REPORT NUMBER: NCAPSIDE-MGA-2006-004

NEW CAR ASSESSMENT PROGRAM
SIDE IMPACT TEST

KIA MOTORS CORPORATION
2006 KIA RIO
NHTSA NUMBER: M60510

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

Test Date: October 4, 2005

Report Date: October 31, 2005

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
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David Winkelbauer, Facility Director

Technical Report Documentation Page

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15. Supplementary Notes

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP side impact was conducted on the subject 2006 Kia Rio 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 October 4, 2005. The impact velocity of the Moving Deformable Barrier (MDB) was 61.8 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 329 mm at level 2. The test vehicle's occupant performance is as follows:

	DRIVER	PASS.
Left Upper Rib (LUR) Accel., g	59.8	103.7
Left Lower Rib (LLR) Accel., g	55.7	97.3
Lower Spine (T_{12}) Accel., g	87.7	68.5
Thoracic Trauma Index (TTI)	73.8	86.1
Pelvis (PEV) Accel., g	83.0	82.9
HIC	195	405

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.

17. Key Words New Car Assessment Program (NCAP) Side Impact Side Impact Hybrid III Dummy (SID/HIII) Occupant Side Impact Protection		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Adm. Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590	
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SECTION 1

PURPOSE AND TEST PROCEDURE

PURPOSE

This side impact test was conducted as part of the FY' 2006 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 2006 Kia Rio 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 2006 Kia Rio 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 61.8 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 1333.0 kg and the test weight of the MDB was 1360.8 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on October 4, 2005.

One (1) real-time motion picture camera and nine (9) 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-five (25) structural accelerometers and the MDB was instrumented with six (6) 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 329 mm at level 2, 900 mm rearward of the left vertical impact point. The driver and passenger SID/HIIIs, Serial Nos. 904 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^1	T^2	TTI (G's)	Peak Pelvis (G's)
Driver	195.3	31.0	67.0	73.8	83.0
Passenger	404.8	35.2	66.2	86.1	82.9

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Information	Left Front (Driver)		Left Rear (Passenger)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Side Torso Airbag	Yes	Yes	No	
Head Airbag	None		No	
Curtain Airbag	Yes	Yes*	Yes	Yes*

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

TEST NOTES

* The curtain airbag did not fully deploy. Please see Appendix A for photos.

The following channels did not collect any valid data:
LF Door Centerline Y after 20ms
Midrear of LF Door Y after 20ms

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2006 Kia Rio
Test Program: NCAP Side Impact
NHTSA No. M60510
Test Date: 10/04/05

TEST VEHICLE INFORMATION

Make	Kia
Model	Rio
Body Style	Sedan
NHTSA No.	M50610
VIN	KNADE123066035625
Color	Silver
Delivery Date	9/16/05
Odometer Reading (mile)	42
Dealer	Conlon-Collins Kia
Transmission	Manual
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	1.6
Engine Placement	Lateral
Automatic Door Locks (ADL)	No
Owner's Manual Details Instructions on Disabling ADLs	NA

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	No
Tilt Wheel	Yes
Anti-lock Brakes	Yes
Traction Control	No
All Wheel Drive	No
Power Seats	No
Pretensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Kia Motors Corporation
Date of Manufacture	07/05

GVWR (kg)	1650
GAWR Front (kg)	870
GAWR Rear (kg)	850

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Buckets	Split Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.9

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	358.0	212.5		413.0	299.0	
Right	kg	350.0	215.0		352.0	269.0	
Ratio	%	62.0	38.0		57.0	43.0	
Totals	kg	708.0	427.5	1135.5	765.0	568.0	1333.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1135.5
Weight of 2 P572E ATDs	kg	161.5
Rated Cargo/Luggage Weight (RCLW)	kg	44.9
Calculated Vehicle Target Weight (TVTW)	kg	1341.9

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

Weight of Ballast in Cargo Area: 11.3 kg

TEST VEHICLE ATTITUDES AND CG

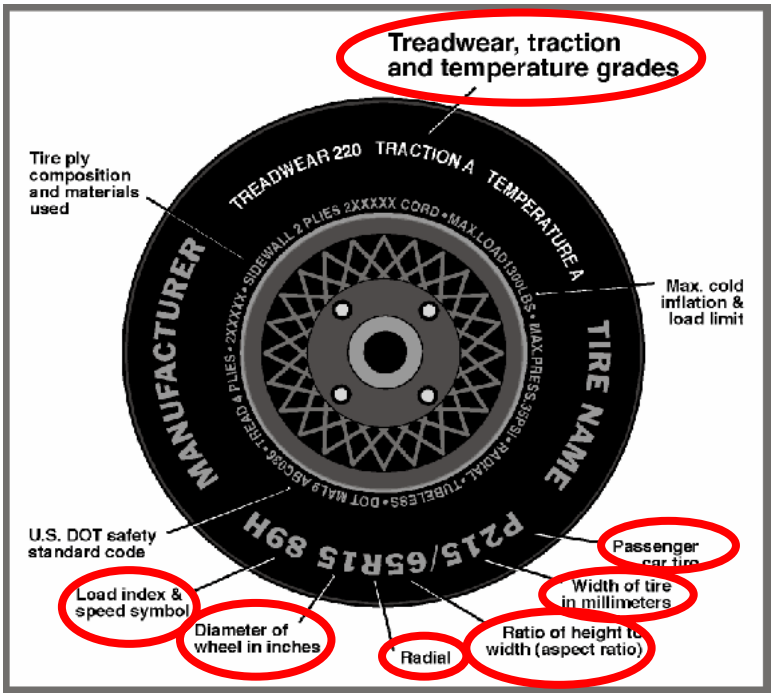
	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	663	668	648	645	943
As Tested	mm	641	661	604	618	1067
Fully Loaded	mm	640	660	600	608	

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2505
Target Impact Point Aft of Front Axle	mm	313
Actual Impact Point Aft of Front Axle	mm	312

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold / Test Pressure (kPa)	220	220
Recommended Tire Size	P185/65R14	P185/65R14
Tire Size on Vehicle	P185/65R14	P185/65R14
Tire Manufacturer	Hankook	Hankook
Tire Name	Optimo H418	Optimo H418
Tire Type	P	P
Tire Width (mm)	185	185
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	14	14
Load Index & Speed Symbol	85H	85H
Treadwear	400	400
Traction Grade	A	A
Temperature Grade	A	A

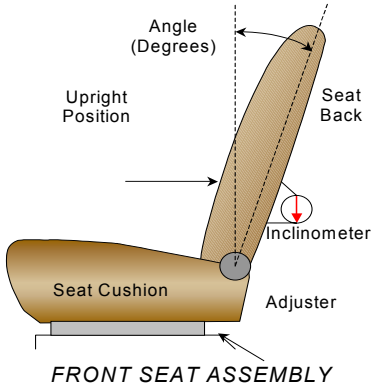
DATA SHEET NO. 3

TEST VEHICLE INFORMATION

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. Manufacturer's test detent = 5th detent with forwardmost as 0.



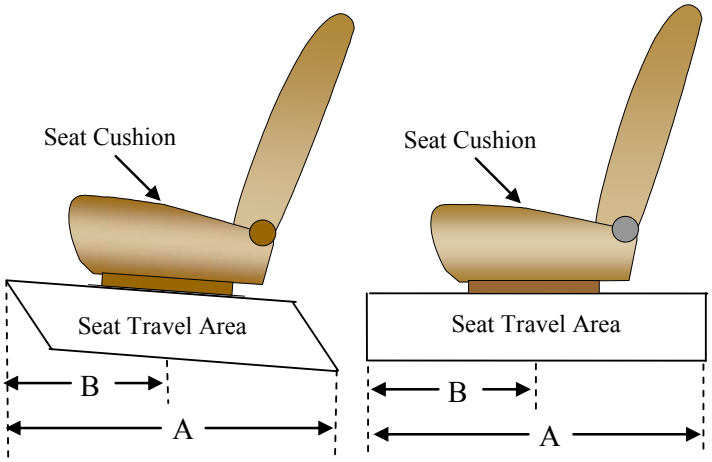
Test detent: 5th detent, with forwardmost at 0.
Driver seat back angle: 14.8° on head rest post
Passenger seat back angle: non adjustable

SEAT FORE/AFT POSITIONS

Forward-most measurements and rearward-most measurements should be taken from the bottom of the seat cushion (including the plastic base if applicable).

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in position #
Driver Seat	22 detents, forwardmost as 0.	11th detent
Rear Seat	Non adjustable	Non adjustable



DATA SHEET NO. 3 (CONTINUED)

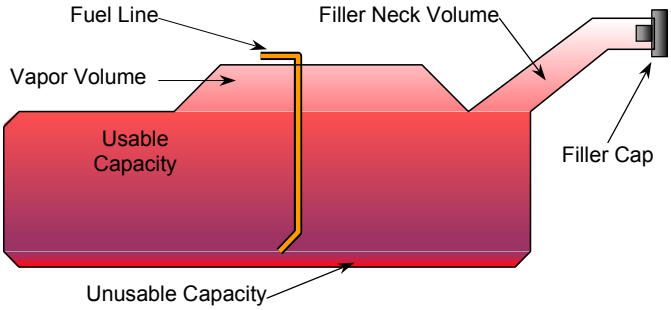
TEST VEHICLE INFORMATION

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	45.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	41.4 - 42.3
Actual Amount of Solvent used	41.4
1/3 of Usable Capacity	15.0

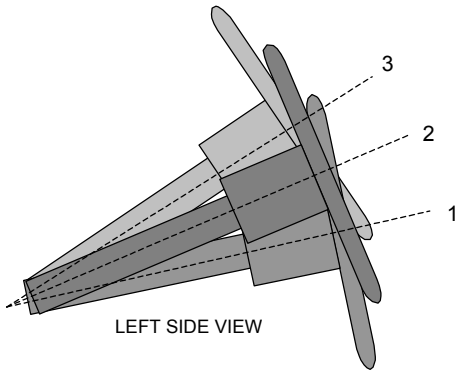
The test vehicle is equipped with electric fuel pump and pump operates normally when vehicle's electrical system is activated.



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 POSITIONS

	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		22.7
Geometric center position No. 2		24.6
Uppermost position No. 3		26.4

DATA SHEET NO. 4

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

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	61.8
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

POST TEST OBSERVATIONS
MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	1 mm left
Vertical Offset	mm	+/-20	9 mm up

DATA SHEET NO. 5

POST TEST OBSERVATIONS

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat SID/HIII	Rear Seat SID/HIII
Dummy Type / Serial No.	SID HIII / 904	SID HIII / 271
Head Contact	Curtain Airbag	Curtain, Head Liner, Headrest
Upper Torso Contact	Side Airbag, Door panel	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	Doors were unlocked	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 Rear Passenger Window Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

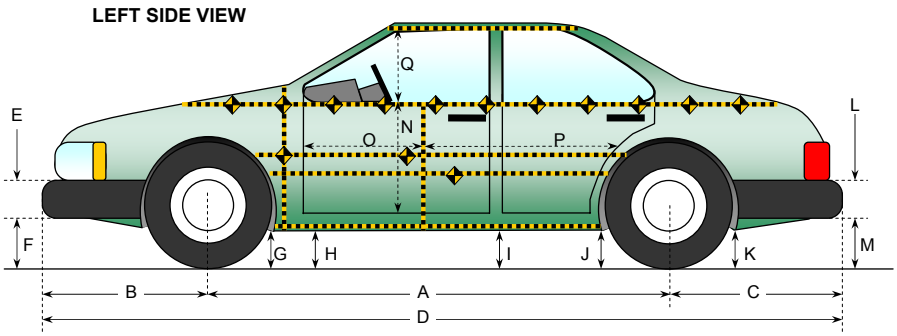
Restraint Type	Occupant Location 01		Occupant Location 04	
	Installed	Operation	Installed	Operation
Front Airbag	Yes	No	No	
Side Airbag	Yes	Yes	No	
Head Airbag	None		No	
Curtain Airbag	Yes	Yes*	Yes	Yes*
Seat Belt Pretensioner	Yes		Yes	
Seat Belt Load Limiter	Yes		Yes	

* The curtain airbag did not fully deploy. Please see Appendix A for photos

DATA SHEET NO. 6

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05



All Measurements in mm

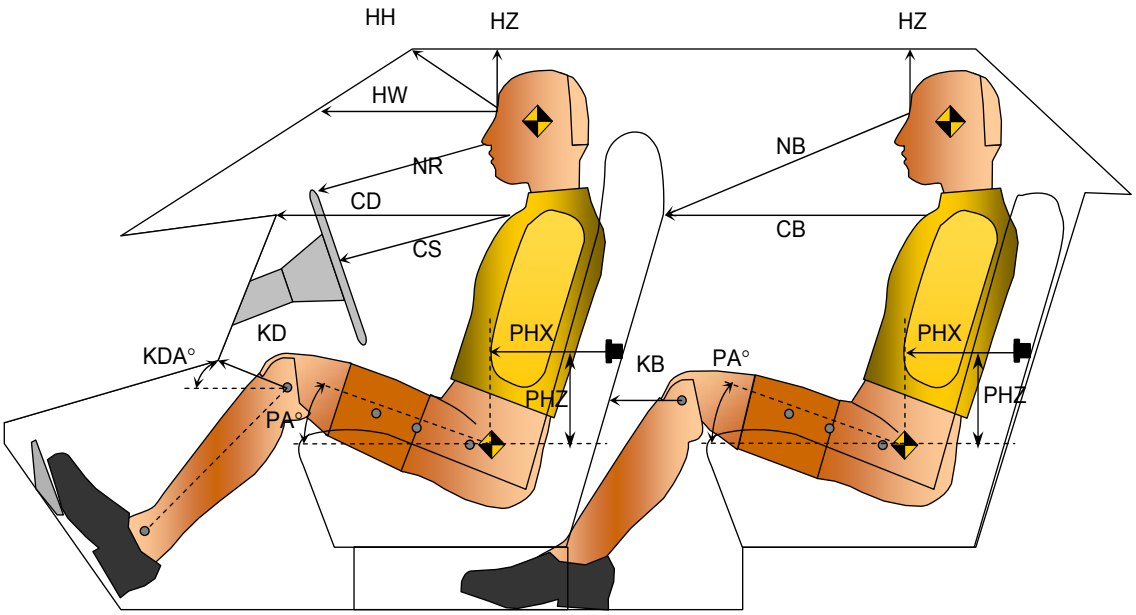
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2505	2491	14
B	Front Axle to FSOV	828	790	38
C	Rear Axle to RSOV	885	905	-20
D	Total Length at Centerline	4218	4186	32
E	Front Bumper Thickness	127	127	0
F	Front Bumper Bottom to Ground	245	265	-20
G	Sill Height at Front Wheel Well	175	240	-65
H	Sill Height at Front Door Leading Edge	174	245	-71
I	Sill Height at "B" Pillar	174	223	-49
J1	Sill Height at Rear Wheel Well	170	180	-10
J2	Pinch Weld Height at Rear Wheel Well	165	186	-21
K	Sill Height Aft of Rear Wheel Well	220	206	14
L	Rear Bumper Thickness	143	143	0
M	Rear Bumper Bottom to Ground	300	320	-20
N	Sill Height to Window Bottom Sill	681	588	93
O	Front Door Leading Edge to Impact CL	791	764	27
P	Rear Door Trailing Edge to Impact CL	1144	1022	122
Q	Front Window Opening	384	370	14
R	Right Side Length	3523	3523	0
S	Left Side Length	3522	3455	67
T	Vehicle Width at "B" Post	1694	1366	328

DATA SHEET NO. 7

SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2006 Kia Rio
Test Program: NCAP Side Impact

NHTSA No. M60510
Test Date: 10/04/05

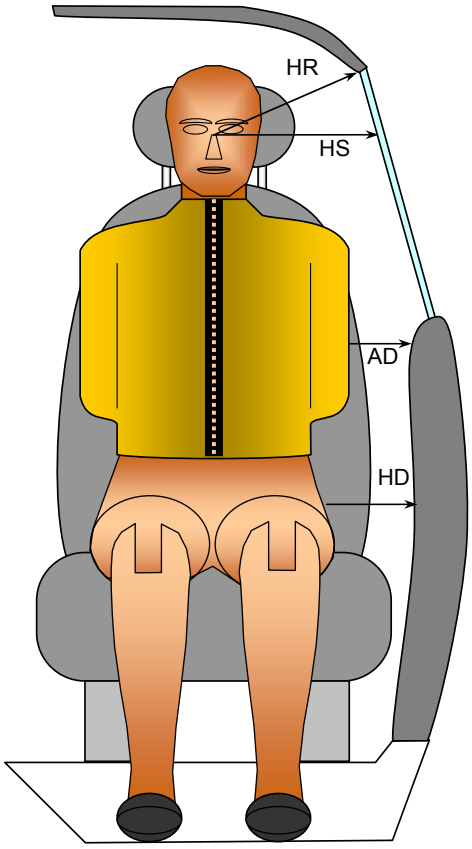


Driver Code	Pass. Code	Measurement Description	Driver S/N 904		Passenger S/N 271	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	386			
HW		Head to Windshield	584			
HZ	HZ	Head to Roof	171		138	
NR	NB	Nose to Rim/Nose to Seatback	481		547	
CD	CB	Chest to Dash or Seatback	552		472	
CS		Chest to Steering Wheel	370			
KDL	KBL	Left Knee to Dash or Seatback	201	26.9	164	21.0
KDR	KBR	Right Knee to Dash or Seatback	175	34.2	157	26.6
PA	PA	Pelvic Angle		24.5		23.0
PHX	PHX	H-Point to Striker (X-Axis)	138		244	
PHZ	PHZ	H-Point to Striker (Z-Axis)	159		238	

DATA SHEET NO. 8

SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05



FRONT VIEW OF DUMMY

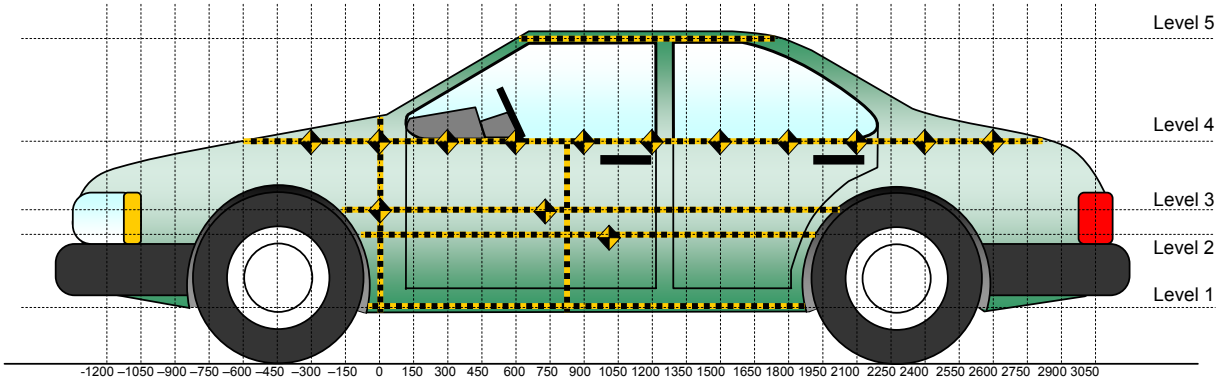
Code	Measurement Description	Units	Driver S/N 904	Passenger S/N 271
HR	Head to Side Header	mm	222	202
HS	Head to Side Window	mm	317	322
AD	Arm to Door	mm	68	52
HD	H-Point to Door	mm	149	123

DATA SHEET NO. 9

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2006 Kia Rio
Test Program: NCAP Side Impact

NHTSA No. M60510
Test Date: 10/04/05



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	49	1350	1370
4	Window Sill	212	1350	954
3	Mid Door	320	600	609
2	Occupant H-Point	329	900	500
1	Sill Top	158	1350	265
	Maximum Penetration	329		

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-600				365					345					-20	
-450				356					346					-10	
-300				346					351					5	
-150				342					359					17	
0		236	259	344			454	432	371			218	173	27	
150	310	272	267	336		442	542	503	380		132	270	236	44	
300	312	271	264	334		463	577	551	427		151	306	287	93	
450	312	269	263	334		468	584	564	467		156	315	301	133	
600	311	269	262	335		468	590	582	496		157	321	320	161	
750	312	268	262	335	553	467	596	561	508	558	155	328	299	173	5
900	312	267	260	336	537	467	596	556	519	559	155	329	296	183	22
1050	312	267	260	337	540	464	595	542	524	574	152	328	282	187	34
1200	312	268	261	342	544	468	590	568	547	583	156	322	307	205	39
1350	312	268	262	344	546	470	582	564	556	595	158	314	302	212	49
1500	314	268	264	345	545	449	560	561	546	586	135	292	297	201	41
1650	314	269	265	350	545	420	541	549	533	578	106	272	284	183	33
1800	312	268	268	353	545	377	485	513	484	564	65	217	245	131	19
1950			263	356	556			407	409	565			144	53	9
2100			255	360				310	355				55	-5	
2250			260	368				294	386				34	18	
2400			283	379				301	392				18	13	
2550			302	394				317	398				15	4	
2700			326	412				340	409				14	-3	

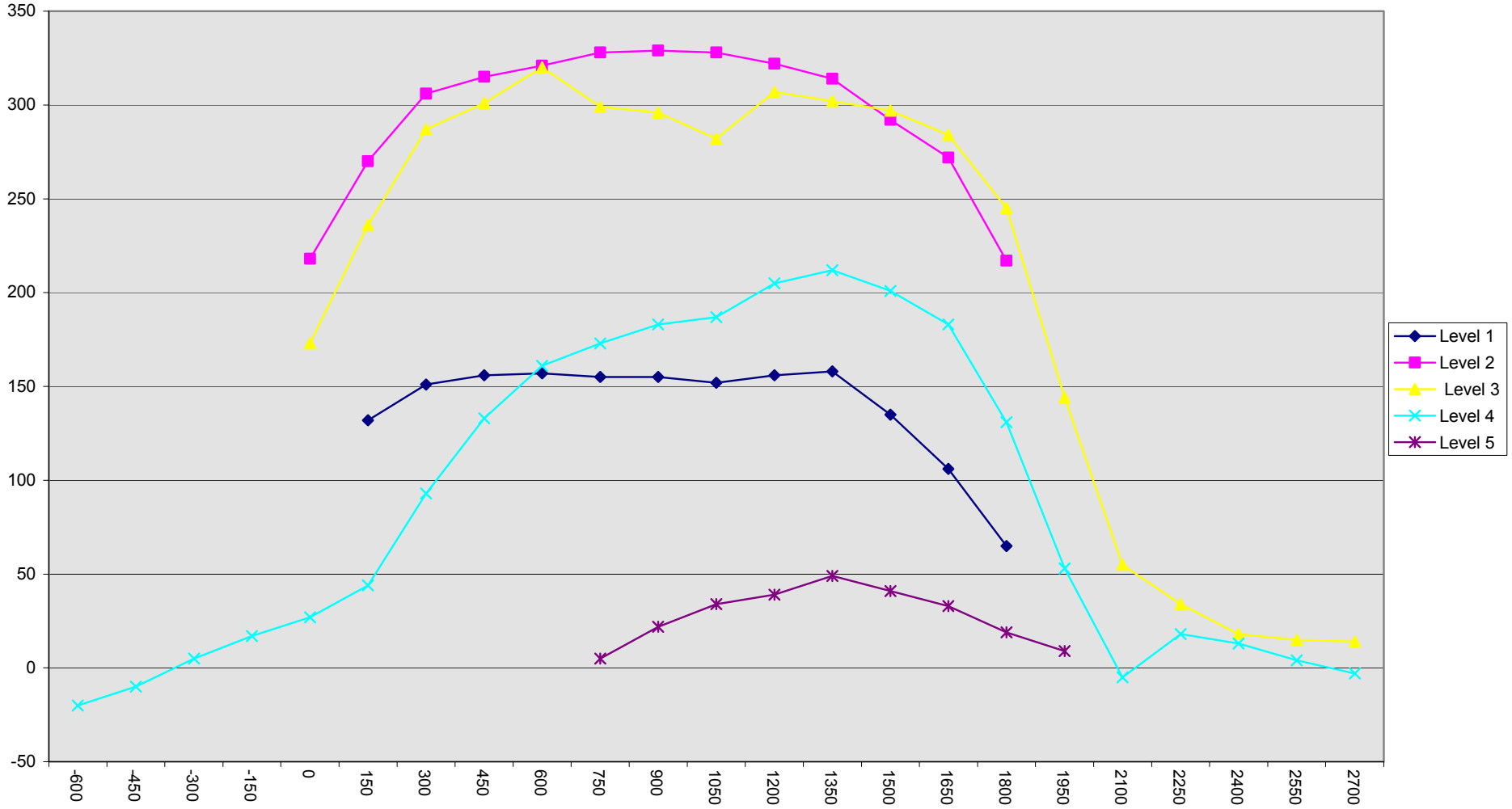
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body

DATA SHEET NO. 10... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

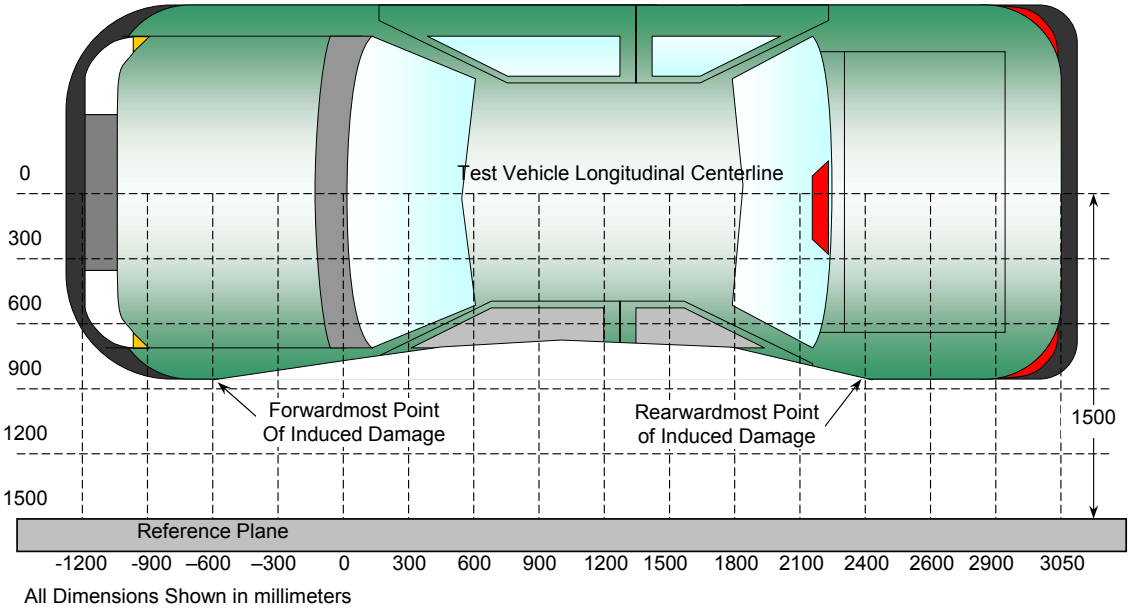


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2006 Kia Rio
Test Program: NCAP Side Impact

NHTSA No. M60510
Test Date: 10/04/05



TOP VIEW

DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2700 mm	3	326	340	14
2	2109 mm	3	255	313	58
3	1471 mm	2	268	562	294
4	875 mm	2	267	596	329
5	275 mm	2	271	574	303
6	-300 mm	4	346	351	5

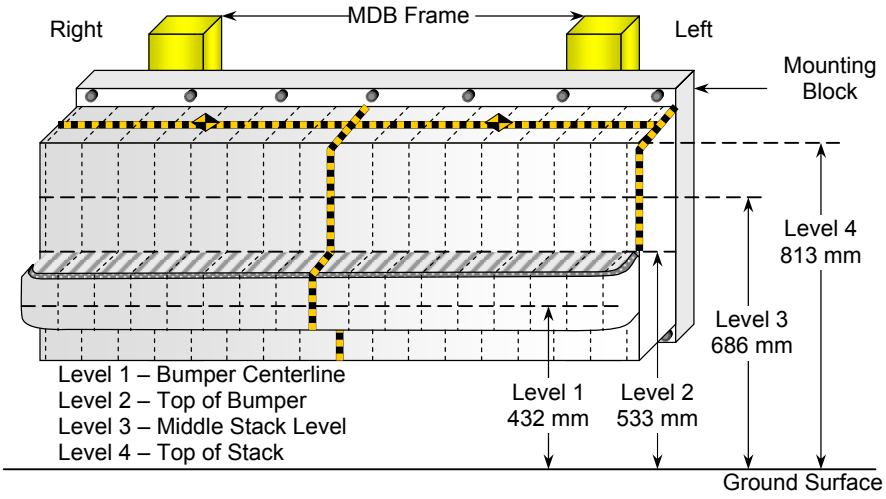
Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body.

