

REPORT NUMBER: SINCAP-MGA-2011-002

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

**HYUNDAI MOTOR MANUFACTURING ALABAMA, LLC
2011 Hyundai Sonata GLS 4-Dr Sedan
NHTSA No.: MB5001**

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



Test Date: June 9, 2010

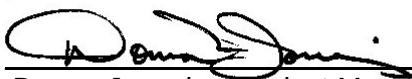
Final Report Date: July 8, 2010

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: July 8, 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

1. Report No. SINCAP-MGA-2011-002	2. Government Accession No.	3. Recipient's Catalog No.																																													
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Testing of 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No.: MB5001		5. Report Date July 8, 2010																																													
		6. Performing Organization Code MGA																																													
7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer		8. Performing Organization Report No. SINCAP-MGA-2011-002																																													
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. Work Unit No.																																													
		11. Contract or Grant No. DTNH22-09-D-00124																																													
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		13. Type of Report and Period Covered: Final Test Report June 9, 2010 to July 8, 2010																																													
		14. Sponsoring Agency Code NVS-111																																													
15. Supplementary Notes																																															
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2011 Hyundai Sonata GLS 4-Dr Sedan in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on June 9, 2010. The impact velocity of the Moving Deformable Barrier (MDB) was 62.4 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 254 mm at level 2. 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>170</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>22</td> </tr> <tr> <td>Combined Abdominal Force</td> <td>N</td> <td>2500</td> <td>1321</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1932</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>199</td> </tr> <tr> <td>Lower Spine (T12) Resultant Acceleration</td> <td>G</td> <td>82</td> <td>70</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2789</td> </tr> </tbody> </table>					Driver ATD (ES-2re)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	170	Maximum Thorax Rib Deflection	mm	44	22	Combined Abdominal Force	N	2500	1321	Pubic Symphysis Force	N	6000	1932		Passenger ATD (SID-IIs)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	199	Lower Spine (T12) Resultant Acceleration	G	82	70	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2789
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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																																													
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 198	22. Price																																												

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the FY 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 Hyundai Sonata GLS 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated January 2010.

SUMMARY

A 2011 Hyundai Sonata GLS 4-Dr Sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.4 km/h (38.8 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 June 9, 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	170
Maximum Thorax Rib Deflection	mm	44	22
Combined Abdominal Force	N	2500	1321
Pubic Symphysis Force	N	6000	1932

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	199
Lower Spine (T12) Resultant Acceleration	G	82	70
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2789

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	No	No	
Seat Belt Load Limiter	Yes		No	

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

GENERAL COMMENTS

There was no valid data collected for:

- Left Rear Sill Y
- Left Mid B-Post Y
- Left Lower A-Post Y
- Driver Seat Track Y

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 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB5001	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Hyundai	Power Steering	Yes
Model	Sonata	Driver Front Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	5NPEB4AC5BH028639	Driver Head/Torso Airbag	No
Body Color	Harbor Grey Metallic	Driver Torso Airbag	No
Delivery Date	5/17/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	40	Driver Pelvis Airbag	No
Odometer (km)	64	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	No	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Power Seats	No
Does owner's manual provide instruction to turn off automatic door locks?			No

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Manufacturing Alabama, LLC	GVWR (kg)	1950
Date of Manufacture	Mar/04/10	GAWR Front (kg)	1100
		GAWR Rear (kg)	960

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				410	(A)
DSC x 68.04 (kg)				340	(B)
Cargo Weight (RCLW) (kg)				70	(A-B)

VEHICLE SEAT TYPE

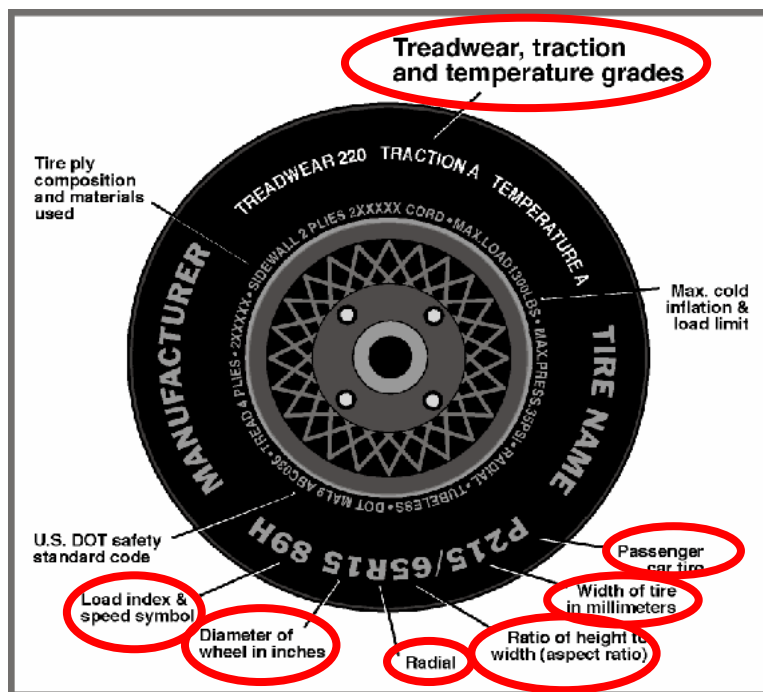
	Type of Seat Pan				Type of Seat Back		
Seating Location	Bucket	Bench	60/40 Split Folding	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/Lever	
Rear or Second Row			X		X		
Third Row Seat							

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2011 Hyundai Sonata GLS 4-Dr Sedan	NHTSA No.	MB5001
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/09/2010

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	225	225
Recommended Tire Size	P205/65R16	P205/65R16
Tire Size on Vehicle	P205/65R16	P205/65R16
Tire Manufacturer	Kumho	Kumho
Tire Model	Solus KH25	Solus KH25
Treadwear	480	480
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 poly	1 poly
Tire Plies Body	2 steel / 1 poly / 1 nylon	2 steel / 1 poly / 1 nylon
Load Index & Speed Symbol	94H	94H
Tire Material	Rubber	Rubber
DOT Safety Code Right	DOT Y0L4 YPL8	DOT Y0L4 YPL8
DOT Safety Code Left	DOT Y0L4 YPL8	DOT Y0L4 YPL8

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2011 Hyundai Sonata GLS 4-Dr Sedan	NHTSA No.	MB5001
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/09/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	448.6	296.2		478.5	389.2		489.0	388.7	
Right	kg	445.0	279.0		458.6	334.3		443.6	346.6	
Ratio	%	60.8	39.2		56.4	43.6		55.9	44.1	
Totals	kg	893.6	575.2	1468.8	937.1	723.5	1660.6	932.6	735.3	1667.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1468.8	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	70	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1668.1	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	680	701	672	673	
As Tested (Fully Loaded $\pm$ 10mm at each wheel well)	mm	682	695	680	668	1233

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2796
Total Vehicle Length at Left Side	mm	4620
Total Vehicle Length at Centerline	mm	4820
Total Vehicle Length at Right Side	mm	4620
Weight of Ballast in Cargo Area	kg	39.0
Weight of Vehicle Components Removed	kg	20.0
Amount of Stoddard Solvent in Fuel Tank	L	65.1

Vehicle components removed to meet target vehicle test weight: RF mirror, spare tire, trunk carpet, jack & tools, RR taillight.

TEST VEHICLE VERTICAL IMPACT POINT DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	458
Actual Impact Point Aft of Front Axle	mm	453

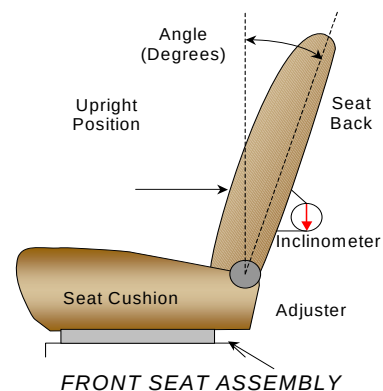
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

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 stay angle is 9.21°. (Door sill angle is 0 degrees). The left rear passenger's seat back angle is fixed.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	9.0° at headrest post
Passenger with Seated Dummy	Fixed

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

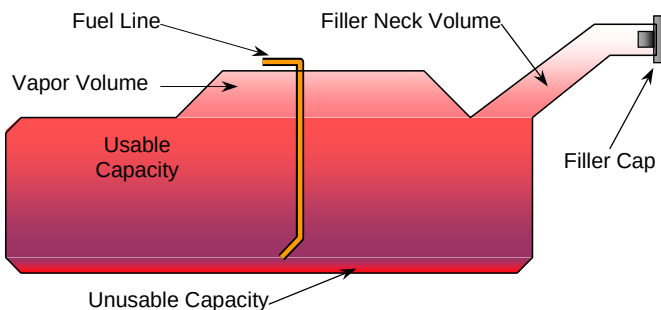
Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

FUEL TANK CAPACITY DATA

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

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

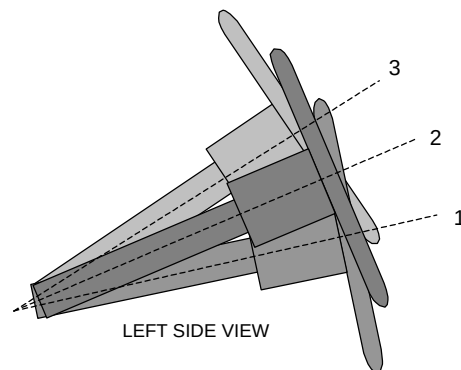
The test vehicle is equipped with an electric fuel pump. Fuel pump will operate when engine system is normally operating. The fuel pipe is on the left side.



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

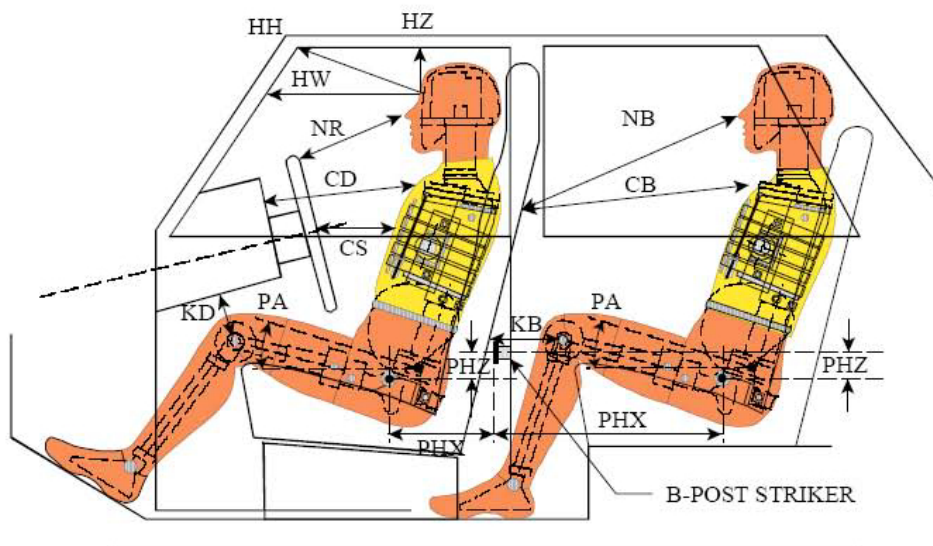
	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	64.6	190
Geometric Center – Position 2	66.6	210
Uppermost – Position 3	68.6	230
Telescoping Steering Wheel Travel		40
Test Position	66.6	210

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan
 Test Program: NCAP Side MDB Impact Test

NHTSA No. MB5001
 Test Date: 6/09/2010



LEFT SIDE VIEW

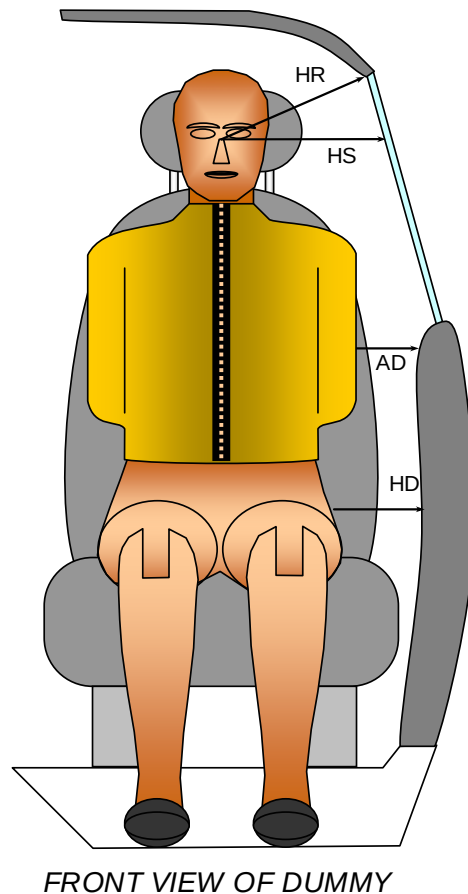
NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

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	435	14.9		
HW		Head to Windshield	669	0		
HZ	HZ	Head to Roof	178	90	260	90
NR	NB	Nose to Rim/Seat Back	518	12.9	538	5.8
CD	CB	Chest to Dash/Seat Back	609	8.4	548	15.8
CS		Chest to Steering Wheel	422	5.3		
KDL	KBL	Left Knee to Dash/Seat Back	214	23.3	304	17.3
KDR	KBR	Right Knee to Dash/Seat Back	162	22.2	287	14.9
PA	PA	Pelvic Angle		25.0		21.7
PHX	PHX	H-Point to Striker (X-Axis)	227	0	265	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	266	90	267	90
SA	SA	Seat Back Angle (headrest post)		9.0		Fixed

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

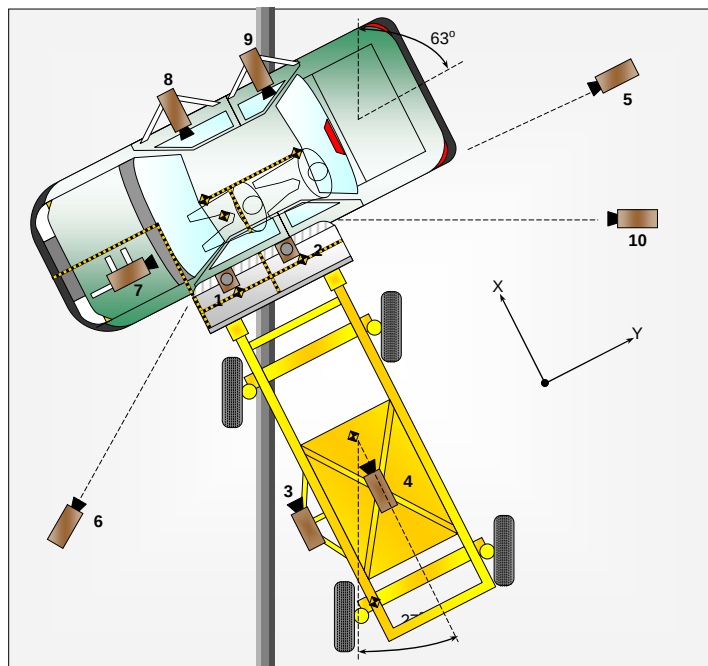


DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 296
HR	Head to Side Header	mm	183	240
HS	Head to Side Window	mm	325	375
AD	Arm to Door	mm	113	190
HD	H-Point to Door	mm	157	198

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

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Angle	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Overhead Overall	-890	0	-5050	86.6	14	1000
2	Overhead Close-up	660	1140	-5050	79.5	50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	-3510	5320	-1280	4.6	24	1000
6	Left Front	3540	-4310	-1180	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

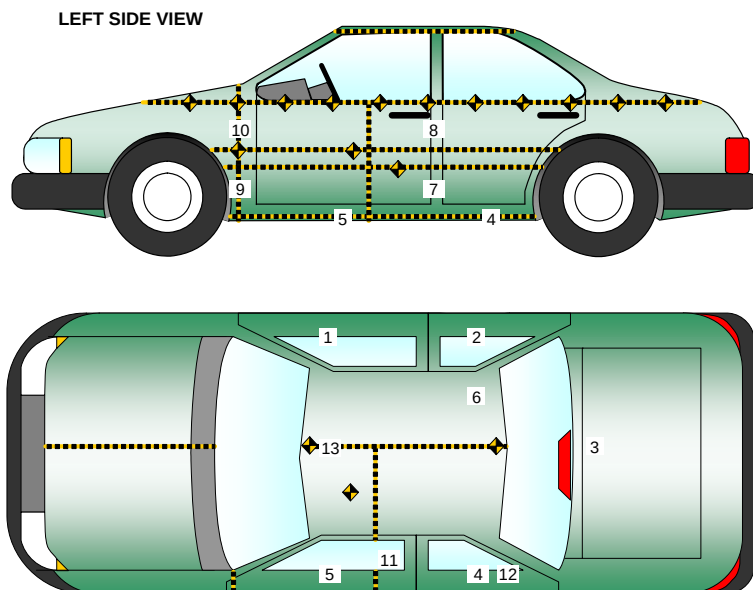
Reference: Impact Point projected to Ground
+X = To Front of MDB, +Y = To Right of MDB, +Z = Down

* All measurements accurate to ± 6 mm

DATA SHEET NO. 6

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

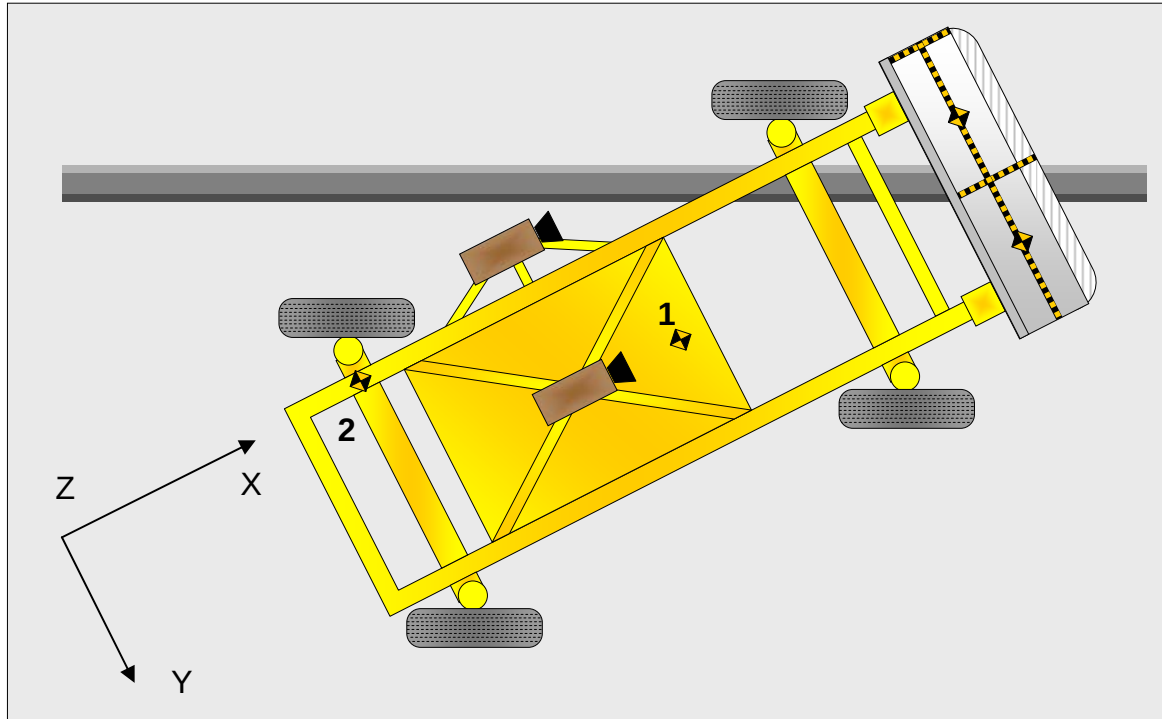
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2638	725	180
2	Right Sill at Rear Seat	1744	717	175
3	Rear Floorpan Above Axle	1032	0	505
4	Left Sill at Rear Door	1715	-717	188
5	Left Sill at Front Door	2574	-725	182
6	Rt. Rear Occ. Compartment	1940	380	195
7	Left Lower B-Post	2160	-740	471
8	Left Middle B-Post	2125	-742	726
9	Left Lower A-Post	3255	-710	524
10	Left Middle A-Post	3320	-836	788
11	Front Seat Track	2327	-600	375
12	Rear Seat Track or Structure			
13	Vehicle CG	2615	170	165

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 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



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 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	43	230
2	Occupant H-Point	mm	254	505
3	Mid Door	mm	232	625
4	Window Sill	mm	158	950
5	Window Top	mm	31	1375
	Maximum Penetration	mm	254	

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 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

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	62.4
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	800	Left	184
B	Top of Bumper	533	800	Left	111
C	Mid-Level	686	800	Left	116
D	Top of Stack	813	800	Left	175

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

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

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

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, Center Rear Seat 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	Left Front and Left Rear Windows Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

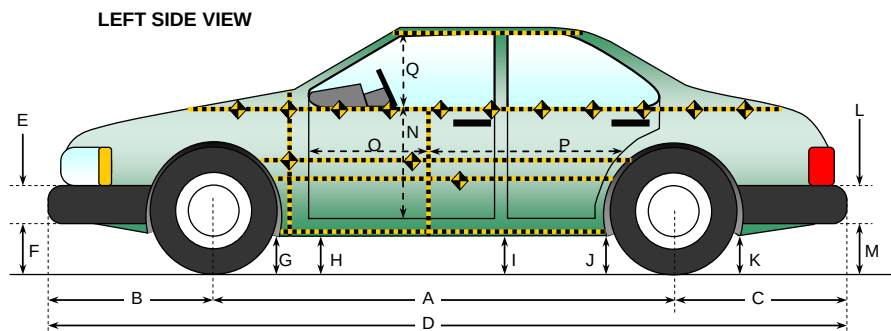
MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	5 forward
Vertical Offset	mm	+/-20	7 down

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



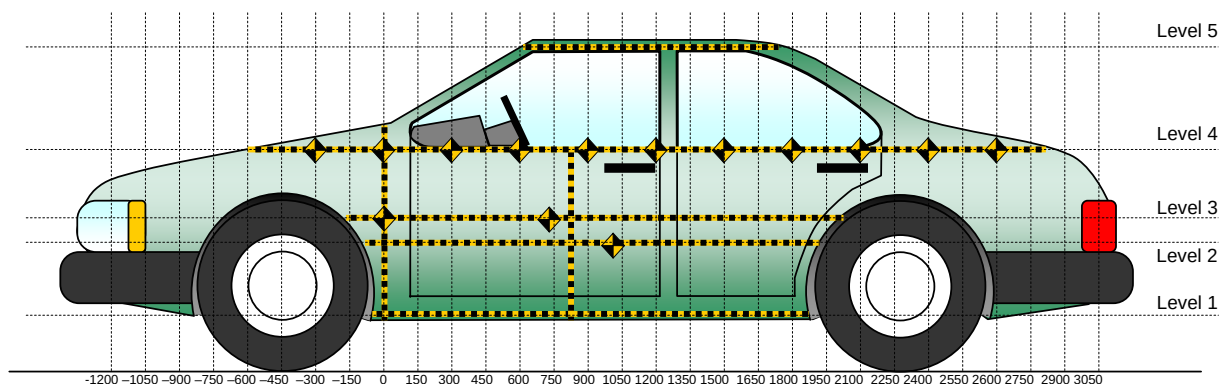
All measurements in (mm) with tolerance of ± 3 mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2796	2788	8
B	Front Axle to FSOV	940	942	-2
C	Rear Axle to RSOV	1084	1084	0
D	Total Length at Centerline	4820	4814	6
E	Front Bumper Thickness	126	126	0
F	Front Bumper Bottom to Ground	350	360	-10
G	Sill Height at Front Wheel Well	160	174	-14
H	Sill Height at Front Door Leading Edge	162	179	-17
I	Sill Height at B Pillar	164	188	-24
J1	Sill Height at Rear Wheel Well	155	172	-17
J2	Pinch Weld Height at Rear Wheel Well	158	168	-10
K	Sill Height Aft of Rear Wheel Well	195	180	15
L	Rear Bumper Thickness	183	183	0
M	Rear Bumper Bottom to Ground	320	333	-13
N	Sill Height to Window Bottom Sill	760	641	119
O	Front Door Leading Edge to Impact CL	785	756	29
P	Rear Door Trailing Edge to Impact CL	1238	1176	62
Q	Front Window Opening	400	392	8
R	Right Side Length	4620	4620	0
S	Left Side Length	4620	4600	20
T	Vehicle Width at B Post	1821	1596	225

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

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



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	230
2	Occupant H-Point	505
3	Mid-Door	625
4	Window Sill	950
5	Window Top	1375

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

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-600				314					314					0	
-450				295					306					11	
-300				287					303					16	
-150			179	279				196	293				17	14	
0	209	187	187	265		199	231	218	283		-10	44	31	18	
150	220	193	186	255		219	330	331	286		-1	137	145	31	
300	221	194	185	252		228	366	359	308		7	172	174	56	
450	222	194	185	251		237	389	385	331		15	195	200	80	
600	222	193	184	250		245	406	387	346		23	213	203	96	
750	222	193	183	252	469	253	413	392	352	489	31	220	209	100	20
900	220	192	182	251	472	260	420	407	360	498	40	228	225	109	26
1050	221	192	182	254	477	263	427	414	363	504	42	235	232	109	27
1200	221	194	184	255	483	264	448	389	358	512	43	254	205	103	29
1350	221	195	186	258	487	264	446	389	416	518	43	251	203	158	31
1500	221	197	188	257	489	262	429	417	408	519	41	232	229	151	30
1650	220	199	191	262	492	253	382	416	398	523	33	183	225	136	31
1800	221	197	194	262	500	236	257	362	377	525	15	60	168	115	25
1950	218	199	191	272	517	200	258	290	334	538	-18	59	99	62	21
2100			185	273				214	287				29	14	
2250			182	284				201	308				19	24	
2400				288					307					19	
2550				303					320					17	
2700				315					328					13	
2850				339					345					6	
3000				355					360					5	

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)	43	254	232	158	31
Distance From Impact (mm)	1200	1200	1050	1350	1350

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

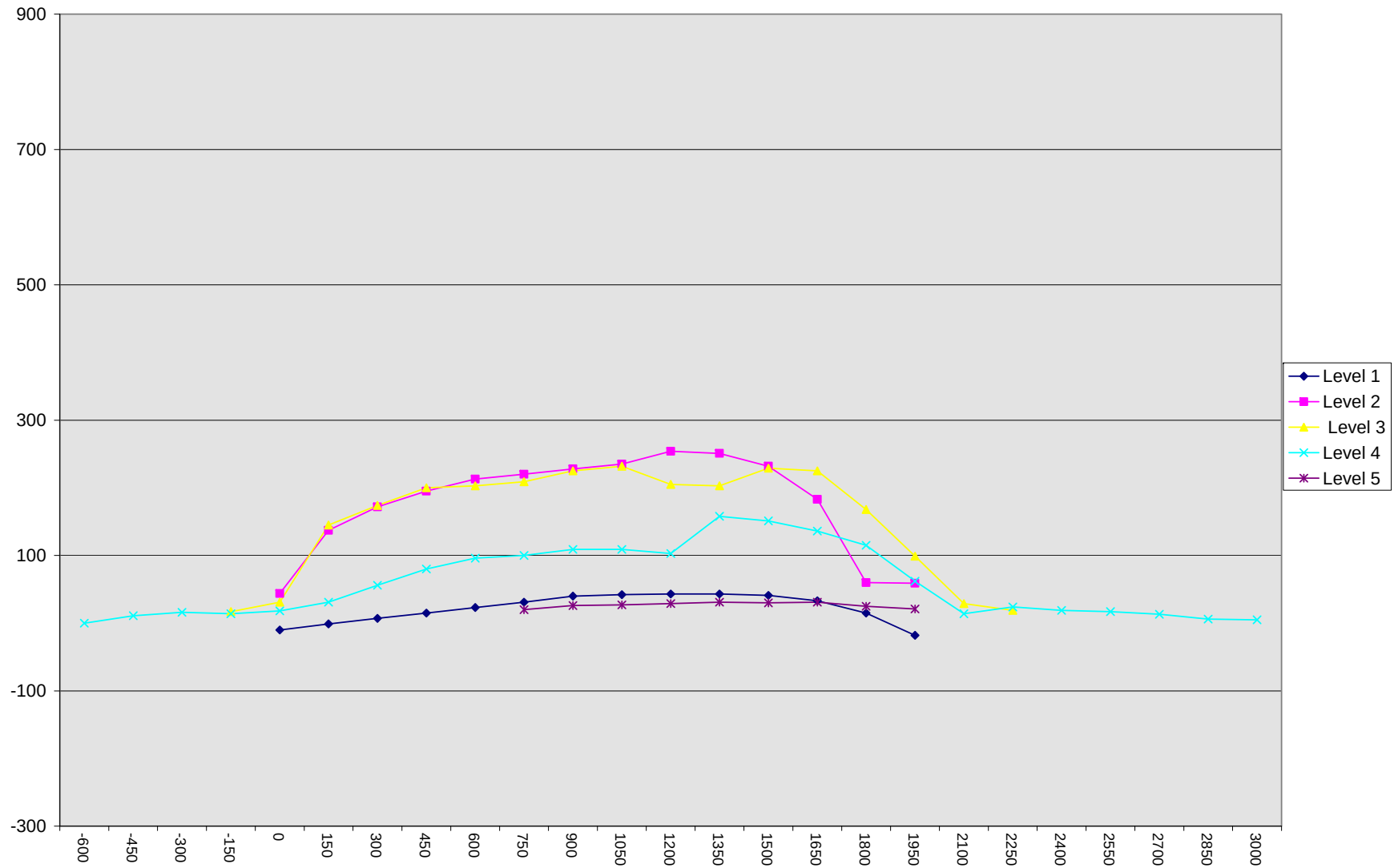
Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan

NHTSA No. MB5001

Test Program: NCAP Side MDB Impact Test

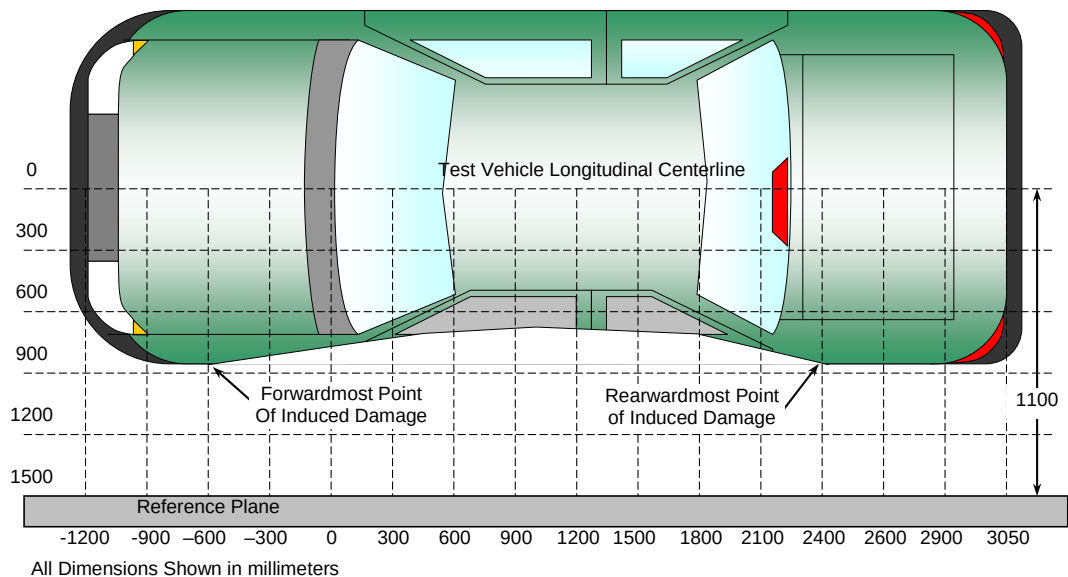
Test Date: 6/09/2010

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DATA SHEET NO. 13 **VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



TOP VIEW

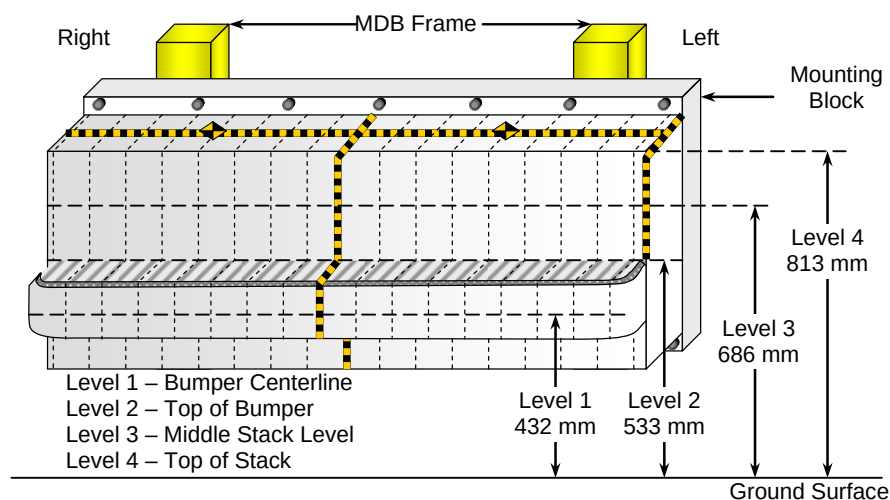
DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	3000	4	355	360	5
2	2250	4	284	308	24
3	1545	4	258	451	193
4	805	2	193	415	222
5	110	2	190	319	129
6	-600	4	314	314	0

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



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	46	18	9	21	45	81	90	77	69	57	44	53	64	81	105	130	175
3	49	16	15	20	30	64	57	32	23	19	18	20	25	34	50	70	116
2	53	54	47	47	55	66	65	65	59	59	72	77	80	87	90	99	111
1	126	123	129	133	139	145	147	149	146	142	140	144	149	151	156	175	184

DATA SHEET NO. 15

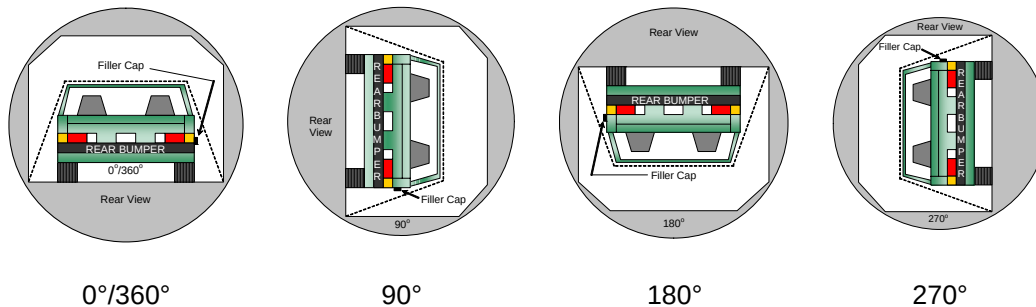
FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
 Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010

Test Time: 10:55 am Temperature: 21° C

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

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	114	300	414
90° to 180°	112	300	412
180° to 270°	104	300	404
270° to 360°	116	300	416

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

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

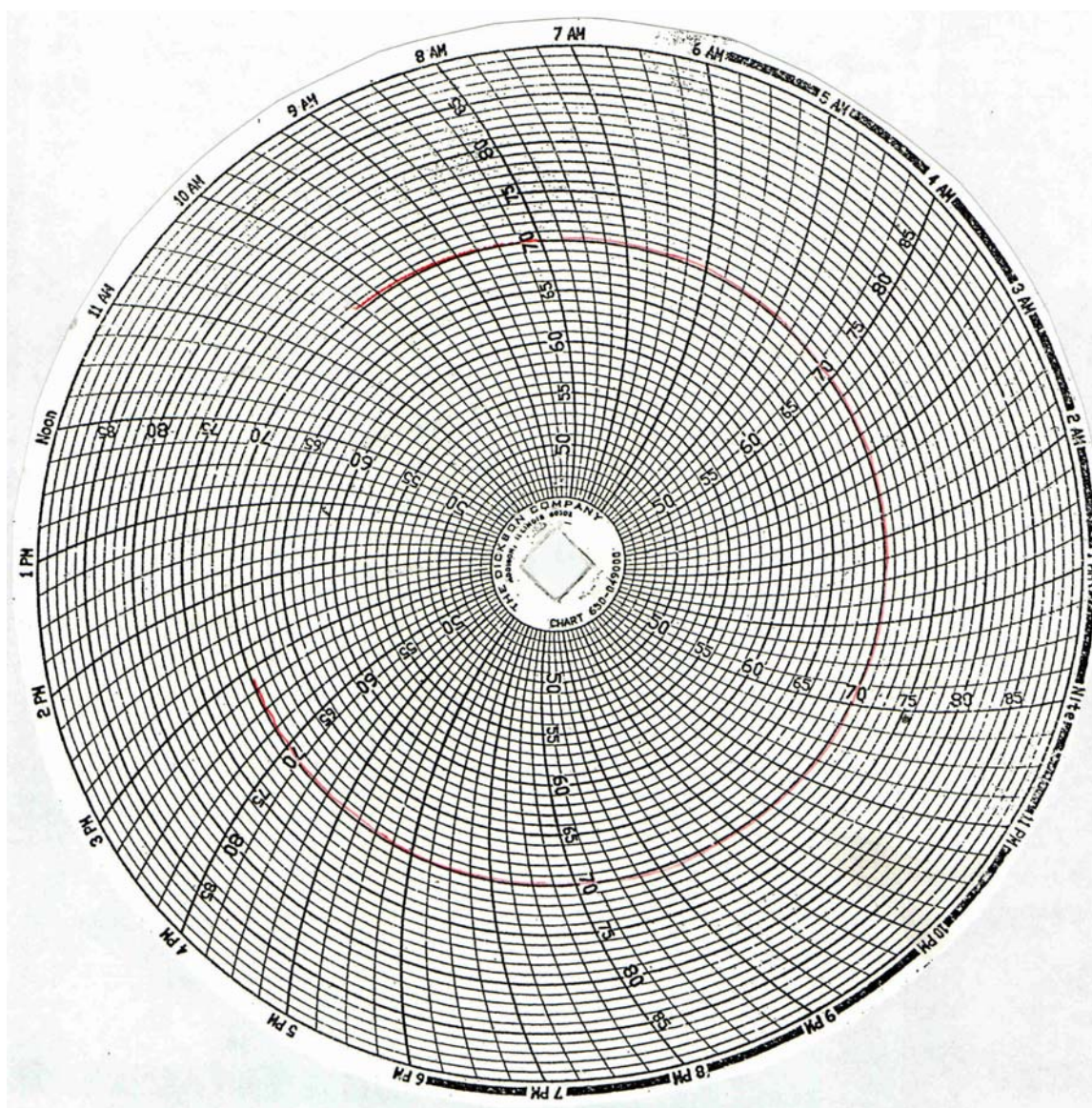
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 16

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Hyundai Sonata GLS 4-Dr Sedan NHTSA No. MB5001
Test Program: NCAP Side MDB Impact Test Test Date: 6/09/2010



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



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



Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Left $\frac{3}{4}$ 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 the Test Vehicle with MDB Positioned Against the Side of the Test Vehicle



Post-Test Overhead View of the Test Vehicle and MDB



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



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



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 (through front window)



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



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



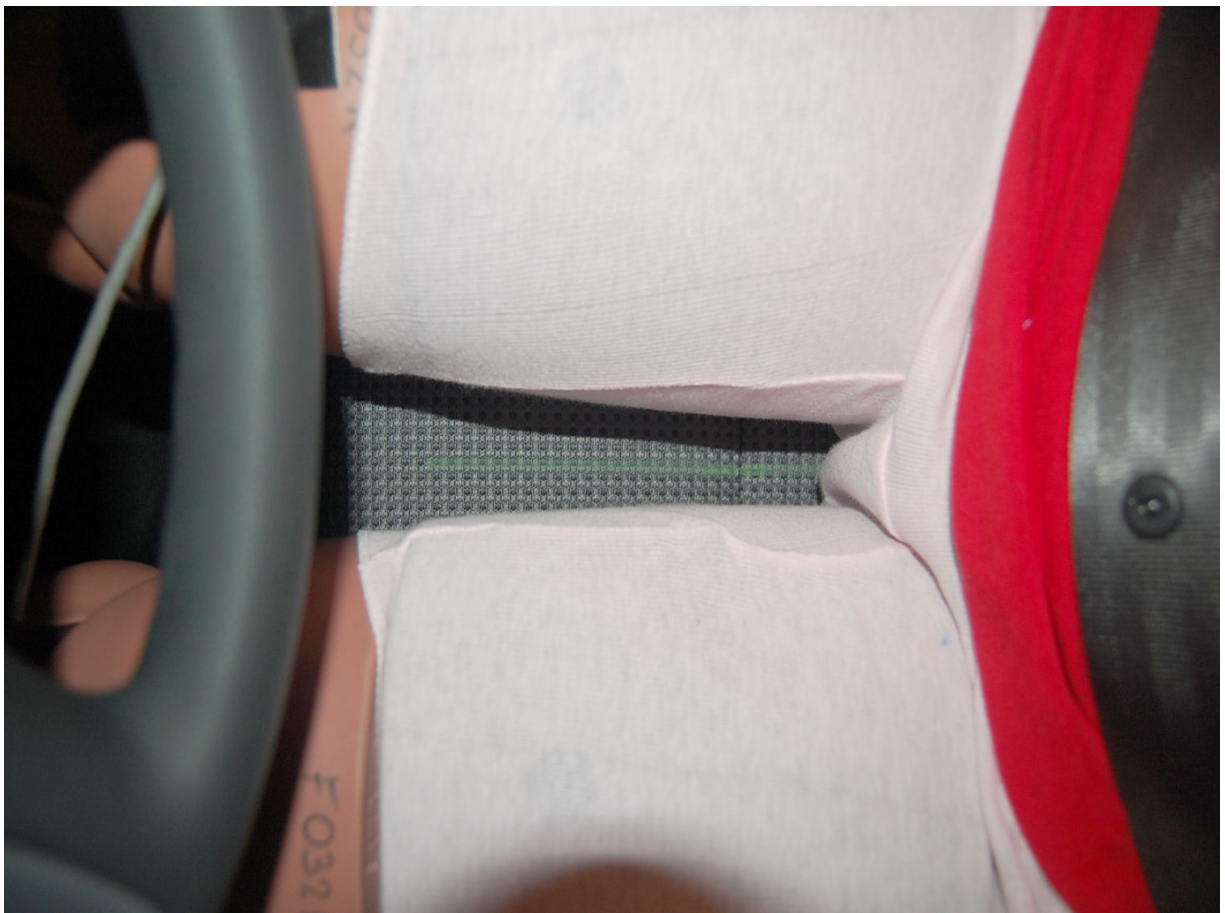
Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



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 Seat Positioning



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



Pre-Test Close-Up View of Driver Seat Back/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 (with dummy removed)



Post-Test Driver Dummy Head Contact with Vehicle View



Post-Test Driver Dummy Head Contact with Side Airbag View



Post-Test Driver Dummy Torso Contact with Vehicle View



Post-Test Driver Dummy Torso Contact with Side Airbag View



Post-Test Driver Dummy Pelvis Contact with Vehicle Interior View



Post-Test Driver Dummy 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 Passenger Dummy Shoulder and Door Top View



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



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



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



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



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



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



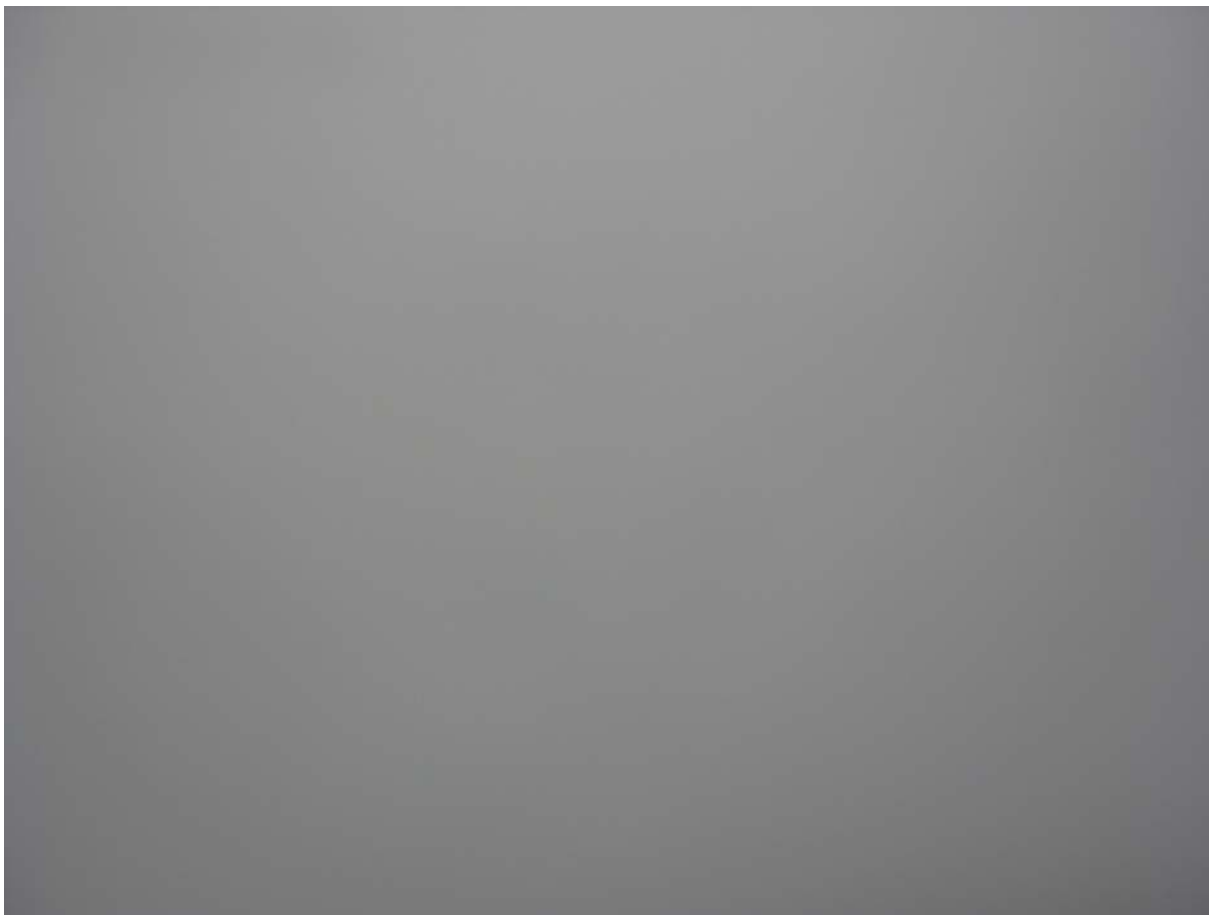
Pre-Test View of Passenger Dummy's Head Showing Dummy's Head is Level



Pre-Test Placement of Passenger Dummy's Feet



Pre-Test View of Belt Anchorage for Passenger Dummy



Pre-Test Close-Up Left Side View of Passenger Seat Track View - Not Applicable



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



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



Pre-Test Passenger Dummy and Door Clearance View



Post-Test Passenger Dummy and Door Clearance View



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



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



Pre-Test Passenger Inner Door Panel View



Post-Test Passenger Inner Door Panel View (with dummy removed)



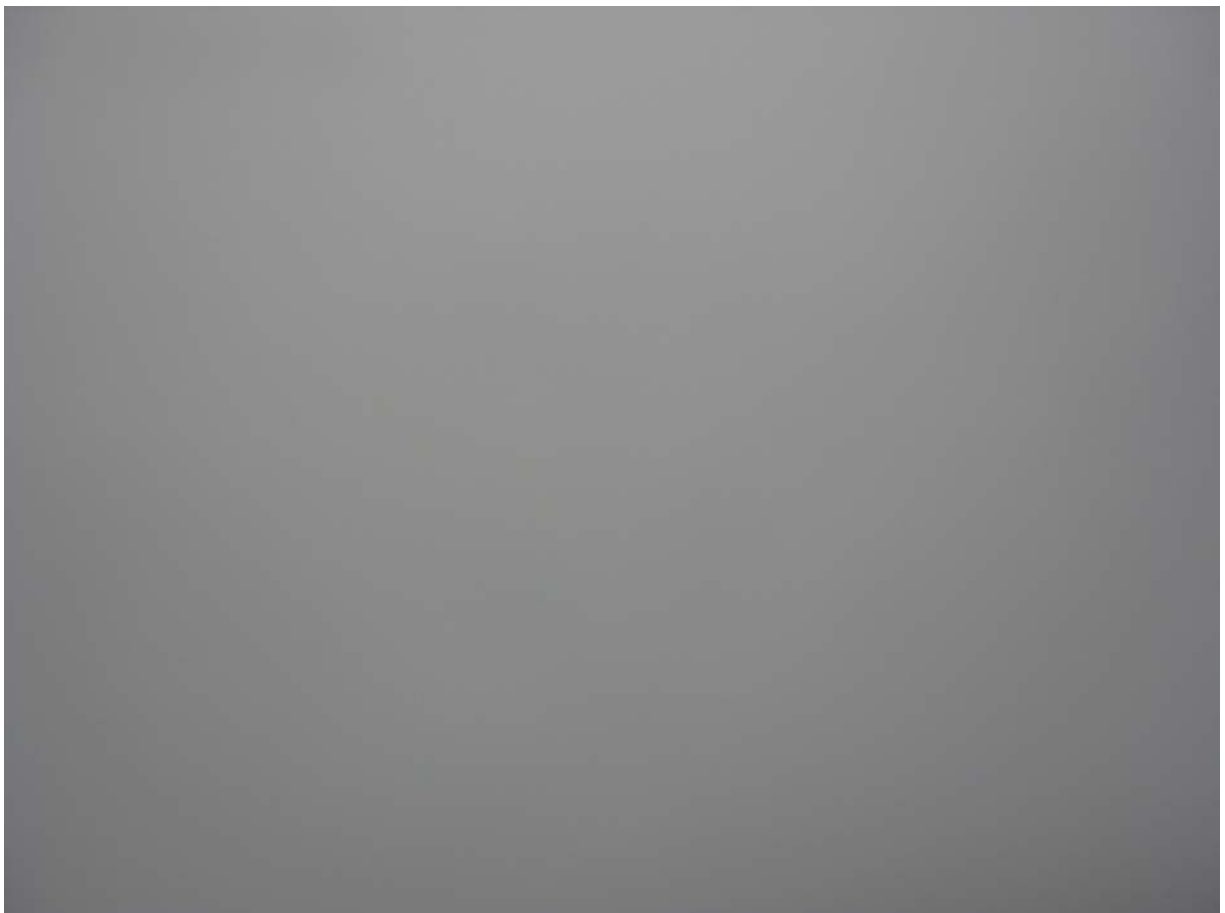
Post-Test Passenger Dummy Head Contact with Vehicle View



Post-Test Passenger Dummy Head Contact with Side Airbag View



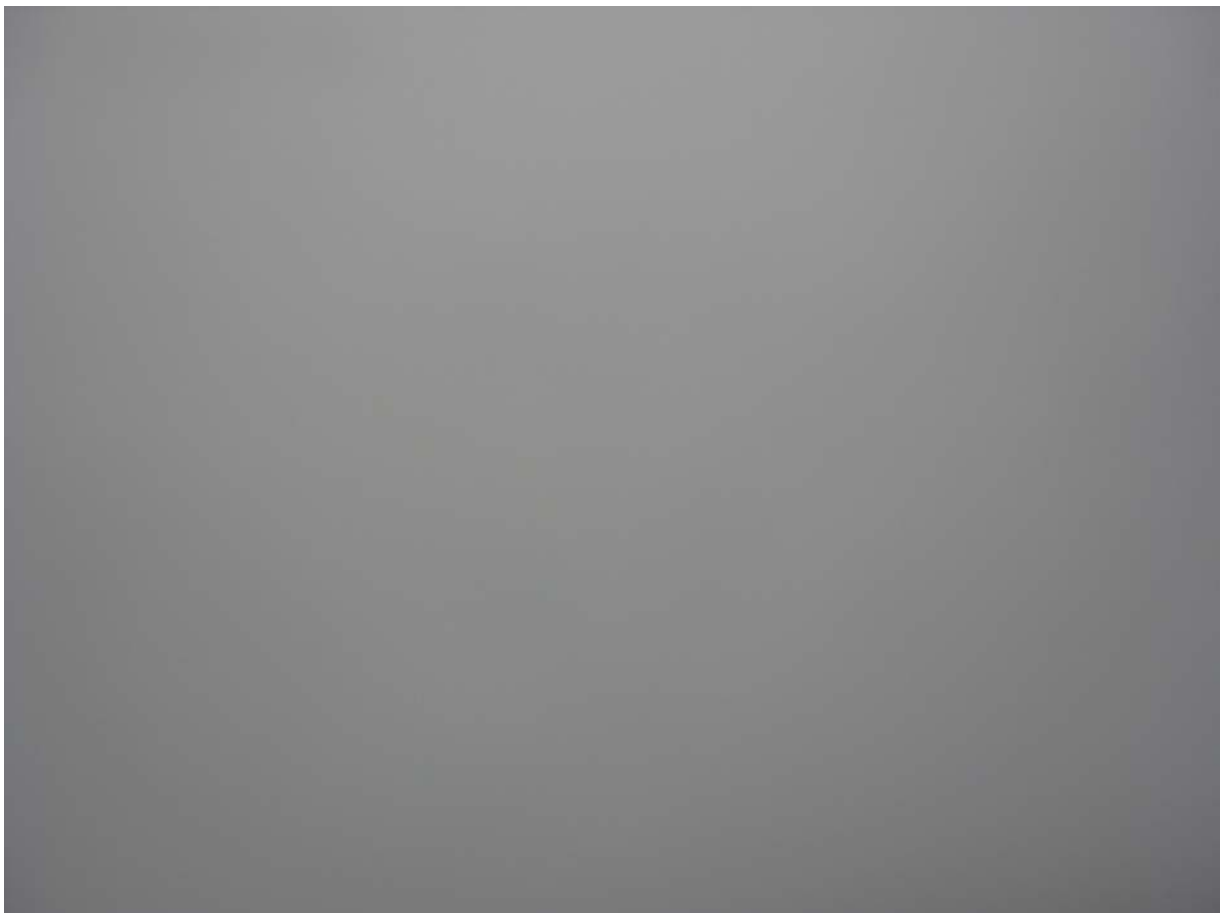
Post-Test Passenger Dummy Torso Contact with Vehicle View



Post-Test Passenger Dummy Torso Contact with Side Airbag View - Not Applicable



Post-Test Passenger Dummy Pelvis Contact with Vehicle Interior View



Post-Test Passenger Dummy Pelvis Contact with Side Airbag View - Not Applicable



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



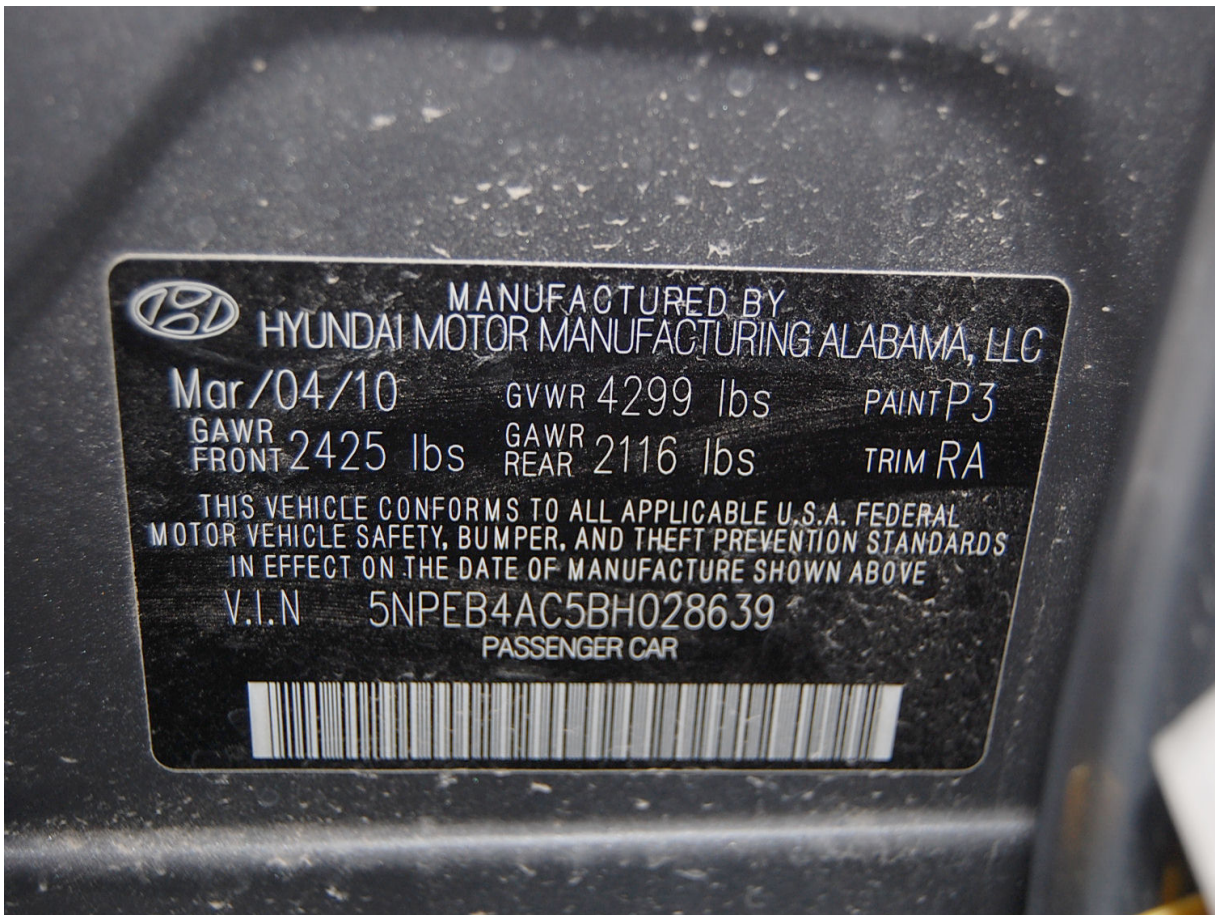
Post-Test Left Side View of MDB Impactor Face



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 of Label



Pre-Test Ballast View



Post-Test Speed Trap Velocity Read-Out with Placard Showing NHTSA Number



FMVSS No. 301/305 Rollover 0 Degrees



FMVSS No. 301/305 Rollover 90 Degrees



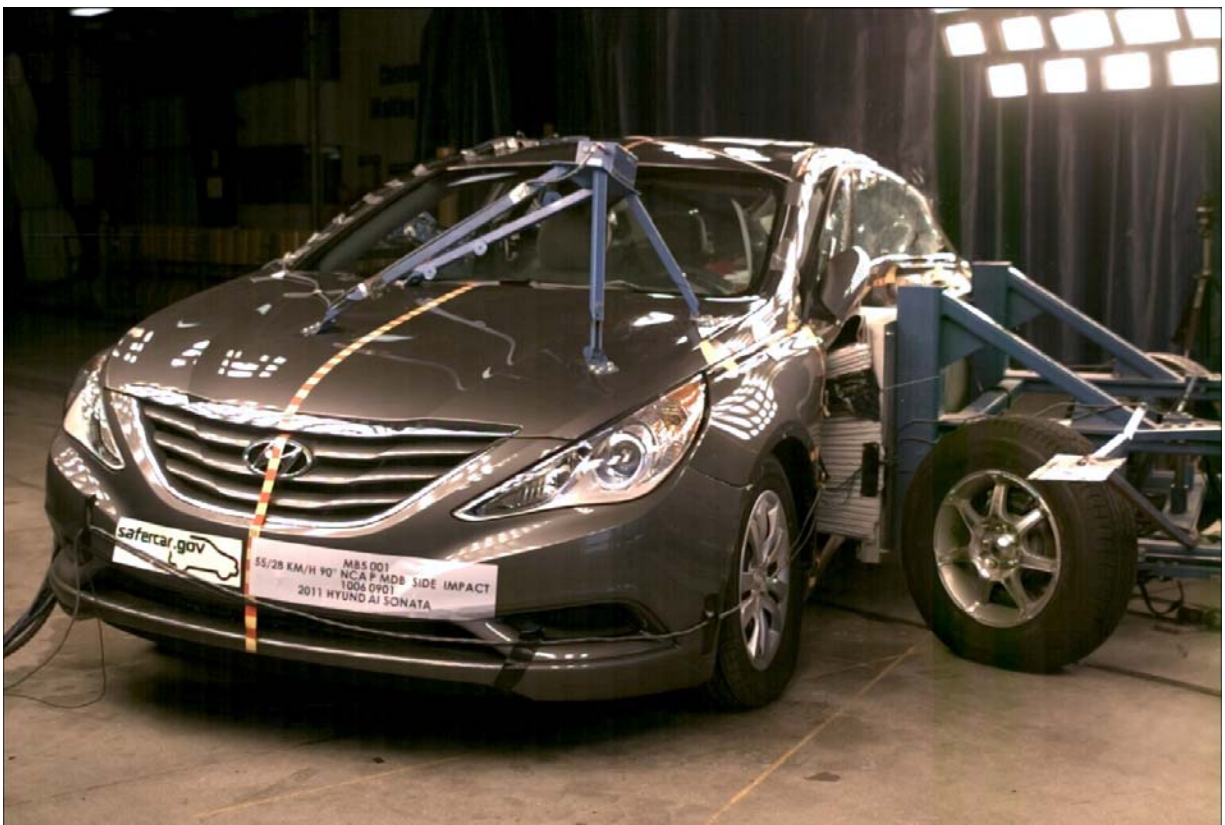
FMVSS No. 301/305 Rollover 180 Degrees



FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees



Impact Event



2011 SONATA GLS: Fuel Economy, Safety, Design, and Technology

VIN: 5NPEB4AC5BH028639
MODEL: 27402
ENGINE: G4KJAK030022

PORT OF ENTRY: MA
COLOR: Harbor Gray Metallic
MODE OF TRANSPORT: Truck
ACCESSORY WEIGHT: 0 lbs.

SOLD TO: W014
BOUCHER HYUNDAI
1583 EAST MORELAND BOULEVARD
WAUKESHA, WI 53186

SHIPPED TO: W014

Manufacturer's suggested retail price includes manufacturer's recommended options and destination charge. Tax, license and title are extra. Dealer's price may vary. Dealer's price includes dealer's accessories and is not included in the manufacturer's suggested retail price.

