

**REPORT NUMBER: NCAPSIDE-MGA-2008-017**

**NEW CAR ASSESSMENT PROGRAM  
SIDE IMPACT TEST**

**KIA MOTORS CORPORATION  
2009 KIA BORREGO EX 4X2  
NHTSA NUMBER: K90501**

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



**Test Date: August 21, 2008**


**Report Date: October 10, 2008**

**FINAL REPORT**

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

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

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by:  Date: 10/10/08  
Ben Fischer, Project Engineer

Reviewed by:  Date: 10/10/08  
David Winkelbauer, Facility Director

### Technical Report Documentation Page

<p>1. Report No. NCAPSIDE-MGA-2008-017</p>	<p>2. Government Accession No.</p>	<p>3. Recipient's Catalog No.</p>																						
<p>4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Testing of 2009 Kia Borrego EX 4x2 NHTSA No.: K90501</p>		<p>5. Report Date October 10, 2008</p>																						
		<p>6. Performing Organization Code MGA</p>																						
<p>7. Author(s) Ben Fischer, Project Engineer</p>		<p>8. Performing Organization Report No. NCAPSIDE-MGA-2008-017</p>																						
<p>9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105</p>		<p>10. Work Unit No.</p>																						
		<p>11. Contract or Grant No. DTNH22-03-D-12005</p>																						
<p>12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410, NVS-111 Washington, D.C. 20590</p>		<p>13. Type of Report and Period Covered: Final Report 8/21/2008 to 10/10/2008</p>																						
		<p>14. Sponsoring Agency Code NVS-111</p>																						
<p>15. Supplementary Notes</p>																								
<p>16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP side impact was conducted on the subject 2009 Kia Borrego EX 4x2 to obtain new car assessment and research data indicant of FMVSS No. 214D performance. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on August 21, 2008. The impact velocity of the Moving Deformable Barrier (MDB) was 62.6 km/h, and the ambient temperature at the struck side (drivers) of the vehicle was 21°C. The target vehicle's maximum post test static crush was 296 mm at level 2. The test vehicle's occupant performance is as follows:</p> <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th style="text-align: left;"></th> <th style="text-align: center;"><u>DRIVER</u></th> <th style="text-align: center;"><u>PASS.</u></th> </tr> </thead> <tbody> <tr> <td>Left Upper Rib (LUR) Accel., g</td> <td style="text-align: center;">32.3</td> <td style="text-align: center;">23.2</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td style="text-align: center;">26.1</td> <td style="text-align: center;">32.4</td> </tr> <tr> <td>Lower Spine (T<sub>12</sub>) Accel., g</td> <td style="text-align: center;">33.7</td> <td style="text-align: center;">29.3</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">33</td> <td style="text-align: center;">31</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td style="text-align: center;">61.8</td> <td style="text-align: center;">32.7</td> </tr> <tr> <td>HIC</td> <td style="text-align: center;">73</td> <td style="text-align: center;">109</td> </tr> </tbody> </table> <p>The 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.</p>					<u>DRIVER</u>	<u>PASS.</u>	Left Upper Rib (LUR) Accel., g	32.3	23.2	Left Lower Rib (LLR) Accel., g	26.1	32.4	Lower Spine (T <sub>12</sub> ) Accel., g	33.7	29.3	Thoracic Trauma Index (TTI)	33	31	Pelvis (PEV) Accel., g	61.8	32.7	HIC	73	109
	<u>DRIVER</u>	<u>PASS.</u>																						
Left Upper Rib (LUR) Accel., g	32.3	23.2																						
Left Lower Rib (LLR) Accel., g	26.1	32.4																						
Lower Spine (T <sub>12</sub> ) Accel., g	33.7	29.3																						
Thoracic Trauma Index (TTI)	33	31																						
Pelvis (PEV) Accel., g	61.8	32.7																						
HIC	73	109																						
<p>17. Key Words New Car Assessment Program (NCAP) Side Impact Side Impact Hybrid III Dummy (SID/HIII) Occupant Side Impact Protection</p>		<p>18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Adm. Technical Ref. Division, 1200 New Jersey Ave, SE Washington, D.C. 20590</p>																						
<p>19. Security Classif. (of this report) Unclassified</p>	<p>20. Security Classif. (of this page) Unclassified</p>	<p>21. No. of Pages 140</p>	<p>22. Price</p>																					

Form DOT F1700.7 (8-72)

## TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Test Procedure	1
2	Summary of NCAP Side Impact Test	2
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Test Vehicle Tire Information	6
3	Test Vehicle Information	7
4	Moving Deformable Barrier (MDB) Summary of Results	9
5	Post Test Observations	10
6	Vehicle Pre-Test and Post Test Measurements	11
7	SID/HIII Longitudinal Clearance Dimensions	12
8	SID/HIII Lateral Clearance Dimensions	13
9	Vehicle Side Measurements	14
10	Vehicle Exterior Crush Profiles	15
11	Vehicle Damage Profile Distances	17
12	Deformable Barrier Honeycomb Face Static Crush	18
13	Vehicle Accelerometer Locations	19
14	MDB Accelerometer Locations	20
15	Vehicle Structural Measurements	21
16	High Speed Camera Locations and Data	22
17	Summary of FMVSS 301 Data	23
<u>Appendix</u>		
A	Photographs	A
B	SID/HIII Response Data Traces	B
C	Dummy Calibration Data	C

## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

#### **PURPOSE**

This side impact test was conducted as part of the test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-03-D-12005. The purpose of this test was to evaluate side impact protection in a 2009 Kia Borrego EX 4x2 manufactured by Kia Motors Corporation.

#### **TEST PROCEDURE**

The side impact test was conducted in accordance with the Laboratory Test Procedure for New Car Assessment Program Side Impact Testing dated November 2002 and the corresponding MGA Research Corporation Test Procedure MGA-NHTSA5. The procedures for receiving, inspection, testing, and reporting of test results are described in the test procedures and are not repeated in this report.

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

## SECTION 2

### SUMMARY OF NCAP SIDE IMPACT TEST

A model year 2009 Kia Borrego EX 4x2 was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.6 km/h. The specified impact velocity range is from 61.1 to 62.7 km/h. The test (target) vehicle was stationary and positioned 63° to the line of forward motion. The weight of the vehicle as tested was 2182.7 kg and the test weight of the MDB was 1360.8 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on August 21, 2008.

One (1) real-time motion picture camera and eight (8) high-speed motion picture cameras were used to document the impact event. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera. Camera locations and pertinent camera information are documented in the data sheets. Pre- and post-test photographs of the vehicle and Side Impact Dummies (SID/HIIIs) can be found in Appendix A. Two 50th percentile adult male SID/HIIIs were placed in the driver and left rear passenger designated seating positions according to instructions specified in the Laboratory Test Procedure for New Car Assessment Program Side Impact Testing dated November 2002. Each SID/HIII was instrumented in the following locations:

- Left Upper Rib (LUR) uni-axial accelerometer (Y-axis primary and redundant)
- Left Lower Rib (LLR) uni-axial accelerometer (Y-axis primary and redundant)
- Lower Thoracic Spine (T12) uni-axial accelerometer (Y-axis primary and redundant)
- Pelvic (PEV) section uni-axial accelerometer (Y-axis primary and redundant)
- Head Center of Gravity (CG) tri-axial accelerometers (X, Y and Z axes primary and redundant)
- Upper Neck load cell (Fx, Fy, Fz, Mx, My, Mz)

The test vehicle was instrumented with twenty-one (21) structural accelerometers and the MDB was instrumented with five (5) accelerometers and two (2) contact switches on the bumper to compare left side to right side bumper impact timing. All data channels were recorded with a fully self contained on-board DTS TDAS Pro Data Acquisition System. The data was digitally sampled at 10,000 samples per second and processed per Appendix V of the Test Procedure.

#### **2.2 GENERAL COMMENTS**

The test vehicle sustained a maximum static crush of 296 mm at level 2, 1350 mm rearward of the vertical impact point. The driver and passenger SID/HIIIs, Serial Nos. 272 and 271 respectively, were calibrated just prior to this test.

Appendix A contains the still photograph prints. Appendix B contains the SID/HIII response data traces. Appendix C contains the dummy calibration data.

The occupant data is summarized below:

ATD position	HIC	T <sup>1</sup>	T <sup>2</sup>	TTI (G's)	Peak Pelvis (G's)
Driver	73	49.2	85.2	33	61.8
Passenger	109	62.7	98.7	31	32.7

#### SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Information	Left Front (Driver)		Left Rear (Passenger)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Side Torso Airbag	Yes	Yes	No	
Curtain Airbag	Yes	Yes	Yes	Yes

The test data can be found on the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov).

#### TEST NOTES

There was no valid data collected for:

Left Rear Sill Y after 60 msec.

Left Front Sill Y after 15 msec.

Left Lower B-Post Y after 25 msec.

Vehicle CG X after 15 msec.

Vehicle CG Z after 80 msec.

A shield of the curtain airbag became loose from the side header.  
See photo on page A-24.

**DATA SHEET NO. 1**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008

**TEST VEHICLE INFORMATION**

Make	Kia
Model	Borrego
Body Style	MPV
NHTSA No.	K90501
VIN	KNDJJ741095012212
Color	Midnite Blue
Delivery Date	8/6/2008
Odometer Reading (mile)	47
Dealer	Russ Darrow
Transmission	Automatic
Final Drive	Rear
Number of Cylinders	6
Engine Displacement (L)	3.8
Engine Placement	Longitudinal
Automatic Door Locks (ADL)	Yes
Owner's Manual Details Instructions on Disabling ADLs	No

**TEST VEHICLE OPTIONS**

Driver Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso Airbag	No
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	No
Power Seats	Yes
Pretensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Kia Motors Corporation
Date of Manufacture	05/08

GVWR (kg)	2650
GAWR Front (kg)	1300
GAWR Rear (kg)	1650

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Split Bench	
Number Of Occupants	2	3	2	7
Capacity Wt. (VCW) (kg)				525
Cargo Wt. (RCLW) (kg)				49

**DATA SHEET NO. 1 (continued)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008

**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	515.7	487.1		562.9	582.4	
Right	kg	499.9	475.4		504.4	533.0	
Ratio	%	51.3	48.7		48.9	51.1	
Totals	kg	1015.6	962.5	1978.1	1067.3	1115.4	2182.7

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1978.1
Weight of 2 P572M ATDs	kg	161.5
Rated Cargo/Luggage Weight (RCLW)	kg	49
Calculated Vehicle Target Weight (TVTW)	kg	2188.6

\* Actual As Tested Weight (ATW) will be TVTW -5/-10 kg

Weight of Ballast in Cargo Area: 0 kg

**TEST VEHICLE ATTITUDES AND CG**

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	827	826	843	842	1410
As Tested	mm	810	820	820	822	1481
Fully Loaded	mm	809	810	820	821	

**TEST VEHICLE VERTICAL IMPACT LINE DATA**

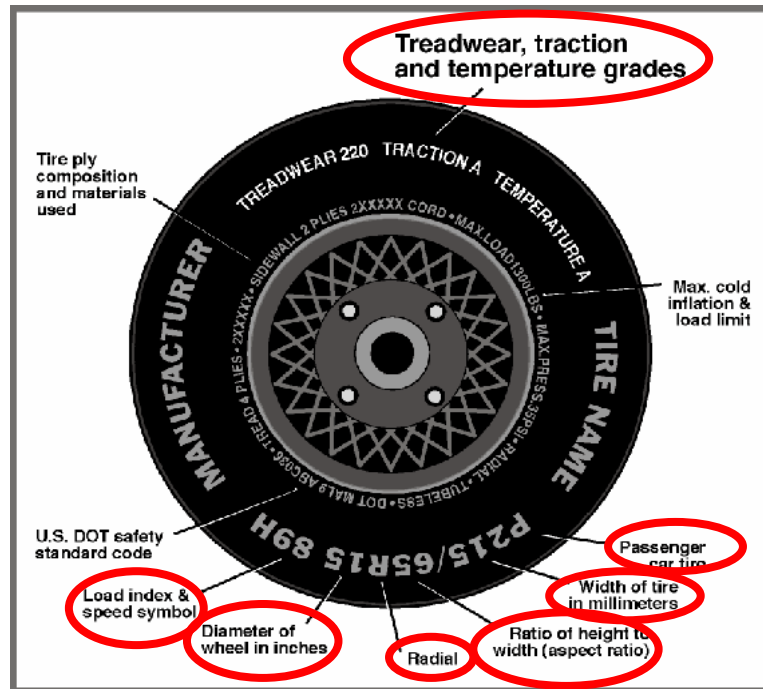
Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2898
Target Impact Point Aft of Front Axle	mm	508
Actual Impact Point Aft of Front Axle	mm	459

## DATA SHEET NO. 2

### TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



#### DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Test Pressure (kPa)	220	220
Recommended Tire Size	P245/70R17	P245/70R17
Tire Size on Vehicle	P245/70R17	P245/70R17
Tire Manufacturer	Hankook	Hankook
Tire Name	Radial RA07	Radial RA07
Tire Type	Passenger	Passenger
Tire Width (mm)	245	245
Ratio of Height to Width (aspect ratio)	70	70
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	108T	108T
Treadwear	440	440
Traction Grade	A	A
Temperature Grade	B	B

**DATA SHEET NO. 3**  
**TEST VEHICLE INFORMATION**

Test Vehicle: 2009 Kia Borrego EX 4x2  
Test Program: NCAP Side Impact

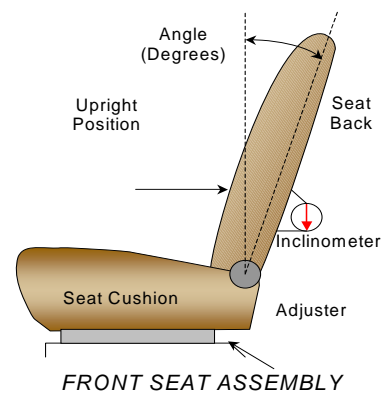
NHTSA No. K90501  
Test Date: 8/21/2008

**NORMAL DESIGN RIDING POSITION**

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Set at 5 degrees on headrest post for driver and 10 degrees on headrest post for left rear passenger.

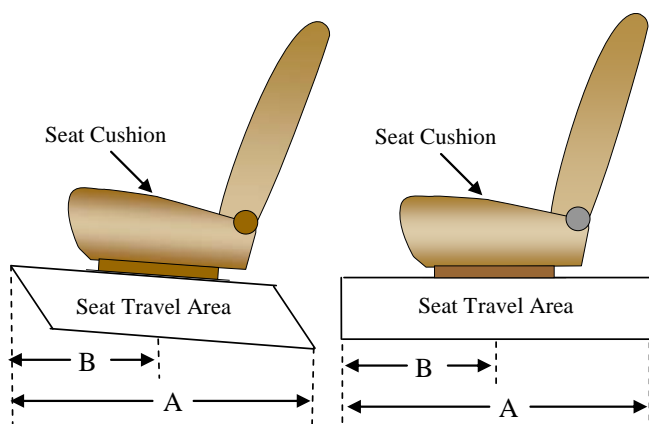
Driver seat back angle: 4.8 degrees from headrest post

Passenger seat back angle: 9.3 degrees from headrest post



**SEAT FORE/AFT POSITIONS**

	Total Fore/Aft Travel	Placed in position #
Driver Seat	260 mm	130 mm
Rear Seat	6 detents	3 <sup>rd</sup> detent (forward-most as 0)



## DATA SHEET NO. 3 (CONTINUED)

### TEST VEHICLE INFORMATION

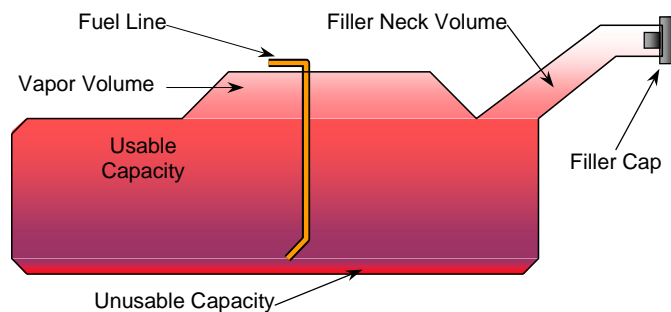
Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008

### FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	78.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	71.8 – 73.3
Actual Amount of Solvent used	71.9
1/3 of Usable Capacity	26.0

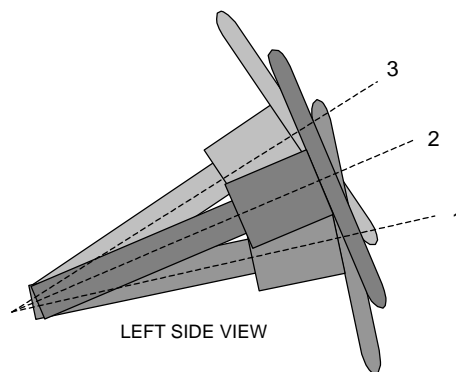
The test vehicle is equipped with an electric fuel pump. Fuel pump operates on ignition "ON".



VEHICLE FUEL TANK ASSEMBLY

### STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

### STEERING COLUMN POSITION

	Fore/Aft (mm)	Degrees
Lowermost position No. 1		16.1
Geometric center position No. 2		23.2
Uppermost position No. 3		30.4

## DATA SHEET NO. 4

### MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2009 Kia Borrego EX 4x2  
Test Program: NCAP Side Impact

NHTSA No. K90501  
Test Date: 8/21/2008

#### MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheel base of Framework Carriage	2588
C.G. Location aft of Front Axle	1101

#### MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	473.5	219.5	
Right	kg	308.3	359.5	
Ratio	%	57.5	42.5	
Totals	kg	781.8	579.0	1360.8

#### SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.6
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.6
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.8

#### POST TEST OBSERVATIONS MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	49 forward
Vertical Offset	mm	+/-20	13 up

**DATA SHEET NO. 5**

**POST TEST OBSERVATIONS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008

**TEST DUMMY INFORMATION AND CONTACT POINTS**

Description	Front Seat SID/HIII	Rear Seat SID/HIII
Dummy Type / Serial No.	SID HIII / 272	SID HIII / 271
Head Contact	Curtain Airbag, Headrest, Side Header	Curtain Airbag, Headrest
Upper Torso Contact	Side Airbag	Door Panel
Lower Torso Contact	Door Panel	Door Panel
Left Knee Contact	Door Panel	Door Panel
Right Knee Contact	Left Knee	Left Knee

**POST TEST DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Front	Rear
Locked/Unlocked Doors	Struck side doors were locked Non-struck side doors were unlocked	Struck side doors were locked Non-struck side doors were unlocked
Left Side Door Opening	Door remained closed and latched	Door remained closed and latched
Right Side Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Movement	0	0
Seat Back Failure	None	None

**POST TEST STRUCTURAL OBSERVATIONS**

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

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

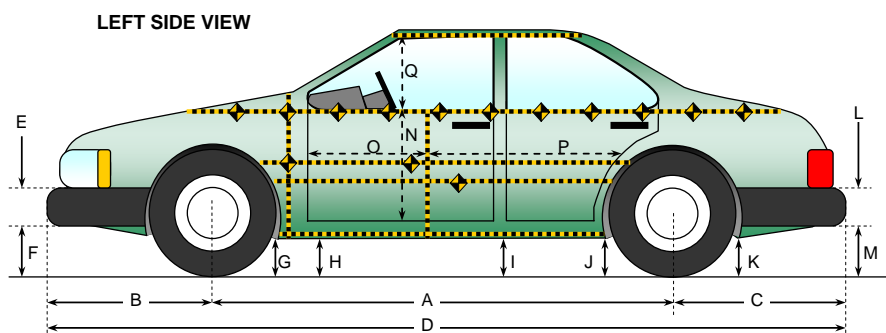
Restraint Information	Left Front (Driver)		Left Rear (Passenger)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Side Torso Airbag	Yes	Yes	No	
Curtain Airbag	Yes	Yes	Yes	Yes

## DATA SHEET NO. 6

### VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



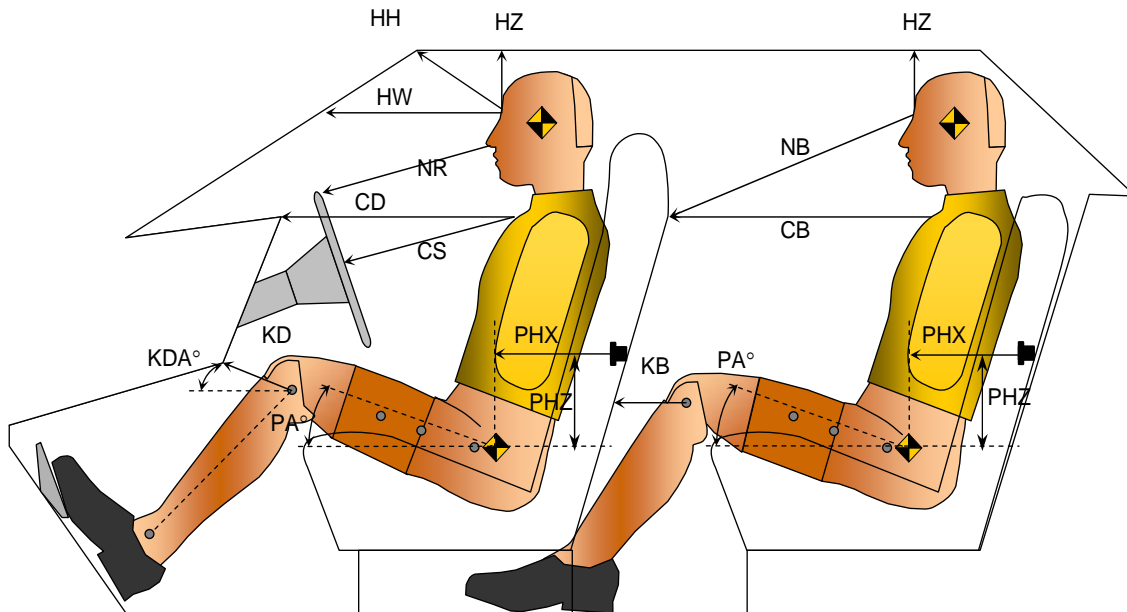
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2898	2903	-5
B	Front Axle to FSOV	887	886	1
C	Rear Axle to RSOV	1071	1072	-1
D	Total Length at Centerline	4856	4861	-5
E	Front Bumper Thickness	138	138	0
F	Front Bumper Bottom to Ground	405	404	1
G	Sill Height at Front Wheel Well	270	272	-2
H	Sill Height at Front Door Leading Edge	230	223	7
I	Sill Height at "B" Pillar	240	242	-2
J1	Sill Height at Rear Wheel Well	261	275	-14
J2	Pinch Weld Height at Rear Wheel Well	303	325	-22
K	Sill Height Aft of Rear Wheel Well	313	339	-26
L	Rear Bumper Thickness	162	162	0
M	Rear Bumper Bottom to Ground	402	456	-54
N	Sill Height to Window Bottom Sill	857	753	104
O	Front Door Leading Edge to Impact CL	823	879	-56
P	Rear Door Trailing Edge to Impact CL	1393	1361	32
Q	Front Window Opening	472	471	1
R	Right Side Length	3874	3883	-9
S	Left Side Length	3874	3842	32
T	Vehicle Width at "B" Post	1878	1738	140

**DATA SHEET NO. 7**  
**SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008

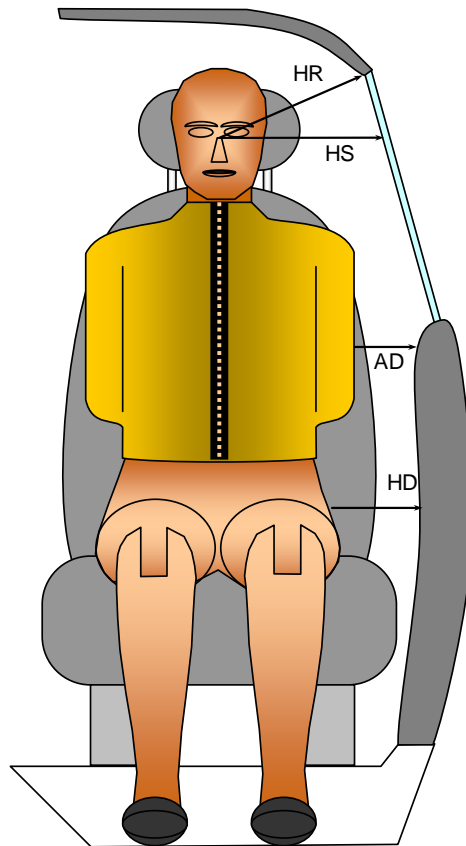


Driver Code	Pass. Code	Measurement Description	Driver S/N 272		Passenger S/N 271	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	371			
HW		Head to Windshield	598			
HZ	HZ	Head to Roof	180		181	
NR	NB	Nose to Rim/Nose to Seatback	420		604	
CD	CB	Chest to Dash or Seatback	517		539	
CS		Chest to Steering Wheel	315			
KDL	KBL	Left Knee to Dash or Seatback	156	16.0	229	24.5
KDR	KBR	Right Knee to Dash or Seatback	139	33.5	206	37.0
PA	PA	Pelvic Angle		24.2		23.9
PHX	PHX	H-Point to Striker (X-Axis)	238		366	
PHZ	PHZ	H-Point to Striker (Z-Axis)	148		179	

**DATA SHEET NO. 8**  
**SID/HIII LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



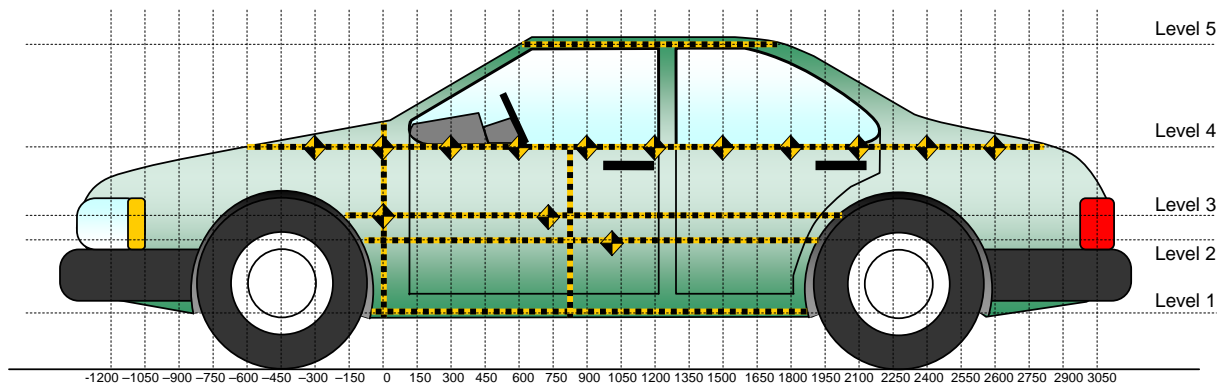
*FRONT VIEW OF DUMMY*

Code	Measurement Description	Units	Driver S/N 272	Passenger S/N 271
HR	Head to Side Header	mm	212	229
HS	Head to Side Window	mm	327	347
AD	Arm to Door	mm	81	104
HD	H-Point to Door	mm	160	184

**DATA SHEET NO. 9**  
**VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
Test Program: NCAP Side Impact

NHTSA No. K90501  
Test Date: 8/21/2008



All Measurements Shown in mm

**LEFT SIDE VIEW**

Measurements are taken with vehicle in the as tested condition.  
Measurements along the vertical 800 mm.  
All measurements below in mm.

Level	Measurement Description	Maximum Exterior Static Crush	Distance From Impact	Height Above Ground
5	Window	31	1500	1680
4	Window Sill	124	1200	1135
3	Mid Door	295	1350	820
2	Occupant H-Point	296	1350	760
1	Sill Top	174	1200	320
	Maximum Penetration	296		

**DATA SHEET NO. 10**  
**VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2009 Kia Borrego EX 4x2  
Test Program: NCAP Side Impact

NHTSA No. K90501  
Test Date: 8/21/2008

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900				291					281					-10	
-750				267					268					1	
-600				252					256					4	
-450			145	241				168	253				23	12	
-300			148	235				180	253				32	18	
-150		158	164	230			205	208	254			47	44	24	
0	280	170	171	227		301	238	235	258		21	68	64	31	
150	284	169	169	233		318	382	355	242		34	213	186	9	
300	284	167	167	236		435	406	399	259		151	239	232	23	
450	282	166	166	236		432	422	411	264		150	256	245	28	
600	282	166	165	237	455	438	433	421	276	481	156	267	256	39	26
750	282	165	165	233	454	432	442	428	289	476	150	277	263	56	22
900	281	165	164	236	454	422	448	438	303	481	141	283	274	68	27
1050	281	164	163	234	454	418	449	447	319	484	137	285	284	85	30
1200	281	164	163	236	456	455	455	446	360	486	174	291	283	124	30
1350	280	165	164	236	457	433	461	459	349	487	153	296	295	113	30
1500	279	166	165	239	460	400	443	444	340	491	121	277	279	101	31
1650	280	166	165	241	464	381	413	418	310	491	101	247	253	69	27
1800	282	167	165	242	464	377	368	376	292	492	95	201	211	50	28
1950		163	161	244	466		281	293	278	492		118	132	34	26
2100		142	147	247	466		232	224	269	490		90	77	22	24
2250			140	249	467			186	270	494			46	21	27
2400				253	471				286	491				33	20
2550				249	471				277	490				28	19
2700				248	474				272	493				24	19
2850				257	476				276	496				19	20
3000				271	494				286	496				15	2

Reference plane is parallel to test vehicle longitudinal centerline.

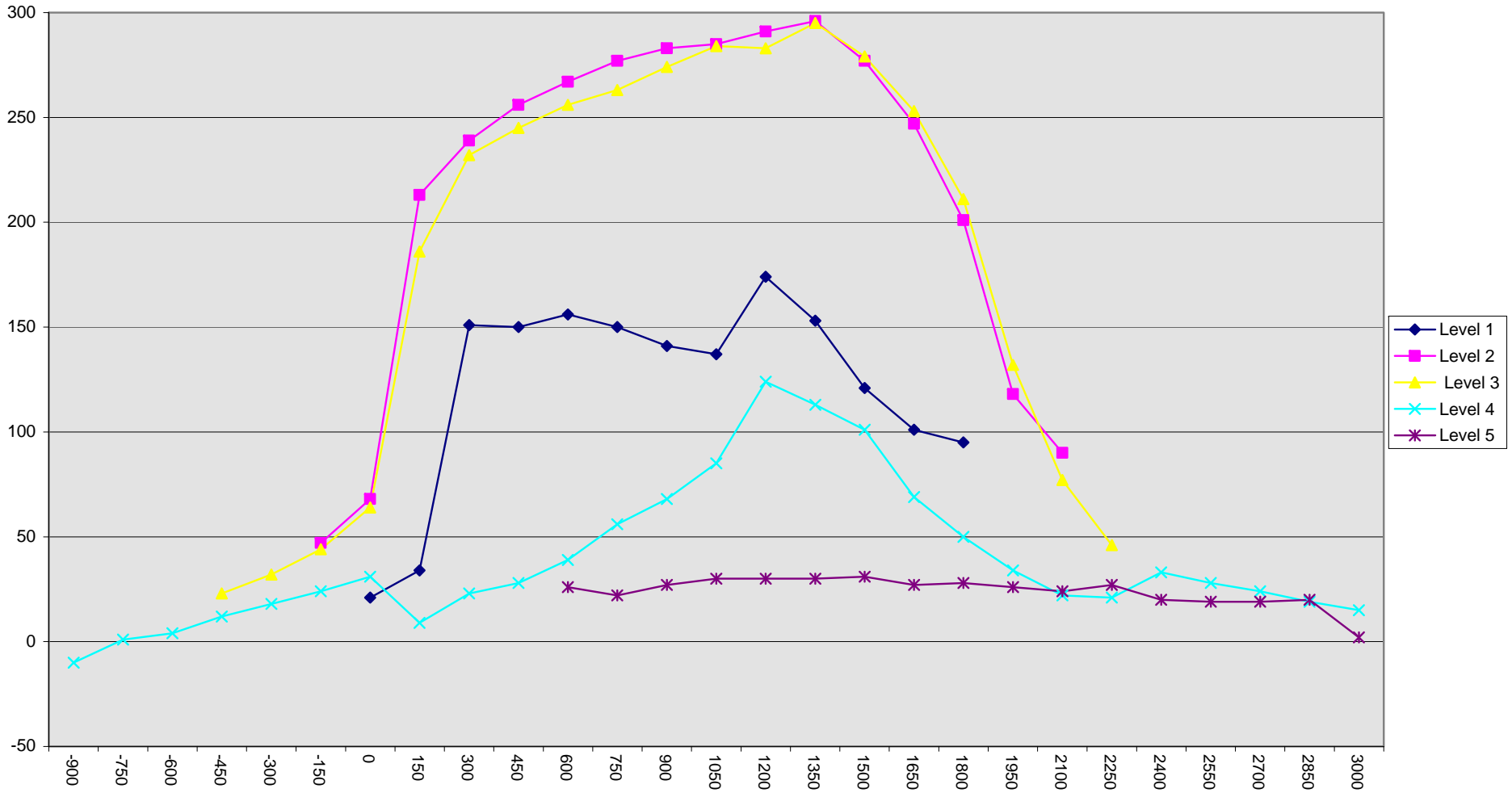
Given dimensions = Reference plane to car body

**DATA SHEET NO. 10... (continued)**  
**VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2009 Kia Borrego EX 4x2  
Test Program: NCAP Side Impact

NHTSA No. K90501  
Test Date: 8/21/2008

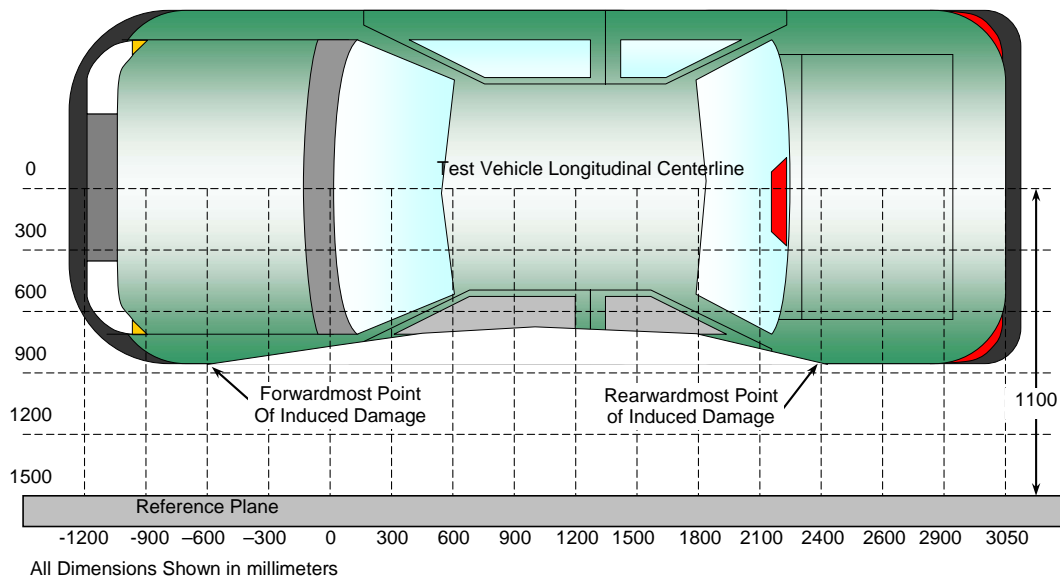
16



**DATA SHEET NO. 11**  
**VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



**TOP VIEW**

**DAMAGE PROFILE DISTANCES**

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	3000	4	271	286	15
2	2200	4	270	270	0
3	1445	3	443	451	8
4	615	2	435	471	36
5	125	4	247	256	9
6	-900	4	291	281	-10

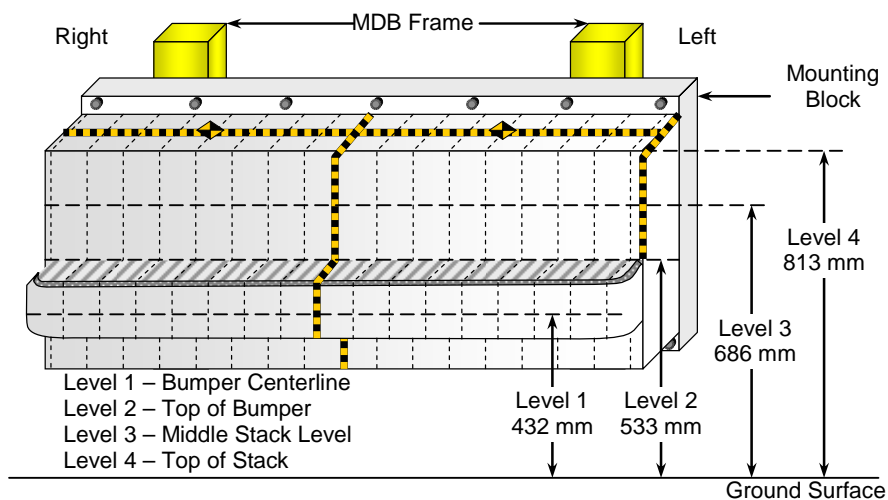
Reference plane is parallel to test vehicle longitudinal centerline.  
 Given dimensions = Reference plane to car body.