DATA SHEET NO. 12

DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2006 Kia Rio
Test Program: NCAP Side Impact

NHTSA No. M60510
Test Date: 10/04/05



DEFORMABLE BARRIER STATIC CRUSH

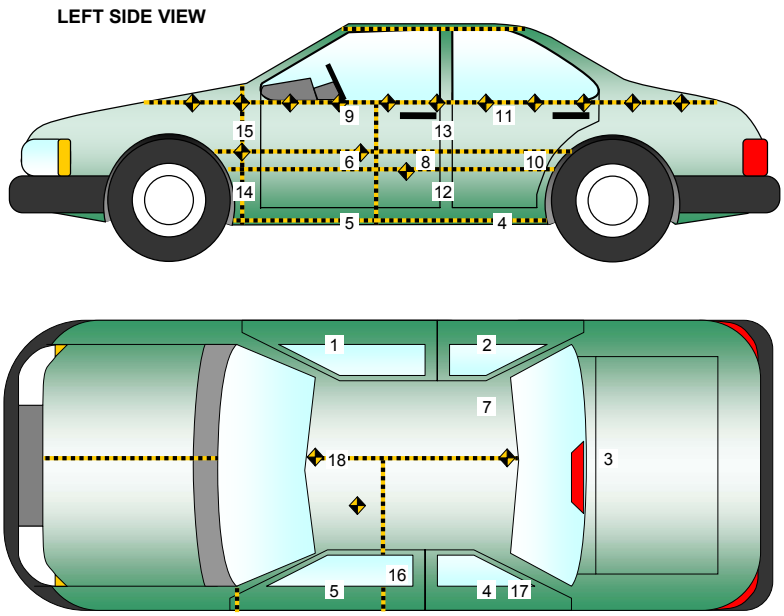
Stack Level	Distance Right of Center								C_L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	103	88	79	71	71	76	72	69	67	68	71	71	72	72	80	88	86
2	58	48	41	39	39	33	37	36	36	36	40	40	41	45	46	55	56
3	22	0	3	4	6	16	26	14	9	10	11	11	15	17	28	80	105
4	45	6	-2	0	6	20	27	15	17	10	13	15	13	45	80	132	170

All Dimensions in mm

DATA SHEET NO. 13

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05



Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2279	686	220
2	Right Sill at Rear Seat	1495	690	230
3	Rear Floorpan Above Axle	1095	23	509
4	Left Sill at Rear Door	1629	-687	218
5	Left Sill at Front Door	2496	-690	224
6	Left Front Door C/L	2111	-733	527
7	Rear Occupant Compartment	1657	287	377
8	Left Front Door Mid-Rear	2423	-727	570
9	Left Front Door Upper C/L	2384	-718	784
10	Left Rear Door Mid-Rear	1222	-742	691
11	Left Rear Door Upper C/L	1530	-736	682
12	Left Lower B-Post	1917	-695	402
13	Left Middle B-Post	1914	-672	697
14	Left Lower A-Post	2885	-690	468
15	Left Middle A-Post	2901	-788	862
16	Front Seat Track	1924	-558	346
17	Rear Seat Track or Structure			
18	Vehicle CG	2573	0	370

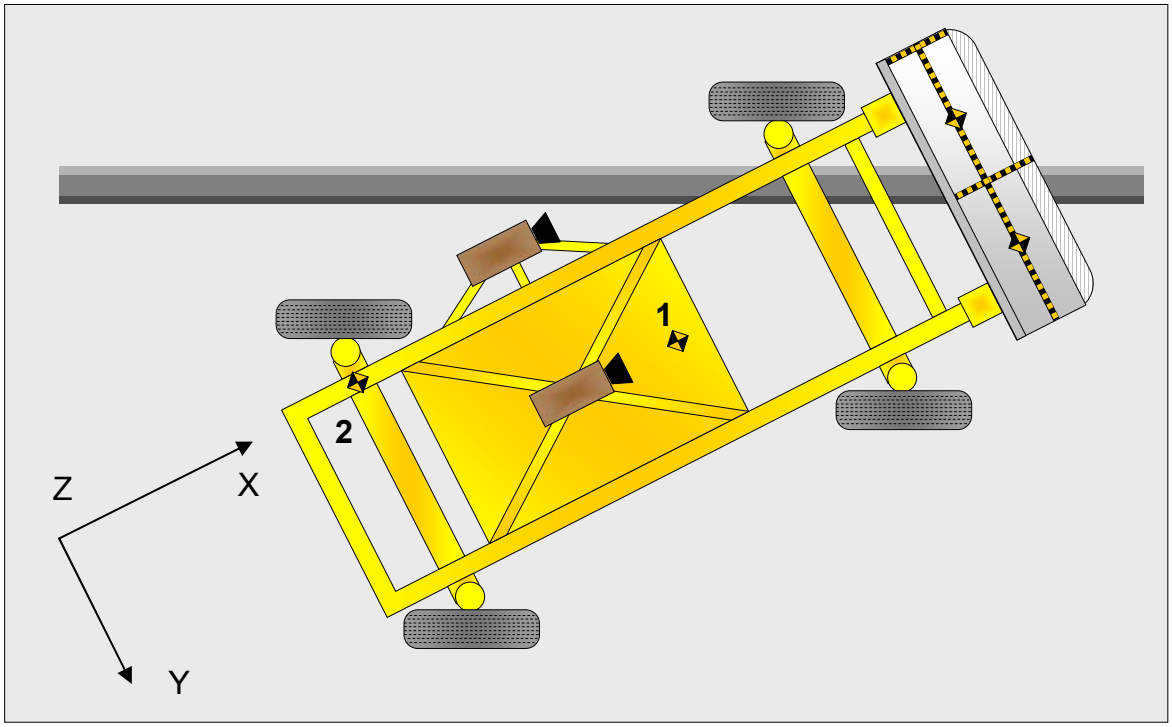
Reference Points
X - Test Vehicle Rear Bumper (+ forward)
Y - Test Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 14

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2006 Kia Rio
Test Program: NCAP Side Impact

NHTSA No. M60510
Test Date: 10/04/05



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

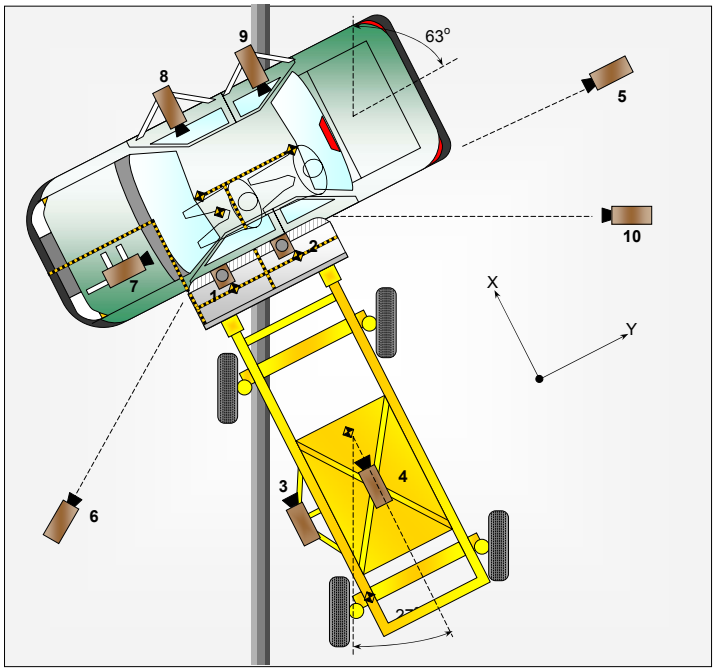
Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

	Elements	Pre-Test (mm)
1	Total Length	4218
2	Total Width	1694
3	Bumper Top Height	535
4	Bumper Bottom Height	410
5	Longitudinal Member Top Height	451
6	Distance between Longitudinal Members	880
7	Longitudinal Member Width	58
8	Engine Top Height	802
9	Engine Bottom Height	220
10	Engine and gearbox width	760
11	Front bumper-engine distance	453
12	Front shock absorber fixing height	865
13	Bonnet leading edge height	740
14	Front shock absorber fixing width	1100
15	Front bumper – front axle distance	828
16	Front axle – a pillar distance	470
17	A-pillar – B-pillar distance	1005
18	B-Pillar – rear axle distance	1033
19	B-pillar – C-pillar distance	910
20	Roof sill bottom height	1440
21	Roof sill top height	1473
22	Floor sill bottom height	280
23	Floor sill top height	338

DATA SHEET NO. 16

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Close-up	845	0	4840	50	1000
2	Overhead Overall	190	-475	5820	12.5	1000
3	MDB Onboard, Impact Point Close-up				50	1000
4	MDB Onboard, Centerline of Impact				25	1000
5	Right Side, Ground Level, Overall	-2300	7915	1415	35	1000
6	Left Side, Ground Level, Overall	2560	-5280	1425	35	1000
7	Vehicle Onboard Front SID/HIII, Front				12.5	500
8	Vehicle Onboard Front SID/HIII, Side				12.5	500
9	Vehicle Onboard Rear SID/HIII, Side				12.5	500
10	Real Time Coverage				13	24

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

DATA SHEET NO. 17

SUMMARY OF FMVSS 301 DATA

Test Vehicle: 2006 Kia Rio NHTSA No. M60510
Test Program: NCAP Side Impact Test Date: 10/04/05

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 12:03 pm

Stoddard Solvent Spillage Measurements

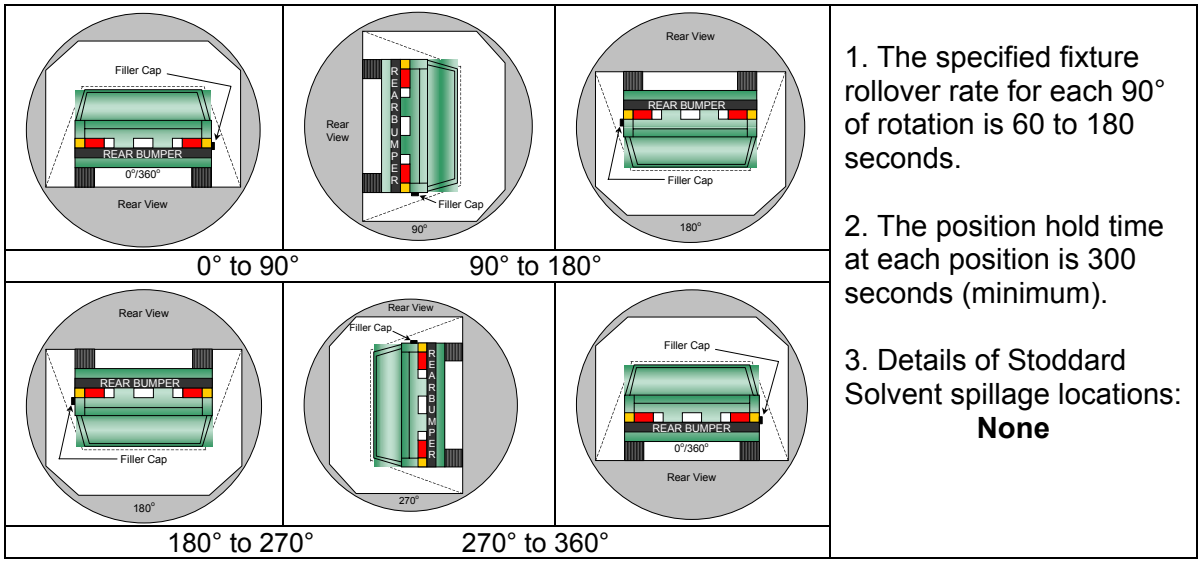
A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)

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



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.

2. The position hold time at each position is 300 seconds (minimum).

3. Details of Stoddard Solvent spillage locations: **None**

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage Collection Time (min)	Spillage (oz.)
0° to 90°	171	300	First 5	0
90° to 180°	150	300	First 5	0
180° to 270°	135	300	First 5	0
270° to 360°	160	300	First 5	0

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Left Front ¾ View, As Received

Right Rear ¾ View, As Received

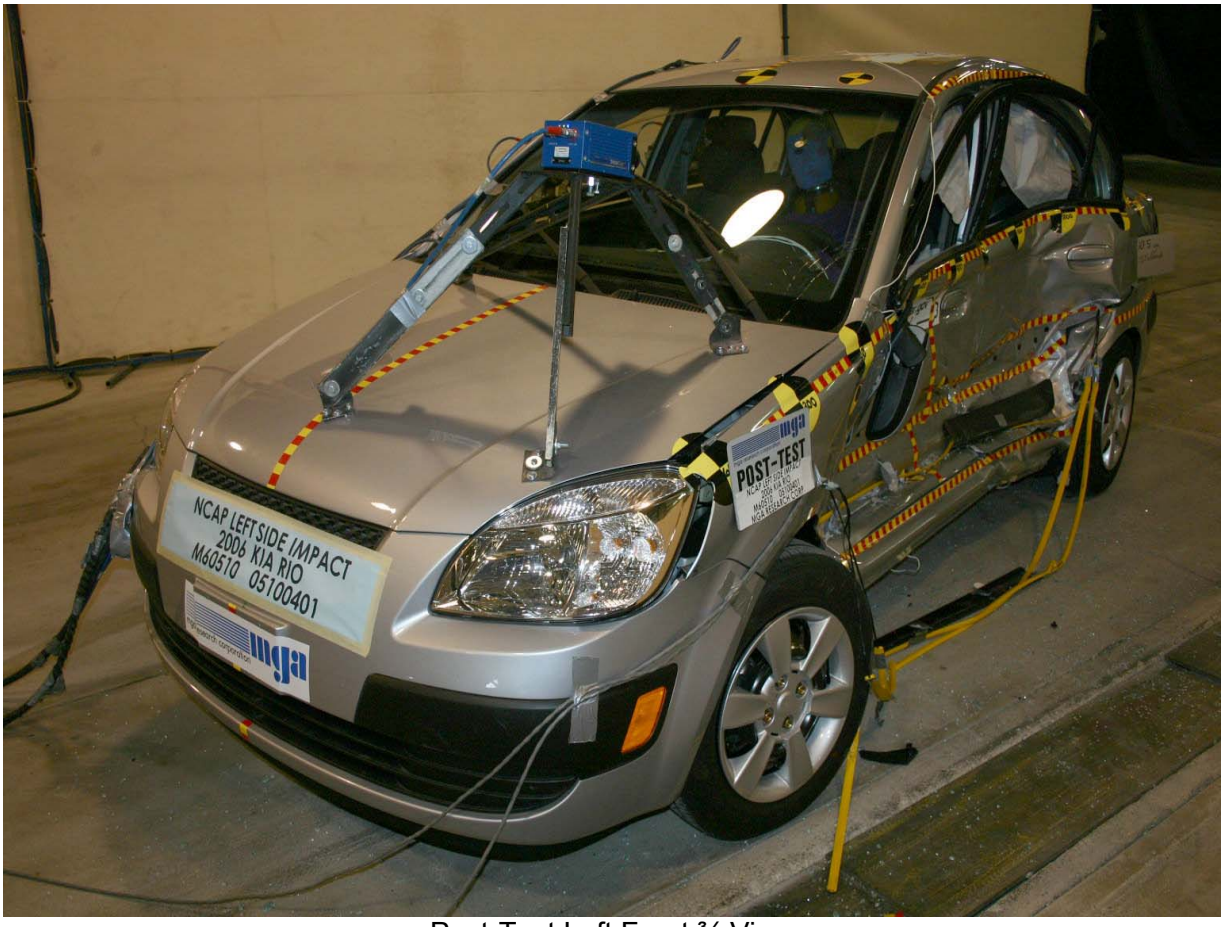
Manufacturer's Label

Tire Placard

Pre-Test Front View

Post-Test Front View

Pre-Test Left Front ¾ View



Post-Test Left Front ¾ View

Pre-Test Left Side View

Post-Test Left Side View

Pre-Test Left Rear ¾ View

Post-Test Left Rear ¾ View

Pre-Test Rear View

Post-Test Rear View

Pre-Test Right Rear ¾ View

Post-Test Right Rear ¾ View

Post-Test Right Side View

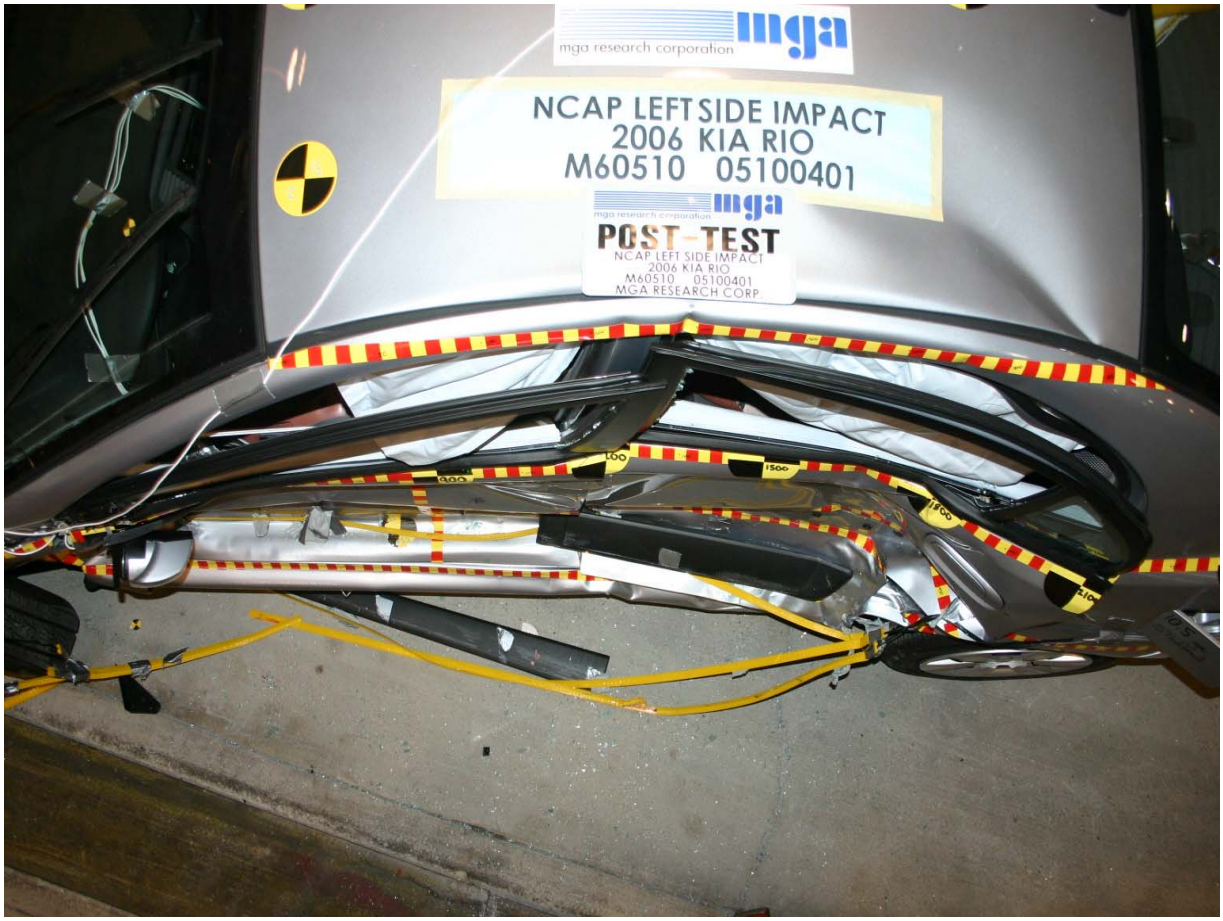
Pre-Test Right Front ¾ View

Post-Test Right Front ¾ View

Pre-Test Overhead View

Post-Test Overhead View

Pre-Test Overhead Close-up View



Post-Test Overhead Close-up View

Pre-Test Left Impact Point

Post-Test Left Impact Point

Pre-Test Front ¾ View of Left Side Doors

Post-Test Front ¾ View of Left Side Doors

Pre-Test Rear ¾ View of Left Side Doors

Post-Test Rear ¾ View of Left Side Doors

Pre-Test Left Front Door

Post-Test Left Front Door

Pre-Test Left Rear Door

Post-Test Left Rear Door

Pre-Test Driver Dummy (Door Open)

Pre-Test Driver Dummy (Through Window)

Post-Test Driver Dummy (Through Window)

Pre-Test Driver Dummy Clearance From Door

Post-Test Driver Dummy Clearance From Door

Pre-Test Driver Dummy Right Side View

Post-Test Driver Dummy Right Side View

Pre-Test Front Door Panel (Interior)

Post-Test Front Door Panel (Interior)

Pre-Test Passenger Dummy (Door Open)

Pre-Test Passenger Dummy (Through Window)

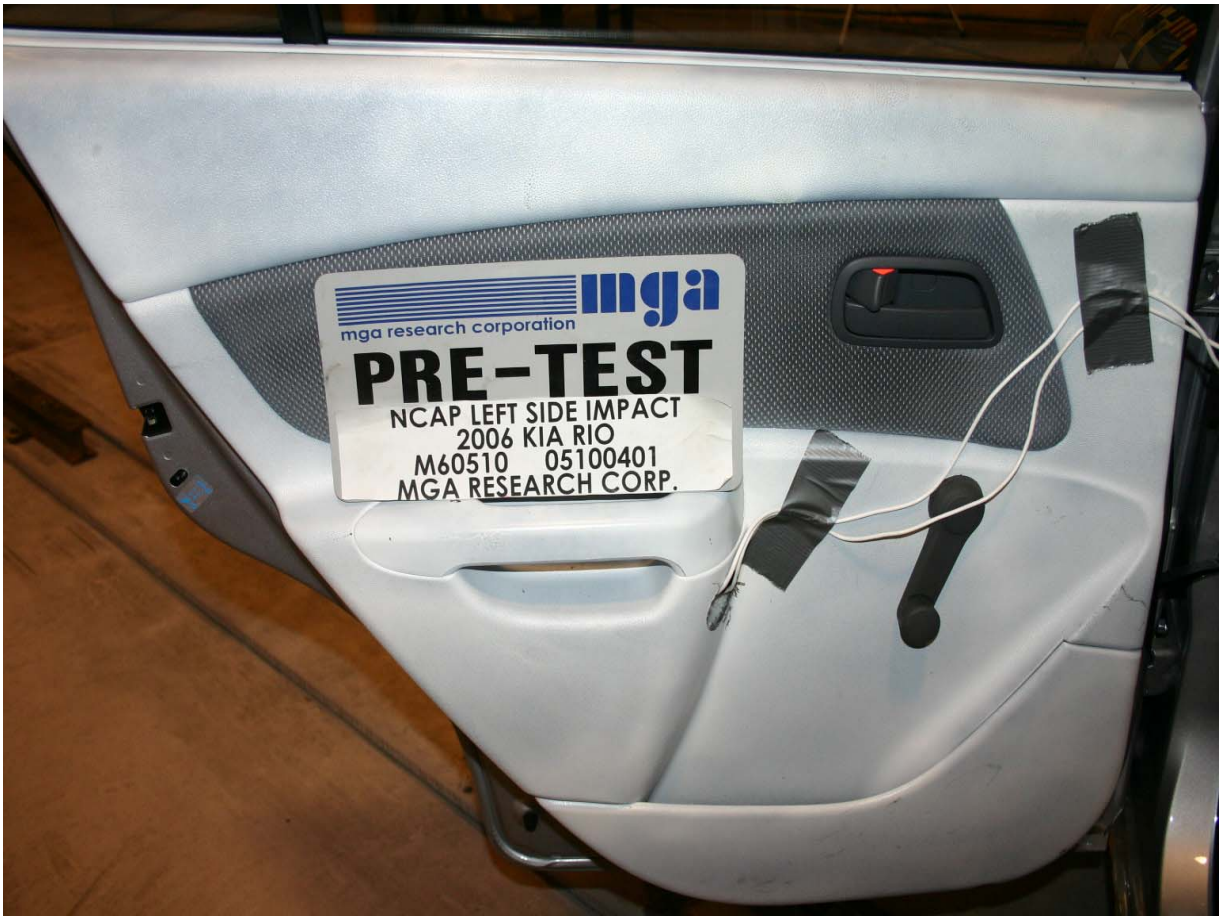
Post-Test Passenger Dummy (Through Window)

Pre-Test Passenger Dummy Clearance From Door

Post-Test Passenger Dummy Clearance From Door

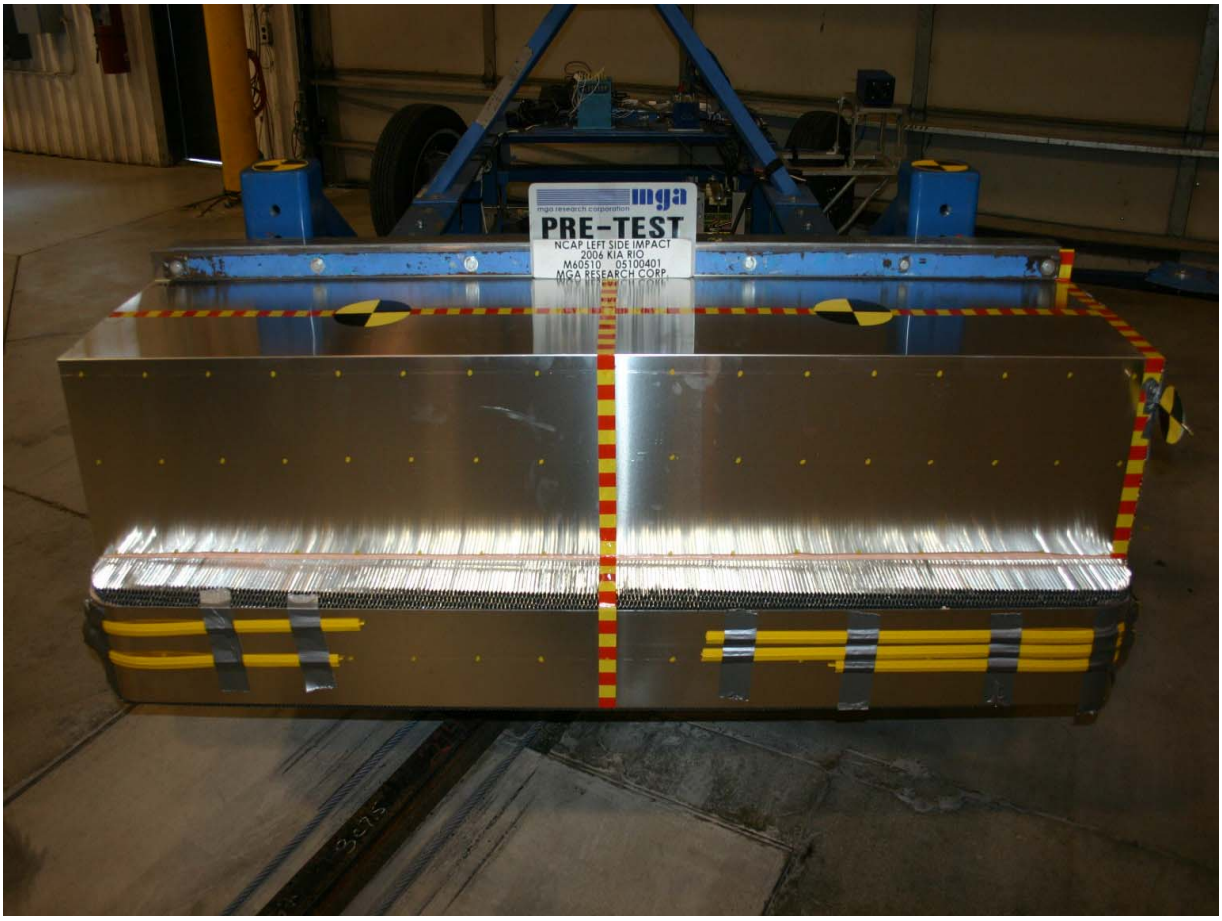
Pre-Test Passenger Dummy Right Side View

Post-Test Passenger Dummy Right Side View



Pre-Test Rear Door Panel (Interior)

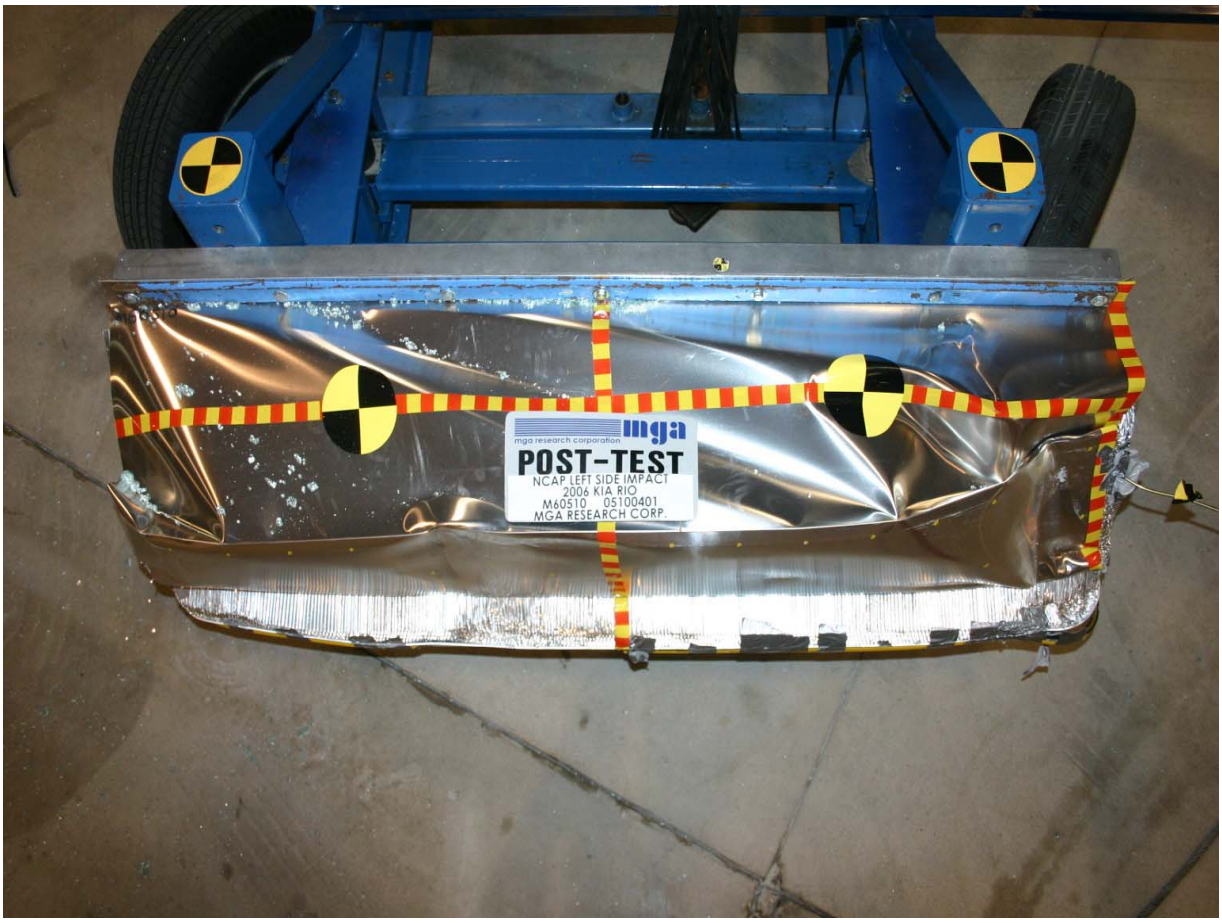
Post-Test Rear Door Panel (Interior)



Pre-Test Front View of Deformable Barrier

Post-Test Front View of Deformable Barrier

Pre-Test Top View of Deformable Barrier



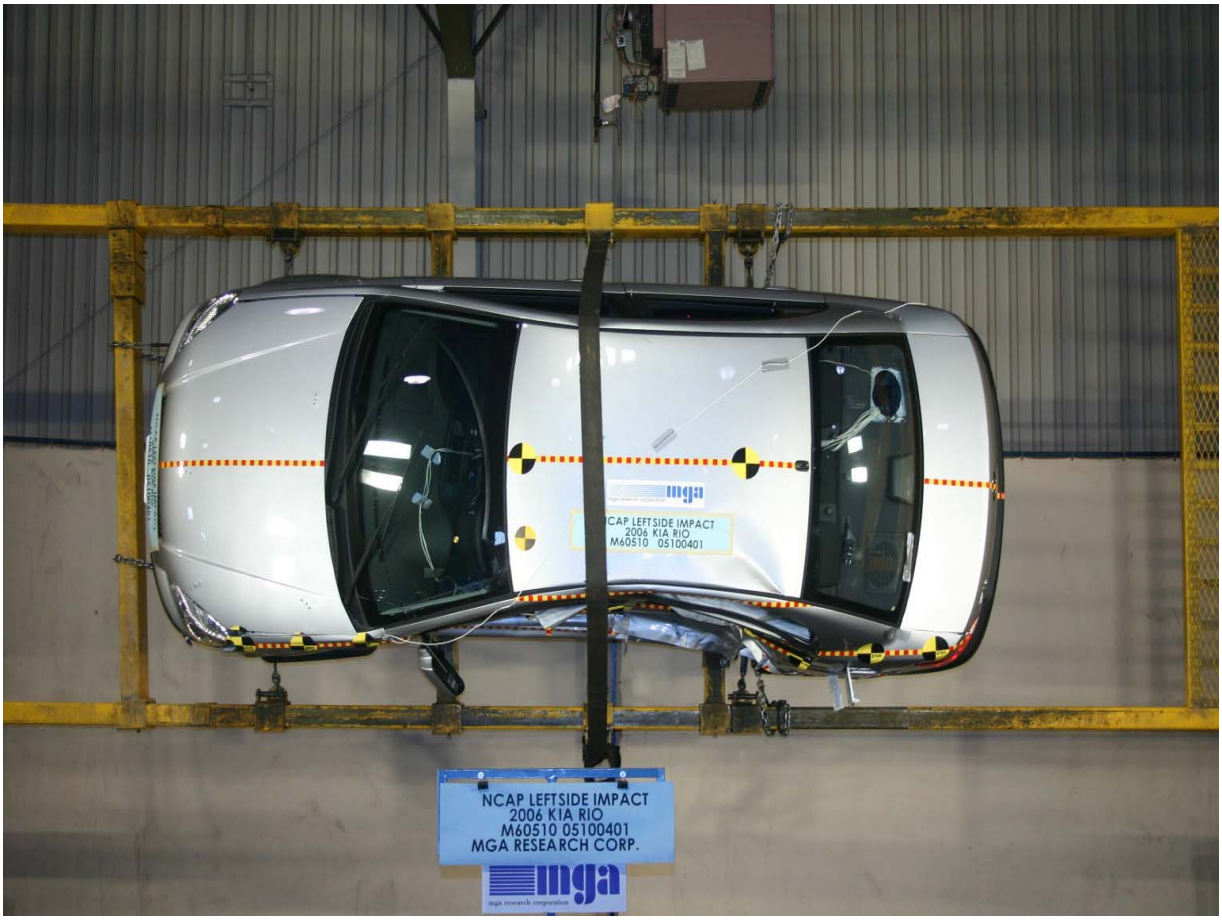
Post-Test Top View of Deformable Barrier

