REPORT NUMBER: SINCAP-MGA-2012-002

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

KIA MOTORS MANUFACTURING GEORGIA, INC.
2012 Kia Sorento LX SUV
NHTSA No.: KC0501

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: August 9, 2011

Final Report Date: August 29, 2011

FINAL REPORT

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

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

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Approved by: _____
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Approval Date: August 29, 2011

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

1. Report No. SINCAP-MGA-2012-002	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Testing of a 2012 Kia Sorento LX SUV NHTSA No.: KC0501		*5. Report Date* August 29, 2011 *6. Performing Organization Code* MGA
7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer		*8. Performing Organization Report No.* SINCAP-MGA-2012-002
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-09-D-00124
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered:* Final Test Report August 9, 2011 to August 29, 2011 *14. Sponsoring Agency Code* NVS-111
15. Supplementary Notes		

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2012 Kia Sorento LX SUV in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on August 9, 2011.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.4 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The target vehicle post-test maximum crush was 235 mm at level 3. The test vehicle's performance was as follows:

	Driver ATD (ES-2re)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	69
Maximum Thorax Rib Deflection	mm	44	23
Combined Abdominal Force	N	2500	788
Pubic Symphysis Force	N	6000	1343

	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	198
Lower Spine (T12) Resultant Acceleration	G	82	59
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	4197

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Adm. Technical Reference Division 1200 New Jersey Ave, SE Washington, D.C. 20590	
19. Security Classif. (of this report) Unclassified	*20. Security Classif. (of this page)* Unclassified	*21. No. of Pages* 199	22. Price

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2012 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2012 Kia Sorento LX SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated January 2010.

SUMMARY

A 2012 Kia Sorento LX SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.4 km/h (38.8 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin, on August 9, 2011. Pretest and post test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

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

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Head CG Triaxial Accelerometers
Thorax Rib 1 to Rib 3 Displacement Potentiometers
Abdomen Forward, Middle, and Rear Load Cells
Lower Spine Triaxial Accelerometers
Pubic Load Cell

PASSENGER ATD (SID-IIs)
Head CG Triaxial Accelerometers
Thorax Upper, Middle, and Lower Rib Displacement Potentiometers
Abdomen Upper and Lower Rib Displacement Potentiometers
Lower Spine Triaxial Accelerometers
Iliac Load Cell
Acetabulum Load Cell

DUMMY INJURY VALUES

	Driver ATD (ES-2re)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	69
Maximum Thorax Rib Deflection	mm	44	23
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	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
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Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	4197

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

GENERAL COMMENTS

There was no valid data collected for:

Left Lower B-Post Y after 4 msec.
Left Mid B-Post Y after 30 msec.
Left Lower A-Post Y after 15 msec.
Driver Seat Track Y after 4 msec.

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

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	KC0501	Anti-Lock Brakes	Yes
Model Year	2012	All Wheel Drive	No
Make	Kia	Power Steering	Yes
Model	Sorento	Driver Front Airbag	Yes
Body Style	MPV	Driver Curtain Airbag	Yes
VIN	5XYKT3A6XCG205862	Driver Head/Torso Airbag	No
Body Color	Bright Silver	Driver Torso Airbag	No
Delivery Date	7/21/2011	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	35	Driver Pelvis Airbag	No
Odometer (km)	56	Driver Knee Airbag	No
Dealer	Palmen Kia	Rear Pass. Front Airbag	No
Transmission	Automatic	Rear Pass. Curtain Airbag	Yes
Final Drive	Front	Rear Pass. Head/Torso Airbag	No
Type/No. Cylinders	4	Rear Pass. Torso Airbag	No
Engine Displacement (L)	2.4	Rear Pass. Torso/Pelvis Airbag	No
Engine Placement	Lateral	Rear Pass. Pelvis Airbag	No
Roof Rack	Yes	Rear Pass. Knee Airbag	No
Sunroof/T-Top	No	Pretensioners	Yes
Tinted Glass	Yes	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	Yes
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Power Seats	Yes
Does owner's manual provide instruction to turn off automatic door locks?			No

DATA FROM CERTIFICATION LABEL

Manufactured By	Kia Motors Manufacturing Georgia, Inc.	GVWR (kg)	2190
Date of Manufacture	JUN/02/11	GAWR Front (kg)	1350
		GAWR Rear (kg)	1450

VEHICLE SEATING AND WEIGHT CAPACITY DATA

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

VEHICLE SEAT TYPE

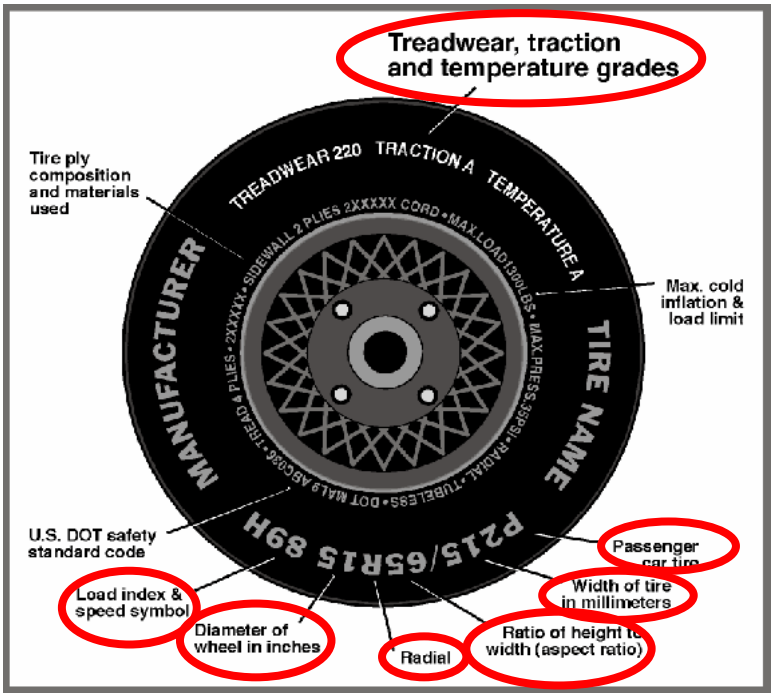
	Type of Seat Pan				Type of Seat Back		
Seating Location	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X				w/lever	X	
Rear or Second Row			X		w/lever	X	
Third Row Seat							

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P235/65R17	P235/65R17
Tire Size on Vehicle	P235/65R17	P235/65R17
Tire Manufacturer	Continental	Continental
Tire Model	Cross Contact	Cross Contact
Treadwear	680	680
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index & Speed Symbol	103T	103T
Tire Material	Rubber	Rubber
DOT Safety Code Right	P587 3Y5 2011	P587 3Y5 2011
DOT Safety Code Left	P587 3Y5 2011	P587 3Y5 2011

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	479.9	361.5		532.1	439.1		523.9	457.2	
Right	kg	479.0	350.2		484.4	417.3		480.4	416.9	
Ratio	%	57.4	42.6		54.3	45.7		53.5	46.5	
Totals	kg	958.9	711.7	1670.6	1016.5	856.4	1872.9	1004.3	874.1	1878.4

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1670.6	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	80	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1879.9	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	780	785	764	773	
As Tested (Fully Loaded ± 10mm at each wheel well)	mm	773	775	774	773	1239

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2710
Total Vehicle Length at Left Side	mm	3736
Total Vehicle Length at Centerline	mm	4675
Total Vehicle Length at Right Side	mm	3736
Weight of Ballast in Cargo Area	kg	39.9
Weight of Vehicle Components Removed	kg	24.5
Amount of Stoddard Solvent in Fuel Tank	L	63.2

Vehicle components removed to meet target vehicle test weight: Right tail light, right side mirror, trunk carpet, right side plastic, jack & tools.

TEST VEHICLE VERTICAL IMPACT POINT DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	413
Actual Impact Point Aft of Front Axle	mm	432

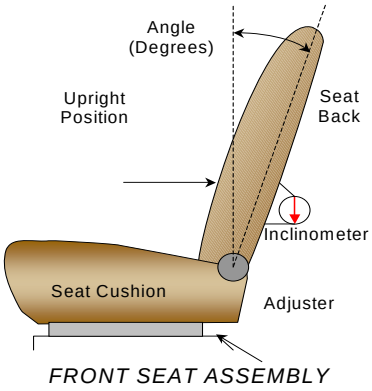
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

NOMINAL DESIGN RIDING POSITION

The driver seatback is positioned to the manufacturer's designated angle. The procedure is as follows: Set seat back angle at -0.7° measured on headrest post relative to the door sill. The right front passenger seatback is set to match the driver seatback. The left rear passenger seat back was set as specified in Appendix B of the TP dated January 2010.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	-0.7° on headrest post
Passenger with Seated Dummy	4.8° on top of seatback recline lever

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	24 detents	12th detent (forward-most as 0)
Rear Seat	Fixed	Fixed

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

SEAT BELT UPPER ANCHORAGES

	Total # of Positions	Placed in Position #
Driver Seat	3 detents (1st as 0)	0 detent (uppermost as 0)
Rear Seat	Fixed	Fixed

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

DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

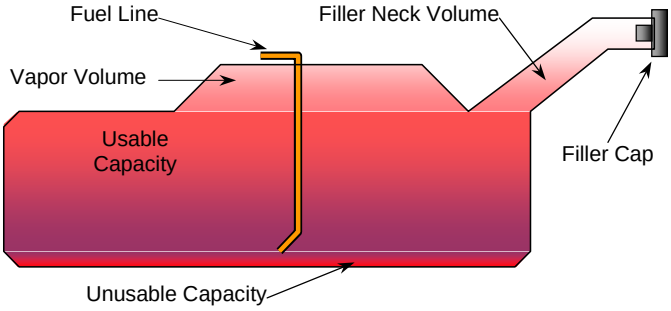
FUEL TANK CAPACITY DATA

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

FUEL PUMP

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

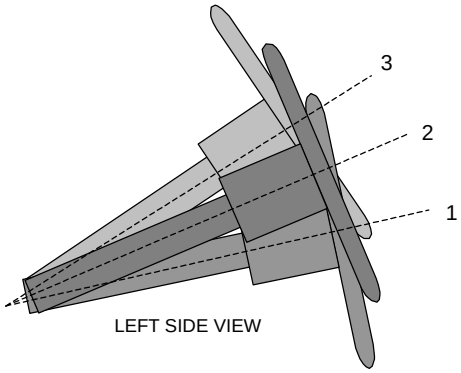
The test vehicle is equipped with an electric fuel pump. Key is "ON" position. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

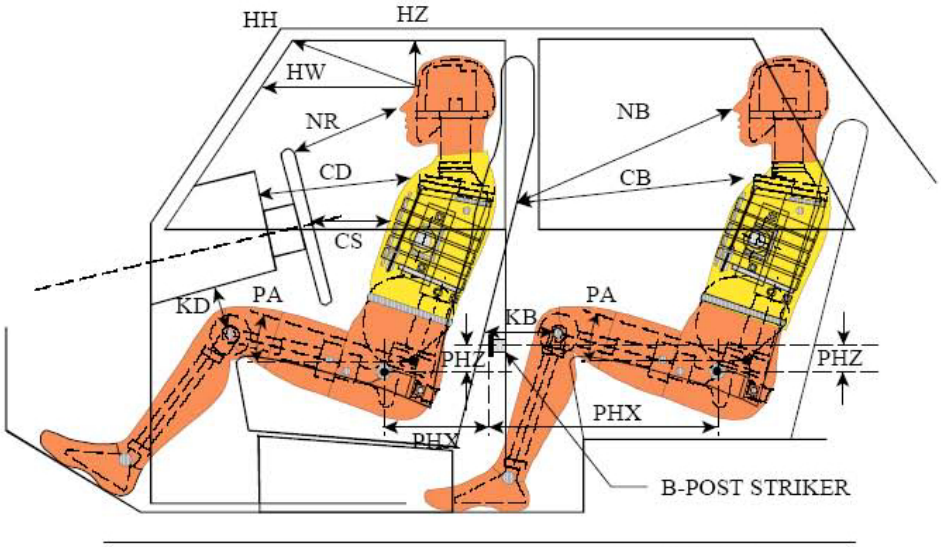
STEERING COLUMN POSITION

	Detent	Fore/Aft Position (mm)
Lowermost - Position 1	66.8	138
Geometric Center – Position 2	64.6	118
Uppermost – Position 3	62.4	98
Telescoping Steering Wheel Travel		40
Test Position	64.6	118

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



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

LEFT SIDE VIEW

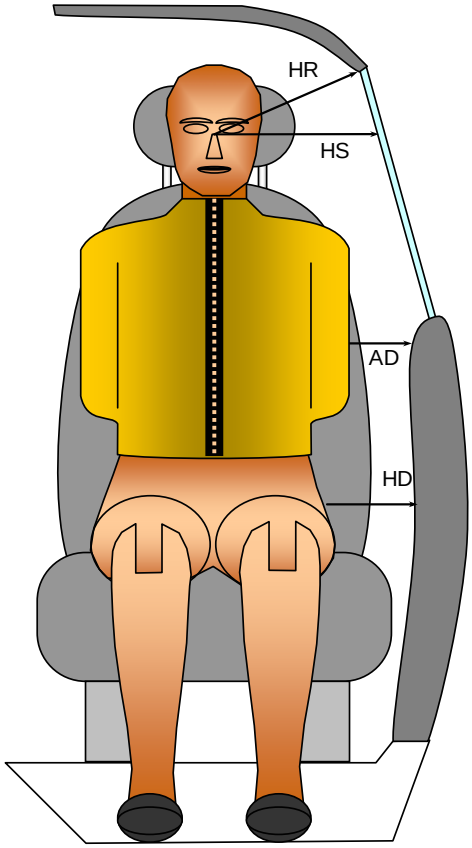
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 306	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	357	16.5		
HW		Head to Windshield	586	0		
HZ	HZ	Head to Roof	159	90	298	90
NR	NB	Nose to Rim/Seat Back	440	14.9	496	13.3
CD	CB	Chest to Dash/Seat Back	551	9.9	516	17.7
CS		Chest to Steering Wheel	349	13.4		
KDL	KBL	Left Knee to Dash/Seat Back	158	24.9	274	23.2
KDR	KBR	Right Knee to Dash/Seat Back	155	28.6	274	20.1
PA	PA	Pelvic Angle		25.0		17.5
PHX	PHX	H-Point to Striker (X-Axis)	210	0	319	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	198	90	241	90
SA	SA	Seat Back Angle		-0.7		4.8

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



FRONT VIEW OF DUMMY

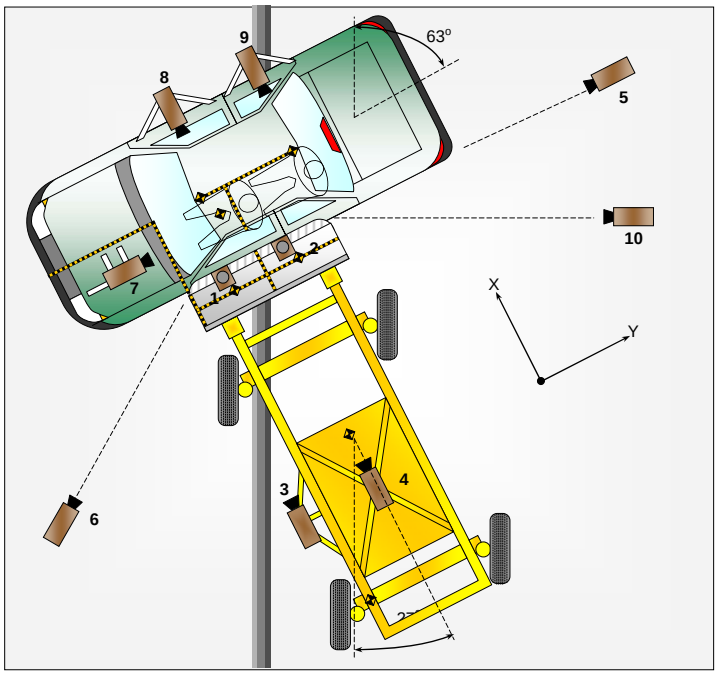
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 306
HR	Head to Side Header	mm	189	270
HS	Head to Side Window	mm	328	383
AD	Arm to Door	mm	105	191
HD	H-Point to Door	mm	160	172

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



CAMERA LOCATIONS AND DATA

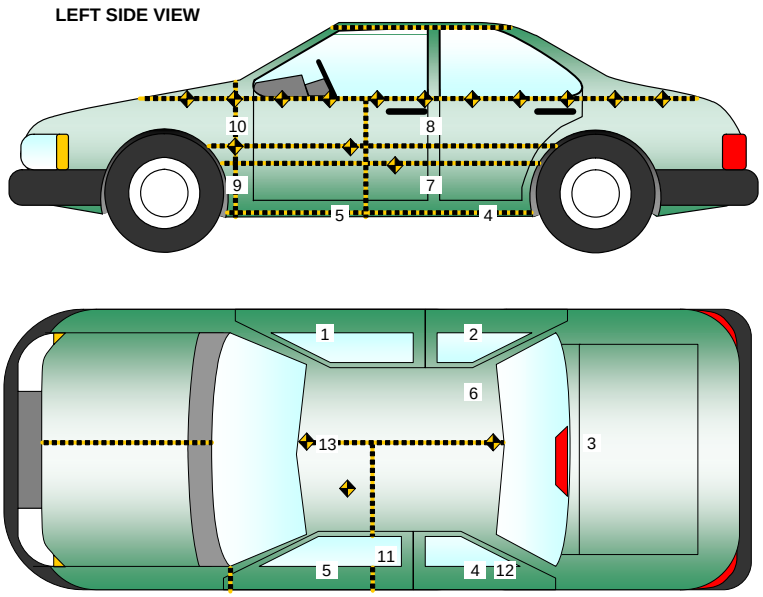
No.	Camera View	Coordinates (mm)			Angle	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Overhead Overall	-740	0	-5050	85.8	14	1000
2	Overhead Close-up	660	1170	-5050	80.1	50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	-3420	5190	-1220	5.4	24	1000
6	Left Front	3380	-4210	-1180	5.9	24	1000
7	Driver Front (OB)					16	1000
8	Driver Side (OB)					8	1000
9	Passenger Side (OB)					8	1000
10	Real Time Left Rear						30
11	Real Time Inrun						30

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

* All measurements accurate to ± 6 mm

DATA SHEET NO. 6
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

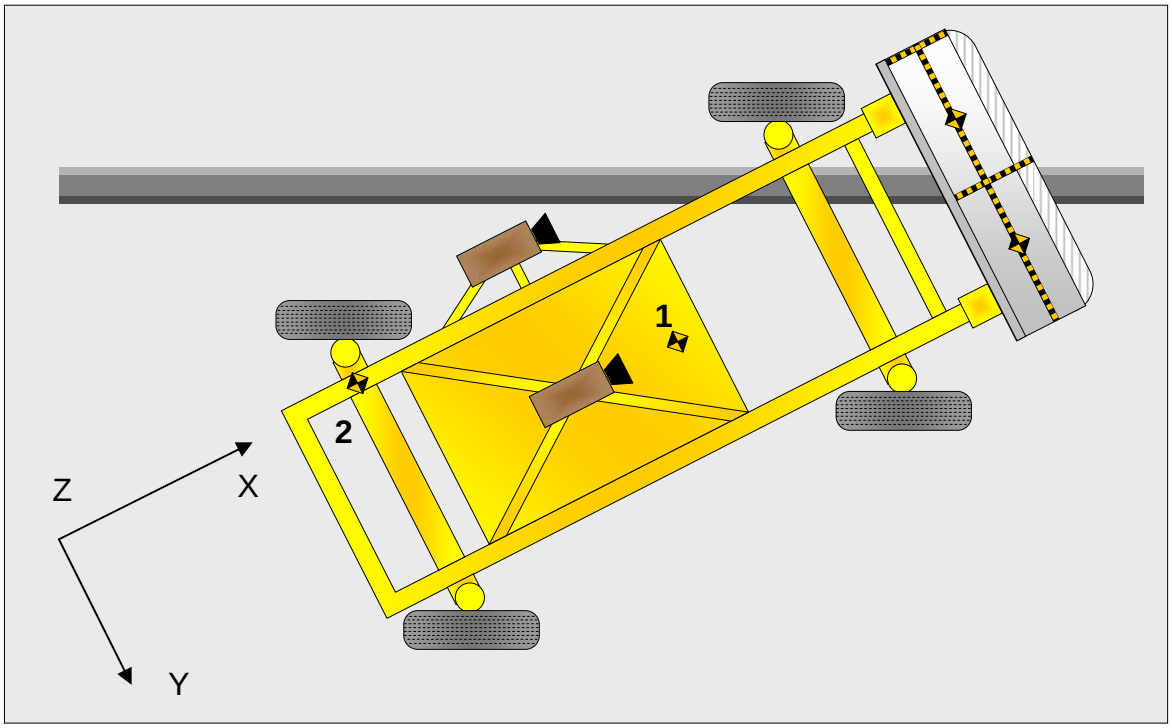
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2511	750	-280
2	Right Sill at Rear Seat	1755	750	-285
3	Rear Floorpan Above Axle	1030	0	-558
4	Left Sill at Rear Door	1780	-750	-288
5	Left Sill at Front Door	2690	-750	-285
6	Rt. Rear Occ. Compartment	1897	360	-440
7	Left Lower B-Post	2070	-740	-695
8	Left Middle B-Post	2070	-740	-940
9	Left Lower A-Post	3090	-722	-613
10	Left Middle A-Post	3221	-820	-905
11	Front Seat Track	2175	-570	-494
12	Rear Seat Track or Structure	1735	-525	-548
13	Vehicle CG	2540	0	-450

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

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



MDB ACCELEROMETER LOCATIONS

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

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

DATA SHEET NO. 8

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	52	343
2	Occupant H-Point	mm	228	716
3	Mid Door	mm	235	752
4	Window Sill	mm	94	1093
5	Window Top	mm	3	1621
	Maximum Penetration	mm	235	

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	21
MDB Accelerometers	5
Total No. of Contact Switches – not installed	8
Monitoring Channels – not installed	4
Total	70

CAMERA COVERAGE

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

DATA SHEET NO. 9

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheelbase of Framework Carriage	2588
CG Location aft of Front Axle	1125

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	407.9	287.2	
Right	kg	368.1	309.6	
Ratio	%	56.5	43.5	
Totals	kg	776.0	596.8	1372.8

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.4
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.3
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.8

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	300	Right	212
B	Top of Bumper	533	800	Right	110
C	Mid-Level	686	800	Left	118
D	Top of Stack	813	800	Left	185

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

TEST DUMMY INFORMATION AND CONTACT

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

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

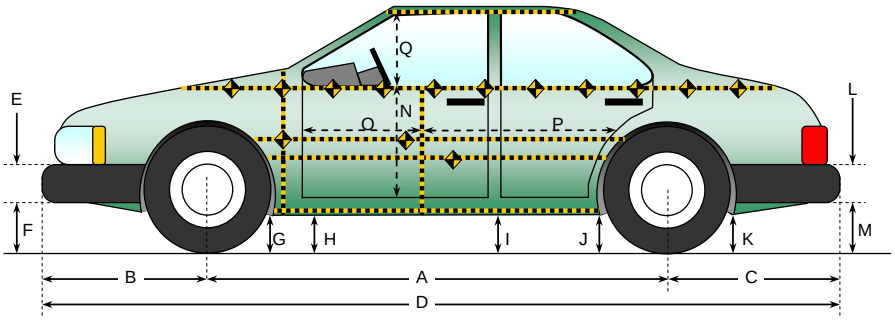
MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	19 rearward
Vertical Offset	mm	+/-20	3 up

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



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

LEFT SIDE VIEW

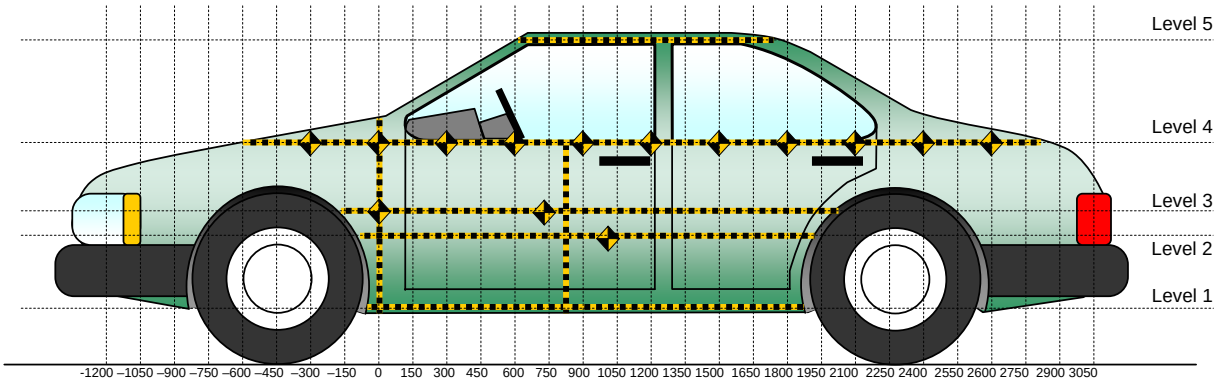
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2710	2705	5
B	Front Axle to FSOV	1033	1033	0
C	Rear Axle to RSOV	932	932	0
D	Total Length at Centerline	4675	4670	5
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	442	446	-4
G	Sill Height at Front Wheel Well	256	262	-6
H	Sill Height at Front Door Leading Edge	252	260	-8
I	Sill Height at B Pillar	253	294	-41
J1	Sill Height at Rear Wheel Well	248	274	-26
J2	Pinch Weld Height at Rear Wheel Well	251	269	-18
K	Sill Height Aft of Rear Wheel Well	282	295	-13
L	Rear Bumper Thickness	100	100	0
M	Rear Bumper Bottom to Ground	408	406	2
N	Sill Height to Window Bottom Sill	791	730	61
O	Front Door Leading Edge to Impact CL	749	742	7
P	Rear Door Trailing Edge to Impact CL	1190	1145	45
Q	Front Window Opening	474	485	-11
R	Right Side Length	3736	3738	-2
S	Left Side Length	3736	3714	22
T	Vehicle Width at B Post	1860	1655	205

DATA SHEET NO. 12

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 Kia Sorento LX SUV
Test Program: NCAP Side MDB Impact Test
NHTSA No. KC0501
Test Date: 8/09/2011



All Measurements Shown in mm

LEFT SIDE VIEW

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

Level	Measurement Description	Height Above Ground (mm)
1	Sill Top	343
2	Mid Door	716
3	Occupant H-Point	752
4	Window Sill	1093
5	Window Top	1621

DATA SHEET NO. 12 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-600				278					268					-10	
-450				265					255					-10	
-300				256					251					-5	
-150				248					256					8	
0		170	173	242			195	193	253			25	20	11	
150	212	180	181	260		262	343	338	243		50	163	157	-17	
300	212	180	180	258		264	368	354	245		52	188	174	-13	
450	212	179	179	248		263	370	369	267		51	191	190	19	
600	212	178	177	242		261	374	385	273		49	196	208	31	
750	214	178	177	236	470	258	378	382	278	462	44	200	205	42	-8
900	211	177	177	231	465	255	379	387	285	460	44	202	210	54	-5
1050	212	177	176	227	464	254	388	402	297	463	42	211	226	70	-1
1200	212	178	177	224	466	251	400	404	318	464	39	222	227	94	-2
1350	212	179	178	221	469	248	407	413	305	470	36	228	235	84	1
1500	211	180	179	221	470	245	406	413	293	468	34	226	234	72	-2
1650	212	182	180	220	471	243	402	408	300	471	31	220	228	80	0
1800	212	178	180	221	471	237	398	398	260	471	25	220	218	39	0
1950		167	170	222	473		328	320	241	471		161	150	19	-2
2100			166	225	477			255	227	477			89	2	0
2250				228	482				258	485				30	3
2400				233	490				255	490				22	0
2550				240	500				252	491				12	-9
2700				247	511				253	504				6	-7

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

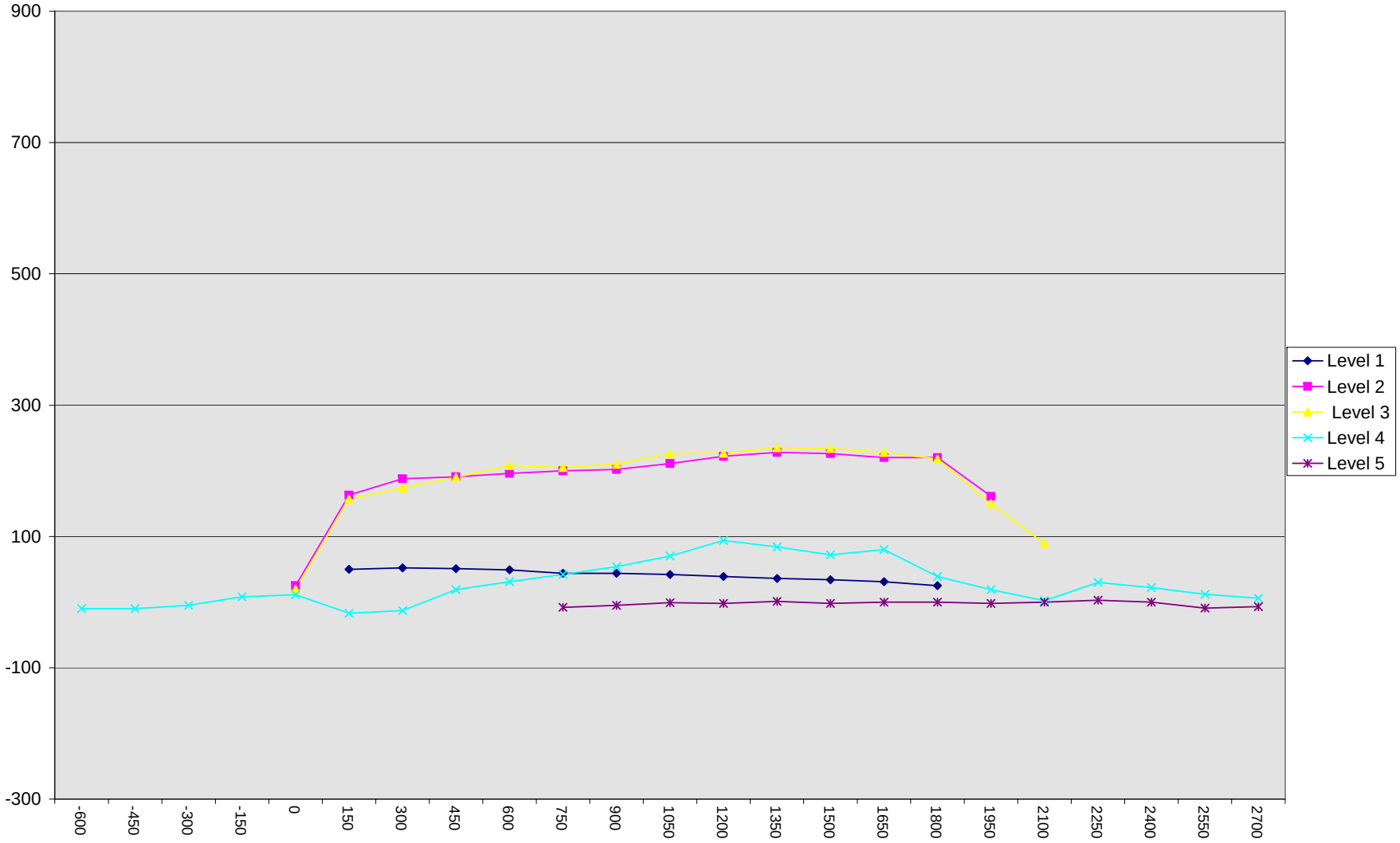
MAXIMUM CRUSH DATA

	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	52	228	235	94	3
Distance From Impact (mm)	300	1350	1350	1200	2250

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

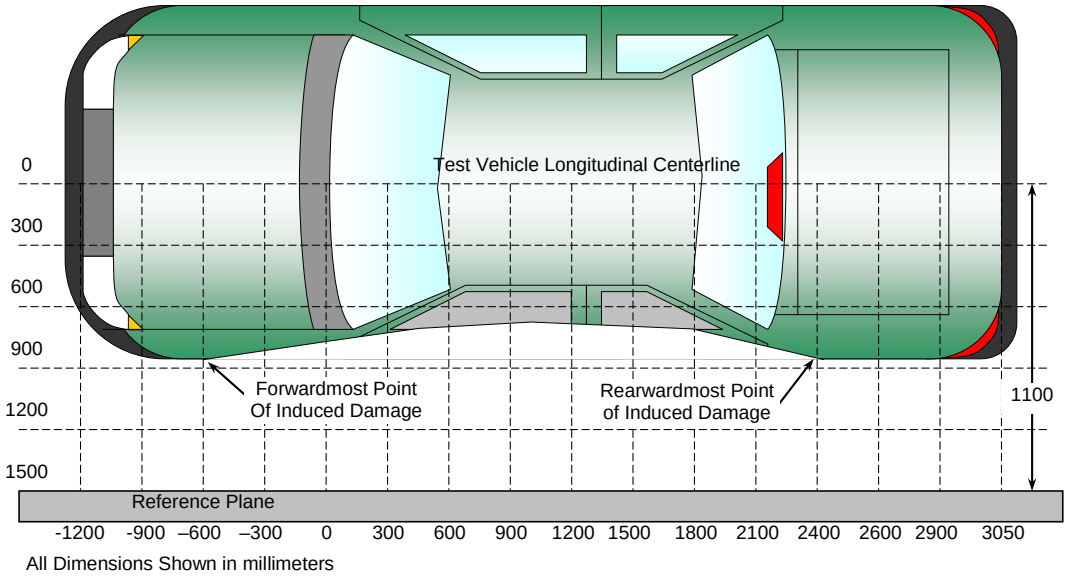
Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



DATA SHEET NO. 13

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



TOP VIEW

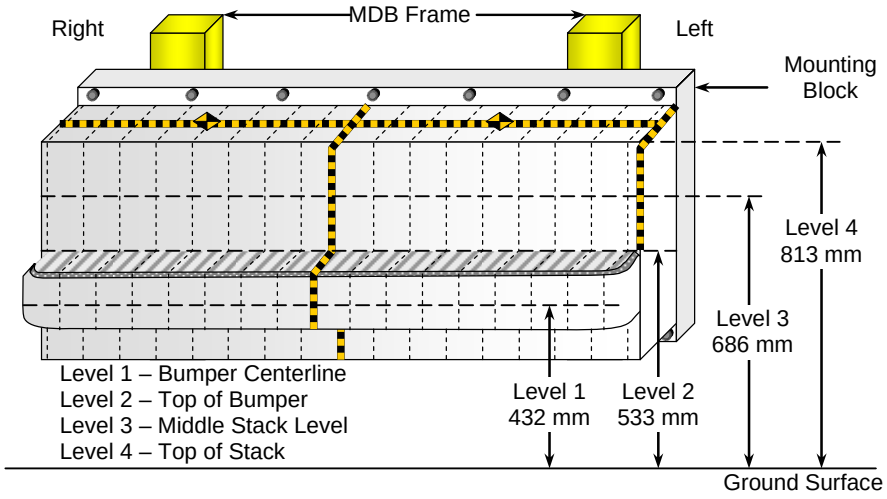
DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2700	4	247	247	0
2	2040	3	178	254	76
3	1380	3	177	421	244
4	720	1	214	415	201
5	60	4	251	258	7
6	-600	4	278	268	-10

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



FRONT VIEW

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C_L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
4	70	50	43	42	40	51	83	58	50	62	65	70	82	95	119	150	185
3	51	43	43	43	43	49	73	78	77	70	60	59	52	61	78	99	118
2	110	108	100	91	86	80	77	86	83	87	92	93	95	96	93	93	98
1	209	210	208	207	209	212	210	217	209	202	202	203	204	202	194	198	192

DATA SHEET NO. 15

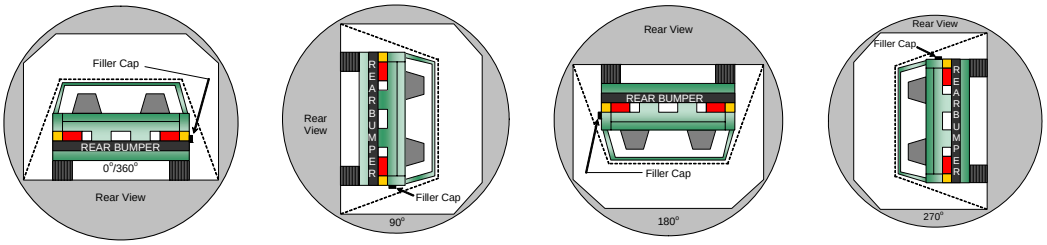
FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011

Test Time: 11:31 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



0°/360° 90° 180° 270°

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	114	300	414
90° to 180°	115	300	415
180° to 270°	109	300	409
270° to 360°	118	300	418

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

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

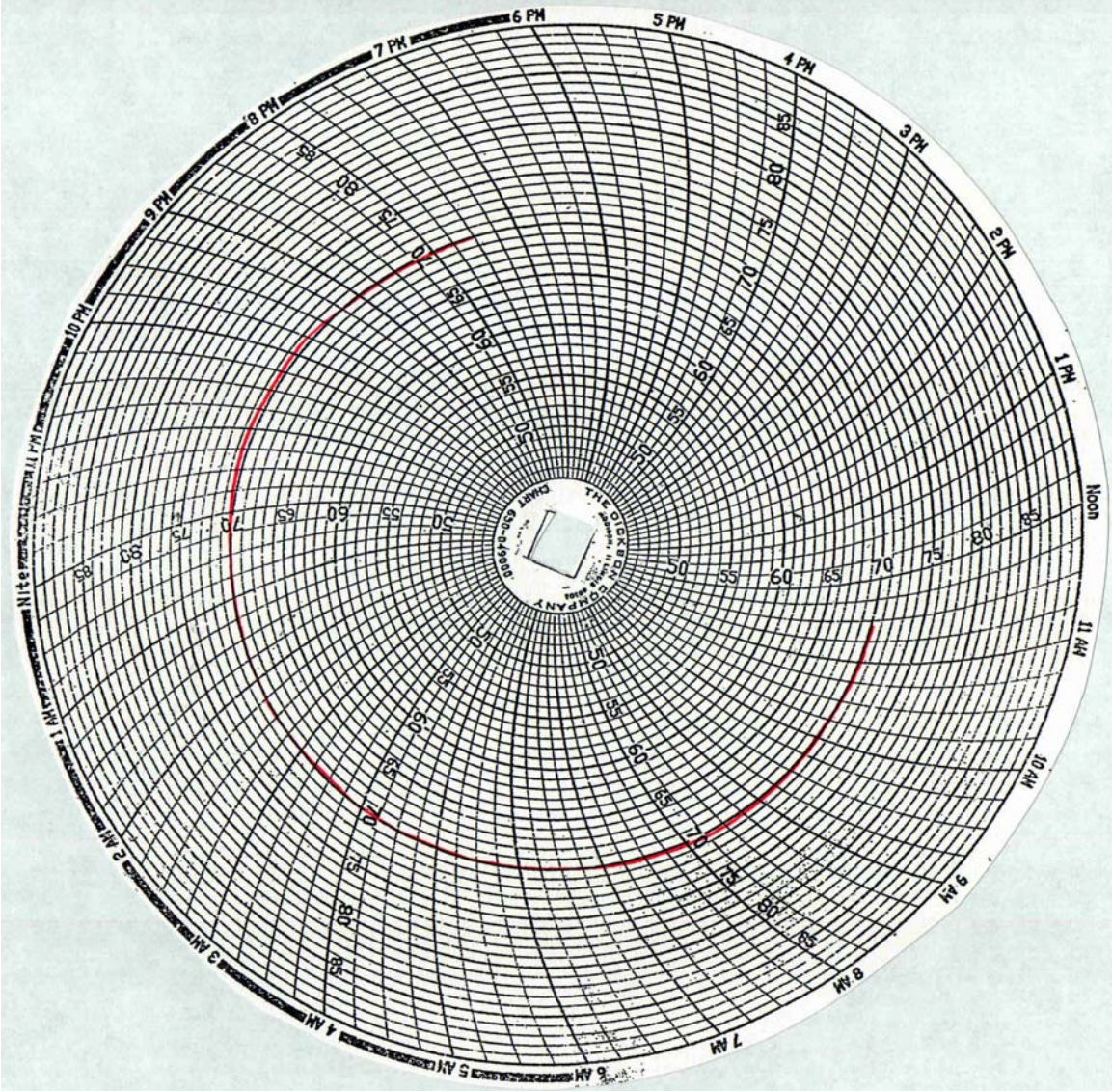
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 16

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2012 Kia Sorento LX SUV NHTSA No. KC0501
Test Program: NCAP Side MDB Impact Test Test Date: 8/09/2011



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

As Delivered Right Front Three-Quarter View of Test Vehicle

As Delivered Left Rear Three-Quarter View of Test Vehicle

Pre-Test Frontal View of Test Vehicle

Post-Test Frontal View of Test Vehicle

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

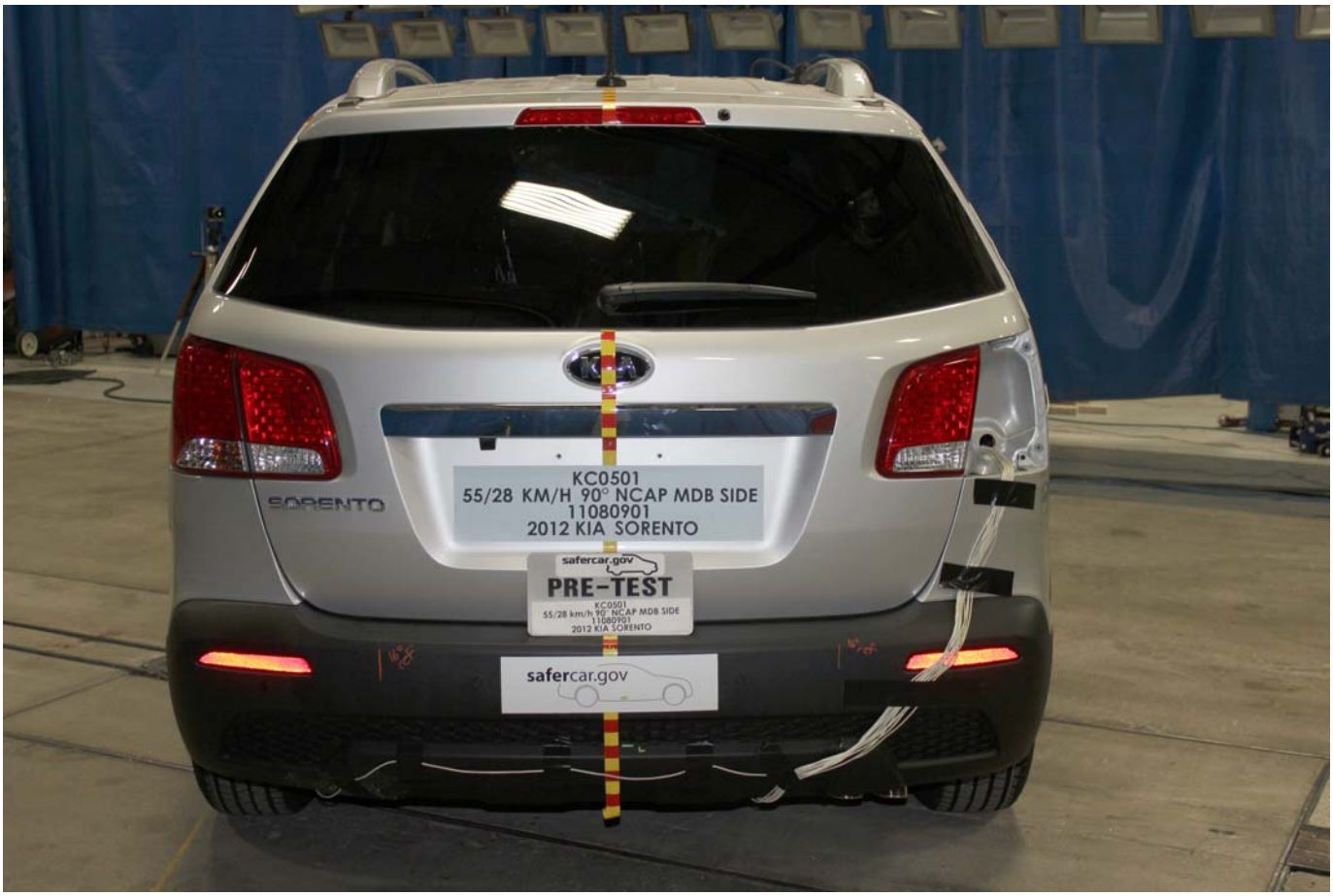
Post-Test Left Three-Quarter Front View of Test Vehicle

Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

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

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



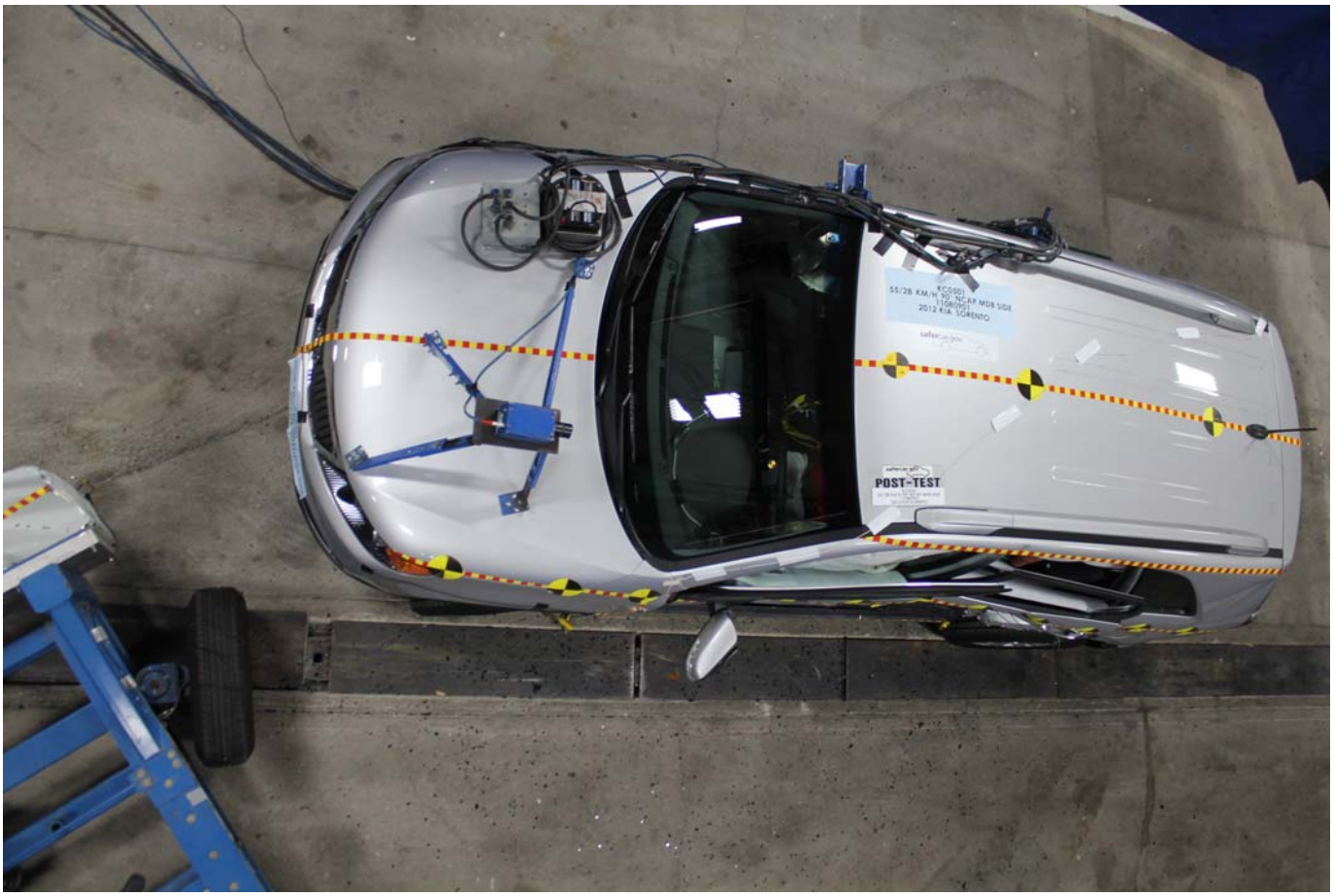
Pre-Test Rear View of Test Vehicle

Post-Test Rear View of Test Vehicle

Pre-Test Right Side View of Test Vehicle

Post-Test Right Side View of Test Vehicle

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



Post-Test Overhead View of Test Vehicle and MDB

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

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

Pre-Test Close-Up View of Impact Point Target

Post-Test Close-Up View of Impact Point Target

Pre-Test Left Front Door Latch Close-Up

Post-Test Left Front Door Latch Close-Up

Pre-Test Left Rear Door Latch Close-Up

Post-Test Left Rear Door Latch Close-Up

Pre-Test Front Close-Up View of Driver Dummy

Post-Test Front Close-Up View of Driver Dummy

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

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

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

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


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

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

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

Pre-Test Placement of Driver Dummy's Feet

Pre-Test View of Belt Anchorage for Driver Dummy

Pre-Test Left Side View of Steering Wheel

Pre-Test View of Parking Brake

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

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

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

Pre-Test Driver Dummy and Door Clearance View

Post-Test Driver Dummy and Door Clearance View

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

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

Pre-Test Driver Inner Door Panel View

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

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

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

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

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

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

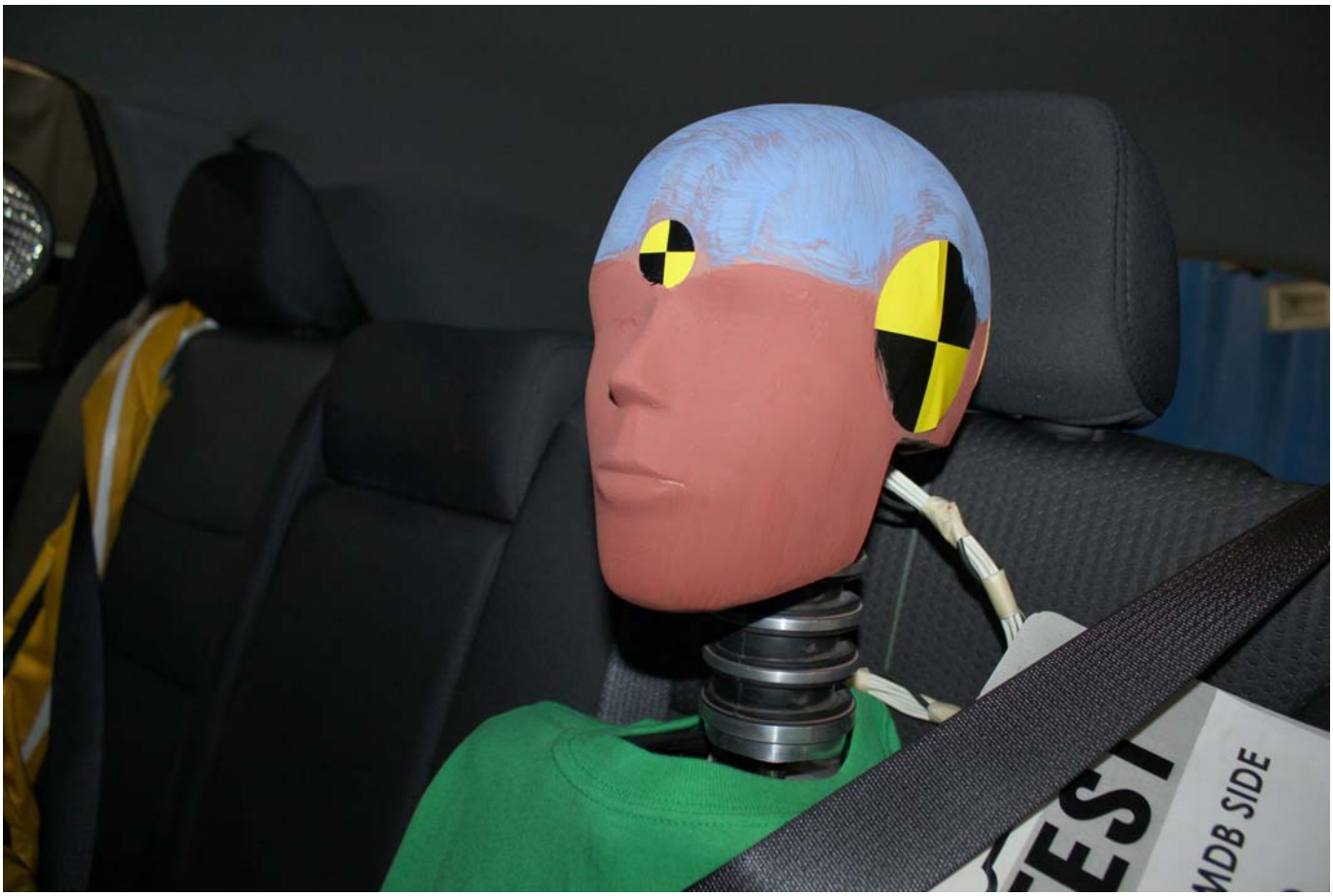
Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View

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

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

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

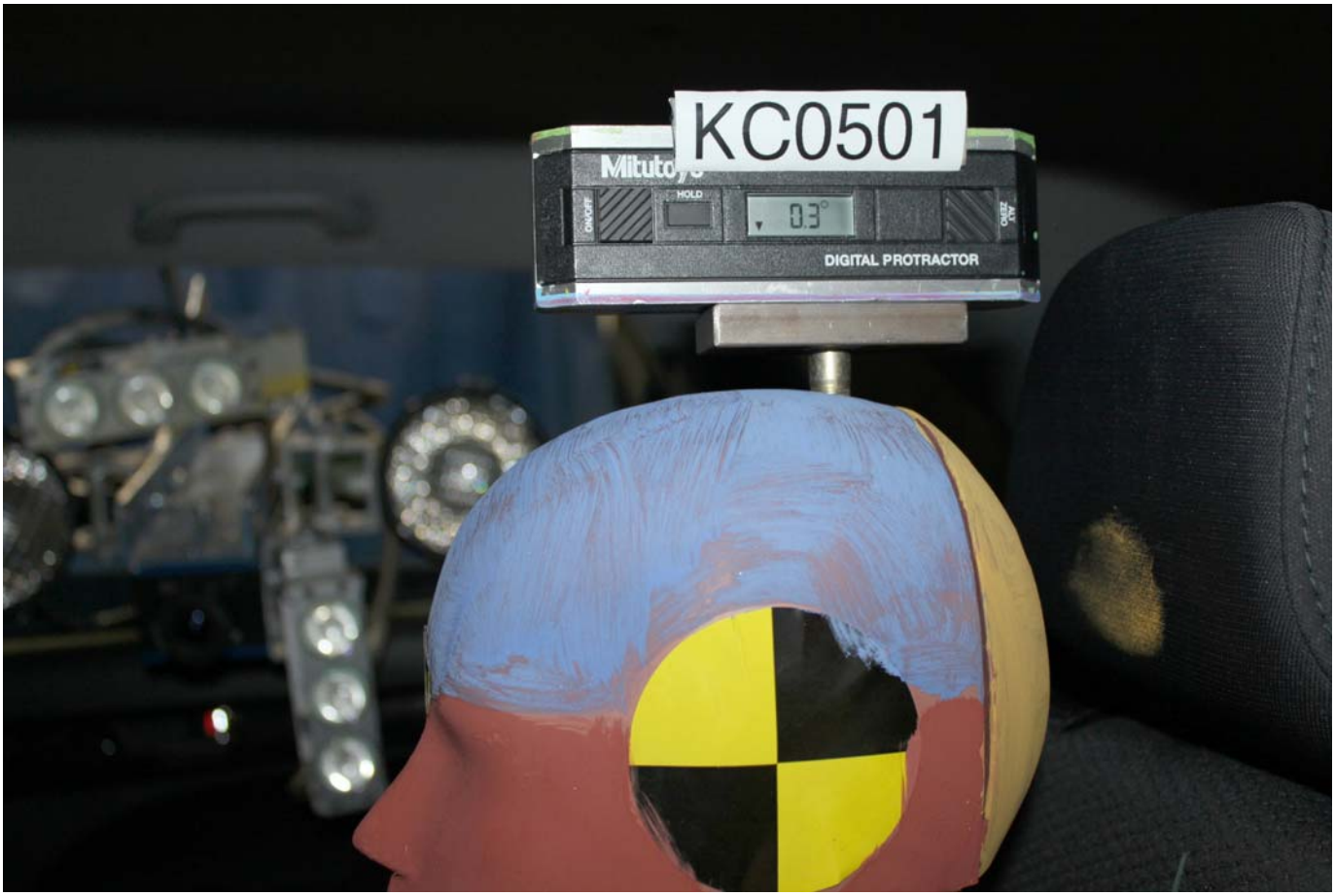
Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning


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

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

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

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



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

Pre-Test Placement of Rear Passenger Dummy's Feet

Pre-Test View of Belt Anchorage for Rear Passenger Dummy

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

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

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

Pre-Test Rear Passenger Dummy and Door Clearance View

Post-Test Rear Passenger Dummy and Door Clearance View

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

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

Pre-Test Passenger Inner Door Panel View

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

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

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

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

PHOTOGRAPH NOT APPLICABLE

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

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

PHOTOGRAPH NOT APPLICABLE

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

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

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

Pre-Test Front View of MDB Impactor Face

Post-Test Front View of MDB Impactor Face

Pre-Test Top View of MDB Impactor Face

Post-Test Top View of MDB Impactor Face

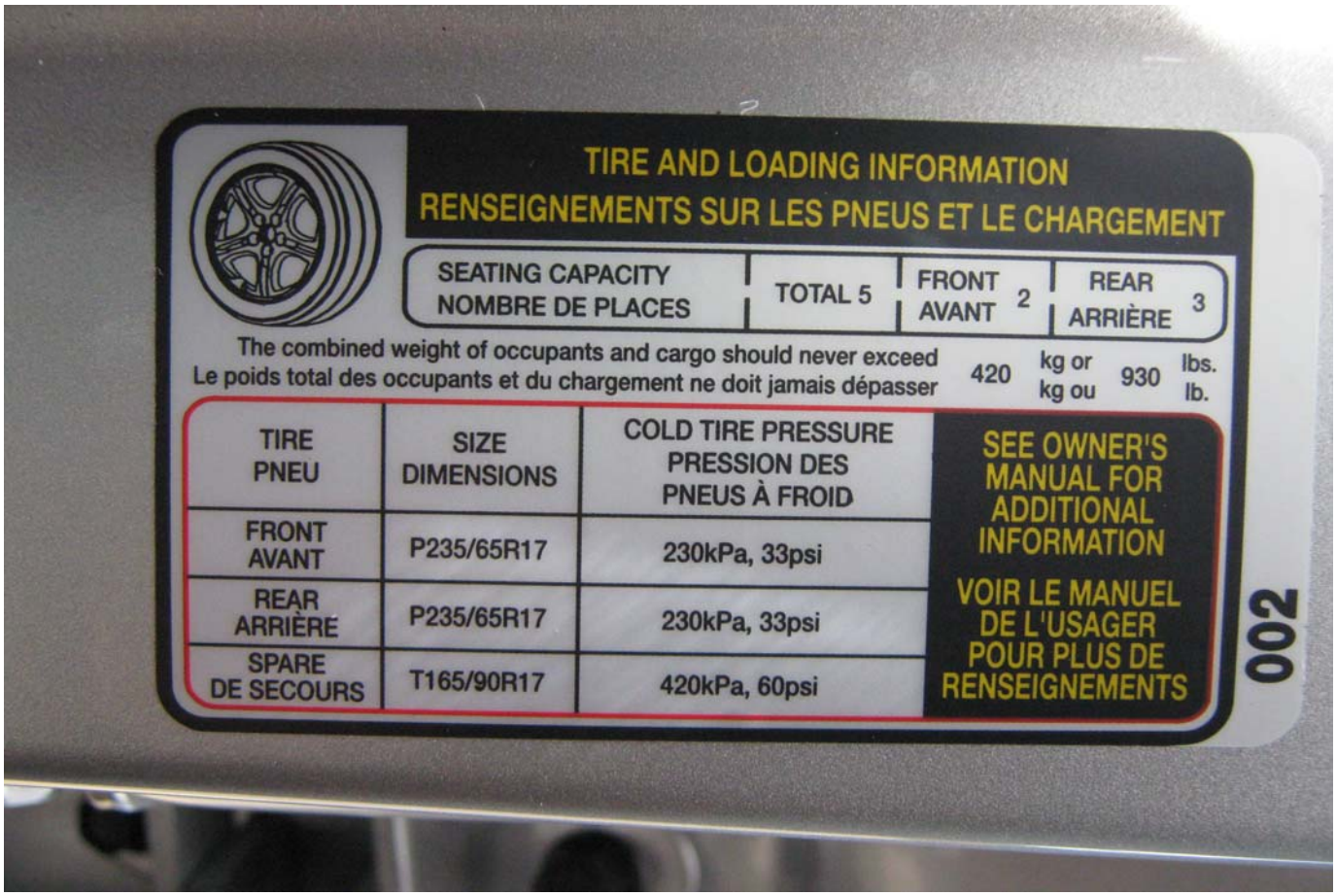
Pre-Test Left Side View of MDB Impactor Face

Post-Test Left Side View of MDB Impactor Face

Pre-Test Right Side View of MDB Impactor Face

Post-Test Right Side View of MDB Impactor Face

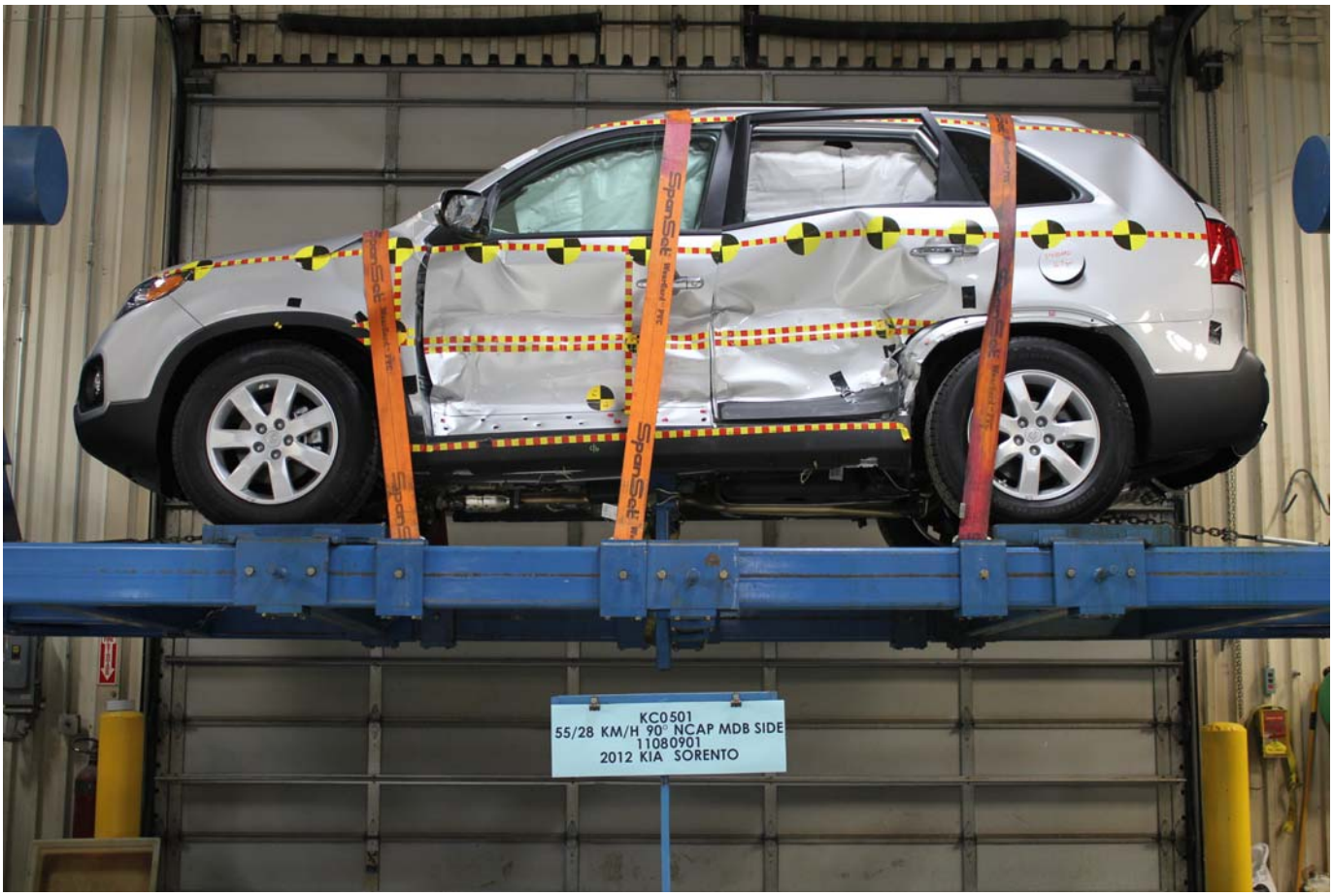
Close-Up View of Vehicle's Certification Label