## DATA SHEET NO. 12

### DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



### DEFORMABLE BARRIER STATIC CRUSH

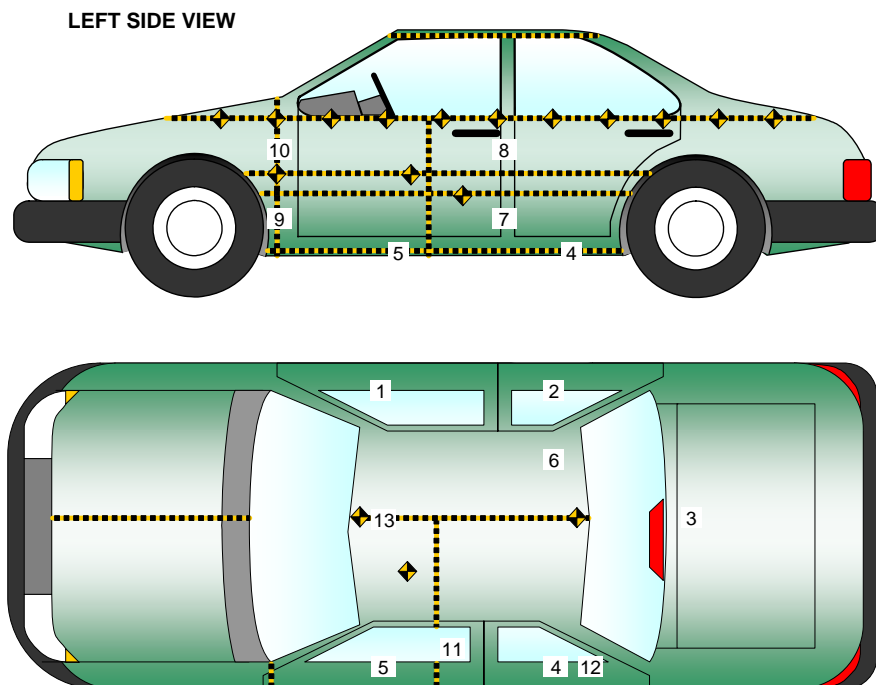
Stack Level	Distance Right of Center								C <sub>L</sub>	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	229	221	203	191	168	150	142	139	136	134	128	128	125	122	121	127	136
2	161	154	135	105	85	72	74	74	83	88	86	85	82	82	80	82	86
3	130	89	65	48	37	41	51	50	45	39	36	33	35	45	54	70	103
4	116	79	53	36	30	47	56	38	36	40	47	56	63	71	84	109	145

All Dimensions in mm

**DATA SHEET NO. 13**  
**VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



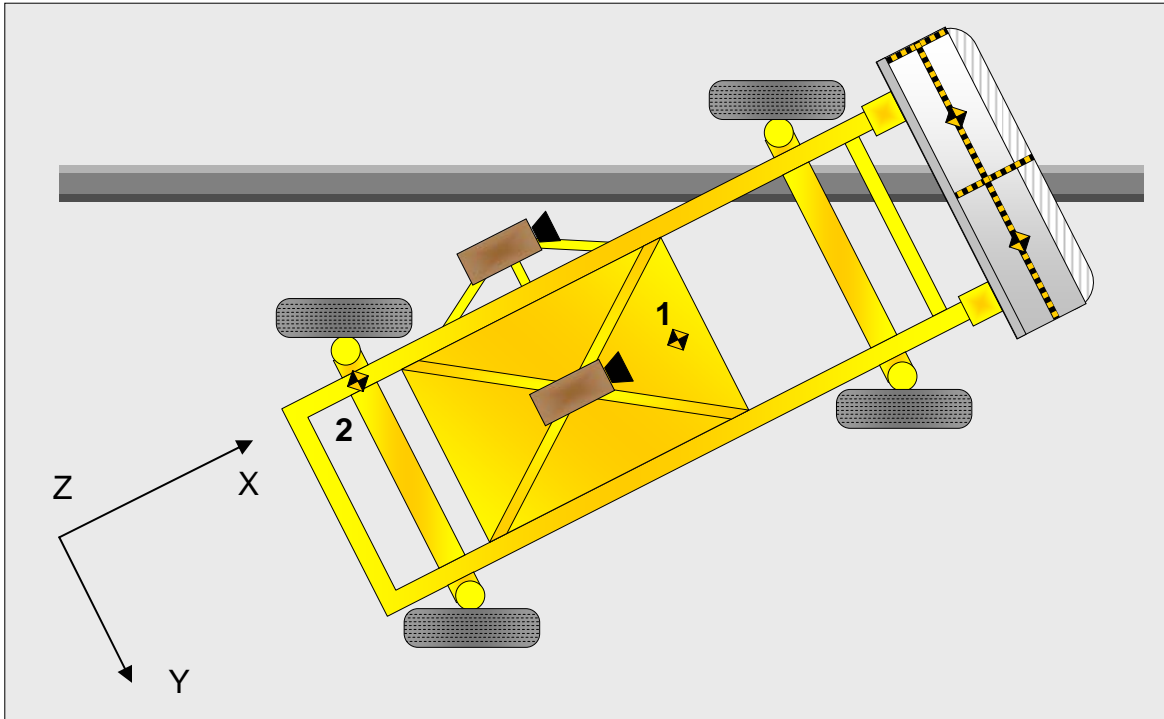
Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2960	743	-344
2	Right Sill at Rear Seat	1667	755	-357
3	Rear Floorpan Above Axle	596	0	-694
4	Left Sill at Rear Door	1696	-755	-351
5	Left Sill at Front Door	2884	-743	-341
6	Rear Occupant Compartment	1994	-333	-532
7	Left Lower B-Post	2277	-754	-758
8	Left Middle B-Post	2242	-741	-976
9	Left Lower A-Post	3375	-739	-681
10	Left Middle A-Post	3428	-857	-955
11	Front Seat Track	2474	-597	-618
12	Rear Seat Track or Structure	2111	-534	-606
13	Vehicle CG	2549	0	-511

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

**DATA SHEET NO. 14**  
**MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	MDB CG	-1092	0	-483
2	MDB Rear	-2591	-625	-622

Reference Points    X - MDB Front Axle (+ forward)  
                           Y - MDB Centerline (+ to right)  
                           Z - Ground Plane (+ down)

**DATA SHEET NO. 15**  
**VEHICLE STRUCTURAL MEASUREMENTS**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

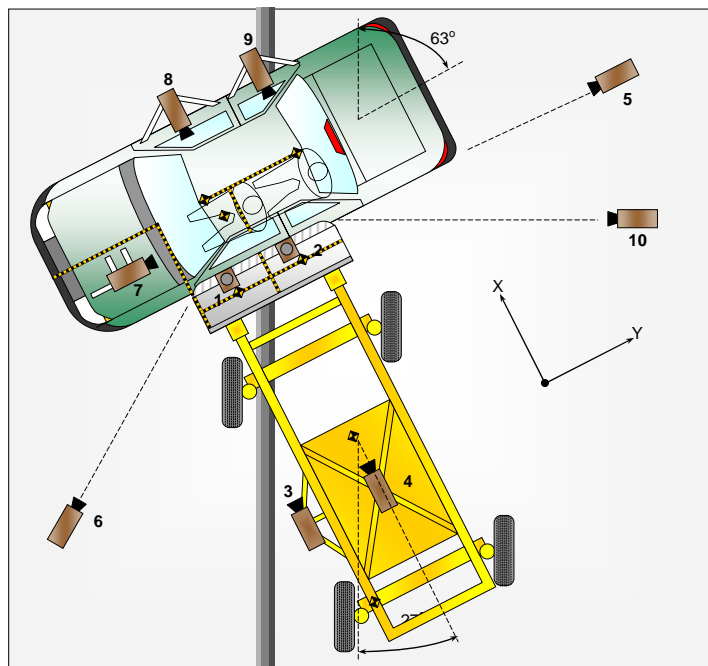
NHTSA No. K90501  
 Test Date: 8/21/2008

	Elements	Pre-Test (mm)
1	Total Length	4856
2	Total Width	1878
3	Bumper Top Height	770
4	Bumper Bottom Height	624
5	Longitudinal Member Top Height	553
6	Distance between Longitudinal Members	905
7	Longitudinal Member Width	67
8	Engine Top Height	1061
9	Engine Bottom Height	391
10	Engine and gearbox width	584
11	Front bumper-engine distance	610
12	Front shock absorber fixing height	723
13	Bonnet leading edge height	950
14	Front shock absorber fixing width	975
15	Front bumper – front axle distance	880
16	Front axle – a pillar distance	533
17	A-pillar – B-pillar distance	1134
18	B-Pillar – rear axle distance	1236
19	B-pillar – C-pillar distance	1101
20	Roof sill bottom height	1675
21	Roof sill top height	1717
22	Floor sill bottom height	290
23	Floor sill top height	476

**DATA SHEET NO. 16**  
**HIGH SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Close-up	100	0	5050	50	1000
2	Overhead Overall	-375	0	5050	14	1000
3	MDB Onboard, Impact Point Close-up				50	1000
4	MDB Onboard, Centerline of Impact				16	1000
5	Right Side, Ground Level, Overall	-1060	5270	1260	20	1000
6	Left Side, Ground Level, Overall	2705	-5410	1225	24	1000
7	Vehicle Onboard Front SID/HIII, Front				12.5	1000
8	Vehicle Onboard Front SID/HIII, Side				8	1000
9	Vehicle Onboard Rear SID/HIII, Side				8	1000
10	Real Time Coverage				13	24

Reference Points X - Impact Line  
 Y - MDB Left Edge Impact Point  
 Z - Ground Plane

Camera #7 did not record video.

**DATA SHEET NO. 17**  
**SUMMARY OF FMVSS 301 DATA**

Test Vehicle: 2009 Kia Borrego EX 4x2  
 Test Program: NCAP Side Impact

NHTSA No. K90501  
 Test Date: 8/21/2008

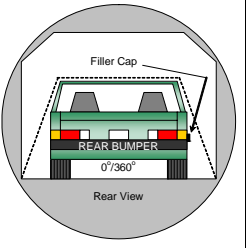
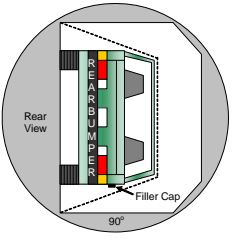
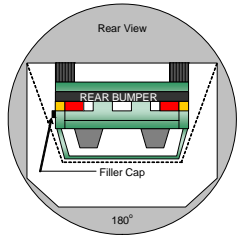
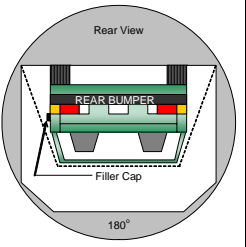
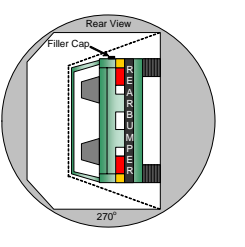
**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 21° C      Test Time: 10:23 am

Stoddard Solvent Spillage Measurements

- 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**

			<p>1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.</p> <p>2. The position hold time at each position is 300 seconds (minimum).</p> <p>3. Details of Stoddard Solvent spillage locations:  <b>None</b></p>
0° to 90°	90° to 180°		
			
180° to 270°	270° to 360°		

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage Collection Time (min)	Spillage (oz.)
0° to 90°	119	300	First 5	0
90° to 180°	118	300	First 5	0
180° to 270°	115	300	First 5	0
270° to 360°	117	300	First 5	0

**APPENDIX A**  
**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 1.	Left Front $\frac{3}{4}$ View, As Received	A-1
Photo No. 2.	Right Rear $\frac{3}{4}$ View, As Received	A-1
Photo No. 3.	Manufacturer's Label	A-2
Photo No. 4.	Tire Placard	A-2
Photo No. 5.	Pre-Test Front View	A-3
Photo No. 6.	Post-Test Front View	A-3
Photo No. 7.	Pre-Test Left Front $\frac{3}{4}$ View	A-4
Photo No. 8.	Post-Test Left Front $\frac{3}{4}$ View	A-4
Photo No. 9.	Pre-Test Left Side View	A-5
Photo No. 10.	Post-Test Left Side View	A-5
Photo No. 11.	Pre-Test Left Rear $\frac{3}{4}$ View	A-6
Photo No. 12.	Post-Test Left Rear $\frac{3}{4}$ View	A-6
Photo No. 13.	Pre-Test Rear View	A-7
Photo No. 14.	Post-Test Rear View	A-7
Photo No. 15.	Pre-Test Right Rear $\frac{3}{4}$ View	A-8
Photo No. 16.	Post-Test Right Rear $\frac{3}{4}$ View	A-8
Photo No. 17.	Pre-Test Right Side View	A-9
Photo No. 18.	Post-Test Right Side View	A-9
Photo No. 19.	Pre-Test Right Front $\frac{3}{4}$ View	A-10
Photo No. 20.	Post-Test Right Front $\frac{3}{4}$ View	A-10
Photo No. 21.	Pre-Test Left Impact Point	A-11
Photo No. 22.	Post-Test Left Impact Point	A-11
Photo No. 23.	Pre-Test Front $\frac{3}{4}$ View of Left Side Doors	A-12
Photo No. 24.	Post-Test Front $\frac{3}{4}$ View of Left Side Doors	A-12
Photo No. 25.	Pre-Test Rear $\frac{3}{4}$ View of Left Side Doors	A-13
Photo No. 26.	Post-Test Rear $\frac{3}{4}$ View of Left Side Doors	A-13
Photo No. 27.	Pre-Test Left Side Impact Close-up	A-14
Photo No. 28.	Post-Test Left Side Impact Close-up	A-14
Photo No. 29.	Pre-Test Overhead View	A-15
Photo No. 30.	Post-Test Overhead View	A-15

	<u>Page No.</u>
Photo No. 31. Pre-Test Overhead Close-up View	A-16
Photo No. 32. Post-Test Overhead Close-up View	A-16
Photo No. 33. Pre-Test Driver Dummy (Door Open)	A-17
Photo No. 34. Pre-Test Driver Dummy Clearance From Door	A-18
Photo No. 35. Post-Test Driver Dummy Clearance From Door	A-18
Photo No. 36. Pre-Test Driver Dummy (Through Window)	A-19
Photo No. 37. Post-Test Driver Dummy (Through Window)	A-19
Photo No. 38. Pre-Test Driver Dummy Right Side View	A-20
Photo No. 39. Post-Test Driver Dummy Right Side View	A-20
Photo No. 40. Pre-Test Passenger Dummy (Door Open)	A-21
Photo No. 41. Pre-Test Passenger Dummy Clearance From Door	A-22
Photo No. 42. Post-Test Passenger Dummy Clearance From Door	A-22
Photo No. 43. Pre-Test Passenger Dummy (Through Window)	A-23
Photo No. 44. Post-Test Passenger Dummy (Through Window)	A-23
Photo No. 45. Pre-Test Passenger Dummy Right Side View	A-24
Photo No. 46. Post-Test Passenger Dummy Right Side View	A-24
Photo No. 47. Pre-Test Front View of Deformable Barrier	A-25
Photo No. 48. Post-Test Front View of Deformable Barrier	A-25
Photo No. 49. Pre-Test Top View of Deformable Barrier	A-26
Photo No. 50. Post-Test Top View of Deformable Barrier	A-26
Photo No. 51. Pre-Test Right Side View of Deformable Barrier	A-27
Photo No. 52. Post-Test Right Side View of Deformable Barrier	A-27
Photo No. 53. Pre-Test Left Side View of Deformable Barrier	A-28
Photo No. 54. Post-Test Left Side View of Deformable Barrier	A-28
Photo No. 55. Vehicle on Rollover Device (90 Degrees)	A-29
Photo No. 56. Vehicle on Rollover Device (180 Degrees)	A-29
Photo No. 57. Vehicle on Rollover Device (270 Degrees)	A-30
Photo No. 58. Vehicle on Rollover Device (360 Degrees)	A-30
Photo No. 59. Vehicle Impact	A-31
Photo No. 60. Post-Test Driver Dummy Head Contact	A-31
Photo No. 61. Post-Test Driver Dummy Upper Torso Contact	A-32
Photo No. 62. Post-Test Driver Dummy Lower Torso Contact	A-32

	<u>Page No.</u>
Photo No. 63. Post-Test Driver Dummy Contact	A-33
Photo No. 64. Post-Test Passenger Dummy Head Contact	A-33
Photo No. 65. Post-Test Passenger Dummy Torso Contact	A-34
Photo No. 66. Post-Test Passenger Dummy Contact	A-34



Left Front ¾ View, As Received



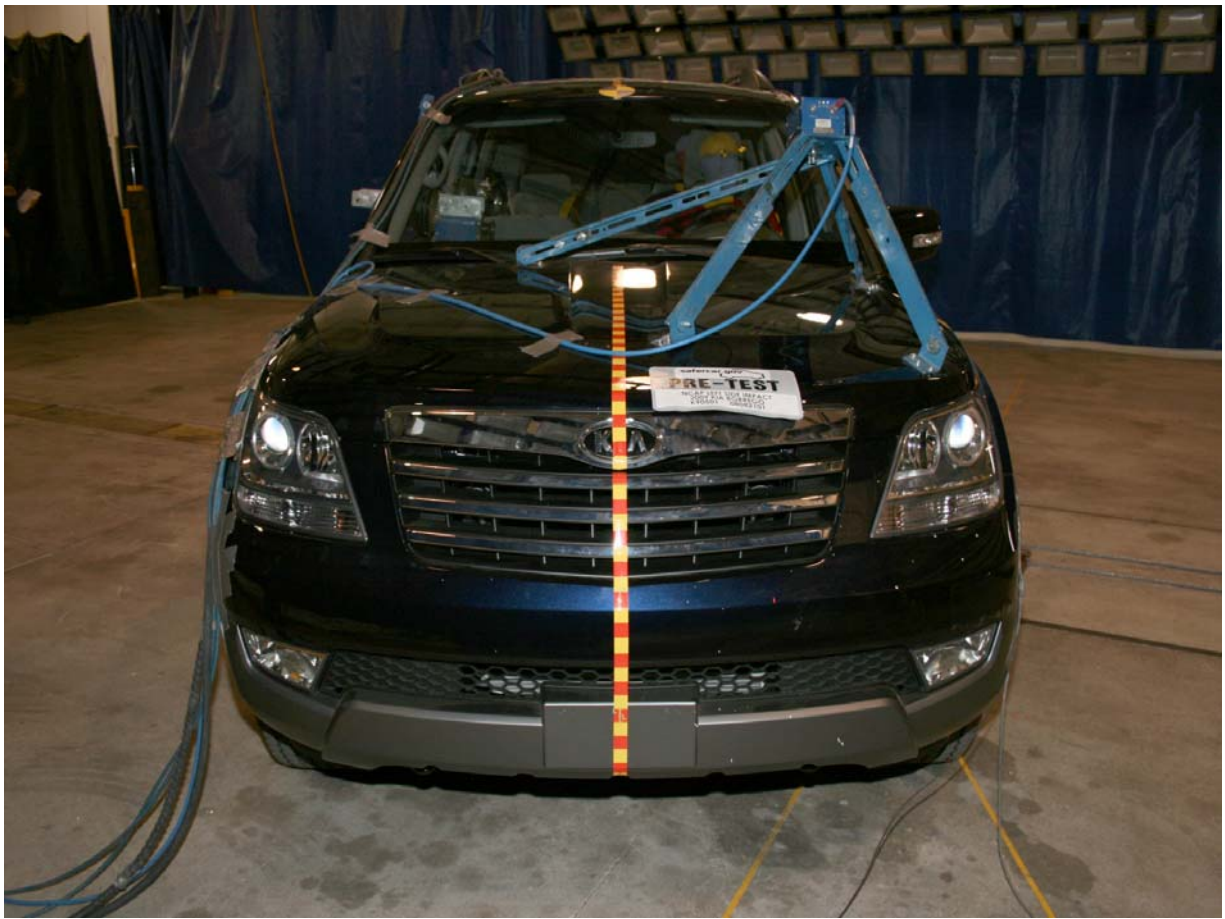
Right Rear ¾ View, As Received



Manufacturer's Label



Tire Placard



Pre-Test Front View



Post-Test Front View



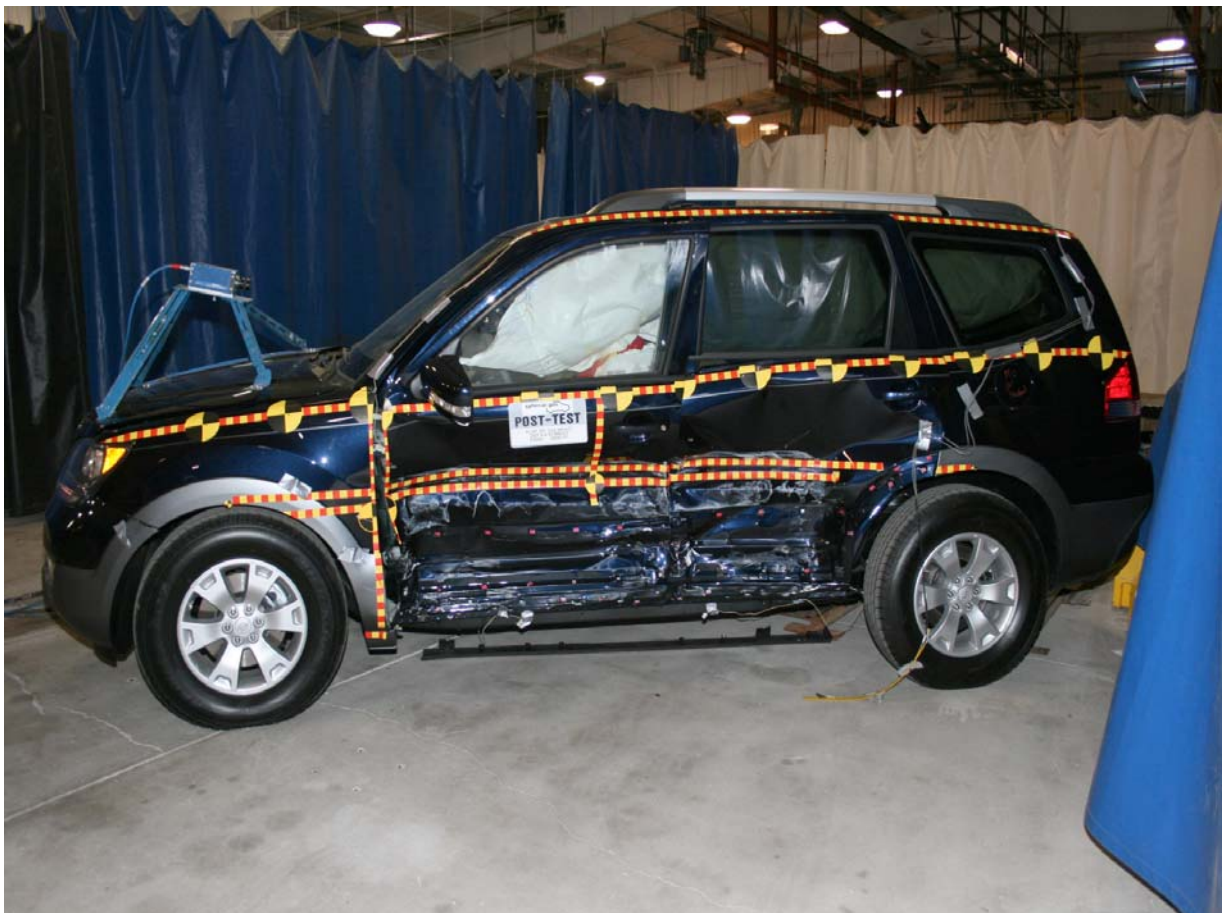
Pre-Test Left Front  $\frac{3}{4}$  View



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



Pre-Test Left Side View



Post-Test Left Side View



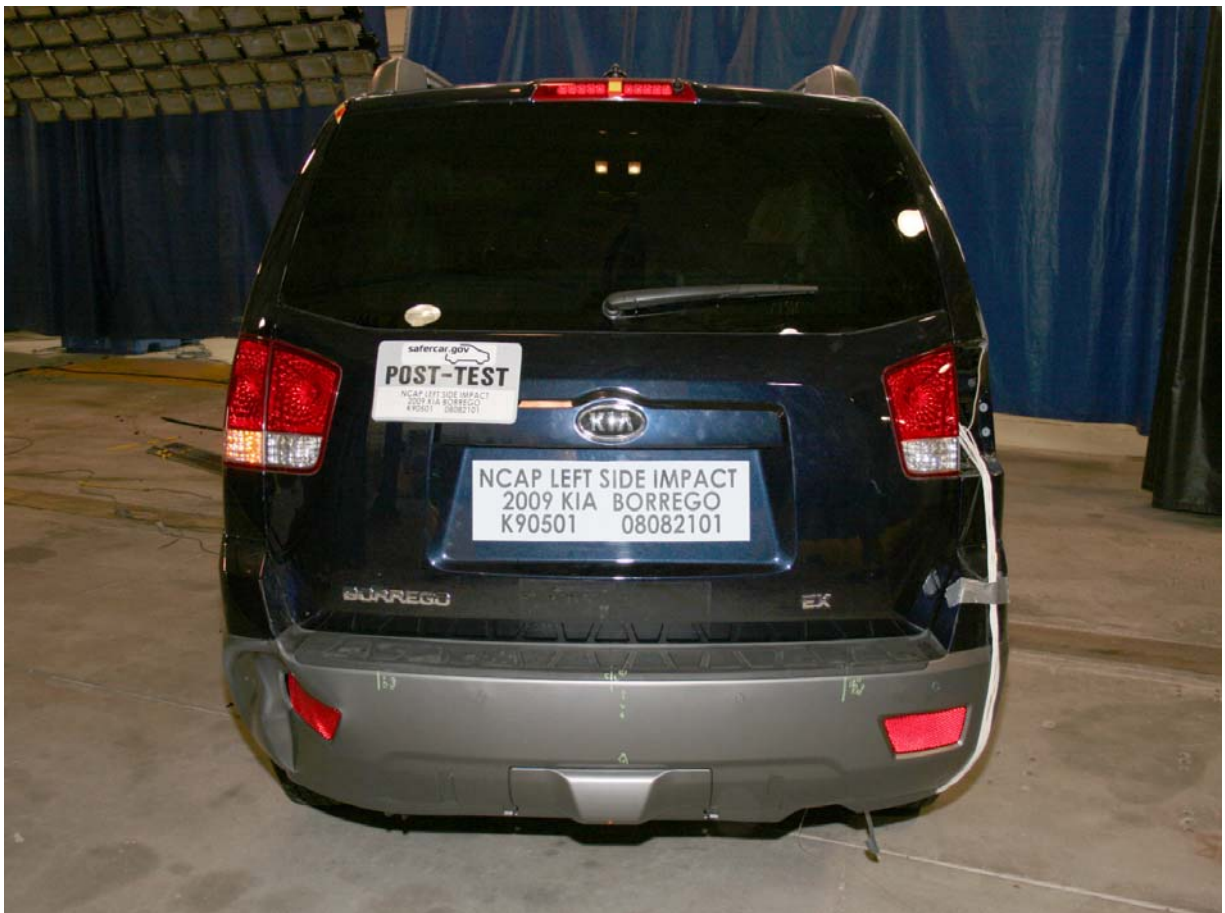
Pre-Test Left Rear 3/4 View



Post-Test Left Rear 3/4 View



Pre-Test Rear View



Post-Test Rear View



Pre-Test Right Rear  $\frac{3}{4}$  View



Post-Test Right Rear  $\frac{3}{4}$  View



Pre-Test Right Side View



Post-Test Right Side View



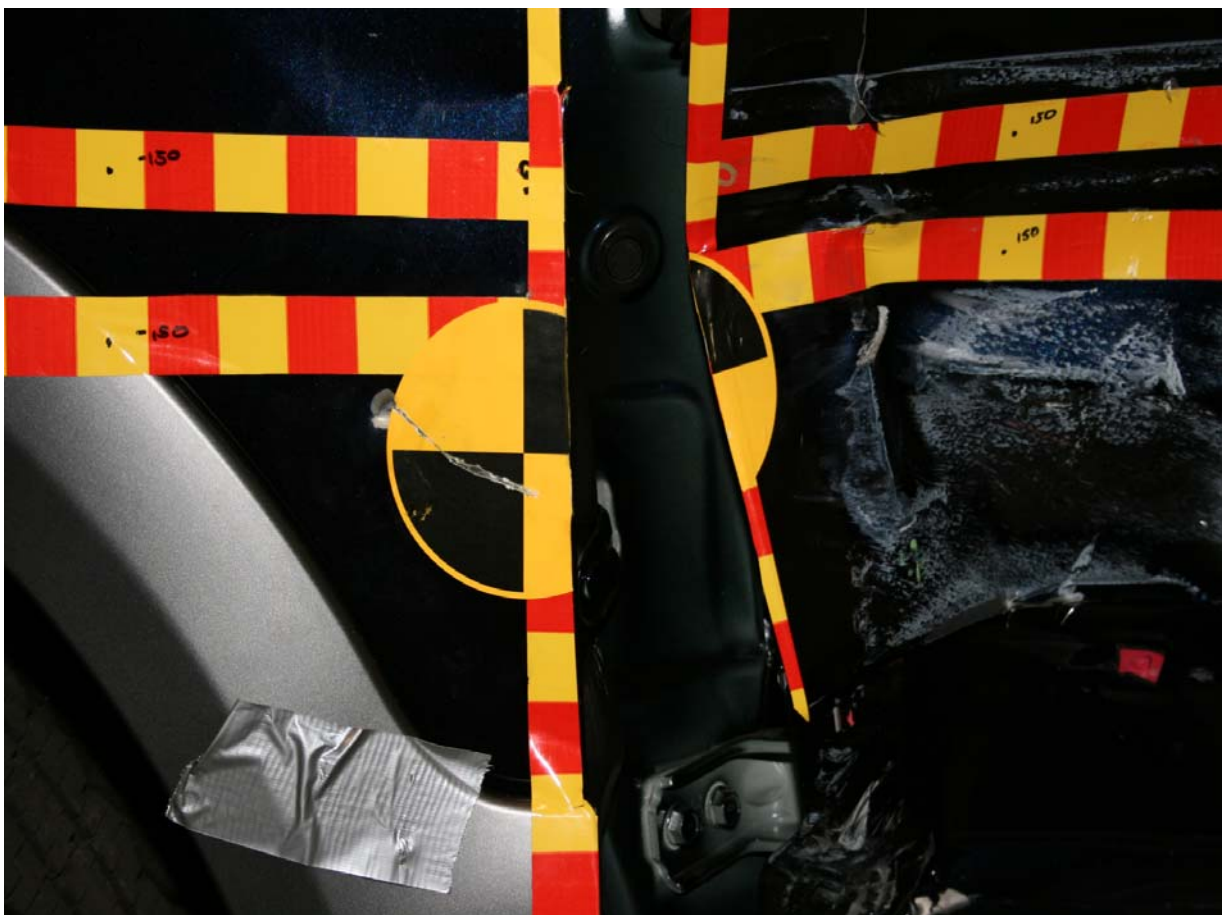
Pre-Test Right Front  $\frac{3}{4}$  View



Post-Test Right Front  $\frac{3}{4}$  View



Pre-Test Left Impact Point



Post-Test Left Impact Point





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



Post-Test Rear  $\frac{3}{4}$  View of Left Side Doors



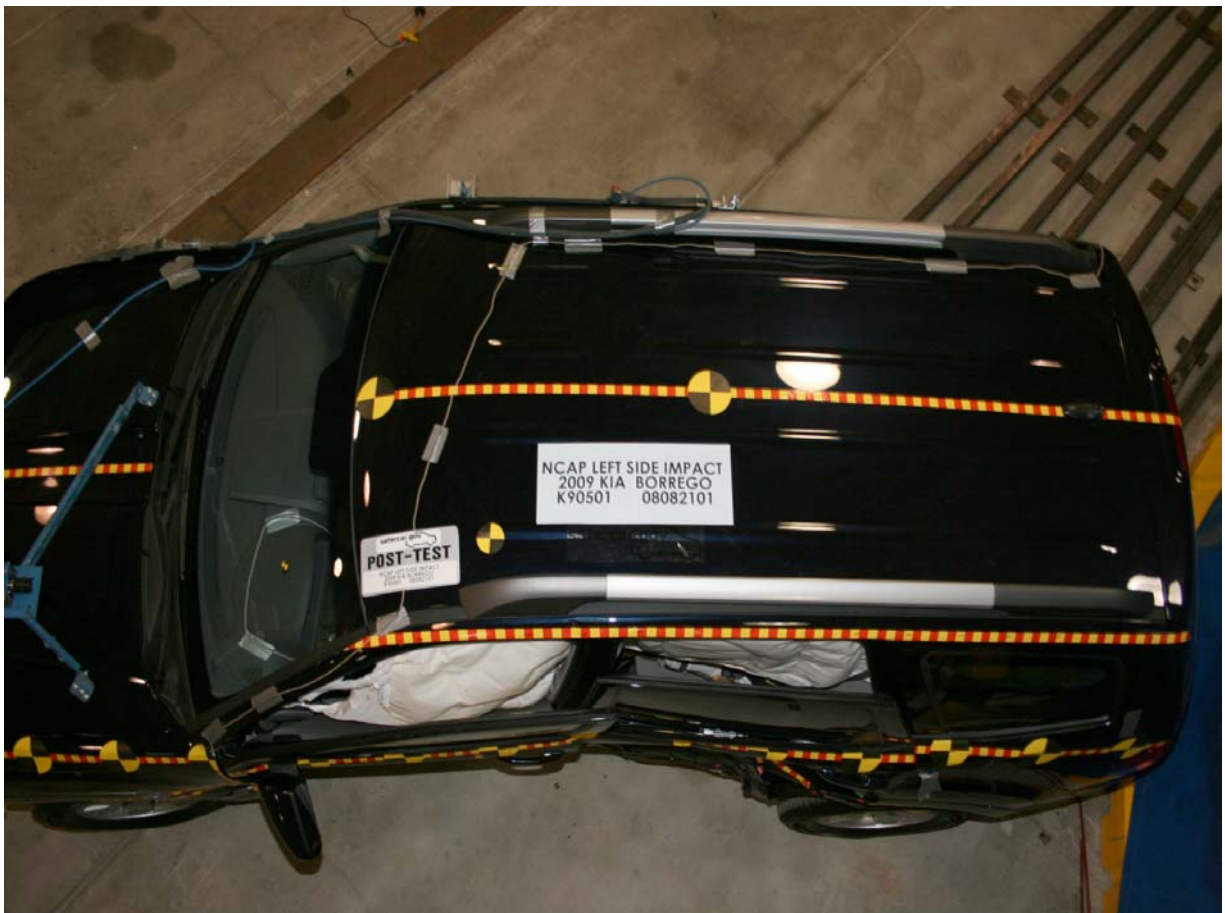
Pre-Test Left Side Impact Close-up



Post-Test Left Side Impact Close-up



Pre-Test Overhead View



Post-Test Overhead View



Pre-Test Overhead Close-up View



Post-Test Overhead Close-up View



Pre-Test Driver Dummy (Door Open)



Pre-Test Driver Dummy Clearance From Door



Post-Test Driver Dummy Clearance From Door



Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View



Pre-Test Passenger Dummy (Door Open)



