

REPORT NUMBER: SINCAP-MGA-2011-005

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

**KIA MOTORS MANUFACTURING GEORGIA, INC.
2011 Kia Sorento LX FWD
NHTSA No.: MB0504**

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



Test Date: July 23, 2010

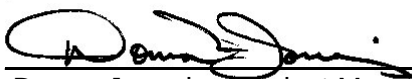
Final Report Date: August 17, 2010

FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
1200 New Jersey Ave, SE
Mail Code: NVS 111, Room W43-410
Washington, DC 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-09-D-00124.

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Approved by: 
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Approval Date: August 17, 2010

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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15. Supplementary Notes																																															
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2011 Kia Sorento LX FWD 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 July 23, 2010. The impact velocity of the Moving Deformable Barrier (MDB) was 62.0 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 280 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>76</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>27</td> </tr> <tr> <td>Combined Abdominal Force</td> <td>N</td> <td>2500</td> <td>953</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1789</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>181</td> </tr> <tr> <td>Lower Spine (T12) Resultant Acceleration</td> <td>G</td> <td>82</td> <td>59</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>5026</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.					Driver ATD (ES-2re)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	76	Maximum Thorax Rib Deflection	mm	44	27	Combined Abdominal Force	N	2500	953	Pubic Symphysis Force	N	6000	1789		Passenger ATD (SID-IIs)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	181	Lower Spine (T12) Resultant Acceleration	G	82	59	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	5026
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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 Kia Sorento LX FWD. 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 Kia Sorento LX FWD 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 62.0 km/h (38.5 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 July 23, 2010. 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 Accelerometers
 - Thorax Rib 1 to Rib 3 Potentiometers
 - Abdomen Forward, Middle, and Rear Load Cells
 - Lower Spine Accelerometers
 - Pubic Load Cell

- PASSENGER ATD (SID-IIs)
 - Head Accelerometers
 - Thorax Upper, Middle, and Lower Rib Potentiometers
 - Abdomen Upper and Lower Rib Potentiometers
 - Lower Spine 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	76
Maximum Thorax Rib Deflection	mm	44	27
Combined Abdominal Force	N	2500	953
Pubic Symphysis Force	N	6000	1789

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	181
Lower Spine (T12) Resultant Acceleration	G	82	59
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	5026

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/Pelvis 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 Lower B-Post Y
 Left Mid B-Post Y
 Left Lower A-Post Y after 20 msec.
 Left Mid 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 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB0504	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	KIA	Power Steering	Yes
Model	Sorento	Driver Front Airbag	Yes
Body Style	MPV	Driver Curtain Airbag	Yes
VIN	5XYKT3A15BG069286	Driver Head/Torso Airbag	No
Body Color	Titanium Silver	Driver Torso Airbag	No
Delivery Date	7/12/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	50	Driver Pelvis Airbag	No
Odometer (km)	80	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	4	Rear Pass. Torso Airbag	No
Engine Displacement (L)	2.4	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	Yes	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	No
Does owner's manual provide instruction to turn off automatic door locks?			No

DATA FROM CERTIFICATION LABEL

Manufactured By	Kia Motors Manufacturing Georgia, Inc.	GVWR (kg)	2190
Date of Manufacture	JUN/05/10	GAWR Front (kg)	1350
		GAWR Rear (kg)	1450

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				420	(A)
DSC x 68.04 (kg)				340	(B)
Cargo Weight (RCLW) (kg)				80	(A-B)

VEHICLE SEAT TYPE

	Type of Seat Pan				Type of Seat Back		
Seating Location	Bucket	Bench	60/40 Split Folding	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/Lever	
Rear or Second Row			X			w/Lever	
Third Row Seat							

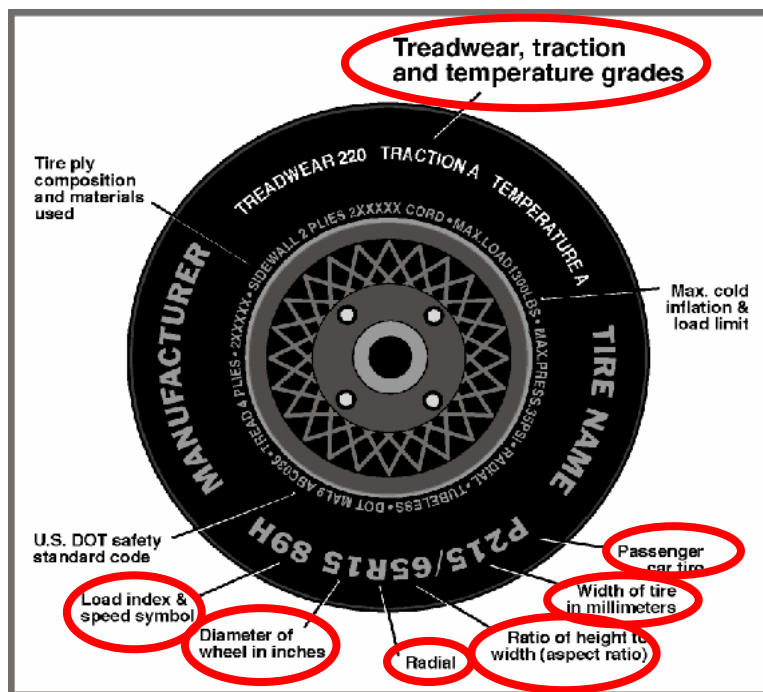
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

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

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	478.1	356.5		519.8	440.8		517.1	450.9	
Right	kg	480.4	341.6		488.1	411.9		483.1	416.4	
Ratio	%	57.9	42.1		54.2	45.8		53.6	46.4	
Totals	kg	958.5	698.1	1656.6	1007.9	852.7	1860.6	1000.2	867.3	1867.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1656.6	(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	1865.9	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	787	794	767	776	
As Tested (Fully Loaded $\pm$ 10mm at each wheel well)	mm	785	796	773	775	1239

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2704
Total Vehicle Length at Left Side	mm	3832
Total Vehicle Length at Centerline	mm	4681
Total Vehicle Length at Right Side	mm	3832
Weight of Ballast in Cargo Area	kg	45.4
Weight of Vehicle Components Removed	kg	23.1
Amount of Stoddard Solvent in Fuel Tank	L	63.2

Vehicle components removed to meet target vehicle test weight: RF mirror, spare tire, trunk carpet and cover, jack & tools, engine splash shield, rear floor mats, and RR taillight.

TEST VEHICLE VERTICAL IMPACT POINT DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	412
Actual Impact Point Aft of Front Axle	mm	394

DATA SHEET NO. 2

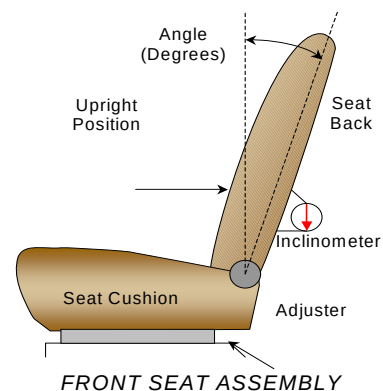
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010

NOMINAL DESIGN RIDING POSITION

The driver and passenger seat backs are positioned to the manufacturer's designated angle. The procedure is as follows:
For the driver seat, the headrest post angle is -0.7° . The left rear passenger's seat back angle is -9.6° in reference to the door sill.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	-1.2° at headrest post
Passenger with Seated Dummy	-10.0° at seatback

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	24 detents	12 th detent
Rear Seat	Fixed	Fixed

Describe method: 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.

SEAT BELT UPPER ANCHORAGES

	Total # of Positions	Placed in Position #
Driver Seat	3 detents	0 (uppermost as 0)
Rear Seat	Fixed	

Describe method: The driver seat anchorage was set in the uppermost position. The rear seat anchorage is non-adjustable.

DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

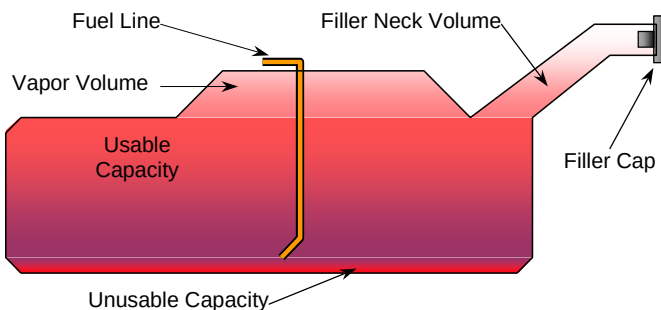
NHTSA No. MB0504
 Test Date: 7/23/2010

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	68.0
Usable Capacity of "Optional" Tank	
Usable Capacity Used for FMVSS 301	62.6 to 63.9
Actual Amount of Solvent used	63.2

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

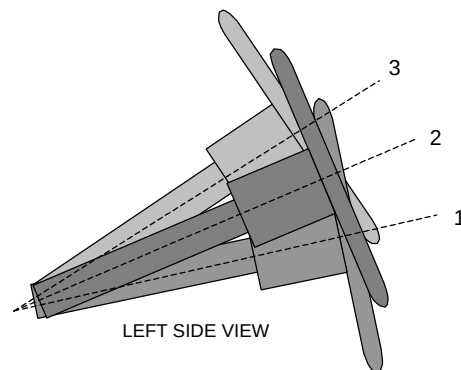
The test vehicle is equipped with an electric fuel pump. Fuel pump will operate when the key is in the "ON" position. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

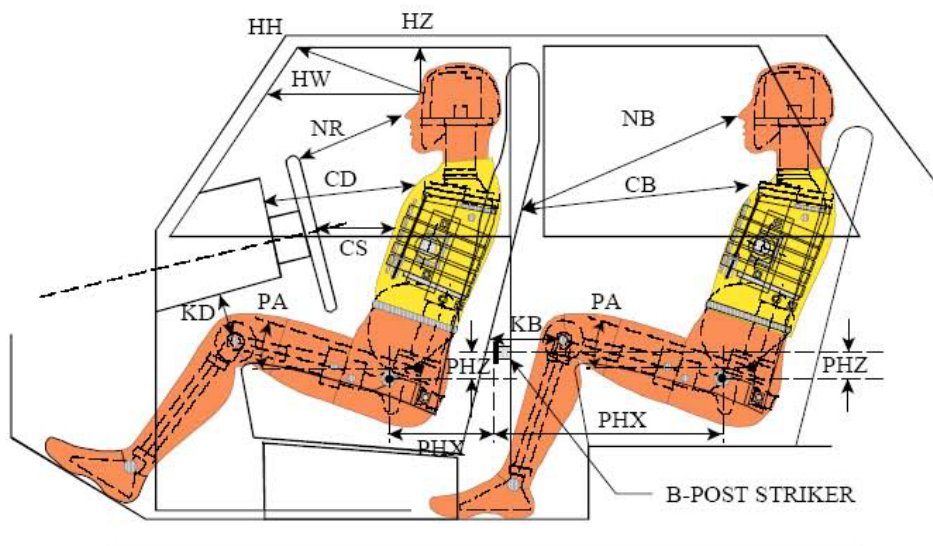
	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	66.3	187
Geometric Center – Position 2	64.1	167
Uppermost – Position 3	61.9	147
Telescoping Steering Wheel Travel		40
Test Position	64.1	167

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010



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

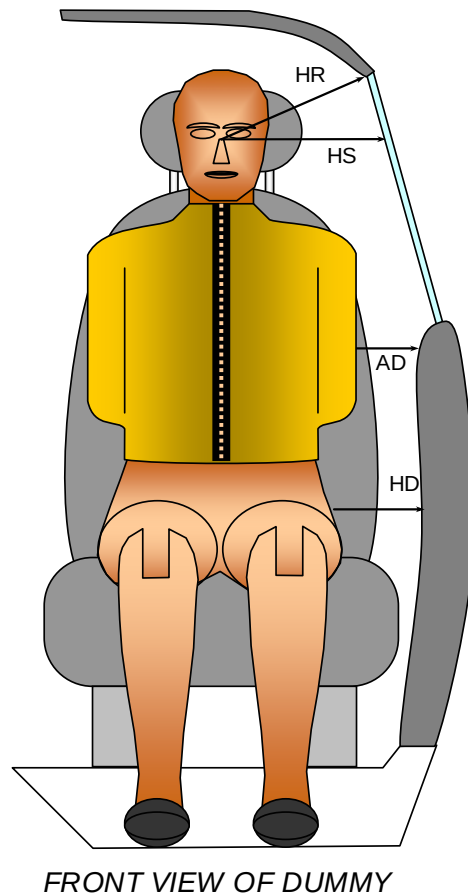
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 296	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	364	13.6		
HW		Head to Windshield	613	0		
HZ	HZ	Head to Roof	176	90	289	90
NR	NB	Nose to Rim/Seat Back	459	18.5	452	14.0
CD	CB	Chest to Dash/Seat Back	555	0.8	454	11.9
CS		Chest to Steering Wheel	342	9.2		
KDL	KBL	Left Knee to Dash/Seat Back	155	22.7	250	24.4
KDR	KBR	Right Knee to Dash/Seat Back	157	27.9	248	25.1
PA	PA	Pelvic Angle		25.8		18.2
PHX	PHX	H-Point to Striker (X-Axis)	220	0	324	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	201	90	253	90
SA	SA	Seat Back Angle (headrest post)		-1.2		10.0

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010



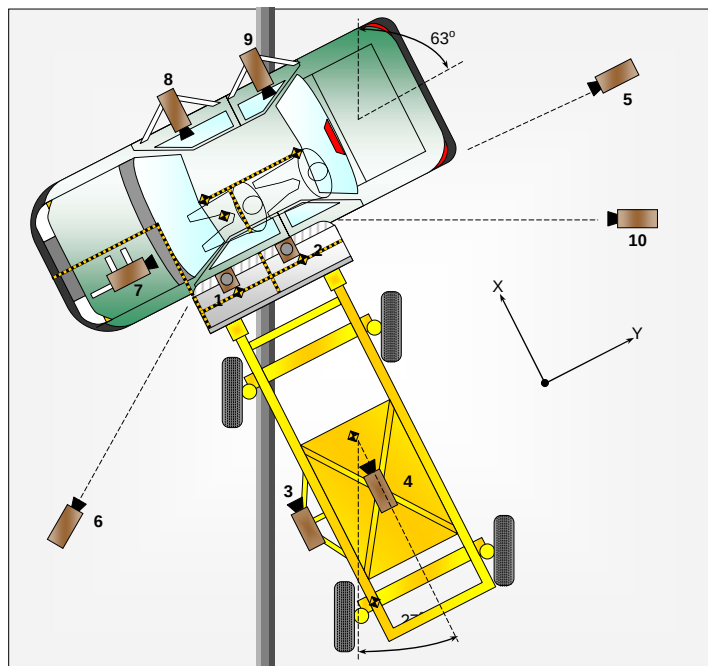
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 296
HR	Head to Side Header	mm	242	290
HS	Head to Side Window	mm	335	375
AD	Arm to Door	mm	105	190
HD	H-Point to Door	mm	160	184

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

Test Vehicle: 2011 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Angle	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Overhead Overall	-870	0	-5050	86.6	14	1000
2	Overhead Close-up	645	1110	-5050	79.5	50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	-3310	5260	-1250	4.6	24	1000
6	Left Front	3350	-4180	-1230	6.3	24	1000
7	Driver Front (OB)					12.5	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

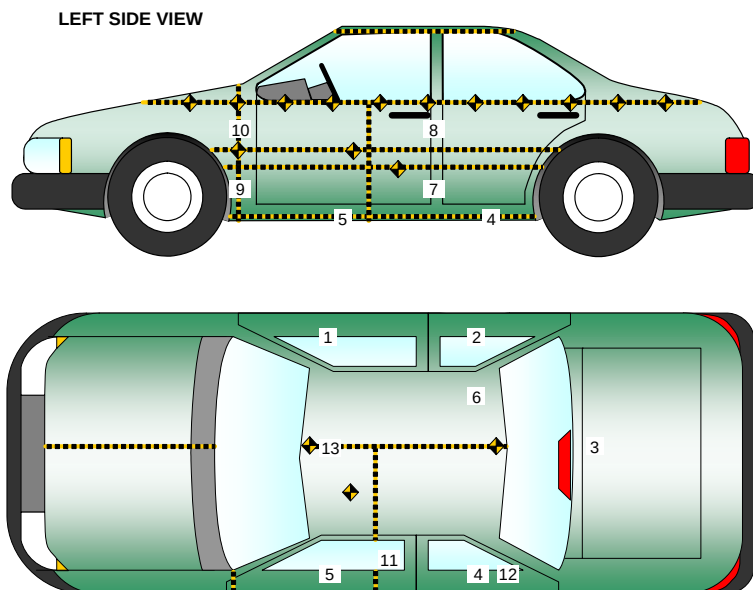
* All measurements accurate to ± 6 mm

DATA SHEET NO. 6

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2661	741	287
2	Right Sill at Rear Seat	1734	741	290
3	Rear Floorpan Above Axle	1258	0	529
4	Left Sill at Rear Door	1740	-741	290
5	Left Sill at Front Door	2648	-741	287
6	Rt. Rear Occ. Compartment	1830	372	433
7	Left Lower B-Post	2111	-771	670
8	Left Middle B-Post	2111	-763	923
9	Left Lower A-Post	3122	-745	622
10	Left Middle A-Post	3215	-832	887
11	Front Seat Track	2672	-385	550
12	Rear Seat Track or Structure	1680	-528	525
13	Vehicle CG	2470	-170	358

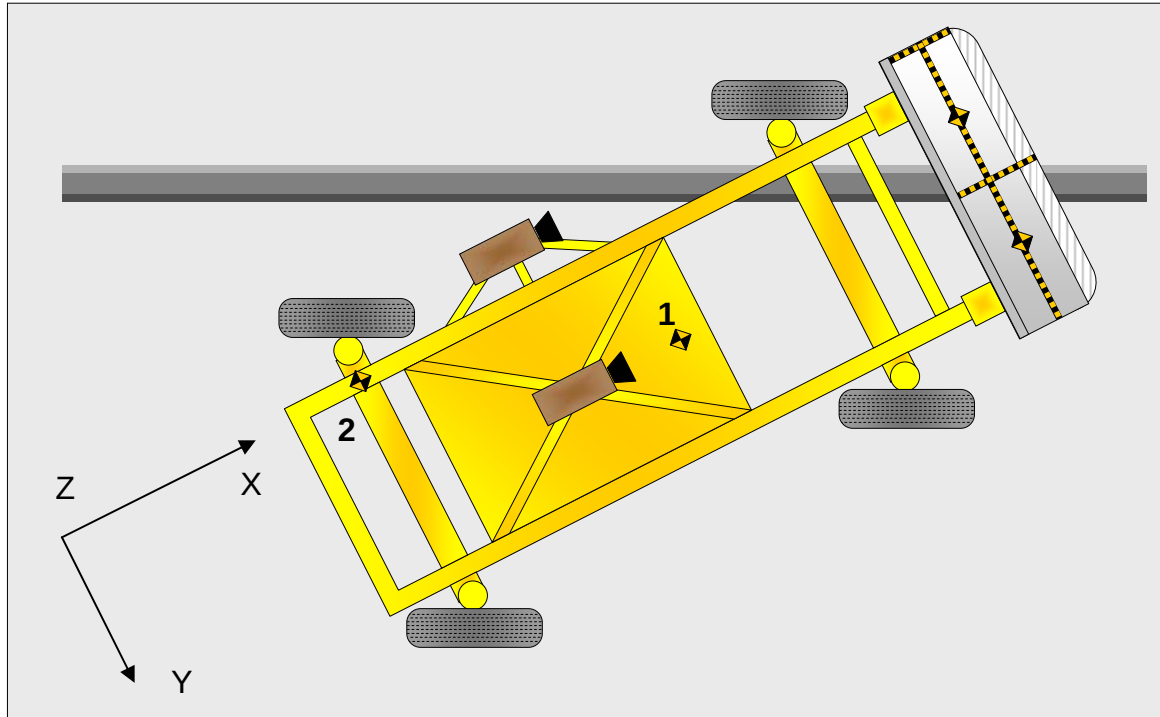
Reference: X – Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ up)

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010



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 (+ up)

DATA SHEET NO. 8
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	109	1650
2	Occupant H-Point	mm	275	1050
3	Mid Door	mm	280	1350
4	Window Sill	mm	128	1350
5	Window Top	mm	16	1500
	Maximum Penetration	mm	280	

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 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

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	62.0
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.3
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	700	Left	193
B	Top of Bumper	533	800	Left	110
C	Mid-Level	686	800	Left	114
D	Top of Stack	813	800	Left	169

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10**POST-TEST OBSERVATIONS**

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

TEST DUMMY INFORMATION AND CONTACT

Description	Driver (ES-2re)	Passenger (SID-IIs)
Dummy Type / Serial No.	ES-2re / 032	SID-IIs / 296
Head Contact	Curtain Airbag, Side Header, Headrest	Curtain Airbag, Headrest
Upper Torso Contact	Side Airbag	Door Panel
Lower Torso Contact	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	None
Window Damage	None
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/Pelvis Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes		No	

MDB LEFT EDGE IMPACT POINT DATA

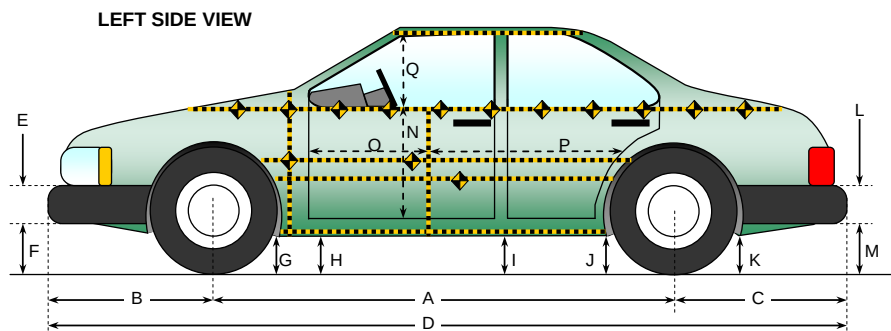
Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	18 forward
Vertical Offset	mm	+/-20	1 down

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010



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

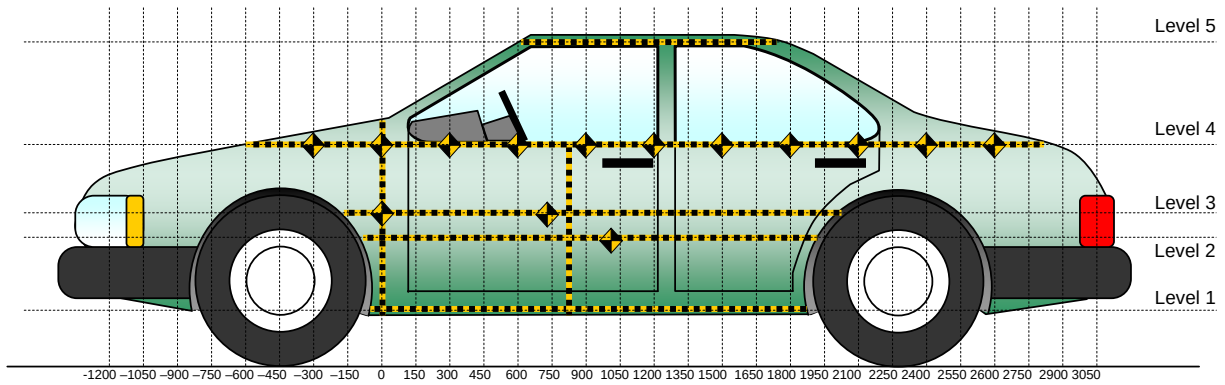
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2704	2698	6
B	Front Axle to FSOV	929	915	14
C	Rear Axle to RSOV	1048	1060	-12
D	Total Length at Centerline	4681	4673	8
E	Front Bumper Thickness	118	118	0
F	Front Bumper Bottom to Ground	462	475	-13
G	Sill Height at Front Wheel Well	263	263	0
H	Sill Height at Front Door Leading Edge	263	260	3
I	Sill Height at B Pillar	258	302	-44
J1	Sill Height at Rear Wheel Well	253	300	-47
J2	Pinch Weld Height at Rear Wheel Well	255	286	-31
K	Sill Height Aft of Rear Wheel Well	281	292	-11
L	Rear Bumper Thickness	83	83	0
M	Rear Bumper Bottom to Ground	523	531	-8
N	Sill Height to Window Bottom Sill	793	705	88
O	Front Door Leading Edge to Impact CL	757	748	9
P	Rear Door Trailing Edge to Impact CL	1198	1152	46
Q	Front Window Opening	466	470	-4
R	Right Side Length	3832	3839	-7
S	Left Side Length	3832	3798	34
T	Vehicle Width at B Post	1858	1619	239

DATA SHEET NO. 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010



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	335
2	Occupant H-Point	737
3	Mid-Door	770
4	Window Sill	1095
5	Window Top	1595

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

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900				334					333					-1	
-750				302					302					0	
-600				283					284					1	
-450				267					269					2	
-300				257					262					5	
-150				248					266					18	
0		166	168	241			246	236	255			80	68	14	
150	209	175	175	257		294	348	342	250		85	173	167	-7	
300	210	174	174	245		300	372	376	258		90	198	202	13	
450	212	173	173	239		303	391	399	269		91	218	226	30	
600	212	173	172	231		307	410	418	279		95	237	246	48	
750	213	173	172	225	460	311	414	423	288	468	98	241	251	63	8
900	214	172	172	220	459	315	423	435	300	471	101	251	263	80	12
1050	214	172	172	215	460	317	447	448	313	475	103	275	276	98	15
1200	215	173	173	212	462	320	432	438	338	476	105	259	265	126	14
1350	215	174	174	211	463	322	446	454	339	478	107	272	280	128	15
1500	215	176	176	211	463	323	446	451	328	479	108	270	278	117	16
1650	214	178	178	213	463	323	444	450	324	479	109	266	272	111	16
1800	216	176	179	214	467	322	443	441	338	480	106	267	262	124	13
1950			168	217	467			341	281	479			173	64	12
2100				220	472				248	484				28	12
2250				224	476				272	490				48	14
2400				229	485				270	492				41	7
2550				236	497				264	502				28	5
2700				245	514				265	521				20	7
2850				260					273					13	

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

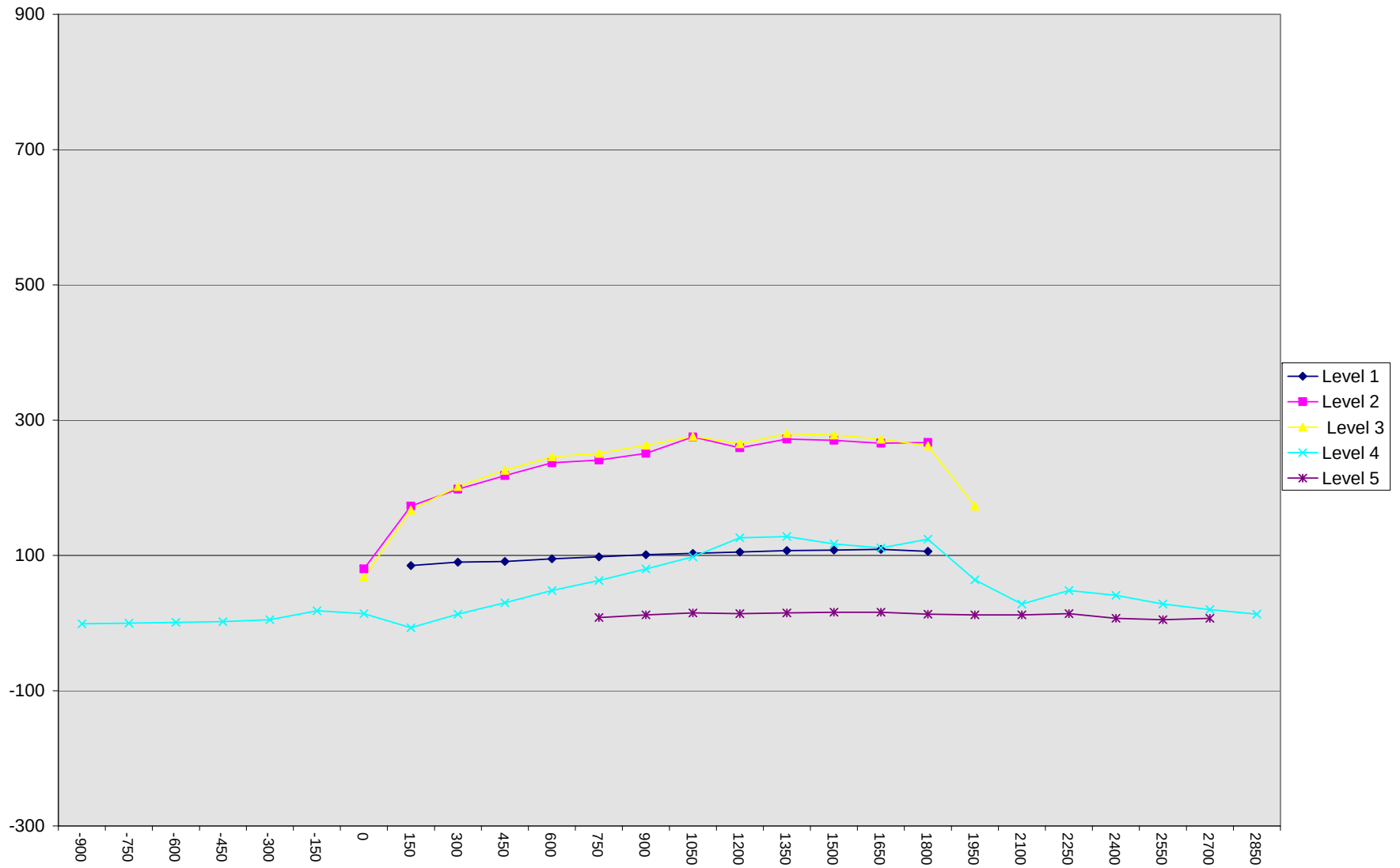
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	109	275	280	128	16
Distance From Impact (mm)	1650	1050	1350	1350	1500

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

Test Vehicle: 2011 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010

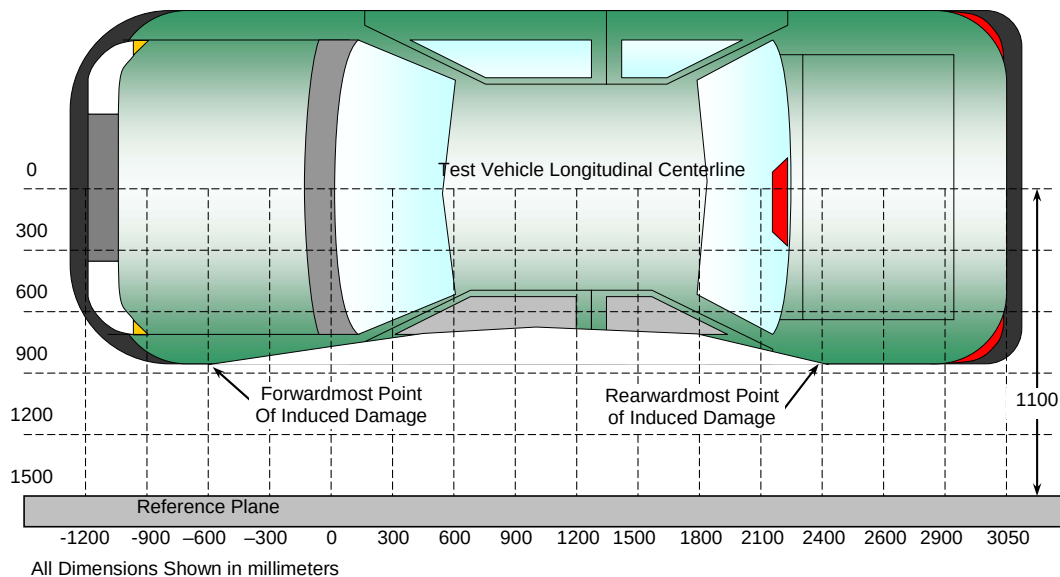
20



DATA SHEET NO. 13
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010



TOP VIEW

DAMAGE PROFILE DISTANCES

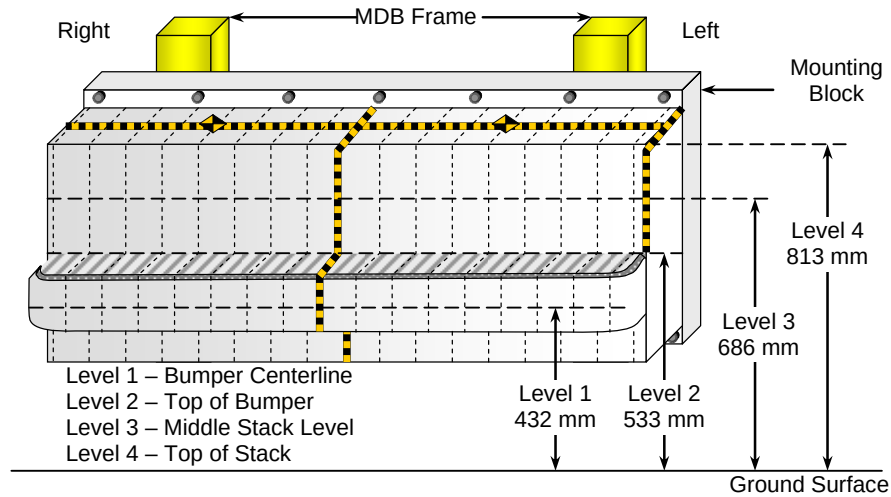
DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2850	4	260	273	13
2	2100	4	220	248	28
3	1350	3	174	454	280
4	600	3	172	418	246
5	-150	4	248	266	18
6	-900	4	334	333	-1

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010



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	56	38	31	29	52	59	72	48	33	39	46	57	69	80	98	133	169
3	30	33	32	29	52	68	55	43	50	41	38	37	41	53	71	90	114
2	83	74	70	62	75	78	88	81	82	79	78	85	88	90	91	95	110
1	182	179	173	175	175	177	179	180	183	184	186	187	188	190	191	193	188

DATA SHEET NO. 15

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

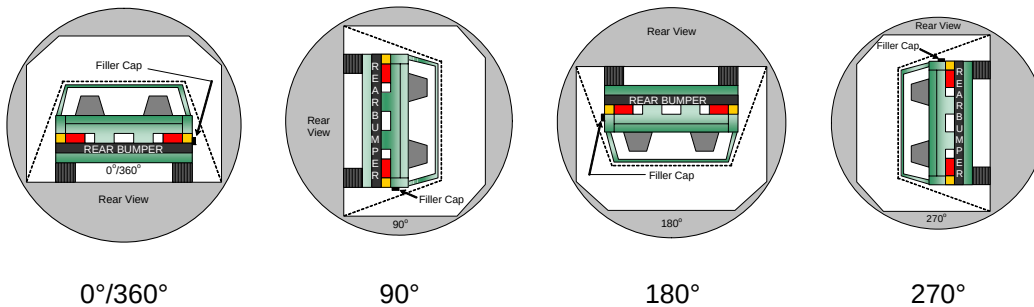
Test Vehicle: 2011 Kia Sorento LX FWD
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
 Test Date: 7/23/2010

Test Time: 11:44 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°	125	300	425
90° to 180°	110	300	410
180° to 270°	113	300	413
270° to 360°	115	300	415

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

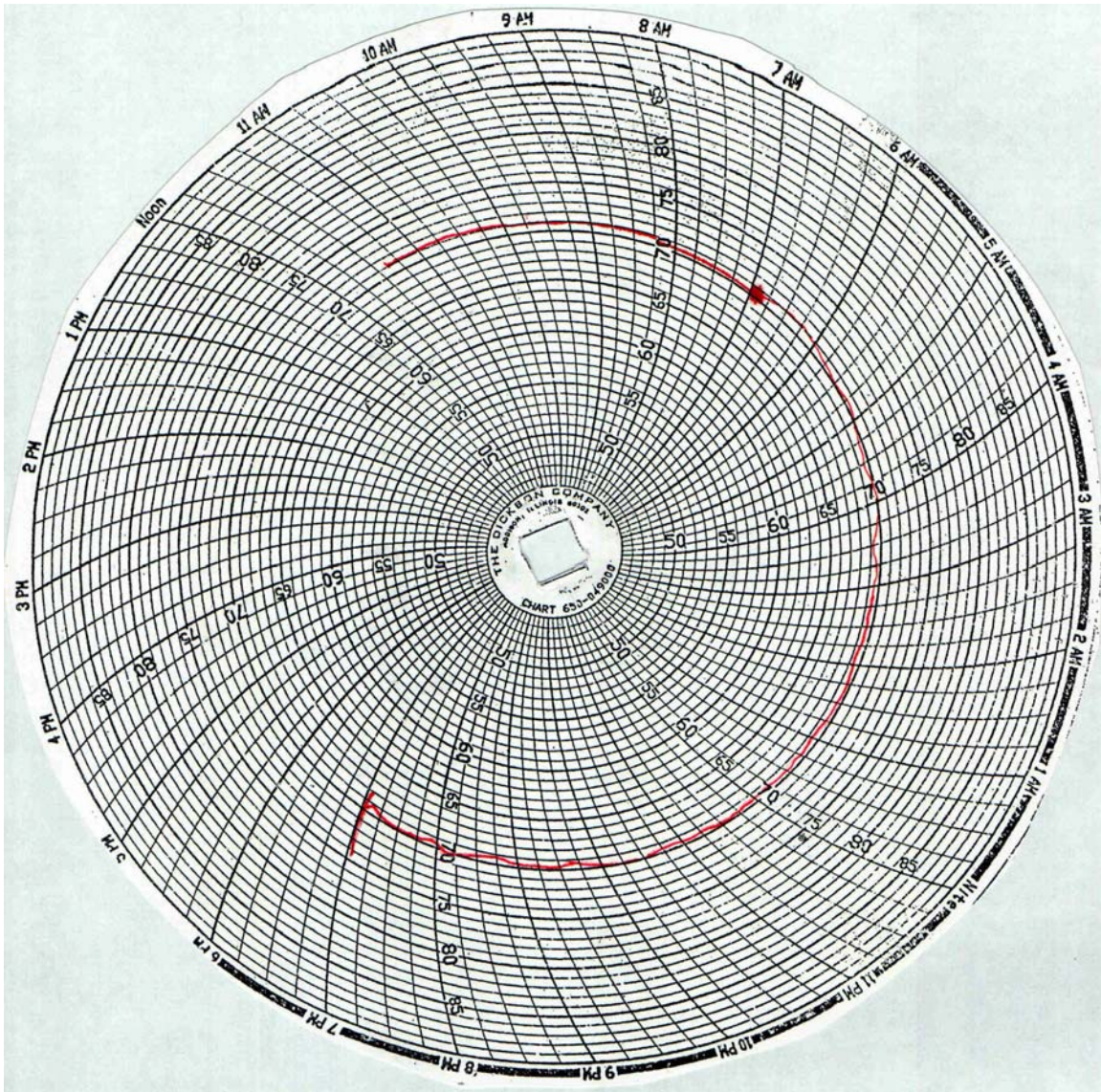
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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 Kia Sorento LX FWD
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB0504
Test Date: 7/23/2010



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 1.	As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle	A-1
Photo No. 2.	As Delivered Left Rear $\frac{3}{4}$ 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 $\frac{3}{4}$ Front View of Test Vehicle	A-3
Photo No. 6.	Post-Test Left $\frac{3}{4}$ 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 $\frac{3}{4}$ Rear View of Test Vehicle	A-5
Photo No. 10.	Post-Test Left $\frac{3}{4}$ 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 Target Vehicle at Ideal Impact Point	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 Target Vehicle at Ideal Impact Point	A-9
Photo No. 18.	Pre-Test Right Side View of MDB Positioned Against Side of Target Vehicle at Ideal Impact Point	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 Showing Impact Point Location	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 (Door Open)	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 to Show Position	A-18
Photo No. 36.	Pre-Test Left Side View of Steering Wheel to Show Position	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 Showing Test Position	A-20
Photo No. 39.	Pre-Test Close-Up Left Side View of Driver Seat Back Showing Test Position	A-20
Photo No. 40.	Pre-Test Close-Up View of Driver Seat Back or Head Restraint Showing Seat Back Test Position	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 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 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 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 (Door Open)	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 to Show Position	A-33
Photo No. 64.	Pre-Test Close-Up Left Side View of Rear Passenger Seat Track Showing Test Position	A-34
Photo No. 65.	Pre-Test Close-Up Left Side View of Rear Passenger Seat Back Showing Test Position	A-34
Photo No. 66.	Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint Showing Seat Back Test Position	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 Rear Passenger Dummy Contact Locations	A-38
Photo No. 73.	Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle View	A-39
Photo No. 74.	Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View	A-39
Photo No. 75.	Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle View	A-40
Photo No. 76.	Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View	A-40
Photo No. 77.	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View	A-41
Photo No. 78.	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View	A-41
Photo No. 79.	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	A-42
Photo No. 80.	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	A-42
Photo No. 81.	Pre-Test Front View of MDB Impactor Face	A-43
Photo No. 82.	Post-Test Front View of MDB Impactor Face	A-43
Photo No. 83.	Pre-Test Top View of MDB Impactor Face	A-44
Photo No. 84.	Post-Test Top View of MDB Impactor Face	A-44
Photo No. 85.	Pre-Test Left Side View of MDB Impactor Face	A-45
Photo No. 86.	Post-Test Left Side View of MDB Impactor Face	A-45
Photo No. 87.	Pre-Test Right Side View of MDB Impactor Face	A-46
Photo No. 88.	Post-Test Right Side View of MDB Impactor Face	A-46
Photo No. 89.	Close-Up View of Vehicle's Certification Label	A-47
Photo No. 90.	Close-Up View of Vehicle's Tire Information Placard or Label	A-47
Photo No. 91.	Pre-Test Ballast View	A-48
Photo No. 92.	Post-Test Primary and Redundant Speed Trap Read-Out	A-48
Photo No. 93.	FMVSS No. 301/305 Rollover 0 Degrees	A-49
Photo No. 94.	FMVSS No. 301/305 Rollover 90 Degrees	A-49
Photo No. 95.	FMVSS No. 301/305 Rollover 180 Degrees	A-50

		<u>Page No.</u>
Photo No. 96.	FMVSS No. 301/305 Rollover 270 Degrees	A-50
Photo No. 97.	FMVSS No. 301/305 Rollover 360 Degrees	A-51
Photo No. 98.	Impact Event (Impact Side)	A-51
Photo No. 99.	Monroney Label	A-52
Photo No. 100.	Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-53
Photo No. 101.	Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-54



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



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



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



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



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



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



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



Post-Test Left $\frac{3}{4}$ 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 Target Vehicle at Ideal Impact Point



Post-Test Overhead View of Test Vehicle and MDB



Pre-Test Left Side View of MDB Positioned Against Side of Target Vehicle at Ideal Impact Point



Pre-Test Right Side View of MDB Positioned Against Side of Target Vehicle at Ideal Impact Point



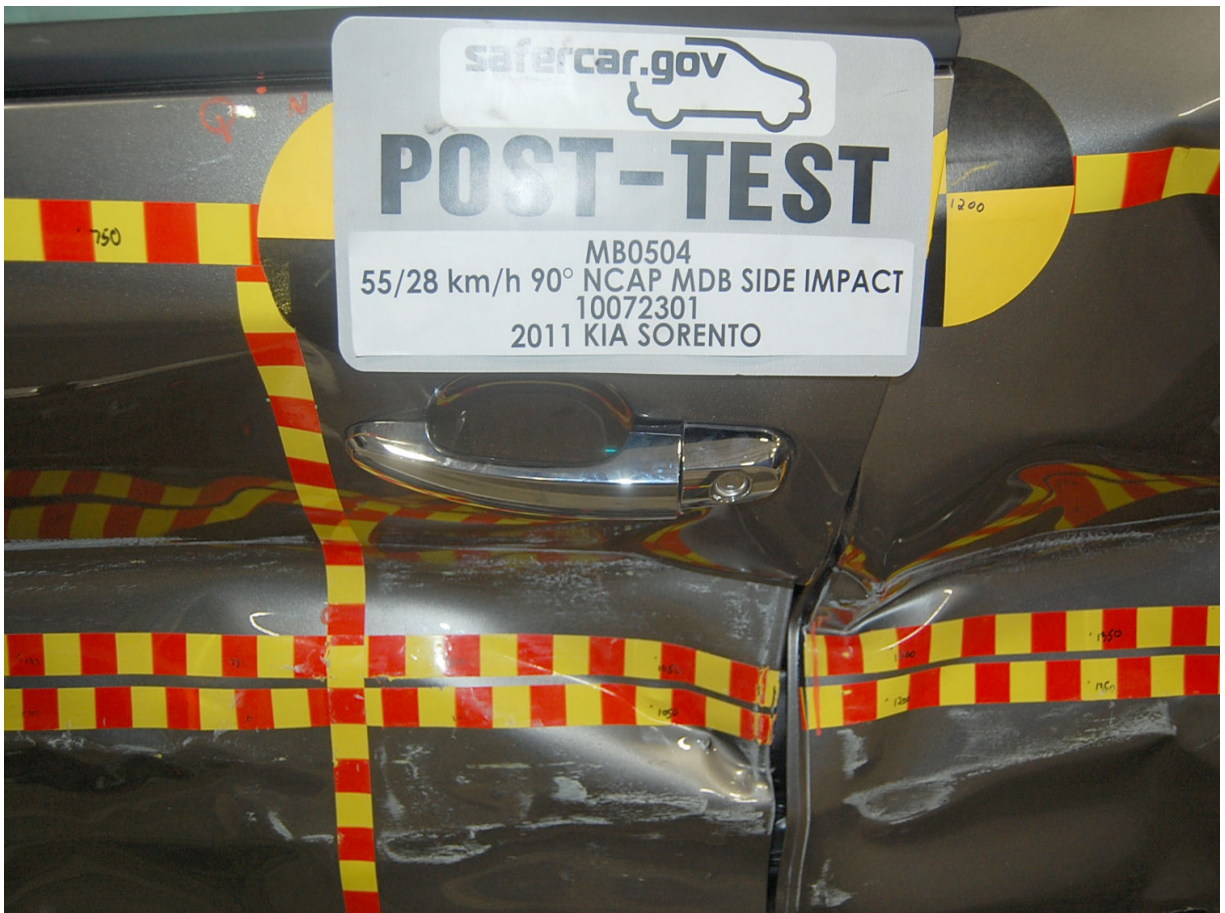
Pre-Test Close-Up View of Impact Point Target



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



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 (Door Open)



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 to Show Position



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



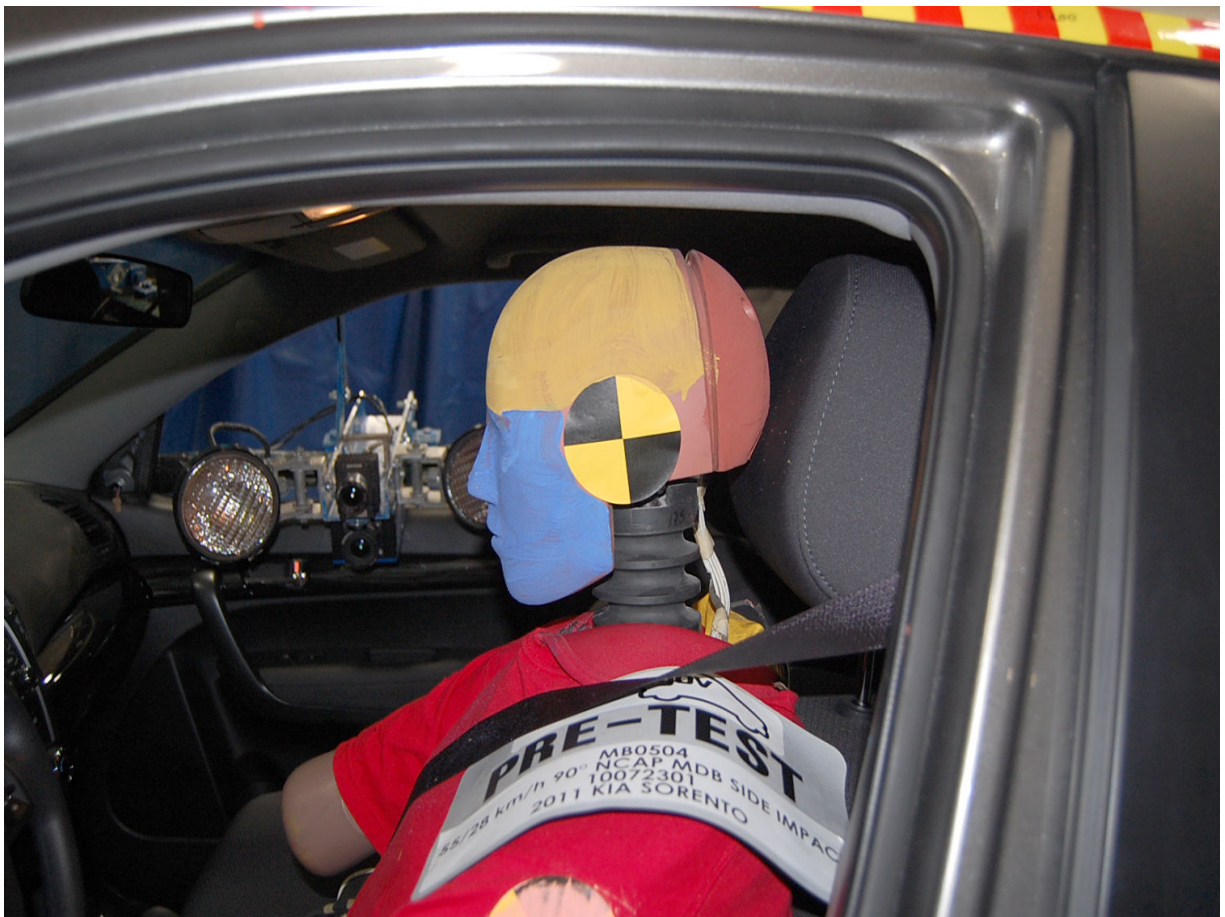
Pre-Test View of Parking Brake



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



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



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



Pre-Test 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 View



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



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



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



Post-Test Driver Dummy Close-up Pelvis Contact 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 (Door Open)



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 to Show Position



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



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



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



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 Rear Passenger Dummy Contact Locations



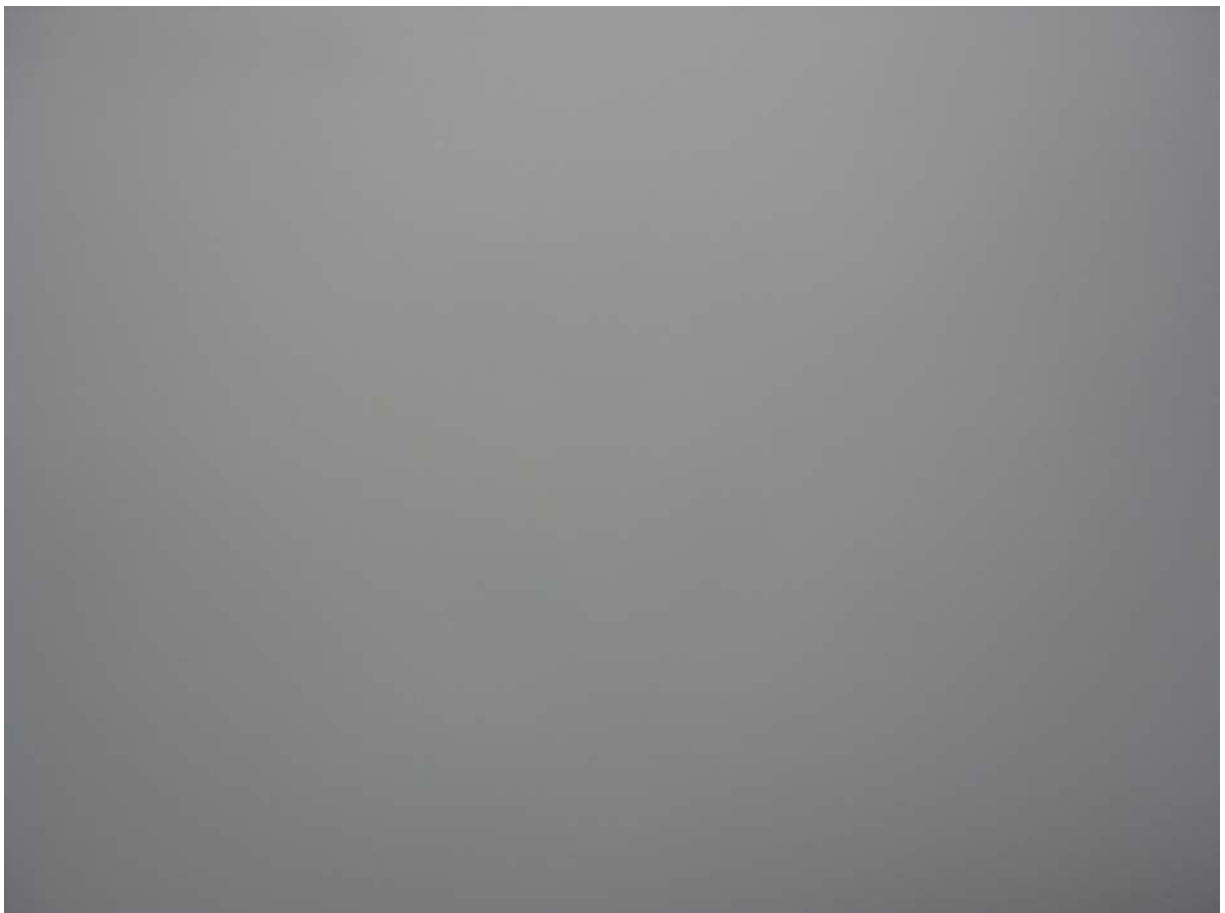
Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle View



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



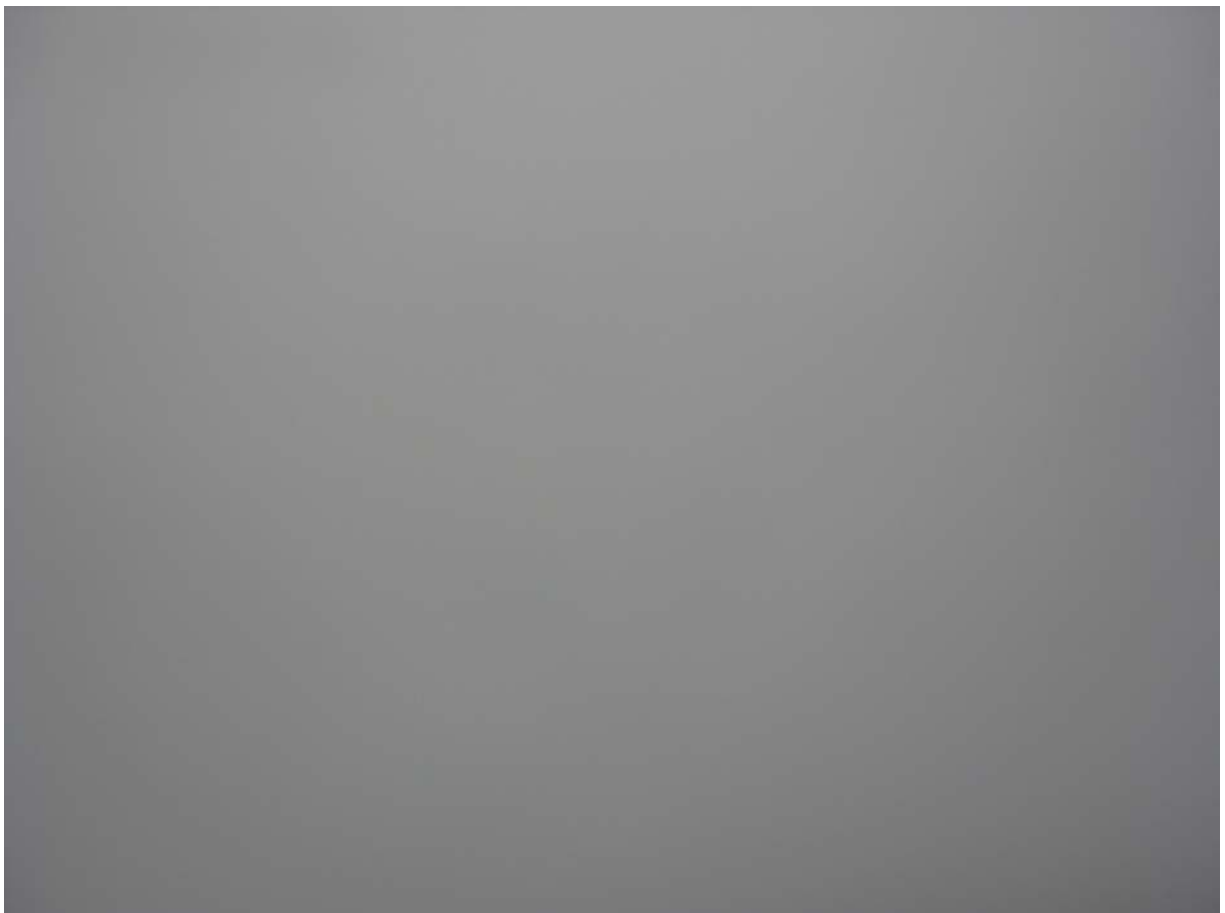
Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle View



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



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



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



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



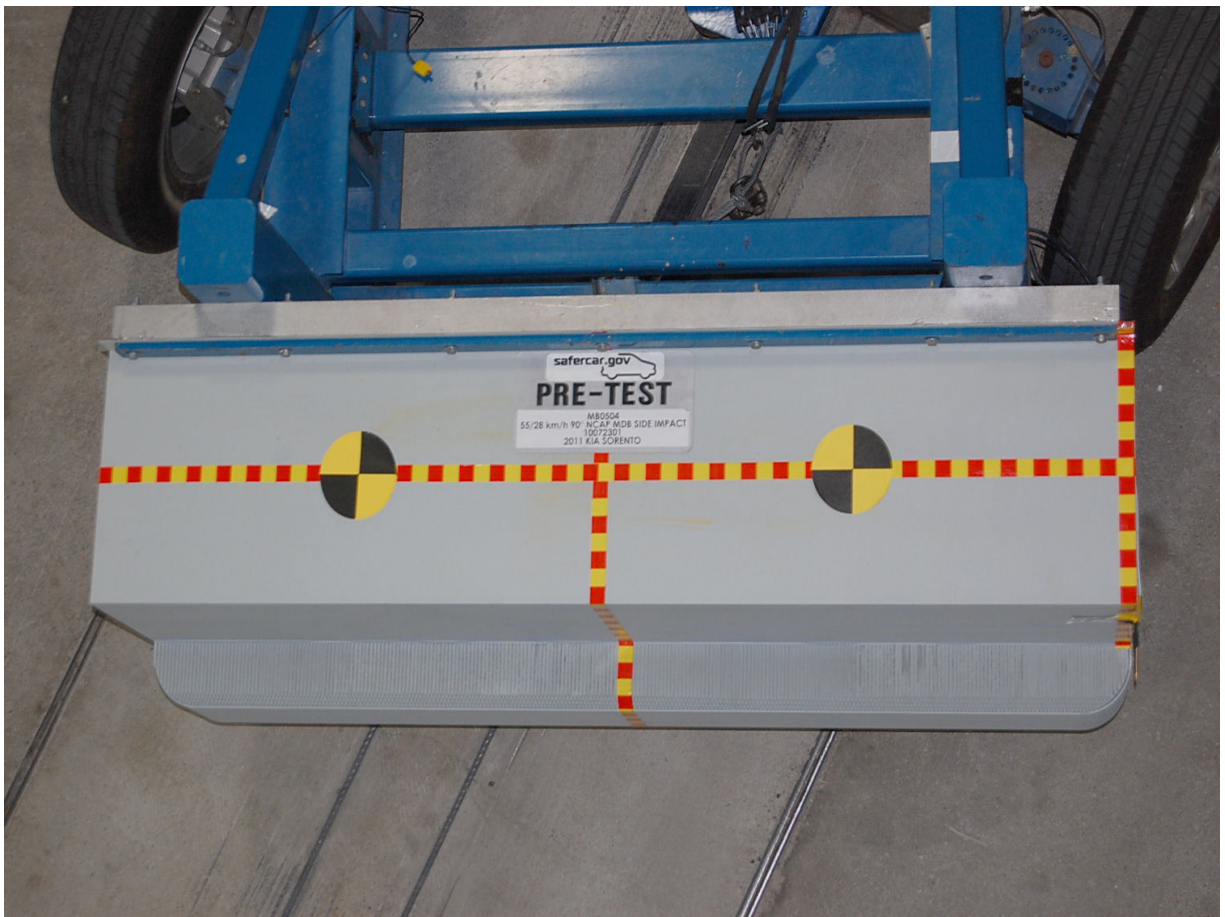
Post-Test View of Fuel Filler Cap or Fuel Filler Neck



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



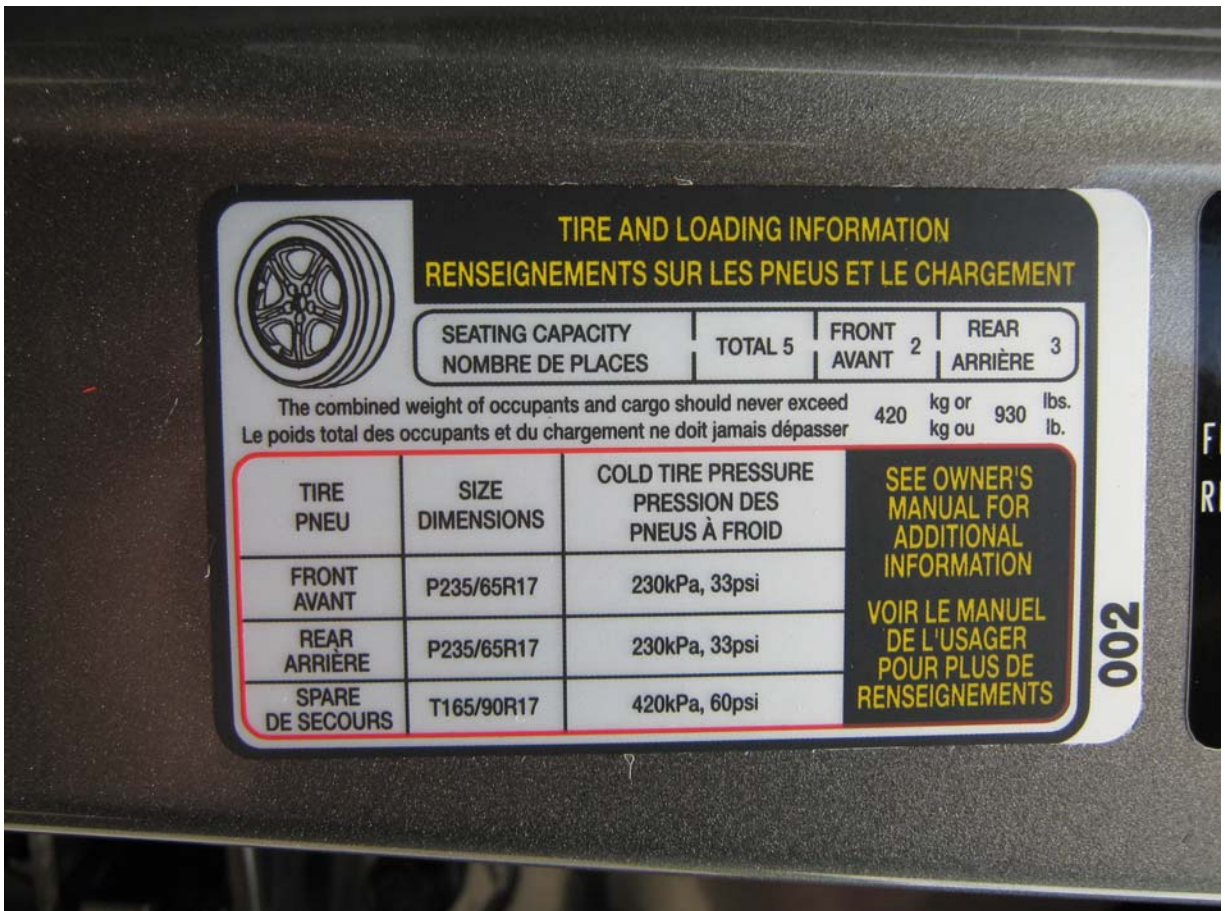
Pre-Test Right Side View of MDB Impactor Face



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



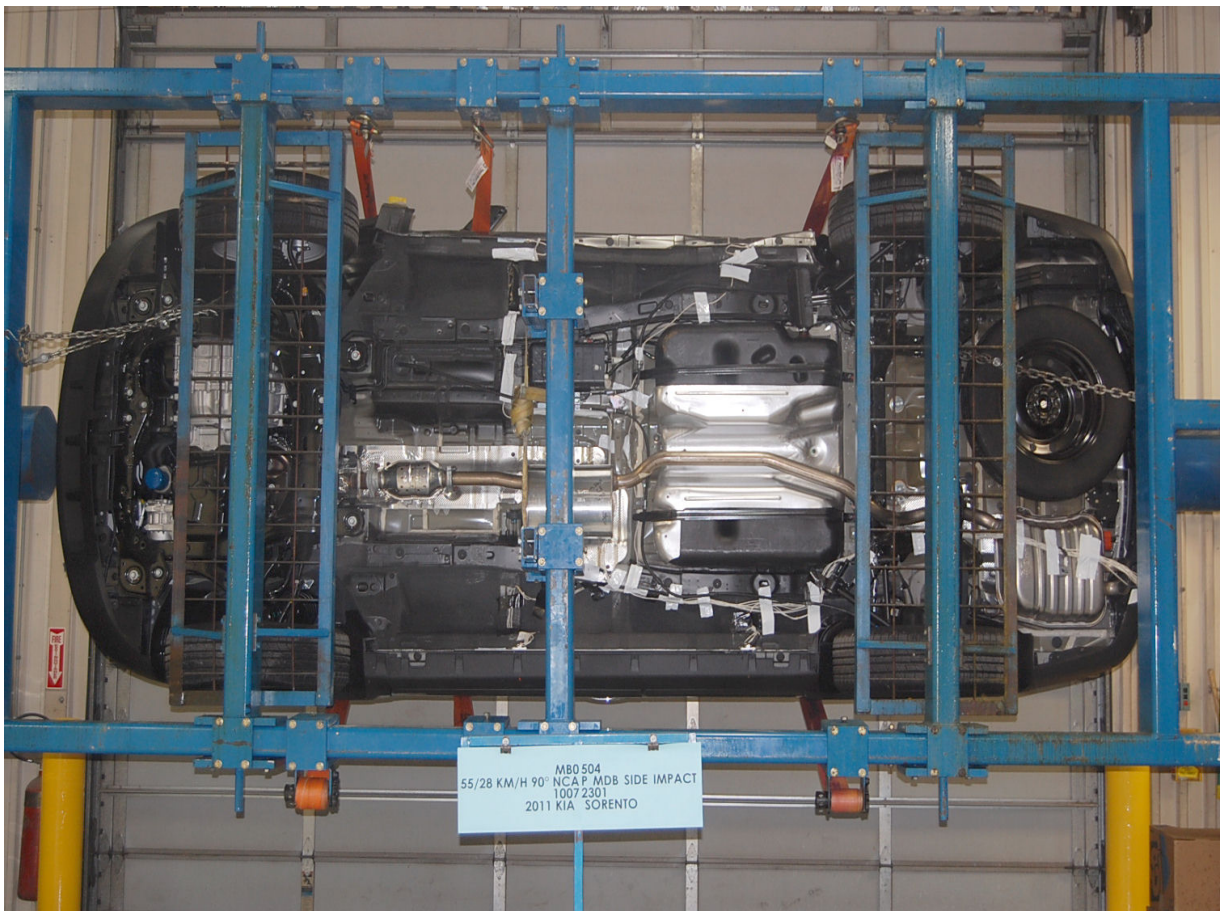
FMVSS No. 301/305 Rollover 0 Degrees



FMVSS No. 301/305 Rollover 90 Degrees



FMVSS No. 301/305 Rollover 180 Degrees



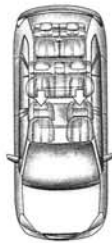
FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees



Impact Event (Impact Side)



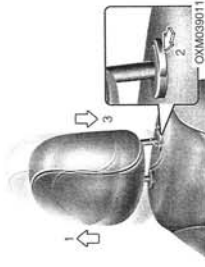
OHM039048N

Headrest

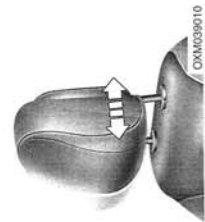
The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort. The headrest not only provides comfort for the driver and front passenger, but also helps protect the head and neck in the event of a rear collision.

