

REPORT NUMBER: SNCAP-MGA-2009-005

**VALIDATION
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

**HYUNDAI MOTOR COMPANY
2010 HYUNDAI GENESIS 2-DR COUPE
NHTSA NUMBER: MA0504**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: April 21, 2009

Report Date: August 28, 2009

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVENUE, SE
ROOM W43-410
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-03-D-12005.

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Approval Date: August 28, 2009

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Validation Test was conducted on the subject 2010 Hyundai Genesis 2-Dr Coupe in accordance with the specifications of the Office of Crashworthiness Standards 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 April 21, 2009. The impact velocity of the Moving Deformable Barrier (MDB) was 62.6 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 312 mm at level 2. The test vehicle's occupant performance was as follows: <table border="1" style="margin: 0 auto; border-collapse: collapse;"> <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 style="background-color: yellow;">147</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td style="background-color: yellow;">41</td> </tr> <tr> <td>Combined Abdominal Force</td> <td>N</td> <td>2500</td> <td style="background-color: yellow;">1777</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td style="background-color: yellow;">3562</td> </tr> </tbody> </table> <table border="1" style="margin: 0 auto; border-collapse: collapse;"> <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 style="background-color: yellow;">576</td> </tr> <tr> <td>Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td style="background-color: yellow;">68</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td style="background-color: yellow;">2495</td> </tr> </tbody> </table>					Driver ATD (ES-2re)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	147	Maximum Thorax Rib Deflection	mm	44	41	Combined Abdominal Force	N	2500	1777	Pubic Symphysis Force	N	6000	3562		Passenger ATD (SID-IIs)			Measurement Description	Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	576	Lower Spine Acceleration	G	82	68	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2495
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the NCAP Side Validation Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-03-D-12005. The purpose of this test is to generate comparative side impact performance in a 2010 Hyundai Genesis 2-Dr Coupe. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated April 2009.

SUMMARY

A 2010 Hyundai Genesis 2-Dr Coupe 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 62.6 km/h (38.9 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 April 21, 2009. 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 Side Impact Laboratory Test Procedure, dated April 2009. 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
- Upper Neck Load Cells
- Shoulder Displacement Potentiometer
- 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	147
Maximum Thorax Rib Deflection	mm	44	41
Combined Abdominal Force	N	2500	1777
Pubic Symphysis Force	N	6000	3562

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	576
Lower Spine Acceleration	G	82	68
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2495

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front Driver		Left Rear Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Knee Airbag	No		No	
Side Torso Airbag	Yes	Yes	No	
Head/Torso Airbag	No		No	
Side Head Curtain/Tube Airbag	Yes	Yes	No	
Pretensioner	Yes	No	No	
Load Limiter	Yes	No	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:

- Passenger Head X Redundant after 45 msec.
- Left Rear Sill Y
- Left Lower B-Post Y after 20 msec.
- Driver Seat Track Y after 10 msec.

The following accelerometers were not used:

- Driver Lower Spine X and Z
- Passenger Lower Spine X and Z
- Front Door Centerline
- Front Door Mid-Rear
- Front Door Upper Centerline
- Rear Door Mid-Rear
- Rear Door Upper Centerline

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: 2010 Hyundai Genesis 2-Dr Coupe
Test Program: Side Validation Testing

NHTSA No. MA0504
Test Date: 4/21/2009

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MA0504	Anti-Lock Brakes	Yes
Model Year	2010	All Wheel Drive	No
Make	Hyundai	Power Steering	Yes
Model	Genesis	Driver Front Airbag	Yes
Body Style	Coupe	Driver Side Torso Airbag	Yes
VIN	KMHHT6KD1AU005274	Driver Side Head Airbag	No
Body Color	Mirabeau Blue	Driver Curtain Airbag	Yes
Delivery Date	4/14/09	Driver Knee Airbag	No
Odometer (km/mi)	156 km / 97 mi	Driver Head/Torso Combo Airbag	No
Dealer	Northtown Hyundai	Rear Pass. Front Airbag	No
Transmission	Automatic	Rear Pass. Side Torso Airbag	No
Final Drive	Rear	Rear Pass. Side Head Airbag	No
Type/No. Cylinders	Turbo I4	Rear Pass. Curtain Airbag	No
Engine Displacement (L)	2.0	Rear Pass. Combo Airbag	No
Engine Placement	Longitudinal	Pretensioners	Yes
Roof Rack	No	Load Limiters	Yes
Sunroof/T-Top	No	Air Conditioning	Yes
Tinted Glass	No	AM/FM CD	Yes
Traction Control	Yes	Tilt Steering	Yes
Power Brakes	Yes	Automatic Door Locks	Yes
Front Disc	Yes	Power Windows	Yes
Rear Disc	Yes	Power Seats	No
Does owner's manual provide instructions to turn off automatic door locks?	No		

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company	GVWR (kg)	1930
Date of Manufacture	JAN/07/09	GAWR Front (kg)	1000
		GAWR Rear (kg)	1050

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	2		4	(A)
Capacity Wt. (VCW) (kg)				322	(B)
DSC x 68.04 (kg)				272	(A-B)
Cargo Wt. (RCLW) (kg)				50	

VEHICLE SEAT TYPE

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

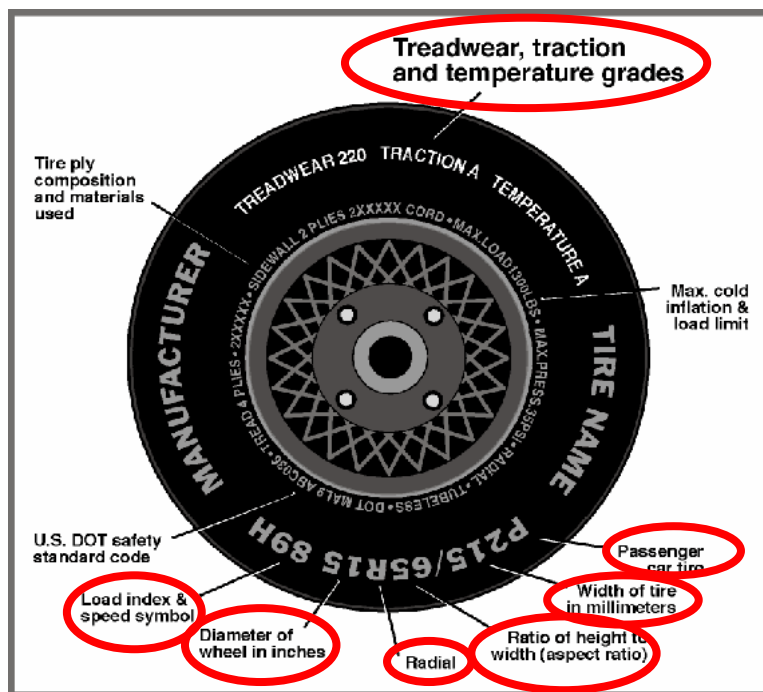
DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	225/45R18	245/45R18
Tire Size on Vehicle	225/45R18	245/45R18
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Potenza	Potenza
Treadwear	260	260
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	3 Polyester	3 Polyester
Tire Plies Body	2 Polyester + 2 Steel + 1 Nylon	2 Polyester + 2 Steel + 1 Nylon
Load Index & Speed Symbol	91V	96V
Tire Material	Rubber	Rubber
DOT Safety Code	DOT EJJ7	DOT EJ1K

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW) (Axle)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	414.6	353.8		447.7	439.5		450.0	432.8	
Right	kg	426.4	339.3		436.4	384.2		428.2	402.3	
Ratio	%	54.8	45.2		51.8	48.2		51.3	48.7	
Totals	kg	841.0	693.1	1534.1	884.1	823.7	1707.8	878.2	835.1	1713.3

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1534.1	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	50	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1713.4	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	690	694	712	719	
As Tested (Fully Loaded $\pm$ 10mm at each wheel well)	mm	683	692	707	714	1360

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2820
Total Vehicle Length at Left Side	mm	3465
Total Vehicle Length at Centerline	mm	4574
Total Vehicle Length at Right Side	mm	3465
Weight of Ballast in Cargo Area	kg	9.1
Weight of Vehicle Components Removed	kg	
Amount of Stoddard Solvent in Fuel Tank	L	59.8

Vehicle components removed to meet Test Weight: Right rear taillight, trunk carpet, spare tire, tools, passenger side mirror, right rear window.

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	470
Actual Impact Point Aft of Front Axle	mm	460

DATA SHEET NO. 2

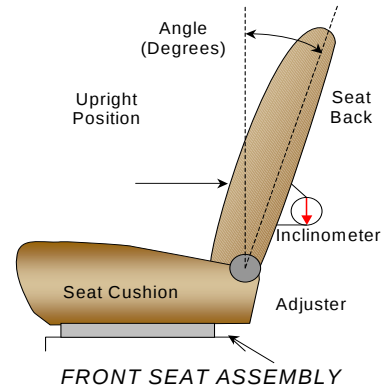
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
Test Program: Side Validation Testing

NHTSA No. MA0504
Test Date: 4/21/2009

NORMAL 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, set at 14 degrees using the head rest post.
The left rear passenger seat is fixed.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	13.3 at headrest post
Passenger with Seated Dummy	Fixed

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	22 detents	11 th detent (forwardmost as 0)
Rear Seat	Fixed	Fixed

Describe method: Using only the controls that primarily move the seat in the fore-aft direction, the seat was placed in the full rear position. The seat was moved forward marking each detent position until the forwardmost position was reached. The seat was placed in the mid point of travel or next rearward locking detent.

SEAT BELT UPPER ANCHORAGES

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	Fixed
Rear Seat	Fixed	Fixed

Describe method: The anchorages were non-adjustable.

DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

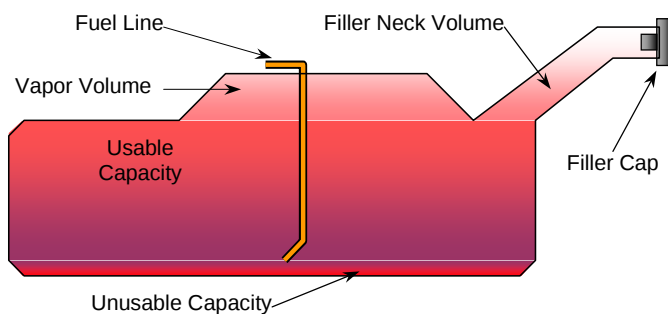
NHTSA No. MA0504
 Test Date: 4/21/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	64.3
Usable Capacity of "Optional" Tank	
Usable Capacity Used for FMVSS 301	59.2 to 60.4
Actual Amount of Solvent used	59.8

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

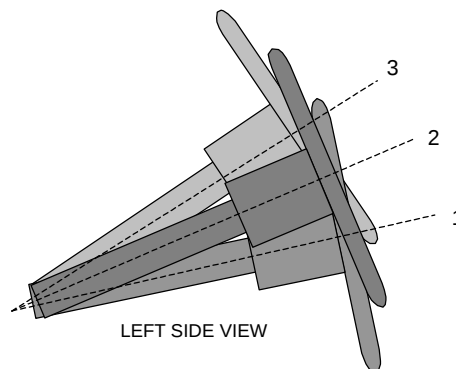
The test vehicle is equipped with an electric fuel pump. Fuel pump will operate when engine system is normally operating. The fuel pipe is on the left side.



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

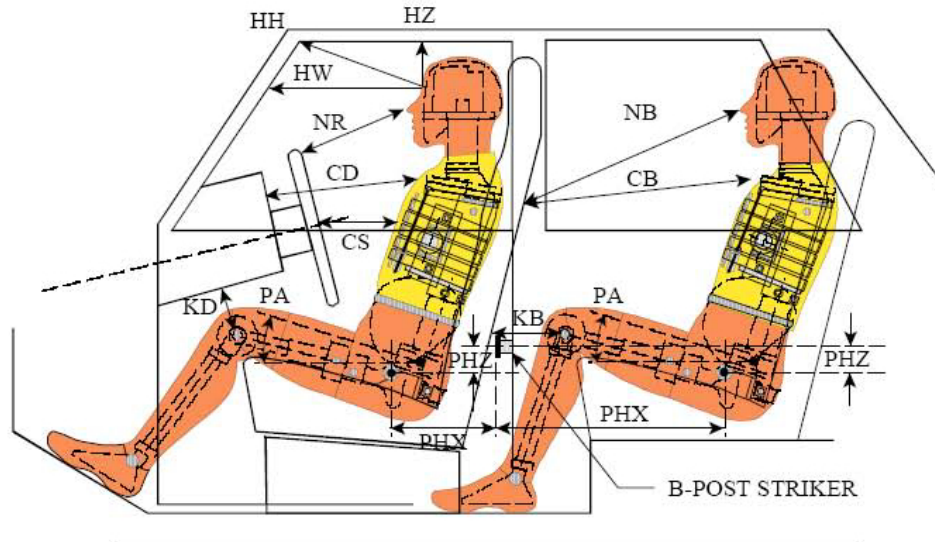
STEERING COLUMN POSITION

	Fore/Aft (mm)	Degrees
Lowermost - Position 1		67.5
Geometric Center – Position 2		69.5
Uppermost – Position 3		71.5
Telescoping Steering Wheel Travel		
Test Position		69.5

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



LEFT SIDE VIEW

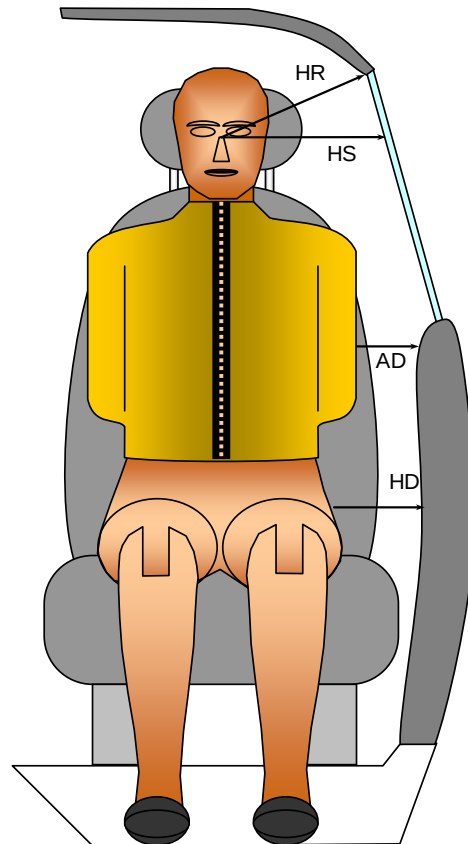
NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 296	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	483			
HW		Head to Windshield	662			
HZ	HZ	Head to Roof	153		141	
NR	NB	Nose to Rim/Seat Back	502		449	
CD	CB	Chest to Dash/Seat Back	572		383	
CS		Chest to Steering Wheel	372			
KDL	KBL	Left Knee to Dash/Seat Back	225	27.1	153	36.4
KDR	KBR	Right Knee to Dash/Seat Back	230	28.3	150	36.5
PA	PA	Pelvic Angle		24.3		21.6
PHX	PHX	H-Point to Striker (X-Axis)	496		340	
PHZ	PHZ	H-Point to Striker (Z-Axis)	284		164	
SA	SA	Seat Back Angle		13.3		Fixed

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



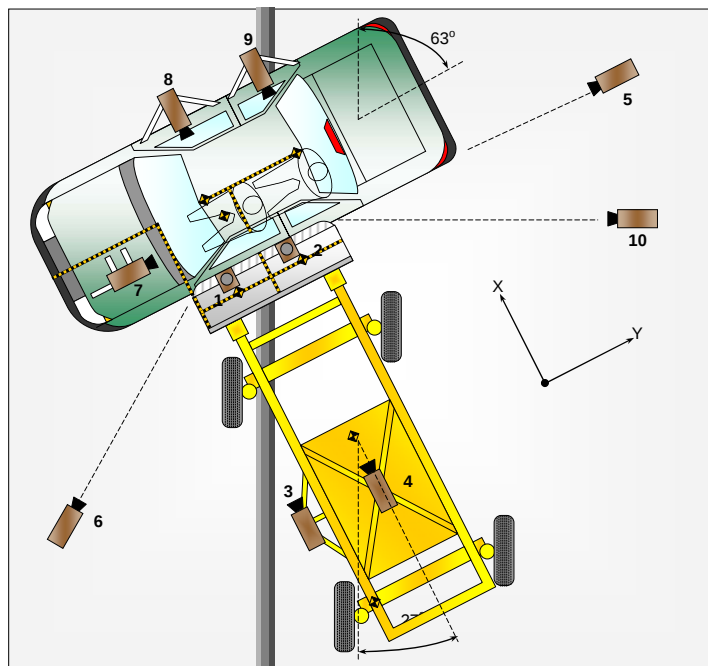
FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 296
HR	Head to Side Header	mm	195	210
HS	Head to Side Window	mm	313	374
AD	Arm to Door	mm	170	159
HD	H-Point to Door	mm	151	129

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

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



No.	Camera View	Location (mm)			Angle	Lens (mm)	Film Speed (fps)
		X	Y	Z			
1	Overhead Overall	125	1280	-5055		14	1000
2	Overhead Close-up	-510	-215	-5080		50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	70	6675	-1160		24	1000
6	Left Front	-3240	-4810	-1100		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 Front					13	24
11	Real Time Inrun					13	24

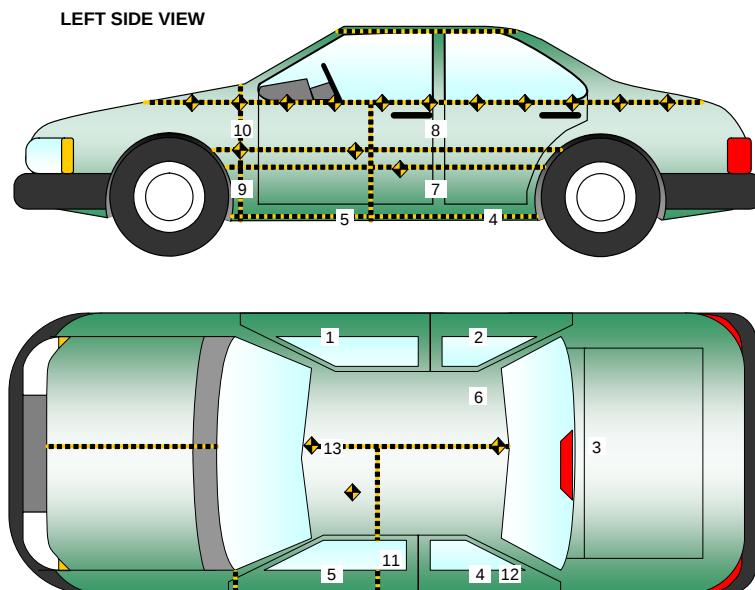
Reference: Impact Point projected to Ground
 +X = To Front of MDB, +Y = To Right of MDB, +Z = Down
 * All measurements accurate to ± 6 mm

DATA SHEET NO. 6

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2211	704	-183
2	Right Sill at Rear Seat	1403	699	-196
3	Rear Floorpan Above Axle	211	0	-503
4	Left Sill at Rear Door	1381	-699	-171
5	Left Sill at Front Door	2136	-704	-166
6	Rt. Rear Occ. Compartment	1808	383	-384
7	Left Lower B-Post	1879	-747	-486
8	Left Middle B-Post	1815	-751	-704
9	Left Lower A-Post	3022	-749	-474
10	Left Middle A-Post	3079	-823	-699
11	Front Seat Track	2165	-582	-273
12	Rear Seat Track or Structure			
13	Vehicle CG	2623	0	-479

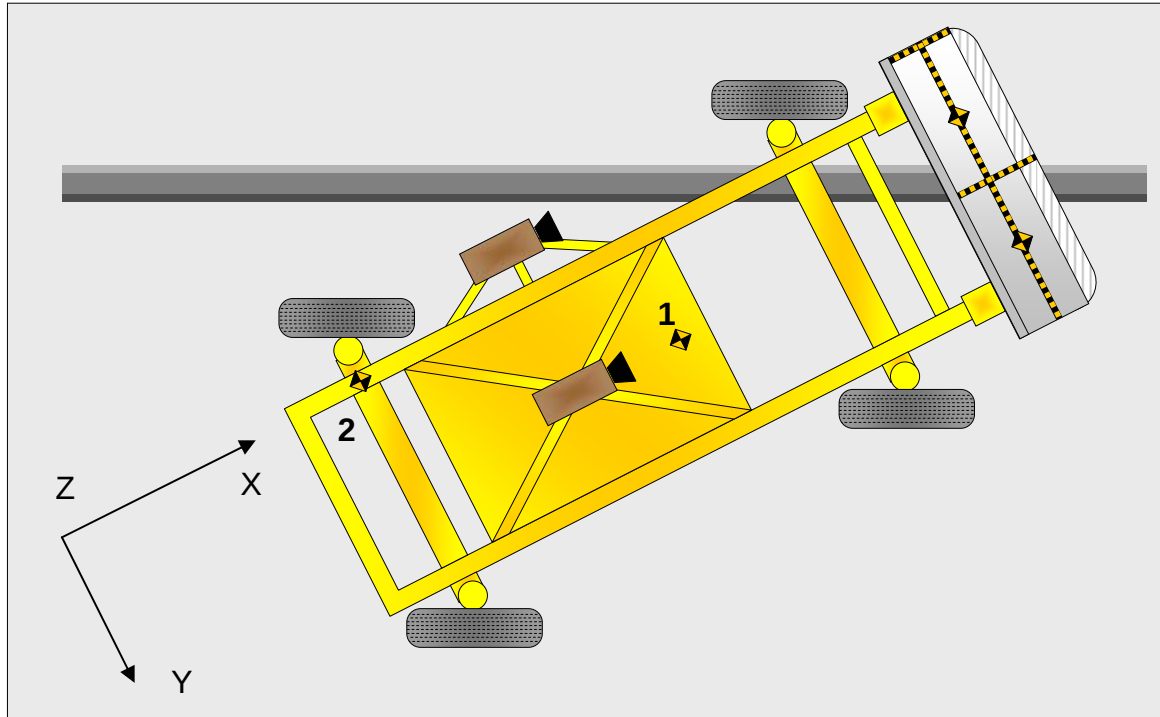
Reference: X - Test Vehicle Rear Bumper (+ forward)
 Y - Test Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER ACCELEROMETER LOCATIONS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



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

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

DATA SHEET NO. 8
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	99	1800
2	Occupant H-Point	mm	312	1650
3	Mid Door	mm	308	1800
4	Window Sill	mm	144	600
5	Window Top	mm	40	1800
	Maximum Penetration	mm	312	1650

INSTRUMENTATION

Driver Dummy Channels	14
Passenger Dummy Channels	21
Vehicle Structure Accelerometers	20
MDB Accelerometers	5
Total No. of Contact Switches	10
Monitoring Channels	1
Total	71

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 SUMMARY OF RESULTS**

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

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	62.6
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.6
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.8

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	162
B	Top of Bumper	533	800	Left	107
C	Mid-Level	686	800	Left	149
D	Top of Stack	813	800	Left	191

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

TEST DUMMY INFORMATION AND CONTACT

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Dummy Type / Serial No.	ES-2re / 032	SID-IIs / 296
Head Contact	Curtain Airbag, Headrest	C-Post
Upper Torso Contact	Side Airbag	Door Panel
Lower Torso Contact	Side Airbag	Door Panel
Left Knee Contact	Door Panel	B-Post
Right Knee Contact	Left Knee	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

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

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front Driver		Left Rear Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Knee Airbag	No		No	
Side Torso Airbag	Yes	Yes	No	
Head/Torso Airbag	No		No	
Side Head Curtain/Tube Airbag	Yes	Yes	No	
Pretensioner	Yes	No	No	
Load Limiter	Yes	No	No	

MDB LEFT EDGE IMPACT POINT DATA

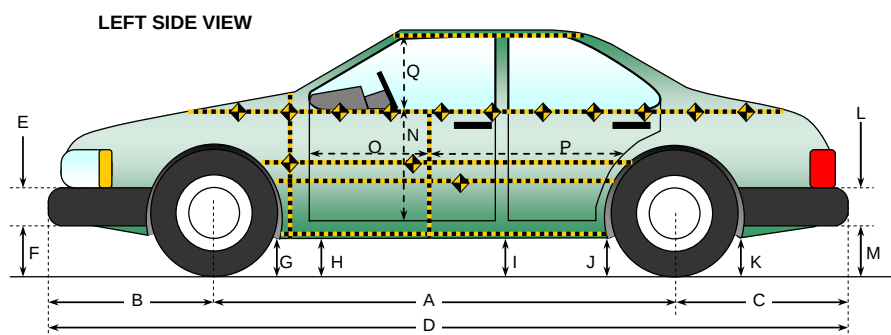
Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	10 forward
Vertical Offset	mm	+/-20	1 down

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



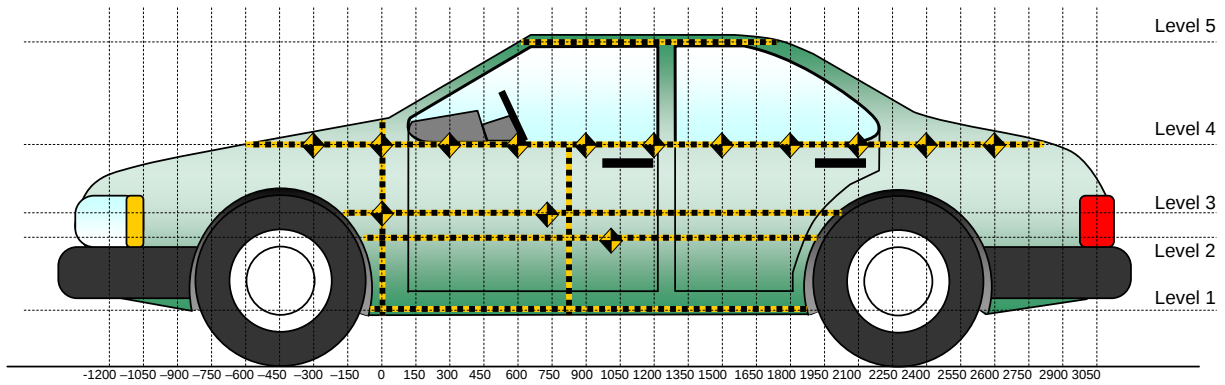
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2820	2804	16
B	Front Axle to FSOV	827	871	-44
C	Rear Axle to RSOV	927	941	-14
D	Total Length at Centerline	4574	4616	-42
E	Front Bumper Thickness	160	160	0
F	Front Bumper Bottom to Ground	190	207	-17
G	Sill Height at Front Wheel Well	149	176	-27
H	Sill Height at Front Door Leading Edge	146	144	2
I	Sill Height at B Pillar	162	219	-57
J1	Sill Height at Rear Wheel Well	166	237	-71
J2	Pinch Weld Height at Rear Wheel Well	152	144	8
K	Sill Height Aft of Rear Wheel Well	204	208	-4
L	Rear Bumper Thickness	210	210	0
M	Rear Bumper Bottom to Ground	255	264	-9
N	Sill Height to Window Bottom Sill	677	494	183
O	Front Door Leading Edge to Impact CL	683	671	12
P	Rear Door Trailing Edge to Impact CL	710	707	3
Q	Front Window Opening	352	410	-58
R	Right Side Length	3465	3467	-2
S	Left Side Length	3465	3405	60
T	Vehicle Width at B Post	1832	1577	255

DATA SHEET NO. 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



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	205
2	Occupant H-Point	429
3	Mid-Door	600
4	Window Sill	920
5	Window Top	1340

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

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-600				273					274					1	
-450				259					265					6	
-300				249					263					14	
-150			179	247				245	262				66	15	
0	223	191	191	247		236	282	274	266		13	91	83	19	
150	234	198	194	245		258	344	324	275		24	146	130	30	
300	239	201	195	247		275	398	403	316		36	197	208	69	
450	239	202	196	249		287	434	429	349		48	232	233	100	
600	241	203	196	243		297	453	445	387		56	250	249	144	
750	242	204	195	254		306	465	450	375		64	261	255	121	
900	243	204	195	257	470	314	474	449	366	477	71	270	254	109	7
1050	241	203	194	261	463	320	479	457	361	479	79	276	263	100	16
1200	239	201	192	267	467	324	482	449	355	488	85	281	257	88	21
1350	237	198	189	273	470	326	486	448	350	496	89	288	259	77	26
1500	232	192	186	283	474	324	495	446	340	506	92	303	260	57	32
1650	227	185	182	296	481	322	497	474	380	520	95	312	292	84	39
1800	219	176	178	305	492	318	475	486	374	532	99	299	308	69	40
1950	209	169	170	315	505	282	378	418	378	524	73	209	248	63	19
2100			163	329	524			324	360	527			161	31	3
2250				339					350					11	
2400				351					358					7	
2550				361					354					-7	
2700				379					372					-7	

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

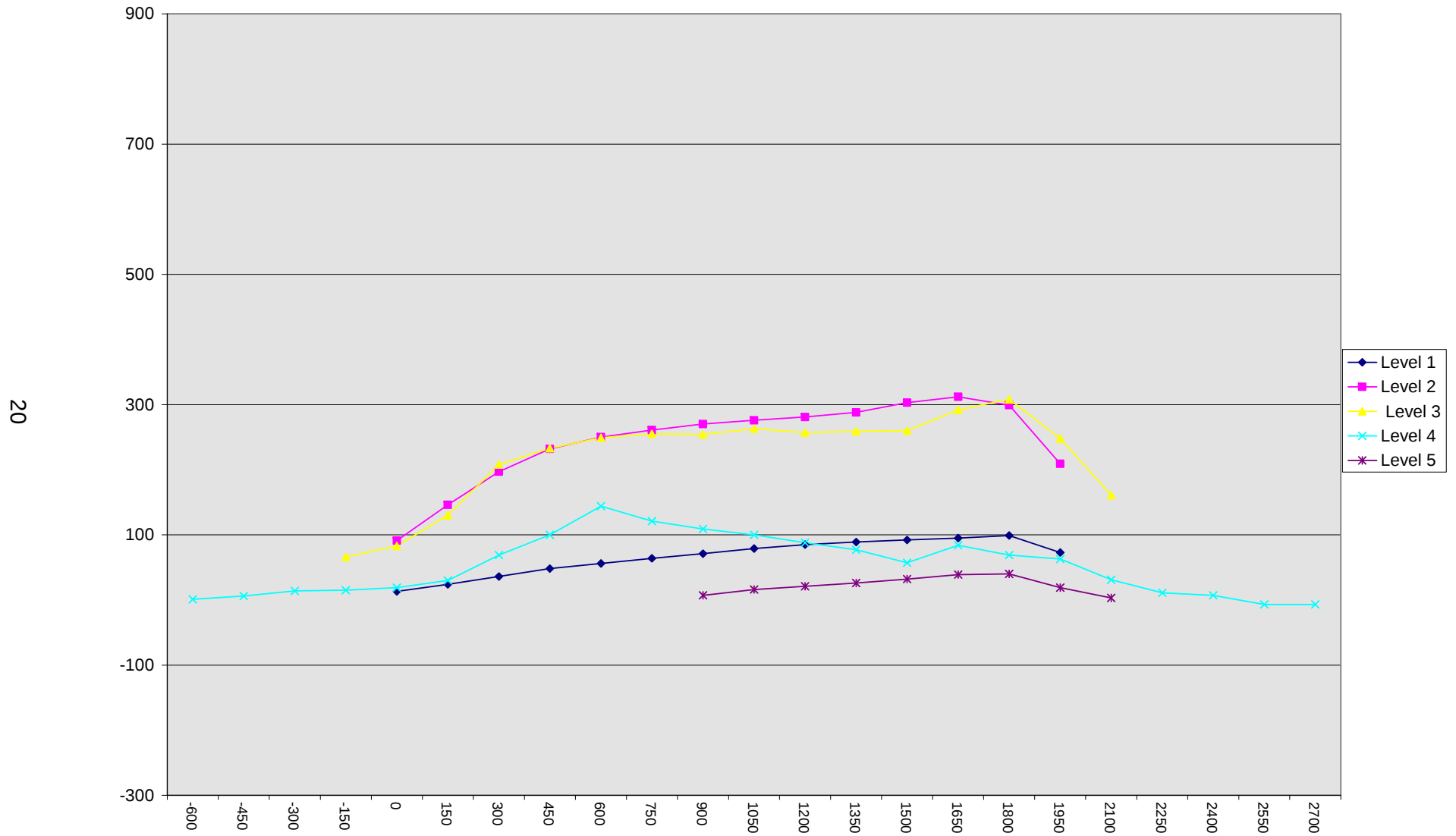
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	99	312	308	144	40
Distance From Impact (mm)	1800	1650	1800	600	1800

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
Test Program: Side Validation Testing

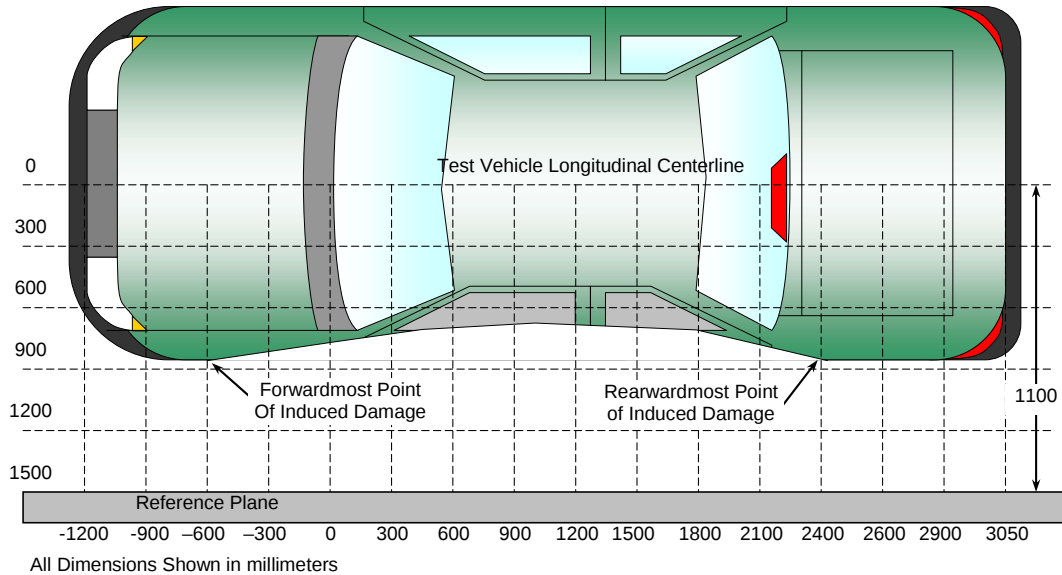
NHTSA No. MA0504
Test Date: 4/21/2009



DATA SHEET NO. 13
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



TOP VIEW

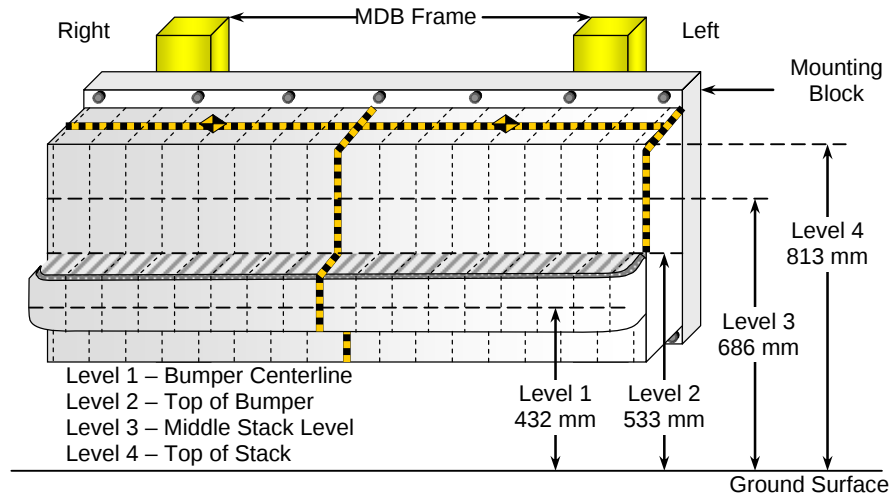
DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2700	4	379	372	-7
2	2042	3	165	382	217
3	1340	2	199	508	309
4	672	2	203	487	284
5	38	2	193	300	107
6	-600	4	273	274	1

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009



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	80	31	25	65	56	32	9	5	3	3	6	12	28	57	93	144	191
3	49	15	20	45	25	9	4	4	4	4	6	8	12	23	50	93	149
2	55	53	52	49	48	45	40	39	37	38	39	40	43	48	63	88	107
1	137	135	131	120	122	112	105	96	91	86	84	83	83	89	112	147	162

DATA SHEET NO. 15

FMVSS 301 FUEL INTEGRITY POST-IMPACT DATA

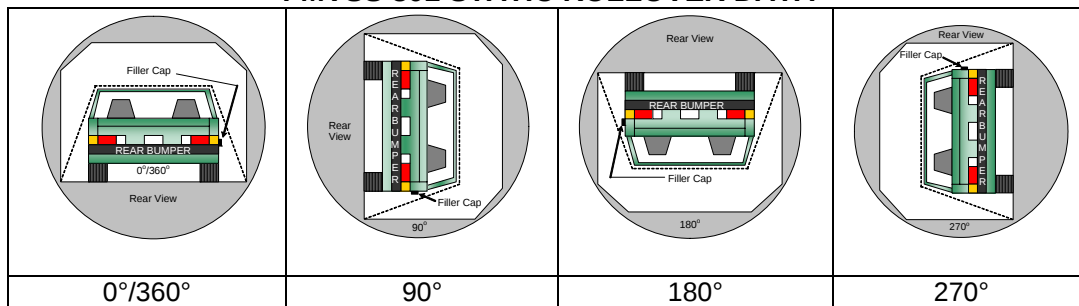
Test Vehicle: 2010 Hyundai Genesis 2-Dr Coupe
 Test Program: Side Validation Testing

NHTSA No. MA0504
 Test Date: 4/21/2009

Test Time: 11:30 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°	124	300	424
90° to 180°	115	300	415
180° to 270°	118	300	418
270° to 360°	112	300	412

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°	

APPENDIX A
PHOTOGRAPHS

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As Delivered Right Front ¾ View of Test Vehicle



As Delivered Left Rear ¾ View of Test Vehicle



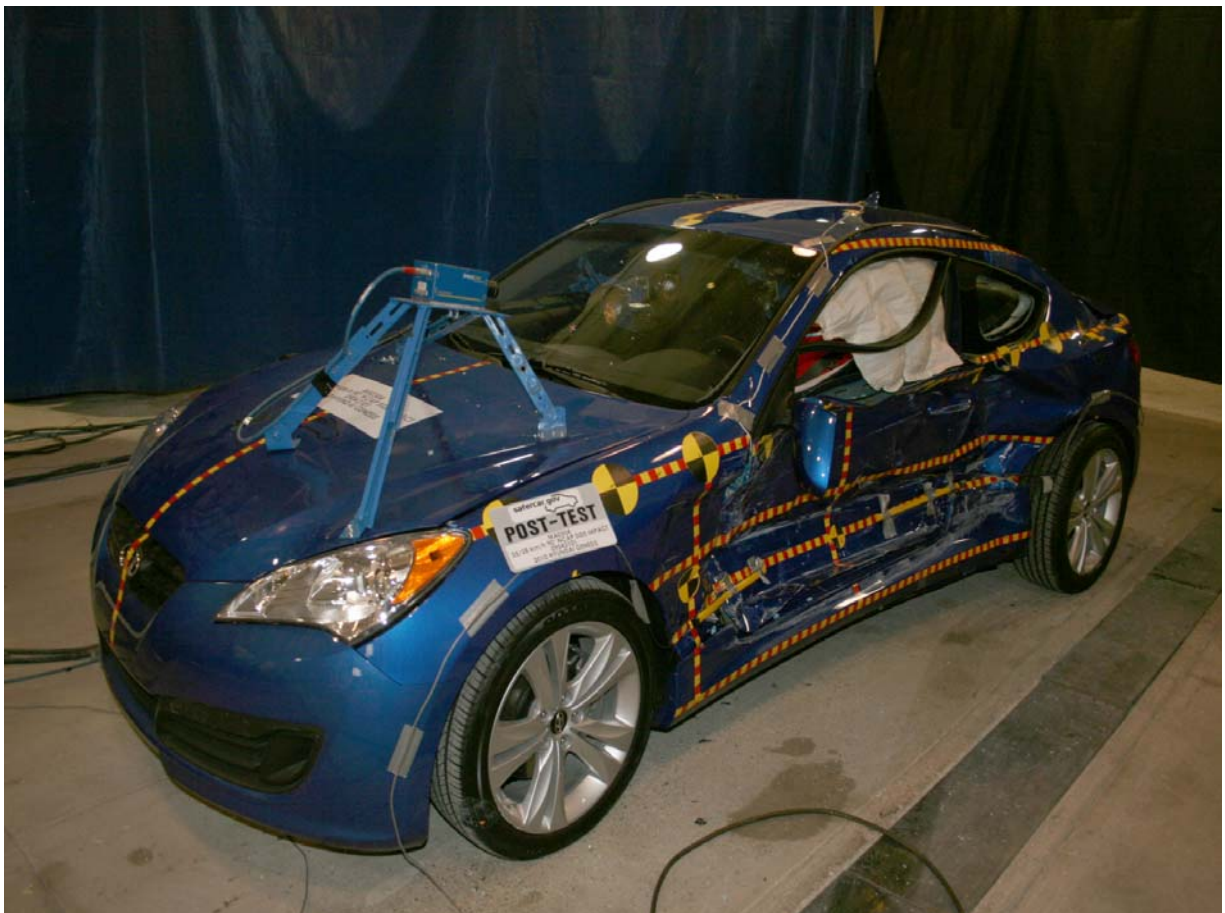
Pre-Test Frontal View of Test Vehicle



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



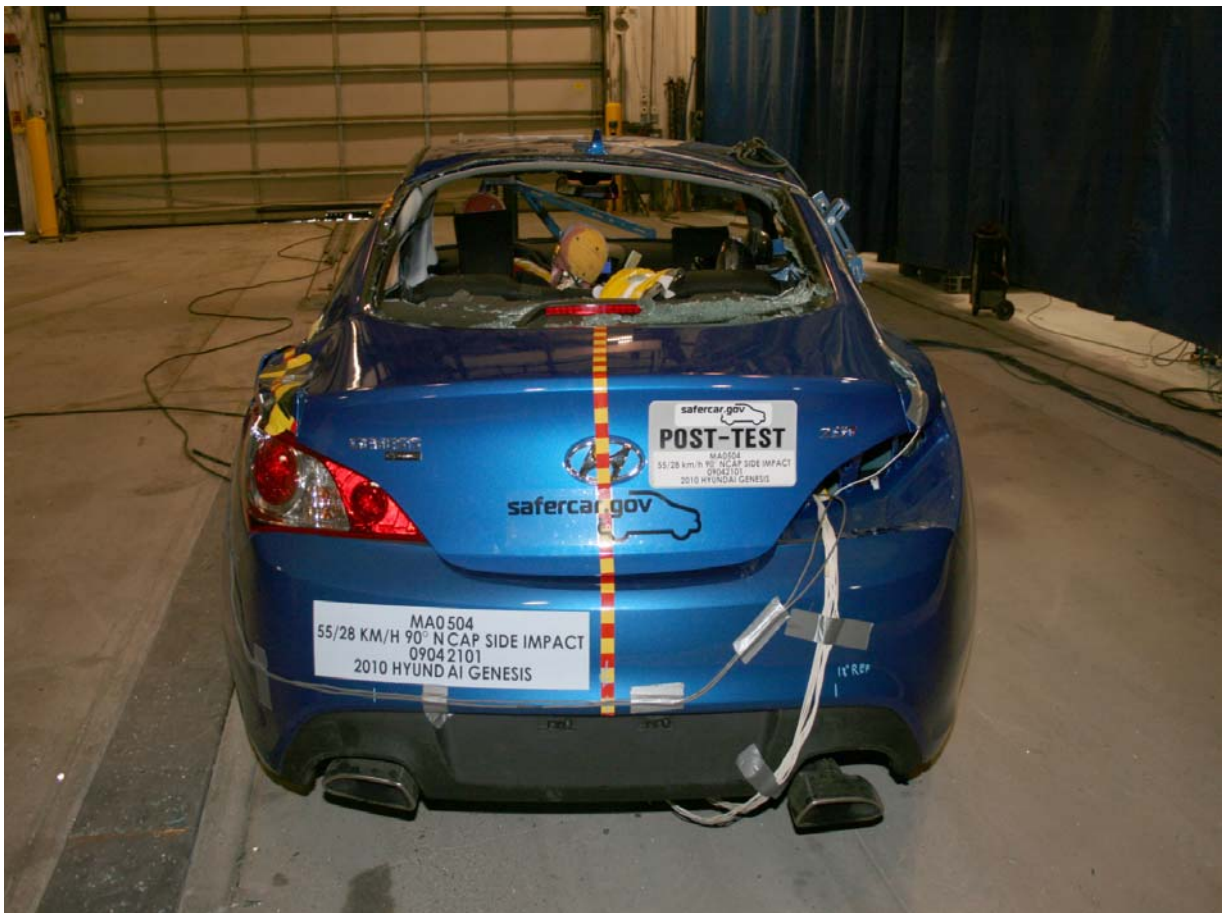
Pre-Test Left $\frac{3}{4}$ Rear View of Test Vehicle



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



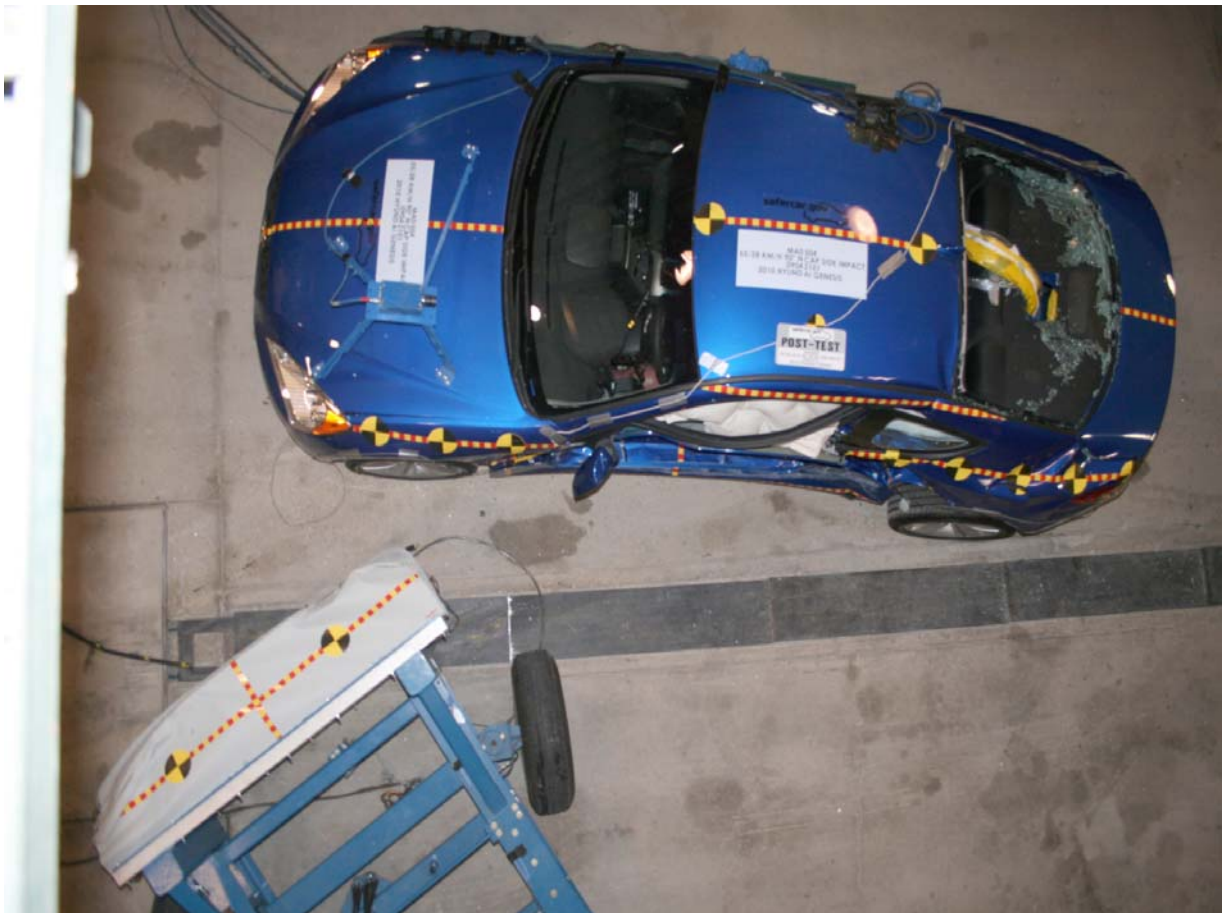
Pre-Test Right Side View of Test Vehicle



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 at the Ideal Impact Point



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 at the Ideal Impact Point



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



Pre-Test Close-Up View of Impact Point Target



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



Pre-Test Left Front Door Latch Close-Up



Post-Test Left Front Door Latch Close-Up

NO REAR DOOR

Pre-Test Left Rear Door Latch Close-Up

NO REAR DOOR

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



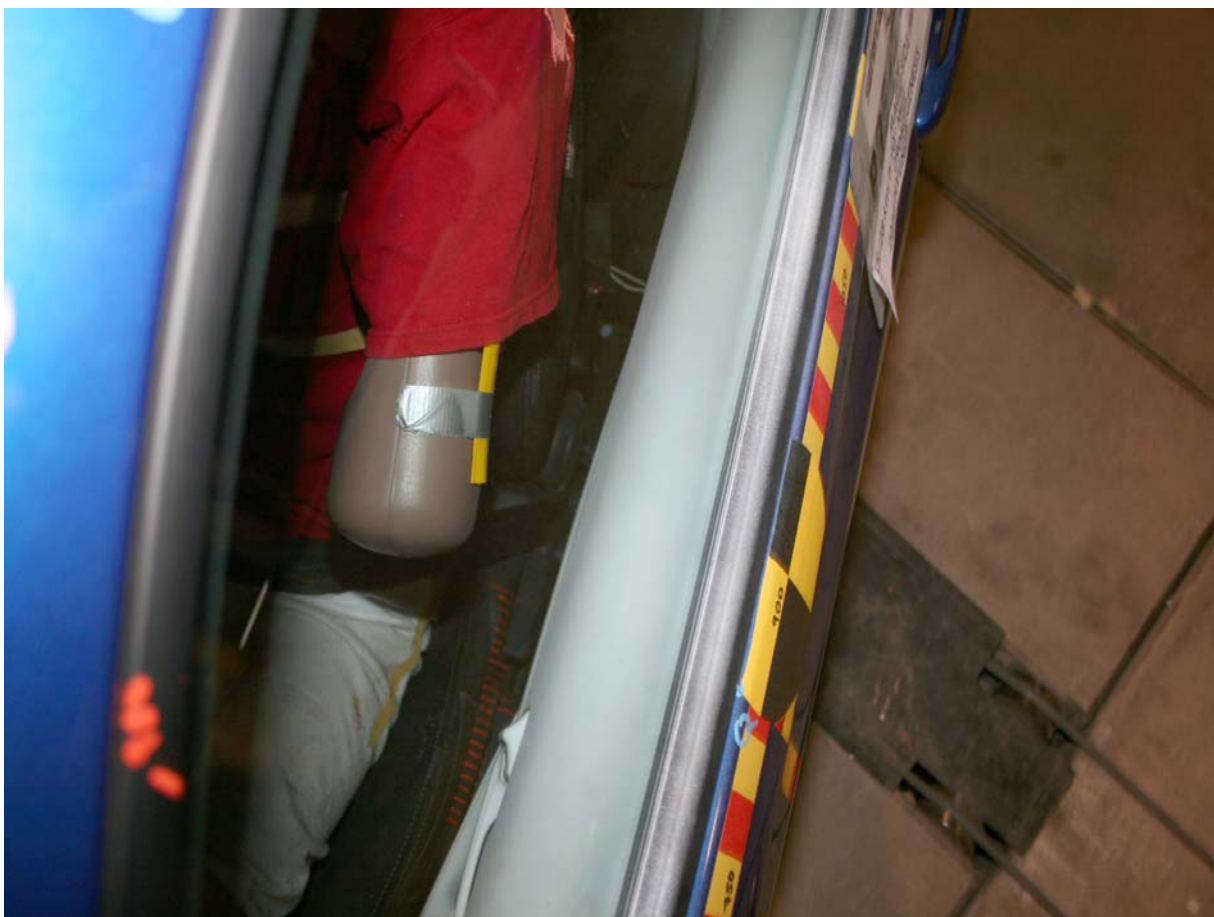
Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



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

NO PHOTO AVAILABLE

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



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



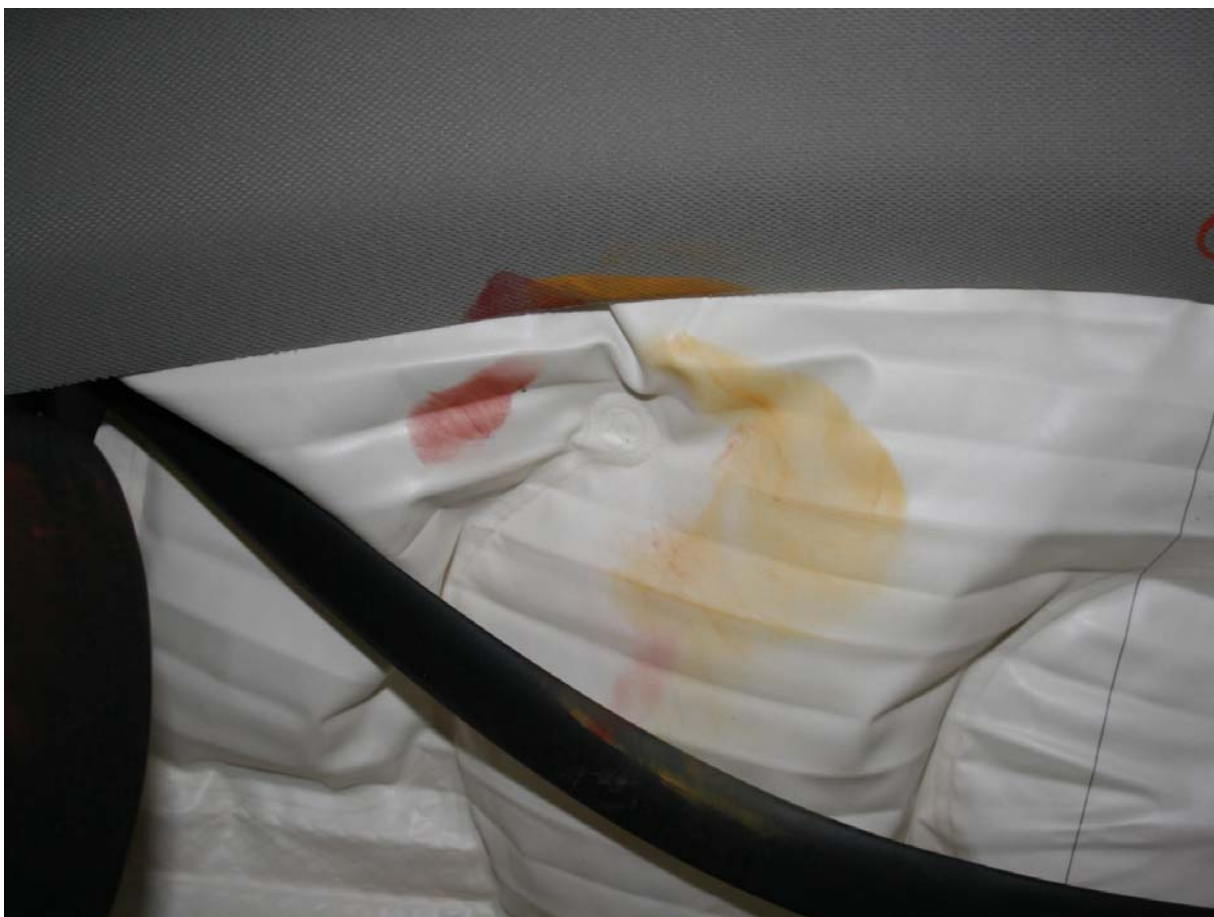
Post-Test Right Side View of Front Seat of Occupant Compartment

NO PHOTO AVAILABLE

Pre-Test Driver Inner Door Panel View



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



Post-Test Driver Dummy Head Contact View



Post-Test Driver Dummy Door Contact View

NO REAR DOOR

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 Close-Up Left Side View of Passenger Seat Track Showing Seat Positioning



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



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



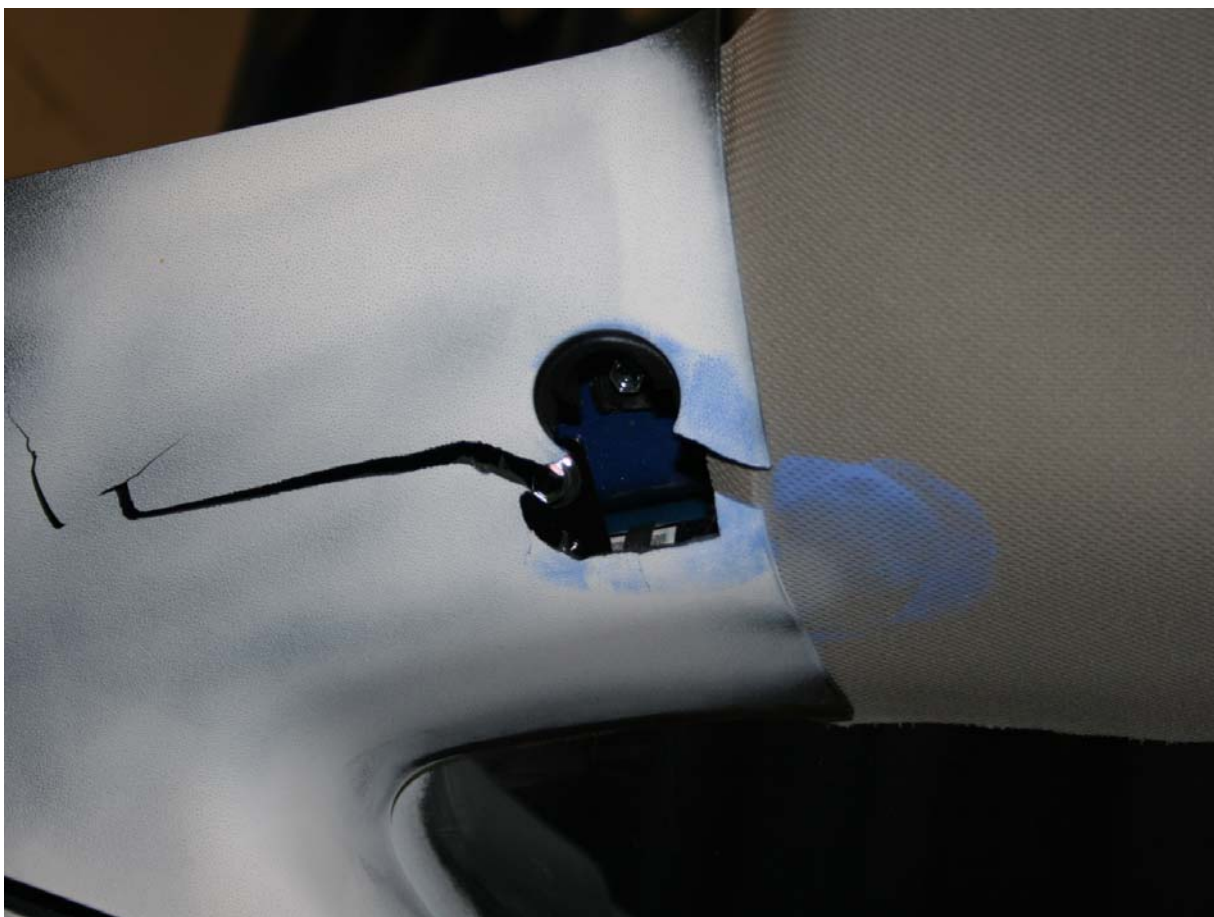
Post-Test Right Side View of Rear Seat of Occupant Compartment

NO REAR DOOR

Pre-Test Passenger Inner Door Panel View



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



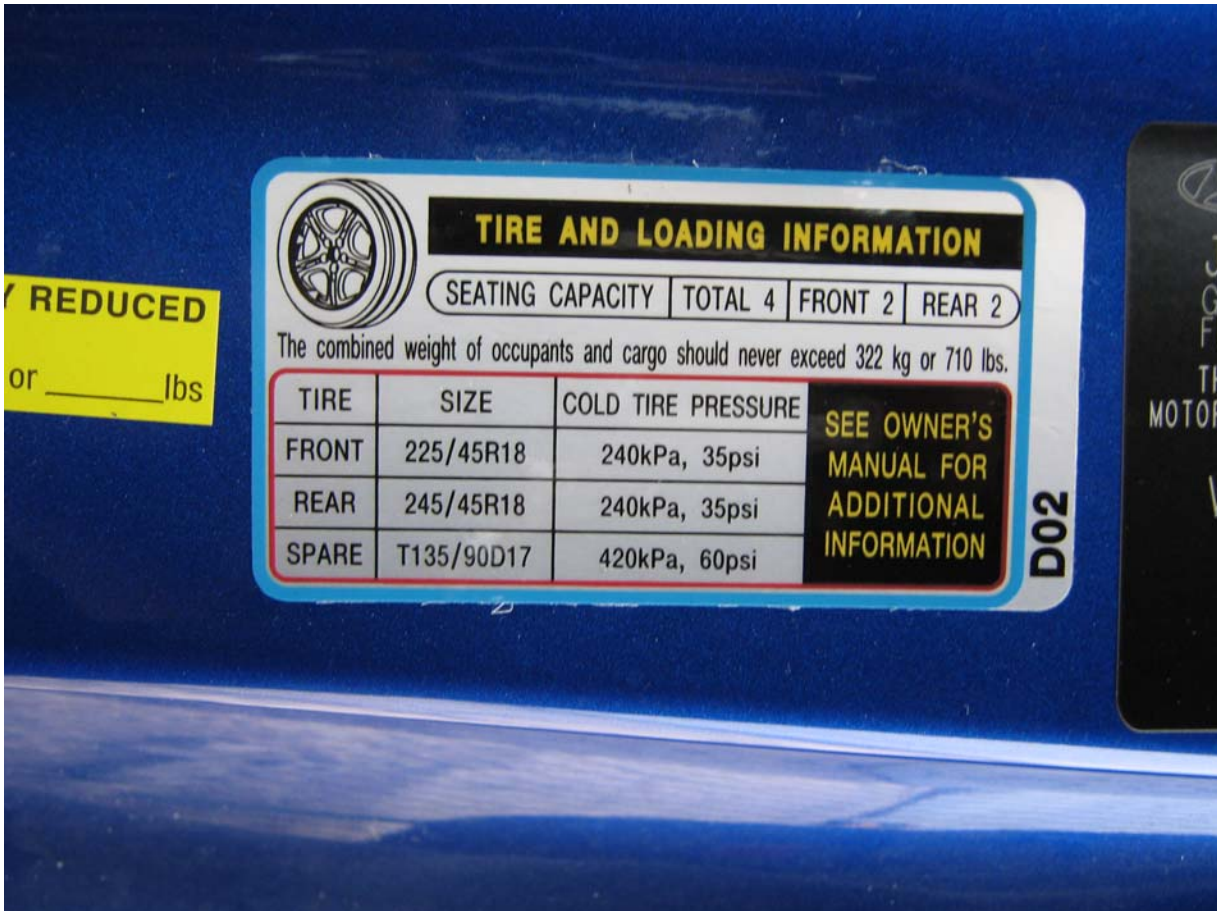
Post-Test Passenger Dummy Head Contact View



