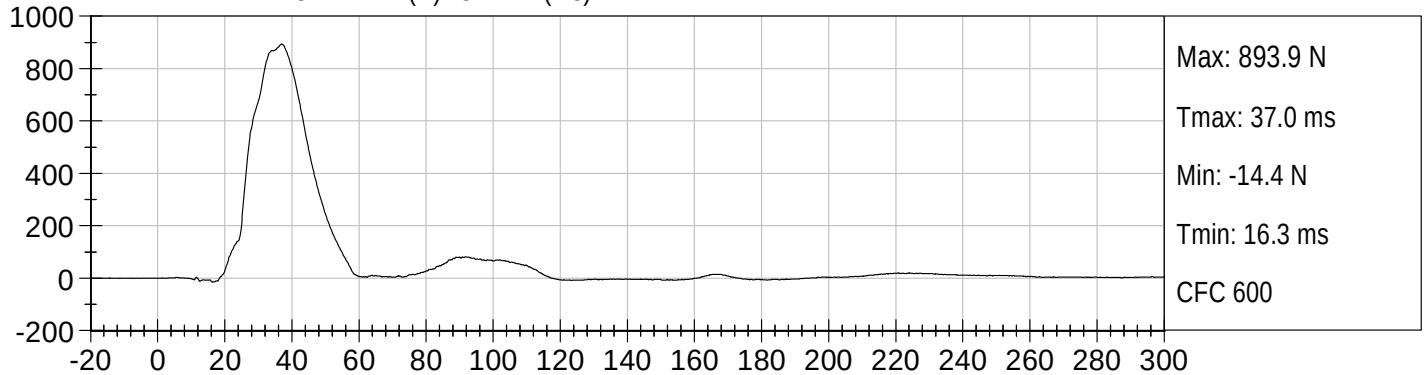
55/28 km/h 90° NCAP MDB Side Impact
2011 Buick Lucerne - GB0101

Test Date: 02/24/2011
Speed: 38.6 mph (62.1 km/h)

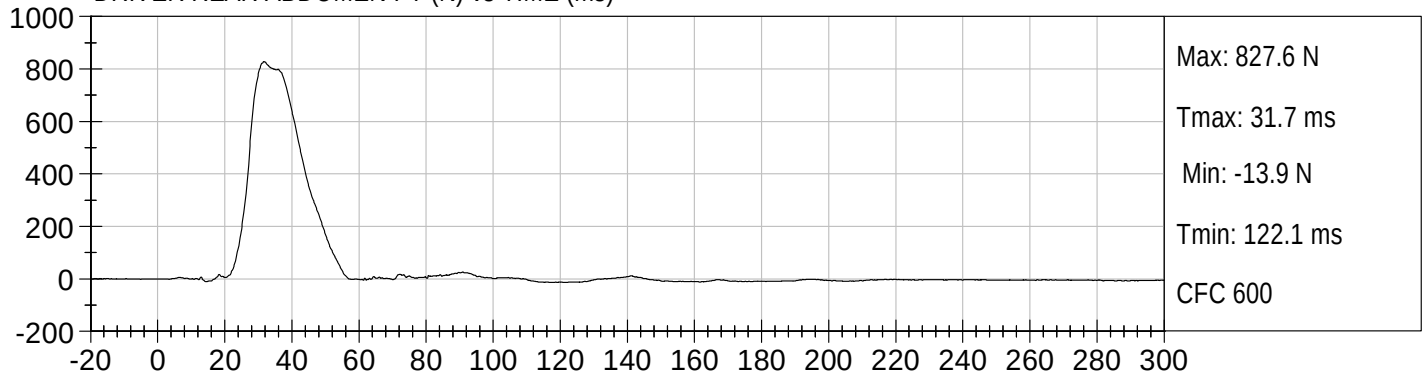
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



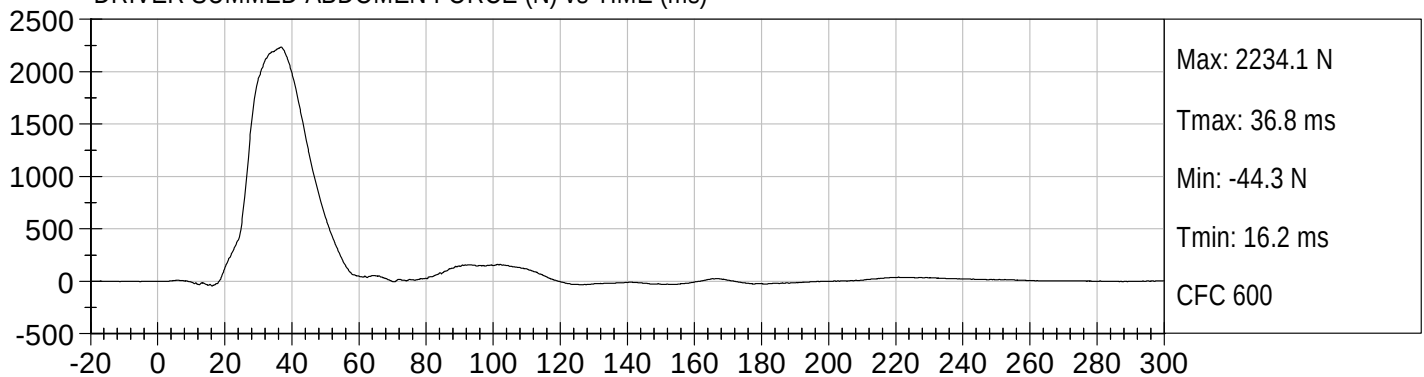
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



DRIVER REAR ABDOMEN FY (N) vs TIME (ms)



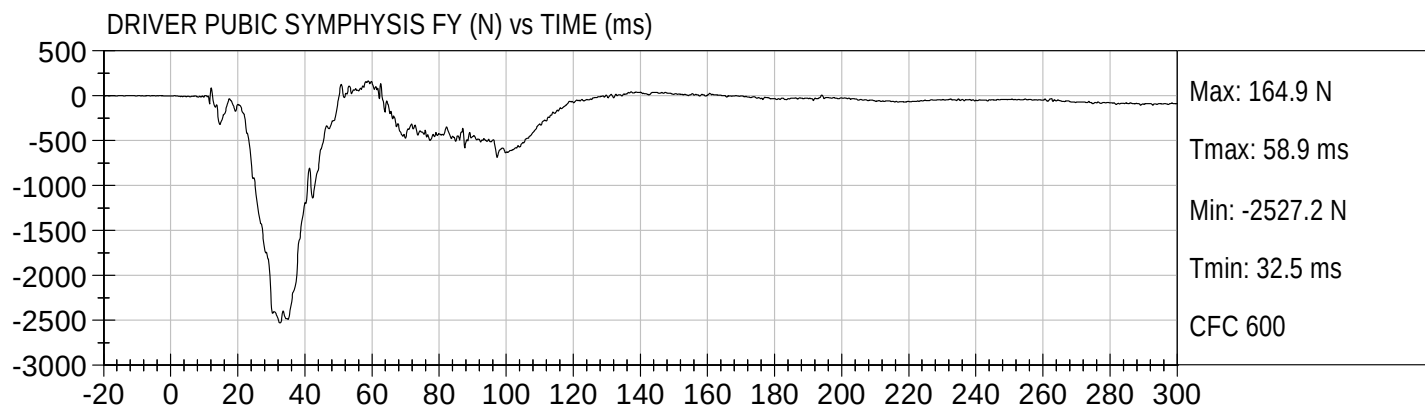
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)





55/28 km/h 90° NCAP MDB Side Impact
2011 Buick Lucerne - GB0101

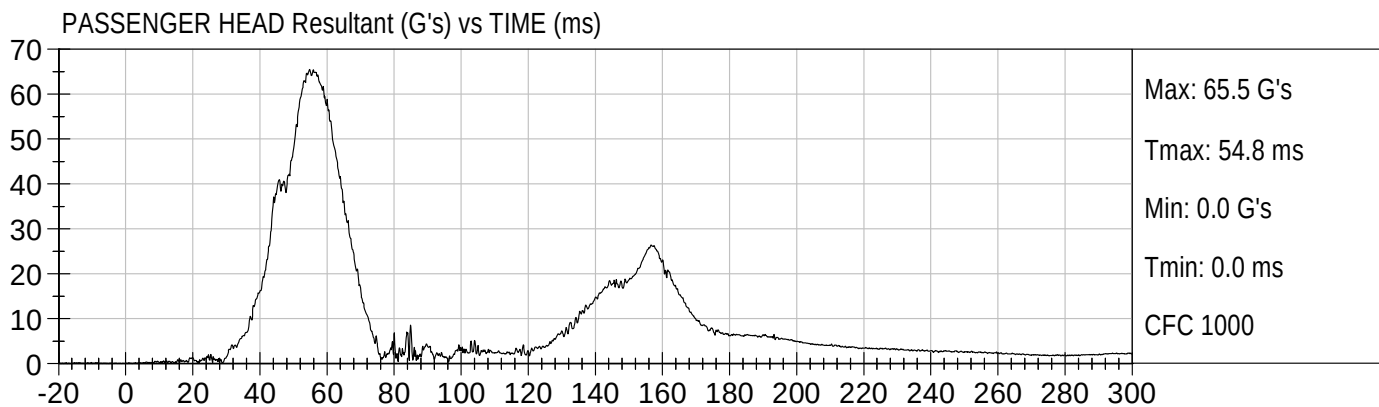
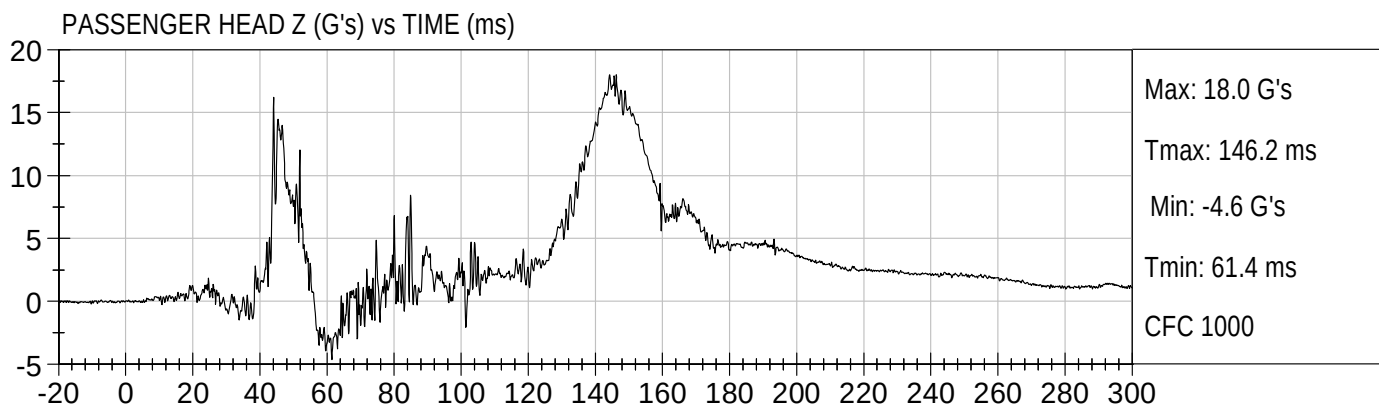
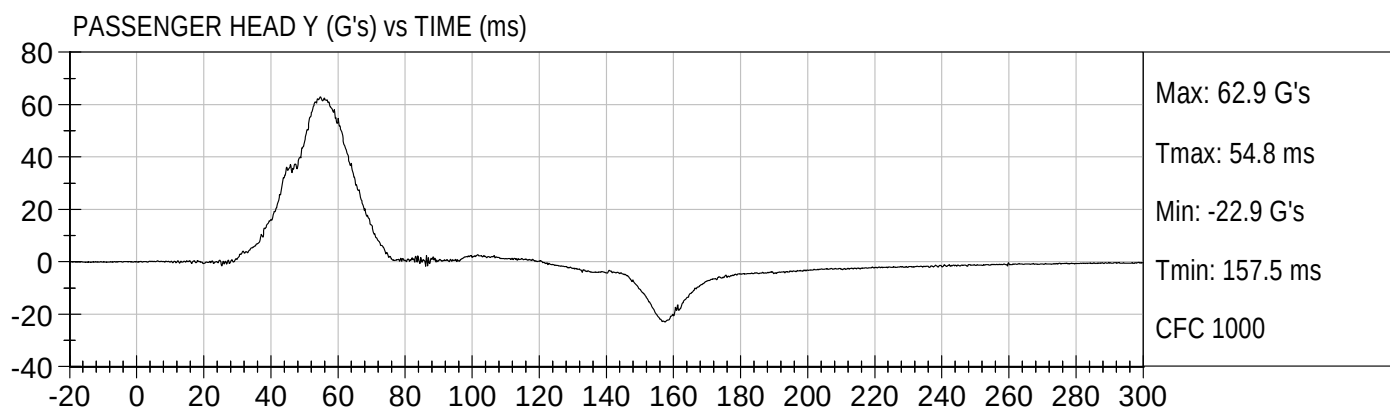
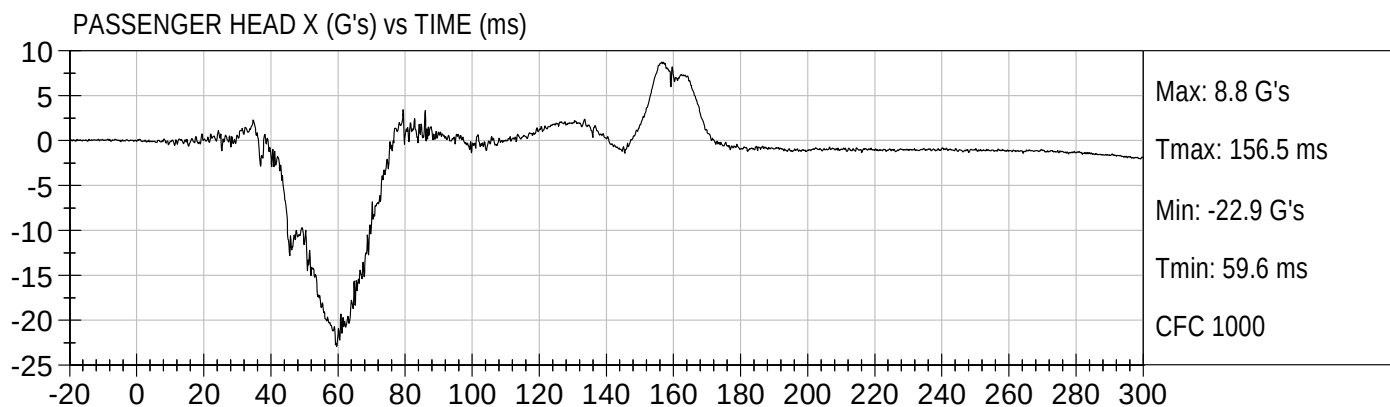
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Speed: 38.6 mph (62.1 km/h)





55/28 km/h 90° NCAP MDB Side Impact
2011 Buick Lucerne - GB0101

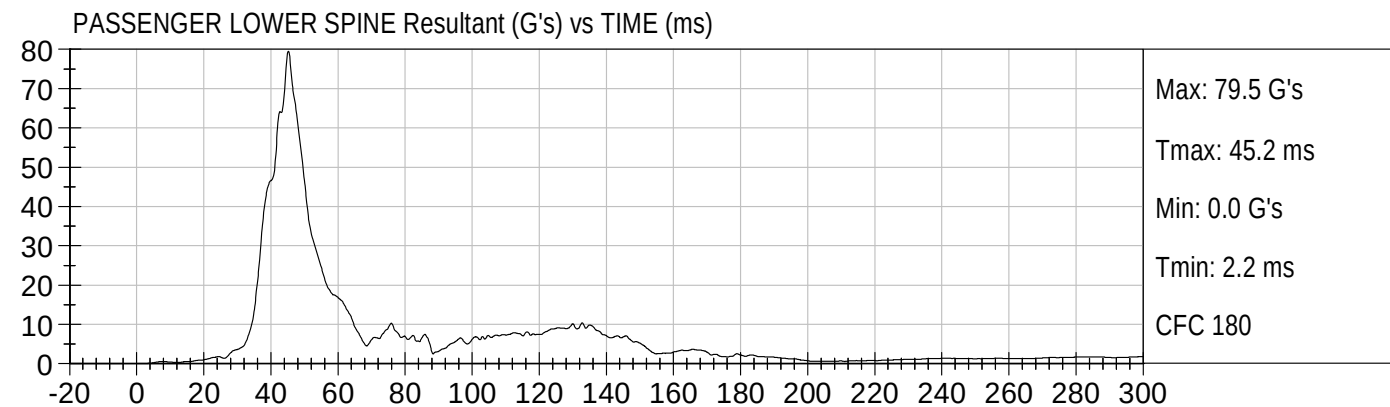
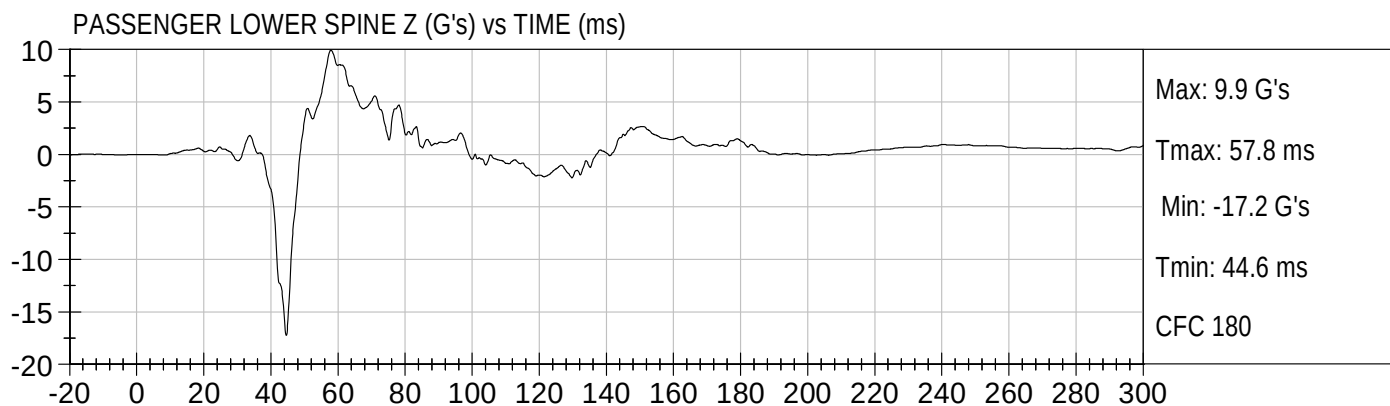
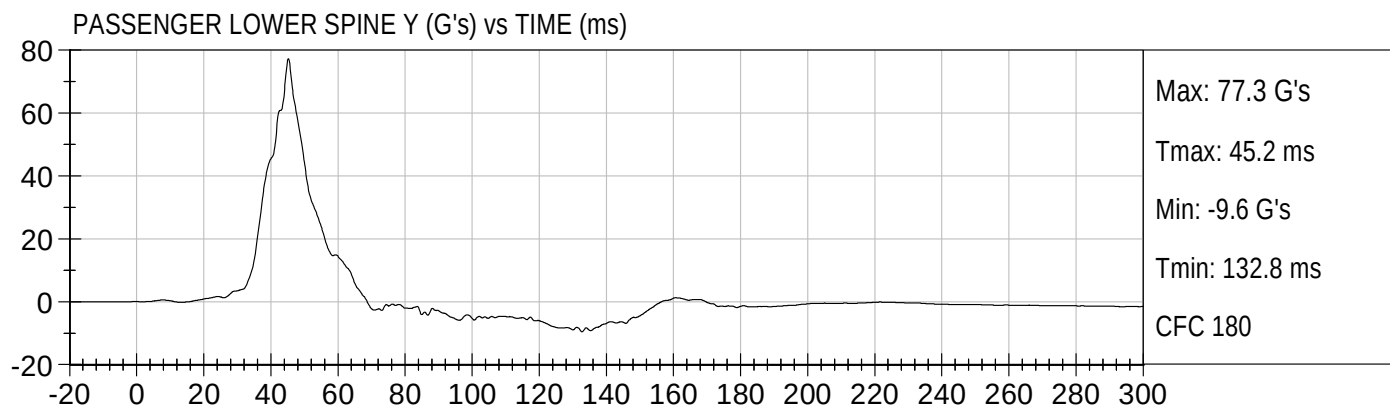
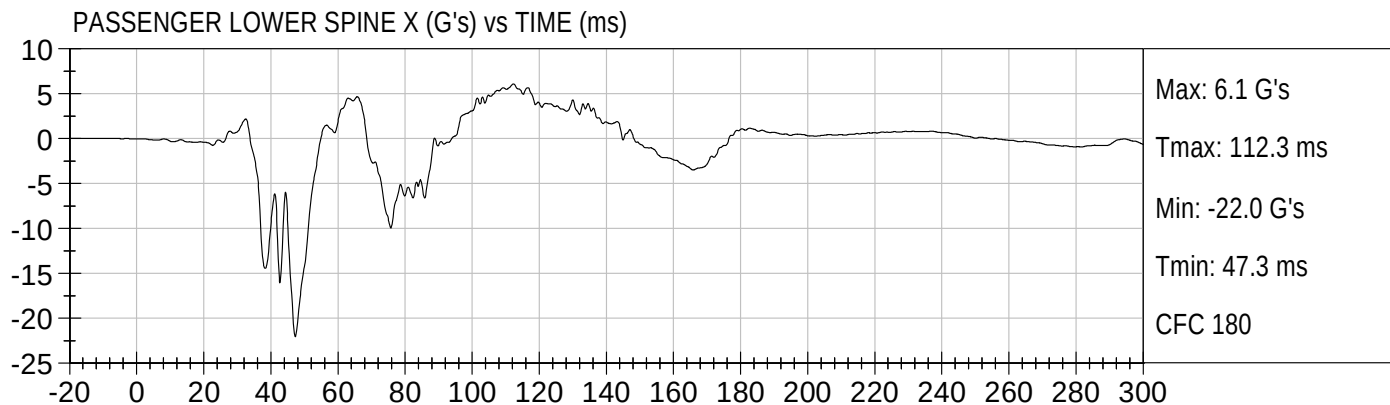
Test Date: 02/24/2011
Speed: 38.6 mph (62.1 km/h)

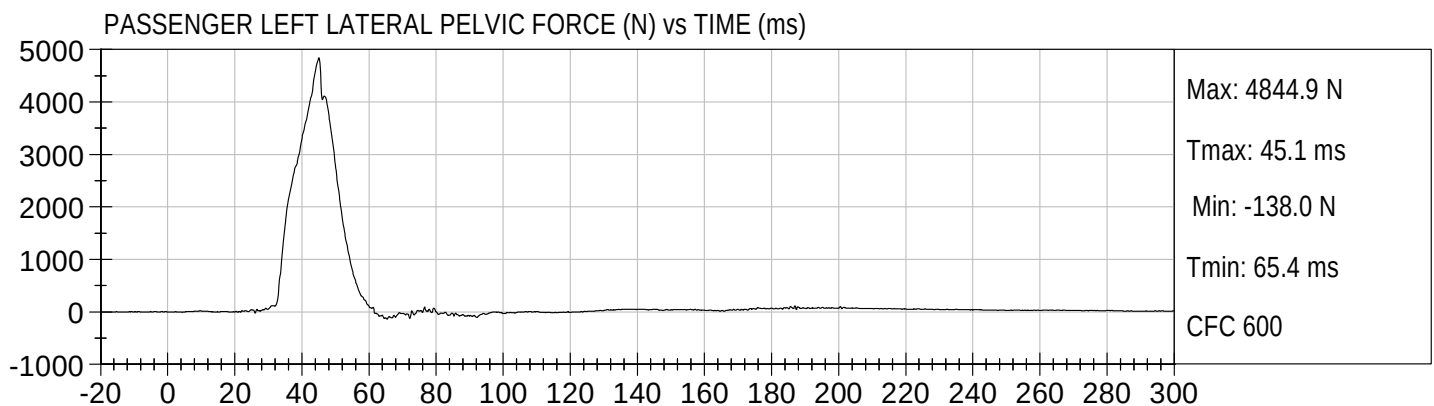
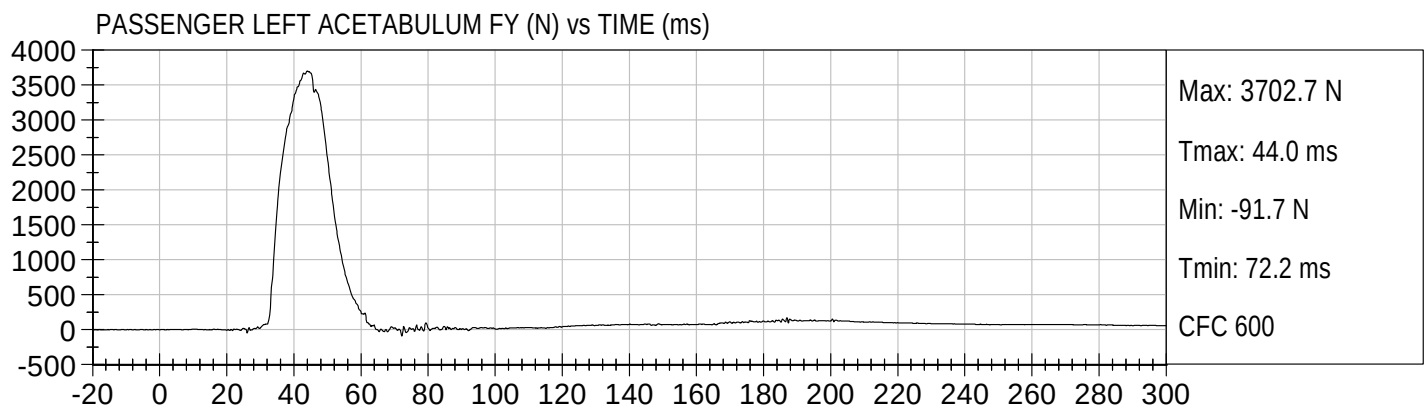
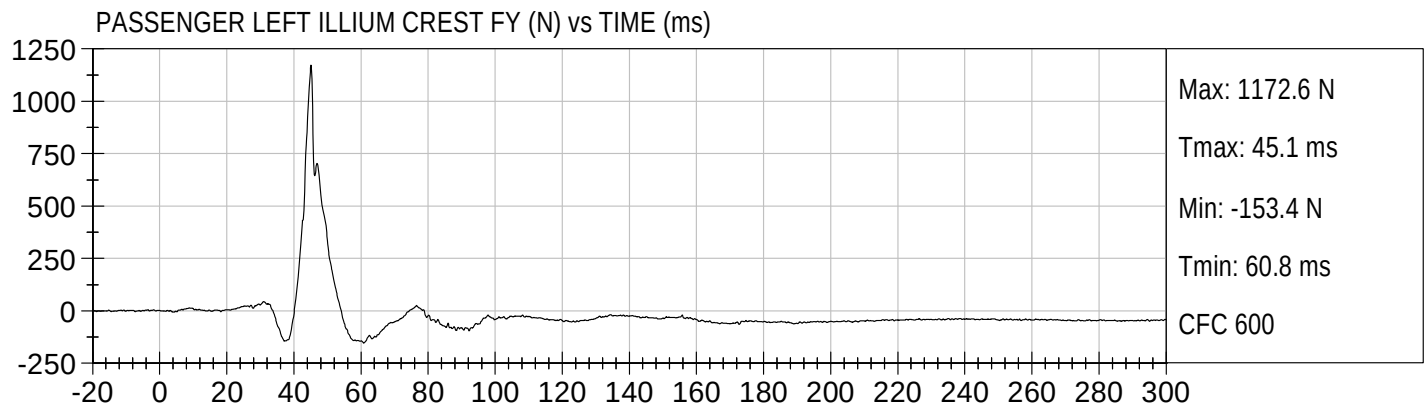




55/28 km/h 90° NCAP MDB Side Impact
2011 Buick Lucerne - GB0101

Test Date: 02/24/2011
Speed: 38.6 mph (62.1 km/h)





APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032

Test ID: D11661

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	125 to 155	154	Pass
Peak Lateral Acceleration	G's	+/- 15	-9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

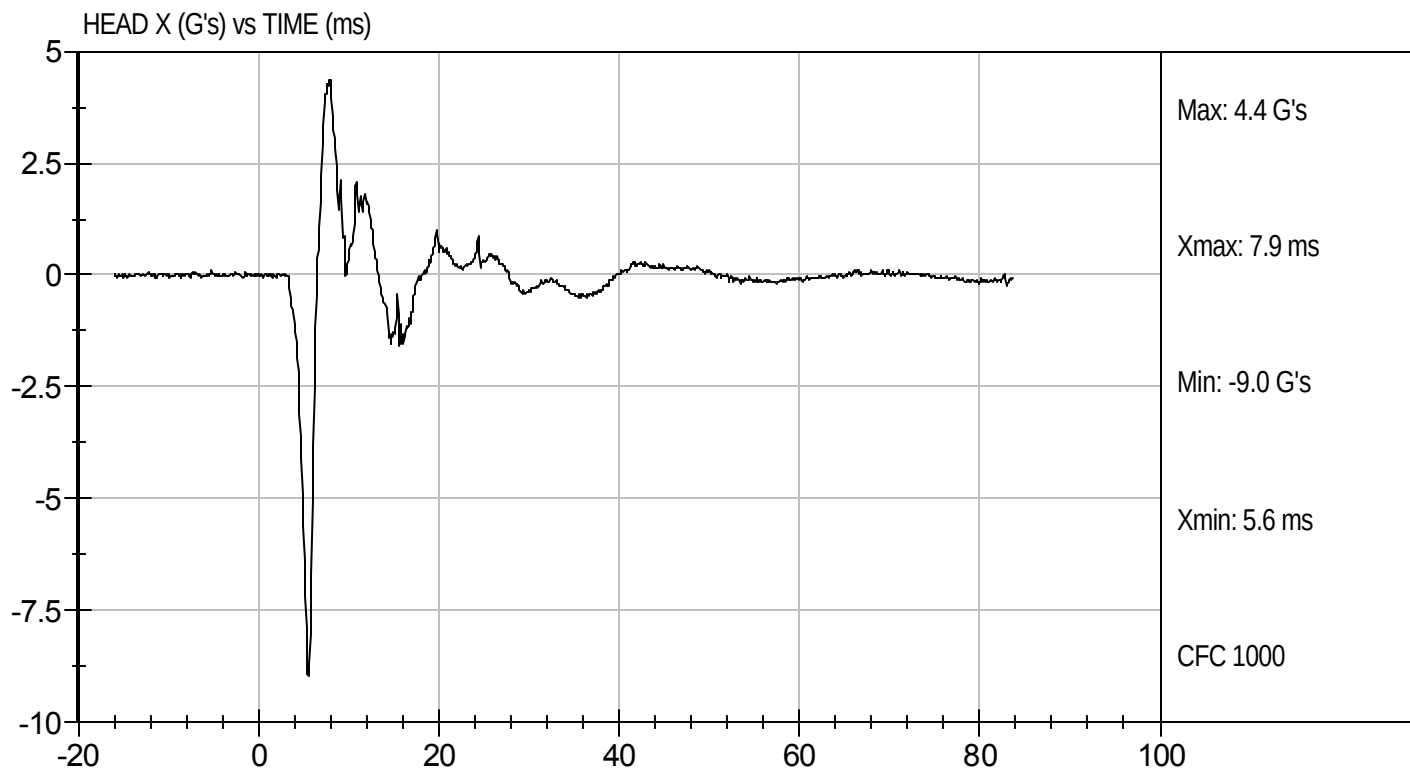
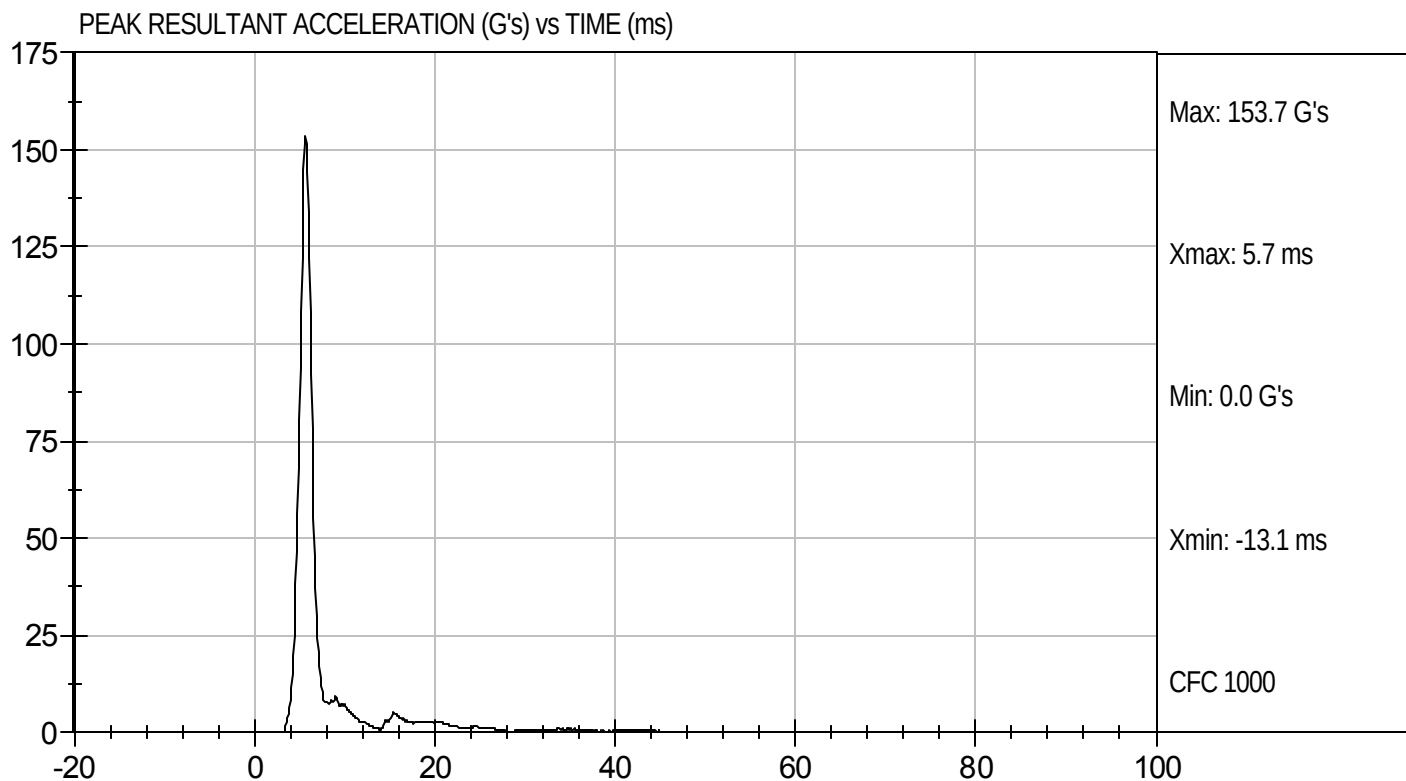
2/23/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D11661

Test Date: 2/23/11
Velocity: 0 ft/s, 0 m/s

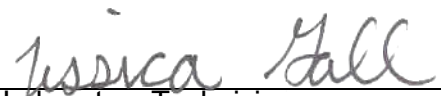


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11662

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	23	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.4	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.36	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.3	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	59.5	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	61.1	Pass
Overall Test Results					Pass


 Laboratory Technician

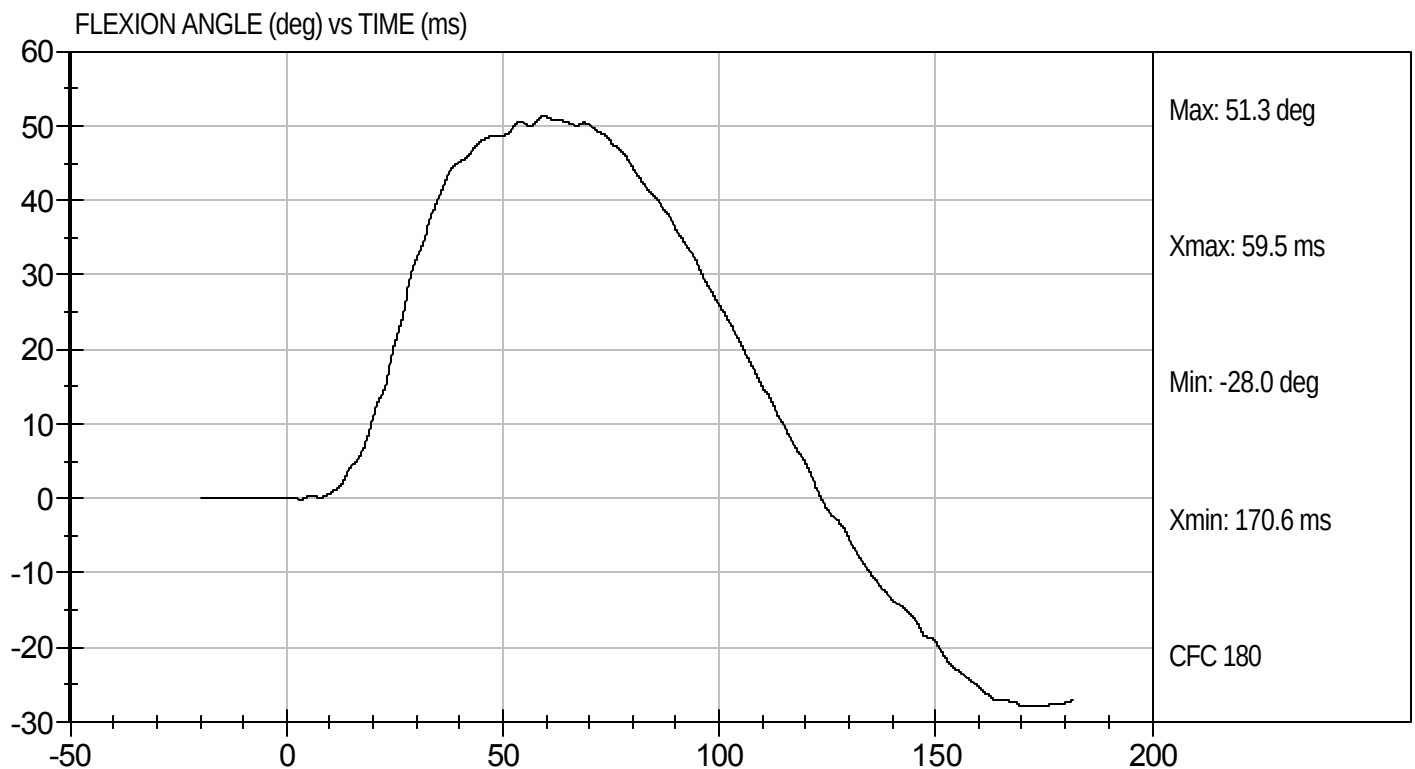
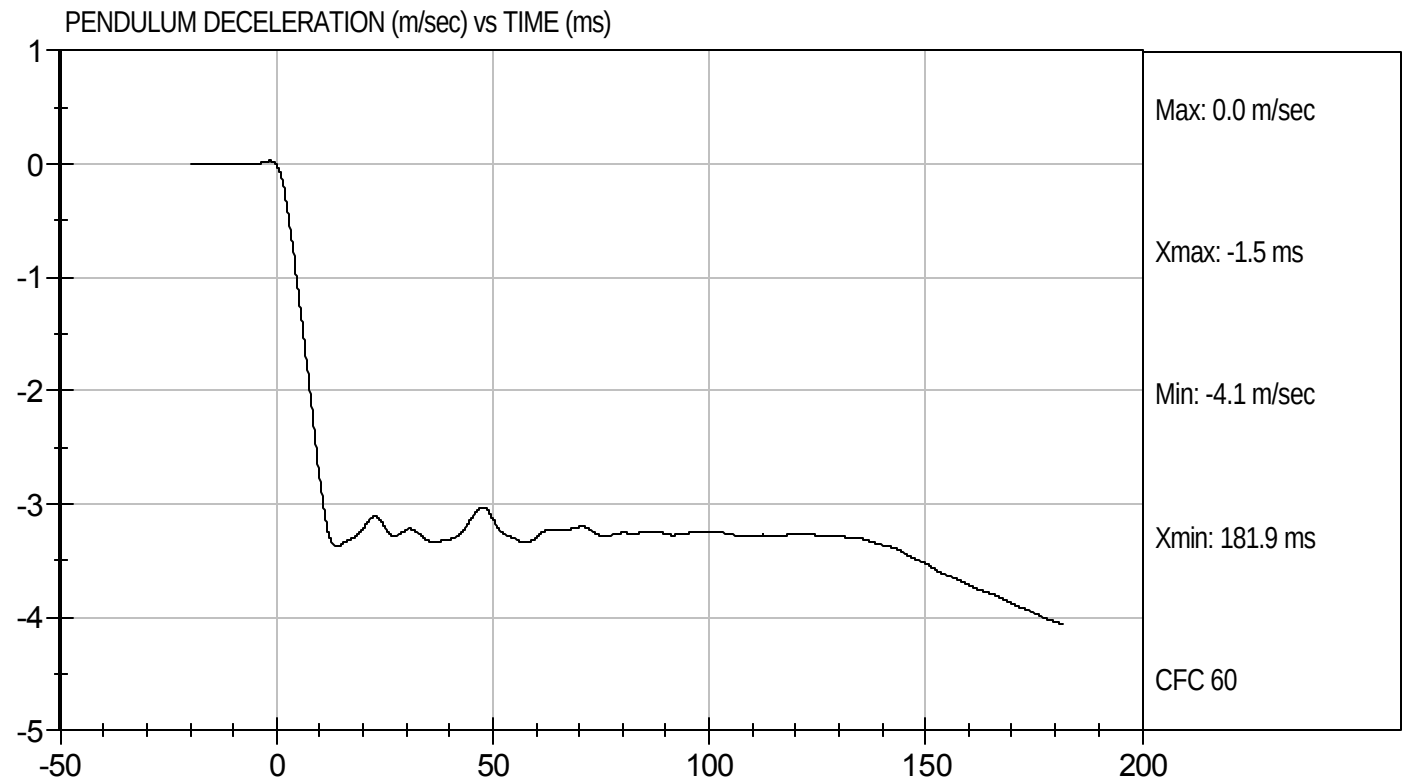
2/23/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11662

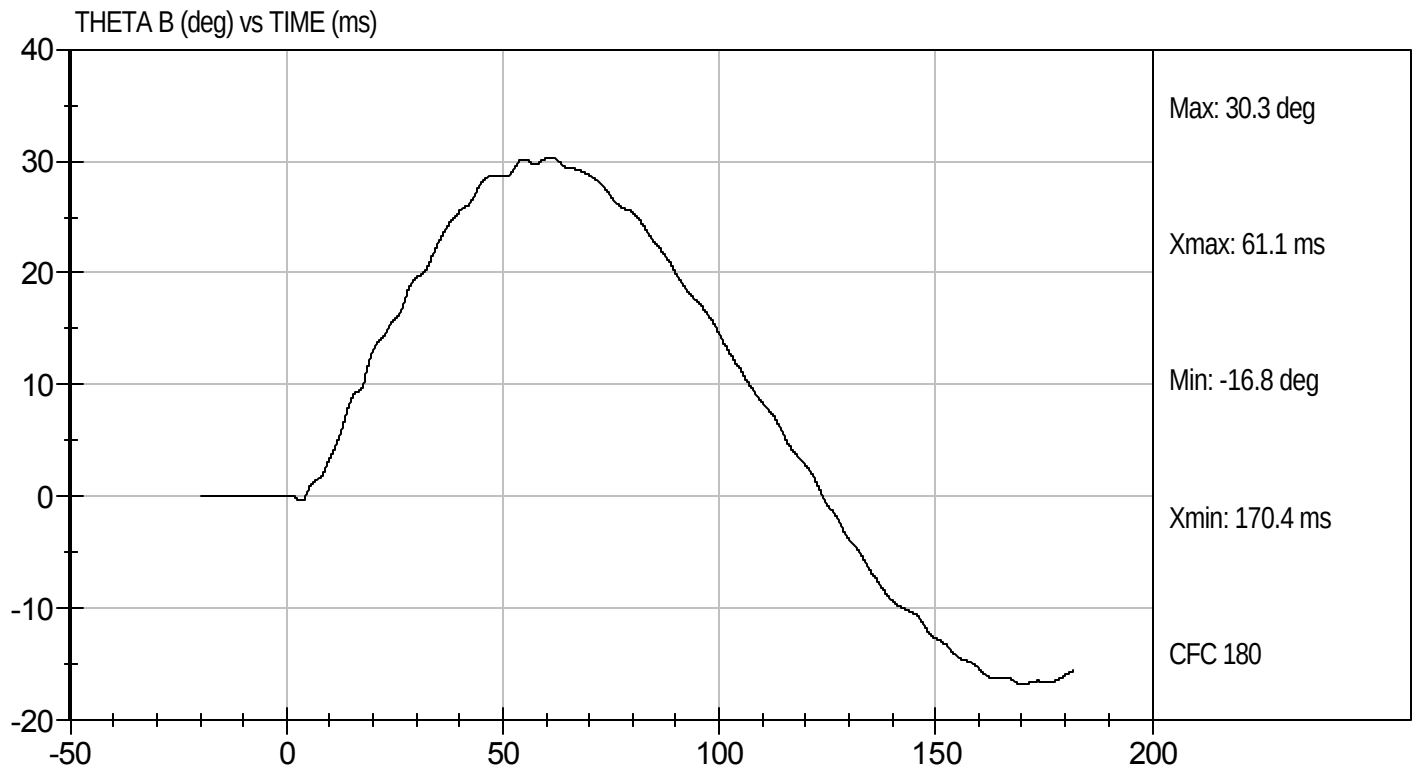
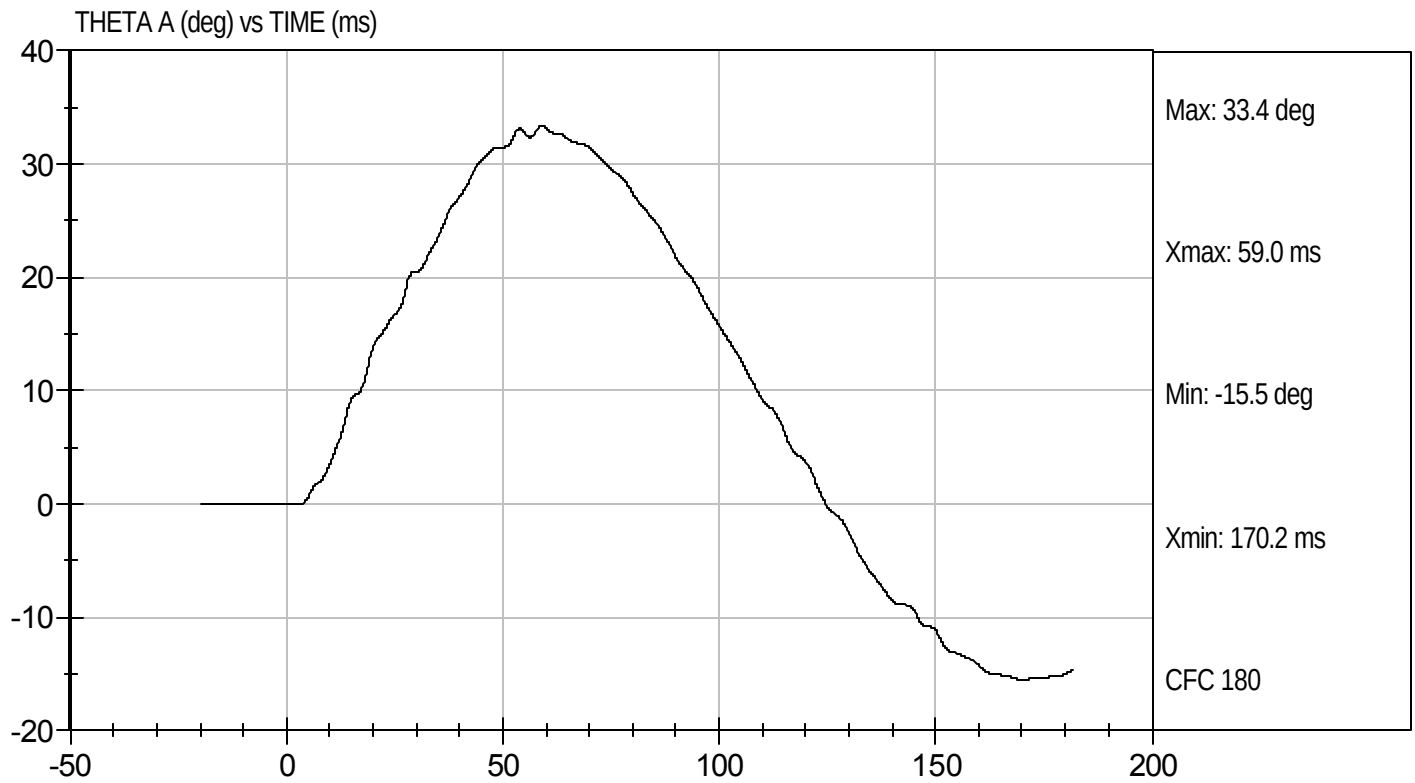
Test Date: 2/23/11
Velocity: 11.26 ft/s, 3.4 m/s





Test Desc: Neck Bending
Component ID: D11662

Test Date: 2/23/11
Velocity: 11.26 ft/s, 3.4 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11663

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
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.1	Pass
Time of Peak Shoulder Acceleration	ms	NA	32.4	Pass
Overall Test Results			Pass	


Laboratory Technician

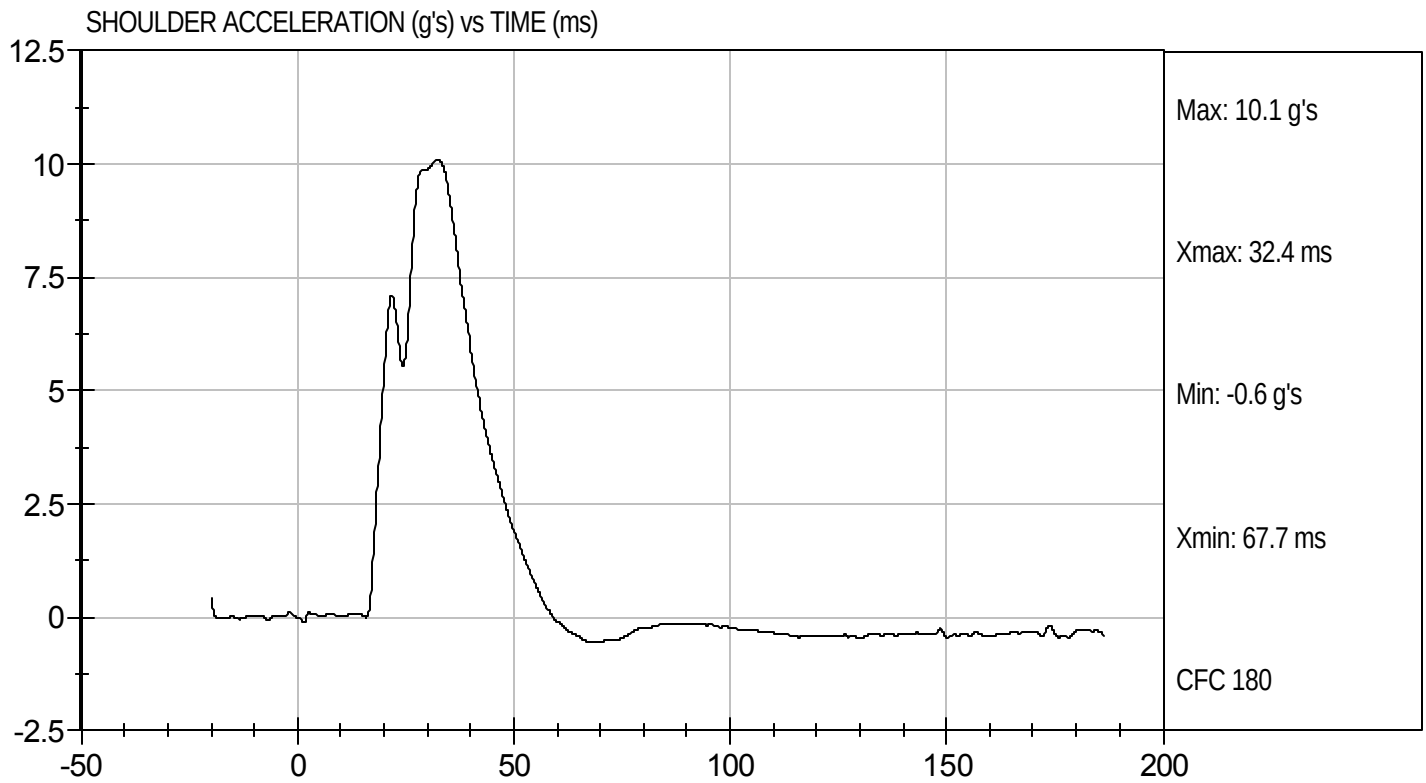
2/23/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11663

