REPORT NUMBER: SINCAP-MGA-2011-056

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

FUJI HEAVY INDUSTRIES LTD.
2011 Subaru Forester
NHTSA No.: MB5504

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: December 17, 2010

Final Report Date: February 4, 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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Date: _____

_____
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NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

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16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2011 Subaru Forester 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 December 17, 2010.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.1 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The target vehicle post-test maximum crush was 257 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	150
Maximum Thorax Rib Deflection	mm	44	21
Combined Abdominal Force	N	2500	1052
Pubic Symphysis Force	N	6000	1857

	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	209
Lower Spine (T12) Resultant Acceleration	G	82	51
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	5425

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	
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2011 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test is to generate comparative side impact performance in a 2011 Subaru Forester. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated January 2010.

SUMMARY

A 2011 Subaru Forester was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.1 km/h (38.6 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin, on December 17, 2010. Pretest and post test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

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

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Head 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	150
Maximum Thorax Rib Deflection	mm	44	21
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	Passenger ATD (SID-IIs)		
Measurement Description	**Units**	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/A	1000	209
Lower Spine (T12) Resultant Acceleration	G	82	51
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	5425

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

GENERAL COMMENTS

There was no valid data collected for:

Left Rear Sill Y after 25 msec.
Left Front Sill Y after 5 msec.
Left Lower B-Post Y after 15 msec.
Left Mid B-Post Y after 15 msec.
Left Lower A-Post Y after 10 msec.
Left Mid A-Post Y after 20 msec.
Driver Seat Track Y after 10 msec.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	MB5504	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	Yes
Make	Subaru	Power Steering	Yes
Model	Forester	Driver Front Airbag	Yes
Body Style	MPV	Driver Curtain Airbag	Yes
VIN	JF2SHBBCXBG707171	Driver Head/Torso Airbag	No
Body Color	Sage Green Metallic	Driver Torso Airbag	No
Delivery Date	11/11/2010	Driver Torso/Pelvis Airbag	Yes
Odometer (mi)	60	Driver Pelvis Airbag	No
Odometer (km)	97	Driver Knee Airbag	No
Dealer	Sommer's Subaru	Rear Pass. Front Airbag	No
Transmission	Manual	Rear Pass. Curtain Airbag	Yes
Final Drive	AWD	Rear Pass. Head/Torso Airbag	No
Type/No. Cylinders	4	Rear Pass. Torso Airbag	No
Engine Displacement (L)	2.5	Rear Pass. Torso/Pelvis Airbag	No
Engine Placement	Longitudinal	Rear Pass. Pelvis Airbag	No
Roof Rack	Yes	Rear Pass. Knee Airbag	No
Sunroof/T-Top	No	Pretensioners	Yes
Tinted Glass	No	Load Limiters	Yes
Traction Control	Yes	Automatic Door Locks	No
Power Brakes	Yes	Bucket Seats	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Power Seats	No
Does owner's manual provide instruction to turn off automatic door locks?			N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	Fuji Heavy Industries Ltd.	GVWR (kg)	2035
Date of Manufacture	09/10	GAWR Front (kg)	1050
		GAWR Rear (kg)	1095

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				408	(A)
DSC x 68.04 (kg)				340	(B)
Cargo Weight (RCLW) (kg)				68	(A-B)

VEHICLE SEAT TYPE

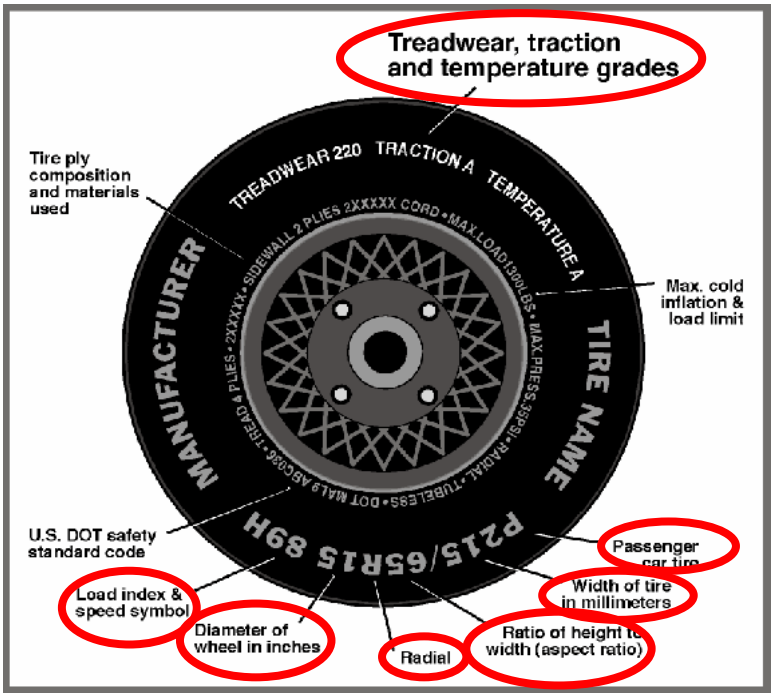
	Type of Seat Pan				Type of Seat Back		
Seating Location	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						Manual	Power
Front Seat	X					w/Lever	
Rear or Second Row			X		X		
Third Row Seat							

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	210	200
Recommended Tire Size	P215/65R16	P215/65R16
Tire Size on Vehicle	P215/65R16	P215/65R16
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Dueler H/T	Dueler H/T
Treadwear	300	300
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	4	4
Load Index & Speed Symbol	96H	96H
Tire Material	Rubber	Rubber
DOT Safety Code Right	EMHB DML3810	EMHB DML3810
DOT Safety Code Left	EMHB DML3810	EMHB DML3810

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	399.2	335.2		434.5	416.4		438.2	424.1	
Right	kg	396.9	322.5		406.0	387.4		399.6	389.2	
Ratio	%	54.8	45.2		51.1	48.9		50.7	49.3	
Totals	kg	796.1	657.7	1453.8	840.5	803.8	1644.3	837.8	813.3	1651.1

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1453.8	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	68	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1651.1	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	762	770	737	748	
As Tested (Fully Loaded ± 10mm at each wheel well)	mm	766	774	747	748	1278

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2615
Total Vehicle Length at Left Side	mm	3833
Total Vehicle Length at Centerline	mm	4563
Total Vehicle Length at Right Side	mm	3833
Weight of Ballast in Cargo Area	kg	42.2
Weight of Vehicle Components Removed	kg	0.0
Amount of Stoddard Solvent in Fuel Tank	L	59.4

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

TEST VEHICLE VERTICAL IMPACT POINT DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	368
Actual Impact Point Aft of Front Axle	mm	359

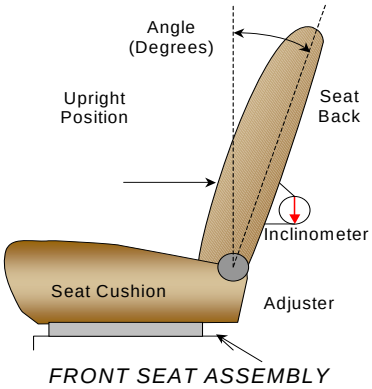
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle:	2011 Subaru Forester	NHTSA No.	MB5504
Test Program:	NCAP Side MDB Impact Test	Test Date:	12/17/2010

NOMINAL DESIGN RIDING POSITION

The driver and right front passenger seat backs are positioned to the manufacturer's designated angle. The procedure is as follows: For the driver, set seat back in the 6th detent (first-locking as 0). The left rear passenger seat back was fixed.



SEAT BACK ANGLES

	Degrees
Driver with Seated Dummy	7.0° on headrest post guide (6th detent, 1st as 0)
Passenger with Seated Dummy	6.9° on headrest post guide

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	19 detents (1st as 1)	9th 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	4 detents (1st as 1)	1st detent (uppermost as 0)
Rear Seat	Fixed	Fixed

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

DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

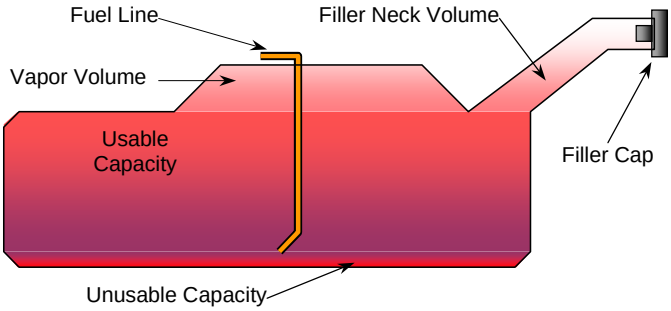
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	64.0
Usable Capacity of "Optional" Tank	
Usable Capacity Used for FMVSS 301	58.9 to 60.2
Actual Amount of Solvent used	59.4

FUEL PUMP

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

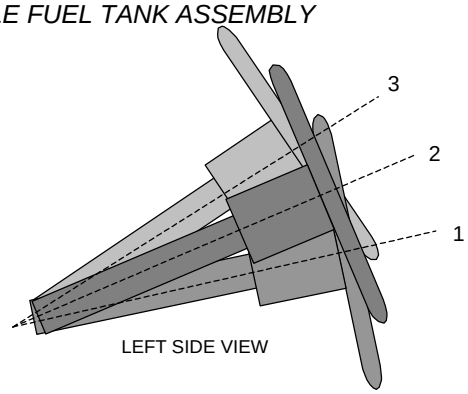
The test vehicle is equipped with an electric fuel pump. Pump operates a few seconds after an ignition is turned ON. After that, pump operates only while engine is running. The fuel pipe is on the right side.



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

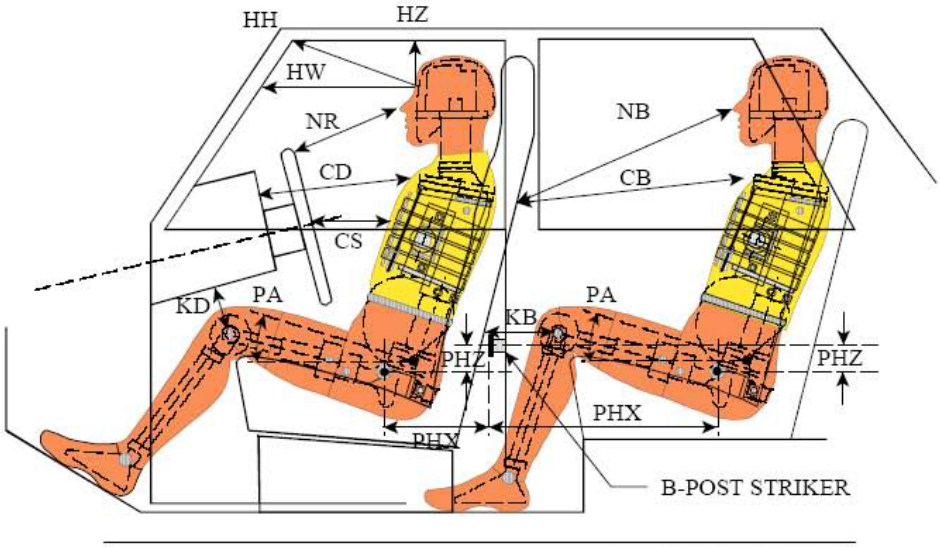
STEERING COLUMN POSITION

	Detent	Fore/Aft Position (mm)
Lowermost - Position 1	65.1	
Geometric Center – Position 2	63.7	
Uppermost – Position 3	62.3	
Telescoping Steering Wheel Travel		
Test Position	63.7	

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010



LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

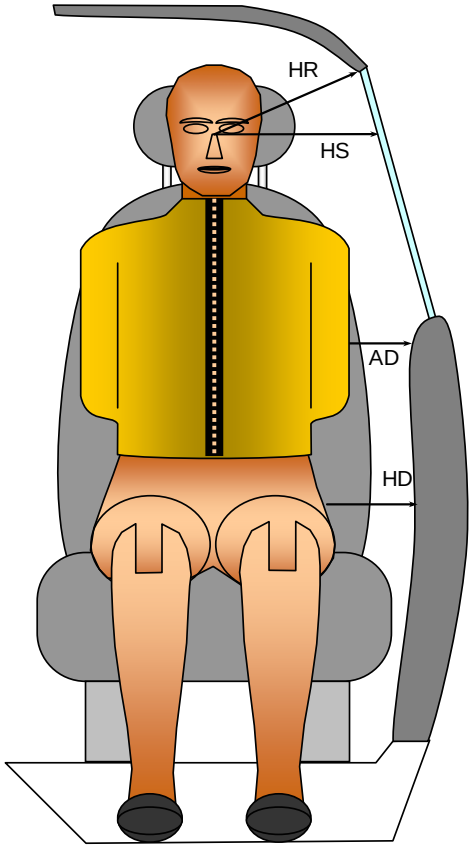
Driver Code	Pass. Code	Measurement Description	Driver S/N 032		Passenger S/N 306	
			Length (mm)	Angle(°)	Length (mm)	Angle(°)
HH		Head to Header	361	23.5		
HW		Head to Windshield	563	0		
HZ	HZ	Head to Roof	197	90	320	90
NR	NB	Nose to Rim/Seat Back	438	19.0	597	14.2
CD	CB	Chest to Dash/Seat Back	508	4.6	569	7.9
CS		Chest to Steering Wheel	318	9.2		
KDL	KBL	Left Knee to Dash/Seat Back	148	33.6	314	17.5
KDR	KBR	Right Knee to Dash/Seat Back	131	36.1	312	15.8
PA	PA	Pelvic Angle		24.1		18.8
PHX	PHX	H-Point to Striker (X-Axis)	206	0	243	0
PHZ	PHZ	H-Point to Striker (Z-Axis)	135	90	253	90
SA	SA	Seat Back Angle		7.0		Fixed

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Subaru Forester
Test Program: NCAP Side MDB Impact Test

NHTSA No. MB5504
Test Date: 12/17/2010



FRONT VIEW OF DUMMY

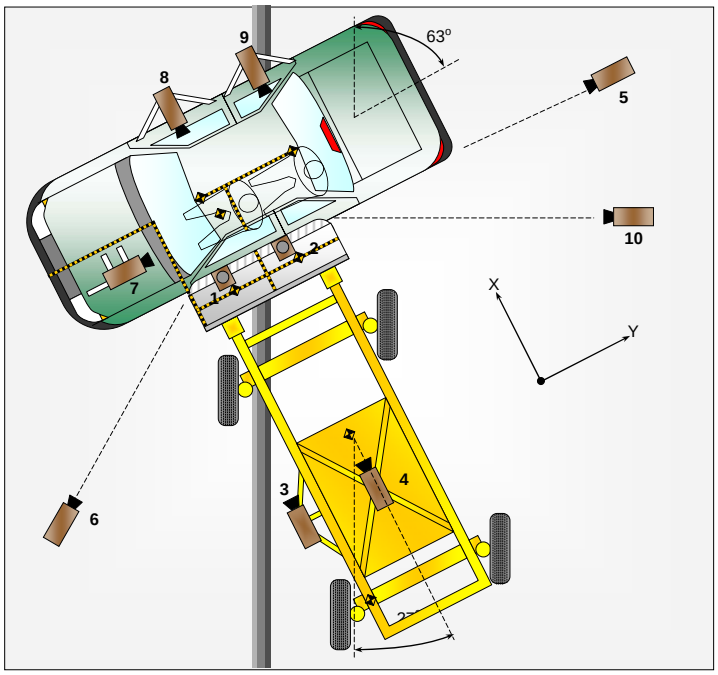
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver S/N 032	Passenger S/N 306
HR	Head to Side Header	mm	225	292
HS	Head to Side Window	mm	336	375
AD	Arm to Door	mm	89	171
HD	H-Point to Door	mm	134	192

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010



CAMERA LOCATIONS AND DATA

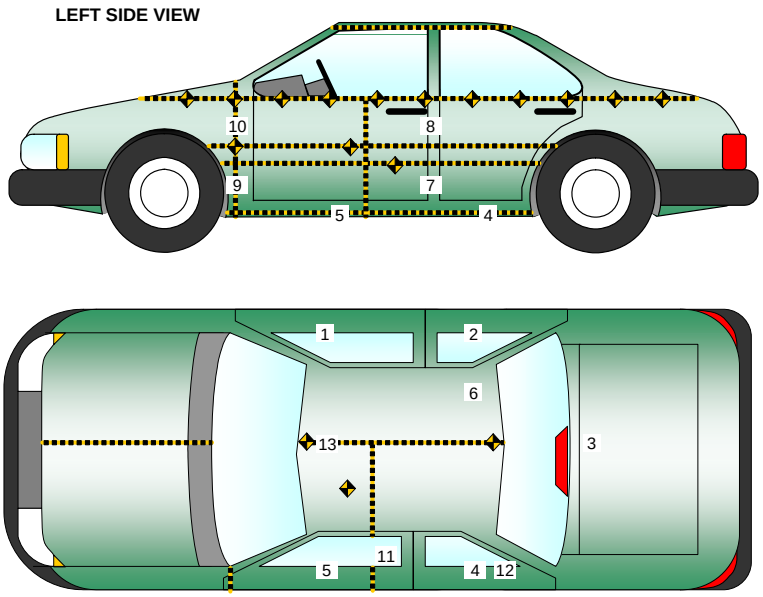
No.	Camera View	Coordinates (mm)			Angle	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Overhead Overall	-170	0	-5050	86.9	14	1000
2	Overhead Close-up	310	1140	-5050	82.5	50	1000
3	Left Impact Point (MDB)					50	1000
4	Side Overall (MDB)					16	1000
5	Rear	40	5190	-1250	6.2	24	1000
6	Left Front	3510	-4270	-1230	5.8	24	1000
7	Driver Front (OB)					16	1000
8	Driver Side (OB)					8	1000
9	Passenger Side (OB)					8	1000
10	Real Time Left Rear						30
11	Real Time Inrun						30

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

* All measurements accurate to ± 6 mm

DATA SHEET NO. 6
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

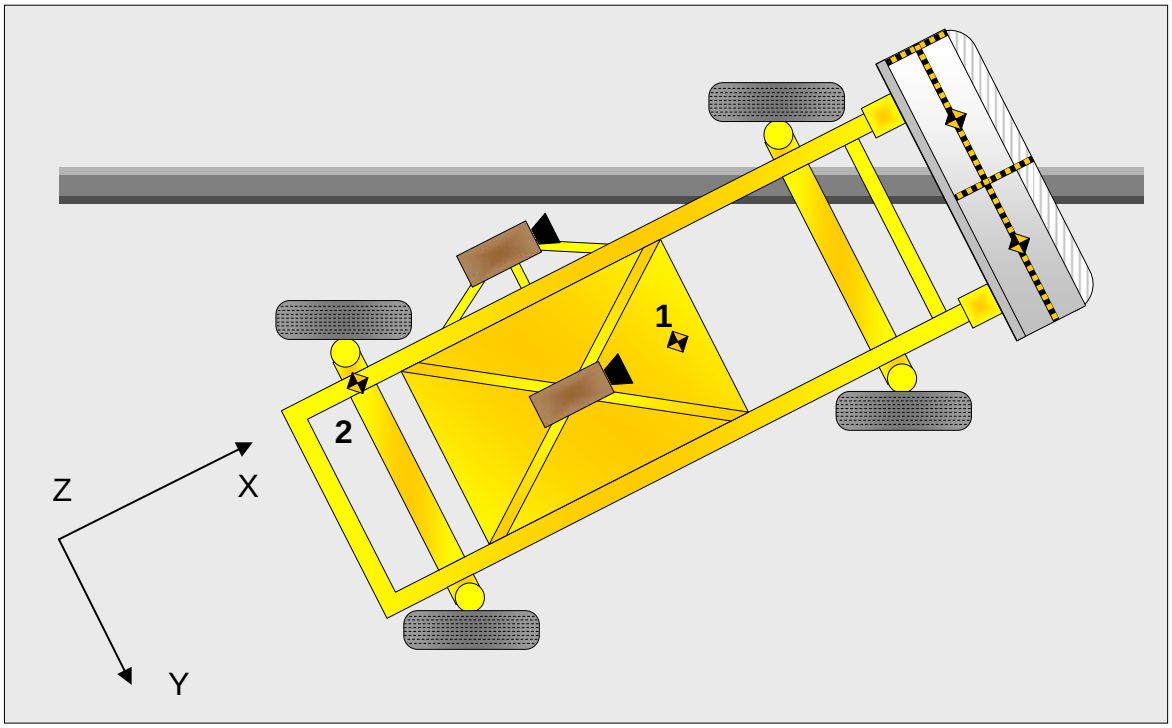
Accelerometer Location				
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2230	710	280
2	Right Sill at Rear Seat	1580	709	285
3	Rear Floorpan Above Axle	915	0	594
4	Left Sill at Rear Door	1607	-709	285
5	Left Sill at Front Door	2408	-710	285
6	Rt. Rear Occ. Compartment	1842	349	312
7	Left Lower B-Post	1973	-707	595
8	Left Middle B-Post	1973	-707	831
9	Left Lower A-Post	3040	-662	590
10	Left Middle A-Post	3080	-784	875
11	Front Seat Track	2423	-577	455
12	Rear Seat Track or Structure			
13	Vehicle CG	2155	220	270

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

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Subaru Forester
Test Program: NCAP Side MDB Impact Test
NHTSA No. MB5504
Test Date: 12/17/2010



MDB ACCELEROMETER LOCATIONS

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

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

DATA SHEET NO. 8

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measurement Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	147	375
2	Mid Door	mm	227	622
3	Occupant H-Point	mm	257	708
4	Window Sill	mm	100	1025
5	Window Top	mm	2	1530
	Maximum Penetration	mm	257	

INSTRUMENTATION

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

CAMERA COVERAGE

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

DATA SHEET NO. 9

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

MDB SPECIFICATIONS

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

MDB WEIGHTS

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

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.1
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.8
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.8

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Left	192
B	Top of Bumper	533	800	Right	146
C	Mid-Level	686	800	Left	119
D	Top of Stack	813	800	Left	161

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High-Speed Cameras	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

TEST DUMMY INFORMATION AND CONTACT

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

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

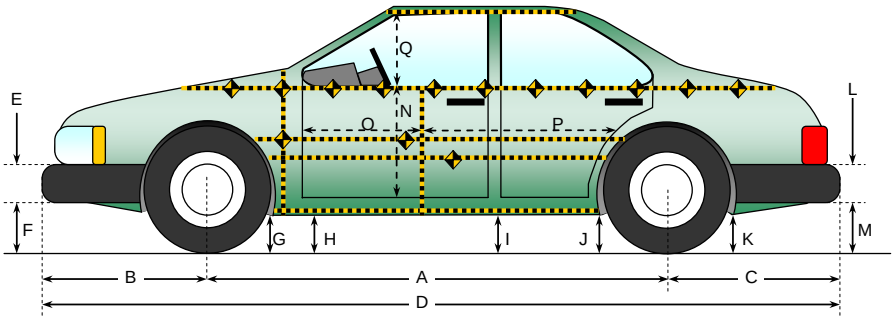
MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	9 forward
Vertical Offset	mm	+/-20	9 down

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010



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

LEFT SIDE VIEW

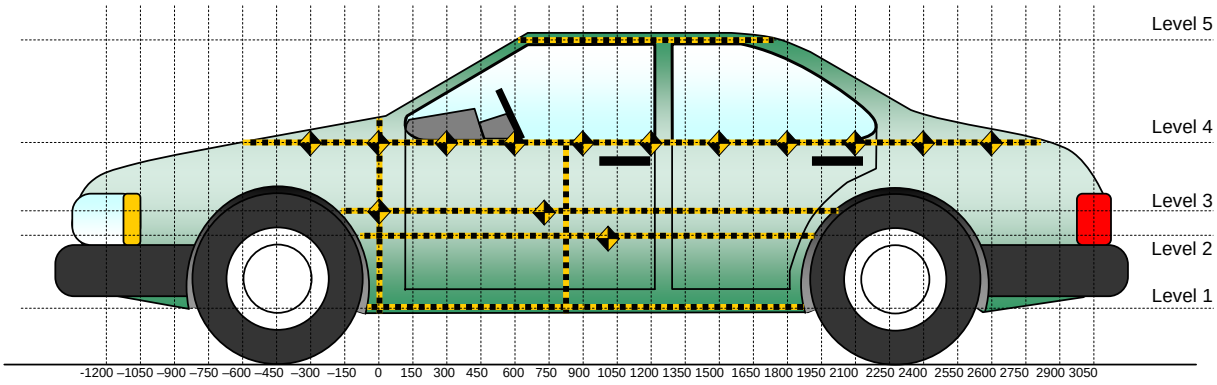
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2615	2608	7
B	Front Axle to FSOV	930	935	-5
C	Rear Axle to RSOV	1018	1016	2
D	Total Length at Centerline	4563	4559	4
E	Front Bumper Thickness	152	152	0
F	Front Bumper Bottom to Ground	333	344	-11
G	Sill Height at Front Wheel Well	262	278	-16
H	Sill Height at Front Door Leading Edge	260	296	-36
I	Sill Height at B Pillar	251	296	-45
J1	Sill Height at Rear Wheel Well	244	273	-29
J2	Pinch Weld Height at Rear Wheel Well	248	270	-22
K	Sill Height Aft of Rear Wheel Well	301	300	1
L	Rear Bumper Thickness	117	117	0
M	Rear Bumper Bottom to Ground	382	377	5
N	Sill Height to Window Bottom Sill	726	662	64
O	Front Door Leading Edge to Impact CL	720	703	17
P	Rear Door Trailing Edge to Impact CL	1345	1302	43
Q	Front Window Opening	463	484	-21
R	Right Side Length	3833	3834	-1
S	Left Side Length	3833	3798	35
T	Vehicle Width at B Post	1757	1531	226

DATA SHEET NO. 12

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Subaru Forester
Test Program: NCAP Side MDB Impact Test
NHTSA No. MB5504
Test Date: 12/17/2010



All Measurements Shown in mm

LEFT SIDE VIEW

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

Level	Measurement Description	Height Above Ground (mm)
1	Sill Top	375
2	Mid Door	622
3	Occupant H-Point	708
4	Window Sill	1025
5	Window Top	1530

DATA SHEET NO. 12 (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-600				371					363					-8	
-450				350					349					-1	
-300				332					338					6	
-150				320					334					14	
0		215	220	310			264	259	320			49	39	10	
150	258	240	236	302		398	388	375	321		140	148	139	19	
300	288	238	234	299		411	430	427	328		123	192	193	29	
450	285	235	231	291		418	431	443	332		133	196	212	41	
600	282	234	230	288		421	430	460	333		139	196	230	45	
750	282	233	228	282	486	423	431	465	338	485	141	198	237	56	-1
900	283	233	228	276	488	423	428	470	339	484	140	195	242	63	-4
1050	281	233	226	273	490	424	438	475	345	490	143	205	249	72	0
1200	284	233	227	268	492	427	423	454	368	492	143	190	227	100	0
1350	284	235	229	267	495	431	446	475	357	496	147	211	246	90	1
1500	286	238	230	263	498	422	457	487	340	497	136	219	257	77	-1
1650	285	239	231	262	500	408	466	479	322	500	123	227	248	60	0
1800	252	231	234	263	503	367	433	455	303	501	115	202	221	40	-2
1950		210	211	266	506		318	436	289	504		108	225	23	-2
2100			210	270	510			281	278	512			71	8	2
2250				277	516				306	511				29	-5
2400				282	525				302	515				20	-10
2550				290	535				298	525				8	-10
2700				301					304					3	

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

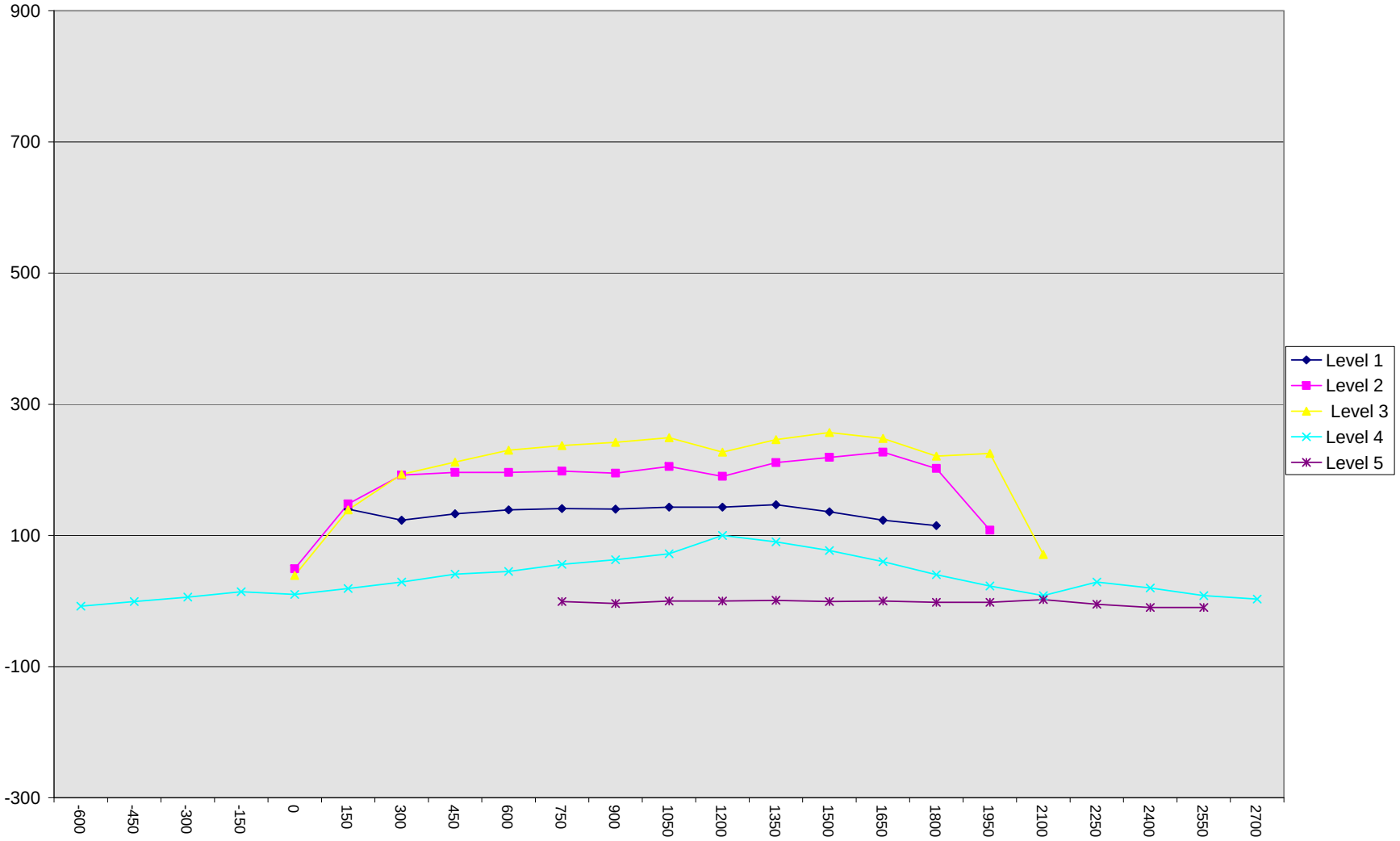
MAXIMUM CRUSH DATA

	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	147	227	257	100	2
Distance From Impact (mm)	1350	1650	1500	1200	2100

DATA SHEET NO. 12 (continued)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

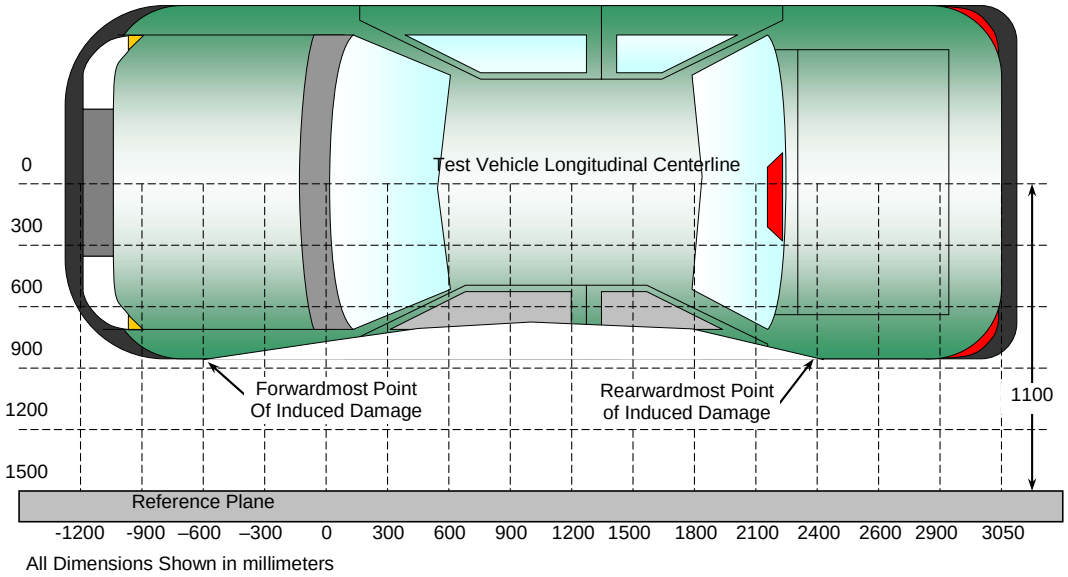
Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010



DATA SHEET NO. 13

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2011 Subaru Forester
Test Program: NCAP Side MDB Impact Test
NHTSA No. MB5504
Test Date: 12/17/2010



TOP VIEW

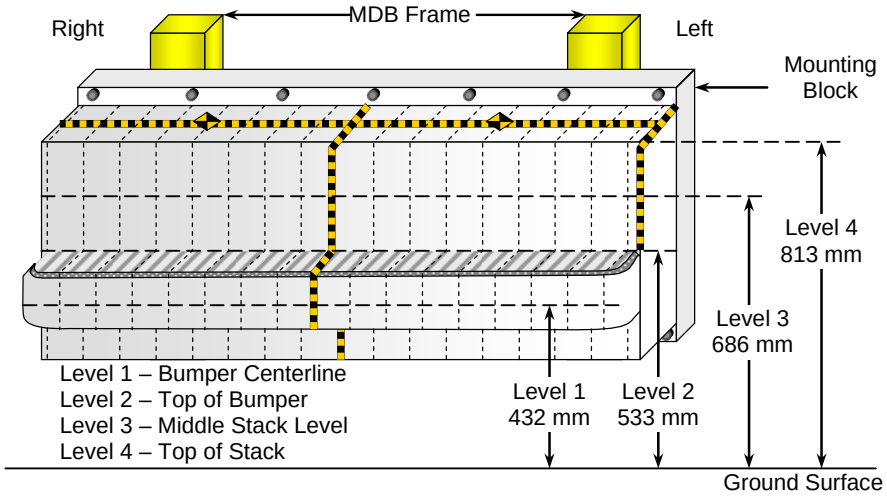
DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2700	4	301	304	3
2	2078	4	268	316	48
3	1442	3	229	489	260
4	792	3	228	472	244
5	181	2	240	413	173
6	-450	4	350	349	-1

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2011 Subaru Forester
Test Program: NCAP Side MDB Impact Test
NHTSA No. MB5504
Test Date: 12/17/2010



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	87	70	53	39	63	59	69	67	45	49	54	58	68	76	88	120	161
3	41	33	33	49	55	73	50	35	33	30	31	35	43	55	67	81	119
2	146	128	119	93	87	87	89	85	89	91	97	100	101	100	101	109	126
1	183	174	162	151	153	150	147	148	146	144	145	142	141	144	152	165	192

DATA SHEET NO. 15

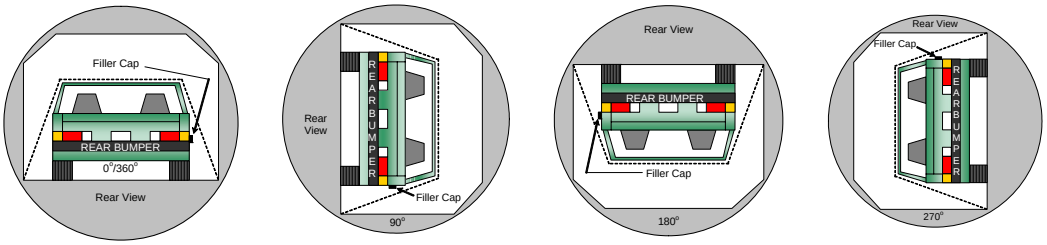
FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010

Test Time: 10:57 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°	111	300	411
90° to 180°	110	300	410
180° to 270°	103	300	403
270° to 360°	117	300	417

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

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

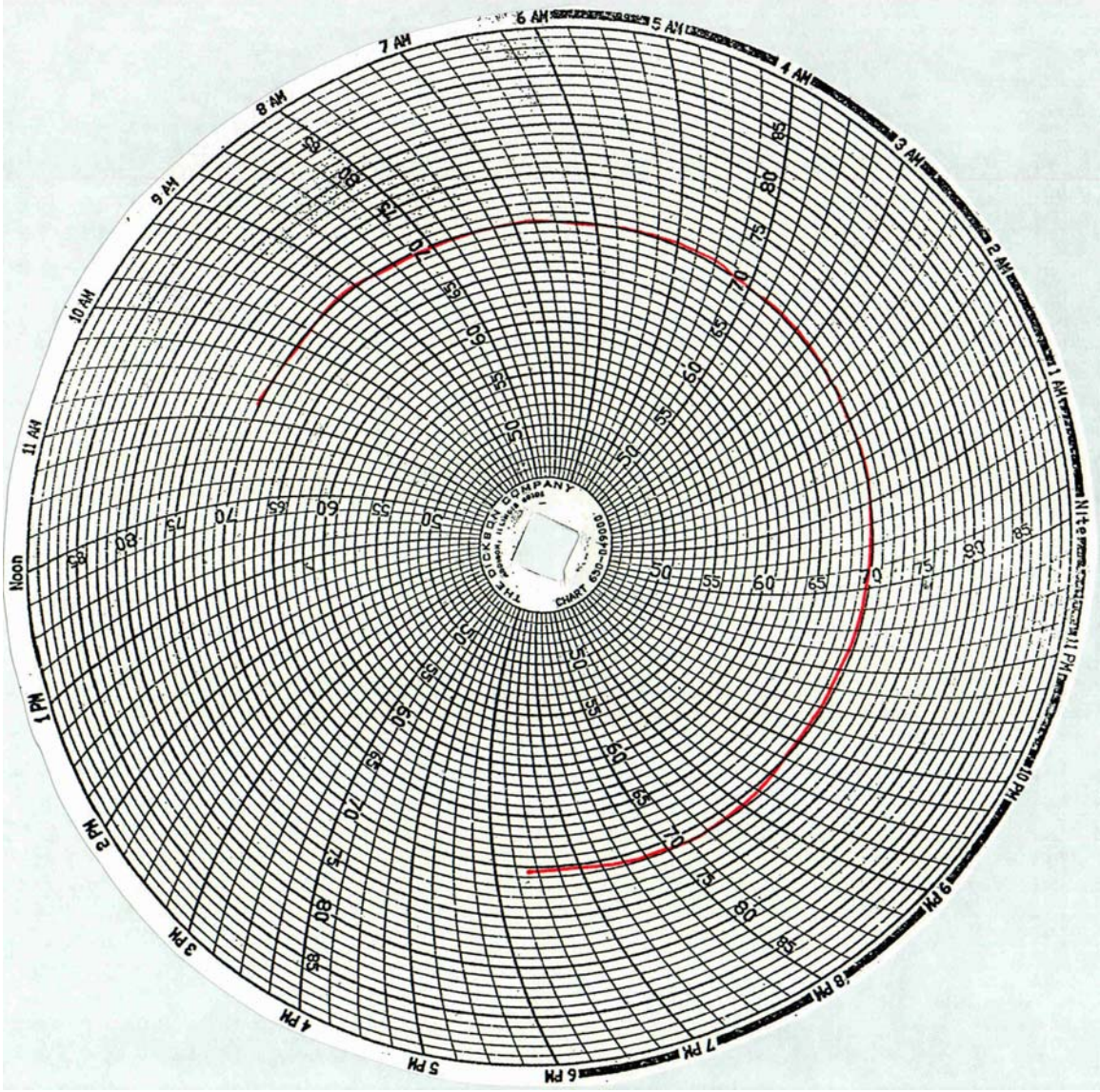
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 16

DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2011 Subaru Forester NHTSA No. MB5504
Test Program: NCAP Side MDB Impact Test Test Date: 12/17/2010



APPENDIX A

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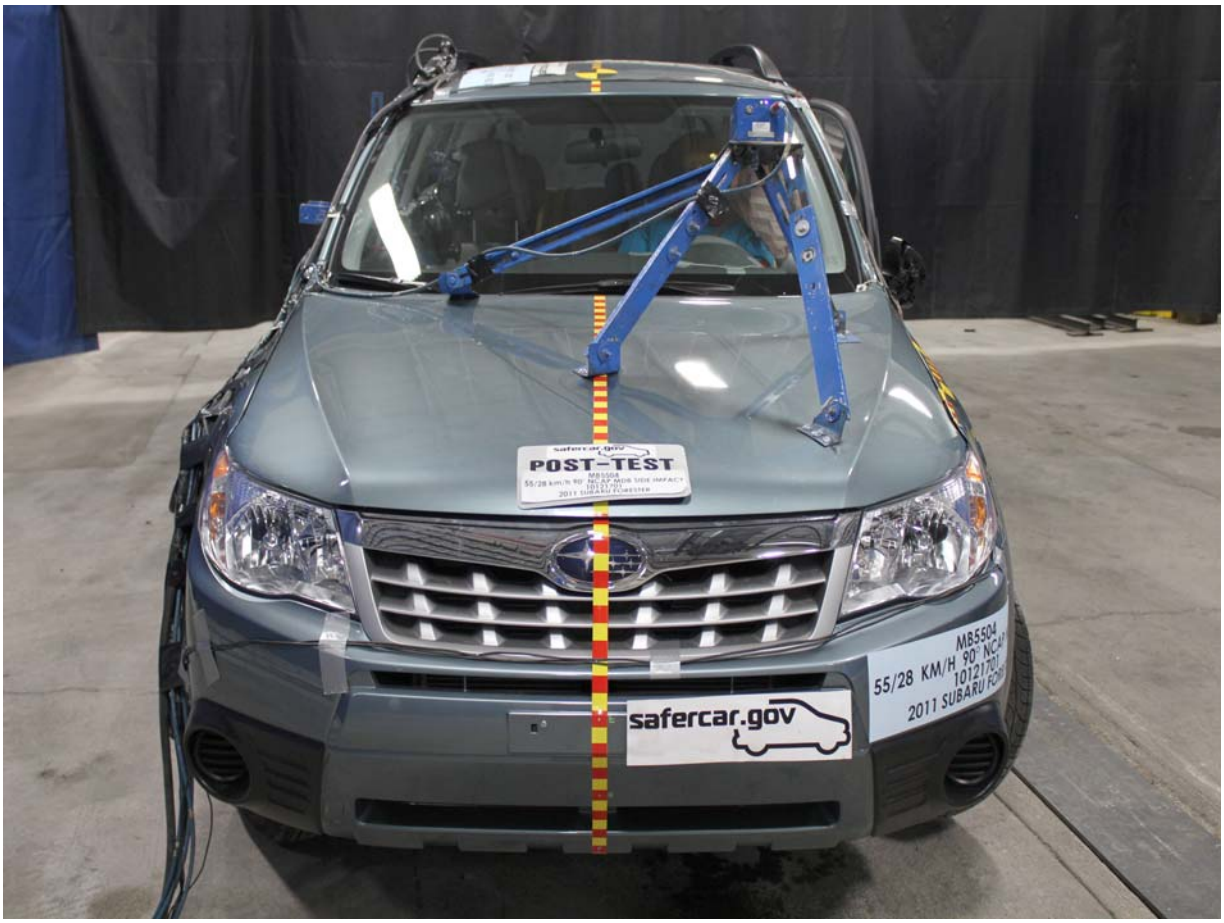
As Delivered Right Front Three-Quarter View of Test Vehicle

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

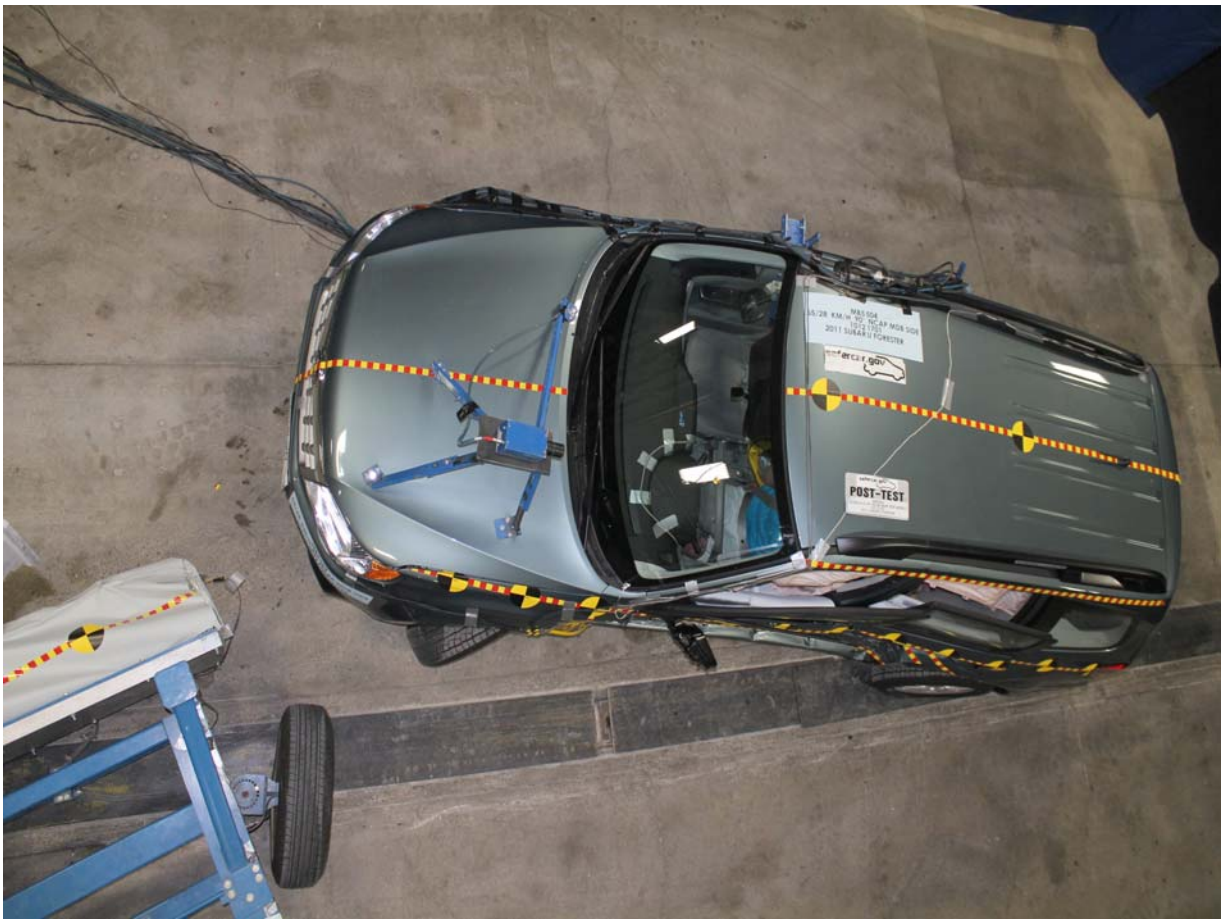
Pre-Test Rear View of Test Vehicle

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

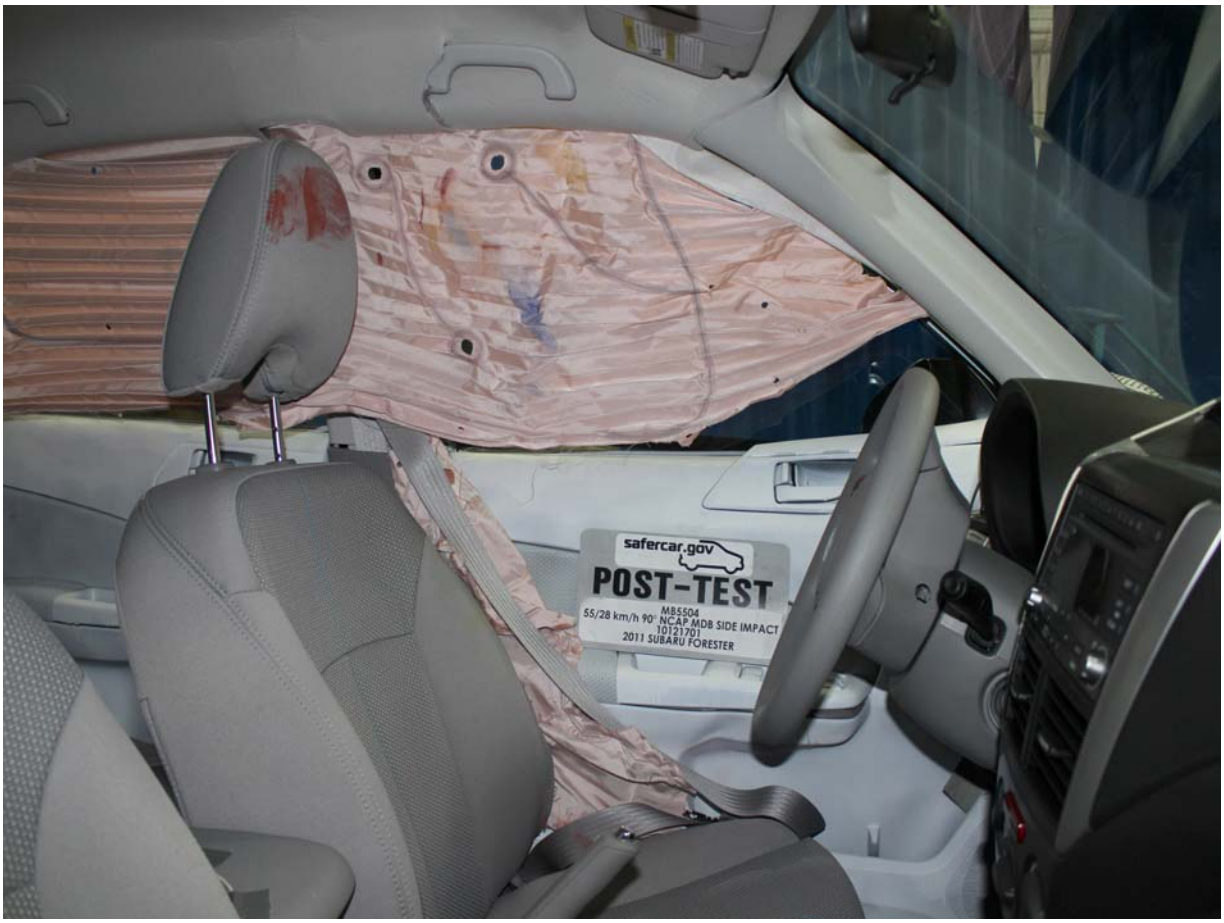
Pre-Test Driver Dummy and Door Clearance View

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

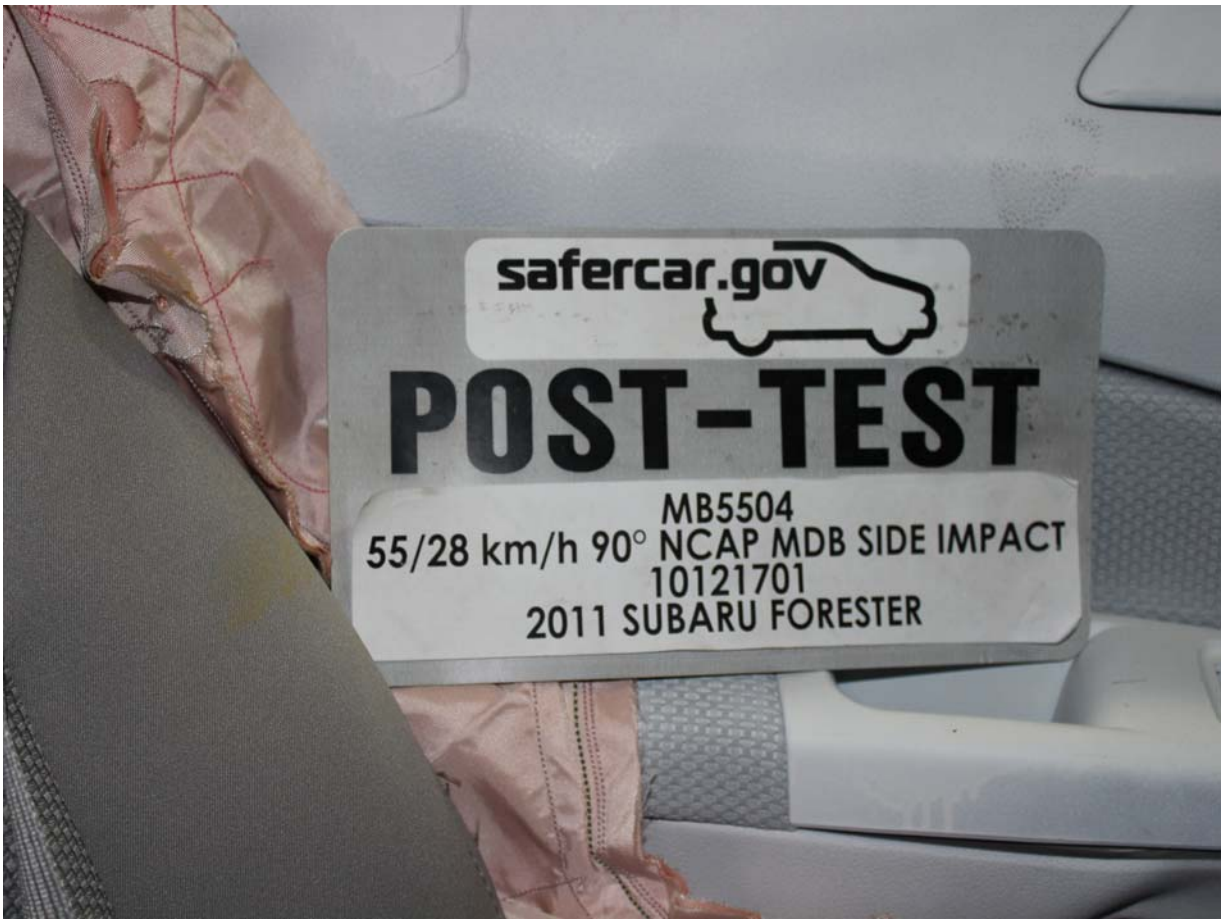
Pre-Test Driver Inner Door Panel View



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

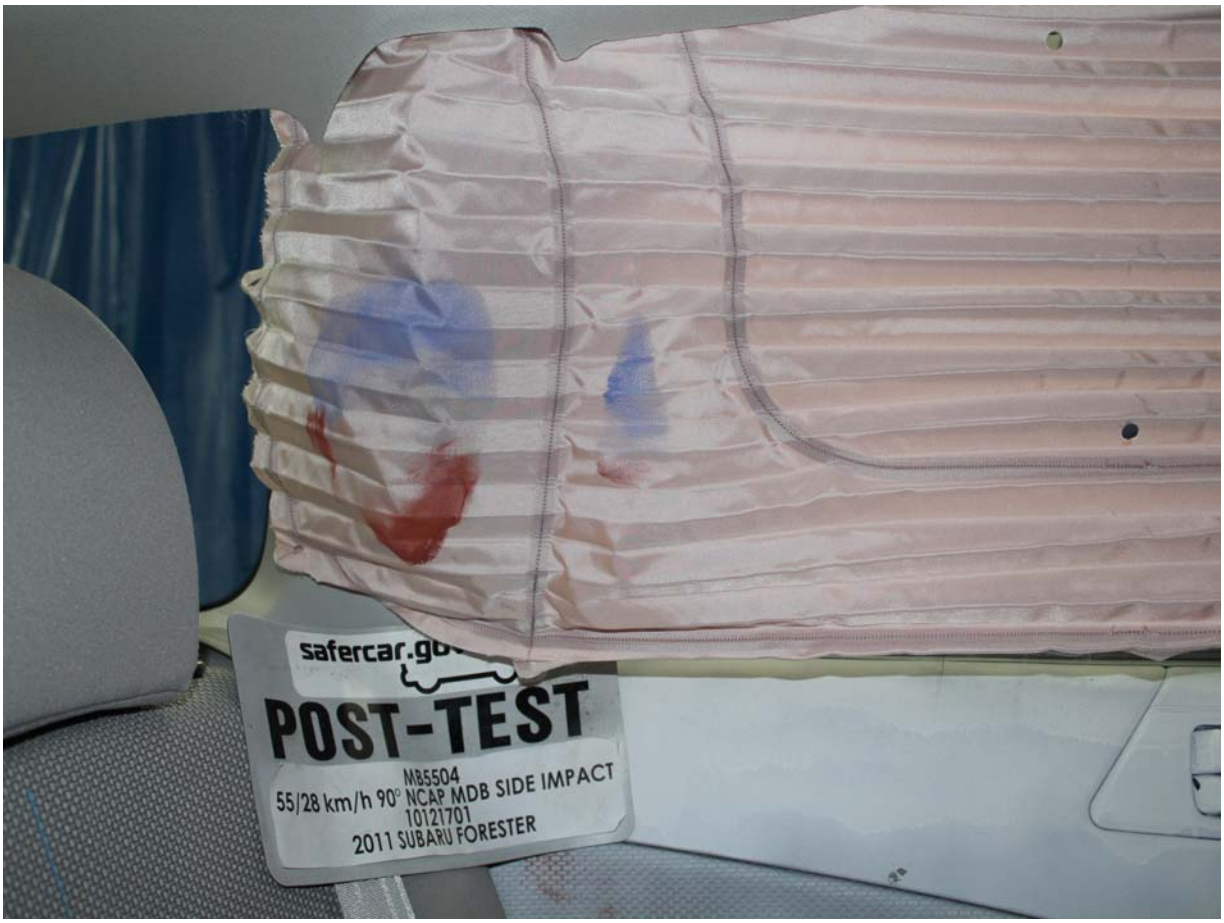
Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

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

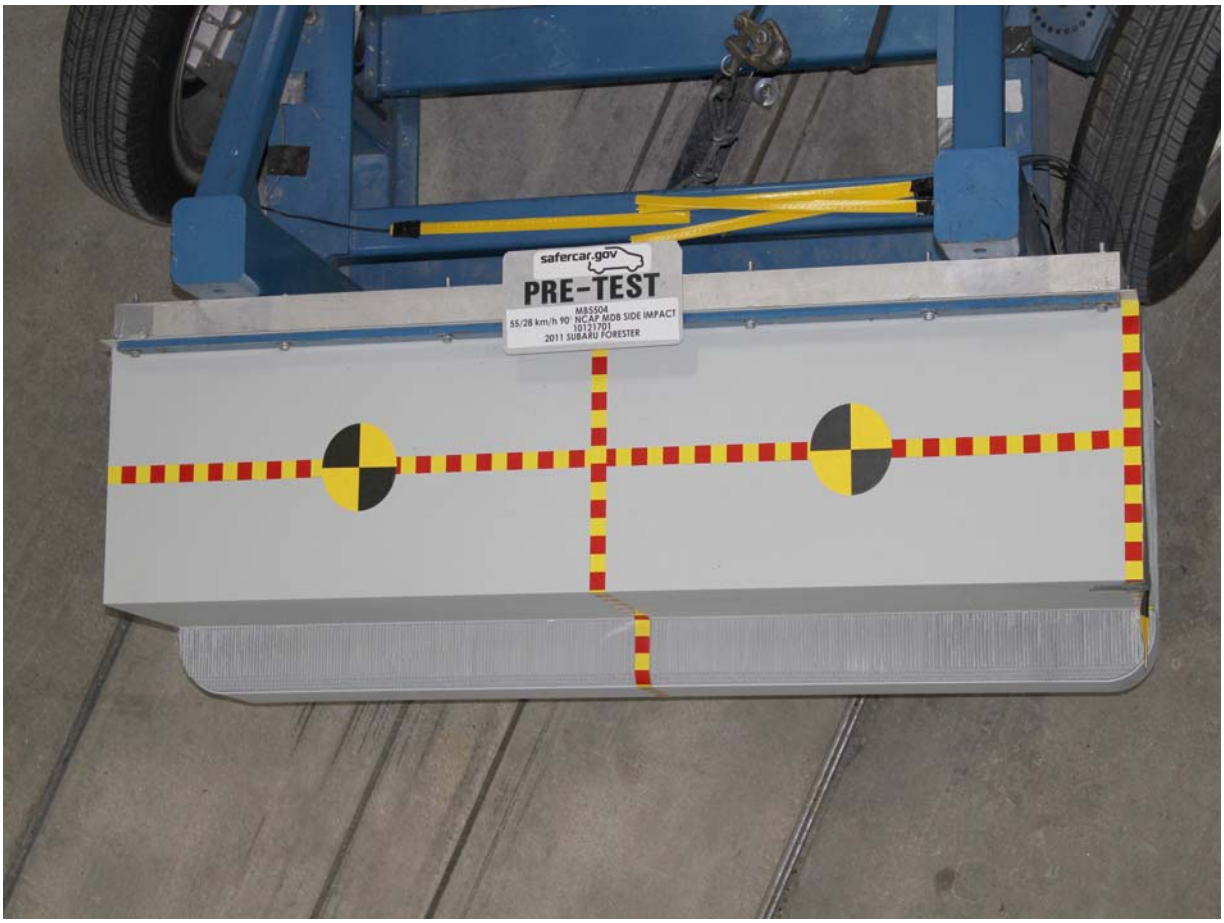
Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View

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

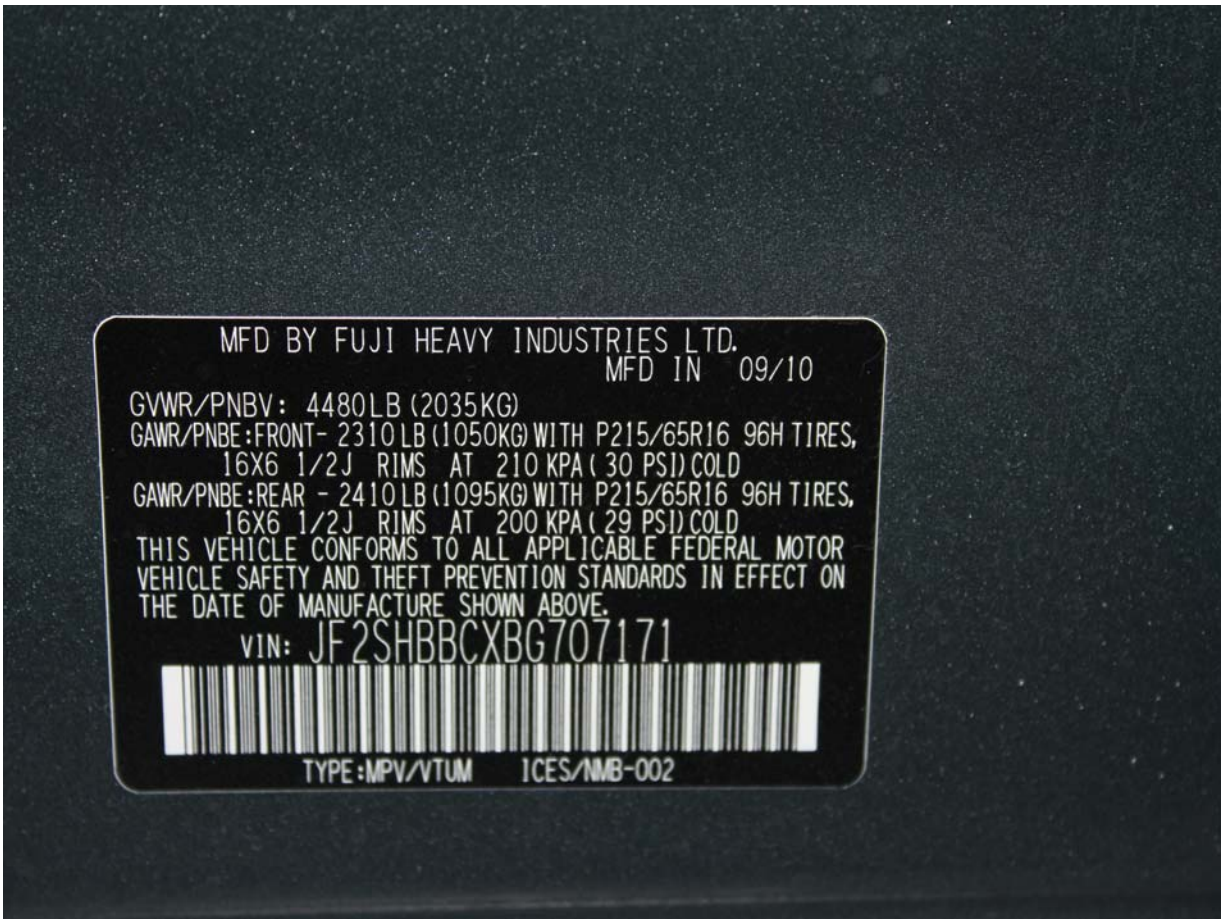
Post-Test Top View of MDB Impactor Face

Pre-Test Left Side View of MDB Impactor Face

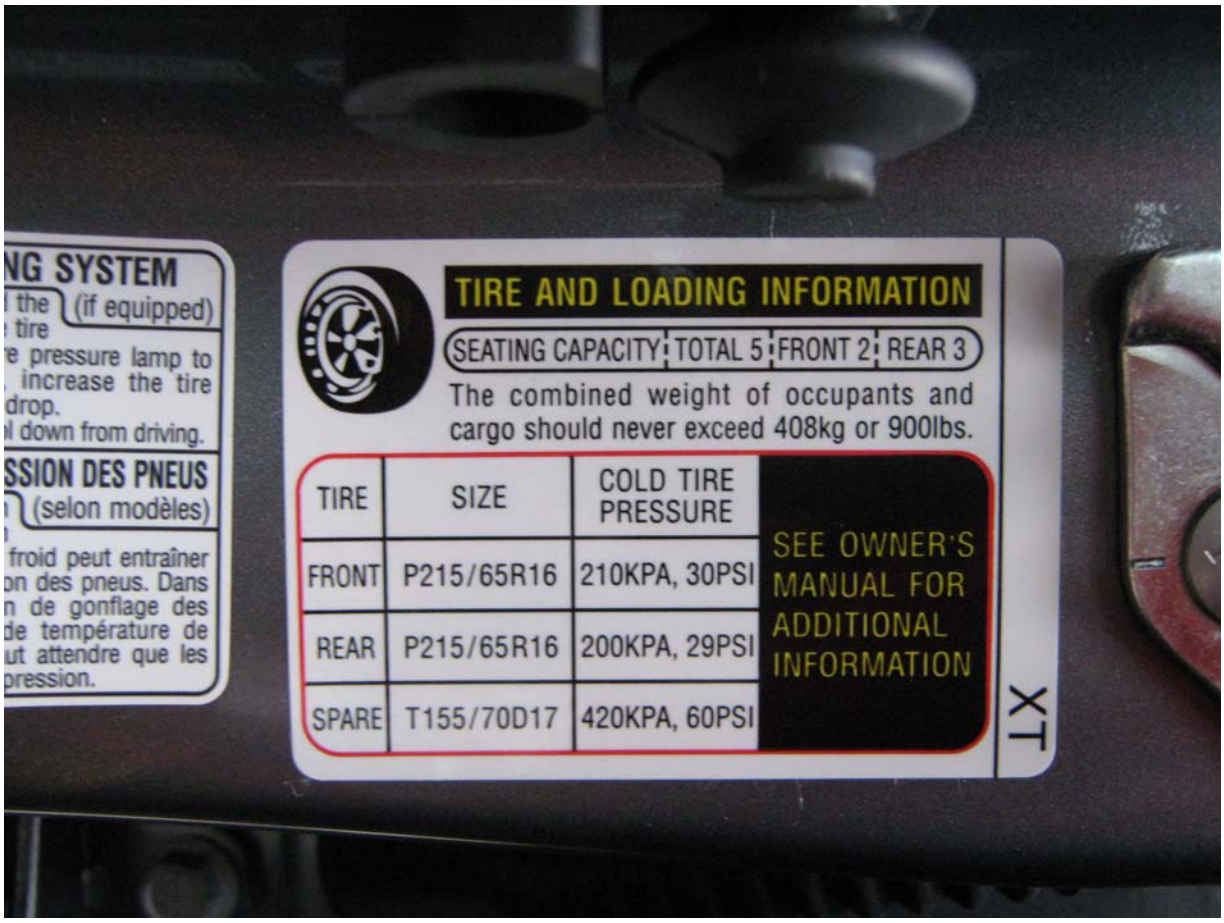
Post-Test Left Side View of MDB Impactor Face

Pre-Test Right Side View of MDB Impactor Face

Post-Test Right Side View of MDB Impactor Face



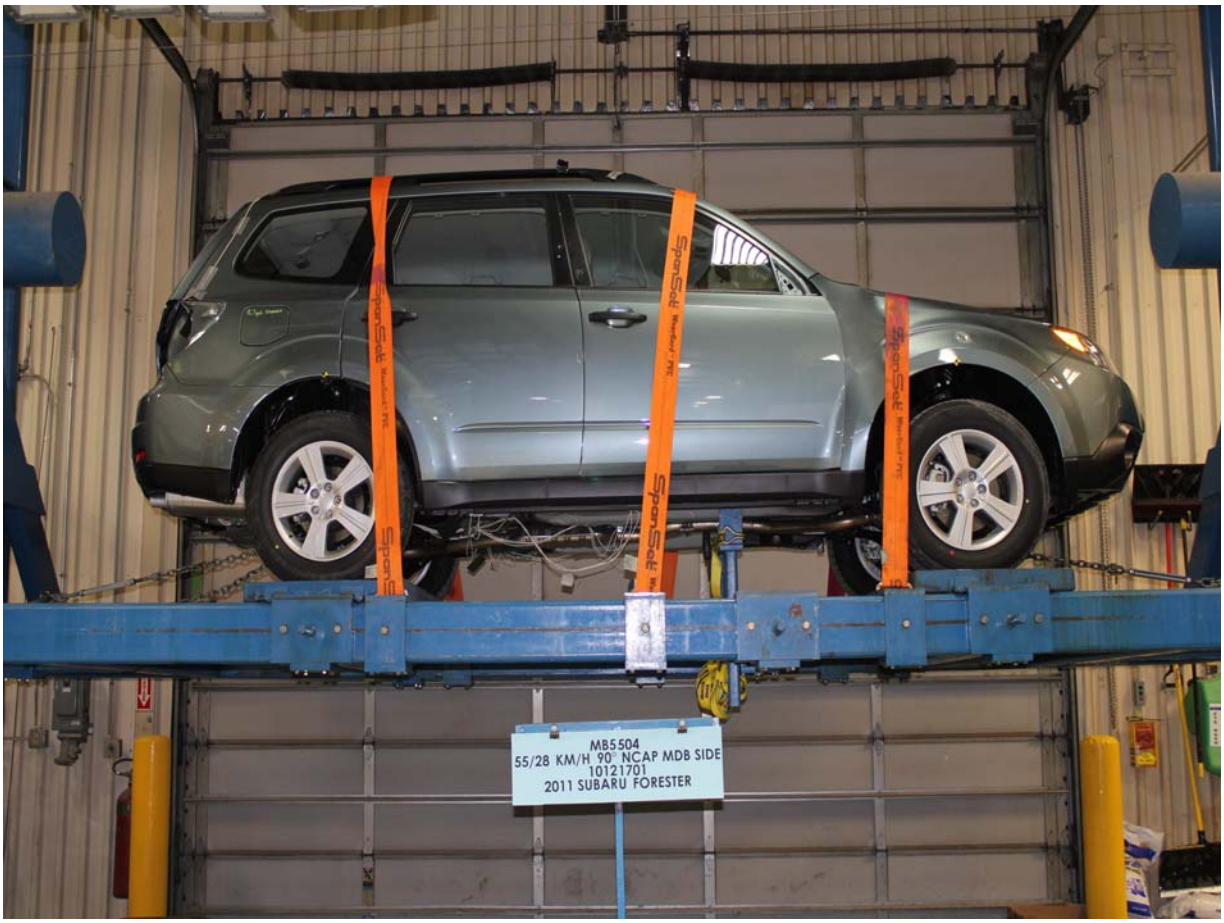
Close-Up View of Vehicle's Certification Label



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

PHOTOGRAPH NOT AVAILABLE

FMVSS No. 301/305 Rollover 360 Degrees

Impact Event

FORESTER

VIN: JF2SHBBCXBG707171
Model/Code: 2011 Subaru Forester 2.5X / BFA
Exterior Color: Sage Green Metallic
Port / Assembly: Vancouver, WA
Deliver by / Carrier: Truck / 601–601061

SHIP TO: 070456
SOMMER'S SUBARU
7211 MEQUON RD
MEQUON, WI 53092

SOLD TO 070456
SOMMER'S SUBARU
7211 MEQUON RD
MEQUON, WI 53092

SUBARU

STANDARD EQUIPMENT

SAFETY
Symmetrical All–Wheel Drive (AWD)
Vehicle Dynamics Control (VDC)
Subaru Advanced Frontal Air Bag System
Front Seat Side–Impact Air Bags
Side Curtain Air Bags w/Rollover Sensor
Active Front Seat Head Restraints
Safety Pedal System
4–Wheel Disc Brakes w/Brake Assist
Anti–Lock Braking System (ABS)
Electronic Brake–Force Distribution
Tire Pressure Monitoring System (TPMS)
Ring–Shape Reinforcement Frame Design
Anti–Theft Alarm & Immobilizer System
Daytime Running Lights

PERFORMANCE AND EXTERIOR
2.5L Horizontally–Opposed DOHC Engine
205/55 R16 All–Season Tires
Variable Intermittent Windshield Wipers
Rear Window Wiper/Washer

COMFORT, CONVENIENCE AND INTERIOR
Air Conditioning w/Air Filtration System
AM/FM w/Single–Disc CD Player&Aux Input
Off–Delay Dome Light & Accent Lighting
Cruise Control & Tilt Steering Column
Power Door Locks & Dual Power Mirrors
Remote Keyless Entry System
Power Windows With Driver's Auto Down
Height Adjustable Driver's Seat
60/40 Split Fold–Down Rear Seatback
Overhead Console w/ Dual Map Lights
Exterior Temperature Gauge
Multi–function Center Console Box
Cargo–Area Tie Down & Grocery Bag Hooks
12V Outlet In Dash, Console & Cargo Area

LIMITED WARRANTY/ROADSIDE ASSISTANCE
3 Years / 36,000 Miles Basic
5 Years / 60,000 Miles Powertrain
5 Yrs/Unlimited Mileage Rust Perforation
3 Yrs / 36,000 24/7 Roadside Assistance
See Owner Info Kit&Warranty For Details

OPTIONAL EQUIPMENT

Manufacturer's Suggested Retail Price	$20,495.00
Option Package: 21	
ALLOY WHEEL PACKAGE SUGGESTED VALUE	$900.00
16–Inch Alloy Wheels	
Roof Rails	
ALLOY WHEEL VALUE PACKAGE DISCOUNT	–$500.00
ALLOY WHEEL VALUE PACKAGE PRICE	$400.00
Full Tank of Gas	INCLD
Destination and Delivery	$725.00
Total Suggested Retail Price	**$21,620.00**

GOVERNMENT SAFETY RATINGS

Frontal	Driver	Not Rated
	Passenger	Not Rated

Star ratings based on the risk of injury in a frontal impact.