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

Pre-Test Ballast View

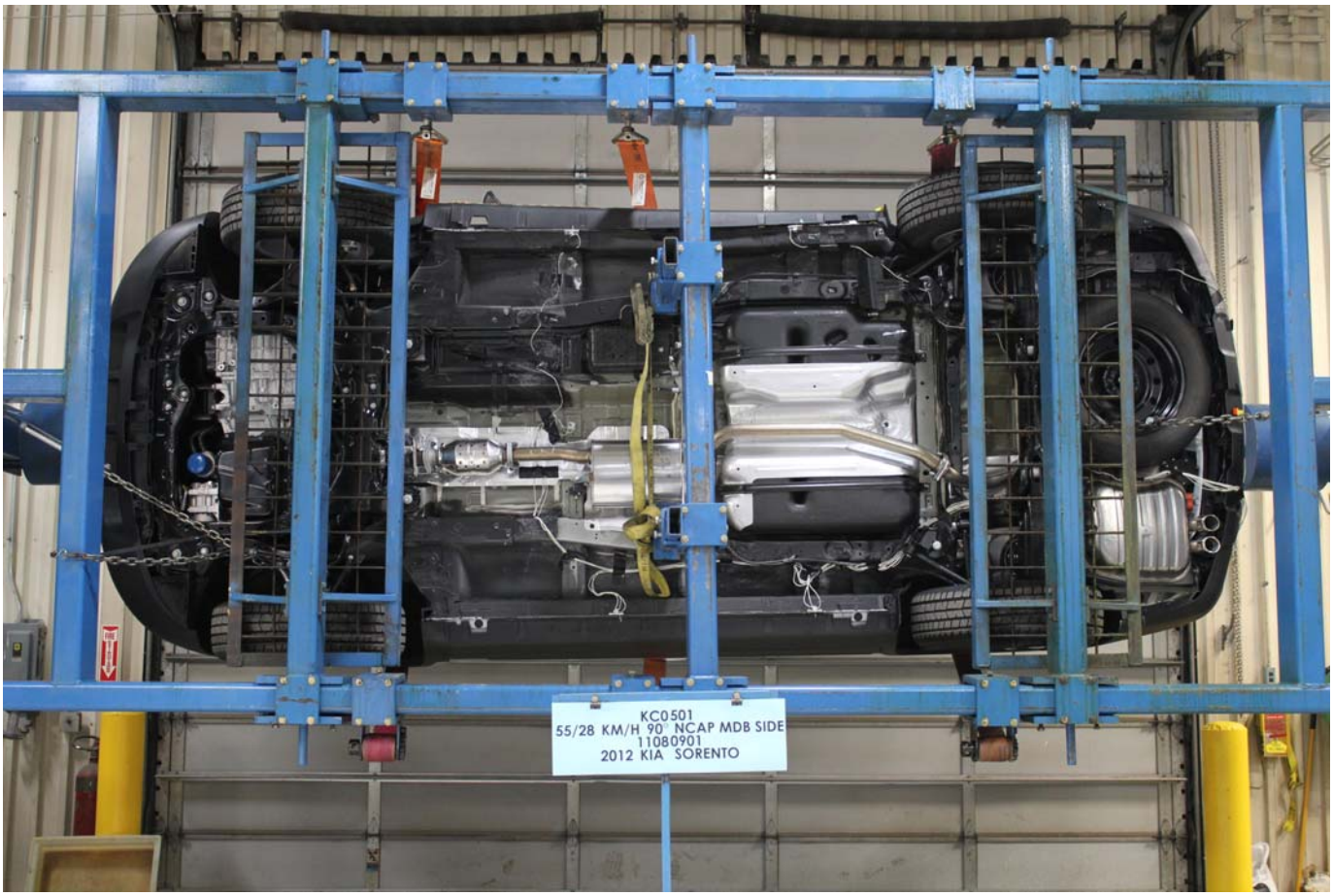
Post-Test Primary and Redundant Speed Trap Read-Out



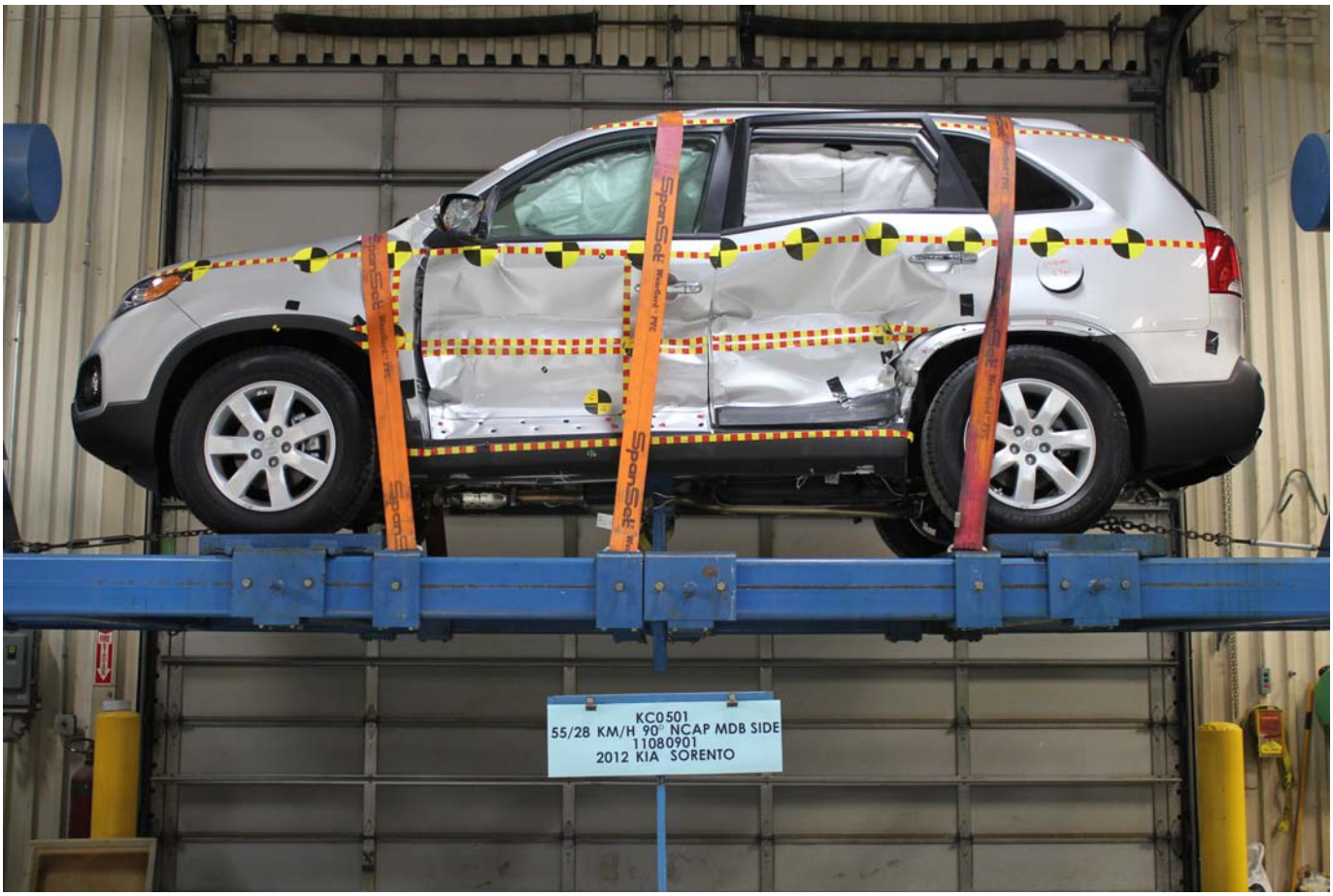
FMVSS No. 301/305 Rollover 0 Degrees

FMVSS No. 301/305 Rollover 90 Degrees

FMVSS No. 301/305 Rollover 180 Degrees



FMVSS No. 301/305 Rollover 270 Degrees



FMVSS No. 301/305 Rollover 360 Degrees

Impact Event

Monroney Label

A-52

2012	73222	KIA SORENTO LX FWD
MODEL YEAR	MODEL	MODEL DESCRIPTION

BRIGHT SILVER/BLACK
EXTERIOR / INTERIOR COLOR

5XYKT3A6XCG205862	G4KJBK29
VEHICLE NUMBER	ENGINE NUMBER

WEST POINT	TRUCK
PORT OF ENTRY	MODE OF TRANSPORTATION

SOLD TO:
WI008
PALMEN KIA OF KENOSHA
5301 75TH STREET
5431 75TH STREET
KENOSHA WI 53142

SHIP TO:
WI008

STANDARD FEATURES

MECHANICAL
2.4L 16-Valve DOHC CVVT 4-Cylinder Engine
6-Speed Automatic Transmission w/ Sportmatic
Independent Front and Rear Suspension
Alloy Wheels

SAFETY
Dual Front Advanced Airbags
Front Seat-Mounted Side Airbags
Side Curtain Airbags (1st & 2nd Row)
Front Active Headrests
Lower Anchors and Tethers for Children (LATCH)
Anti-Lock Brake System (ABS)
Traction Control System (TCS)
Electronic Stability Control (ESC)
Downhill Brake/Hill-start Assist Control (DBC/HAC)
Tire Pressure Monitoring System (TPMS)

INTERIOR
Air Conditioning
Power Windows, Door Locks & Outside Mirrors
AM/FM/CD/MP3 Audio System
SIRIUS Satellite Radio w/ free 3-mo. subscription**
USB/Auxiliary Input Jacks
BLUETOOTH® WIRELESS TECHNOLOGY
60/40 Split Folding and Reclining Rear Seats
YES Essentials Seat Fabric Material
Rear Center Armrest with Cupholders
Remote Keyless Entry
Cruise Control
Steering Wheel Controls (Bluetooth/Audio/Cruise)
Tilt and Telescopic Steering Column
Dual Illuminated Visor Vanity Mirrors
ECOMINDER ™ Indicator

EXTERIOR
Privacy Glass
Heated Outside Mirrors w/ Turn Signal Indicators

WARRANTY
10 Year/100,000 Mile Limited Powertrain Warranty
5 Year/60,000 Mile Limited Basic Warranty
5 Year/60,000 Mile Roadside Assistance
**Ask dealer for details

MANUFACTURER'S SUGGESTED RETAIL PRICE ➤	$23,150.00
ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features)	
Convenience Package	$1,650.00
* Gas Direct Injection Fuel System Upgrade	
* Back-Up Warning System	
* Auto-dimming Mirror w/Display Camera	
* Heated Front Seats	
* Front Fog Lights	
* Roof Rails	
Cross Bars (Black)	$195.00
Carpeted Floor Mats	$115.00
Cargo Cover	$125.00
MSRP INCLUDING OPTIONS	$25,235.00
INLAND FREIGHT AND HANDLING	$800.00
TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ➤	$26,035.00

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer installed options and accessories are not included in the manufacturer's suggested retail price.

TOTAL ADDITIONAL WEIGHT: 19.1

EPA Fuel Economy Estimates

These estimates reflect new EPA methods beginning with 2008 models.

CITY MPG
22
Expected range for most drivers
18 to **26** MPG

Estimated Annual Fuel Cost
$1800.00
based on 15,000 miles at $3.00 per gallon

Combined Fuel Economy
This Vehicle
25
10 — 32
ALL SUVS

HIGHWAY MPG
32
Expected range for most drivers
26 to **38** MPG

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

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

GOVERNMENT SAFETY RATINGS

This vehicle has not been rated by the government for frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA).

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

Environmental Performance

Protect the environment, choose vehicles with **higher scores:**

Global Warming Score	Smog Score
7	5
1 Average new vehicle 10 Cleanest	1 Average new vehicle 10 Cleanest

Using alternative fuels may improve scores. See www.DriveClean.ca.gov

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

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 60%

MAJOR SOURCES OF FOREIGN PARTS:

KOREA: 40%

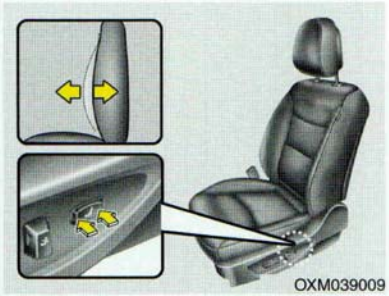
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE FINAL ASSEMBLY POINT:
USA

COUNTRY OF ORIGIN
ENGINE : **USA**
TRANSMISSION : **USA**

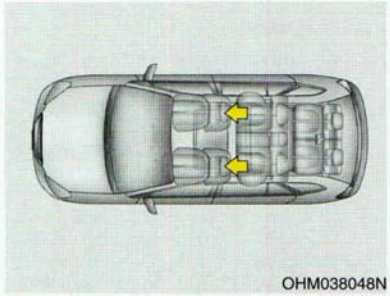
Seat height (for driver's seat)

Pull the front portion of the control switch up to raise or press down to lower the front part of the seat cushion. Pull the rear portion of the control switch up to raise or press down to lower the rear part of the seat cushion. Release the switch once the seat reaches the desired position.



Lumbar support (for driver's seat)

The lumbar support can be adjusted by pressing the button.



C010104AHM

Headrest

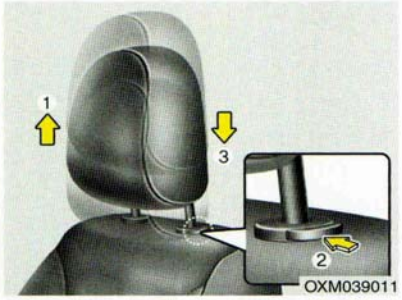
The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort.

The headrest not only provides comfort for the driver and front passenger, but also helps protect the head and neck in the event of a rear collision.

Driver Head Restraint Use and Adjustment Information from Vehicle Manual

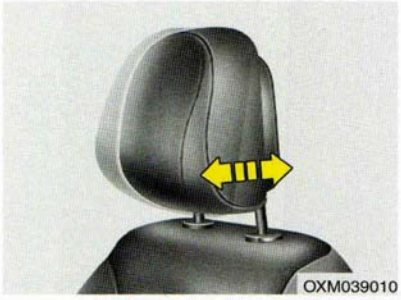
⚠ WARNING

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



Adjusting the height up and down

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



Adjusting the angle (if equipped)

The headrest angle may be adjusted by pulling or pushing the lower part of the headrest.

Adjust the headrest so that it properly supports the head and neck.

⚠ CAUTION

Excessive pulling or pushing may damage the headrest.

Driver Head Restraint Use and Adjustment Information from Vehicle Manual

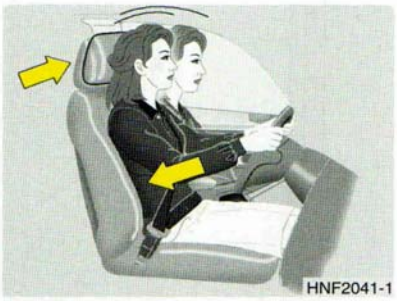
Removal (except active headrest)

To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest up (2).

To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height.

⚠ WARNING

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



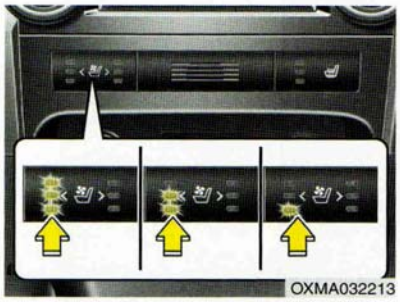
Active headrest (if equipped)

The active headrest is designed to move forward and upward during a rear impact. This helps prevent the driver's and front passenger's heads from moving backward and thus helps minimize neck injuries.

For your safety, the active headrest can't be removed. If there is any problem with the active headrest, take your vehicle to an authorized KIA dealer and have the system checked.

⚠ WARNING

A gap between the seat and the headrest release button may appear when sitting on the seat or when you push or pull the seat. Be careful not to get your finger, etc. caught in the gap.



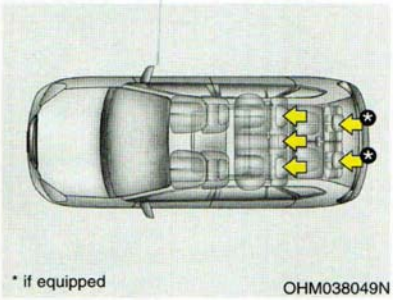
Seat heater (if equipped)

The seat heater is provided to warm the front seats during cold weather. With the ignition switch in the ON position, push either of the switches to warm the driver's seat or the front passenger's seat.

Driver Head Restraint Use and Adjustment Information from Vehicle Manual

⚠ WARNING - Cargo
Cargo should always be secured to prevent it from being thrown about the vehicle in a collision and causing injury to the vehicle occupants. Do not place objects on the rear (2nd and/or 3rd row) seats, since they cannot be properly secured and may hit the front seat occupants in a collision.

⚠ WARNING - Cargo loading
Make sure the engine is off, the automatic transaxle is in P (Park) or the manual transaxle is in reverse or 1st, and the parking brake is securely applied whenever loading or unloading cargo. Failure to take these steps may allow the vehicle to move if the shift lever is inadvertently moved to another position.



C010303AHM

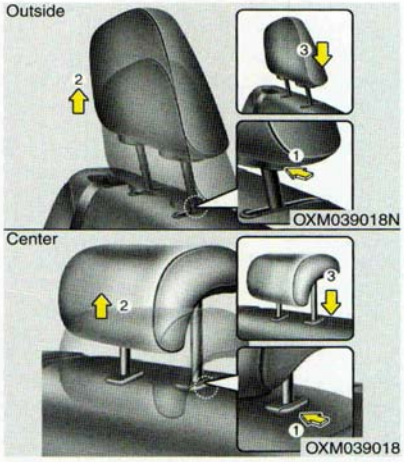
Headrest

The rear seat(s) is equipped with headrests in all the seating positions for the occupant's safety and comfort.

The headrest not only provides comfort for passengers, but also helps protect the head and neck in the event of a collision.

⚠ WARNING
- **For maximum effectiveness in case of an accident, the 2nd row headrest should be adjusted so the middle of the headrest is at the same height of the center of gravity of an occupant's head. Generally, the center of gravity of most people's head is level to the height of the top of their eyes.**
- **Also adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.**
- **Do not operate the vehicle with the headrests removed. Severe injury to an occupant may occur in the event of an accident. Headrests may provide protection against severe neck injuries when properly adjusted.**
- **After adjusting or reinstalling the headrest, always make sure the headrest locks in the upright position to properly protect the occupants.**

Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Manual



2nd row headrest

Adjusting the height up and down

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

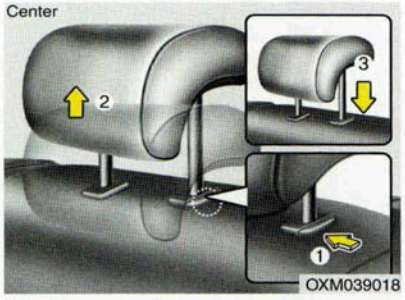
Removal

Outer

To remove the headrest :

1. Raise it as far as it can go.
2. Insert the small thin bar into the release hole (A).
3. While pressing the release hole (A), press the button (B), then pull the headrest up.

To reinstall the headrest, insert the headrest holes (3) into the poles and press the headrest down. Then adjust it to the appropriate height and make sure the headrest is locked in place.



Center

To remove the headrest, raise it as far as it can go then press the release button while pulling the headrest up (2).

To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height.

Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Manual

APPENDIX B

DUMMY RESPONSE DATA

TABLE OF DATA PLOTS
Driver & Passenger Dummy Instrumentation Plots
FILTERED DATA

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

Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Passenger Upper Thorax Rib Deflection (Y)

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Driver Shoulder Contact Switch – not installed

Driver Torso Contact Switch – not installed

Driver Pelvis Contact Switch – not installed

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Passenger Shoulder Contact Switch – not installed

Passenger Torso Contact Switch – not installed

Passenger Pelvis Contact Switch – not installed

Vehicle Instrumentation Data

Driver Side Airbag Timing – not installed

Driver Side Curtain Airbag Timing – not installed

Passenger Side Airbag Timing – not installed

Passenger Side Curtain Airbag Timing – not installed

Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)

Right Side Sill at Front Seat Acceleration (Z)

Right Side Sill at Rear Seat Acceleration (X)

Right Side Sill at Rear Seat Acceleration (Y)

Right Side Sill at Rear Seat Acceleration (Z)

Rear Floorpan Above Axle Acceleration (X)

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

Left Side Sill at Front Seat Acceleration (Y)

Left Side Sill at Rear Seat Acceleration (Y)

Right Rear Occupant Compartment Acceleration (Y)

Lower A-Post Acceleration (Y)

Middle A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Middle B-Post Acceleration (Y)

Front Seat Track Acceleration (Y)

Rear Seat Track Acceleration (Y)

Vehicle Center of Gravity Acceleration (X)

Vehicle Center of Gravity Acceleration (Y)

Vehicle Center of Gravity Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

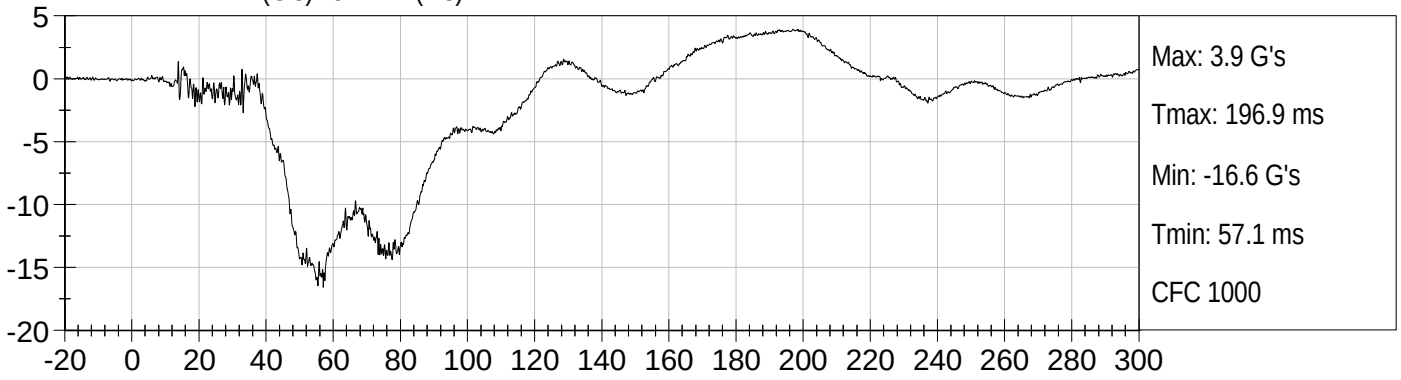
Left MDB Contact Switch

Right MDB Contact Switch

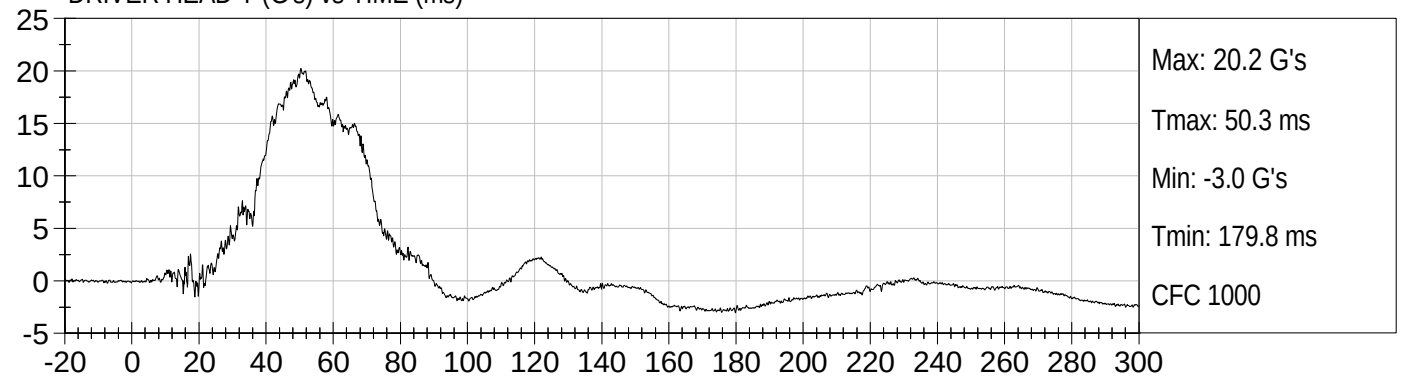
55/28 km/h 90° NCAP MDB Side Impact
2012 Kia Sorento - KC0501

Test Date: 08/09/2011
Speed: 38.8 mph (62.4 km/h)

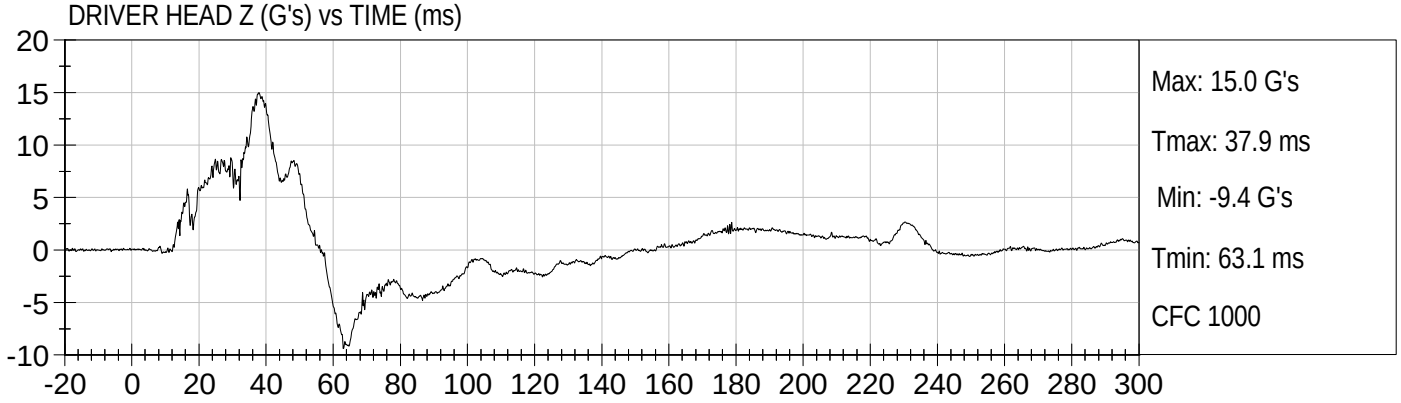
DRIVER HEAD X (G's) vs TIME (ms)



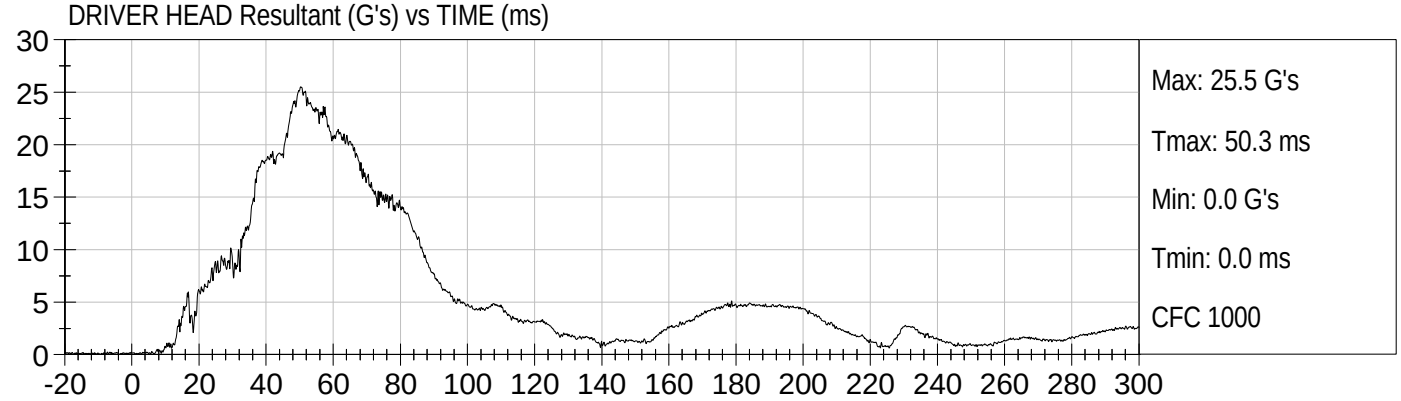
DRIVER HEAD Y (G's) vs TIME (ms)



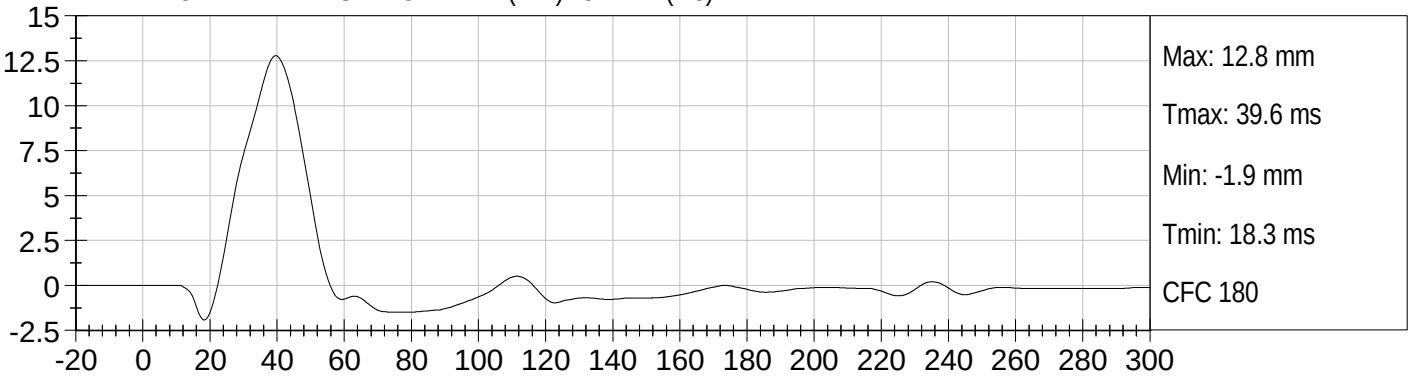
DRIVER HEAD Z (G's) vs TIME (ms)



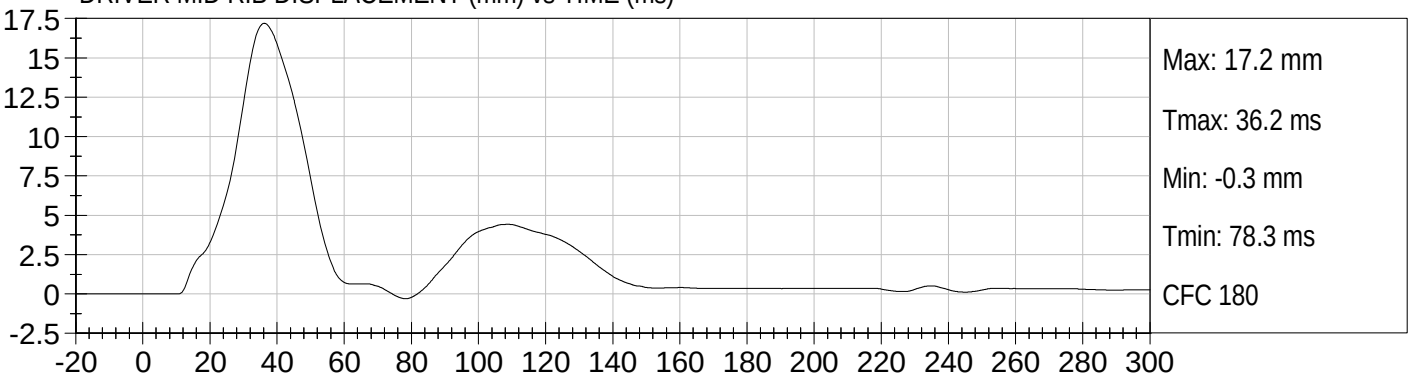
DRIVER HEAD Resultant (G's) vs TIME (ms)



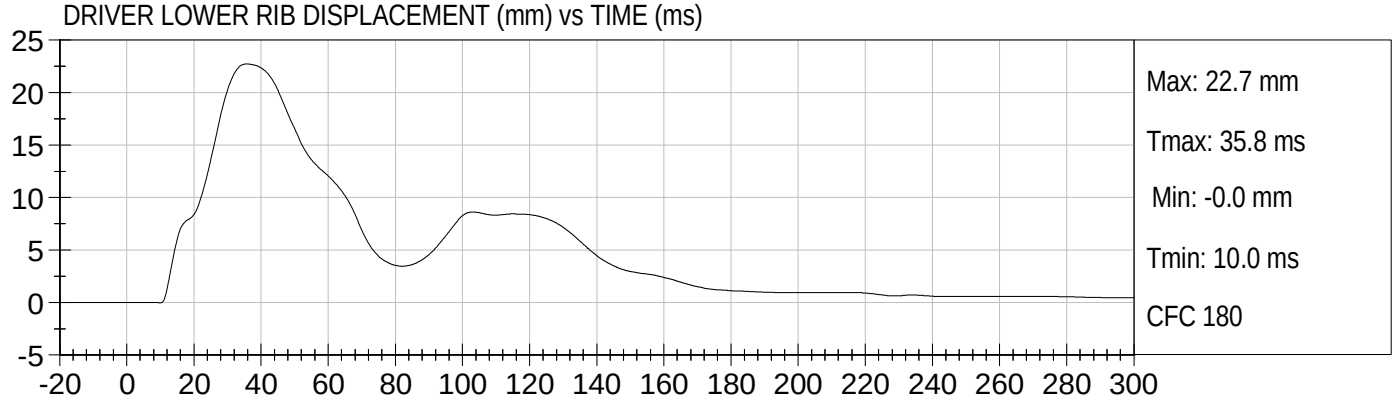
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



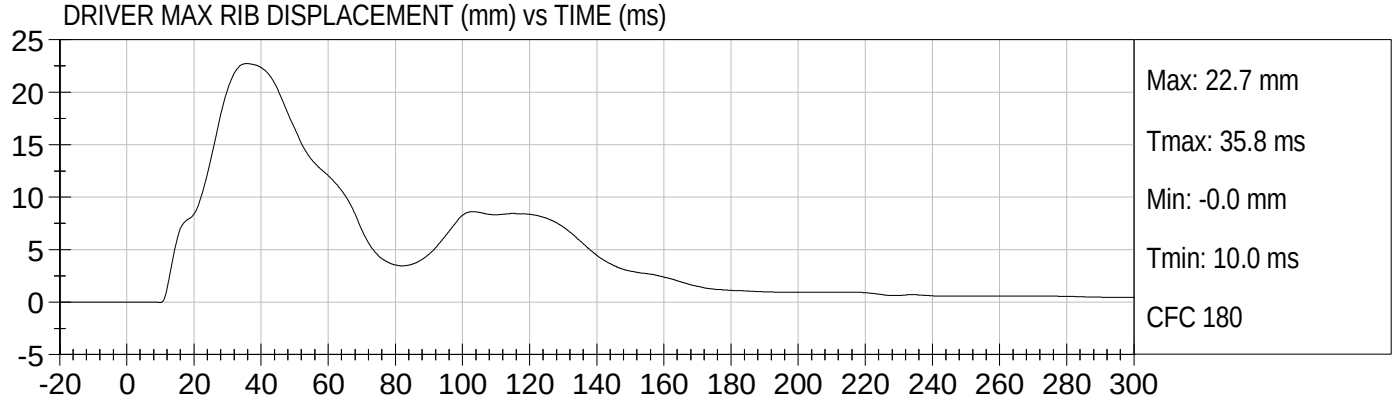
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



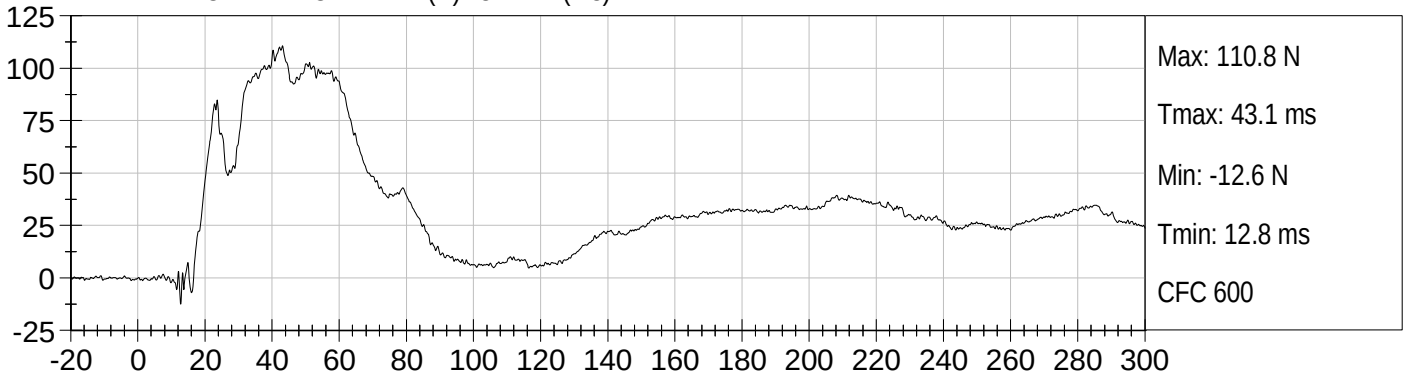
DRIVER LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



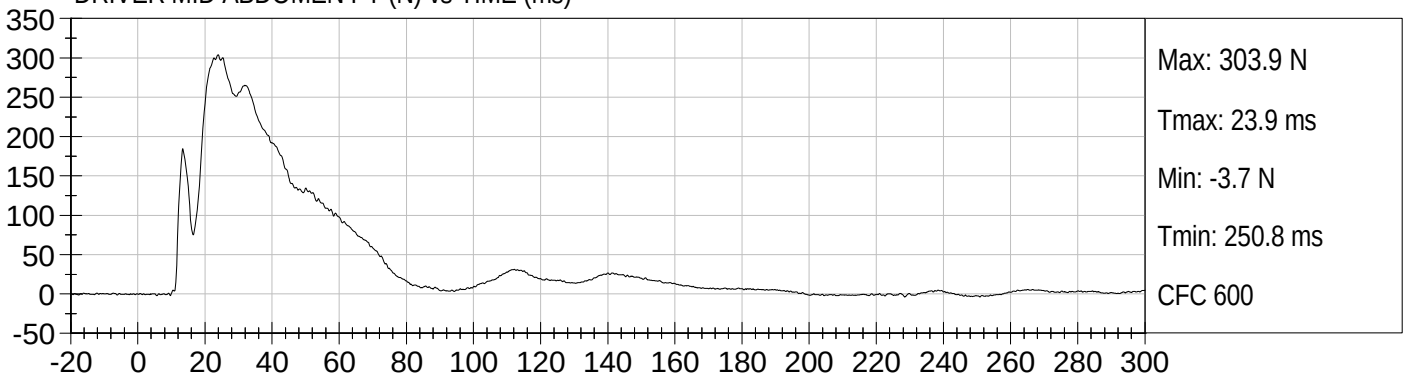
DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)



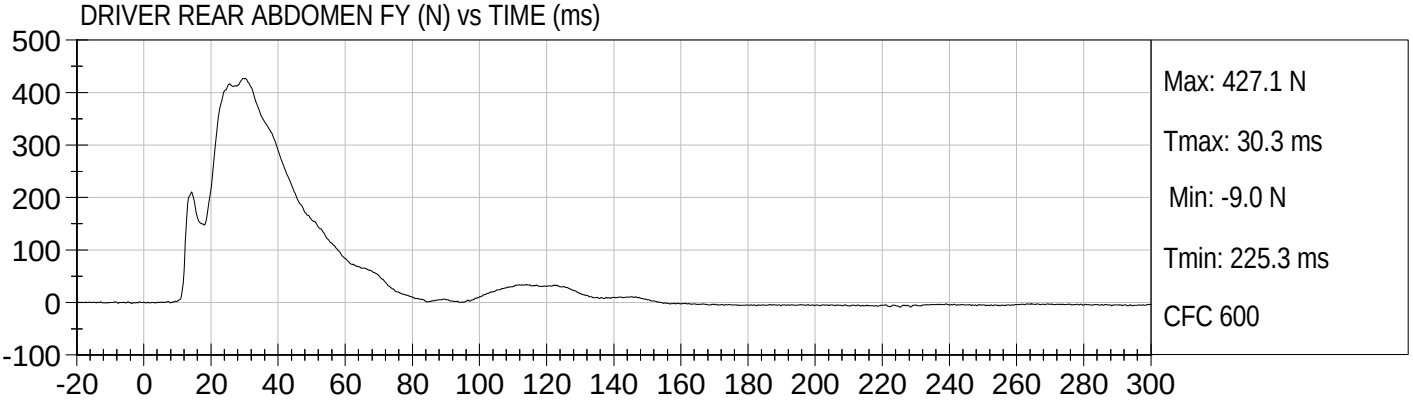
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



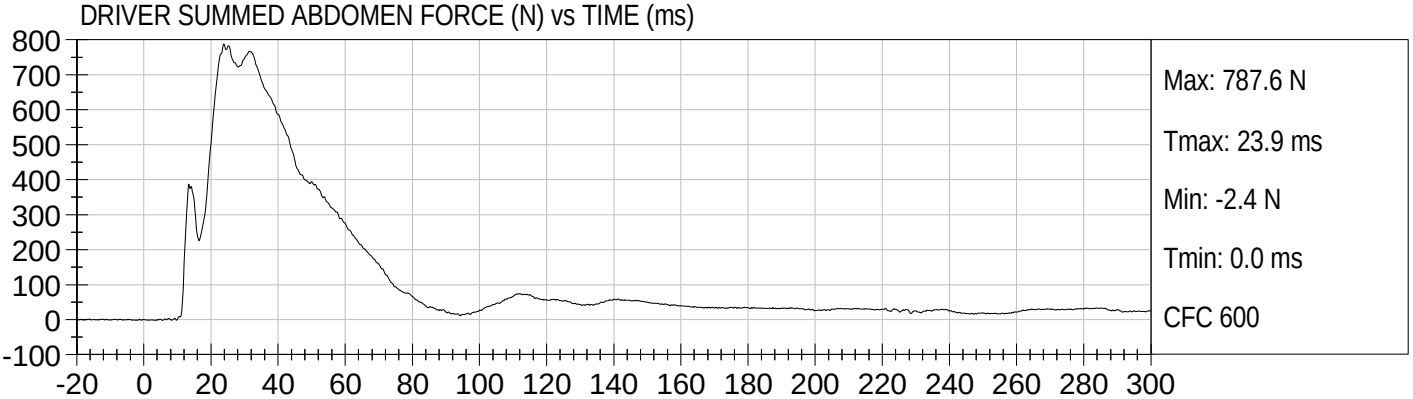
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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

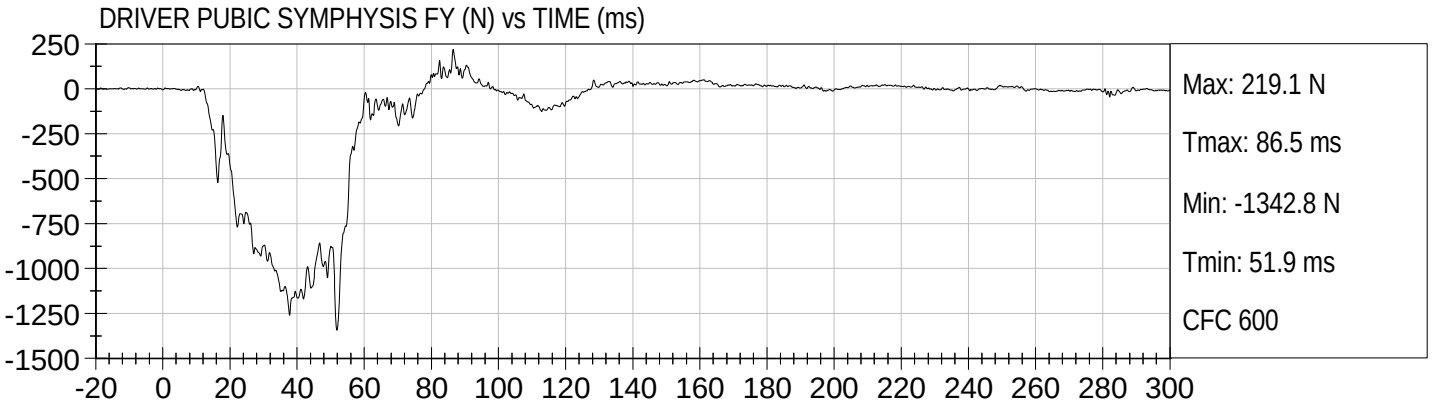


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



55/28 km/h 90° NCAP MDB Side Impact
2012 Kia Sorento - KC0501

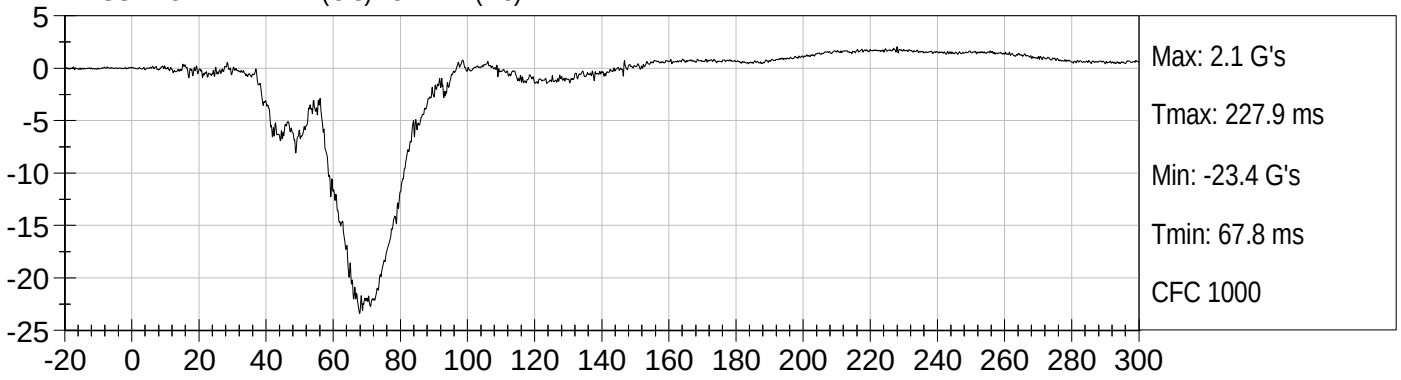
Test Date: 08/09/2011
Speed: 38.8 mph (62.4 km/h)



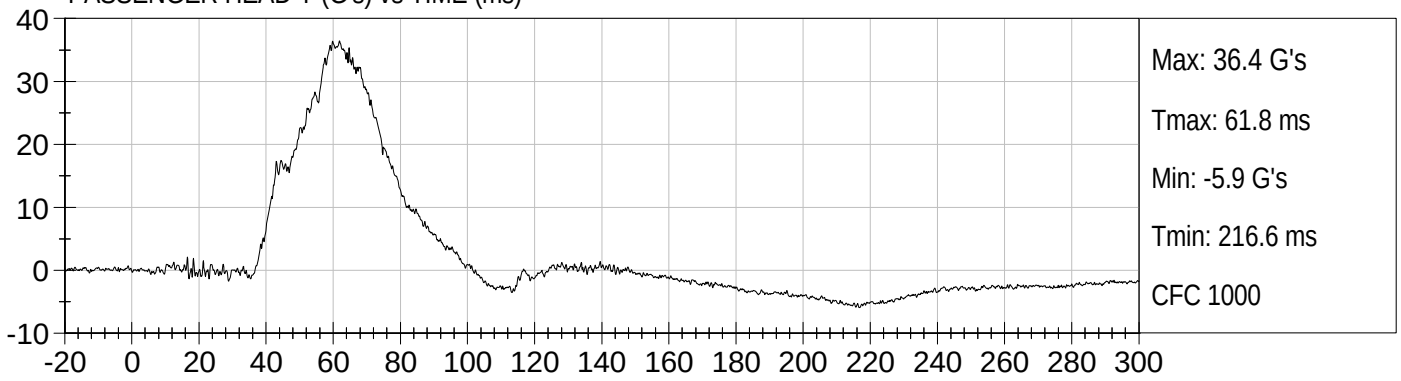
55/28 km/h 90° NCAP MDB Side Impact
2012 Kia Sorento - KC0501

Test Date: 08/09/2011
Speed: 38.8 mph (62.4 km/h)

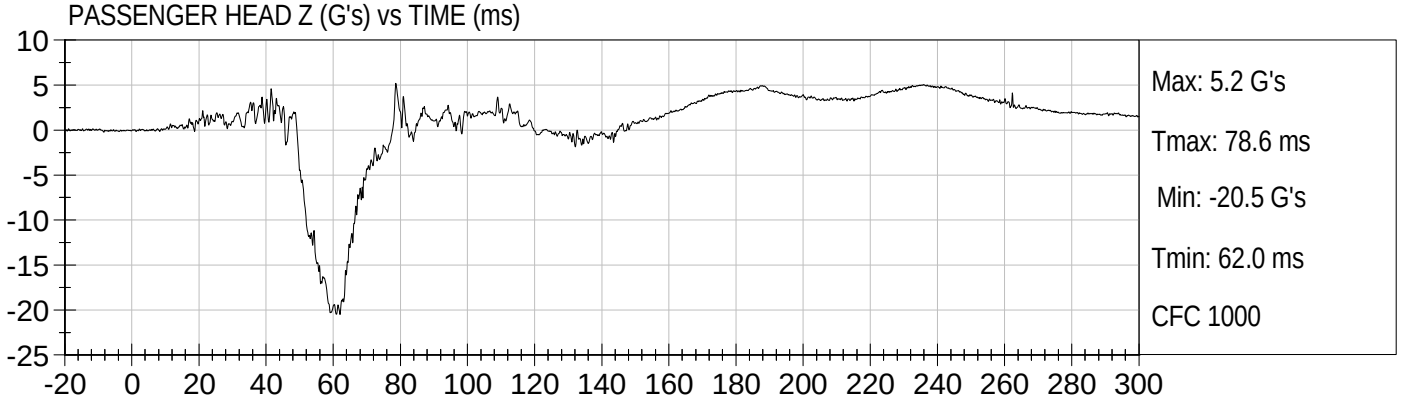
PASSENGER HEAD X (G's) vs TIME (ms)



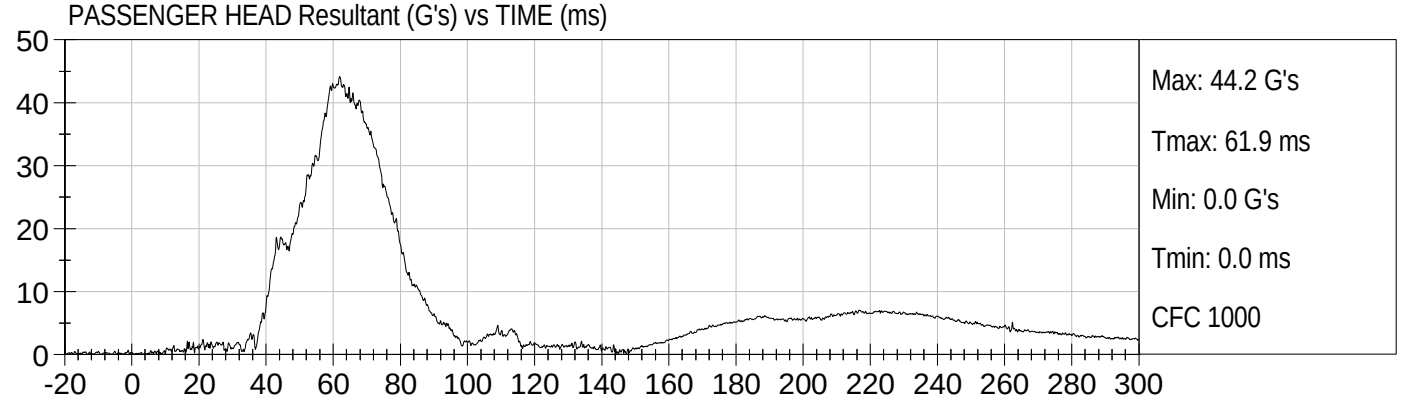
PASSENGER HEAD Y (G's) vs TIME (ms)



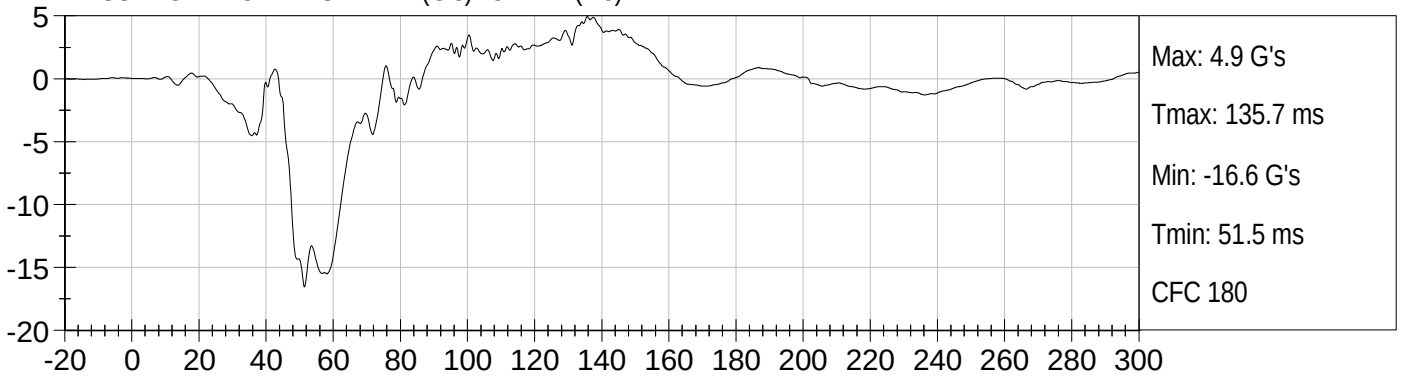
PASSENGER HEAD Z (G's) vs TIME (ms)



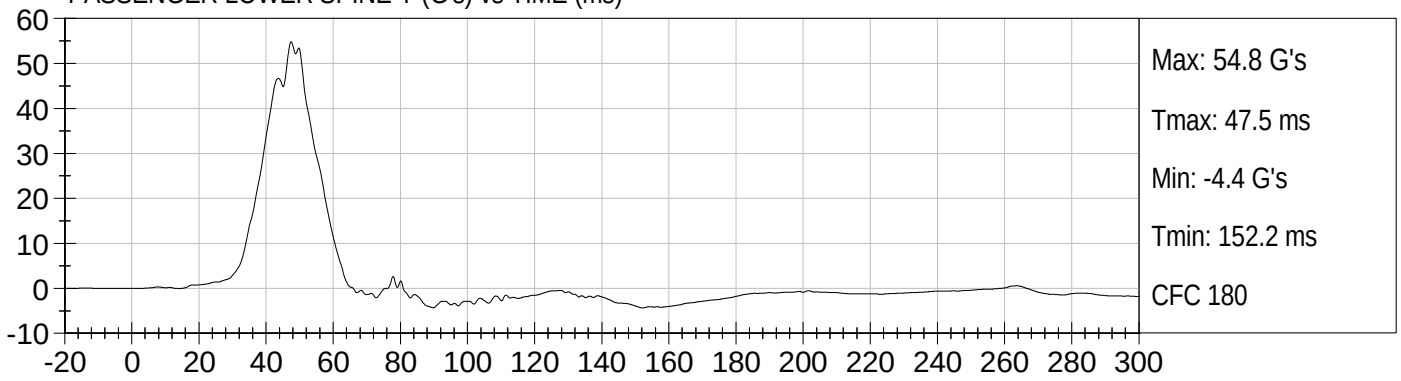
PASSENGER HEAD Resultant (G's) vs TIME (ms)



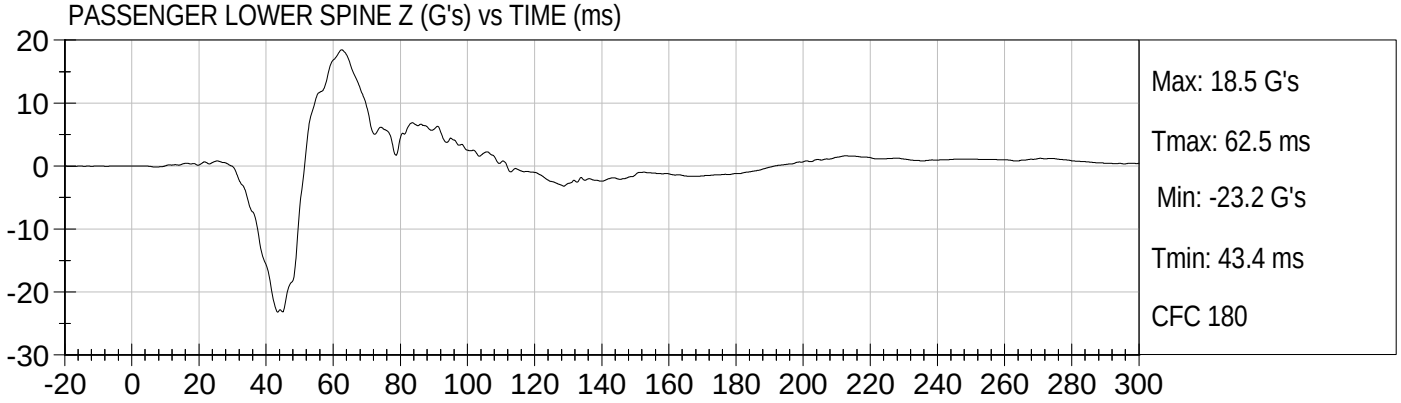
PASSENGER LOWER SPINE X (G's) vs TIME (ms)



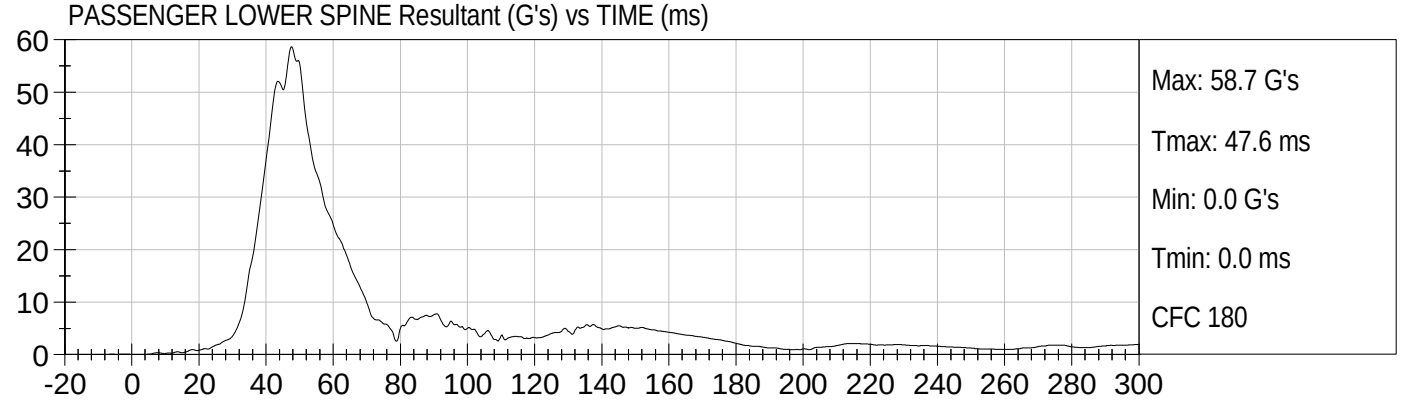
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



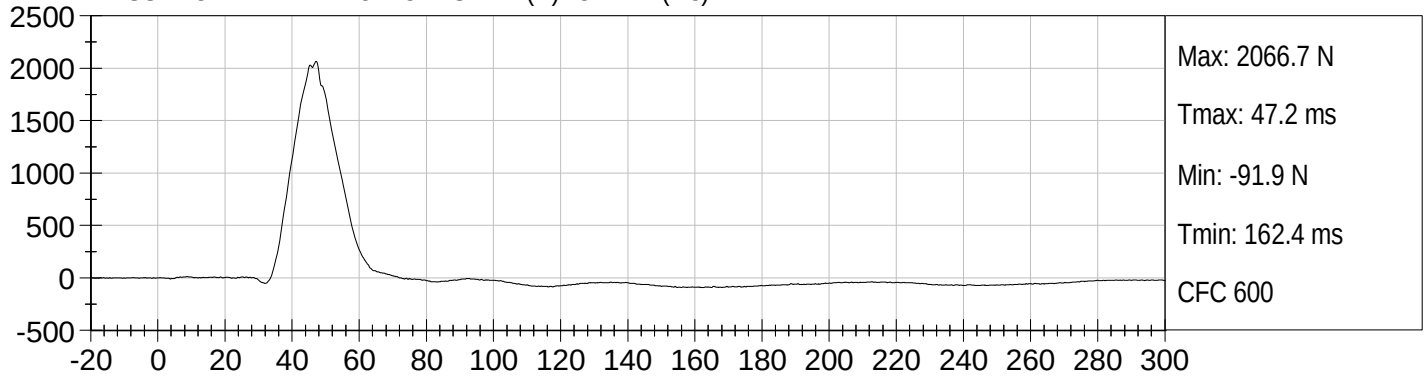
PASSENGER LOWER SPINE Z (G's) vs TIME (ms)



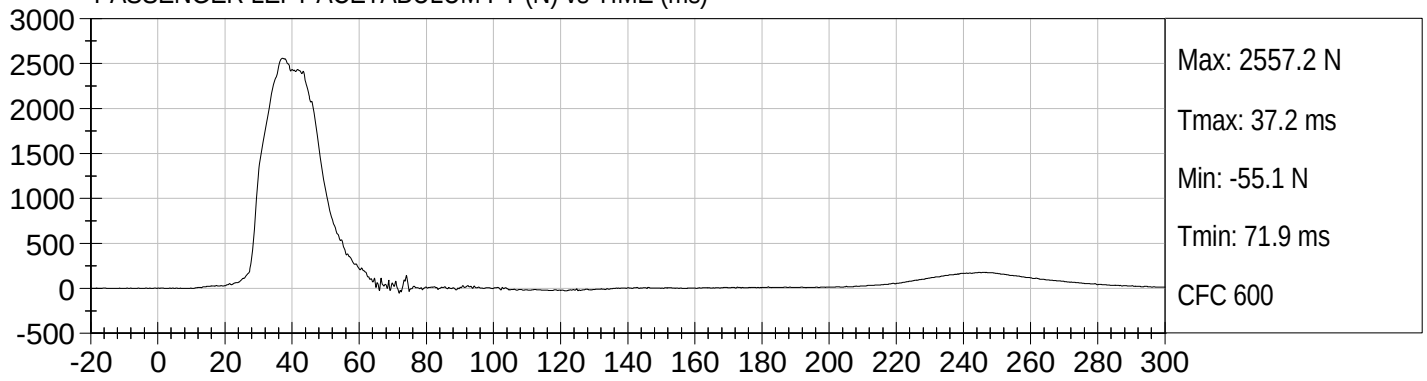
PASSENGER LOWER SPINE Resultant (G's) vs TIME (ms)