WARNING

- For maximum effectiveness in case of an accident, the headrest should be adjusted so the middle of the headrest is at the same height of the center of gravity of an occupant's head. Generally, the center of gravity of most people's head is similar with the height of the top of their eyes. Also, adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.
- Do not operate the vehicle with the headrests removed. Severe injury to the occupants may occur in the event of an accident. Headrests may provide protection against neck injuries when properly adjusted.
- Do not adjust the headrest position of the driver's seat while the vehicle is in motion.



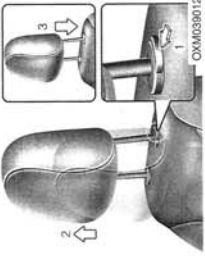
Adjusting the height up and down
To raise the headrest, pull it up to the desired position (1). To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).



Adjusting the angle (if equipped)
The headrest angle may be adjusted by pulling or pushing the lower part of the headrest. Adjust the headrest so that it properly supports the head and neck.

CAUTION

Excessive pulling or pushing may damage the headrest.



Removal (except active headrest)
To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest up (2). To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height.

WARNING

Make sure the headrest locks in position after adjusting it to properly protect the occupants.



HNH2041-1

Active headrest (if equipped)
The active headrest is designed to move forward and upward during a rear impact. This helps prevent the driver's and front passenger's heads from moving backward and thus helps minimize neck injuries. For your safety, the active headrest can't be removed. If there is any problem with the active headrest, take your vehicle to an authorized KIA dealer and have the system checked.

2nd row seat

1. Insert the rear seat belt buckle in the pocket (if equipped) between the rear seatback and cushion, and insert the rear seat belt webbing into the guide to prevent the seat belt from being damaged.
2. Set the front seatback to the upright position and, if necessary, slide the front seat forward.
3. Lower the rear headrests to the lowest position.



OXM03021N



OXM03024N

4. Pull on the seatback folding lever, then fold the seat toward the front of the vehicle; the headrest will automatically fold down.
5. When you return the seatback to its upright position, always be sure it has locked into position by pushing on the top of the seatback.



OCUR0005N

6. Unfold the headrest manually.
7. Return the rear seat belt to the proper position.

WARNING

When you return the rear seatback to its upright position after being folded down:

Be careful not to damage the seat belt webbing or buckle. Do not allow the seat belt webbing or buckle to get caught or pinched in the rear seat. Ensure that the seatback is completely locked into its upright position by pushing on the top of the seatback. Otherwise, in an accident, the sudden stop, the seat could fold down and allow passengers to enter the passenger compartment, which could result in serious injury or death.



OXM03023N

Double folding (2nd row right seat, if equipped)

Pull the double folding strap on the right rear seatback, then pull up the rear of the portion seat cushion toward the front of the vehicle. When you return the seat cushion to its original position, always be sure it has locked into position by pulling the rear portion of the seat cushion.

WARNING - Uprighting seat

When you return the seatback to its upright position, hold the seatback and return it slowly and be sure there are no other occupants around the seat. If the seatback is returned without being held and controlled, the back of the seat could move forward or backward resulting in accidental injury to a person struck by the seatback.

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
Driver Torso Contact Switch
Driver Pelvis Contact Switch
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)
Passenger Shoulder Contact Switch
Passenger Torso Contact Switch
Passenger Pelvis Contact Switch

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)

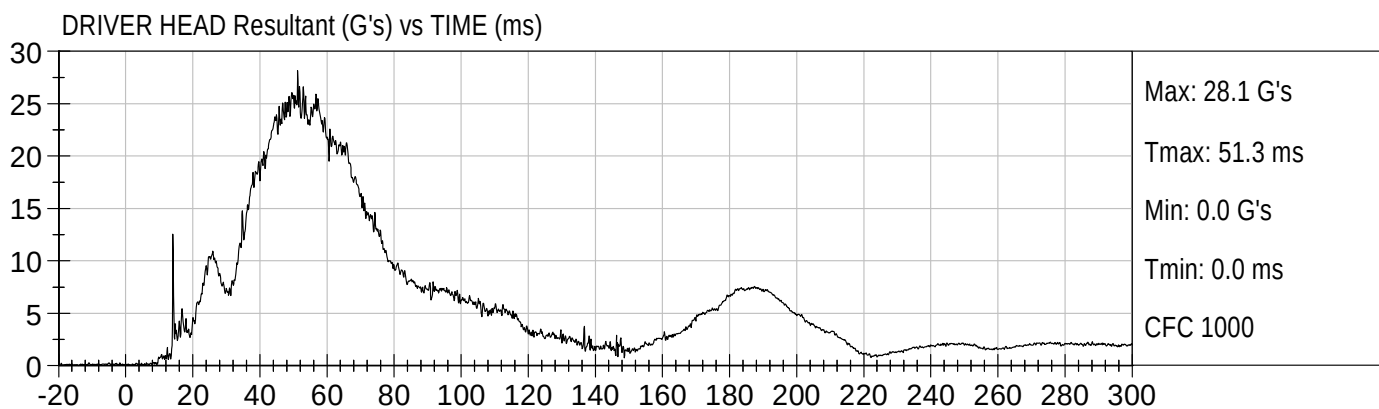
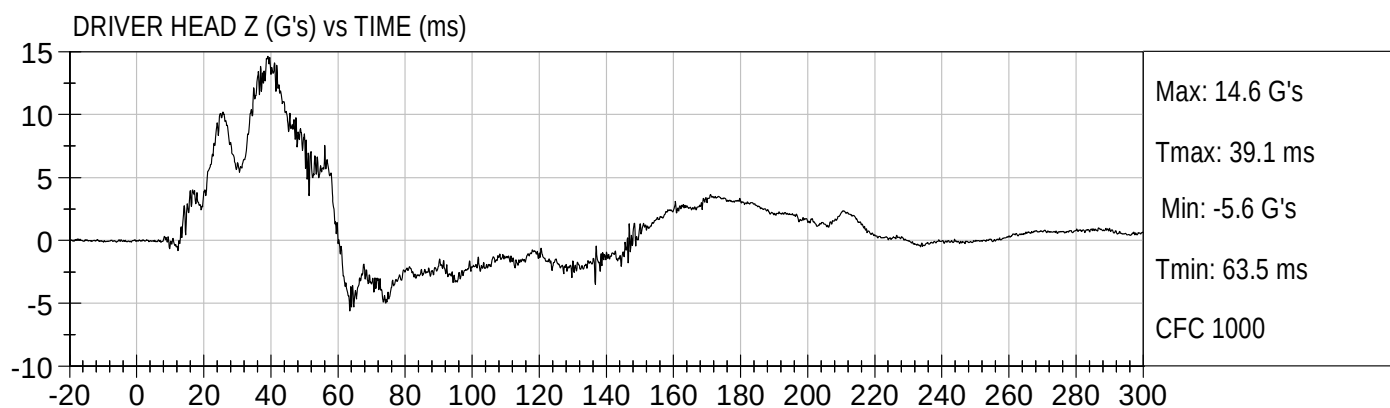
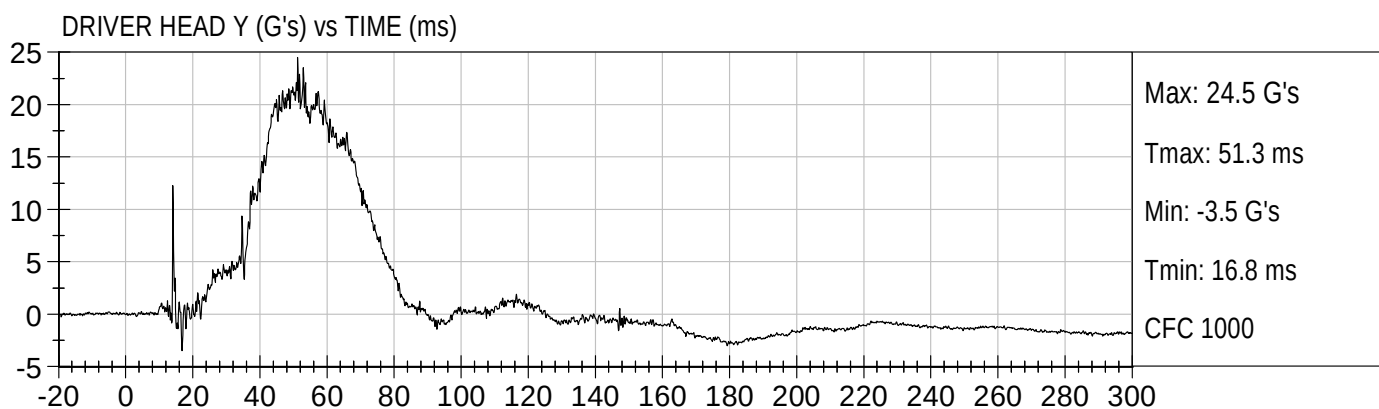
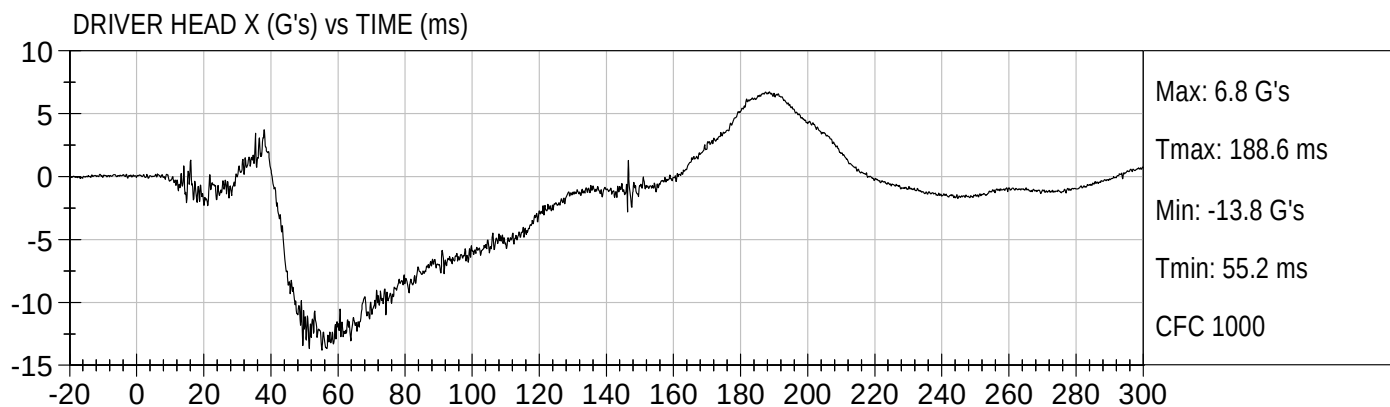
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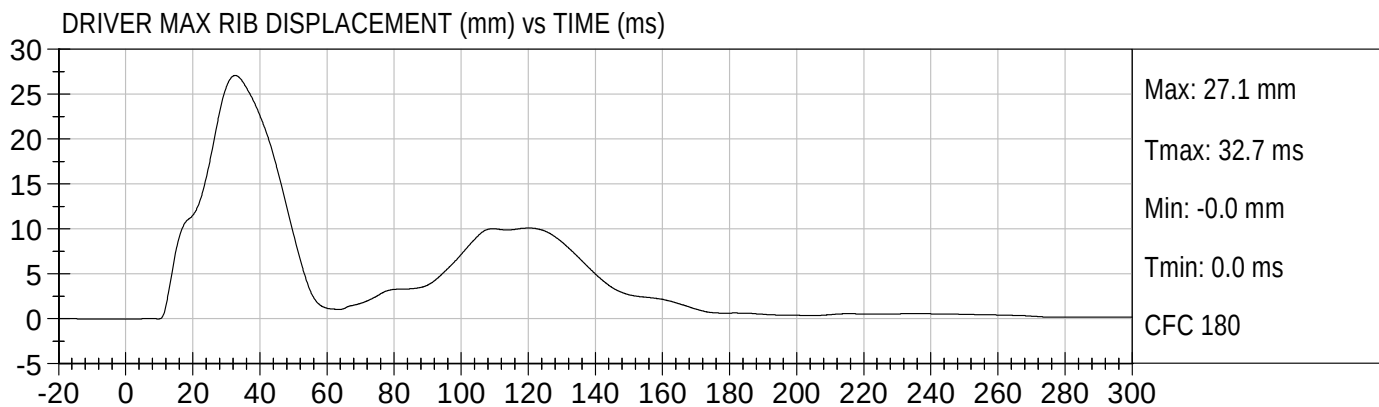
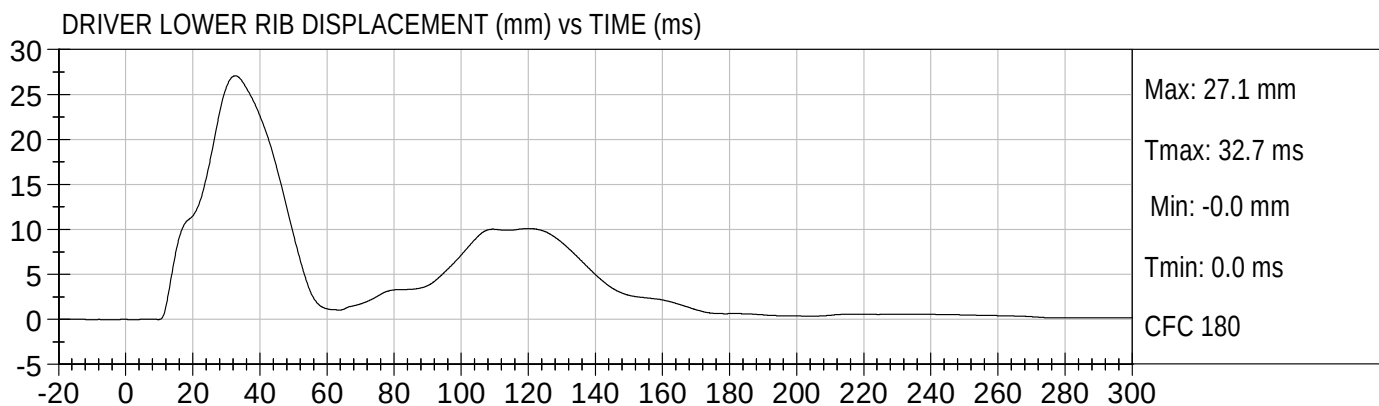
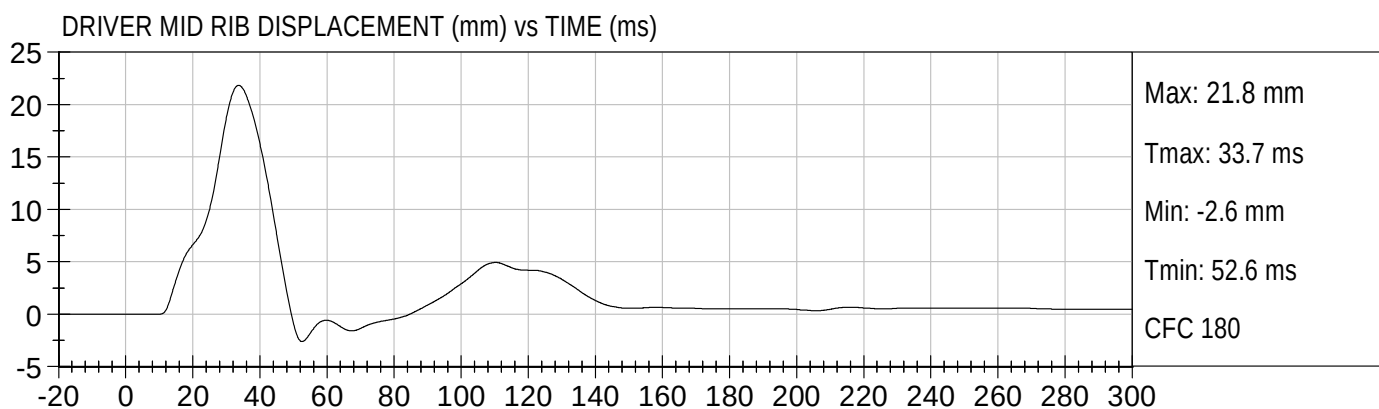
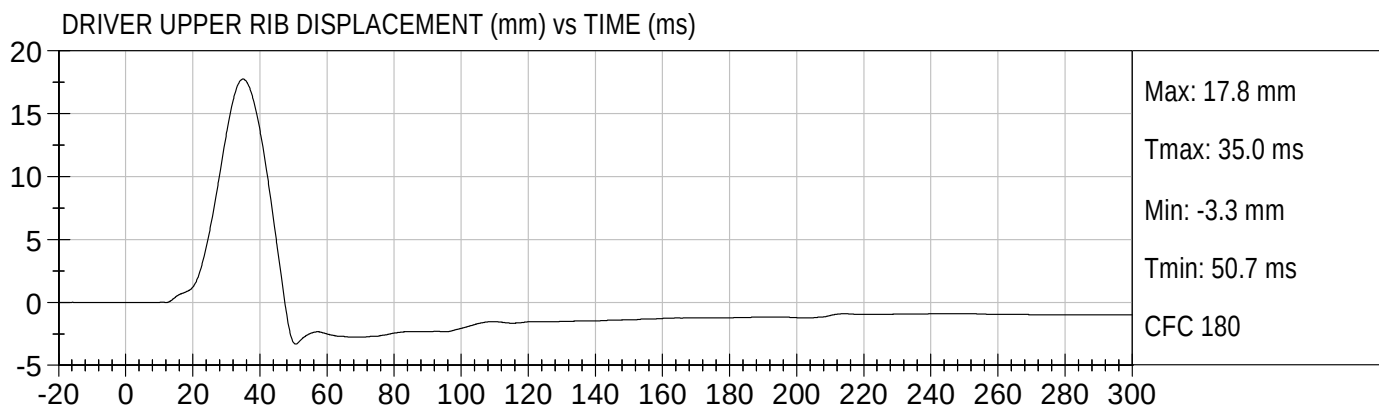
MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch



55/28 km/h 90° NCAP MDB Side Impact
2011 Kia Sorento - MB0504

Test Date: 07/23/2010
Speed: 38.5 mph (62.0 km/h)



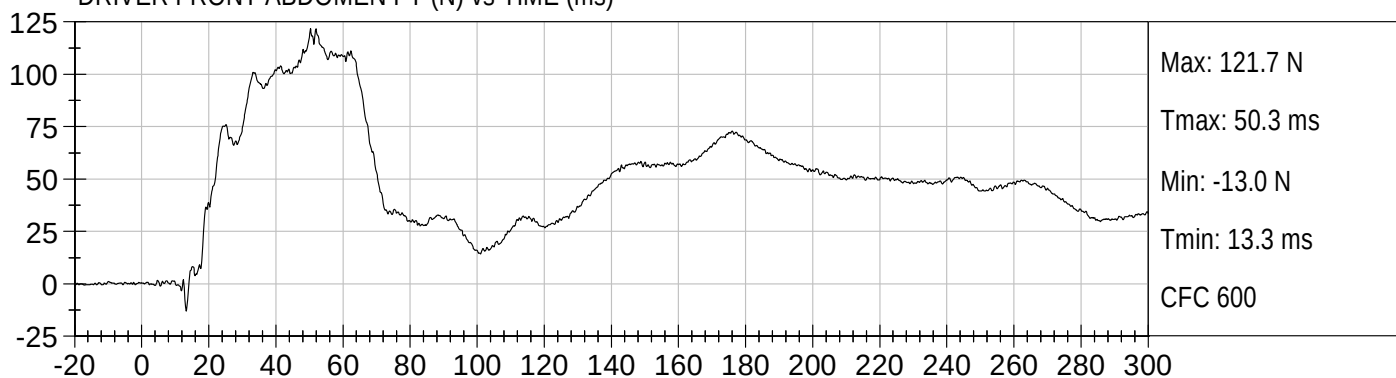




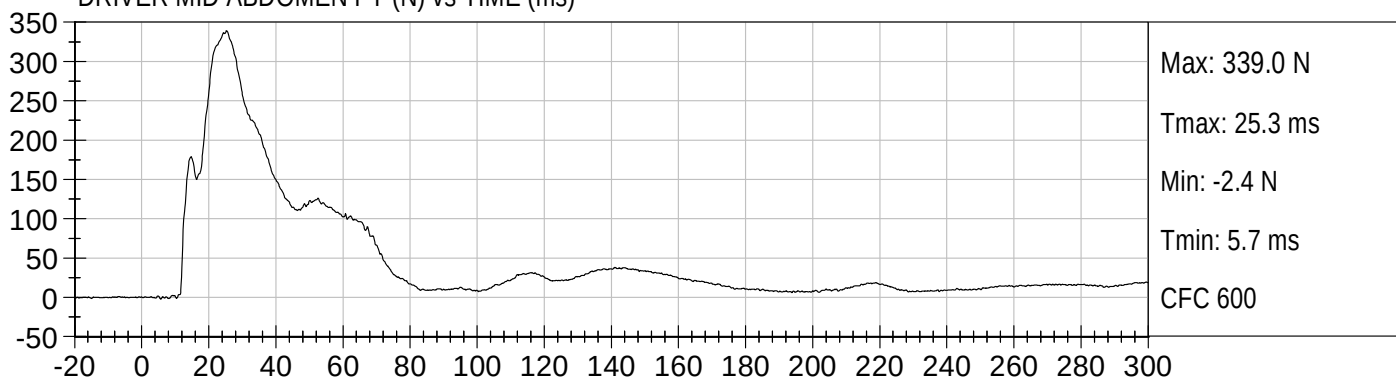
55/28 km/h 90° NCAP MDB Side Impact
2011 Kia Sorento - MB0504

Test Date: 07/23/2010
Speed: 38.5 mph (62.0 km/h)

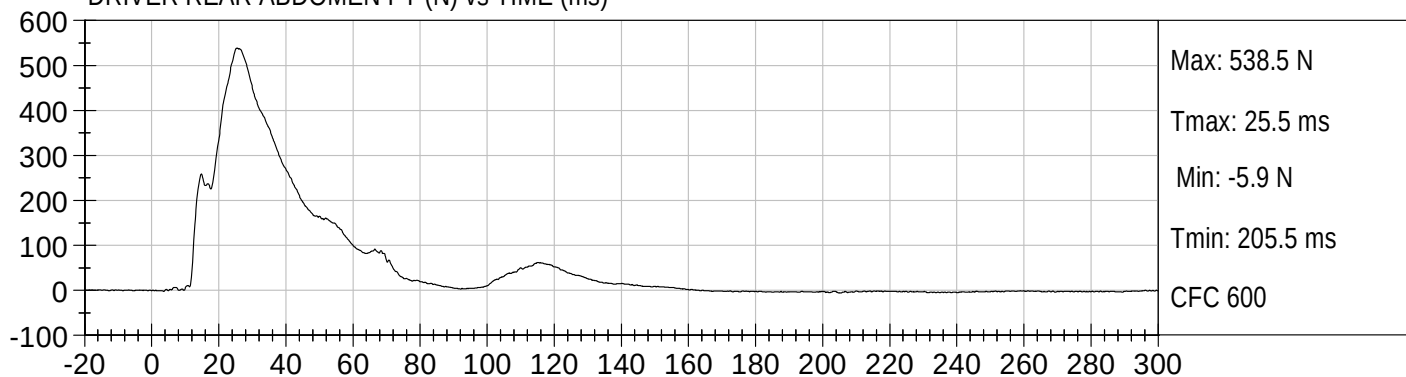
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



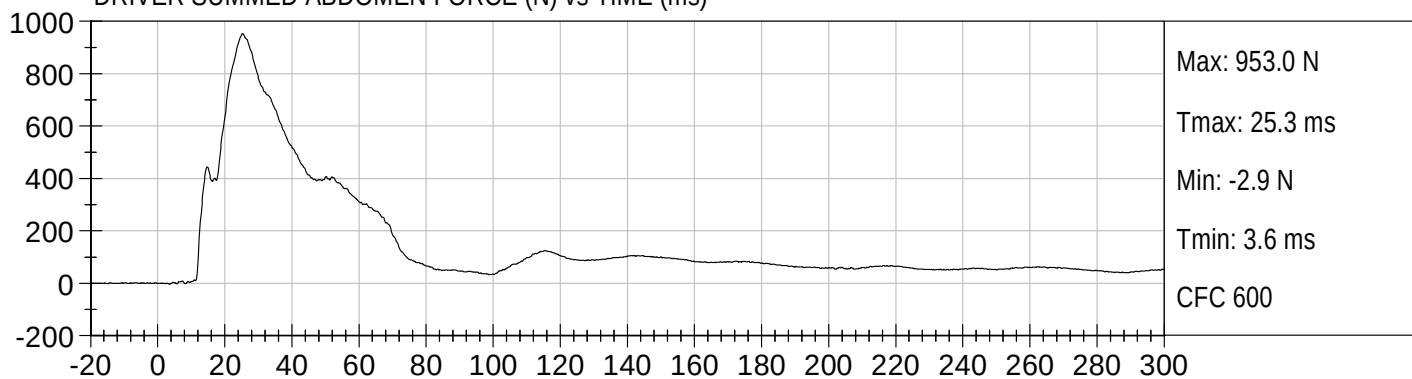
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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



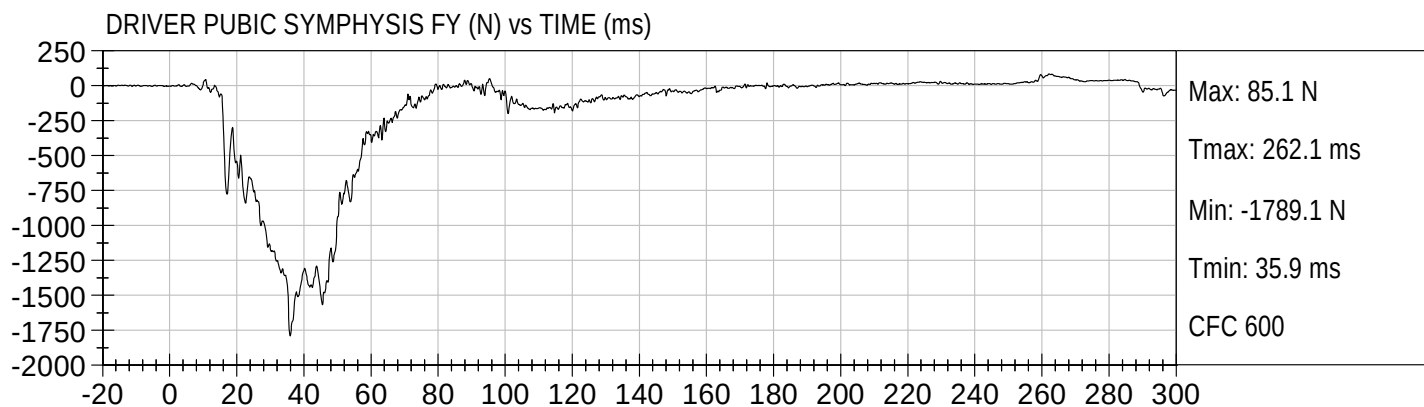
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)

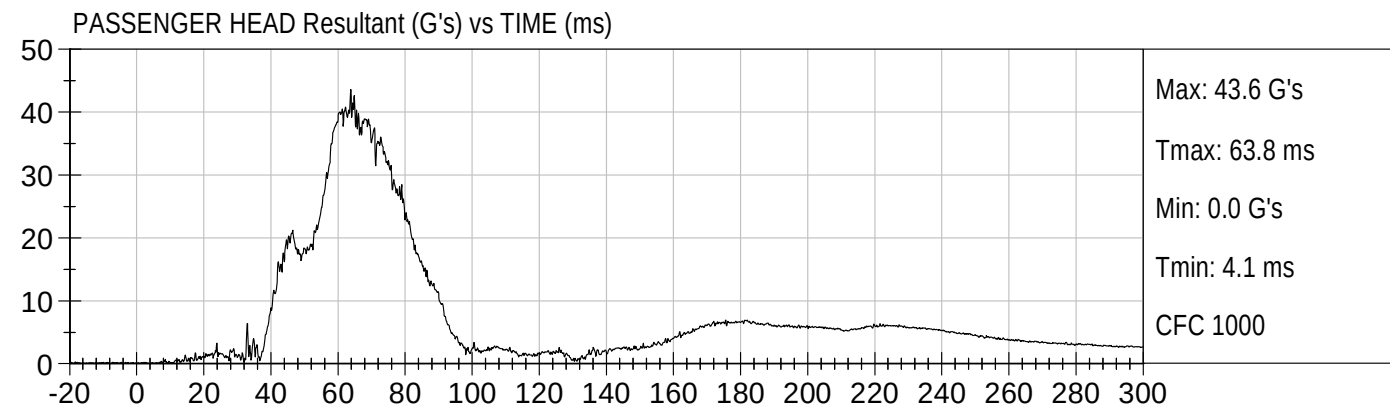
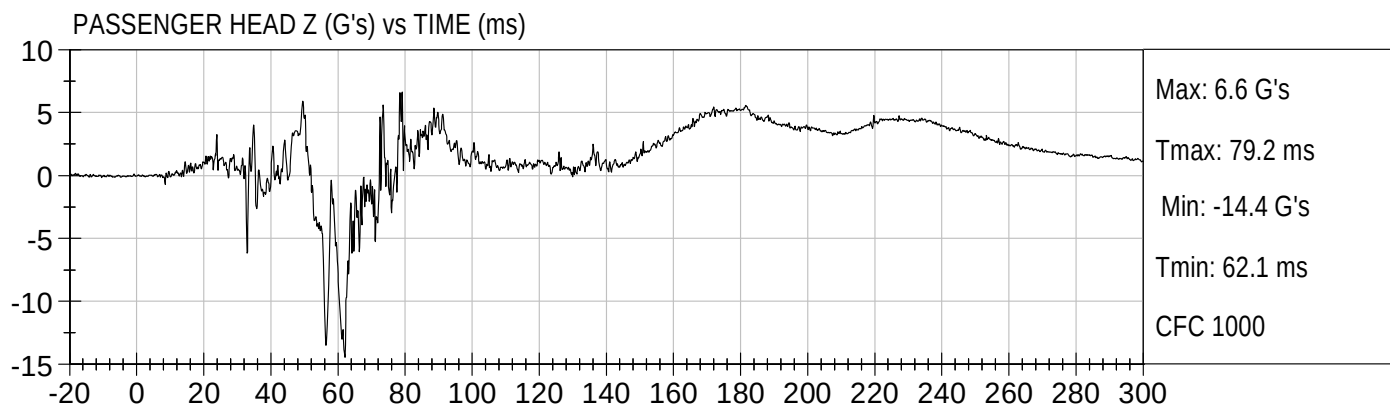
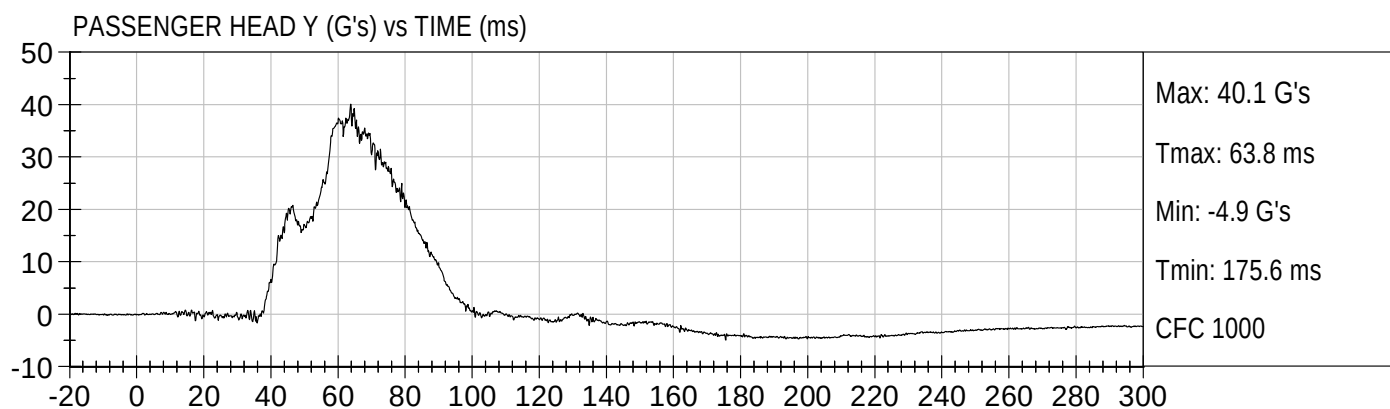
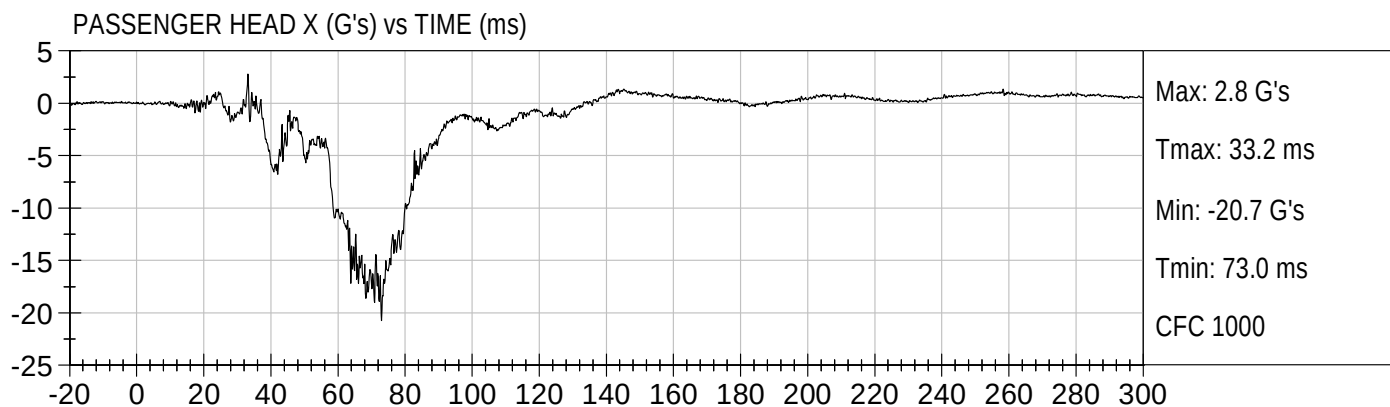


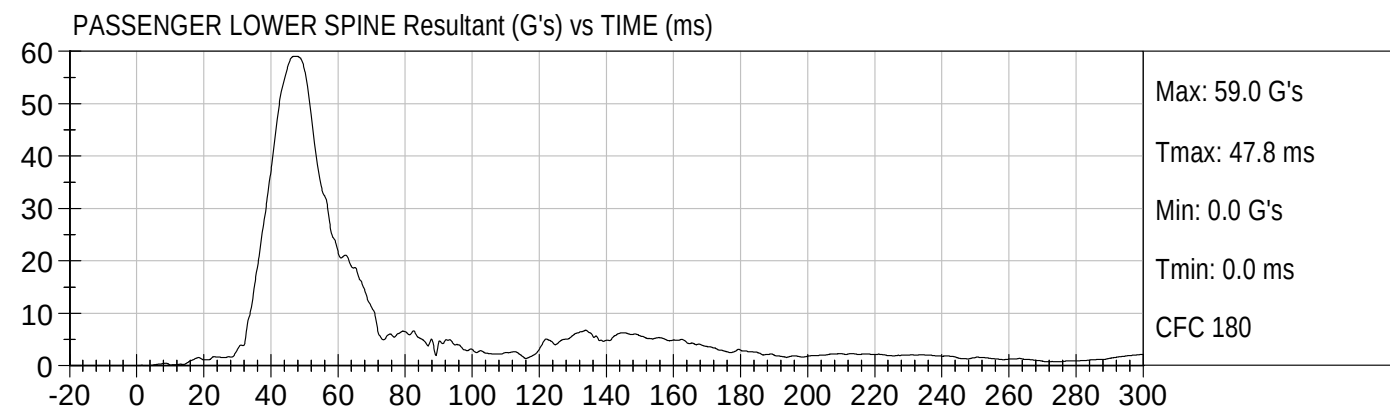
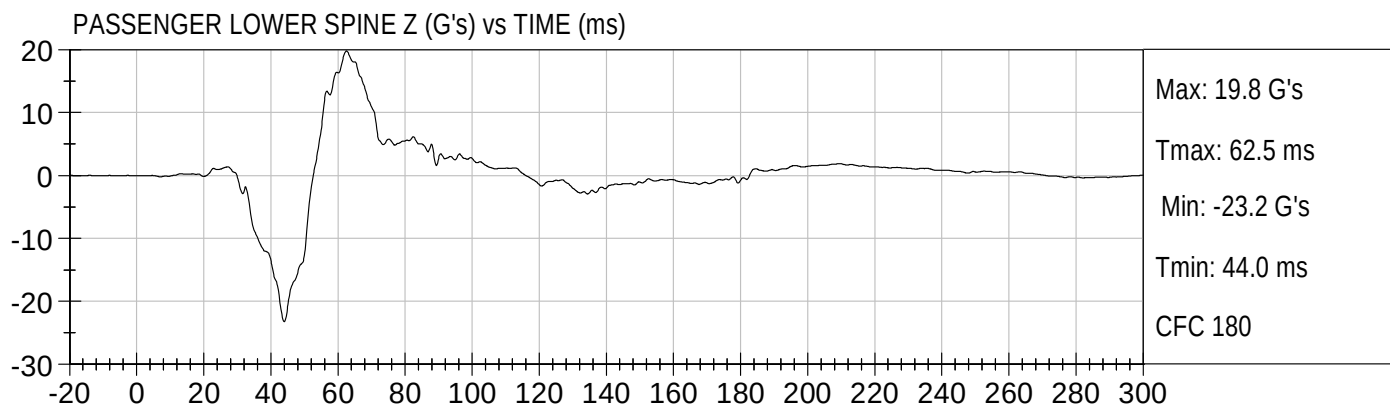
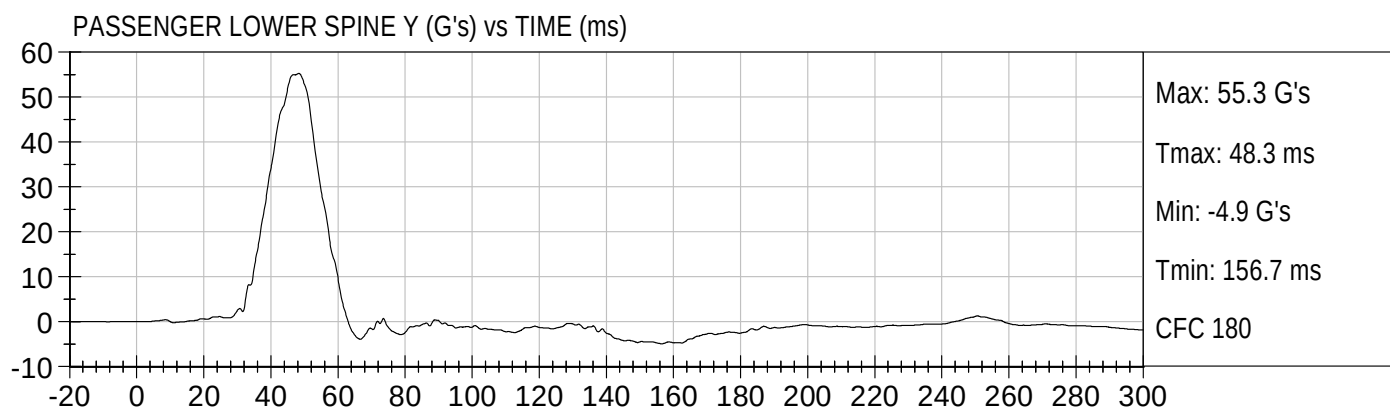
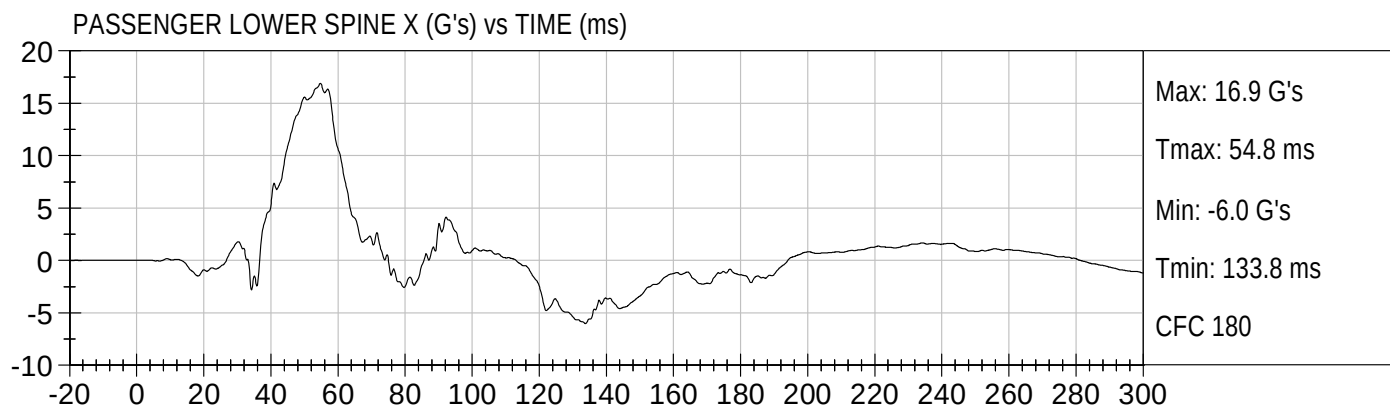


55/28 km/h 90° NCAP MDB Side Impact
2011 Kia Sorento - MB0504

Test Date: 07/23/2010
Speed: 38.5 mph (62.0 km/h)

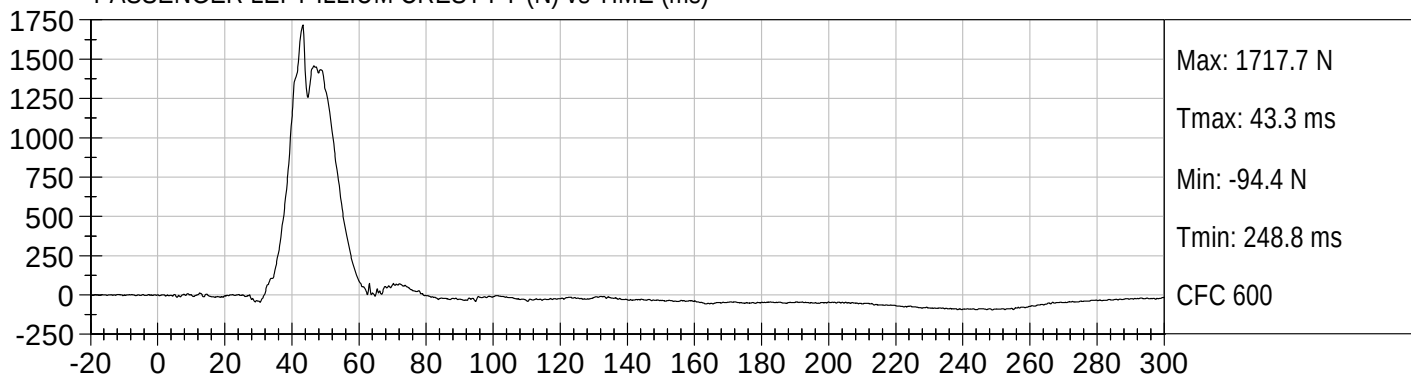




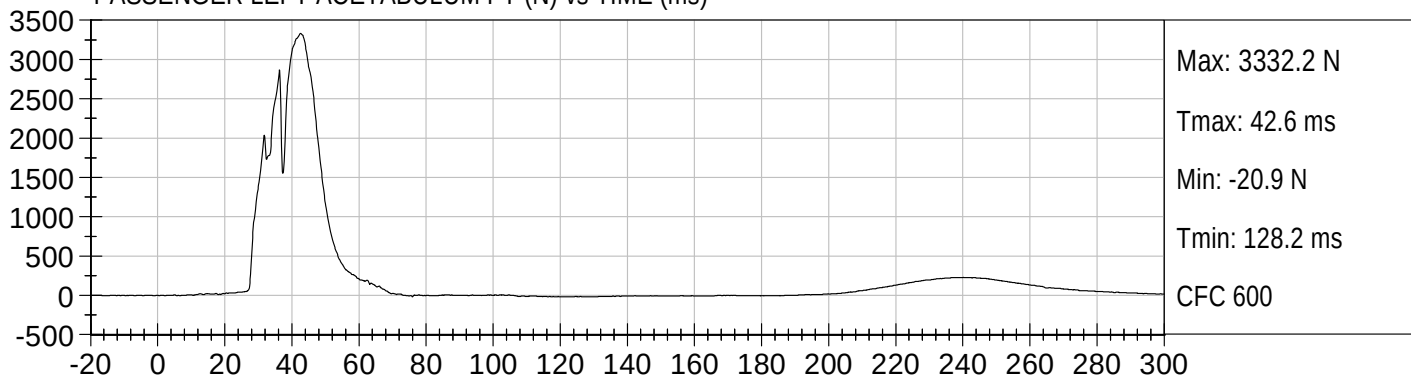




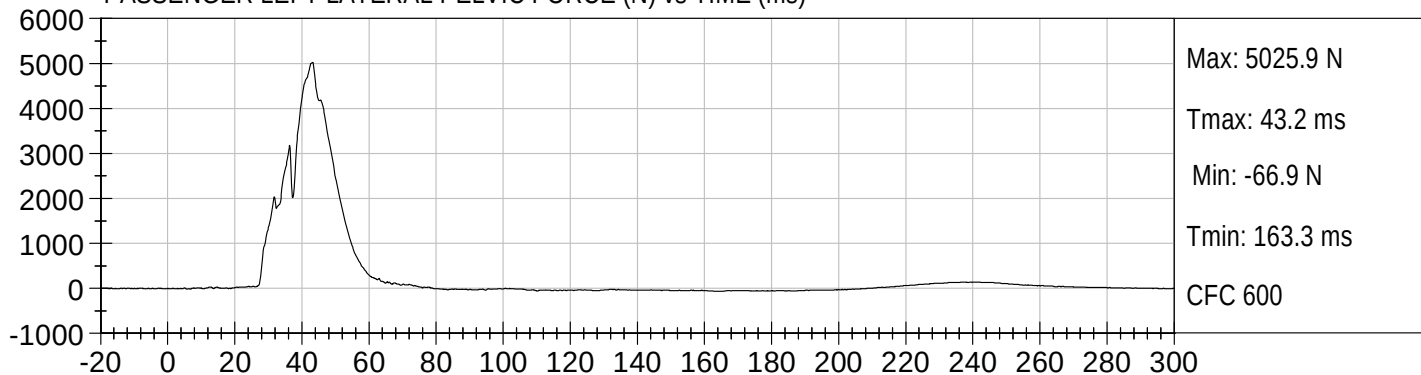
PASSENGER LEFT ILLIUM CREST FY (N) vs TIME (ms)



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



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



APPENDIX C

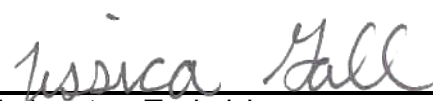
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D101771

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	125 to 155	151	Pass
Peak Lateral Acceleration	G's	+/- 15	5.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

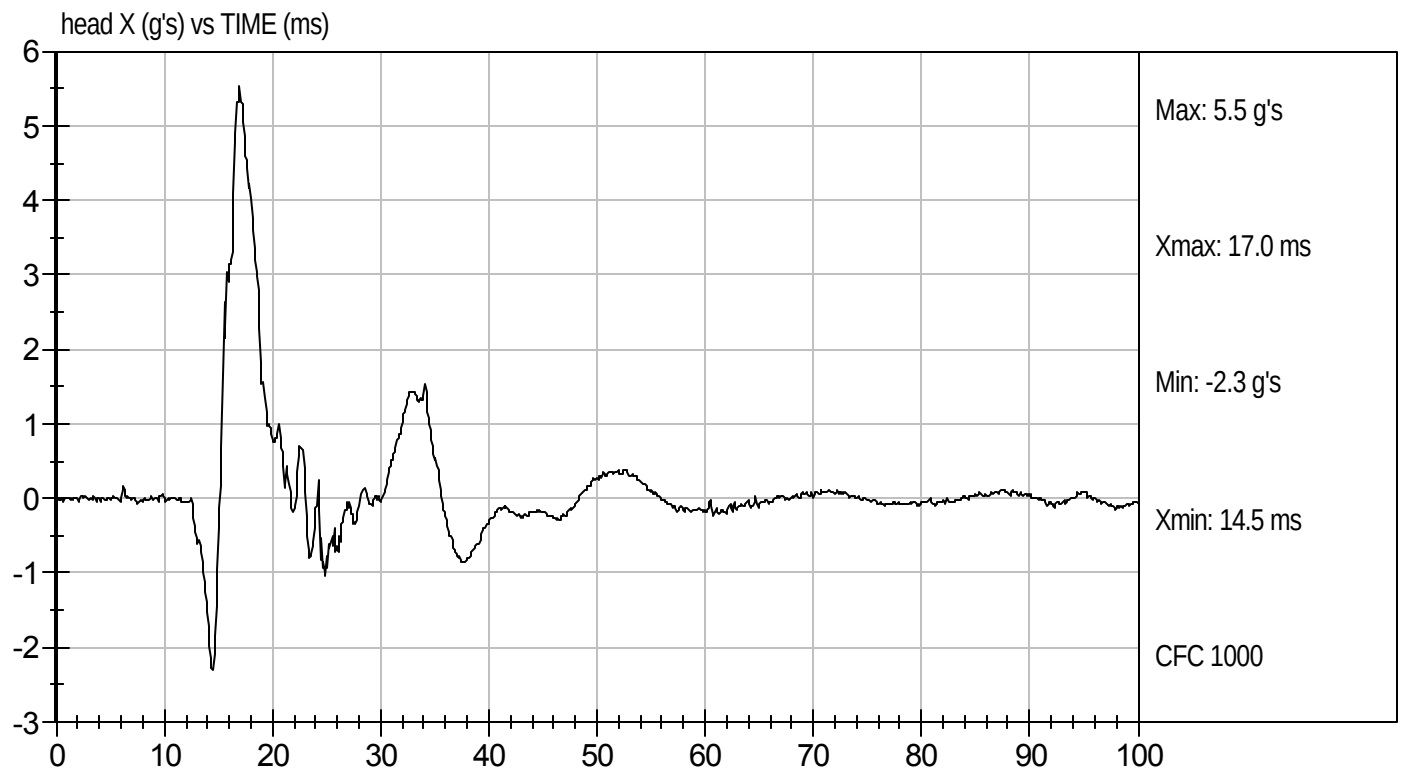
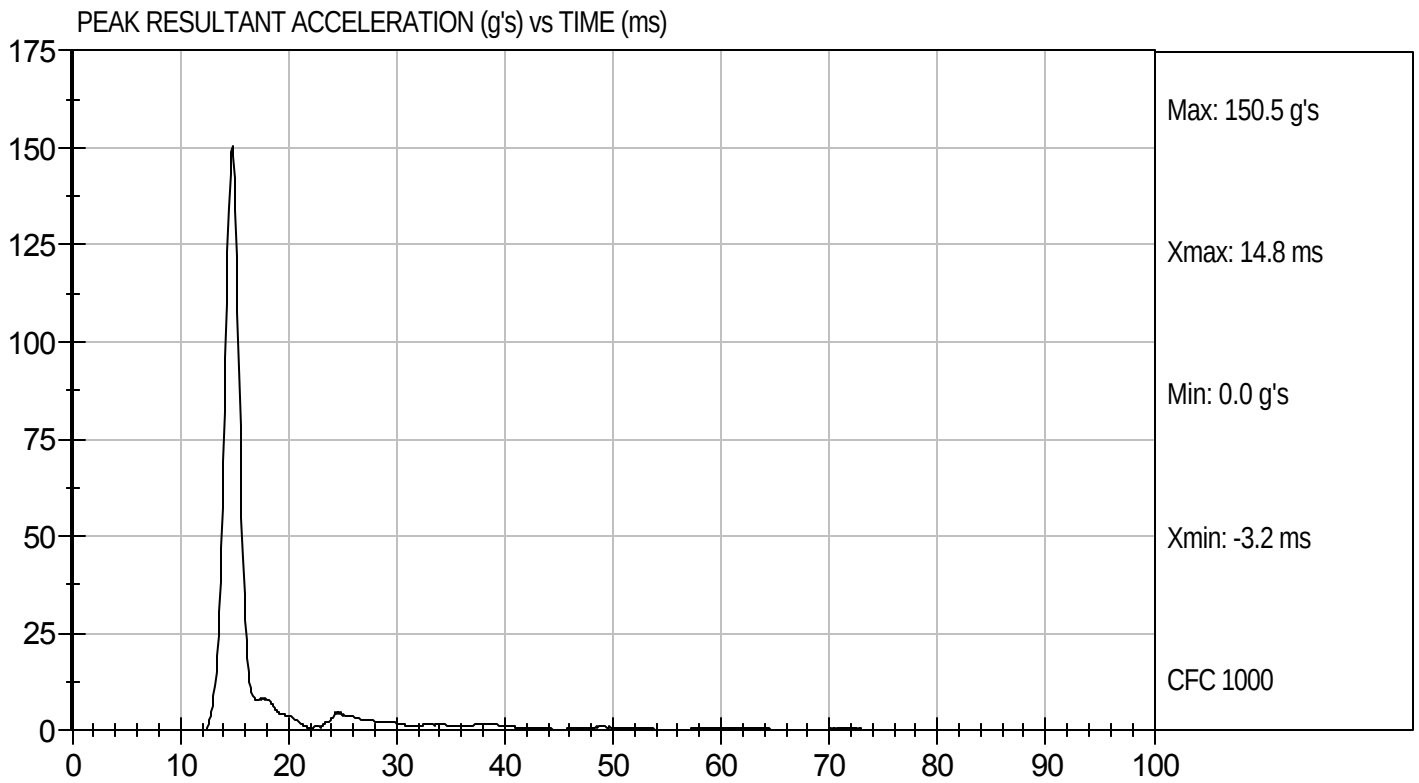
6/10/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D101771

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

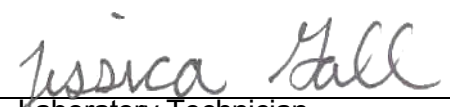


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101772

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.31	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.8	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	61.2	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	55.2	Pass
Overall Test Results					Pass


 Laboratory Technician

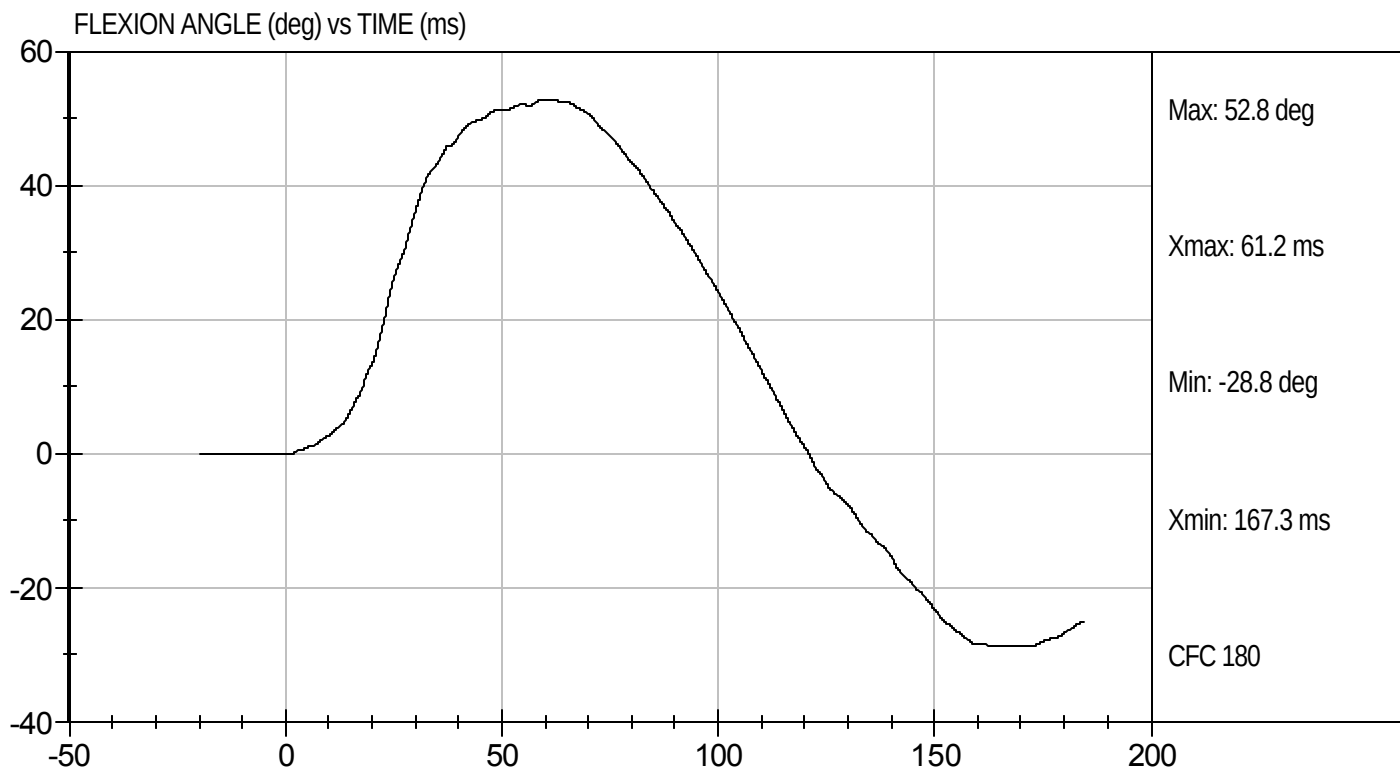
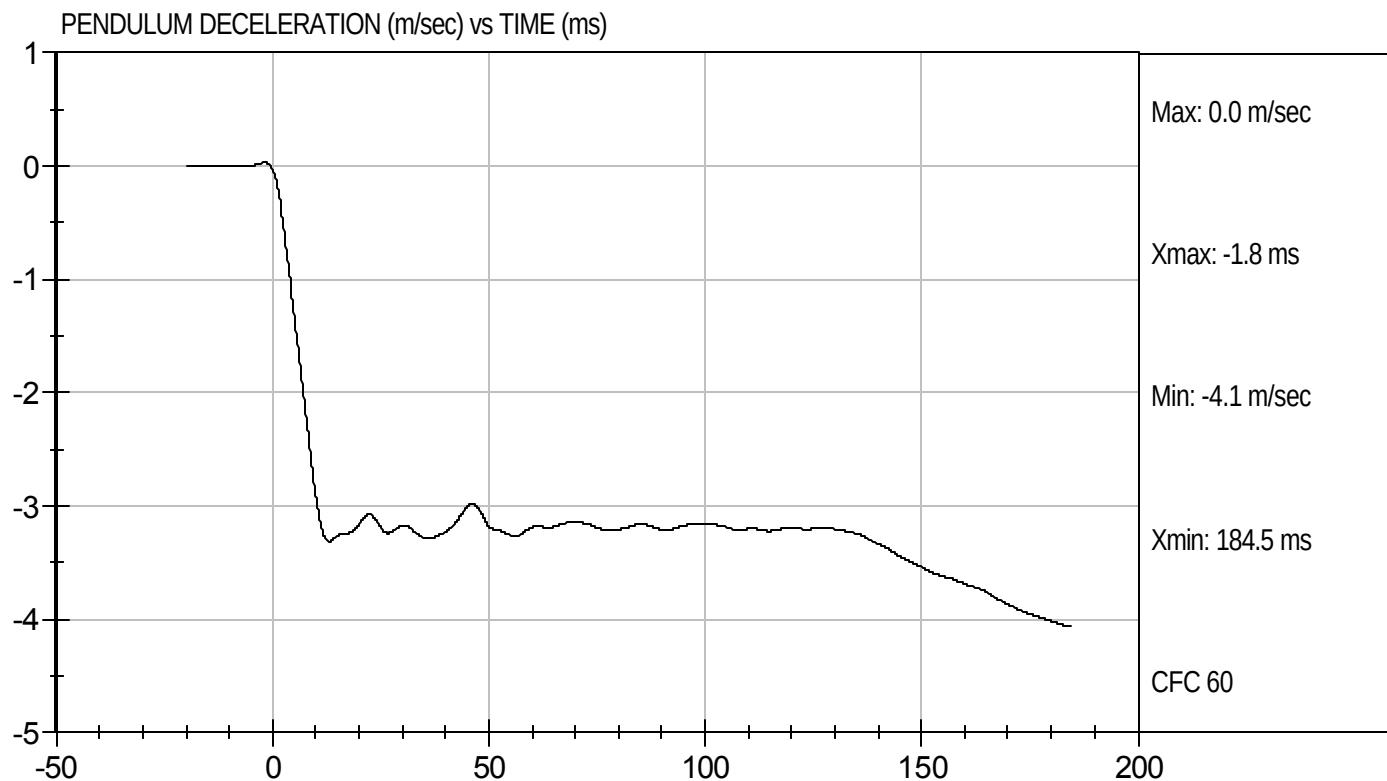
6/10/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D101772