Side	Front Seat	Not Rated
	Rear Seat	Not Rated

Star ratings based on the risk of injury in a side impact.

Rollover	Not Rated

Star ratings based on the risk of rollover in a single vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★), with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA)
Visit www.safercar.gov or 1-888-327-4236

EPA Fuel Economy Estimates

CITY MPG
21
Expected range for most drivers
17 to 25 MPG

Estimated Annual Fuel Cost
$1,957
based on 15,000 miles at 3.00 per gallon

Combined Fuel Economy
This Vehicle
23
10 — 32
All SUV – 4WD

HIGHWAY MPG
27
Expected range for most drivers
22 to 32 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

Environmental Performance

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

Global Warming Score
7
1 — Average new vechicle — 10 Cleanest

Smog Score
4
1 — Average new vechicle — 10 Cleanest

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

PART CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S/CANADIAN PARTS CONTENT: 0%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN: 100%

FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: Ota Gunma, JAPAN
COUNTRY OF ORIGIN:
ENGINE: JAPAN
TRANSMISSION: JAPAN

Note: Parts content does not include final assembly, distribution, or other non–parts costs.

JF2SHBBCXBG707171

Monroney Label

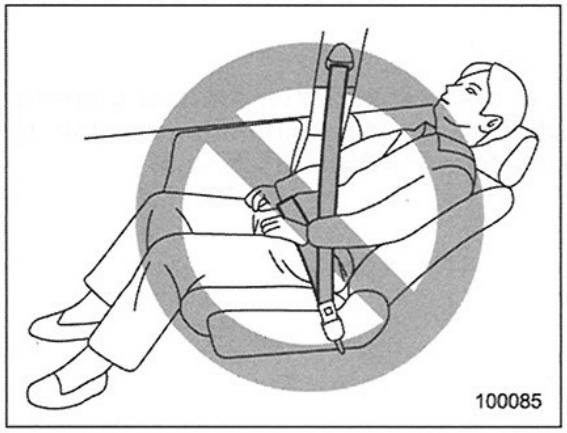
justment of the seat, you cannot adjust the seat cushion angle or seat cushion height.

2) **Seat cushion angle control switch**
To adjust the seat cushion angle, pull up or push down the front end of the control switch.

3) **Seatback angle (reclining) control switch**
To adjust the angle of the seatback, move the control switch.

4) **Seat height control switch**
To adjust the seat height, pull up or push down the rear end of the control switch.

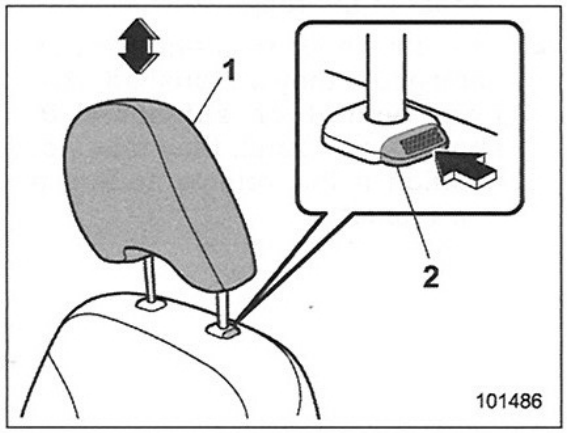
5) **Lumbar support control switch**
To increase lumbar support, push the front side of the switch. To decrease lumbar support, push the rear side of the switch.



⚠ WARNING

To prevent the passenger from sliding under the seatbelt in the event of a collision, always put the seatback in the upright position while the vehicle is in motion. Also, do not place objects such as cushions between the passenger and the seatback. If you do so, the risk of sliding under the lap belt and of the lap belt sliding up over the abdomen will increase, and both can result in serious internal injury or death.

■ Head restraint adjustment



1) Head restraint
2) Release button

Both the driver's seat and the front passenger's seat are equipped with head restraints.

The head restraint should be adjusted so that the center of the head restraint is closest to the top of the occupant's ears.

To raise:

Pull the head restraint up.

To lower:

Push the head restraint down while pressing the release button on the top of the seatback.

To remove:

While pressing the release button, pull out the head restraint.

To install:

Install the head restraint into the holes that are located on the top of the seatback until the head restraint locks.

⚠ WARNING

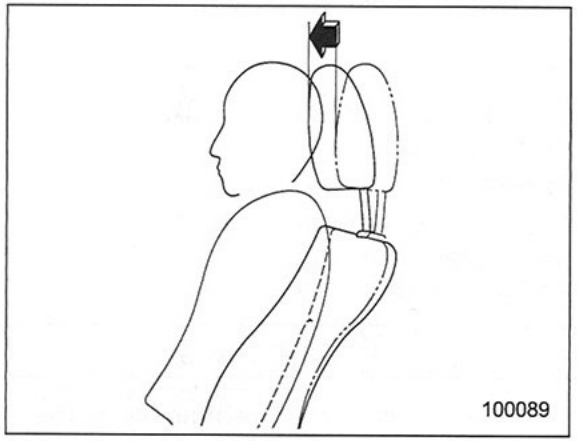
- **Never drive the vehicle with the head restraints removed because they are designed to reduce the risk of serious neck injury in the event that the vehicle is struck from the rear. Therefore, when you remove the head restraints, you must reinstall all head restraints to protect vehicle occu-**

– CONTINUED –

pants.

- **All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.**

■ Active head restraint



The front seats of your vehicle are equipped with active head restraints. They automatically tilt forward slightly in the event the vehicle is struck from the rear, decreasing the amount of rearward head movement and thus reducing the risk of whiplash. For maximum effectiveness, the head restraint should be adjusted so that the center of the head restraint is closest to the top of the occupant's ears.

⚠ CAUTION

- **Each active head restraint is effective only when its height is properly adjusted and driver/passenger sits in the correct position on the seat.**
- **If your vehicle is involved in a rear-end collision, have an authorized SUBARU dealer inspect the active head restraints.**
- **The active head restraints may not operate in the event the vehicle experiences only a slight impact in the rear.**
- **The active head restraints may be damaged if they are pushed hard from behind or subjected to shock. As a result, they may not function if the vehicle suffers a rear impact.**

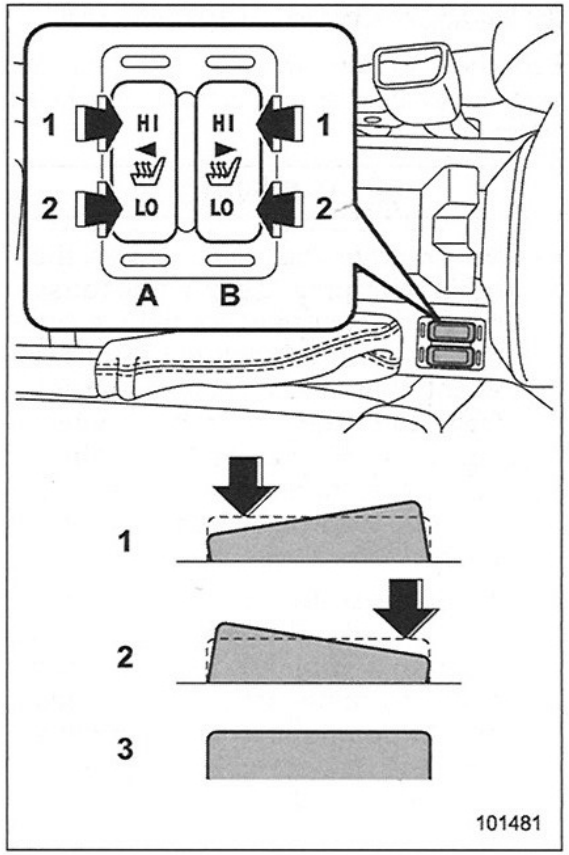
Seat heater (if equipped)

⚠ CAUTION

- **There is a possibility that people with delicate skin may suffer slight burns even at low temperatures if they use the seat heater for a long period of time. When using the heater, always be sure to warn the persons concerned.**
- **Do not put anything on the seat which insulates against heat, such as a blanket, cushion, or similar items. This may cause the seat heater to overheat.**

NOTE

Use of the seat heater for a long period of time while the engine is not running can cause battery discharge.



1) **HI** – Rapid heating
2) **LO** – Normal heating
3) **OFF** – Off
A) Left-hand side
B) Right-hand side

The seat heater operates when the ignition switch is either in the "Acc" or "ON" position.

To turn on the seat heater, press the "LO" or "HI" position on the switch, as desired, depending on the temperature.
Selecting the "HI" position will cause the seat to heat up quicker.

To turn off the seat heater, lightly press the opposite side of the current position.

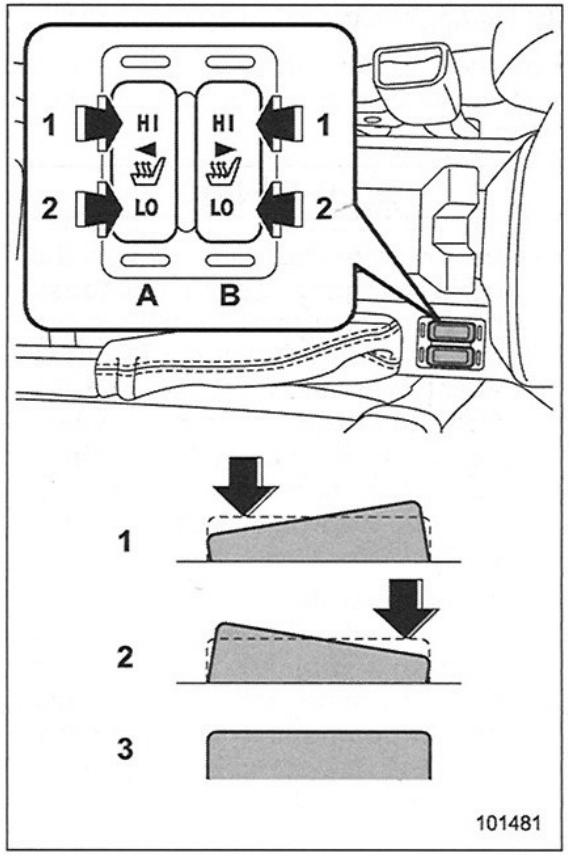
The indicator next to the switch illuminates when the seat heater is in operation. When the vehicle's interior is warmed enough or before you leave the vehicle, be sure to turn the switch off.

Rear seats

⚠ WARNING

Seatbelts provide maximum restraint when the occupant sits well back and upright in the seat. Do not put cushions or any other materials between occupants and seatbacks or seat cushions. If you do so, the risk of sliding under the lap belt and of the lap belt sliding up over the abdomen will increase, and both can result in serious internal injury or death.

– CONTINUED –



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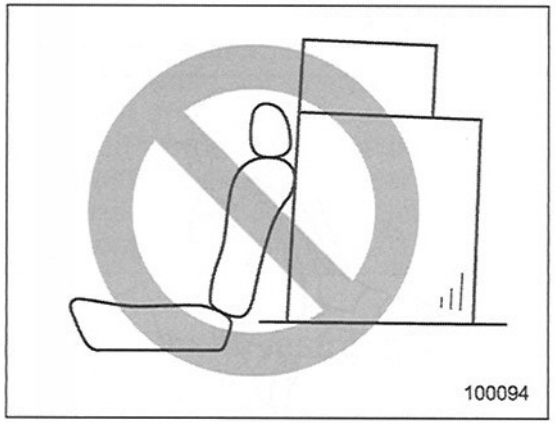
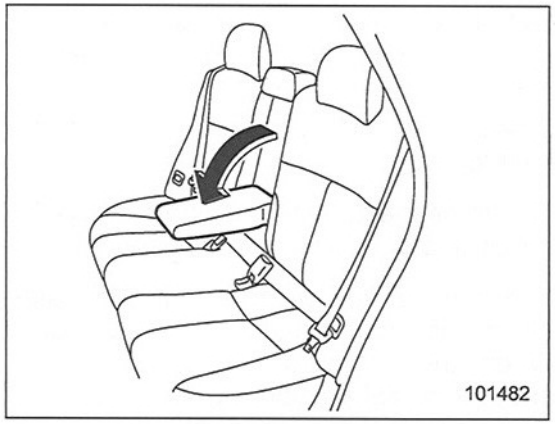
– CONTINUED –



⚠ WARNING

Never stack luggage or other cargo higher than the top of the seatback because it could tumble forward and injure passengers in the event of a sudden stop or accident.

■ Armrest



To lower the armrest, pull on the top edge of the armrest.

⚠ WARNING

To avoid the possibility of serious injury, passengers must never be allowed to sit on the center armrest while the vehicle is in motion.

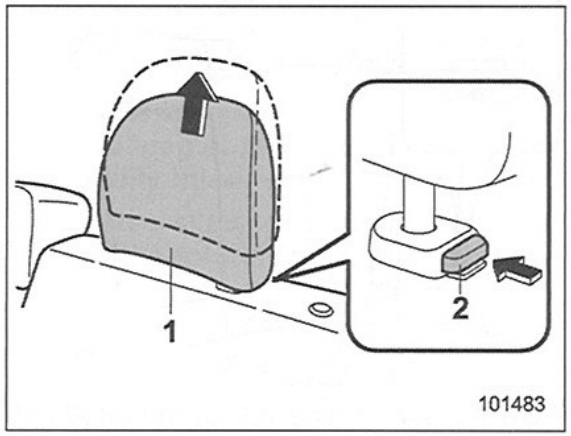
■ Head restraint adjustment

Both the rear window side seats and the rear center seat are equipped with head restraints.

⚠ WARNING

- **Never drive the vehicle with the head restraints removed because they are designed to reduce the risk of serious neck injury in the event that the vehicle is struck from the rear. Therefore, when you remove the head restraints, you must reinstall all head restraints to protect vehicle occupants.**
- **All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.**

▼ **Rear windows side seating position**



1) Head restraint
2) Release button

To remove:

While pressing the release button, pull out the head restraint.

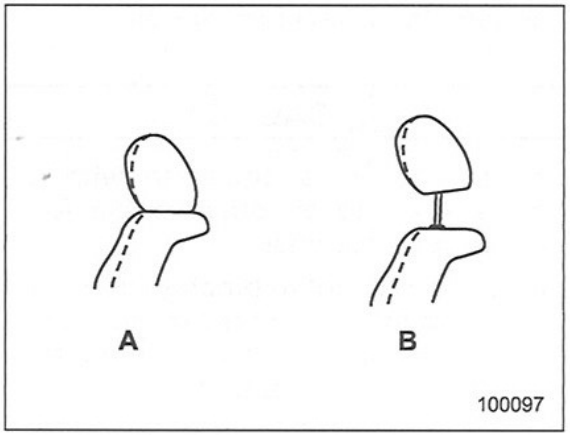
To install:

Install the head restraint into the holes that are located on the top of the seatback until the head restraint locks.

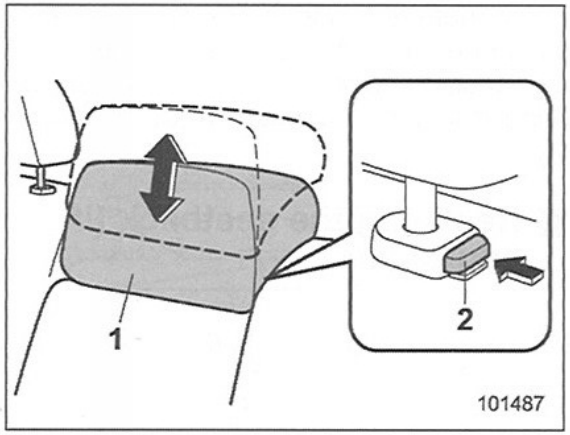
▼ **Rear center seating position**

⚠ CAUTION

The head restraint is not intended to be used at the lowest position. Before sitting on the seat, raise the head restraint to an appropriate position depending on your sitting height.



A) When not used (retracted position)
B) When used (click position)



1) Head restraint
2) Release button

To raise:

Pull the head restraint up.

To lower:

Push the head restraint down while pressing the release button on the top of the seatback.

To remove:

While pressing the release button, pull out the head restraint.

To install:

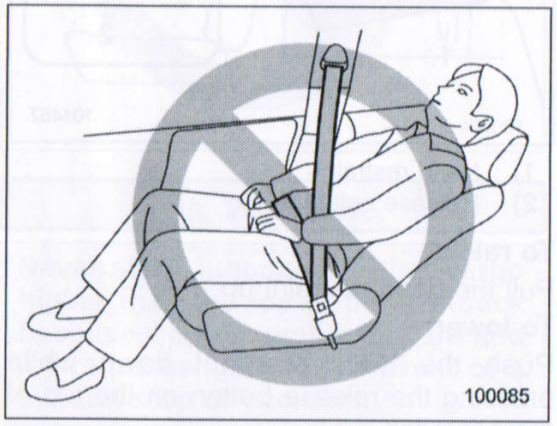
Install the head restraint into the holes that are located on the top of the seatback until the head restraint locks.

When the rear-center seating position is occupied, raise the head restraint to an

– CONTINUED –

appropriate position depending on your sitting height. When the rear center seating position is not occupied, lower the head restraint to improve rearward visibility.

■ Reclining the seatback (if equipped)


100085

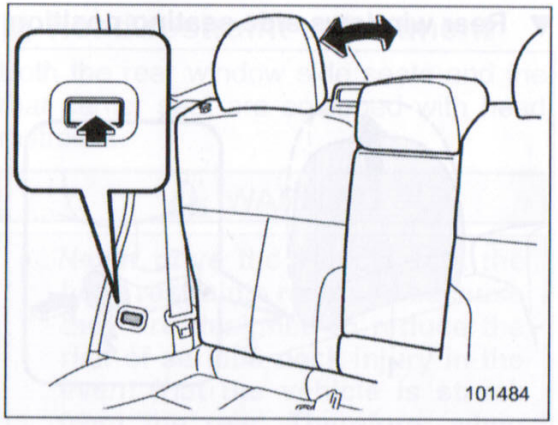
⚠ WARNING

To prevent the passenger from sliding under the seatbelt in the event of a collision, always put the seatback in the upright position while the vehicle is in motion. Also, do not place objects such as cushions between the passenger and the seatback. If you do so, the risk of sliding under the lap belt and of the lap belt sliding up over the abdomen will increase, and both can result in serious internal injury or death.

⚠ CAUTION

If the vehicle is equipped with a cargo area cover, observe the following precautions.

- **Be careful not to pinch your hand between the headrest and the cargo area cover when you recline the rear seat.**
- **Move the front cover of the cargo area cover backward so that the cover is not damaged by the reclined seatback. Refer to "Cargo area cover (dealer option)" ☞6-13.**


101484

Push the switch and adjust the seatback to the desired position.

Then release the switch and make sure the seatback is securely locked into place.

■ Folding down the rear seatback

⚠ WARNING

- **When you fold down the seatback, confirm that there are no passengers or objects on the rear seat. Not doing so creates a risk of injury or property damage if the seatback suddenly folds down.**
- **For models equipped with the rear seat center table, when fold-**

APPENDIX B

DUMMY RESPONSE DATA

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

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

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

Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Passenger Upper Thorax Rib Deflection (Y)

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Driver Shoulder Contact Switch

Driver Torso Contact Switch

Driver Pelvis Contact Switch

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Passenger Shoulder Contact Switch

Passenger Torso Contact Switch

Passenger Pelvis Contact Switch

Vehicle Instrumentation Data

Driver Side Airbag Timing

Driver Side Curtain Airbag Timing (not installed)

Passenger Side Airbag Timing (not installed)

Passenger Side Curtain Airbag Timing (not installed)

Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)

Right Side Sill at Front Seat Acceleration (Z)

Right Side Sill at Rear Seat Acceleration (X)

Right Side Sill at Rear Seat Acceleration (Y)

Right Side Sill at Rear Seat Acceleration (Z)

Rear Floorpan Above Axle Acceleration (X)

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

Left Side Sill at Front Seat Acceleration (Y)

Left Side Sill at Rear Seat Acceleration (Y)

Right Rear Occupant Compartment Acceleration (Y)

Lower A-Post Acceleration (Y)

Middle A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Middle B-Post Acceleration (Y)

Front Seat Track Acceleration (Y)

Rear Seat Track Acceleration (Y)

Vehicle Center of Gravity Acceleration (X)

Vehicle Center of Gravity Acceleration (Y)

Vehicle Center of Gravity Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

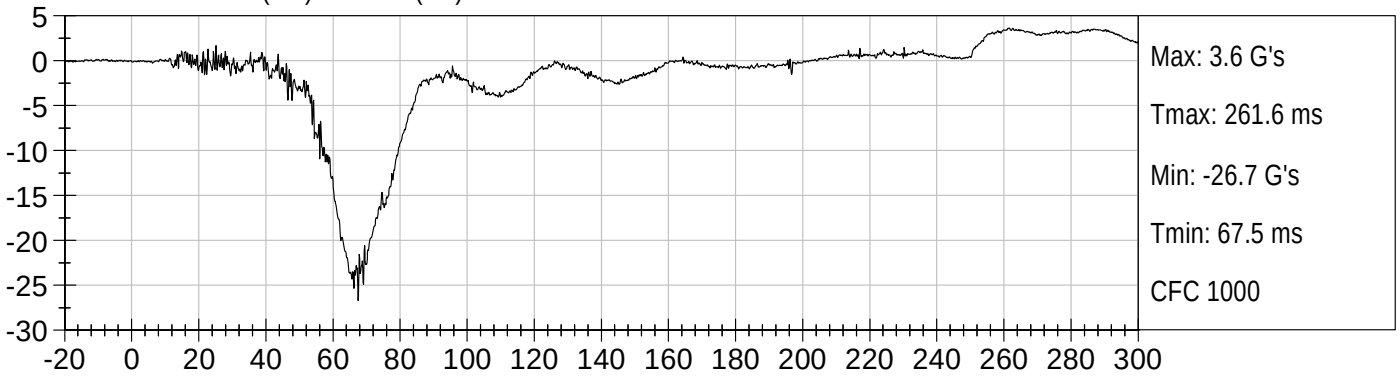
Left MDB Contact Switch

Right MDB Contact Switch

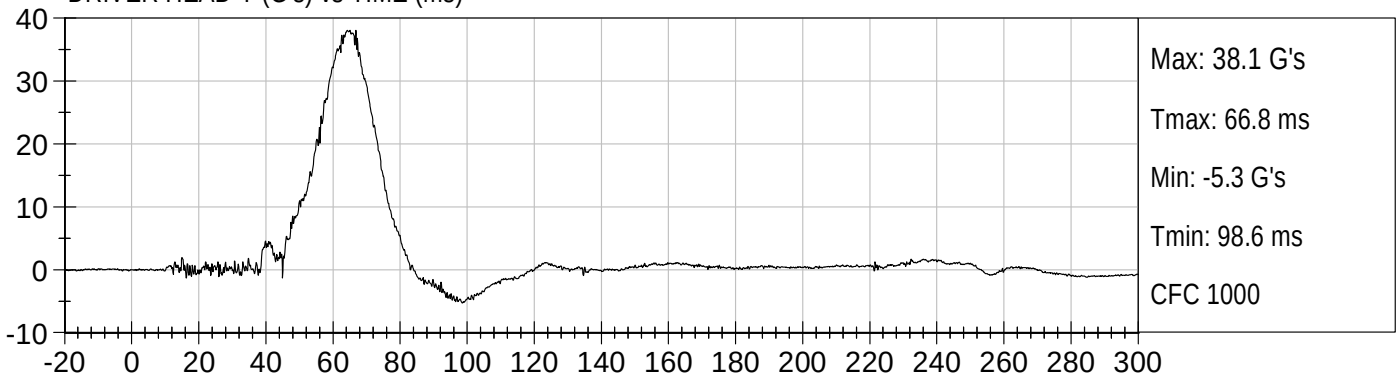
55/28 km/h 90° NCAP MDB Side Impact
2011 Subaru Forester - MB5504

Test Date: 12/17/2010
Speed: 38.6 mph (62.1 km/h)

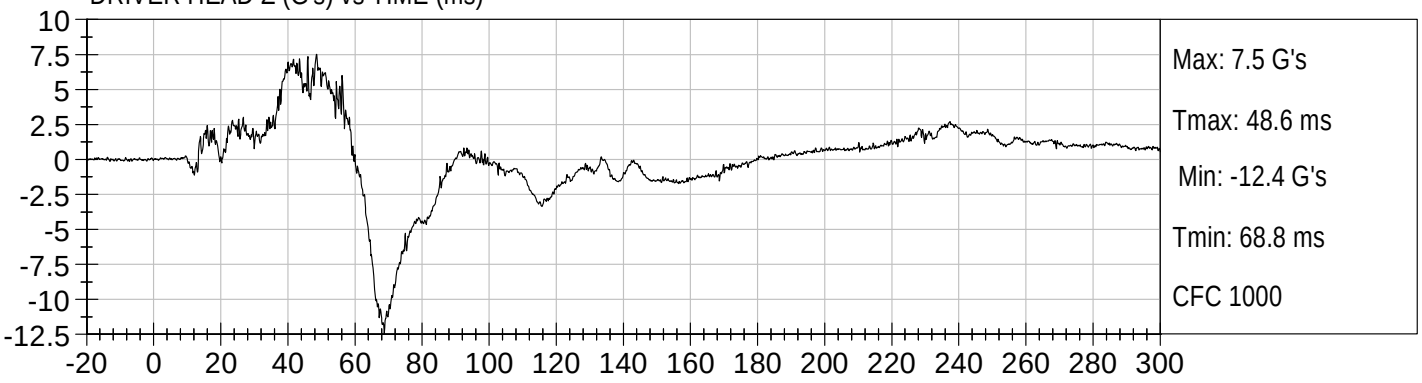
DRIVER HEAD X (G's) vs TIME (ms)



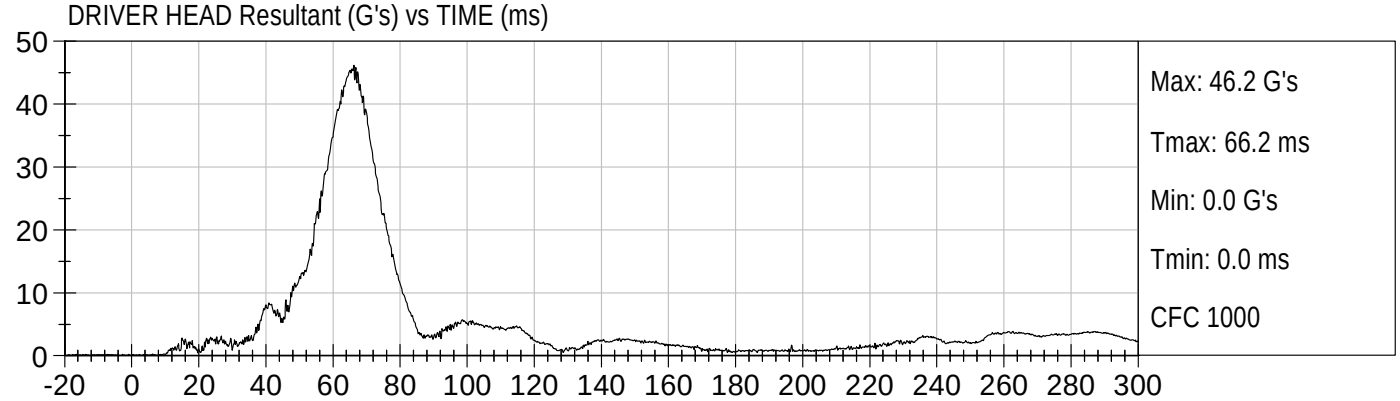
DRIVER HEAD Y (G's) vs TIME (ms)



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



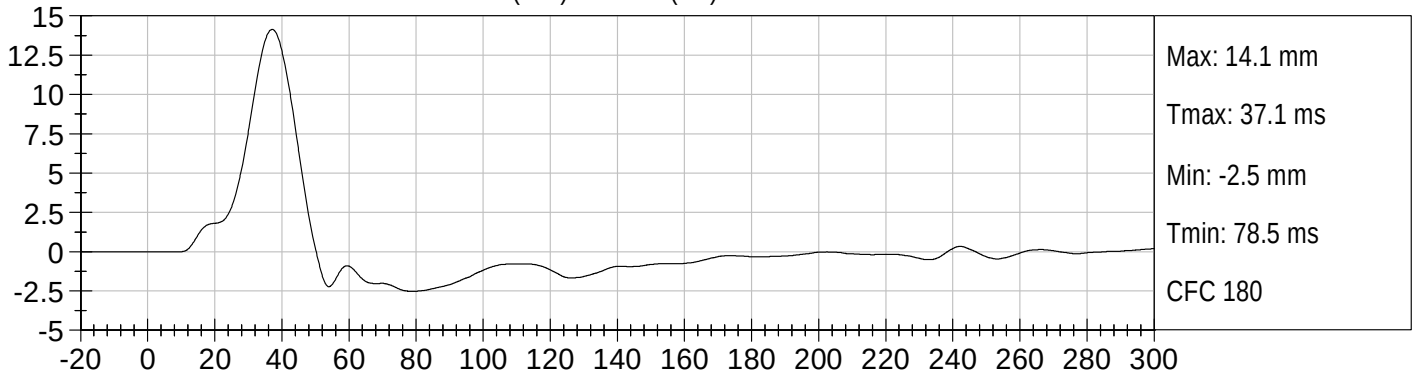
DRIVER HEAD Resultant (G's) vs TIME (ms)



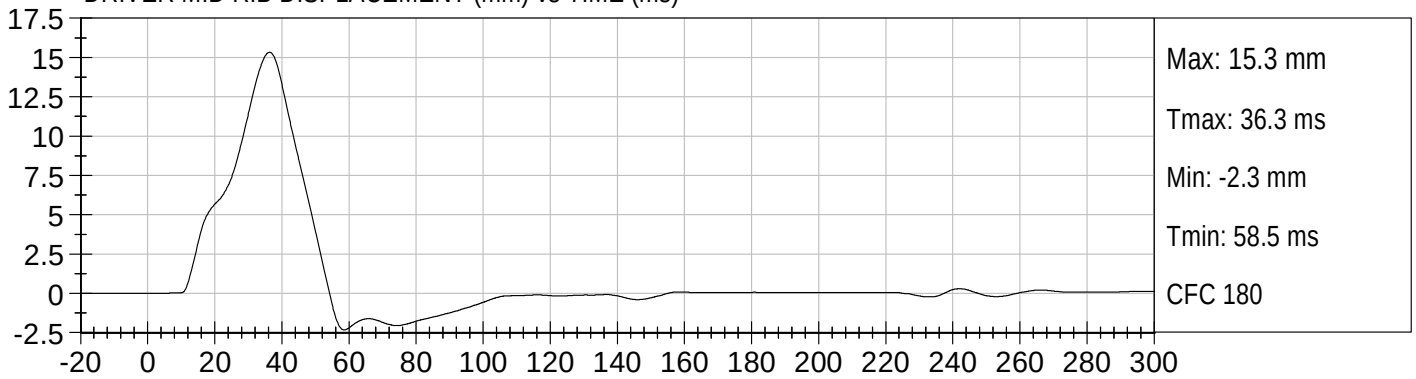
55/28 km/h 90° NCAP MDB Side Impact
2011 Subaru Forester - MB5504

Test Date: 12/17/2010
Speed: 38.6 mph (62.1 km/h)

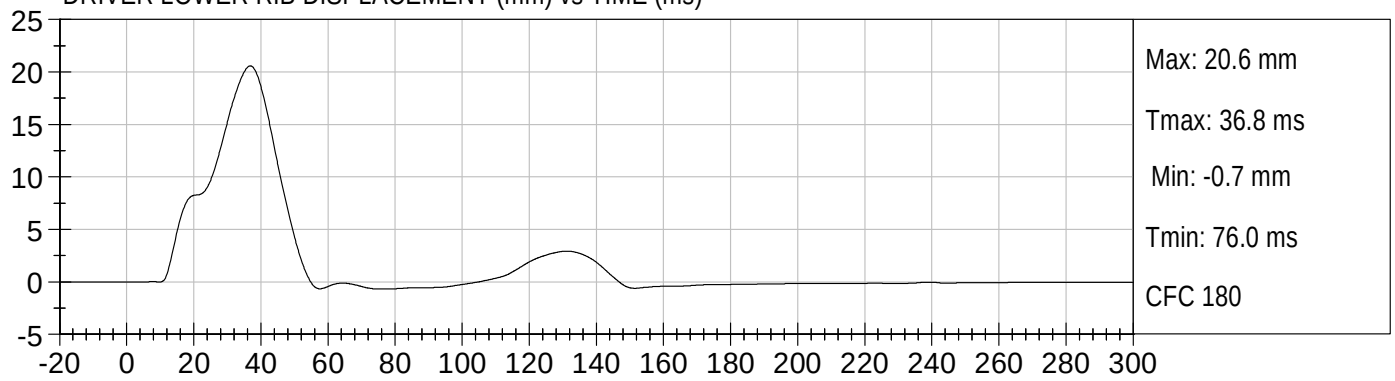
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



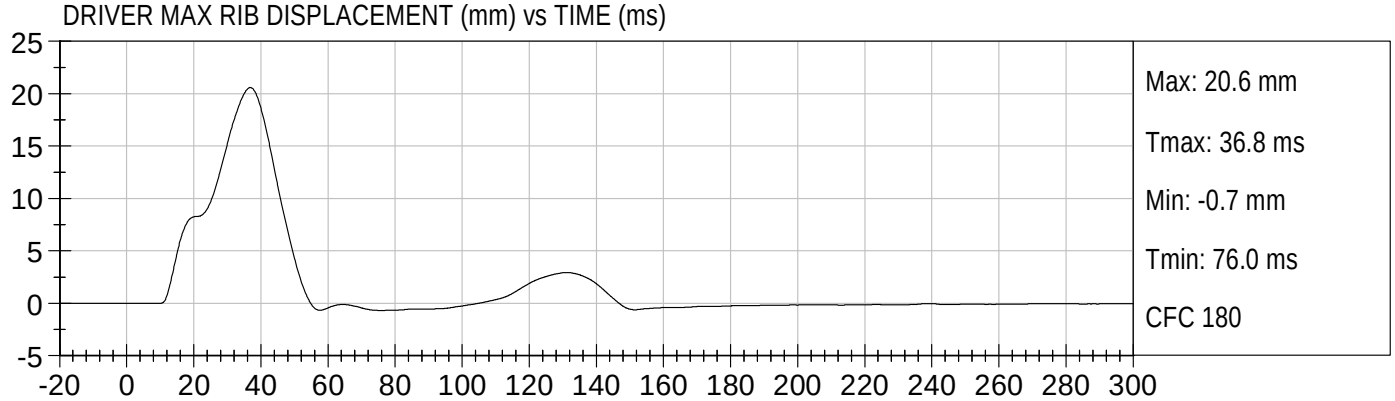
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



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



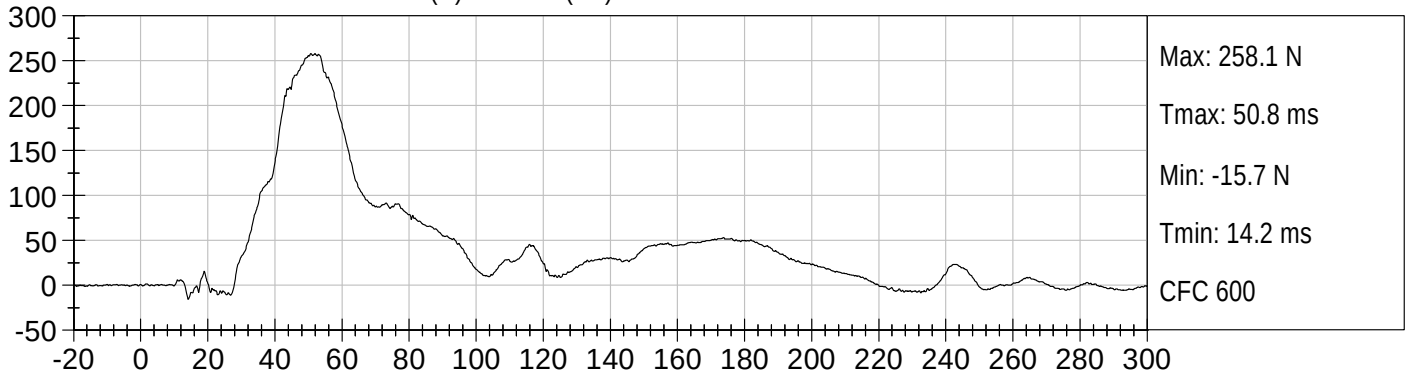
DRIVER MAX RIB DISPLACEMENT (mm) vs TIME (ms)



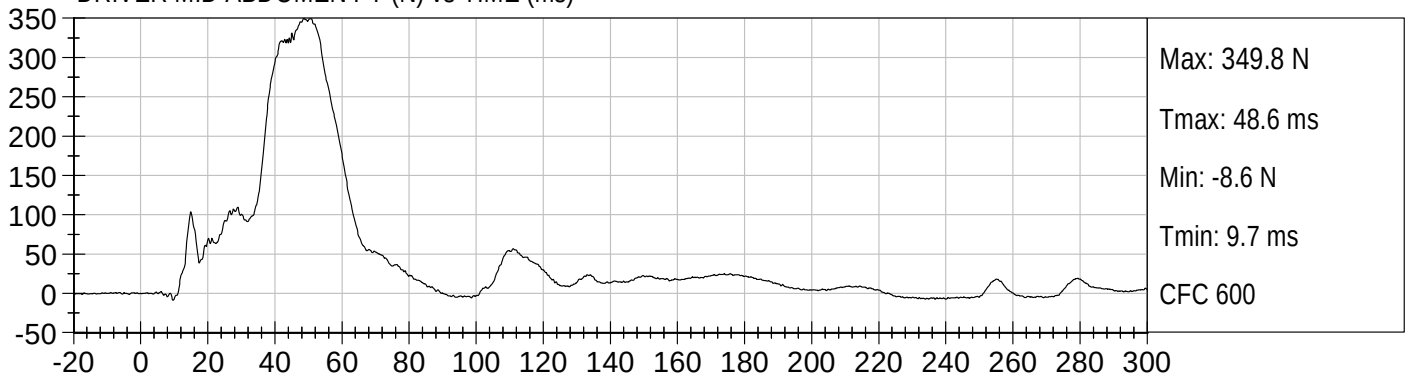
55/28 km/h 90° NCAP MDB Side Impact
2011 Subaru Forester - MB5504

Test Date: 12/17/2010
Speed: 38.6 mph (62.1 km/h)

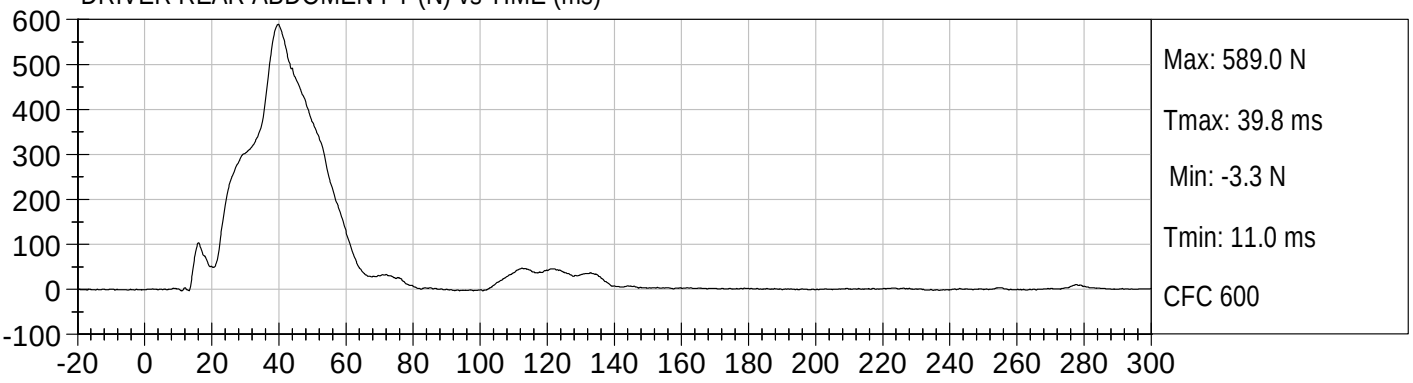
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



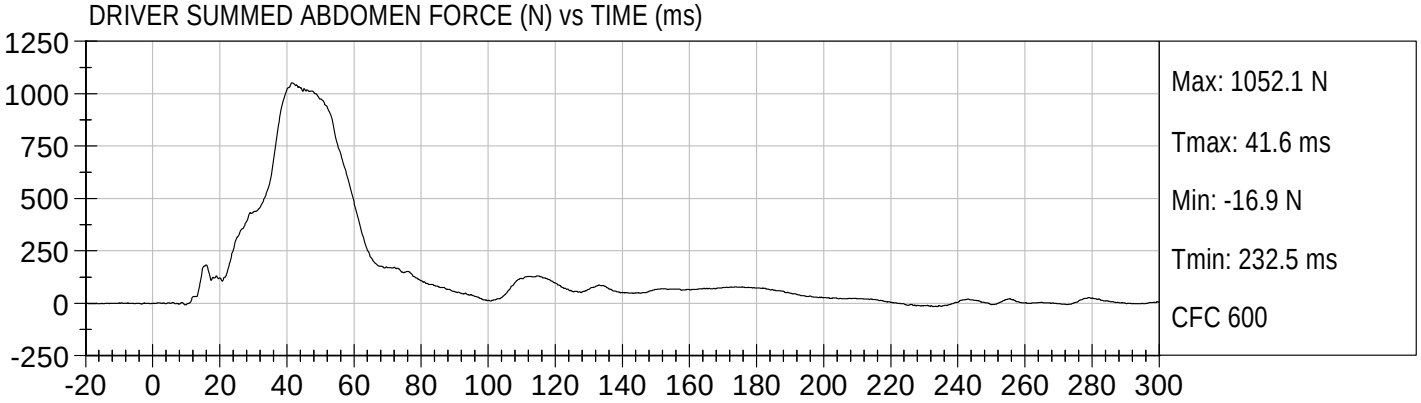
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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

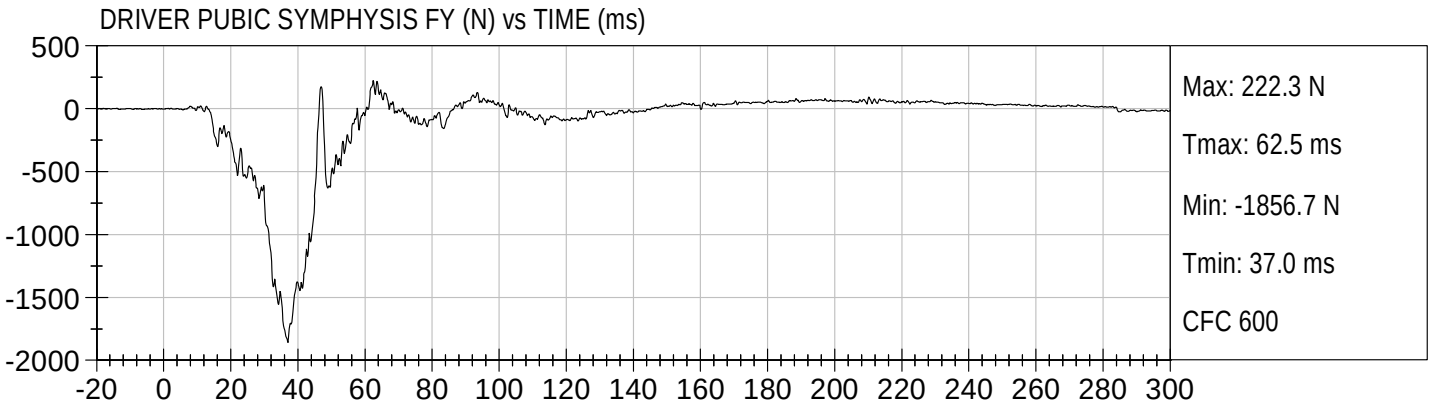


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)

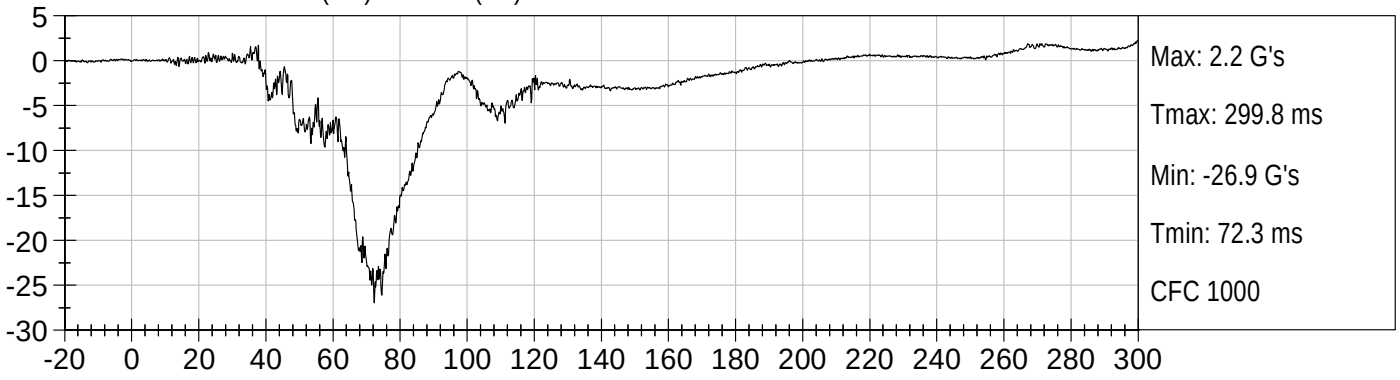


55/28 km/h 90° NCAP MDB Side Impact
2011 Subaru Forester - MB5504

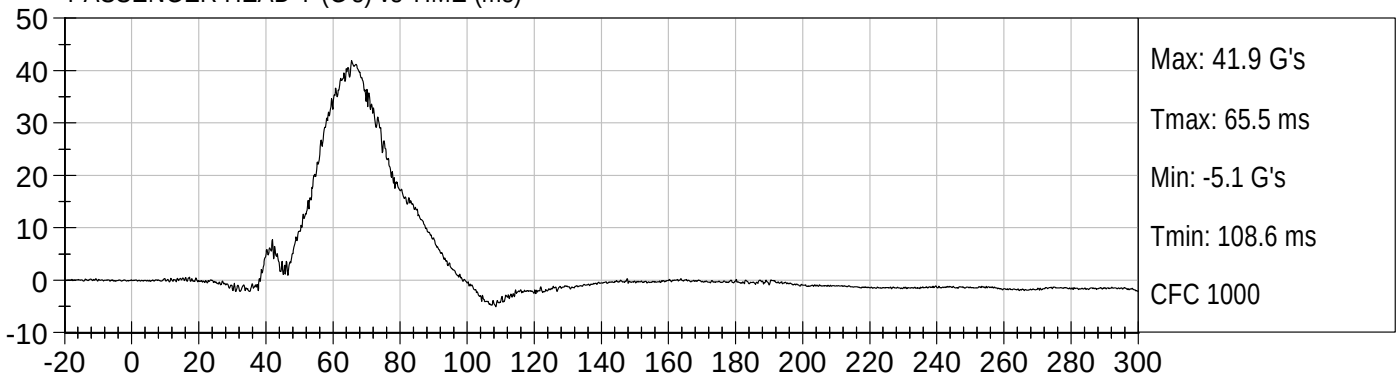
Test Date: 12/17/2010
Speed: 38.6 mph (62.1 km/h)



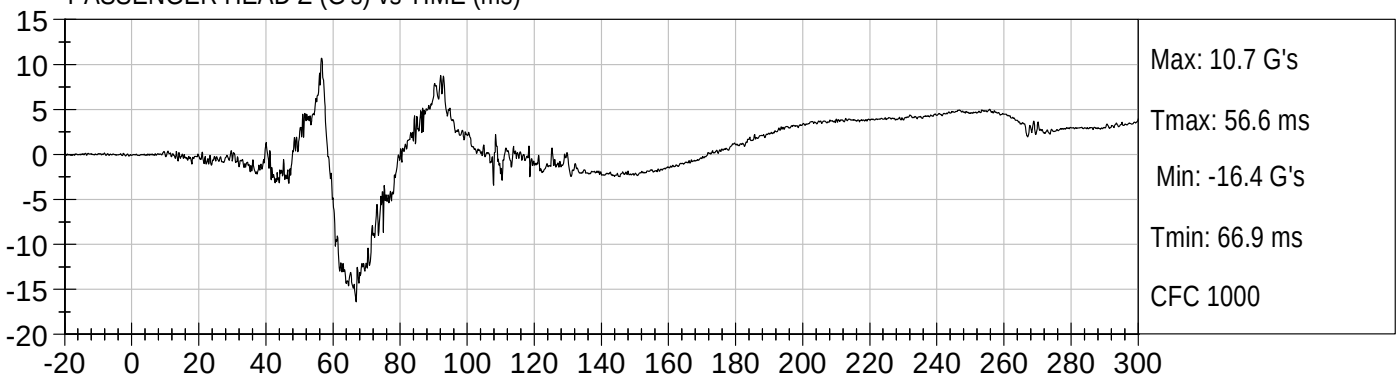
PASSENGER HEAD X (G's) vs TIME (ms)



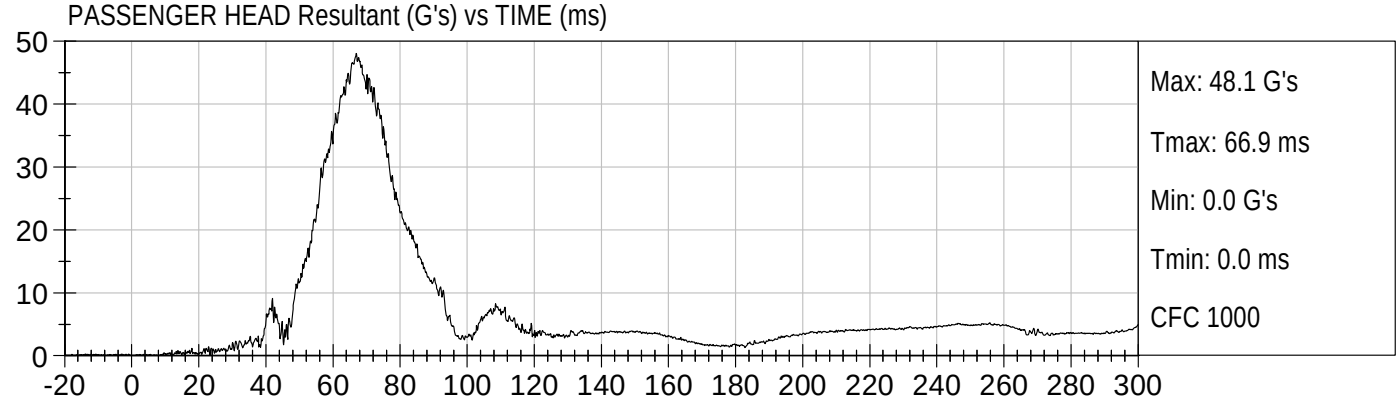
PASSENGER HEAD Y (G's) vs TIME (ms)



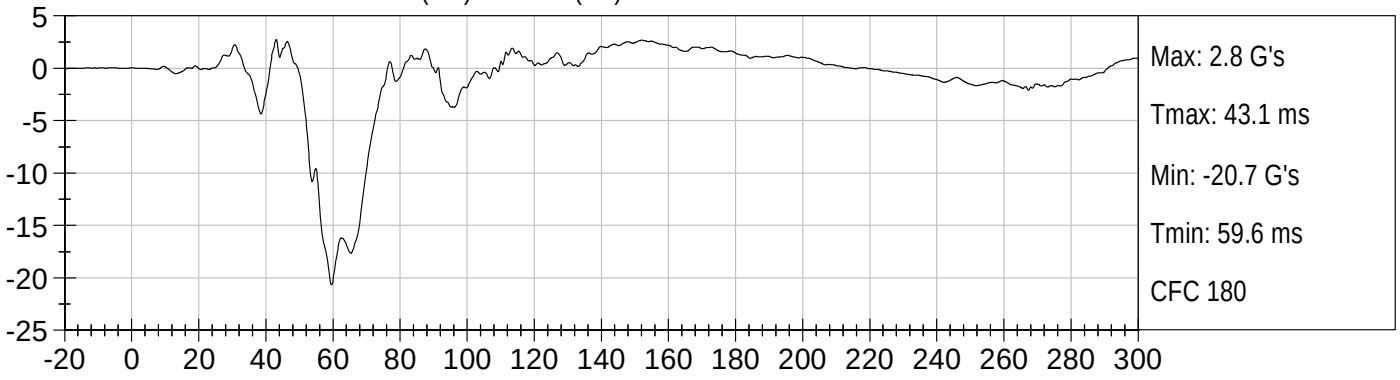
PASSENGER HEAD Z (G's) vs TIME (ms)



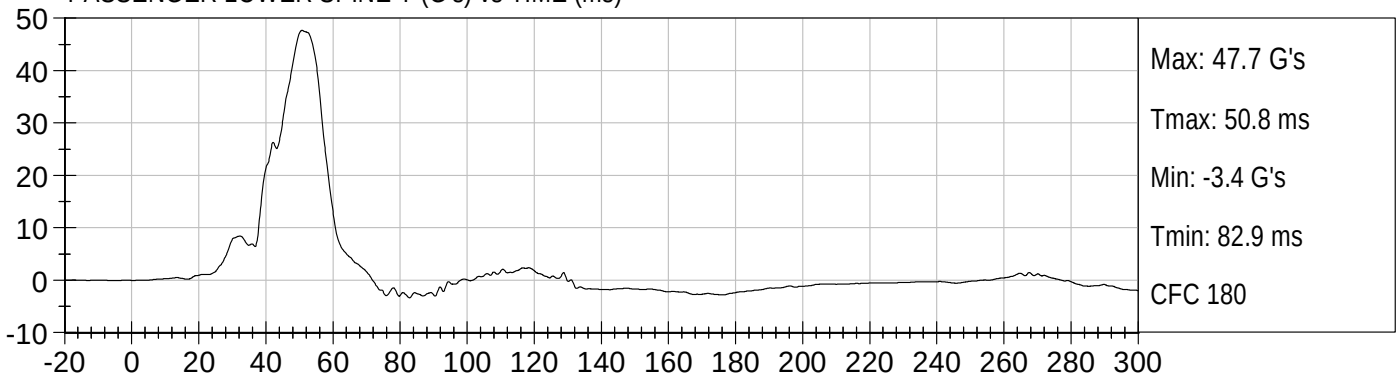
PASSENGER HEAD Resultant (G's) vs TIME (ms)



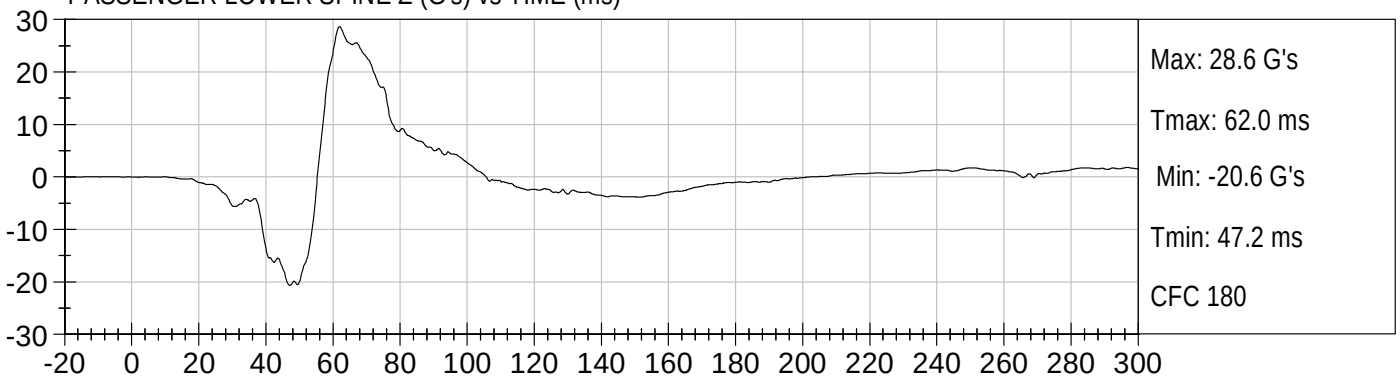
PASSENGER LOWER SPINE X (G's) vs TIME (ms)