Pre-Test Right Side View of Deformable Barrier

Post-Test Right Side View of Deformable Barrier

Pre-Test Left Side View of Deformable Barrier

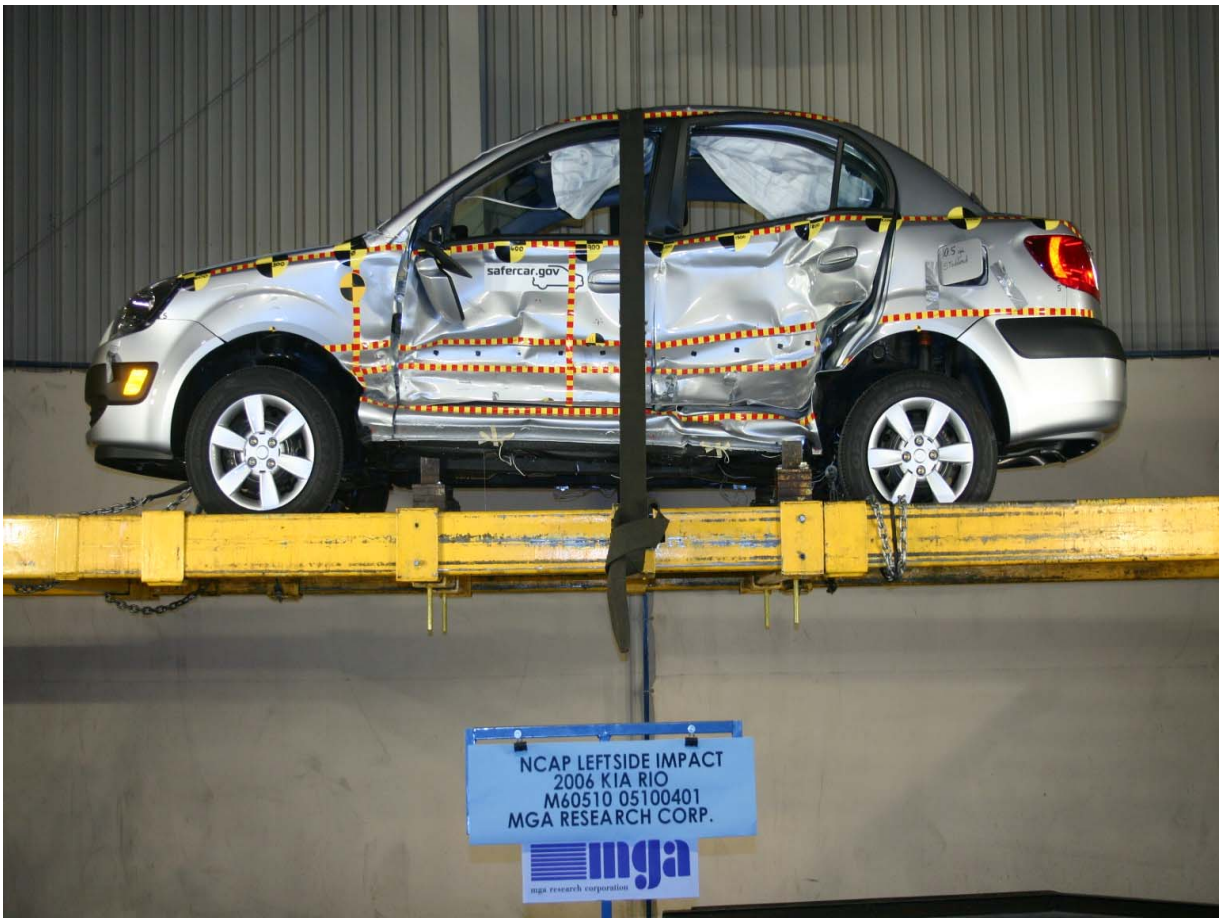
Post-Test Left Side View of Deformable Barrier



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 Passenger Dummy Head Contact

Post-Test Passenger Dummy Upper Torso Contact

Post-Test Passenger Dummy Lower Torso Contact

Curtain Airbag View #1

Curtain Airbag View #2

APPENDIX B

SID/HIII RESPONSE DATA TRACES

TABLE OF DATA PLOTS

The following dummy and vehicle response data can be found in the R&D section of the NHTSA website at 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 Left Front Door CL Y

Vehicle Right Rear Occupant Compartment

Vehicle Left Front Door Mid Rear Y

Vehicle Left Front Door Upper CL Y

Vehicle Left Rear Door Mid Rear Y

Vehicle Left Rear Door Upper CL Y

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 CG X

Vehicle CG Y

Vehicle CG Z

MDB CG X

MDB CG Y

MDB CG Z

MDB Rear X

MDB Rear Y

MDB Rear Z

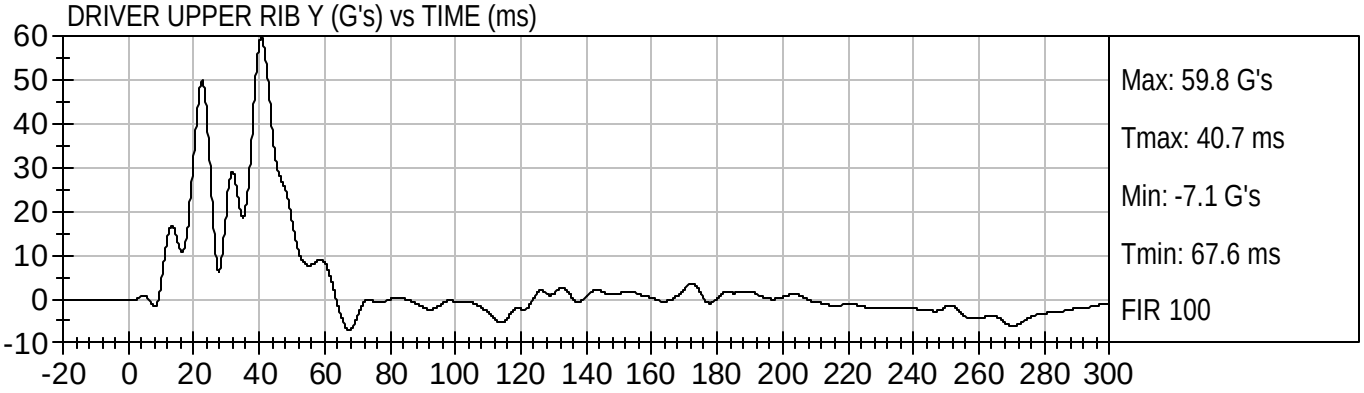
MDB Left Bumper Contact

MDB Right Bumper Contact

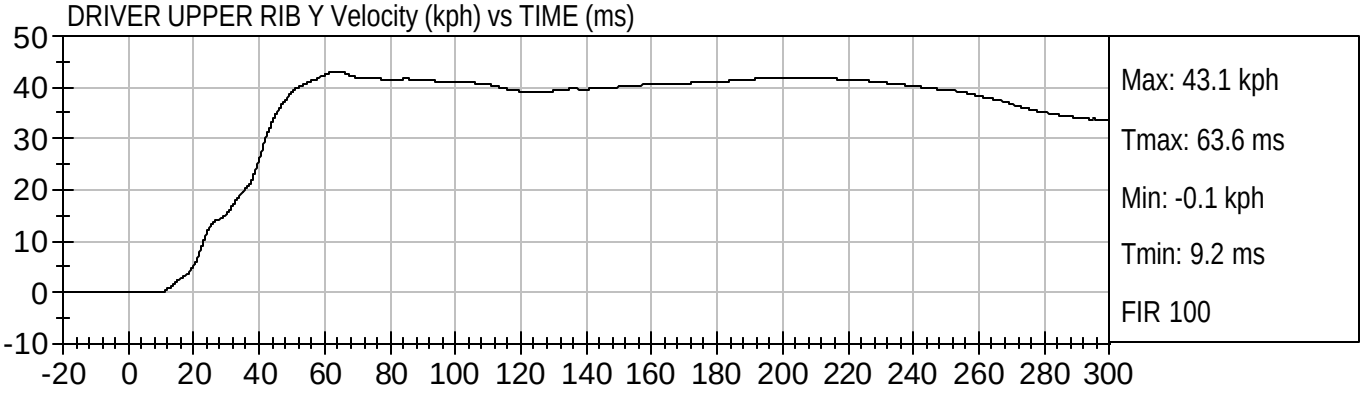
NCAP LEFT SIDE IMPACT
2006 KIA RIO (M60510)

Test Date: 10/4/05
Speed: 38.4 mph (61.8 km/h)

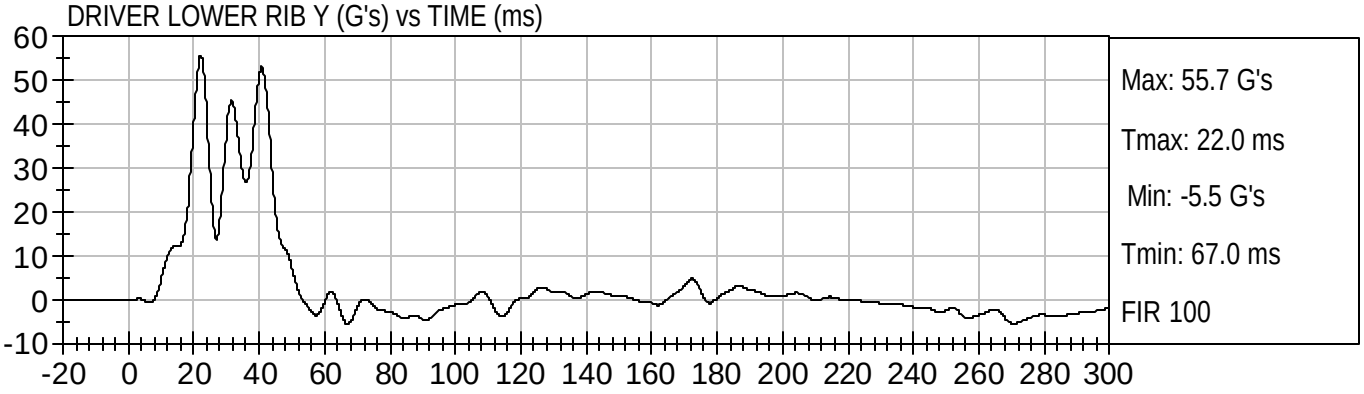
DRIVER UPPER RIB Y (G's) vs TIME (ms)



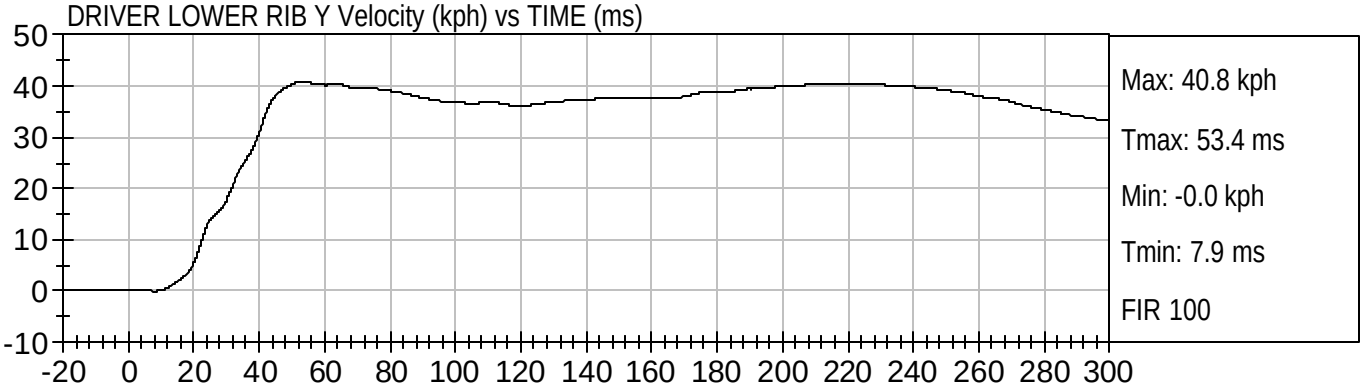
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



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



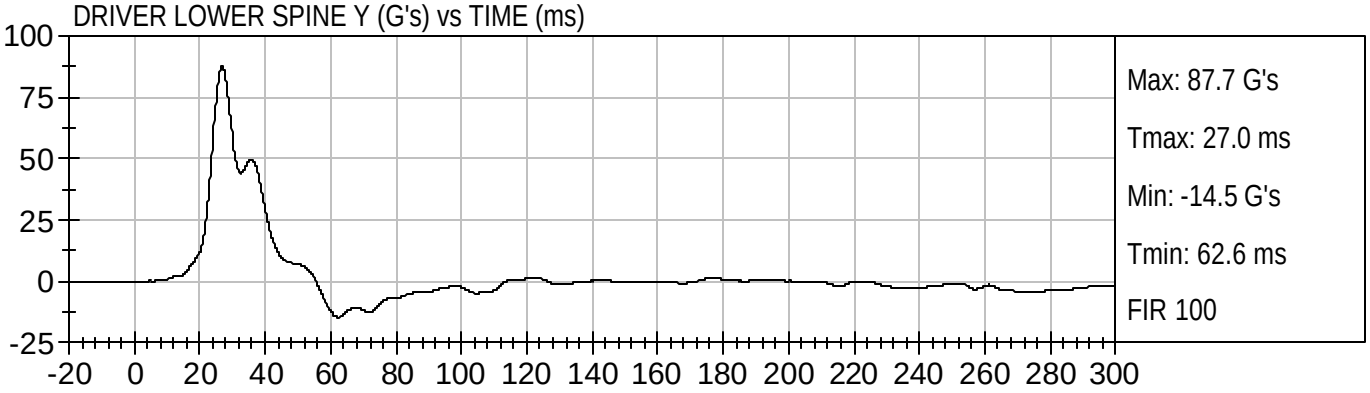
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



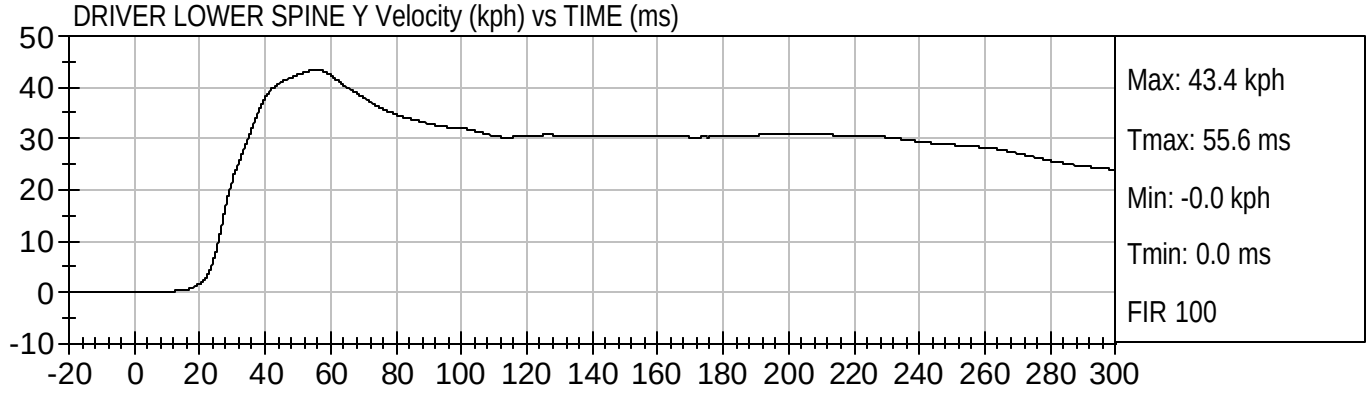
NCAP LEFT SIDE IMPACT
2006 KIA RIO (M60510)

Test Date: 10/4/05
Speed: 38.4 mph (61.8 km/h)

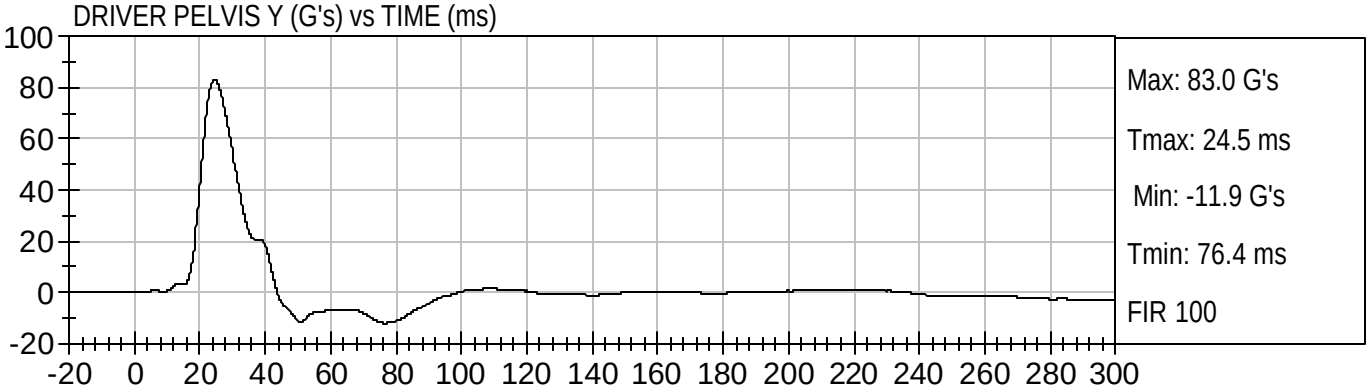
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



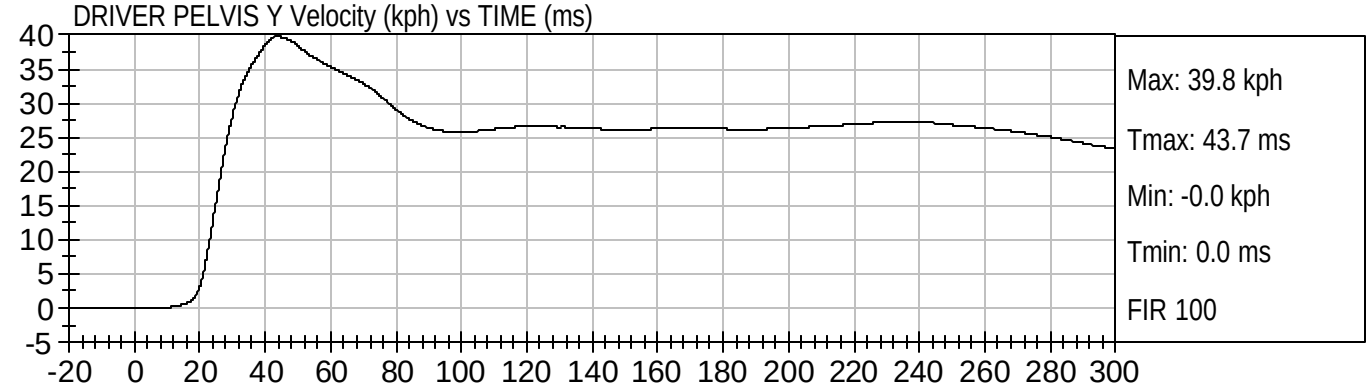
DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



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



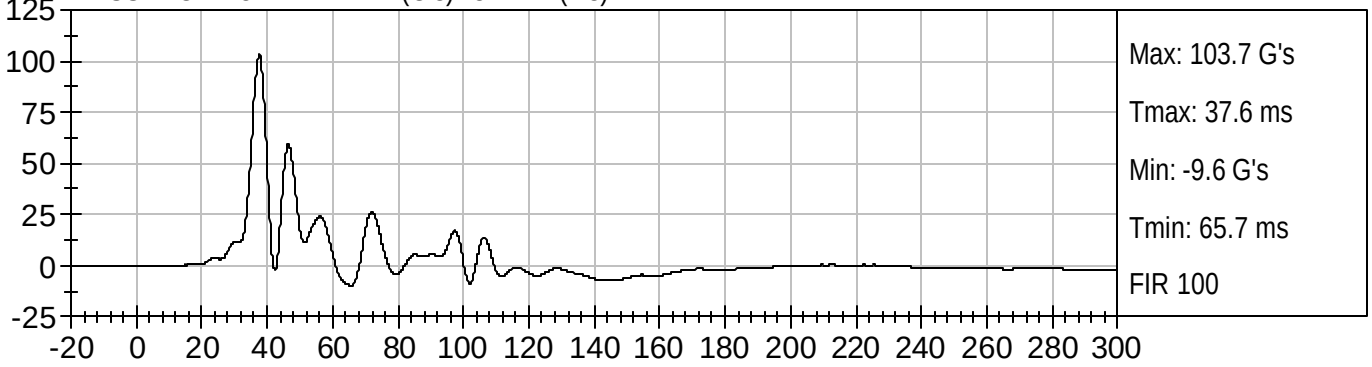
DRIVER PELVIS Y Velocity (kph) vs TIME (ms)



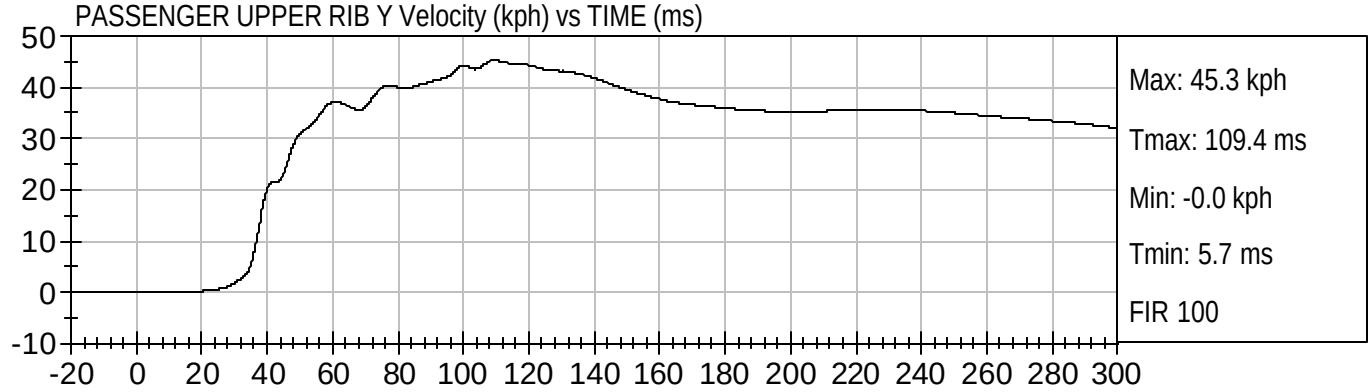
NCAP LEFT SIDE IMPACT
2006 KIA RIO (M60510)

Test Date: 10/4/05
Speed: 38.4 mph (61.8 km/h)

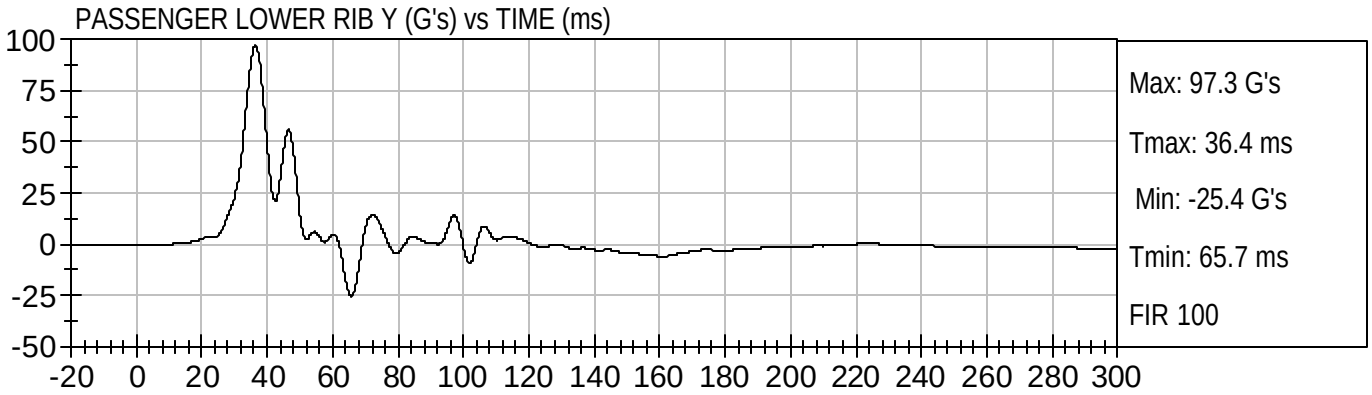
PASSENGER UPPER RIB Y (G's) vs TIME (ms)



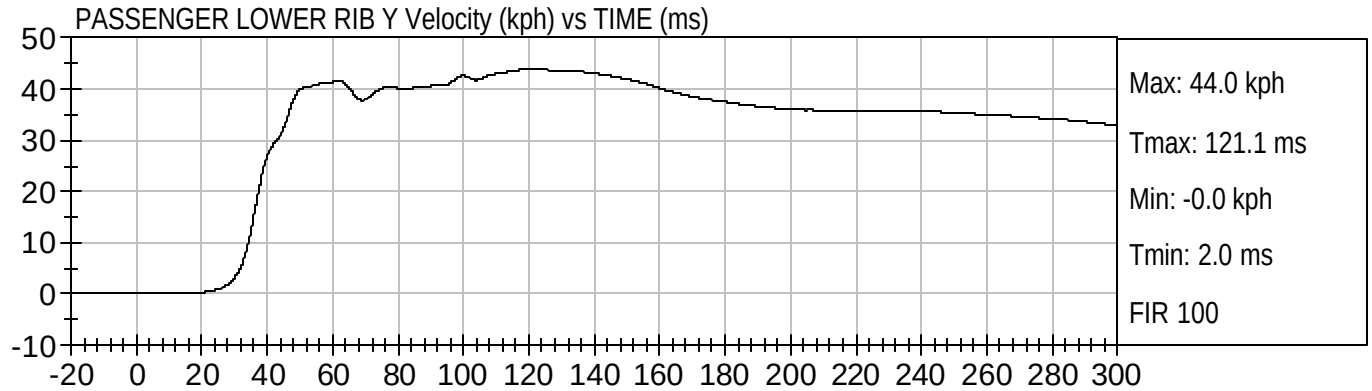
PASSENGER UPPER RIB Y Velocity (kph) vs TIME (ms)



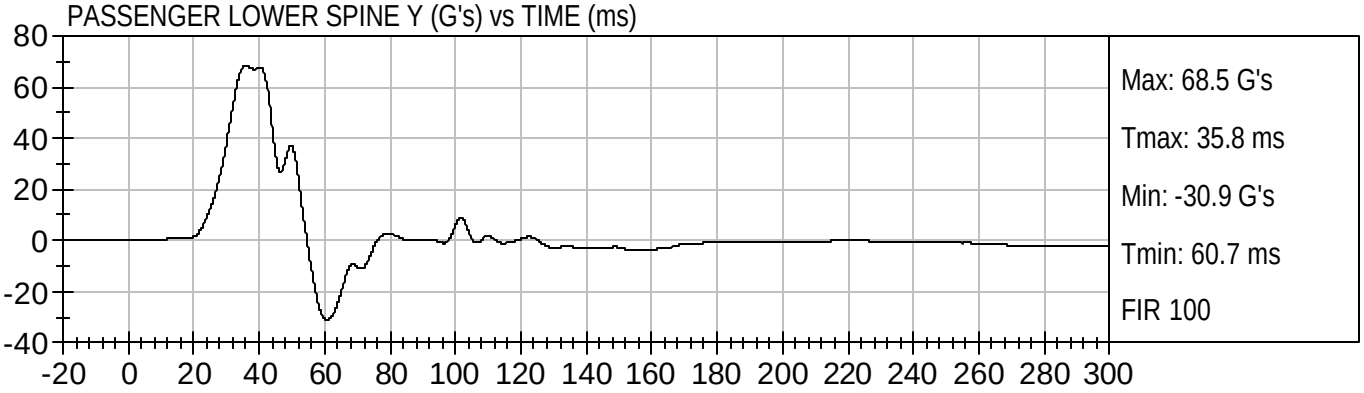
PASSENGER LOWER RIB Y (G's) vs TIME (ms)



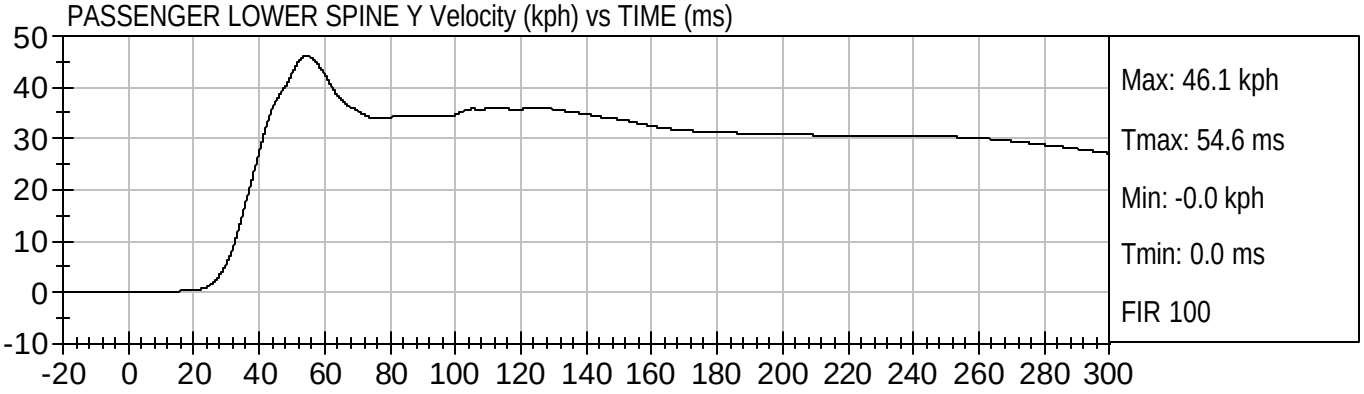
PASSENGER LOWER RIB Y Velocity (kph) vs TIME (ms)



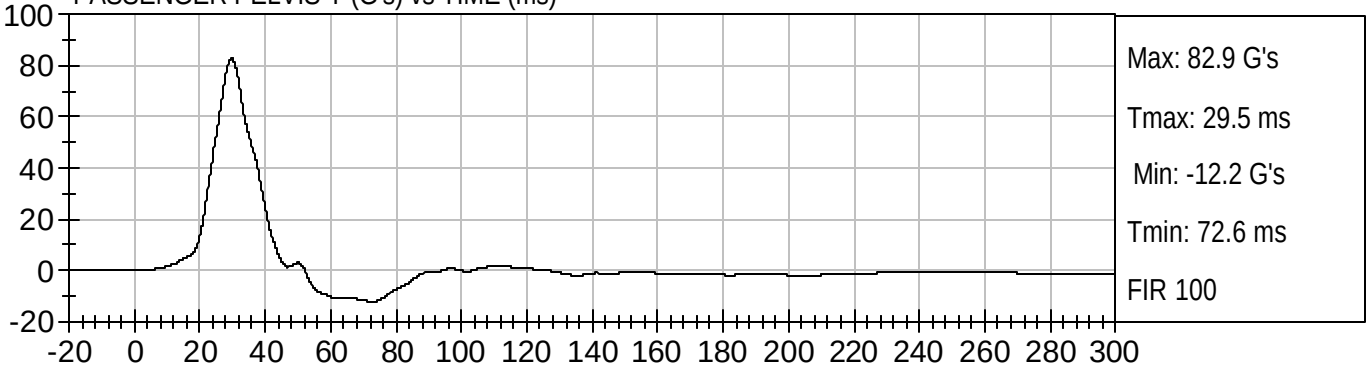
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