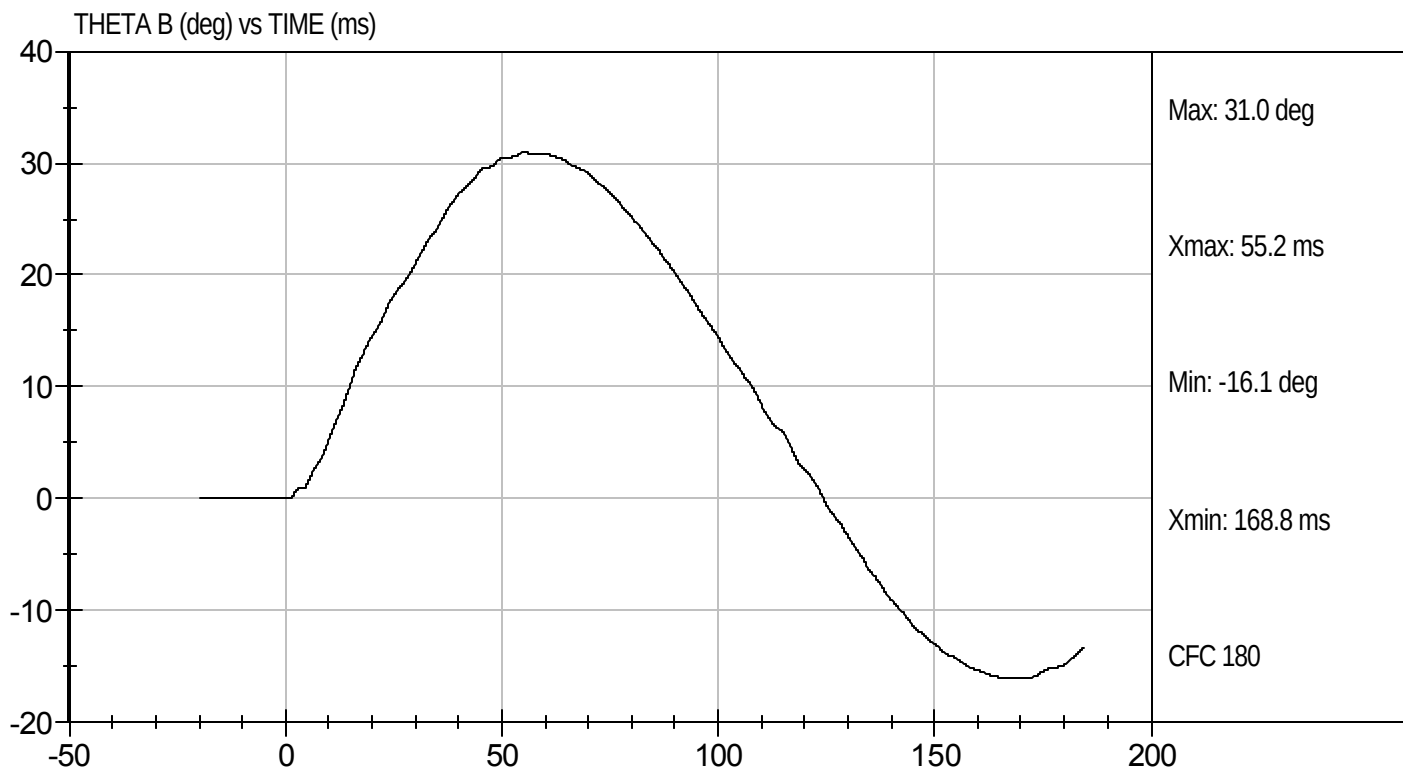
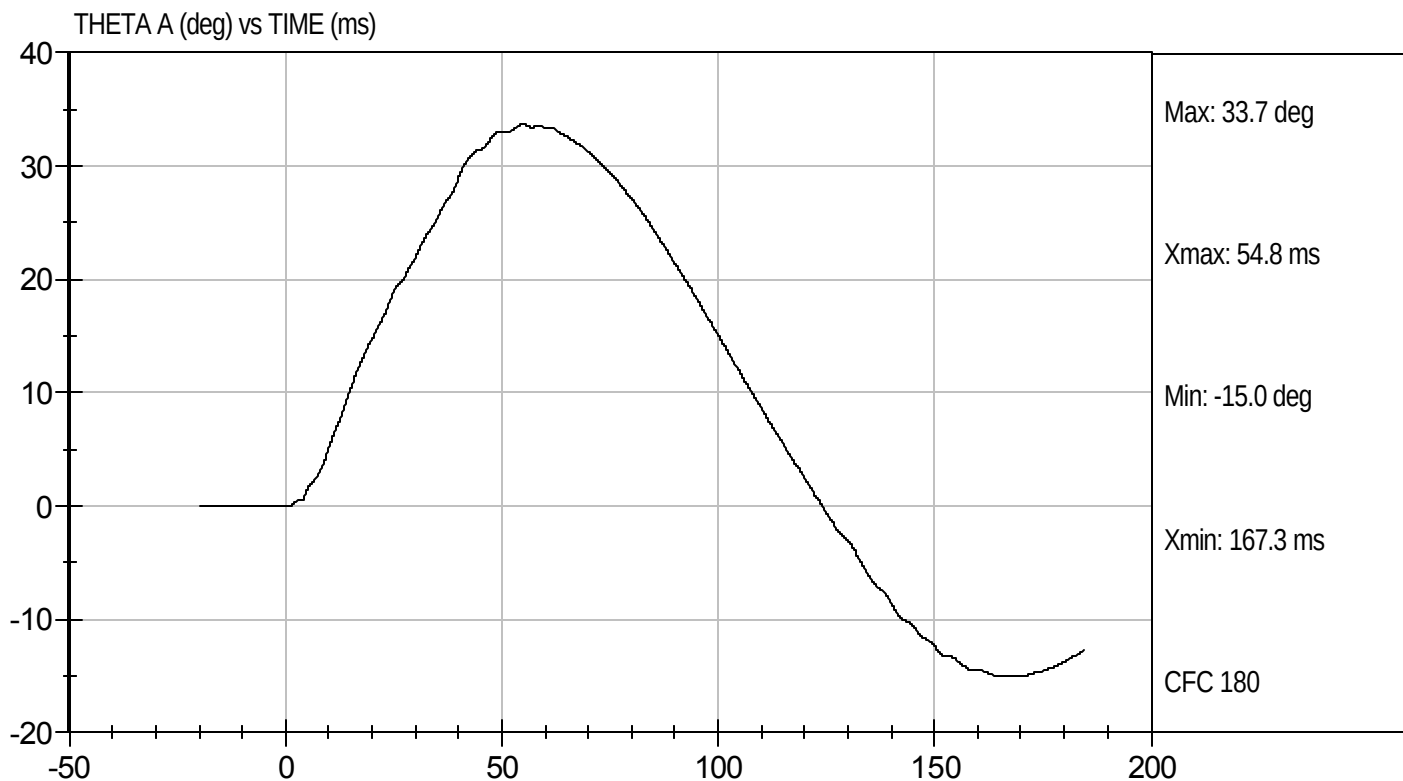
Test Date: 6/10/10
Velocity: 11.34 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D101772

Test Date: 6/10/10
Velocity: 11.34 ft/s, 3.5 m/s

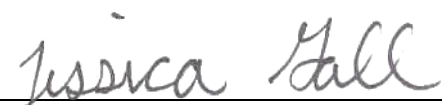


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101773

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	50	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.6	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.4	Pass
Overall Test Results			Pass	


Laboratory Technician

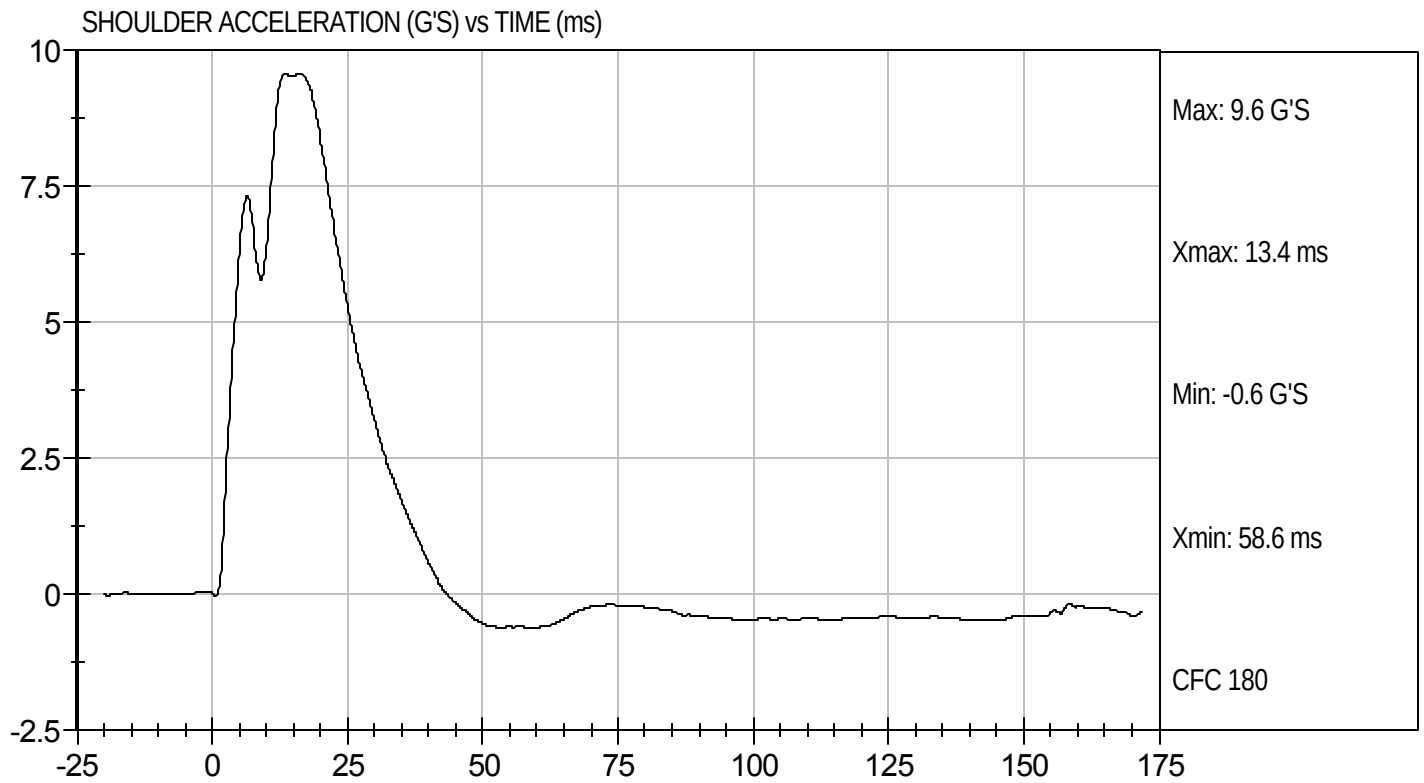
6/9/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D101773

Test Date: 6/9/10
Velocity: 14.25 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

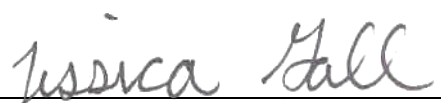
UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101774

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	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.5	Pass
Overall Test Results				Pass


Laboratory Technician

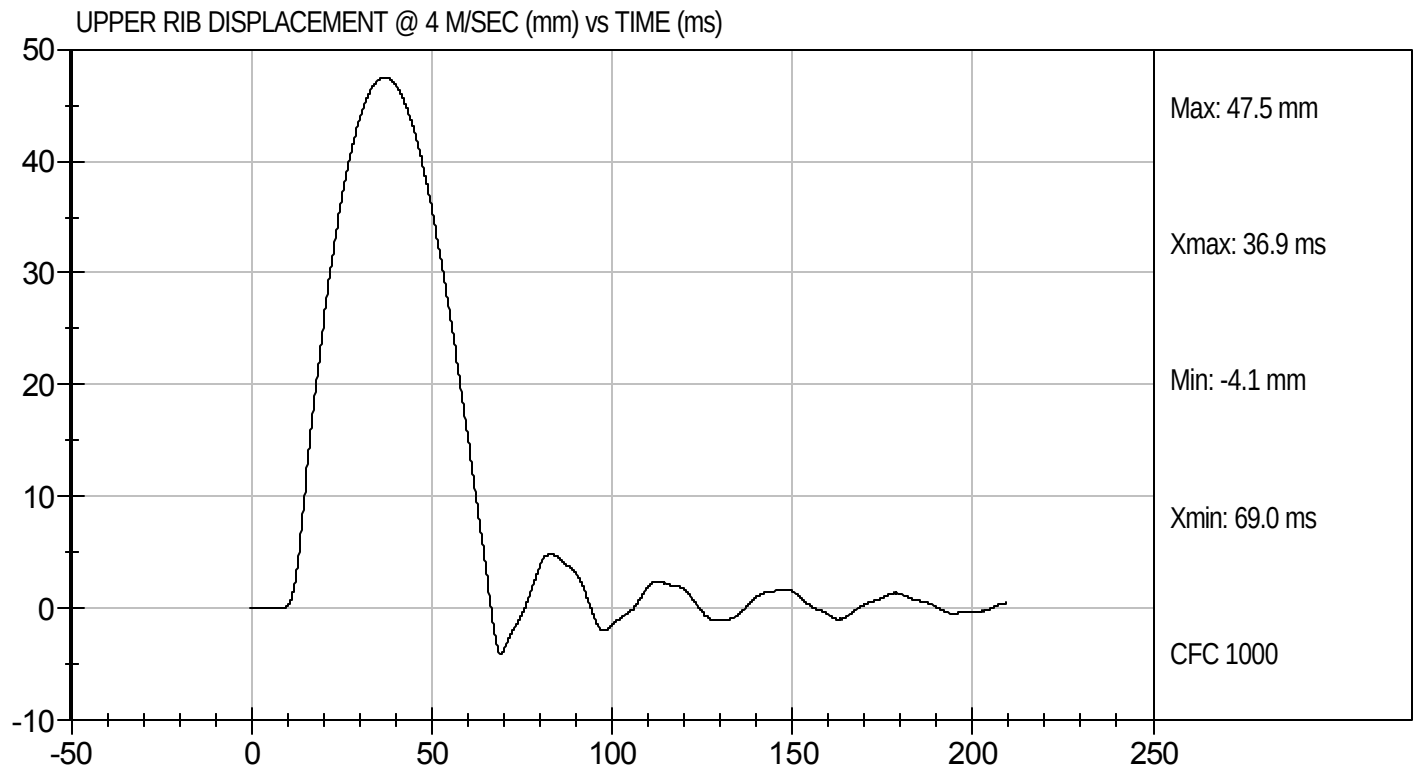
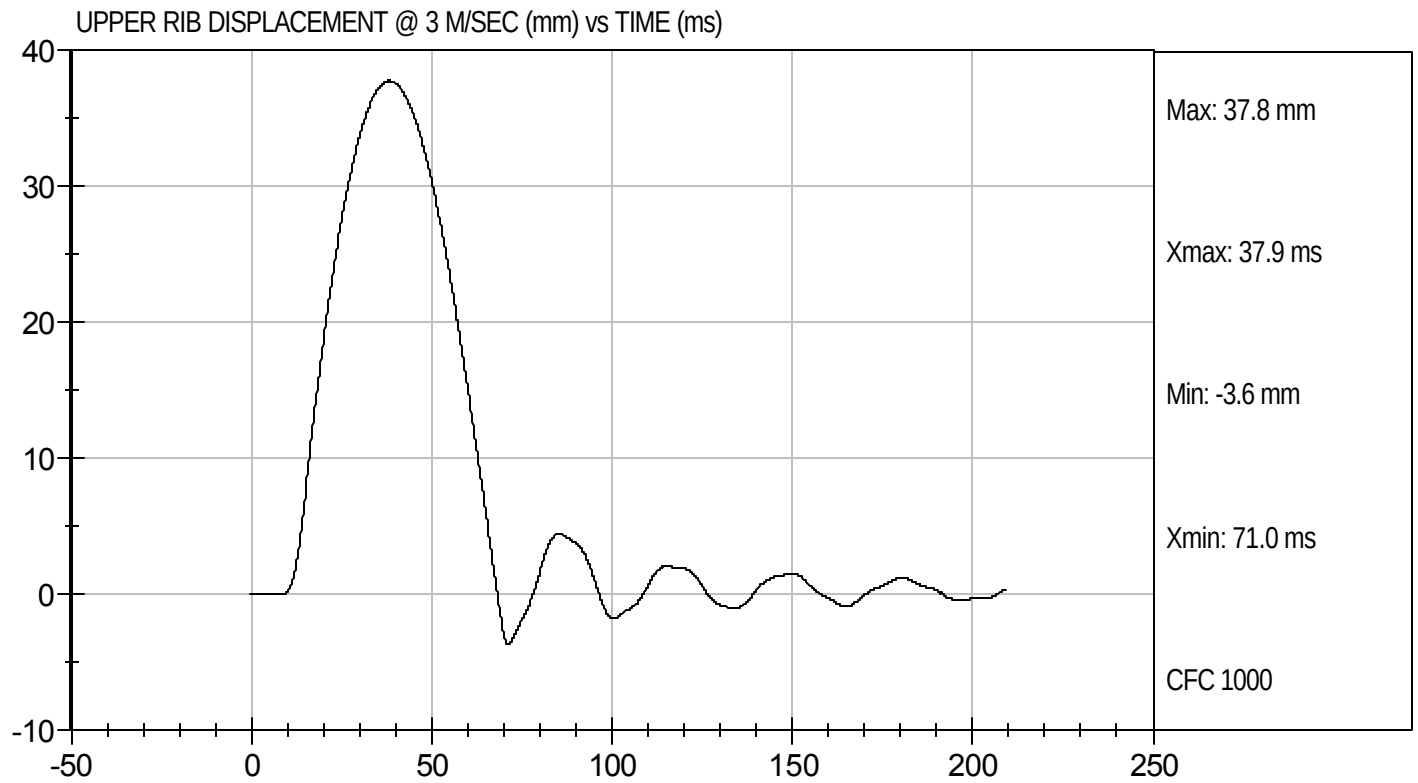
6/10/10
Test Date


Approved By



Test Desc: Rib Impact - Upper
Component ID: D101774

Test Date: 6/10/10



MGA RESEARCH CORPORATION

**MID RIB TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D101775

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	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.1	Pass
Overall Test Results				Pass


Laboratory Technician

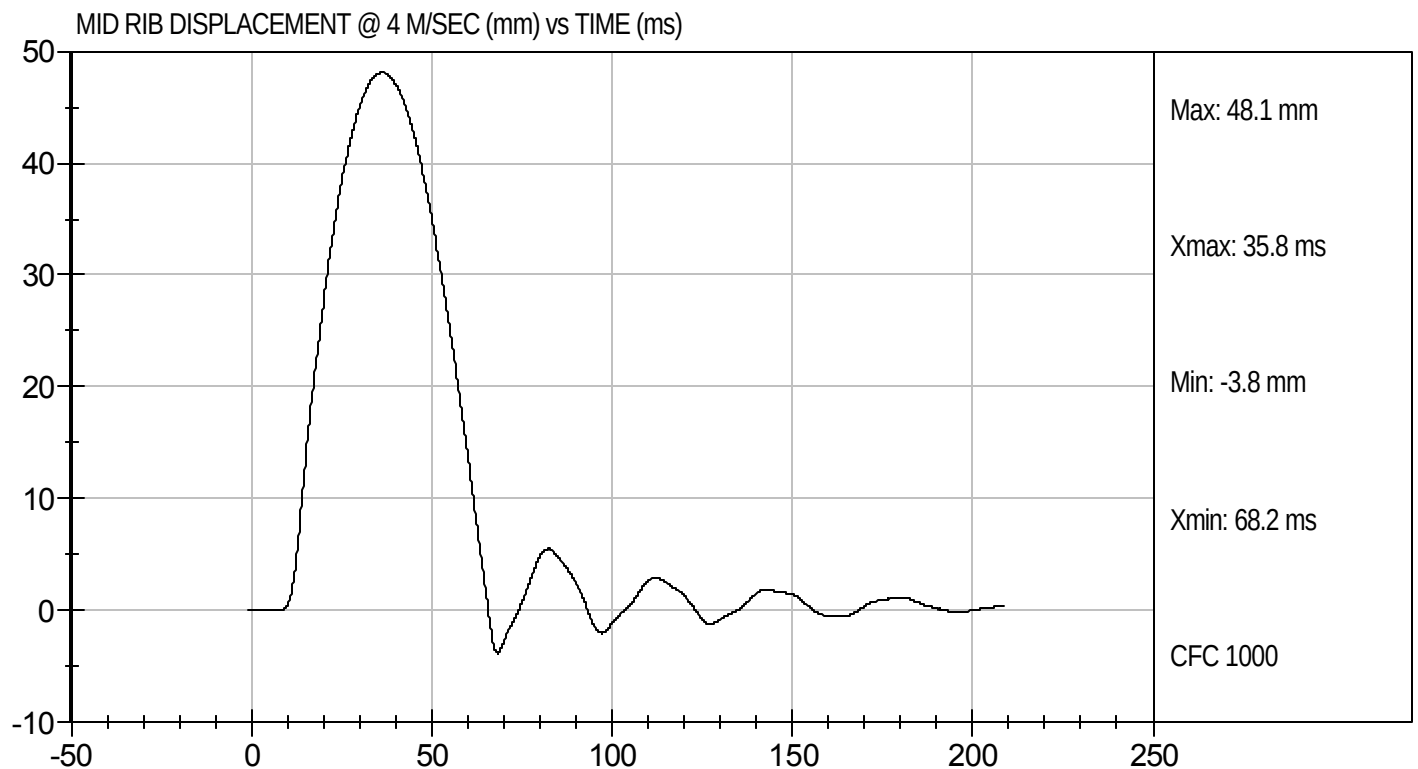
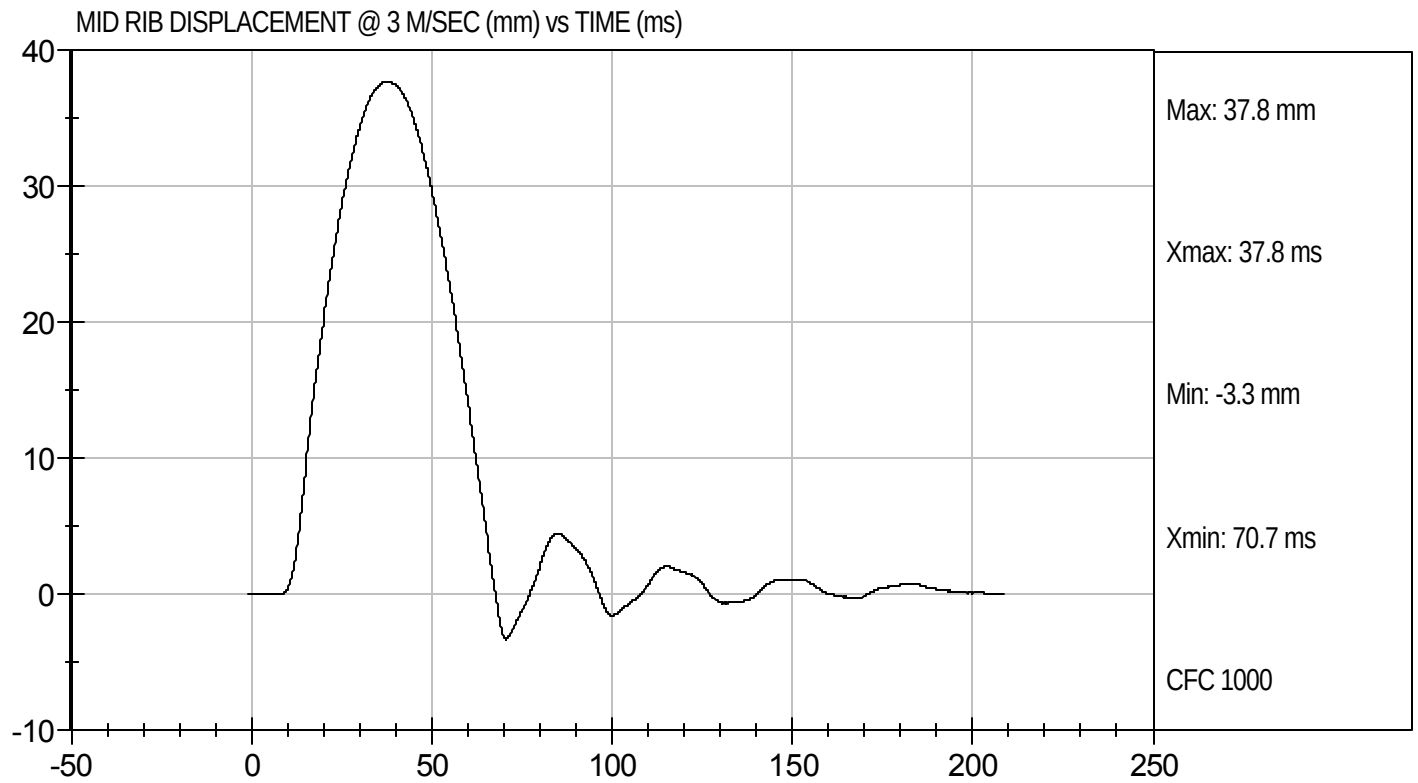
6/10/10
Test Date


Approved By



Test Desc: Rib Impact - Mid
Component ID: D101775

Test Date: 6/10/10



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101776

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	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.5	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

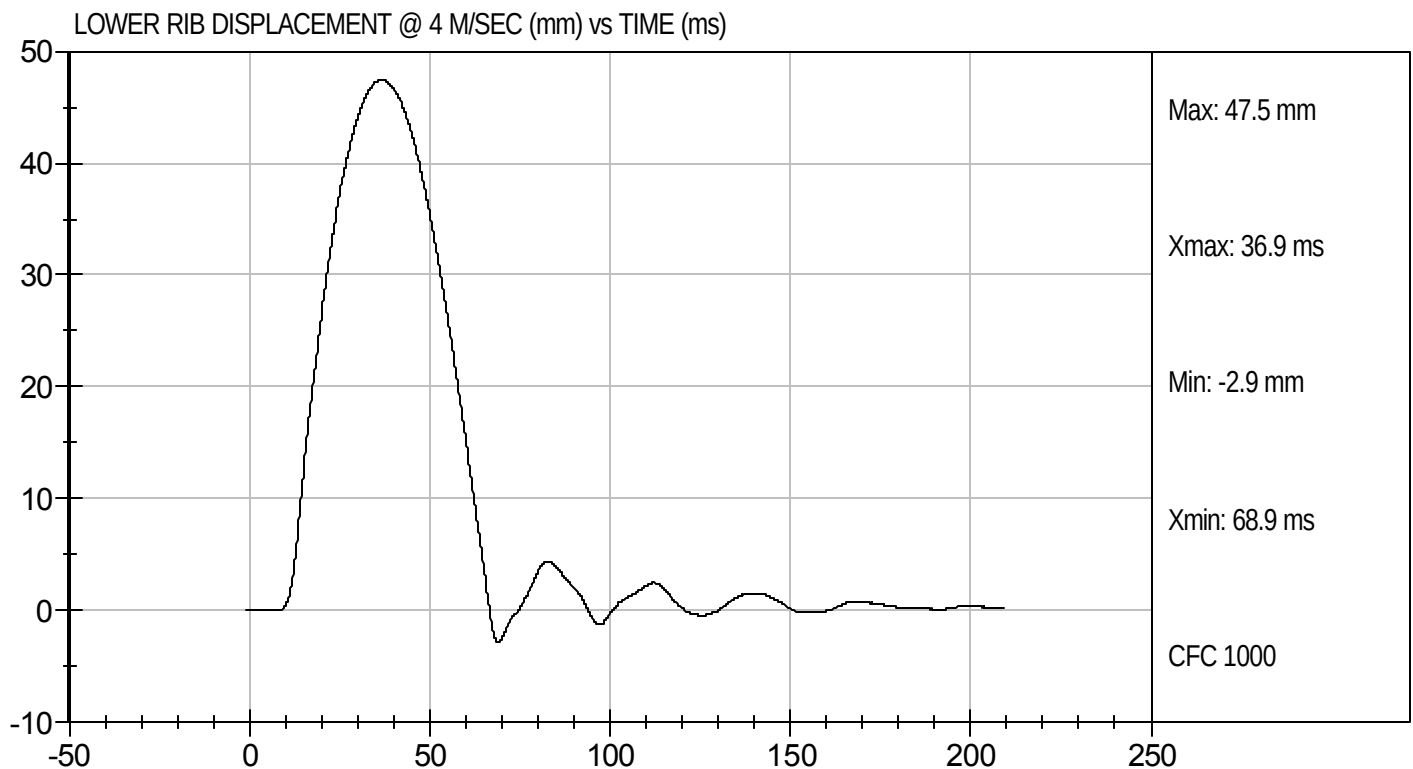
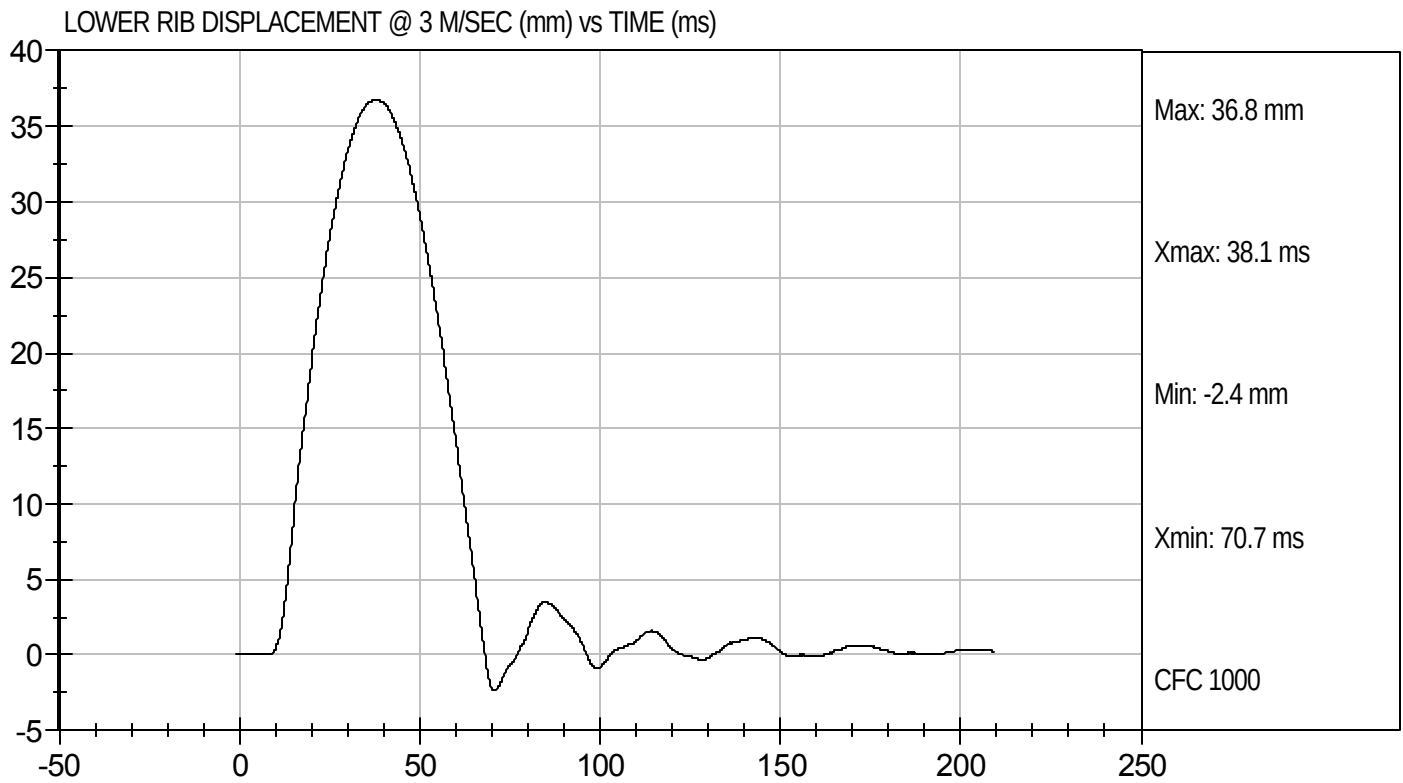
6/10/10
Test Date

David Winkelbauer
Approved By



Test Desc: Rib Impact - Lower
Component ID: D101776

Test Date: 6/10/10



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101777

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	50	Pass
Probe Speed	m/s	3.90 to 4.10	4.03	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.02	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.60	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.46	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	11.20	Pass
Overall Test Results			Pass	


 Laboratory Technician

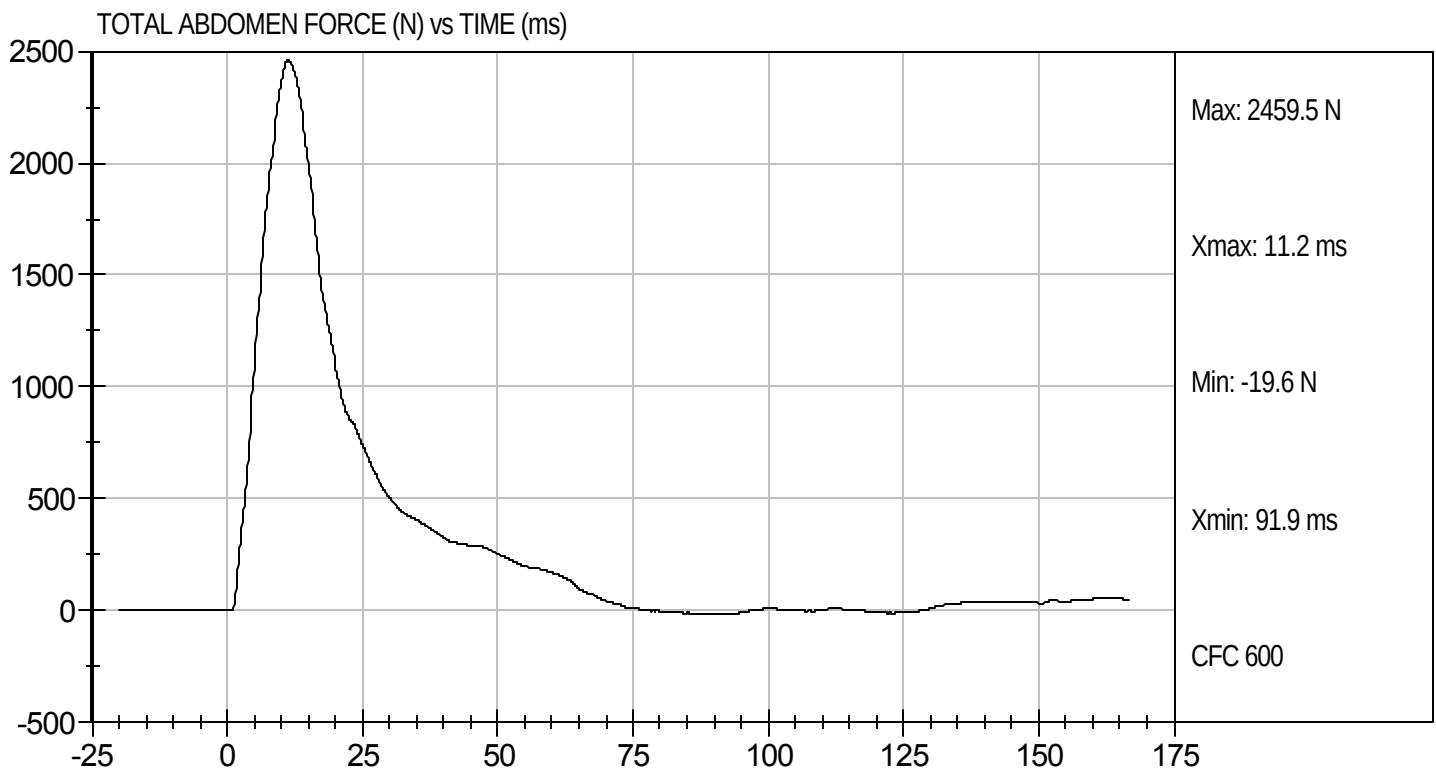
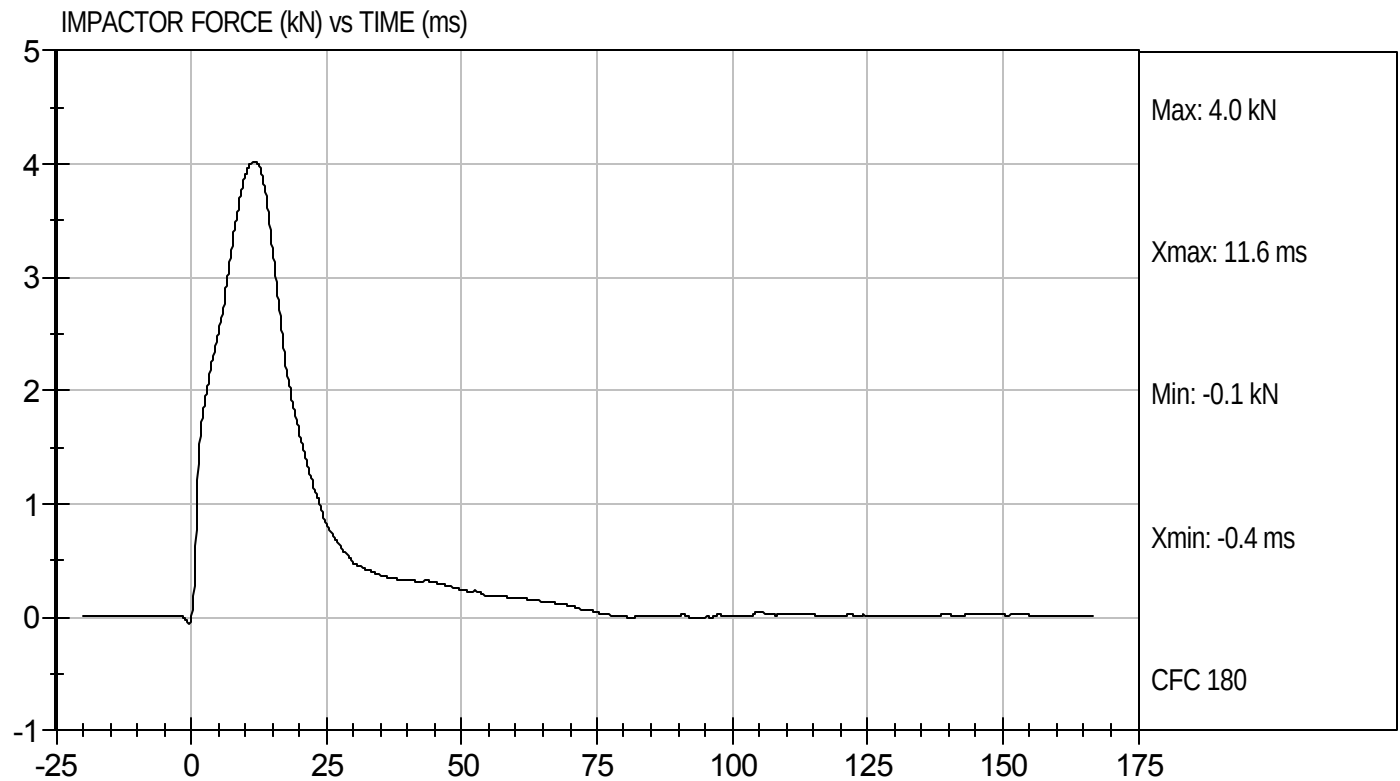
6/9/10
 Test Date


 Approved By



Test Desc: Abdomen Impact
Component ID: D101777

Test Date: 6/9/10
Velocity: 13.23 ft/s, 4.03 m/s

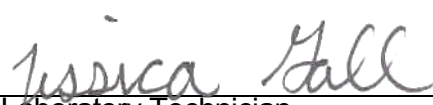


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101778

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.41	Pass
	27 ms	m/s	-6.50 to -5.80	-5.89	Pass
	30 ms	m/s	>= -6.5	-5.78	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.9	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	45.1	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	44	Pass
Overall Results				Pass	


 Laboratory Technician

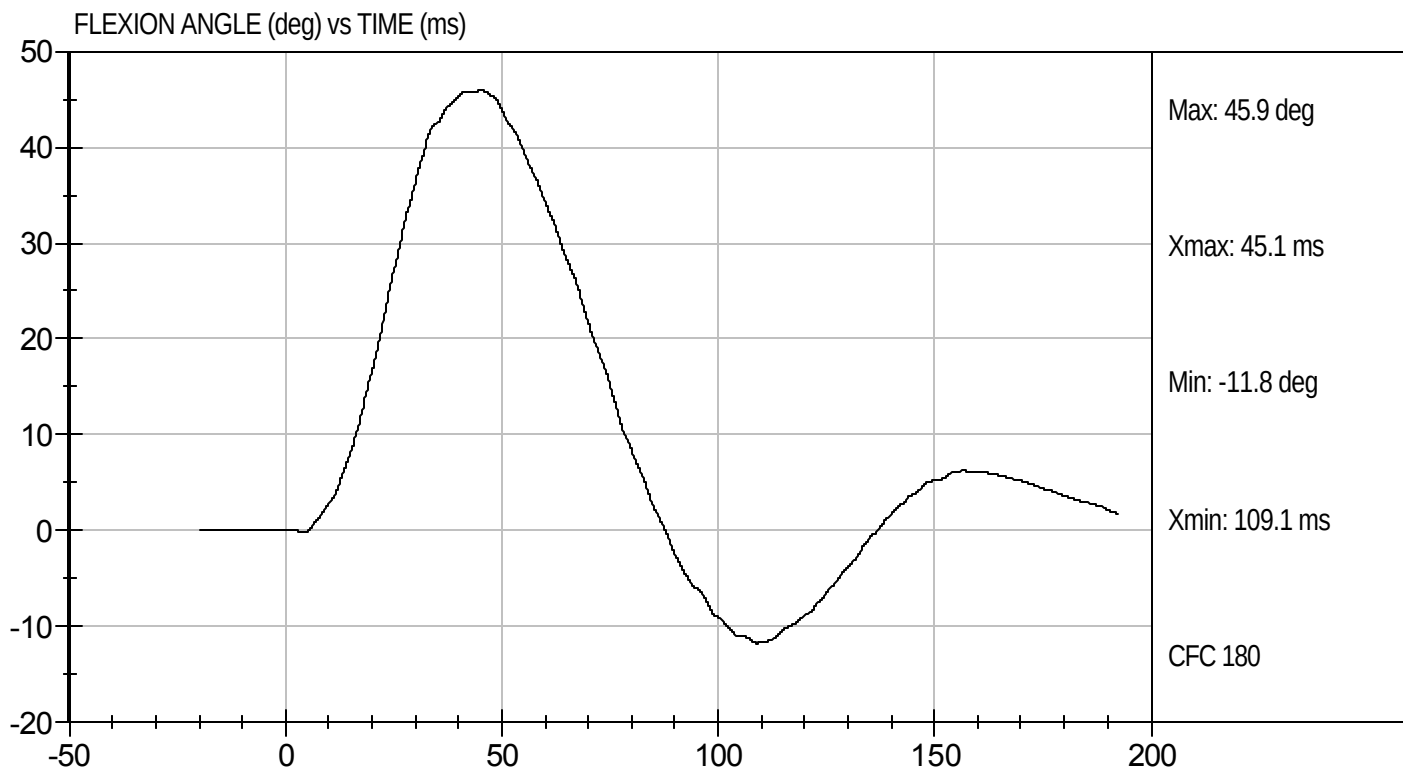
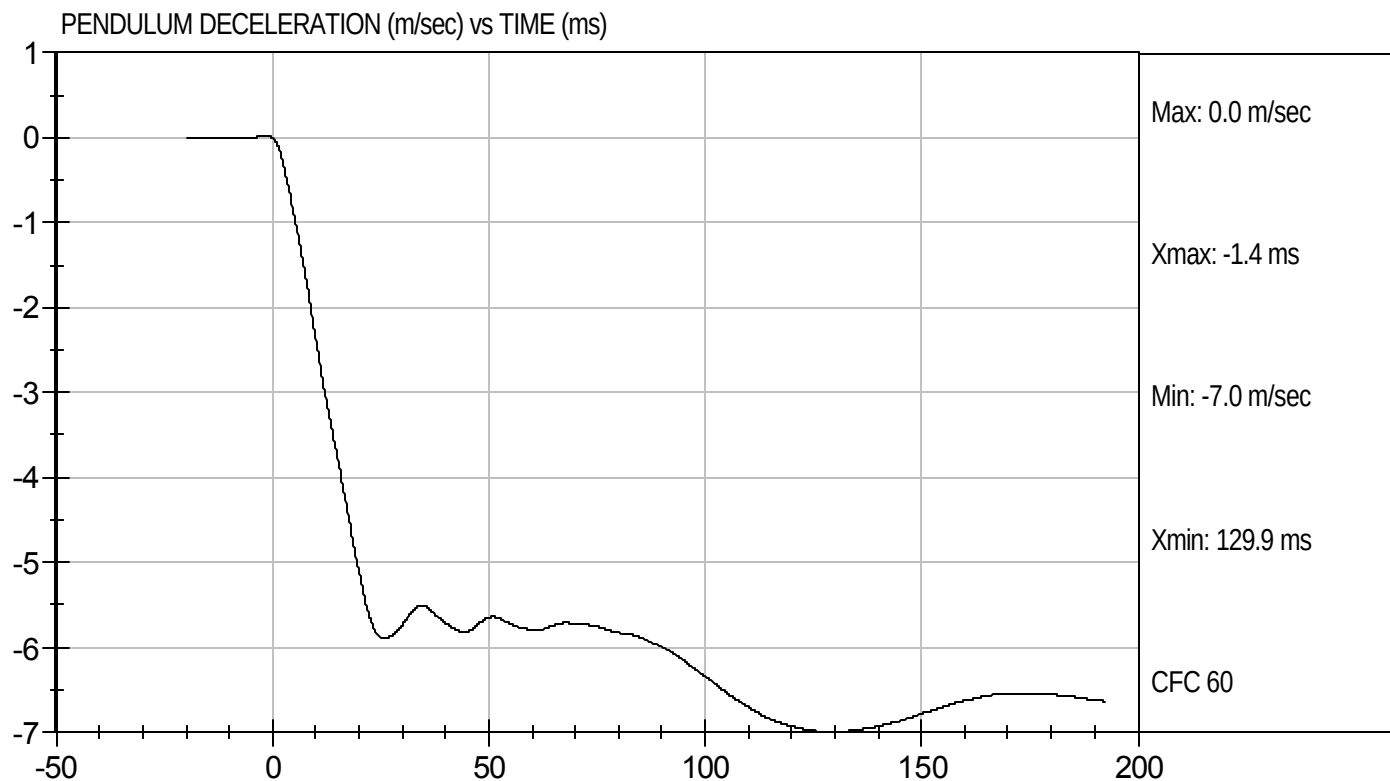
6/10/10
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D101778

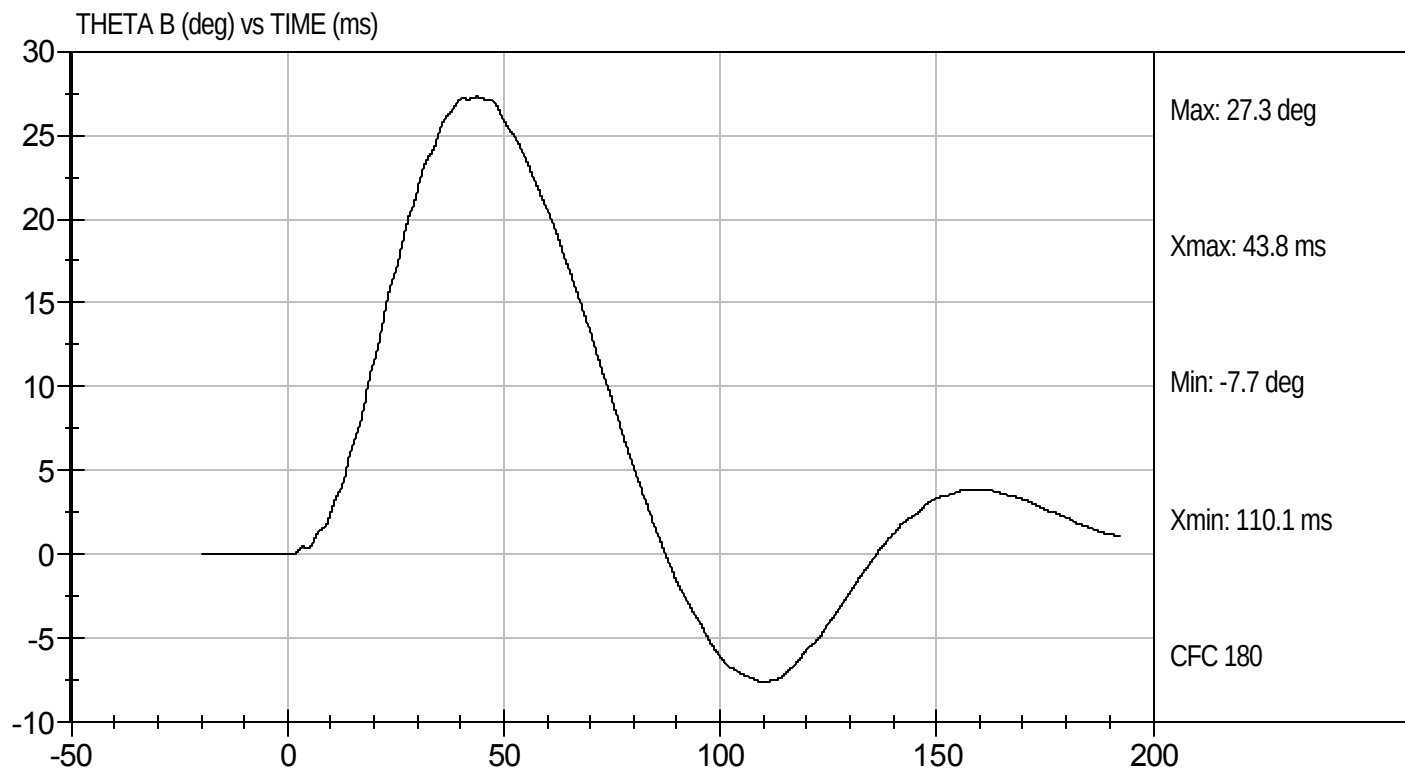
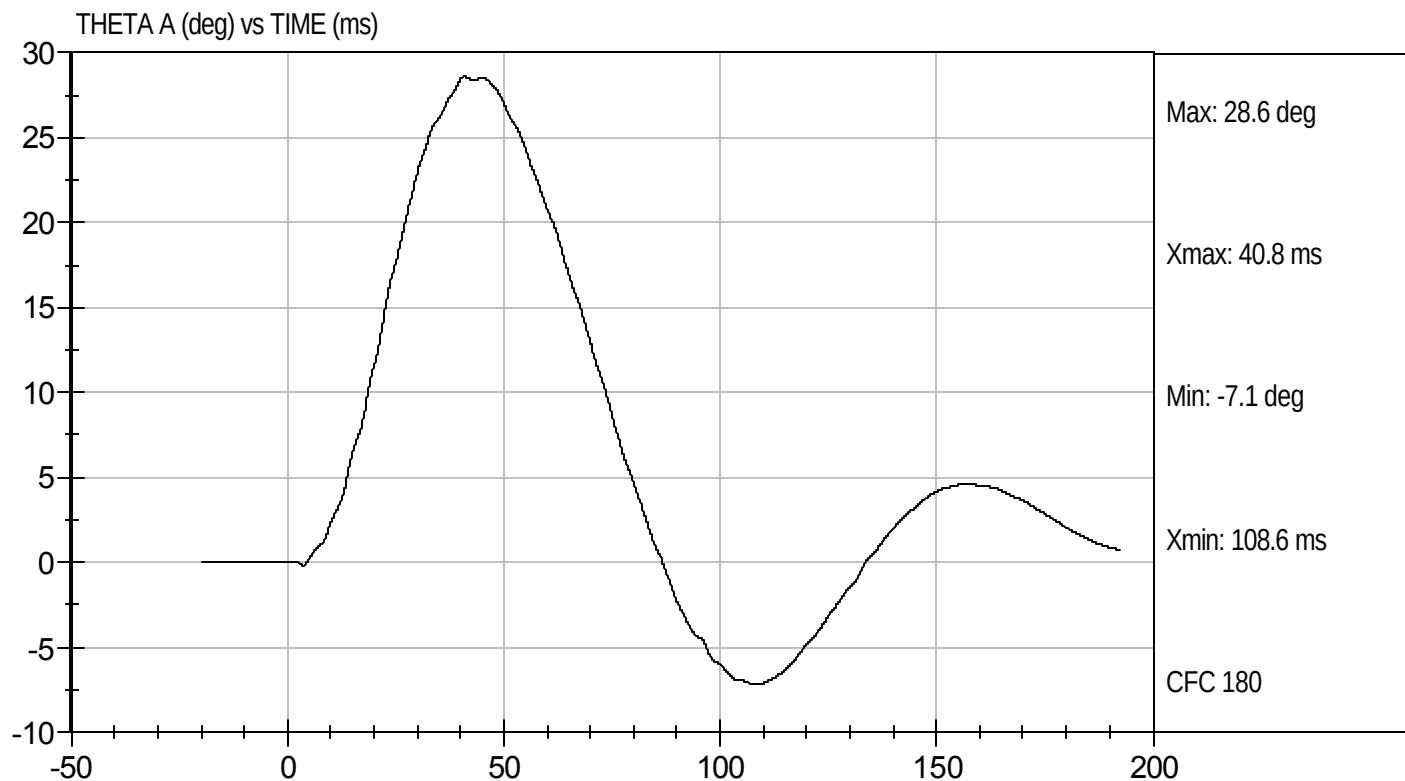
Test Date: 6/10/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D101778

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



MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 032

Test I.D: D101779

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	50	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.80	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.80	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.52	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	14.30	Pass
Overall Test Results				Pass


Laboratory Technician

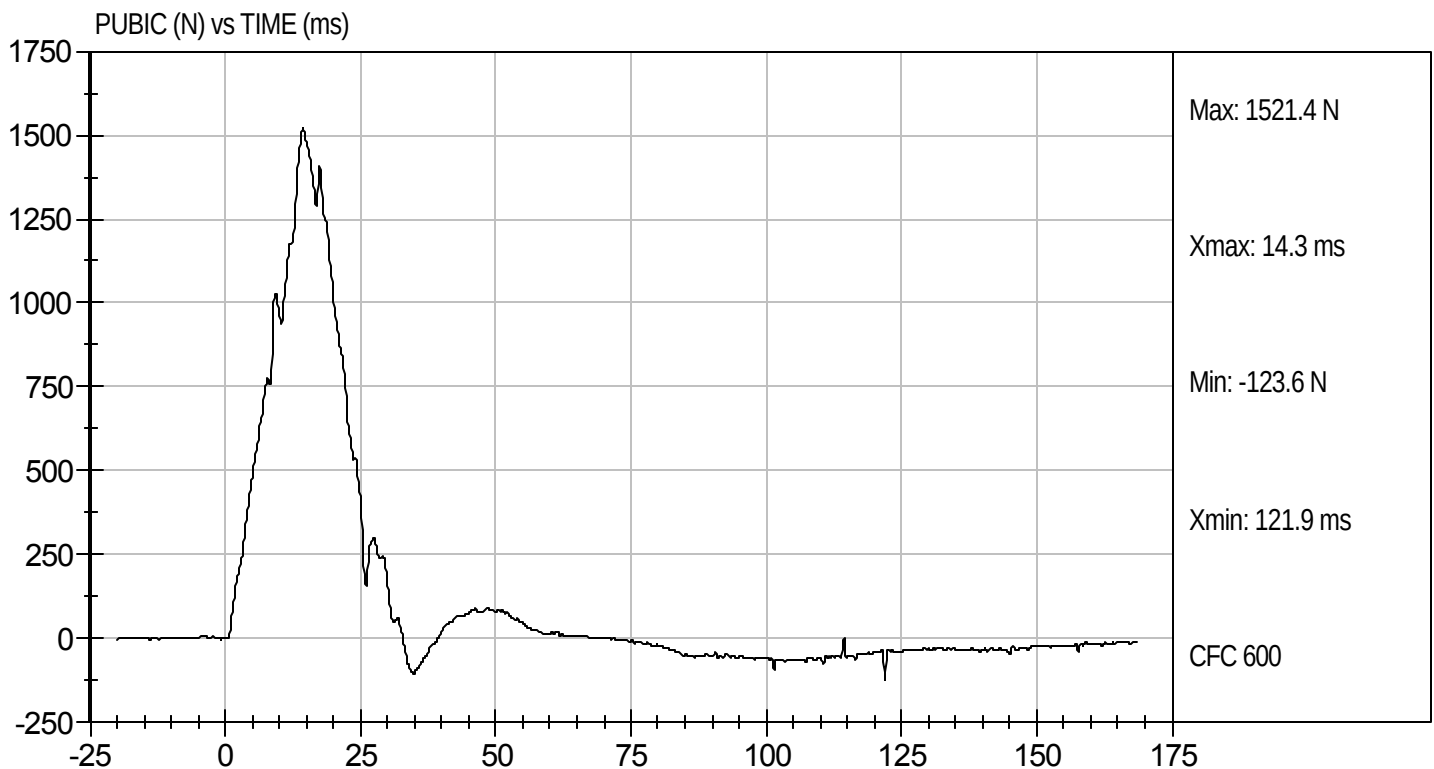
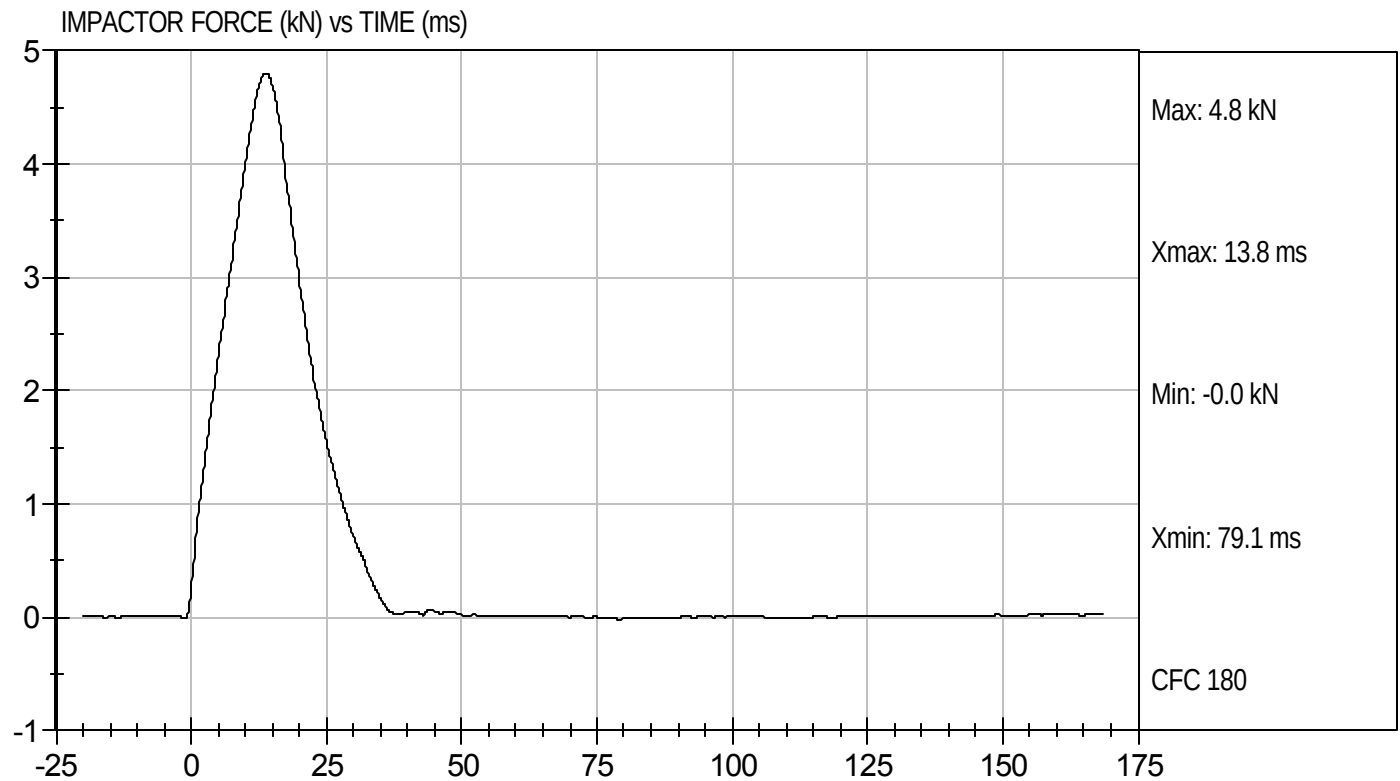
6/9/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D101779

Test Date: 6/9/10
Velocity: 14.12 ft/s, 6.68 m/s



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

ATD Serial No: 032

Test I.D: D101770

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	49	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	5.20	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