Test Date: 2/23/11
Velocity: 14.25 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11664

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.9	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.1	Pass
			Overall Test Results	Pass


Laboratory Technician

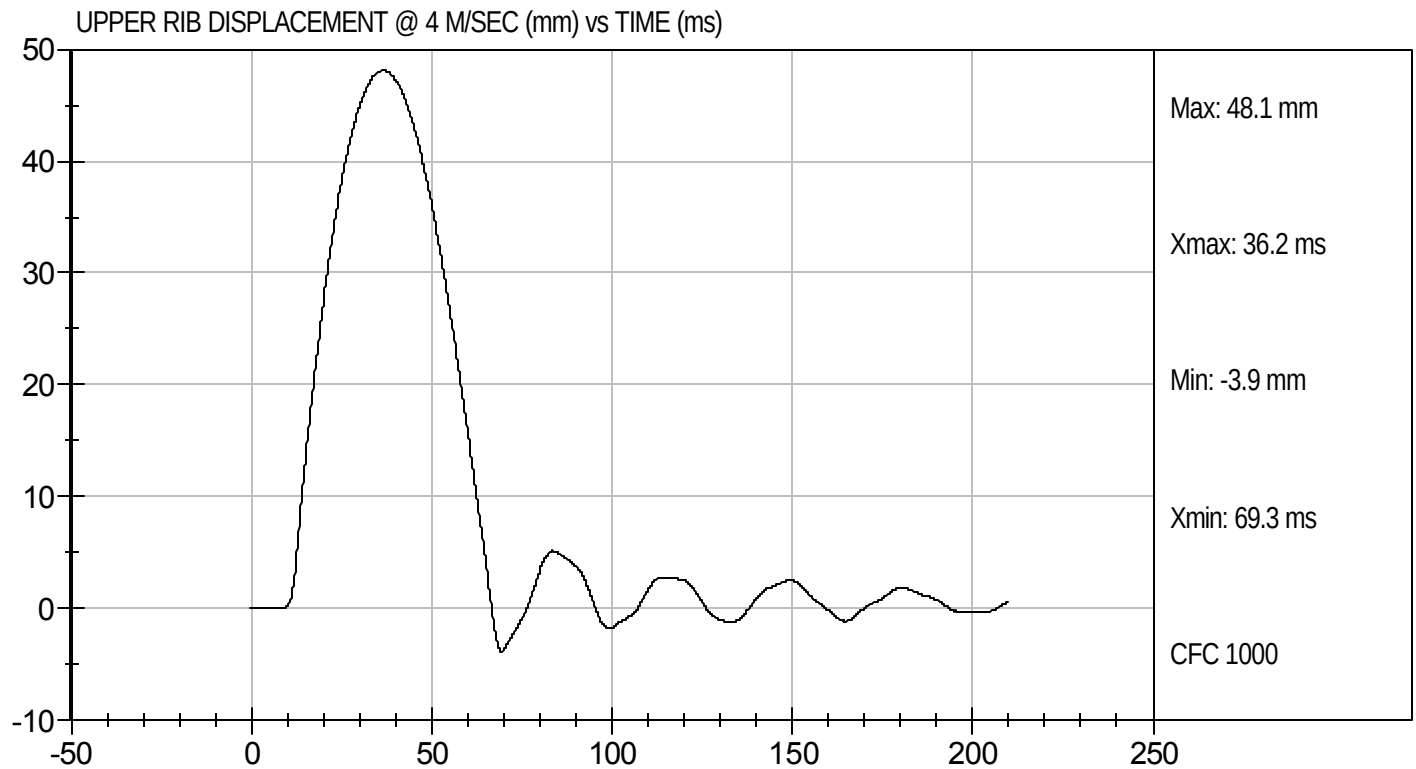
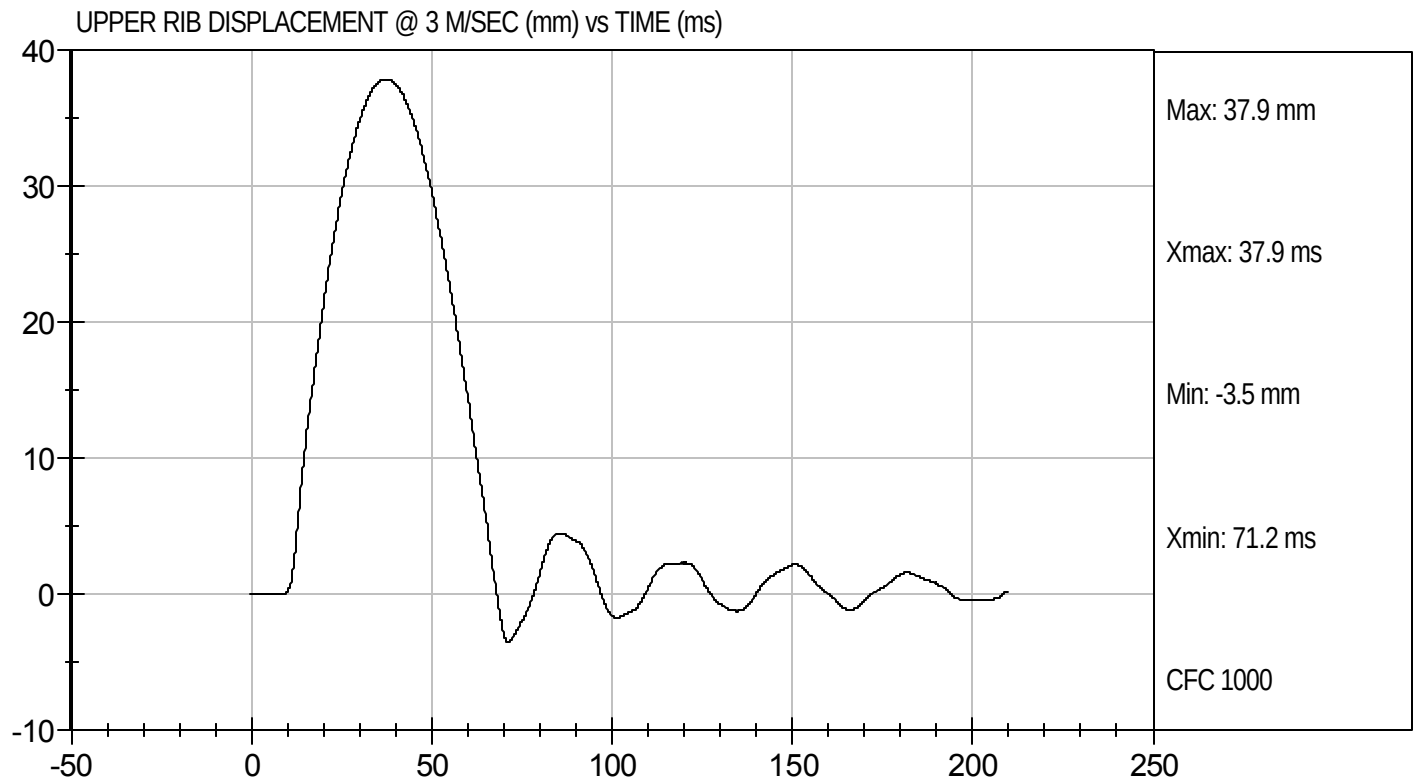
2/23/11
Test Date


Approved By



Test Desc: Rib Impact - Upper
Component ID: D11664

Test Date: 2/23/11



MGA RESEARCH CORPORATION

MID RIB TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11665

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.3	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

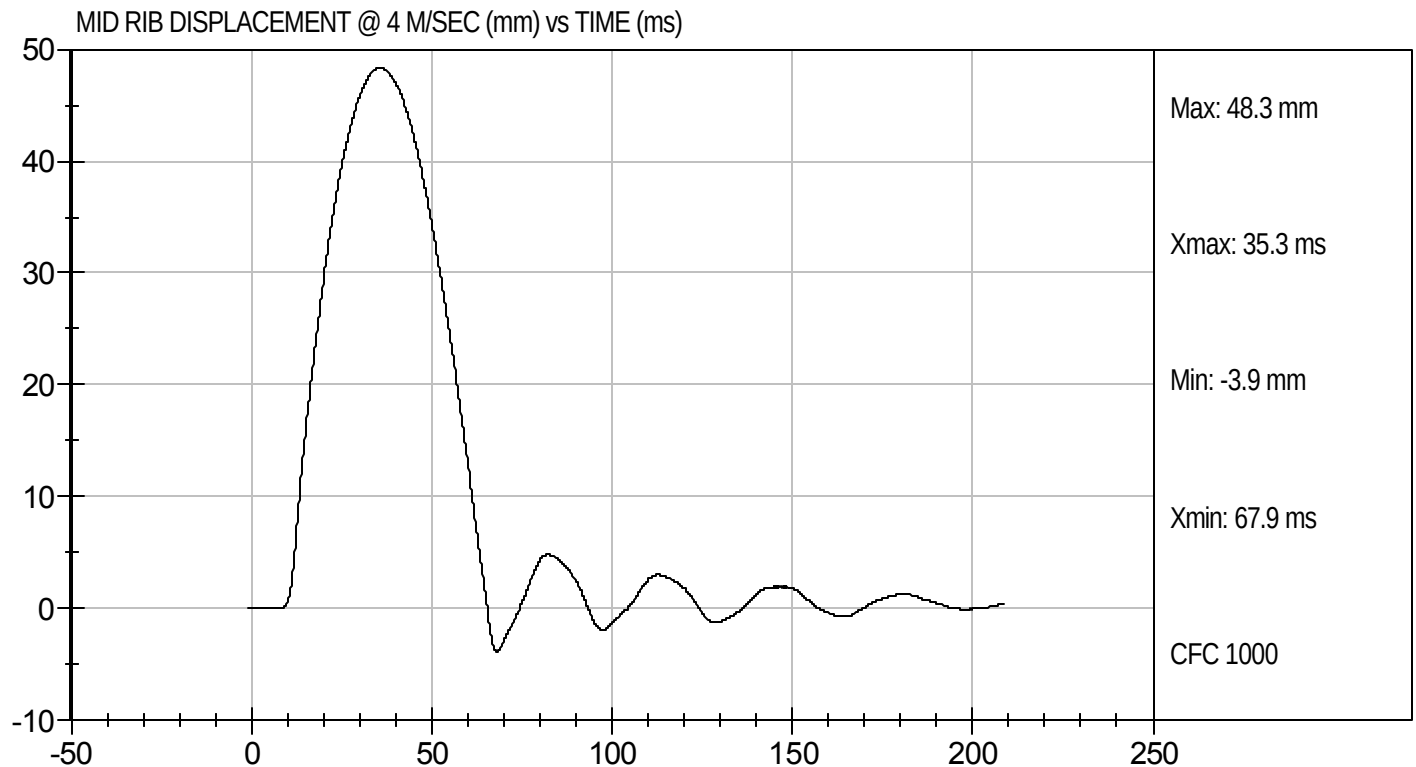
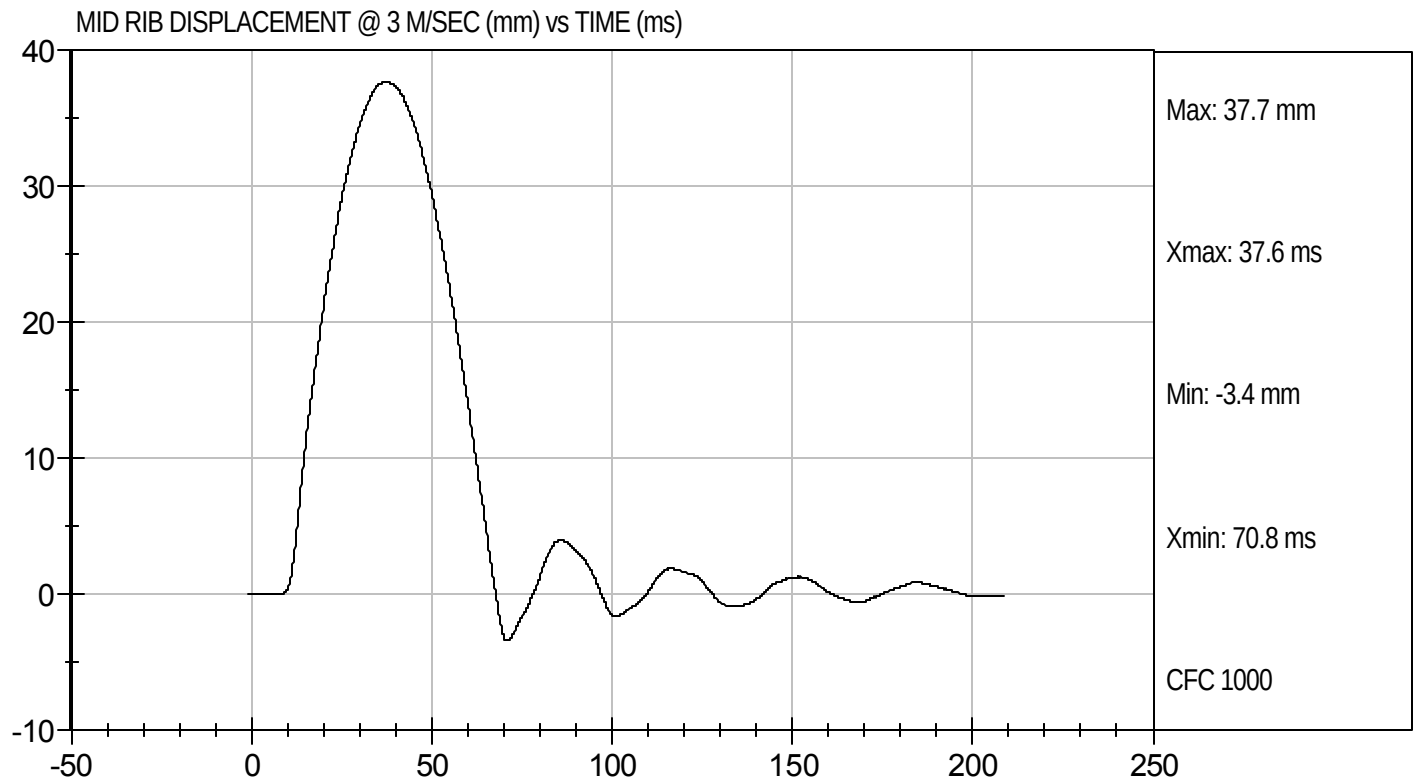
2/23/11
Test Date

David Winkelbauer
Approved By



Test Desc: Rib Impact - Mid
Component ID: D11665

Test Date: 2/23/11



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11666

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	39.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.1	Pass
			Overall Test Results	Pass

Jessica Gall
Laboratory Technician

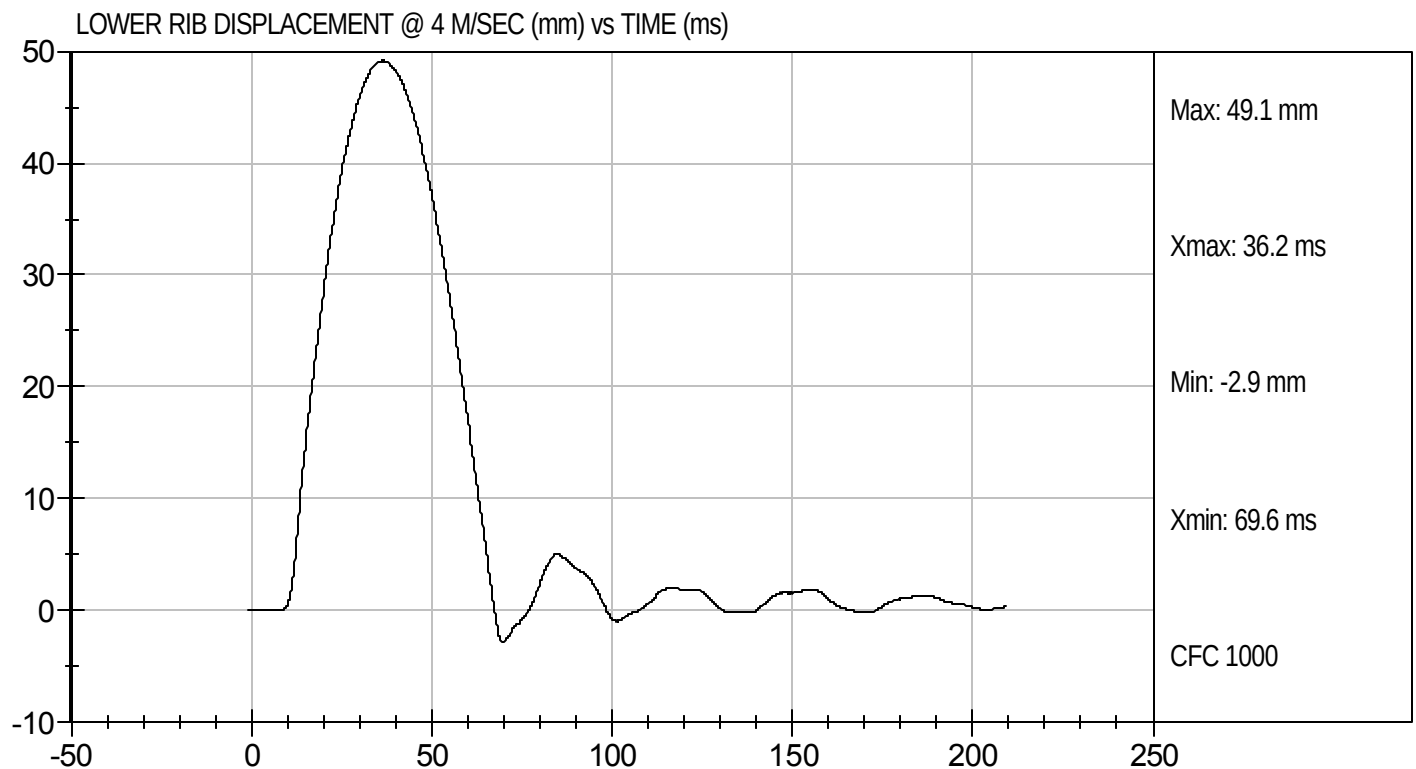
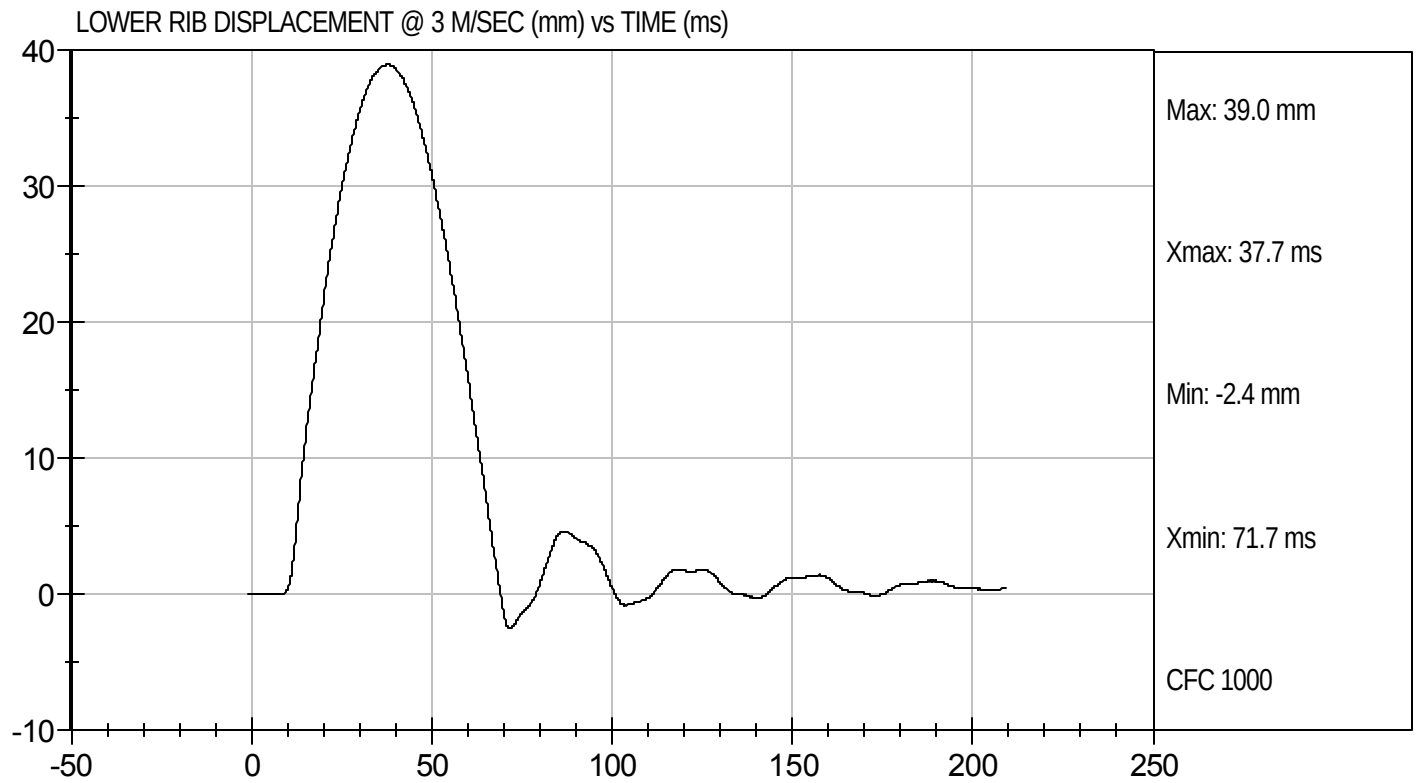
2/23/11
Test Date

David Winkelbauer
Approved By



Test Desc: Rib Impact - Lower
Component ID: D11666

Test Date: 2/23/11



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11667

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	23	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.19	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.70	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.39	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.20	Pass
Overall Test Results				Pass


Laboratory Technician

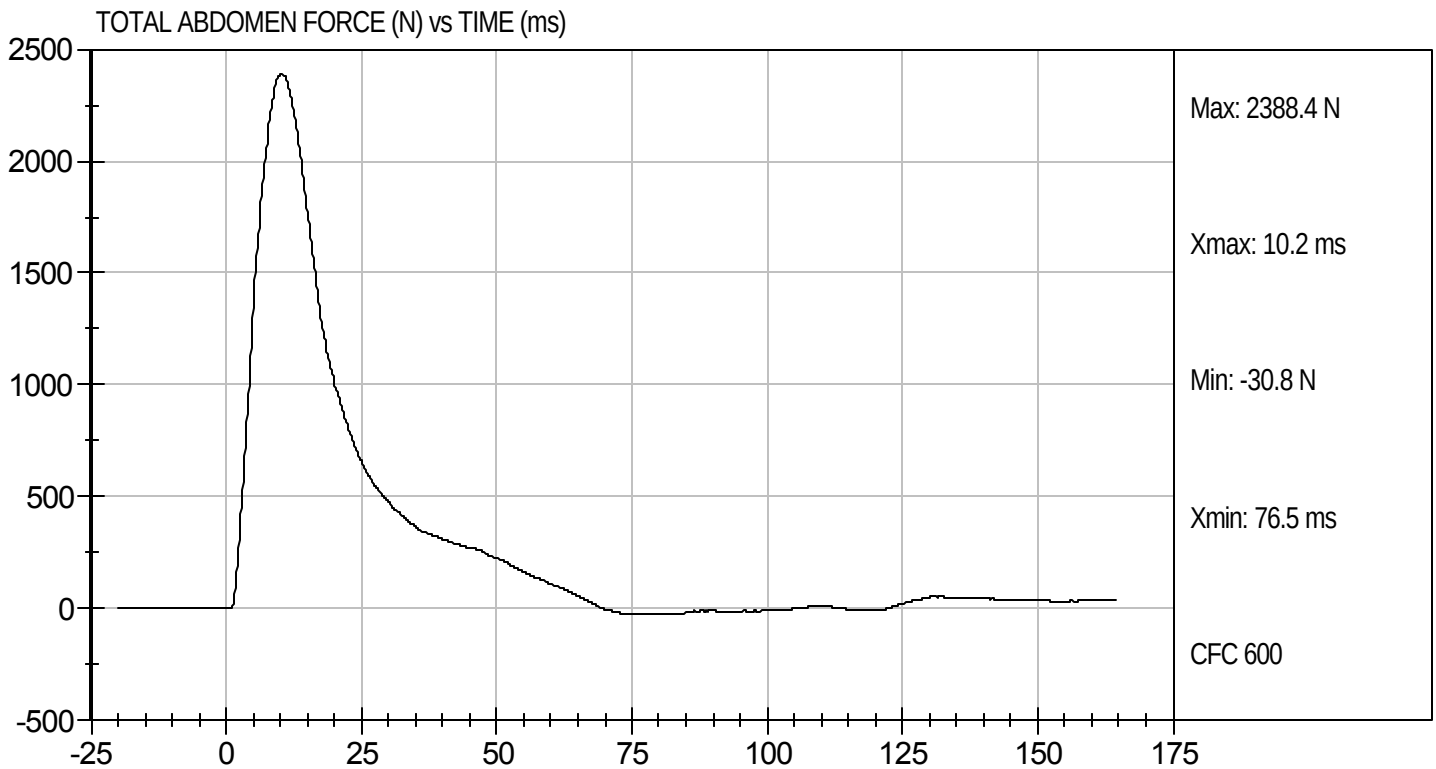
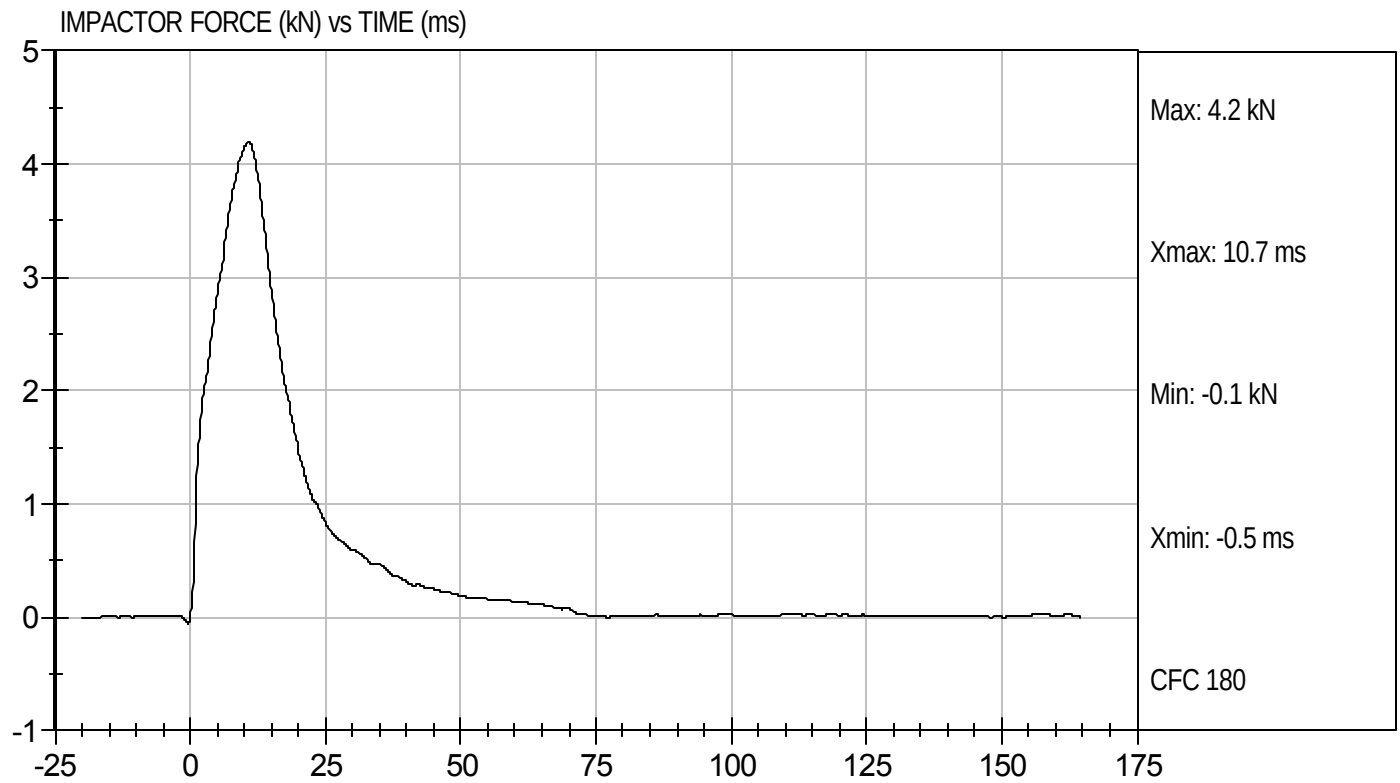
2/23/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D11667

Test Date: 2/23/11
Velocity: 13.33 ft/s, 4.06 m/s

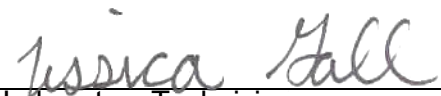


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11668

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.42	Pass
	27 ms	m/s	-6.50 to -5.80	-6.09	Pass
	30 ms	m/s	>= -6.5	-5.96	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	49.9	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	39.2	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	40	Pass
Overall Results					Pass


 Laboratory Technician

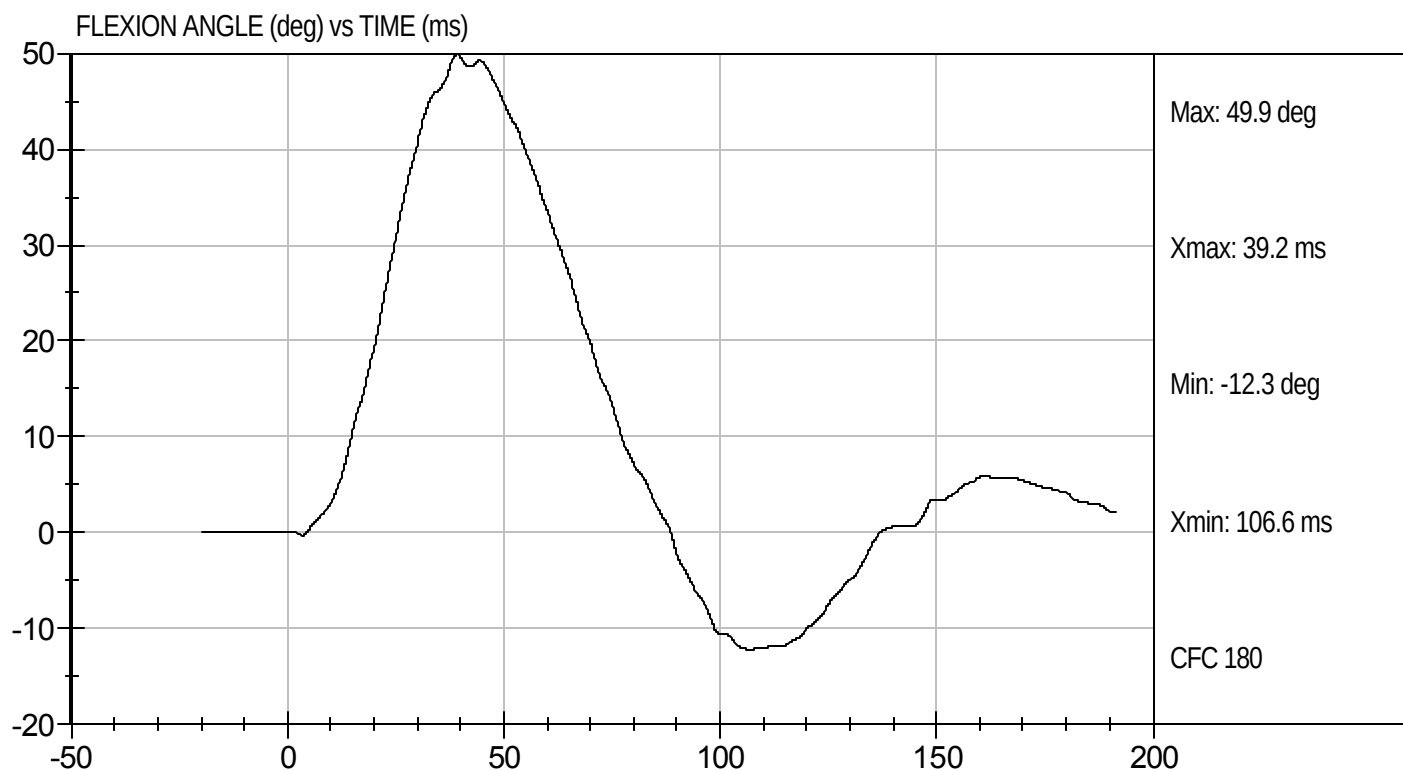
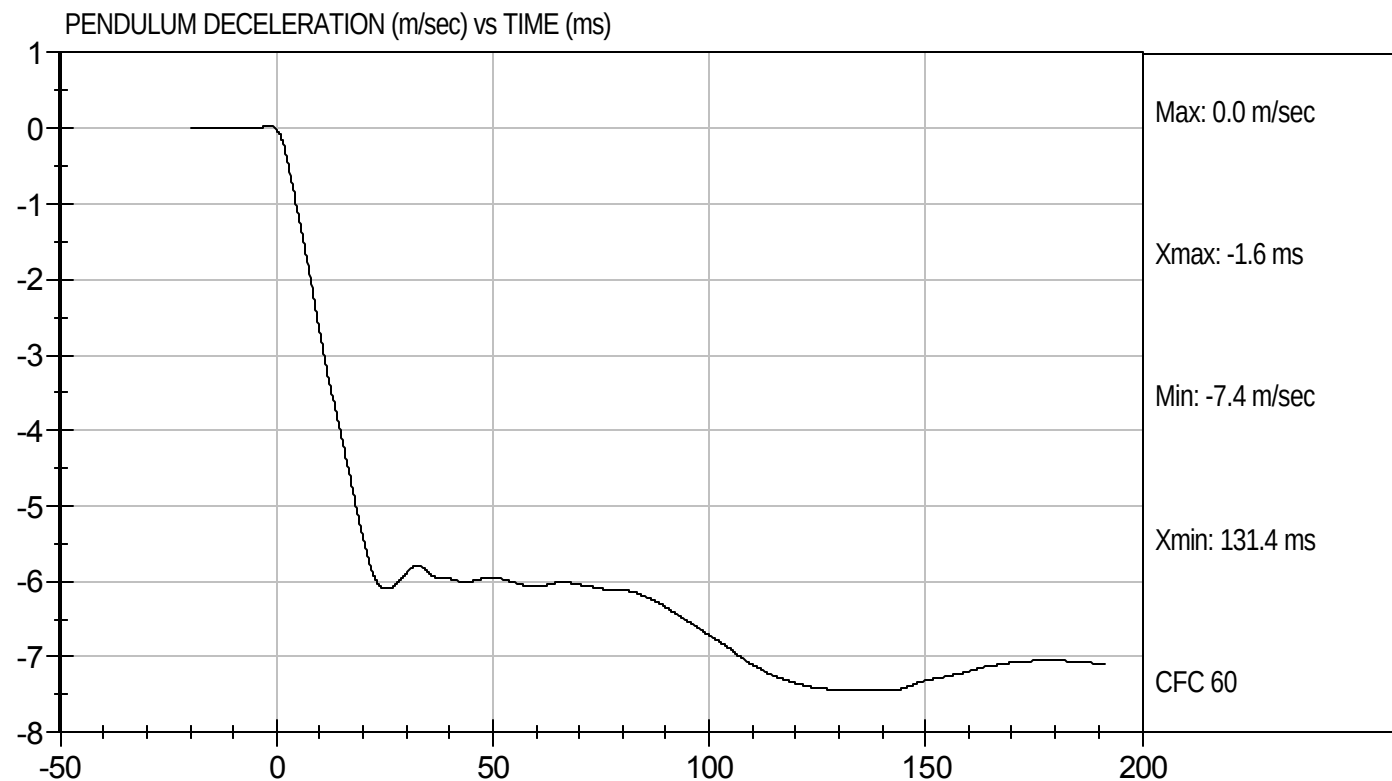
2/23/11
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D11668

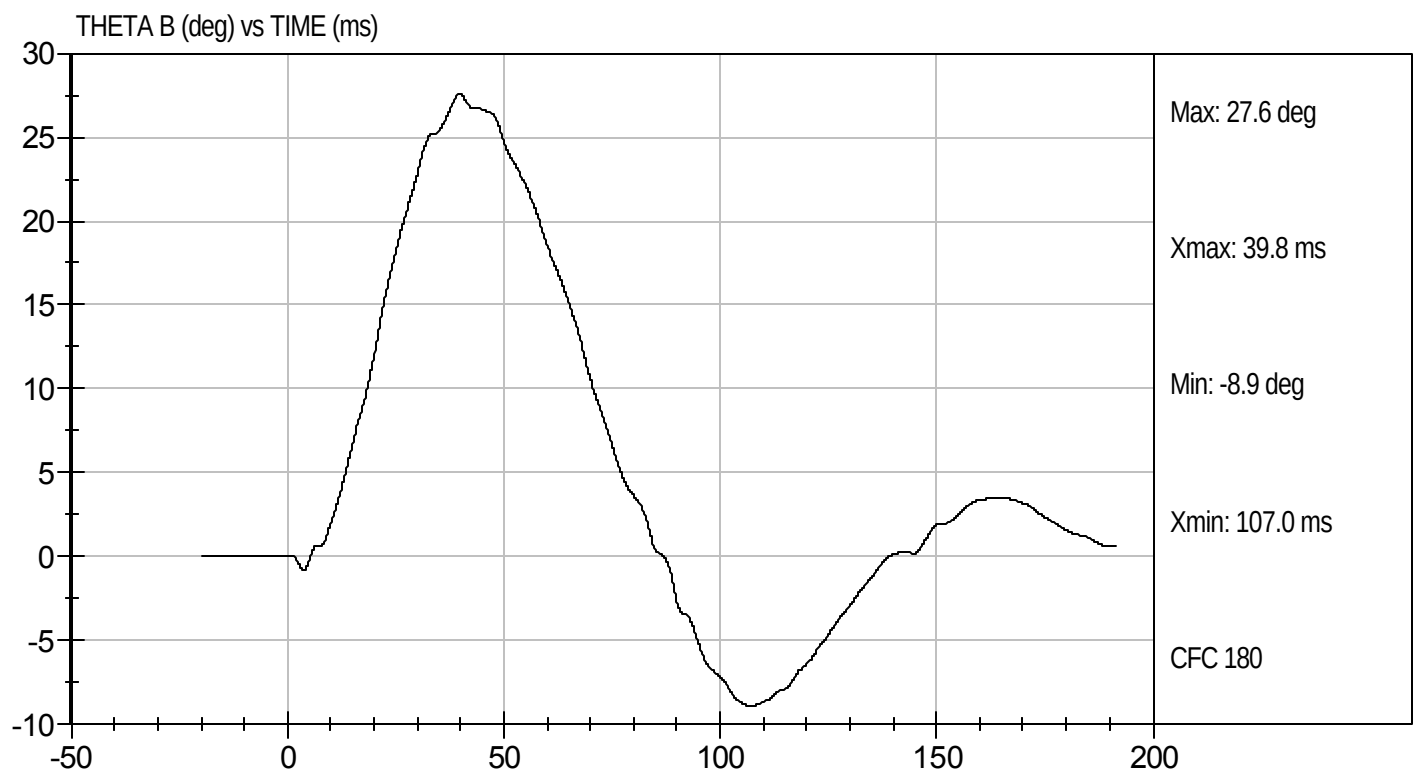
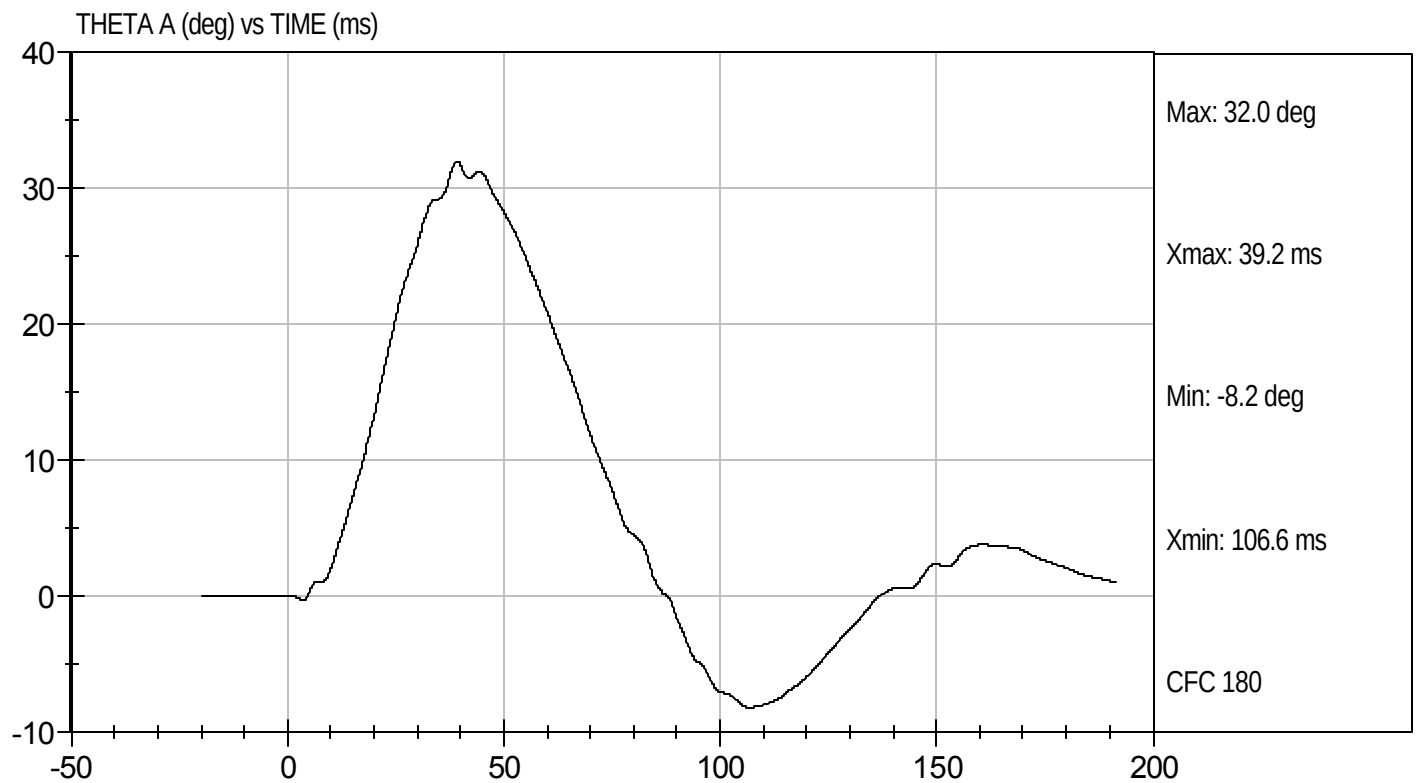
Test Date: 2/23/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D11668

Test Date: 2/23/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D11669

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
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.75	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	12.30	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.39	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	13.30	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

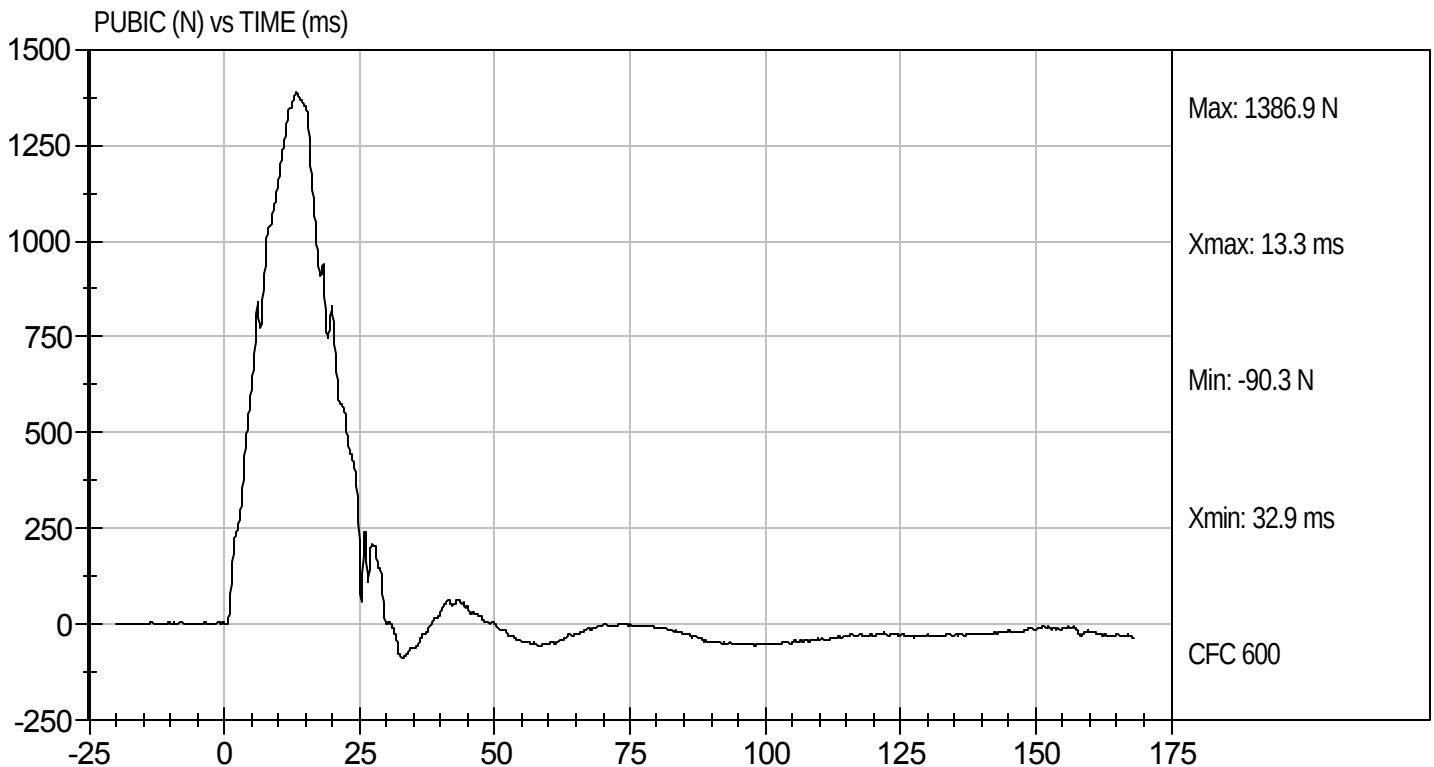
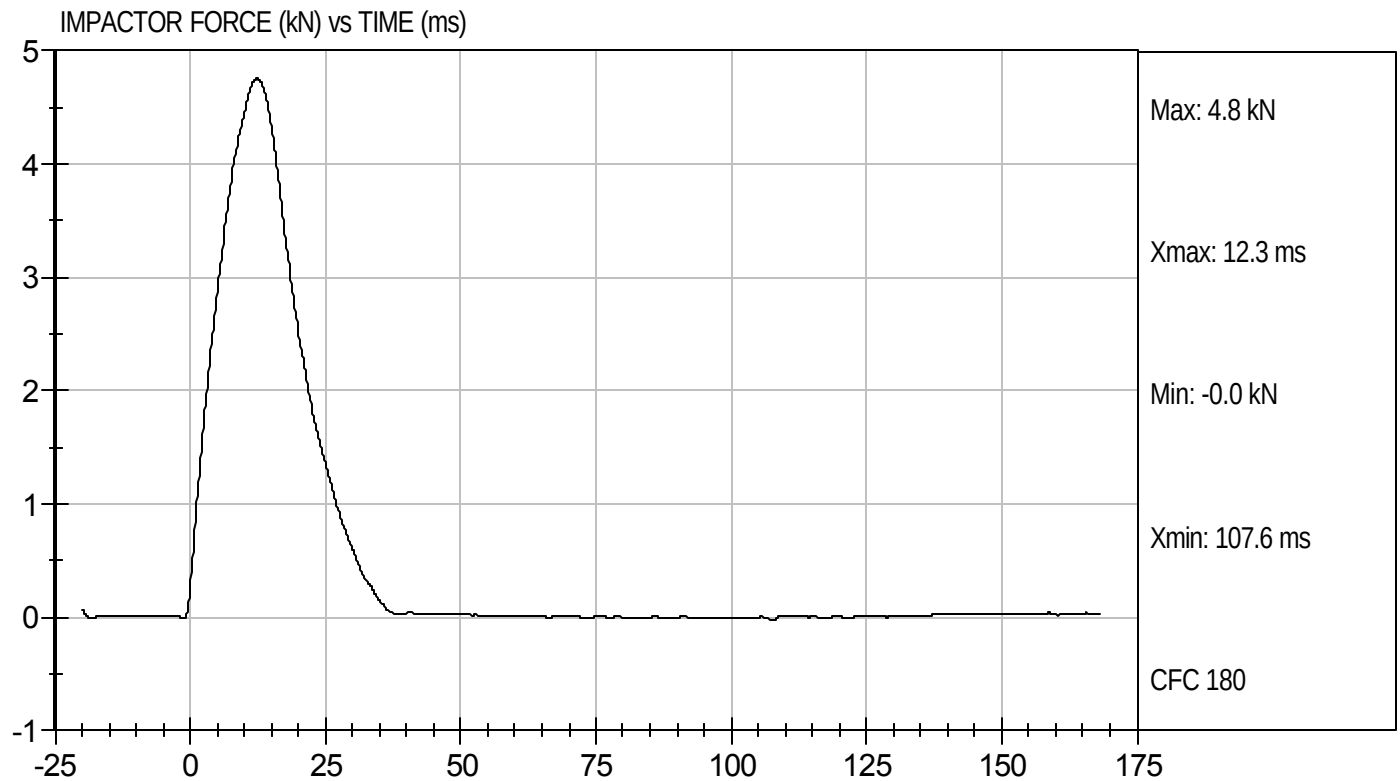
2/23/11
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D11669

Test Date: 2/23/11
Velocity: 14.25 ft/s, 4.35 m/s



MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11660

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.13	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.7	Pass
Lower Rib Displacement	mm	37.0 to 44.0	39.5	Pass
Overall Test Results			Pass	