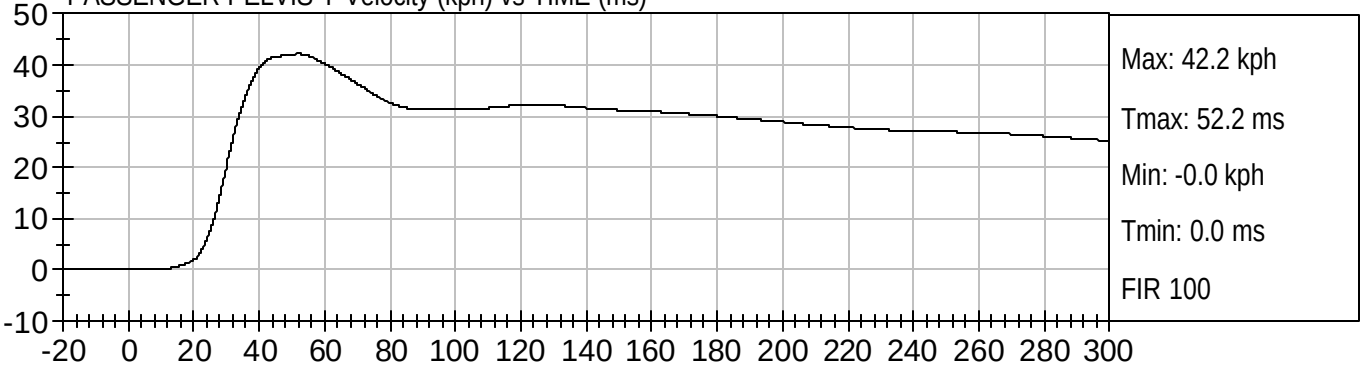
PASSENGER LOWER SPINE Y Velocity (kph) vs TIME (ms)



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



PASSENGER PELVIS Y Velocity (kph) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION DATA

CERTIFICATION DATA

Dummy Serial Number: 904

Calibration Test Results Summary

Dummy Serial Number: 904

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: 904 **Test I.D:** D05235

Tested Parameter	Units	Specification	Result	Pass/Fail
SH - Seated Height	mm	889 - 909	903	Pass
RH - Rib Height	mm	501 - 521	509	Pass
HP - Hip Pivot Height	mm	99 ref.	99	Pass
RD - Rib from Back Line	mm	229 - 241	240	Pass
KV - Knee Pivot to Back Line	mm	511 - 526	525	Pass
SW - Knee Pivot to Floor	mm	490 - 505	500	Pass
HW - Hip Width	mm	356 - 391	368	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

08/23/2005
Test Date

David Winkelbauer
Approved By

SID Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 904 **Test I.D:** D052591

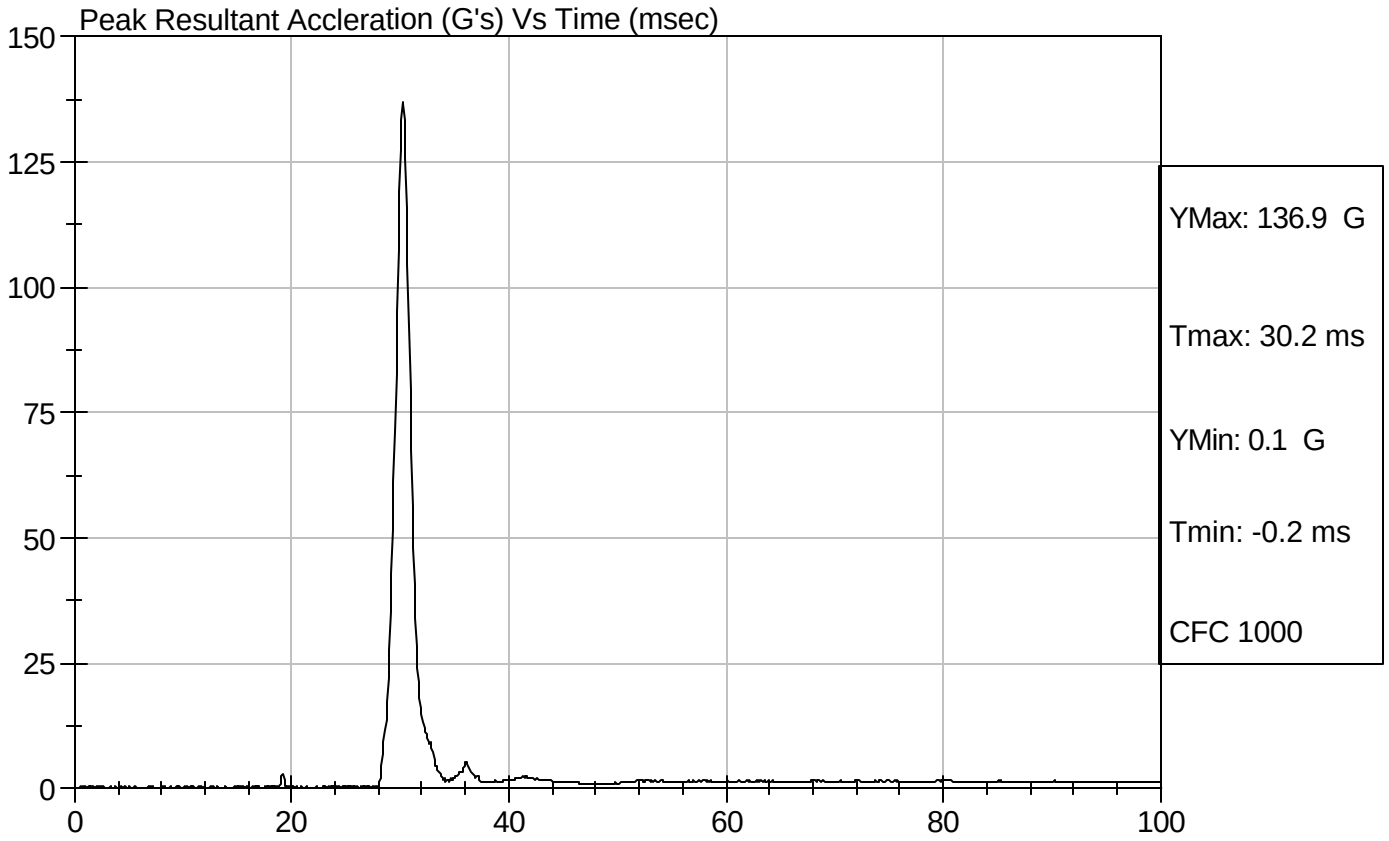
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	120 to 150	137	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-8	Pass
		Overall Test Results		Pass

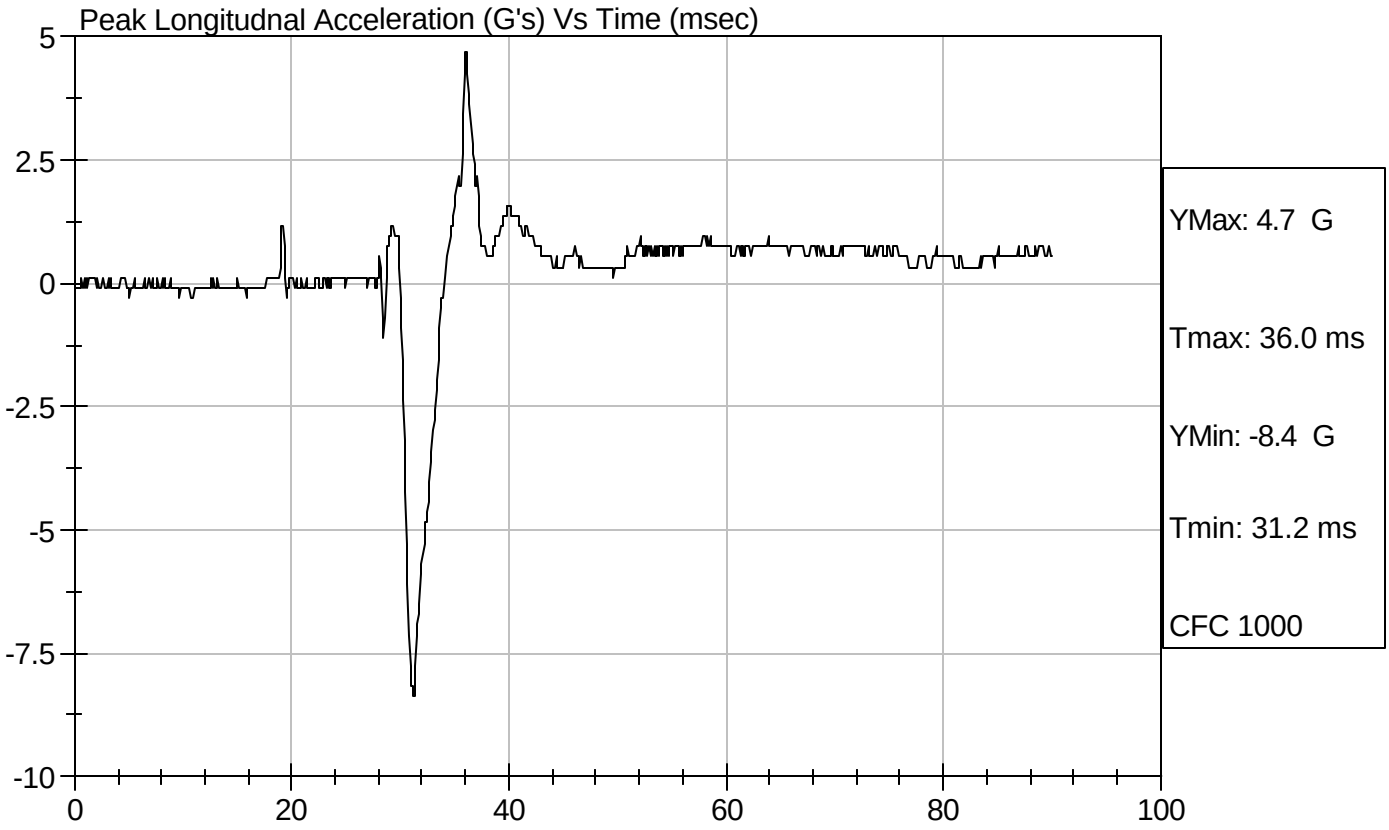
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

	Test Description: Head Drop	Test Date: 09/21/2005
	Component: D052591	Speed: 0 ft/s, 0.00 m/s





SID Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 904 **Test I.D:** D052592

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Velocity	m/s	4.22 - 4.31	4.28	Pass
Upper Rib	G's	37 - 46	39	Pass
Lower Rib	G's	37 - 46	39	Pass
Lower Spine	G's	15 - 22	22	Pass
		Overall Test Results		Pass

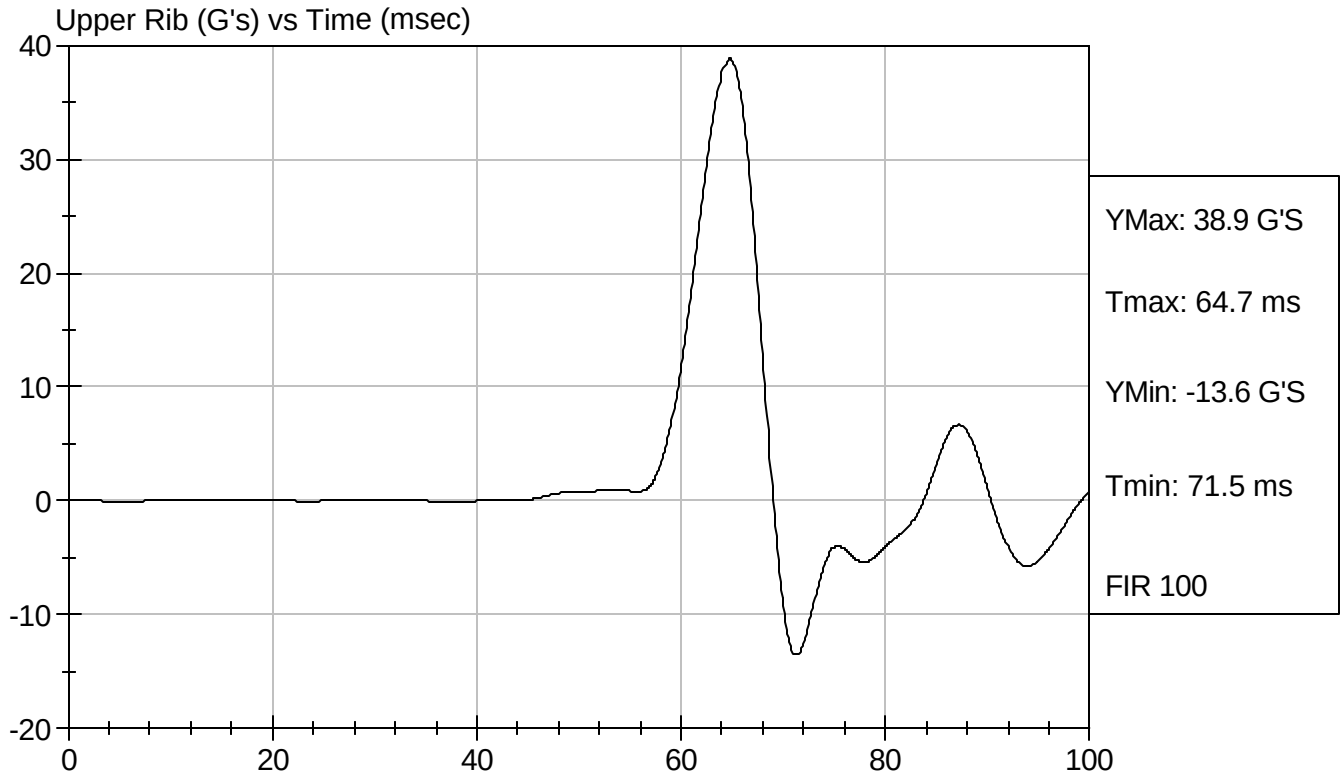
Jessica Hall
Laboratory Technician

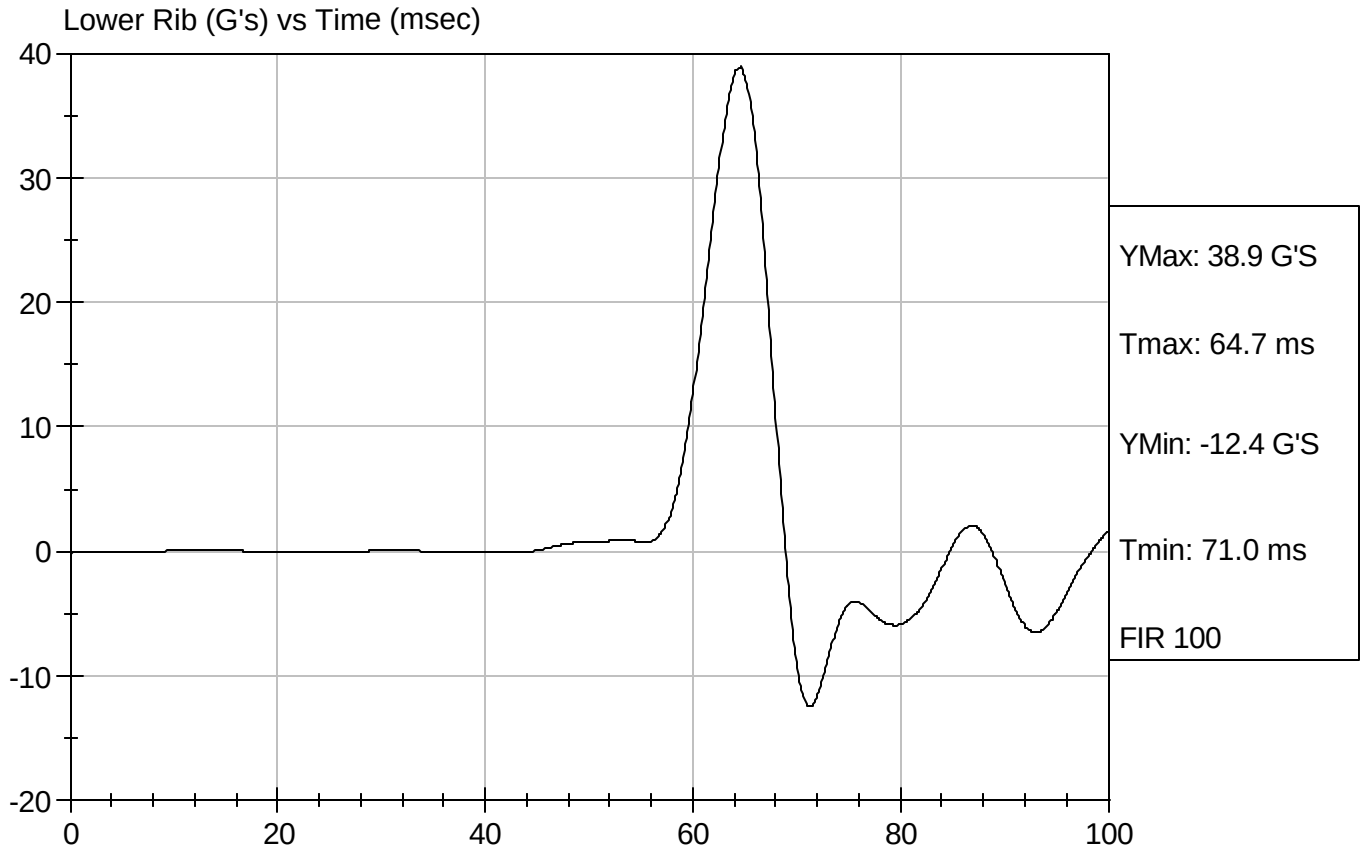
09/21/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D052592

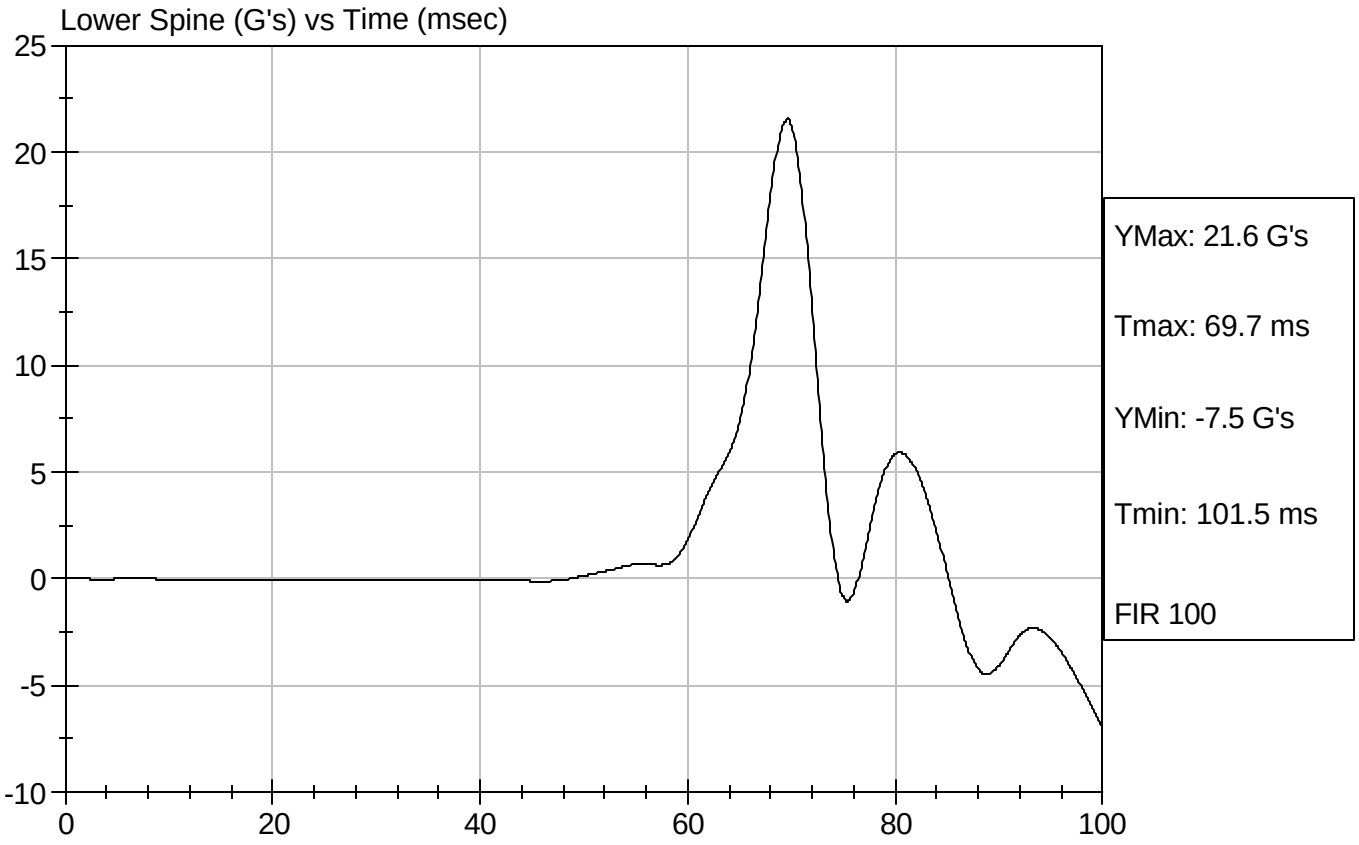
Test Date: 09/21/2005
Speed: 14.03 ft/sec, 4.28 m/sec





Test Desc: Thorax Impact
Component ID: D052592

Test Date: 09/21/2005
Speed: 14.03 ft/sec, 4.28m/sec



SID Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 904 **Test I.D:** D052593

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	4.27 - 4.33	4.33	Pass
Pelvis Acceleration	G's	40 - 60	45	Pass
		Overall Test Results		Pass

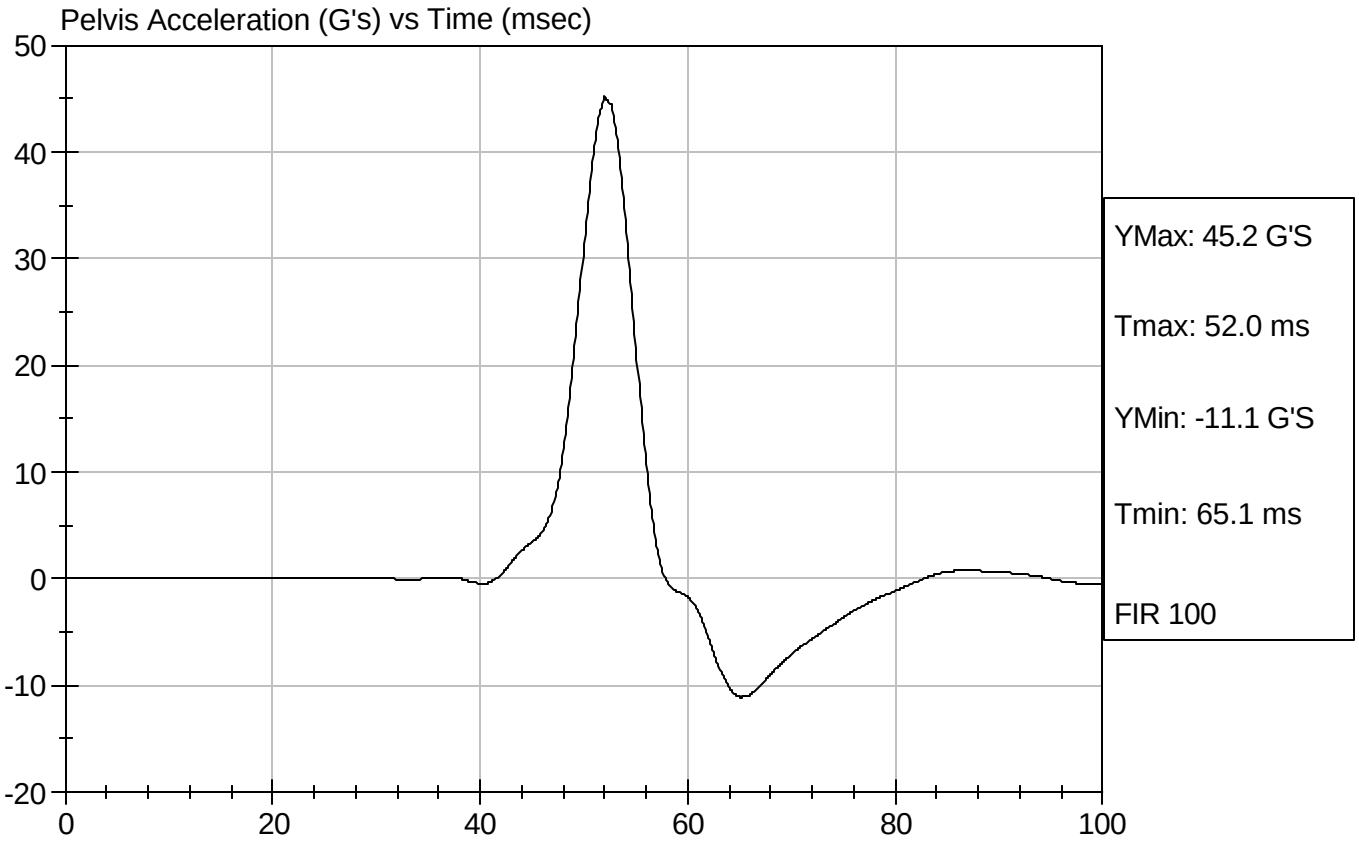
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D052593

Test Date: 09/21/2005
Speed: 14.19 ft/sec, 4.33 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 904 **Test I.D:** D052594

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Force At 12.7 mm	N	104 -162	140	Pass
Force At 19 mm	N	163 - 222	191	Pass
Force At 25.4 mm	N	222 - 280	260	Pass
Force At 33 mm	N	325 - 391	353	Pass
		Overall Test Results		Pass

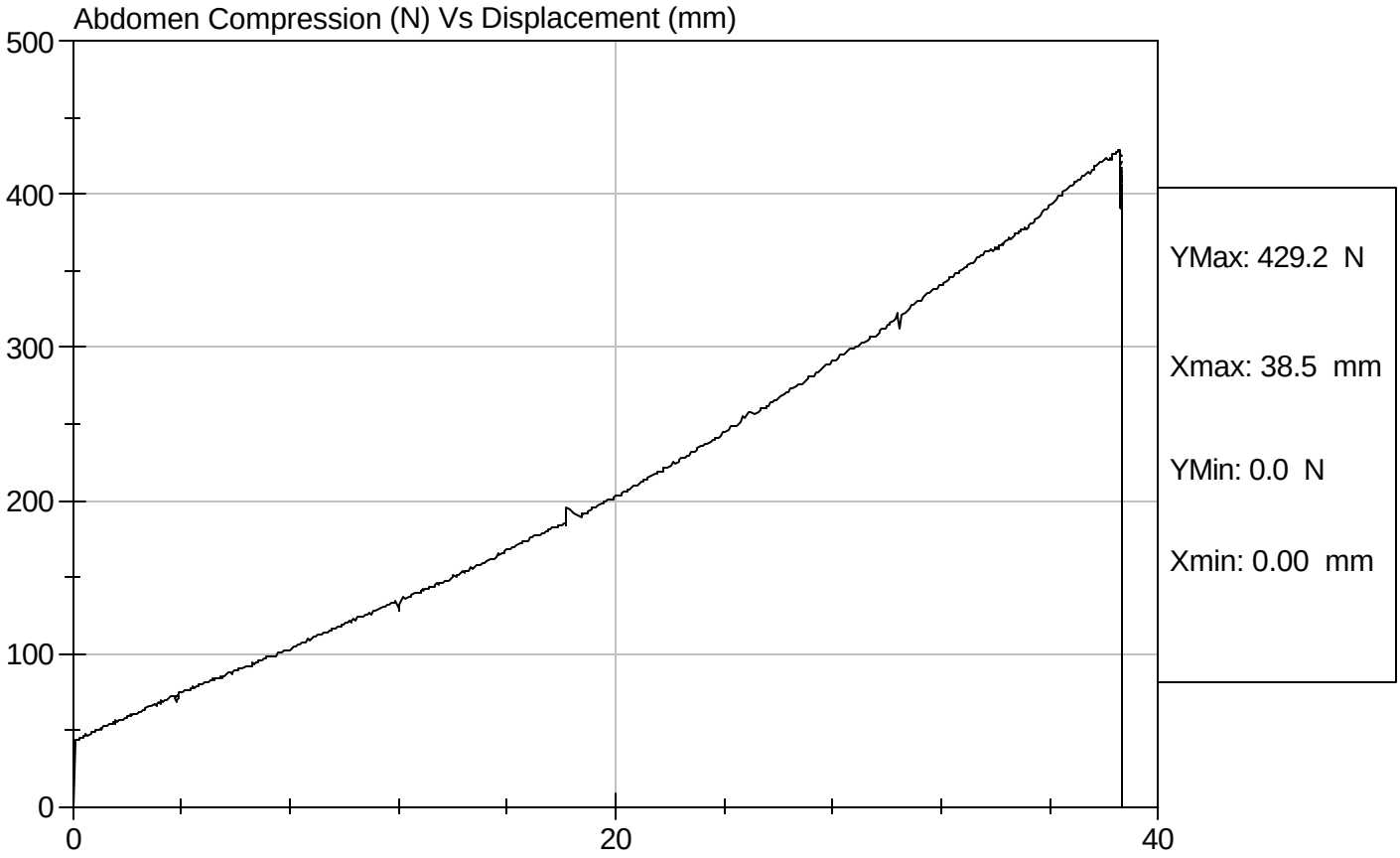
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 09/21/2005

Component: D052594 Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 904 **Test I.D:** D052595

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	106.3	Pass
Force At 30 deg	N	151.2 - 204.6	160.6	Pass
Force At 40 deg	N	204.6 - 258.0	207.2	Pass
Return Angle	Deg	12 Maximum	2	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

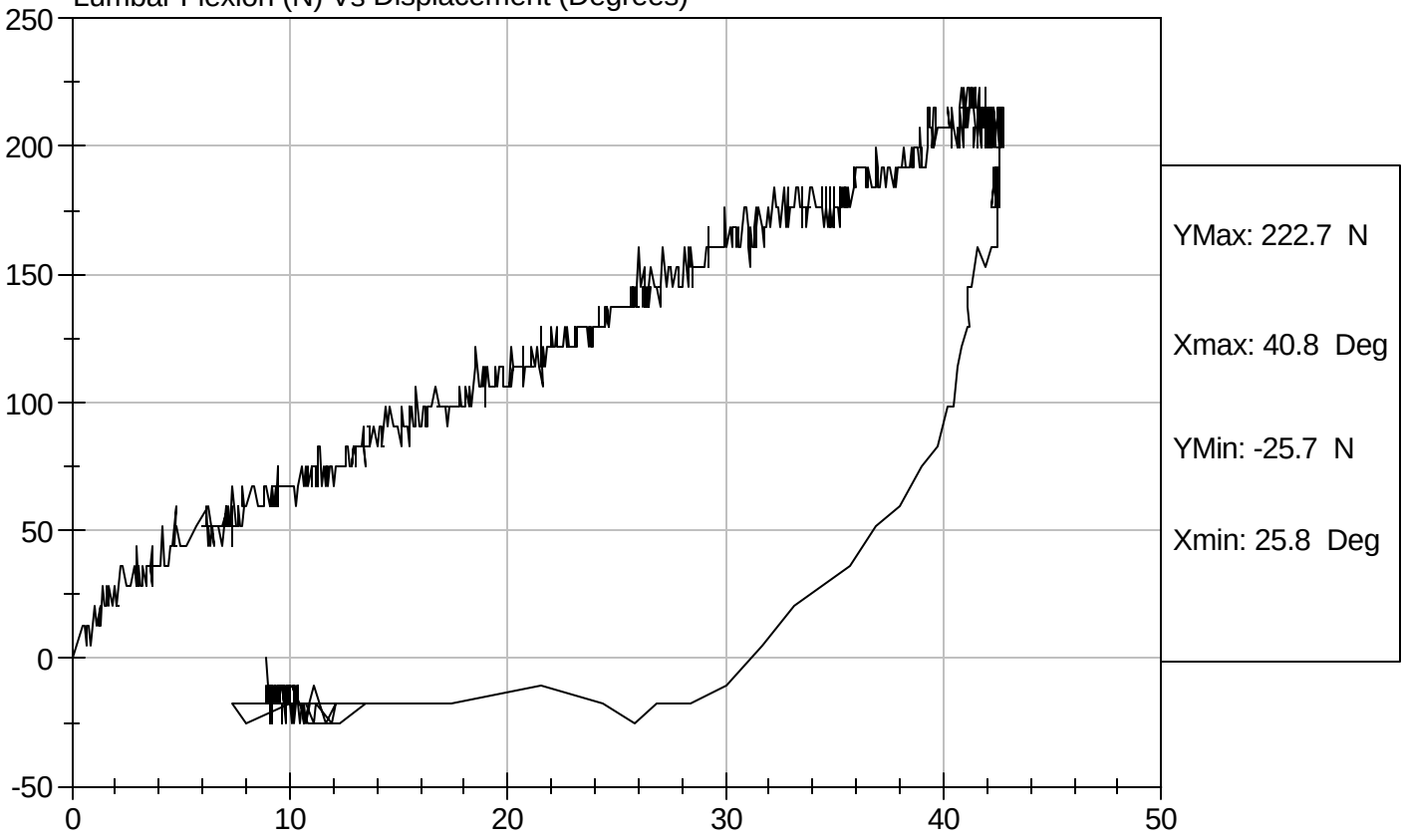
09/21/2005
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 09/21/2005