Pre-Test Passenger Dummy Clearance From Door



Post-Test Passenger Dummy Clearance From Door



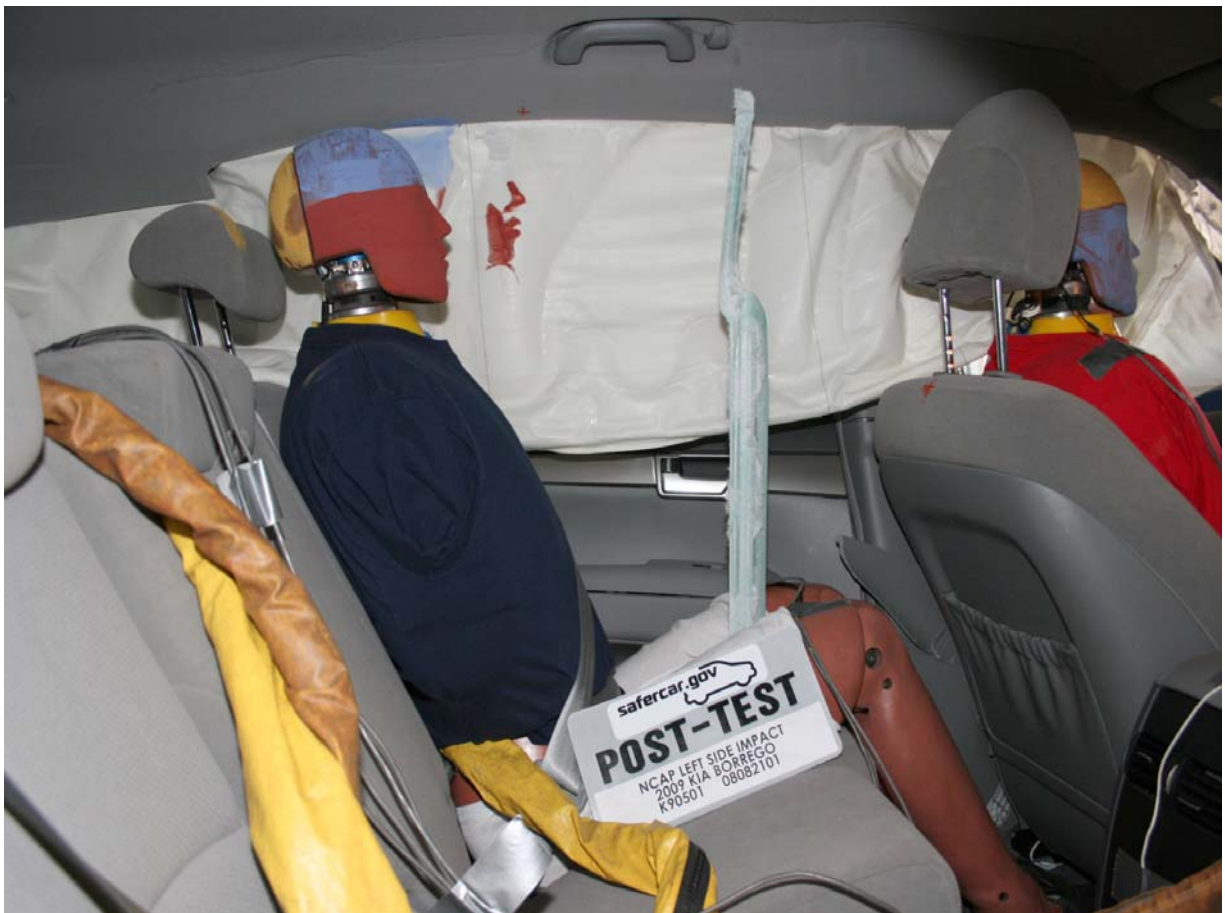
Pre-Test Passenger Dummy (Through Window)



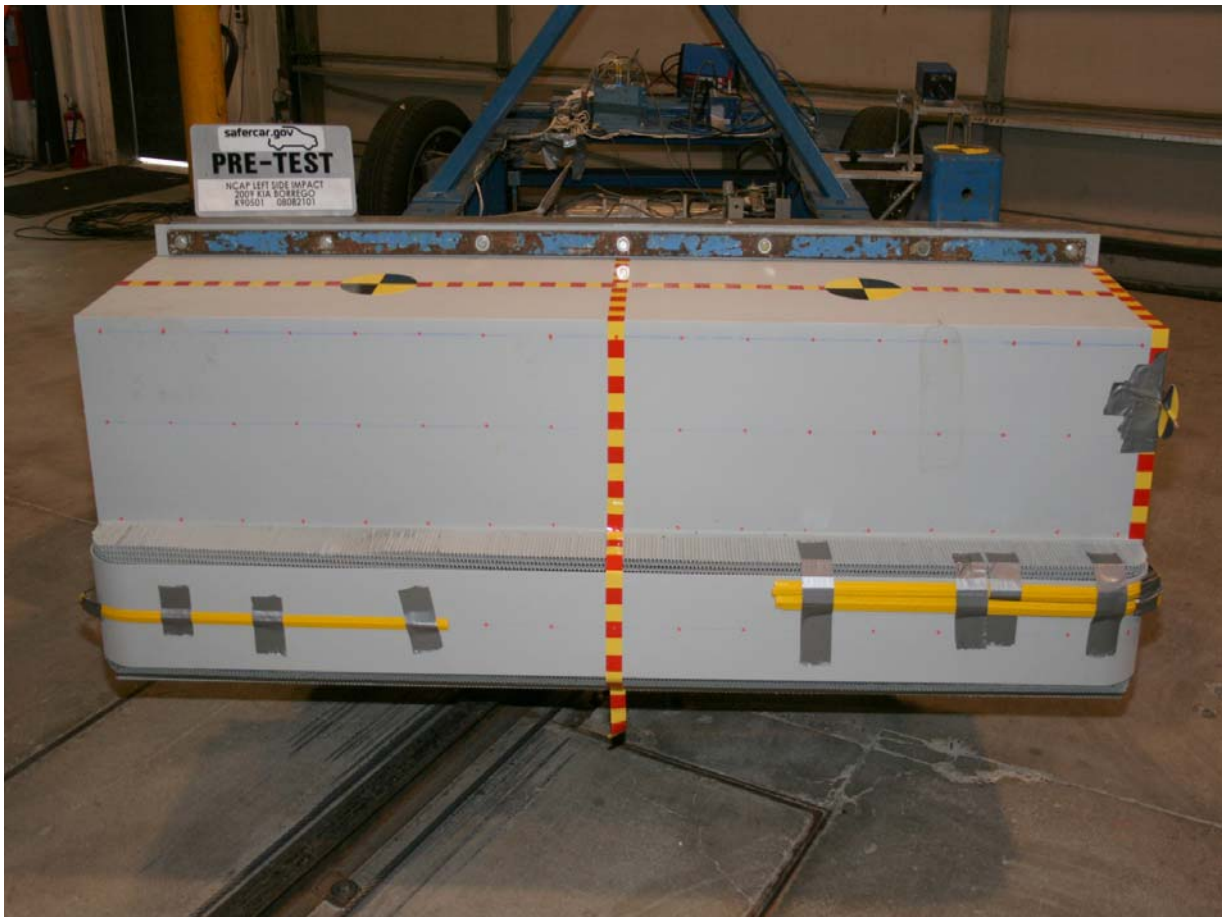
Post-Test Passenger Dummy (Through Window)



Pre-Test Passenger Dummy Right Side View



Post-Test Passenger Dummy Right Side View



Pre-Test Front View of Deformable Barrier



Post-Test Front View of Deformable Barrier



Pre-Test Top View of Deformable Barrier



Post-Test Top View of Deformable Barrier



Pre-Test Right Side View of Deformable Barrier



Post-Test Right Side View of Deformable Barrier





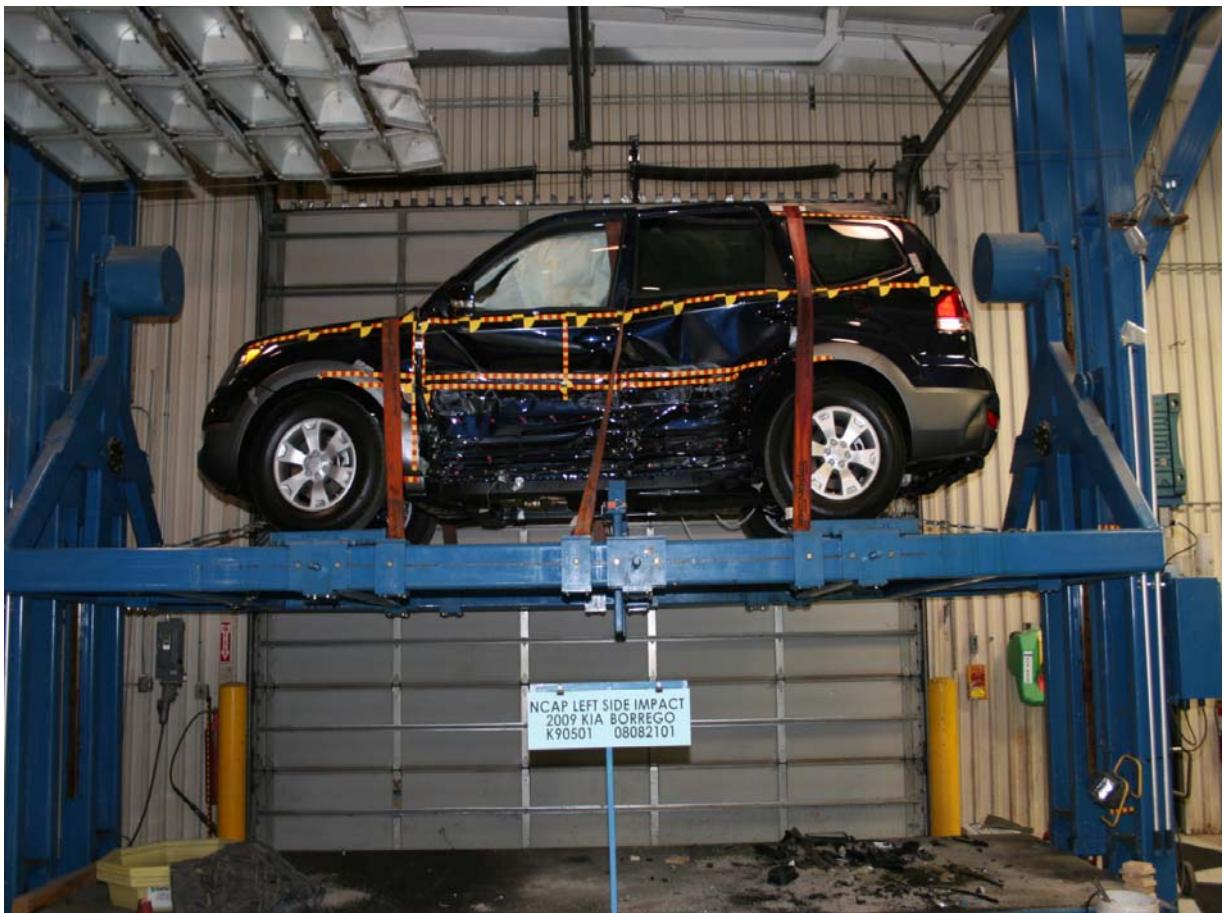
Vehicle on Rollover Device (90 Degrees)



Vehicle on Rollover Device (180 Degrees)



Vehicle on Rollover Device (270 Degrees)



Vehicle on Rollover Device (360 Degrees)



Vehicle Impact



Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Upper Torso Contact



Post-Test Driver Dummy Lower Torso Contact



Post-Test Driver Dummy Contact



Post-Test Passenger Dummy Head Contact



Post-Test Passenger Dummy Torso Contact



Post-Test Passenger Dummy Contact

**APPENDIX B**  
**SID/HIII RESPONSE DATA TRACES**

## TABLE OF DATA PLOTS

Page No.

### List of Data Plots Provided in the Test Report

Figure No. 1.	Driver Upper Rib Y Acceleration vs. Time	B-1
Figure No. 2.	Driver Upper Rib Y Velocity vs. Time	B-1
Figure No. 3.	Driver Lower Rib Y Acceleration vs. Time	B-1
Figure No. 4.	Driver Lower Rib Y Velocity vs. Time	B-1
Figure No. 5.	Driver Lower Spine Y Acceleration vs. Time	B-2
Figure No. 6.	Driver Lower Spine Y Velocity vs. Time	B-2
Figure No. 7.	Driver Pelvis Y Acceleration vs. Time	B-2
Figure No. 8.	Driver Pelvis Y Velocity vs. Time	B-2
Figure No. 9.	Passenger Upper Rib Y Acceleration vs. Time	B-3
Figure No. 10.	Passenger Upper Rib Y Velocity vs. Time	B-3
Figure No. 11.	Passenger Lower Rib Y Acceleration vs. Time	B-3
Figure No. 12.	Passenger Lower Rib Y Velocity vs. Time	B-3
Figure No. 13.	Passenger Lower Spine Y Acceleration vs. Time	B-4
Figure No. 14.	Passenger Lower Spine Y Velocity vs. Time	B-4
Figure No. 15.	Passenger Pelvis Y Acceleration vs. Time	B-4
Figure No. 16.	Passenger Pelvis Y Velocity vs. Time	B-4

**The following dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)**

Driver Head X Primary

Driver Head Y Primary

Driver Head Z Primary

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Upper Neck Force X

Driver Upper Neck Force Y

Driver Upper Neck Force Z

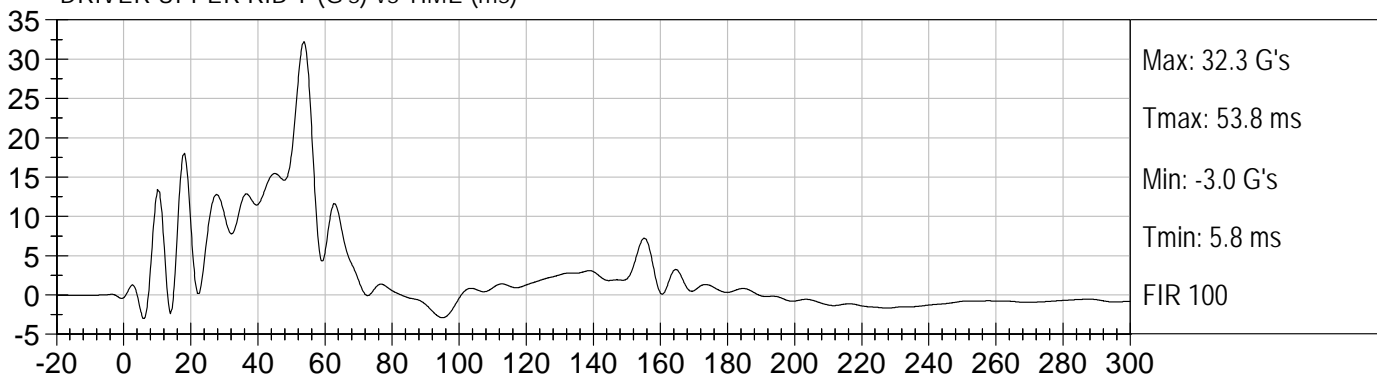
Driver Upper Neck Moment X

Driver Upper Neck Moment Y  
Driver Upper Neck Moment Z  
Driver Upper Rib Redundant Y  
Driver Lower Rib Redundant Y  
Driver Lower Spine Redundant Y  
Driver Pelvis Redundant Y  
Driver Thorax Contact  
Driver Pelvis Contact  
Passenger Head X Primary  
Passenger Head Y Primary  
Passenger Head Z Primary  
Passenger Head X Redundant  
Passenger Head Y Redundant  
Passenger Head Z Redundant  
Passenger Upper Neck Force X  
Passenger Upper Neck Force Y  
Passenger Upper Neck Force Z  
Passenger Upper Neck Moment X  
Passenger Upper Neck Moment Y  
Passenger Upper Neck Moment Z  
Passenger Upper Rib Redundant Y  
Passenger Lower Rib Redundant Y  
Passenger Lower Spine Redundant Y  
Passenger Pelvis Redundant Y  
Passenger Thorax Contact  
Passenger Pelvis Contact  
Vehicle Right Sill at Front Seat X  
Vehicle Right Sill at Front Seat Y  
Vehicle Right Sill at Front Seat Z  
Vehicle Right Sill at Rear Seat X  
Vehicle Right Sill at Rear Seat Y  
Vehicle Right Sill at Rear Seat Z

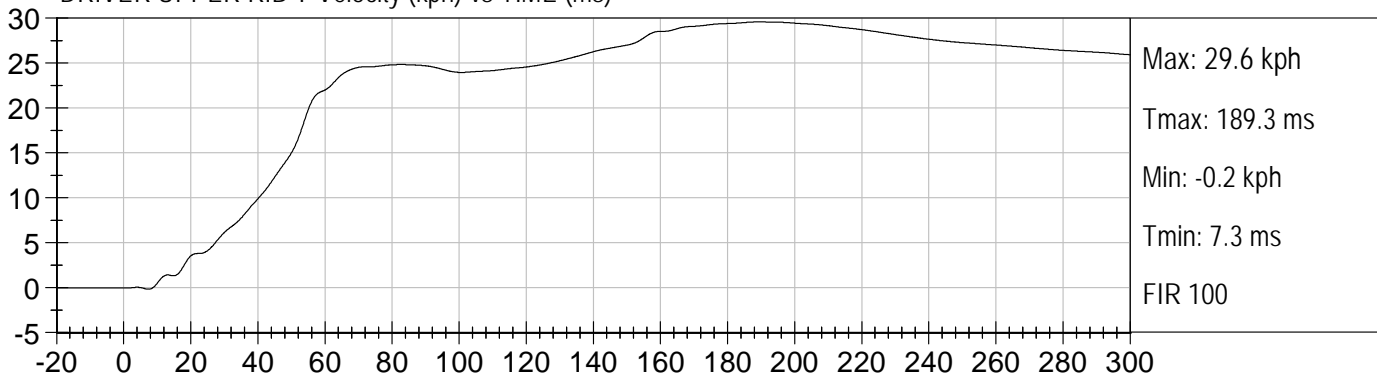
Vehicle Rear Floor Above Axle X  
Vehicle Rear Floor Above Axle Y  
Vehicle Rear Floor Above Axle Z  
Vehicle Left Sill at Rear Door Y  
Vehicle Left Sill at Front Door Y  
Vehicle Right Rear Occupant Compartment  
Vehicle B-Post Lower Y  
Vehicle B-Post Middle Y  
Vehicle A-Post Lower Y  
Vehicle A-Post Middle Y  
Vehicle Left Front Seat Track  
Vehicle Left Rear Seat Track  
Vehicle CG X  
Vehicle CG Y  
Vehicle CG Z  
MDB CG X  
MDB CG Y  
MDB CG Z  
MDB Rear X  
MDB Rear Y  
MDB Left Bumper Contact  
MDB Right Bumper Contact



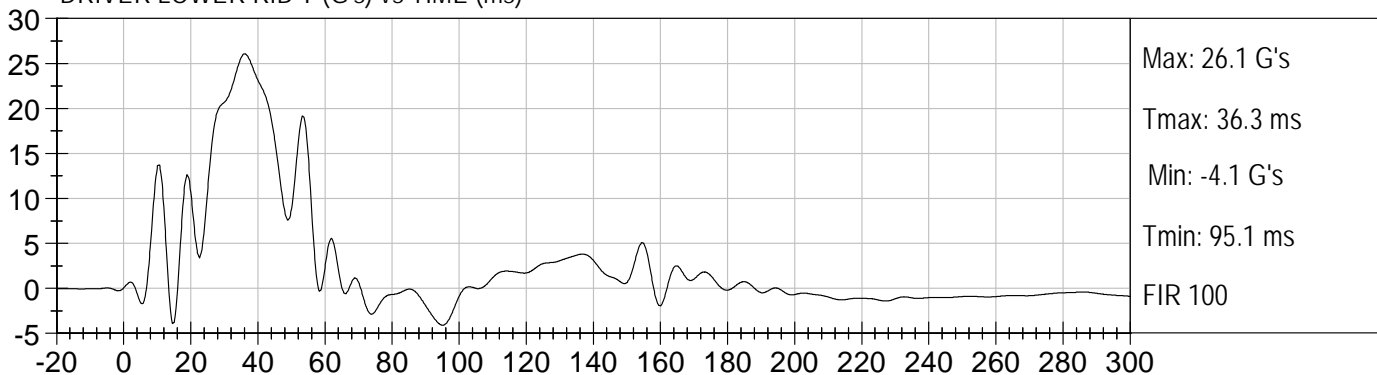
DRIVER UPPER RIB Y (G's) vs TIME (ms)



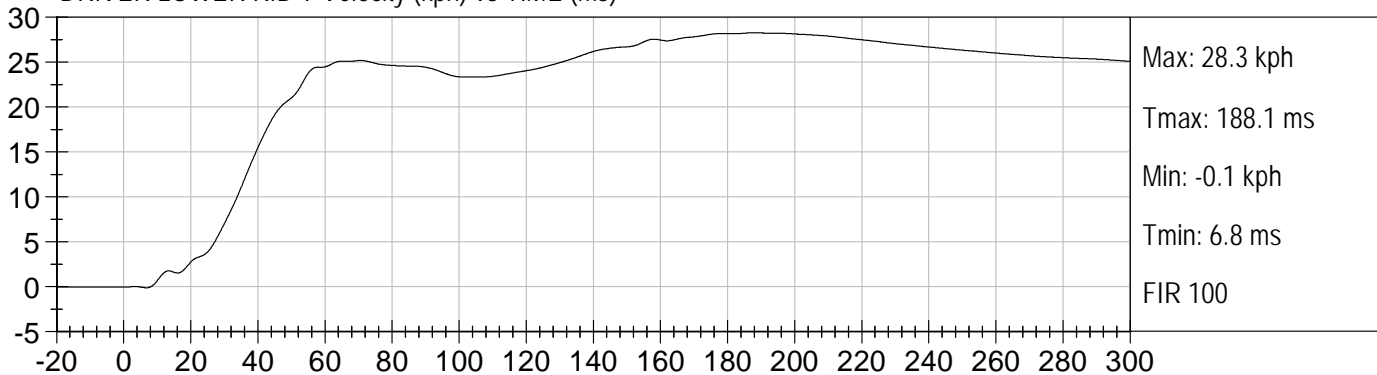
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)

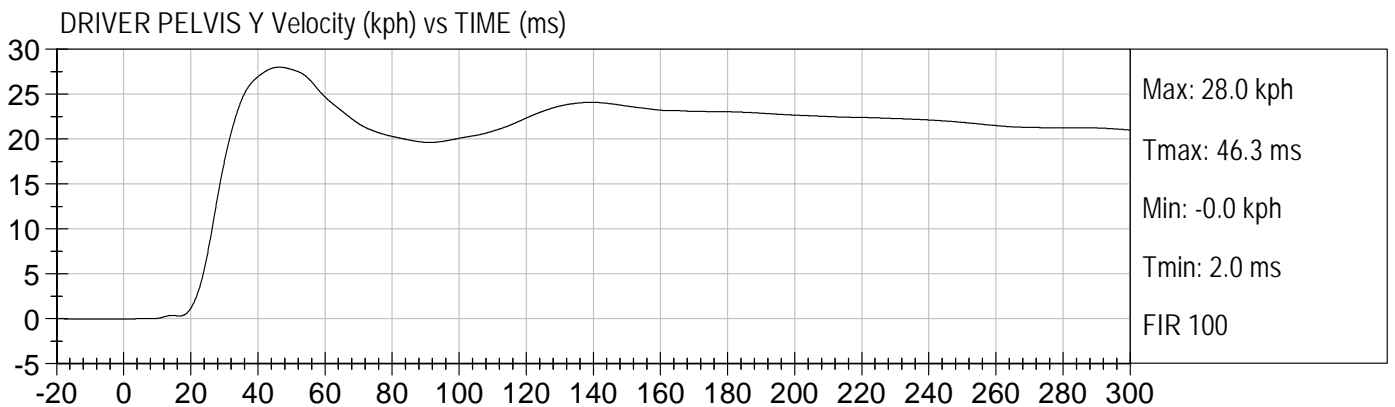
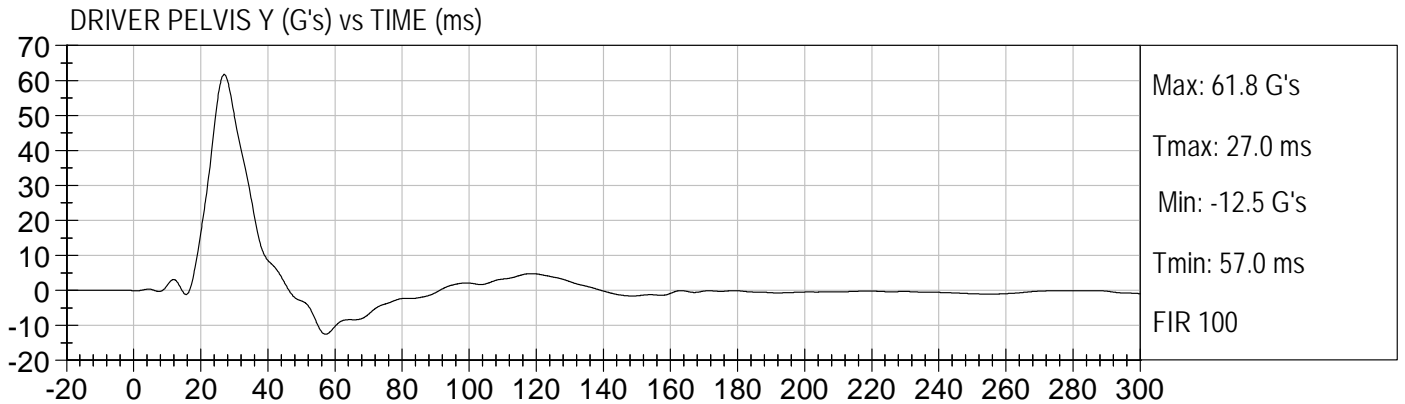
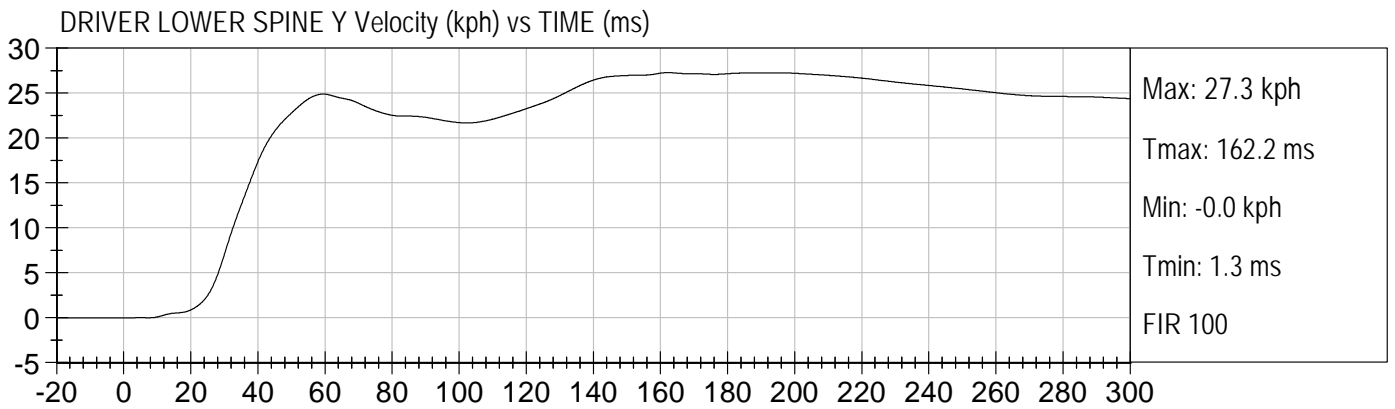
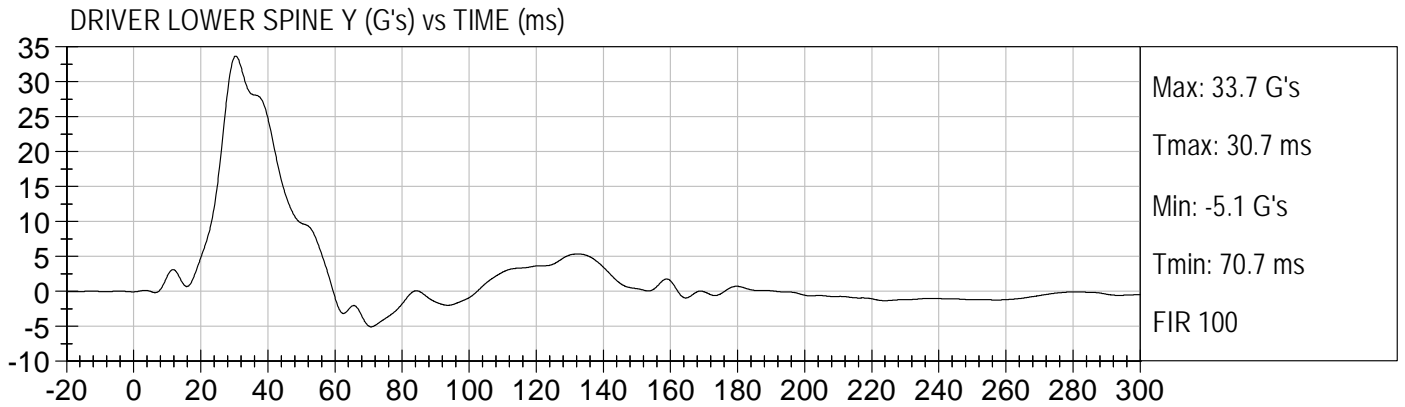


DRIVER LOWER RIB Y (G's) vs TIME (ms)



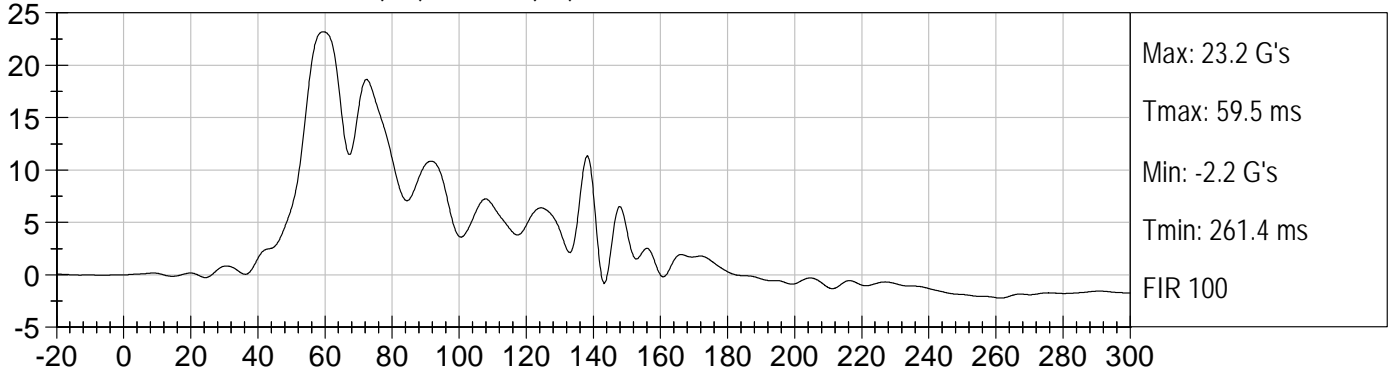
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



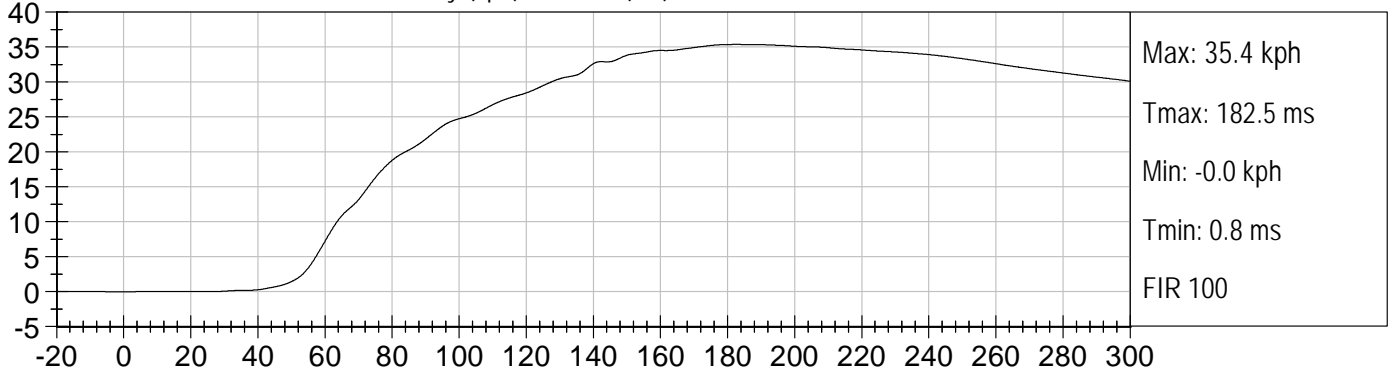




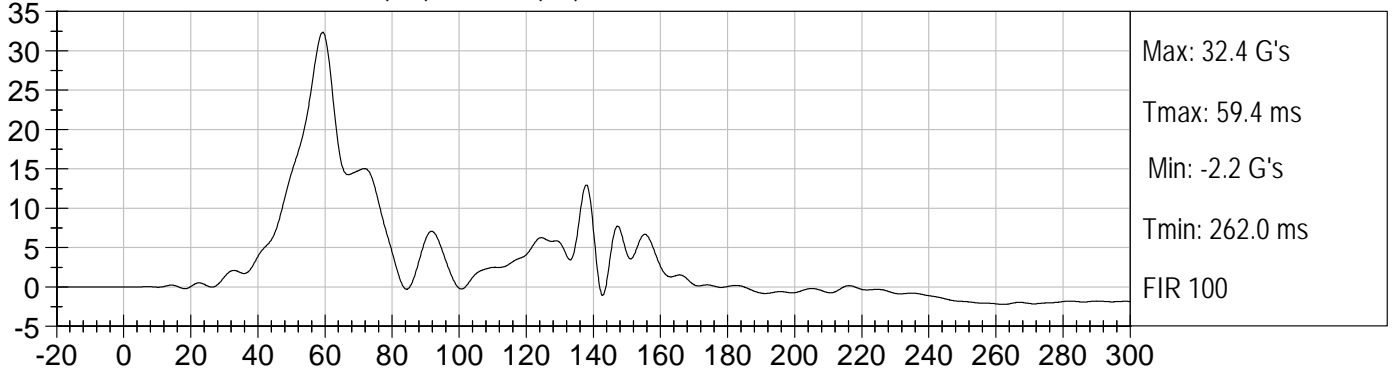
PASSENGER UPPER RIB Y (G's) vs TIME (ms)



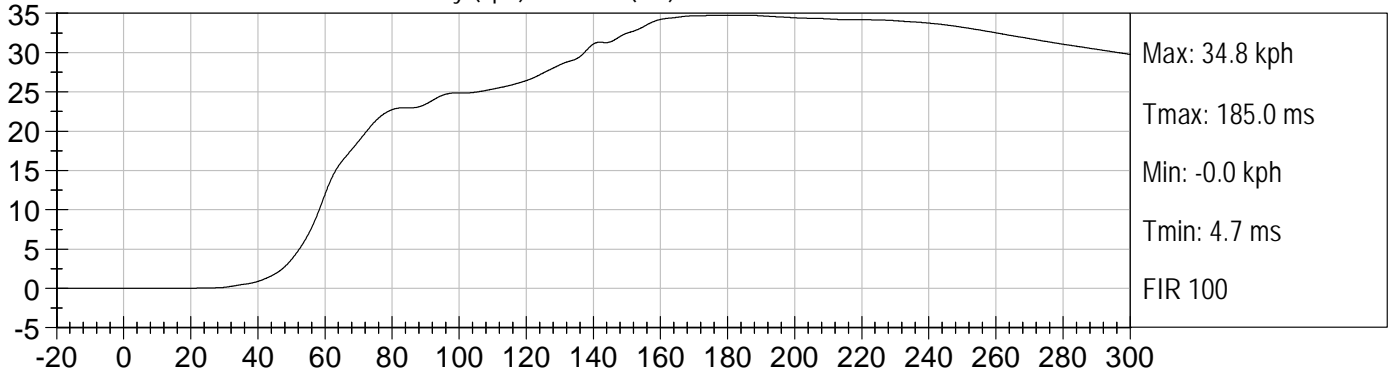
PASSENGER UPPER RIB Y Velocity (kph) vs TIME (ms)