Laboratory Technician

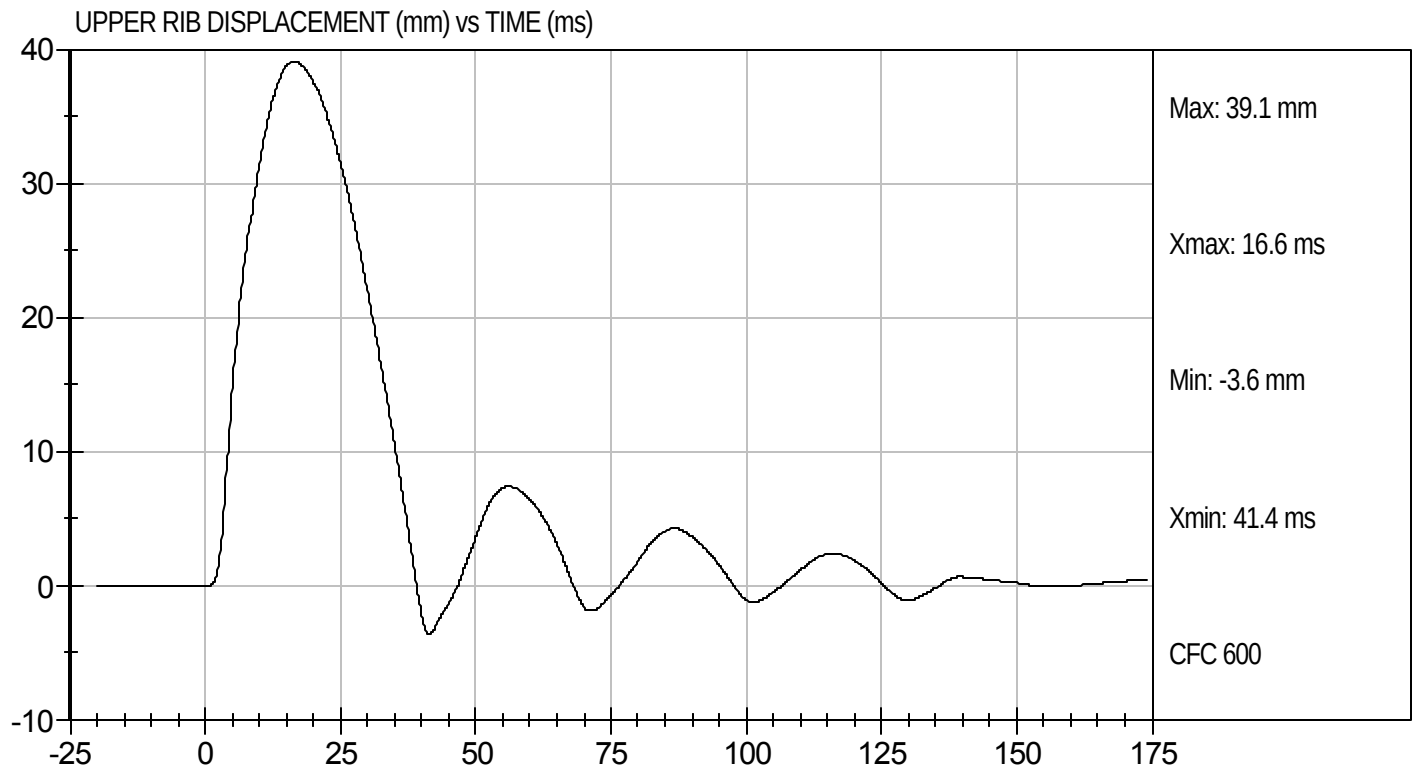
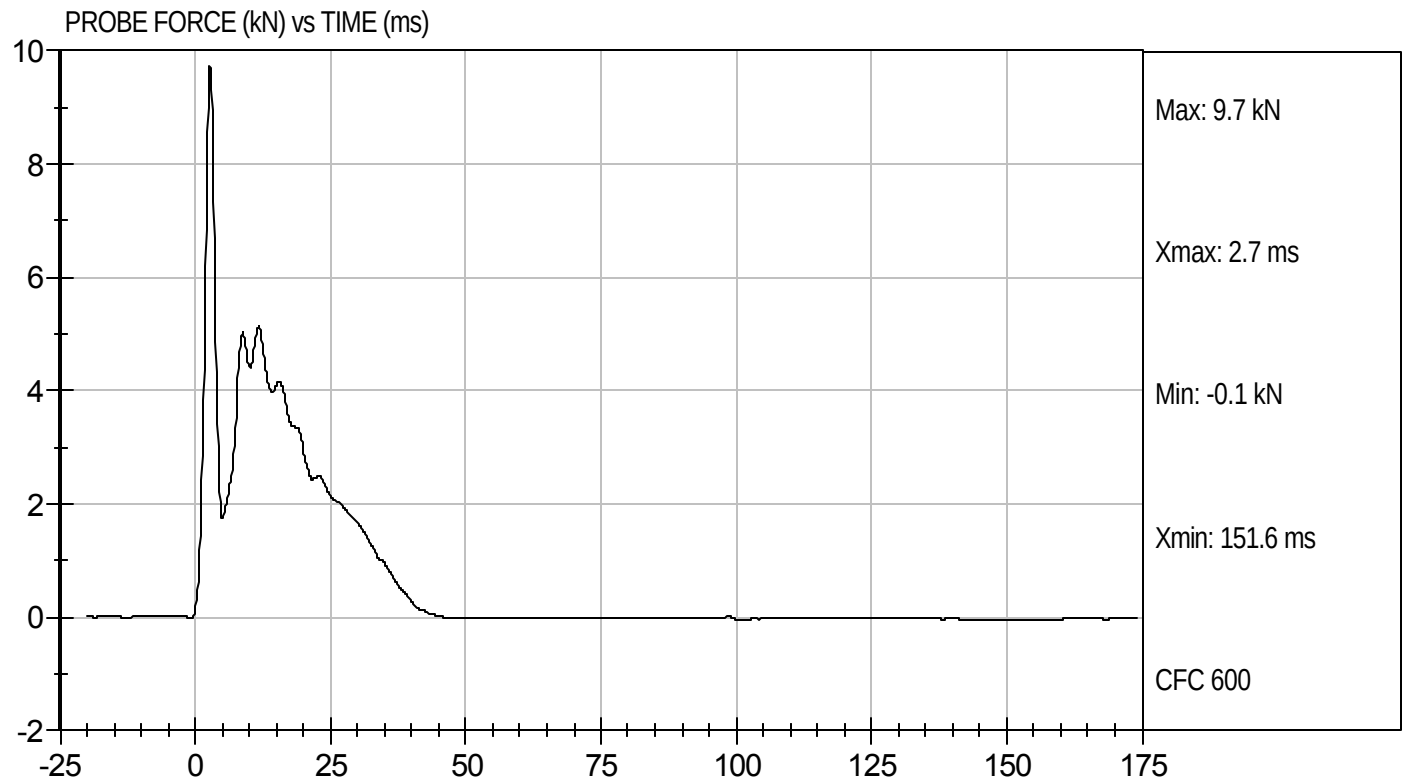
2/23/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11660

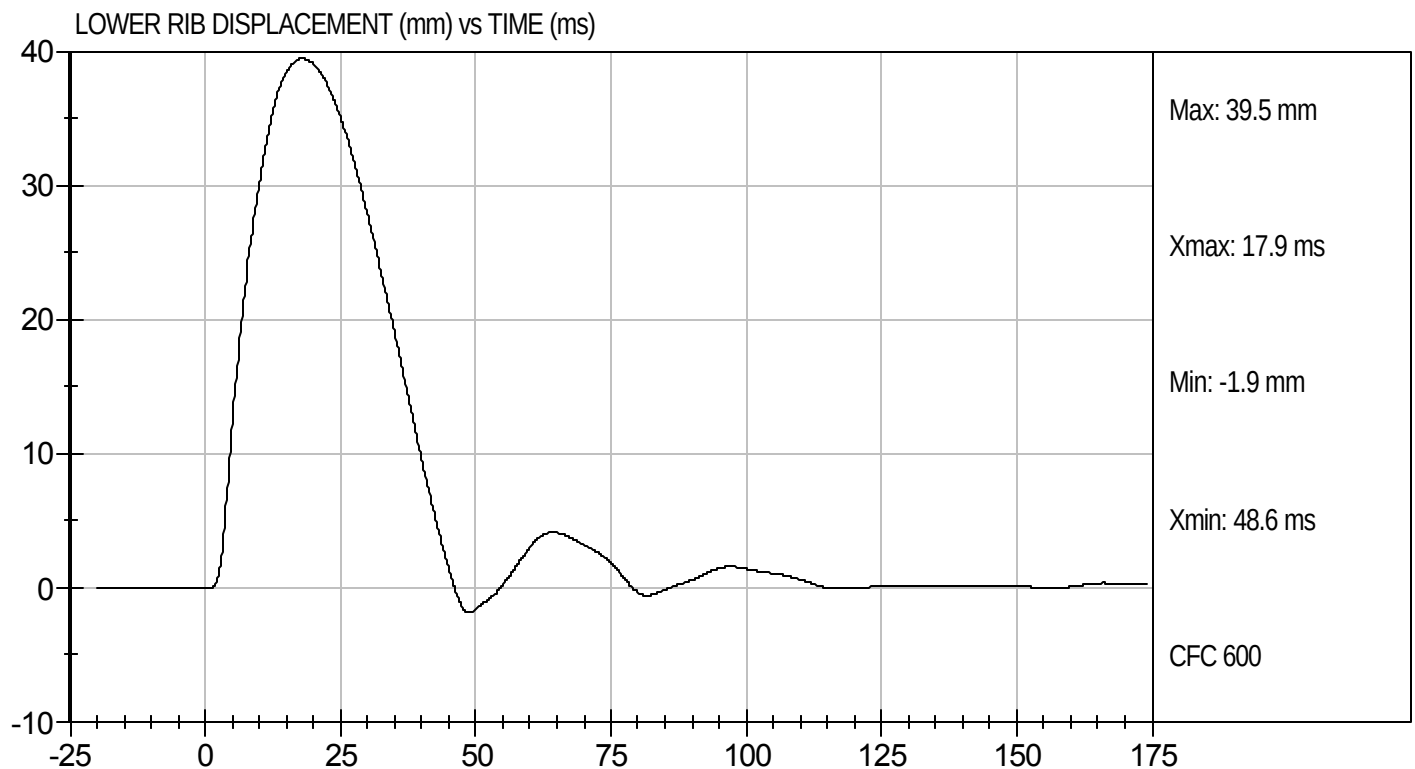
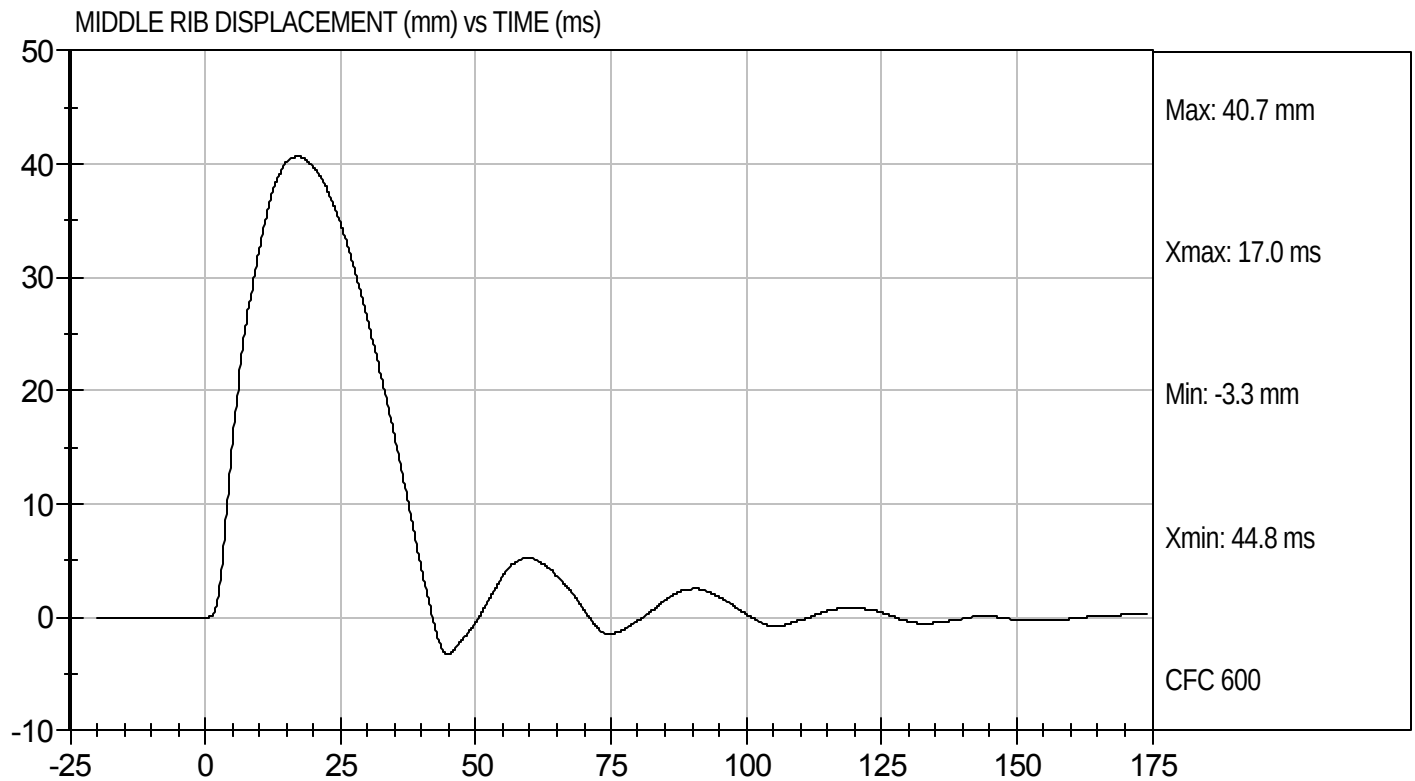
Test Date: 2/23/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Thorax Impact
Component ID: D11660

Test Date: 2/23/11
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION

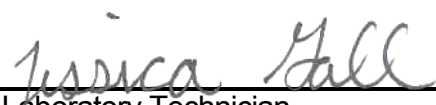
HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032

Test ID: D11701

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	125 to 155	151	Pass
Peak Lateral Acceleration	G's	+/- 15	-12.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

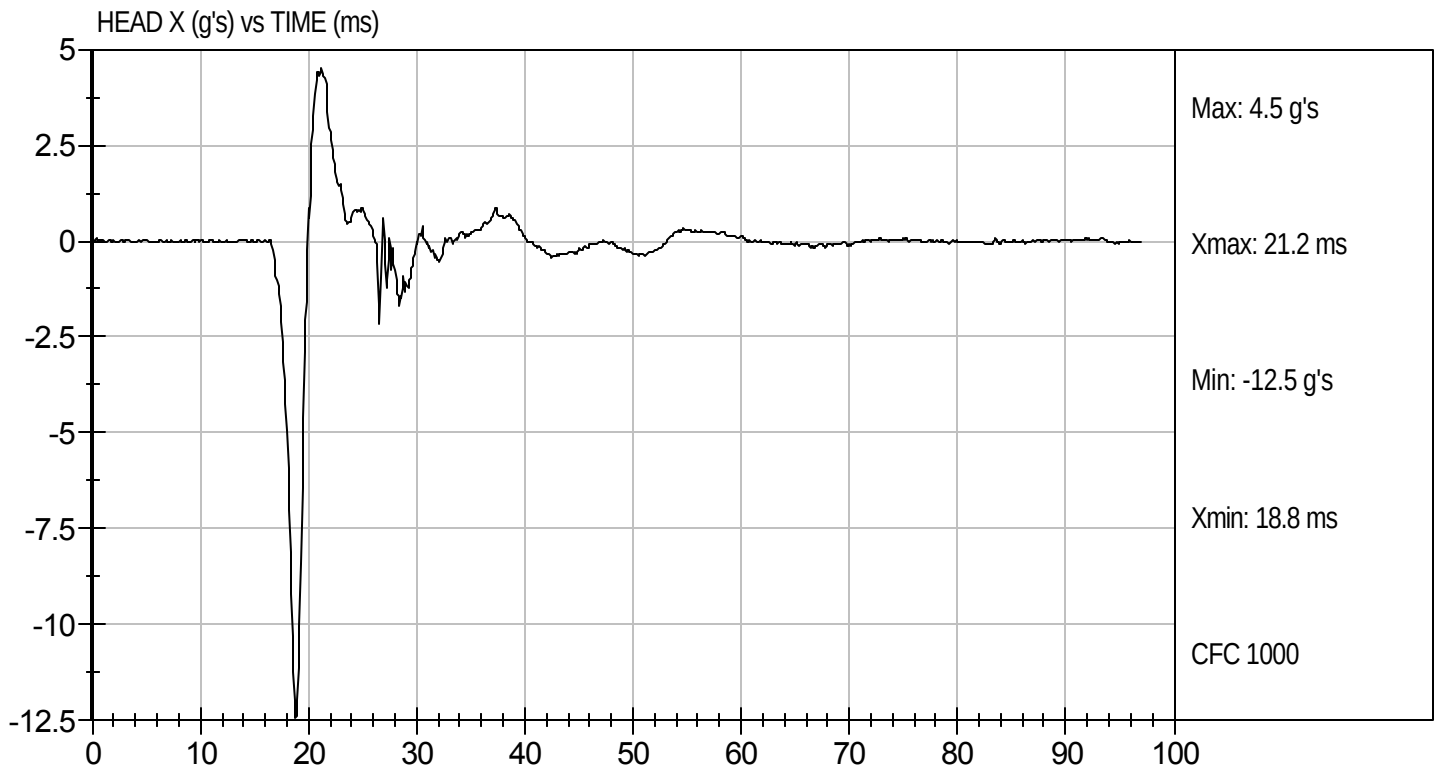
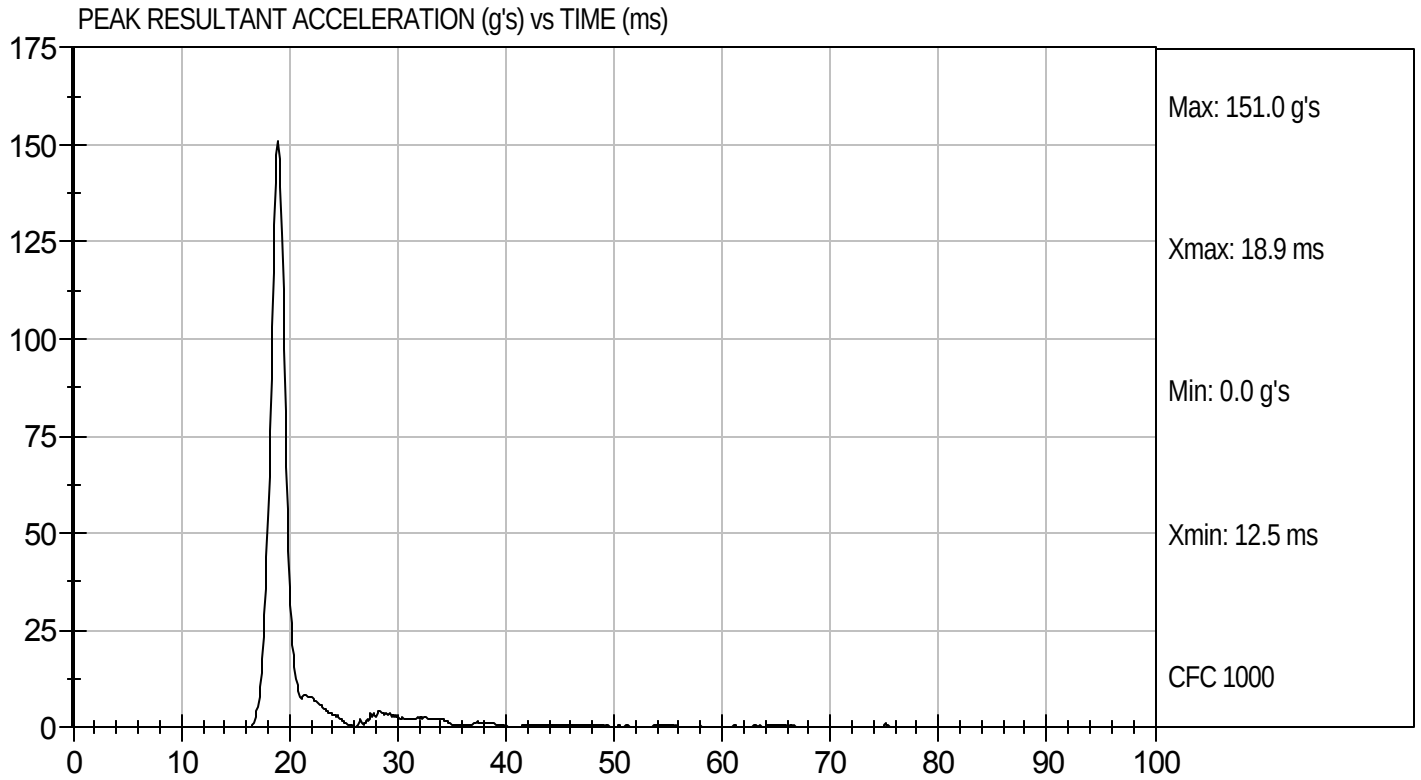
2/24/11
Test Date


Approved By



Test Desc: Head Drop
Component ID: D11701

Test Date: 2/24/11
Velocity: 0 ft/s, 0 m/s

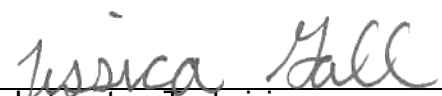


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11702

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.37	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.9	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.4	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	59.8	Pass
Overall Test Results					Pass


 Laboratory Technician

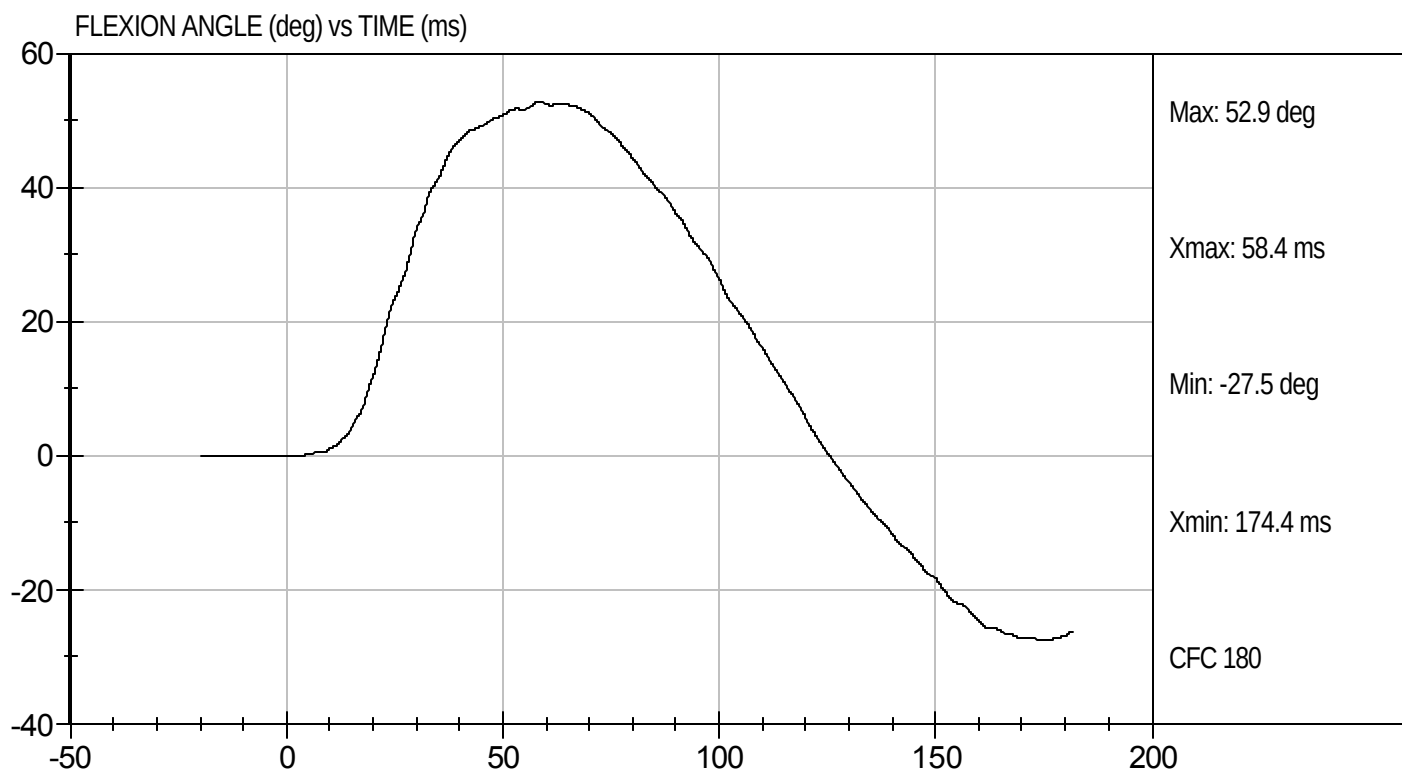
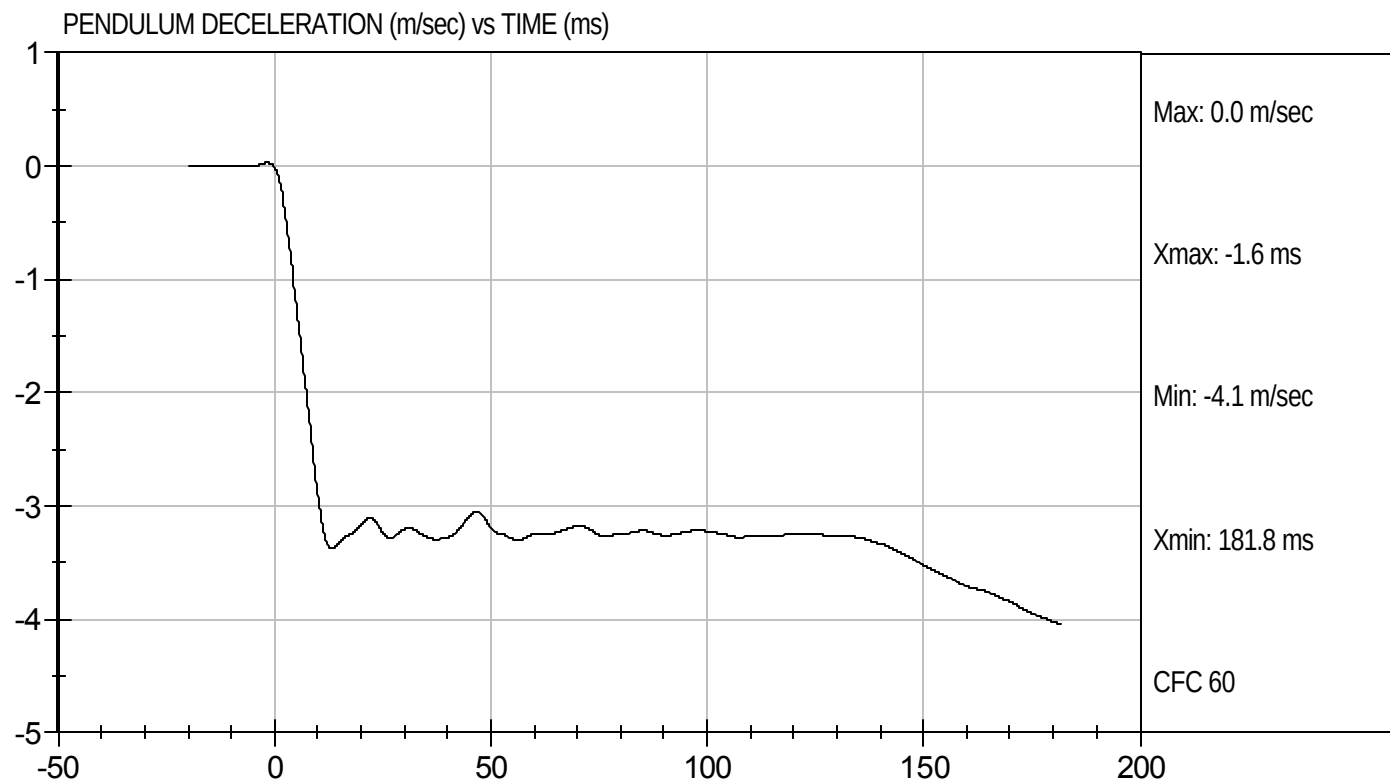
2/24/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11702

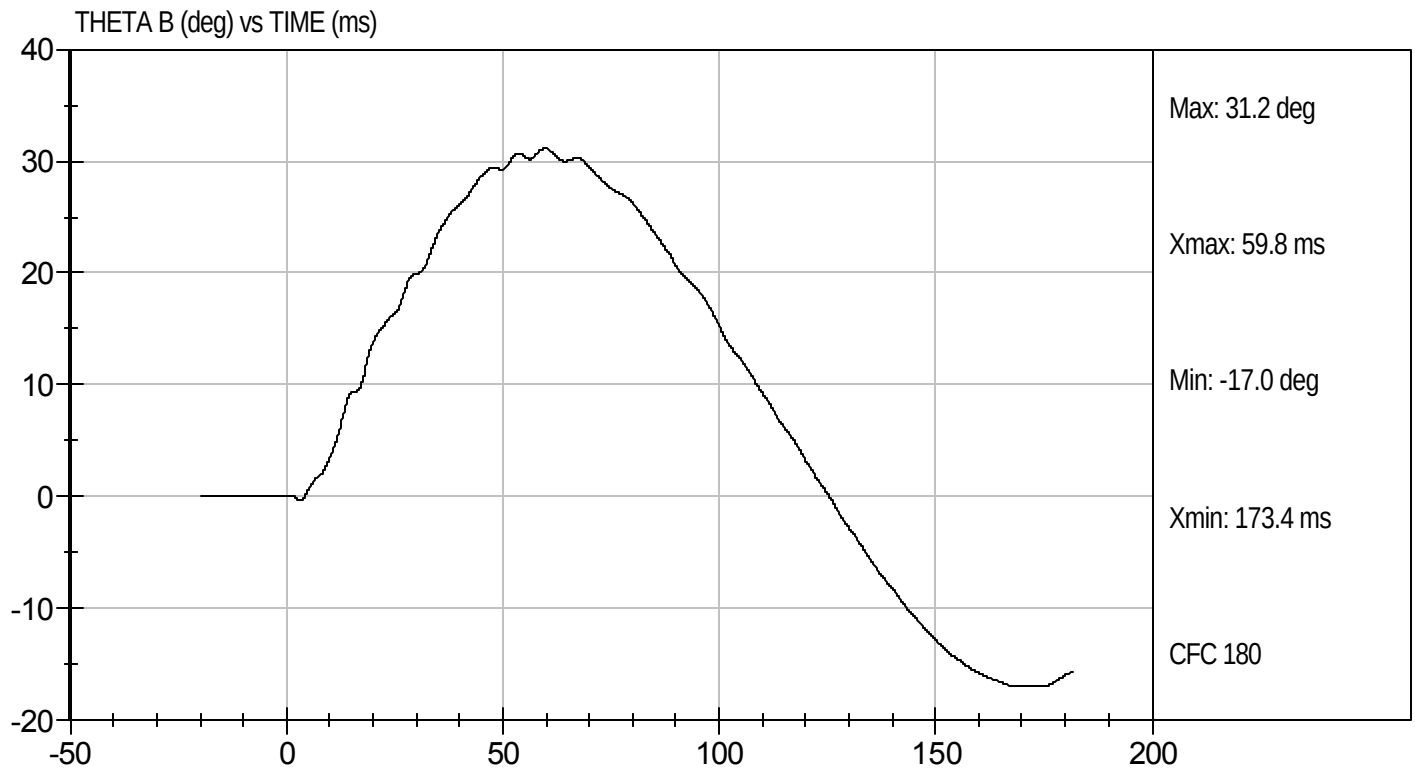
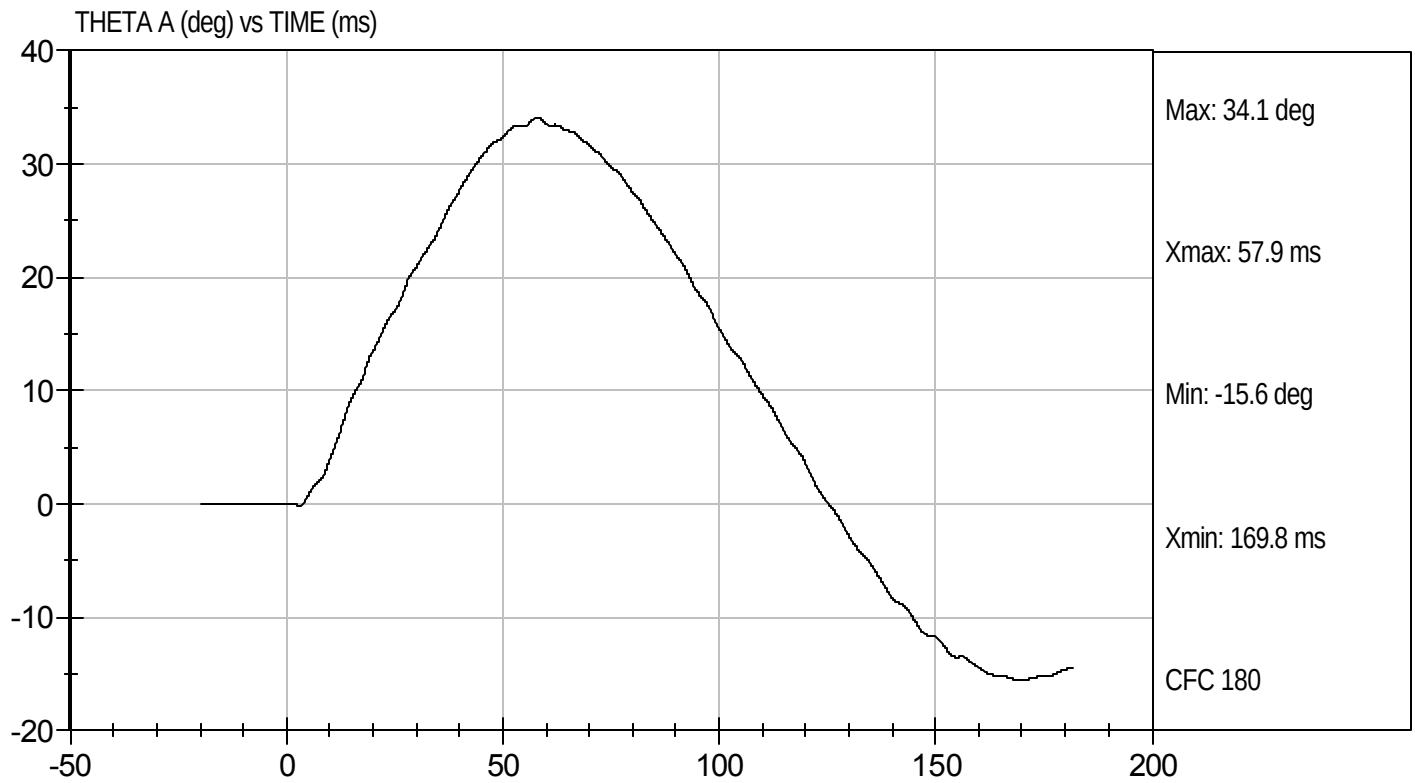
Test Date: 2/24/11
Velocity: 11.34 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D11702

Test Date: 2/24/11
Velocity: 11.34 ft/s, 3.5 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11703

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	27	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.7	Pass
Time of Peak Shoulder Acceleration	ms	NA	12.8	Pass
Overall Test Results			Pass	


Laboratory Technician

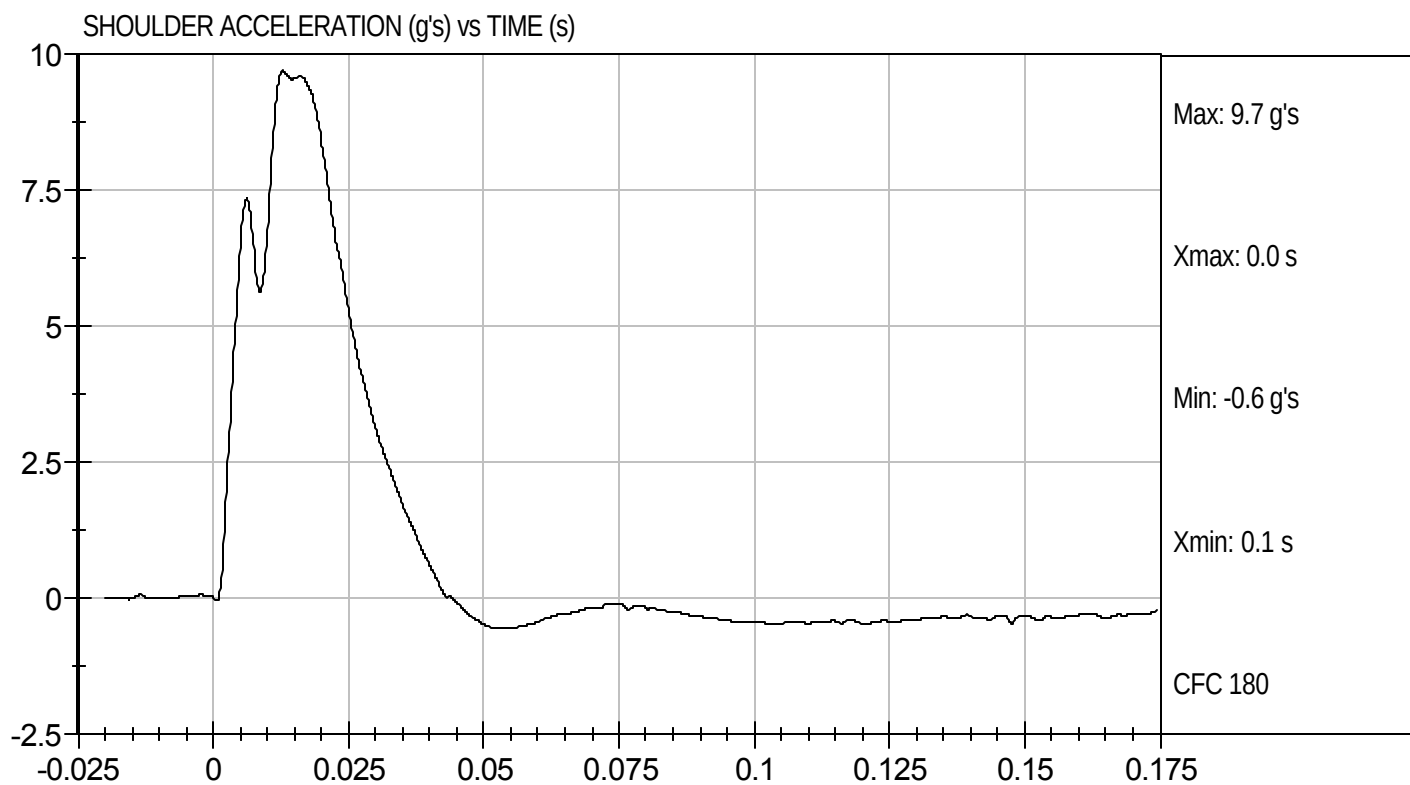
2/24/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11703

Test Date: 2/24/11
Velocity: 14.26 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

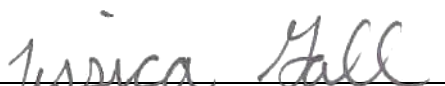
UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11704

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
Displacement at 3 m/s	mm	36.0 to 40.0	38.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.5	Pass
			Overall Test Results	Pass


Laboratory Technician

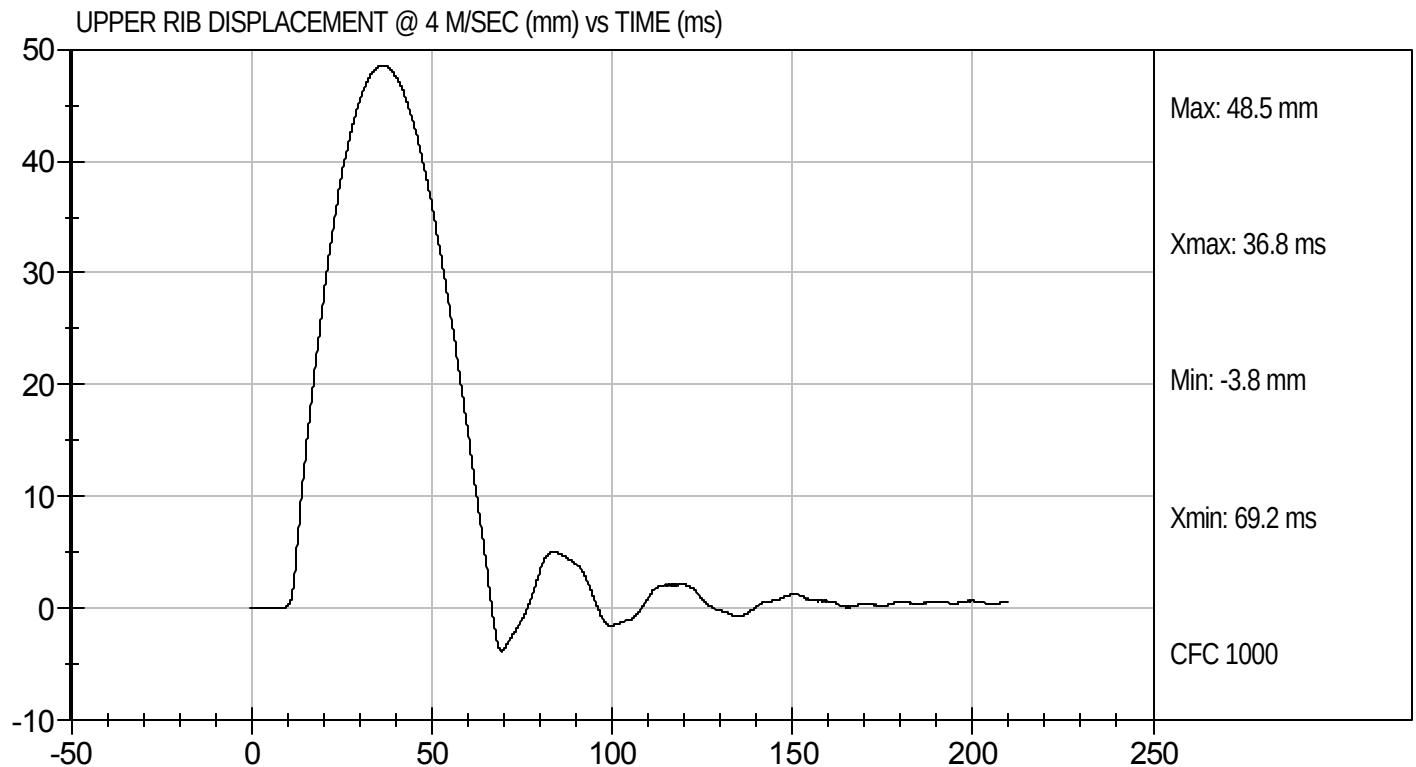
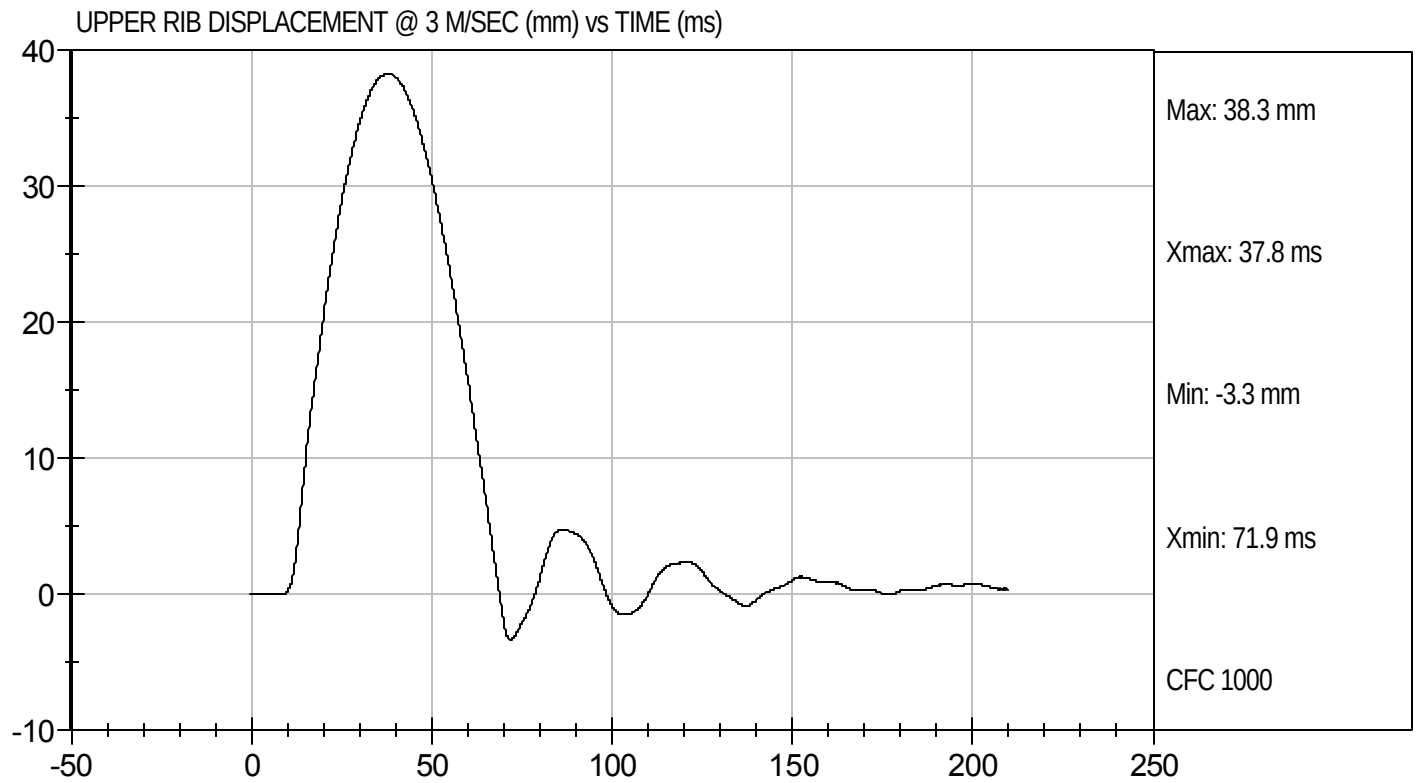
2/25/11
Test Date


Approved By



Test Desc: Rib Impact - Upper
Component ID: D11704

Test Date: 2/25/11



MGA RESEARCH CORPORATION

MID RIB TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11705

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
Displacement at 3 m/s	mm	36.0 to 40.0	38.5	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.1	Pass
			Overall Test Results	Pass


Laboratory Technician

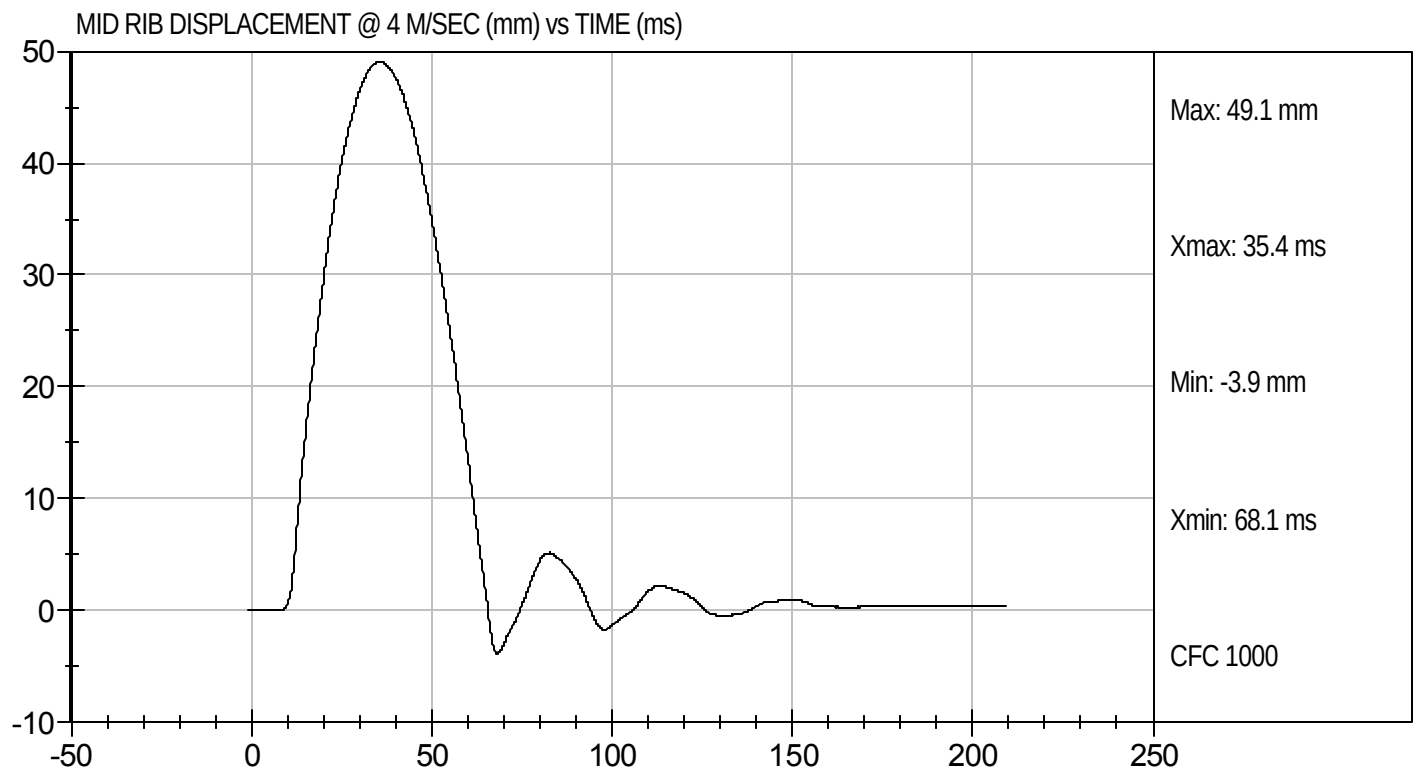
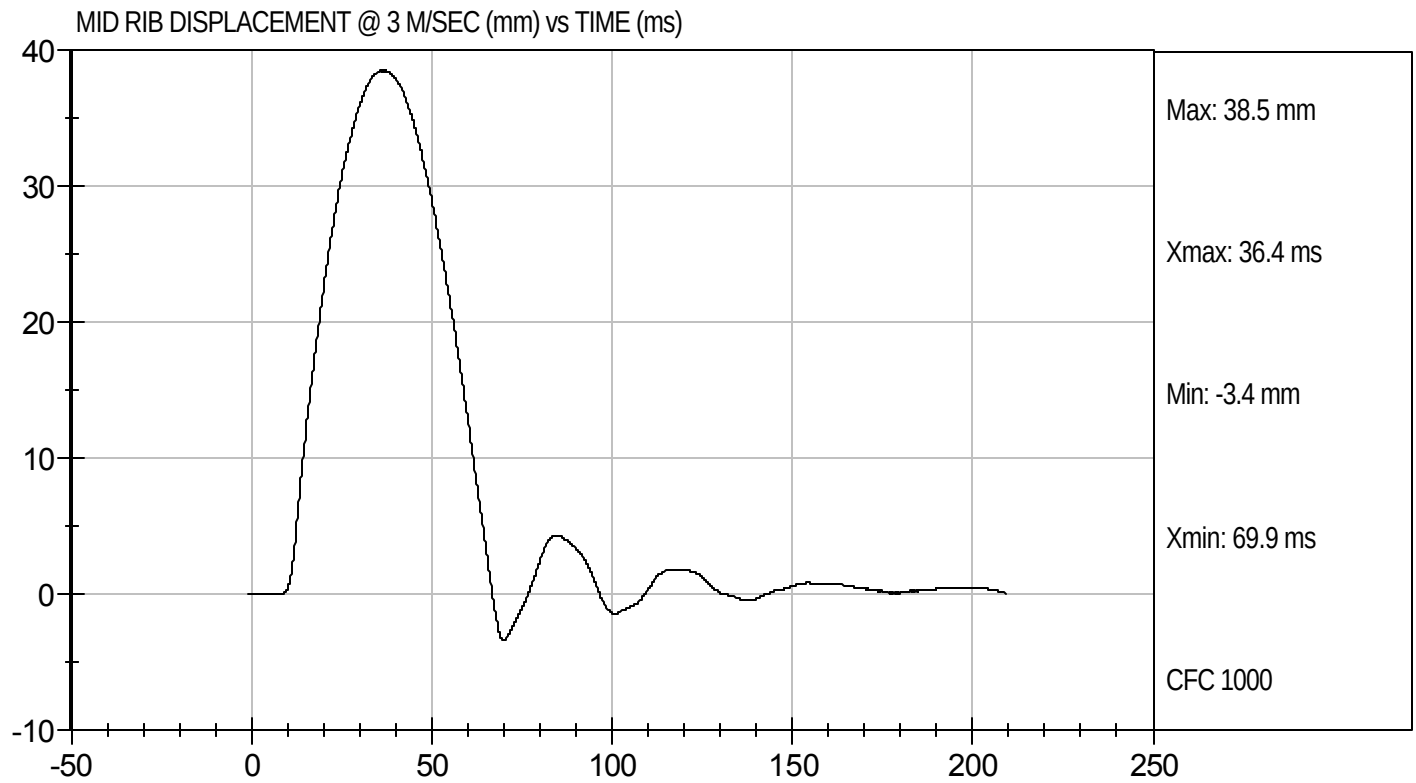
2/25/11
Test Date


Approved By



Test Desc: Rib Impact - Mid
Component ID: D11705

Test Date: 2/25/11



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11706

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
Displacement at 3 m/s	mm	36.0 to 40.0	39.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.3	Pass
Overall Test Results			Pass	