Component: D052595 | Speed: 0 ft/sec, 0 m/sec

Lumbar Flexion (N) Vs Displacement (Degrees)



SID Calibration Data Sheet

Side Impact Dummy (SID)

Neck Pendulum Test

ATD Serial No: 904 **Test I.D:** D052599

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Impact Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.39	Pass
	20 msec	m/s	4.12 to 5.10	4.65	Pass
	30 msec	m/s	5.73 to 7.01	6.48	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.10	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	75	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	58	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	79	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

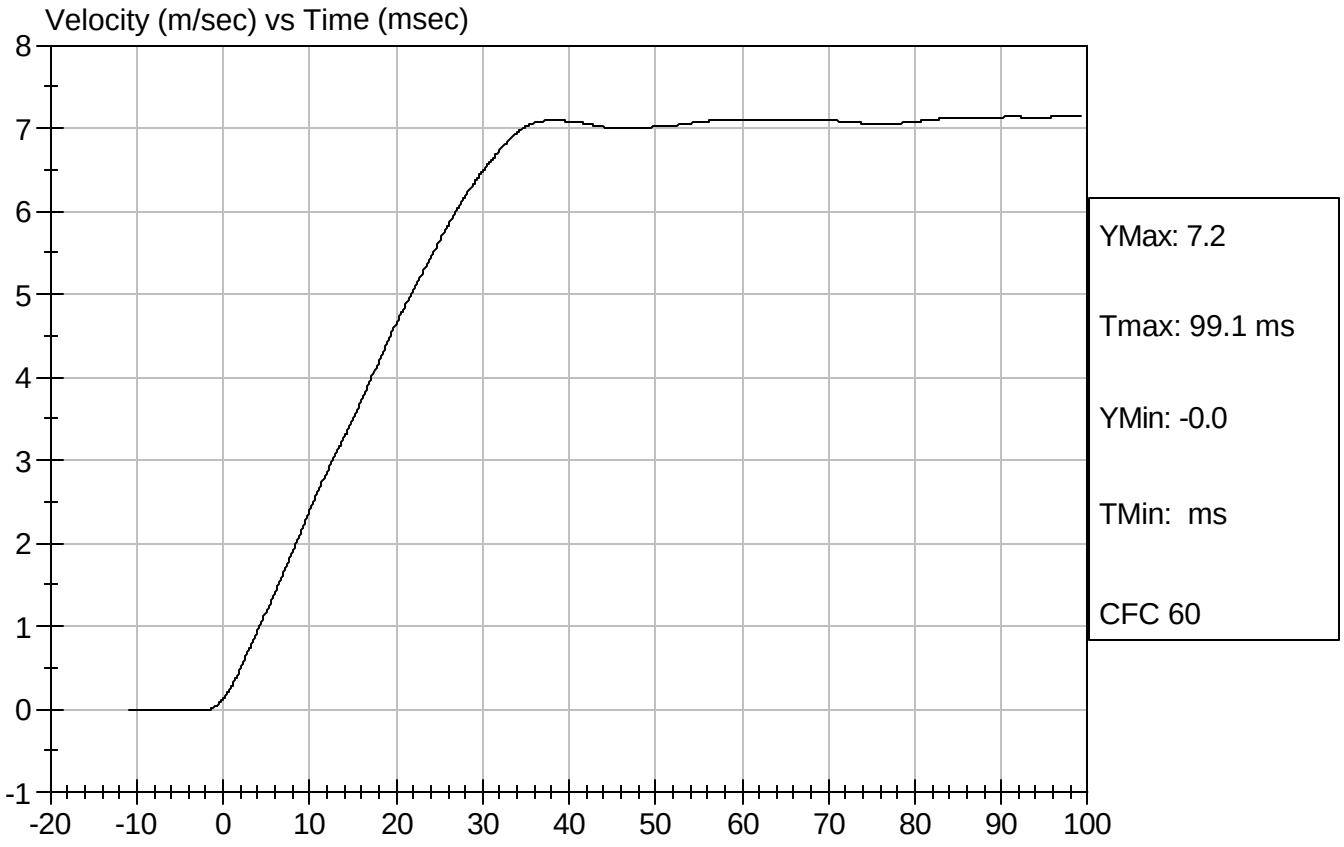
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Bending
Component ID: D052599

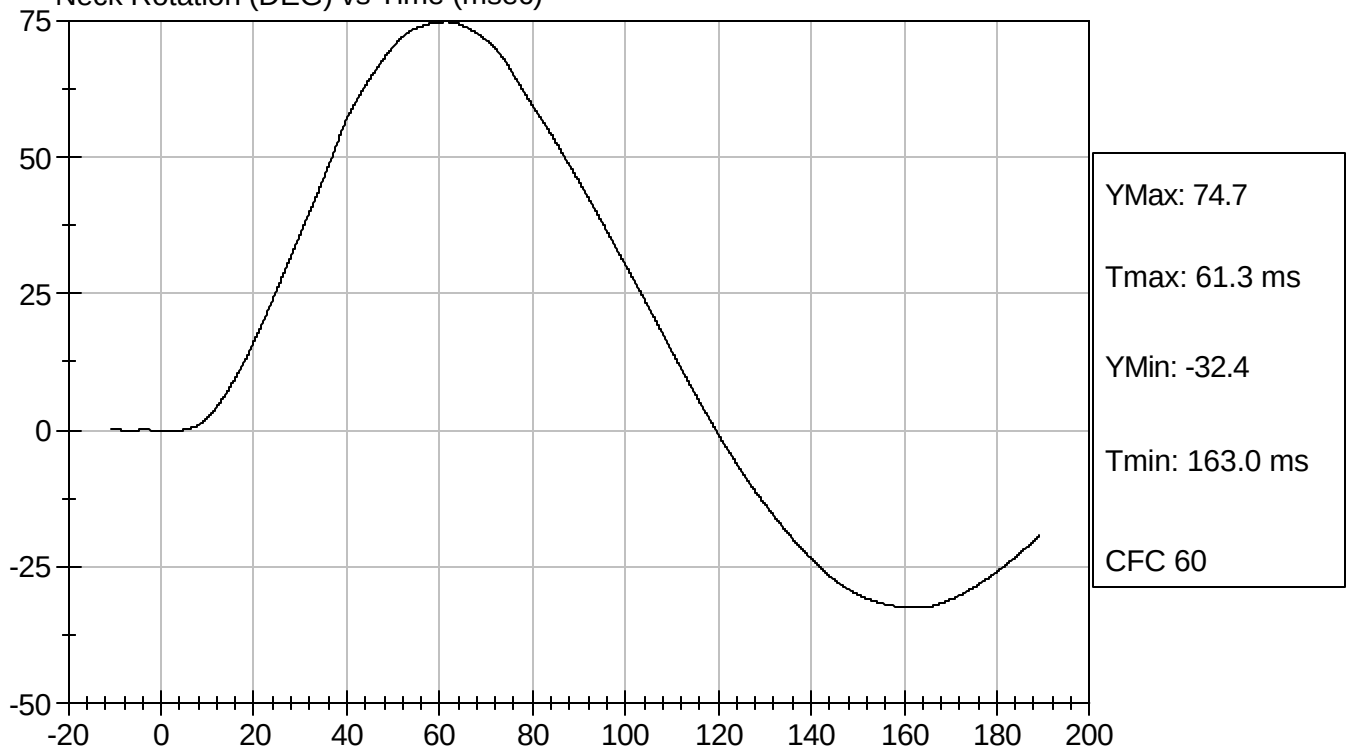
Test Date: 09/21/2005
Speed: 23.11 ft/sec, 7.04 m/sec



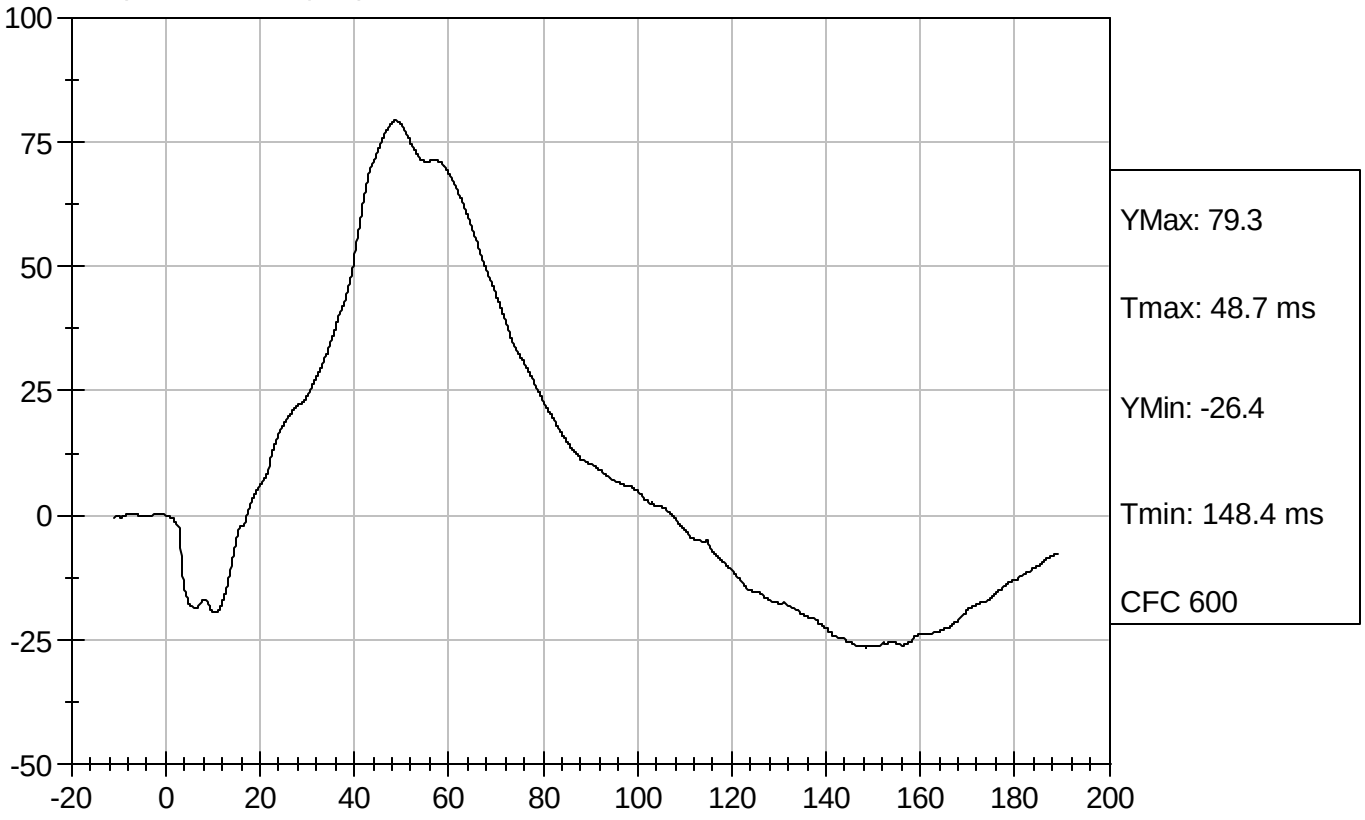
Test Desc: Neck Bending
Component ID: D052599

Test Date: 09/21/2005
Speed: 23.11 ft/sec, 7.04 m/sec

Neck Rotation (DEG) vs Time (msec)



Occipital Moment (Nm) vs Time (msec)



Calibration Test Results Summary

Dummy Serial Number: 904

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 Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 904 **Test I.D:** D052701

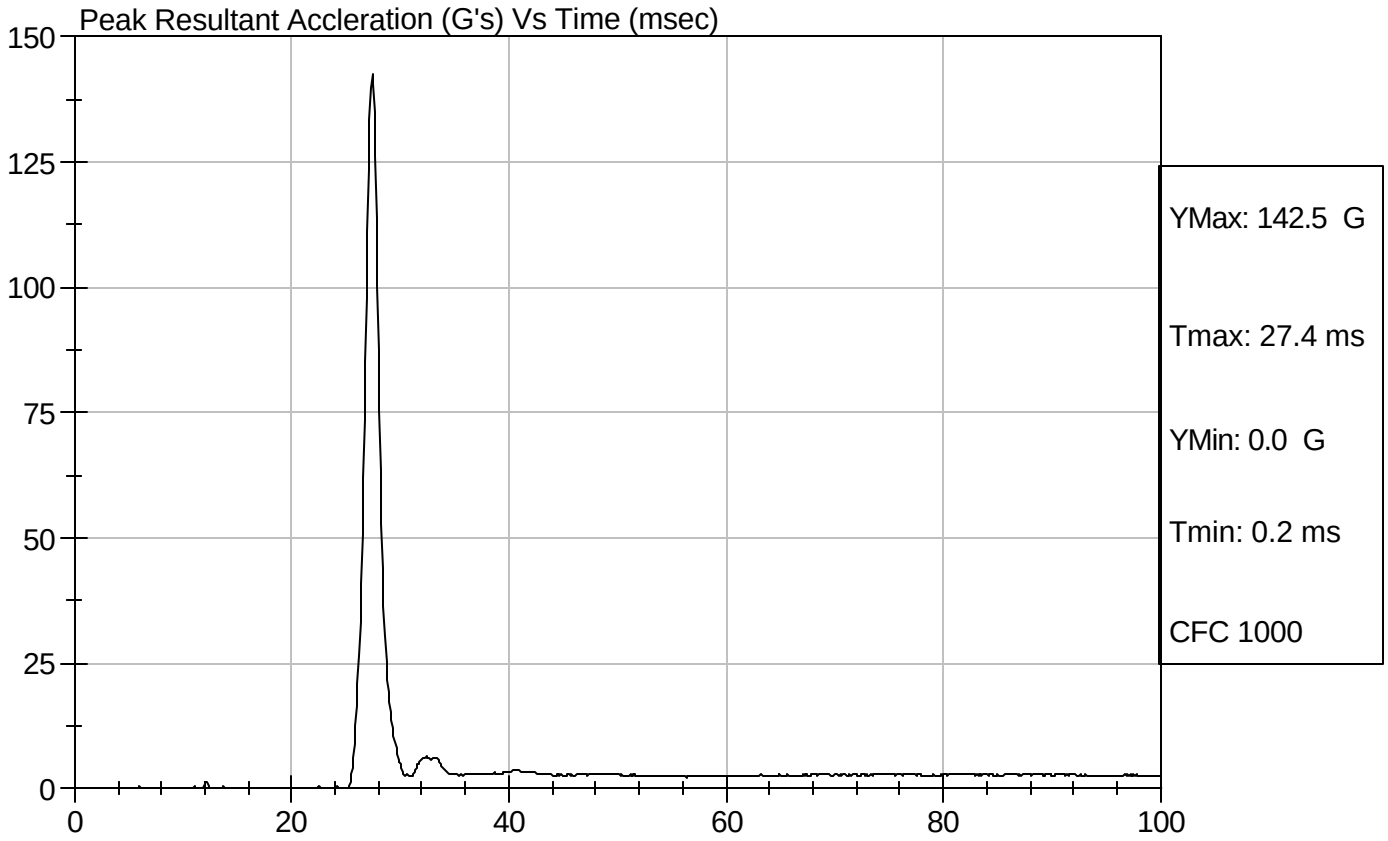
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	120 to 150	143	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	8	Pass
		Overall Test Results		Pass

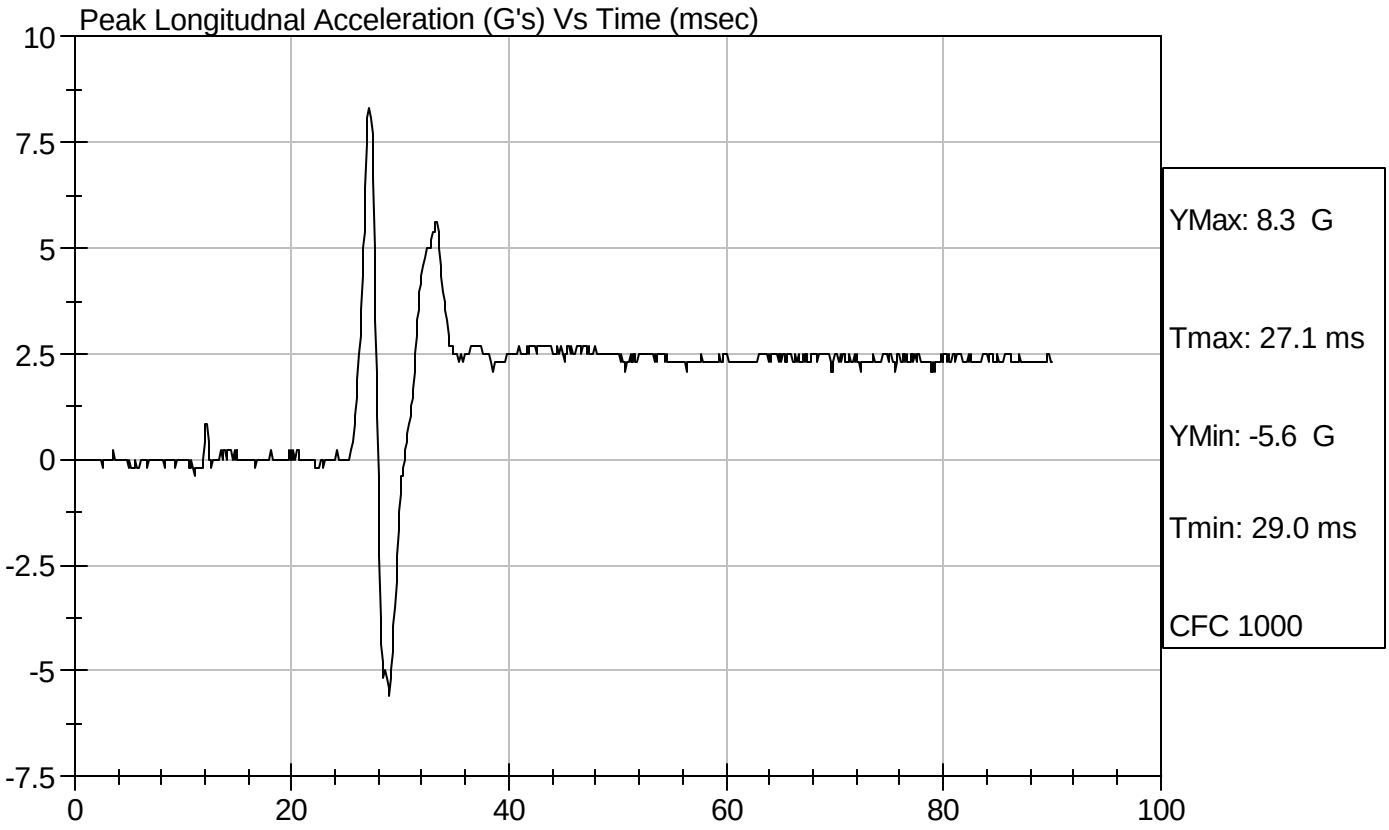
Jessica Hall
Laboratory Technician

10/05/2005
Test Date

David Winkelbauer
Approved By

	Test Description: Head Drop	Test Date: 10/05/2005
	Component: D052701	Speed: 0 ft/s, 0.00 m/s





SID Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 904 **Test I.D:** D052702

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	4.22 - 4.31	4.31	Pass
Upper Rib	G's	37 - 46	43	Pass
Lower Rib	G's	37 - 46	41	Pass
Lower Spine	G's	15 - 22	20	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

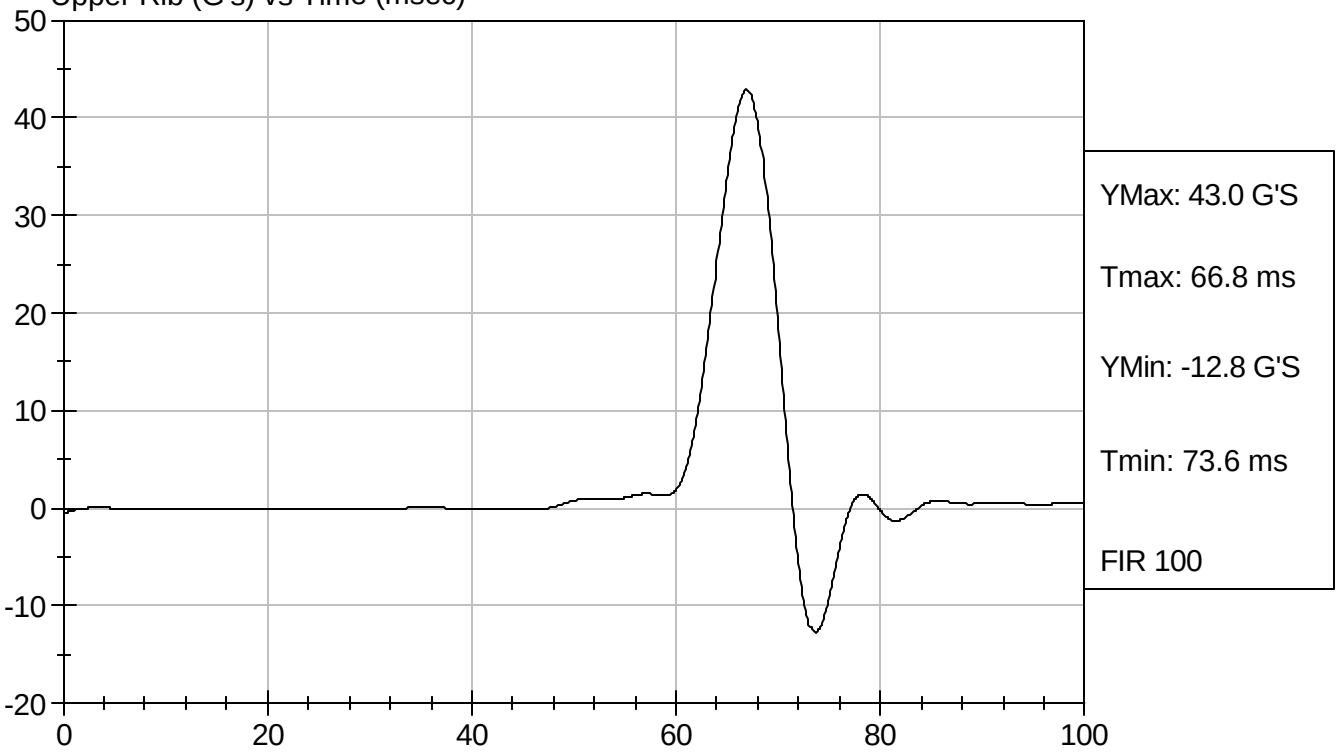
10/05/2005
Test Date

David Winkelbauer
Approved By

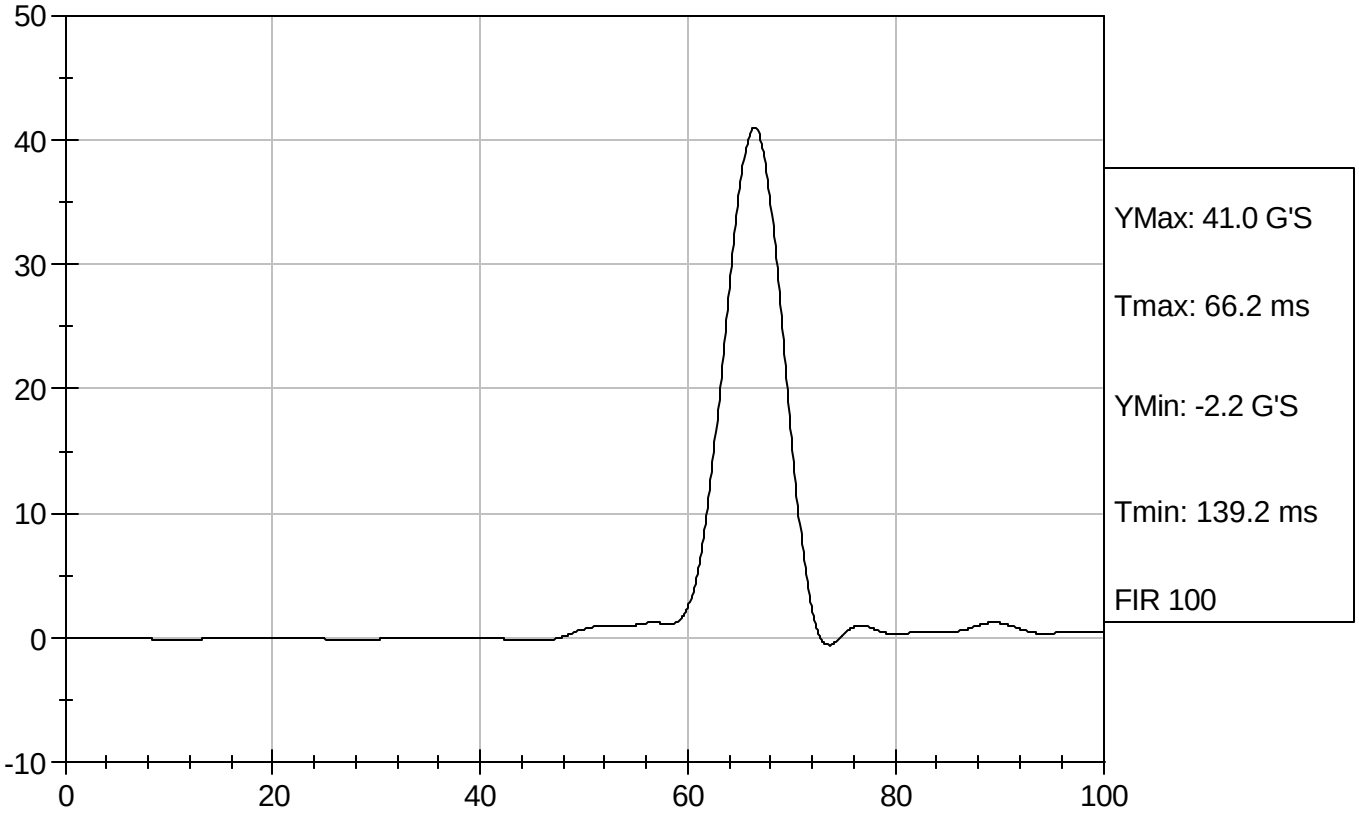
Test Desc: Thorax Impact
Component ID: D052702

Test Date: 10/05/2005
Speed: 14.13 ft/sec, 4.31 m/sec

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

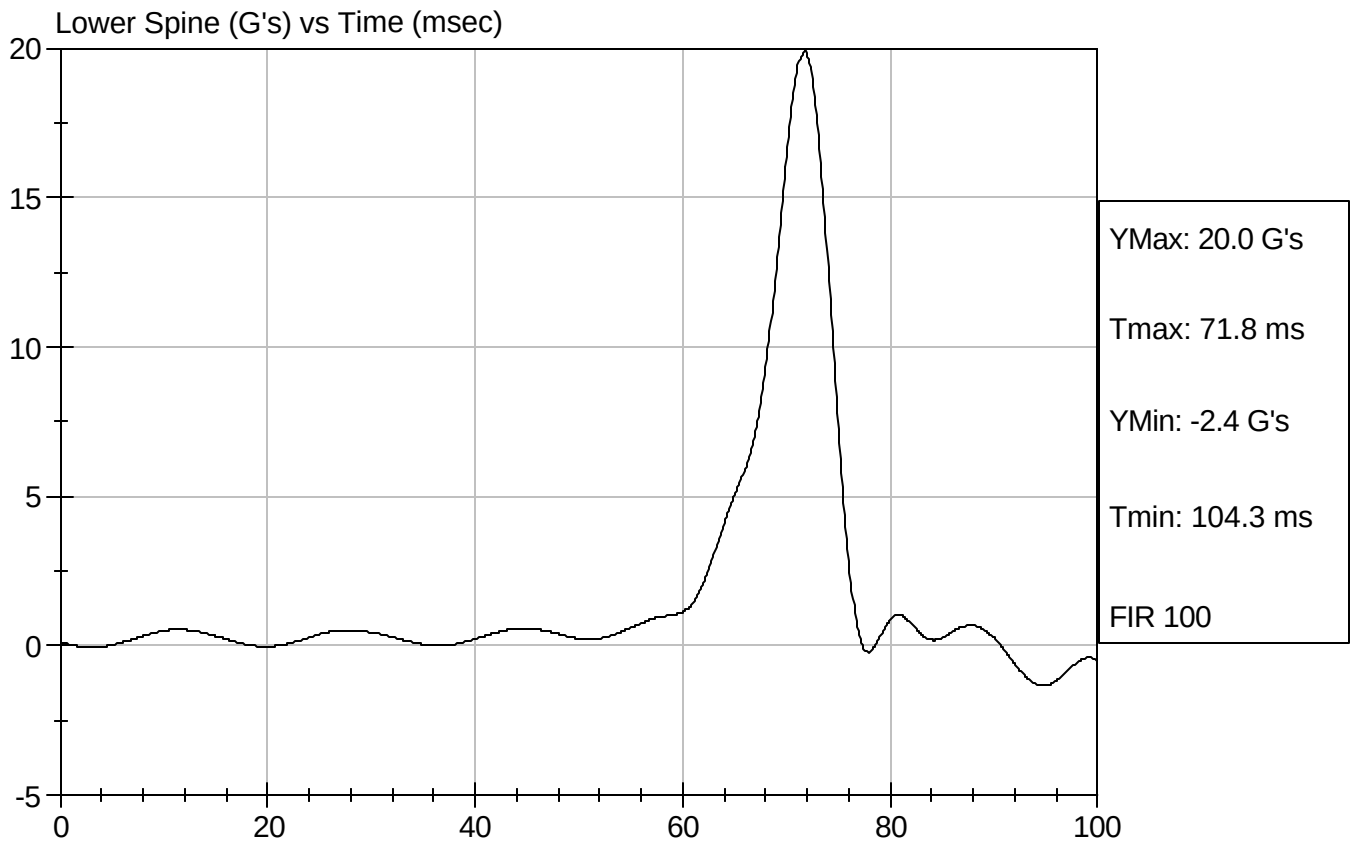


Lower Rib (G's) vs Time (msec)



Test Desc: Thorax Impact
Component ID: D052702

Test Date: 10/05/2005
Speed: 14.13 ft/sec, 4.31 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 904 **Test I.D:** D052703

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	4.27 - 4.33	4.31	Pass
Pelvis Acceleration	G's	40 - 60	42	Pass
		Overall Test Results		Pass