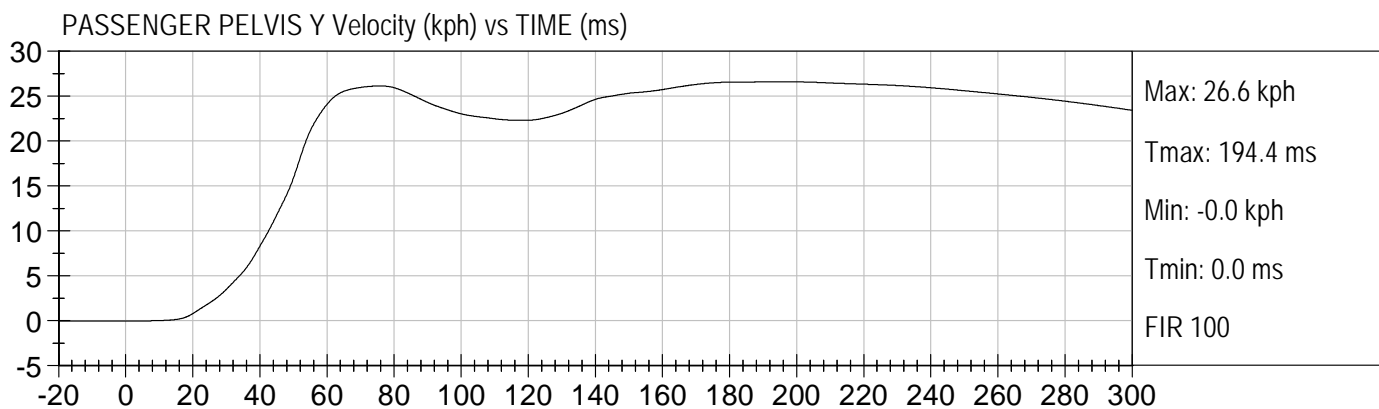
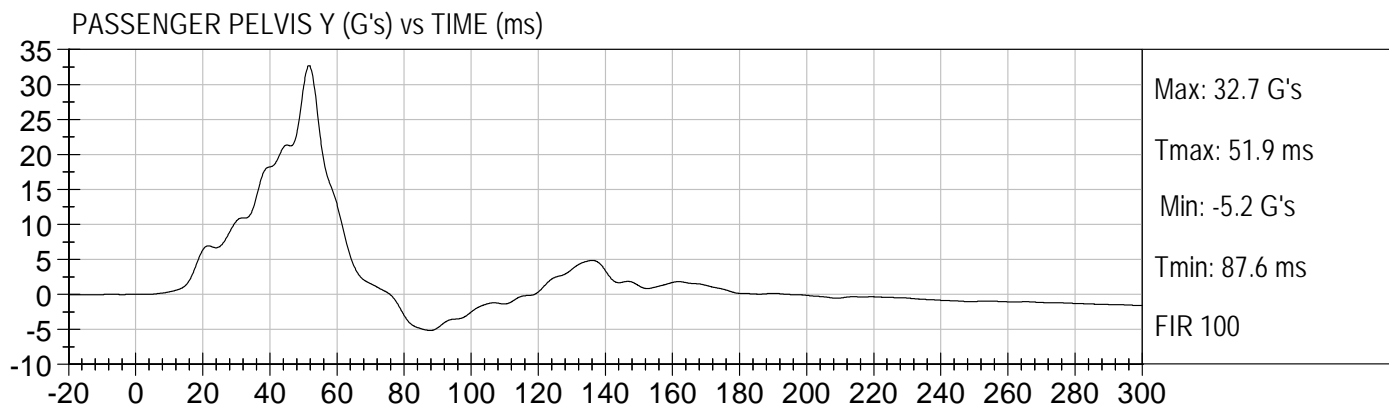
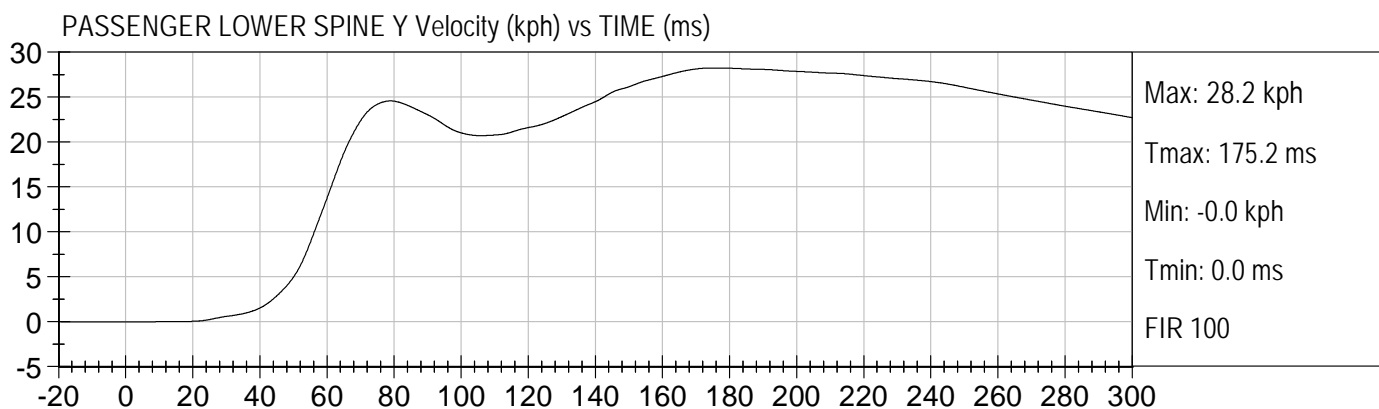
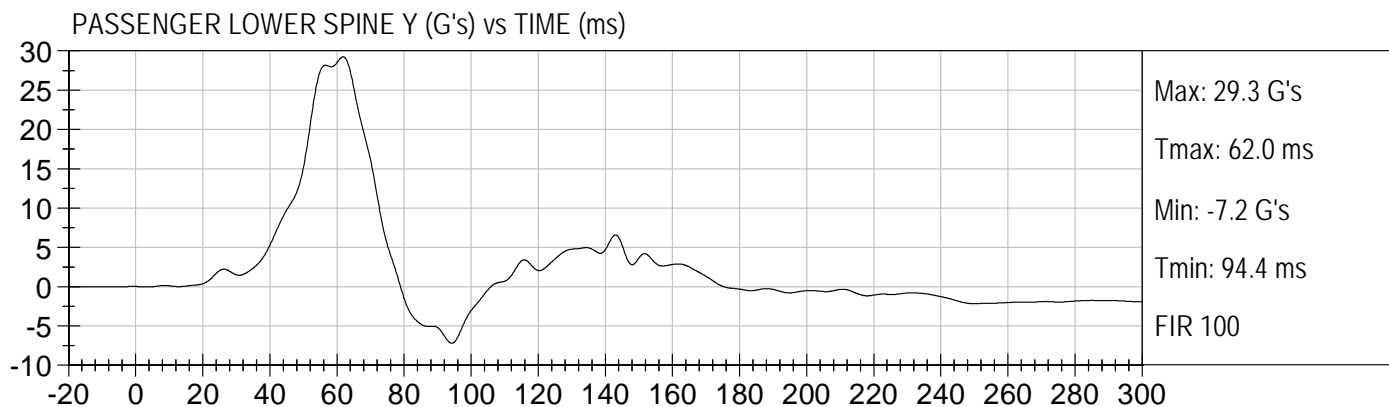


PASSENGER LOWER RIB Y (G's) vs TIME (ms)



PASSENGER LOWER RIB Y Velocity (kph) vs TIME (ms)





**APPENDIX C**  
**DUMMY CALIBRATION DATA**

CERTIFICATION DATA

Dummy Serial Number: 272

## Calibration Test Results Summary

Dummy Serial Number: 272

### Pre-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**External Measurements**

ATD Serial No: 272

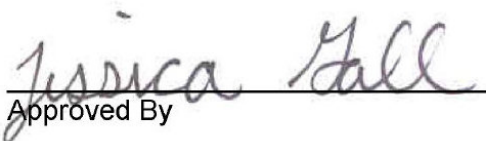
Test I.D.: D08234

Tested Parameter	Units	Specification	Result	Pass/Fail
SH - Seated Height	mm	889 - 909	907	Pass
RH - Rib Height	mm	501 - 521	520	Pass
HP - Hip Pivot Height	mm	99 ref.	99	Pass
RD - Rib from Back Line	mm	229 - 241	230	Pass
KV - Knee Pivot to Back Line	mm	511 - 526	525	Pass
SW - Knee Pivot to Floor	mm	490 - 505	495	Pass
HW - Hip Width	mm	356 - 391	358	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/15/08

Test Date

  
 Approved By

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

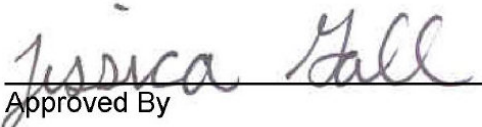
**ATD Serial No:** 272

**Test I.D:** D082341

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Peak Resultant Acceleration	G's	120 to 150	143	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	8.3	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/15/08  
 Test Date

  
 Approved By



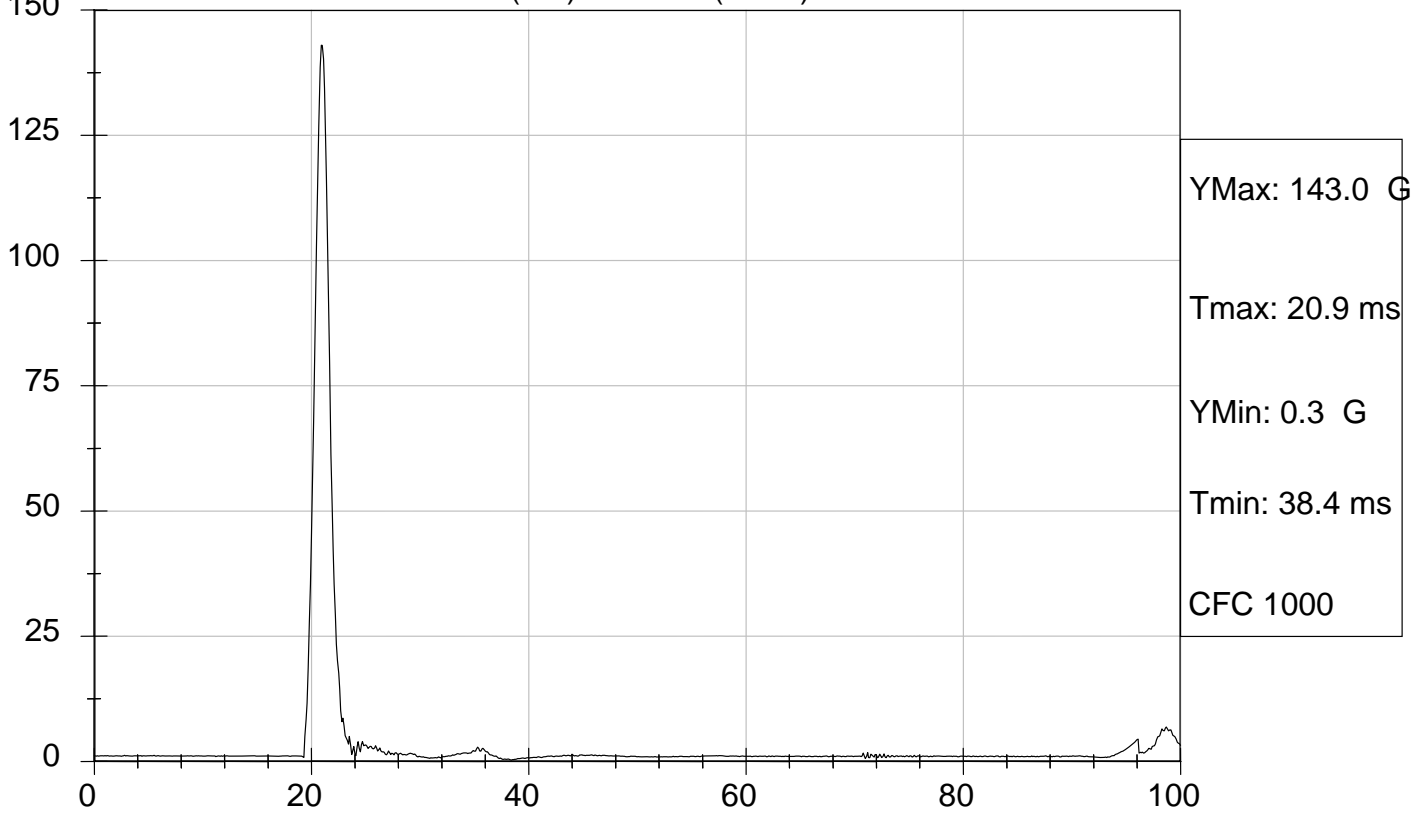
Test Description: Head Drop

Test Date: 8/15/08

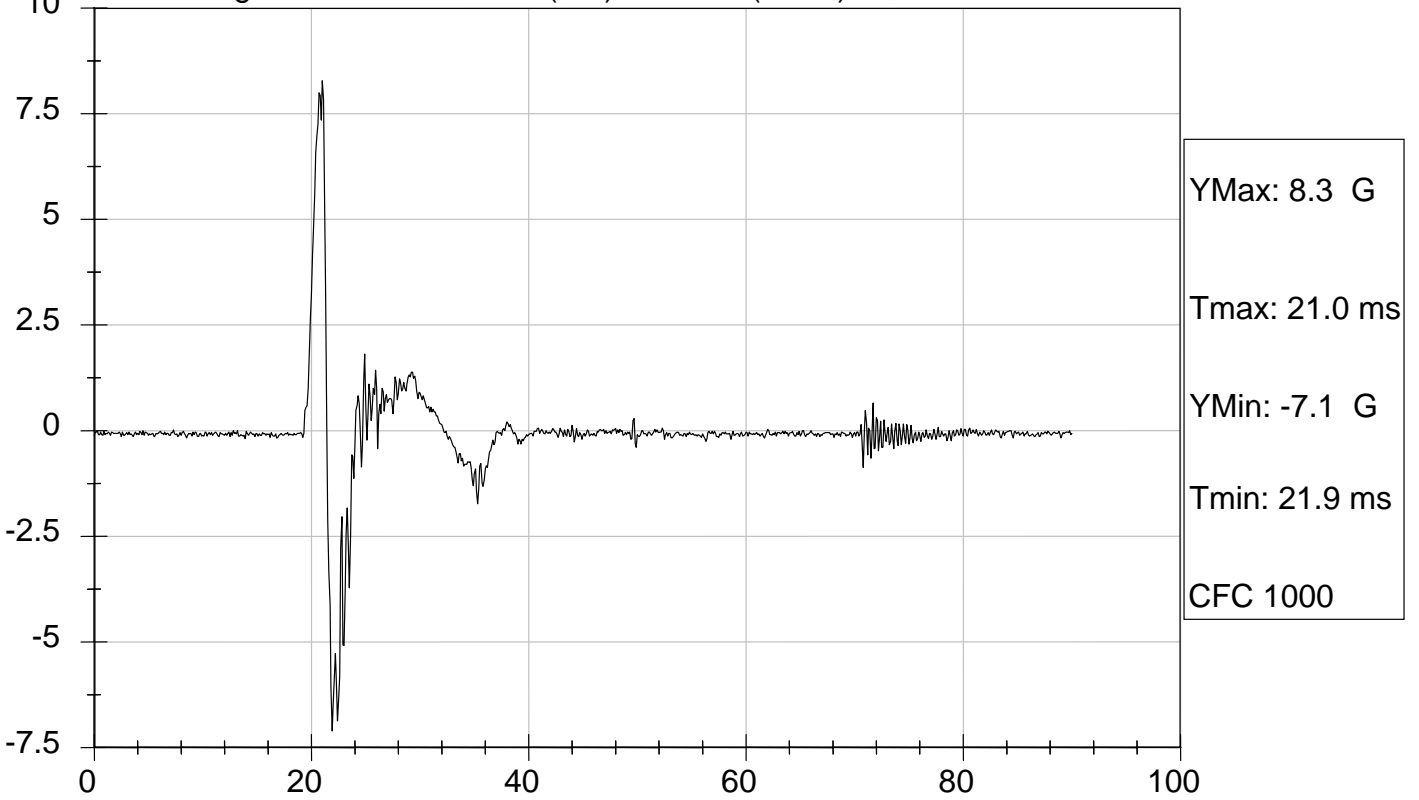
Component: D082341

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (msec)



Peak Longitudinal Acceleration (G's) Vs Time (msec)



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

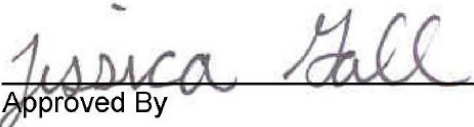
**ATD Serial No:** 272

**Test I.D:** D082342

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	40	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	19	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

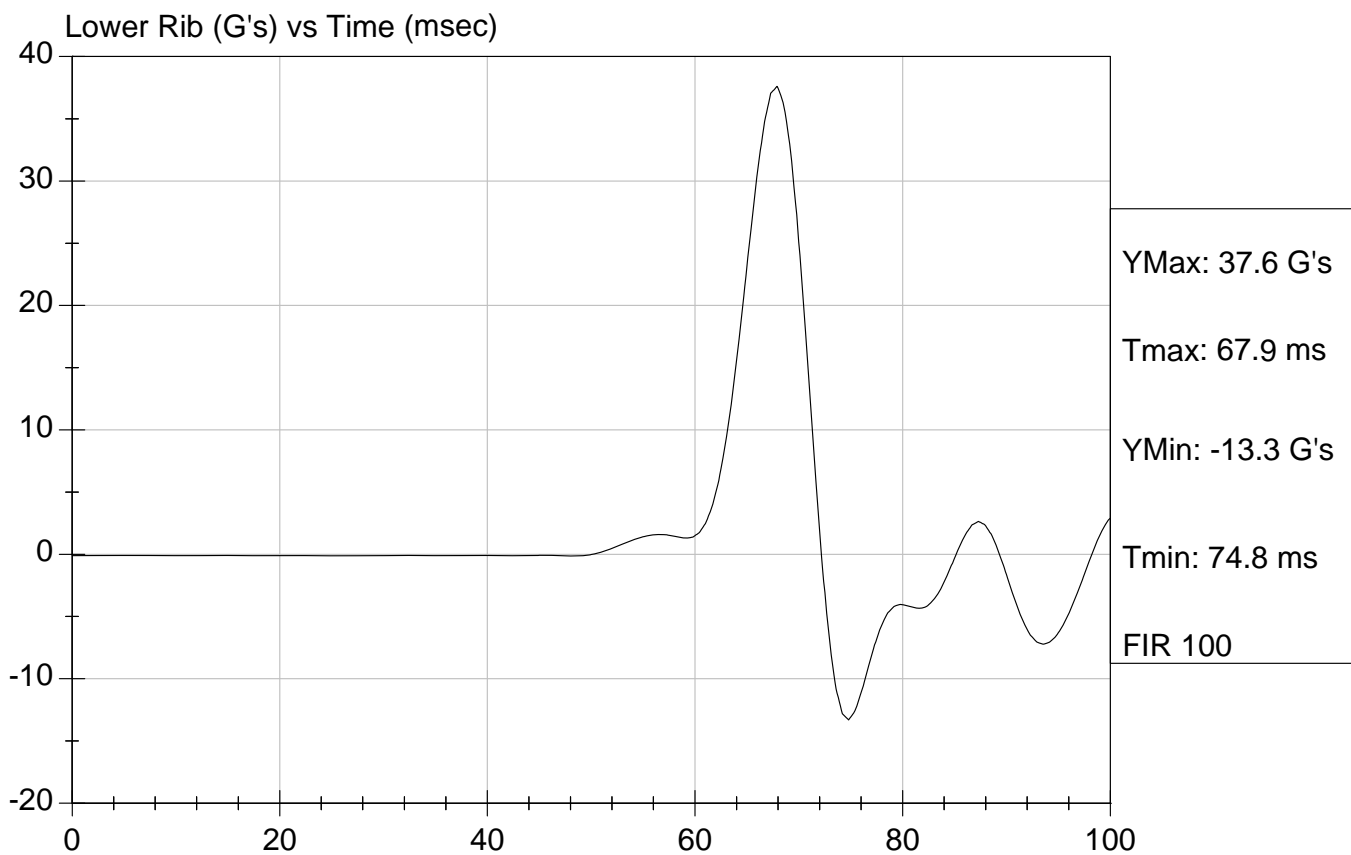
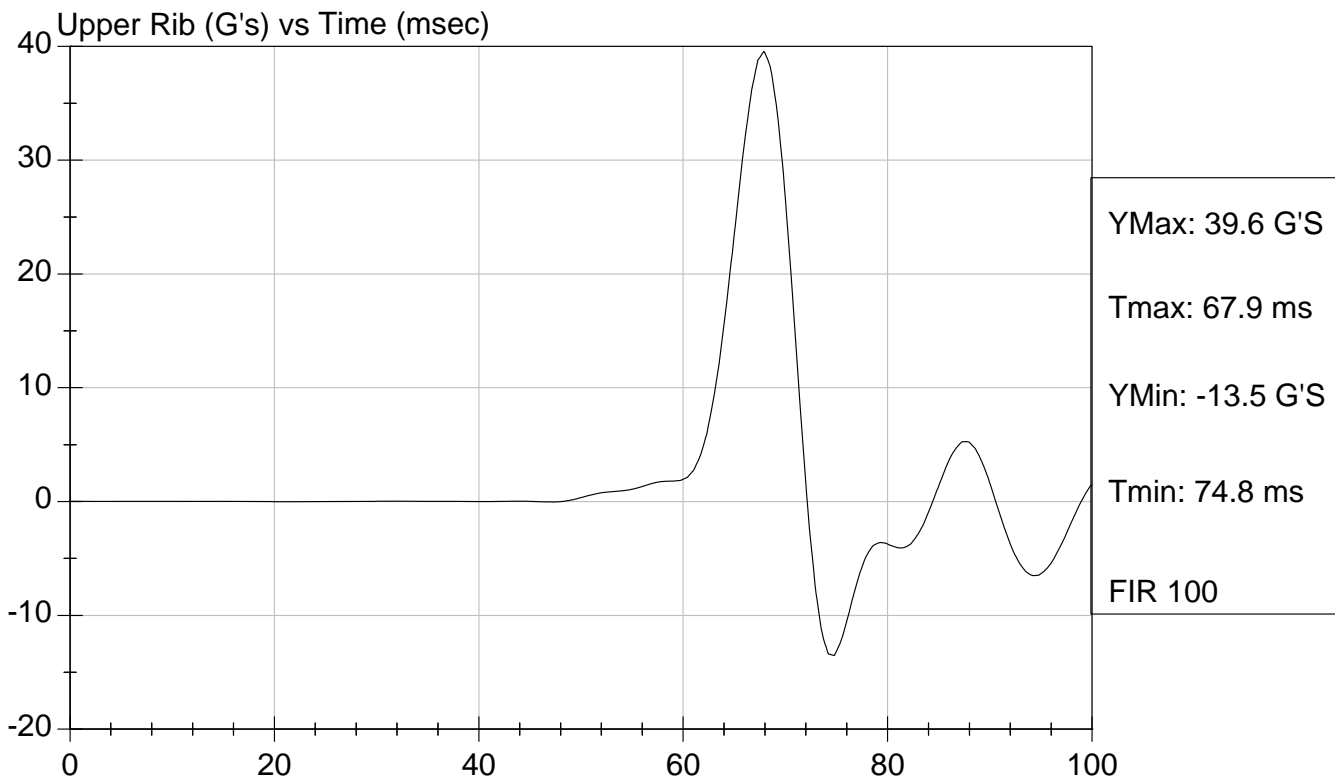
8/14/08  
 Test Date

  
 Approved By



Test Desc: Thorax Impact  
Component ID: D082342

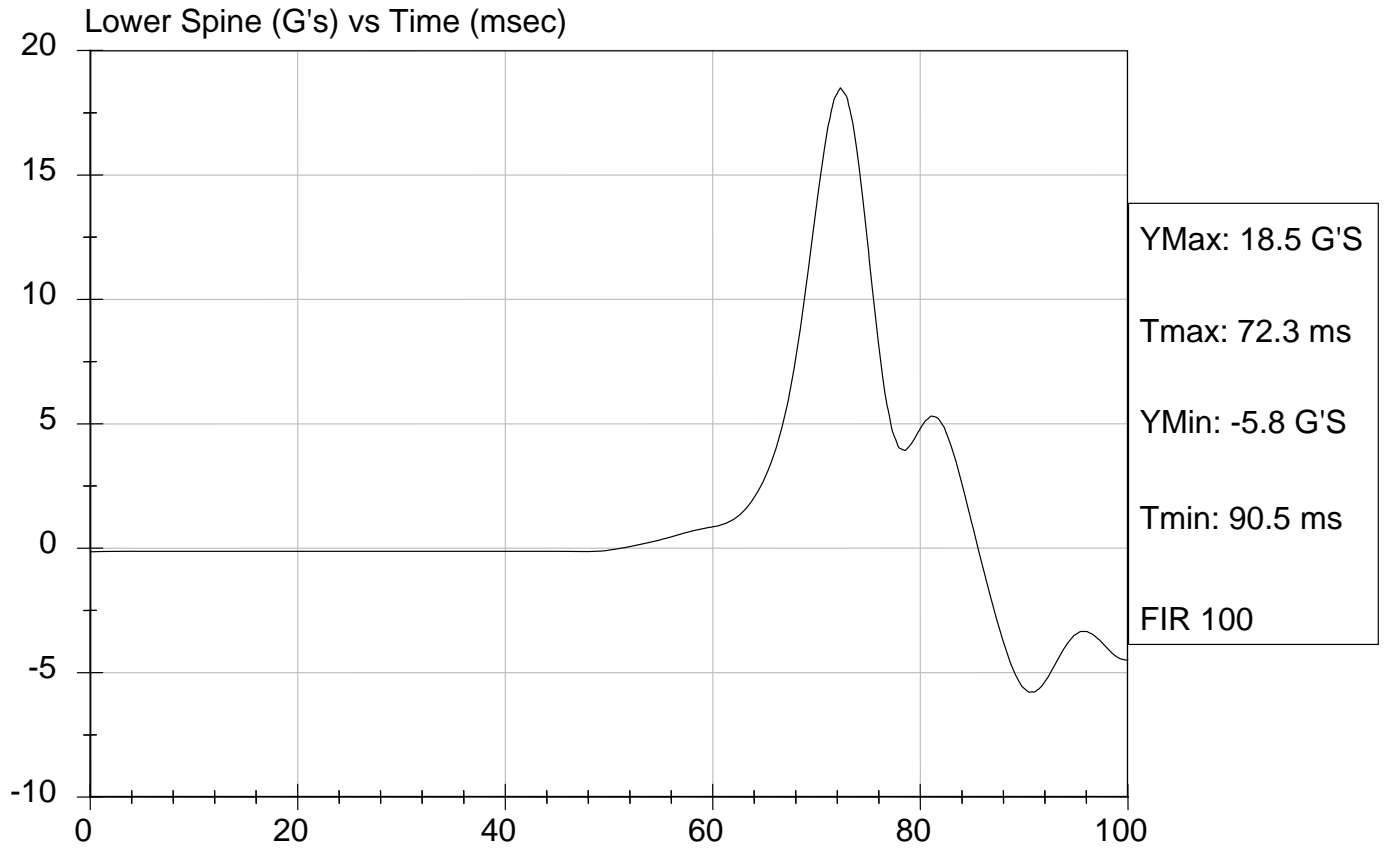
Test Date: 8/14/08  
Speed: 14.12 ft/sec, 4.30 m/sec





Test Desc: Thorax Impact  
Component ID: D082342

Test Date: 8/14/08  
Speed: 14.12 ft/sec, 4.30 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

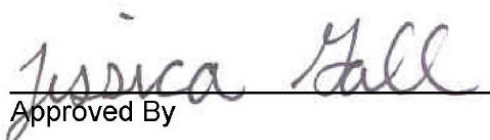
ATD Serial No: 272

Test I.D.: D082343

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	41	Pass
Overall Test Results				Pass

  
 Laboratory Technician

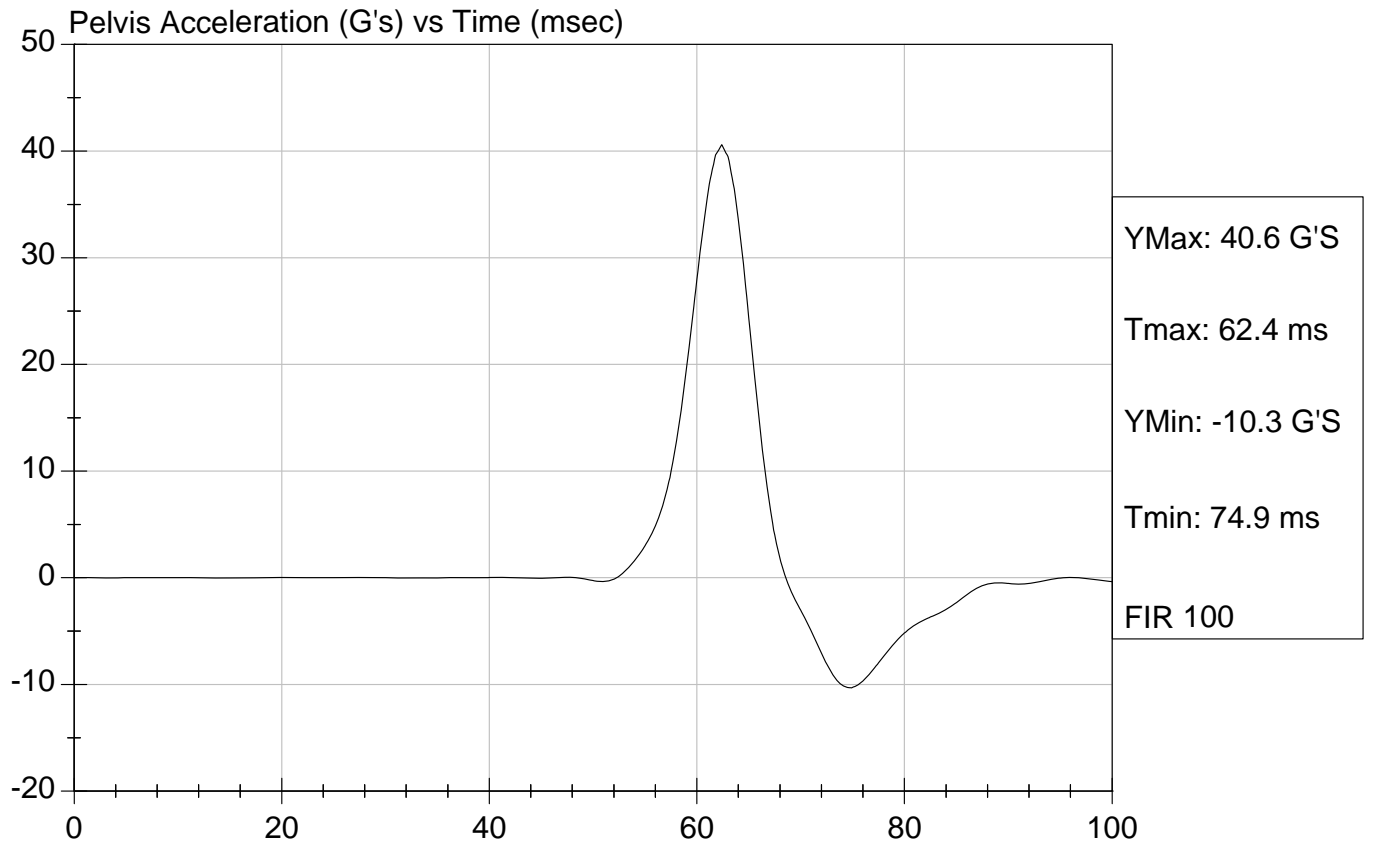
8/14/08  
 Test Date

  
 Approved By



Test Desc: Pelvis Impact  
Component ID: D082343

Test Date: 8/14/08  
Speed: 14.12 ft/sec, 4.30 m/sec

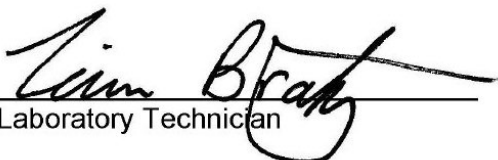


**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

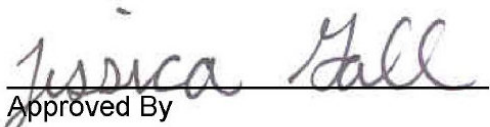
ATD Serial No: 272

Test I.D: D082344

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Force At 12.7 mm	N	104 - 162	135	Pass
Force At 19 mm	N	163 - 222	190	Pass
Force At 25.4 mm	N	222 - 280	256	Pass
Force At 33 mm	N	325 - 391	360	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/15/08  
 Test Date

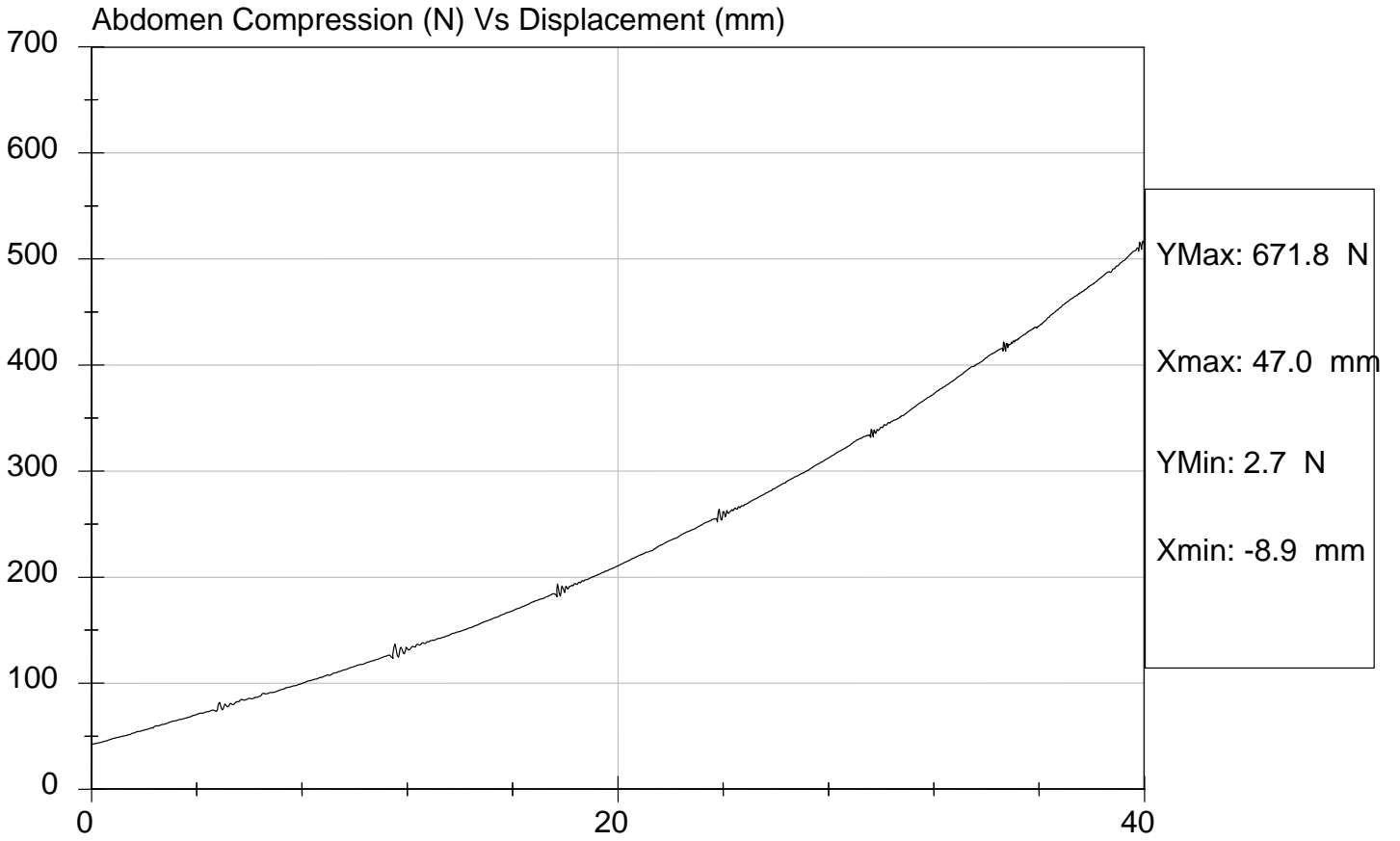
  
 Approved By



Test Description: Abdomen Compression Test Date: 8/8/08

Component: D082244

Speed: 0 ft/sec, 0m/sec

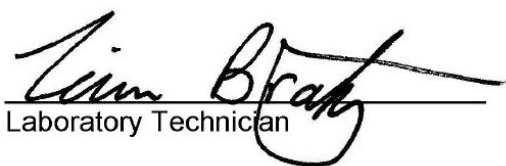


**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

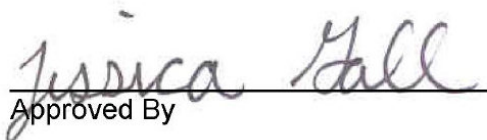
ATD Serial No: 272

Test I.D.: D082345

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	111.7	Pass
Force At 30 deg	N	151.2 - 204.6	159.3	Pass
Force At 40 deg	N	204.6 - 258.0	207.8	Pass
Return Angle	Deg	12 Maximum	6	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/15/08  
 Test Date