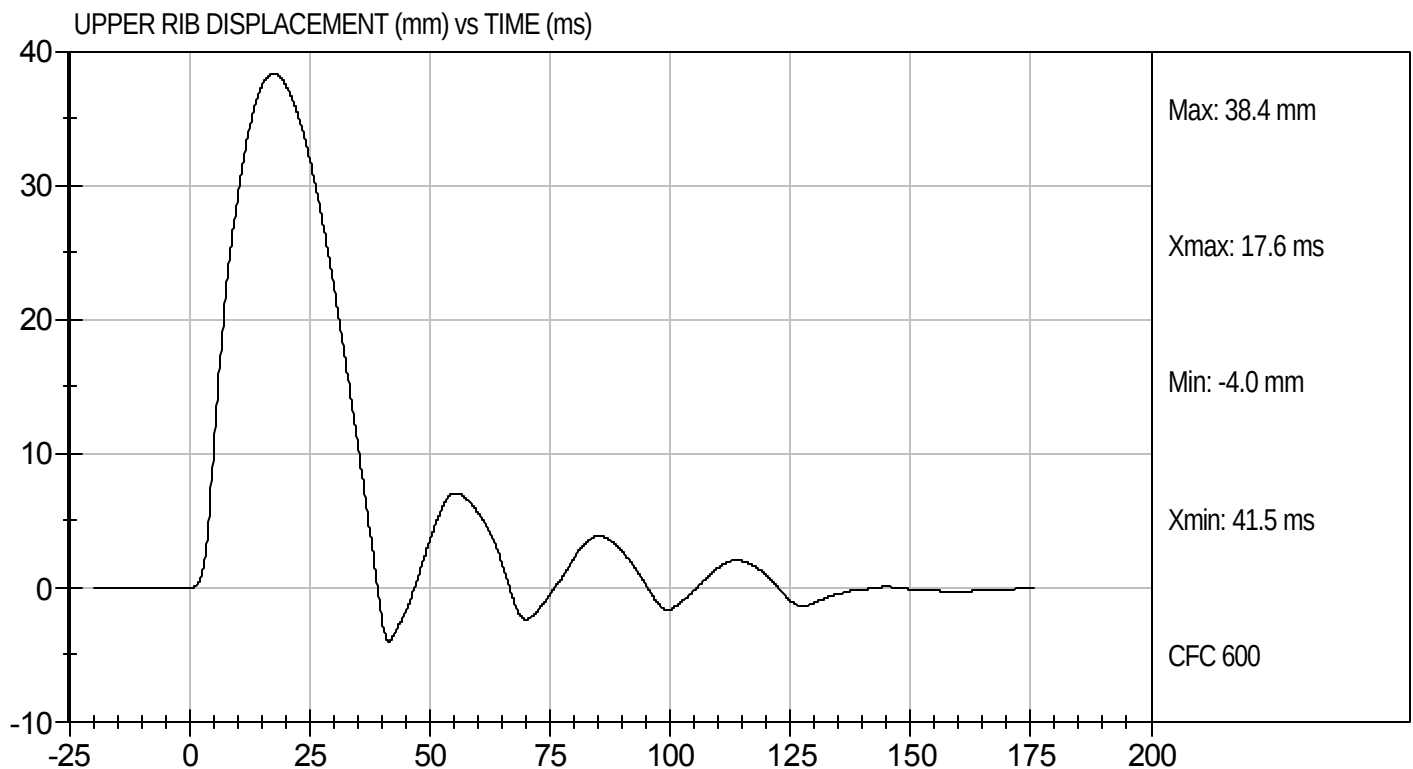
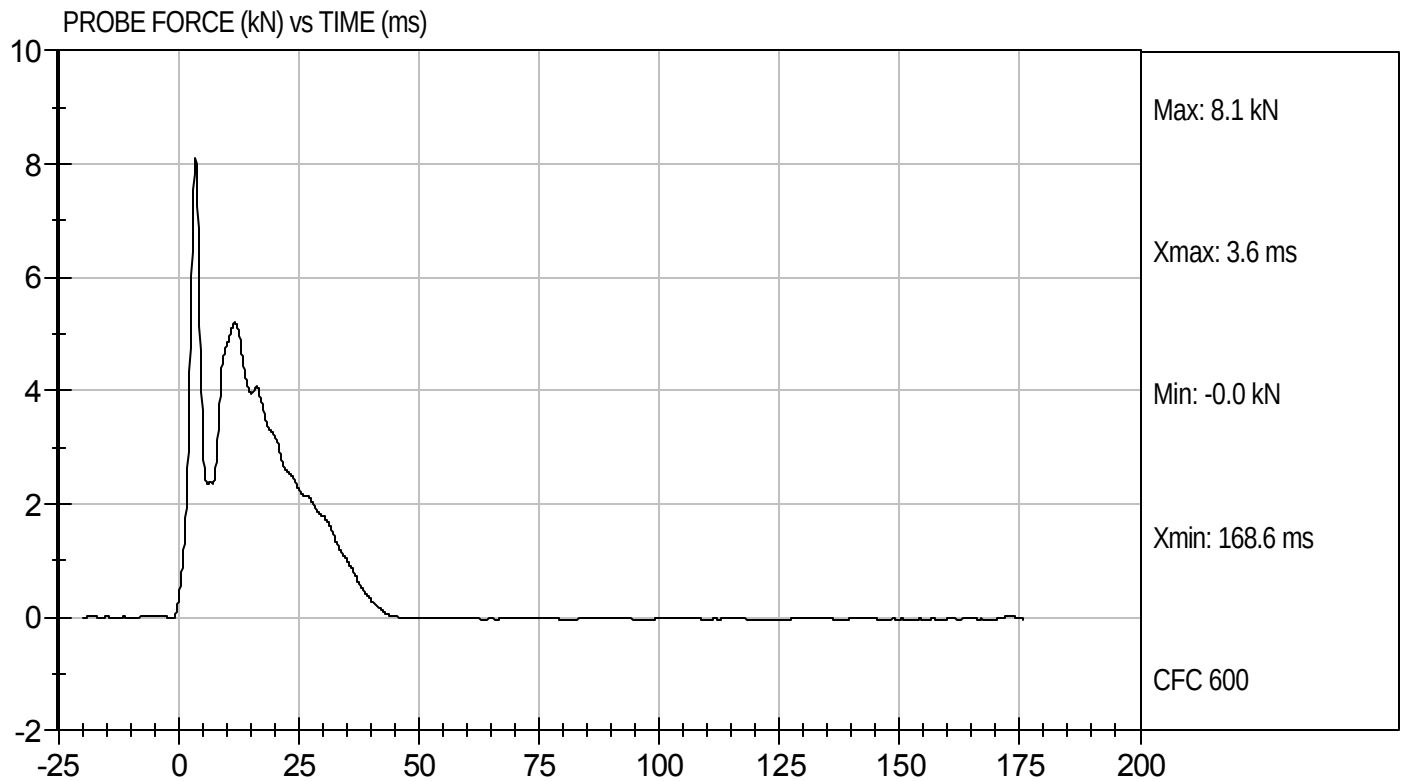
6/9/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D101770

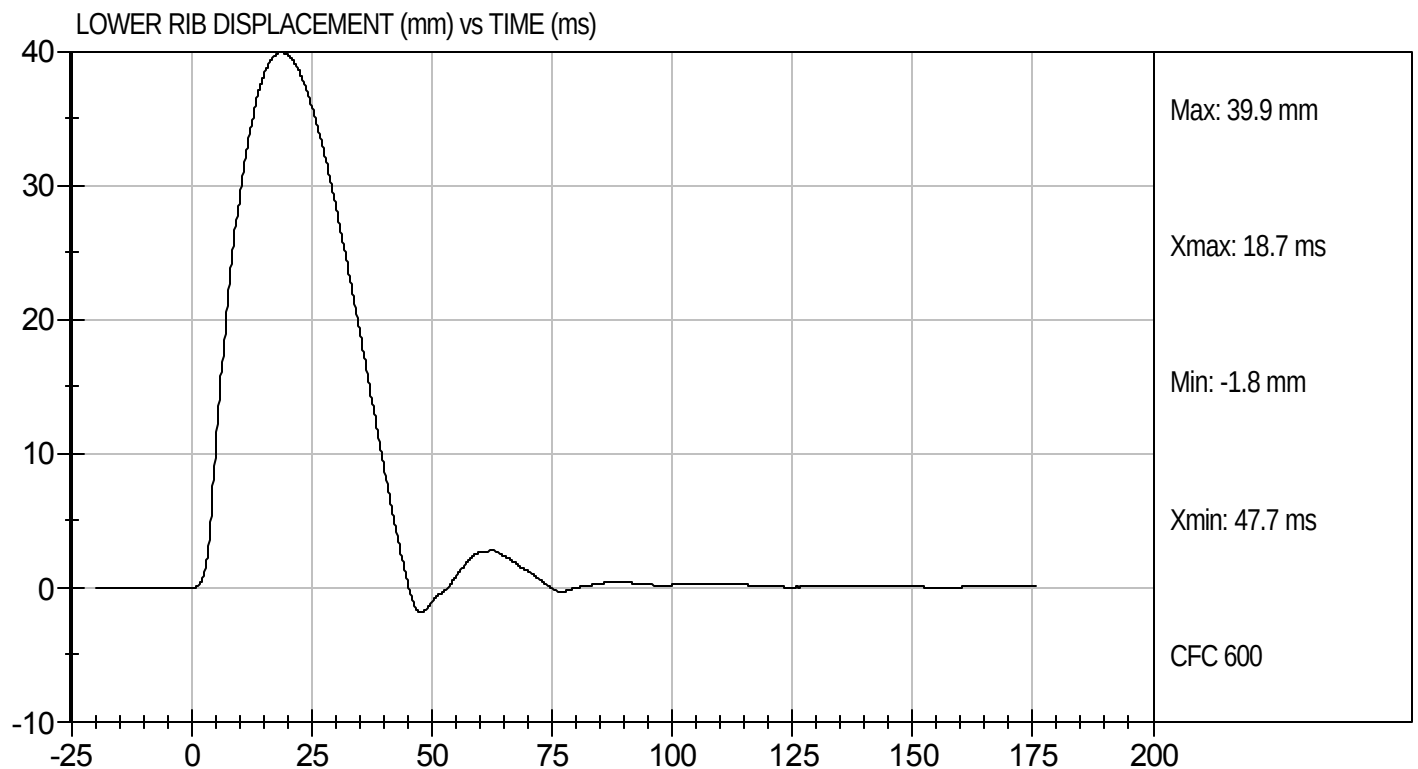
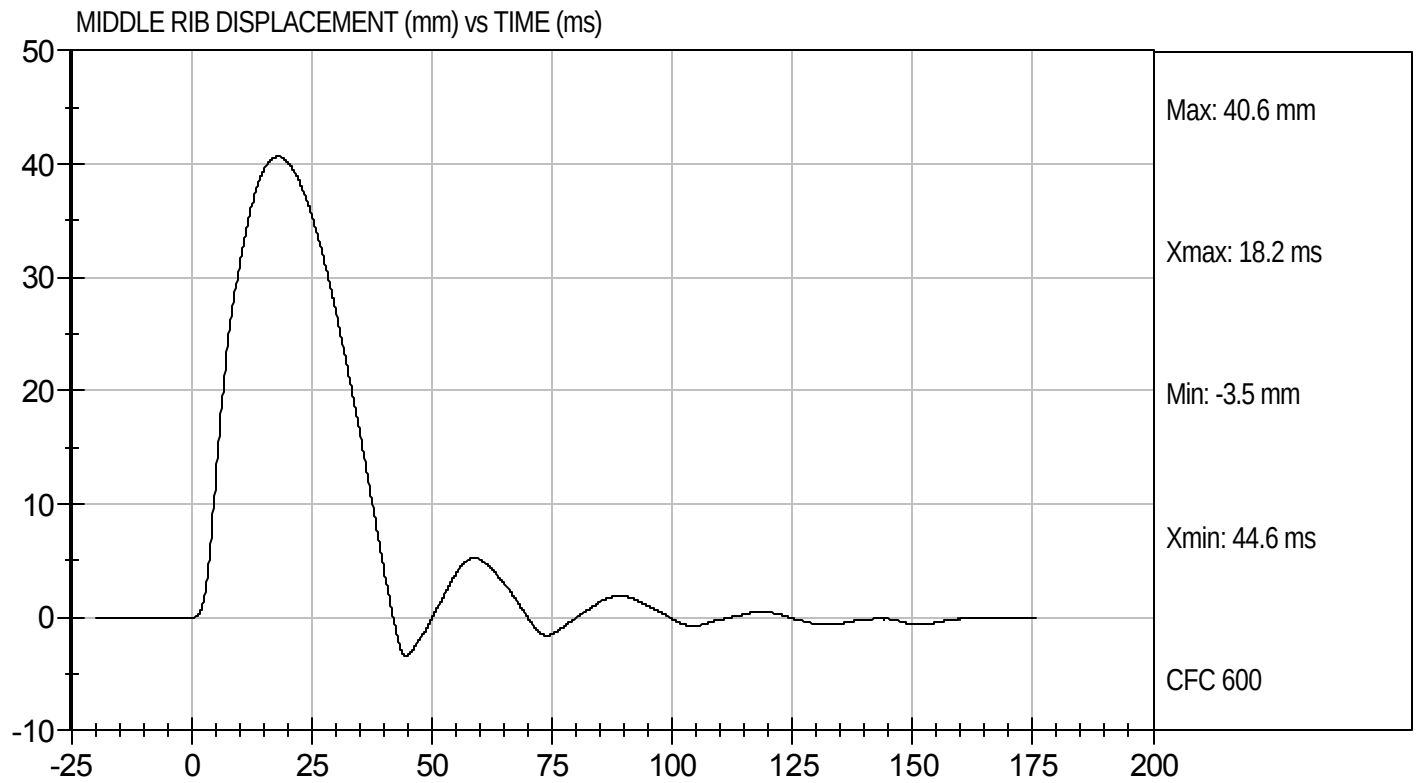
Test Date: 6/9/10
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Thorax Impact
Component ID: D101770

Test Date: 6/9/10
Velocity: 18.32 ft/s, 5.58 m/s

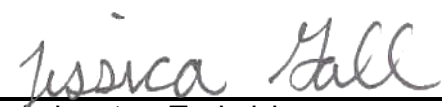


MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D102361

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Peak Resultant Acceleration	G's	125 to 155	149	Pass
Peak Lateral Acceleration	G's	+/- 15	-5.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

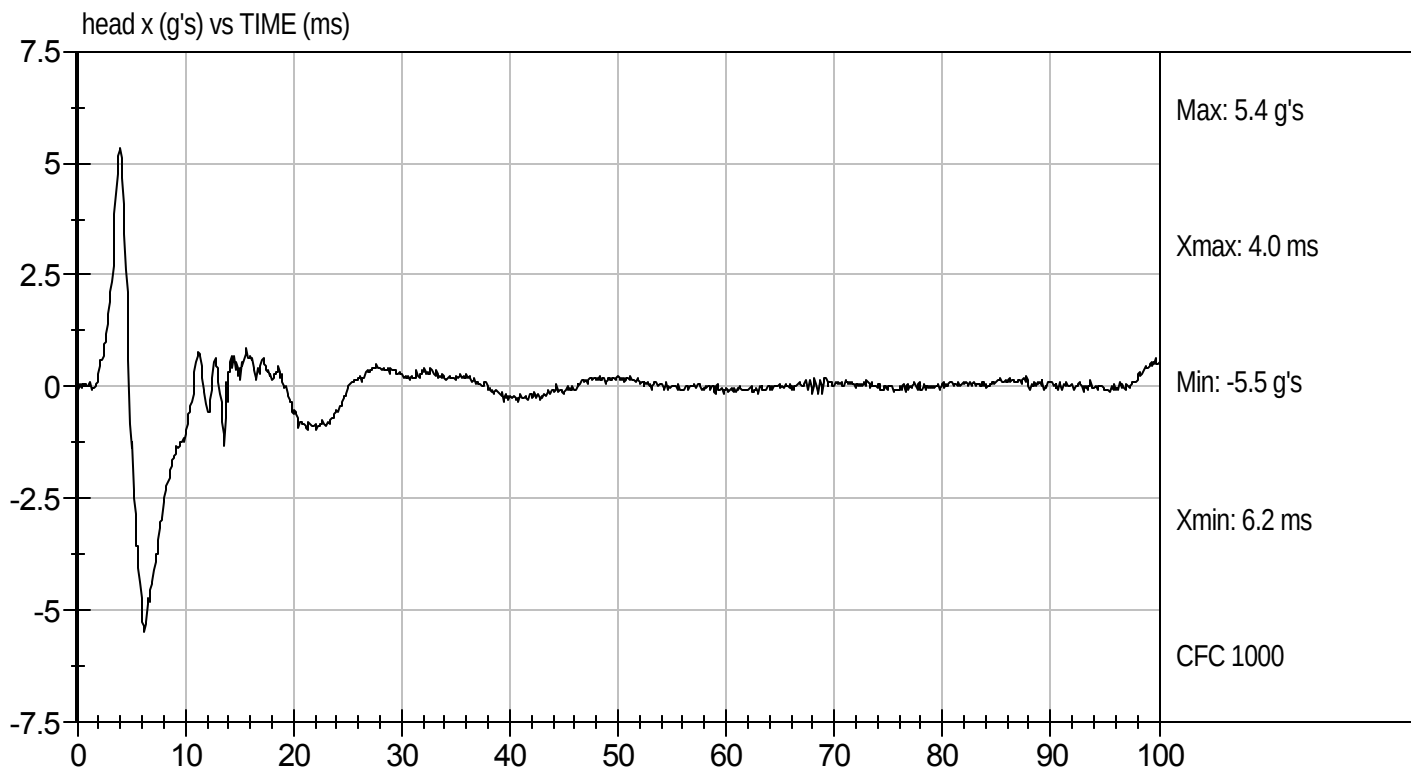
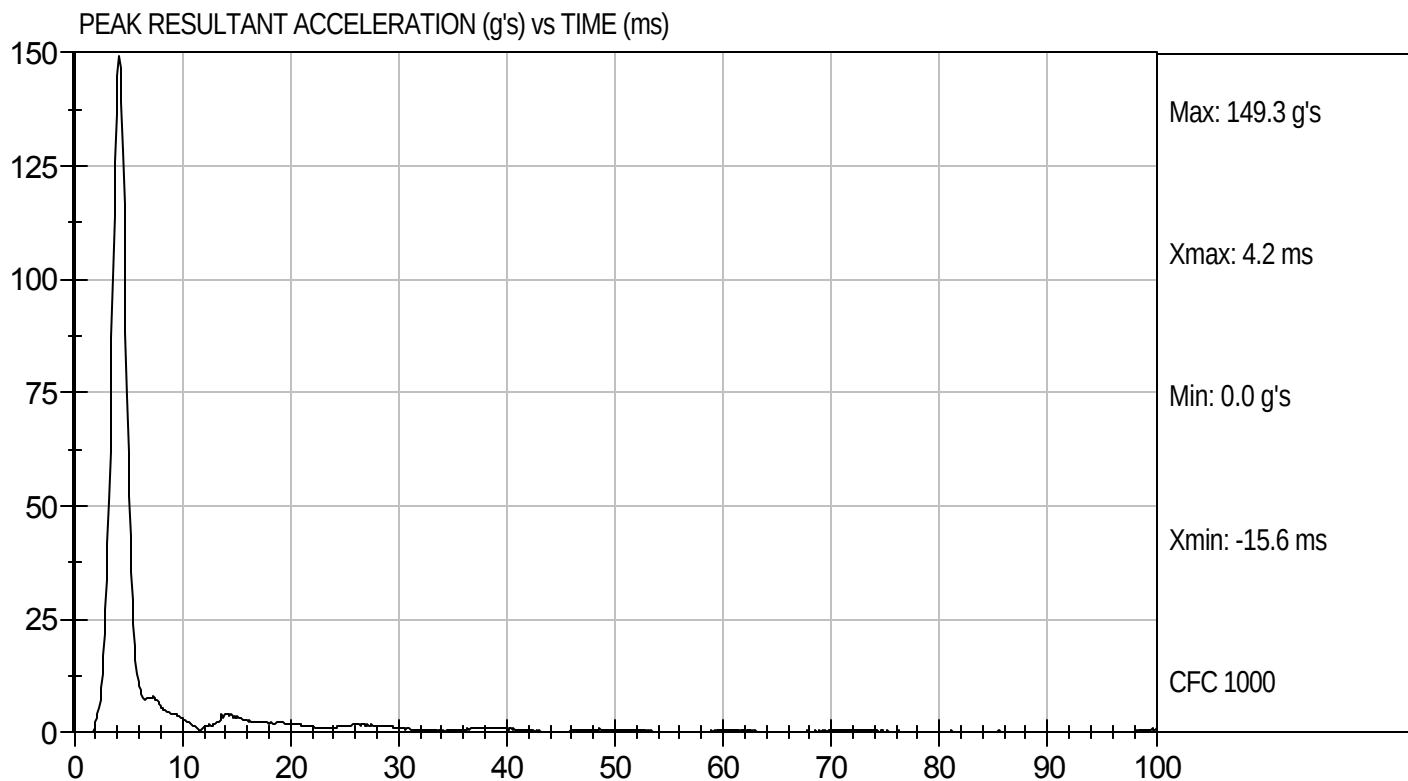
7/26/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D102361

Test Date: 7/26/10
Velocity: 0 ft/s, 0 m/s



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D102362

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	47	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	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.34	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.5	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	63.1	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	57.5	Pass
Overall Test Results					Pass


 Laboratory Technician

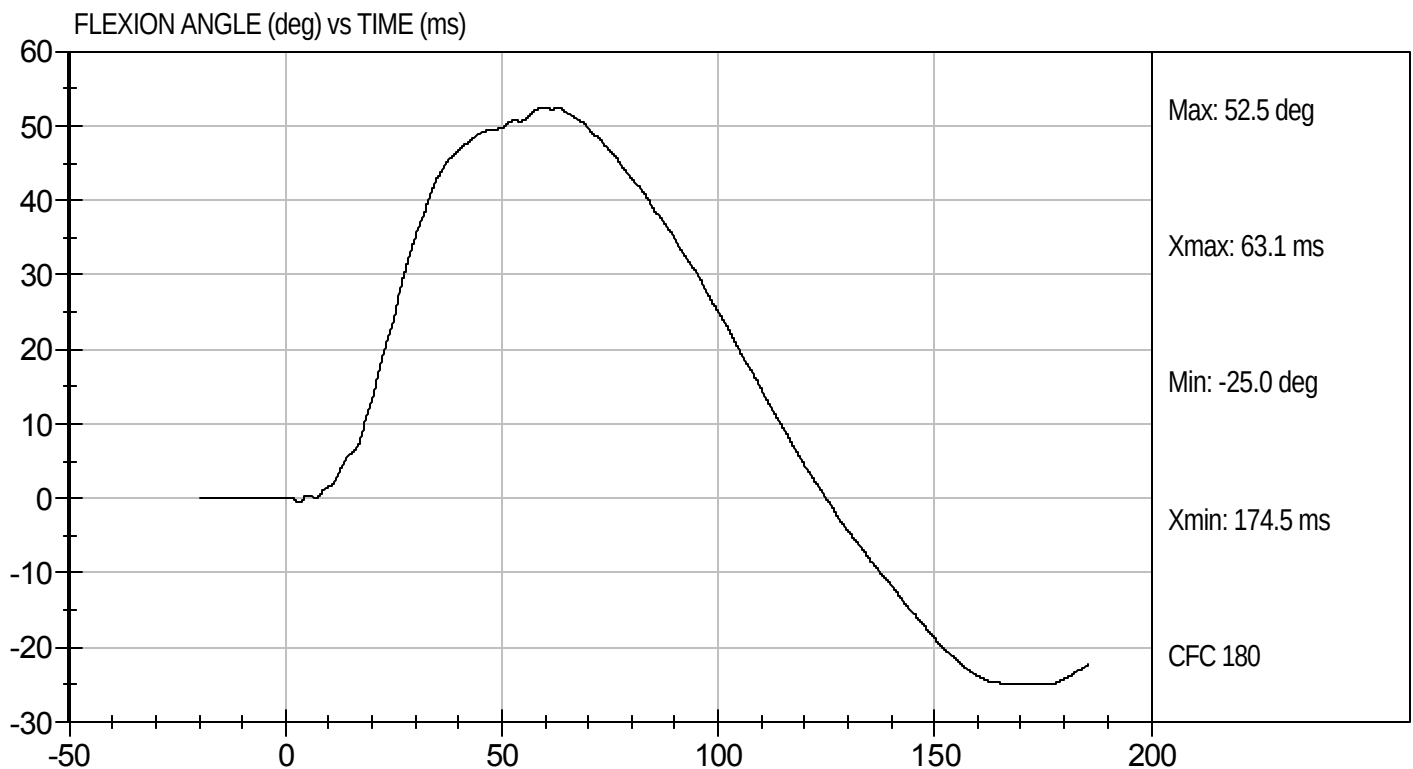
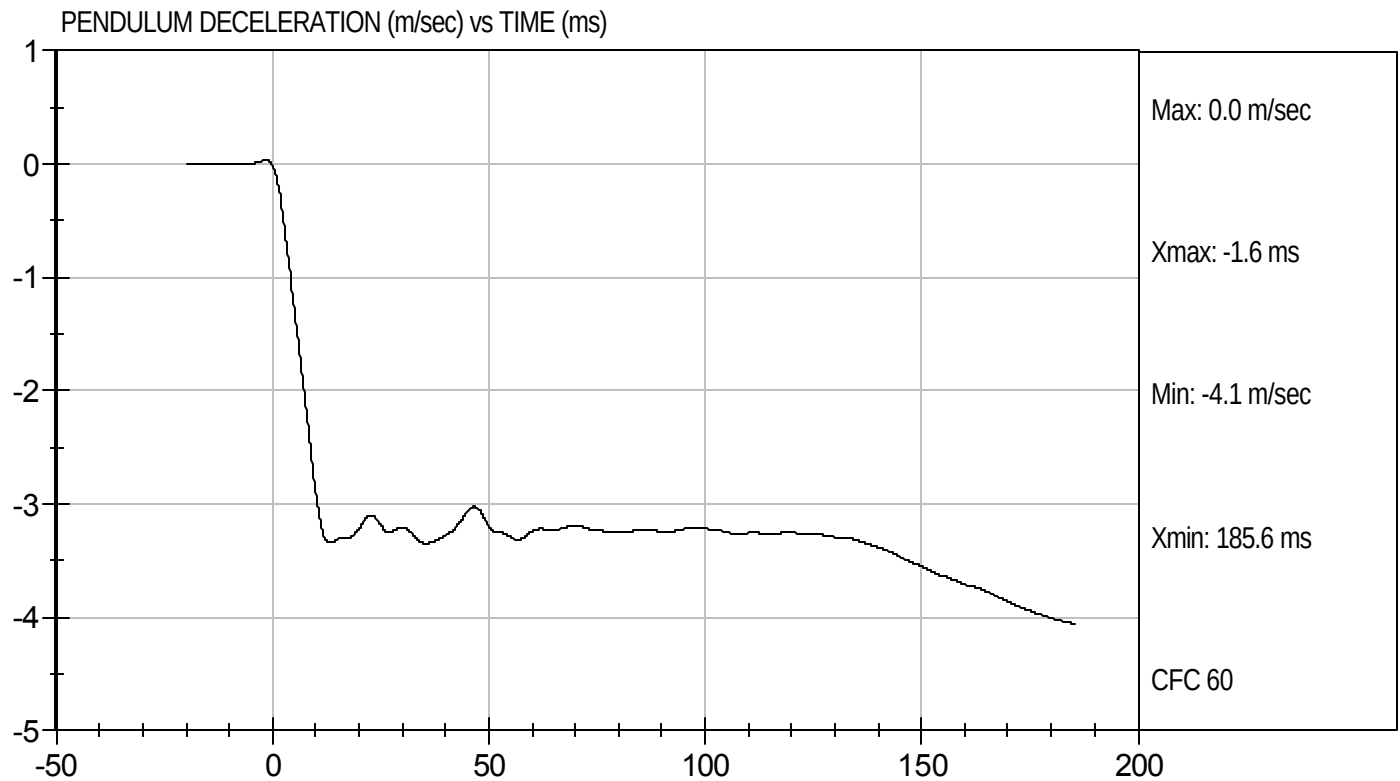
7/26/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D102362

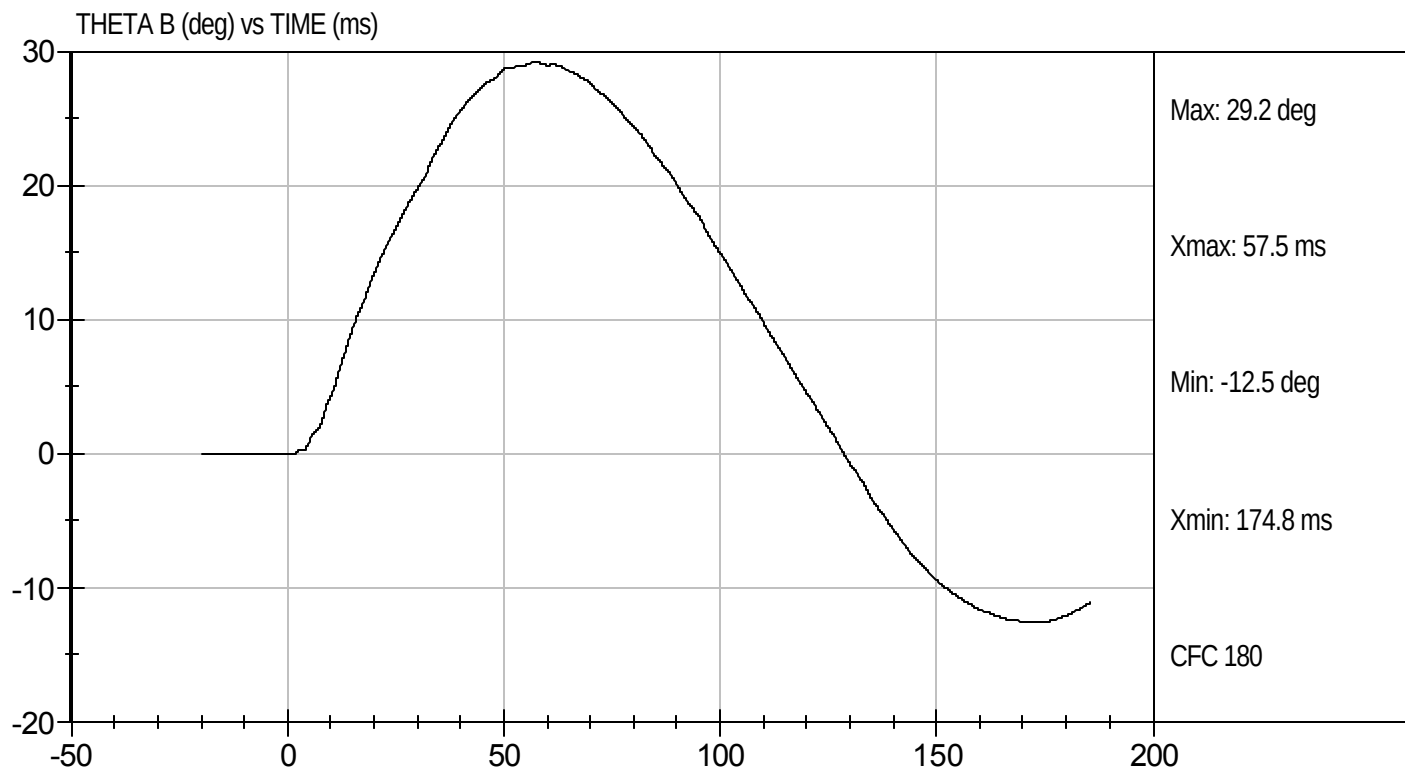
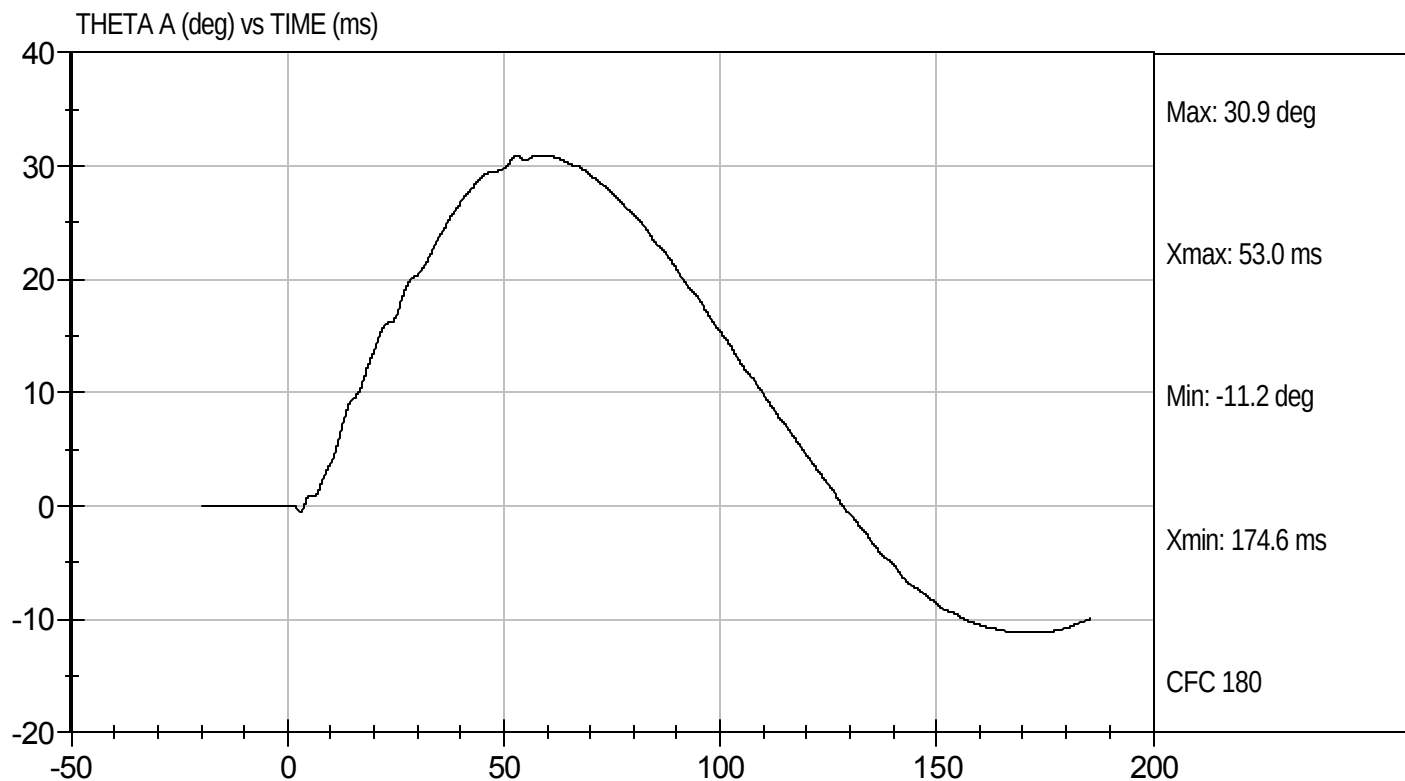
Test Date: 7/26/10
Velocity: 11.34 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D102362

Test Date: 7/26/10
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: D102363

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.2	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.4	Pass
Overall Test Results			Pass	


Laboratory Technician

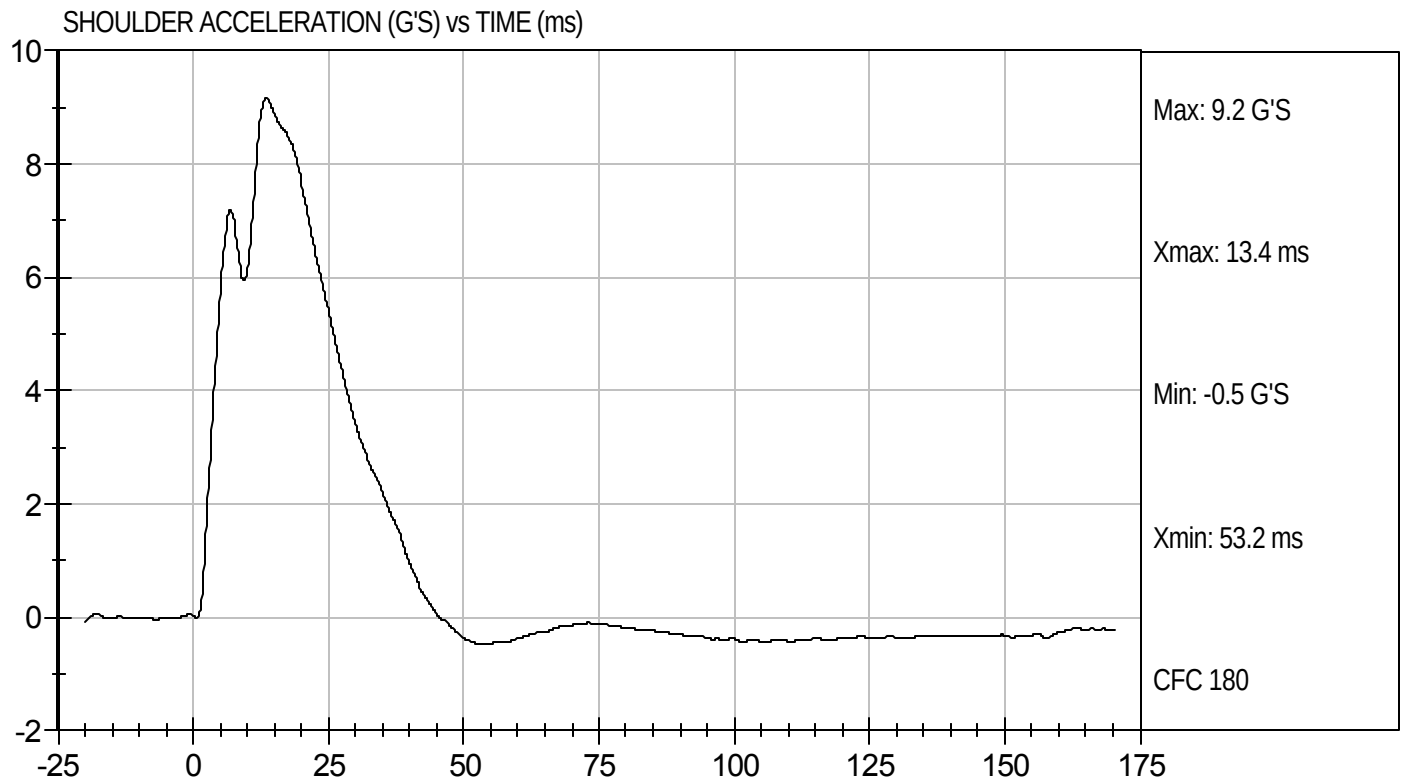
7/27/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D102363

Test Date: 7/27/10
Velocity: 14.0 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D102364

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.4	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.5	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

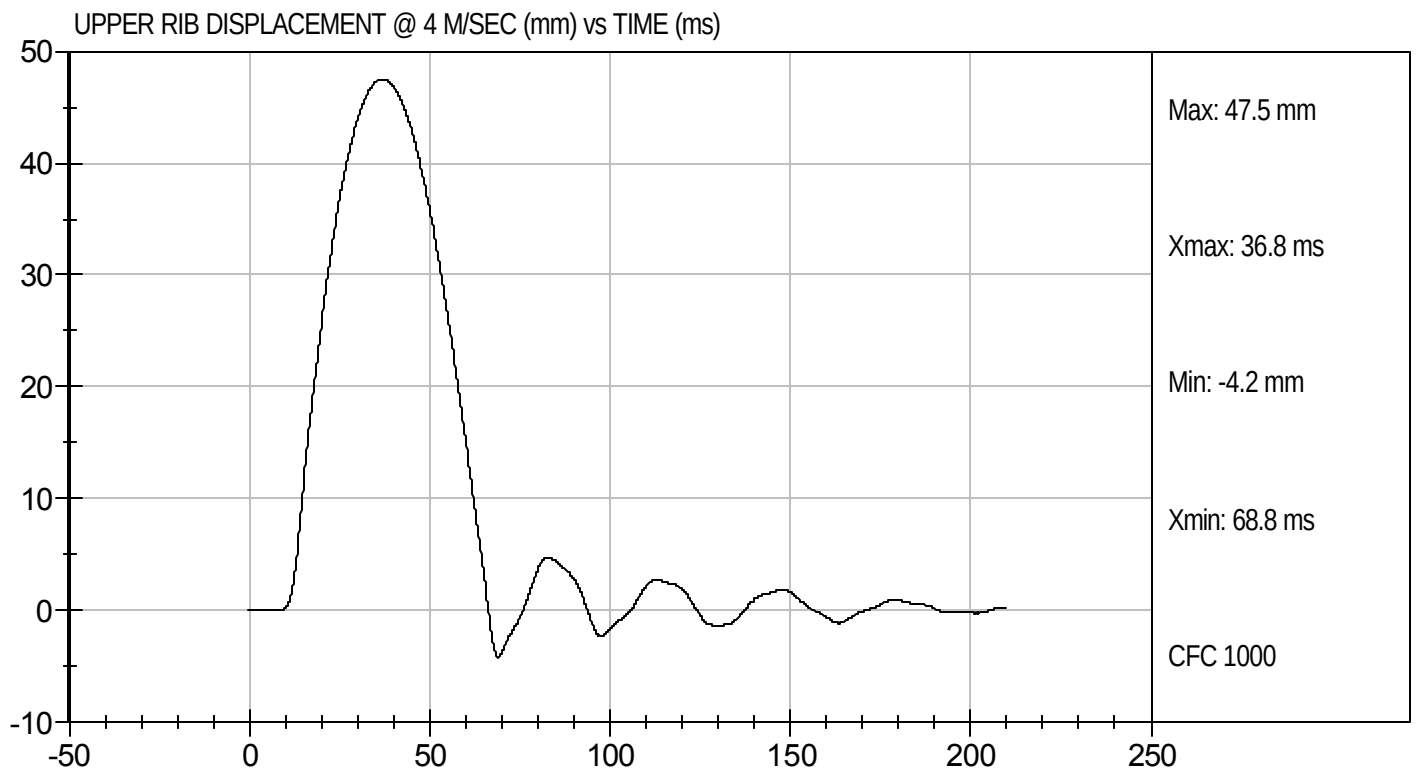
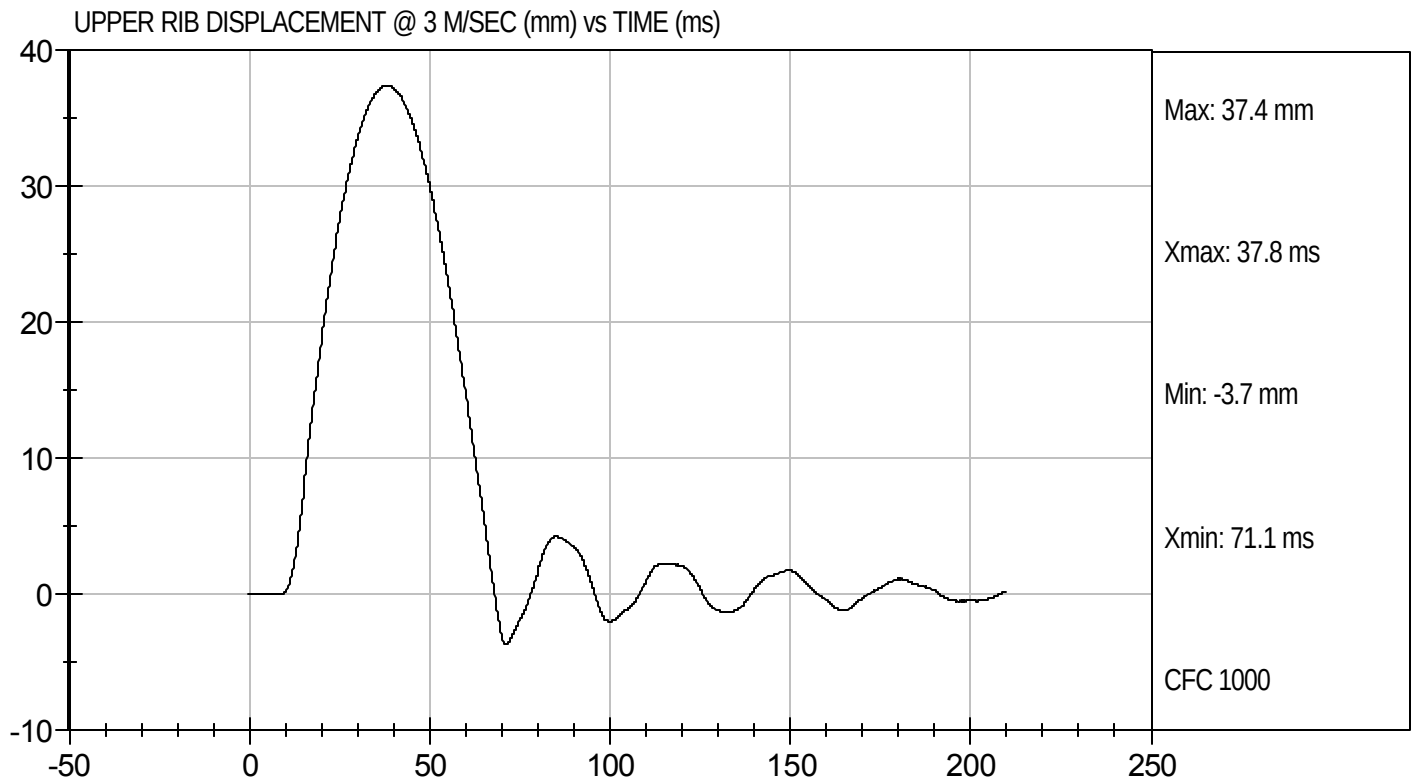
7/26/10
Test Date

David Winkelbauer
Approved By



Test Desc: Rib Impact - Upper
Component ID: D102364

Test Date: 7/26/10



MGA RESEARCH CORPORATION

MID RIB TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D102365

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.5	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.0	Pass
Overall Test Results			Pass	


Laboratory Technician

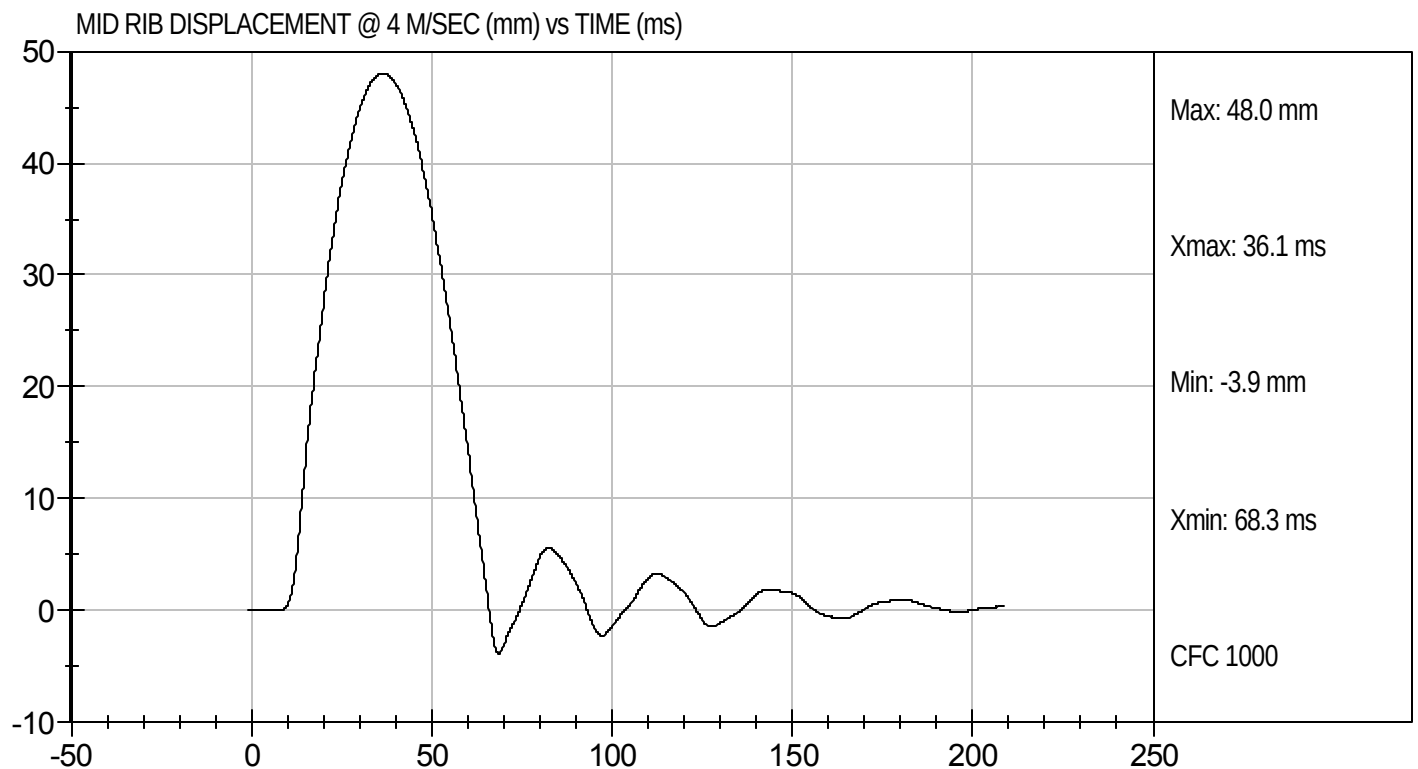
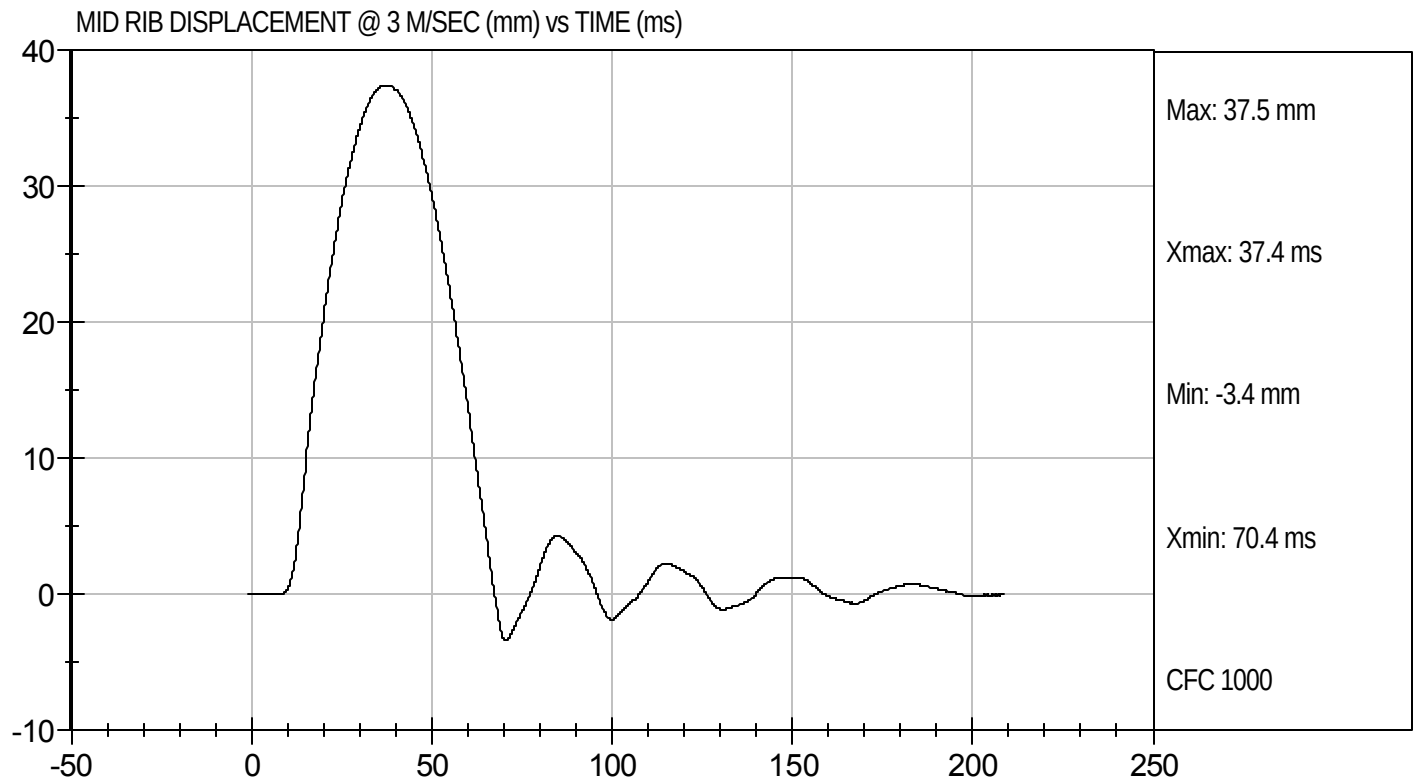
7/26/10
Test Date


Approved By



Test Desc: Rib Impact - Mid
Component ID: D102365

Test Date: 7/26/10



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D102366

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.5	Pass
Overall Test Results				Pass


Laboratory Technician

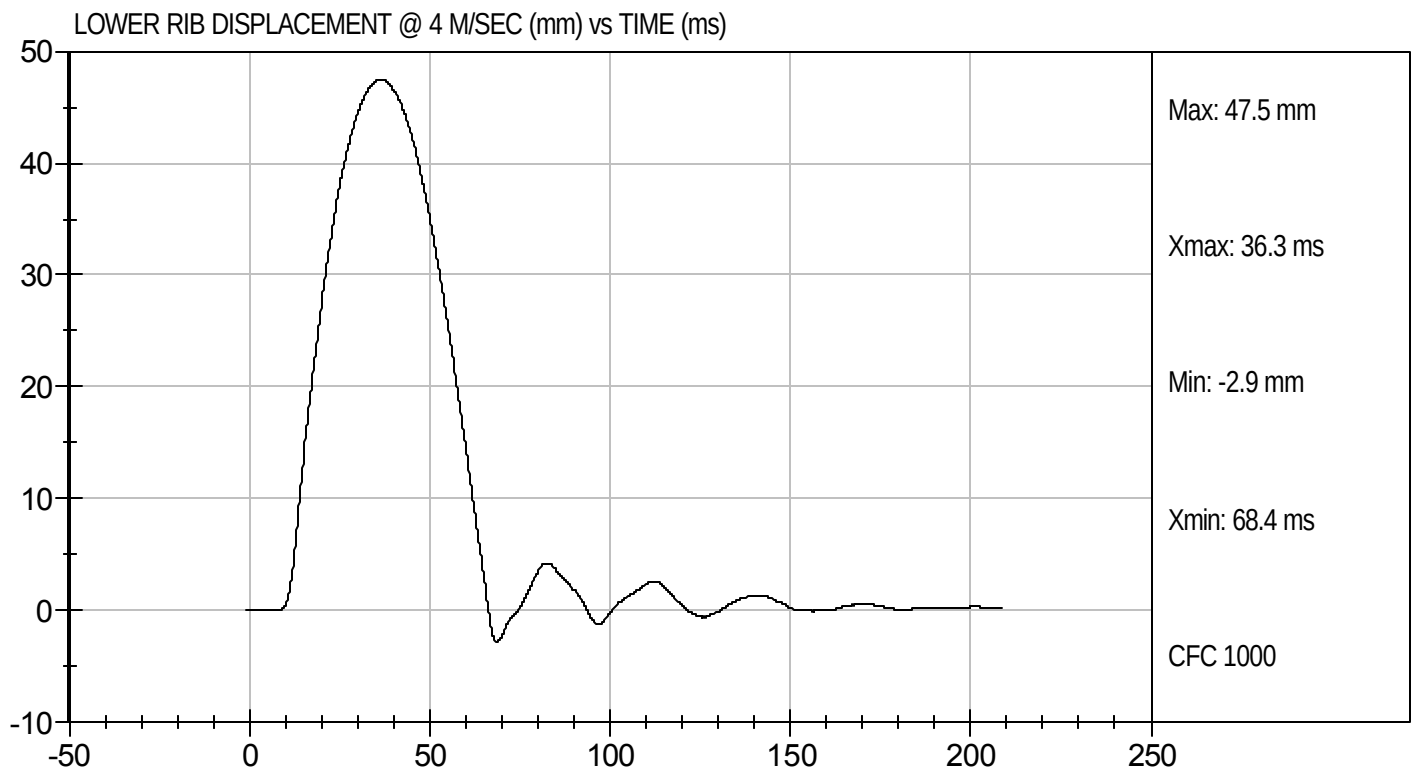
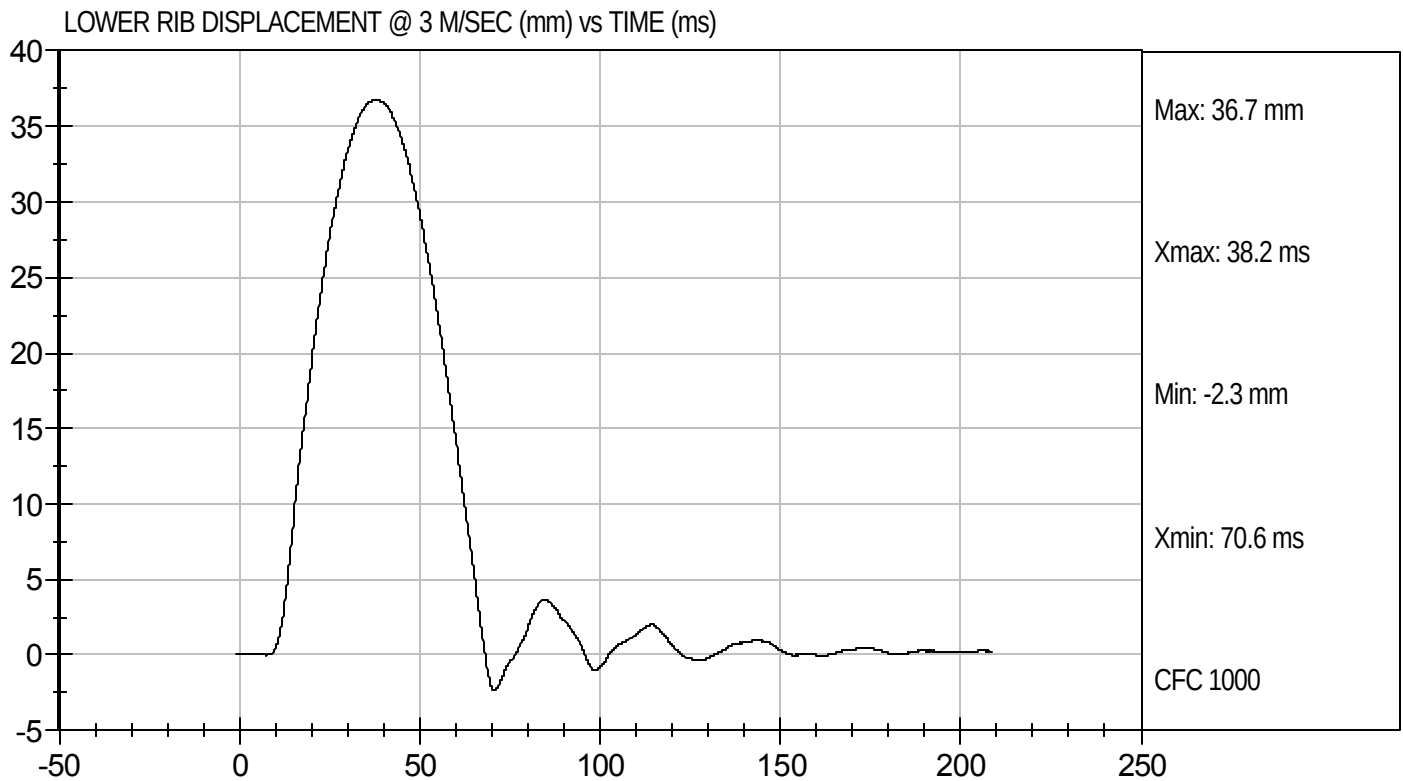
7/26/10
Test Date


Approved By



Test Desc: Rib Impact - Lower
Component ID: D102366

Test Date: 7/26/10



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D102367

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Speed	m/s	3.90 to 4.10	4.05	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.04	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	12.00	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.41	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	11.30	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

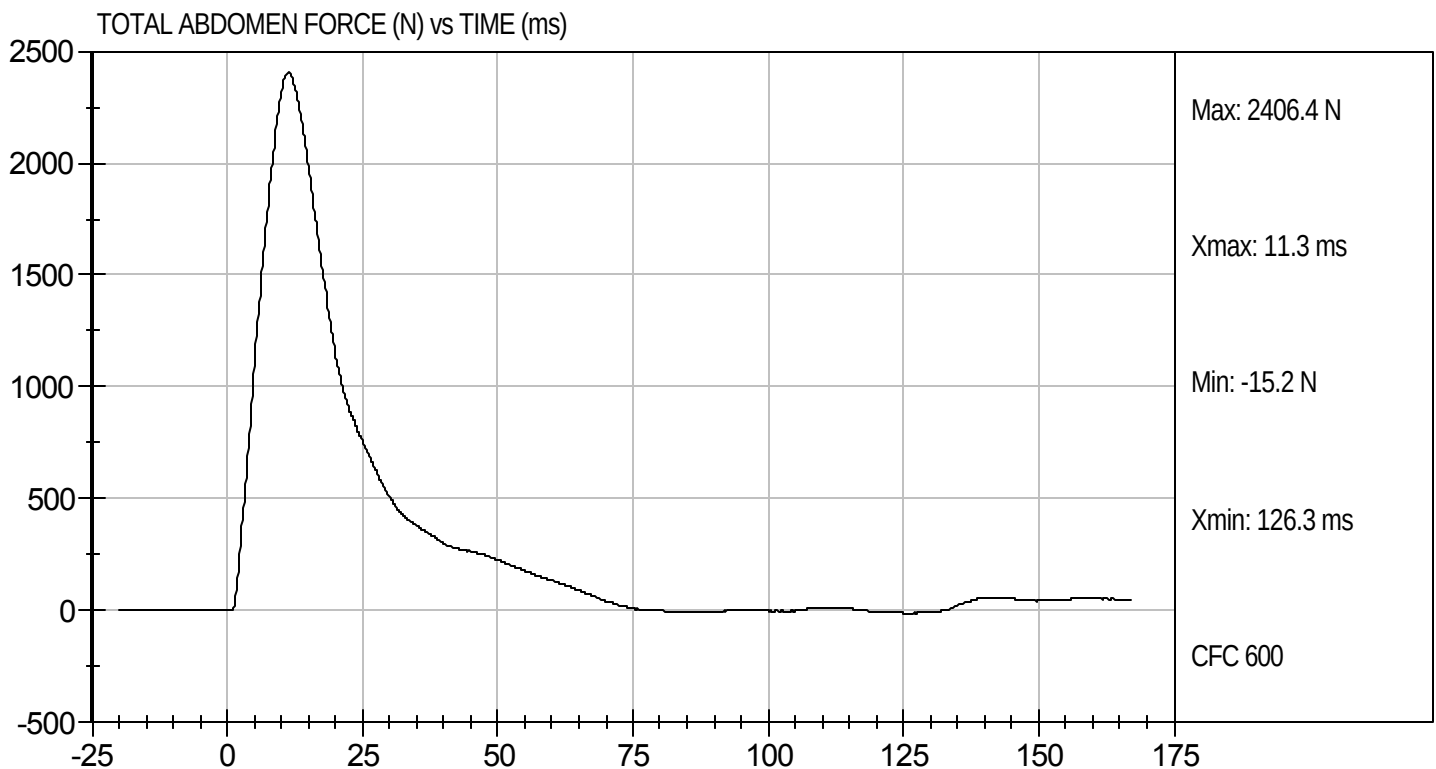
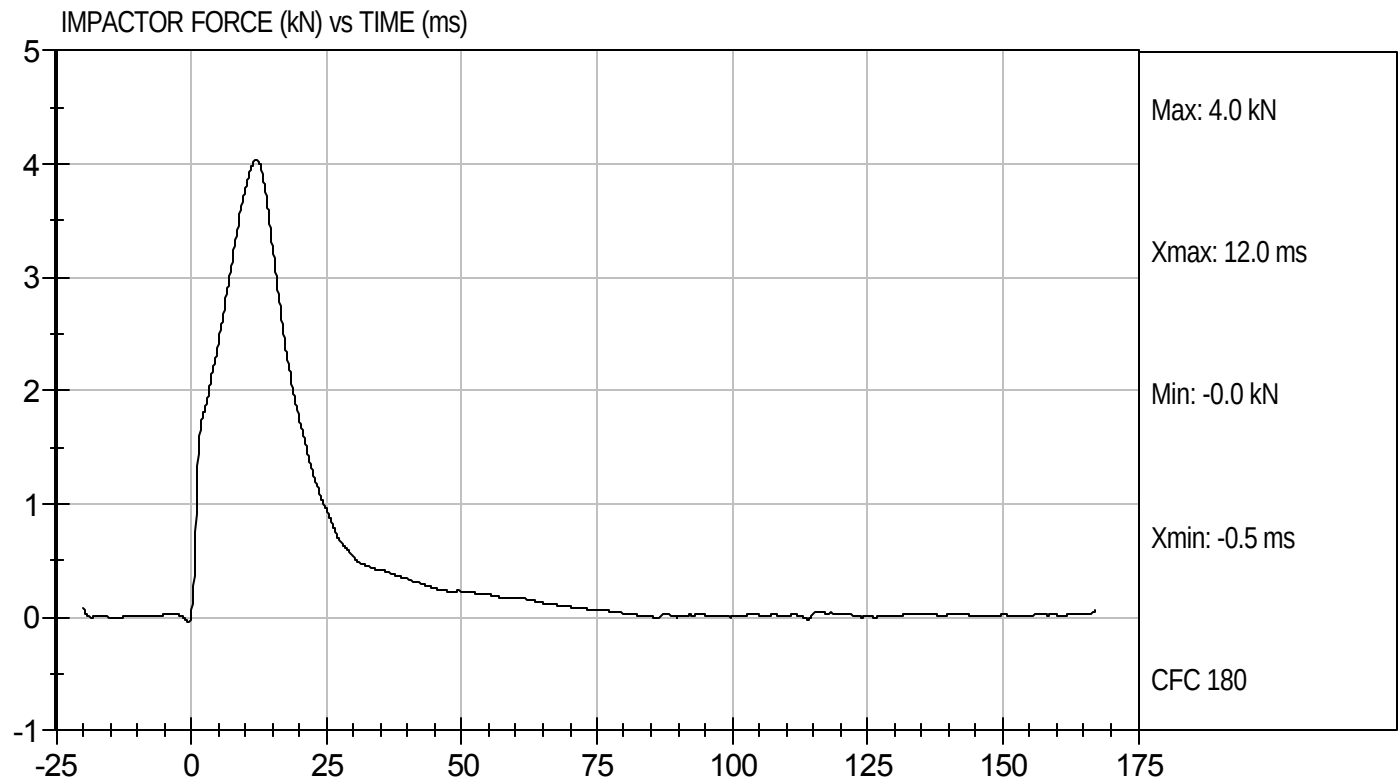
7/27/10
Test Date