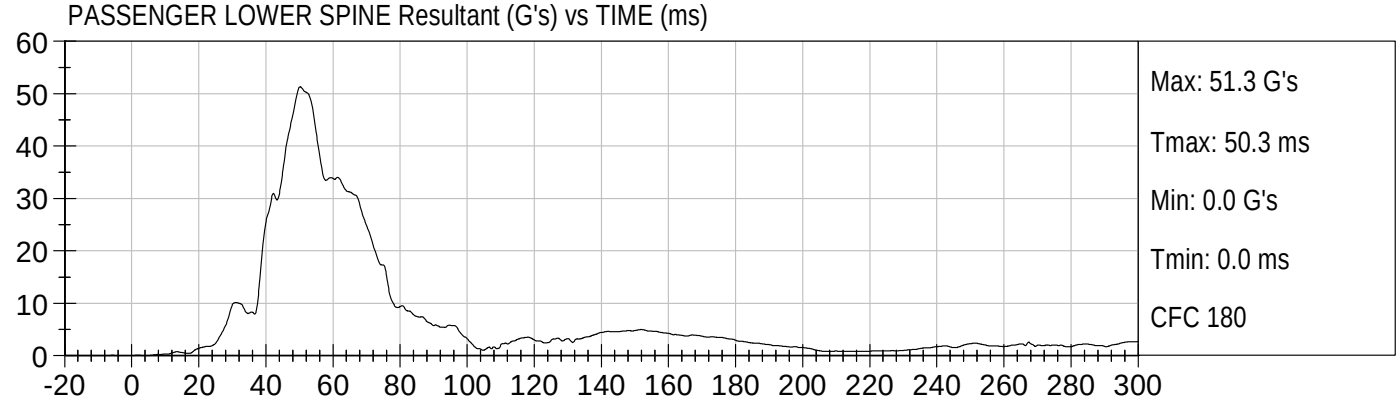
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



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



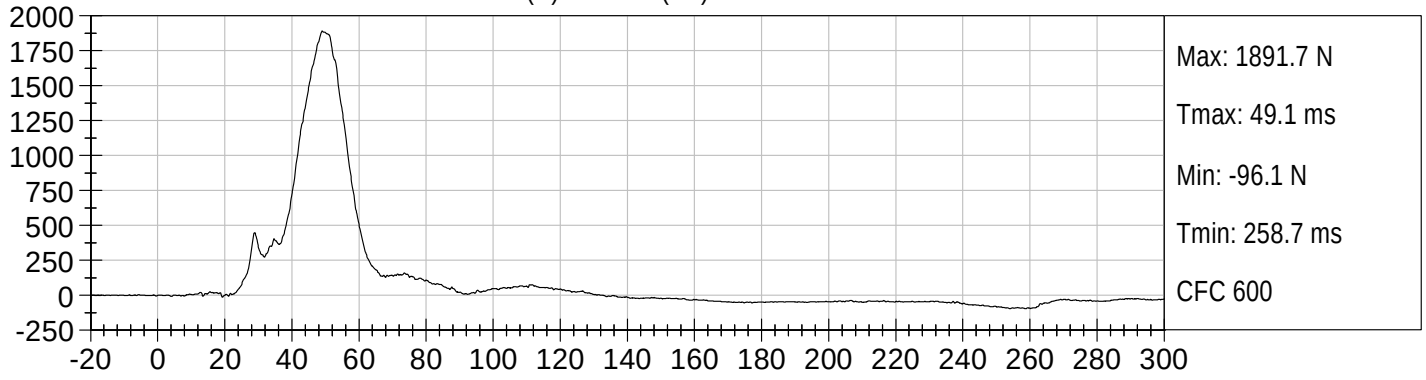
PASSENGER LOWER SPINE Resultant (G's) vs TIME (ms)



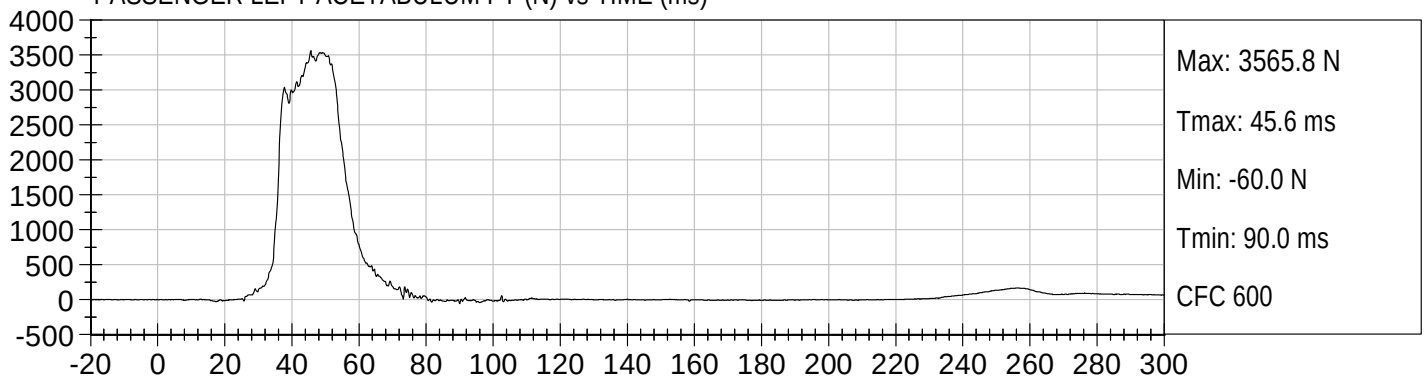
55/28 km/h 90° NCAP MDB Side Impact
2011 Subaru Forester - MB5504

Test Date: 12/17/2010
Speed: 38.6 mph (62.1 km/h)

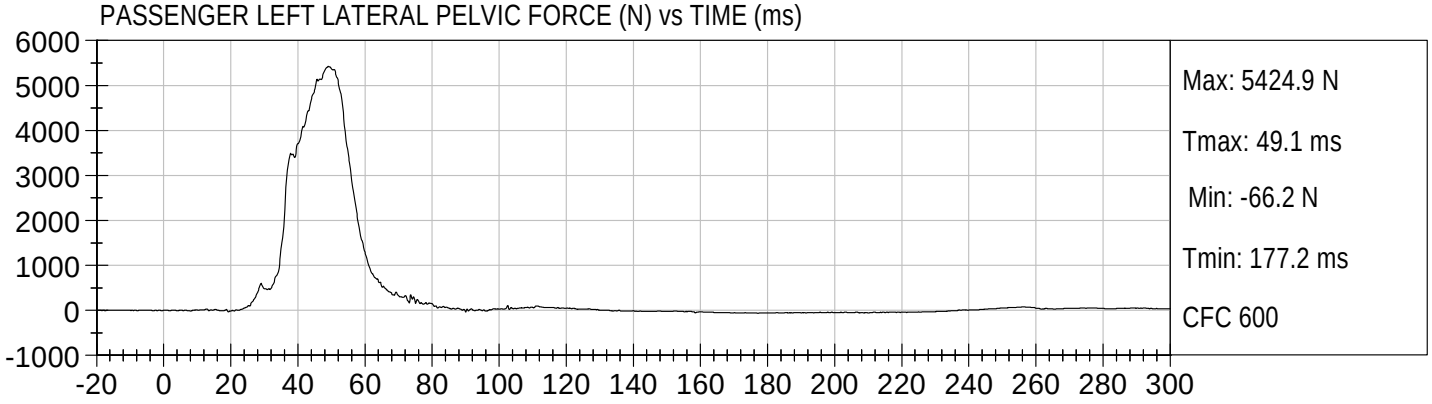
PASSENGER LEFT ILLIUM CREST FY (N) vs TIME (ms)



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



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



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 032 **Test ID:** D104321

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Peak Resultant Acceleration	G's	125 to 155	140	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 Gall
Laboratory Technician

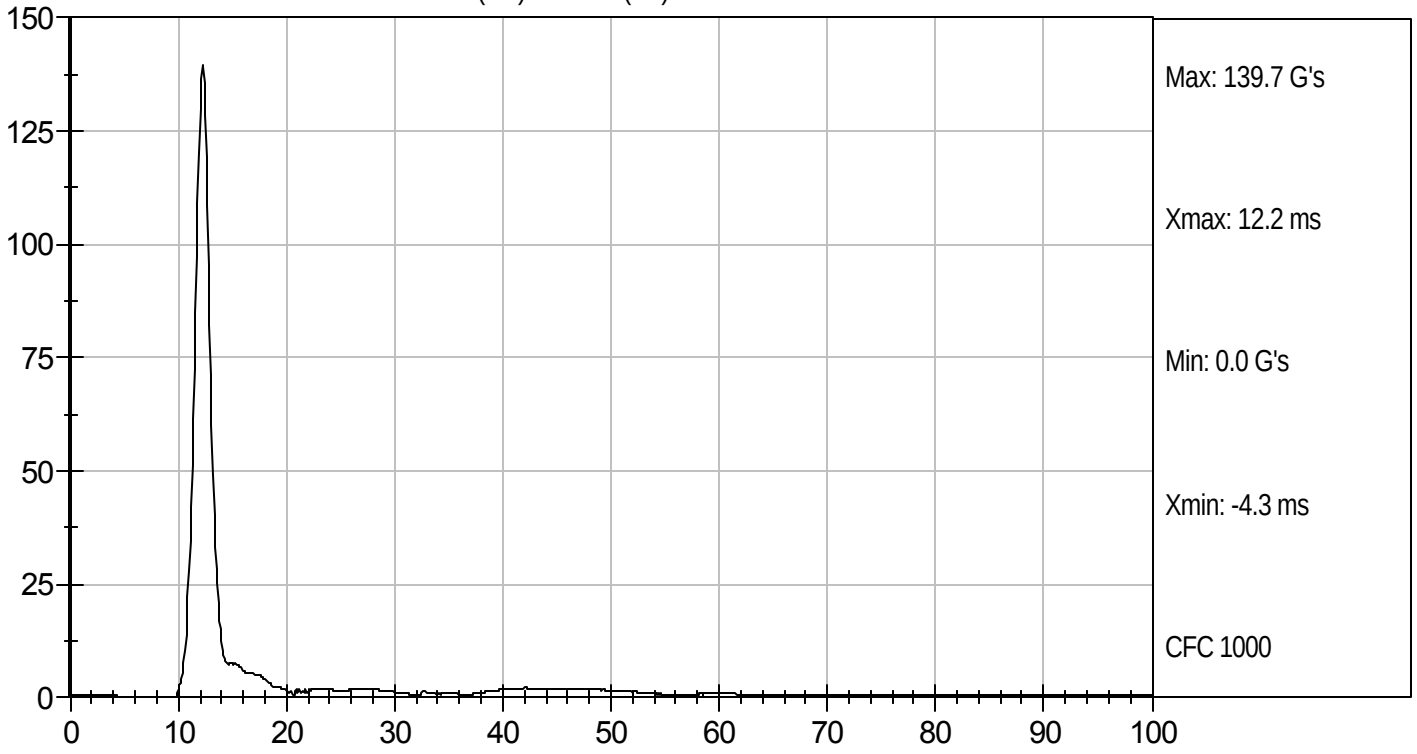
12/9/10
Test Date

David Winkelbauer
Approved By

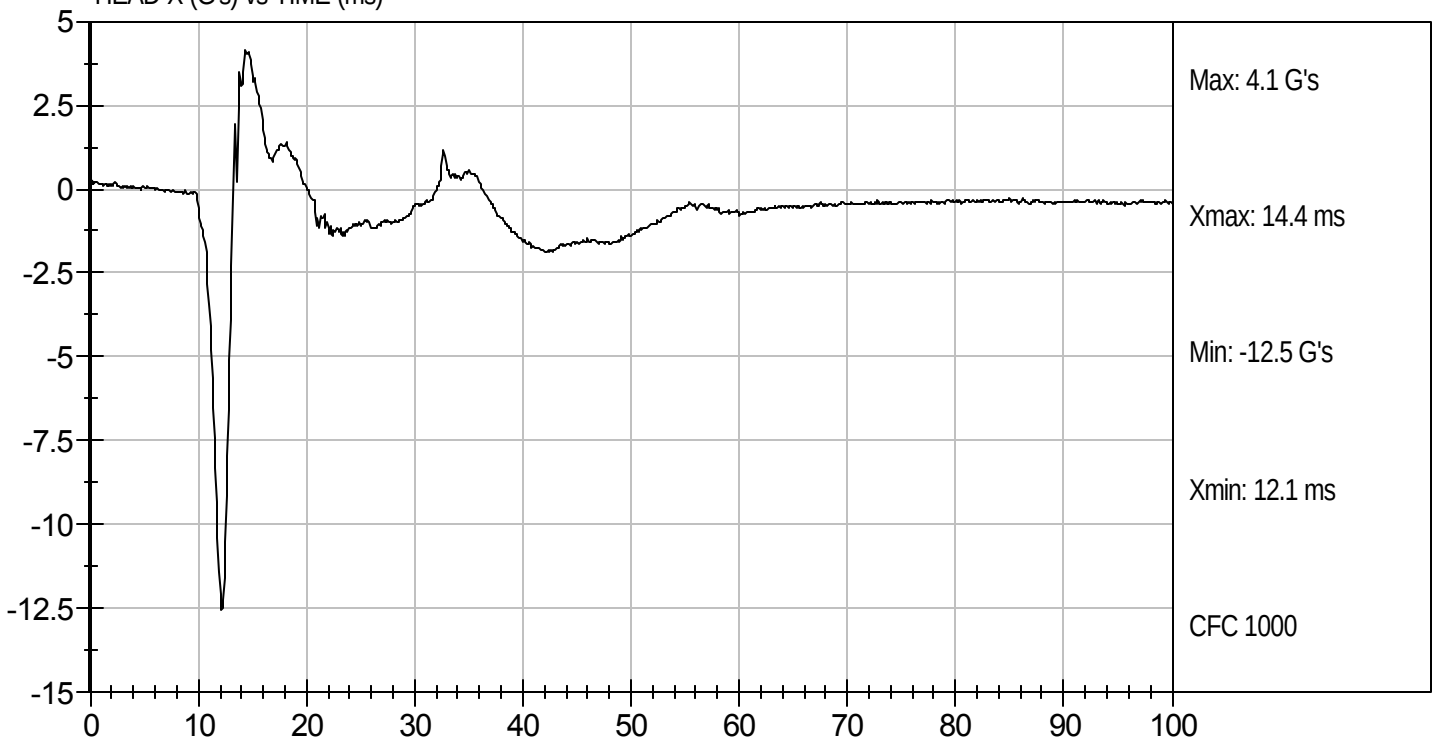
Test Desc: Head Drop
Component ID: D104321

Test Date: 12/9/10
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:** D104322

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	12	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.4	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.34	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.9	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	57.9	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

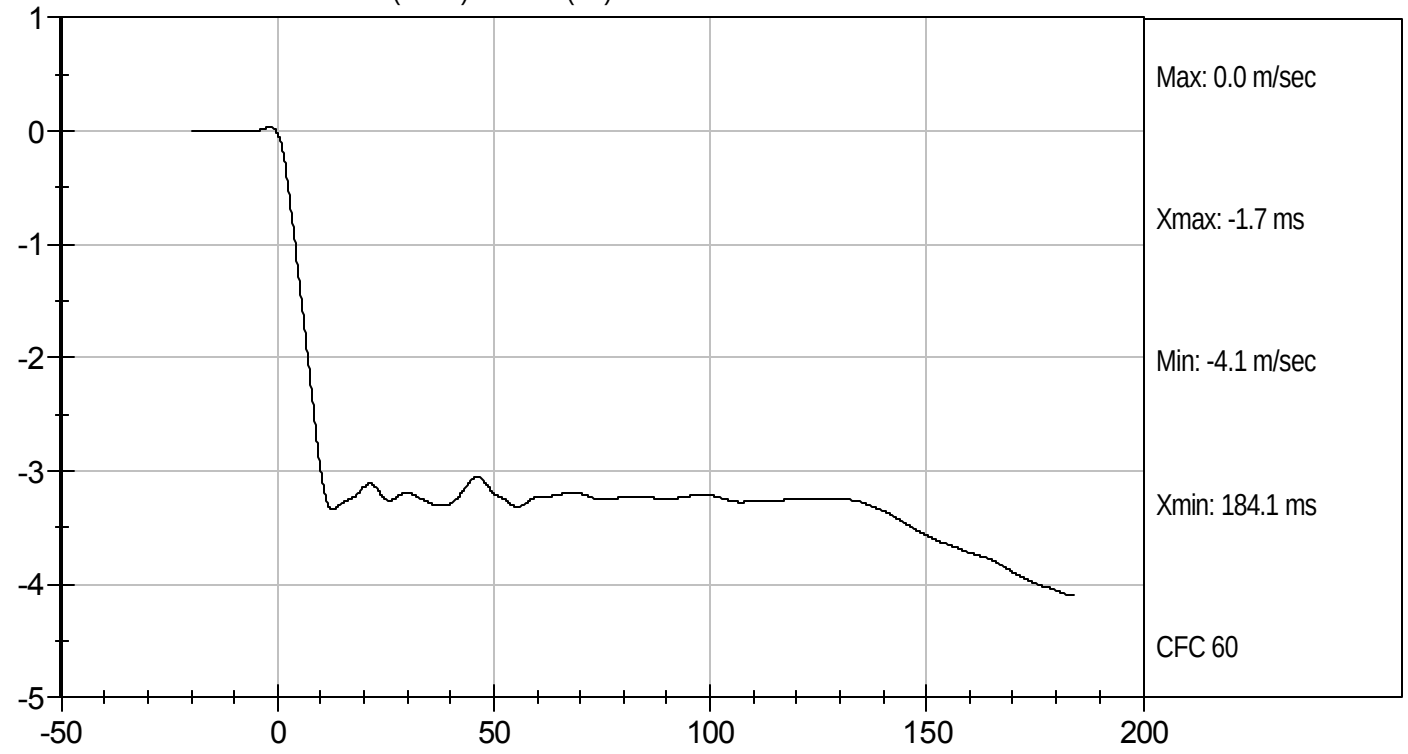
12/9/10
Test Date

David Winkelbauer
Approved By

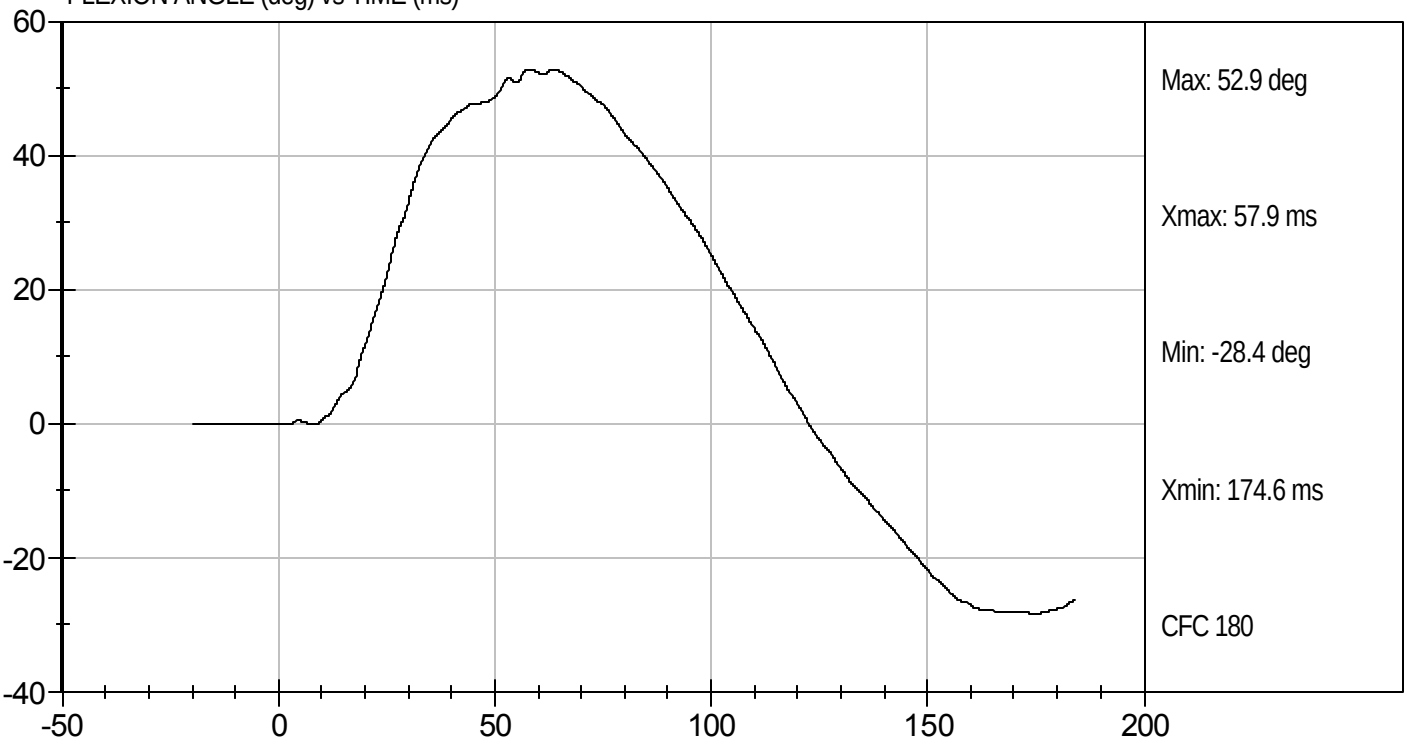
Test Desc: Neck Bending
Component ID: D104322

Test Date: 12/9/10
Velocity: 11.2 ft/s, 3.4 m/s

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

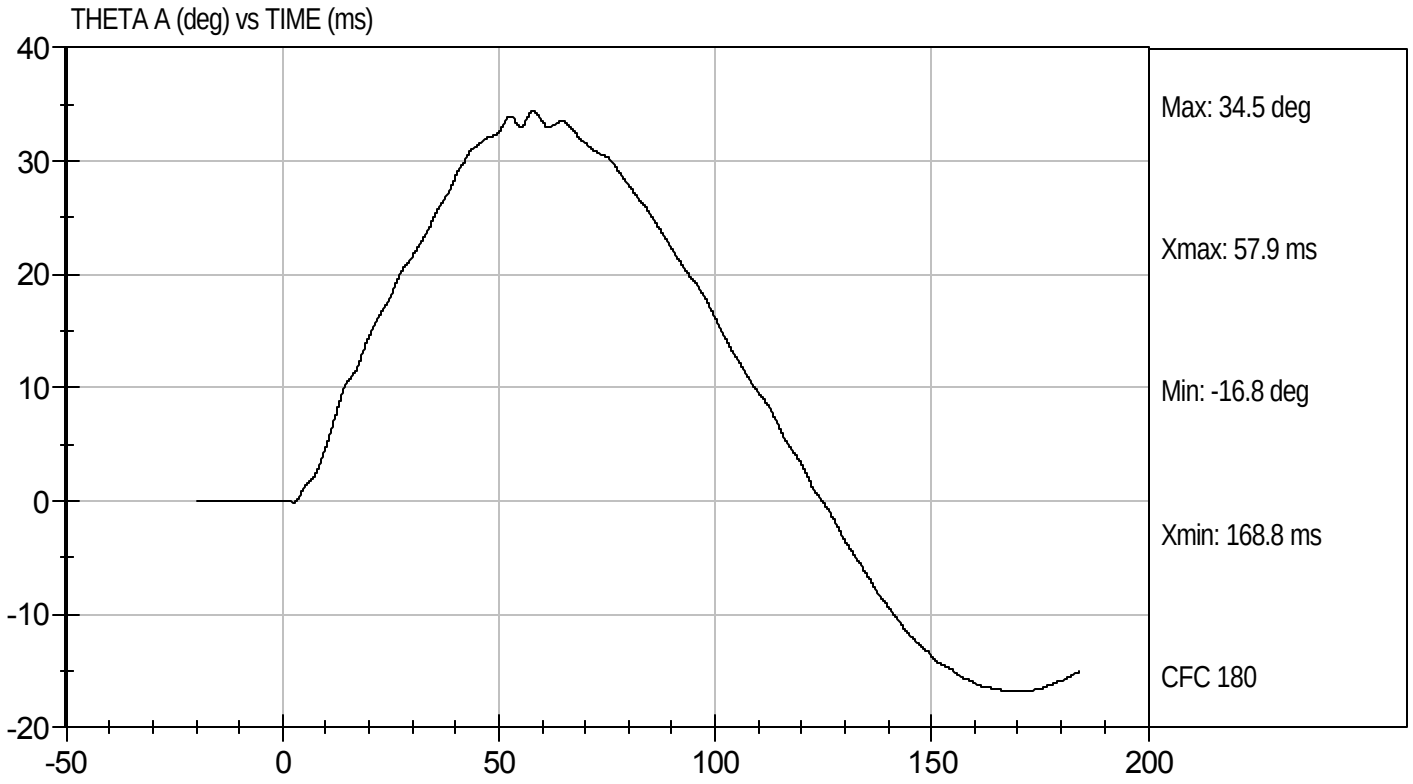


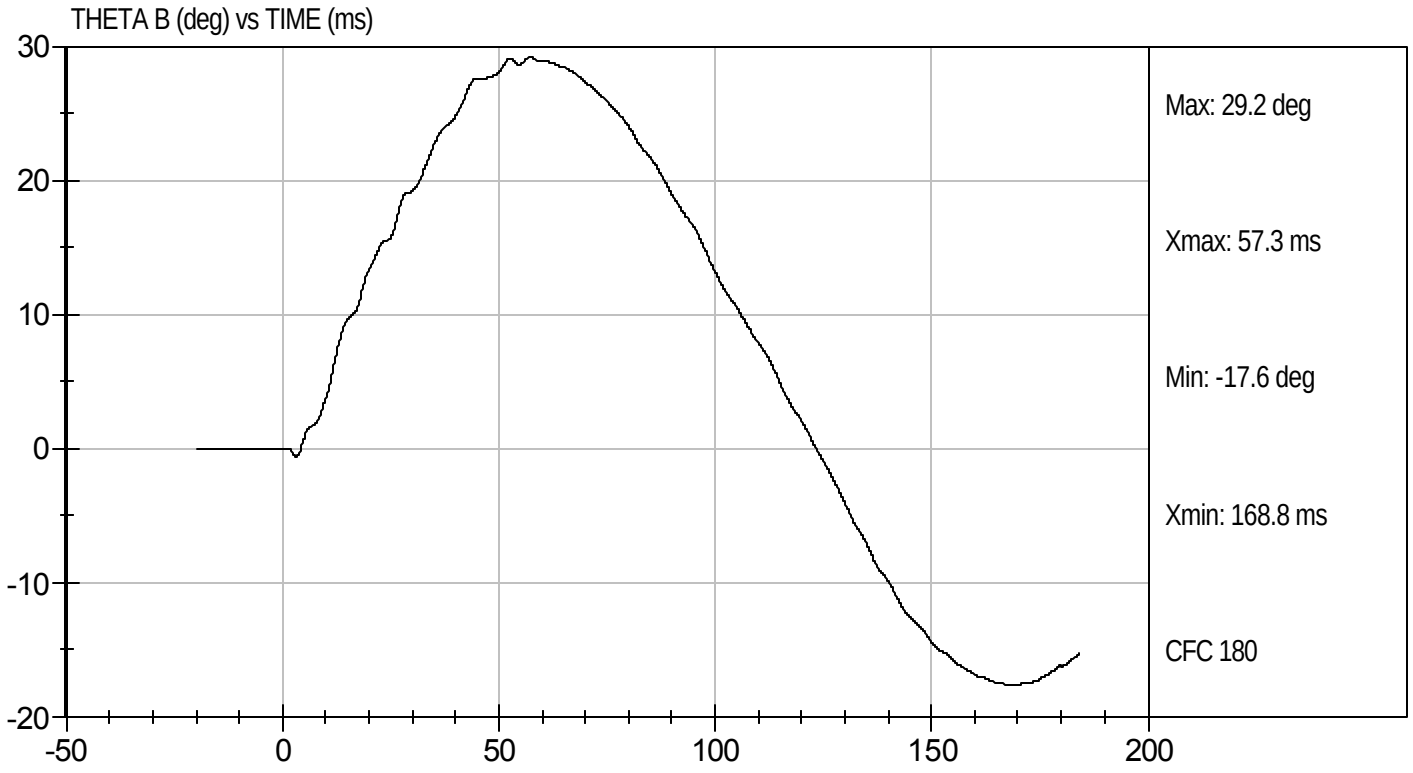
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D104322

Test Date: 12/9/10
Velocity: 11.2 ft/s, 3.4 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104323

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.4	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.6	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.6	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

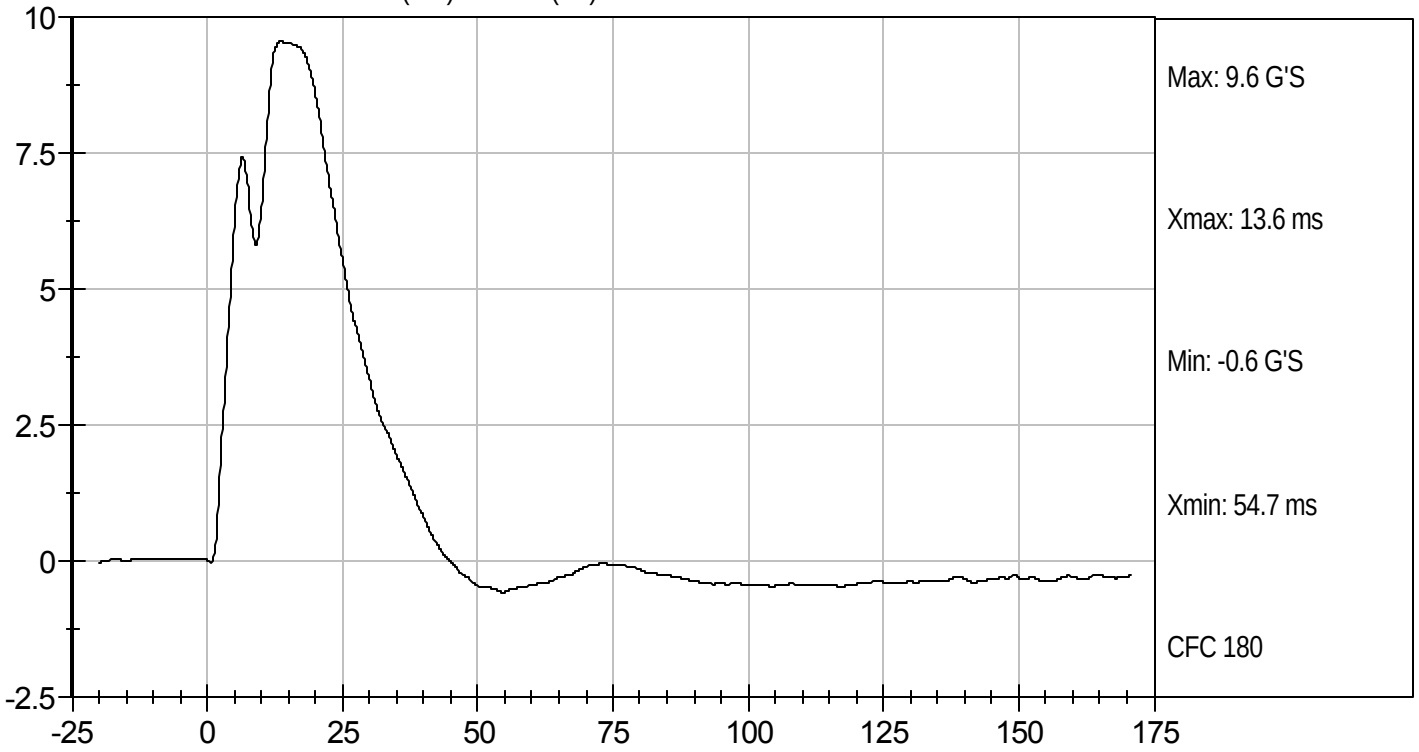
12/9/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D104323

Test Date: 12/9/10
Velocity: 14.36 ft/s, 4.4 m/s

SHOULDER ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104324

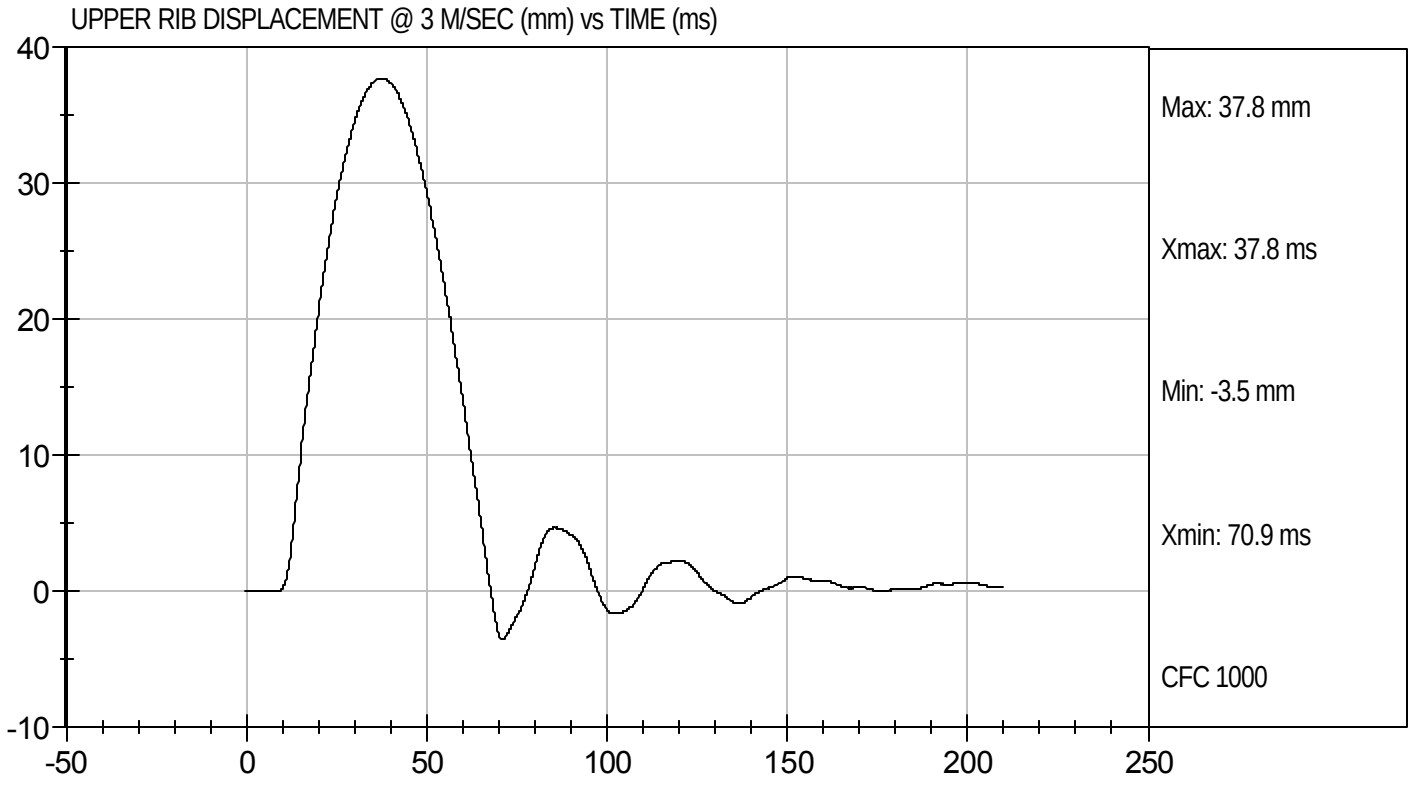
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.0	Pass
		Overall Test Results		Pass

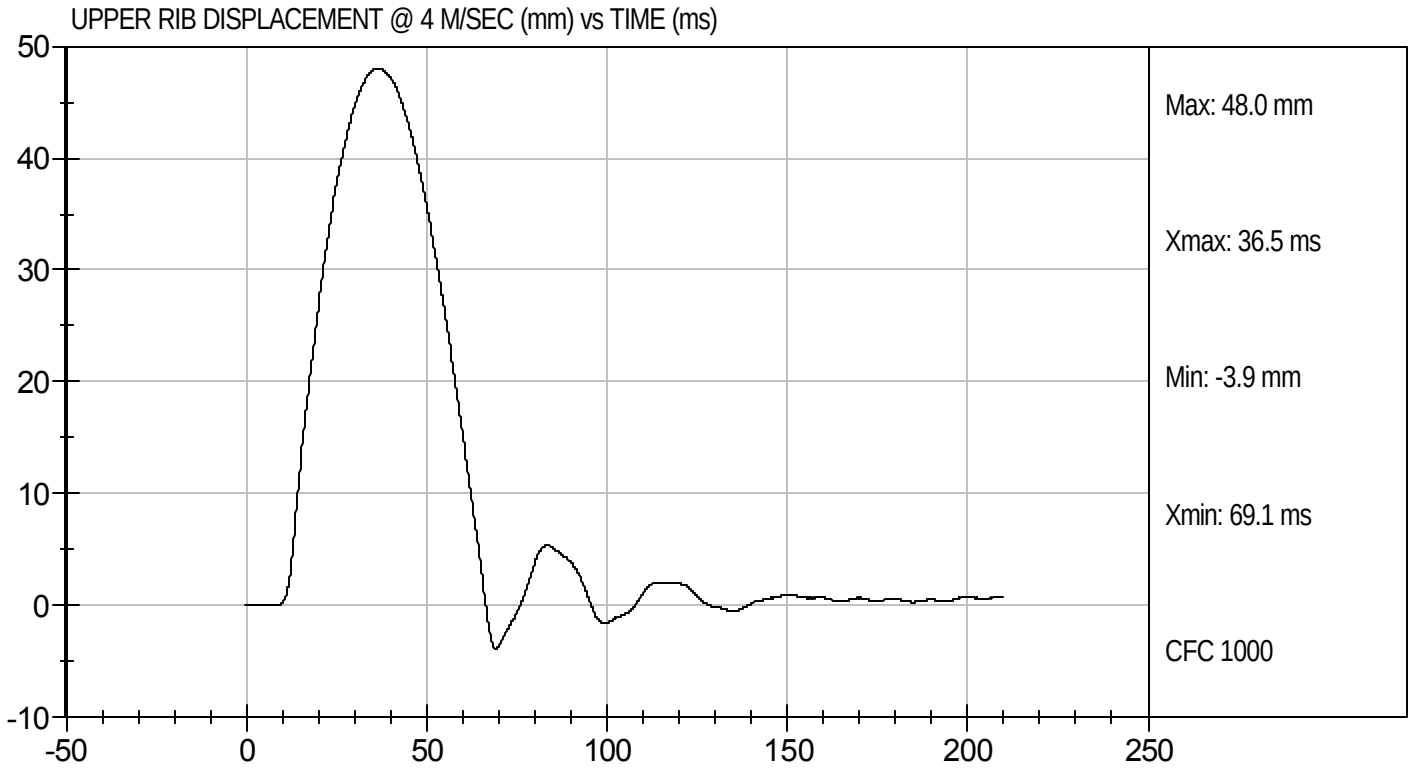
Jessica Gall
Laboratory Technician

12/9/10
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D104324
Test Date: 12/9/10





MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104325

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.6	Pass
		Overall Test Results		Pass

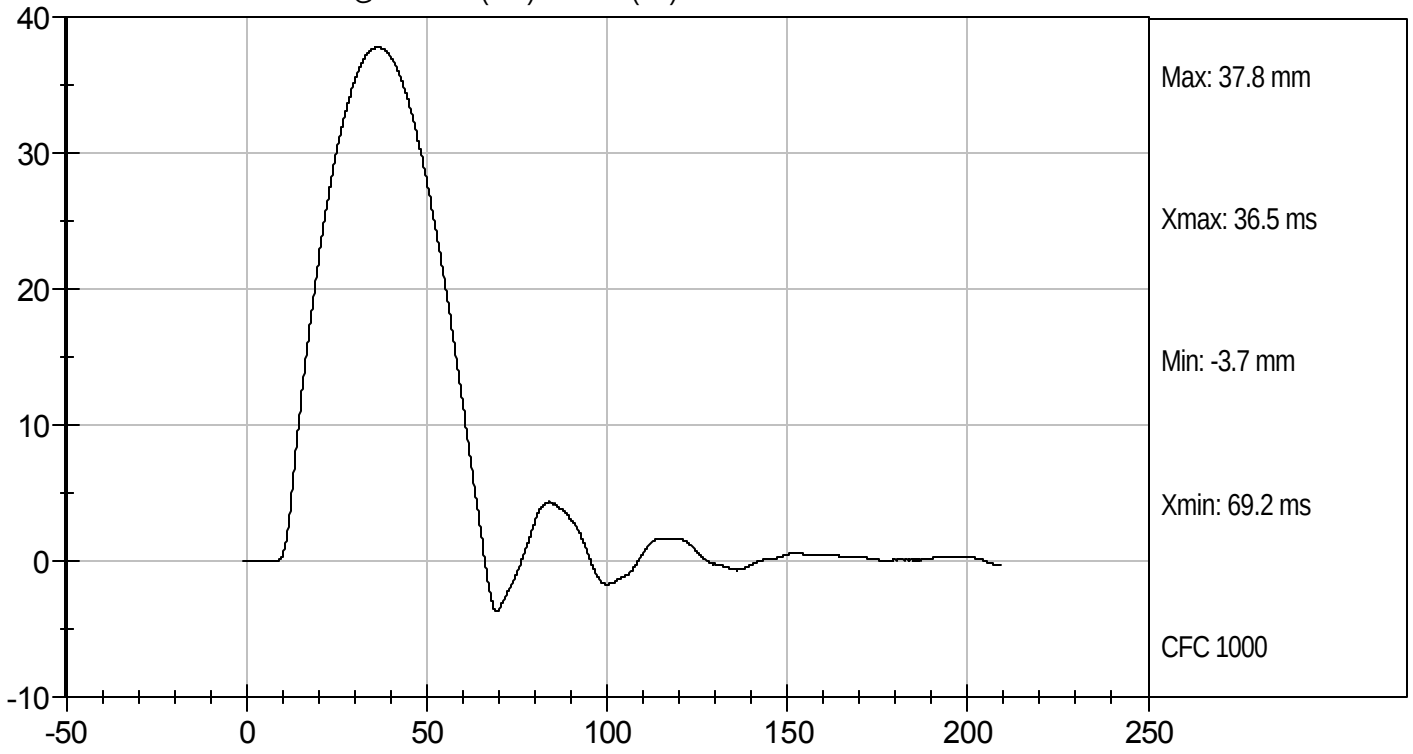
Jessica Gall
Laboratory Technician

12/9/10
Test Date

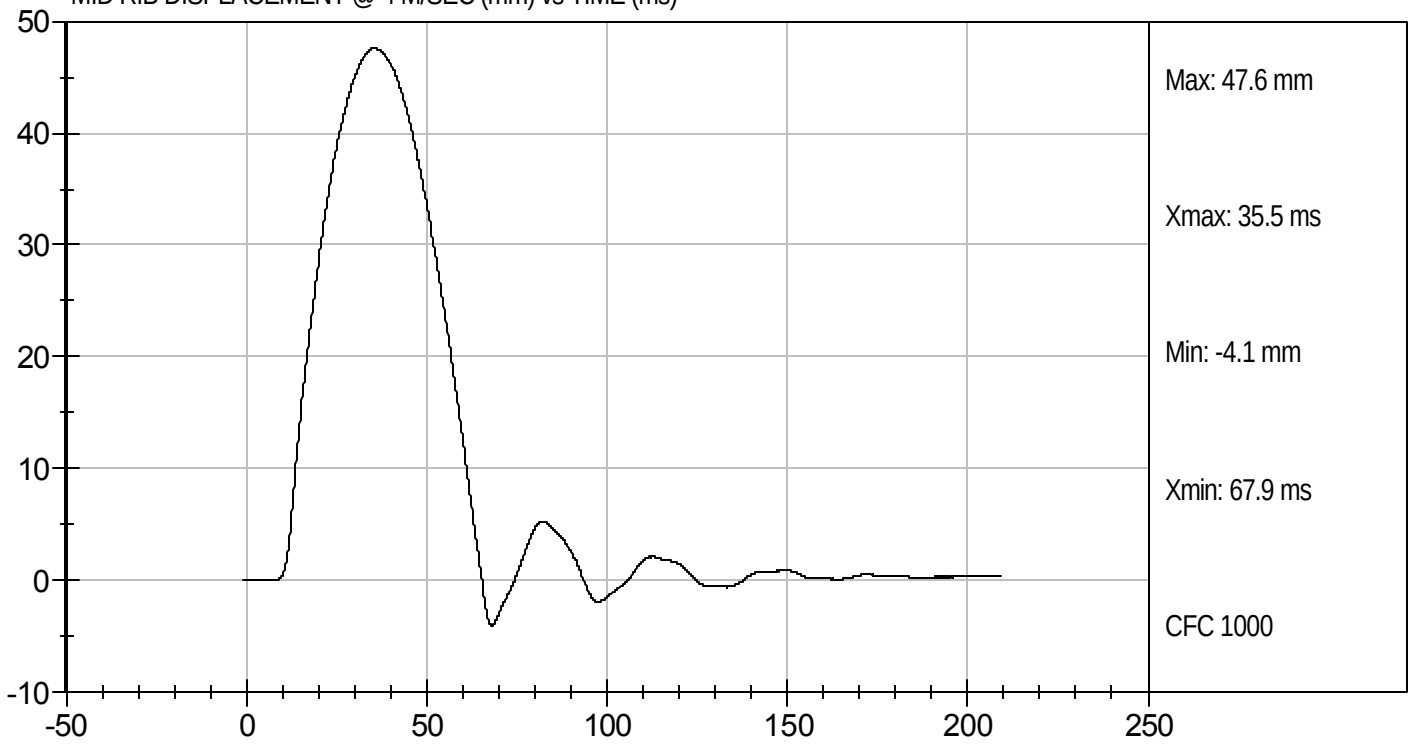
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D104325
Test Date: 12/9/10

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:** D104326

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	14	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	48.1	Pass
		Overall Test Results		Pass

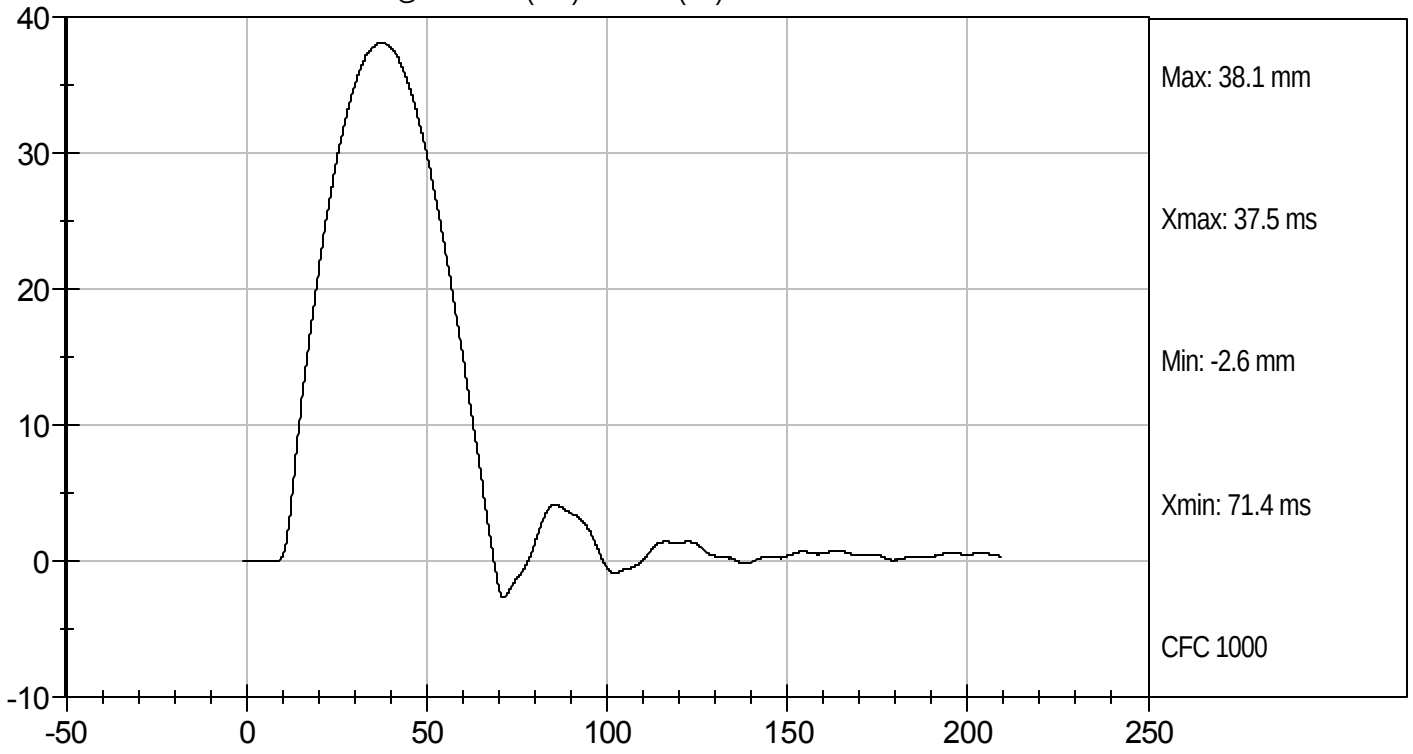
Jessica Hall
Laboratory Technician

12/9/10
Test Date

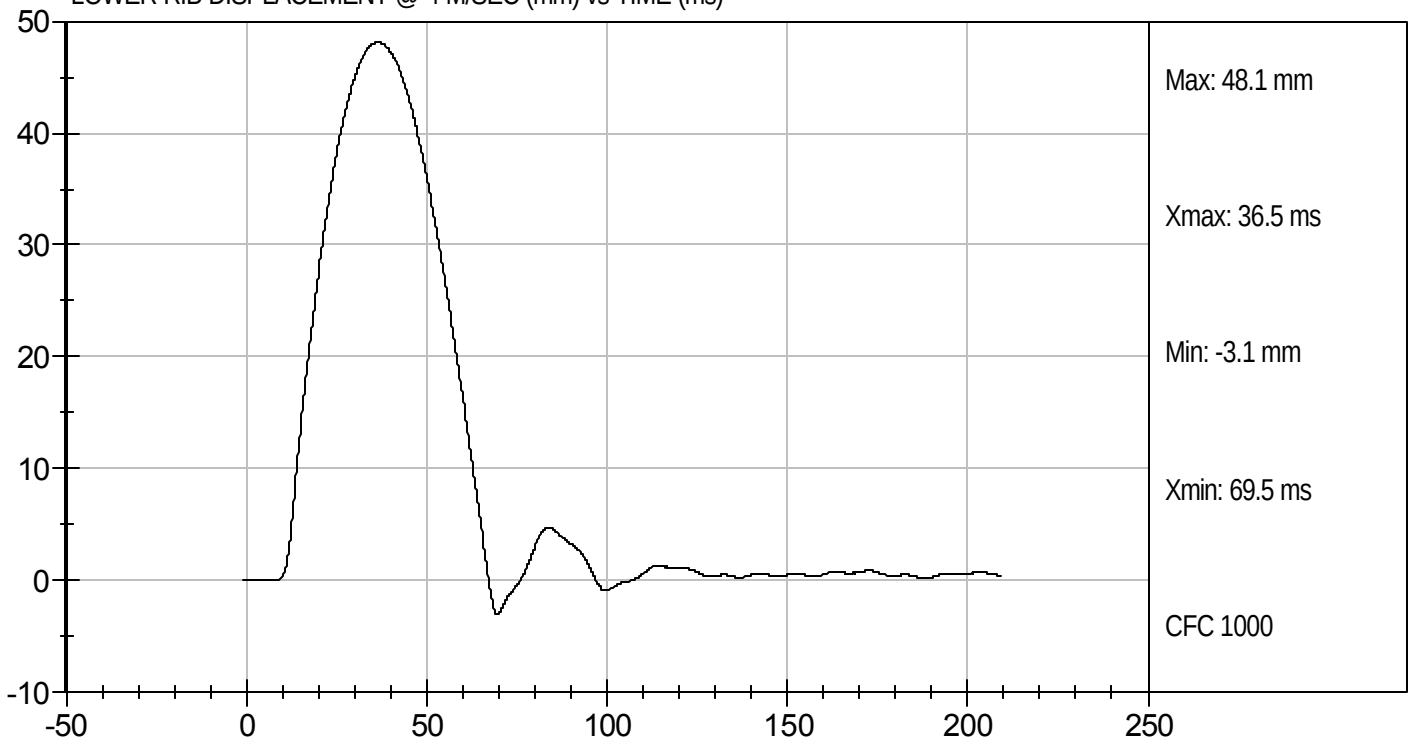
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D104326
Test Date: 12/9/10

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:** D104327

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.35	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.51	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.30	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

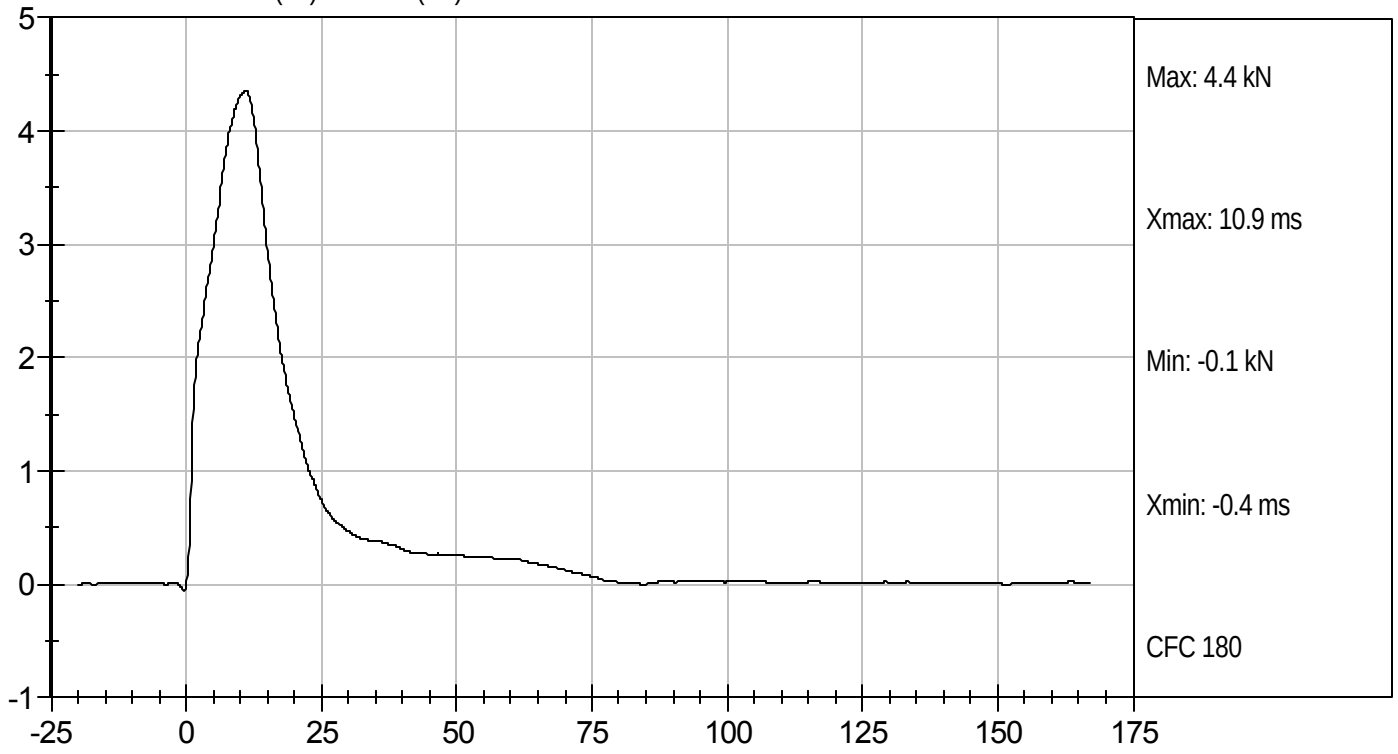
12/9/10
Test Date

David Winkelbauer
Approved By

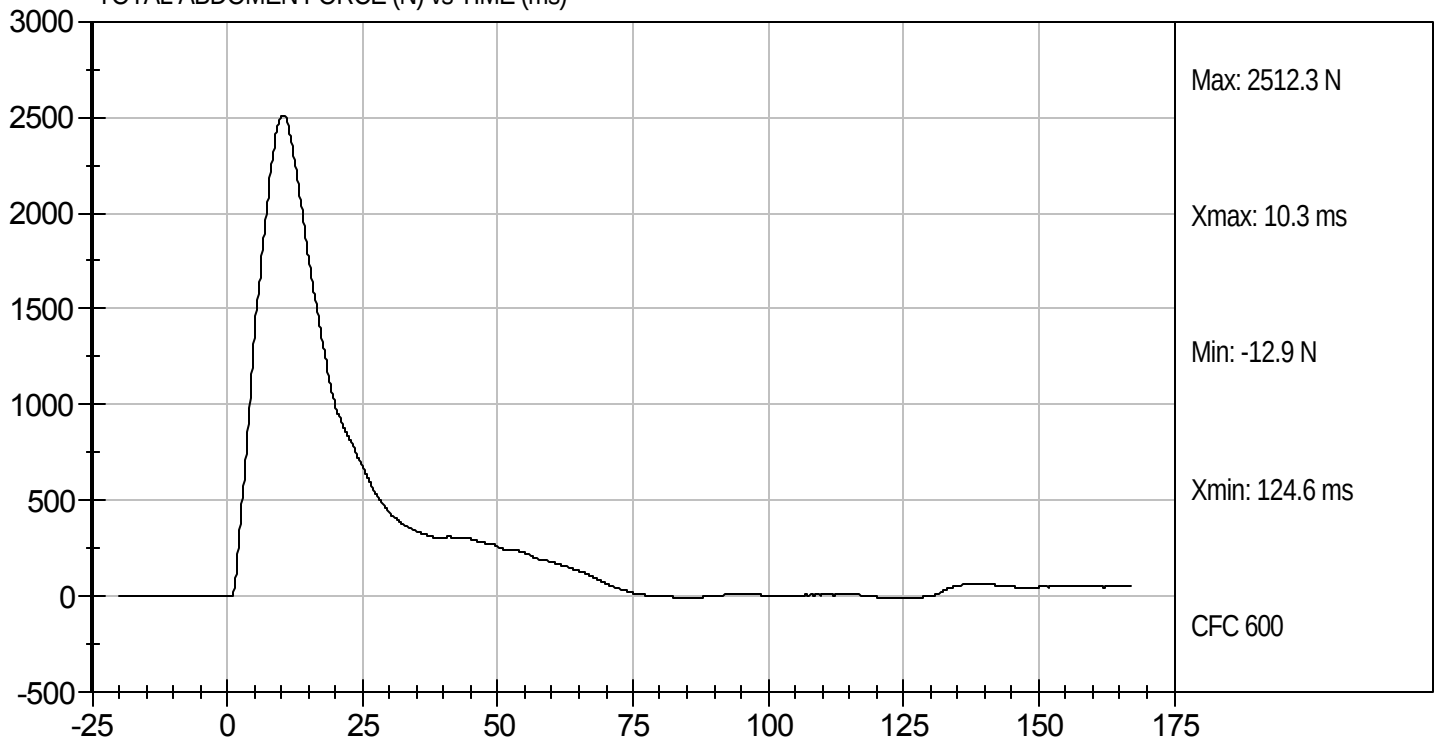
Test Desc: Abdomen Impact
Component ID: D104327

Test Date: 12/9/10
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:** D104328

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	12	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.10	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	-6.02	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	49.9	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	45.8	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
			Overall Results		Pass

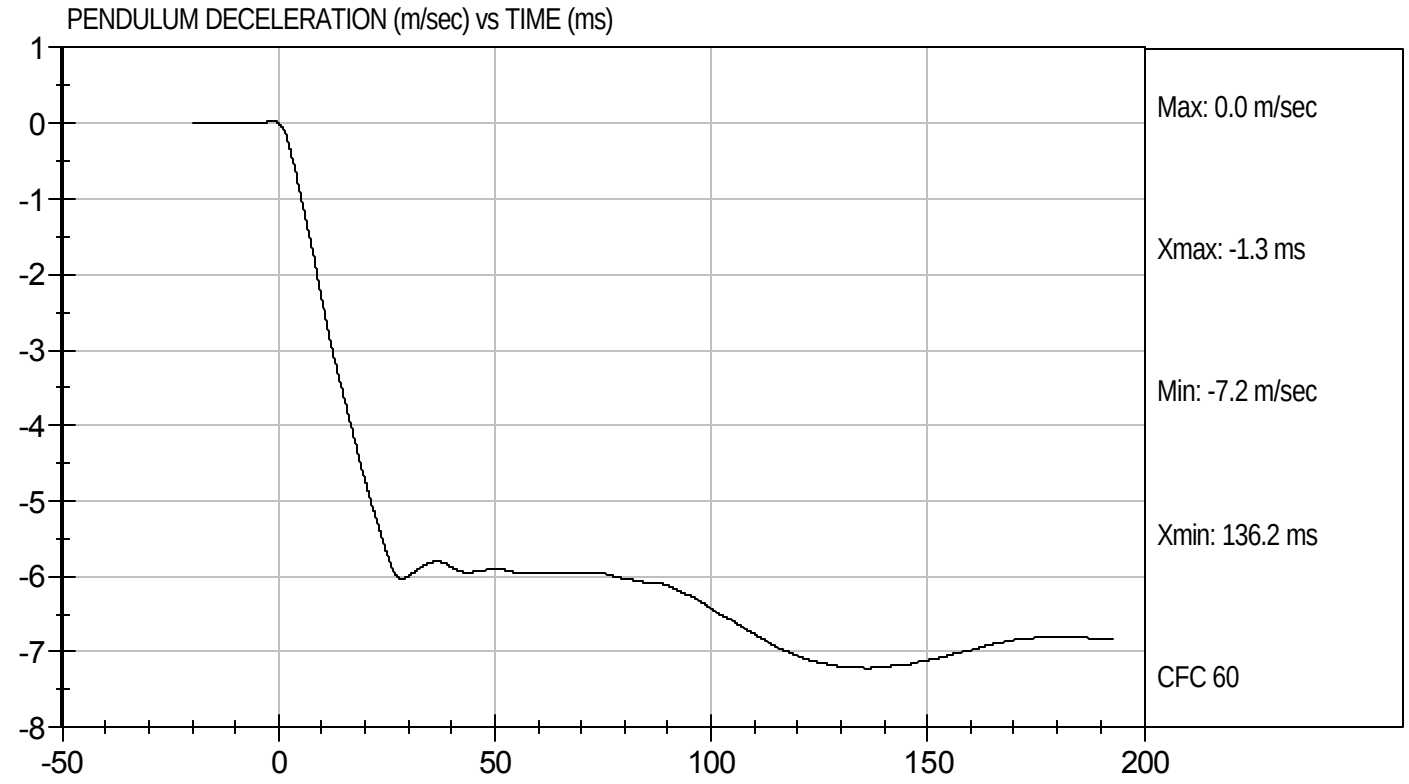
Jessica Hall
Laboratory Technician

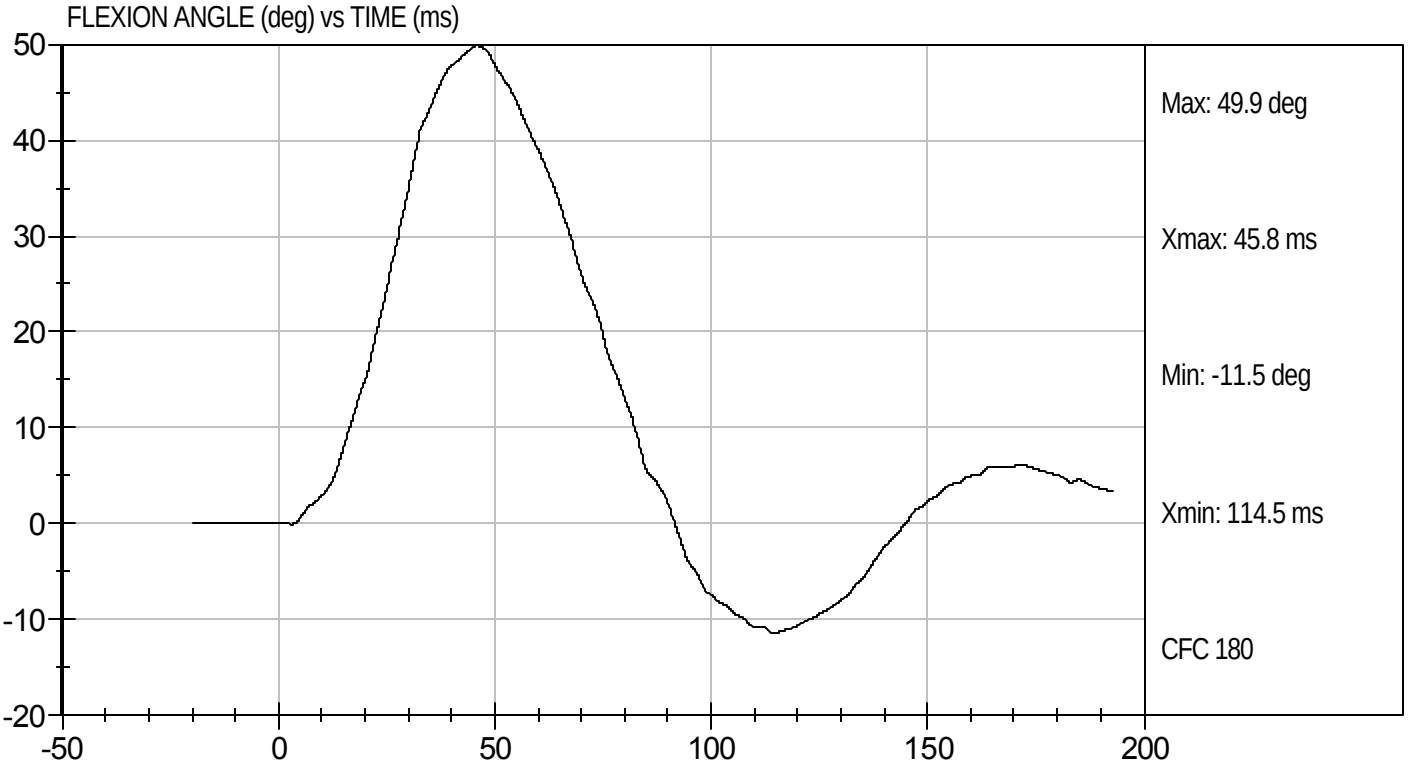
12/9/10
Test Date

David Winkelbauer
Approved By

Test Desc: Lumbar Bending
Component ID: D104328

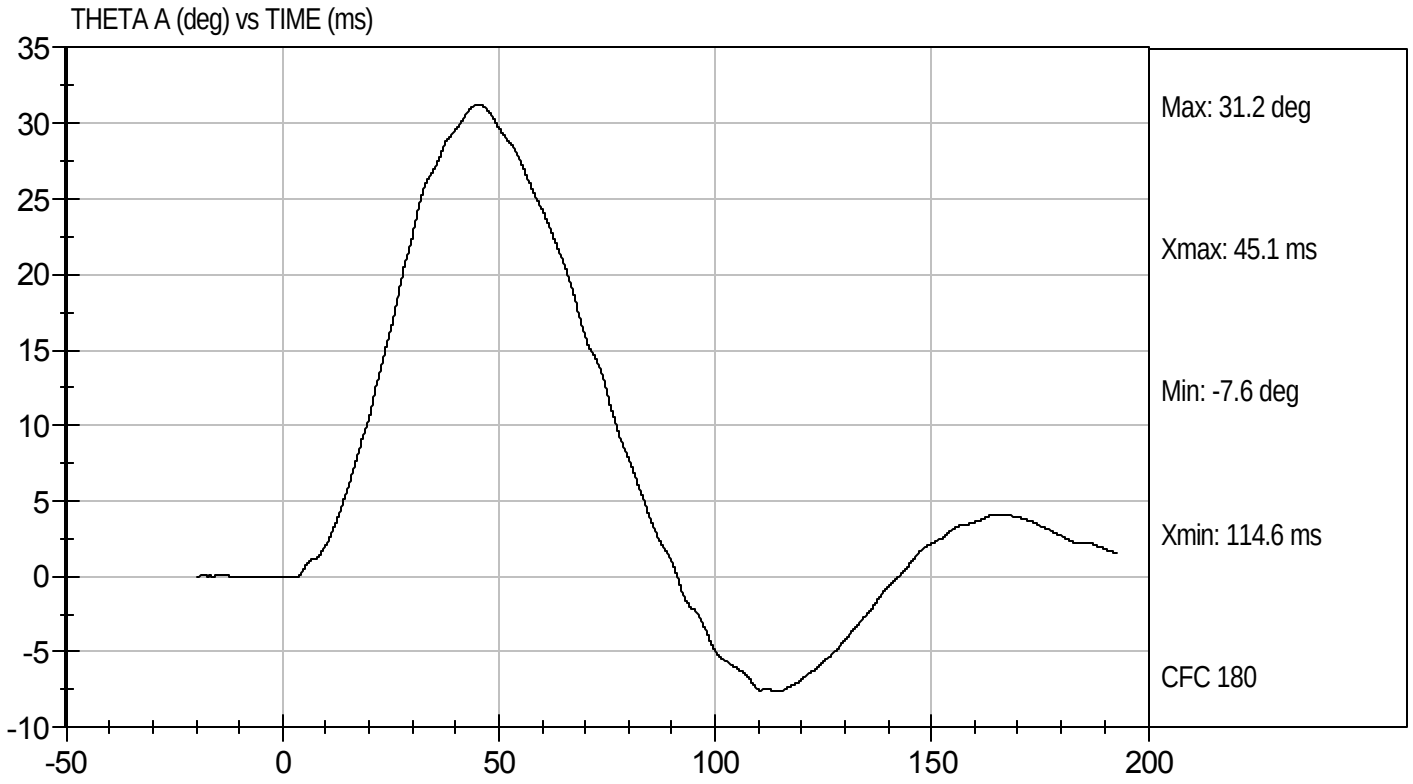
Test Date: 12/9/10
Velocity: 20.08 ft/s, 6.10 m/s