Post-Test Passenger Dummy Door Contact View



Close-Up View of Vehicle's Certification Label



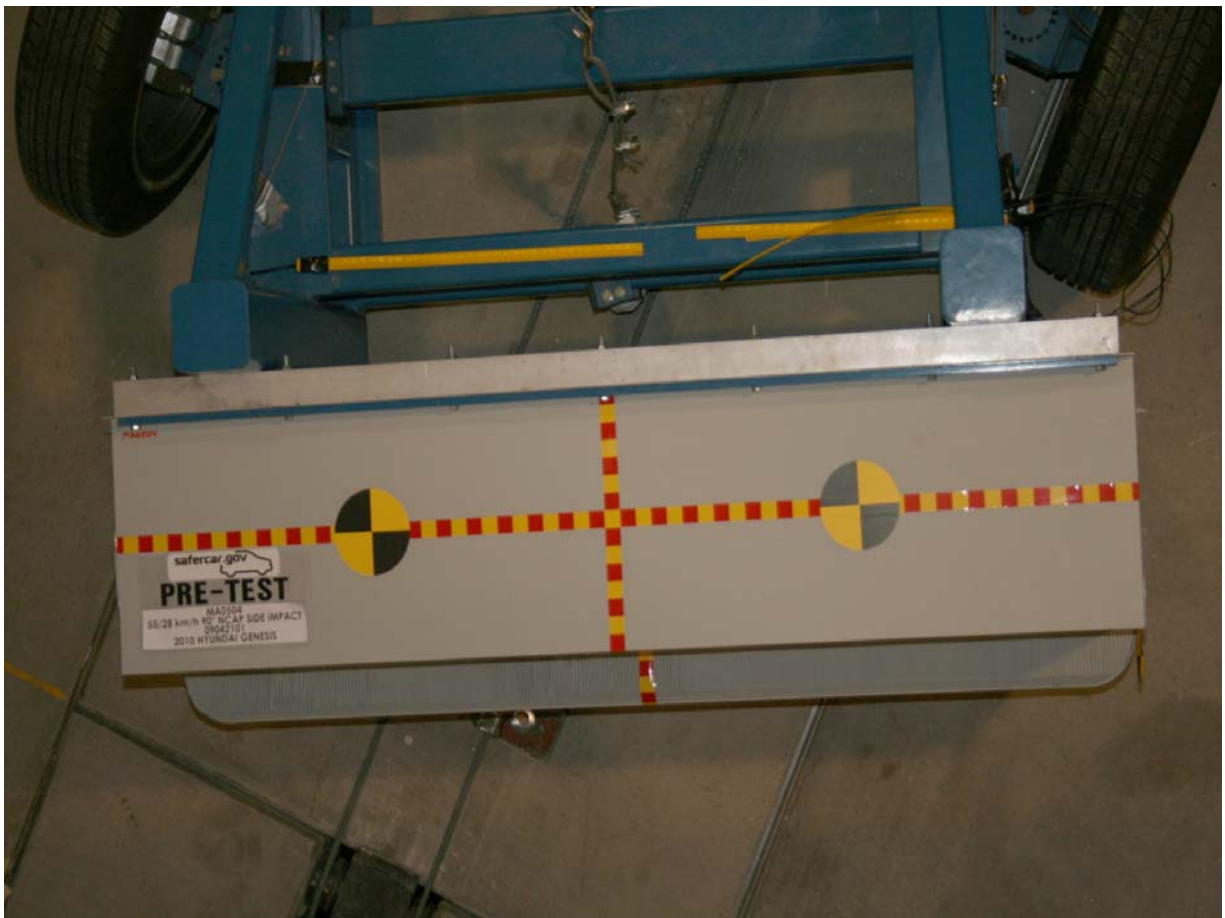
Close-Up View of Vehicle's Tire Information Placard of Label



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



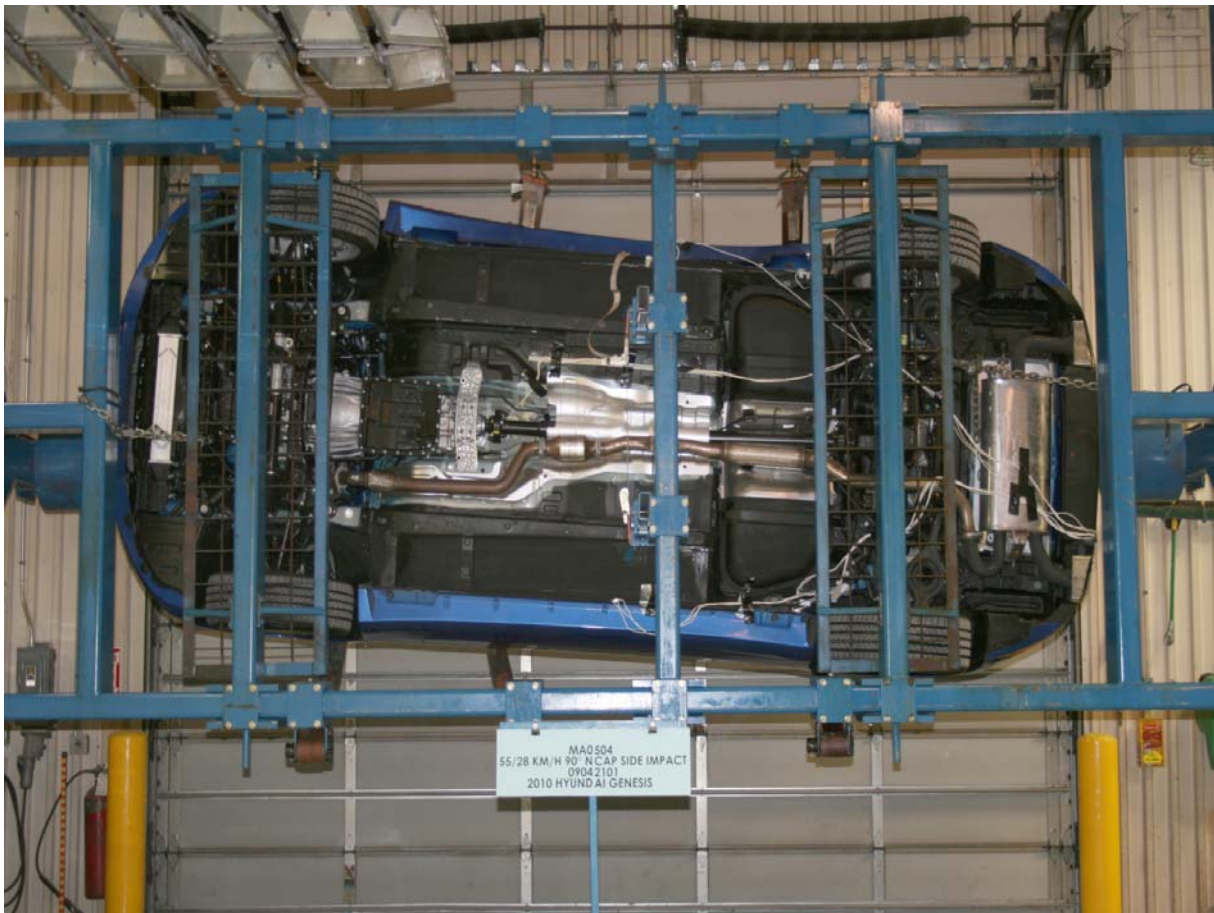
Post-Test Primary and Redundant Speed Trap Velocity Read-Out with Placard Showing NHTSA Number



FMVSS No. 301/305 Rollover 0 Degrees



FMVSS No. 301/305 Rollover 90 Degrees



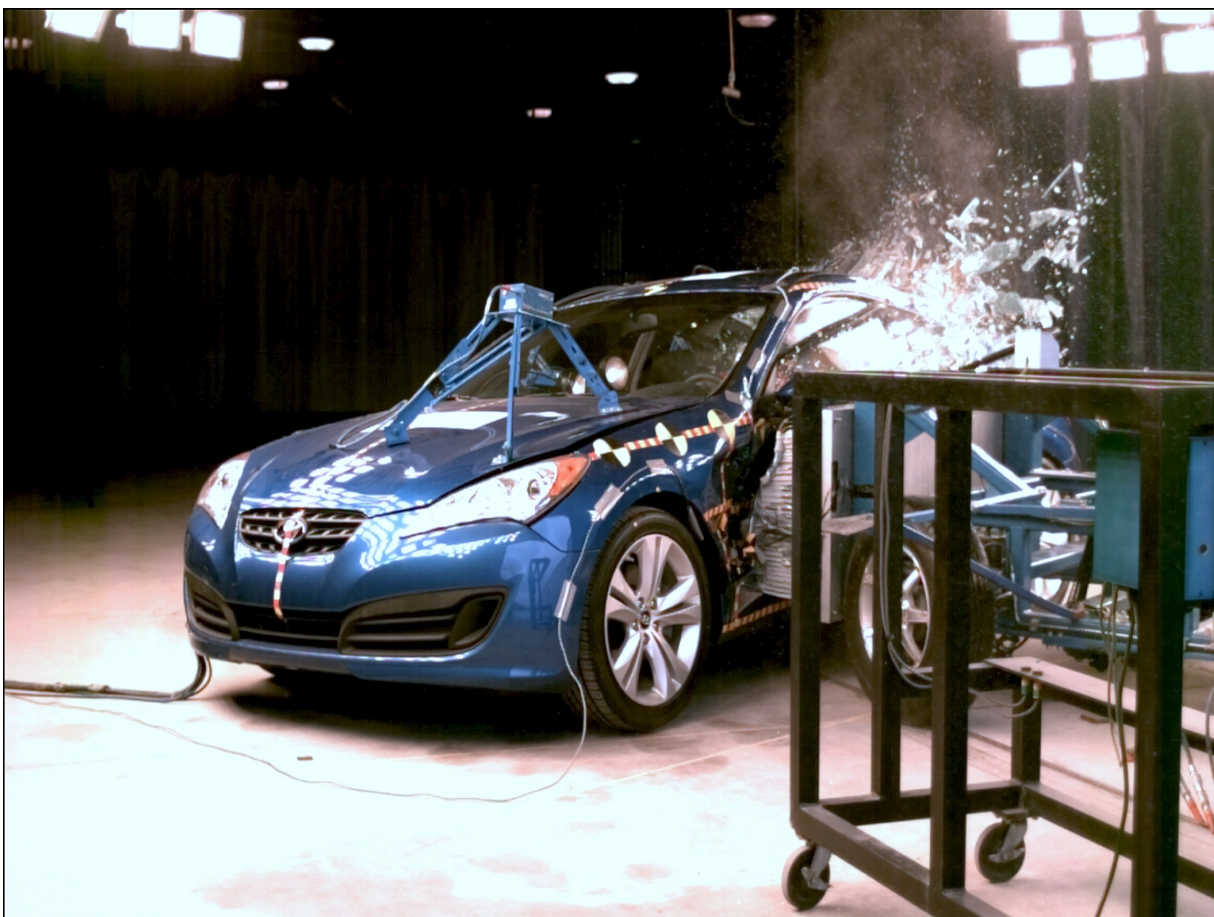
FMVSS No. 301/305 Rollover 180 Degrees



FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees



Impact Event (Impact Side)



Post-Test Driver Dummy Head Contact View 2



Post-Test Passenger Dummy Door Contact View 2

APPENDIX B
DUMMY RESPONSE DATA

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Driver & Passenger Dummy Instrumentation Plots
FILTERED DATA

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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) (not recorded)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z) (not recorded)

Passenger Upper Neck Force (X)

Passenger Upper Neck Force (Y)

Passenger Upper Neck Force (Z)

Passenger Upper Neck Moment About X

Passenger Upper Neck Moment About Y

Passenger Upper Neck Moment About Z

Passenger Shoulder Deflection (Y)

Passenger Upper Thorax Rib Deflection (Y)

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Driver Shoulder Contact Switch

Driver Torso Contact Switch

Driver Pelvis Contact Switch

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Passenger Shoulder Contact Switch

Passenger Torso Contact Switch

Passenger Pelvis Contact Switch

Vehicle Instrumentation Data

Driver Side Airbag Timing

Driver Side Curtain Airbag Timing (not installed)

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)

Upper A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Upper 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)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

MDB Center of Gravity Resultant Acceleration (not reported)

MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

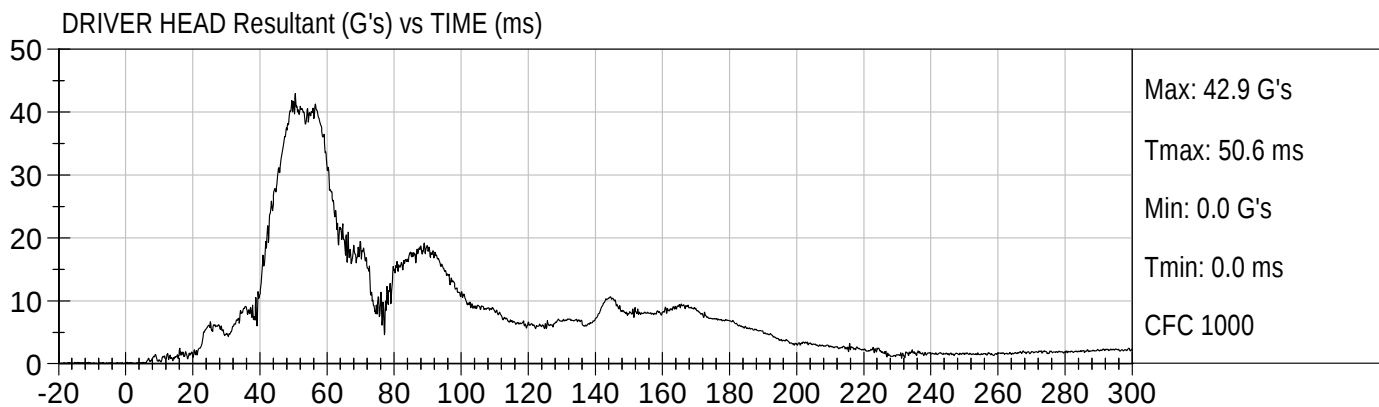
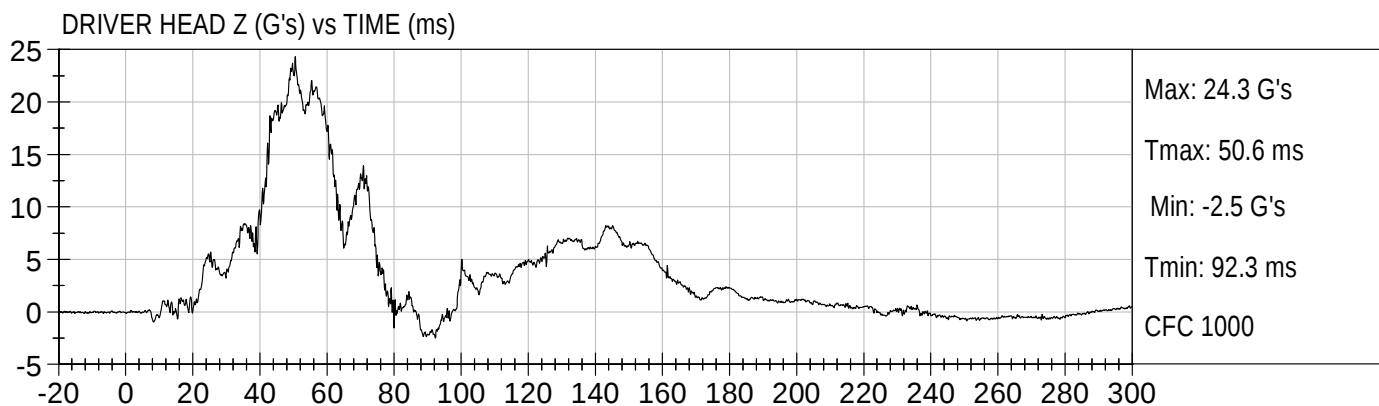
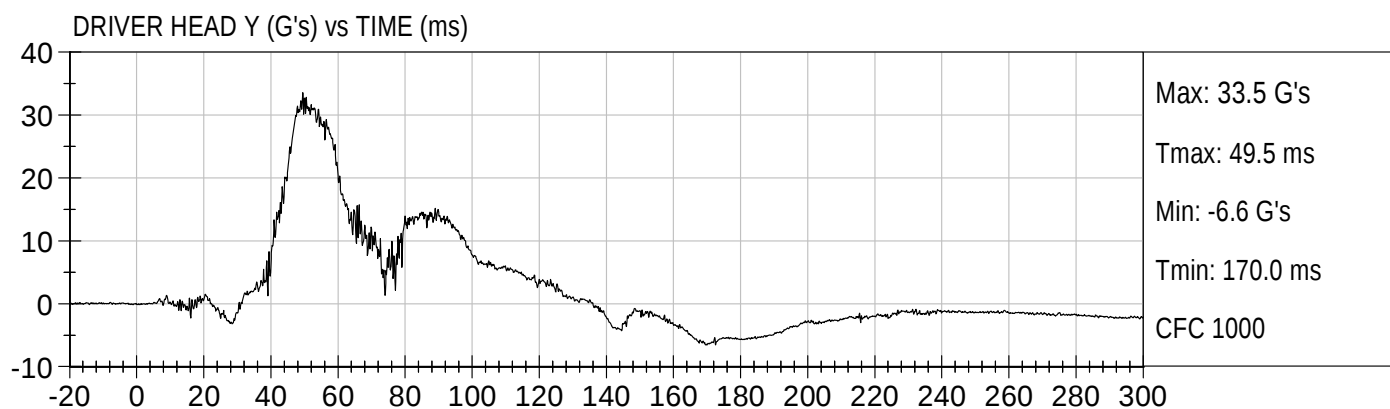
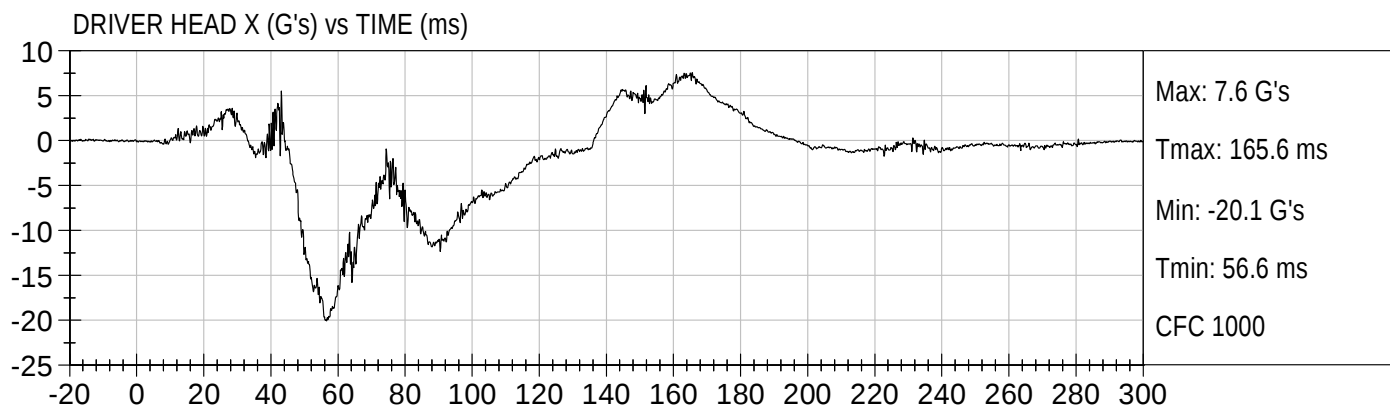
Left MDB Contact Switch

Right MDB Contact Switch



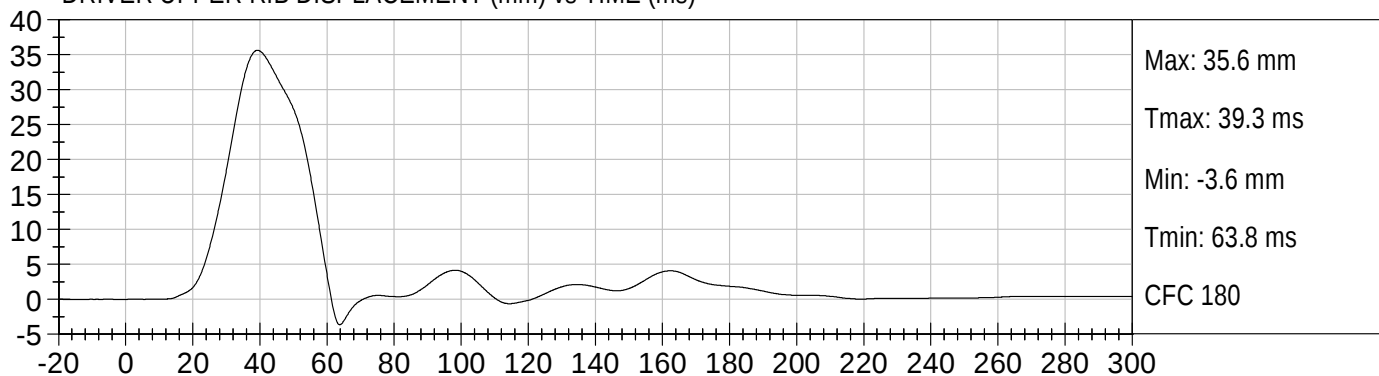
55/28 km/h 90° NCAP Side Impact
2010 Hyundai Genesis - MA0504

Test Date: 04/21/2009
Speed: 38.9 mph (62.6 km/h)

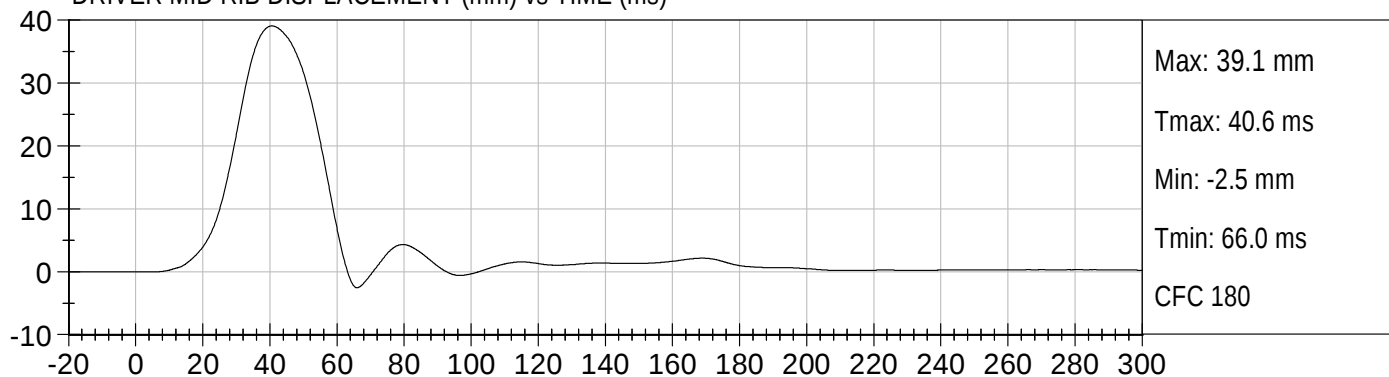




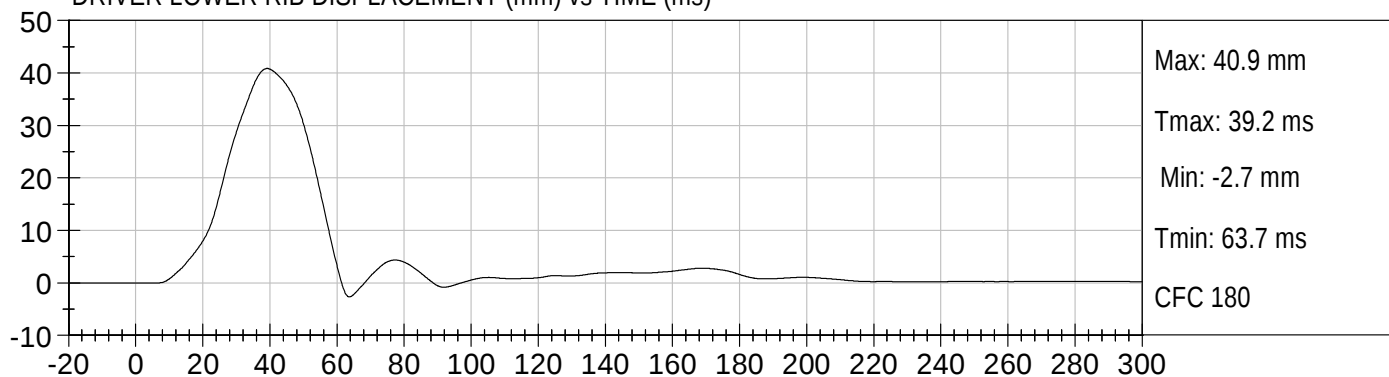
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



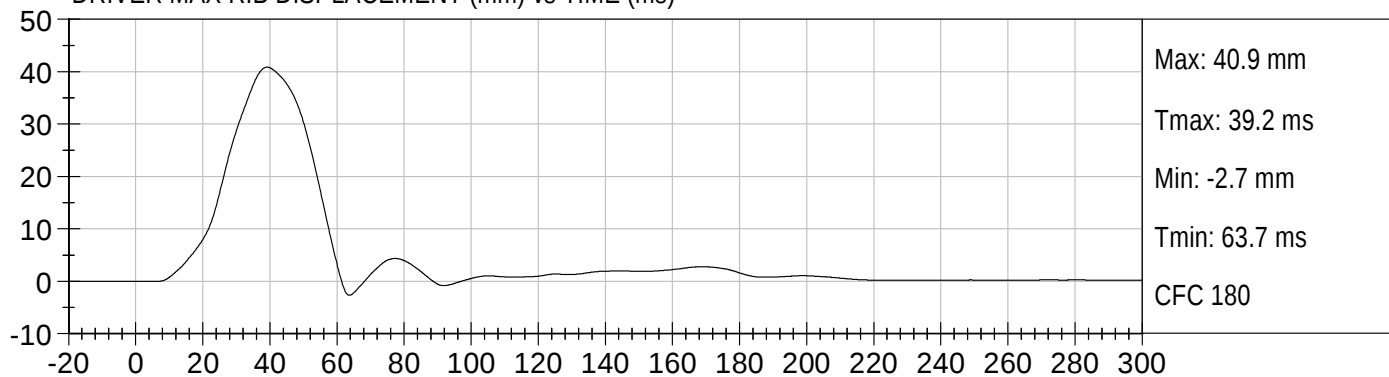
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



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

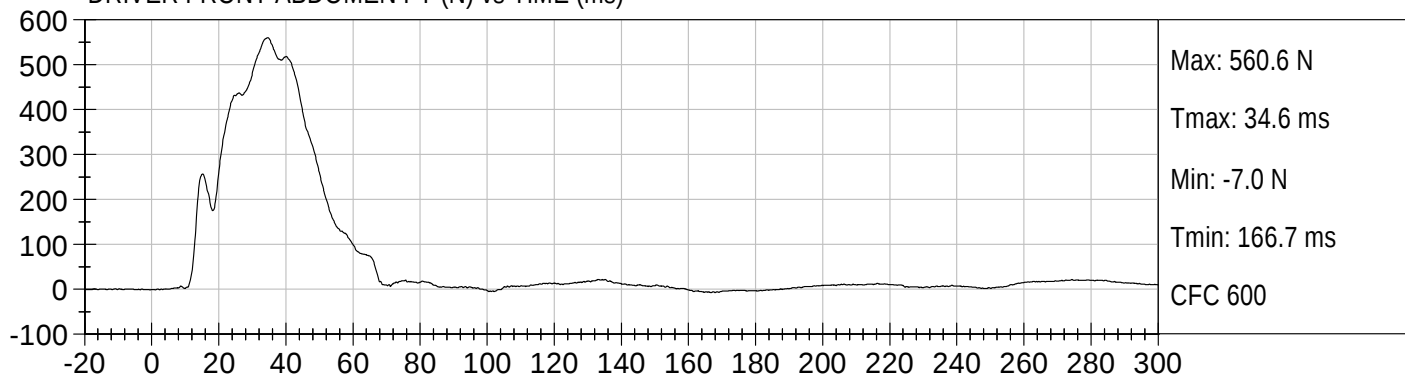


DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)

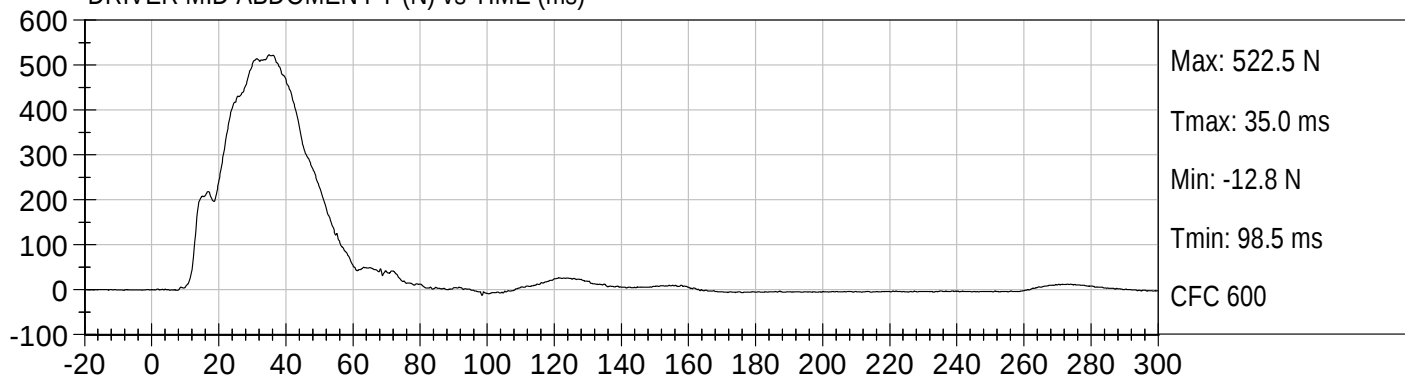




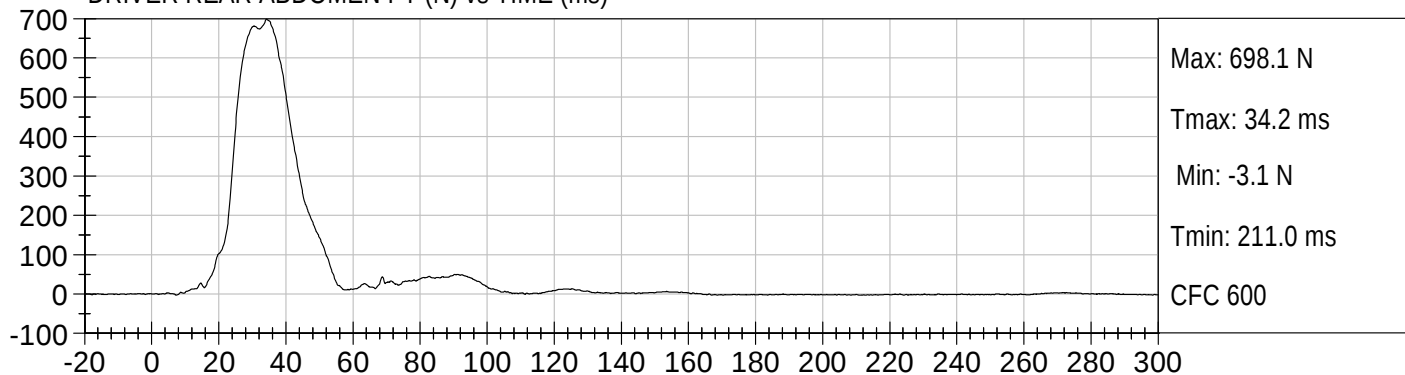
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



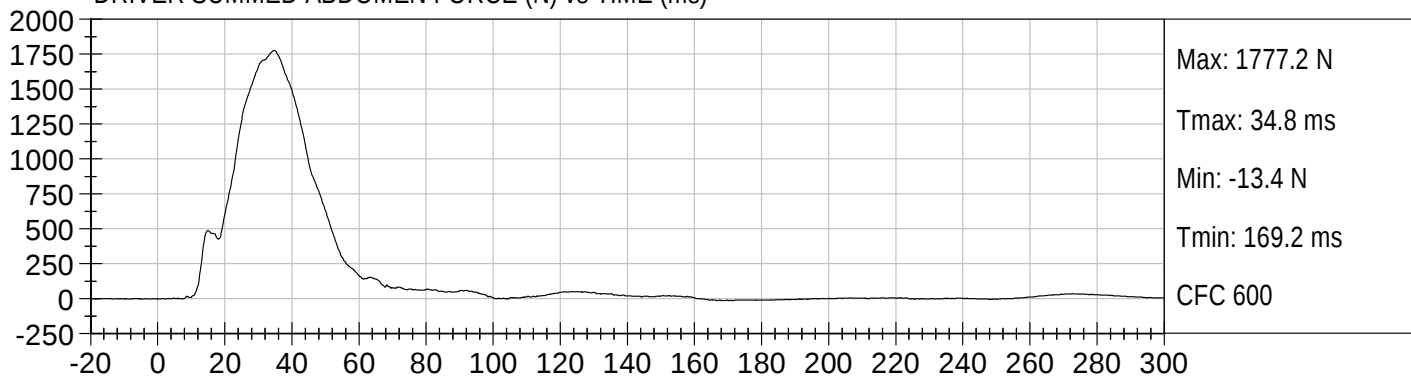
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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



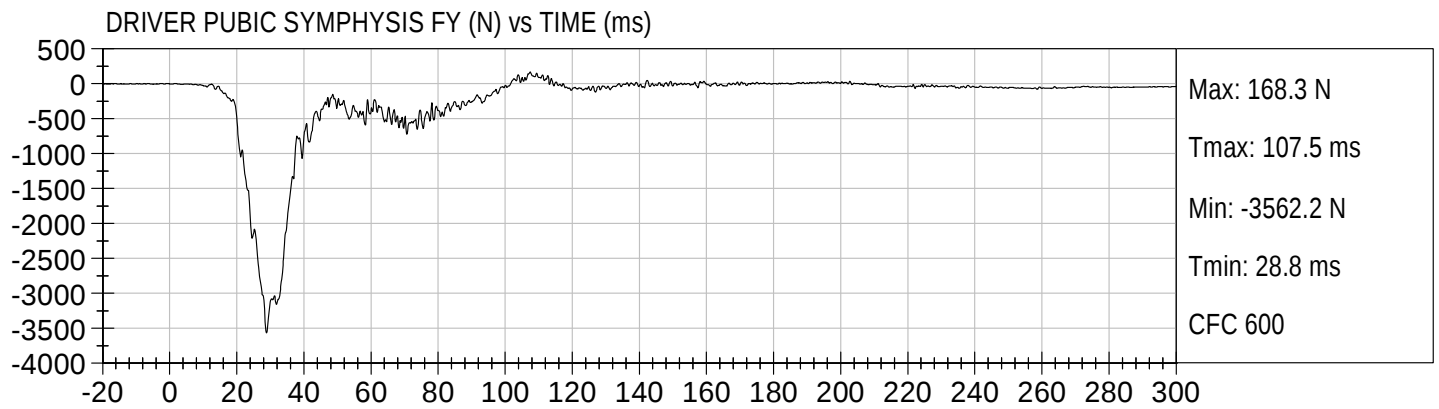
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)





55/28 km/h 90° NCAP Side Impact
2010 Hyundai Genesis - MA0504

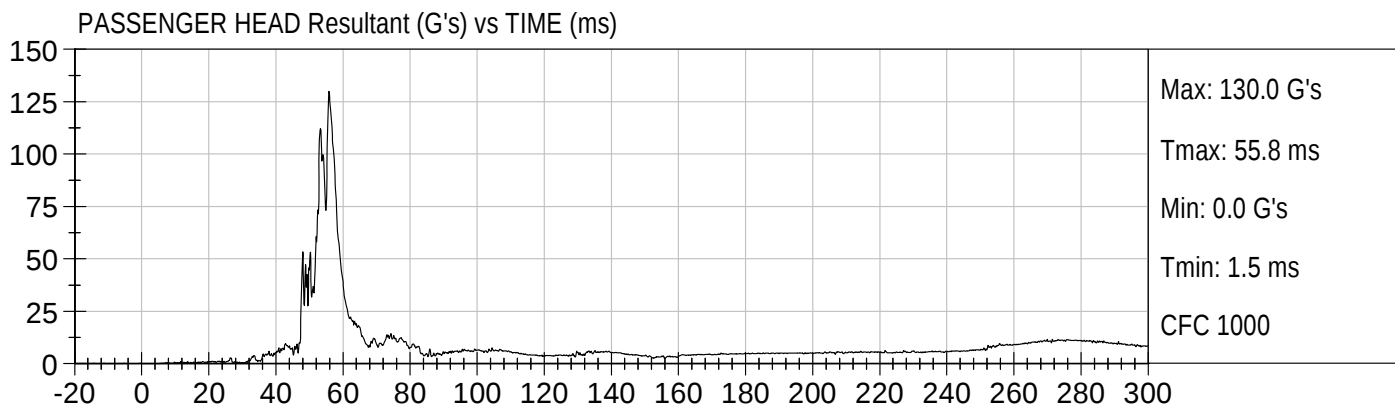
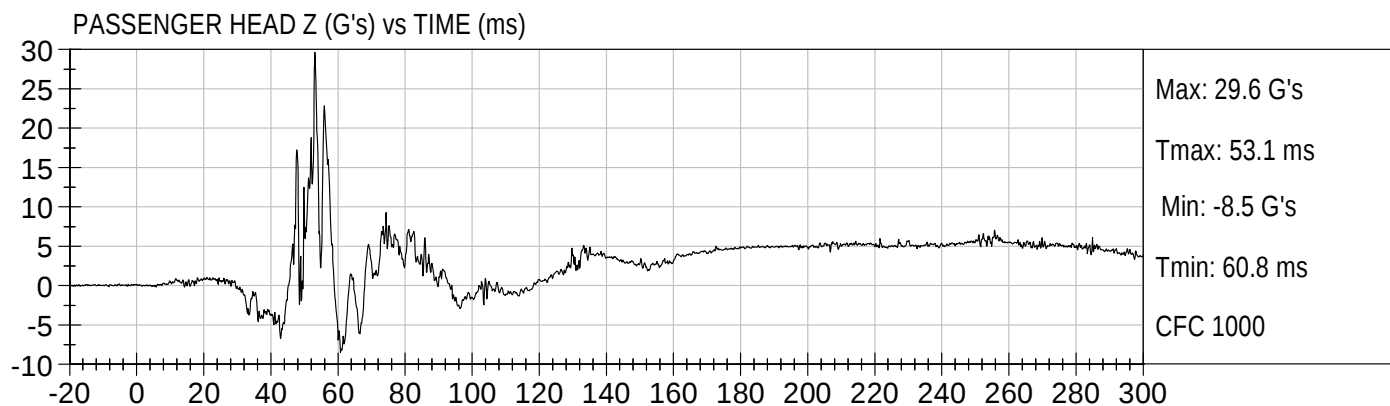
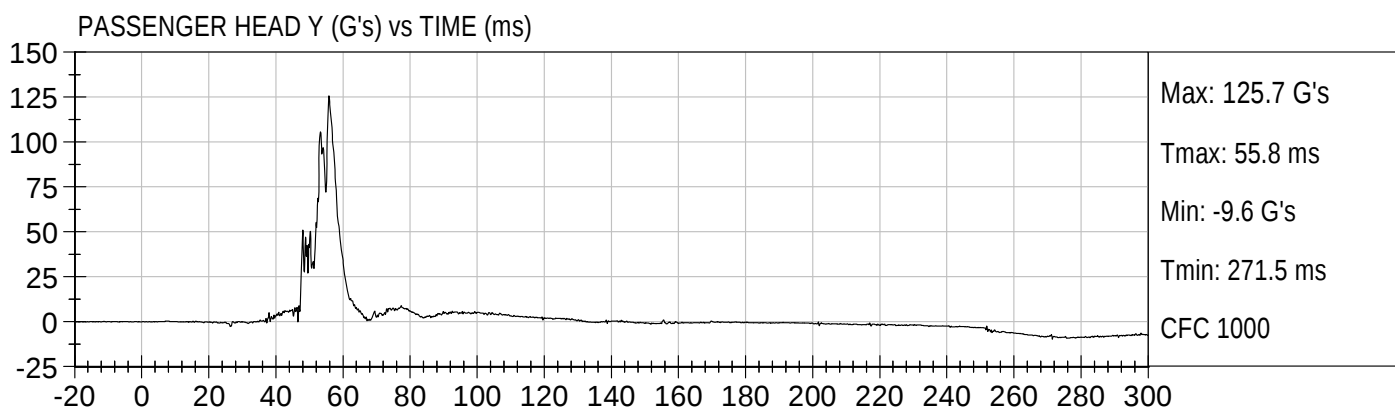
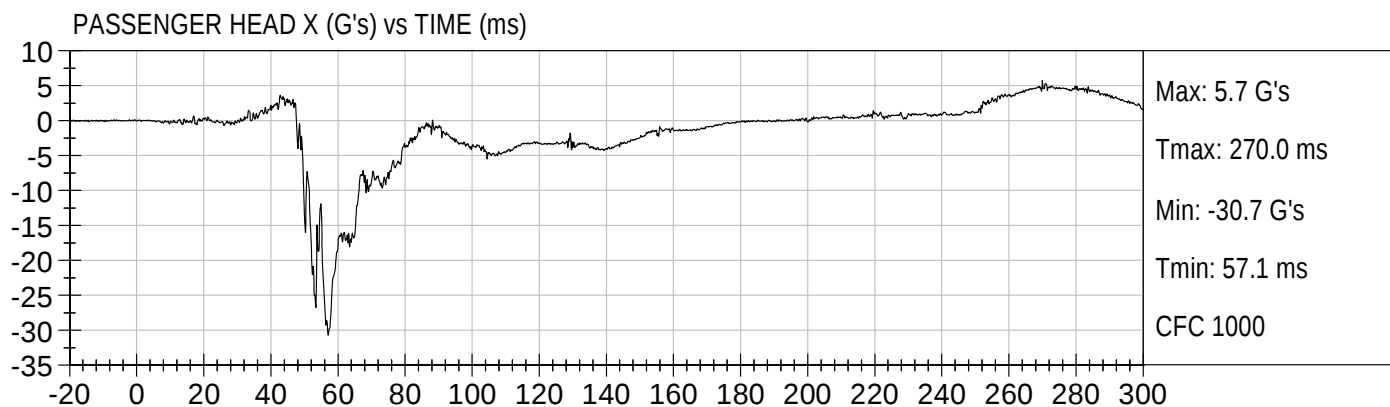
Test Date: 04/21/2009
Speed: 38.9 mph (62.6 km/h)





55/28 km/h 90° NCAP Side Impact
2010 Hyundai Genesis - MA0504

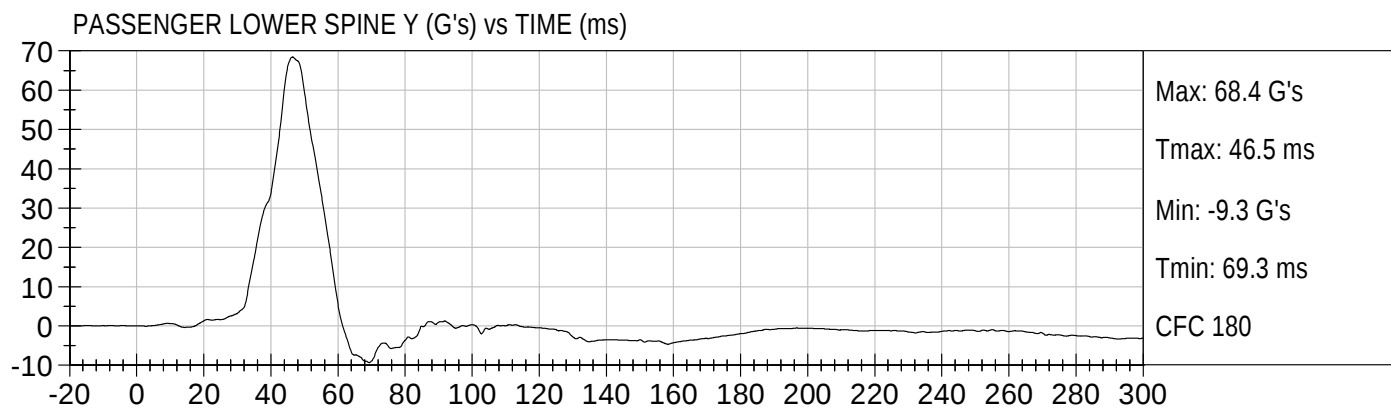
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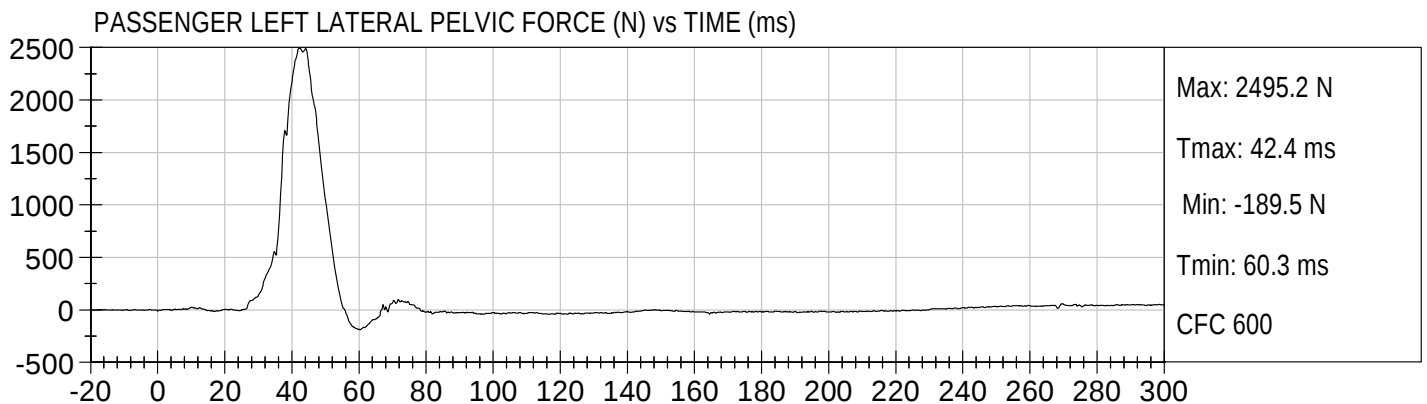
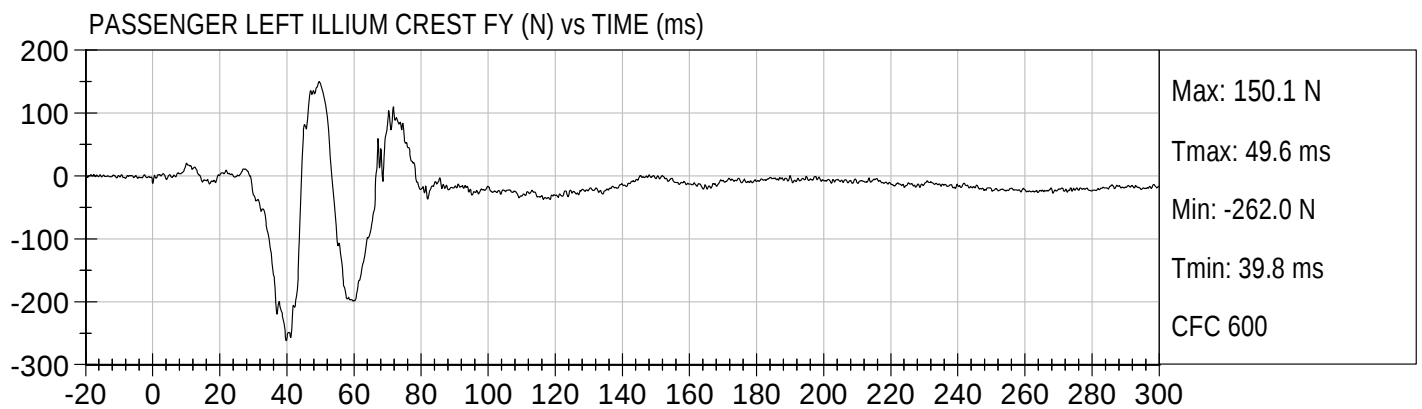
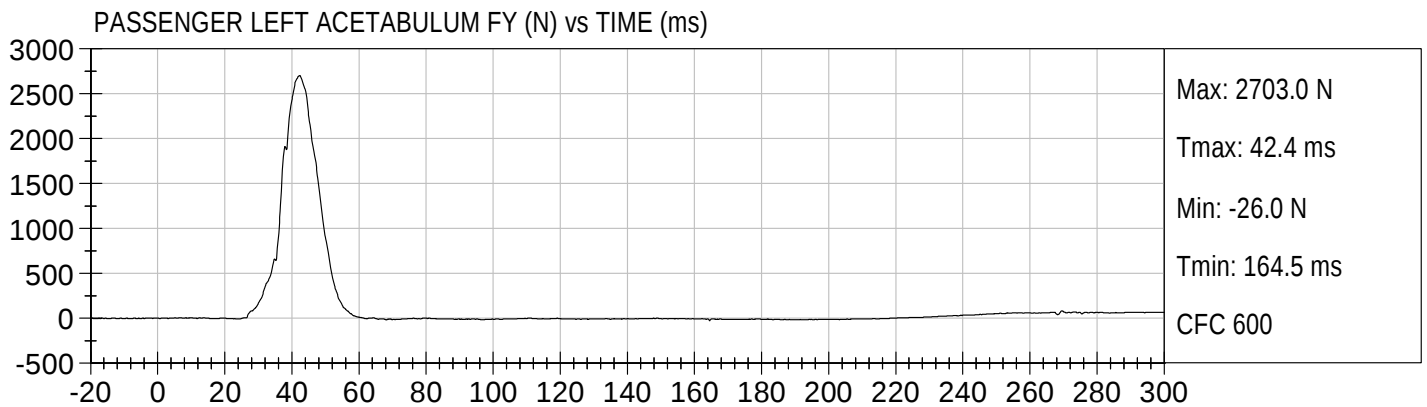




55/28 km/h 90° NCAP Side Impact
2010 Hyundai Genesis - MA0504

Test Date: 04/21/2009
Speed: 38.9 mph (62.6 km/h)





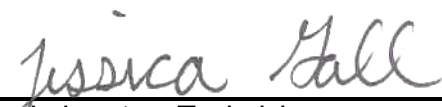
APPENDIX C
DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D09651

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	125 to 155	144	Pass
Peak Lateral Acceleration	G's	+/- 15	6.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

3/26/09
Test Date

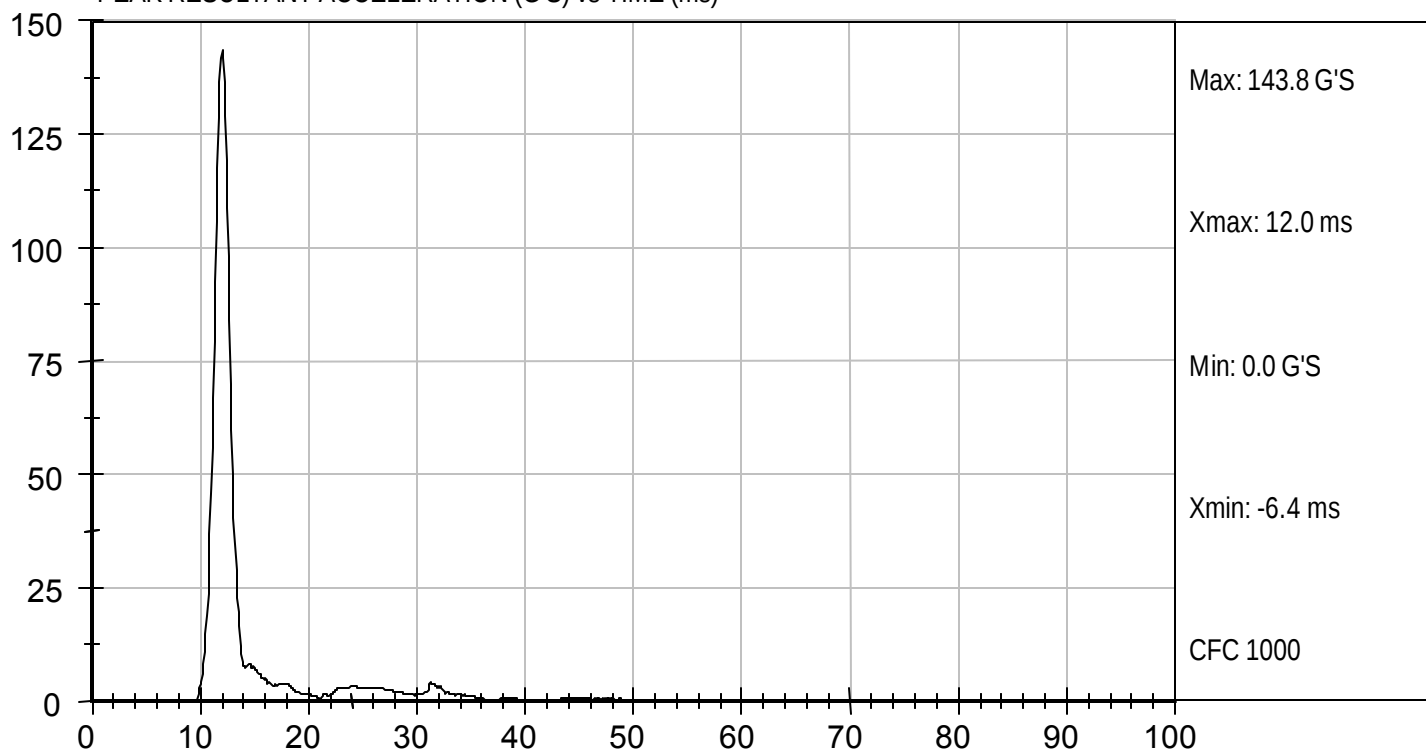

Approved By



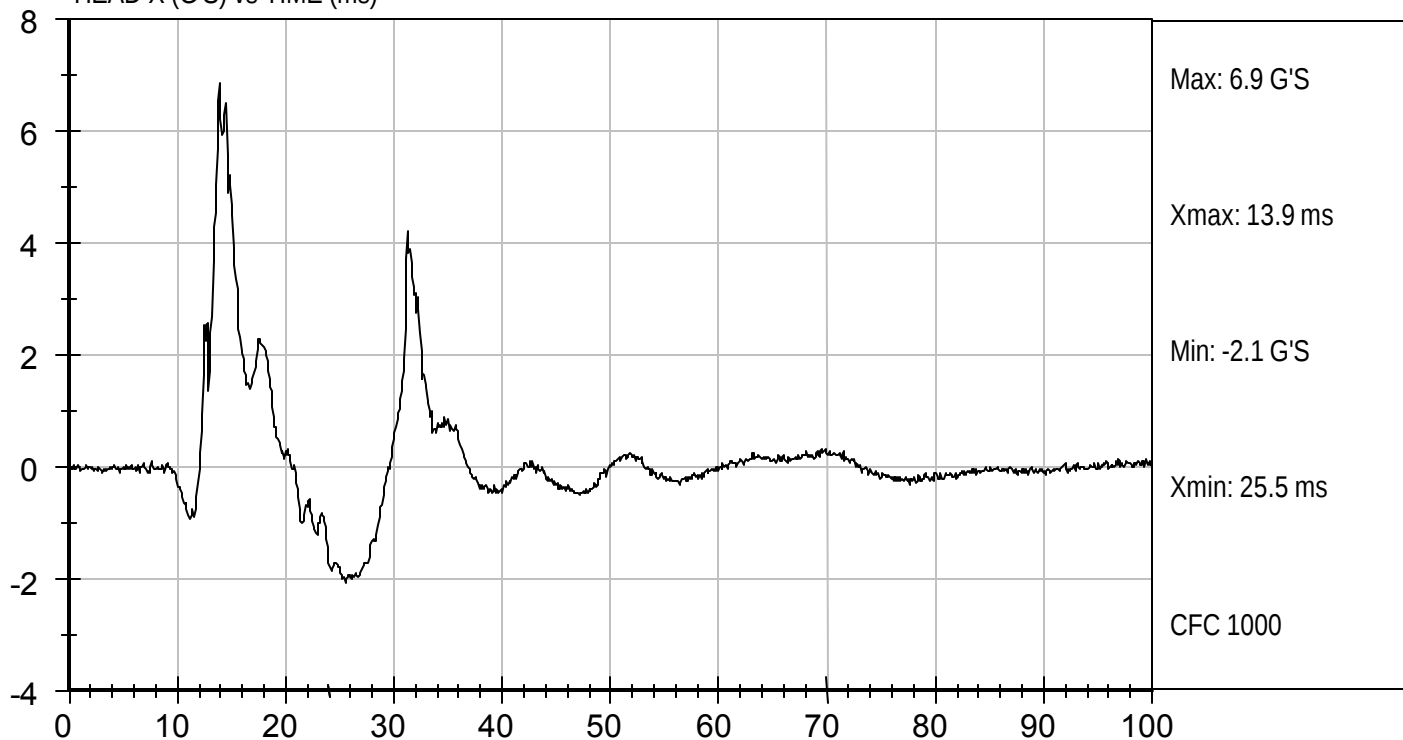
Test Desc: Head Drop
Component ID: D09651

Test Date: 3/26/09
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



HEAD X (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09652

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 msec	G's	0.00 to -0.05	-0.02	Pass
	3 msec	G's	-0.25 to -0.375	-0.30	Pass
	14 msec	G's	-3.20 to -3.70	-3.30	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	54.4	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	63.5	Pass
Head Rotation Decay Time to 0 degree		msec	53 to 88	60.6	Pass
Overall Test Results				Pass	


 Laboratory Technician

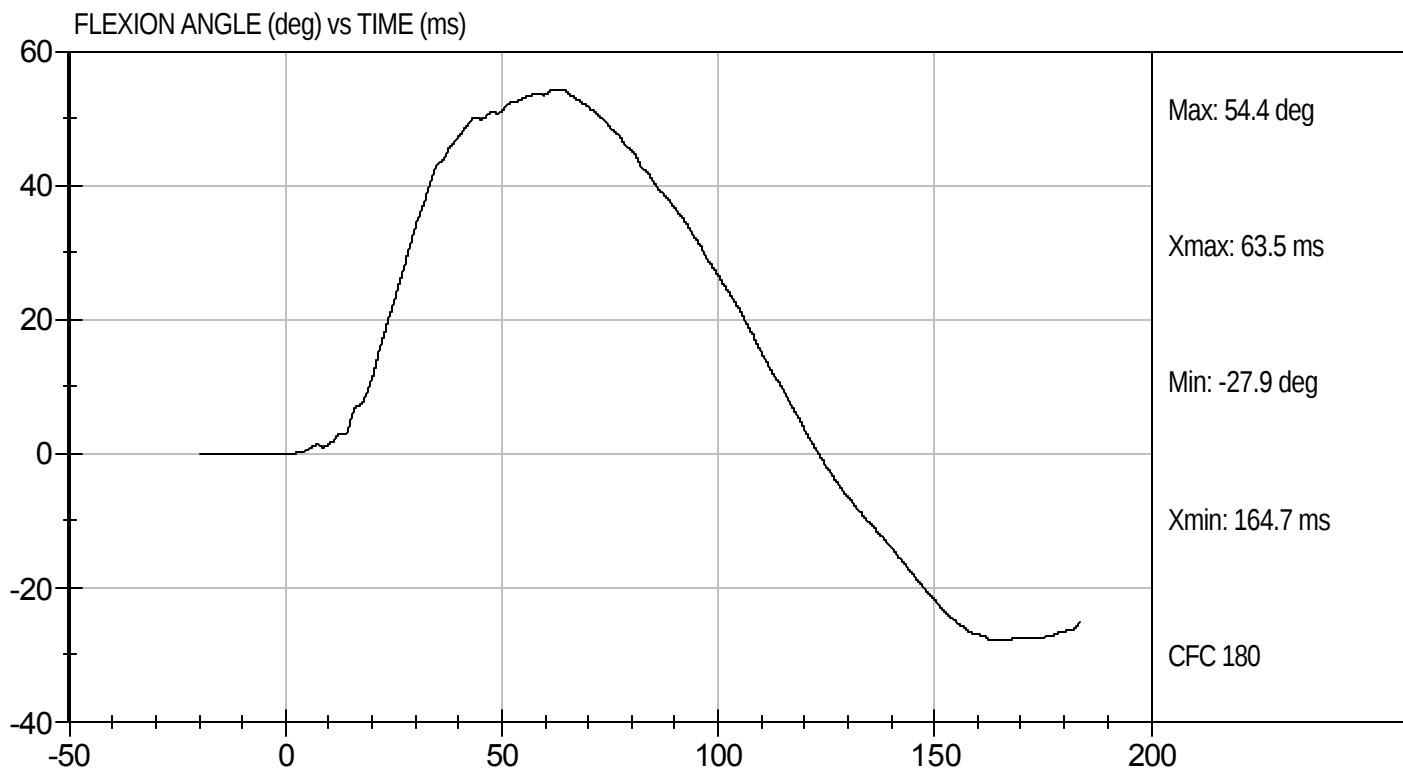
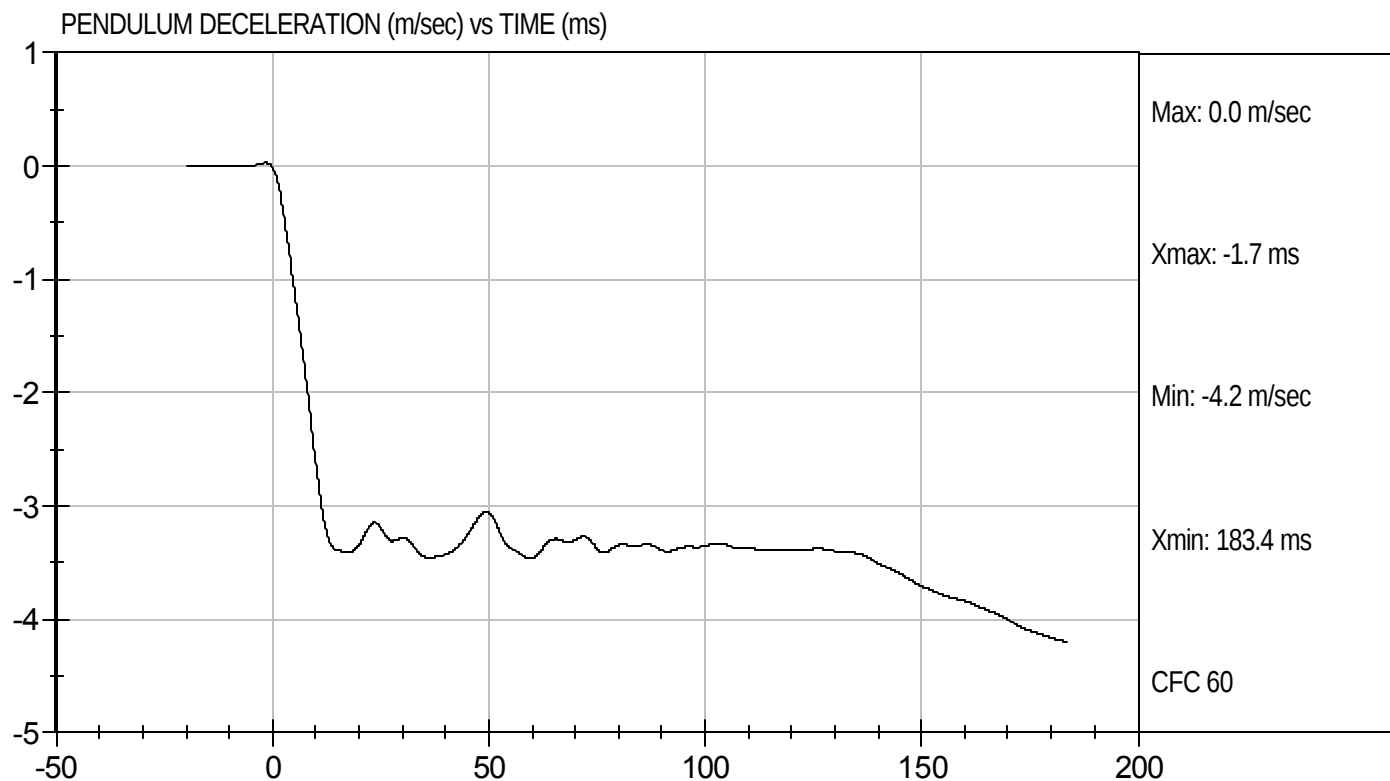
3/26/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D09652