David Winkelbauer
Approved By



Test Desc: Abdomen Impact
Component ID: D102367

Test Date: 7/27/10
Velocity: 13.3 ft/s, 4.05 m/s

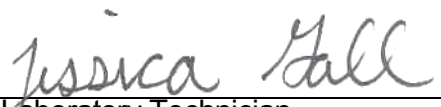


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D102368

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	49	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.05	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.41	Pass
	27 ms	m/s	-6.50 to -5.80	-5.81	Pass
	30 ms	m/s	>= -6.5	-6.02	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.7	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	43.1	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	43	Pass
Overall Results				Pass	


 Laboratory Technician

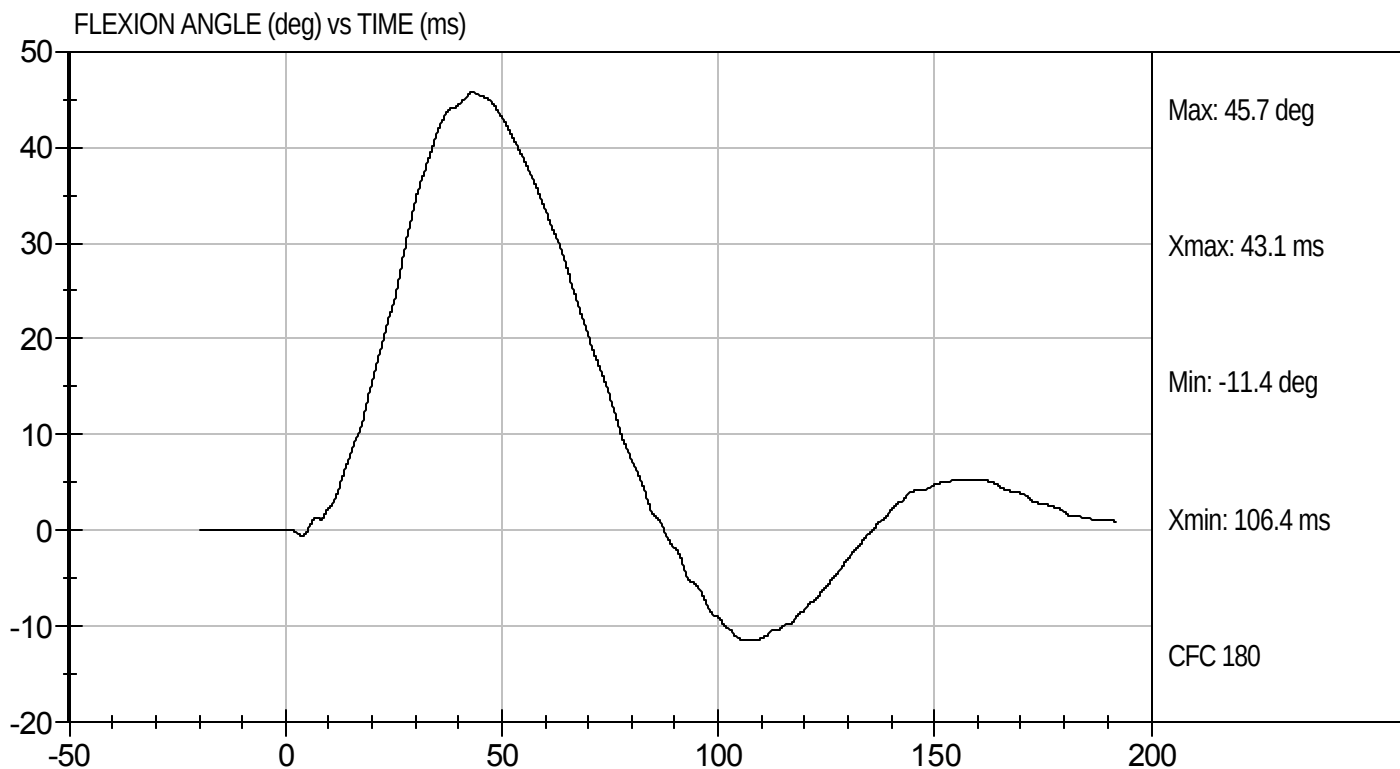
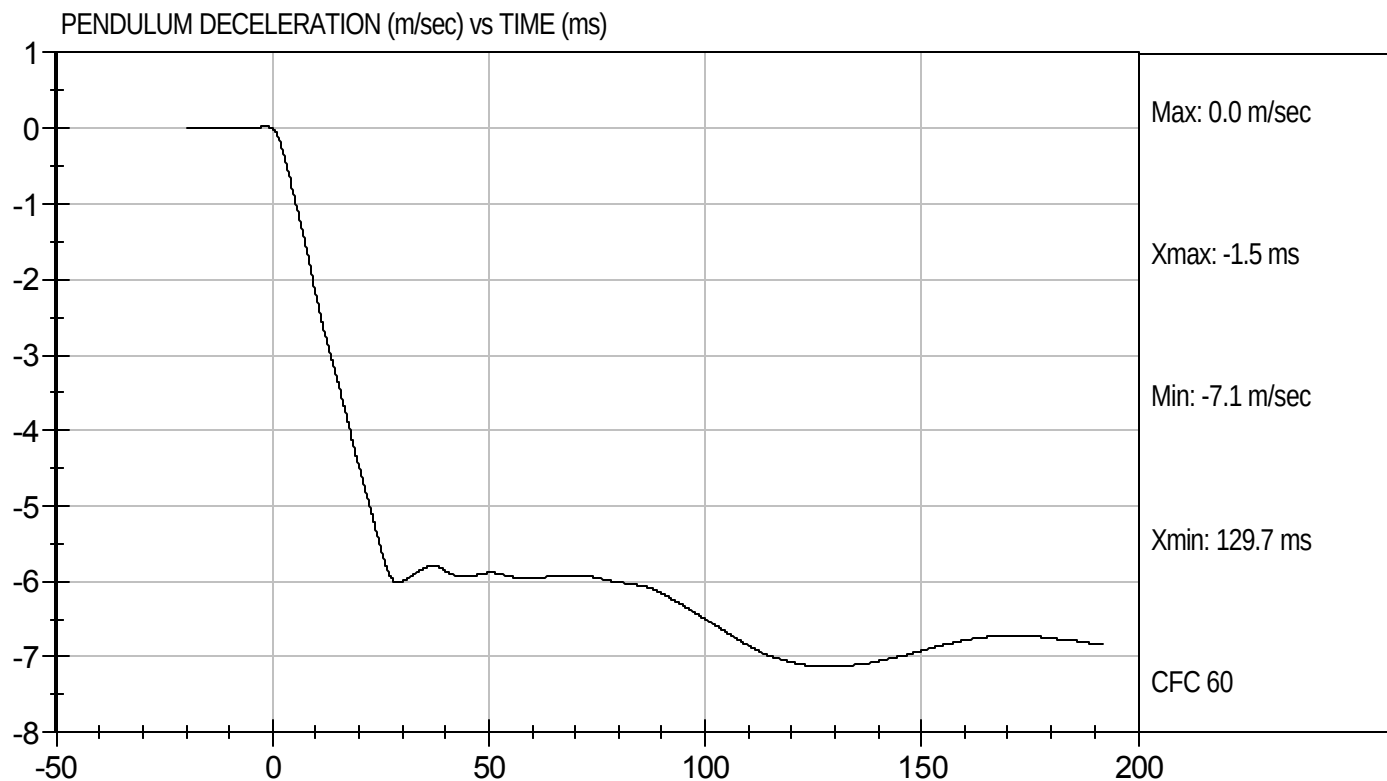
7/26/10
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D102368

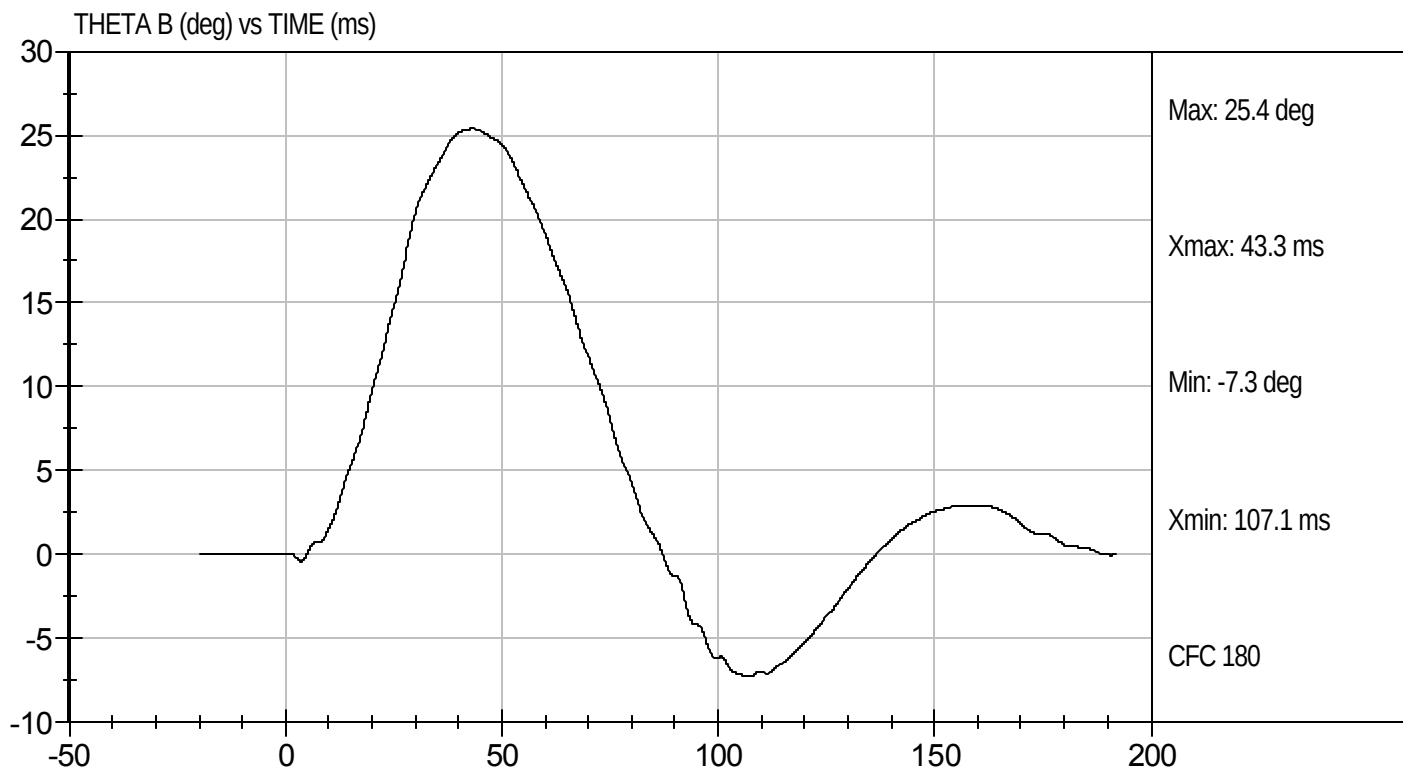
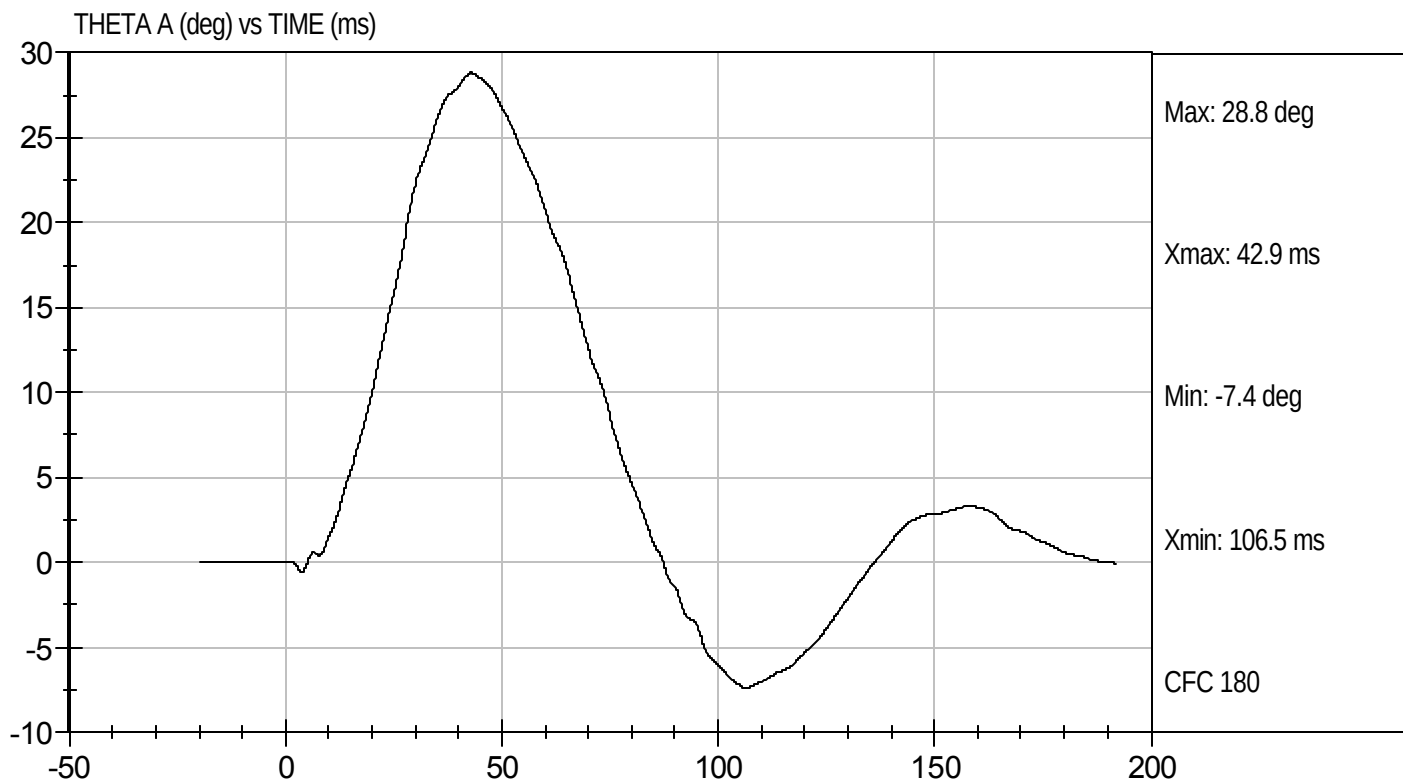
Test Date: 7/26/10
Velocity: 19.84 ft/s, 6.05 m/s





Test Desc: Lumbar Bending
Component ID: D102368

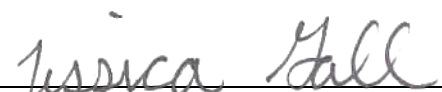
Test Date: 7/26/10
Velocity: 19.84 ft/s, 6.05 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMYATD Serial No: 032Test I.D: D102369

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Speed	m/s	4.20 to 4.40	4.36	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.75	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	14.20	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.50	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	15.20	Pass
Overall Test Results				Pass


Laboratory Technician

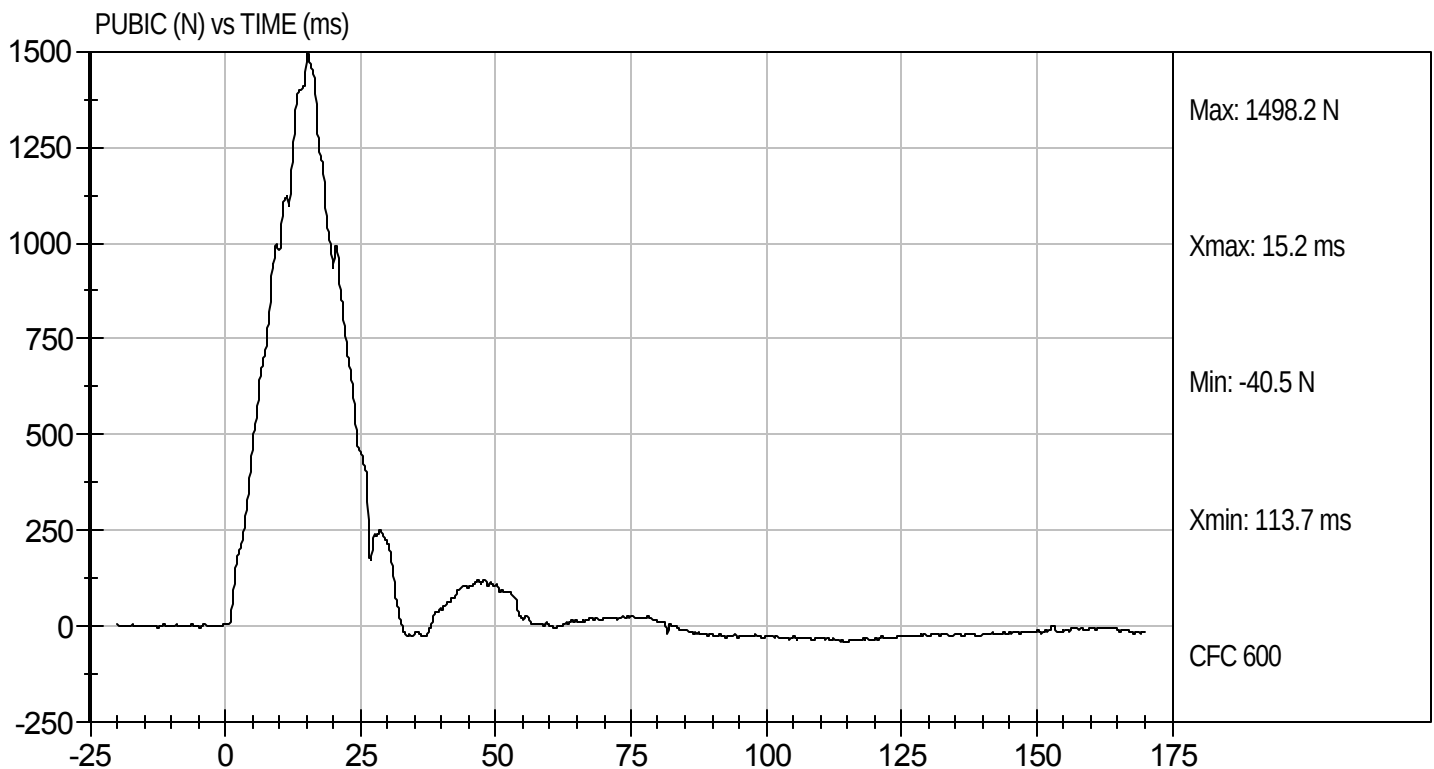
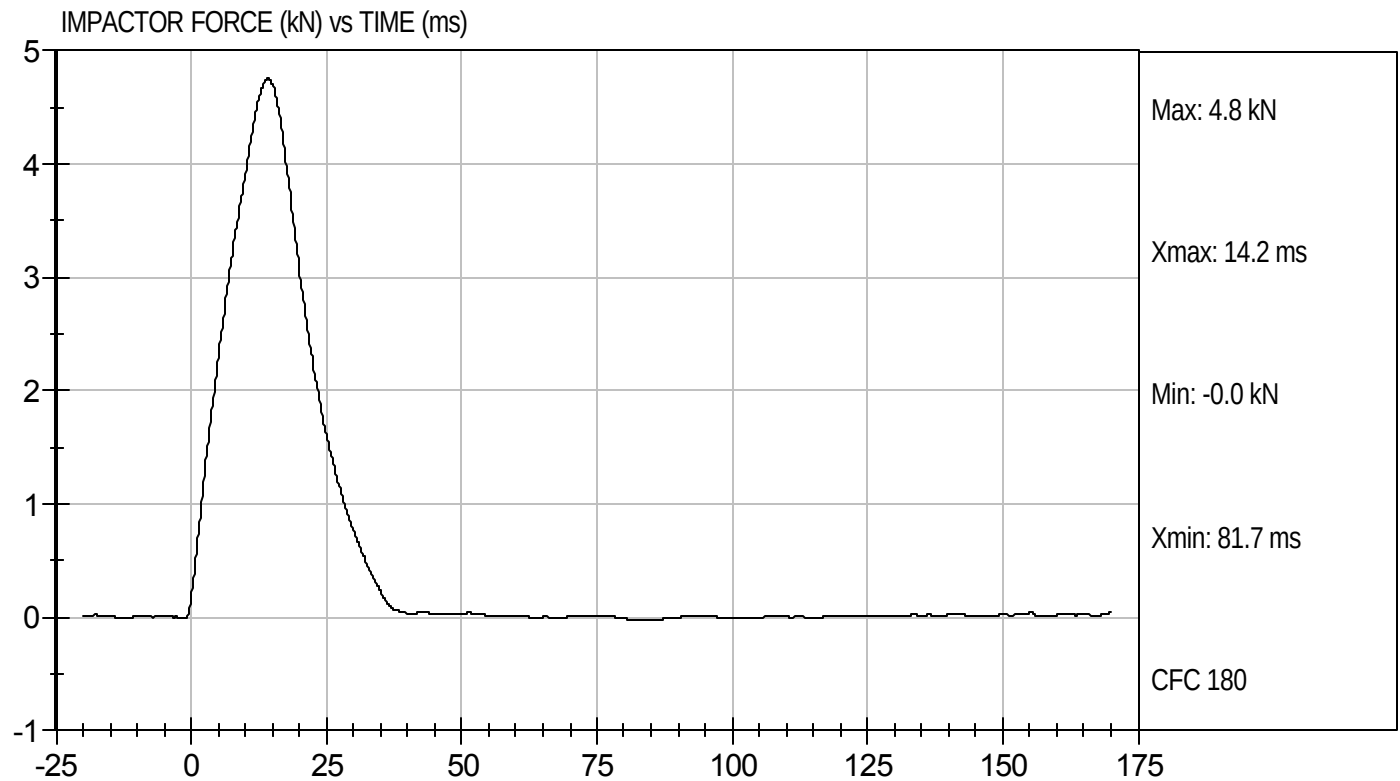
7/27/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D102369

Test Date: 7/27/10
Velocity: 14.3 ft/s, 5.52 m/s



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

ATD Serial No: 032

Test I.D: D102360

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	54	Pass
Probe Speed	m/s	5.40 to 5.60	5.52	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.20	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.6	Pass
Middle Rib Displacement	mm	37.0 to 45.0	39.8	Pass
Lower Rib Displacement	mm	37.0 to 44.0	39.2	Pass
Overall Test Results			Pass	


Laboratory Technician

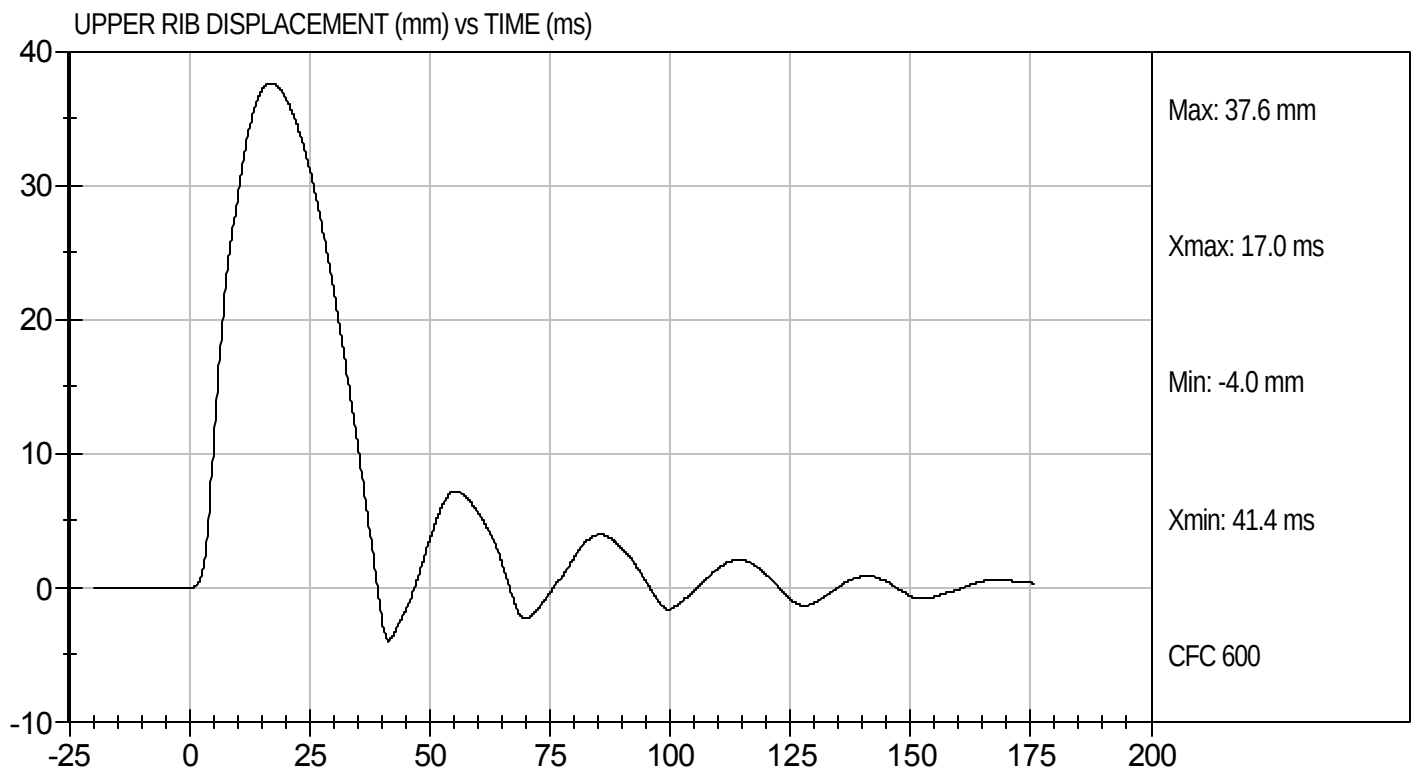
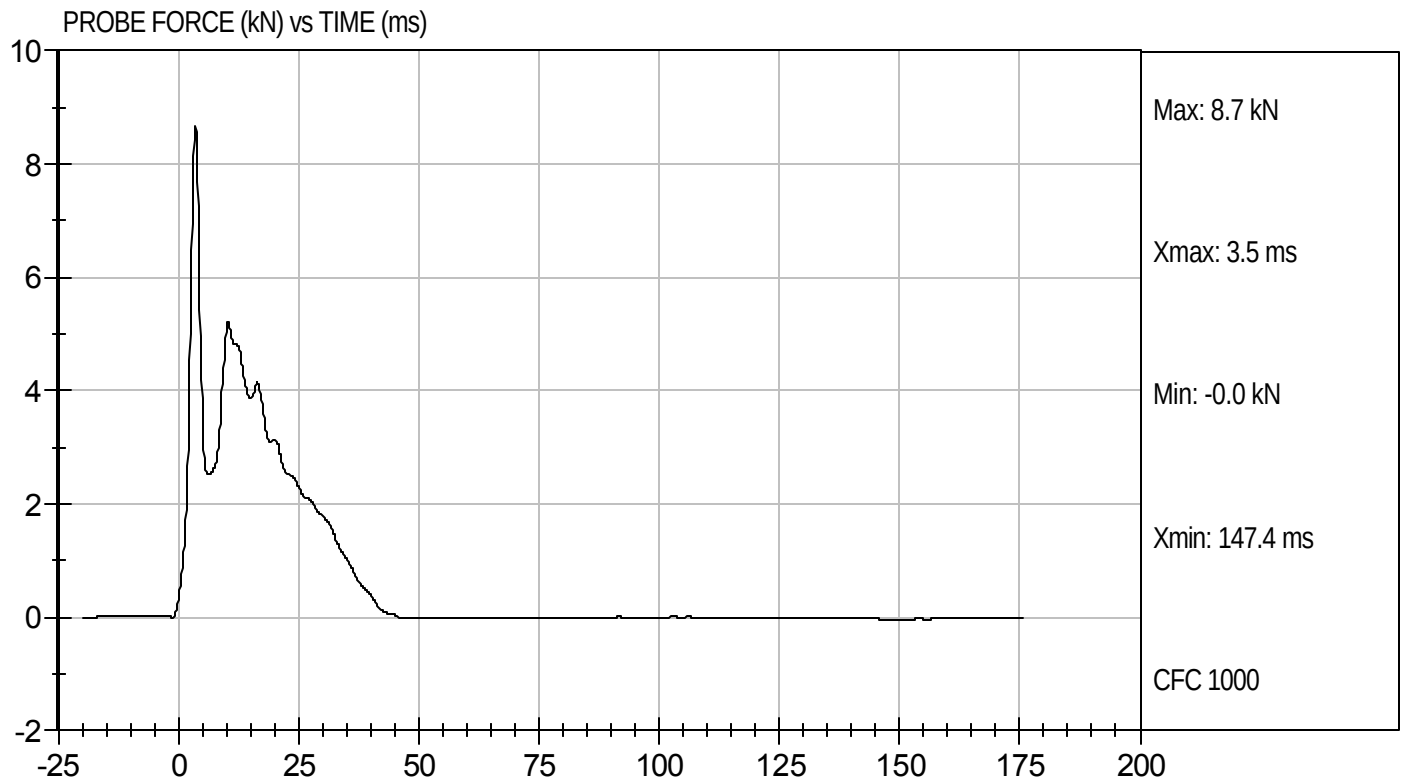
7/27/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D102360

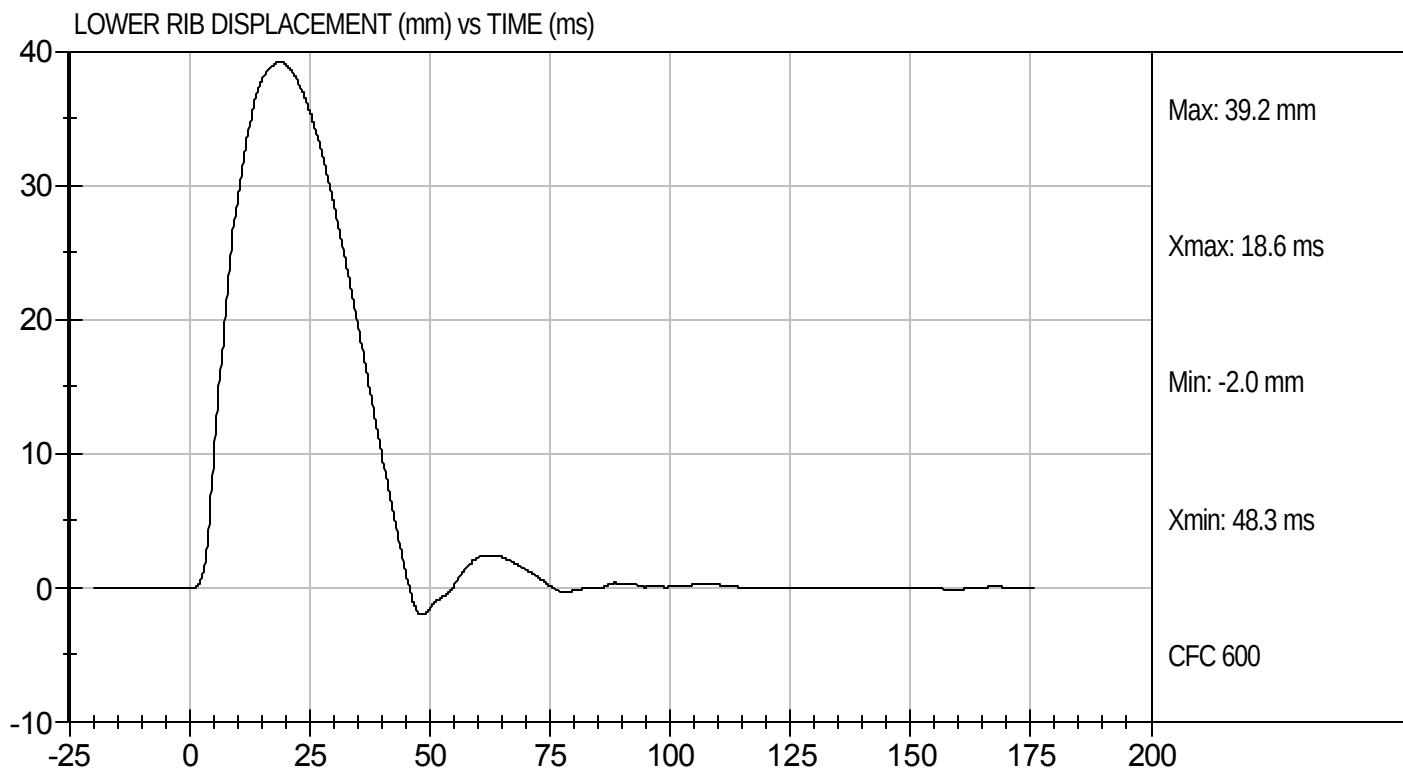
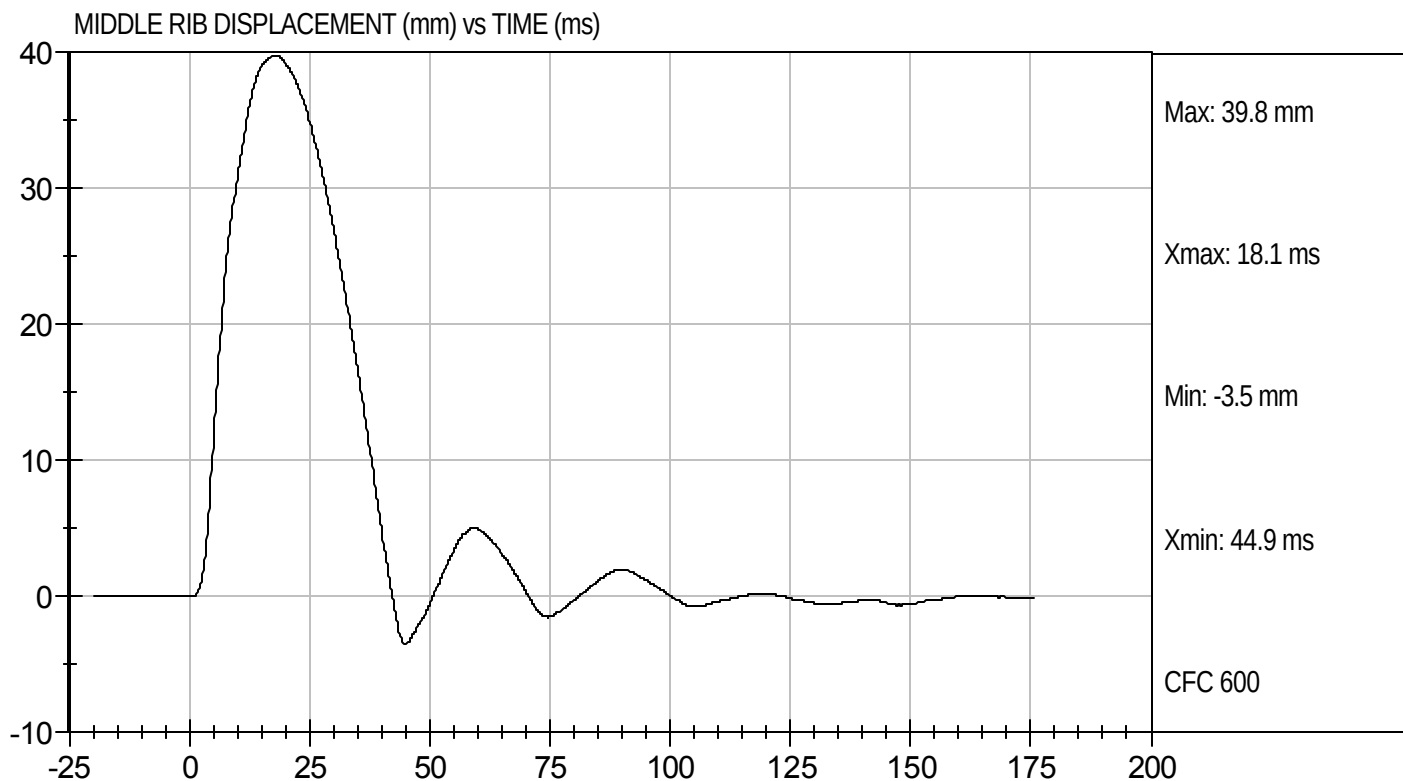
Test Date: 7/27/10
Velocity: 18.1 ft/s, 5.52 m/s





Test Desc: Thorax Impact
Component ID: D102360

Test Date: 7/27/10
Velocity: 18.1 ft/s, 5.52 m/s

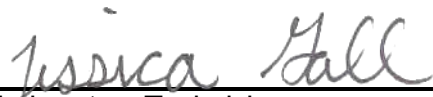


MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D101821

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	115 to 137	128	Pass
Peak Lateral Acceleration	G's	+/- 15	5.1	Pass
Unimodal	N/A	<15%	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

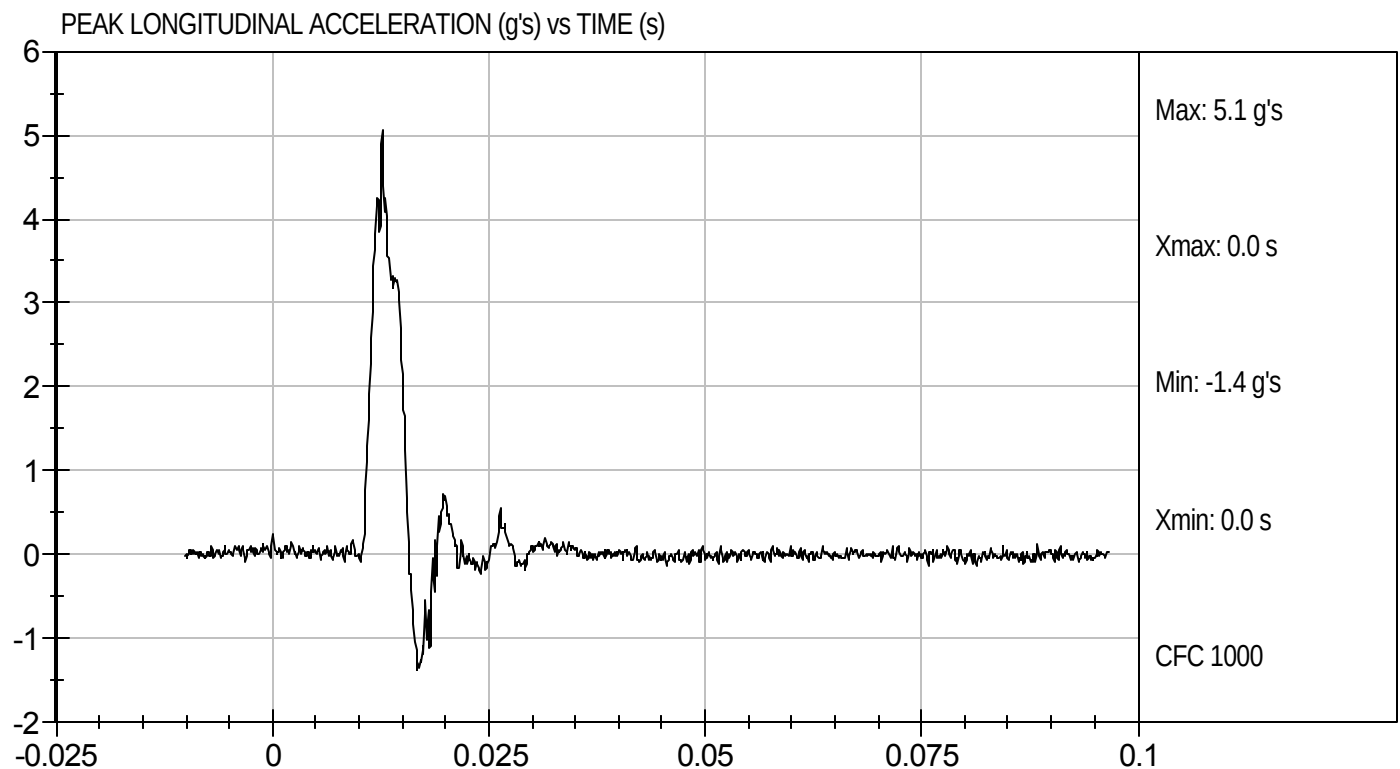
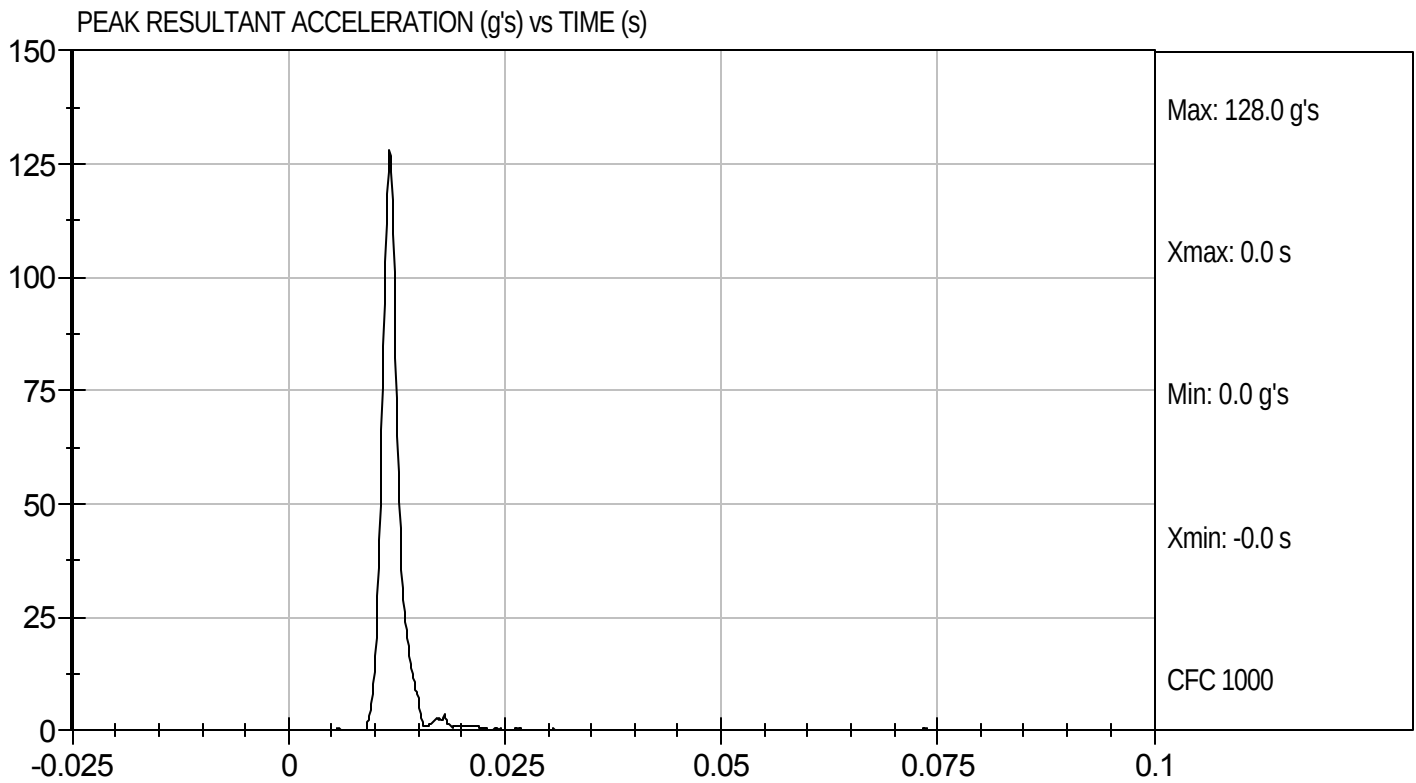
6/15/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D101821

Test Date: 6/15/10
Velocity: 0 ft/s, 0 m/s

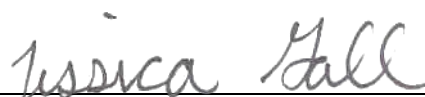


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101822

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.0	Pass
Humidity		%	10 to 70	54	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.72	Pass
	15 ms	m/s	3.30 to 4.10	3.93	Pass
	20 ms	m/s	4.40 to 5.40	5.22	Pass
	25 ms	m/s	5.40 to 6.10	5.46	Pass
	25-100 ms	m/s	5.50 to 6.20	5.50	Pass
Maximum D-Plane Rotation		deg	71 to 81	75	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	66	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-40	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
Overall Test Results				Pass	


 Laboratory Technician

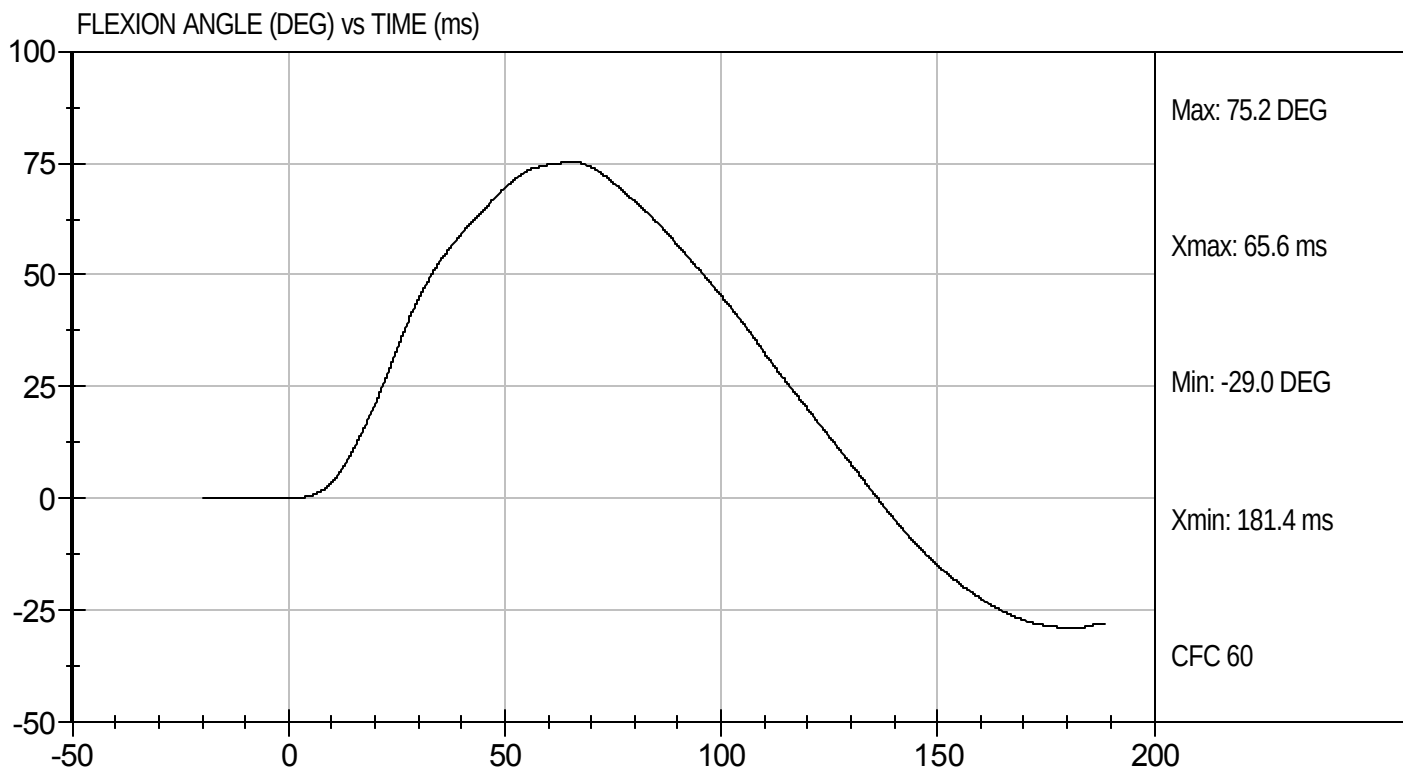
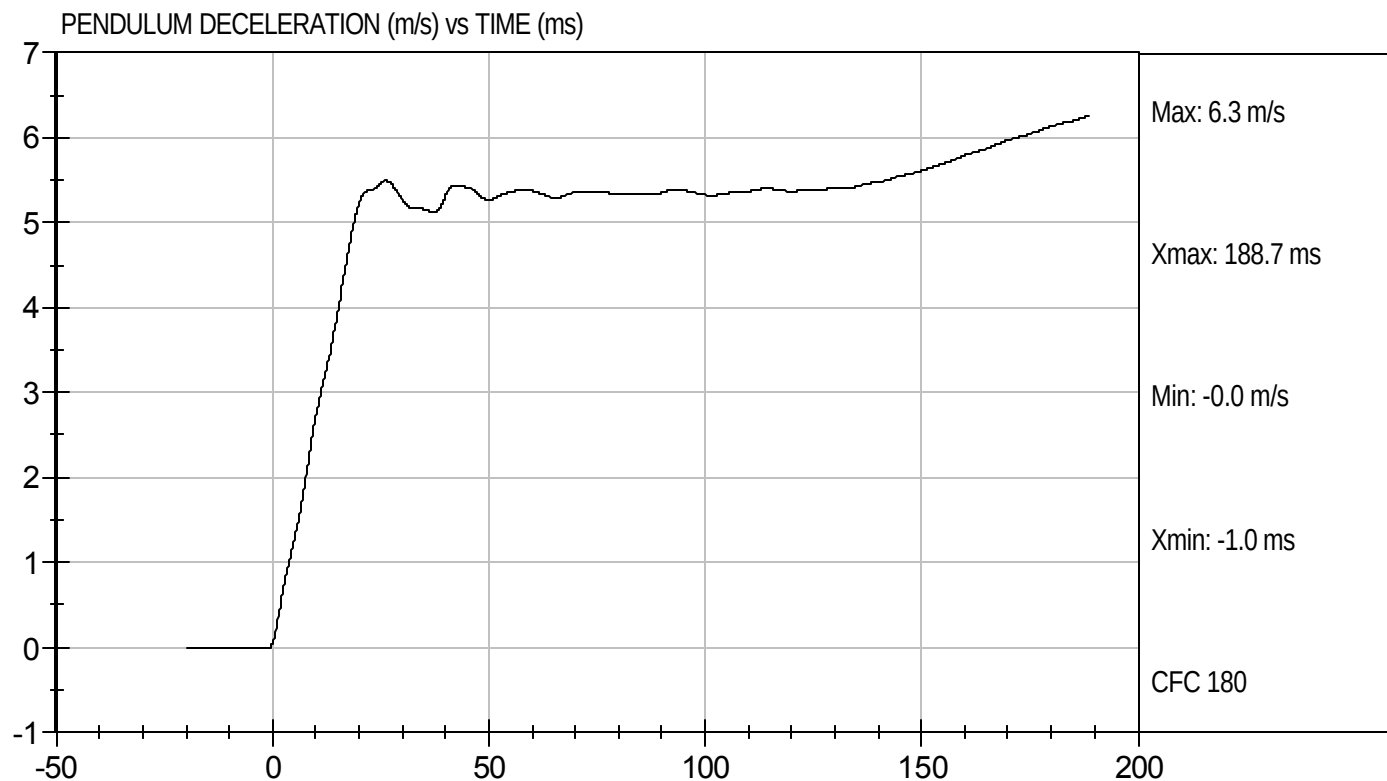
6/15/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D101822

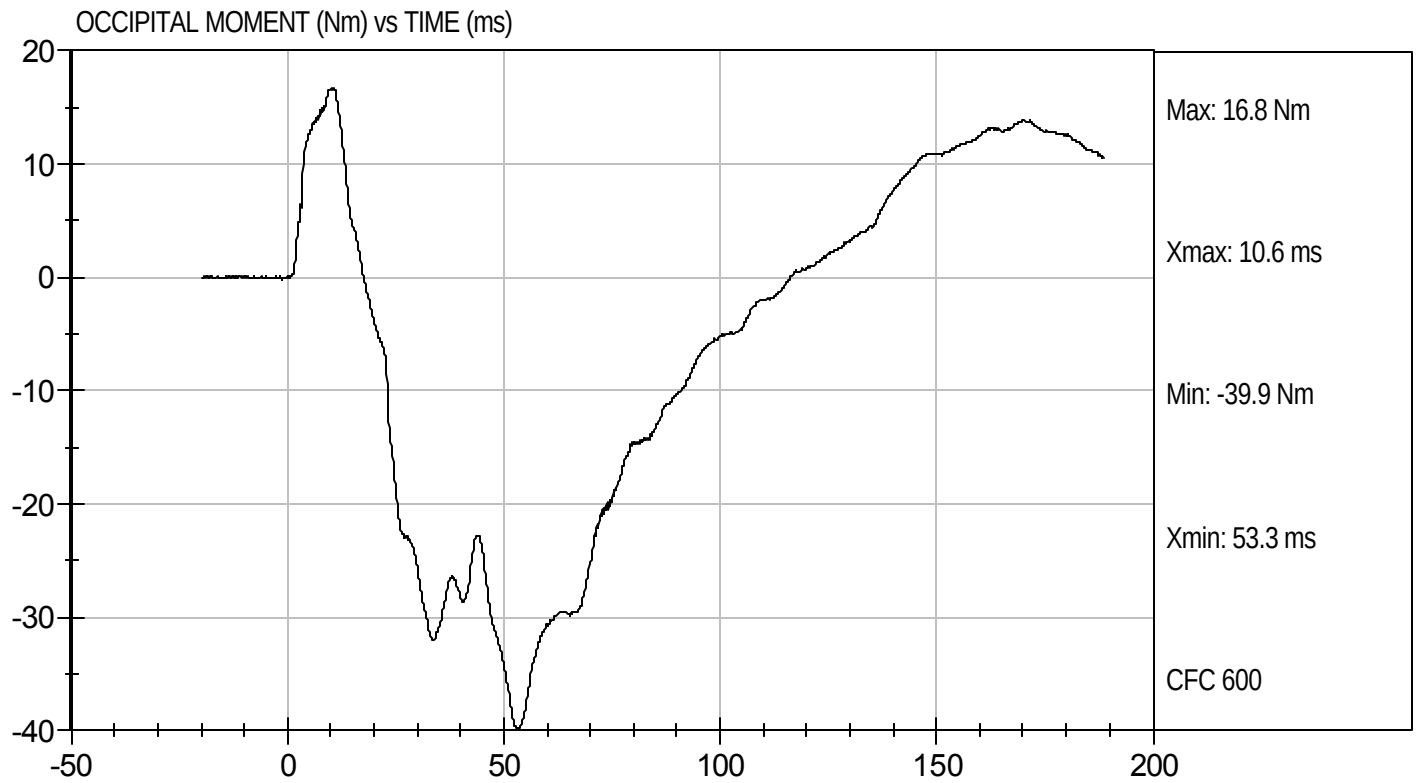
Test Date: 6/15/10
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D101822

Test Date: 6/15/10
Velocity: 18.32 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D101823

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	14	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

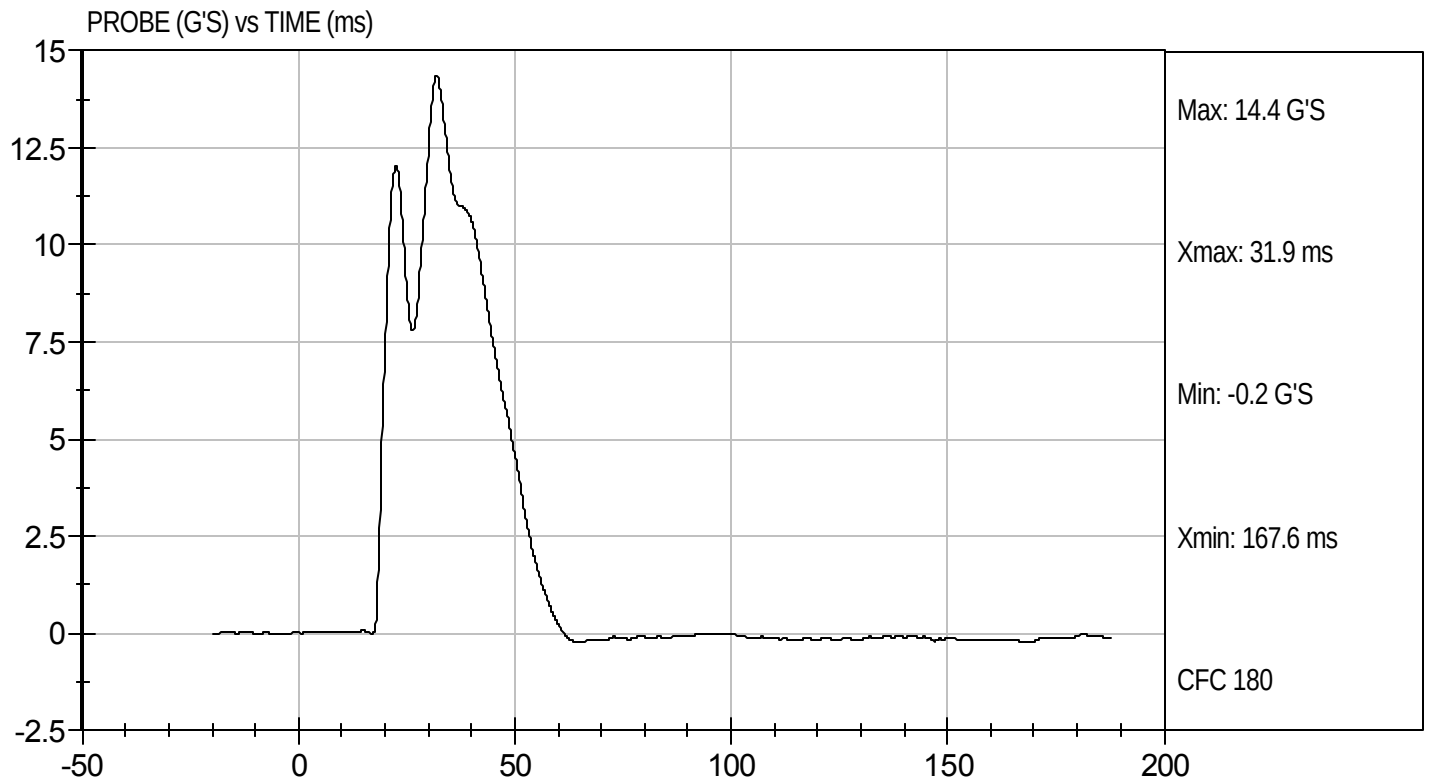
6/14/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D101823