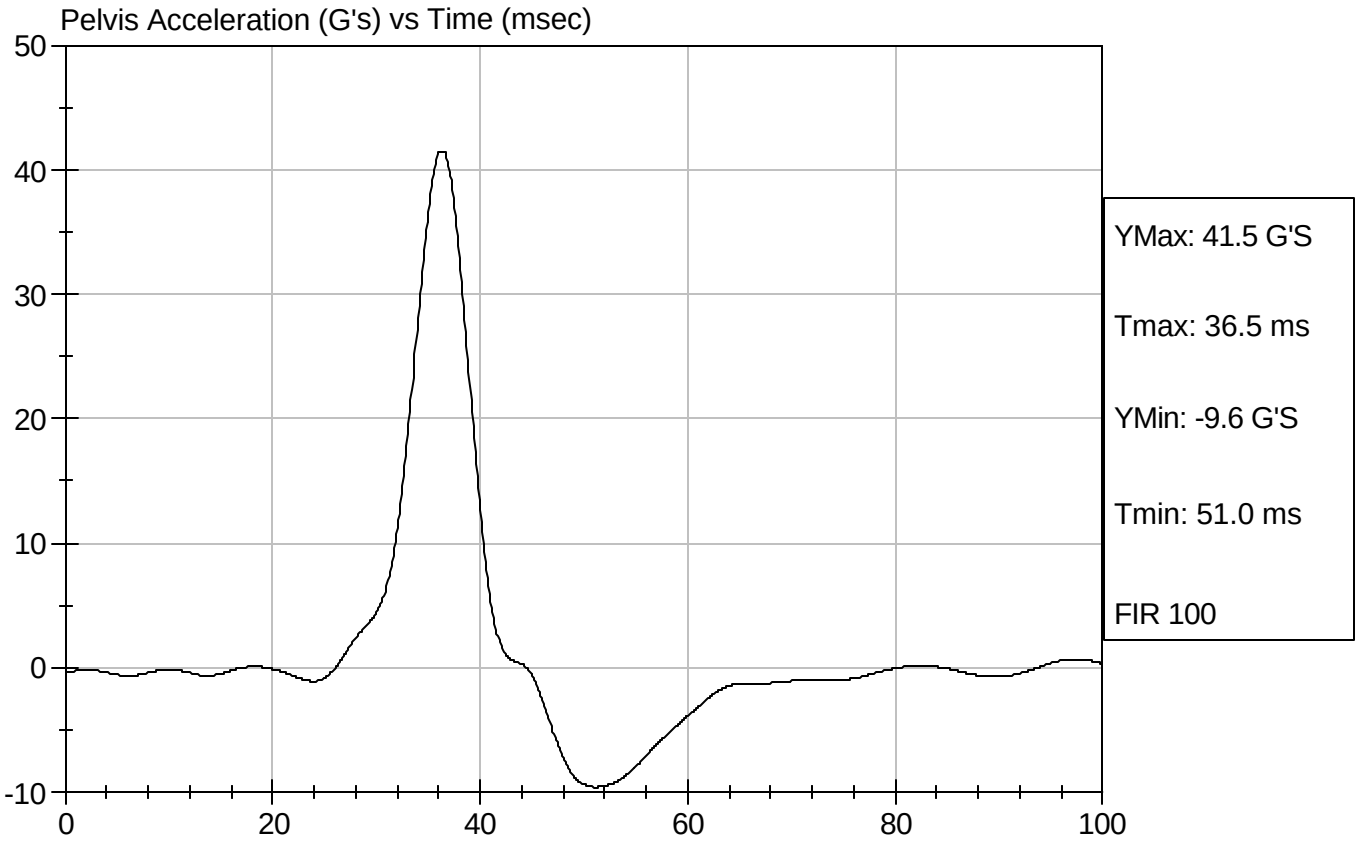
Jessica Hall
Laboratory Technician

10/05/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D052703

Test Date: 10/05/2005
Speed: 14.13 ft/sec, 4.31 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 904 **Test I.D:** D052704

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Force At 12.7 mm	N	104 -162	146	Pass
Force At 19 mm	N	163 - 222	203	Pass
Force At 25.4 mm	N	222 - 280	271	Pass
Force At 33 mm	N	325 - 391	391	Pass
		Overall Test Results		Pass

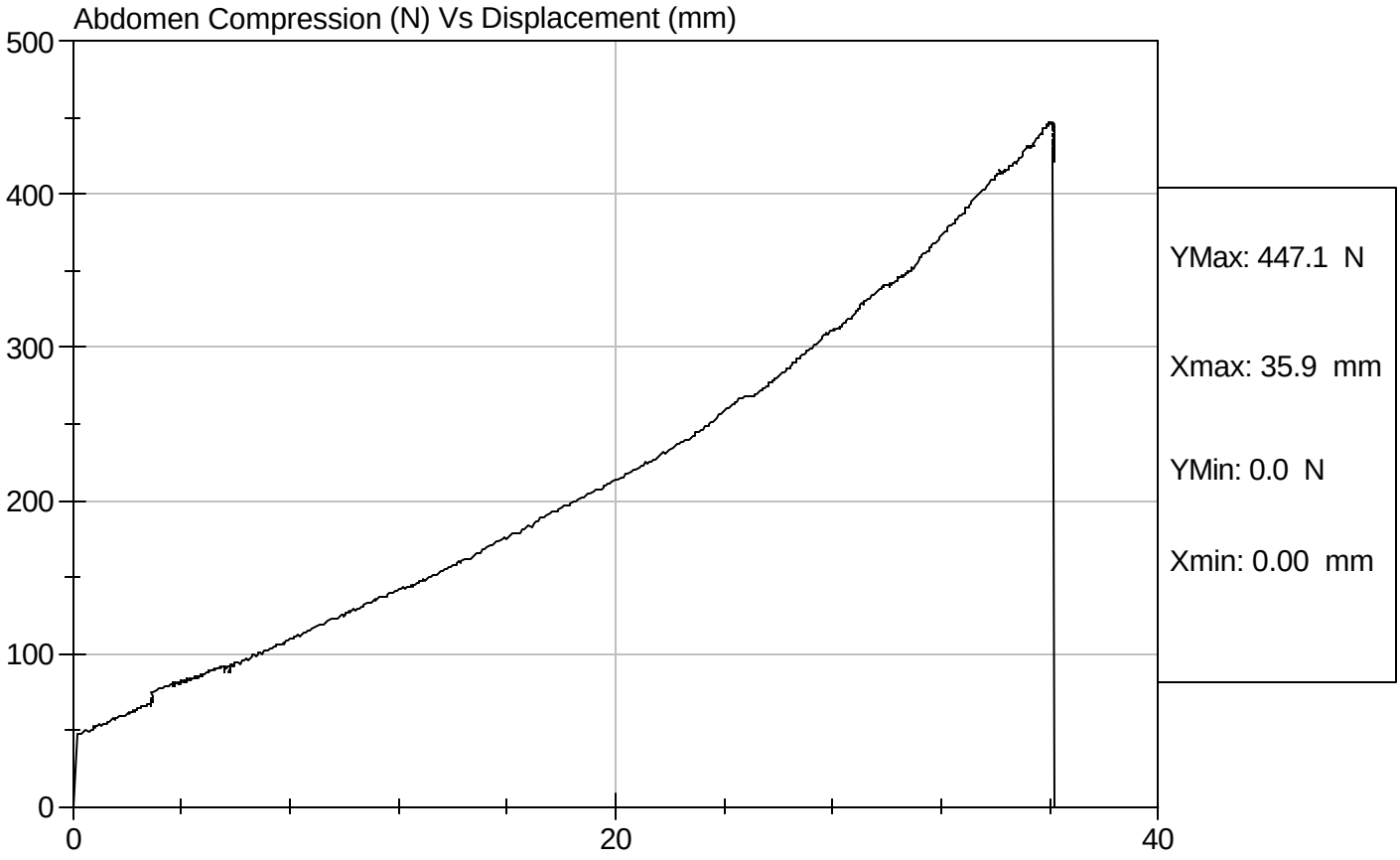
Jessica Hall
Laboratory Technician

10/05/2005
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 10/05/2005

Component: D052704 Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 904 **Test I.D:** D052705

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	131.2	Pass
Force At 30 deg	N	151.2 - 204.6	162.3	Pass
Force At 40 deg	N	204.6 - 258.0	208.9	Pass
Return Angle	Deg	12 Maximum	5	Pass
		Overall Test Results		Pass

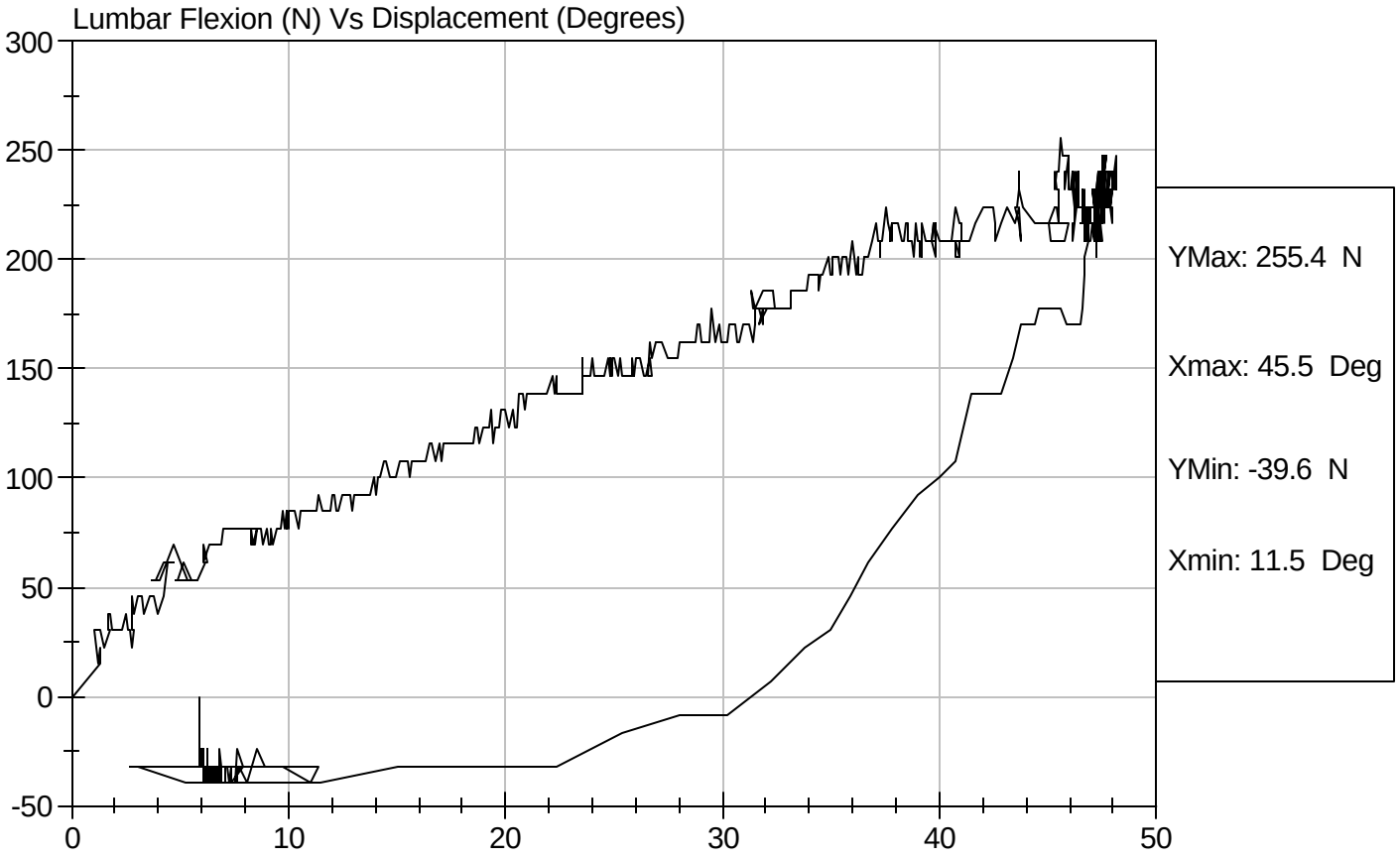
Jessica Hall
Laboratory Technician

10/05/2005
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 10/05/2005

Component: D052705 | Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy (SID)

Neck Pendulum Test

ATD Serial No: 904 **Test I.D:** D052709

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	46	Pass
Impact Velocity		m/s	6.89 to 7.13	7.12	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.26	Pass
	20 msec	m/s	4.12 to 5.10	4.53	Pass
	30 msec	m/s	5.73 to 7.01	6.34	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.41	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	74	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	59	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	80	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	60	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	12	Pass

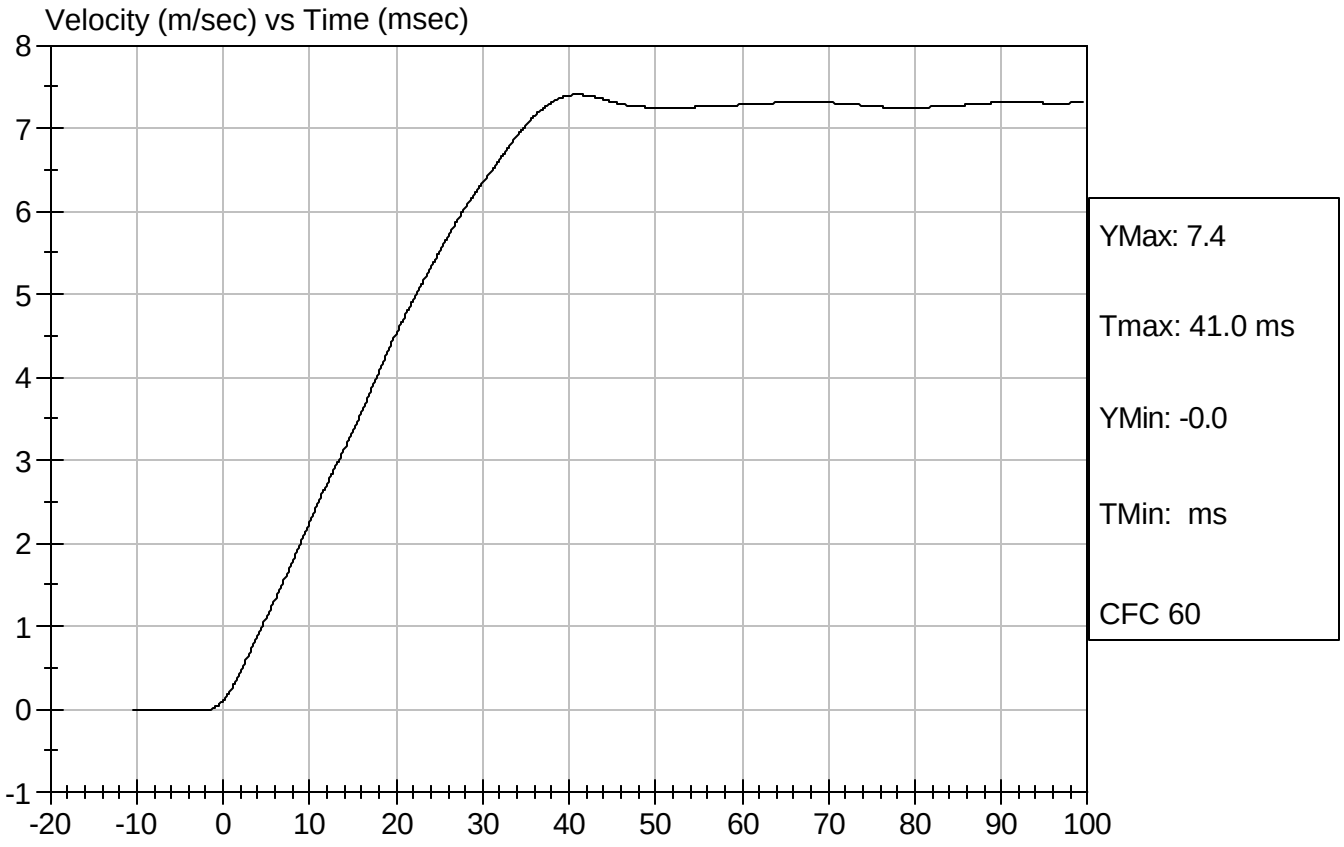
Jessica Hall
Laboratory Technician

10/05/2005
Test Date

David Winkelbauer
Approved By

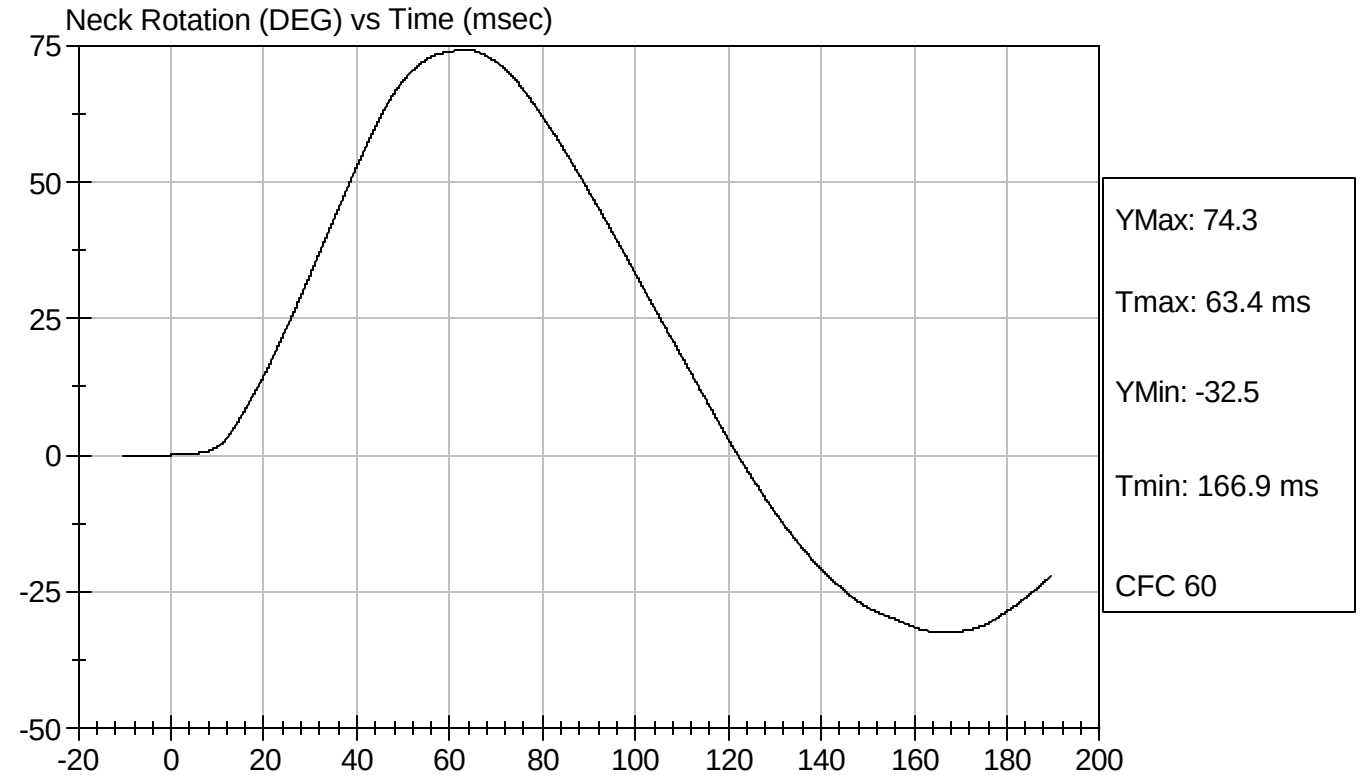
Test Desc: Neck Bending
Component ID: D052709

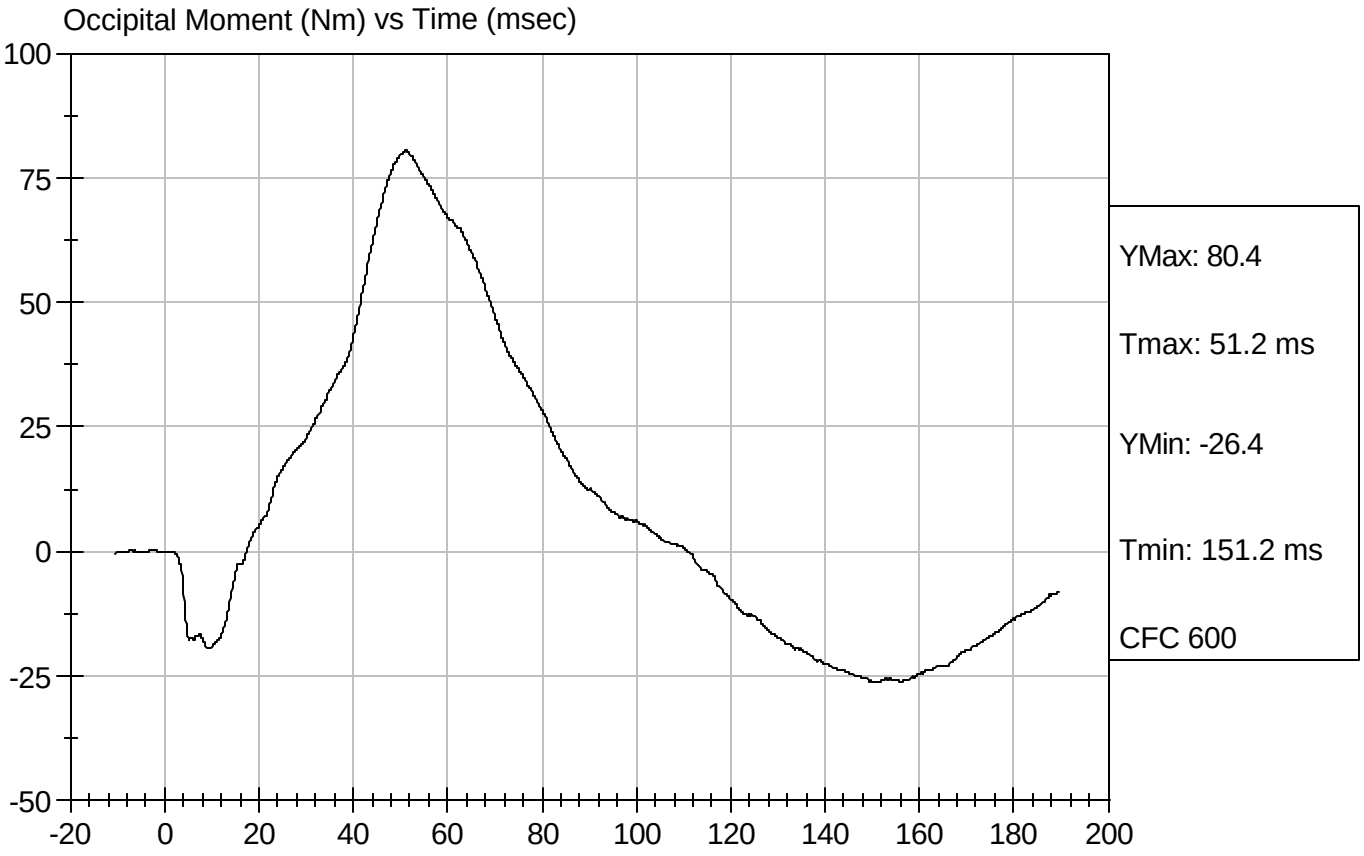
Test Date: 10/05/2005
Speed: 23.35 ft/sec, 7.12 m/sec



Test Desc: Neck Bending
Component ID: D052709

Test Date: 10/05/2005
Speed: 23.35 ft/sec, 7.12 m/sec





SID Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No: 904

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

10/05/2005
Test Date

David Winkelbauer
Approved By

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:** D05234

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

Jessica Hall
Laboratory Technician

08/23/2005
Test Date

David Winkelbauer
Approved By

SID Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 271 **Test I.D:** D052581

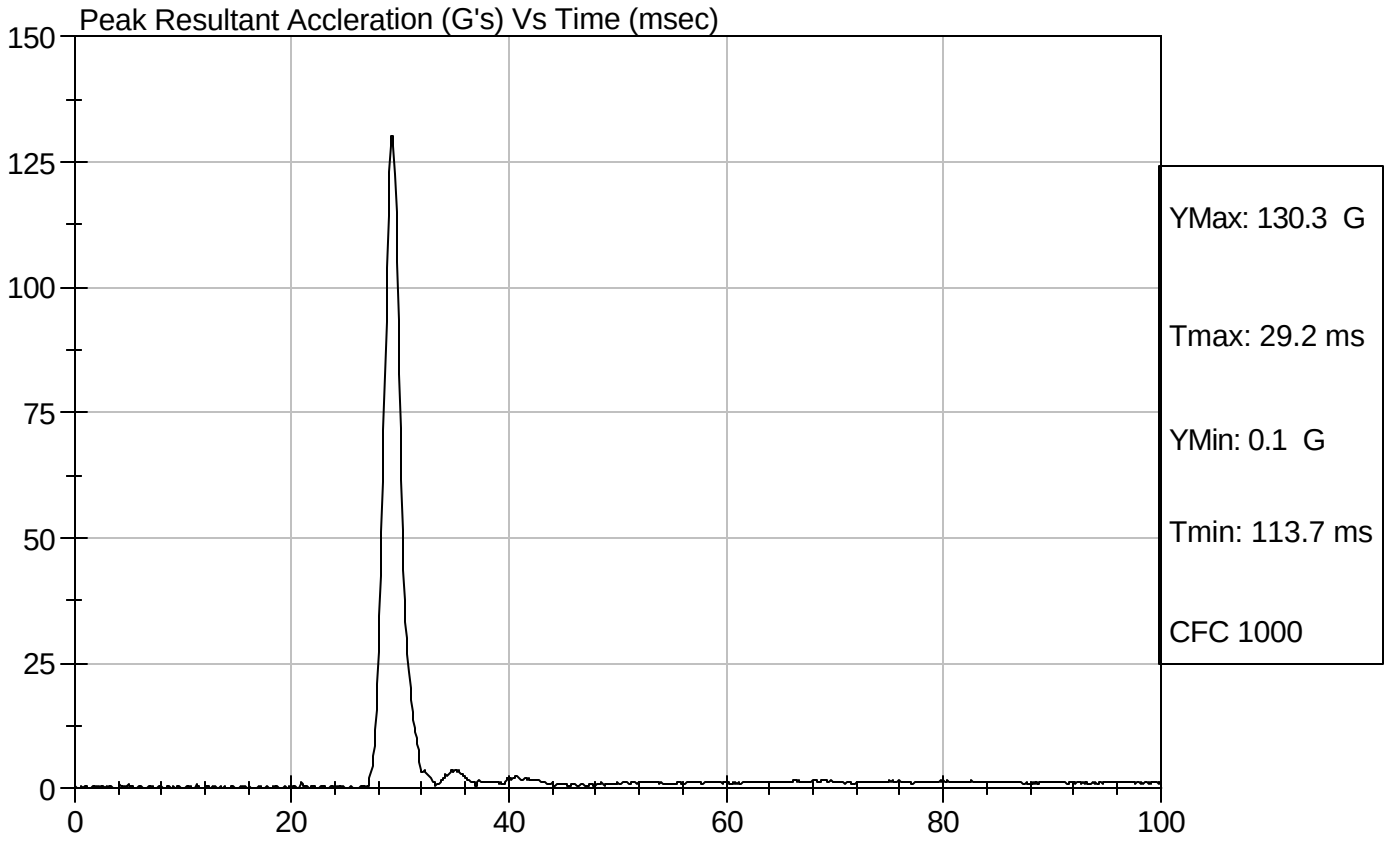
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Peak Resultant Acceleration	G's	120 to 150	130	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-8	Pass
		Overall Test Results		Pass

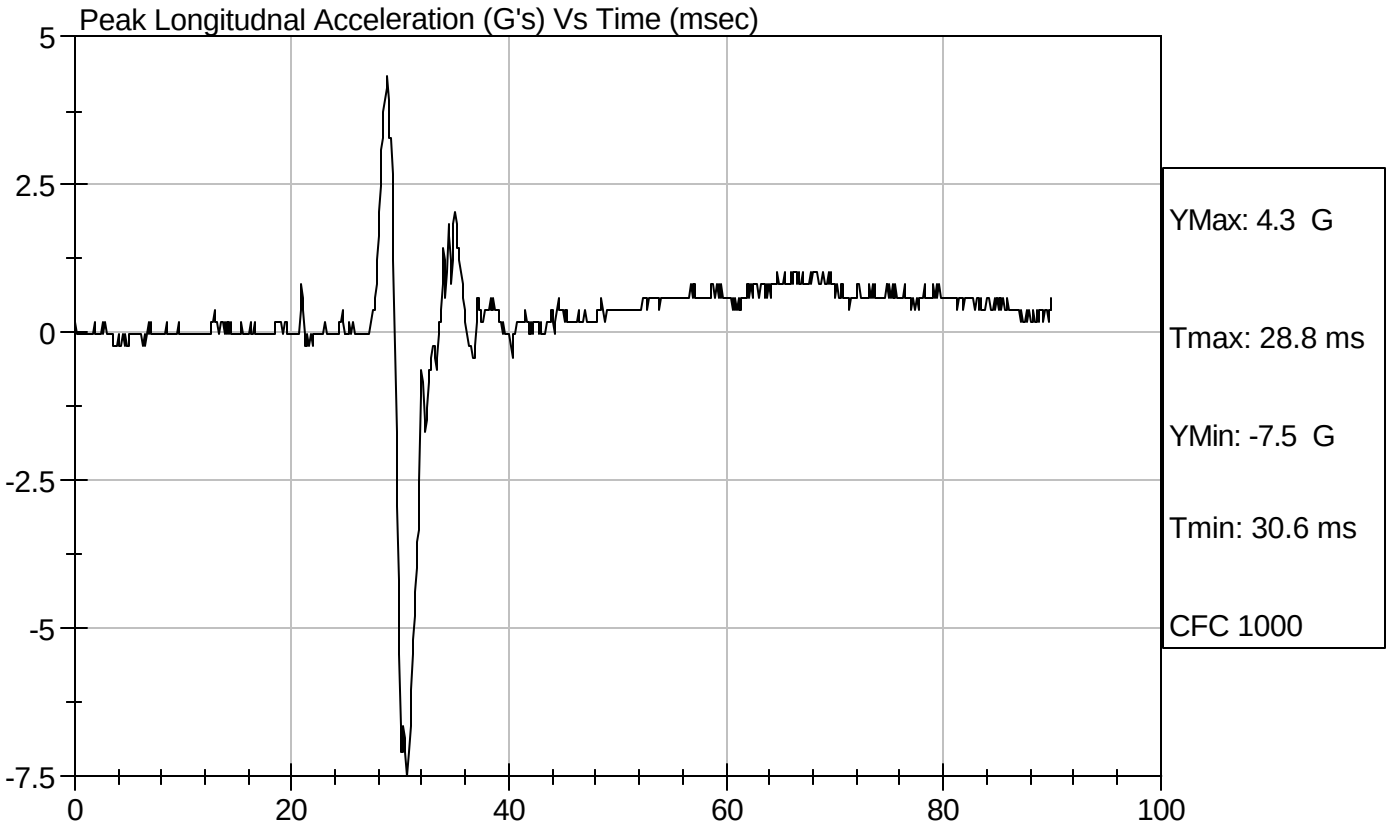
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

	Test Description: Head Drop	Test Date: 09/21/2005
	Component: D052581	Speed: 0 ft/s, 0.00 m/s





SID Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 271 **Test I.D:** D052582

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	45	Pass
Lower Rib	G's	37 - 46	45	Pass
Lower Spine	G's	15 - 22	20	Pass
		Overall Test Results		Pass