Jessica Gall
Laboratory Technician

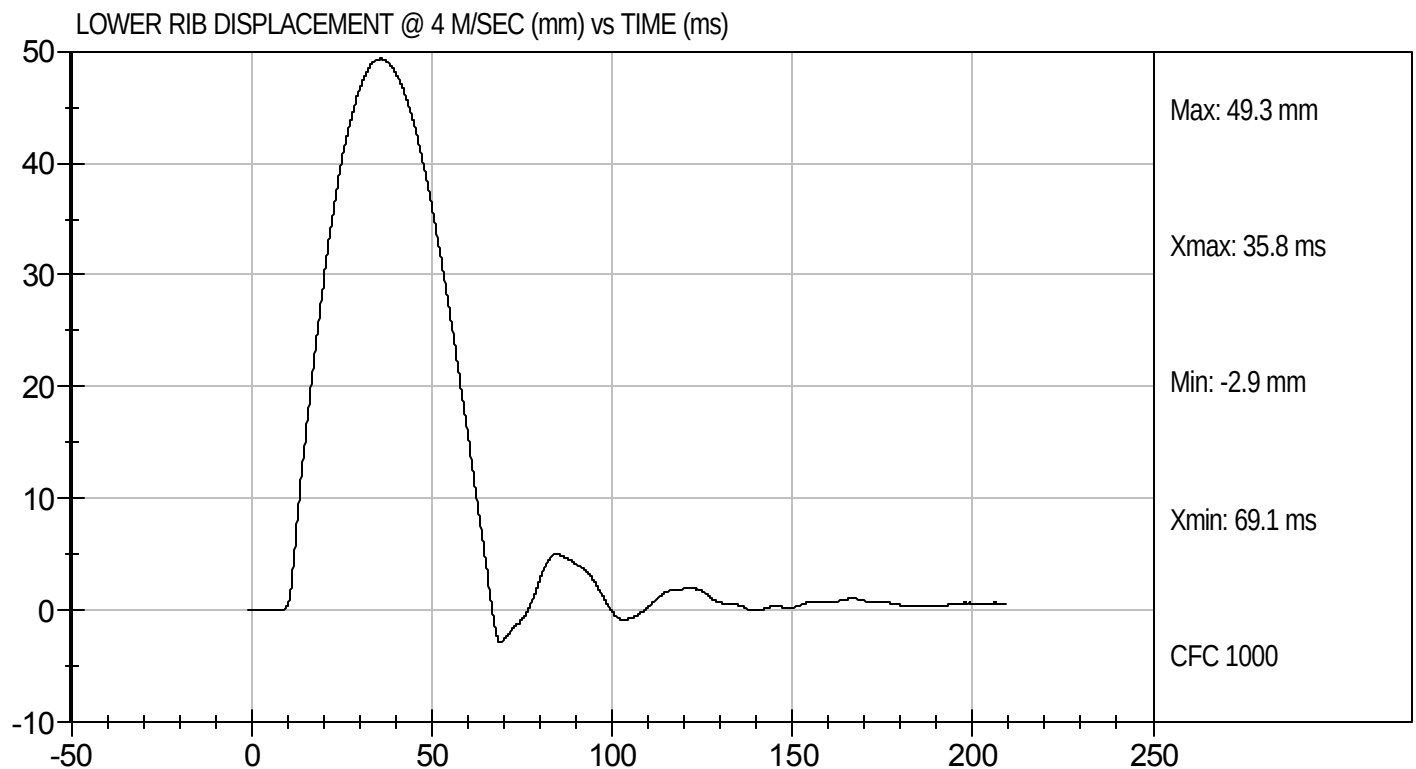
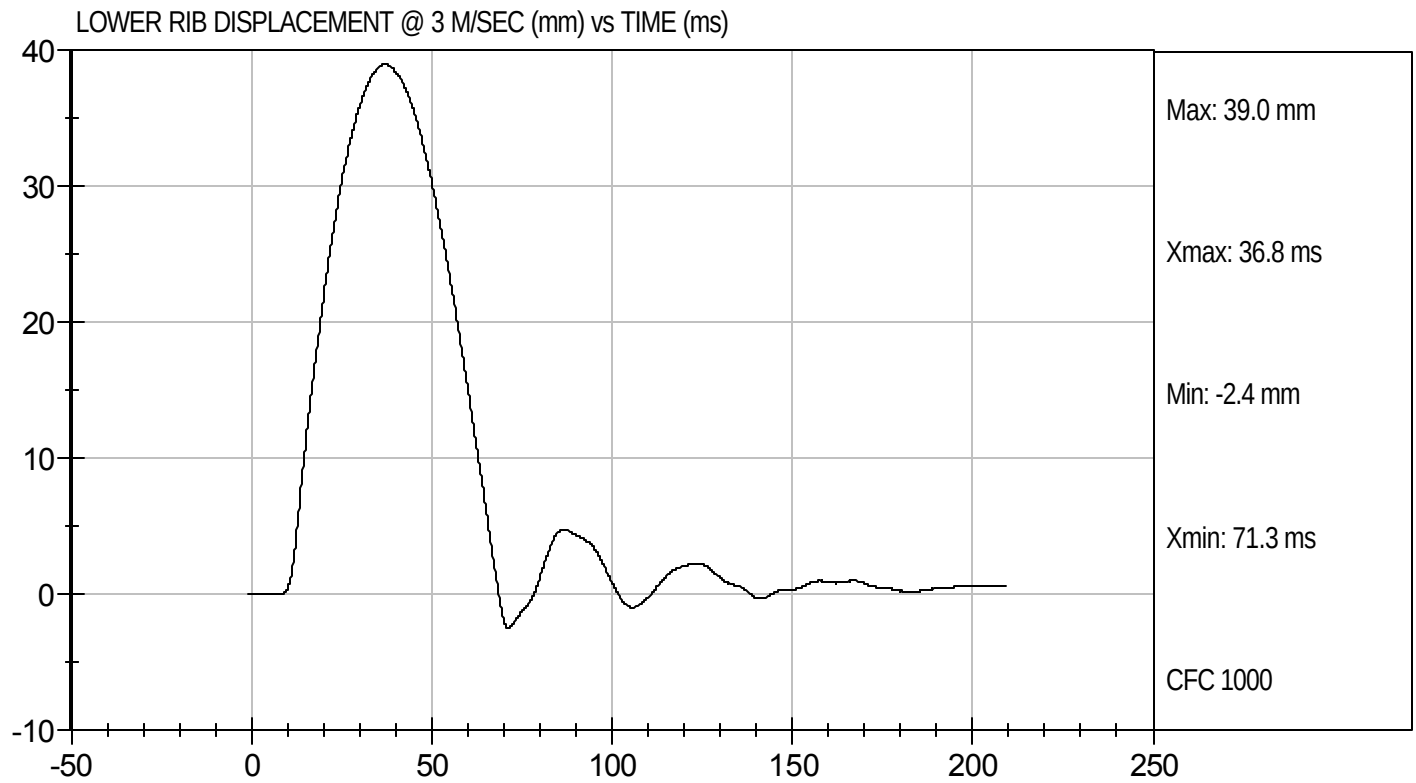
2/25/11
Test Date

David Winkelbauer
Approved By



Test Desc: Rib Impact - Lower
Component ID: D11706

Test Date: 2/25/11



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11707

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	27	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.32	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.43	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.20	Pass
Overall Test Results			Pass	


Laboratory Technician

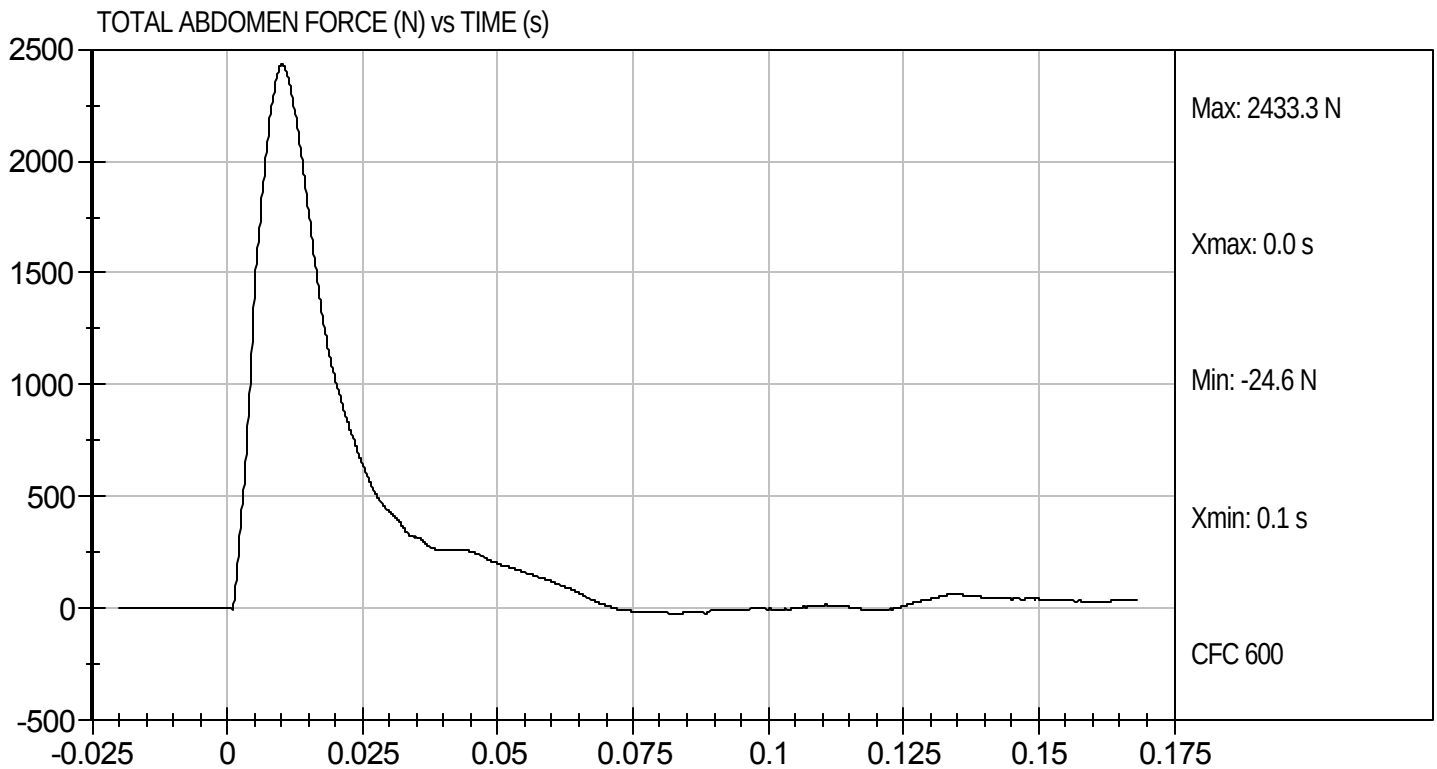
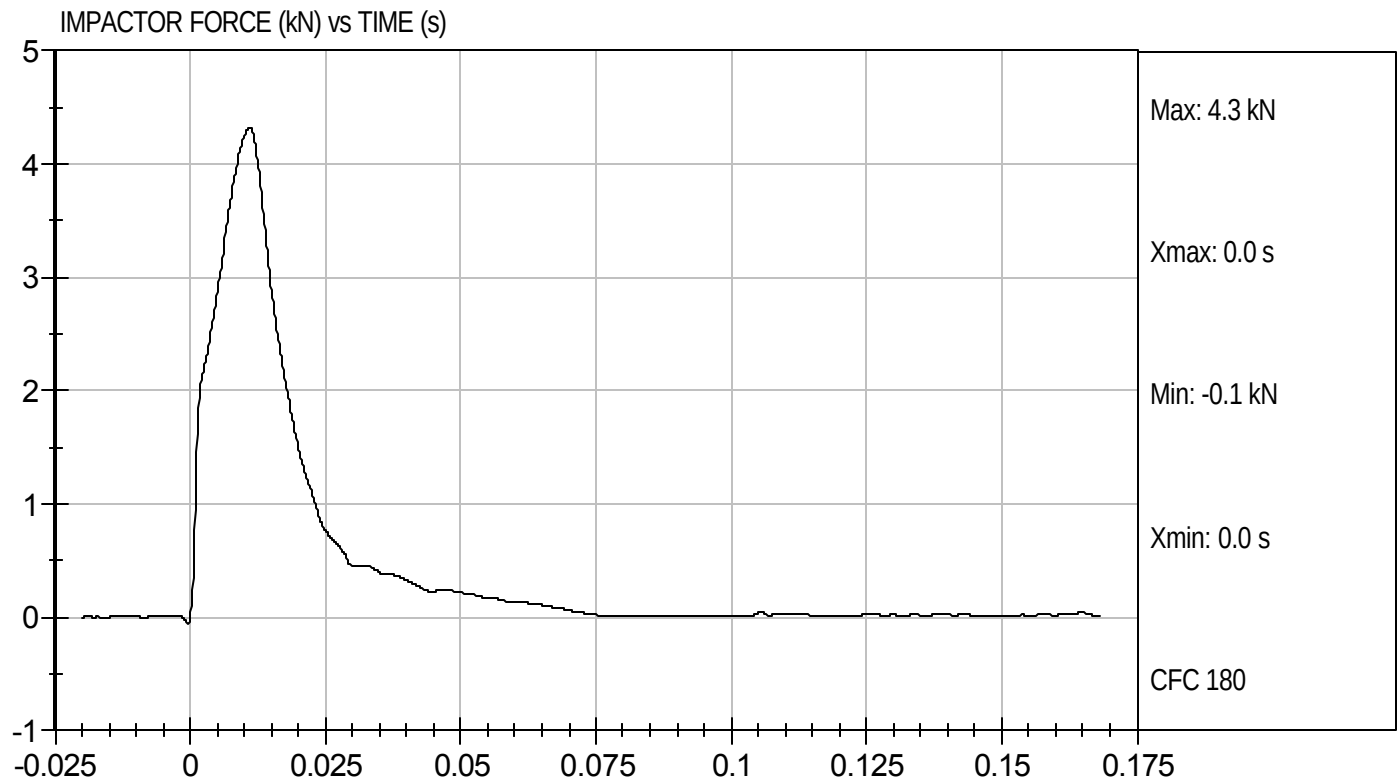
2/24/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D11707

Test Date: 2/24/11
Velocity: 13.44 ft/s, 4.1 m/s

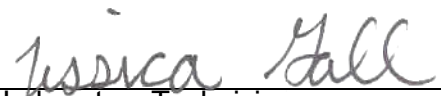


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D.: D11708

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	28	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.42	Pass
	27 ms	m/s	-6.50 to -5.80	-6.09	Pass
	30 ms	m/s	>= -6.5	-6.05	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.4	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	45.7	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	44	Pass
Overall Results					Pass


 Laboratory Technician

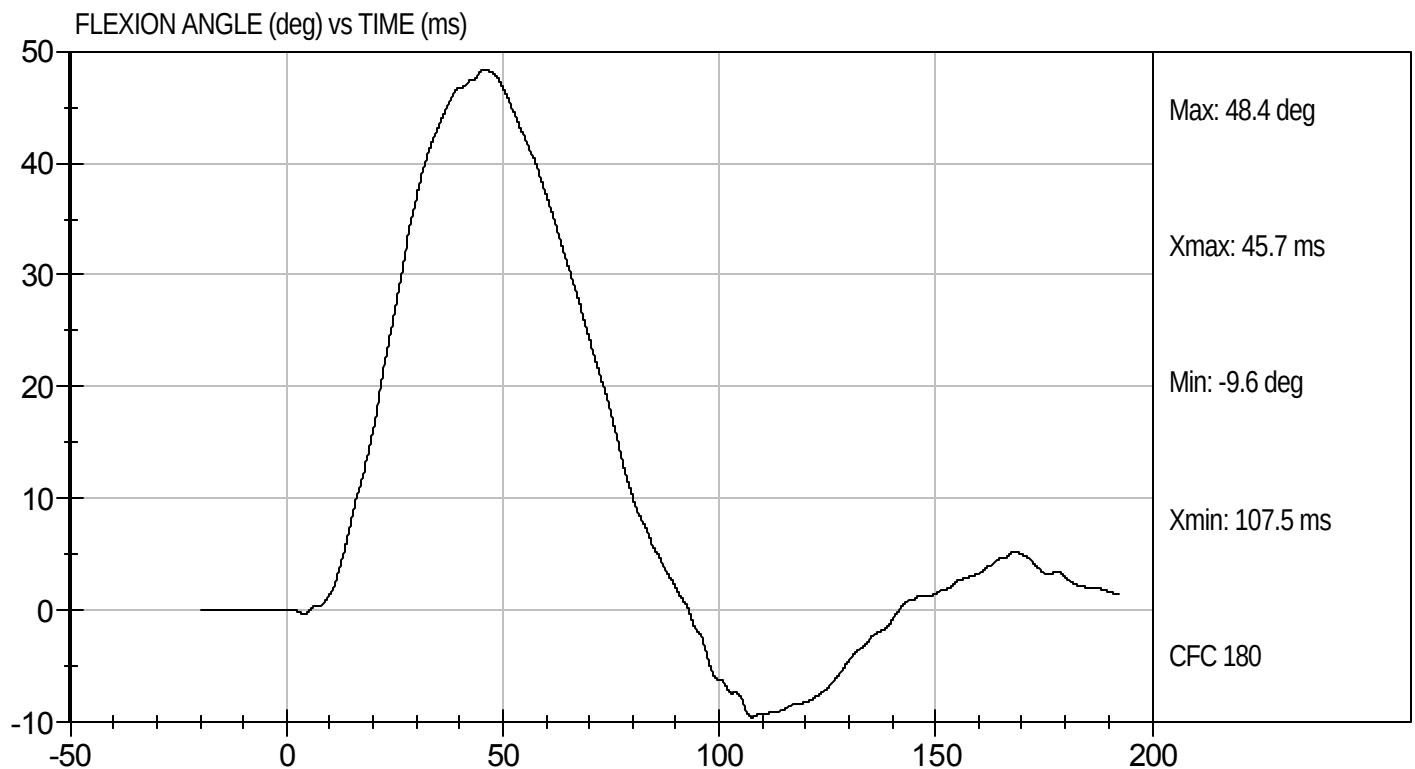
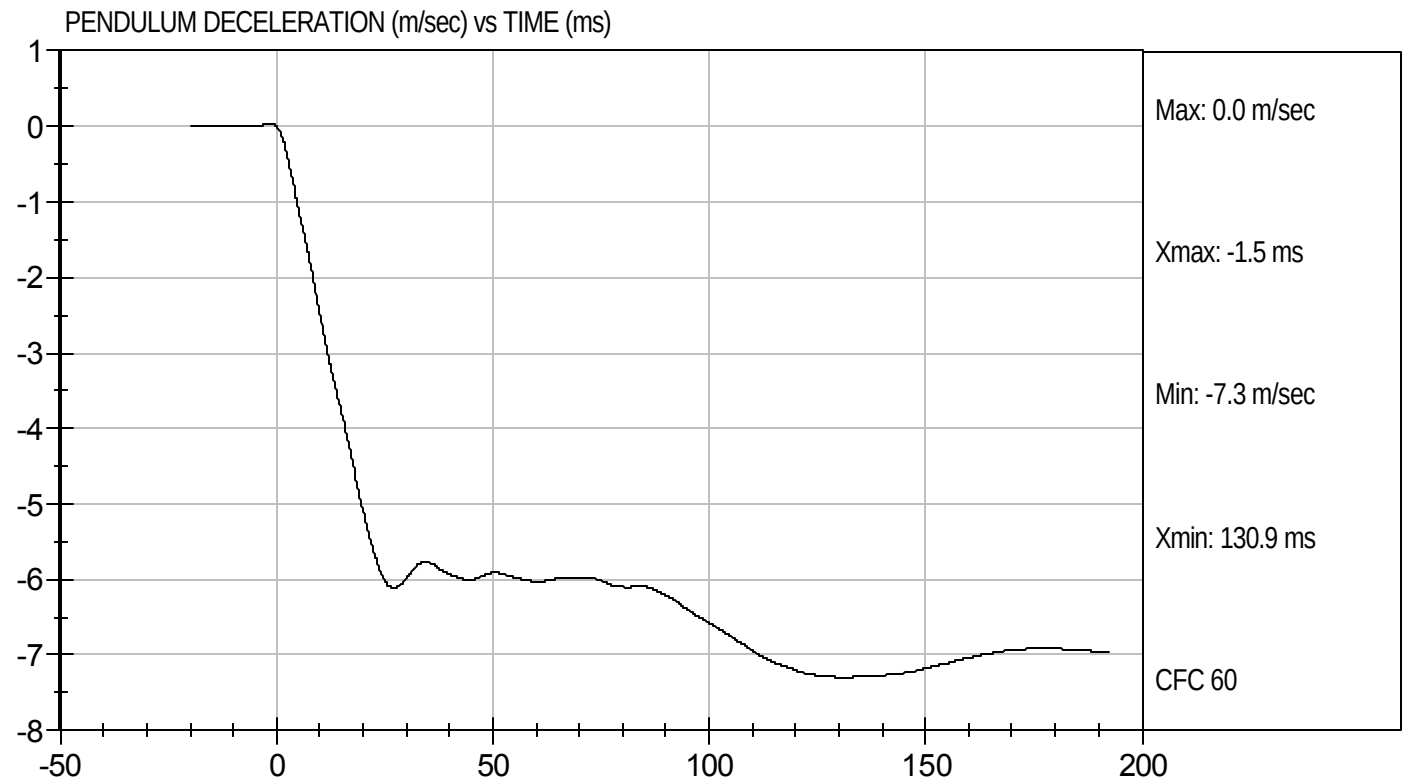
2/24/11
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D11708

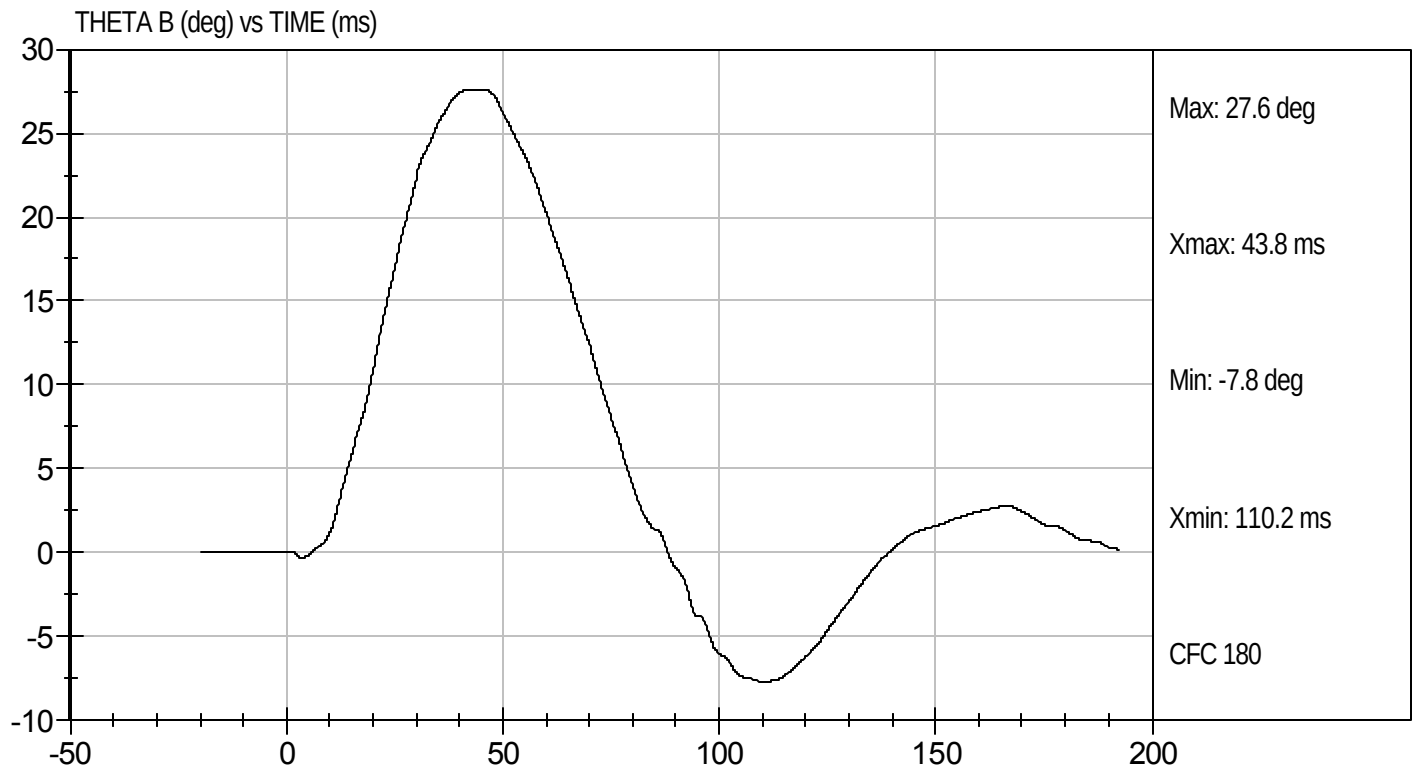
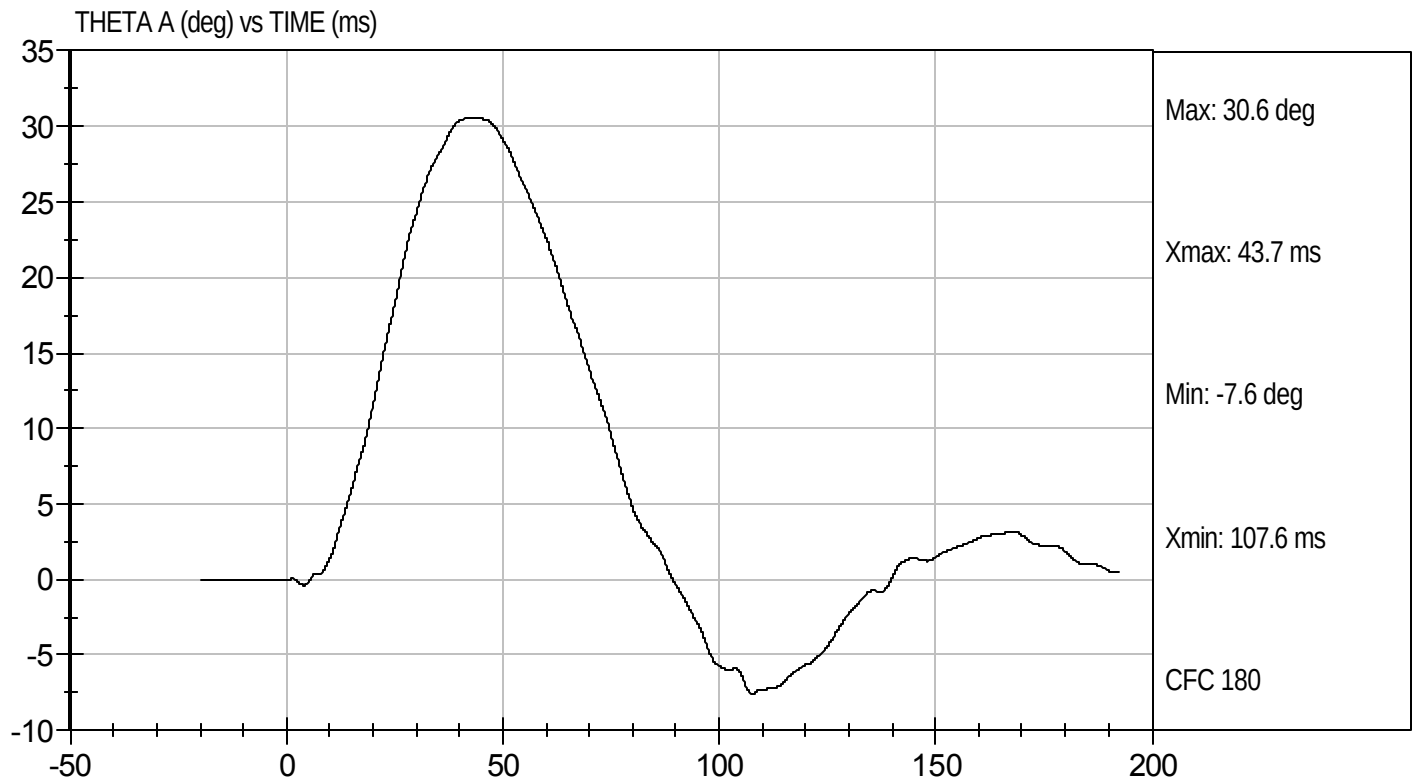
Test Date: 2/24/11
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D11708

Test Date: 2/24/11
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11709

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	27	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.71	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	12.60	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.34	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	13.40	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

2/24/11
Test Date

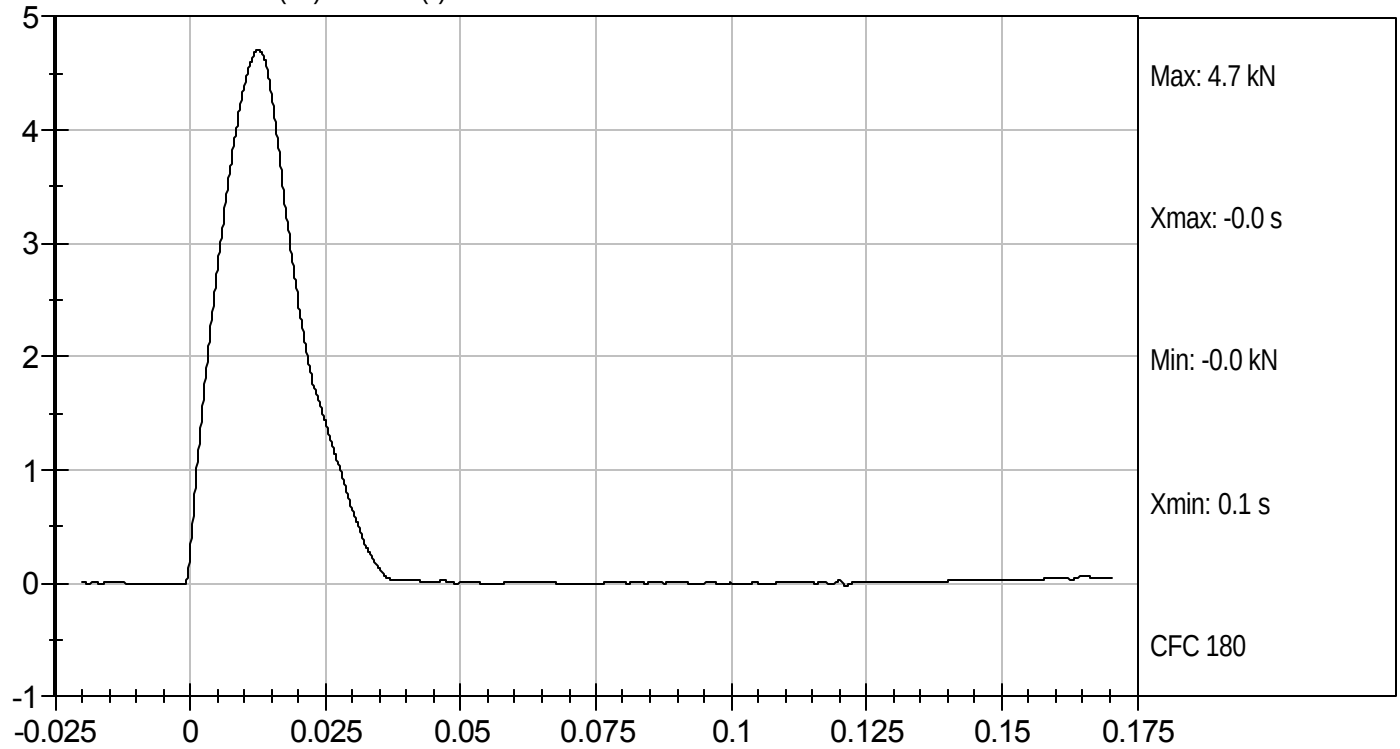
David Winkelbauer
Approved By



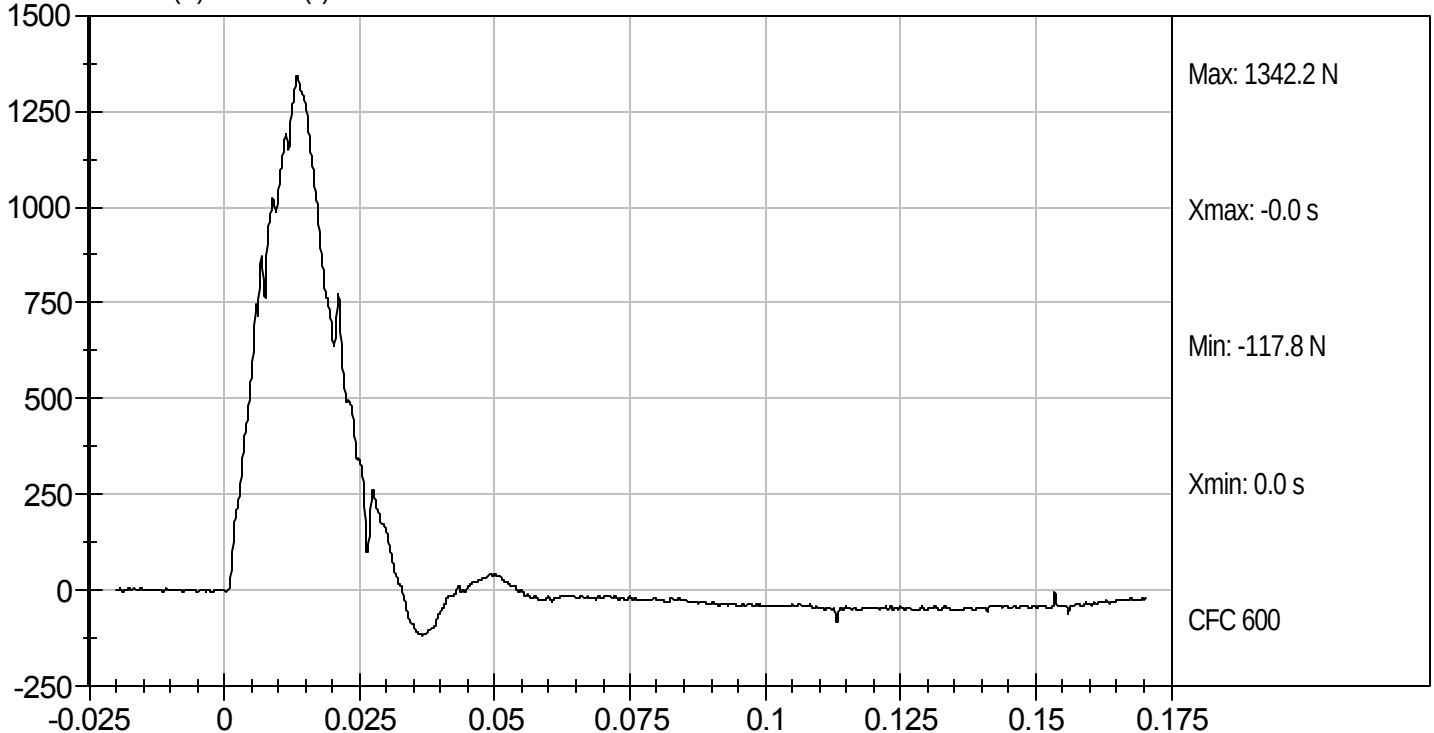
Test Desc: Pelvis Impact
Component ID: D11709

Test Date: 2/24/11
Velocity: 14.36 ft/s, 4.38 m/s

IMPACTOR FORCE (kN) vs TIME (s)



PUBIC (N) vs TIME (s)

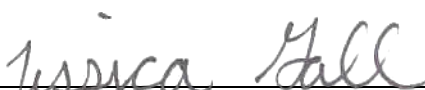


MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D11700

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.24	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.4	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.6	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.0	Pass
Overall Test Results			Pass	


Laboratory Technician

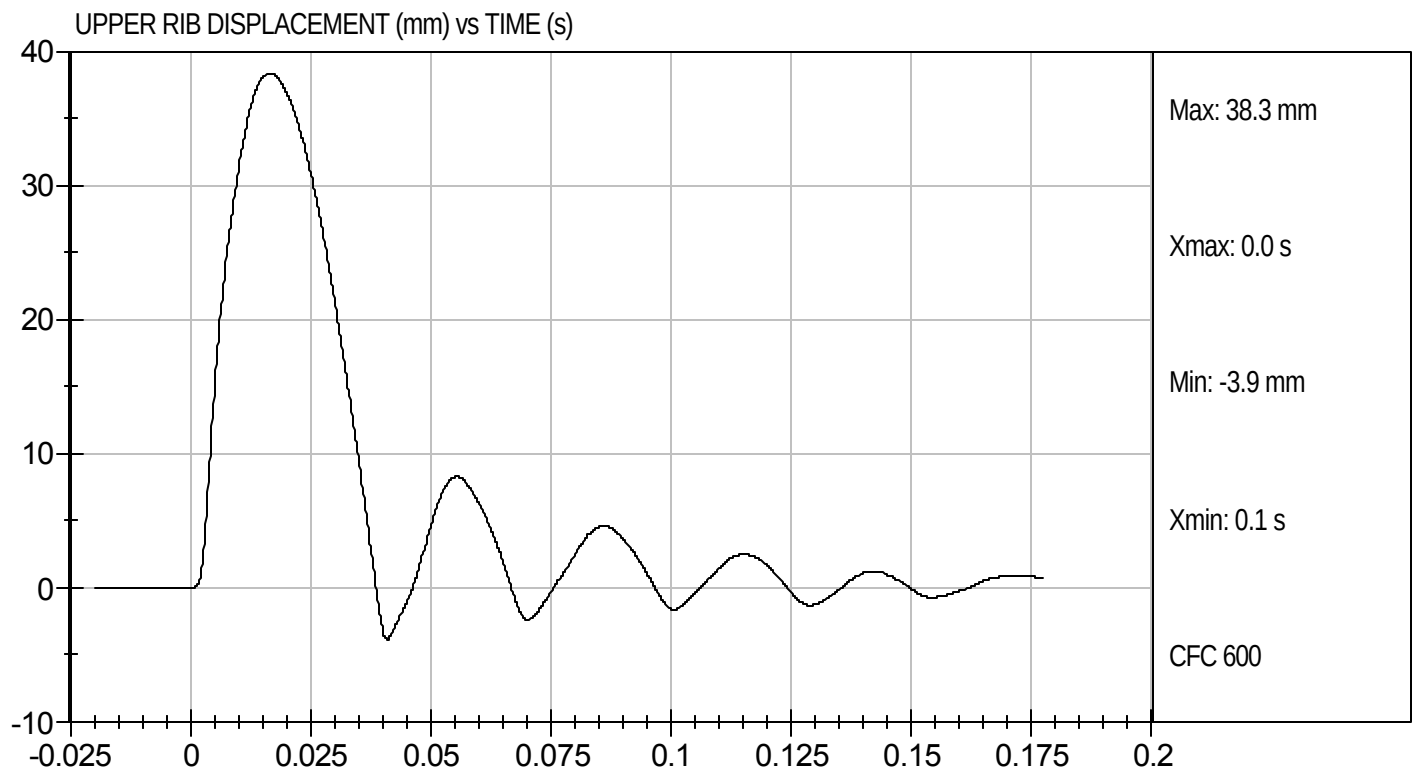
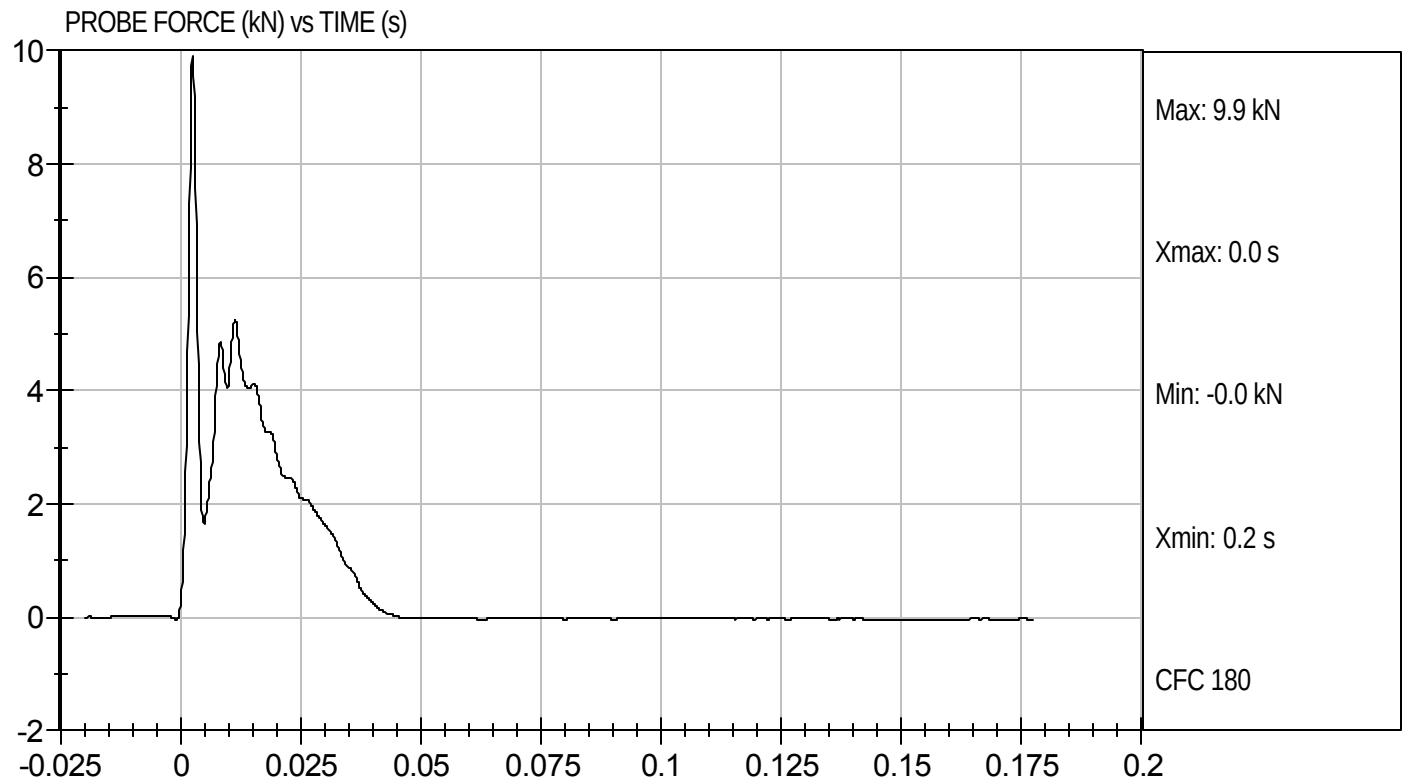
2/24/11
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D11700

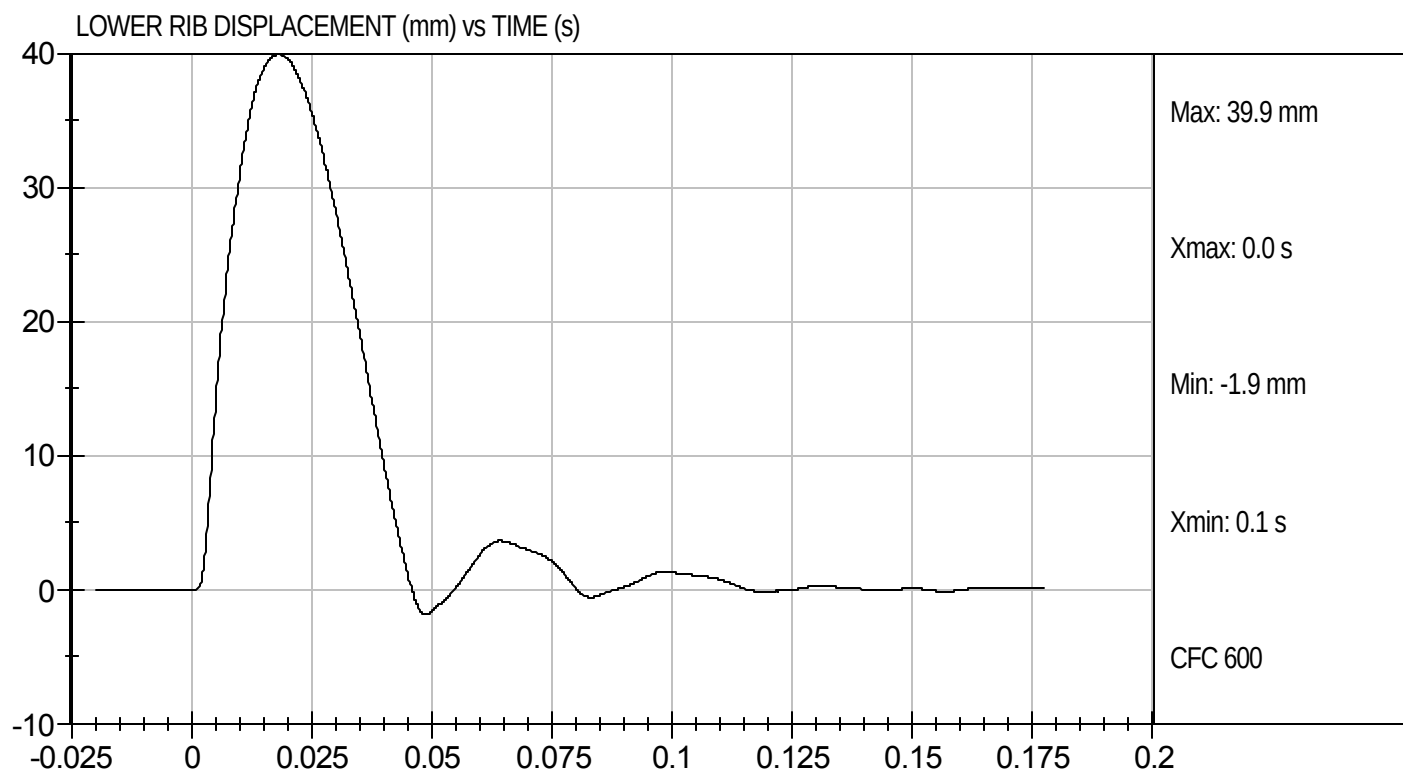
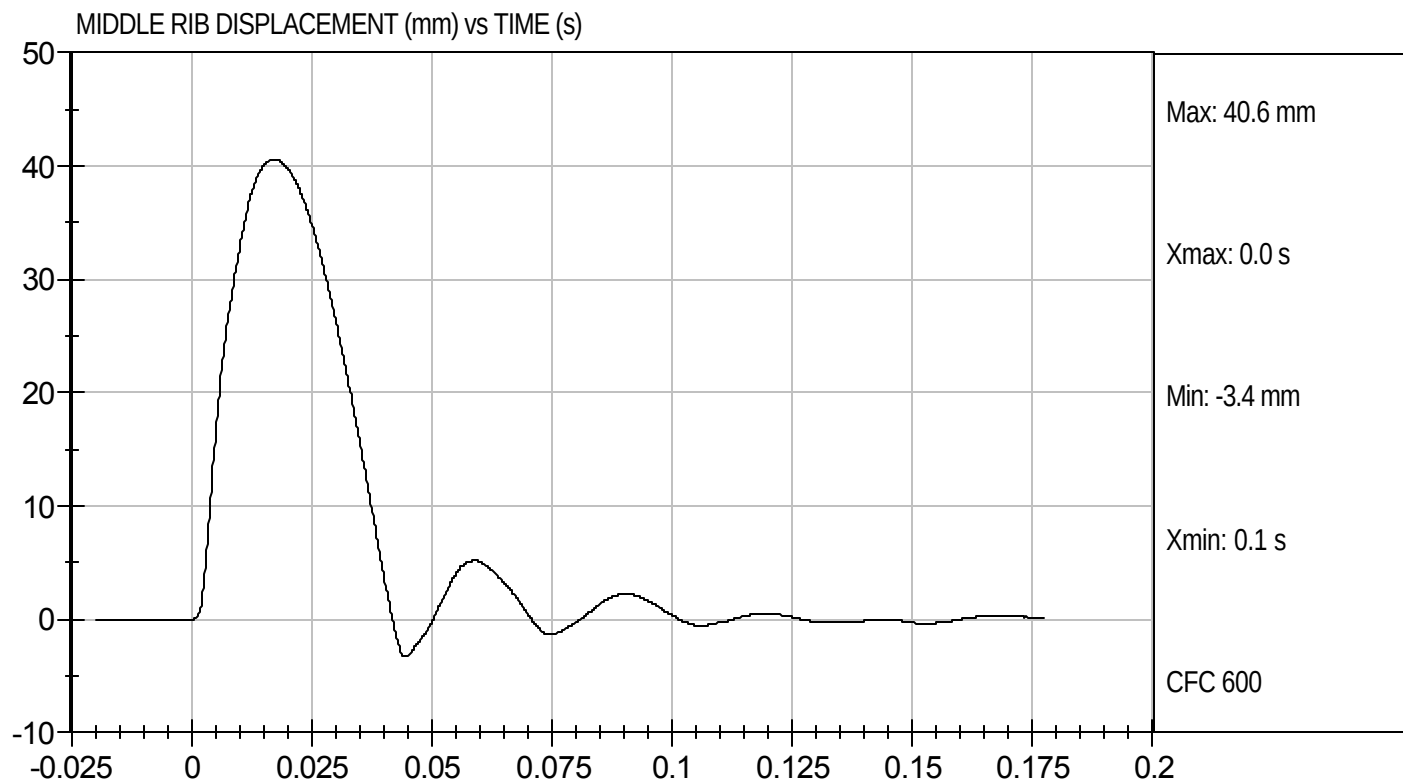
Test Date: 2/24/11
Velocity: 18.31 ft/s, 5.58 m/s





Test Desc: Thorax Impact
Component ID: D11700

Test Date: 2/24/11
Velocity: 18.31 ft/s, 5.58 m/s



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

ATD Serial No: 306

Test ID: D11671

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	24	Pass
Peak Resultant Acceleration	G's	115 to 137	116	Pass
Peak Lateral Acceleration	G's	+/- 15	-6.4	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

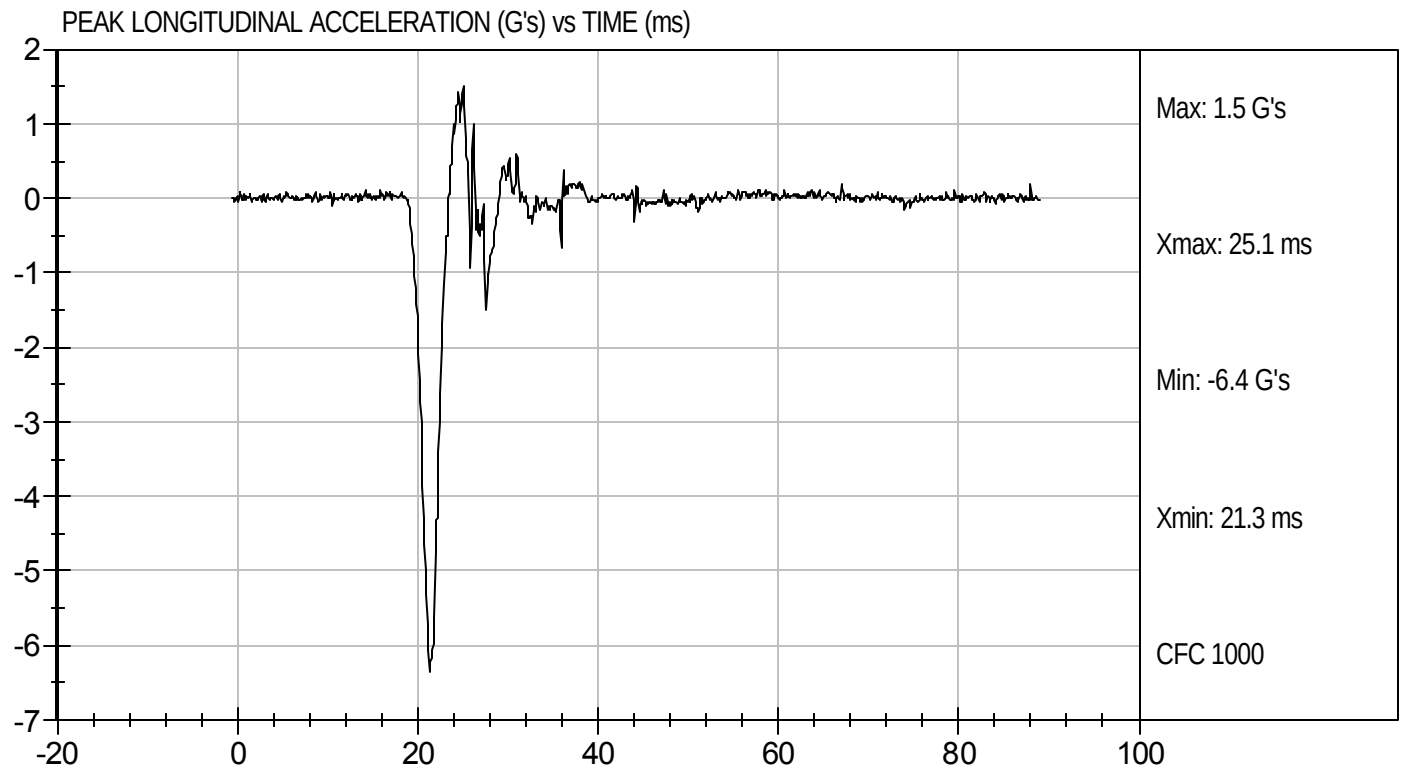
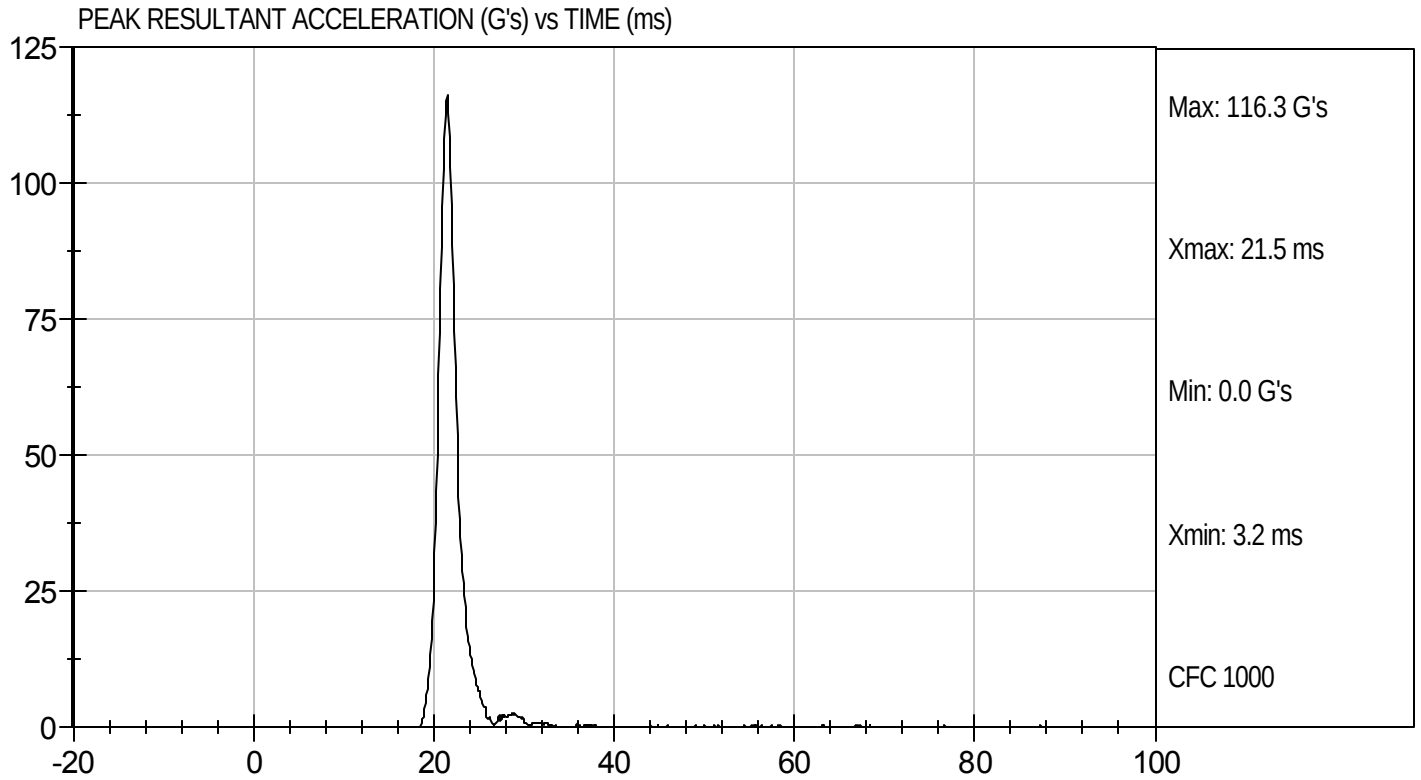
2/23/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11671