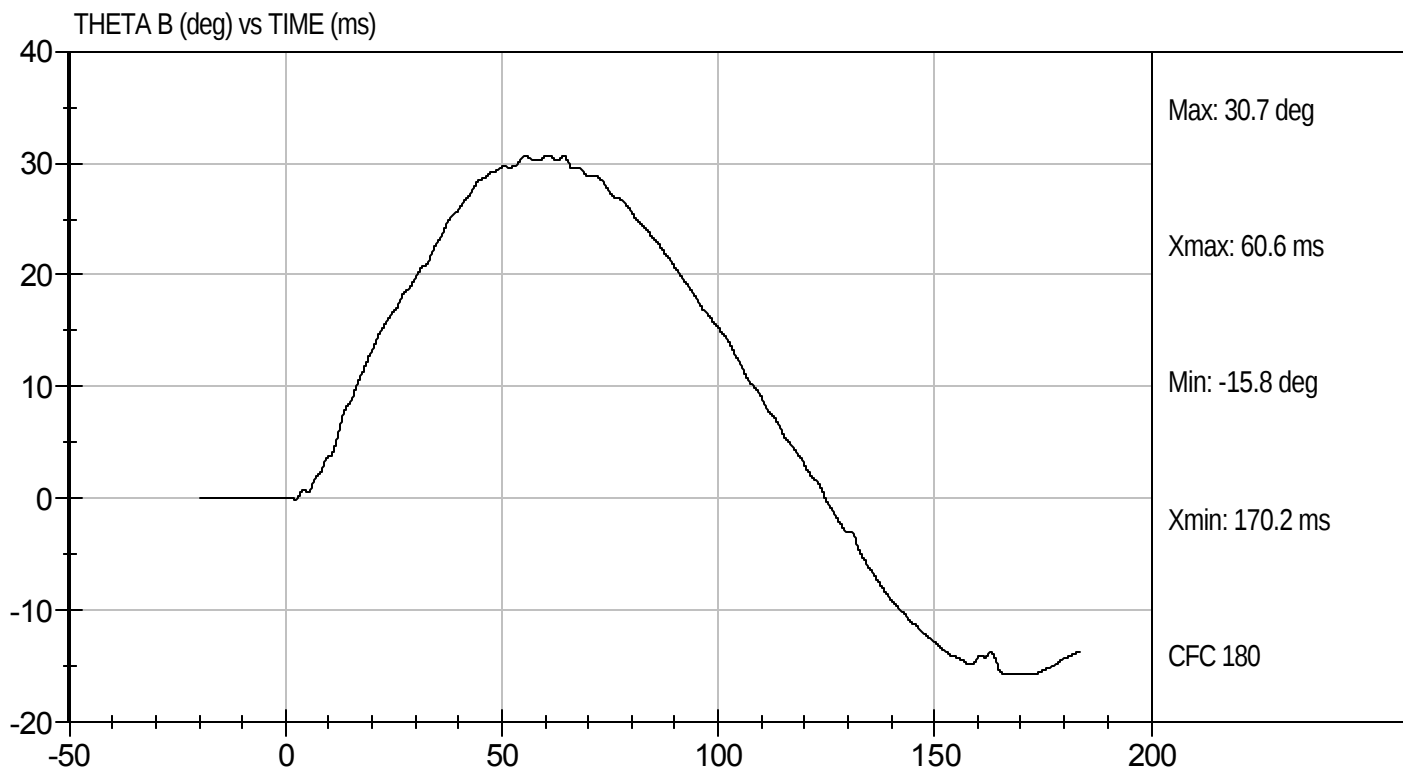
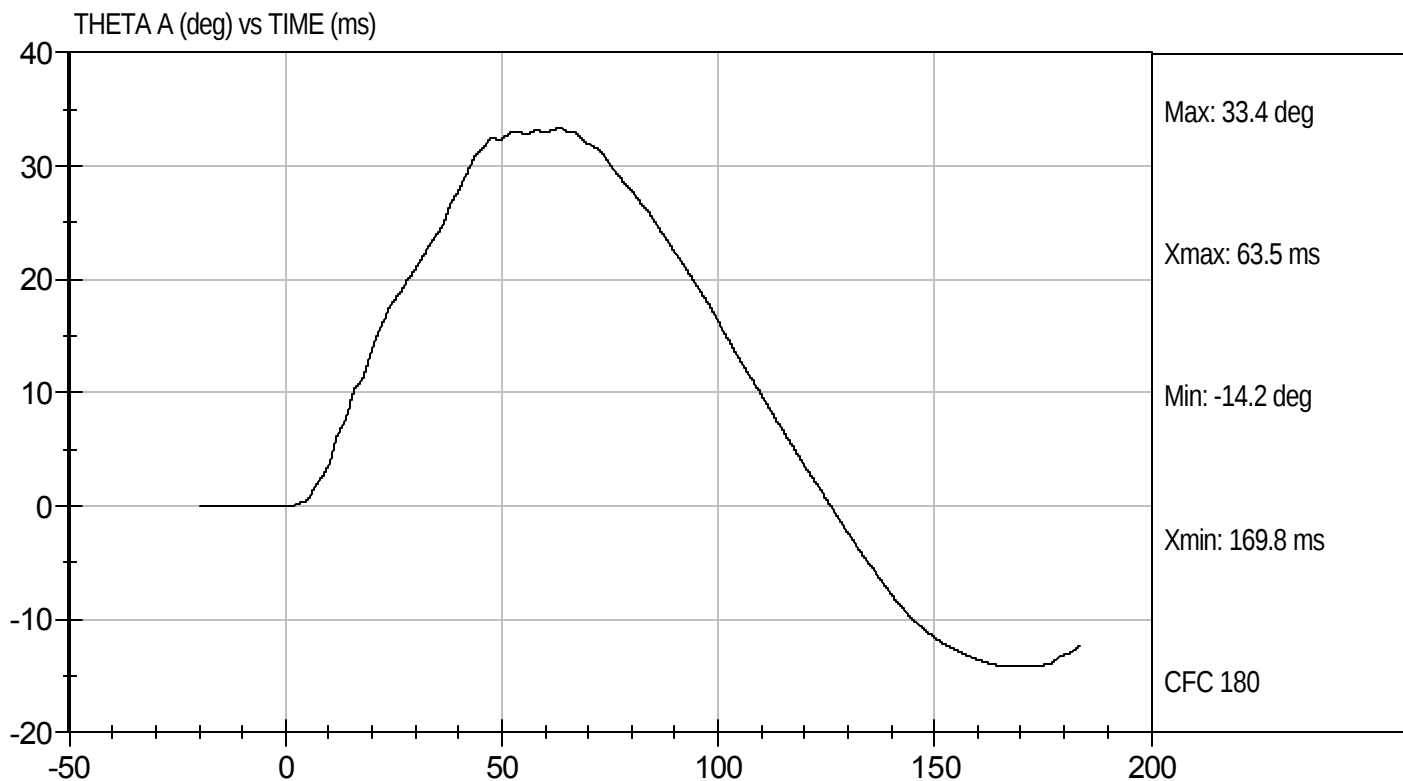
Test Date: 3/26/09
Velocity: 11.5 ft/s, 3.5 m/s





Test Desc: Neck Bending
Component ID: D09652

Test Date: 3/26/09
Velocity: 11.5 ft/s, 3.5 m/s

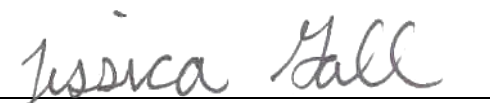


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09653

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	29	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.5	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.4	Pass
Overall Test Results				Pass


Laboratory Technician

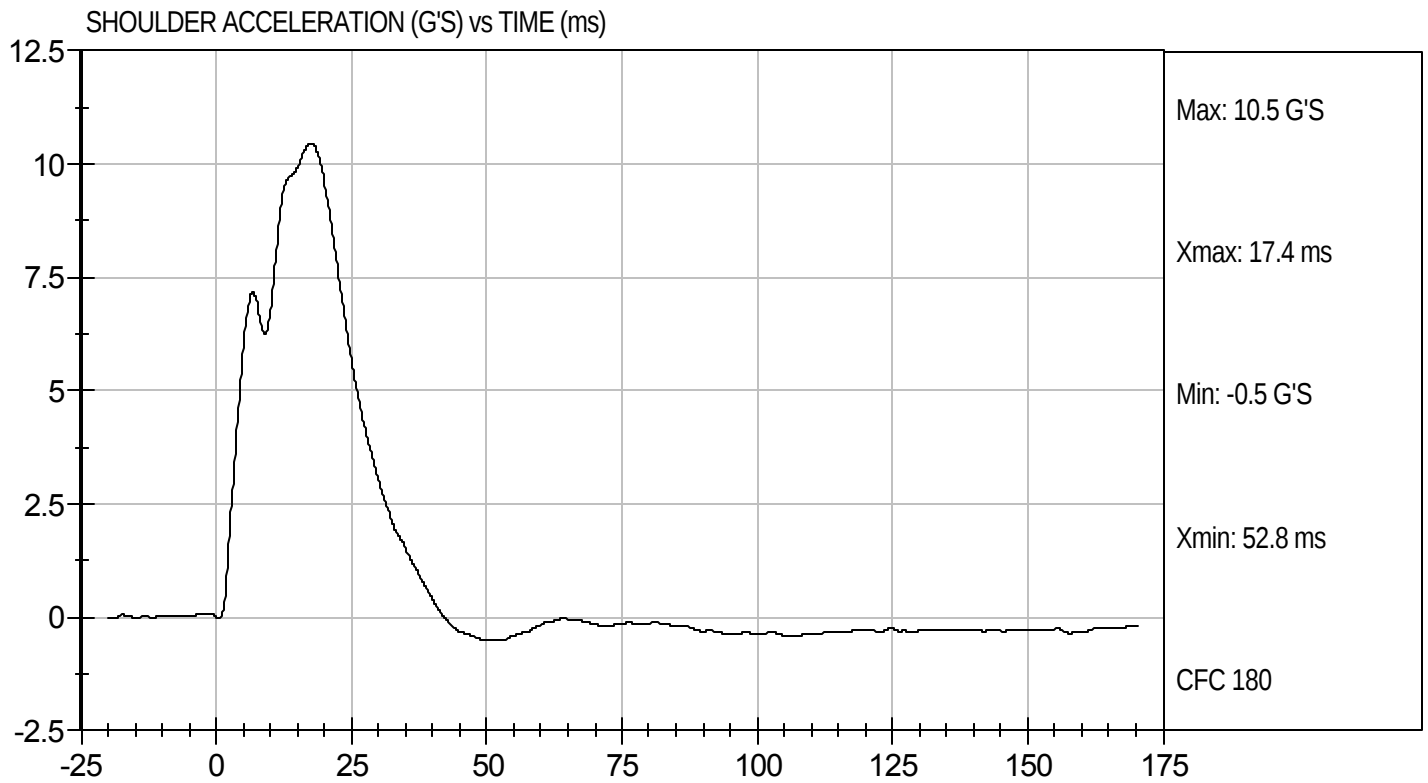
3/27/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D09653

Test Date: 3/27/09
Velocity: 14.12 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09654

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	32	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.3	Pass
Overall Test Results				Pass


Laboratory Technician

3/26/09
Test Date

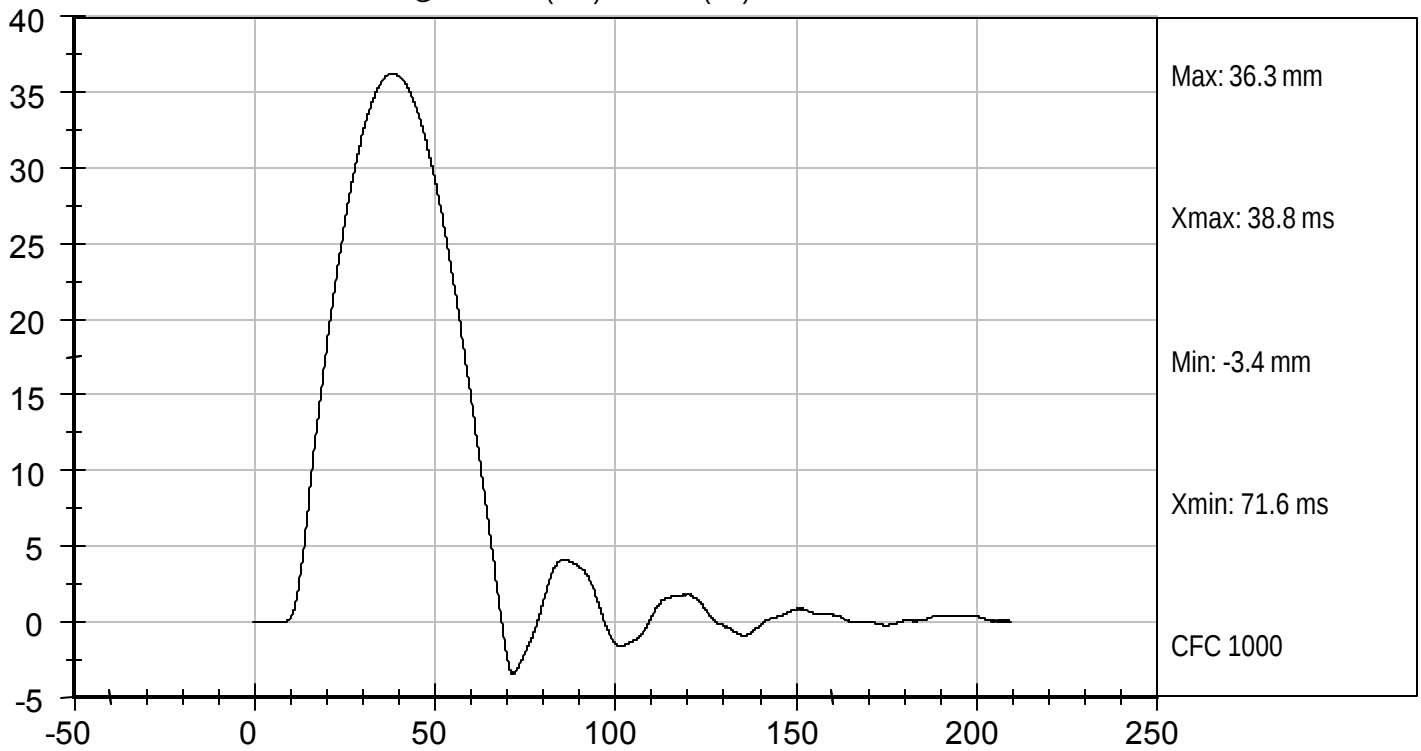

Approved By



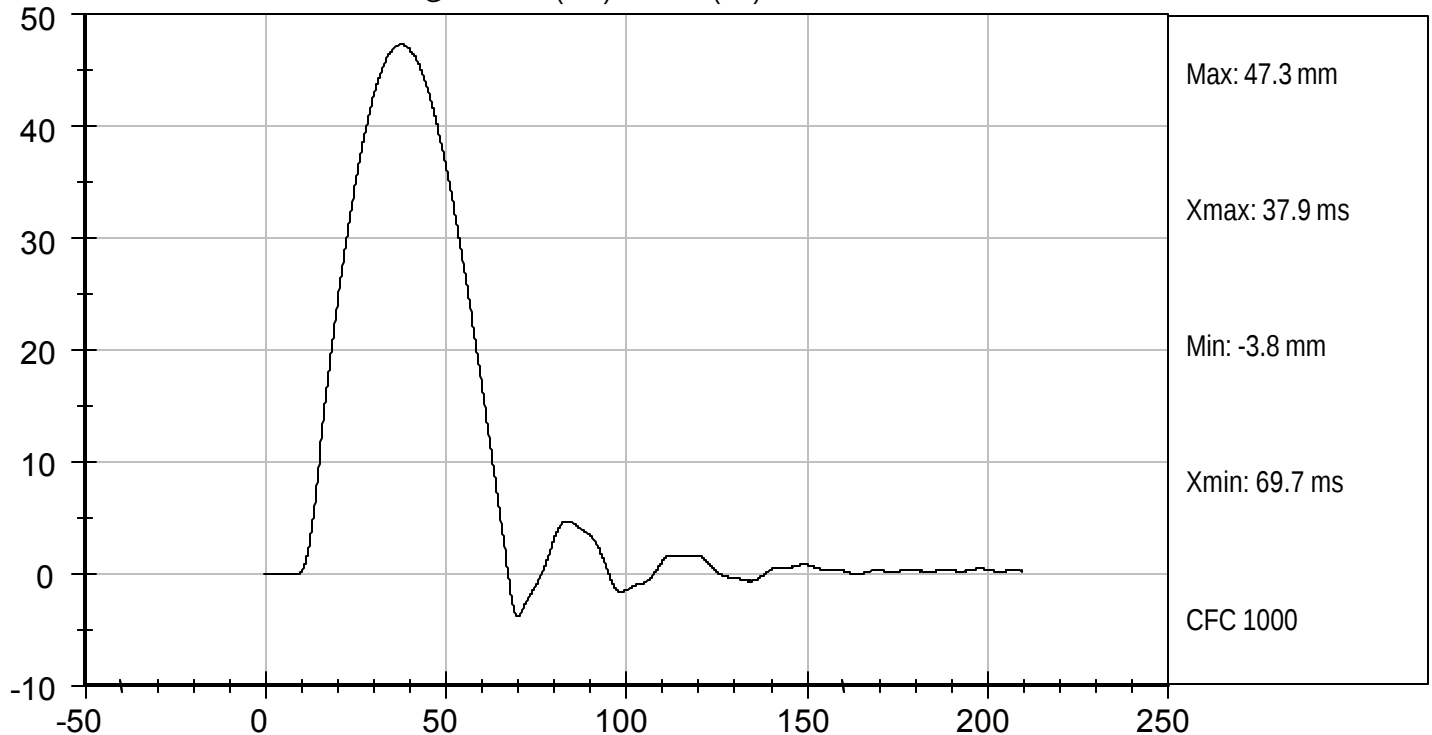
Test Desc: Rib Impact - Upper
Component ID: D09654

Test Date: 3/26/09

UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09655

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	32	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.5	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.8	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

3/26/09
Test Date

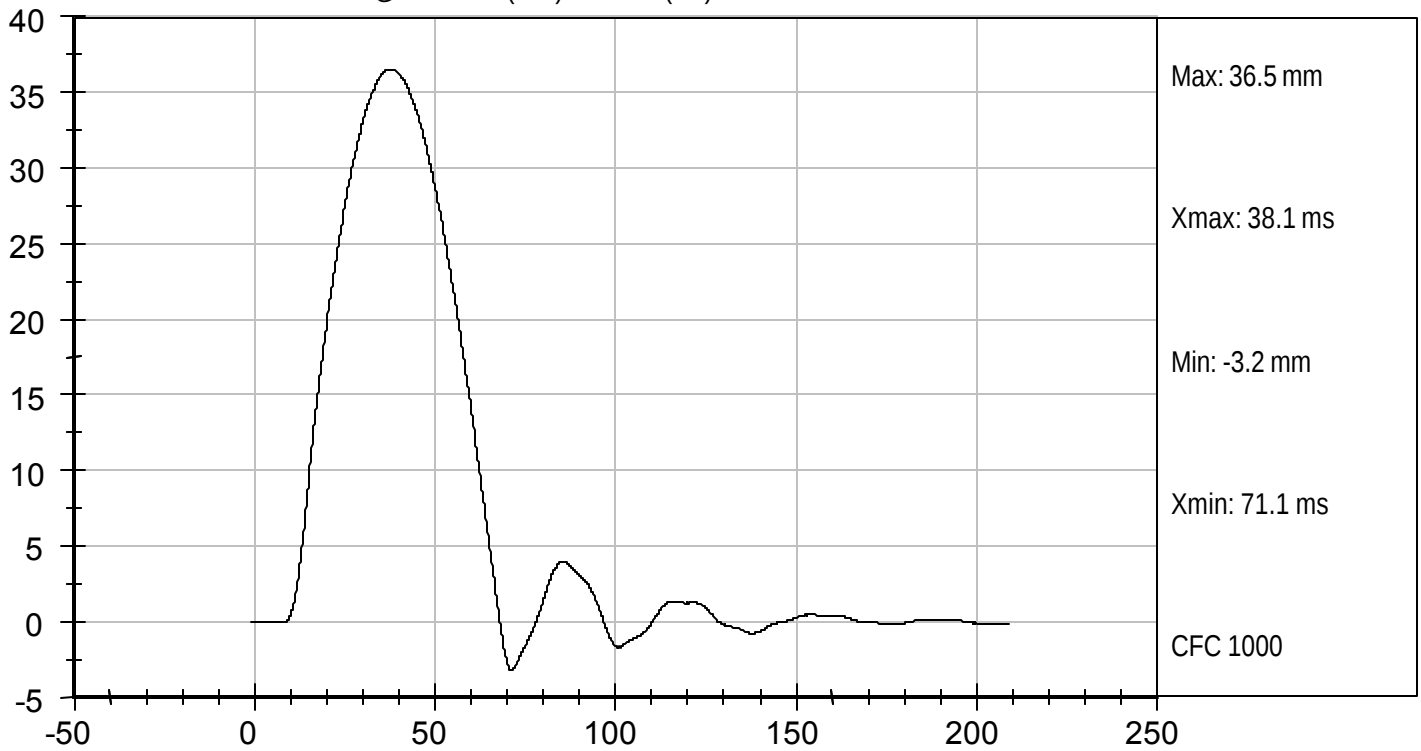
David Winkelbauer
Approved By



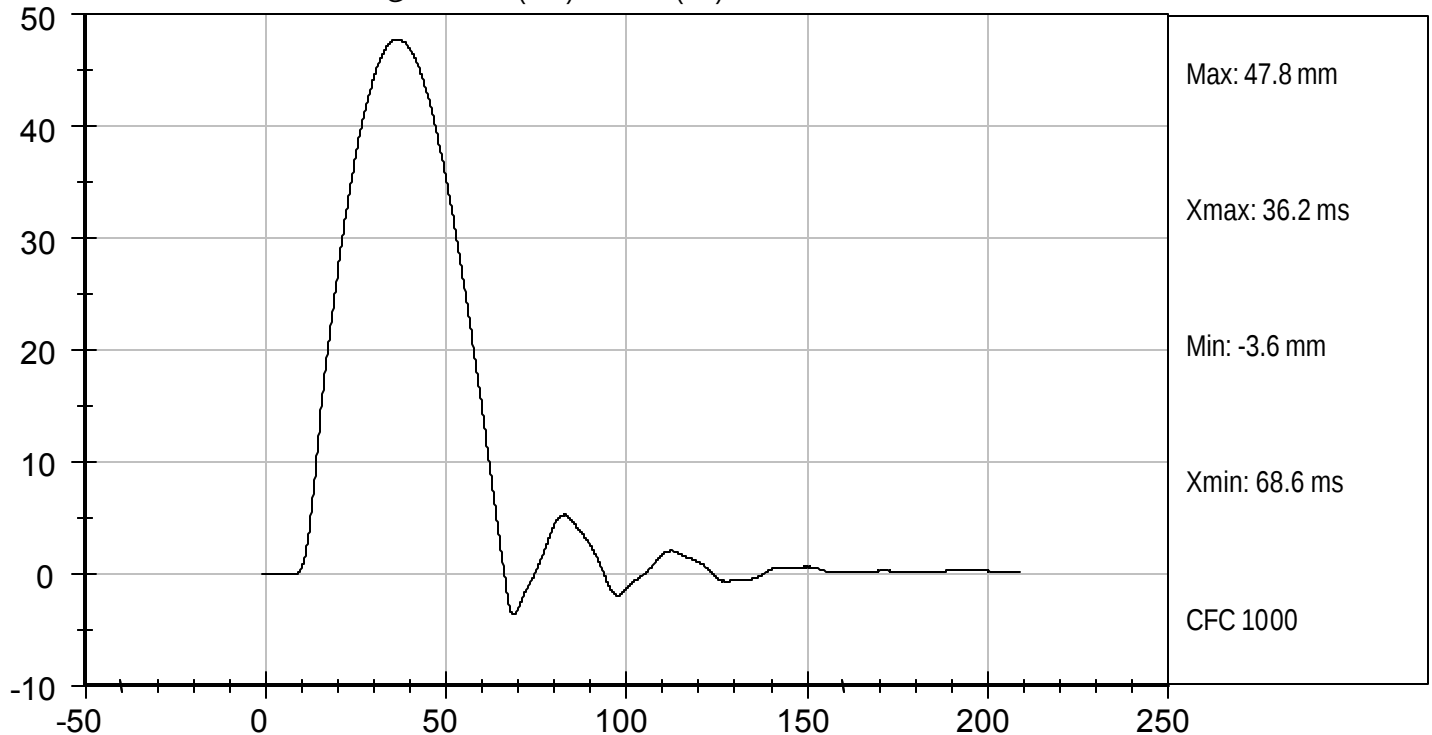
Test Desc: Rib Impact - Mid
Component ID: D09655

Test Date: 3/26/09

MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09656

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.1	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

3/26/09
Test Date

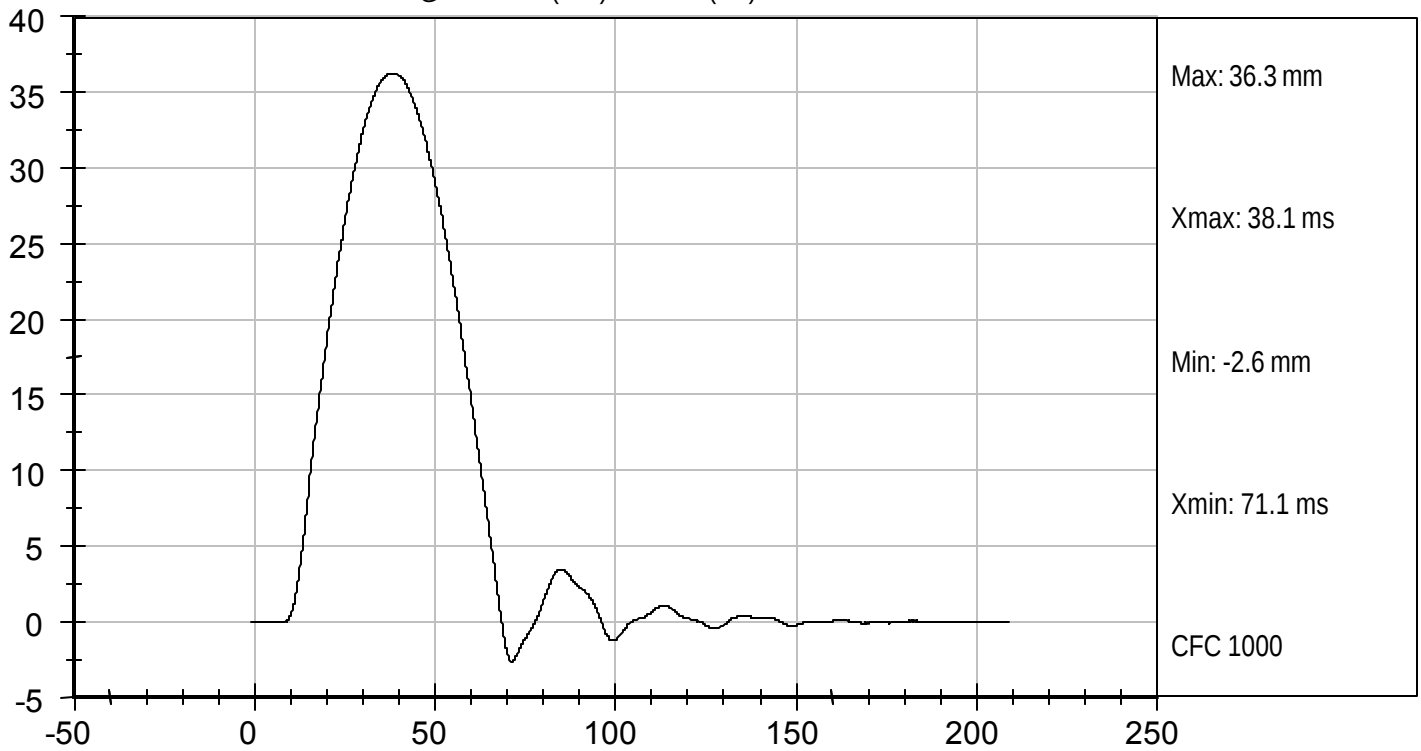
David Winkelbauer
Approved By



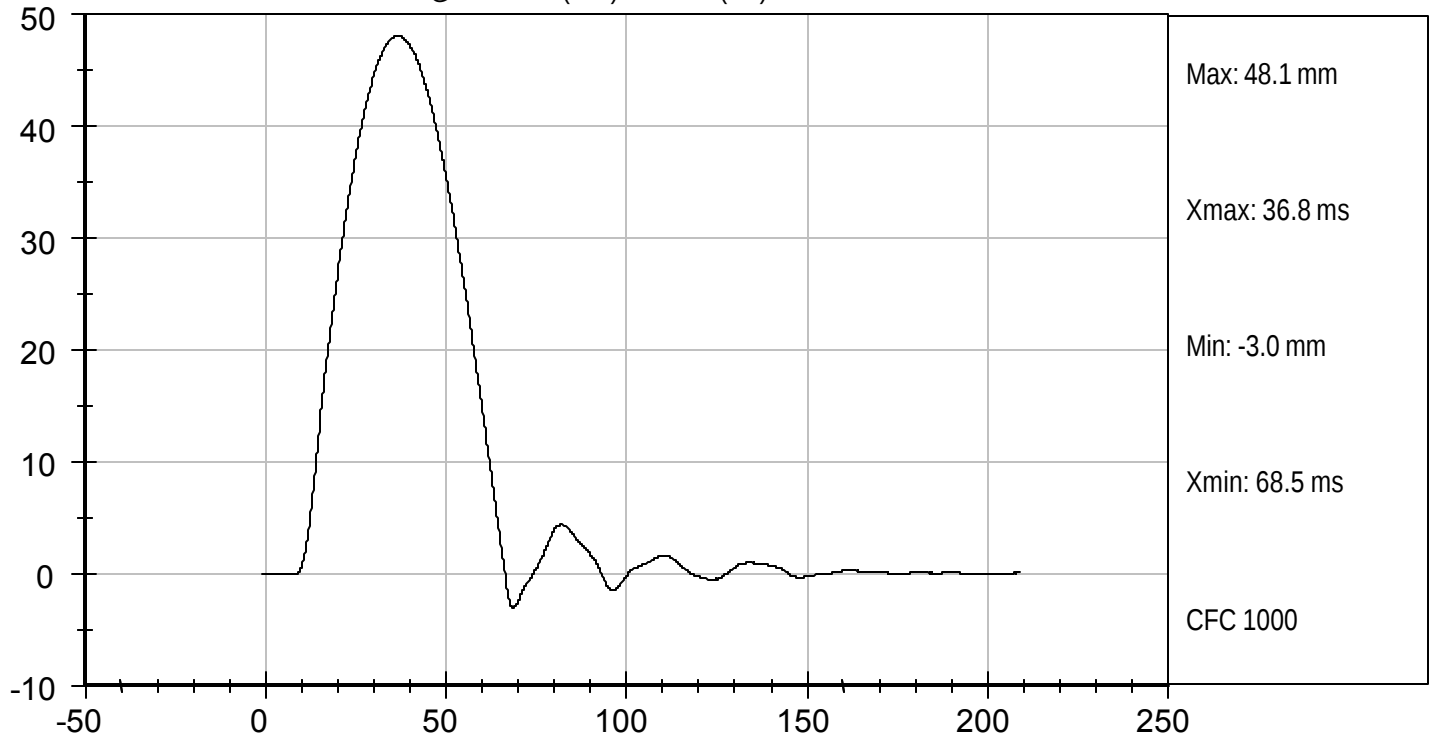
Test Desc: Rib Impact - Lower
Component ID: D09656

Test Date: 3/26/09

LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)

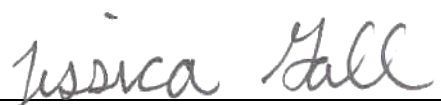


MGA RESEARCH CORPORATION
ABDOMEN TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09657

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	27	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.12	Pass
Time of Maximum Impactor Force	msec	10.60 to 13.00	11.20	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.43	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	10.30	Pass
Overall Test Results				Pass


Laboratory Technician

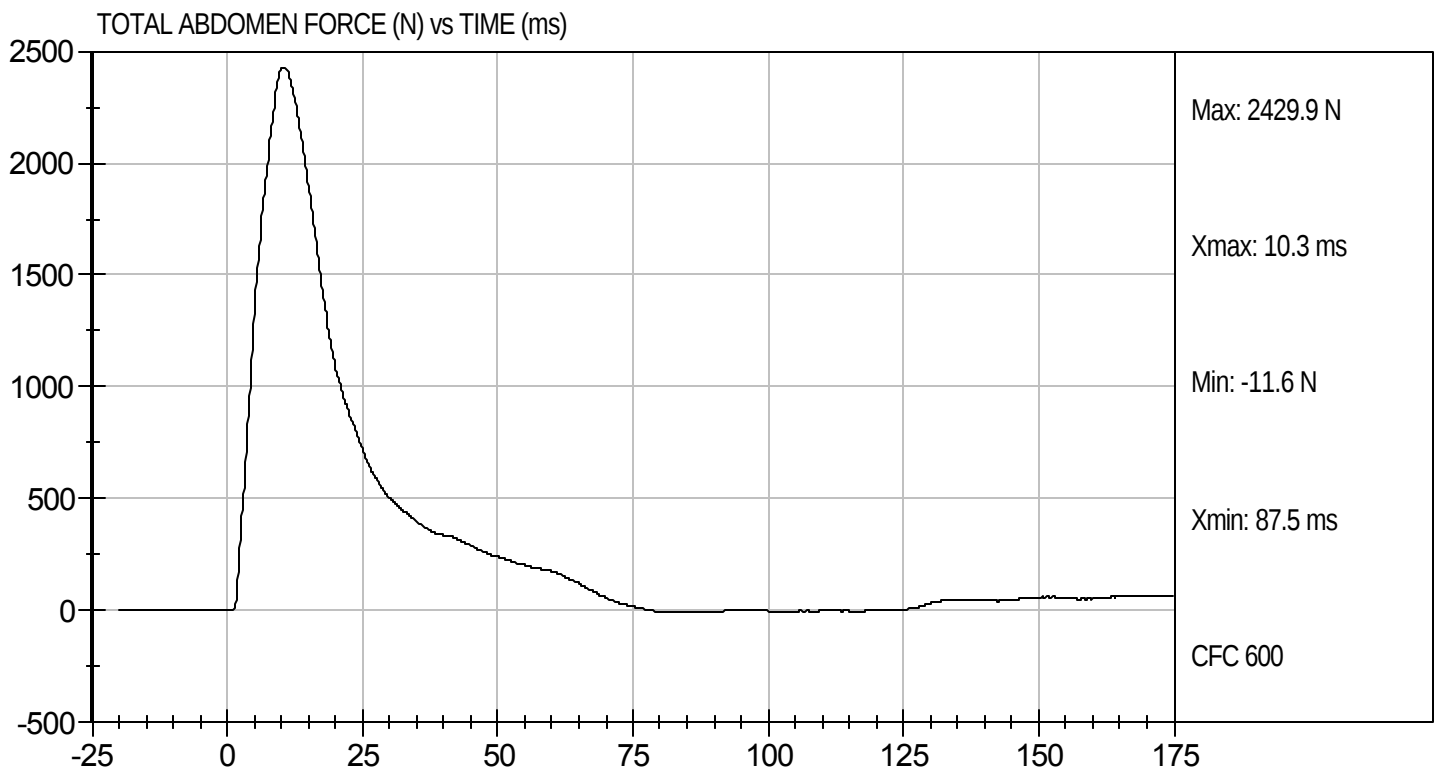
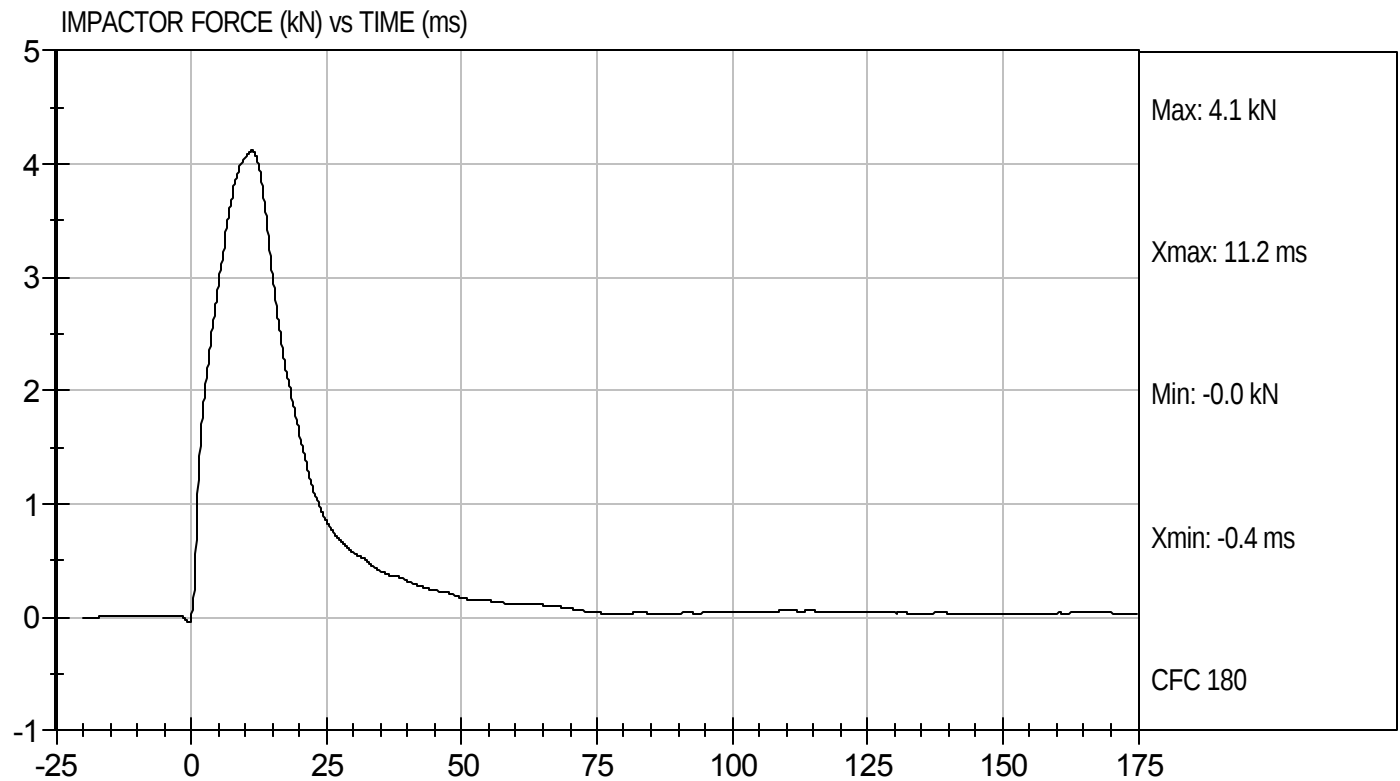
3/27/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D09657

Test Date: 3/27/09
Velocity: 13.44 ft/s, 4.1 m/s

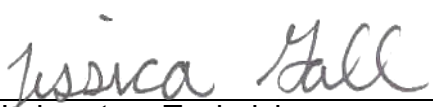


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09658

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.13	Pass
Pendulum Deceleration	1 msec	m/sec	-0.05 to 0.00	-0.03	Pass
	3.7 msec	m/sec	-0.425 to -0.24	-0.41	Pass
	27 msec	m/sec	-6.50 to -5.80	-6.03	Pass
	30 msec	m/sec	>= -6.5	-6.2	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.2	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	45.3	Pass
Headform Rotation Decay to Initial Position		msec	37 to 57	44	Pass
Overall Results				Pass	


 Laboratory Technician

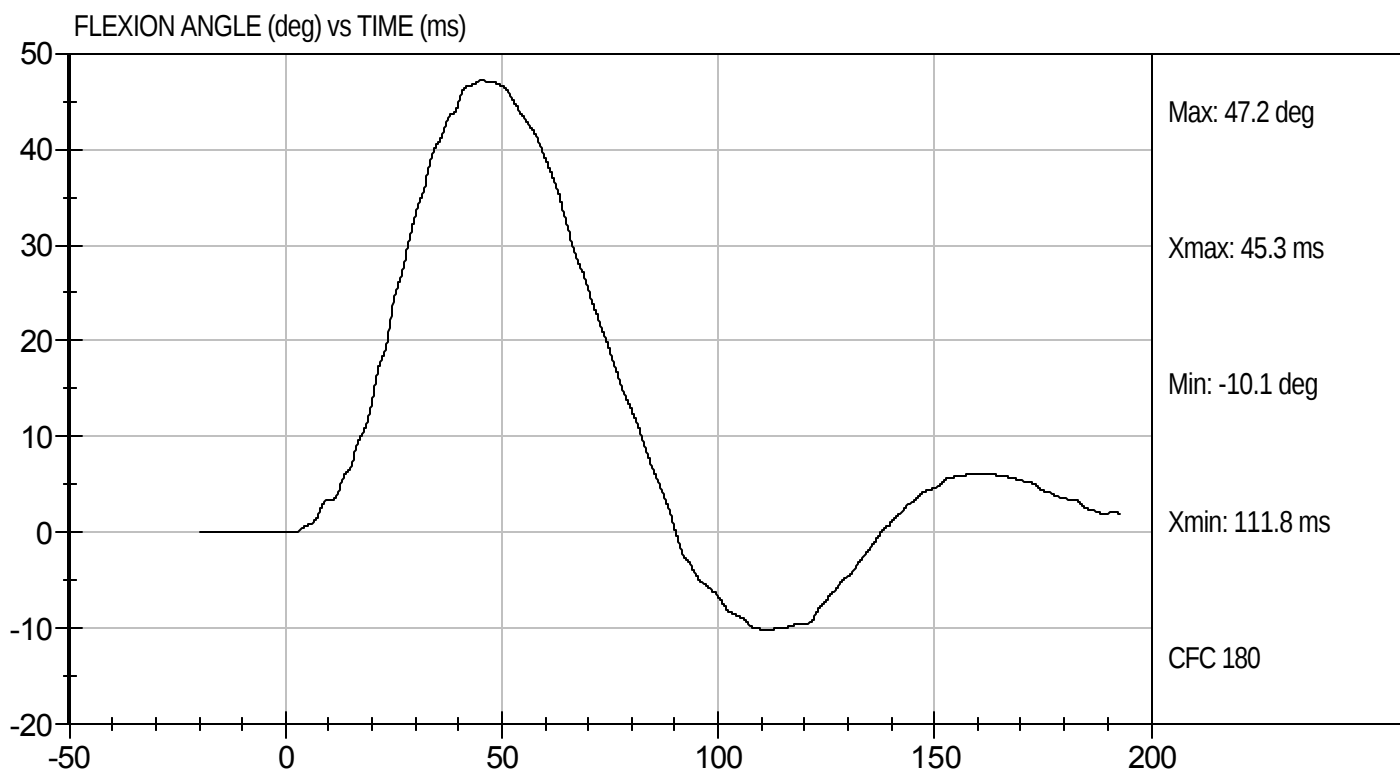
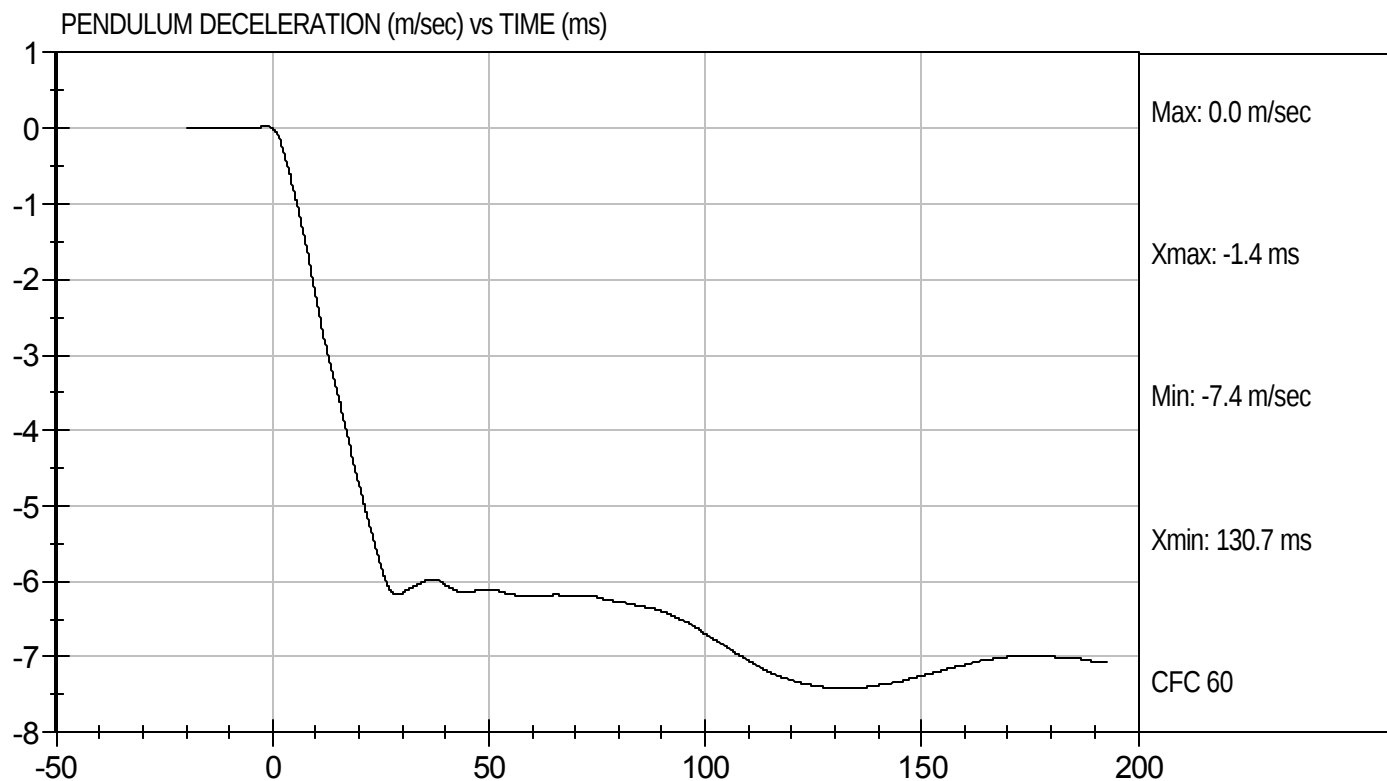
3/26/09
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D09658

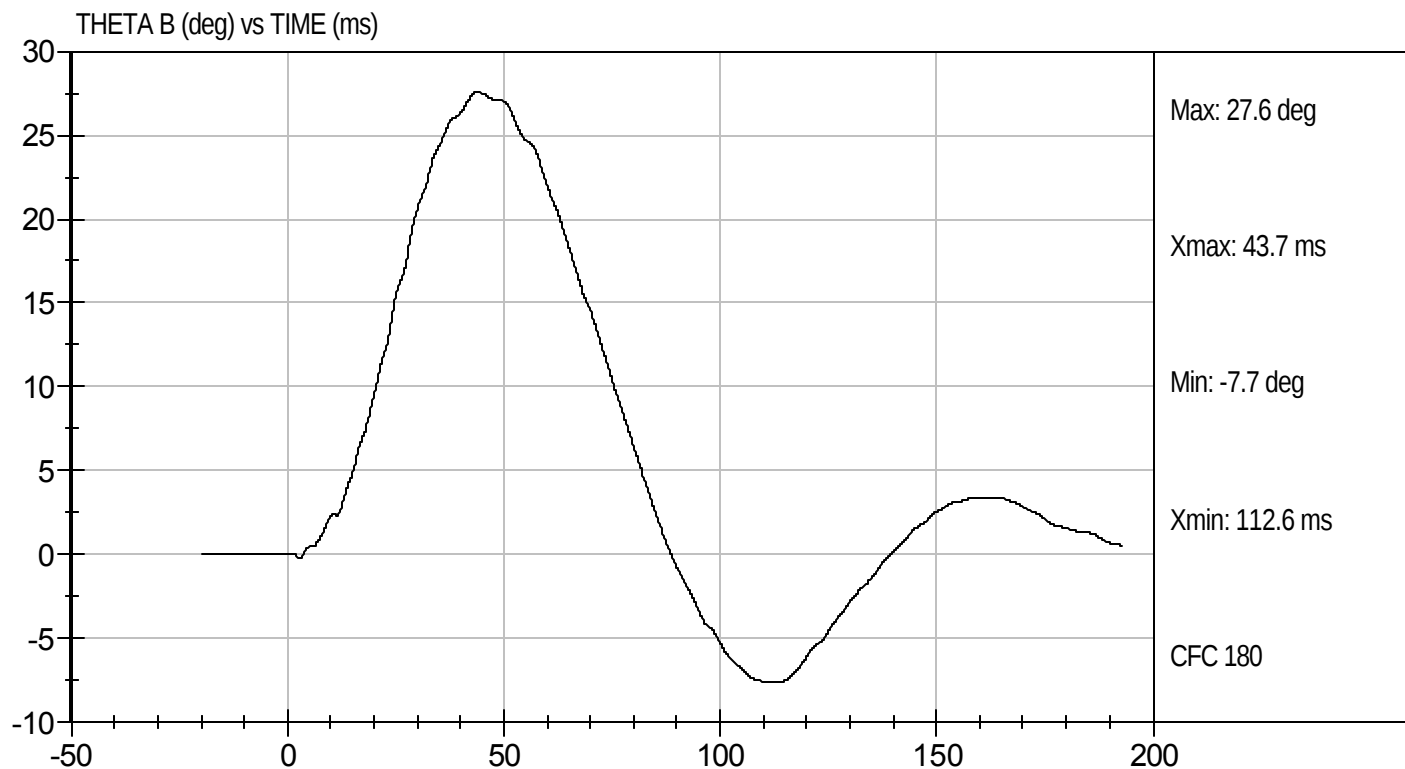
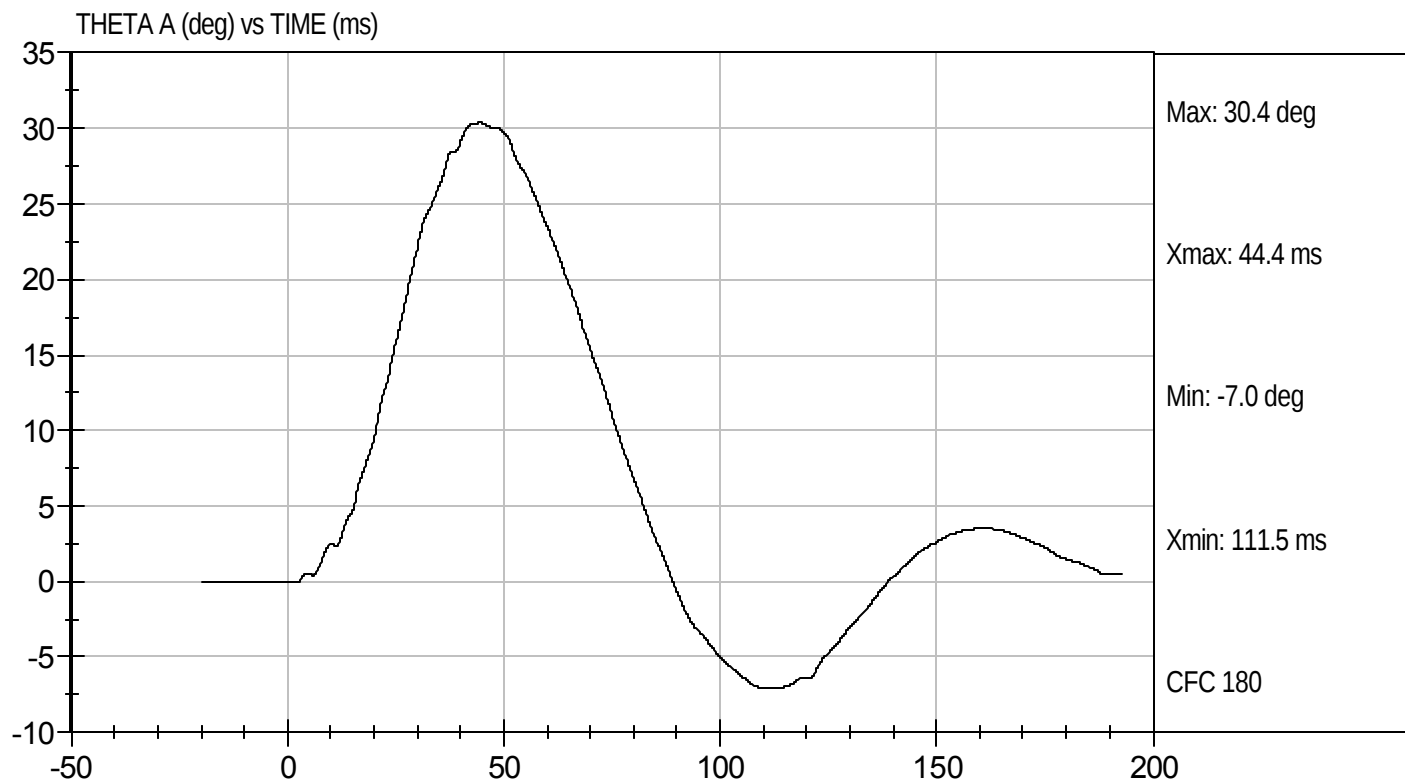
Test Date: 3/26/09
Velocity: 20.1 ft/s, 6.13 m/s





Test Desc: Lumbar Bending
Component ID: D09658

Test Date: 3/26/09
Velocity: 20.1 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMYATD Serial No: 032Test I.D: D09659

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	27	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.82	Pass
Time of Maximum Impactor Force	msec	11.80 to 16.10	13.00	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.44	Pass
Time of Maximum Pubic Force	msec	12.20 to 17.00	13.80	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

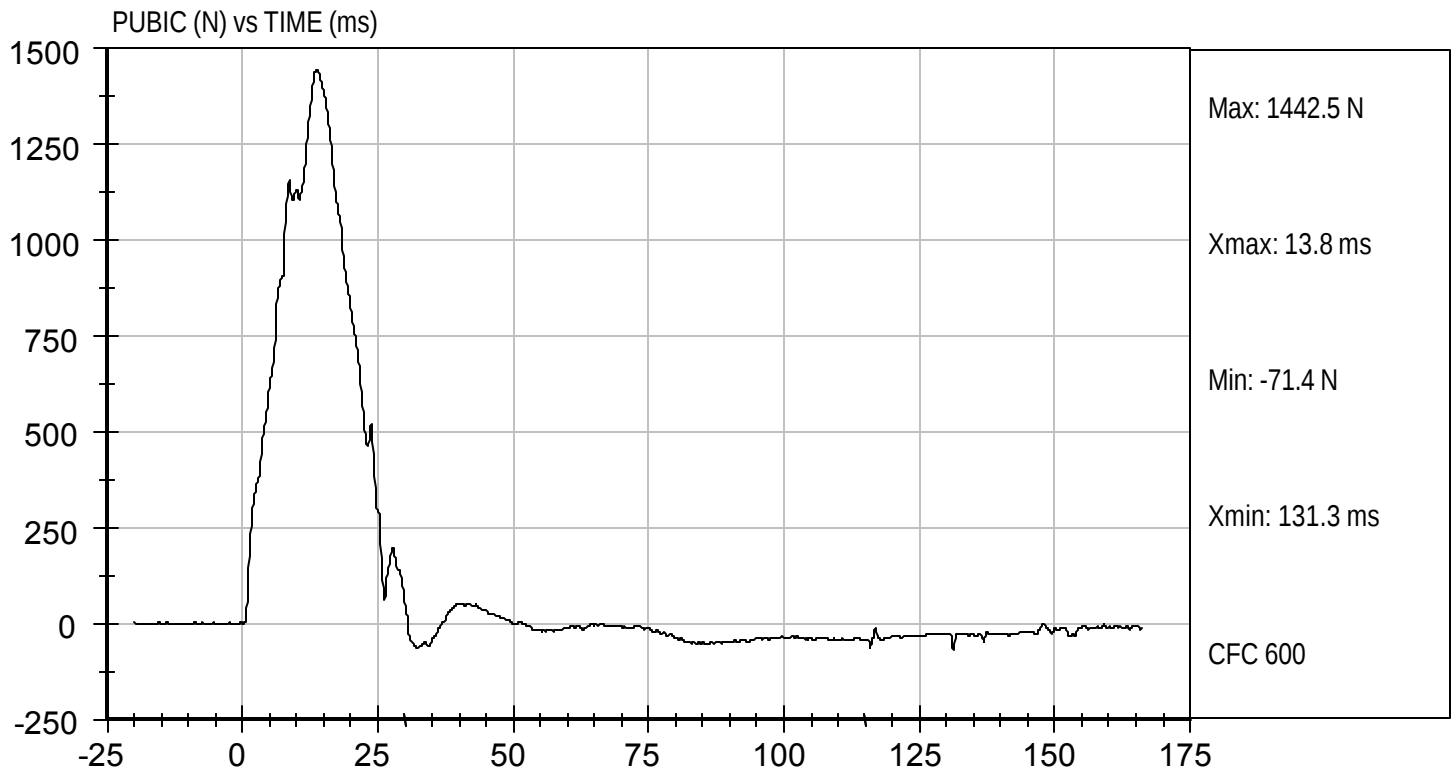
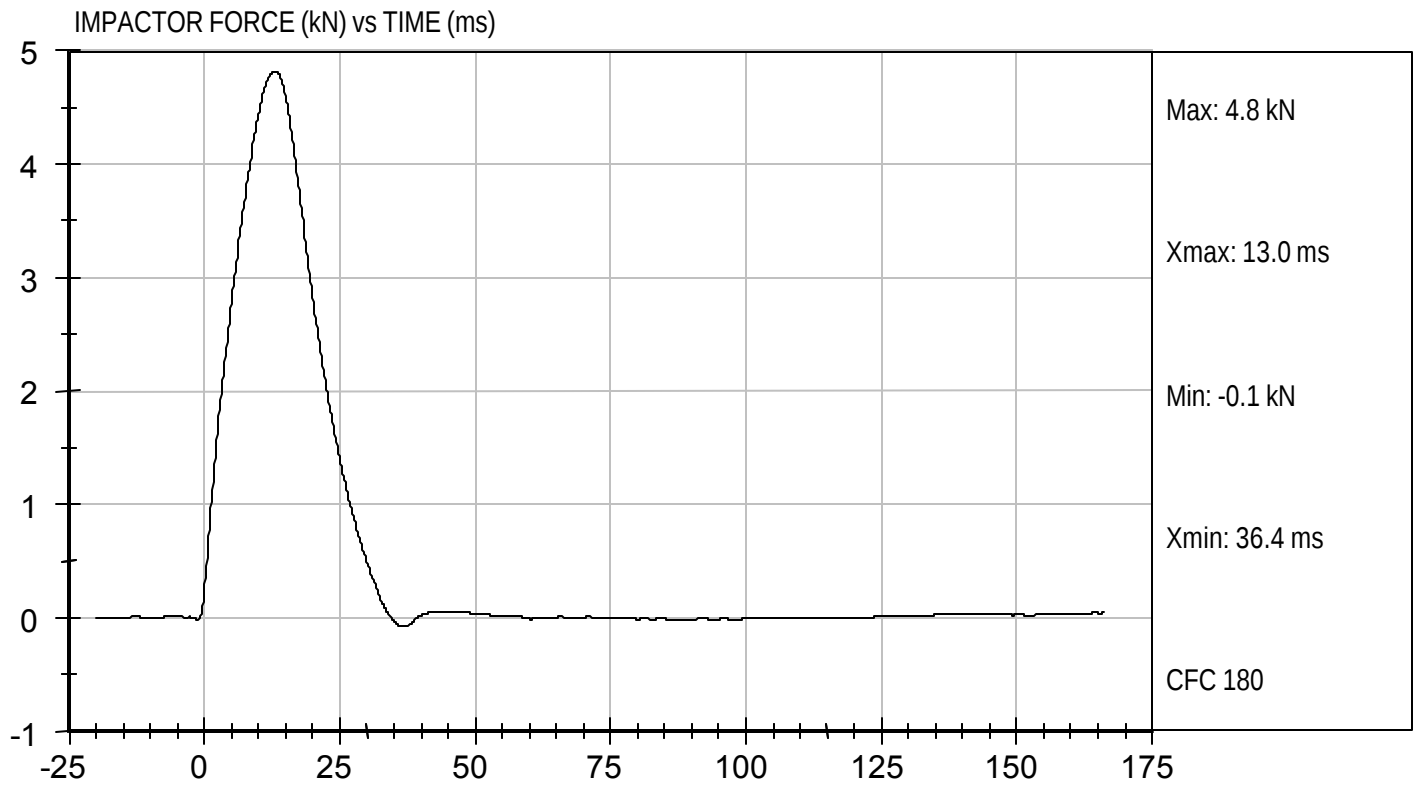
3/27/09
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D09659

Test Date: 3/27/09
Velocity: 14.25 ft/s, 4.34 m/s

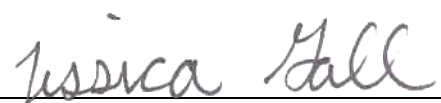


MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09650

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.0	Pass
Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	5.40 to 5.60	5.46	Pass
Maximum Impactor Force (after 6 ms)	kN	5.17 to 6.12	5.32	Pass
Upper Rib Displacement	mm	33.2 to 41.3	36.6	Pass
Middle Rib Displacement	mm	37.1 to 45.4	40.7	Pass
Lower Rib Displacement	mm	35.6 to 43.0	40.1	Pass
			Overall Test Results	Pass