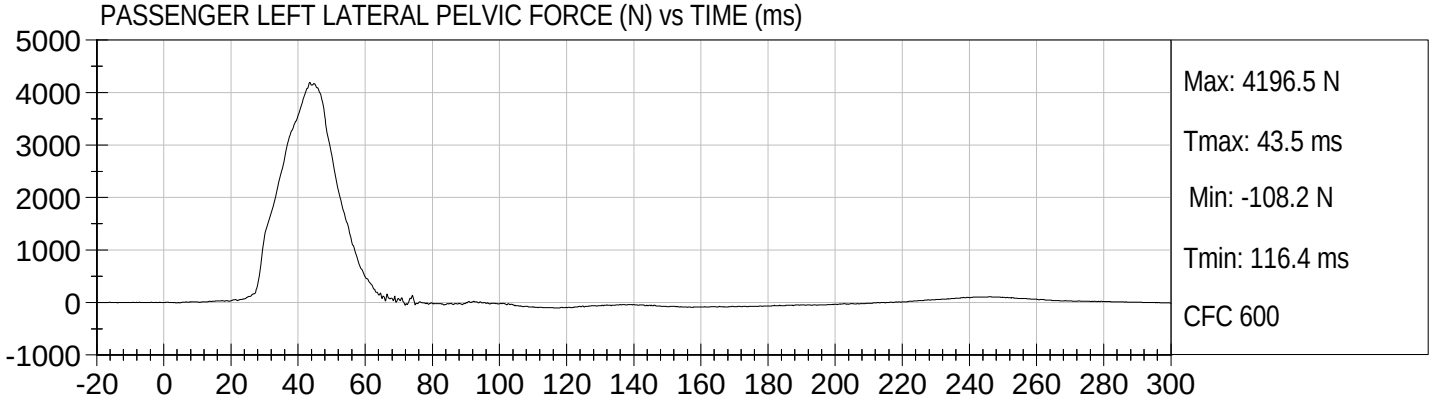
PASSENGER LEFT ILLIUM CREST FY (N) vs TIME (ms)



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



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



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032 **Test ID:** D112131

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	125 to 155	145	Pass
Peak Lateral Acceleration	G's	+/- 15	-12.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

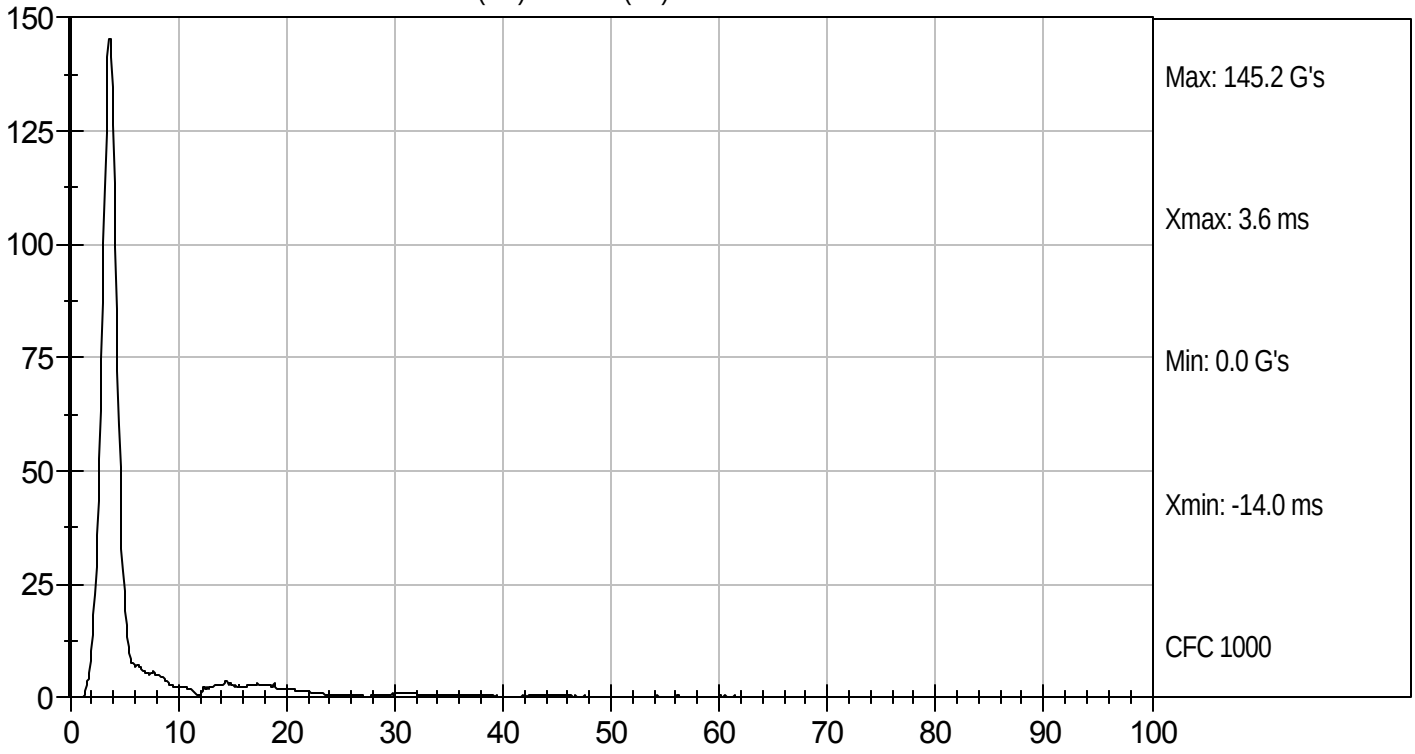
6/17/11
Test Date

David Winkelbauer
Approved By

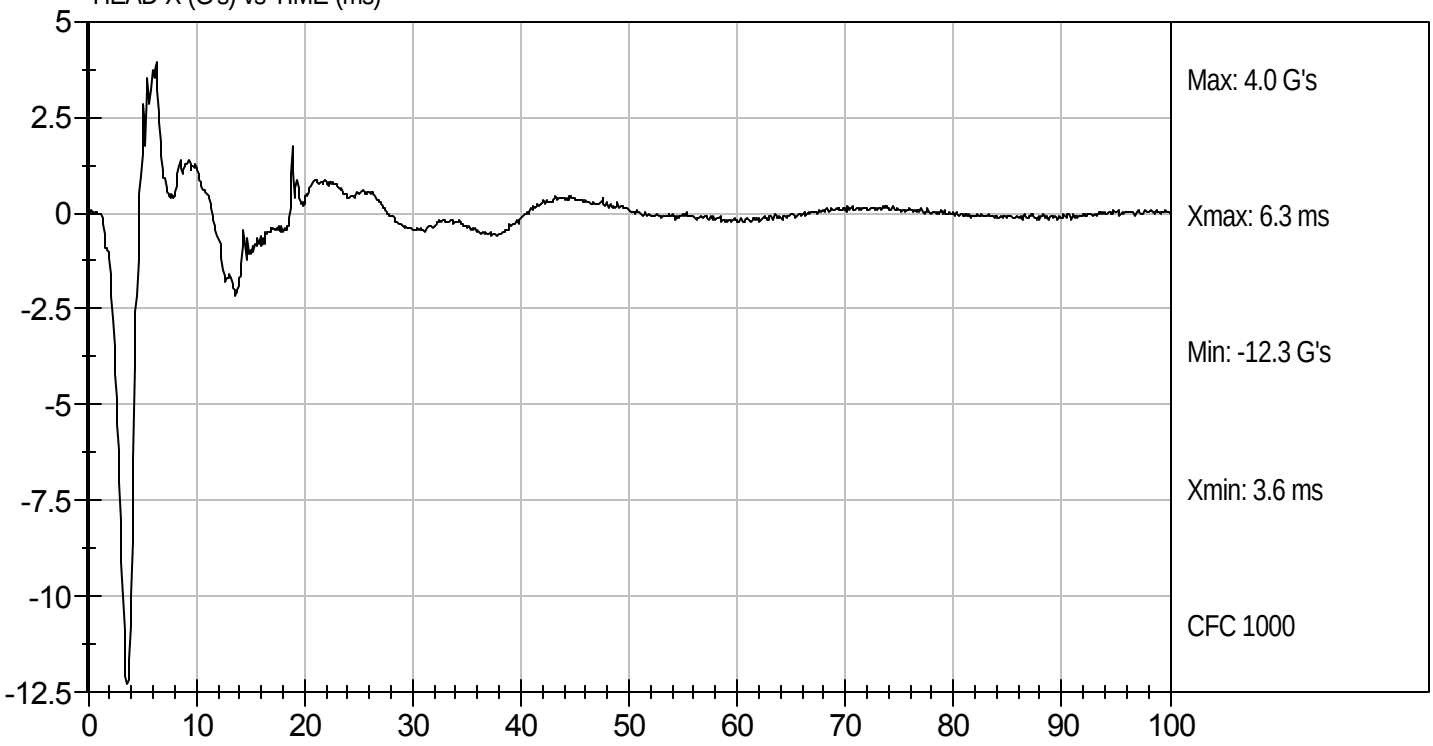
Test Desc: Head Drop
Component ID: D112131

Test Date: 6/17/11
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:** D112132

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	54	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.26	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	53.6	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	56.1	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	56.5	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

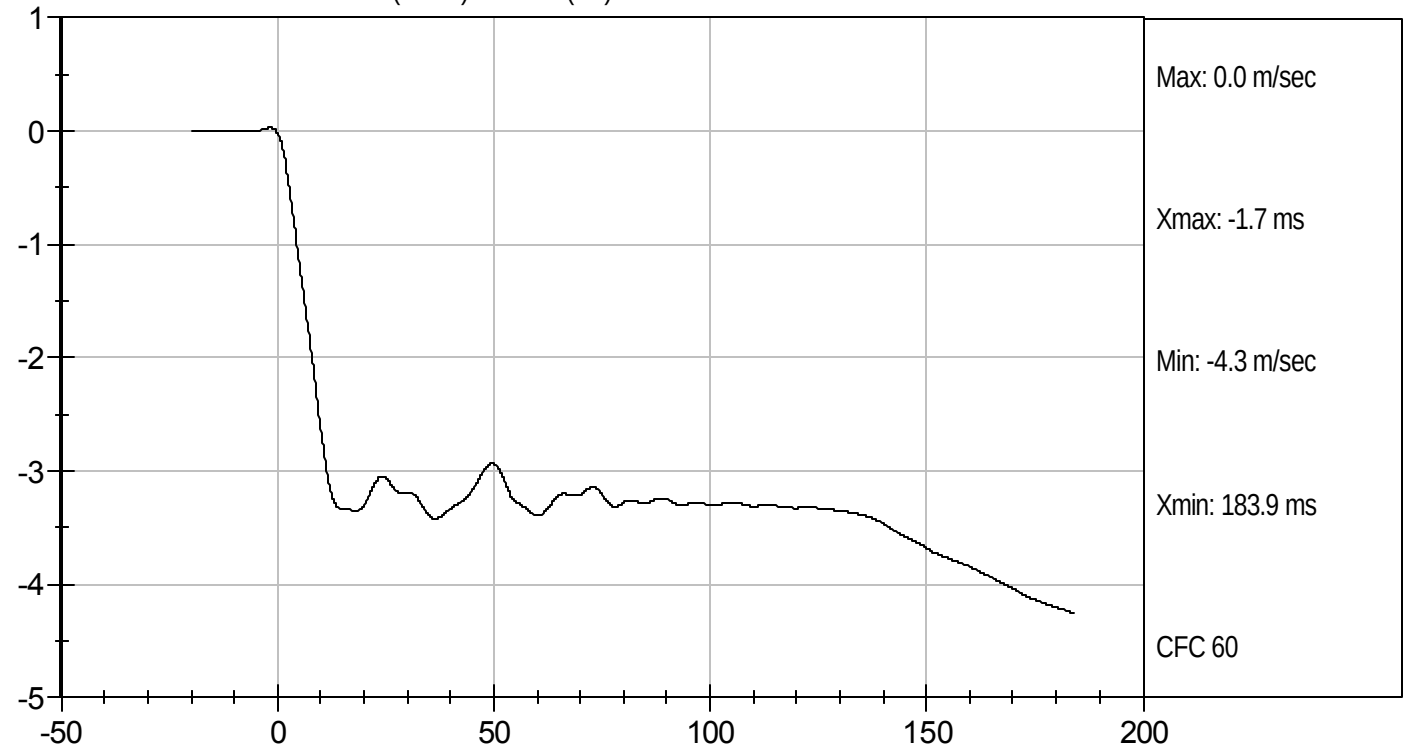
6/20/11
Test Date

David Winkelbauer
Approved By

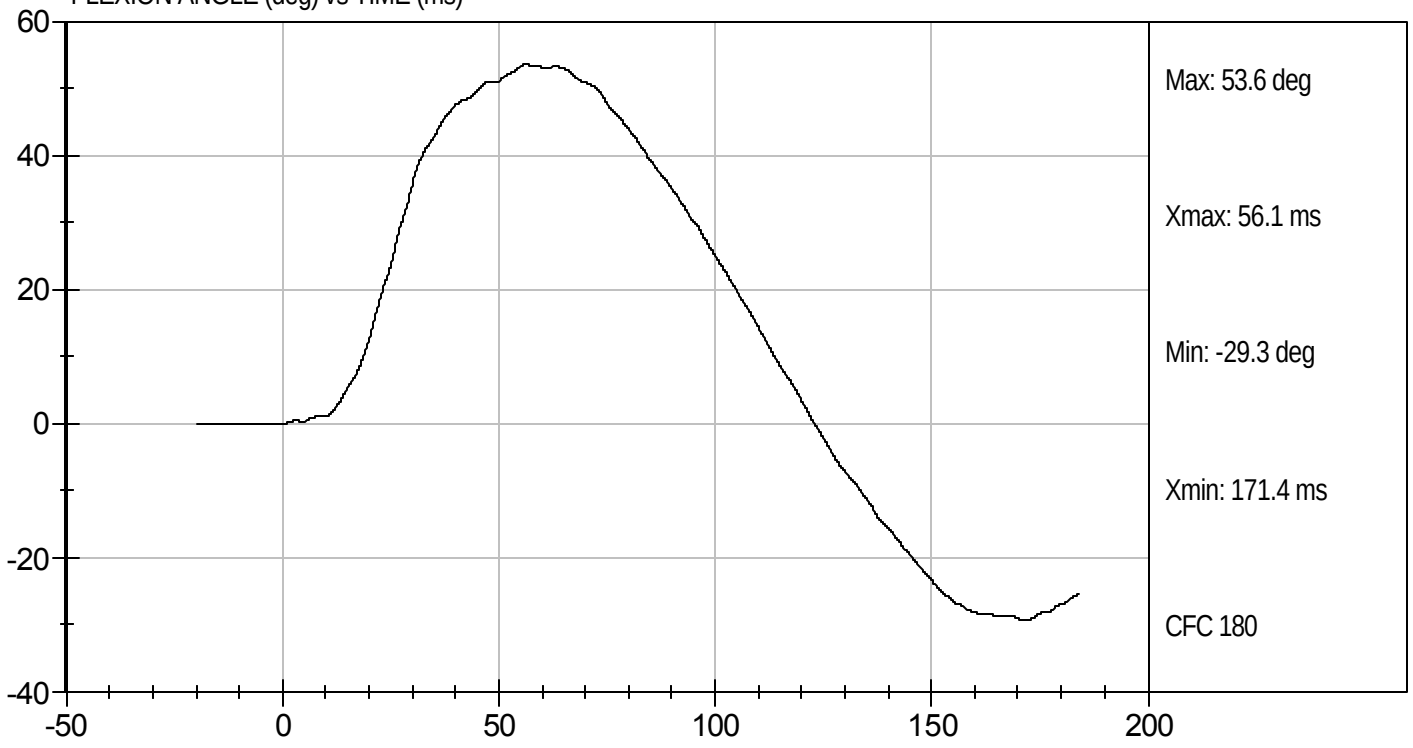
Test Desc: Neck Bending
Component ID: D112132

Test Date: 6/20/11
Velocity: 11.42 ft/s, 3.5 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

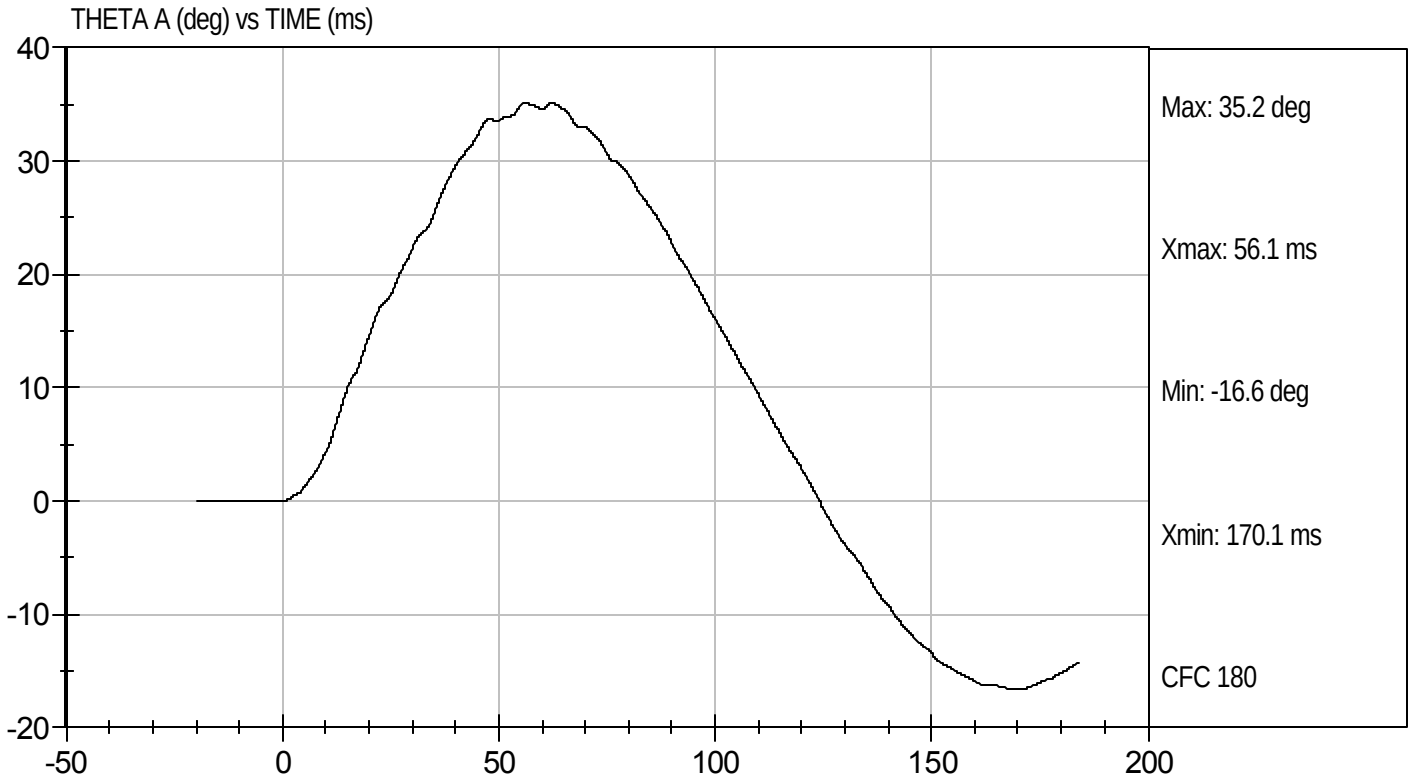


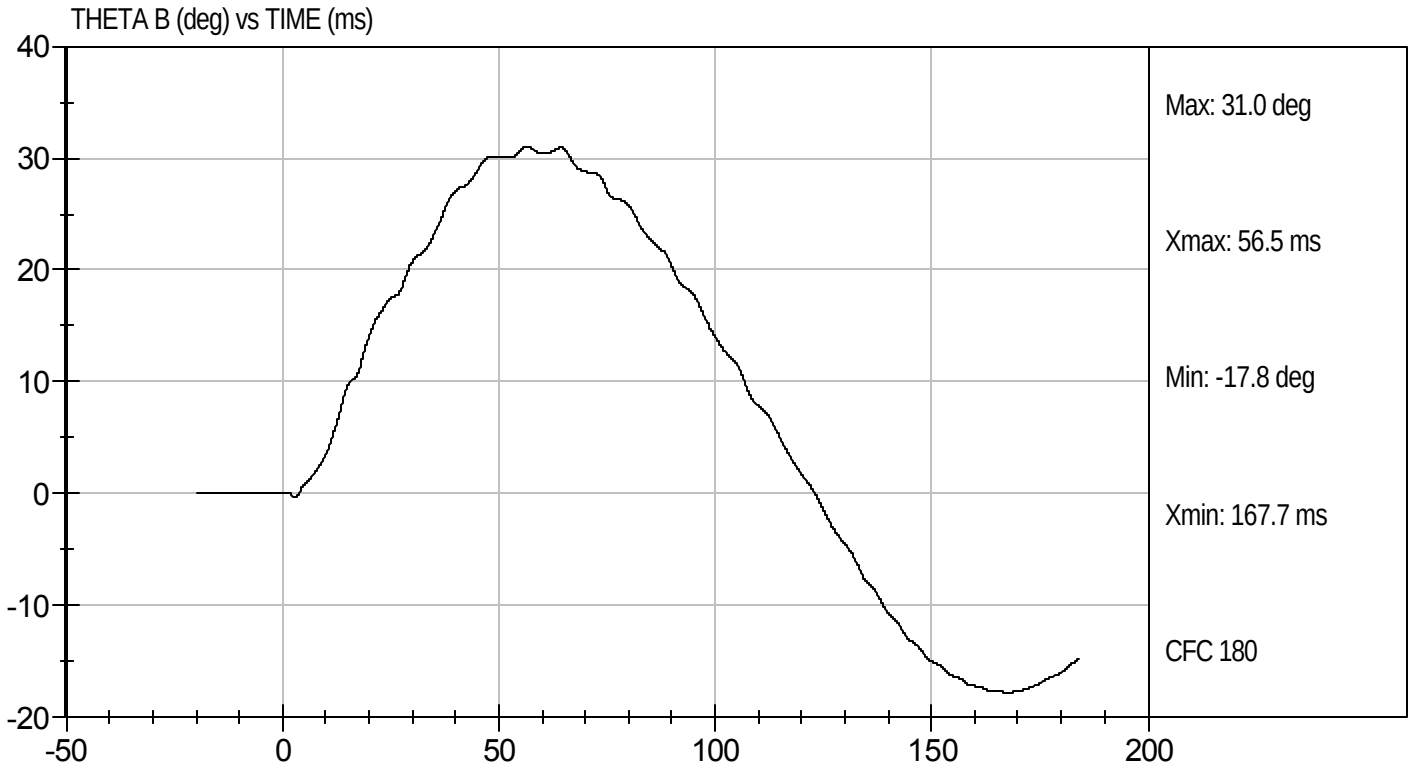
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D112132

Test Date: 6/20/11
Velocity: 11.42 ft/s, 3.5 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112133

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	50	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.4	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.3	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.6	Pass
		Overall Test Results		Pass

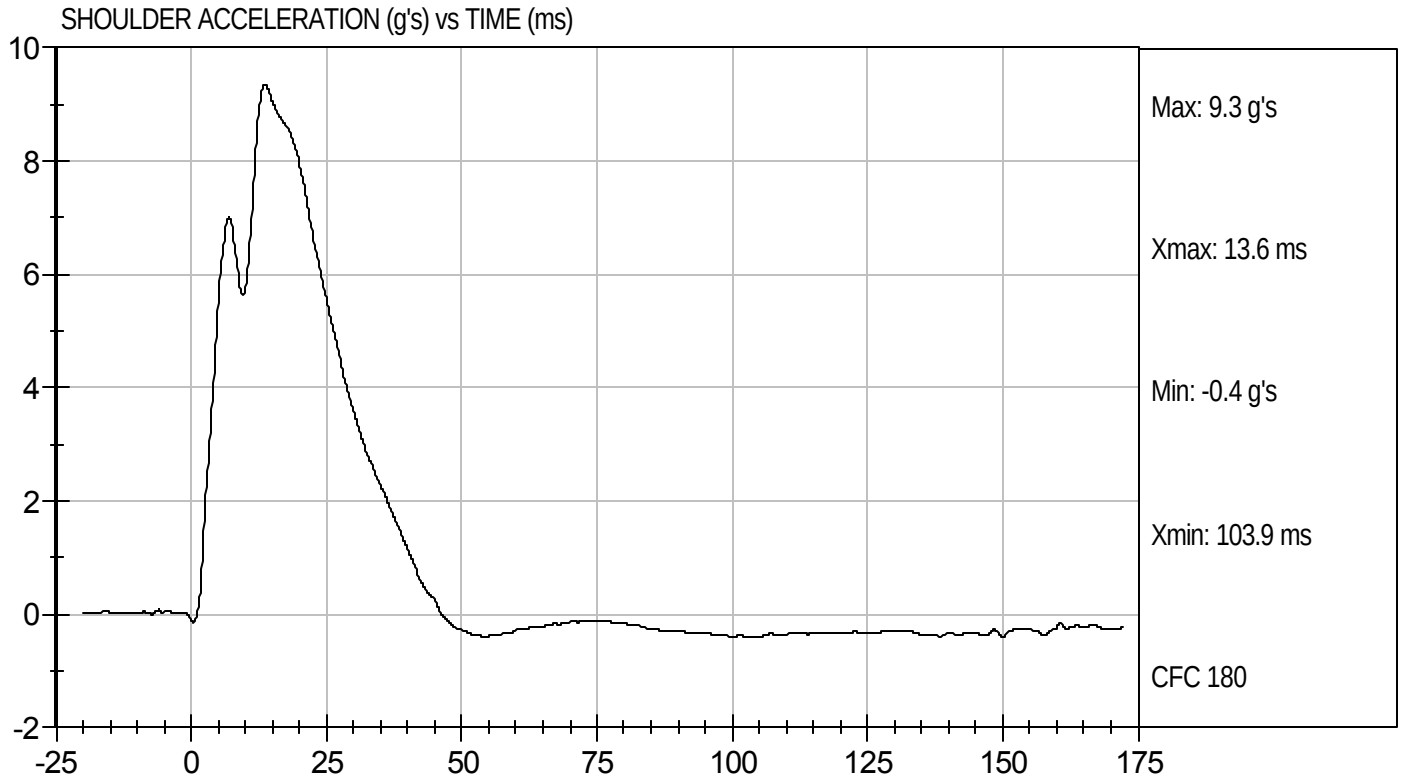
Jessica Gall
Laboratory Technician

6/20/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D112133

Test Date: 6/20/11
Velocity: 14.36 ft/s, 4.4 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112134

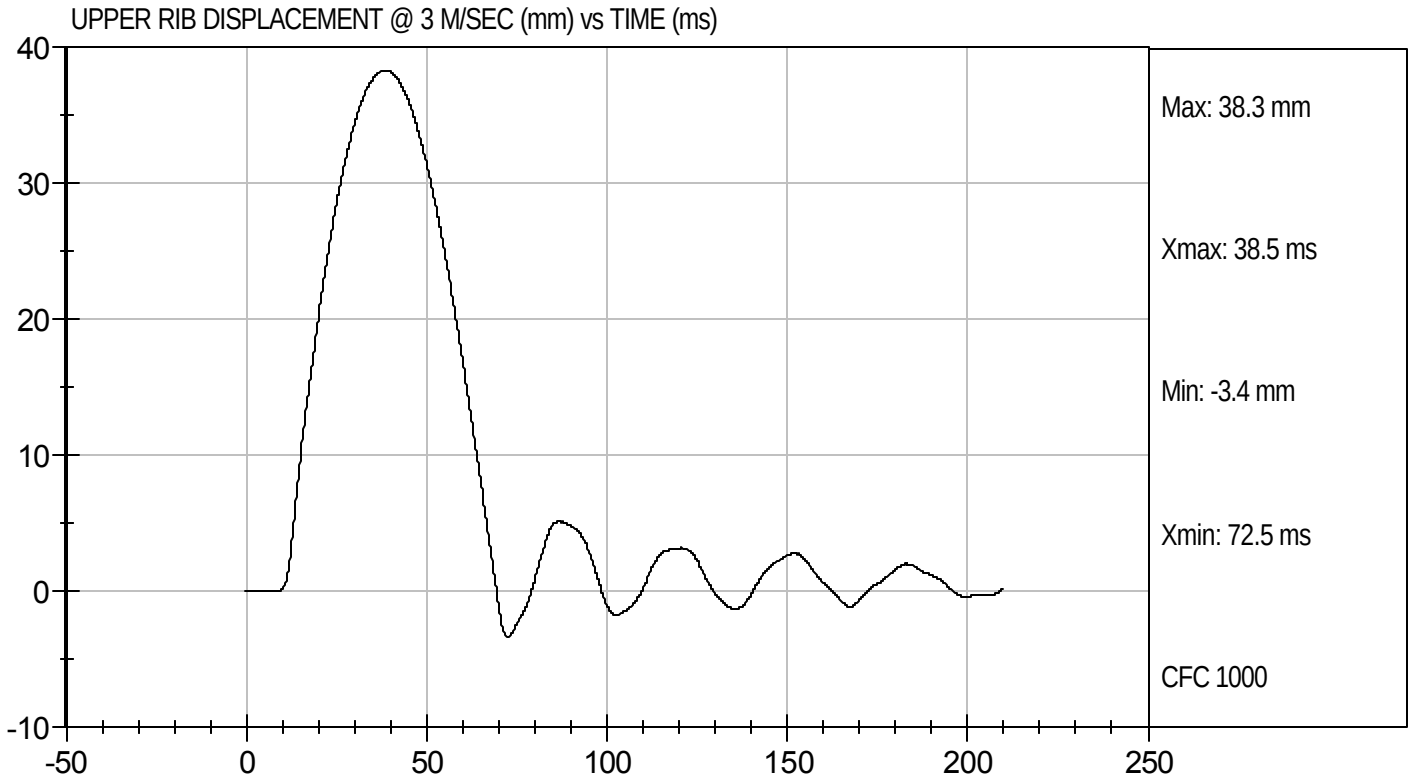
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.8	Pass
		Overall Test Results		Pass

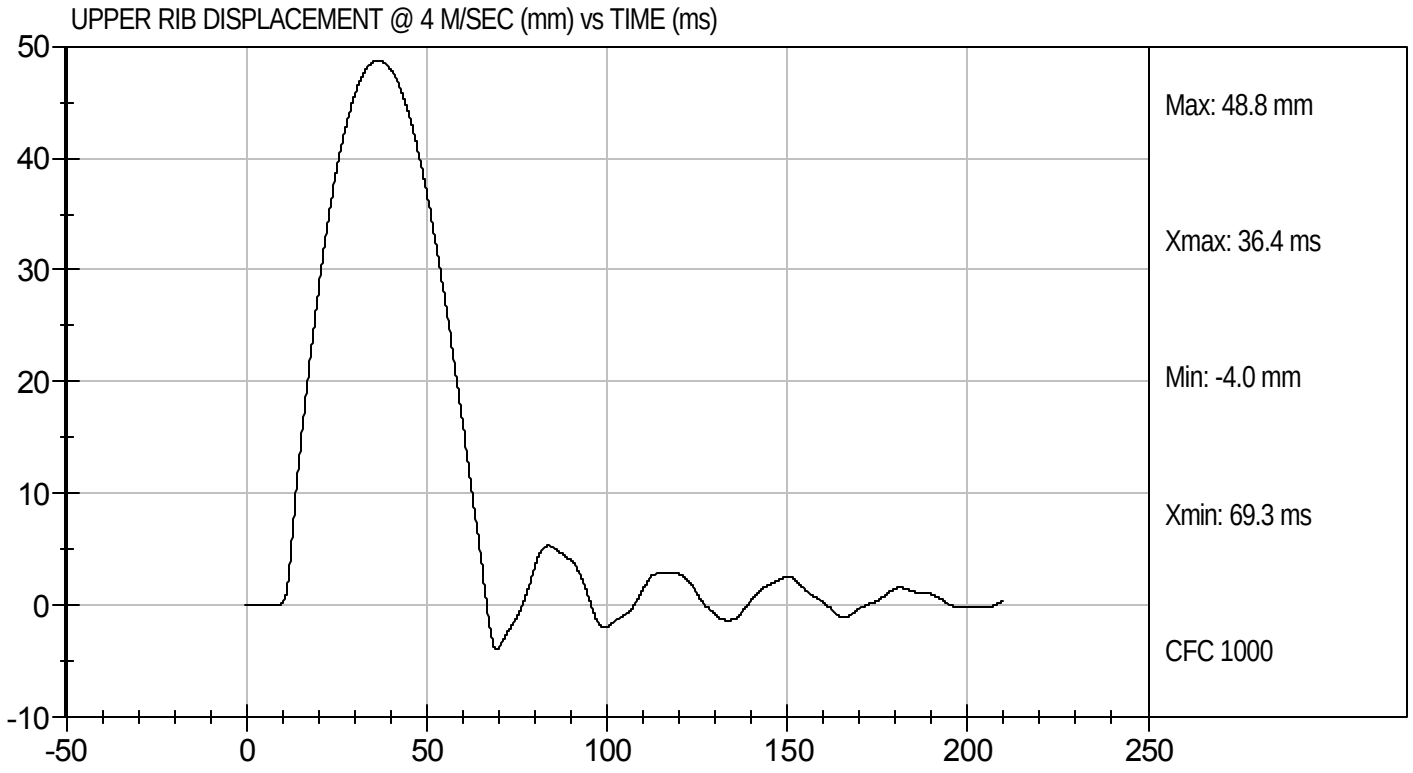
Jessica Gall
Laboratory Technician

6/20/11
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D112134
Test Date: 6/20/11





MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112135

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	54	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.5	Pass
		Overall Test Results		Pass

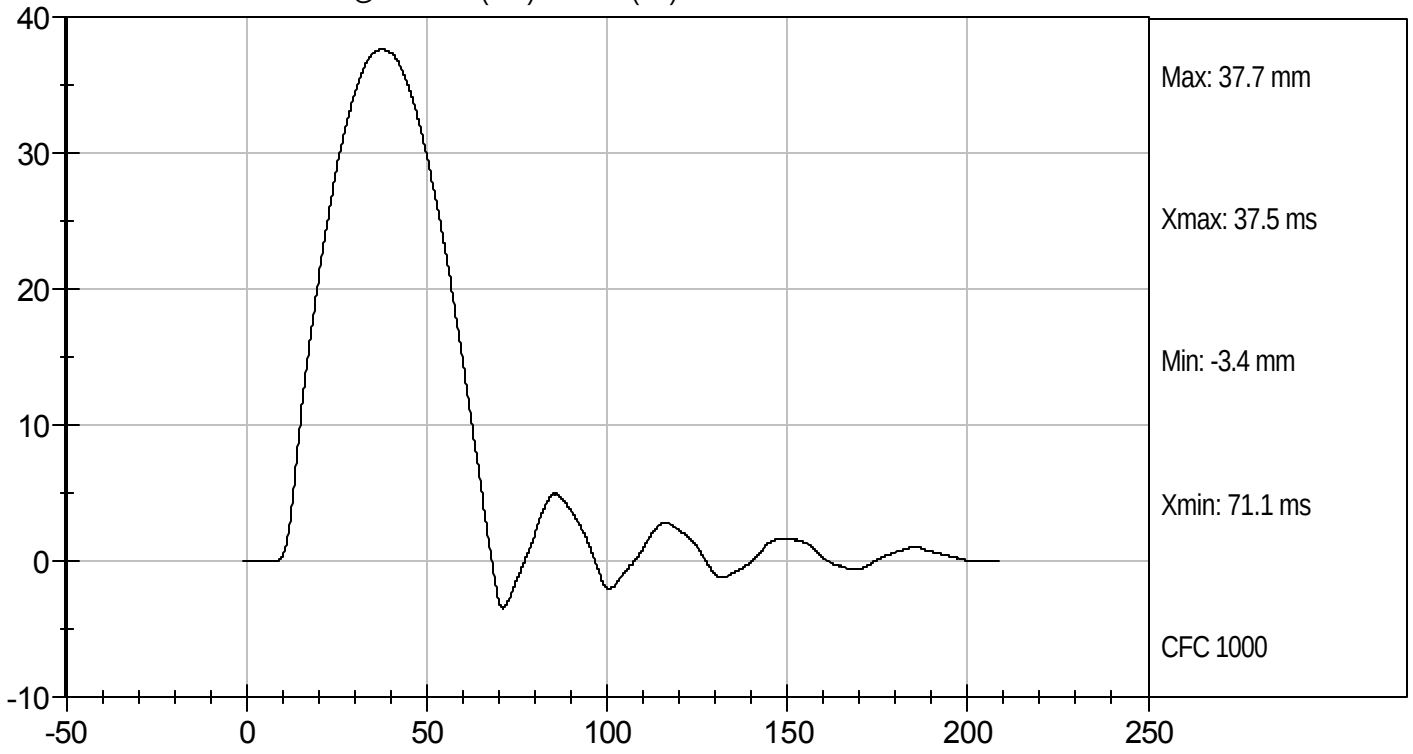
Jessica Gall
Laboratory Technician

6/20/11
Test Date

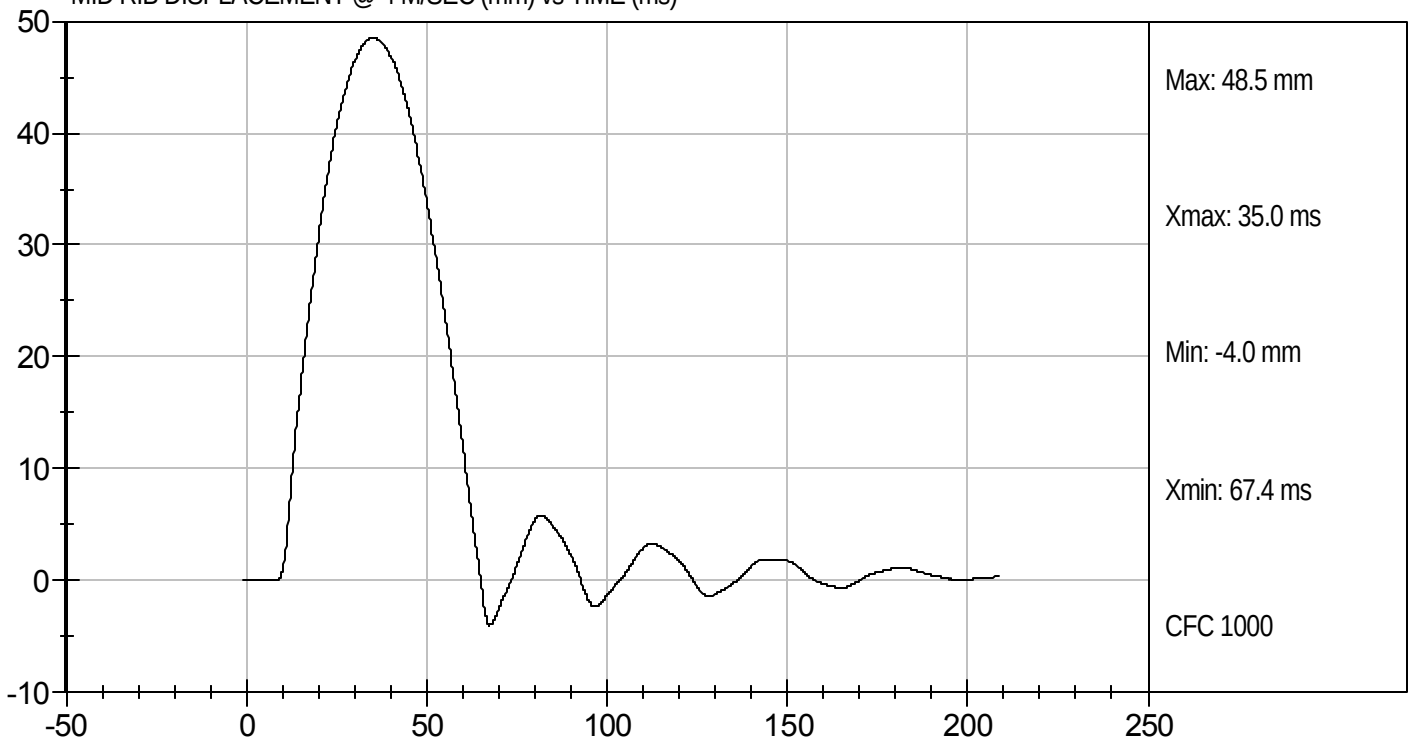
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D112135
Test Date: 6/20/11

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:** D112136

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	54	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.9	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.5	Pass
		Overall Test Results		Pass

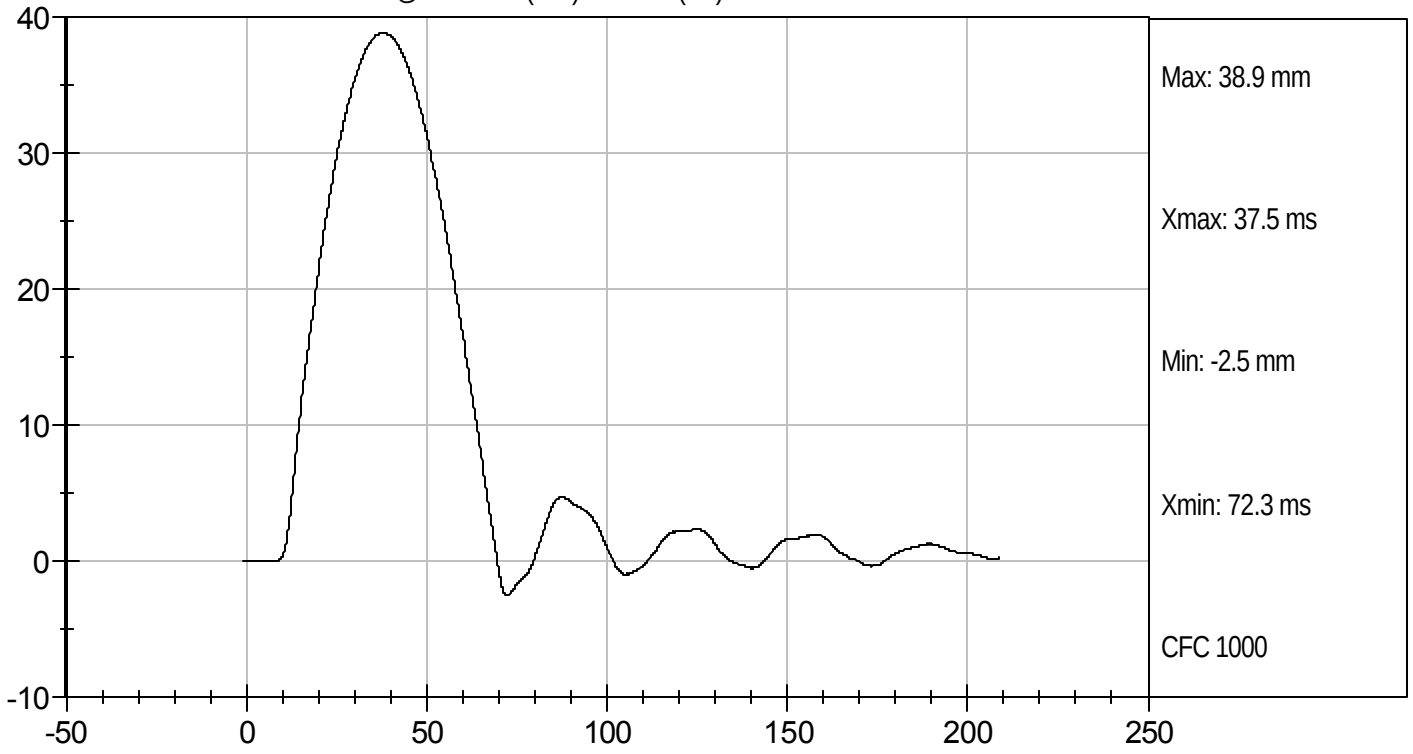
Jessica Gall
Laboratory Technician

6/20/11
Test Date

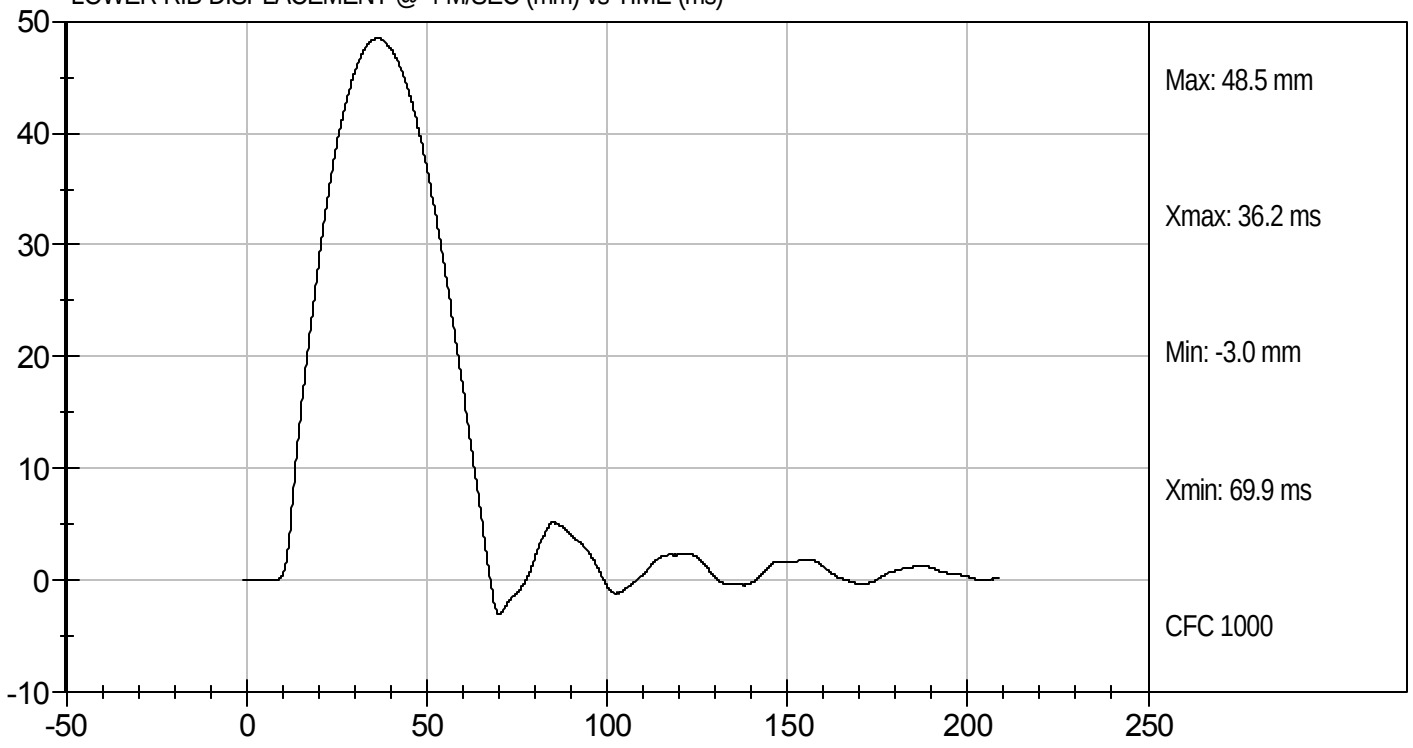
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D112136
Test Date: 6/20/11

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:** D112137

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	50	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.18	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.80	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.33	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	11.30	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

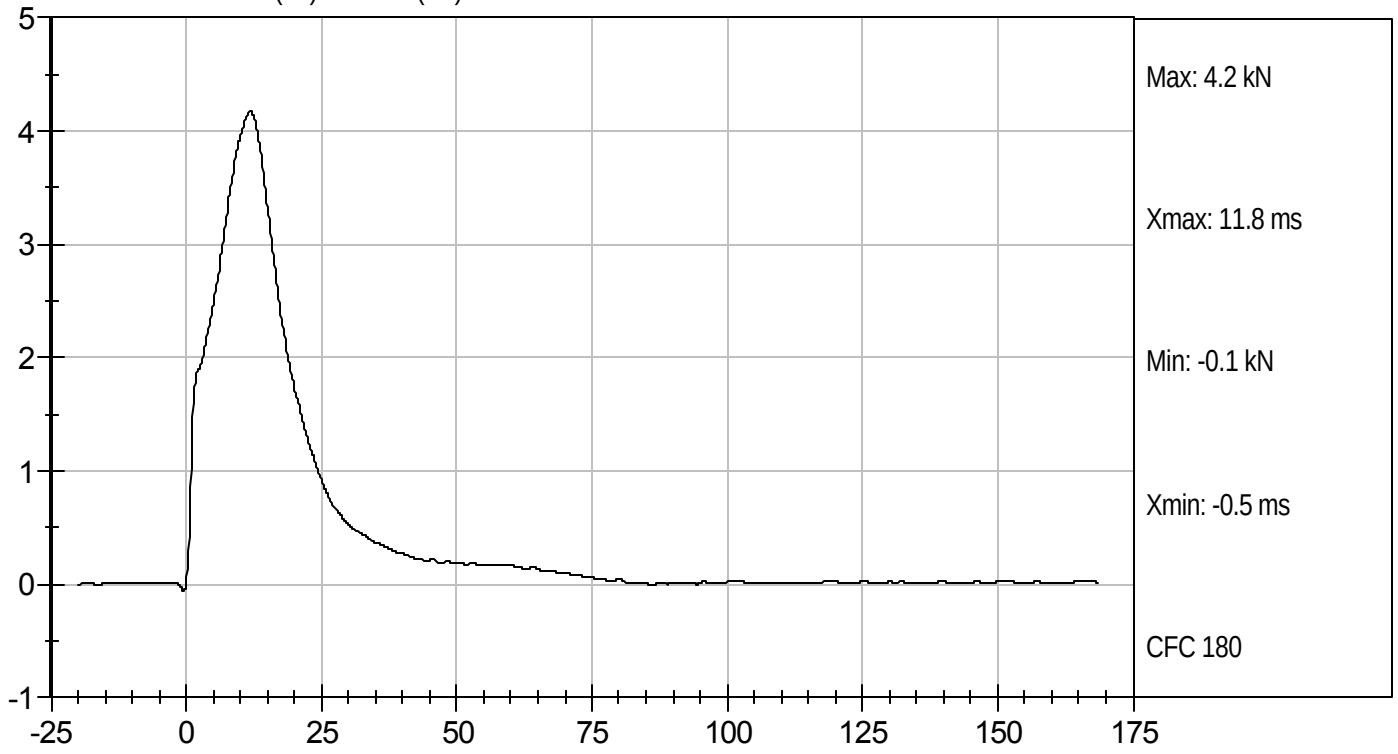
6/20/11
Test Date

David Winkelbauer
Approved By

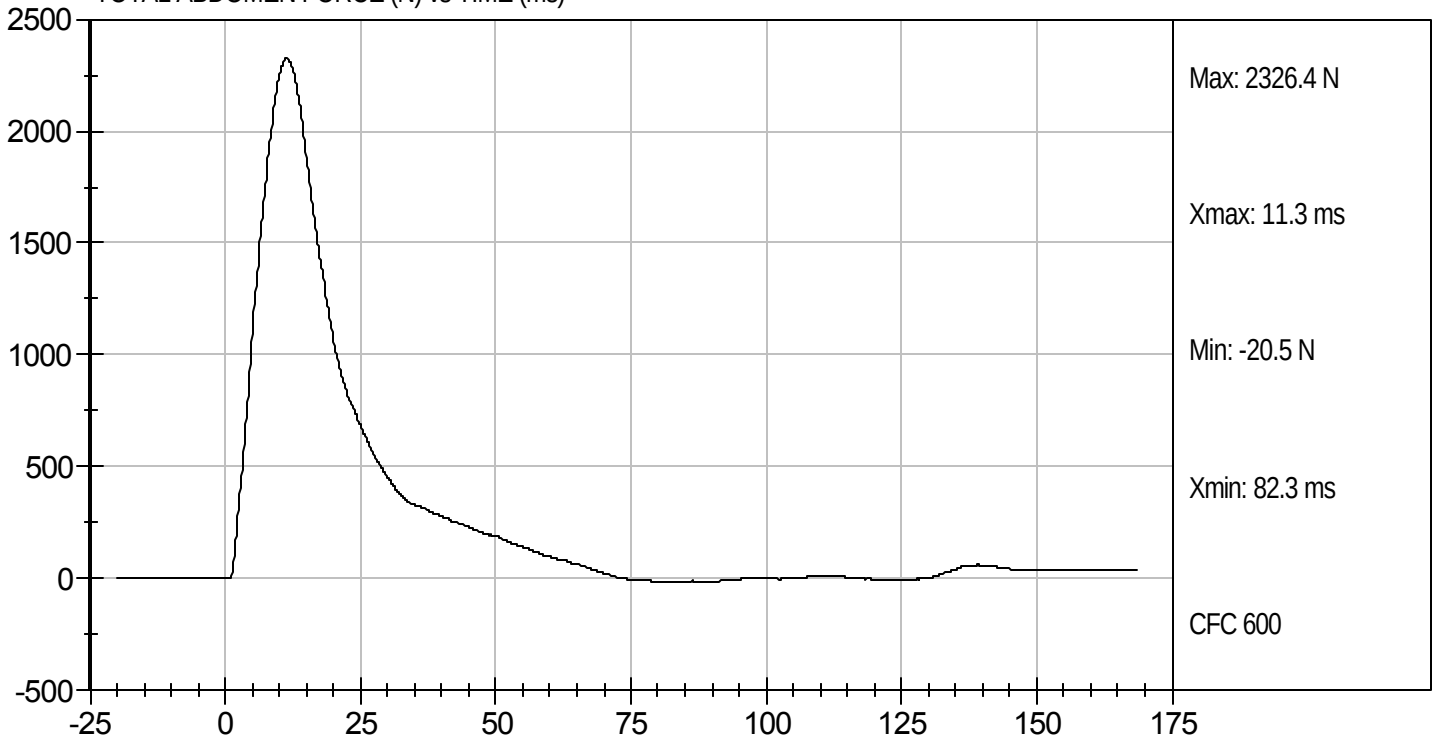
Test Desc: Abdomen Impact
Component ID: D112137

Test Date: 6/20/11
Velocity: 13.44 ft/s, 4.1 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112138

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.42	Pass
	27 ms	m/s	-6.50 to -5.80	-5.91	Pass
	30 ms	m/s	>= -6.5	-6.05	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	52.0	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	45.6	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	47	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

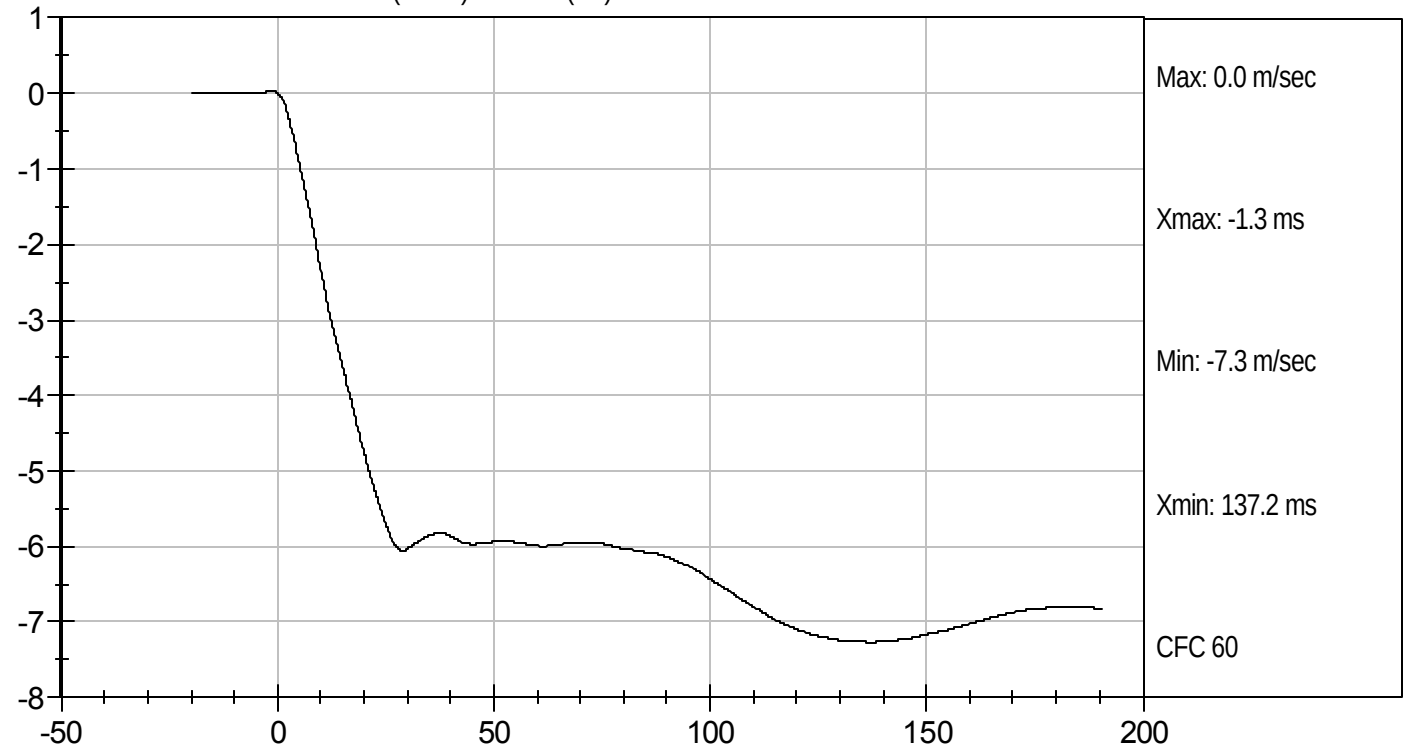
6/17/11
Test Date

David Winkelbauer
Approved By

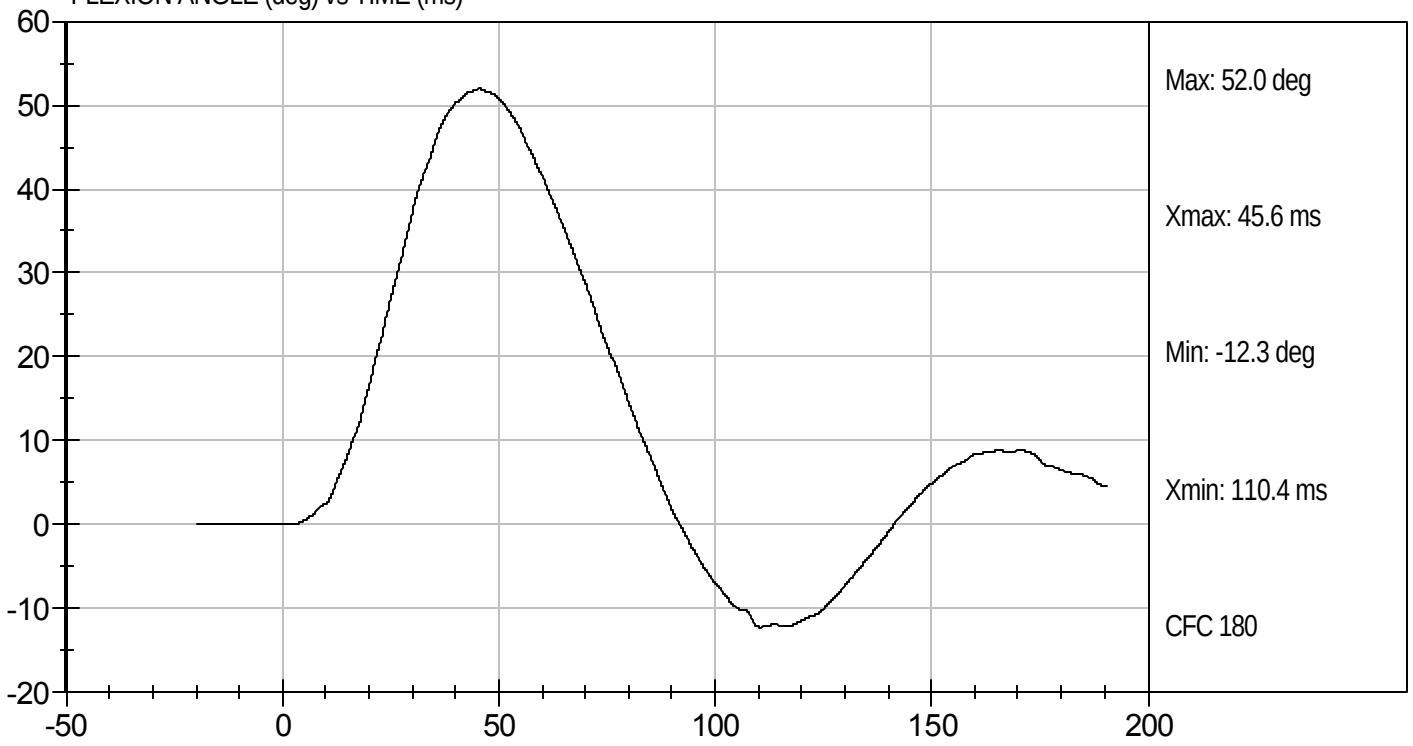
Test Desc: Lumbar Flexion
Component ID: D112138

Test Date: 6/17/11
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

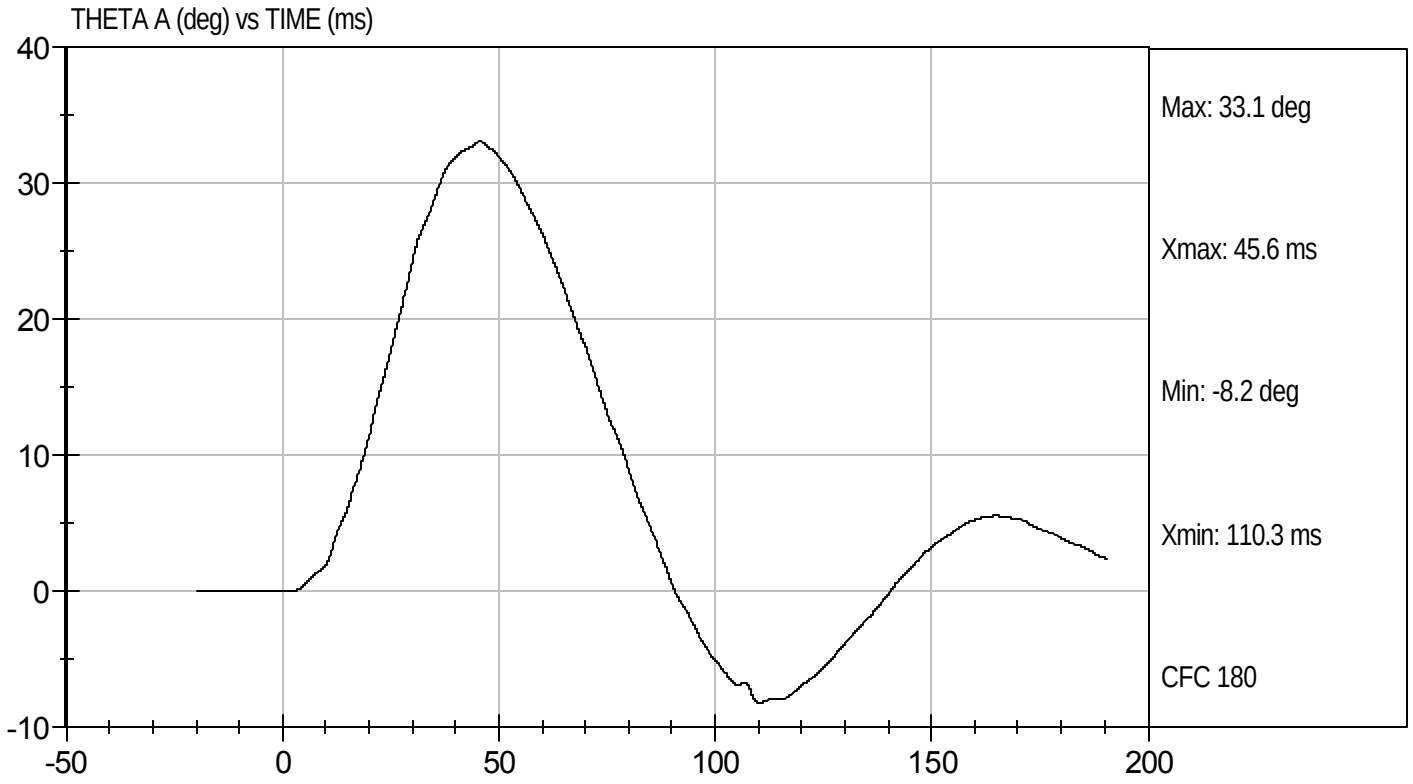


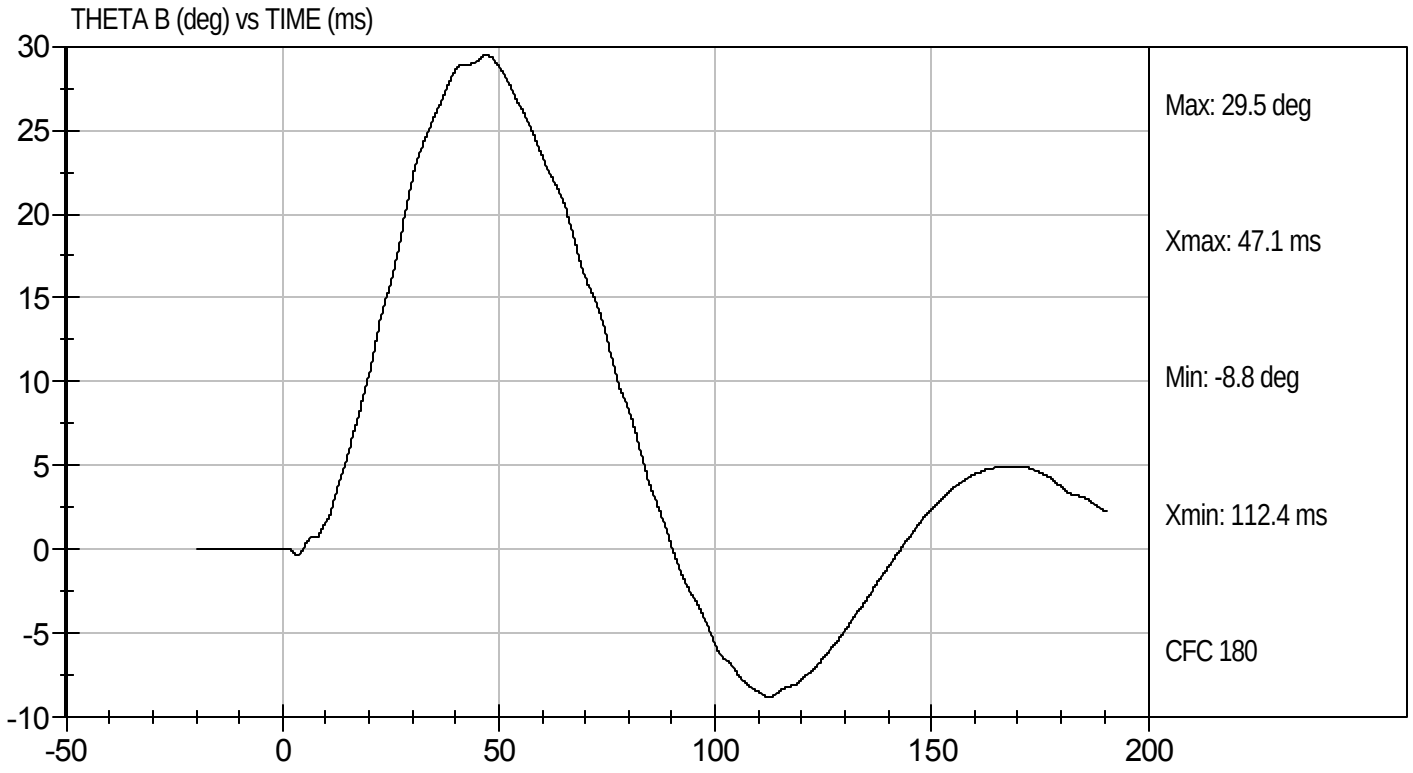
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Flexion
Component ID: D112138