This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1221 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

PART CONTENT INFORMATION
FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 41 %
MAJOR SOURCES OF FOREIGN PARTS CONTENT: Korea 58 %

Note: Parts content does not include final assembly, distribution, or other non-parts costs.
FOR THIS VEHICLE: FINAL ASSEMBLY POINT: Montgomery, Alabama U.S.A.
COUNTRY OF ORIGIN: ENGINE: U.S.A. TRANSMISSION: Korea

EPA Fuel Economy Estimates

CITY MPG

22

Expected range for most drivers
18 to 26 MPG

Estimated Annual Fuel Cost

\$1,501.00
based on 15,000 miles at \$2.60 per gallon

Combined Fuel Economy

26
This Vehicle

13 All Large Cars

HIGHWAY MPG

35

Expected range for most drivers
29 to 41 MPG

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



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

STANDARD FEATURES:

- 5-year/60,000-mile New Vehicle Warranty*
- 10-year/100,000-mile Powertrain Warranty*
- 7-year/Unlimited-mile Anti-rust Protection
- 5-year/Unlimited-mile Roadside Assistance
- 16-inch alloy wheels
- ABS w/ Electronic Brake Force Distribution & Brake Assist
- 4-Wheel Disc Brakes
- Front, Front Side Impact & Side Curtain Airbags
- Front Active Head Restraints
- Front Seatbelt Pretensioners
- Tire Pressure Monitoring System
- Daytime Running Lights

ADVANCED SAFETY TECHNOLOGY

- Electronic Stability Control (ESC) w/ Traction Control
- ABS w/ Electronic Brake Force Distribution & Brake Assist
- 4-Wheel Disc Brakes
- Front, Front Side Impact & Side Curtain Airbags
- Front Active Head Restraints
- Front Seatbelt Pretensioners
- Tire Pressure Monitoring System
- Daytime Running Lights

POWERTRAIN TECHNOLOGY

- 2.4L Gasoline Direct Injection (GDI) 4-Cylinder Engine
- Continuous Variable Valve Timing
- 16-Valve Dual Overhead Cam w/ SHIFTRONIC®

COMFORT & CONVENIENCE

- 16-inch Wheels w/ Full Covers and P205/65R16 Tires
- Chrome Window Belt-Line Moldings
- Solar Control Window Glass
- Remote Keyless Entry w/ Alarm
- Power Windows, Locks & Mirrors
- Premium Cloth Seat Trim
- Metallized Interior Accents
- 60/40 Split-Folding Rear Seat
- Tilt-and-Telescopic Steering Column
- Steering Wheel Mounted Cruise, Audio & Phone Controls
- Power Windows
- Cabin Air Filter
- AM/FM/CD/MP3 Audio System w/ 6 speakers
- XM Satellite Radio w/ 90-Day Trial; Not Available in AK & HI
- iPod®/USB & Auxiliary Input Jacks
- Integrated Bluetooth® Hands-free Phone System
- Power Windows
- ECO Indicator Light
- EZ Lane Change Assist (Three-Blink Turn Signal Programming)
- Full Tank of Gas

Manufacturer's Suggested Retail Price: **\$20,135.00**

ADDED FEATURES:

- This vehicle is certified to meet emission requirements in all 50 states
- iPod® Cable

\$15.00

Inland Freight & Handling: **\$720.00**

TOTAL PRICE: **\$20,950.00**

GOVERNMENT SAFETY RATINGS

Frontal Crash	Driver	Not Rated
Crash	Passenger	Not Rated
Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	Not Rated
Crash	Rear seat	Not Rated
Star ratings based on the risk of injury in a side impact.		
Rollover	Not Rated	Not Rated
Star ratings based on the risk of rollover in a single vehicle crash.		
Star ratings range from 1 to 5 stars! ★★★★★ with 5 being the highest.		

Source: National Highway Traffic Safety Administration (NHTSA)

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

Environmental Performance

Protect the environment, choose vehicles with higher scores:

Global Warming Score Smog Score

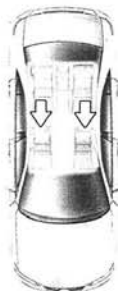


Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on this vehicle's measured emissions. Please visit www.DriveClean.ca.gov for more information. AIR RESOURCES BOARD

064 A MA1201002

14





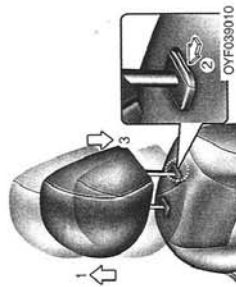
OMG038400

Headrest

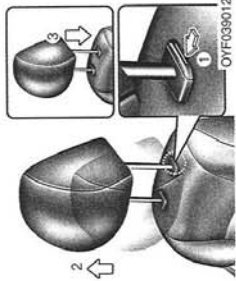
The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort. The headrest not only provides comfort for the driver and front passenger, but also helps to protect the head and neck in the event of a collision.

▲ 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 as 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).



Removal
To remove the headrest, raise it as far as it can go then press the release button (1) while pulling upward (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.

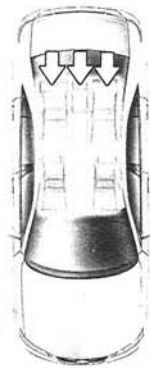
▲ WARNING
Make sure the headrest locks in position after adjusting it to properly protect the occupants.



Active headrest (if equipped)
The active headrest is designed to move forward and upward during a rear impact. This helps to prevent the driver's and front passenger's head from moving rearward and thus helps prevent neck injuries.

▲ 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 as severe injury to an occupant may occur in the event of an accident. Headrests may provide protection against severe neck injuries when properly adjusted.

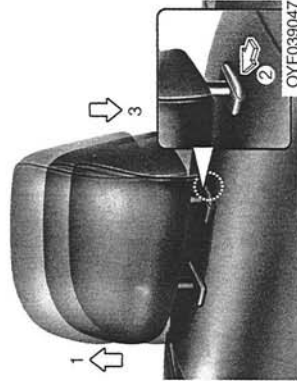


ONF039401

Rear seat Headrest

The rear seat(s) is equipped with headrests in all the seating positions for the occupant's safety and comfort. The headrest not only provides comfort for passengers, but also helps to protect the head and neck in the event of a collision.

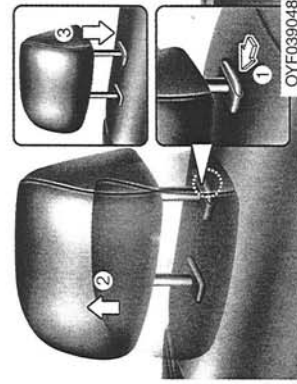
3 11



OYF039047

Adjusting the height up and down

To raise the headrest, pull it up (1). To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest (3).



OYF039048

Removal

To remove the headrest, raise it as far as it can go then press the release button (1) while pulling upward (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.

3 12

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
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) (not installed)
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)

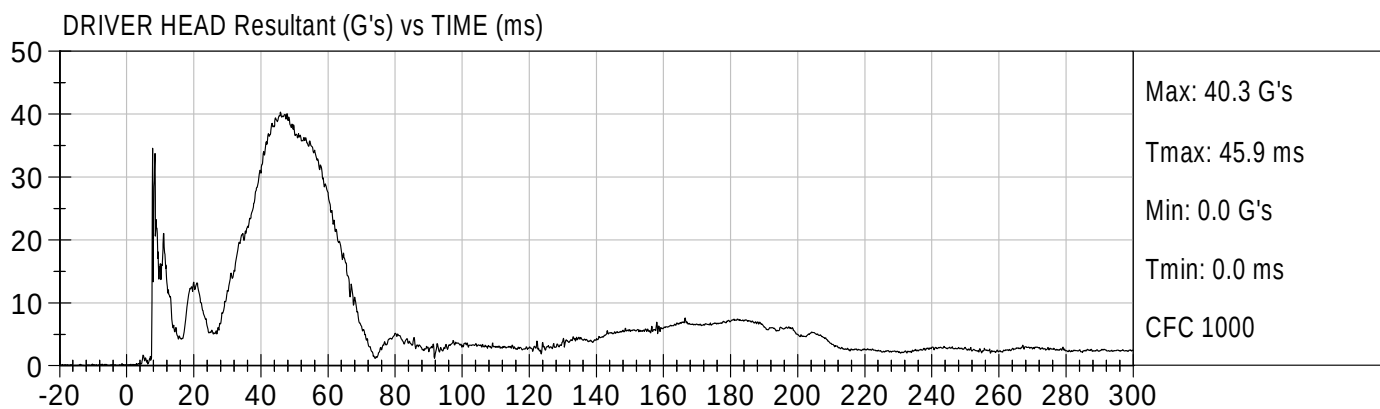
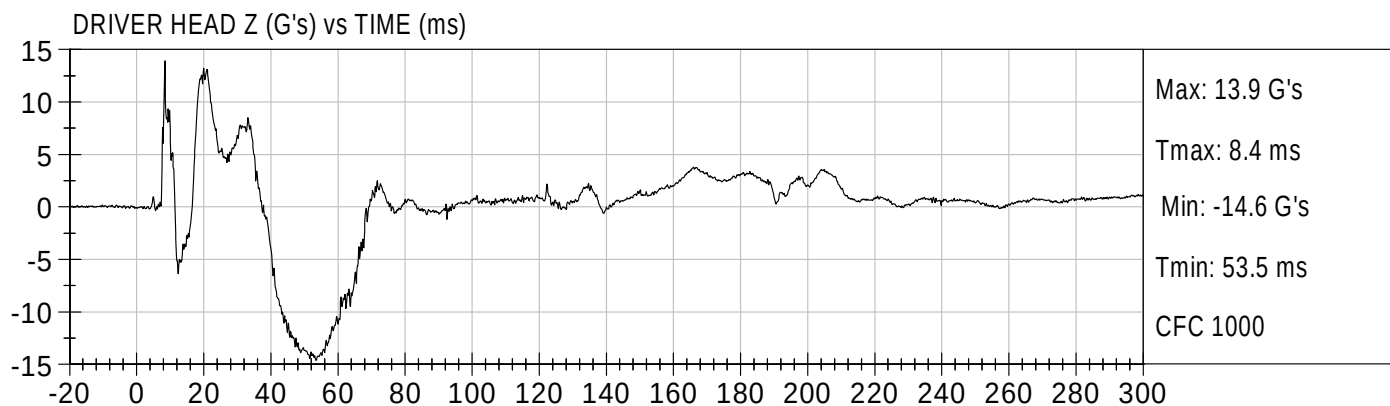
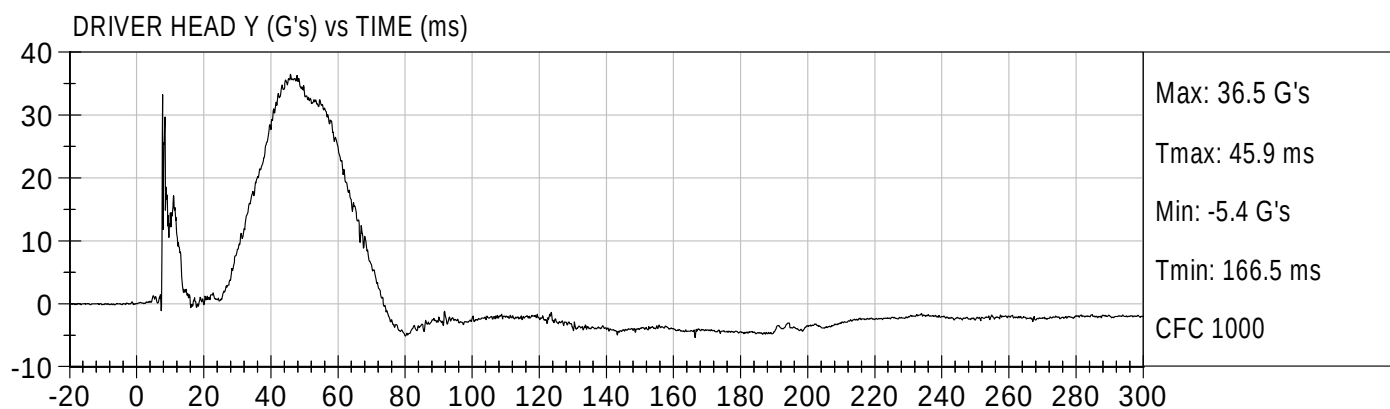
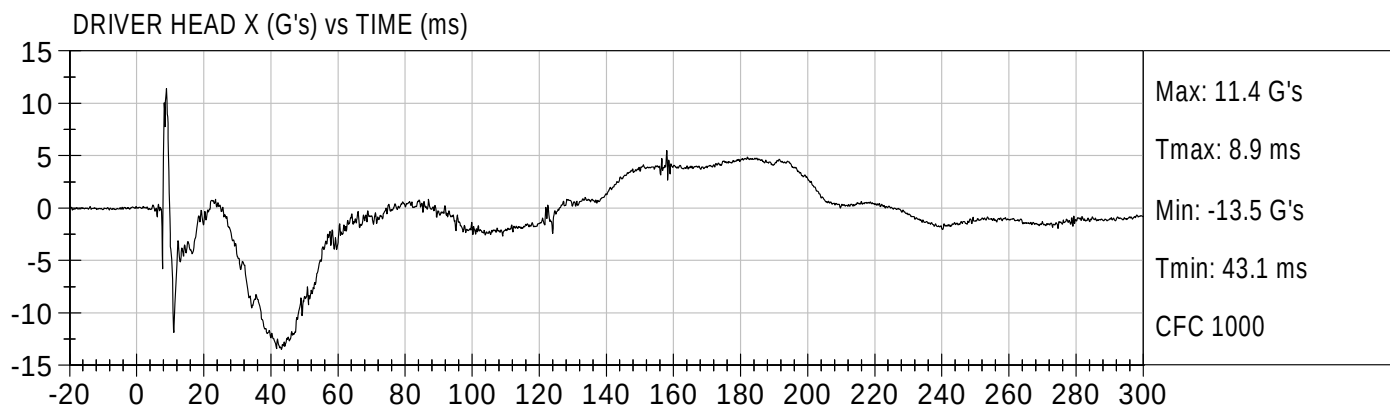
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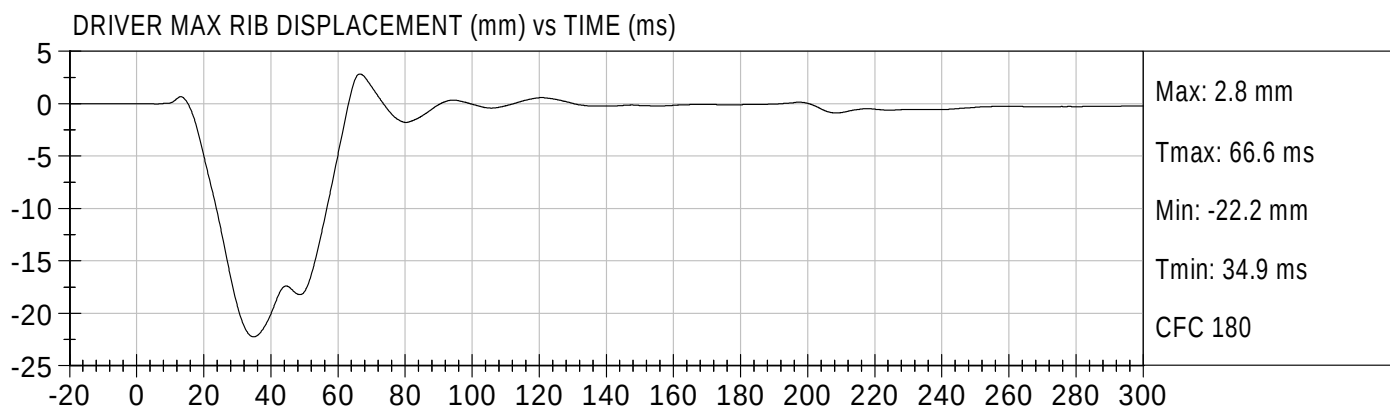
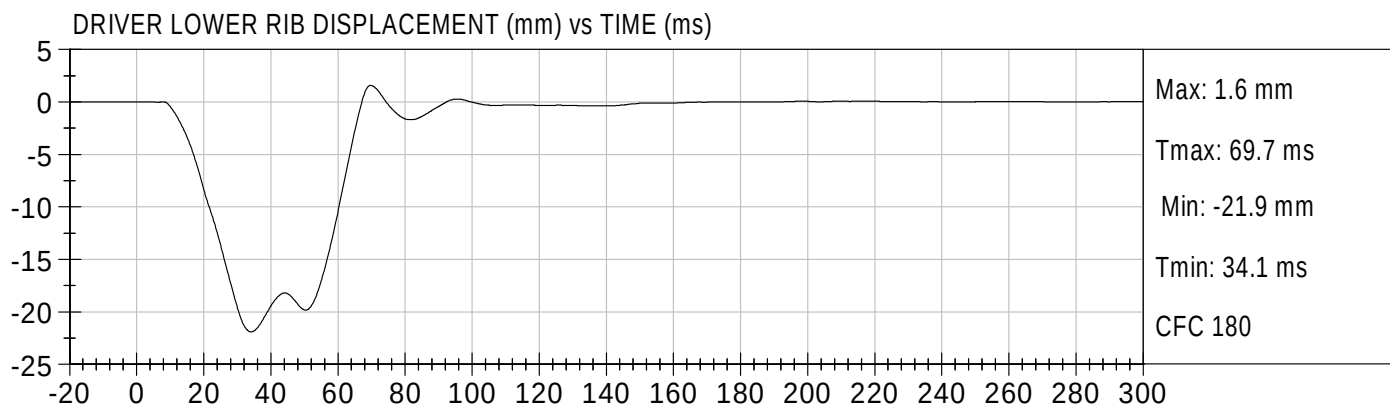
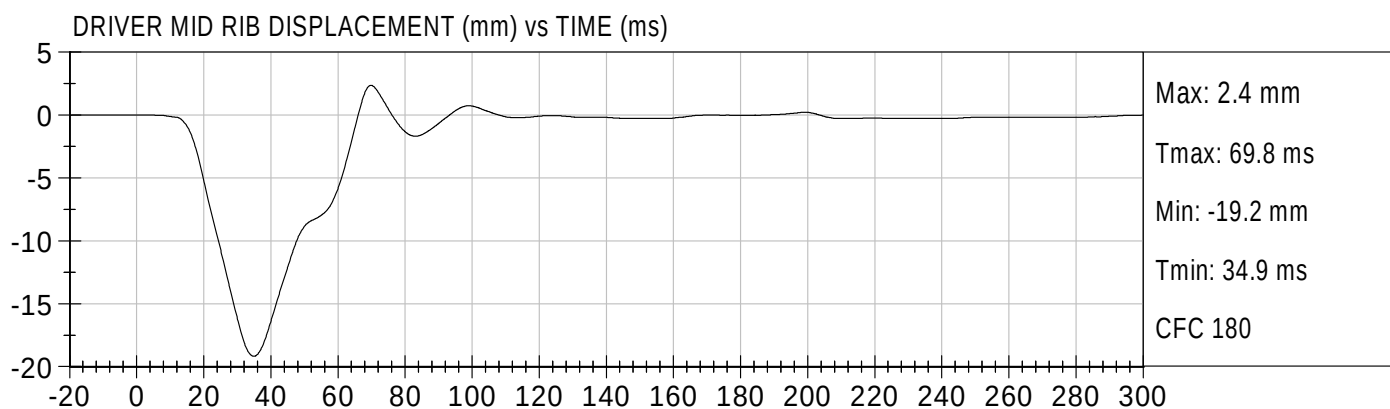
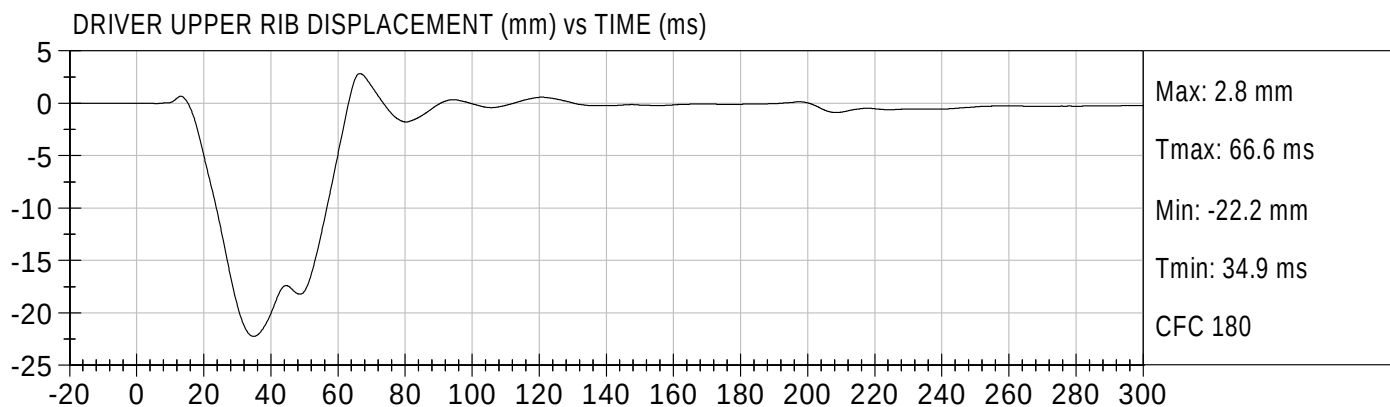
MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

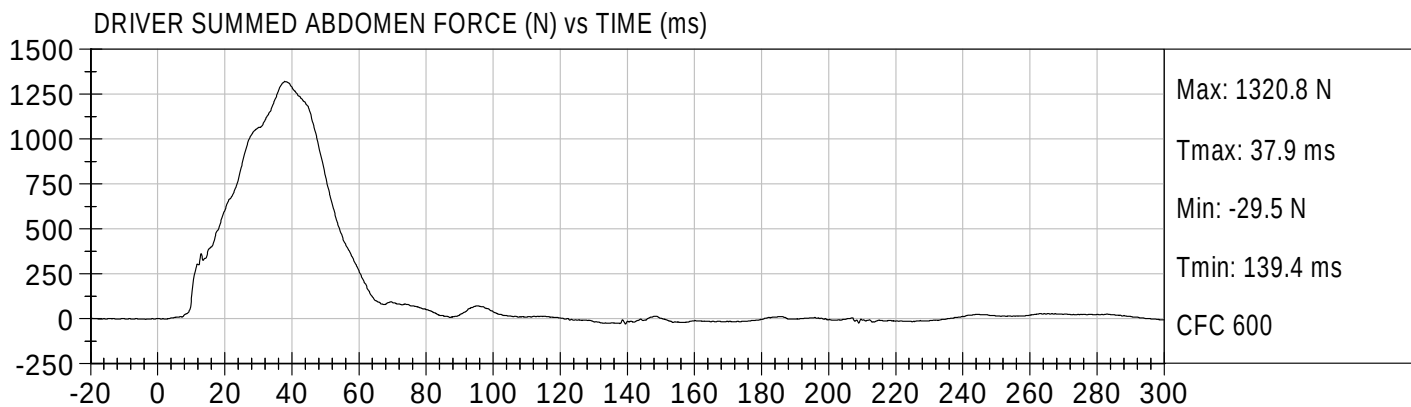
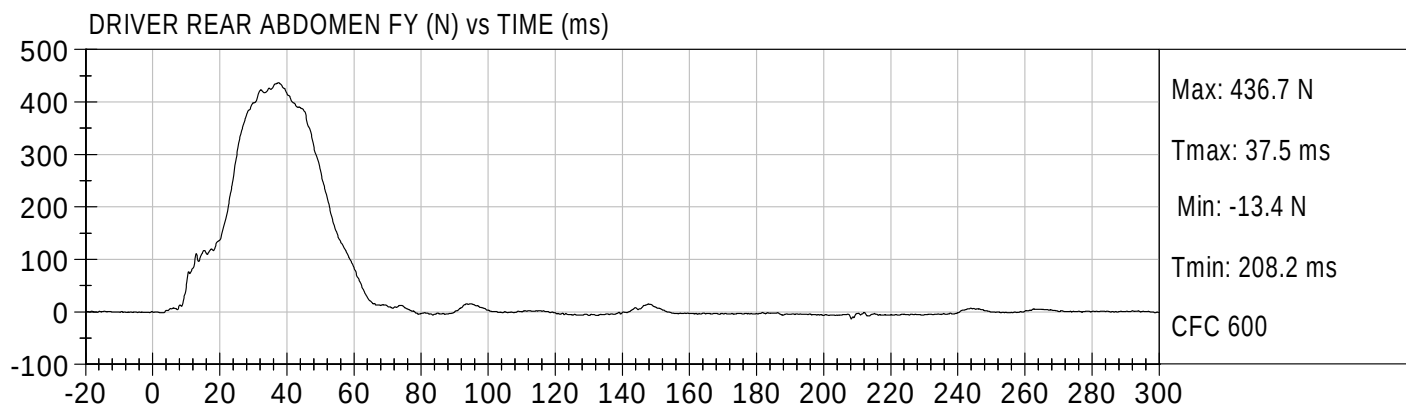
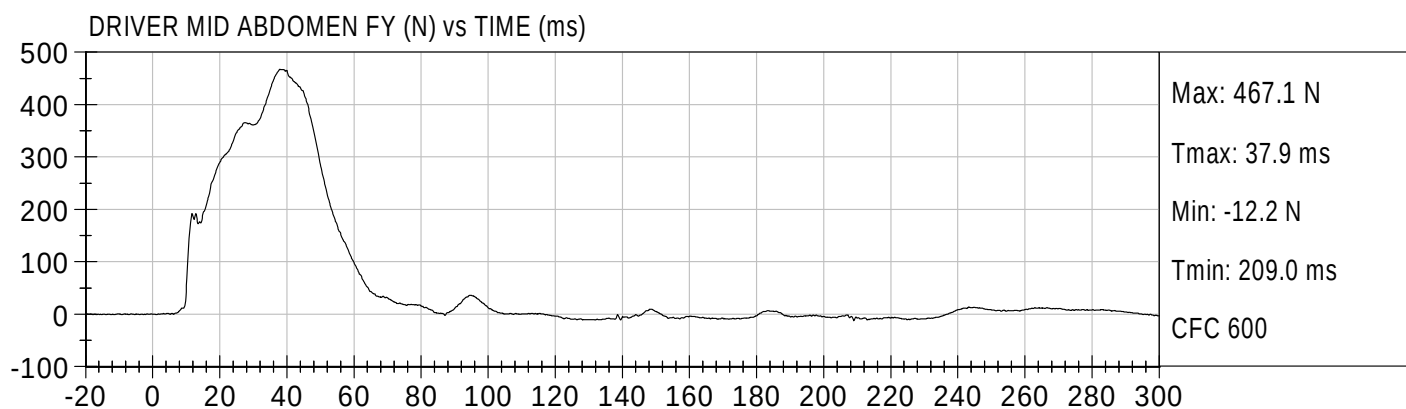
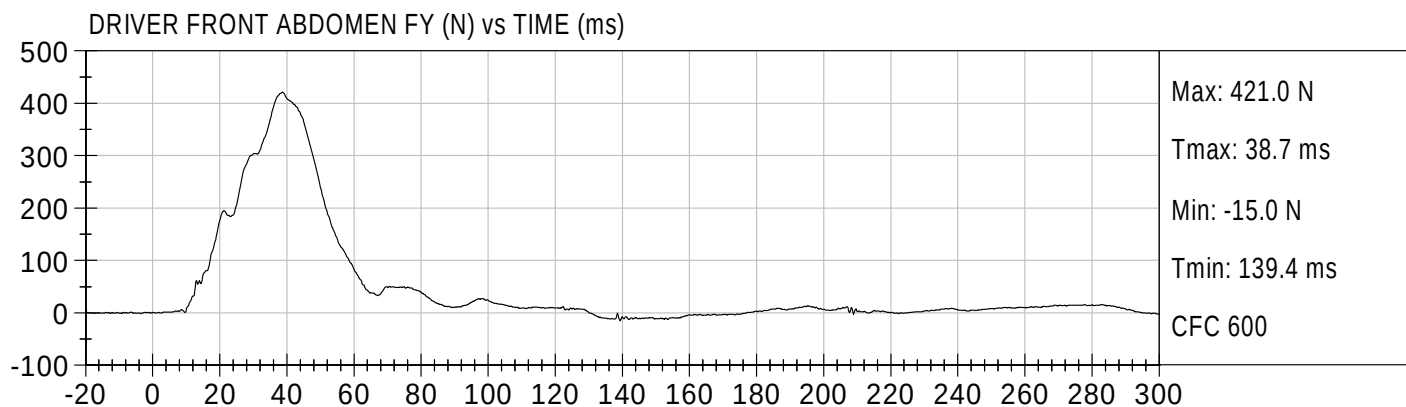


55/28 km/h 90° NCAP MDB Side Impact
2011 Hyundai Sonata - MB5001

Test Date: 06/09/2010
Speed: 38.8 mph (62.4 km/h)



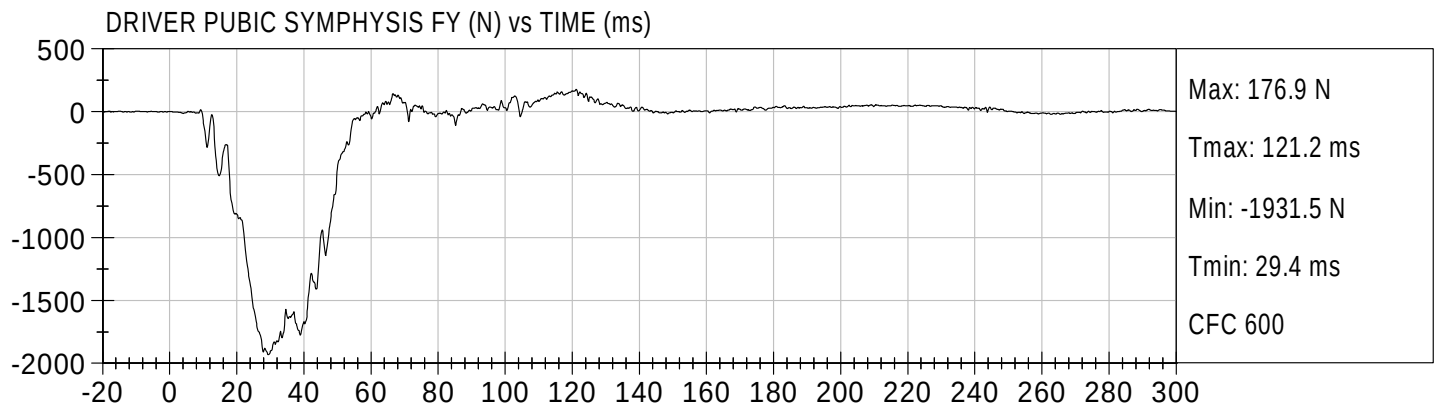






55/28 km/h 90° NCAP MDB Side Impact
2011 Hyundai Sonata - MB5001

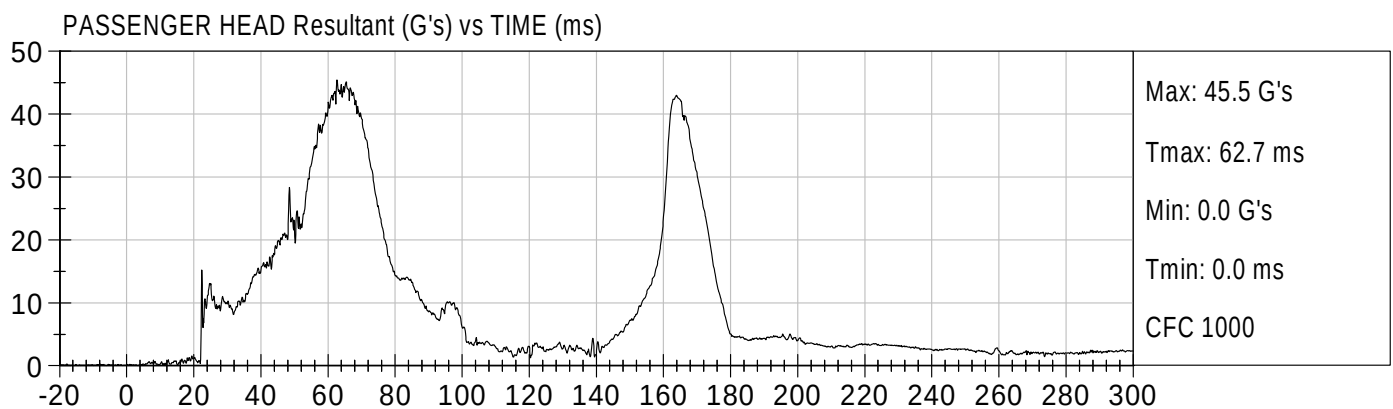
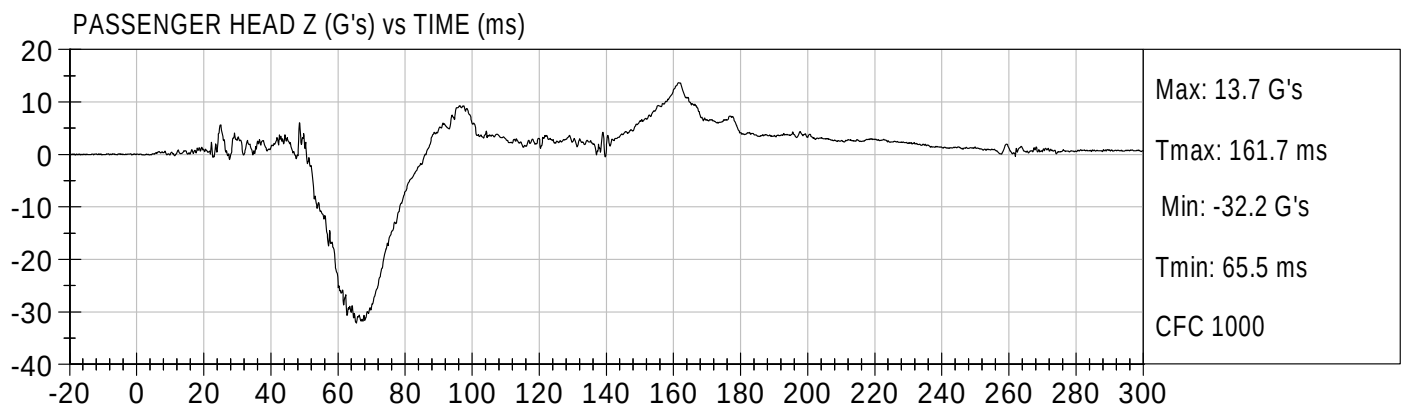
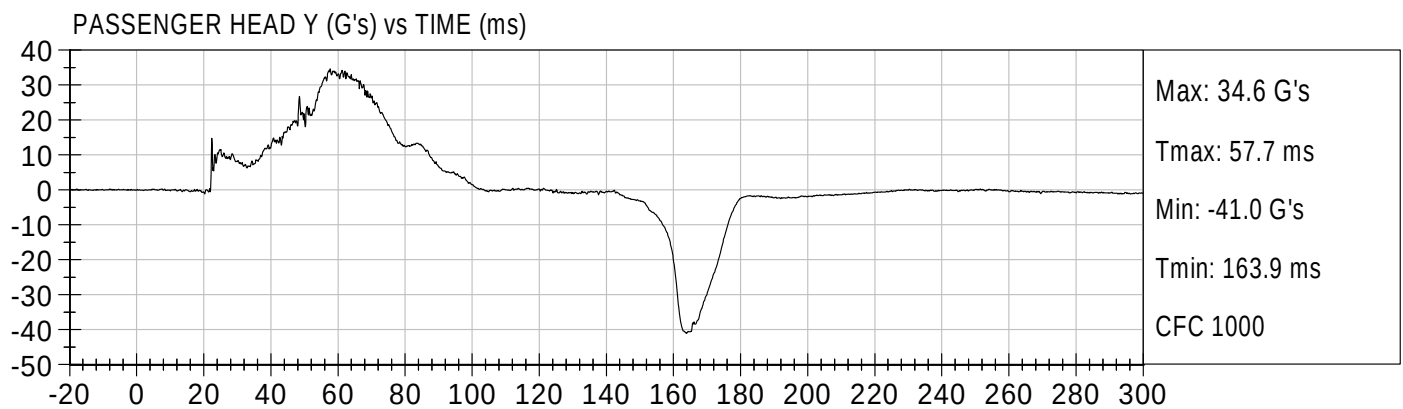
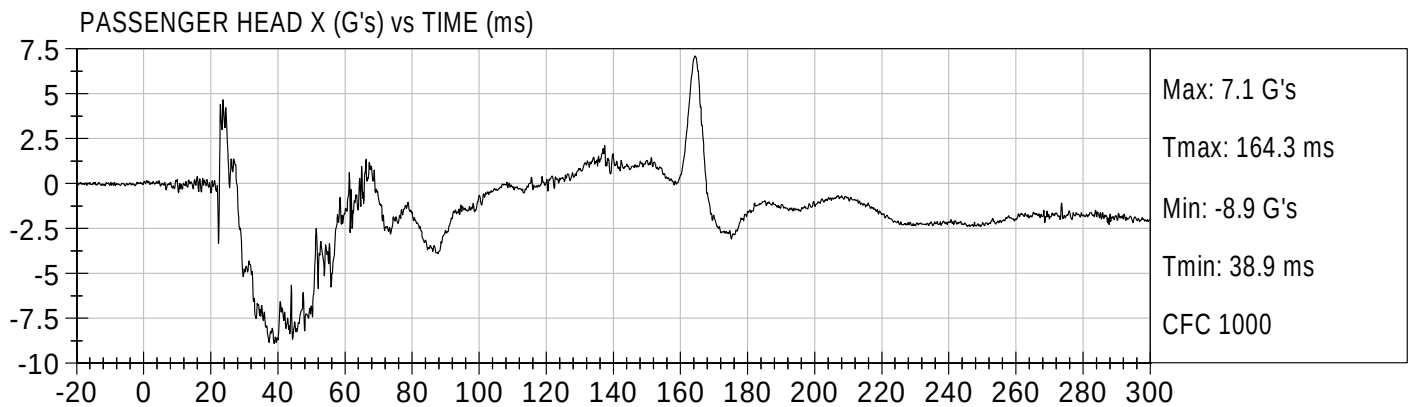
Test Date: 06/09/2010
Speed: 38.8 mph (62.4 km/h)

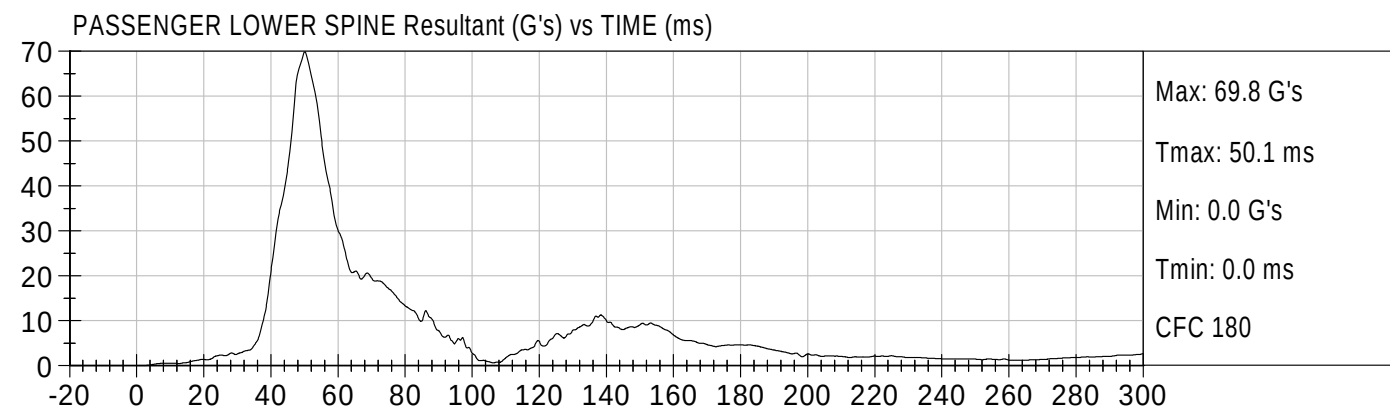
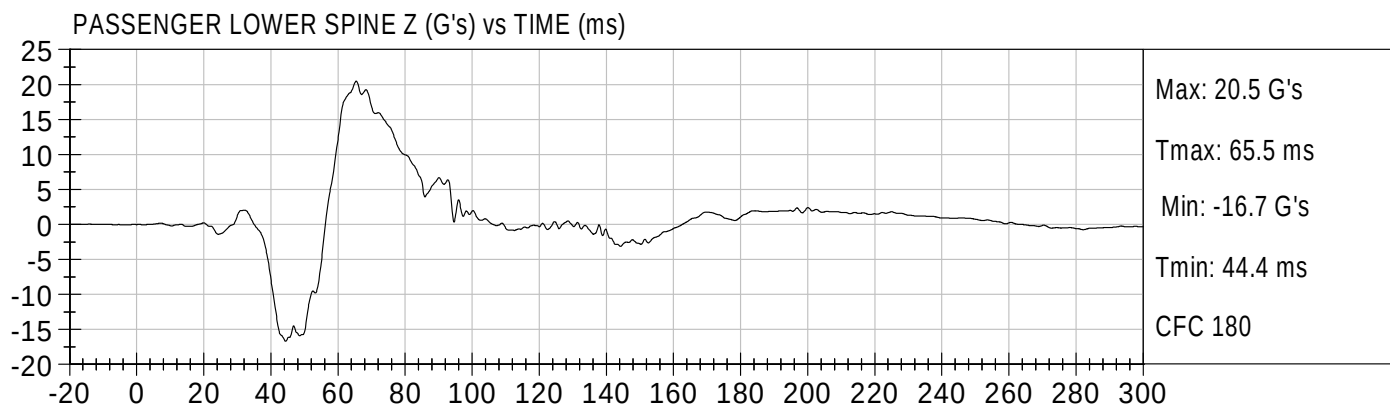
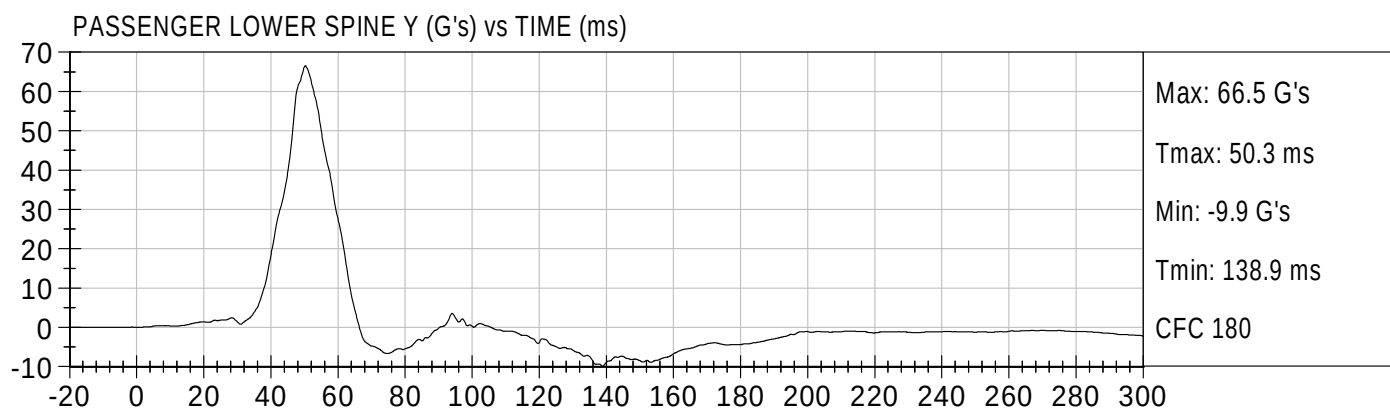
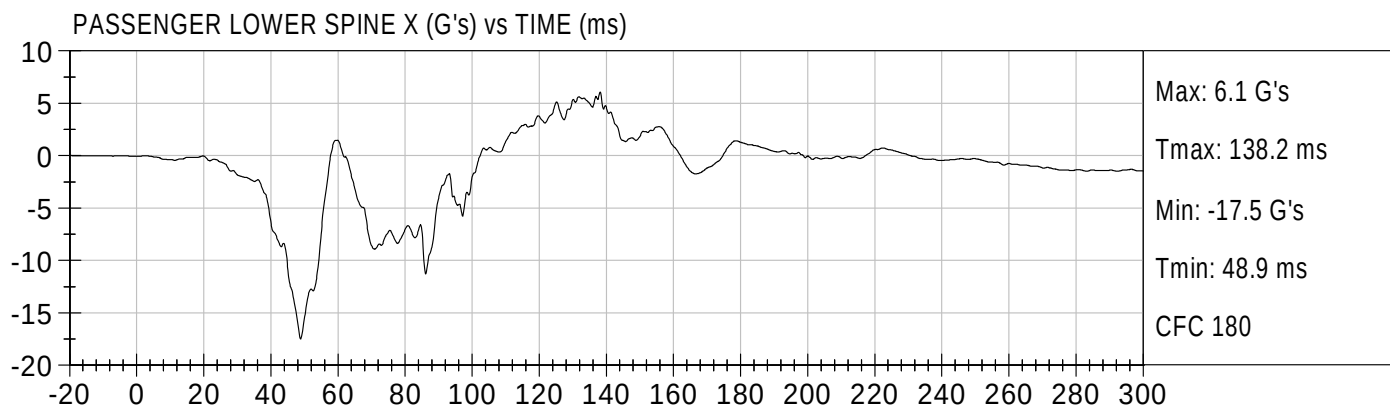


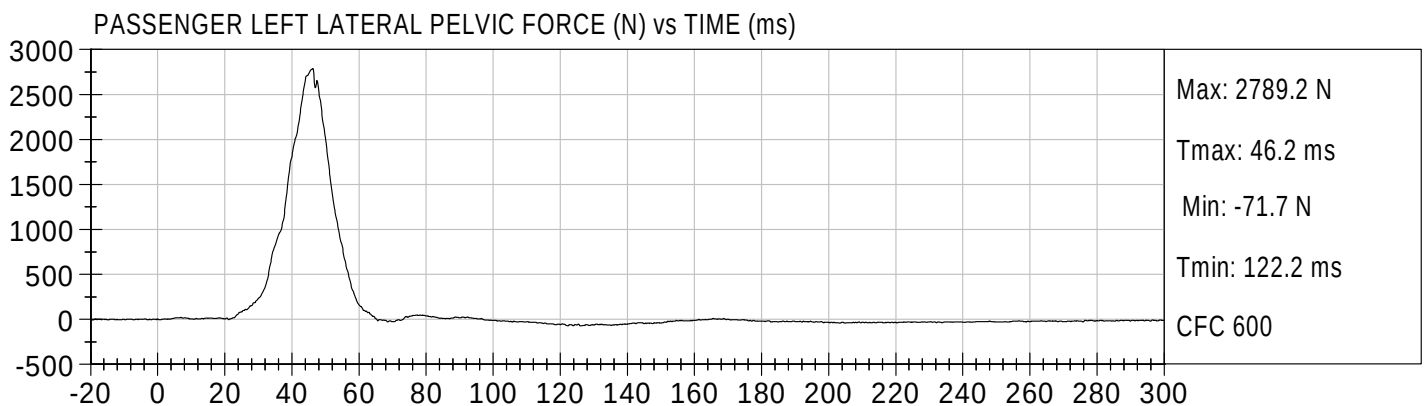
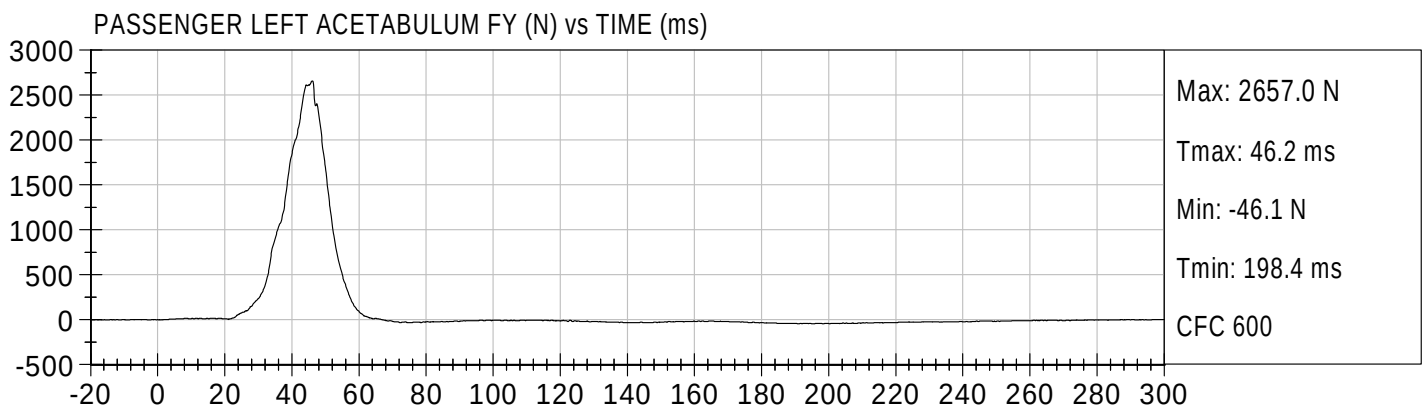
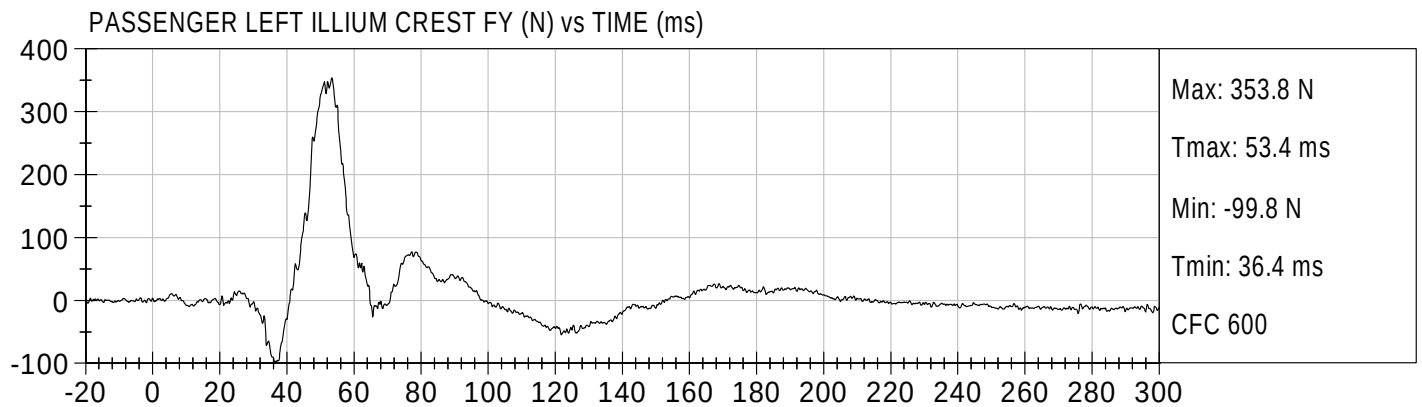


55/28 km/h 90° NCAP MDB Side Impact
2011 Hyundai Sonata - MB5001

Test Date: 06/09/2010
Speed: 38.8 mph (62.4 km/h)







APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D101631

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	125 to 155	147	Pass
Peak Lateral Acceleration	G's	+/- 15	6.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

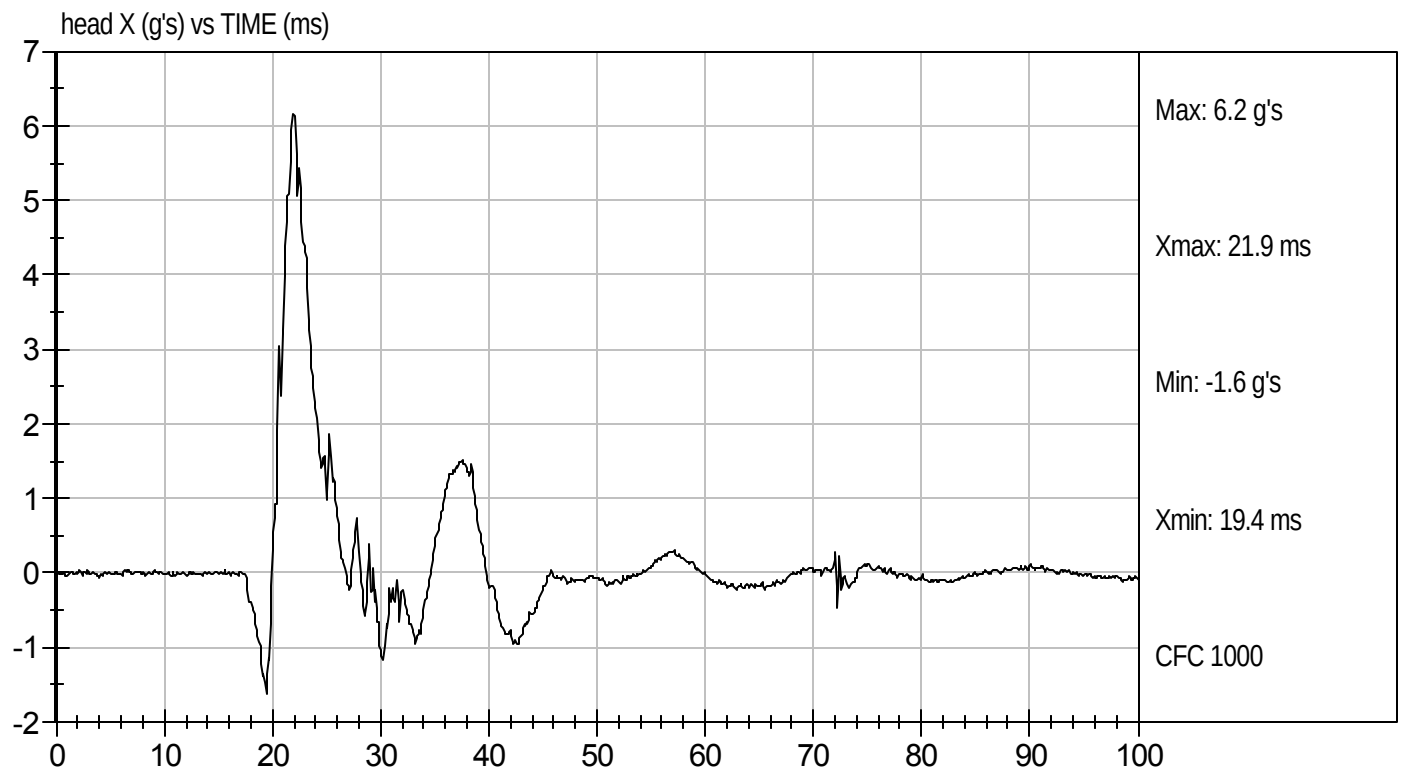
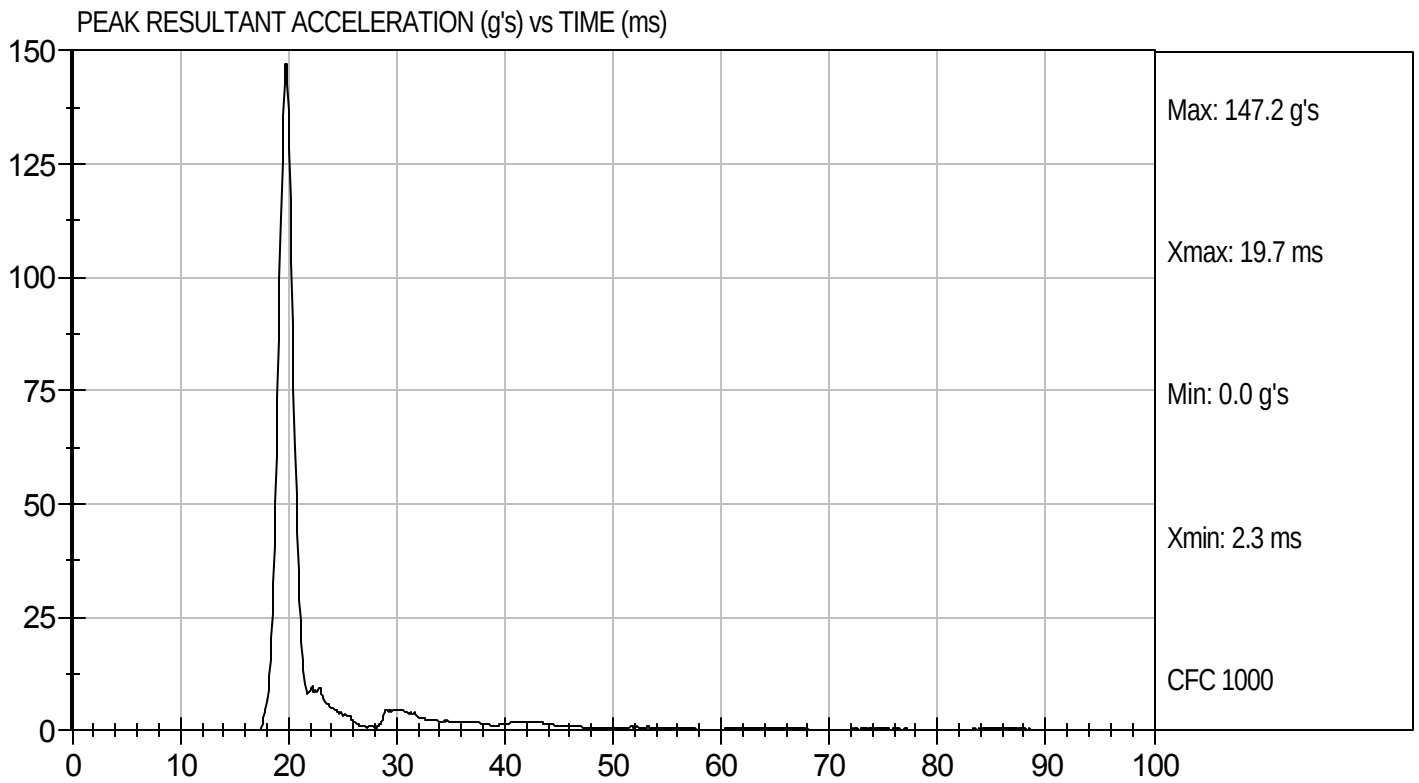
5/28/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D101631

Test Date: 5/28/10
Velocity: 0 ft/s, 0 m/s

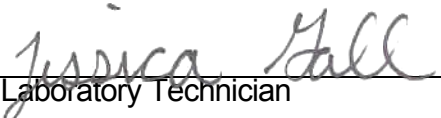


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101632

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	46	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	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.29	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.2	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	60.7	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	54.6	Pass
Overall Test Results					Pass


 Laboratory Technician

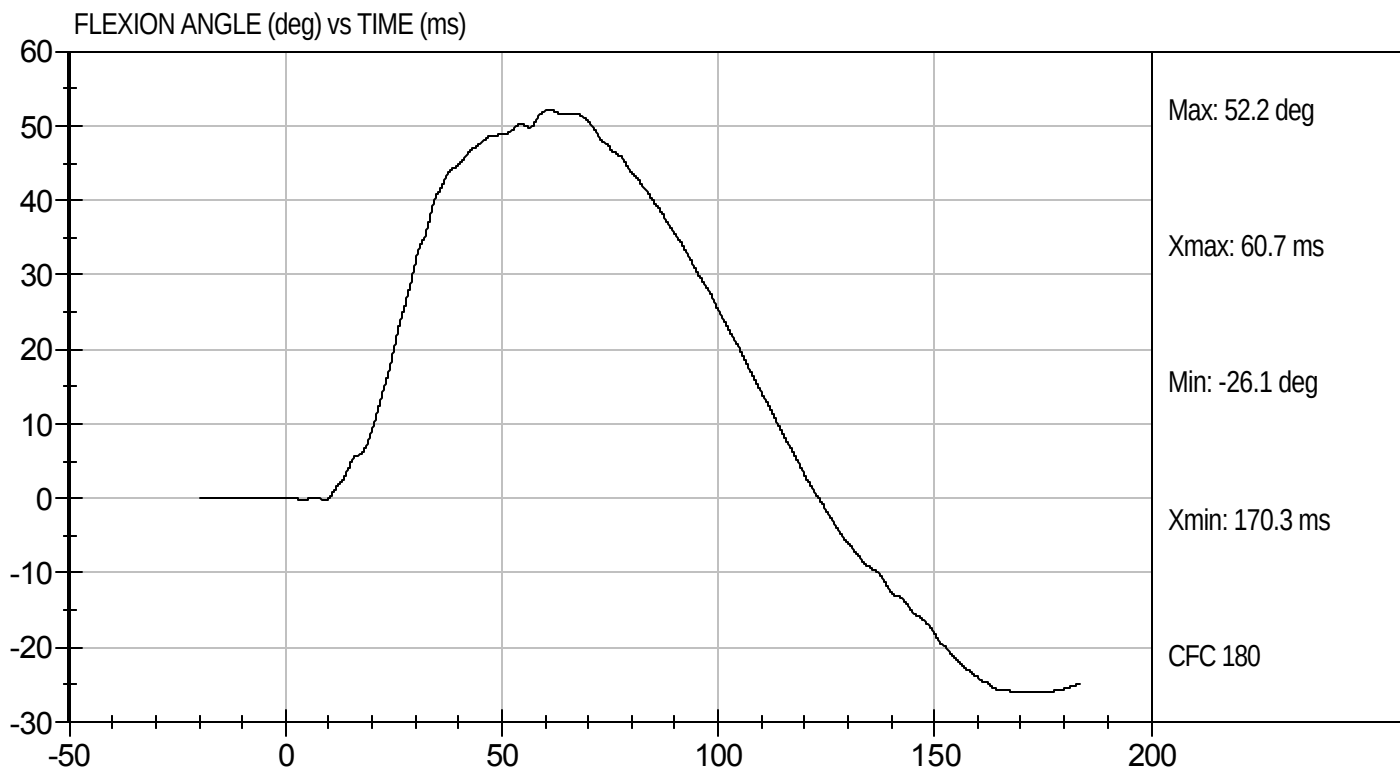
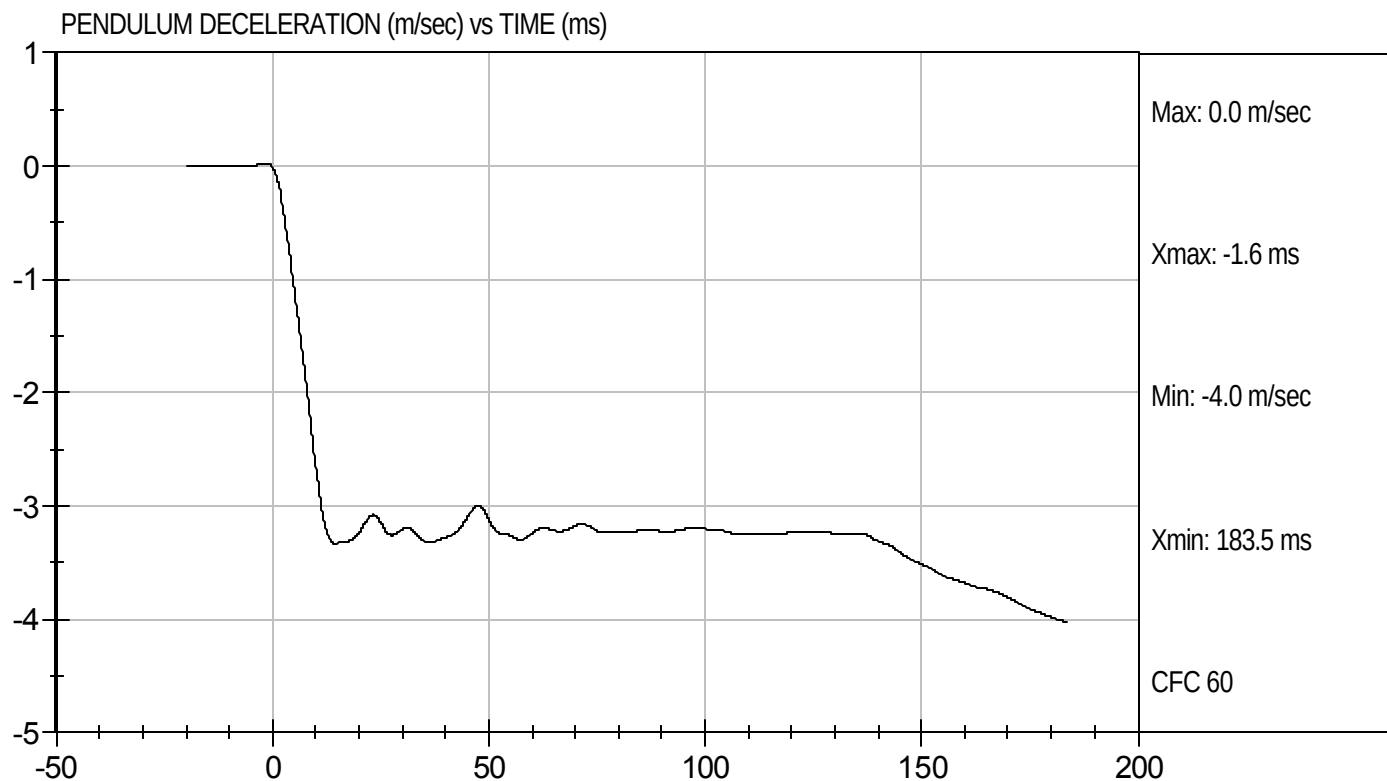
5/28/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D101632