Laboratory Technician

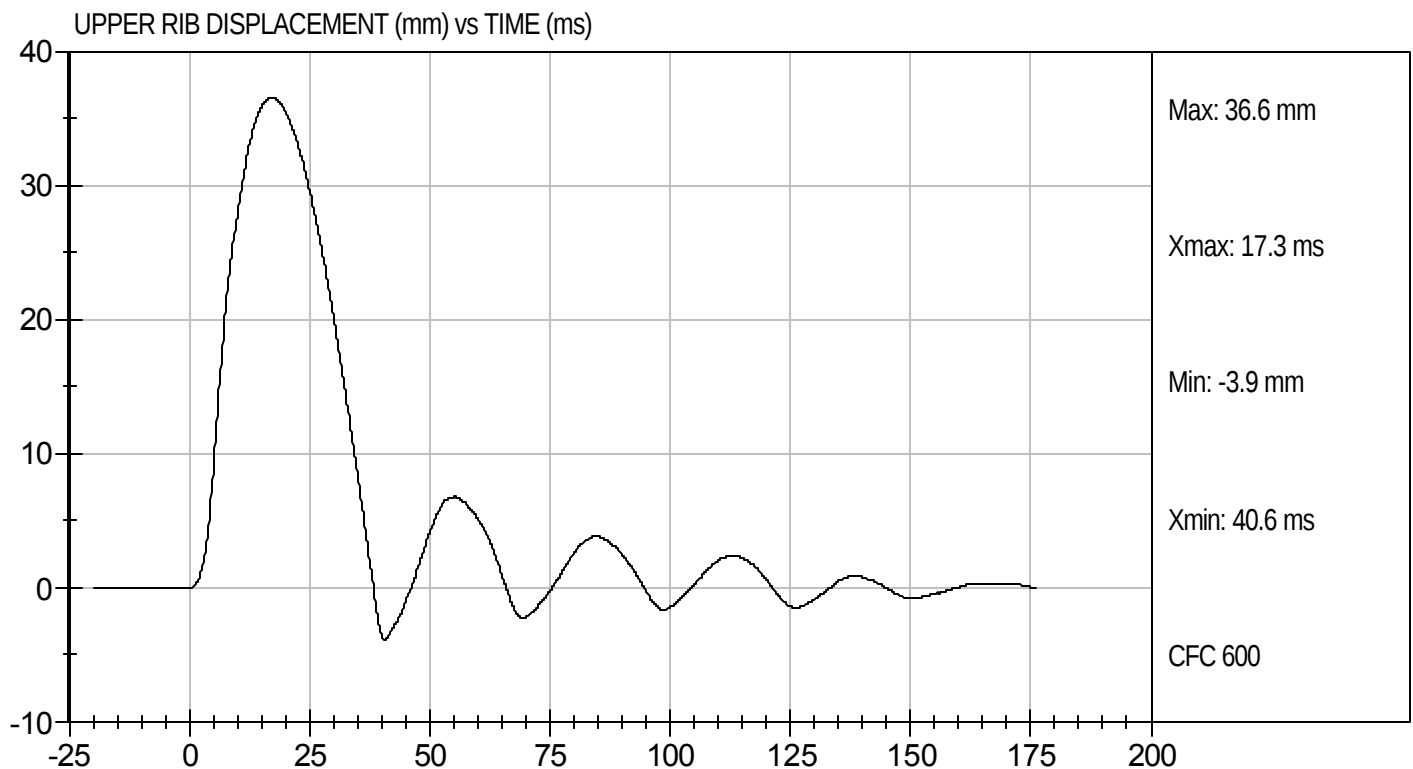
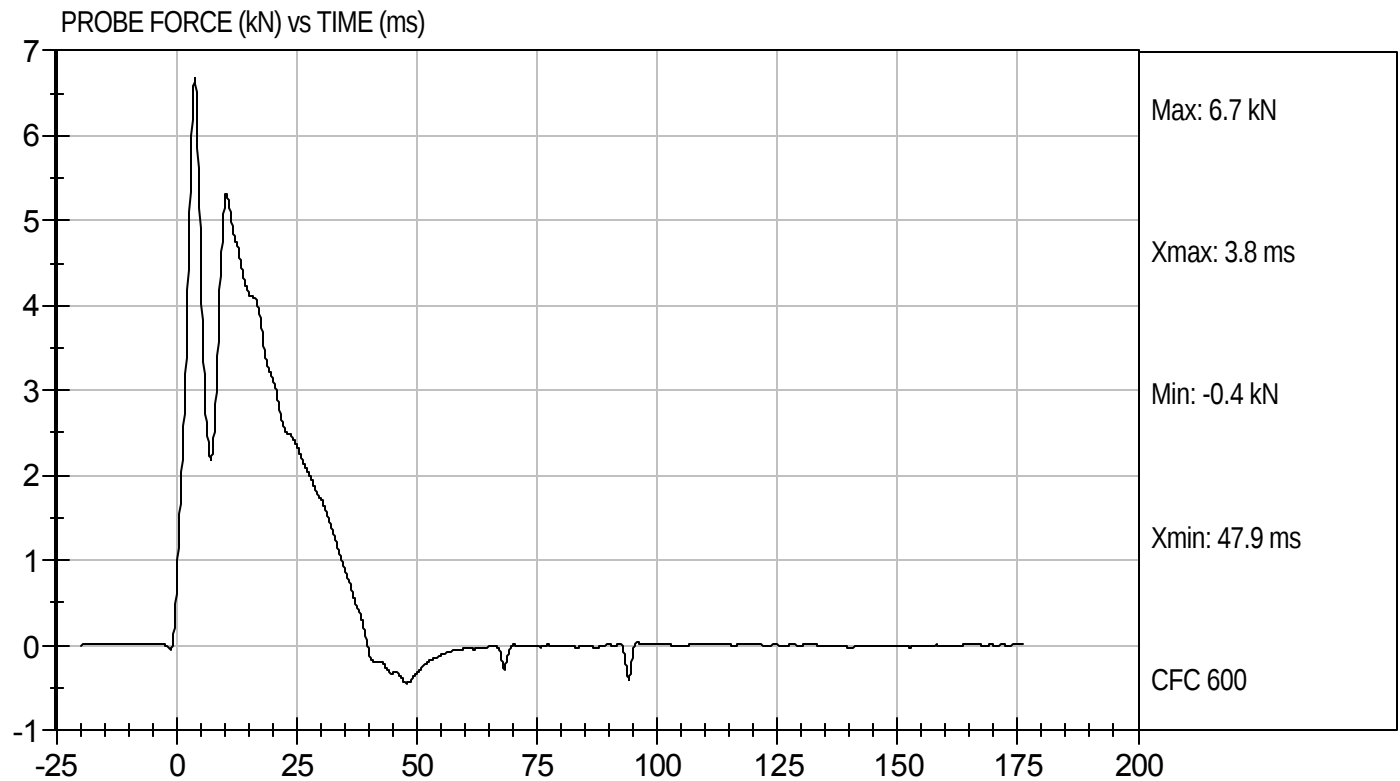
3/27/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D09650

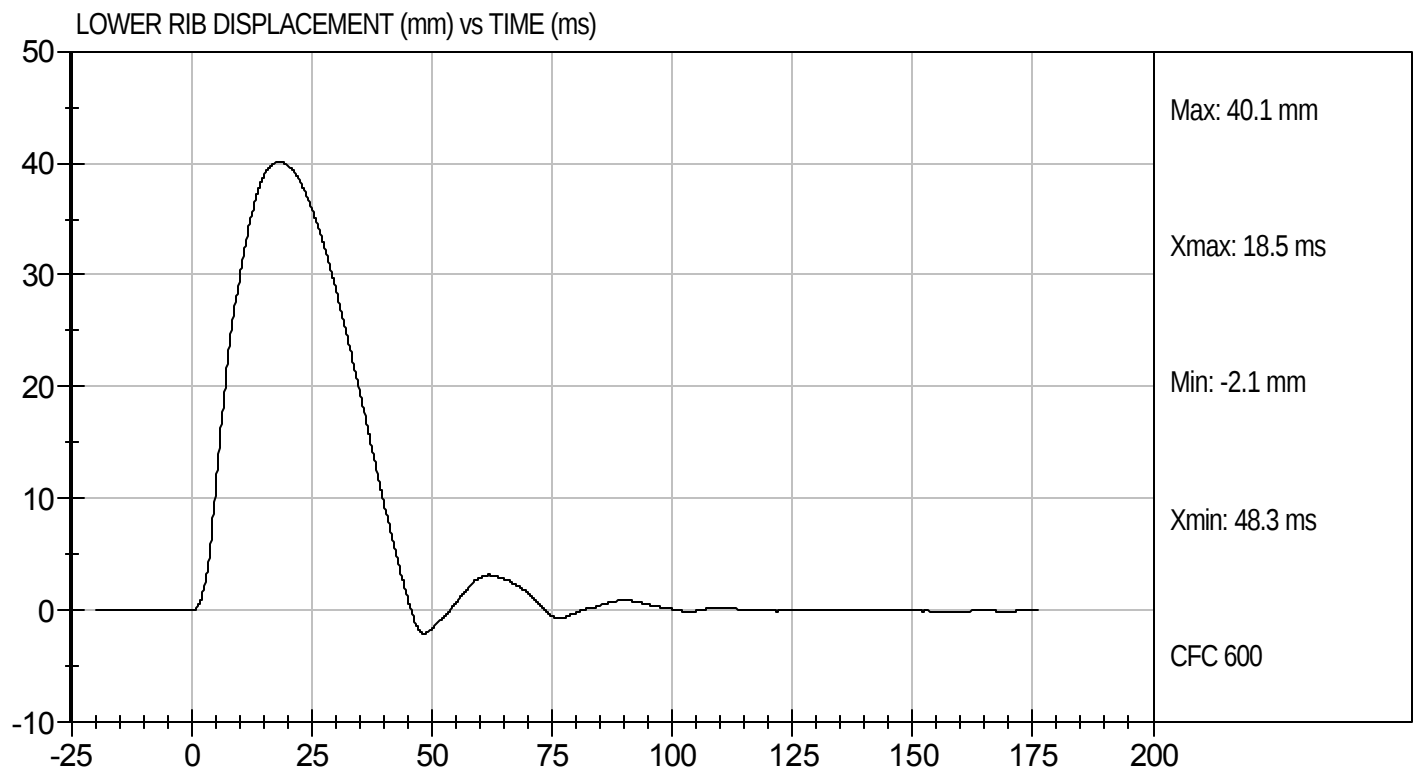
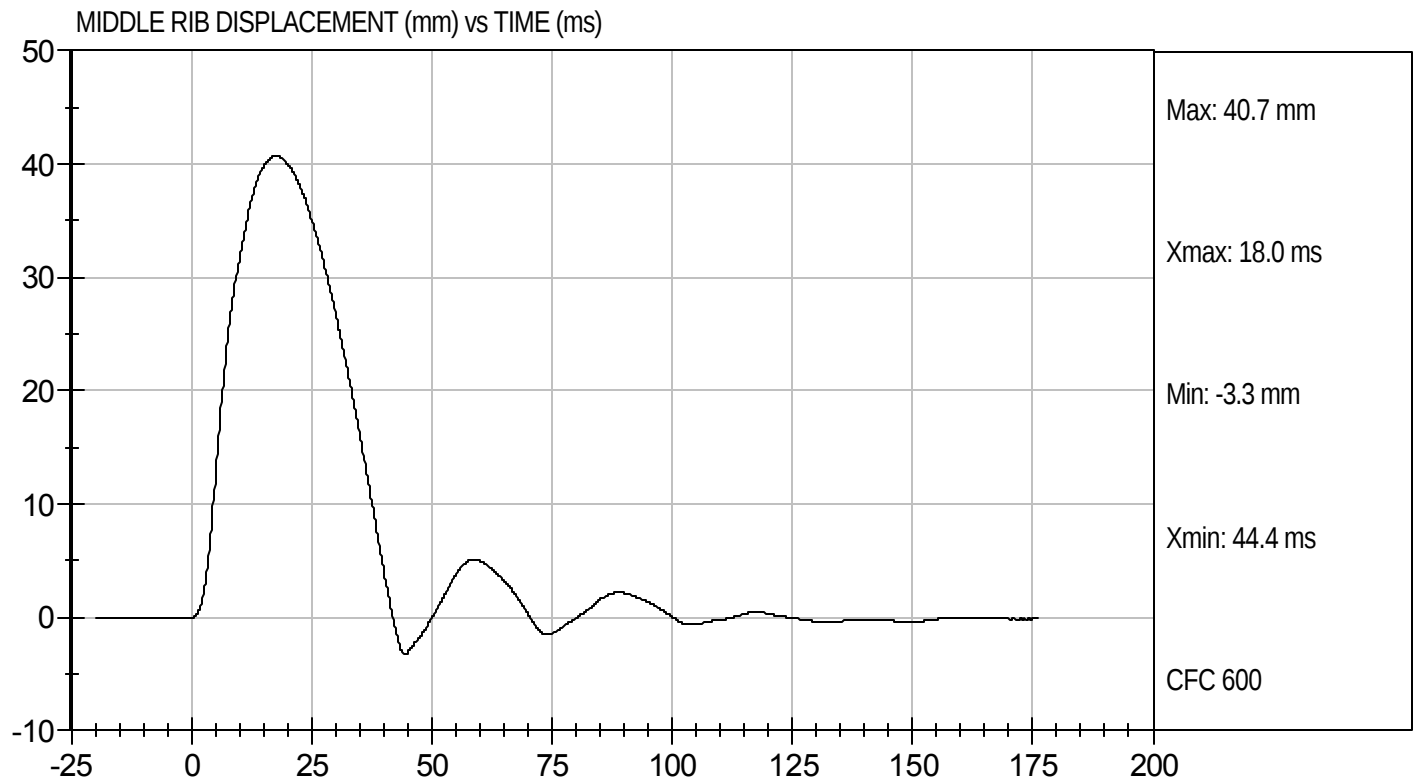
Test Date: 3/27/09
Velocity: 17.92 ft/s, 5.46 m/s





Test Desc: Thorax Impact
Component ID: D09650

Test Date: 3/27/09
Velocity: 17.92 ft/s, 5.46 m/s

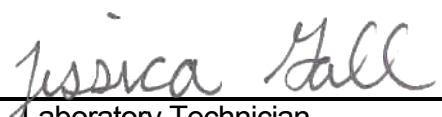


MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 032

Test ID: D09881

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	29	Pass
Peak Resultant Acceleration	G's	125 to 155	147	Pass
Peak Lateral Acceleration	G's	+/- 15	-13.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

4/23/09
Test Date

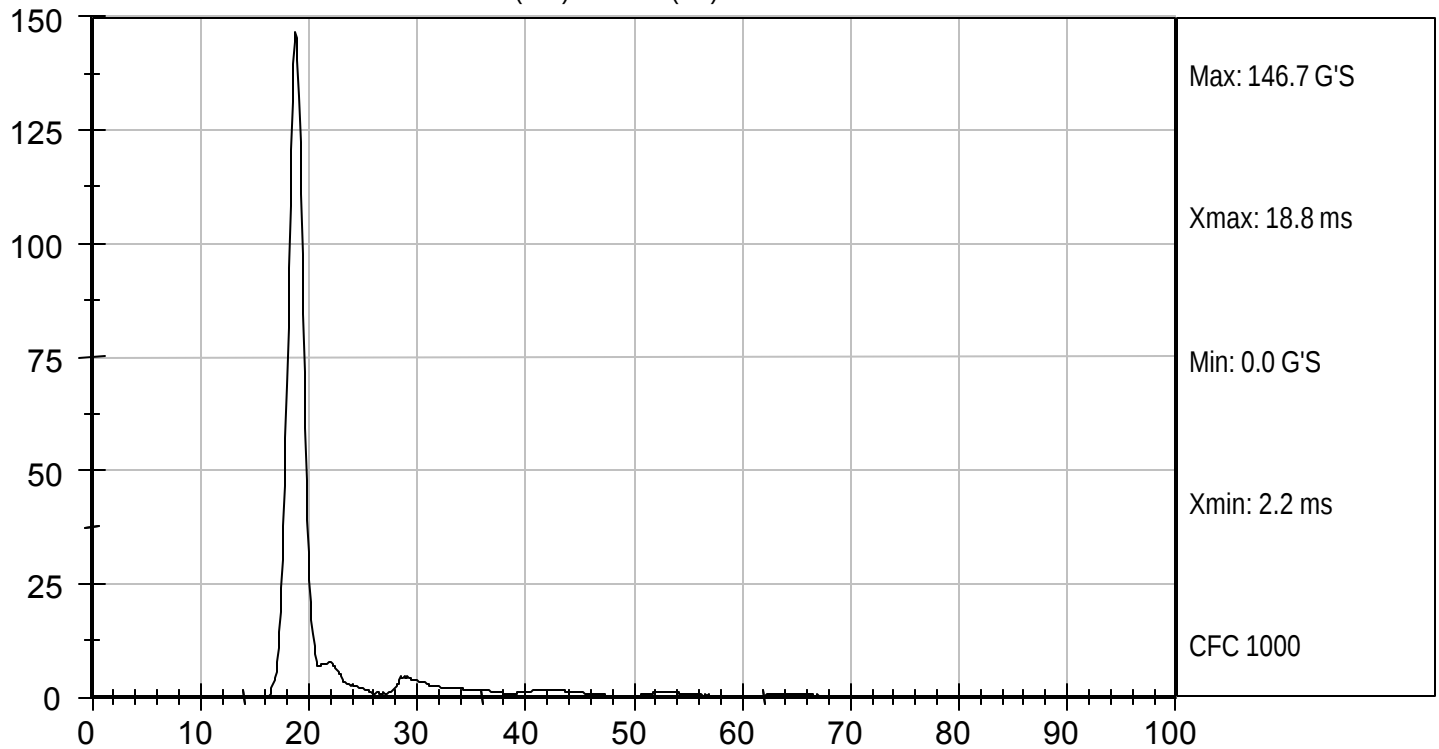

Approved By



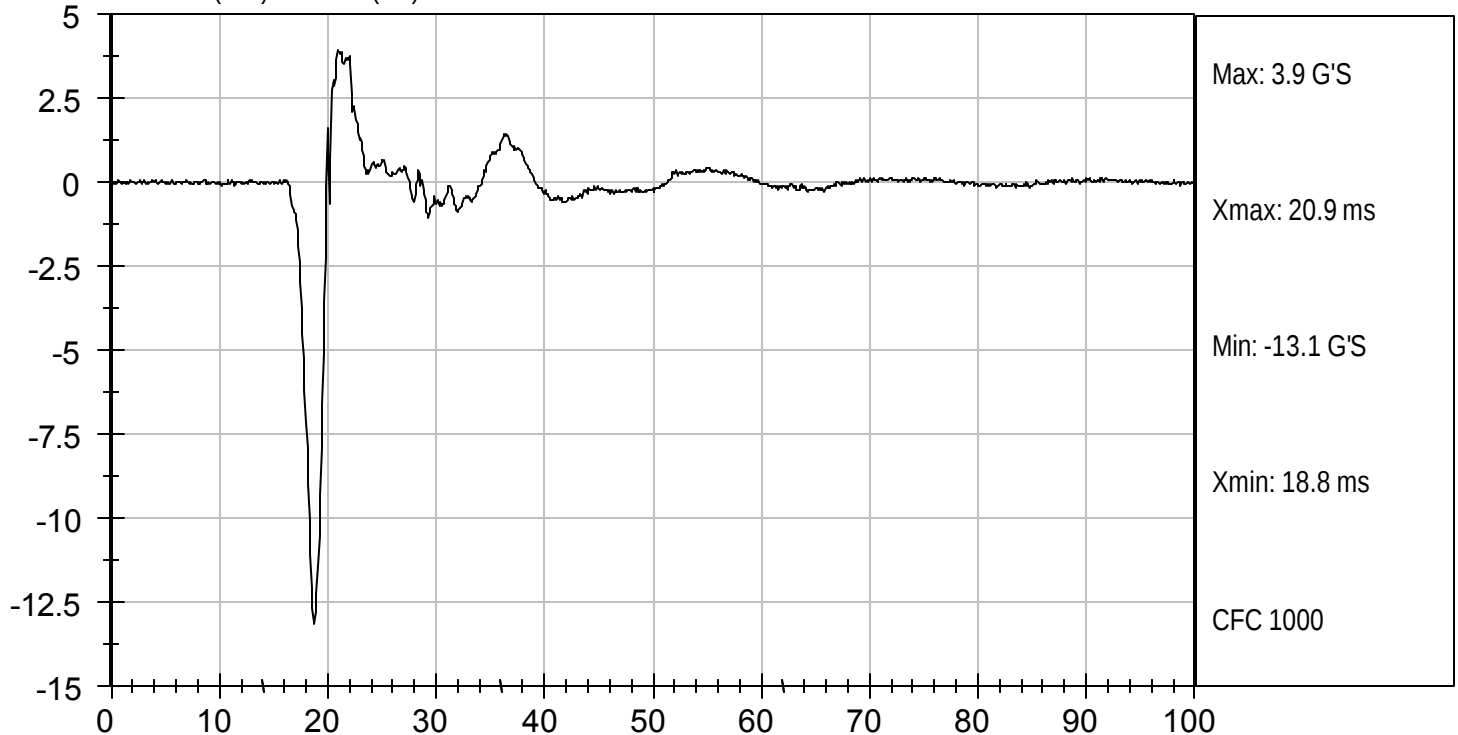
Test Desc: Head Drop
Component ID: D09881

Test Date: 4/23/09
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



HEAD X (G'S) vs TIME (ms)

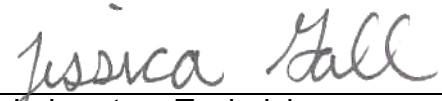


MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09882

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.4	Pass
Pendulum Deceleration	1 msec	G's	0.00 to -0.05	-0.03	Pass
	3 msec	G's	-0.25 to -0.375	-0.33	Pass
	14 msec	G's	-3.20 to -3.70	-3.28	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.0	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	61.1	Pass
Head Rotation Decay Time to 0 degree		msec	53 to 88	53	Pass
Overall Test Results				Pass	


 Laboratory Technician

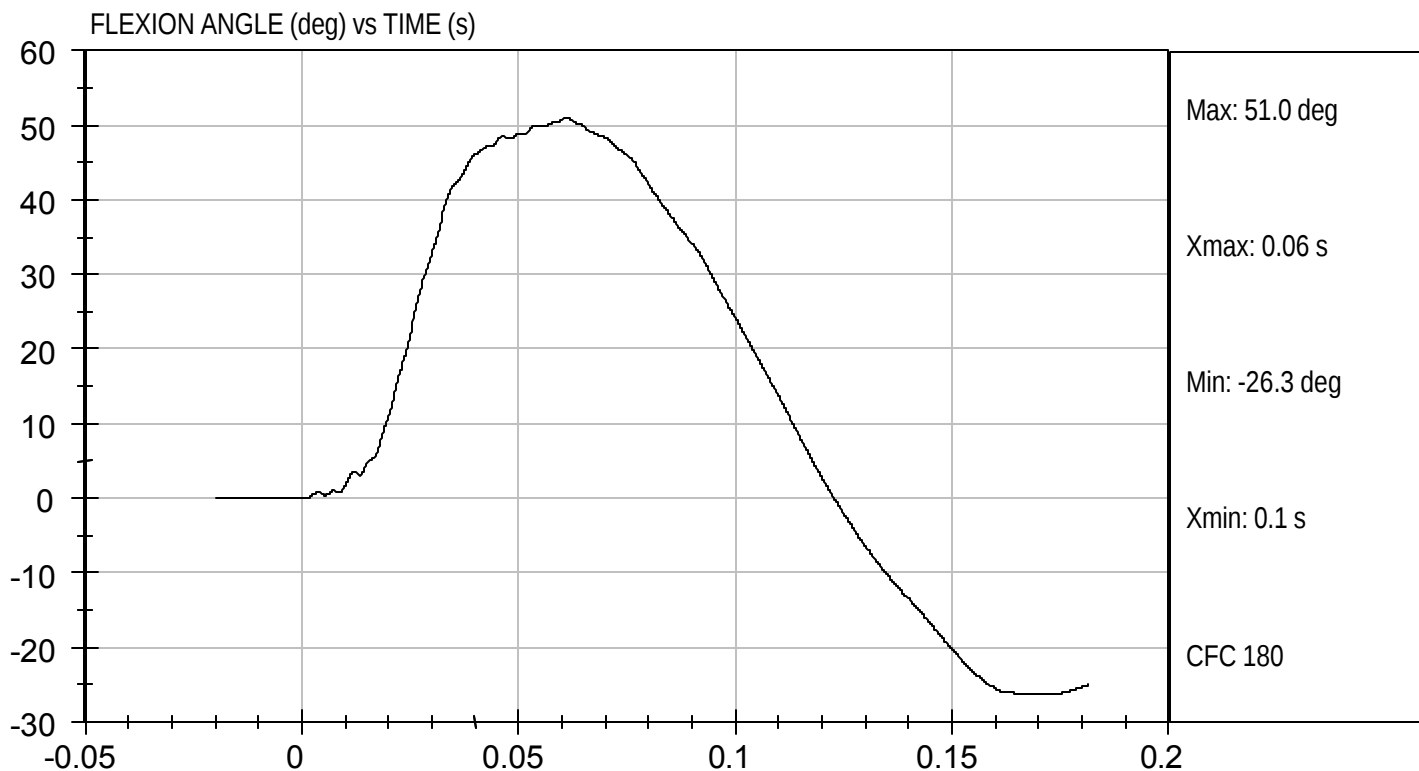
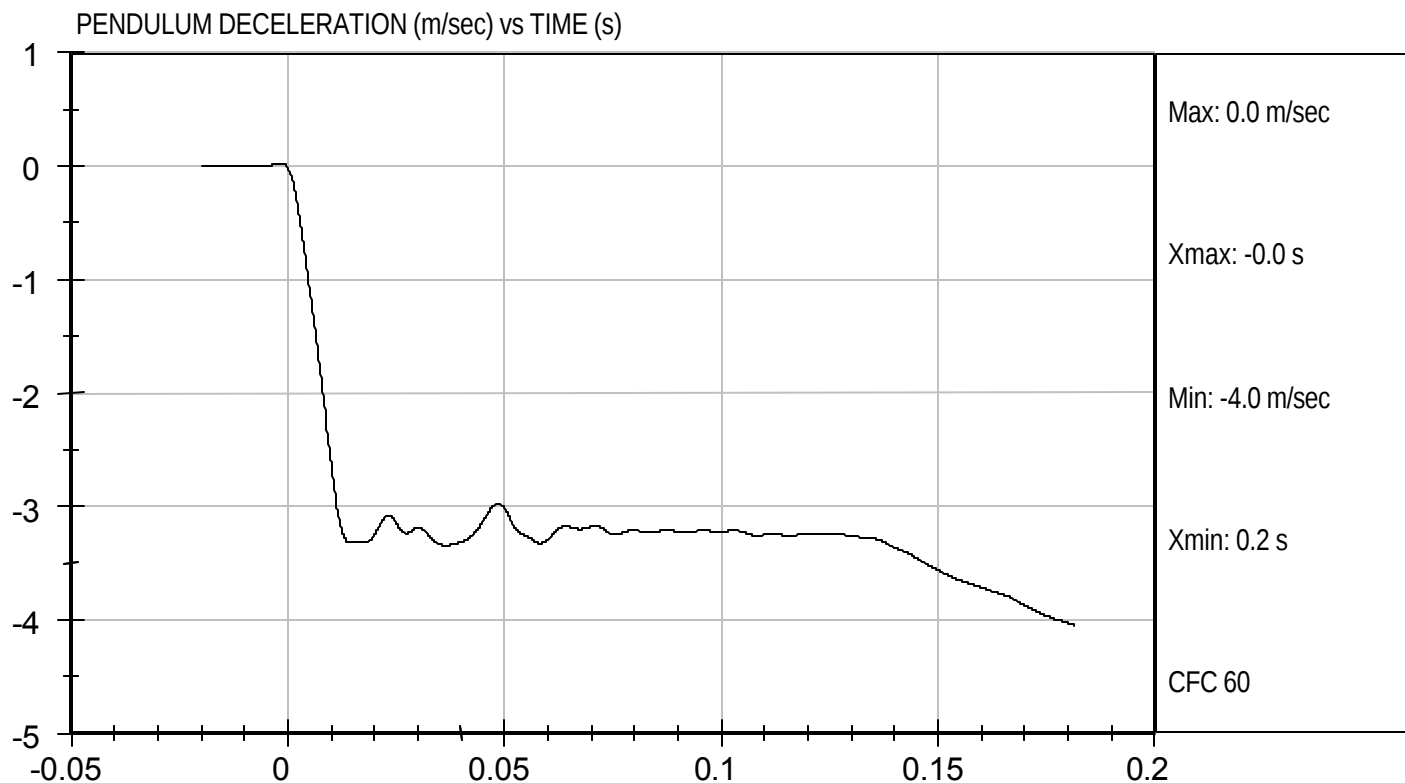
4/23/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D09882

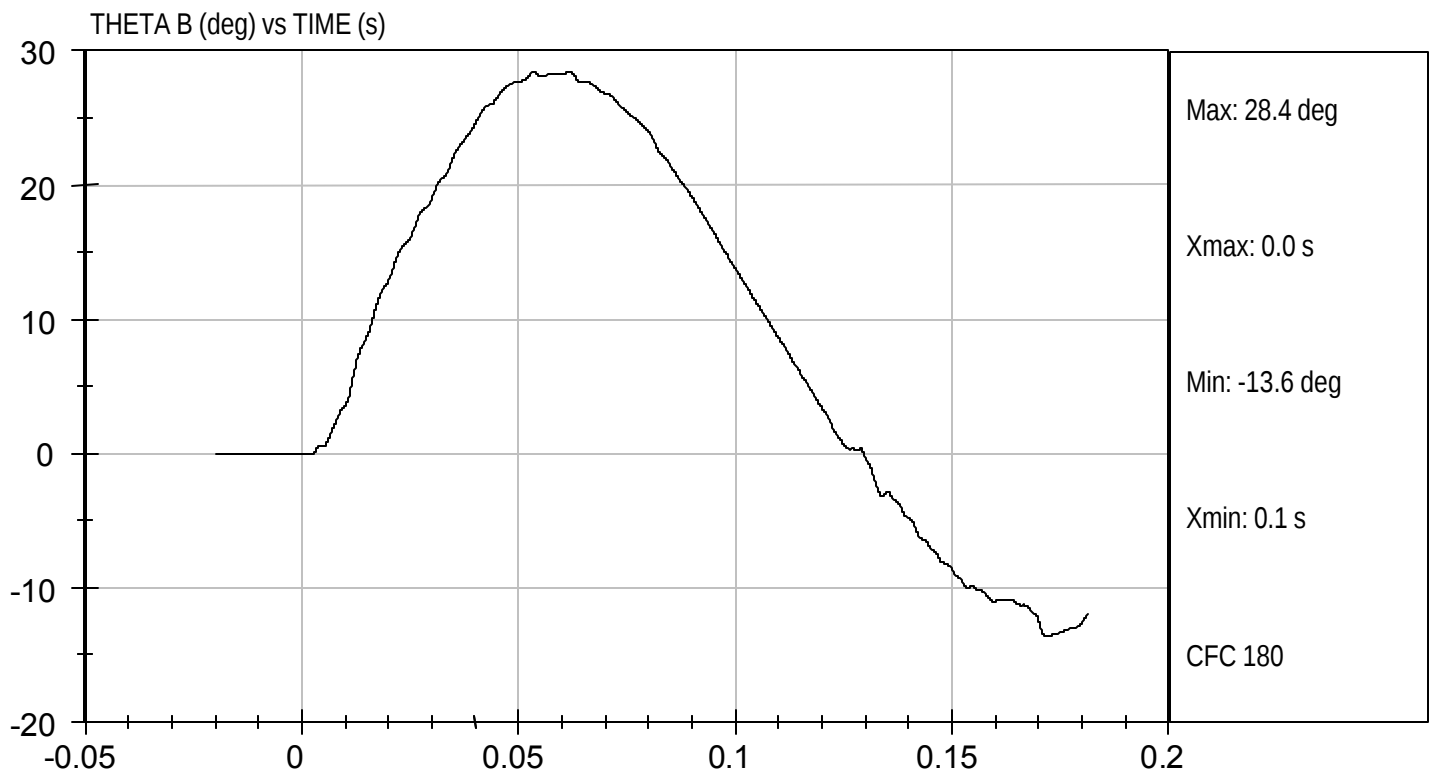
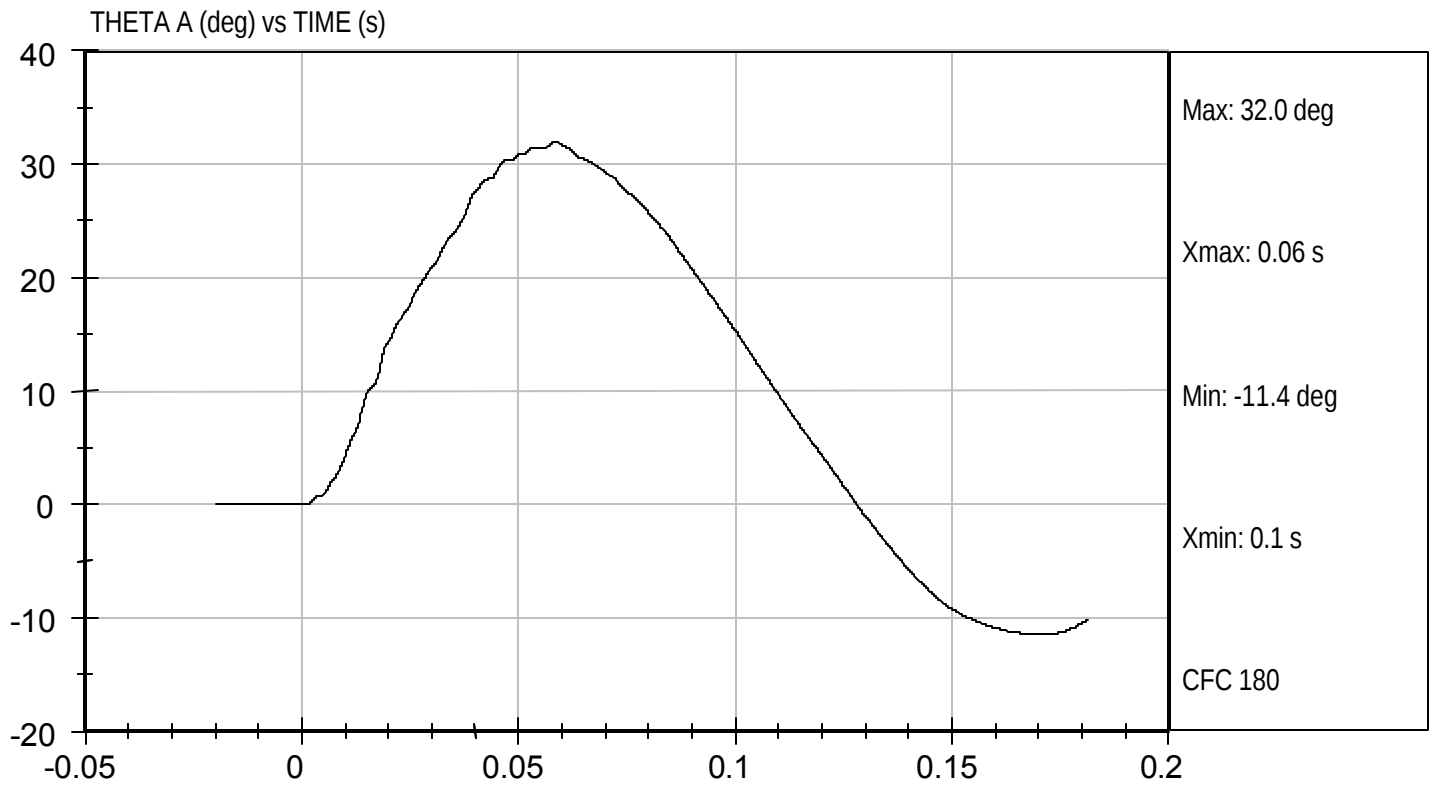
Test Date: 4/23/09
Velocity: 11.26 ft/s, 3.4 m/s





Test Desc: Neck Bending
Component ID: D09882

Test Date: 4/23/09
Velocity: 11.26 ft/s, 3.4 m/s

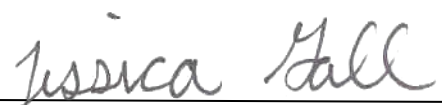


MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09883

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.2	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.1	Pass
Overall Test Results			Pass	


Laboratory Technician

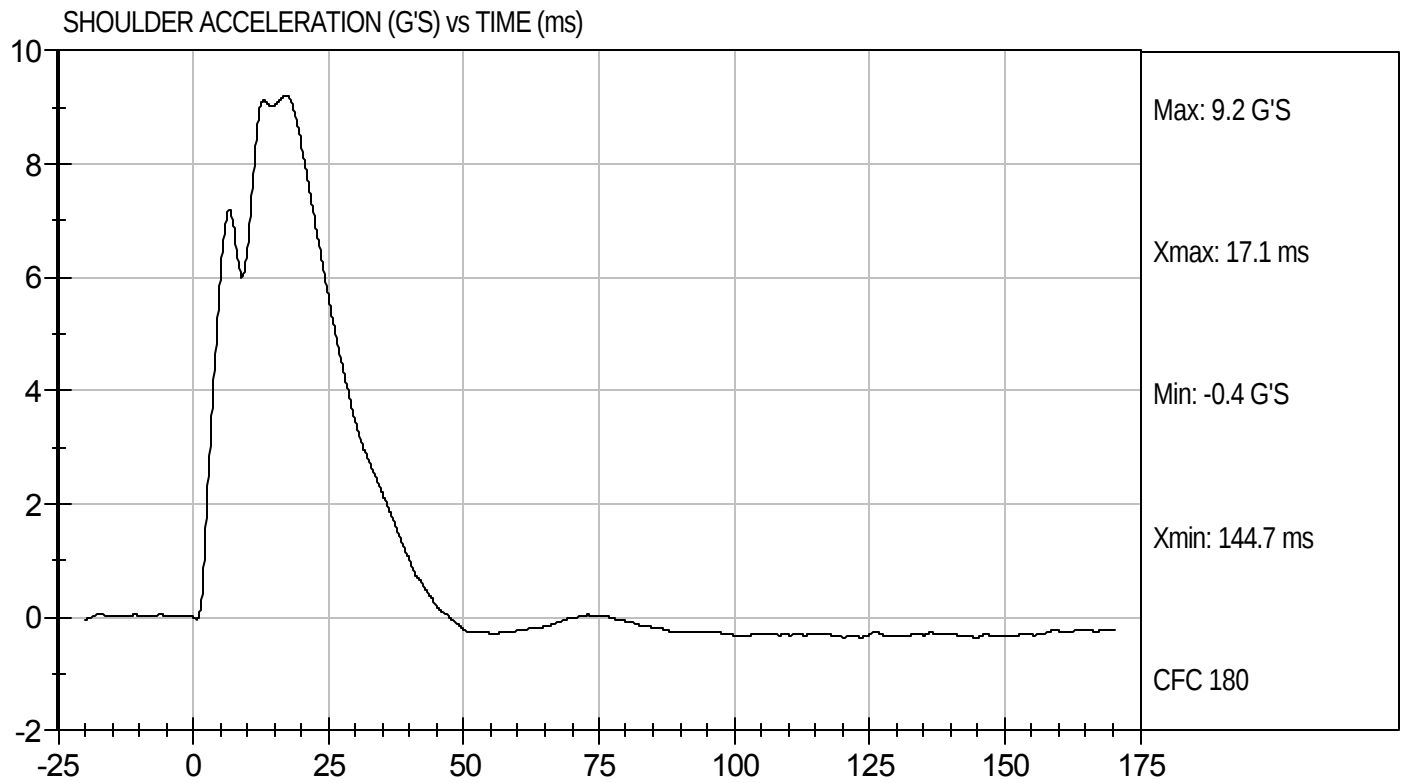
4/23/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D09883

Test Date: 4/23/09
Velocity: 14.0 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09884

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.5	Pass
Overall Test Results			Pass	

Jessica Gall
Laboratory Technician

4/23/09
Test Date

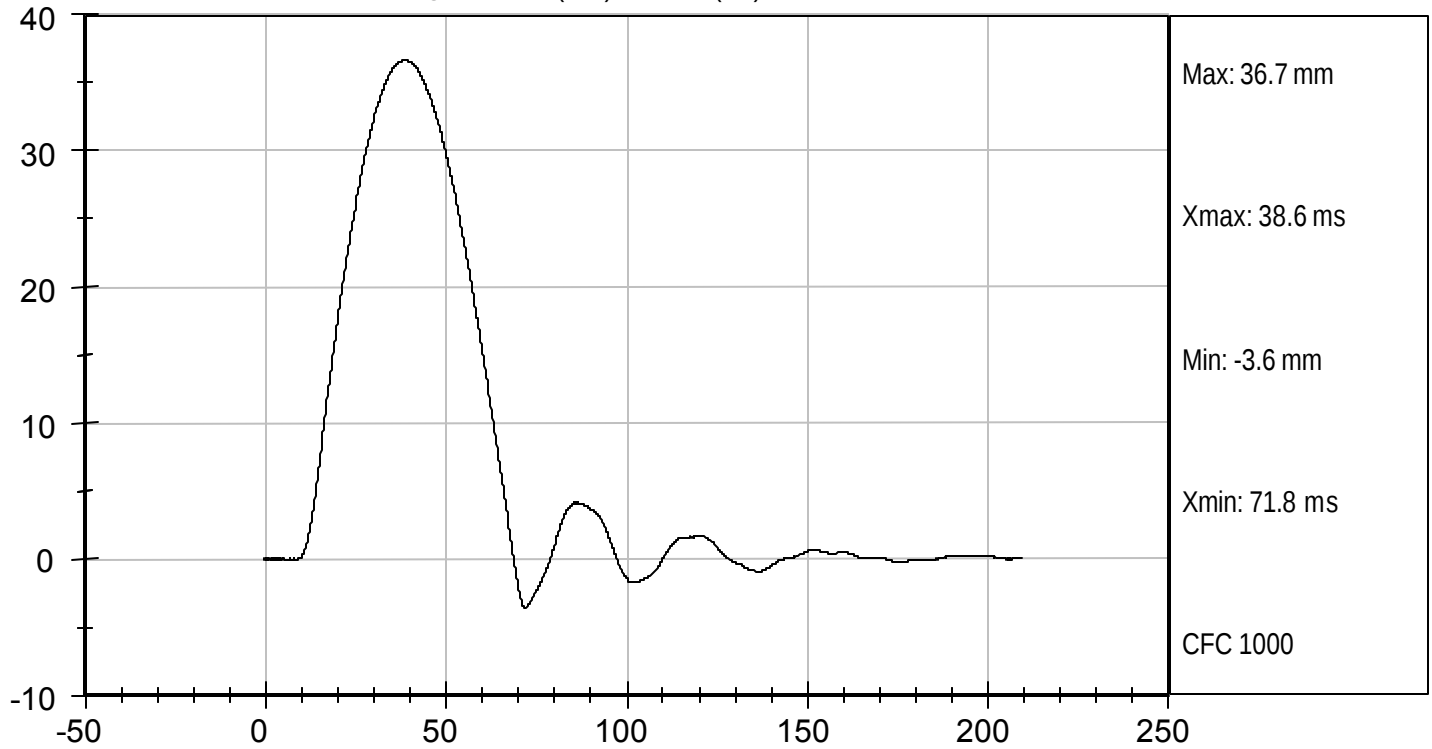
David Winkelbauer
Approved By



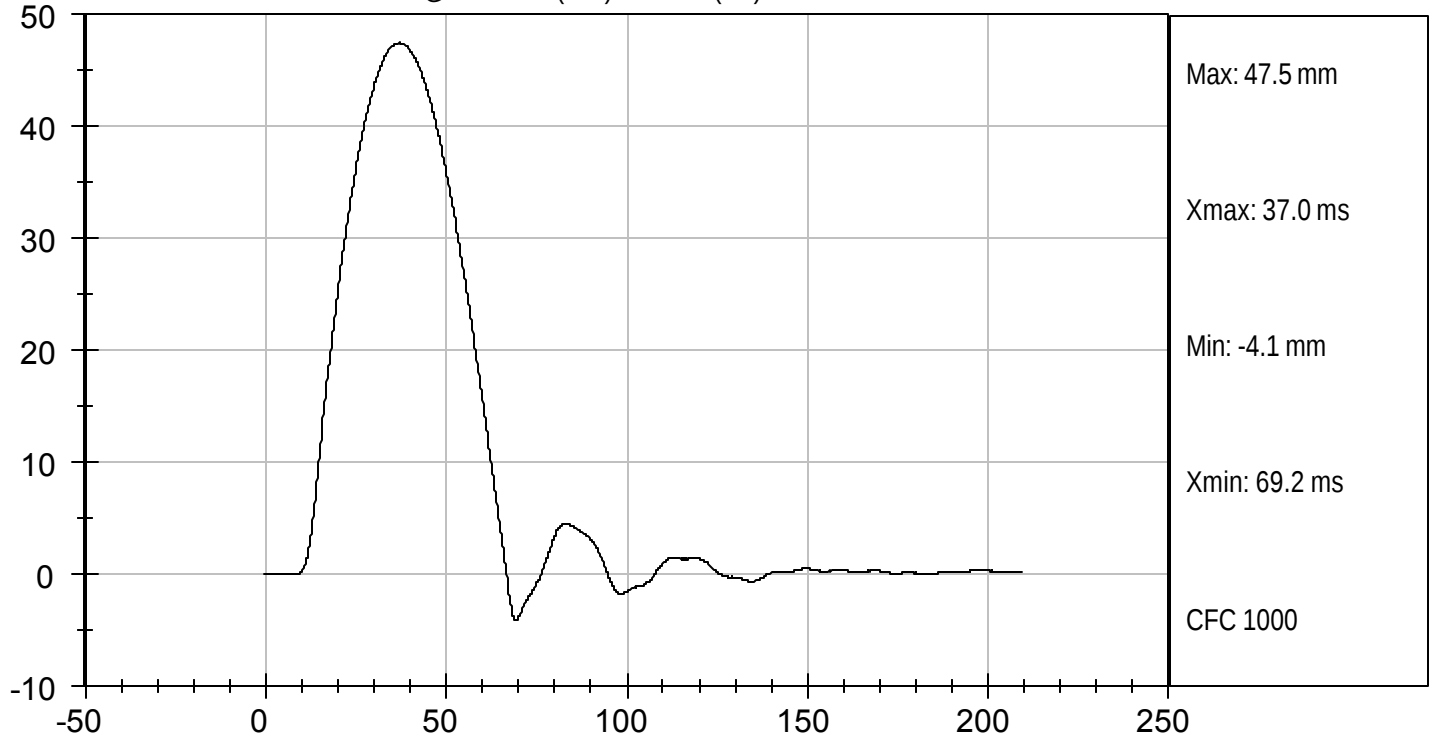
Test Desc: Rib Impact - Upper
Component ID: D09884

Test Date: 4/23/09

UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09885

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.7	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

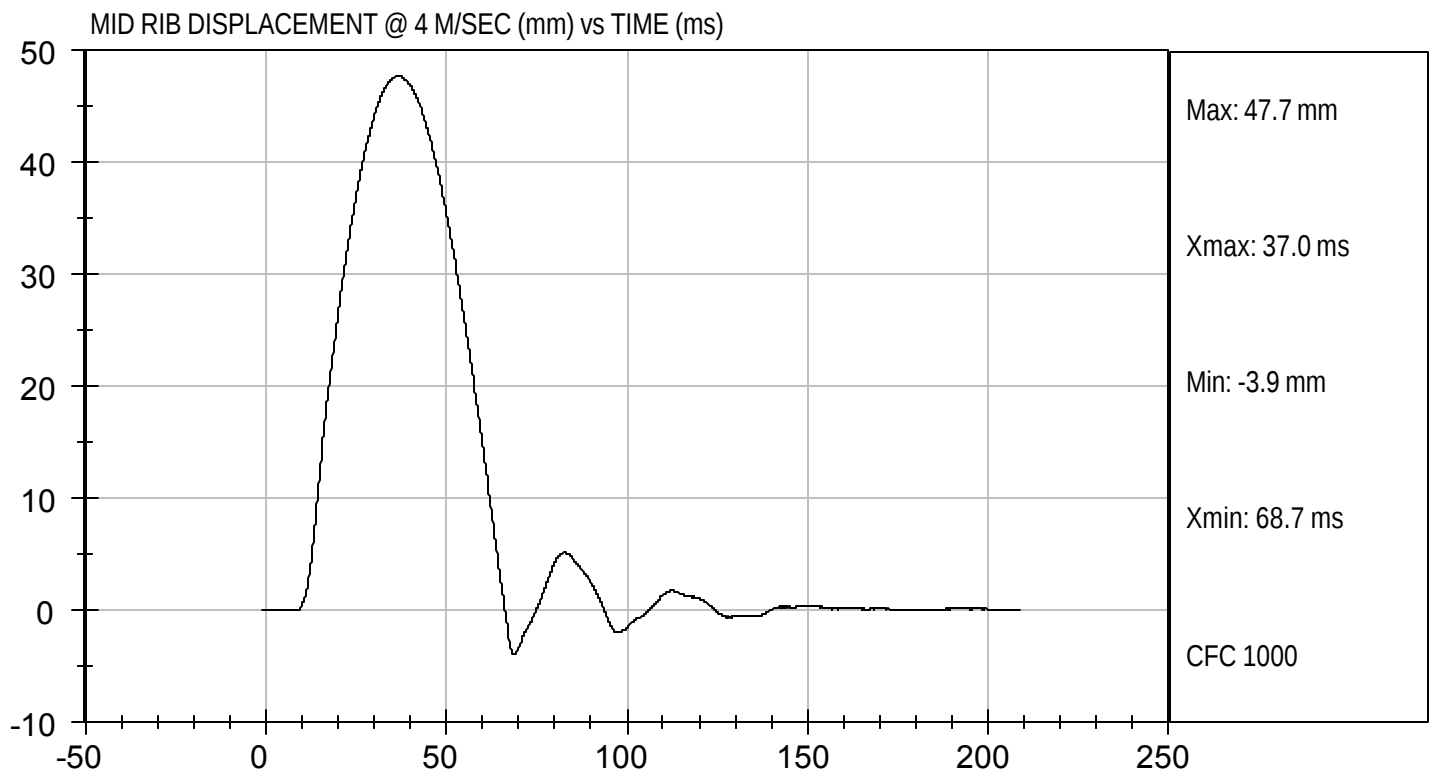
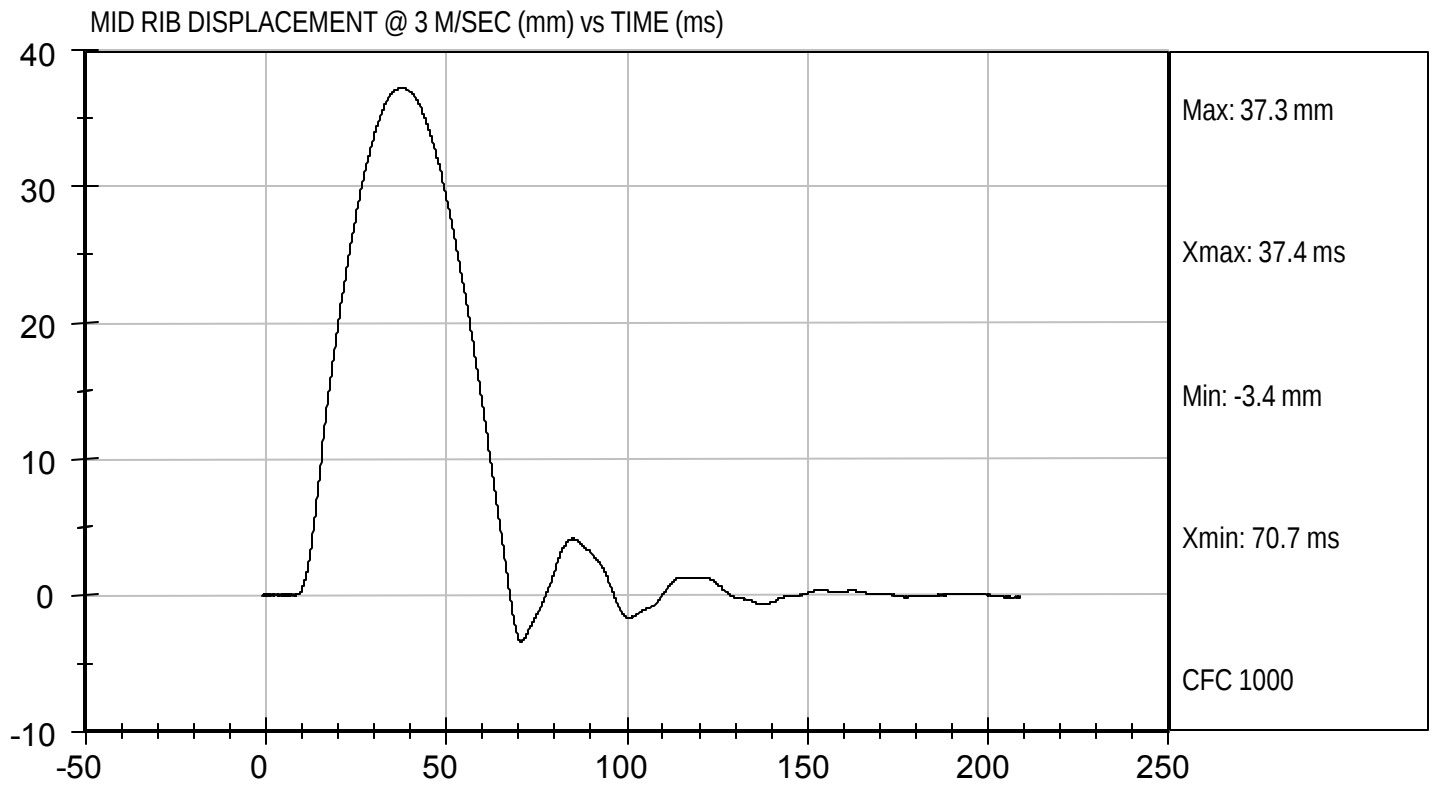
4/23/09
Test Date

David Winkelbauer
Approved By



Test Desc: Rib Impact - Mid
Component ID: D09885

Test Date: 4/23/09



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09886

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.9	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.4	Pass
Overall Test Results			Pass	


Laboratory Technician

4/23/09
Test Date

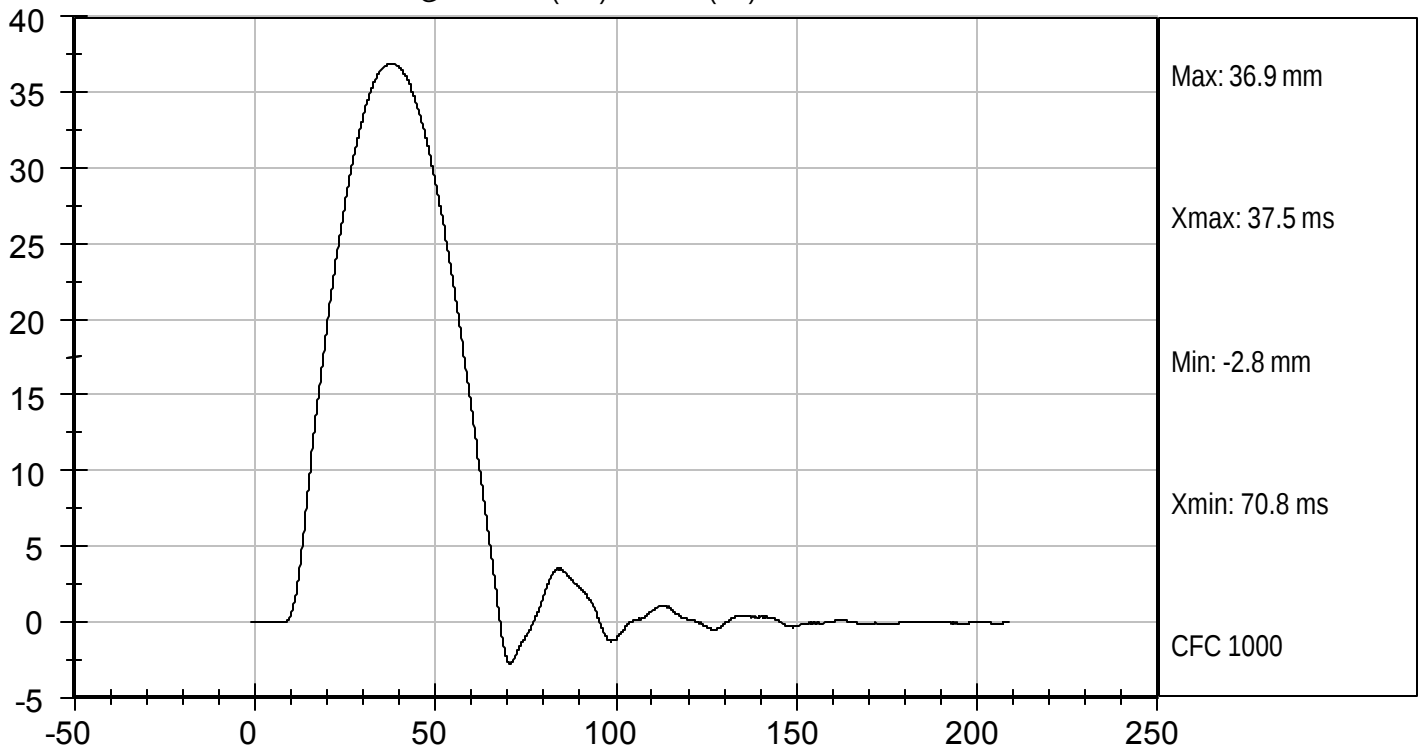

Approved By



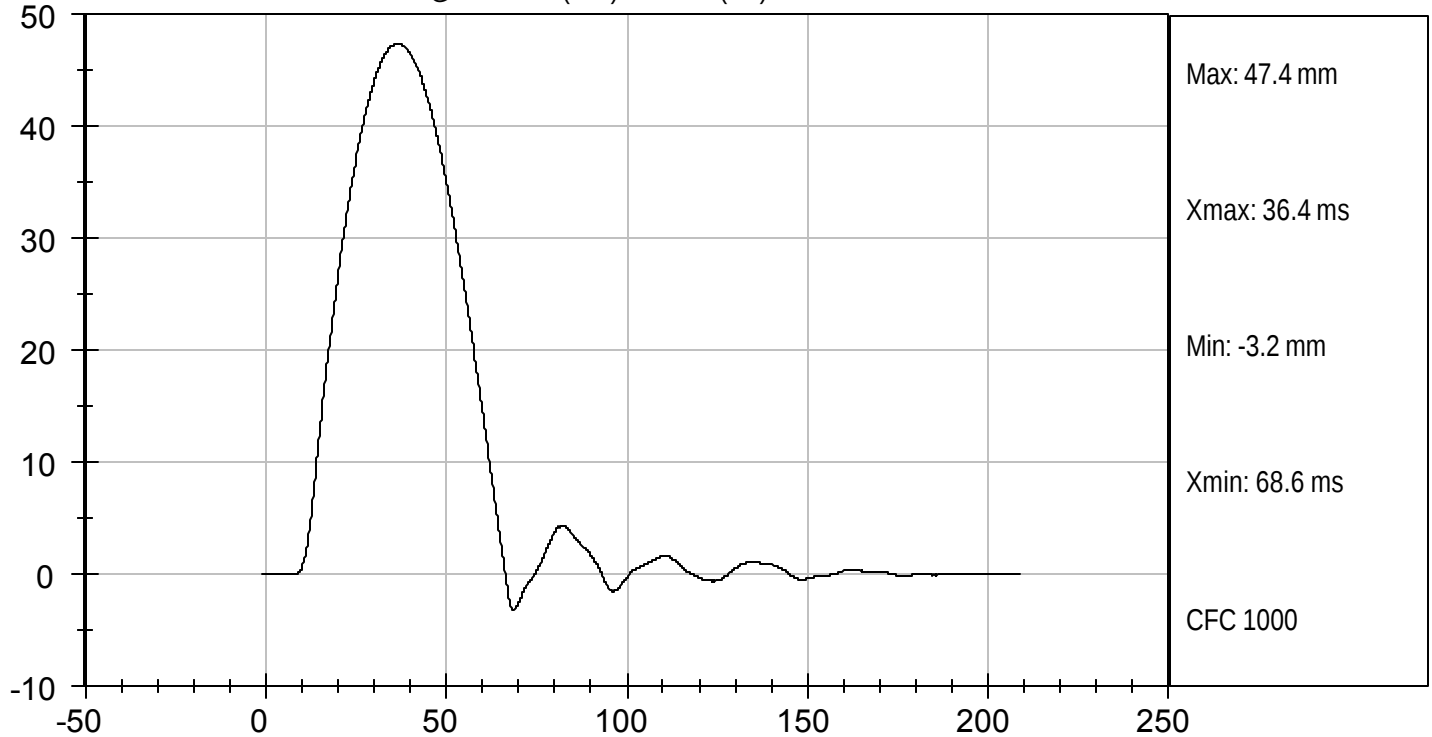
Test Desc: Rib Impact - Lower
Component ID: D09886

Test Date: 4/23/09

LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09887

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	29	Pass
Probe Speed	m/s	3.90 to 4.10	3.96	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.05	Pass
Time of Maximum Impactor Force	msec	10.60 to 13.00	10.80	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.49	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	10.50	Pass
Overall Test Results				Pass


 Laboratory Technician

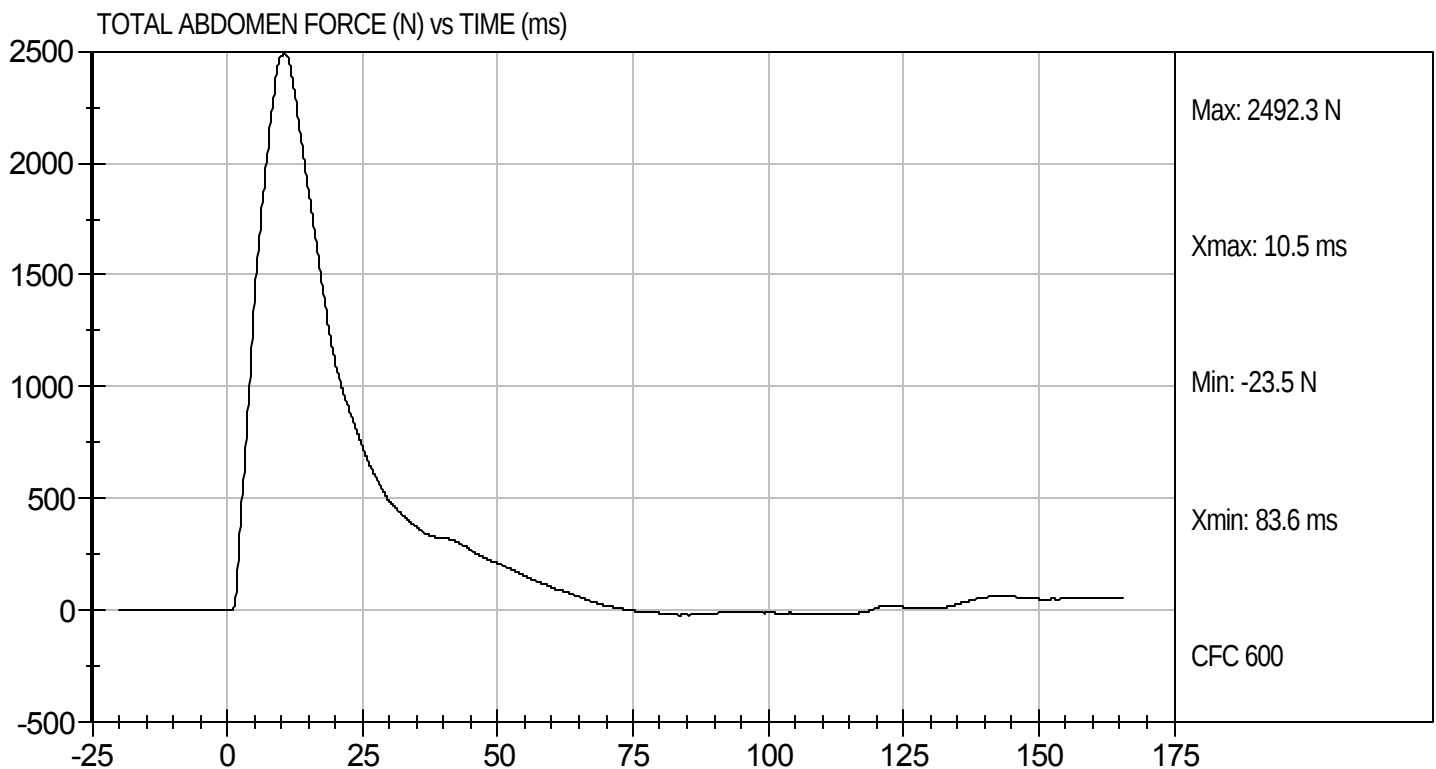
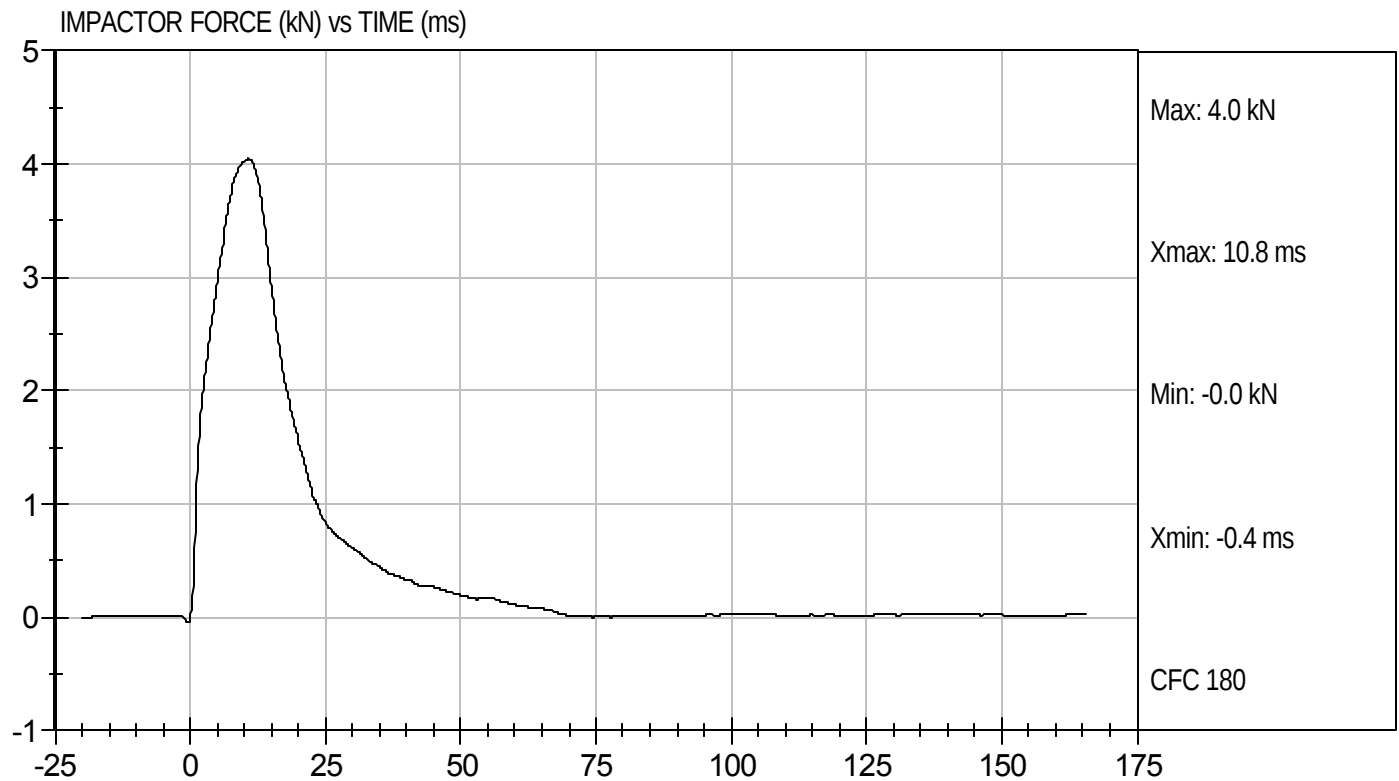
4/23/09
 Test Date