Test Date: 6/17/11
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112139

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	50	Pass
Probe Speed	m/s	4.20 to 4.40	4.27	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.94	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.60	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.52	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	15.30	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

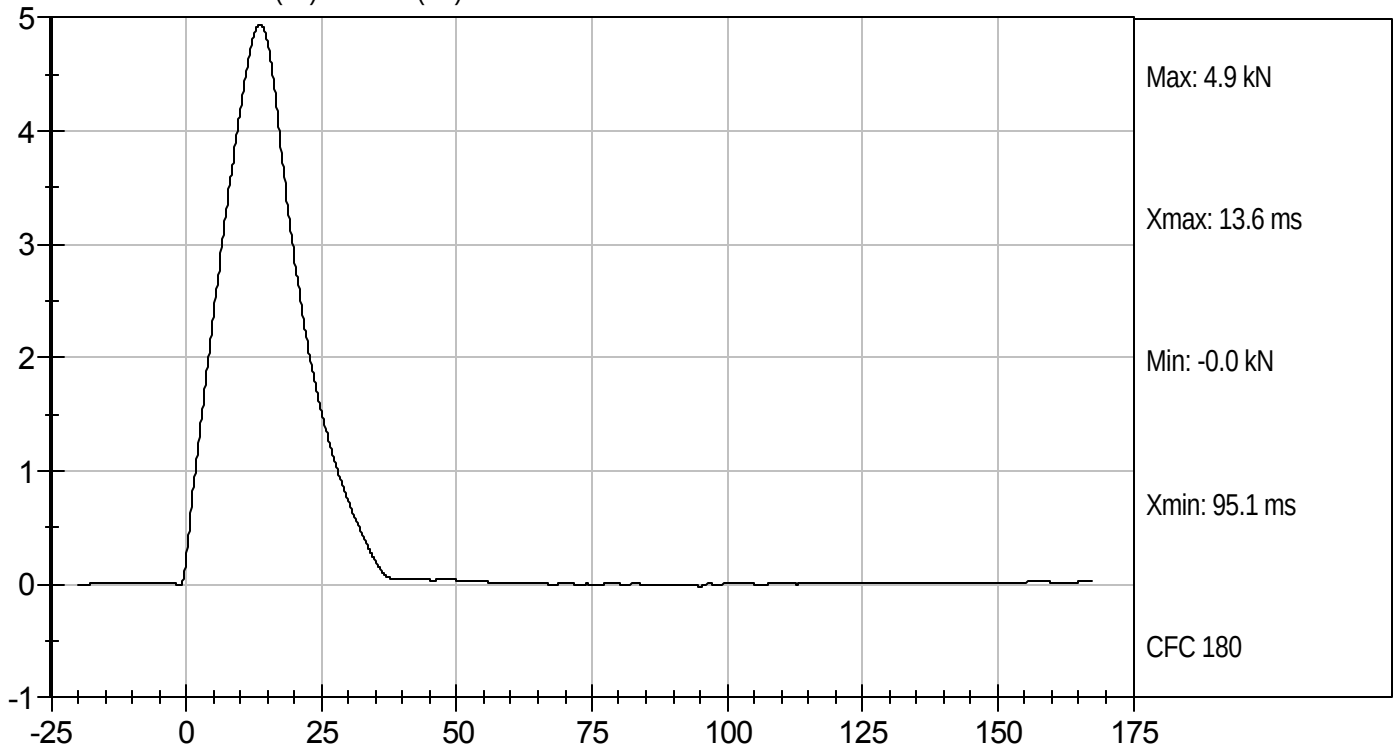
6/20/11
Test Date

David Winkelbauer
Approved By

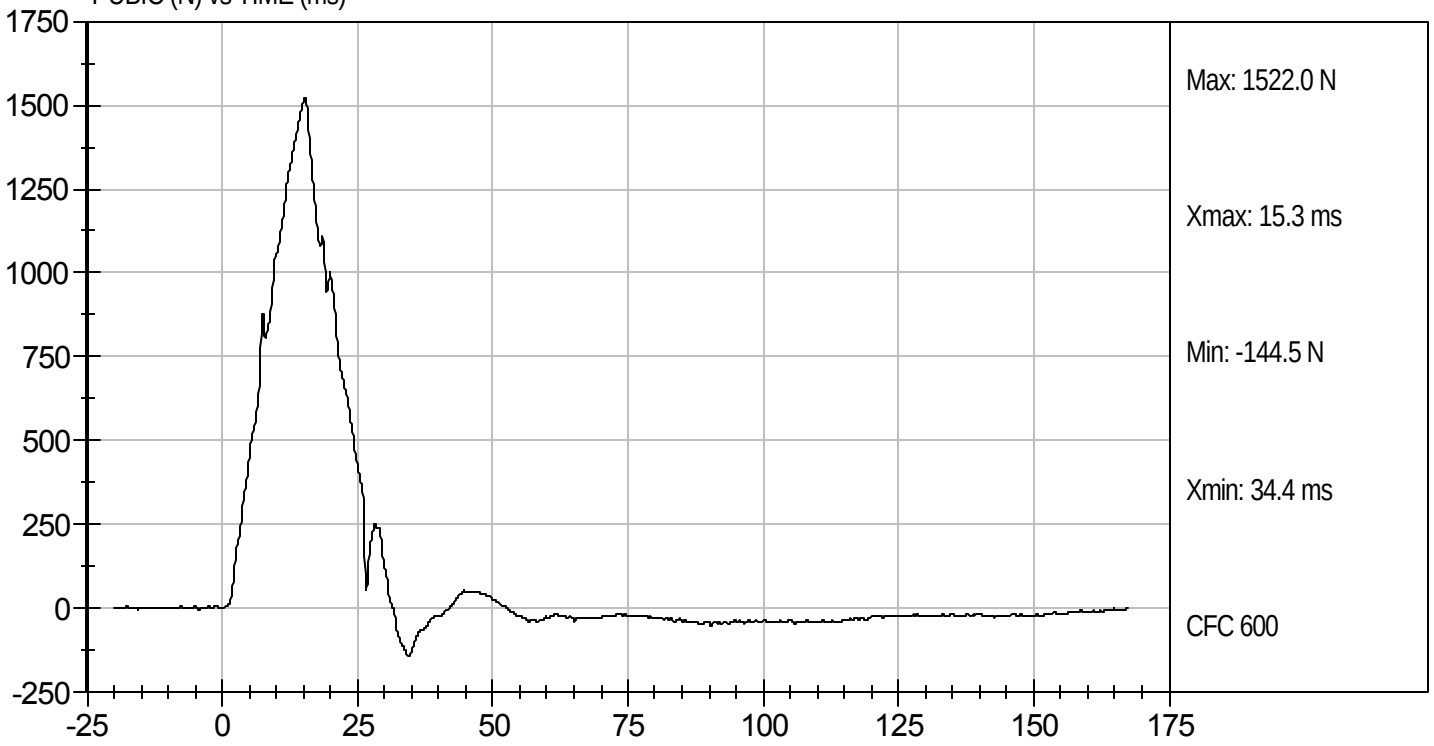
Test Desc: Pelvis Impact
Component ID: D112139

Test Date: 6/20/11
Velocity: 14.00 ft/s, 4.27 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112130

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.38	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.8	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.0	Pass
Lower Rib Displacement	mm	37.0 to 44.0	41.5	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

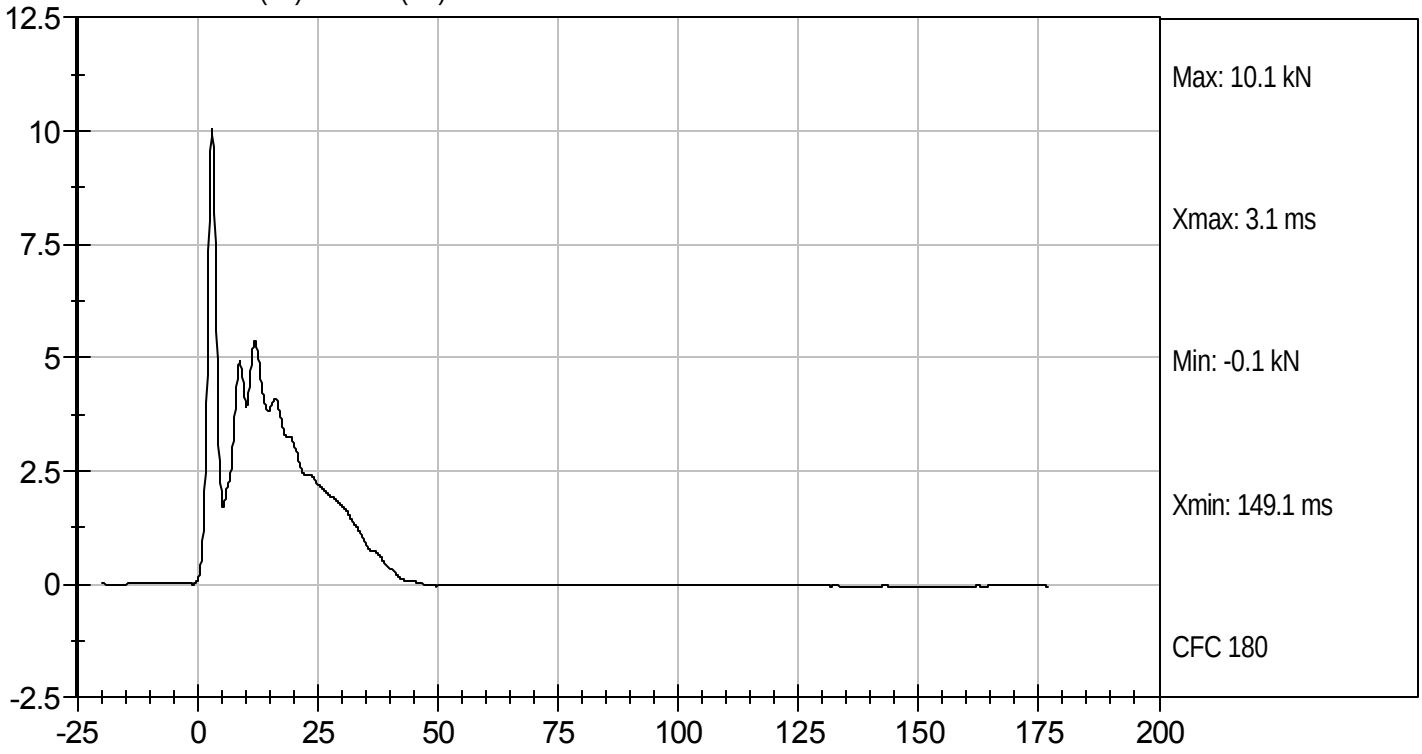
6/20/11
Test Date

David Winkelbauer
Approved By

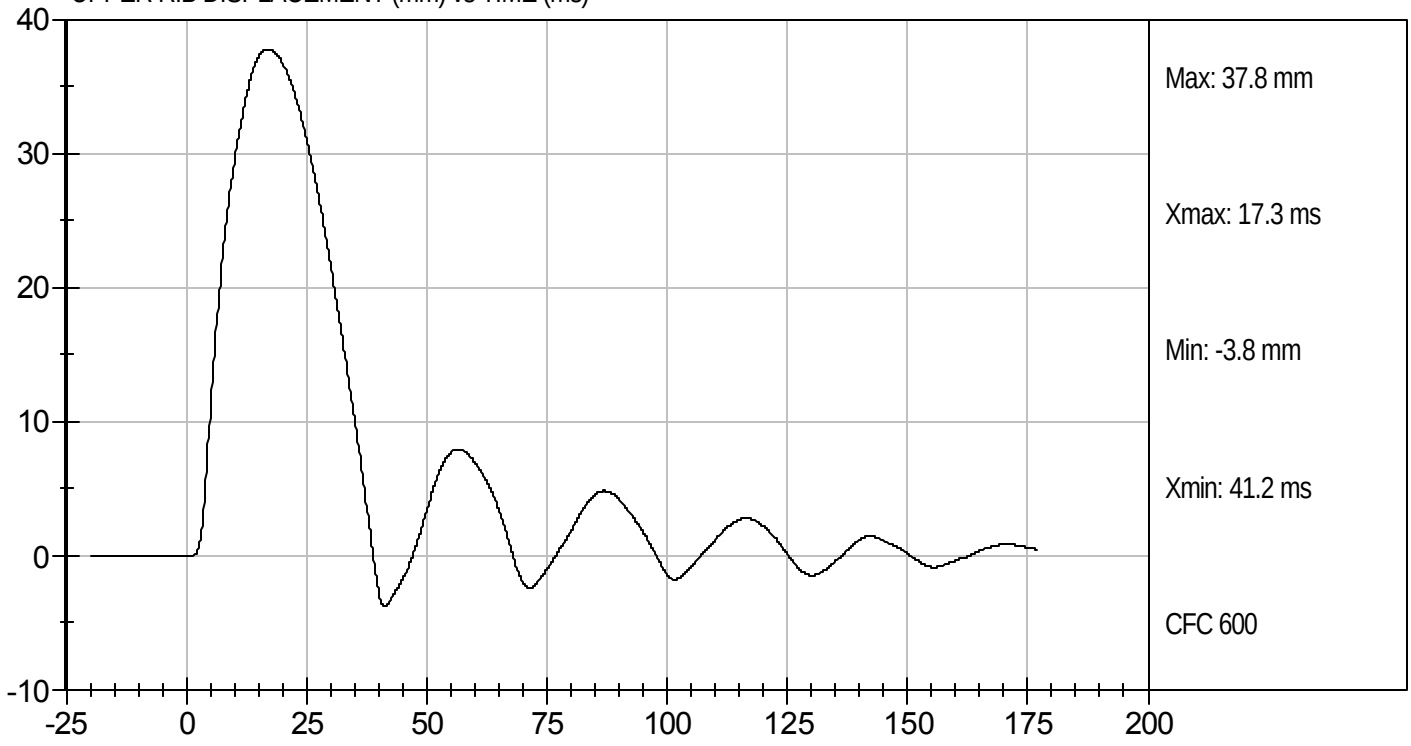
Test Desc: Thorax Impact
Component ID: D112130

Test Date: 6/20/11
Velocity: 18.31 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



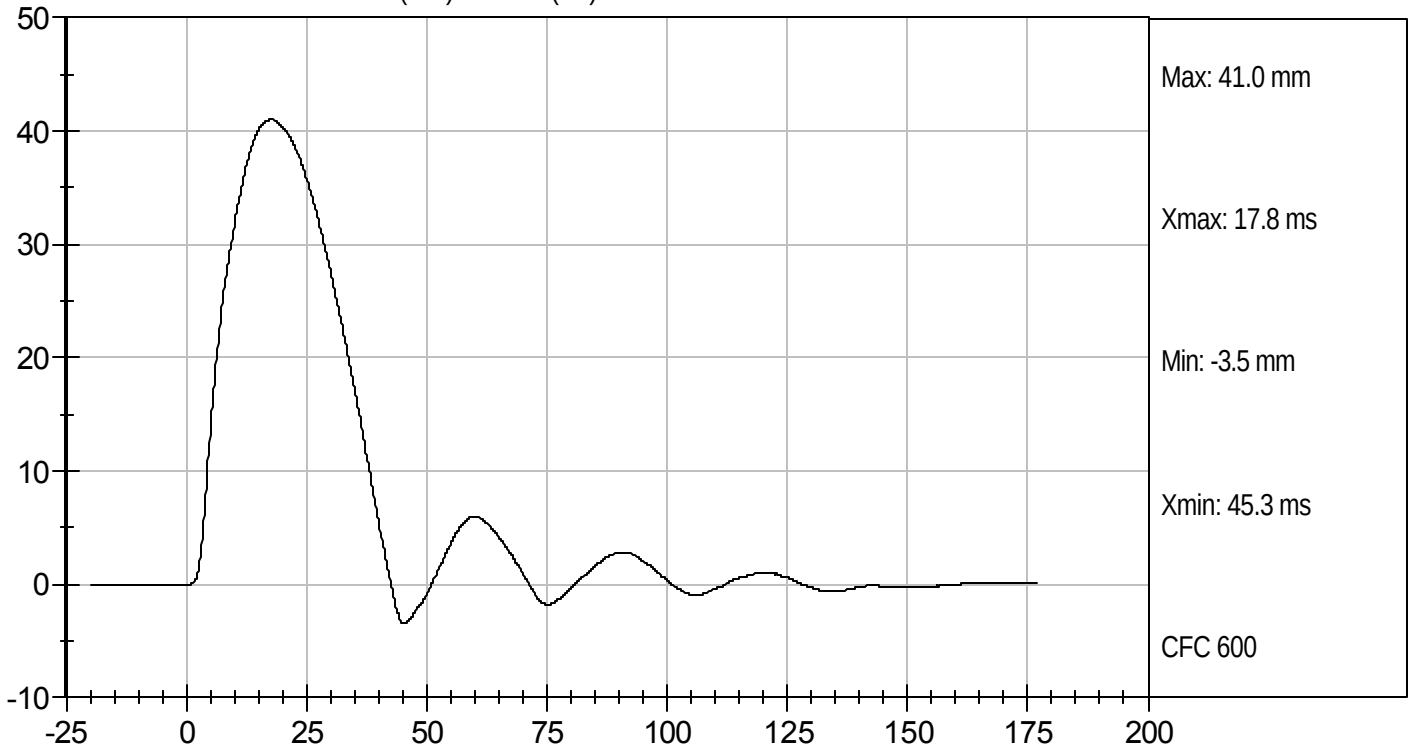
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



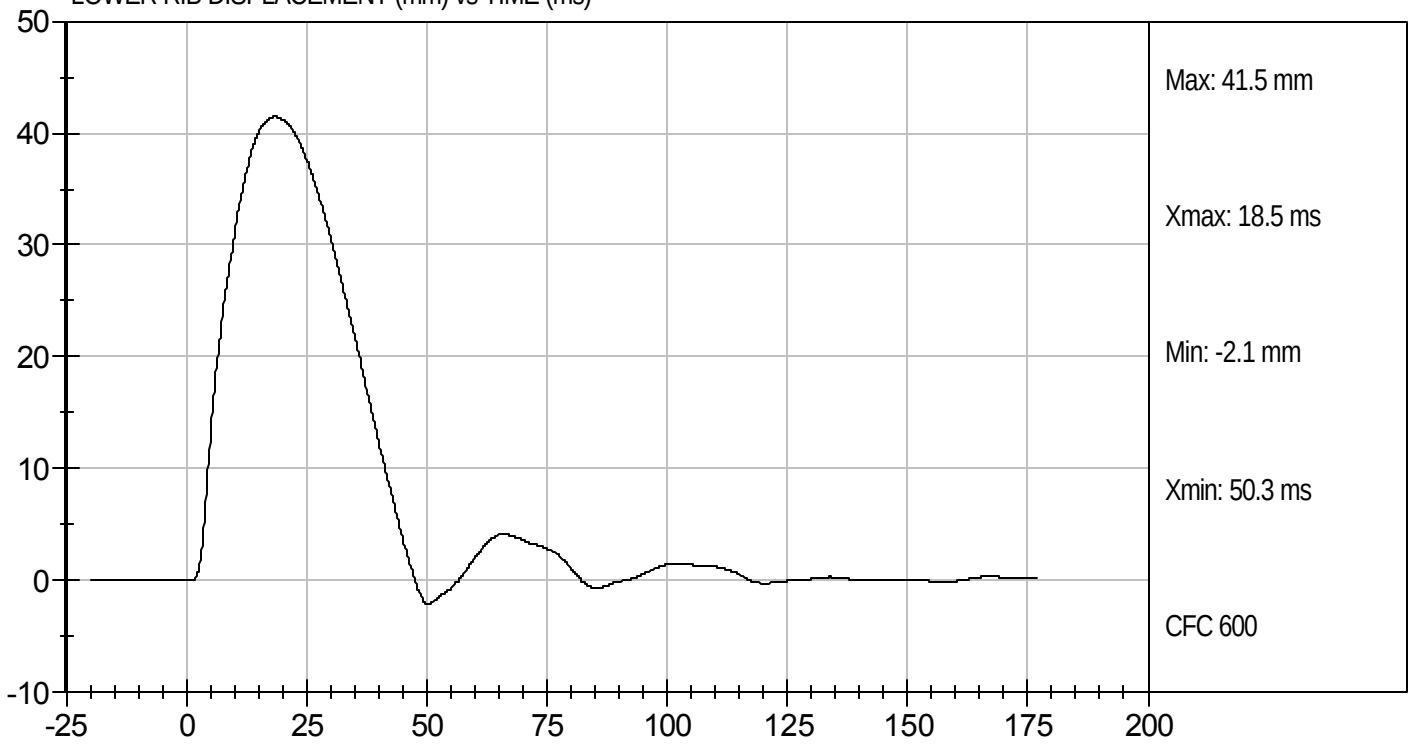
Test Desc: Thorax Impact
Component ID: D112130

Test Date: 6/20/11
Velocity: 18.31 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032 **Test ID:** D112701

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	125 to 155	154	Pass
Peak Lateral Acceleration	G's	+/- 15	-12.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

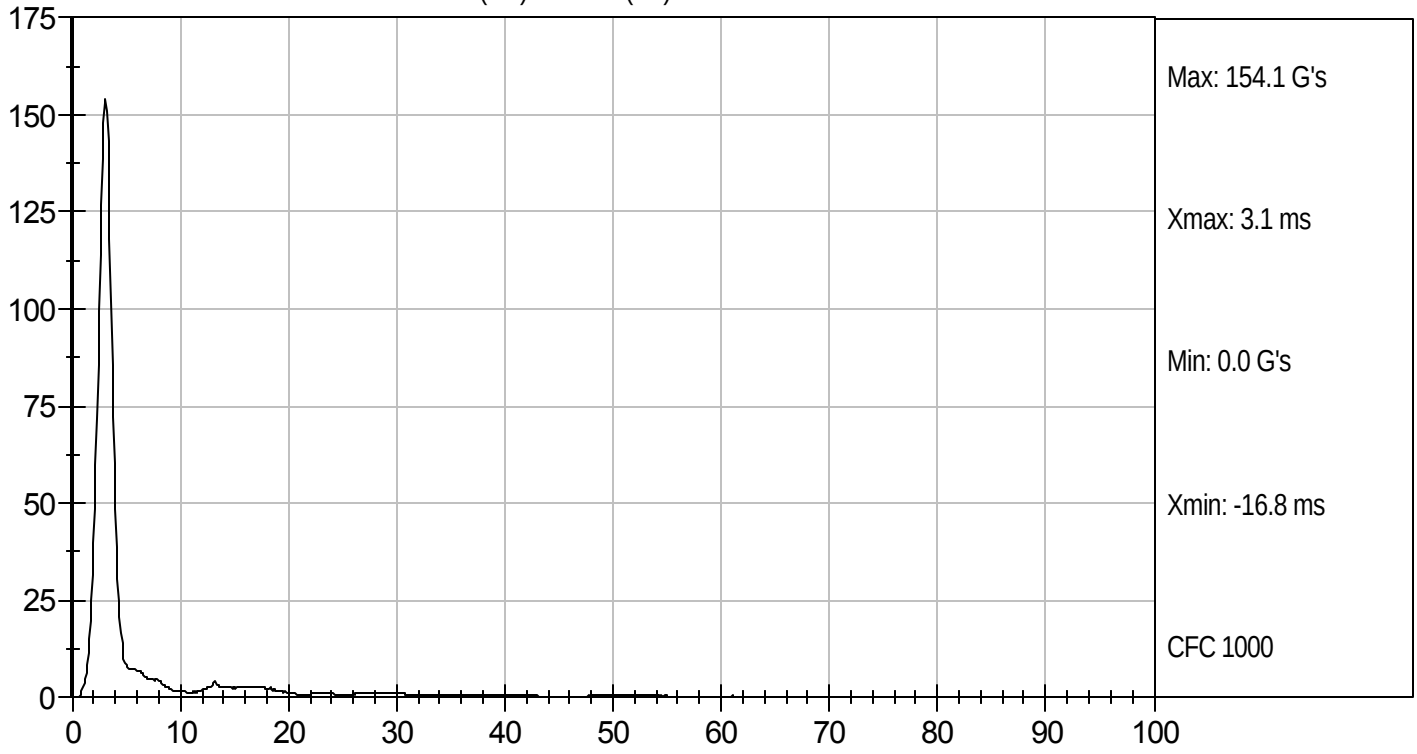
8/10/11
Test Date

David Winkelbauer
Approved By

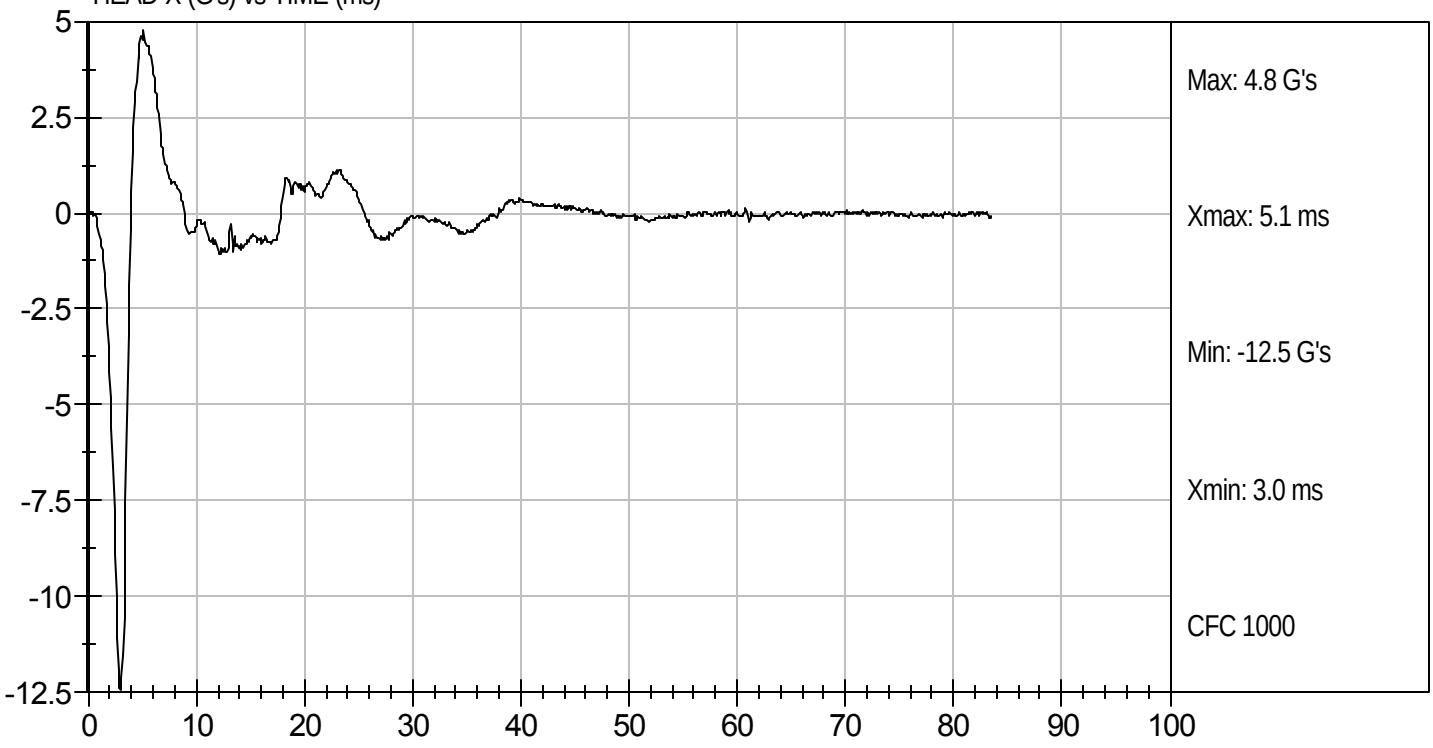
Test Desc: Head Drop
Component ID: D112701

Test Date: 8/10/11
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:** D112702

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	44	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.31	Pass
	14 ms	m/s	-3.20 to -3.70	-3.30	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	54.1	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	62.4	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	57.3	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

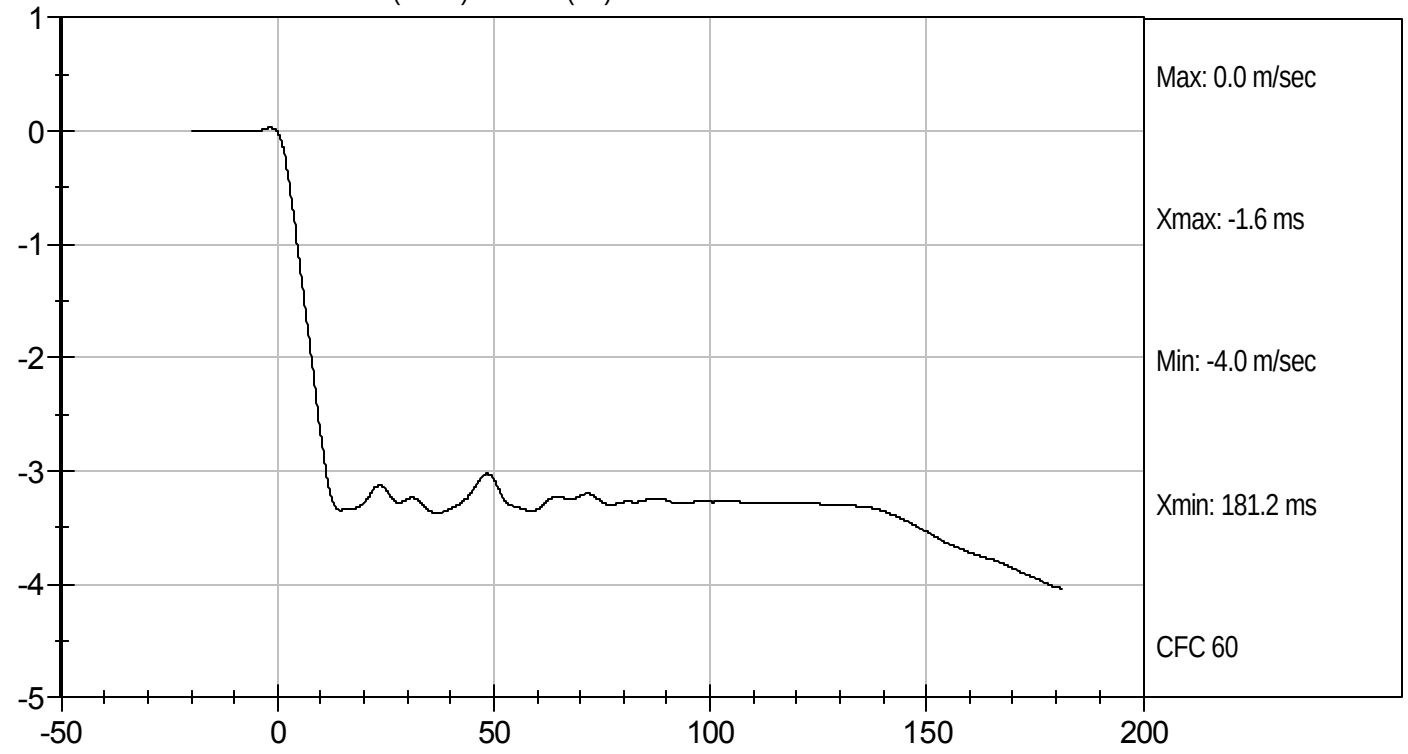
8/10/11
Test Date

David Winkelbauer
Approved By

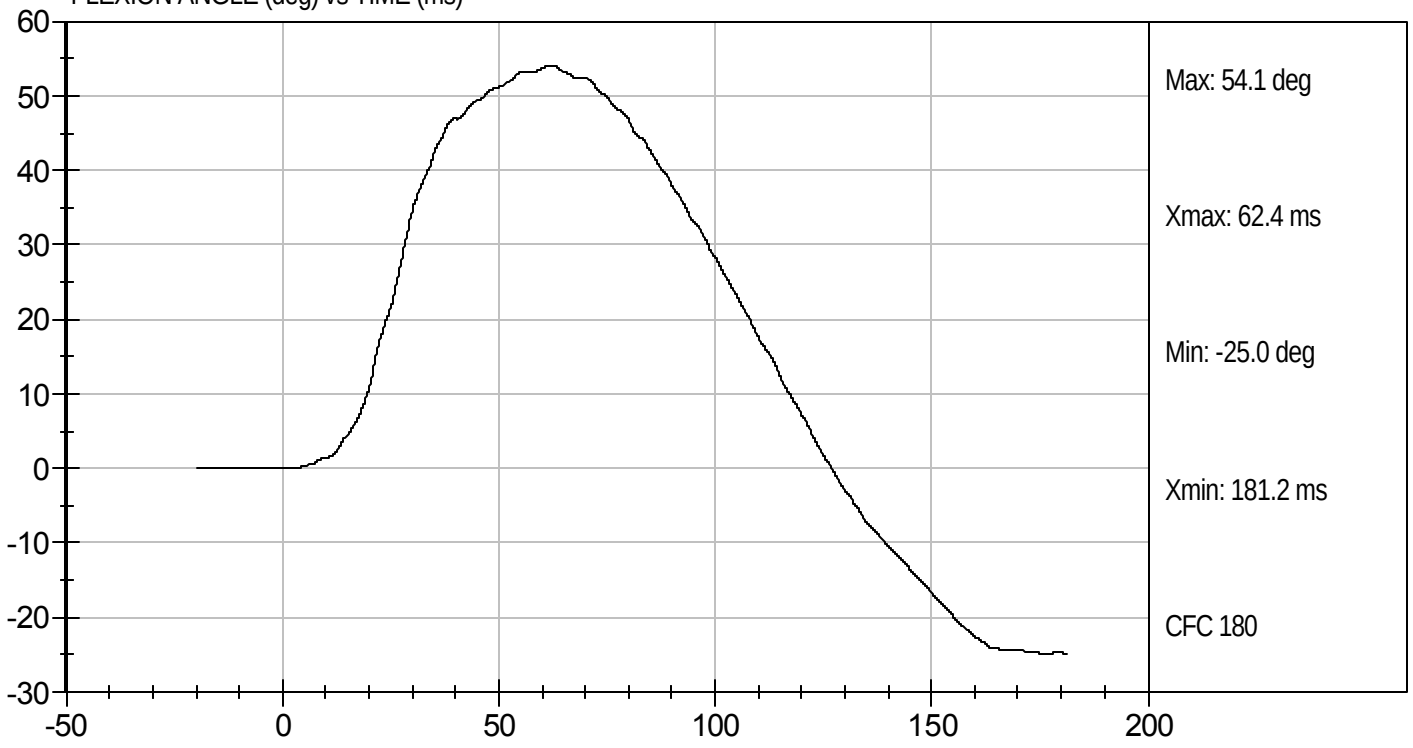
Test Desc: Neck Bending
Component ID: D112702

Test Date: 8/10/11
Velocity: 11.42 ft/s, 3.5 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

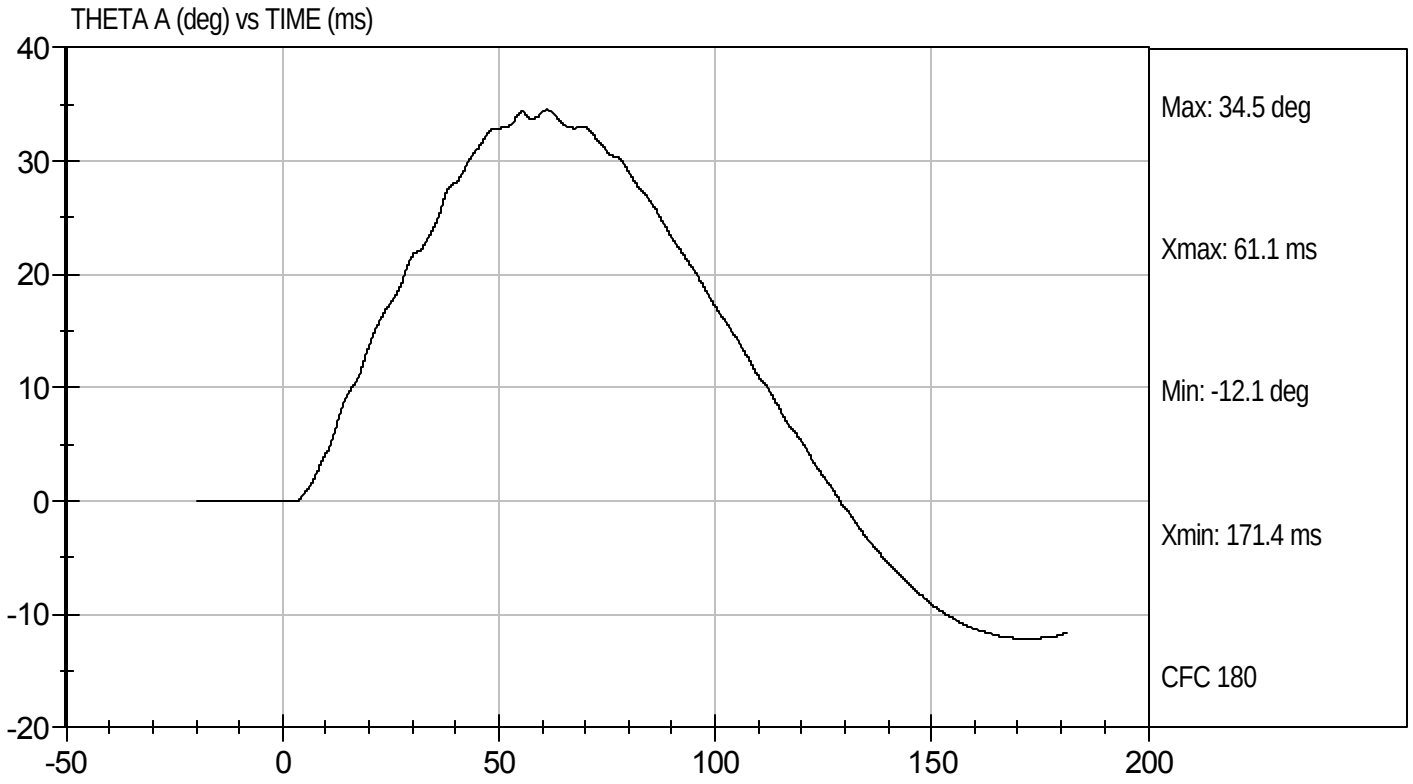


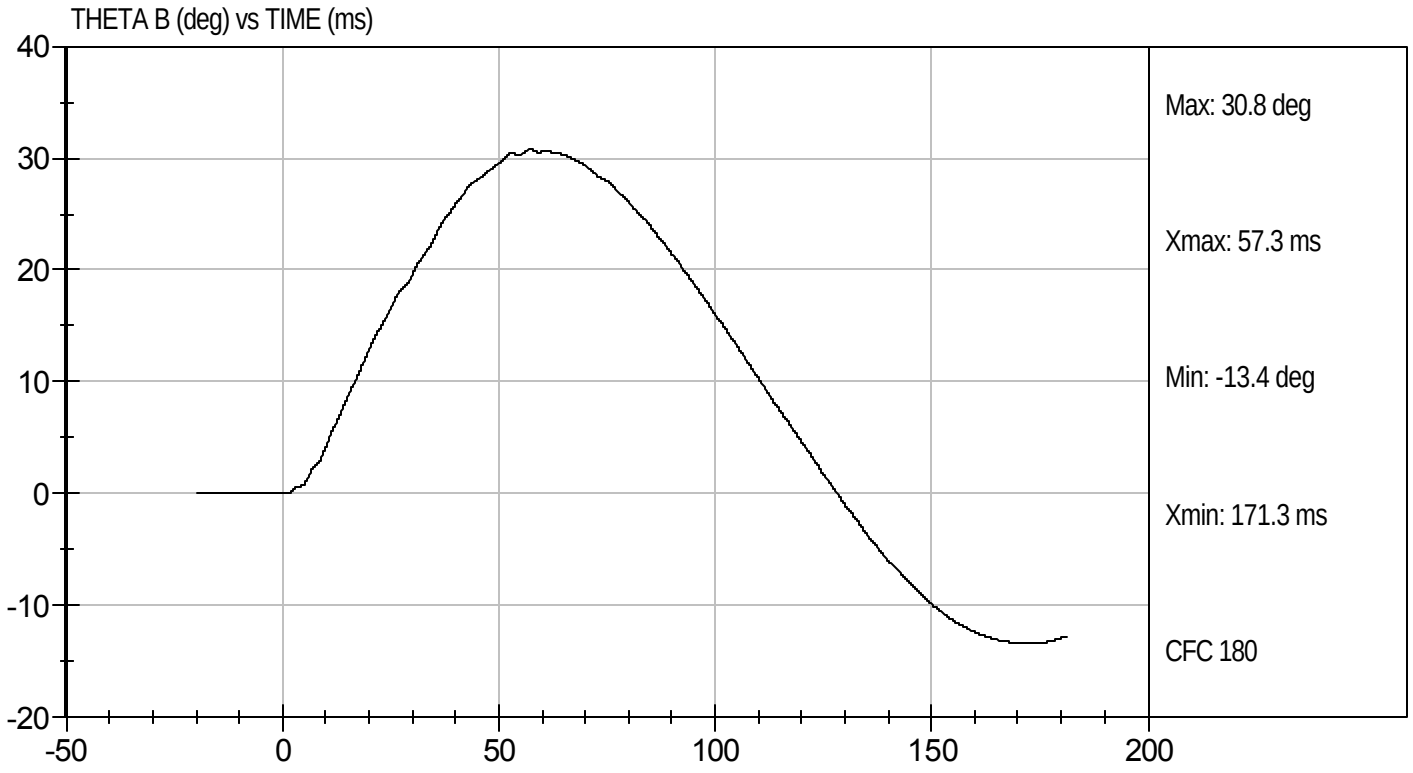
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D112702

Test Date: 8/10/11
Velocity: 11.42 ft/s, 3.5 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112703

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	44	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.5	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.4	Pass
		Overall Test Results		Pass

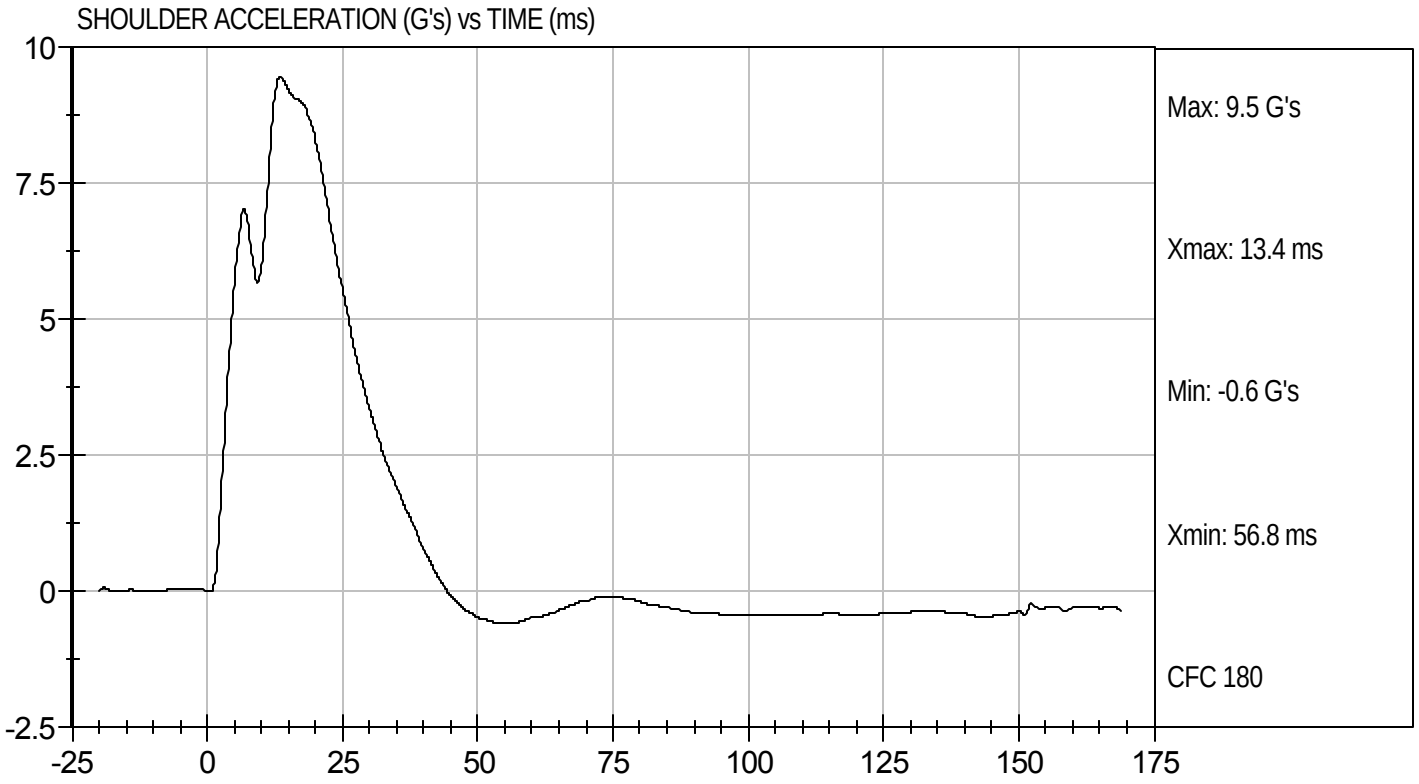
Jessica Hall
Laboratory Technician

8/10/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D112703

Test Date: 8/10/11
Velocity: 14.25 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112704

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	43	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.4	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	50.2	Pass
		Overall Test Results		Pass

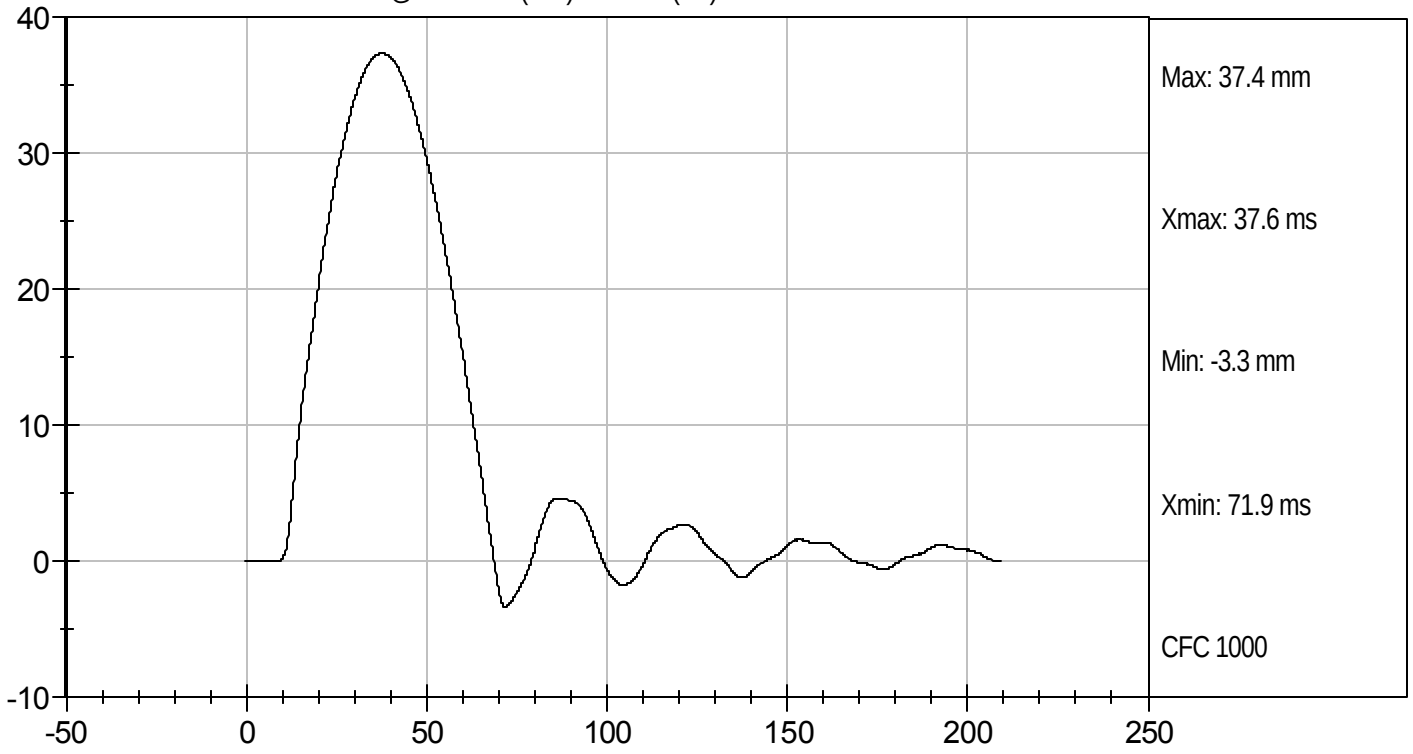
Jessica Hall
Laboratory Technician

8/10/11
Test Date

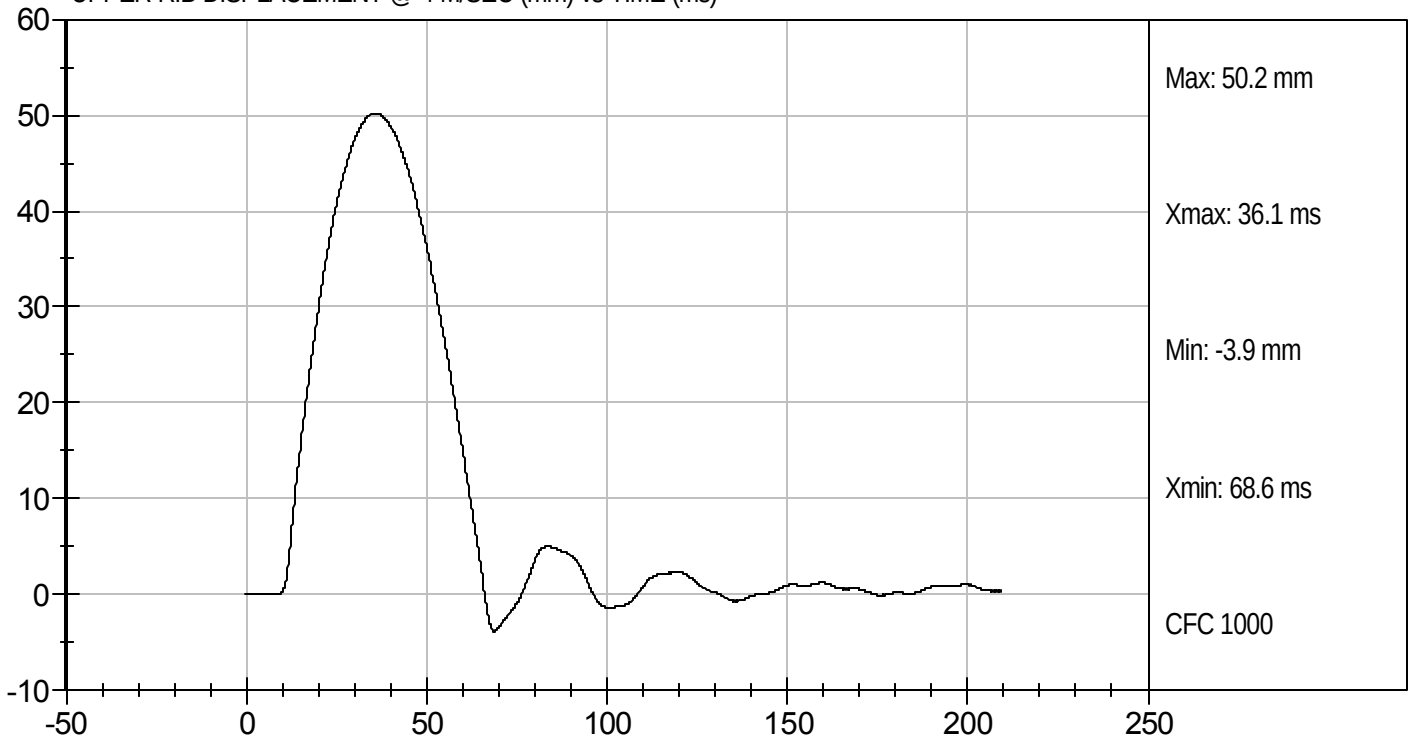
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D112704
Test Date: 8/10/11

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:** D112705

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

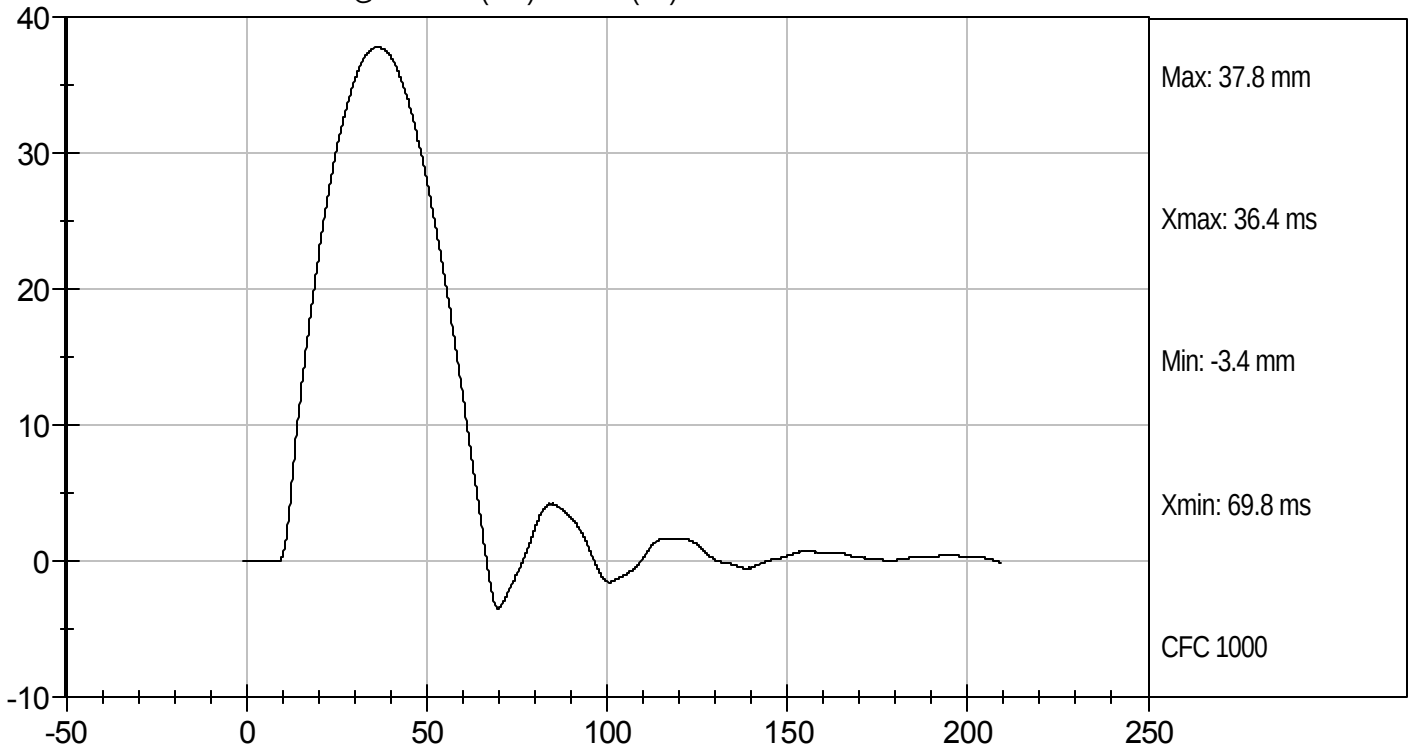
Jessica Gall
Laboratory Technician

8/10/11
Test Date

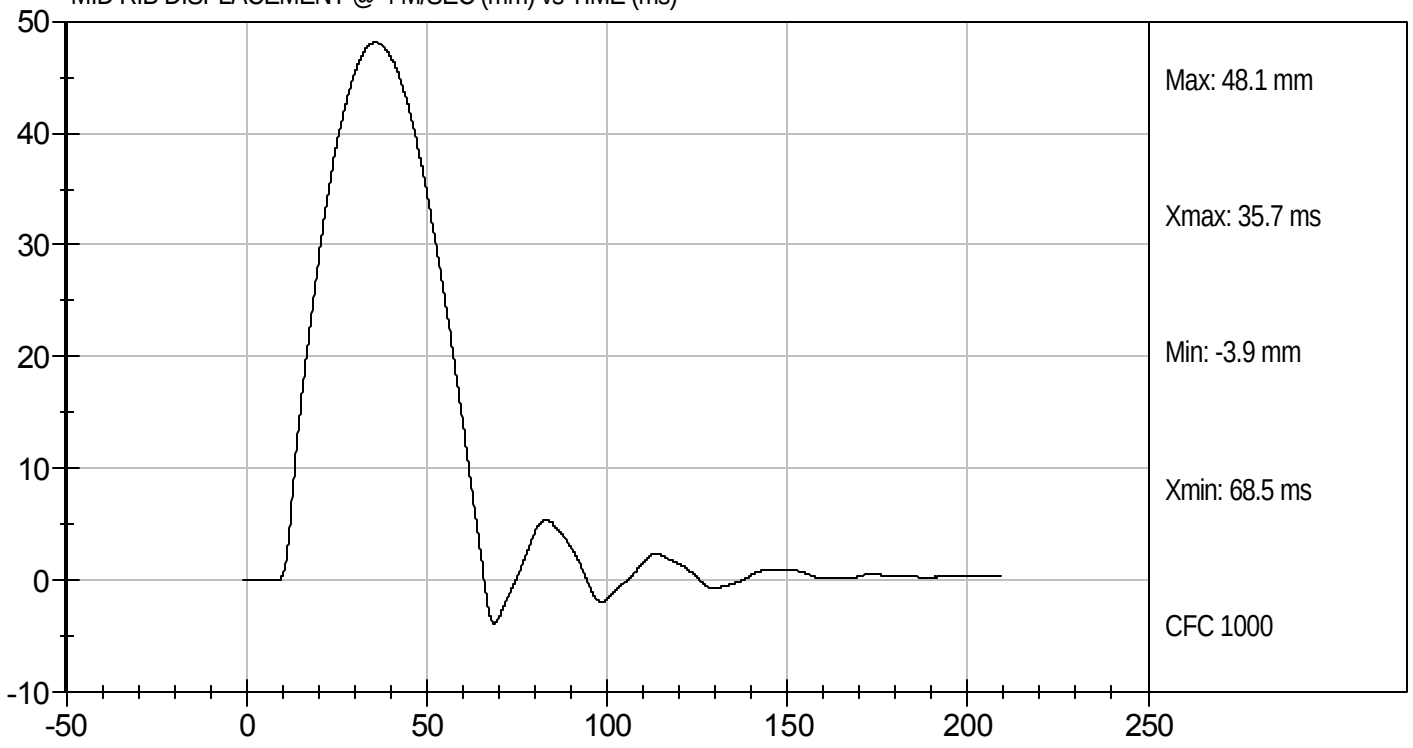
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D112705
Test Date: 8/10/11

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:** D112706

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	43	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.1	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.3	Pass
		Overall Test Results		Pass