  
 Approved By

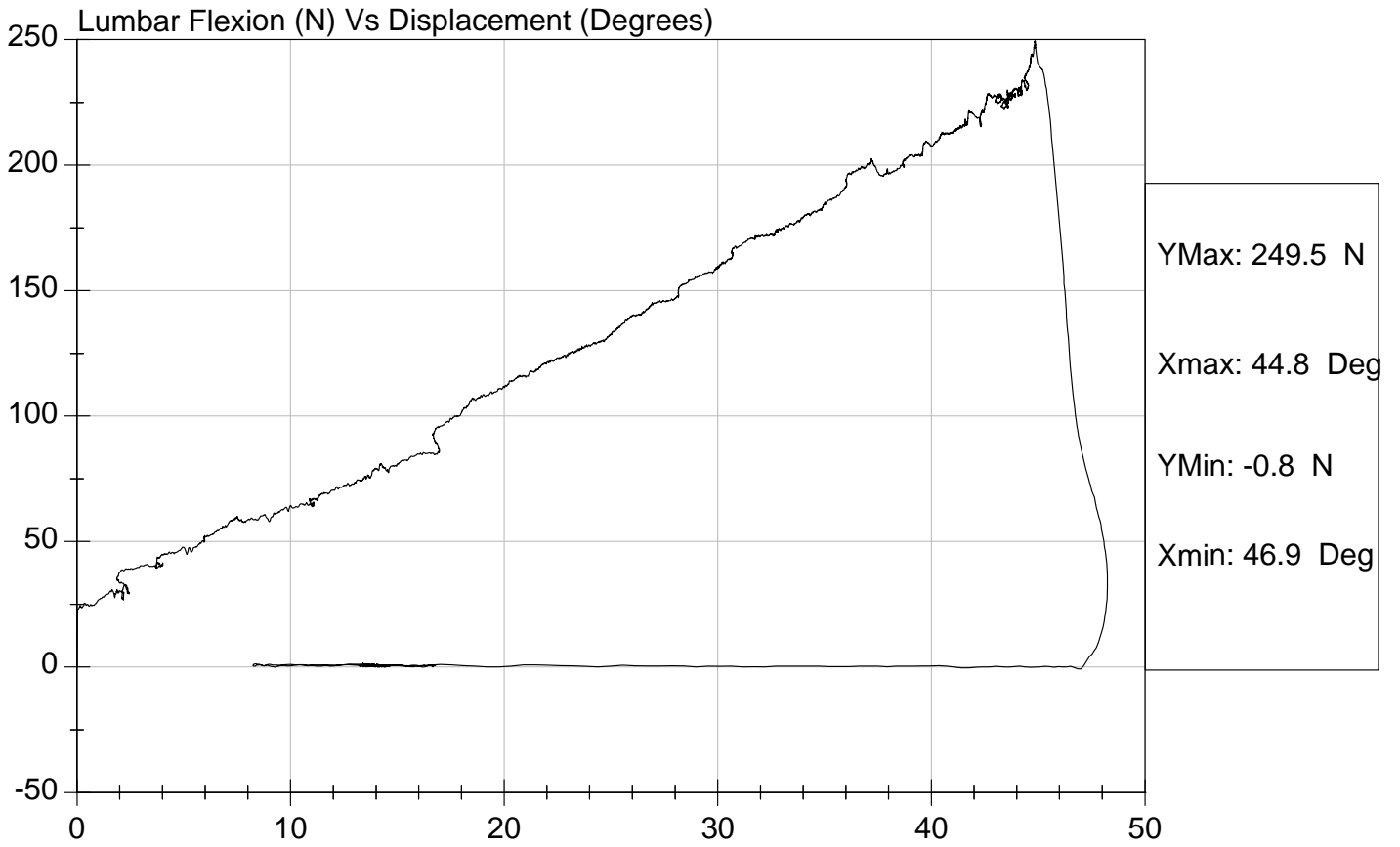


Test Description: Lumbar Flexion

Test Date: 8/15/08

Component: D082345

Speed: 0 ft/sec, m/sec




**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

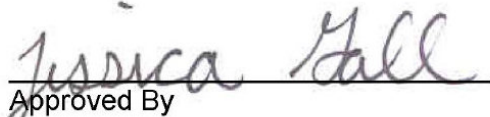
**ATD Serial No:** 272

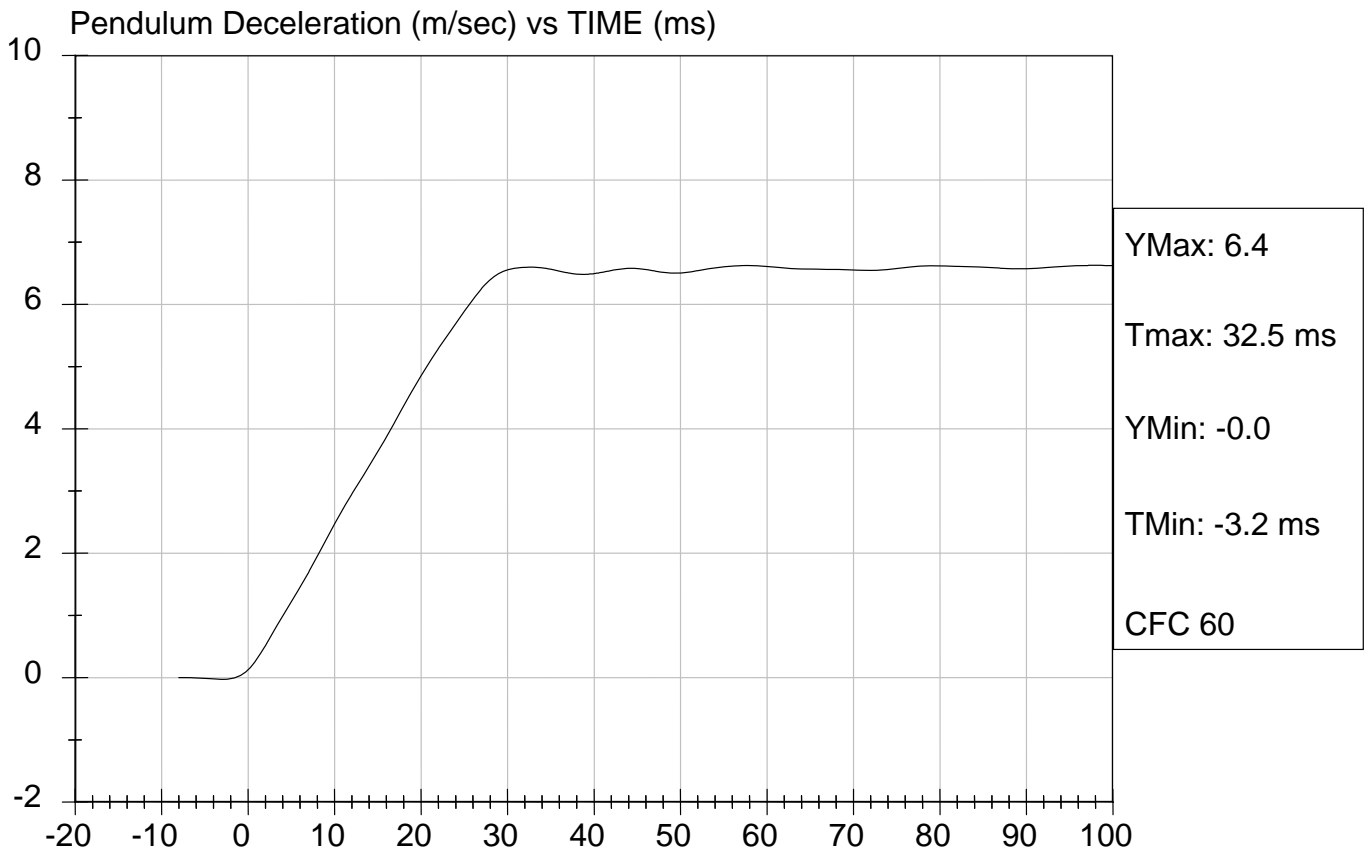
**Test I.D:** D082349

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	39	Pass	
Impact Velocity	m/s	6.89 to 7.13	7.05	Pass	
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.47	Pass
	20 msec	m/s	4.12 to 5.10	4.85	Pass
	30 msec	m/s	5.73 to 7.01	6.55	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.55	Pass
Midsaggital Plane Max Rotation	deg	66 to 82	69	Pass	
Head Rotation Peak to Zero - Decay Time	msec	58 to 67	59	Pass	
Max. Mx at Occipital Condyles	Nm	73 to 88	75	Pass	
Mx Peak To Zero - Decay Time	msec	49 to 64	50	Pass	
Mx Peak to Max. Head Rotation	msec	2 to 16	5	Pass	

  
 Laboratory Technician

8/15/08  
 Test Date

  
 Approved By

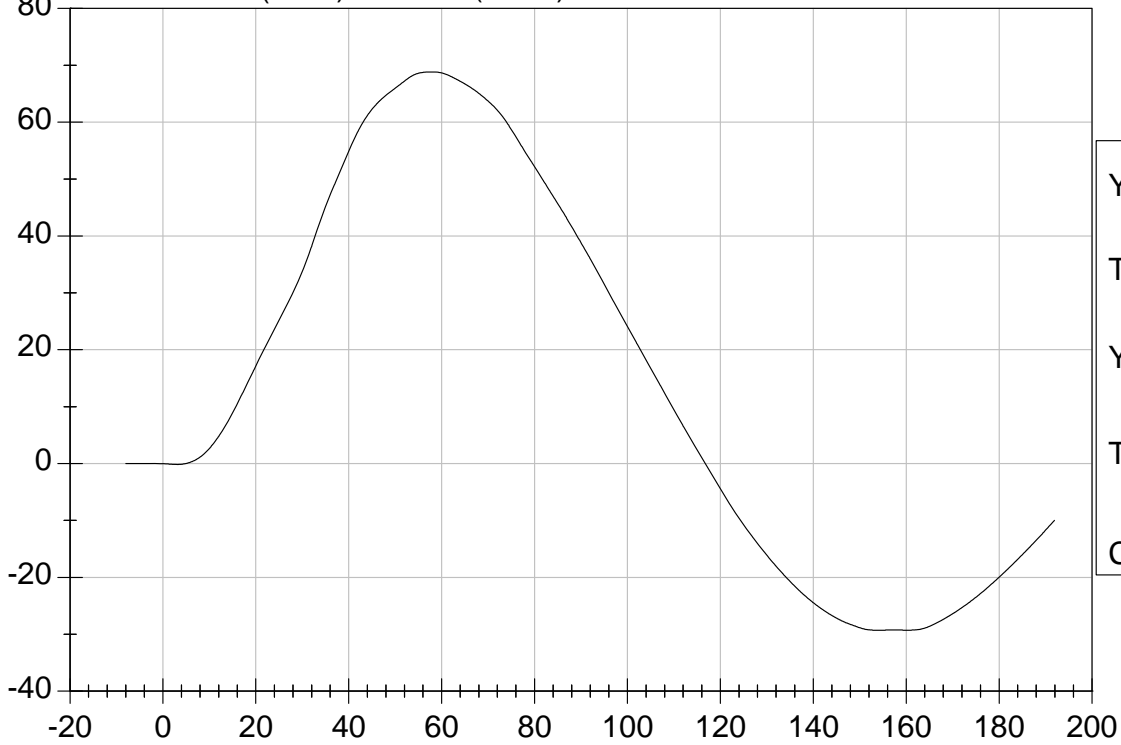




Test Desc: Neck Bending  
Component ID: D082349

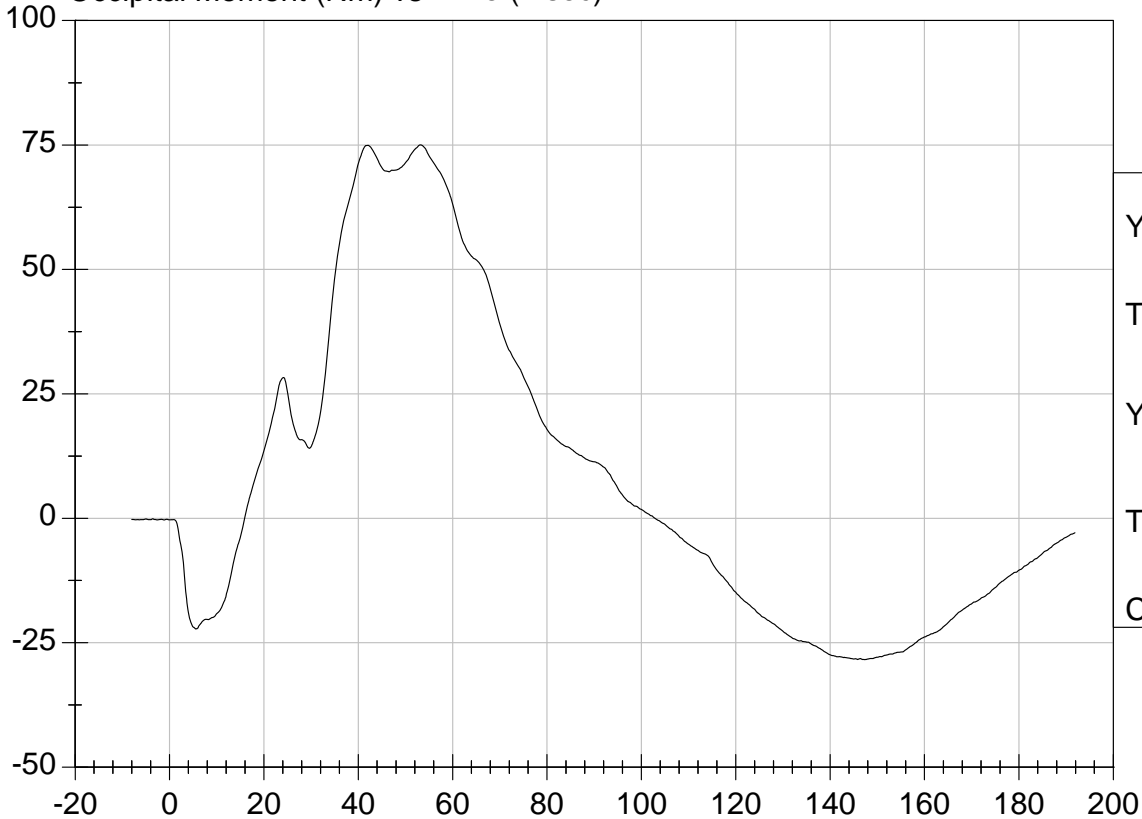
Test Date: 8/15/08  
Speed: 23.14 ft/sec, 7.05 m/sec

Neck Rotation (DEG) vs Time (msec)



YMax: 68.8  
Tmax: 58.0 ms  
YMin: -29.3  
Tmin: 153.8 ms  
CFC 60

Occipital Moment (Nm) vs Time (msec)



YMax: 75.0  
Tmax: 53.2 ms  
YMin: -28.4  
Tmin: 147.4 ms  
CFC 600

## Calibration Test Results Summary

Dummy Serial Number: 272

### Post-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements. 2

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

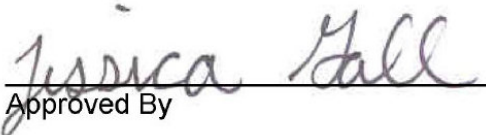
**ATD Serial No:** 272

**Test I.D:** D082441

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	120 to 150	135	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-12.1	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/22/08  
 Test Date

  
 Approved By



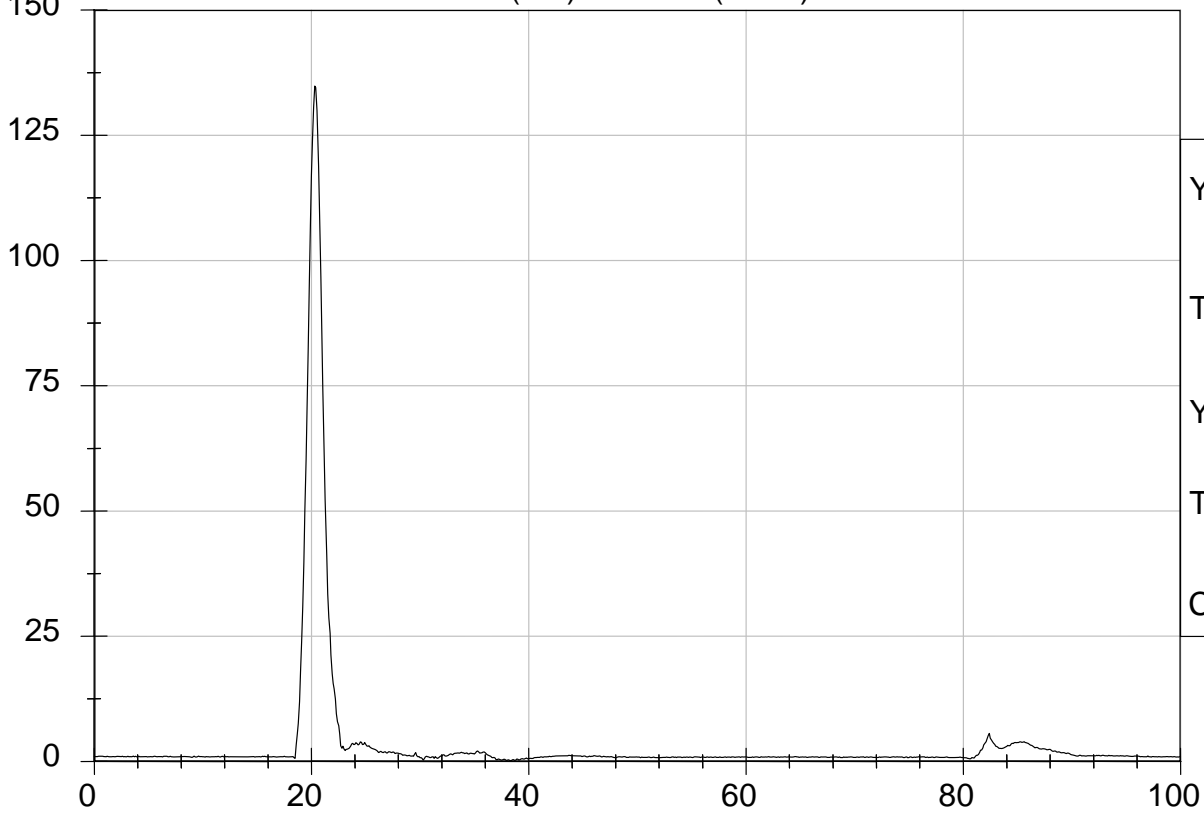
Test Description: Head Drop

Test Date: 8/22/08

Component: D082441

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (msec)



YMax: 134.8 G

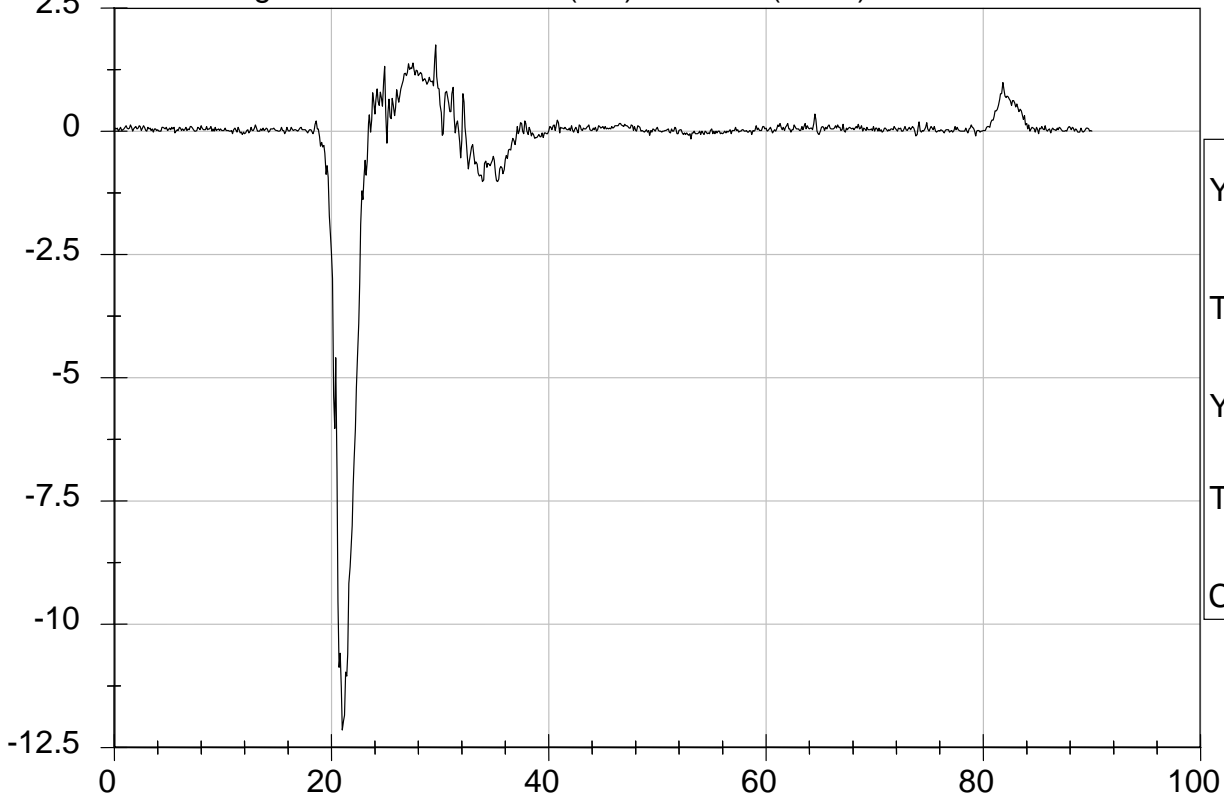
Tmax: 20.3 ms

YMin: 0.2 G

Tmin: 38.4 ms

CFC 1000

Peak Longitudinal Acceleration (G's) Vs Time (msec)



YMax: 1.7 G

Tmax: 29.6 ms

YMin: -12.1 G

Tmin: 21.0 ms

CFC 1000

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

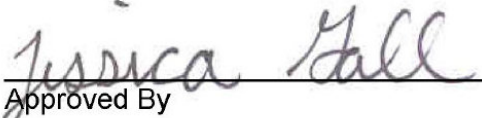
**ATD Serial No:** 272

**Test I.D:** D082442

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	39	Pass
Lower Rib	G's	37 - 46	37	Pass
Lower Spine	G's	15 - 22	19	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/21/08  
 Test Date

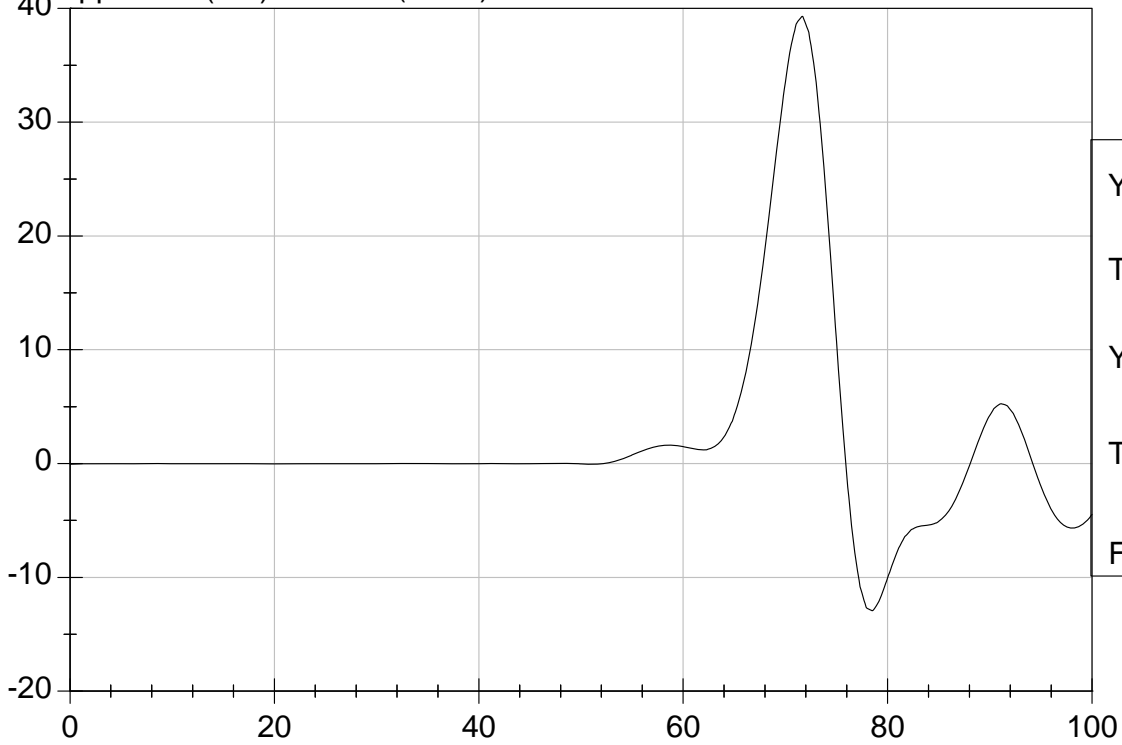
  
 Approved By



Test Desc: Thorax Impact  
Component ID: D082442

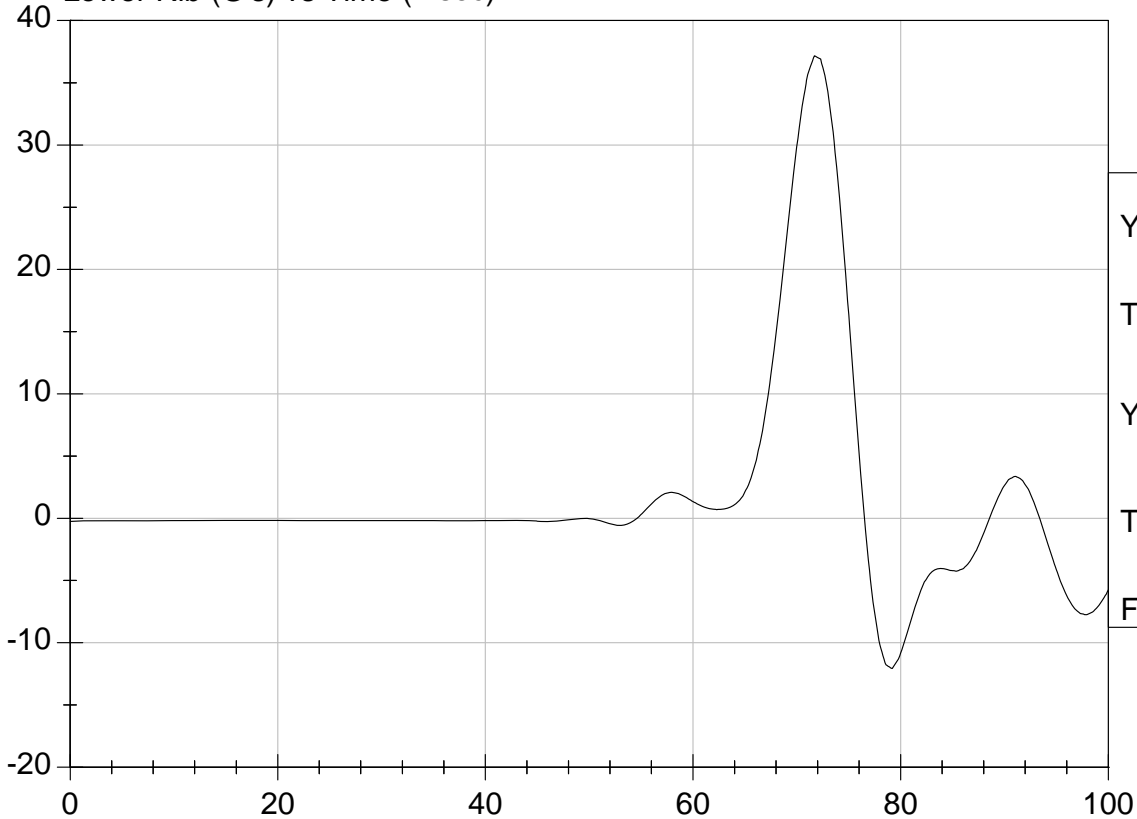
Test Date: 8/21/08  
Speed: 14.12 ft/sec, 4.30 m/sec

Upper Rib (G's) vs Time (msec)



YMax: 39.3 G'S  
Tmax: 71.7 ms  
YMin: -12.9 G'S  
Tmin: 78.5 ms  
FIR 100

Lower Rib (G's) vs Time (msec)

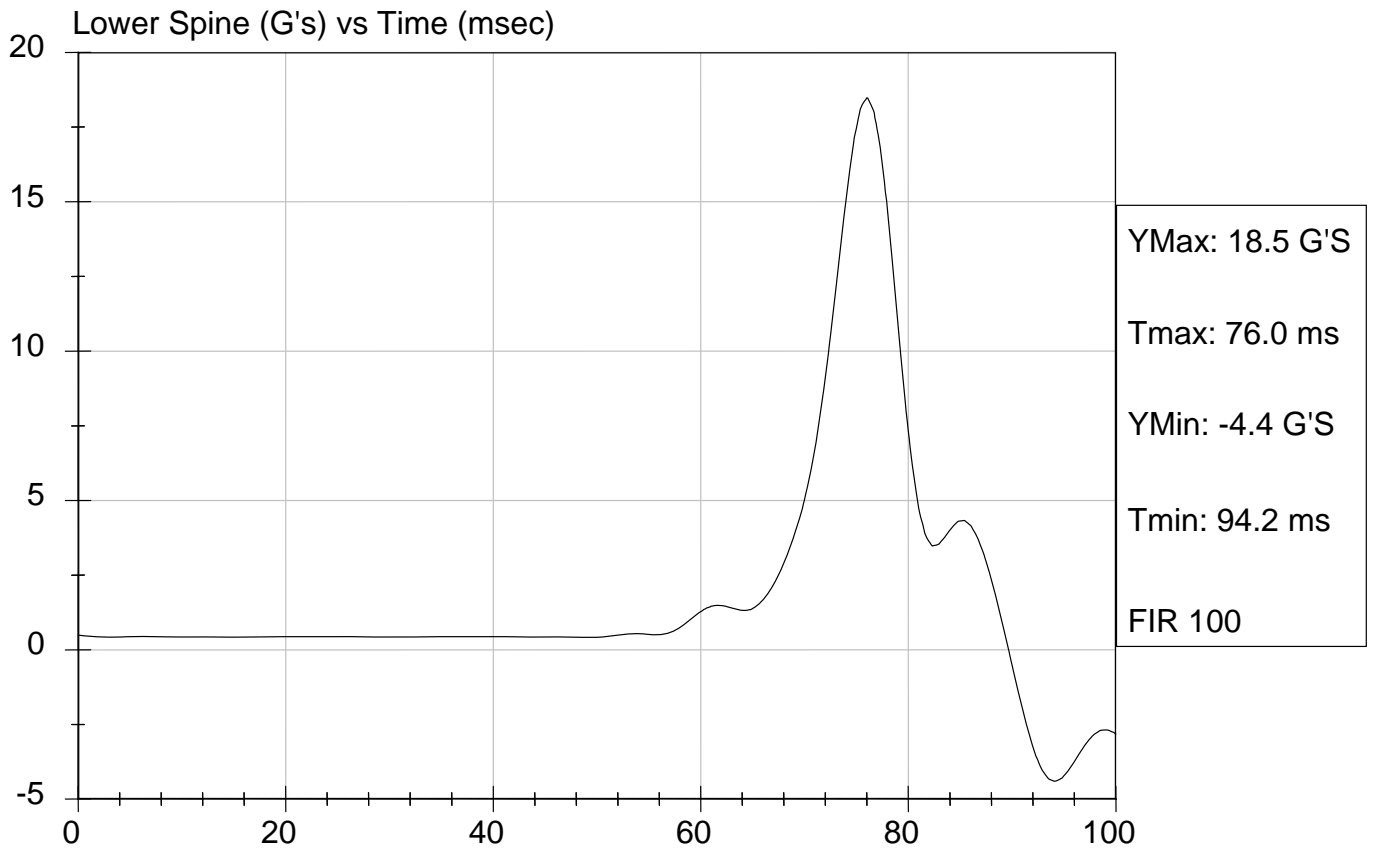


YMax: 37.2 G's  
Tmax: 71.7 ms  
YMin: -12.1 G's  
Tmin: 79.2 ms  
FIR 100



Test Desc: Thorax Impact  
Component ID: D082442

Test Date: 8/21/08  
Speed: 14.12 ft/sec, 4.30 m/sec




**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

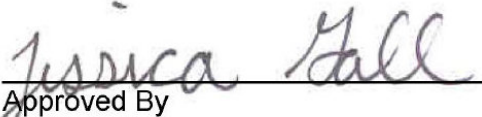
ATD Serial No: 272

Test I.D.: D082443

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	44	Pass
Overall Test Results				Pass

  
 Laboratory Technician

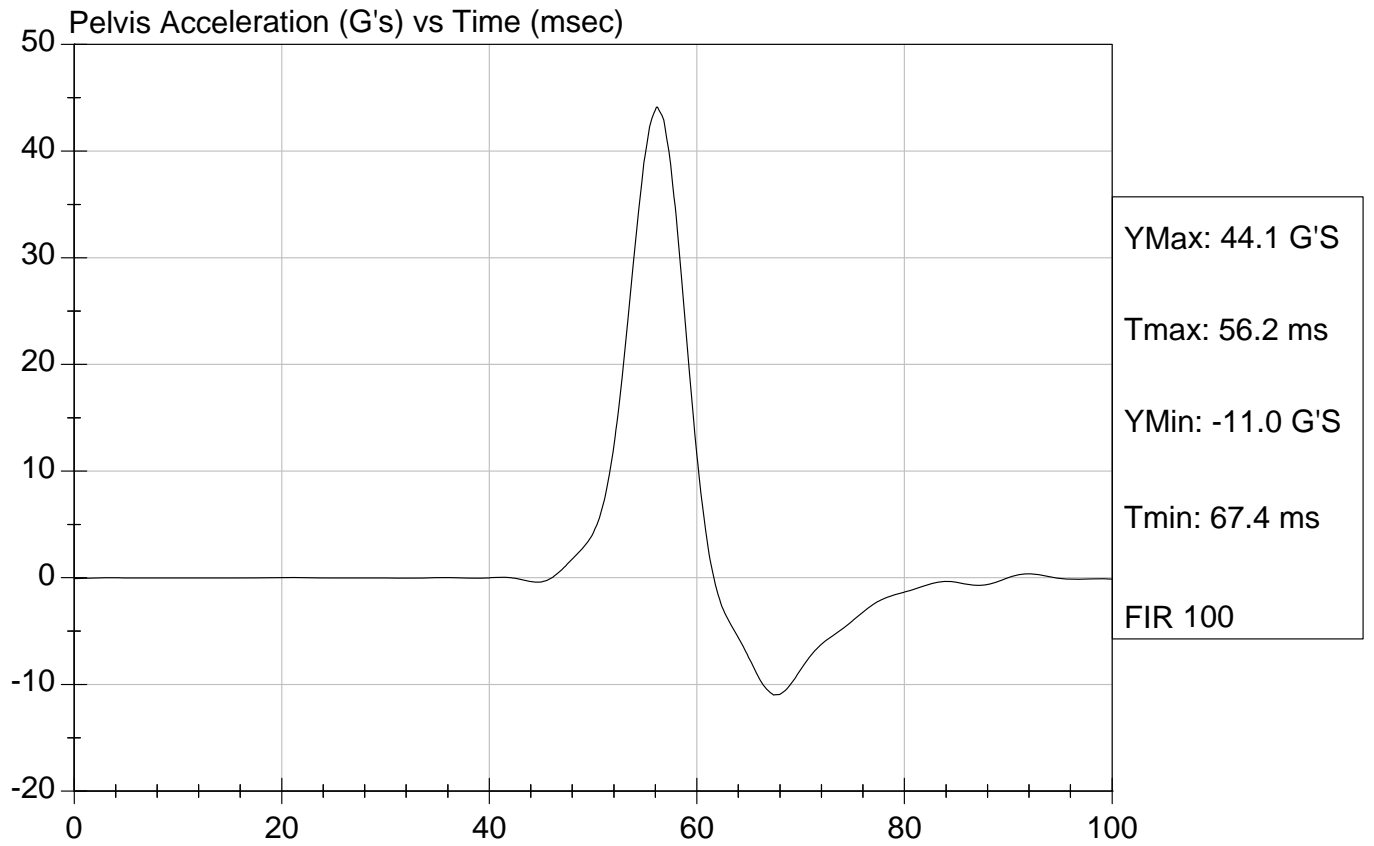
8/21/08  
 Test Date

  
 Approved By



Test Desc: Pelvis Impact  
Component ID: D082443

Test Date: 8/21/08  
Speed: 14.12 ft/sec, 4.30 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**