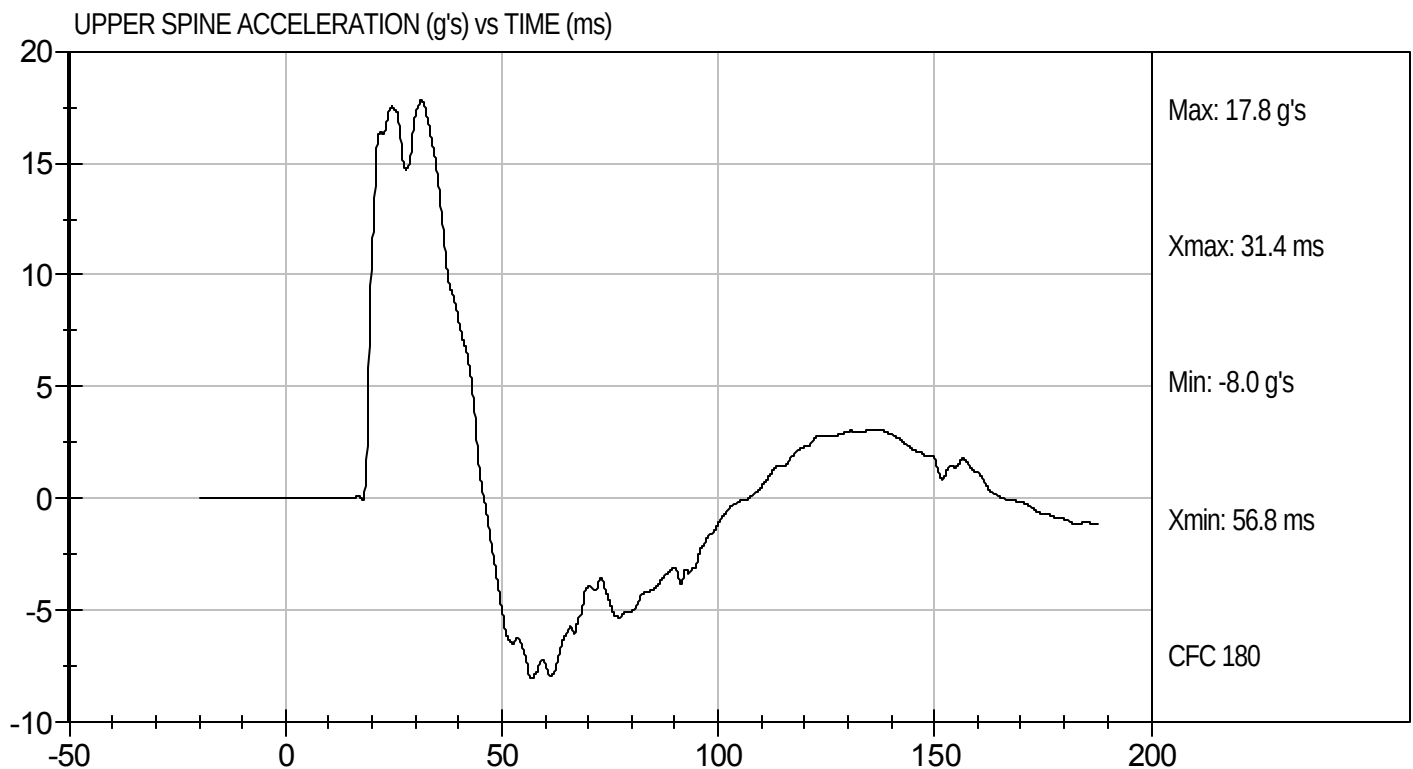
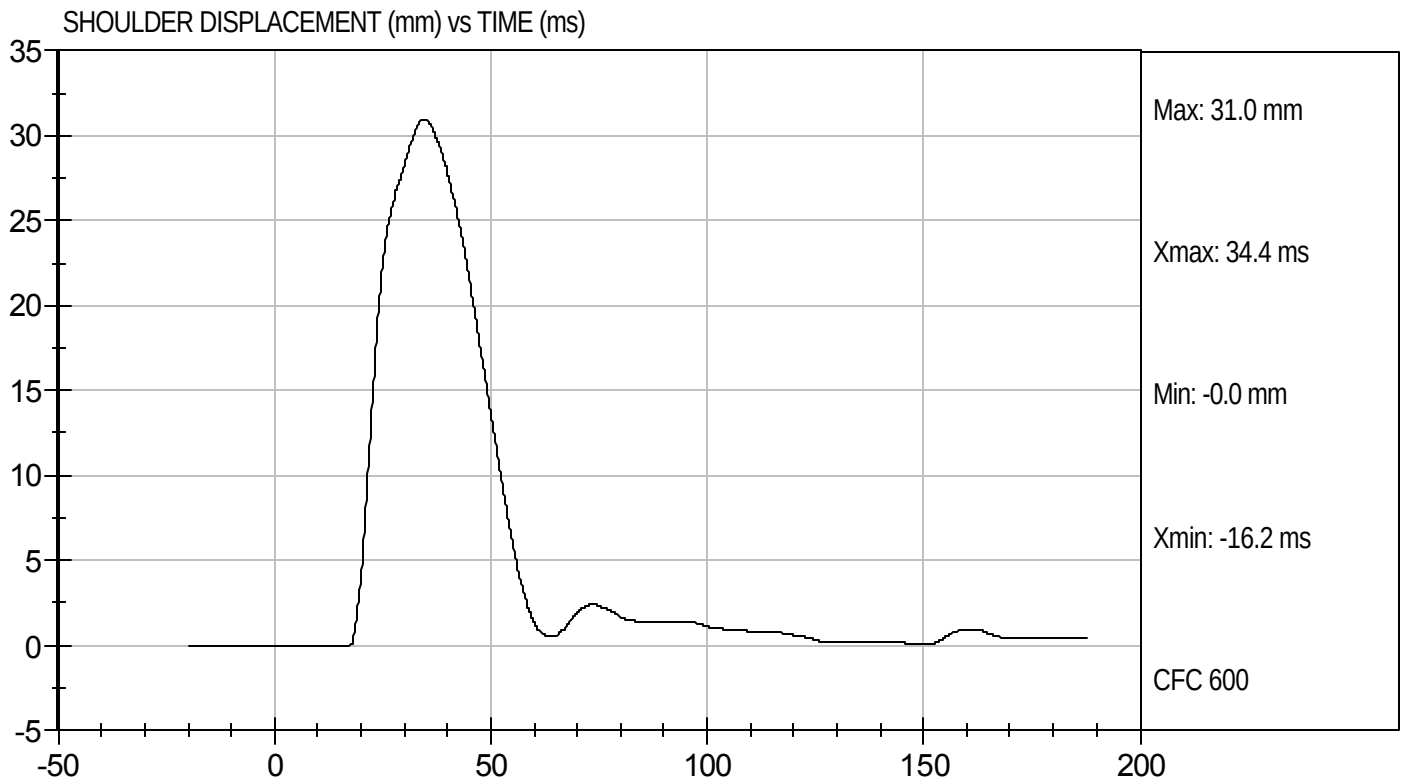
Test Date: 6/14/10
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Shoulder Impact
Component ID: D101823

Test Date: 6/14/10
Velocity: 14.25 ft/s, 4.34 m/s

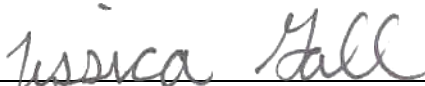


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101824

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	31	Pass
Shoulder Displacement	mm	31 to 40	37	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	34	Pass
Overall Test Results			Pass	


 Laboratory Technician

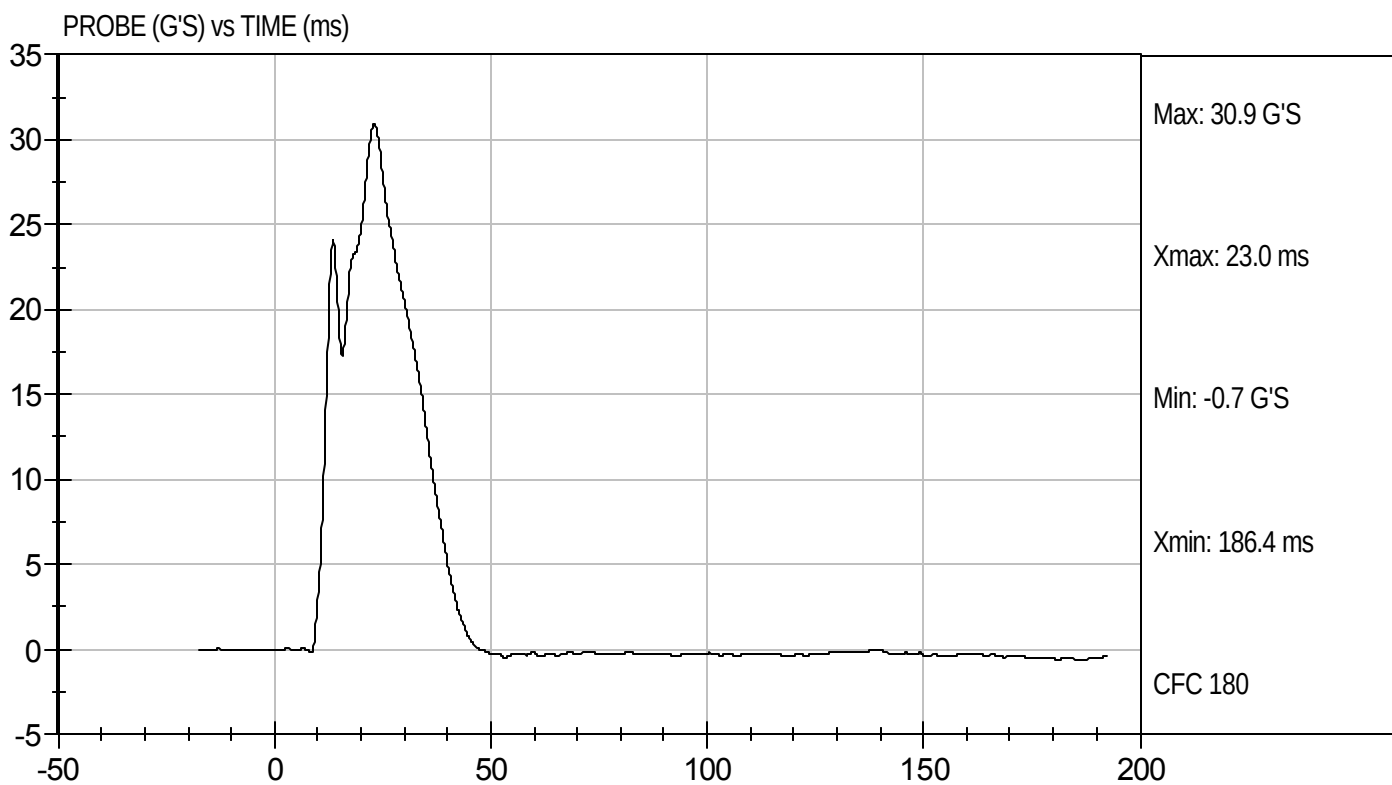
6/14/10
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D101824

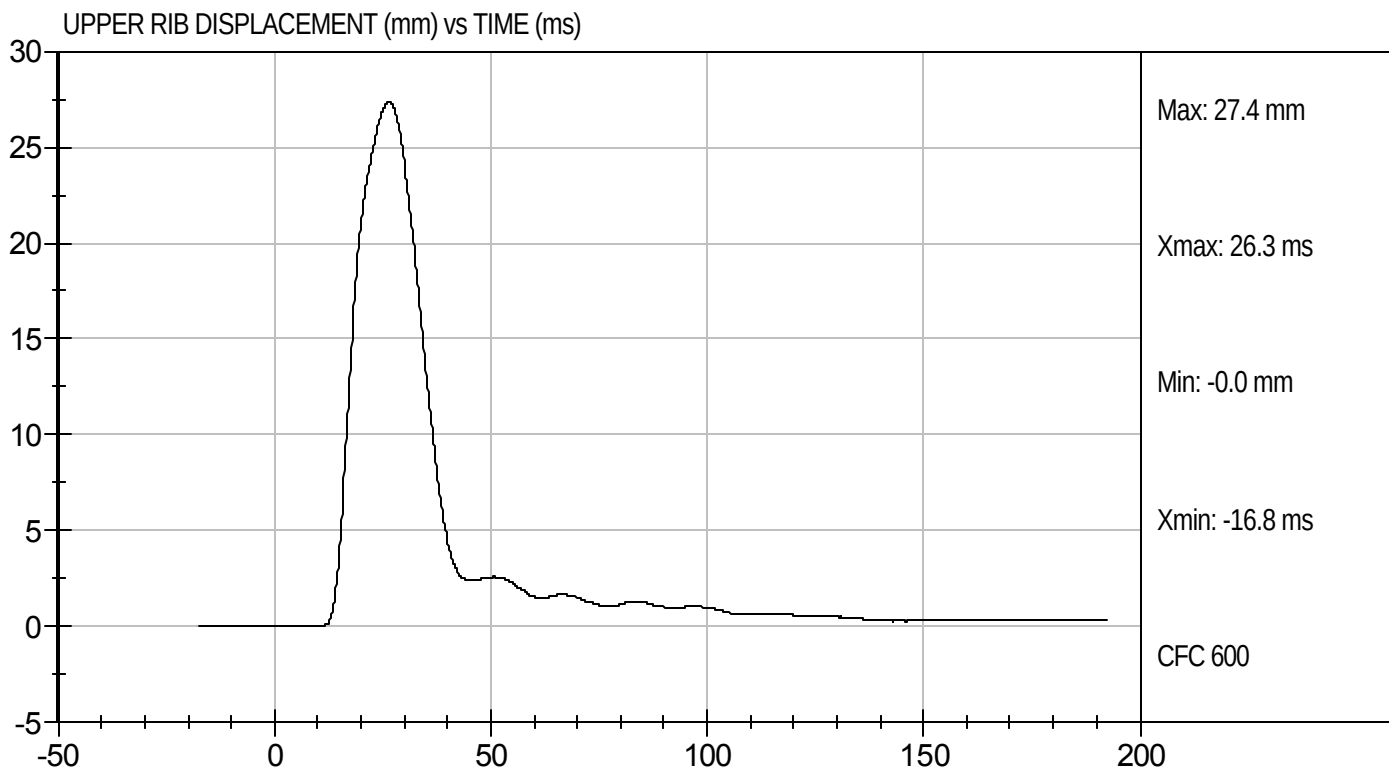
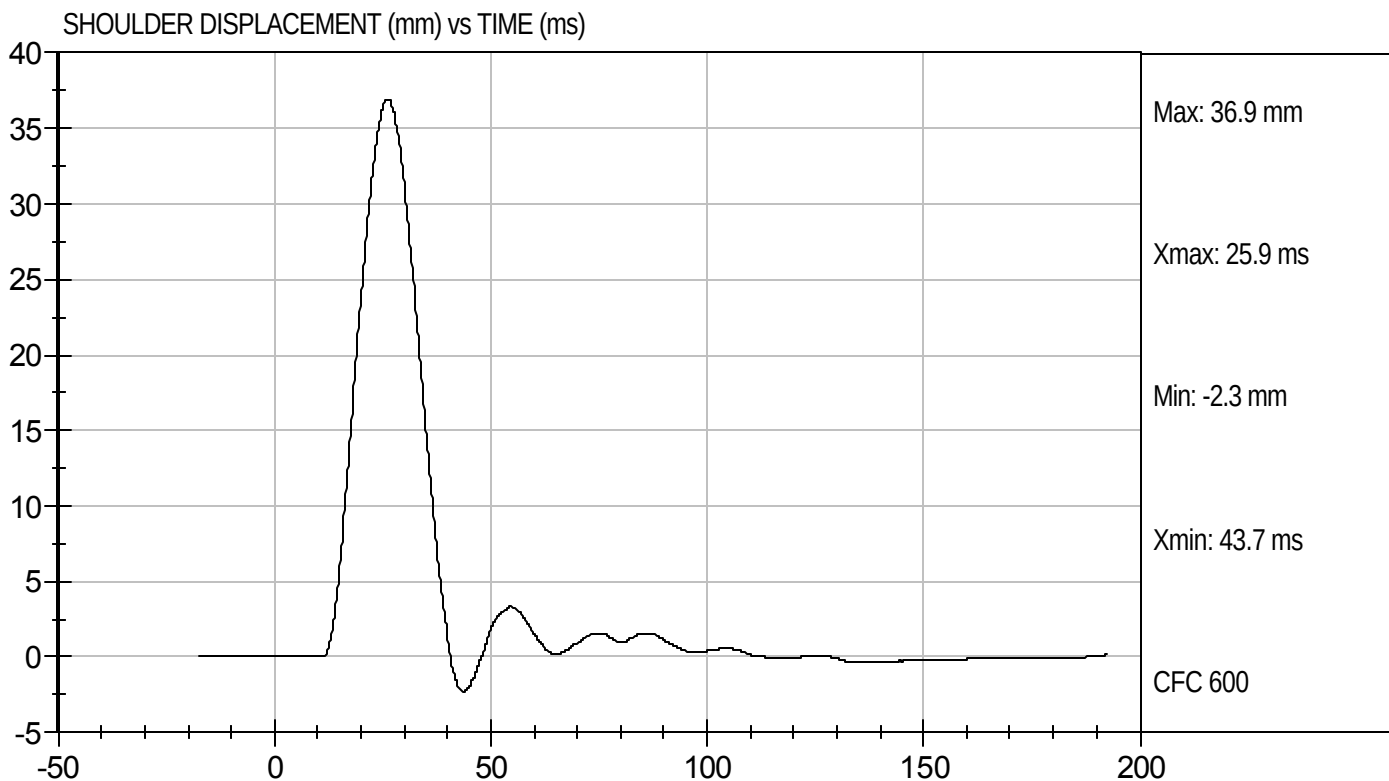
Test Date: 6/14/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D101824

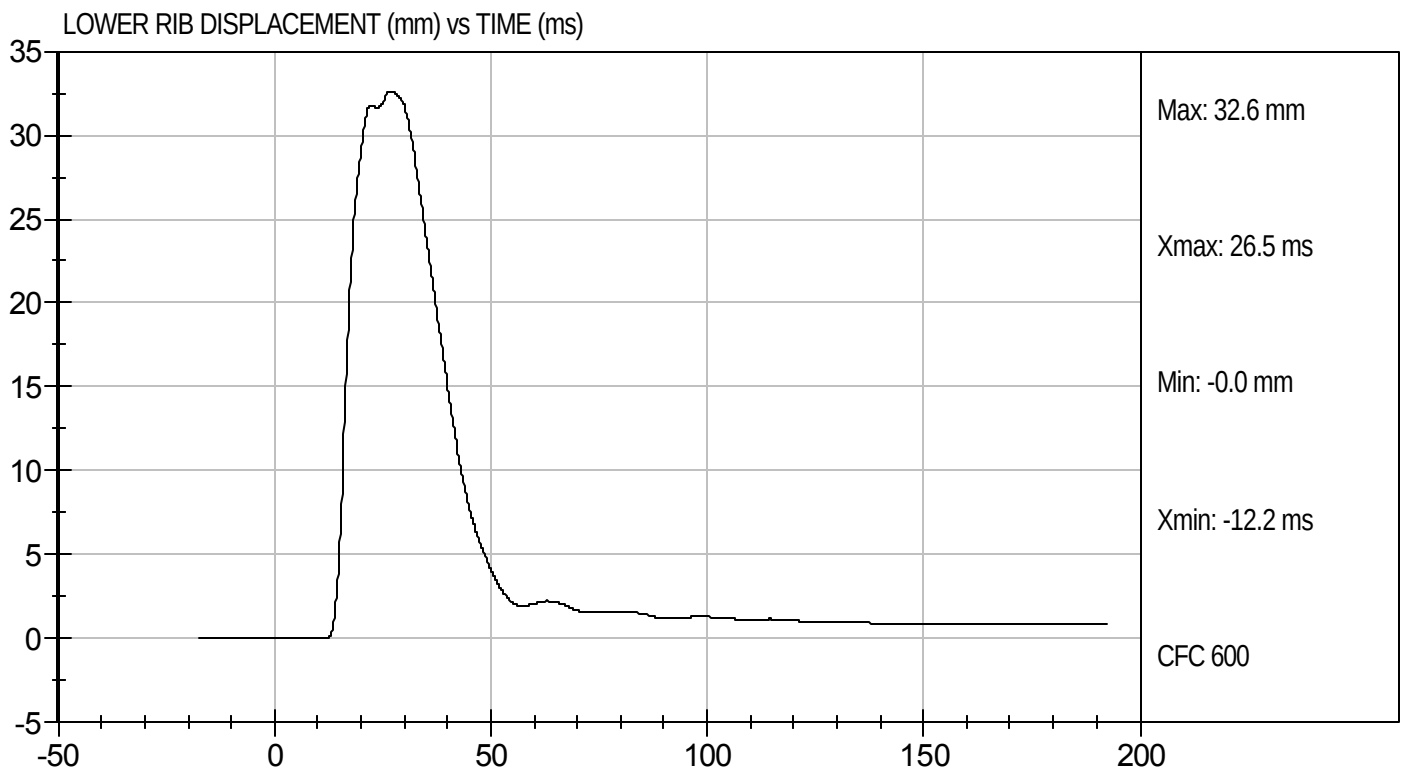
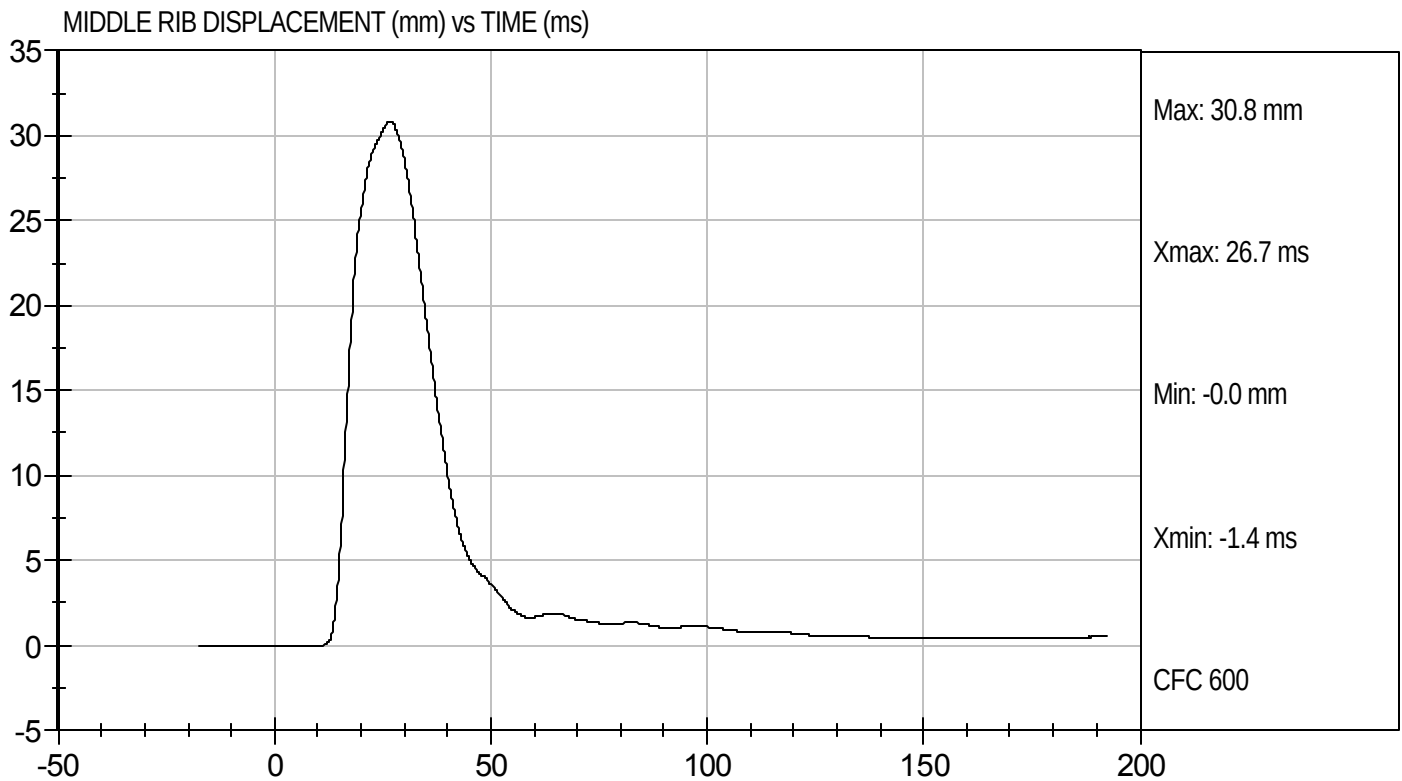
Test Date: 6/14/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D101824

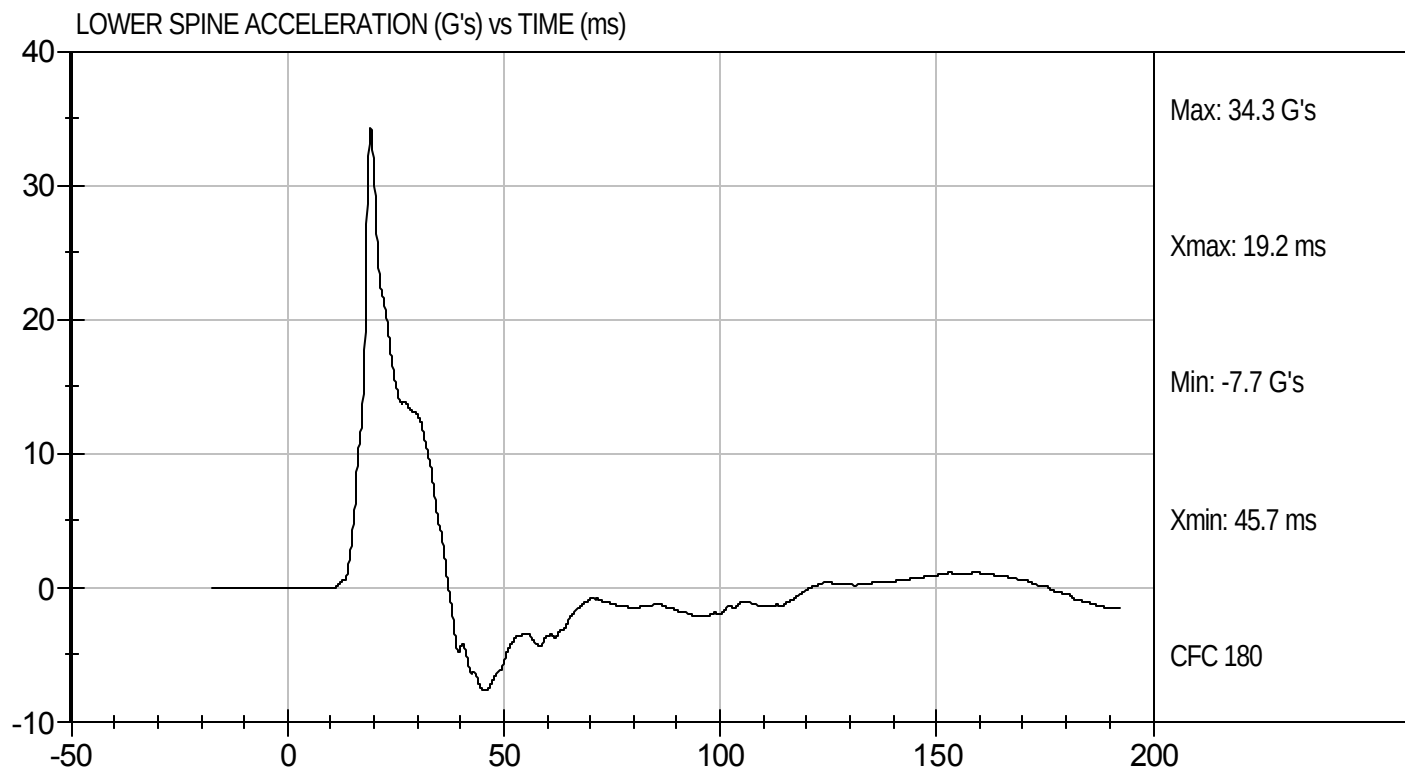
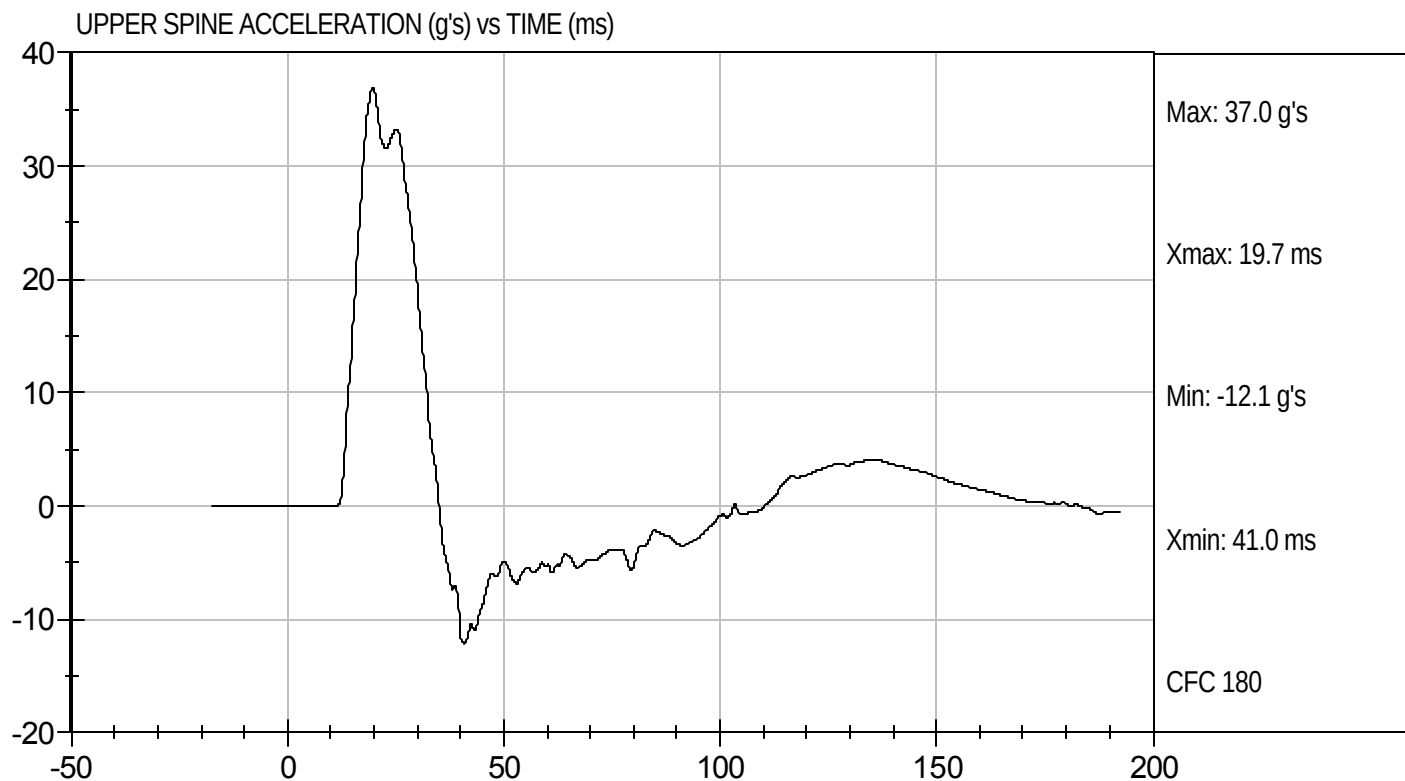
Test Date: 6/14/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D101824

Test Date: 6/14/10
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: 296

Test I.D: D101825

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	56	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Peak Impactor Force	G's	14 to 18	14	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	40	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	13	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass


 Laboratory Technician

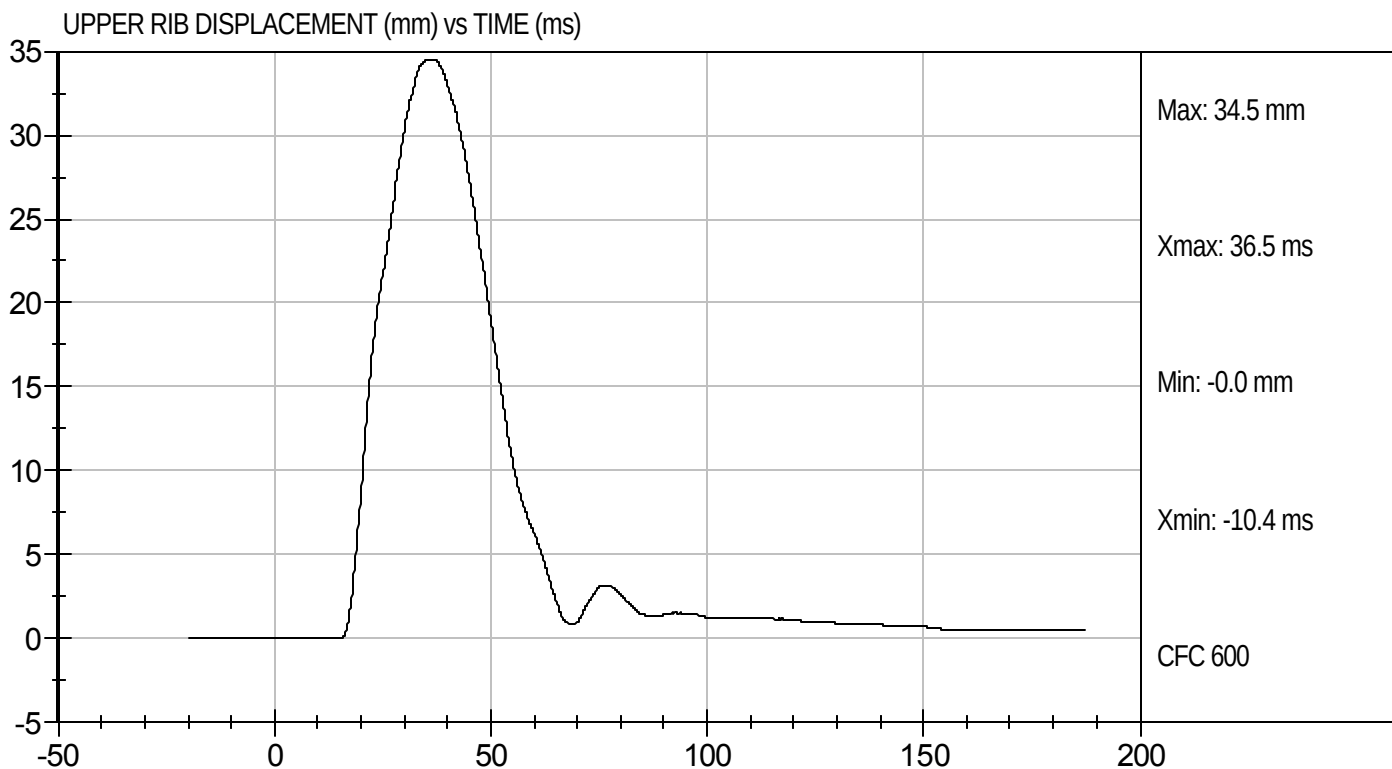
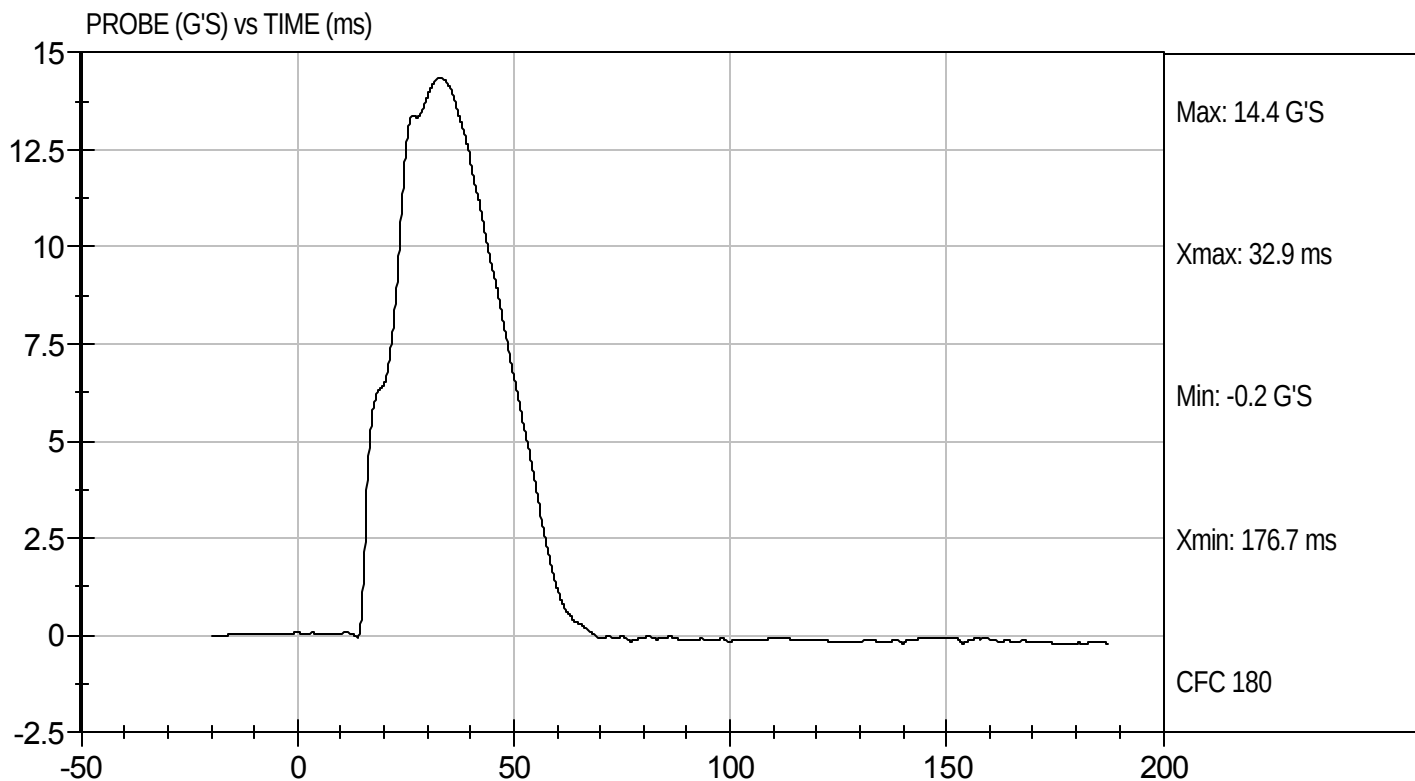
6/14/10
 Test Date


 Approved By



Test Desc: Thorax Without Arm
Component ID: D101825

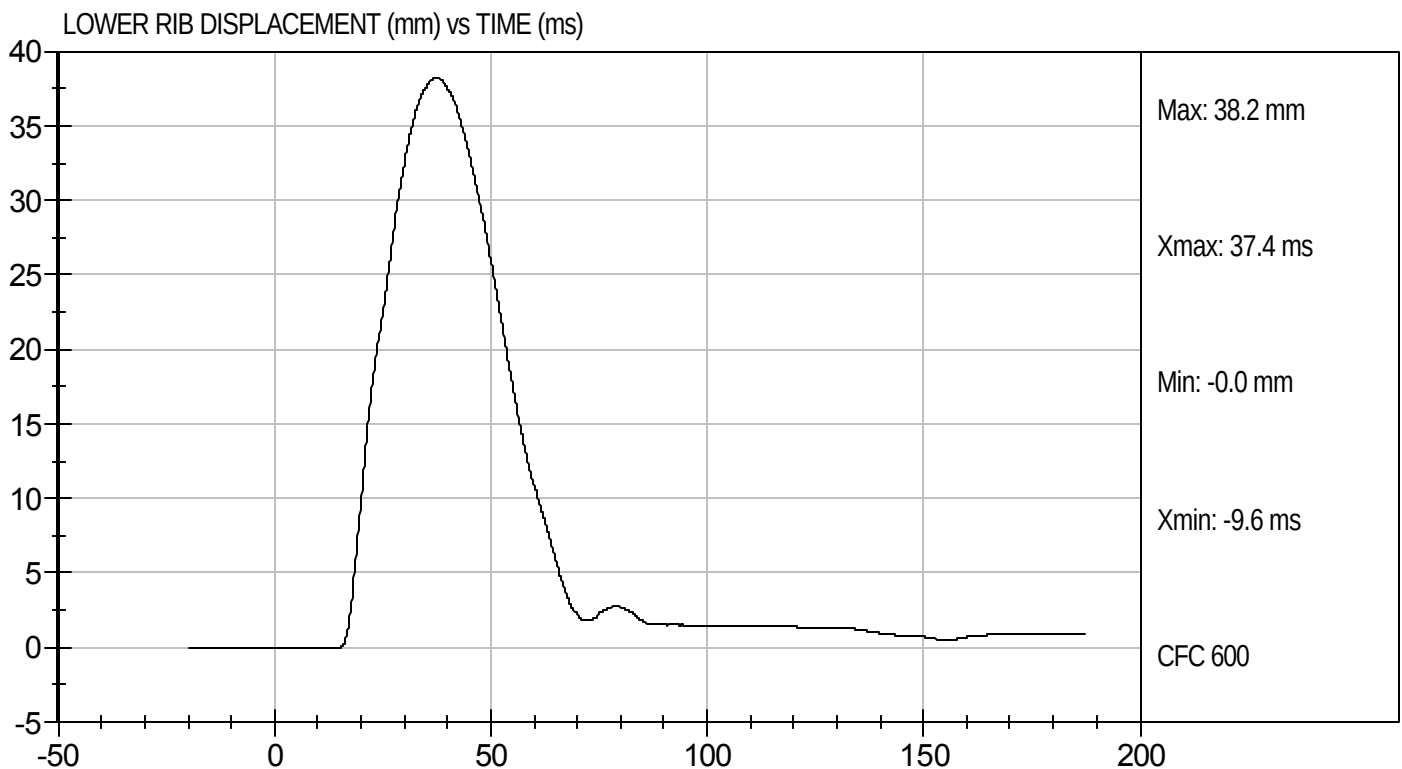
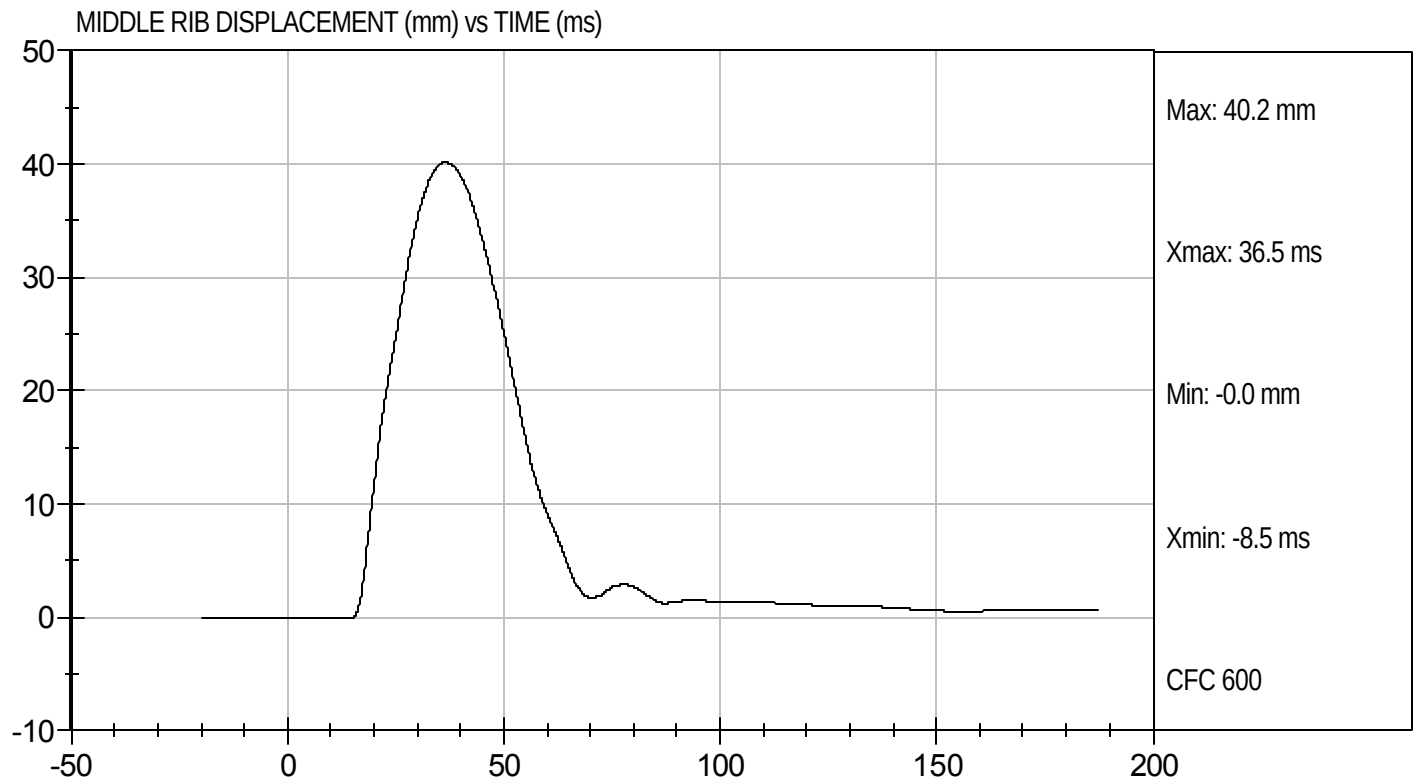
Test Date: 6/14/10
Velocity: 13.89 ft/s, 4.23 m/s





Test Desc: Thorax Without Arm
Component ID: D101825

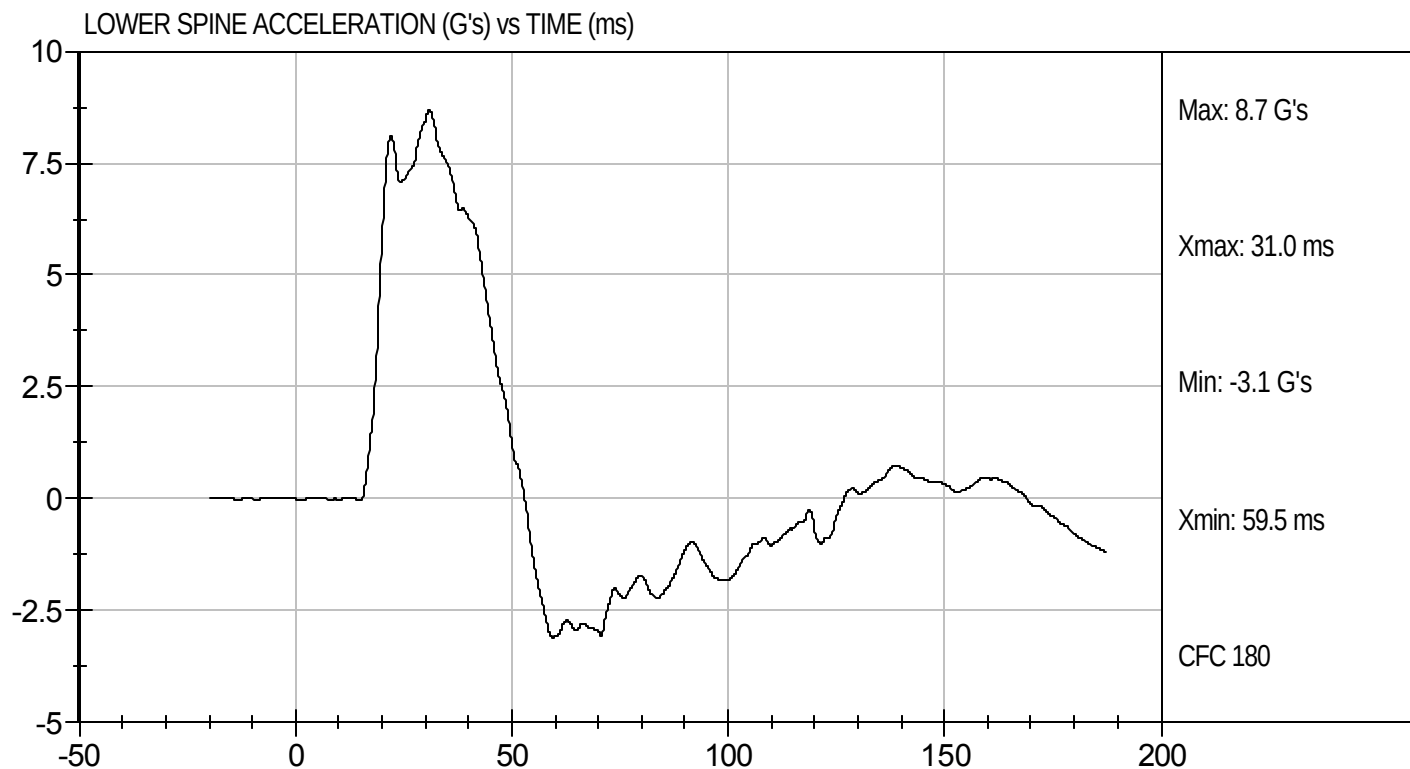
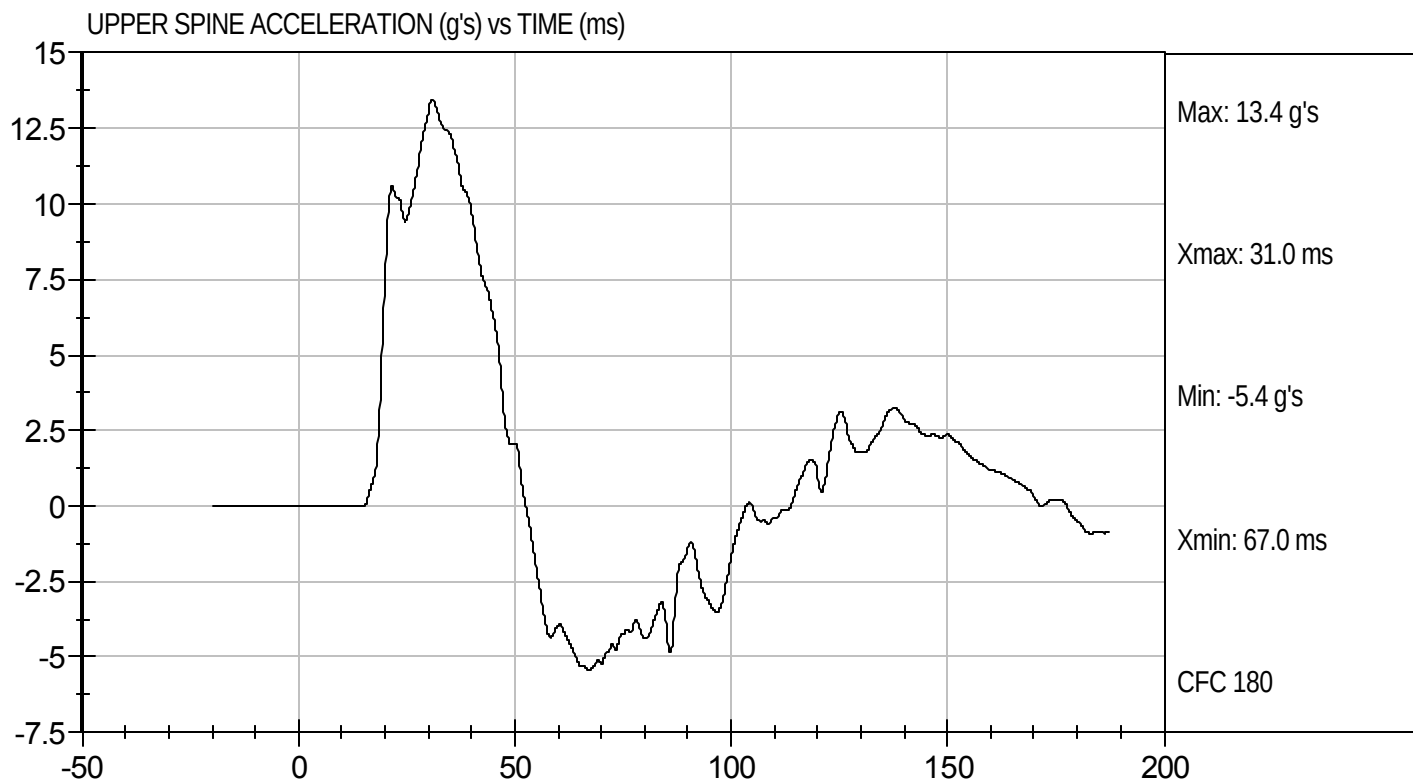
Test Date: 6/14/10
Velocity: 13.89 ft/s, 4.23 m/s





Test Desc: Thorax Without Arm
Component ID: D101825

Test Date: 6/14/10
Velocity: 13.89 ft/s, 4.23 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-II's BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101826

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	56	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	37	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

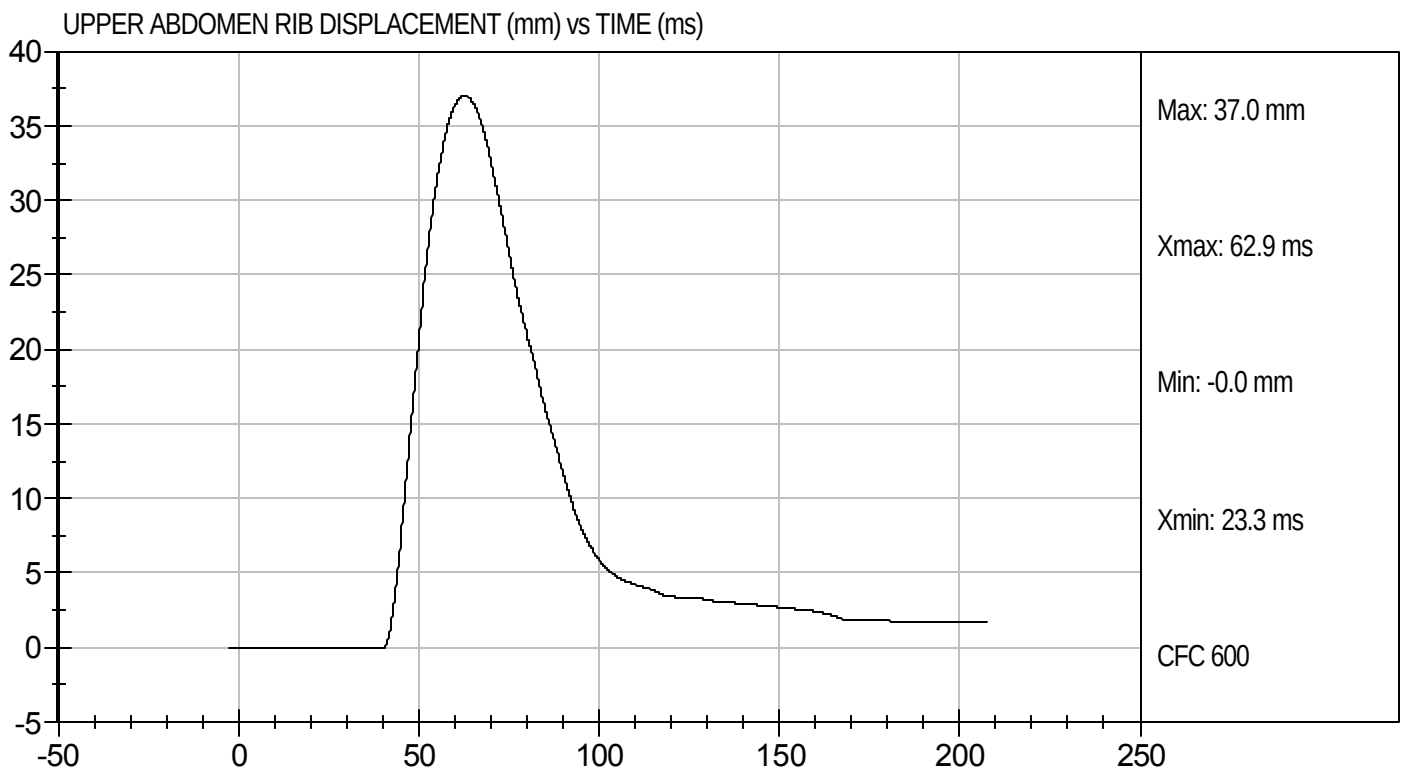
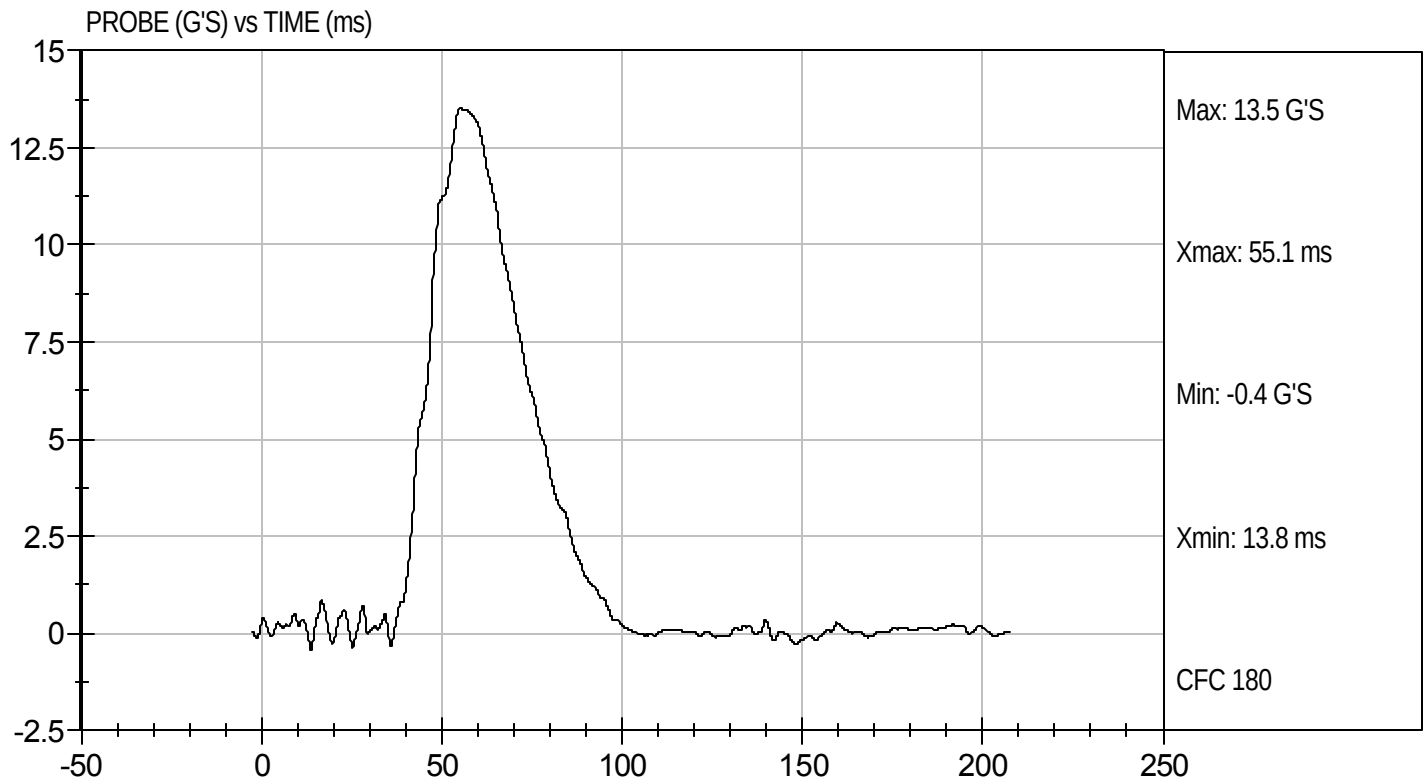
6/14/10
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D101826

Test Date: 6/14/10
Velocity: 13.89 ft/s, 4.23 m/s

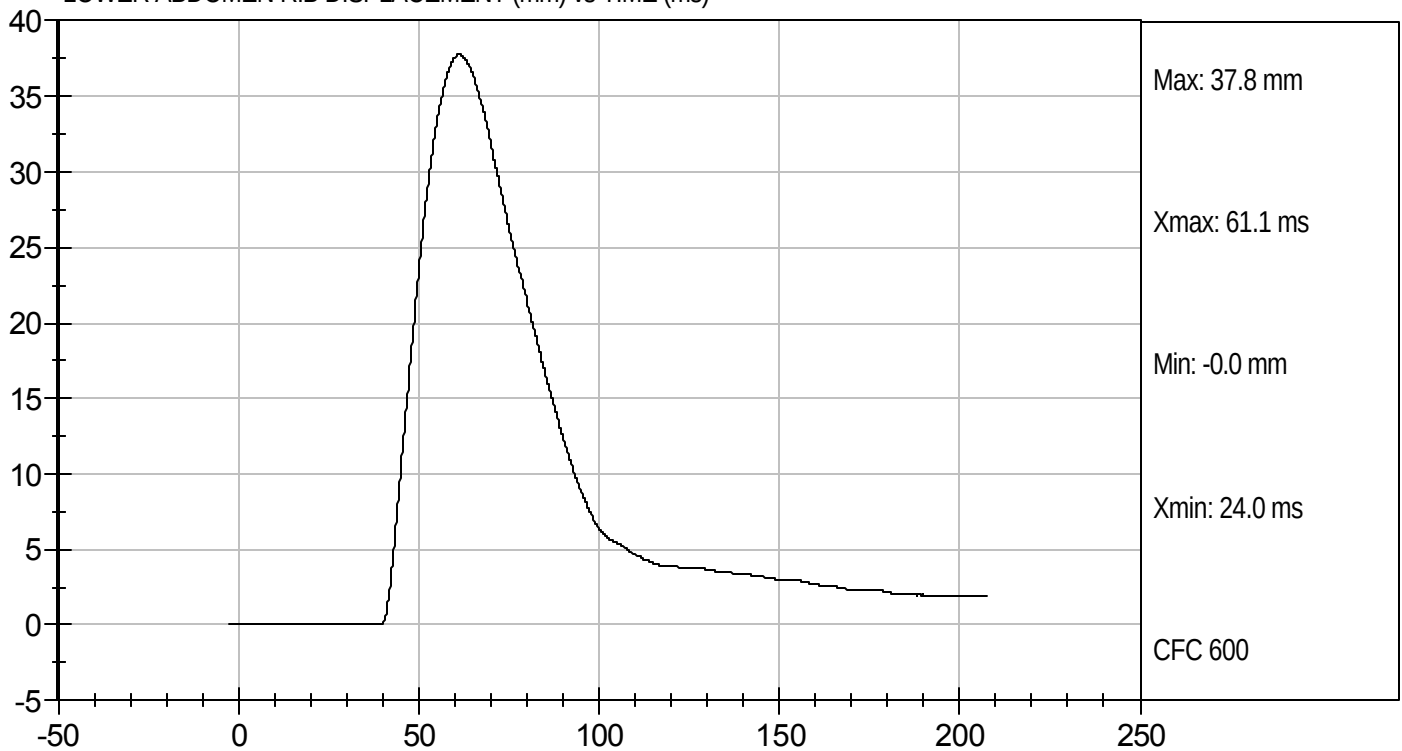




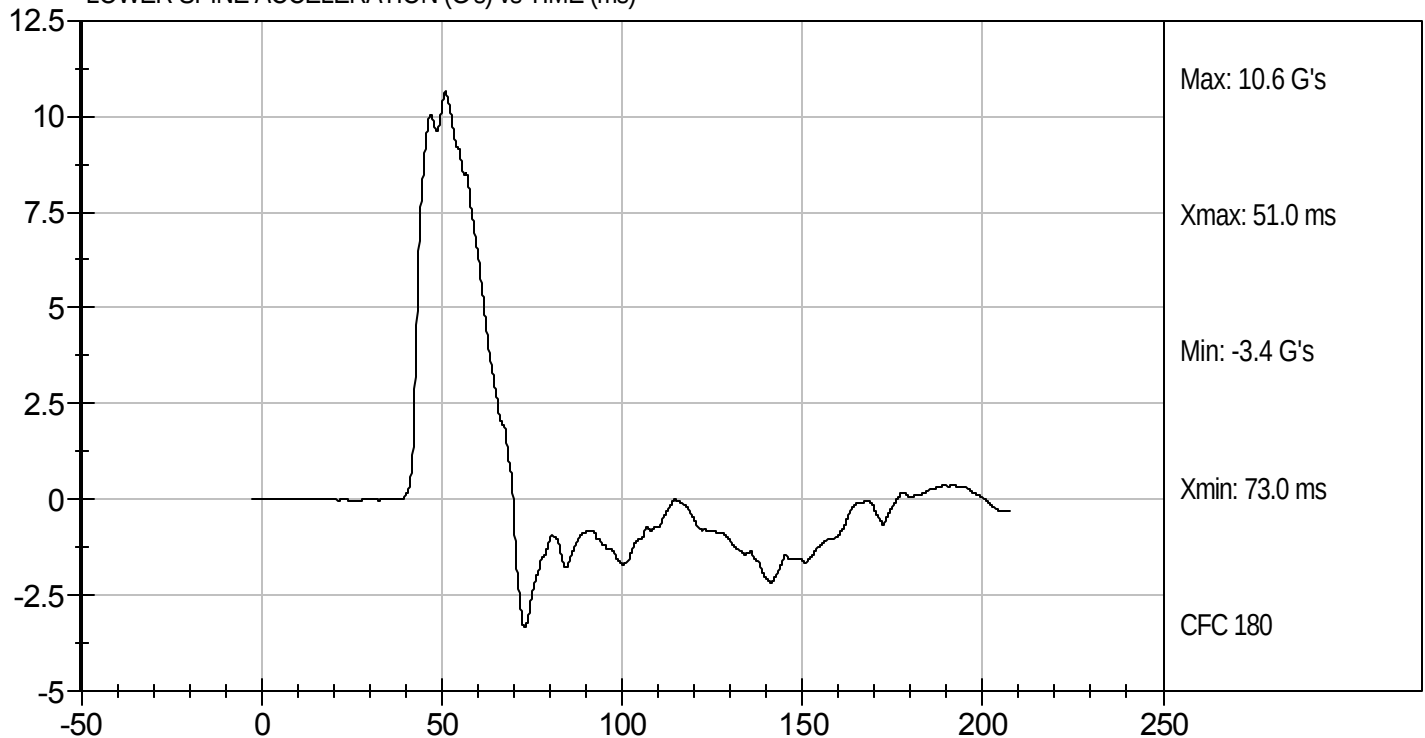
Test Desc: Abdomen Impact
Component ID: D101826

Test Date: 6/14/10
Velocity: 13.89 ft/s, 4.23 m/s

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



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



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

ATD Serial No: 296

Test I.D: D101827

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	55	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	38	Pass
Peak Acetabulum Force	N	3600 to 4300	3998	Pass
Overall Test Results				Pass