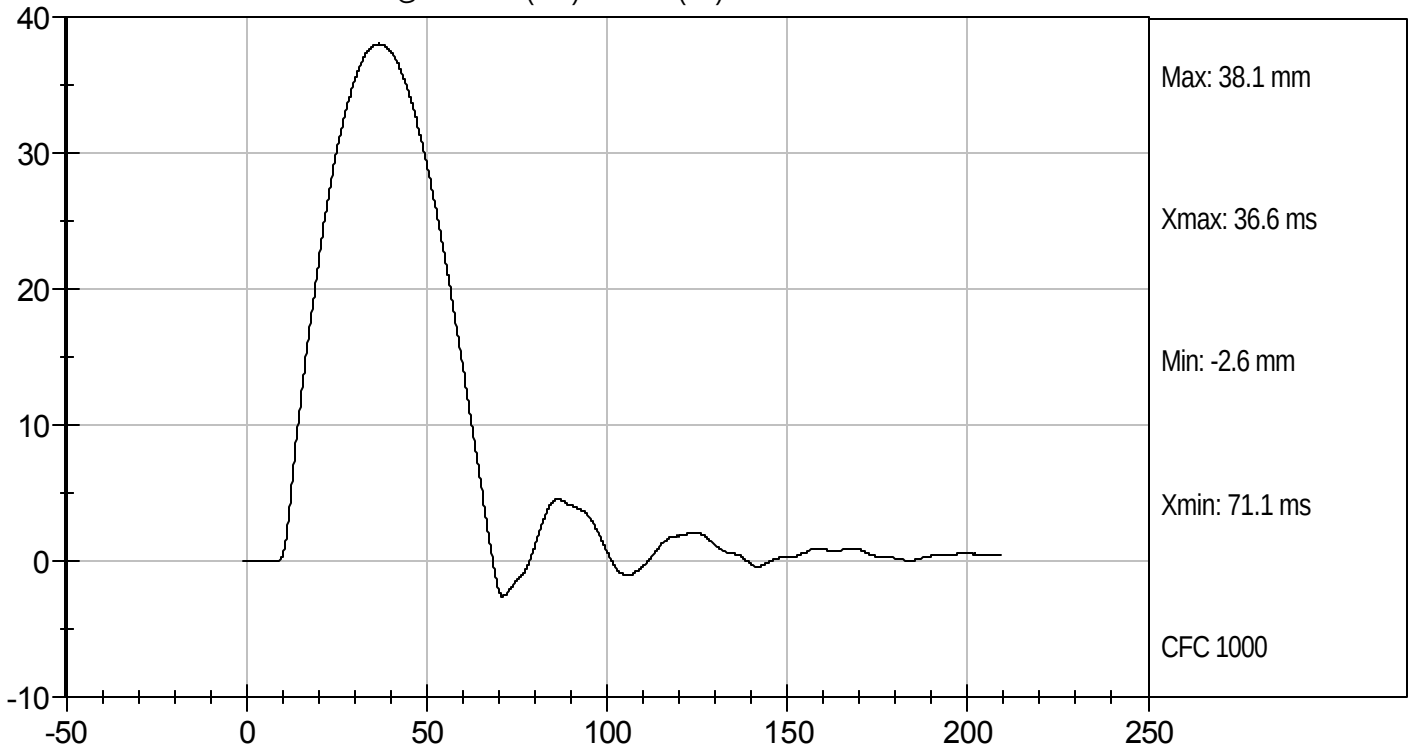
Jessica Hall
Laboratory Technician

8/10/11
Test Date

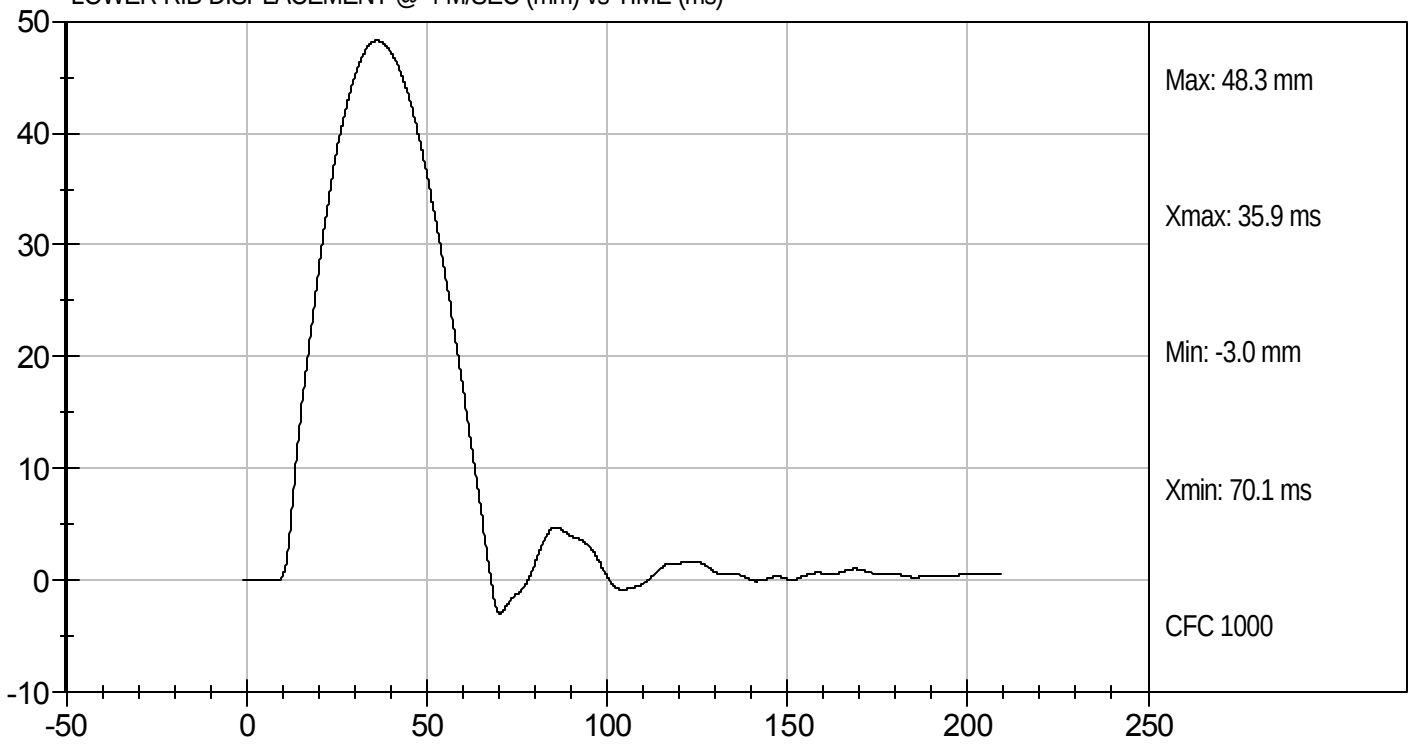
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D112706
Test Date: 8/10/11

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:** D112707

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	44	Pass
Probe Speed	m/s	3.90 to 4.10	4.03	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.05	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.10	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.35	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.80	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

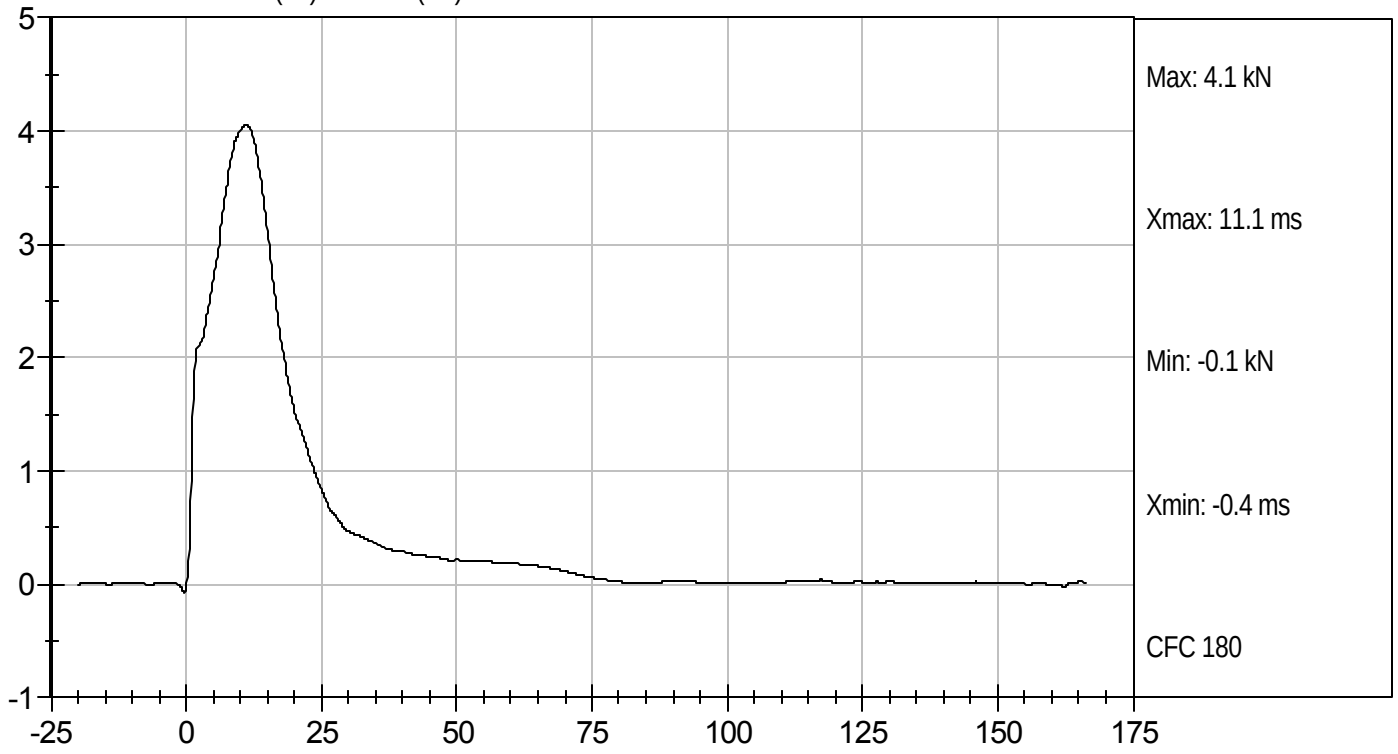
8/10/11
Test Date

David Winkelbauer
Approved By

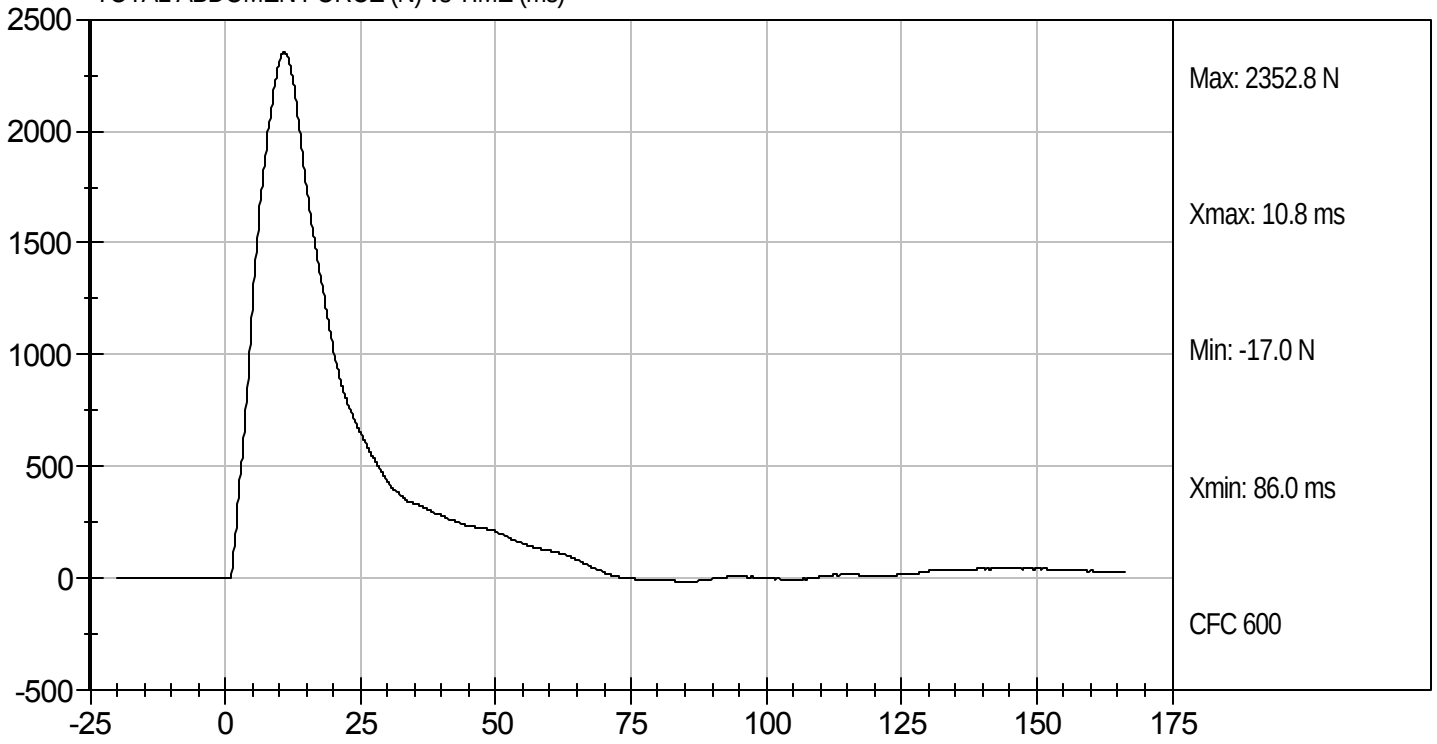
Test Desc: Abdomen Impact
Component ID: D112707

Test Date: 8/10/11
Velocity: 13.23 ft/s, 4.03 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112708

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	44	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.42	Pass
	27 ms	m/s	-6.50 to -5.80	-5.81	Pass
	30 ms	m/s	>= -6.5	-6.29	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	46.5	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	44.1	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	44	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

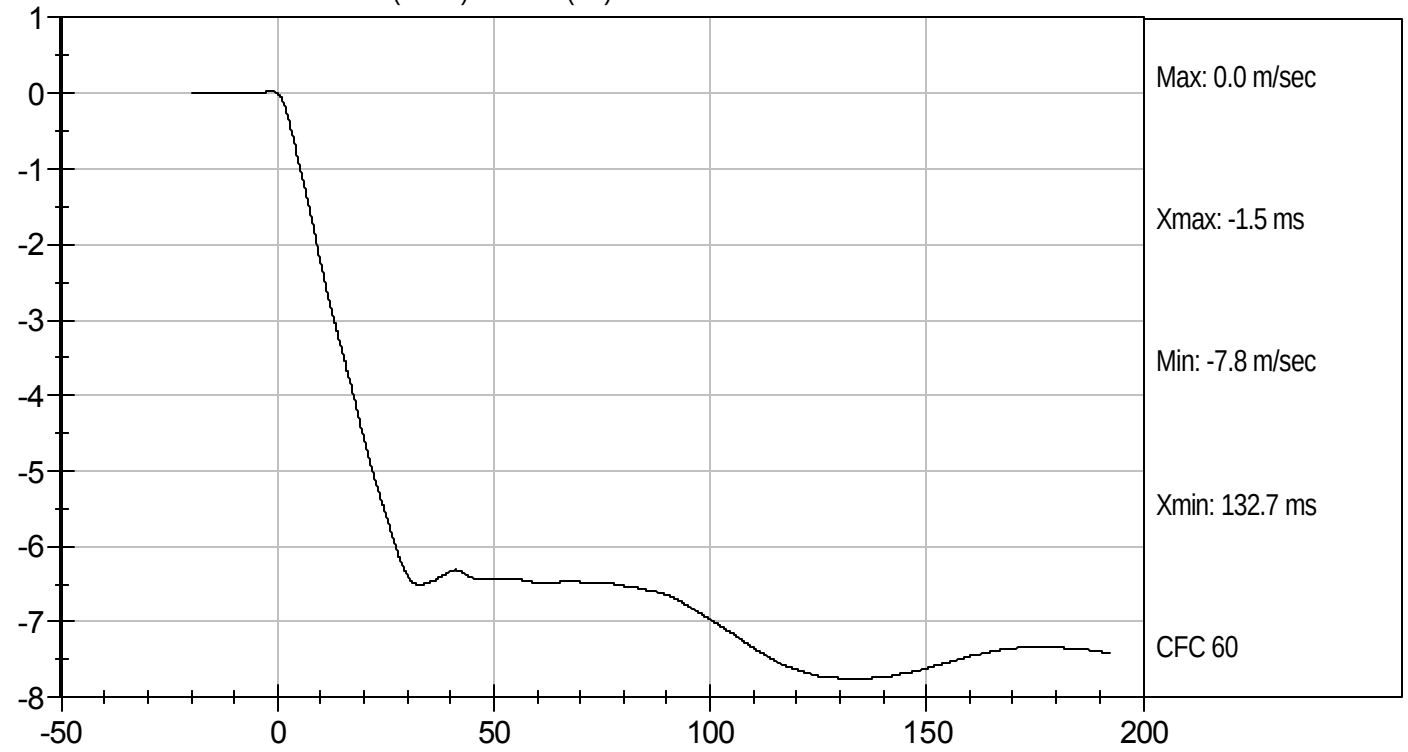
8/10/11
Test Date

David Winkelbauer
Approved By

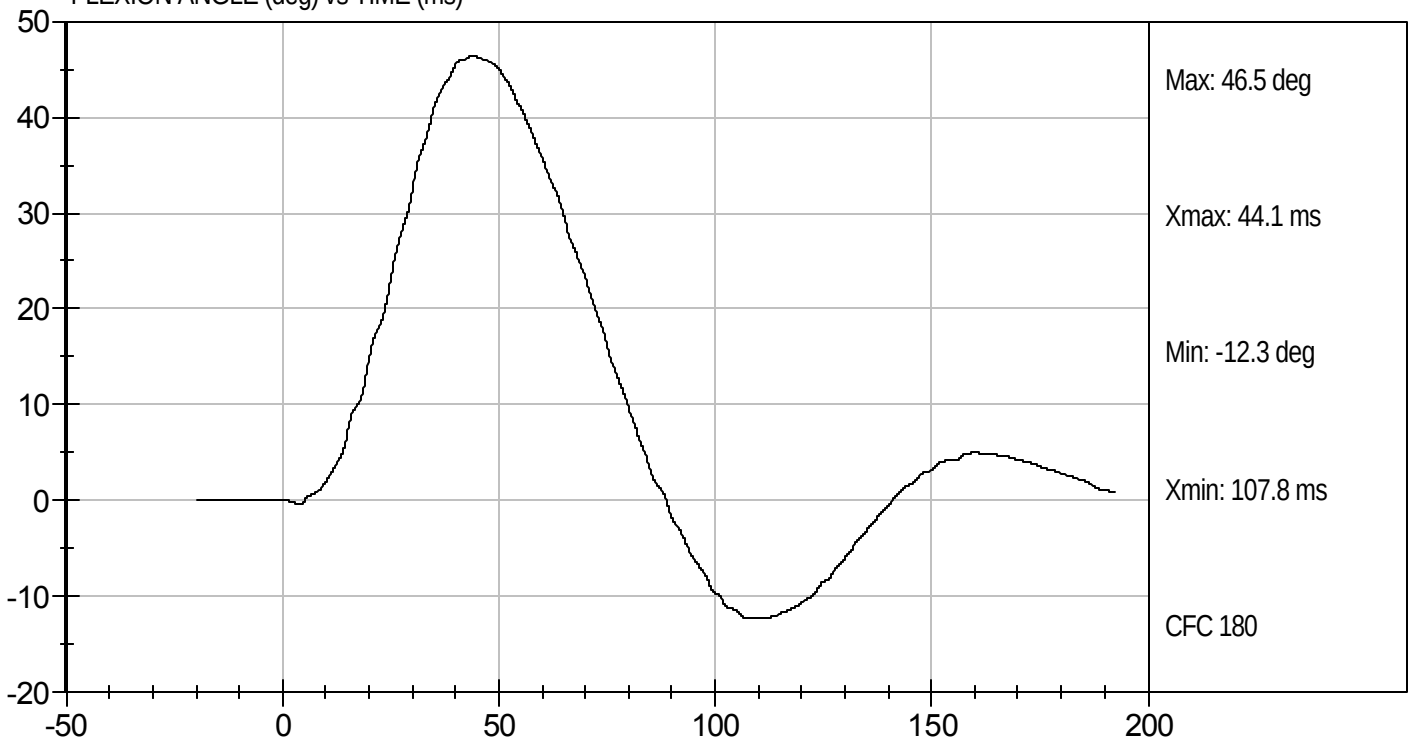
Test Desc: Lumbar Bending
Component ID: D112708

Test Date: 8/10/11
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

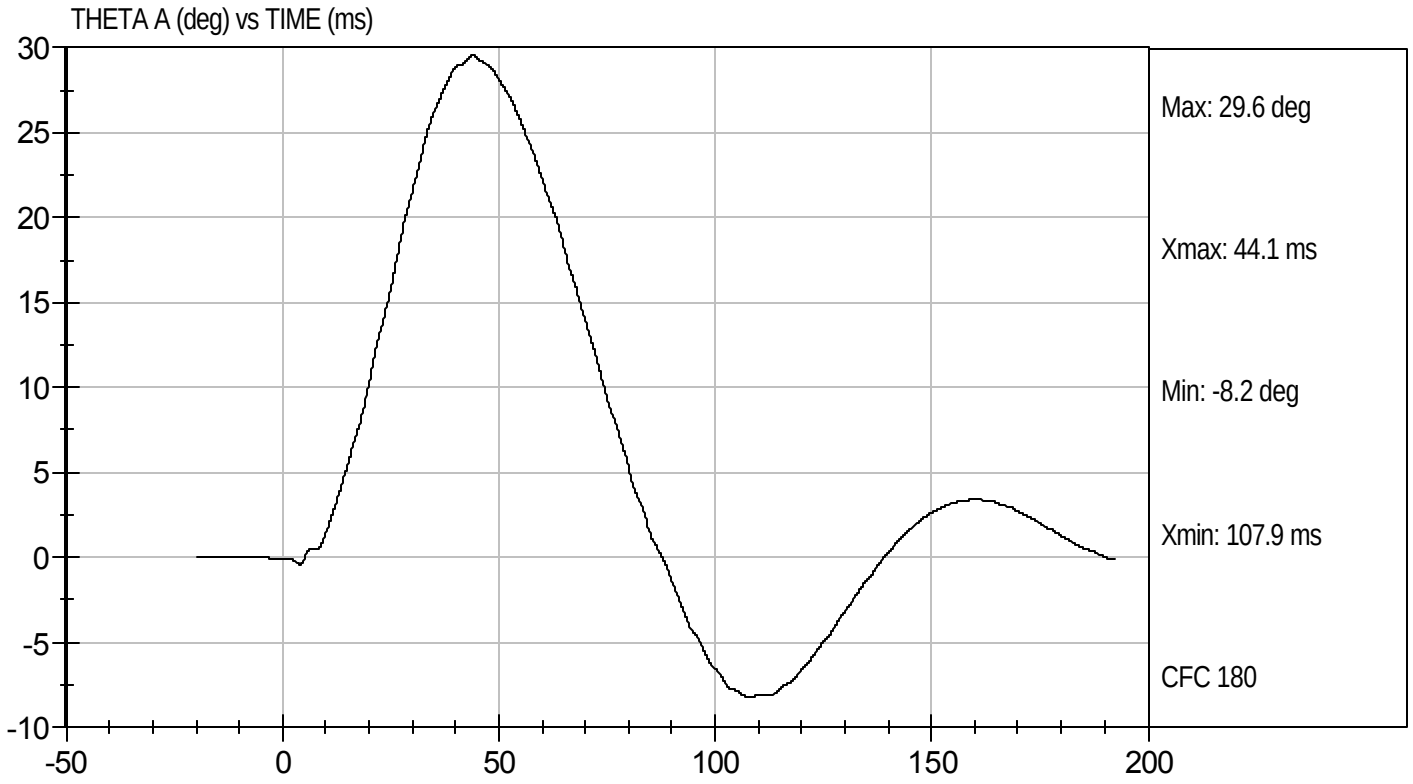


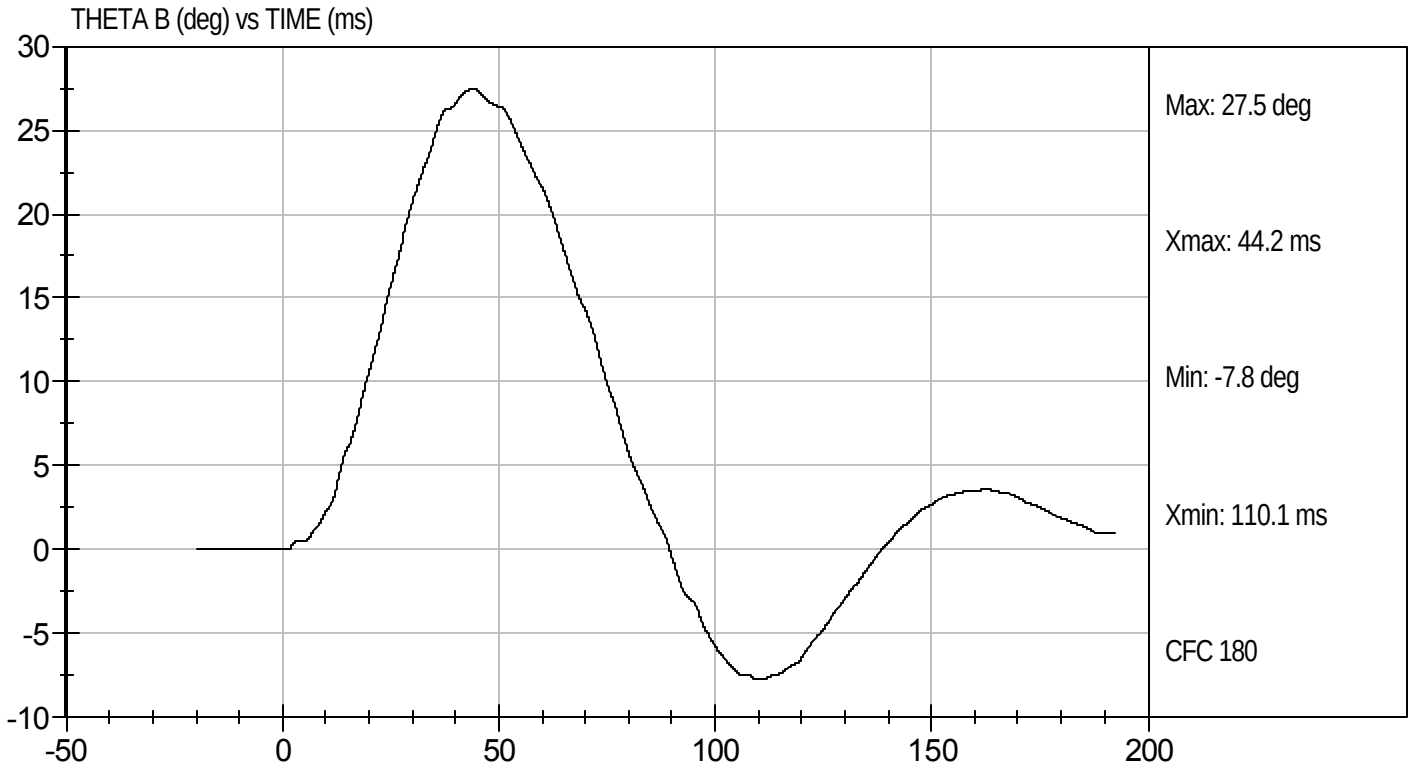
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D112708

Test Date: 8/10/11
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112709

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	43	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.76	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.60	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.37	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	15.10	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

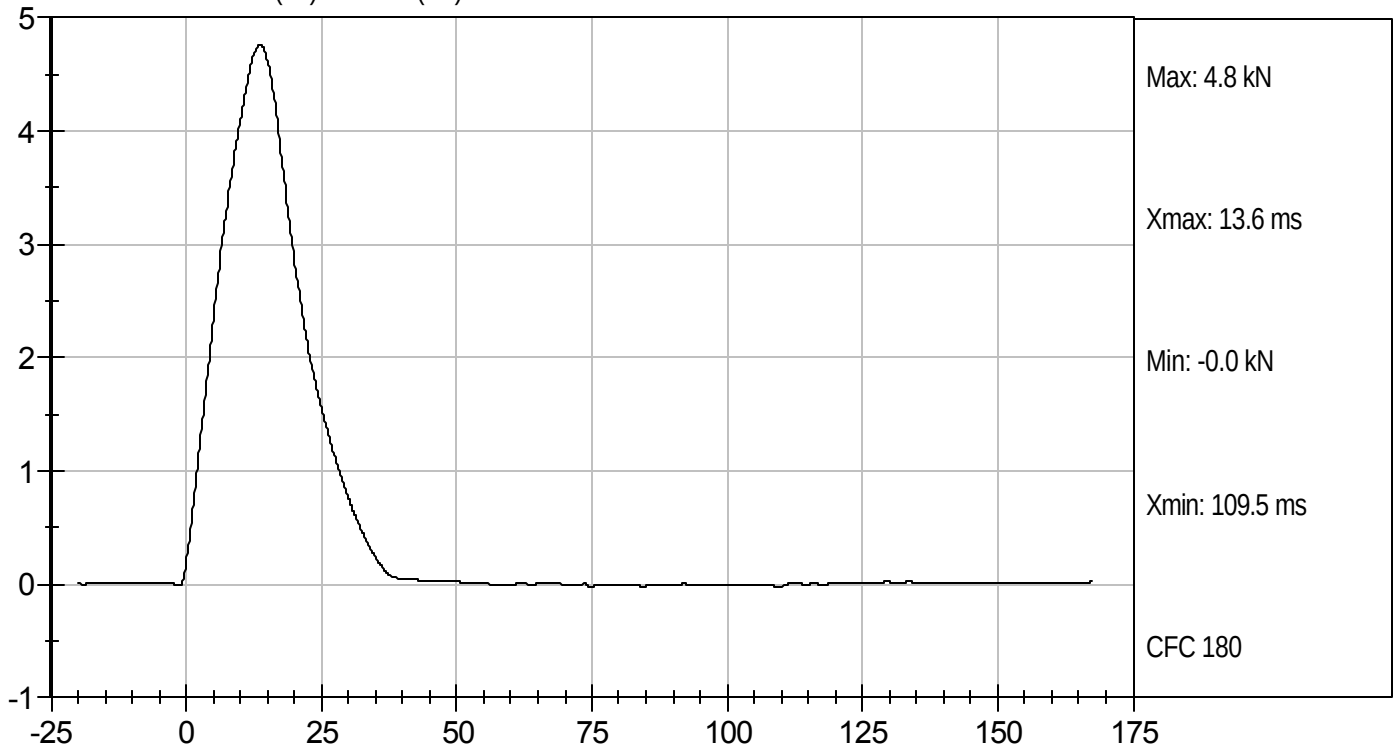
8/10/11
Test Date

David Winkelbauer
Approved By

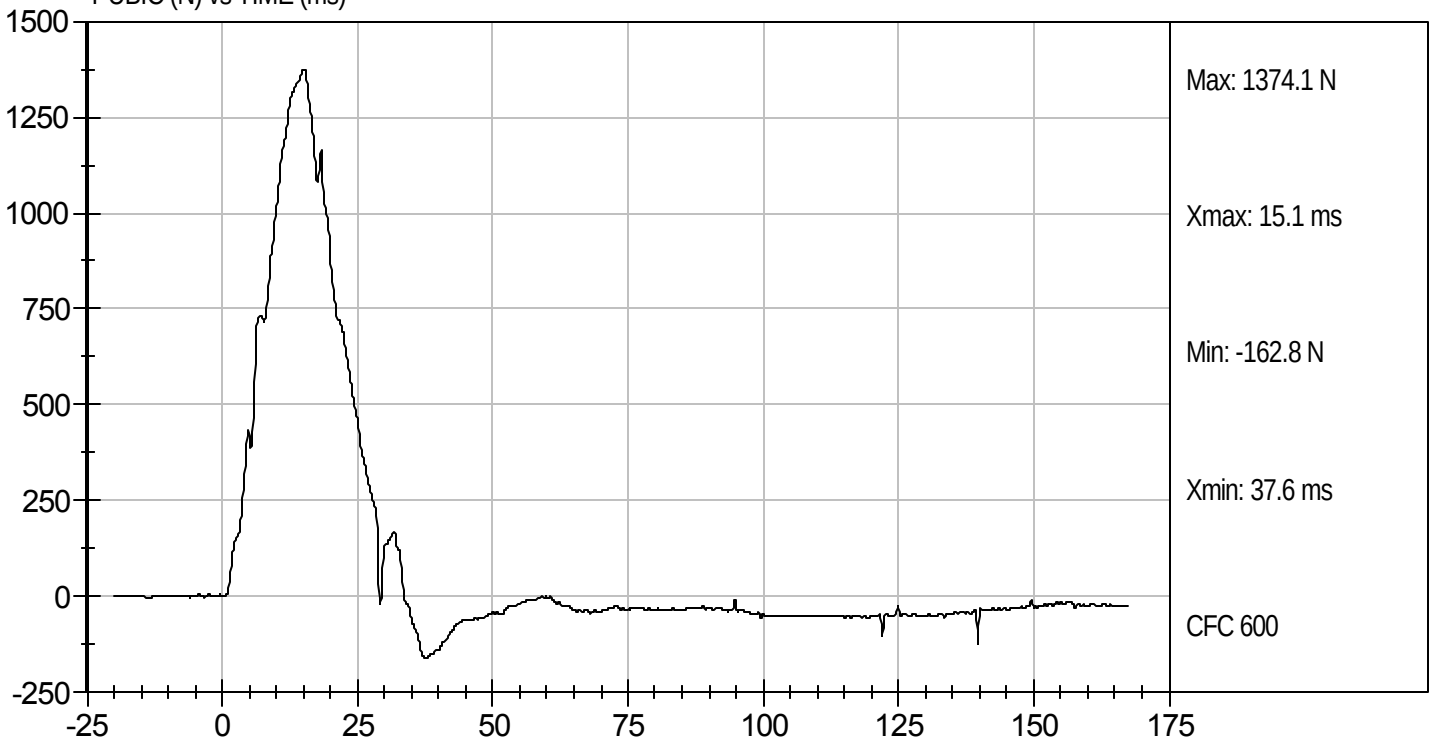
Test Desc: Pelvis Impact
Component ID: D112709

Test Date: 8/10/11
Velocity: 14.12 ft/s, 4.30 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D112700

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.21	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.9	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.5	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.4	Pass
		Overall Test Results		Pass

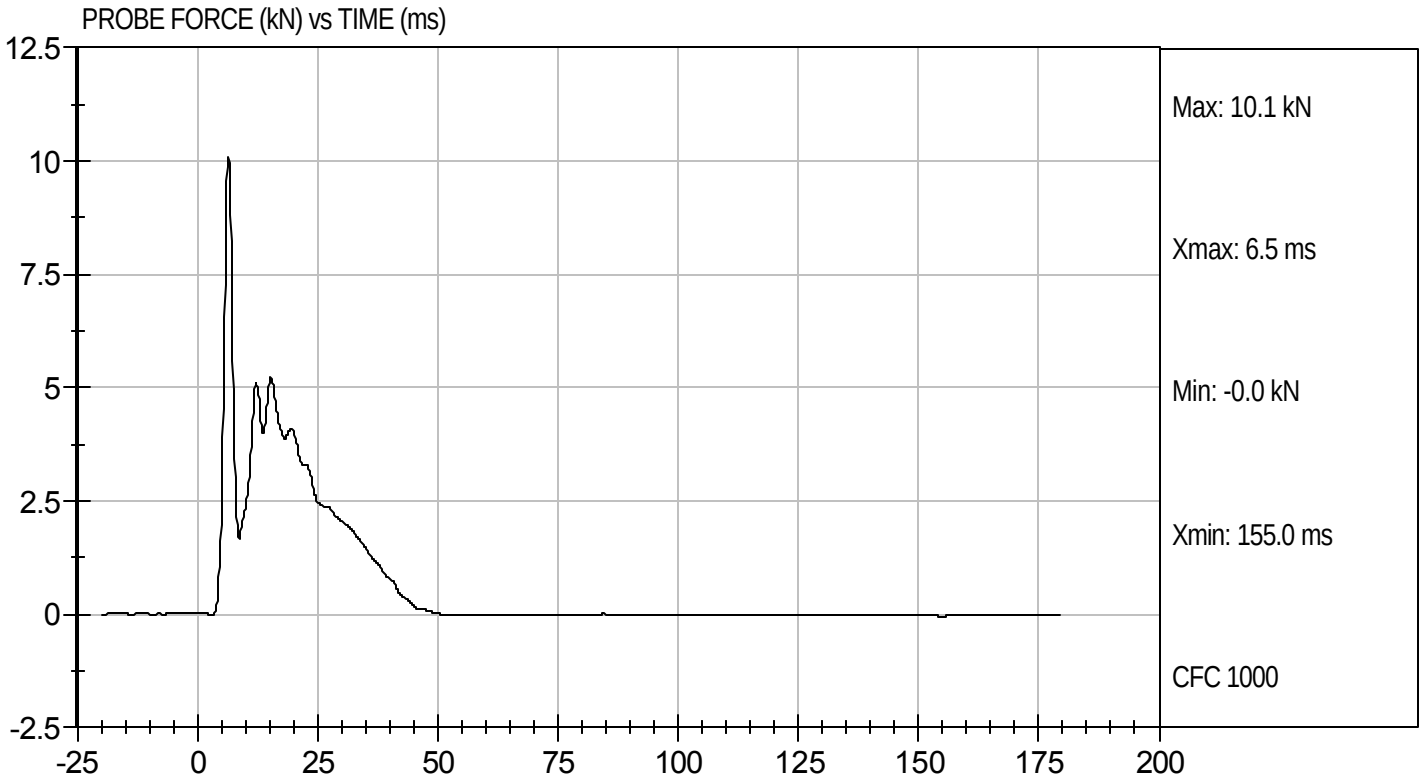
Jessica Hall
Laboratory Technician

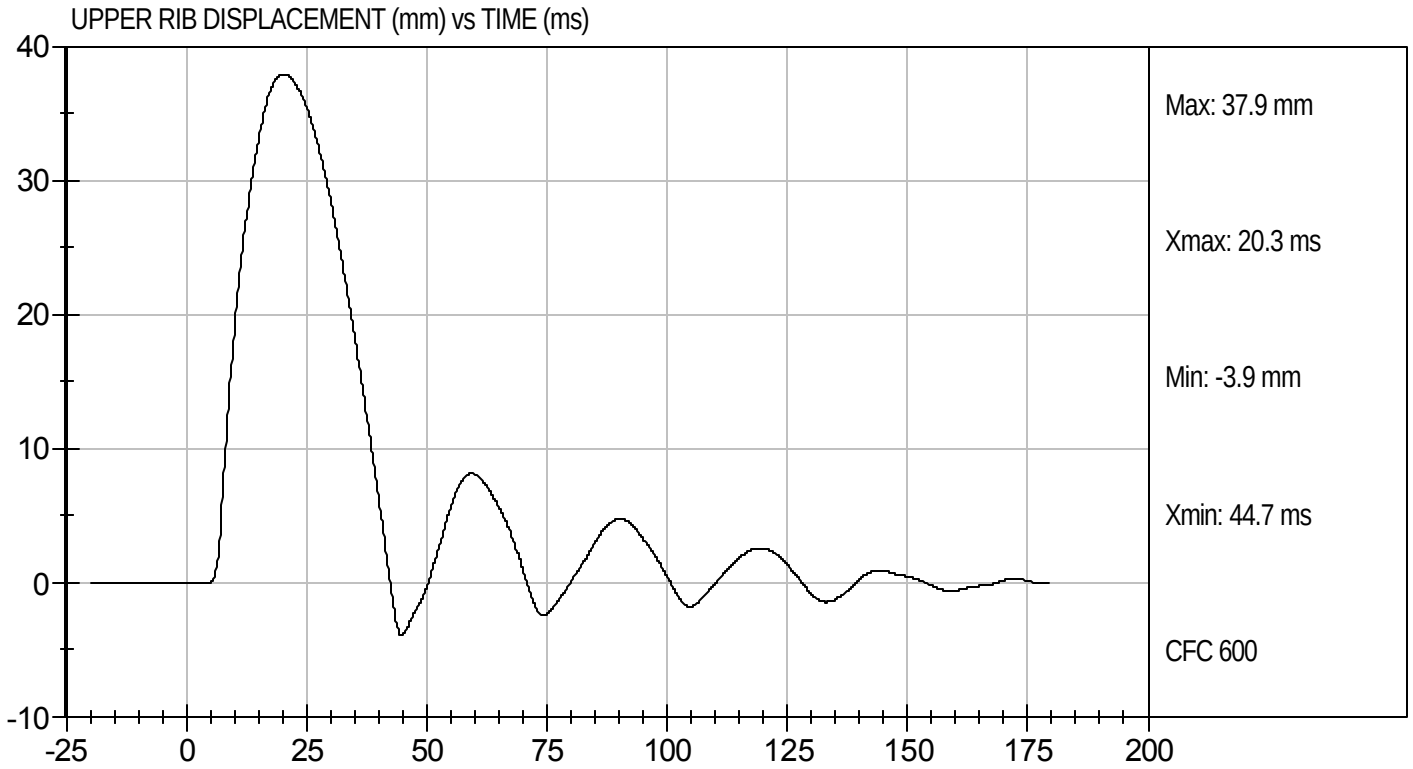
8/10/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D112700

Test Date: 8/10/11
Velocity: 18.32 ft/s, 5.58 m/s

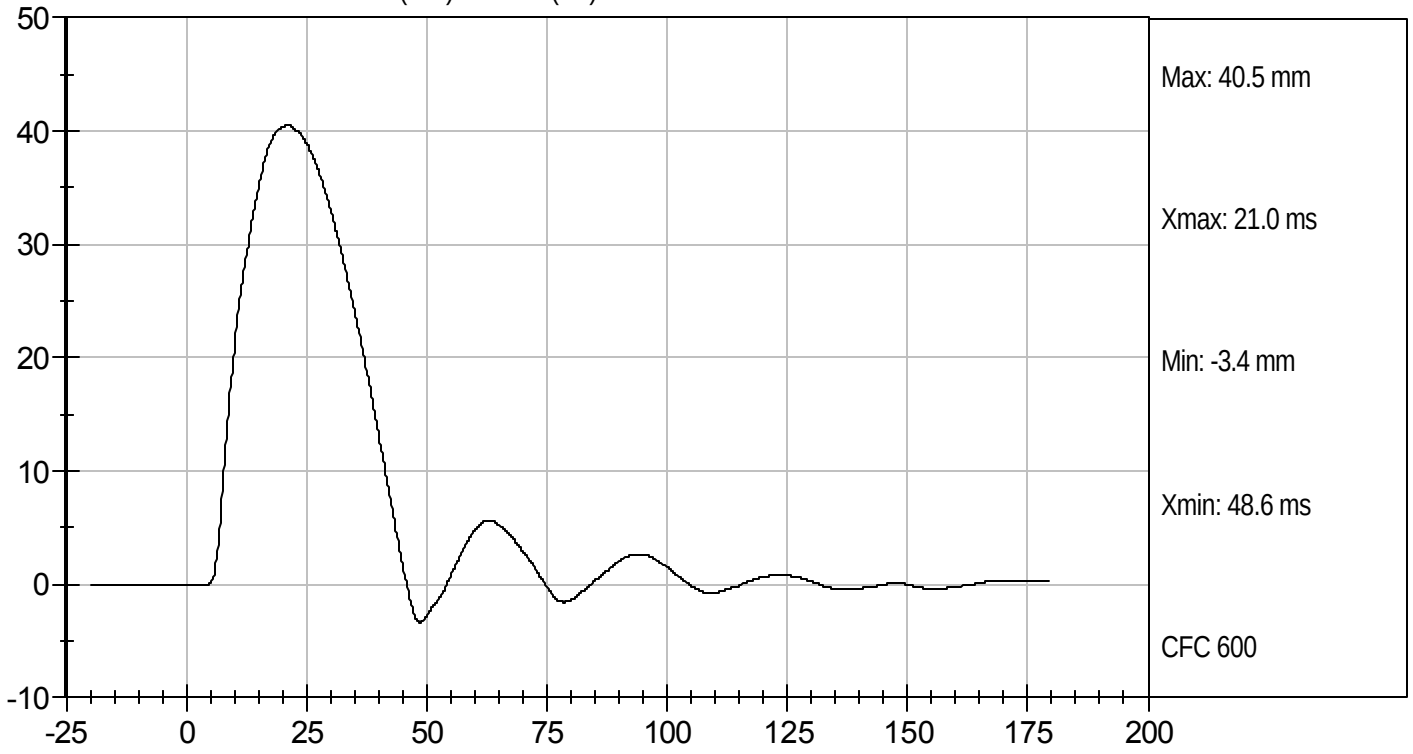




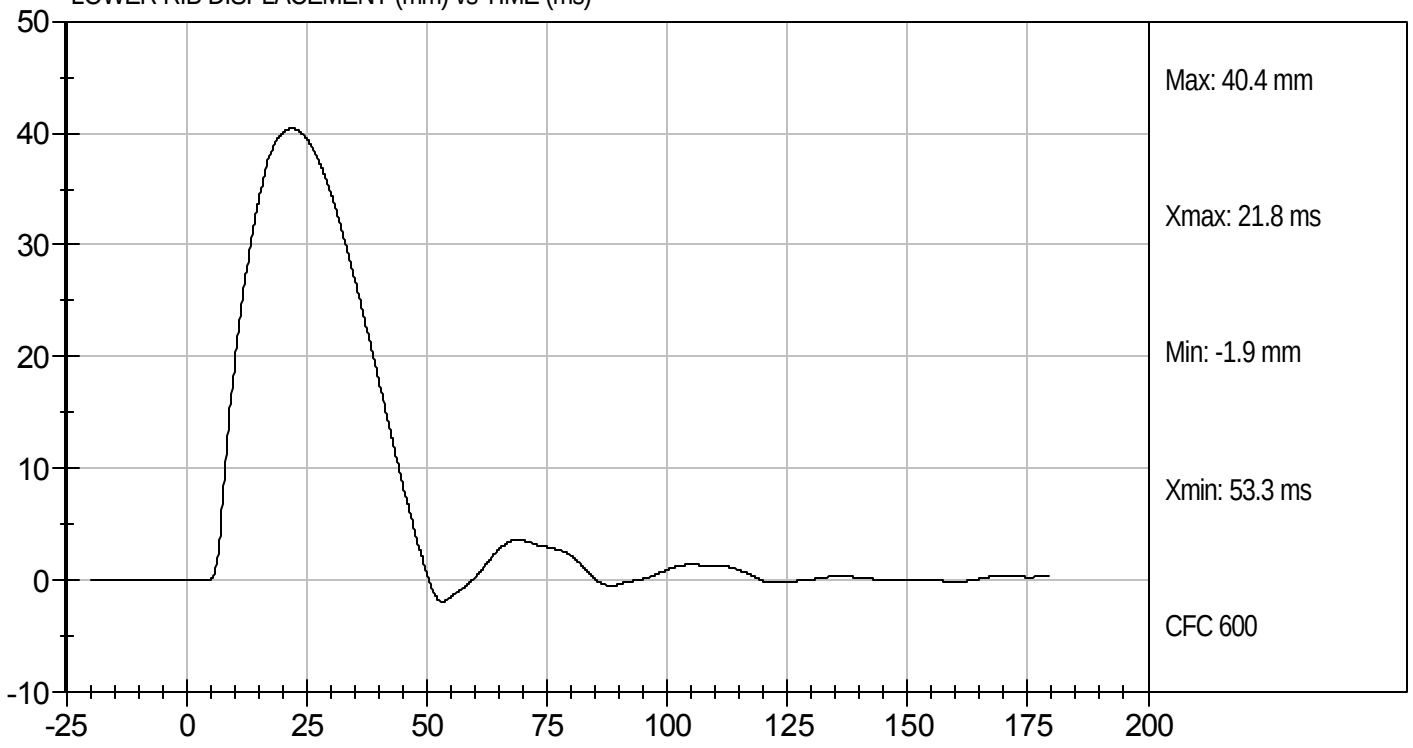
Test Desc: Thorax Impact
Component ID: D112700

Test Date: 8/10/11
Velocity: 18.32 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D112141

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	49	Pass
Peak Resultant Acceleration	G's	115 to 137	119	Pass
Peak Lateral Acceleration	G's	+/- 15	-1.9	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

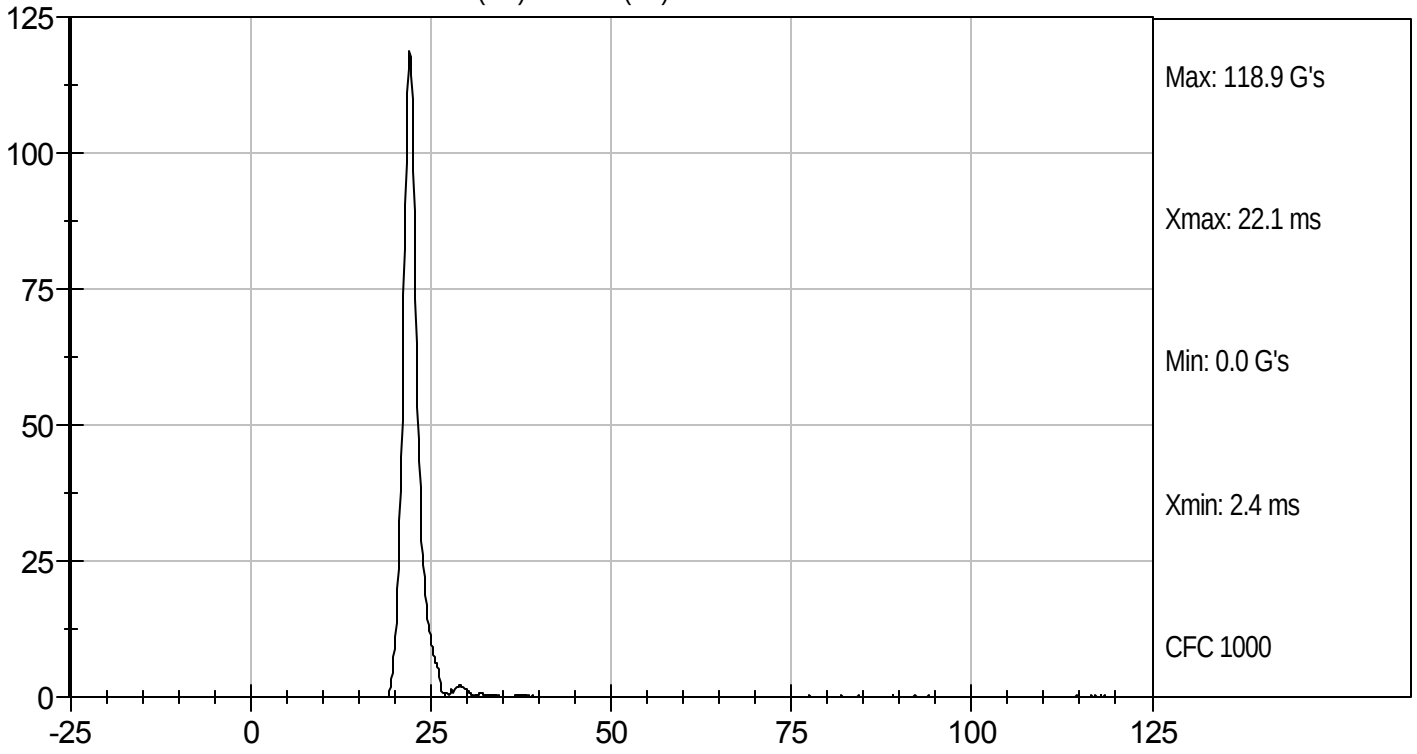
6/17/11
Test Date

David Winkelbauer
Approved By

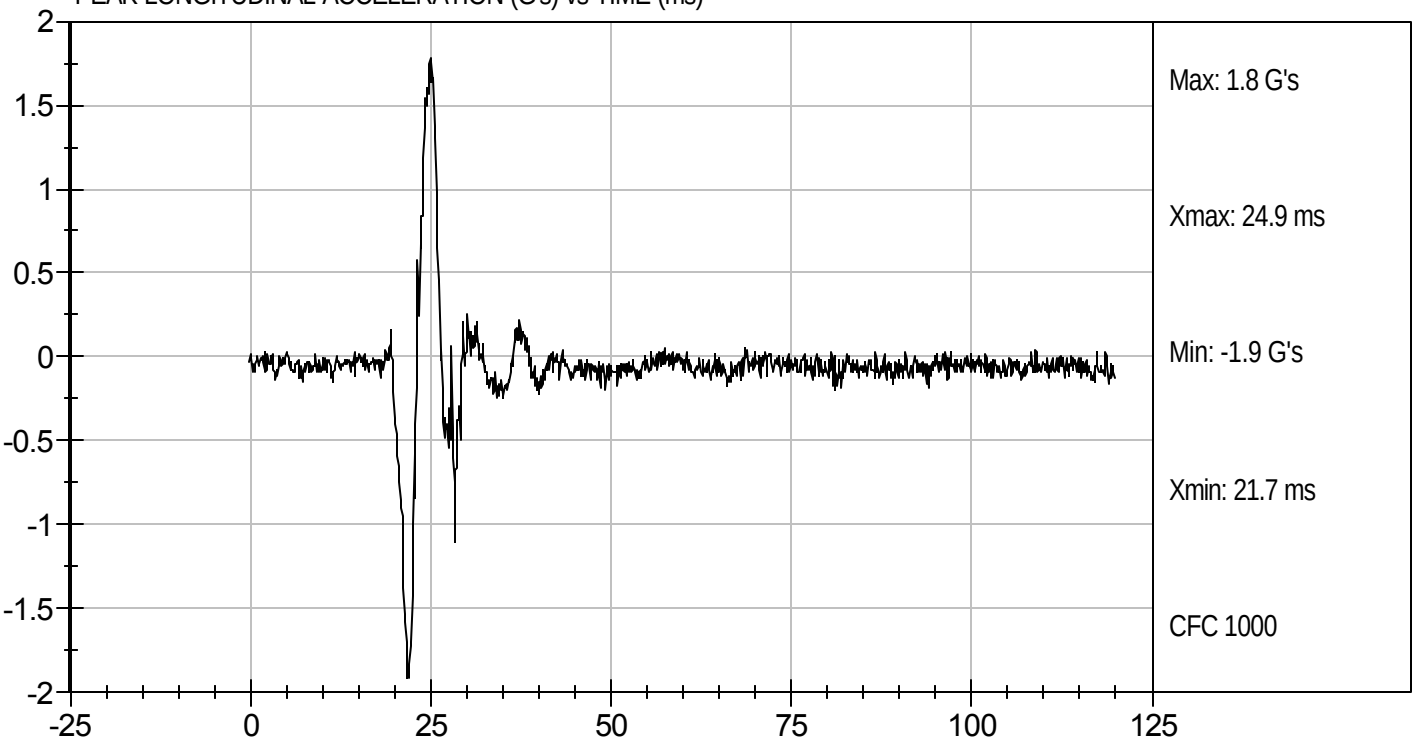
Test Desc: Head Drop
Component ID: D112141

Test Date: 6/17/11
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: 306 **Test I.D:** D112142

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.5	Pass
Humidity		%	10 to 70	54	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.39	Pass
	15 ms	m/s	3.30 to 4.10	3.37	Pass
	20 ms	m/s	4.40 to 5.40	4.51	Pass
	25 ms	m/s	5.40 to 6.10	5.41	Pass
	25-100 ms	m/s	5.50 to 6.20	5.54	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	58	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

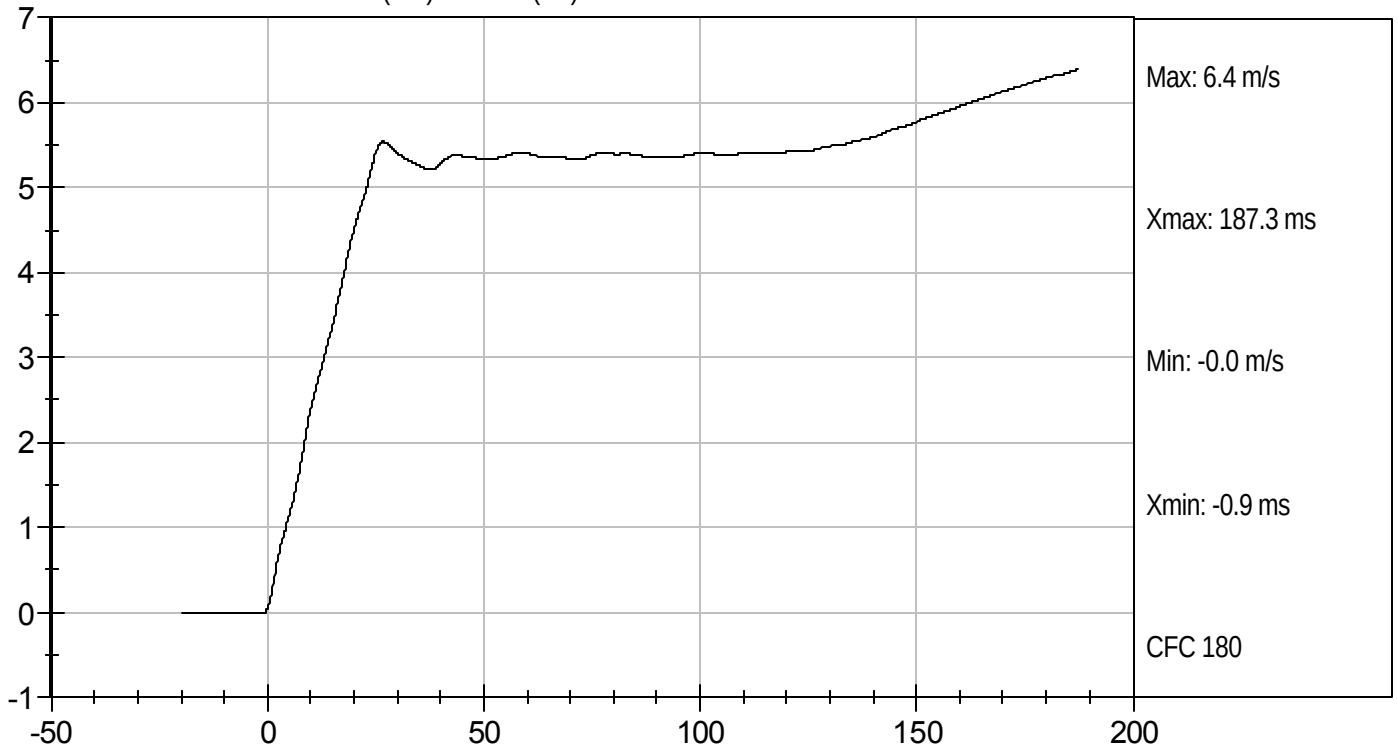
6/20/11
Test Date

David Winkelbauer
Approved By

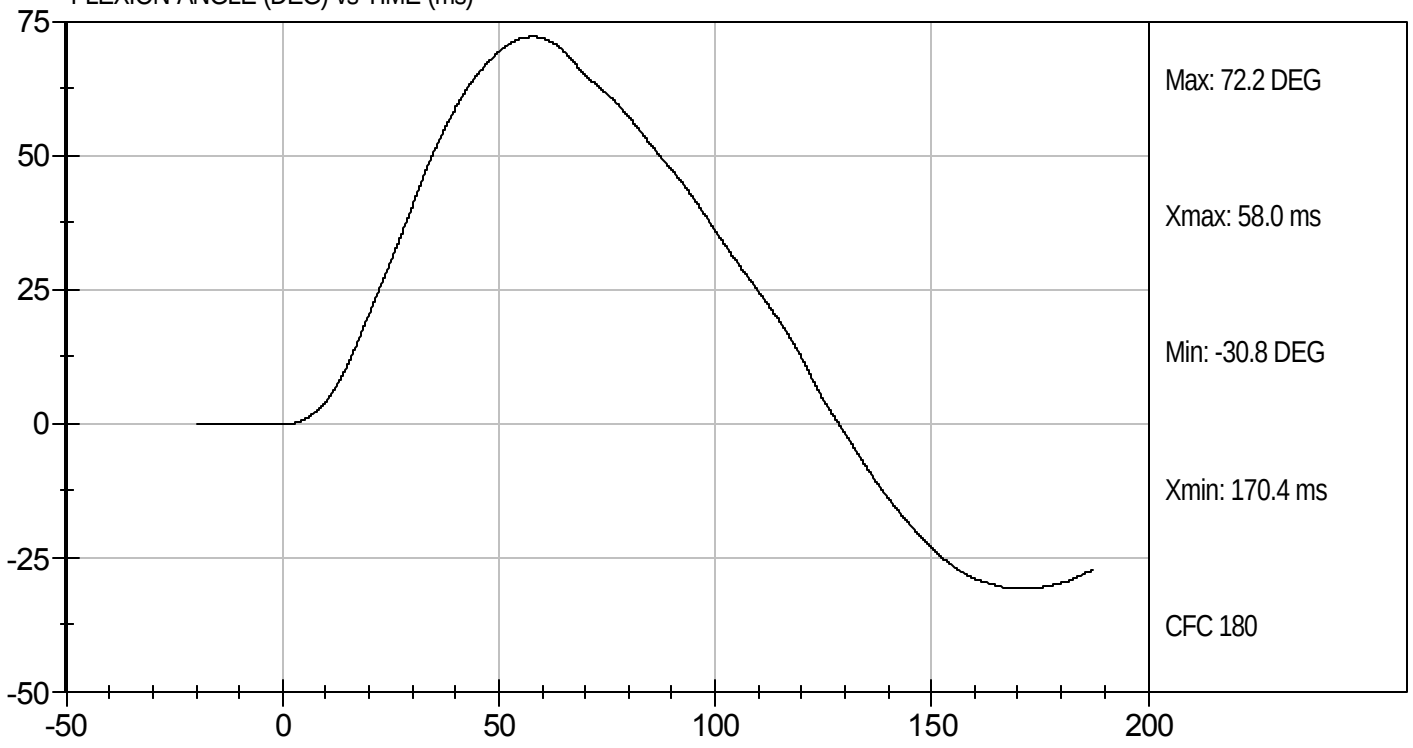
Test Desc: Neck Bending
Component ID: D112142

Test Date: 6/20/11
Velocity: 18.11 ft/s, 5.52 m/s

PENDULUM DECELERATION (m/s) vs TIME (ms)

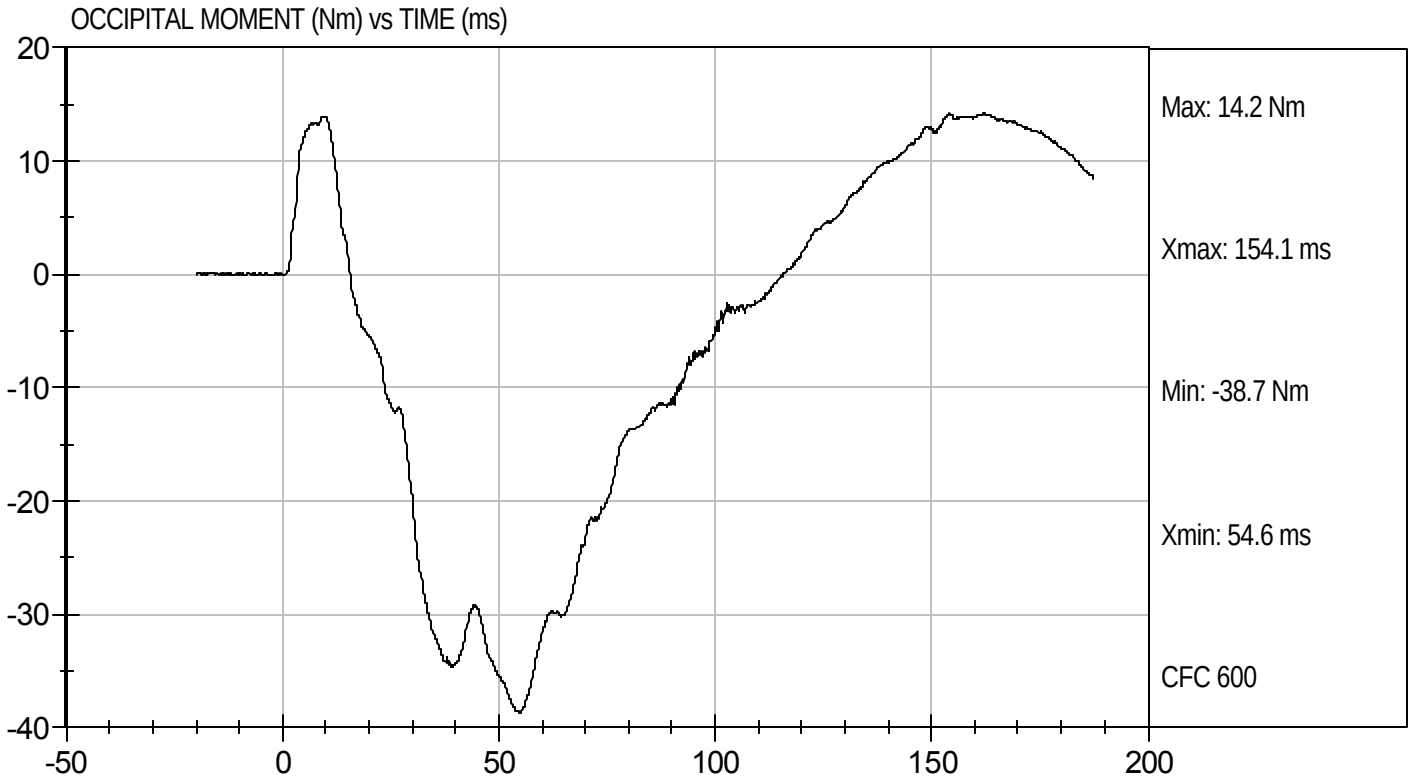


FLEXION ANGLE (DEG) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D112142

Test Date: 6/20/11
Velocity: 18.11 ft/s, 5.52 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D112143

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	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