 Approved By



Test Desc: Abdomen Impact
Component ID: D09887

Test Date: 4/23/09
Velocity: 13.0 ft/s, 3.96 m/s

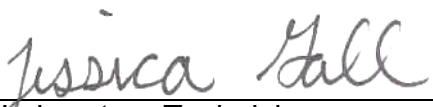


MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09888

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 msec	m/sec	-0.05 to 0.00	-0.02	Pass
	3.7 msec	m/sec	-0.425 to -0.24	-0.41	Pass
	27 msec	m/sec	-6.50 to -5.80	-6.00	Pass
	30 msec	m/sec	>= -6.5	-5.98	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.4	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	44.5	Pass
Headform Rotation Decay to Initial Position		msec	37 to 57	42	Pass
Overall Results				Pass	


 Laboratory Technician

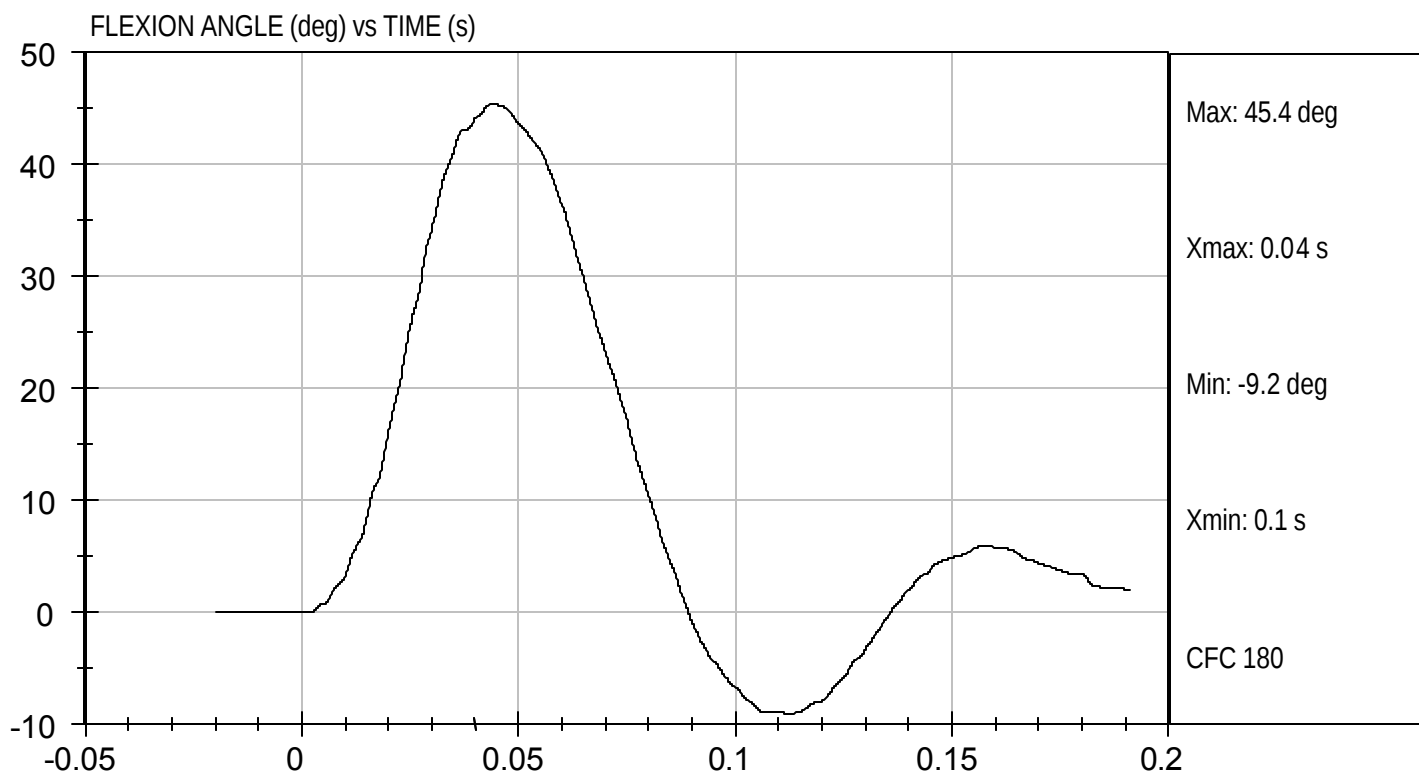
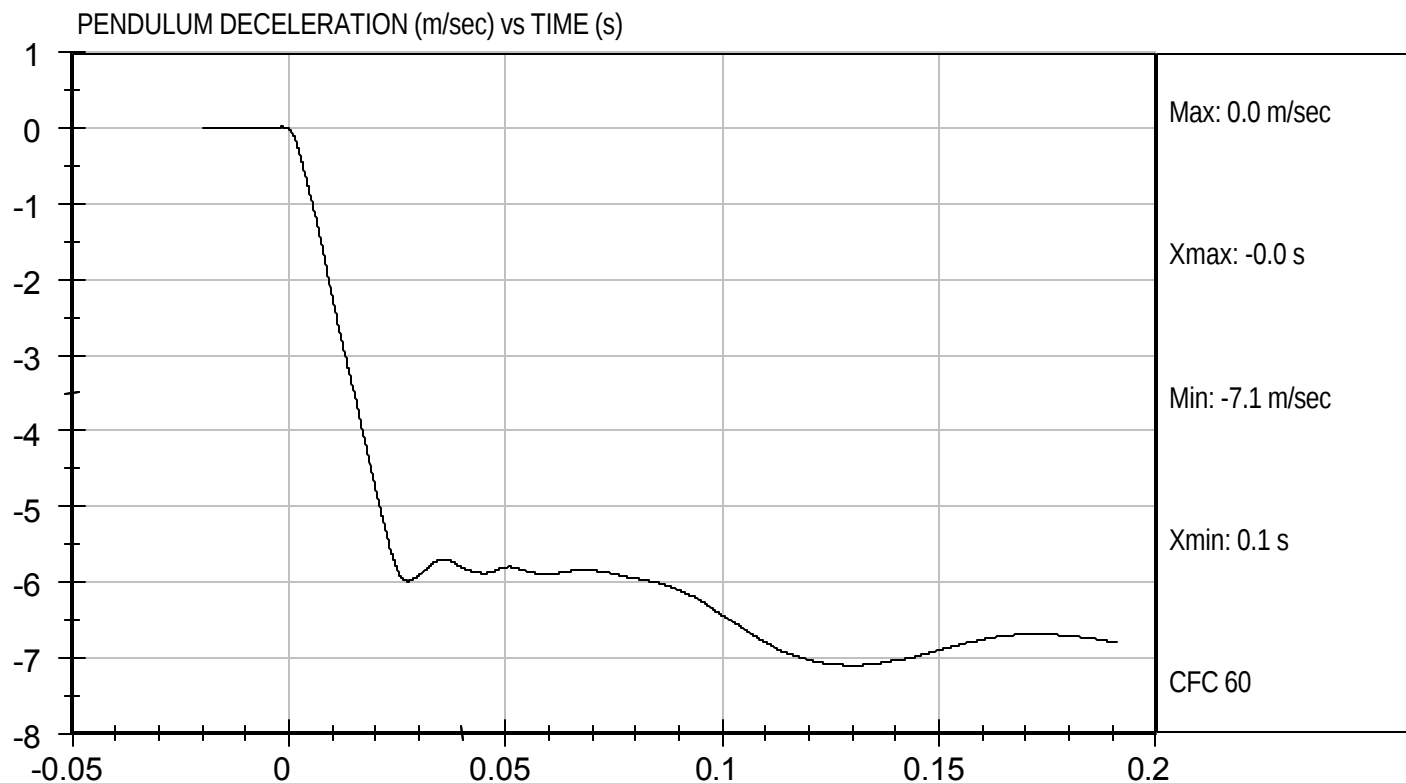
4/23/09
 Test Date


 Approved By



Test Desc: Lumbar Bending
Component ID: D09888

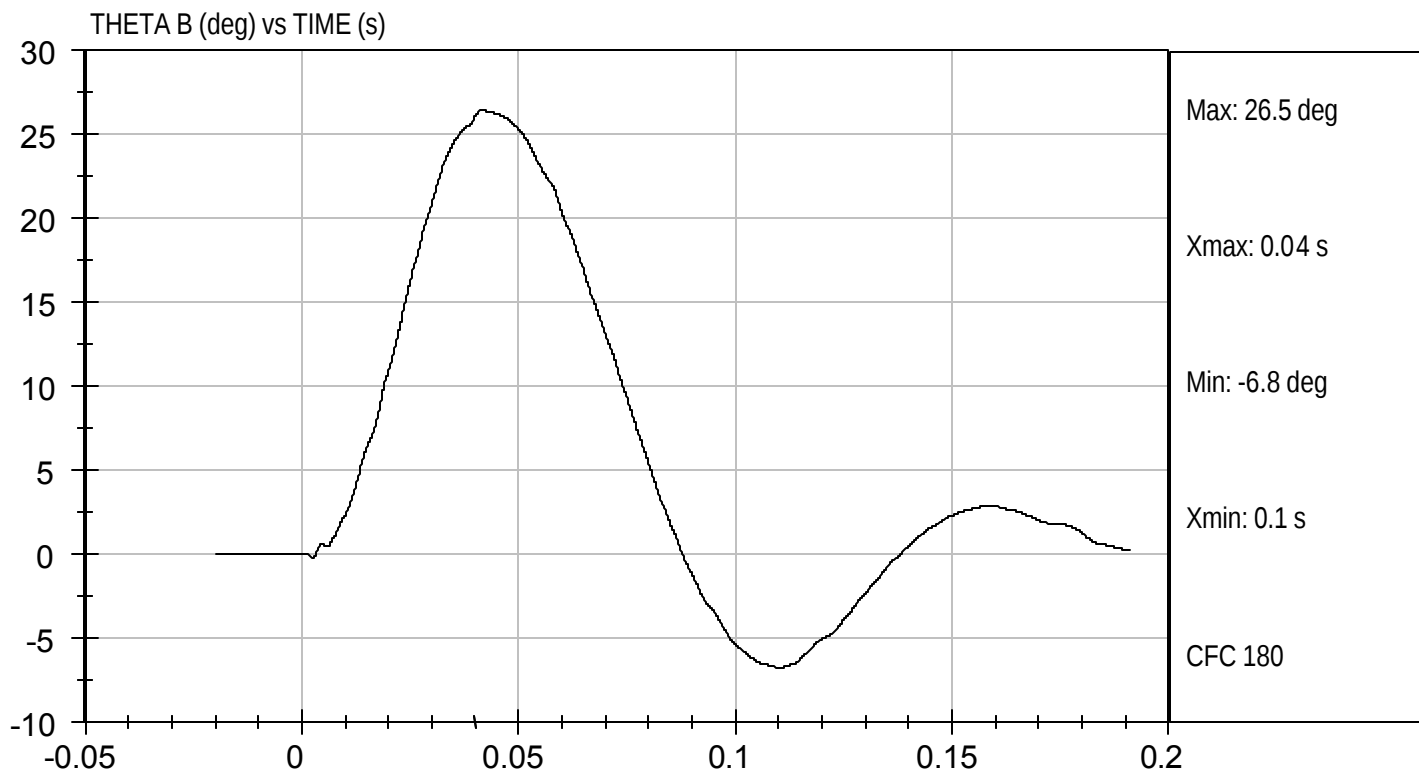
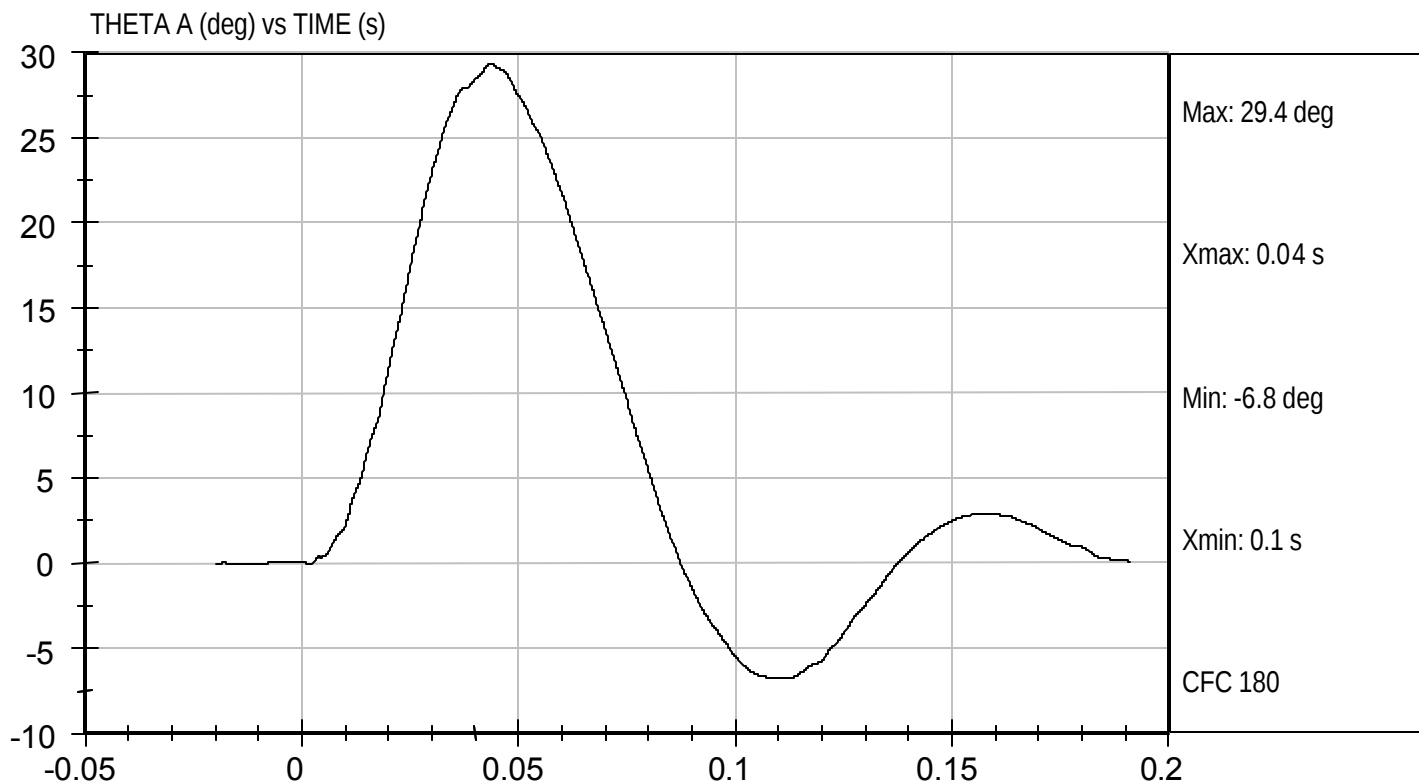
Test Date: 4/23/09
Velocity: 20.08 ft/s, 6.12 m/s





Test Desc: Lumbar Bending
Component ID: D09888

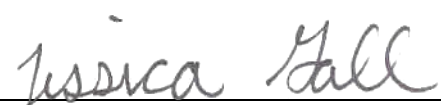
Test Date: 4/23/09
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

PELVIS TEST
ES-2re DUMMYATD Serial No: 032Test I.D: D09889

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	27	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.73	Pass
Time of Maximum Impactor Force	msec	11.80 to 16.10	12.70	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.34	Pass
Time of Maximum Pubic Force	msec	12.20 to 17.00	13.10	Pass
Overall Test Results				Pass


Laboratory Technician

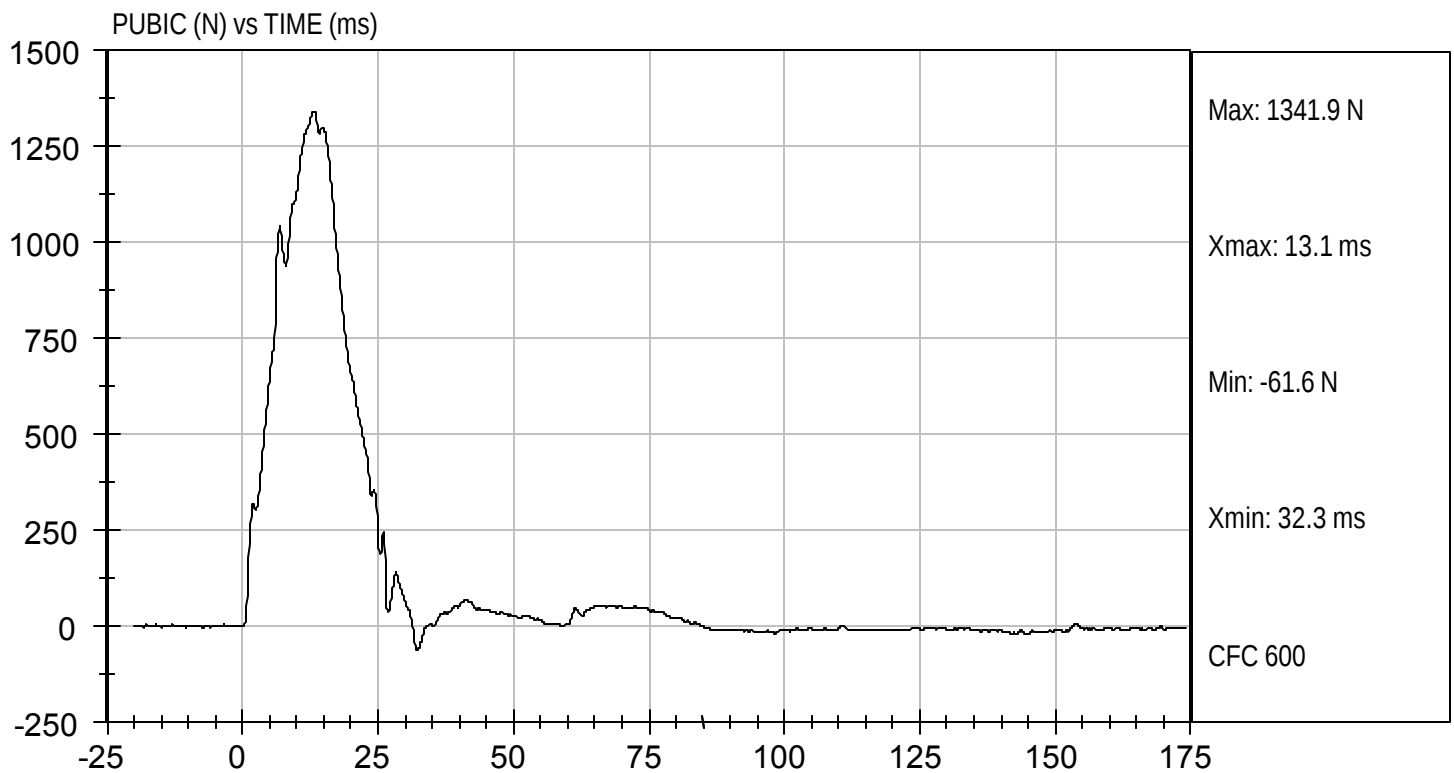
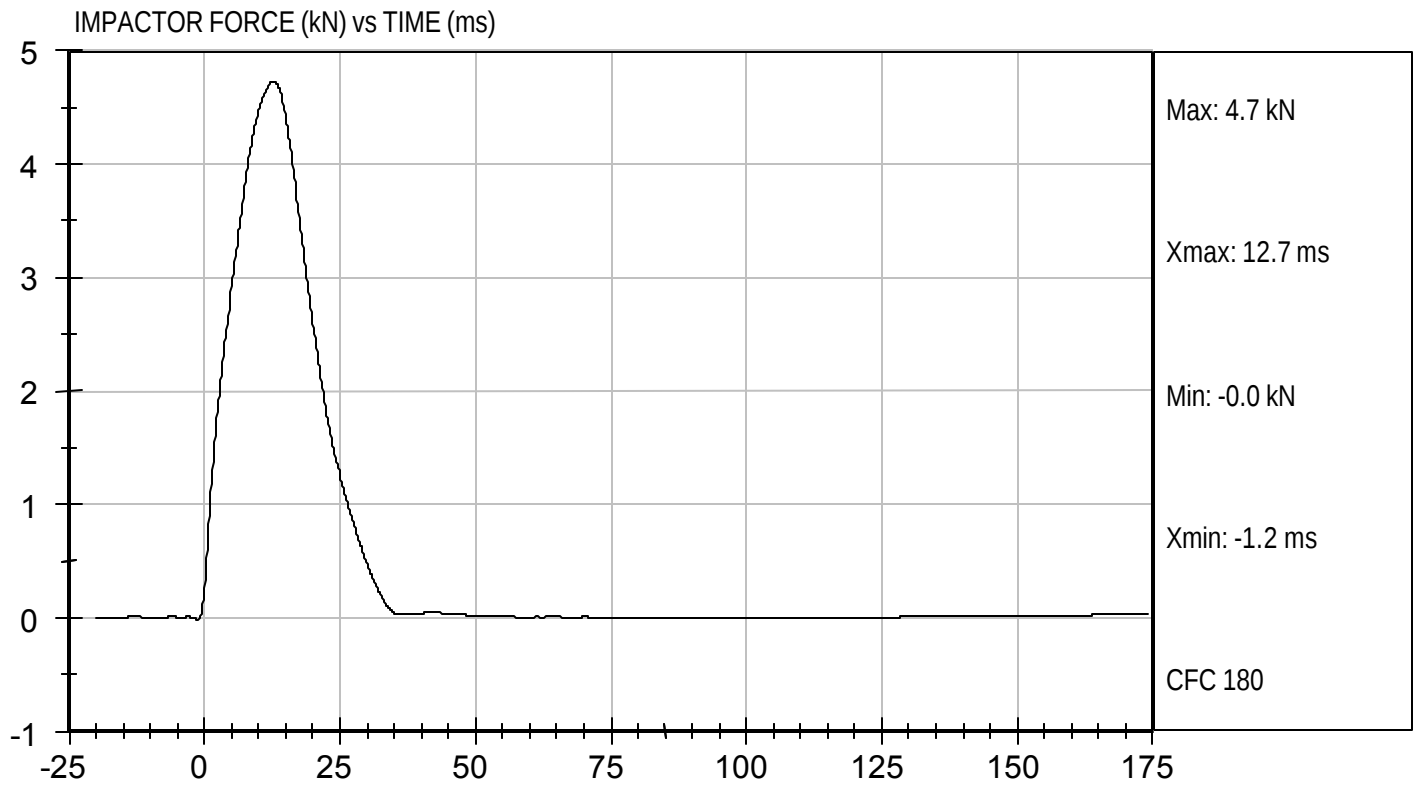
4/23/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D09889

Test Date: 4/23/09
Velocity: 14.1 ft/s, 4.30 m/s

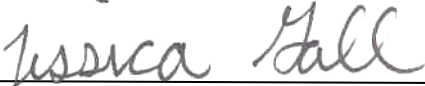


MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 032

Test I.D: D09880

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.17 to 6.12	5.48	Pass
Upper Rib Displacement	mm	33.2 to 41.3	36.4	Pass
Middle Rib Displacement	mm	37.1 to 45.4	40.2	Pass
Lower Rib Displacement	mm	35.6 to 43.0	39.4	Pass
			Overall Test Results	Pass


Laboratory Technician

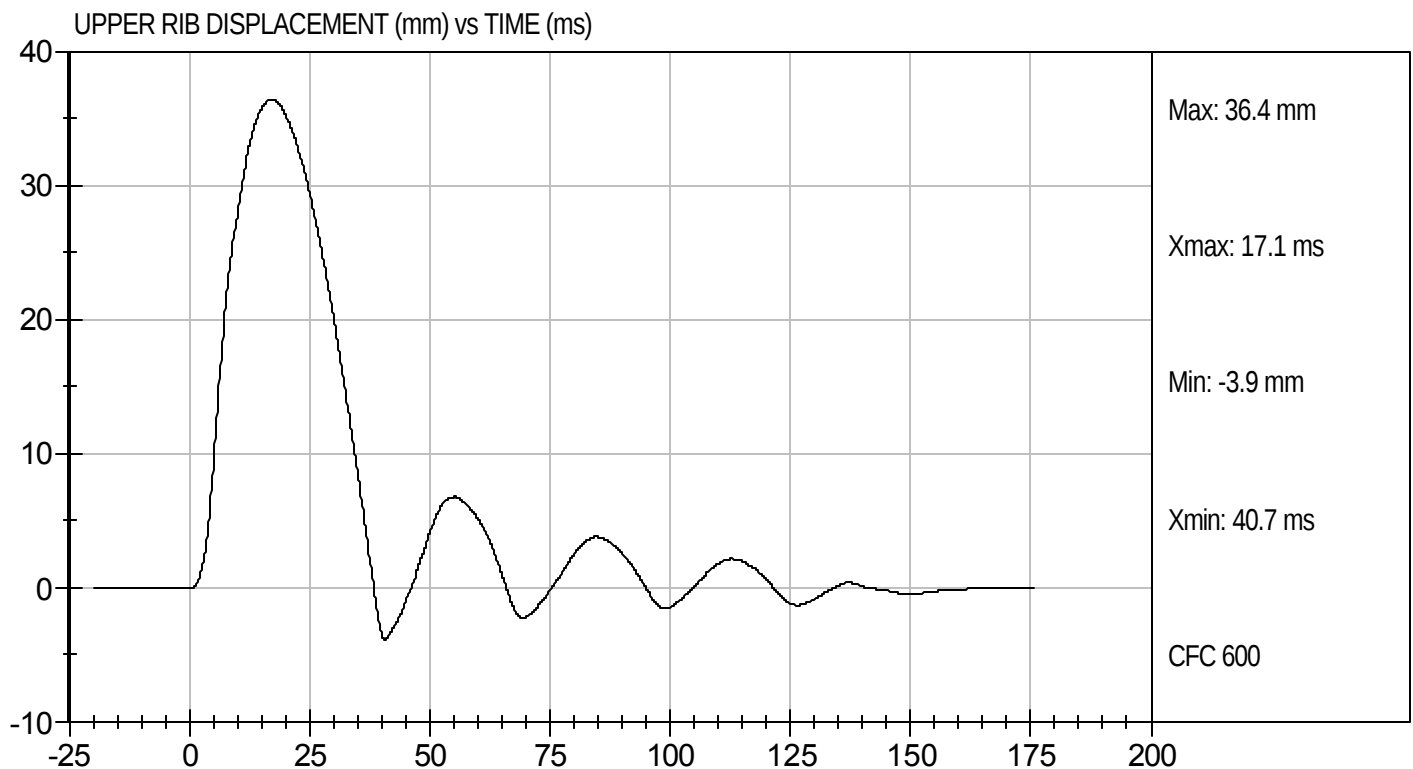
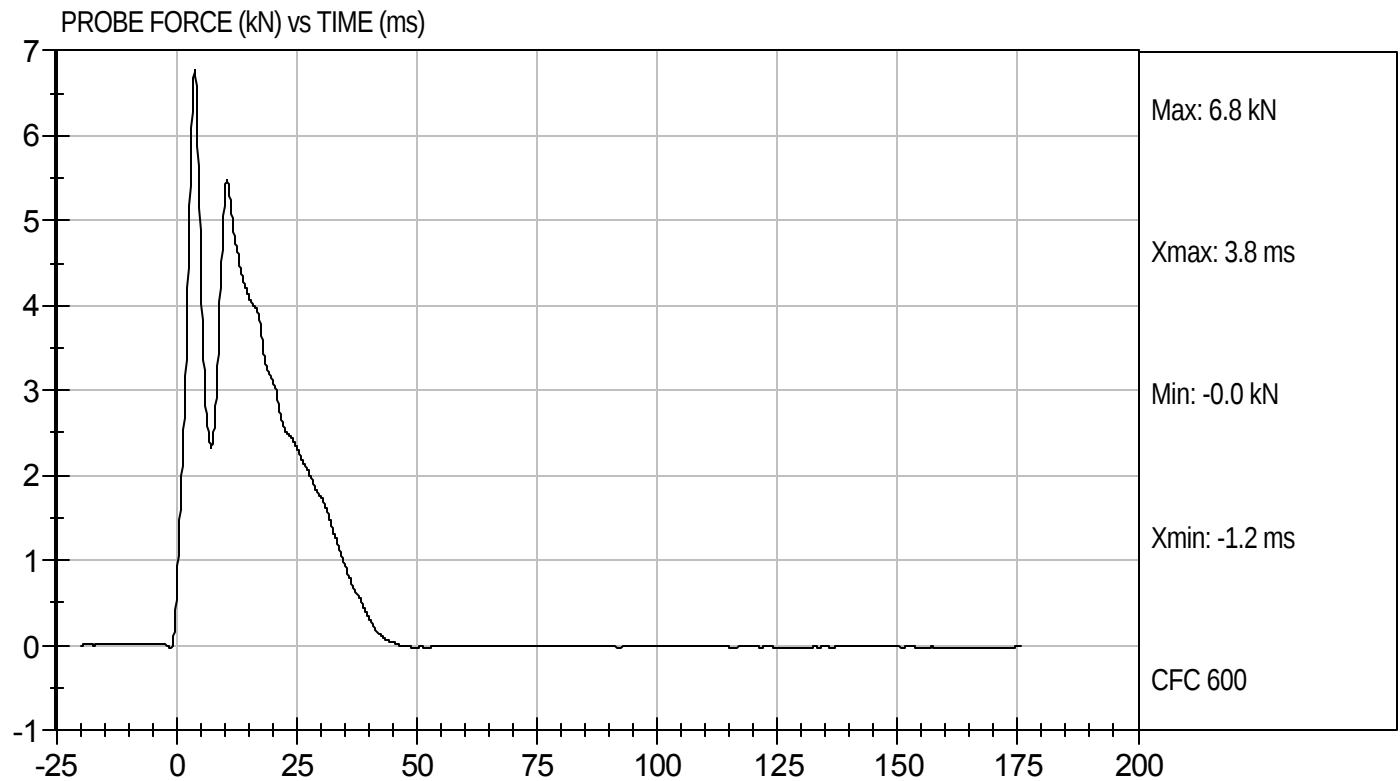
4/23/09
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D09880

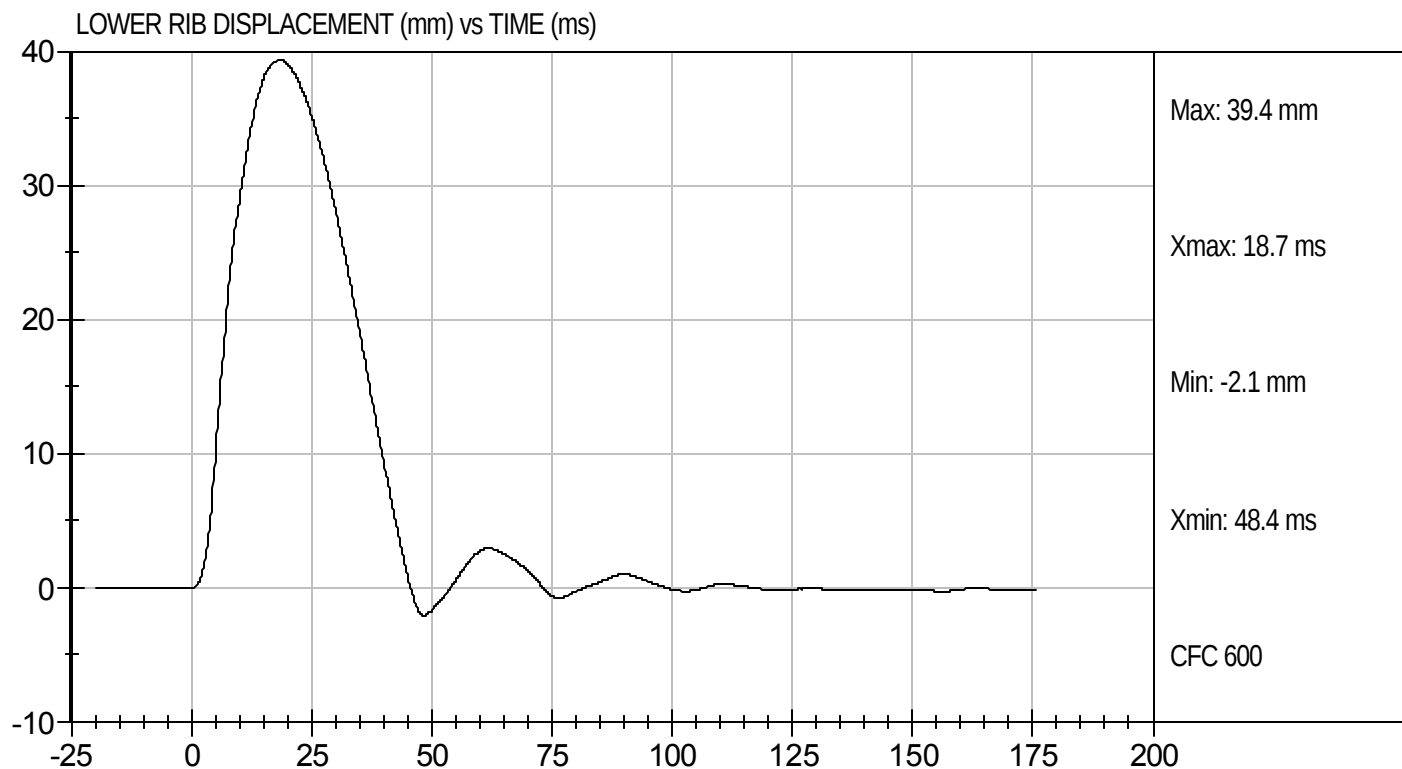
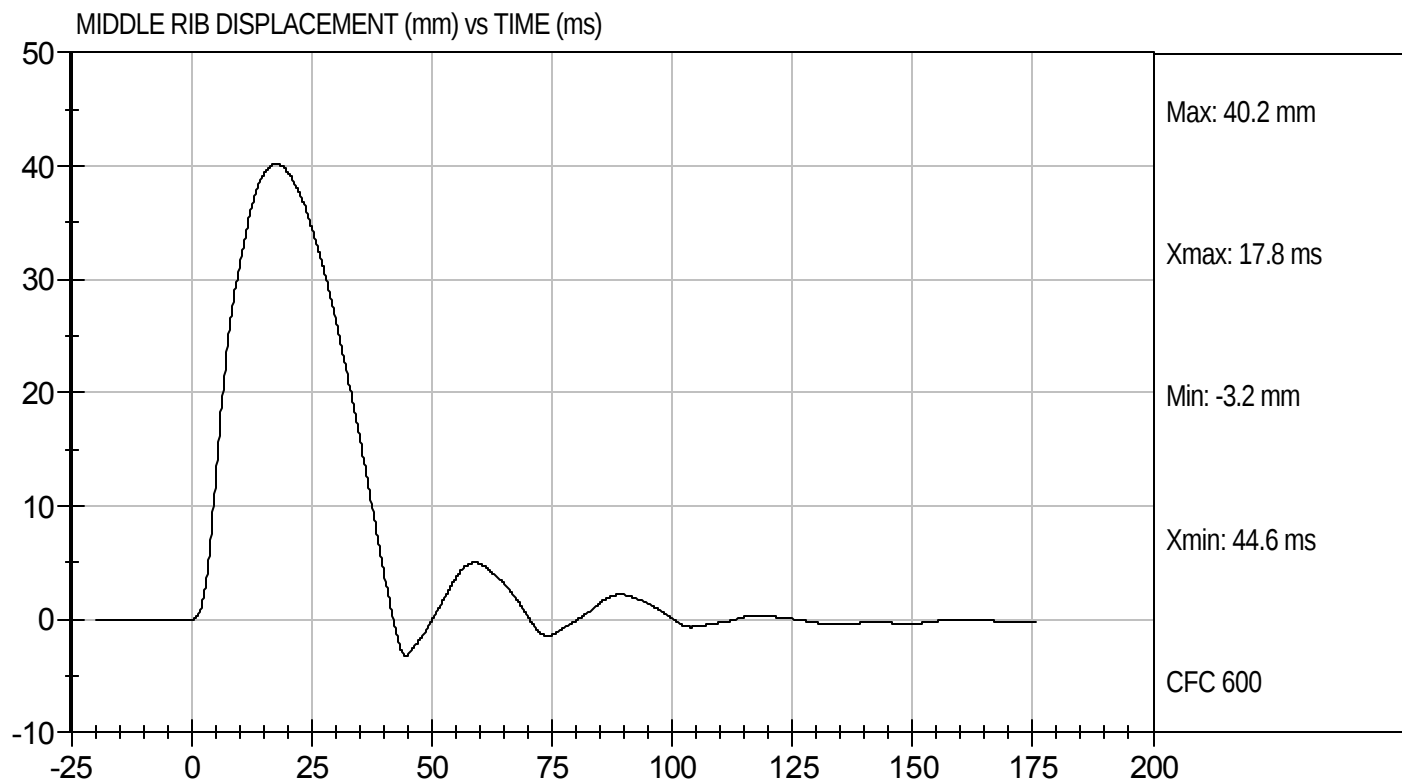
Test Date: 4/23/09
Velocity: 18.3 ft/s, 5.58 m/s





Test Desc: Thorax Without Arm
Component ID: D09880

Test Date: 4/23/09
Velocity: 18.3 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D09661

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	115 to 137	116	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.8	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

3/30/09
Test Date

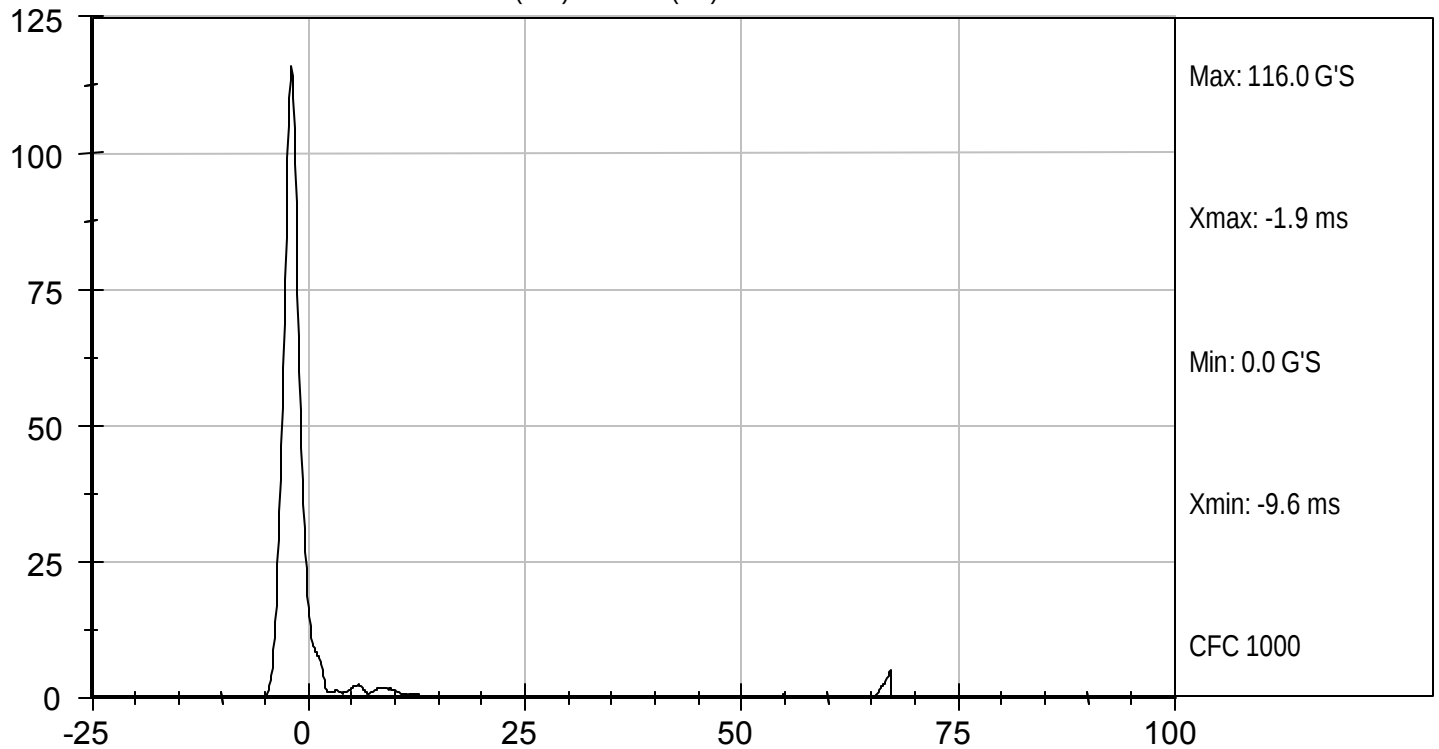

Approved By



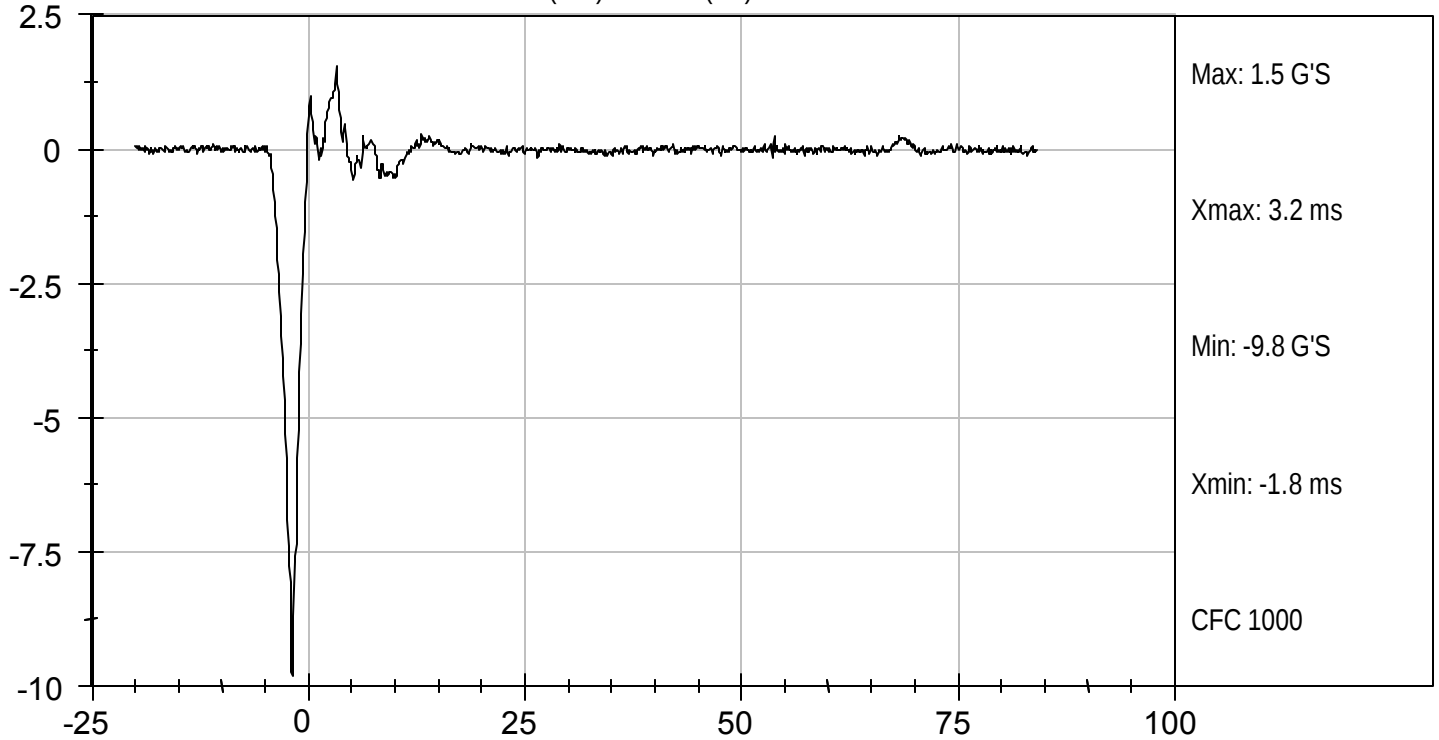
Test Desc: Head Drop
Component ID: D09661

Test Date: 3/30/09
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)

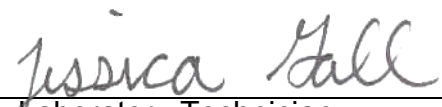


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D09662

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.6	Pass
Humidity		%	10 to 70	19	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.58	Pass
	15 ms	m/s	3.30 to 4.10	3.75	Pass
	20 ms	m/s	4.40 to 5.40	5.01	Pass
	25 ms	m/s	5.40 to 6.10	5.59	Pass
	25-100 ms	m/s	5.50 to 6.20	5.60	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	59	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	114	Pass
Overall Test Results				Pass	


 Laboratory Technician

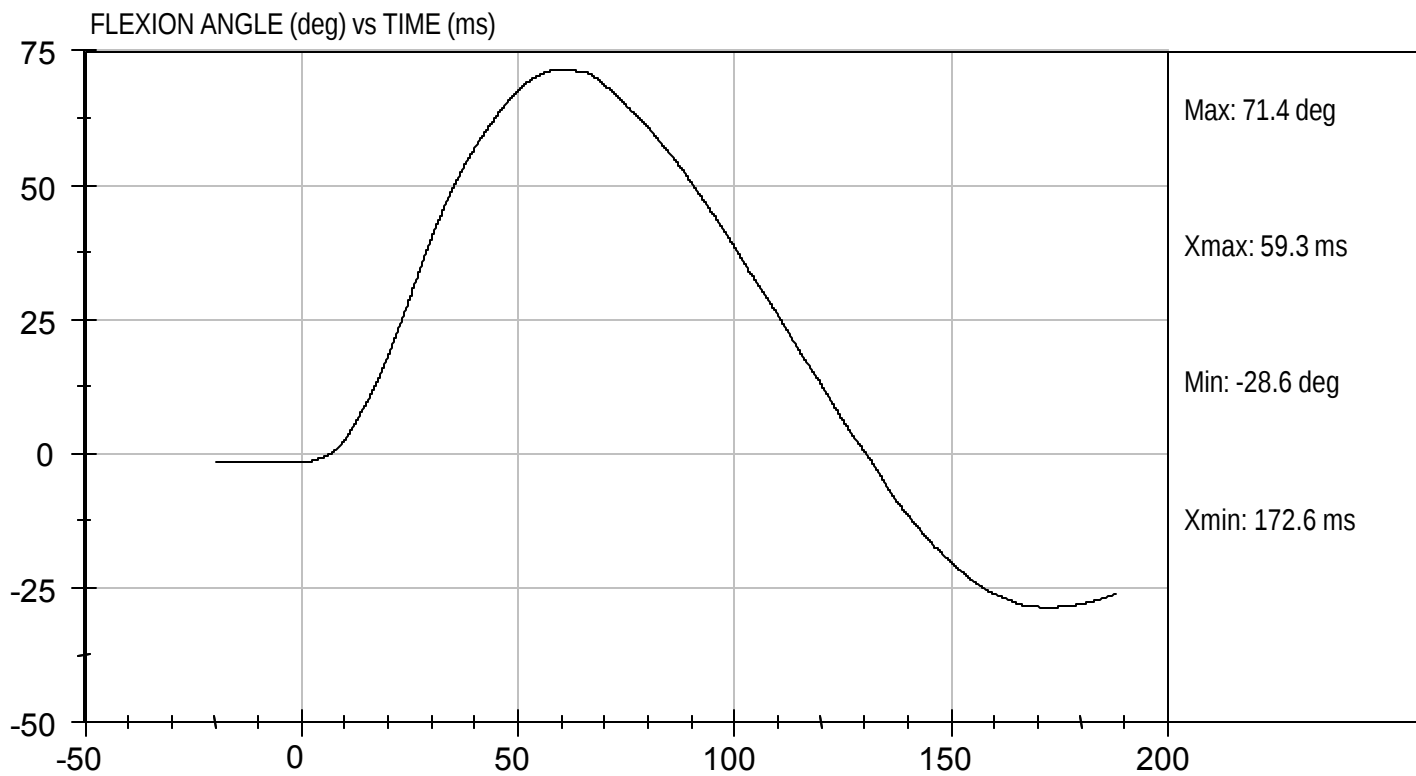
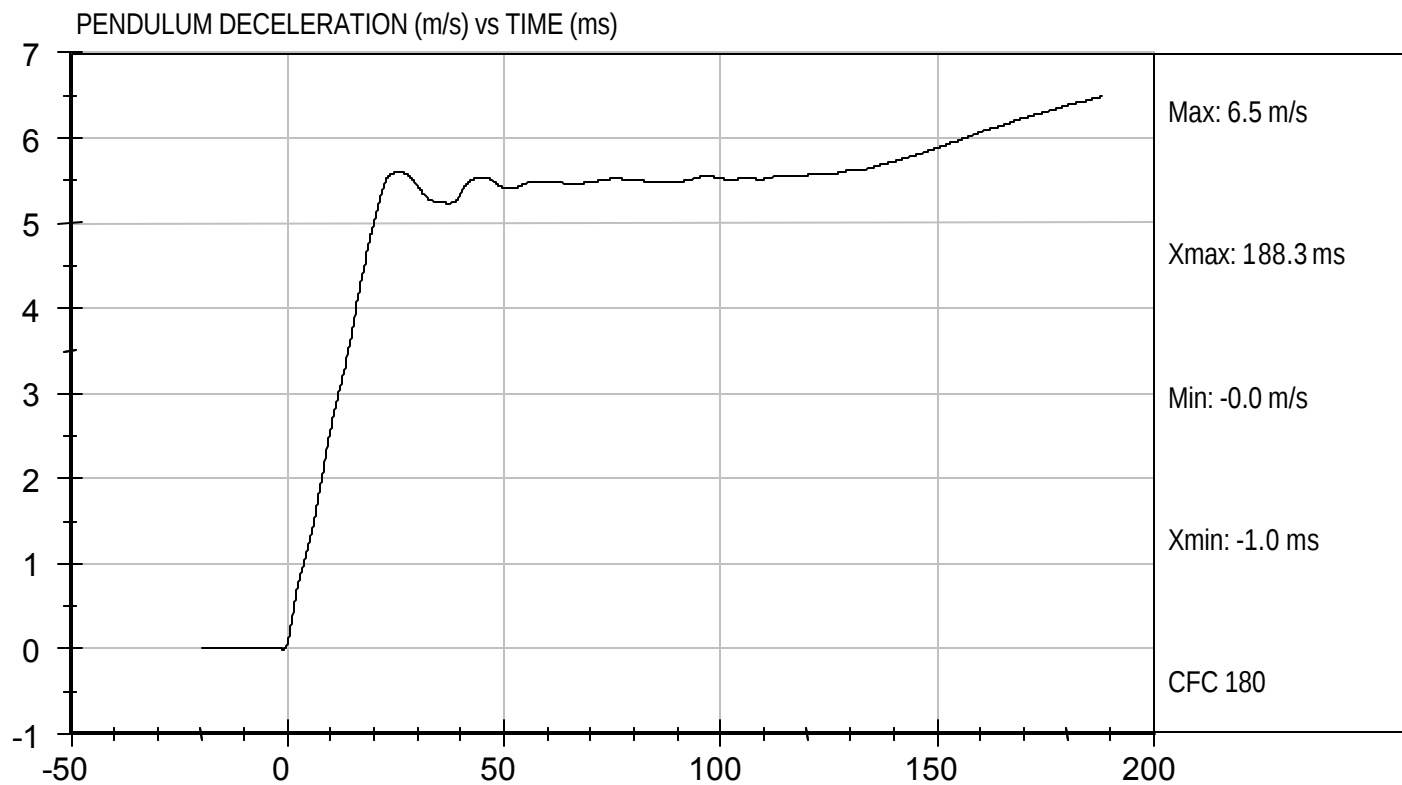
3/30/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D09662

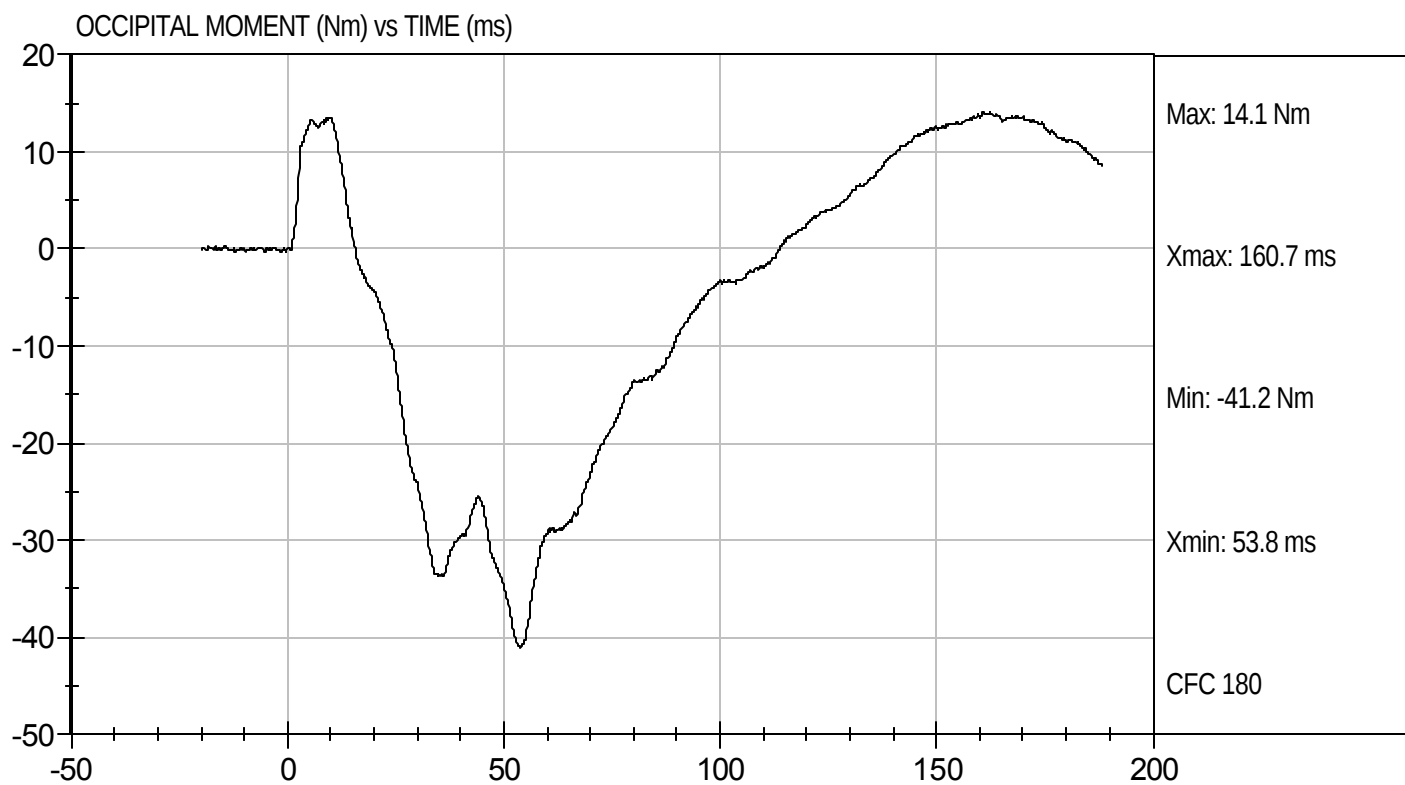
Test Date: 3/30/09
Velocity: 18.3 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D09662

Test Date: 3/30/09
Velocity: 18.3 ft/s, 5.58 m/s



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

ATD Serial No: 296

Test ID: D09663

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	16	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	20	Pass
Overall Test Results				Pass


Laboratory Technician

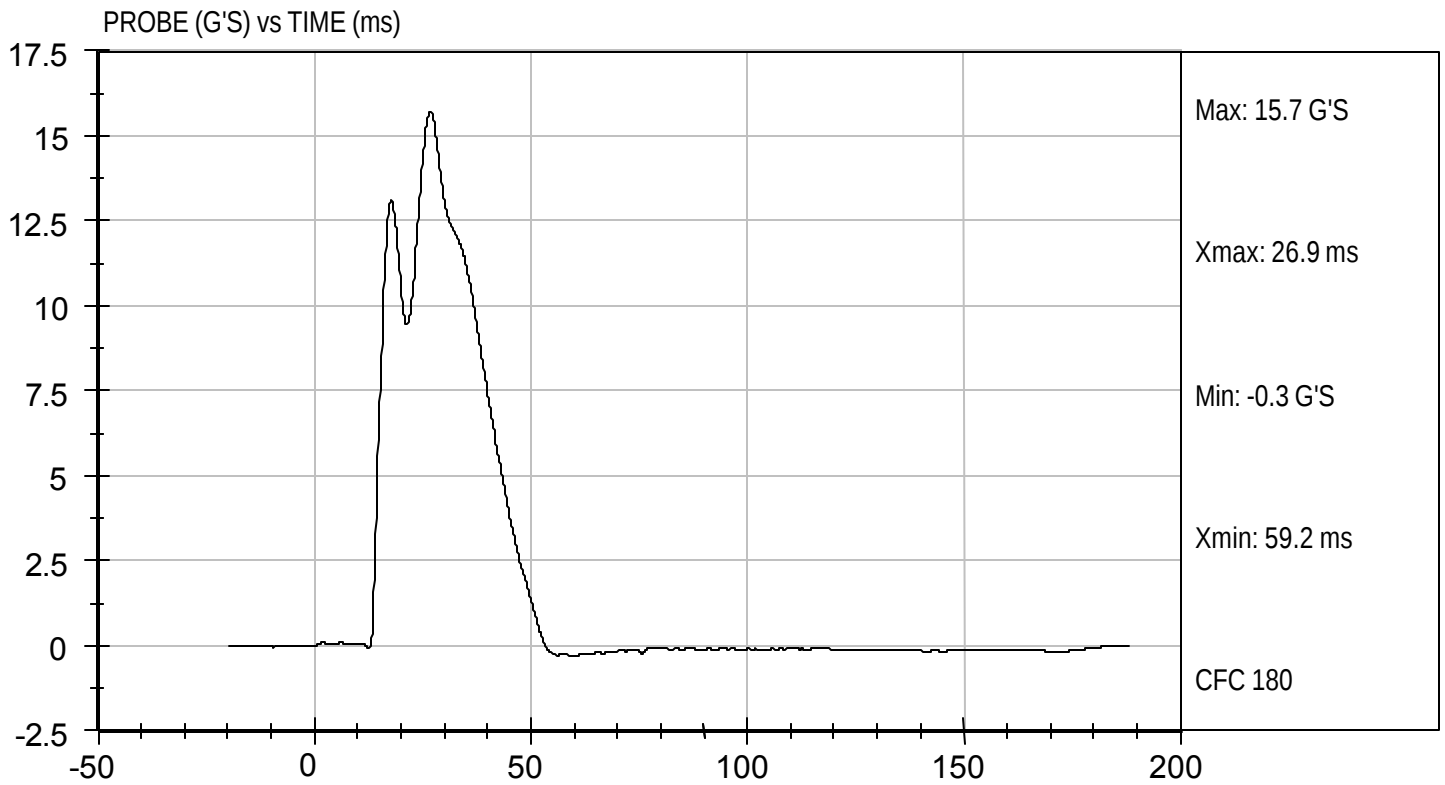
3/30/09
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D09663