ATD Serial No: 272

Test I.D.: D082444

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Force At 12.7 mm	N	104 -162	131	Pass
Force At 19 mm	N	163 - 222	184	Pass
Force At 25.4 mm	N	222 - 280	249	Pass
Force At 33 mm	N	325 - 391	340	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/22/08  
 Test Date

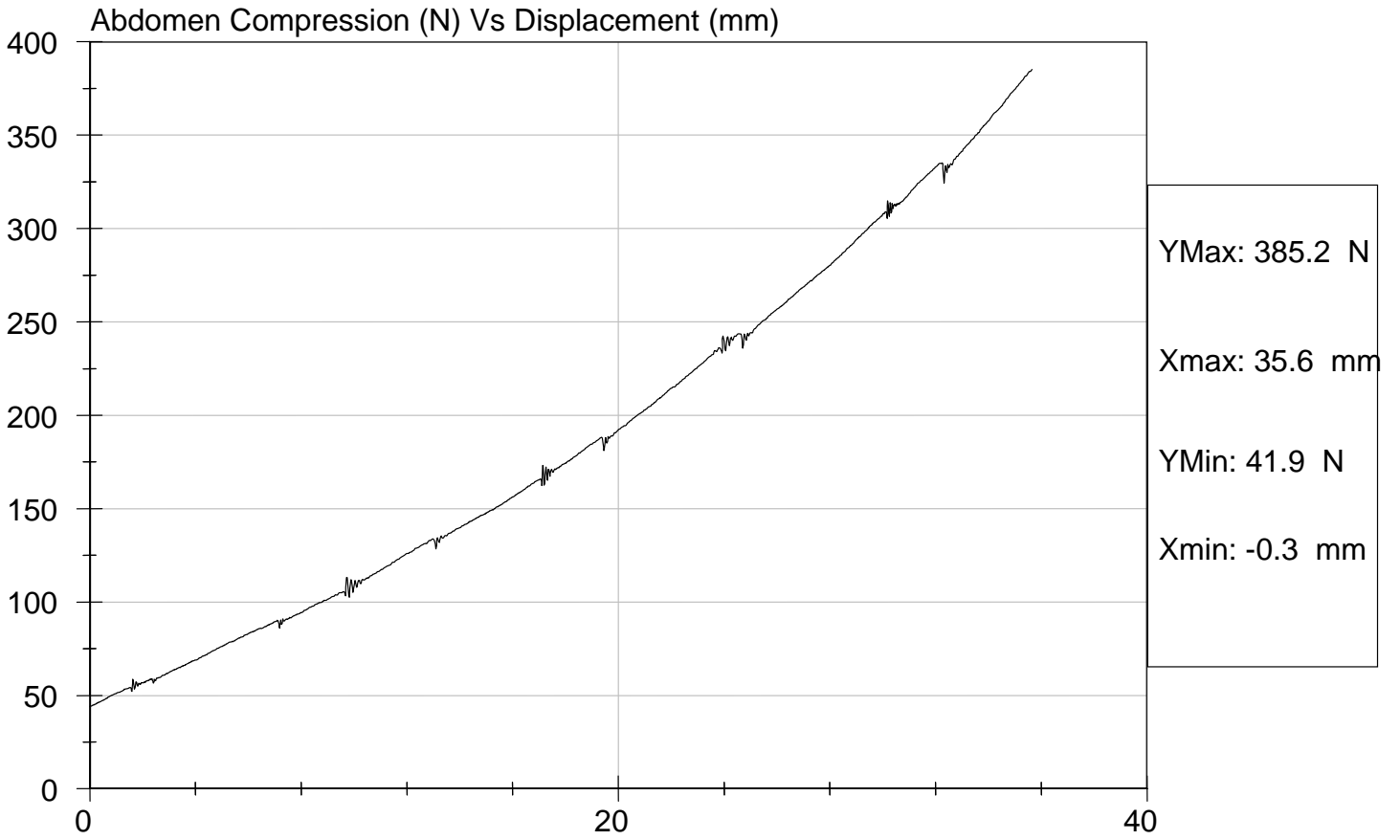
  
 Approved By



Test Description: Abdomen Compression Test Date: 8/22/08

Component: D082444

Speed: 0 ft/sec, 0 m/sec




**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

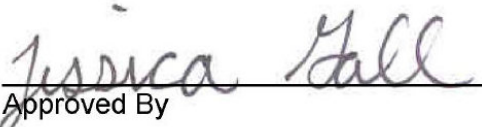
ATD Serial No: 272

Test I.D.: D082445

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	135.7	Pass
Force At 30 deg	N	151.2 - 204.6	179.3	Pass
Force At 40 deg	N	204.6 - 258.0	238.5	Pass
Return Angle	Deg	12 Maximum	6	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/22/08  
 Test Date

  
 Approved By

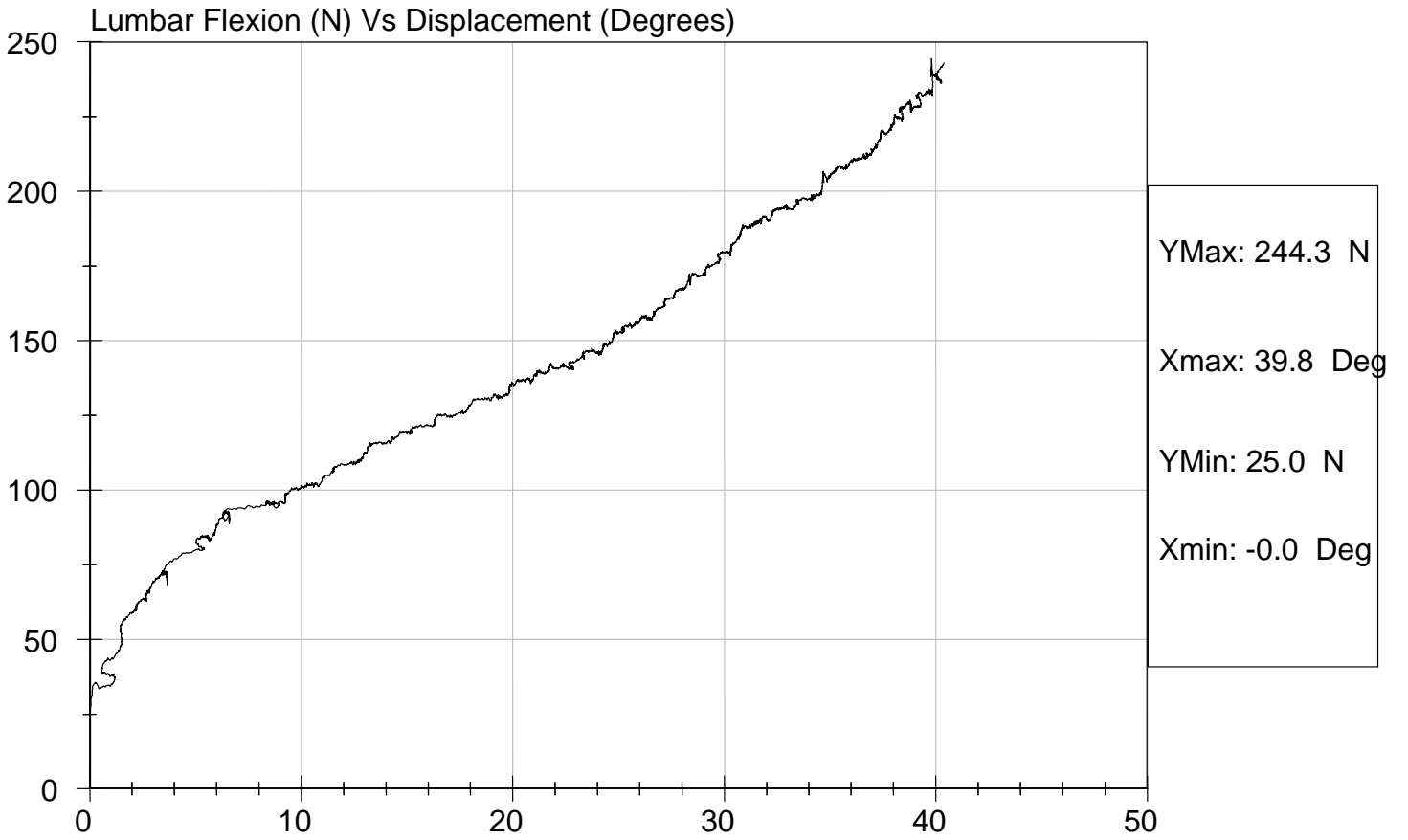


Test Description: Lumbar Flexion

Test Date: 8/22/08

Component: D082445

Speed: 0 ft/sec, 0m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

**ATD Serial No:** 272

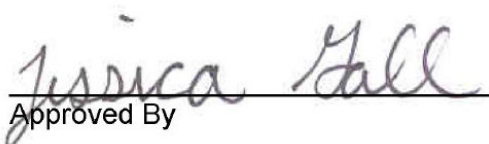
**Test I.D:** D082449

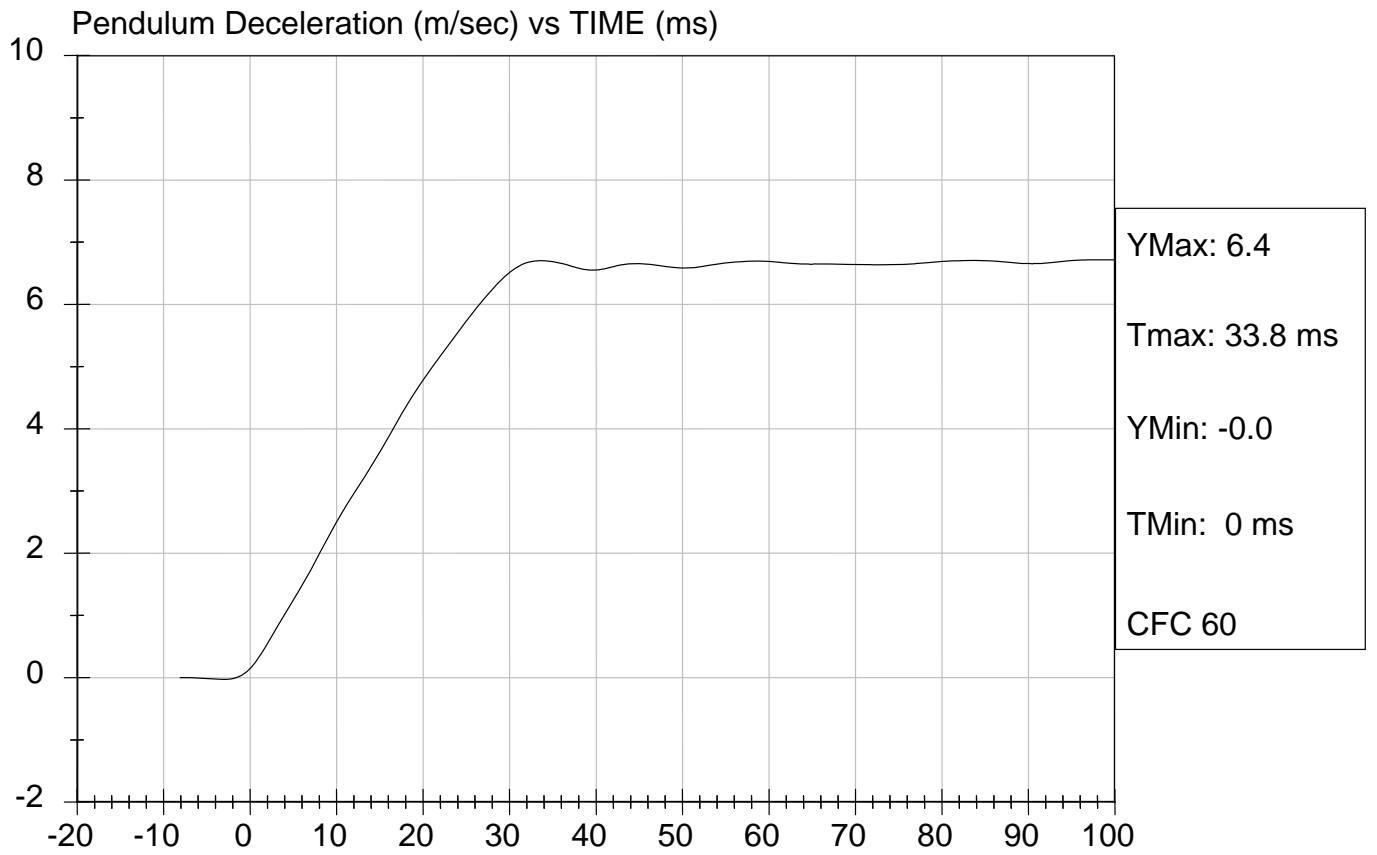
Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass	
Laboratory Relative Humidity	%	10 to 70	42	Pass	
Impact Velocity	m/s	6.89 to 7.13	7.06	Pass	
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.50	Pass
	20 msec	m/s	4.12 to 5.10	4.78	Pass
	30 msec	m/s	5.73 to 7.01	6.51	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.64	Pass
Midsaggital Plane Max Rotation	deg	66 to 82	71	Pass	
Head Rotation Peak to Zero - Decay Time	msec	58 to 67	61	Pass	
Max. Mx at Occipital Condyles	Nm	73 to 88	75	Pass	
Mx Peak To Zero - Decay Time	msec	49 to 64	59	Pass	
Mx Peak to Max. Head Rotation	msec	2 to 16	13	Pass	

  
 Laboratory Technician

8/22/08

Test Date

  
 Approved By

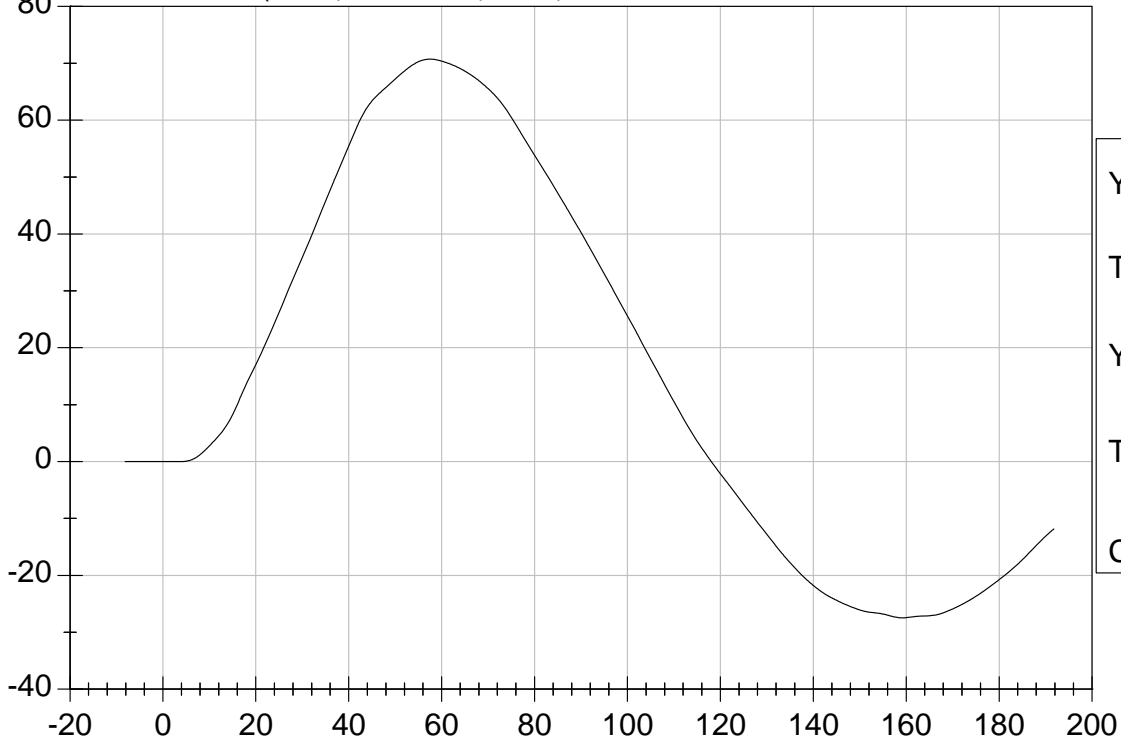




Test Desc: Neck Bending  
Component ID: D082449

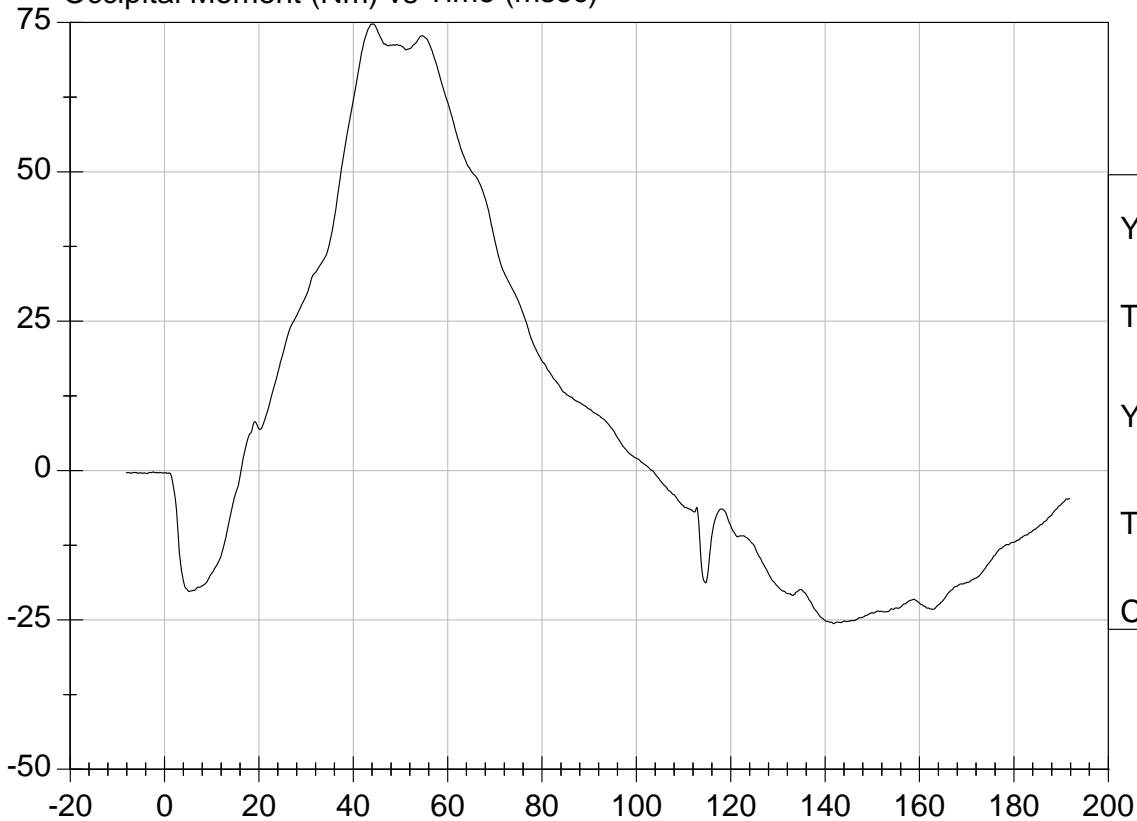
Test Date: 8/22/08  
Speed: 23.15 ft/sec, 7.06 m/sec

Neck Rotation (DEG) vs Time (msec)



YMax: 70.7  
Tmax: 57.6 ms  
YMin: -27.5  
Tmin: 159.2 ms  
CFC 60

Occipital Moment (Nm) vs Time (msec)



YMax: 74.8  
Tmax: 44.3 ms  
YMin: -25.6  
Tmin: 141.9 ms  
CFC 600

**SID Calibration Data Sheet  
Side Impact Dummy  
Inspection Checklist**

**ATD Serial No:** 272

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

*Jessica Hall*  
 \_\_\_\_\_  
 Laboratory Technician  
*David Winkelbauer*  
 \_\_\_\_\_  
 Approved By

8/22/08  
 \_\_\_\_\_  
 Test Date

CERTIFICATION DATA

Dummy Serial Number: 271

## Calibration Test Results Summary

Dummy Serial Number: 271

### Pre-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**External Measurements**

ATD Serial No: 271

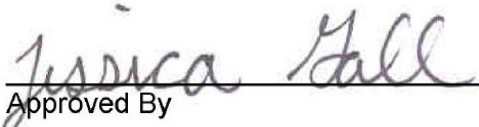
Test I.D.: D08233

Tested Parameter	Units	Specification	Result	Pass/Fail
SH - Seated Height	mm	889 - 909	905	Pass
RH - Rib Height	mm	501 - 521	502	Pass
HP - Hip Pivot Height	mm	99 ref.	99	Pass
RD - Rib from Back Line	mm	229 - 241	239	Pass
KV - Knee Pivot to Back Line	mm	511 - 526	526	Pass
SW - Knee Pivot to Floor	mm	490 - 505	497	Pass
HW - Hip Width	mm	356 - 391	371	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/15/08

Test Date

  
 Approved By

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

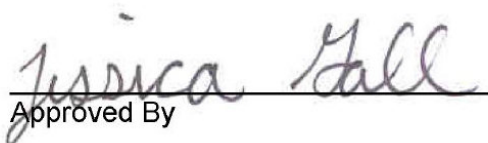
**ATD Serial No:** 271

**Test I.D.:** D082331

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Peak Resultant Acceleration	G's	120 to 150	132	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-8.6	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/15/08  
 Test Date

  
 Approved By



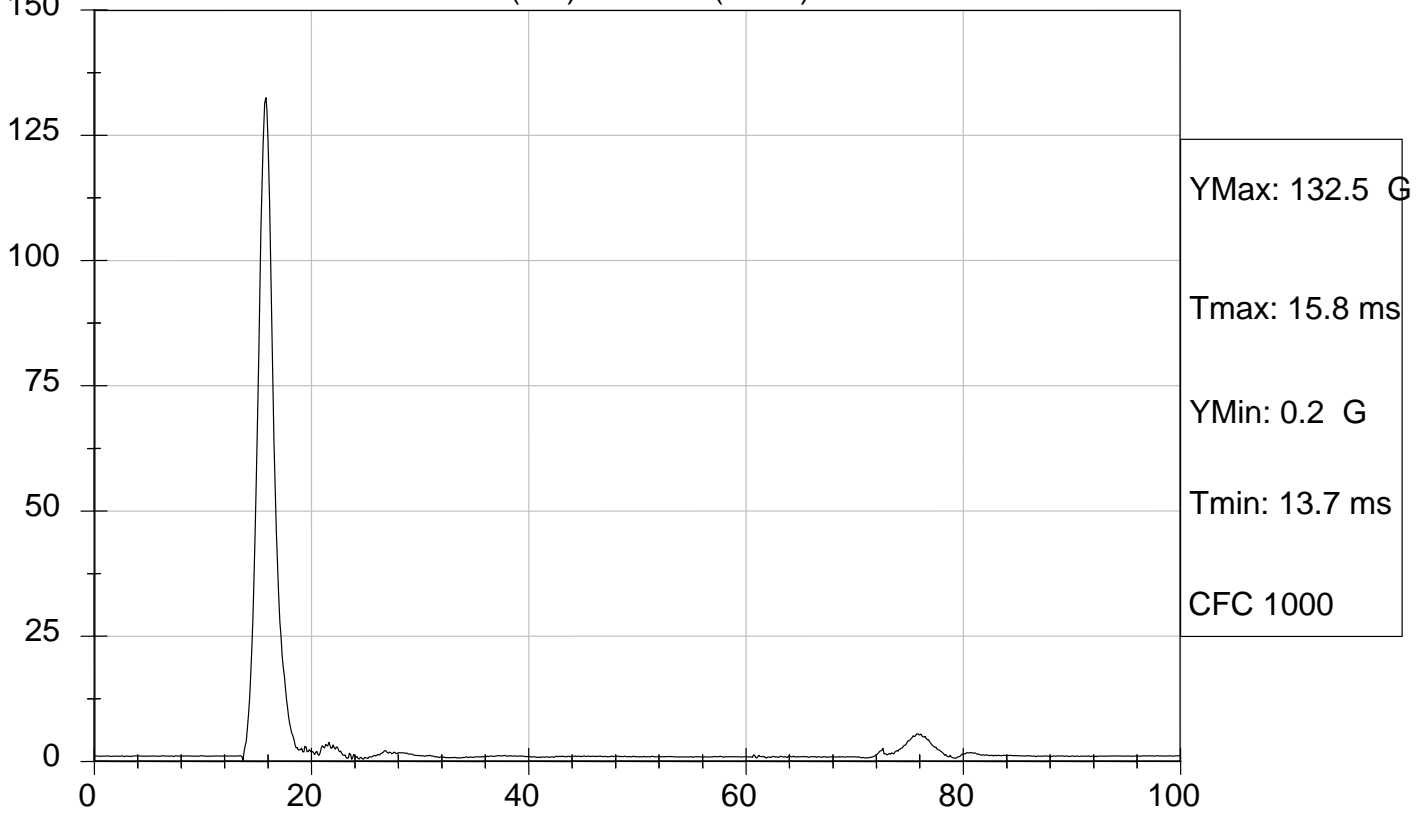
Test Description: Head Drop

Test Date: 8/15/08

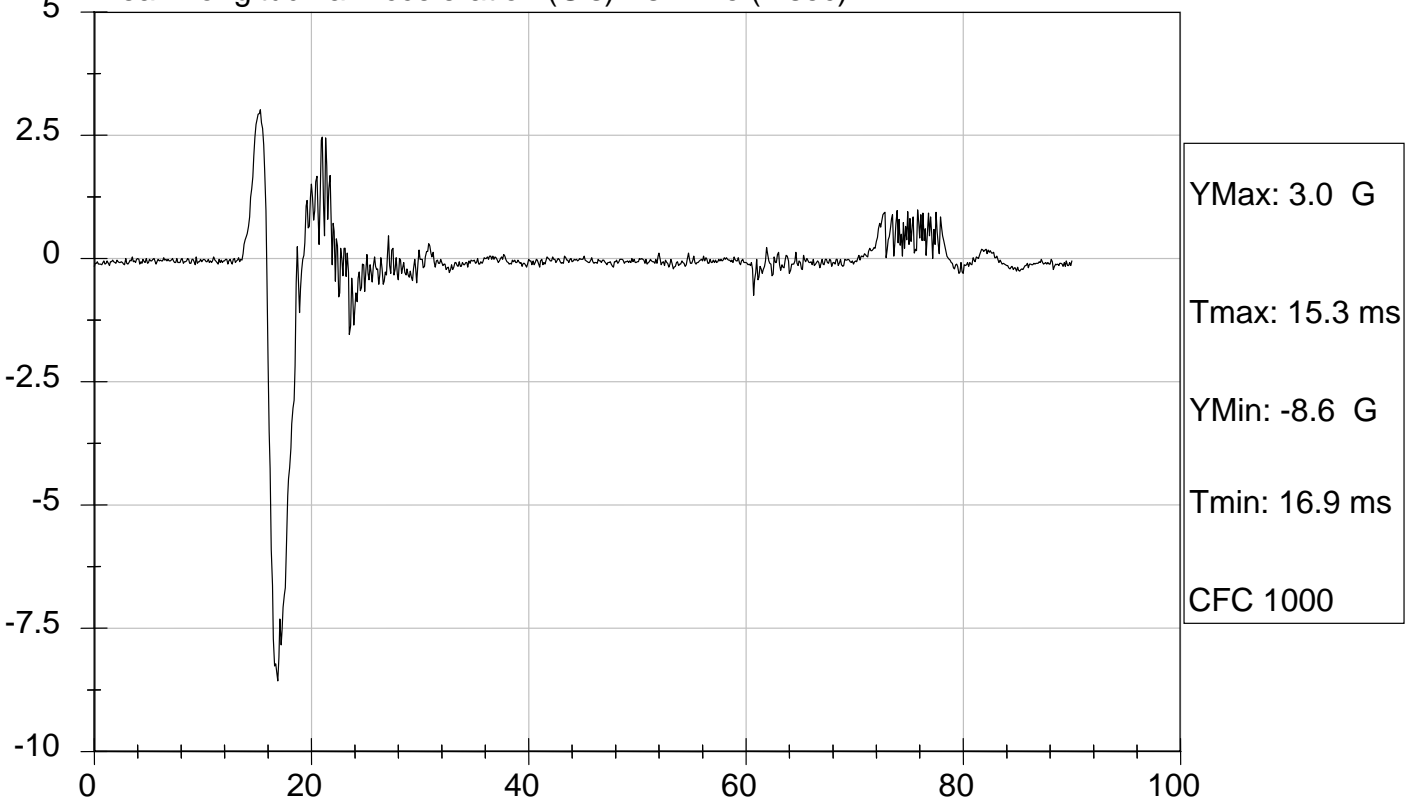
Component: D082331

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (msec)



Peak Longitudinal Acceleration (G's) Vs Time (msec)



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

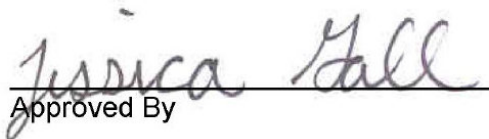
**ATD Serial No:** 271

**Test I.D:** D082332

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	41	Pass
Lower Rib	G's	37 - 46	37	Pass
Lower Spine	G's	15 - 22	17	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

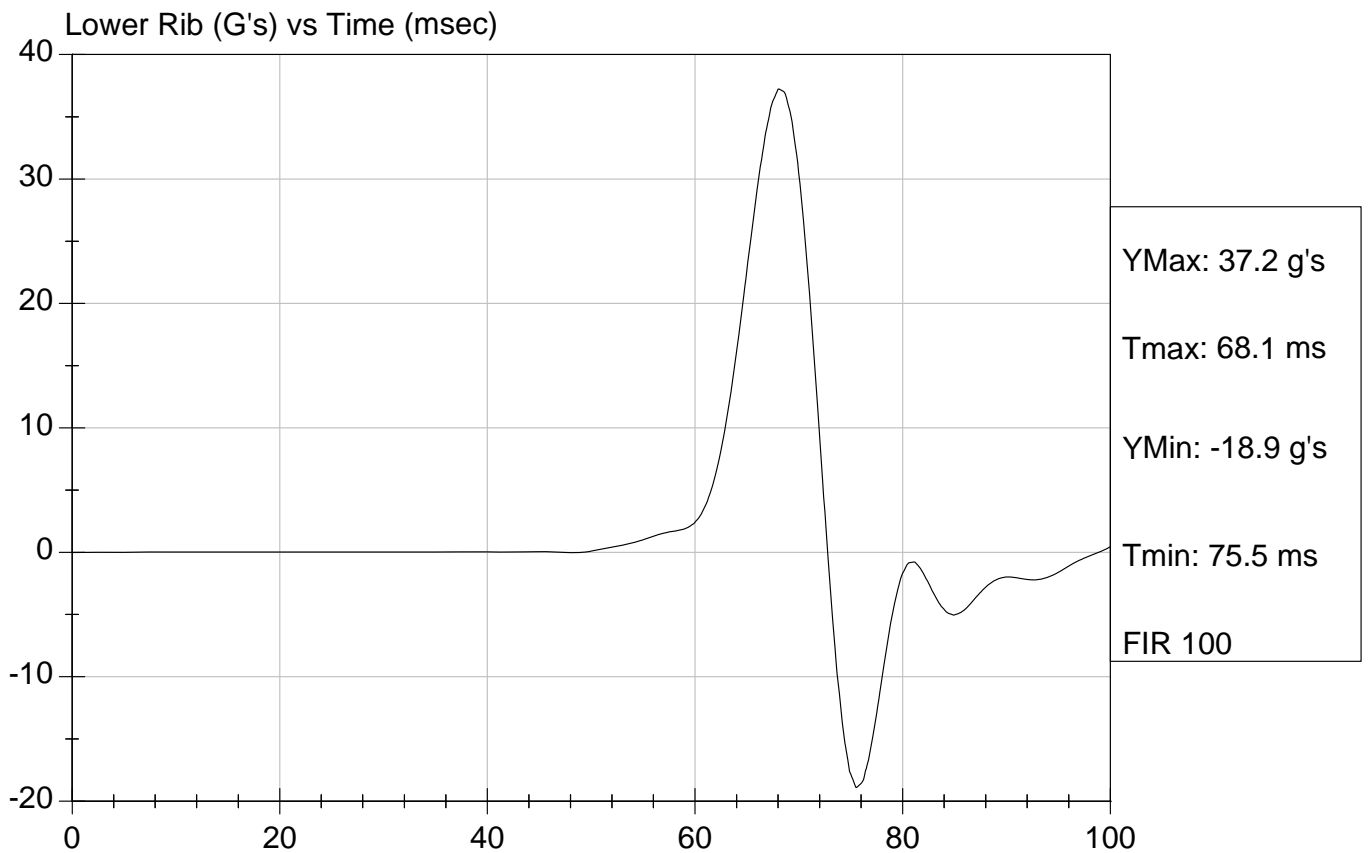
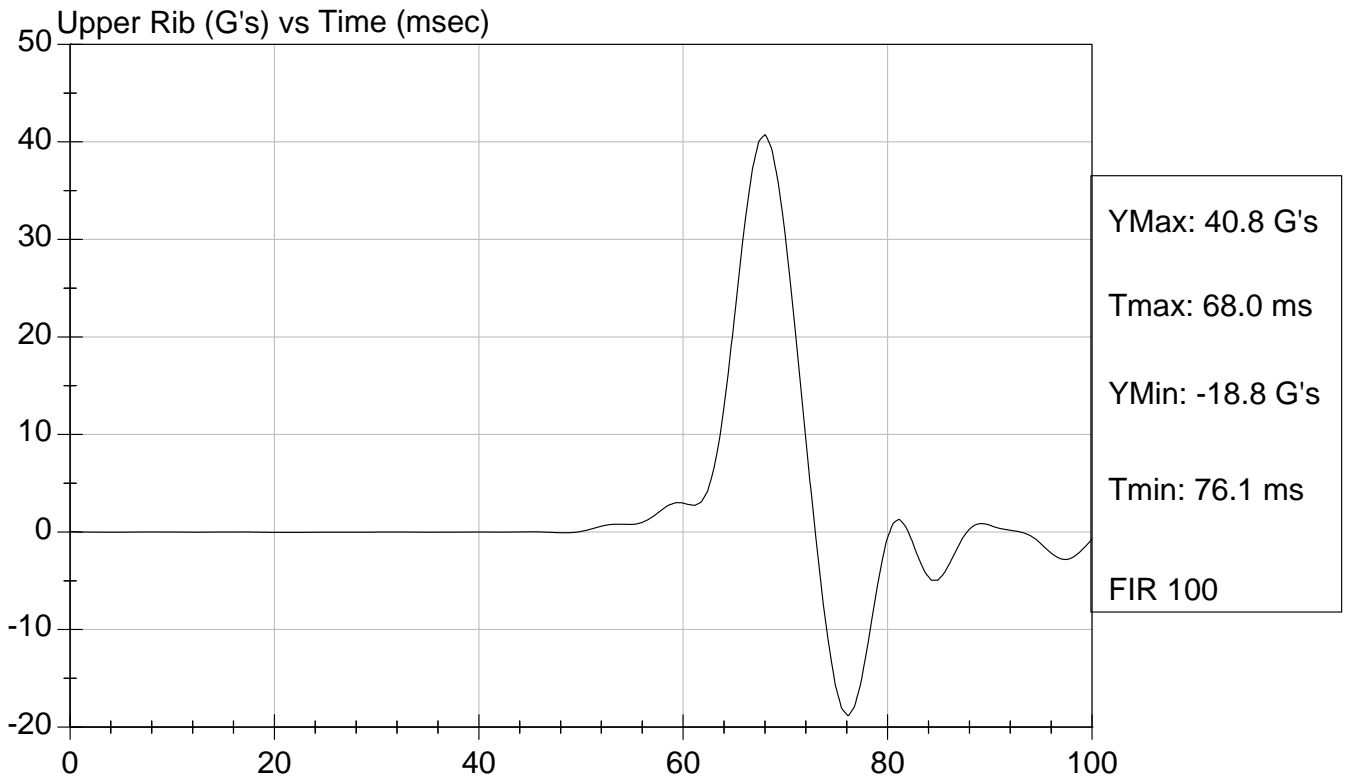
8/14/08  
 Test Date