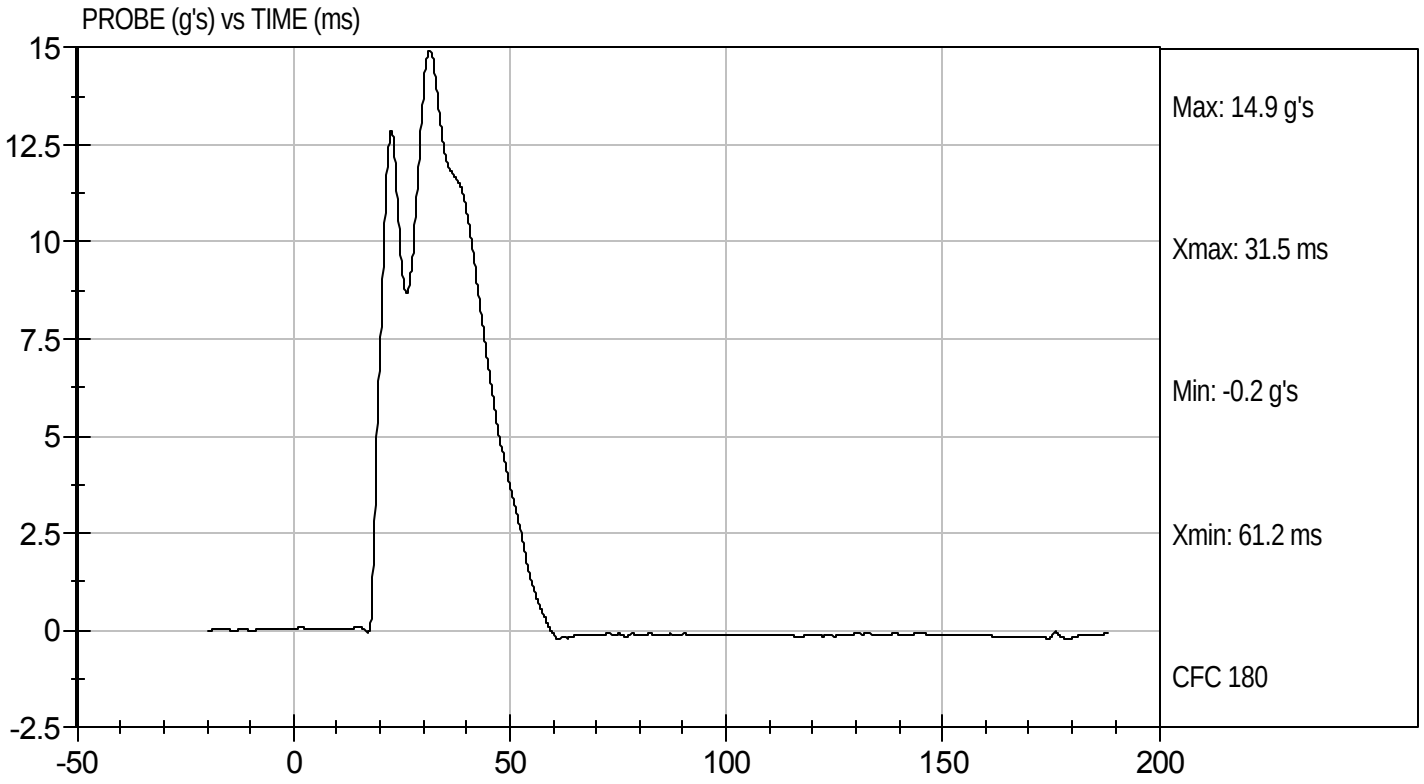
Jessica Hall
Laboratory Technician

6/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D112143

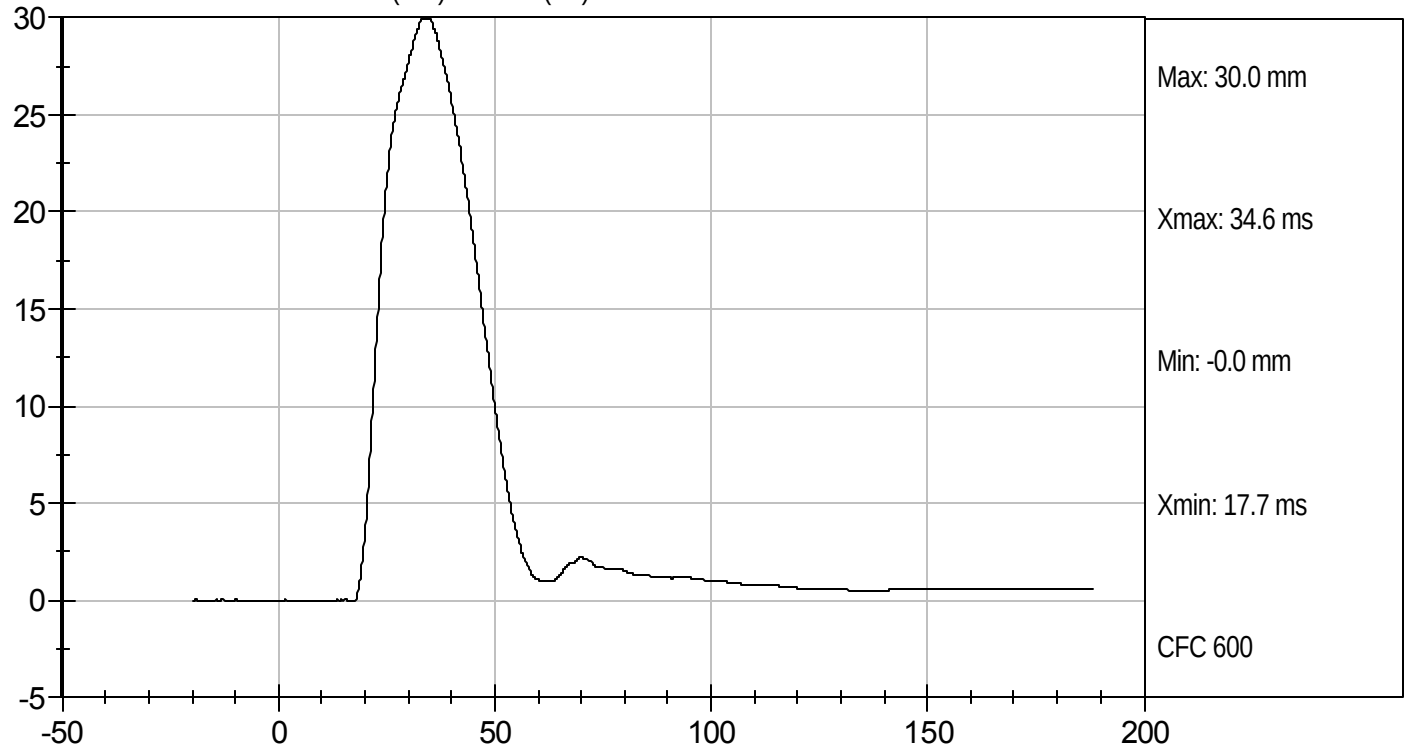
Test Date: 6/21/11
Velocity: 14.37 ft/s, 4.38 m/s



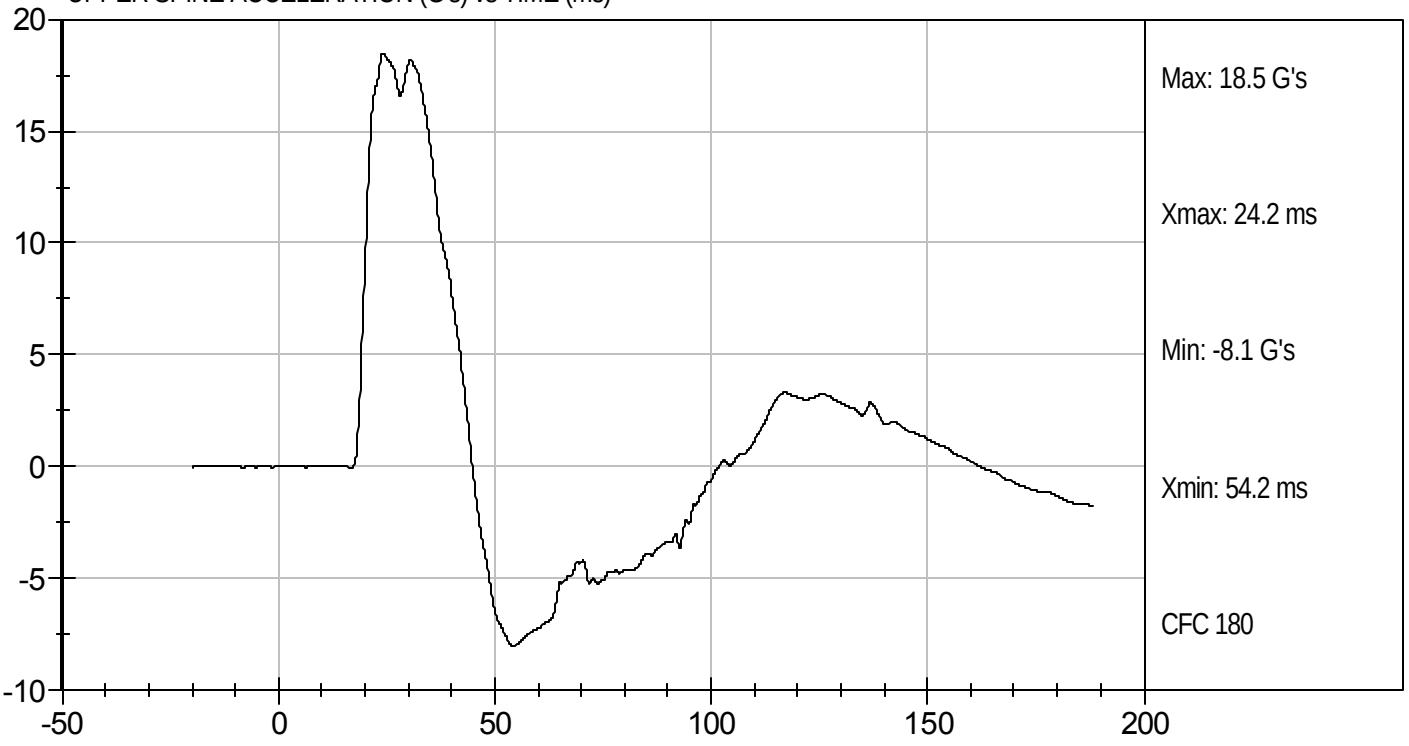
Test Desc: Shoulder Impact
Component ID: D112143

Test Date: 6/21/11
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: 306 **Test I.D:** D112144

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	33	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	40	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
		Overall Test Results		Pass

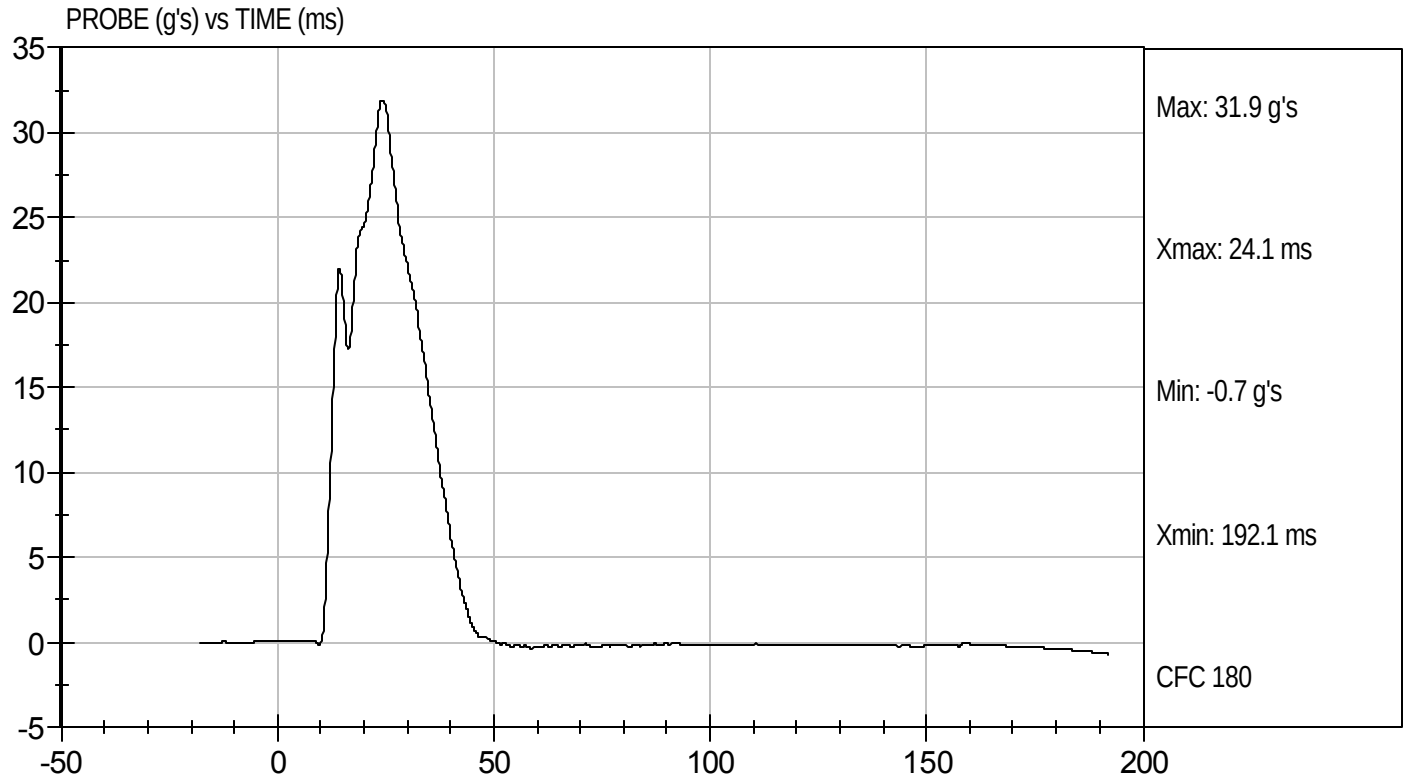
Jessica Hall
Laboratory Technician

6/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D112144

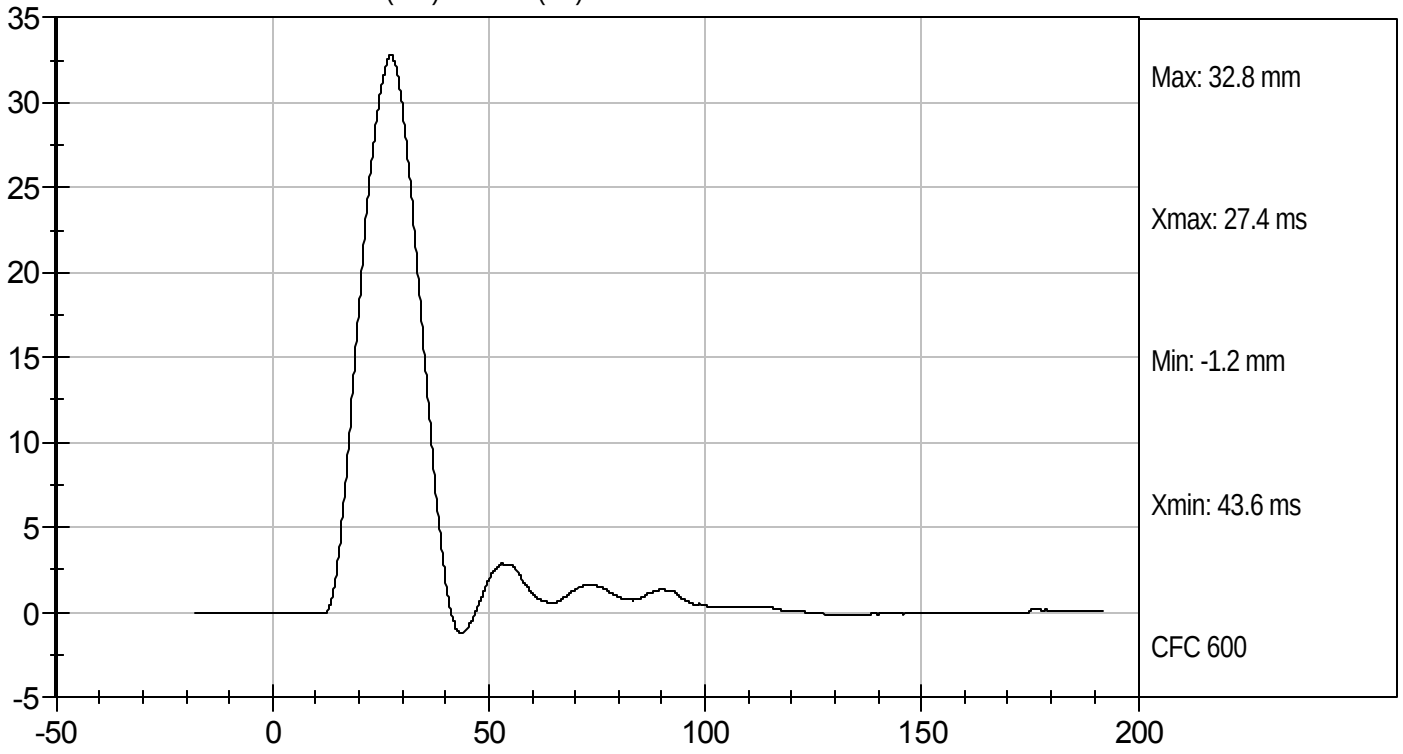
Test Date: 6/21/11
Velocity: 22.2 ft/s, 6.77 m/s



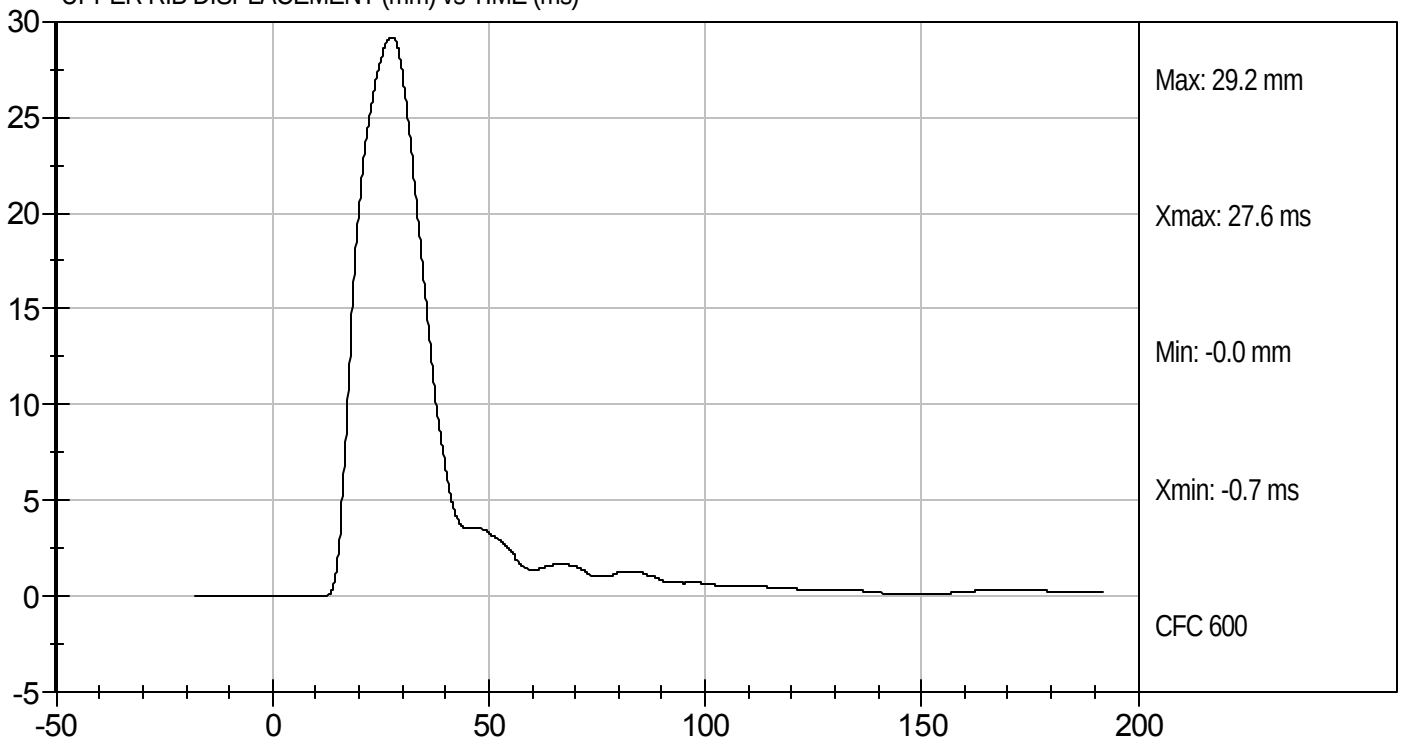
Test Desc: Thorax With Arm
Component ID: D112144

Test Date: 6/21/11
Velocity: 22.2 ft/s, 6.77 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



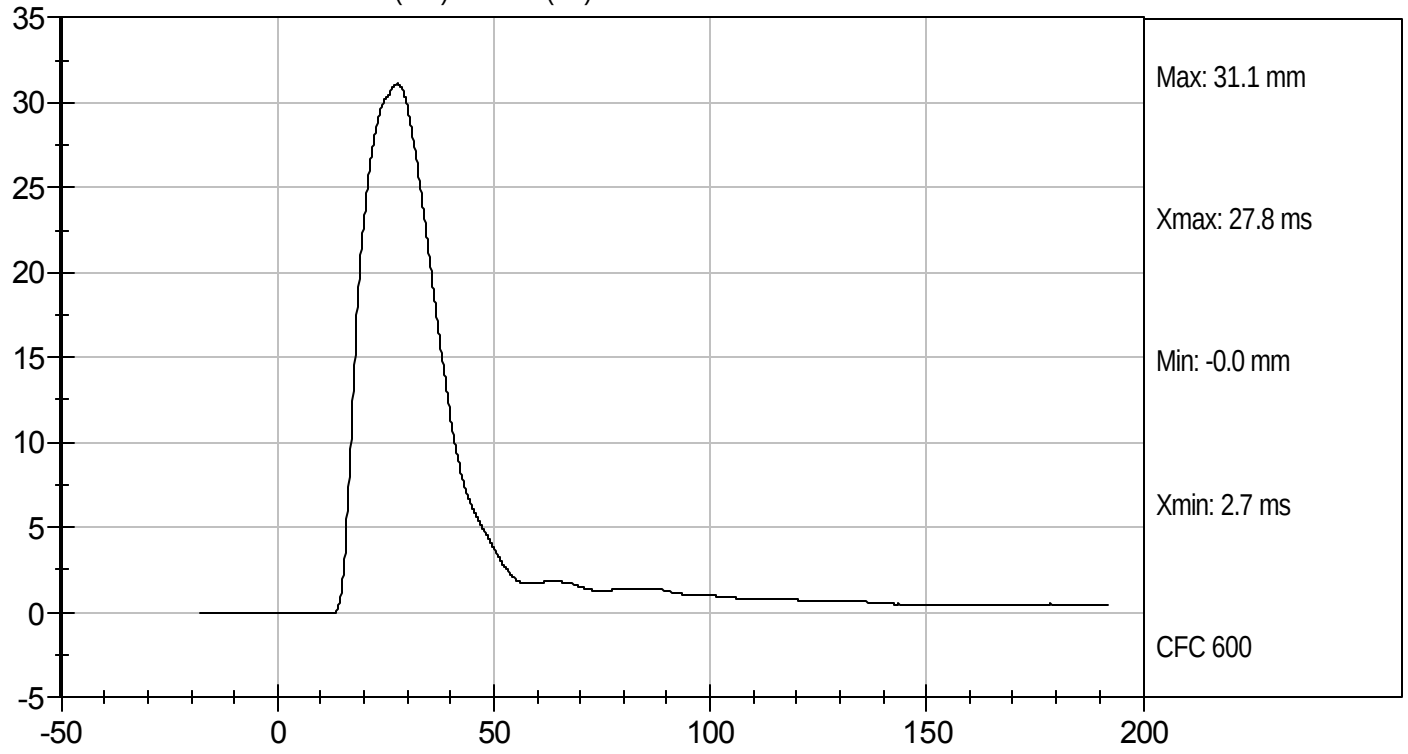
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



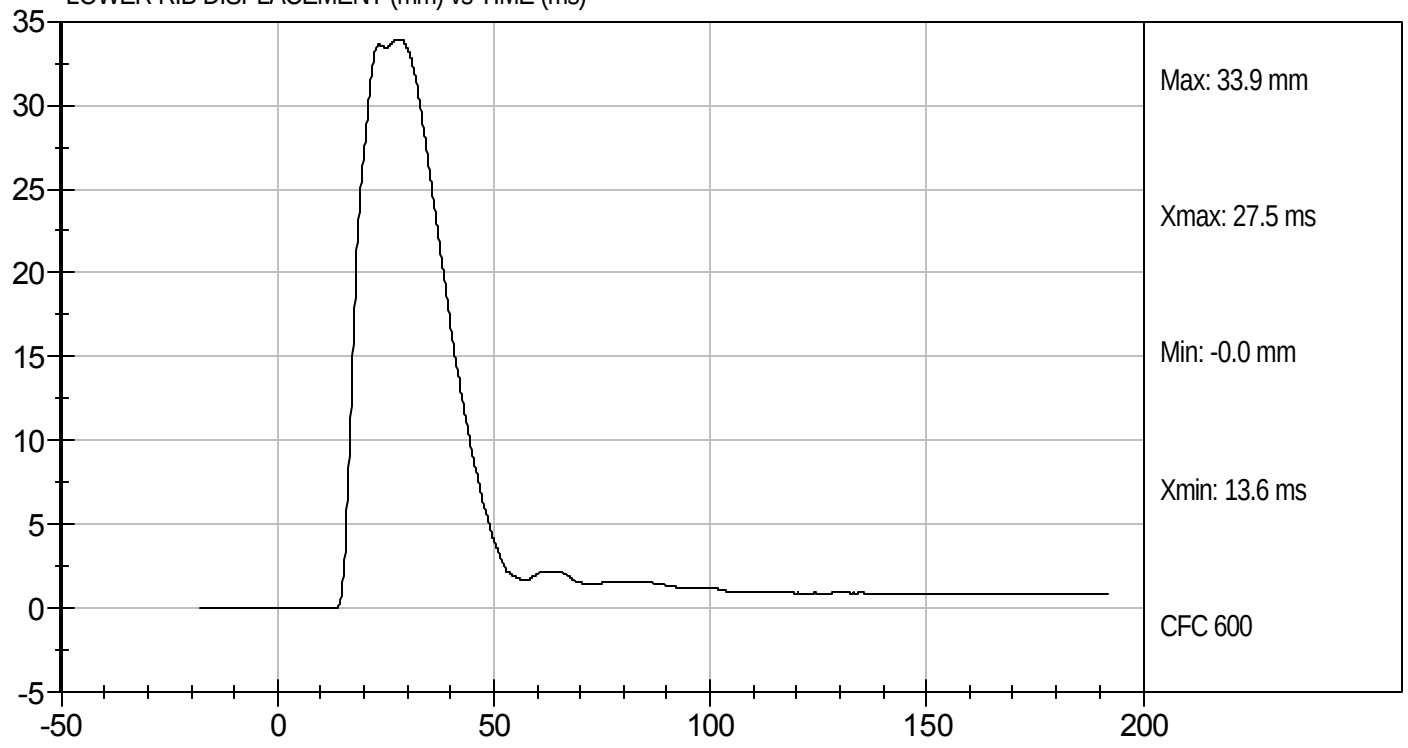
Test Desc: Thorax With Arm
Component ID: D112144

Test Date: 6/21/11
Velocity: 22.2 ft/s, 6.77 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



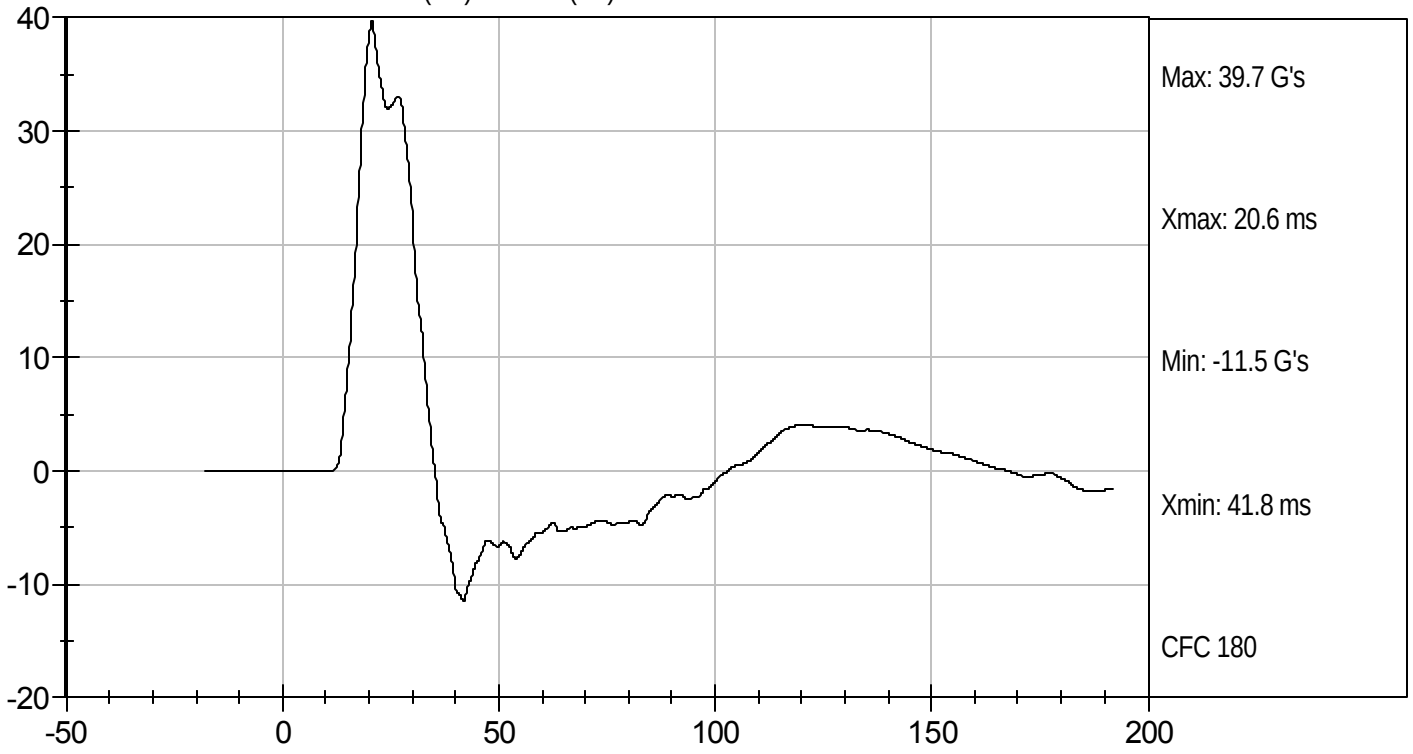
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



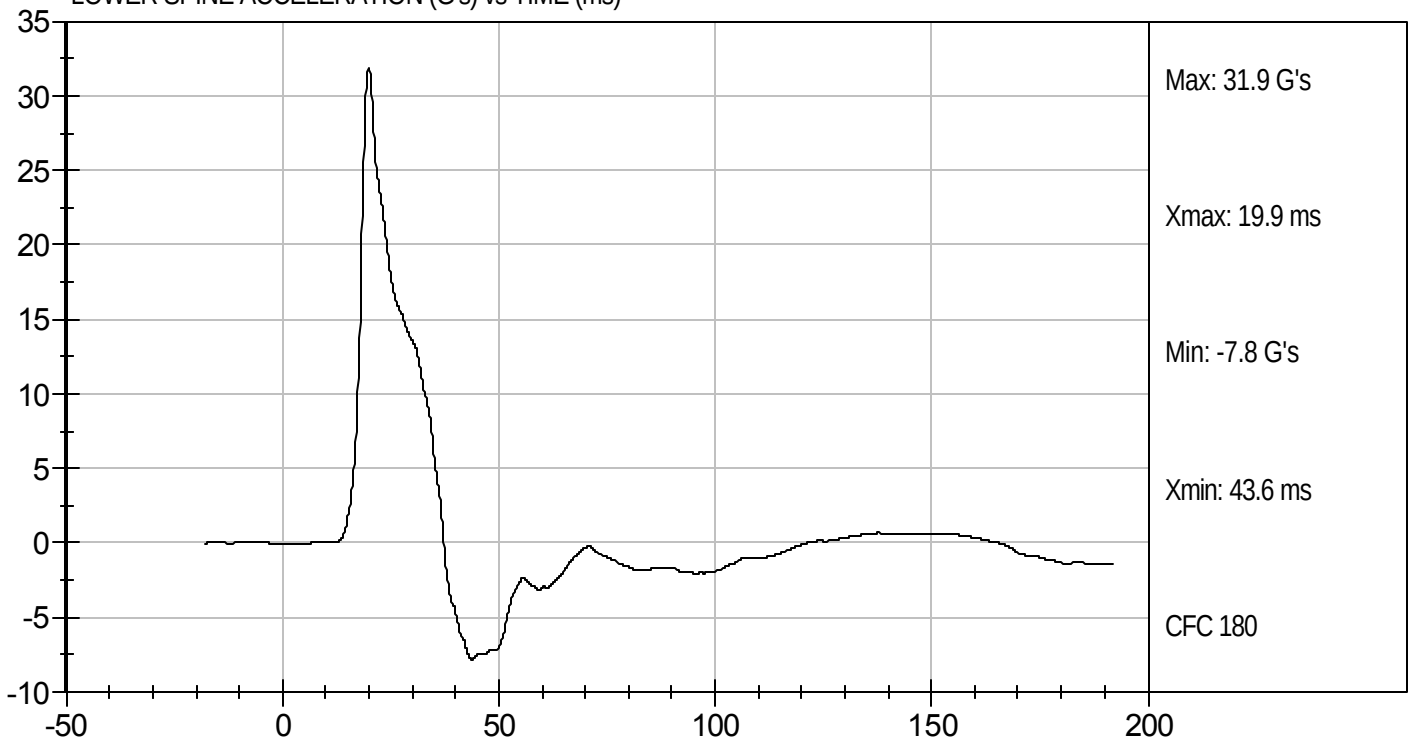
Test Desc: Thorax With Arm
Component ID: D112144

Test Date: 6/21/11
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: 306 **Test I.D:** D112145

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	40	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	8	Pass
		Overall Test Results		Pass

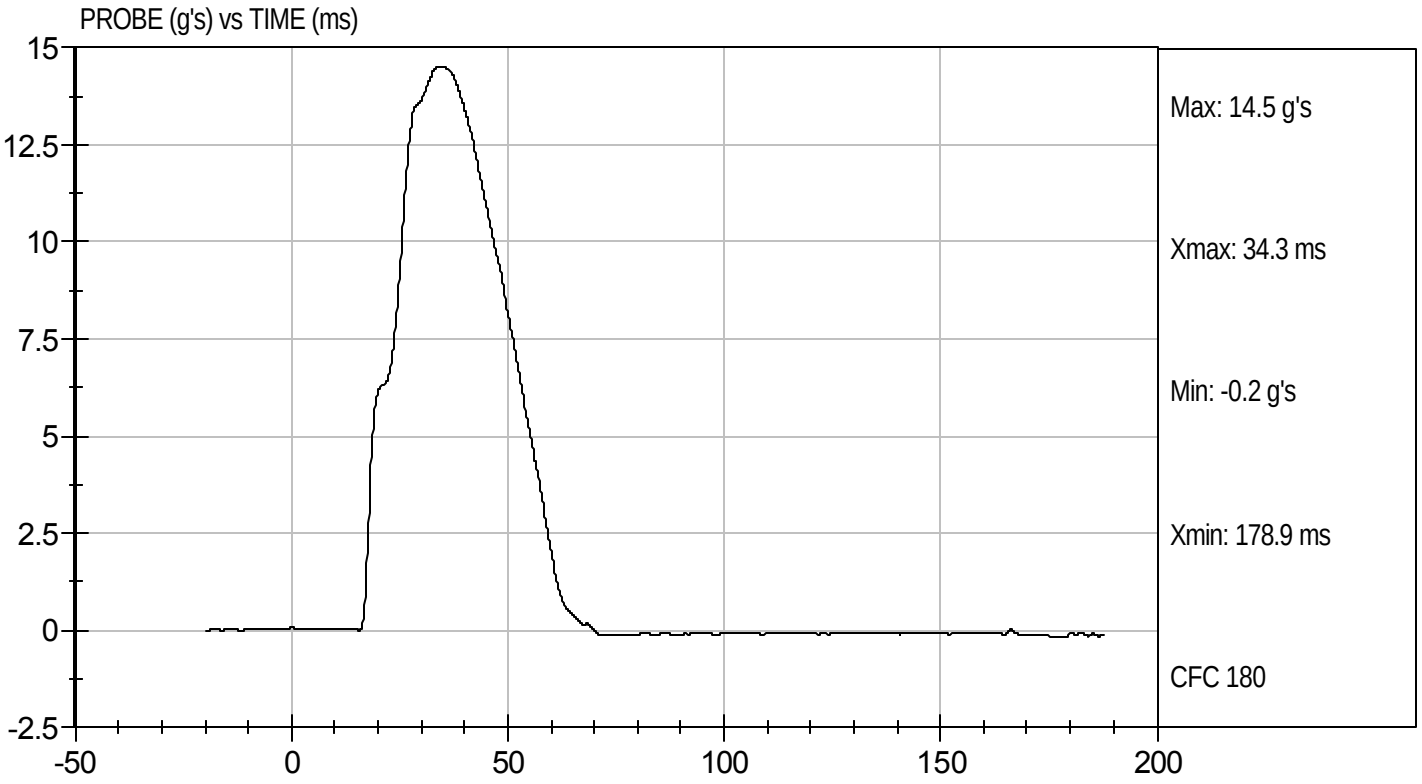
Jessica Hall
Laboratory Technician

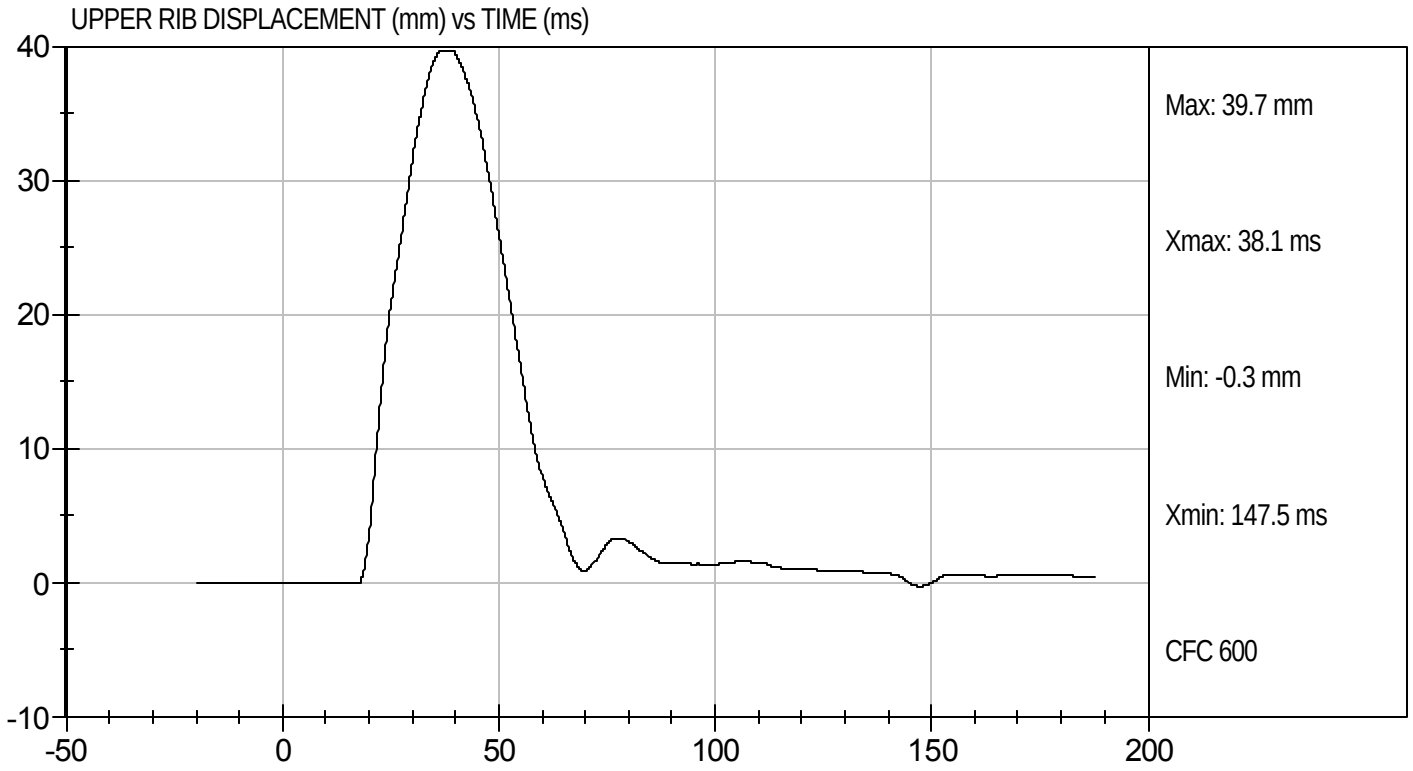
6/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D112145

Test Date: 6/21/11
Velocity: 14.12 ft/s, 4.30 m/s

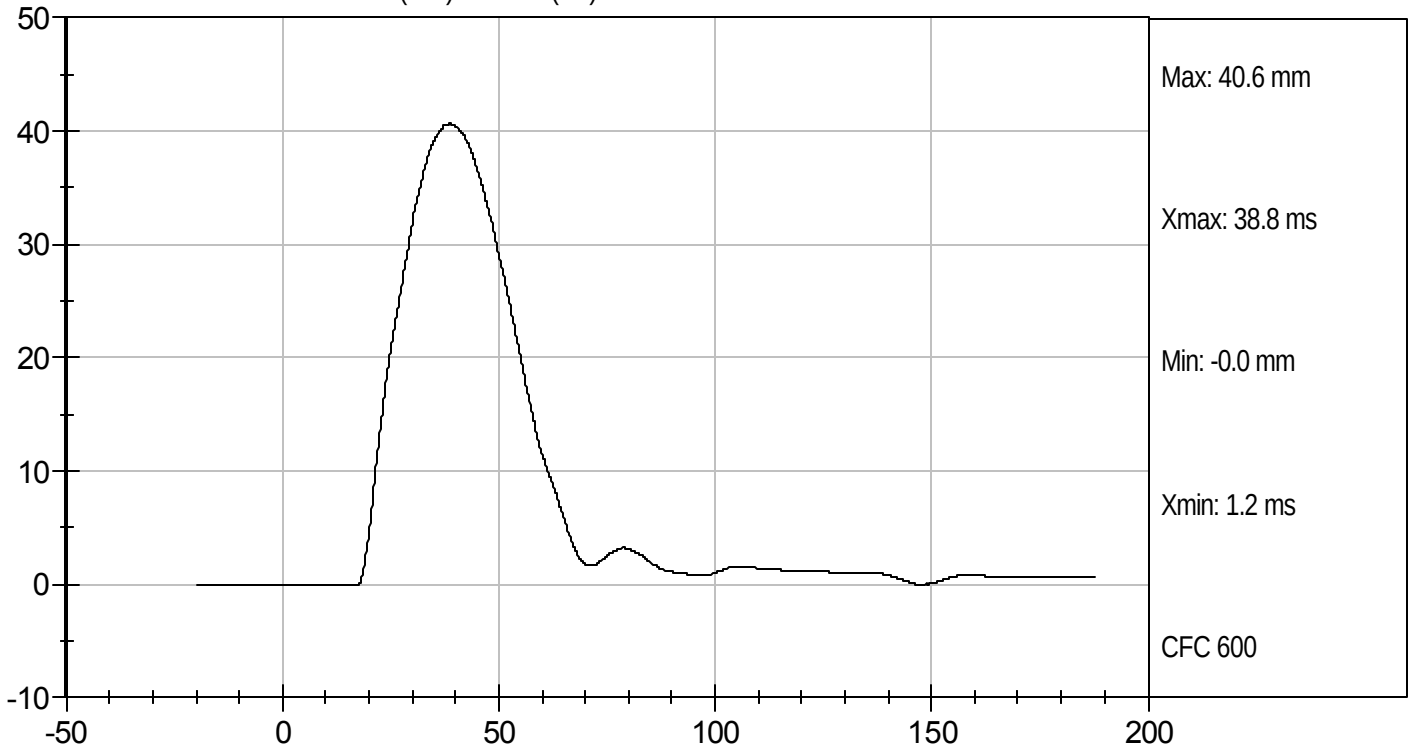




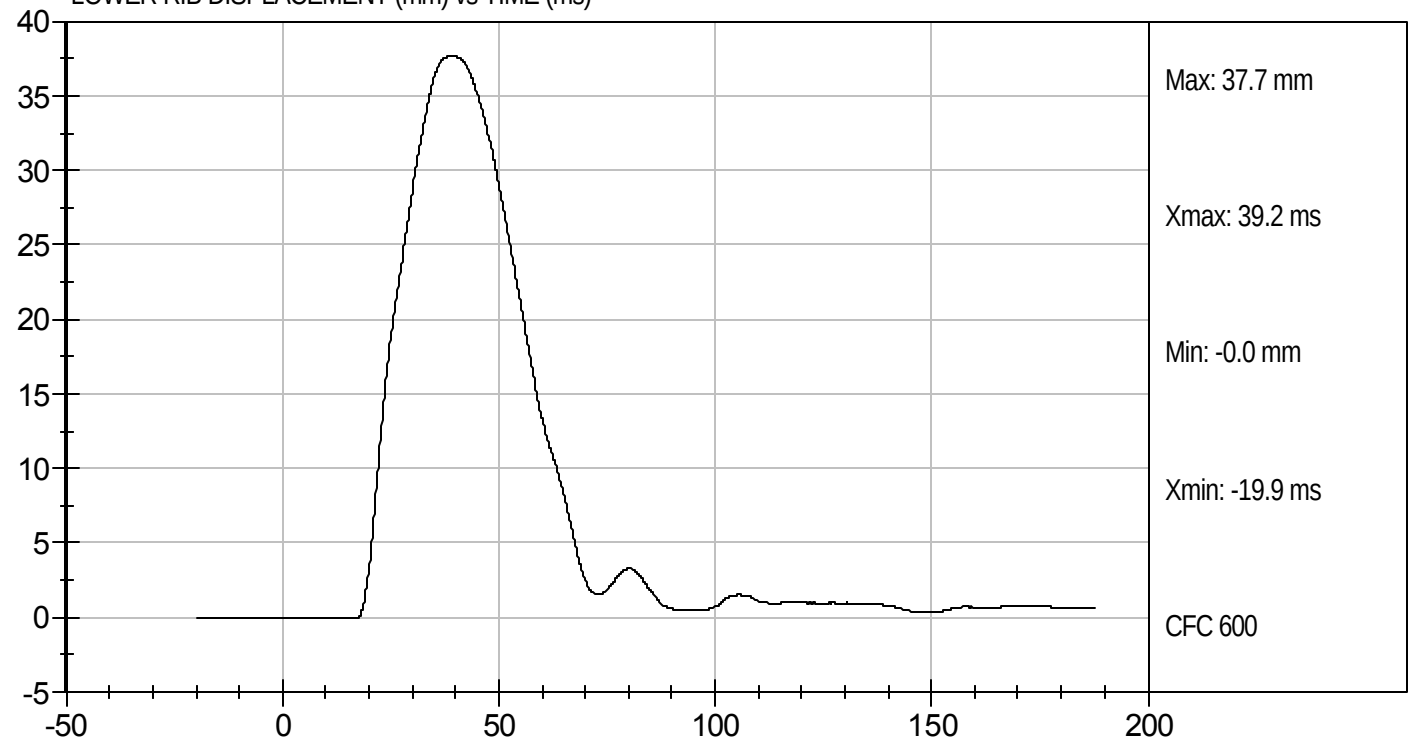
Test Desc: Thorax Without Arm
Component ID: D112145

Test Date: 6/21/11
Velocity: 14.12 ft/s, 4.30 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



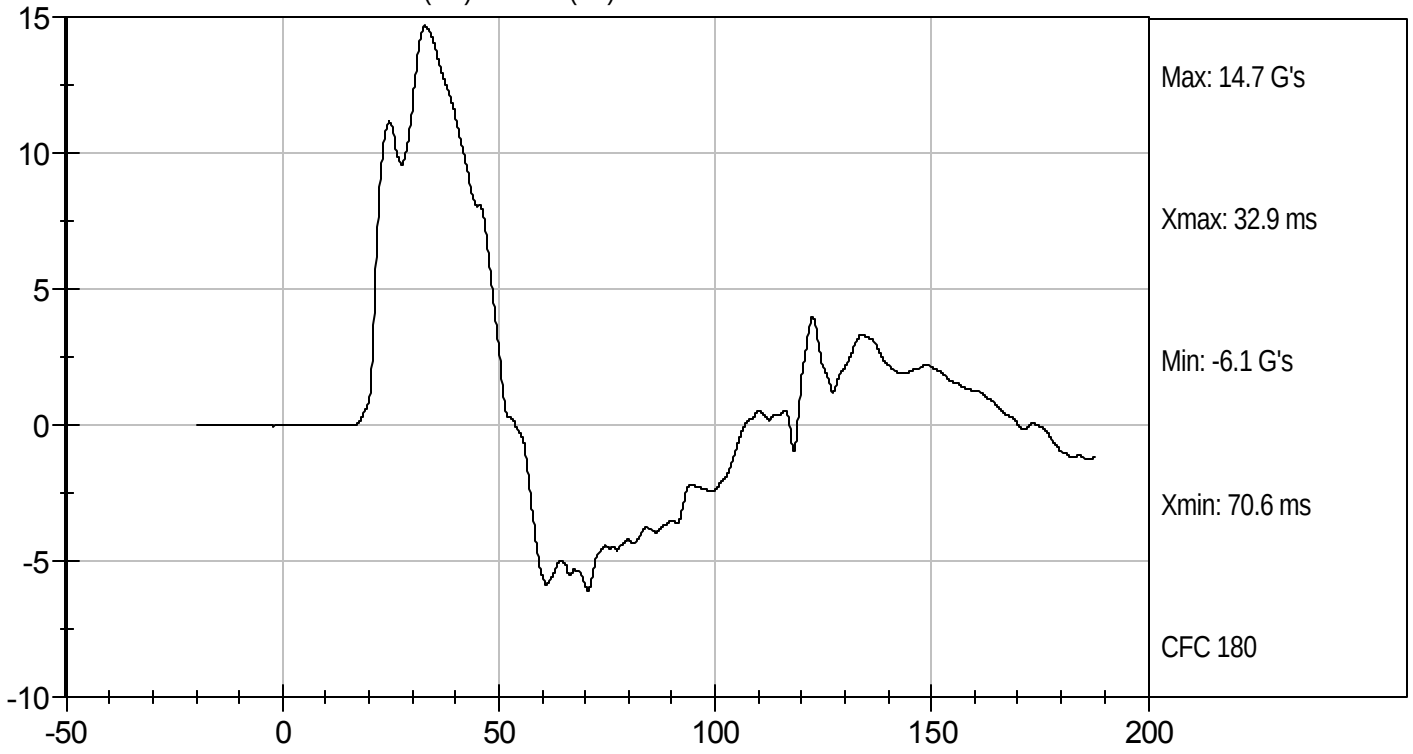
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



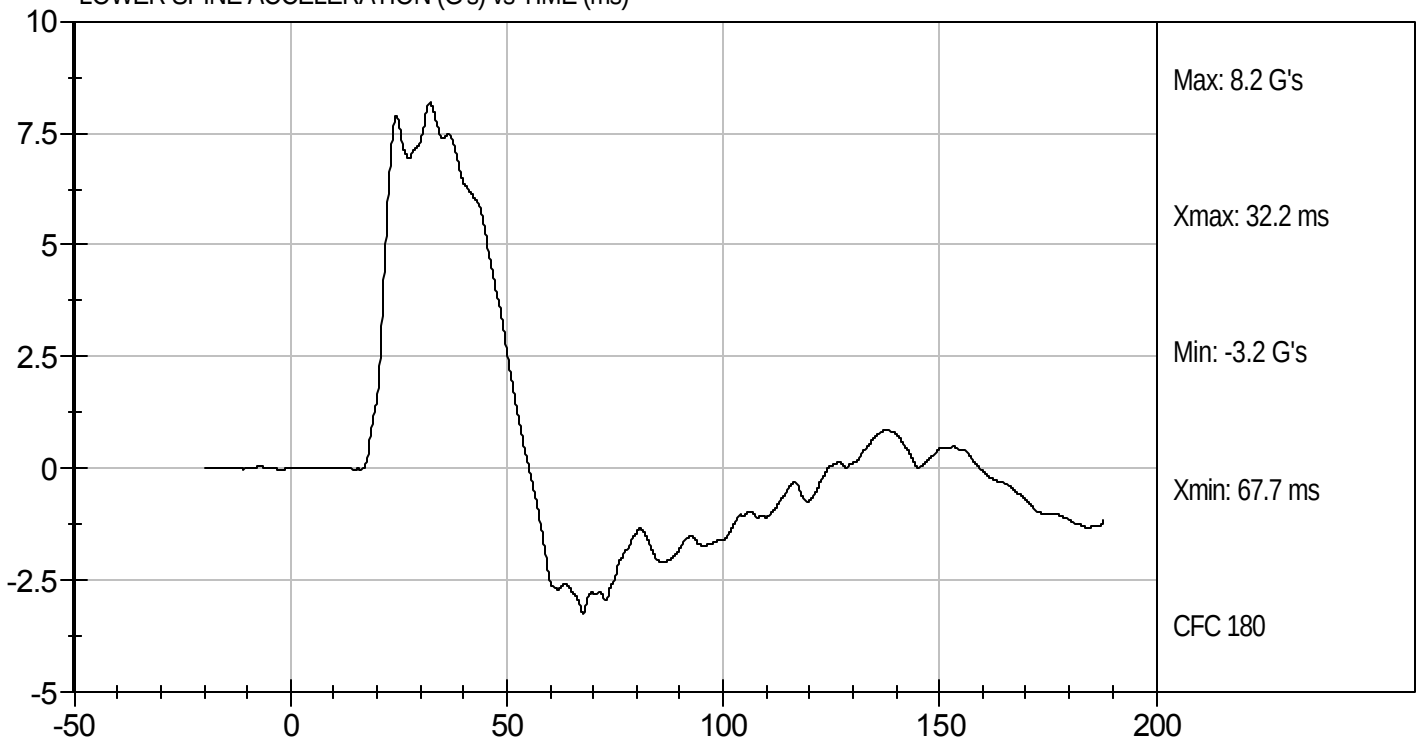
Test Desc: Thorax Without Arm
Component ID: D112145

Test Date: 6/21/11
Velocity: 14.12 ft/s, 4.30 m/s

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112146

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	39	Pass
Lower Rib Displacement	mm	33 to 44	39	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	10	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

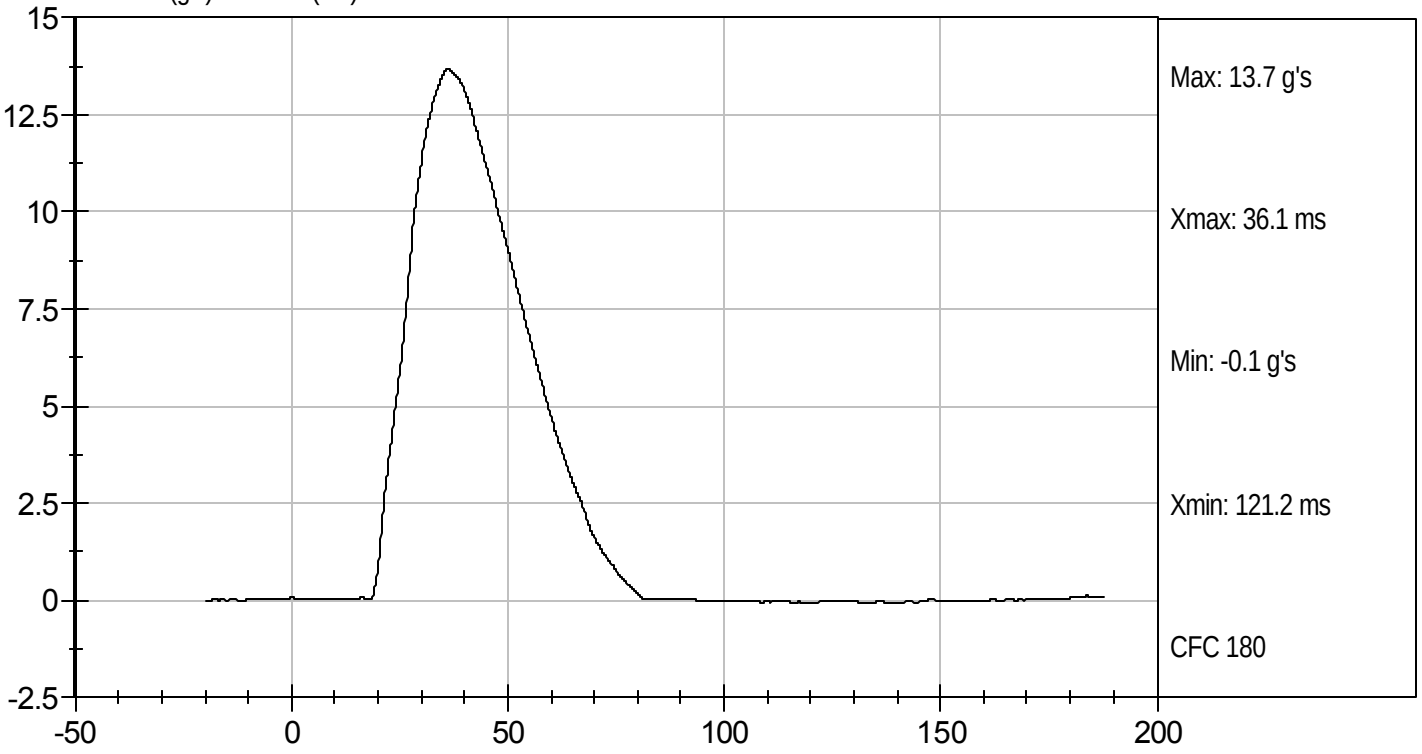
6/21/11
Test Date

David Winkelbauer
Approved By

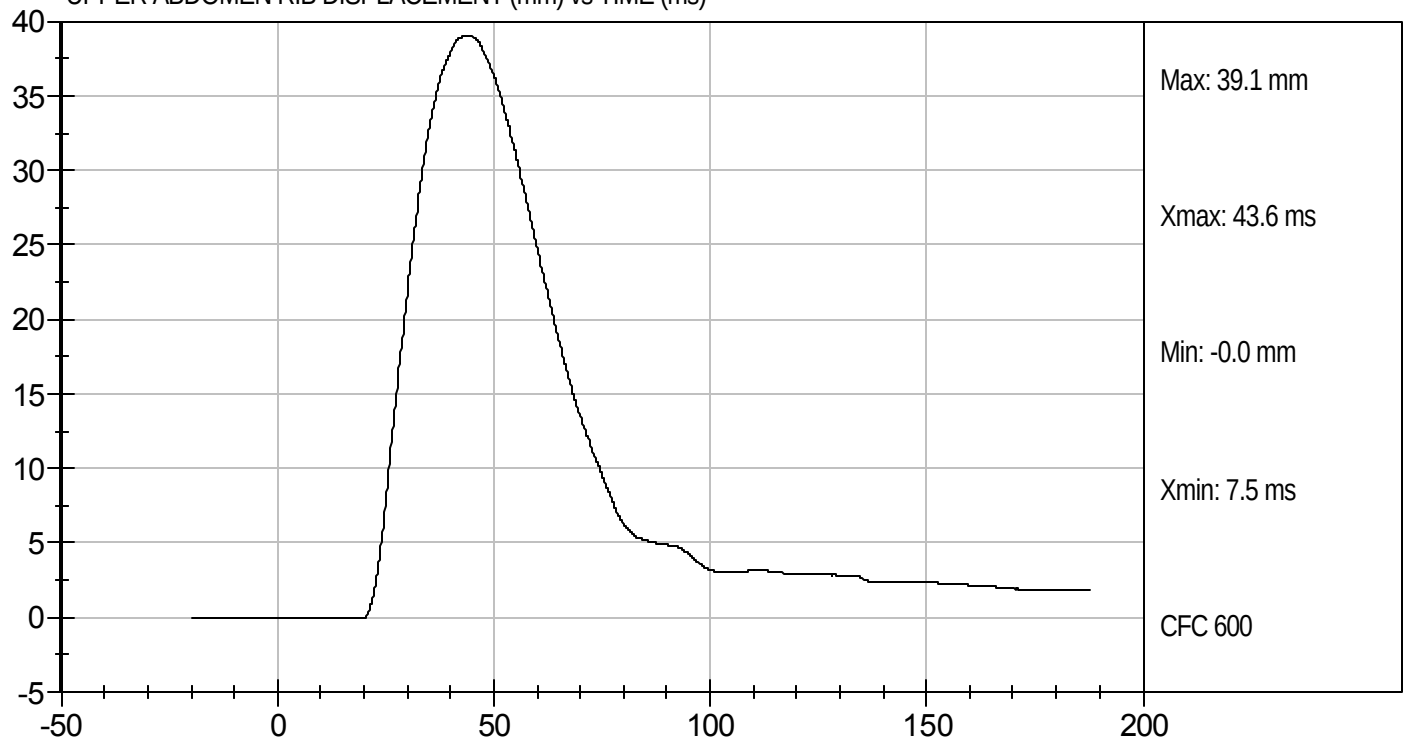
Test Desc: Abdomen Impact
Component ID: D112146

Test Date: 6/21/11
Velocity: 14.12 ft/s, 4.30 m/s

PROBE (g's) vs TIME (ms)



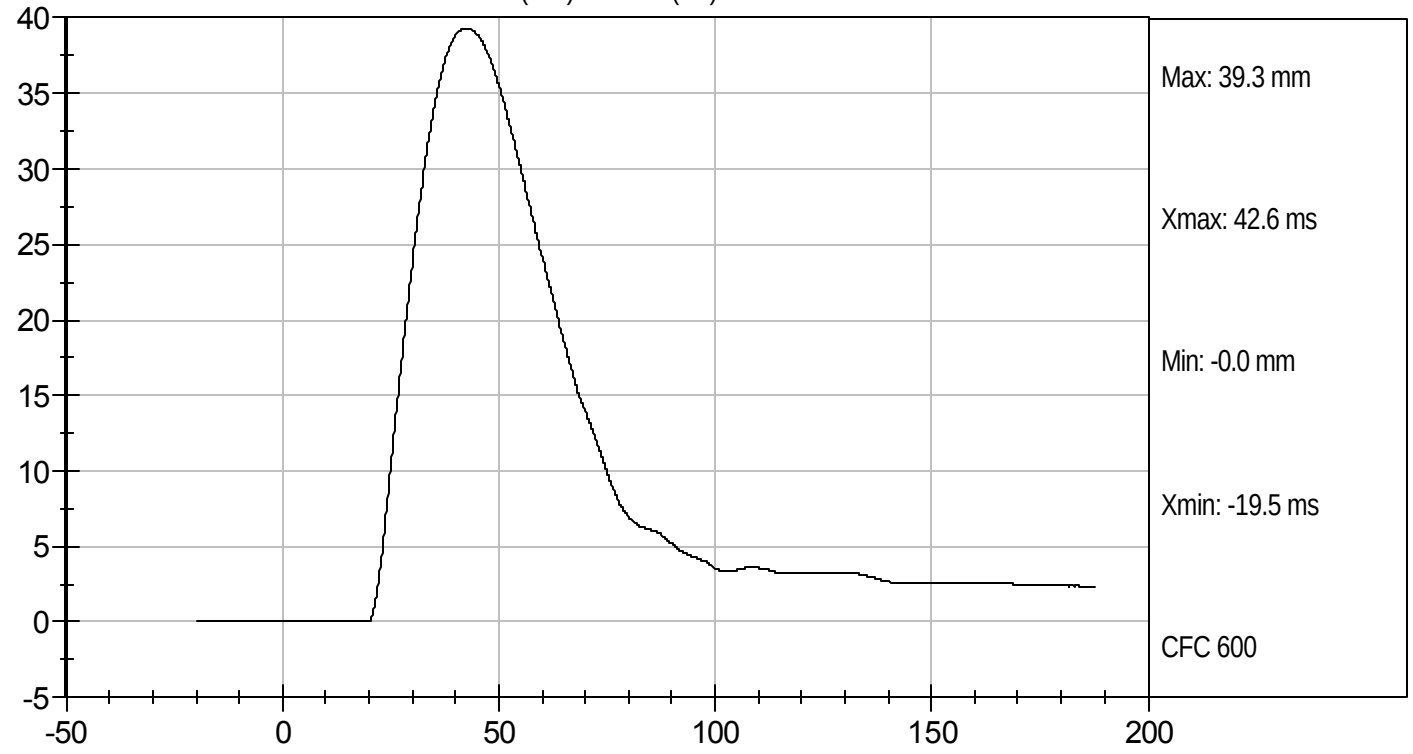
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