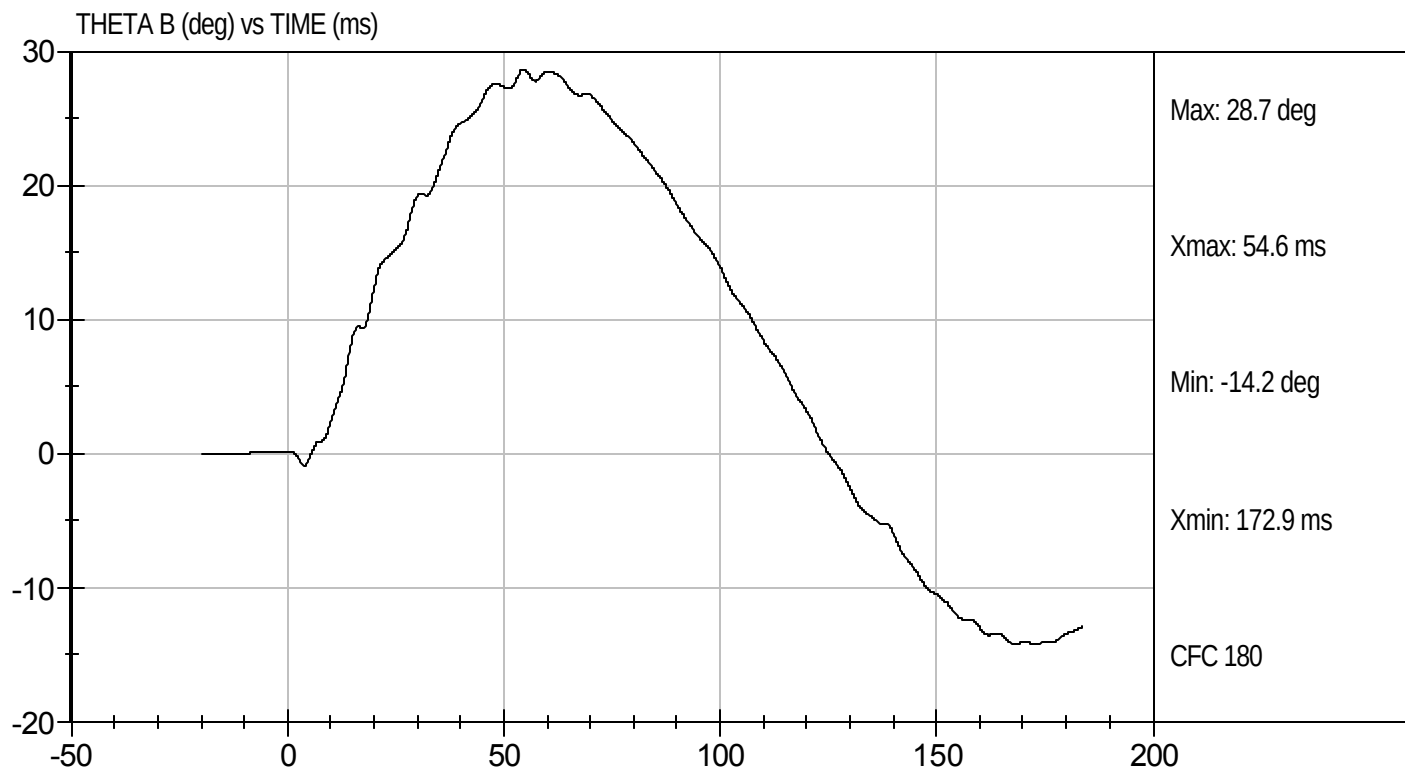
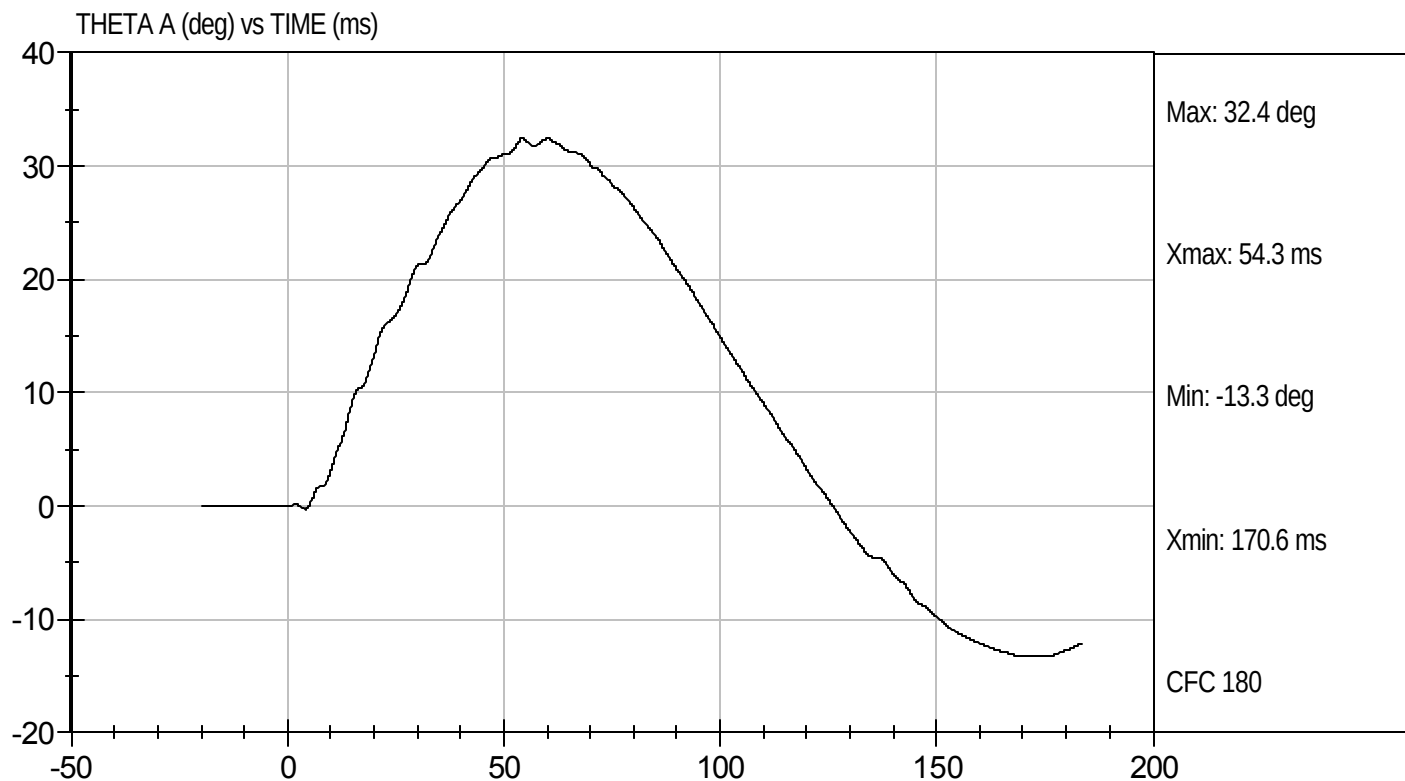
Test Date: 5/28/10
Velocity: 11.34 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D101632

Test Date: 5/28/10
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: D101633

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.7	Pass
Time of Peak Shoulder Acceleration	ms	NA	16.4	Pass
Overall Test Results			Pass	


Laboratory Technician

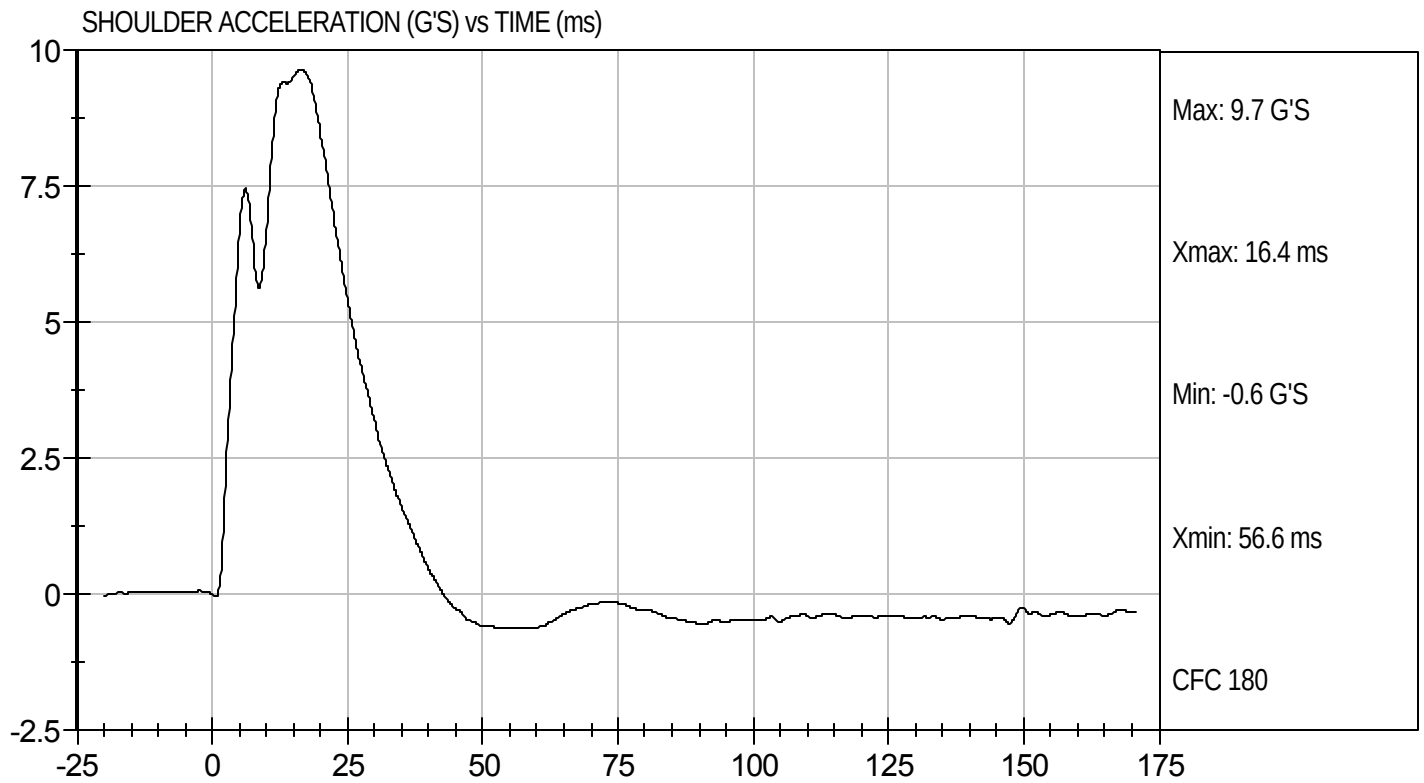
6/1/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D101633

Test Date: 6/1/10
Velocity: 14.24 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101634

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.3	Pass
Overall Test Results				Pass


Laboratory Technician

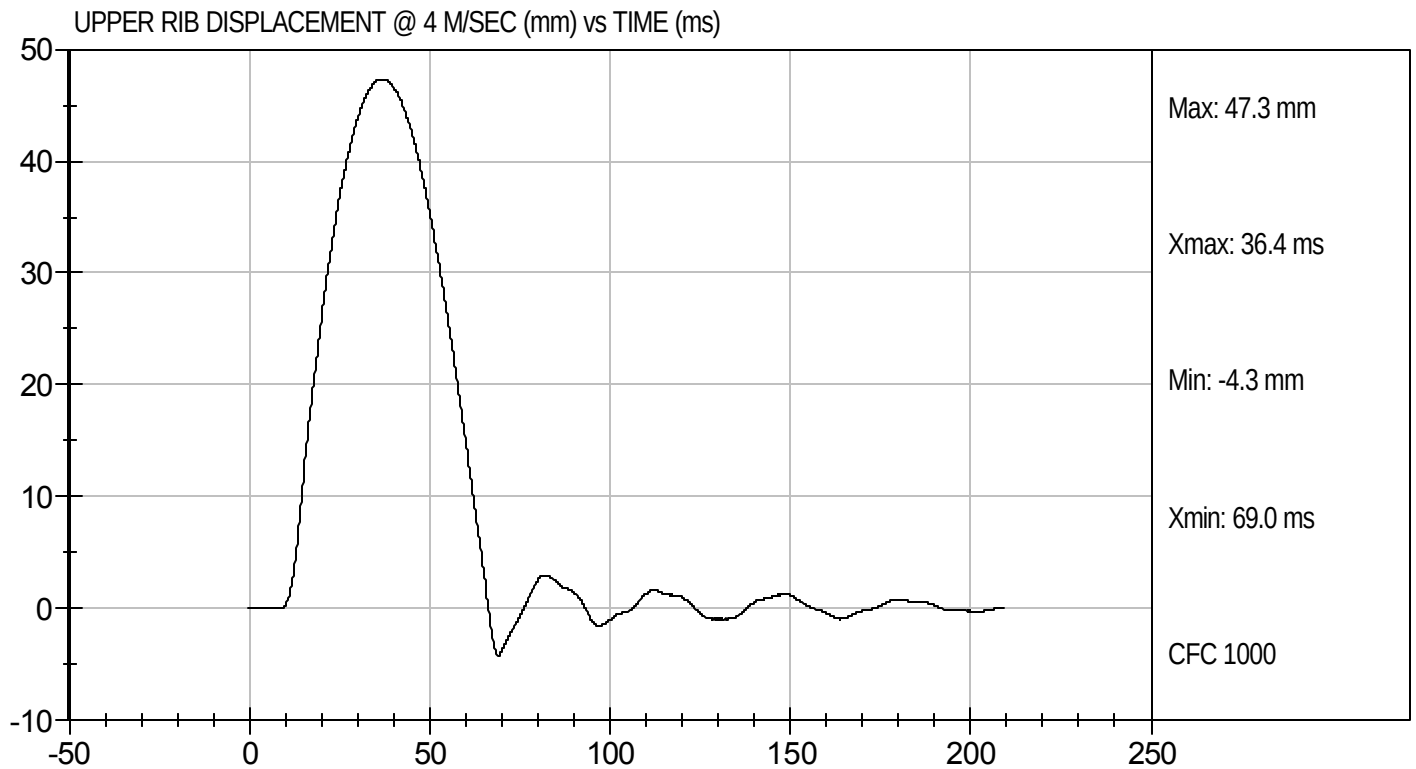
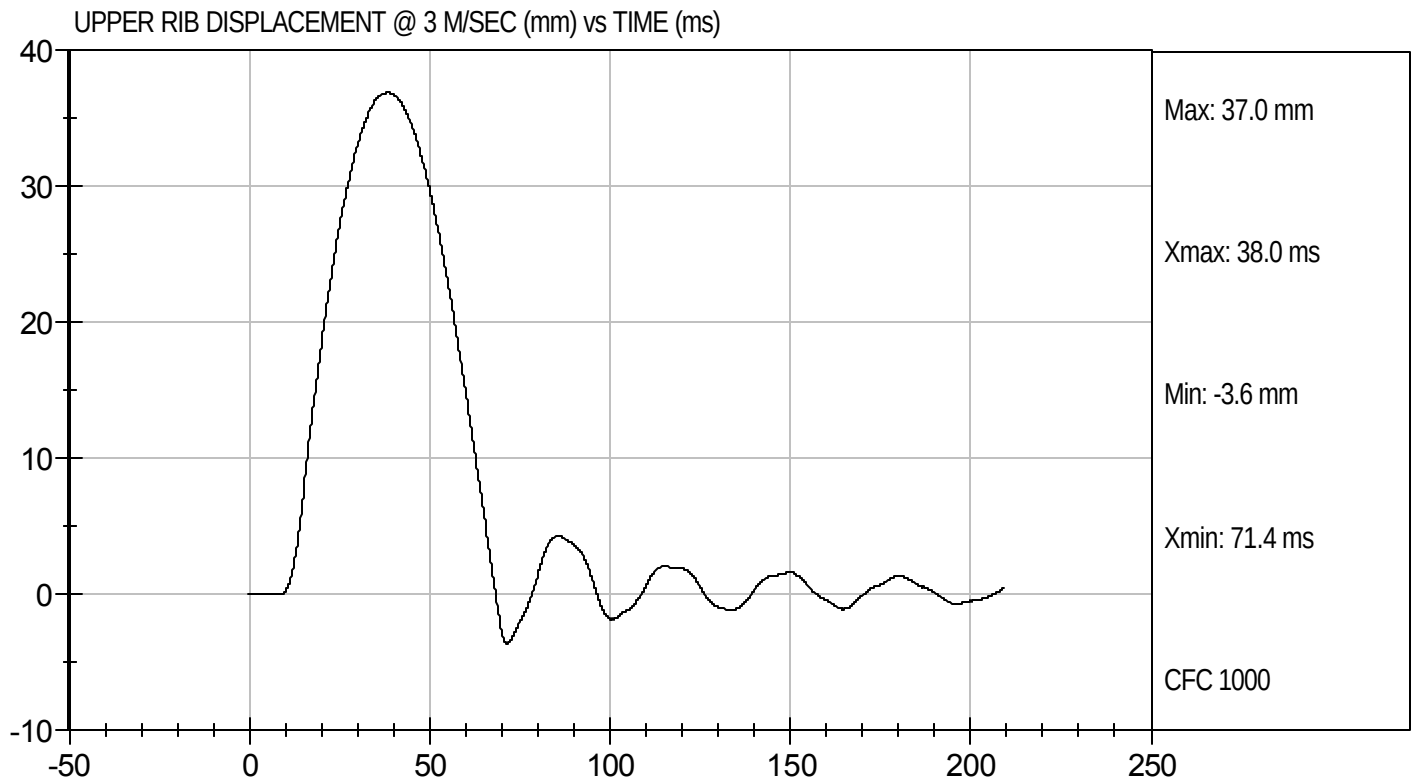
5/28/10
Test Date


Approved By



Test Desc: Rib Impact - Upper
Component ID: D101634

Test Date: 5/28/10



MGA RESEARCH CORPORATION

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

ATD Serial No: 032

Test I.D: D101635

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	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	48.5	Pass
Overall Test Results				Pass


Laboratory Technician

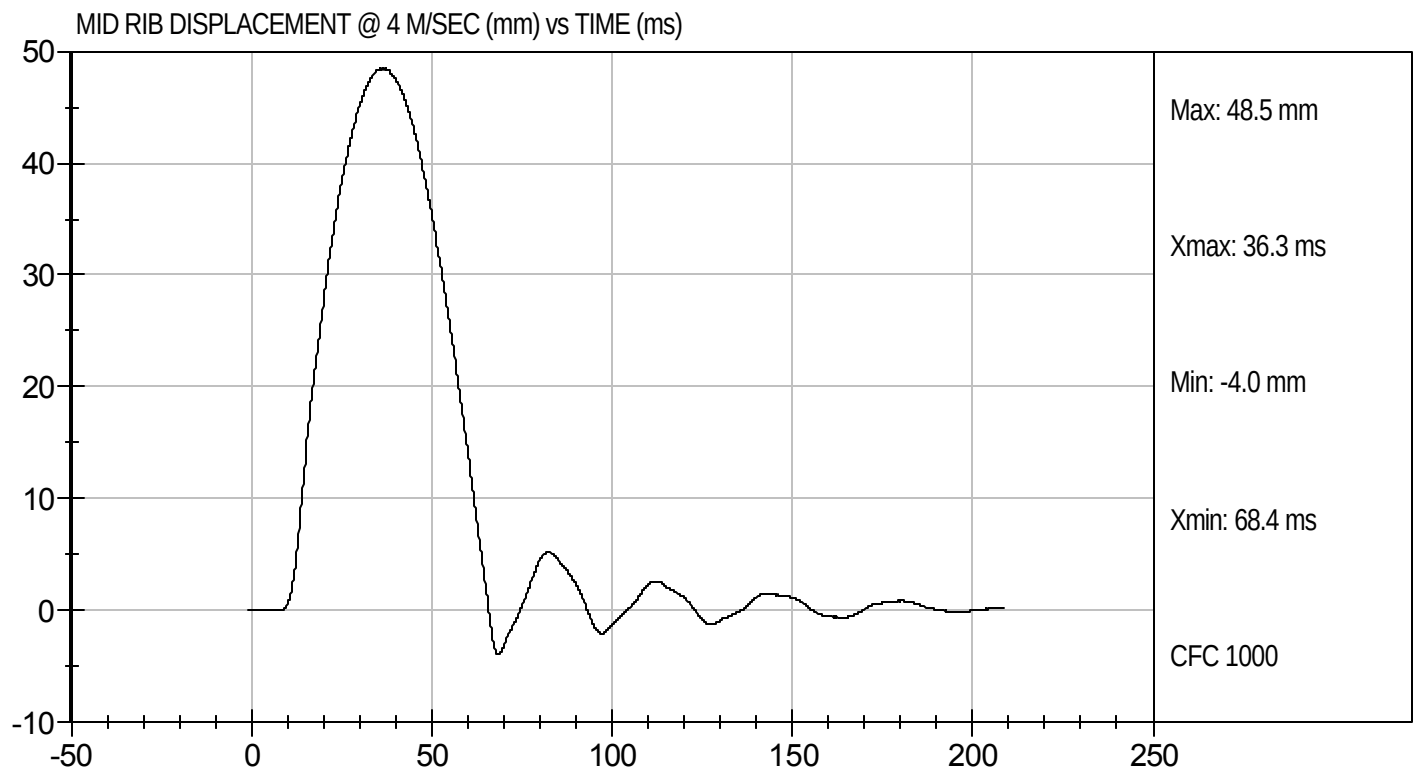
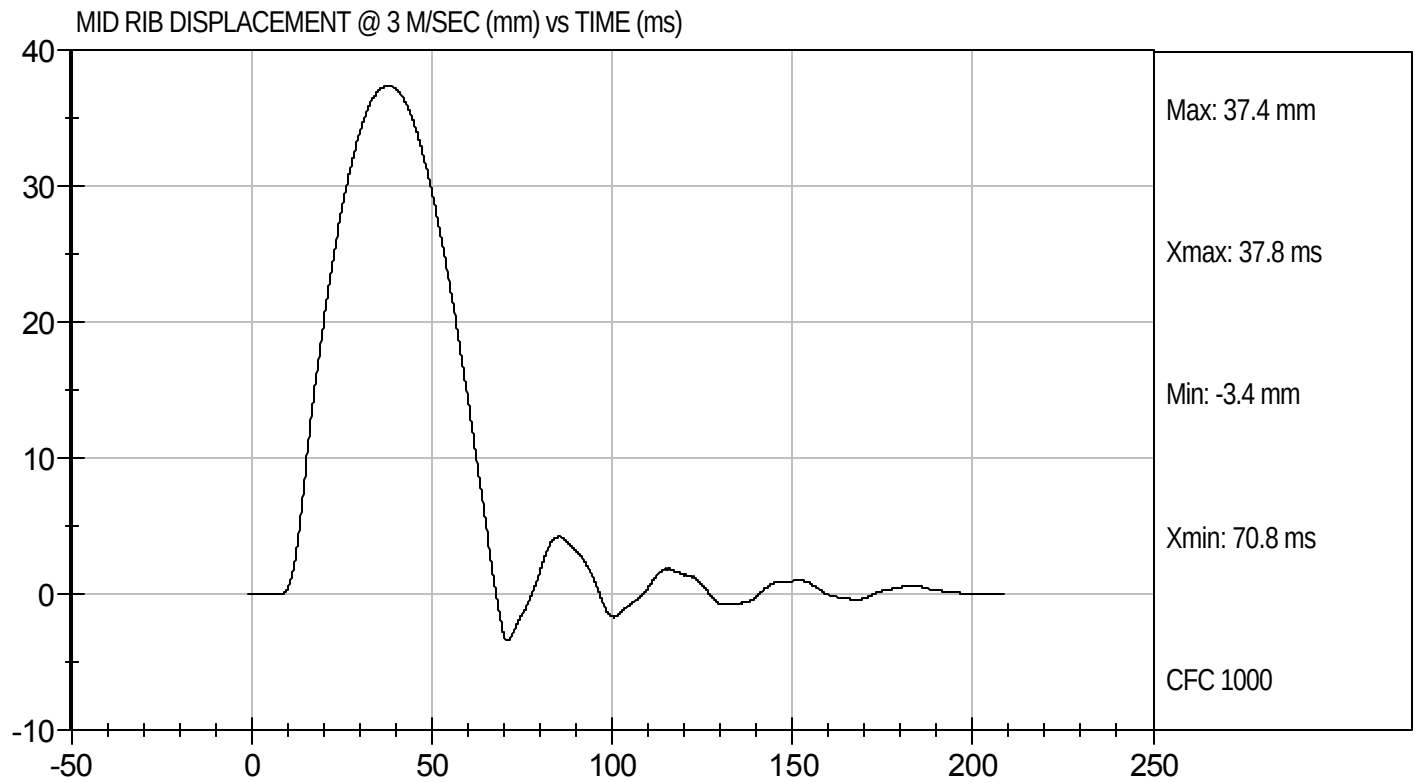
5/28/10
Test Date


Approved By



Test Desc: Rib Impact - Mid
Component ID: D101635

Test Date: 5/28/10



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101636

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.2	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.2	Pass
Overall Test Results				Pass


Laboratory Technician

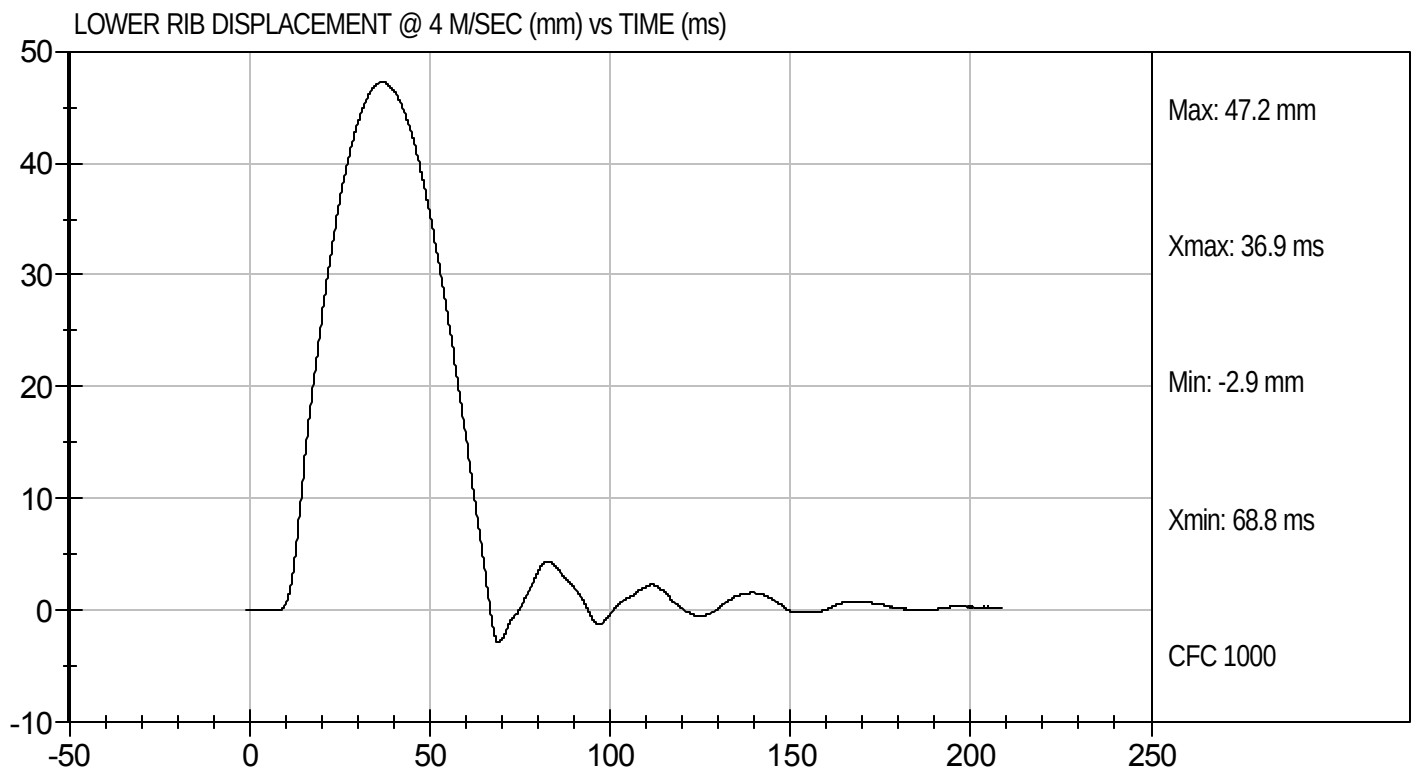
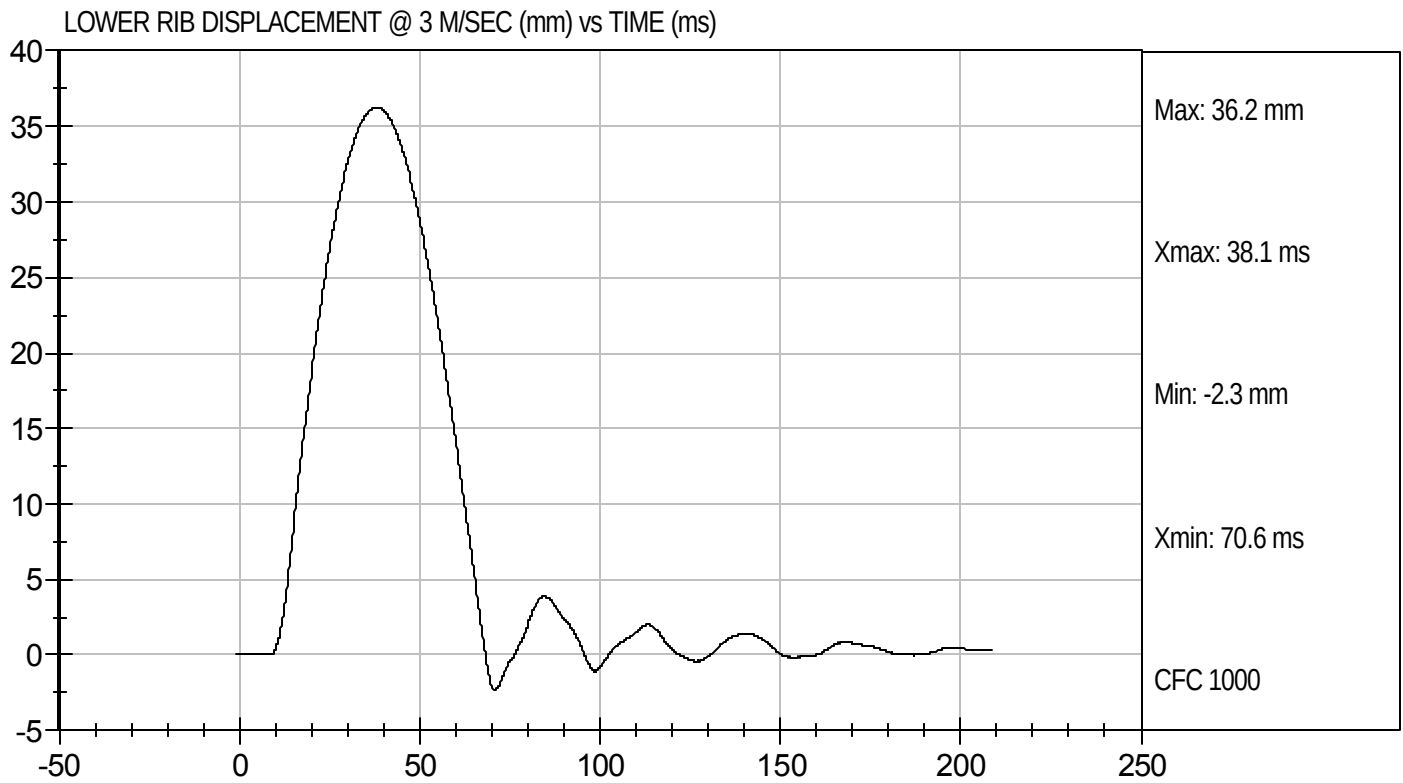
5/28/10
Test Date


Approved By



Test Desc: Rib Impact - Lower
Component ID: D101636

Test Date: 5/28/10



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101637

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	52	Pass
Probe Speed	m/s	3.90 to 4.10	4.1	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.03	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.40	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	11.60	Pass
Overall Test Results				Pass


Laboratory Technician

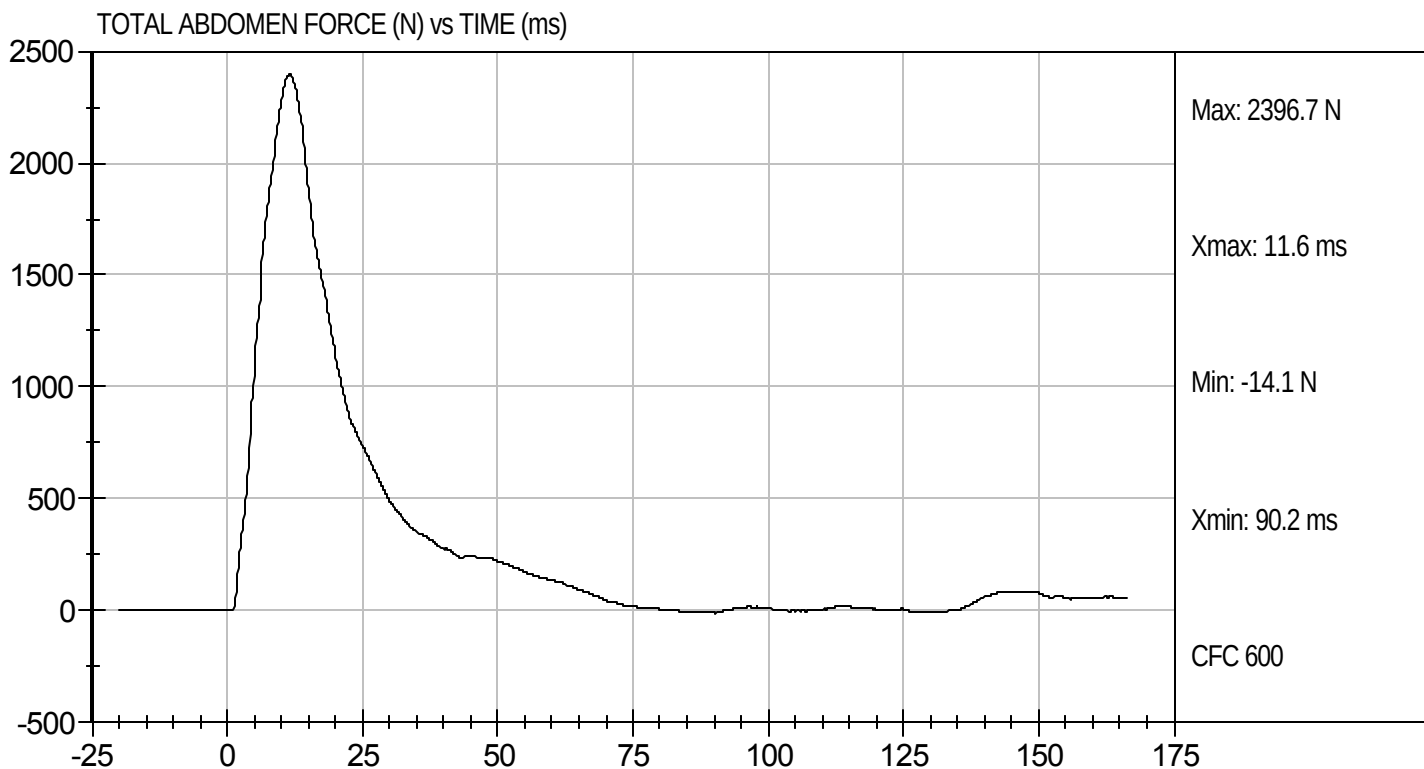
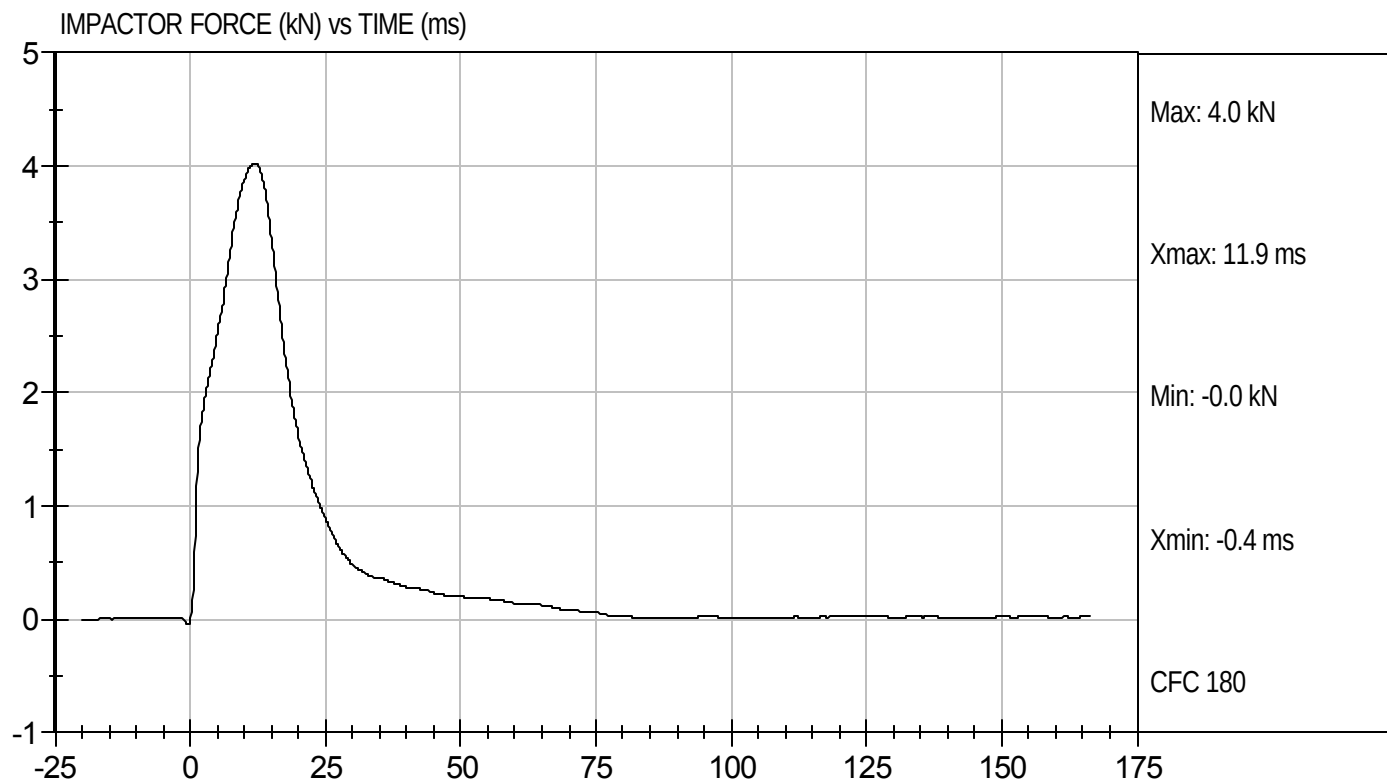
6/1/10
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D101637

Test Date: 6/1/10
Velocity: 13.44 ft/s, 4.1 m/s



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D101638

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	46	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	-0.423	Pass
	27 ms	m/s	-6.50 to -5.80	-5.86	Pass
	30 ms	m/s	>= -6.5	-5.86	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.7	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	44.8	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	42	Pass
Overall Results				Pass	


 Laboratory Technician

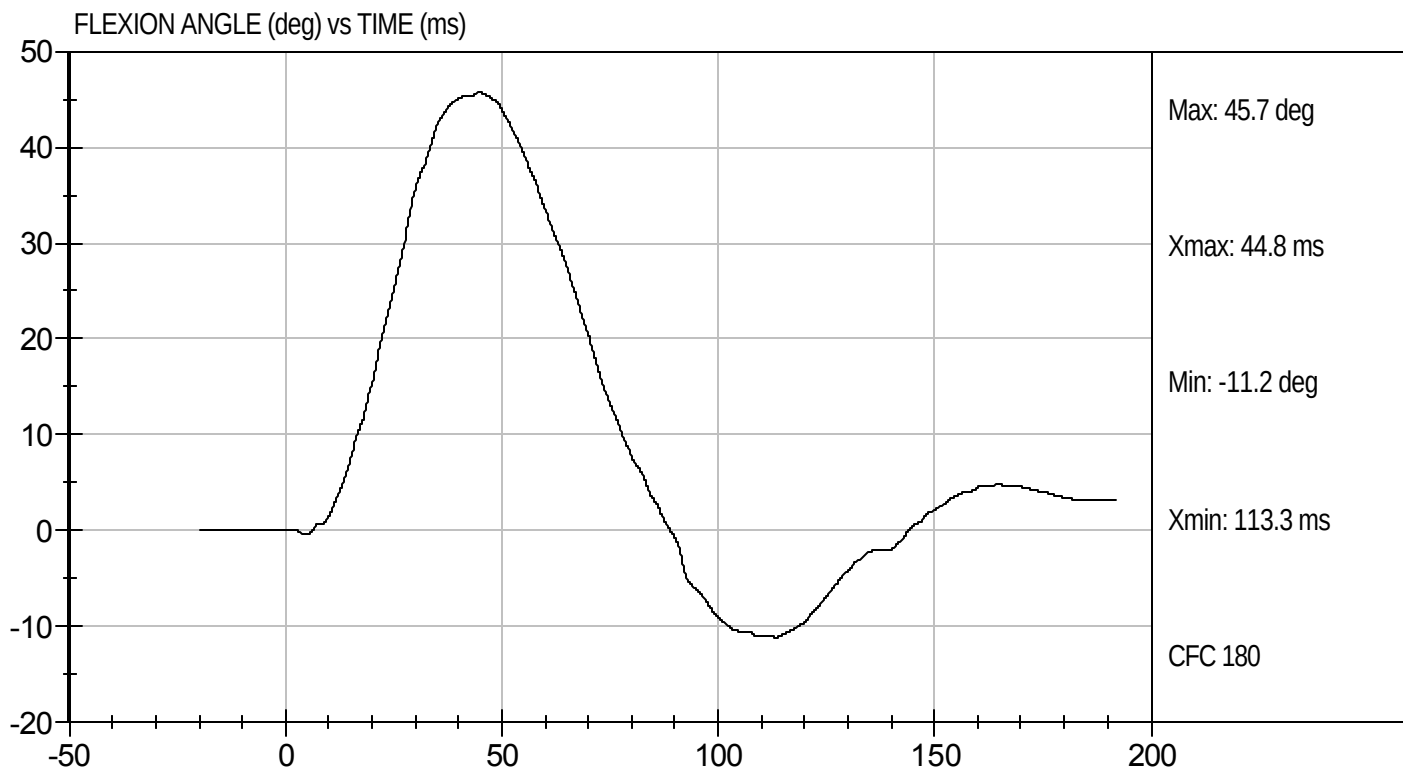
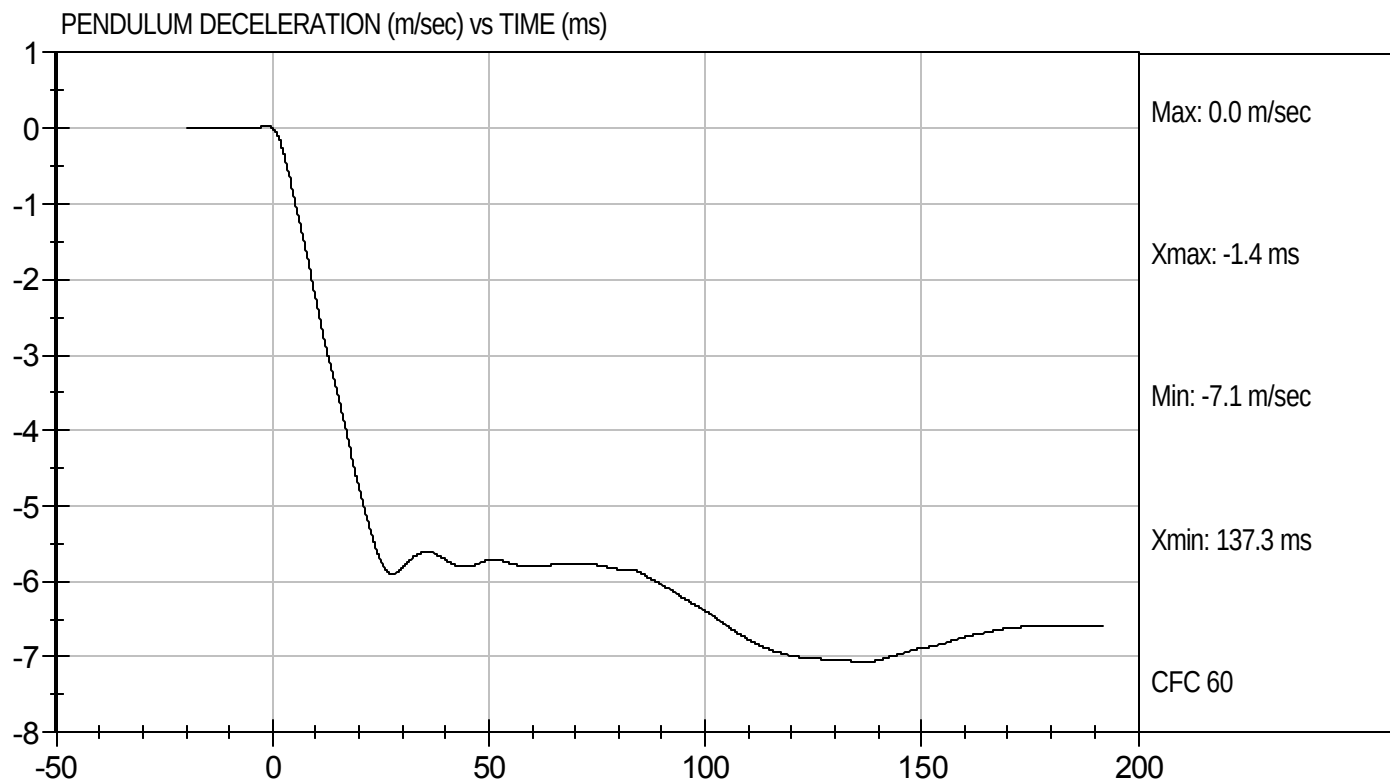
5/28/10
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D101638

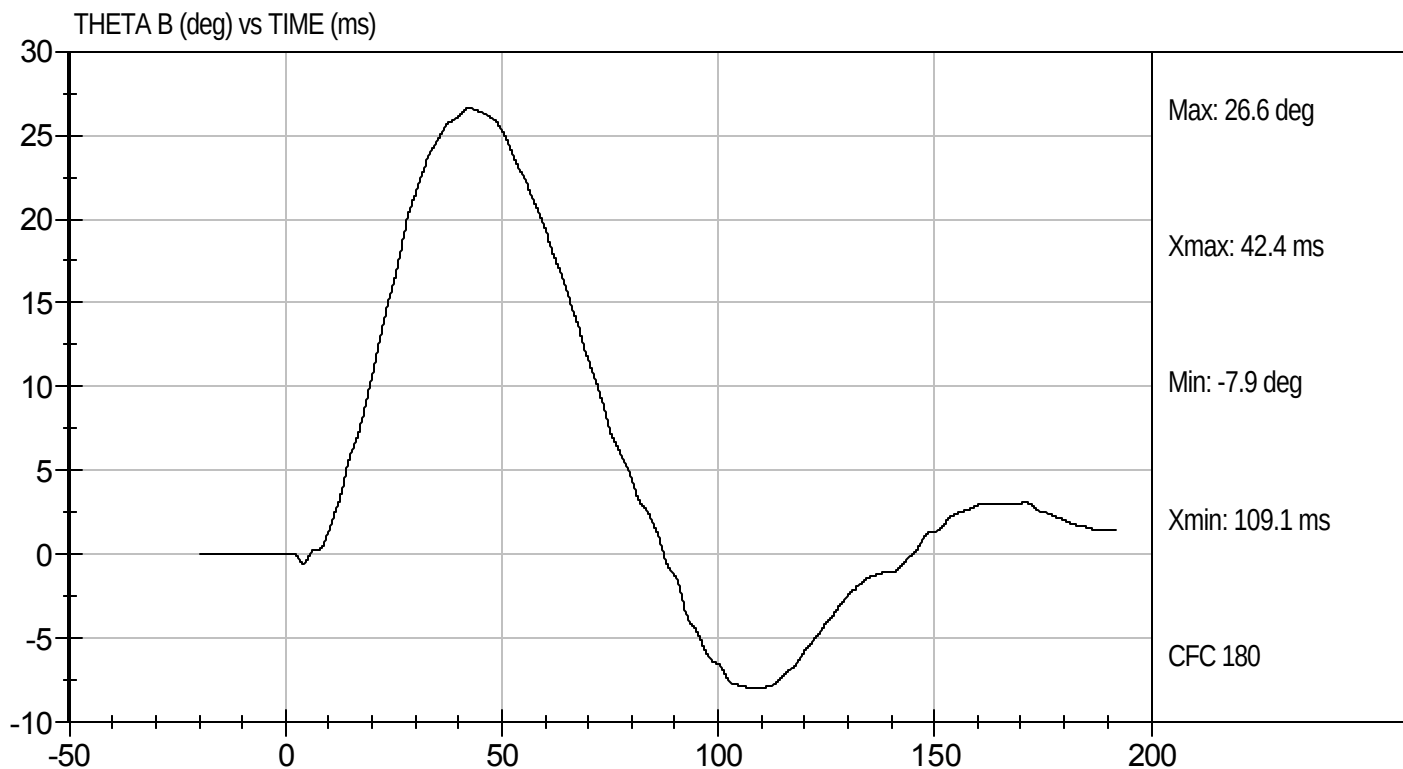
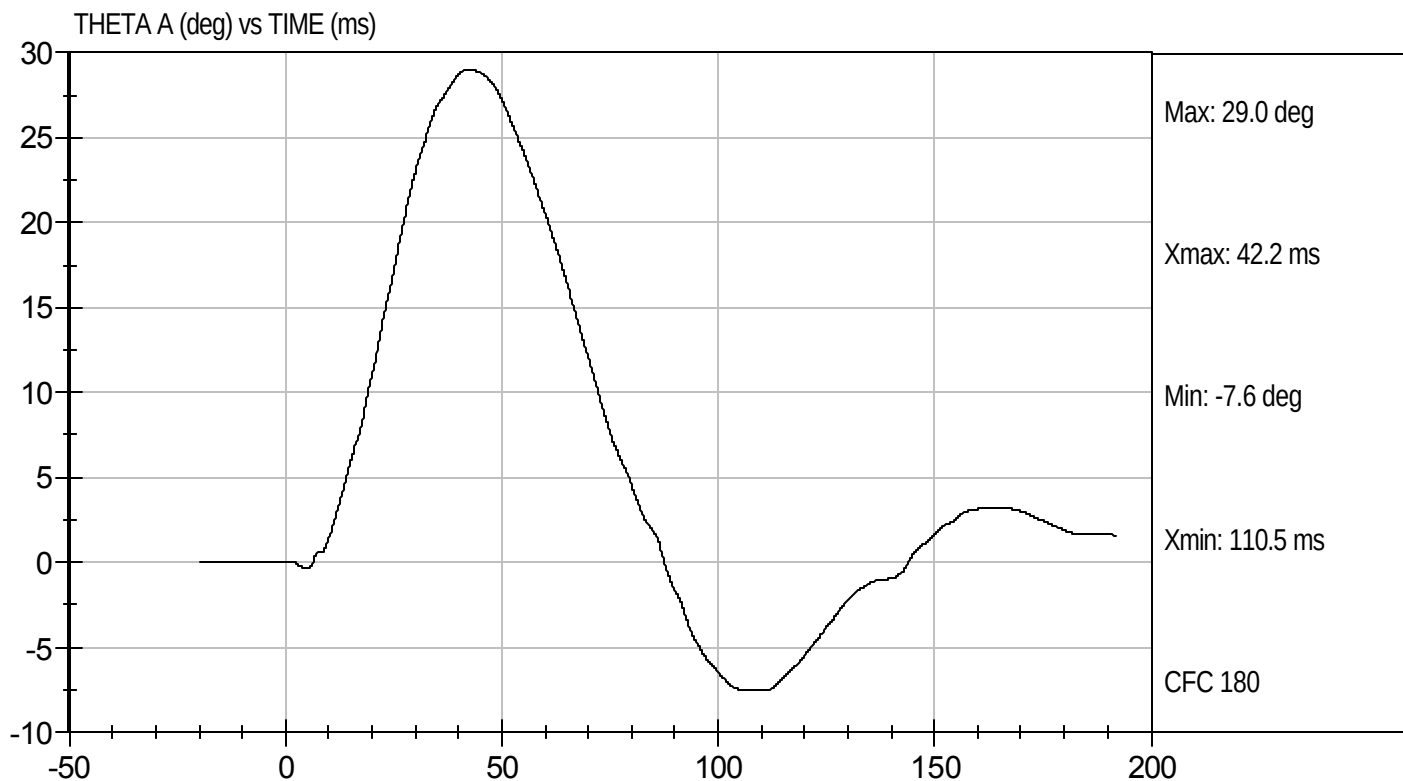
Test Date: 5/28/10
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D101638

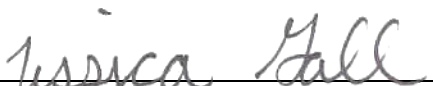
Test Date: 5/28/10
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMYATD Serial No: 032Test I.D: D101639

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	52	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.78	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.90	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.40	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	14.50	Pass
Overall Test Results				Pass


Laboratory Technician

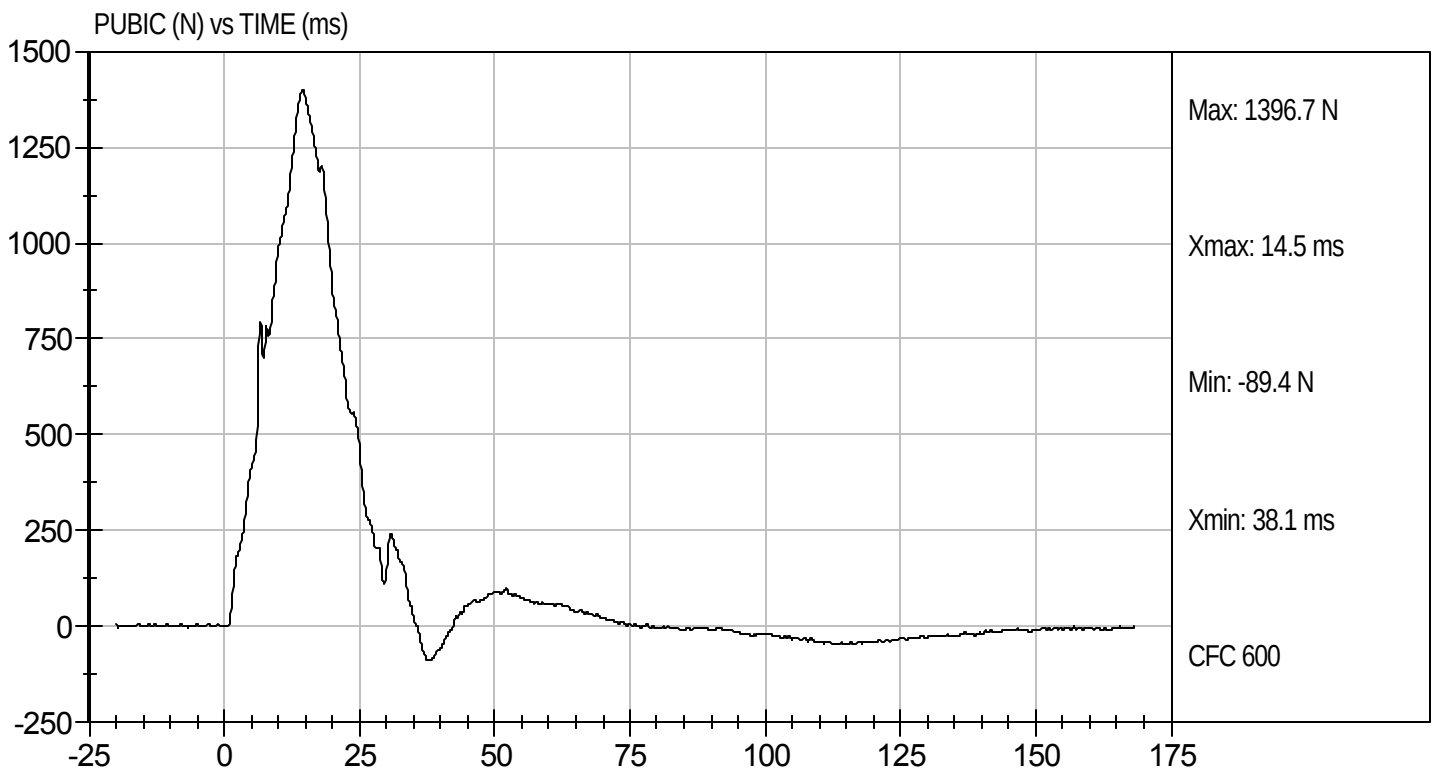
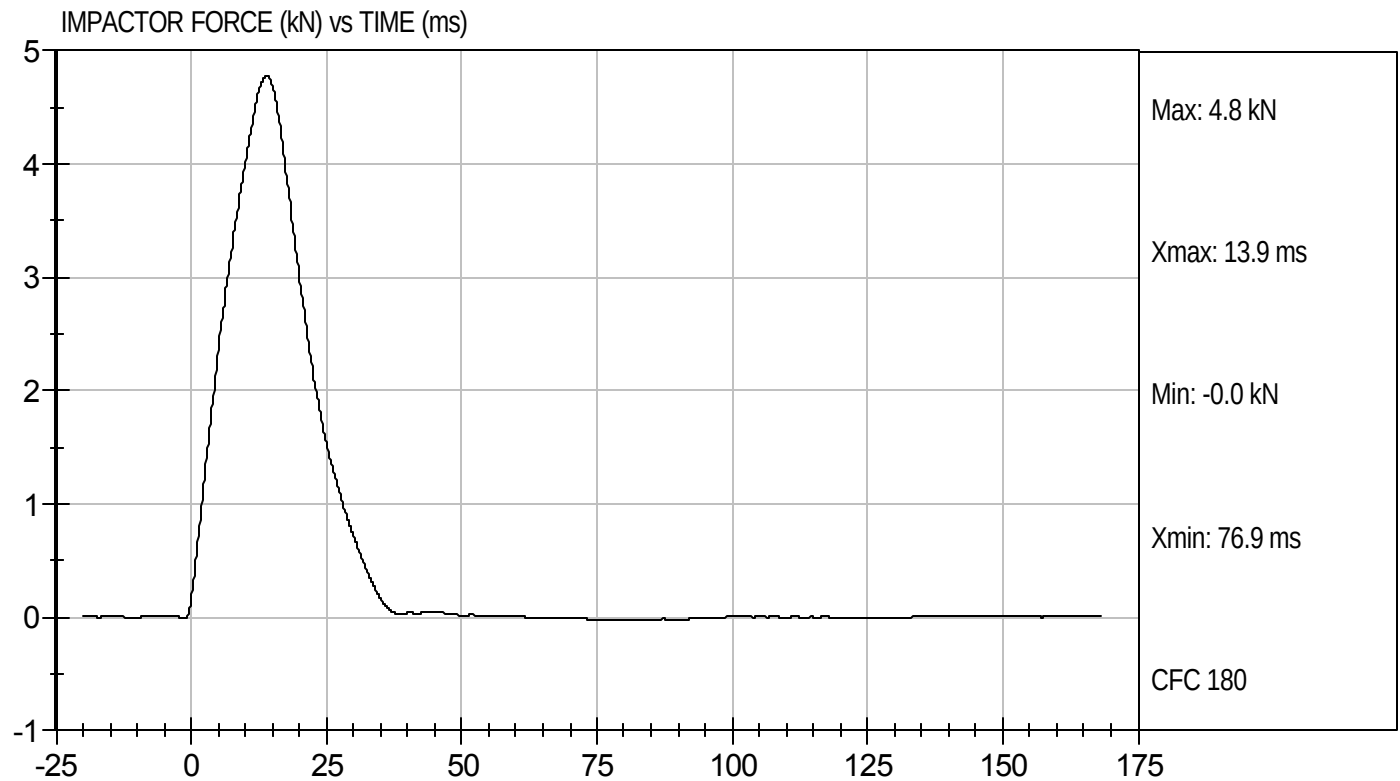
6/1/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D101639

Test Date: 6/1/10
Velocity: 14.24 ft/s, 4.34 m/s



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

ATD Serial No: 032

Test I.D: D101630

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	51	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	5.12	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.2	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.0	Pass
Lower Rib Displacement	mm	37.0 to 44.0	39.6	Pass
Overall Test Results			Pass	