Test Date: 3/30/09
Velocity: 14.37 ft/s, 4.38 m/s

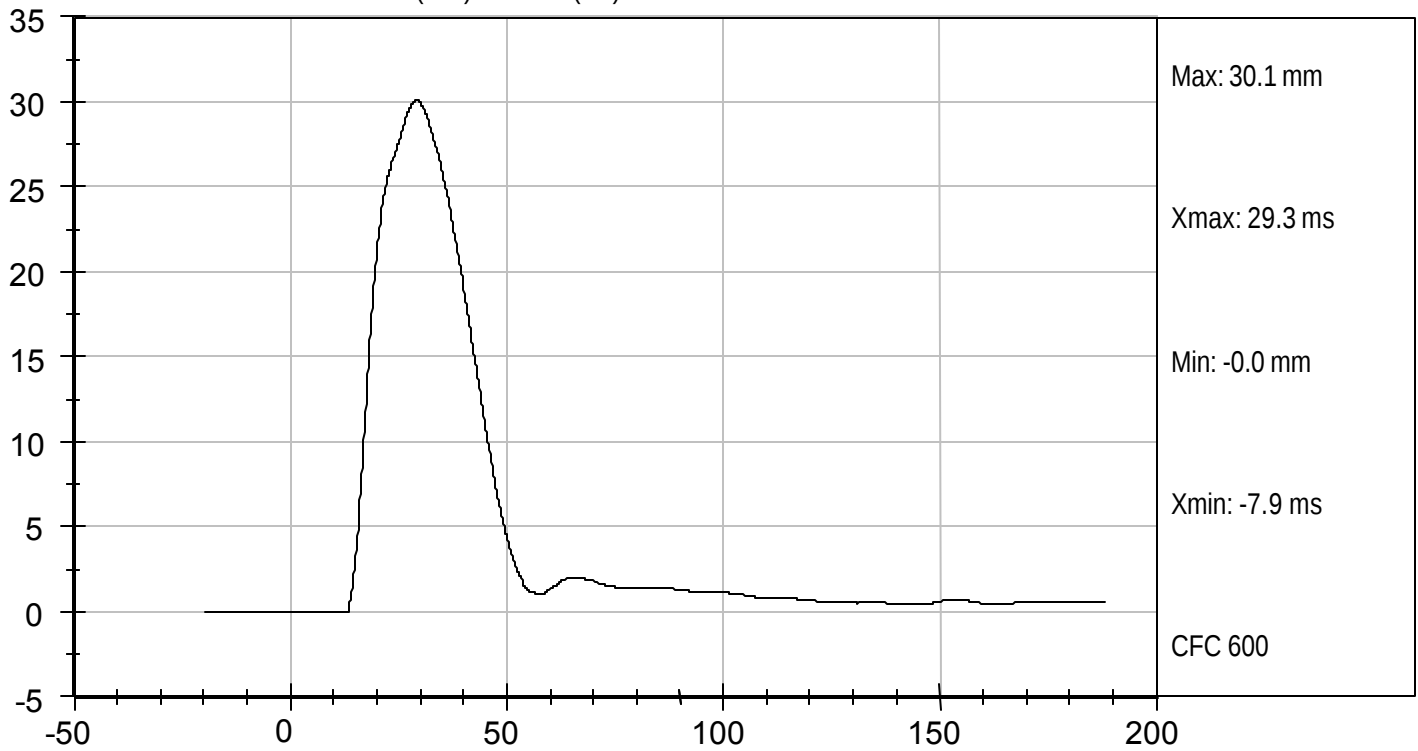




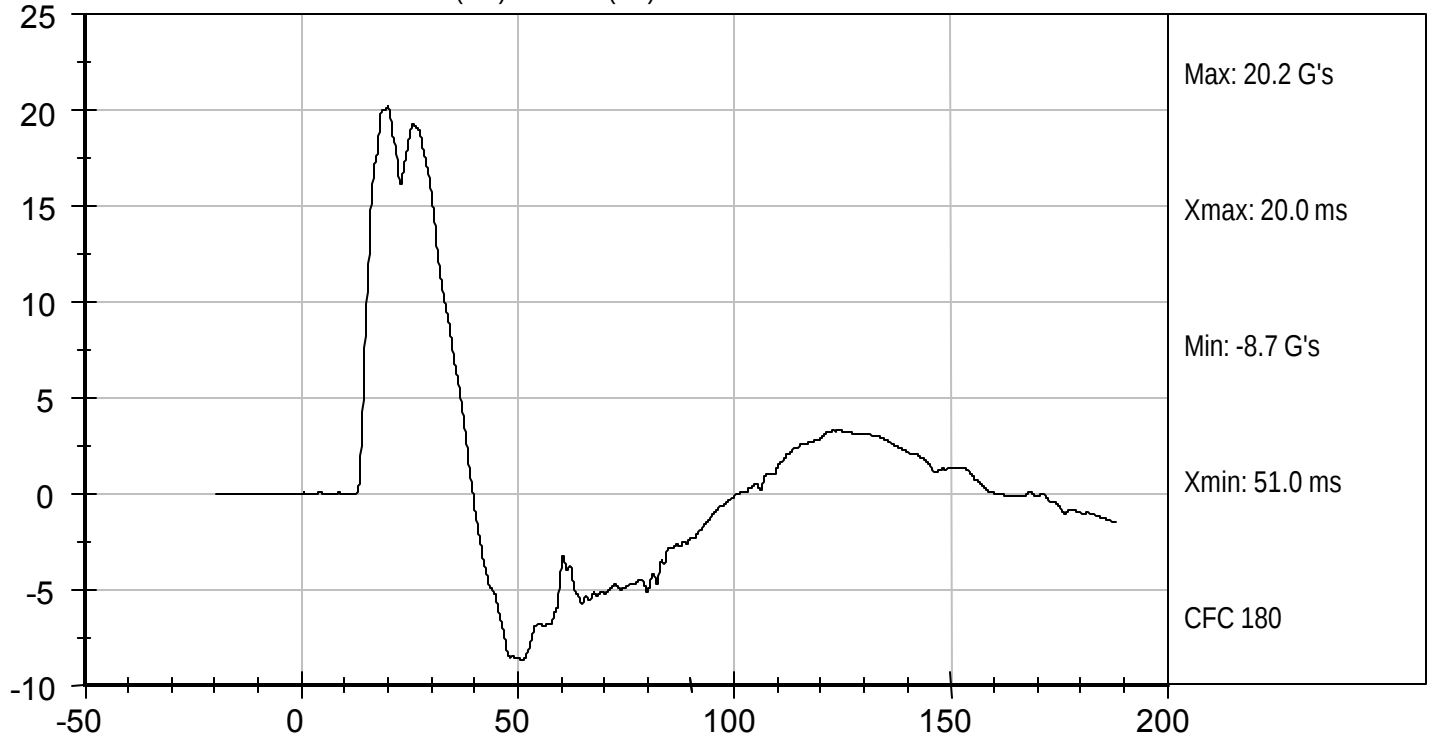
Test Desc: Shoulder Impact
Component ID: D09663

Test Date: 3/30/09
Velocity: 14.37 ft/s, 4.38 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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



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

ATD Serial No: 296

Test I.D: D09664

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	33	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	30	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	39	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	35	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

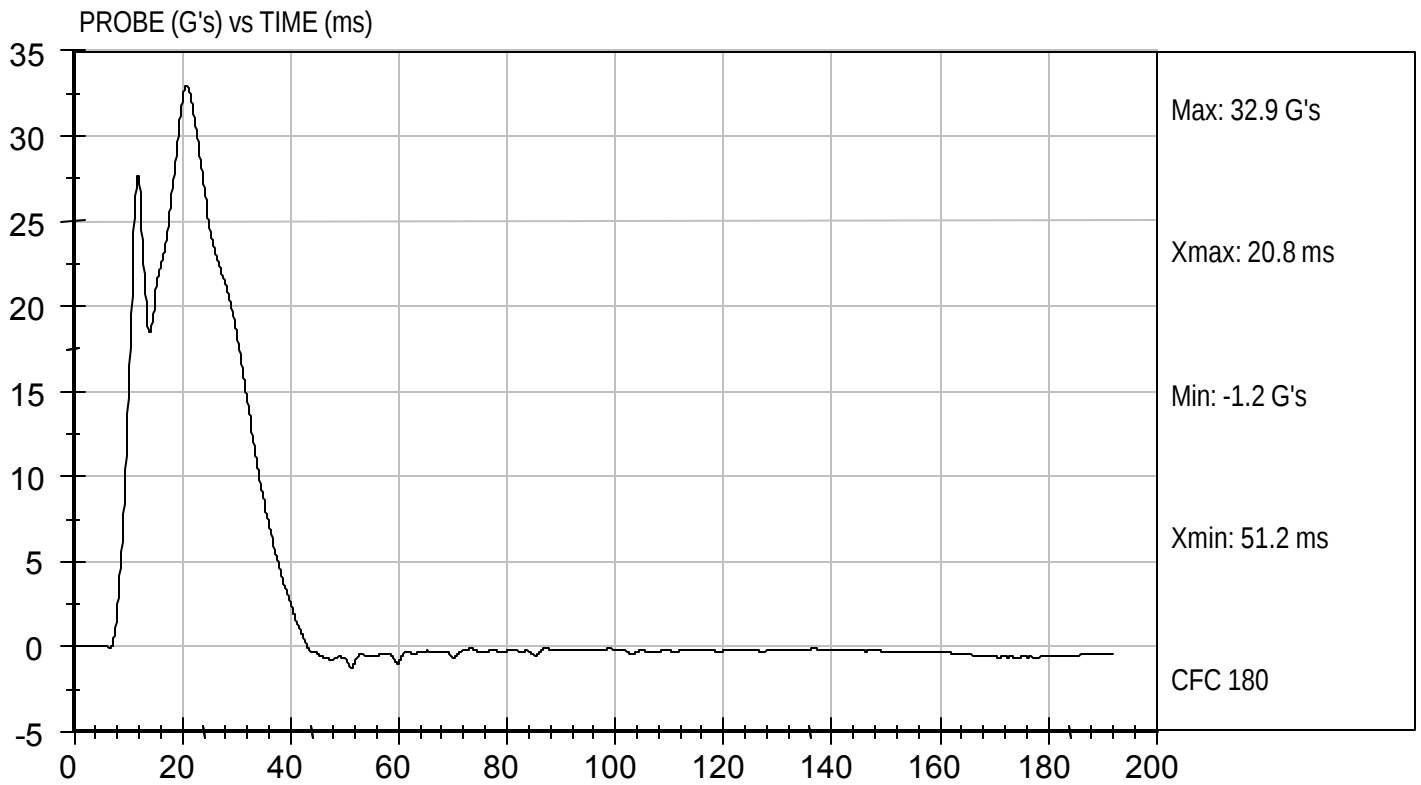
3/31/09
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax With Arm
Component ID: D09664

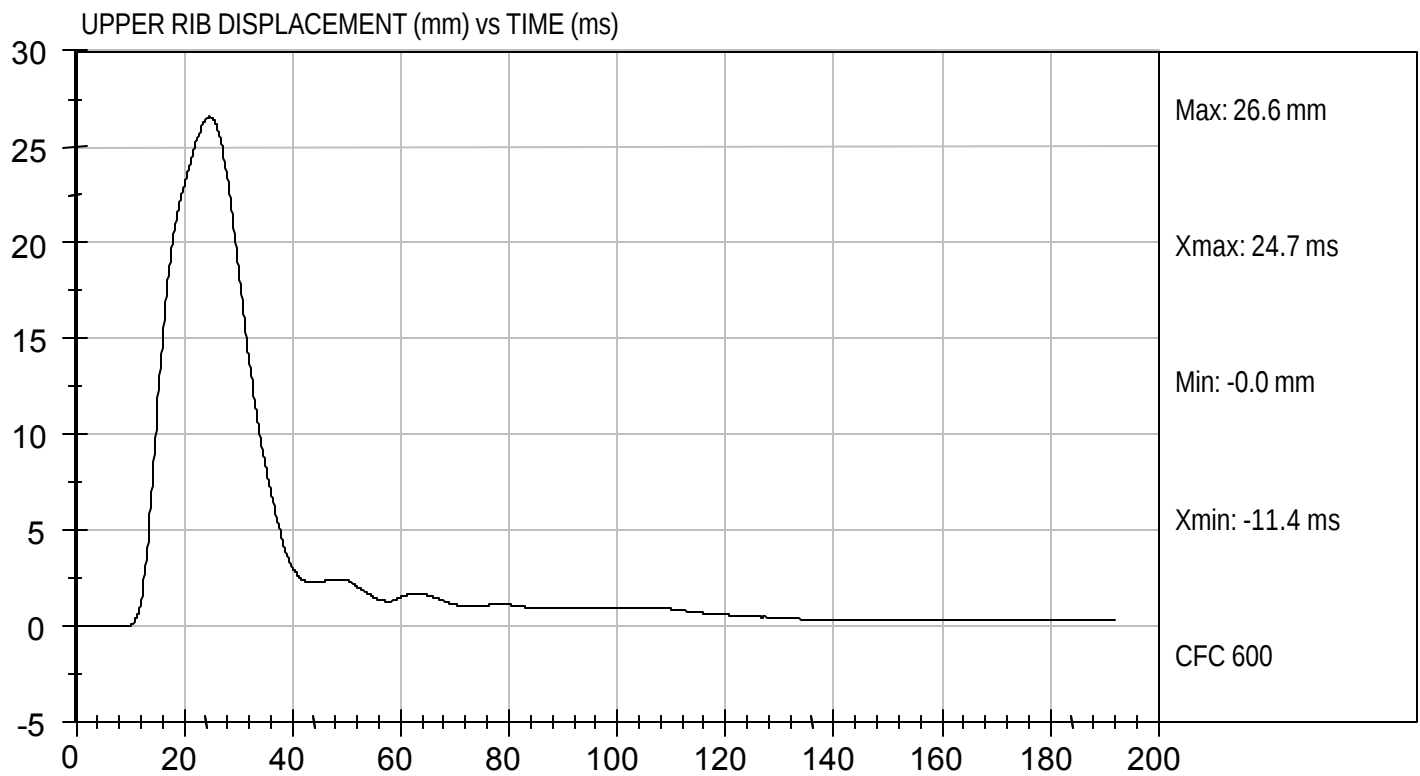
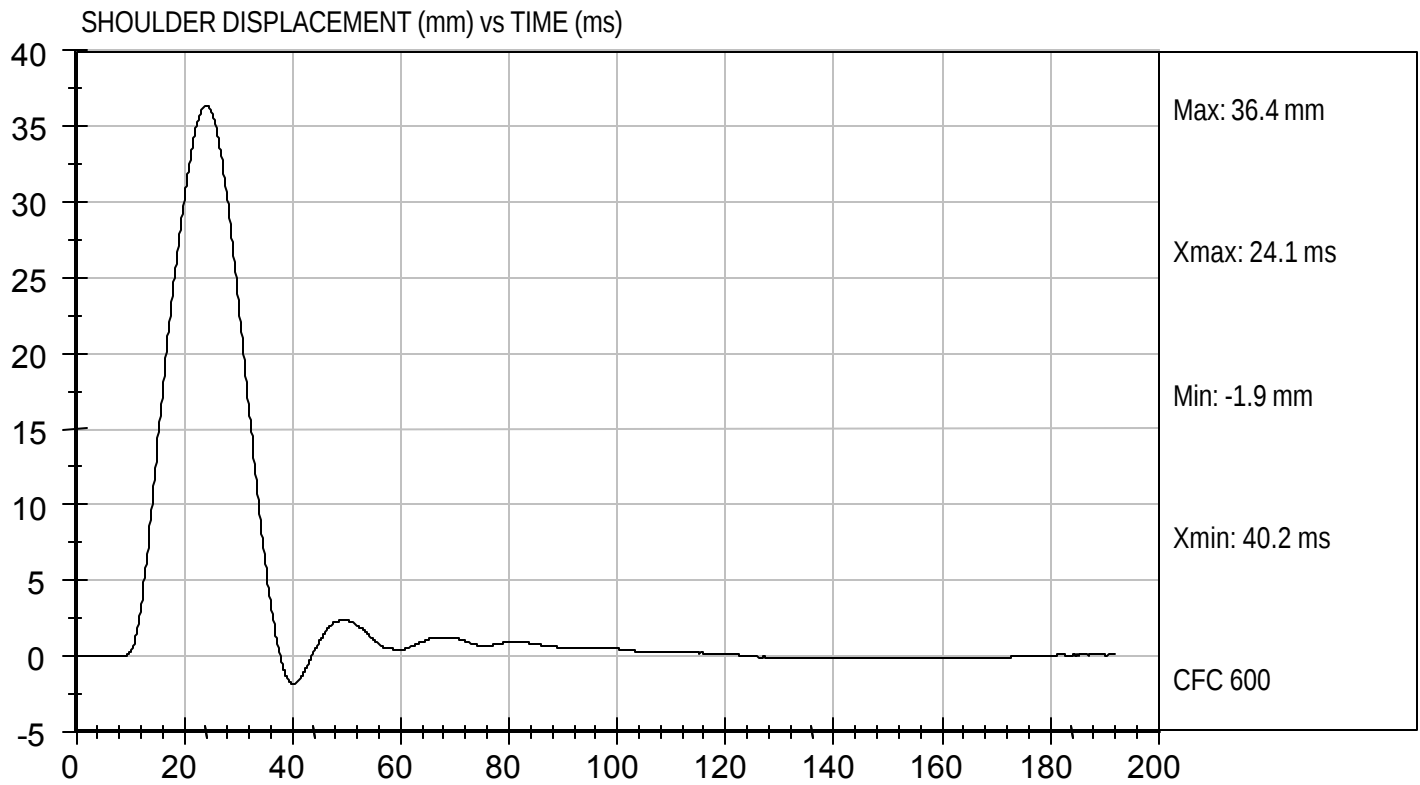
Test Date: 3/31/09
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D09664

Test Date: 3/31/09
Velocity: 22.2 ft/s, 6.77 m/s

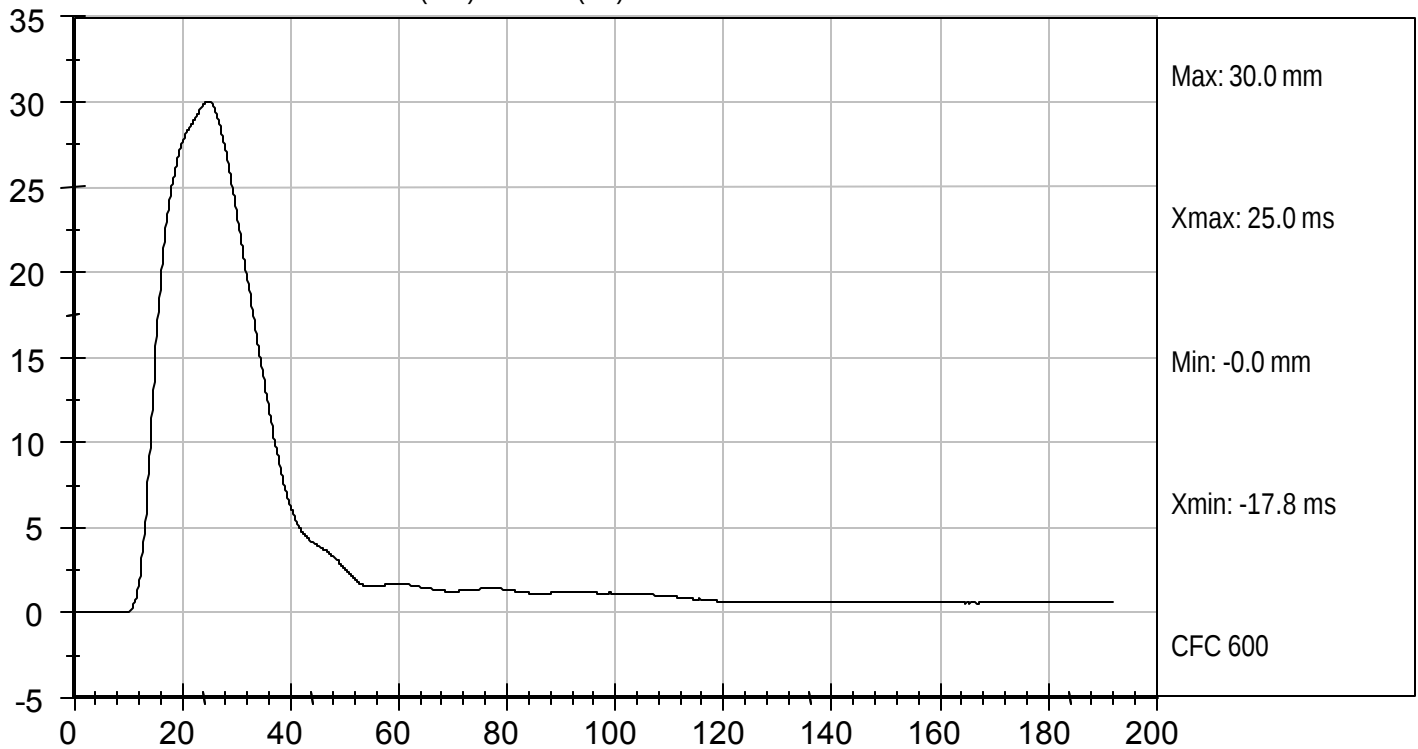




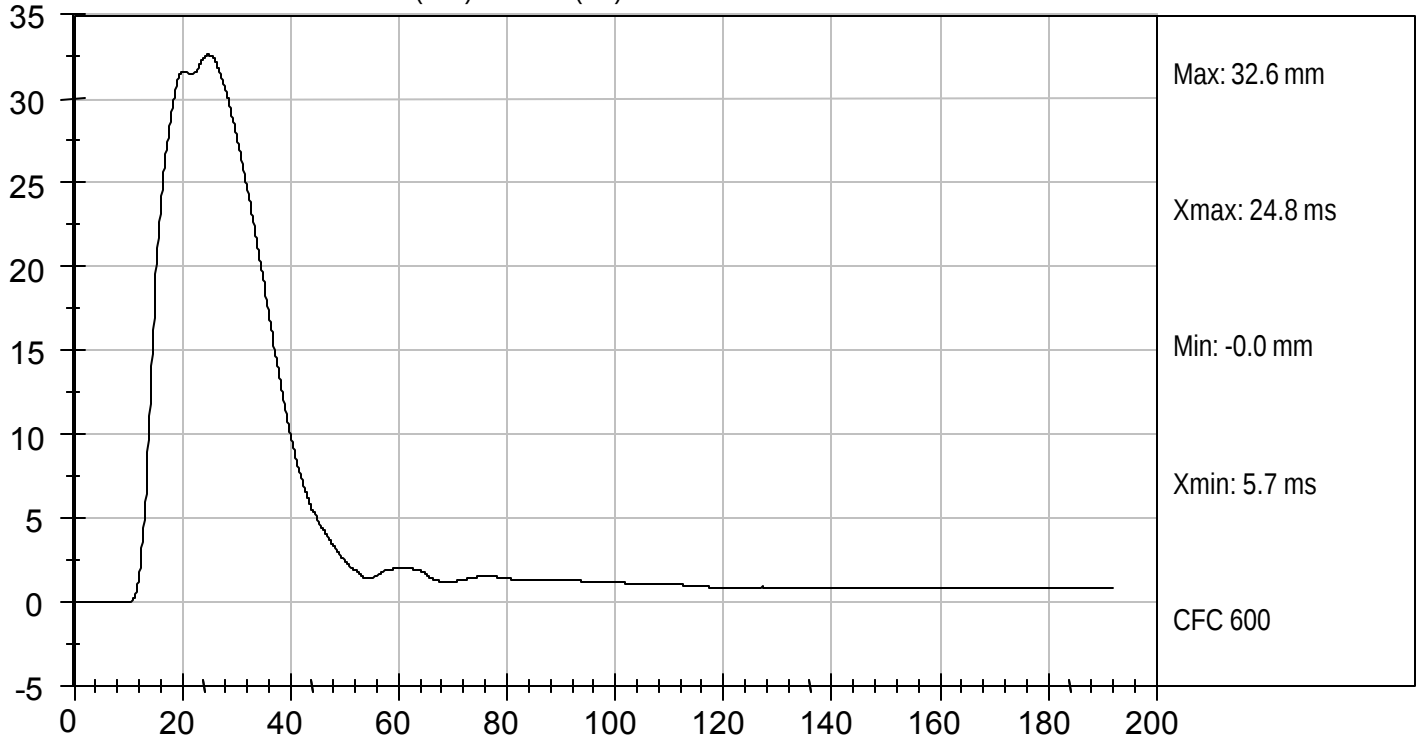
Test Desc: Thorax With Arm
Component ID: D09664

Test Date: 3/31/09
Velocity: 22.2 ft/s, 6.77 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

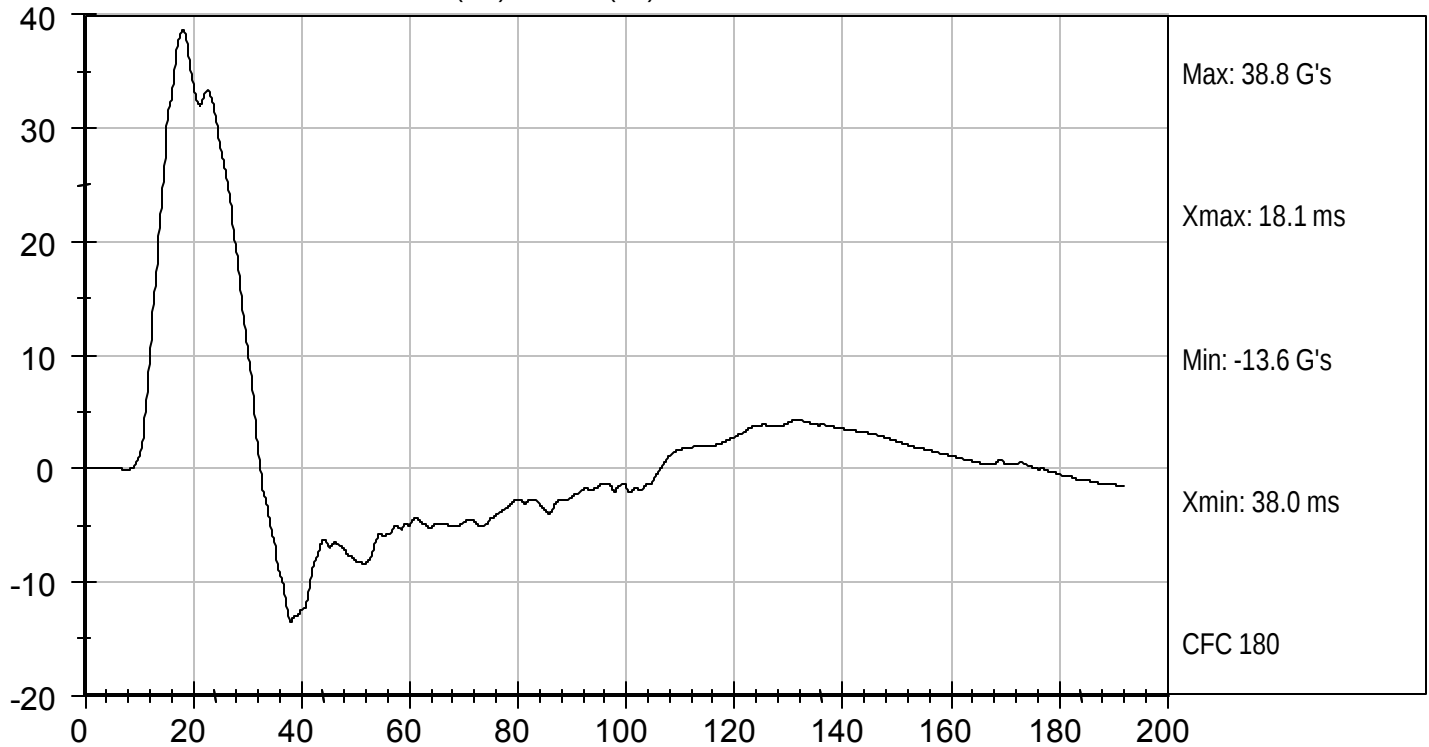




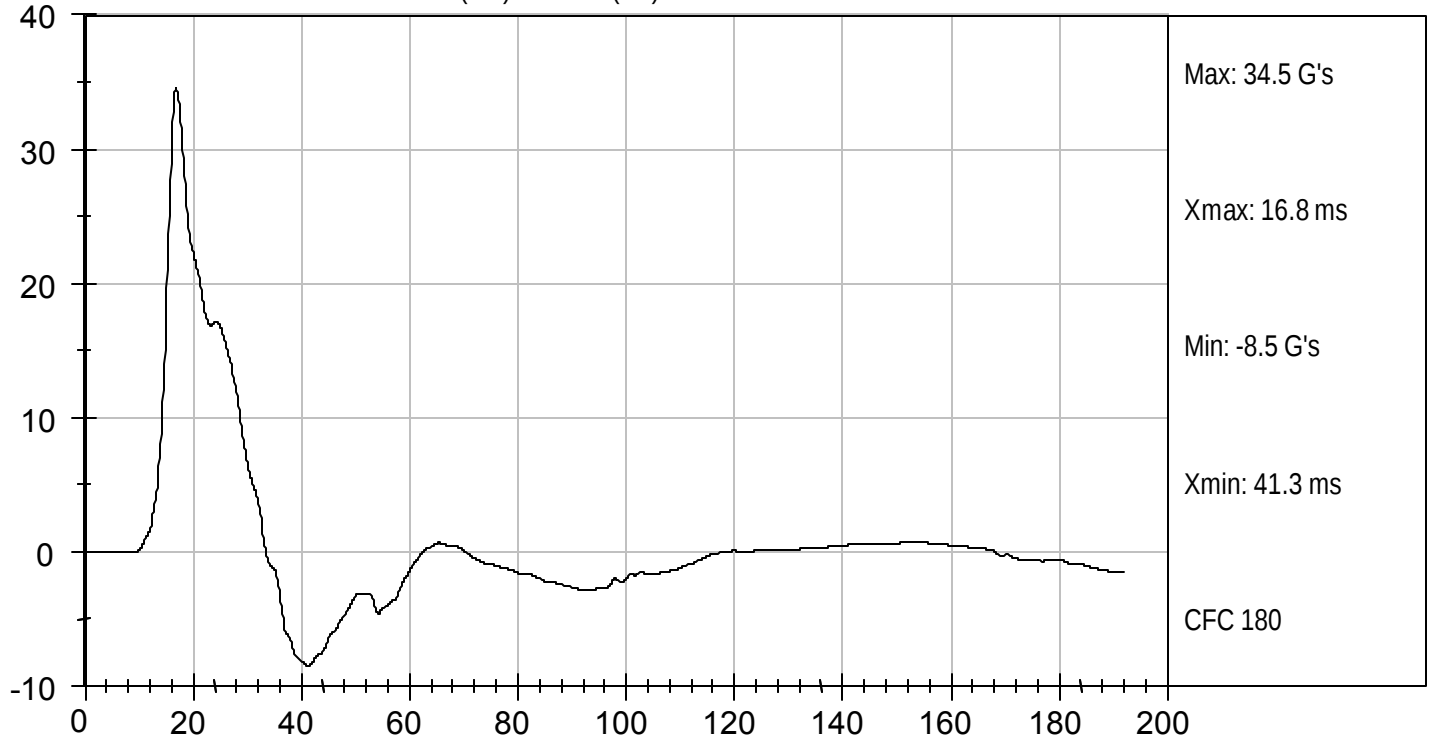
Test Desc: Thorax With Arm
Component ID: D09664

Test Date: 3/31/09
Velocity: 22.2 ft/s, 6.77 m/s

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



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



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

ATD Serial No: 296

Test I.D: D09665

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	30	Pass
Impact Velocity	m/s	4.20 to 4.40	4.39	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	39	Pass
Lower Rib Displacement	mm	35 to 43	37	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

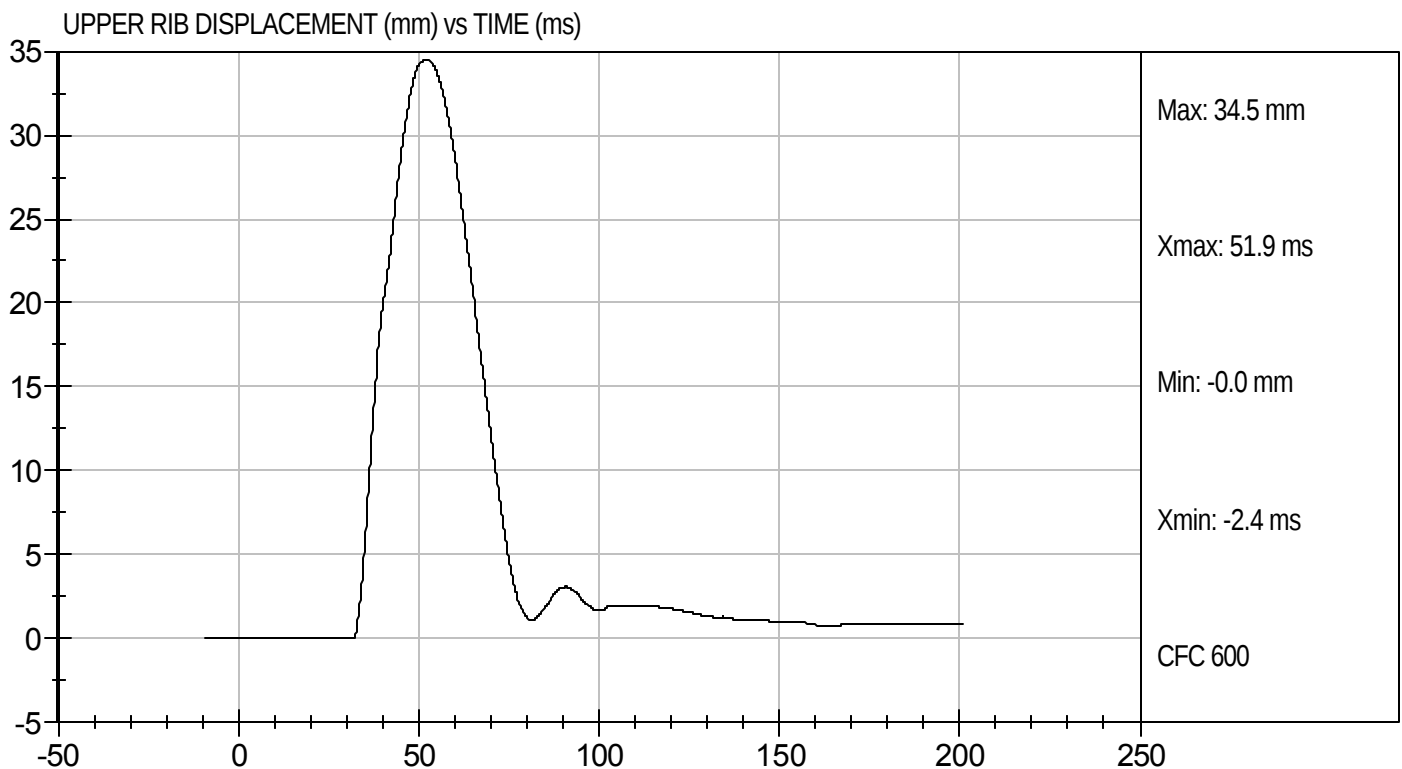
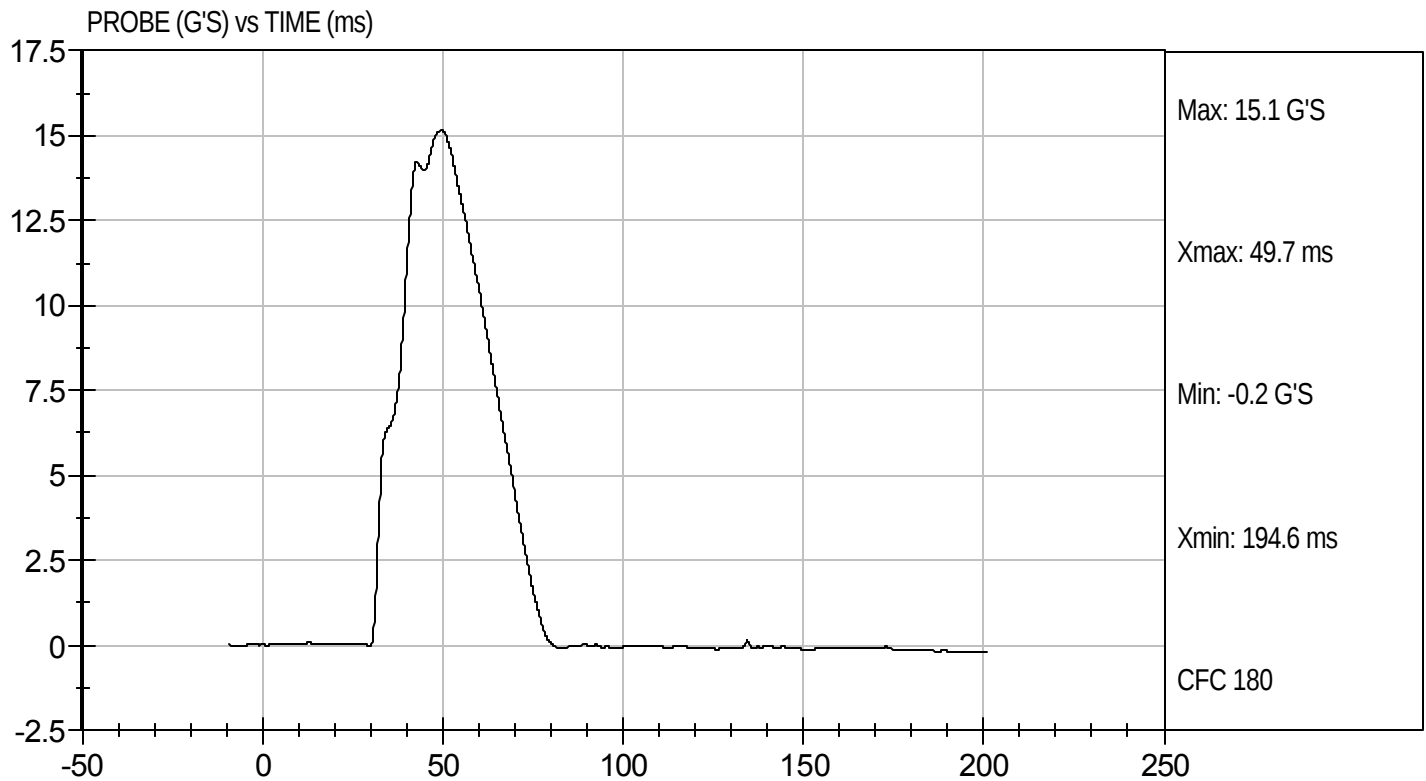
3/31/09
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax Without Arm
Component ID: D09665

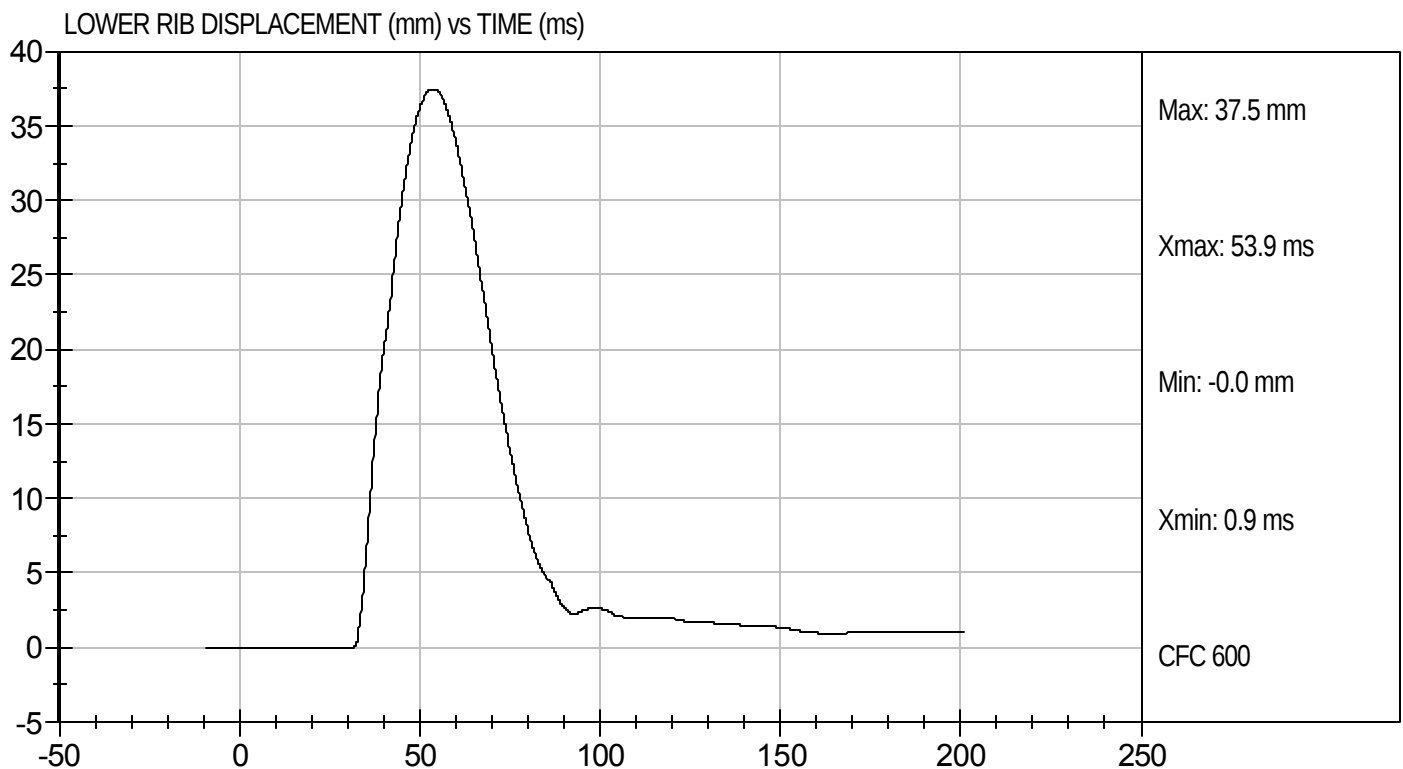
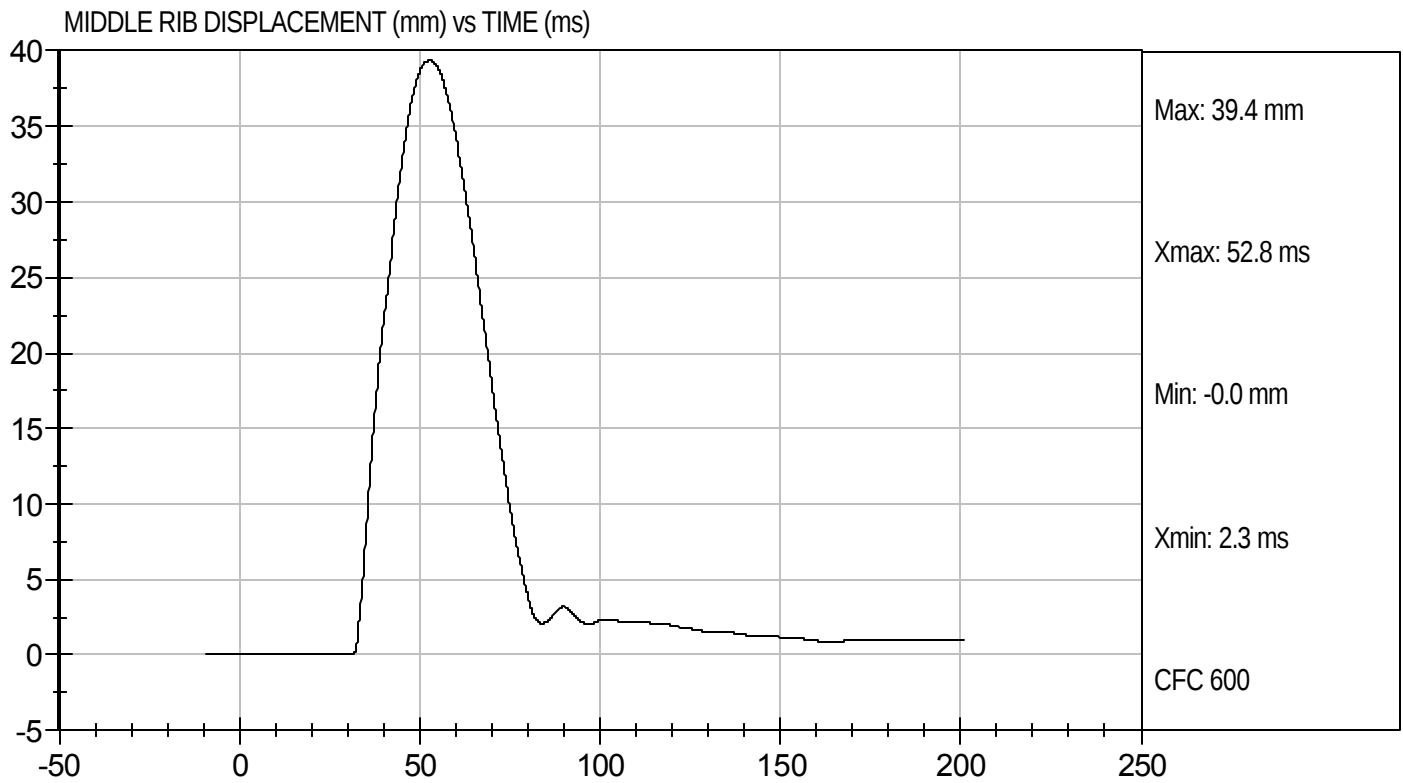
Test Date: 3/31/09
Velocity: 14.4 ft/s, 4.39 m/s





Test Desc: Thorax Without Arm
Component ID: D09665

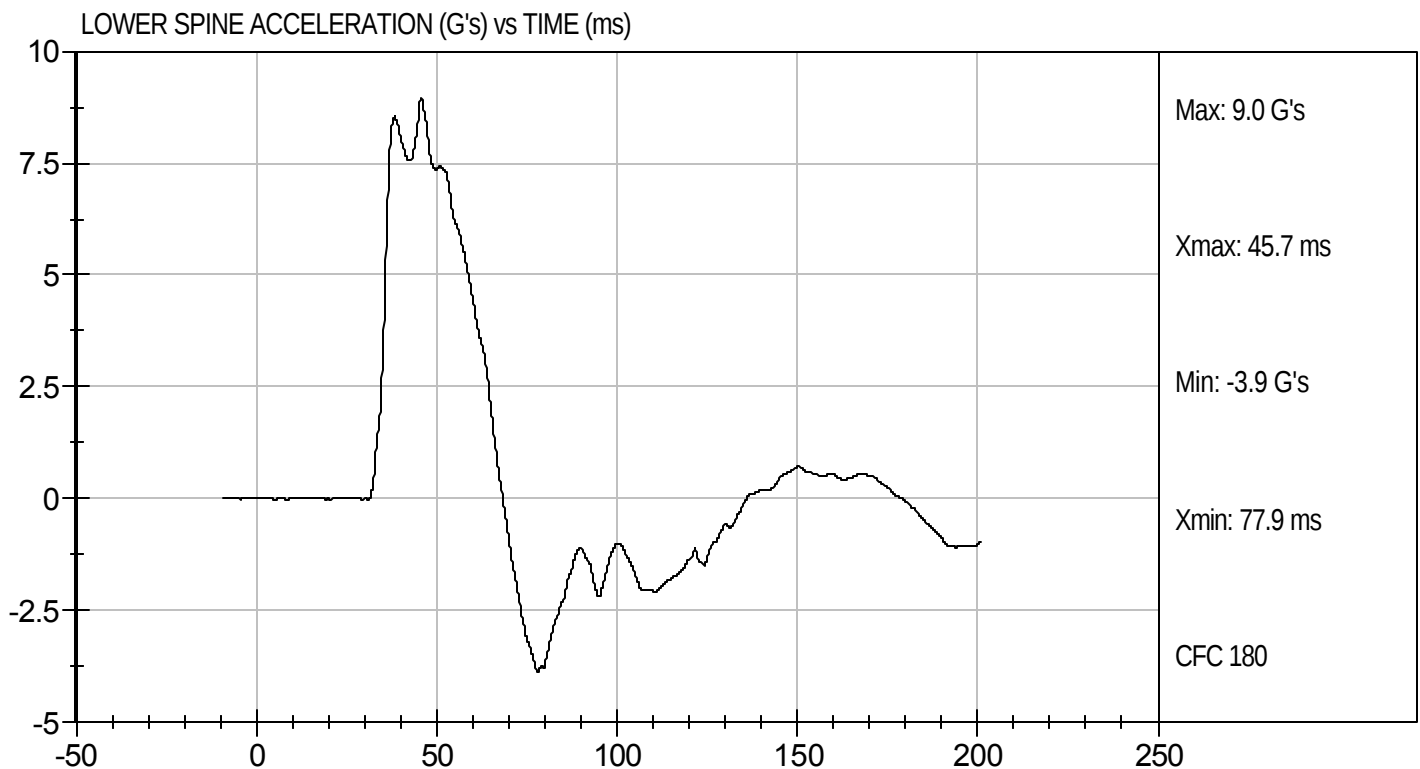
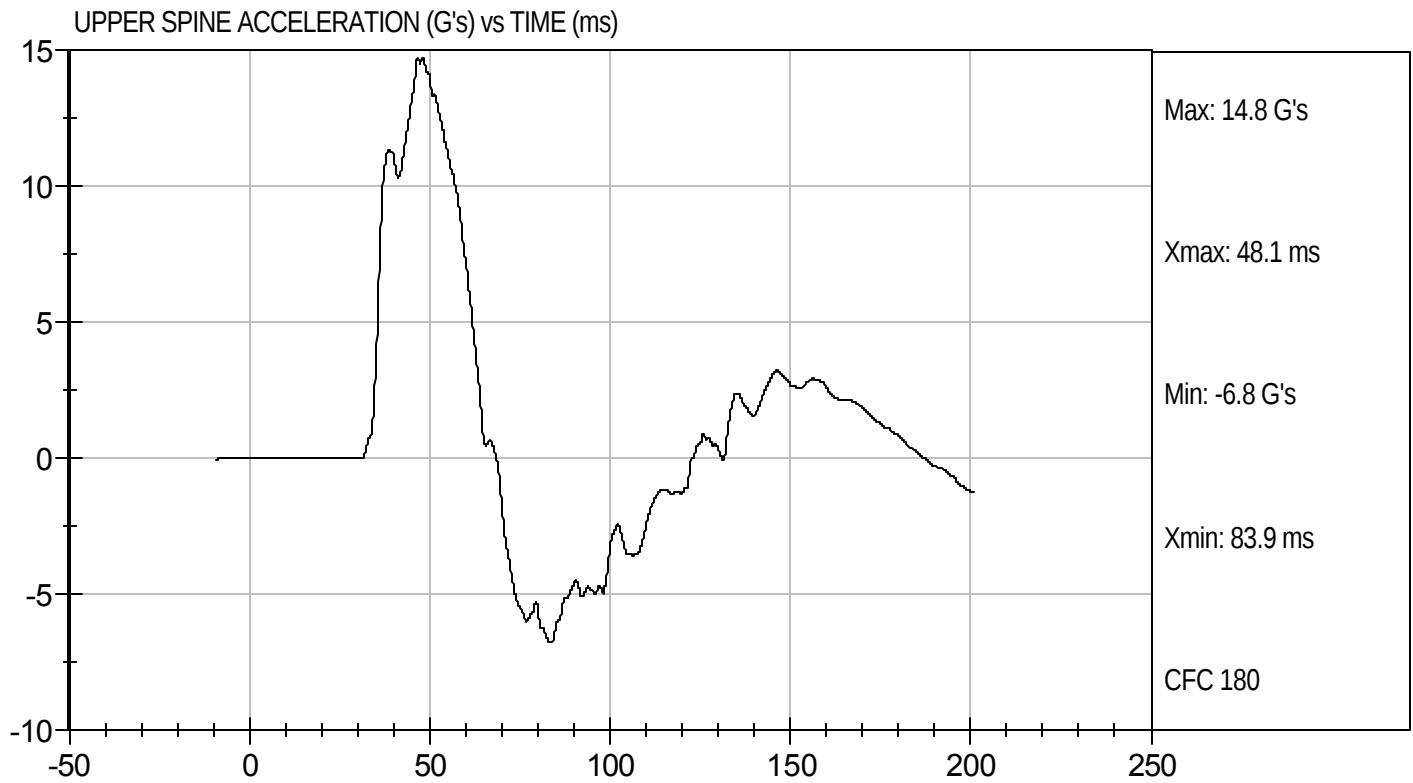
Test Date: 3/31/09
Velocity: 14.4 ft/s, 4.39 m/s





Test Desc: Thorax Without Arm
Component ID: D09665

Test Date: 3/31/09
Velocity: 14.4 ft/s, 4.39 m/s



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

ATD Serial No: 296

Test I.D: D09666

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	30	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	40	Pass
Lower Rib Displacement	mm	33 to 44	39	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician

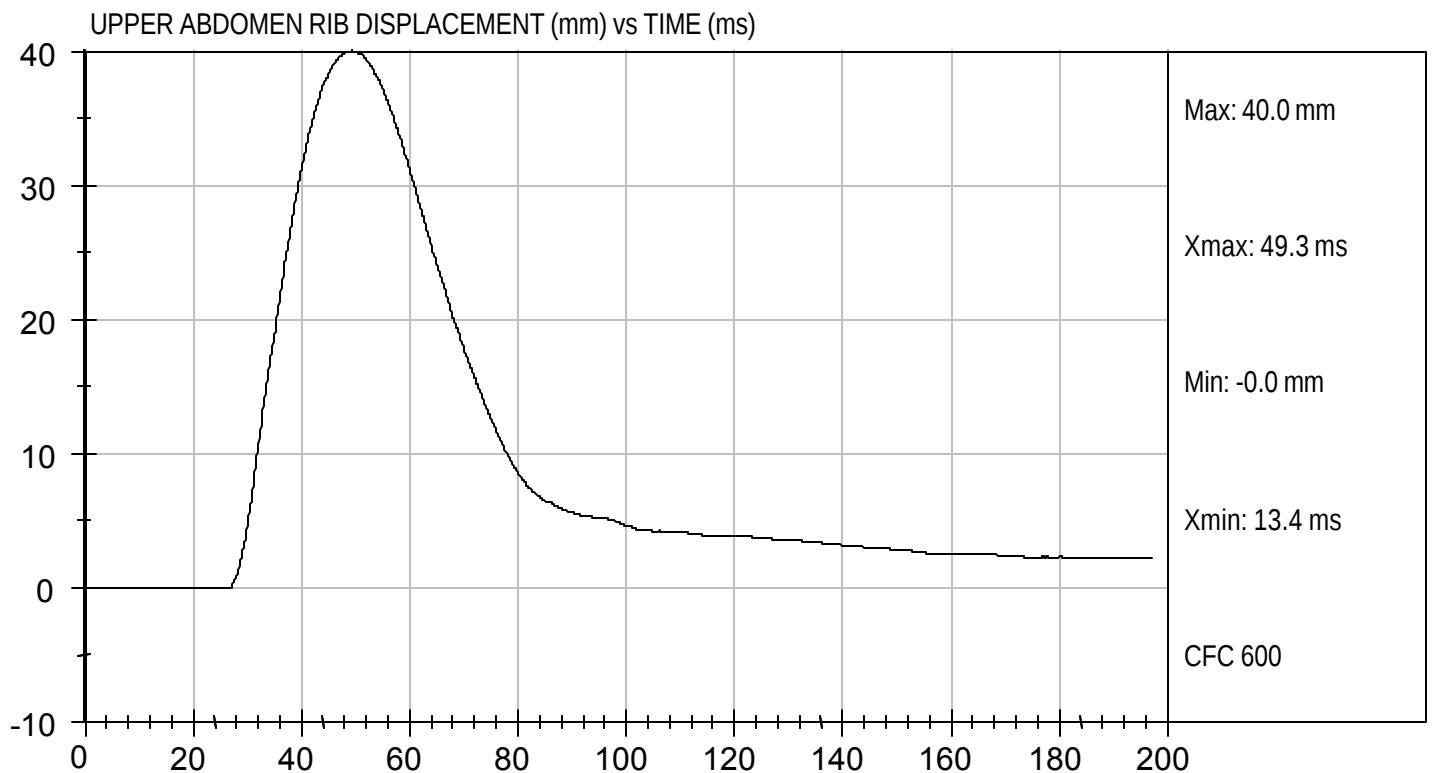
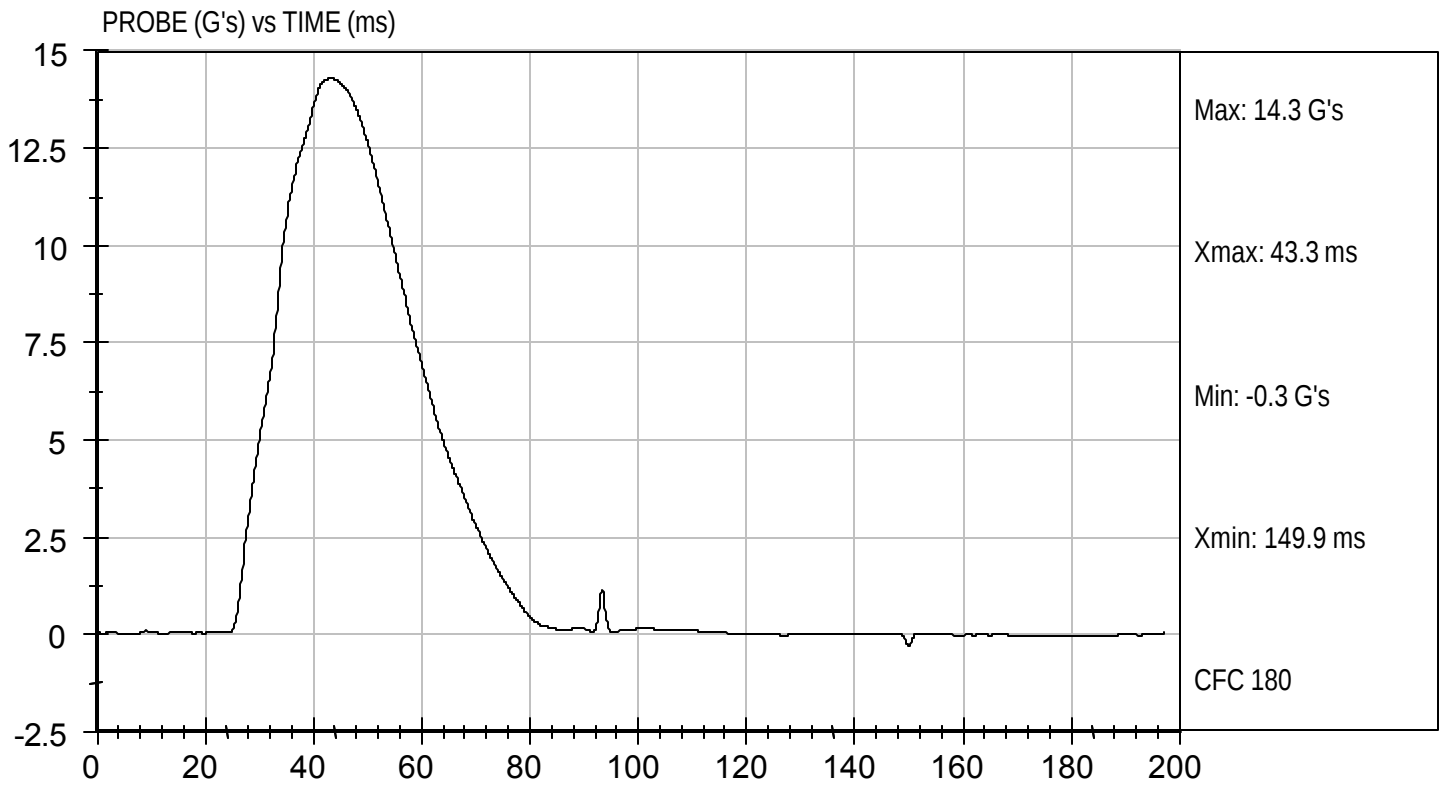
3/31/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D09666

Test Date: 3/31/09
Velocity: 14.37 ft/s, 4.38 m/s

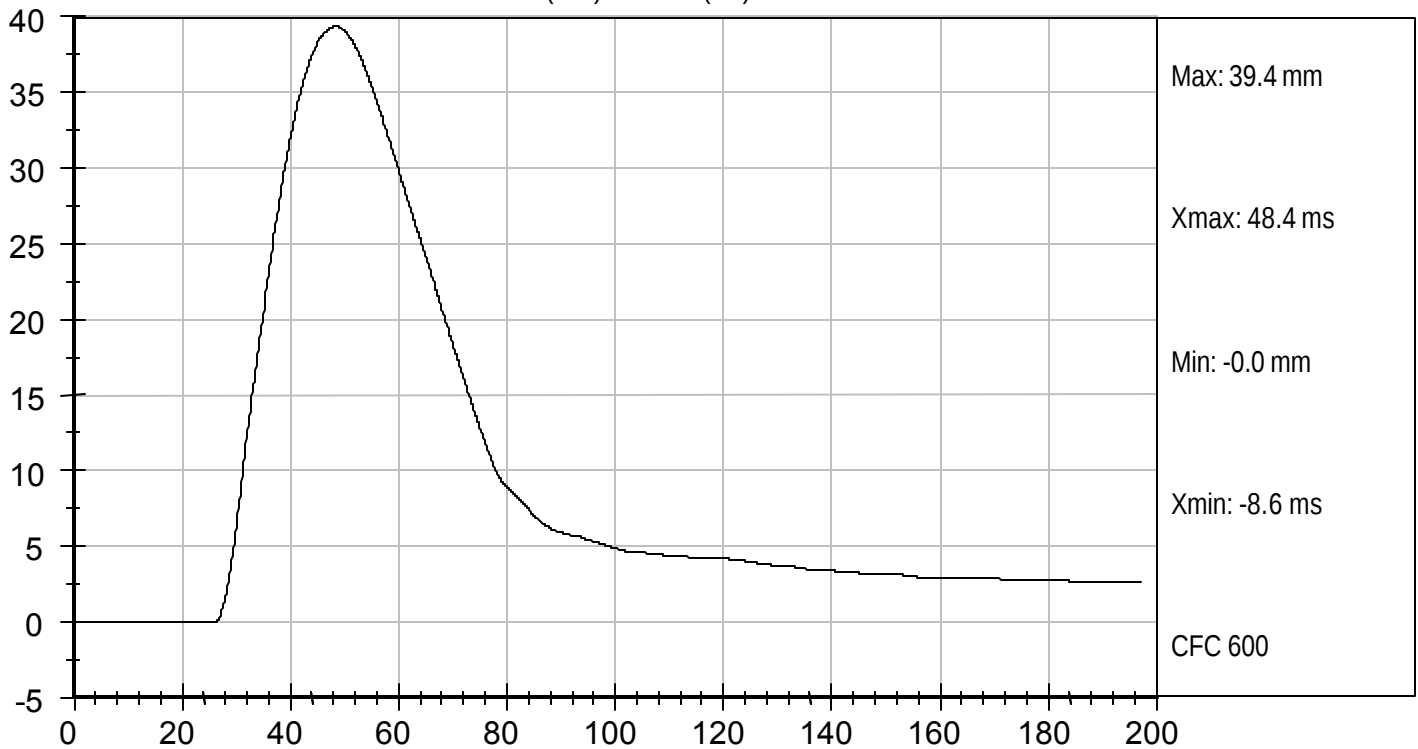




Test Desc: Abdomen Impact
Component ID: D09666

Test Date: 3/31/09
Velocity: 14.37 ft/s, 4.38 m/s

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



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

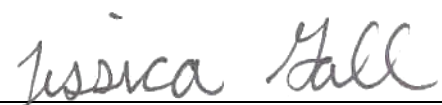


MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D09667

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration after 6 ms	G's	38 to 47	43	Pass
Pelvis Y Acceleration	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	4122	Pass
Overall Test Results				Pass