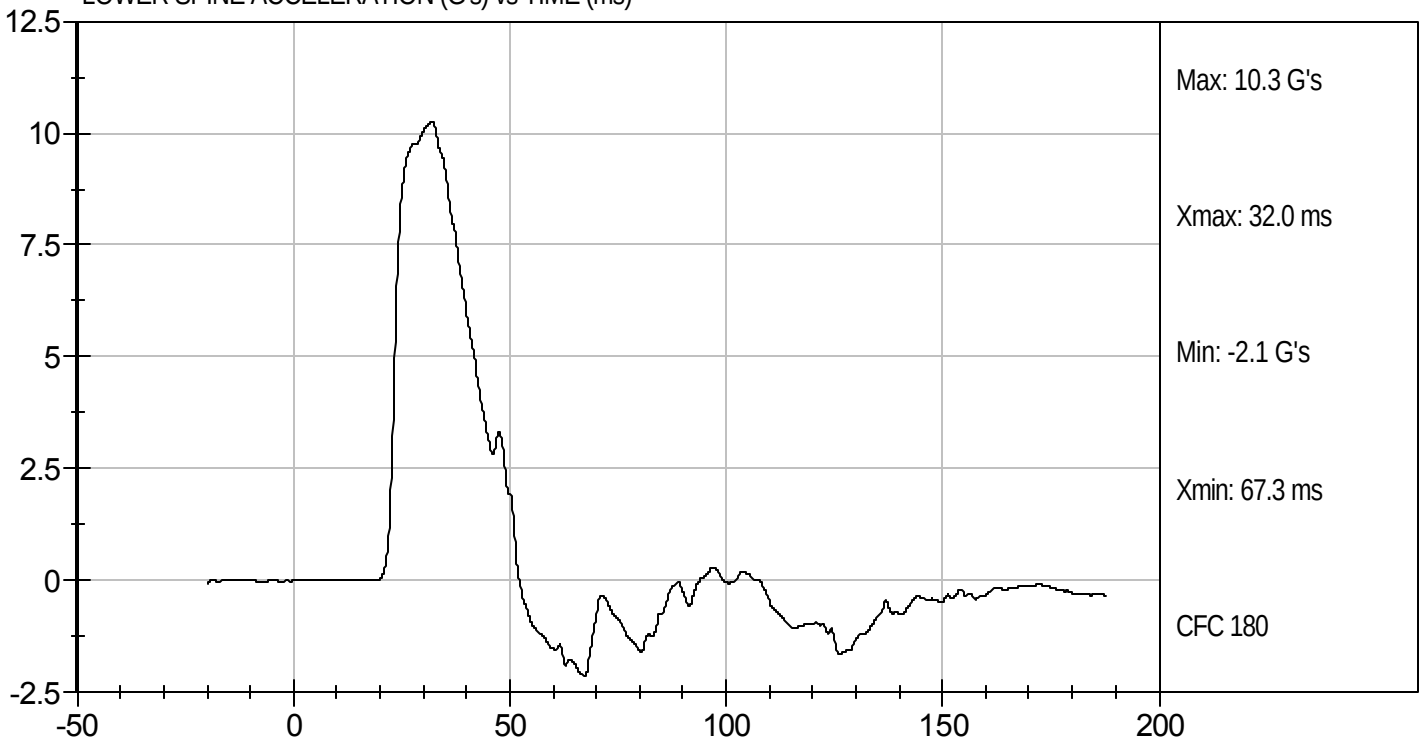
Test Desc: Abdomen Impact
Component ID: D112146

Test Date: 6/21/11
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: 306 **Test I.D:** D112147

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	41	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	3809	Pass
		Overall Test Results		Pass

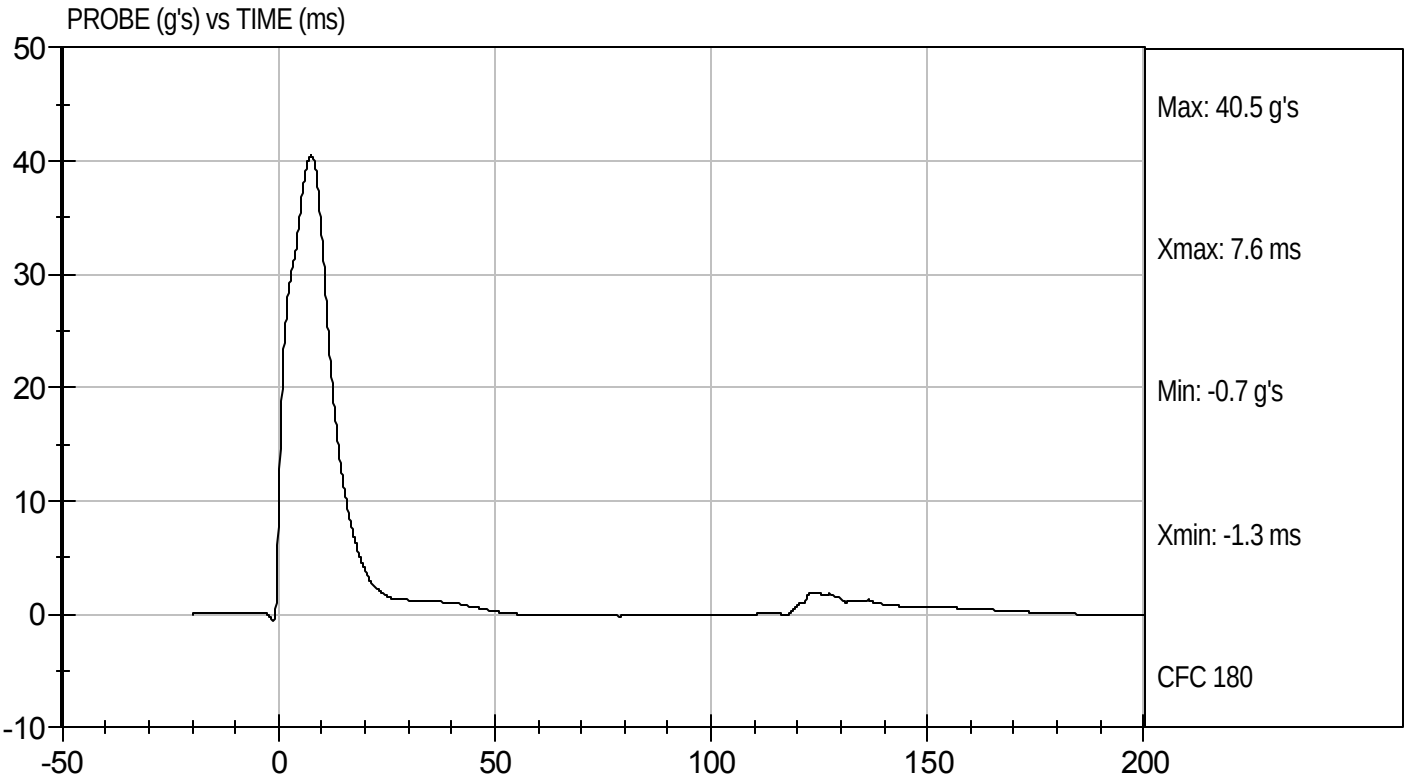
Jessica Hall
Laboratory Technician

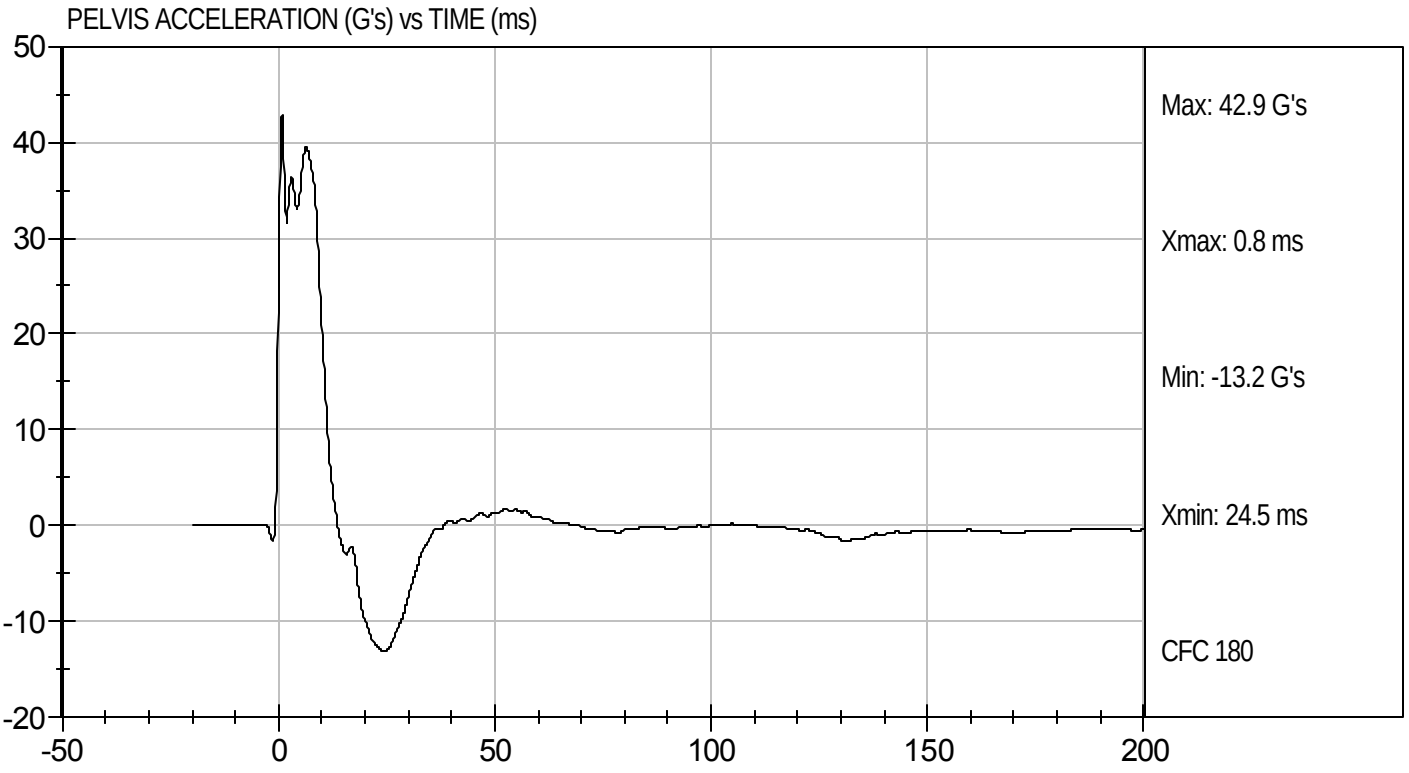
6/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D112147

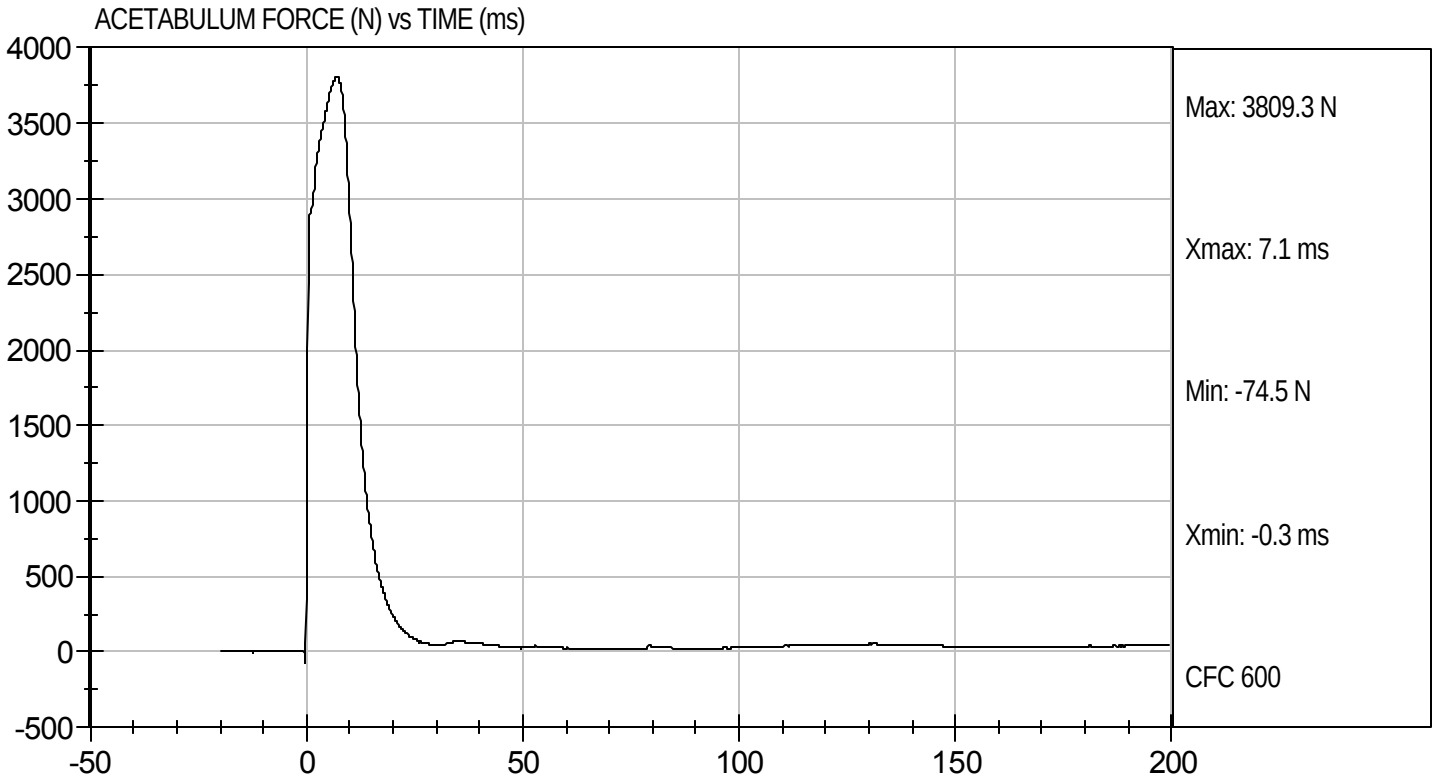
Test Date: 6/21/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D112147

Test Date: 6/21/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112148

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	53	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4930	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

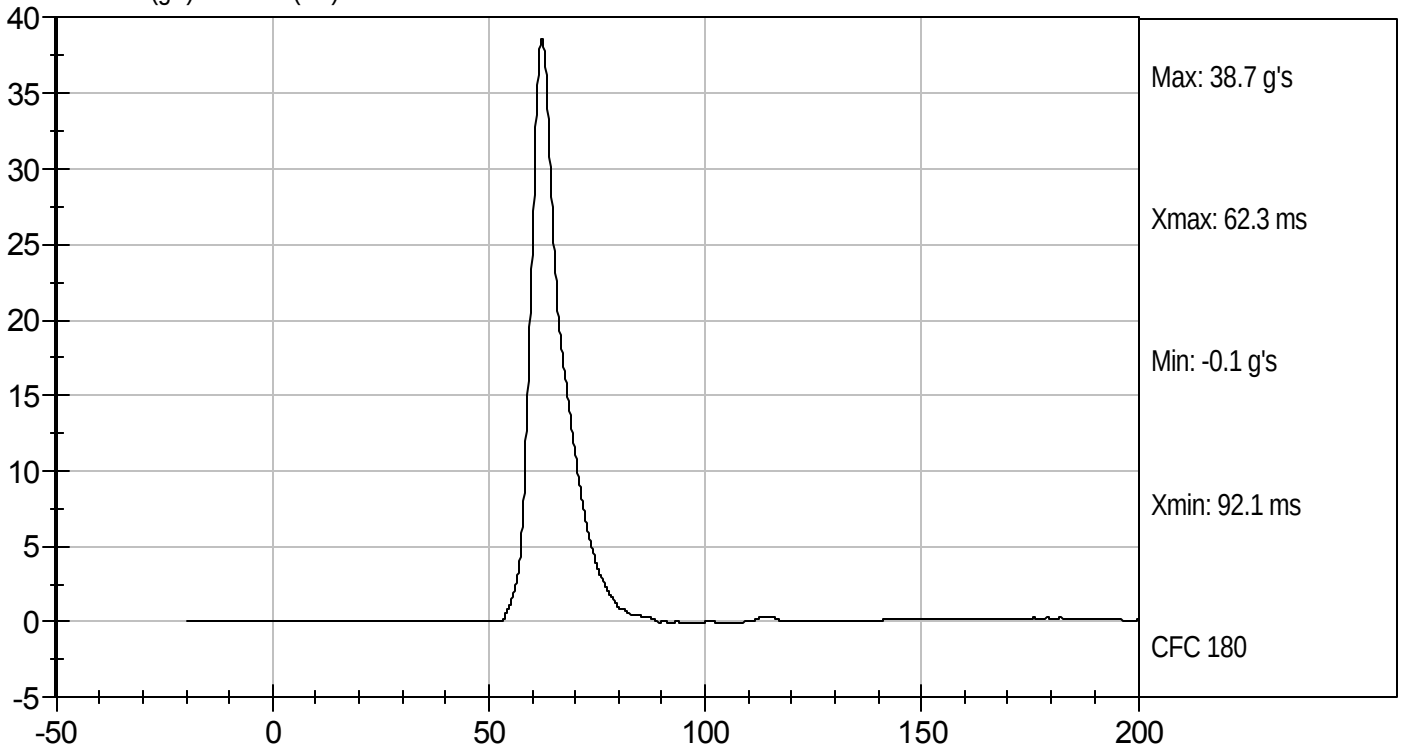
6/21/11
Test Date

David Winkelbauer
Approved By

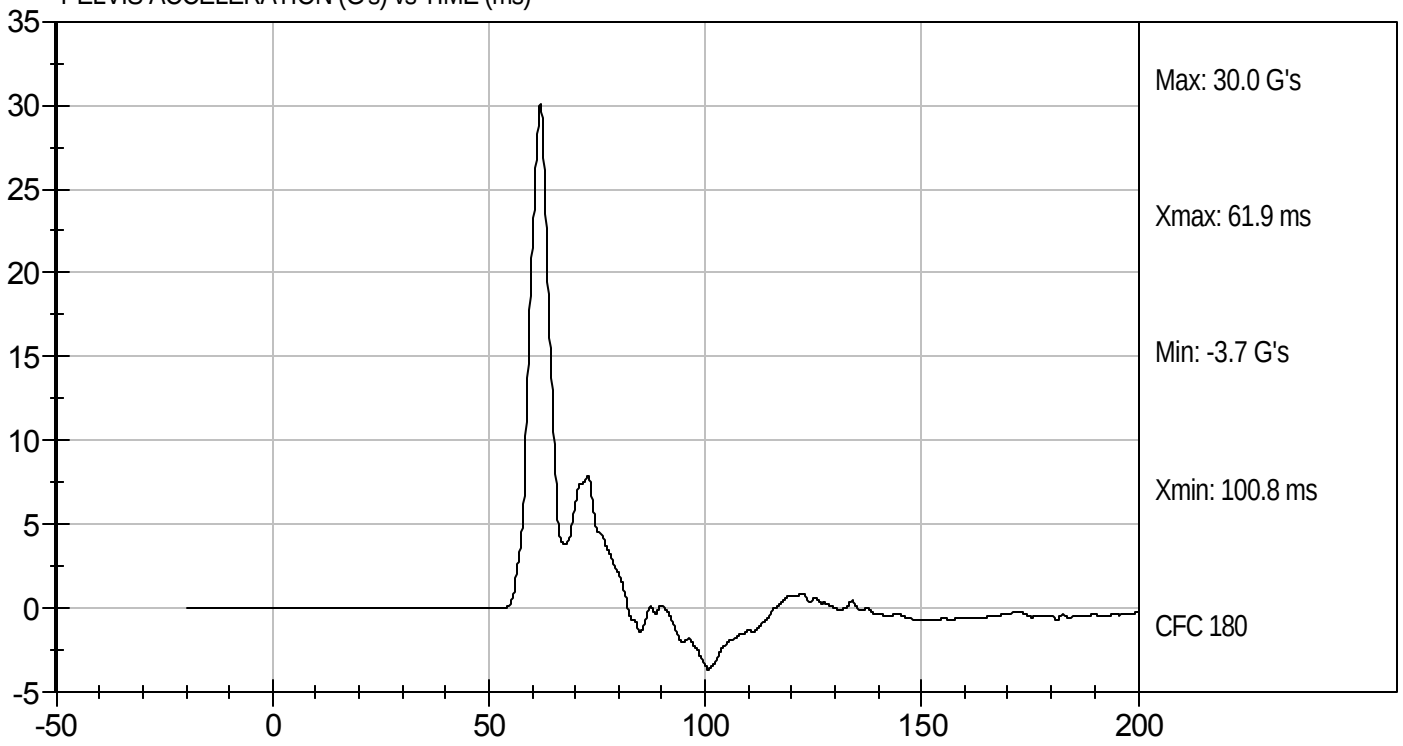
Test Desc: Iliac Impact
Component ID: D112148

Test Date: 6/21/11
Velocity: 14.37 ft/s, 4.38 m/s

PROBE (g's) vs TIME (ms)

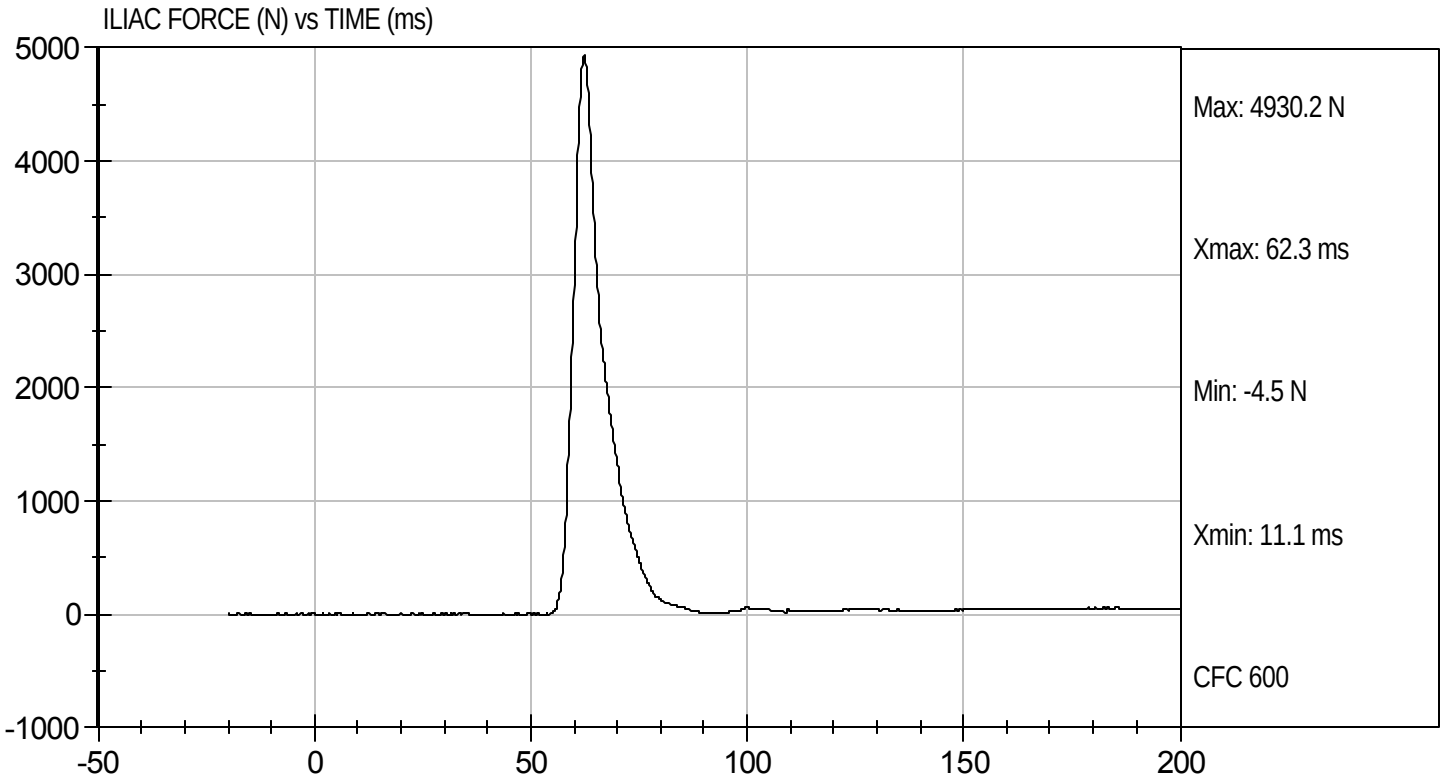


PELVIS ACCELERATION (G's) vs TIME (ms)



Test Desc: Iliac Impact
Component ID: D112148

Test Date: 6/21/11
Velocity: 14.37 ft/s, 4.38 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D112711

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	45	Pass
Peak Resultant Acceleration	G's	115 to 137	126	Pass
Peak Lateral Acceleration	G's	+/- 15	2.6	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

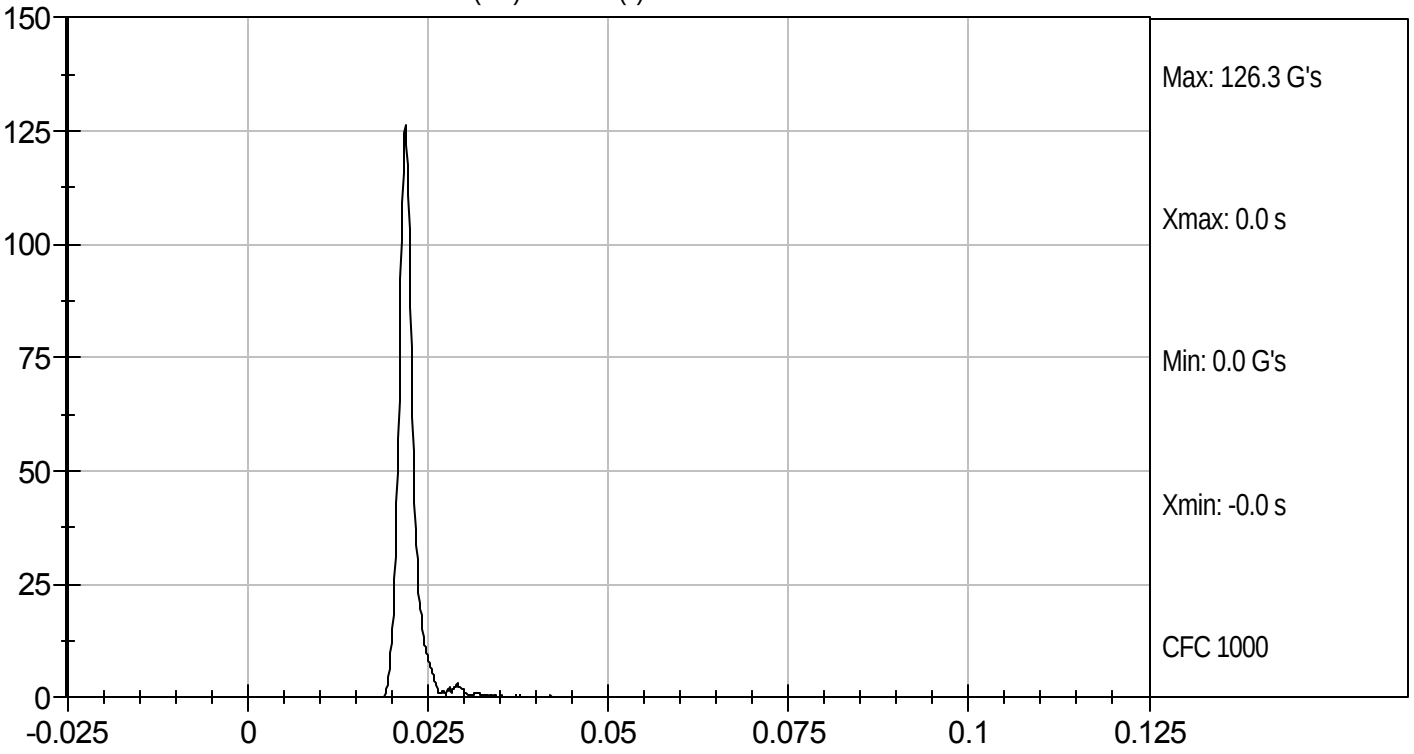
8/9/11
Test Date

David Winkelbauer
Approved By

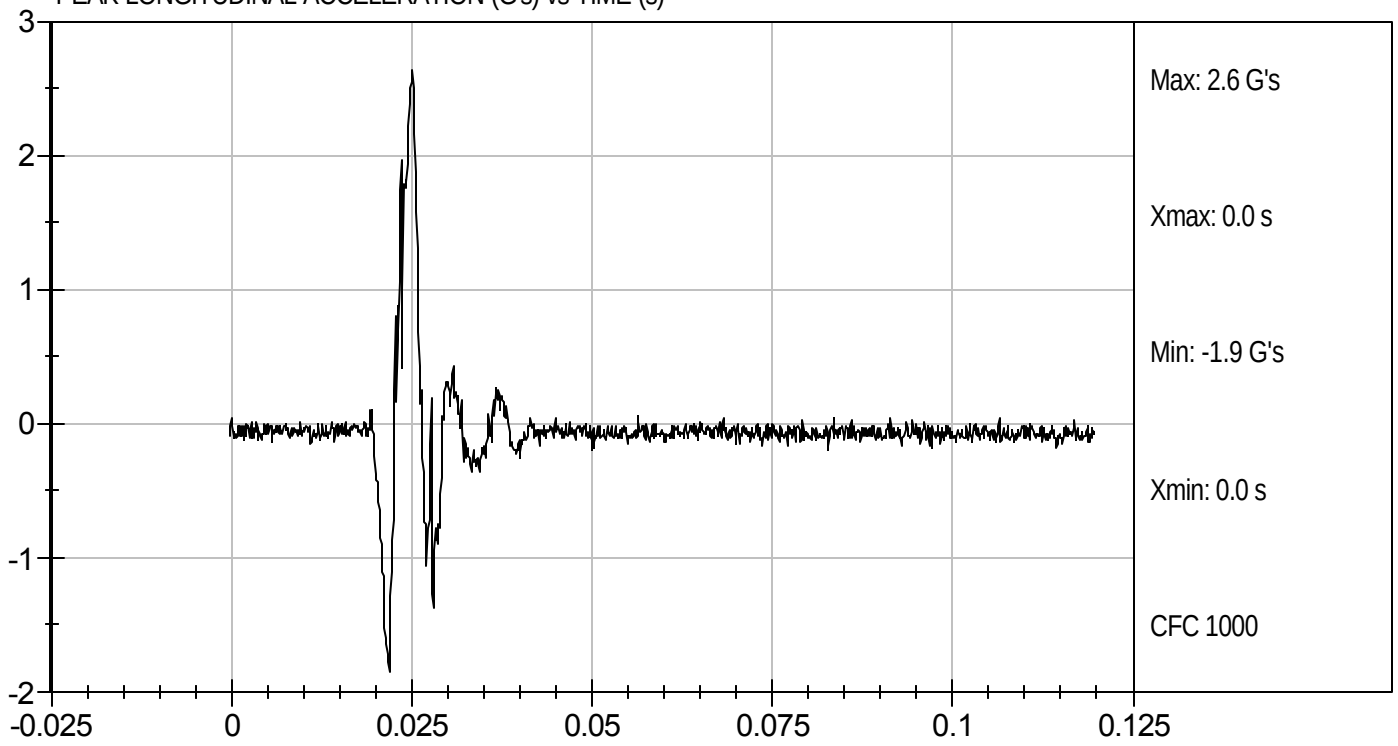
Test Desc: Head Drop
Component ID: D112711

Test Date: 8/9/11
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G's) vs TIME (s)



PEAK LONGITUDINAL ACCELERATION (G's) vs TIME (s)



MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112712

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.0	Pass
Humidity		%	10 to 70	47	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.59	Pass
	15 ms	m/s	3.30 to 4.10	3.64	Pass
	20 ms	m/s	4.40 to 5.40	4.83	Pass
	25 ms	m/s	5.40 to 6.10	5.54	Pass
	25-100 ms	m/s	5.50 to 6.20	5.54	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	56	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-40	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	112	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

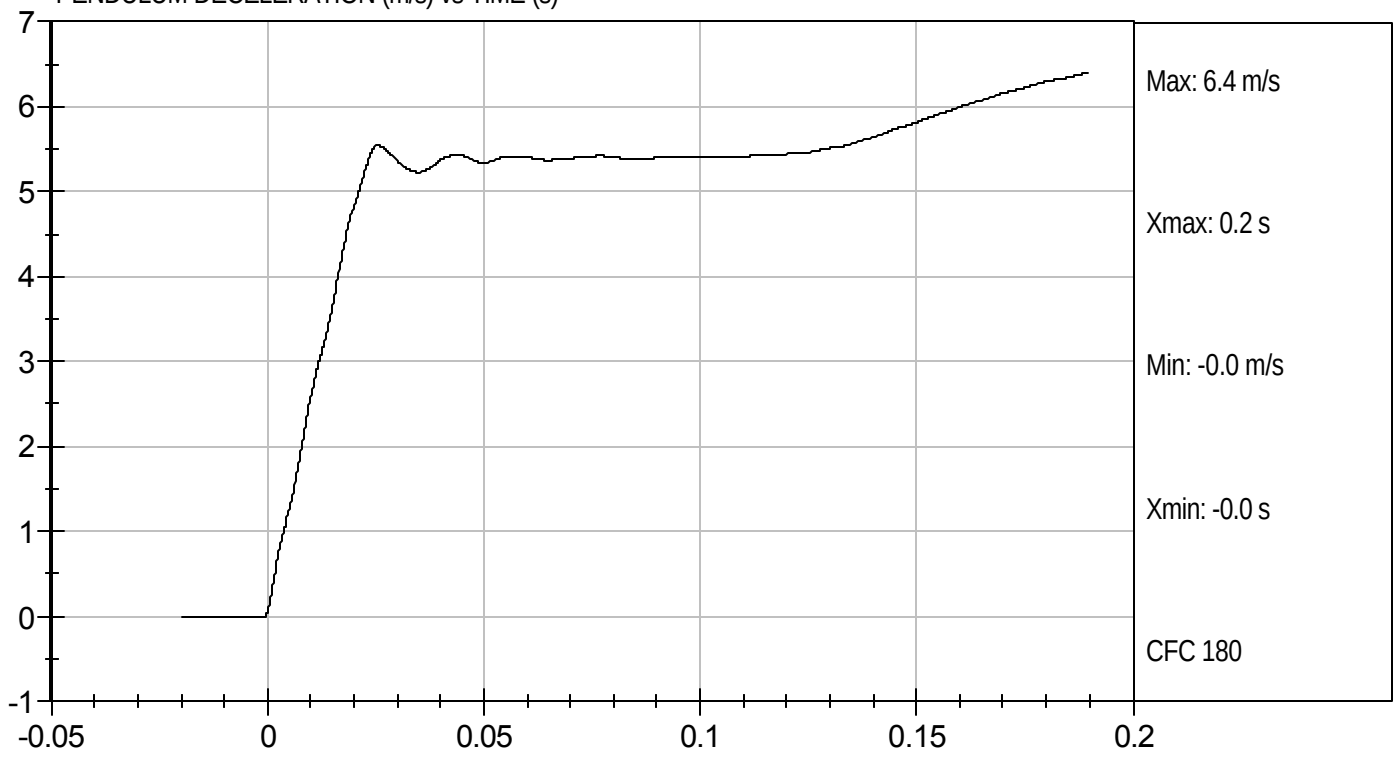
8/9/11
Test Date

David Winkelbauer
Approved By

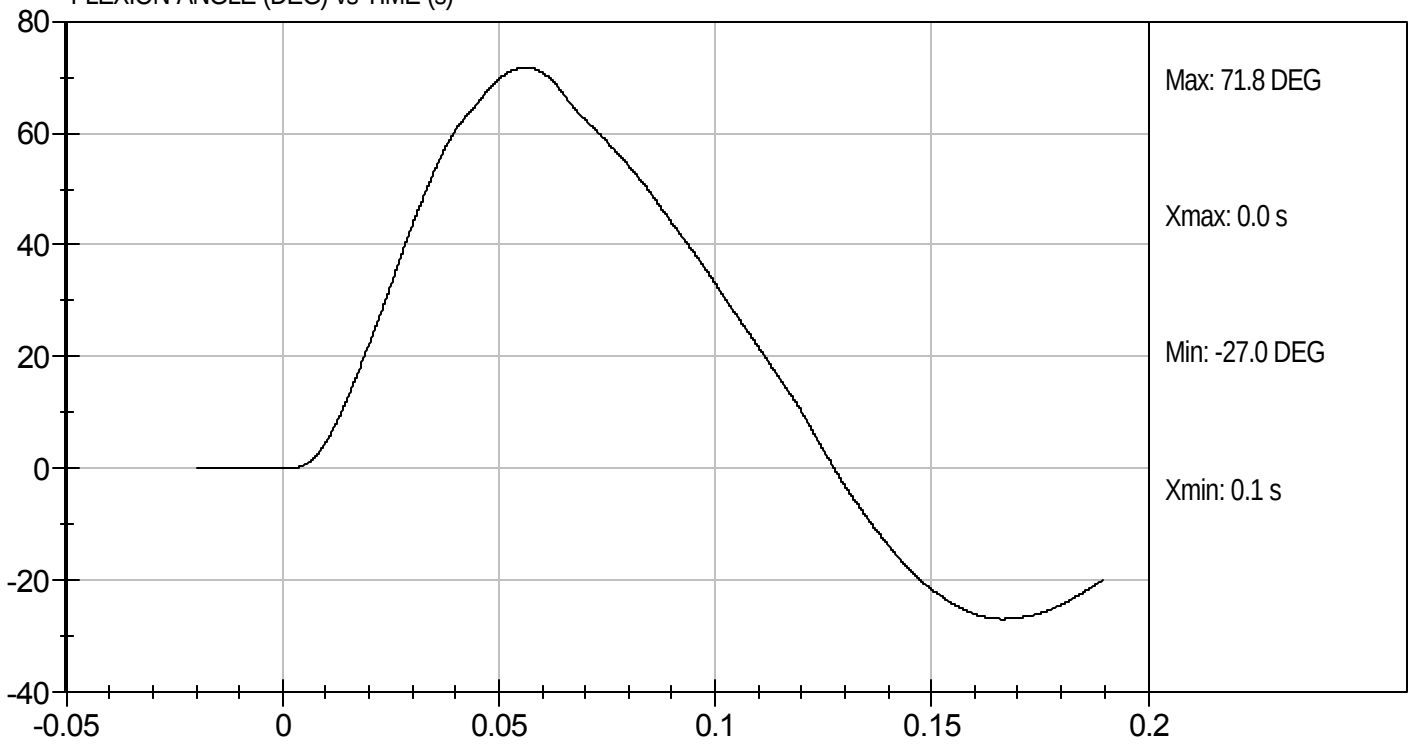
Test Desc: Neck Bending
Component ID: D112712

Test Date: 8/9/11
Velocity: 18.12 ft/s, 5.52 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

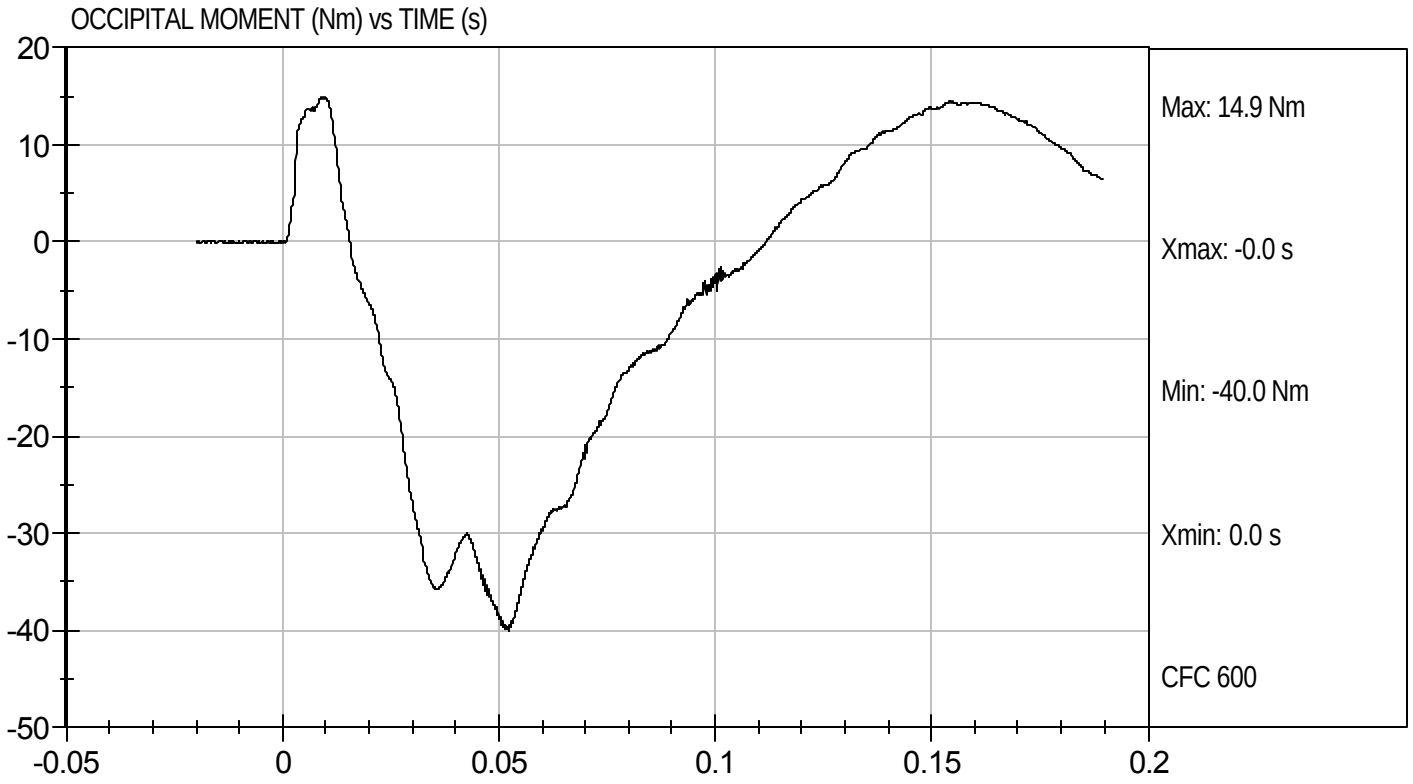


FLEXION ANGLE (DEG) vs TIME (s)



Test Desc: Neck Bending
Component ID: D112712

Test Date: 8/9/11
Velocity: 18.12 ft/s, 5.52 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D112713

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

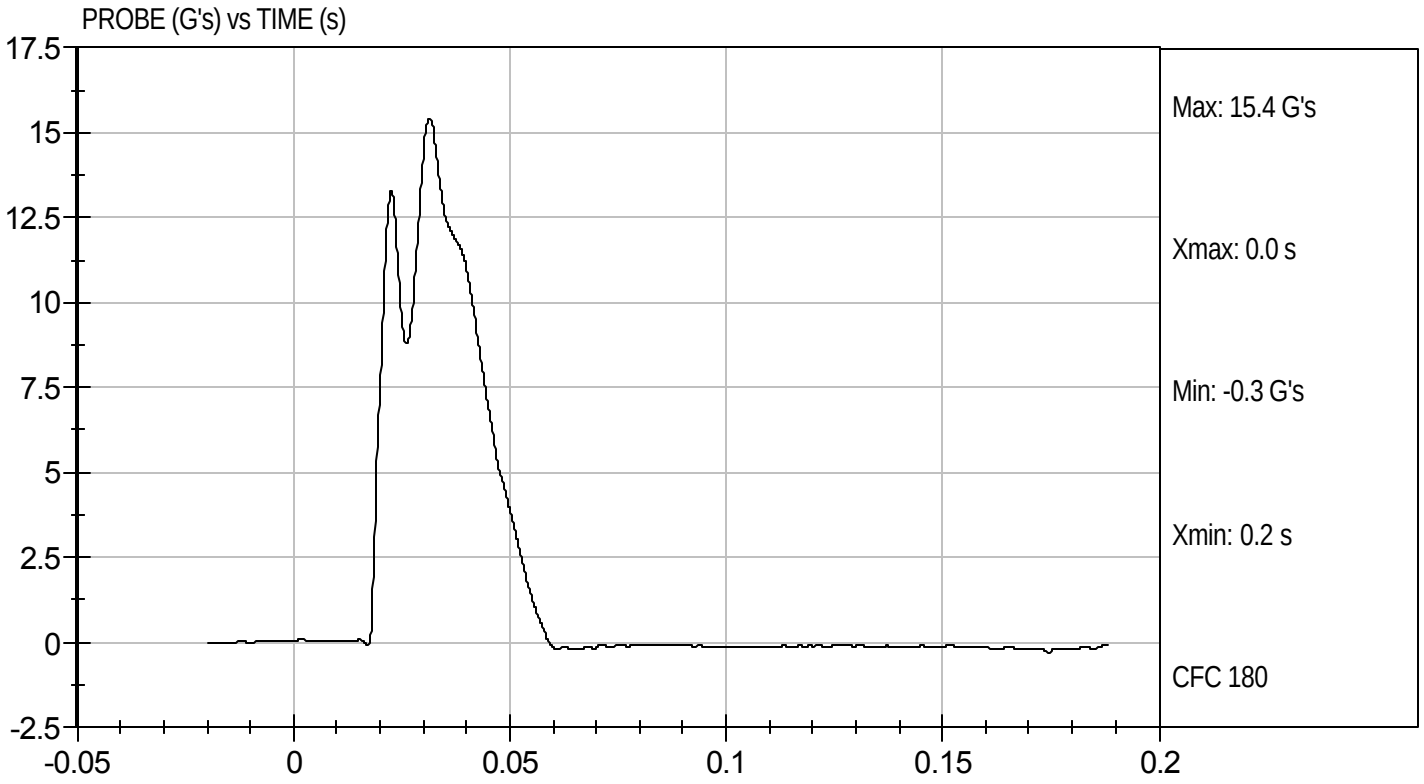
Jessica Hall
Laboratory Technician

8/10/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D112713

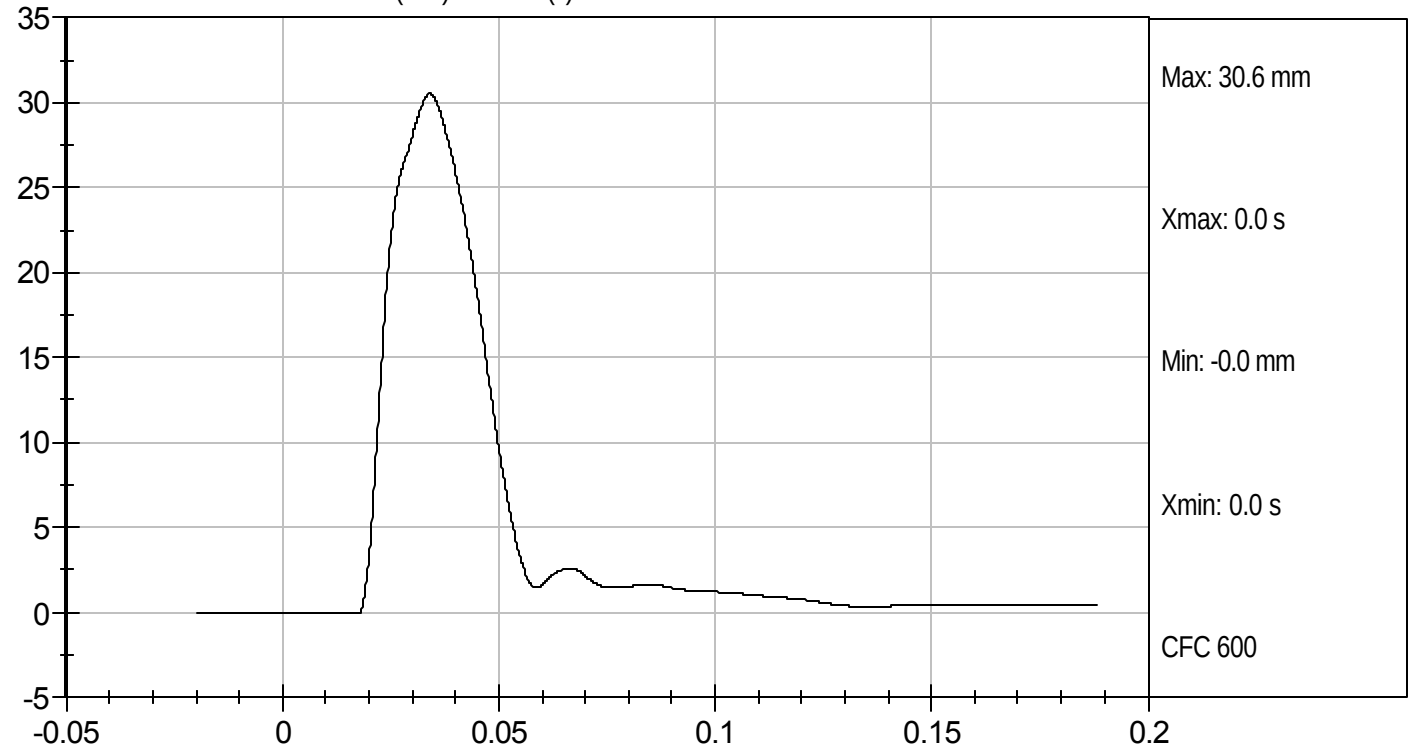
Test Date: 8/10/11
Velocity: 14.37 ft/s, 4.38 m/s



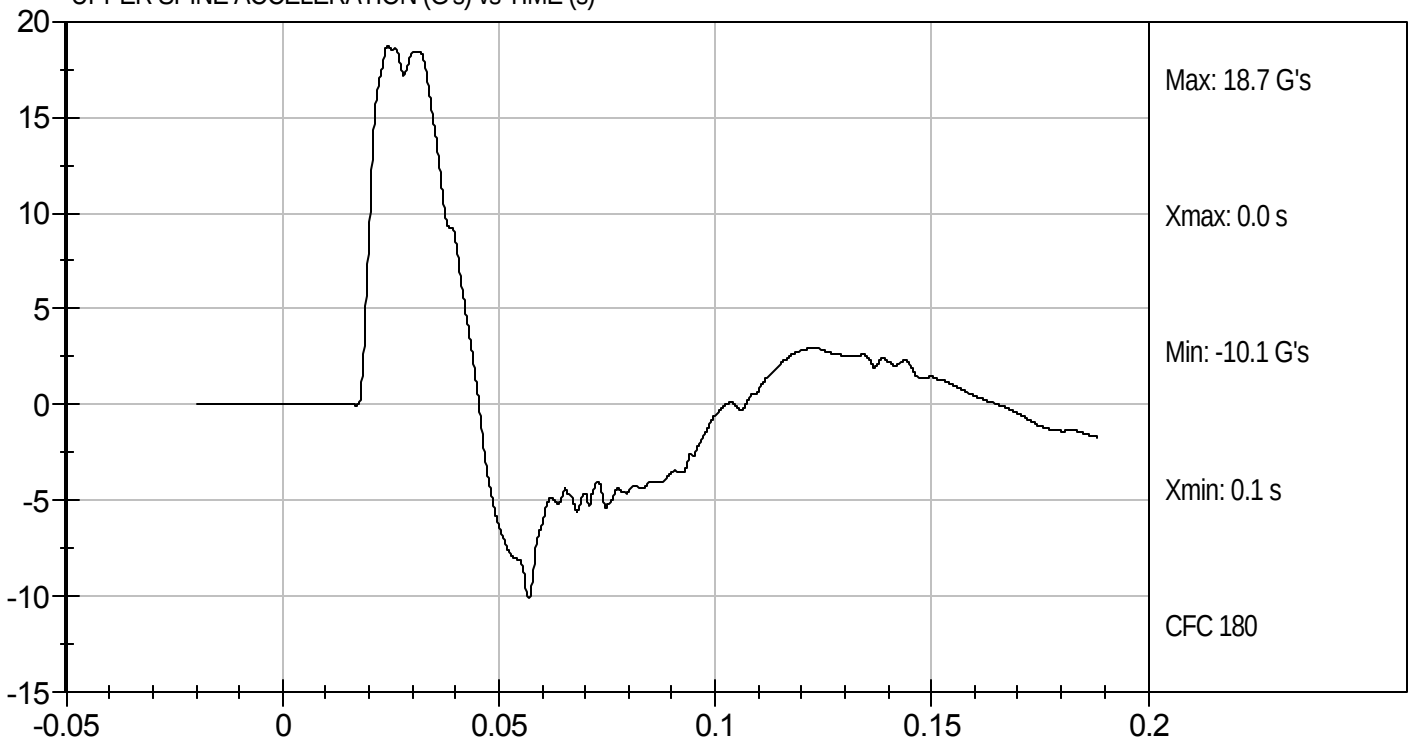
Test Desc: Shoulder Impact
Component ID: D112713

Test Date: 8/10/11
Velocity: 14.37 ft/s, 4.38 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



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



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112714

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	32	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	40	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
		Overall Test Results		Pass

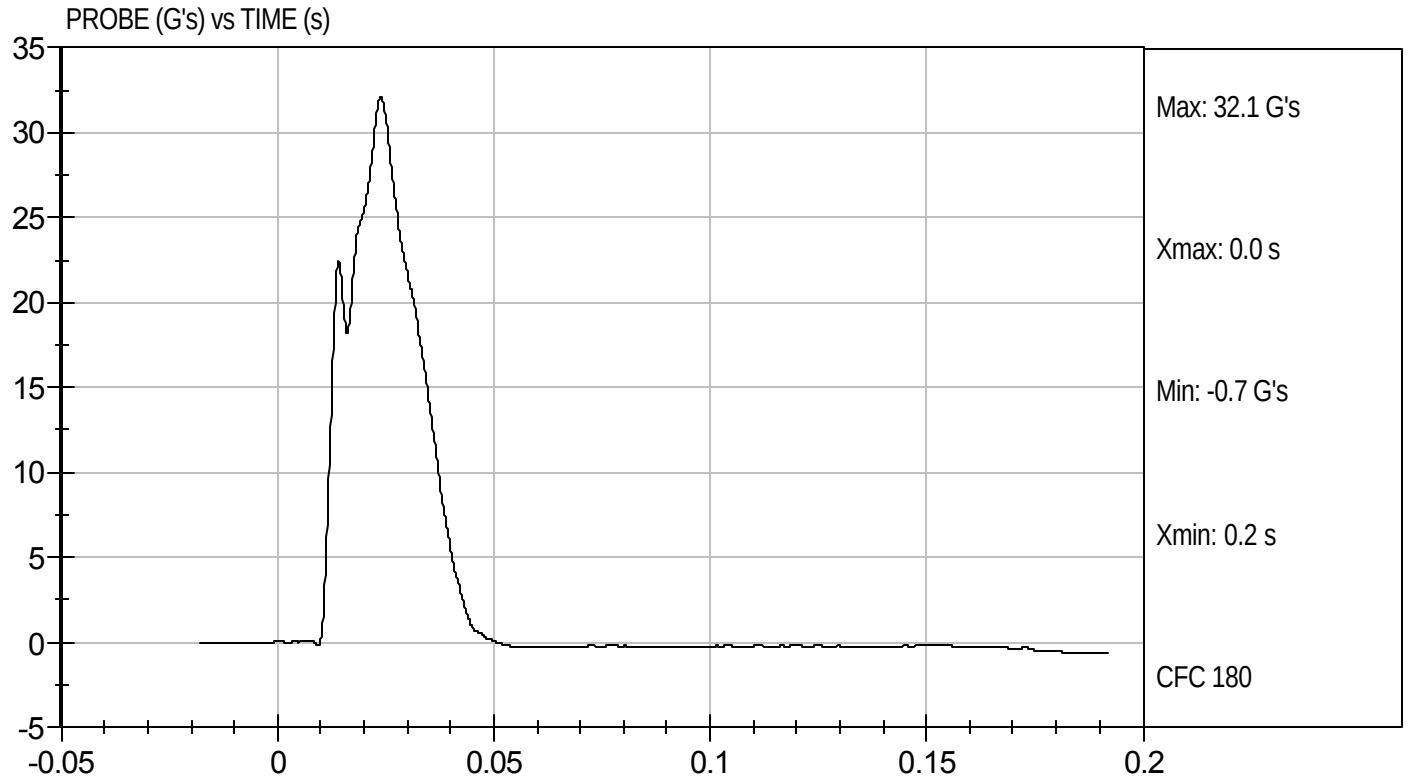
Jessica Gall
Laboratory Technician

8/10/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D112714

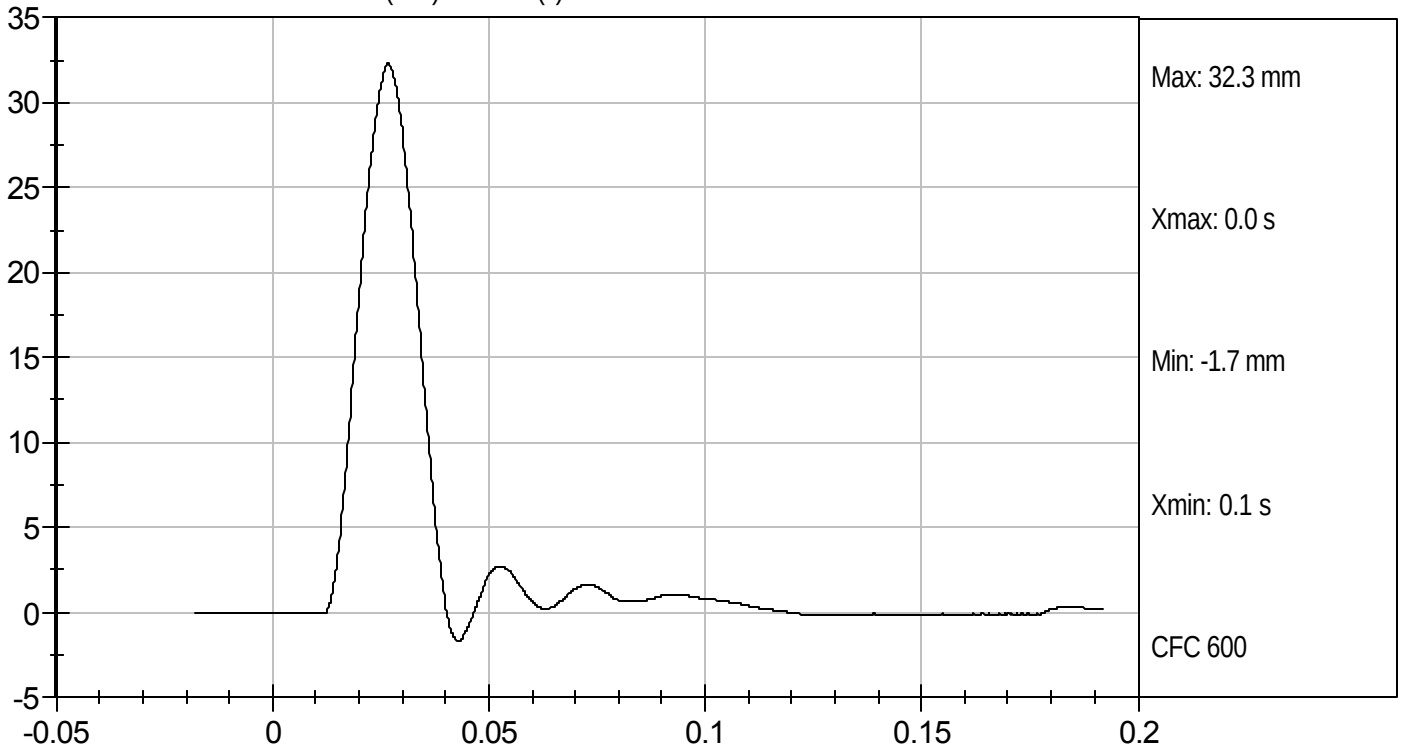
Test Date: 8/10/11
Velocity: 21.93 ft/s, 6.68 m/s



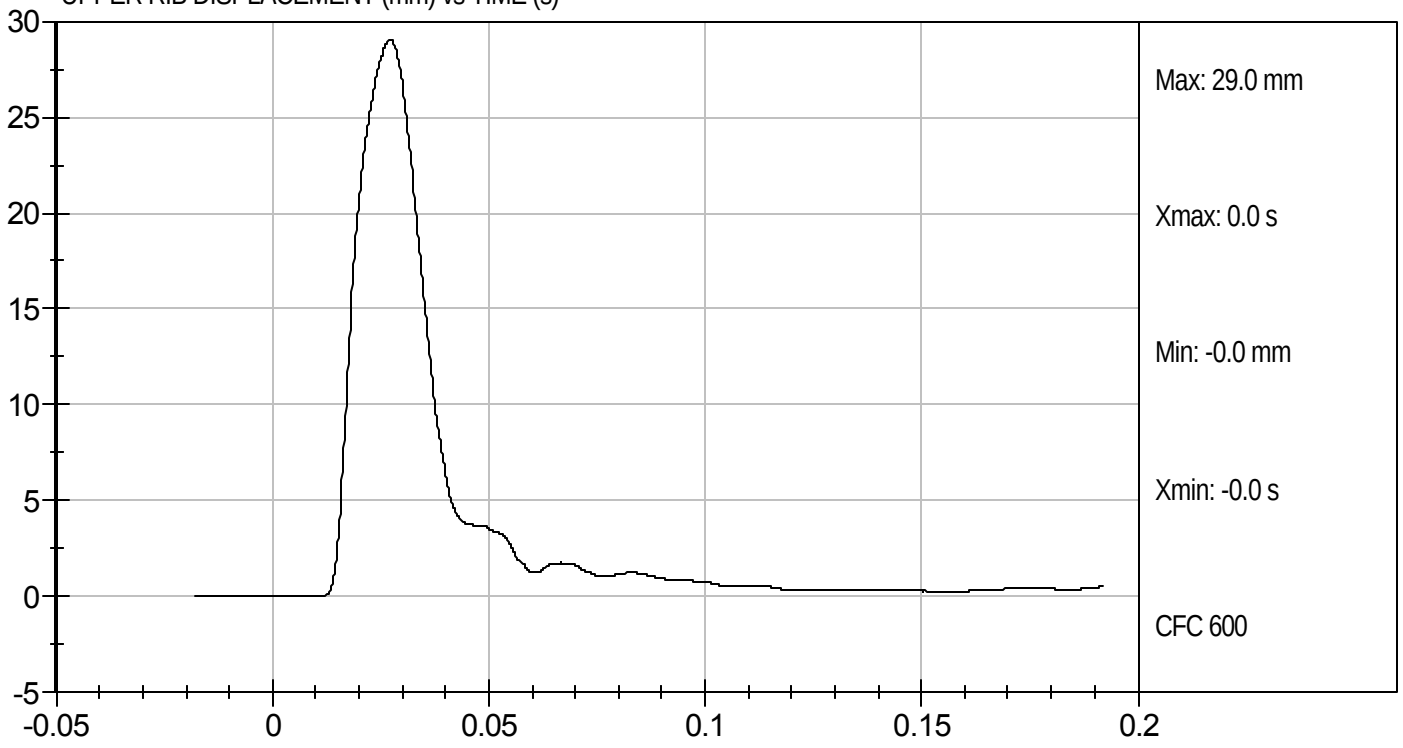
Test Desc: Thorax With Arm
Component ID: D112714

Test Date: 8/10/11
Velocity: 21.93 ft/s, 6.68 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (s)



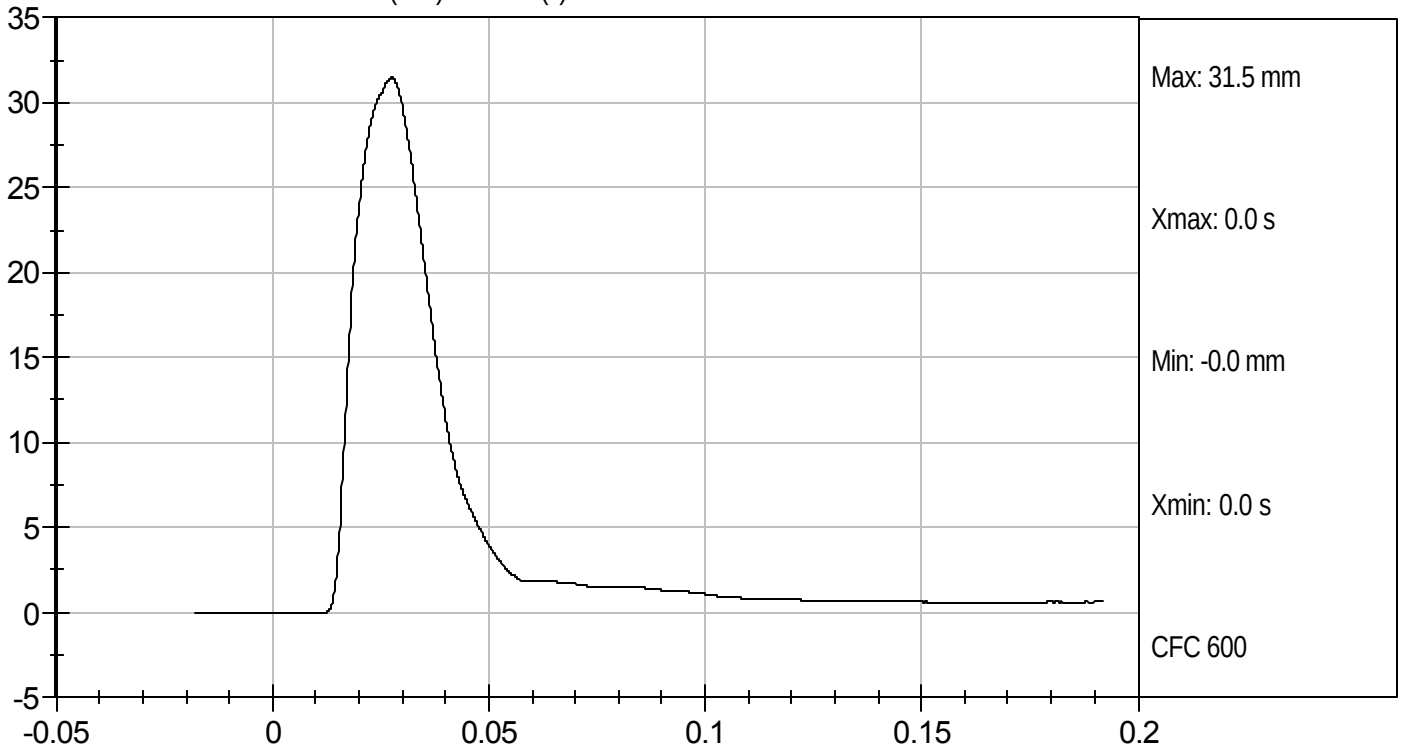
UPPER RIB DISPLACEMENT (mm) vs TIME (s)