Laboratory Technician

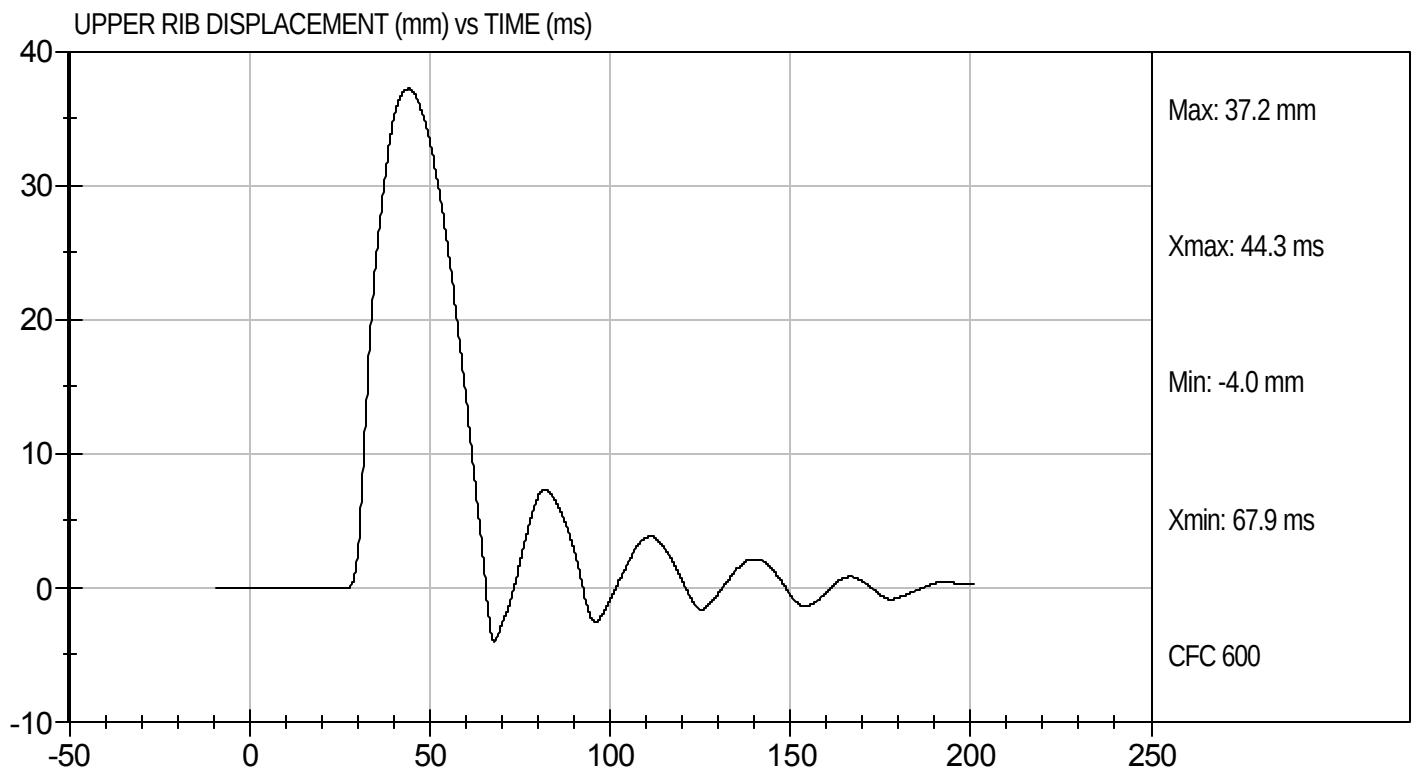
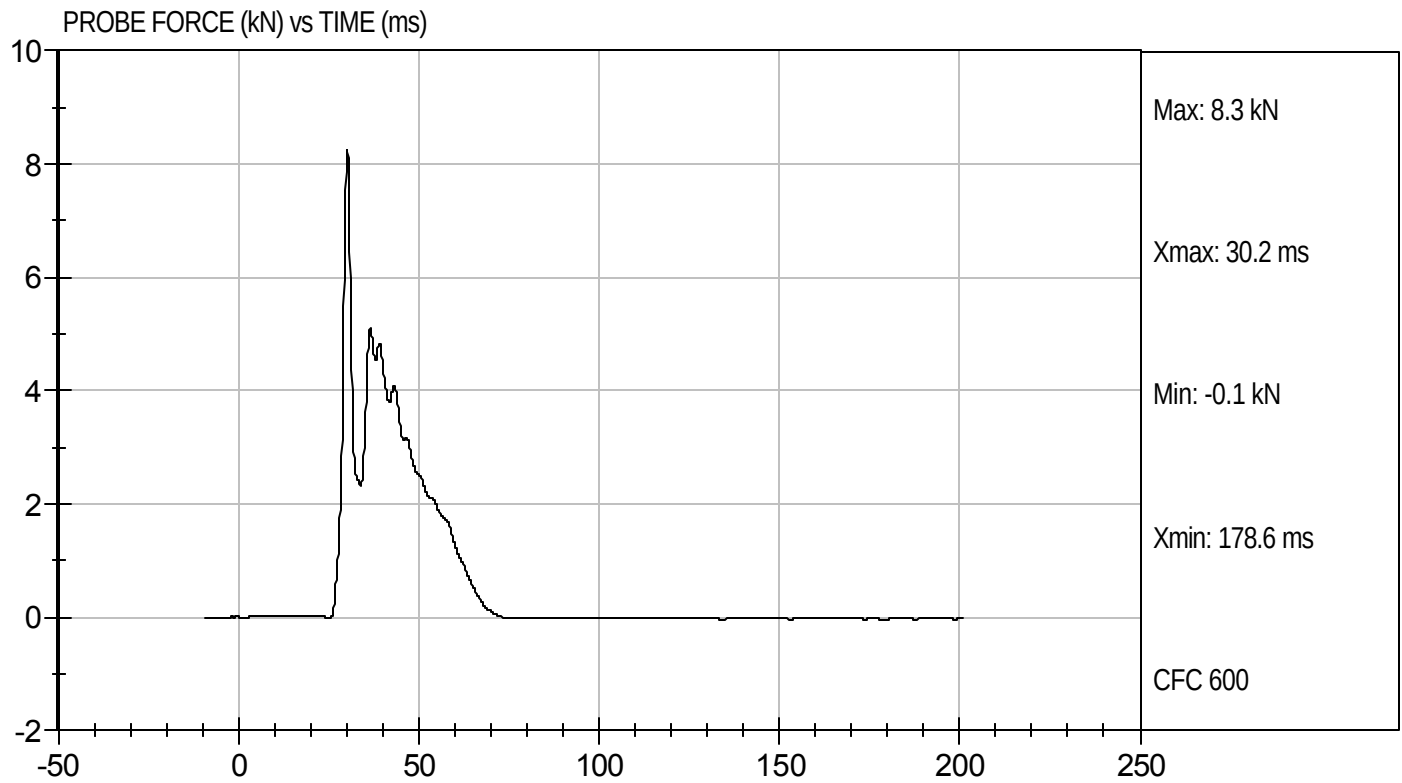
6/1/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D101630

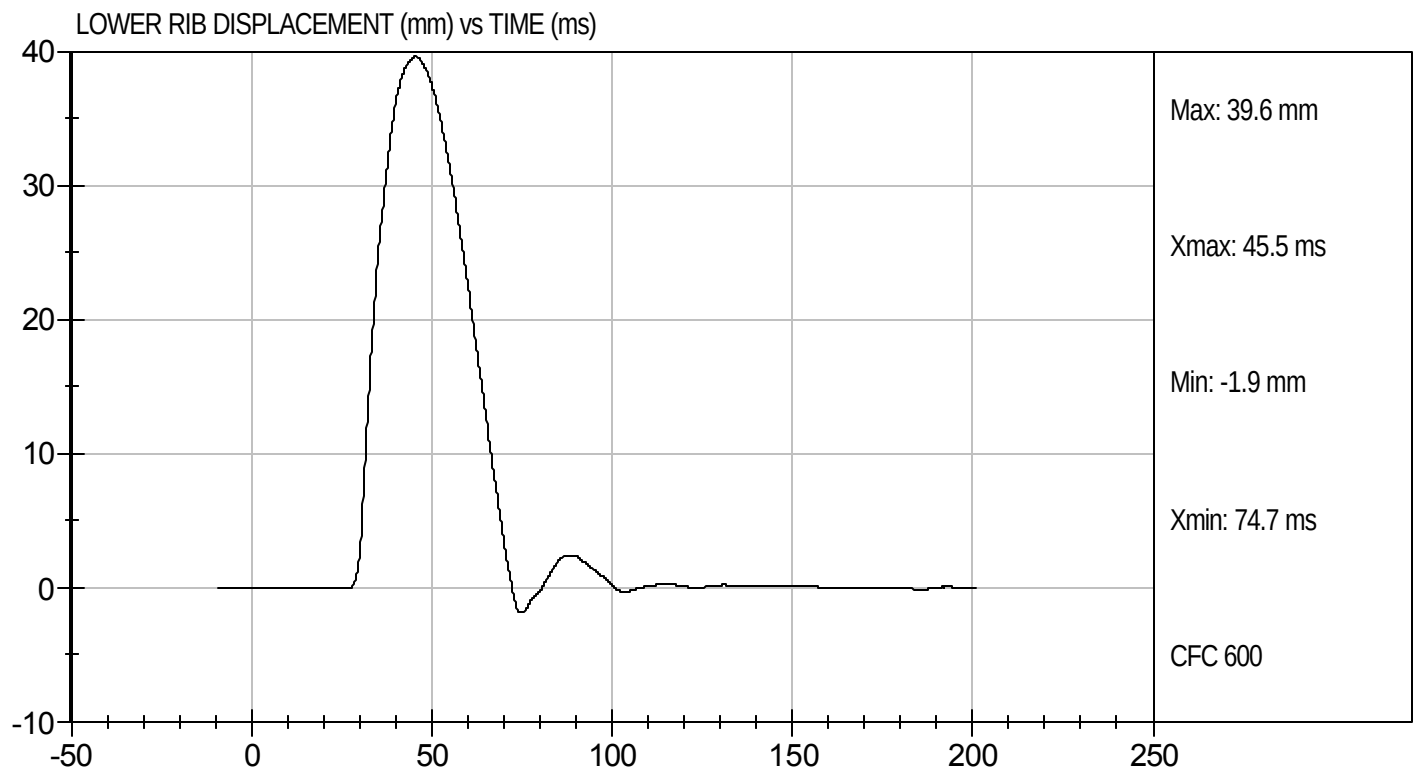
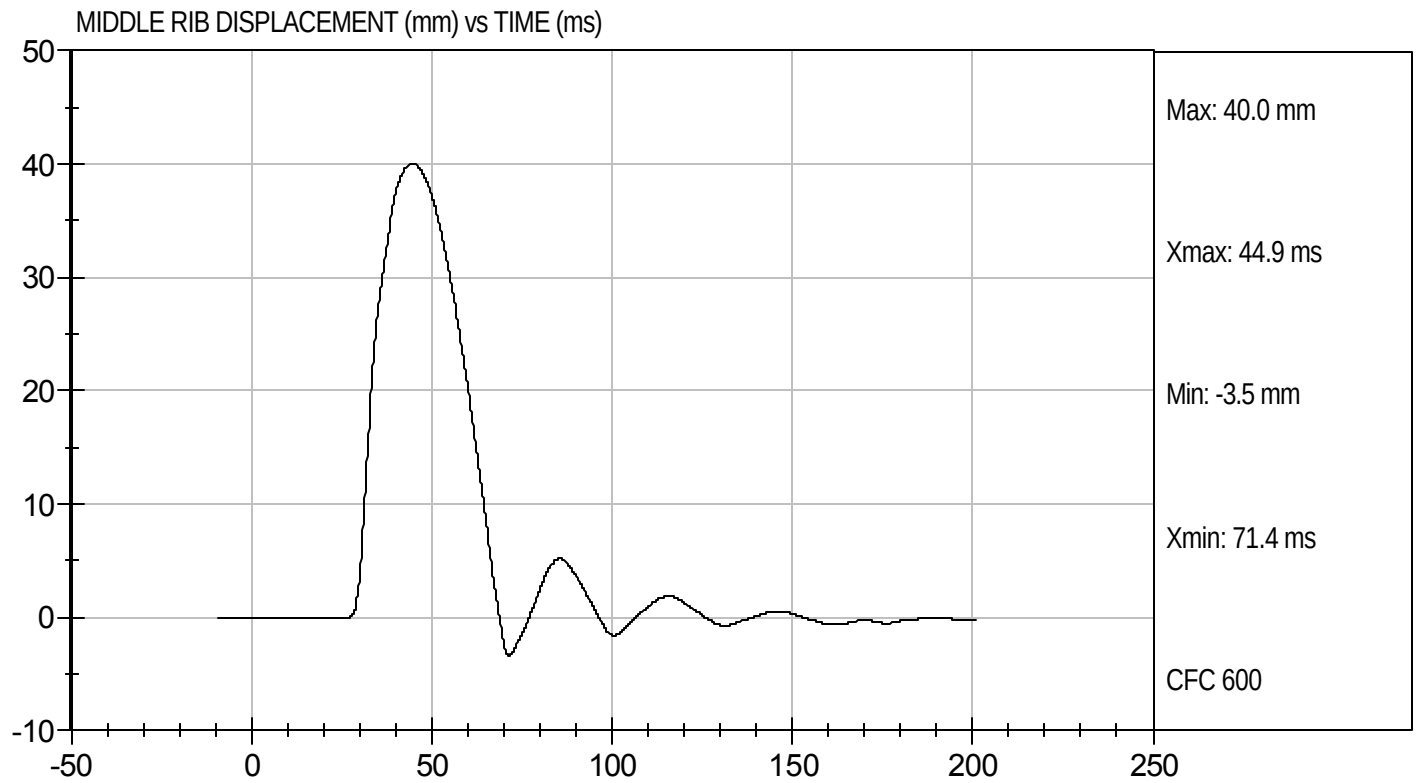
Test Date: 6/1/10
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Thorax Impact
Component ID: D101630

Test Date: 6/1/10
Velocity: 18.32 ft/s, 5.58 m/s

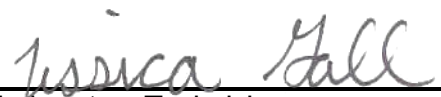


MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: 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

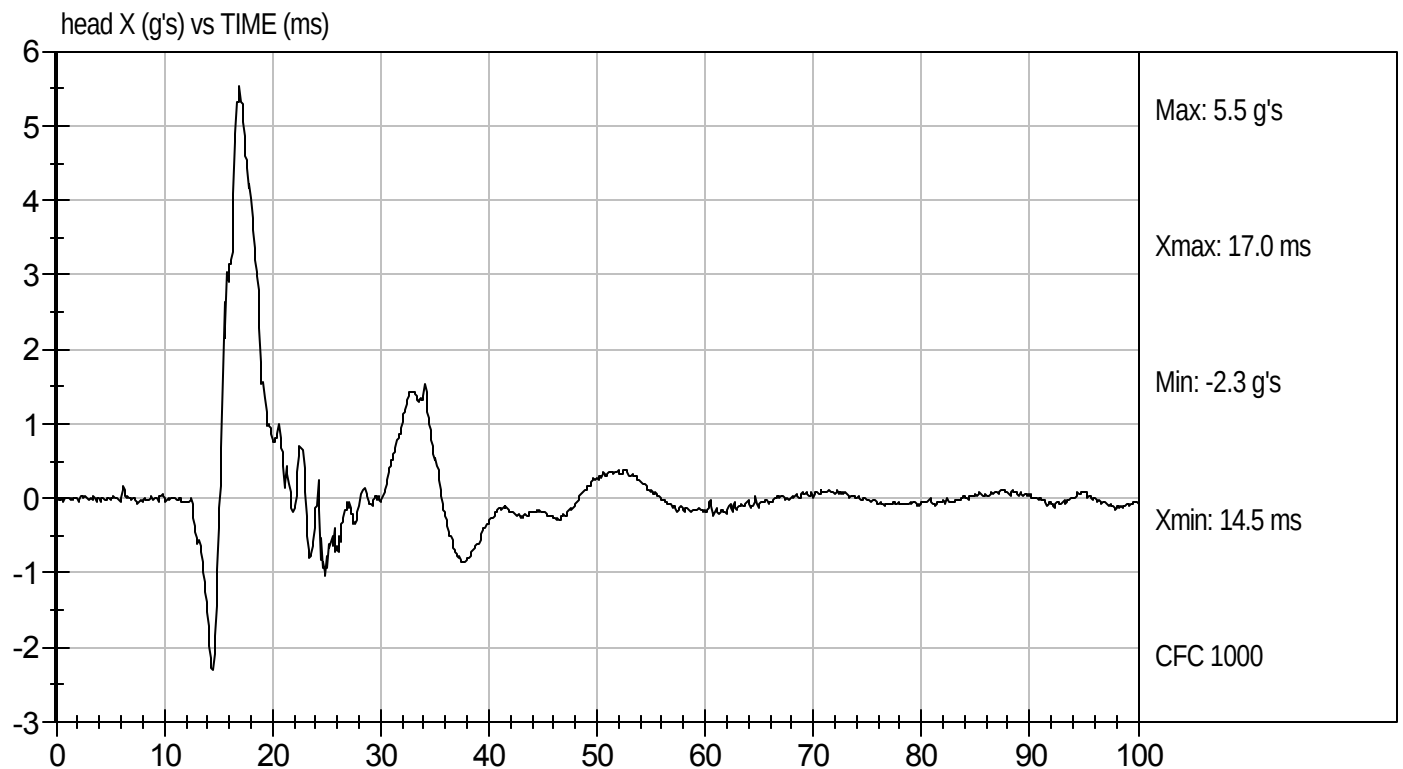
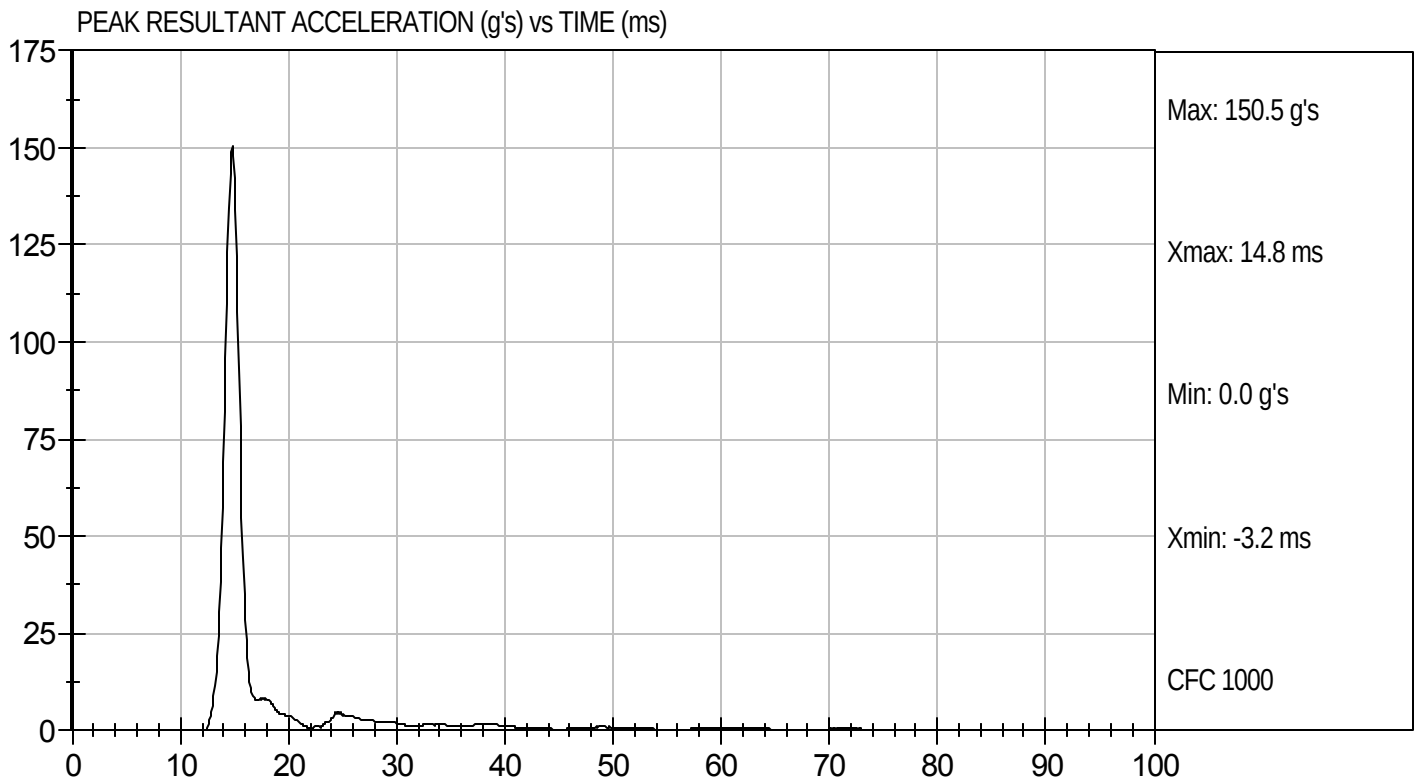
6/10/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D101771

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

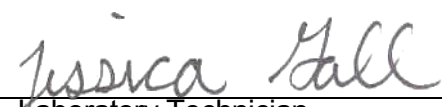


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

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

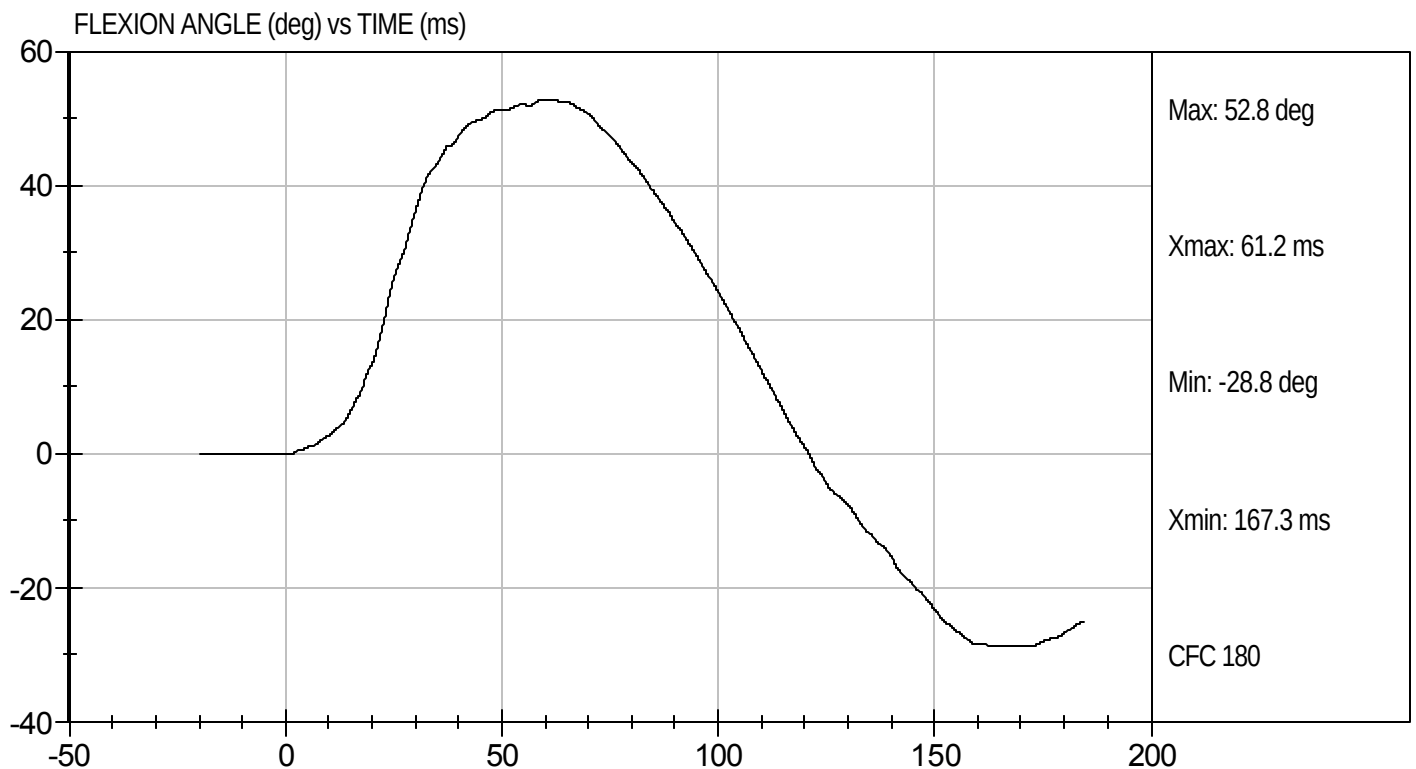
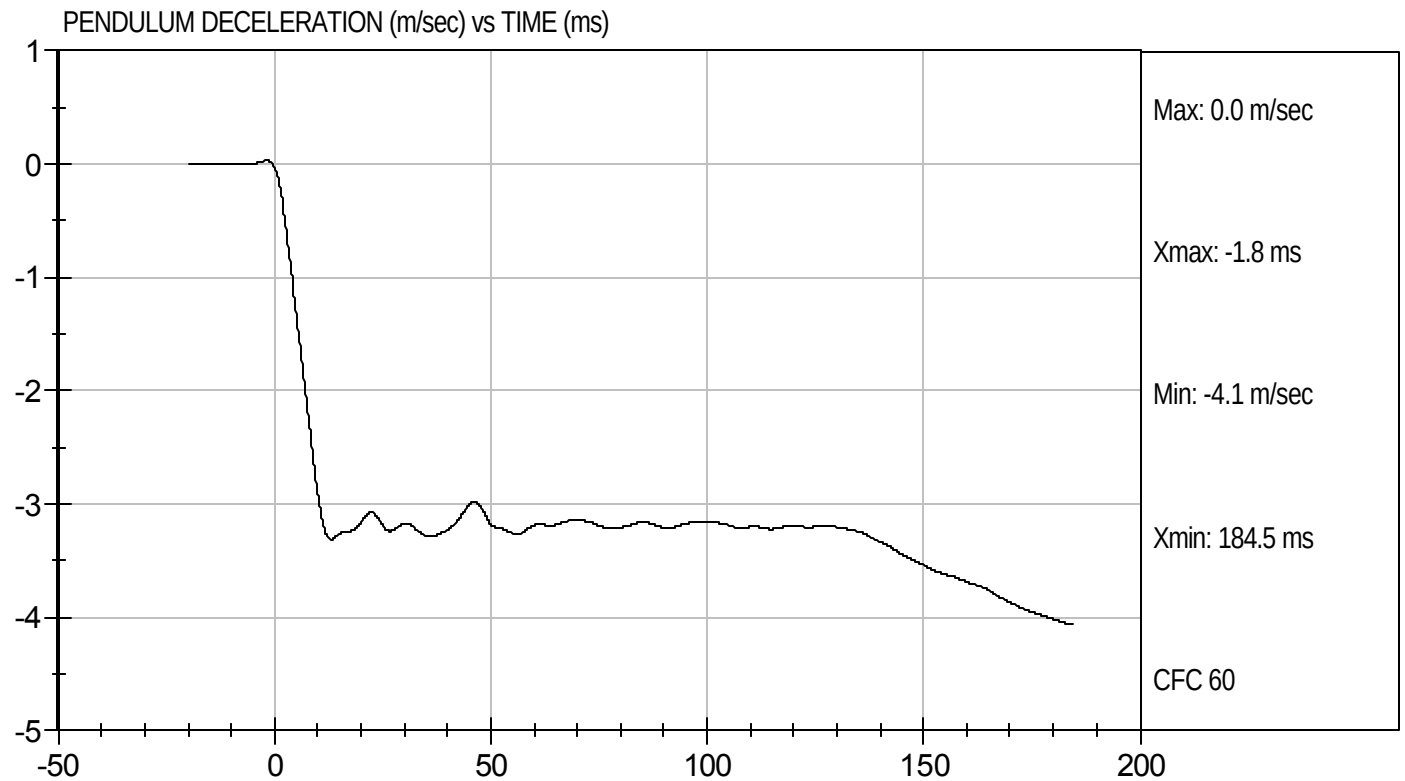
6/10/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D101772

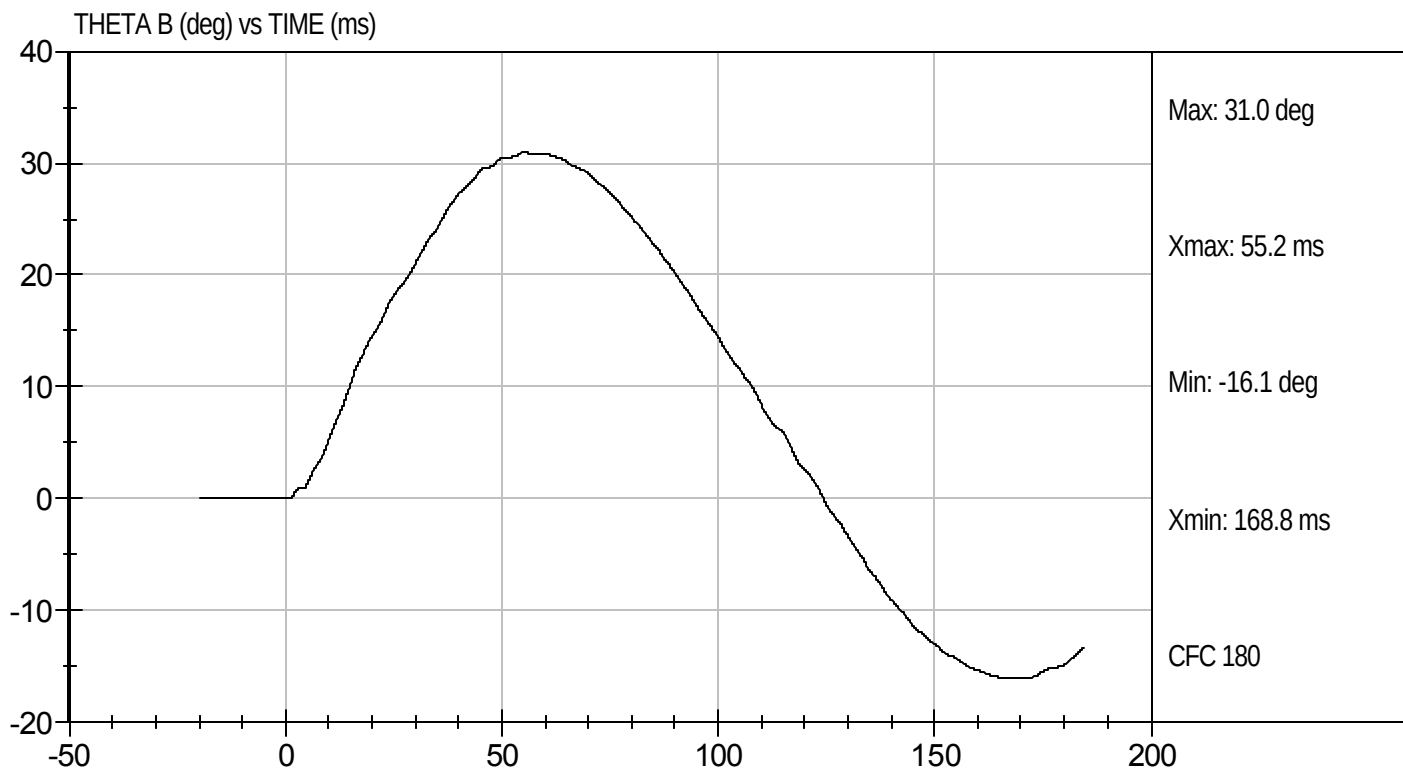
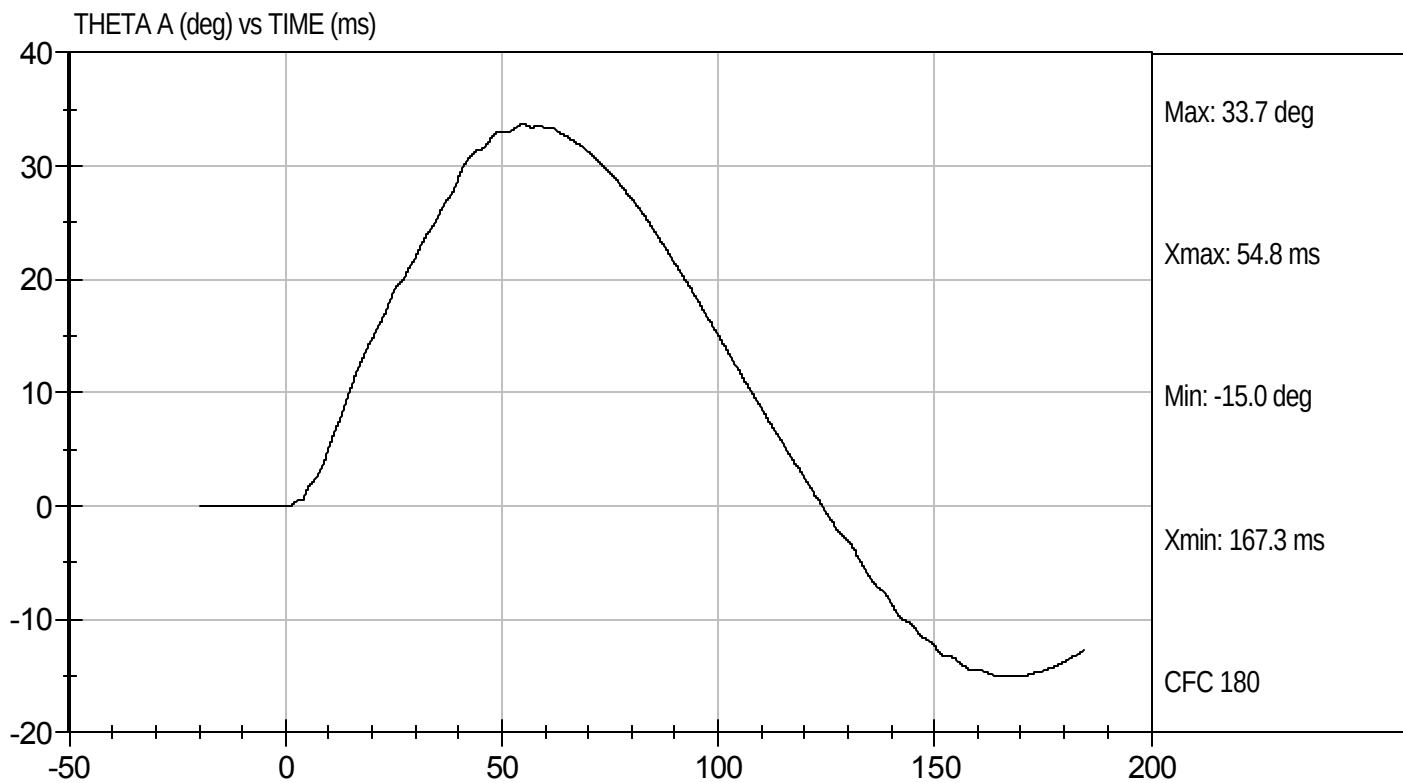
Test Date: 6/10/10
Velocity: 11.34 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D101772

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

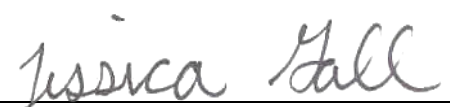


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

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

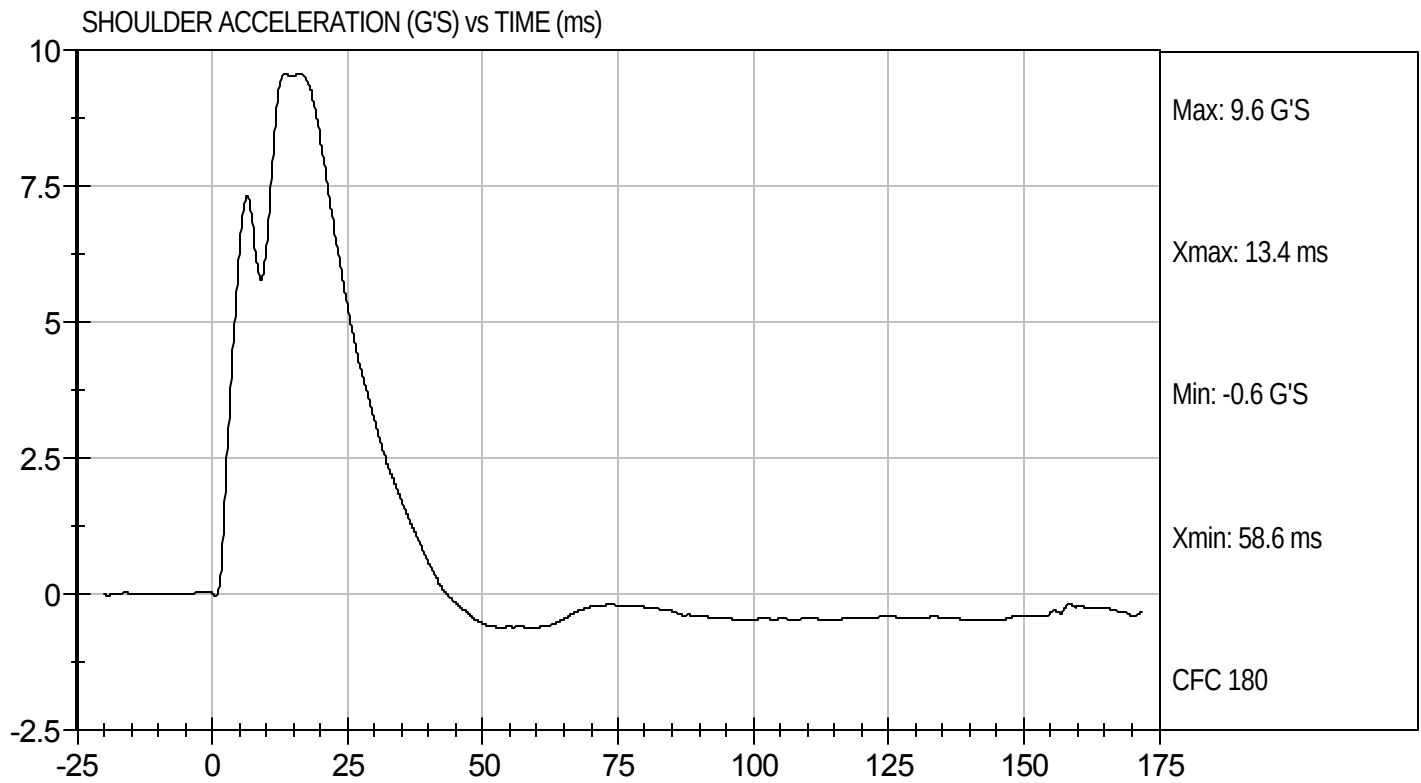
6/9/10
Test Date


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

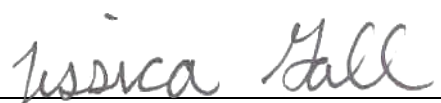
UPPER RIB TEST

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

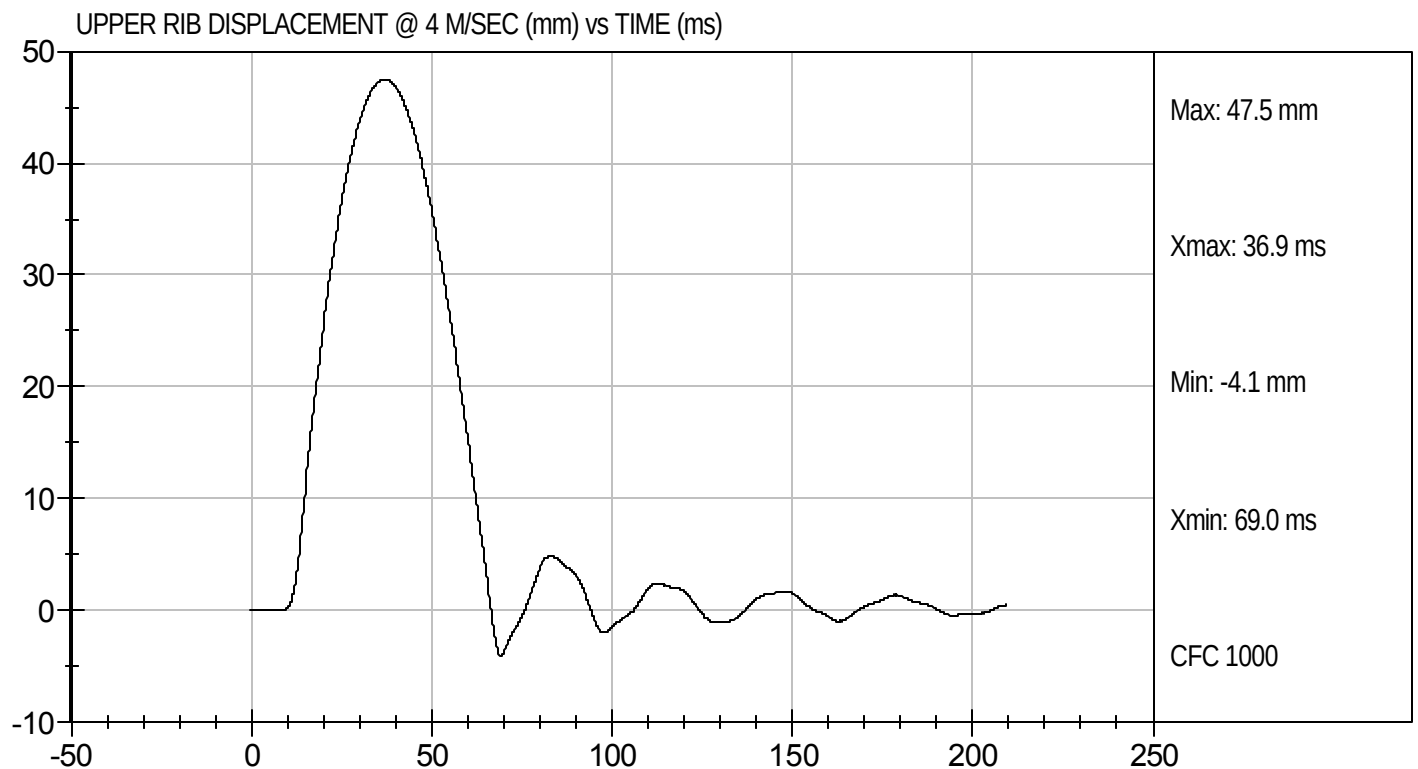
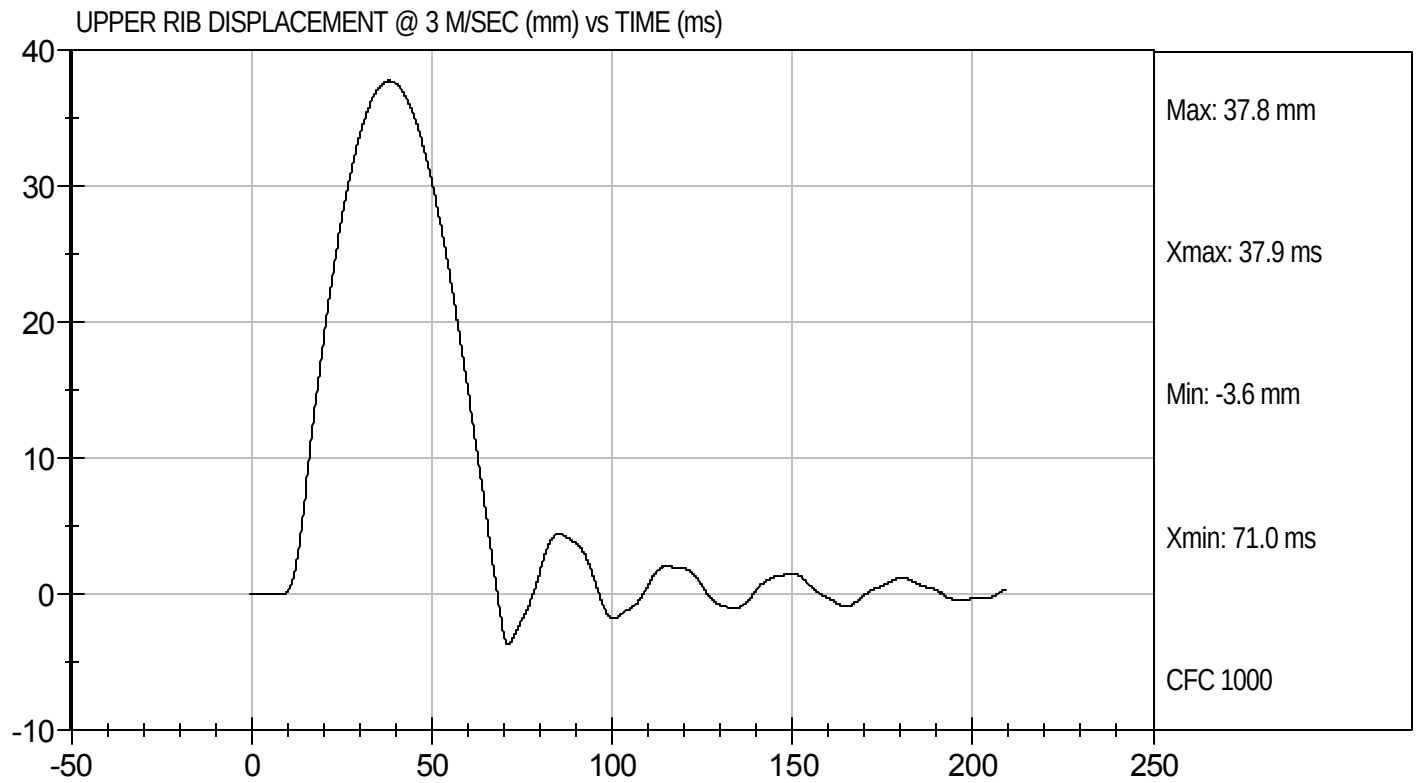
6/10/10
Test Date


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

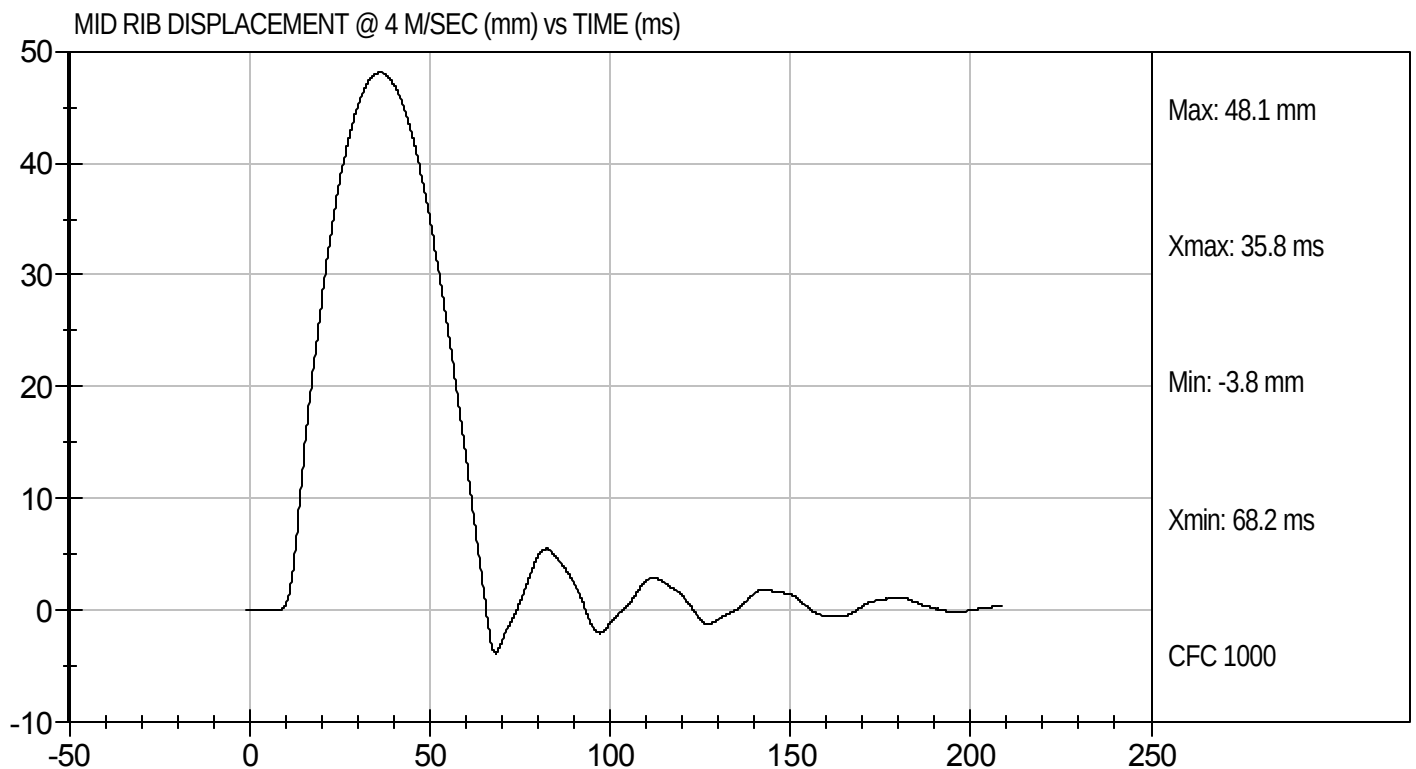
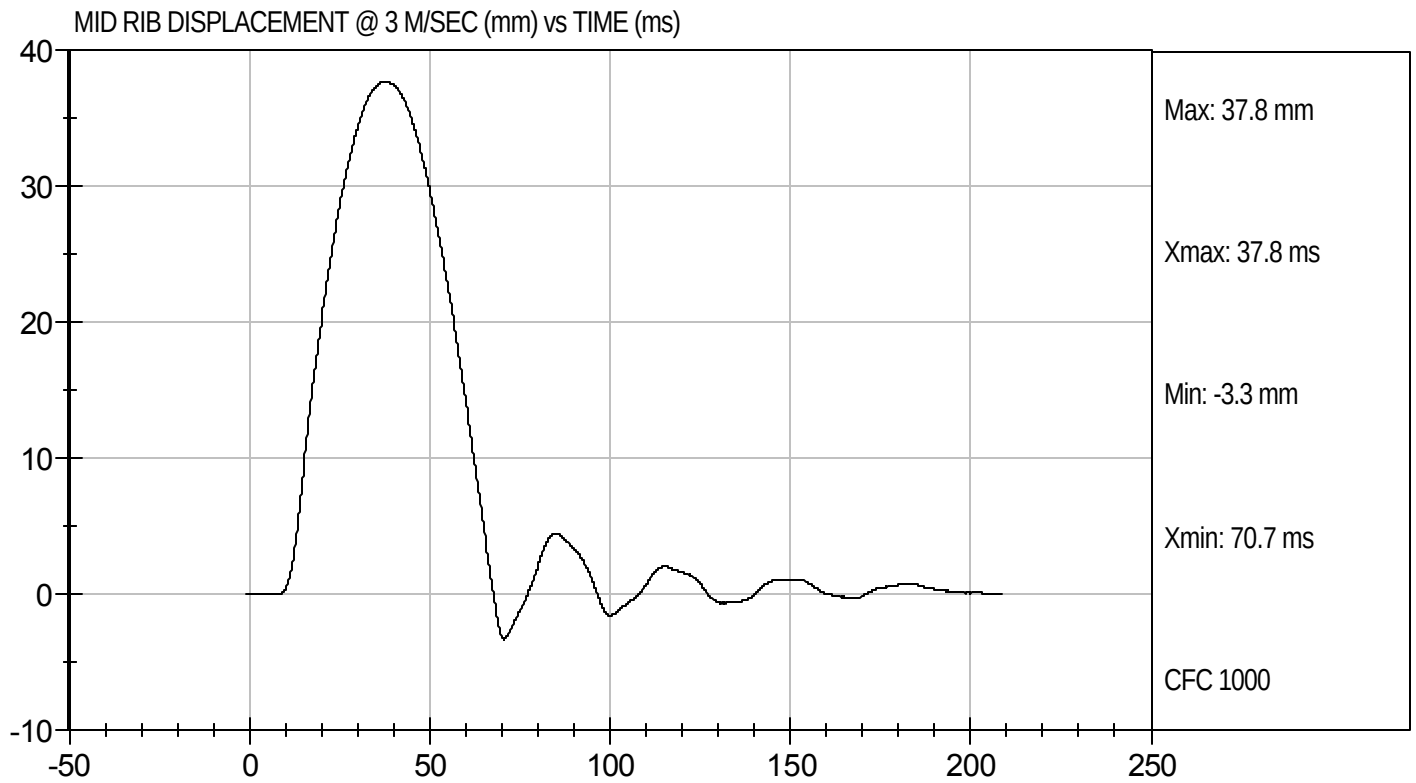
6/10/10
Test Date


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


Laboratory Technician

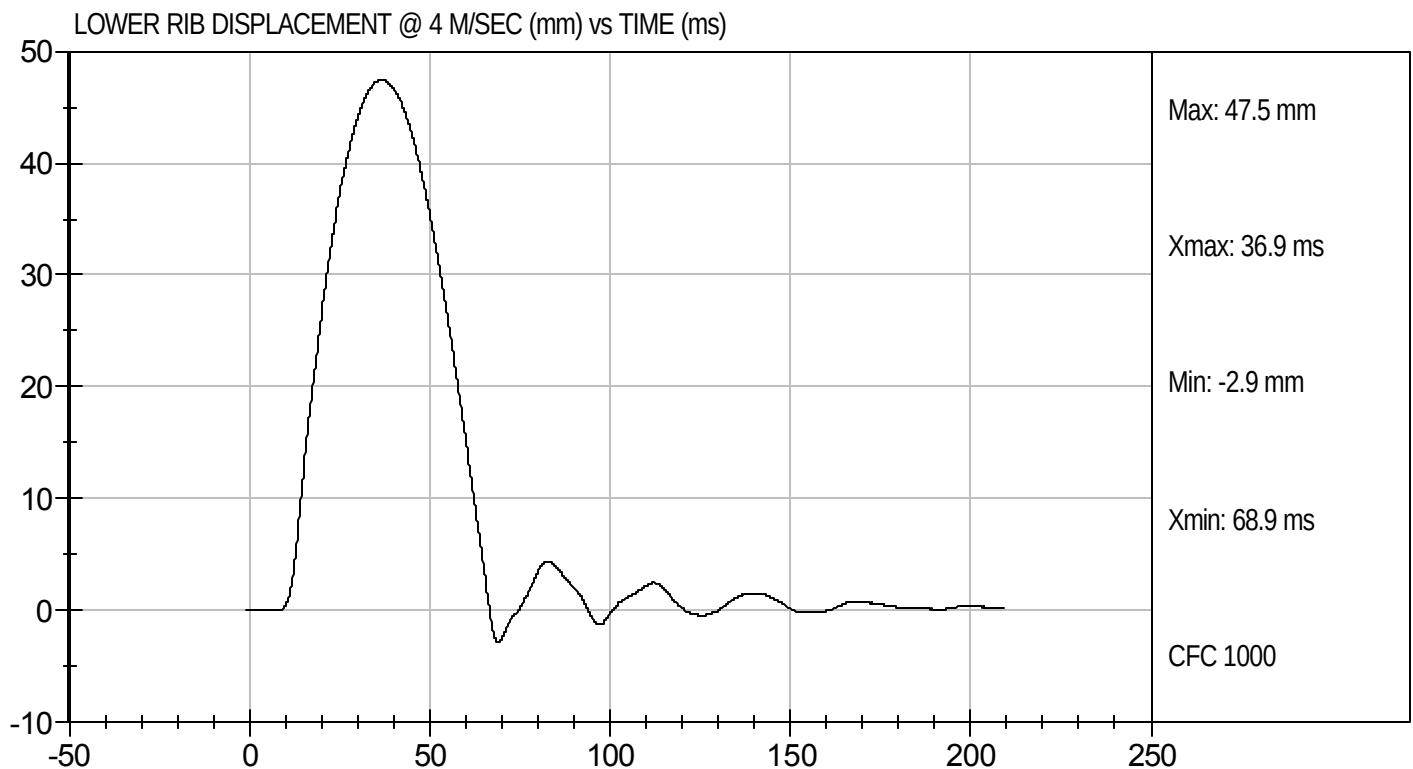
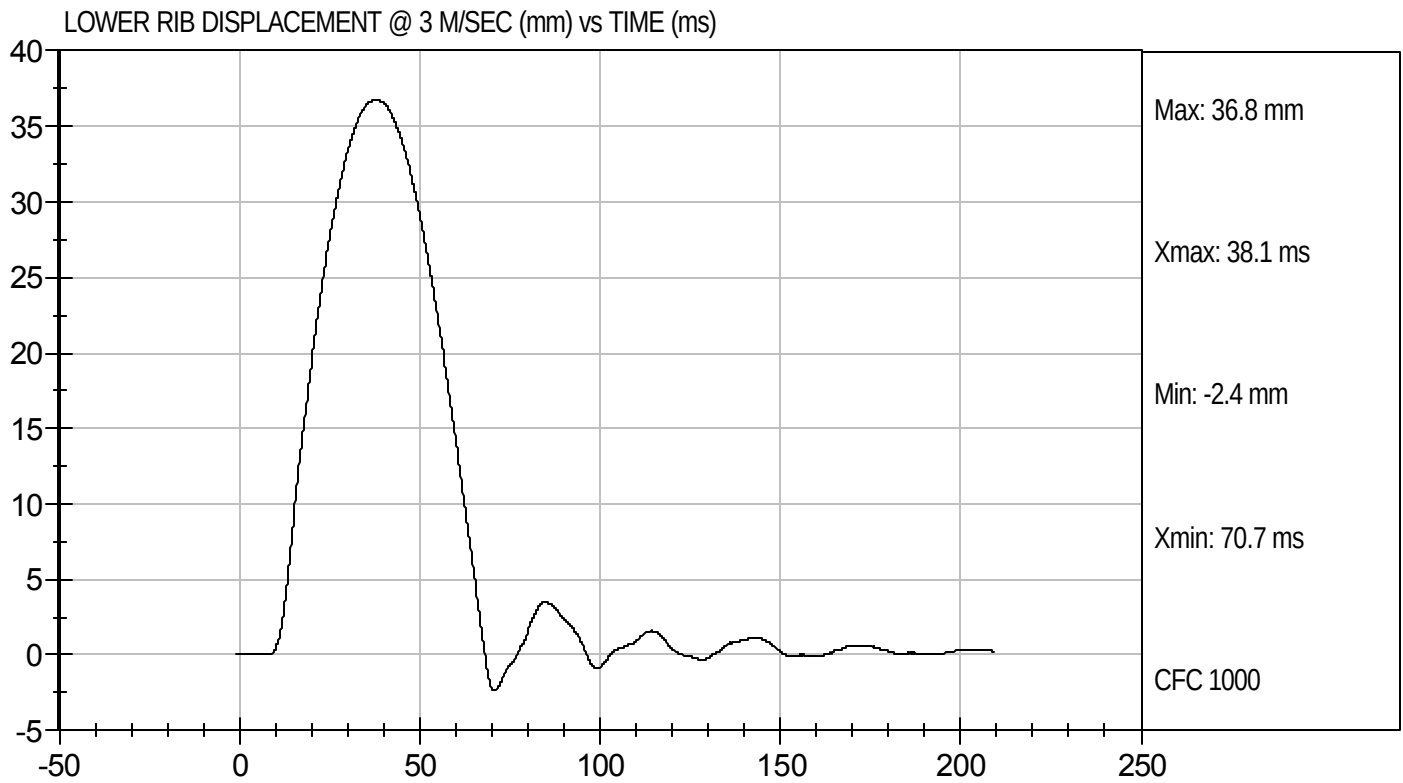
6/10/10
Test Date


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

Jessica Hall
Laboratory Technician

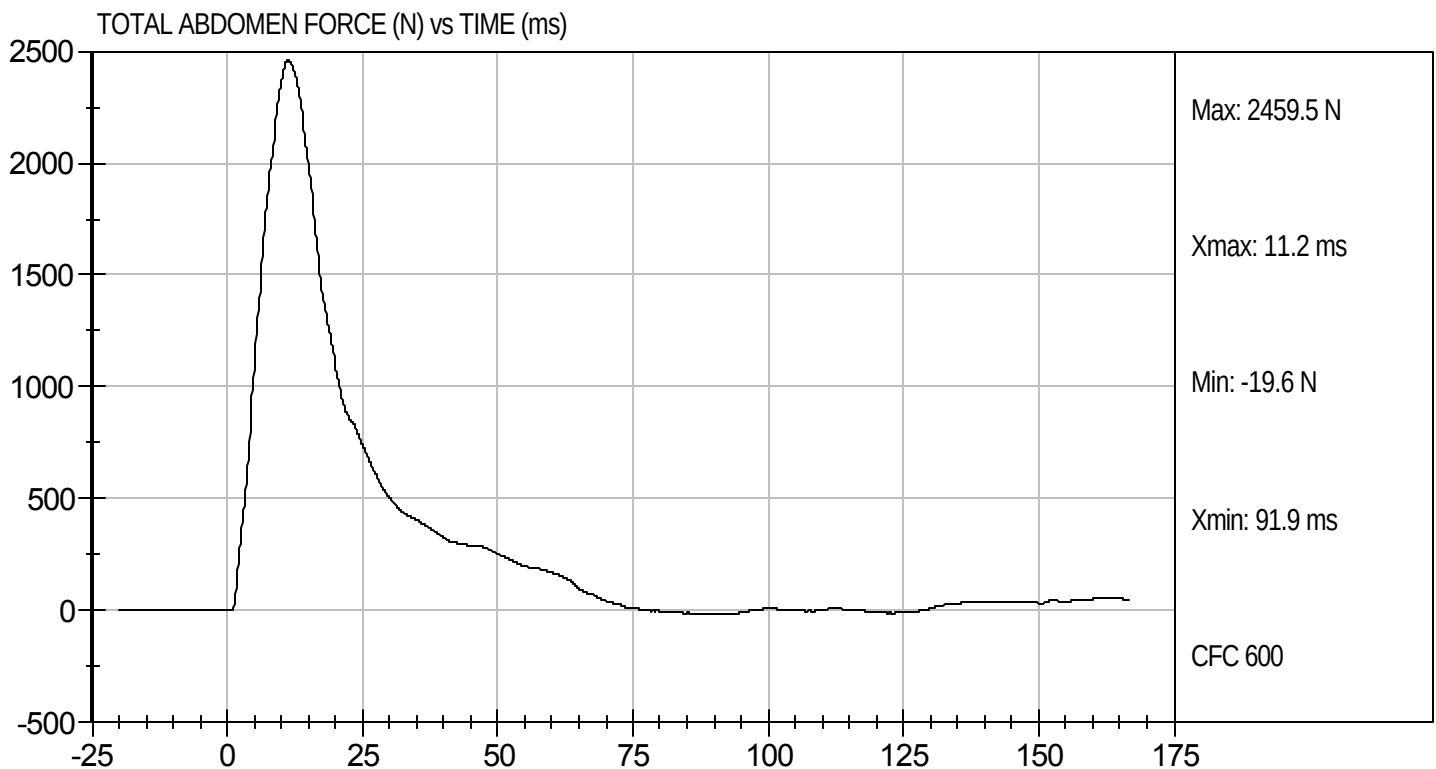
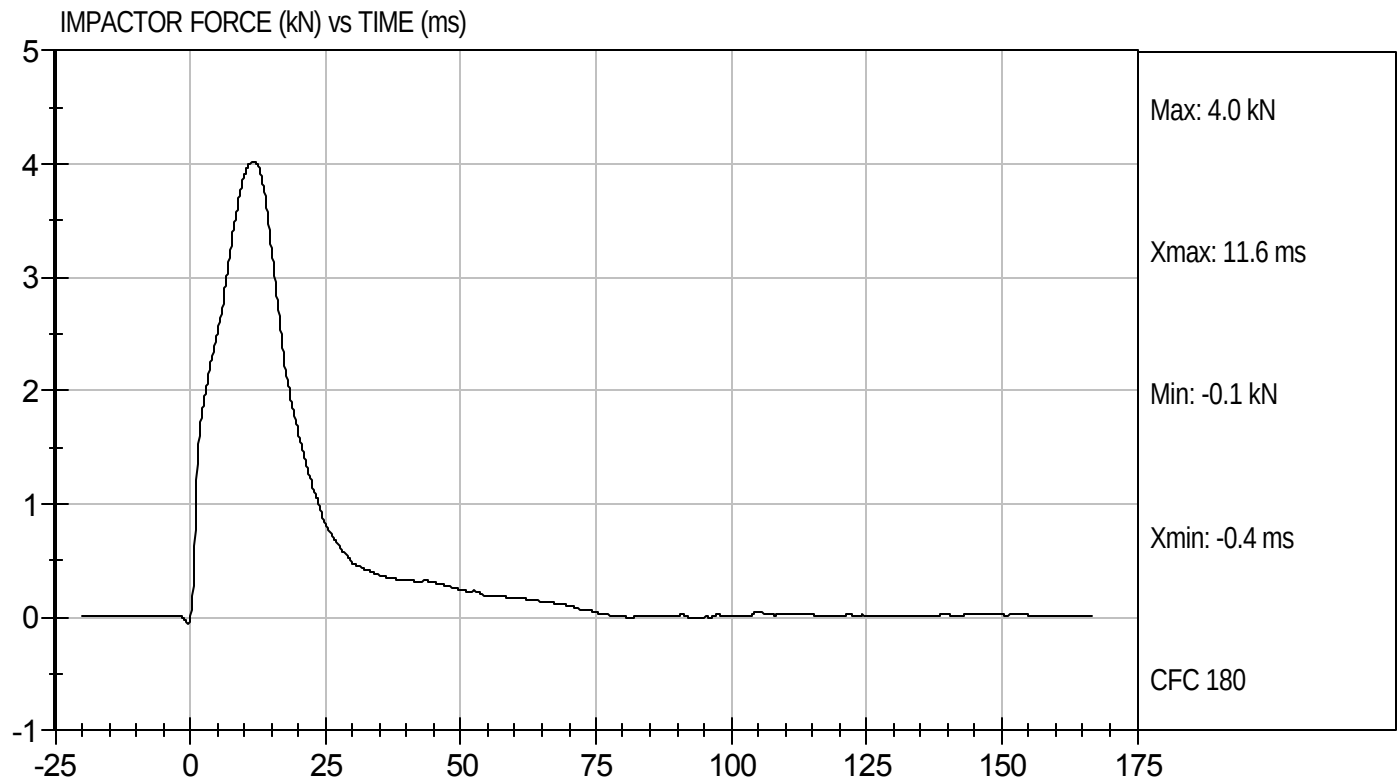
6/9/10
Test Date