Test Date: 2/23/11
Velocity: 0 ft/s, 0 m/s



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

ATD Serial No: 306

Test I.D: D11672

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.2	Pass
Humidity		%	10 to 70	24	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.47	Pass
	15 ms	m/s	3.30 to 4.10	3.56	Pass
	20 ms	m/s	4.40 to 5.40	4.79	Pass
	25 ms	m/s	5.40 to 6.10	5.54	Pass
	25-100 ms	m/s	5.50 to 6.20	5.54	Pass
Maximum D-Plane Rotation		deg	71 to 81	73	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	63	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-43	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	118	Pass
Overall Test Results				Pass	


 Laboratory Technician

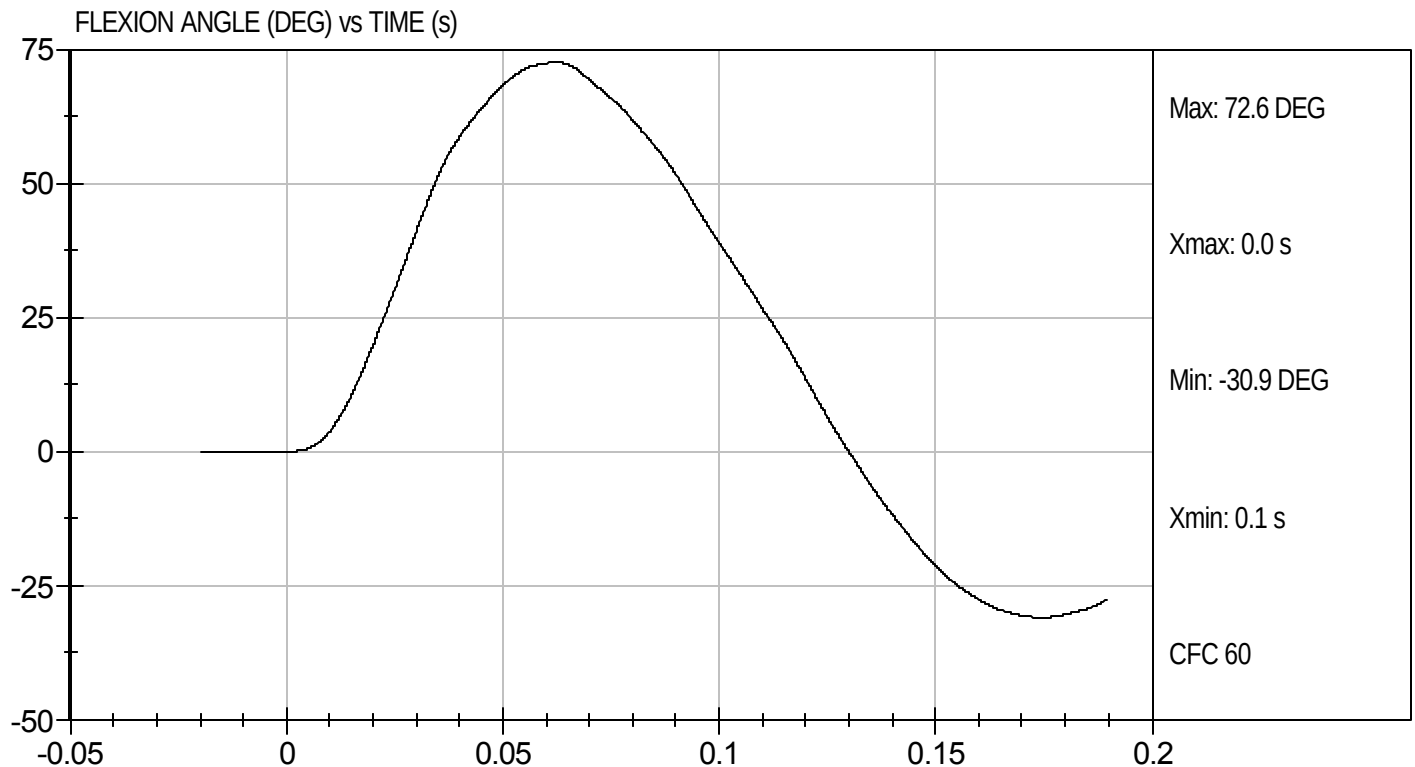
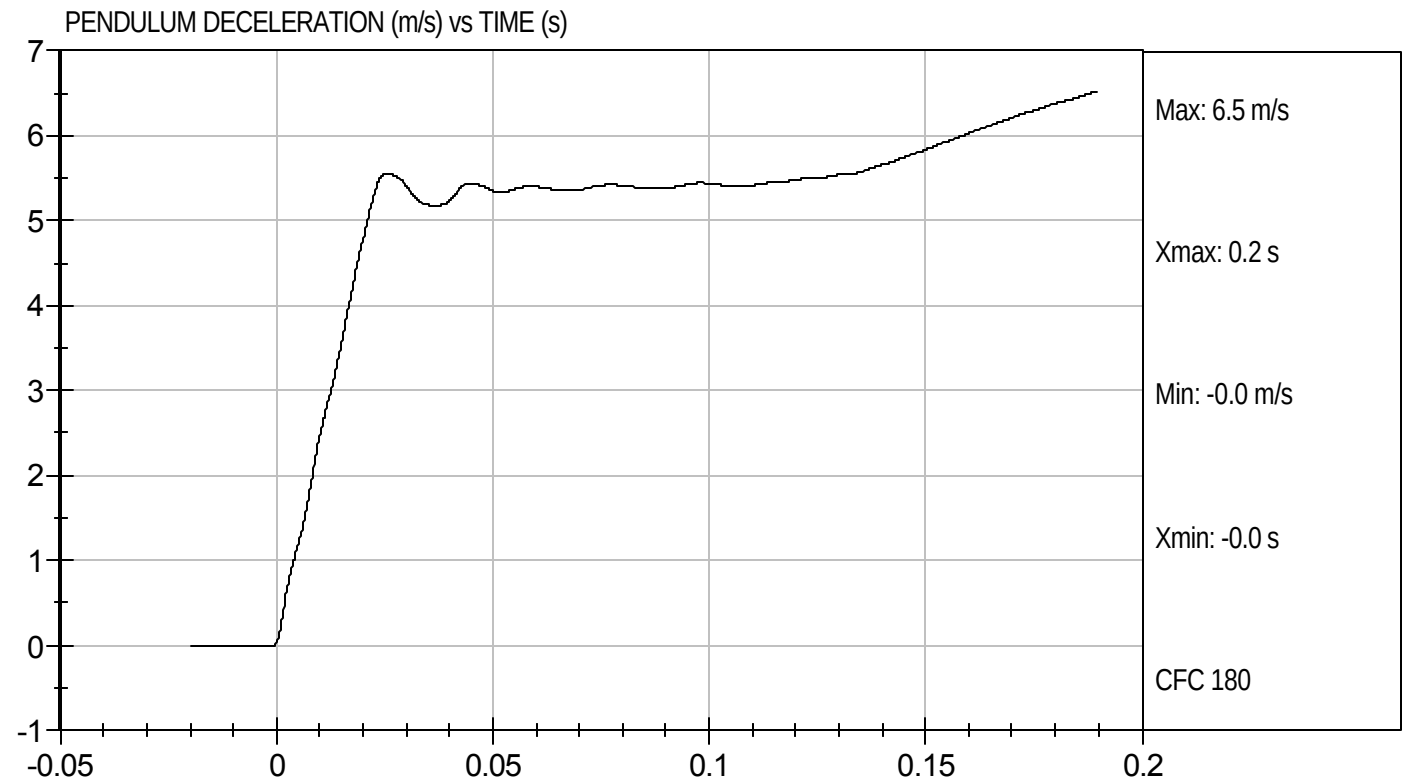
2/23/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11672

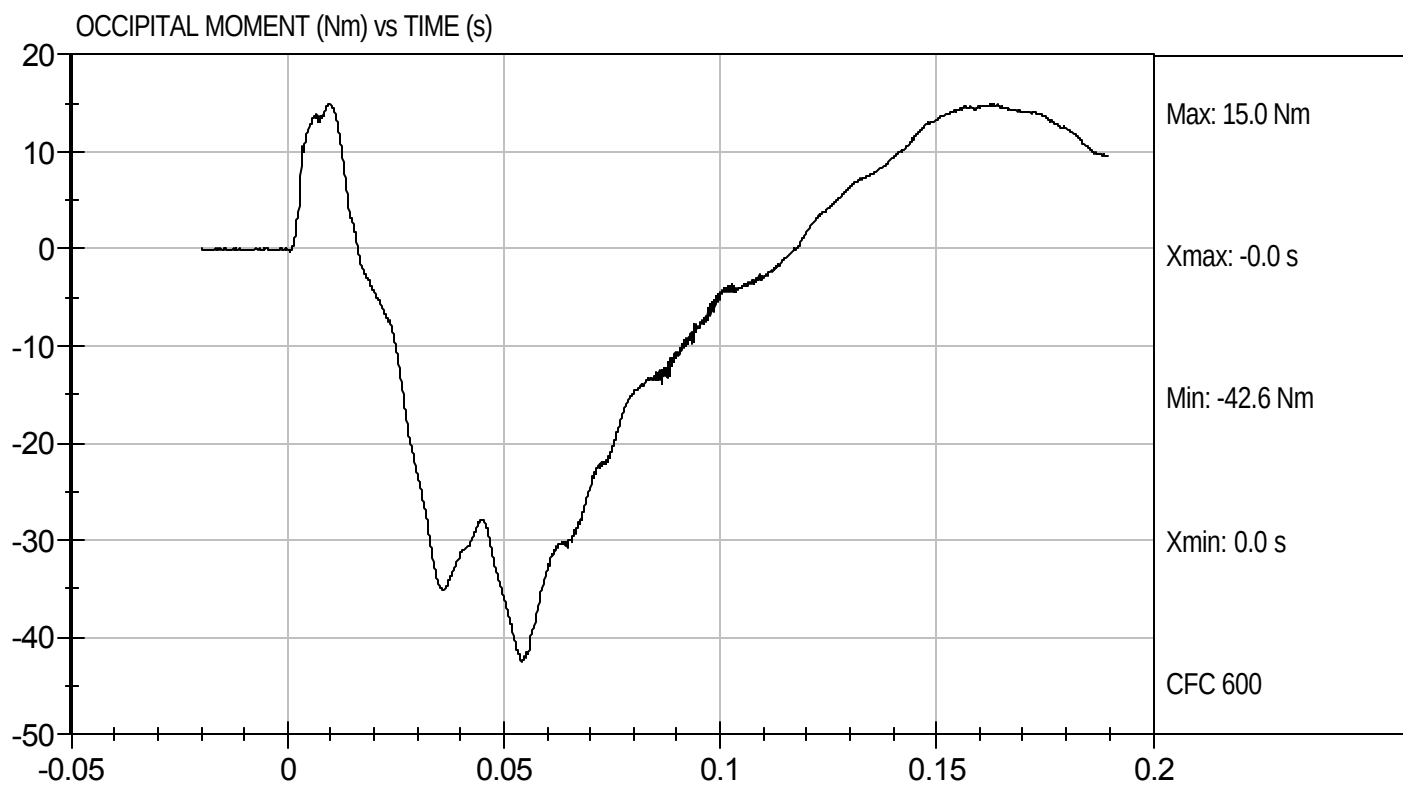
Test Date: 2/23/11
Velocity: 18.31 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D11672

Test Date: 2/23/11
Velocity: 18.31 ft/s, 5.58 m/s



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

ATD Serial No: 306

Test ID: D11673

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	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	14	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
			Overall Test Results	Pass


Laboratory Technician

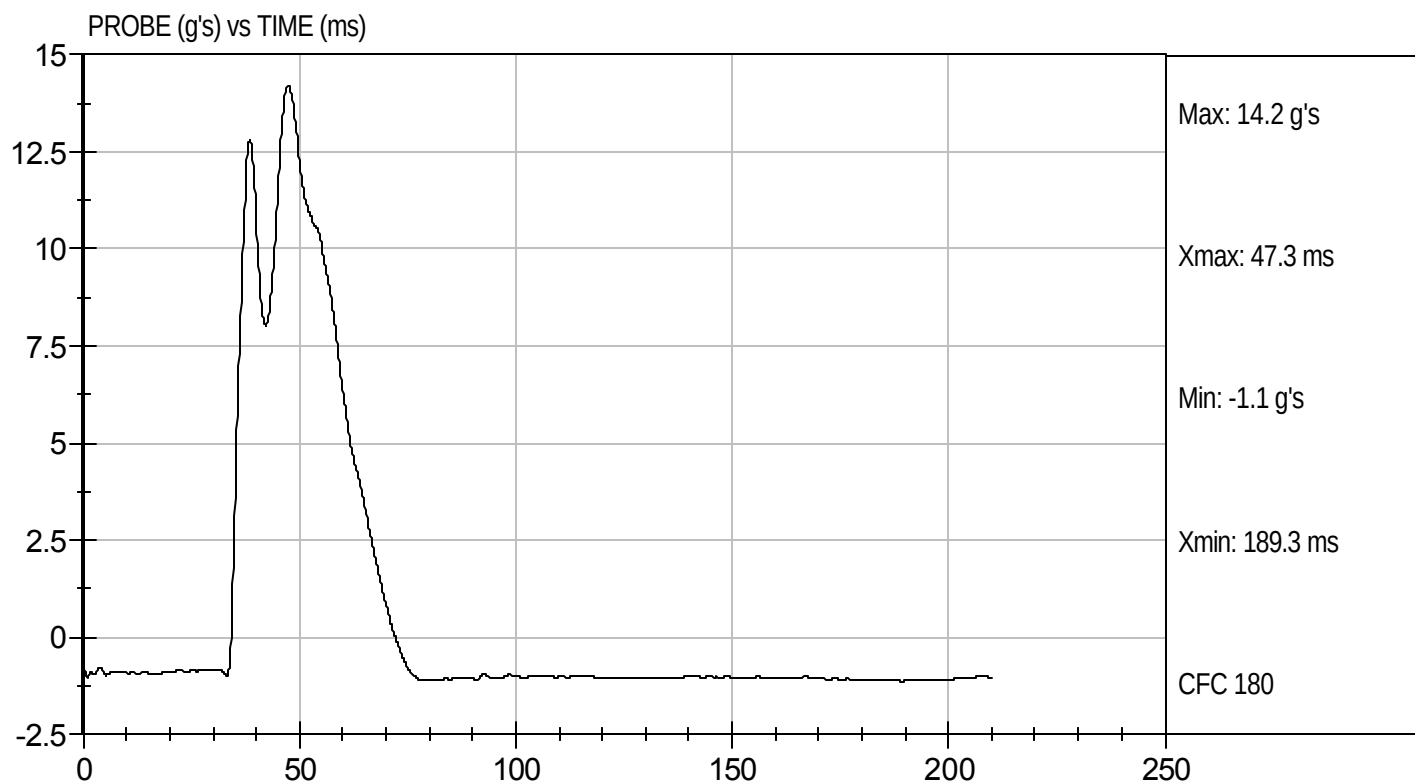
2/23/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11673

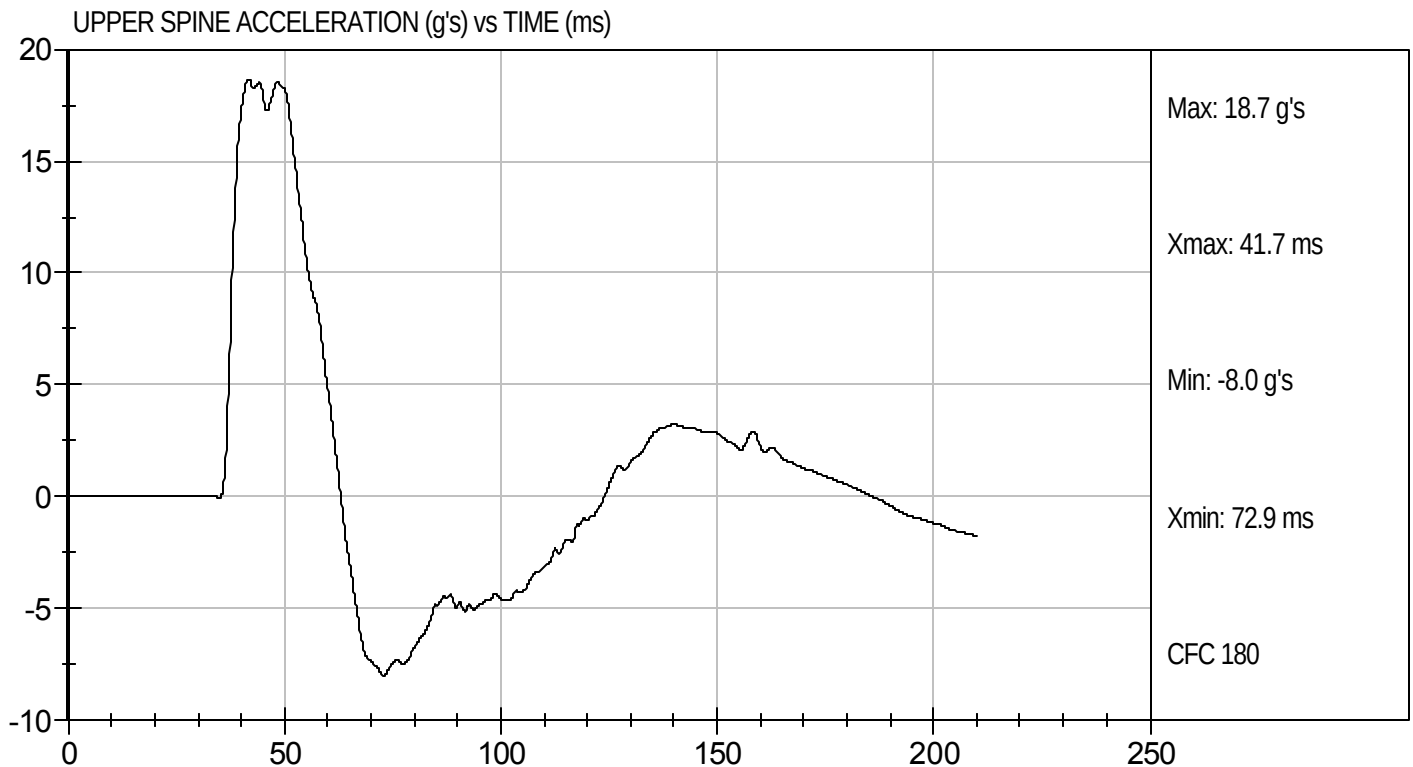
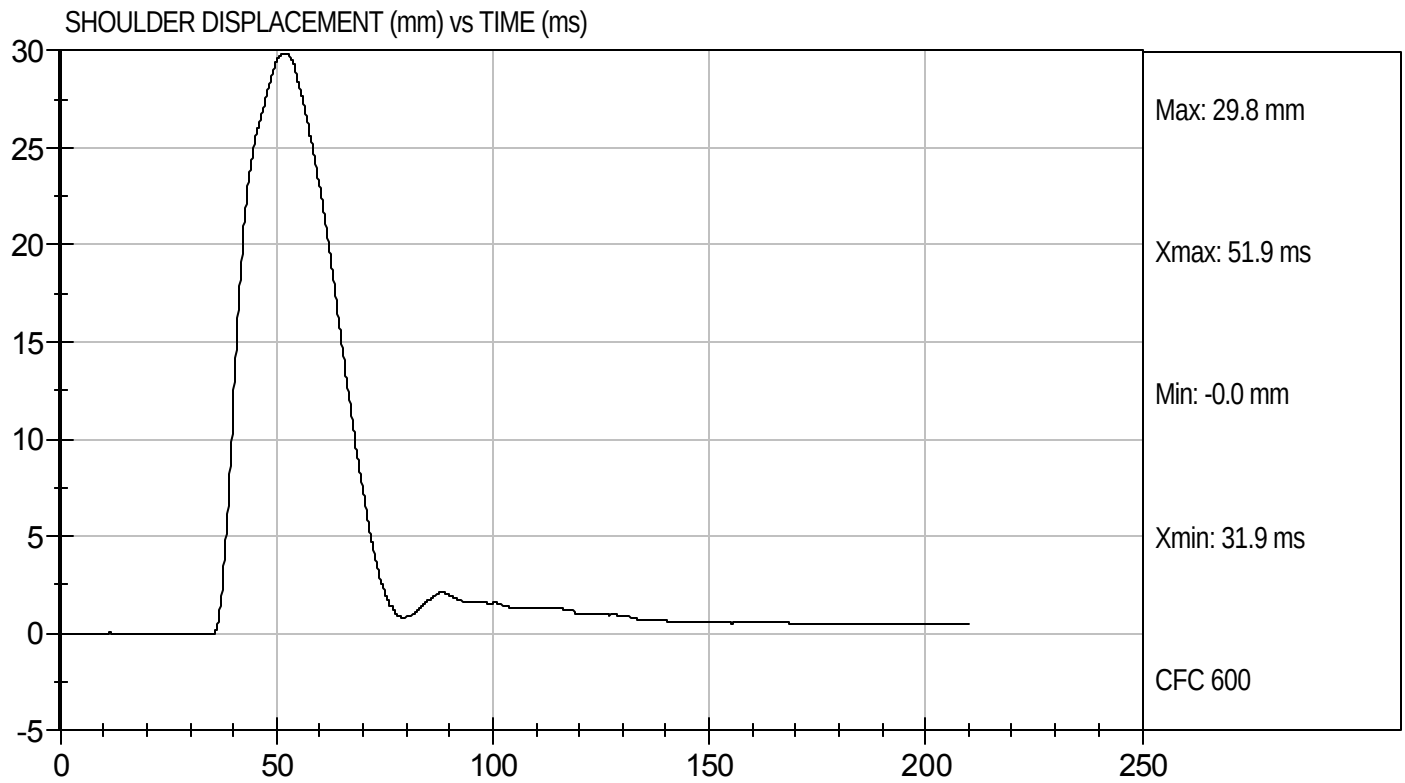
Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D11673

Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s

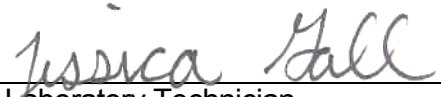


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D11674

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	24	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	32	Pass
Upper Rib Displacement	mm	25 to 32	26	Pass
Middle Rib Displacement	mm	30 to 36	30	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	39	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results				Pass


Laboratory Technician

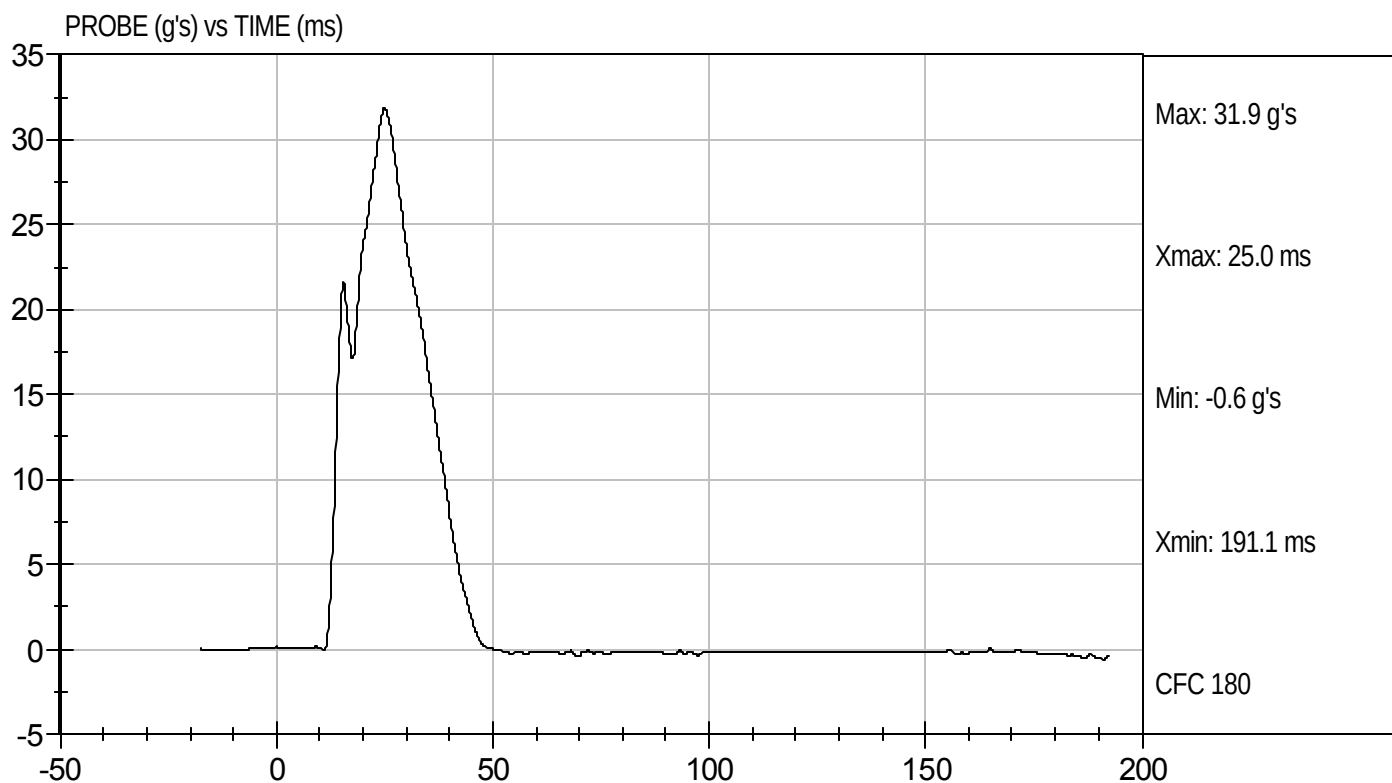
2/23/11
Test Date


Approved By



Test Desc: Thorax With Arm
Component ID: D11674

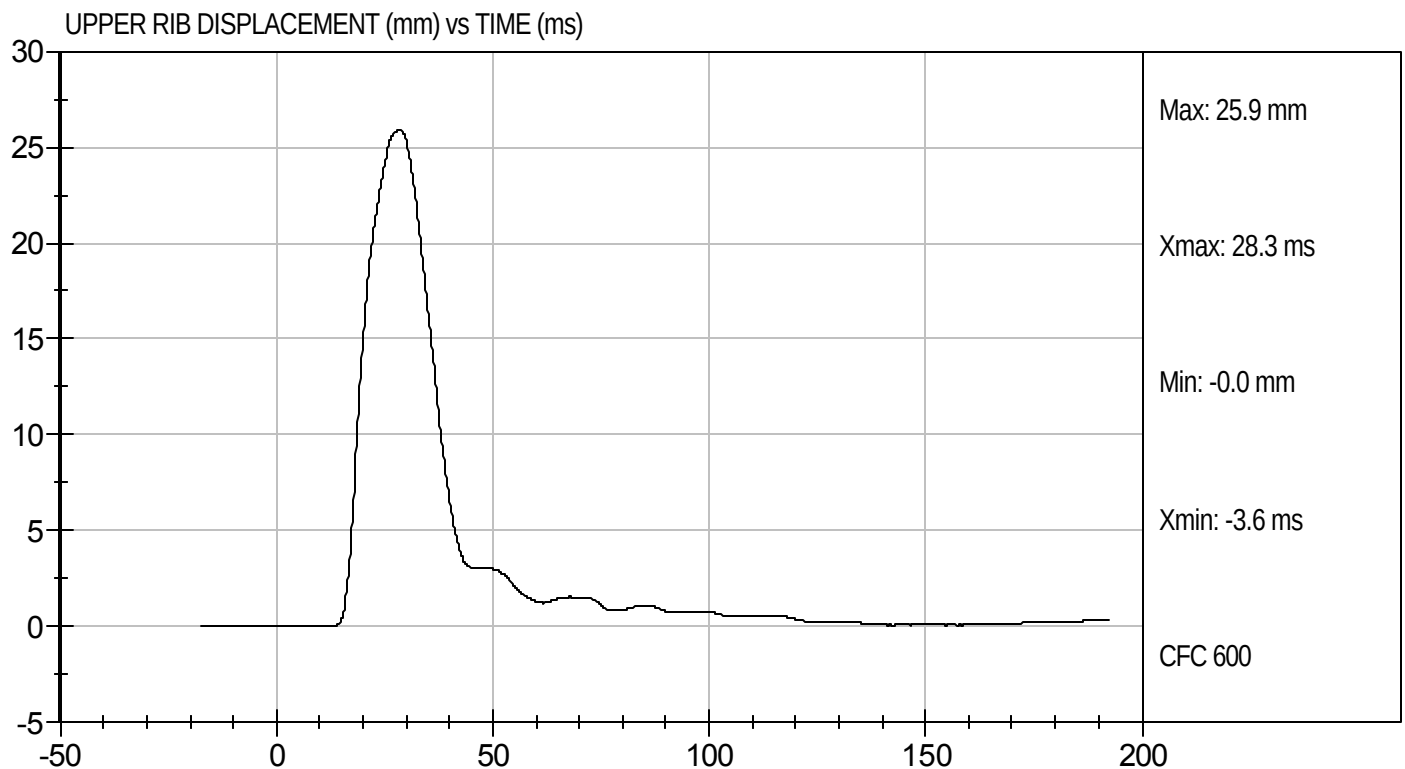
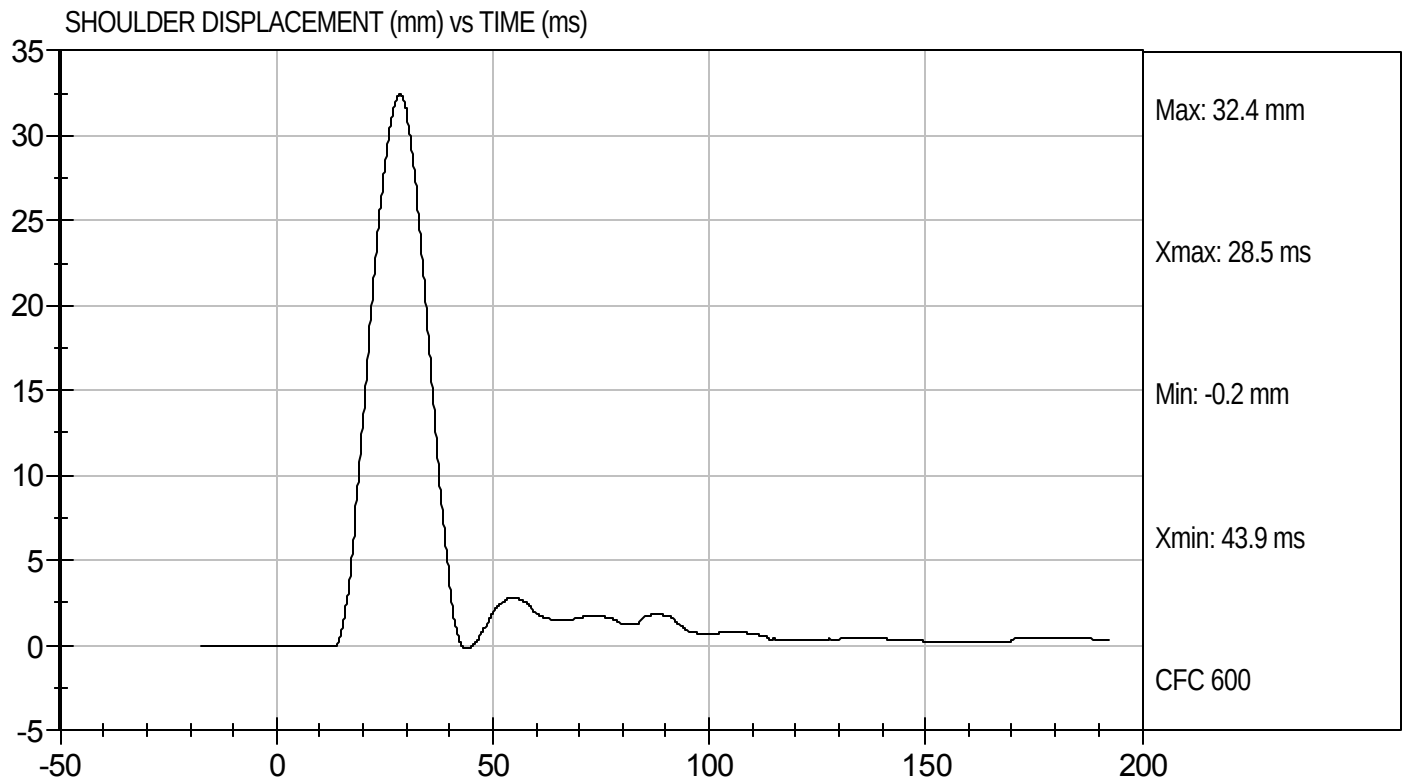
Test Date: 2/23/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11674

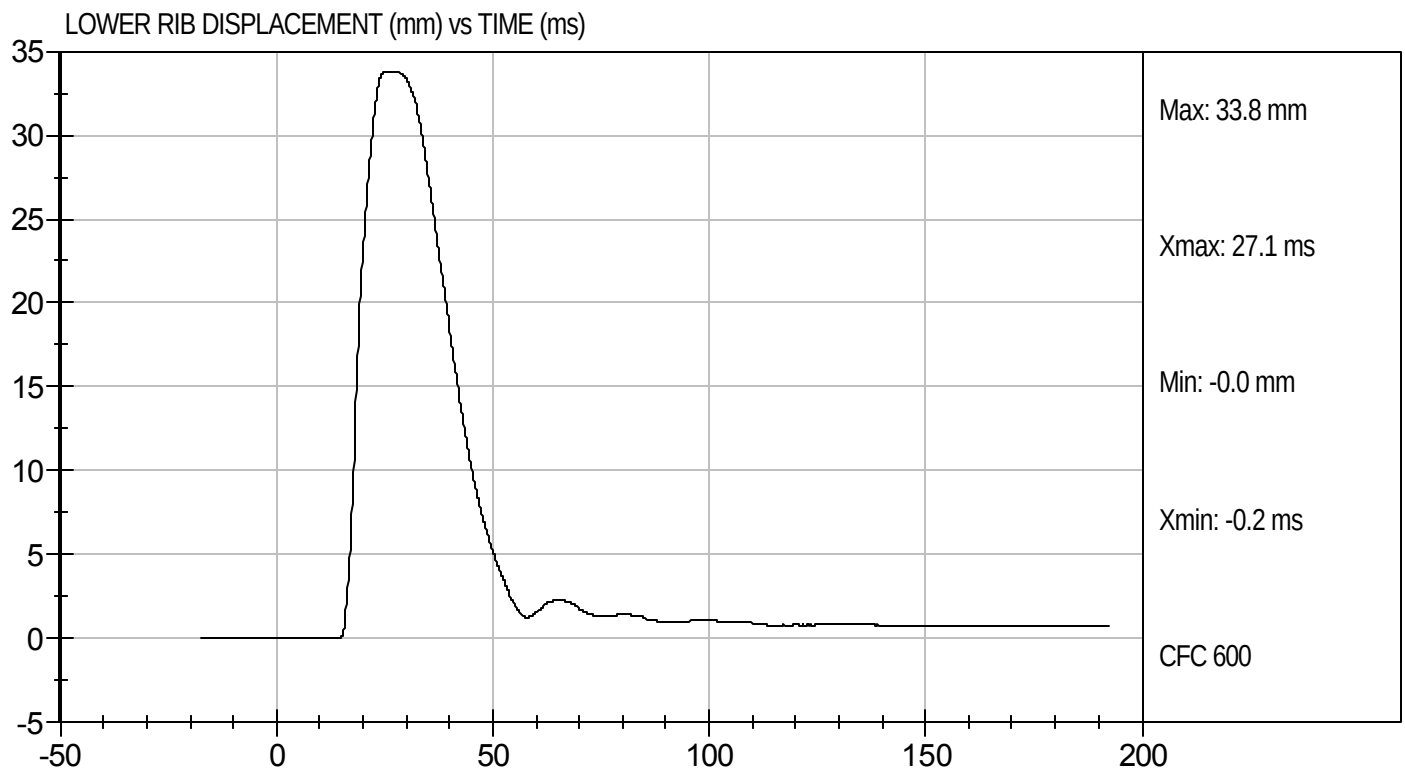
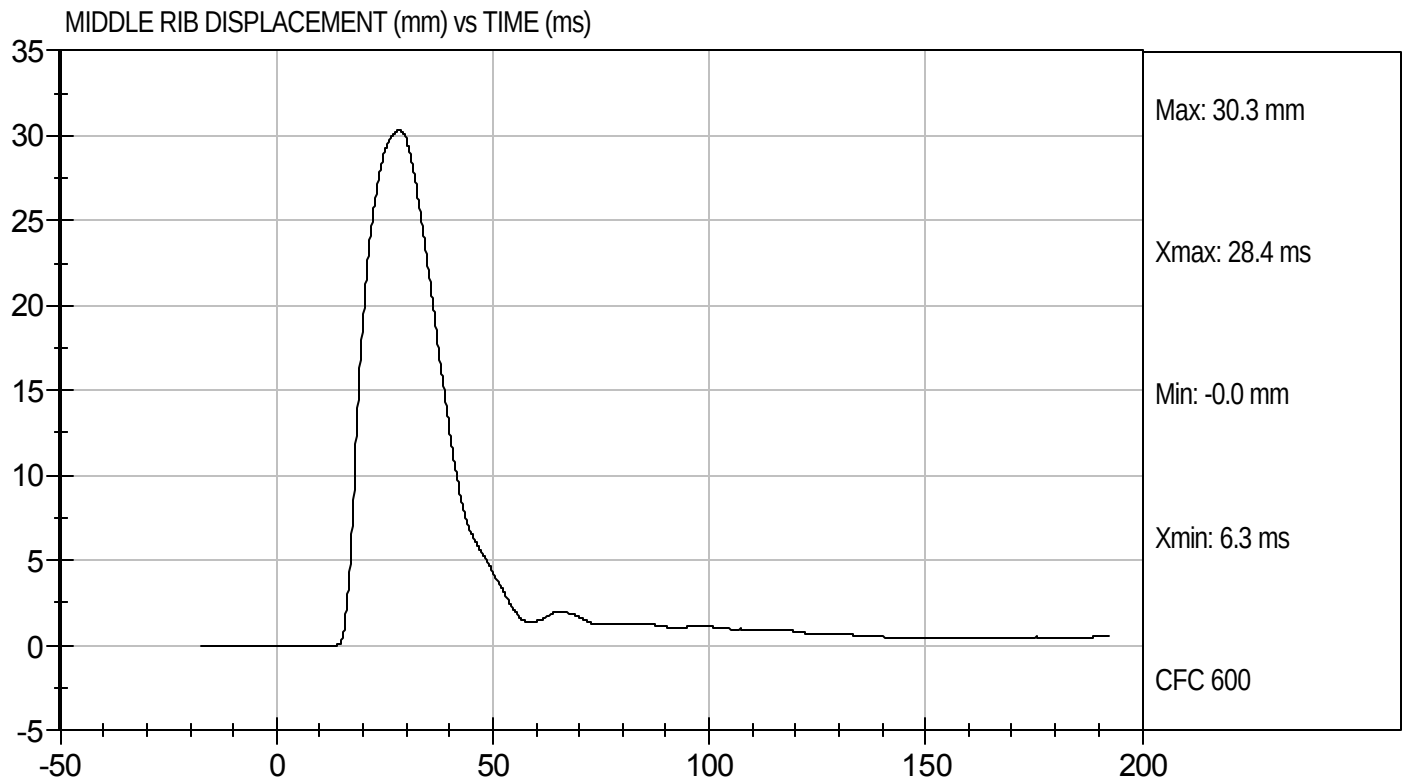
Test Date: 2/23/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11674

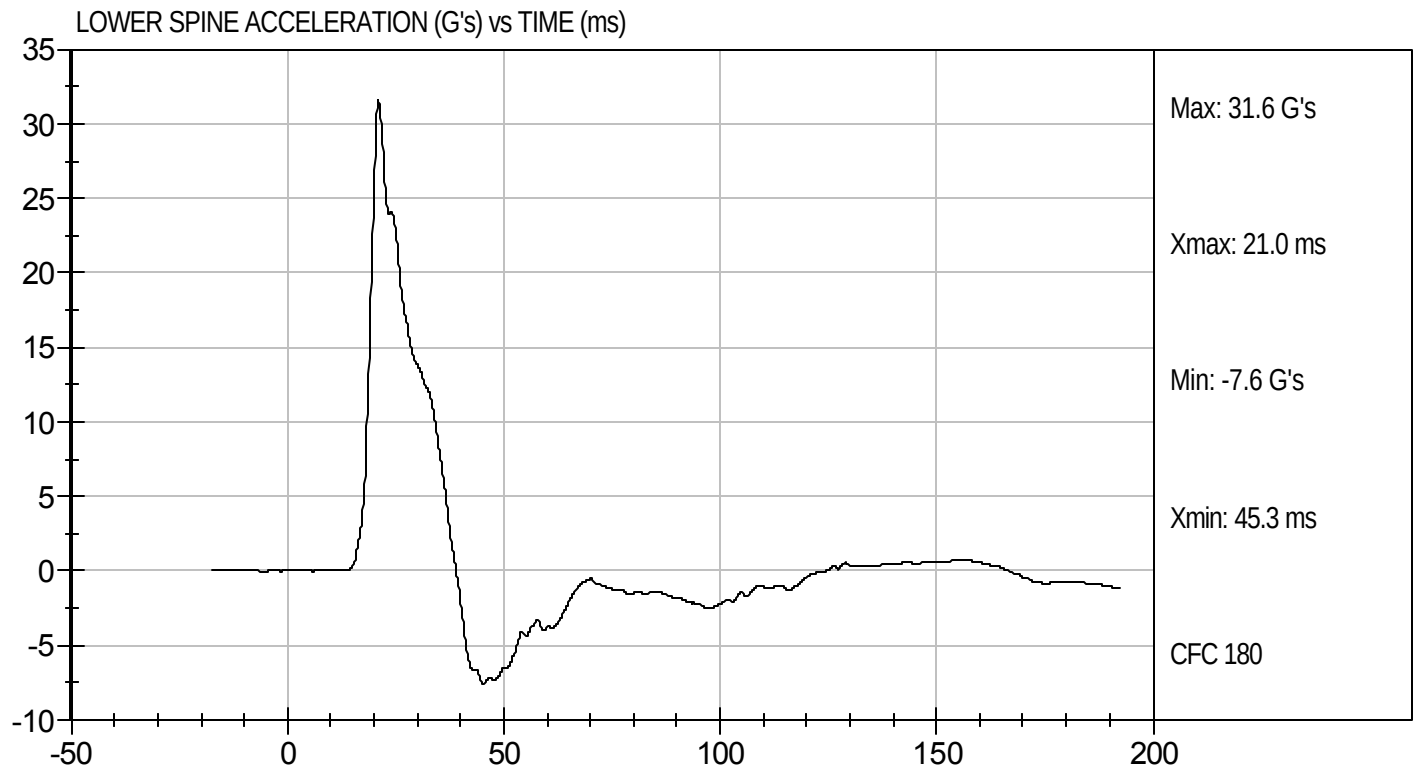
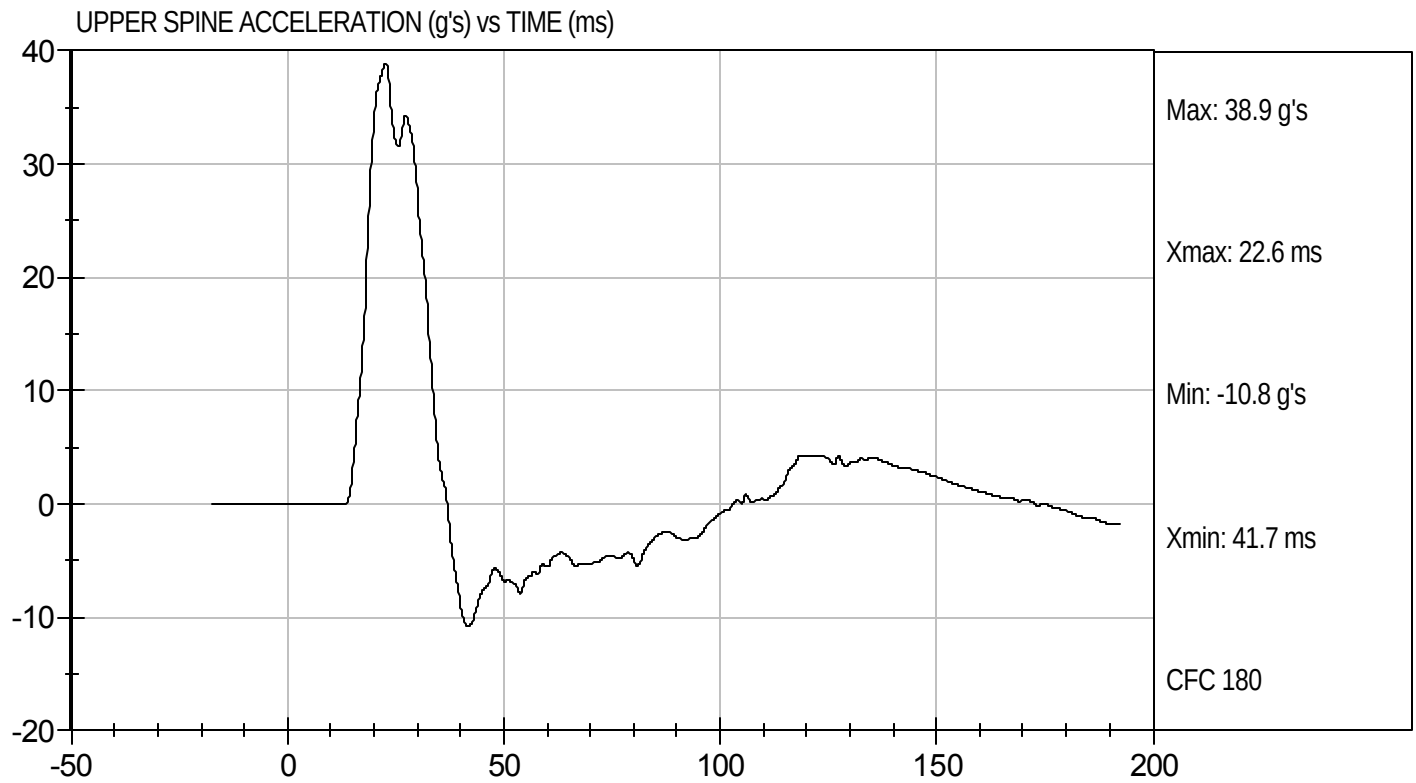
Test Date: 2/23/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11674

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

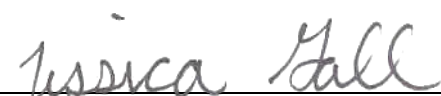


MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D11675

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	24	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	35	Pass
Middle Rib Displacement	mm	39 to 45	39	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

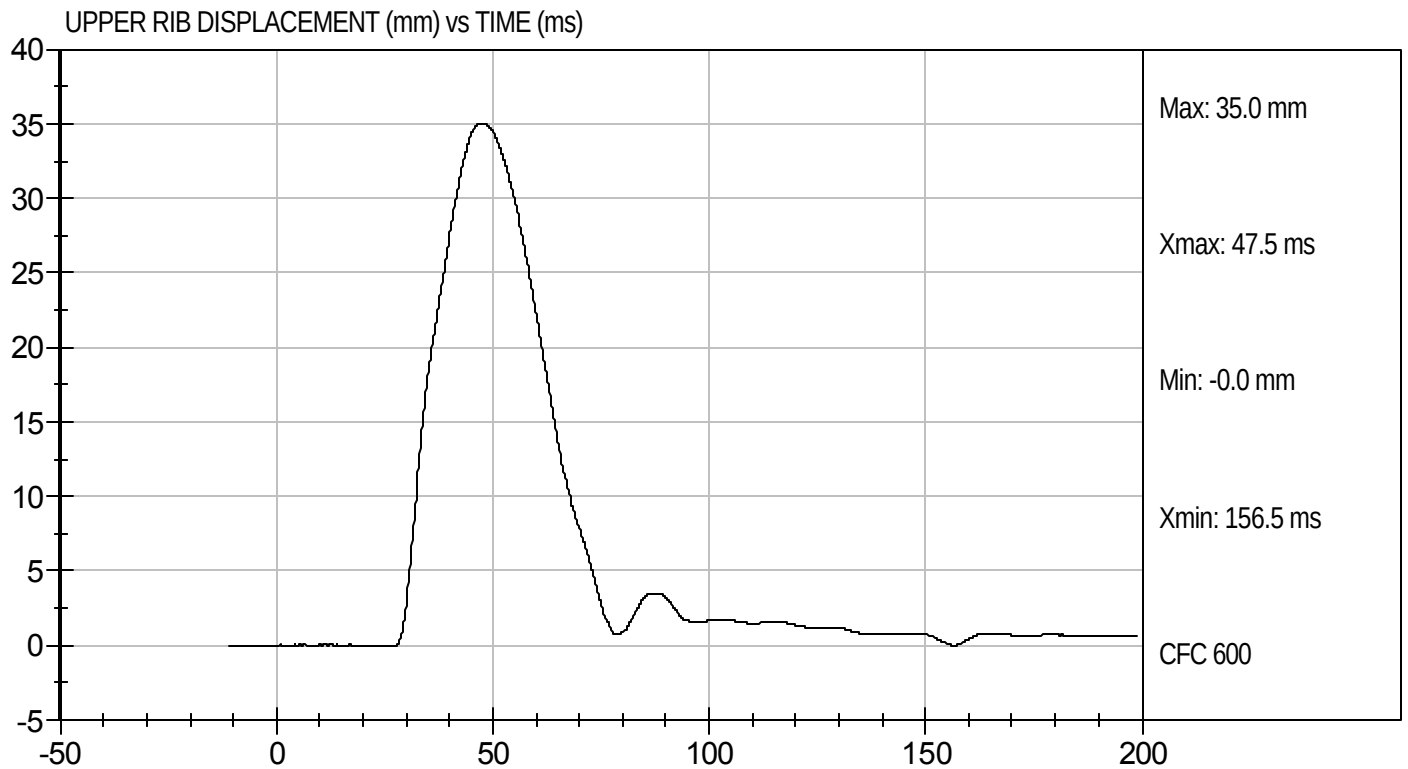
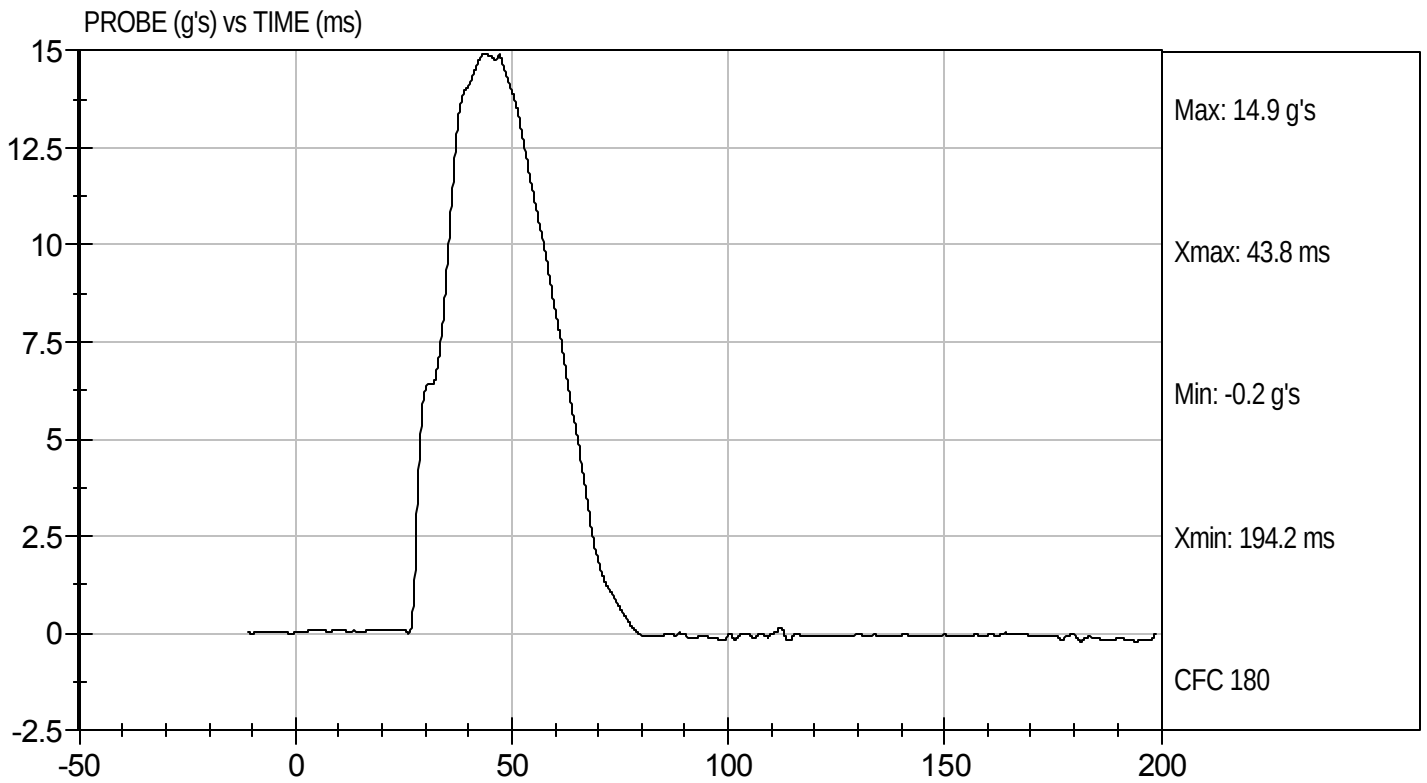
2/23/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D11675