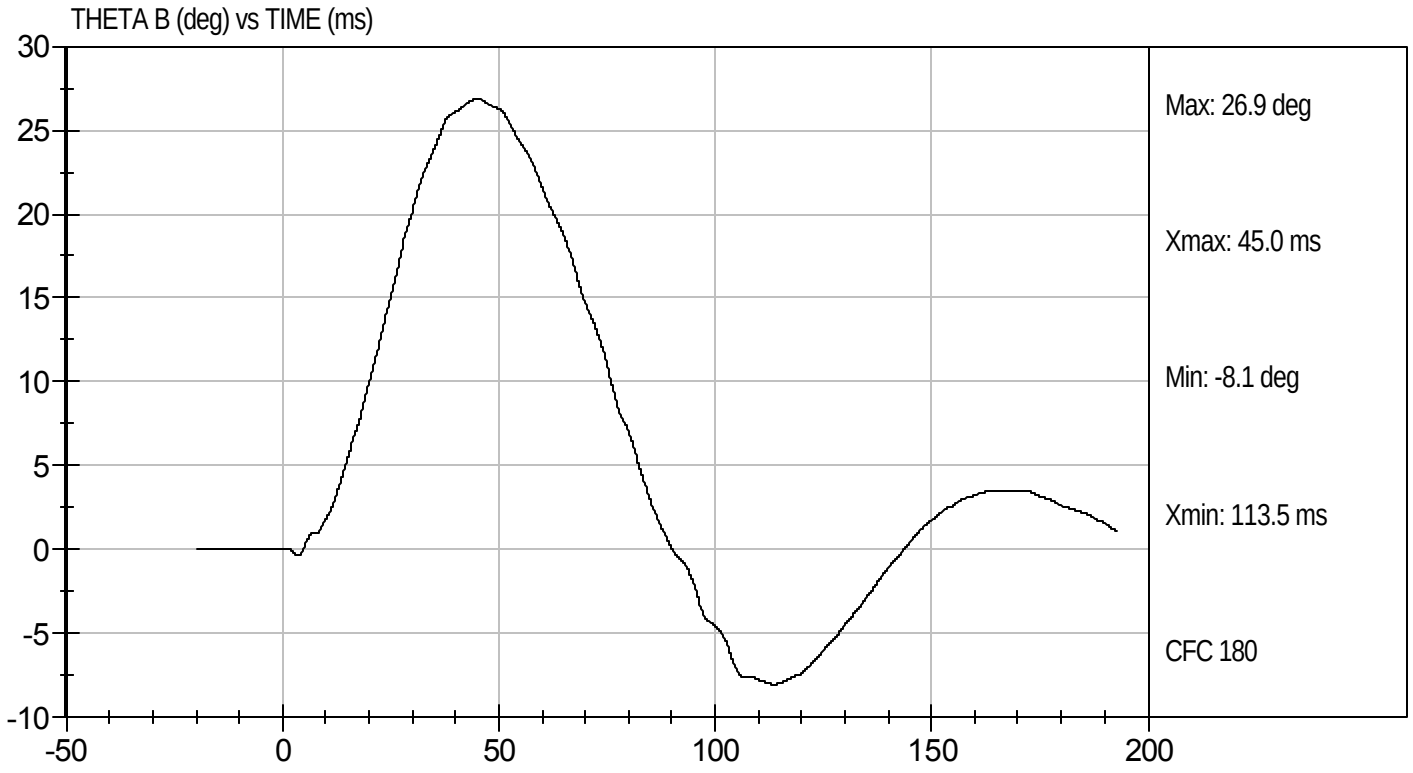




Test Desc: Lumbar Bending
Component ID: D104328

Test Date: 12/9/10
Velocity: 20.08 ft/s, 6.10 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104329

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.77	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	12.60	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.28	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	12.50	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

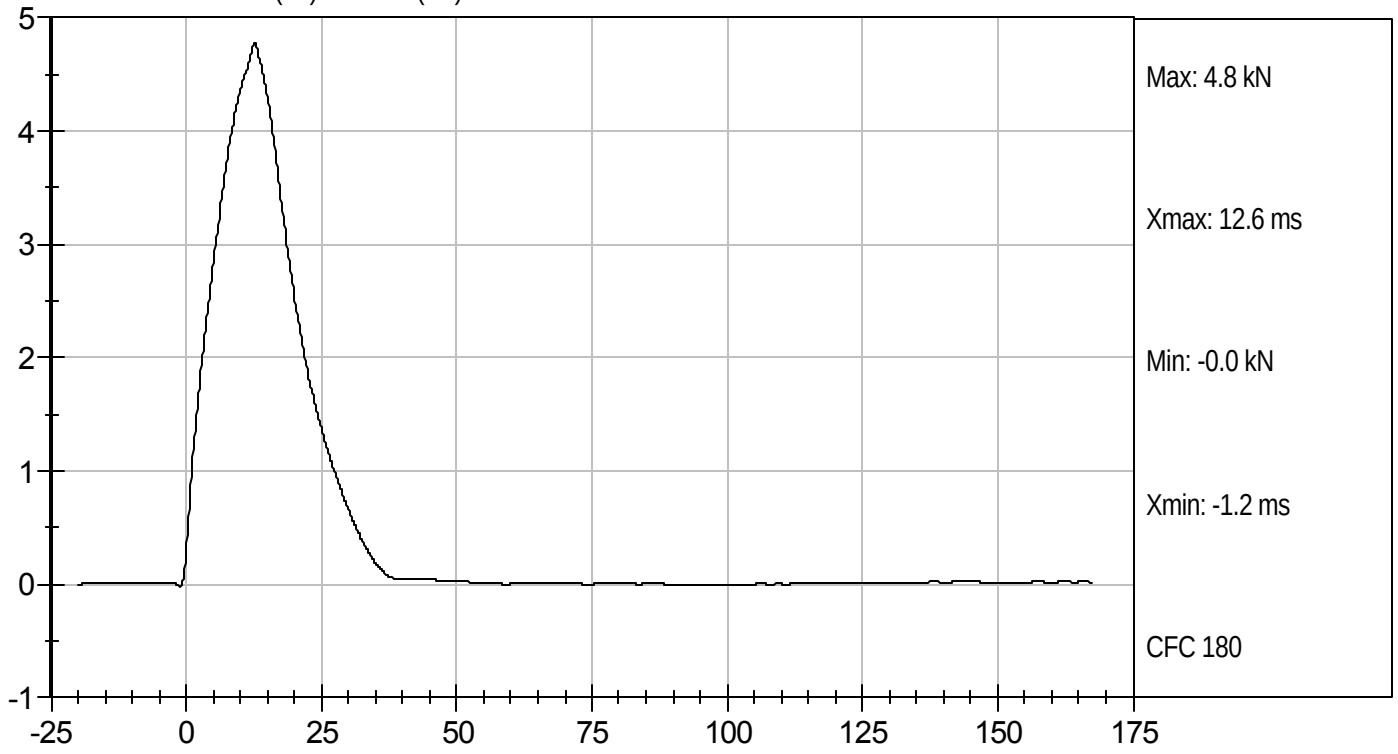
12/9/10
Test Date

David Winkelbauer
Approved By

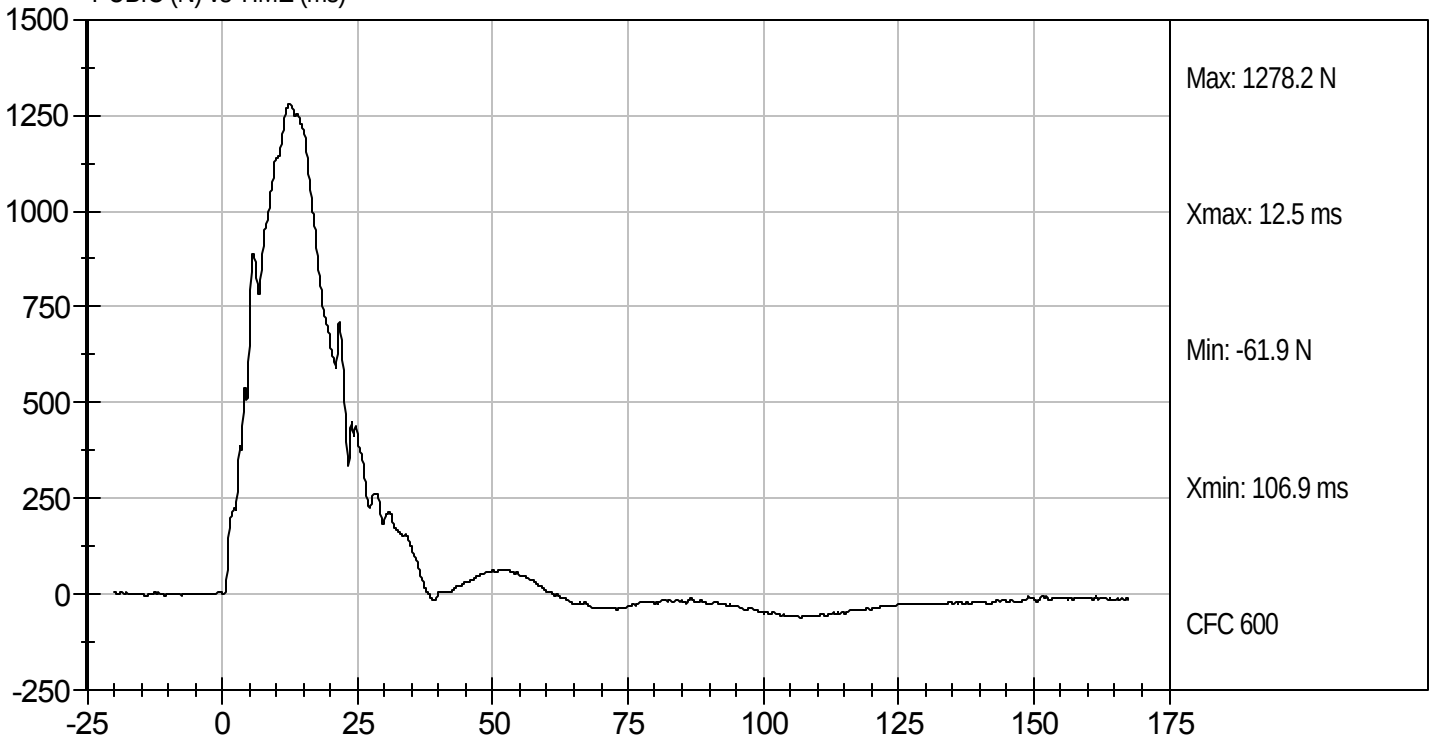
Test Desc: Pelvis Impact
Component ID: D104329

Test Date: 12/9/10
Velocity: 14.36 ft/s, 4.38 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:** D104320

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	15	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	5.15	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.8	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.7	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.2	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

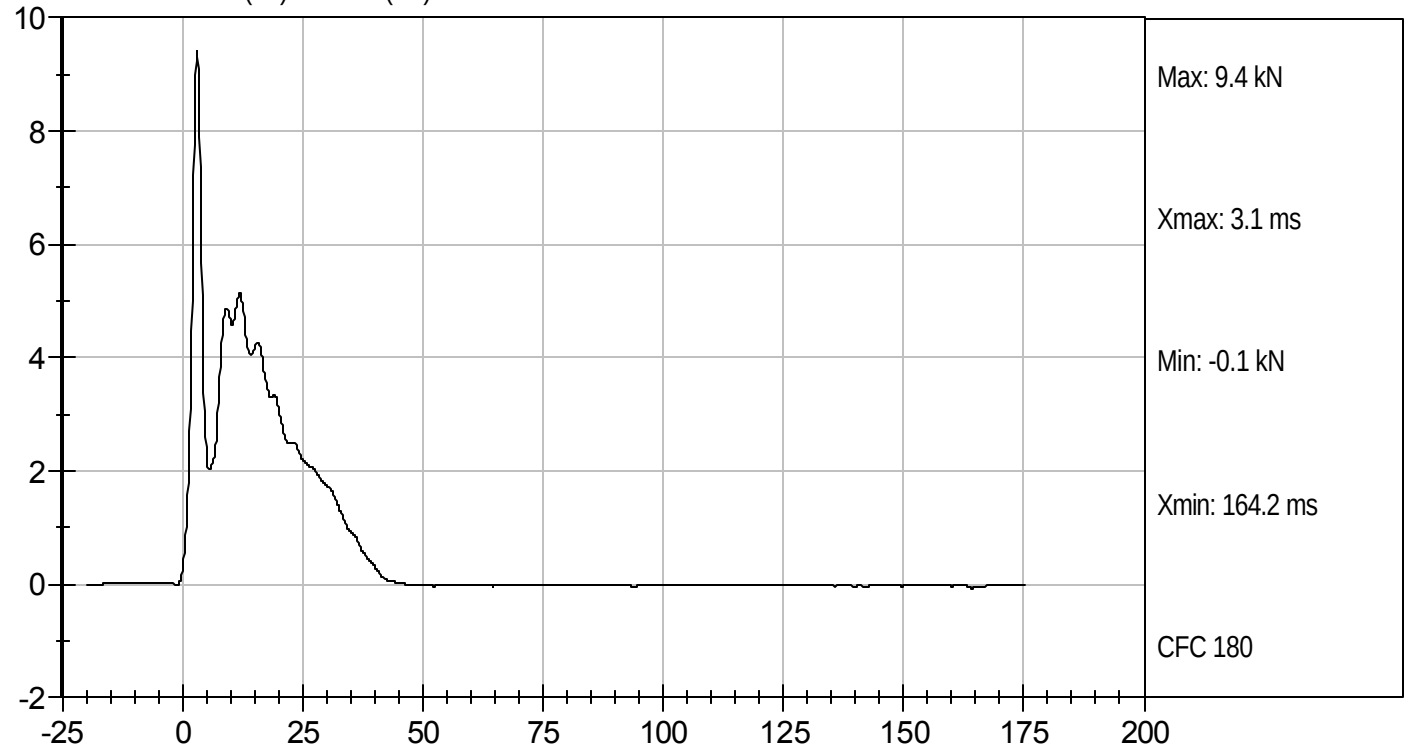
12/9/10
Test Date

David Winkelbauer
Approved By

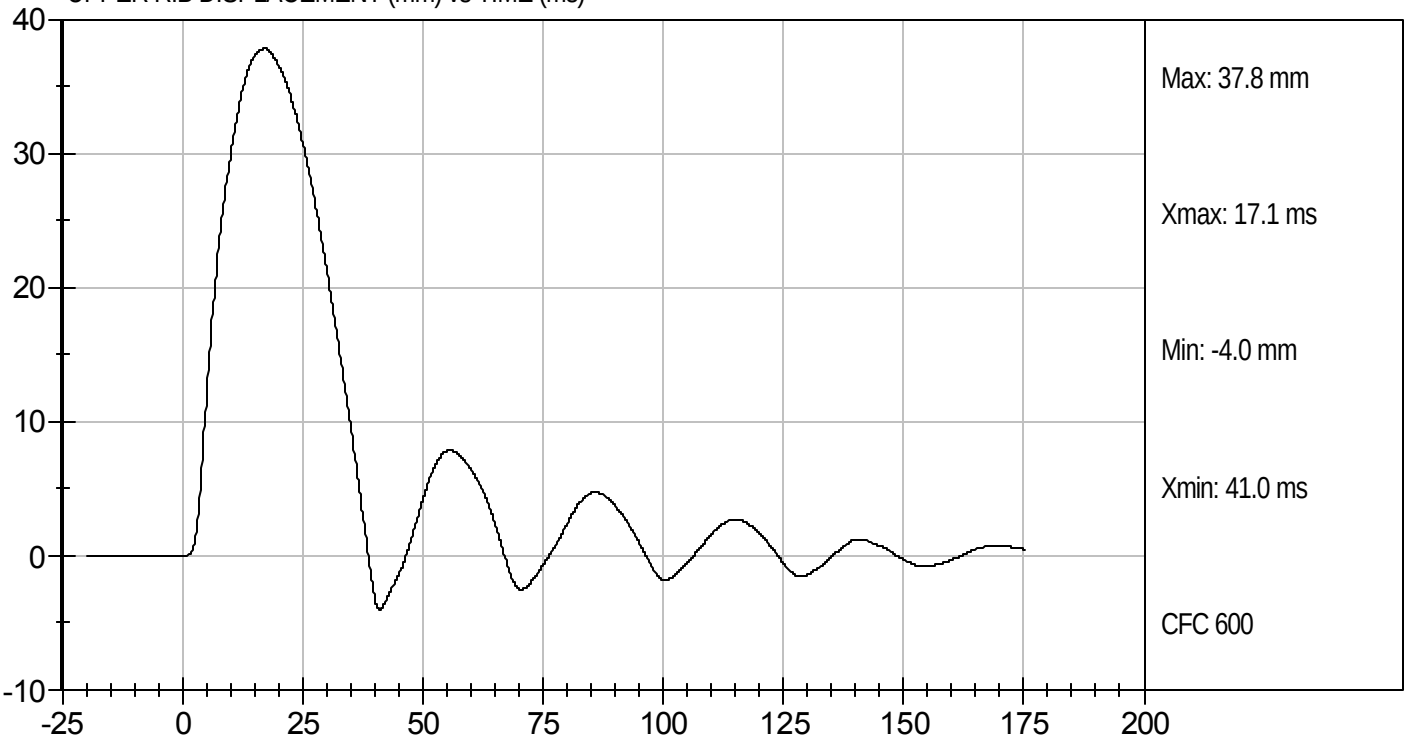
Test Desc: Thorax Impact
Component ID: D104320

Test Date: 12/9/10
Velocity: 18.31 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



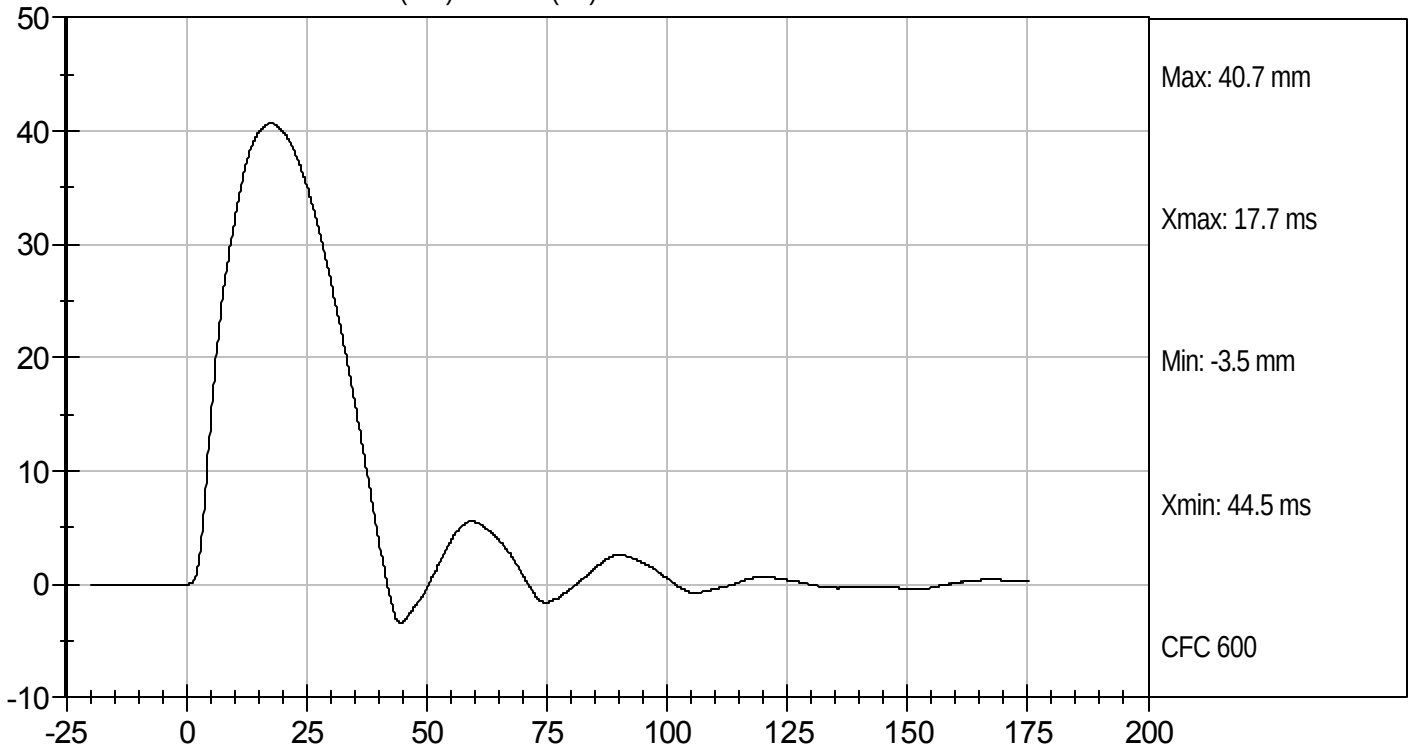
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



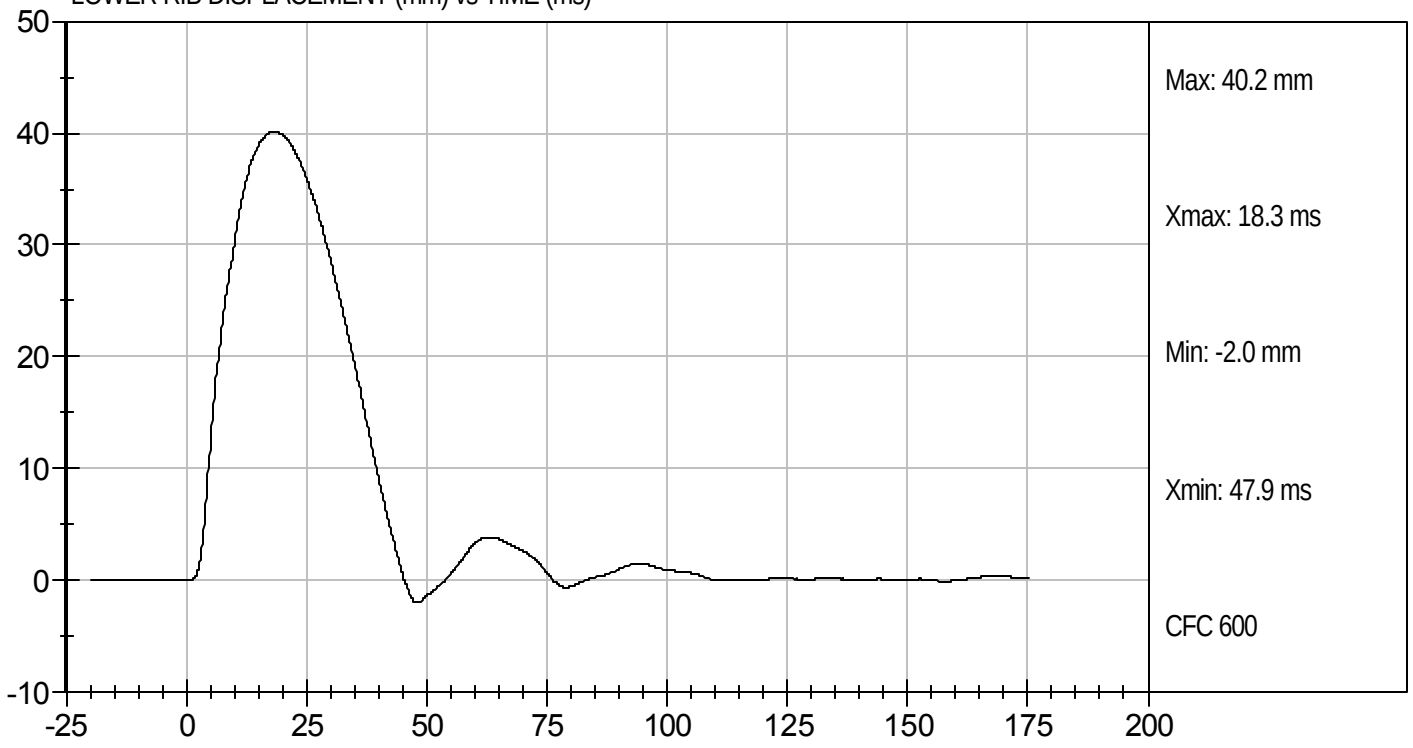
Test Desc: Thorax Impact
Component ID: D104320

Test Date: 12/9/10
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:** D104511

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	15	Pass
Peak Resultant Acceleration	G's	125 to 155	138	Pass
Peak Lateral Acceleration	G's	+/- 15	-6.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

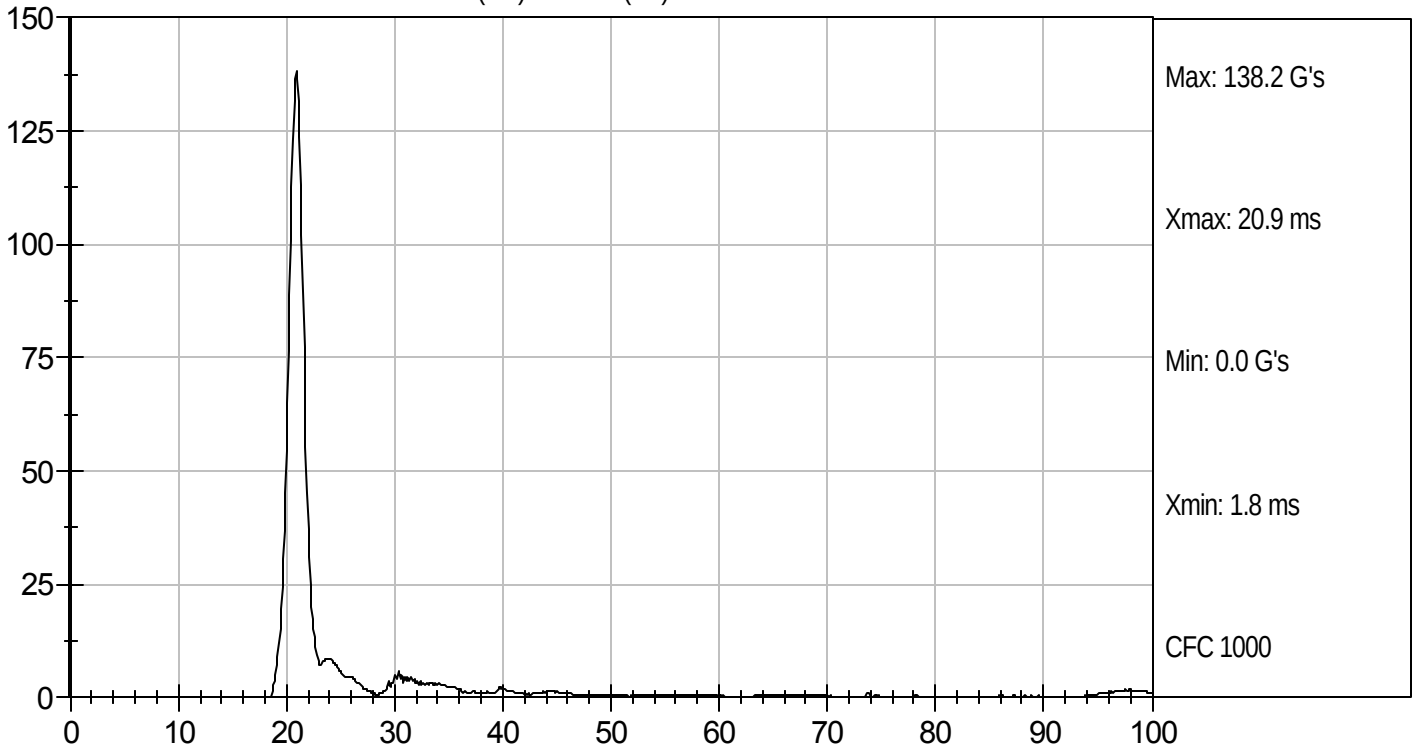
12/20/10
Test Date

David Winkelbauer
Approved By

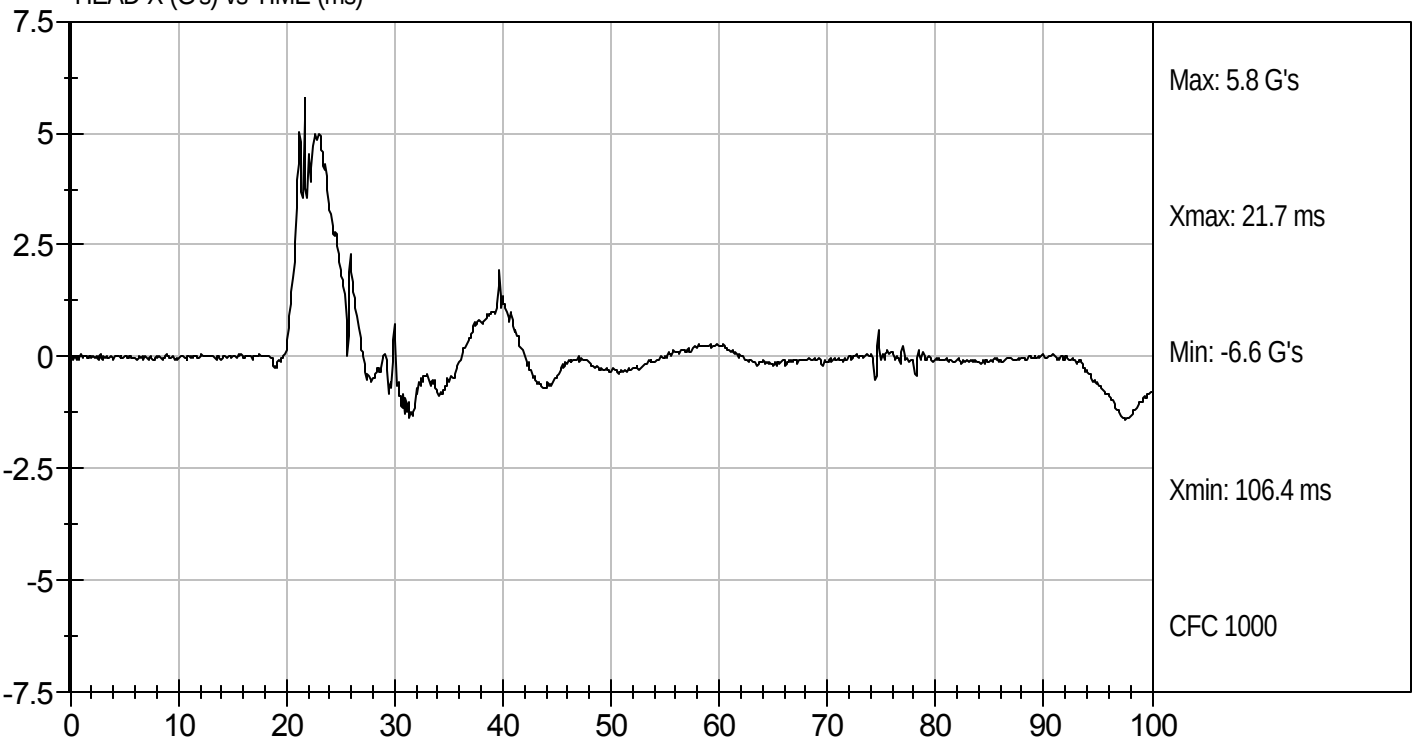
Test Desc: Head Drop
Component ID: D104511

Test Date: 12/20/10
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:** D104512

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.03	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.34	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.7	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.5	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	61.4	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

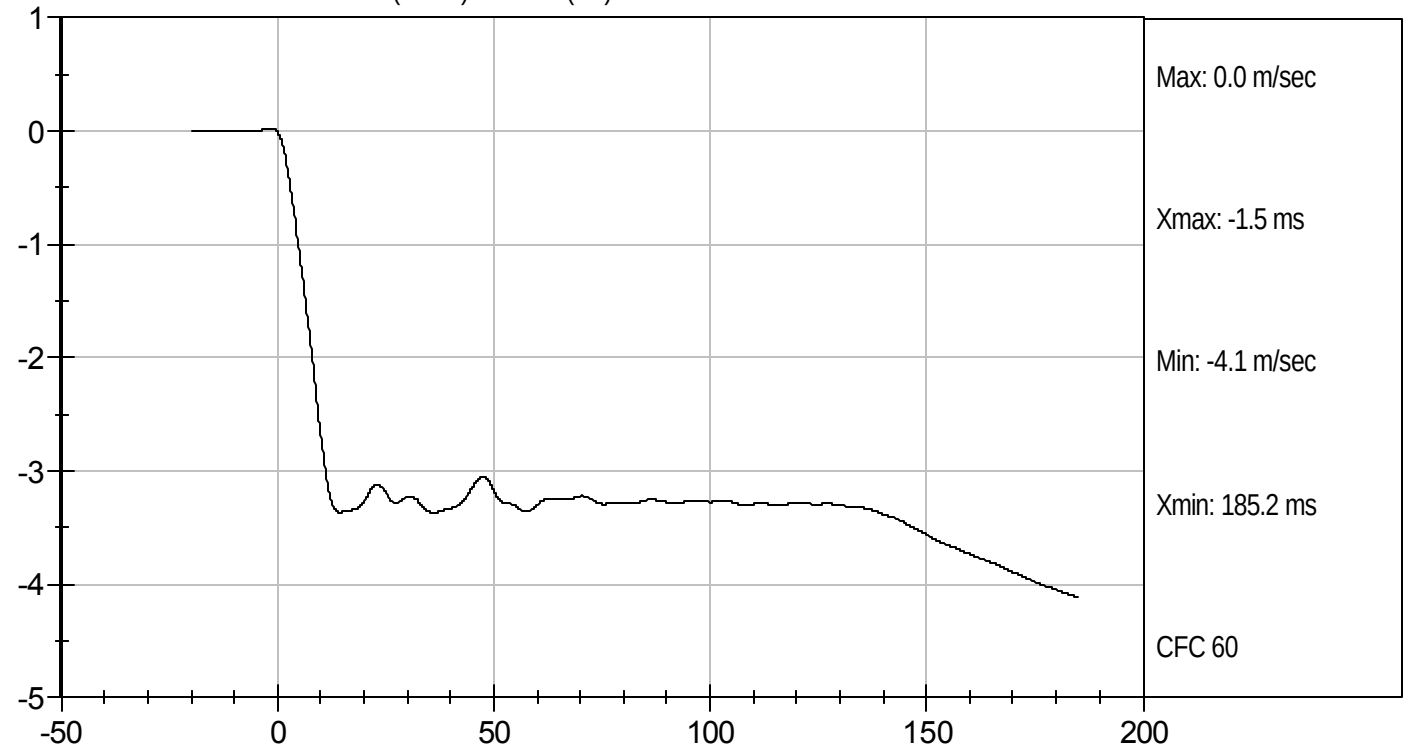
12/20/10
Test Date

David Winkelbauer
Approved By

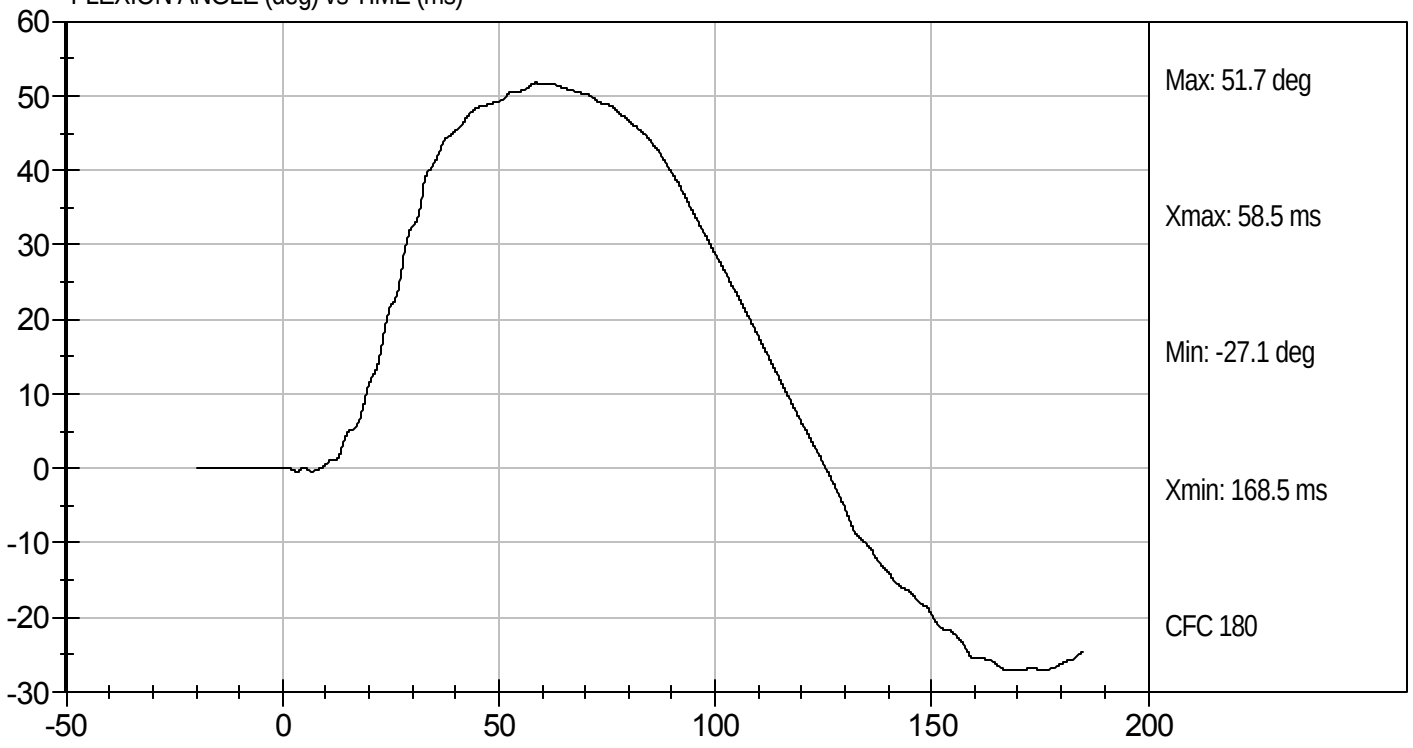
Test Desc: Neck Bending
Component ID: D104512

Test Date: 12/20/10
Velocity: 11.41 ft/s, 3.48 m/s

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

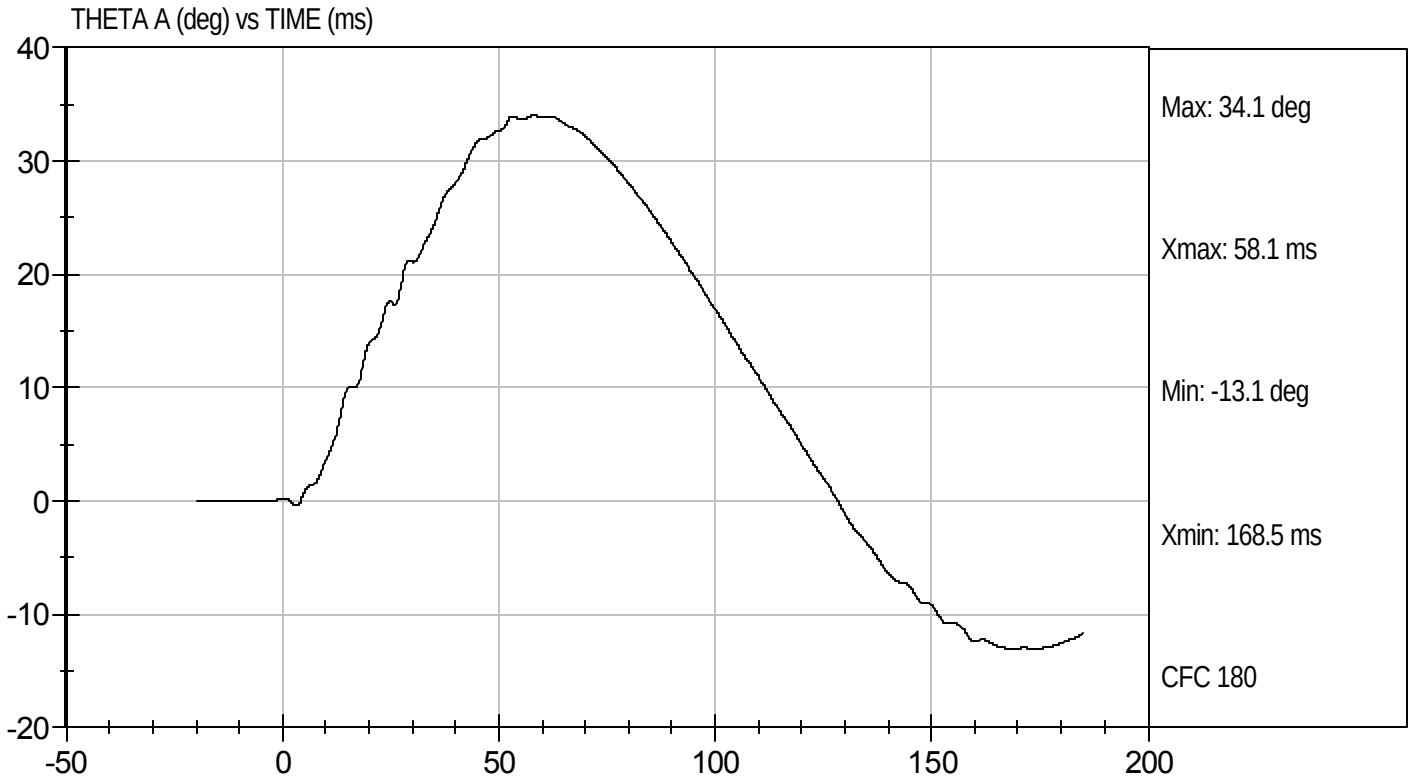


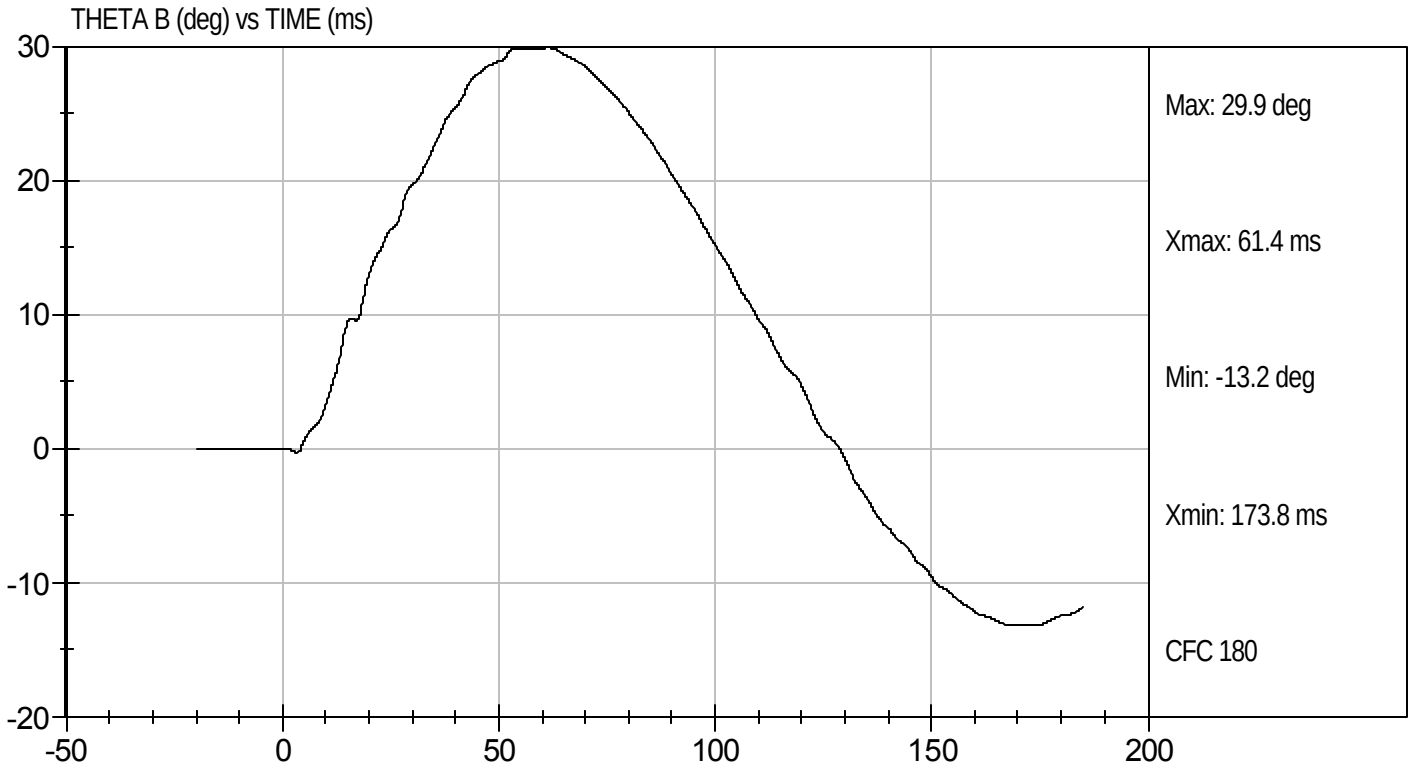
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D104512

Test Date: 12/20/10
Velocity: 11.41 ft/s, 3.48 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104513

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	15	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.2	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.4	Pass
Time of Peak Shoulder Acceleration	ms	NA	13.3	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

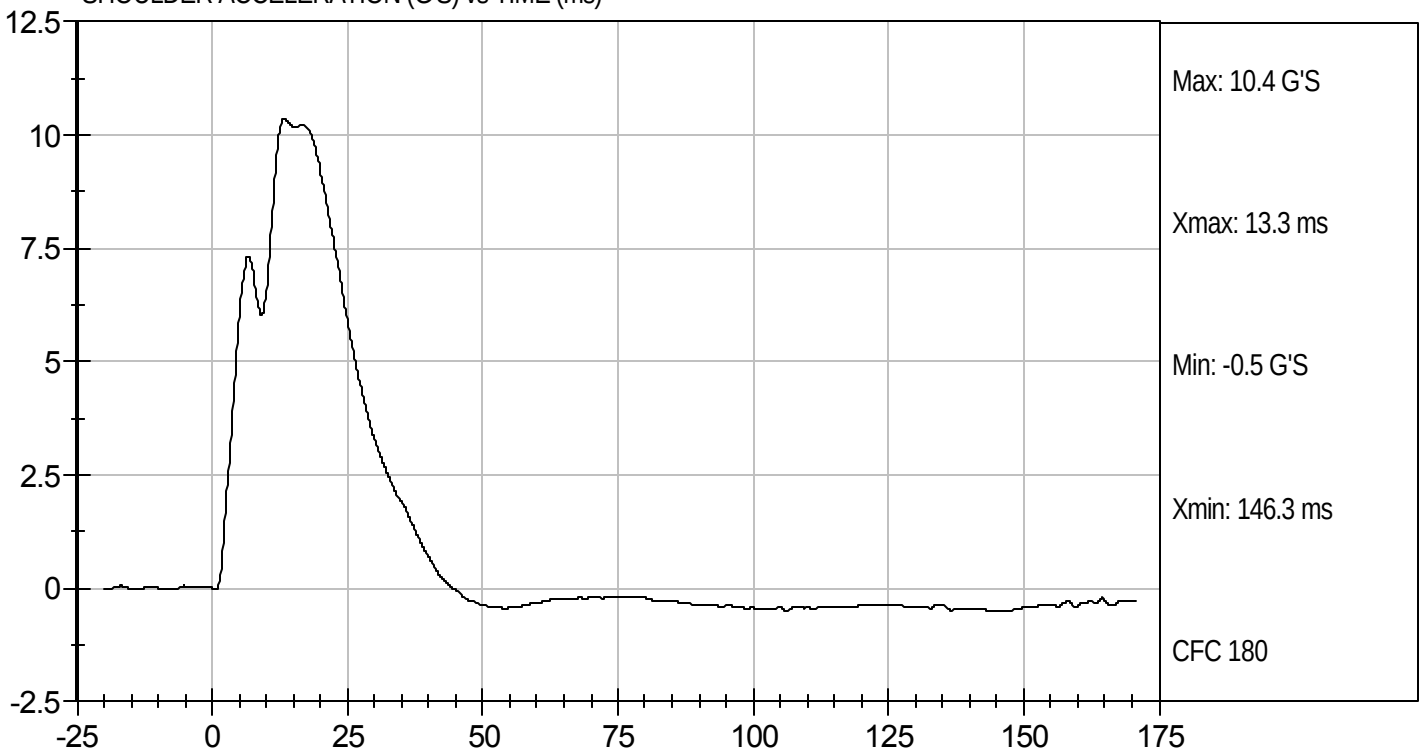
12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D104513

Test Date: 12/20/10
Velocity: 13.89 ft/s, 4.2 m/s

SHOULDER ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104514

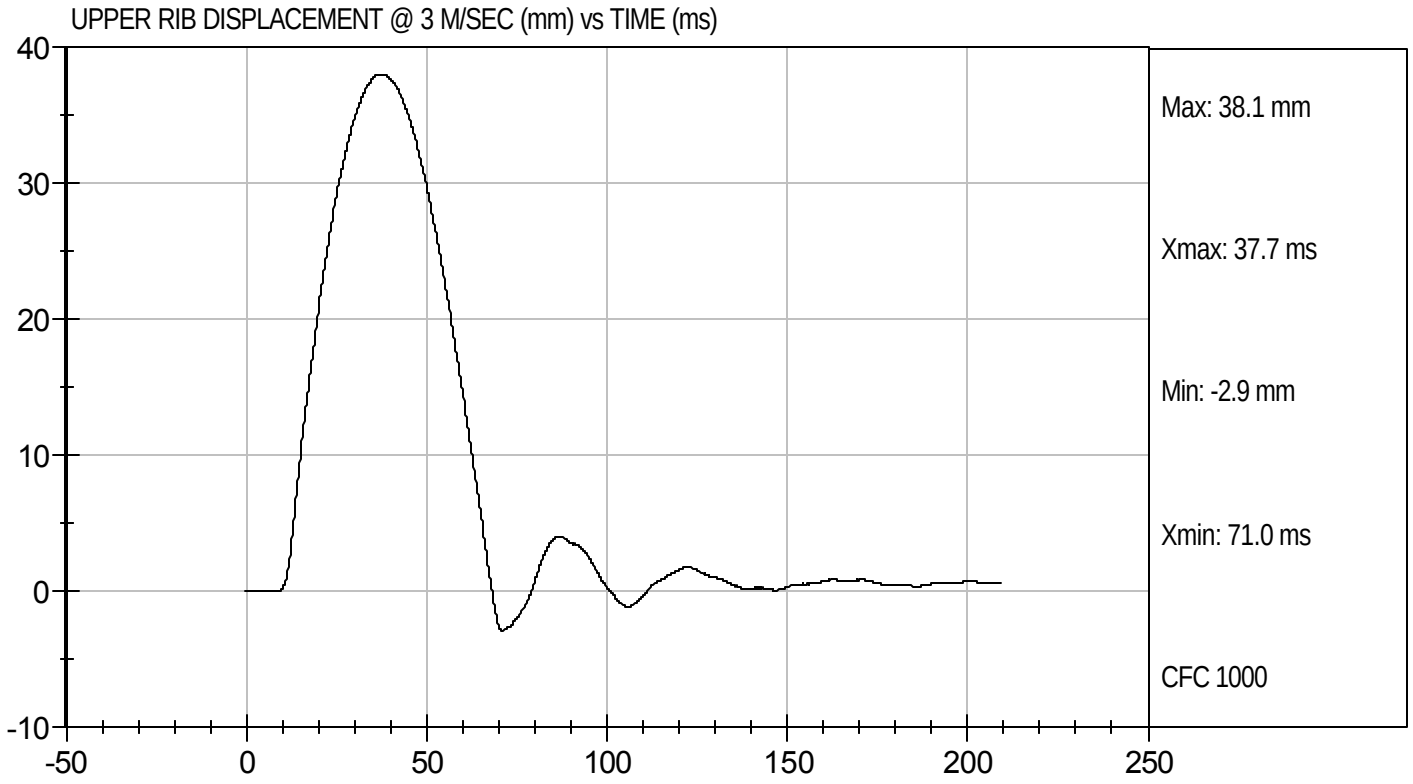
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.1	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.5	Pass
		Overall Test Results		Pass

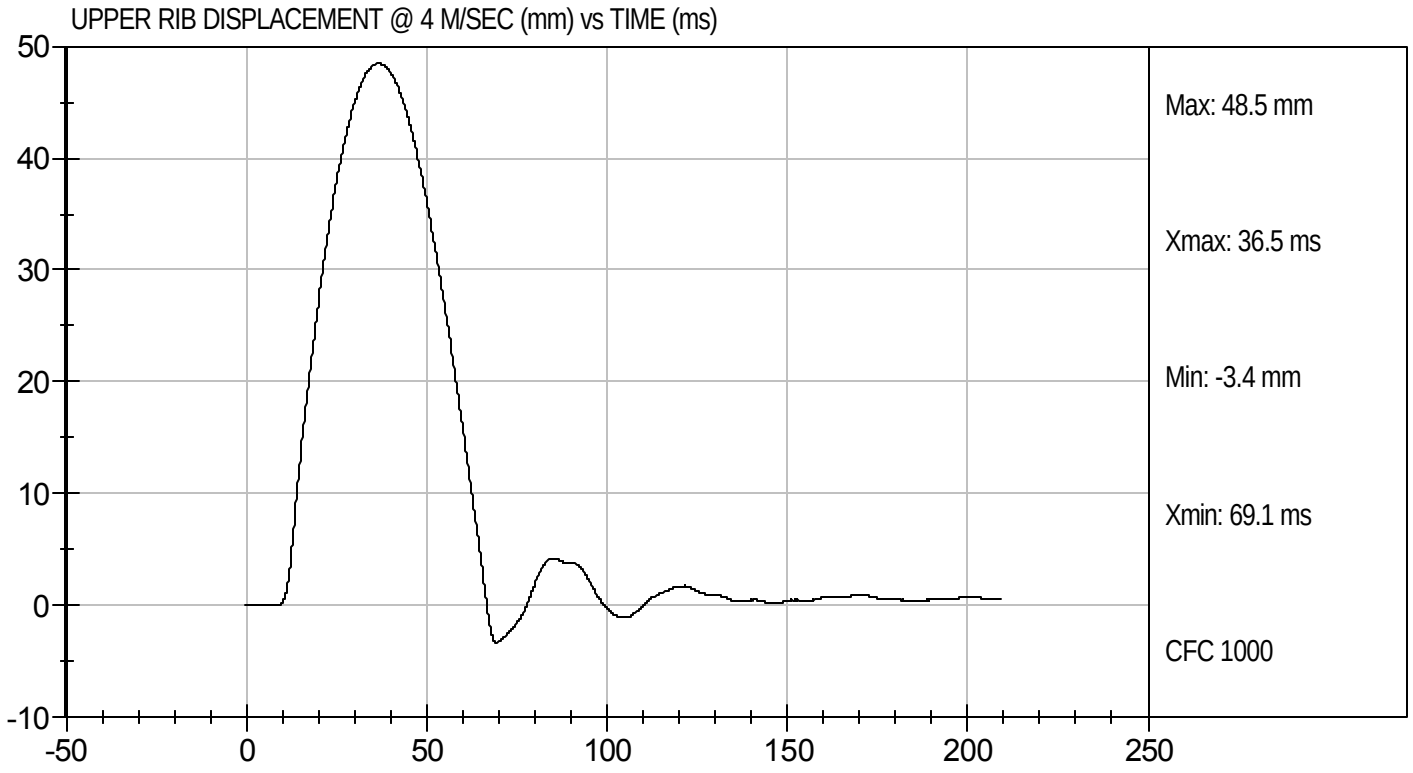
Jessica Gall
Laboratory Technician

12/17/10
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D104514
Test Date: 12/17/10





MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104515

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	18	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	48.1	Pass
		Overall Test Results		Pass

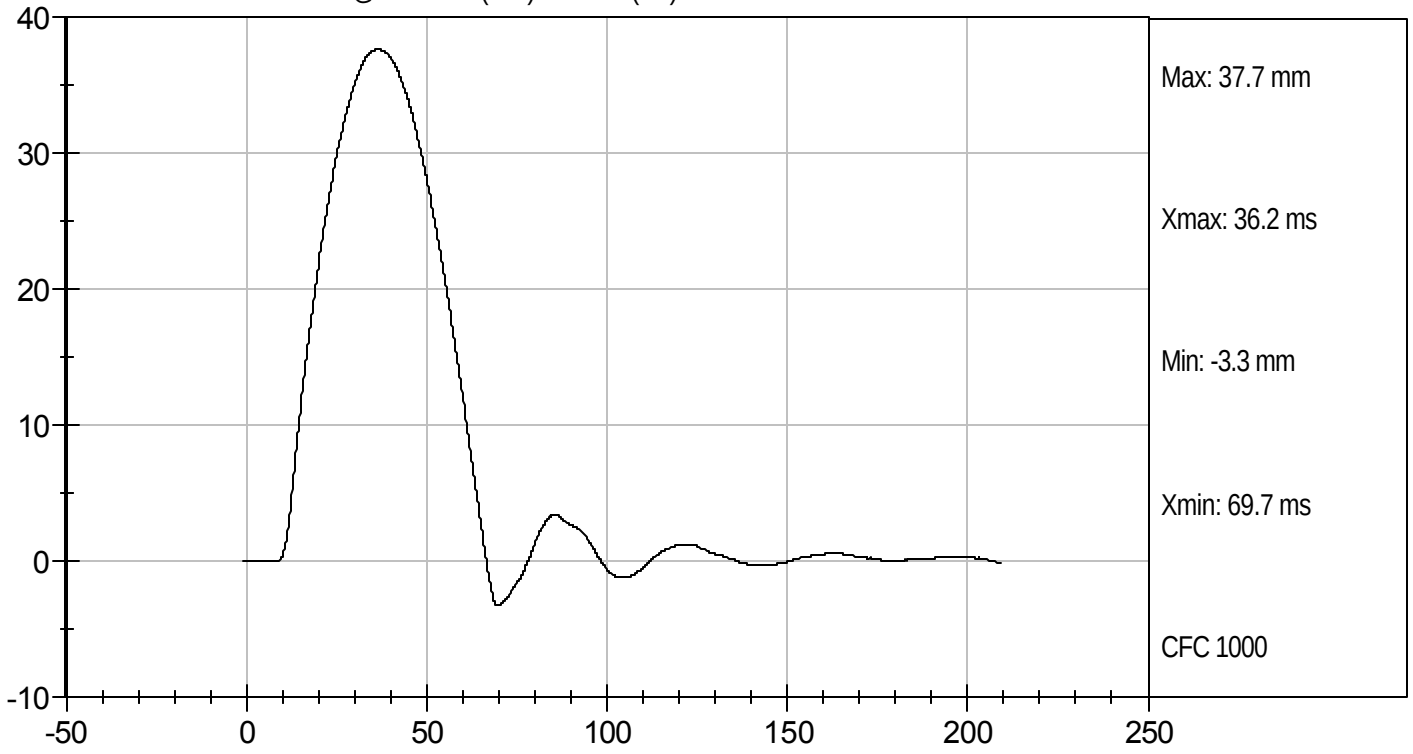
Jessica Gall
Laboratory Technician

12/17/10
Test Date

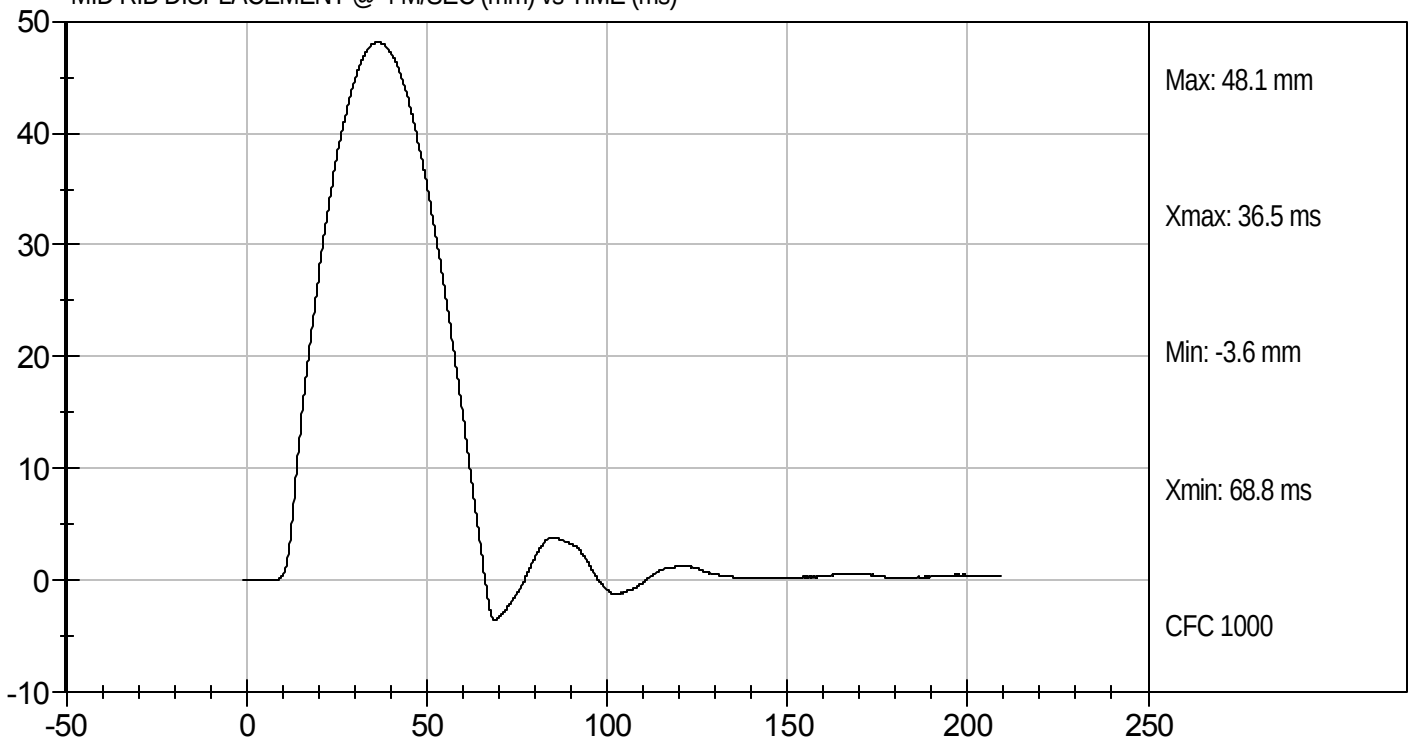
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D104515
Test Date: 12/17/10