  
 Approved By



Test Desc: Thorax Impact  
Component ID: D082332

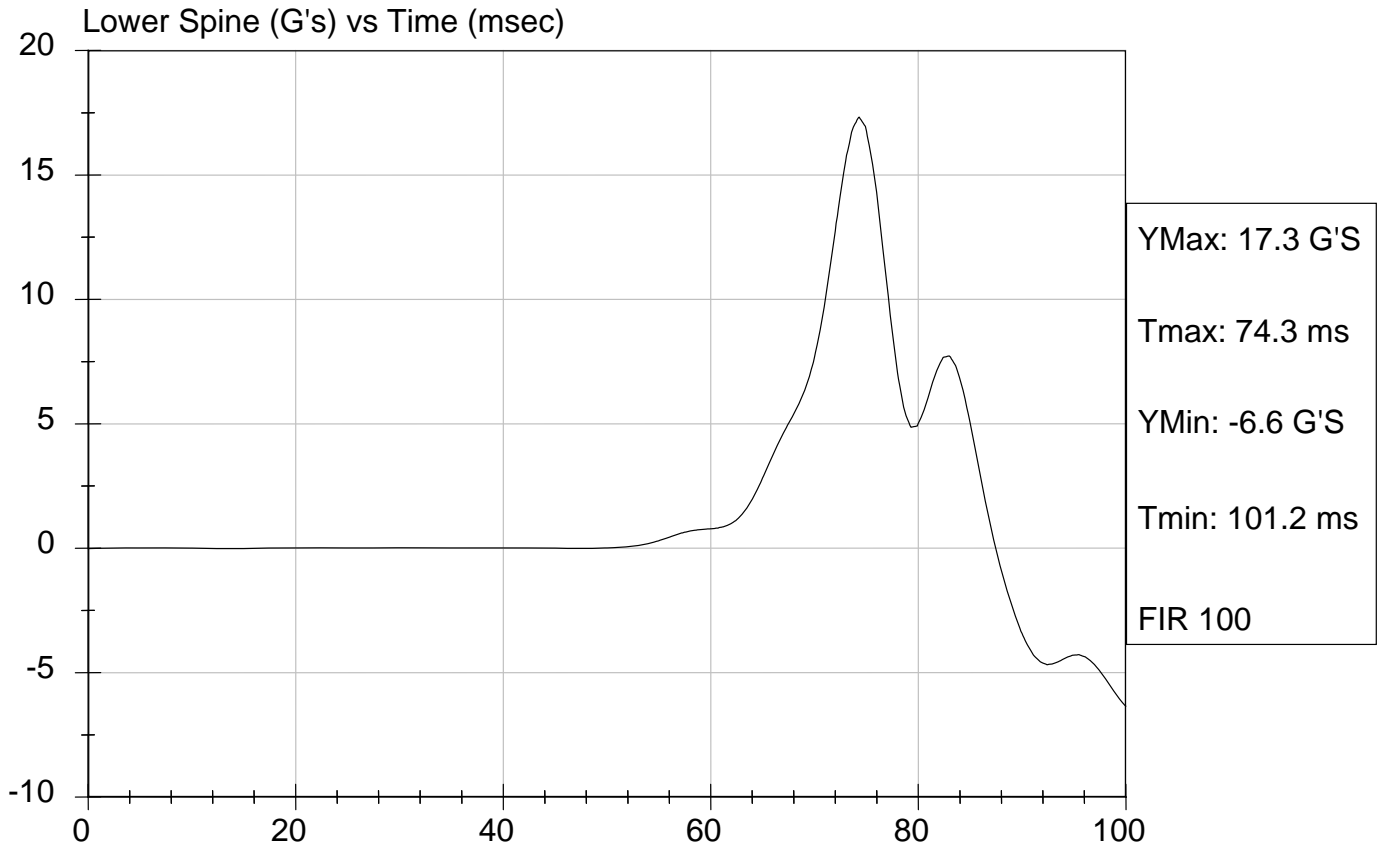
Test Date: 8/14/08  
Speed: 14.12 ft/sec, 4.30 m/sec





Test Desc: Thorax Impact  
Component ID: D082332

Test Date: 8/14/08  
Speed: 14.12 ft/sec, 4.30 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

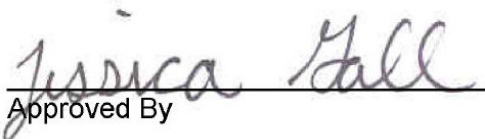
ATD Serial No: 271

Test I.D.: D082333

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	44	Pass
Overall Test Results				Pass

  
 Laboratory Technician

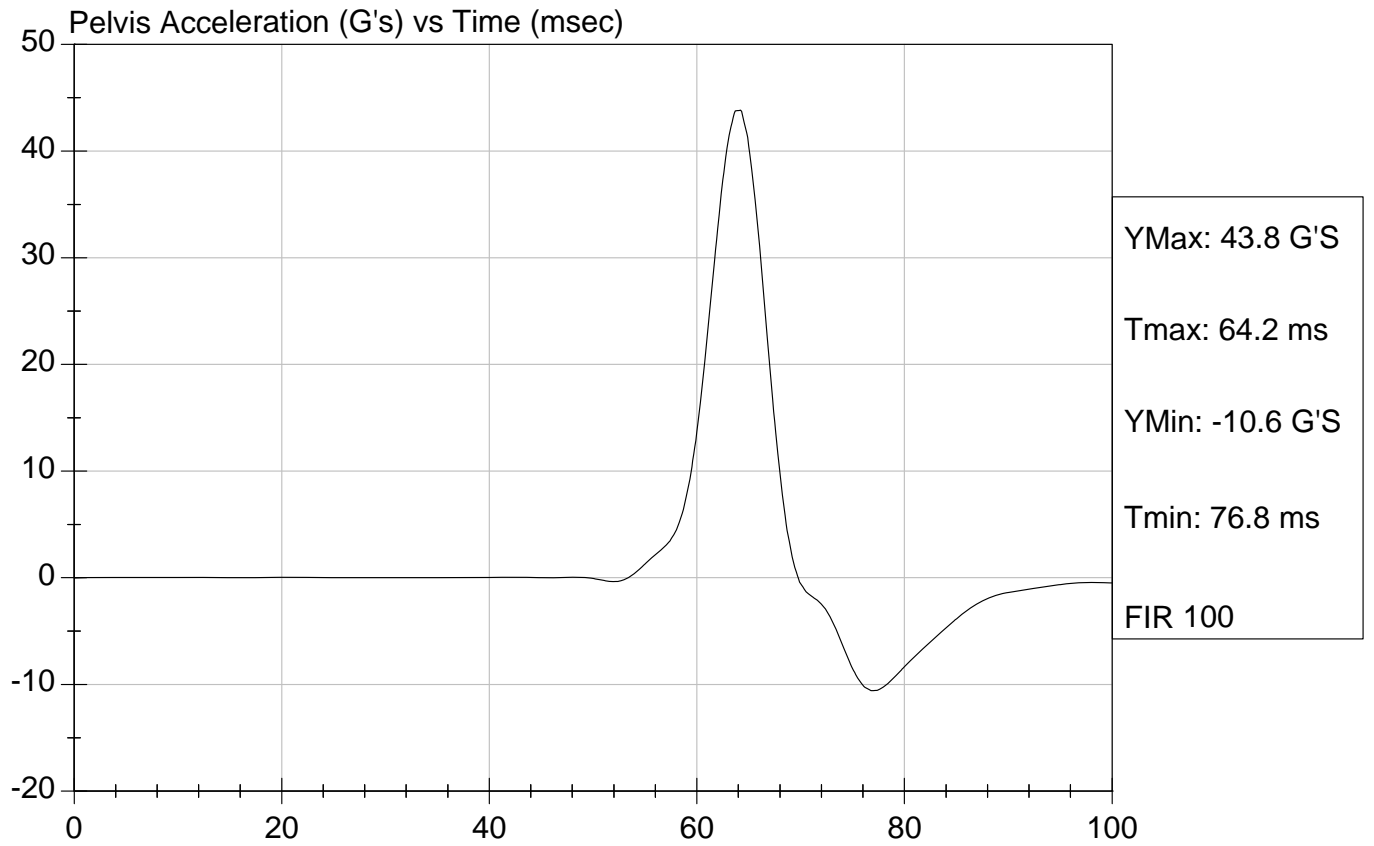
8/14/08  
 Test Date

  
 Approved By



Test Desc: Pelvis Impact  
Component ID: D082333

Test Date: 8/14/08  
Speed: 14.12 ft/sec, 4.30 m/sec




**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

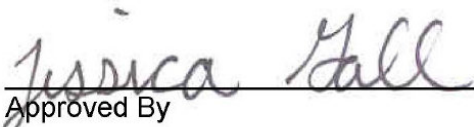
ATD Serial No: 271

Test I.D: D082334

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Force At 12.7 mm	N	104 - 162	134	Pass
Force At 19 mm	N	163 - 222	204	Pass
Force At 25.4 mm	N	222 - 280	267	Pass
Force At 33 mm	N	325 - 391	372	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/15/08  
 Test Date

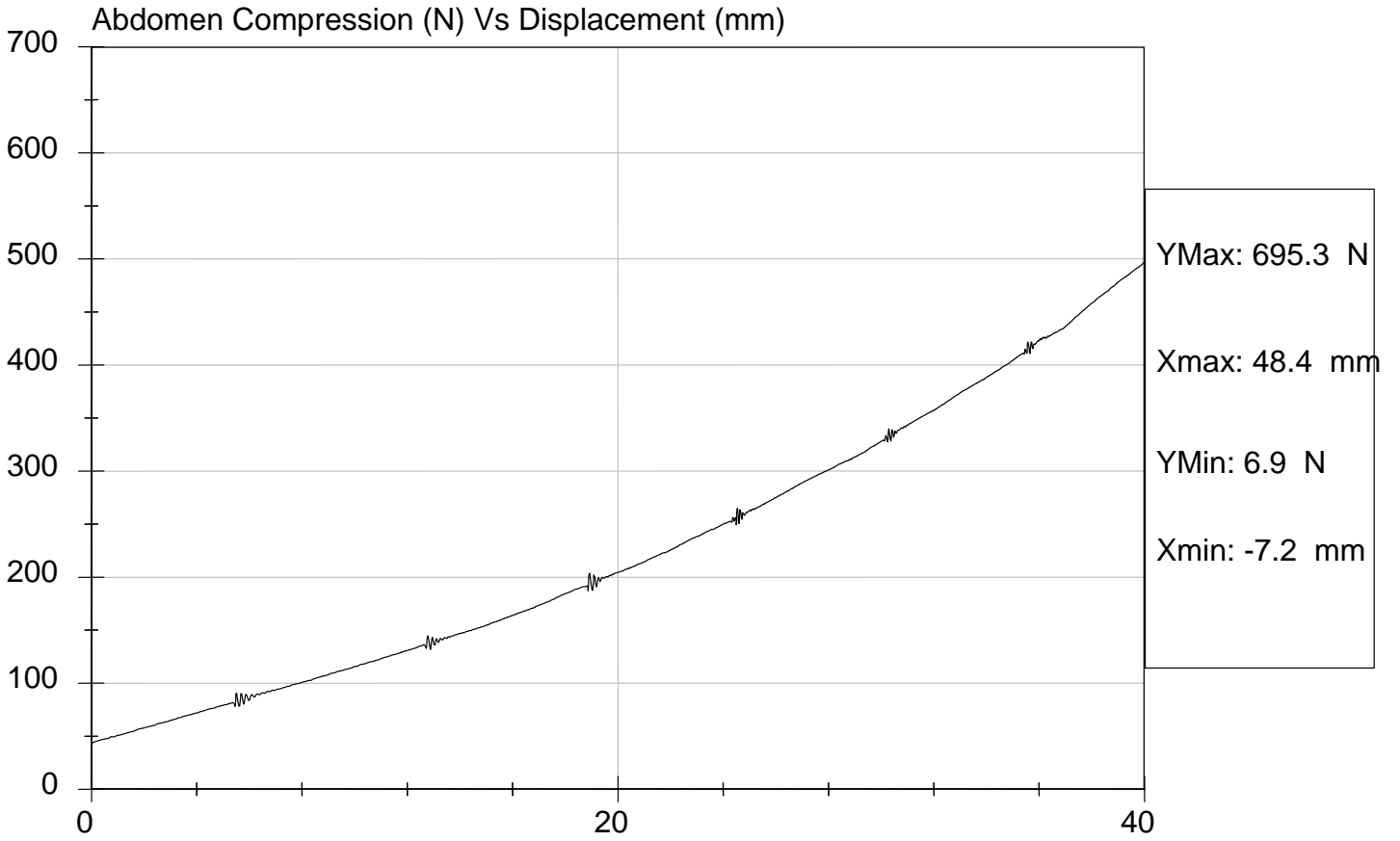
  
 Approved By



Test Description: Abdomen Compression Test Date: 8/15/08

Component: D082334

Speed: 0 ft/sec, 0 m/sec

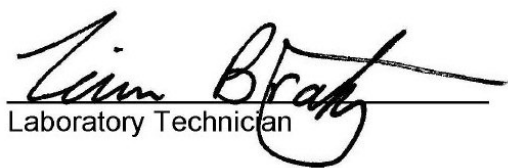


**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

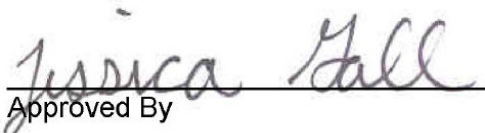
ATD Serial No: 271

Test I.D.: D082335

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	102.1	Pass
Force At 30 deg	N	151.2 - 204.6	154.0	Pass
Force At 40 deg	N	204.6 - 258.0	217.3	Pass
Return Angle	Deg	12 Maximum	4	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/15/08  
 Test Date

  
 Approved By

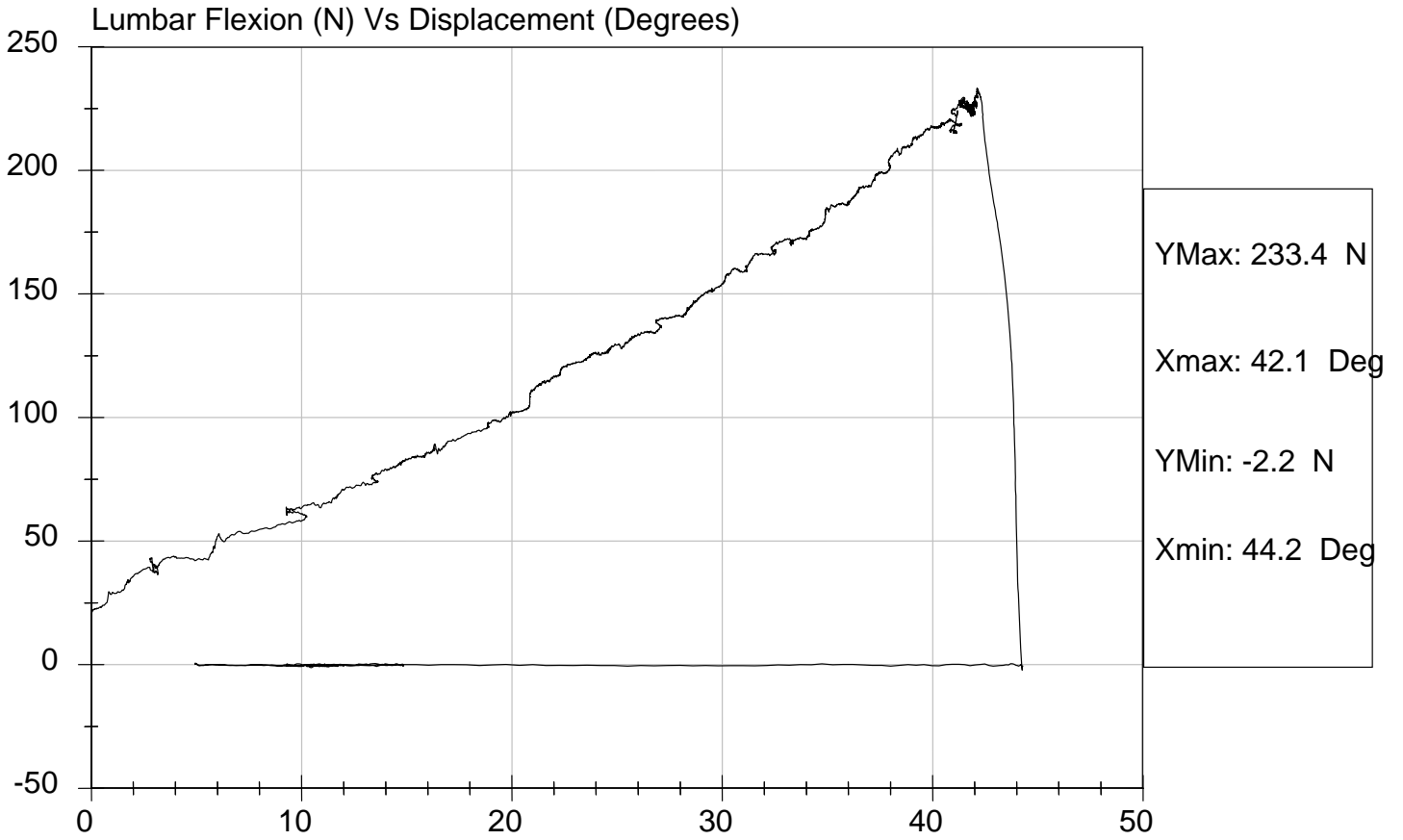


Test Description: Lumbar Flexion

Test Date: 8/15/08

Component: D082335

Speed: 0 ft/sec, 0 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

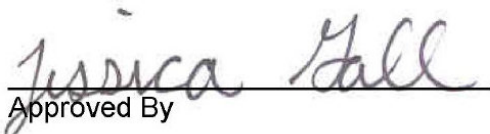
**ATD Serial No:** 271

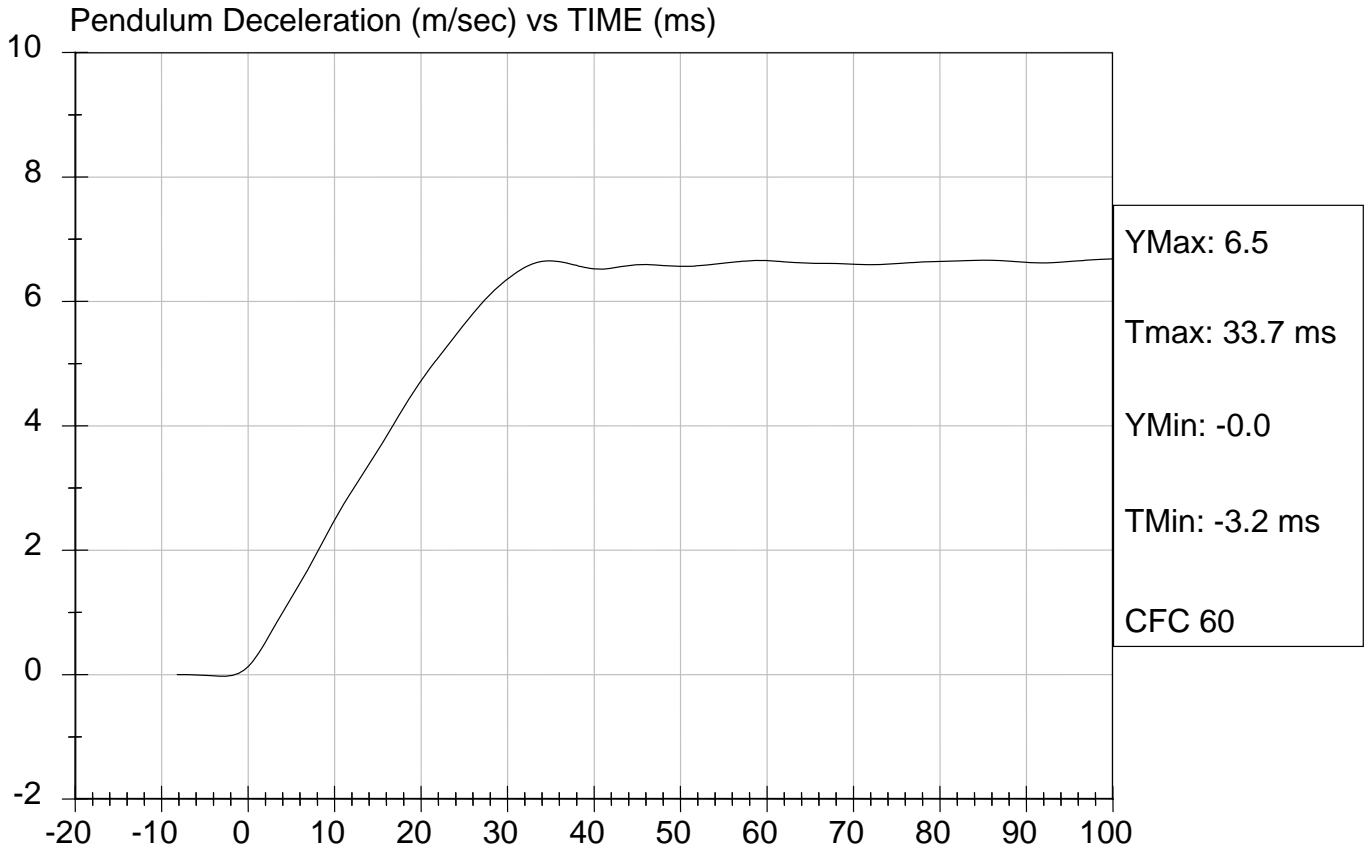
**Test I.D.:** D082339

Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass	
Laboratory Relative Humidity	%	10 to 70	40	Pass	
Impact Velocity	m/s	6.89 to 7.13	7.05	Pass	
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.48	Pass
	20 msec	m/s	4.12 to 5.10	4.72	Pass
	30 msec	m/s	5.73 to 7.01	6.36	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.60	Pass
Midsaggital Plane Max Rotation	deg	66 to 82	73	Pass	
Head Rotation Peak to Zero - Decay Time	msec	58 to 67	60	Pass	
Max. Mx at Occipital Condyles	Nm	73 to 88	75	Pass	
Mx Peak To Zero - Decay Time	msec	49 to 64	60	Pass	
Mx Peak to Max. Head Rotation	msec	2 to 16	13	Pass	

  
 Laboratory Technician

8/15/08  
 Test Date

  
 Approved By

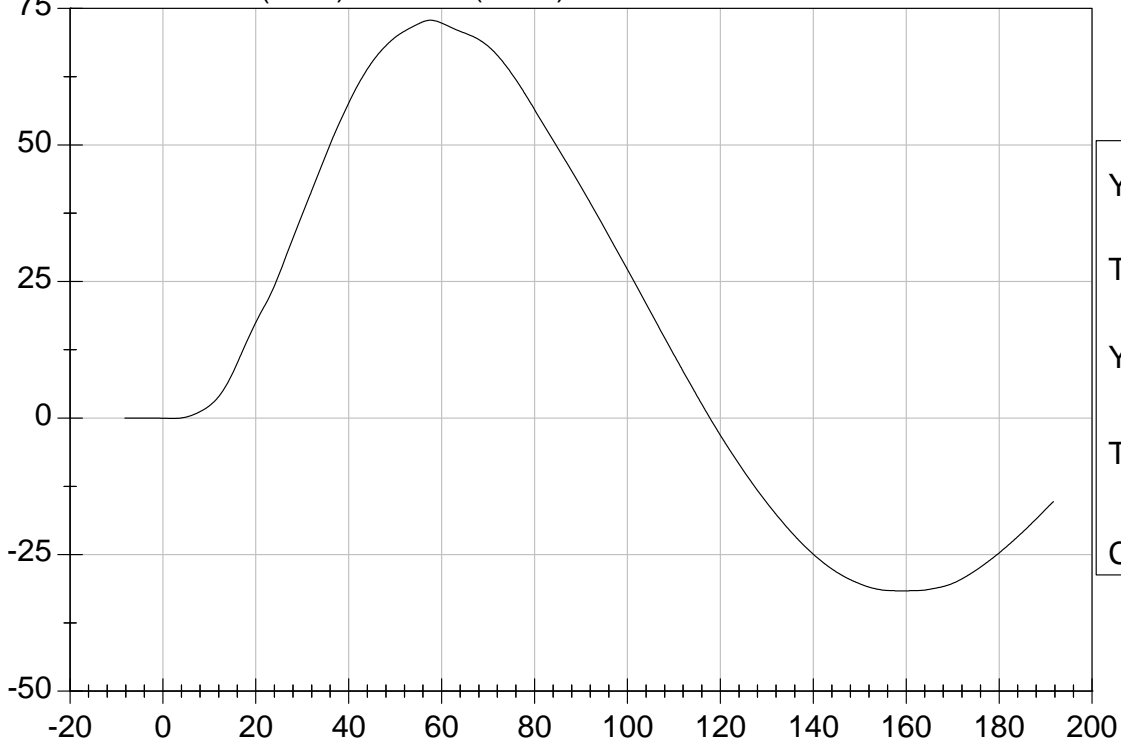




Test Desc: Neck Bending  
Component ID: D082339

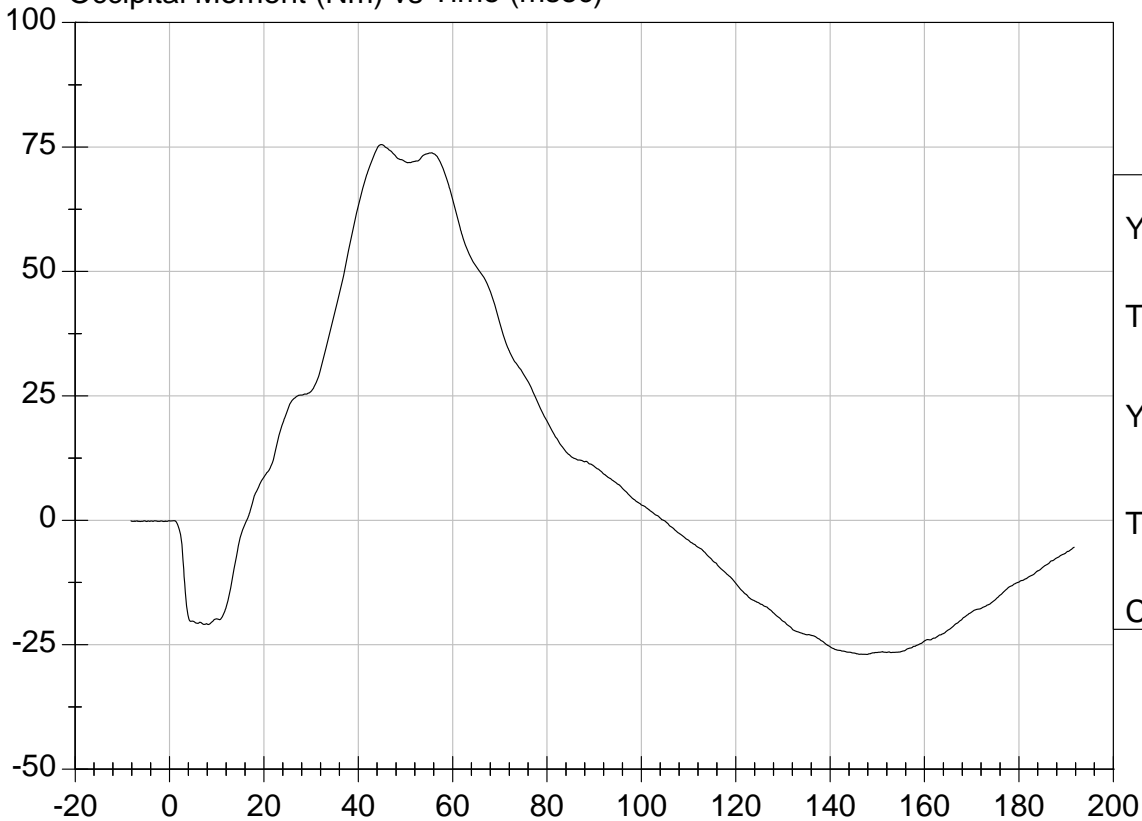
Test Date: 8/15/08  
Speed: 23.14 ft/sec, 7.05 m/sec

Neck Rotation (DEG) vs Time (msec)



YMax: 72.8  
Tmax: 57.6 ms  
YMin: -31.6  
Tmin: 158.4 ms  
CFC 60

Occipital Moment (Nm) vs Time (msec)



YMax: 75.5  
Tmax: 45.0 ms  
YMin: -27.0  
Tmin: 147.8 ms  
CFC 600

## Calibration Test Results Summary

Dummy Serial Number: 271

### Post-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

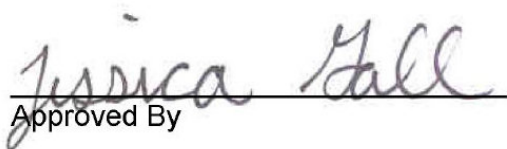
ATD Serial No: 271

Test I.D: D082431

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	120 to 150	138	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-9.4	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/20/08  
 Test Date

  
 Approved By



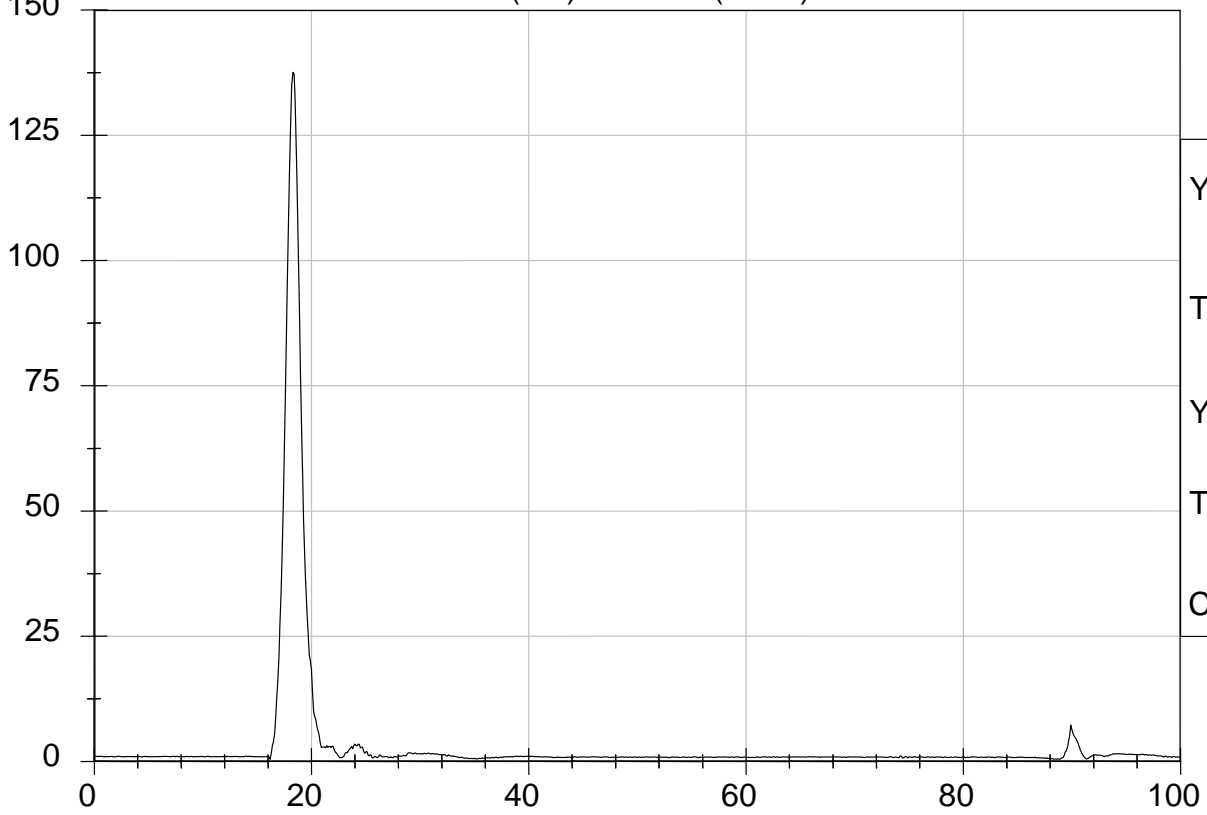
Test Description: Head Drop

Test Date: 8/20/08

Component: D082431

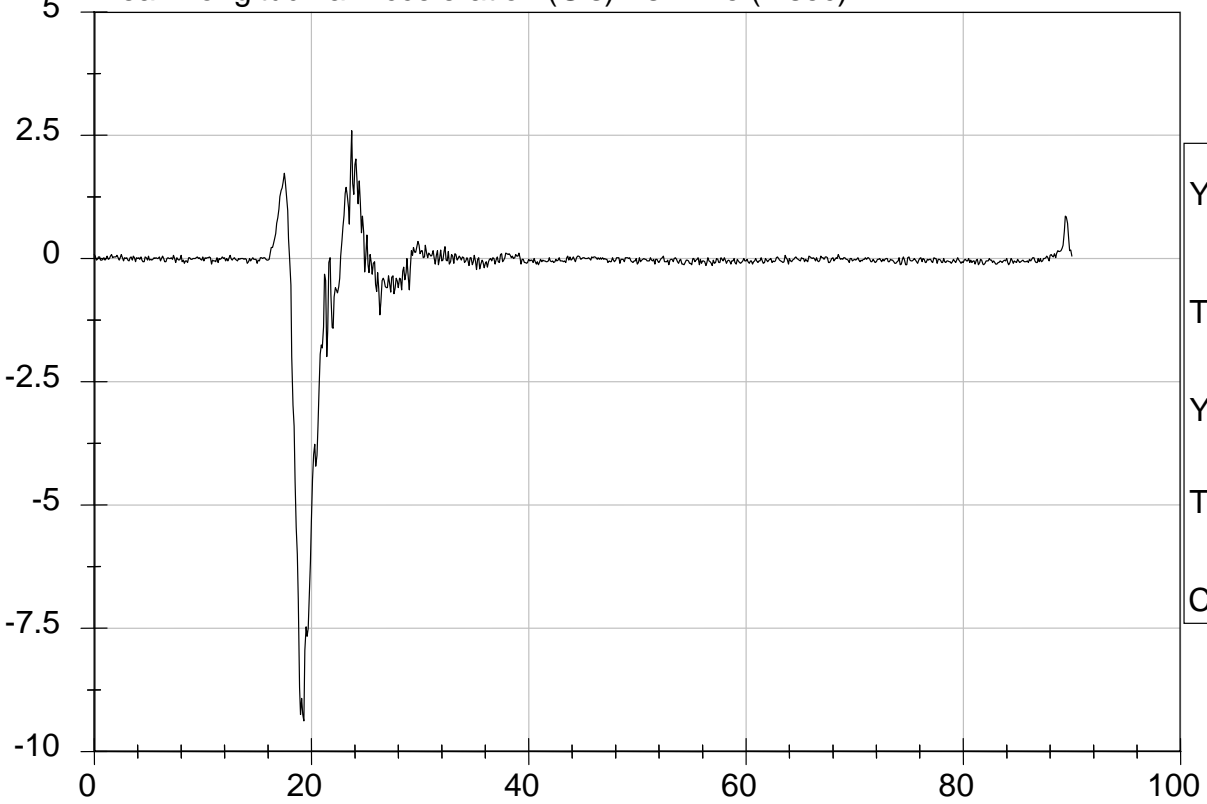
Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (msec)