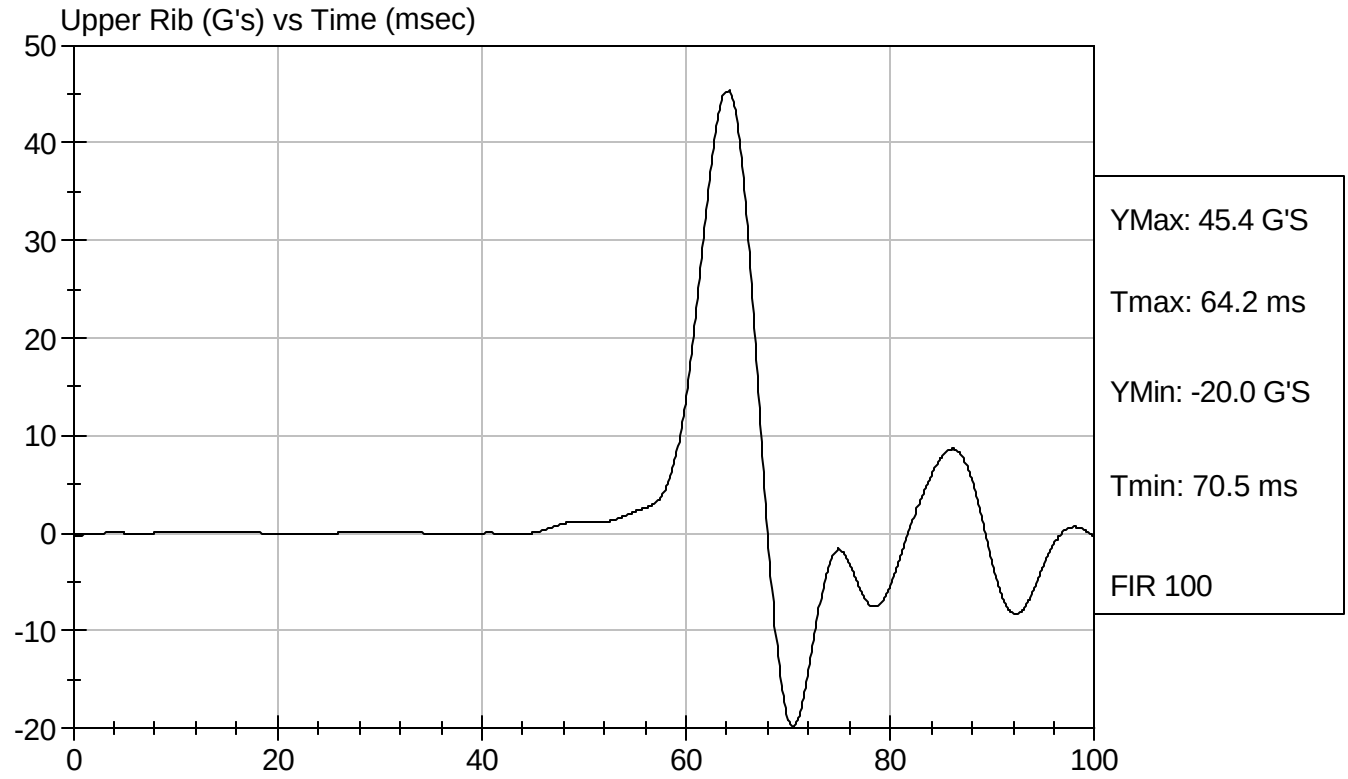
Jessica Hall
Laboratory Technician

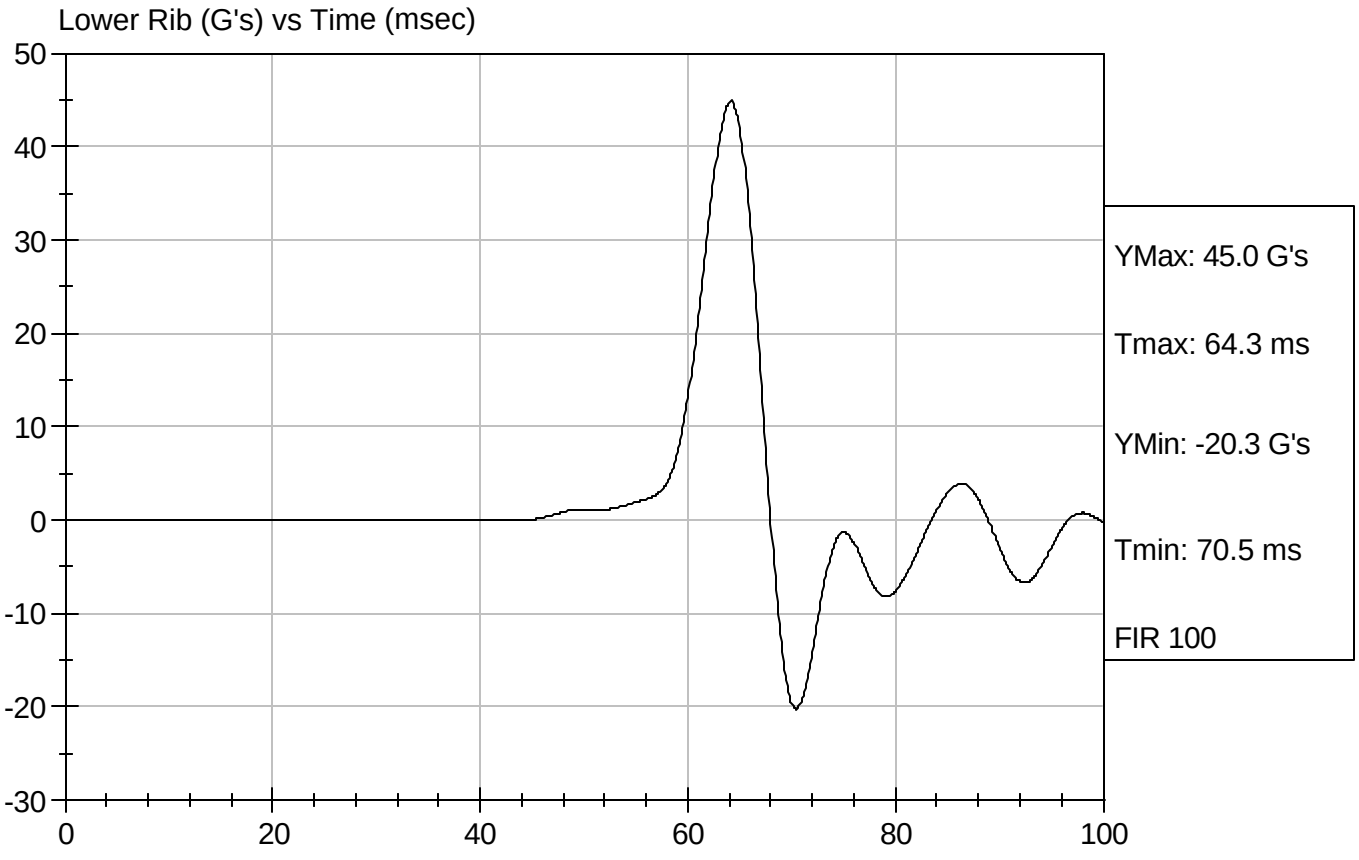
09/21/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D052582

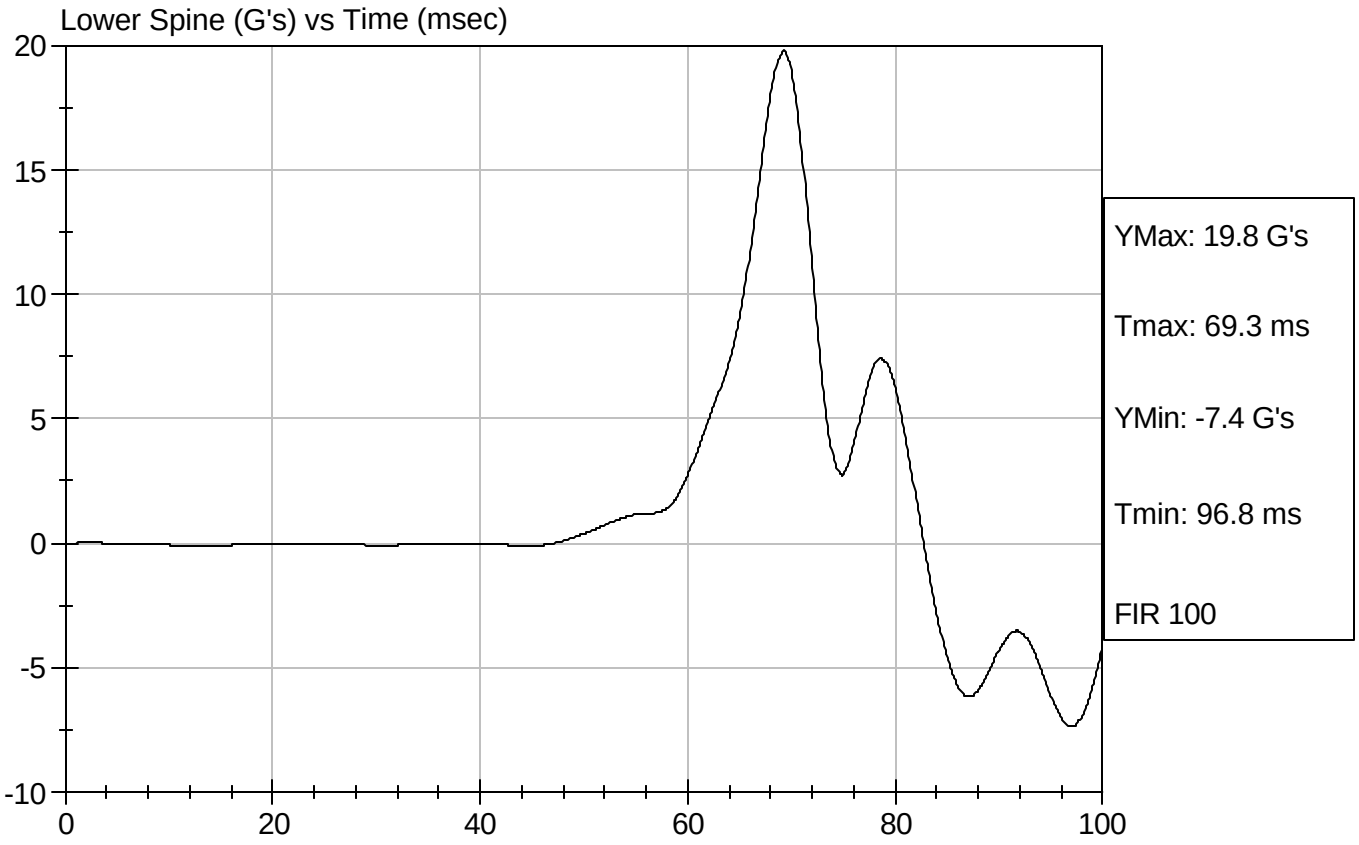
Test Date: 09/21/2005
Speed: 14.12 ft/sec, 4.30 m/sec





Test Desc: Thorax Impact
Component ID: D052582

Test Date: 09/21/2005
Speed: 14.12 ft/sec, 4.30 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 271 **Test I.D:** D052583

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	4.27 - 4.33	4.32	Pass
Pelvis Acceleration	G's	40 - 60	42	Pass
		Overall Test Results		Pass

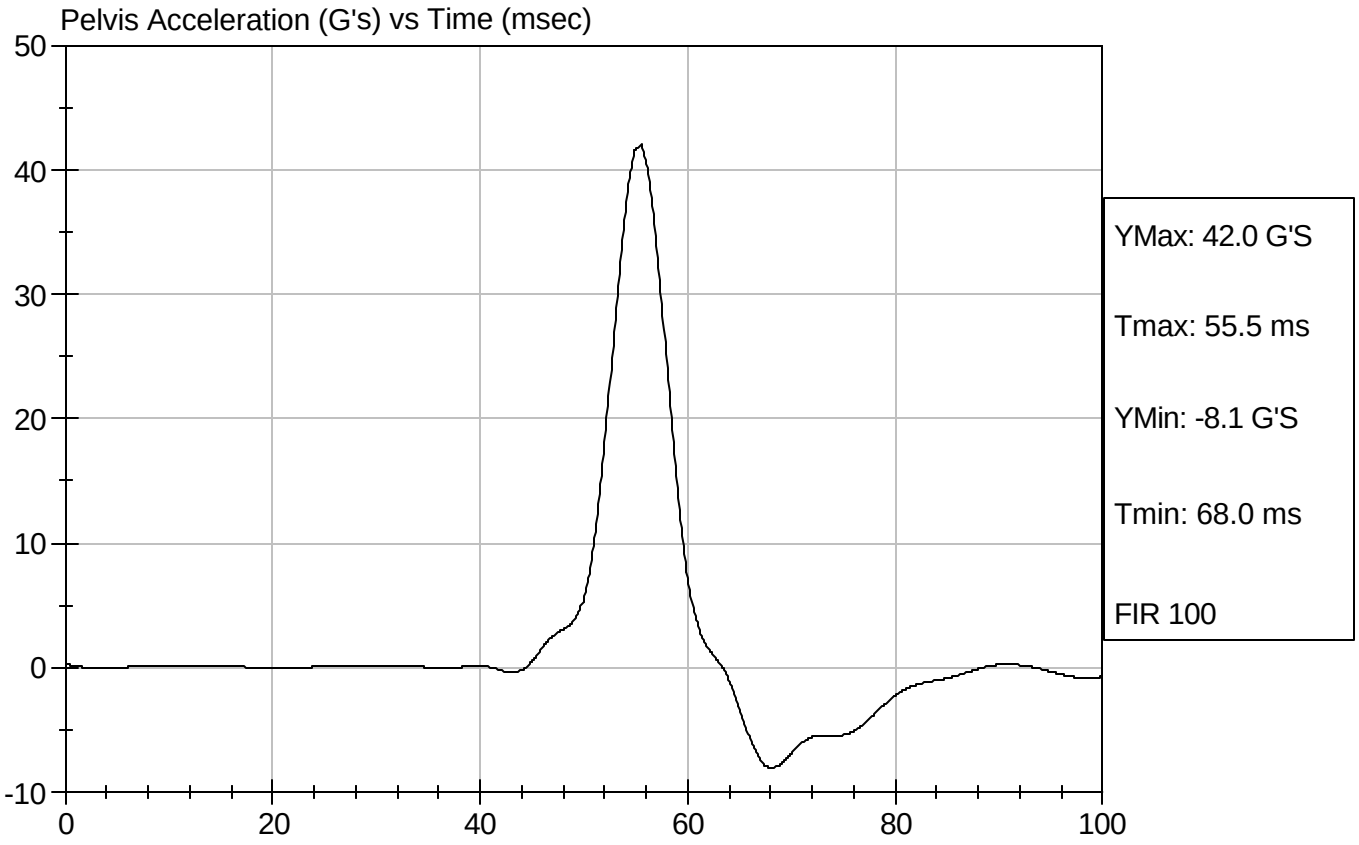
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D052583

Test Date: 09/21/2005
Speed: 14.18 ft/sec, 4.32 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 271 **Test I.D:** D052584

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Force At 12.7 mm	N	104 -162	118	Pass
Force At 19 mm	N	163 - 222	170	Pass
Force At 25.4 mm	N	222 - 280	238	Pass
Force At 33 mm	N	325 - 391	332	Pass
		Overall Test Results		Pass

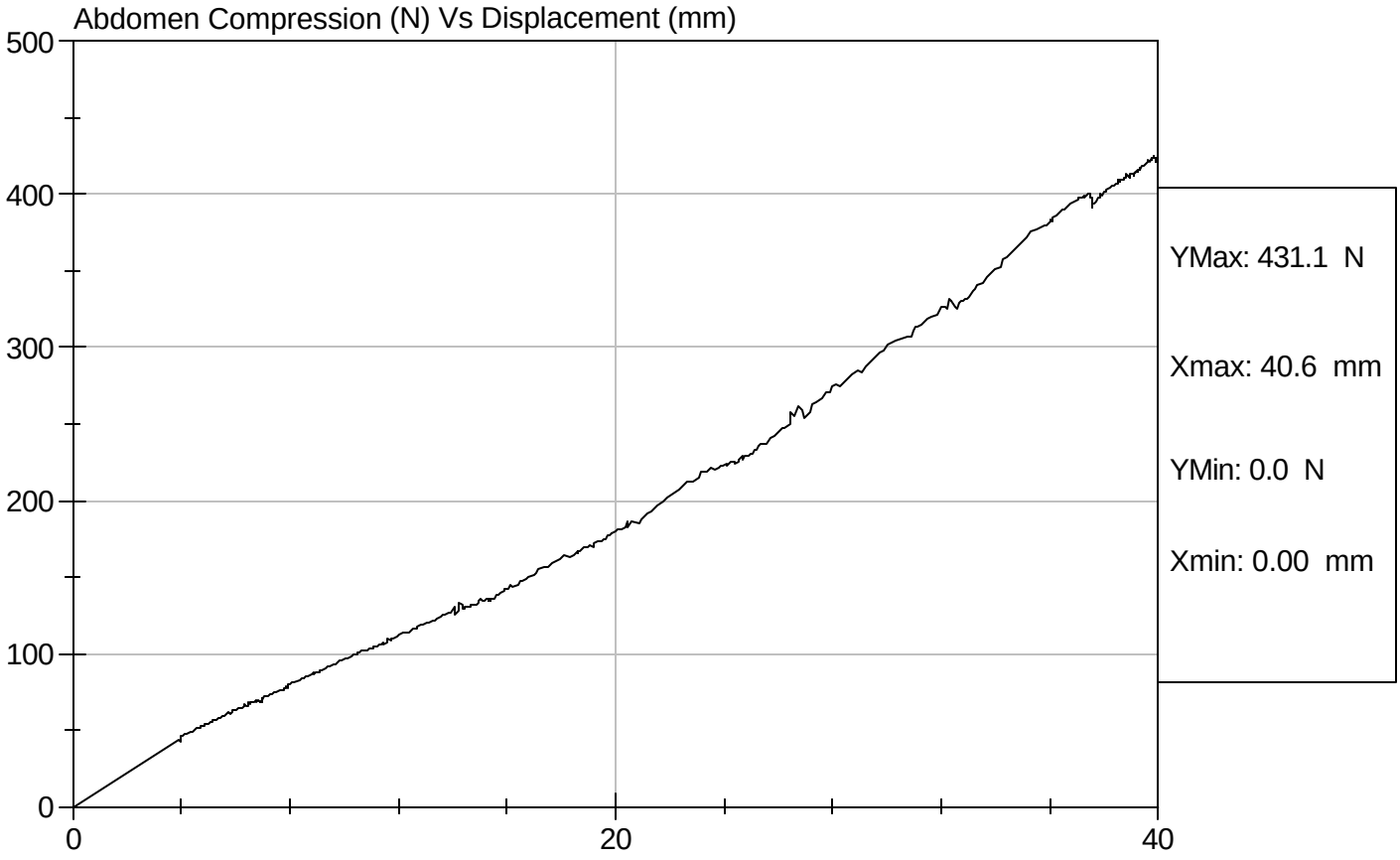
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 09/21/2005

Component: D052584 Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 271 **Test I.D:** D052585

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	116.2	Pass
Force At 30 deg	N	151.2 - 204.6	186.1	Pass
Force At 40 deg	N	204.6 - 258.0	224.9	Pass
Return Angle	Deg	12 Maximum	6	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

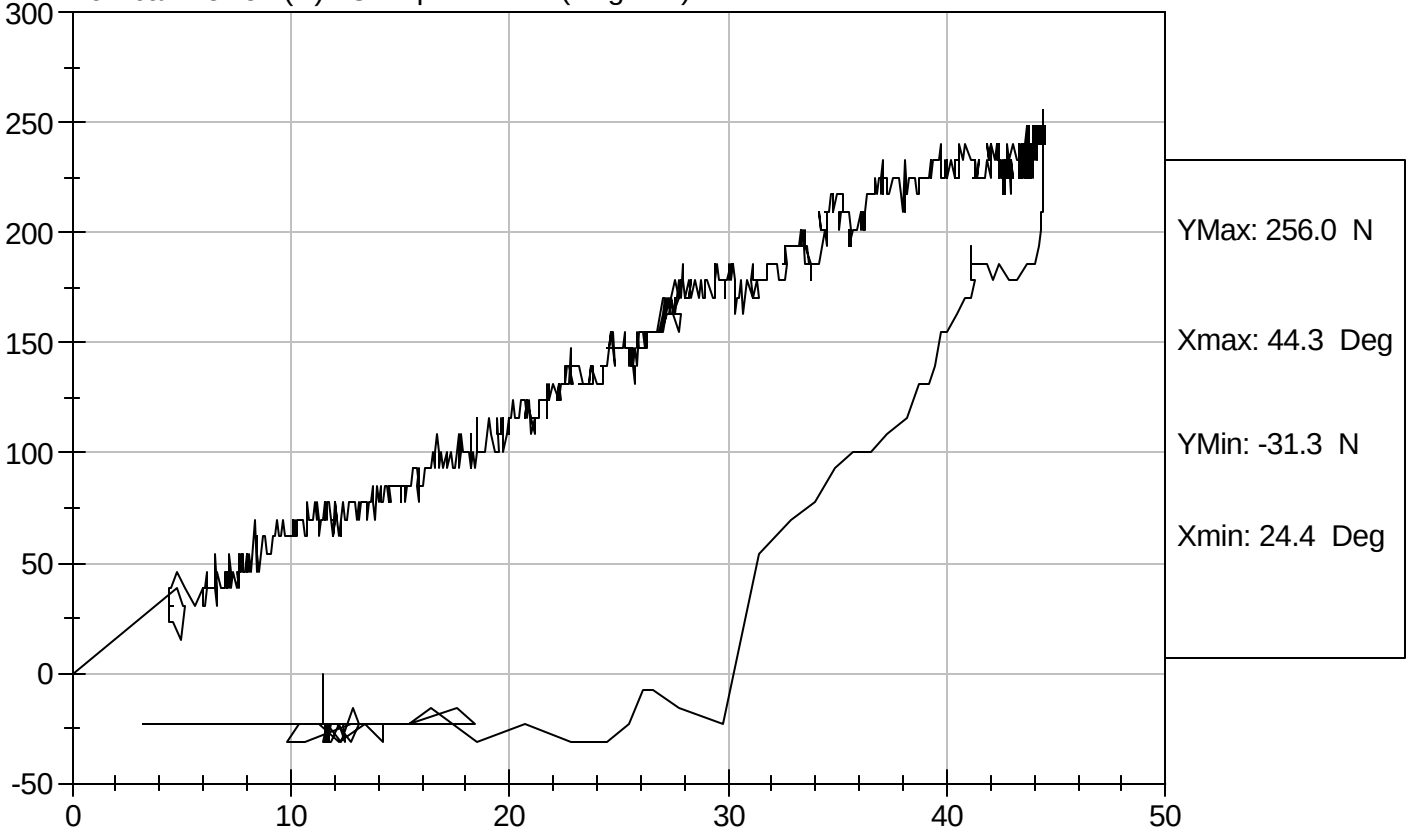
Test Description: Lumbar Flexion

Test Date: 09/21/2005

Component: D052585

Speed: 0 ft/sec, 0 m/sec

Lumbar Flexion (N) Vs Displacement (Degrees)



SID Calibration Data Sheet

Side Impact Dummy (SID)

Neck Pendulum Test

ATD Serial No: 271 **Test I.D:** D052589

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	45	Pass
Impact Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.48	Pass
	20 msec	m/s	4.12 to 5.10	4.81	Pass
	30 msec	m/s	5.73 to 7.01	6.63	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.17	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	75	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	61	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	76	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	59	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	11	Pass

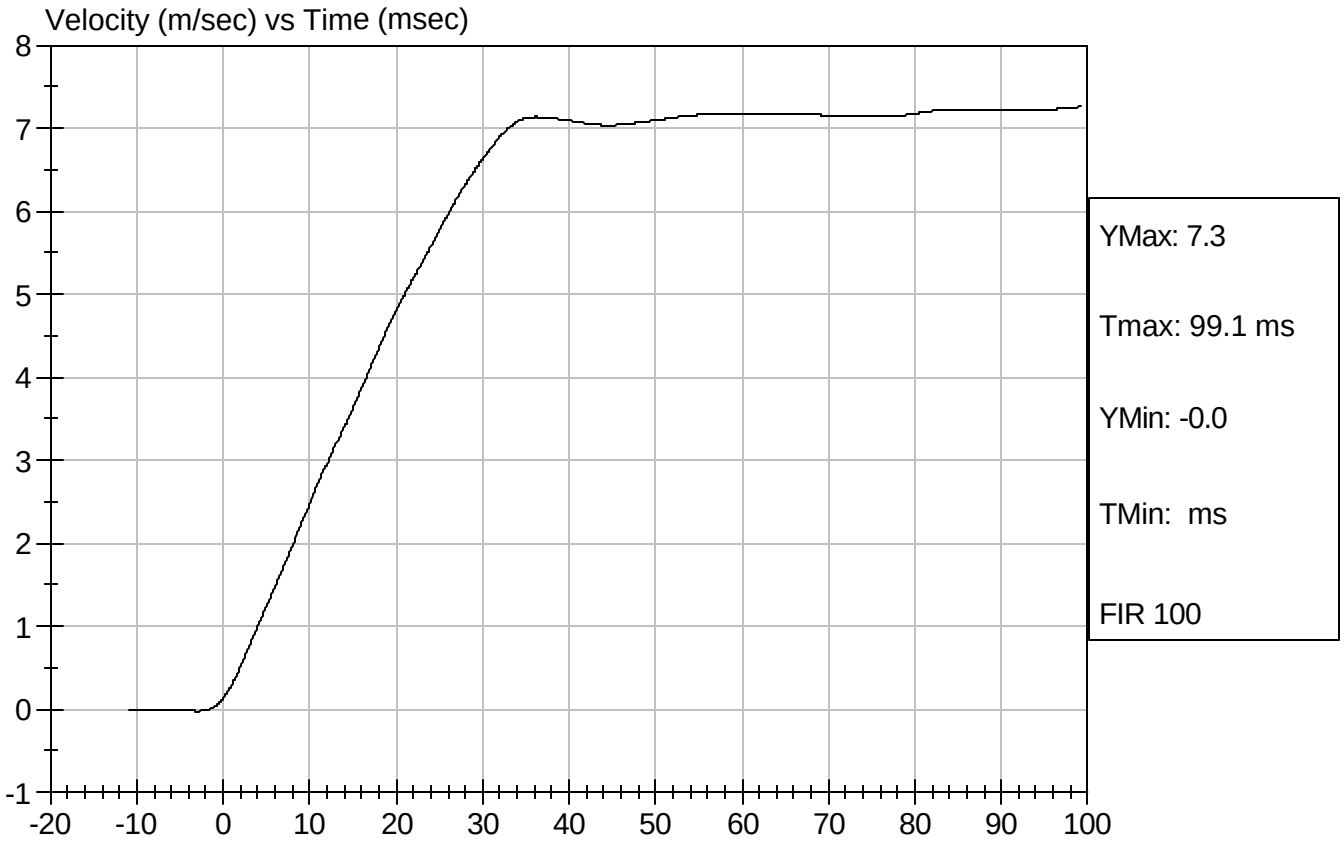
Jessica Hall
Laboratory Technician

09/21/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Bending
Component ID: D052589

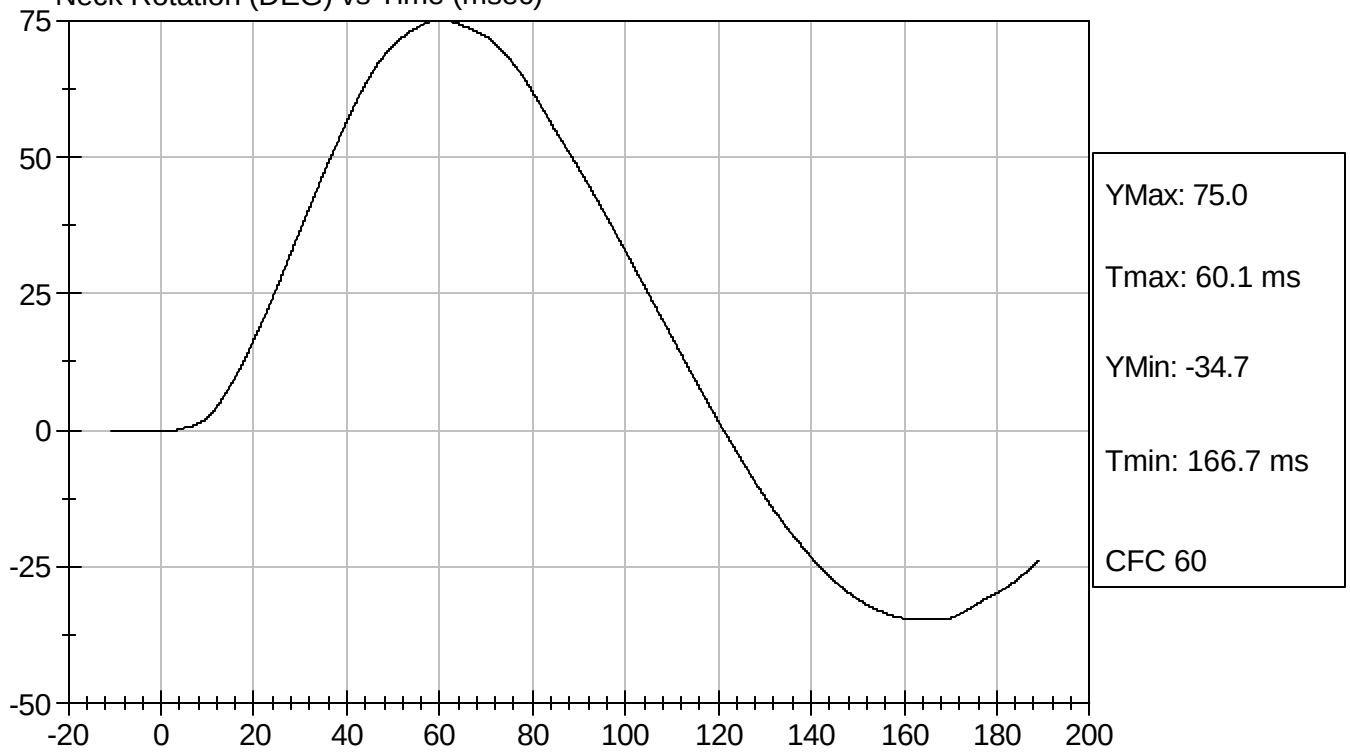
Test Date: 09/21/2005
Speed: 23.1 ft/sec, 7.04 m/sec



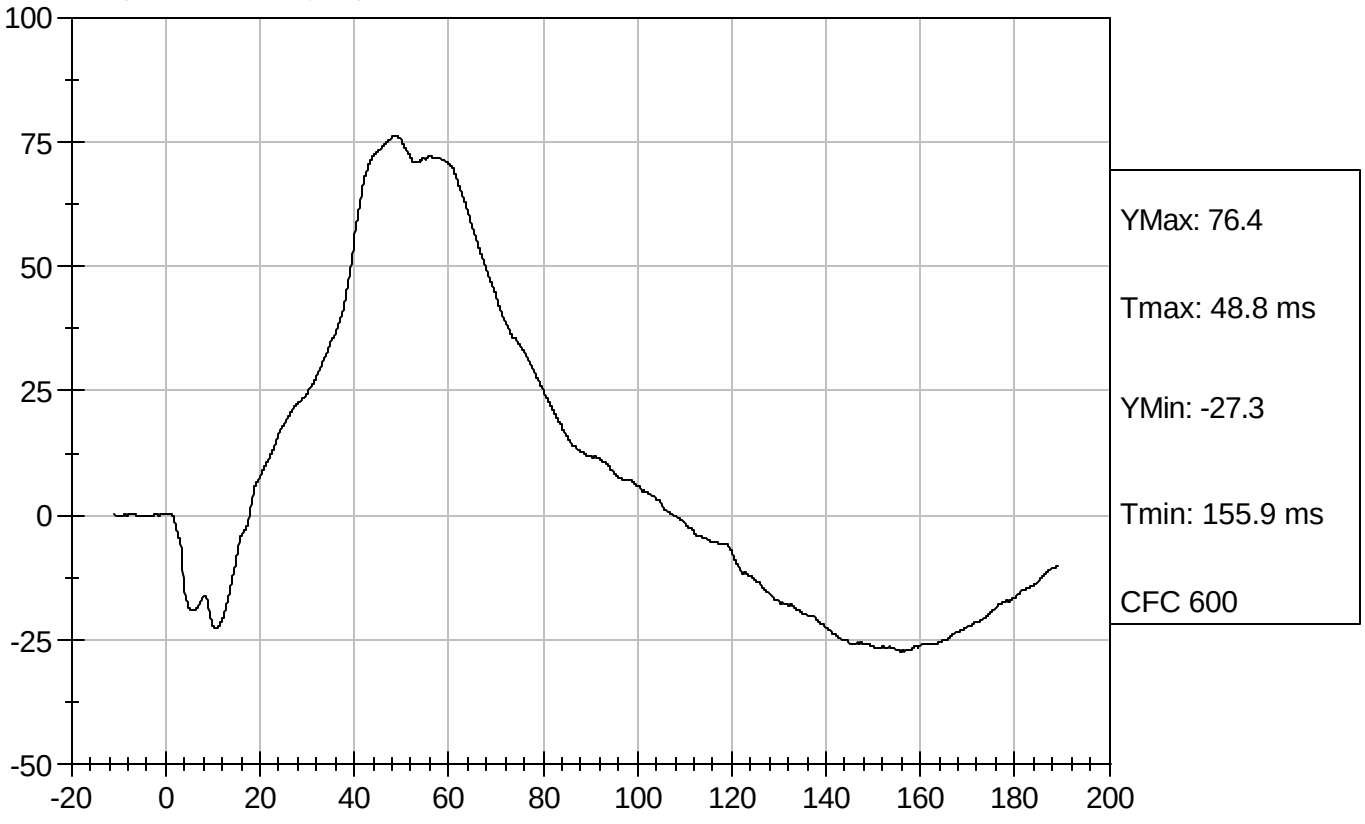
Test Desc: Neck Bending
Component ID: D052589