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:** D104516

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	18	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	48.0	Pass
		Overall Test Results		Pass

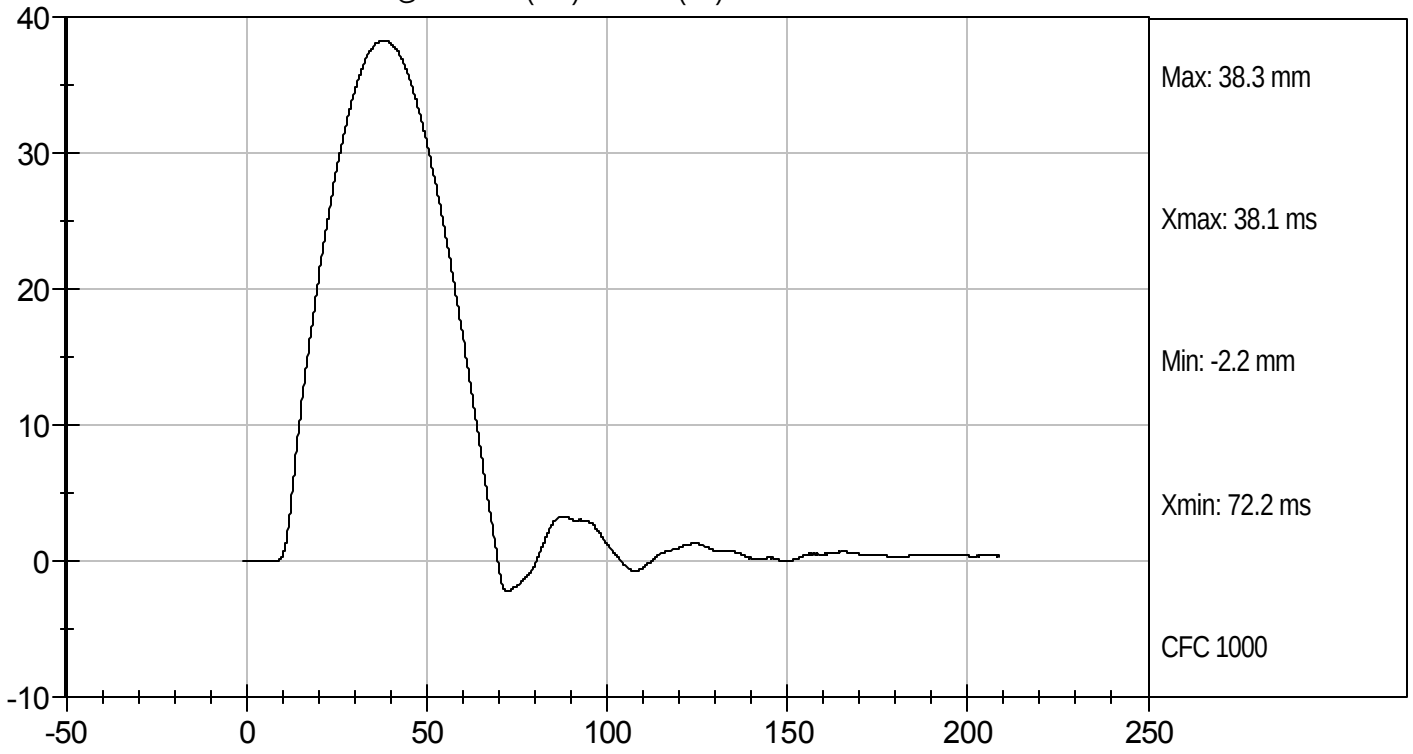
Jessica Hall
Laboratory Technician

12/17/10
Test Date

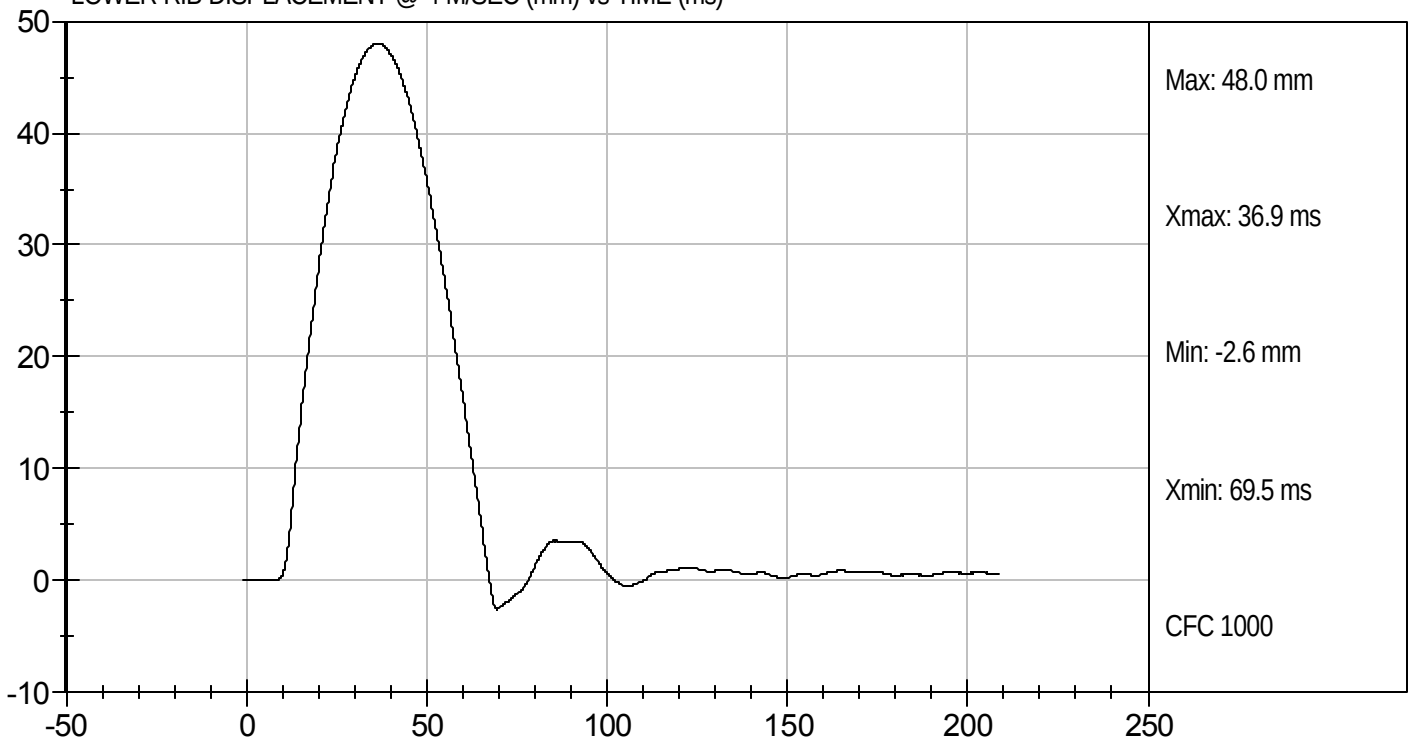
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D104516
Test Date: 12/17/10

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:** D104517

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	15	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.37	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.51	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.50	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

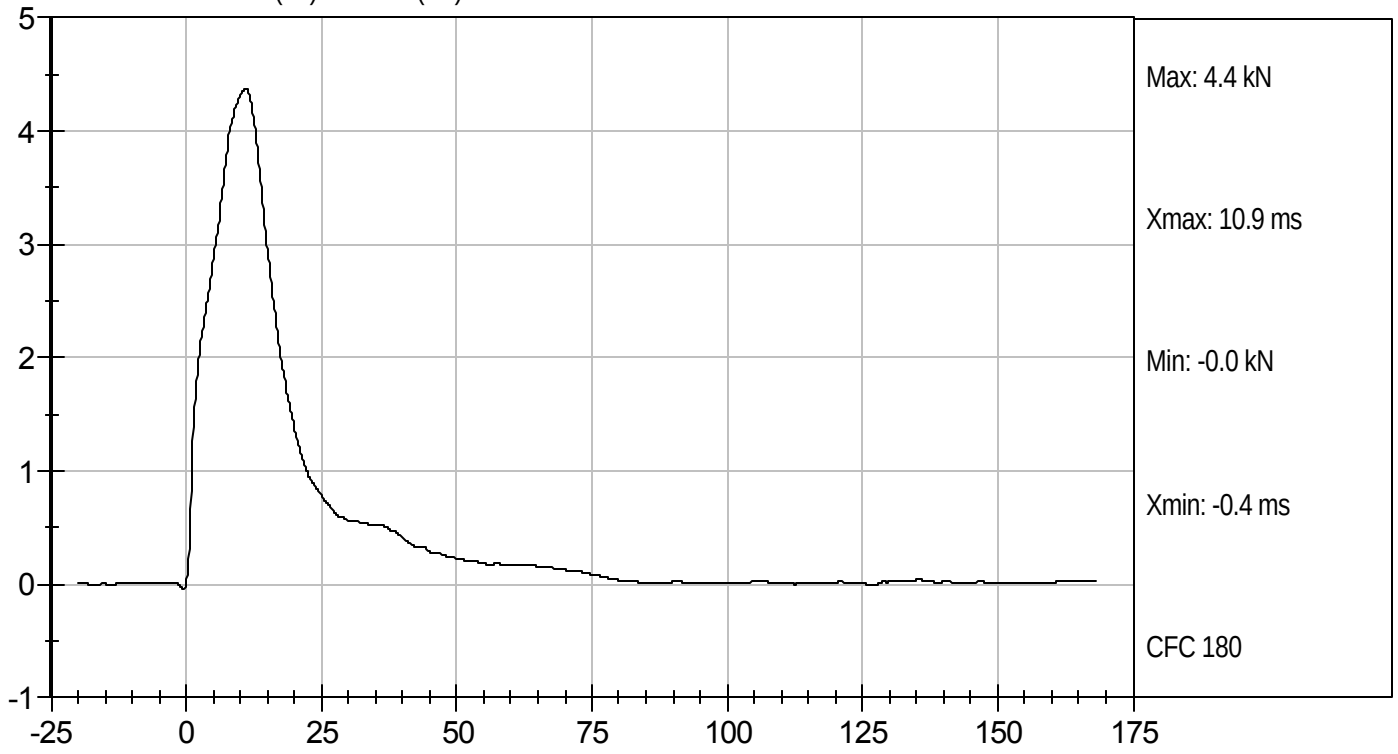
12/20/10
Test Date

David Winkelbauer
Approved By

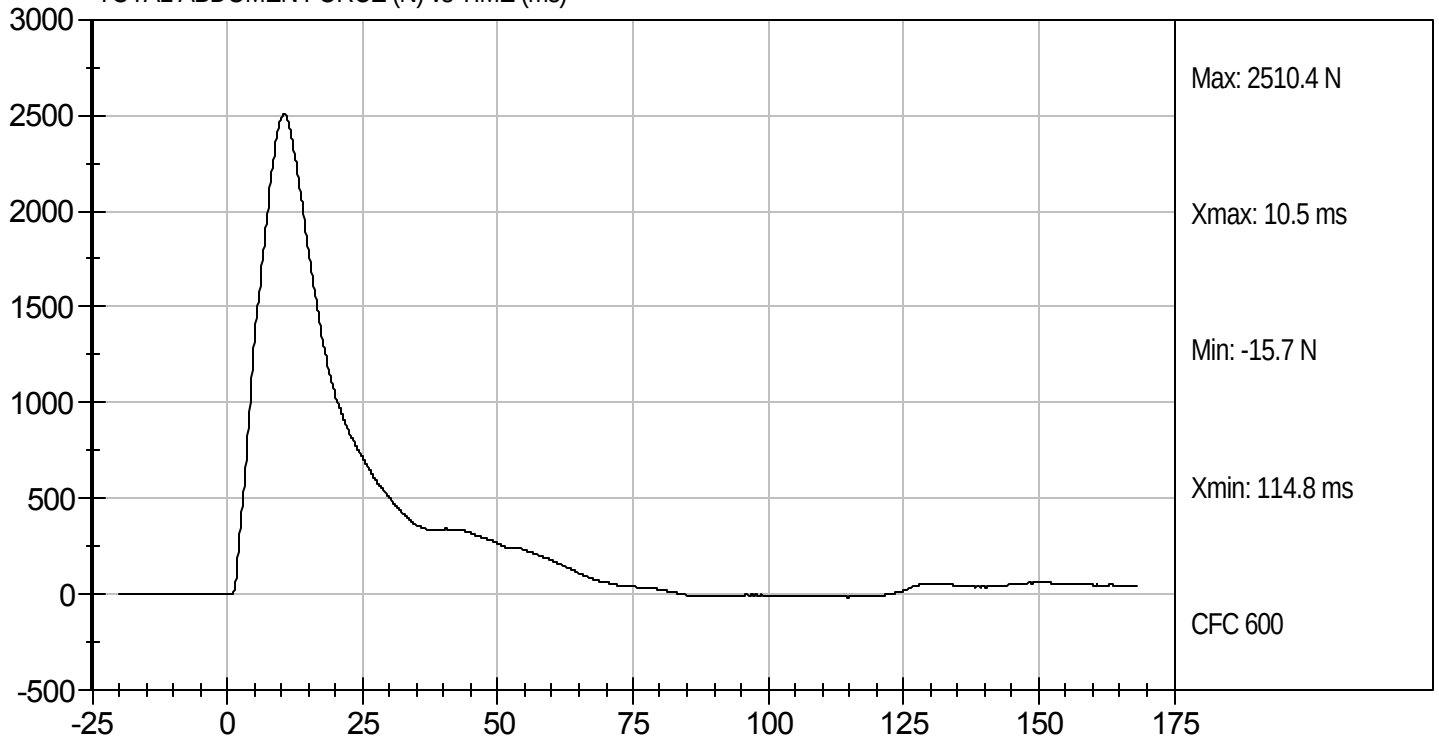
Test Desc: Abdomen Impact
Component ID: D104517

Test Date: 12/20/10
Velocity: 13.33 ft/s, 4.06 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:** D104518

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	15	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.42	Pass
	27 ms	m/s	-6.50 to -5.80	-6.09	Pass
	30 ms	m/s	>= -6.5	-6.07	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.2	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	42.1	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	42	Pass
			Overall Results		Pass

Jessica Gall
Laboratory Technician

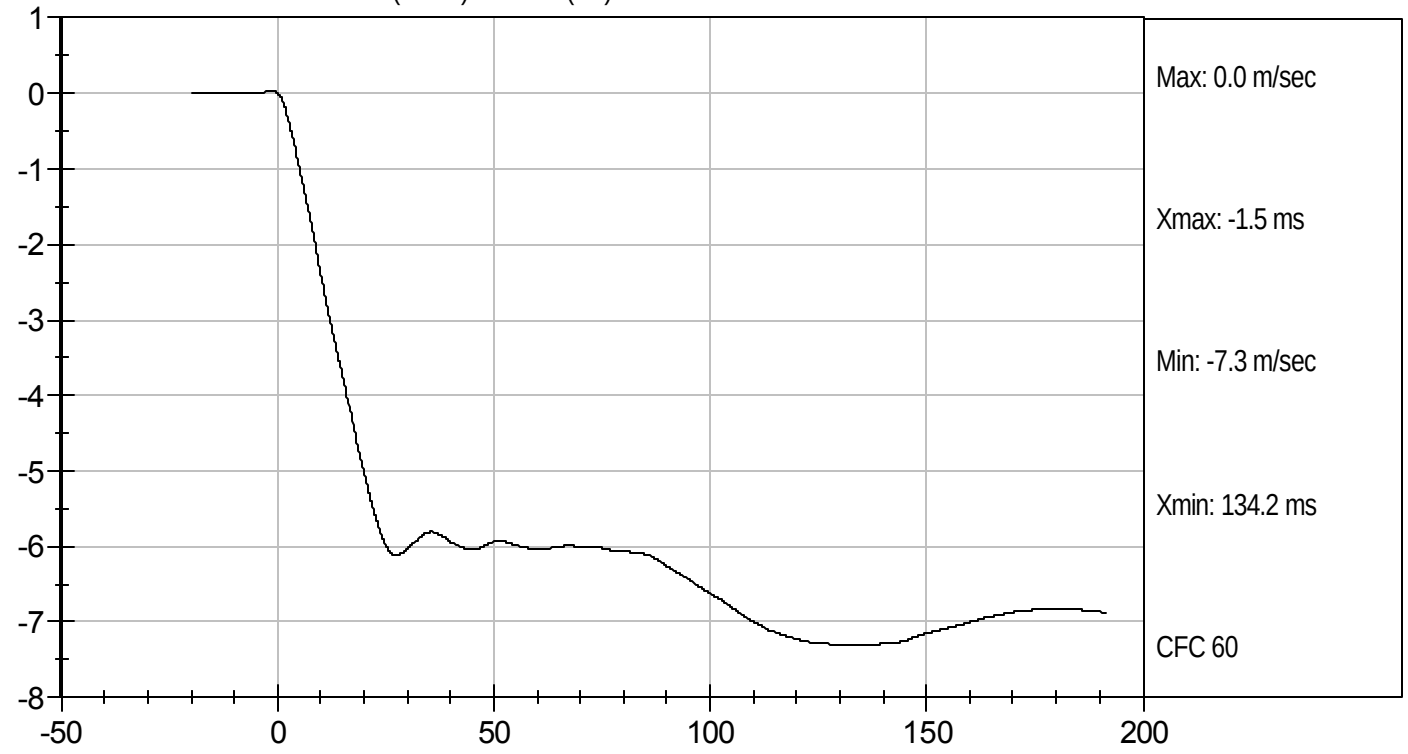
12/17/10
Test Date

David Winkelbauer
Approved By

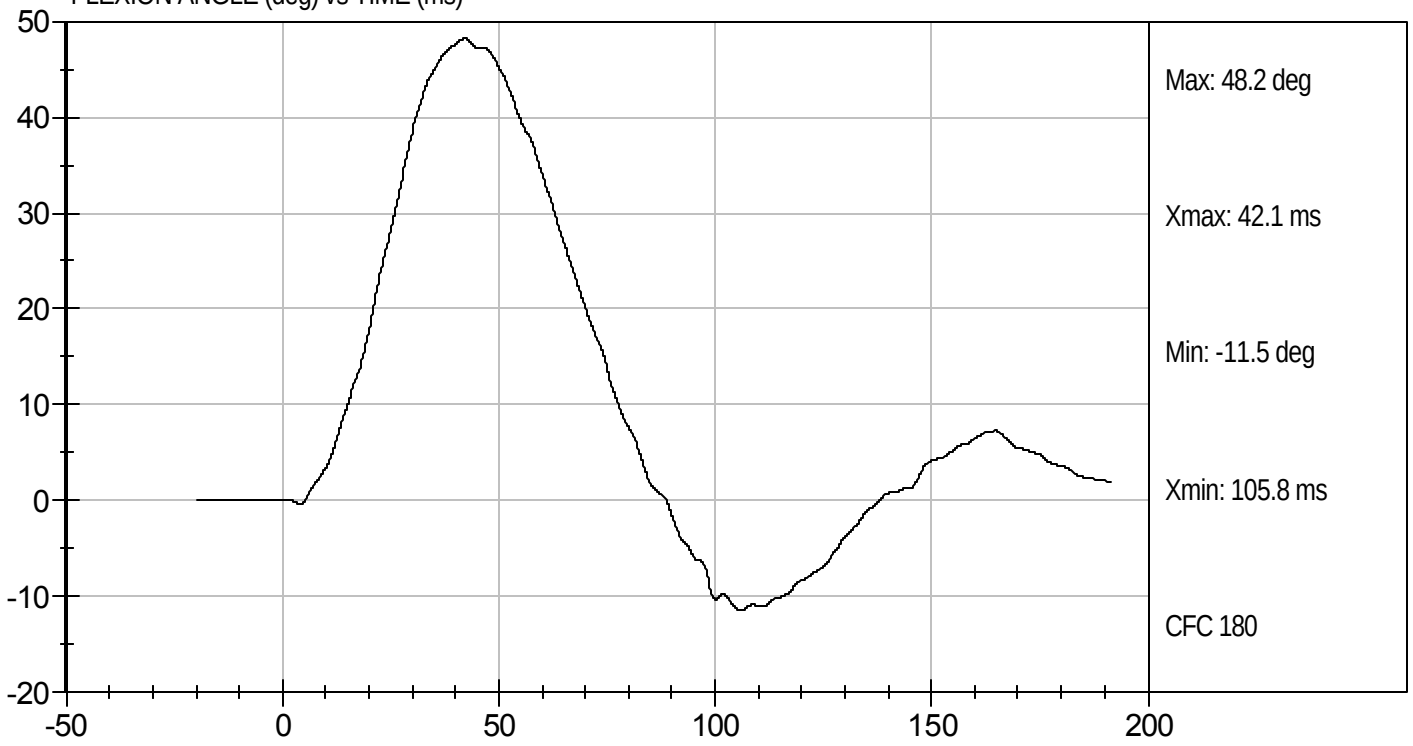
Test Desc: Lumbar Bending
Component ID: D104518

Test Date: 12/17/10
Velocity: 20.08 ft/s, 6.12 m/s

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

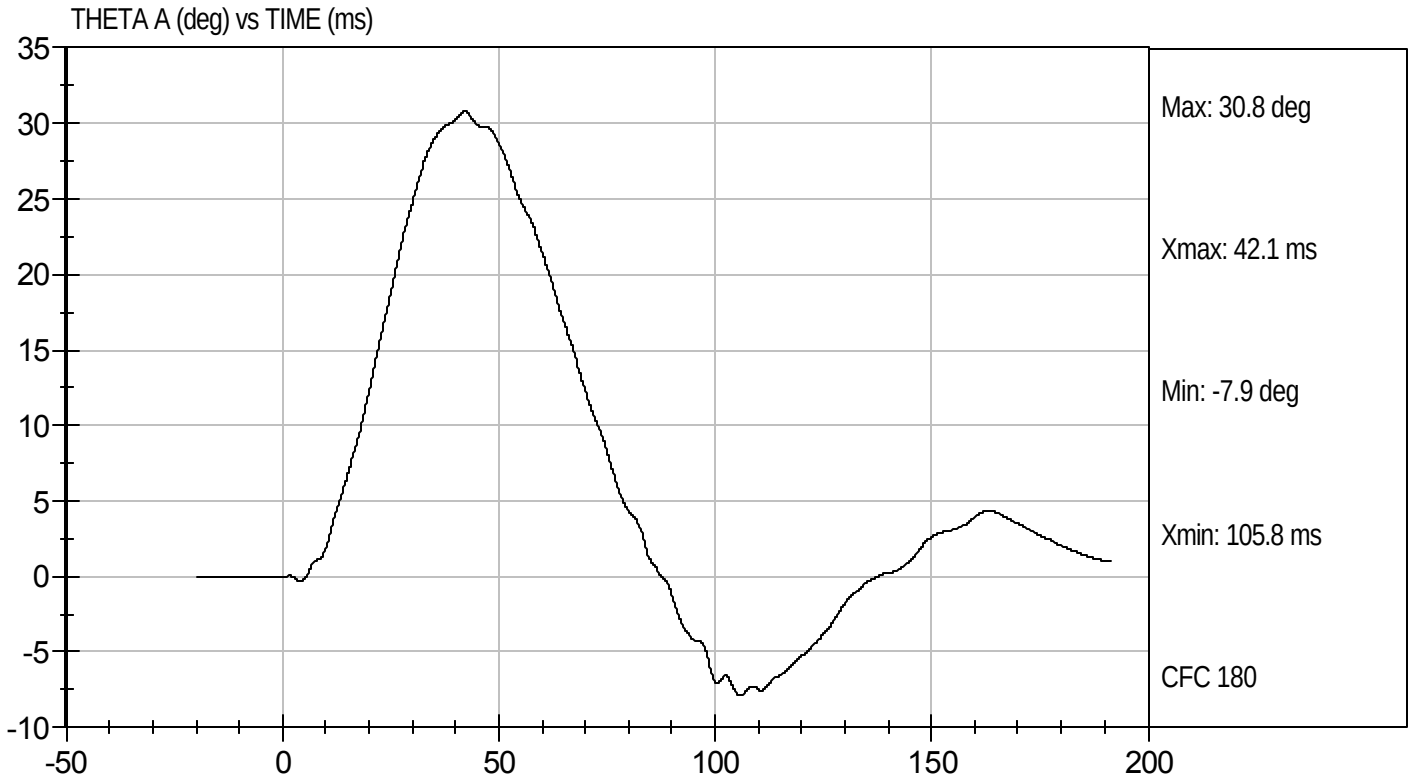


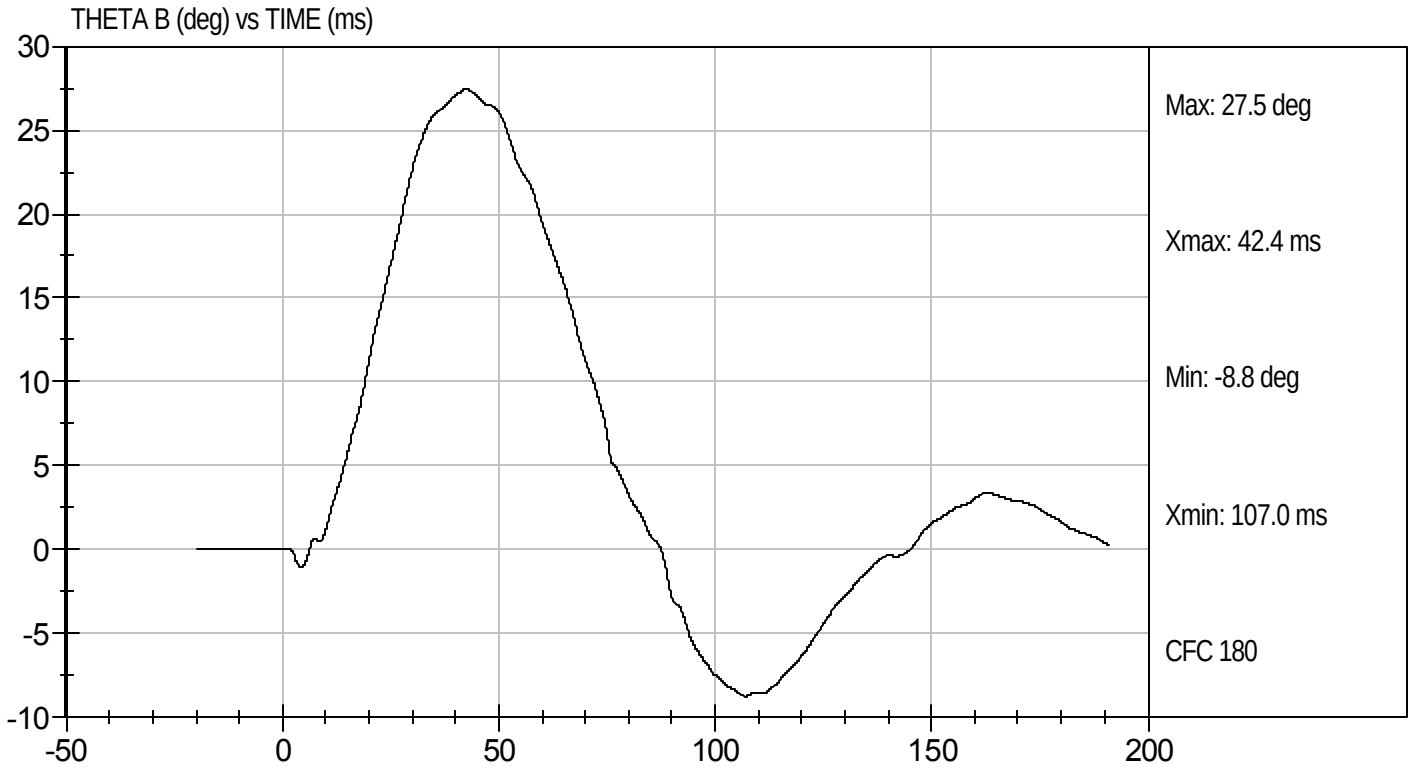
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D104518

Test Date: 12/17/10
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104519

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	17	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.75	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	12.60	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.40	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	13.90	Pass
		Overall Test Results		Pass

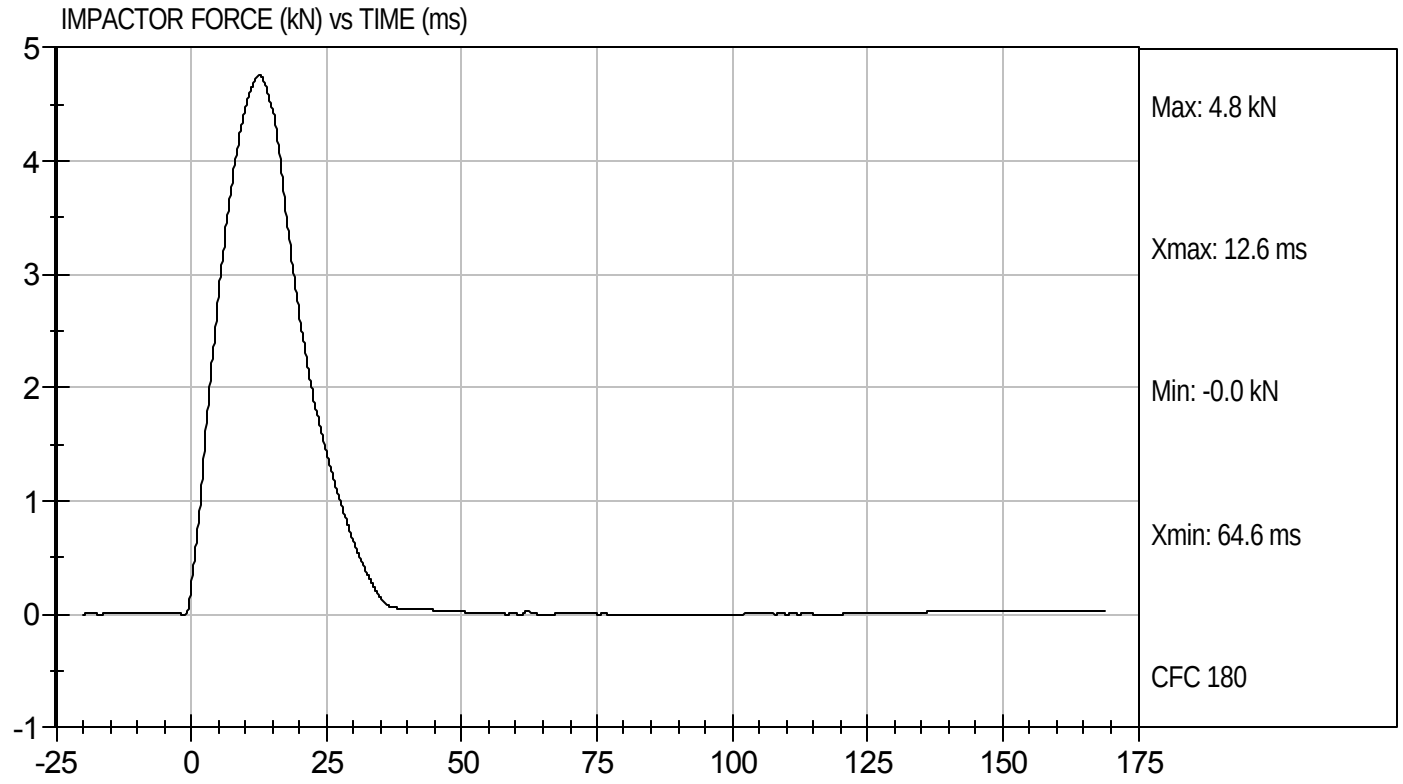
Jessica Hall
Laboratory Technician

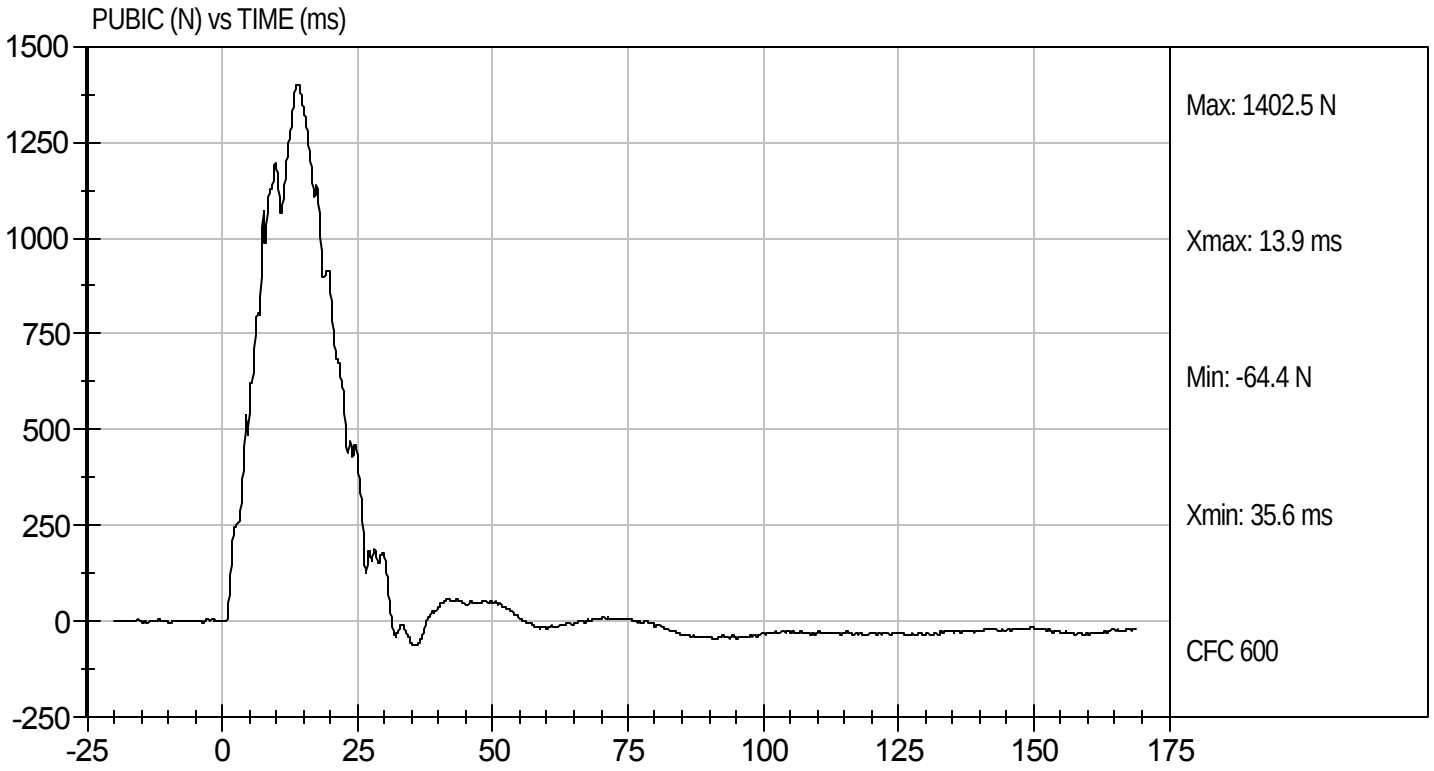
12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D104519

Test Date: 12/20/10
Velocity: 14.37 ft/s, 4.38 m/s





MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 032 **Test I.D:** D104510

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	17	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	5.11	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.7	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.5	Pass
Lower Rib Displacement	mm	37.0 to 44.0	39.6	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

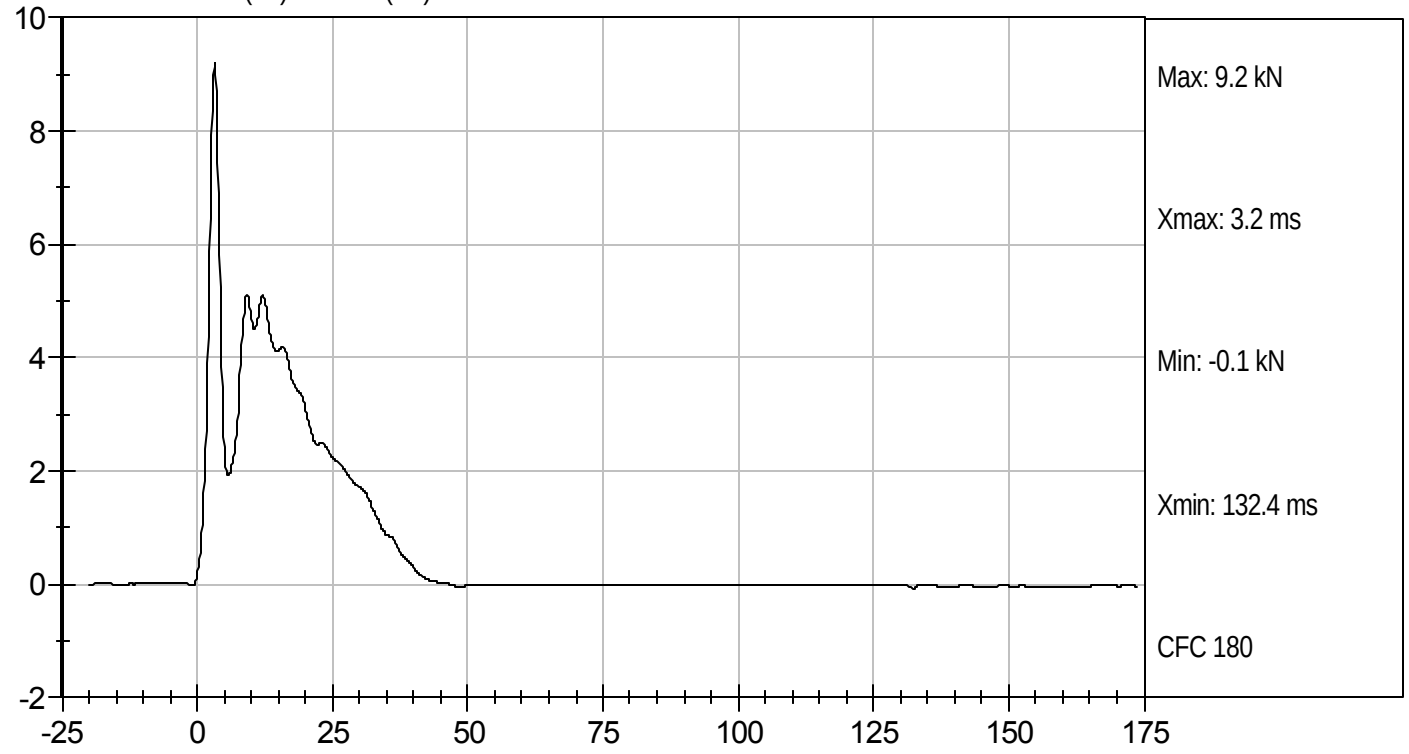
12/20/10
Test Date

David Winkelbauer
Approved By

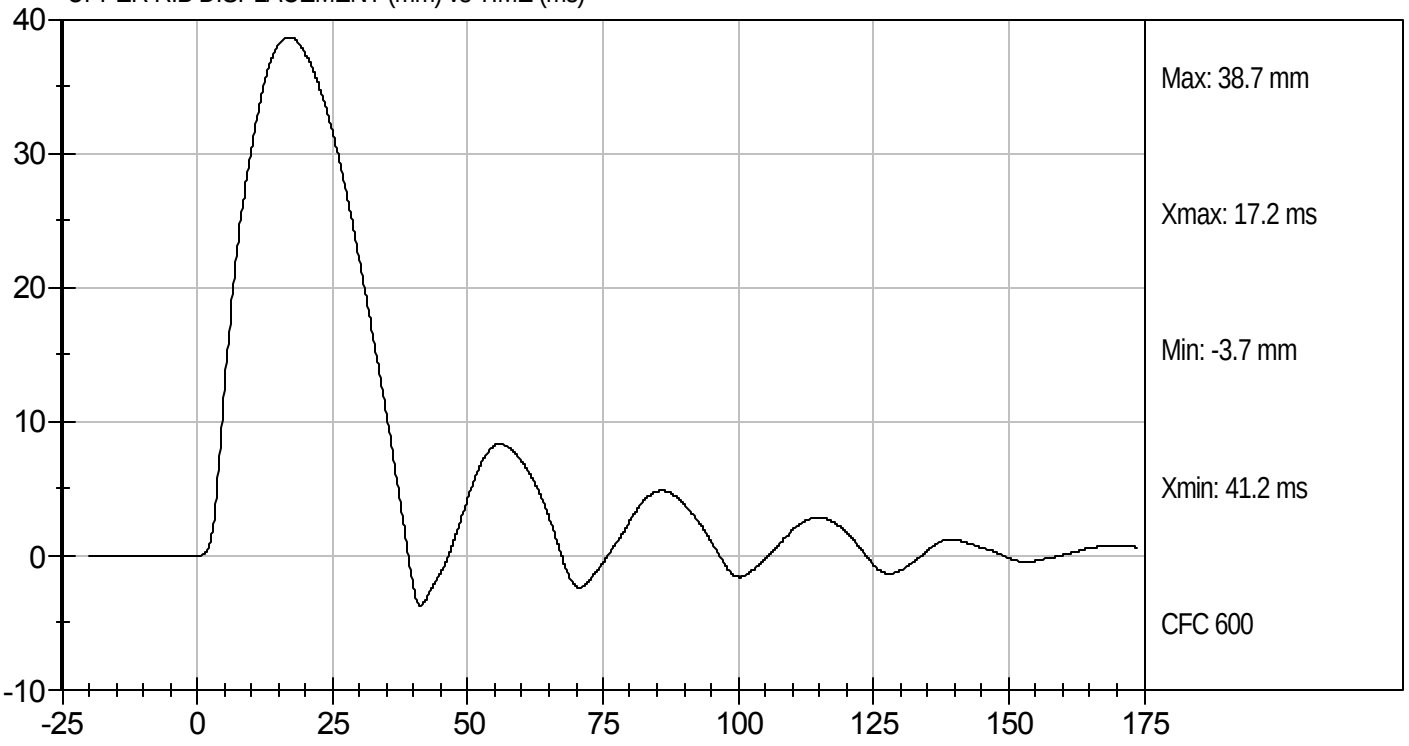
Test Desc: Thorax Impact
Component ID: D104510

Test Date: 12/20/10
Velocity: 18.32 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



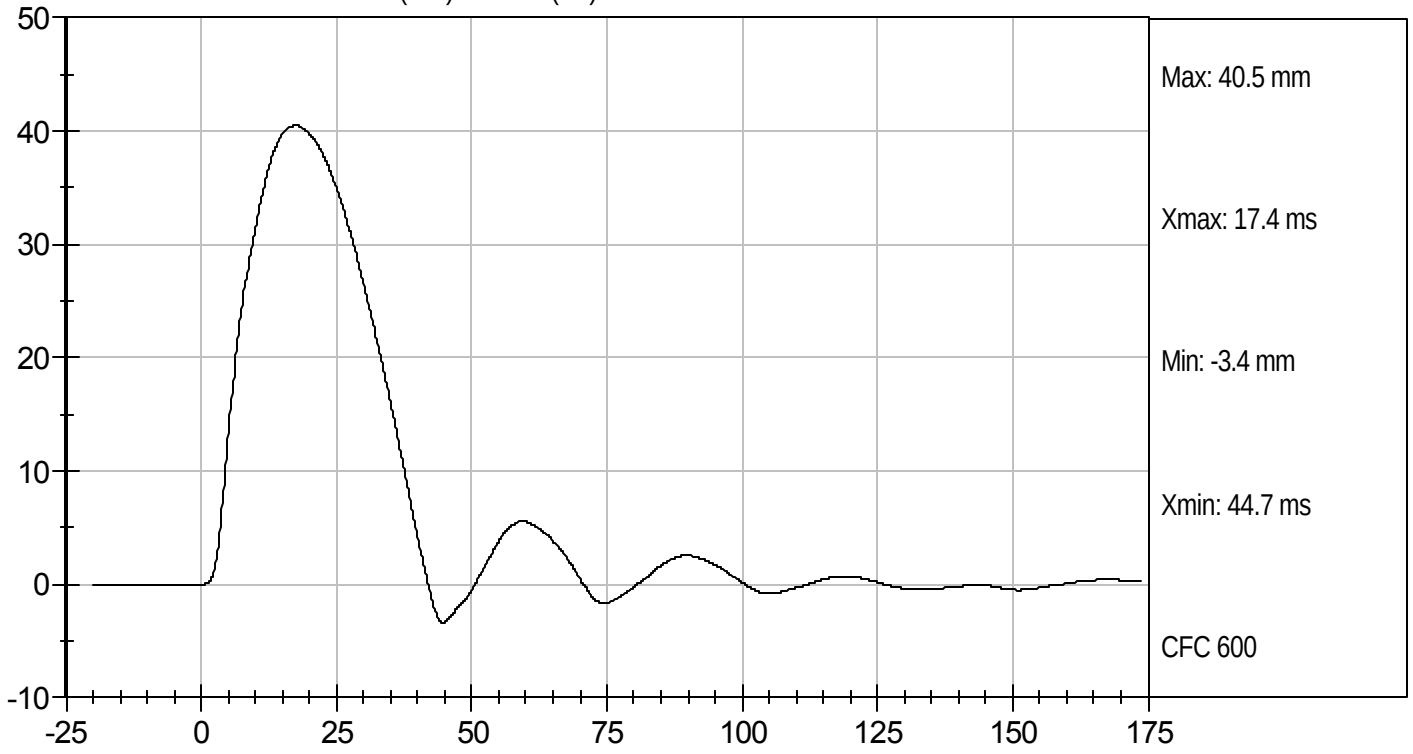
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



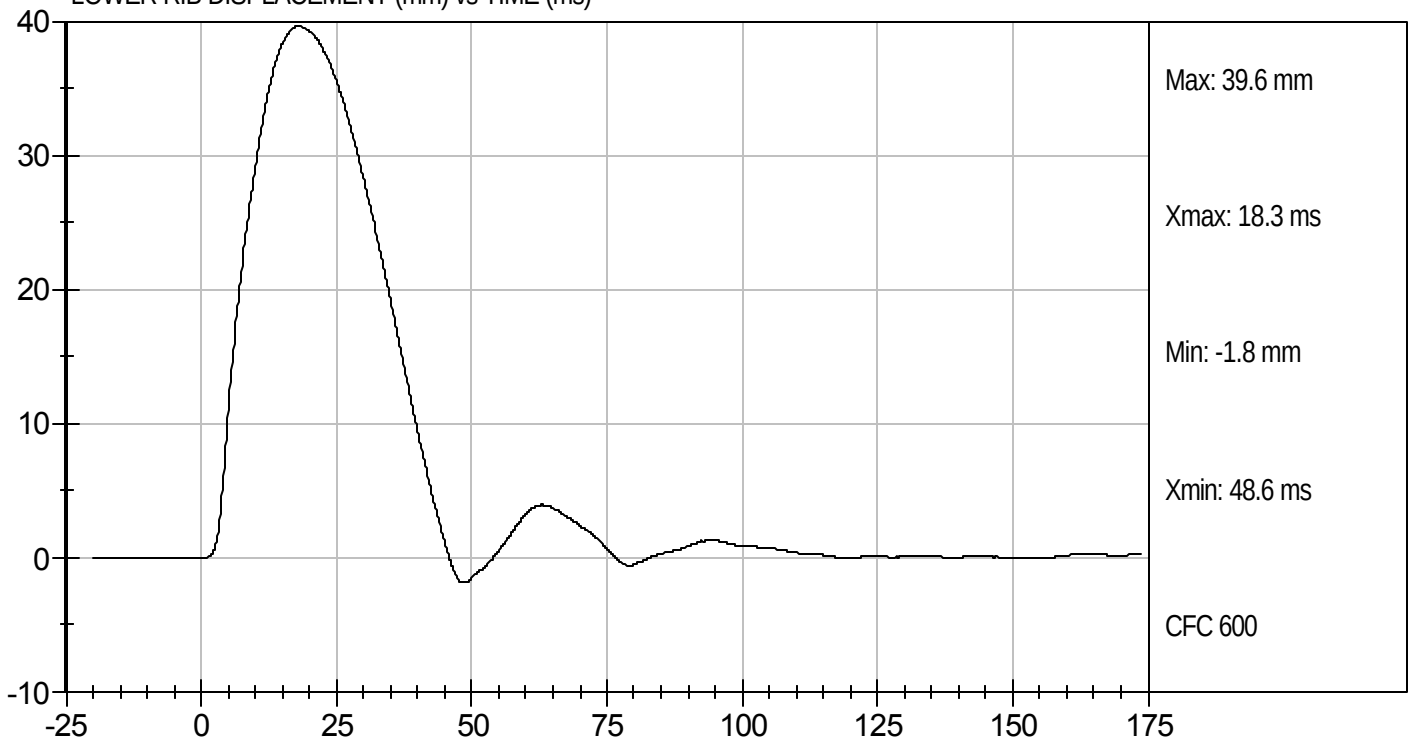
Test Desc: Thorax Impact
Component ID: D104510

Test Date: 12/20/10
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:** D104311

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	15	Pass
Peak Resultant Acceleration	G's	115 to 137	115	Pass
Peak Lateral Acceleration	G's	+/- 15	-3.8	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

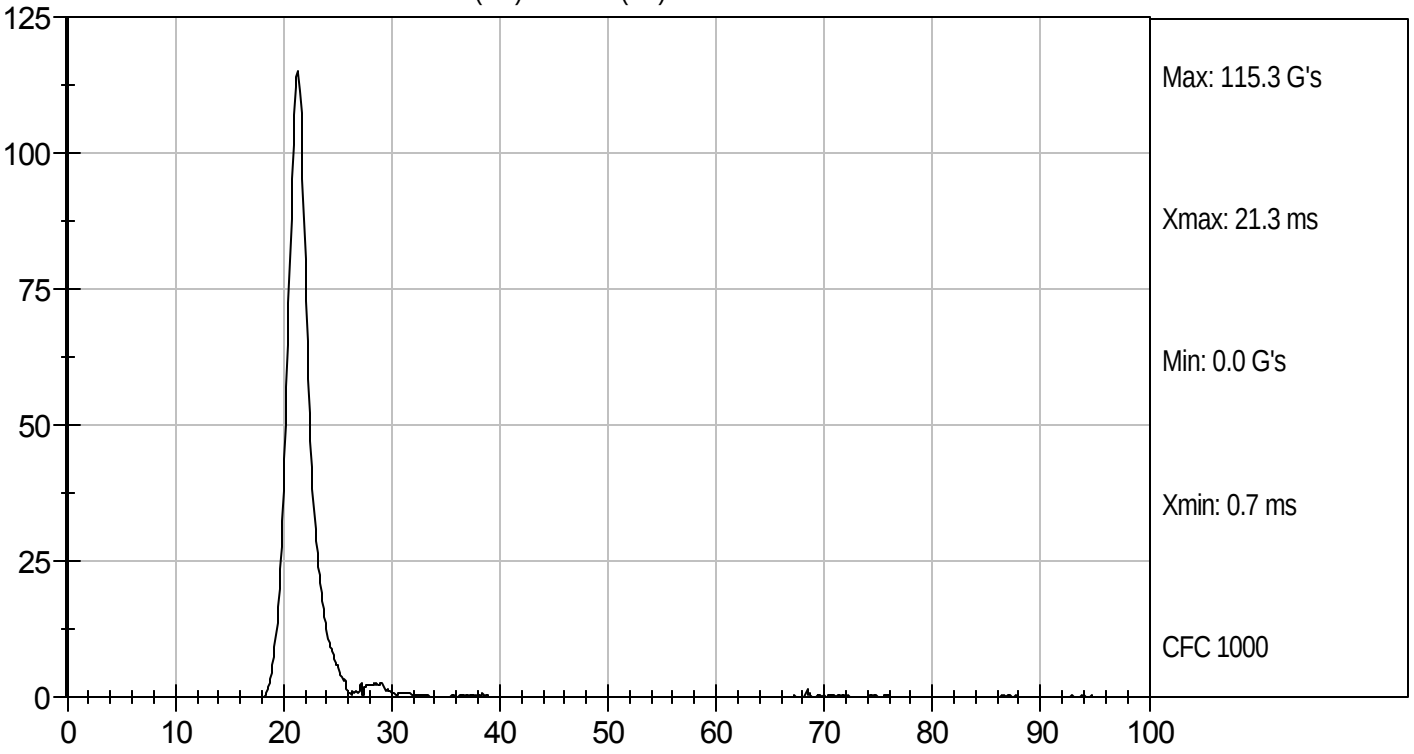
12/9/10
Test Date

David Winkelbauer
Approved By

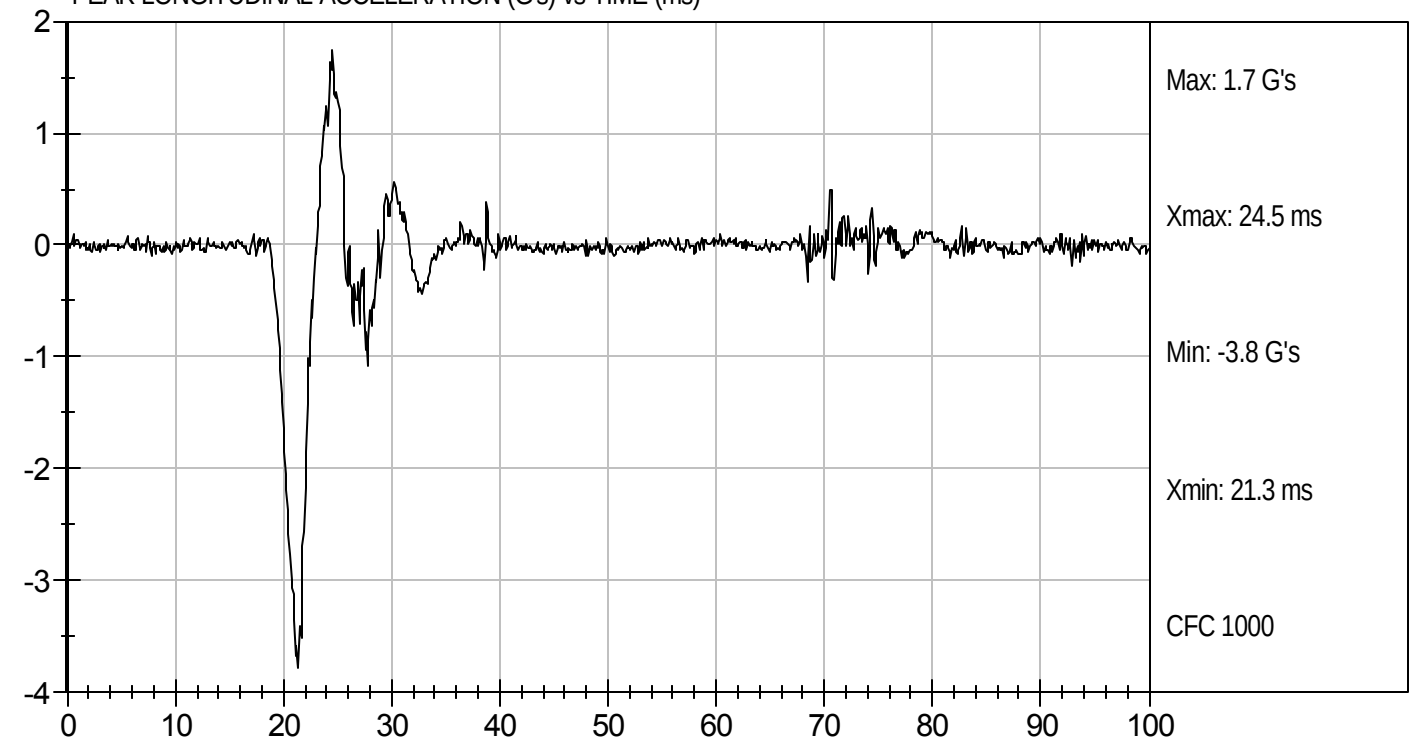
Test Desc: Head Drop
Component ID: D104311

Test Date: 12/9/10
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:** D104312

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.5	Pass
Humidity		%	10 to 70	15	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.70	Pass
	15 ms	m/s	3.30 to 4.10	3.84	Pass
	20 ms	m/s	4.40 to 5.40	5.04	Pass
	25 ms	m/s	5.40 to 6.10	5.51	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	61	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-44 to -36	-43	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

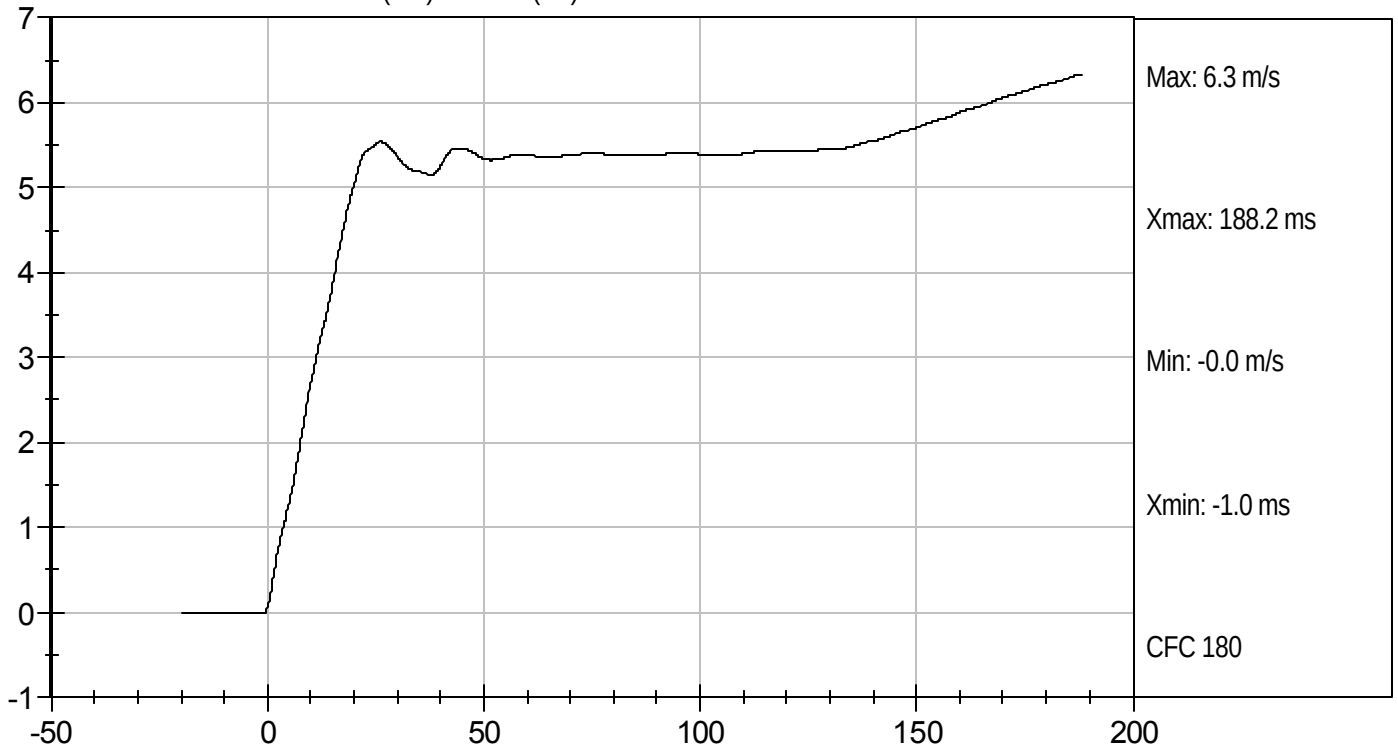
12/9/10
Test Date

David Winkelbauer
Approved By

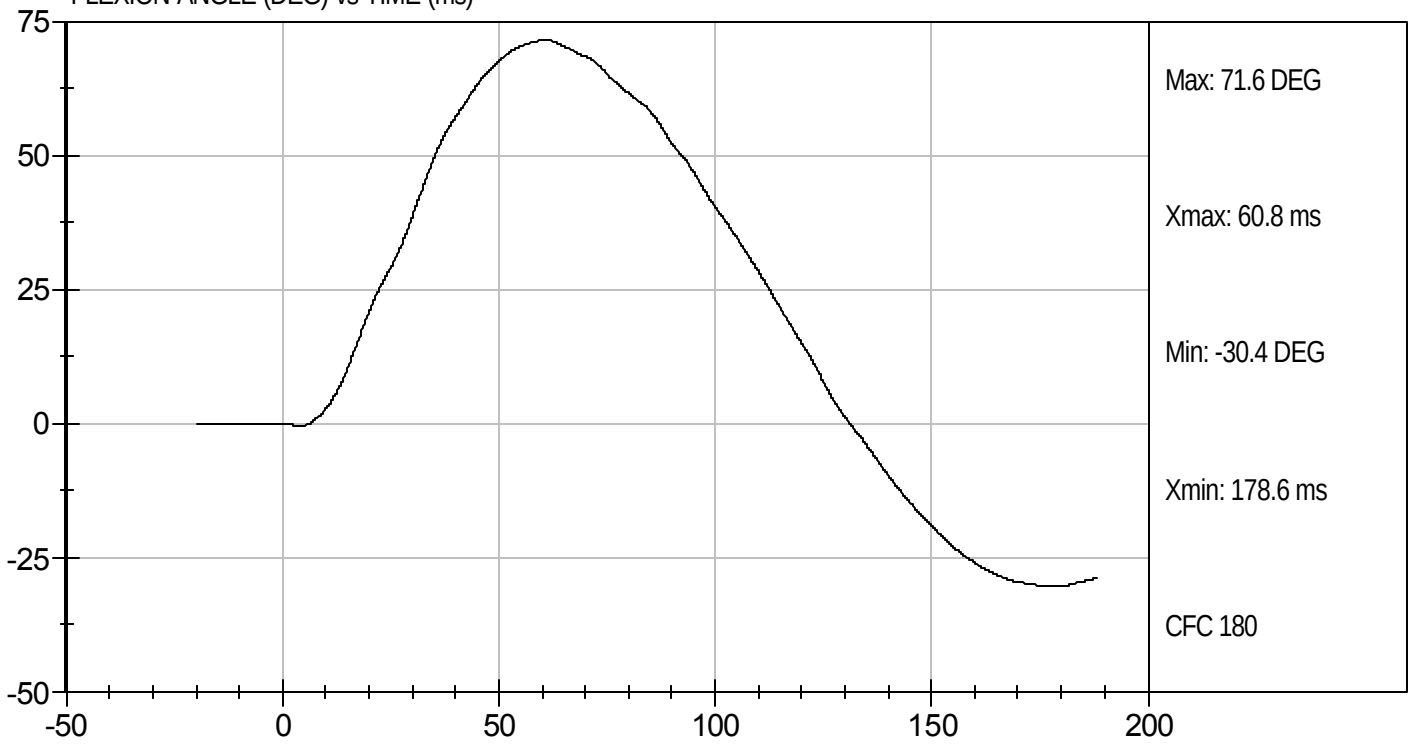
Test Desc: Neck Bending
Component ID: D104312