Laboratory Technician

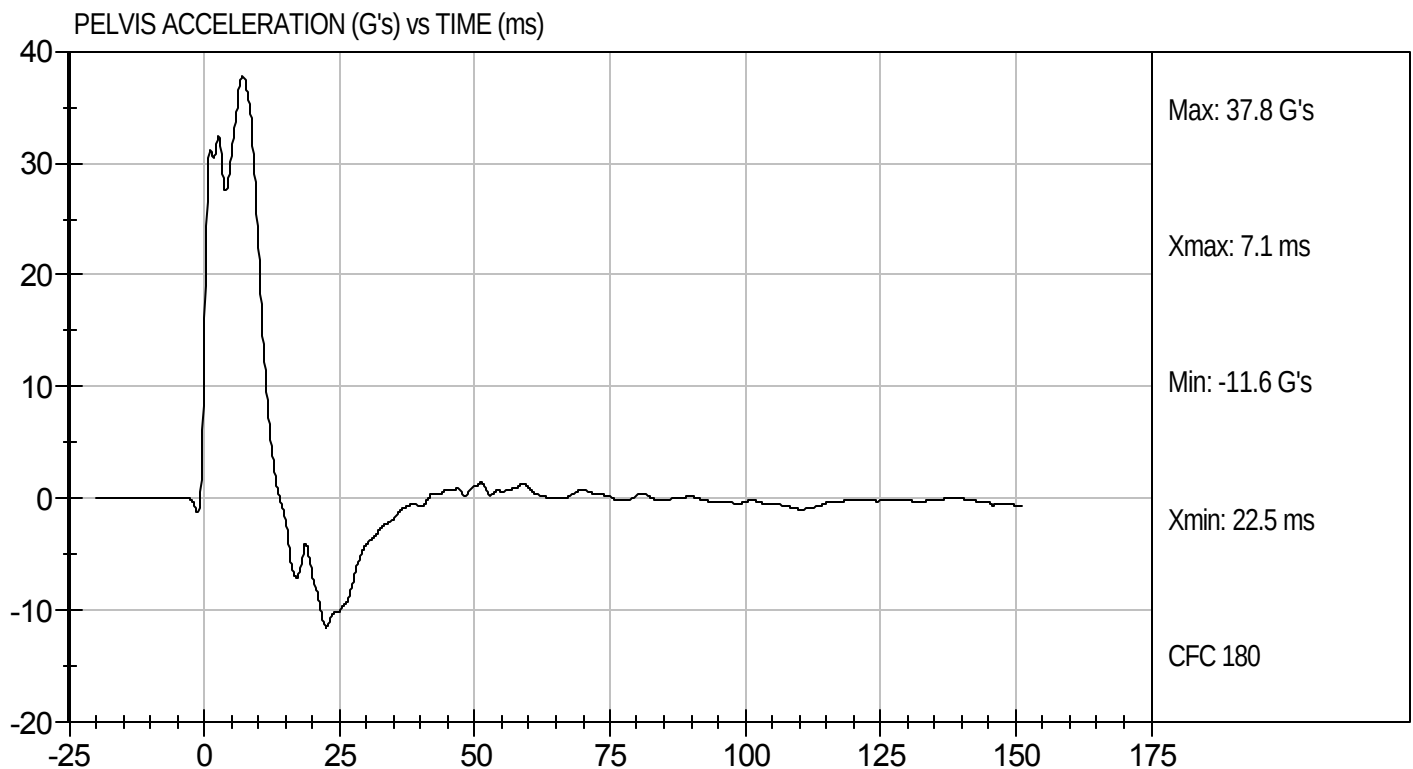
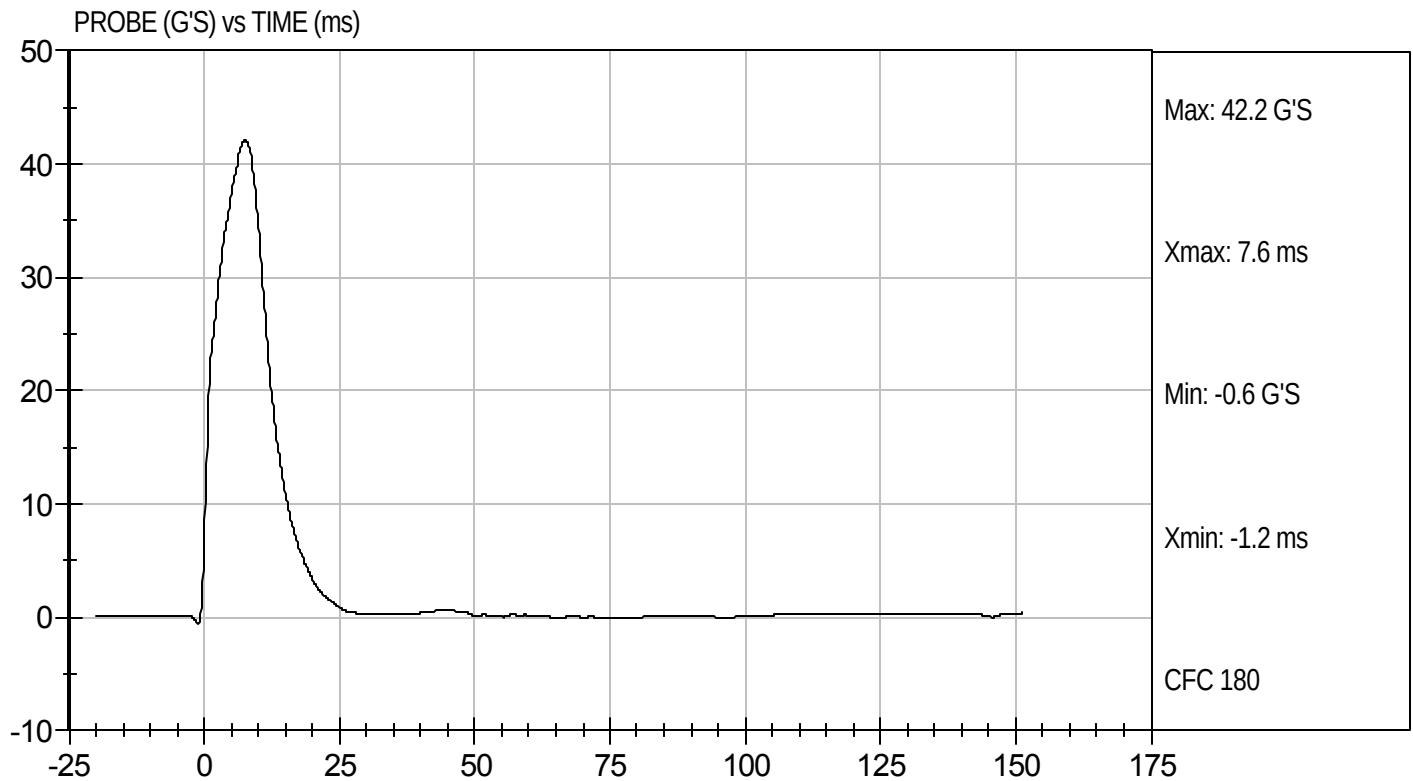
6/14/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D101827

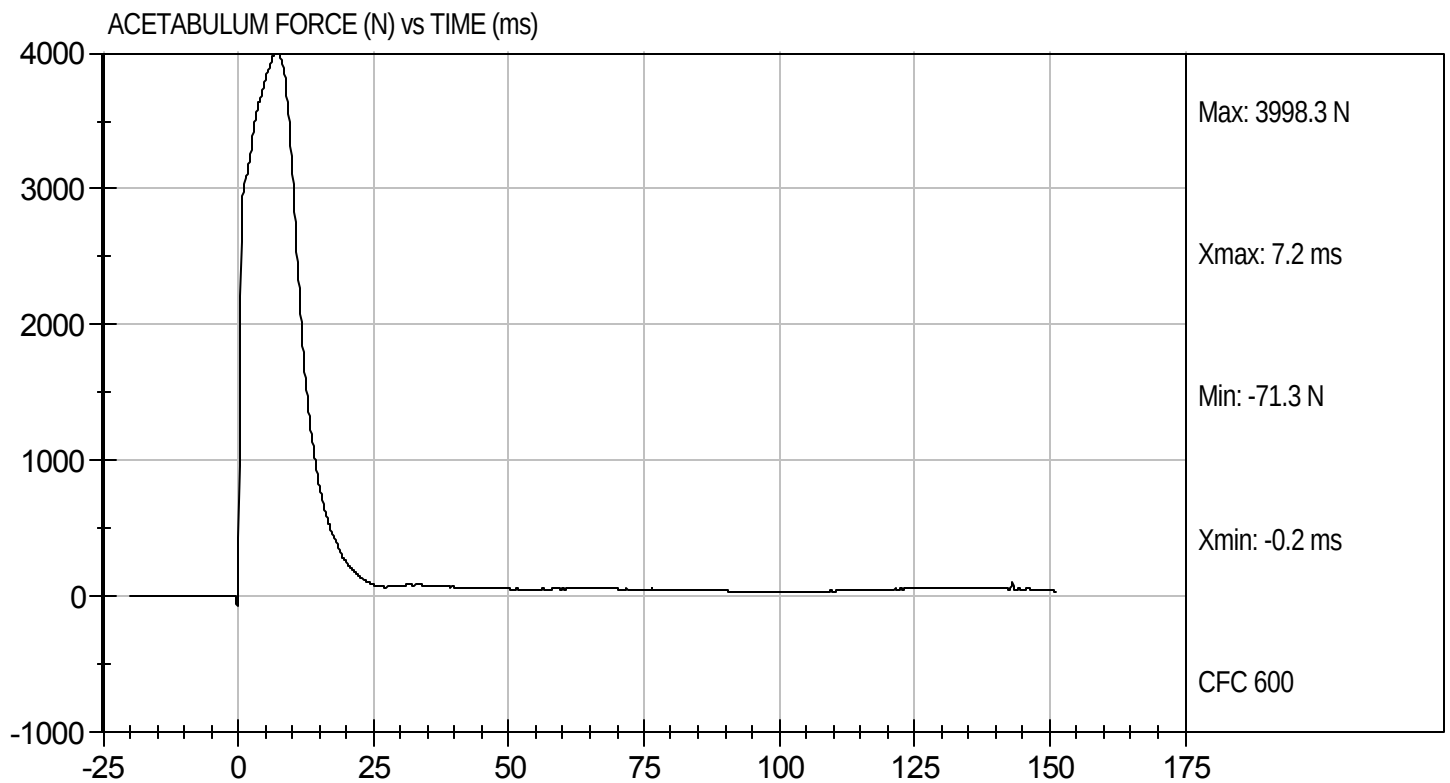
Test Date: 6/14/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D101827

Test Date: 6/14/10
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 296

Test I.D: D101828

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	55	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	36 to 45	37	Pass
Pelvis Y Acceleration	G's	28 to 39	35	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4592	Pass
Overall Test Results			Pass	


Laboratory Technician

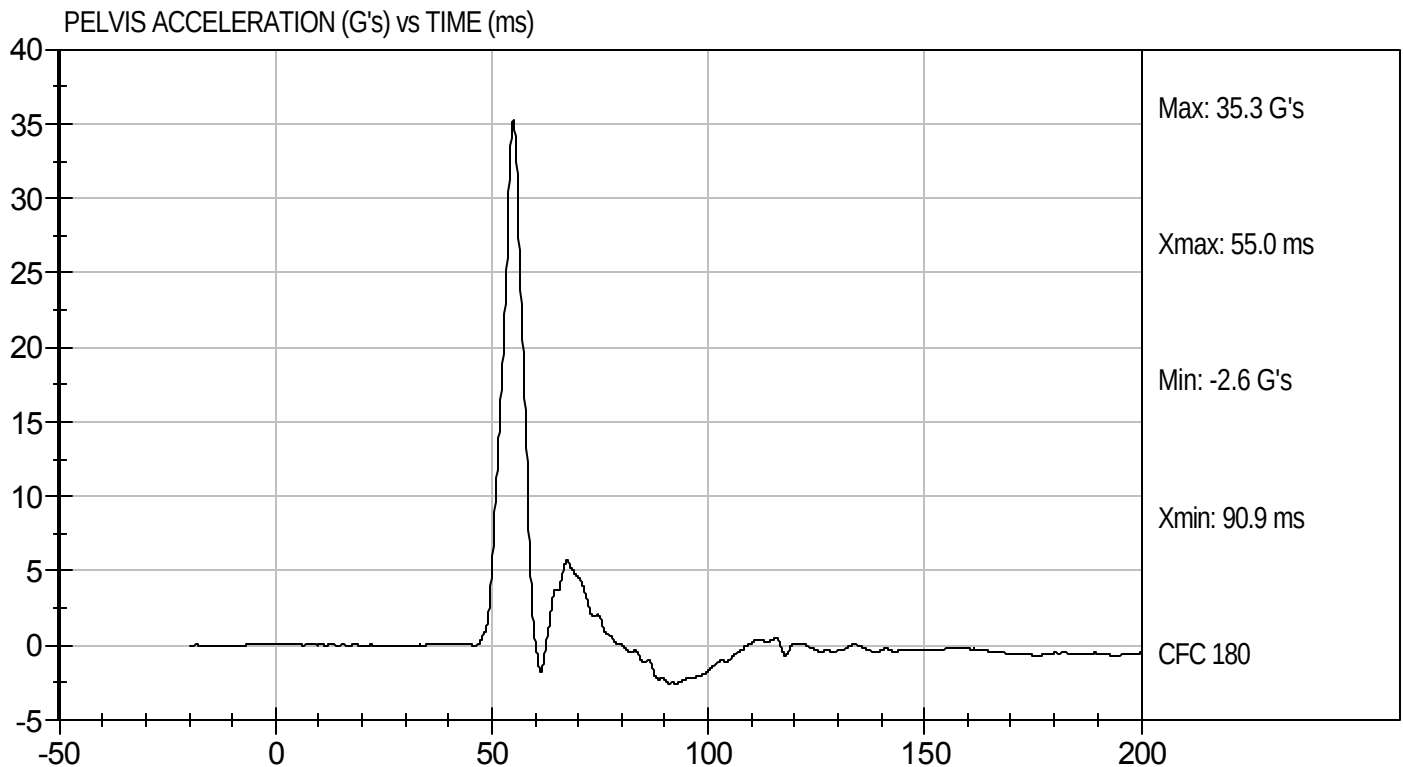
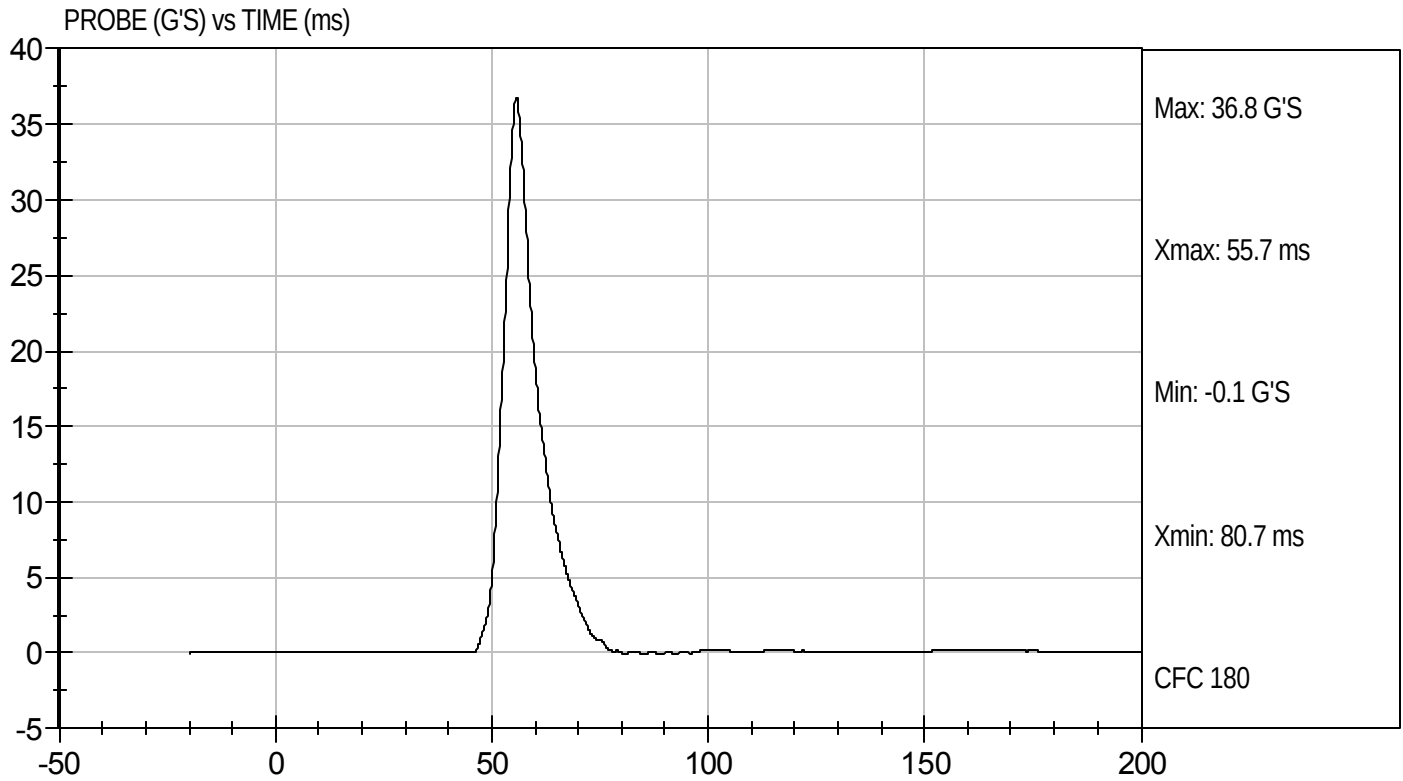
6/14/10
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D101828

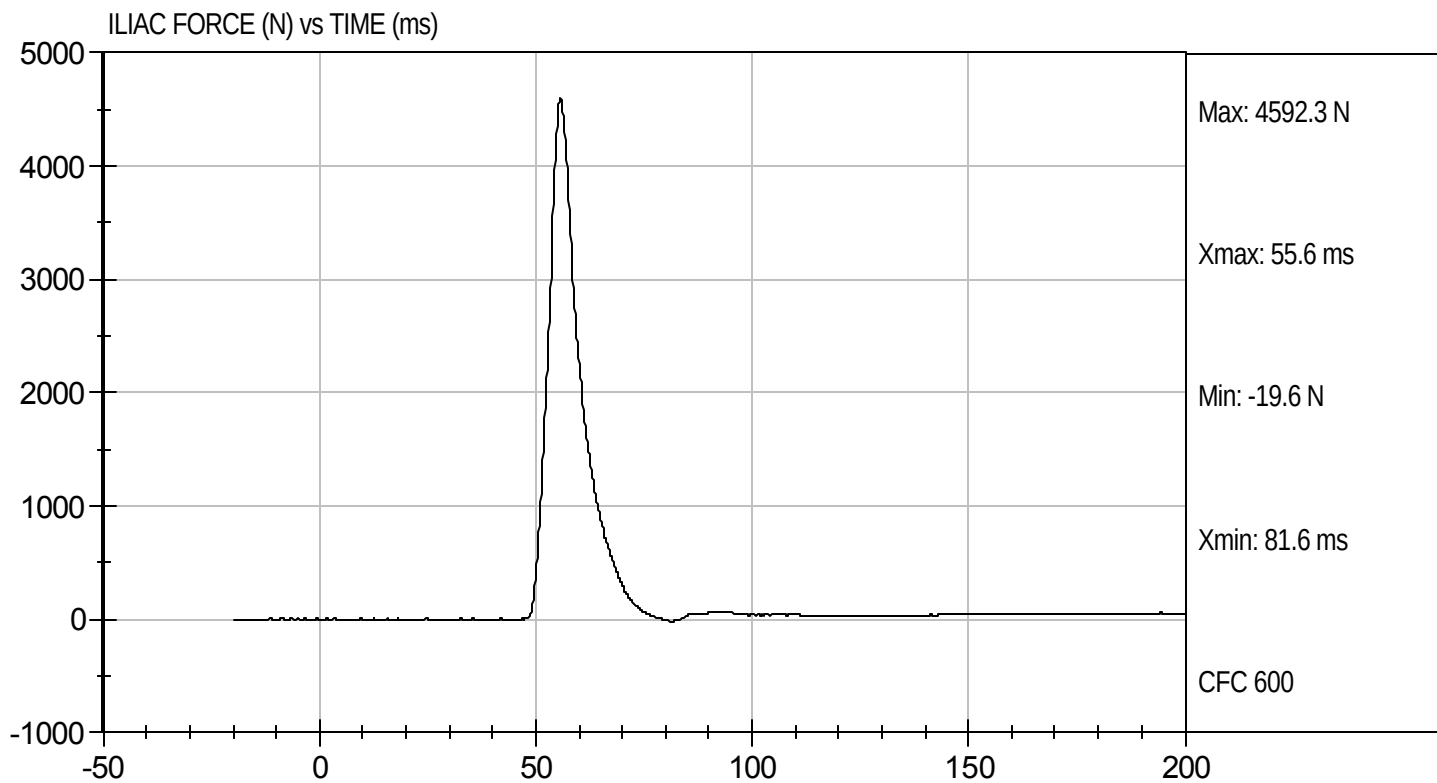
Test Date: 6/14/10
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D101828

Test Date: 6/14/10
Velocity: 14.12 ft/s, 4.30 m/s

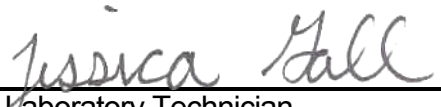


MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D102371

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Peak Resultant Acceleration	G's	115 to 137	116	Pass
Peak Lateral Acceleration	G's	+/- 15	5.3	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

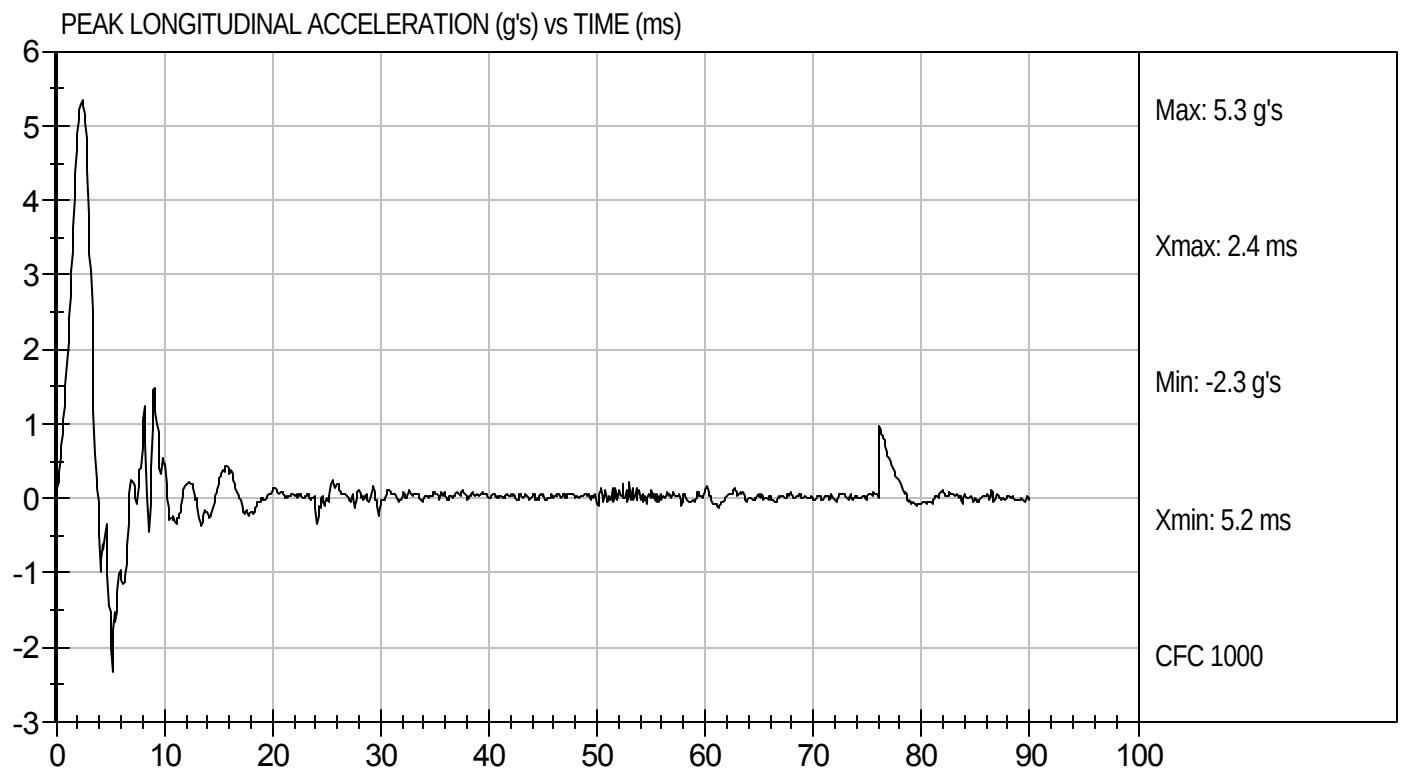
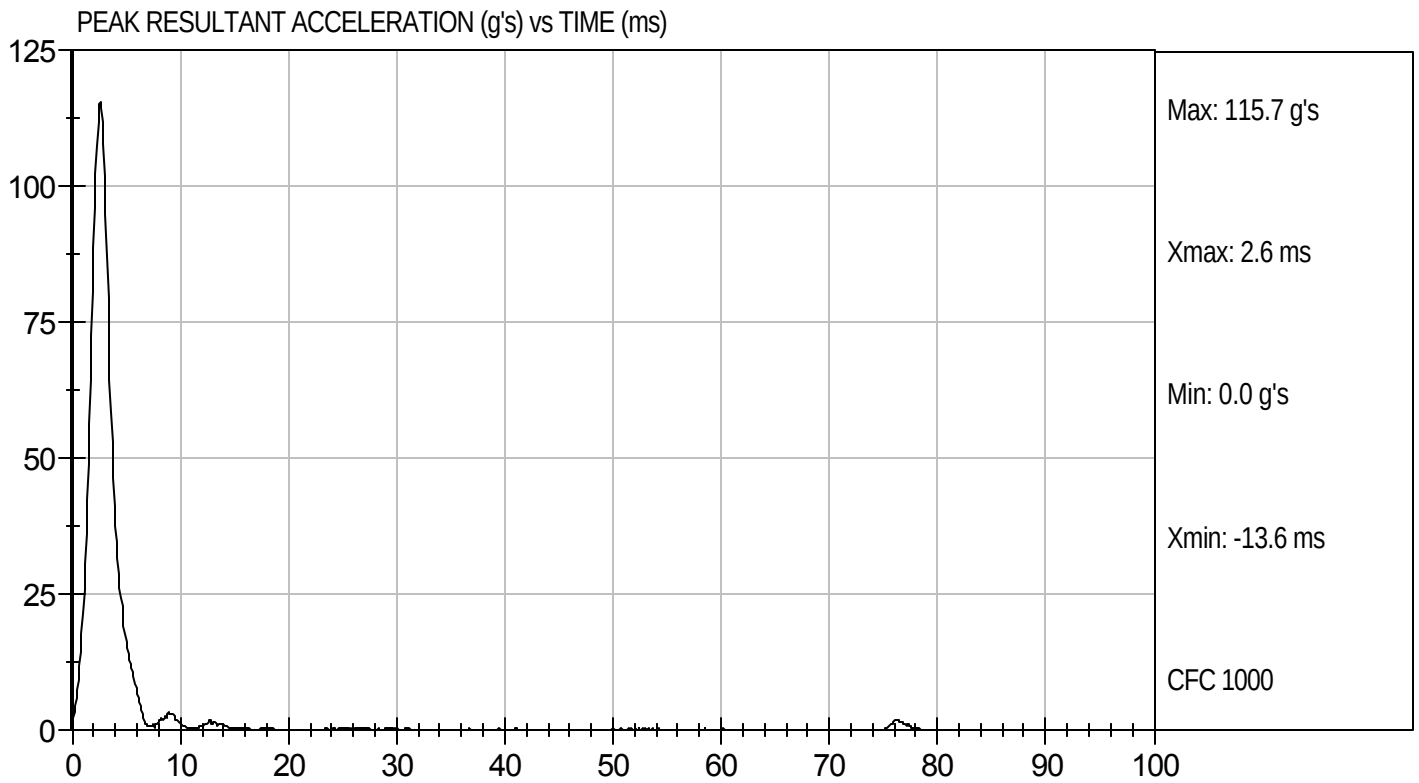
7/26/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D102371

Test Date: 7/26/10
Velocity: 0 ft/s, 0 m/s



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

ATD Serial No: 296

Test I.D: D102372

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.9	Pass
Humidity		%	10 to 70	47	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.73	Pass
	15 ms	m/s	3.30 to 4.10	3.86	Pass
	20 ms	m/s	4.40 to 5.40	5.10	Pass
	25 ms	m/s	5.40 to 6.10	5.55	Pass
	25-100 ms	m/s	5.50 to 6.20	5.56	Pass
Maximum D-Plane Rotation		deg	71 to 81	76	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	60	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	114	Pass
Overall Test Results				Pass	


 Laboratory Technician

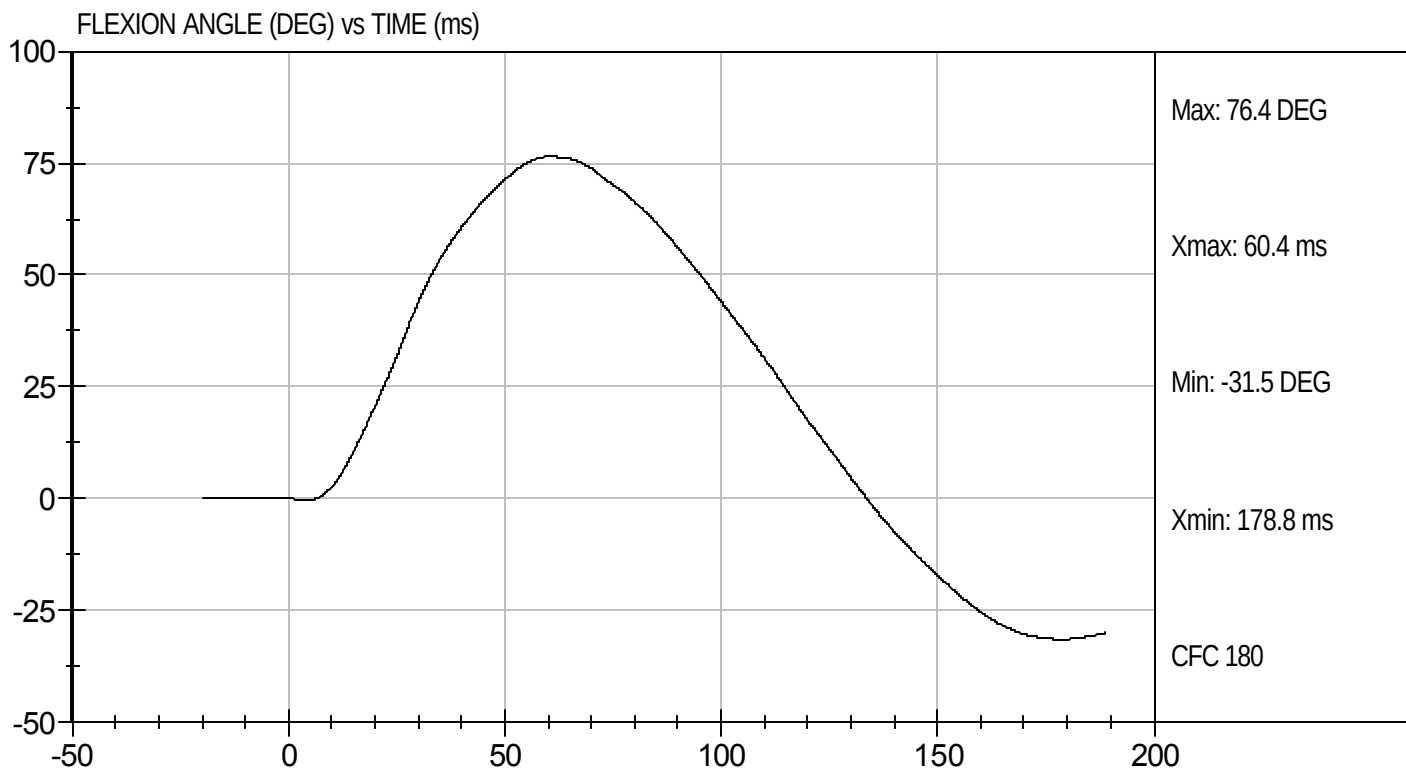
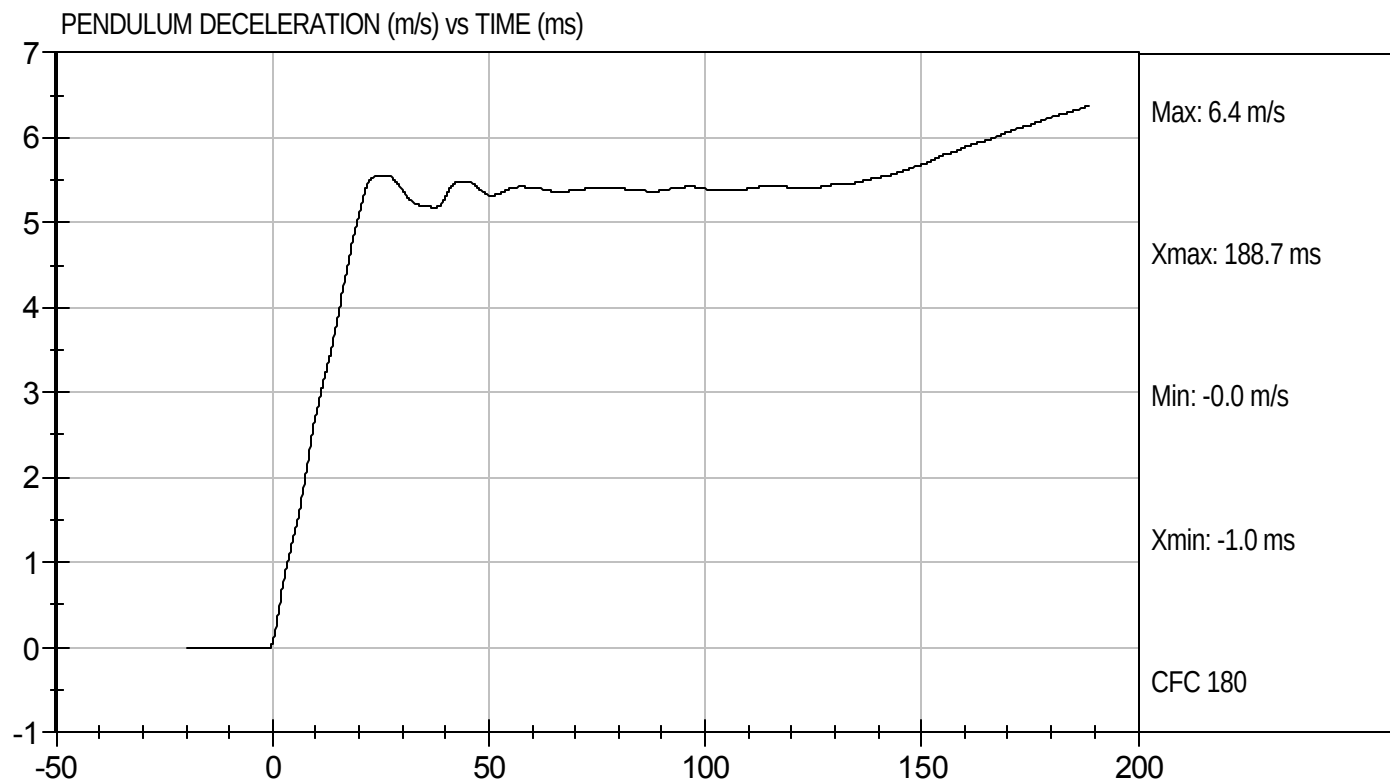
7/26/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D102372

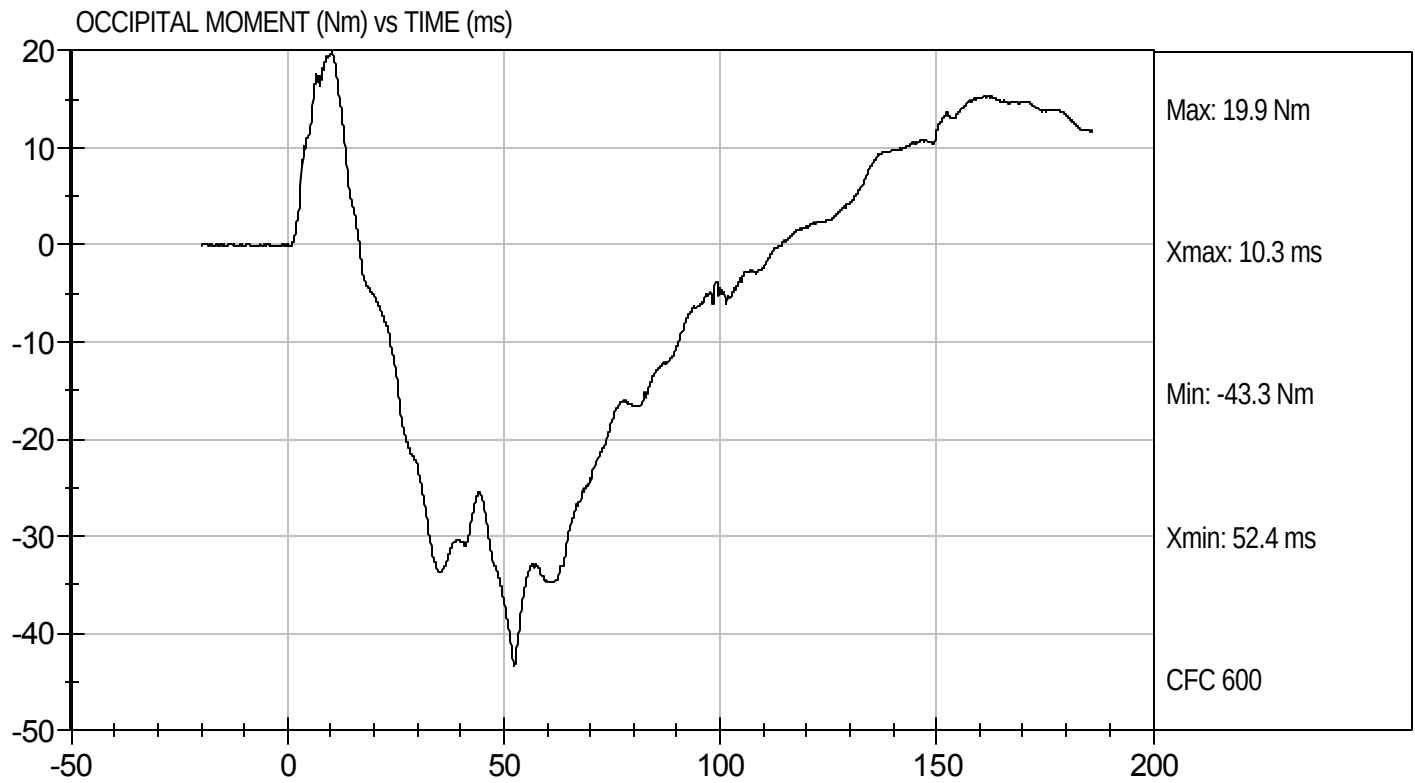
Test Date: 7/26/10
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D102372

Test Date: 7/26/10
Velocity: 18.32 ft/s, 5.58 m/s

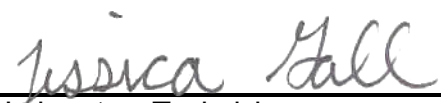


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D102373

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass


Laboratory Technician

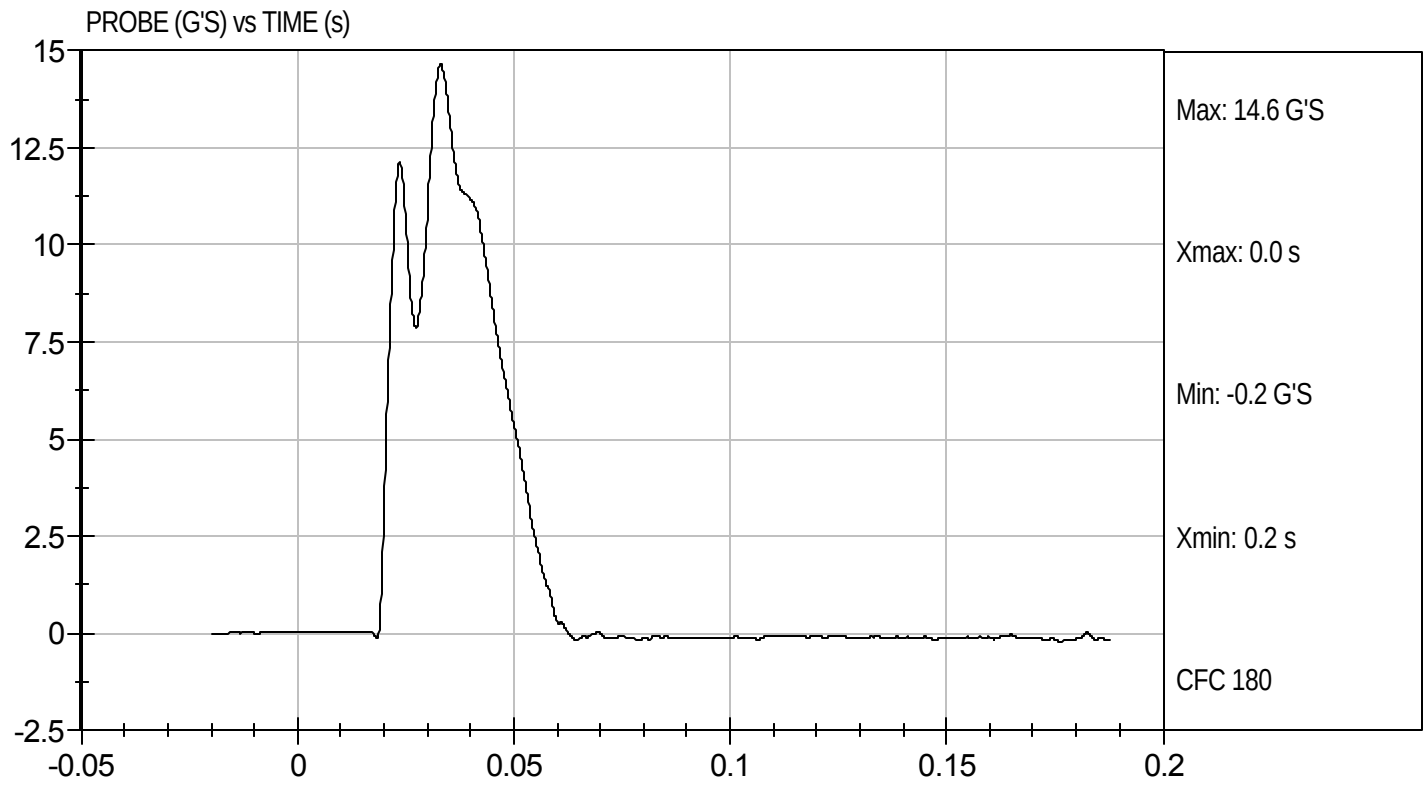
7/26/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D102373

Test Date: 7/26/10
Velocity: 14.0 ft/s, 4.27 m/s

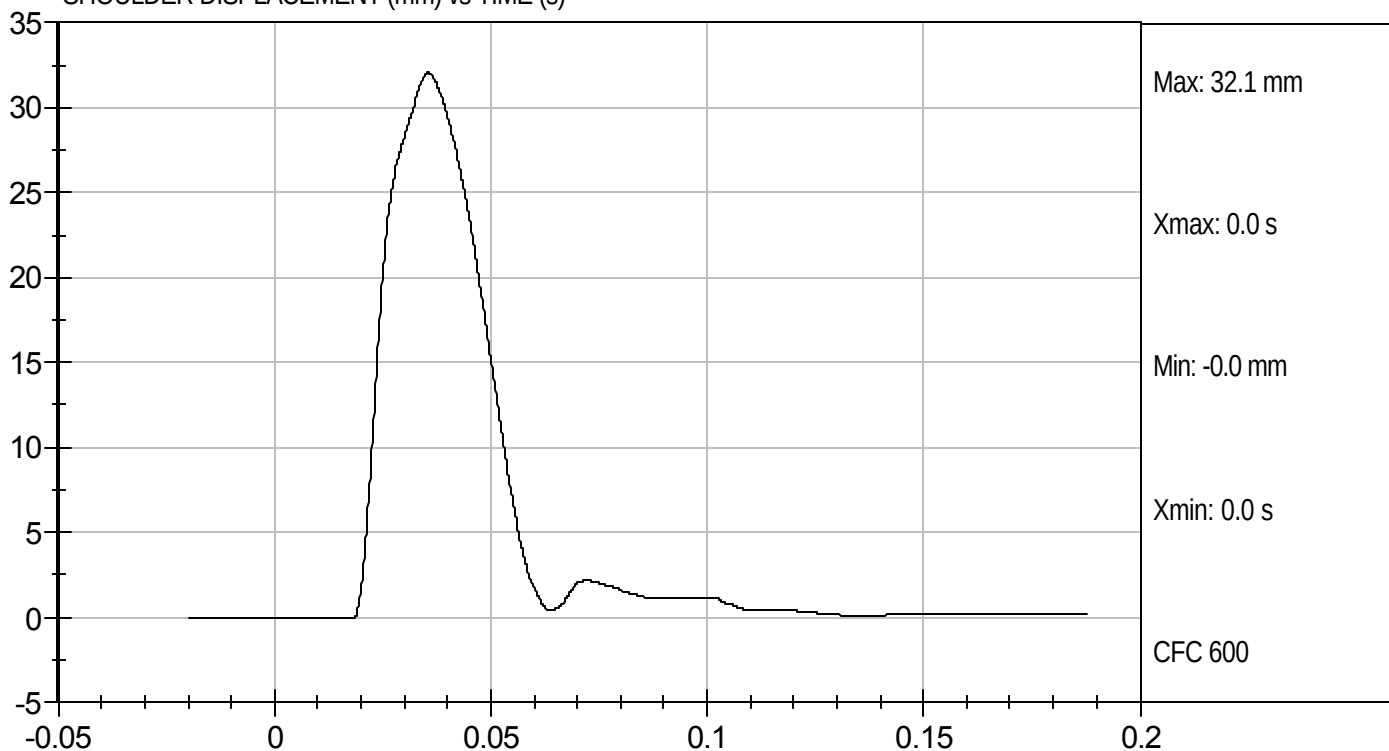




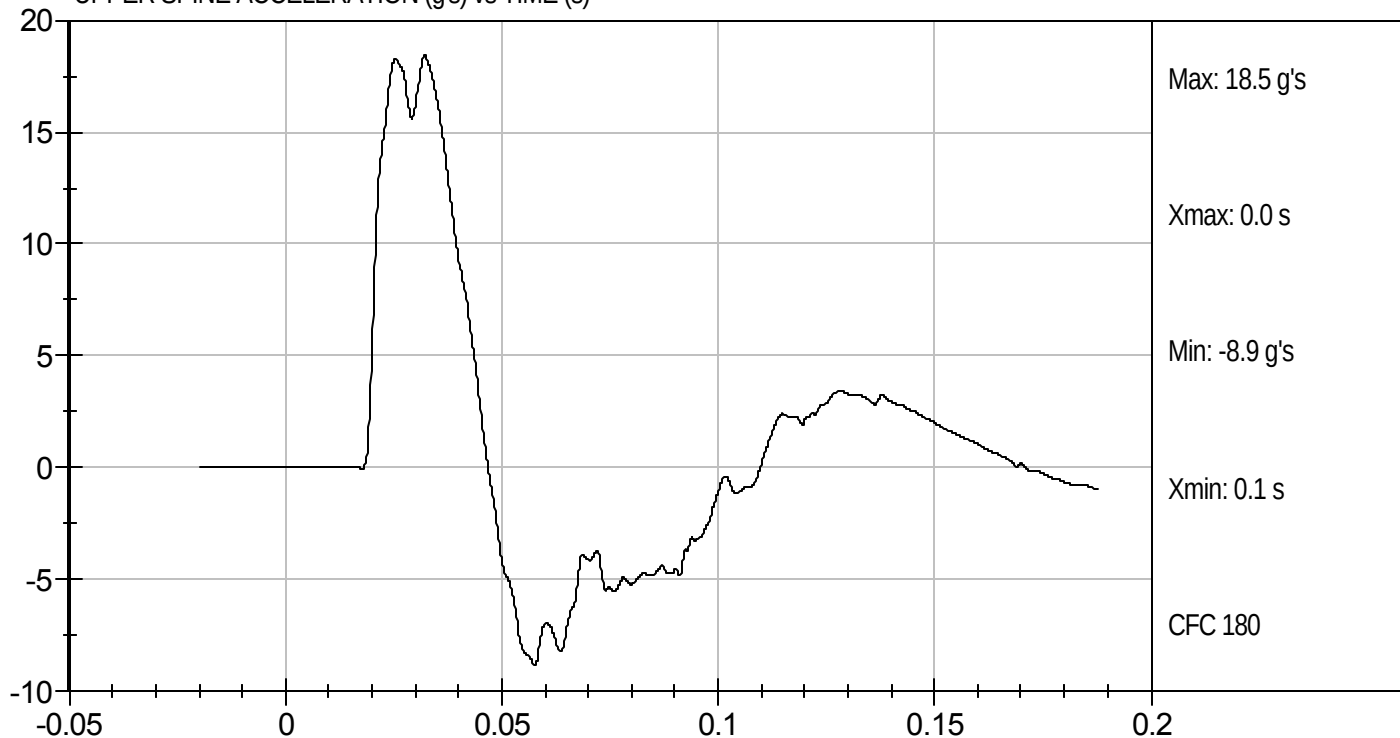
Test Desc: Shoulder Impact
Component ID: D102373

Test Date: 7/26/10
Velocity: 14.0 ft/s, 4.34 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



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

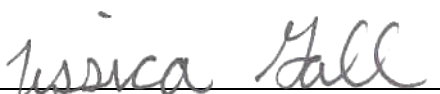


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D102374

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results			Pass	


 Laboratory Technician

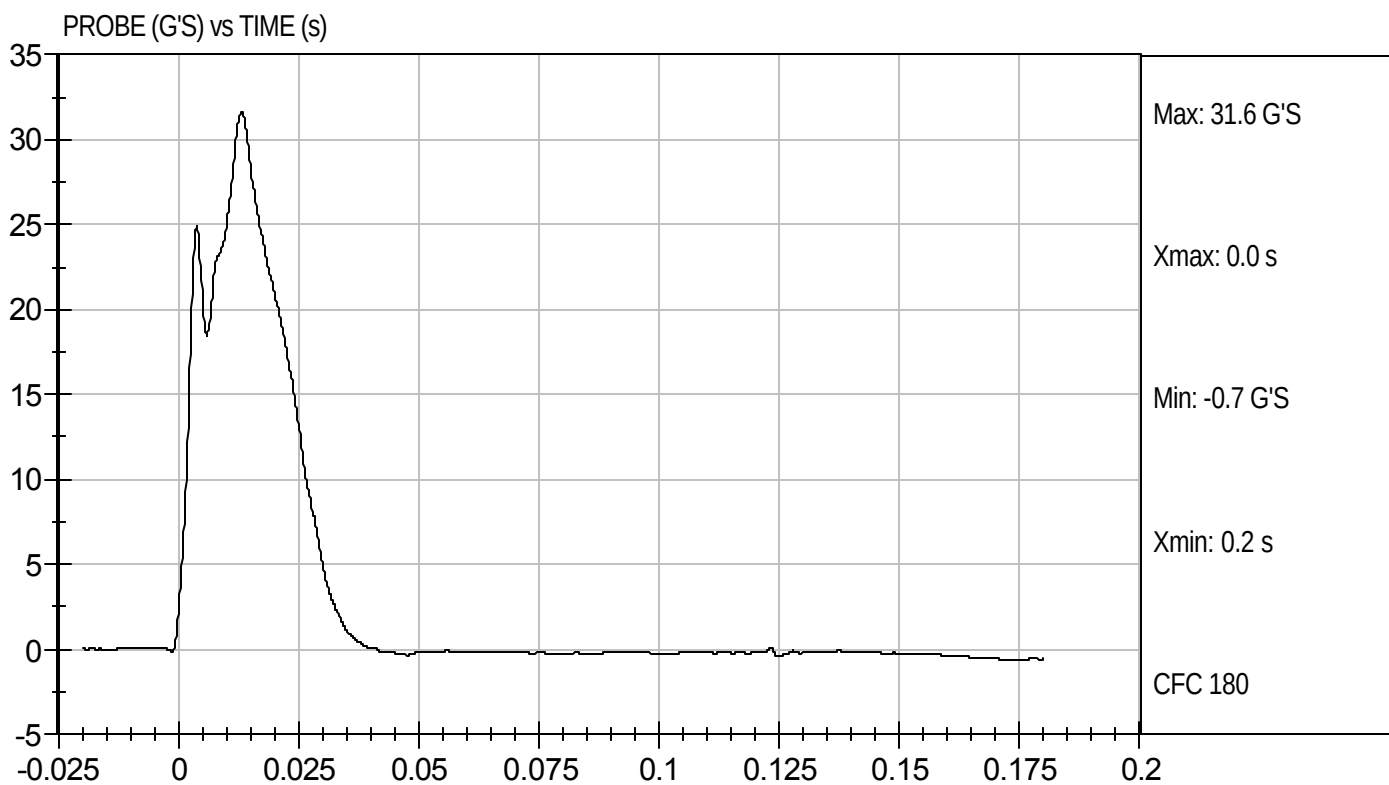
7/26/10
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D102374

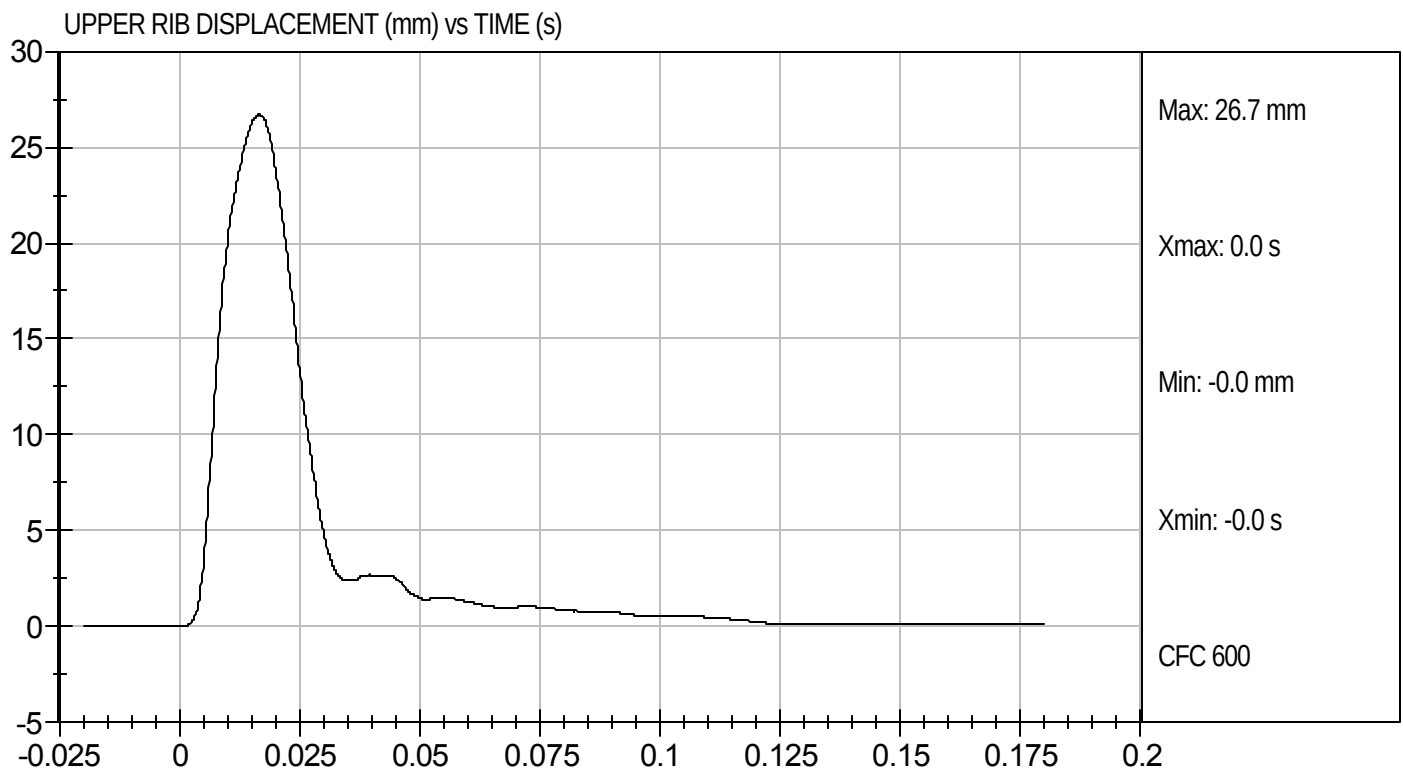
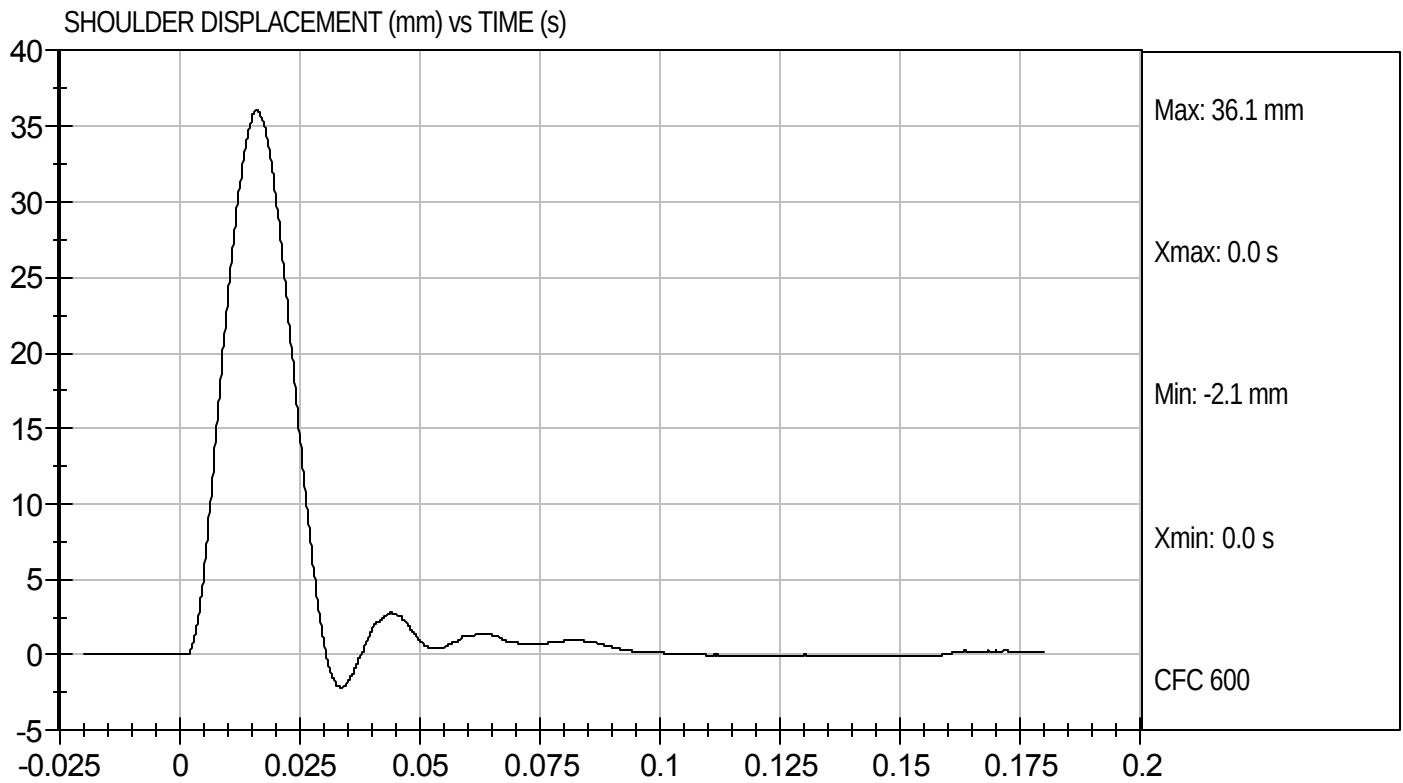
Test Date: 7/26/10
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D102374