David Winkelbauer
Approved By



Test Desc: Abdomen Impact
Component ID: D101777

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

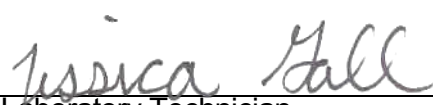


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

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

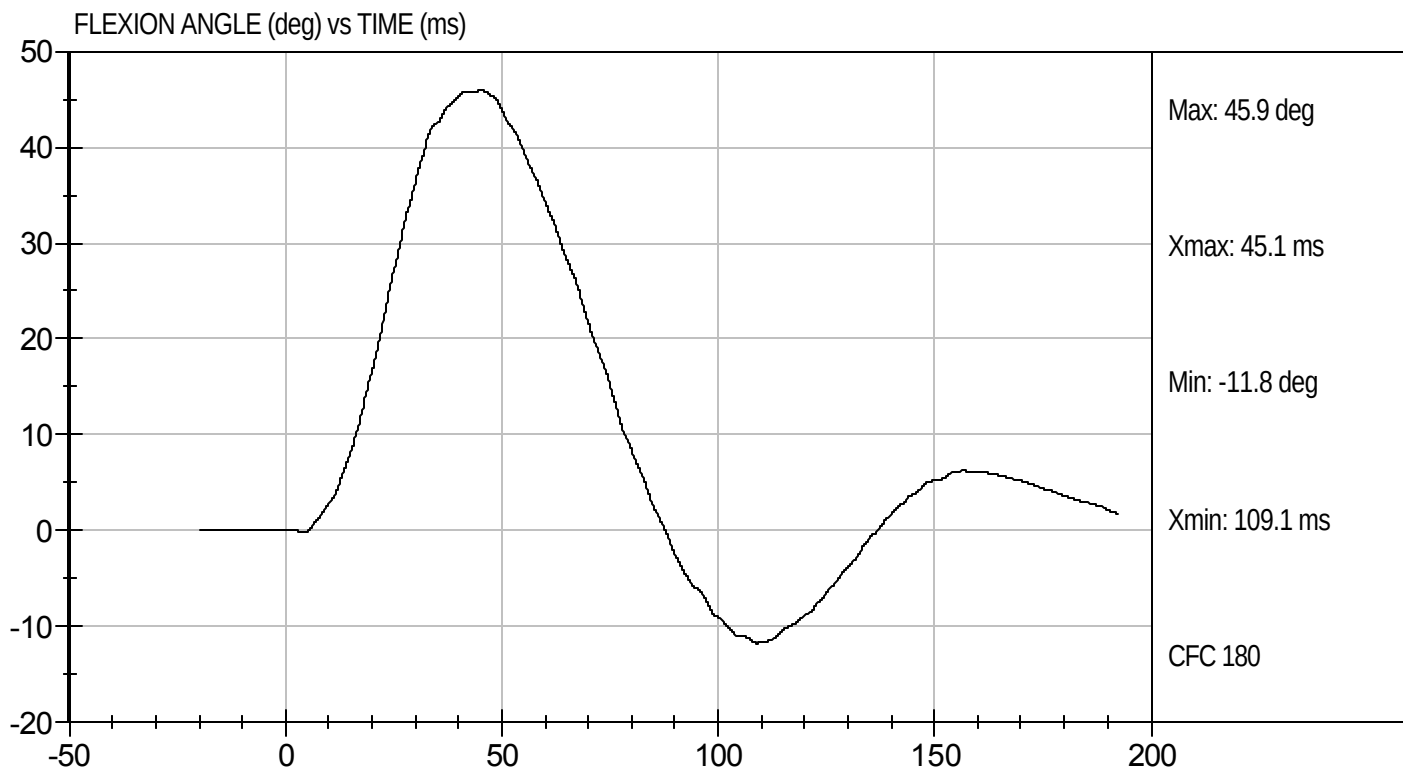
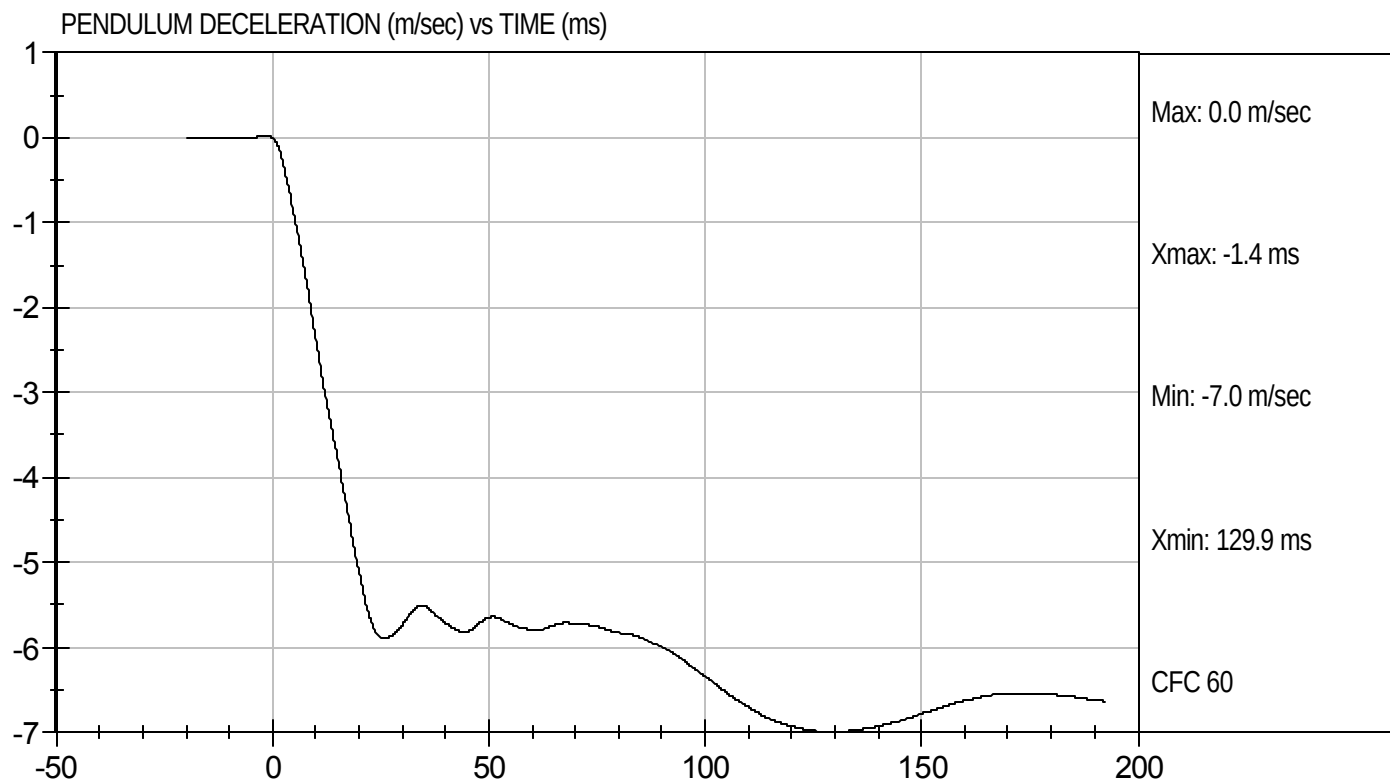
6/10/10
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D101778

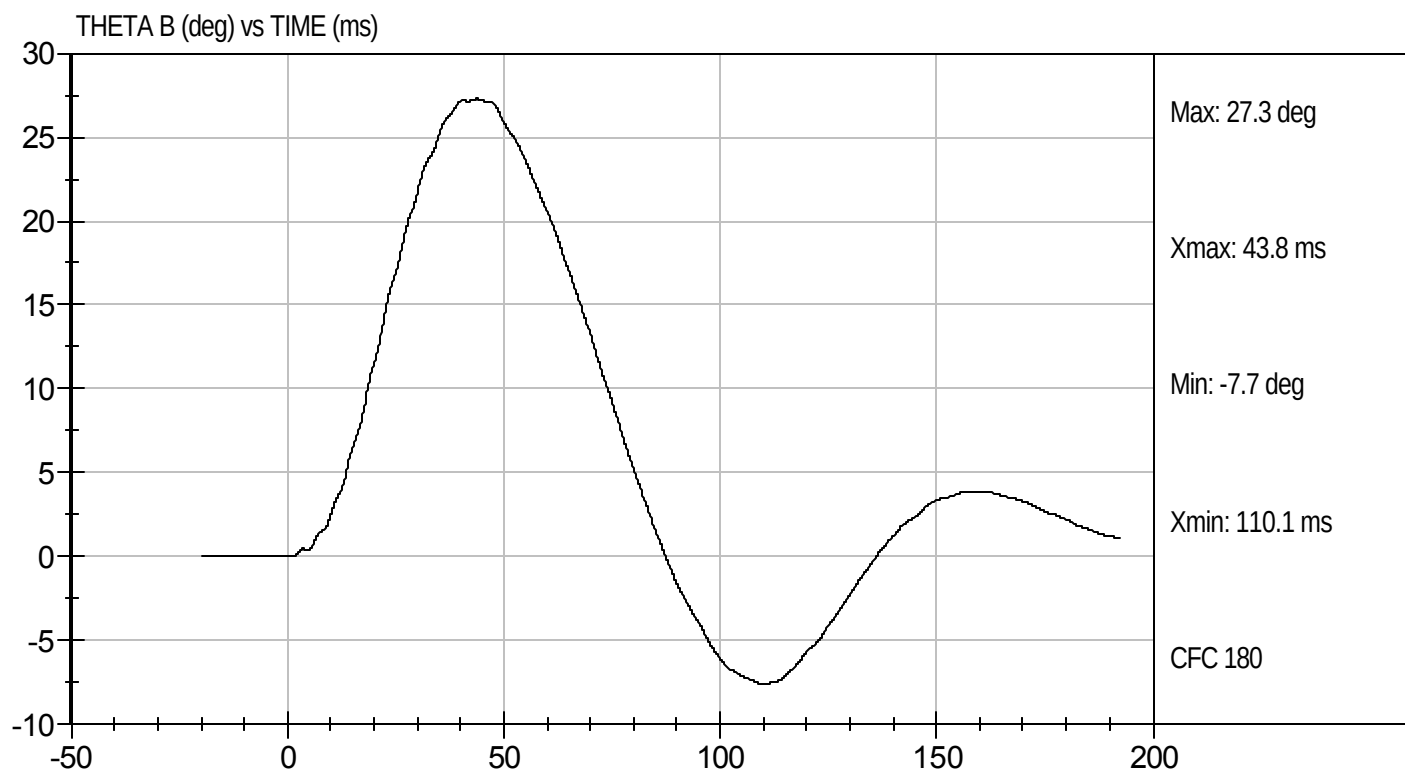
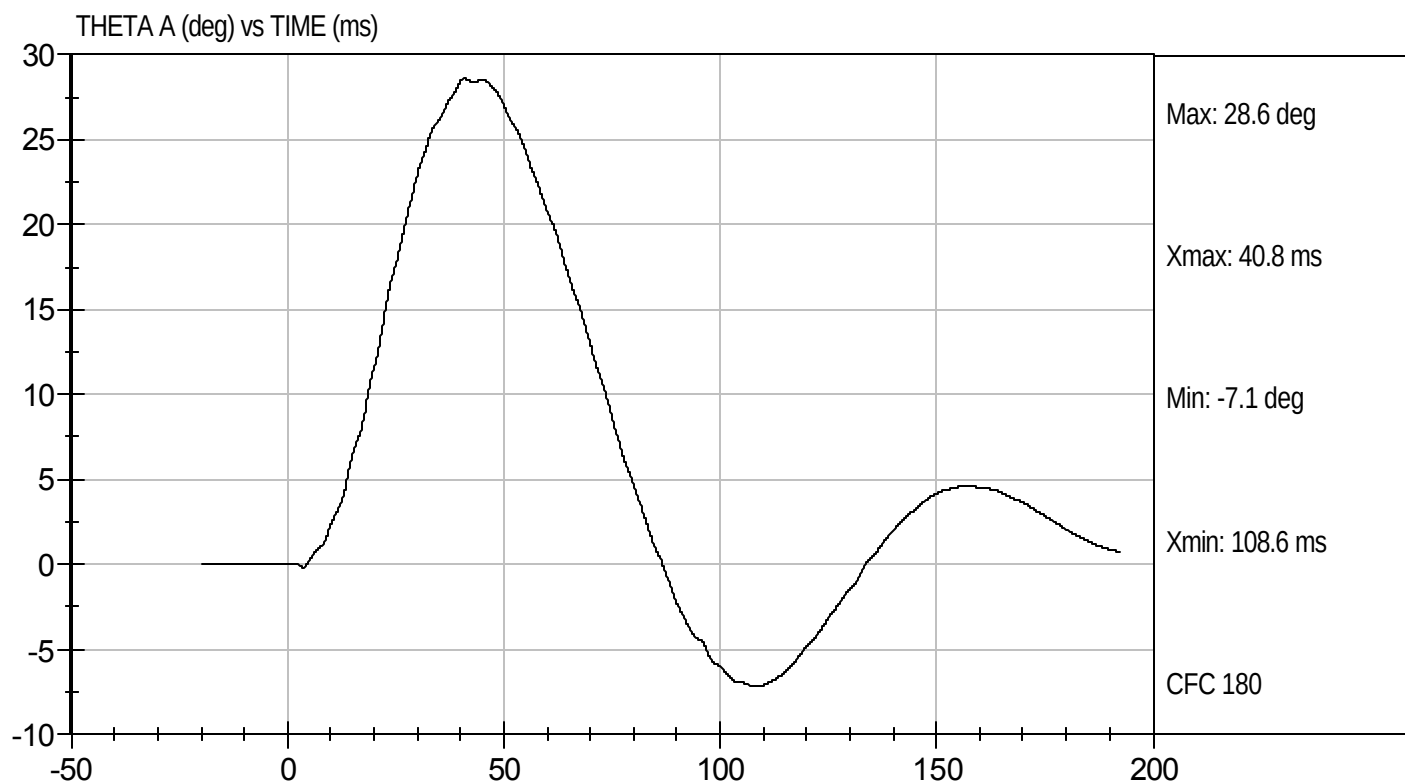
Test Date: 6/10/10
Velocity: 20.08 ft/s, 6.12 m/s





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

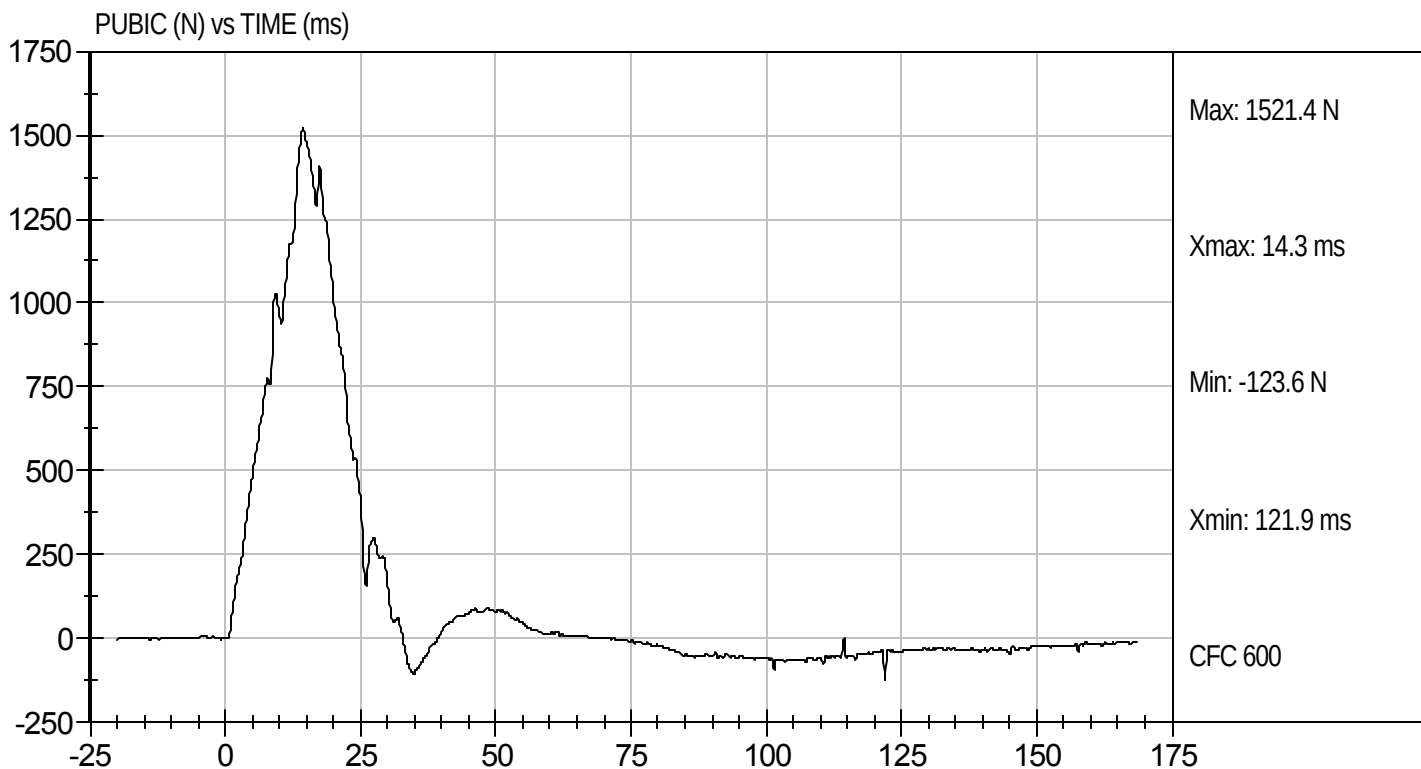
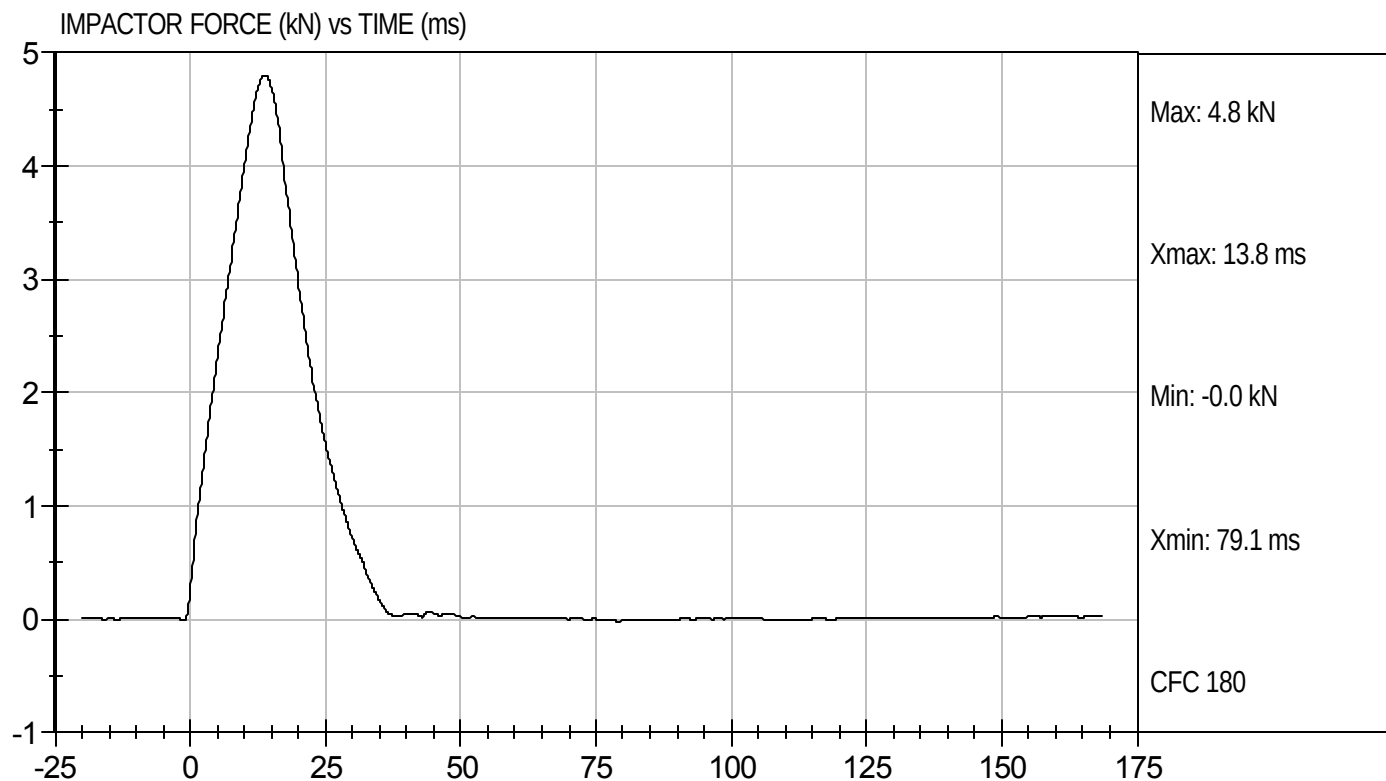
6/9/10
Test Date


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

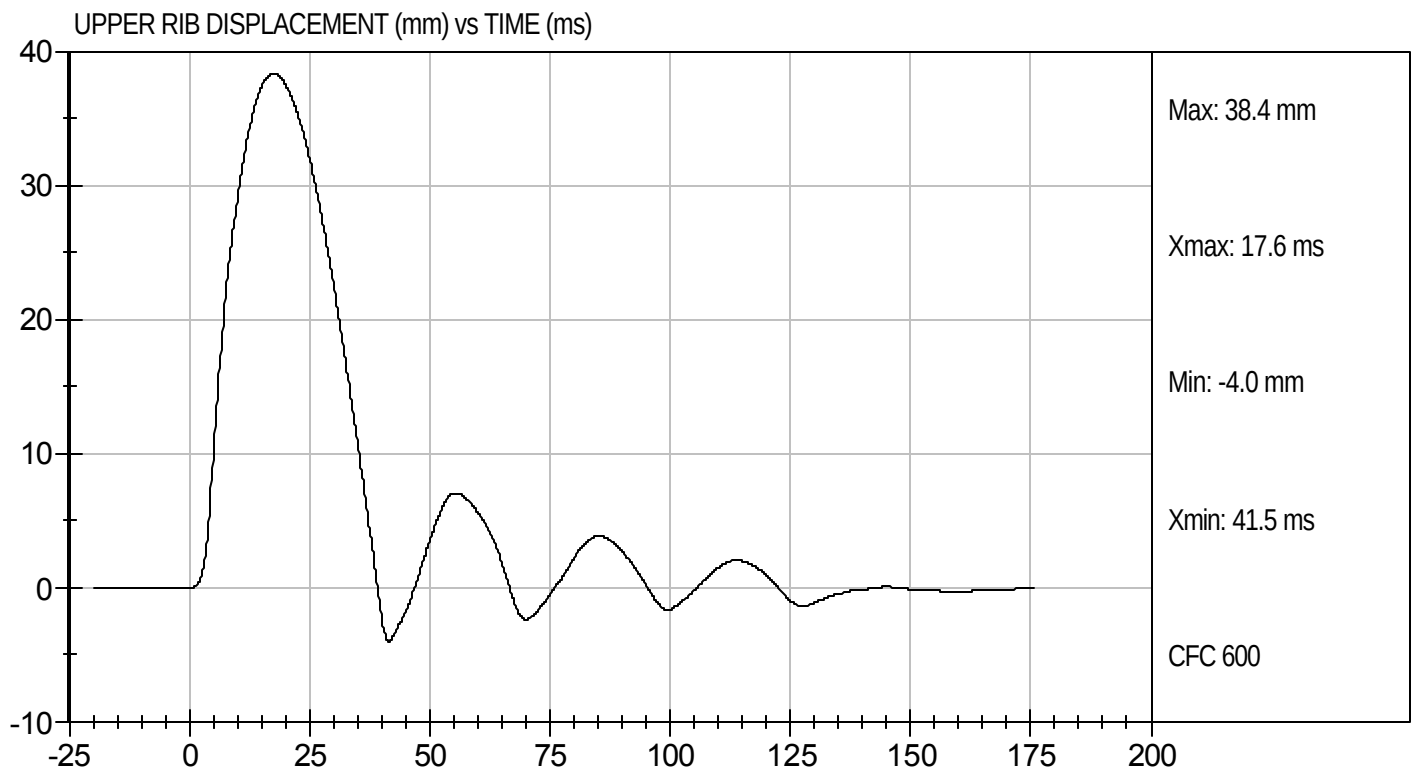
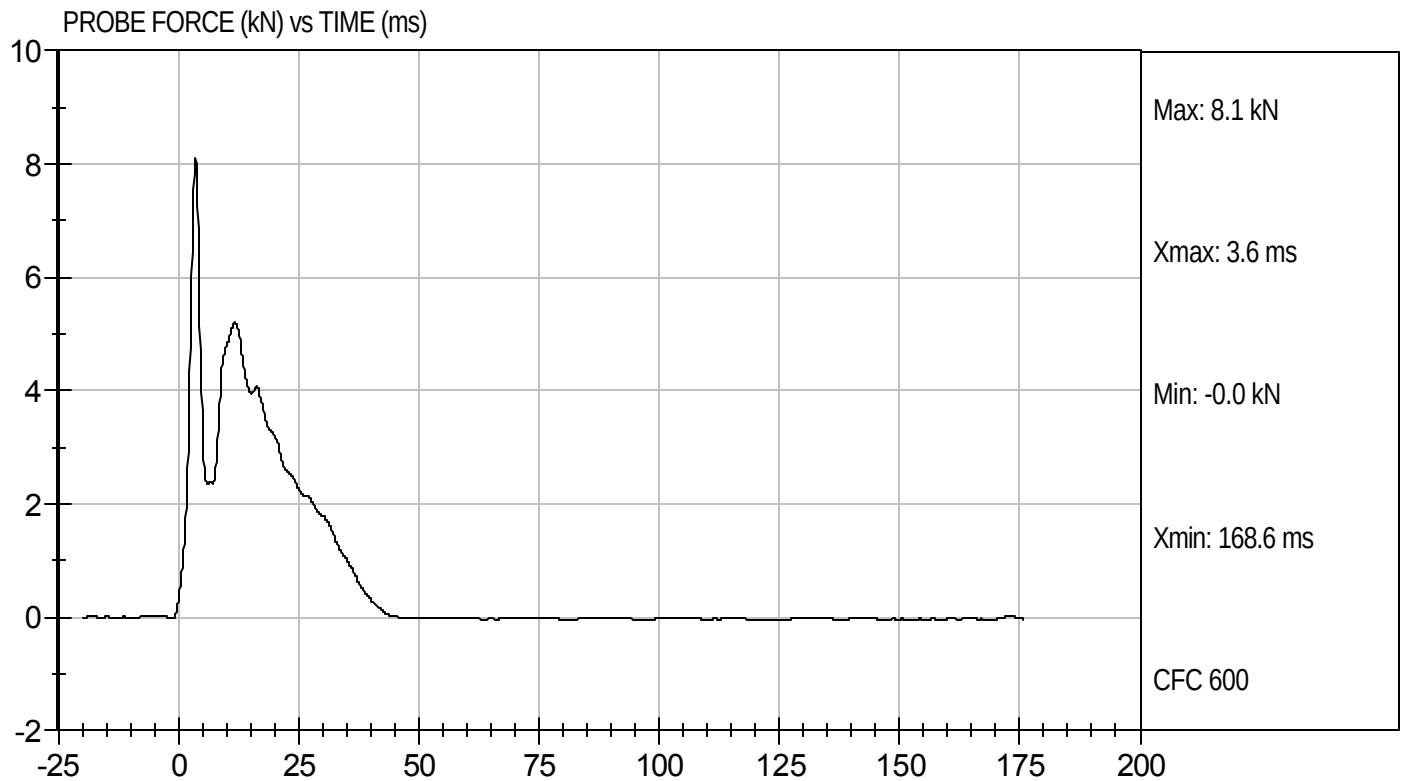
6/9/10
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D101770

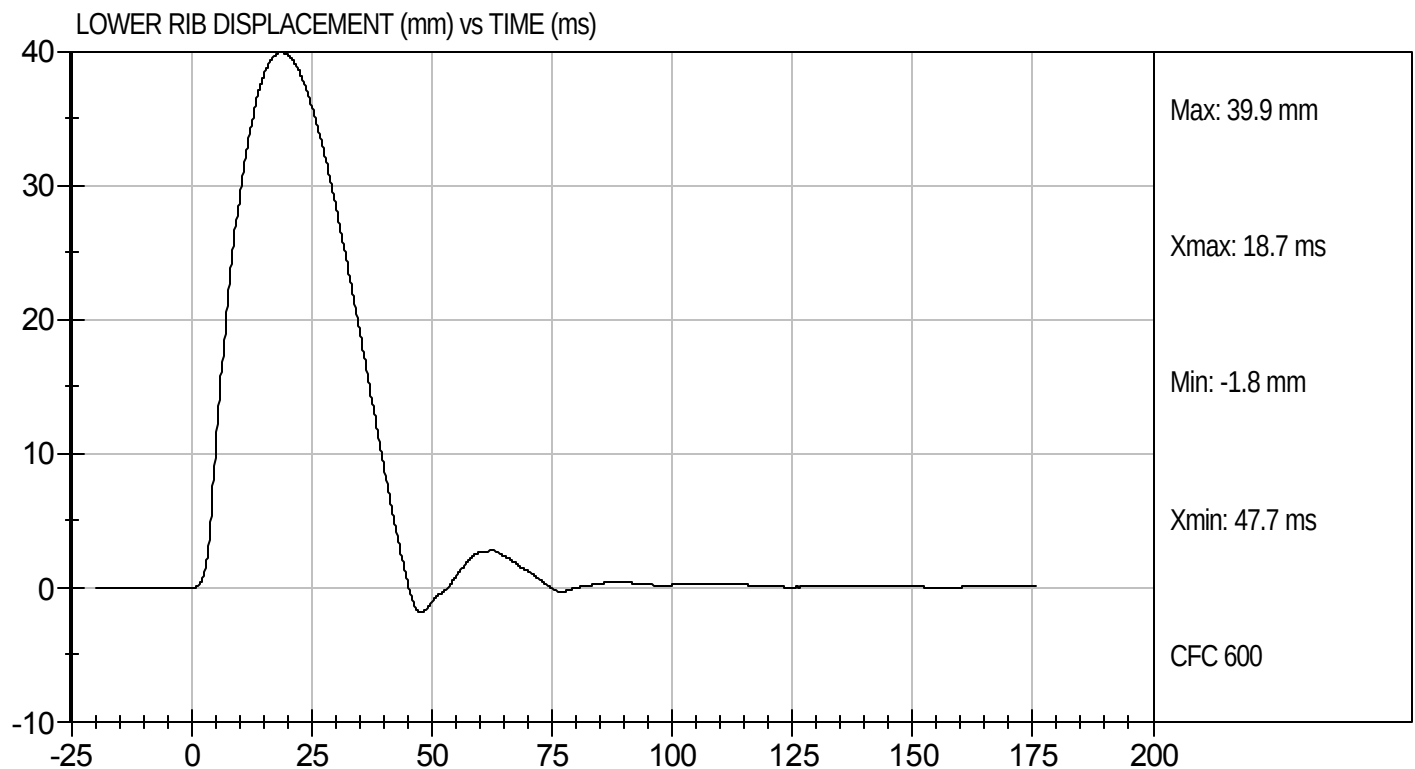
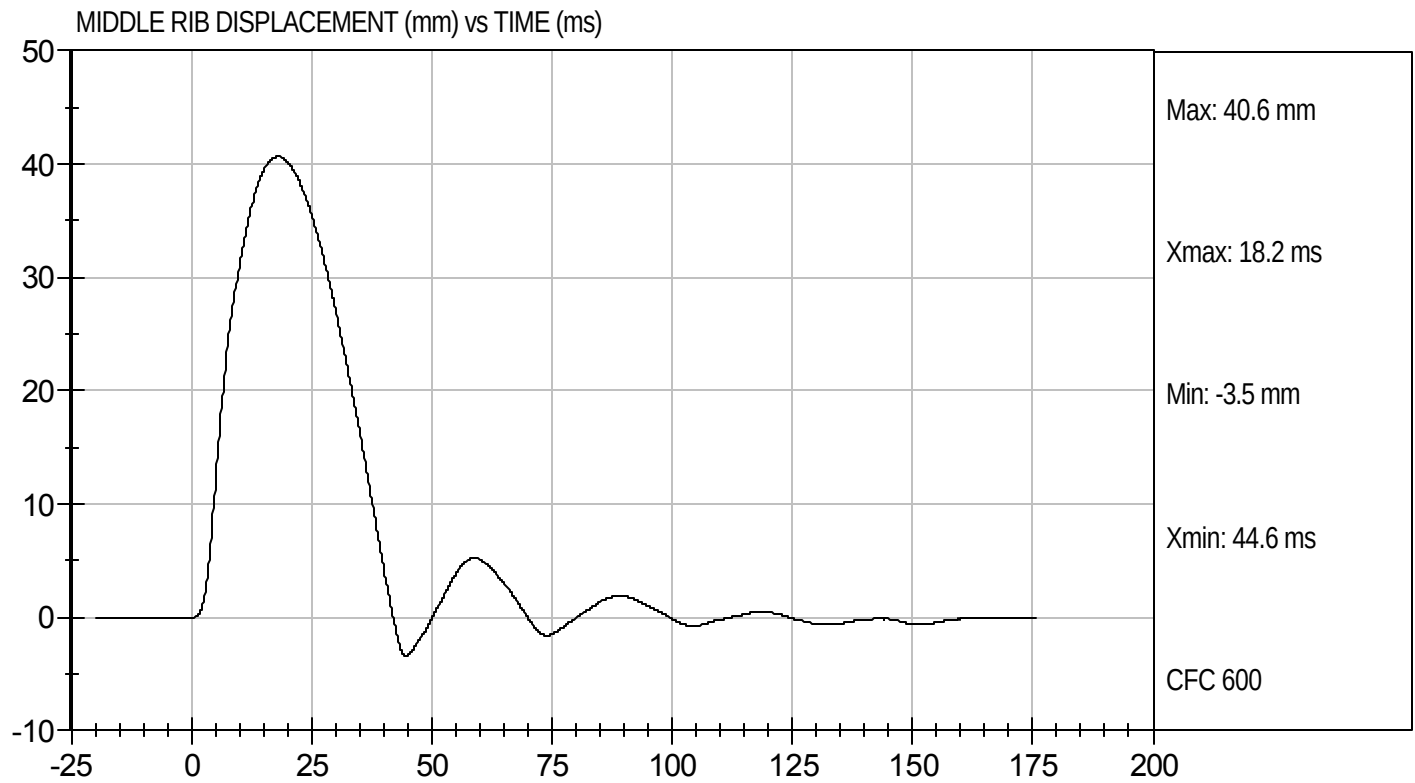
Test Date: 6/9/10
Velocity: 18.32 ft/s, 5.58 m/s





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
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D101641

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Peak Resultant Acceleration	G's	115 to 137	116	Pass
Peak Lateral Acceleration	G's	+/- 15	3.8	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

6/2/10
Test Date

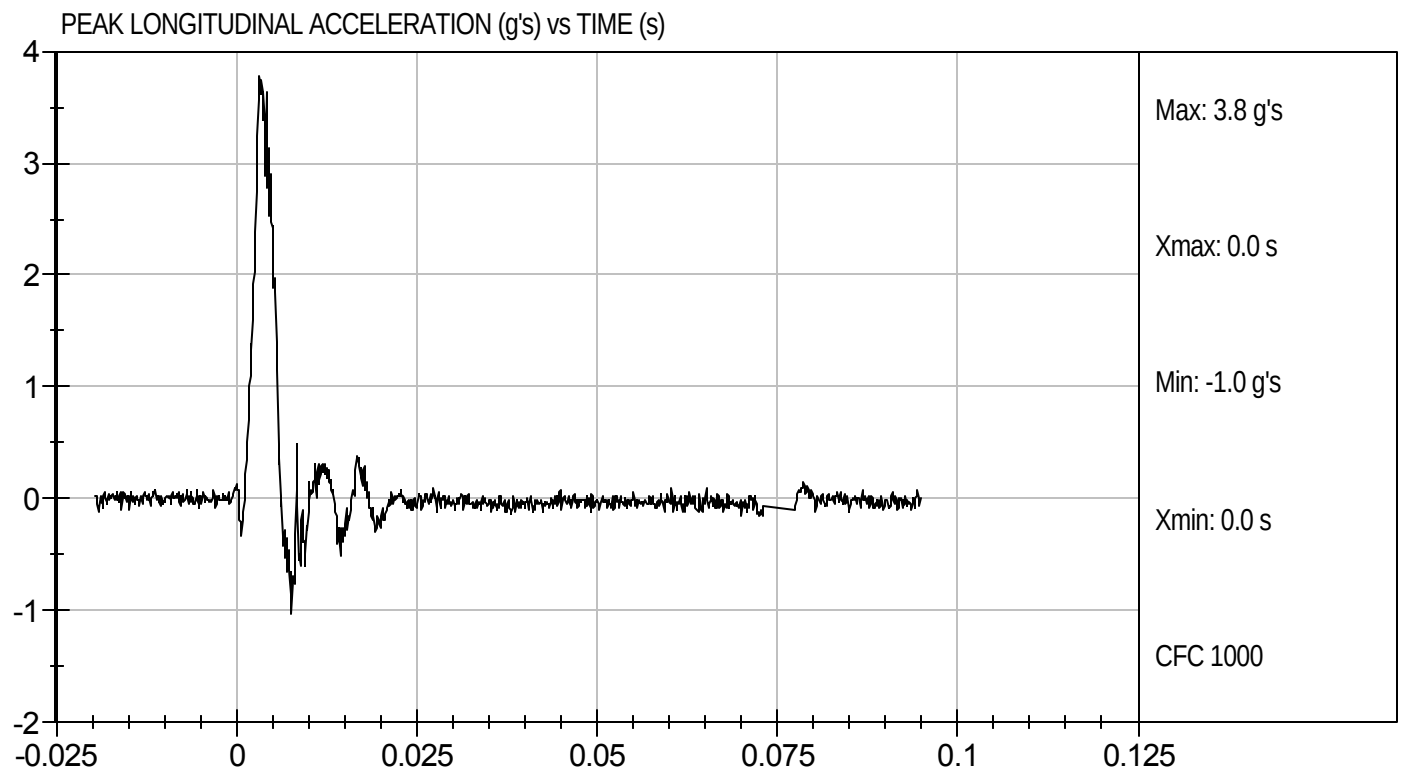
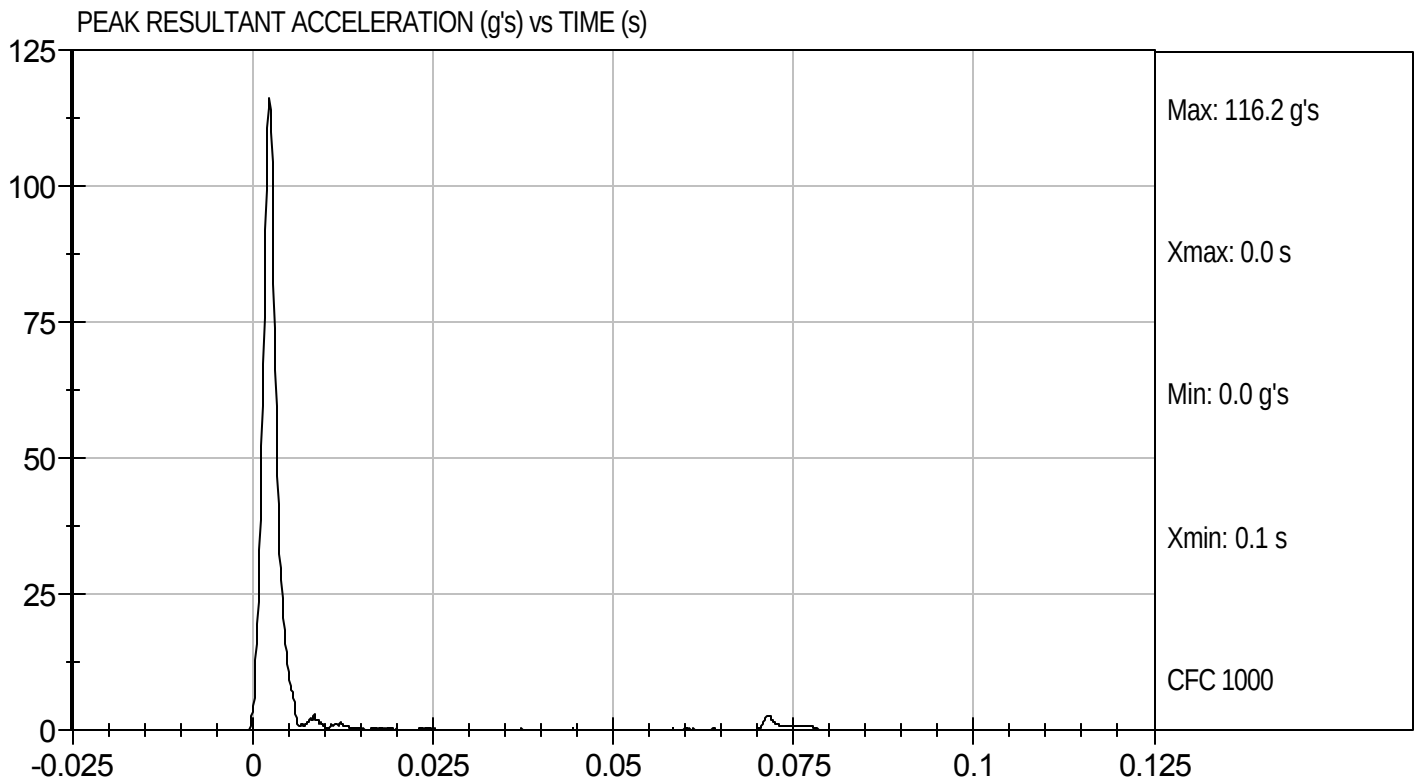


Approved By



Test Desc: Head Drop
Component ID: D101641

Test Date: 6/2/10
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: D101642

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.5	Pass
Humidity		%	10 to 70	53	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.78	Pass
	15 ms	m/s	3.30 to 4.10	3.92	Pass
	20 ms	m/s	4.40 to 5.40	5.14	Pass
	25 ms	m/s	5.40 to 6.10	5.59	Pass
	25-100 ms	m/s	5.50 to 6.20	5.59	Pass
Maximum D-Plane Rotation		deg	71 to 81	75.3	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	60	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	117	Pass
Overall Test Results				Pass	


 Laboratory Technician

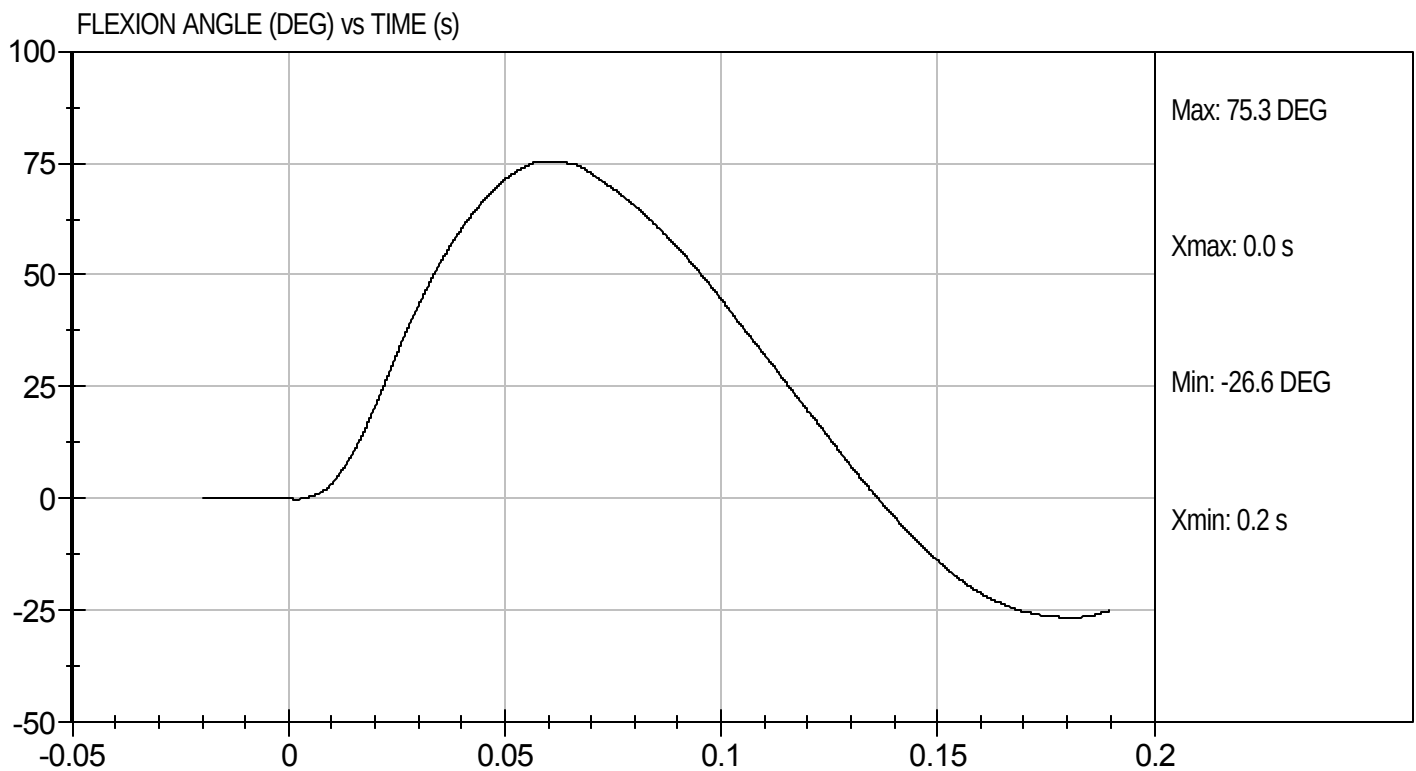
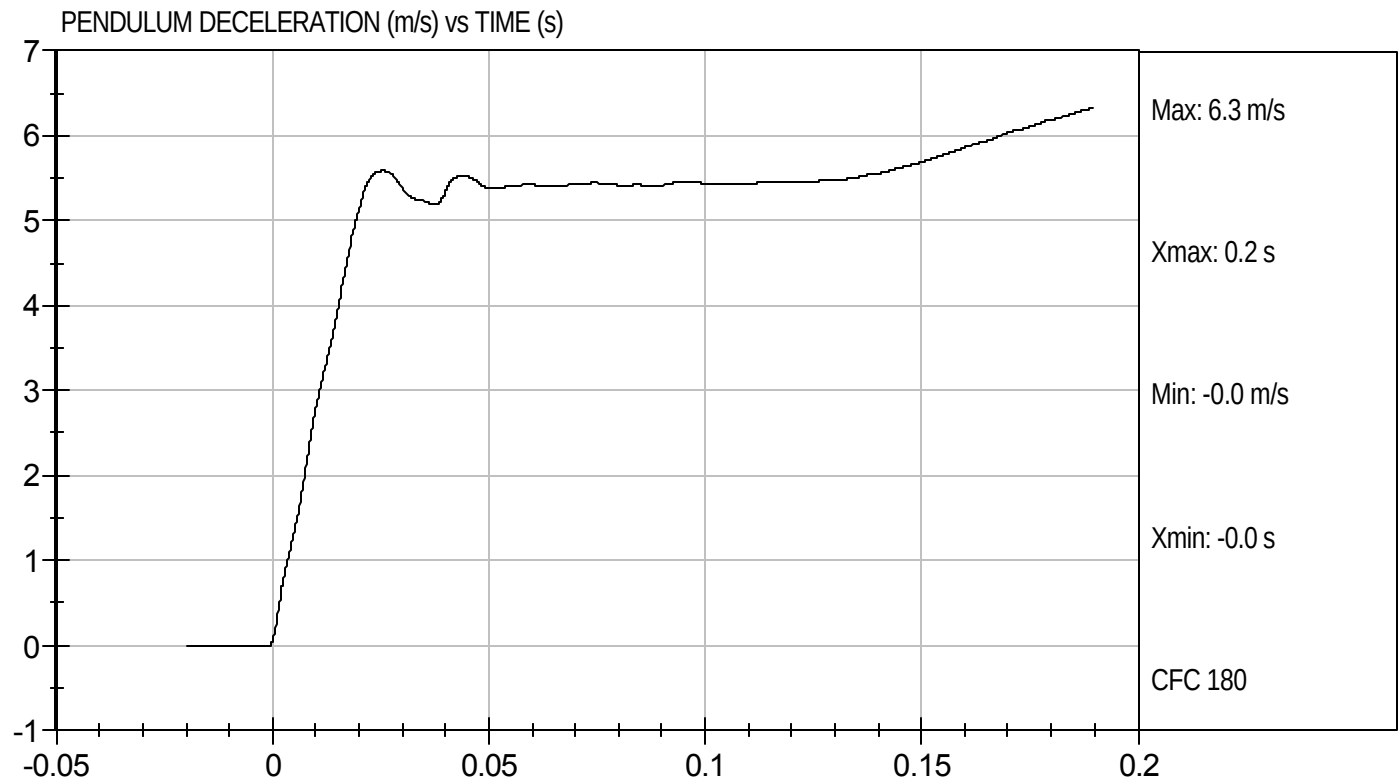
6/2/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D101642

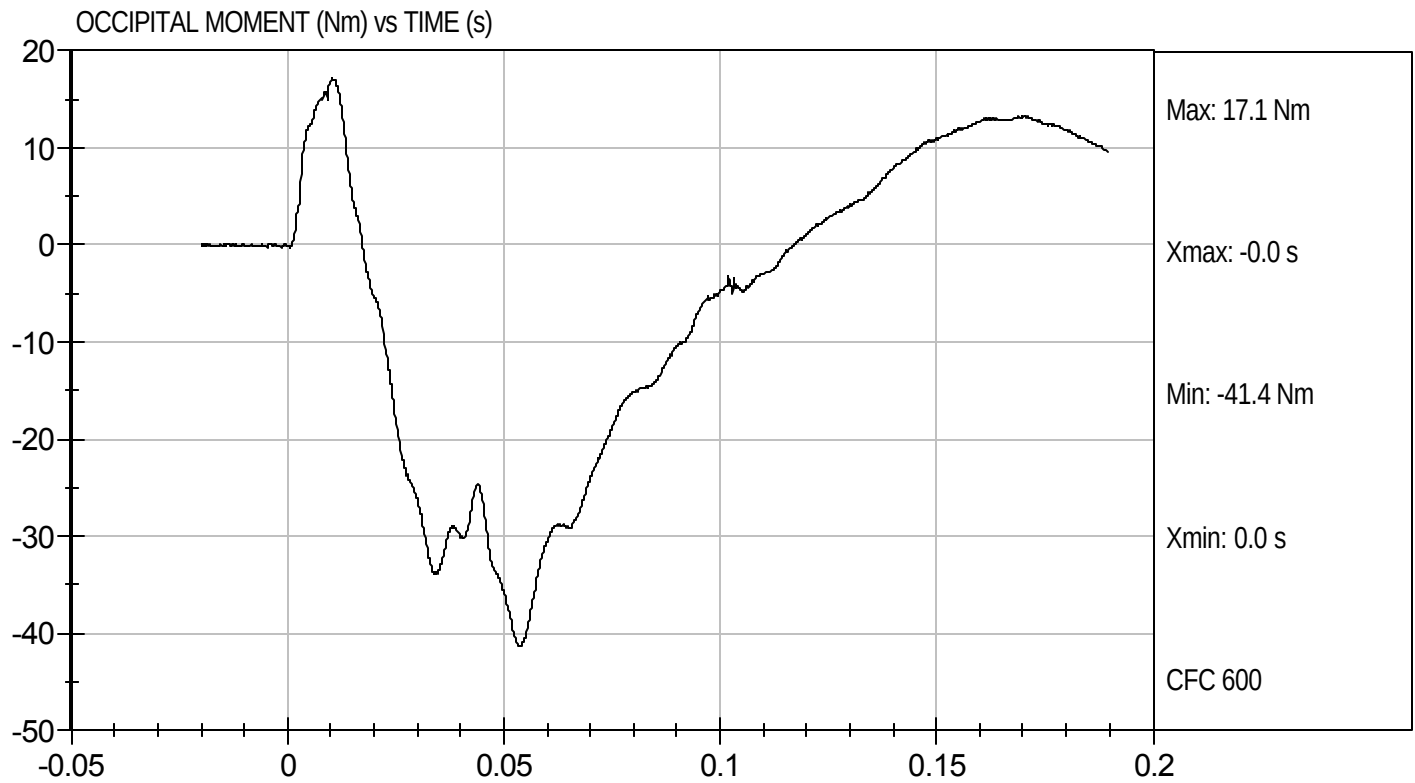
Test Date: 6/2/10
Velocity: 18.12 ft/s, 5.52 m/s





Test Desc: Neck Bending
Component ID: D101642

Test Date: 6/2/10
Velocity: 18.12 ft/s, 5.52 m/s



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

ATD Serial No: 296

Test ID: D101643

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	29	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

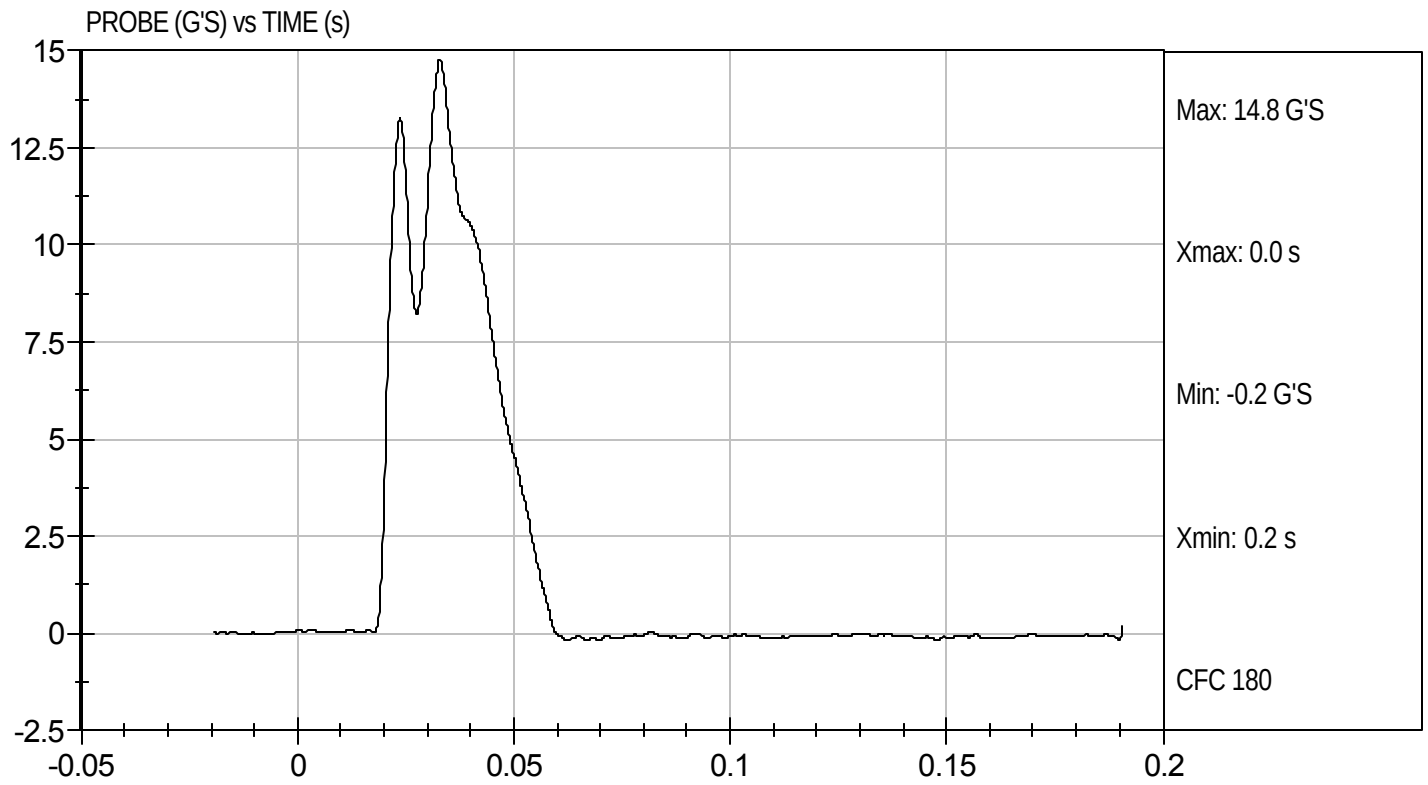
6/2/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D101643

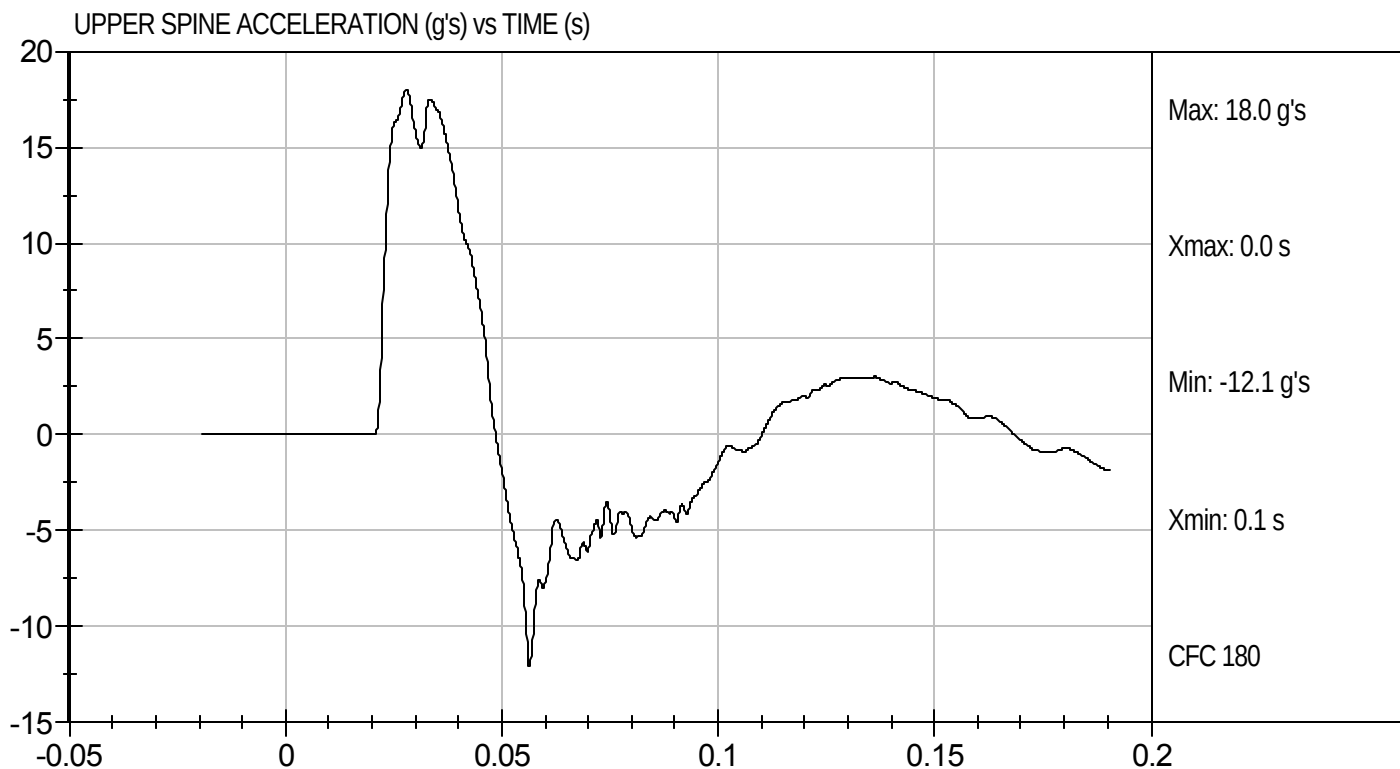
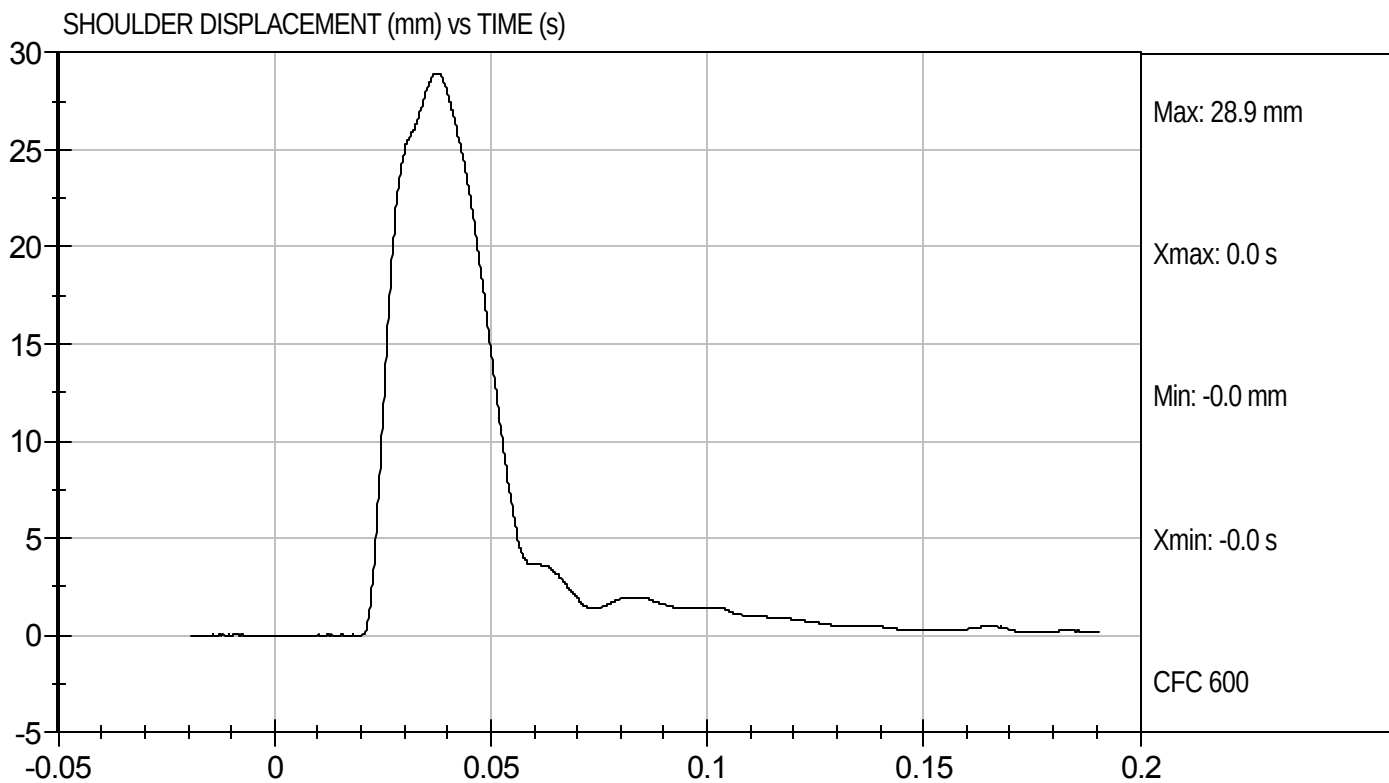
Test Date: 6/2/10
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Shoulder Impact
Component ID: D101643