YMax: 137.6 G  
Tmax: 18.3 ms  
YMin: 0.4 G  
Tmin: 16.2 ms  
CFC 1000

Peak Longitudinal Acceleration (G's) Vs Time (msec)



YMax: 2.6 G  
Tmax: 23.7 ms  
YMin: -9.4 G  
Tmin: 19.3 ms  
CFC 1000

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

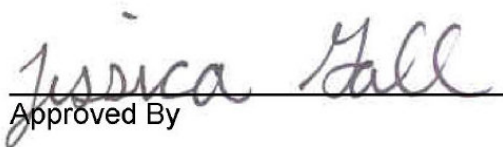
**ATD Serial No:** 271

**Test I.D:** D082432

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	37	Pass
Lower Rib	G's	37 - 46	37	Pass
Lower Spine	G's	15 - 22	17	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

8/21/08  
 Test Date

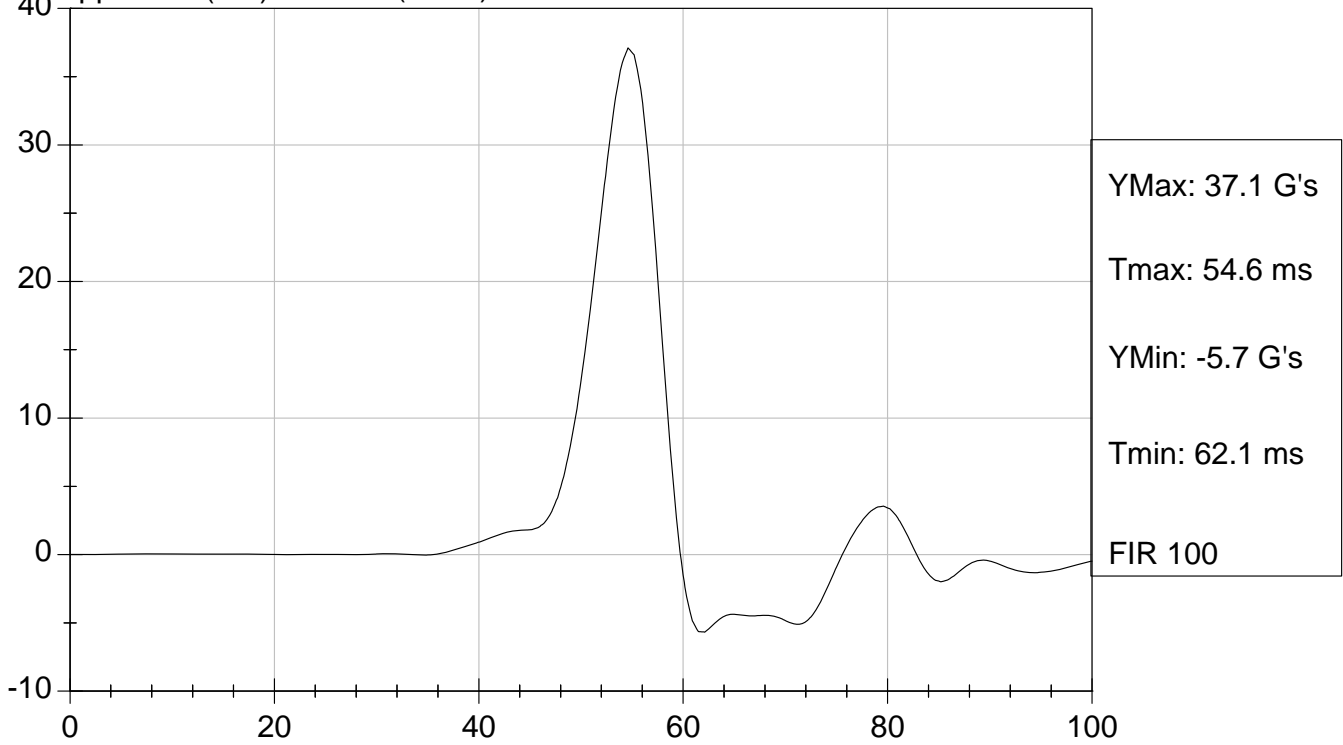
  
 Approved By



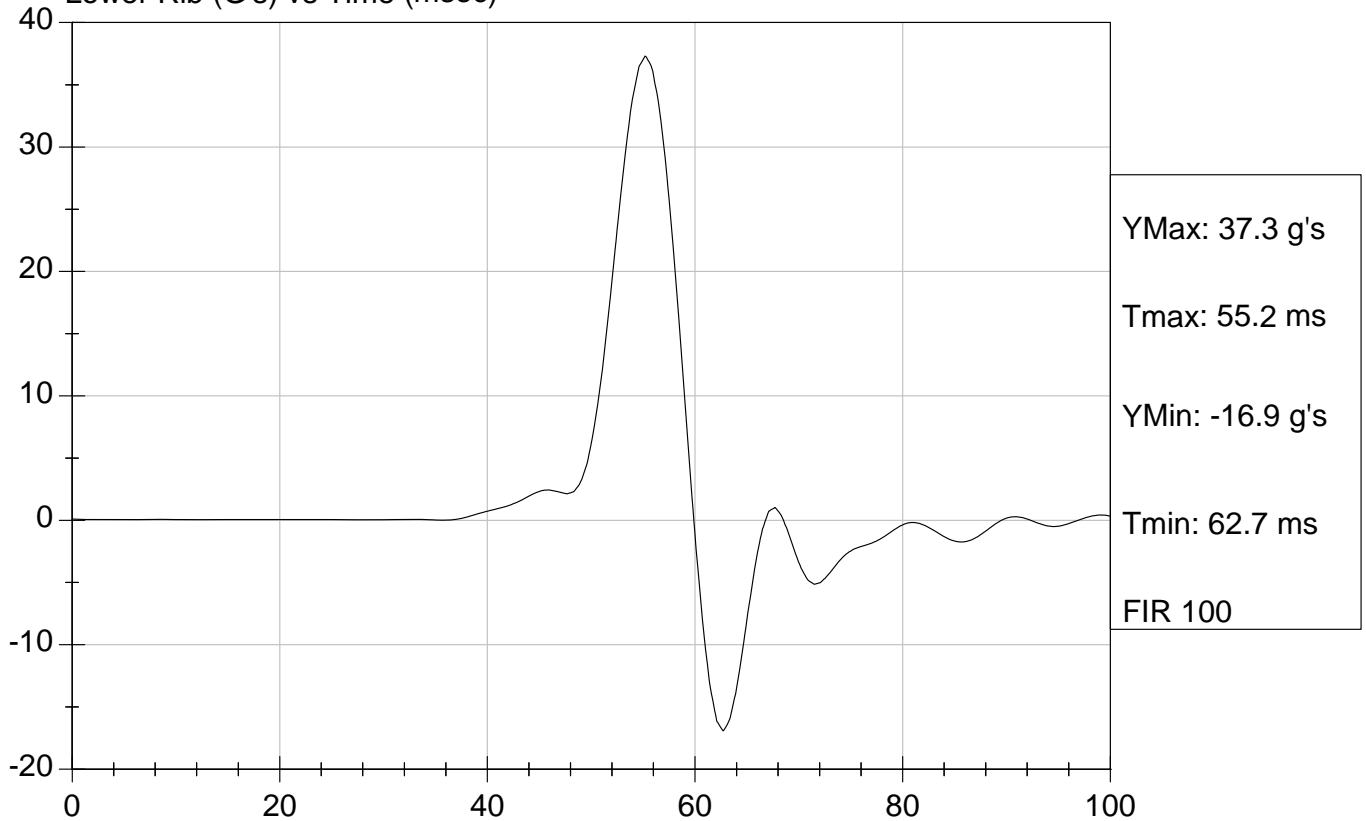
Test Desc: Thorax Impact  
Component ID: D082432

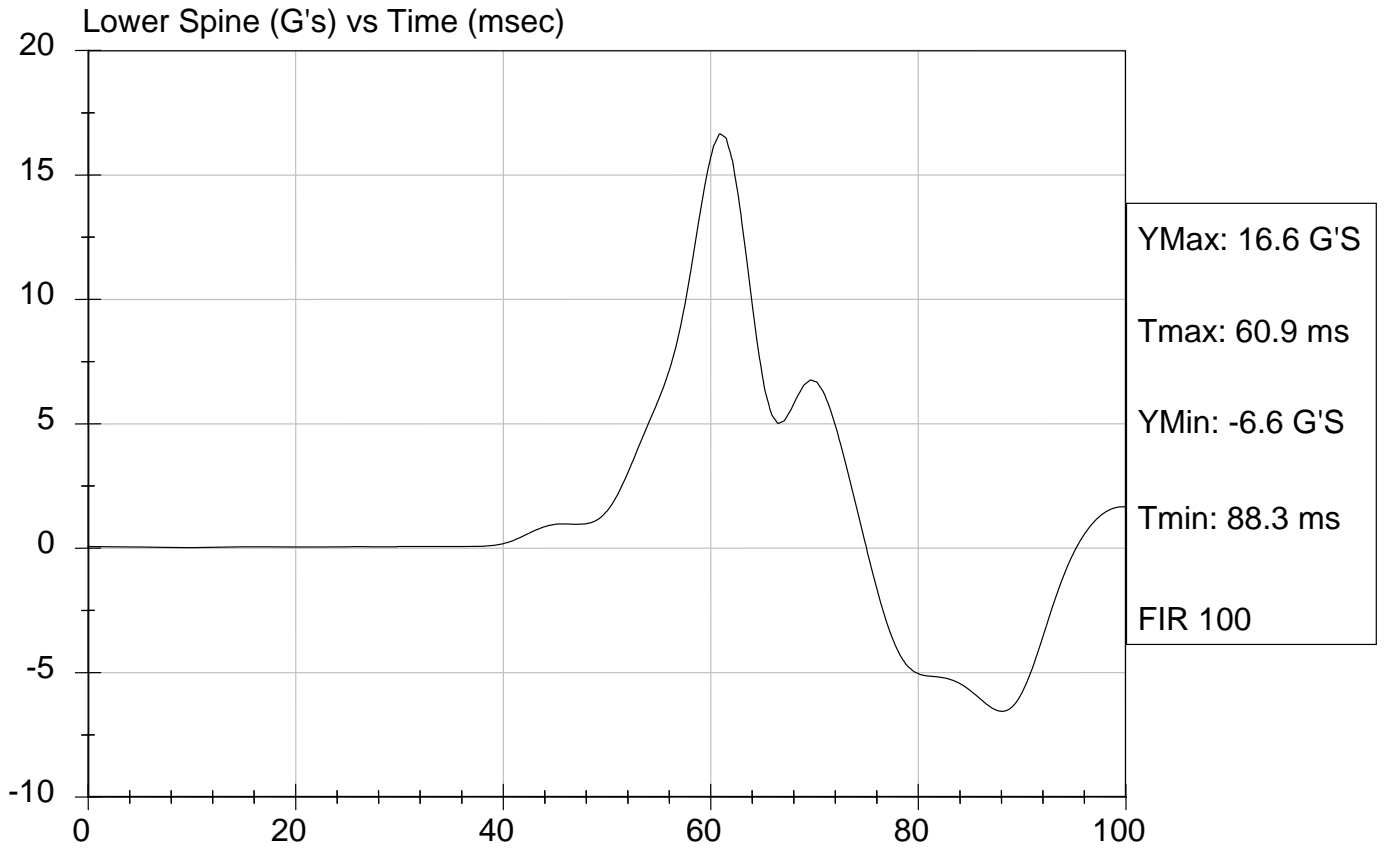
Test Date: 8/21/08  
Speed: 14.12 ft/sec, 4.30 m/sec

Upper Rib (G's) vs Time (msec)



Lower Rib (G's) vs Time (msec)






**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

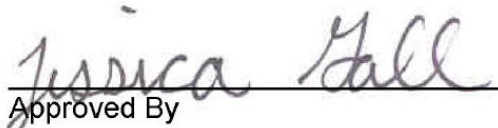
ATD Serial No: 271

Test I.D.: D082433

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.27 - 4.33	4.27	Pass
Pelvis Acceleration	G's	40 - 60	45	Pass
Overall Test Results				Pass

  
 Laboratory Technician

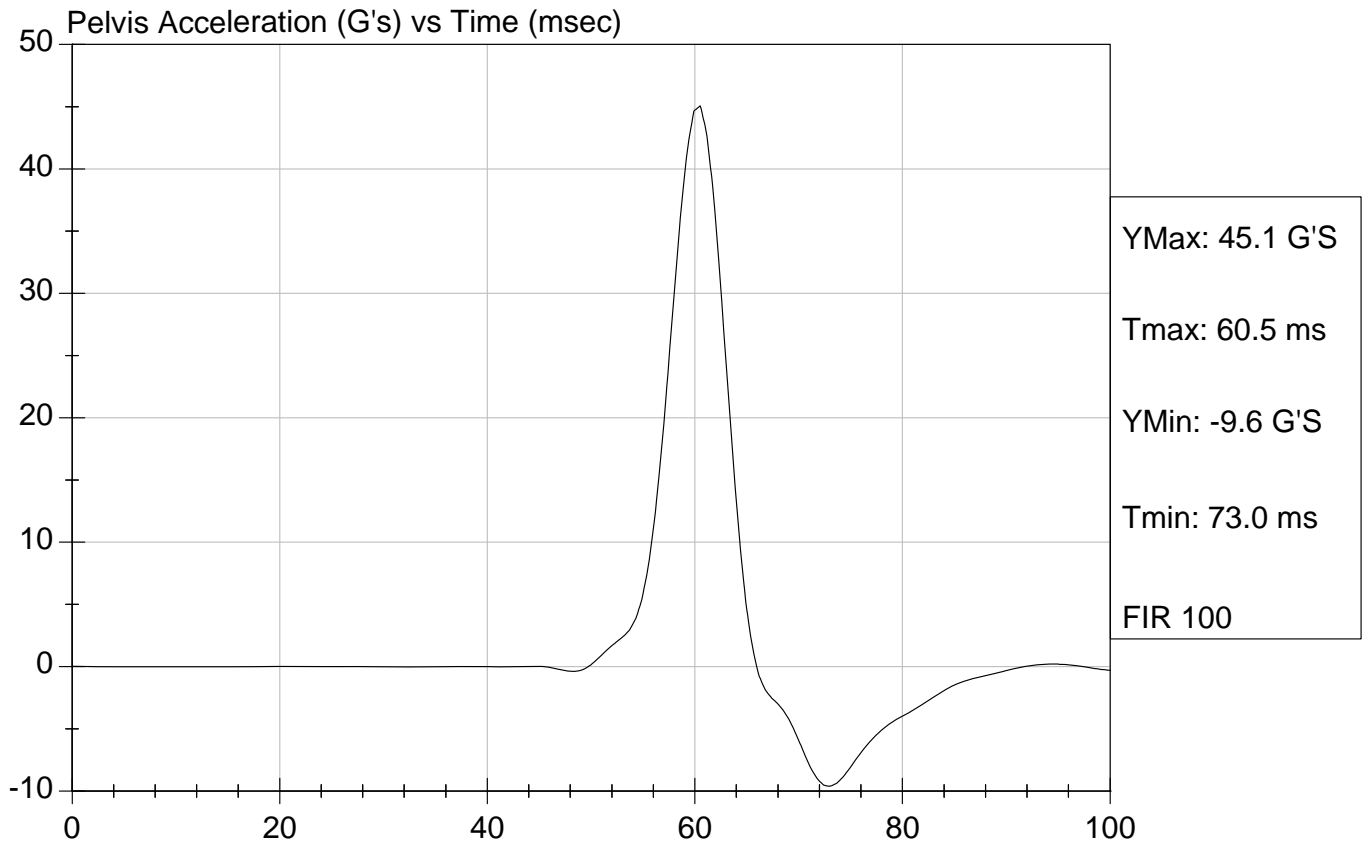
8/21/08  
 Test Date

  
 Approved By



Test Desc: Pelvis Impact  
Component ID: D082433

Test Date: 8/21/08  
Speed: 14.01 ft/sec, 4.27 m/sec




**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**


ATD Serial No: 271

Test I.D.: D082434

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Force At 12.7 mm	N	104 -162	134	Pass
Force At 19 mm	N	163 - 222	181	Pass
Force At 25.4 mm	N	222 - 280	242	Pass
Force At 33 mm	N	325 - 391	329	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/22/08  
 Test Date

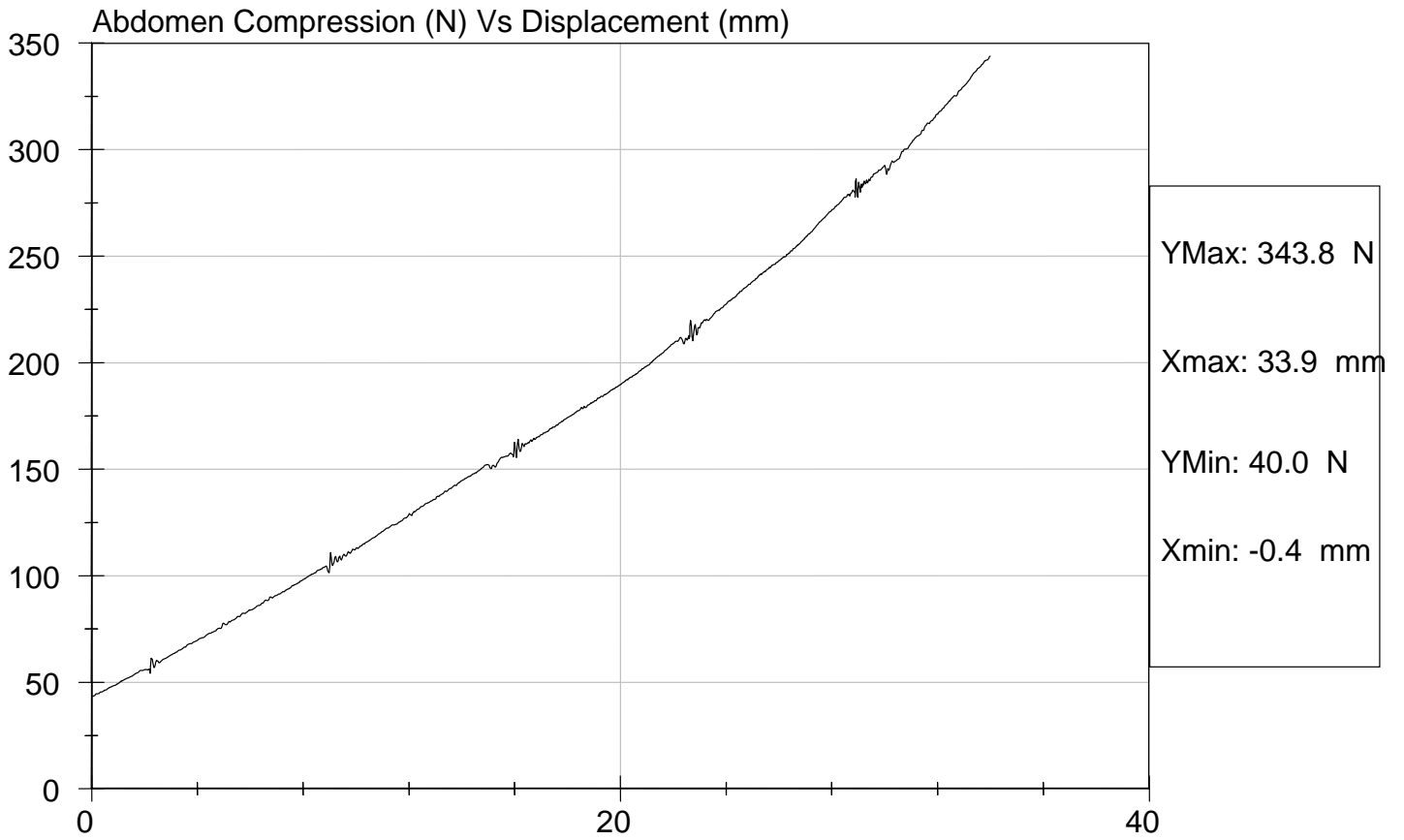
  
 Approved By



Test Description: Abdomen Compression Test Date: 8/22/08

Component: D082434

Speed: 0 ft/sec, 0 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

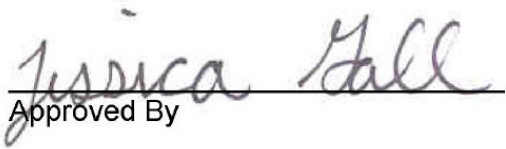
ATD Serial No: 271

Test I.D.: D082435

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	112.6	Pass
Force At 30 deg	N	151.2 - 204.6	174.6	Pass
Force At 40 deg	N	204.6 - 258.0	245.0	Pass
Return Angle	Deg	12 Maximum	8	Pass
Overall Test Results				Pass

  
 Laboratory Technician

8/22/08  
 Test Date

  
 Approved By

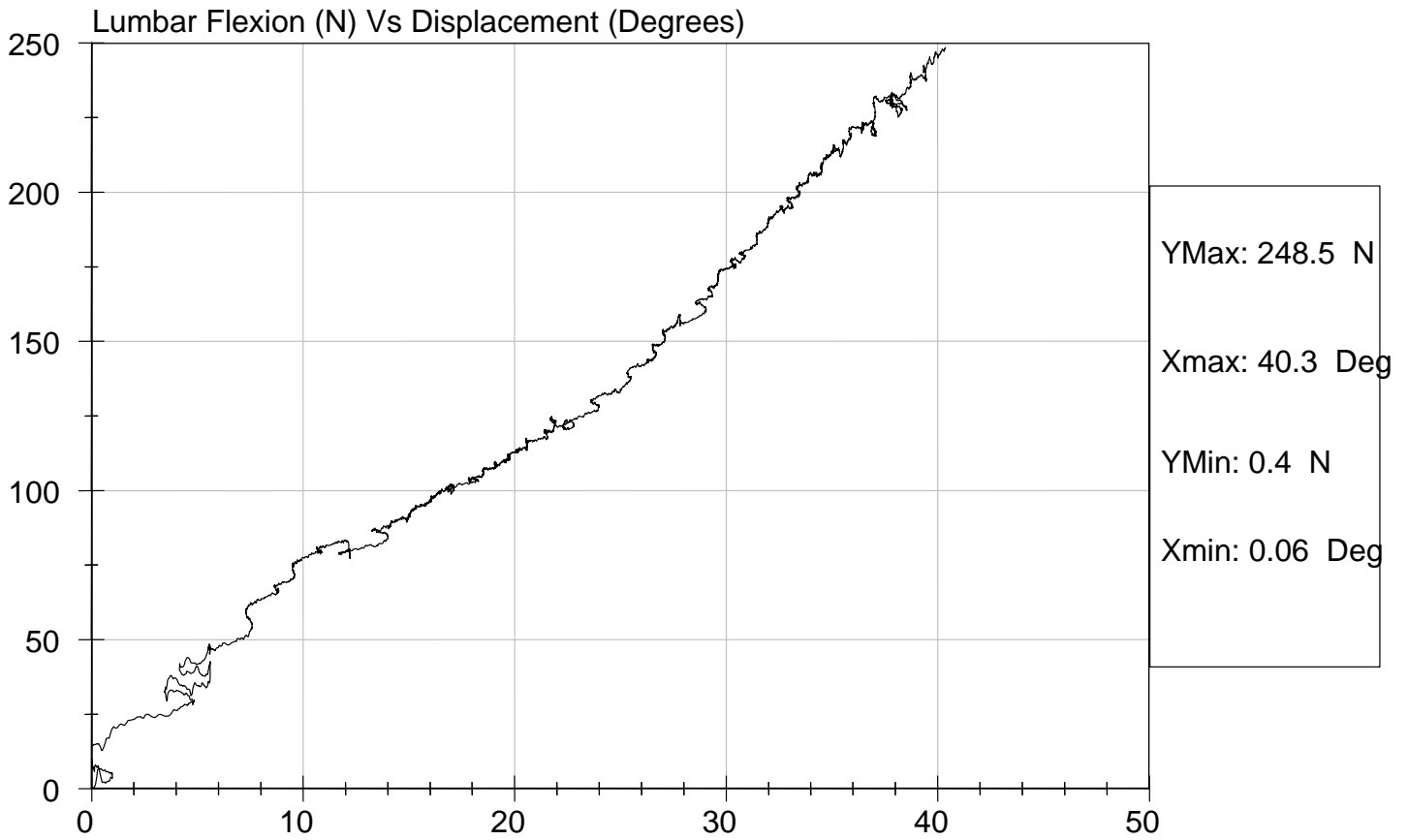


Test Description: Lumbar Flexion

Test Date: 8/22/08

Component: D082435

Speed: 0 ft/sec, 0 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

**ATD Serial No:** 271

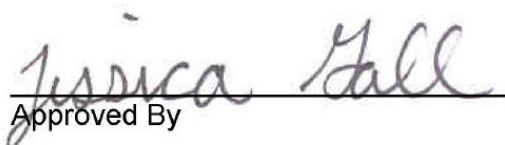
**Test I.D:** D082439

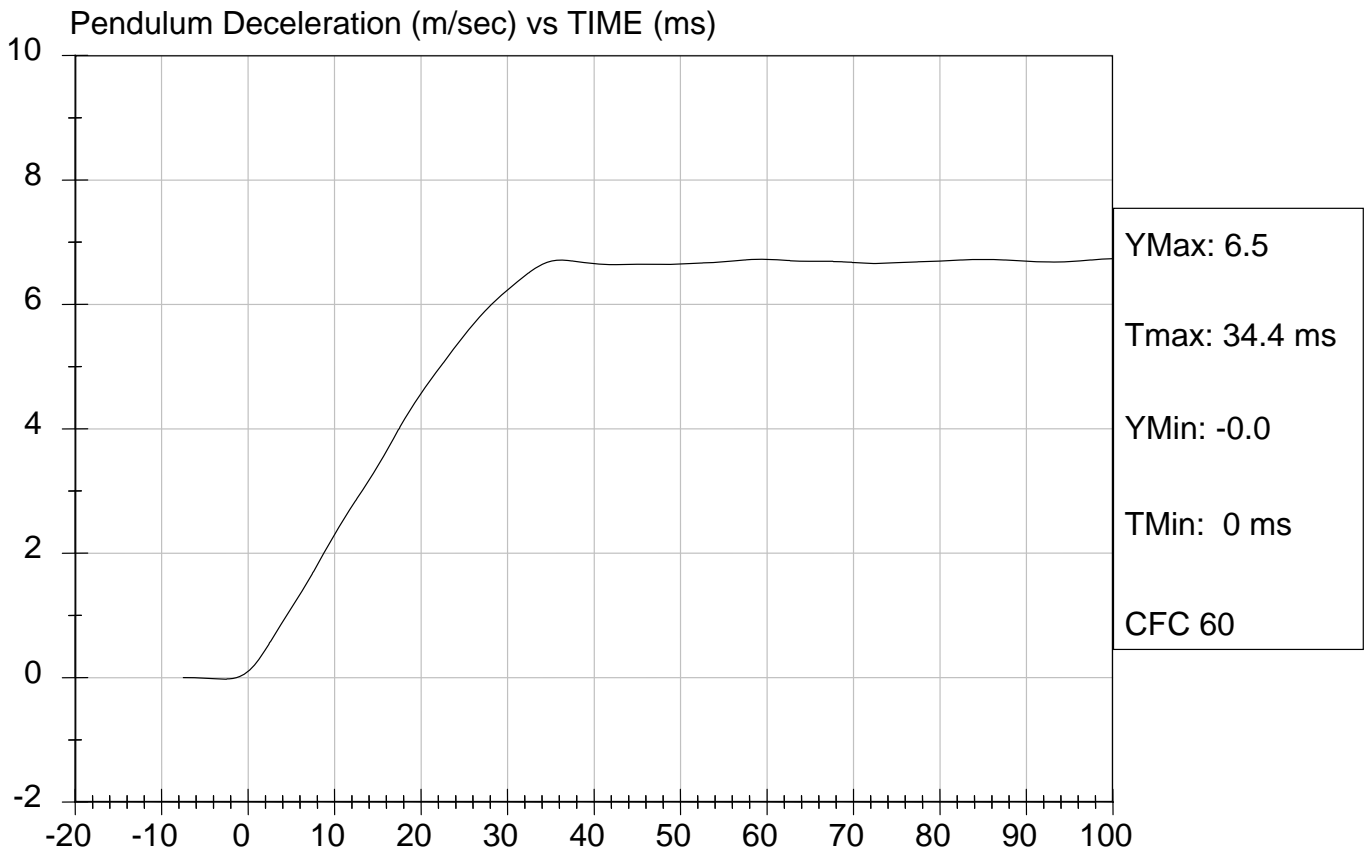
Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass	
Laboratory Relative Humidity	%	10 to 70	42	Pass	
Impact Velocity	m/s	6.89 to 7.13	7.06	Pass	
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.30	Pass
	20 msec	m/s	4.12 to 5.10	4.57	Pass
	30 msec	m/s	5.73 to 7.01	6.23	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.67	Pass
Midsaggital Plane Max Rotation	deg	66 to 82	73	Pass	
Head Rotation Peak to Zero - Decay Time	msec	58 to 67	62	Pass	
Max. Mx at Occipital Condyles	Nm	73 to 88	74	Pass	
Mx Peak To Zero - Decay Time	msec	49 to 64	59	Pass	
Mx Peak to Max. Head Rotation	msec	2 to 16	10	Pass	

  
 Laboratory Technician

8/22/08

Test Date

  
 Approved By

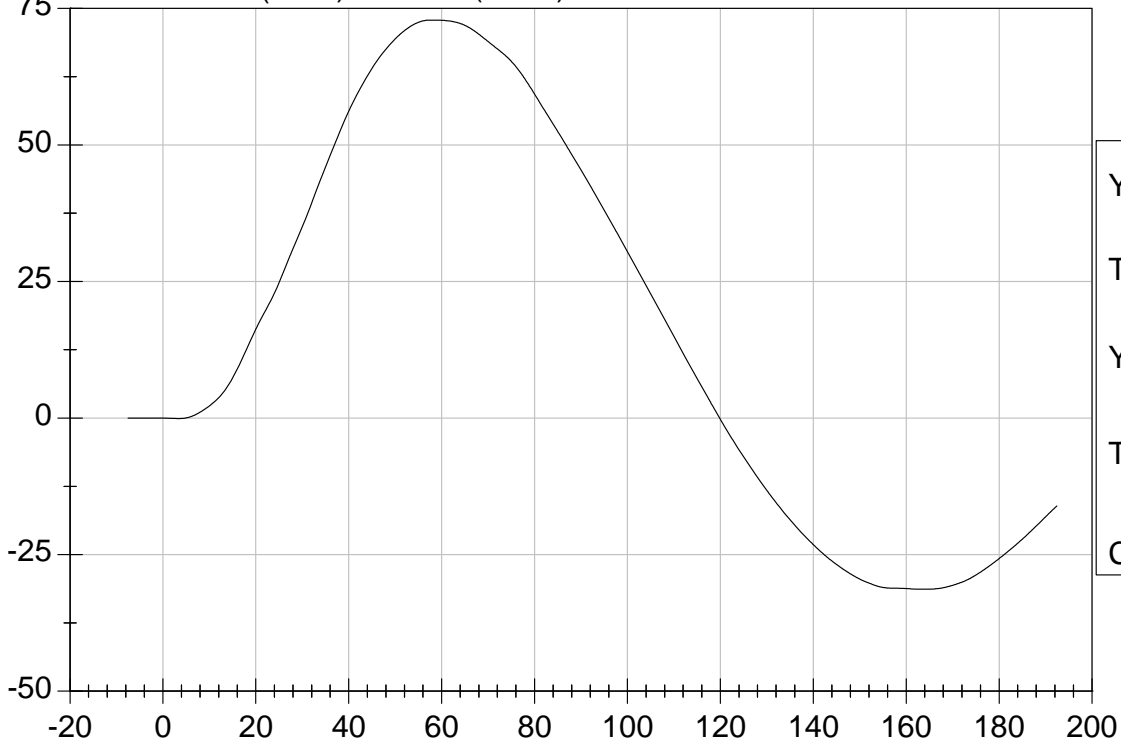




Test Desc: Neck Bending  
Component ID: D082439

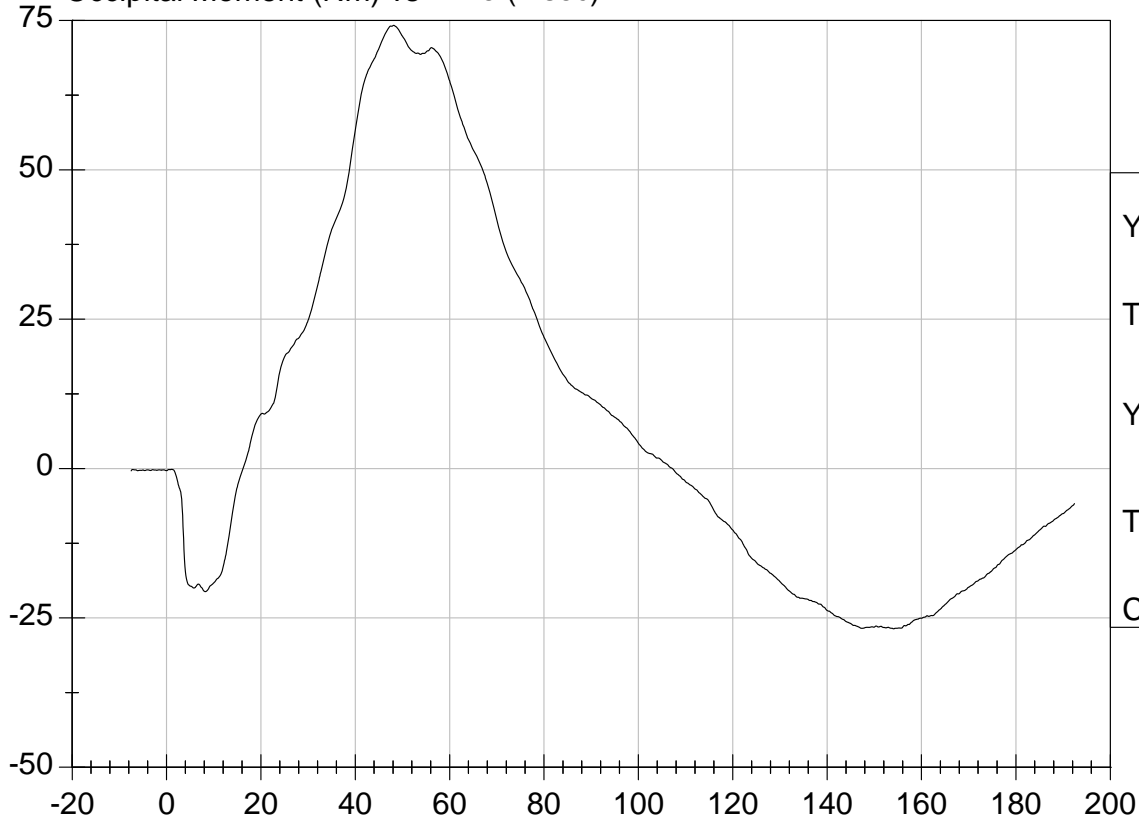
Test Date: 8/22/08  
Speed: 23.15 ft/sec, 7.06 m/sec

Neck Rotation (DEG) vs Time (msec)



YMax: 72.9  
Tmax: 57.7 ms  
YMin: -31.3  
Tmin: 163.8 ms  
CFC 60

Occipital Moment (Nm) vs Time (msec)



YMax: 74.2  
Tmax: 48.1 ms  
YMin: -26.8  
Tmin: 154.1 ms  
CFC 600

**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Inspection Checklist**

**ATD Serial No:** 271

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

*Jessica Hall*  
 Laboratory Technician  
*David Winkelbauer*  
 Approved By

8/22/08  
 Test Date