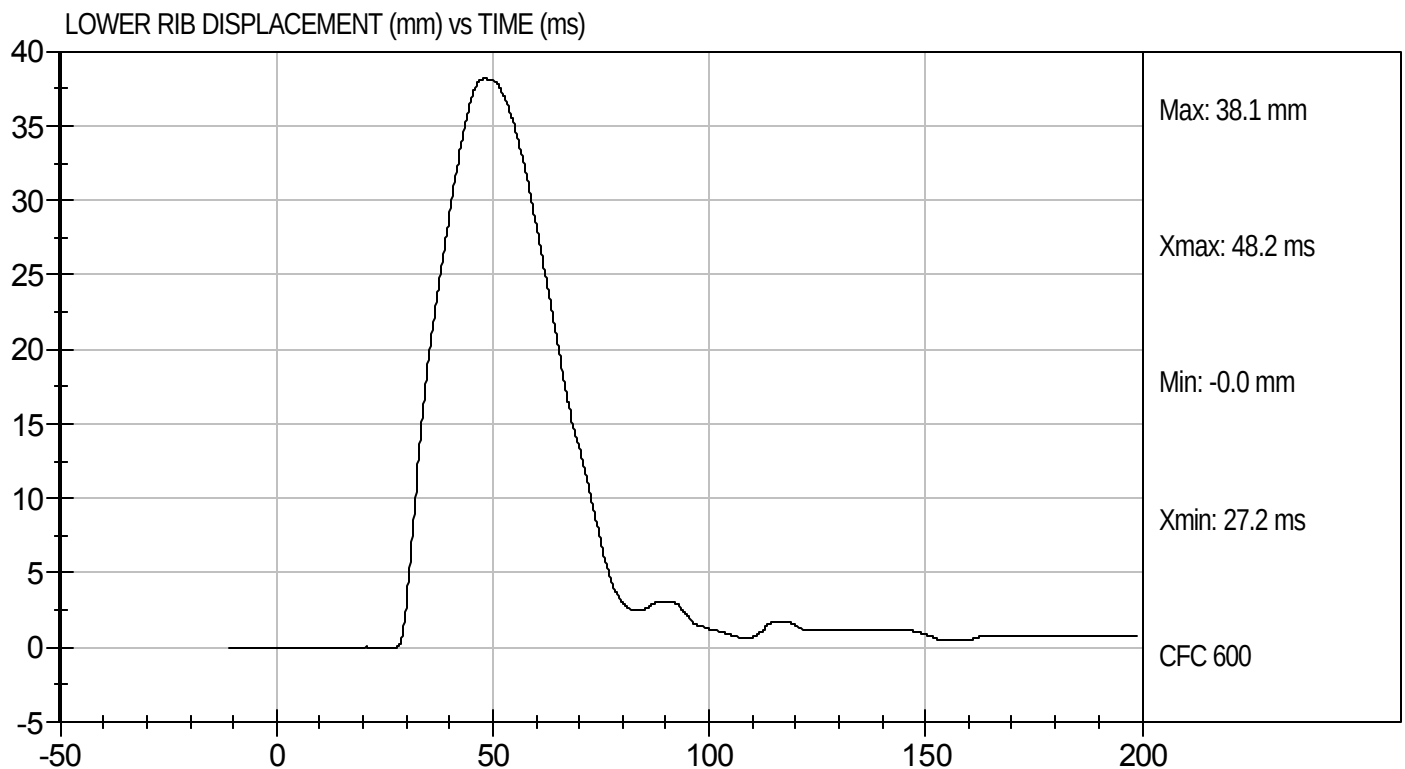
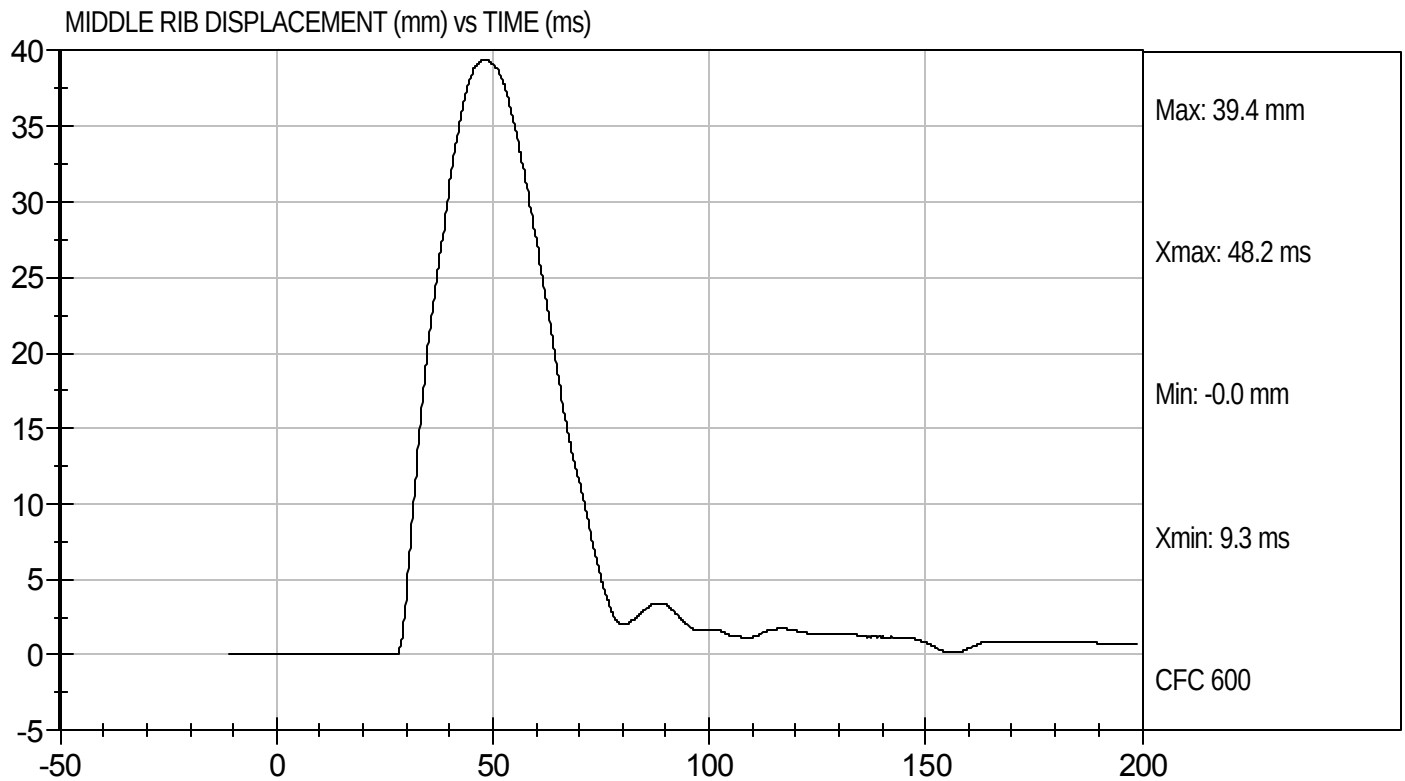
Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D11675

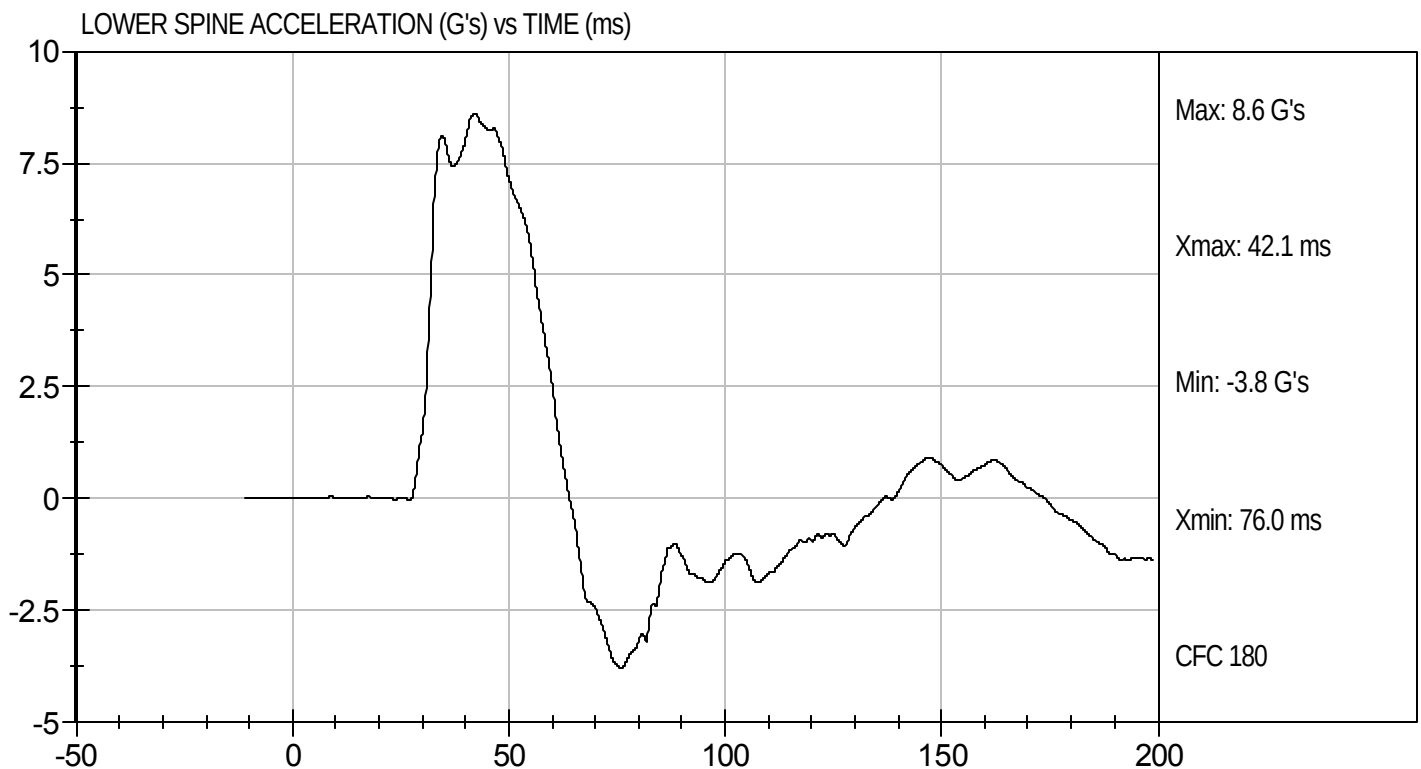
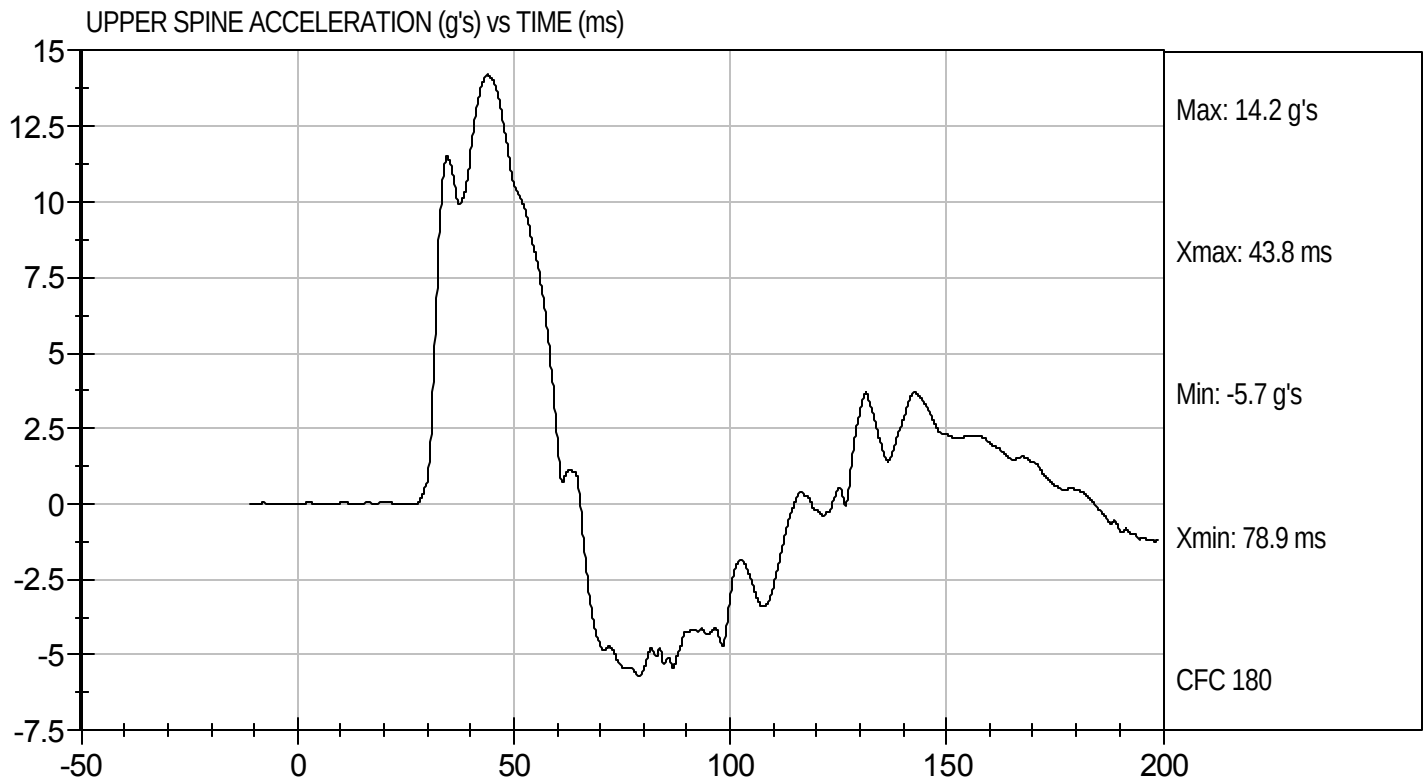
Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D11675

Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s



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

ATD Serial No: 306

Test I.D: D11676

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	24	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	38	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



Laboratory Technician

2/23/11

Test Date

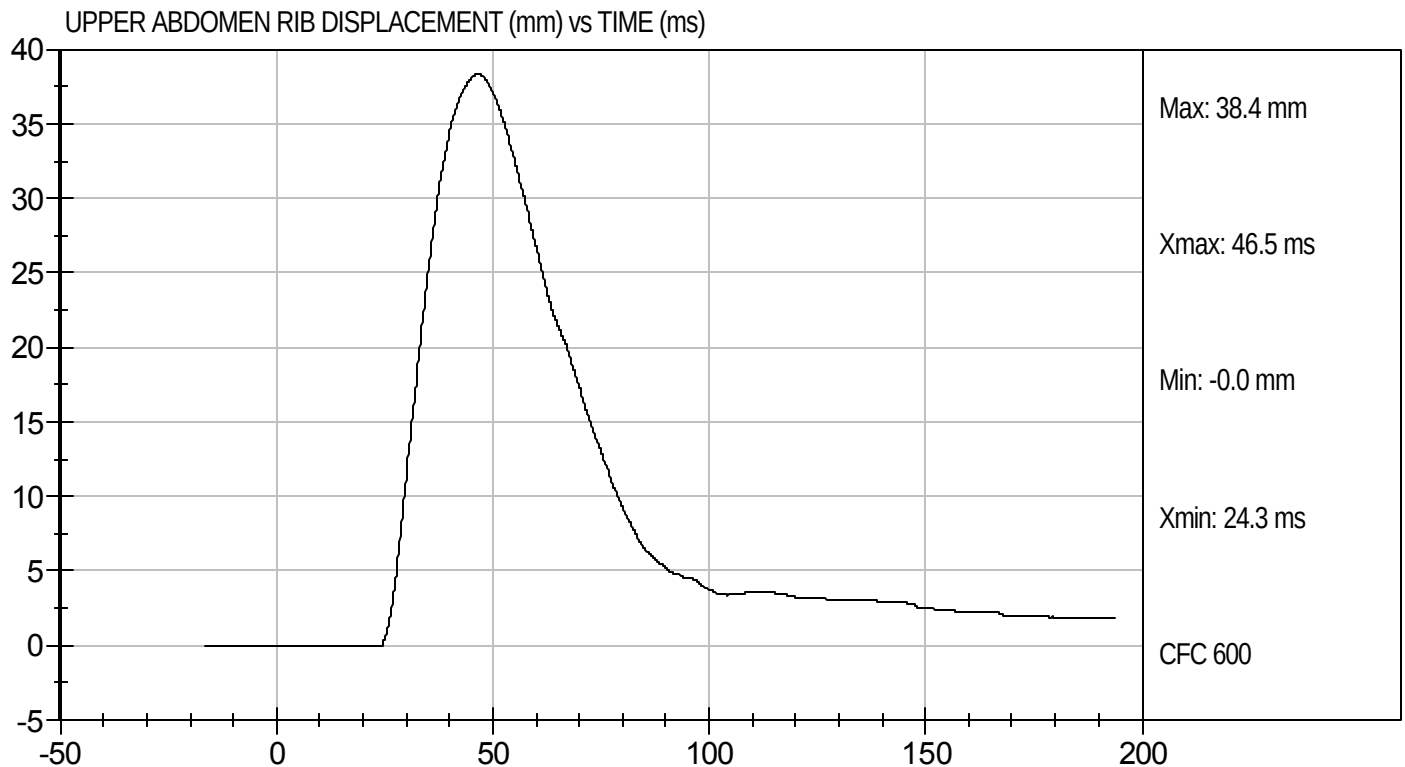
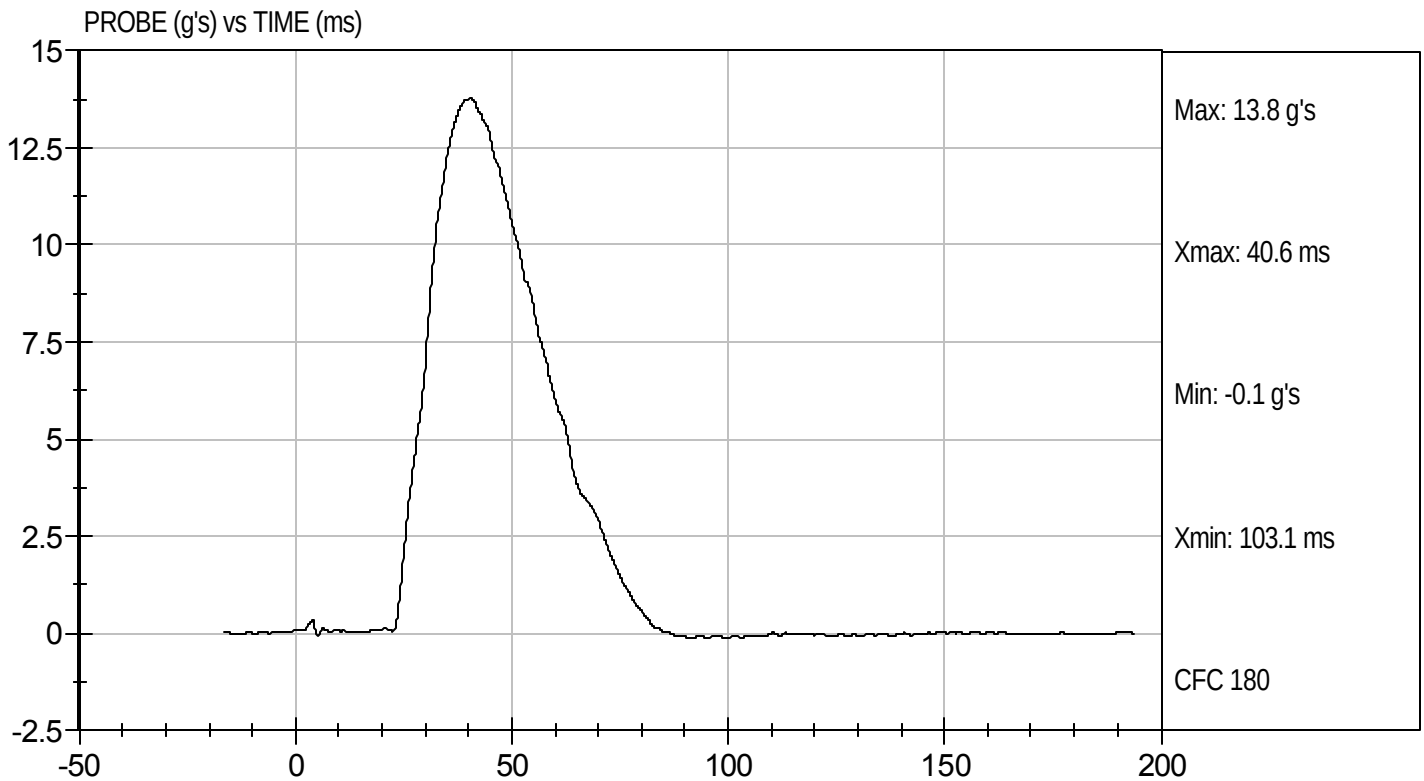


Approved By



Test Desc: Abdomen Impact
Component ID: D11676

Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s

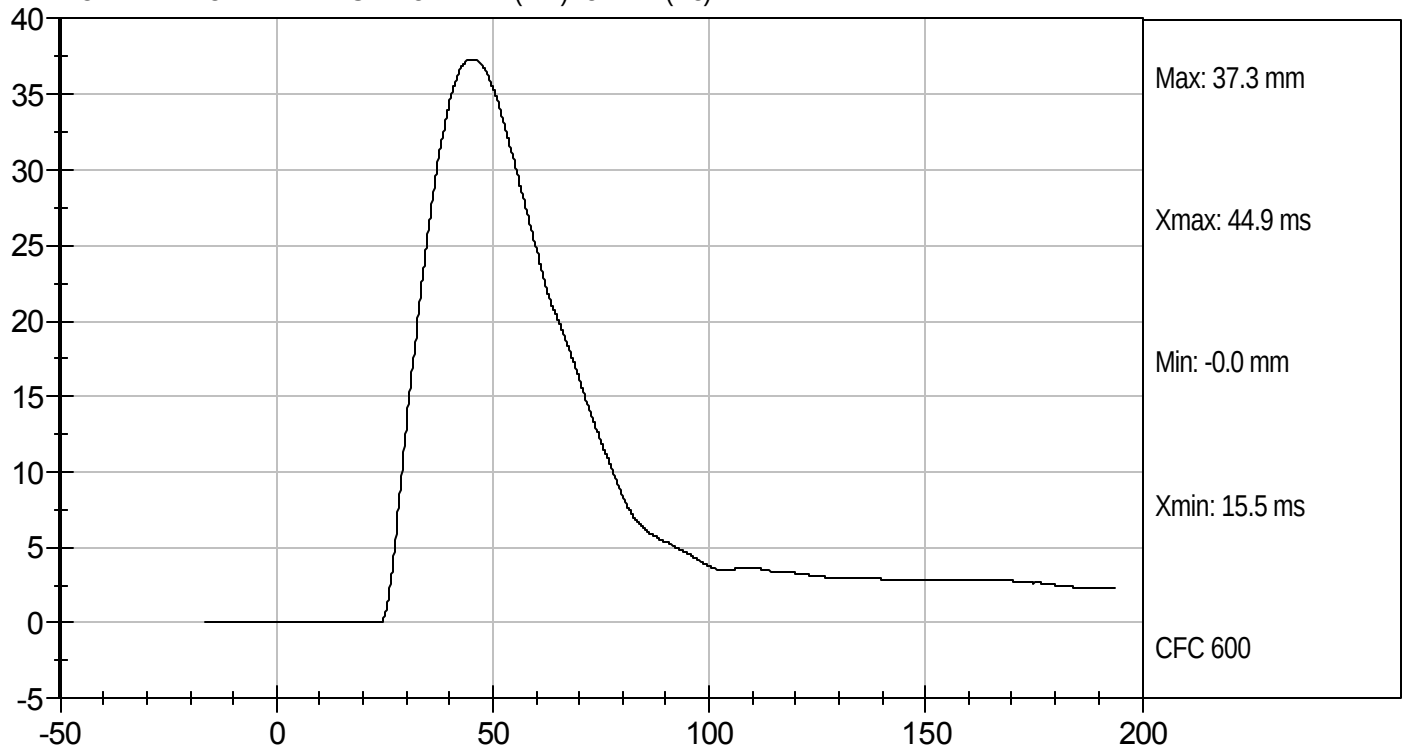




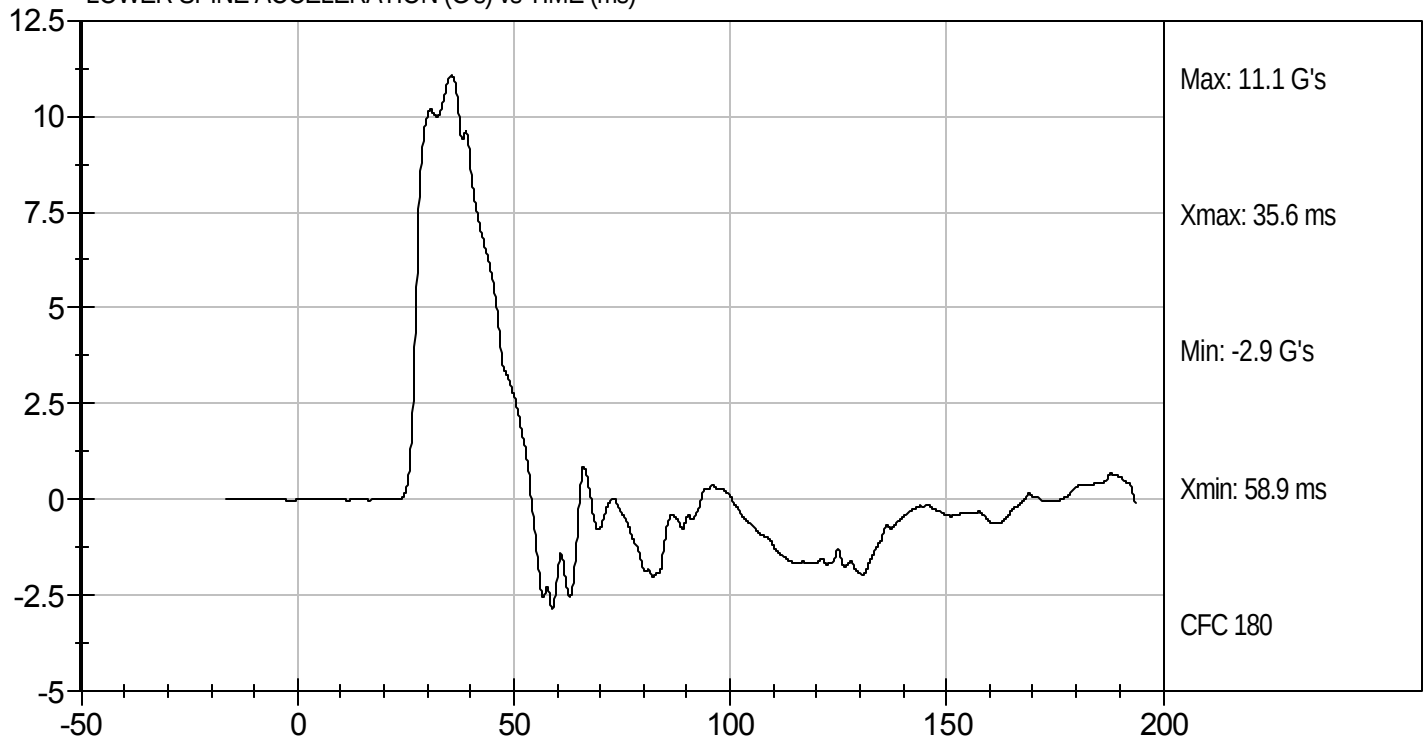
Test Desc: Abdomen Impact
Component ID: D11676

Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s

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



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

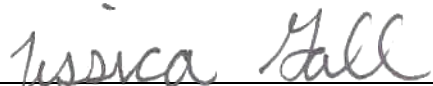


MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D11677

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	42	Pass
Peak Acetabulum Force	N	3600 to 4300	4144	Pass
Overall Test Results				Pass


Laboratory Technician

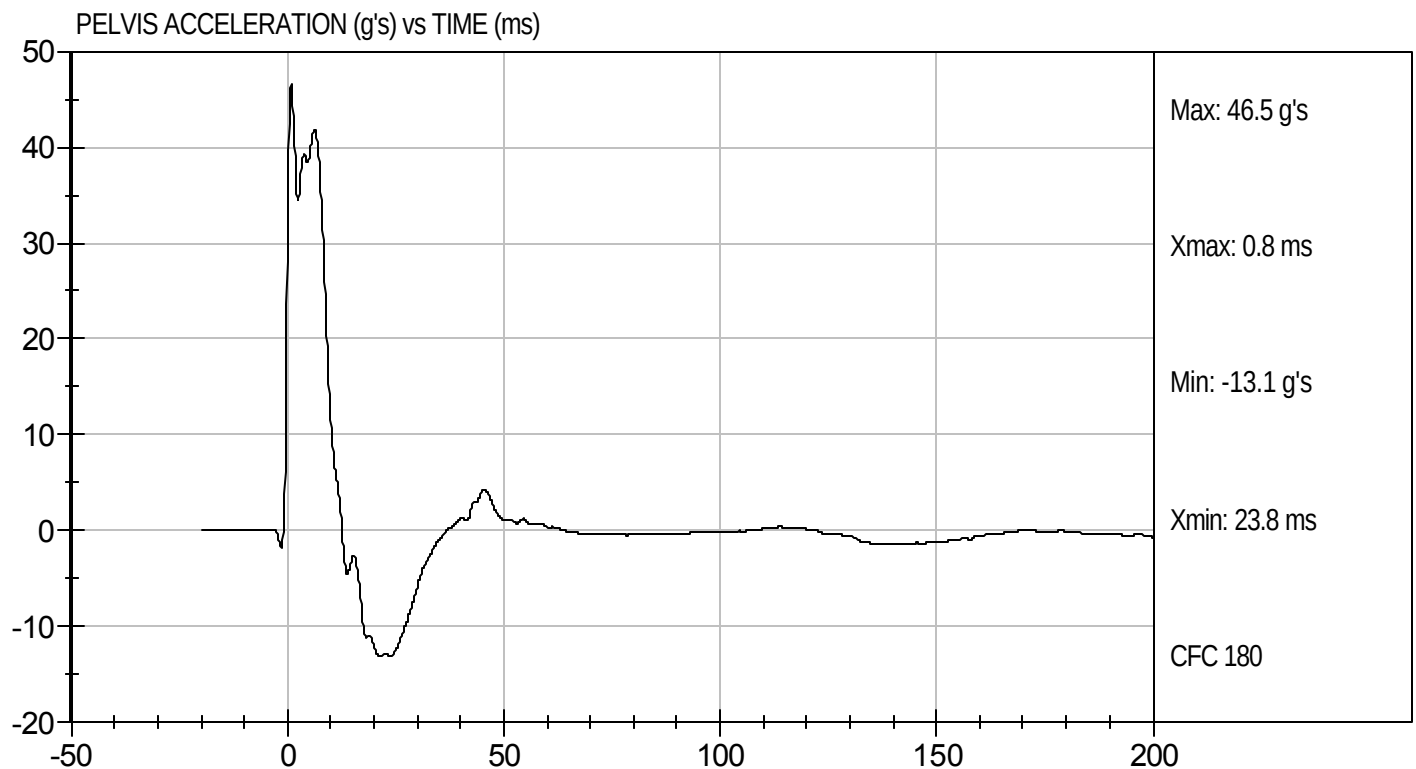
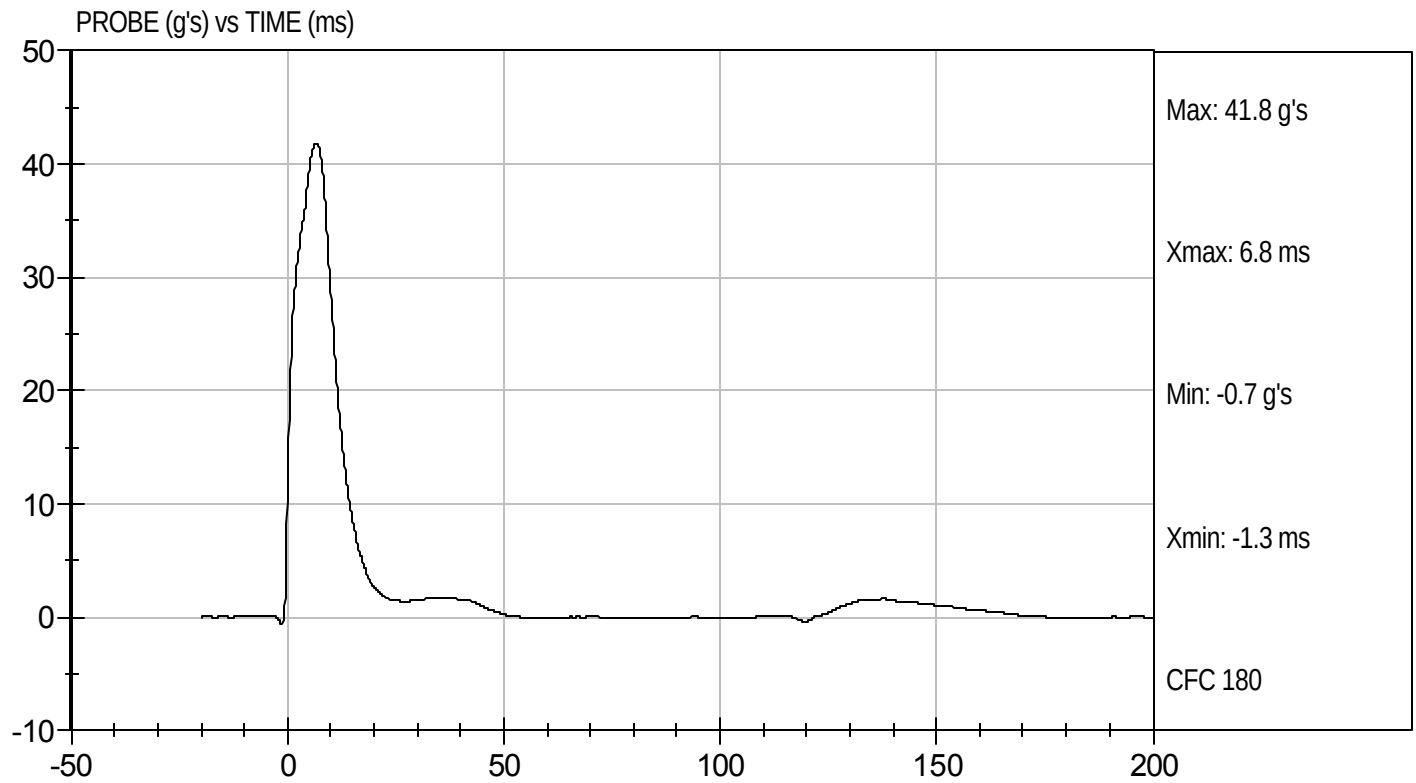
2/23/11
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D11677

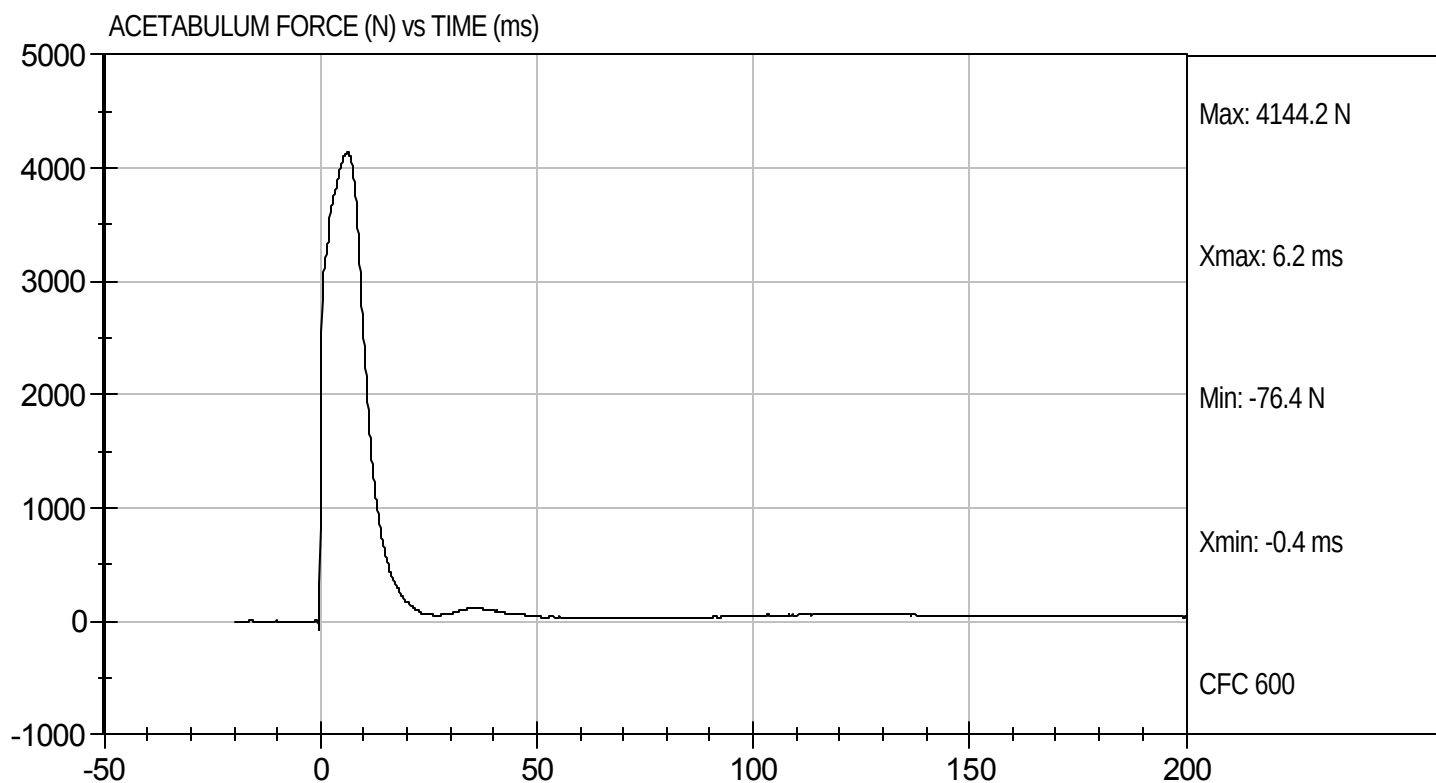
Test Date: 2/23/11
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D11677

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

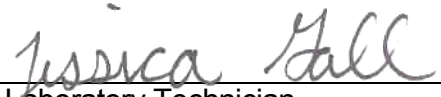


MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D11678

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	29	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	5021	Pass
Overall Test Results			Pass	


Laboratory Technician

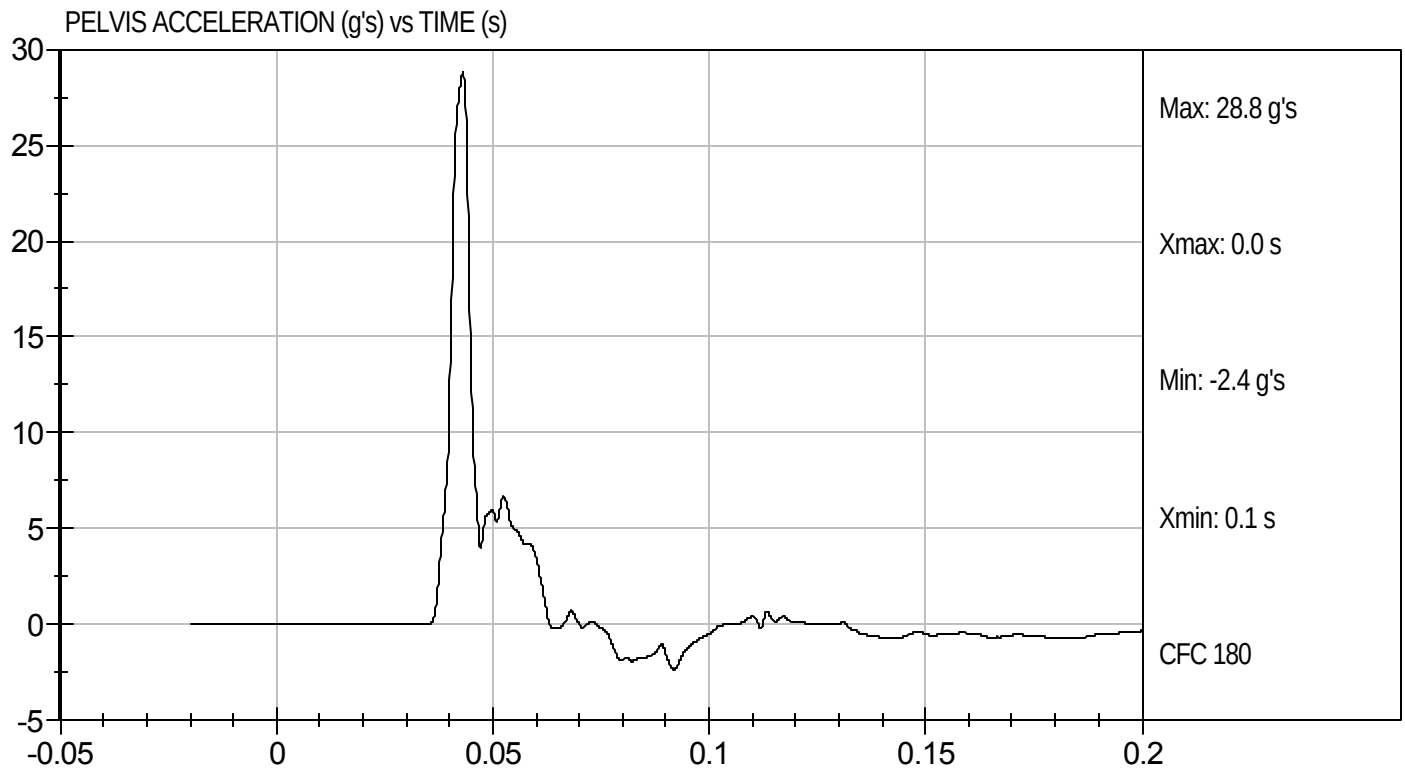
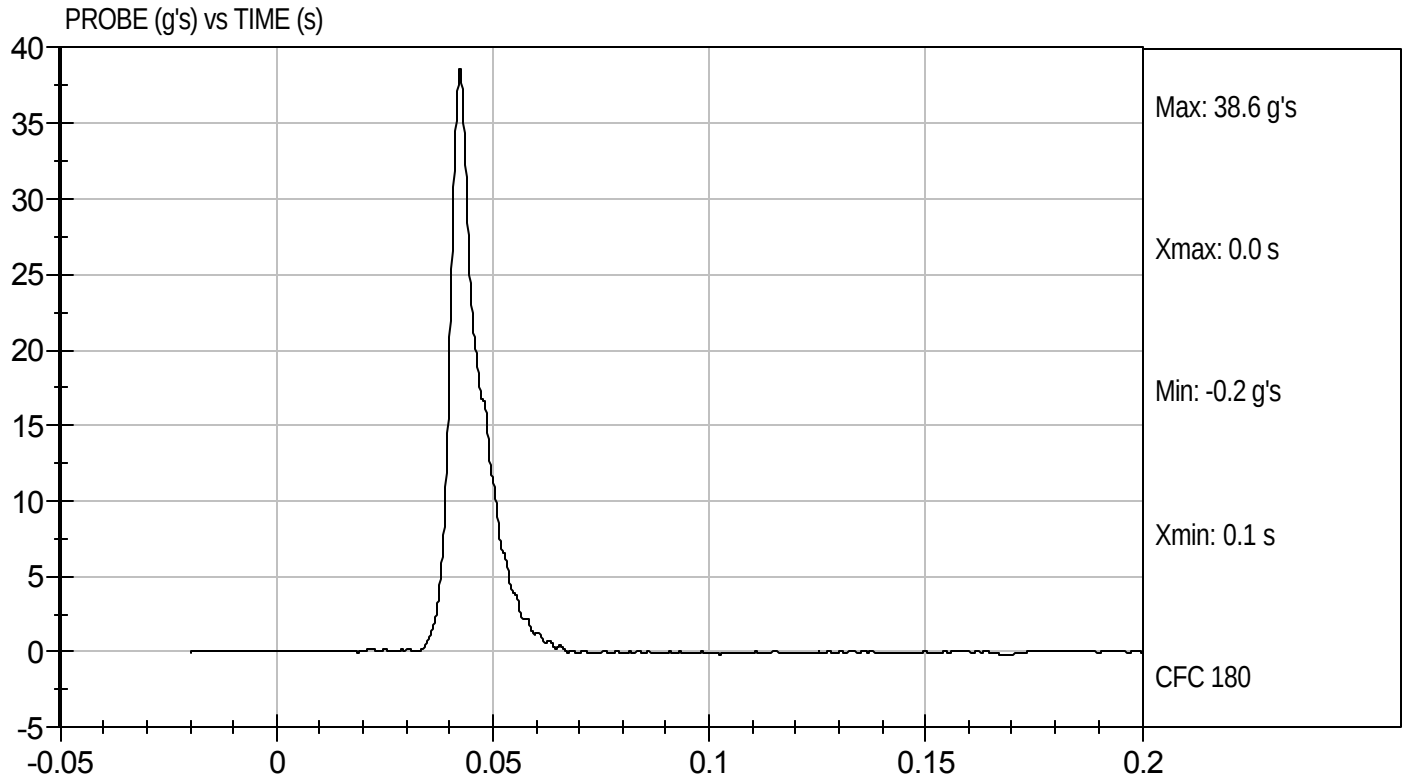
2/23/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D11678

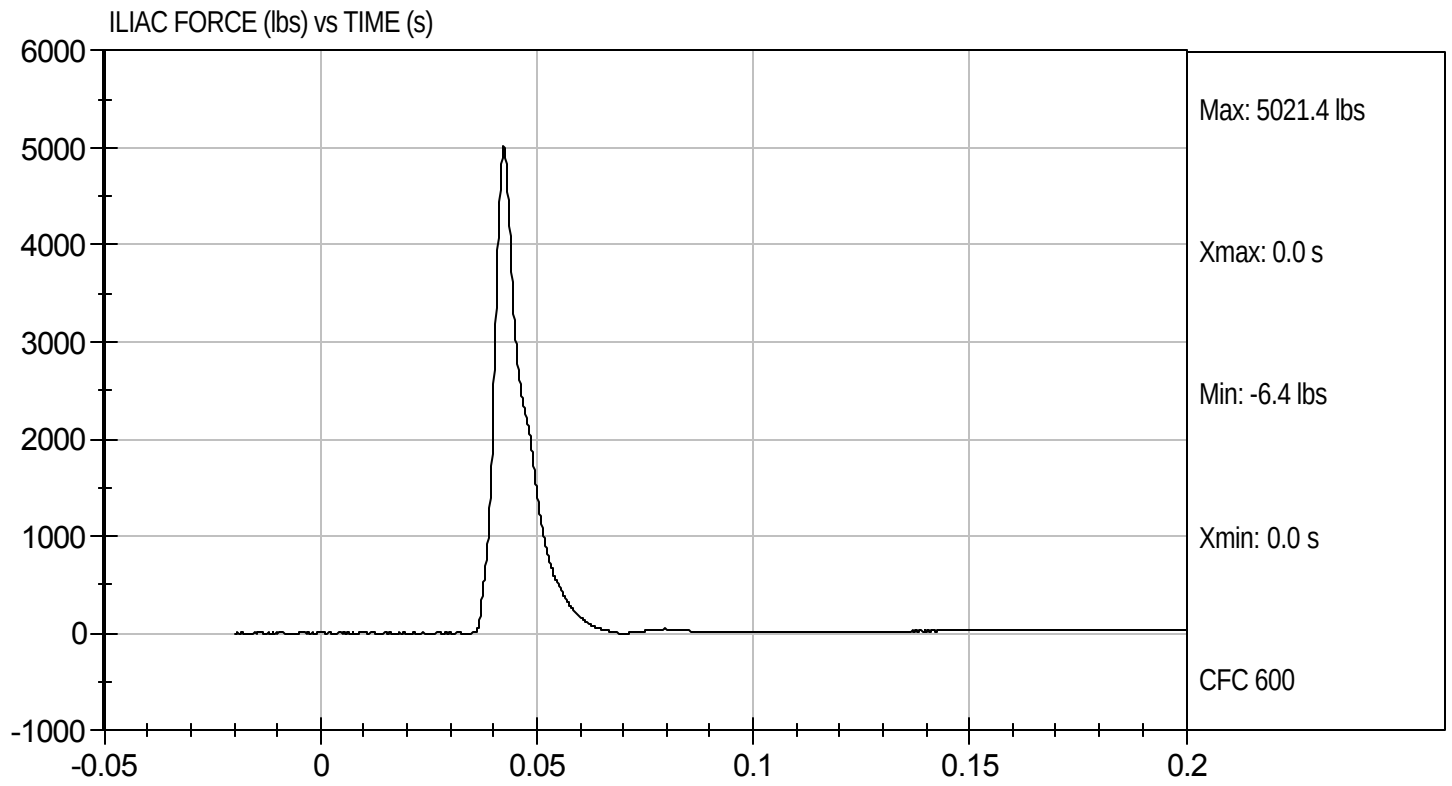
Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D11678

Test Date: 2/23/11
Velocity: 14.36 ft/s, 4.38 m/s



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

ATD Serial No: 306

Test ID: D11711

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Peak Resultant Acceleration	G's	115 to 137	119	Pass
Peak Lateral Acceleration	G's	+/- 15	-5.7	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