Test Date: 12/9/10
Velocity: 18.32 ft/s, 5.58 m/s

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

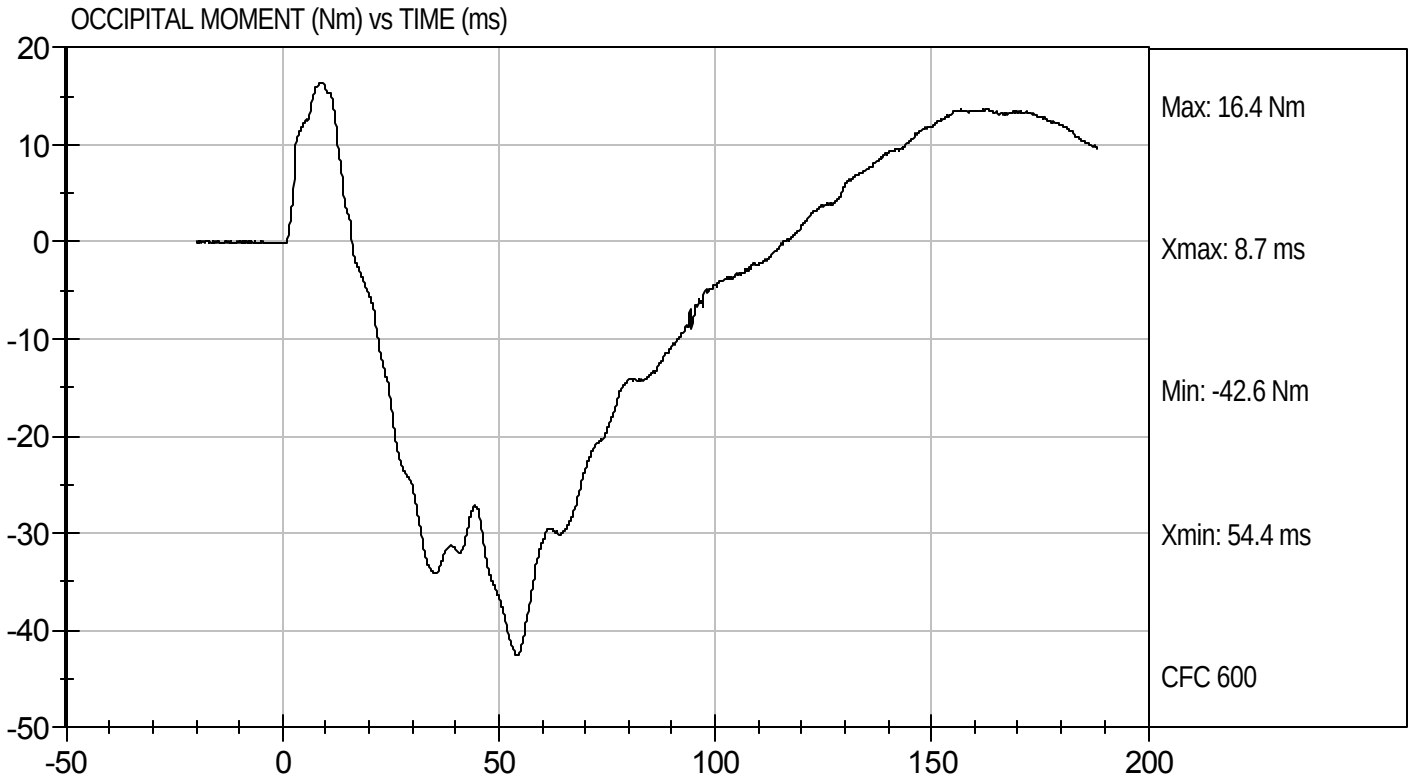


FLEXION ANGLE (DEG) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D104312

Test Date: 12/9/10
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D104313

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	15	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	16	Pass
Shoulder Displacement	mm	28 to 37	29	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	20	Pass
		Overall Test Results		Pass

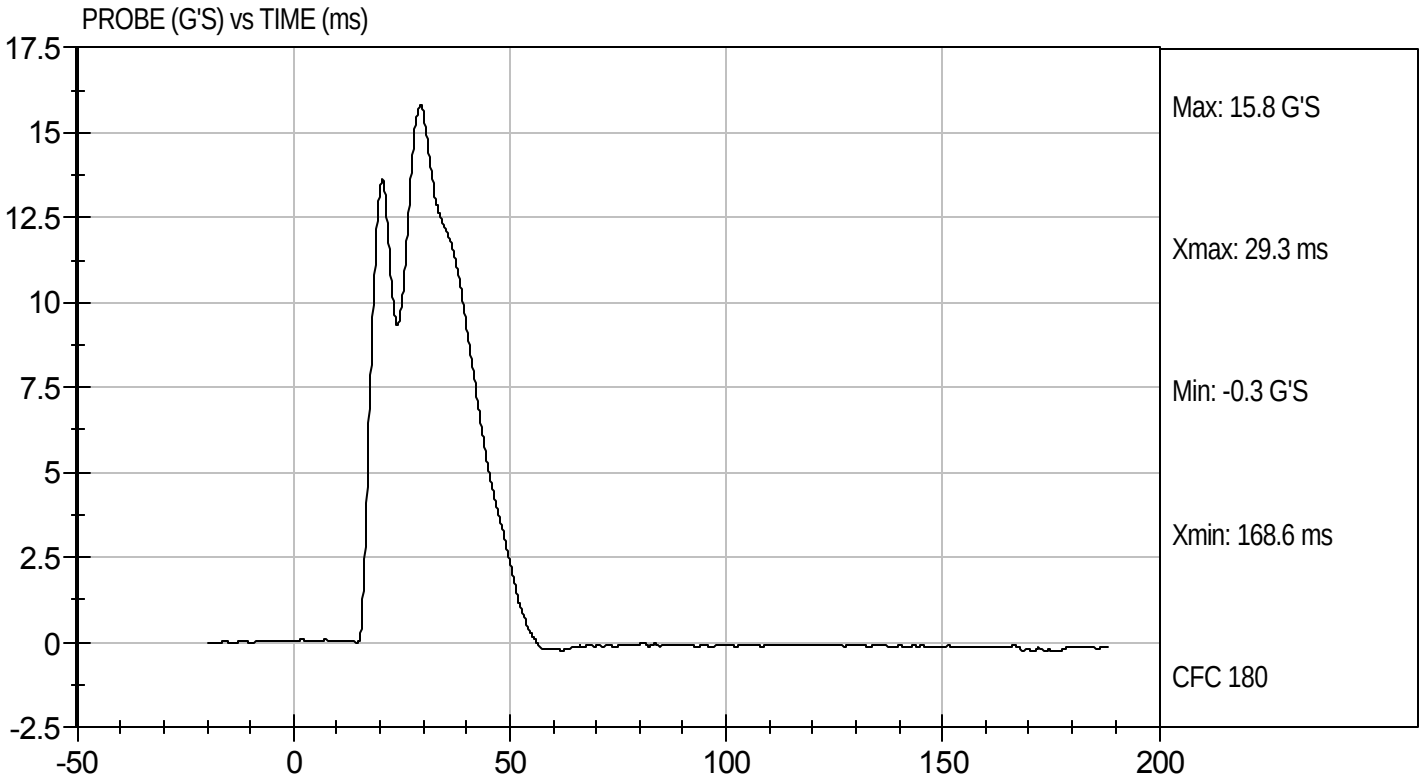
Jessica Hall
Laboratory Technician

12/8/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D104313

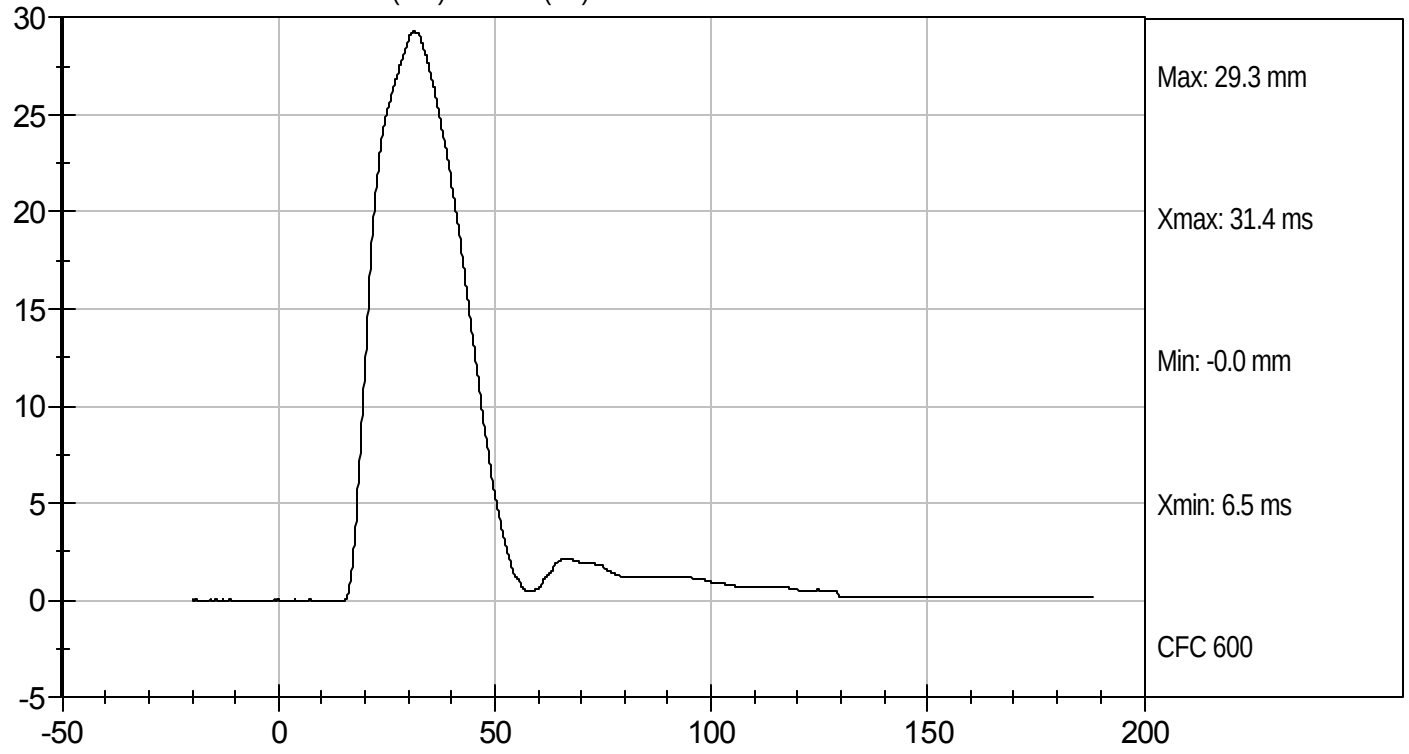
Test Date: 12/8/10
Velocity: 14.37 ft/s, 4.38 m/s



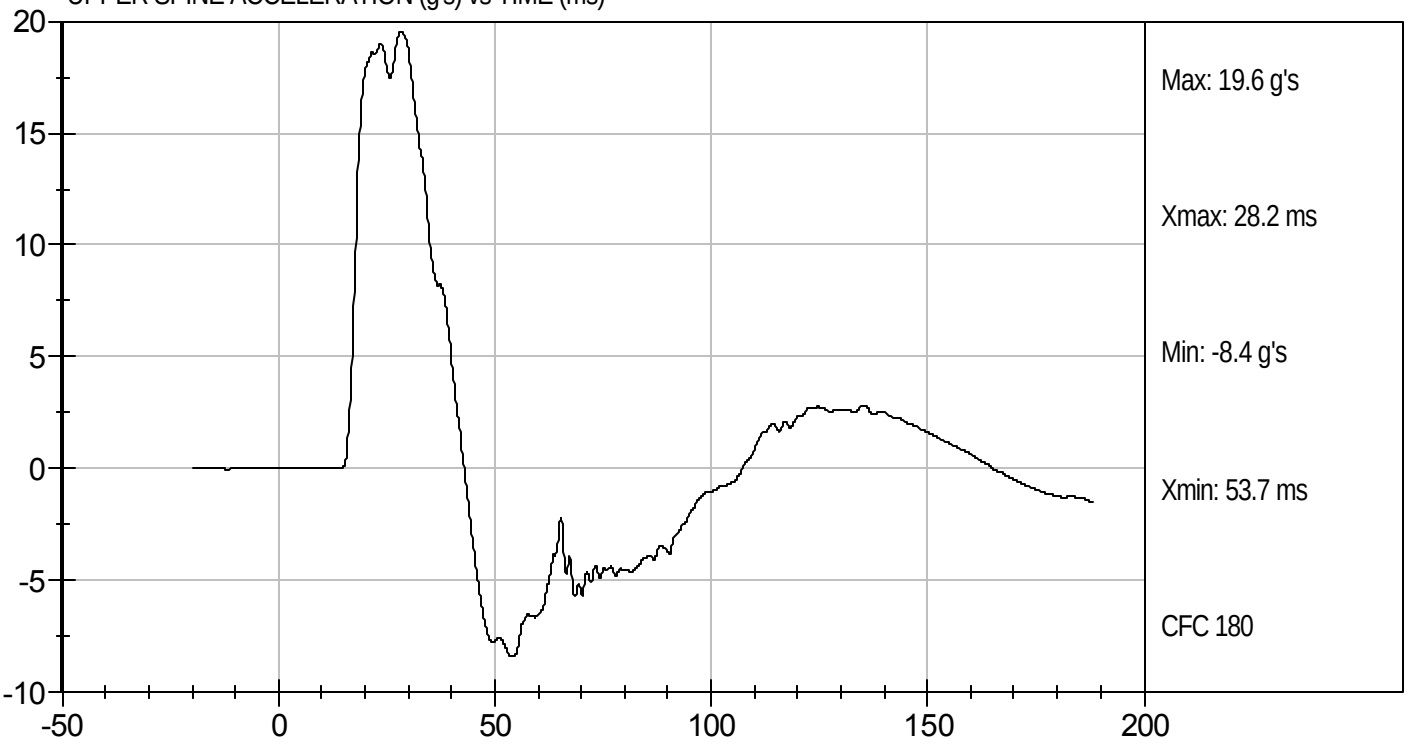
Test Desc: Shoulder Impact
Component ID: D104313

Test Date: 12/8/10
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:** D104314

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	15	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	37	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	39	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
		Overall Test Results		Pass

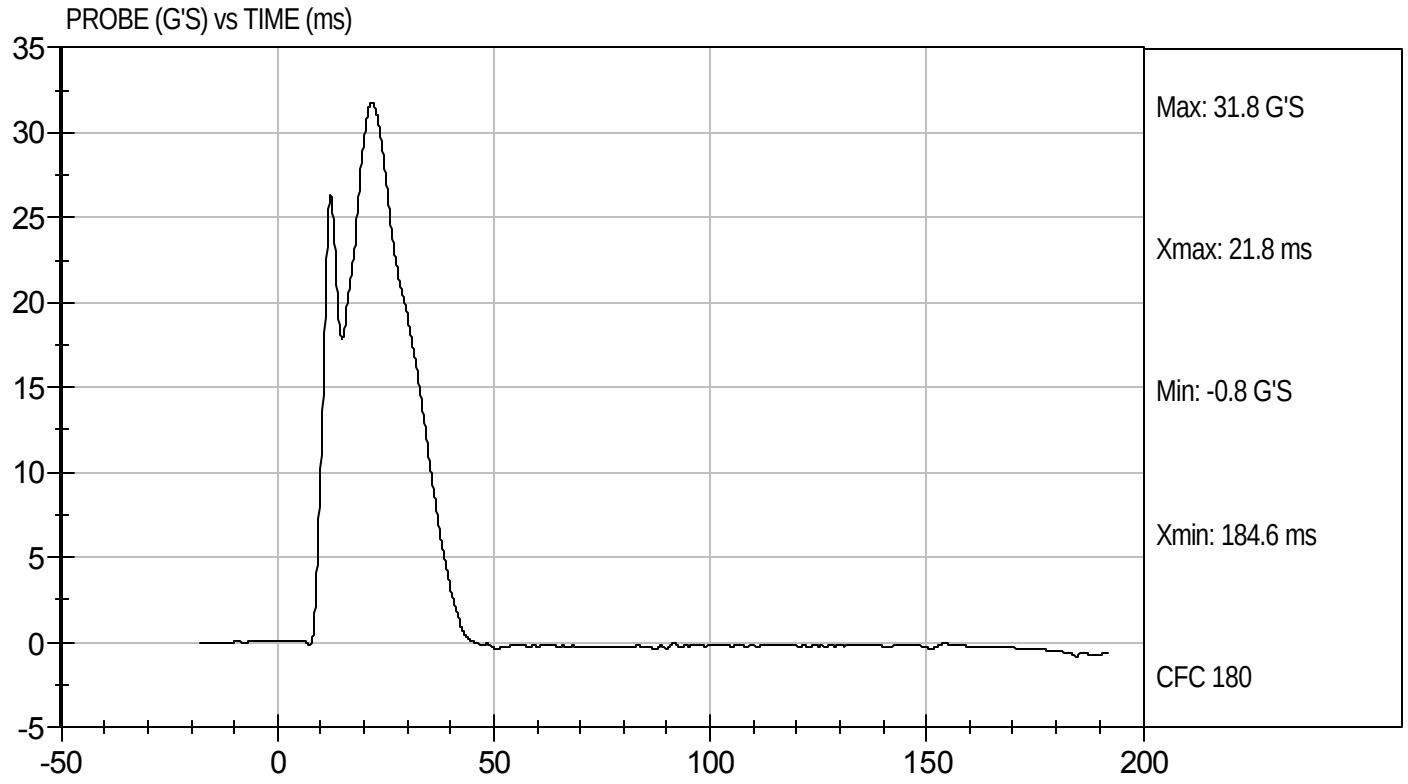
Jessica Hall
Laboratory Technician

12/8/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D104314

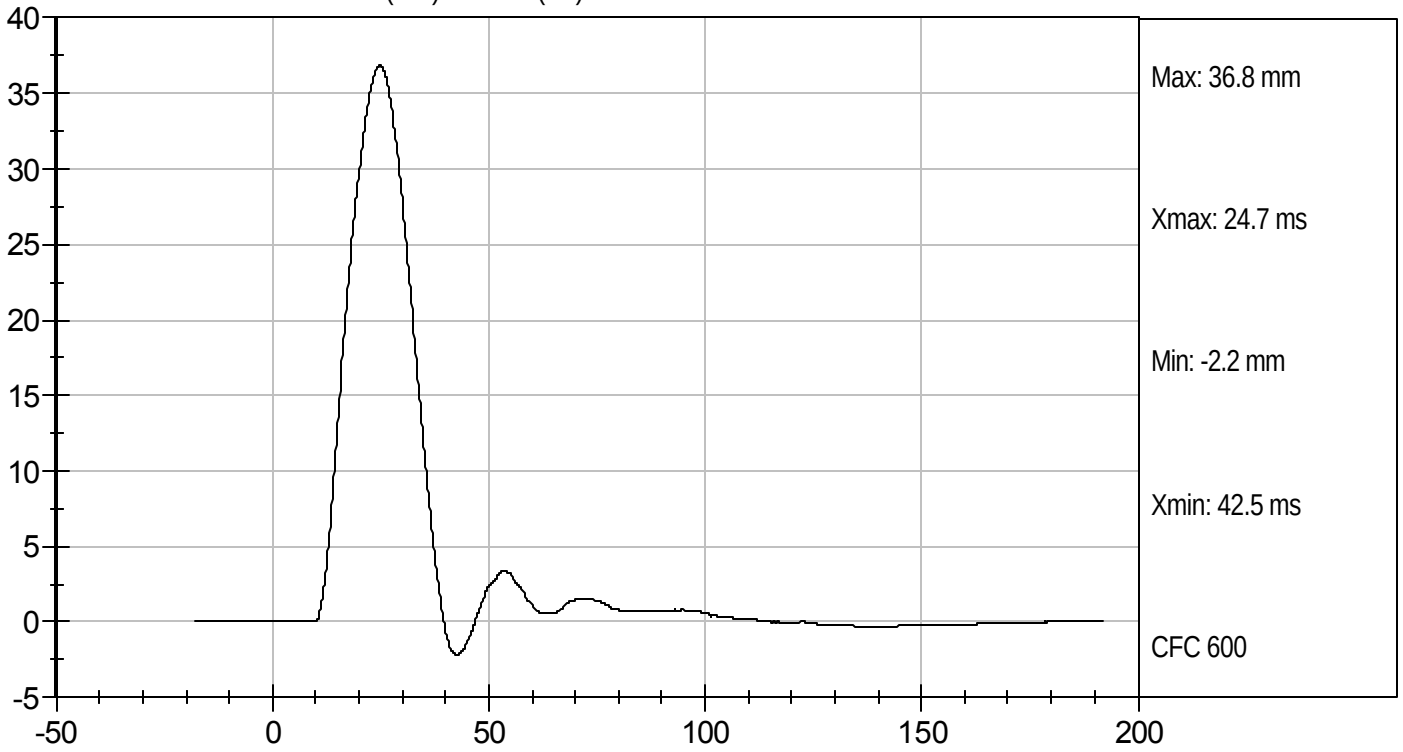
Test Date: 12/8/10
Velocity: 21.93 ft/s, 6.68 m/s



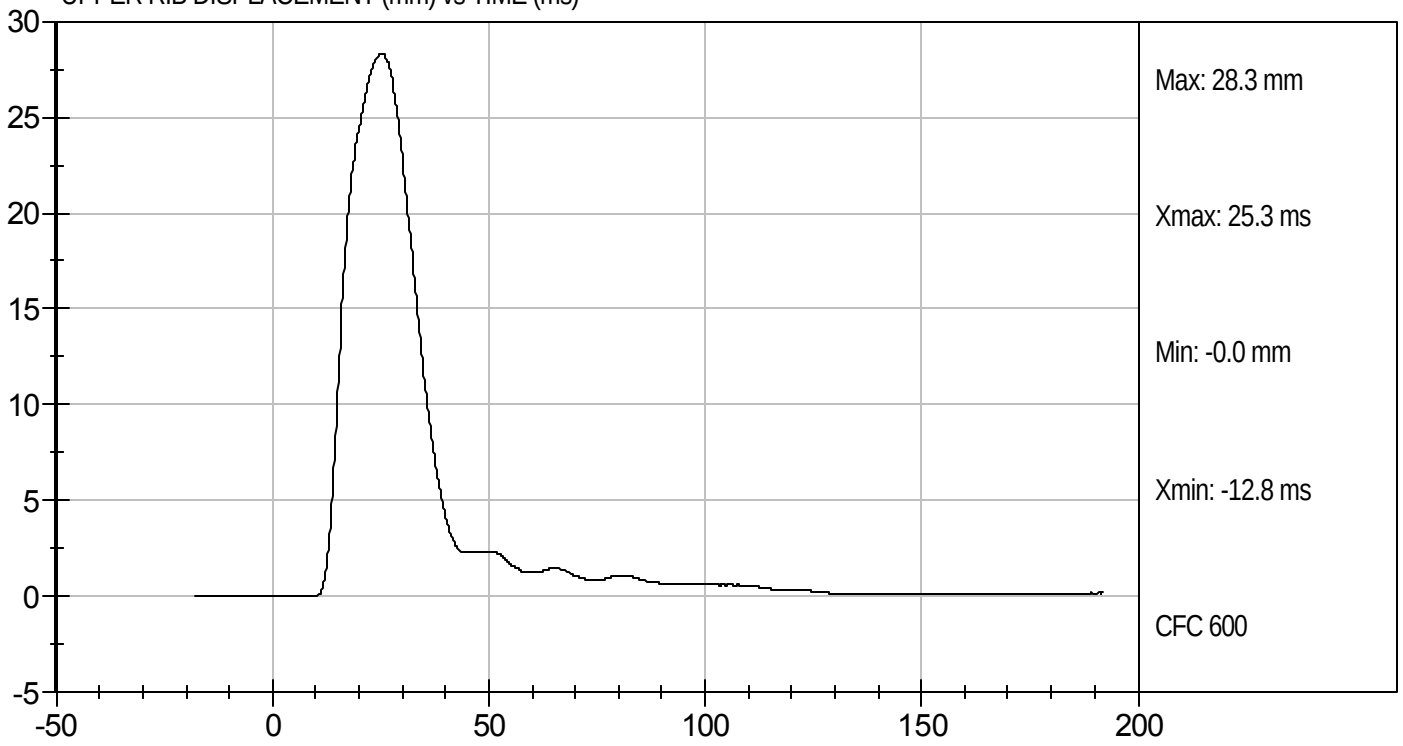
Test Desc: Thorax With Arm
Component ID: D104314

Test Date: 12/8/10
Velocity: 21.93 ft/s, 6.68 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



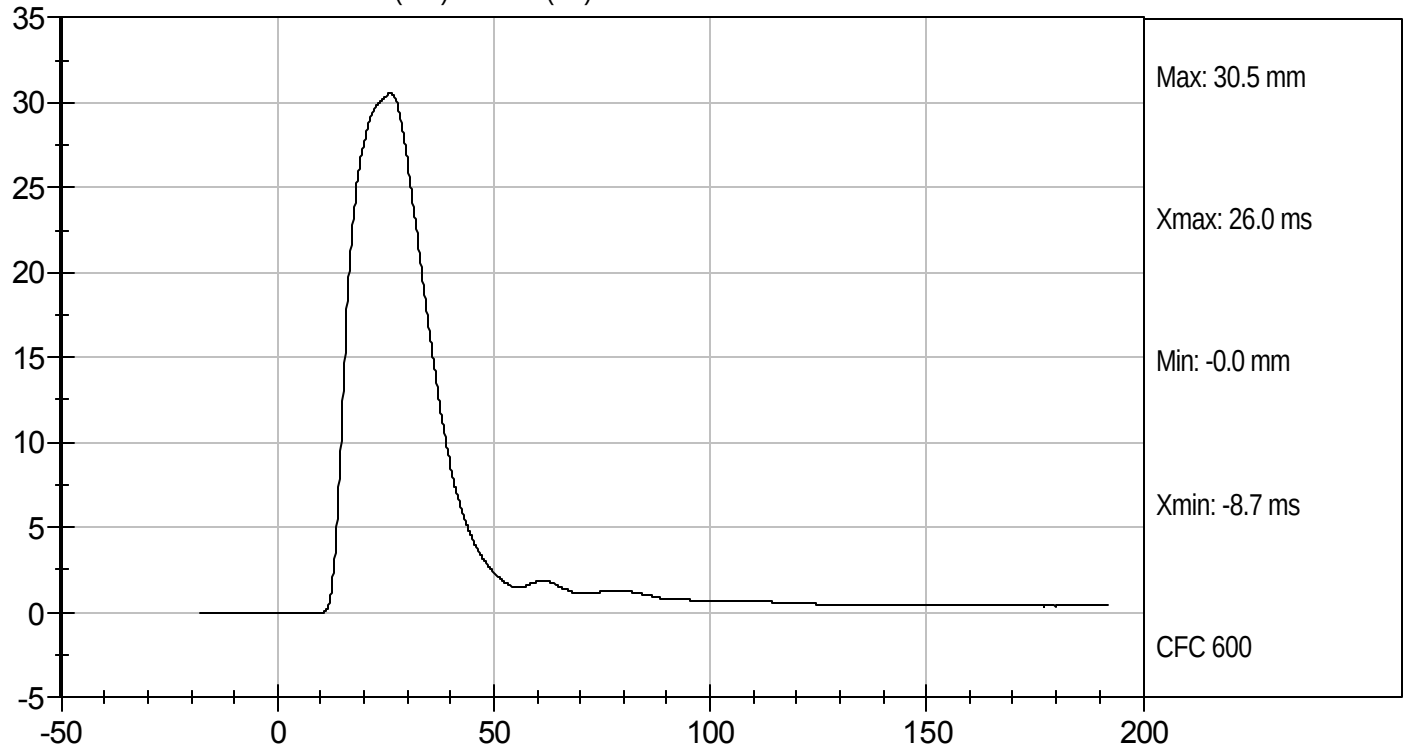
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



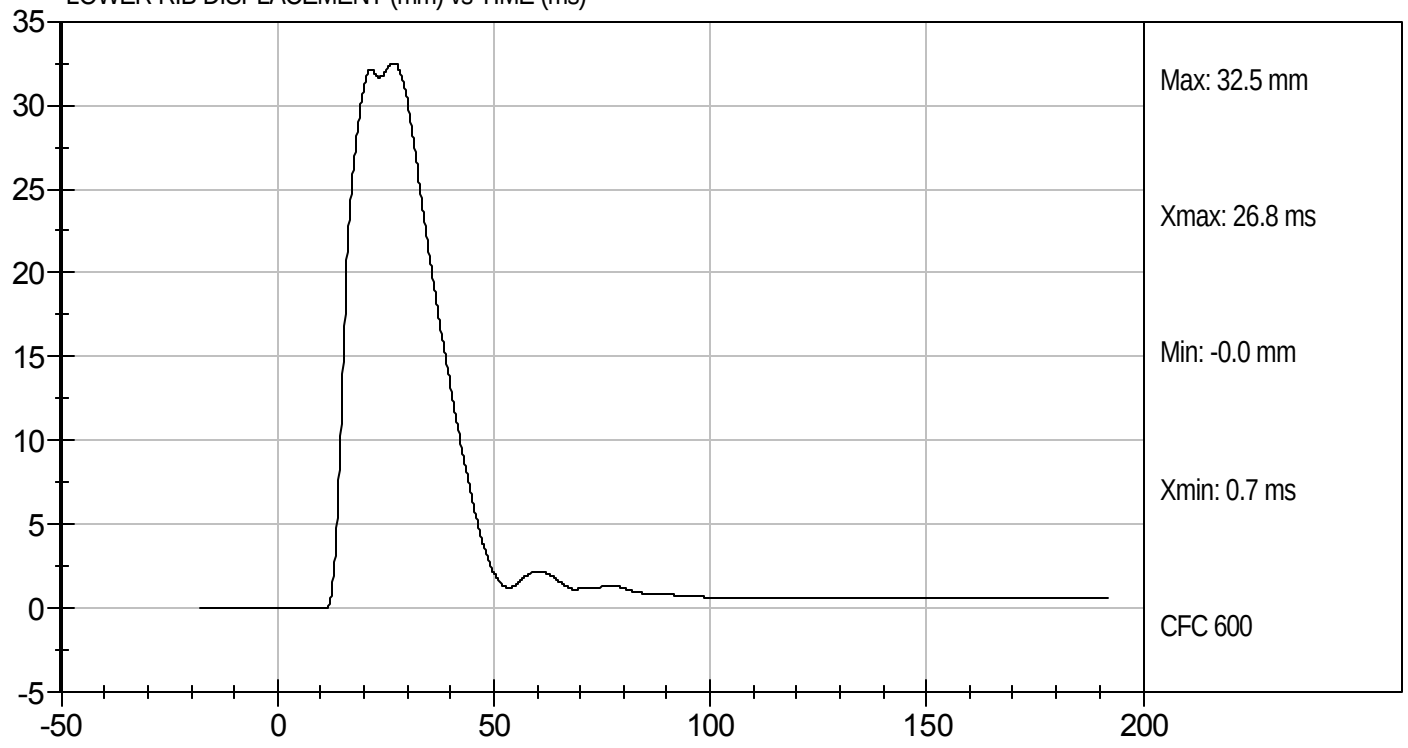
Test Desc: Thorax With Arm
Component ID: D104314

Test Date: 12/8/10
Velocity: 21.93 ft/s, 6.68 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



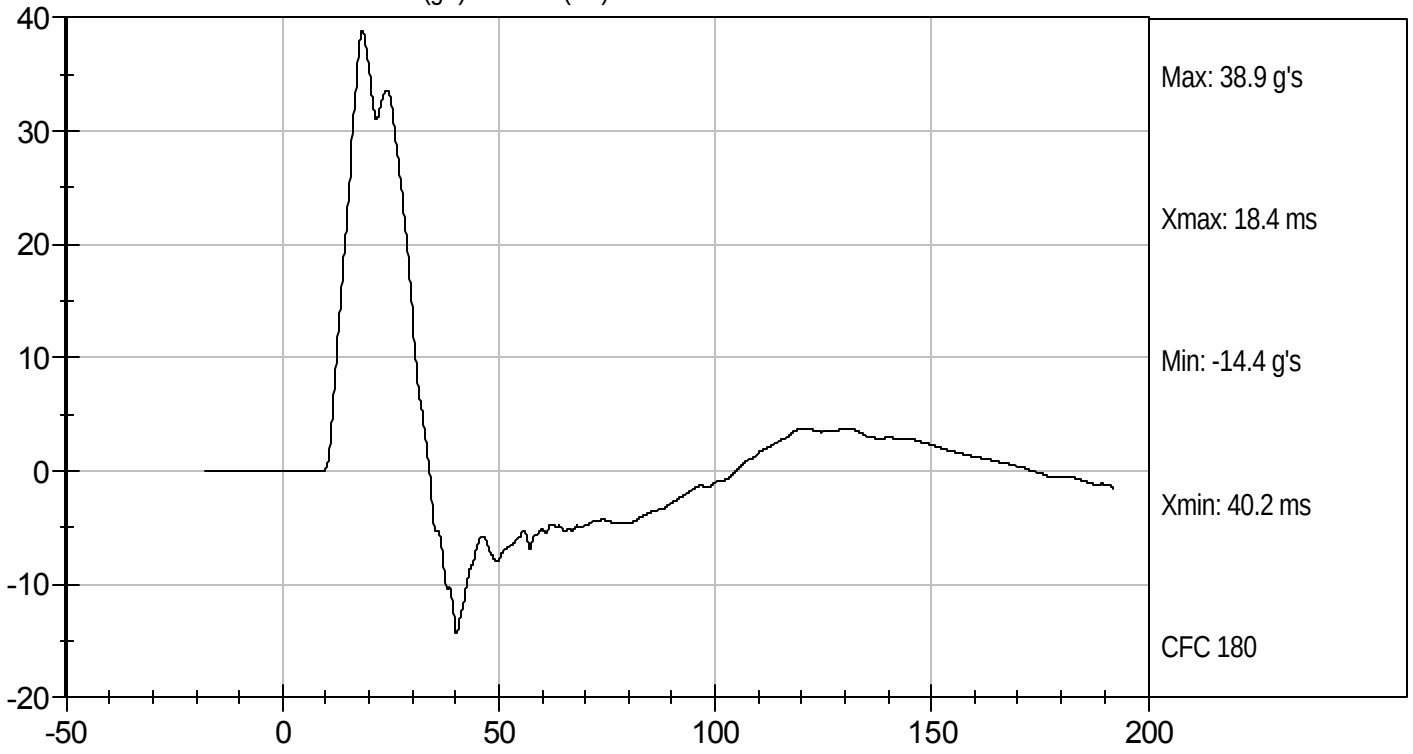
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



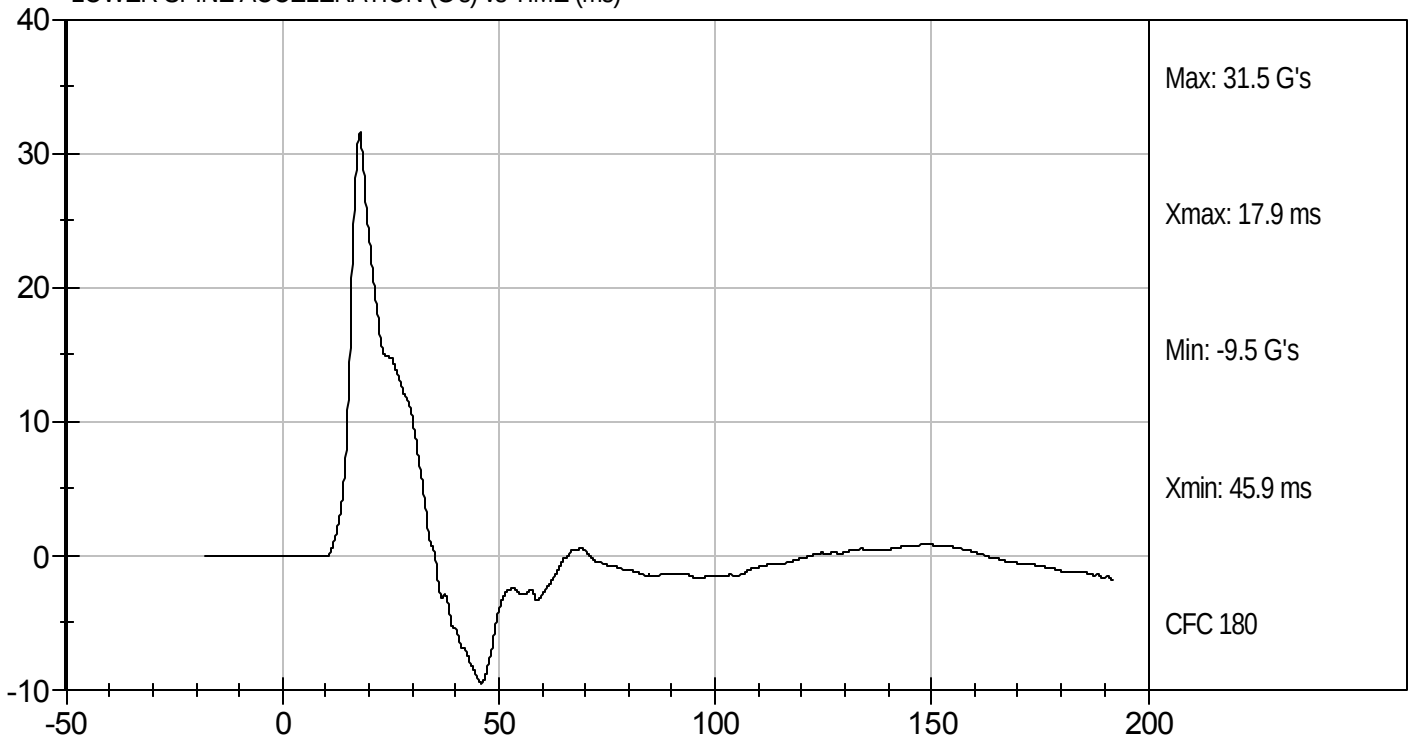
Test Desc: Thorax With Arm
Component ID: D104314

Test Date: 12/8/10
Velocity: 21.93 ft/s, 6.68 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:** D104315

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	16	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Force	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	39	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
		Overall Test Results		Pass

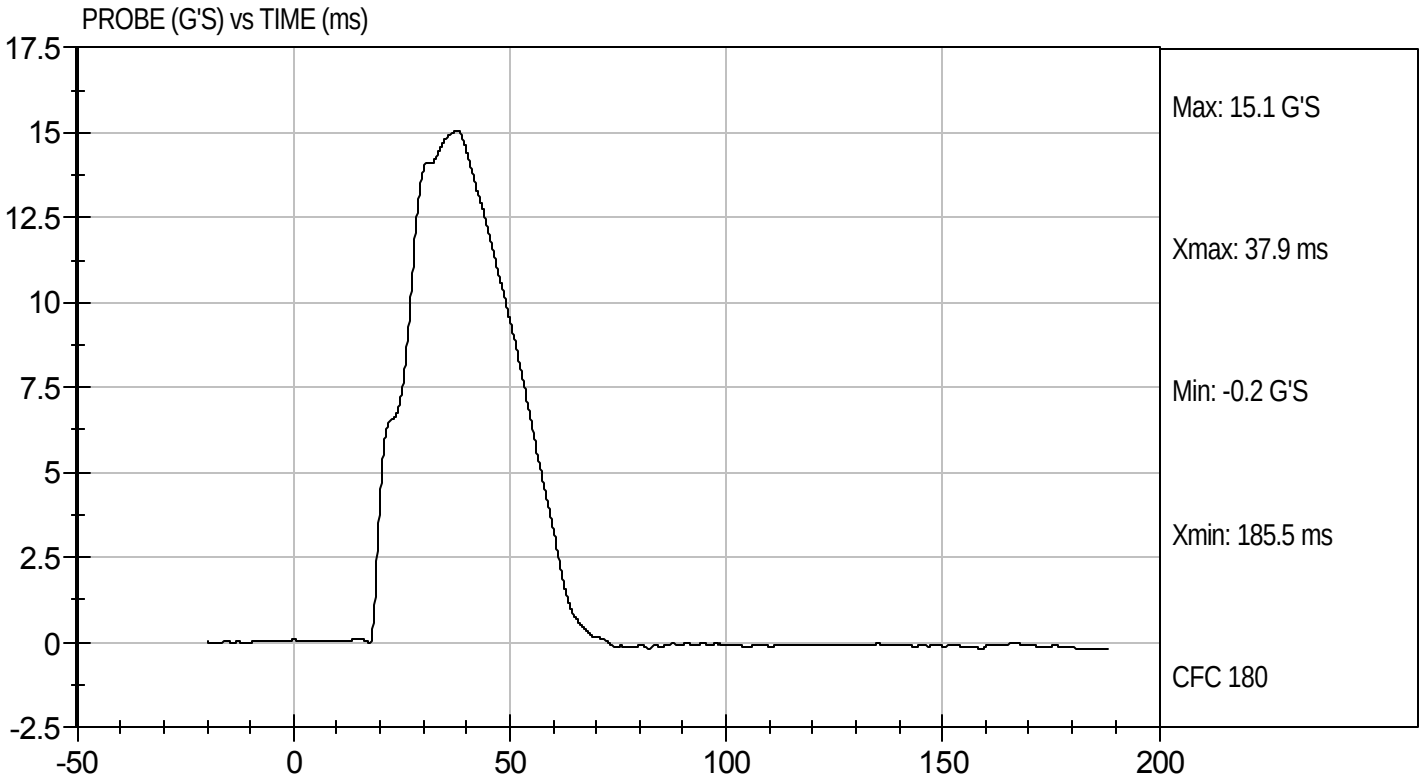
Jessica Hall
Laboratory Technician

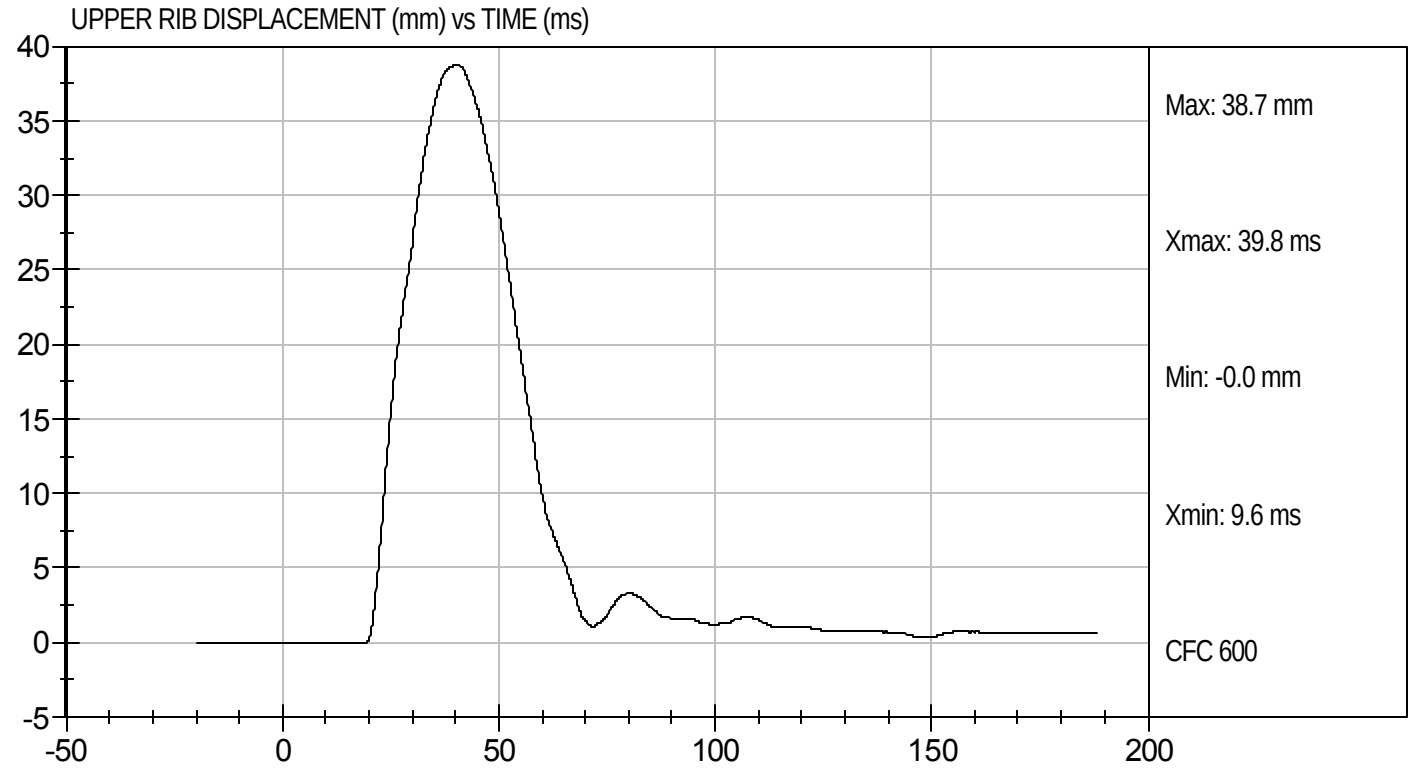
12/8/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D104315

Test Date: 12/8/10
Velocity: 14.25 ft/s, 4.34 m/s

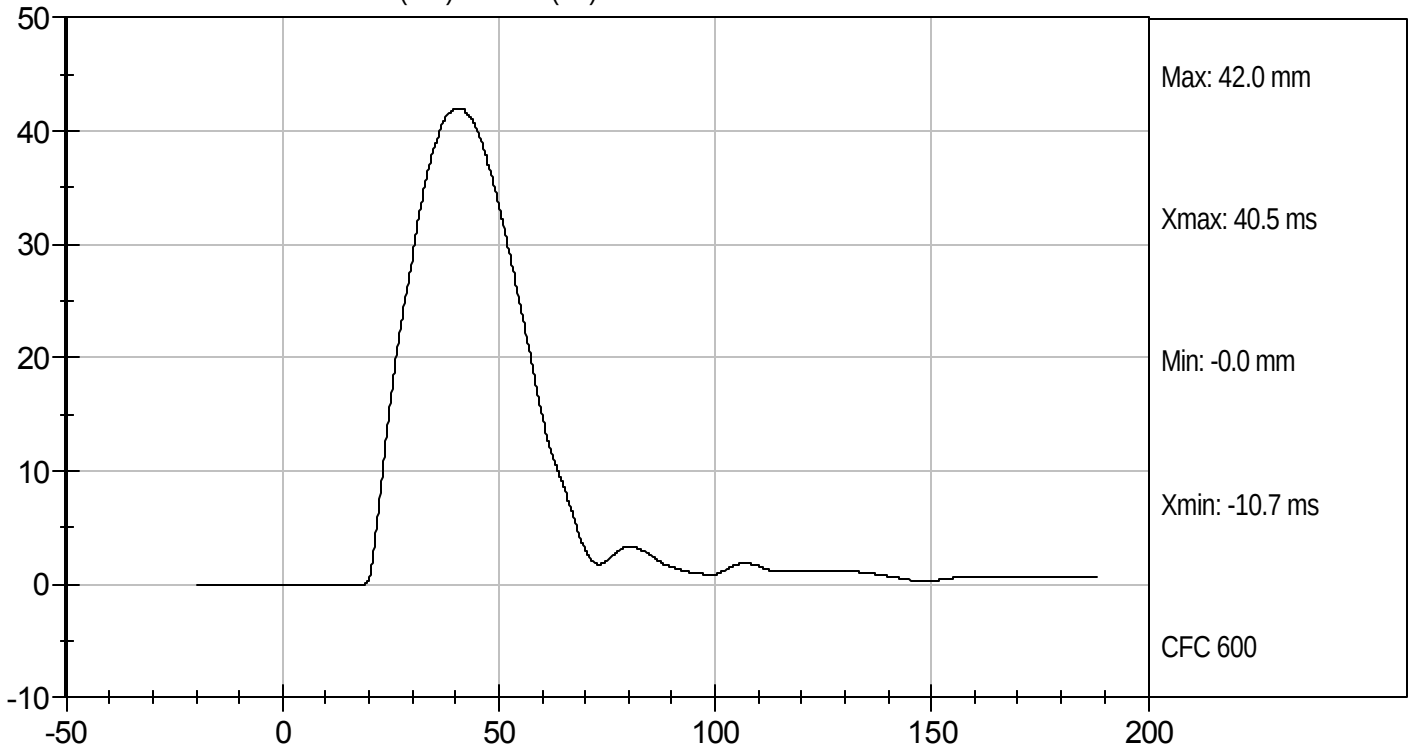




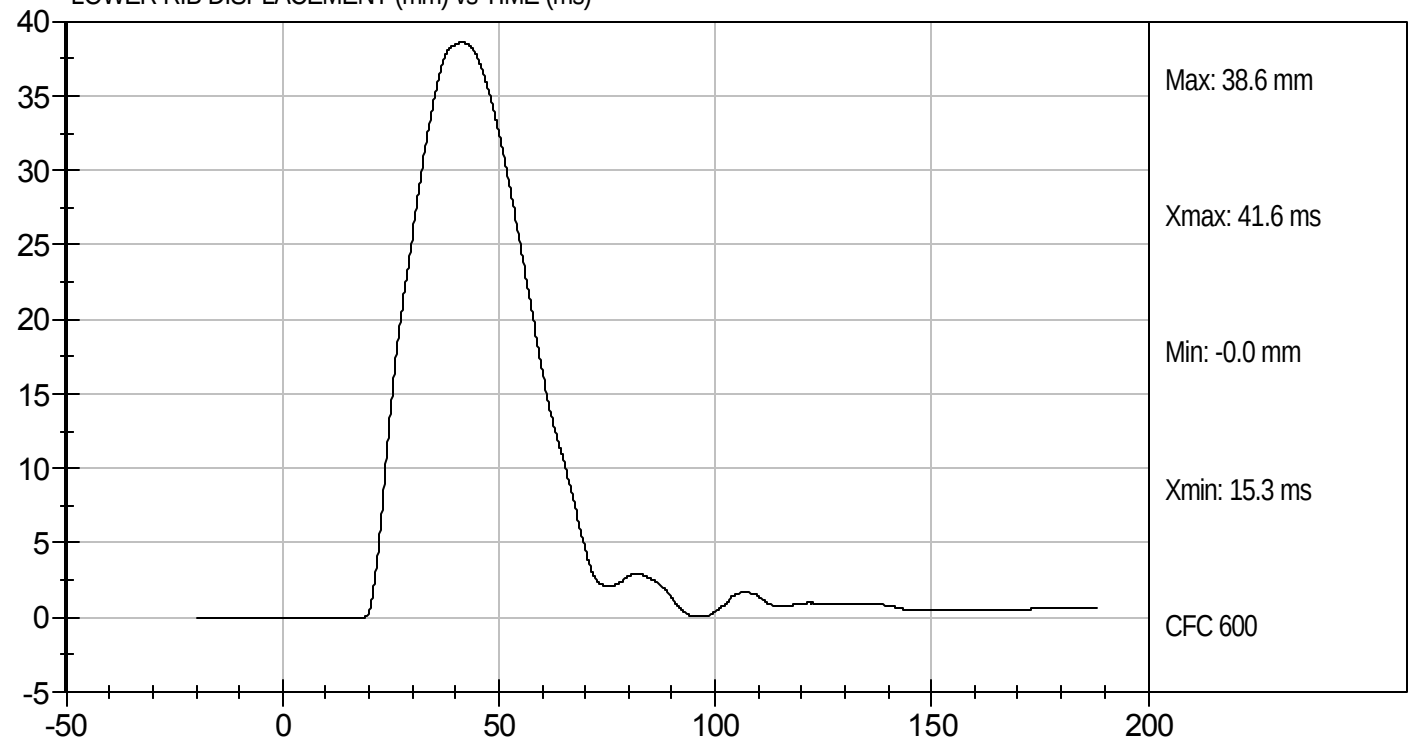
Test Desc: Thorax Without Arm
Component ID: D104315

Test Date: 12/8/10
Velocity: 14.25 ft/s, 4.34 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



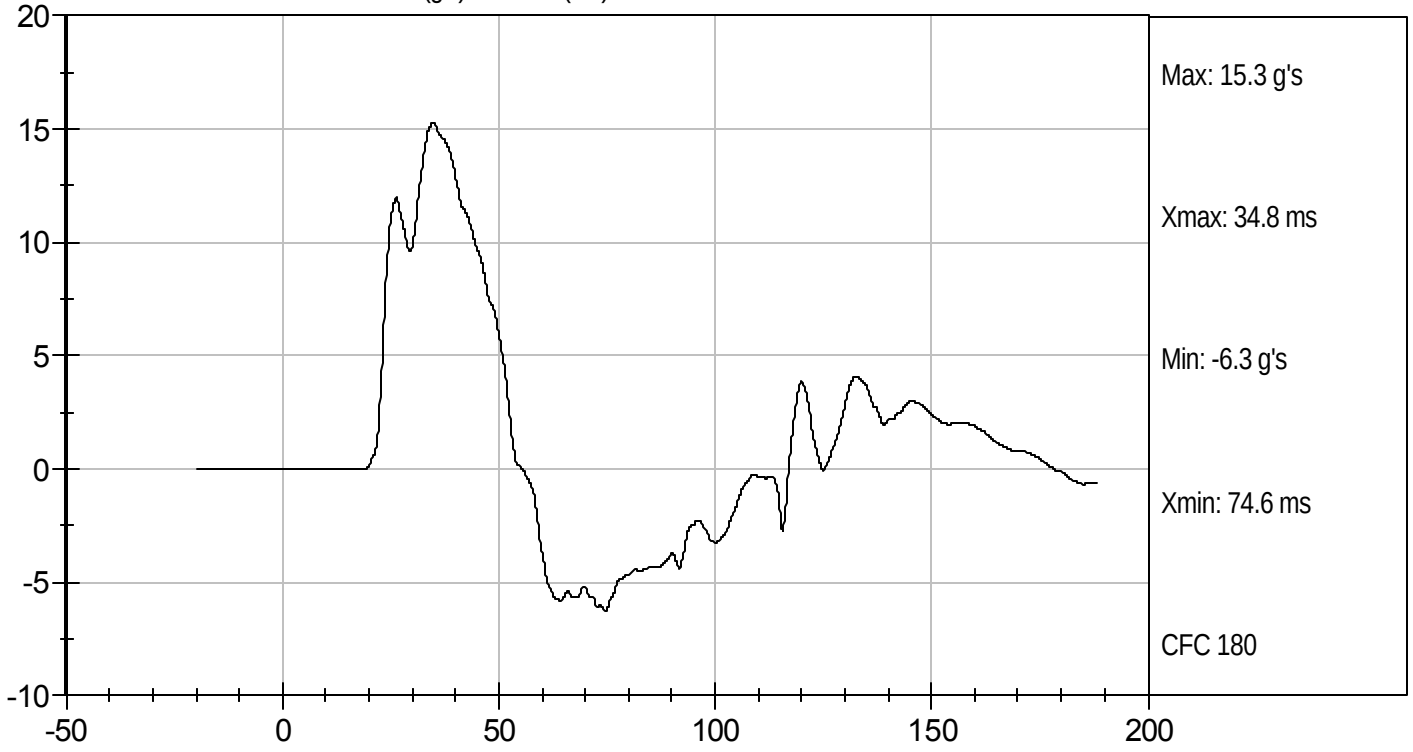
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



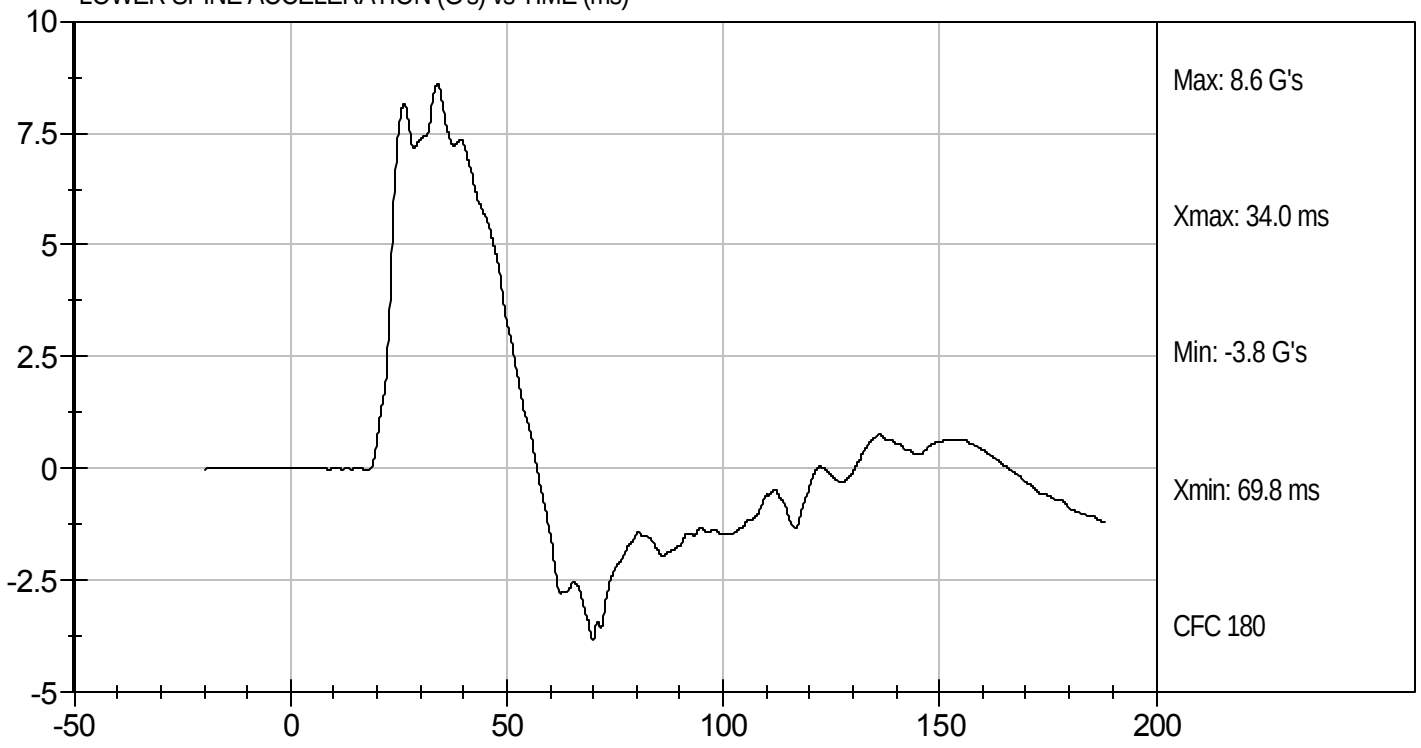
Test Desc: Thorax Without Arm
Component ID: D104315

Test Date: 12/8/10
Velocity: 14.25 ft/s, 4.34 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:** D104316

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	16	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	12 to 16	15	Pass
Upper Rib Displacement	mm	36 to 47	43	Pass
Lower Rib Displacement	mm	33 to 44	34	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

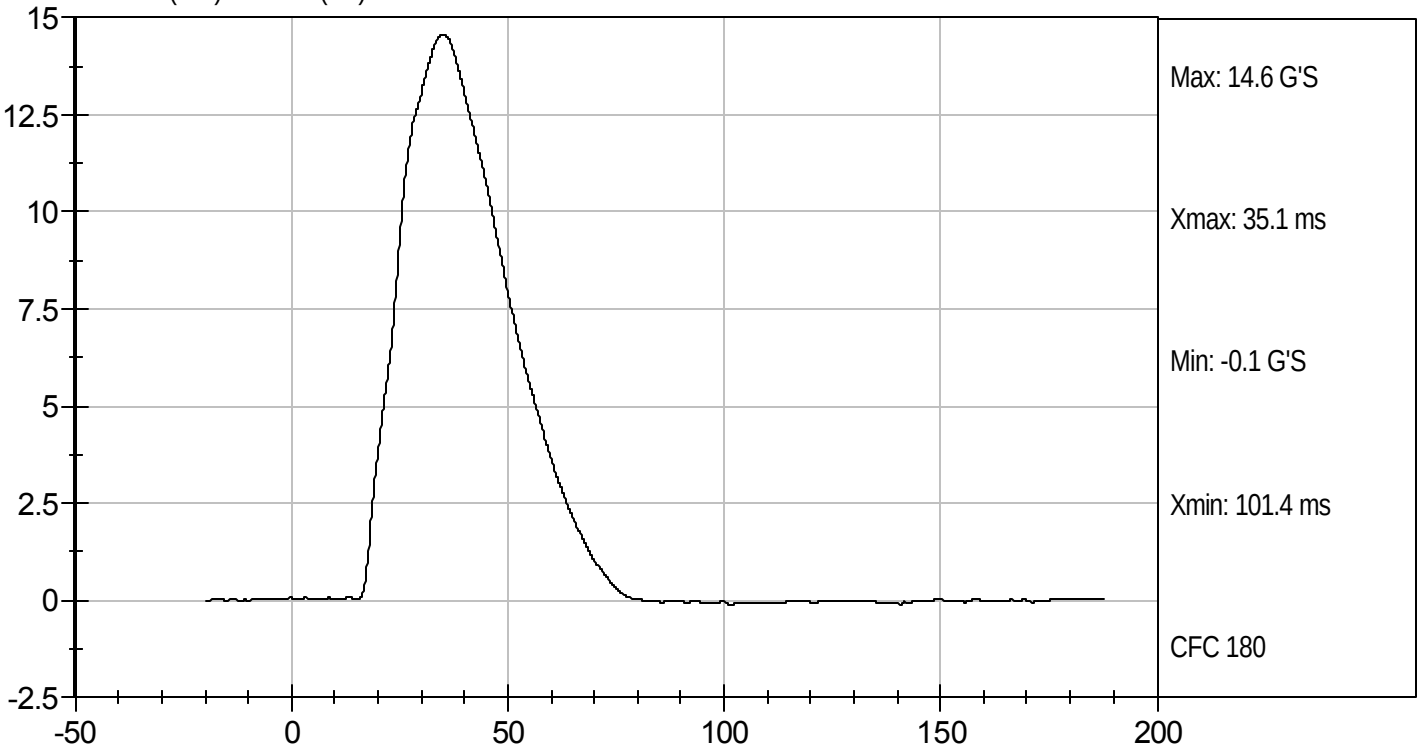
12/8/10
Test Date

David Winkelbauer
Approved By

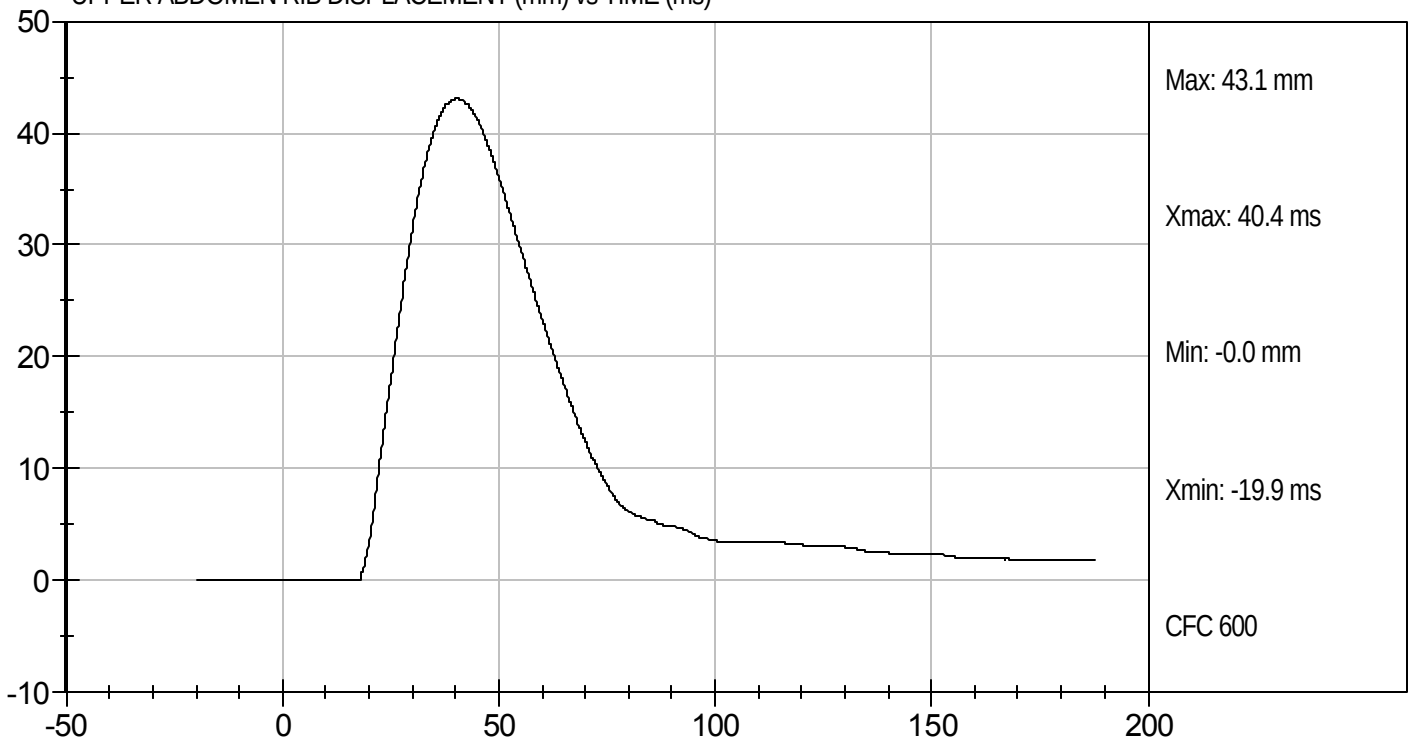
Test Desc: Abdomen Impact
Component ID: D104316

Test Date: 12/8/10
Velocity: 14.12 ft/s, 4.30 m/s

PROBE (G'S) vs TIME (ms)



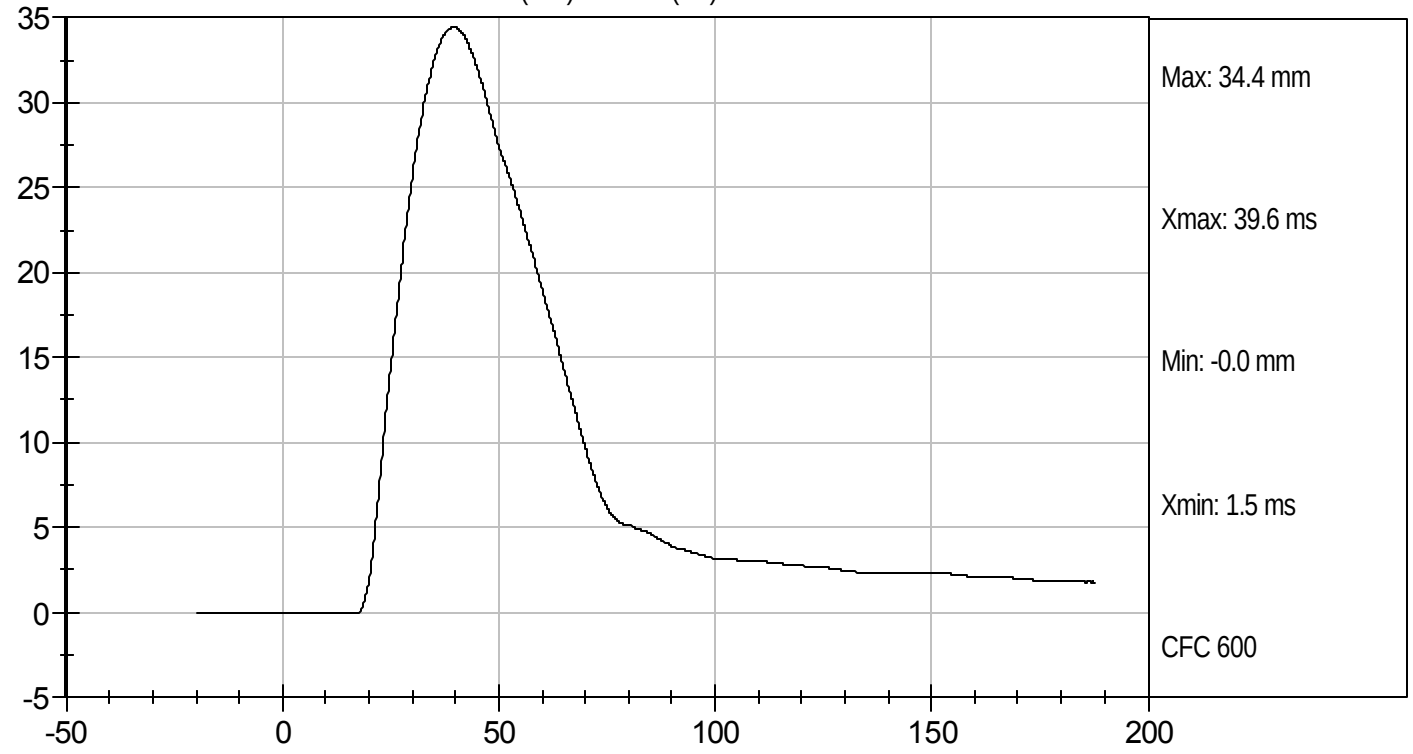
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