Laboratory Technician

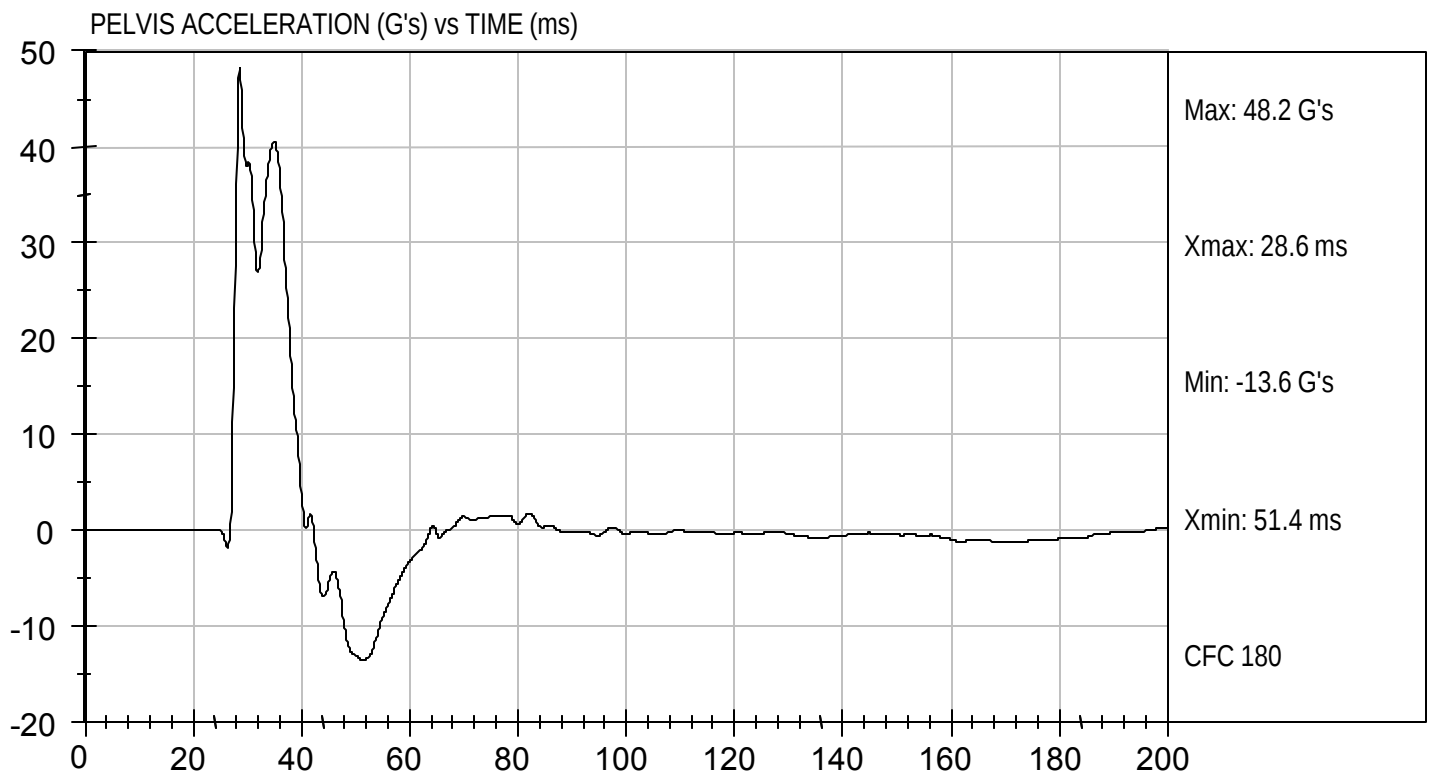
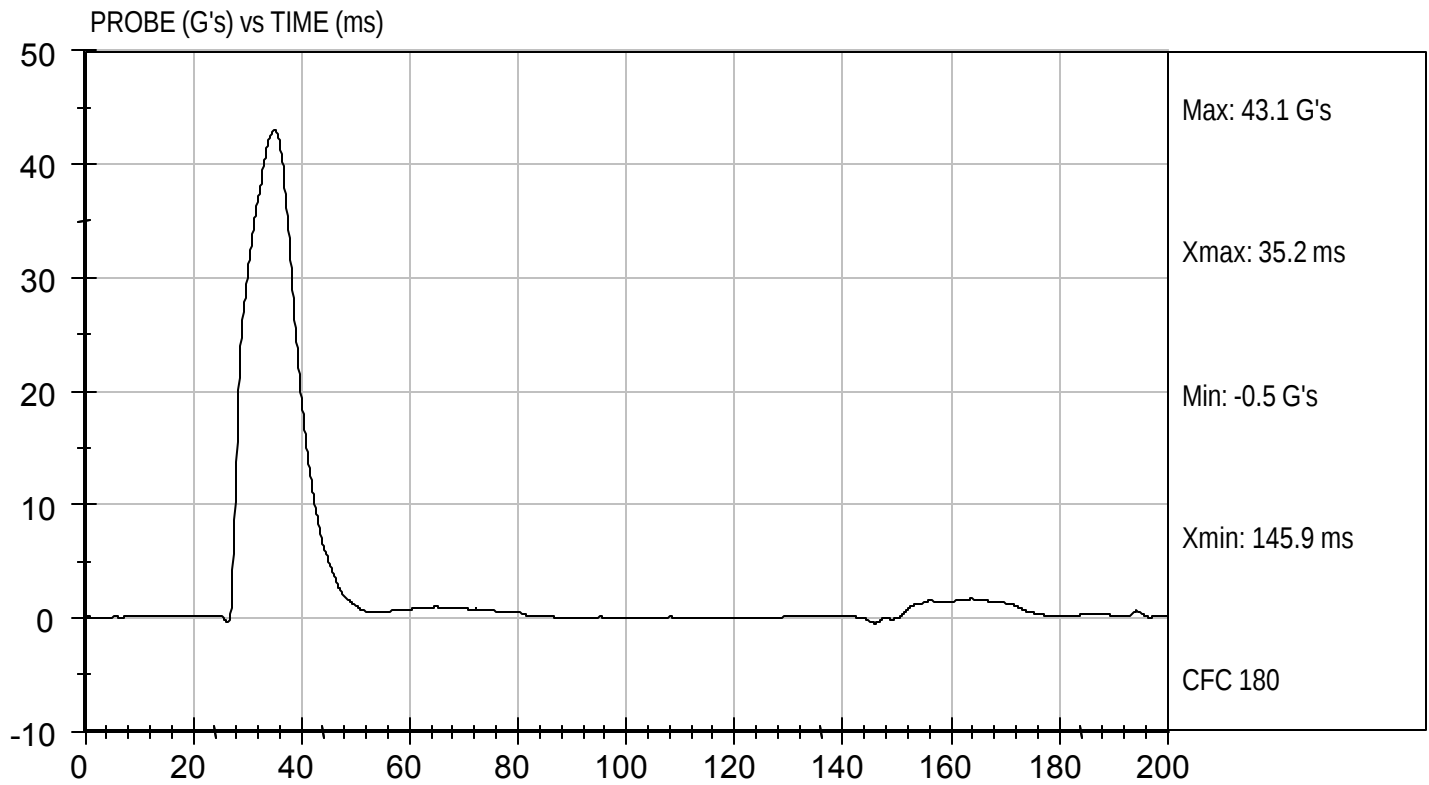
3/31/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D09667

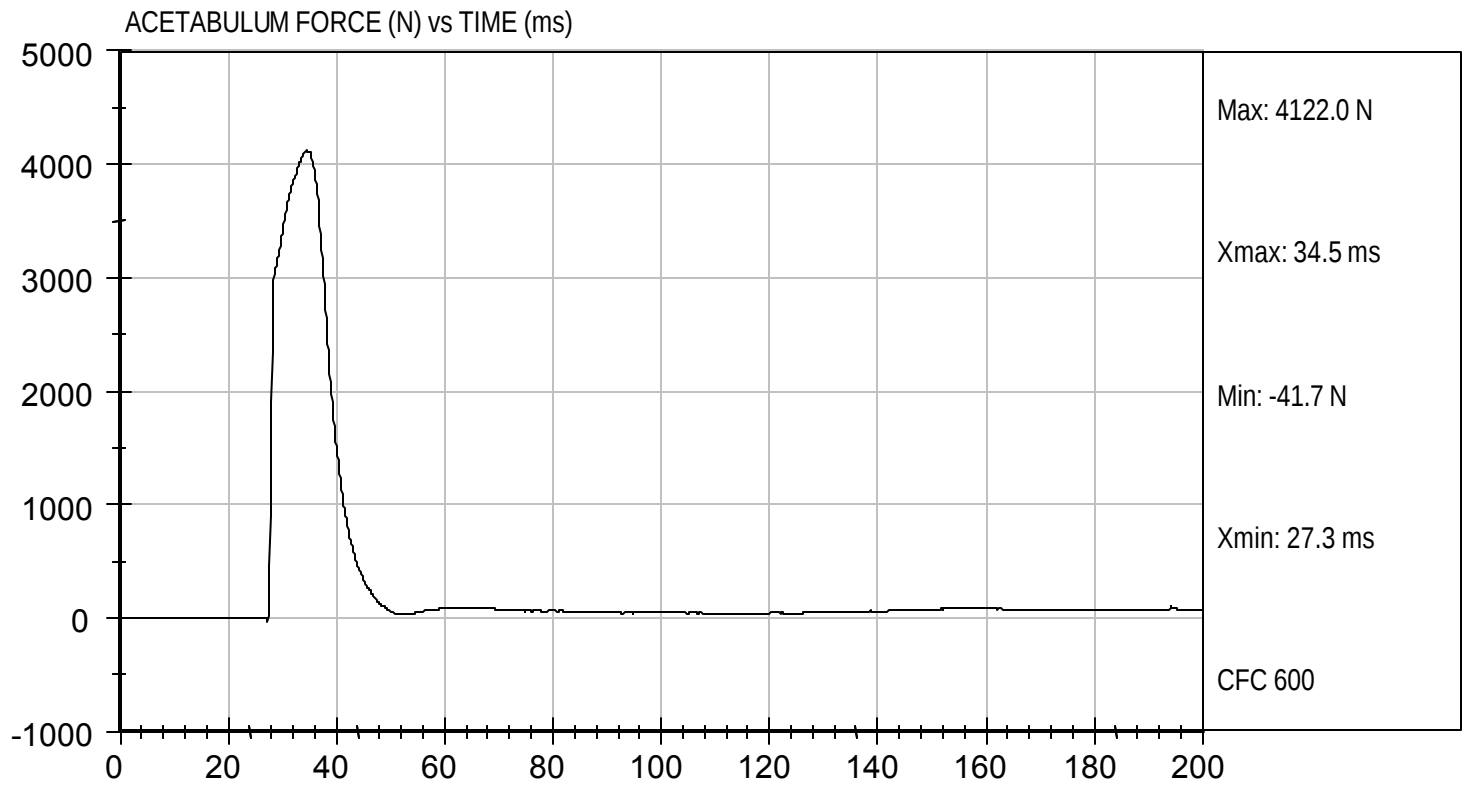
Test Date: 3/31/09
Velocity: 22.2 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D09667

Test Date: 3/31/09
Velocity: 22.2 ft/s, 6.77 m/s

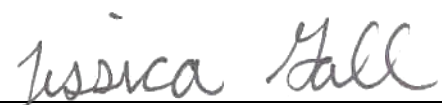


MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D09668

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.37	Pass
Peak Impactor Acceleration	G's	36 to 45	41	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	5031	Pass
Overall Test Results				Pass


Laboratory Technician

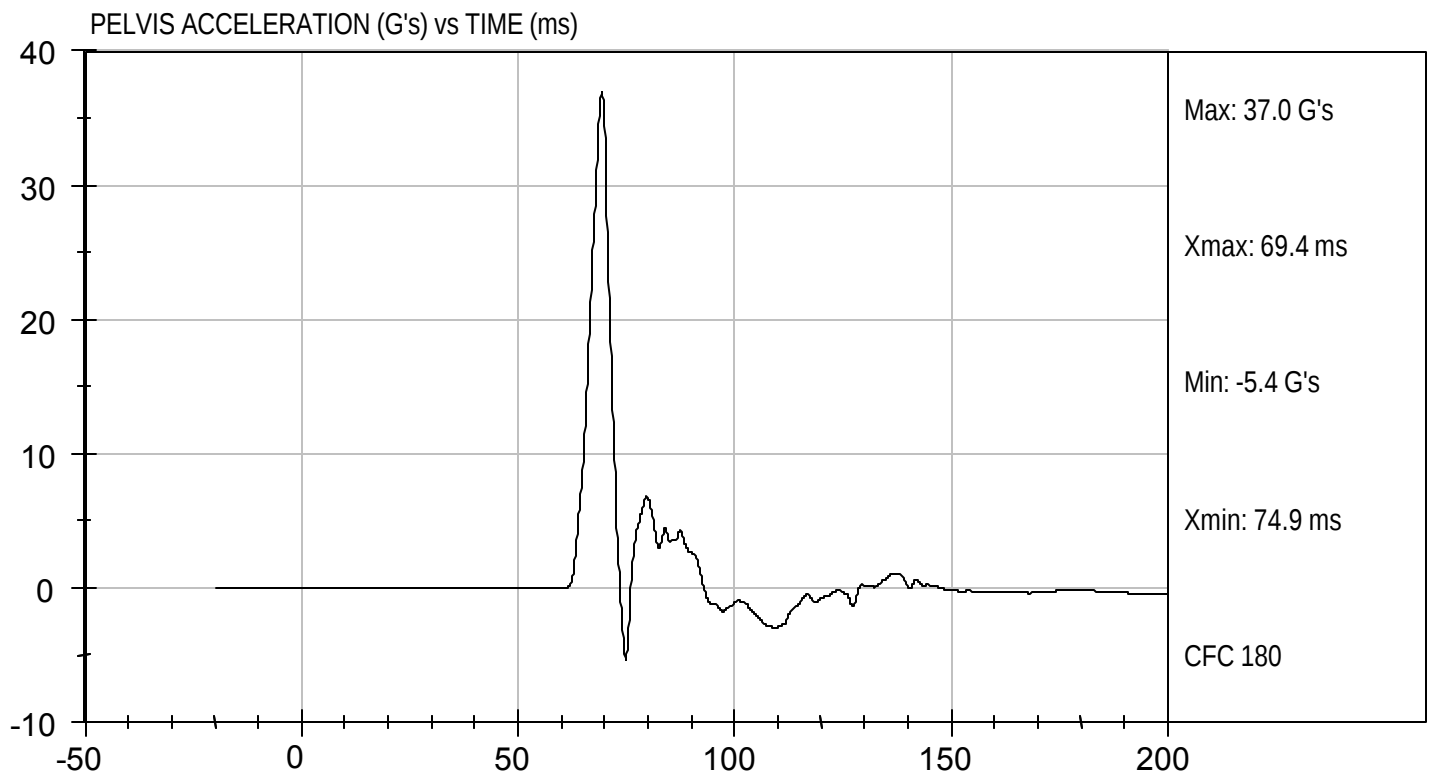
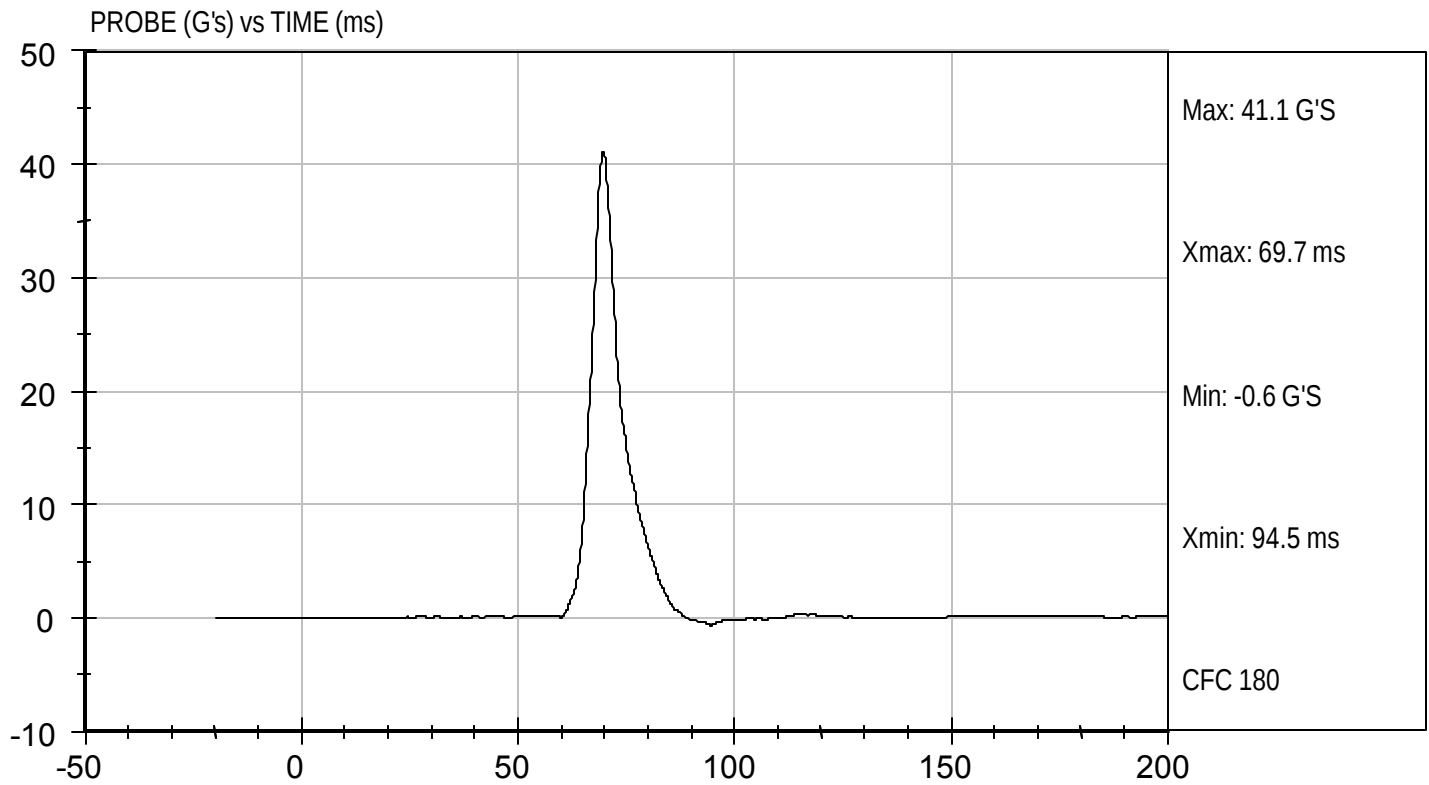
4/1/09
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D09668

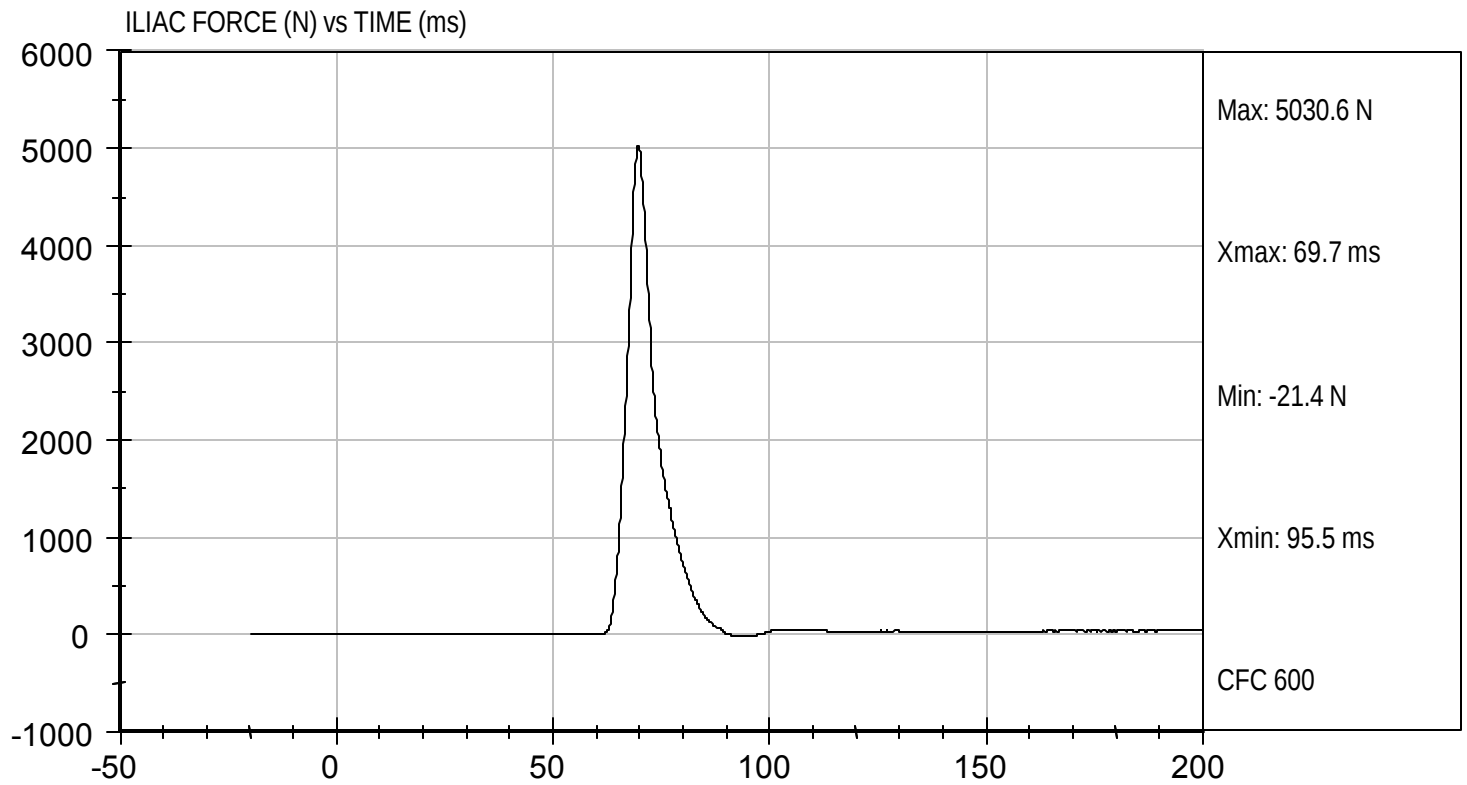
Test Date: 4/1/09
Velocity: 14.3 ft/s, 4.37 m/s





Test Desc: Iliac Impact
Component ID: D09668

Test Date: 4/1/09
Velocity: 14.3 ft/s, 4.37 m/s

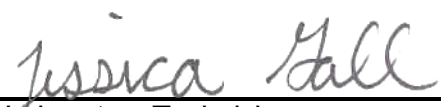


MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test ID: D09891

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	115 to 137	123	Pass
Peak Lateral Acceleration	G's	+/- 15	5.3	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

4/24/09
Test Date

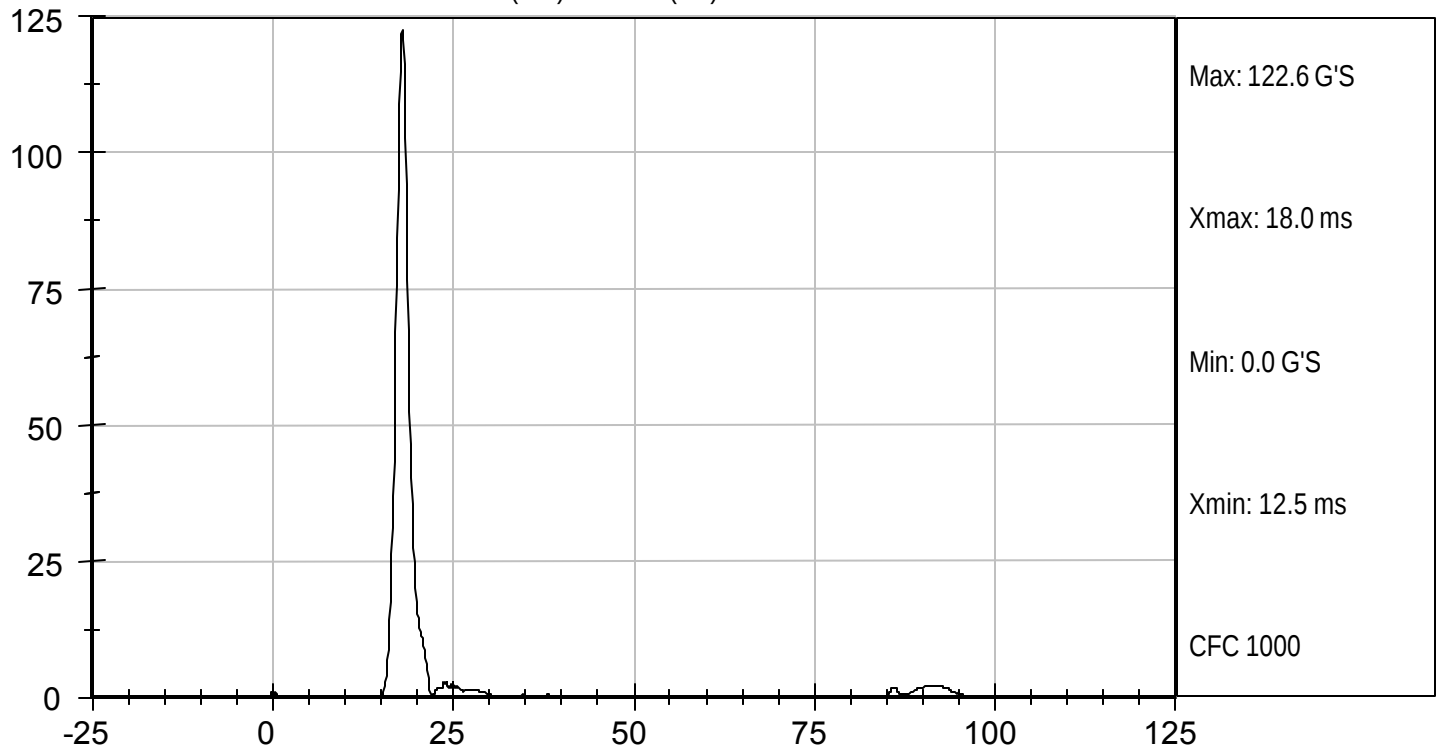

Approved By



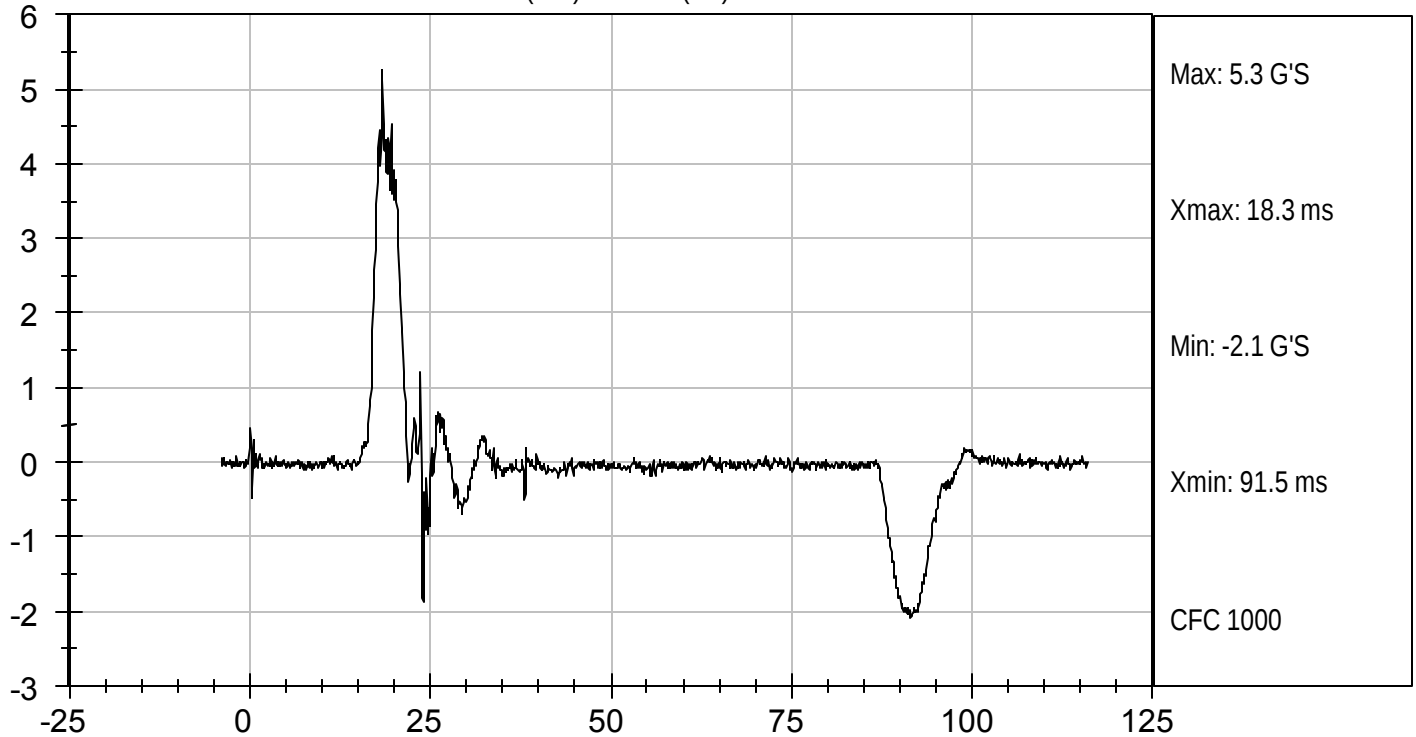
Test Desc: Head Drop
Component ID: D09891

Test Date: 4/24/09
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)

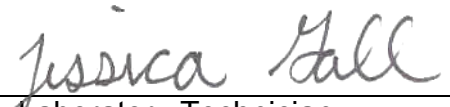


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D09892

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.5	Pass
Humidity		%	10 to 70	48	Pass
Impact Velocity		m/s	5.51 to 5.63	5.60	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.50	Pass
	15 msec	m/s	3.30 to 4.10	3.56	Pass
	20 msec	m/s	4.40 to 5.40	4.79	Pass
	25 msec	m/s	5.40 to 6.10	5.69	Pass
	25-100 msec	m/s	5.50 to 6.20	5.73	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		msec	50 to 70	60	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-44	Pass
Time of Moment Decay to 0 Nm		msec	102 to 126	113	Pass
Overall Test Results				Pass	


 Laboratory Technician

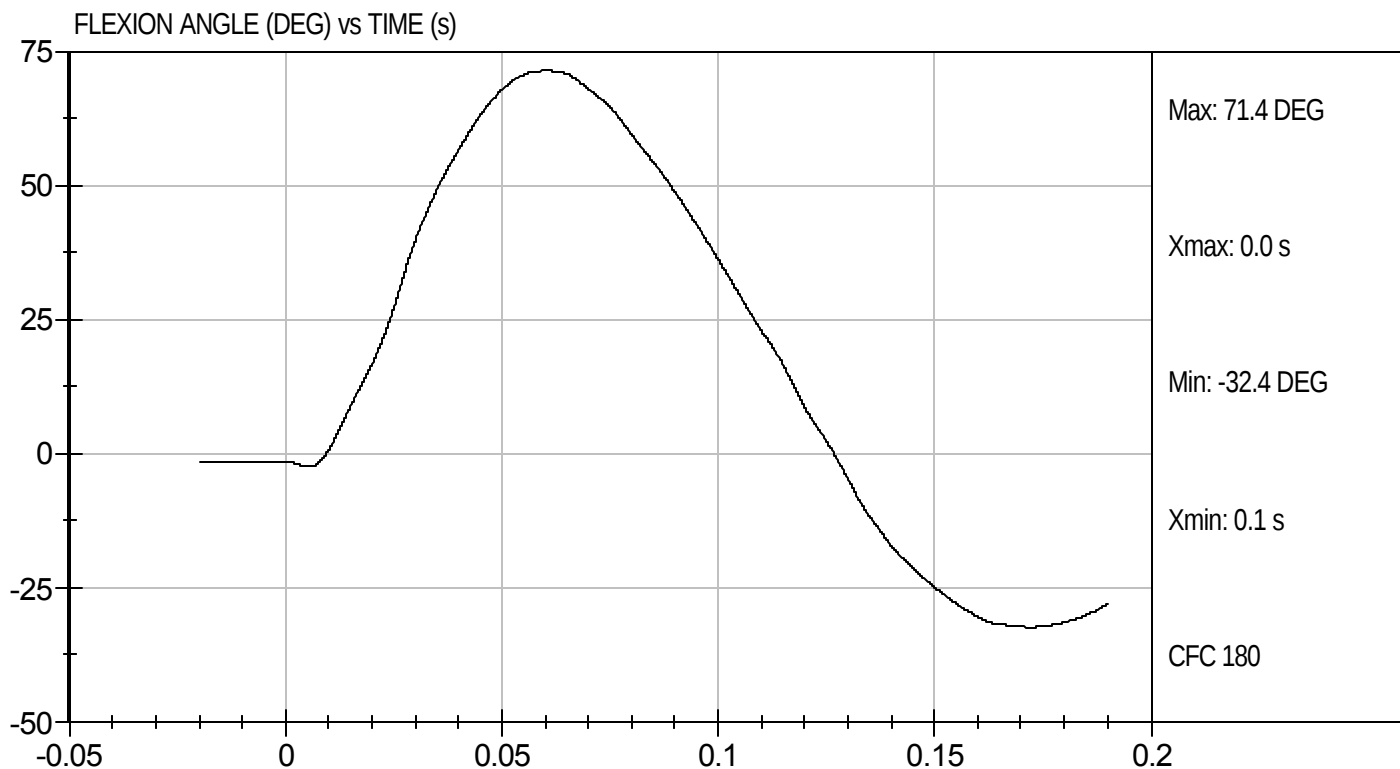
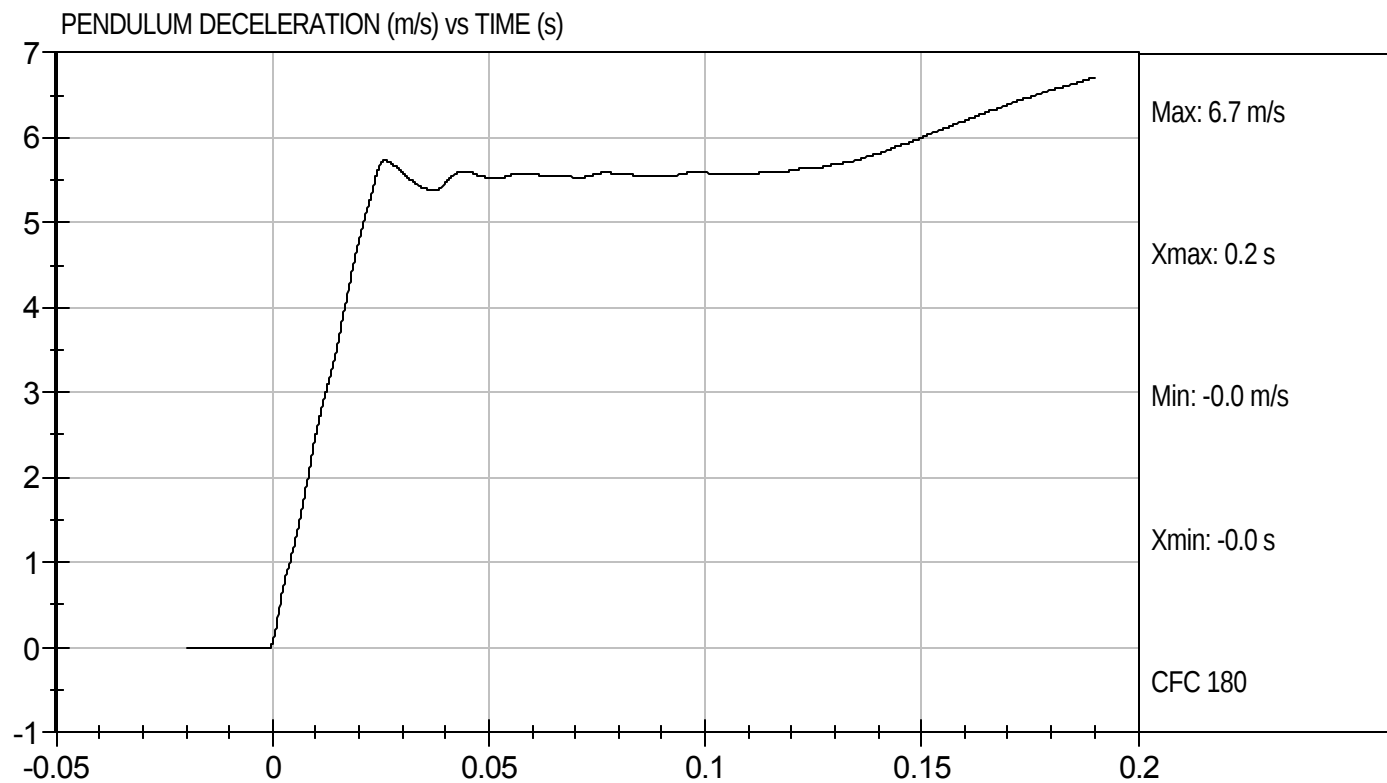
4/24/09
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D09892

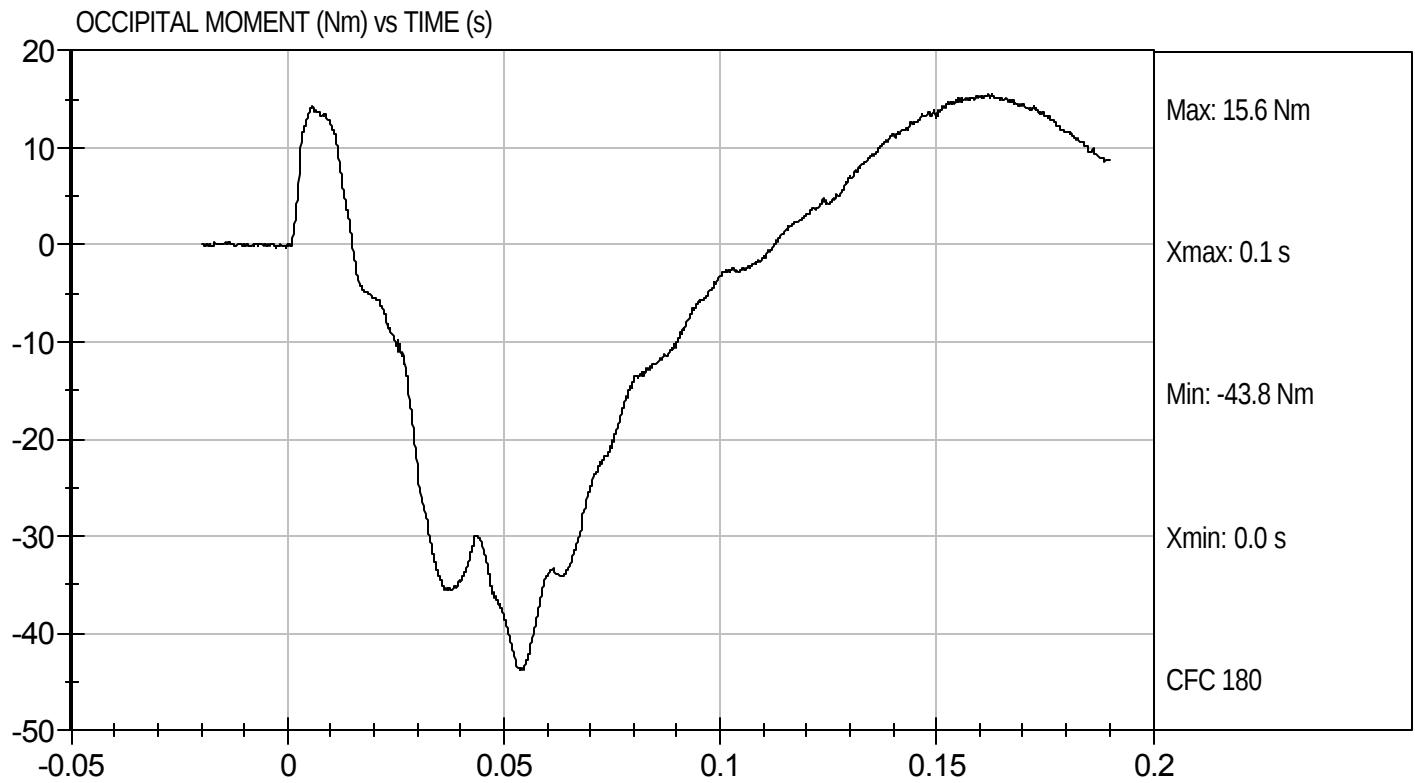
Test Date: 4/24/09
Velocity: 18.37 ft/s, 5.60 m/s





Test Desc: Neck Bending
Component ID: D09892

Test Date: 4/24/09
Velocity: 18.37 ft/s, 5.60 m/s



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

ATD Serial No: 296

Test ID: D09893

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	16	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

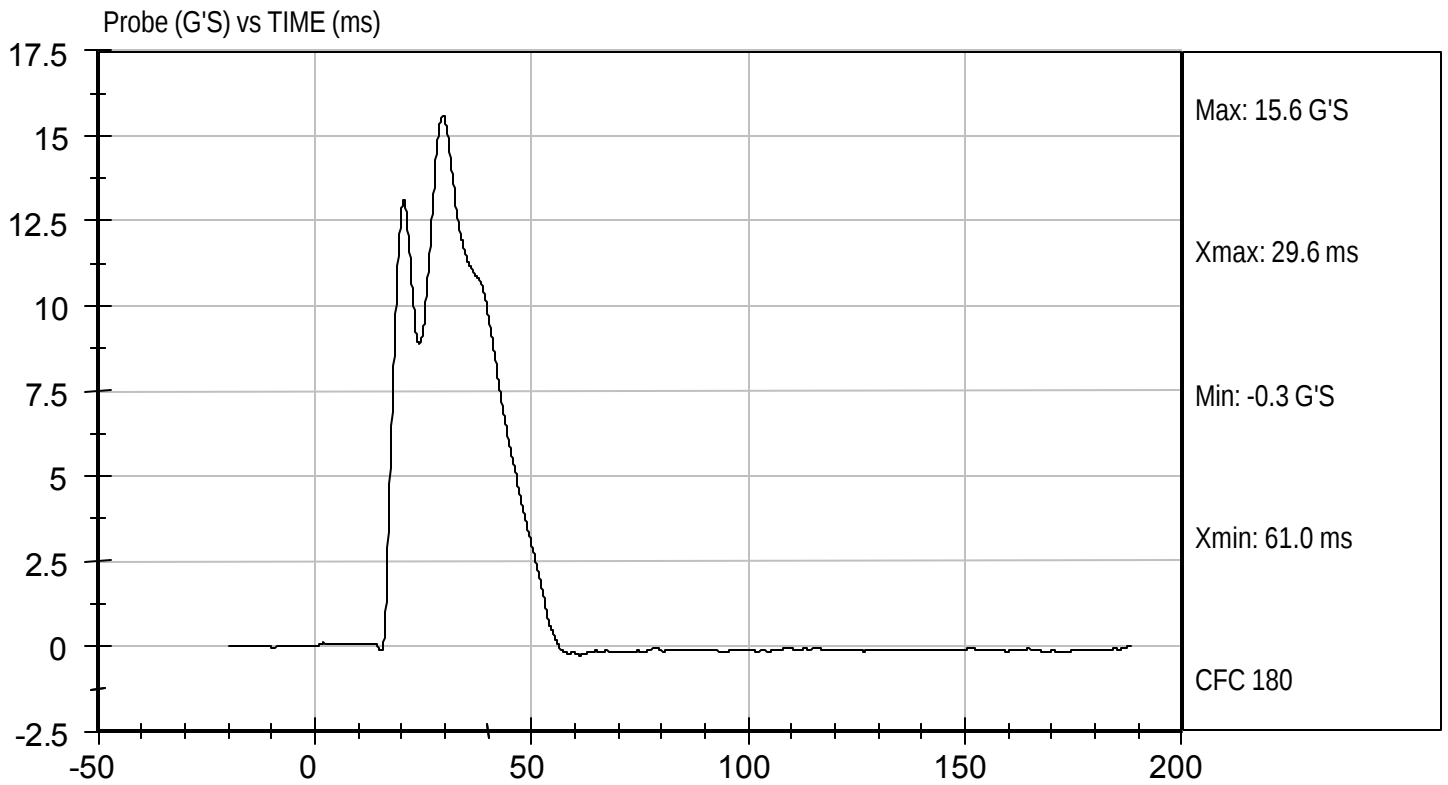
4/24/09
Test Date

David Winkelbauer
Approved By



Test Desc: Shoulder Impact
Component ID: D09893

Test Date: 4/24/09
Velocity: 14.37 ft/s, 4.38 m/s

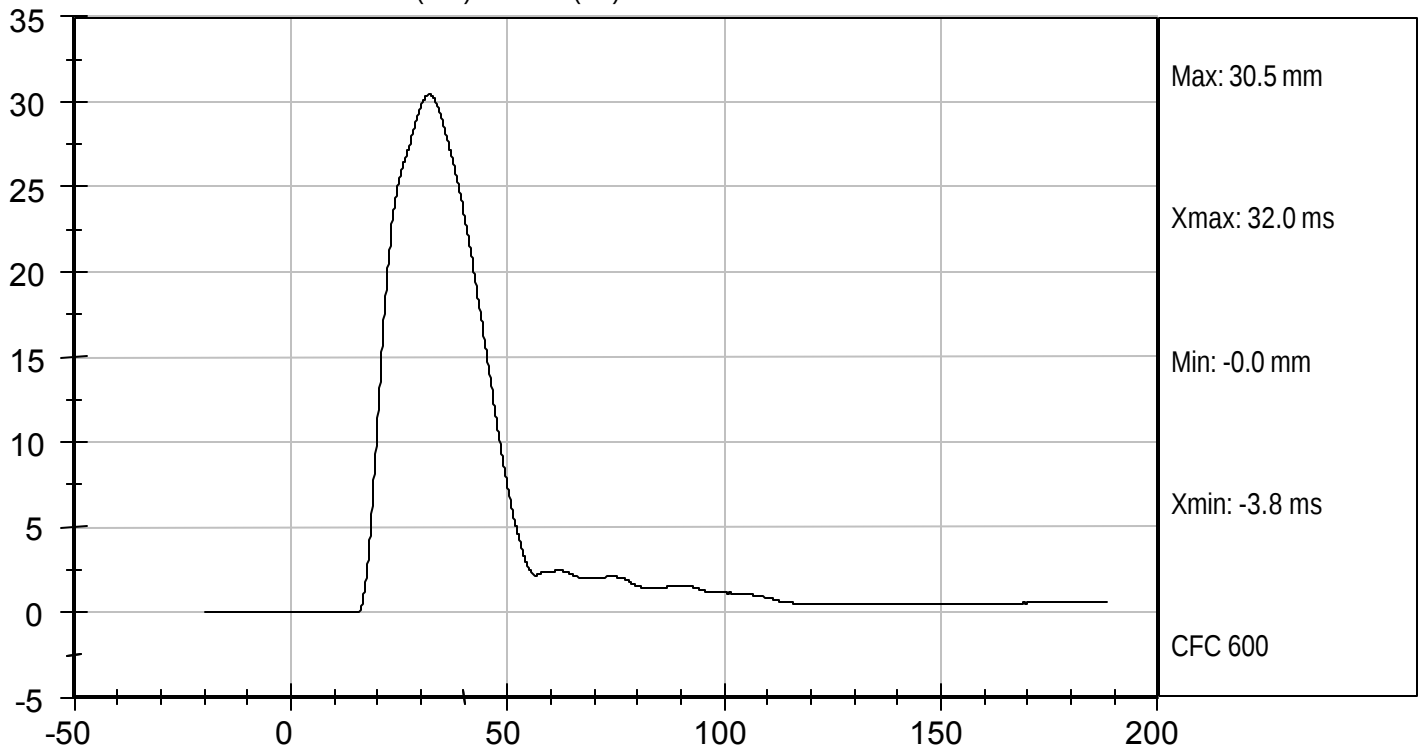




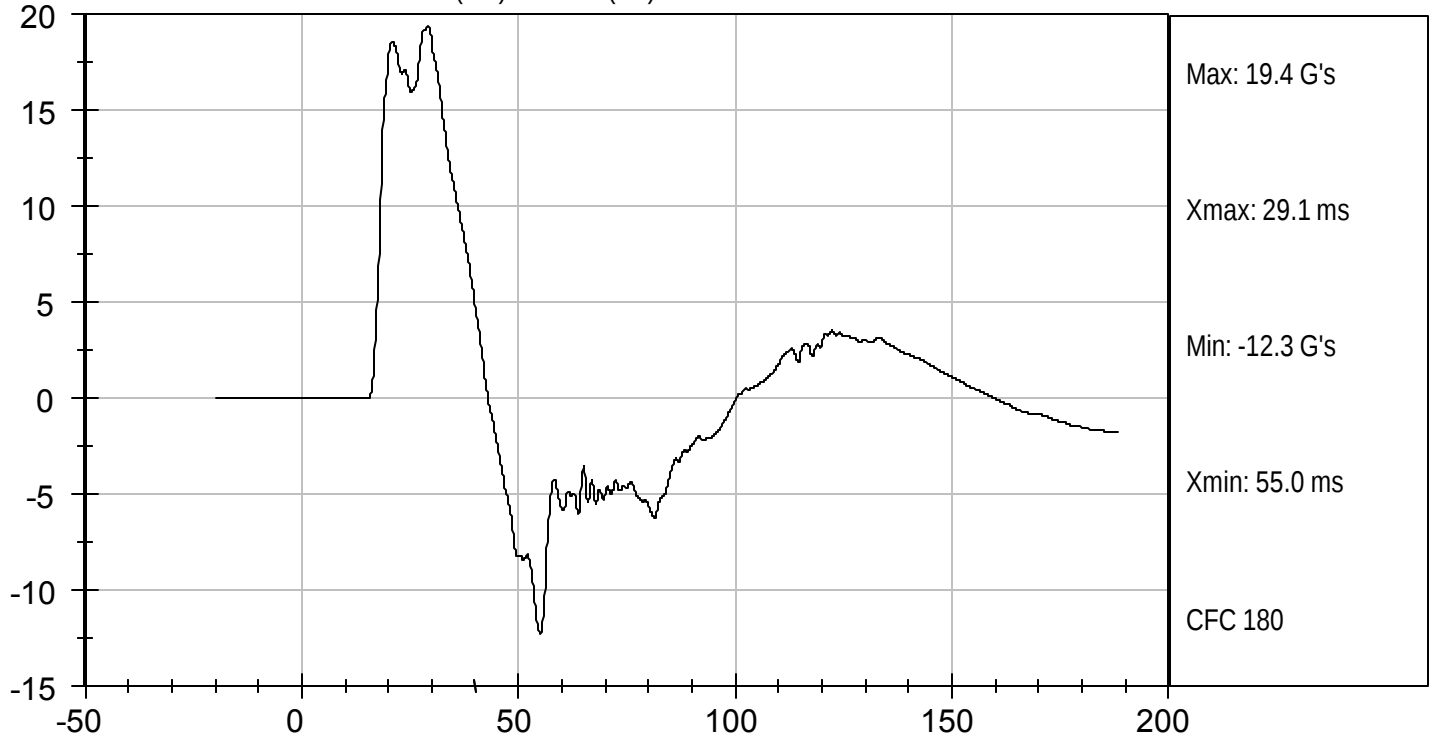
Test Desc: Shoulder Impact
Component ID: D09893

Test Date: 4/24/09
Velocity: 14.37 ft/s, 4.38 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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



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

ATD Serial No: 296

Test I.D: D09894

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	51	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	31 to 36	34	Pass
Shoulder Displacement	mm	31 to 40	33	Pass
Upper Rib Displacement	mm	25 to 32	26	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

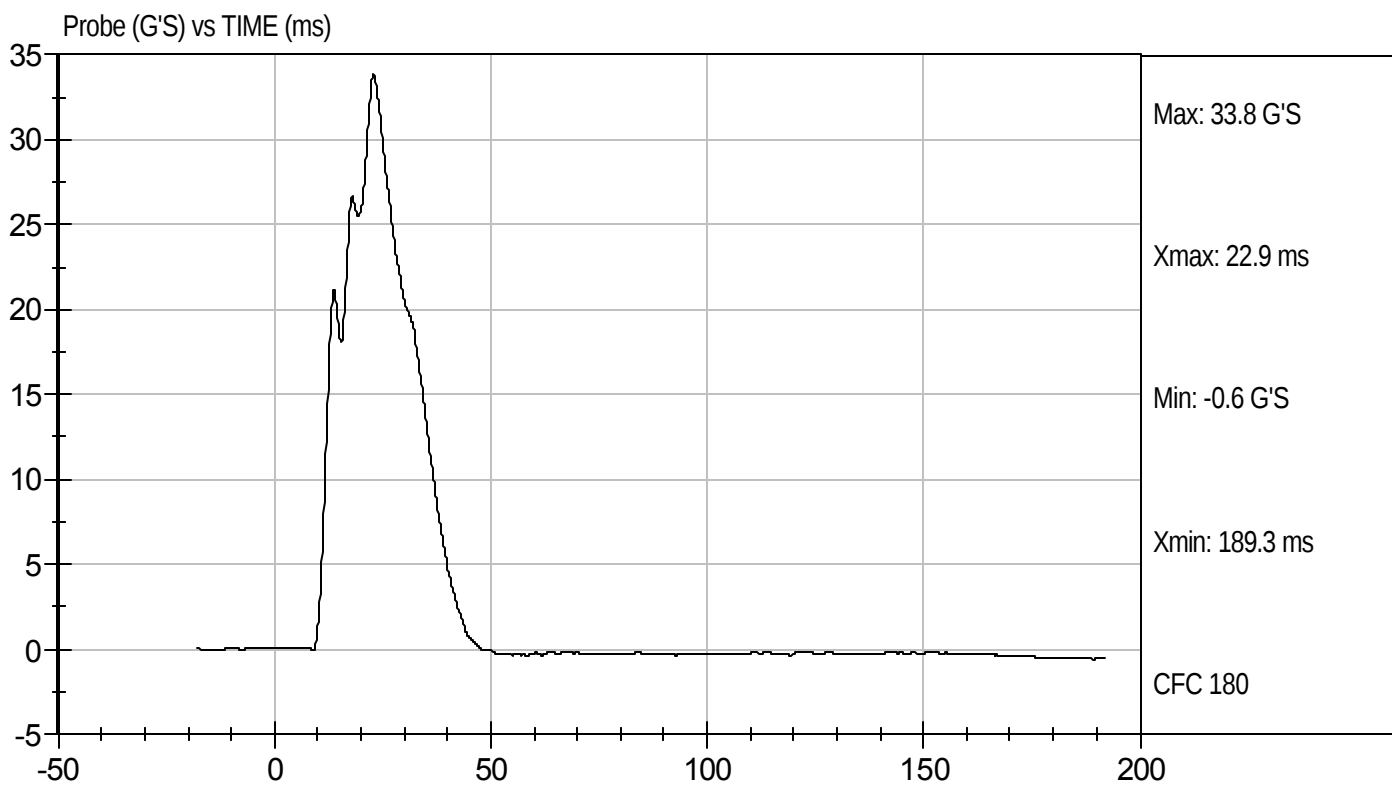
4/24/09
Test Date

David Winkelbauer
Approved By



Test Desc: Thorax With Arm
Component ID: D09894

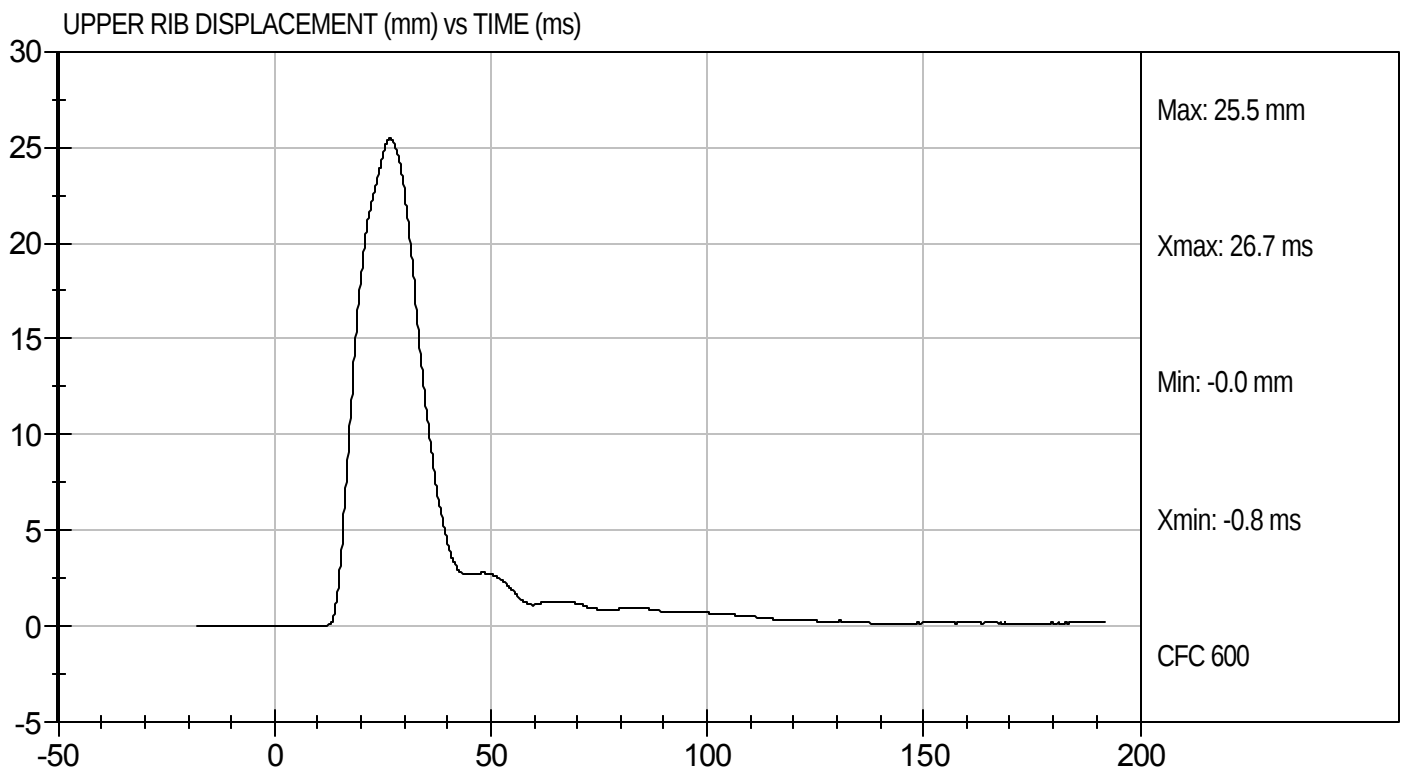
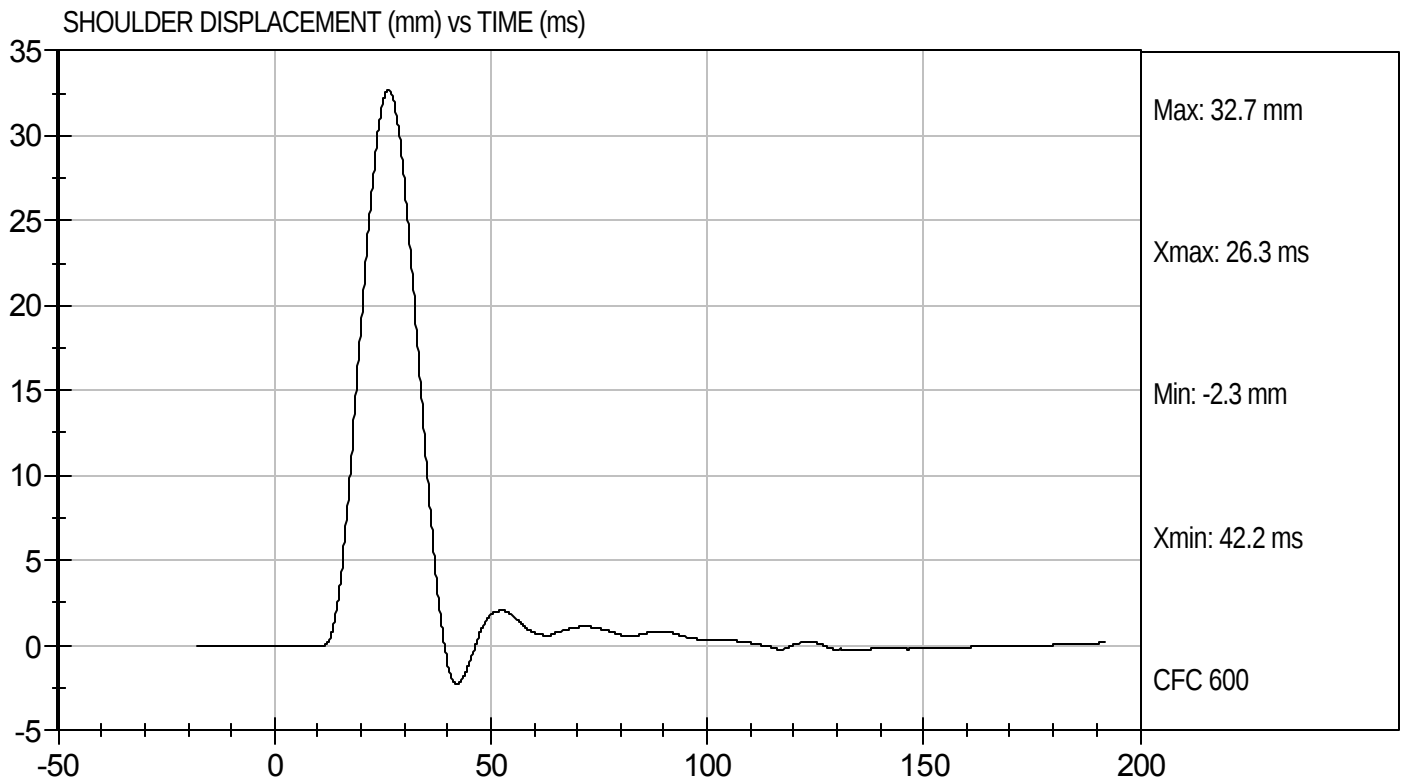
Test Date: 4/24/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D09894