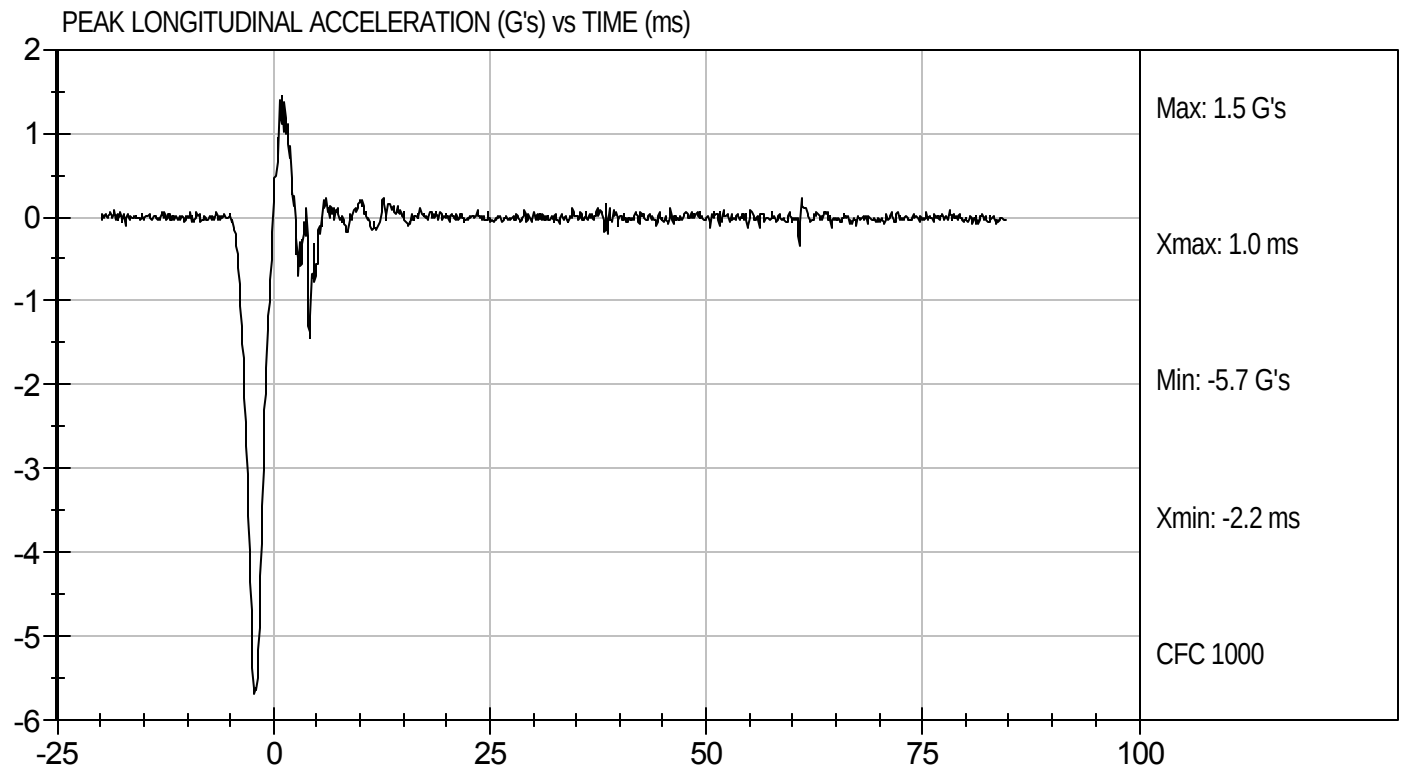
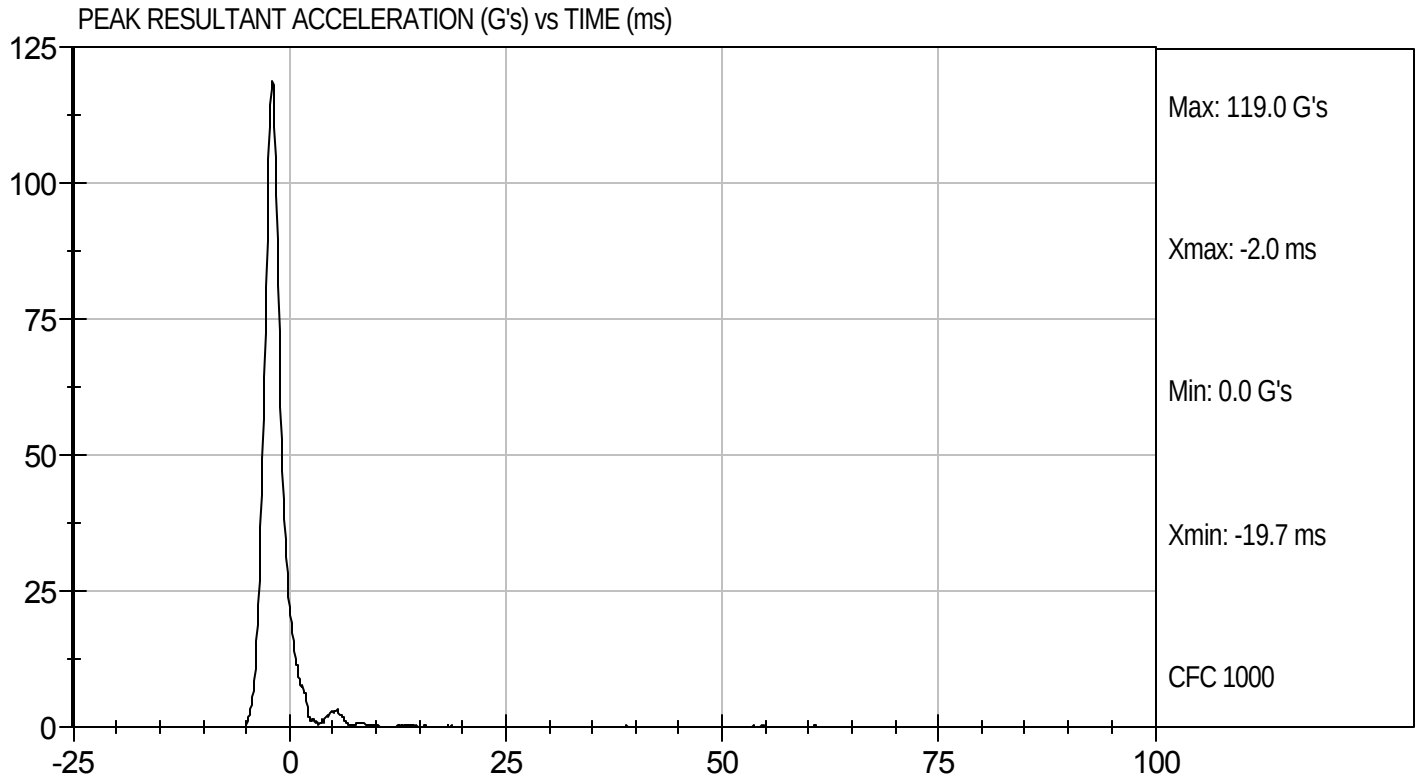
2/24/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D11711

Test Date: 2/24/11
Velocity: 0 ft/s, 0 m/s



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

ATD Serial No: 306

Test I.D.: D11712

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.4	Pass
Humidity		%	10 to 70	27	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.57	Pass
	15 ms	m/s	3.30 to 4.10	3.53	Pass
	20 ms	m/s	4.40 to 5.40	4.67	Pass
	25 ms	m/s	5.40 to 6.10	5.47	Pass
	25-100 ms	m/s	5.50 to 6.20	5.52	Pass
Maximum D-Plane Rotation		deg	71 to 81	76	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-43	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
Overall Test Results				Pass	


 Laboratory Technician

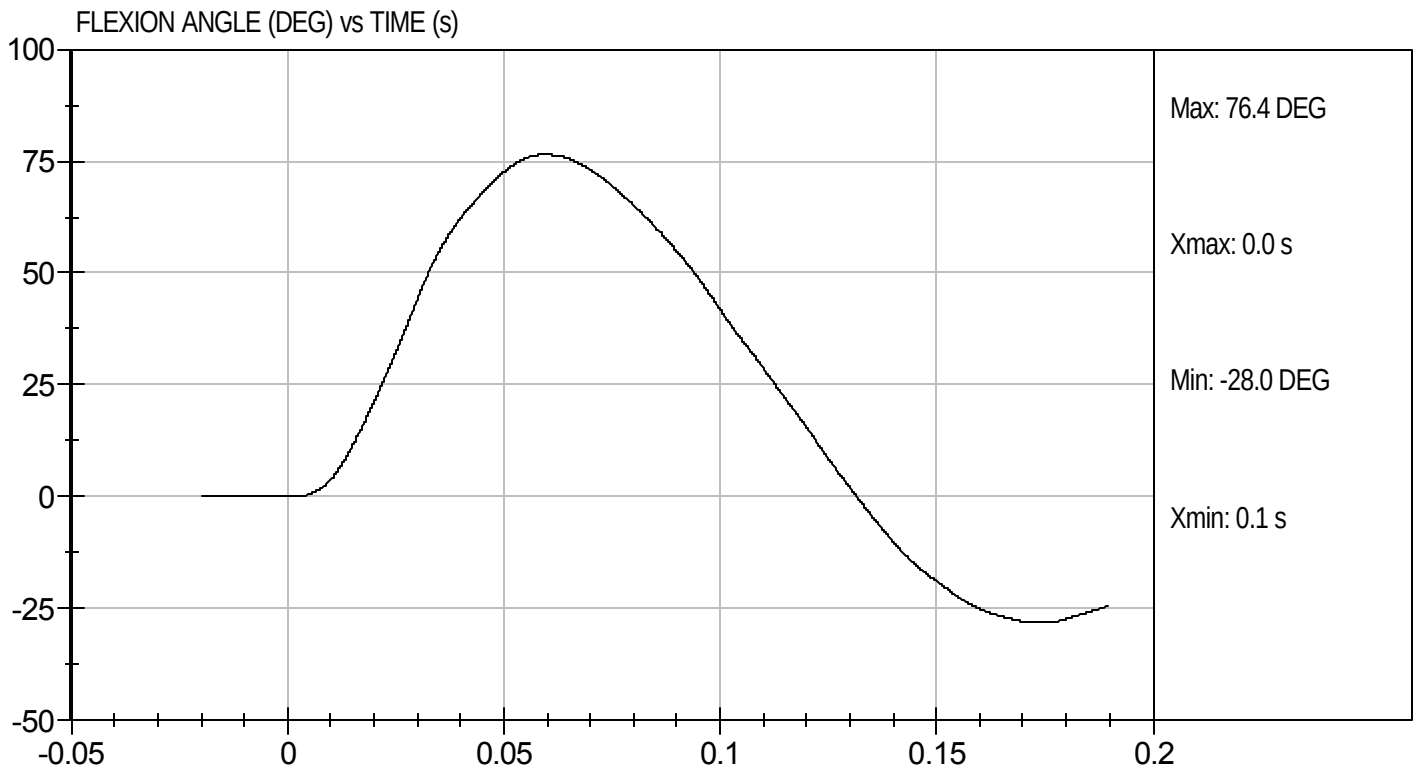
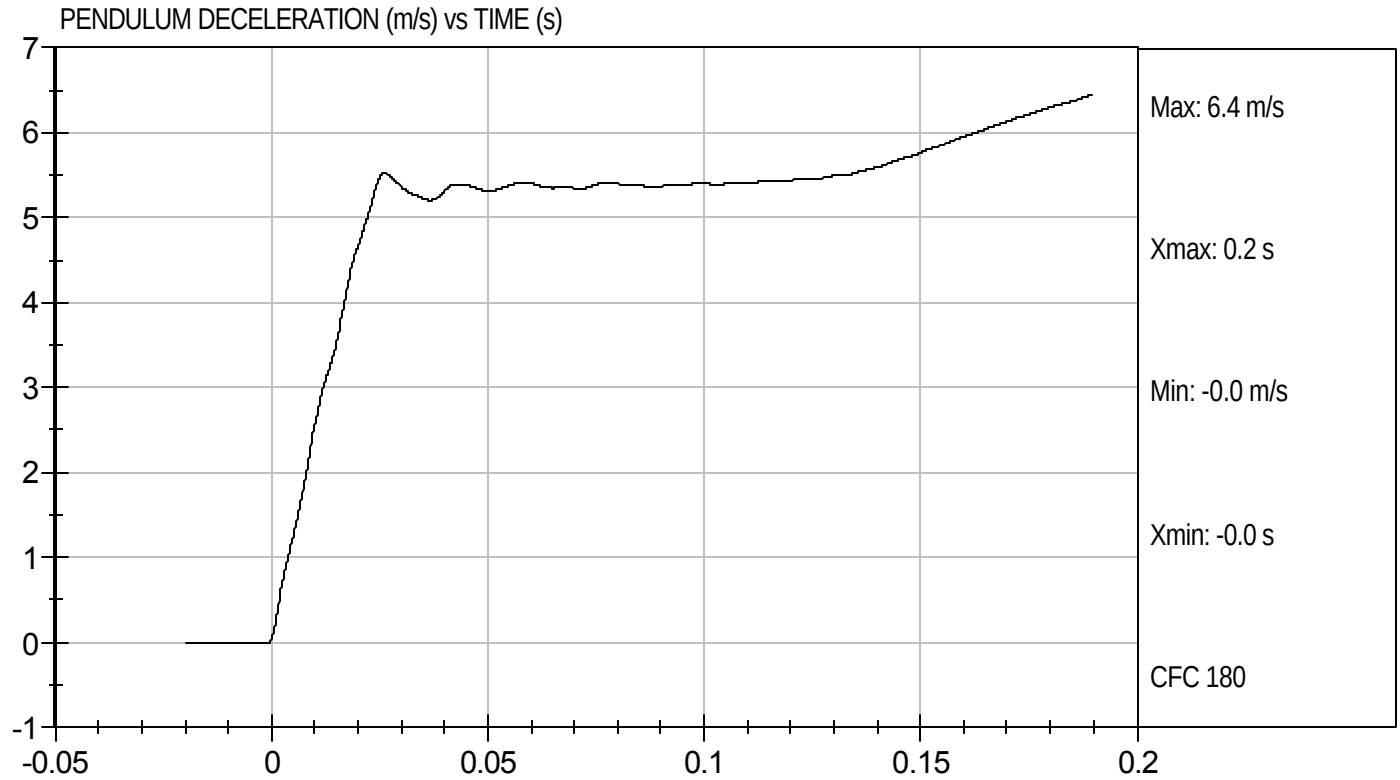
2/24/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D11712

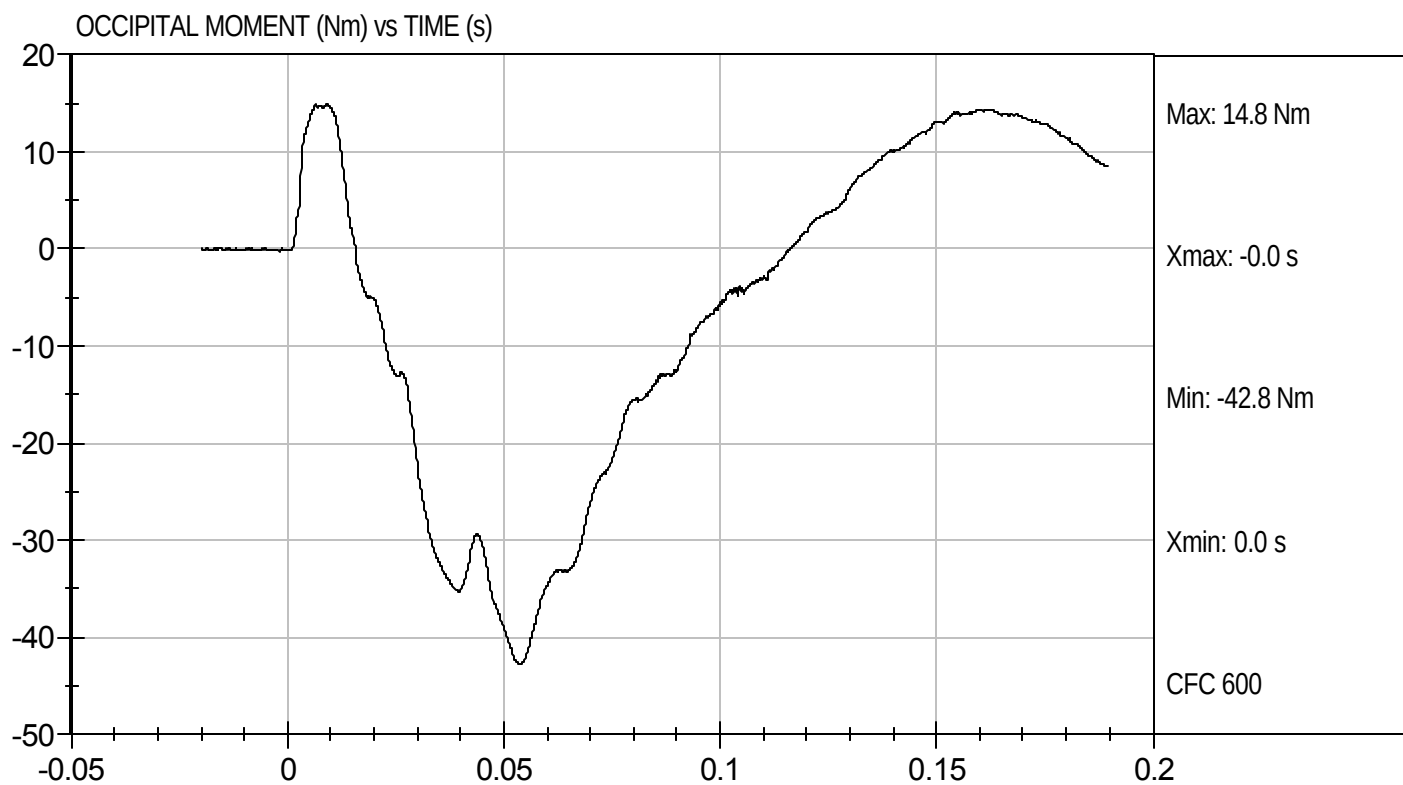
Test Date: 2/24/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D11712

Test Date: 2/24/11
Velocity: 18.32 ft/s, 5.58 m/s



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

ATD Serial No: 306

Test ID: D11713

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	26	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	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results			Pass	


Laboratory Technician

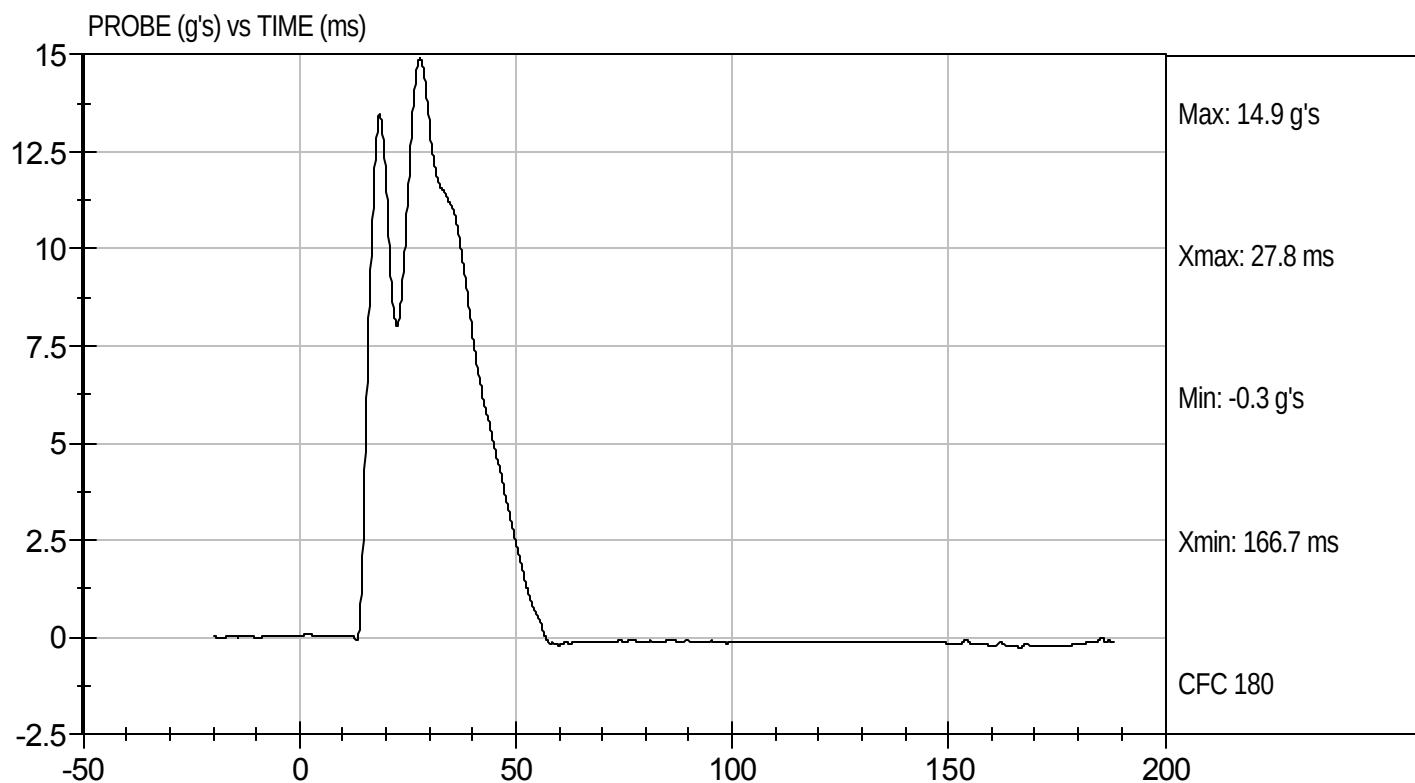
2/24/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D11713

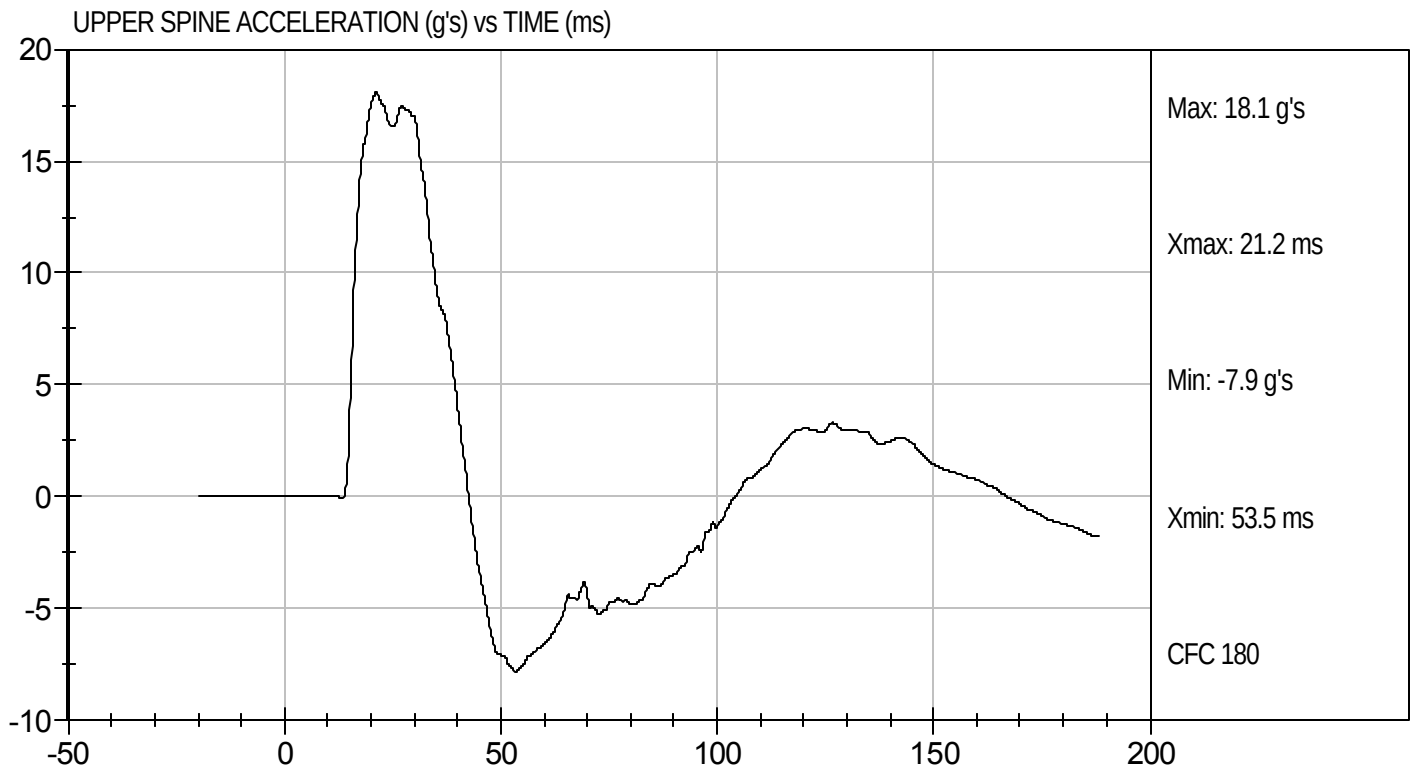
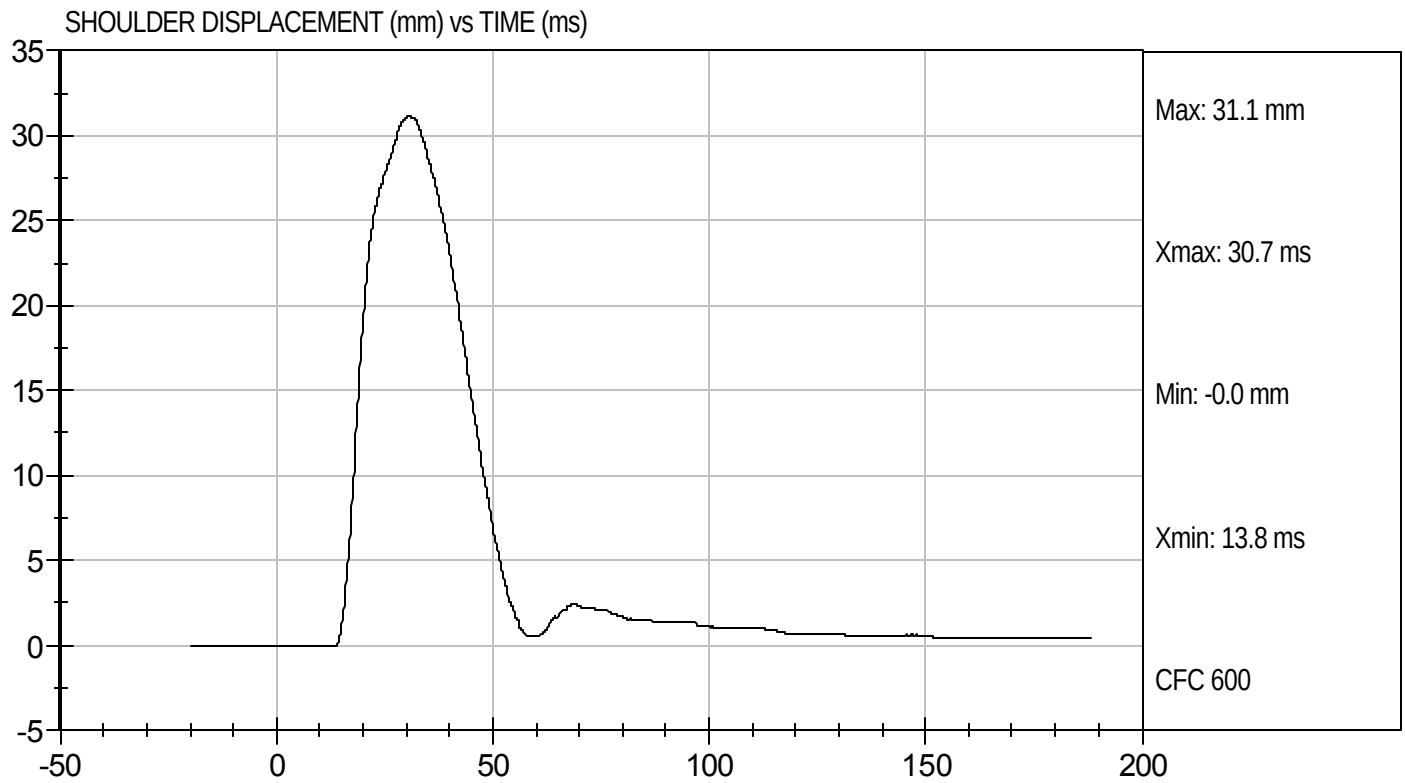
Test Date: 2/24/11
Velocity: 14.37 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D11713

Test Date: 2/24/11
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: 306

Test I.D: D11714

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	26	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	32	Pass
Upper Rib Displacement	mm	25 to 32	27	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	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results			Pass	


Laboratory Technician

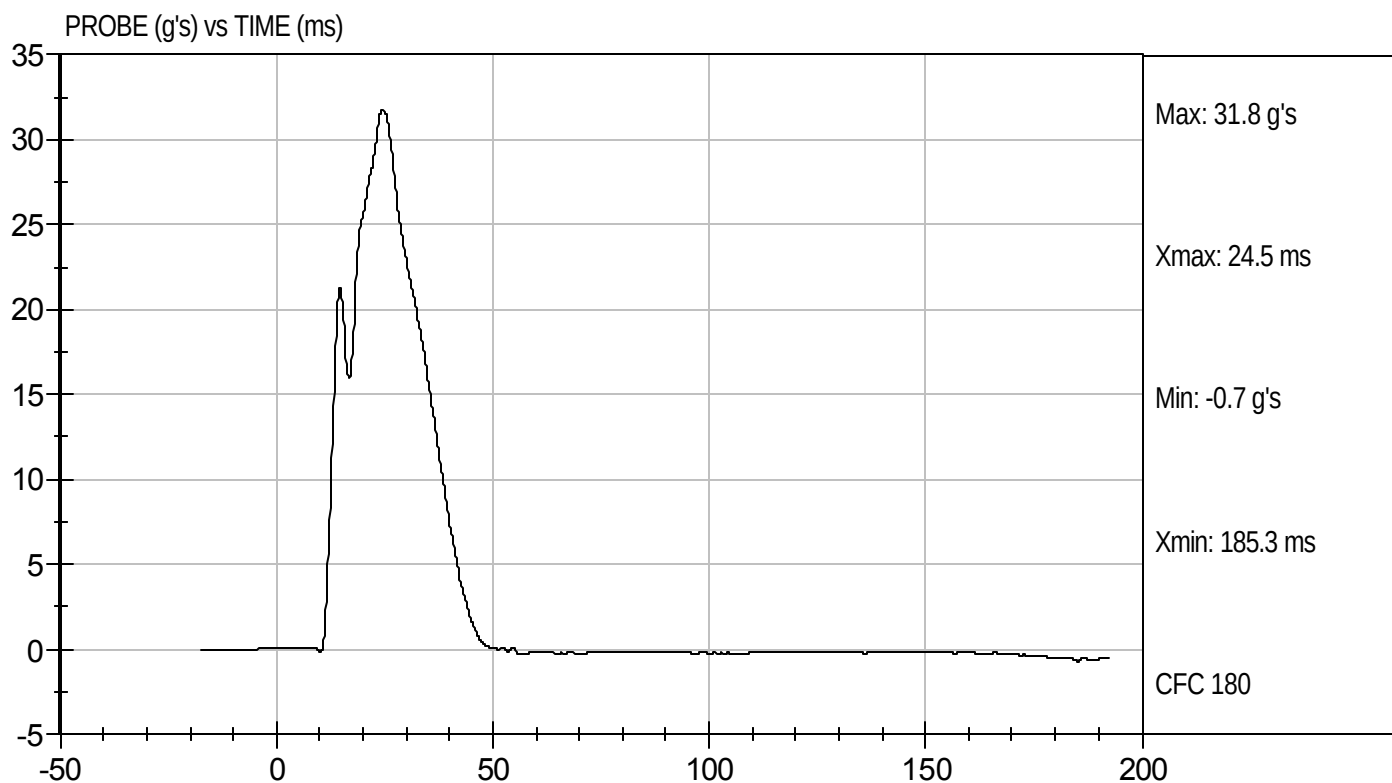
2/24/11
Test Date


Approved By



Test Desc: Thorax With Arm
Component ID: D11714

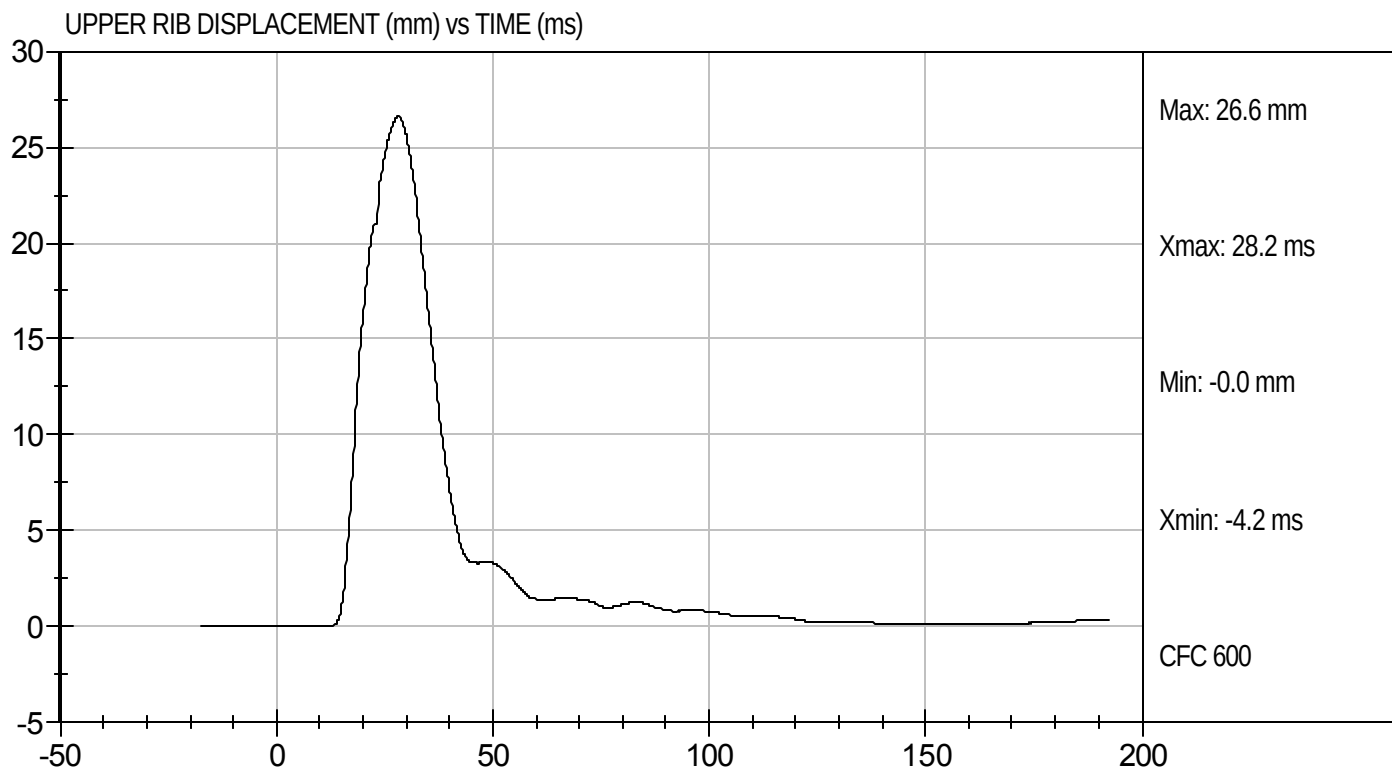
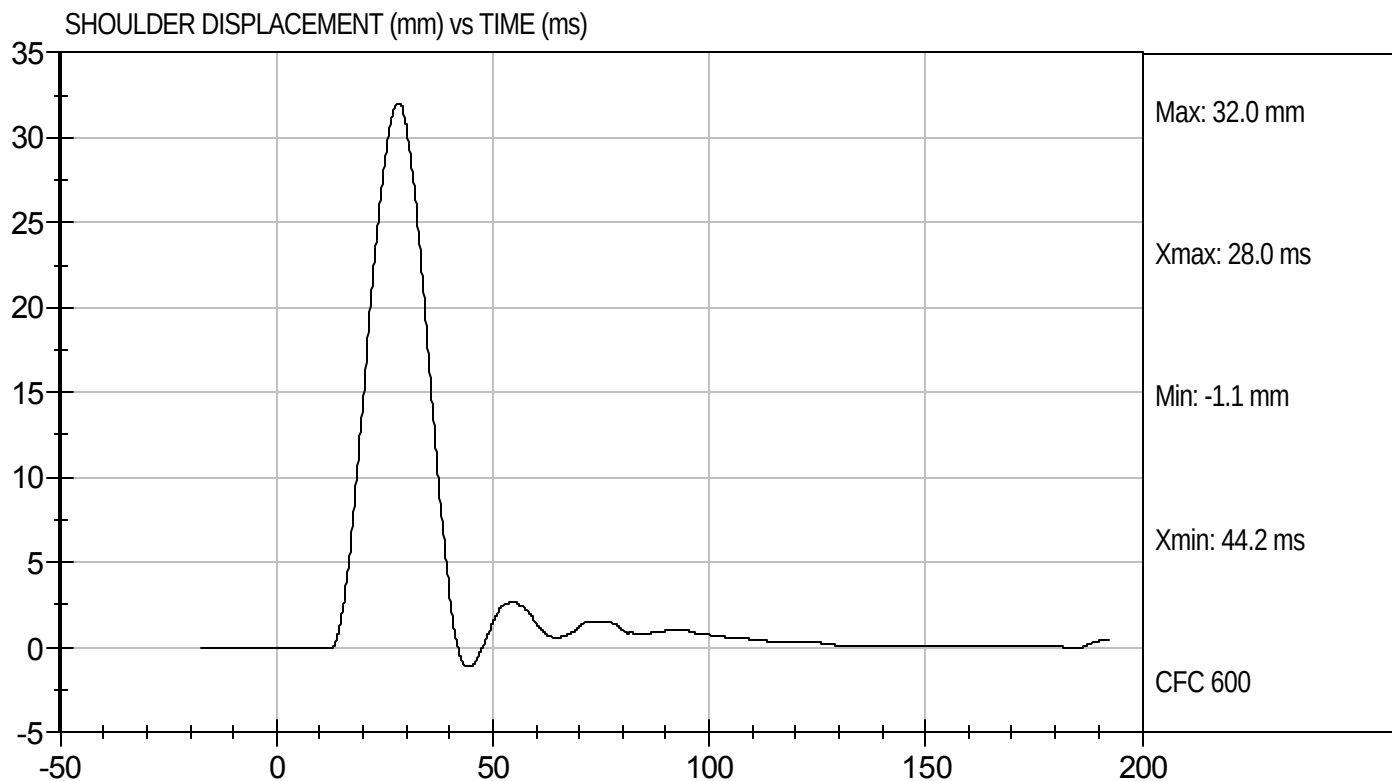
Test Date: 2/24/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11714

Test Date: 2/24/11
Velocity: 22.22 ft/s, 6.77 m/s

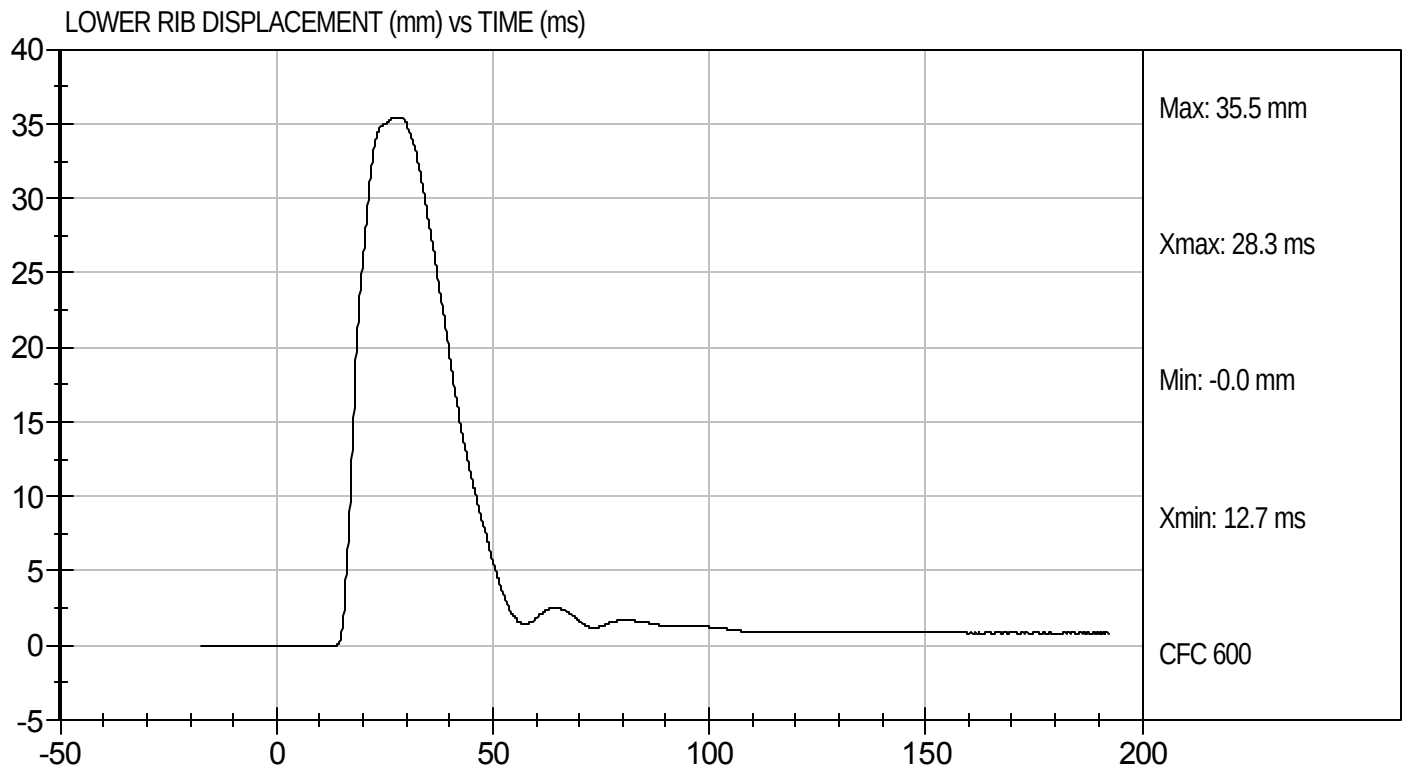
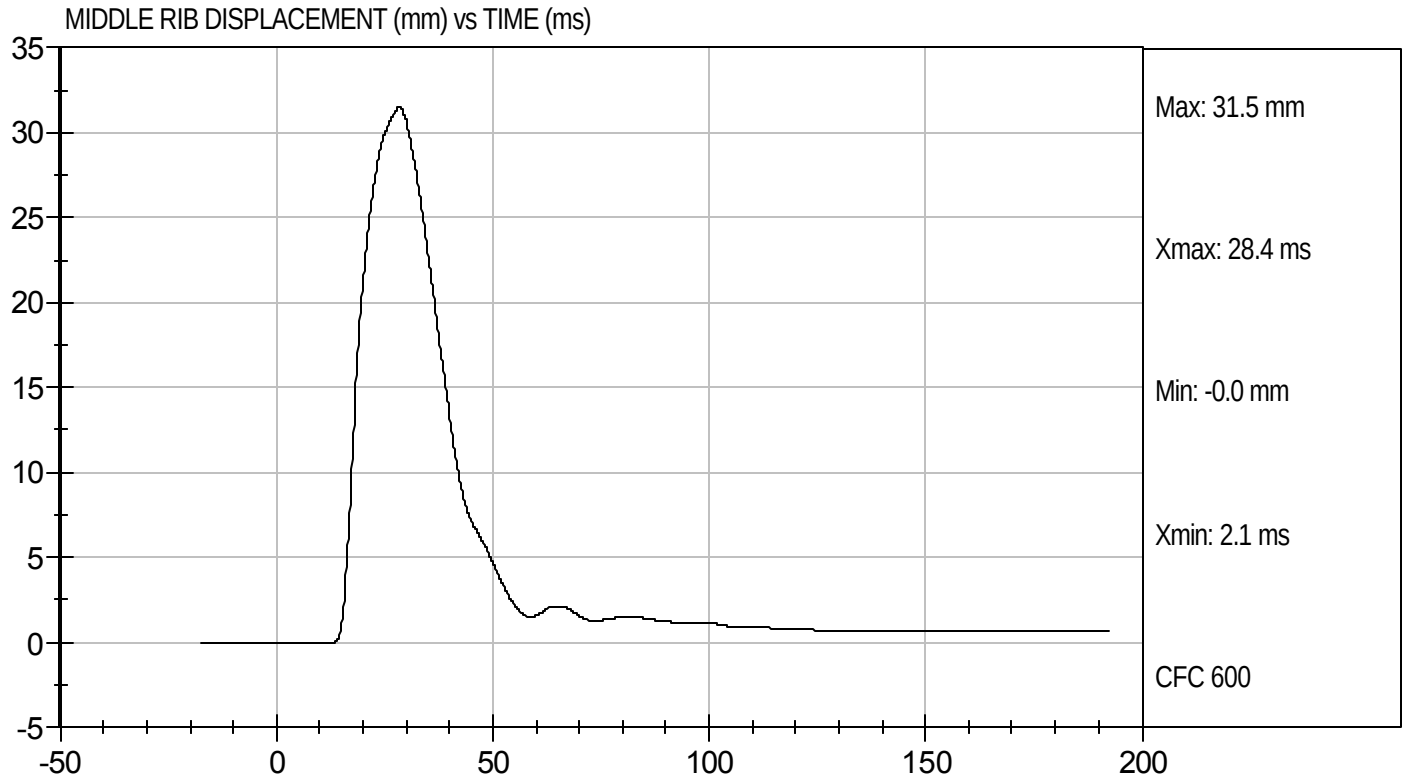




Test Desc: Thorax With Arm
Component ID: D11714

Test Date: 2/24/11

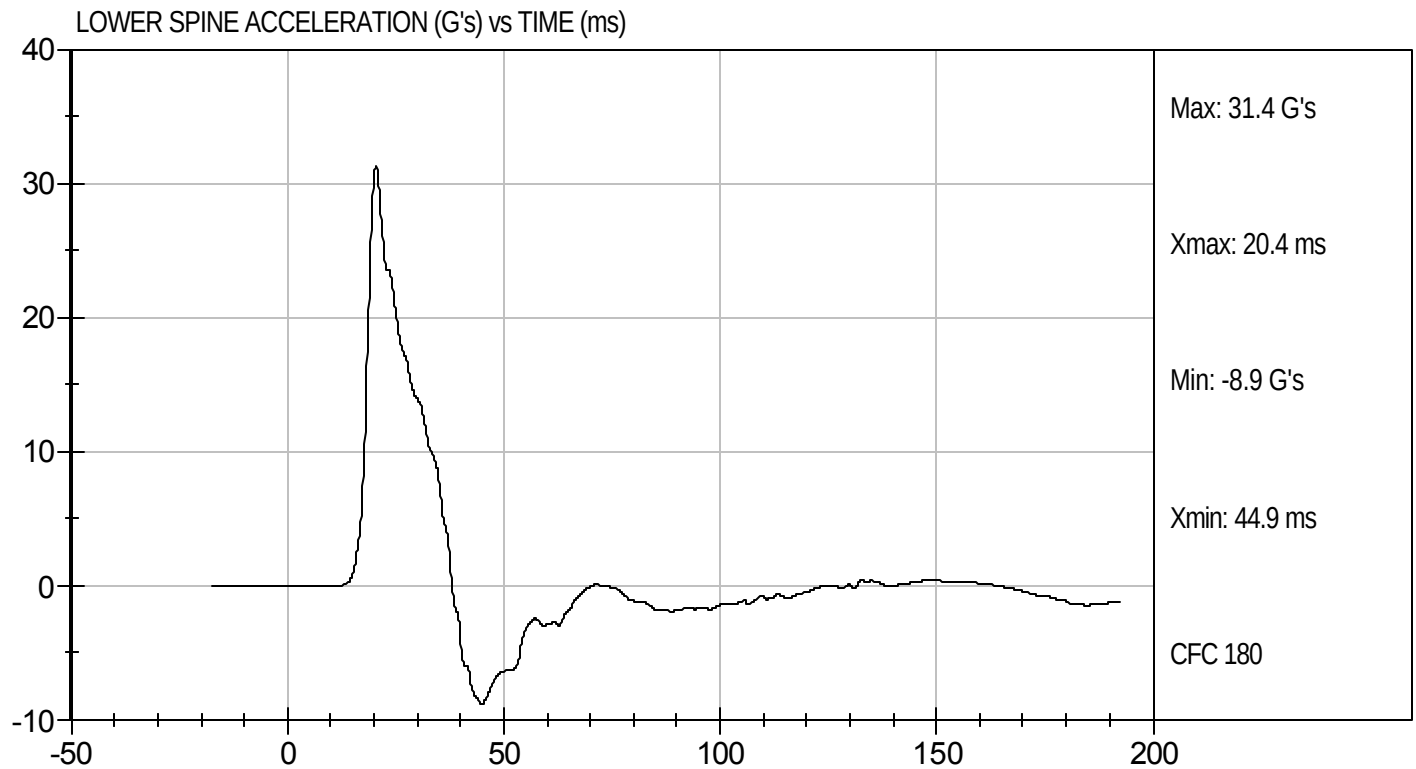
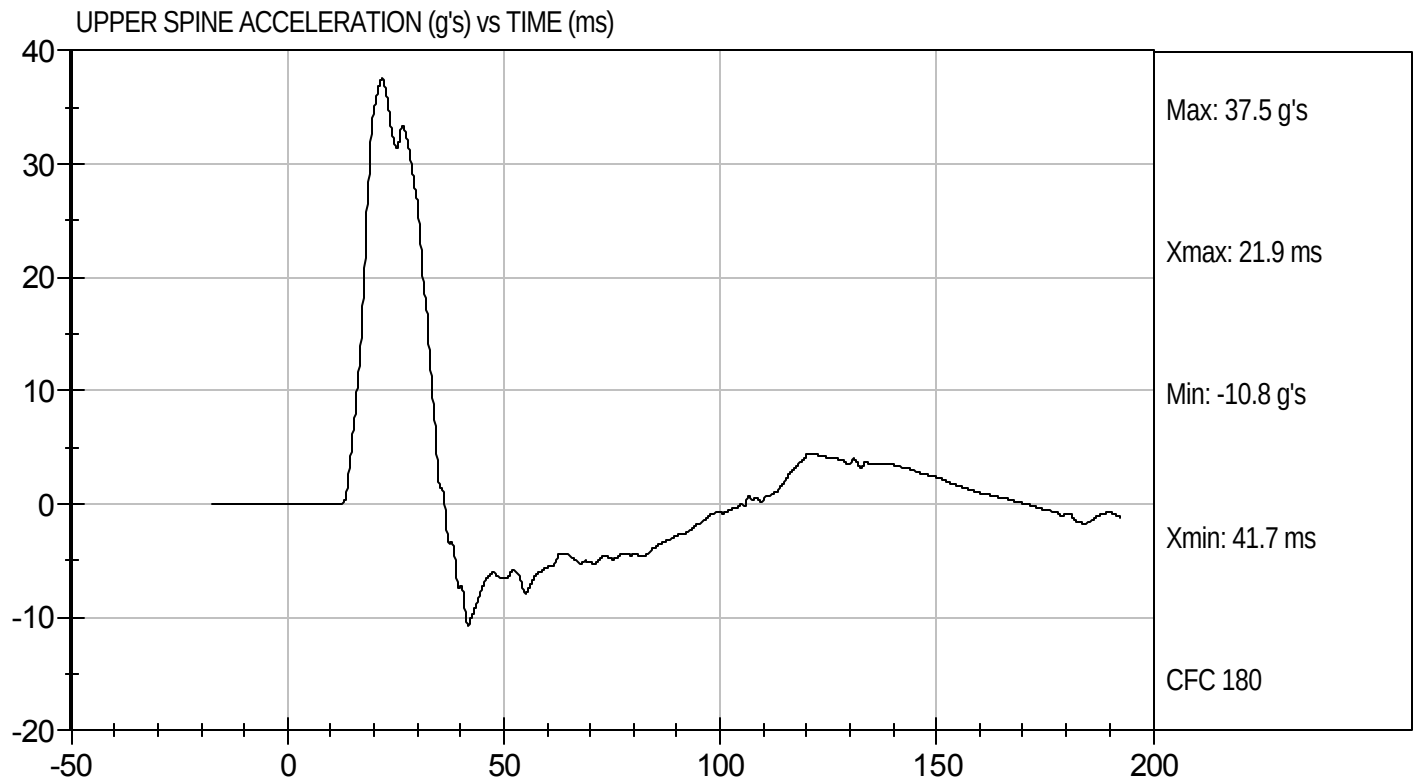
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D11714

Test Date: 2/24/11
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 306

Test I.D: D11715

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Force	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	40	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