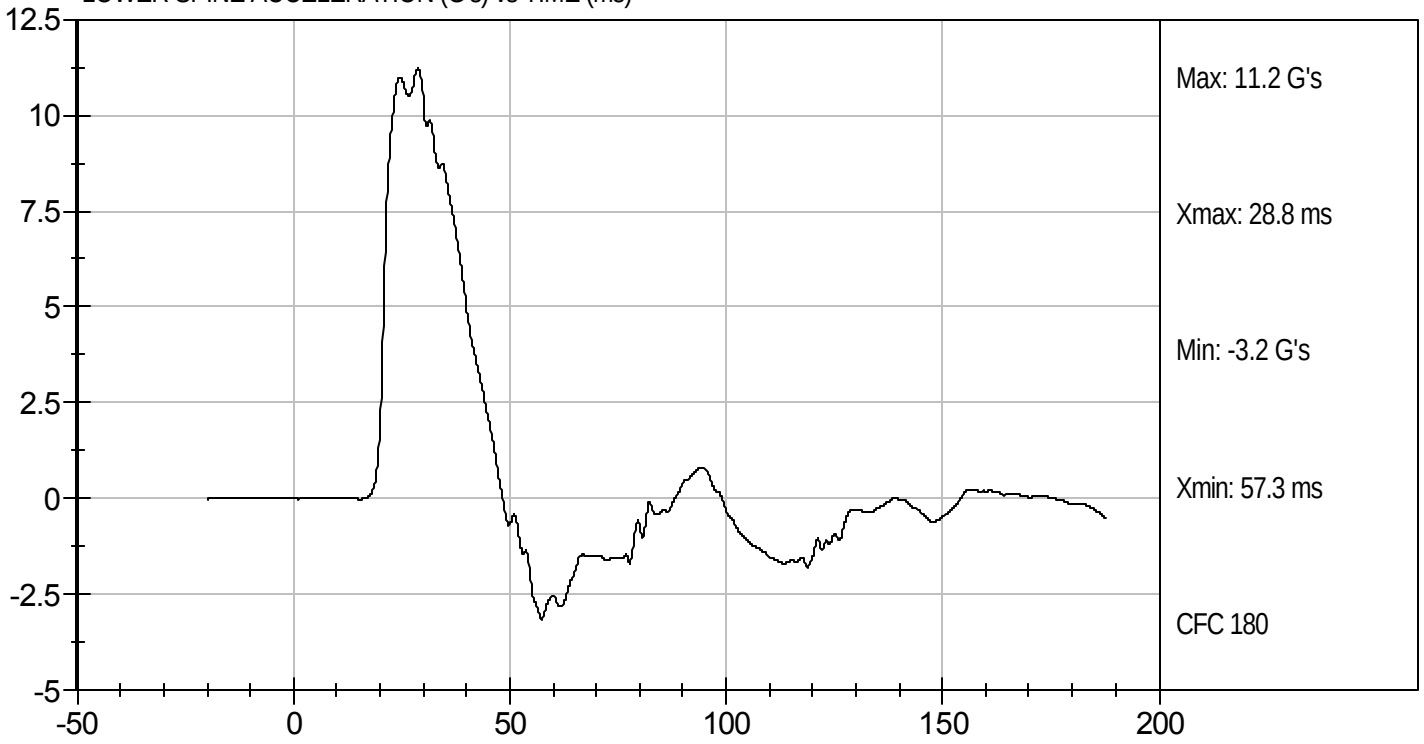
Test Desc: Abdomen Impact
Component ID: D104316

Test Date: 12/8/10
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:** D104317

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	12	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	37	Pass
Peak Acetabulum Force	N	3600 to 4300	4075	Pass
		Overall Test Results		Pass

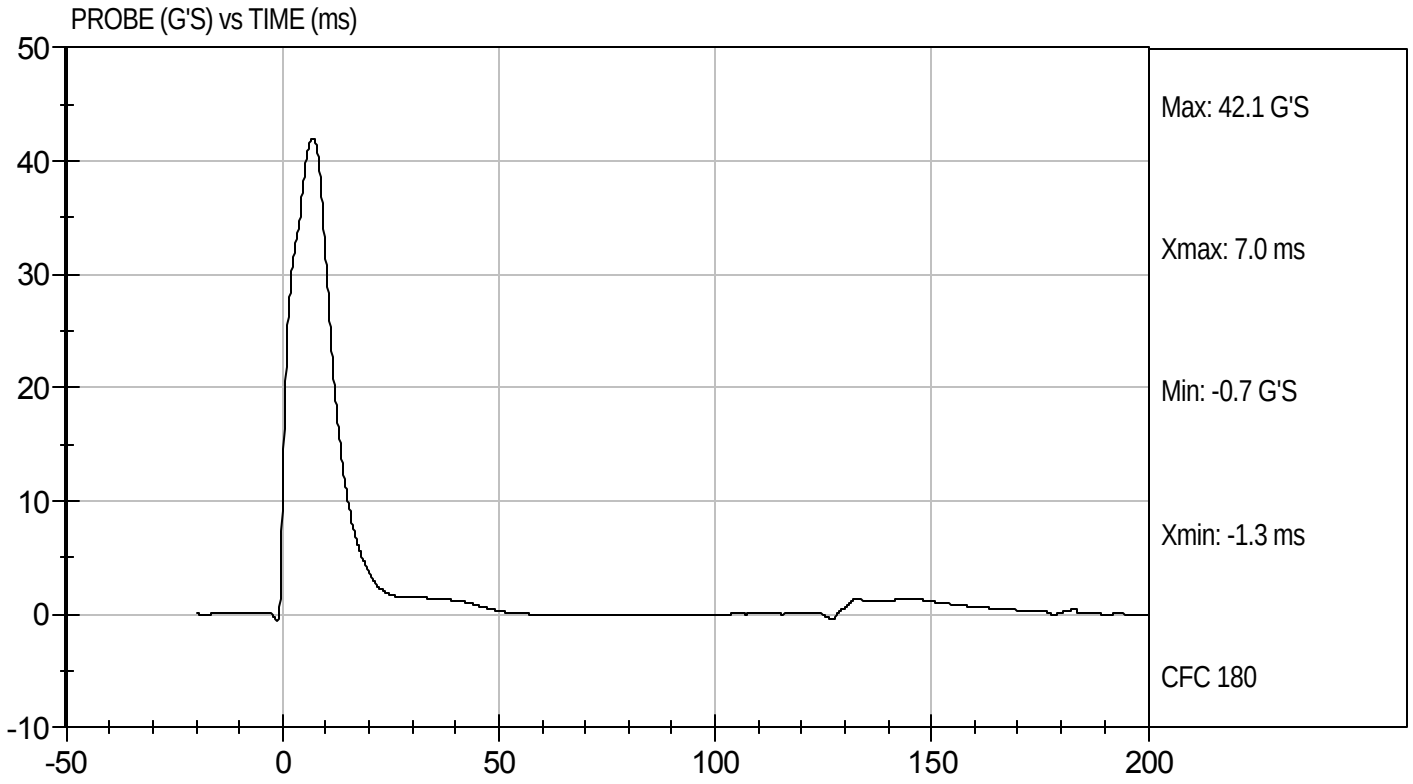
Jessica Gall
Laboratory Technician

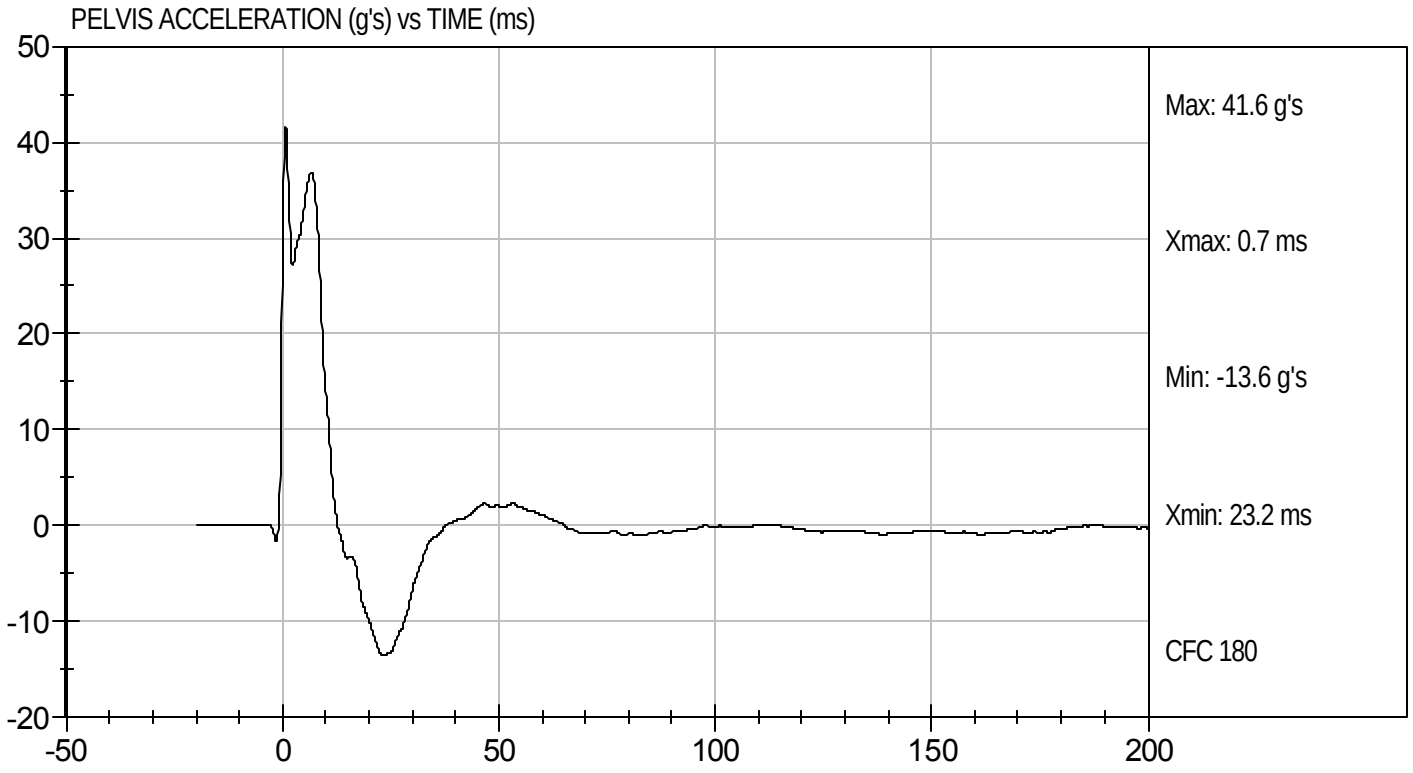
12/9/10
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D104317

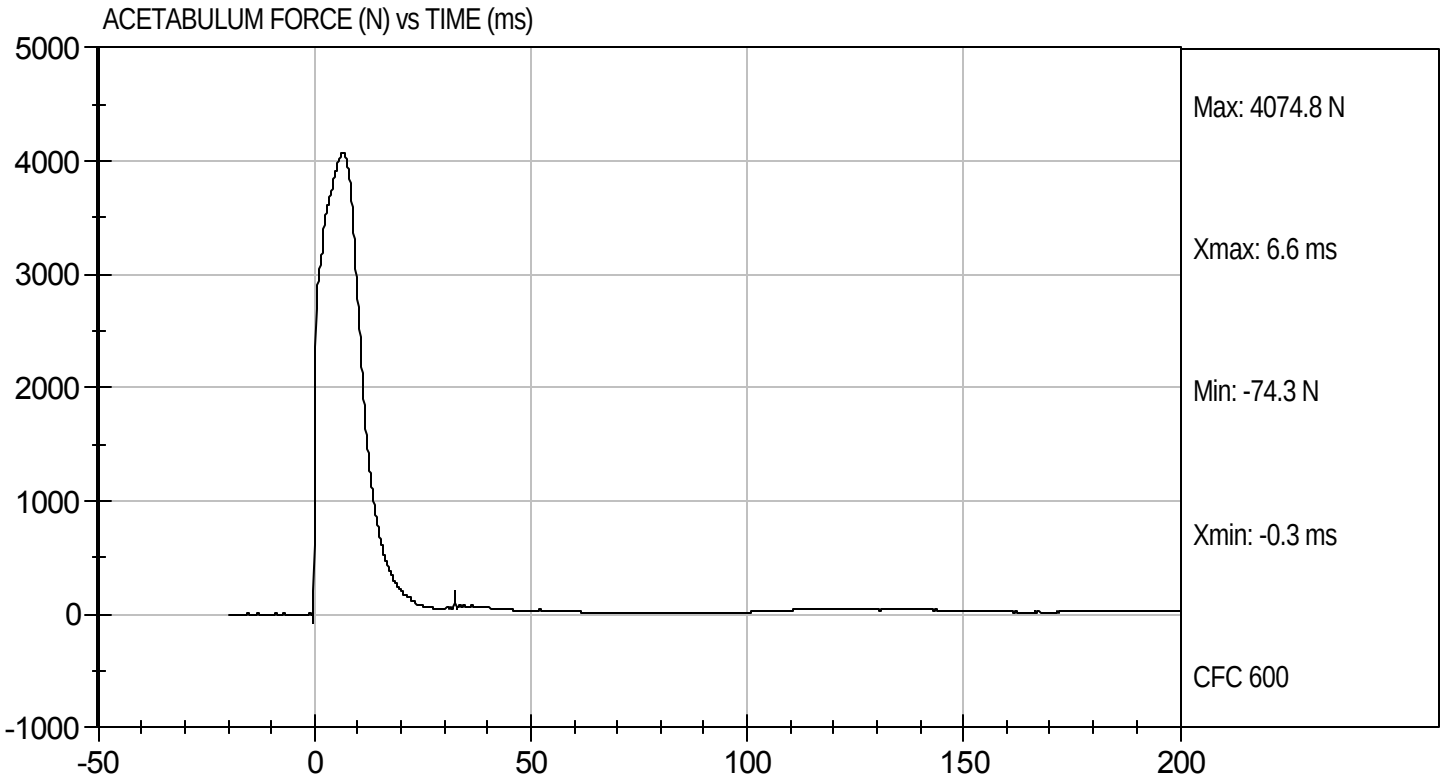
Test Date: 12/9/10
Velocity: 21.90 ft/s, 6.68 m/s





Test Desc: Pelvis Impact
Component ID: D104317

Test Date: 12/9/10
Velocity: 21.90 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D104318

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	12	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	41	Pass
Pelvis Y Acceleration	G's	28 to 39	33	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	5040	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

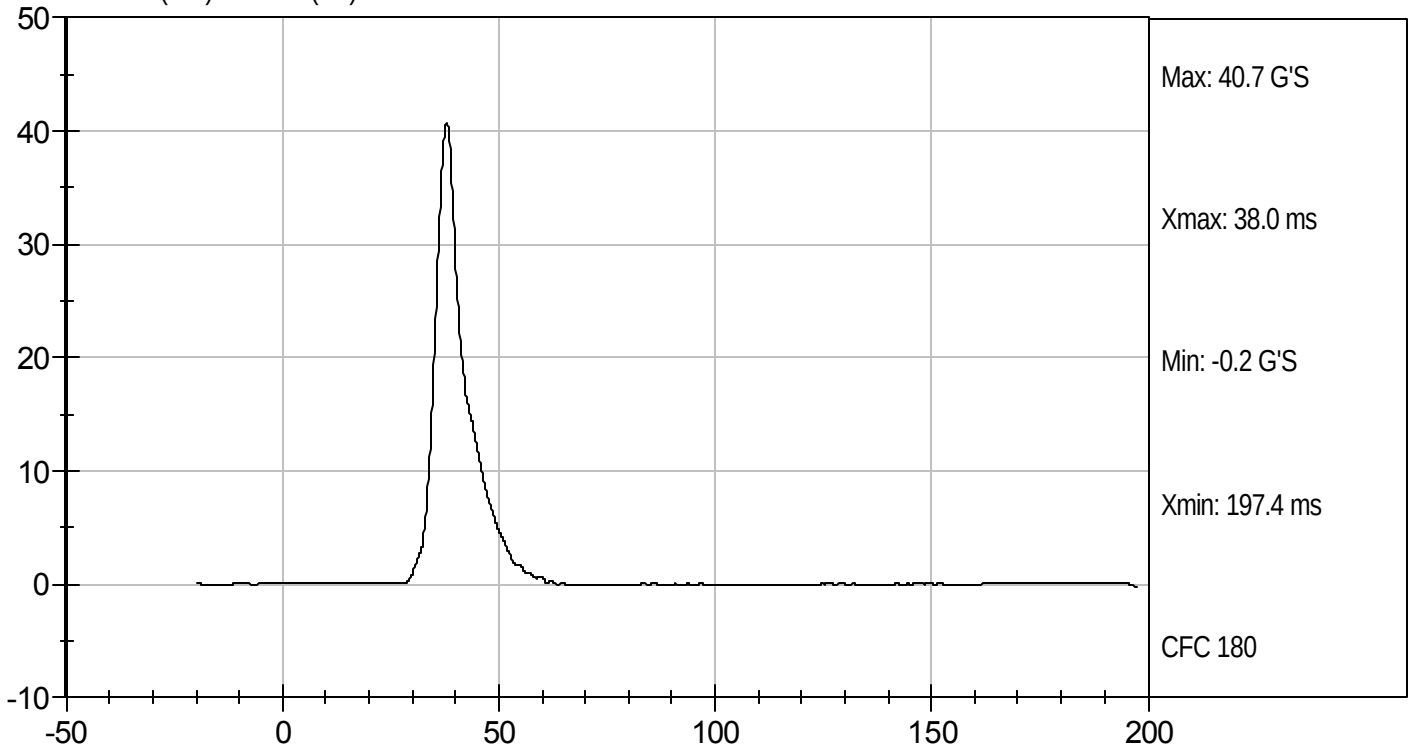
12/9/10
Test Date

David Winkelbauer
Approved By

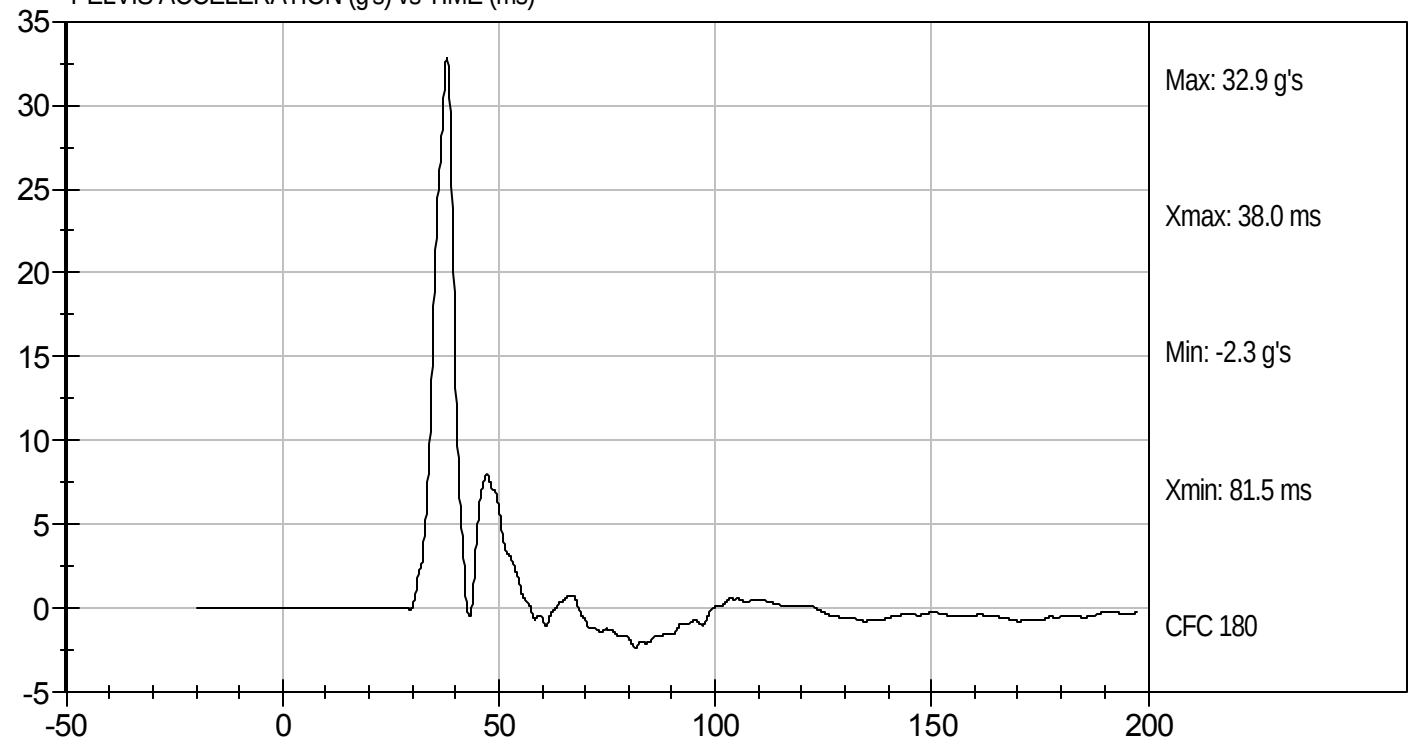
Test Desc: Iliac Impact
Component ID: D104318

Test Date: 12/9/10
Velocity: 14.37 ft/s, 4.38 m/s

PROBE (G'S) vs TIME (ms)

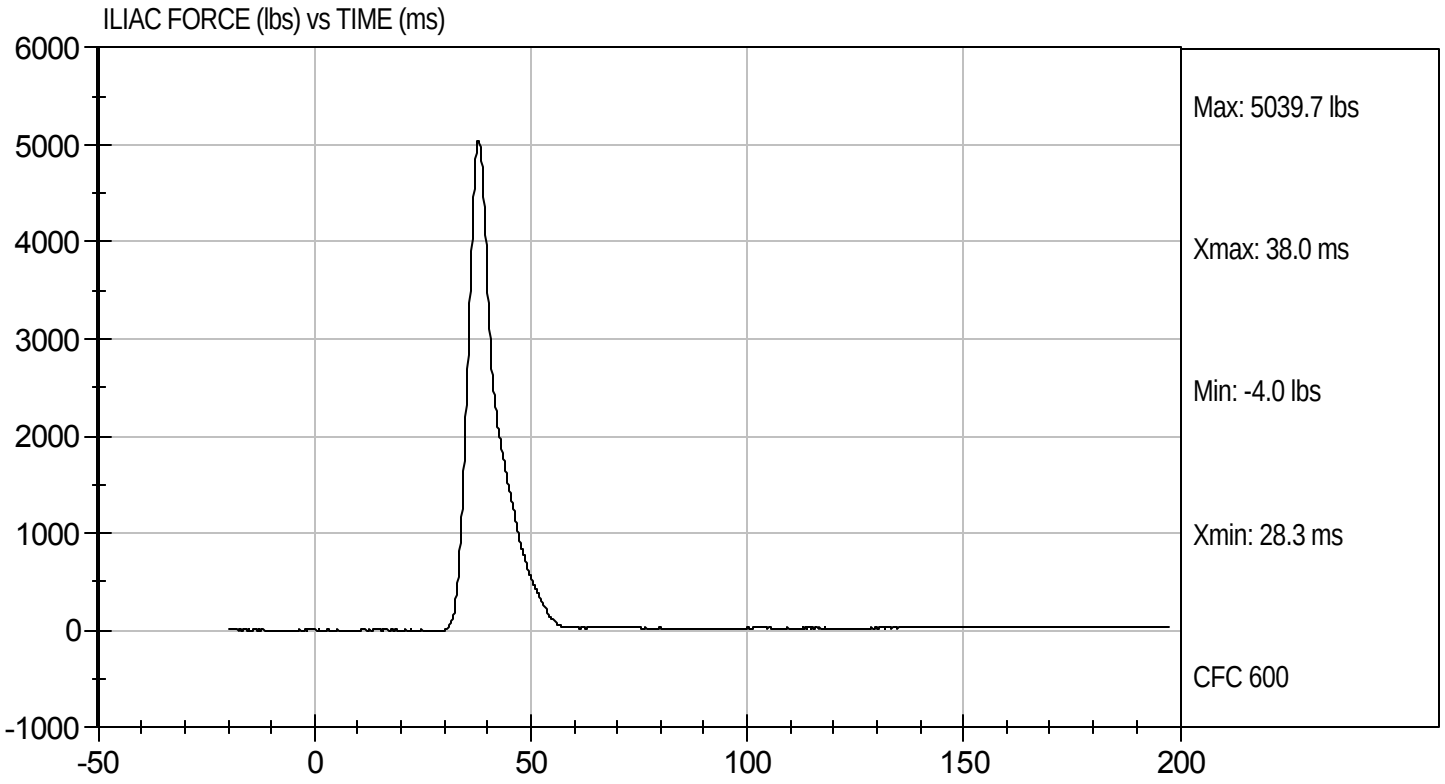


PELVIS ACCELERATION (g's) vs TIME (ms)



Test Desc: Iliac Impact
Component ID: D104318

Test Date: 12/9/10
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:** D104501

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	15	Pass
Peak Resultant Acceleration	G's	115 to 137	118	Pass
Peak Lateral Acceleration	G's	+/- 15	-6.1	Pass
Unimodal	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

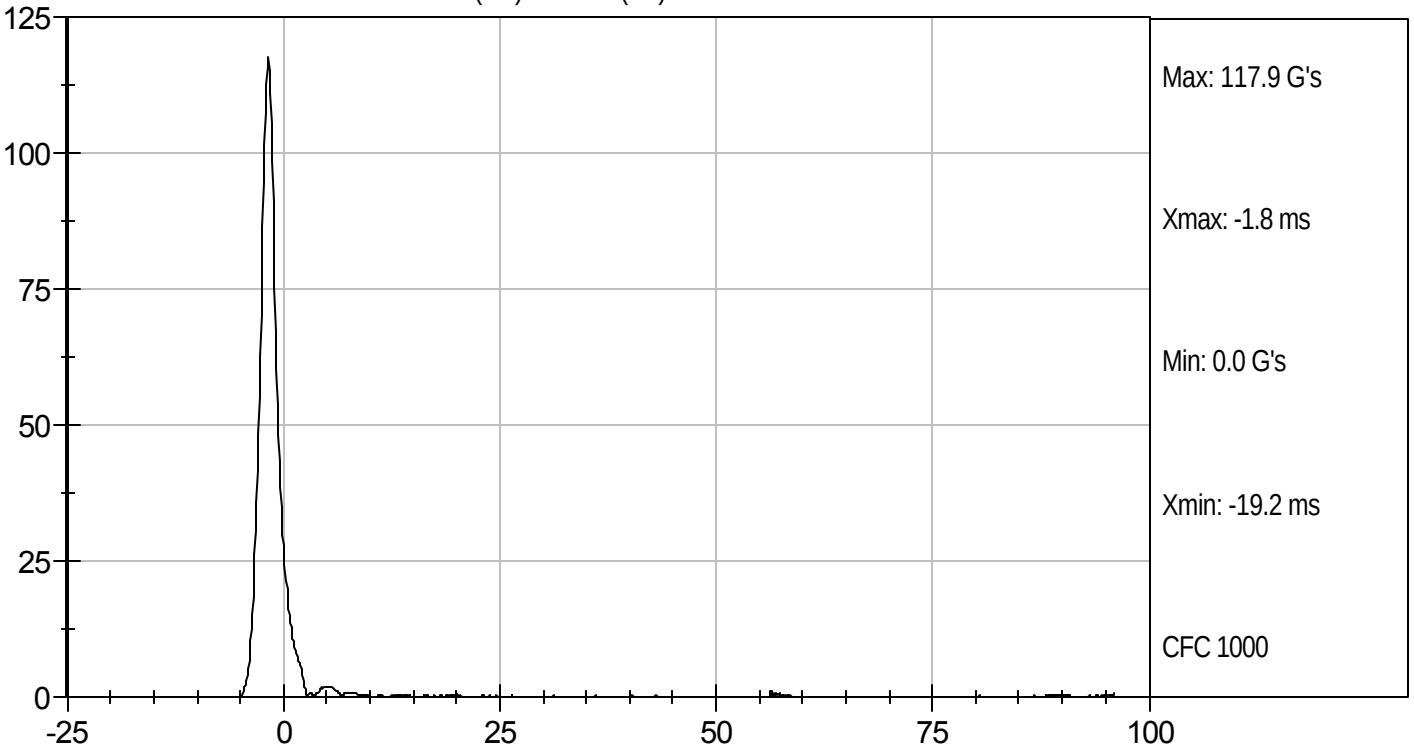
12/17/10
Test Date

David Winkelbauer
Approved By

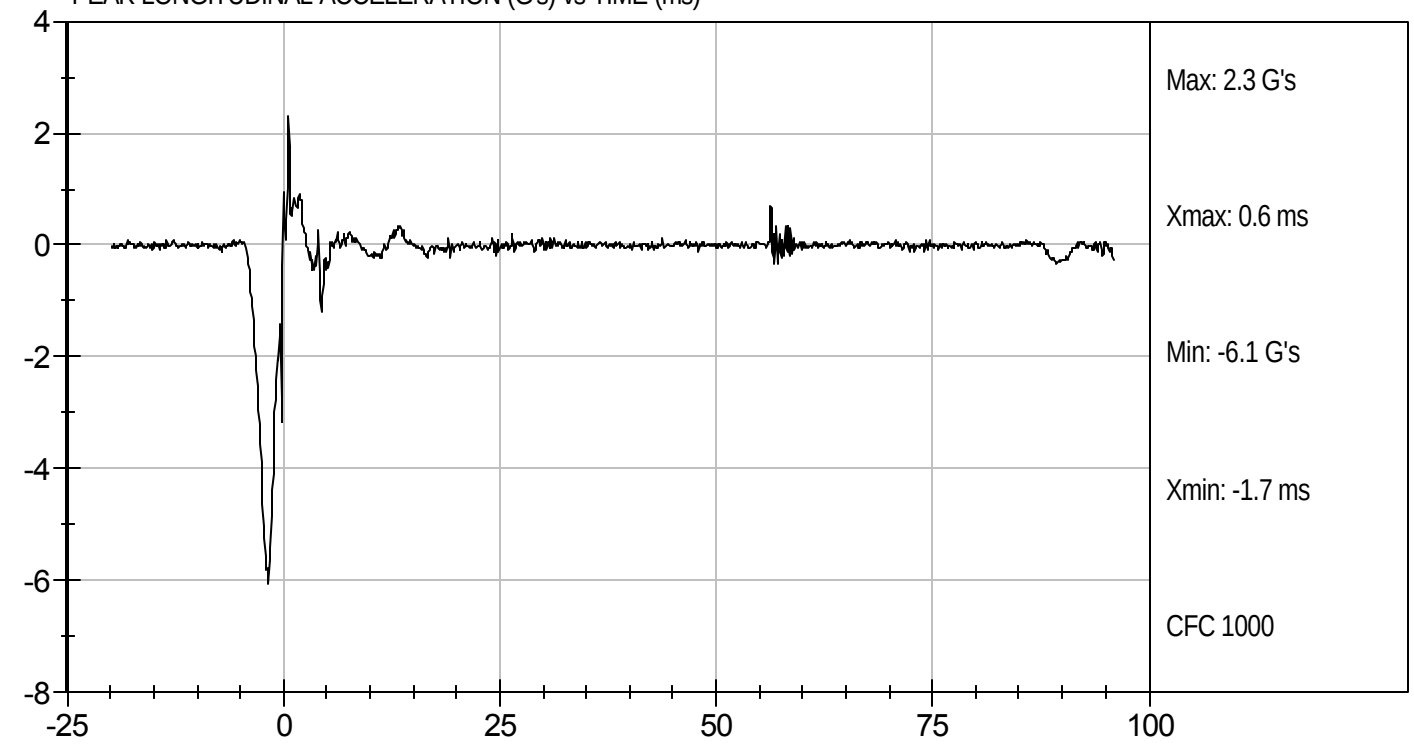
Test Desc: Head Drop
Component ID: D104501

Test Date: 12/17/10
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:** D104502

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.6	Pass
Humidity		%	10 to 70	15	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.40	Pass
	15 ms	m/s	3.30 to 4.10	3.41	Pass
	20 ms	m/s	4.40 to 5.40	4.58	Pass
	25 ms	m/s	5.40 to 6.10	5.46	Pass
	25-100 ms	m/s	5.50 to 6.20	5.51	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	62	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	117	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

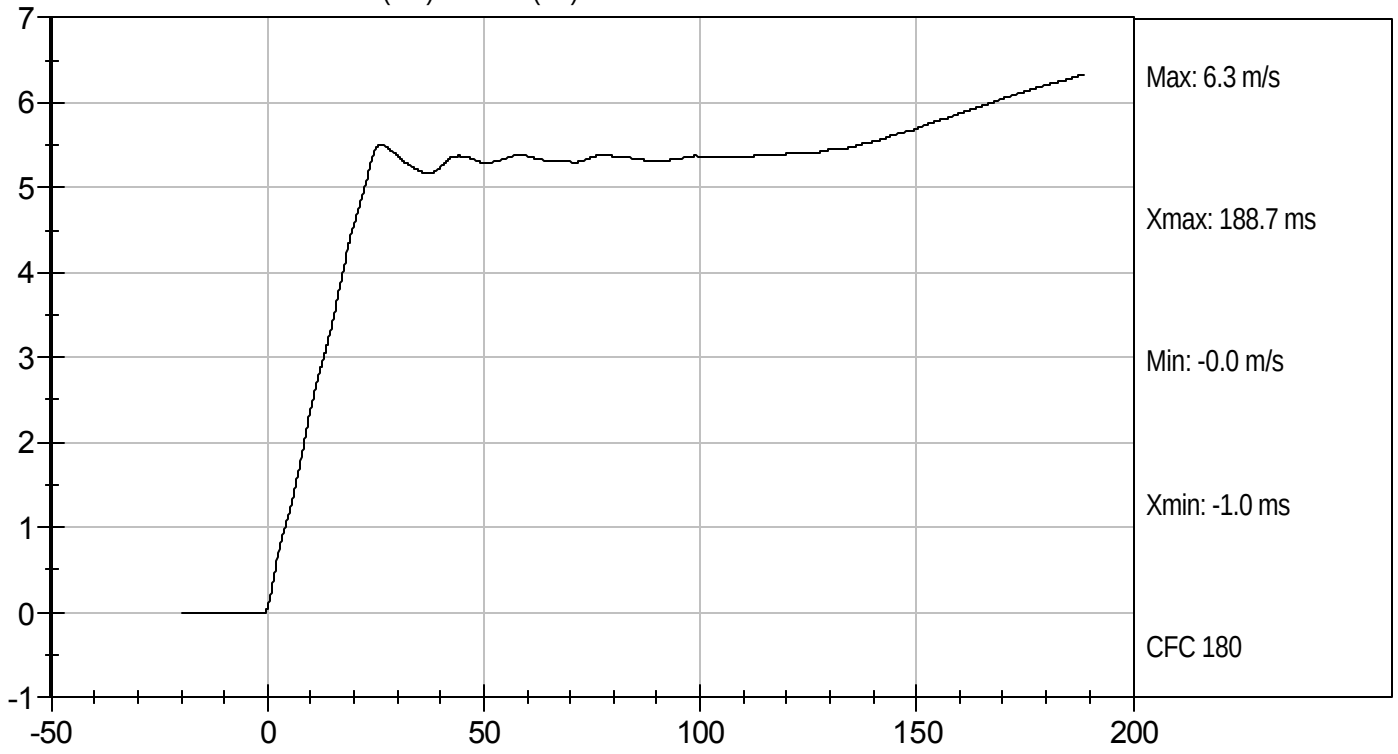
12/17/10
Test Date

David Winkelbauer
Approved By

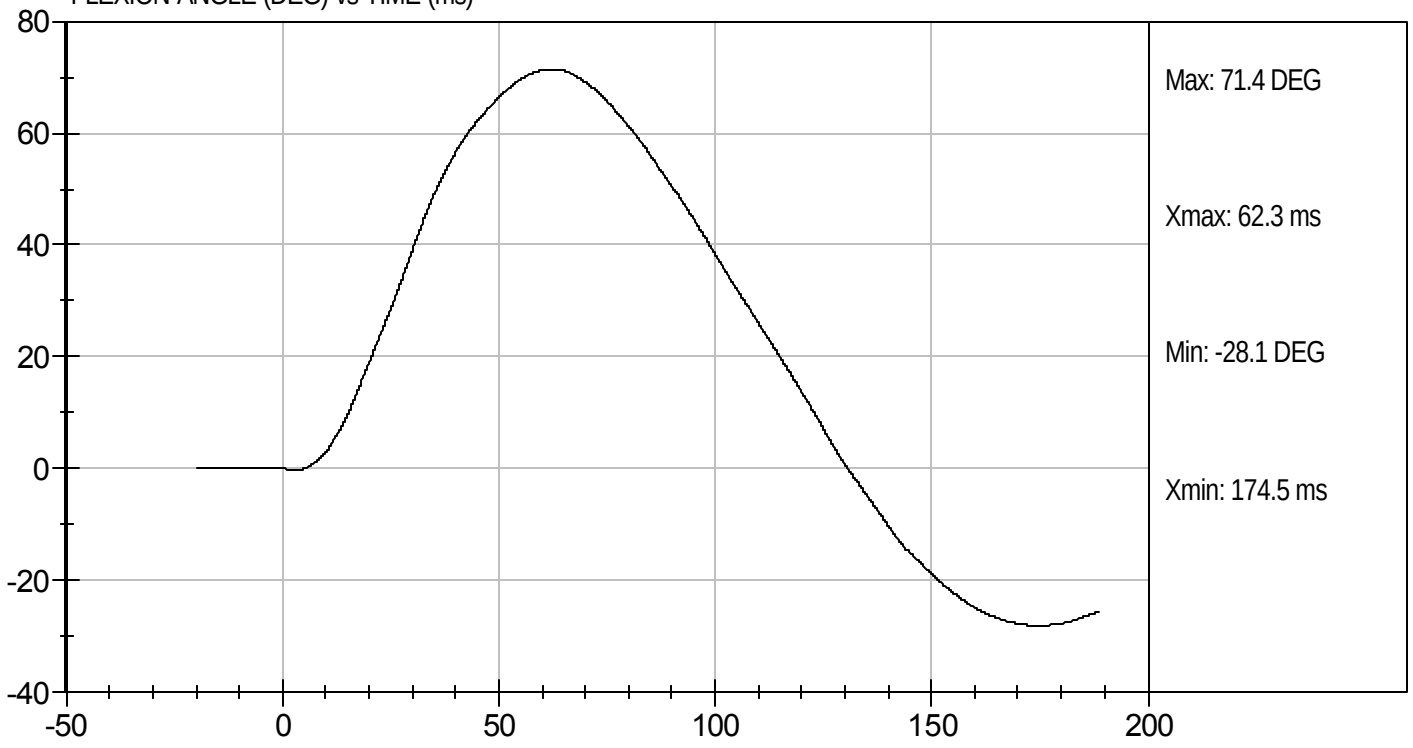
Test Desc: Neck Bending
Component ID: D104502

Test Date: 12/17/10
Velocity: 0 ft/s, 0 m/s

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

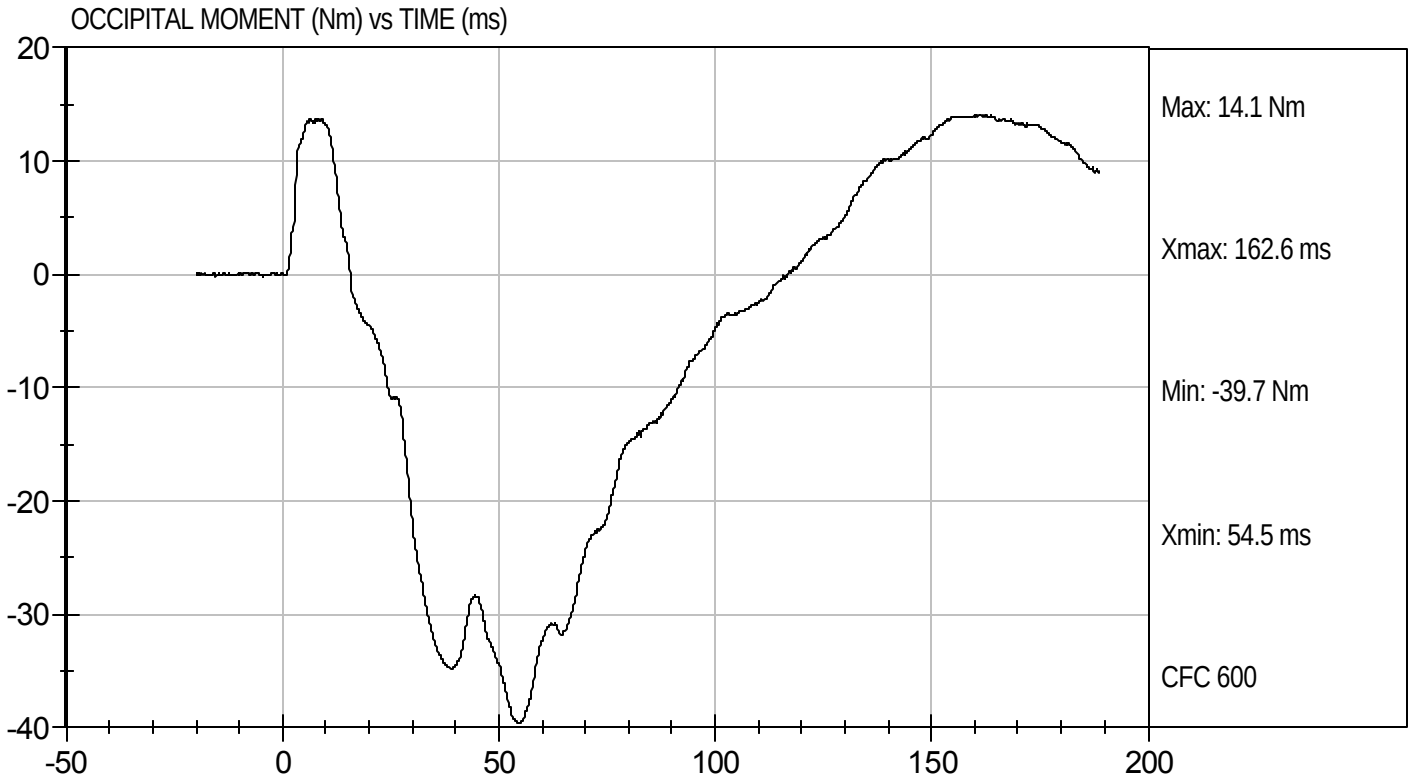


FLEXION ANGLE (DEG) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D104502

Test Date: 12/17/10
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test ID:** D104503

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	11	Pass
Impact Velocity	m/s	4.20 to 4.40	4.39	Pass
Maximum Probe Acceleration	G's	13 to 18	16	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

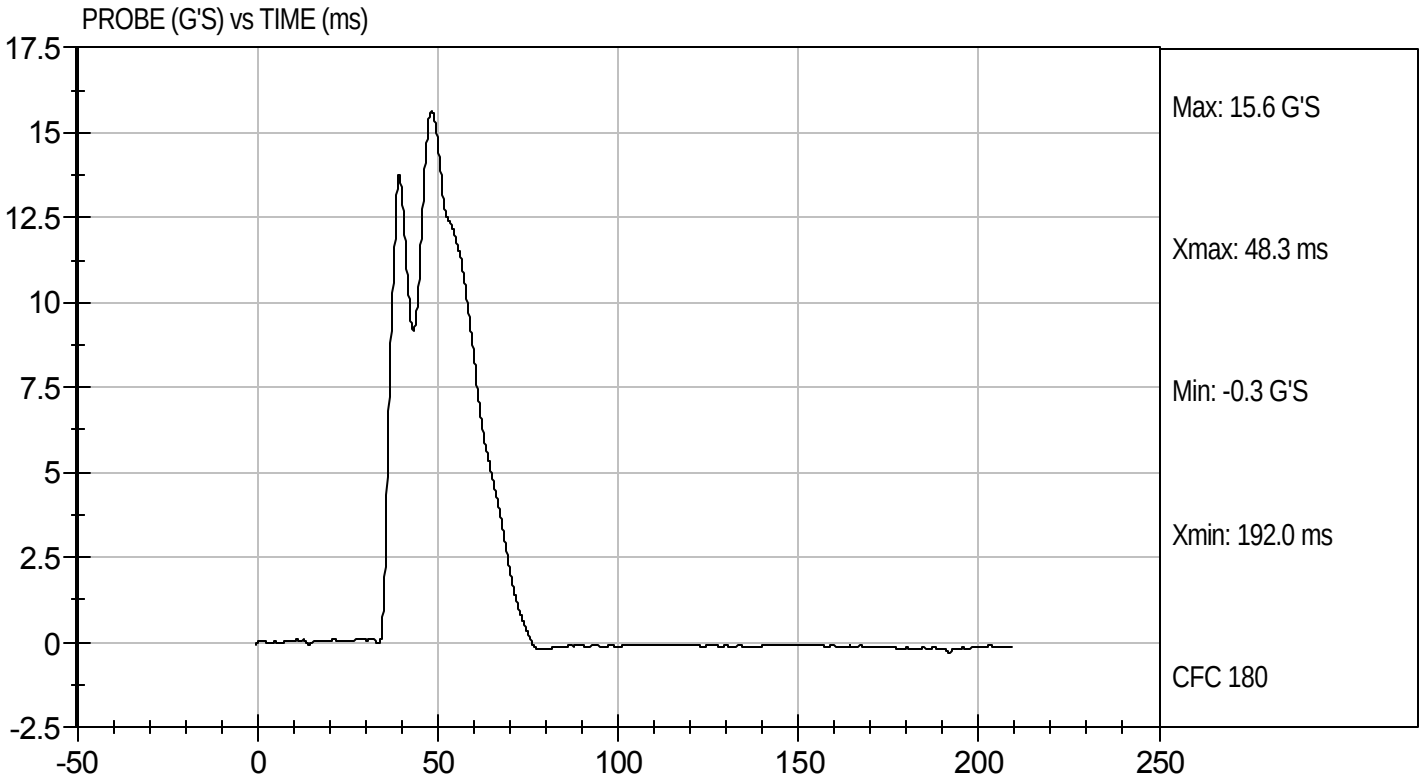
Jessica Gall
Laboratory Technician

12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D104503

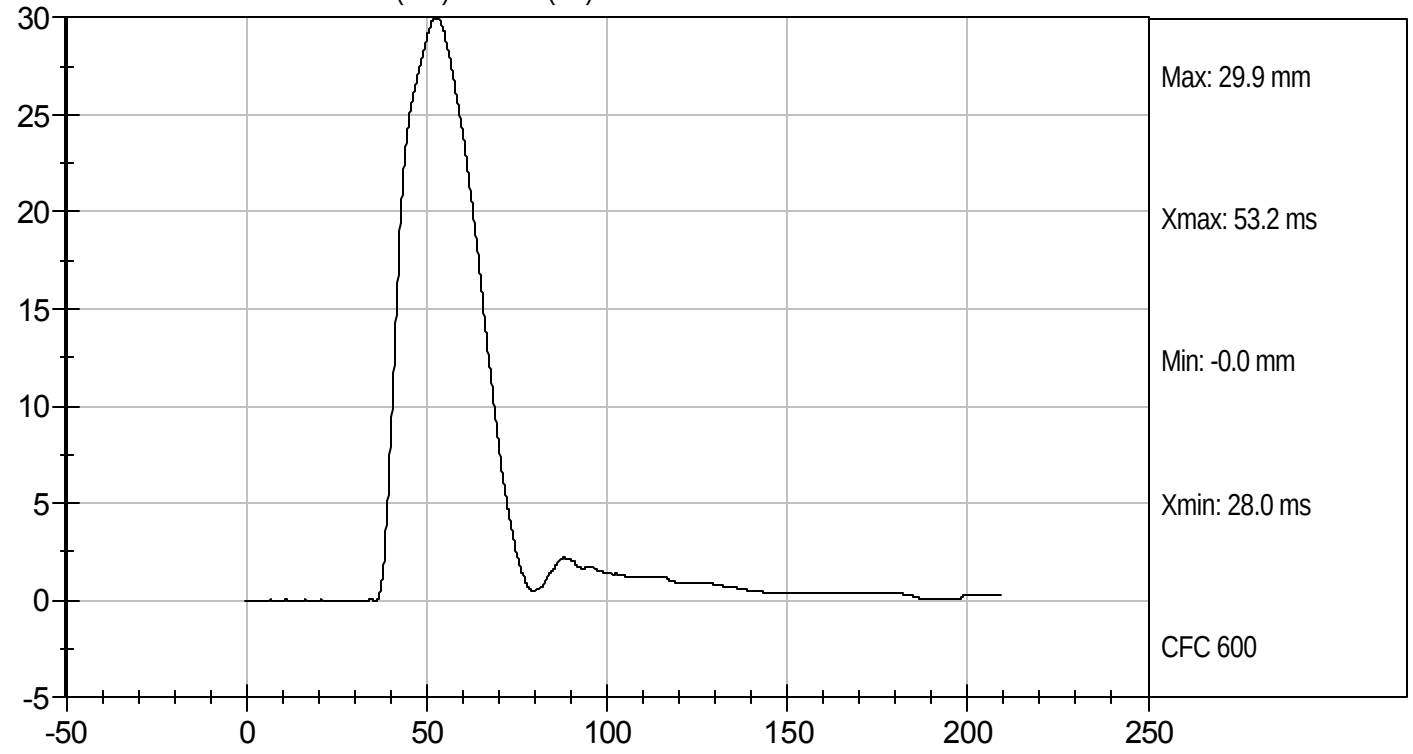
Test Date: 12/20/10
Velocity: 14.40 ft/s, 4.39 m/s



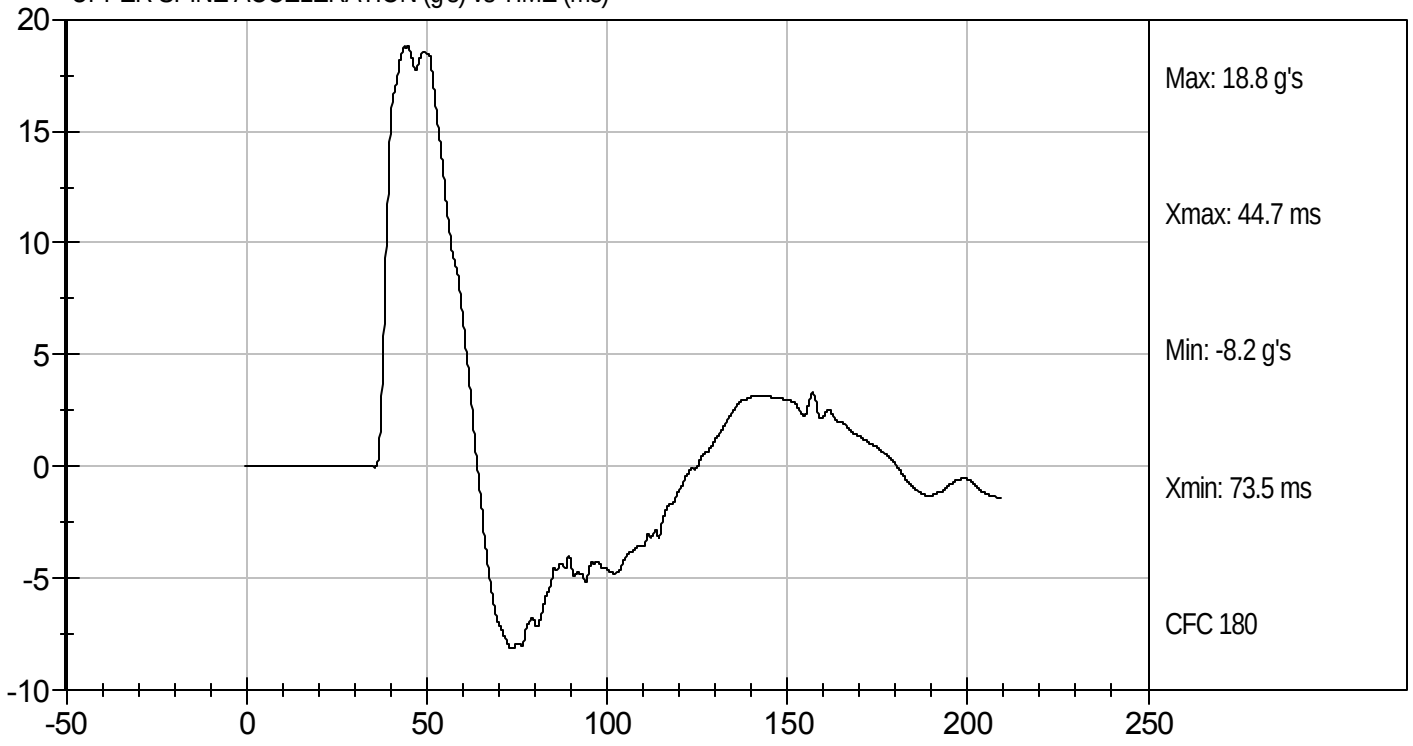
Test Desc: Shoulder Impact
Component ID: D104503

Test Date: 12/20/10
Velocity: 14.40 ft/s, 4.39 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:** D104504

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	11	Pass
Impact Velocity	m/s	6.60 to 6.80	6.79	Pass
Peak Impactor Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	32	Pass
Upper Rib Displacement	mm	25 to 32	26	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	39	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
		Overall Test Results		Pass

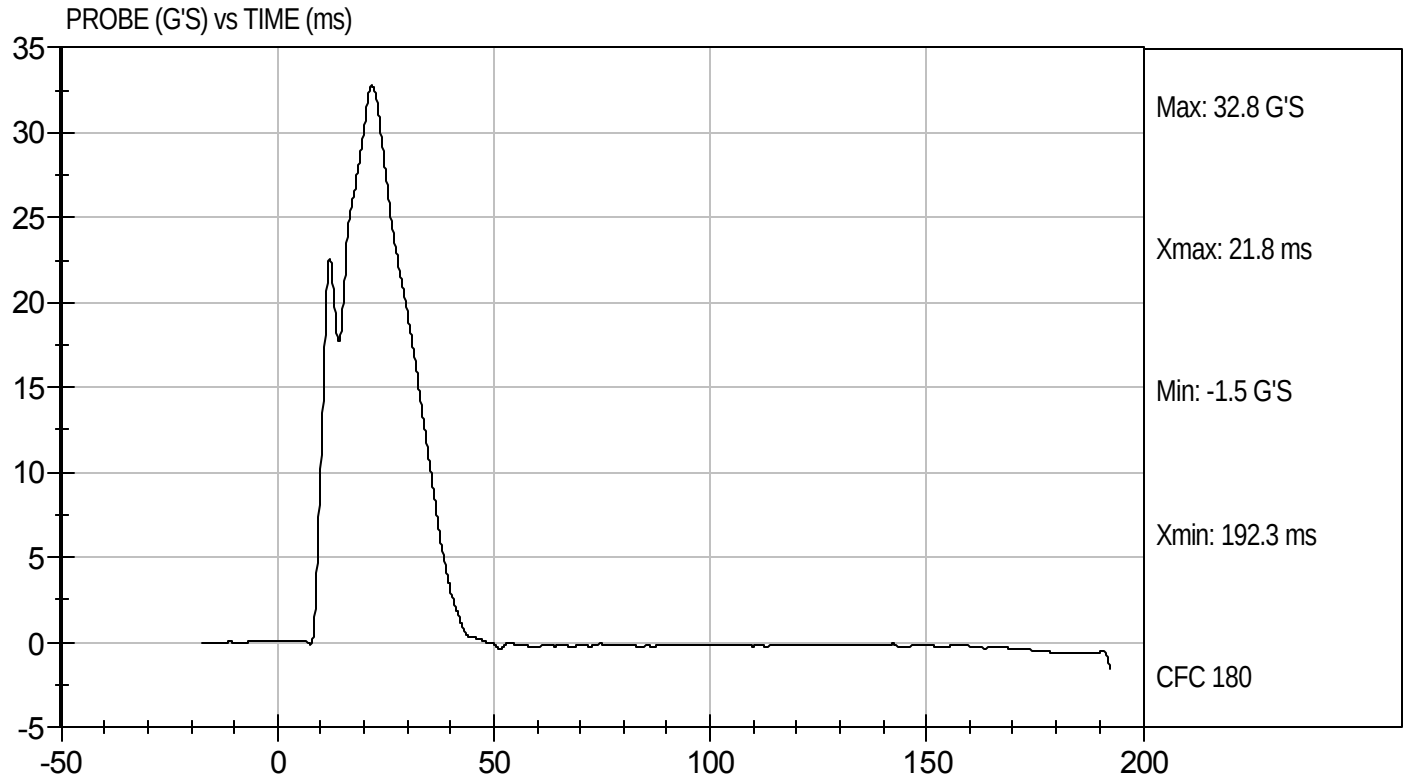
Jessica Hall
Laboratory Technician

12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax With Arm
Component ID: D104504

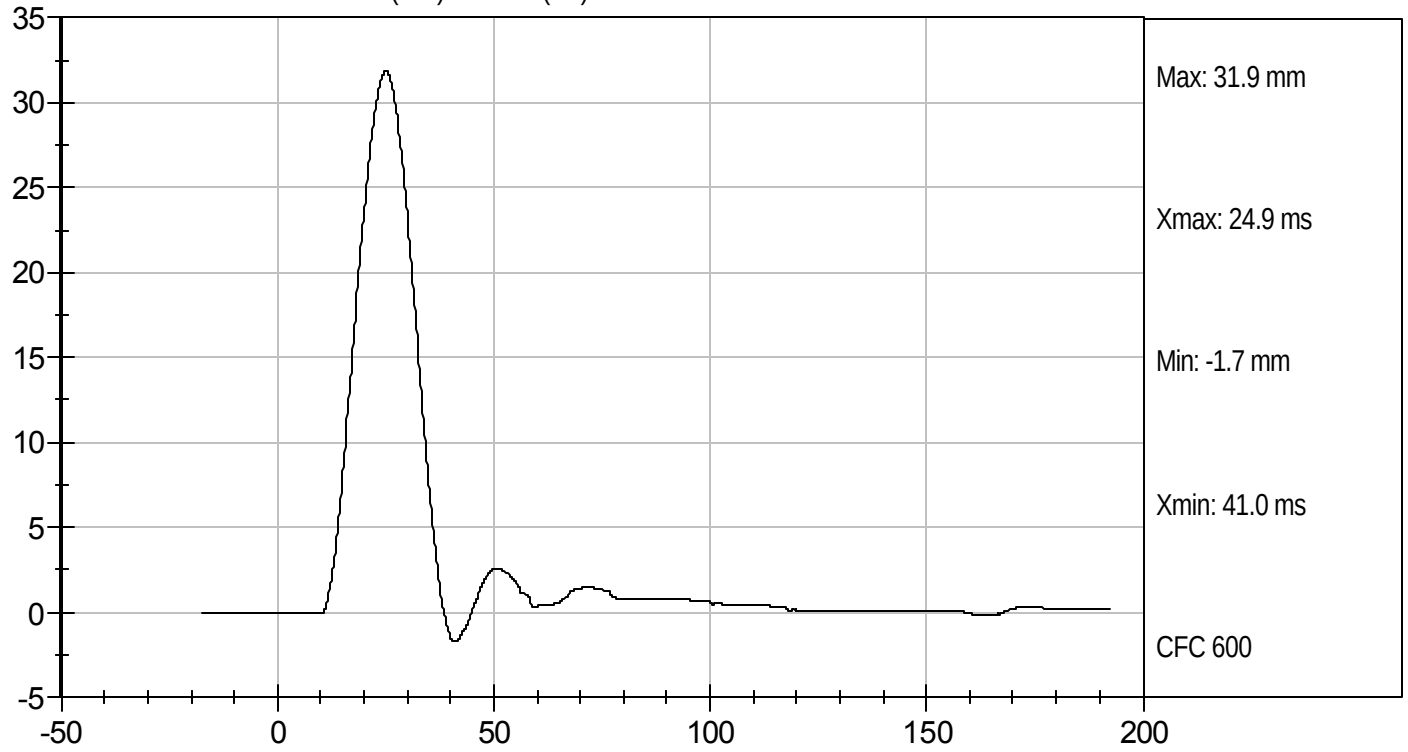
Test Date: 12/20/10
Velocity: 22.29 ft/s, 6.79 m/s



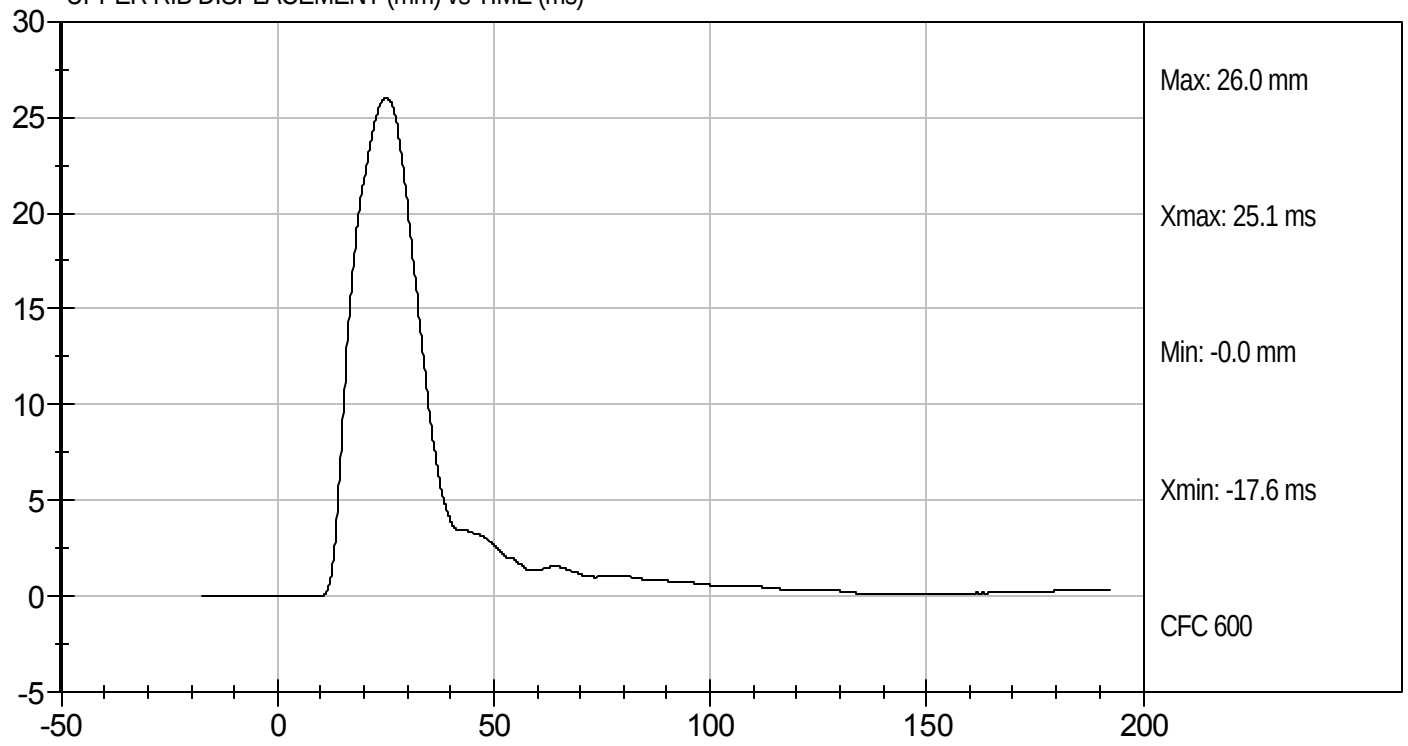
Test Desc: Thorax With Arm
Component ID: D104504