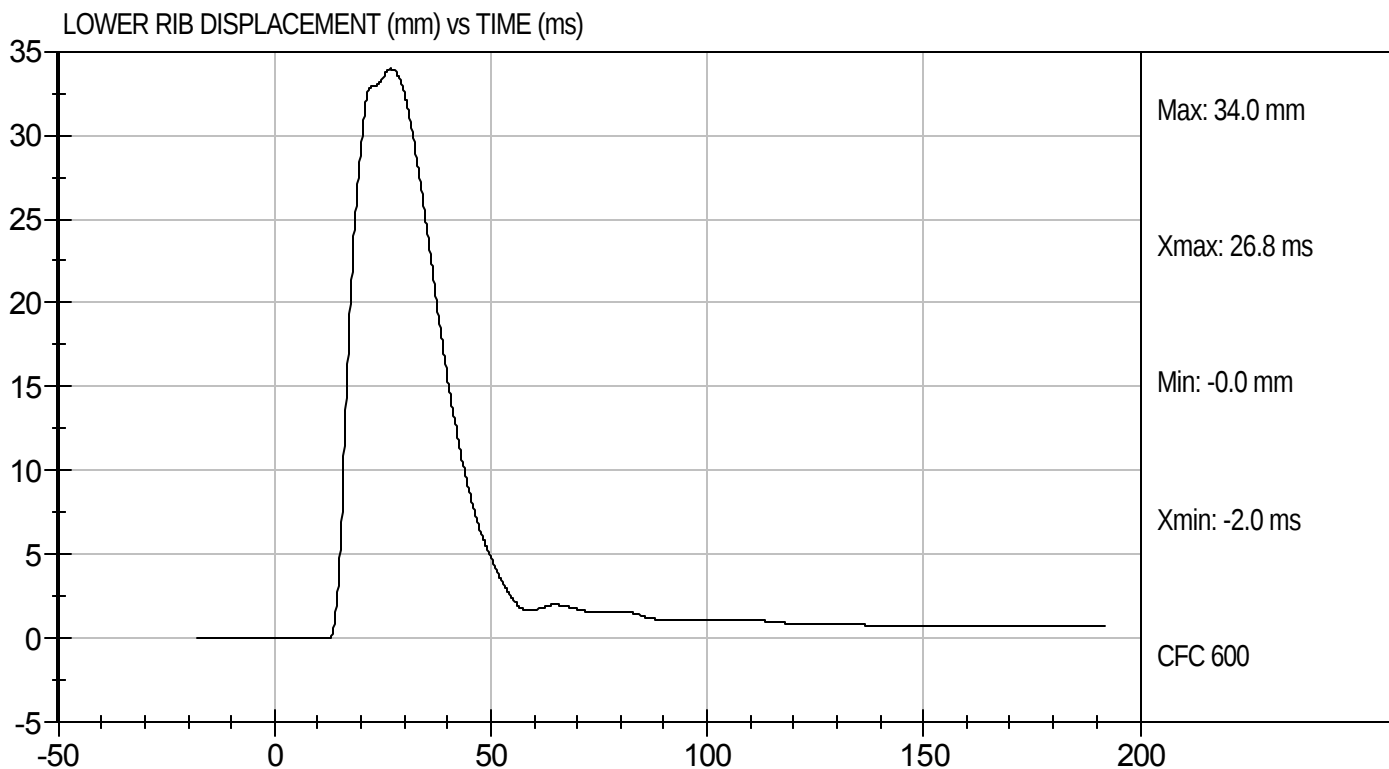
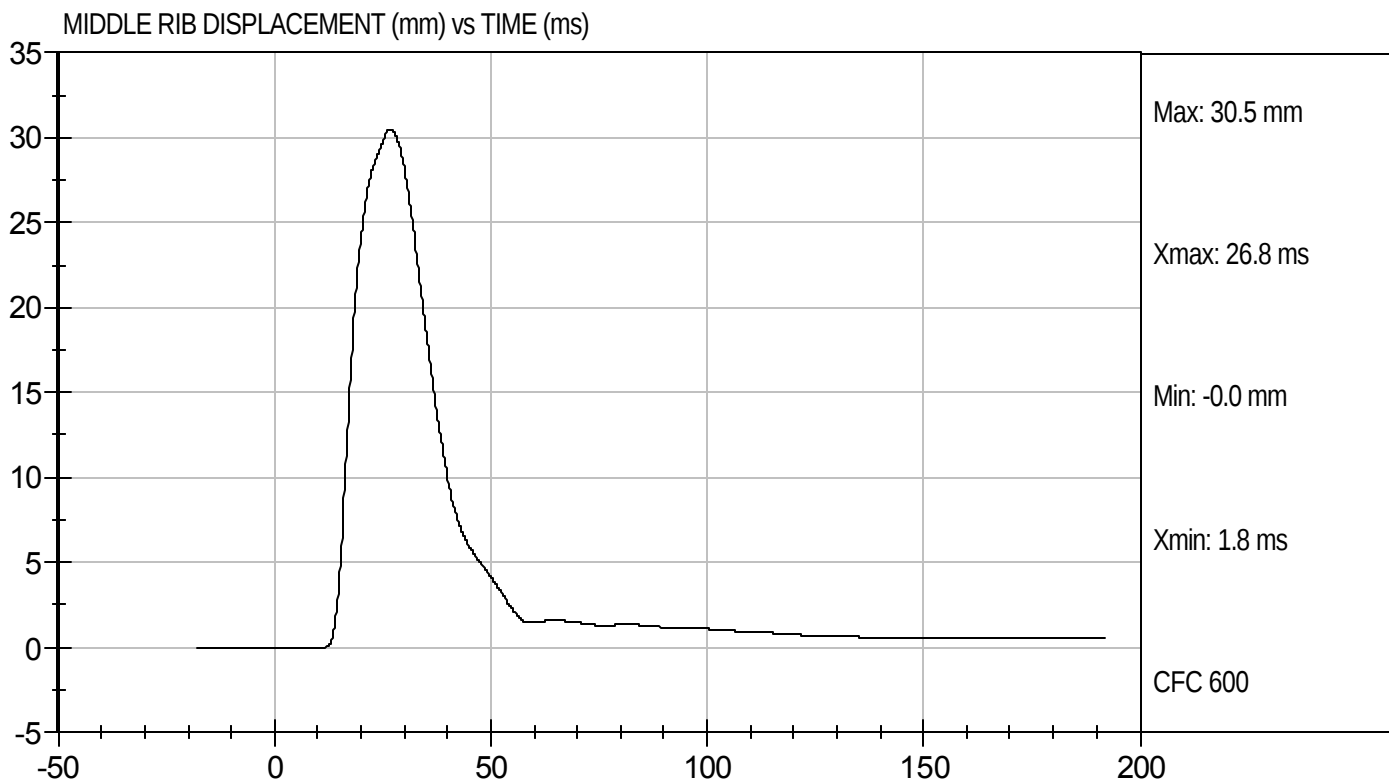
Test Date: 4/24/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D09894

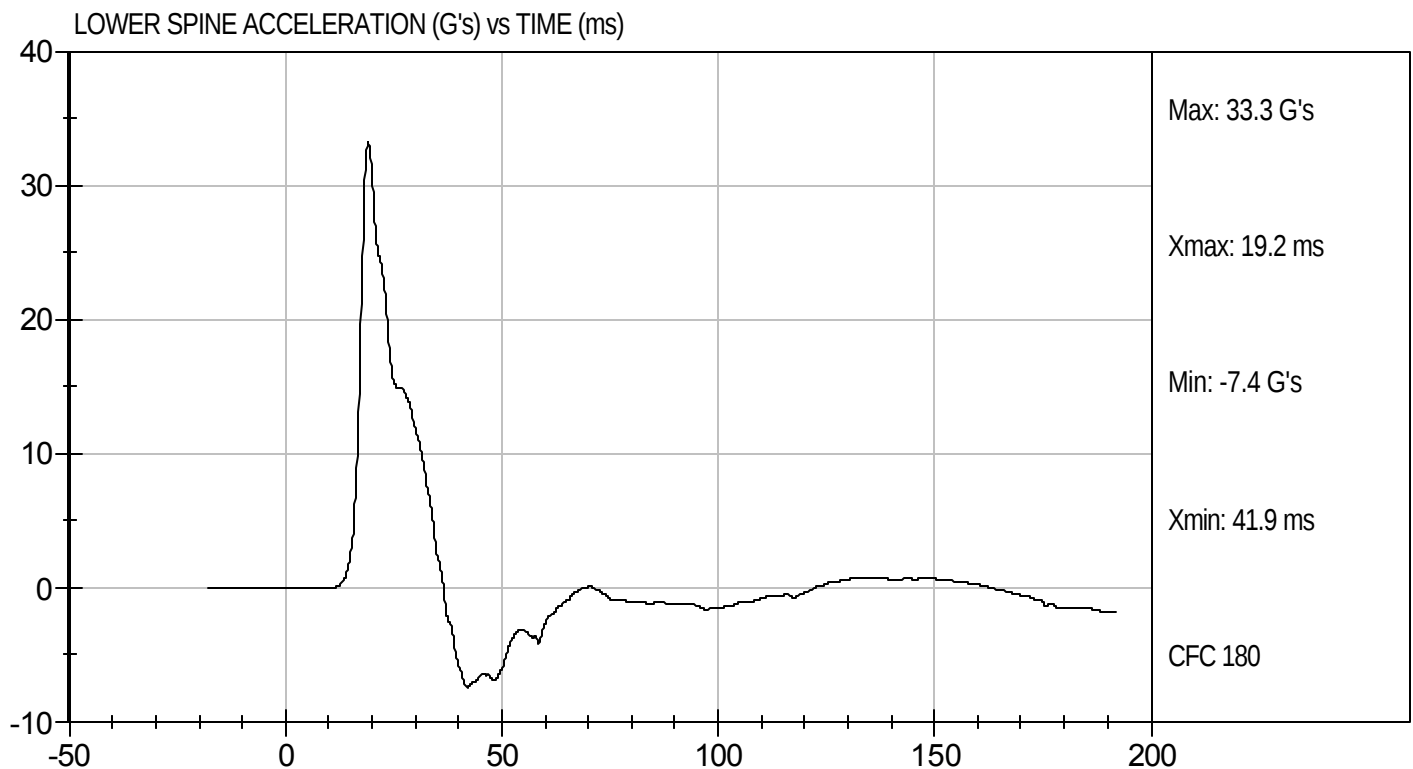
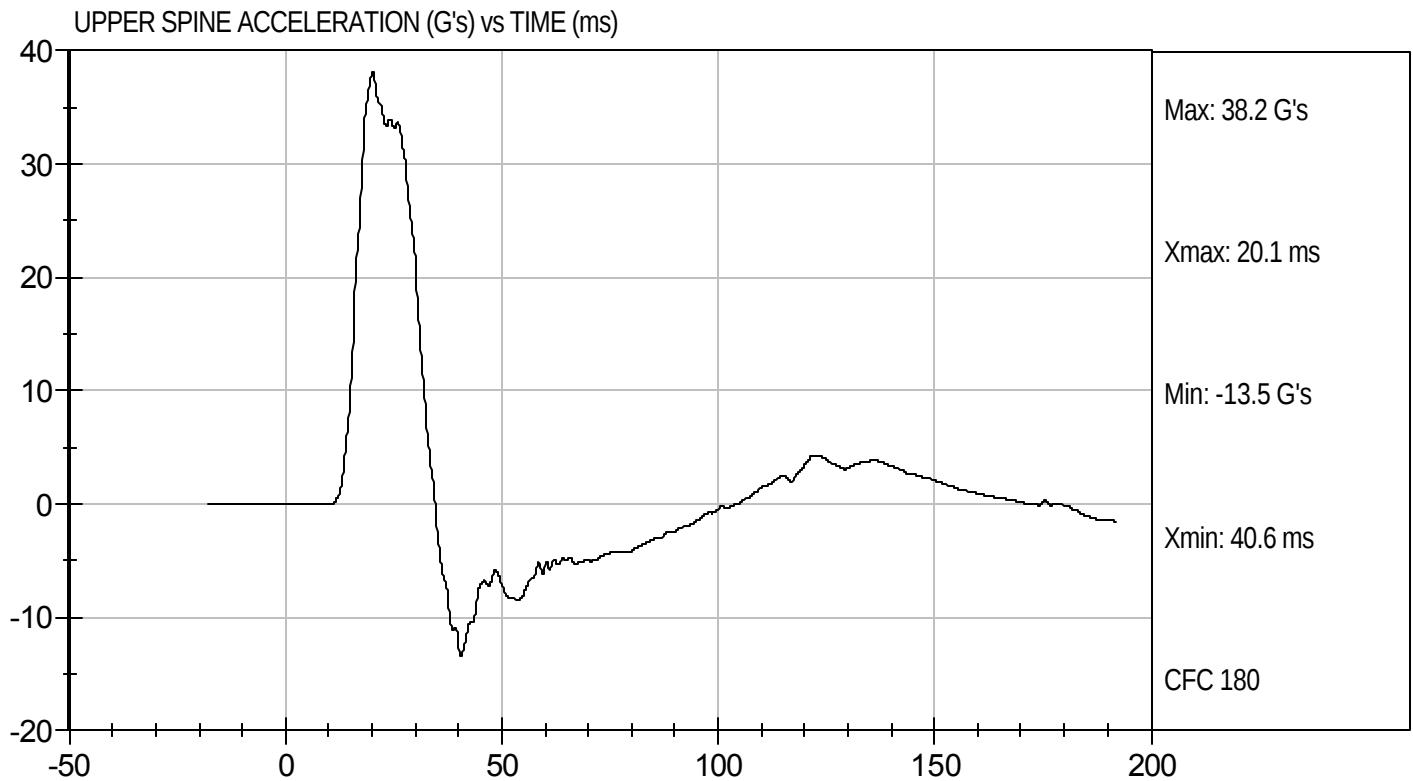
Test Date: 4/24/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D09894

Test Date: 4/24/09
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: D09895

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	51	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	36	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	9	Pass
Overall Test Results				Pass


 Laboratory Technician

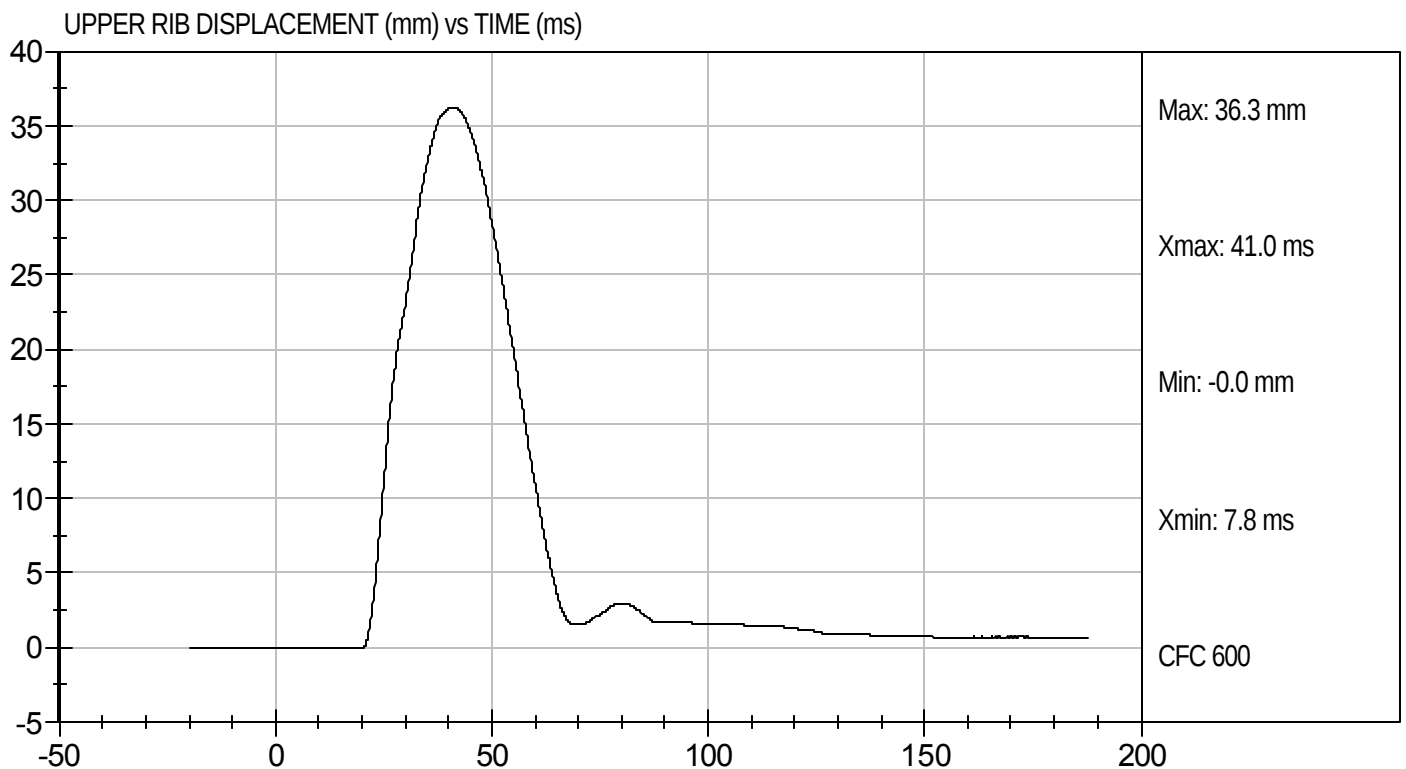
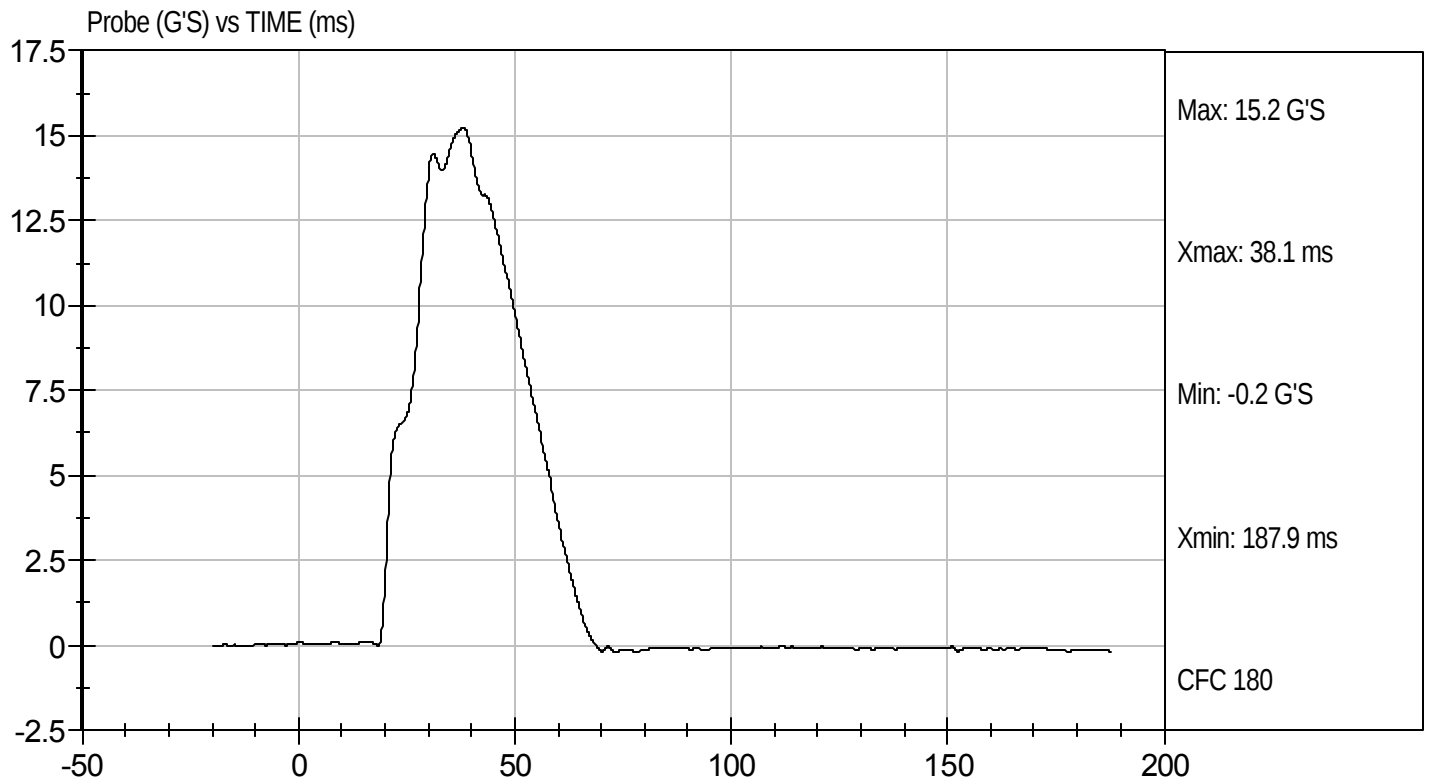
4/24/09
 Test Date


 Approved By



Test Desc: Thorax Without Arm
Component ID: D09895

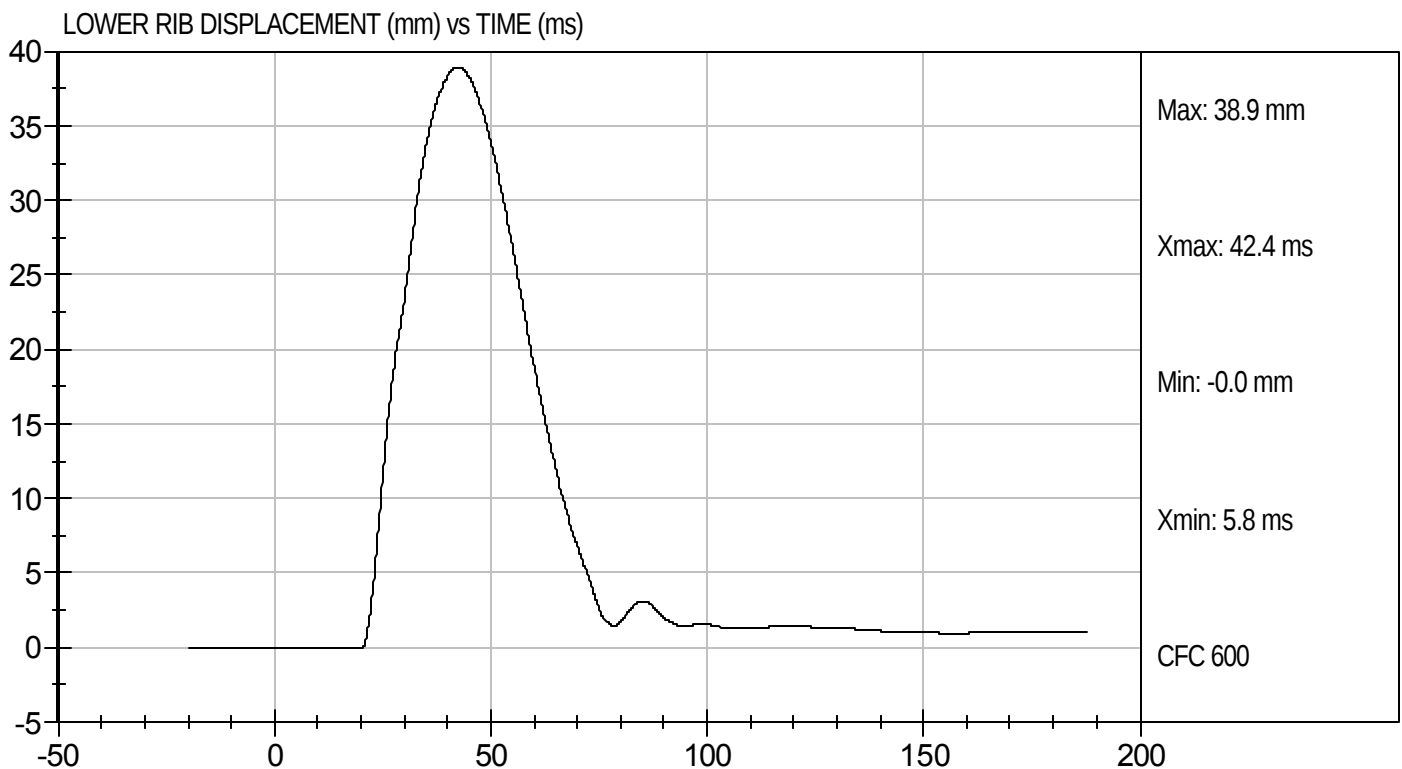
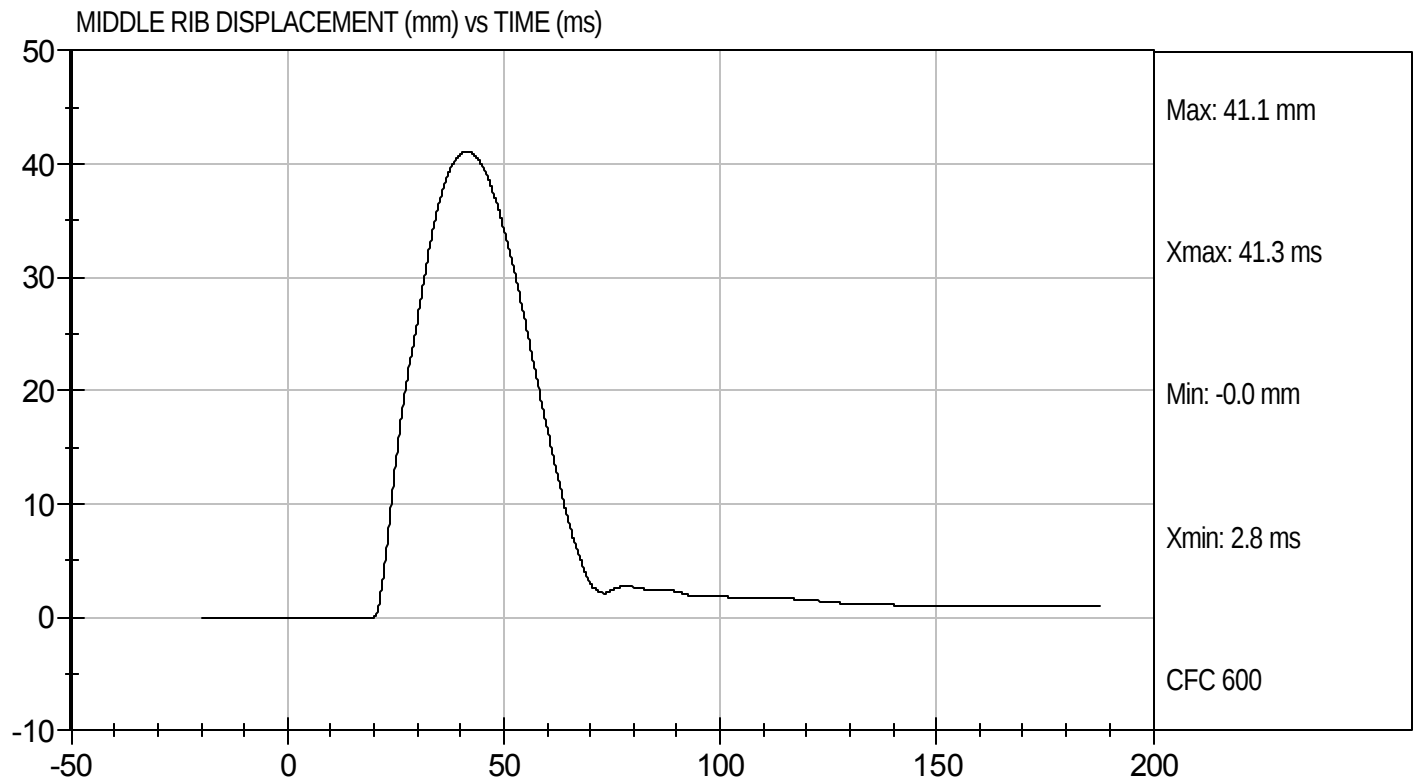
Test Date: 4/24/09
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Thorax Without Arm
Component ID: D09895

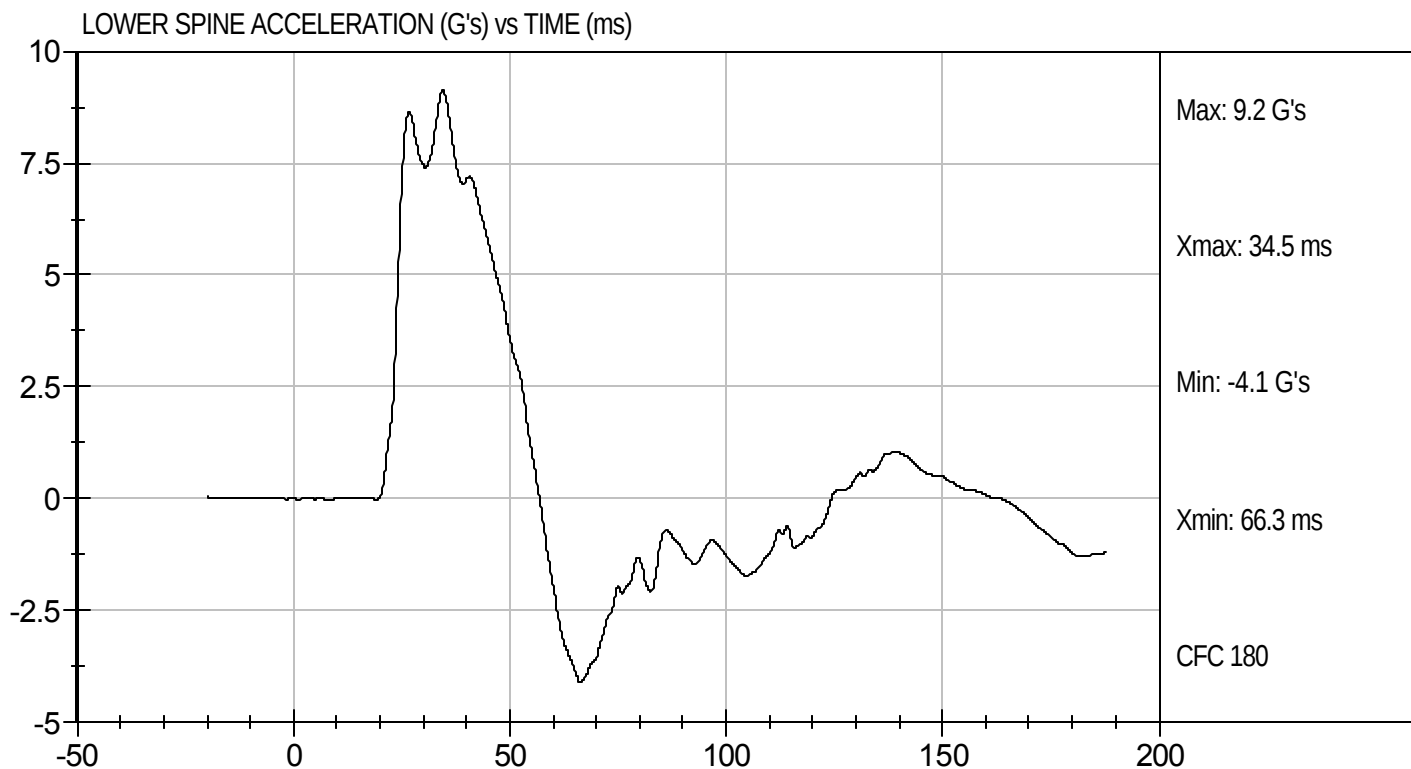
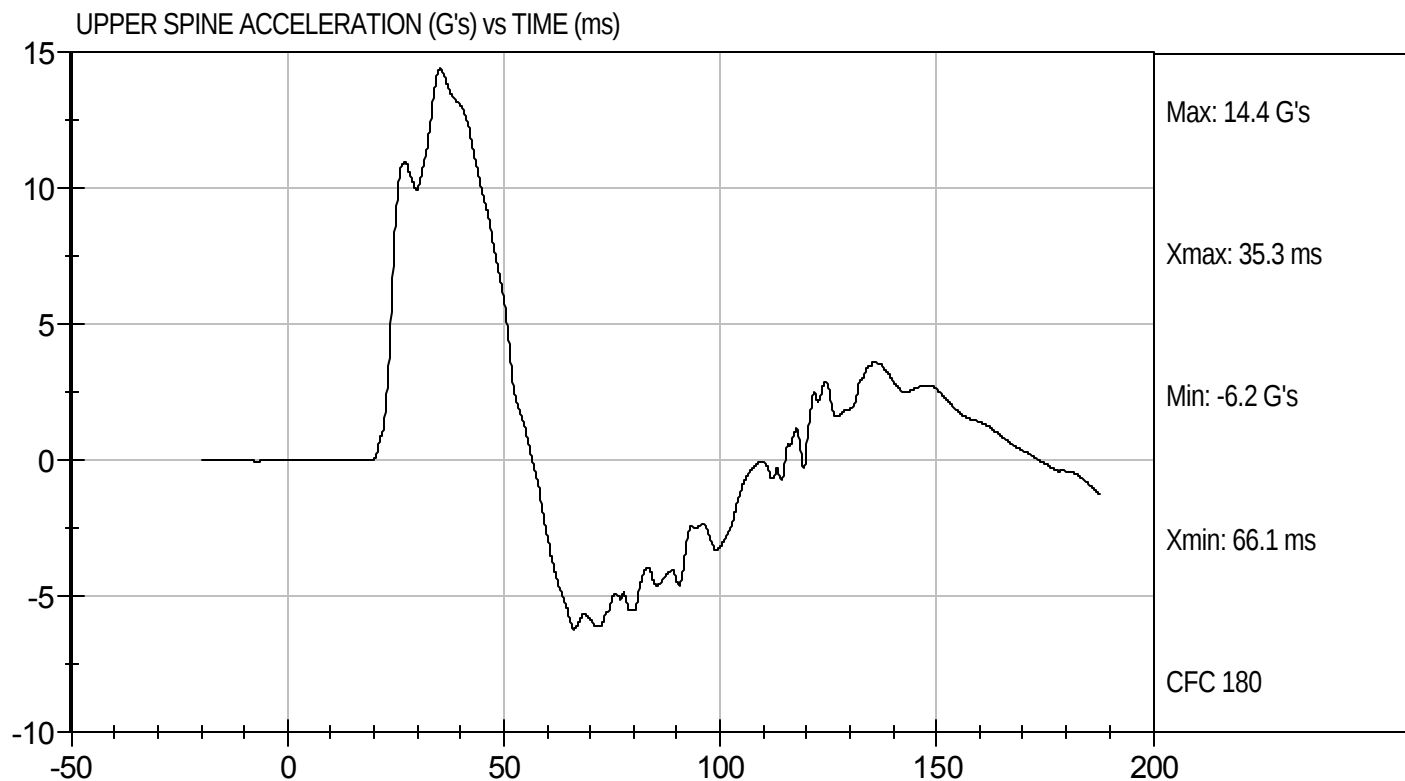
Test Date: 4/24/09
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Thorax Without Arm
Component ID: D09895

Test Date: 4/24/09
Velocity: 14.25 ft/s, 4.34 m/s

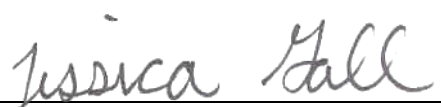


MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-II's BUILD LEVEL D DUMMY

ATD Serial No: 296

Test I.D: D09896

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	51	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	39	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

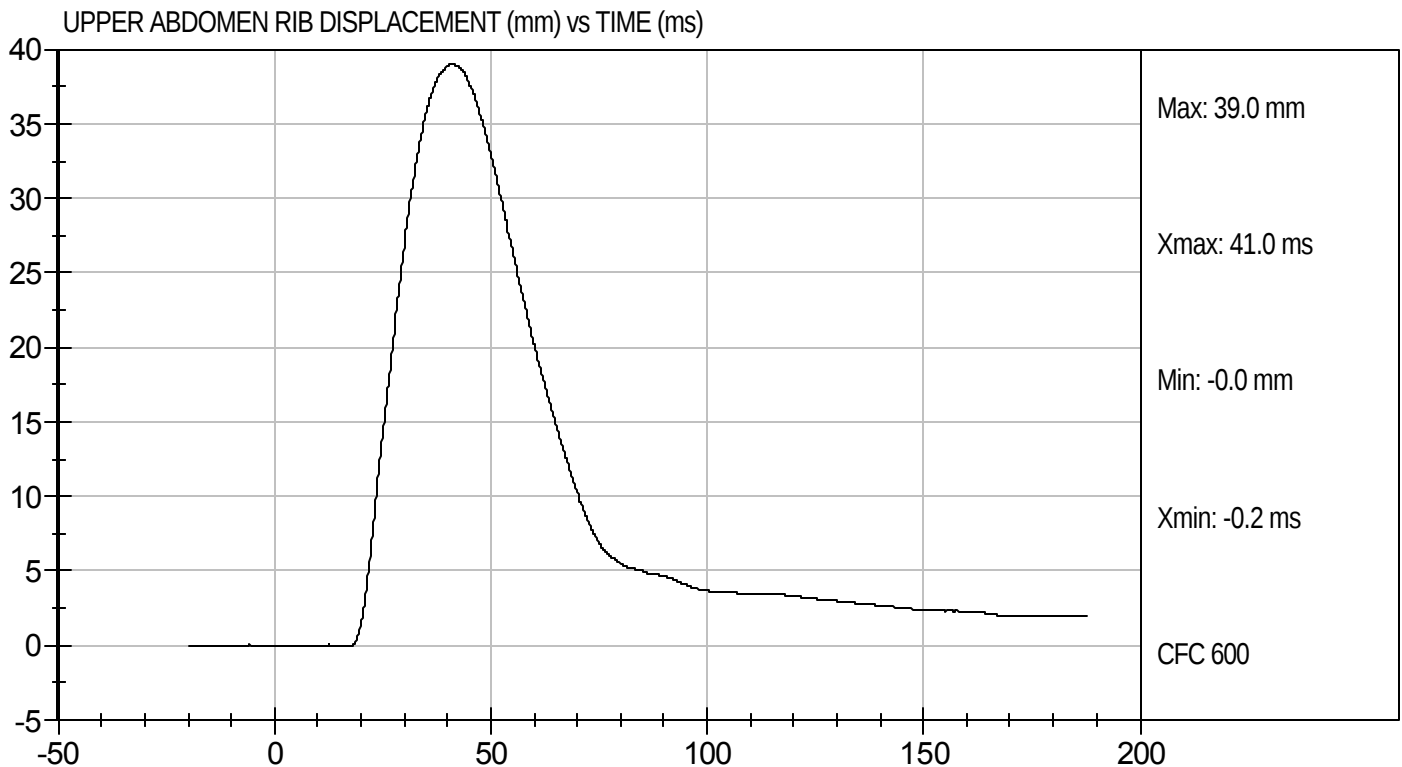
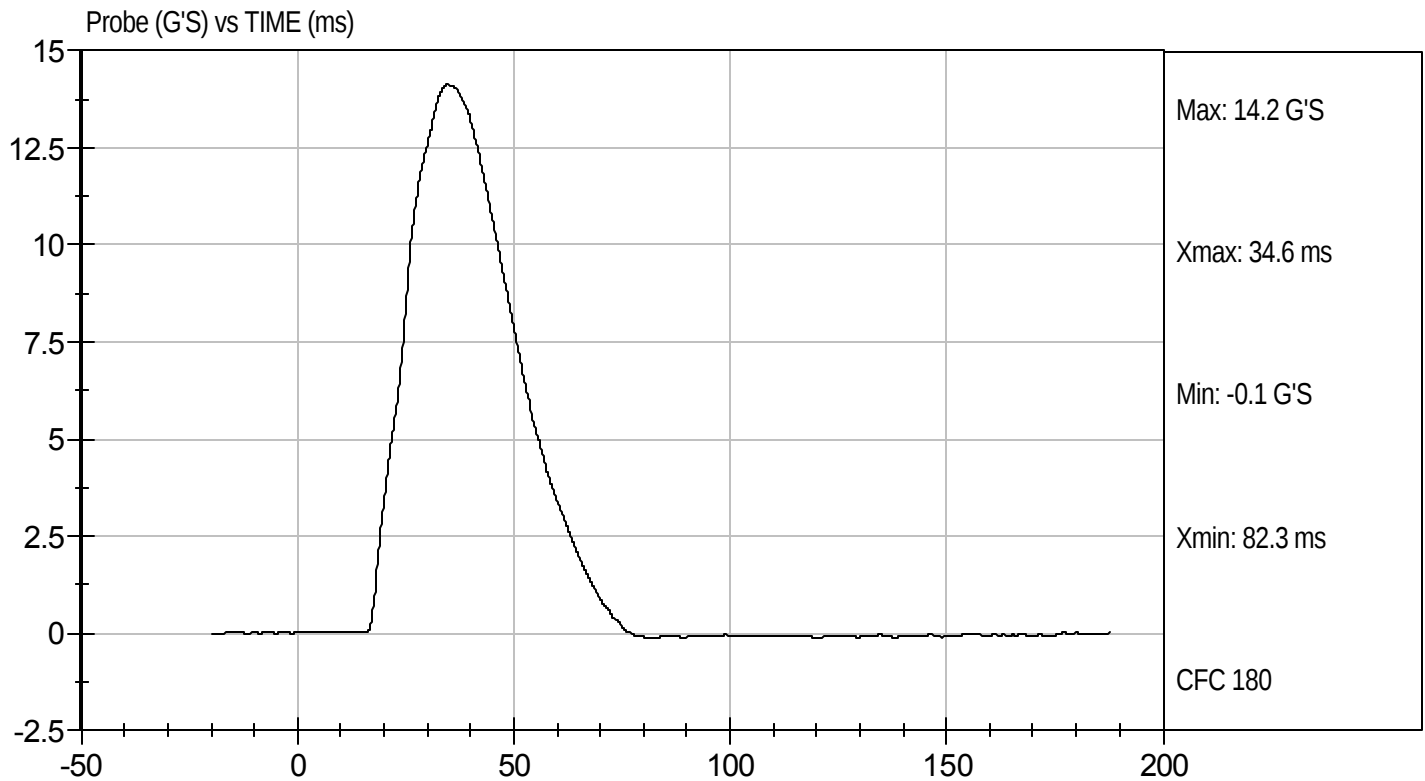
4/24/09
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D09896

Test Date: 4/24/09
Velocity: 14.12 ft/s, 4.30 m/s

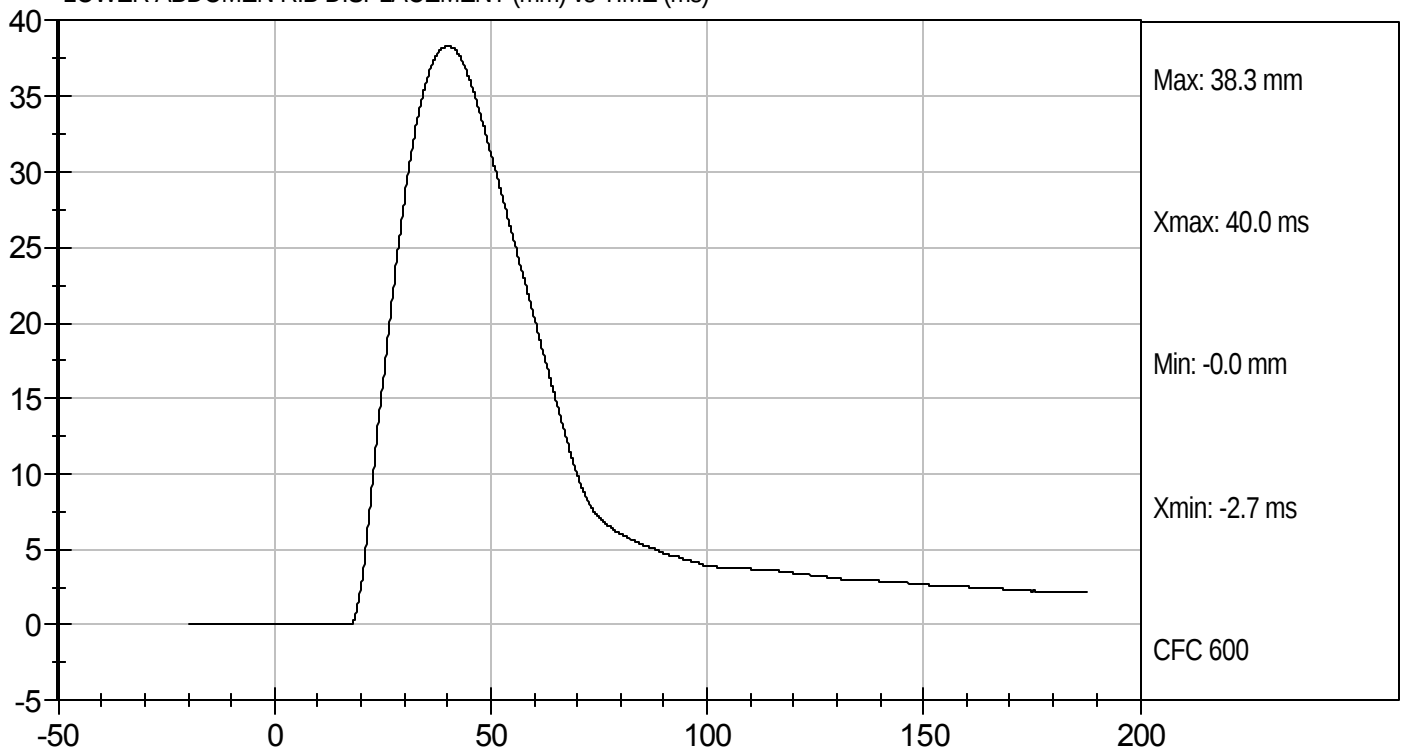




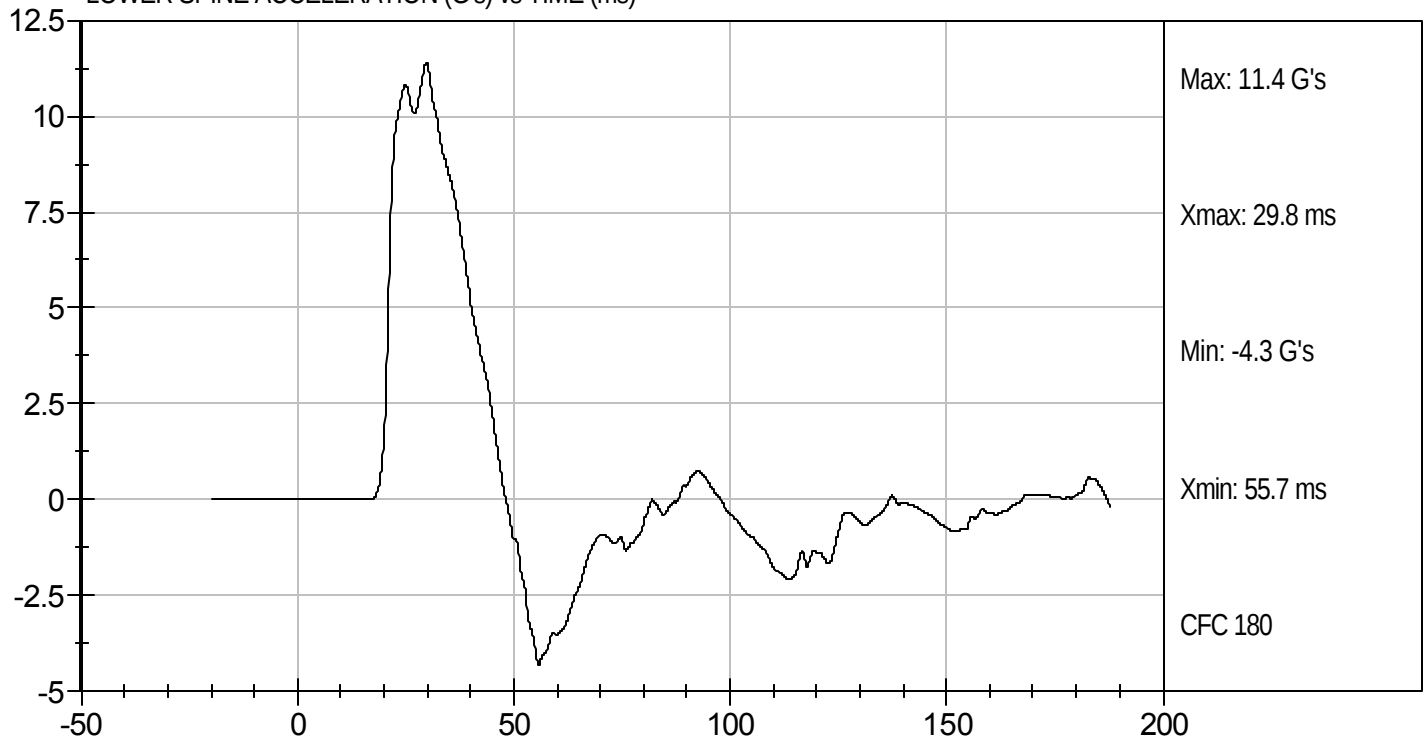
Test Desc: Abdomen Impact
Component ID: D09896

Test Date: 4/24/09
Velocity: 14.12 ft/s, 4.30 m/s

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



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



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

ATD Serial No: 296

Test I.D: D09897

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	44	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	4101	Pass
Overall Test Results			Pass	


Laboratory Technician

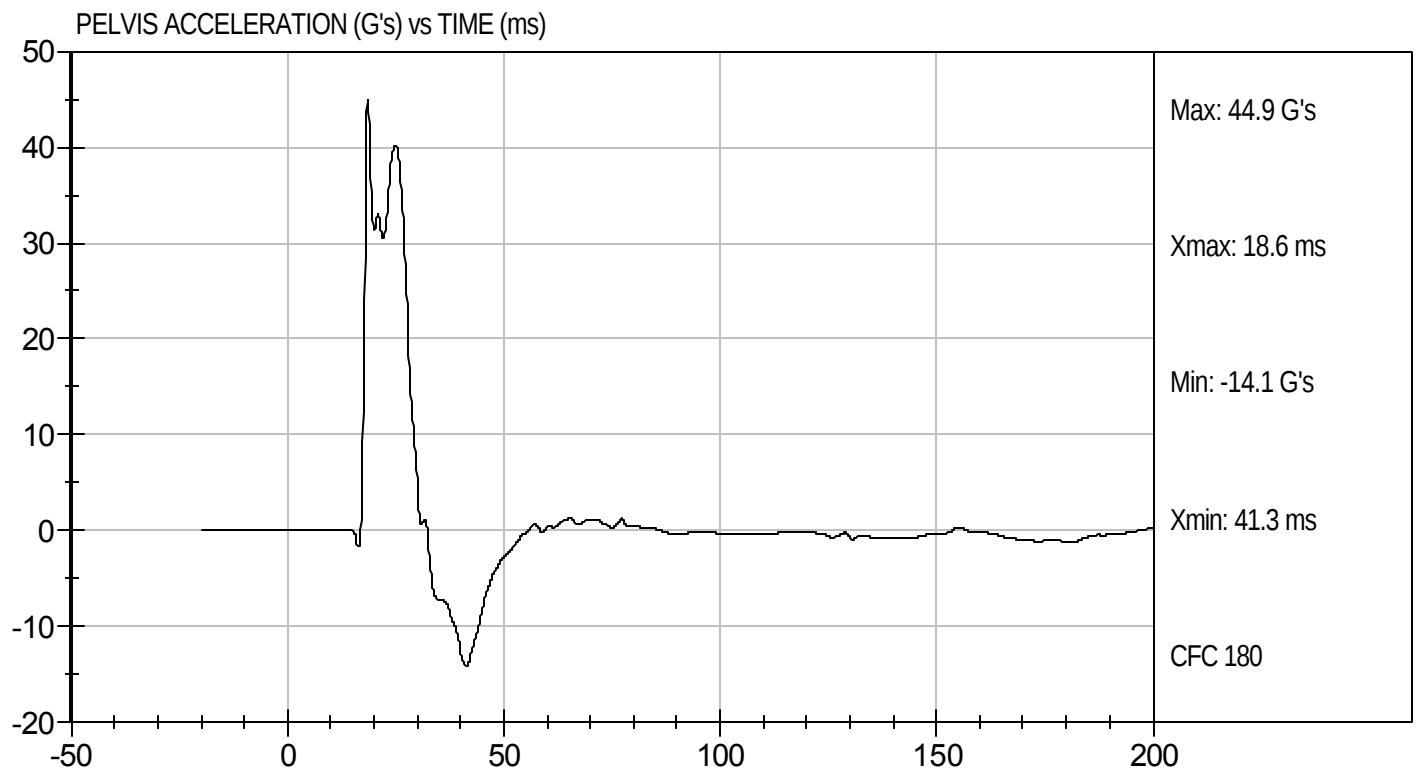
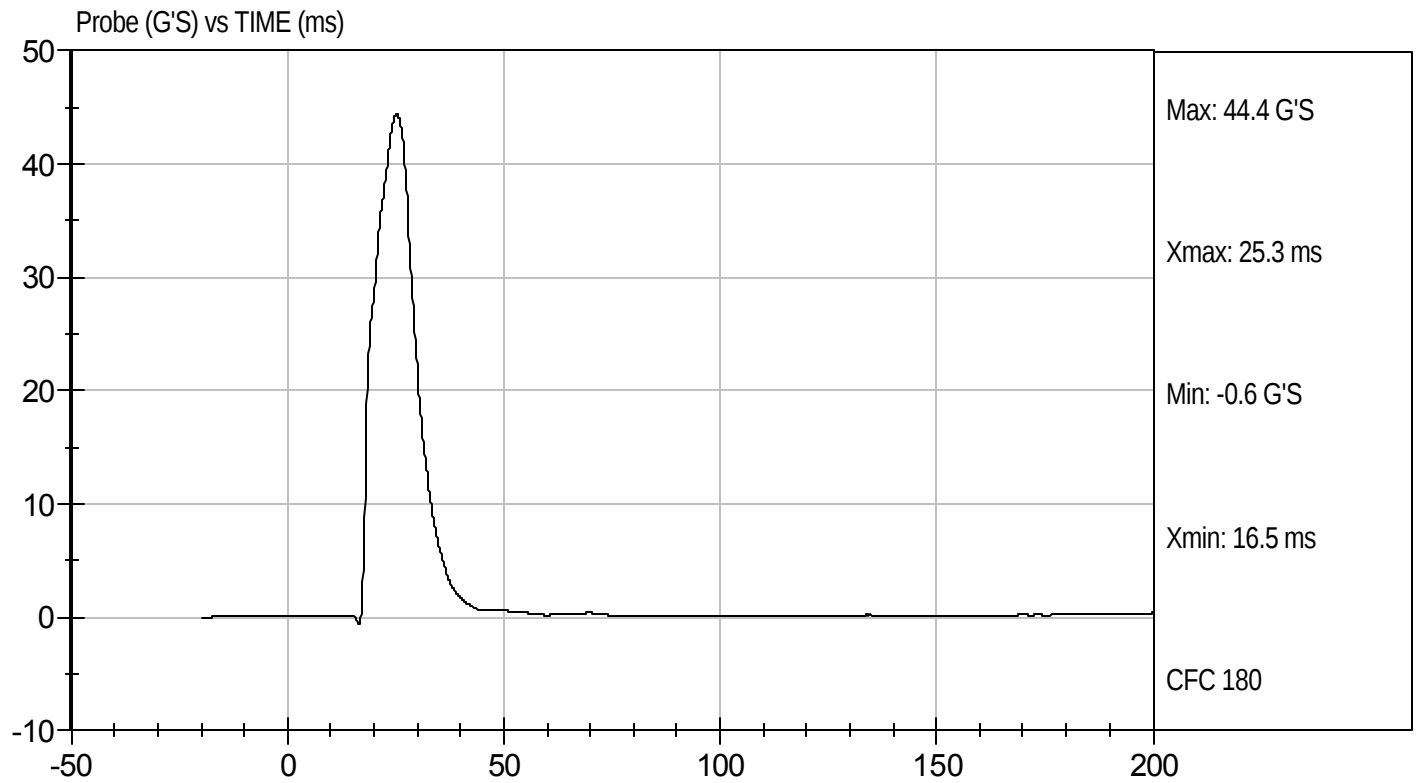
4/24/09
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D09897

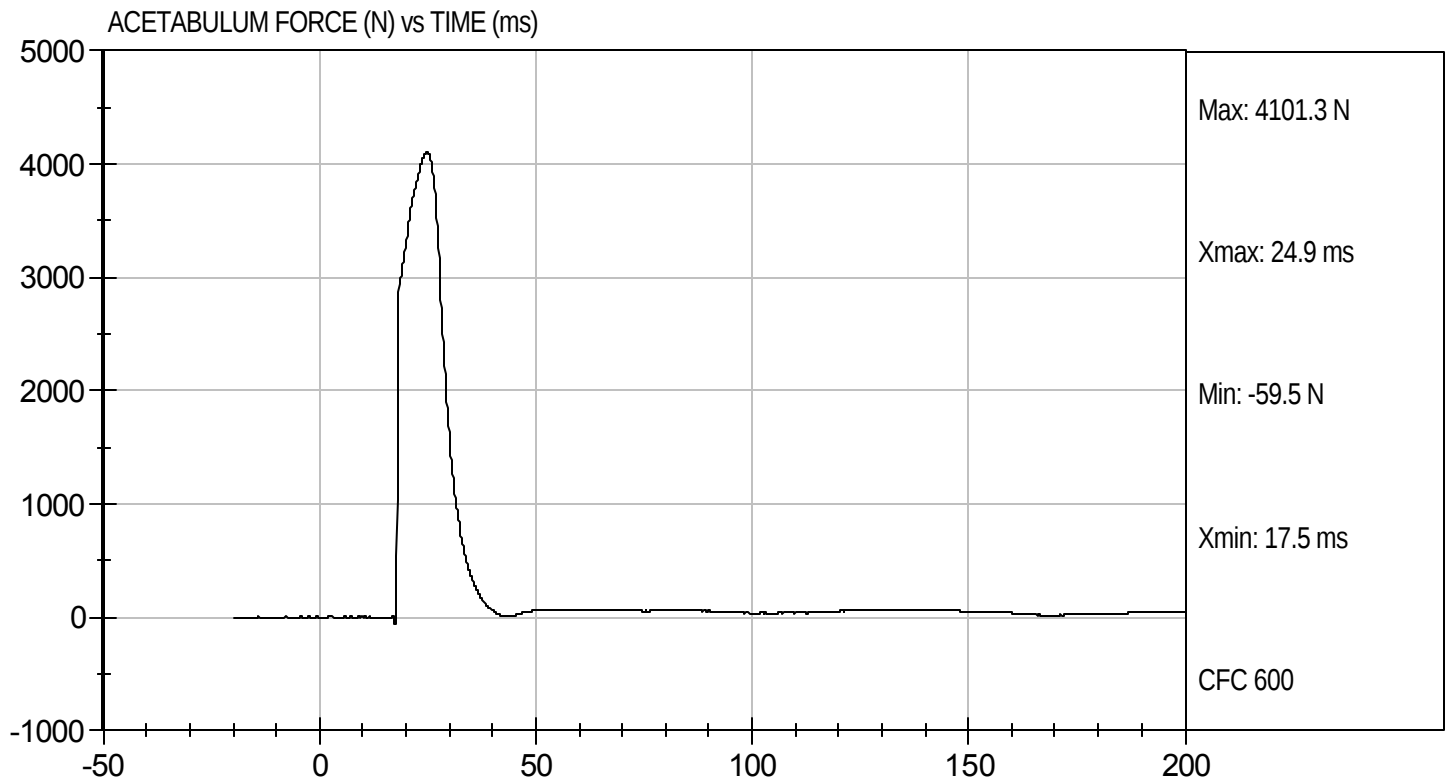
Test Date: 4/24/09
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D09897

Test Date: 4/24/09
Velocity: 22.22 ft/s, 6.77 m/s



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

ATD Serial No: 296

Test I.D: D09898

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4800	Pass
Overall Test Results			Pass	


Laboratory Technician

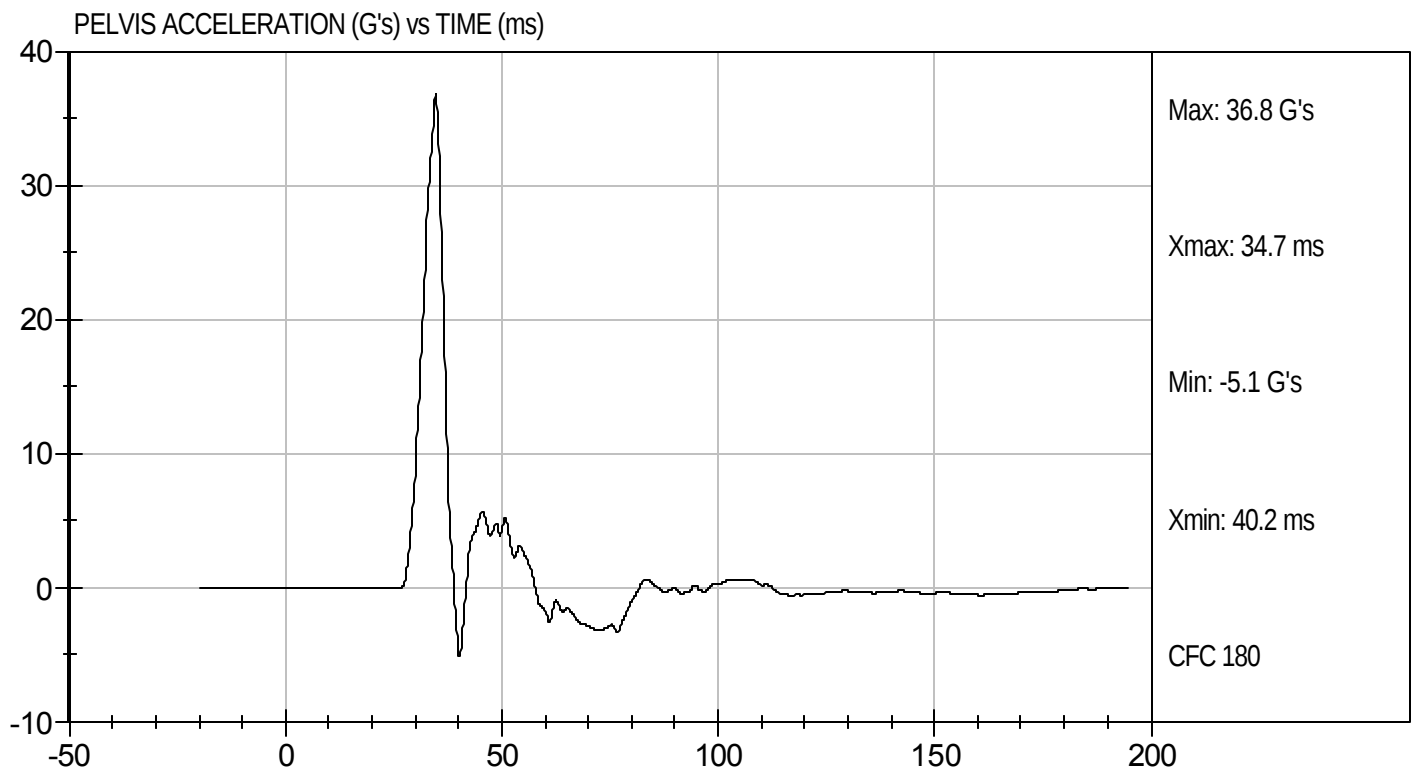
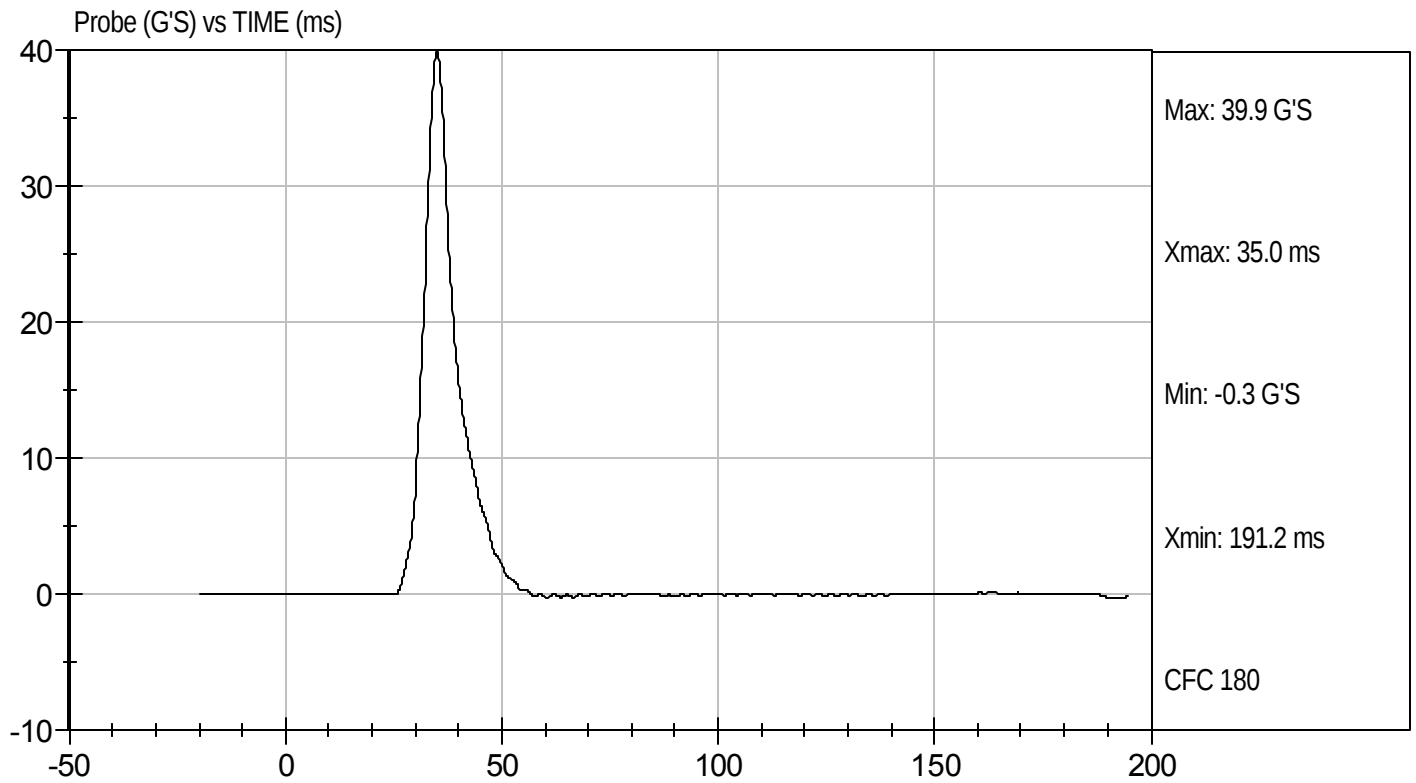
4/24/09
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D09898

Test Date: 4/24/09
Velocity: 14.12 ft/s, 4.30 m/s





Test Desc: Iliac Impact
Component ID: D09898

Test Date: 4/24/09
Velocity: 14.12 ft/s, 4.30 m/s