Test Date: 6/2/10
Velocity: 14.12 ft/s, 4.23 m/s

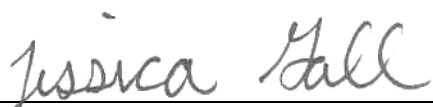


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101644

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	52	Pass
Impact Velocity	m/s	6.60 to 6.80	6.69	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	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results			Pass	


 Laboratory Technician

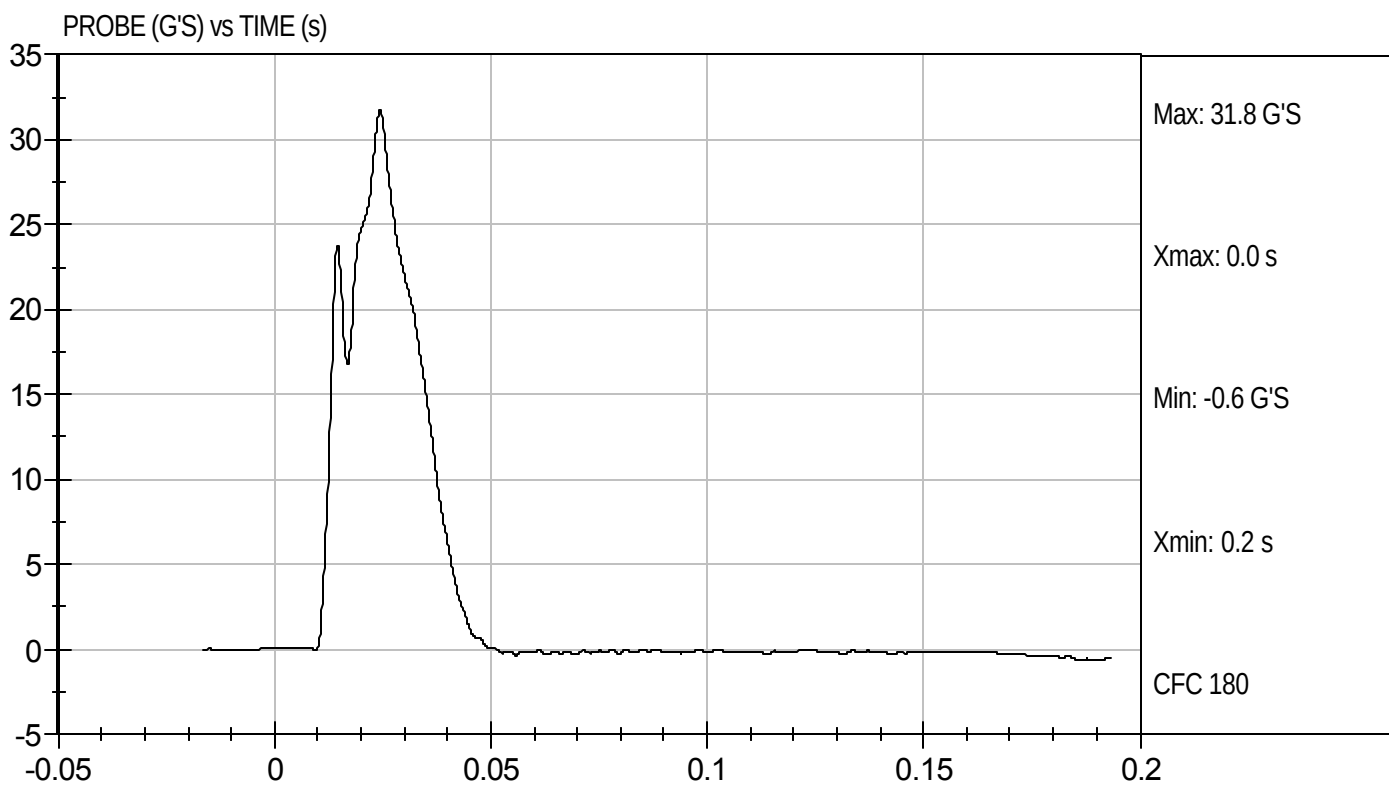
6/2/10
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D101644

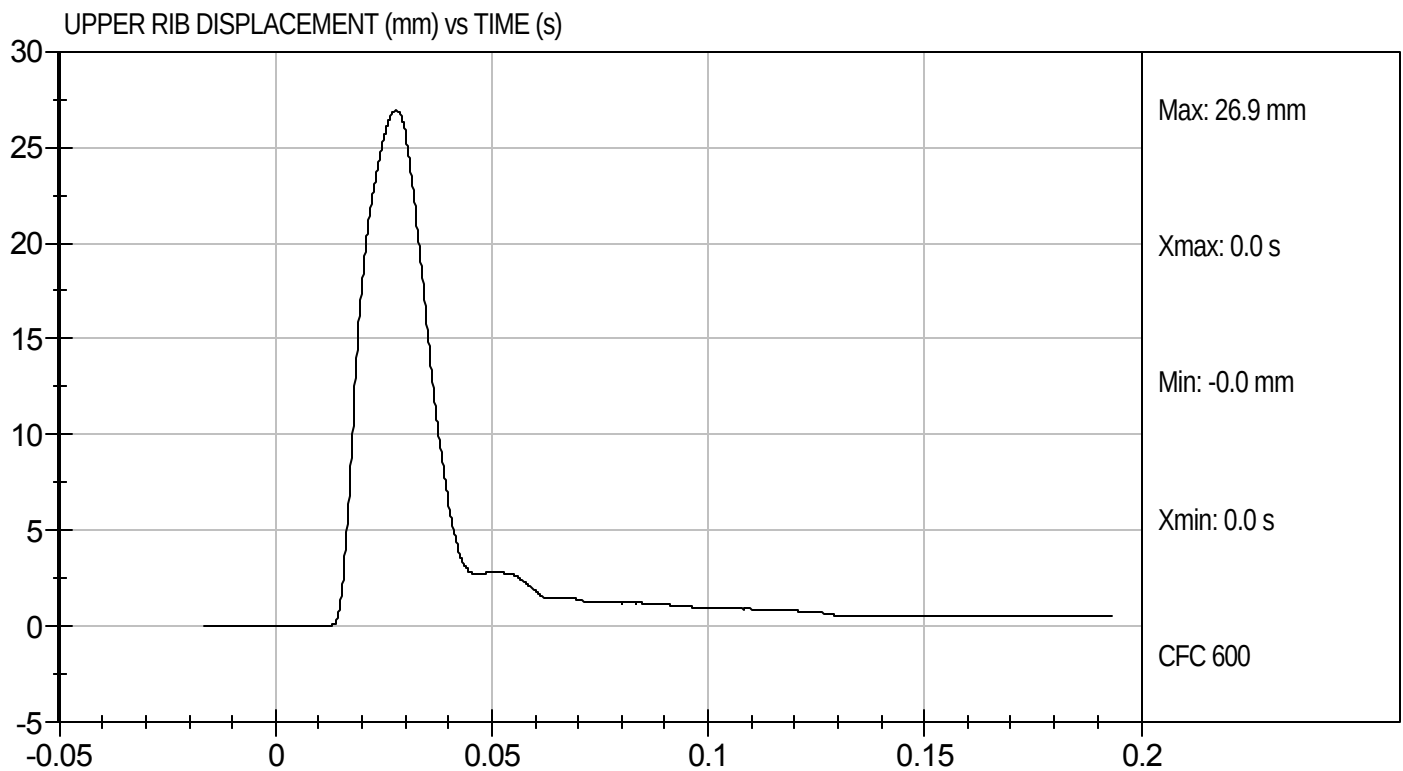
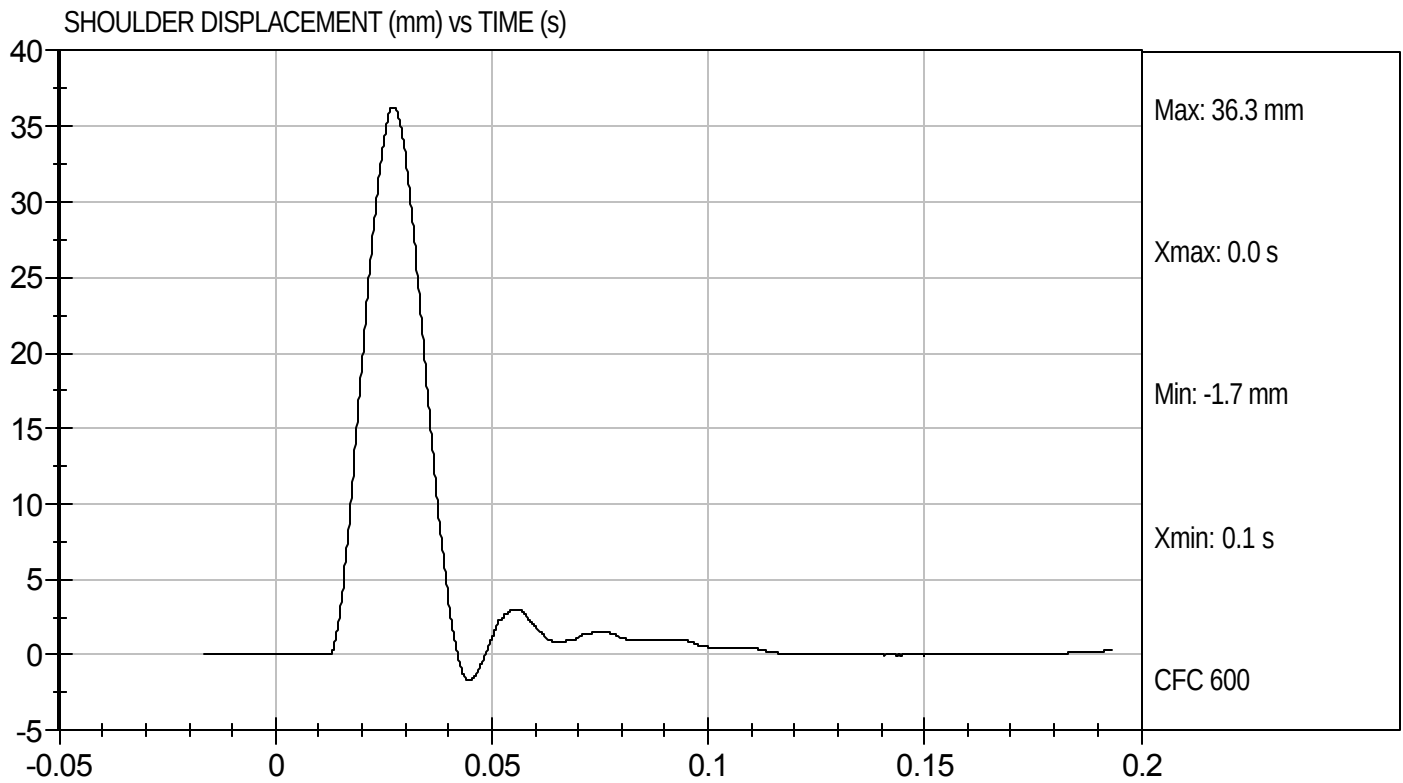
Test Date: 6/2/10
Velocity: 21.96 ft/s, 6.69 m/s





Test Desc: Thorax With Arm
Component ID: D101644

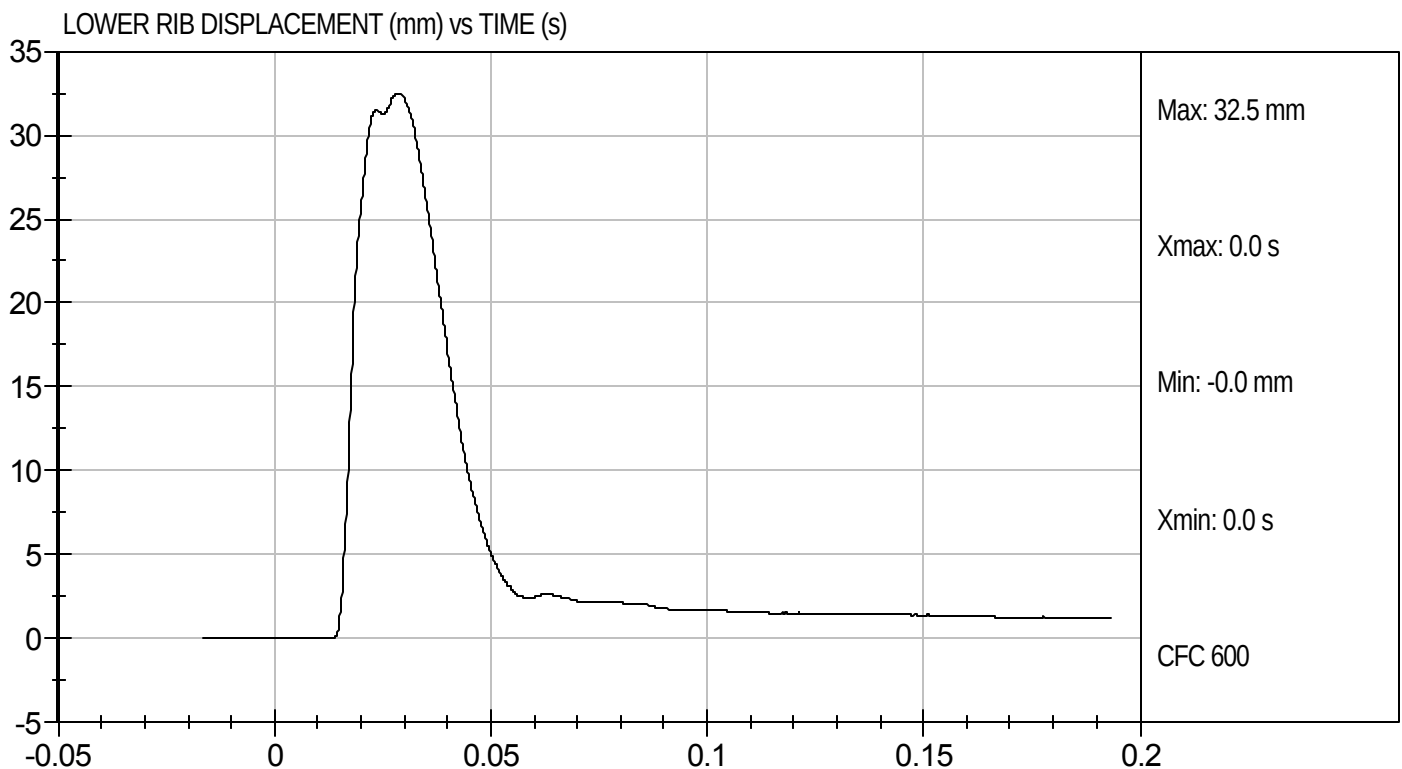
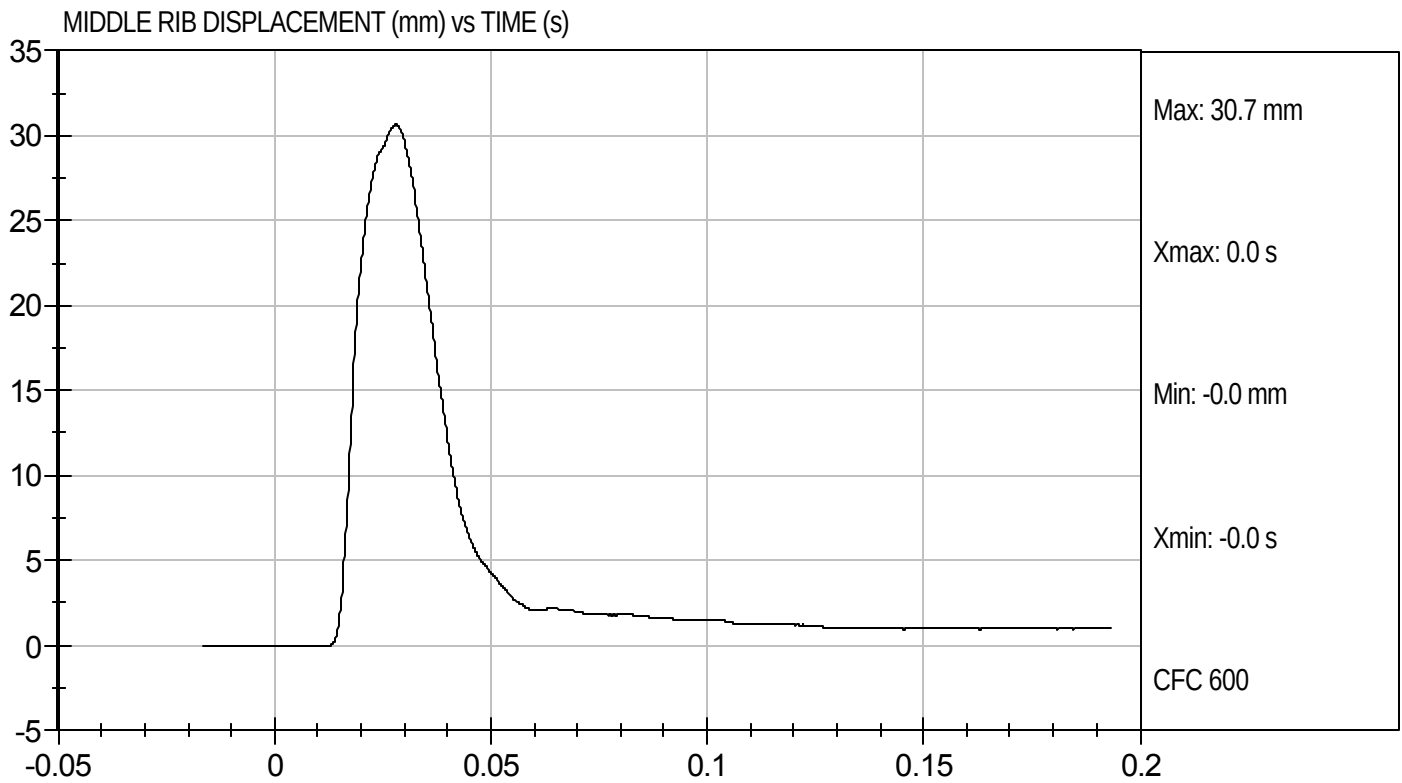
Test Date: 6/2/10
Velocity: 21.96 ft/s, 6.69 m/s





Test Desc: Thorax With Arm
Component ID: D101644

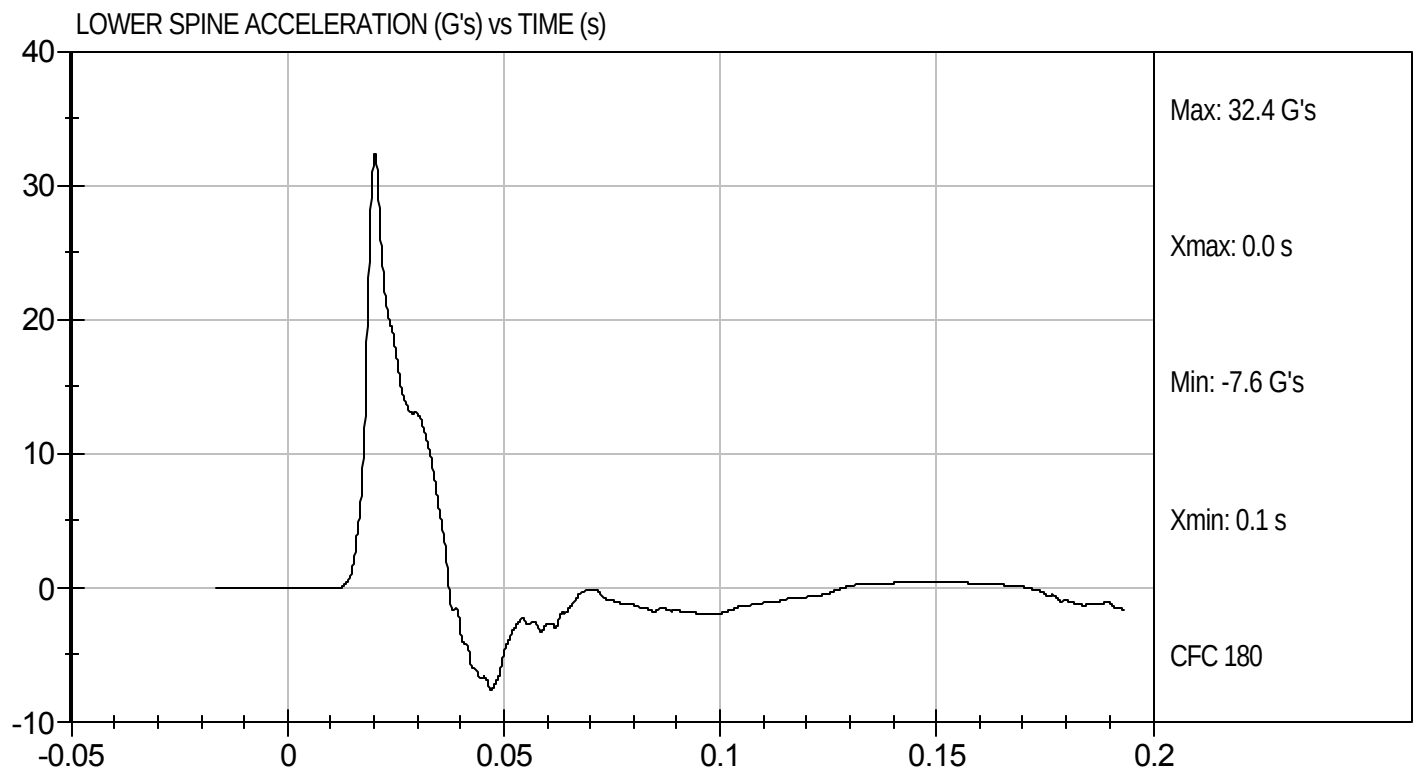
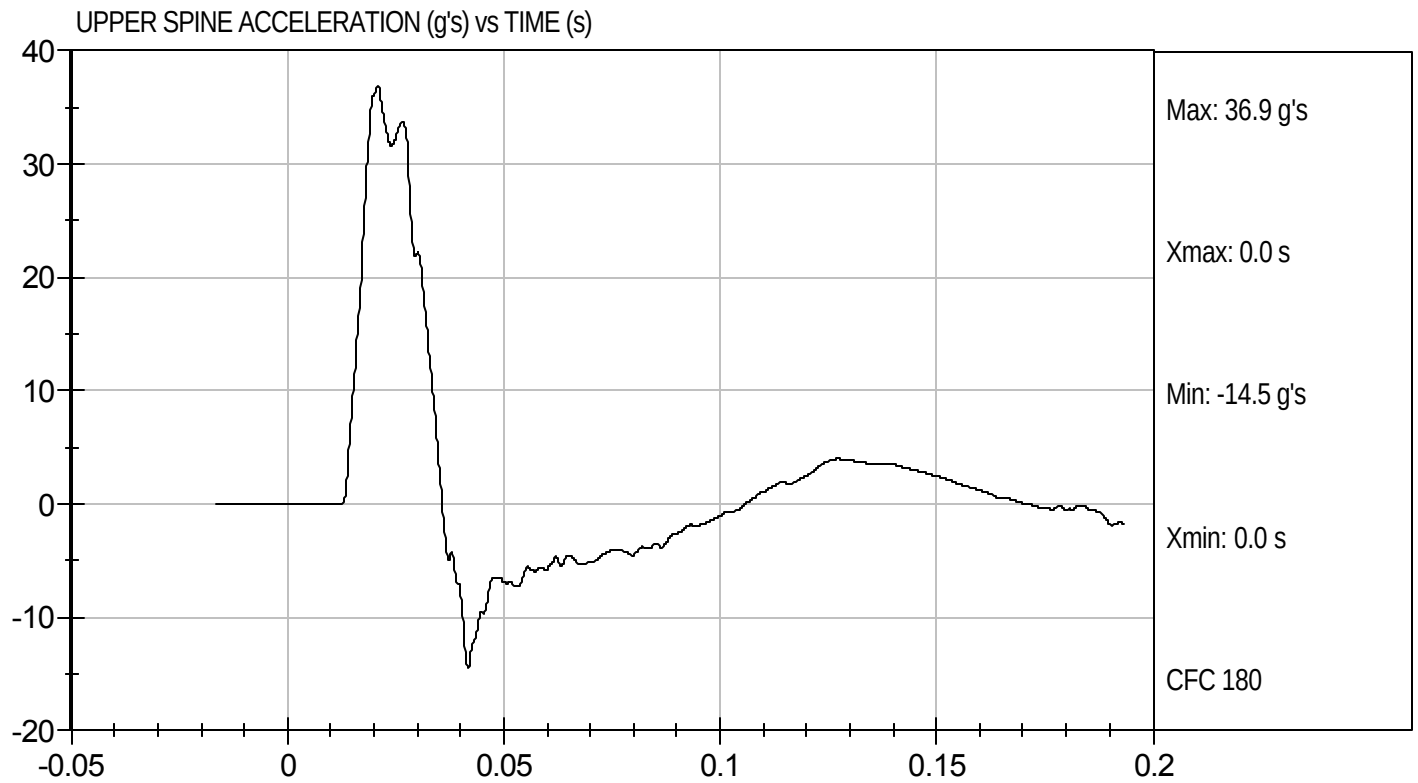
Test Date: 6/2/10
Velocity: 21.96 ft/s, 6.69 m/s





Test Desc: Thorax With Arm
Component ID: D101644

Test Date: 6/2/10
Velocity: 21.96 ft/s, 6.69 m/s



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

ATD Serial No: 296

Test I.D: D101645

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	52	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	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	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

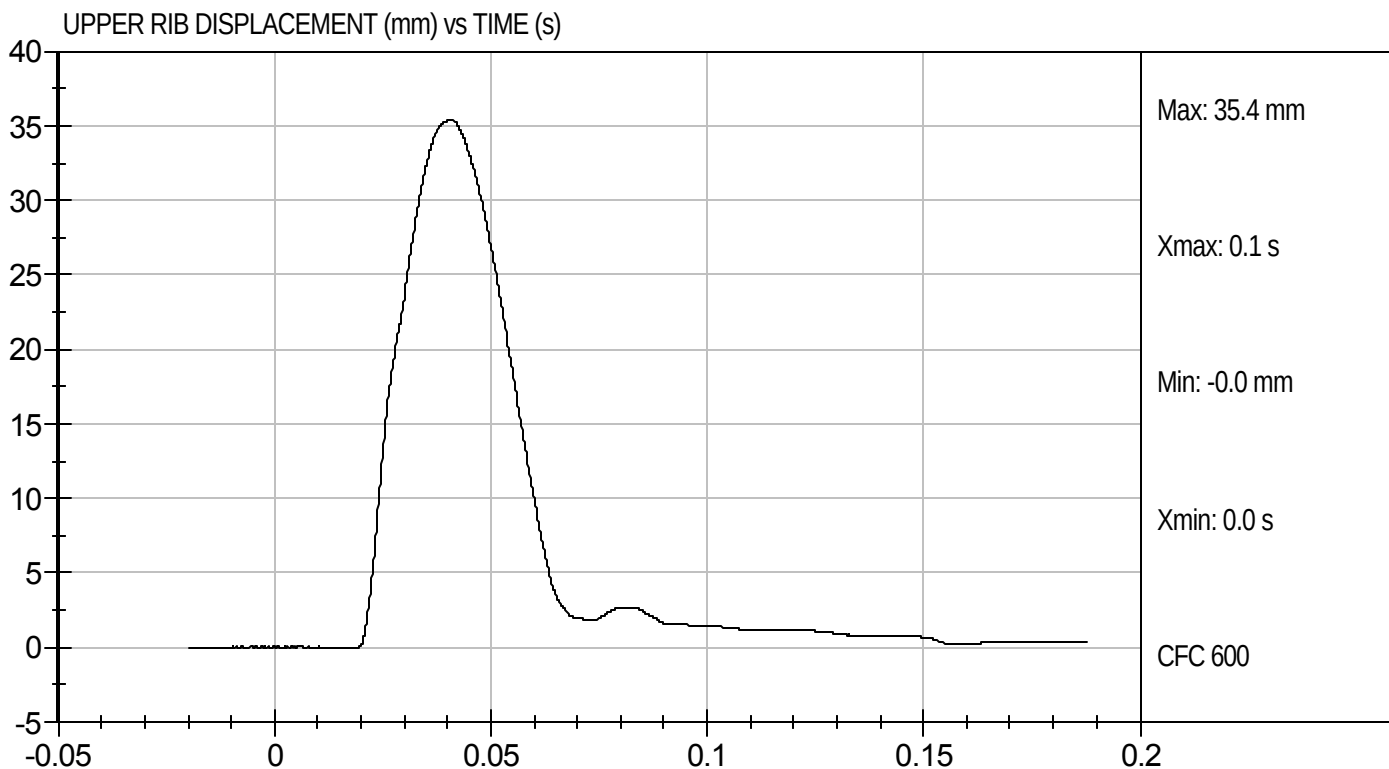
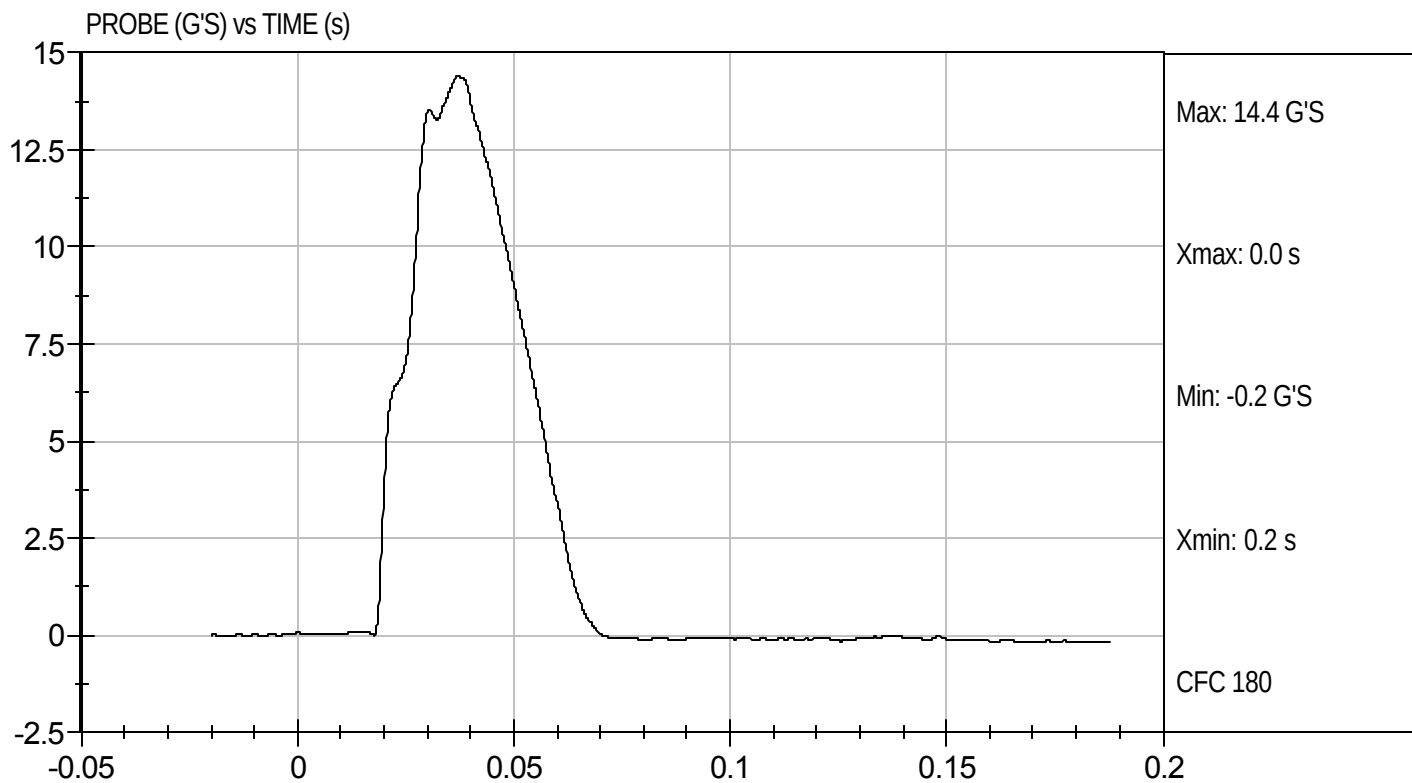
6/2/10
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Without Arm
Component ID: D101645

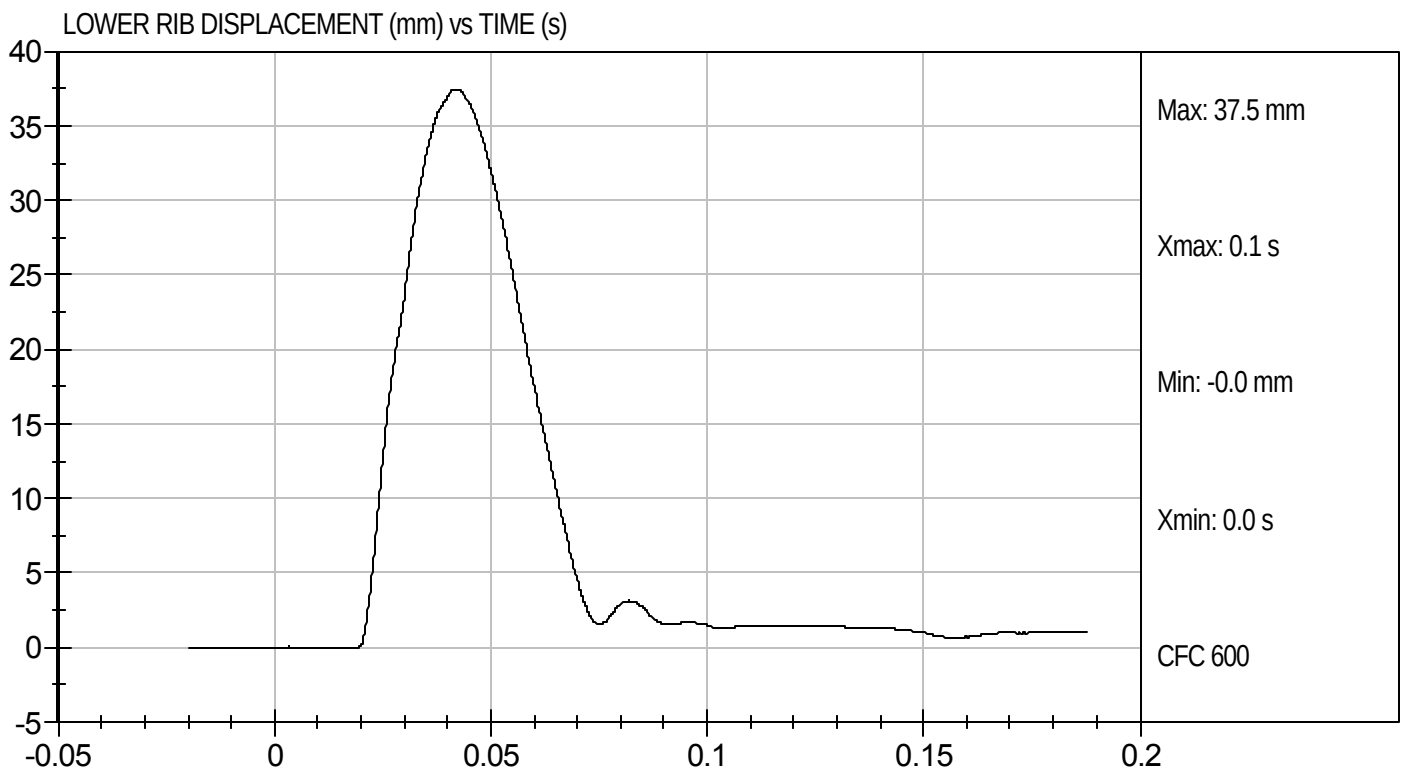
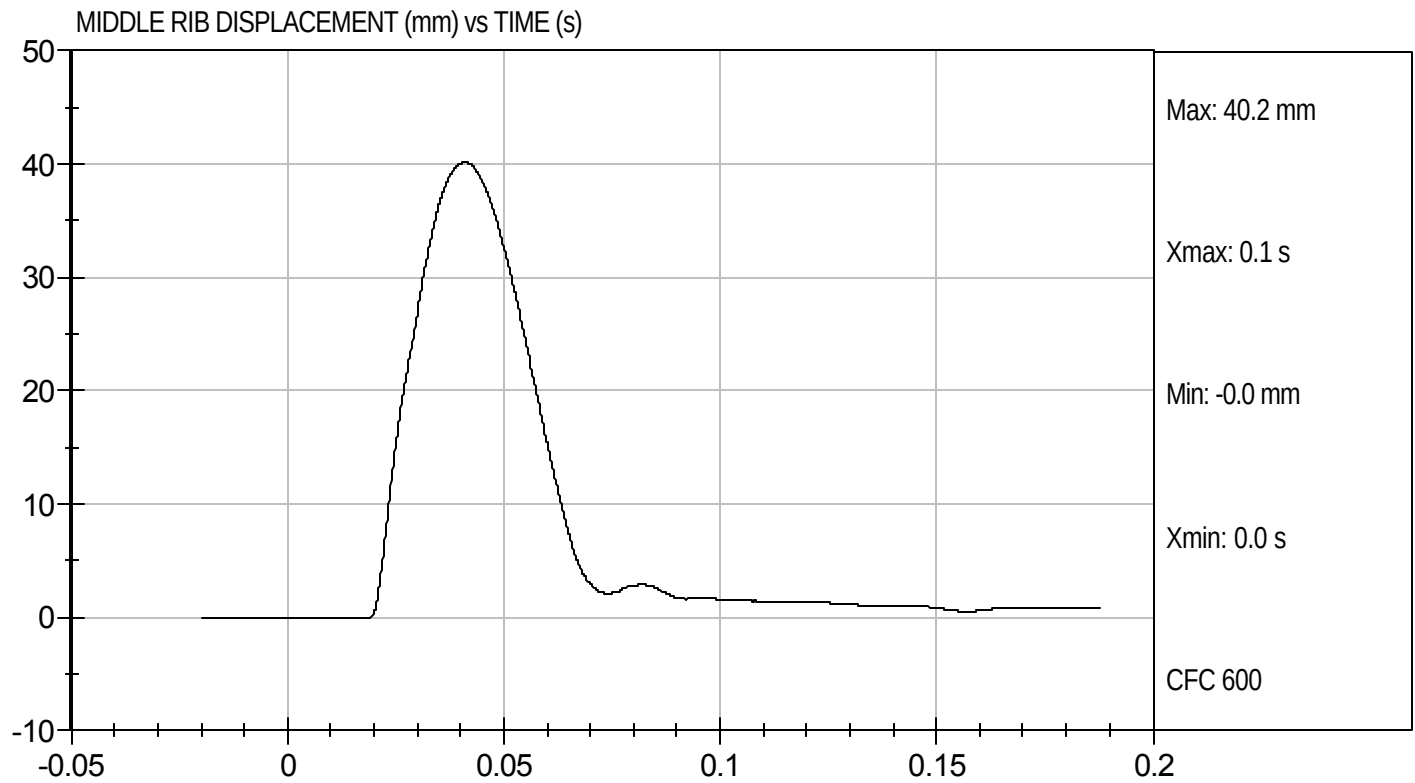
Test Date: 6/2/10
Velocity: 14.01 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Component ID: D101645

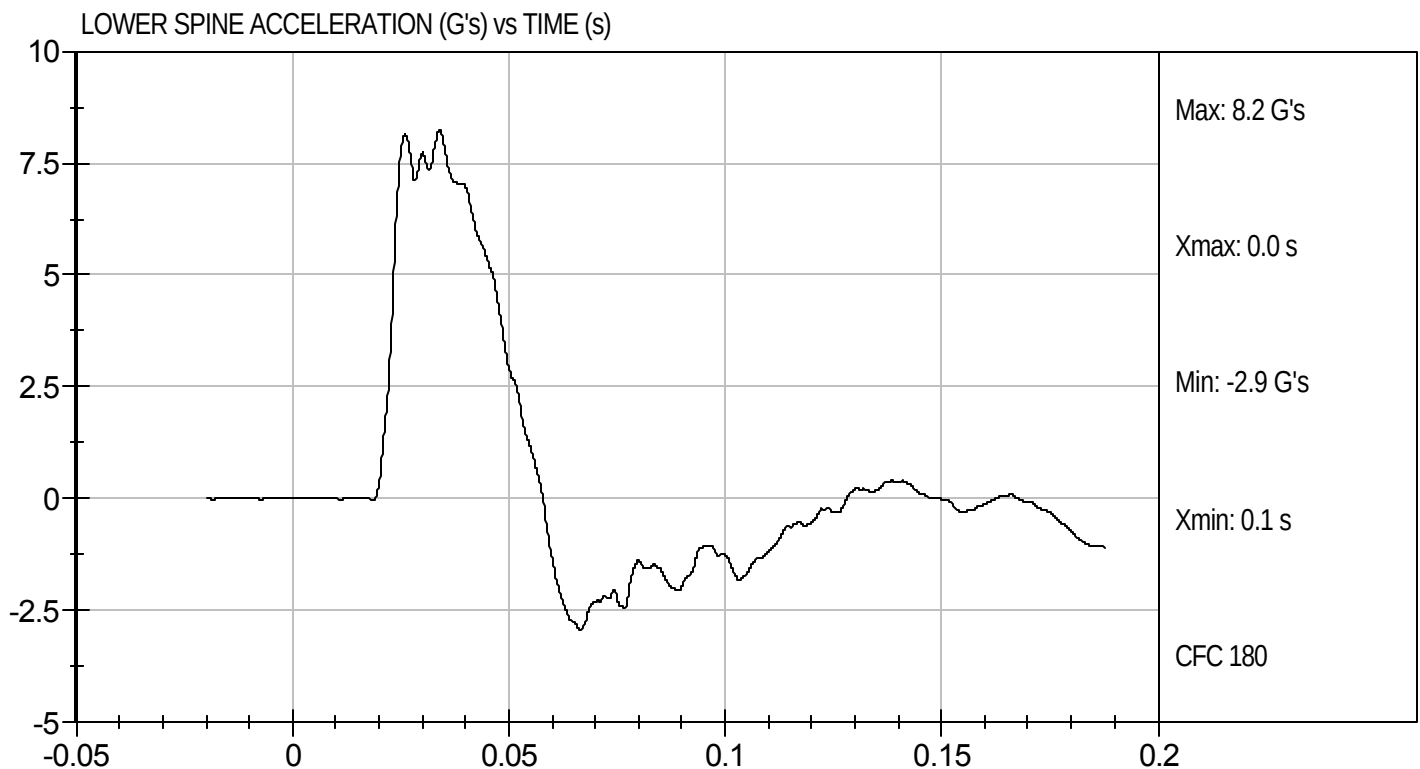
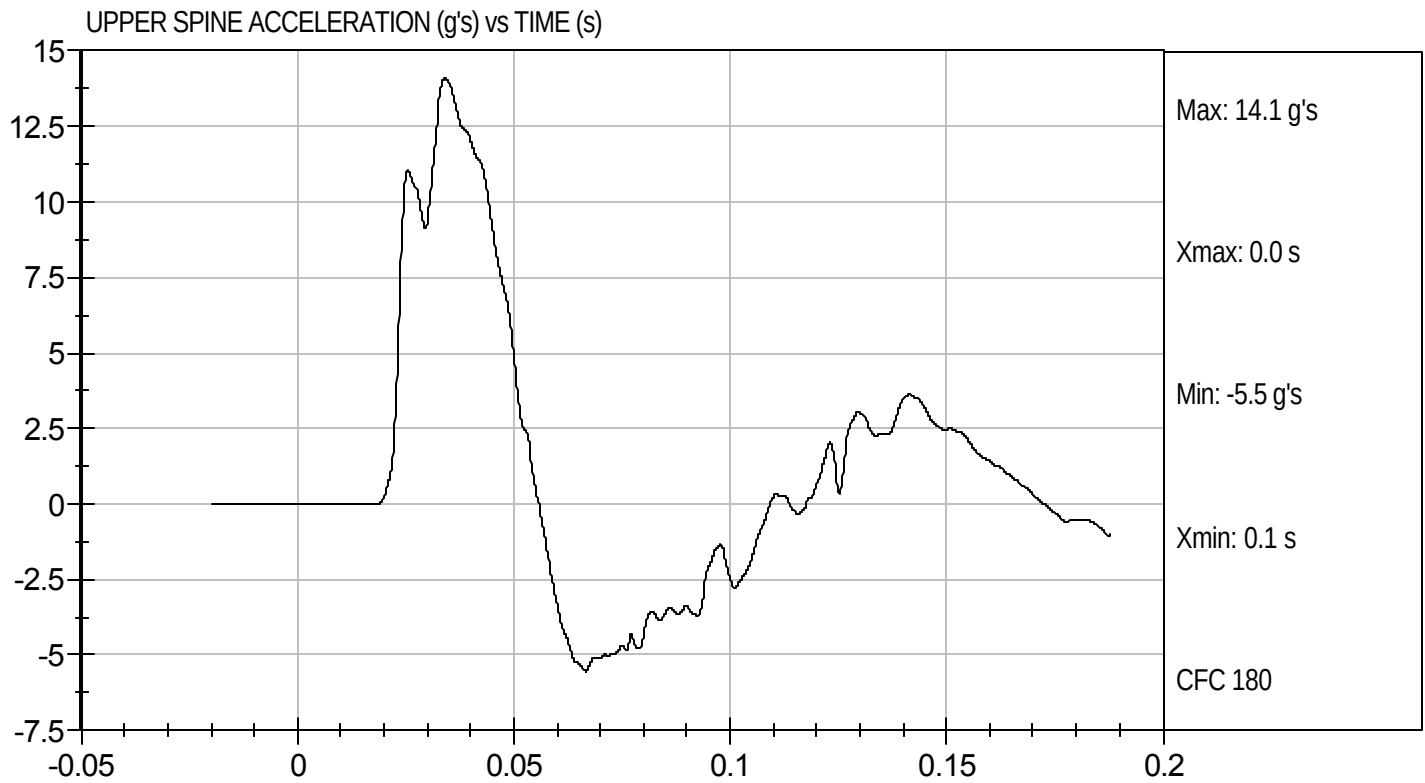
Test Date: 6/2/10
Velocity: 14.01 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Component ID: D101645

Test Date: 6/2/10
Velocity: 14.01 ft/s, 4.27 m/s



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

ATD Serial No: 296

Test I.D: D101646

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	52	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Peak Impactor Acceleration	G's	12 to 16	13	Pass
Upper Rib Displacement	mm	36 to 47	38	Pass
Lower Rib Displacement	mm	33 to 44	37	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

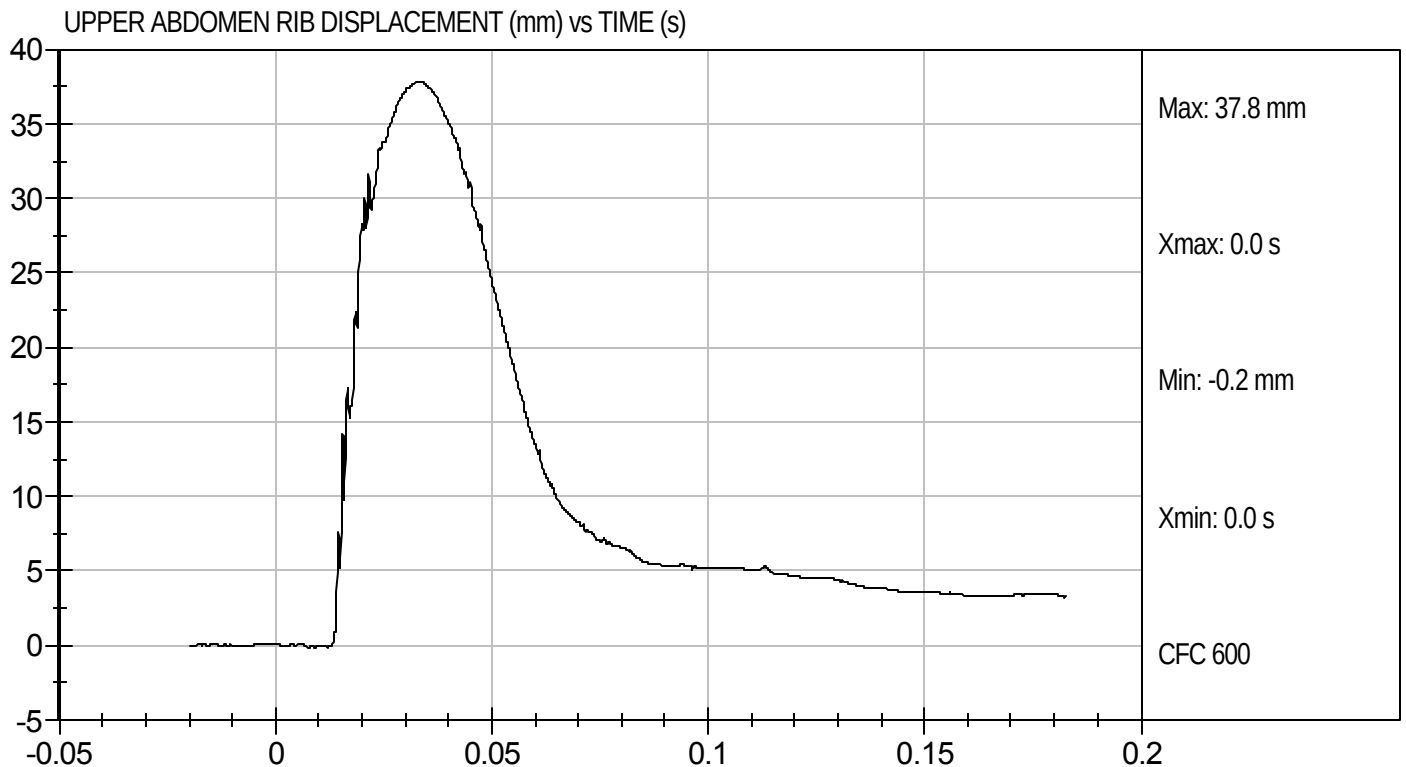
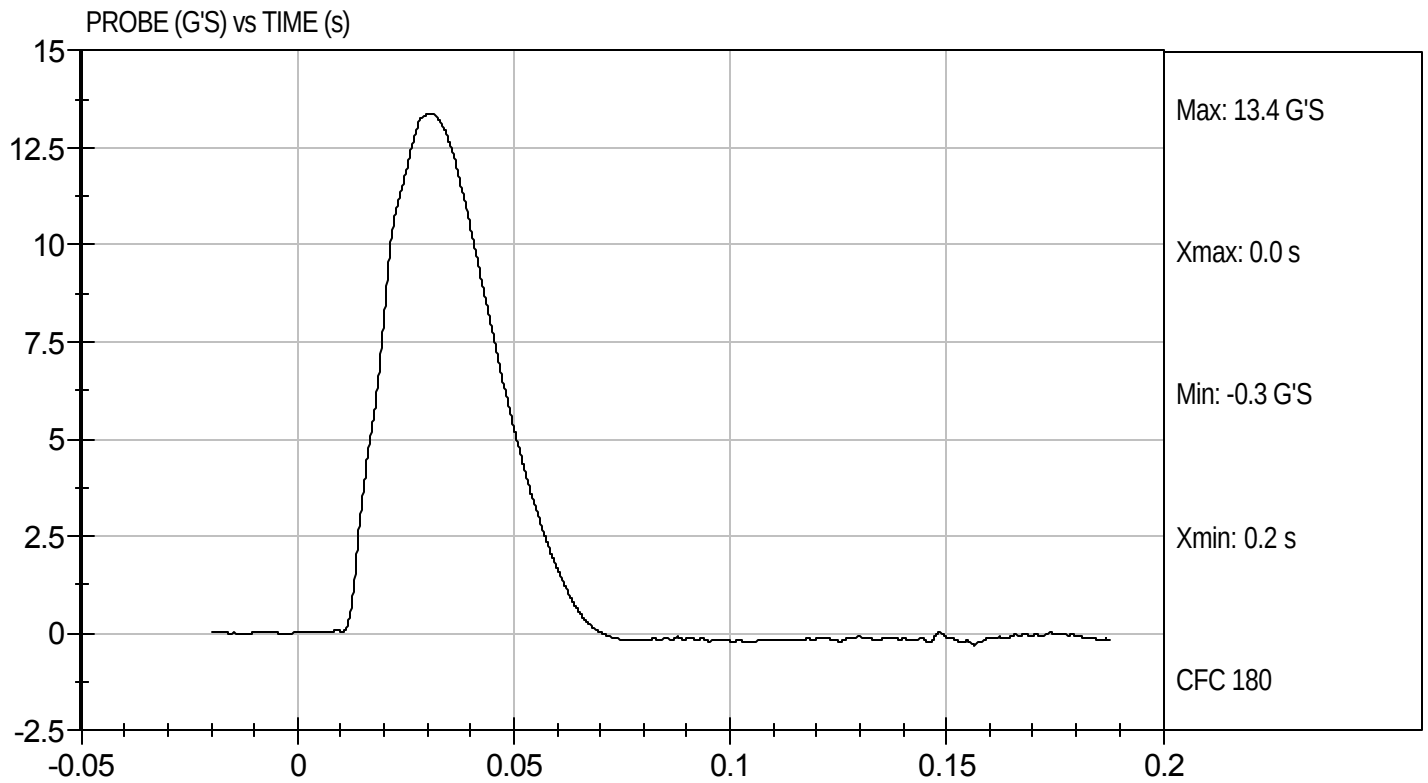
6/2/10
Test Date

David Winkelbauer
Approved By



Test Desc: Abdomen Impact
Component ID: D101646

Test Date: 6/2/10
Velocity: 13.89 ft/s, 4.23 m/s

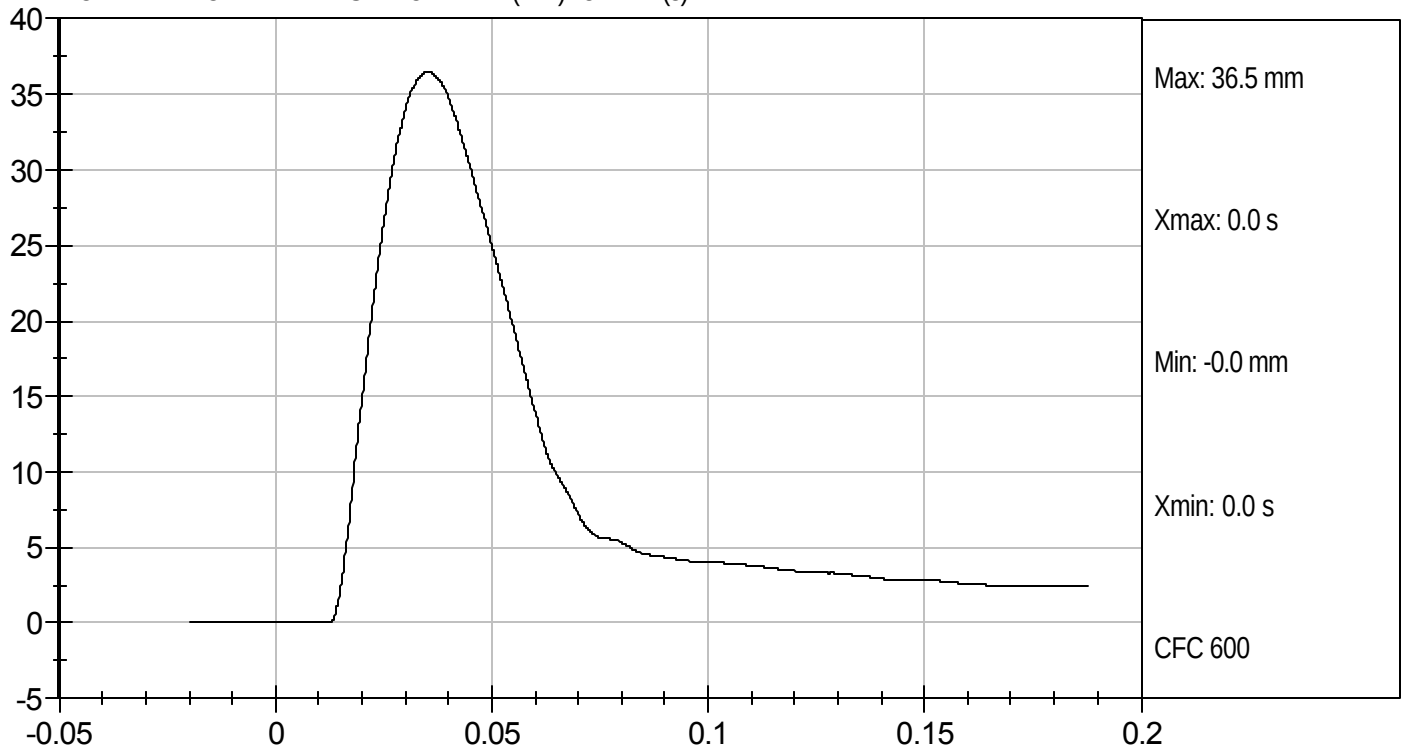




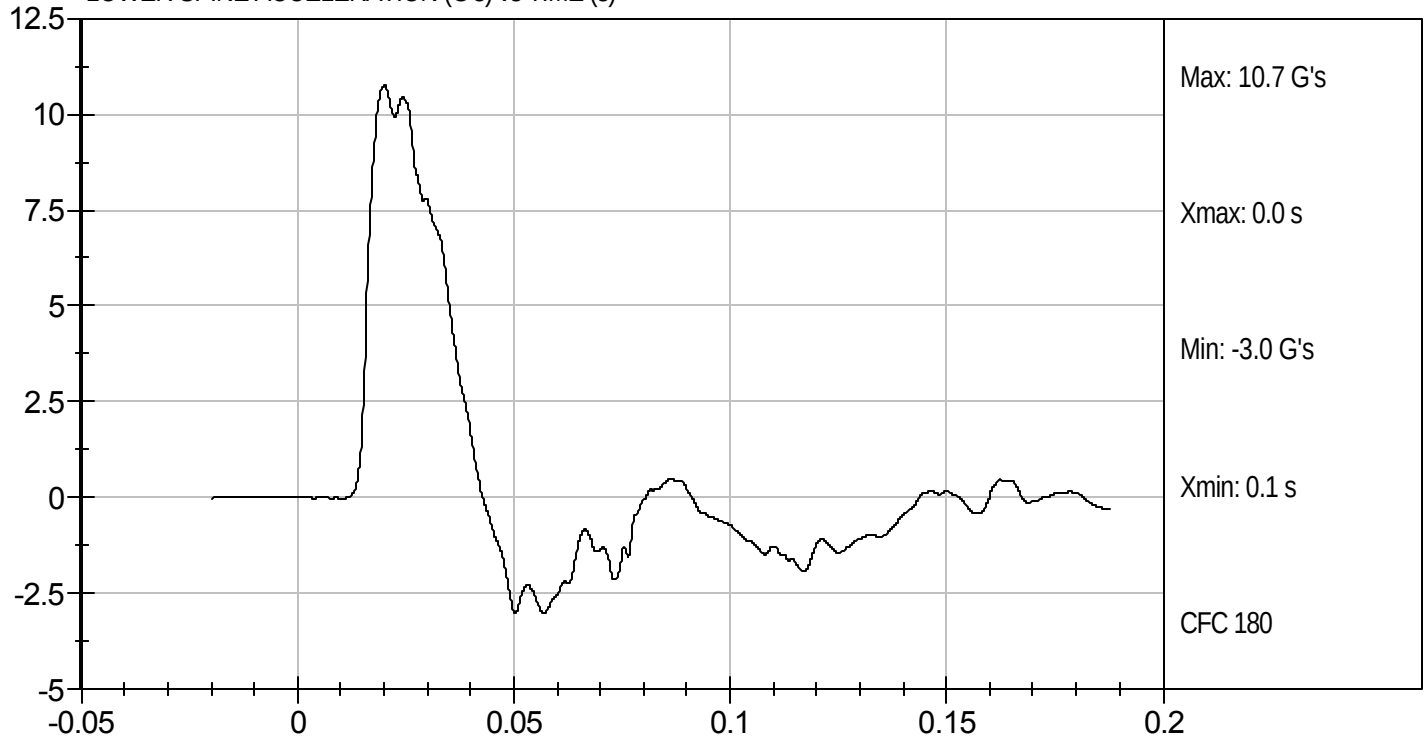
Test Desc: Abdomen Impact
Component ID: D101646

Test Date: 6/2/10
Velocity: 13.89 ft/s, 4.23 m/s

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



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

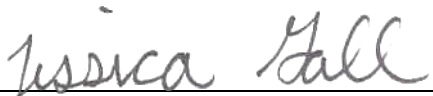


MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101647

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	54	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	3965	Pass
Overall Test Results			Pass	