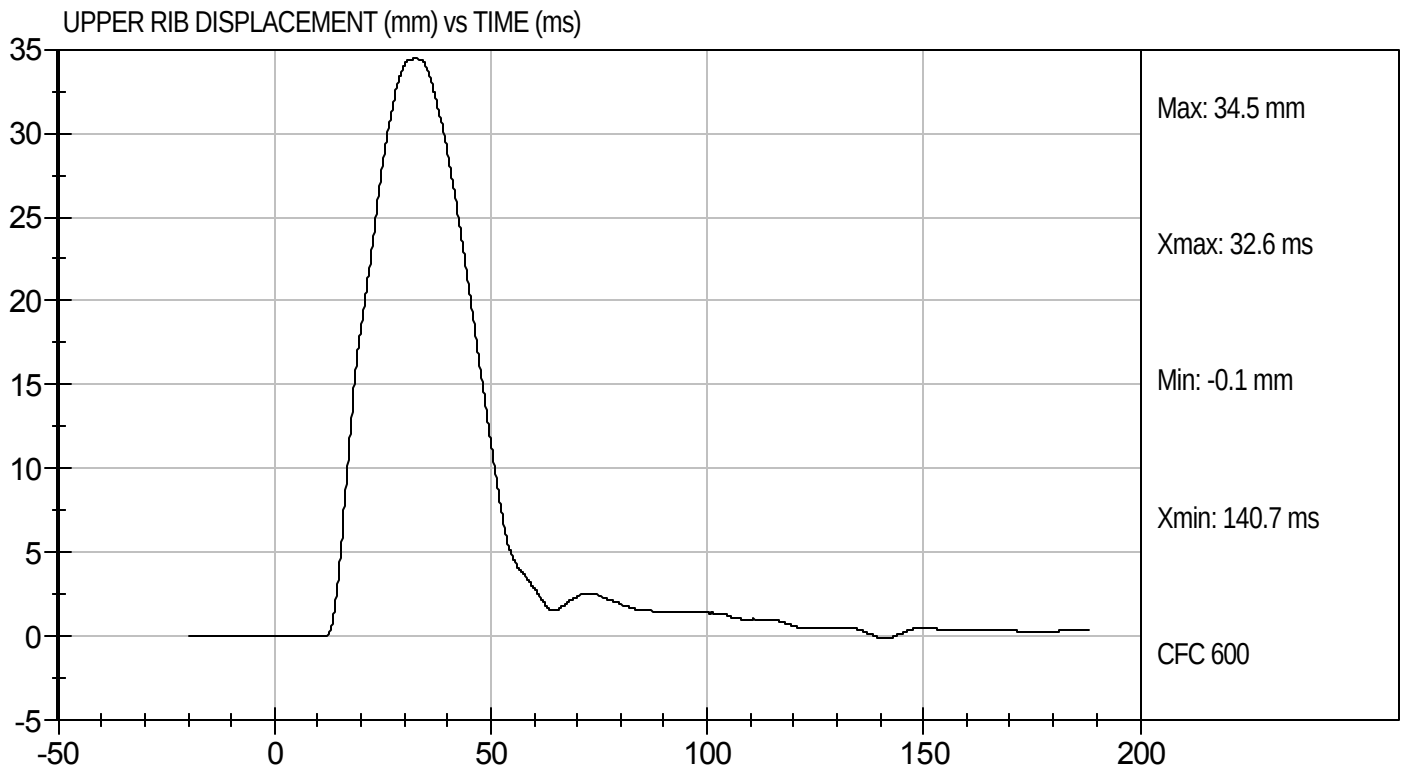
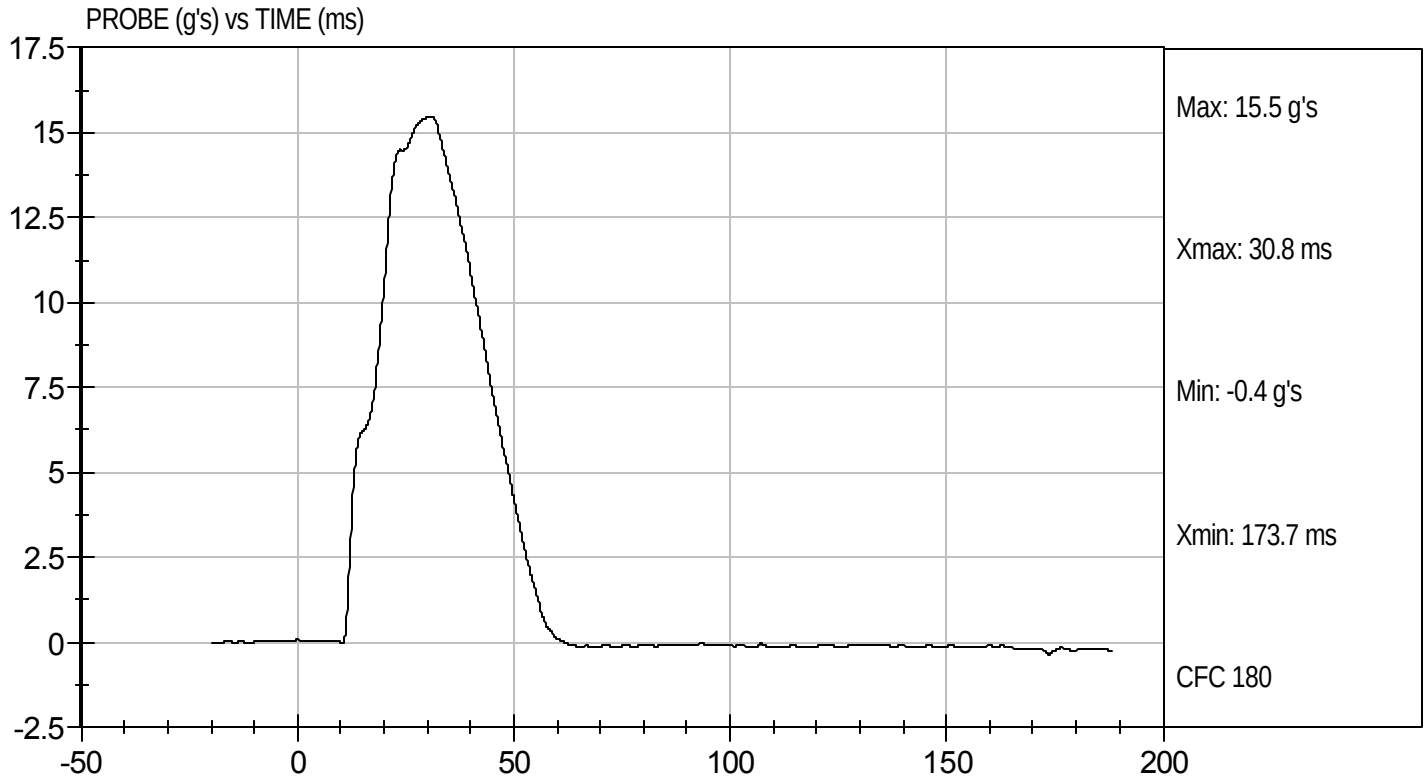
2/24/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D11715

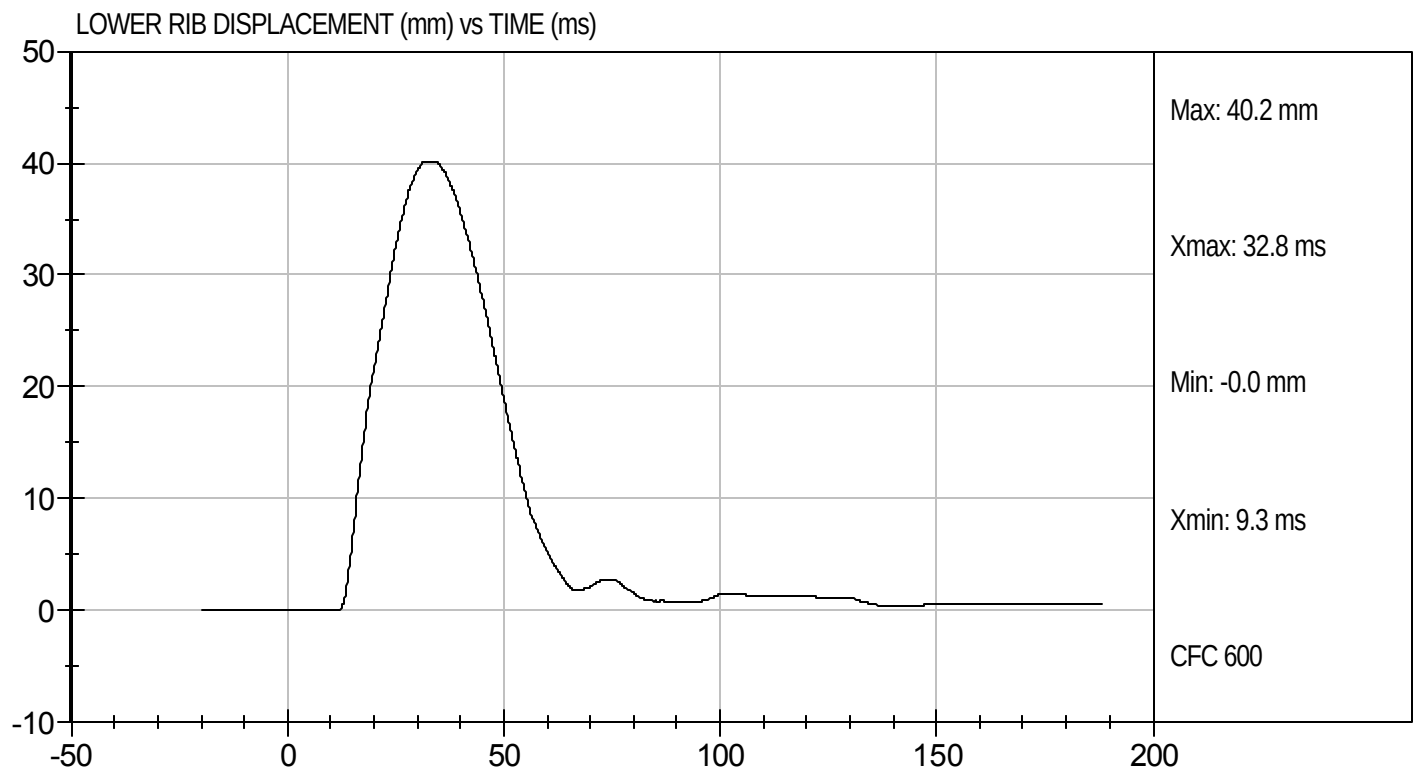
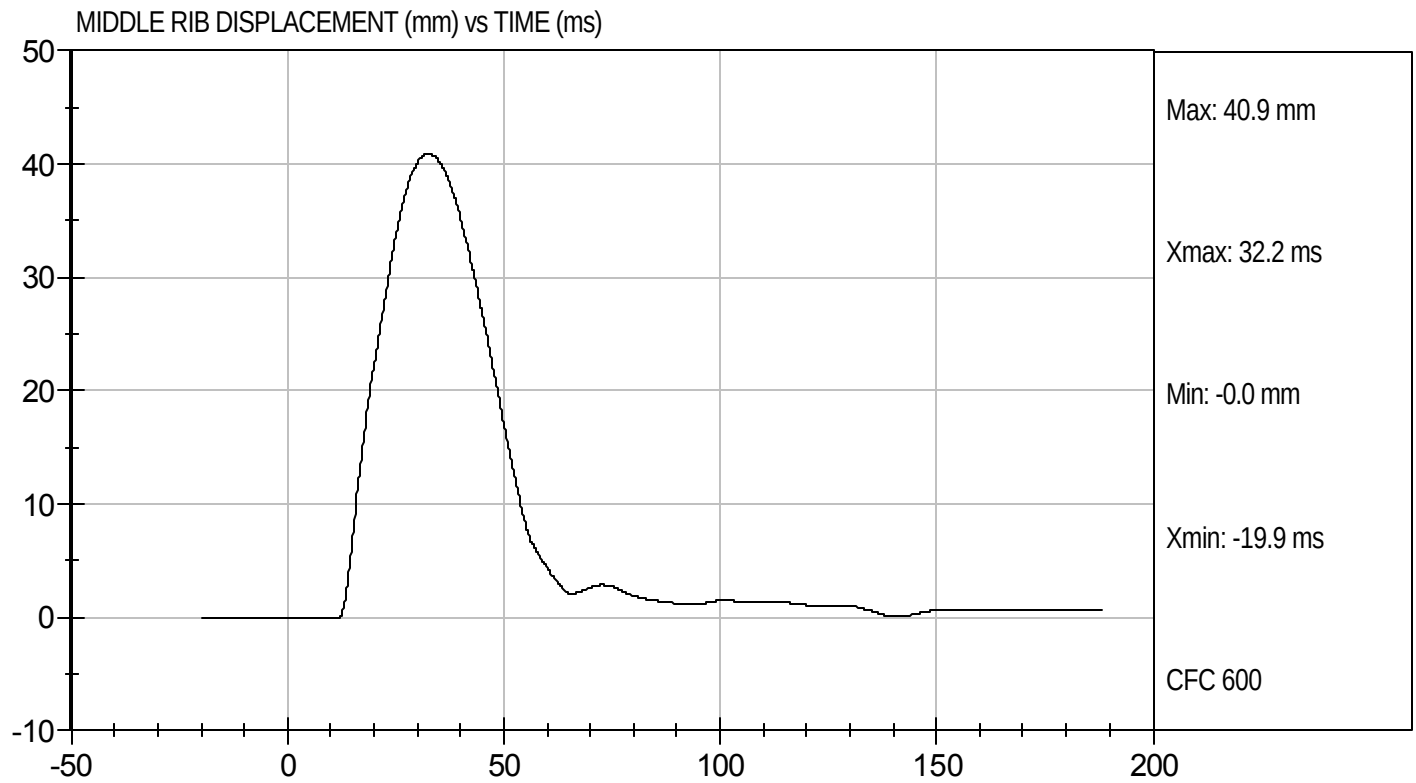
Test Date: 2/24/11
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Thorax Without Arm
Component ID: D11715

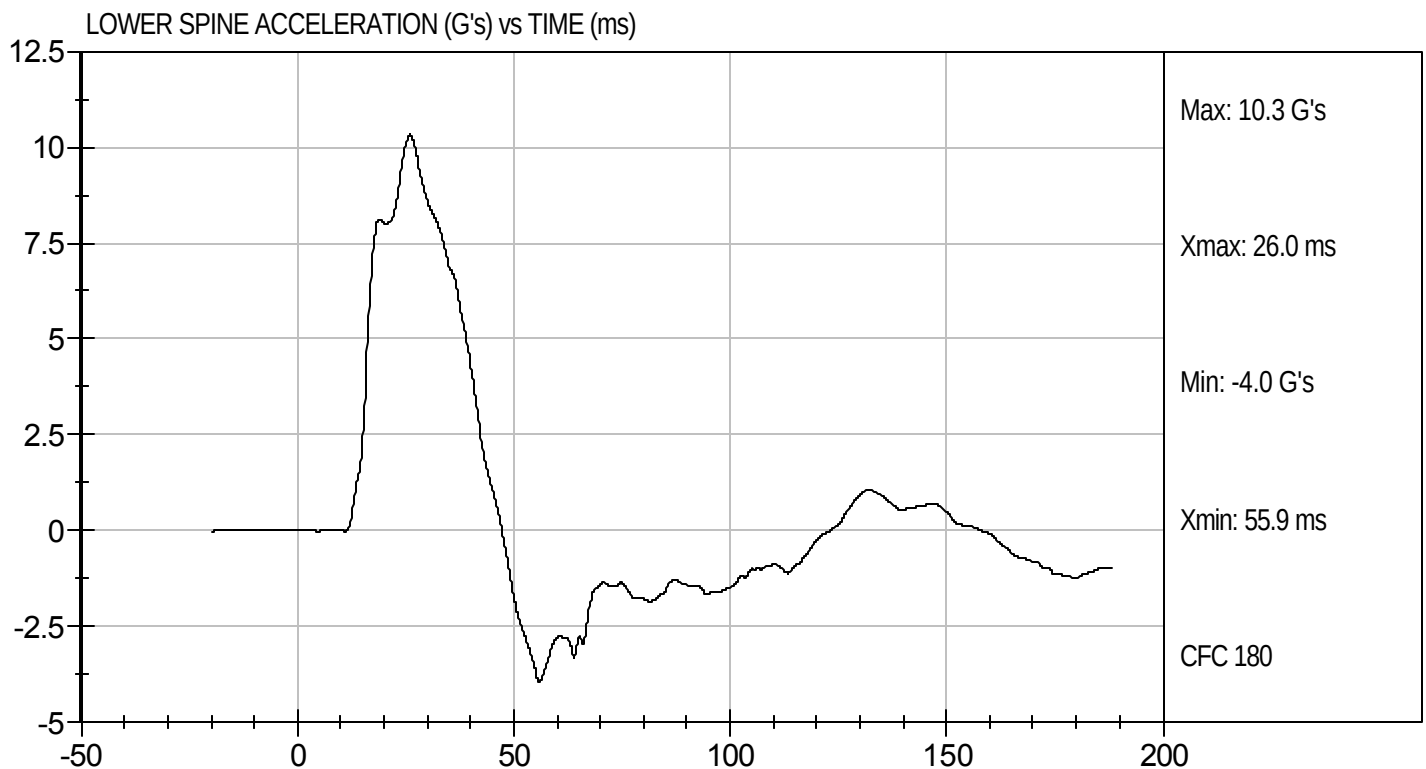
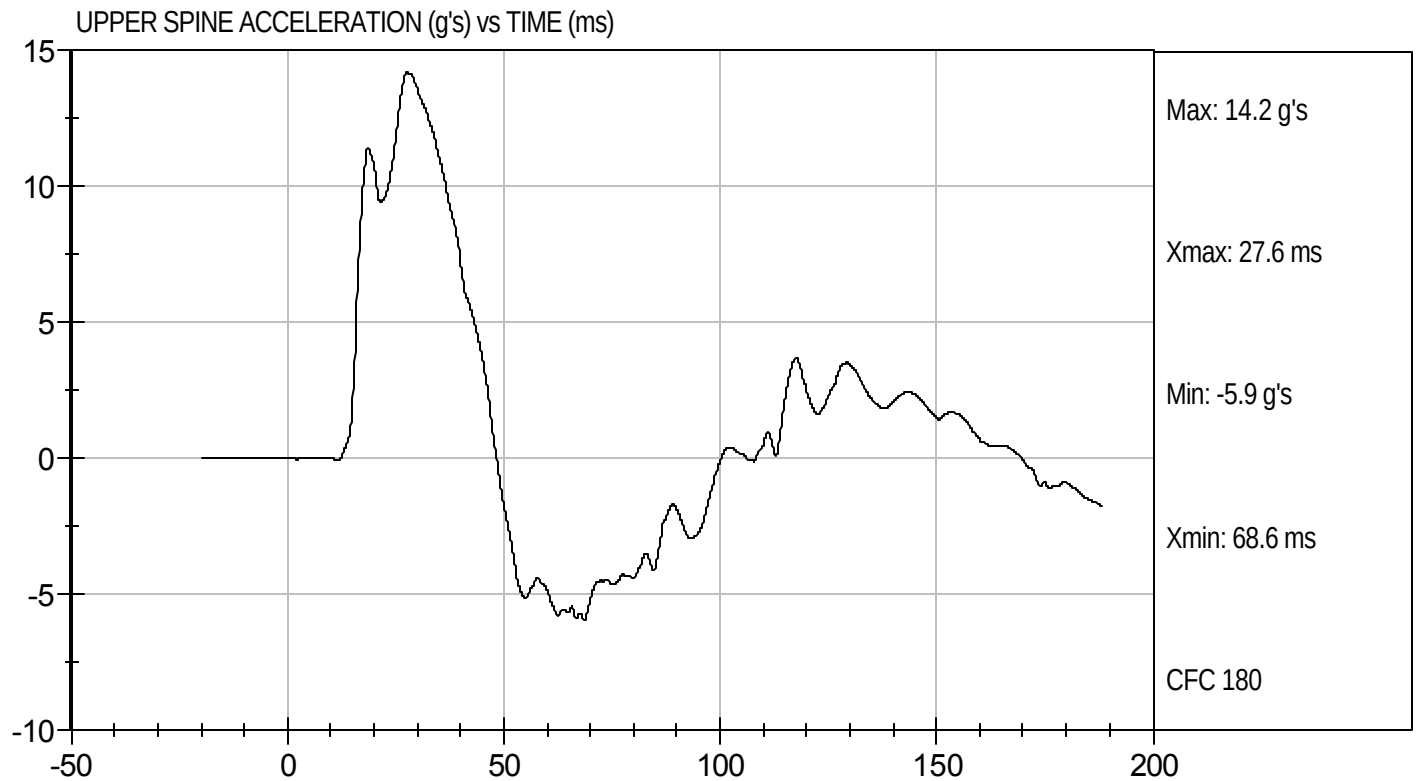
Test Date: 2/24/11
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Thorax Without Arm
Component ID: D11715

Test Date: 2/24/11
Velocity: 14.25 ft/s, 4.34 m/s

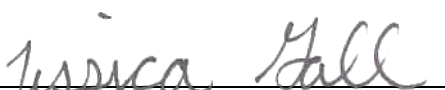


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D11716

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	25	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	44	Pass
Lower Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results			Pass	


Laboratory Technician

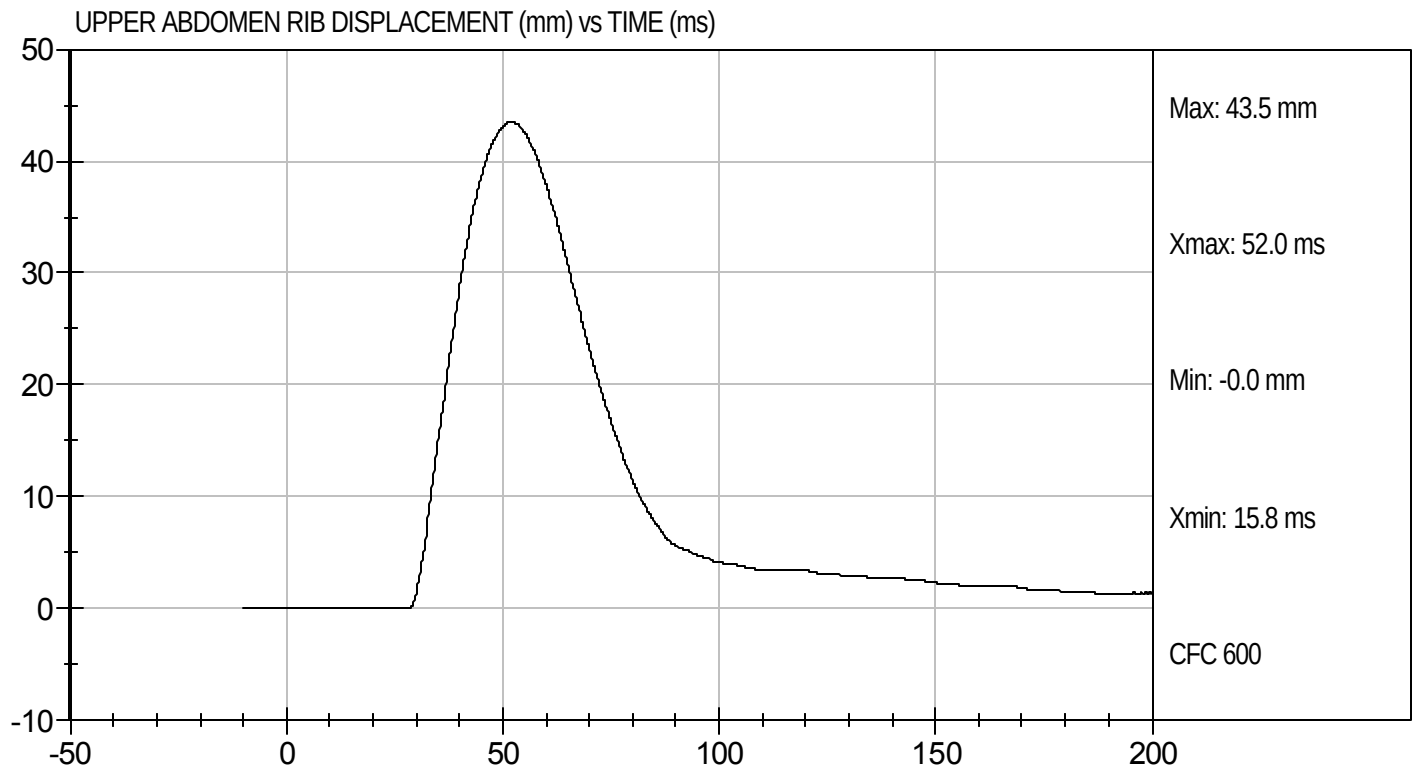
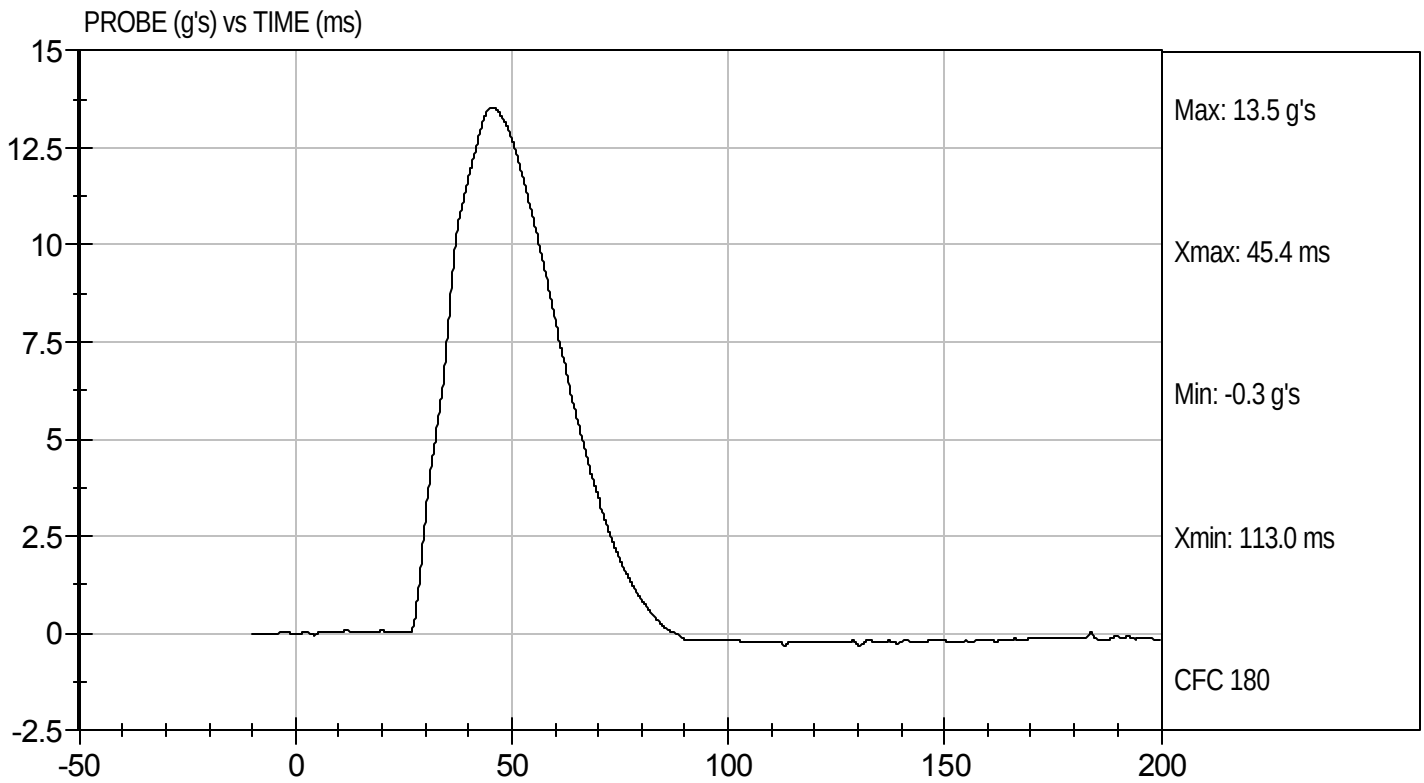
2/24/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D11716

Test Date: 2/24/11
Velocity: 14.37 ft/s, 4.38 m/s

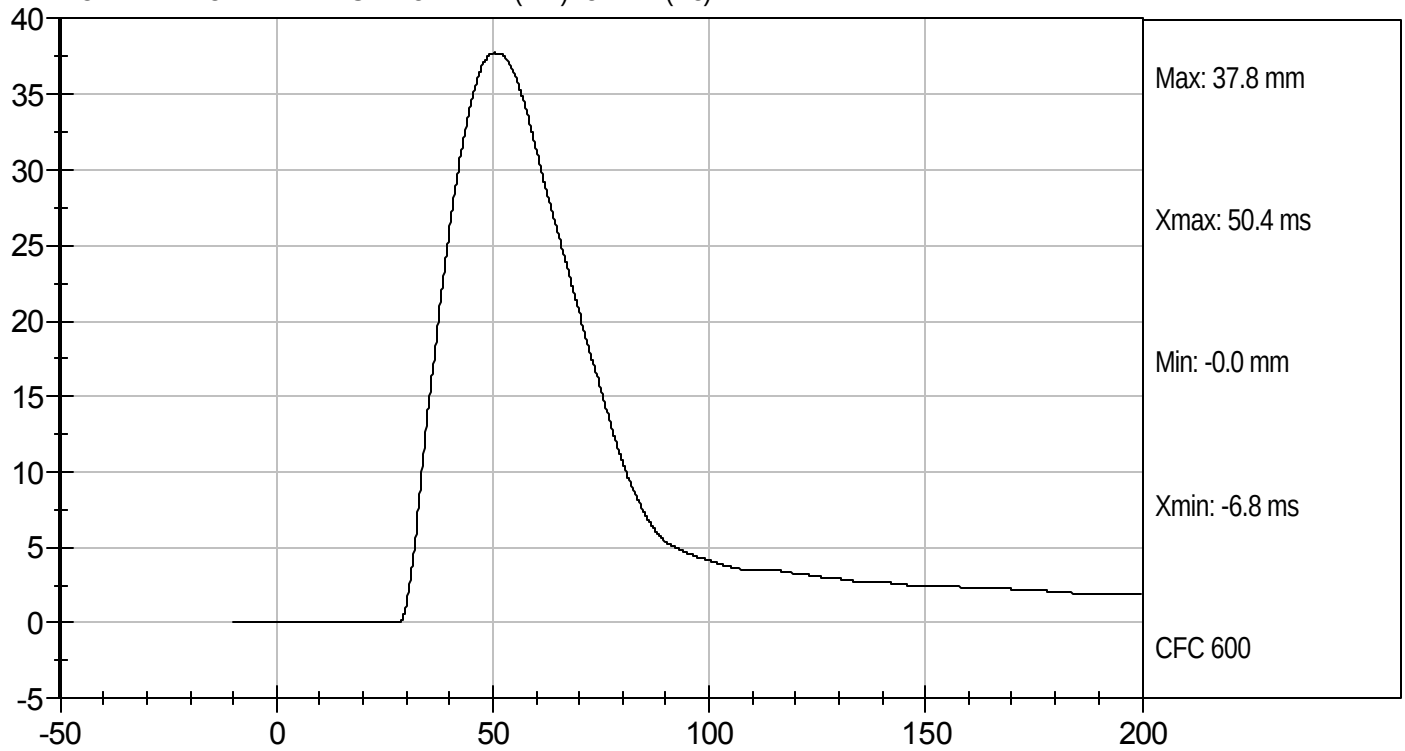




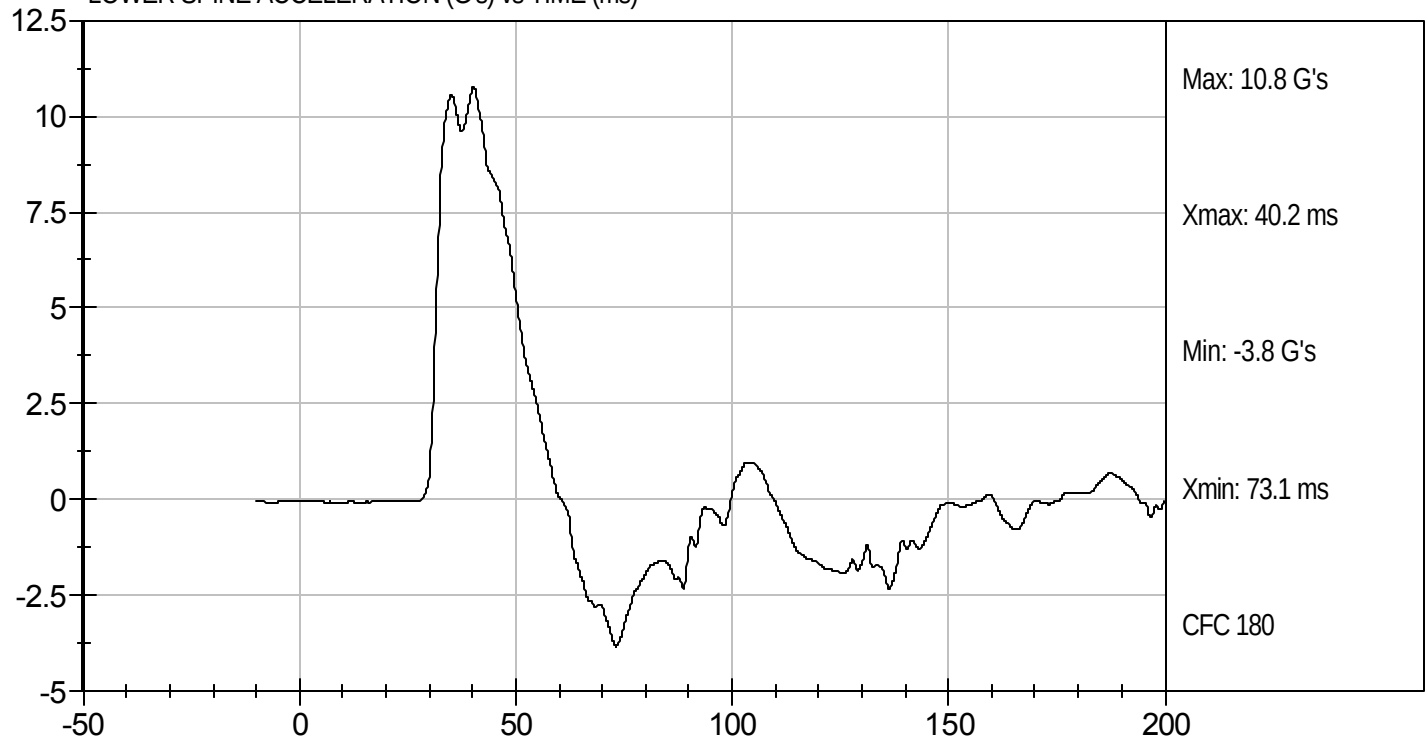
Test Desc: Abdomen Impact
Component ID: D11716

Test Date: 2/24/11
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: 306

Test I.D: D11717

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	6.60 to 6.80	6.66	Pass
Peak Impactor Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	38	Pass
Peak Acetabulum Force	N	3600 to 4300	4150	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

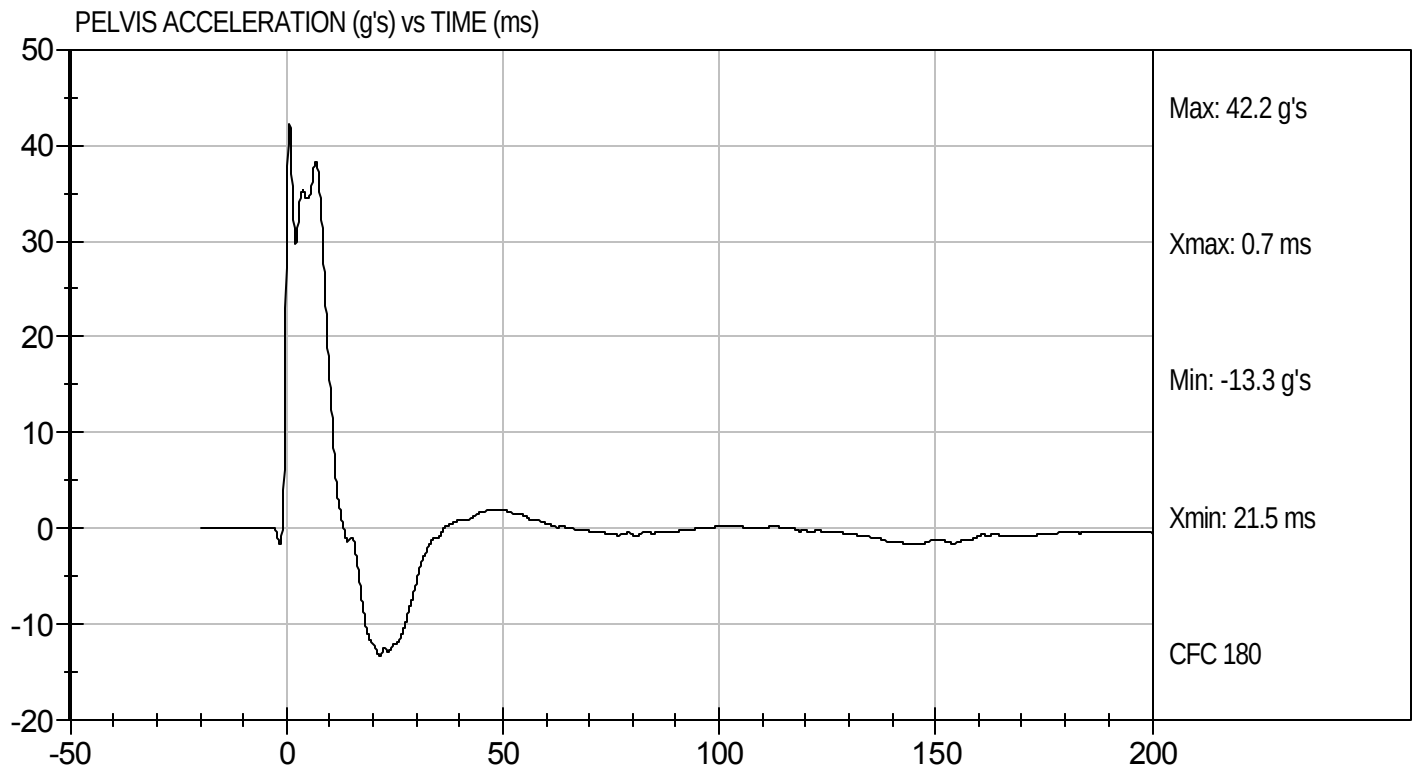
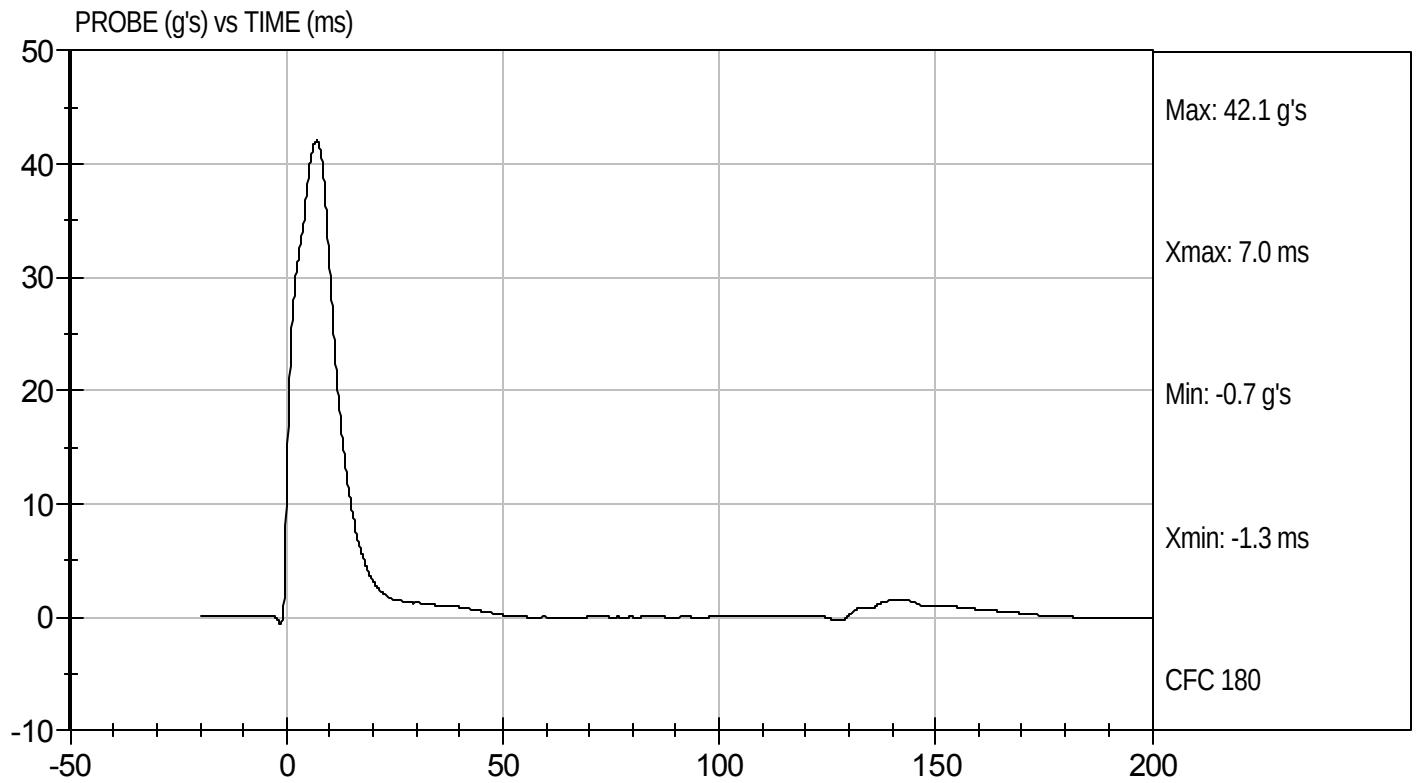
2/24/11
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D11717

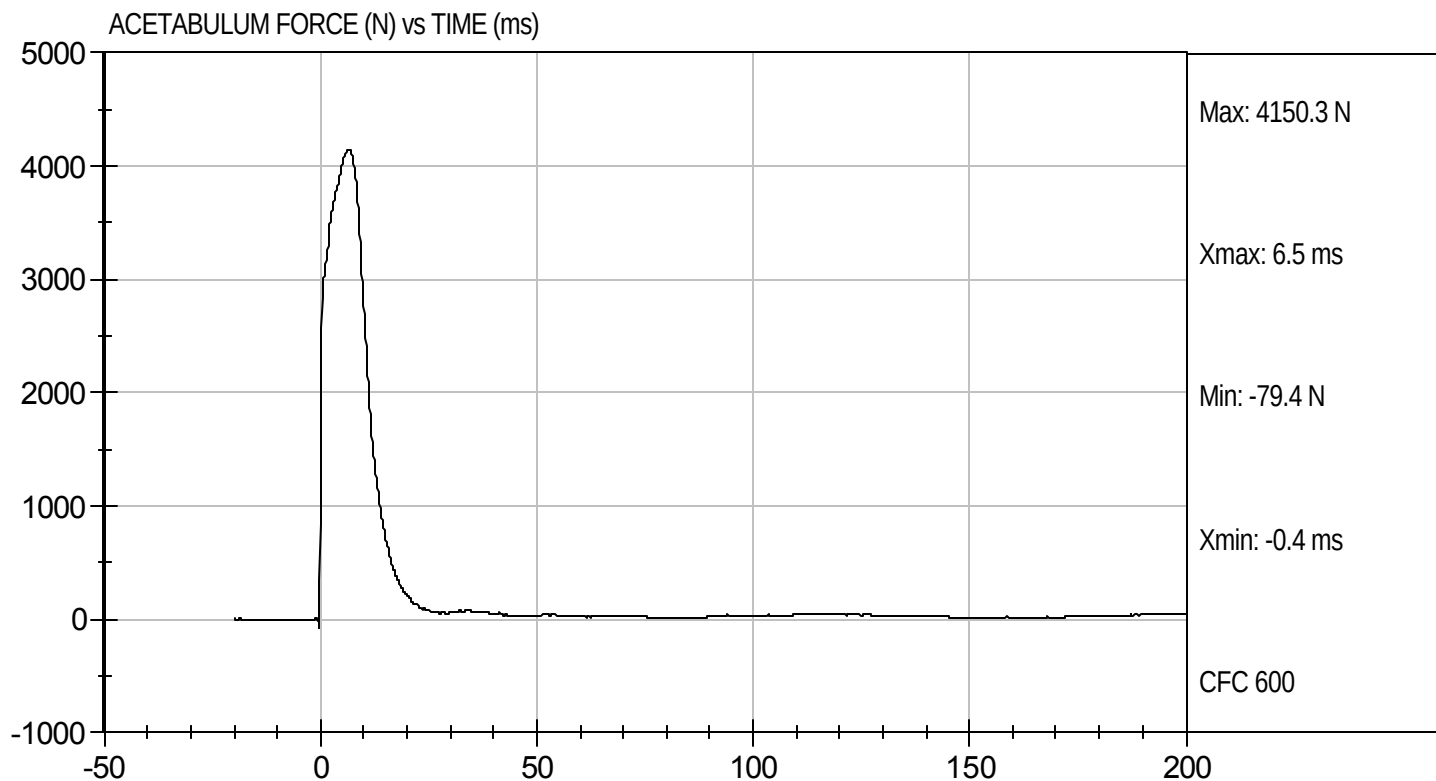
Test Date: 2/24/11
Velocity: 21.85 ft/s, 6.66 m/s





Test Desc: Pelvis Impact
Component ID: D11717

Test Date: 2/24/11
Velocity: 21.85 ft/s, 6.66 m/s



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

ATD Serial No: 306

Test I.D: D11718

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.39	Pass
Peak Impactor Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	32	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	5001	Pass
Overall Test Results			Pass	


Laboratory Technician

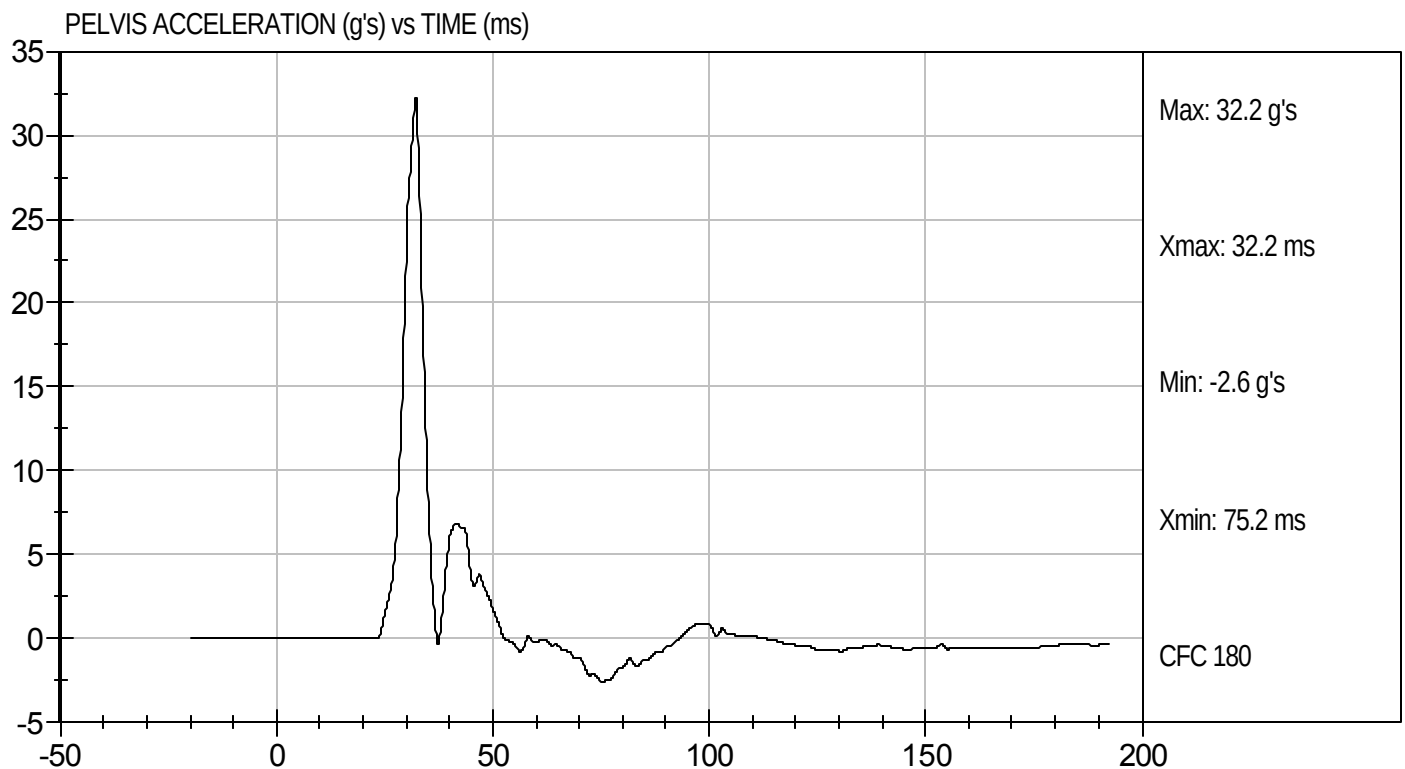
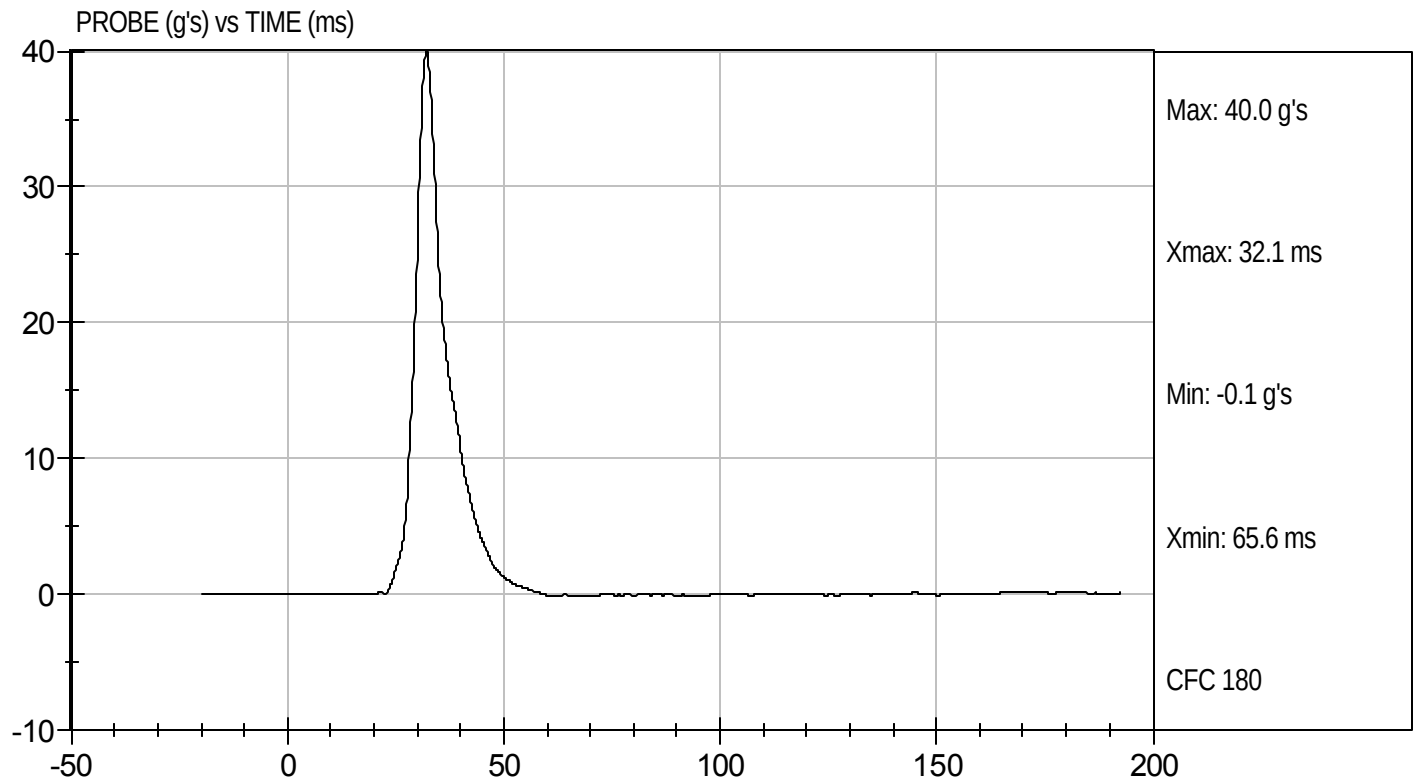
2/24/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D11718

Test Date: 2/24/11
Velocity: 14.39 ft/s, 4.39 m/s





Test Desc: Iliac Impact
Component ID: D11718

Test Date: 2/24/11
Velocity: 14.39 ft/s, 4.39 m/s