Test Date: 12/20/10
Velocity: 22.29 ft/s, 6.79 m/s

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



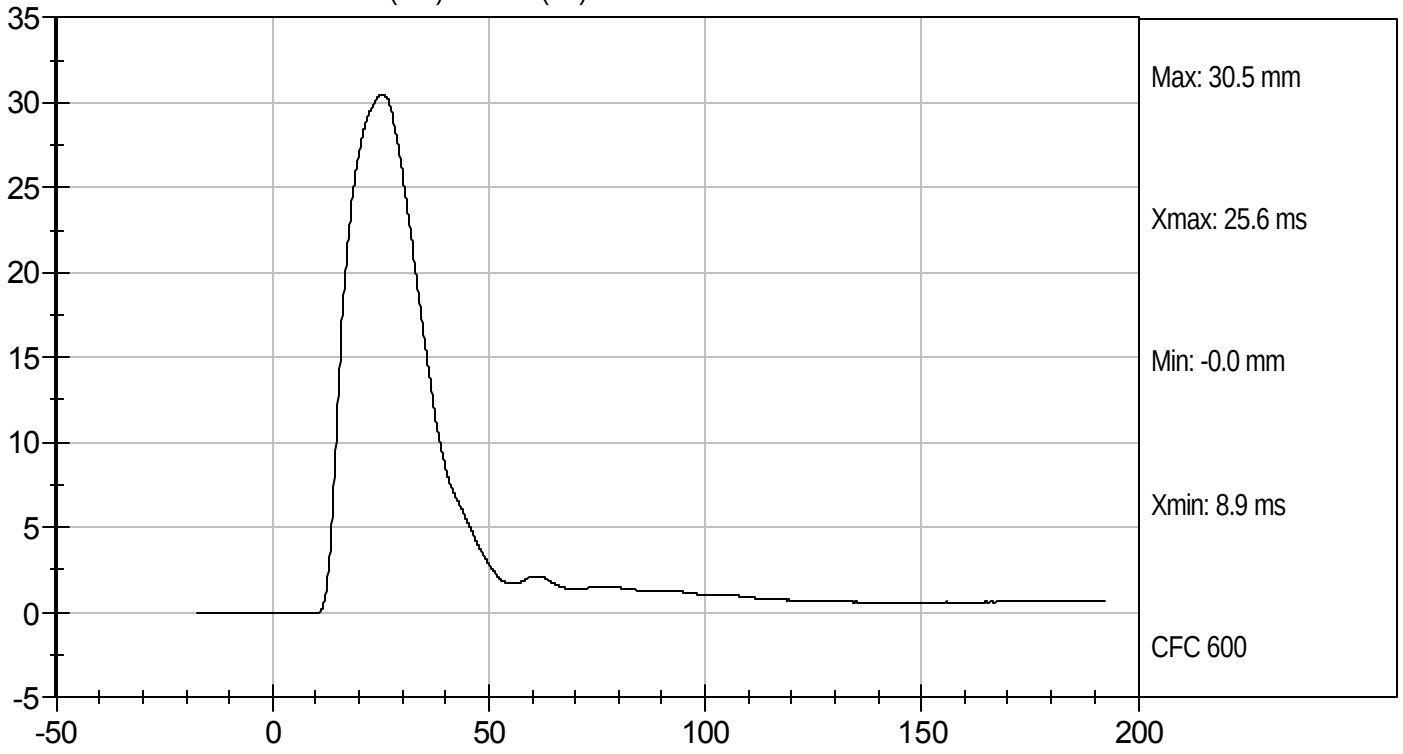
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



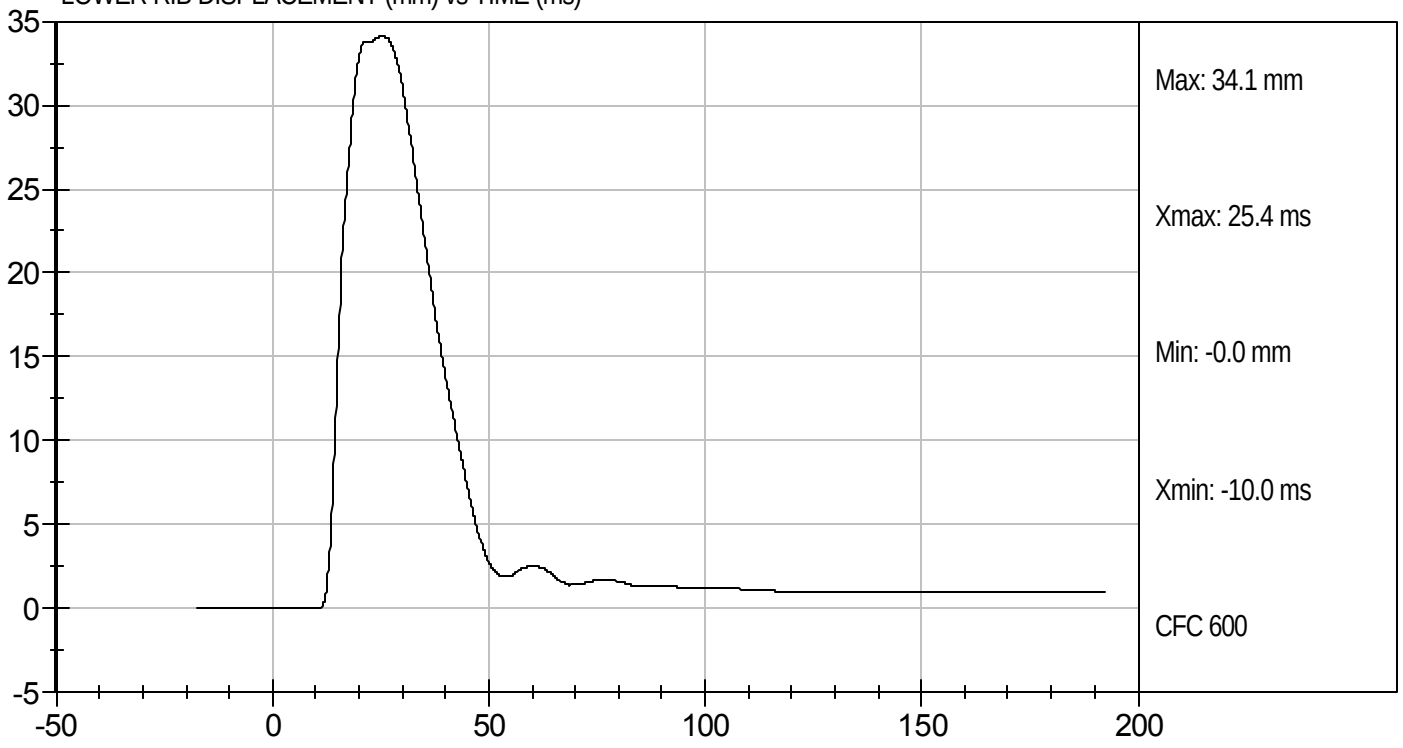
Test Desc: Thorax With Arm
Component ID: D104504

Test Date: 12/20/10
Velocity: 22.29 ft/s, 6.79 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



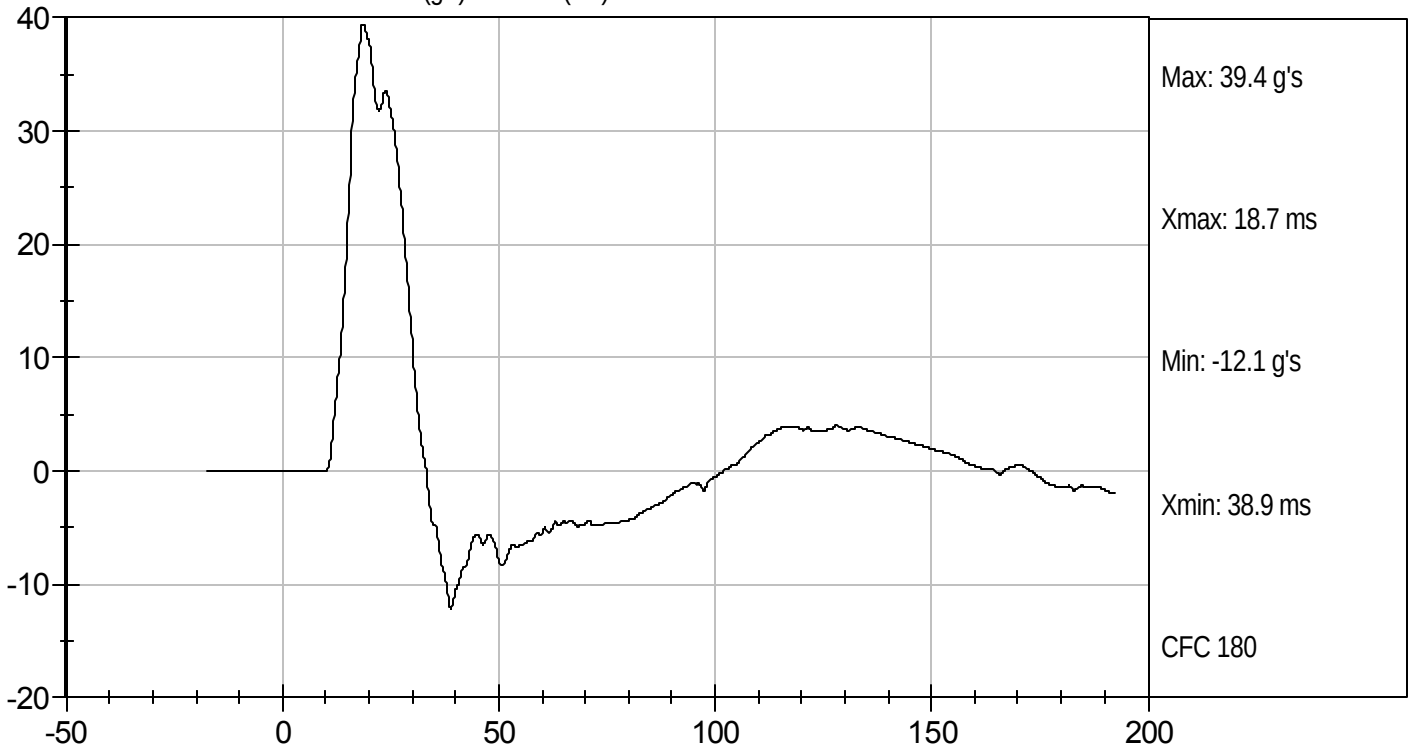
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



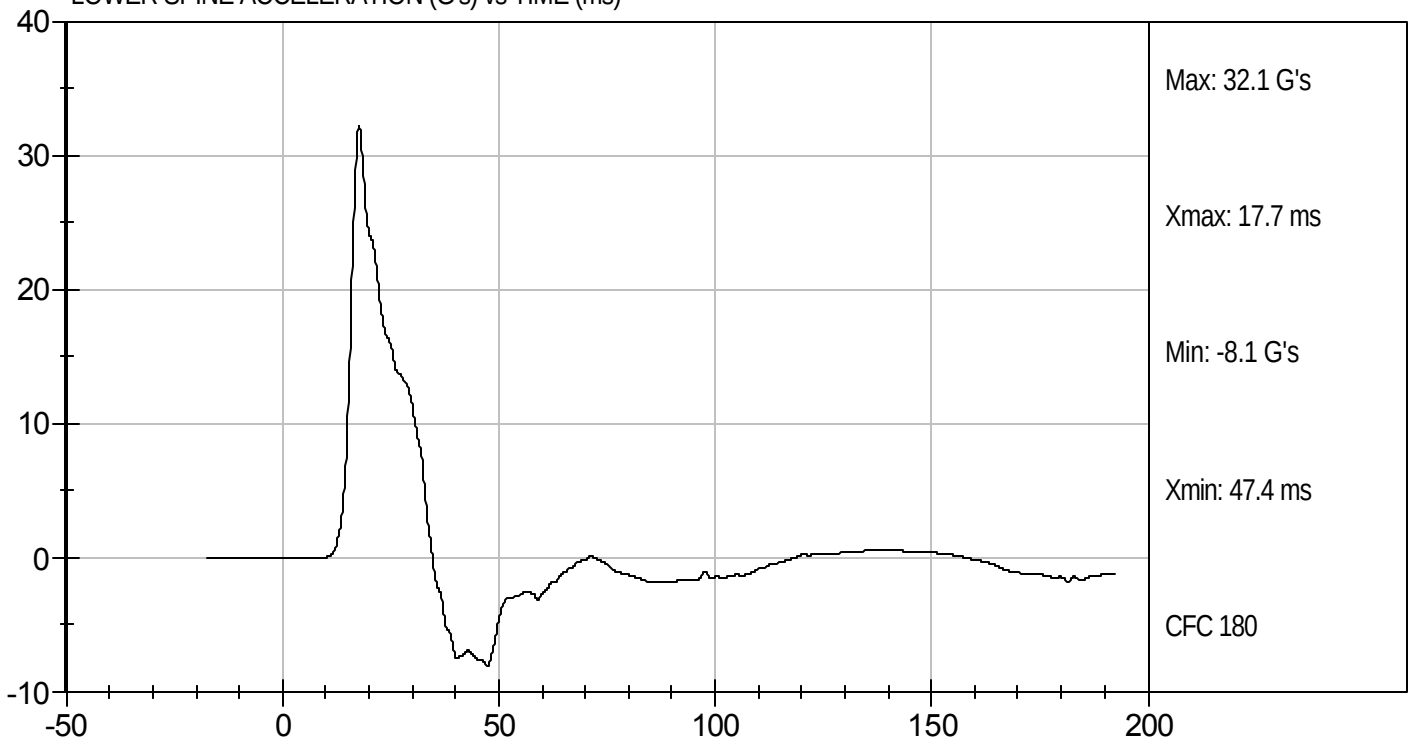
Test Desc: Thorax With Arm
Component ID: D104504

Test Date: 12/20/10
Velocity: 22.29 ft/s, 6.79 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:** D104505

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	12	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Force	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	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

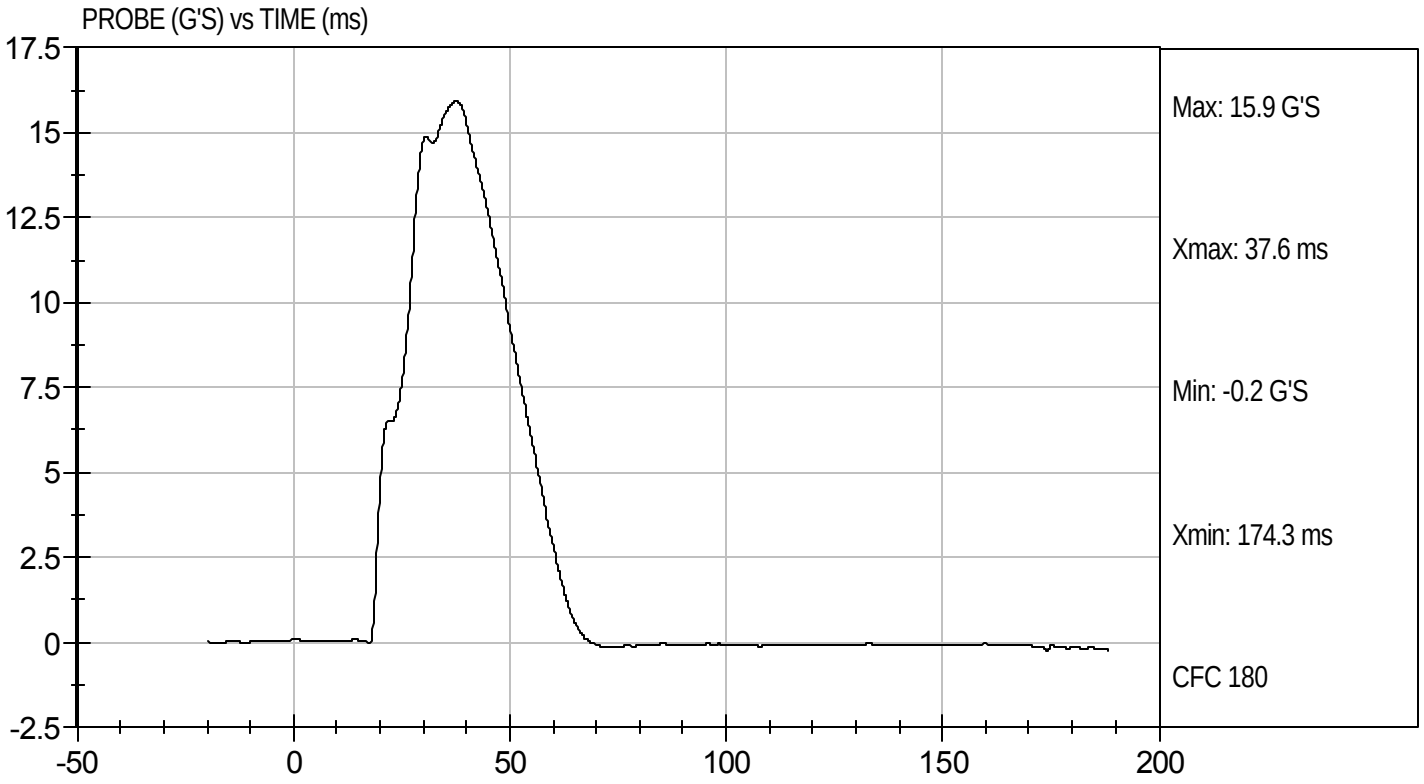
Jessica Hall
Laboratory Technician

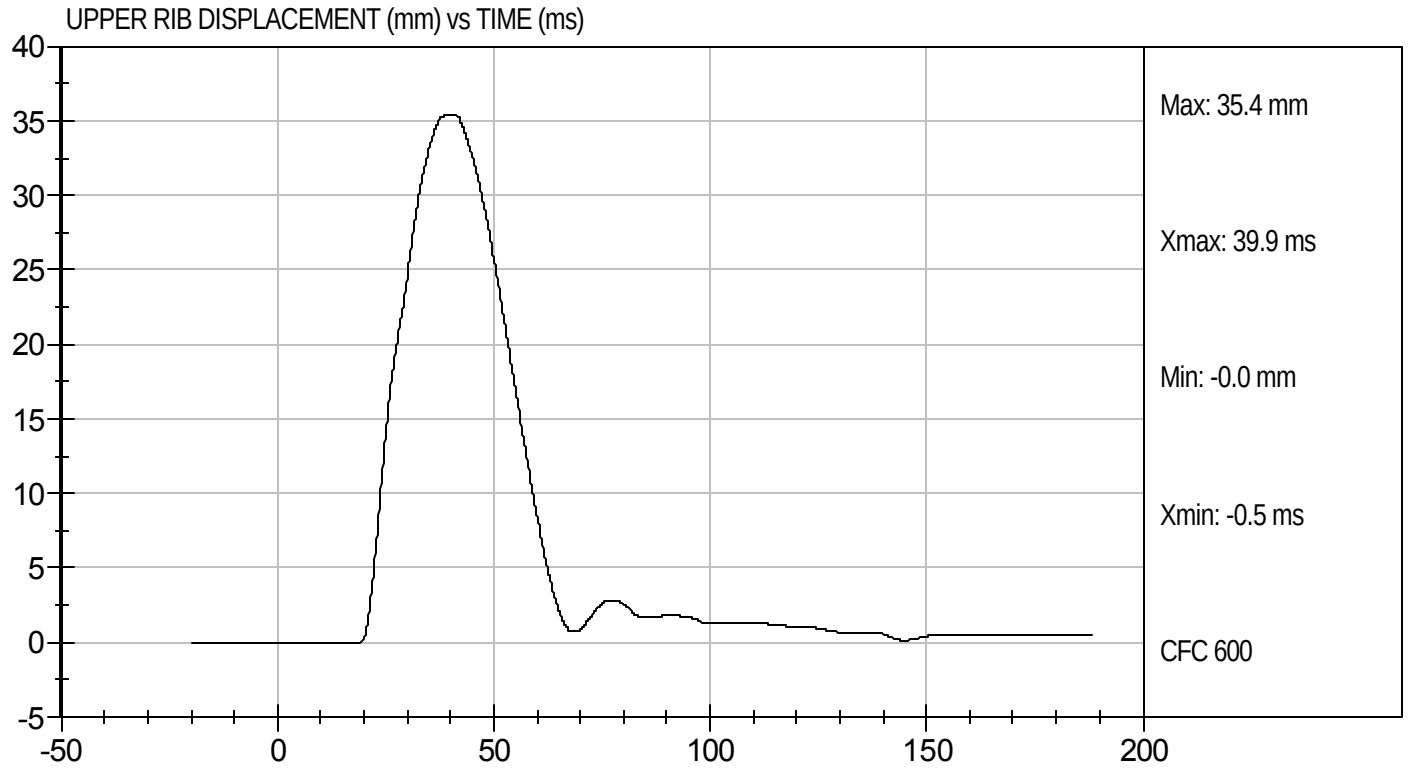
12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Without Arm
Component ID: D104505

Test Date: 12/20/10
Velocity: 14.37 ft/s, 4.38 m/s

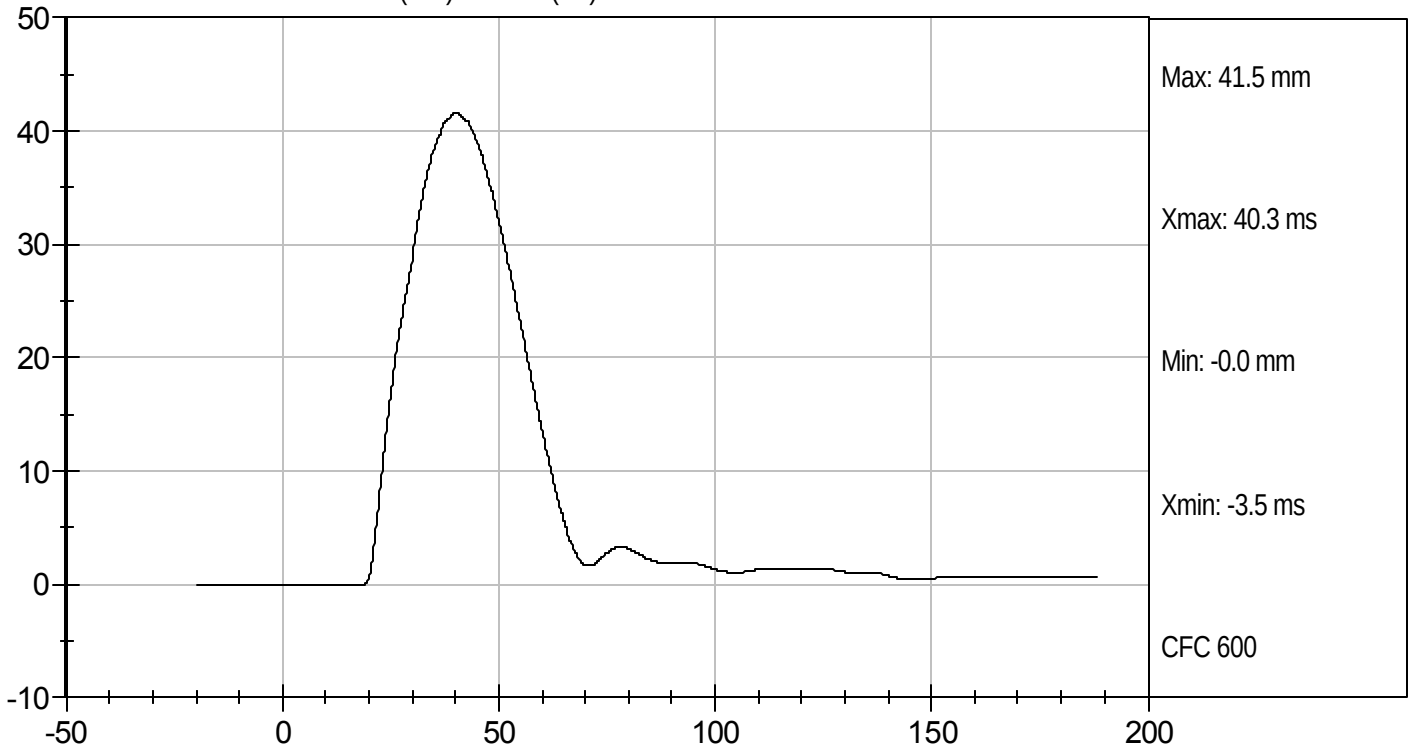




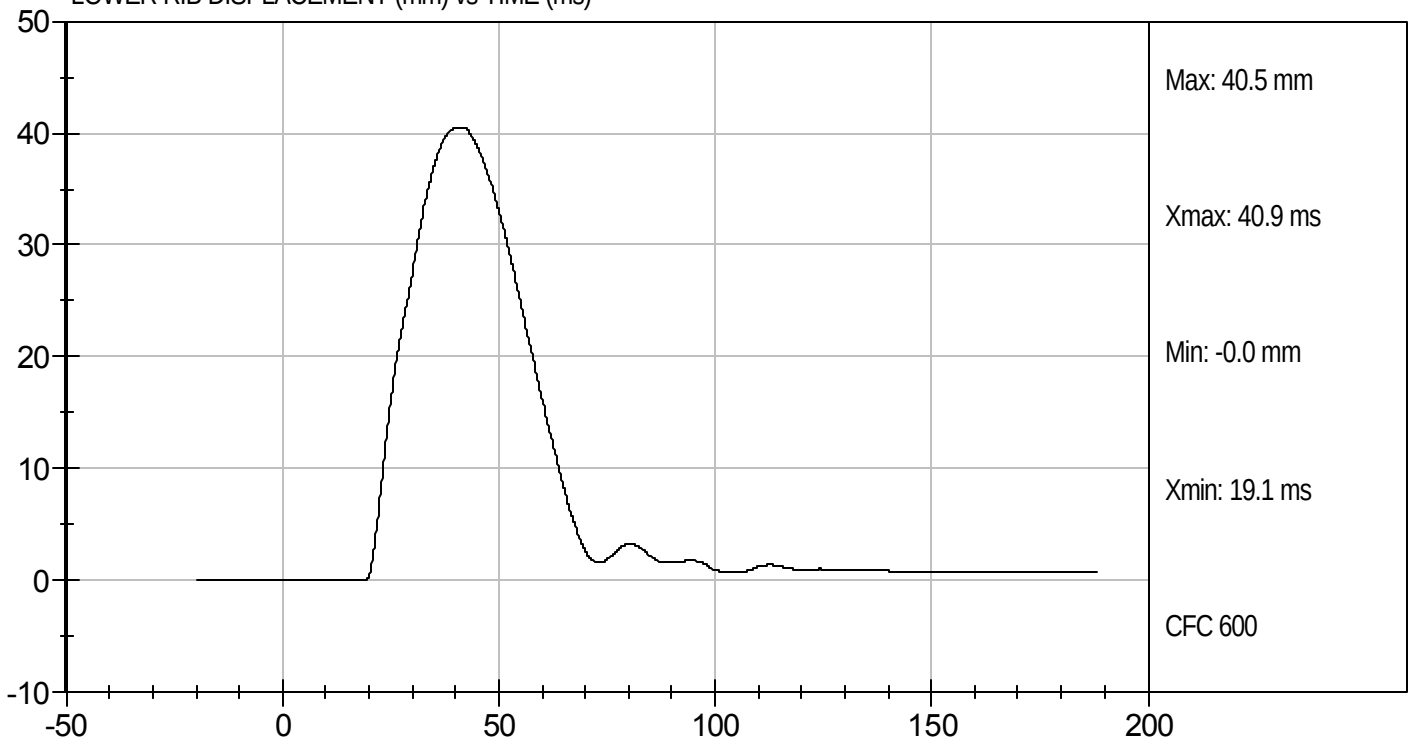
Test Desc: Thorax Without Arm
Component ID: D104505

Test Date: 12/20/10
Velocity: 14.37 ft/s, 4.38 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



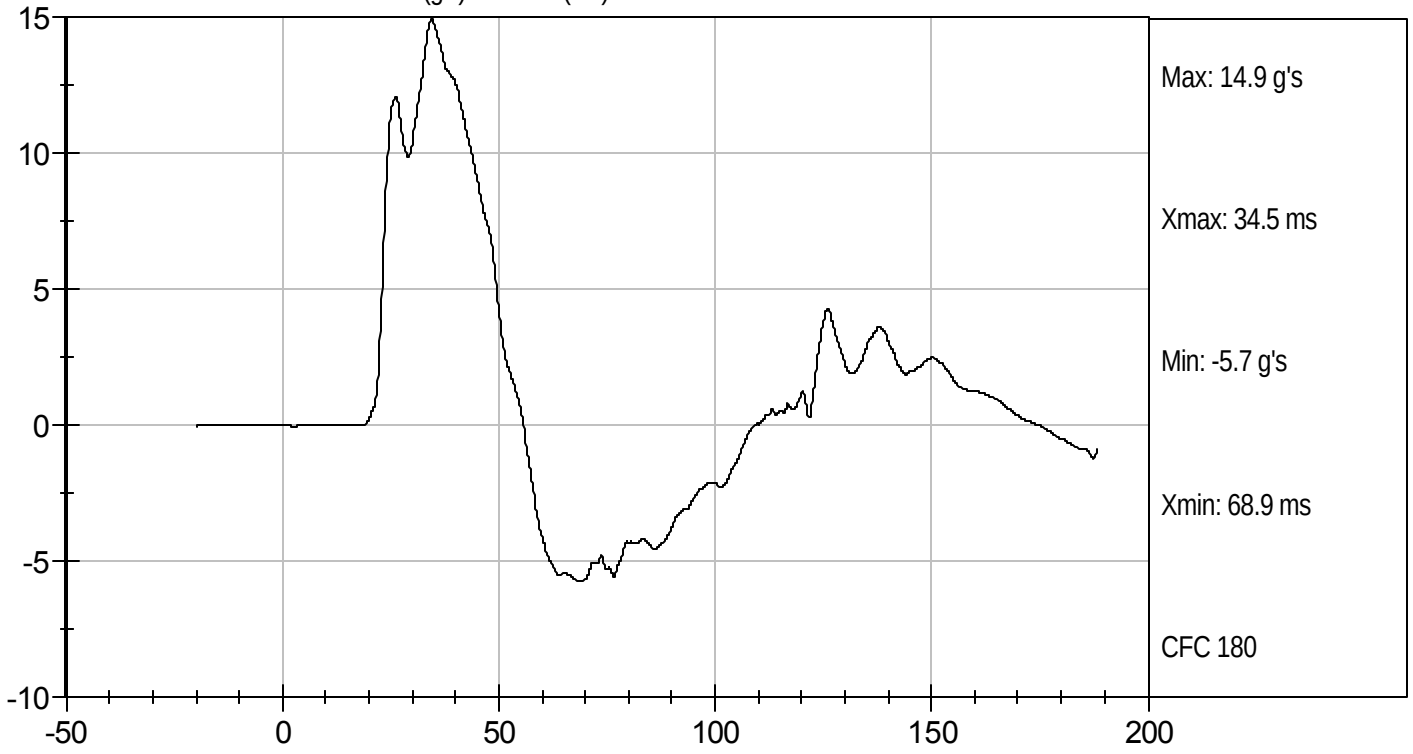
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



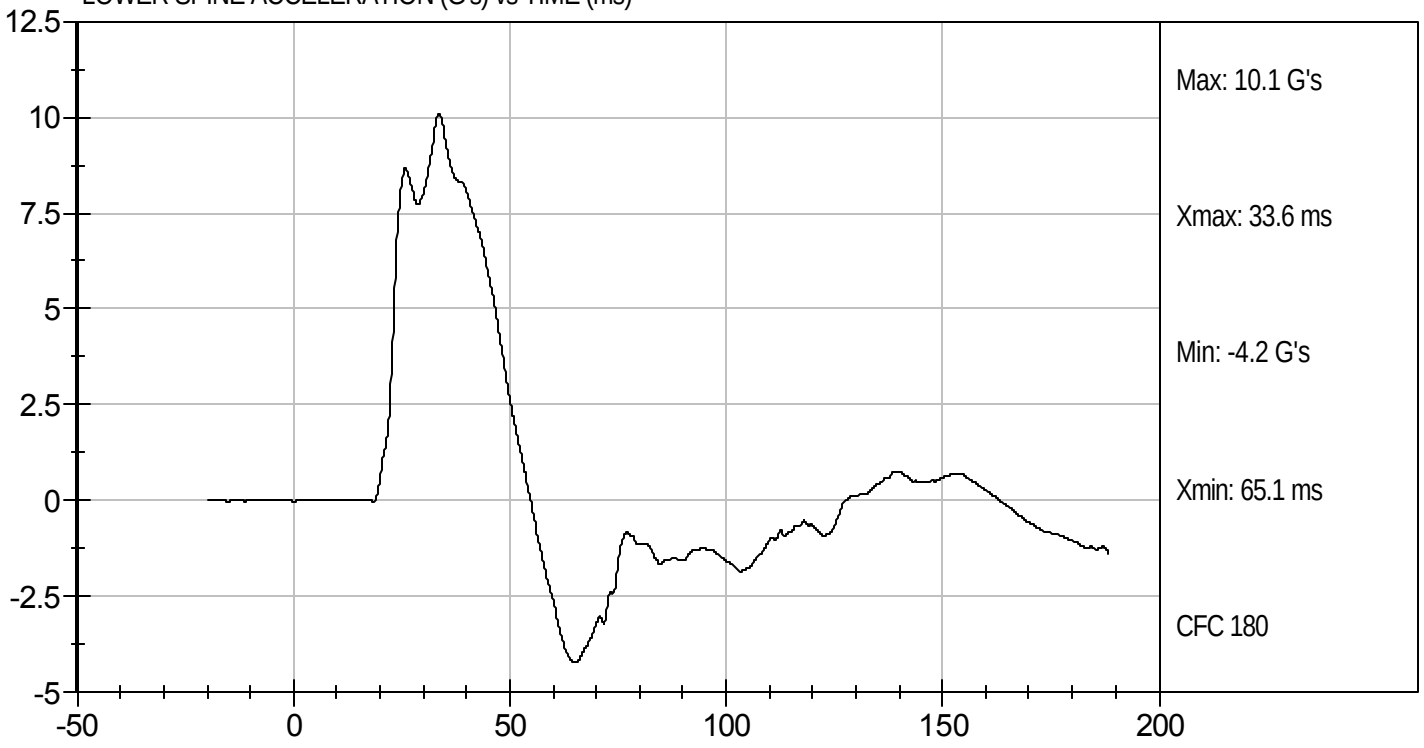
Test Desc: Thorax Without Arm
Component ID: D104505

Test Date: 12/20/10
Velocity: 14.37 ft/s, 4.38 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:** D104506

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	12	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	12 to 16	14	Pass
Upper Rib Displacement	mm	36 to 47	41	Pass
Lower Rib Displacement	mm	33 to 44	37	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

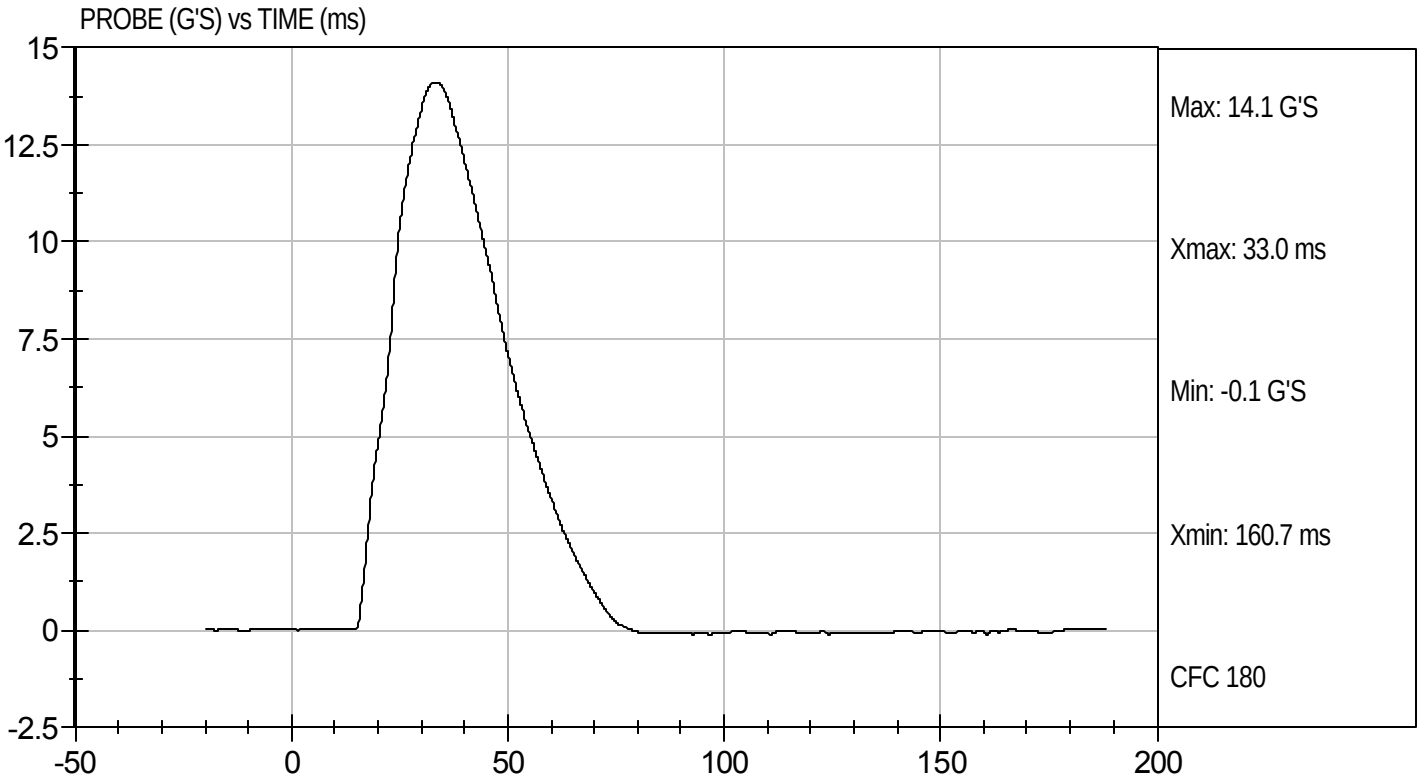
Jessica Gall
Laboratory Technician

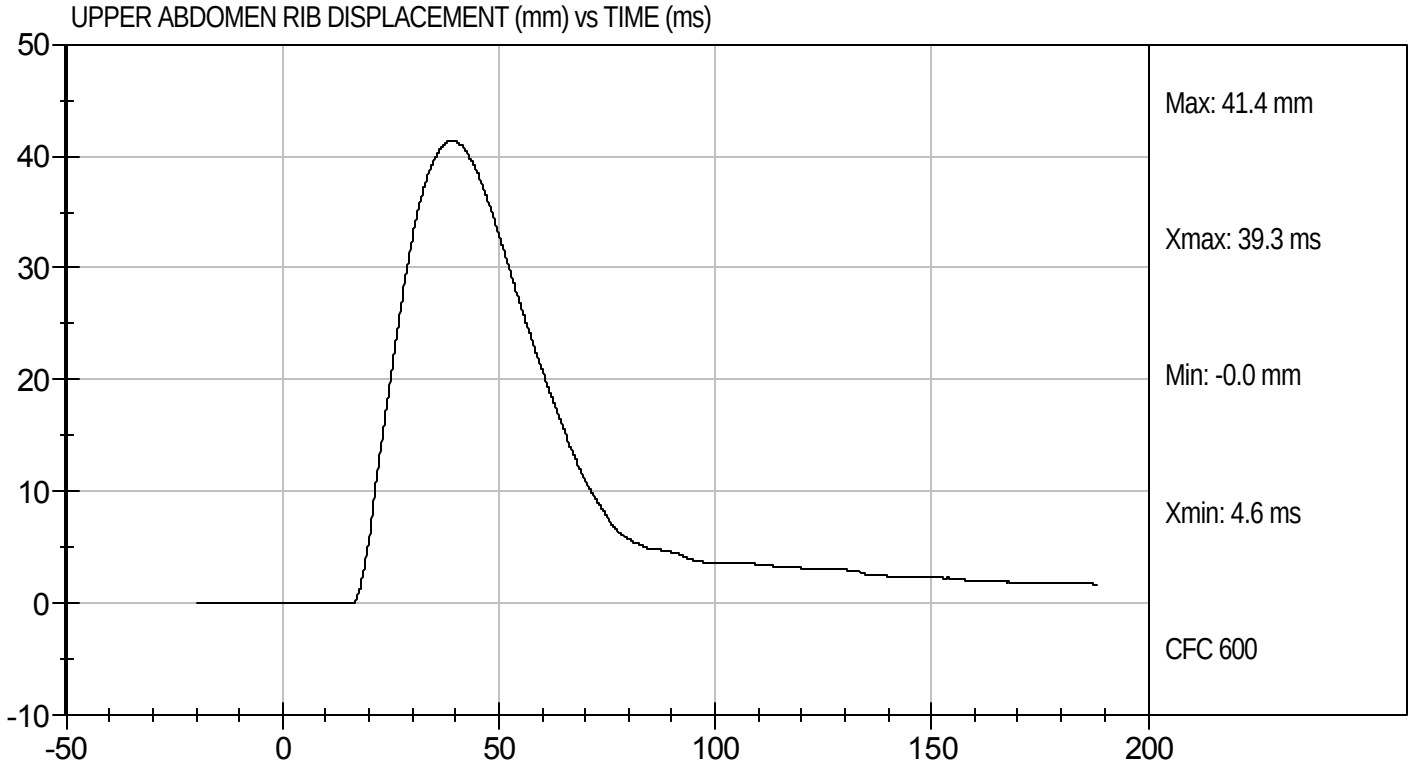
12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Abdomen Impact
Component ID: D104506

Test Date: 12/20/10
Velocity: 14.36 ft/s, 4.38 m/s

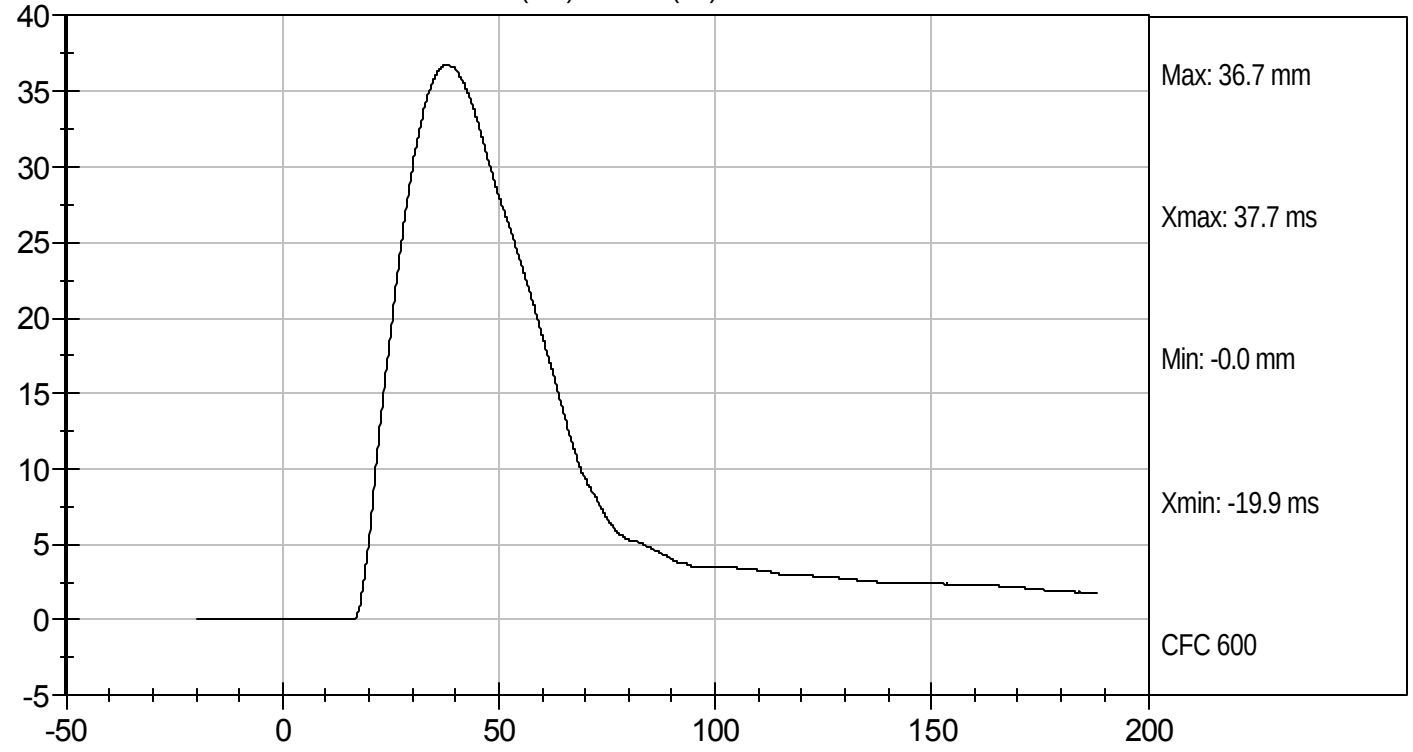




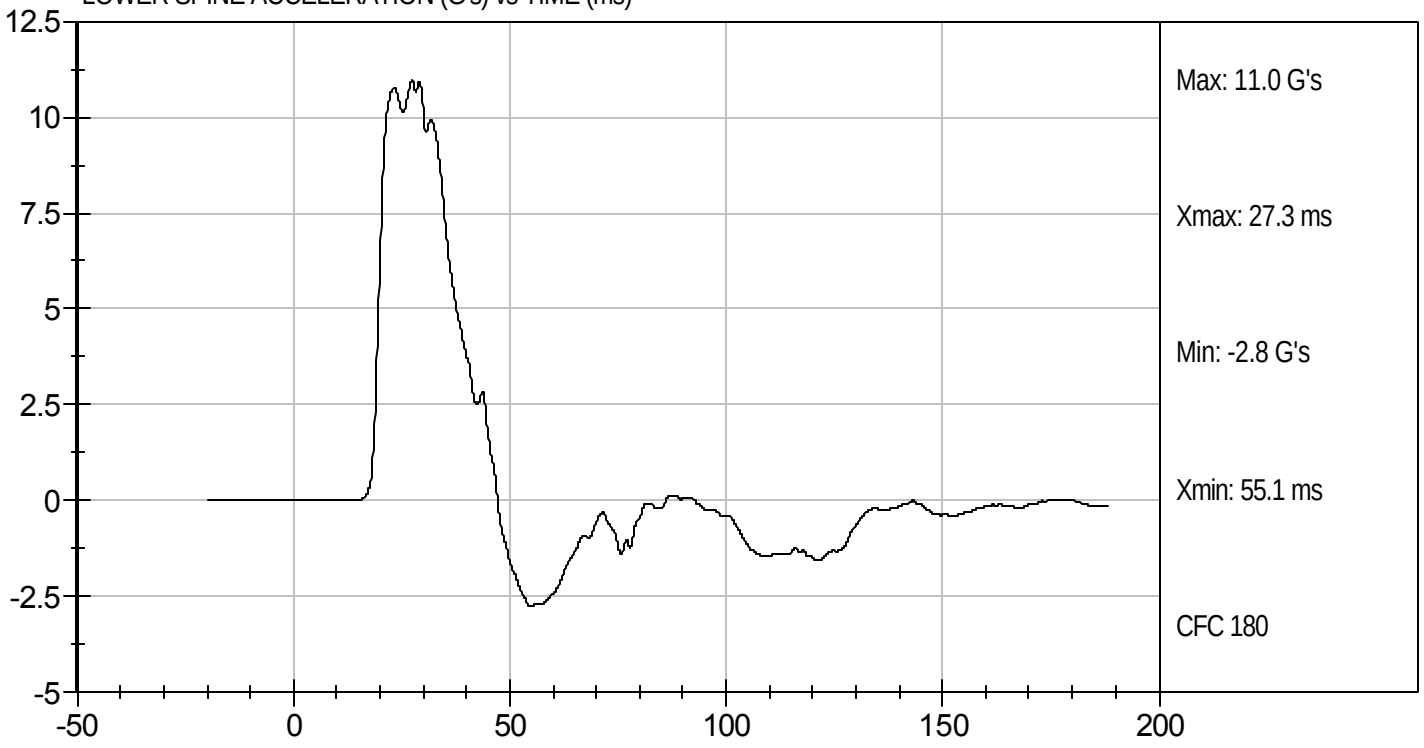
Test Desc: Abdomen Impact
Component ID: D104506

Test Date: 12/20/10
Velocity: 14.36 ft/s, 4.38 m/s

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



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



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D104507

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	13	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	41	Pass
Peak Acetabulum Force	N	3600 to 4300	4084	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

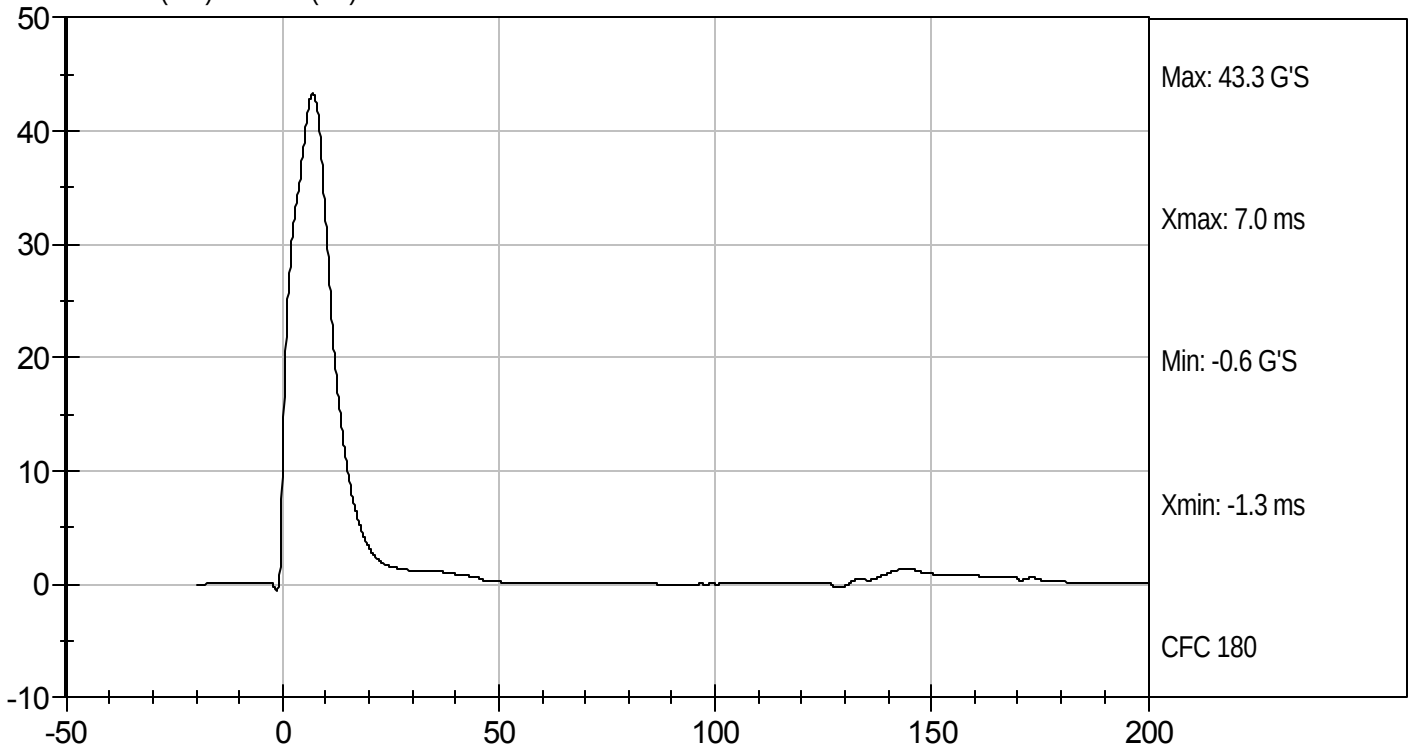
12/20/10
Test Date

David Winkelbauer
Approved By

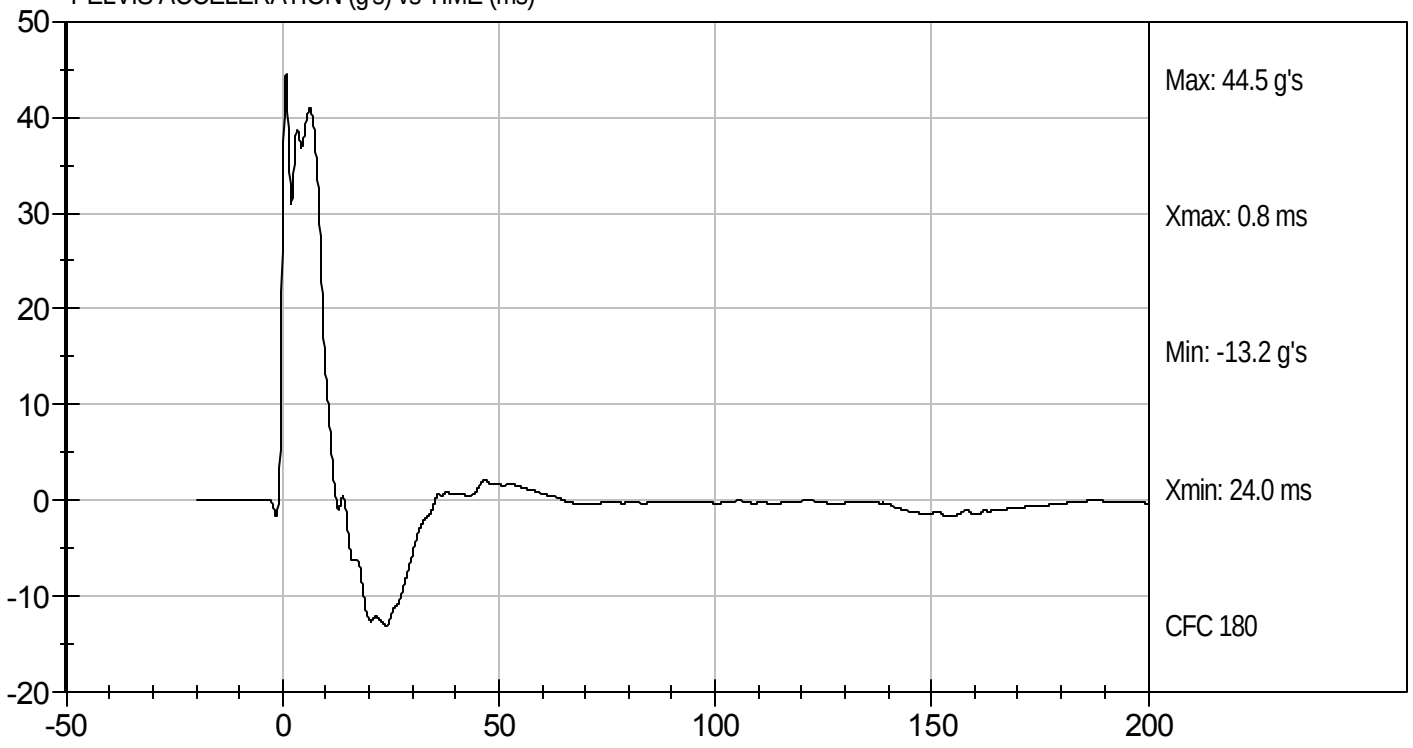
Test Desc: Pelvis Impact
Component ID: D104507

Test Date: 12/20/10
Velocity: 22.20 ft/s, 6.77 m/s

PROBE (G'S) vs TIME (ms)

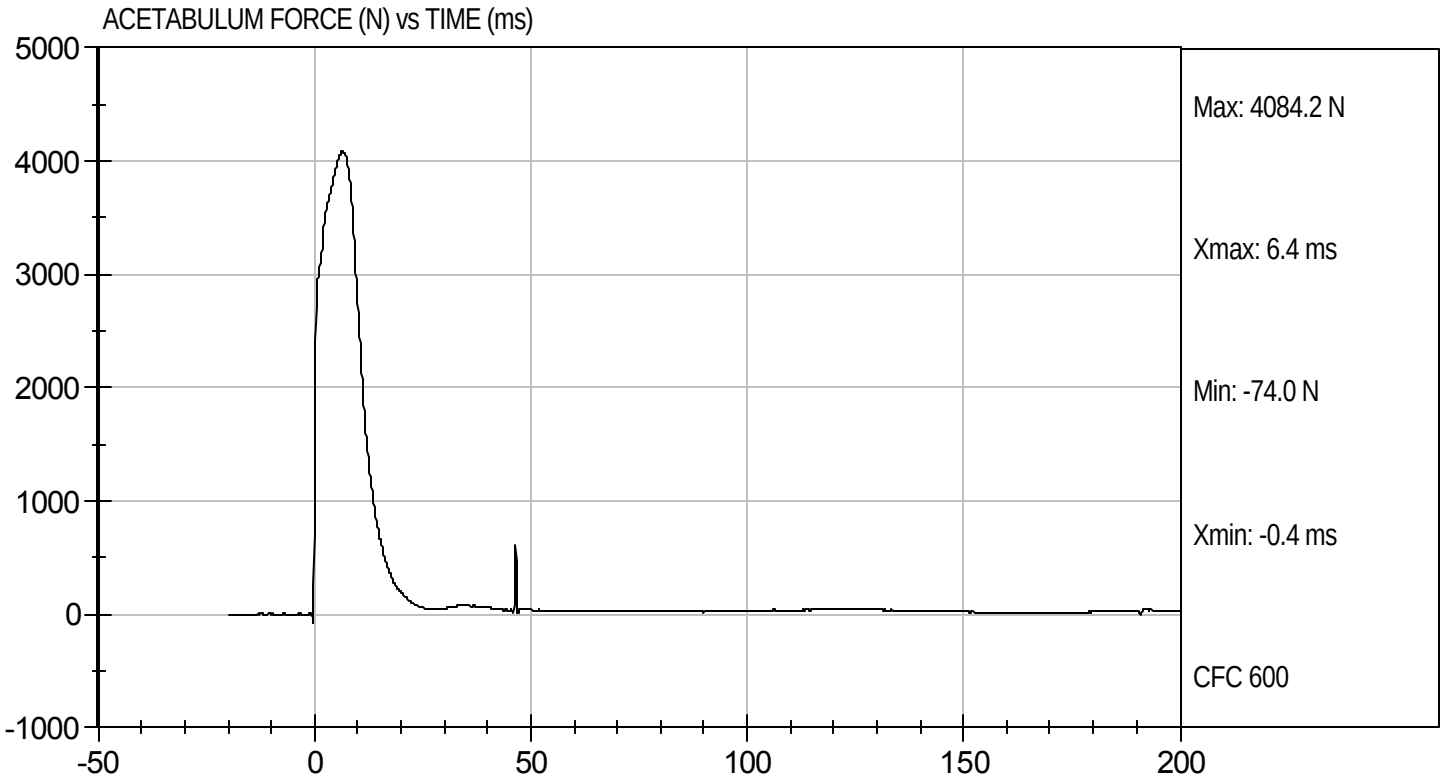


PELVIS ACCELERATION (g's) vs TIME (ms)



Test Desc: Pelvis Impact
Component ID: D104507

Test Date: 12/20/10
Velocity: 22.20 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:** D104508

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	13	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	29	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4821	Pass
		Overall Test Results		Pass

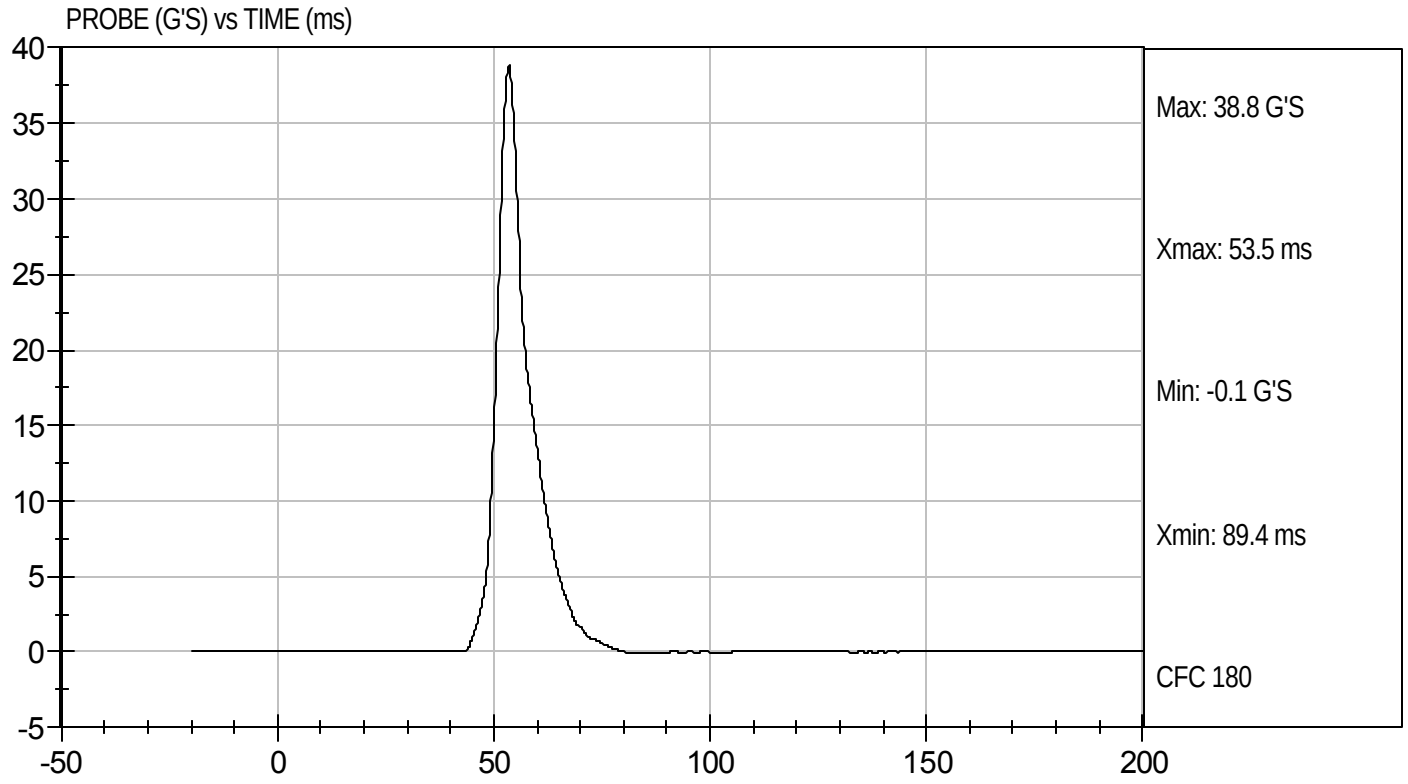
Jessica Hall
Laboratory Technician

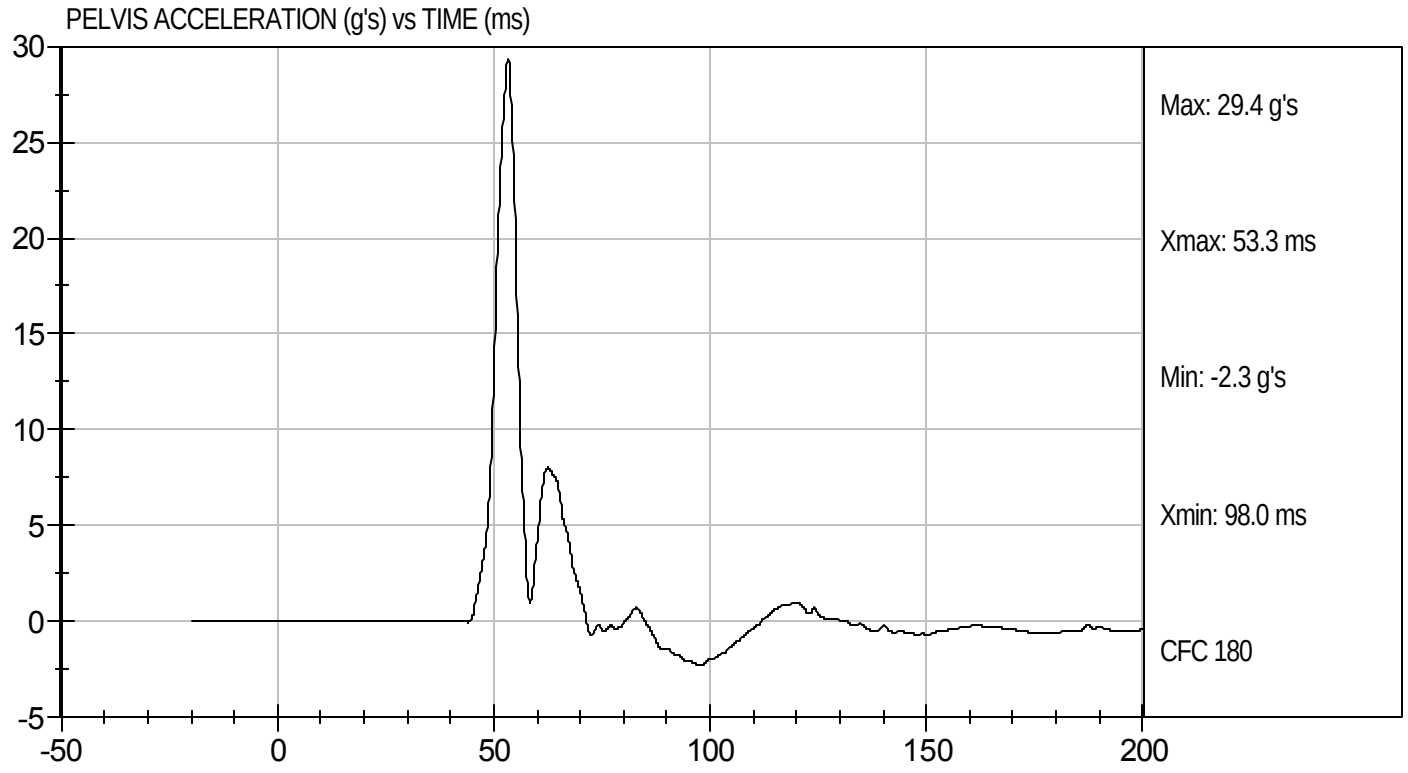
12/20/10
Test Date

David Winkelbauer
Approved By

Test Desc: Iliac Impact
Component ID: D104508

Test Date: 12/20/10
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Iliac Impact
Component ID: D104508

Test Date: 12/20/10
Velocity: 14.25 ft/s, 4.34 m/s