Laboratory Technician

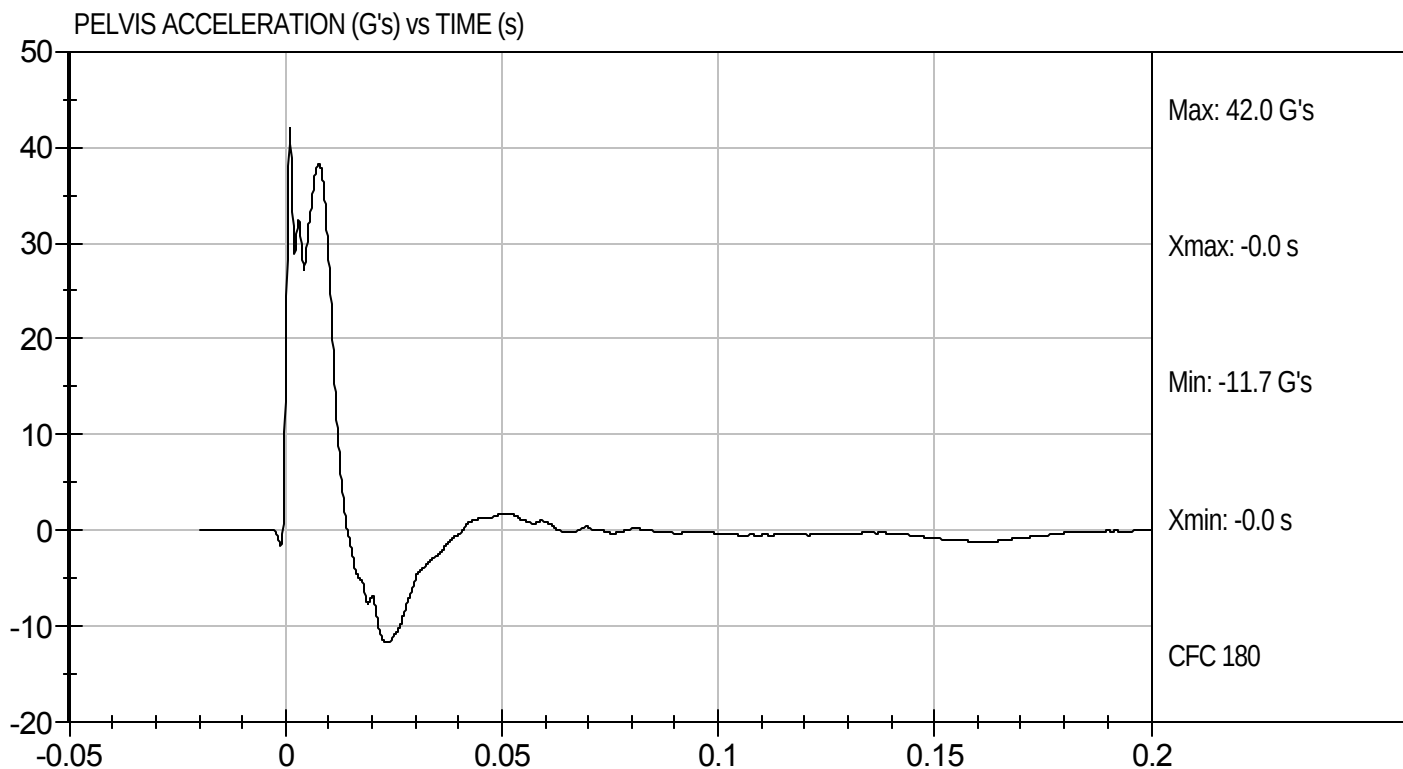
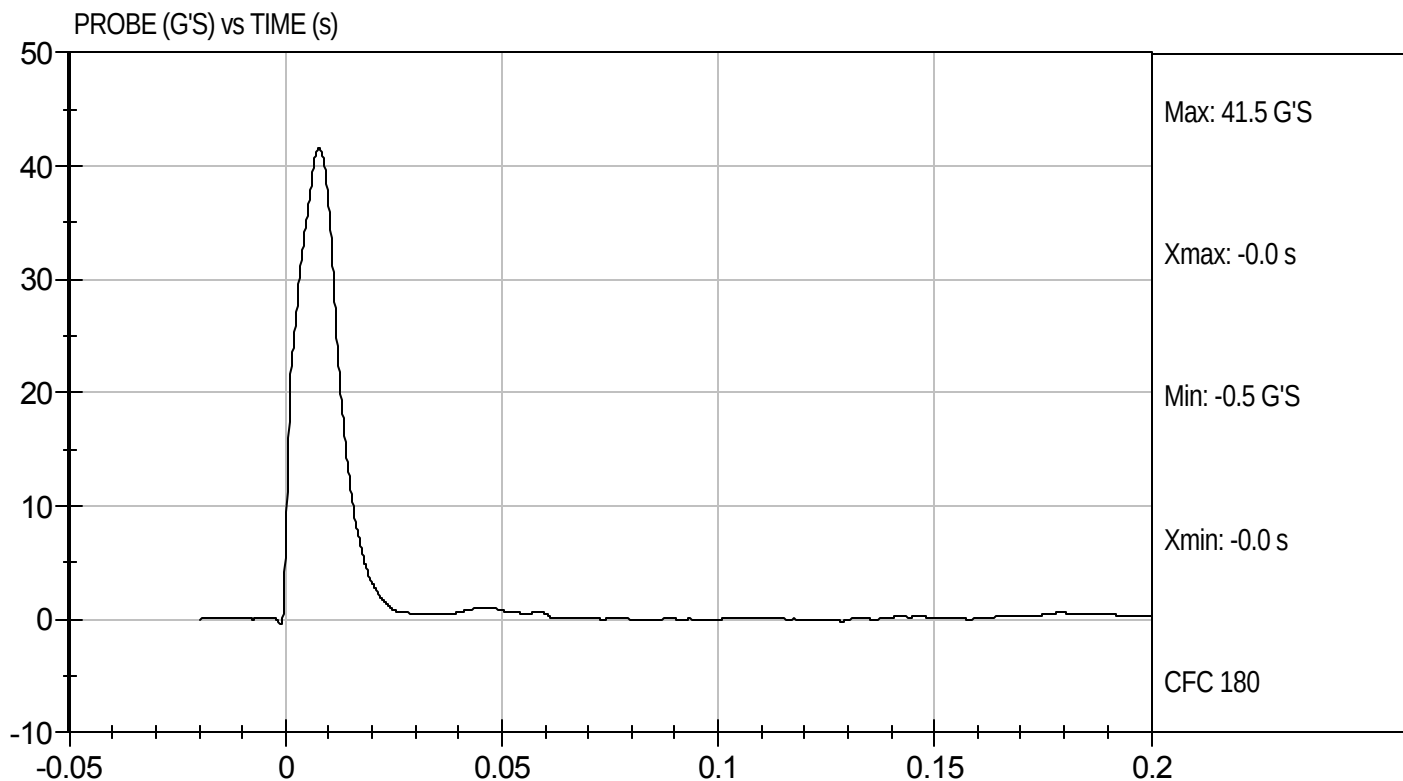
6/2/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D101647

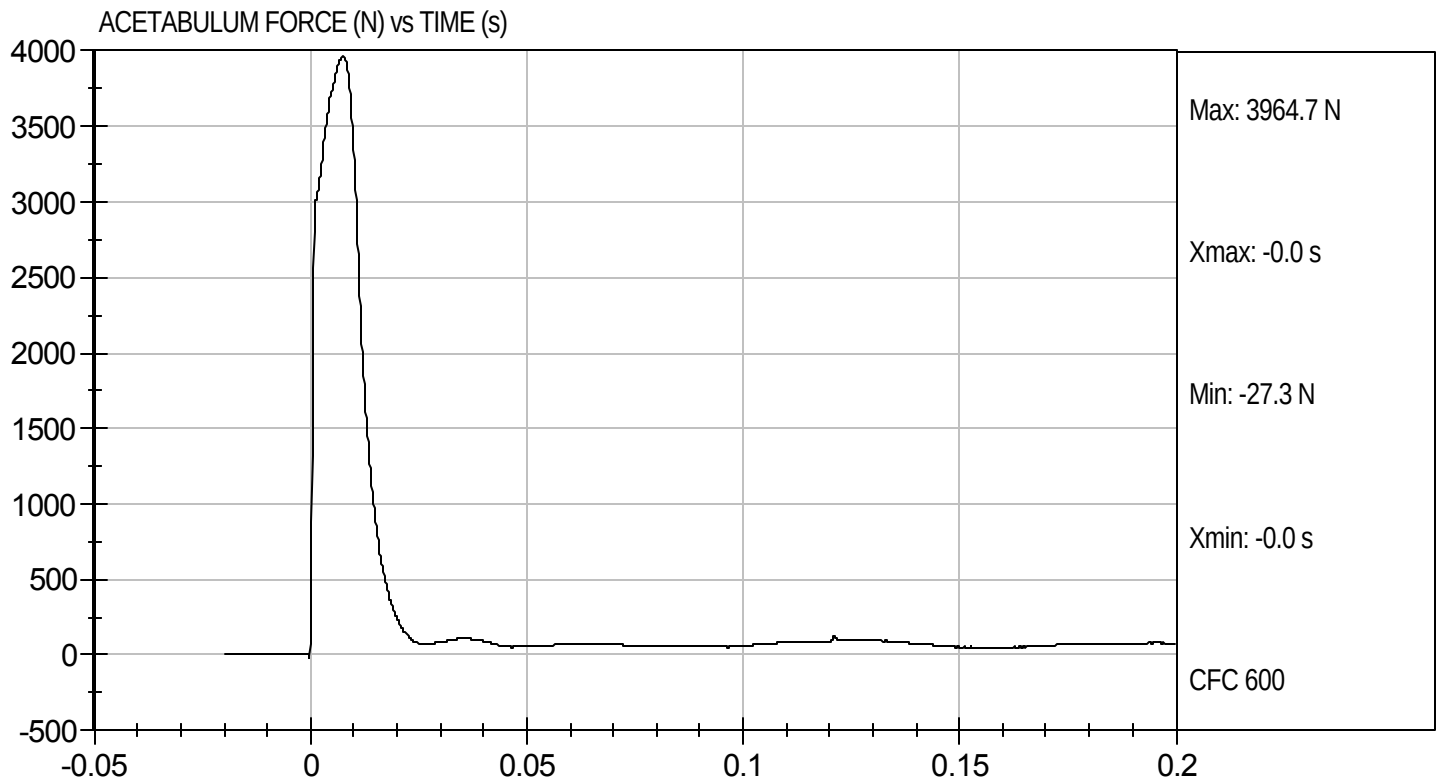
Test Date: 6/2/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D101647

Test Date: 6/2/10
Velocity: 22.22 ft/s, 6.77 m/s

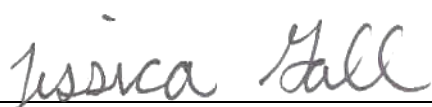


MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101648

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	54	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	33	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4610	Pass
Overall Test Results			Pass	


Laboratory Technician

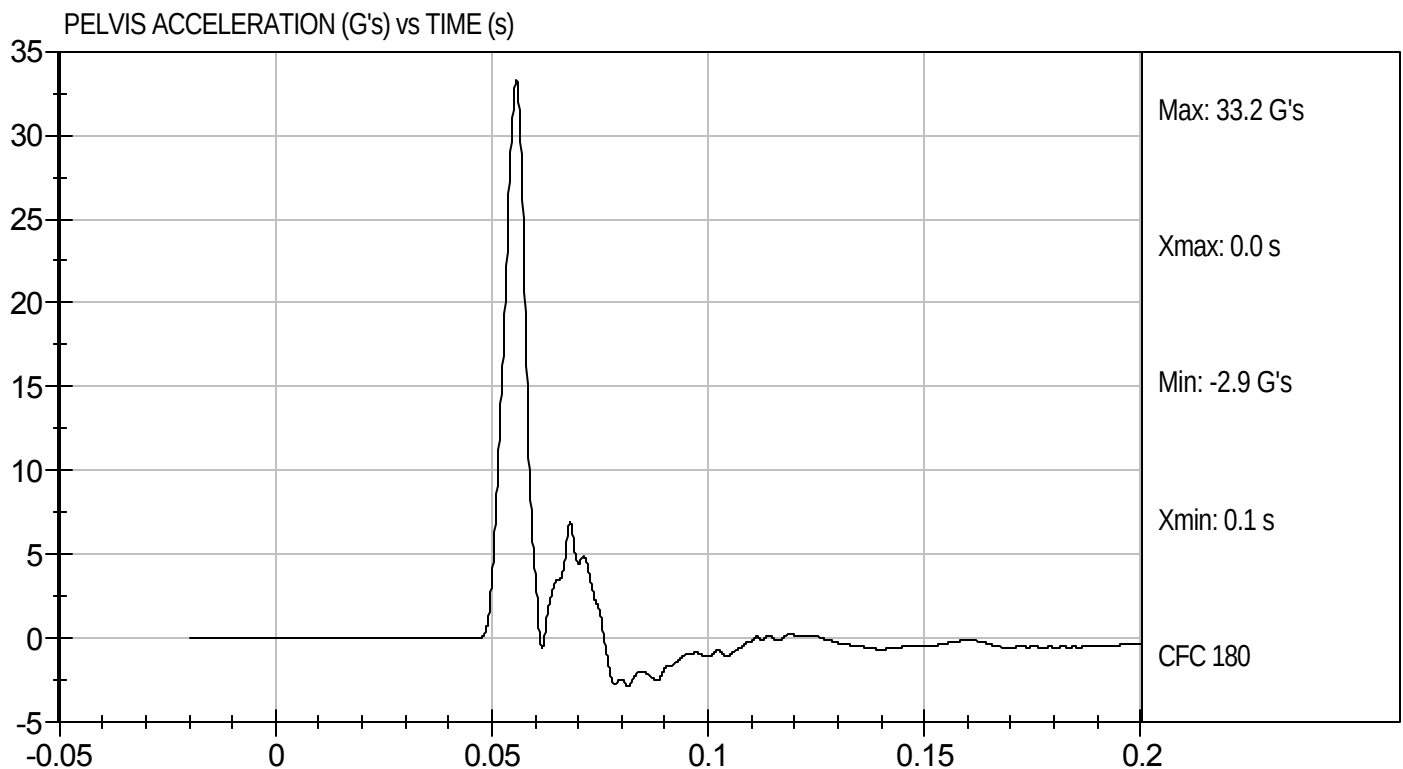
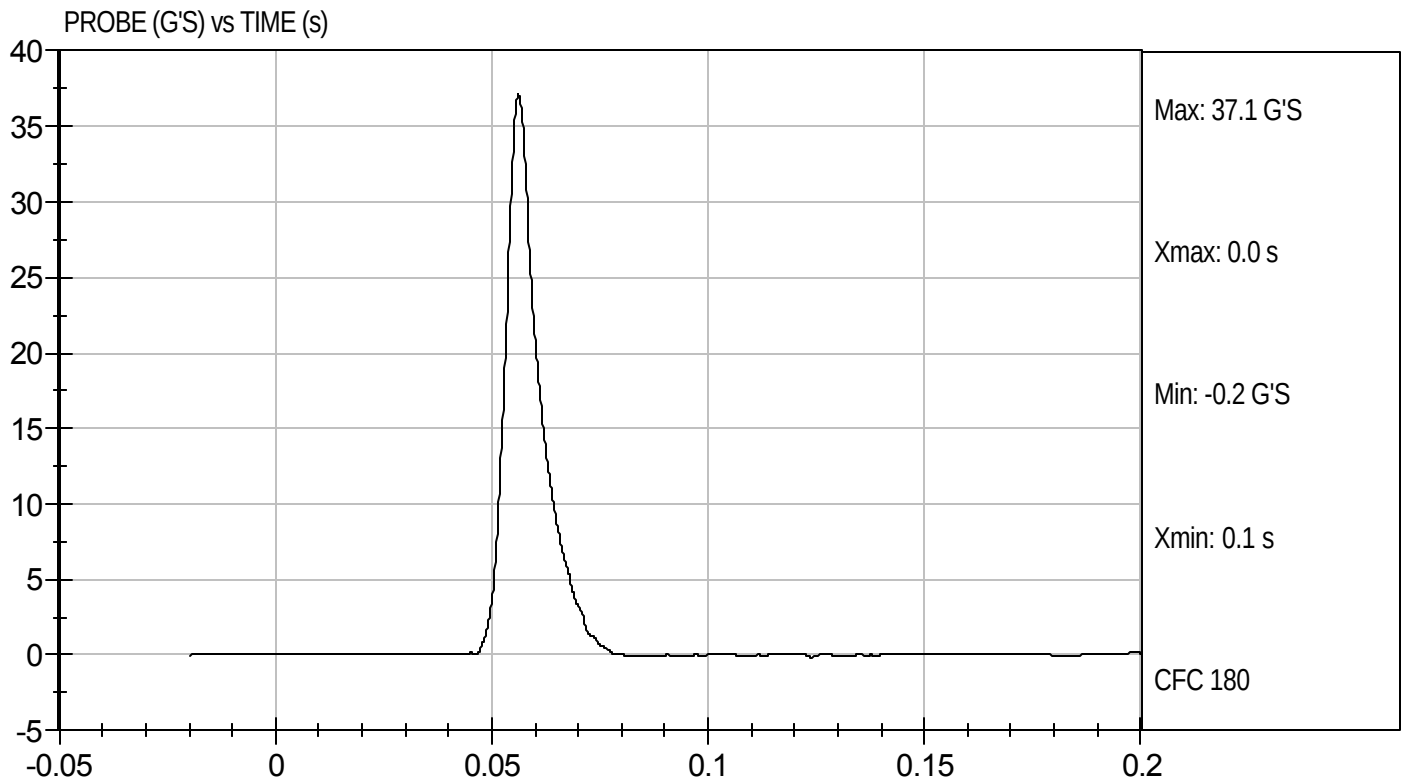
6/2/10
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D101648

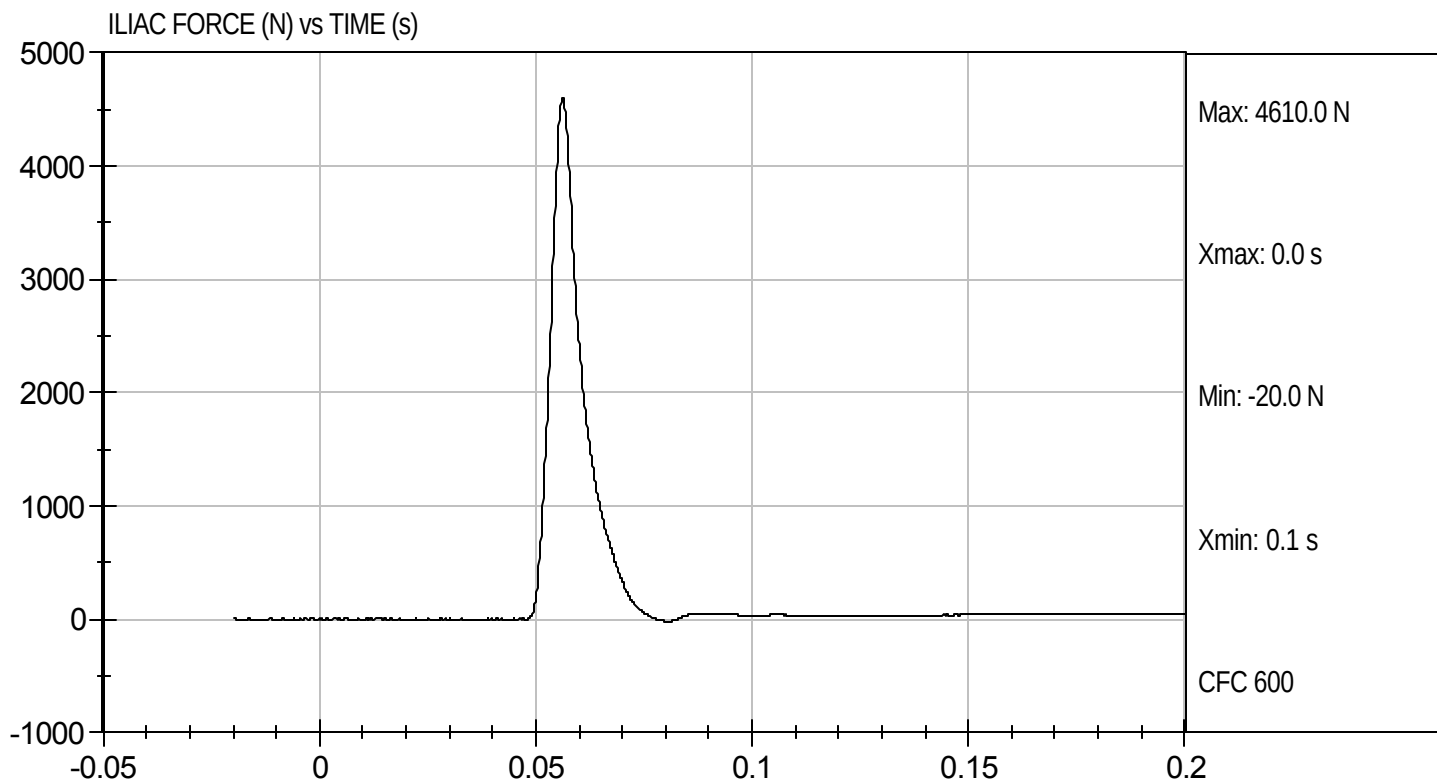
Test Date: 6/2/10
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D101648

Test Date: 6/2/10
Velocity: 14.12 ft/s, 4.30 m/s

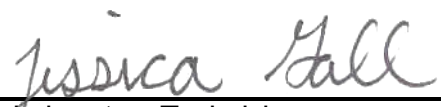


MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D101781

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
Peak Resultant Acceleration	G's	115 to 137	120	Pass
Peak Lateral Acceleration	G's	+/- 15	-5.6	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

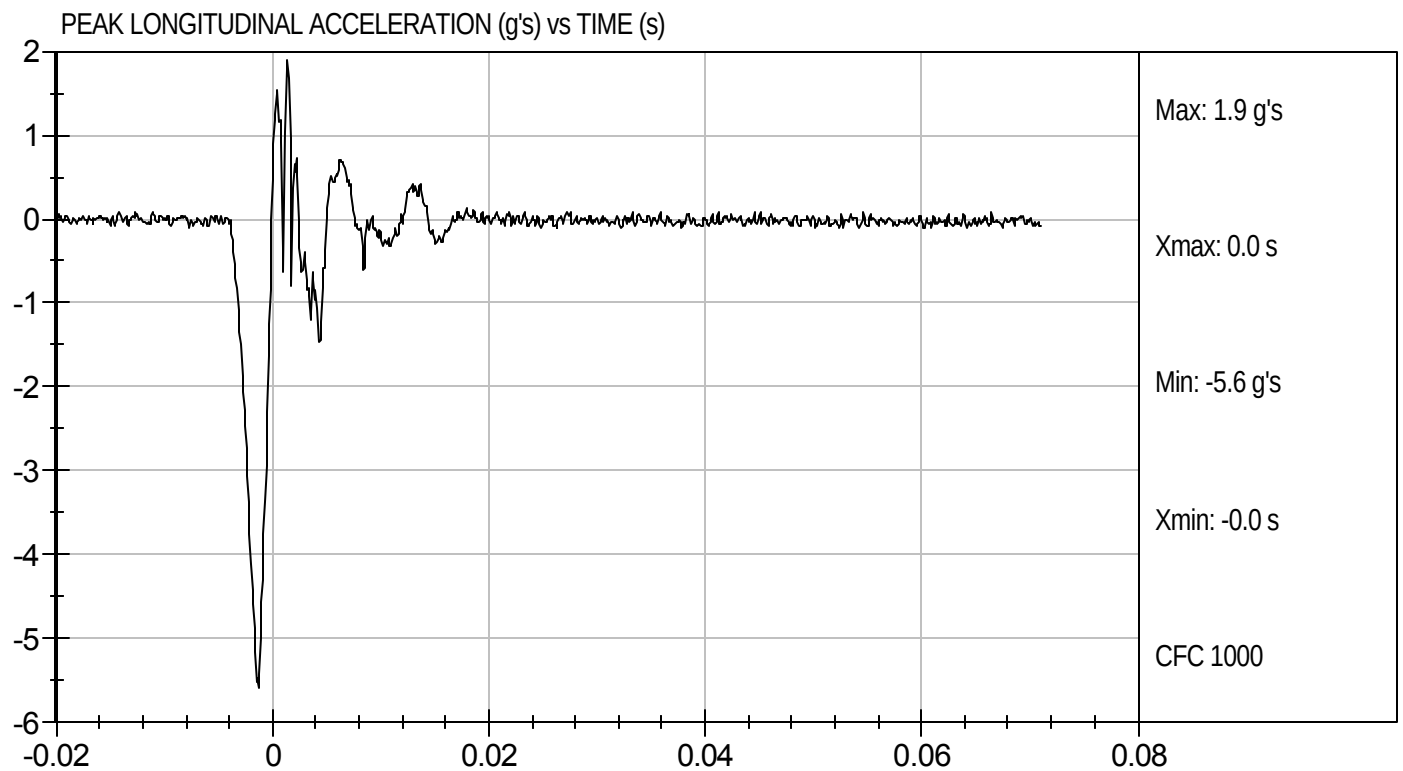
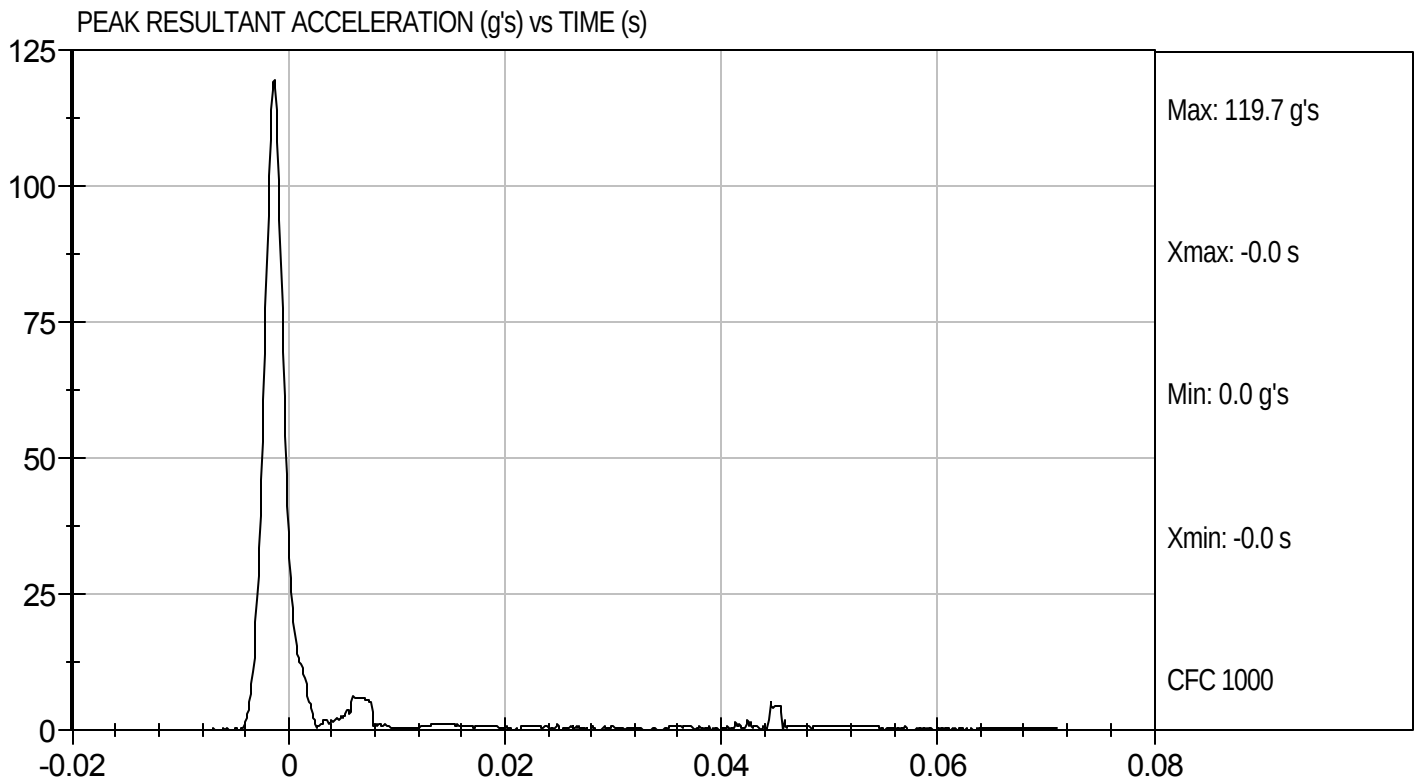
6/9/10
Test Date


Approved By



Test Desc: Head Drop
Component ID: D101781

Test Date: 6/9/10
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: D101782

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	22.0	Pass
Humidity		%	10 to 70	57	Pass
Impact Velocity		m/s	5.51 to 5.63	5.61	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.75	Pass
	15 ms	m/s	3.30 to 4.10	3.93	Pass
	20 ms	m/s	4.40 to 5.40	5.20	Pass
	25 ms	m/s	5.40 to 6.10	5.49	Pass
	25-100 ms	m/s	5.50 to 6.20	5.51	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	58	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

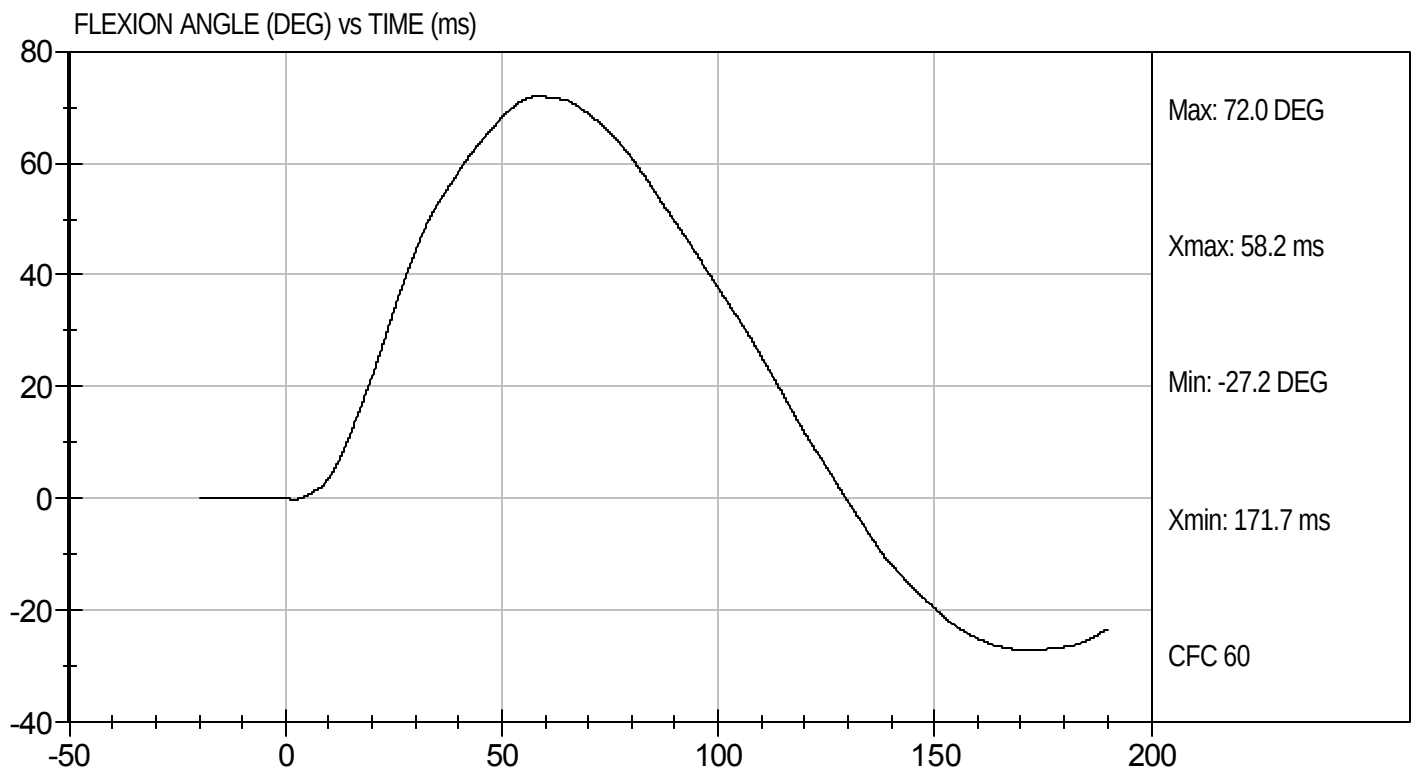
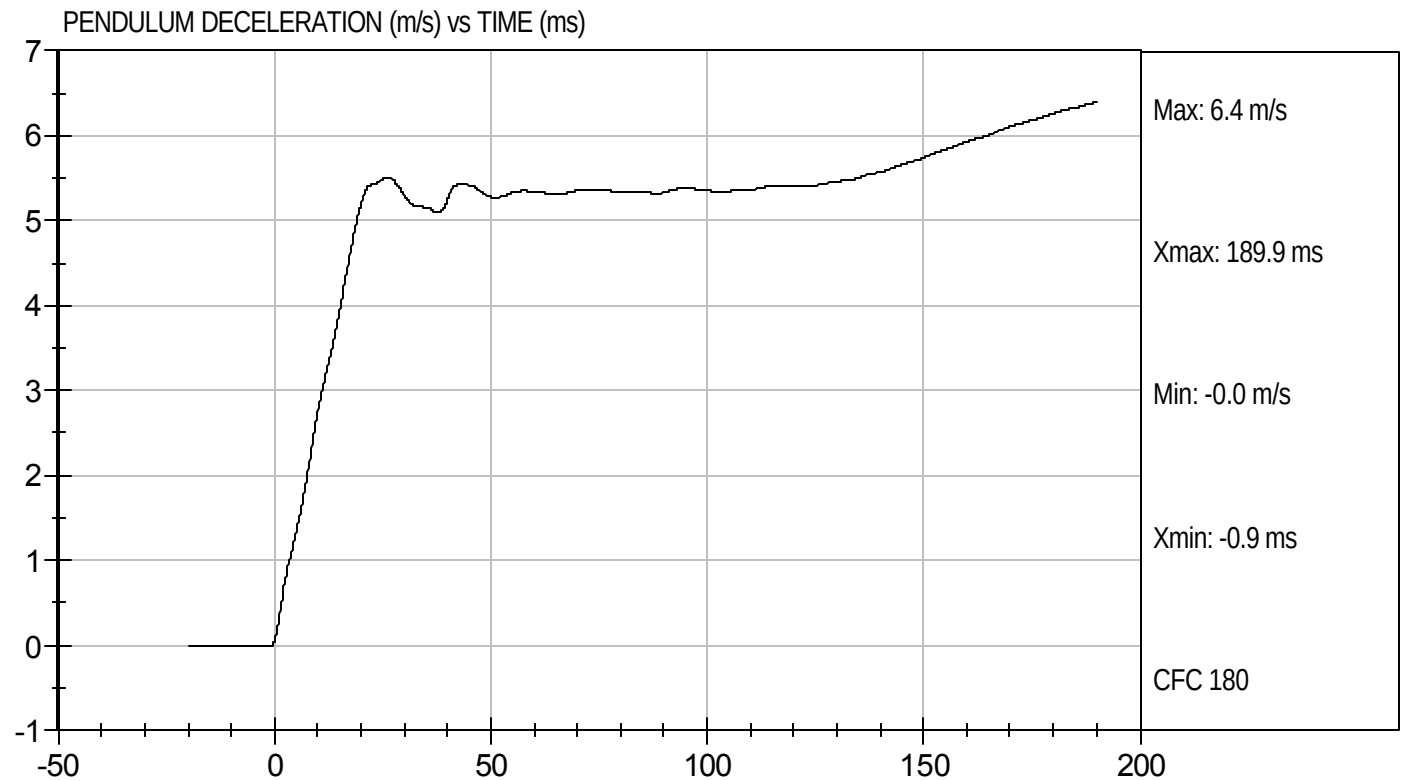
6/9/10
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D101782

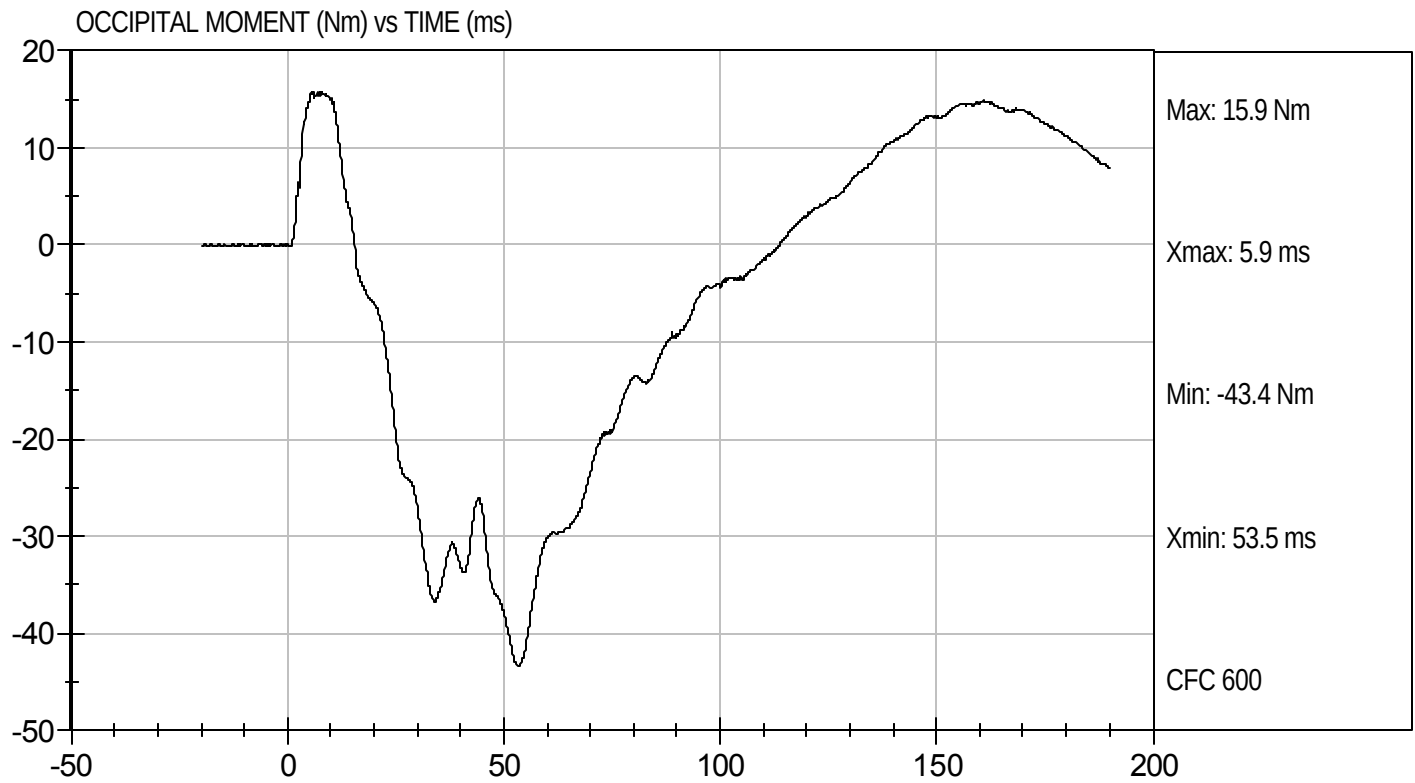
Test Date: 6/9/10
Velocity: 18.42 ft/s, 5.61 m/s





Test Desc: Neck Bending
Component ID: D101782

Test Date: 6/9/10
Velocity: 18.42 ft/s, 5.61 m/s

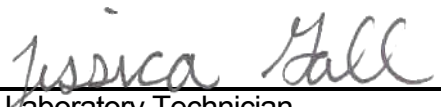


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D101783

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	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

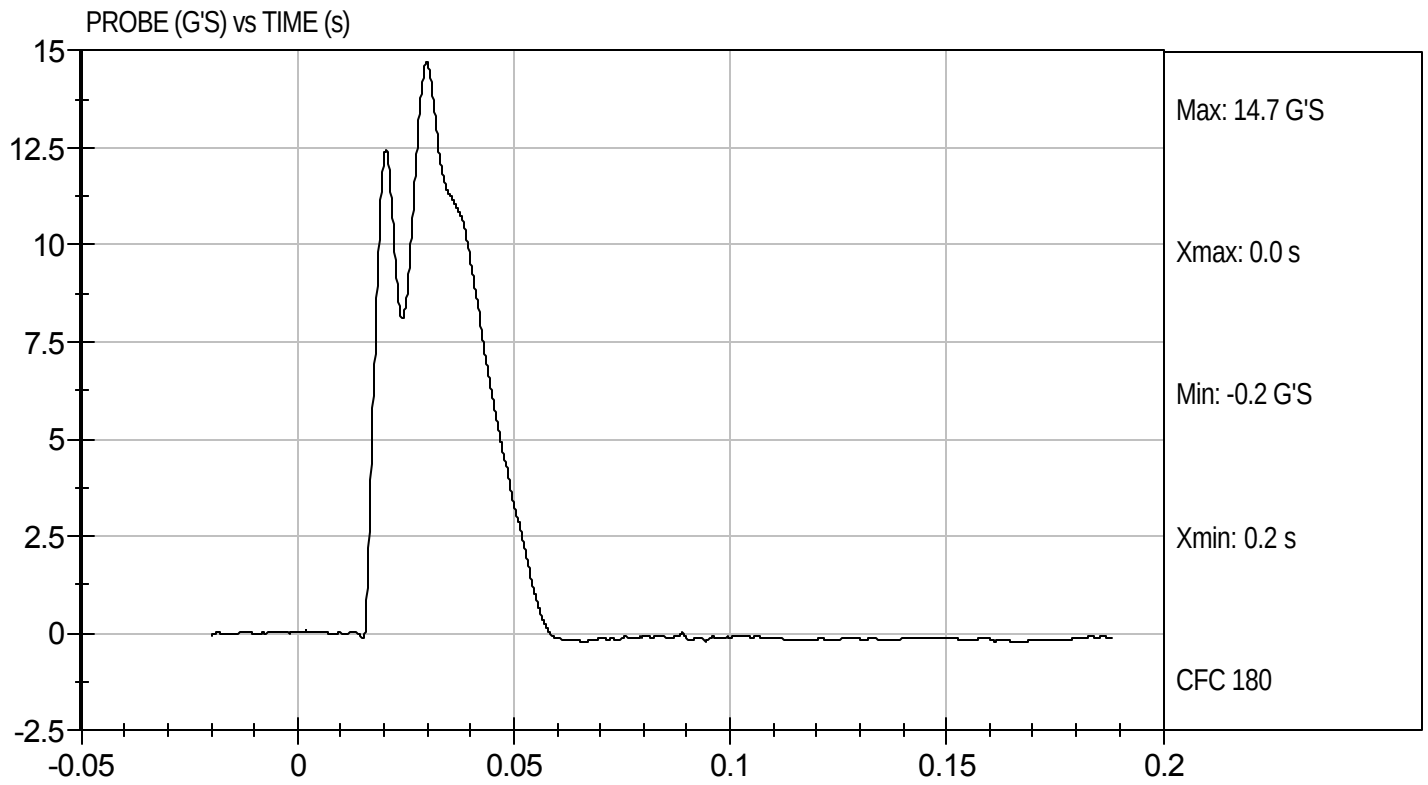
6/10/10
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D101783

Test Date: 6/10/10
Velocity: 14.37 ft/s, 4.38 m/s

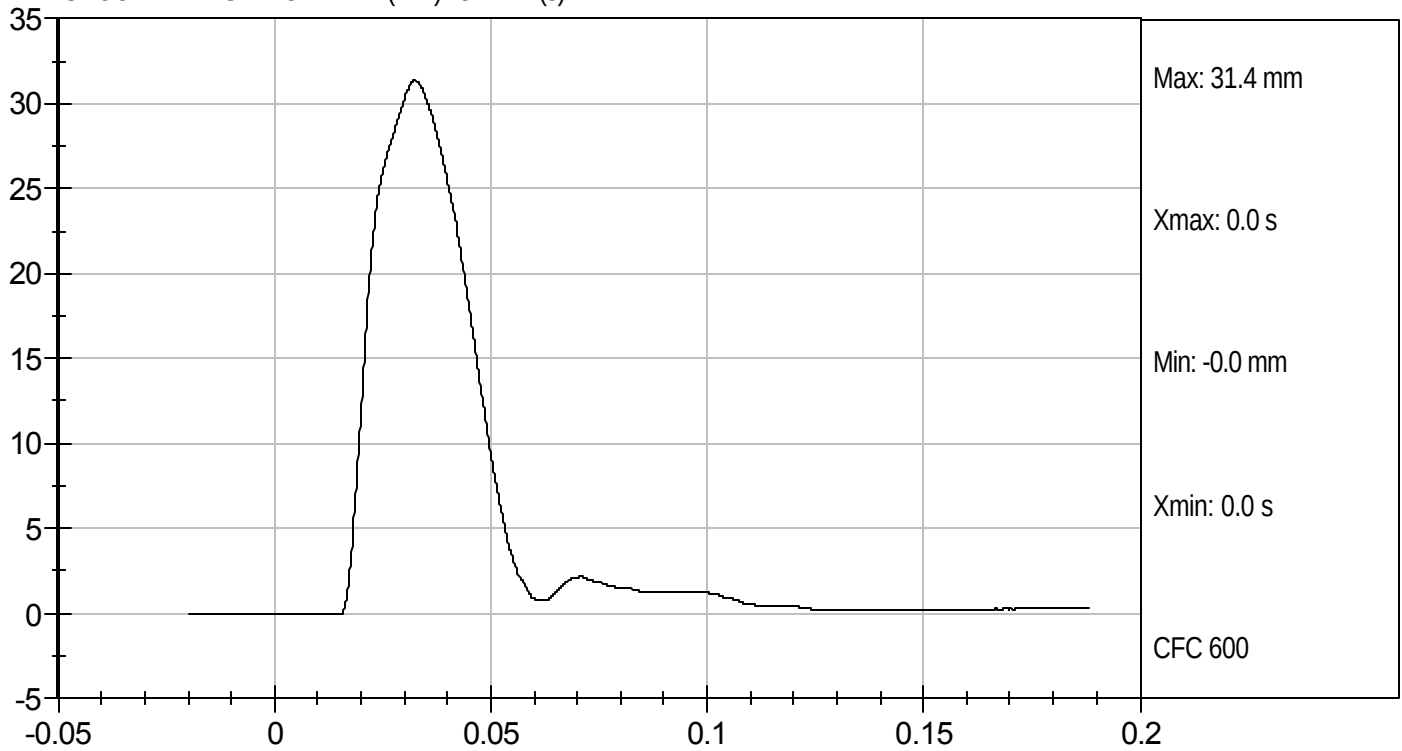




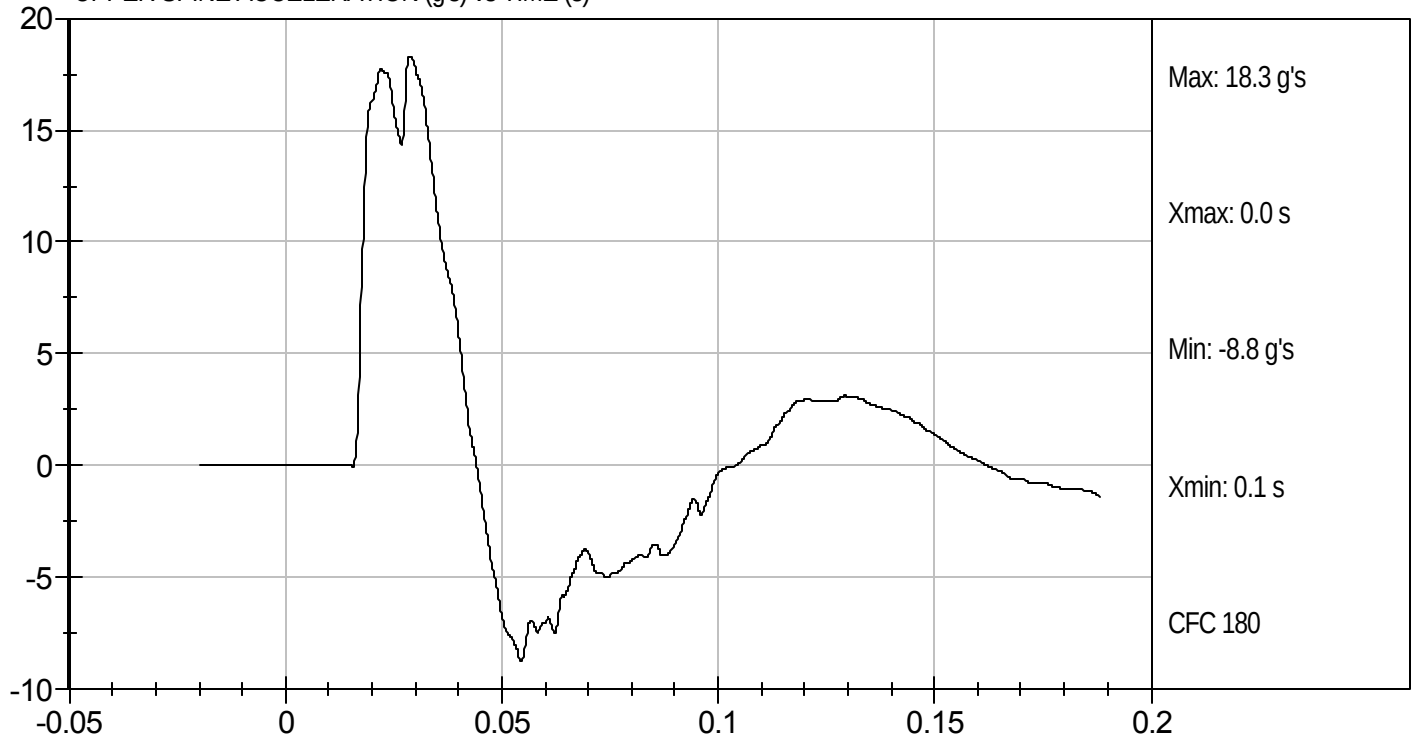
Test Desc: Shoulder Impact
Component ID: D101783

Test Date: 6/10/10
Velocity: 14.37 ft/s, 4.38 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



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

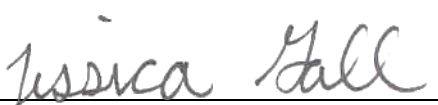


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101784

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	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	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

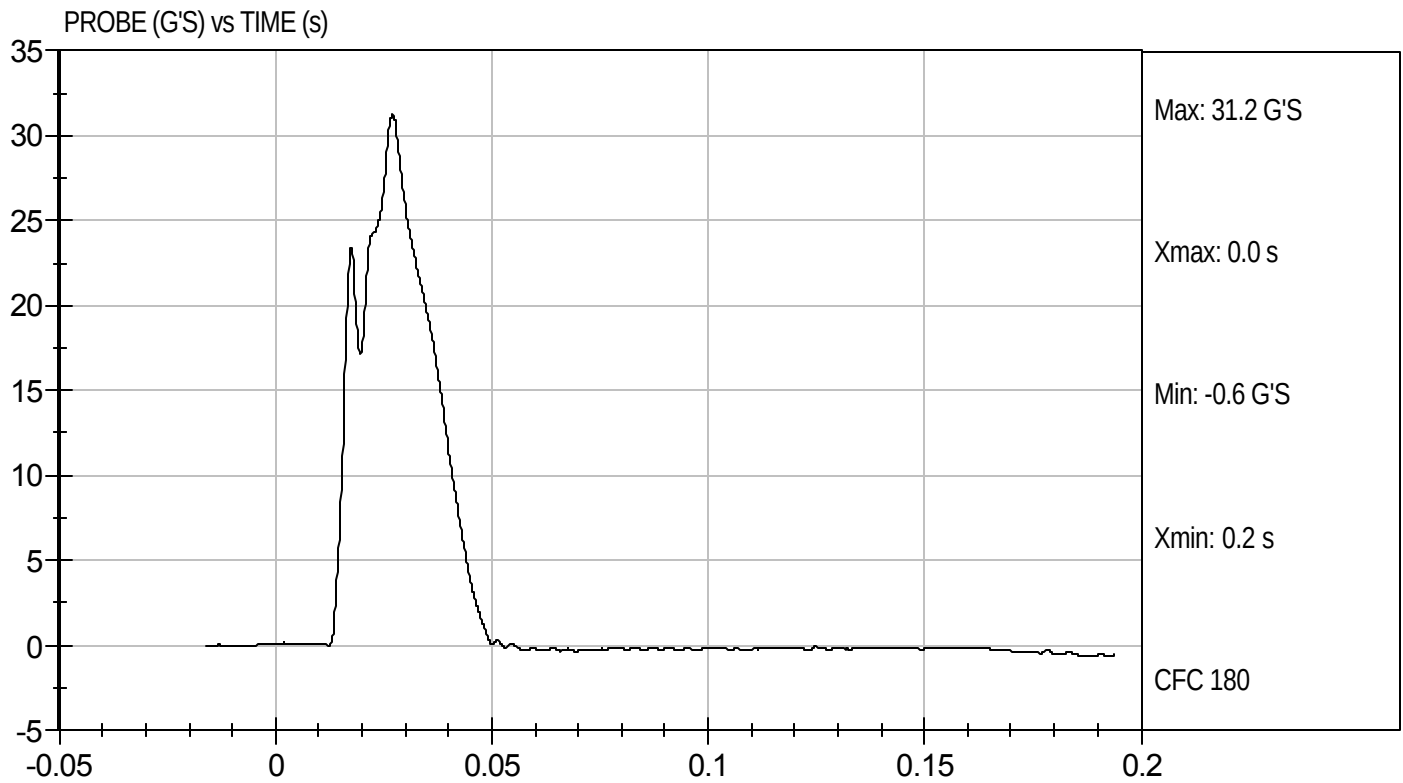
6/10/10
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D101784

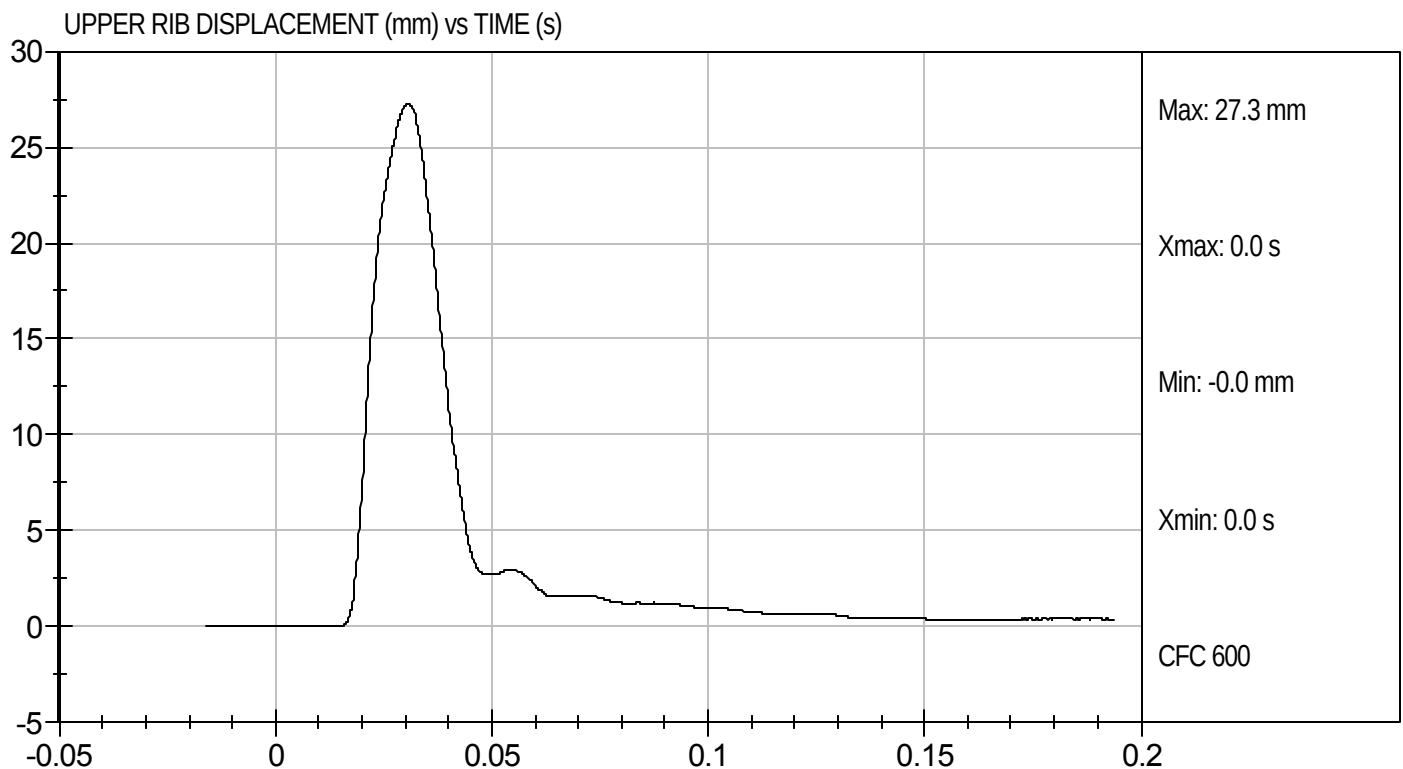
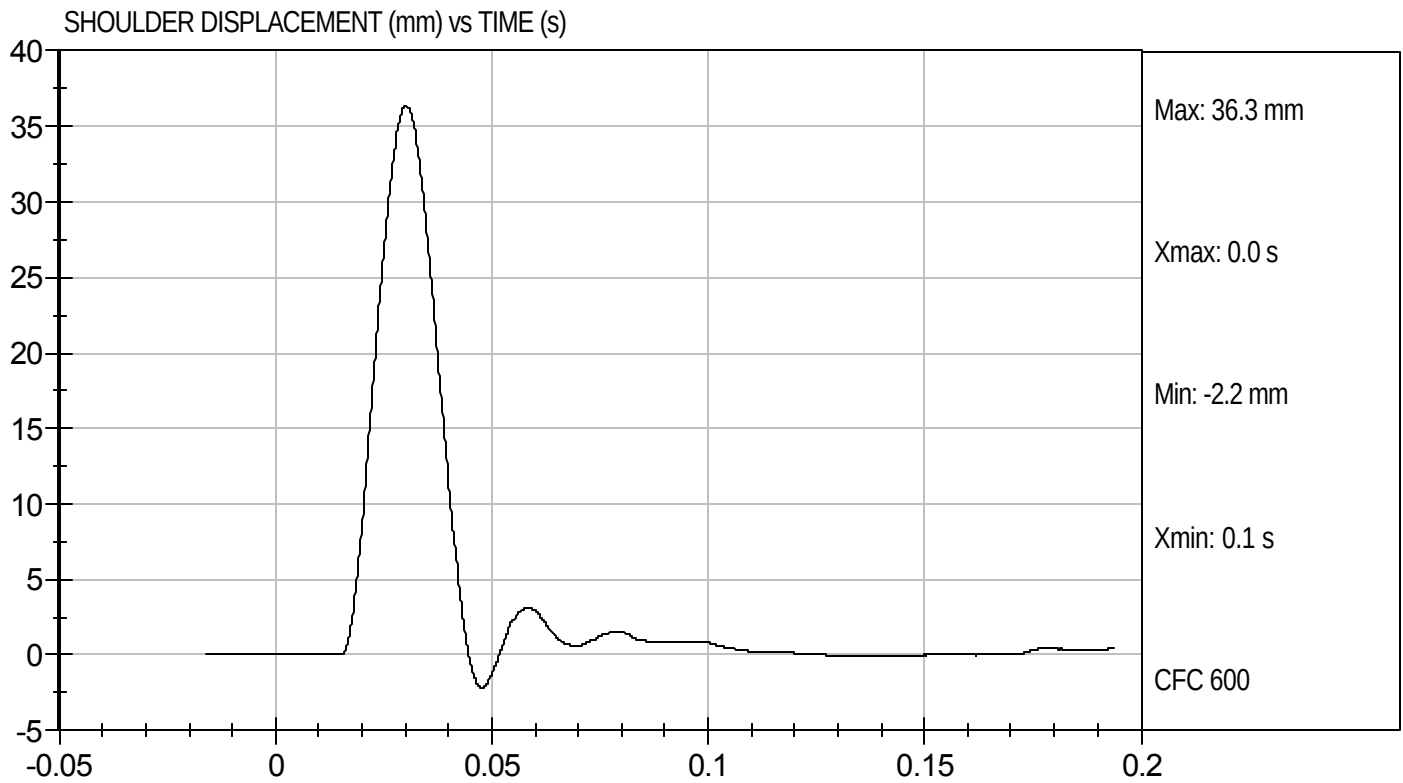
Test Date: 6/10/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D101784