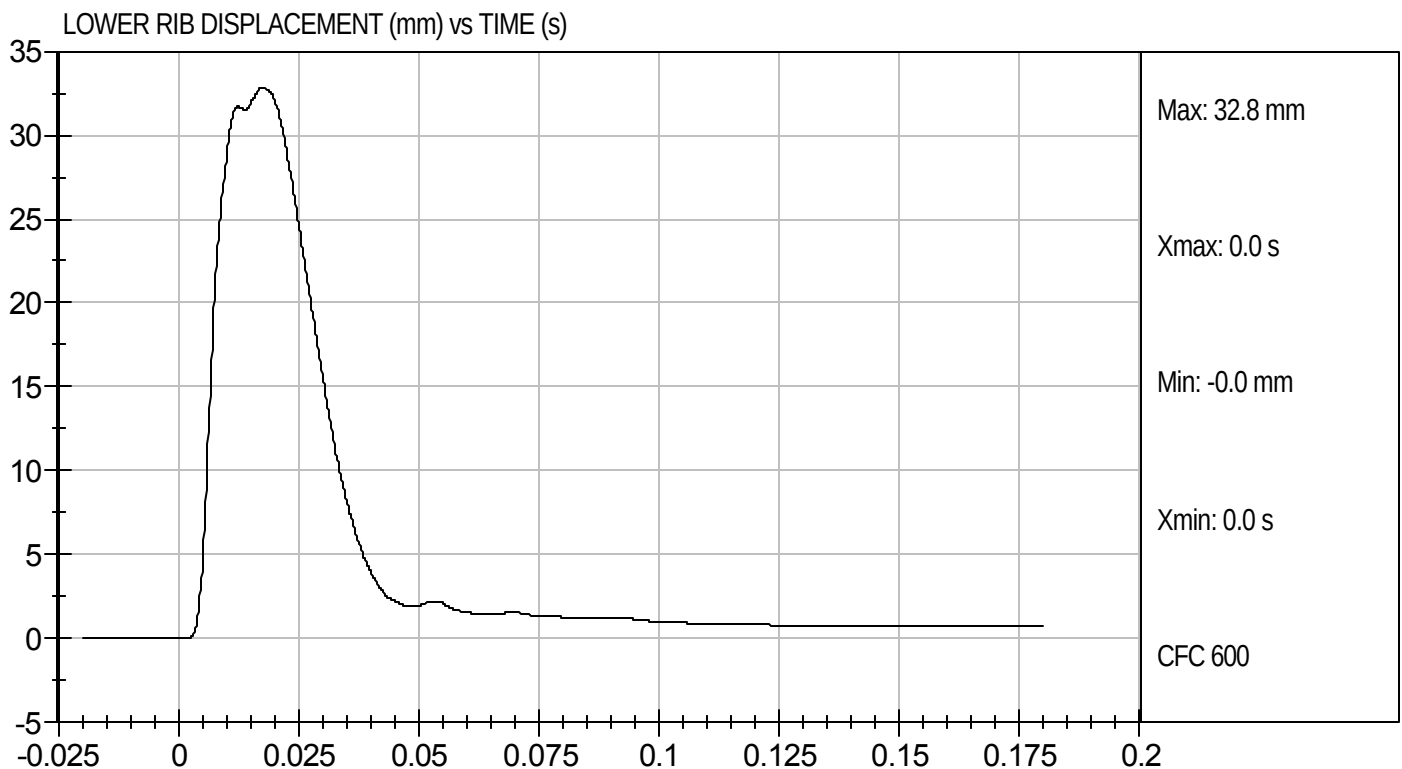
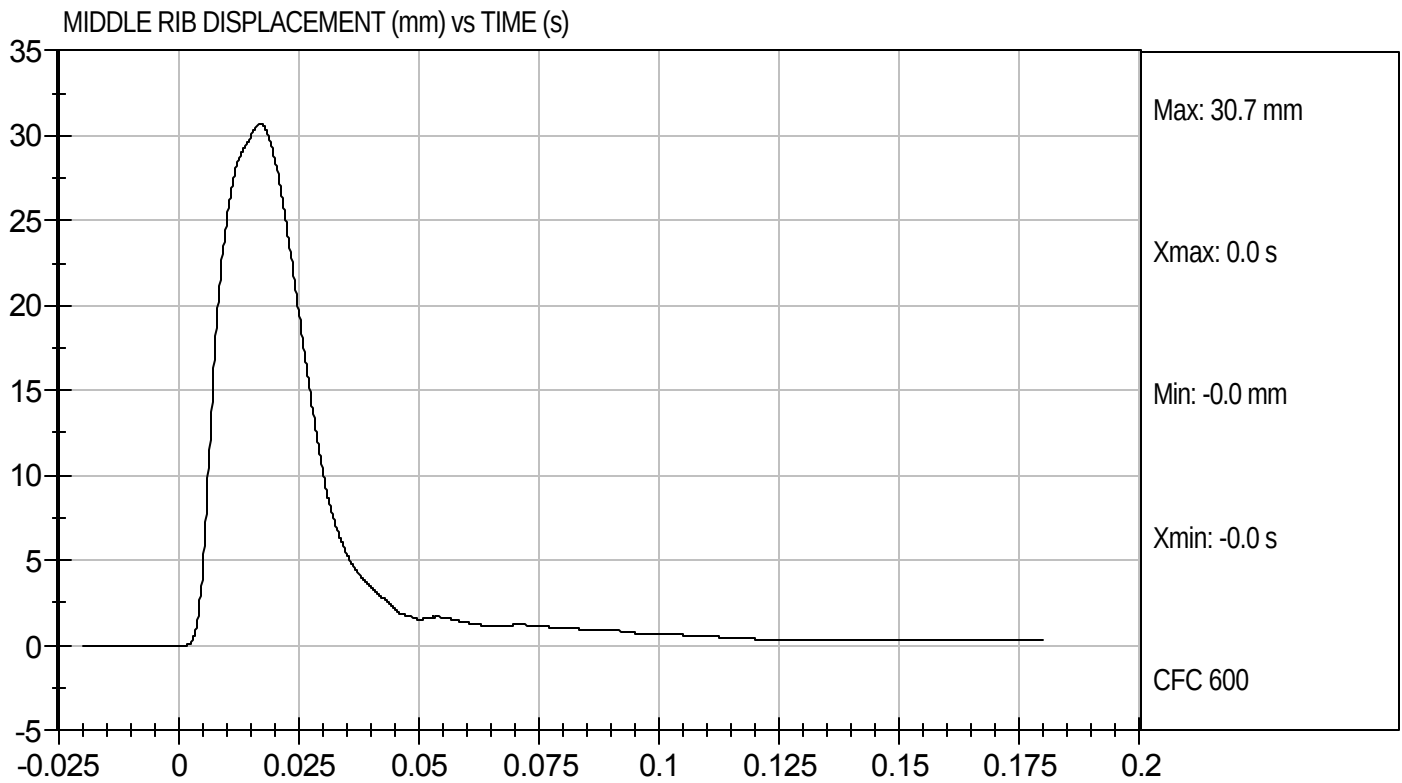
Test Date: 7/26/10
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D102374

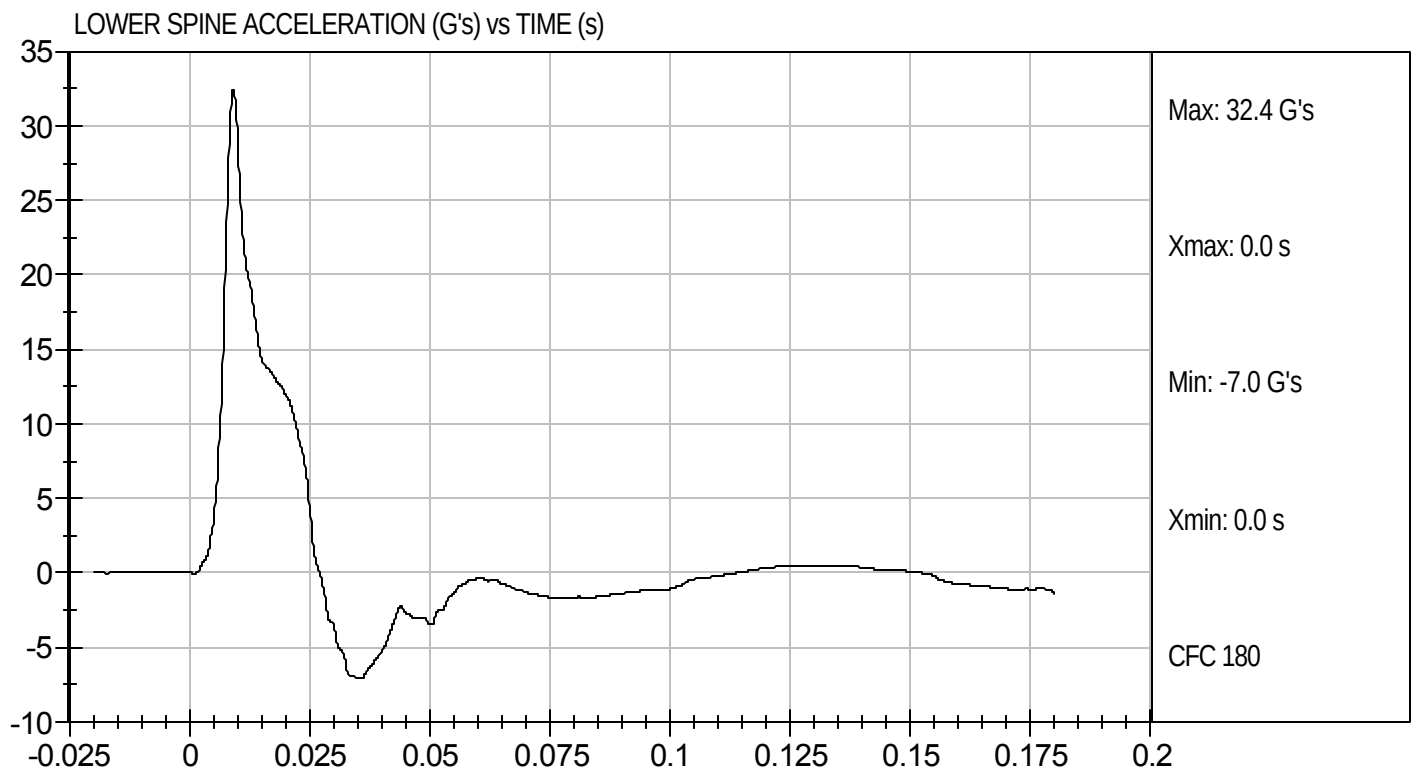
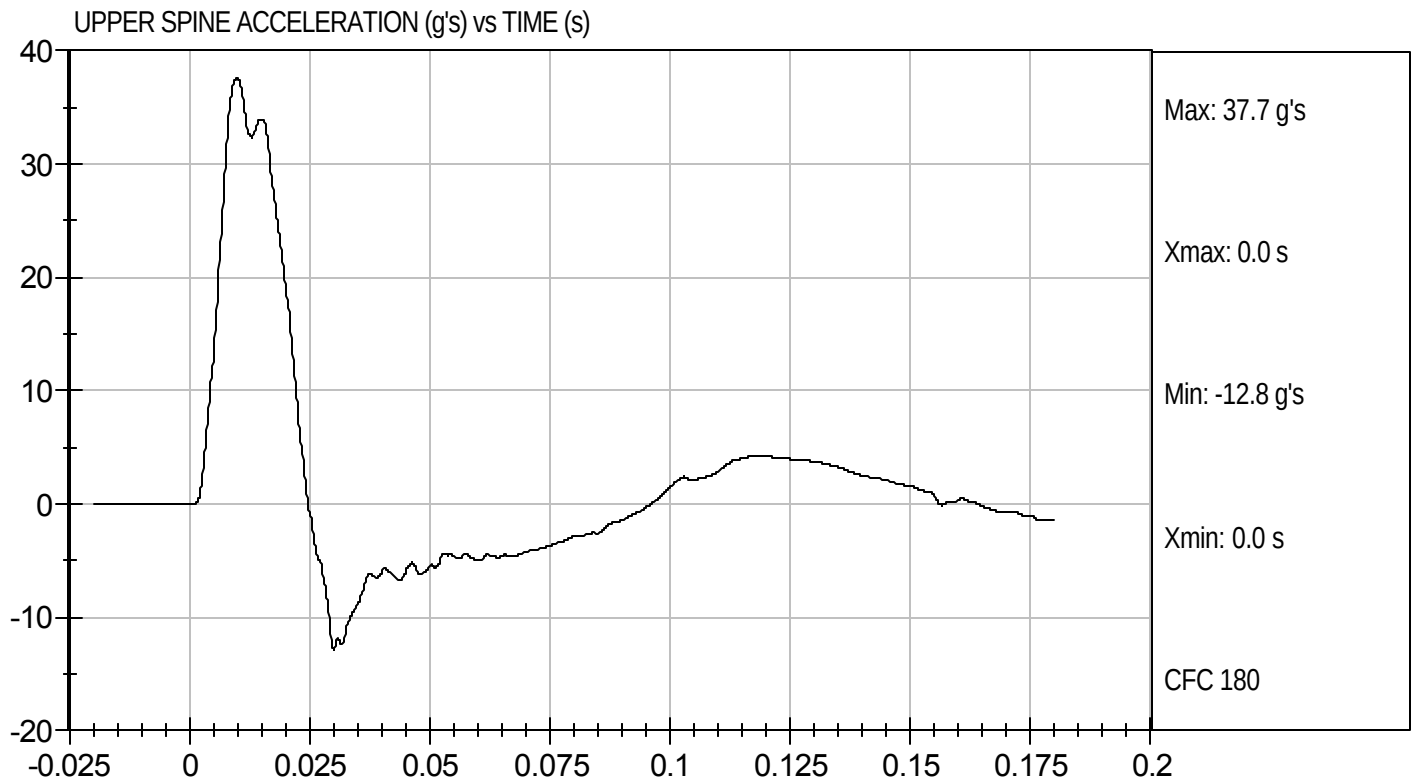
Test Date: 7/26/10
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Component ID: D102374

Test Date: 7/26/10
Velocity: 21.9 ft/s, 6.68 m/s



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

ATD Serial No: 296

Test I.D: D102375

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Force	G's	14 to 18	14	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	36	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	13	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

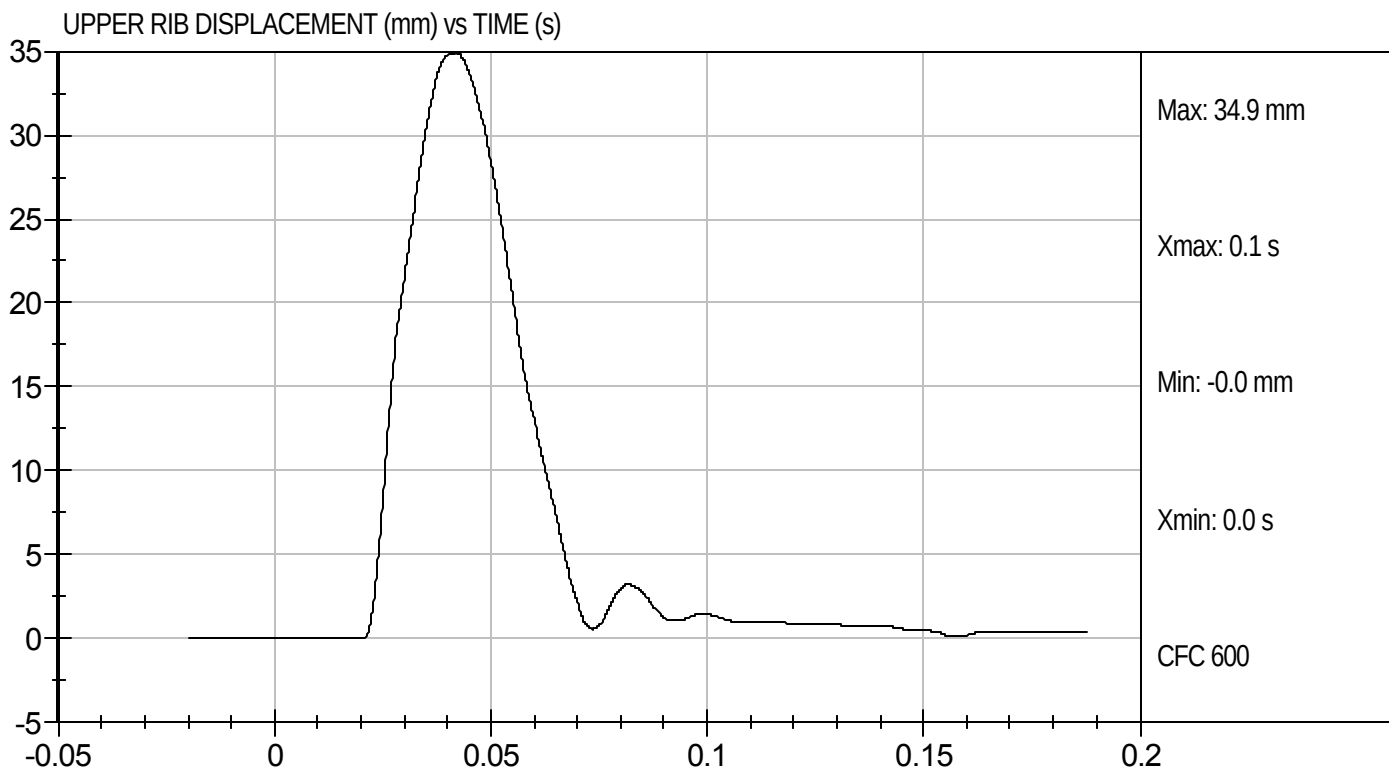
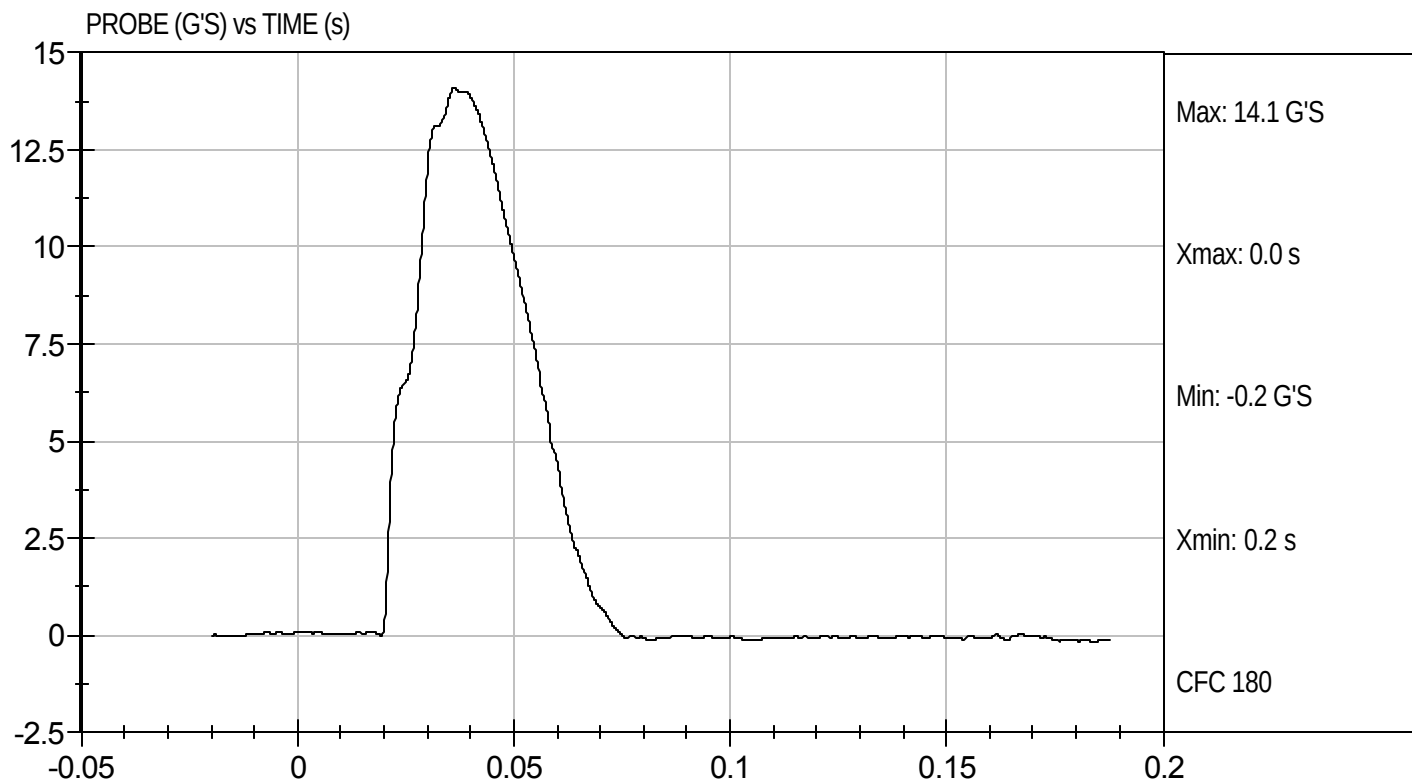
7/26/10
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Without Arm
Component ID: D102375

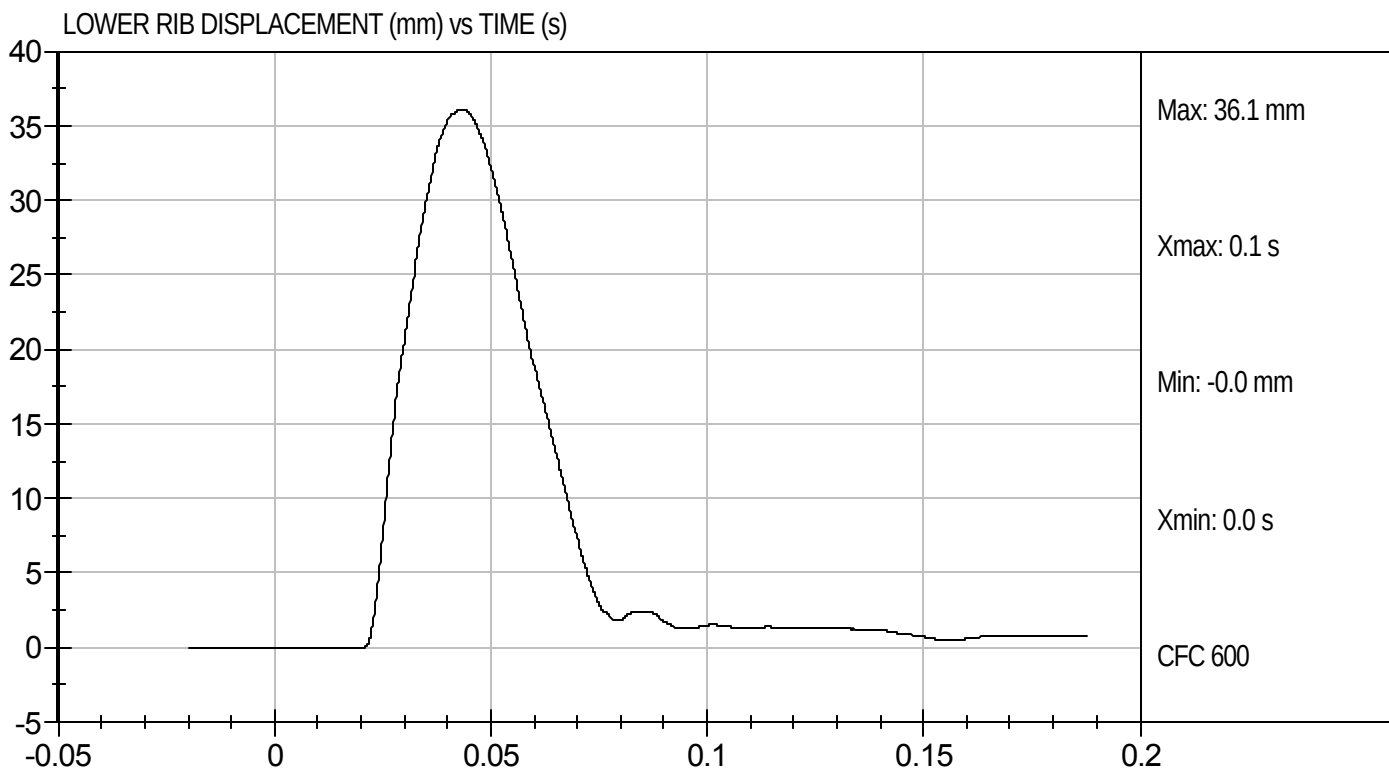
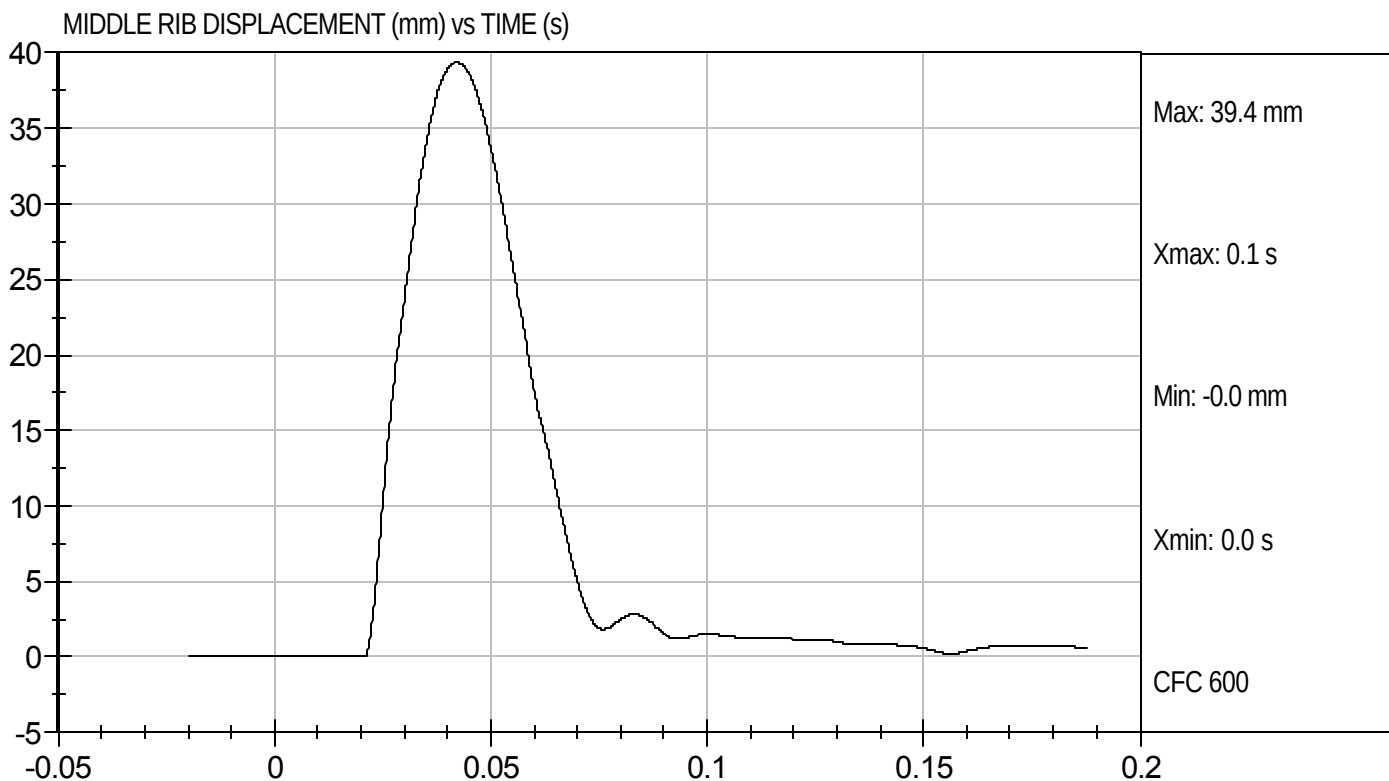
Test Date: 7/26/10
Velocity: 14.1 ft/s, 4.30 m/s





Test Desc: Thorax Without Arm
Component ID: D102375

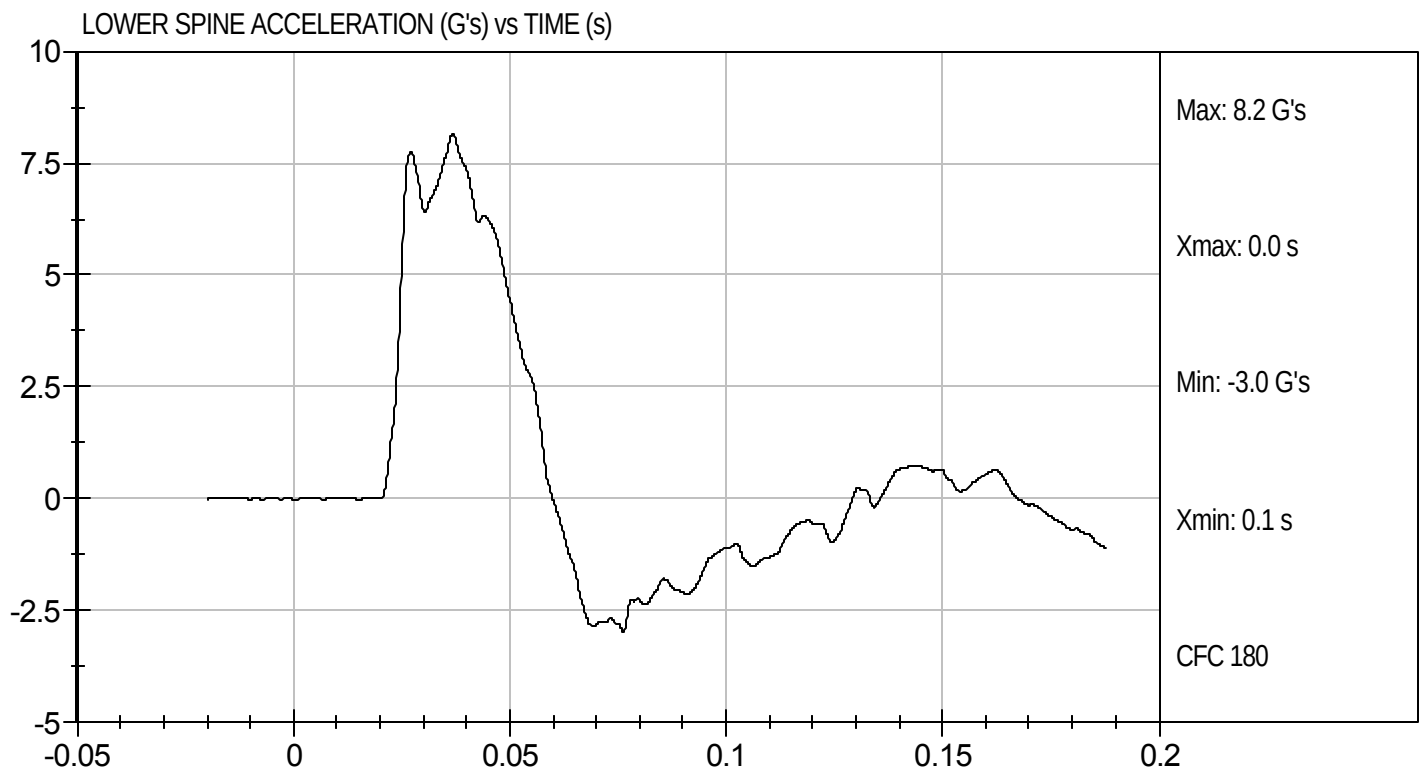
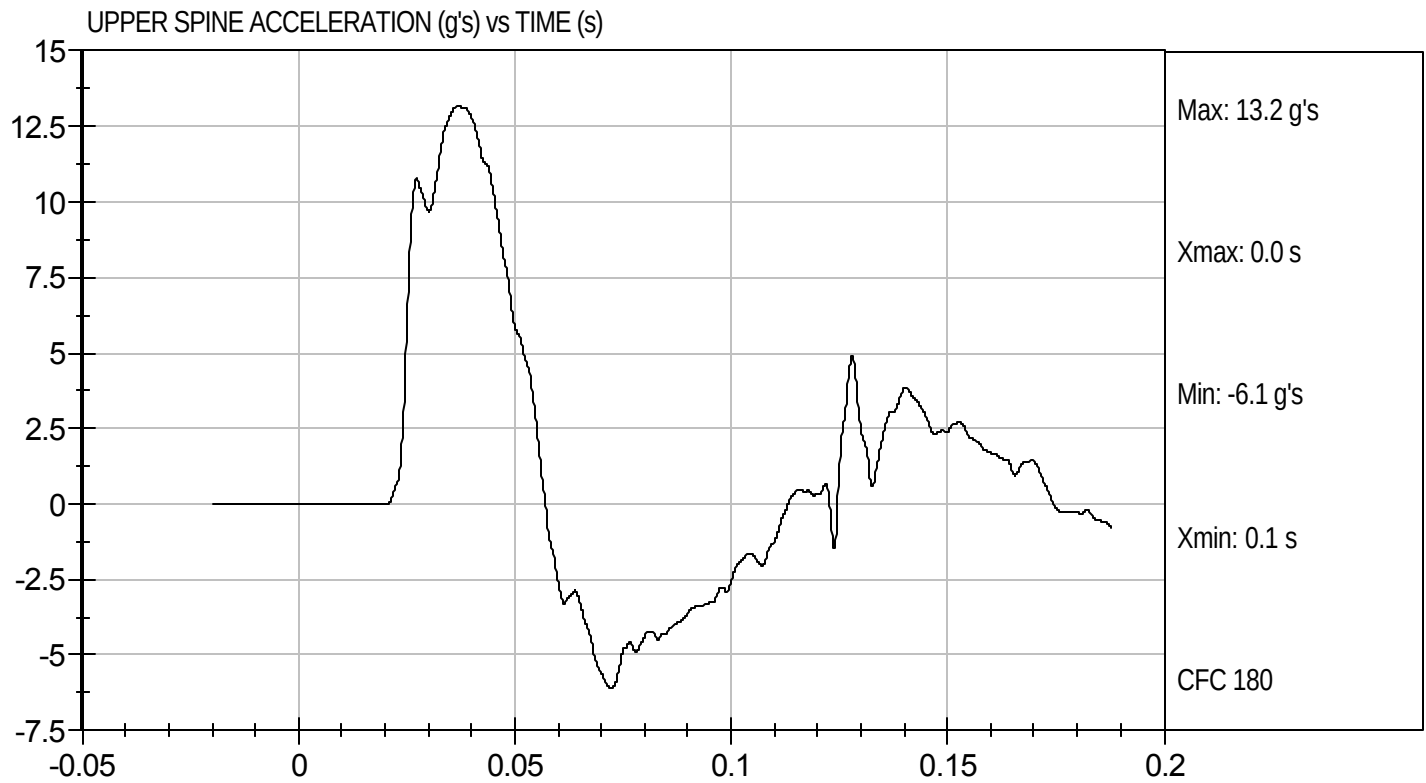
Test Date: 7/26/10
Velocity: 14.1 ft/s, 4.30 m/s





Test Desc: Thorax Without Arm
Component ID: D102375

Test Date: 7/26/10
Velocity: 14.1 ft/s, 4.30 m/s

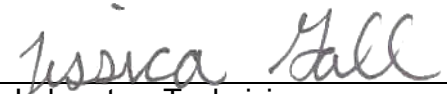


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D102376

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	40	Pass
Lower Rib Displacement	mm	33 to 44	39	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	10	Pass
			Overall Test Results	Pass


Laboratory Technician

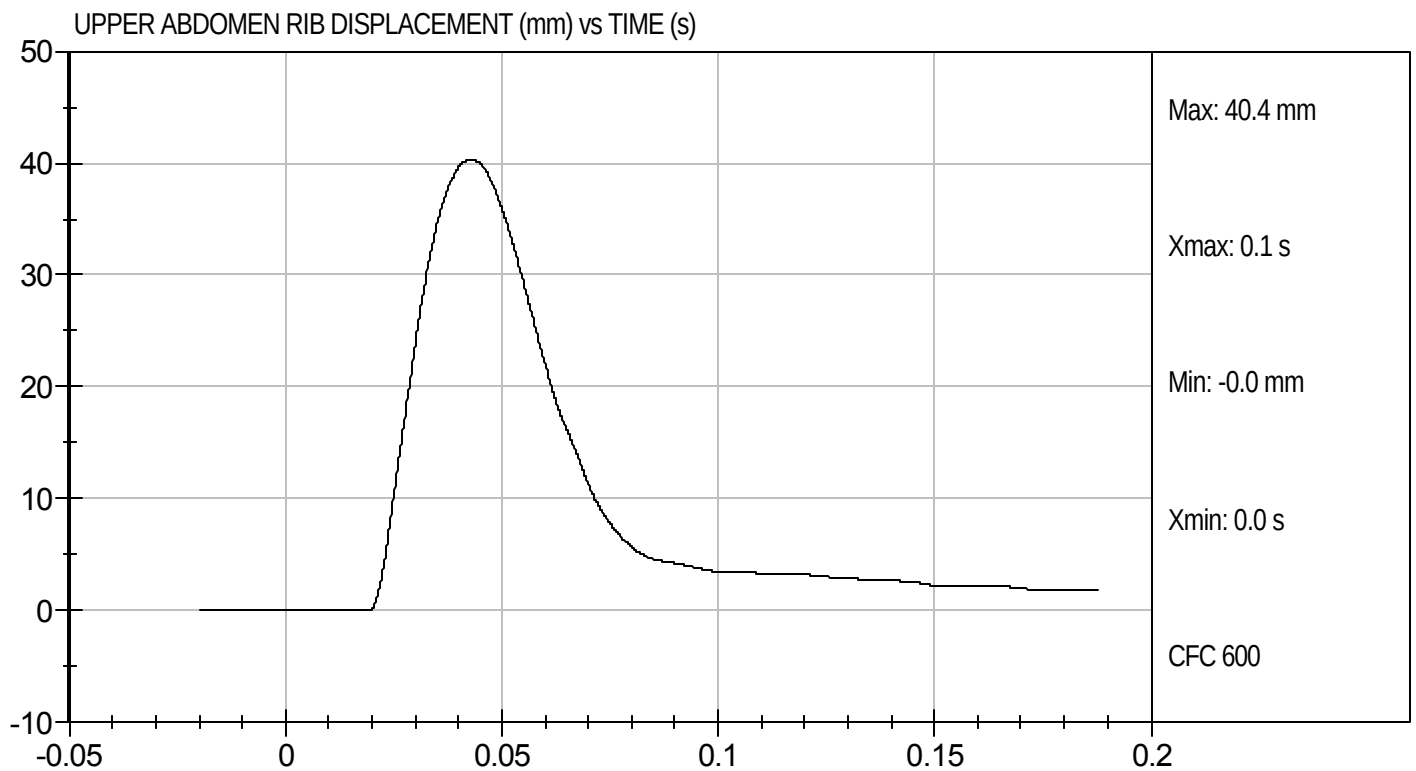
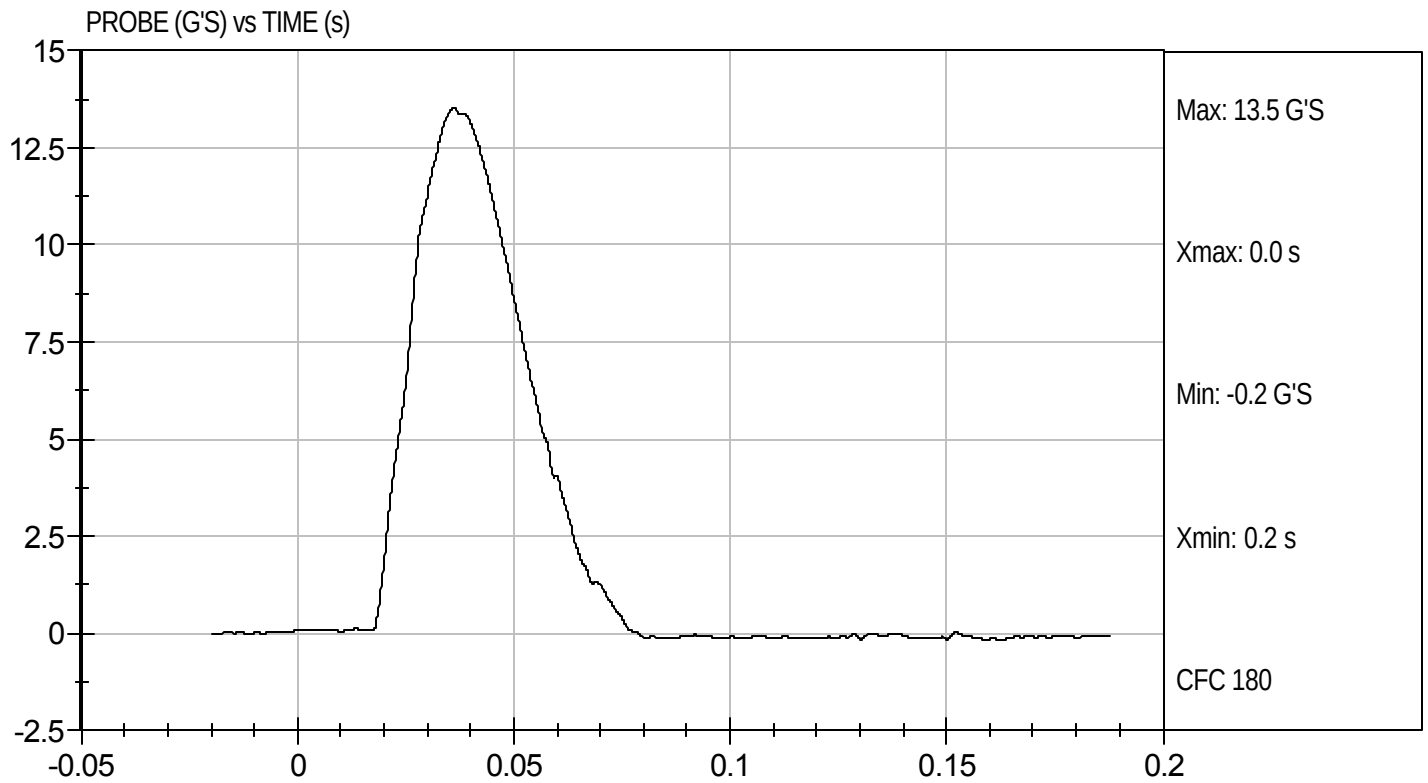
7/26/10
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D102376

Test Date: 7/26/10
Velocity: 14.1 ft/s, 4.30 m/s

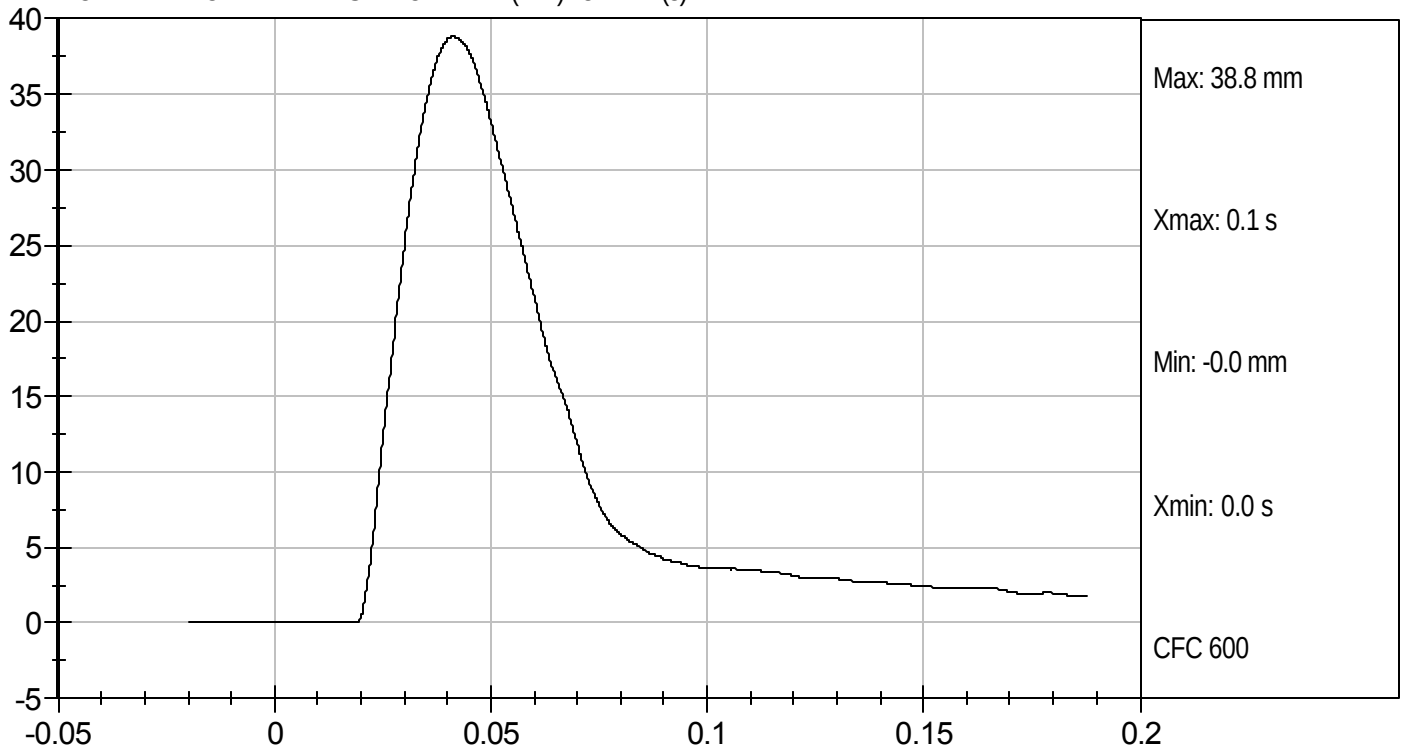




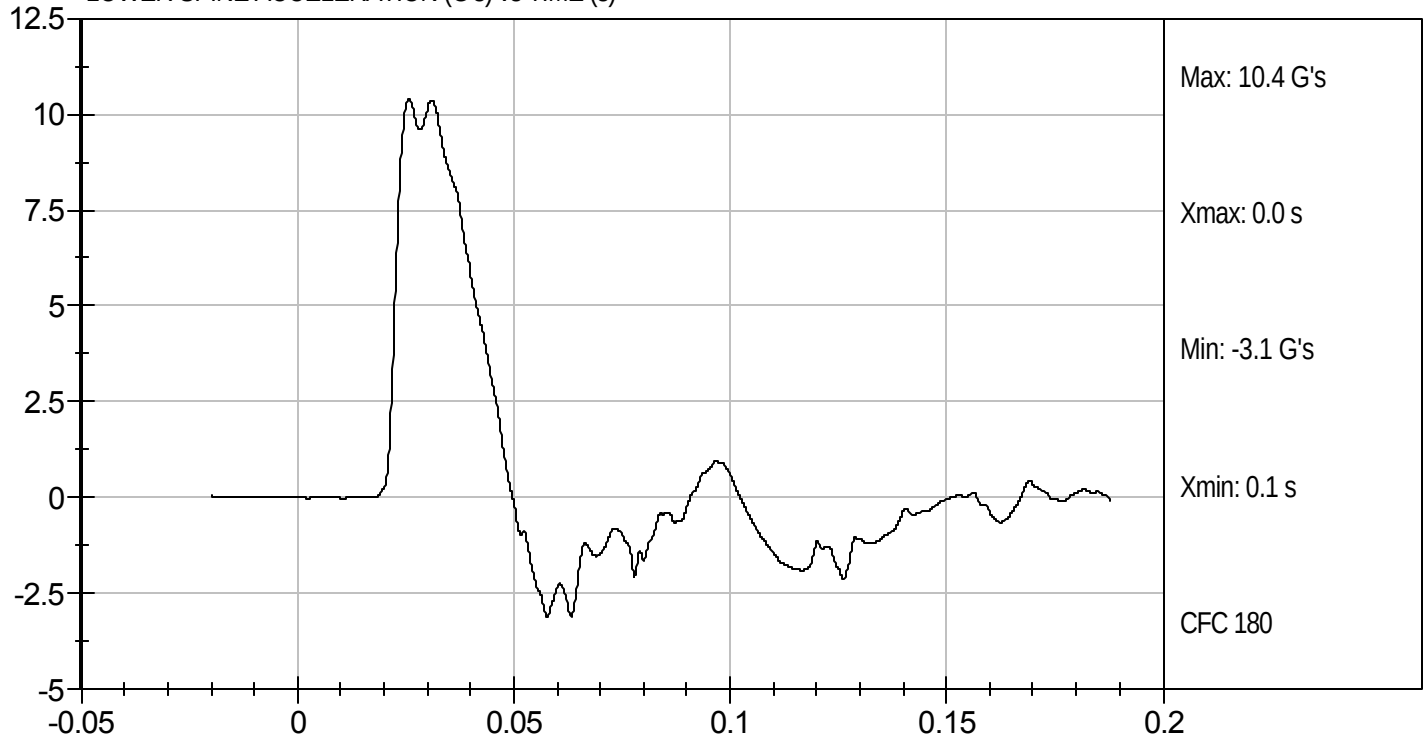
Test Desc: Abdomen Impact
Component ID: D102376

Test Date: 7/26/10
Velocity: 14.1 ft/s, 4.30 m/s

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



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



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

ATD Serial No: 296

Test I.D: D102377

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	4032	Pass
Overall Test Results				Pass


Laboratory Technician

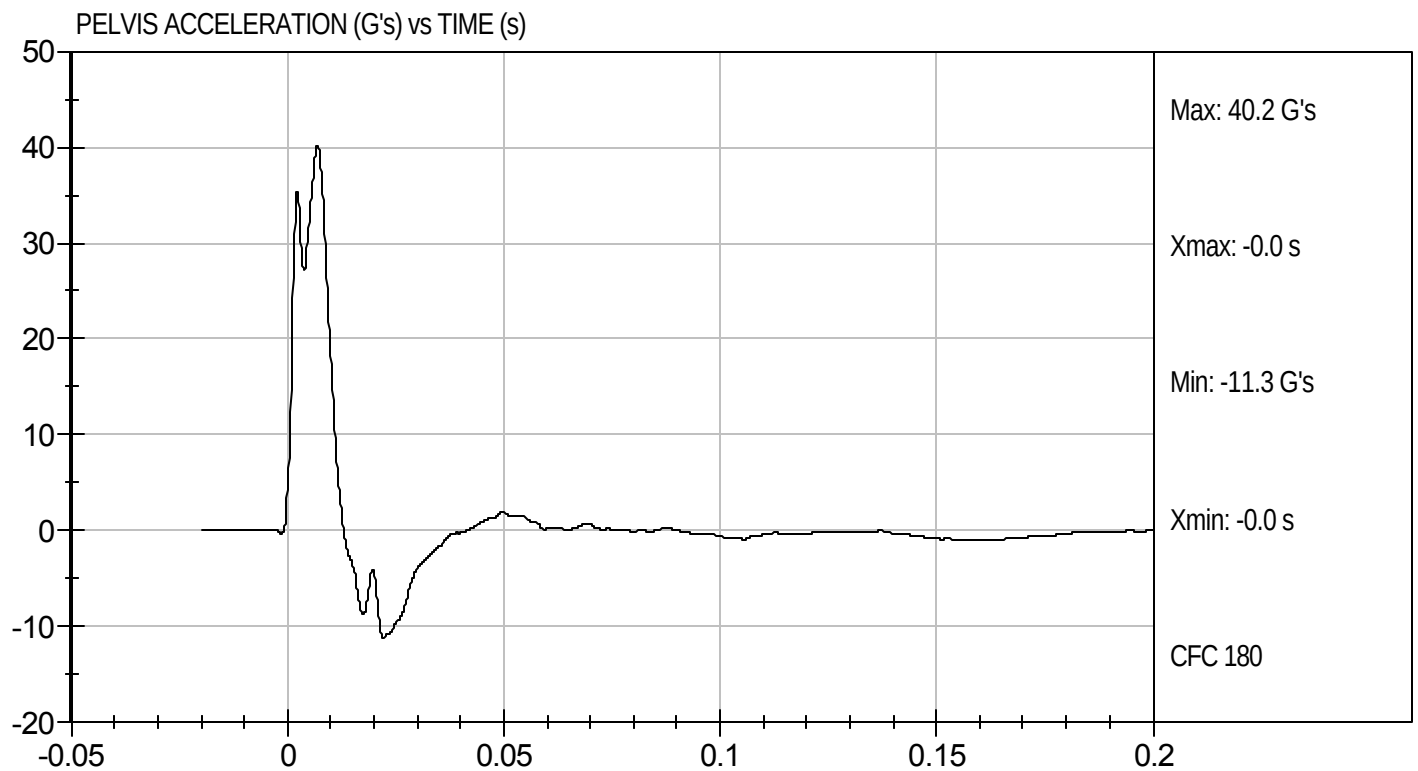
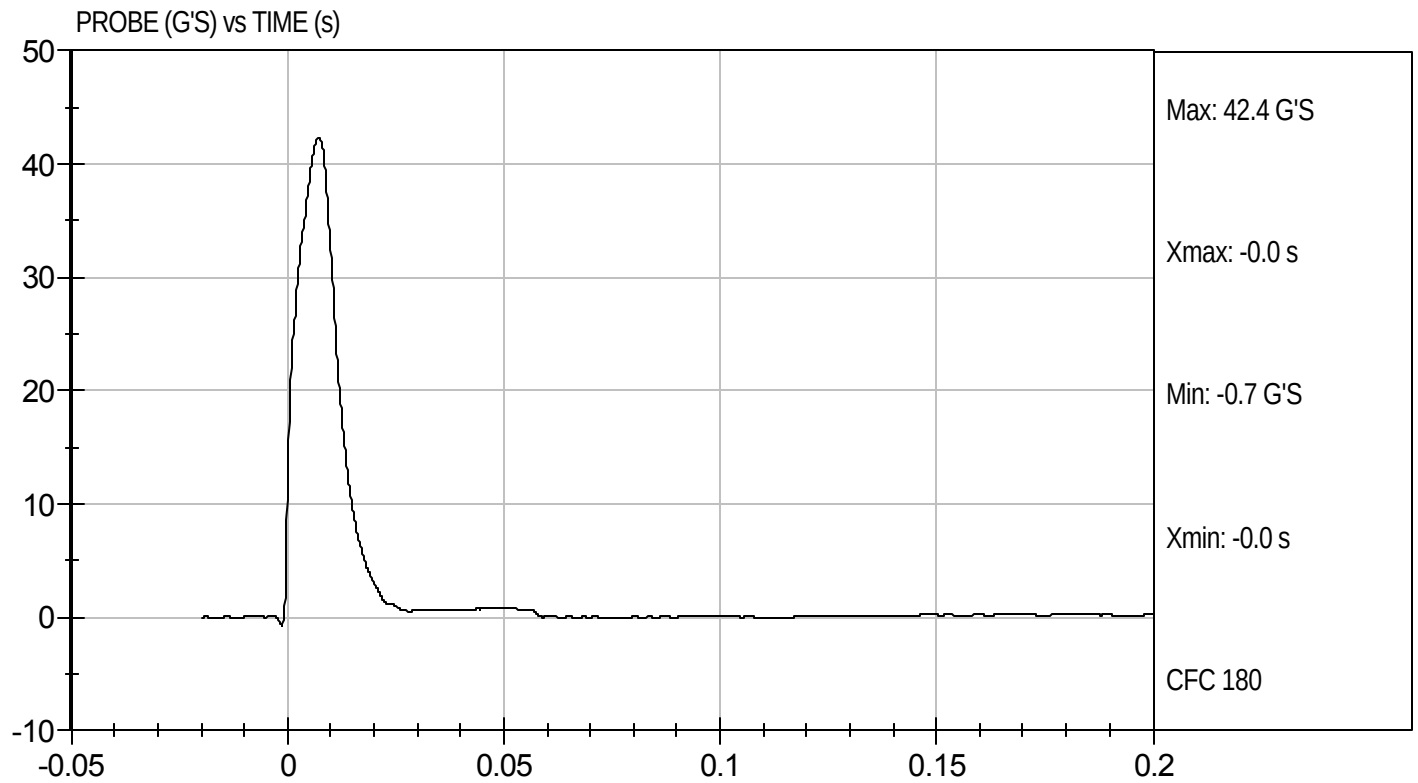
7/26/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D102377

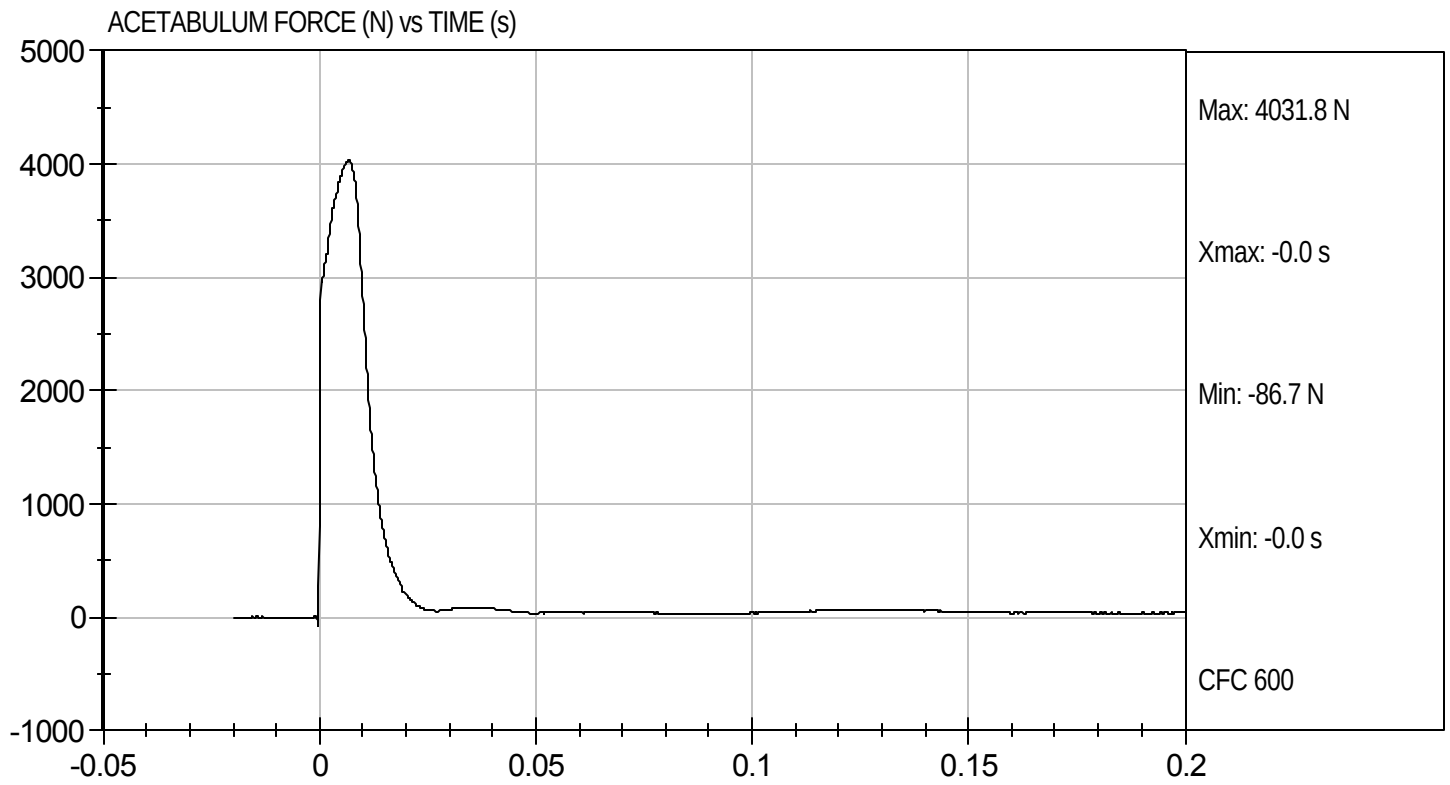
Test Date: 7/26/10
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Pelvis Impact
Component ID: D102377

Test Date: 7/26/10
Velocity: 21.9 ft/s, 6.68 m/s



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

ATD Serial No: 296

Test I.D: D102378

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	36 to 45	36	Pass
Pelvis Y Acceleration	G's	28 to 39	35	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4525	Pass
Overall Test Results			Pass	


Laboratory Technician

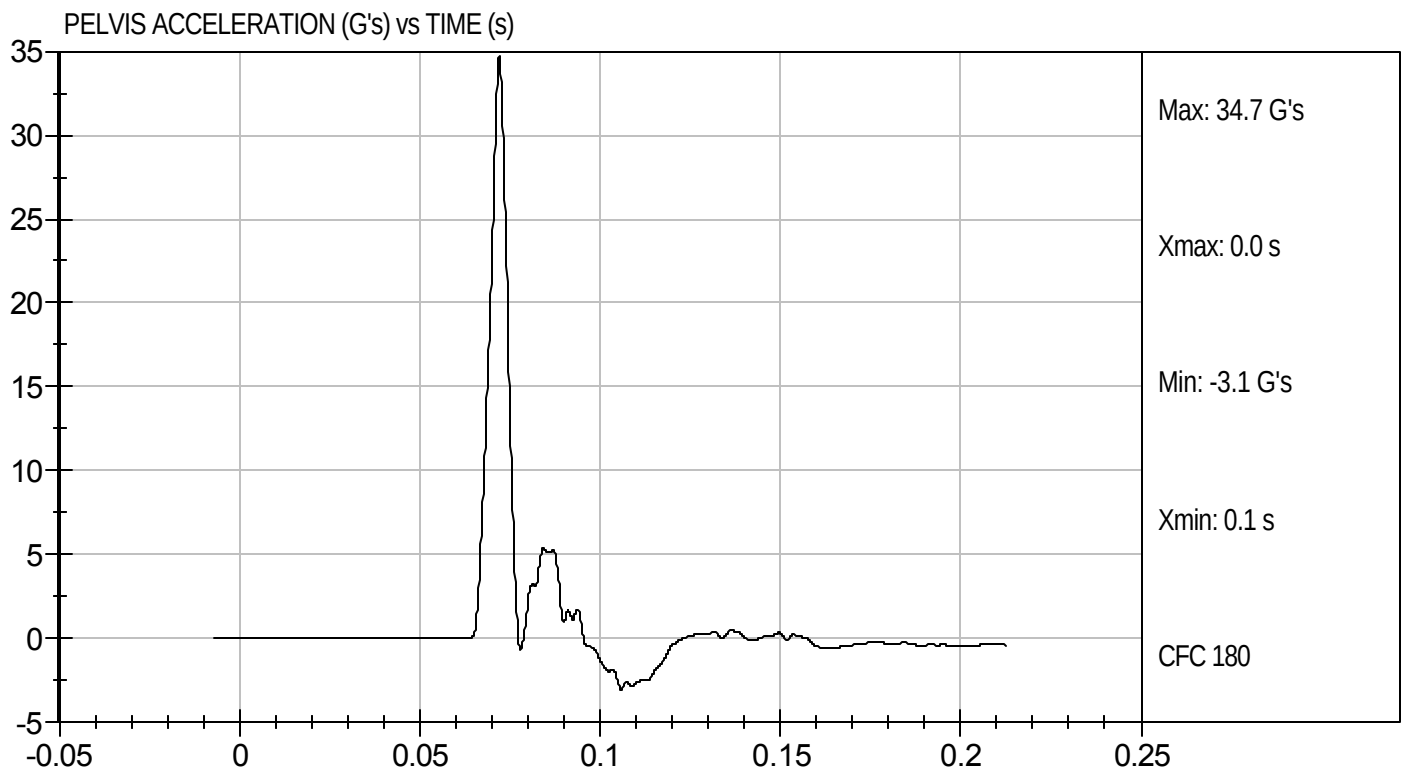
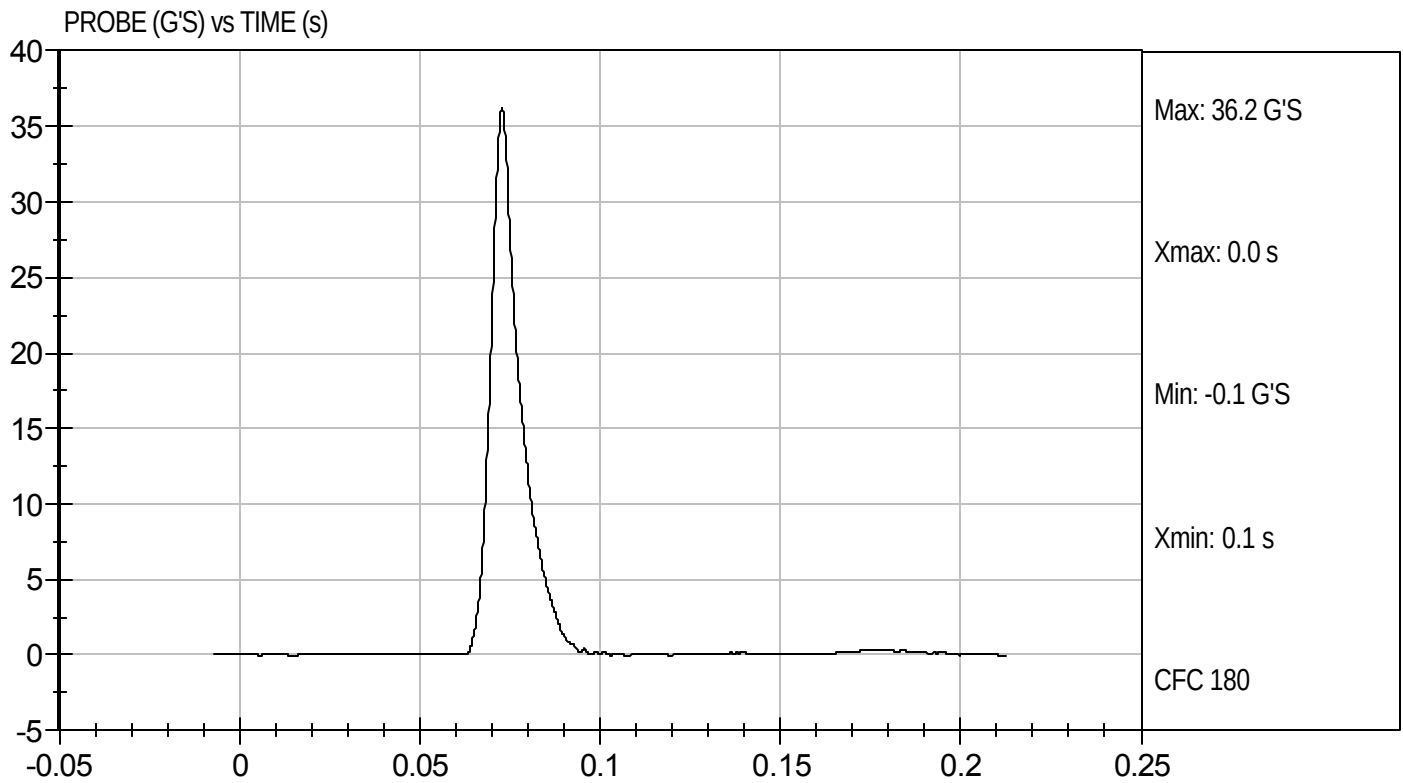
7/26/10
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D102378

Test Date: 7/26/10
Velocity: 14.24 ft/s, 4.34 m/s





Test Desc: Iliac Impact
Component ID: D102378

Test Date: 7/26/10
Velocity: 14.24 ft/s, 4.34 m/s