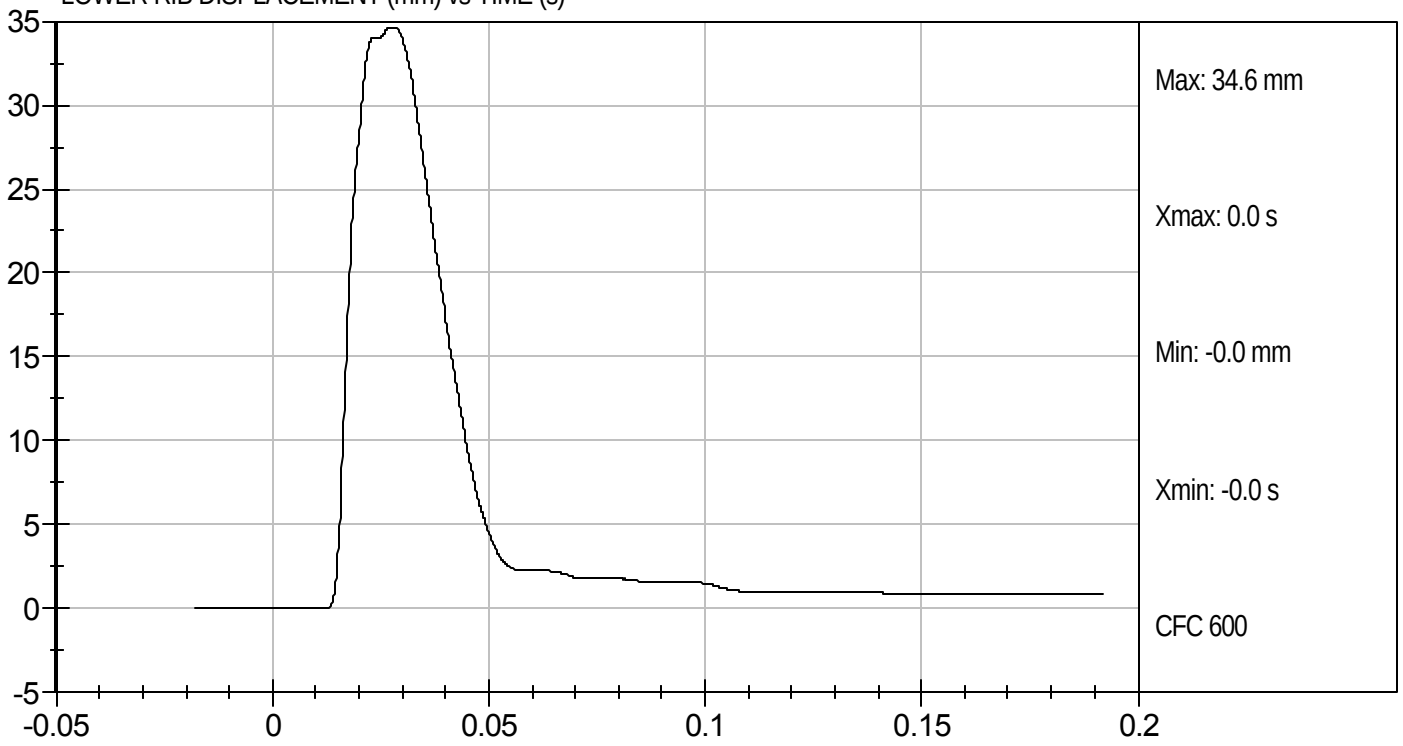
Test Desc: Thorax With Arm
Component ID: D112714

Test Date: 8/10/11
Velocity: 21.93 ft/s, 6.68 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)

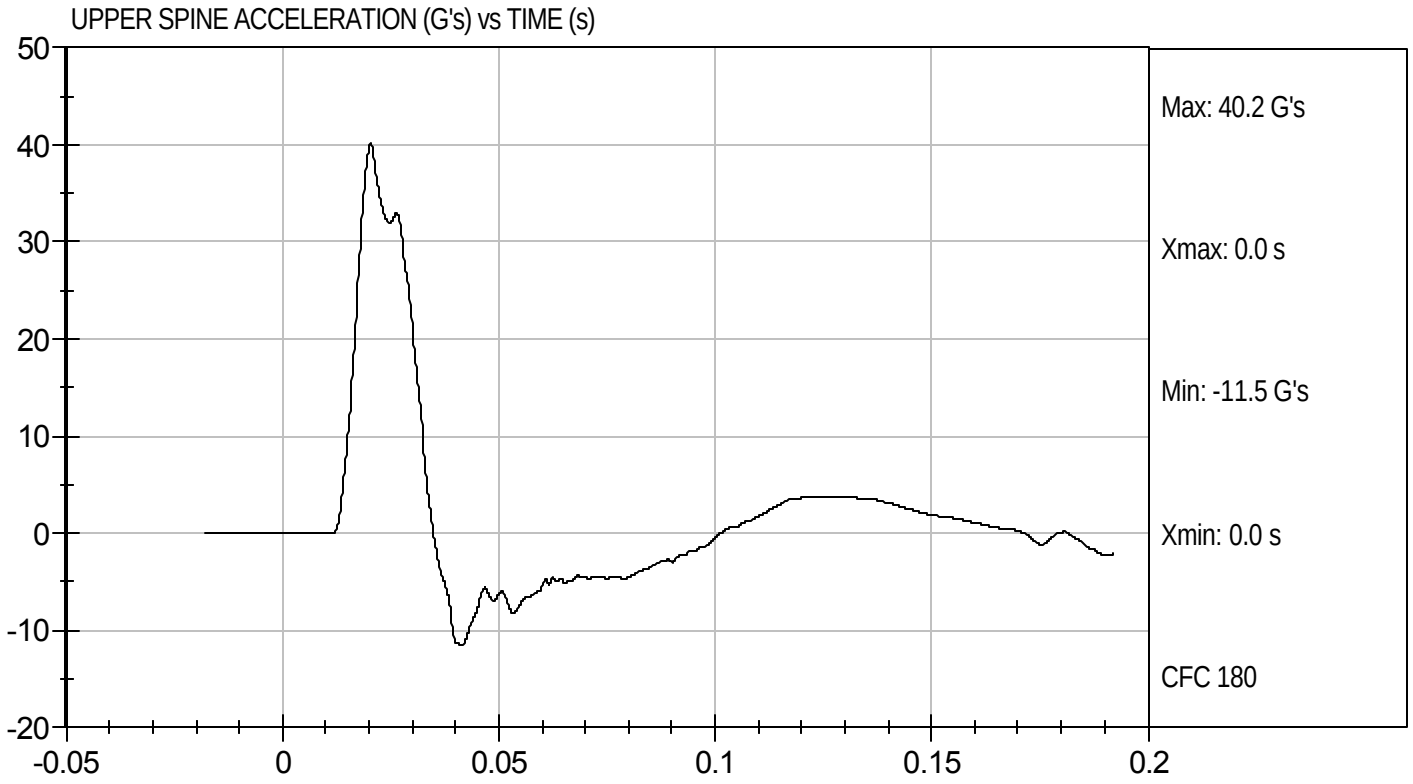


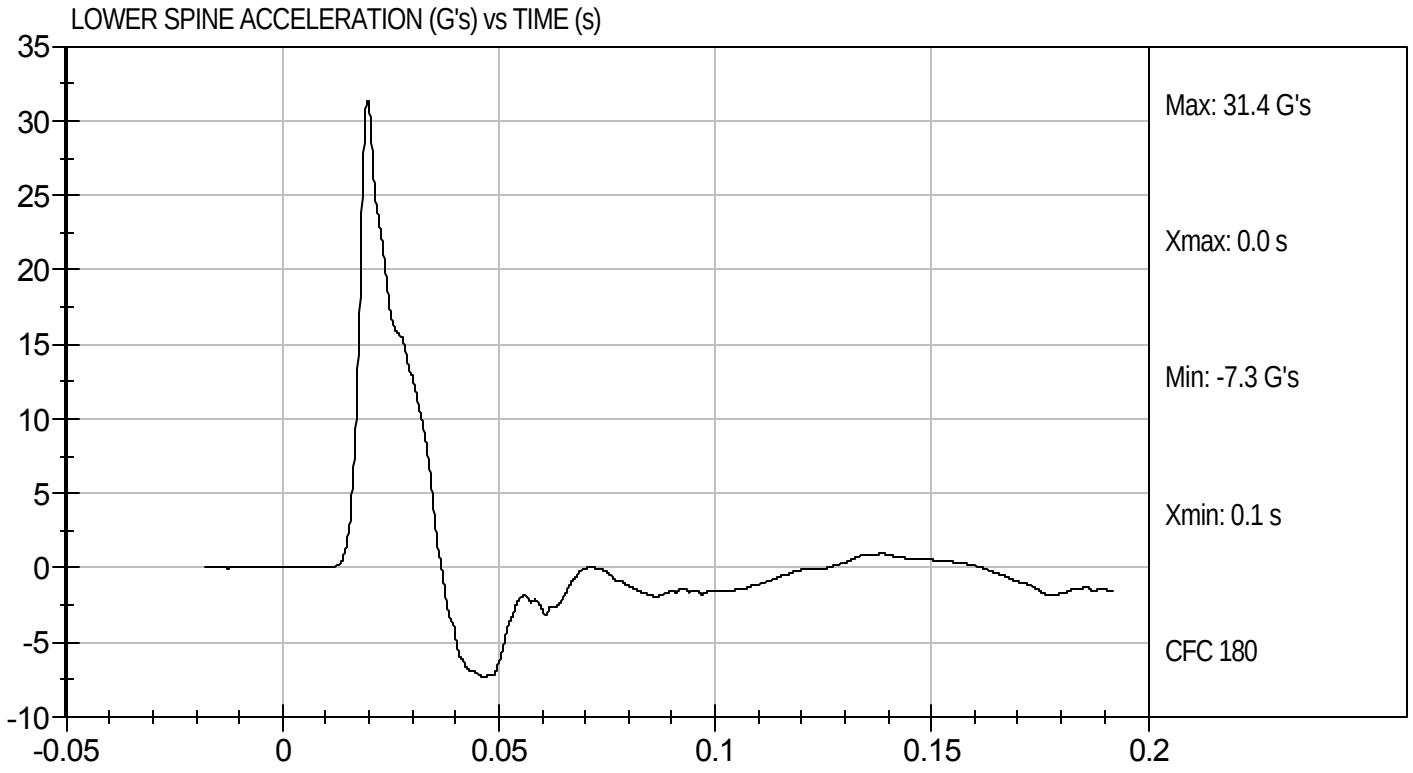
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



Test Desc: Thorax With Arm
Component ID: D112714

Test Date: 8/10/11
Velocity: 21.93 ft/s, 6.68 m/s





MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112715

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	38	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	41	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
		Overall Test Results		Pass

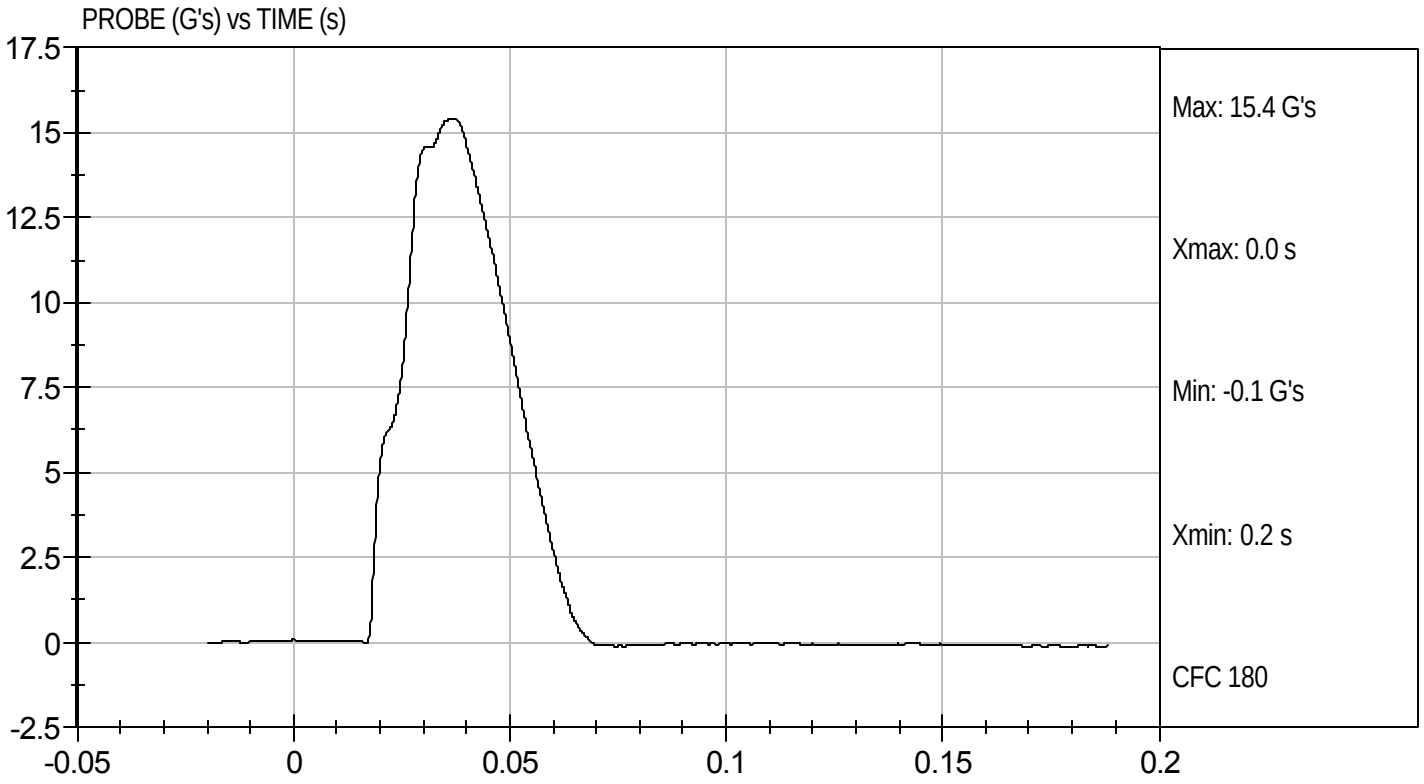
Jessica Gall
Laboratory Technician

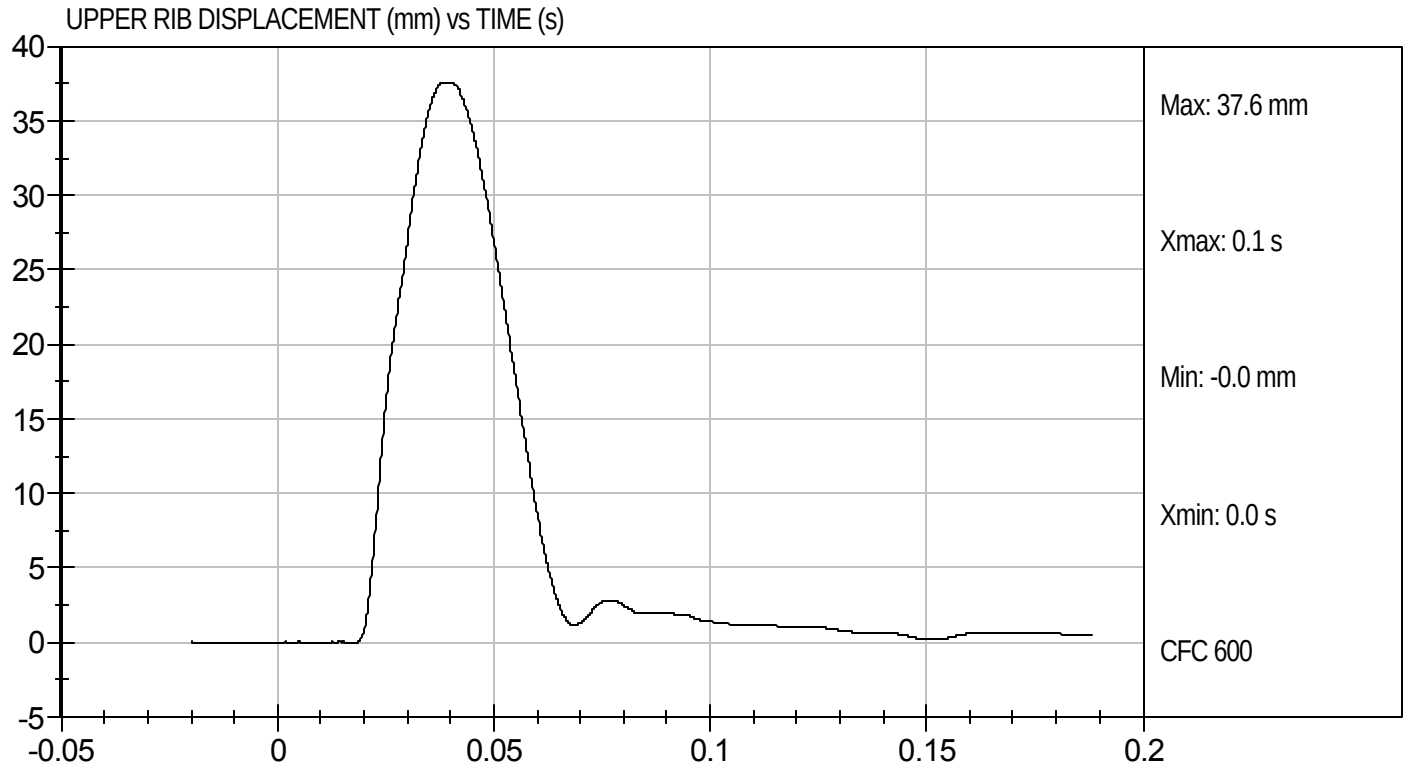
8/10/11
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D112715

Test Date: 8/10/11
Velocity: 14.37 ft/s, 4.38 m/s

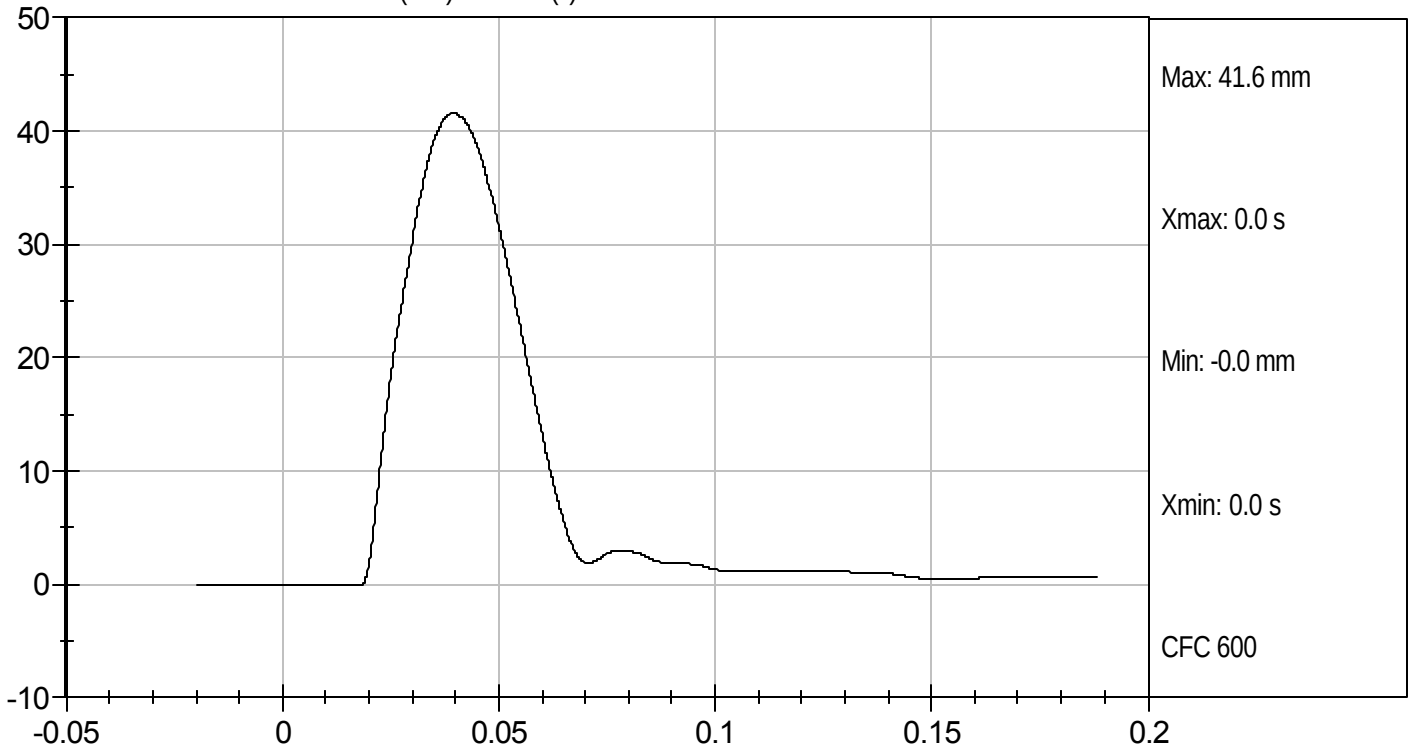




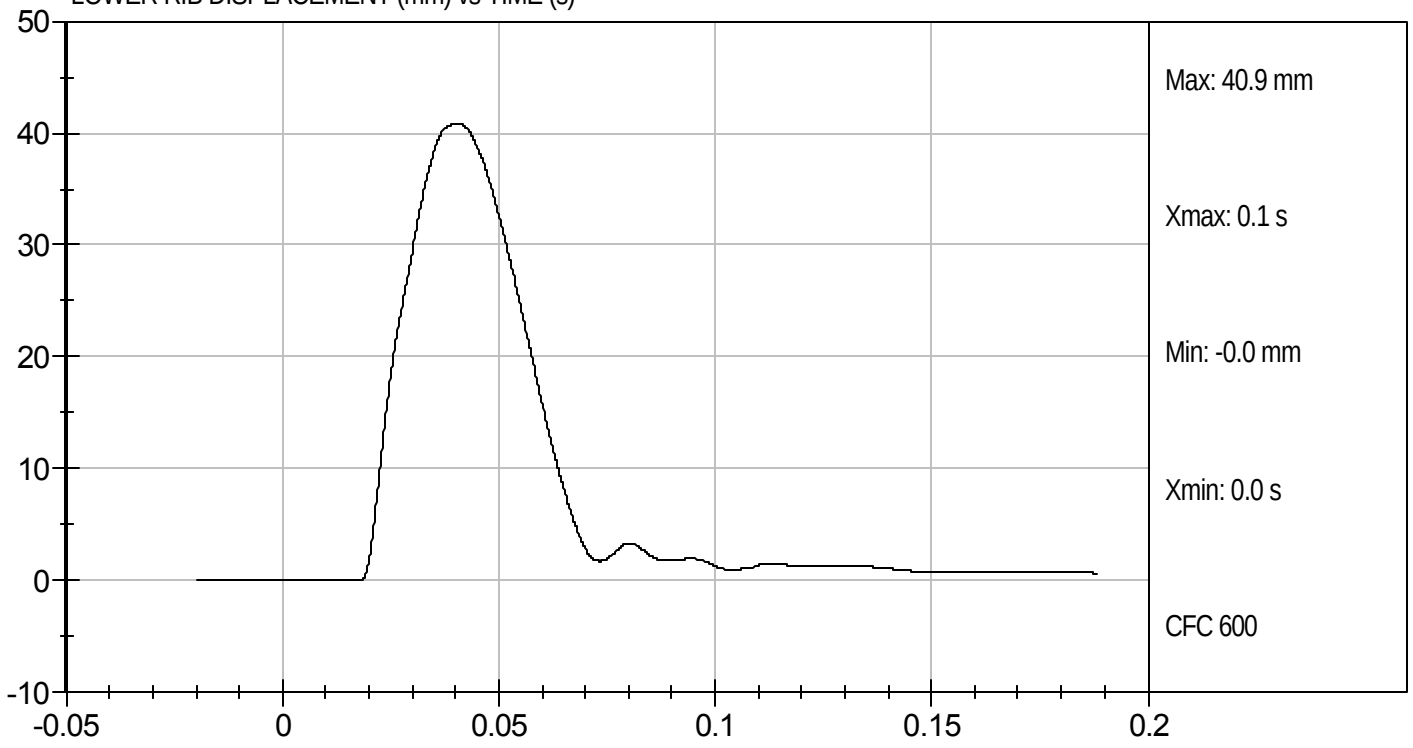
Test Desc: Thorax Without Arm
Component ID: D112715

Test Date: 8/10/11
Velocity: 14.37 ft/s, 4.38 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (s)



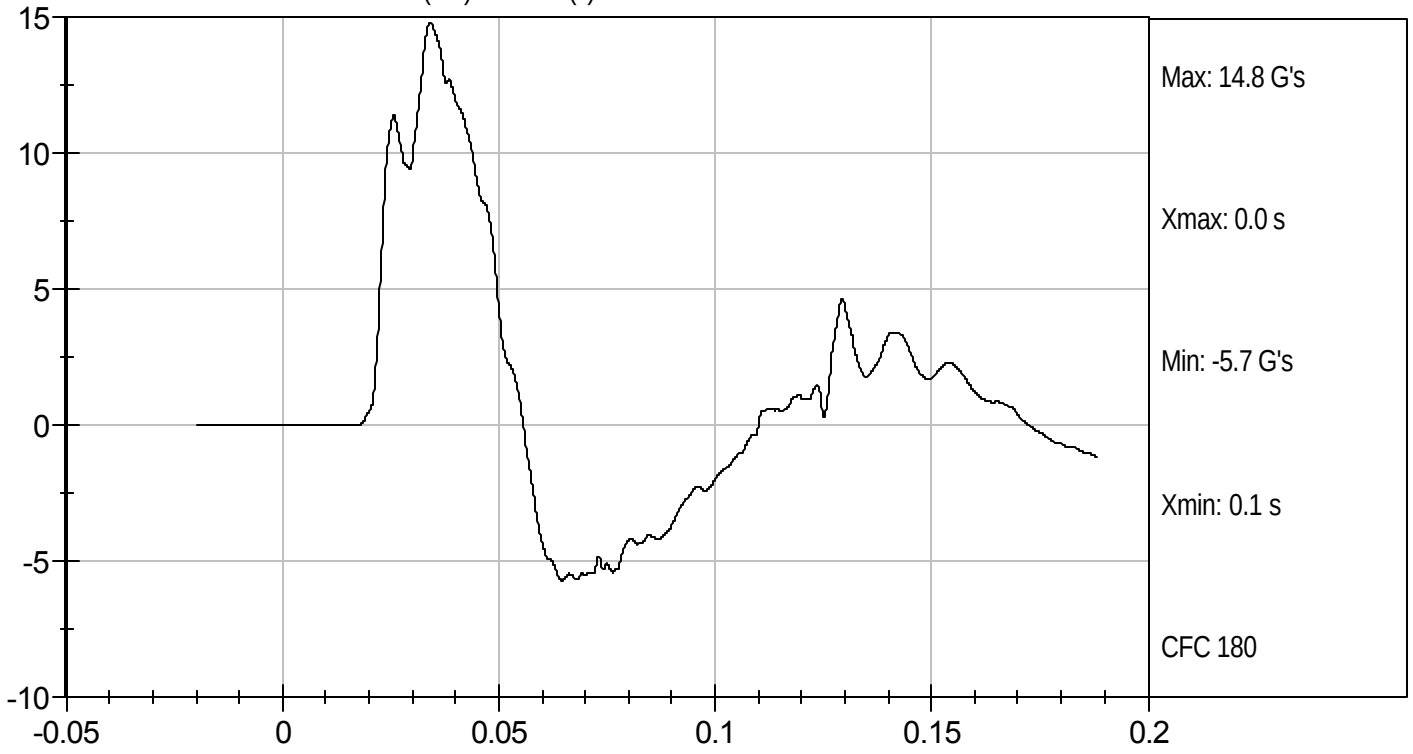
LOWER RIB DISPLACEMENT (mm) vs TIME (s)



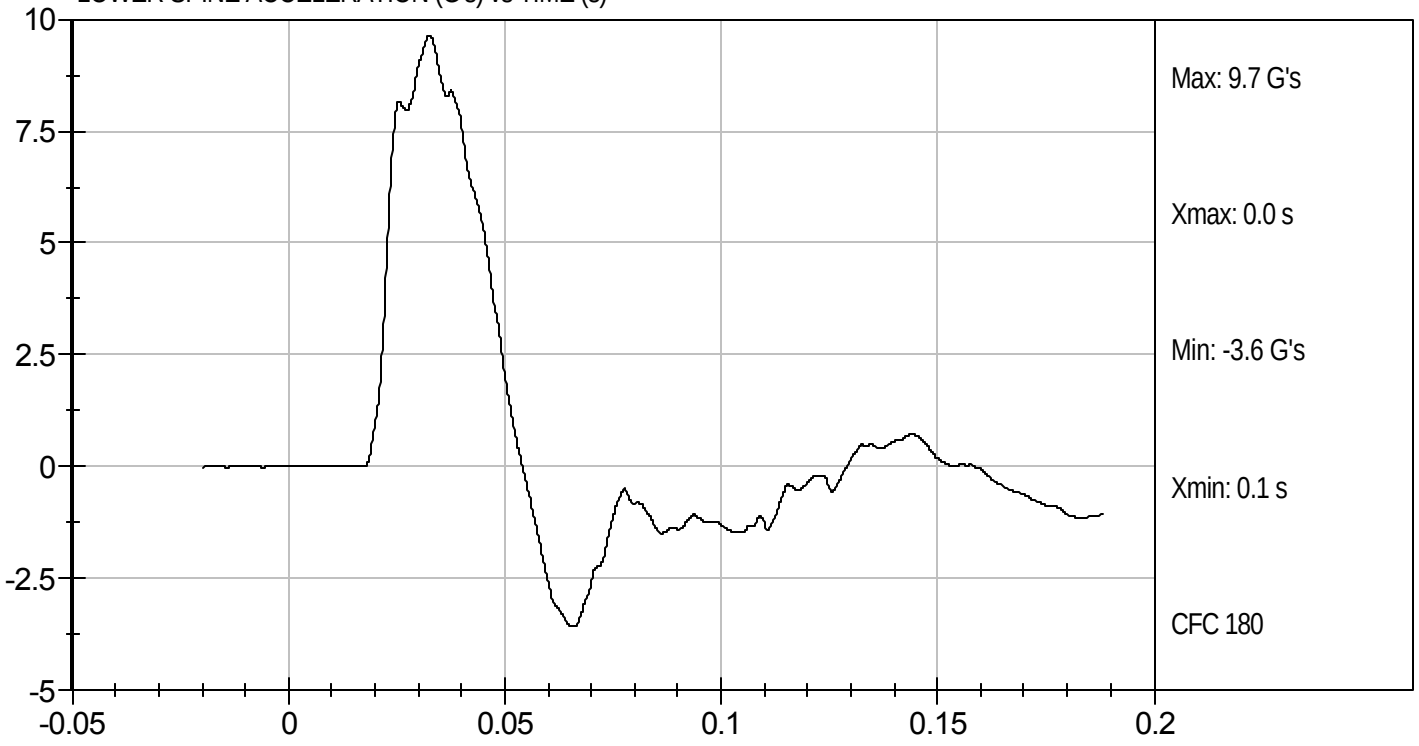
Test Desc: Thorax Without Arm
Component ID: D112715

Test Date: 8/10/11
Velocity: 14.37 ft/s, 4.38 m/s

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



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



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112716

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	46	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	42	Pass
Lower Rib Displacement	mm	33 to 44	42	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

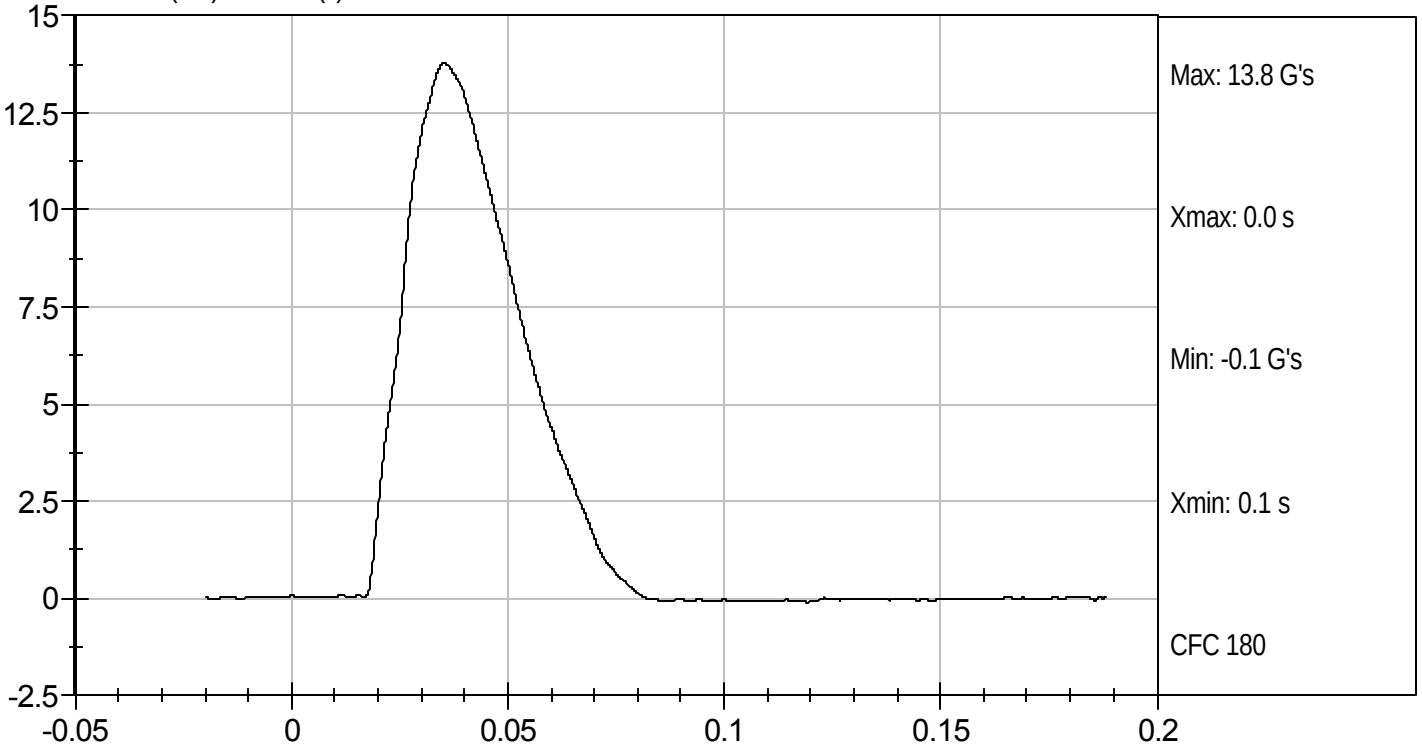
8/10/11
Test Date

David Winkelbauer
Approved By

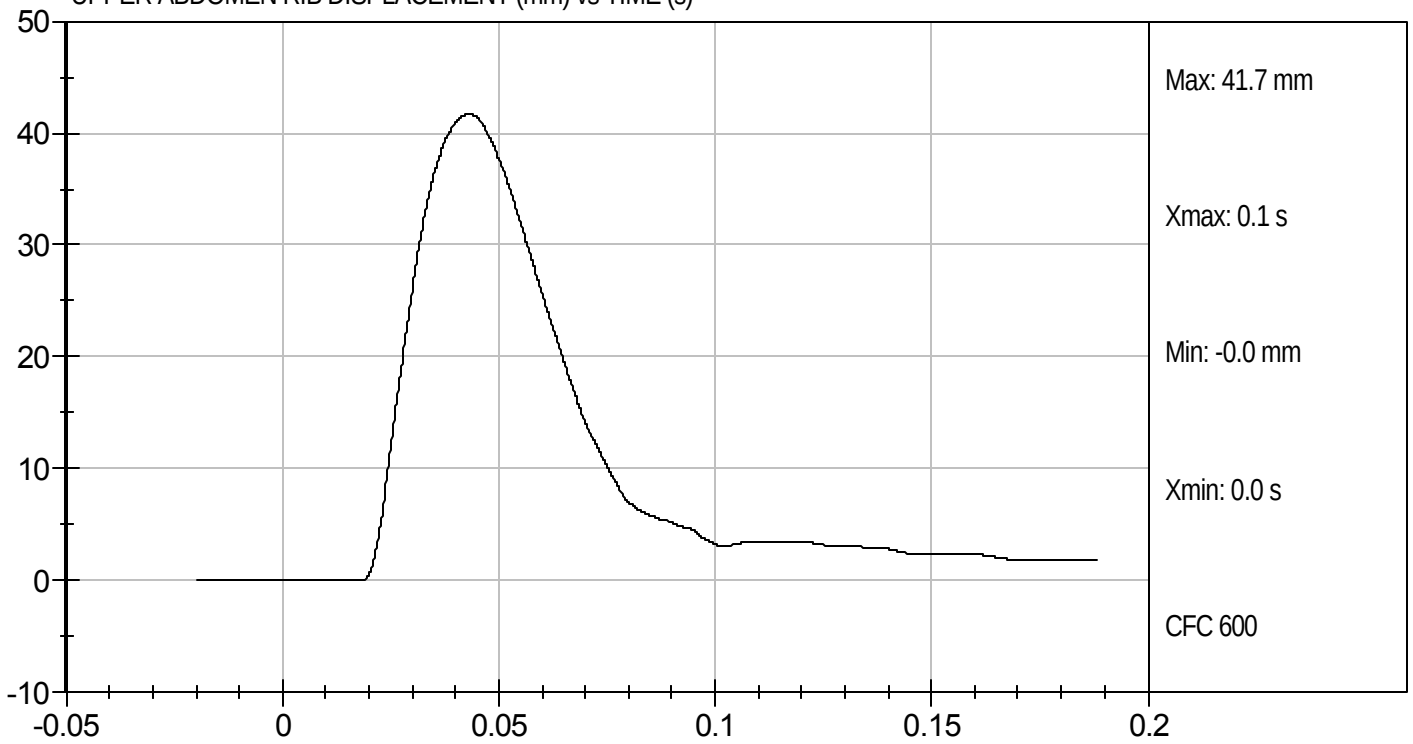
Test Desc: Abdomen Impact
Component ID: D112716

Test Date: 8/10/11
Velocity: 14.12 ft/s, 4.30 m/s

PROBE (G's) vs TIME (s)



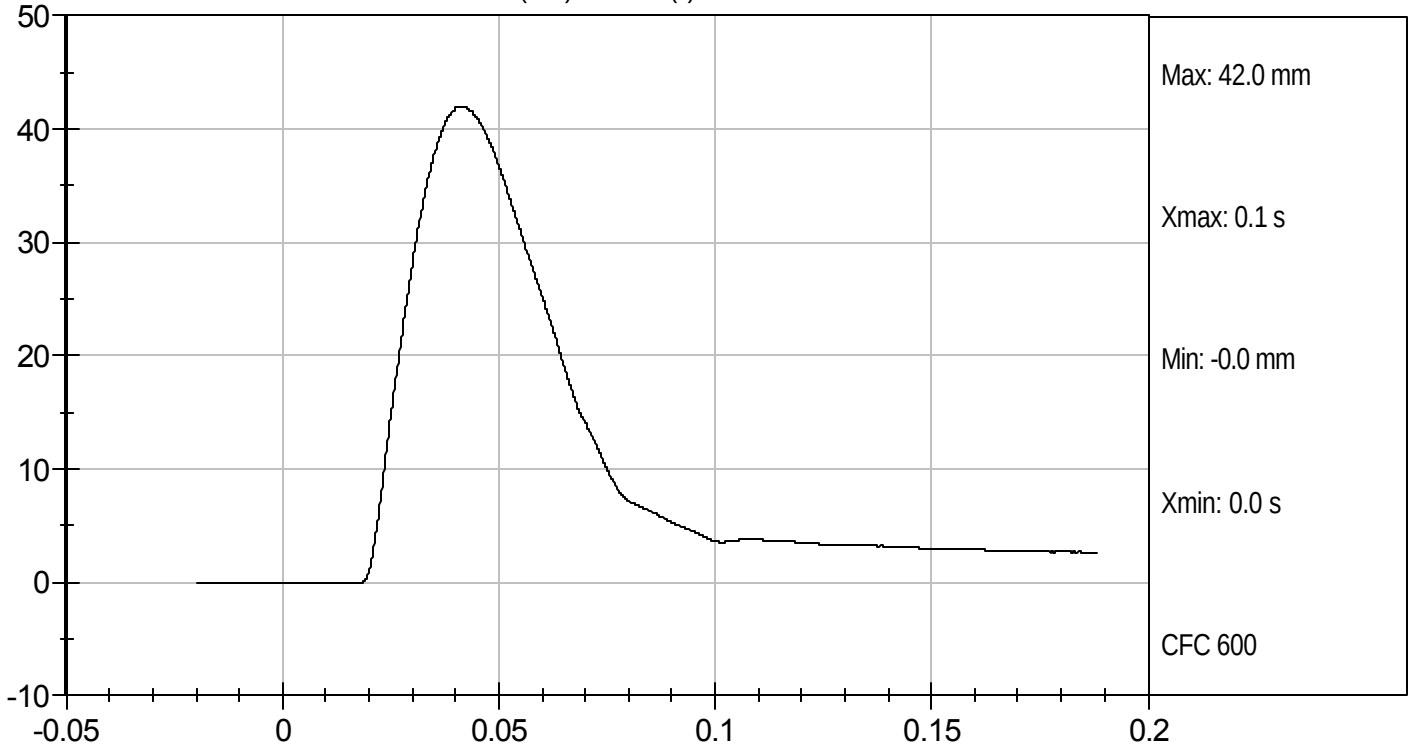
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (s)



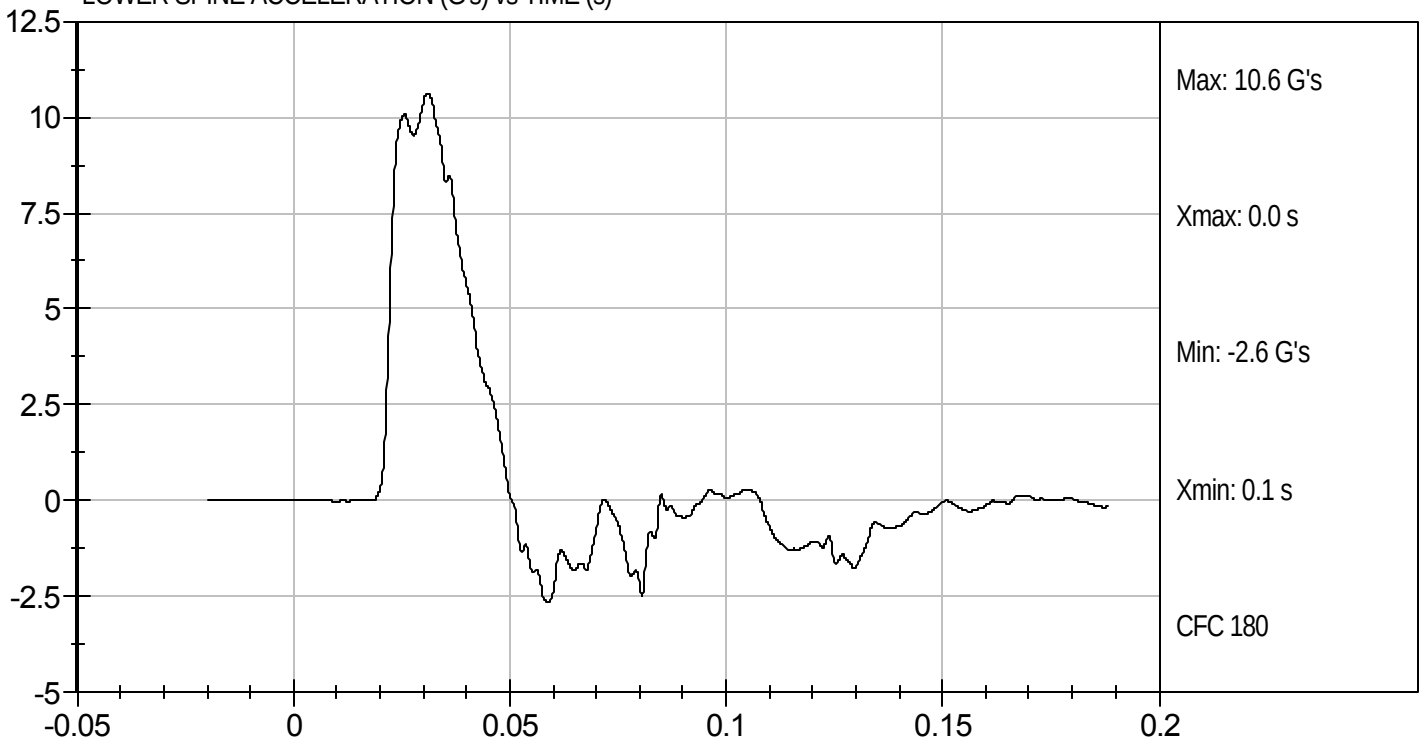
Test Desc: Abdomen Impact
Component ID: D112716

Test Date: 8/10/11
Velocity: 14.12 ft/s, 4.30 m/s

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



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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112717

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	40	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	38	Pass
Peak Acetabulum Force	N	3600 to 4300	3800	Pass
		Overall Test Results		Pass

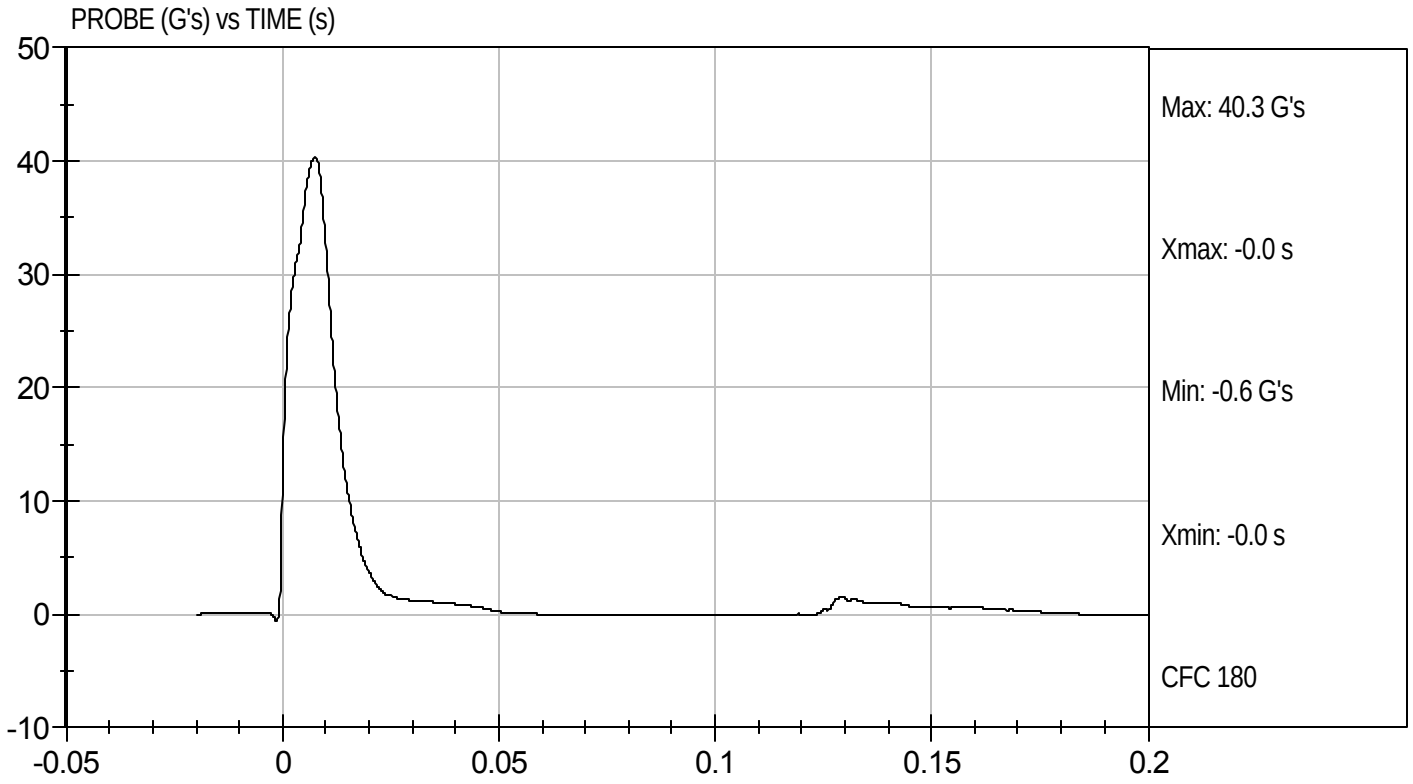
Jessica Hall
Laboratory Technician

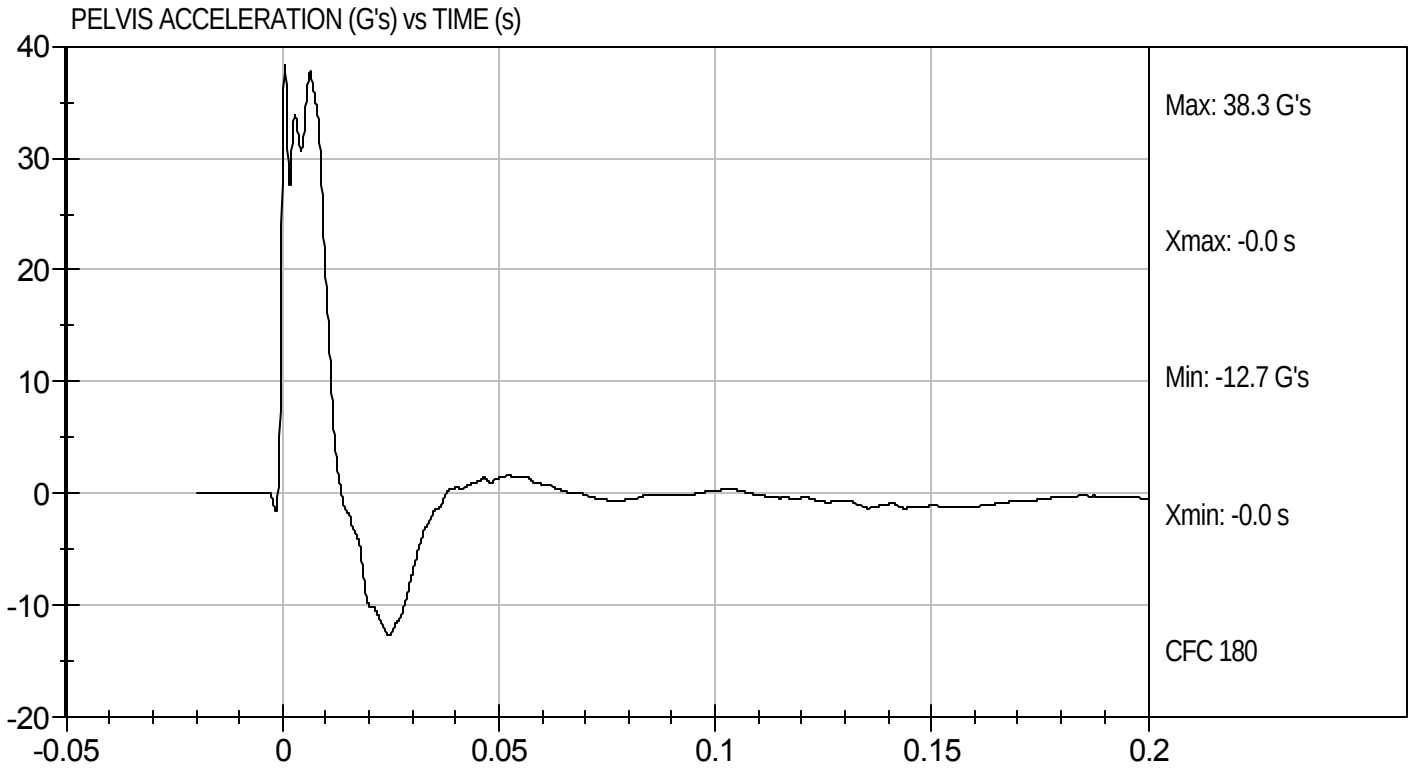
8/10/11
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D112717

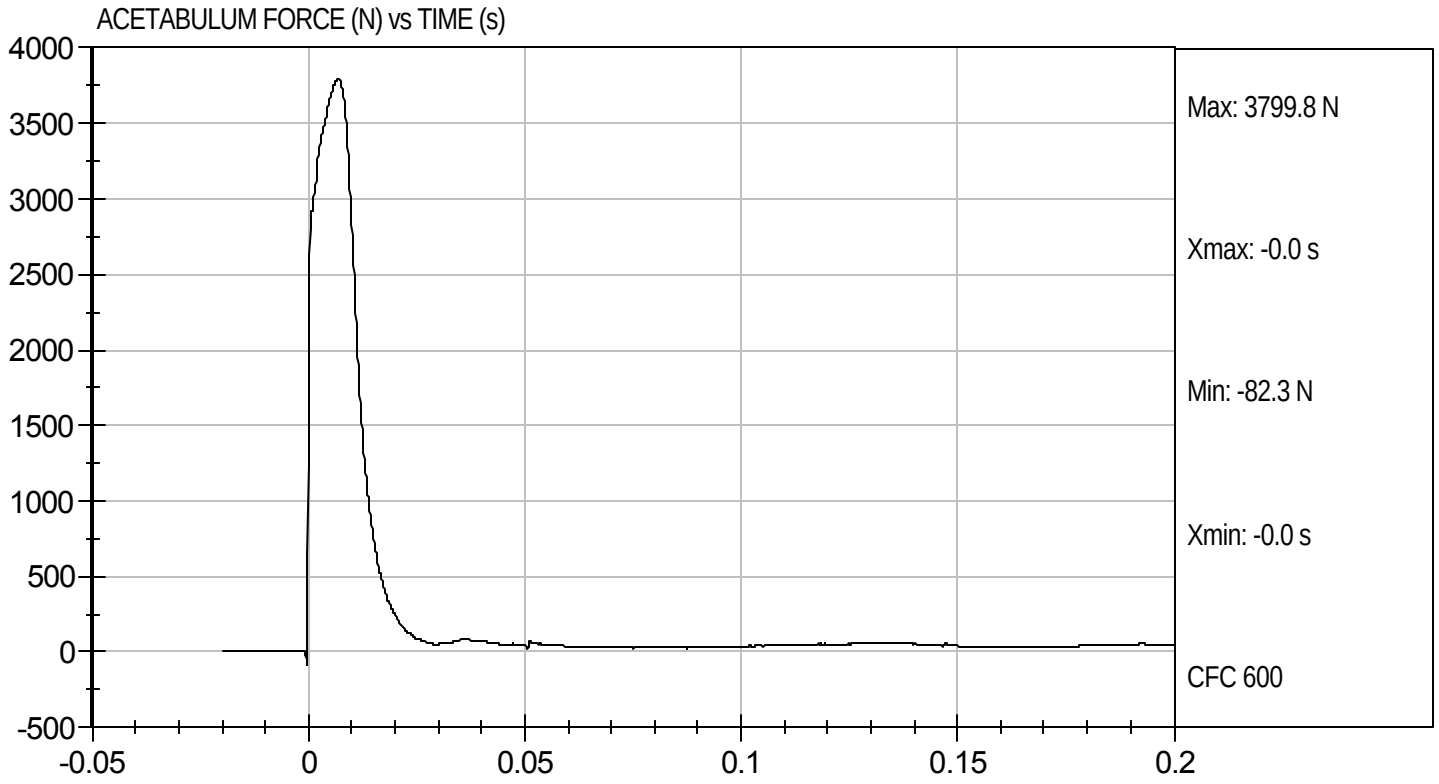
Test Date: 8/10/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D112717

Test Date: 8/10/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D112718

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	50	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4959	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

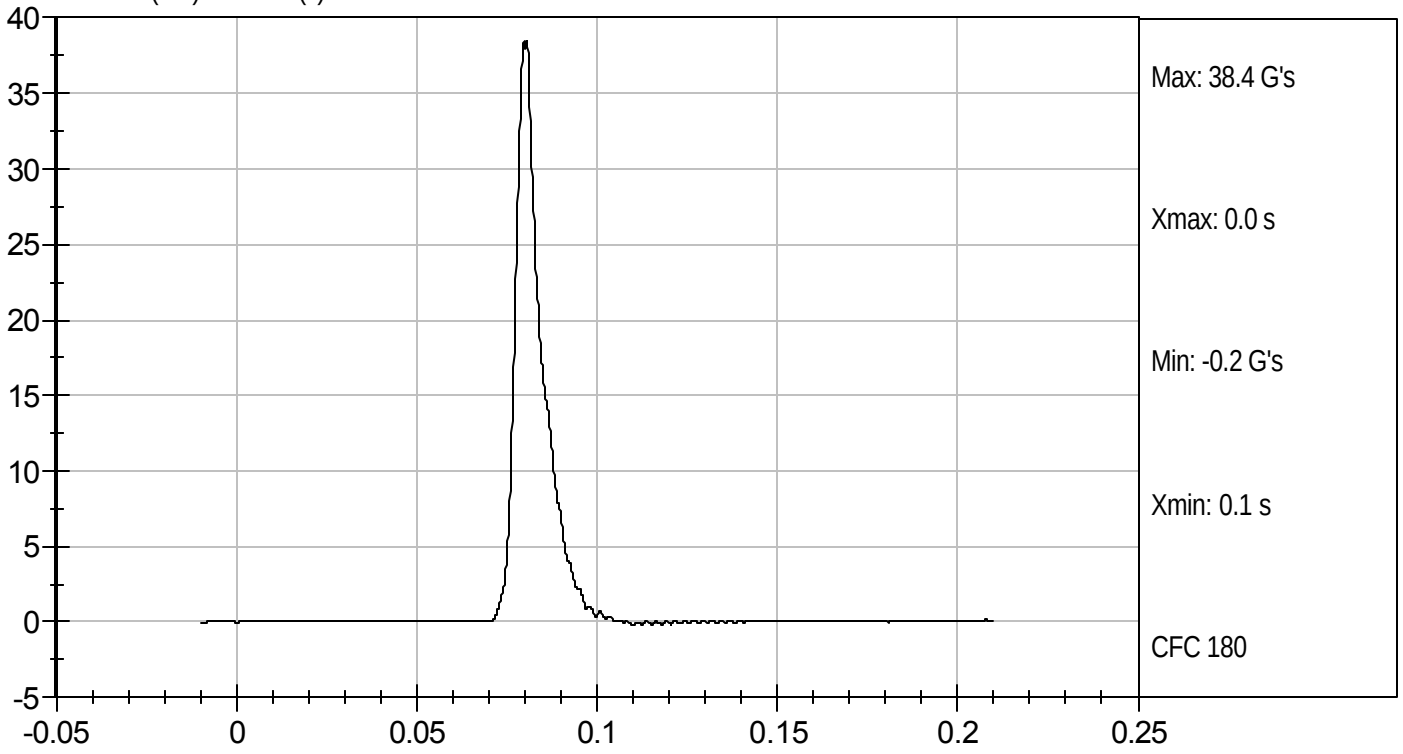
8/10/11
Test Date

David Winkelbauer
Approved By

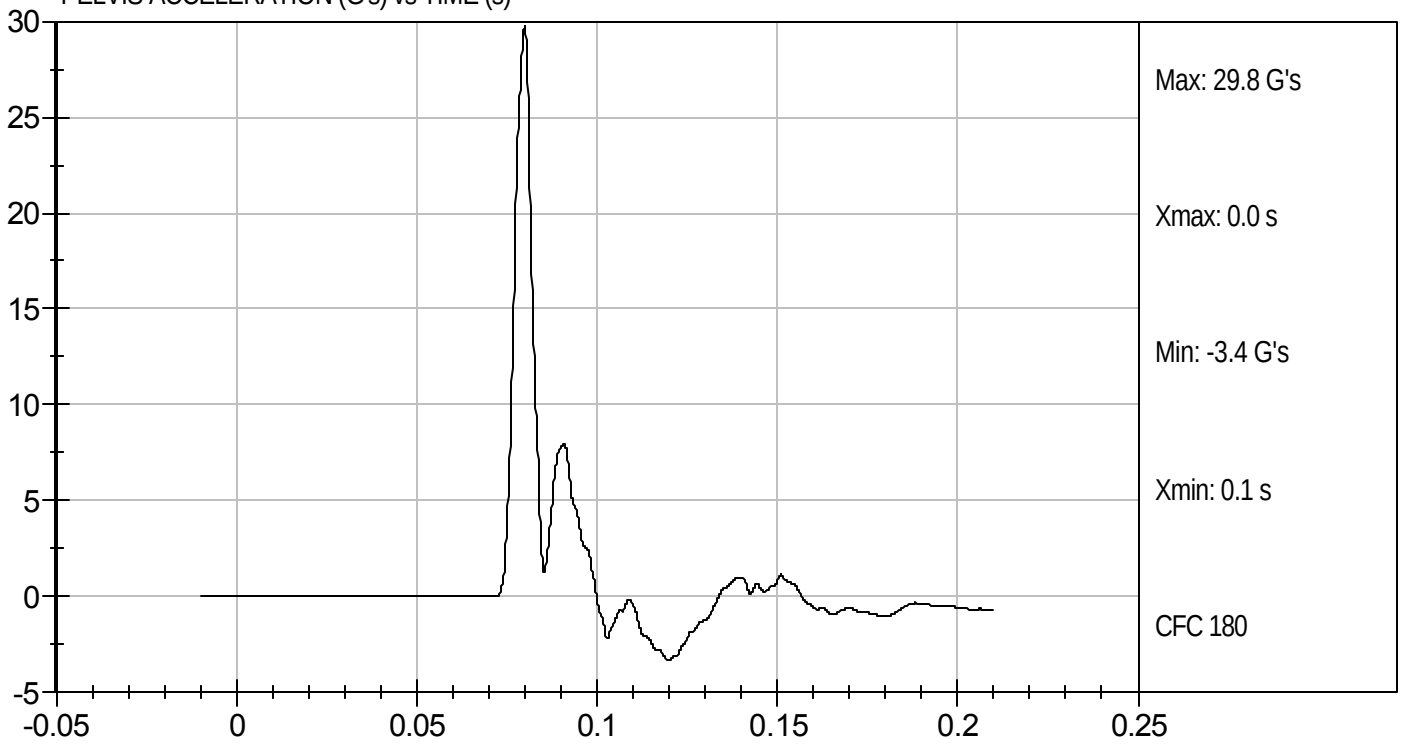
Test Desc: Iliac Impact
Component ID: D112718

Test Date: _T/DT/AS User
Velocity: 14.01 ft/s, 4.27 m/s

PROBE (G's) vs TIME (s)



PELVIS ACCELERATION (G's) vs TIME (s)



Test Desc: Iliac Impact
Component ID: D112718

Test Date: _T/DT/AS User
Velocity: 14.01 ft/s, 4.27 m/s