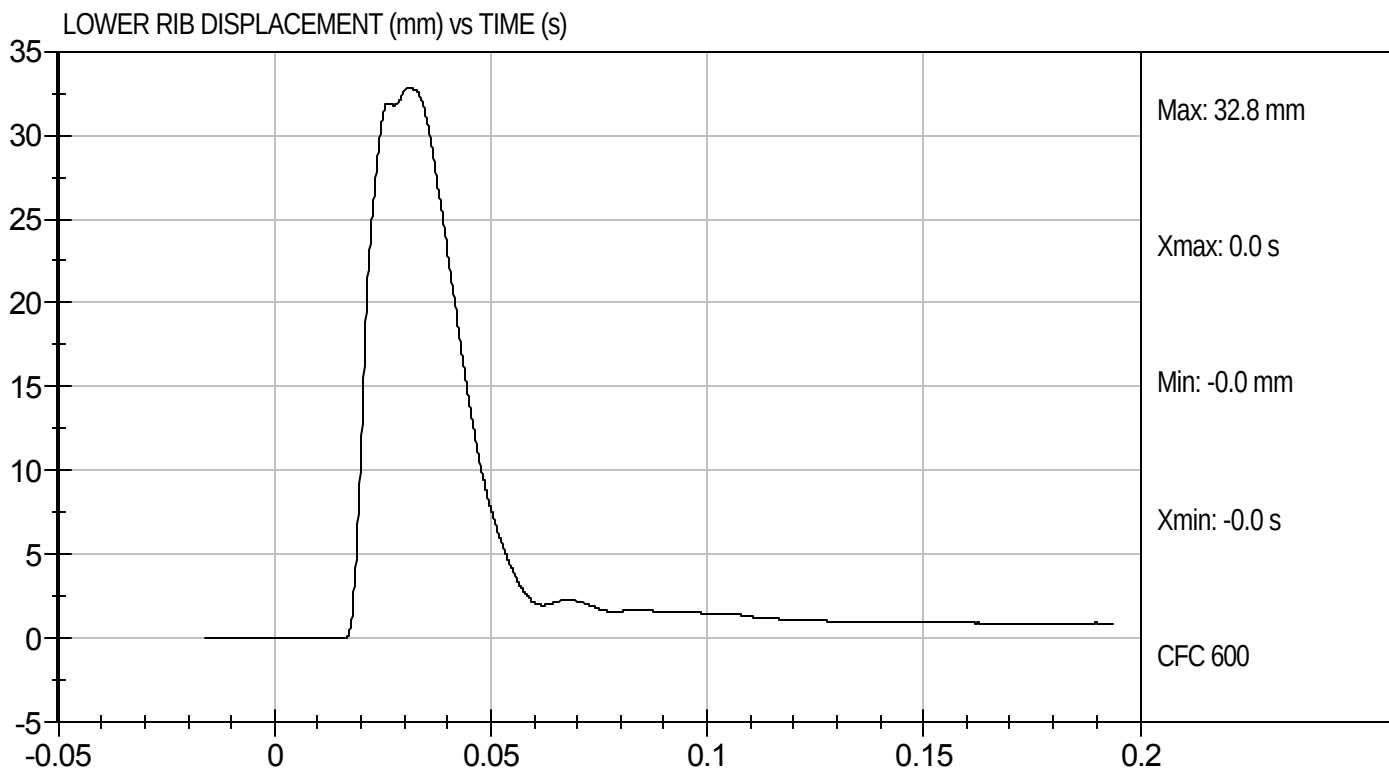
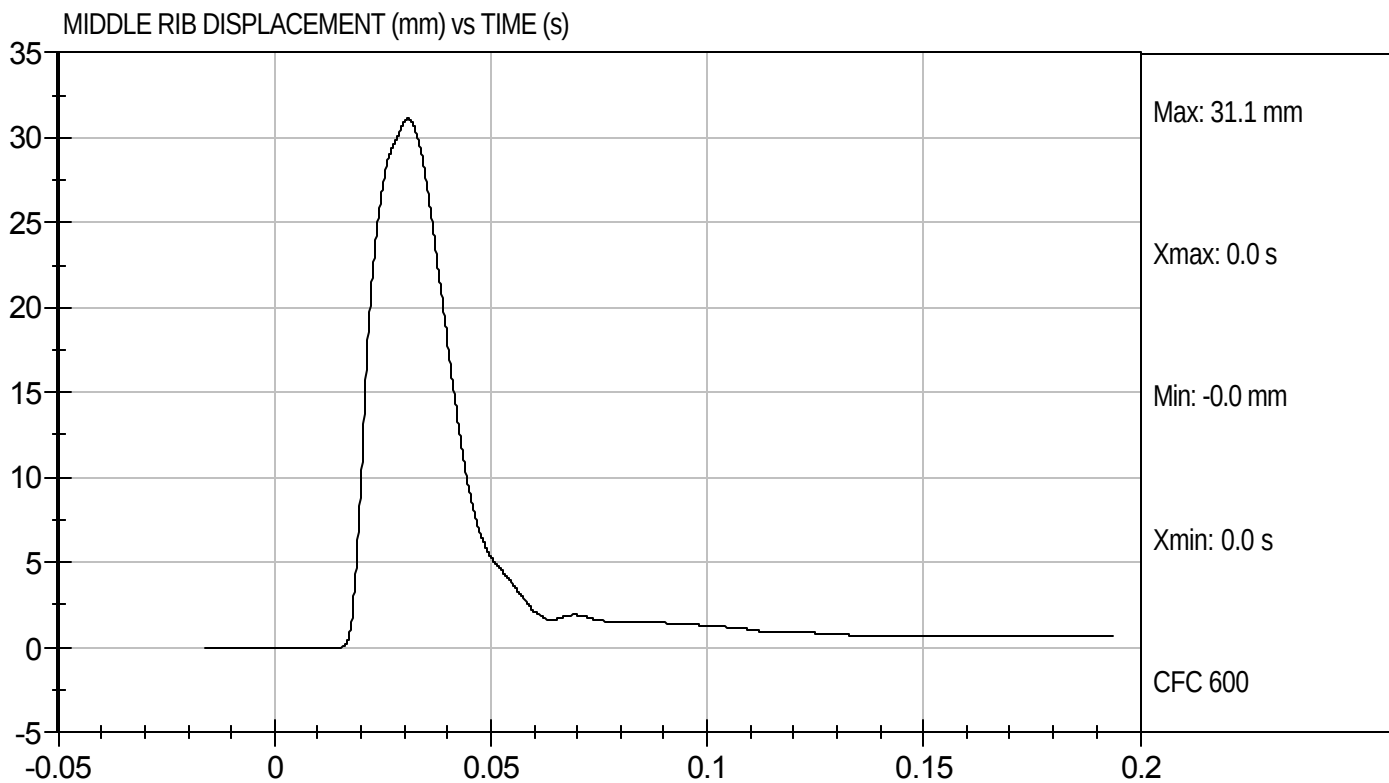
Test Date: 6/10/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D101784

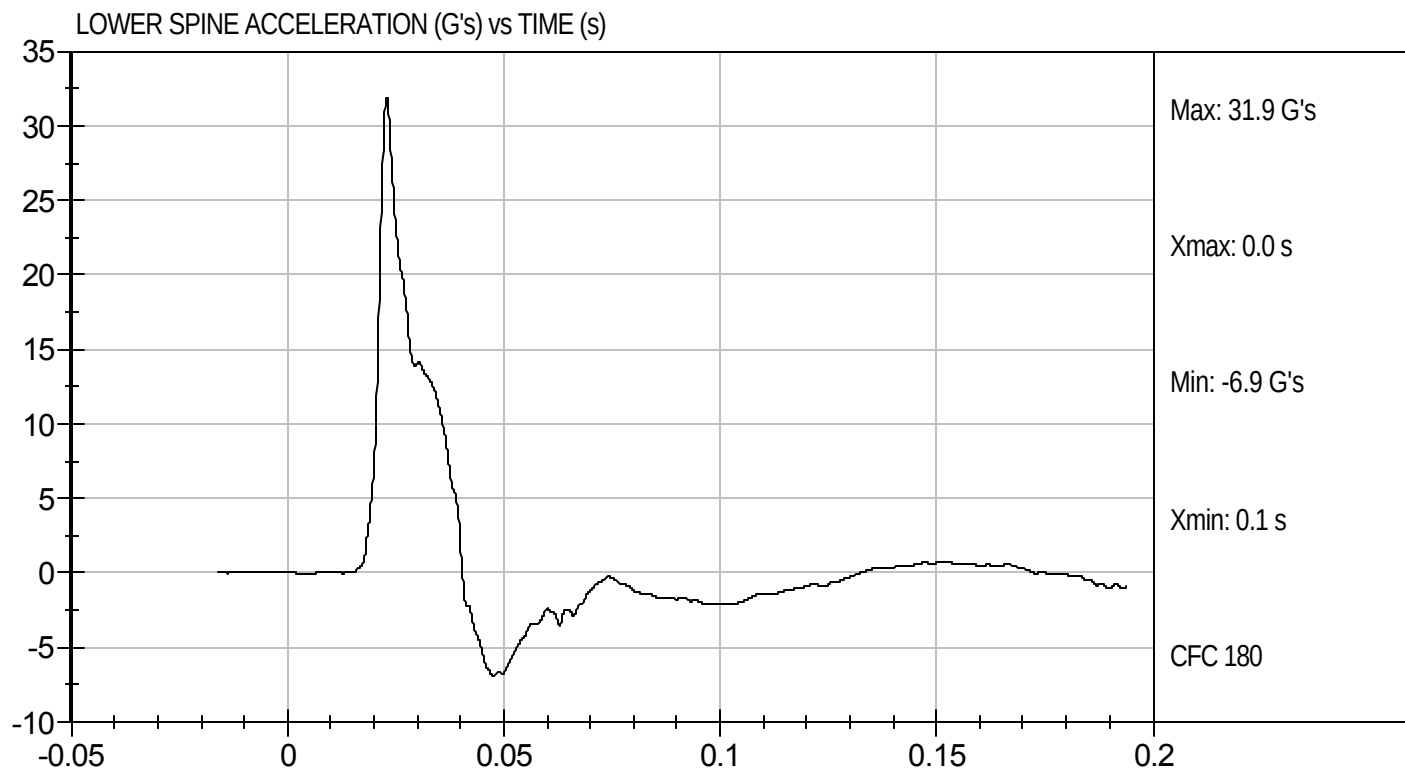
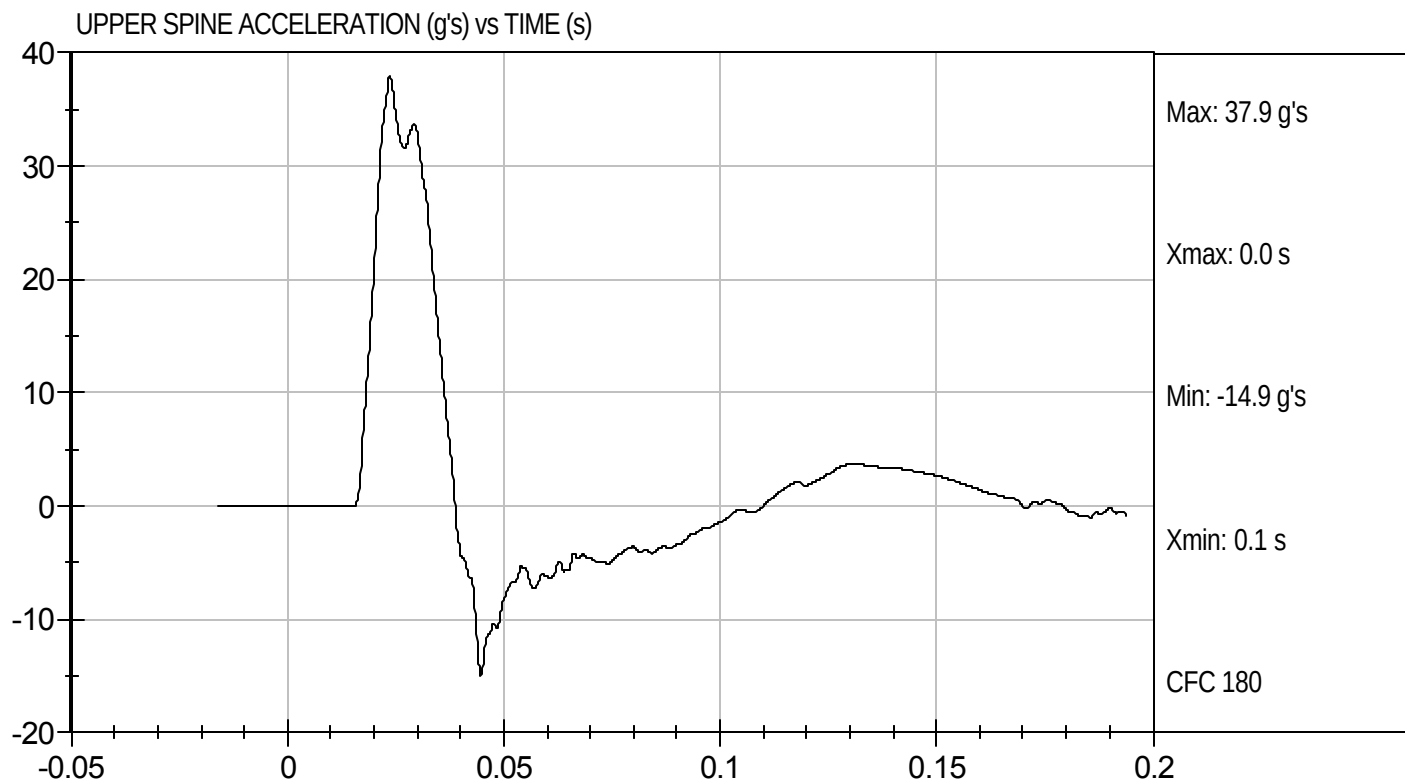
Test Date: 6/10/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D101784

Test Date: 6/10/10
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: D101785

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	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	41	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

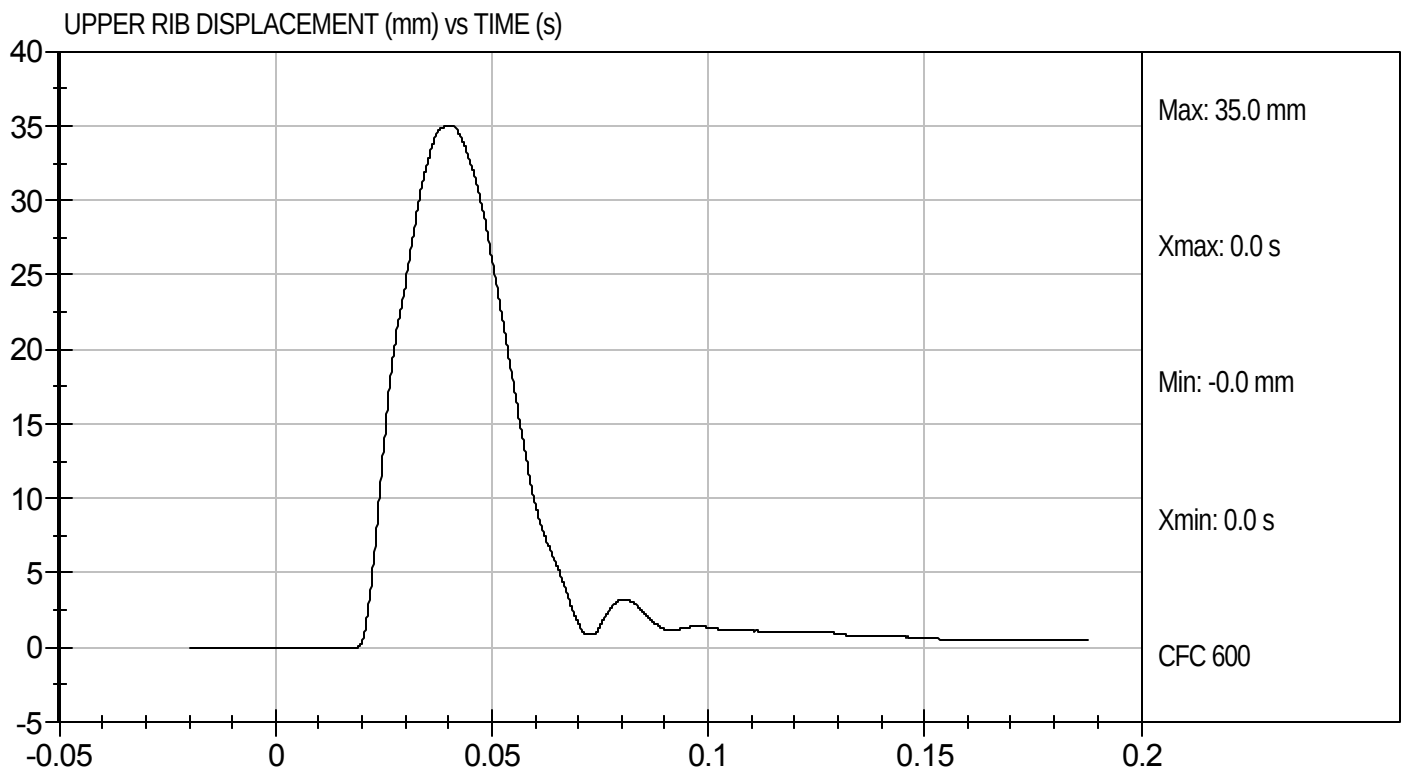
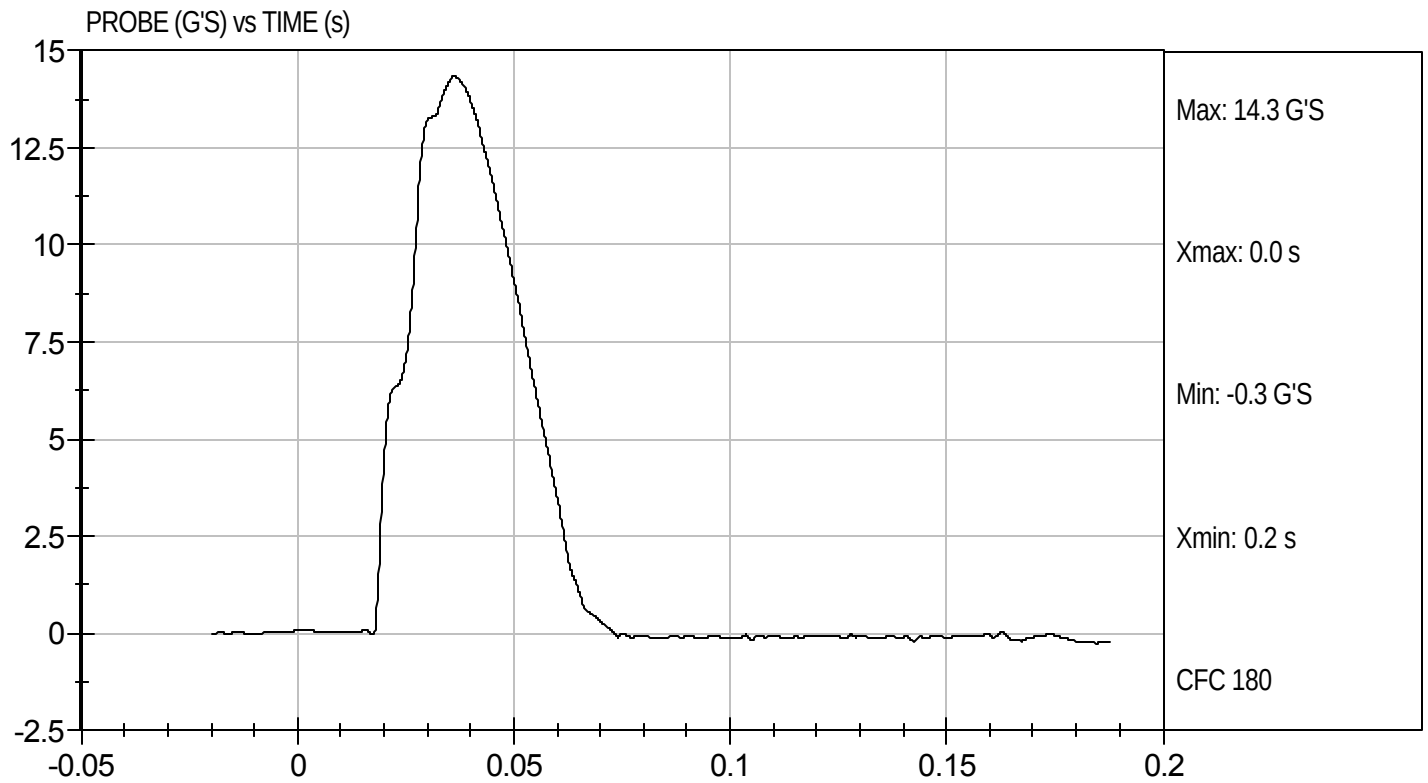
6/10/10
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Without Arm
Component ID: D101785

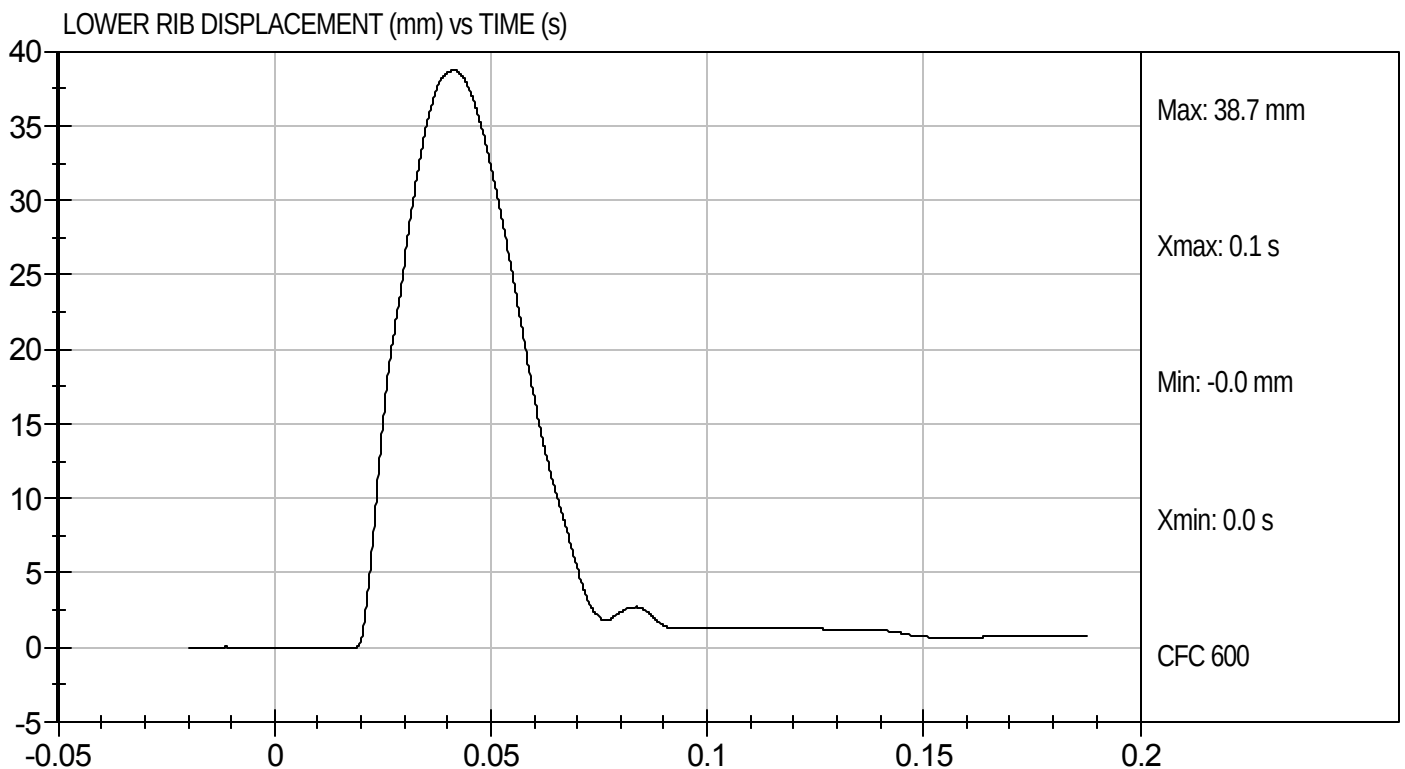
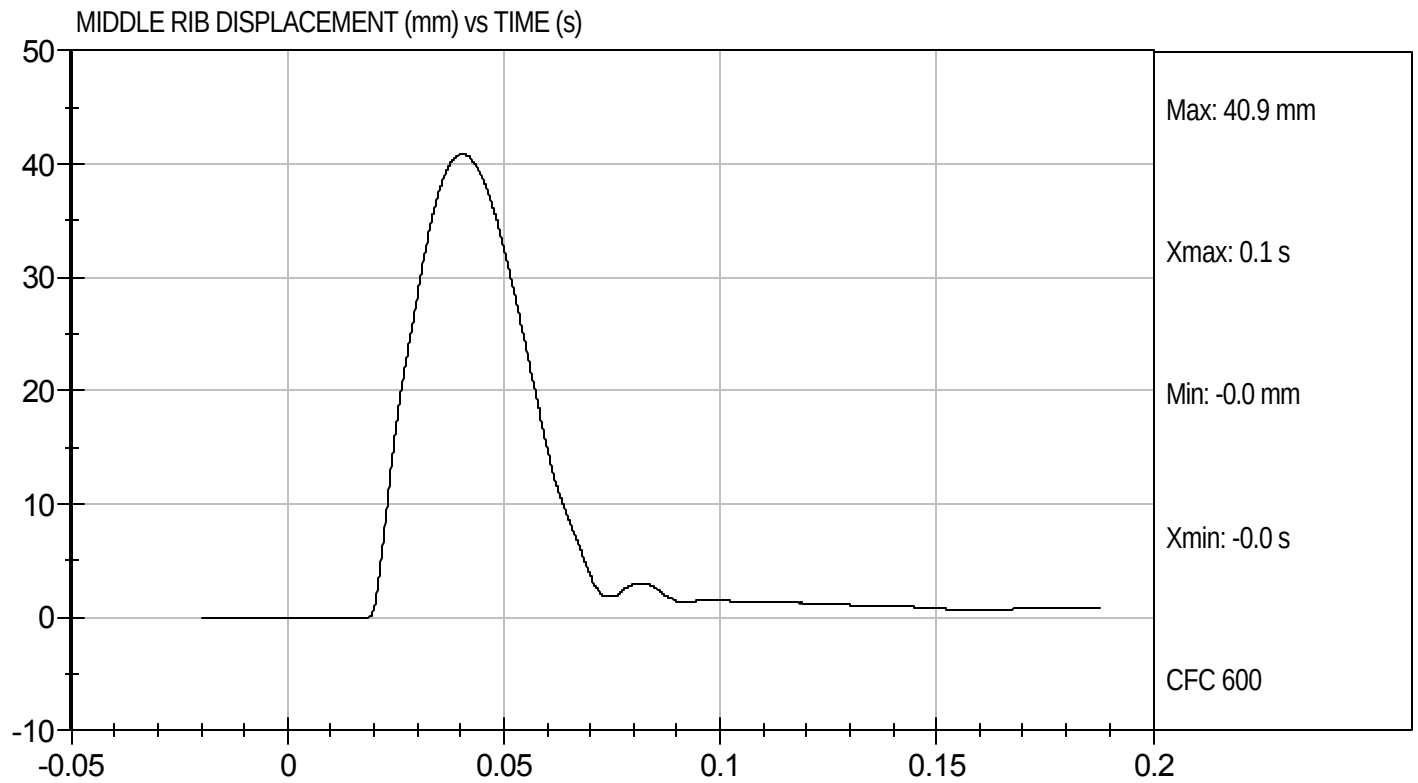
Test Date: 6/10/10
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Thorax Without Arm
Component ID: D101785

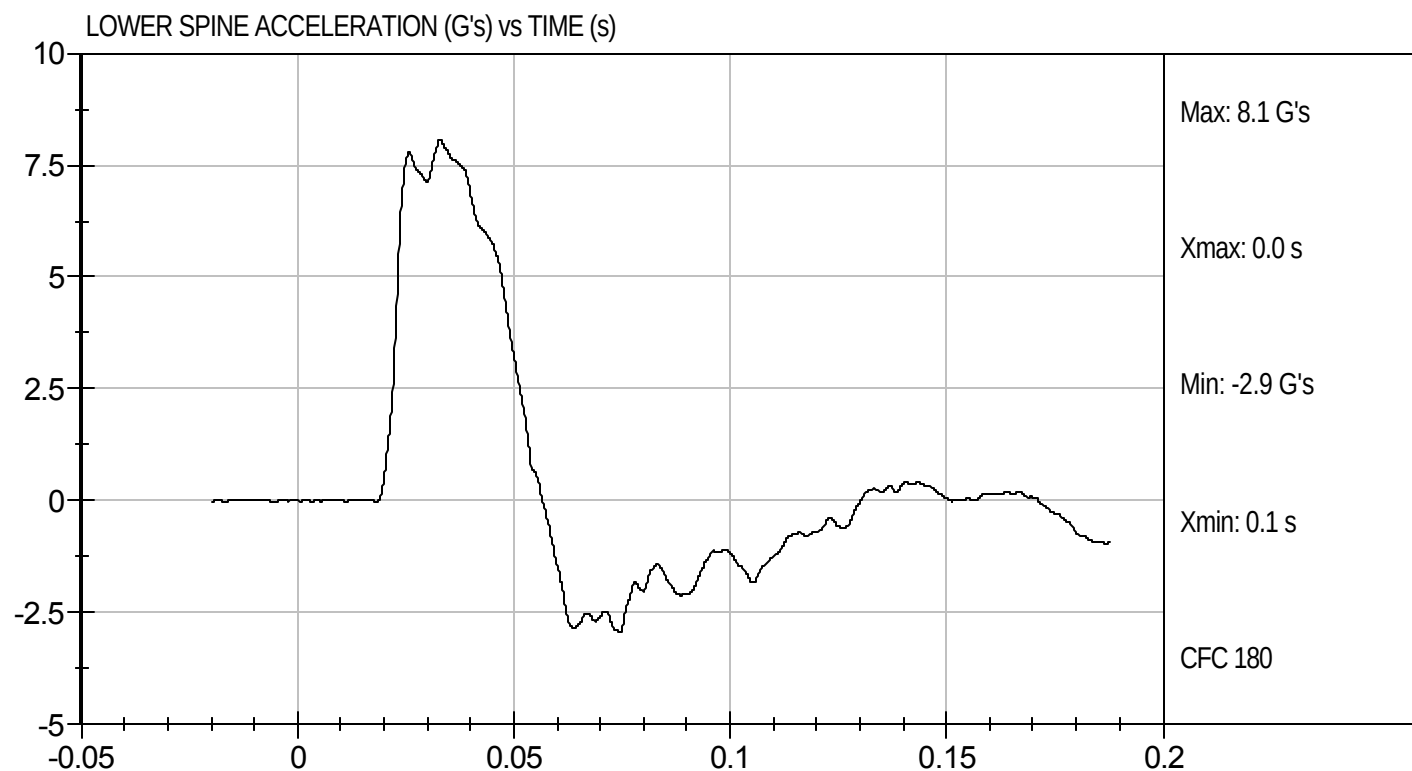
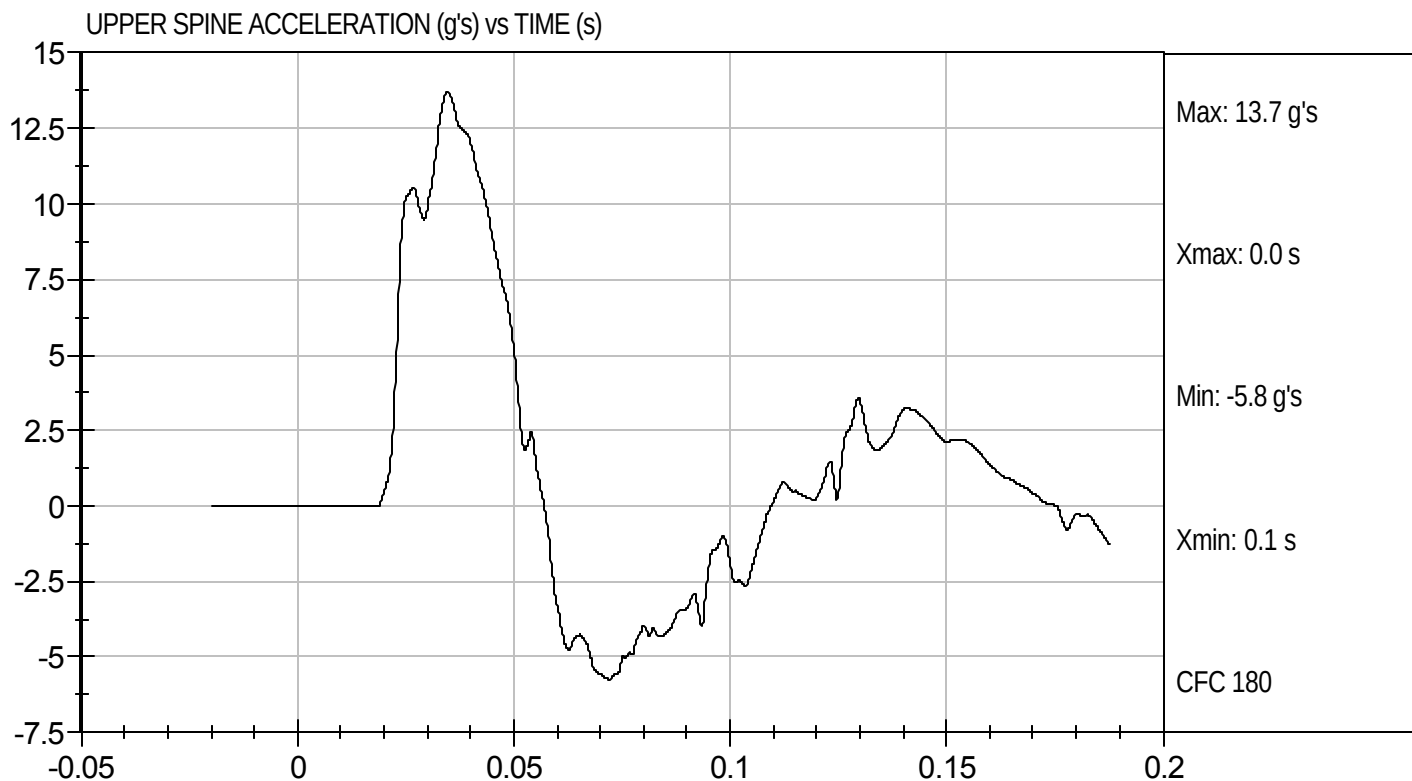
Test Date: 6/10/10
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Thorax Without Arm
Component ID: D101785

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

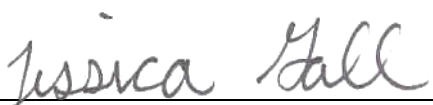


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-II's BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101786

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	48	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	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
			Overall Test Results	Pass


Laboratory Technician

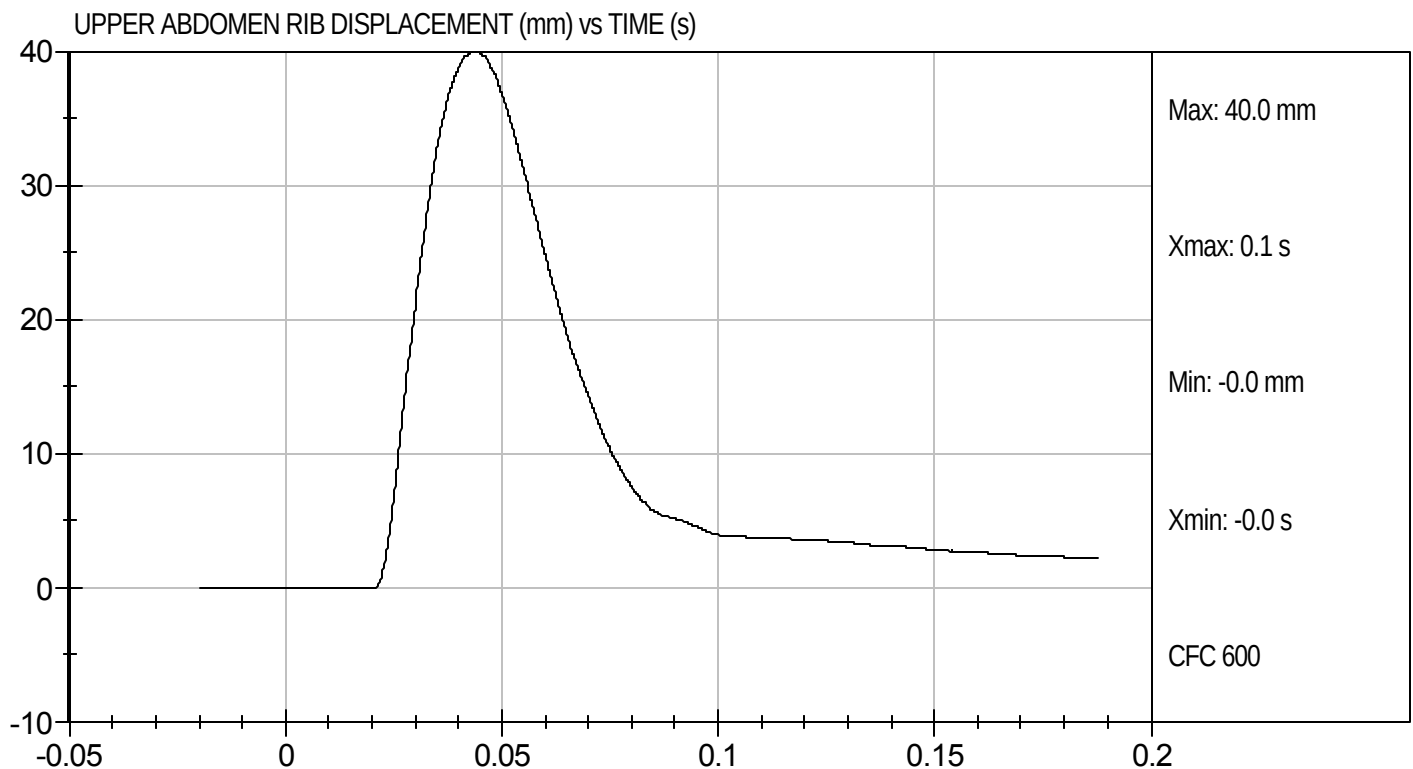
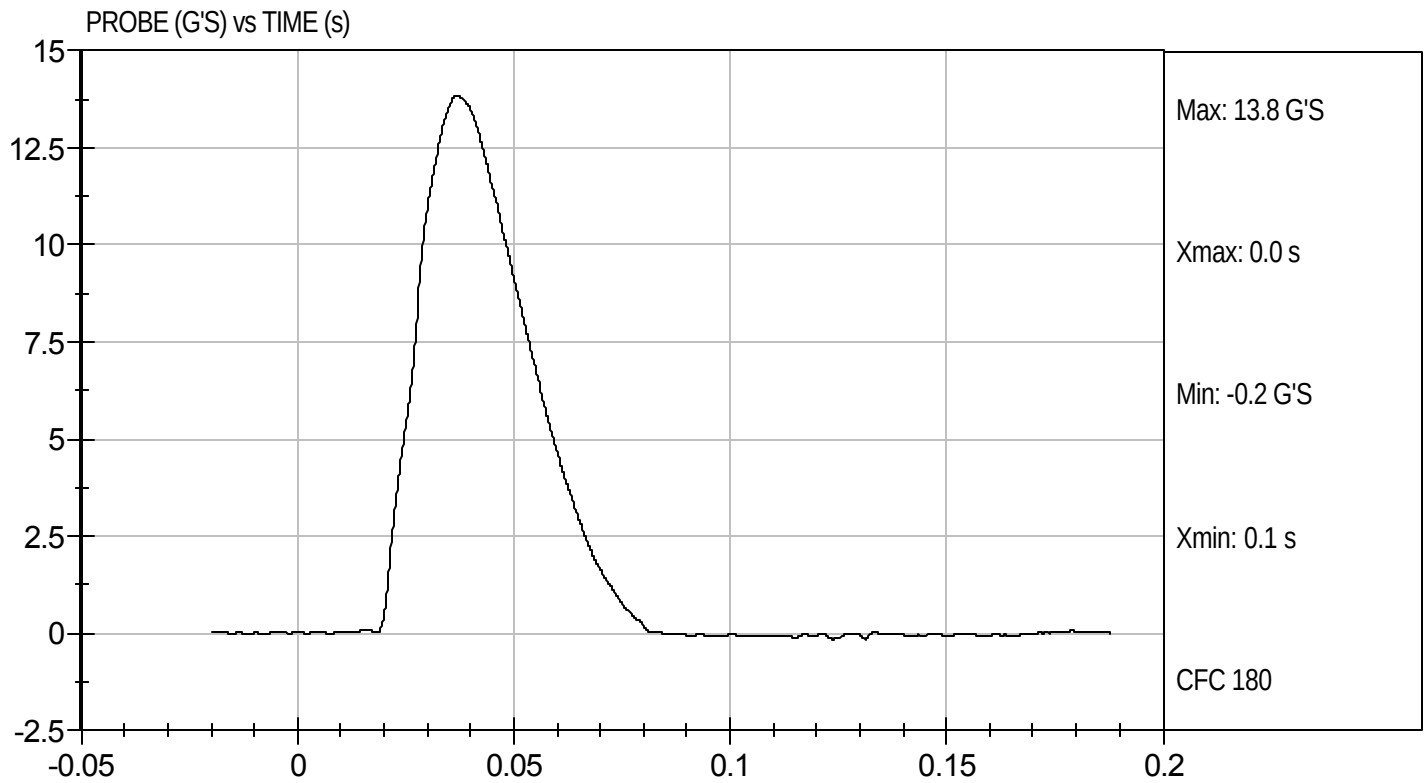
6/10/10
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D101786

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

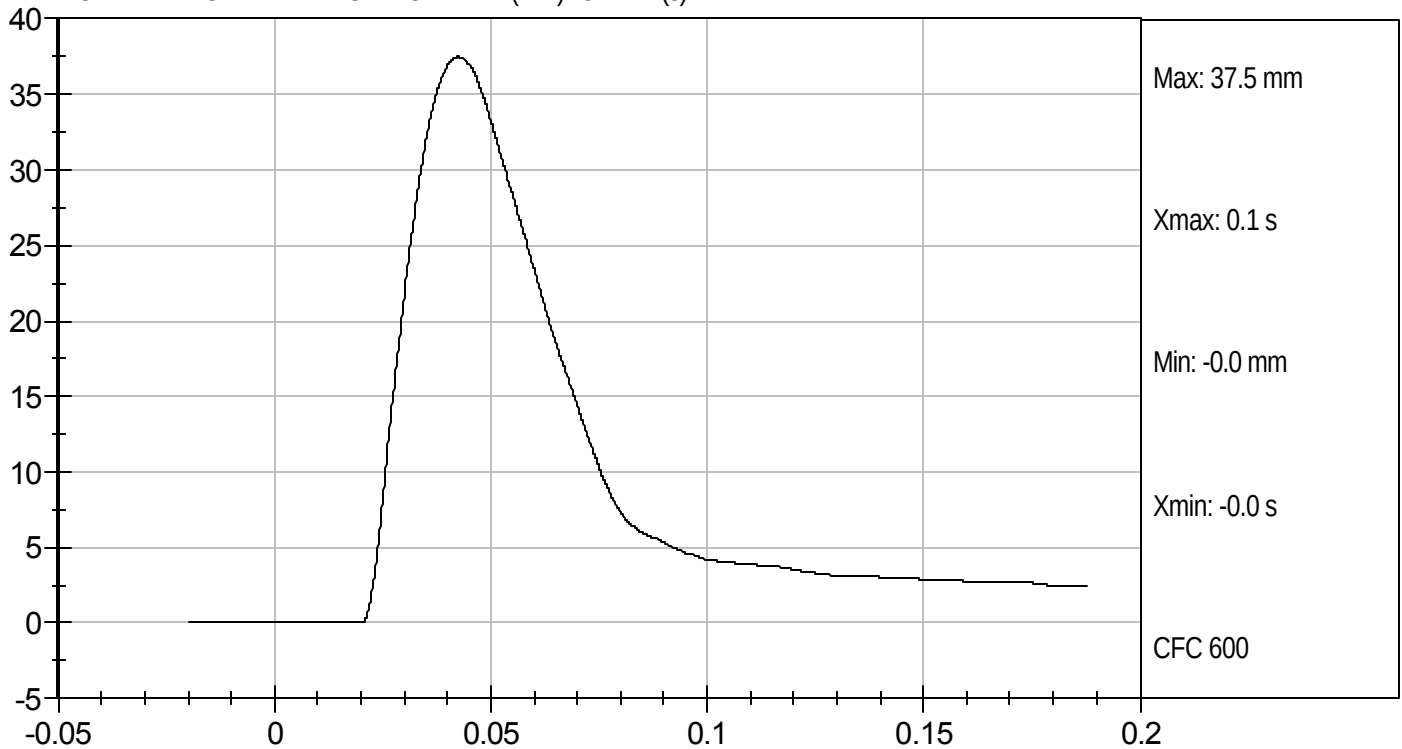




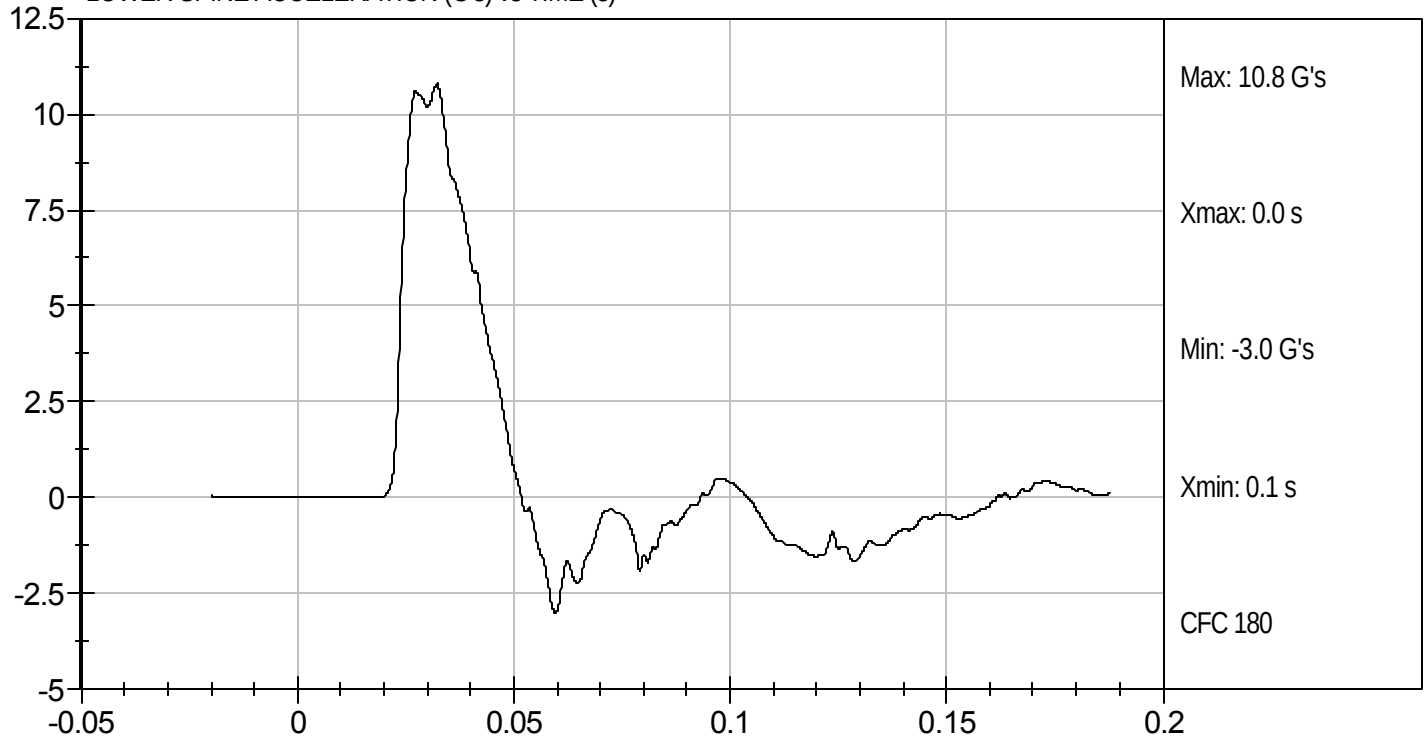
Test Desc: Abdomen Impact
Component ID: D101786

Test Date: 6/10/10
Velocity: 14.12 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: D101787

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	49	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	40	Pass
Peak Acetabulum Force	N	3600 to 4300	3890	Pass
Overall Test Results			Pass	


Laboratory Technician

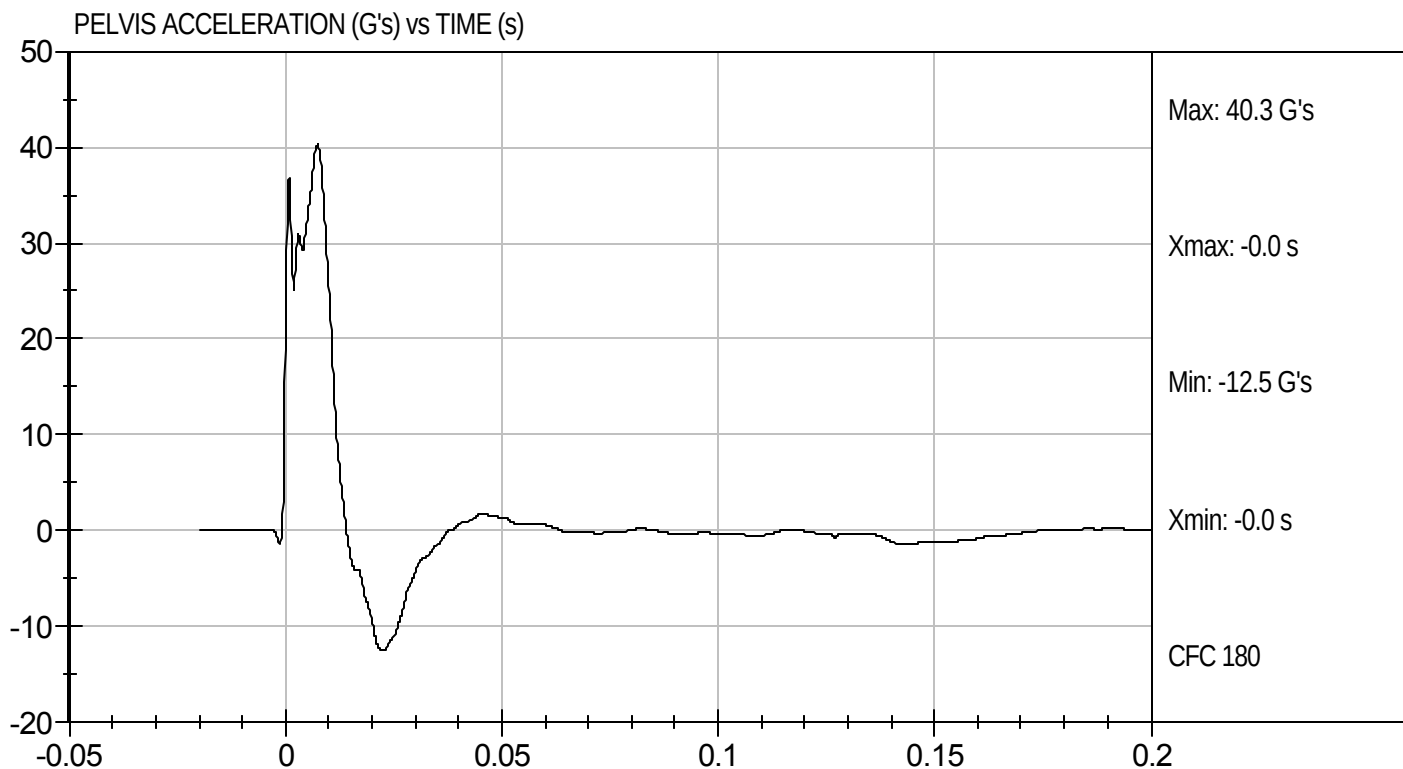
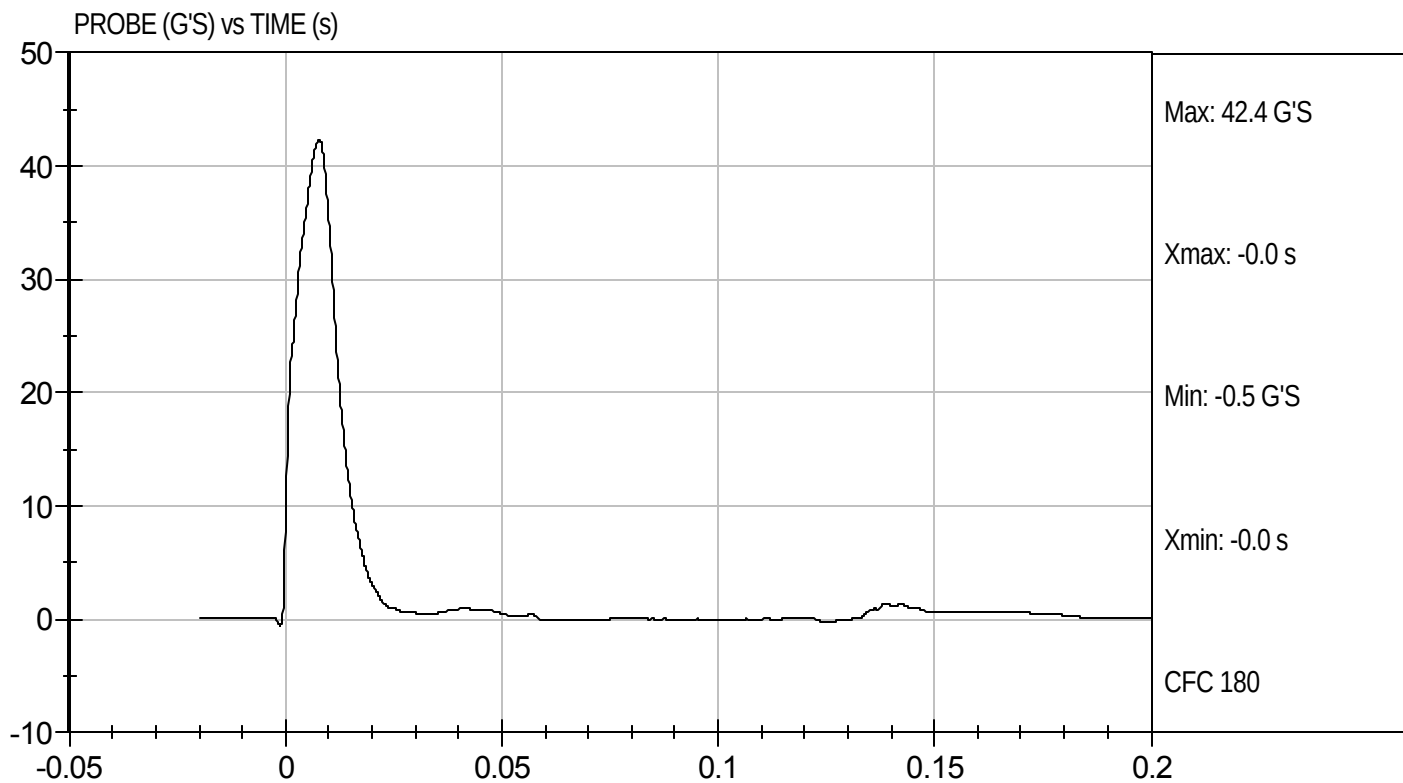
6/10/10
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D101787

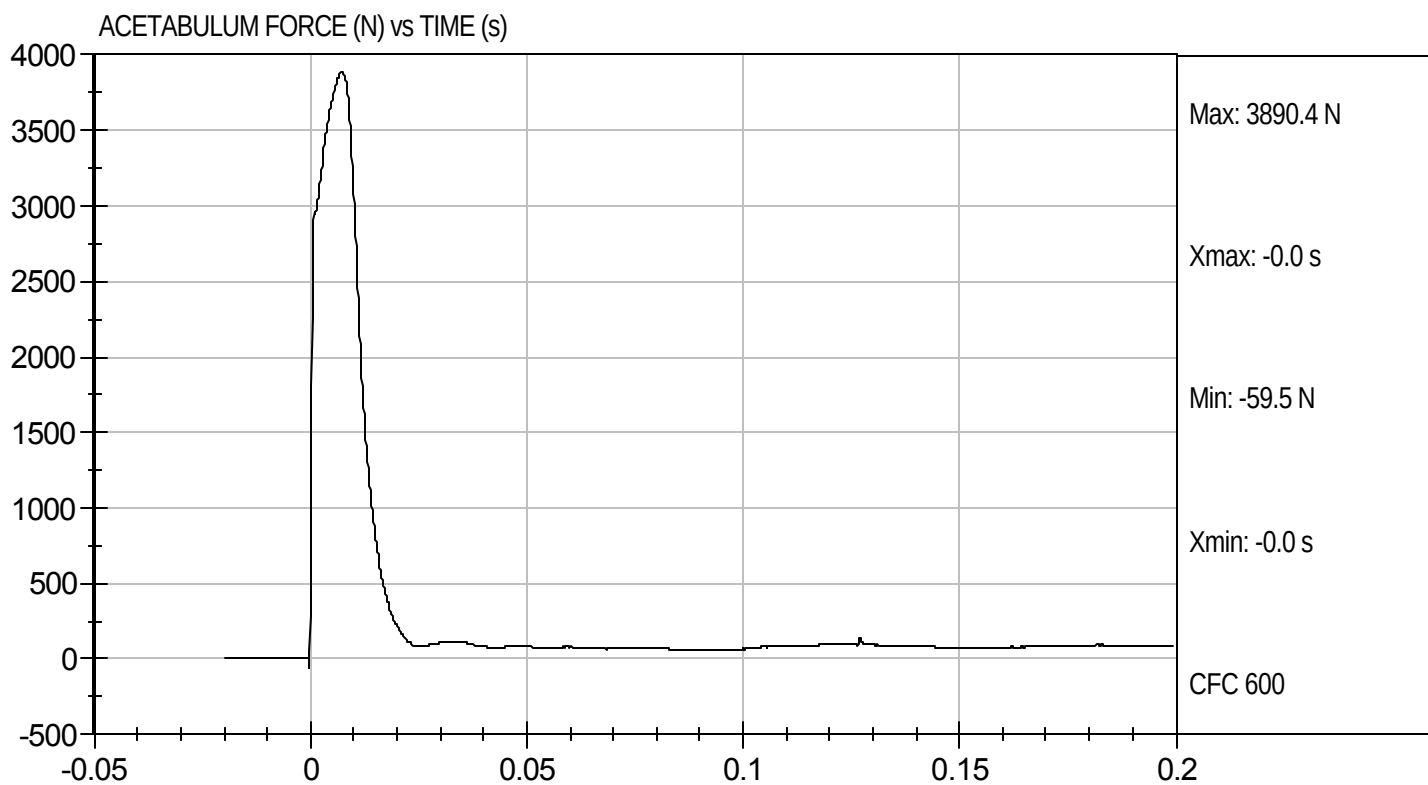
Test Date: 6/10/10
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D101787

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

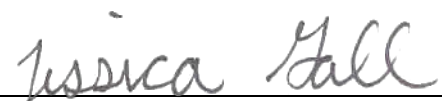


MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D101788

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.0	Pass
Humidity	%	10 to 70	49	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	33	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4699	Pass
Overall Test Results			Pass	


Laboratory Technician

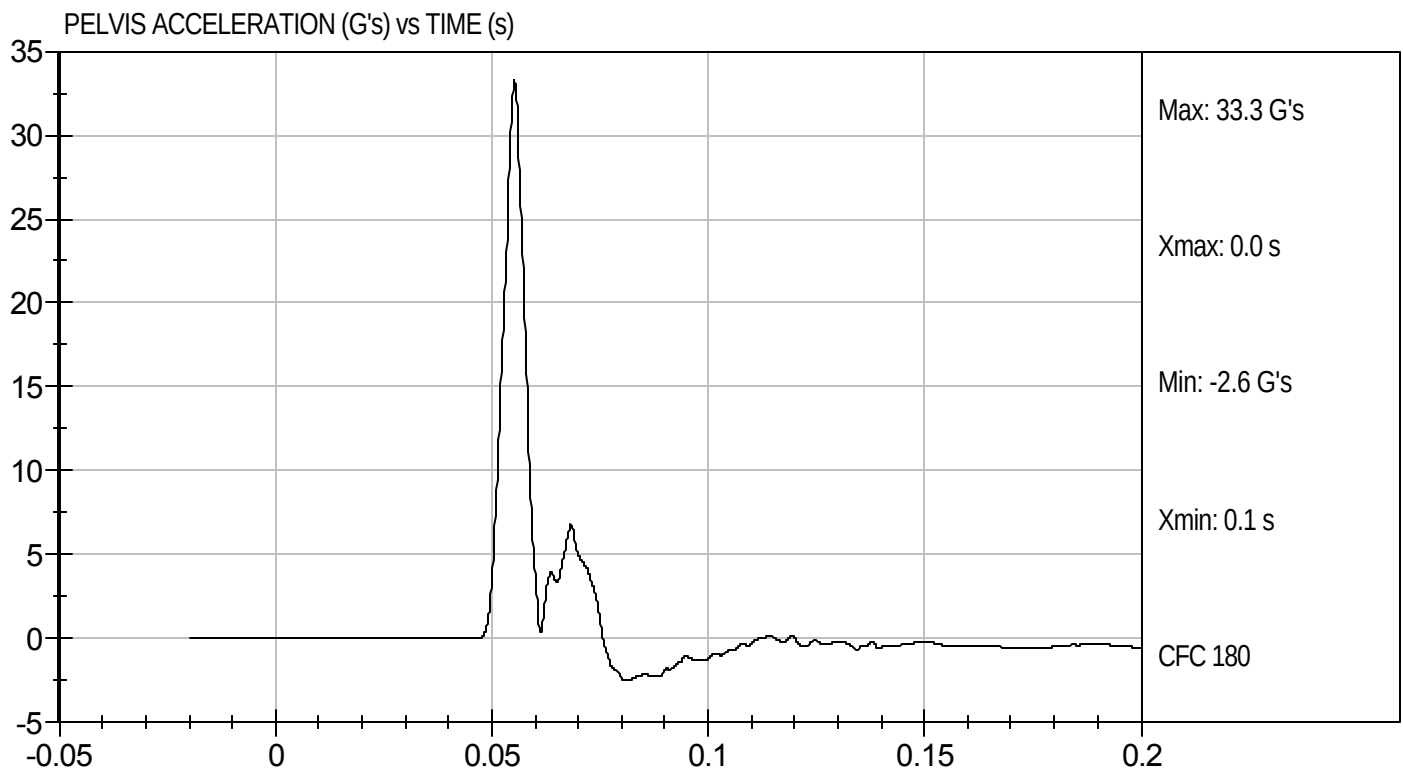
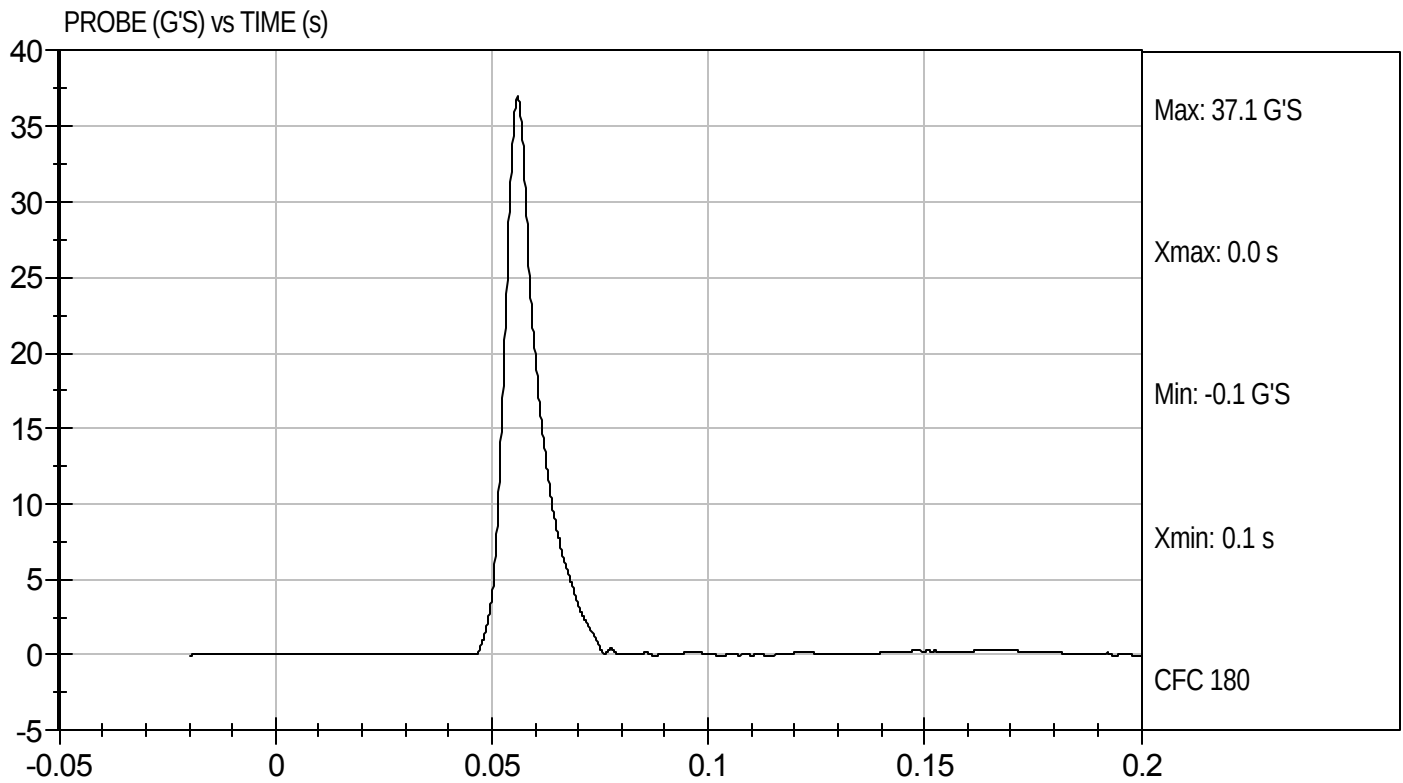
6/9/10
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D101788

Test Date: 6/9/10
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D101788

Test Date: 6/9/10
Velocity: 14.12 ft/s, 4.30 m/s