Test Date: 09/21/2005
Speed: 23.1 ft/sec, 7.04 m/sec

Neck Rotation (DEG) vs Time (msec)



Occipital Moment (Nm) vs Time (msec)



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 Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 271 **Test I.D:** D052711

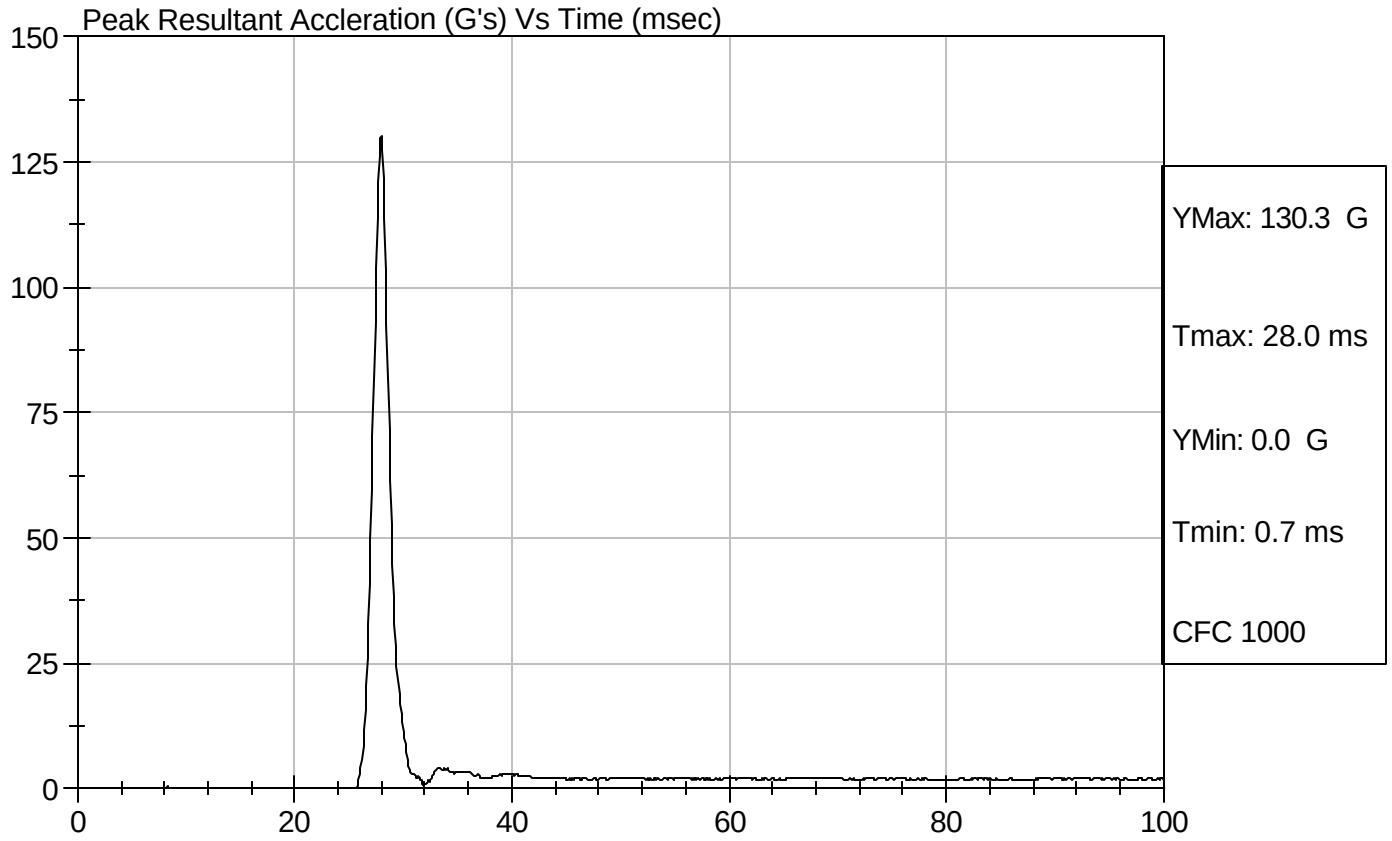
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	120 to 150	130	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	10	Pass
		Overall Test Results		Pass

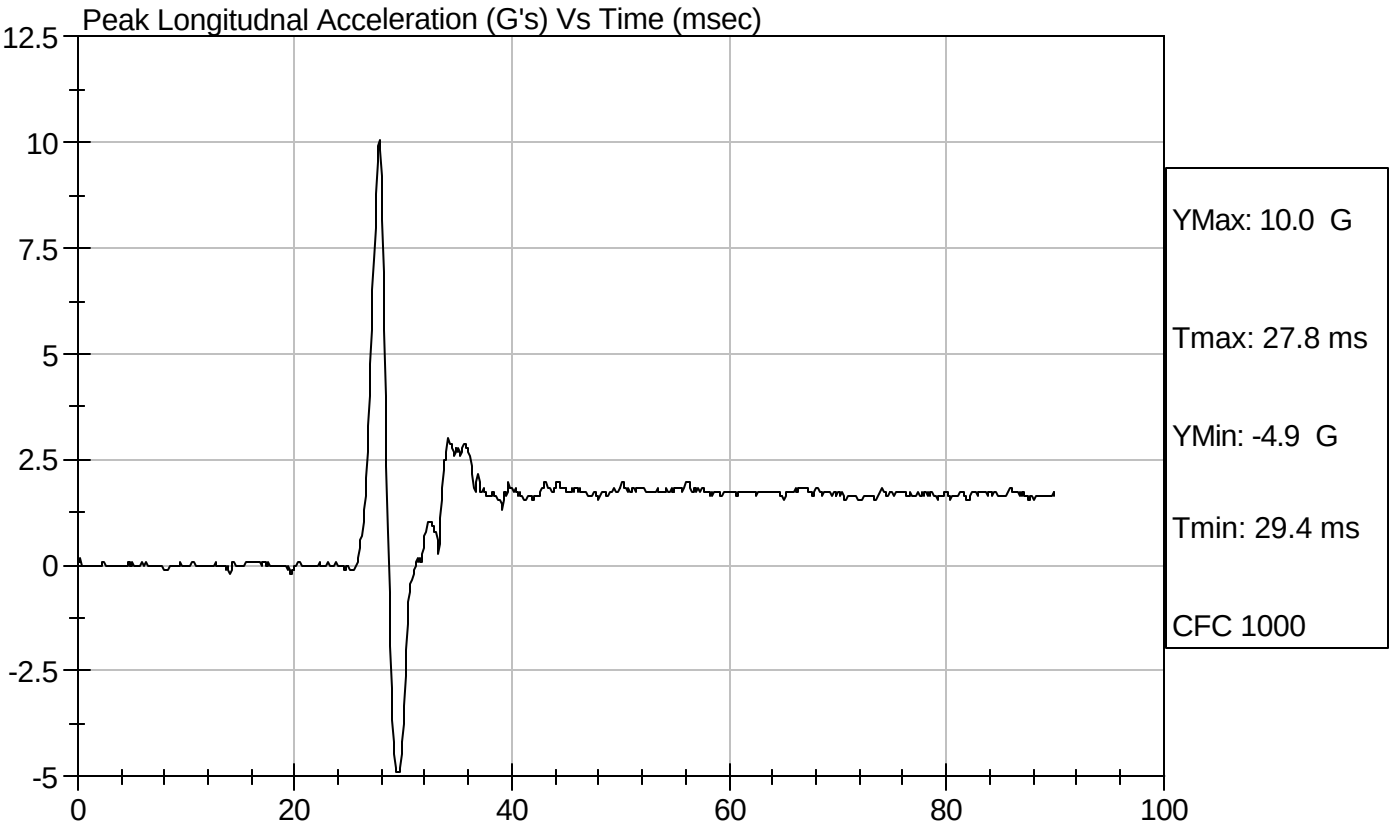
Jessica Hall
Laboratory Technician

10/04/2005
Test Date

David Winkelbauer
Approved By

	Test Description: Head Drop	Test Date: 10/04/2005
	Component: D052711	Speed: 0 ft/s, 0.00 m/s





SID Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 271 **Test I.D:** D052712

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Velocity	m/s	4.22 - 4.31	4.31	Pass
Upper Rib	G's	37 - 46	41	Pass
Lower Rib	G's	37 - 46	45	Pass
Lower Spine	G's	15 - 22	19	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

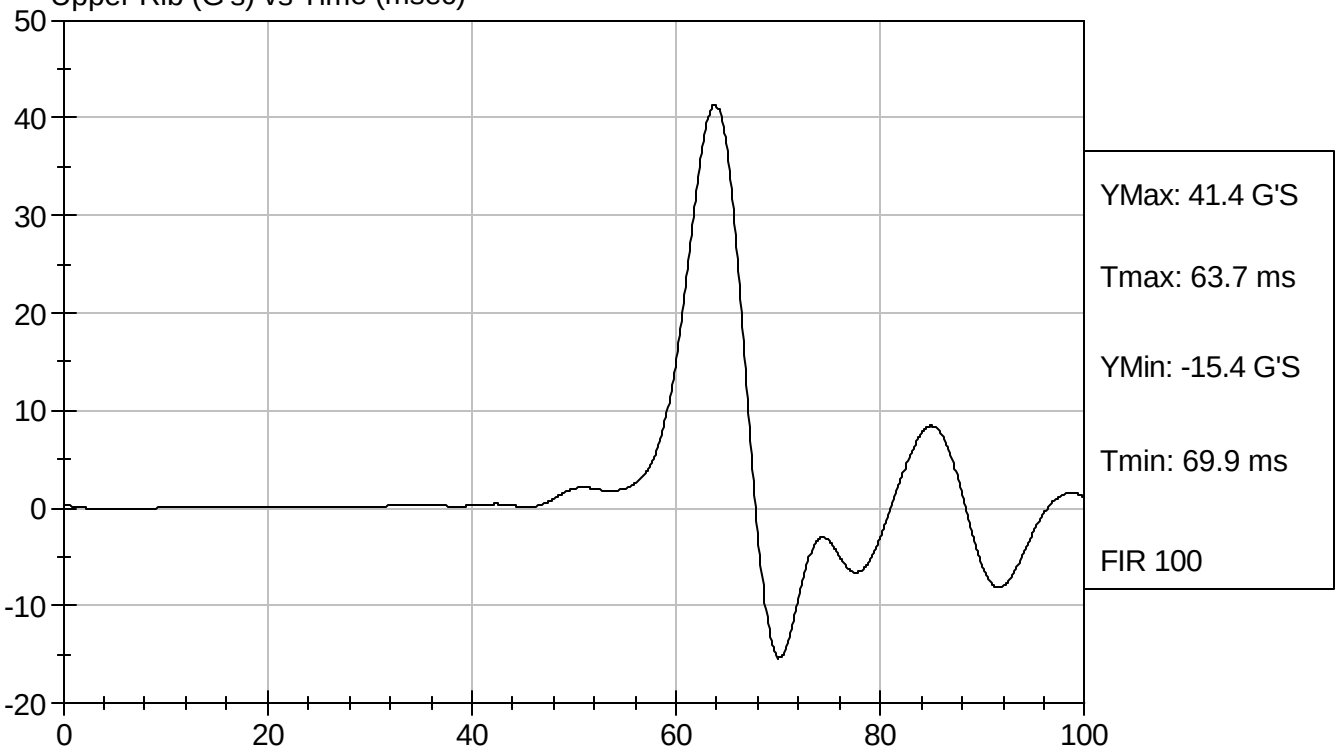
10/04/2005
Test Date

David Winkelbauer
Approved By

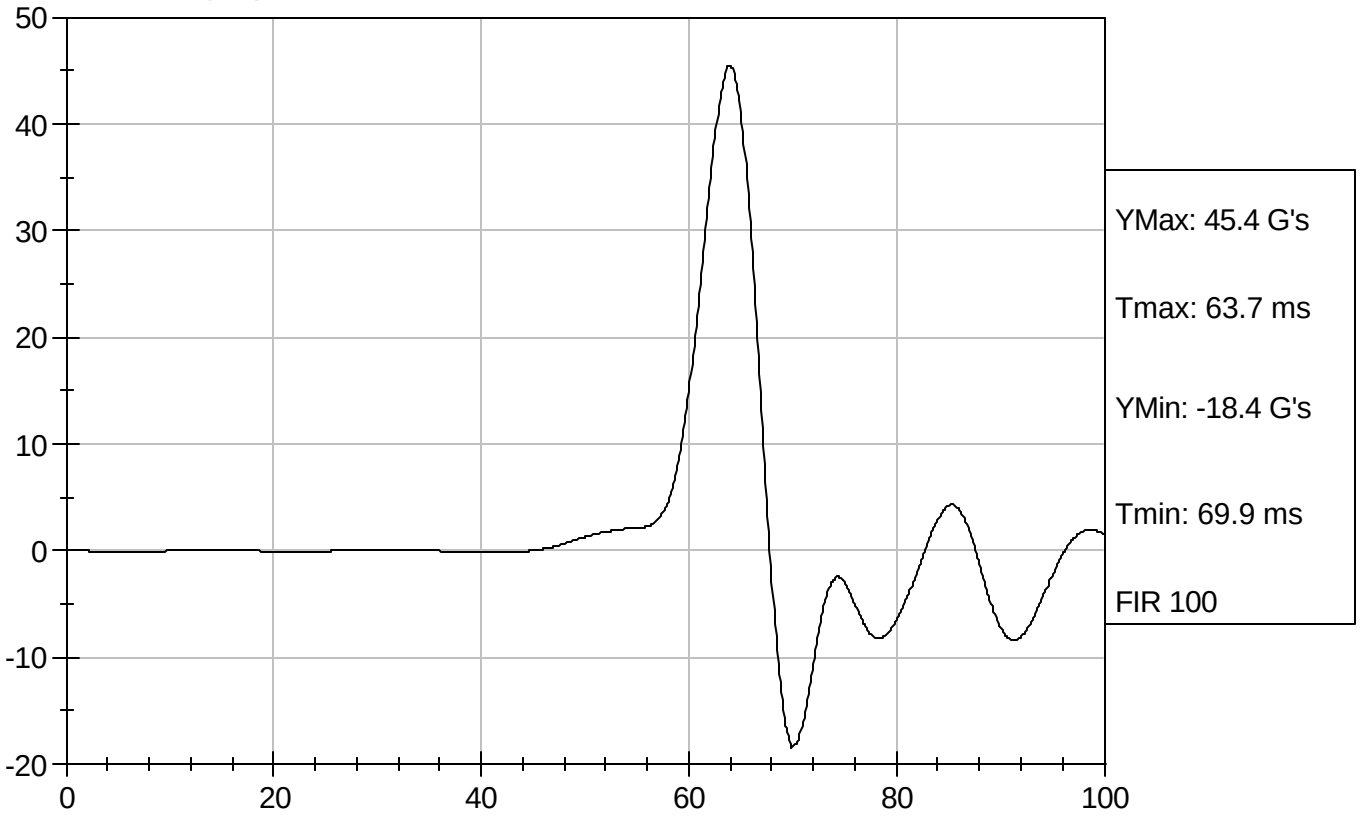
Test Desc: Thorax Impact
Component ID: D052712

Test Date: 10/04/2005
Speed: 14.14 ft/sec, 4.31 m/sec

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

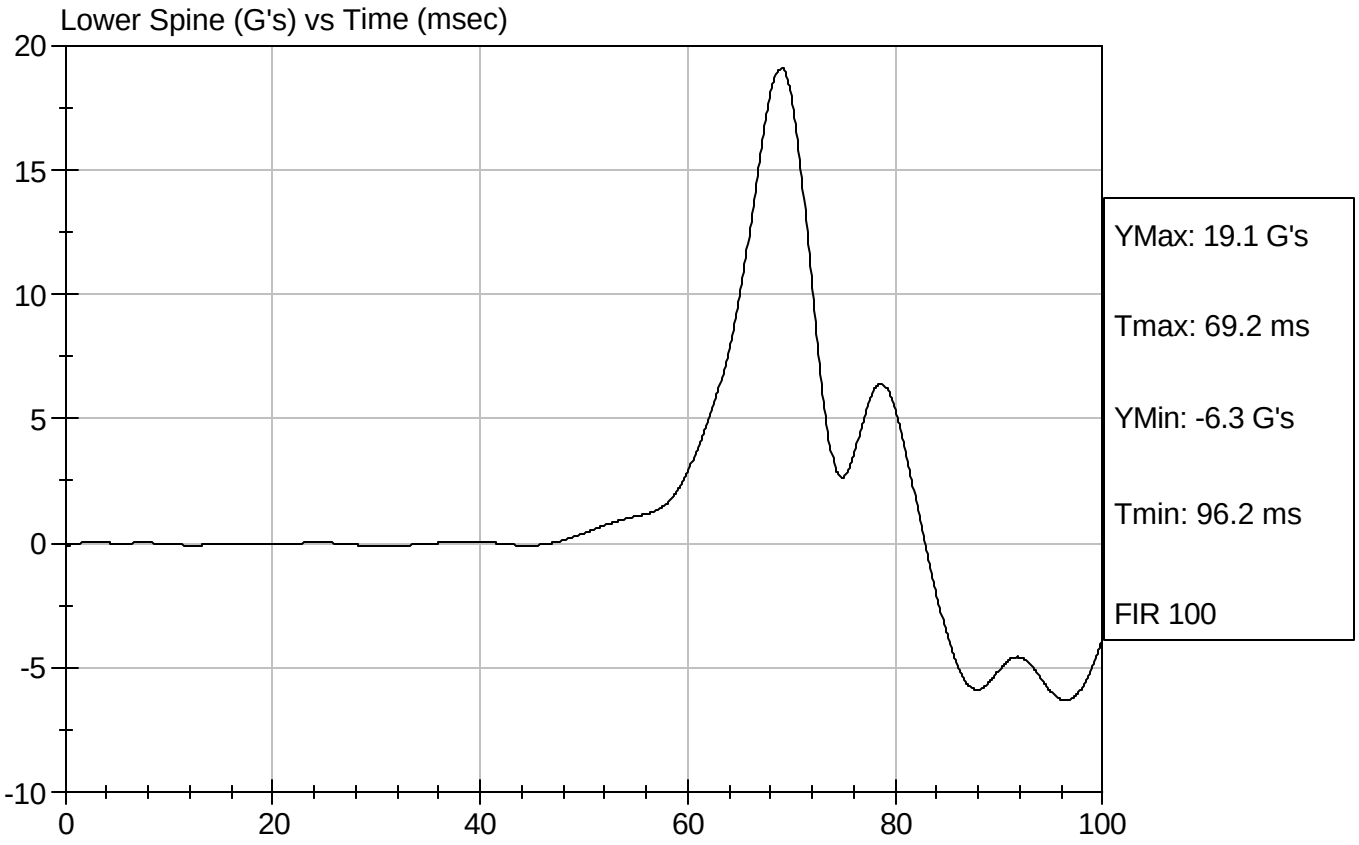


Lower Rib (G's) vs Time (msec)



Test Desc: Thorax Impact
Component ID: D052712

Test Date: 10/04/2005
Speed: 14.14 ft/sec, 4.31 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 271 **Test I.D:** D052713

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	42	Pass
		Overall Test Results		Pass

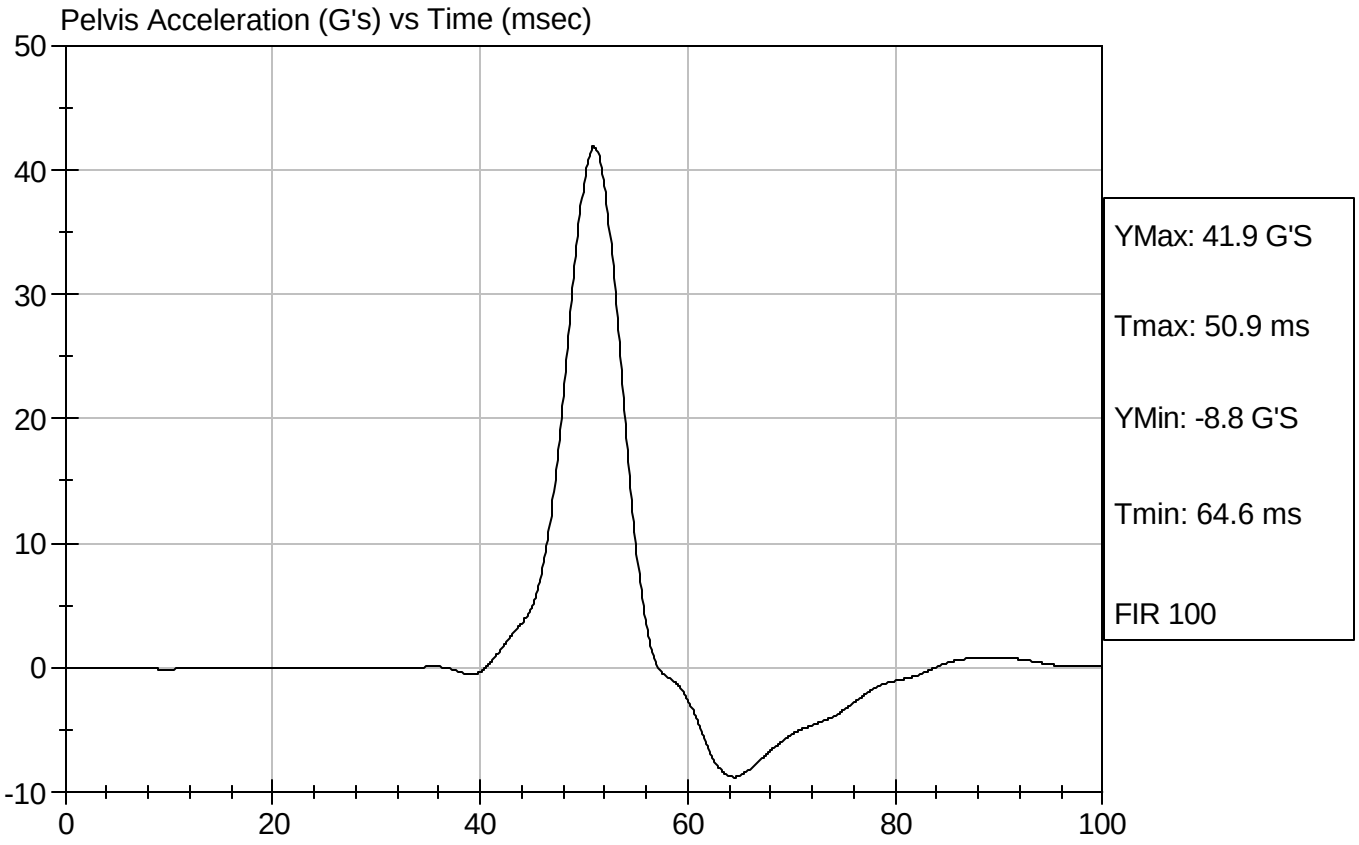
Jessica Hall
Laboratory Technician

10/04/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D052713

Test Date: 10/04/2005
Speed: 14.12 ft/sec, 4.30 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 271 **Test I.D:** D052714

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Force At 12.7 mm	N	104 -162	150	Pass
Force At 19 mm	N	163 - 222	205	Pass
Force At 25.4 mm	N	222 - 280	277	Pass
Force At 33 mm	N	325 - 391	387	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

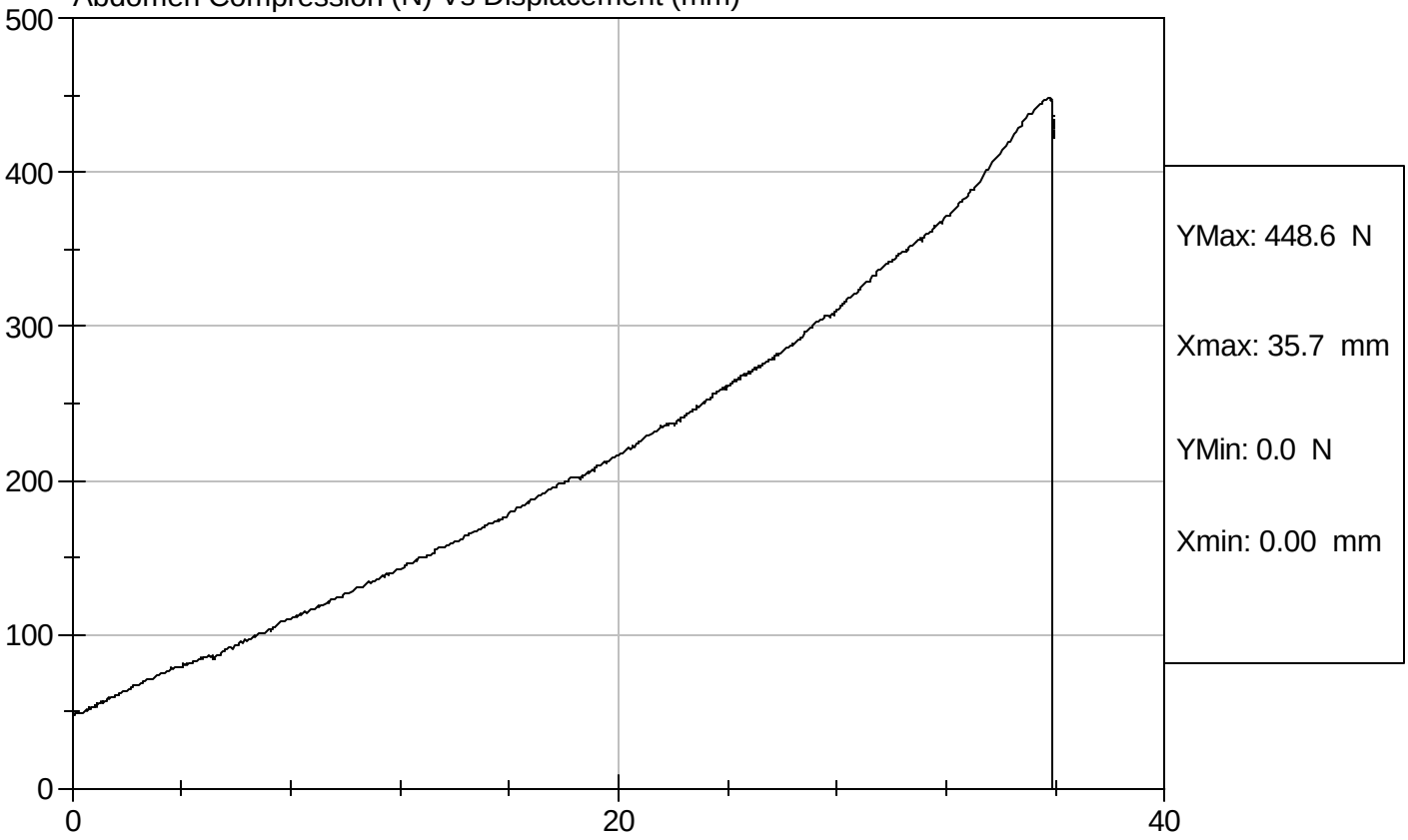
10/04/2005
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 10/04/2005

Component: D052714 Speed: 0 ft/sec, 0 m/sec

Abdomen Compression (N) Vs Displacement (mm)



SID Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 271 **Test I.D:** D052715

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	111.6	Pass
Force At 30 deg	N	151.2 - 204.6	173.7	Pass
Force At 40 deg	N	204.6 - 258.0	228.1	Pass
Return Angle	Deg	12 Maximum	3	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

10/04/2005
Test Date

David Winkelbauer
Approved By

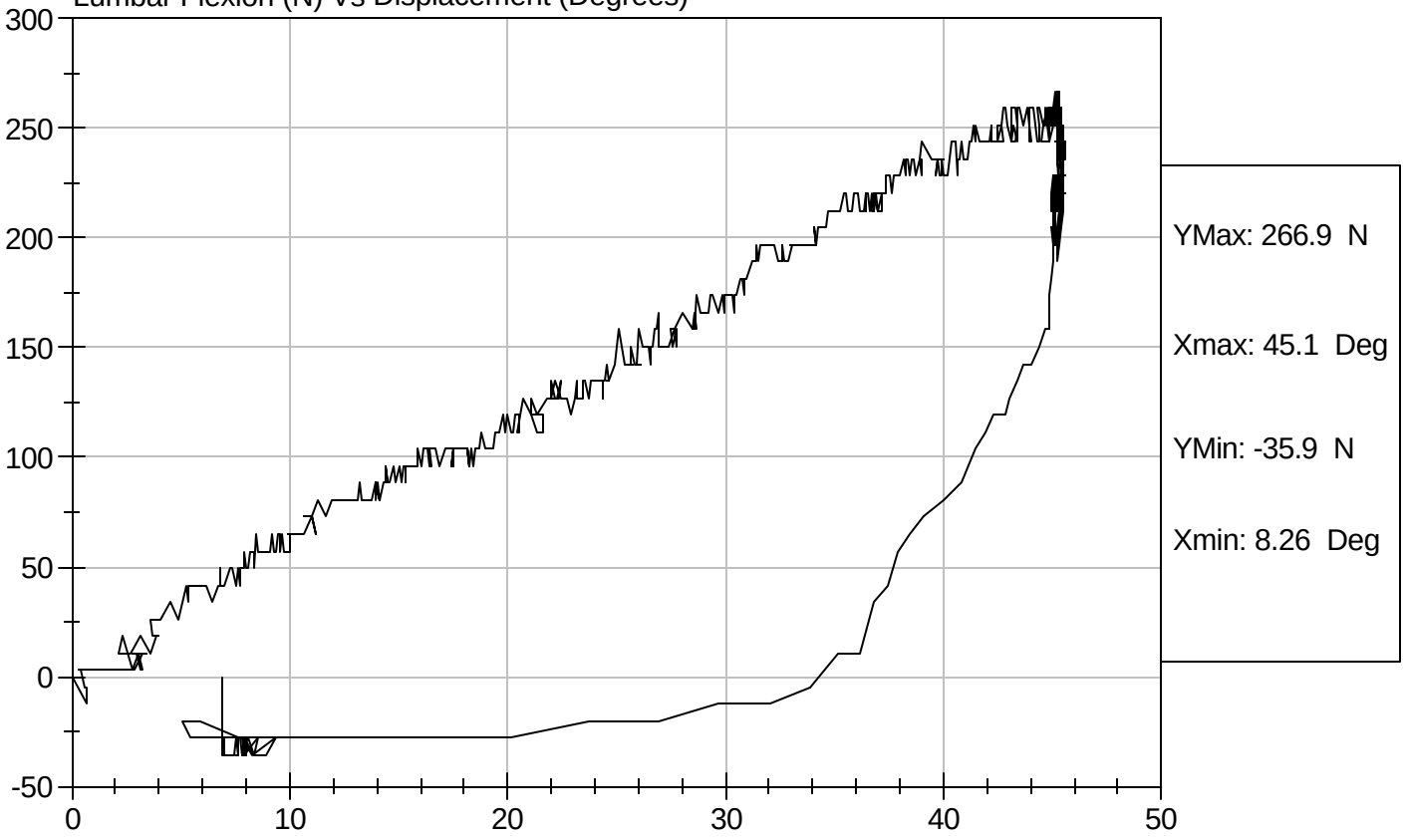
Test Description: Lumbar Flexion

Test Date: 10/04/2005

Component: D052715

Speed: 0 ft/sec, 0 m/sec

Lumbar Flexion (N) Vs Displacement (Degrees)



SID Calibration Data Sheet

Side Impact Dummy (SID)

Neck Pendulum Test

ATD Serial No: 271 **Test I.D:** D052719

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Impact Velocity		m/s	6.89 to 7.13	7.02	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.45	Pass
	20 msec	m/s	4.12 to 5.10	4.88	Pass
	30 msec	m/s	5.73 to 7.01	6.85	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.30	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	80	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	60	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	77	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	51	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	4	Pass

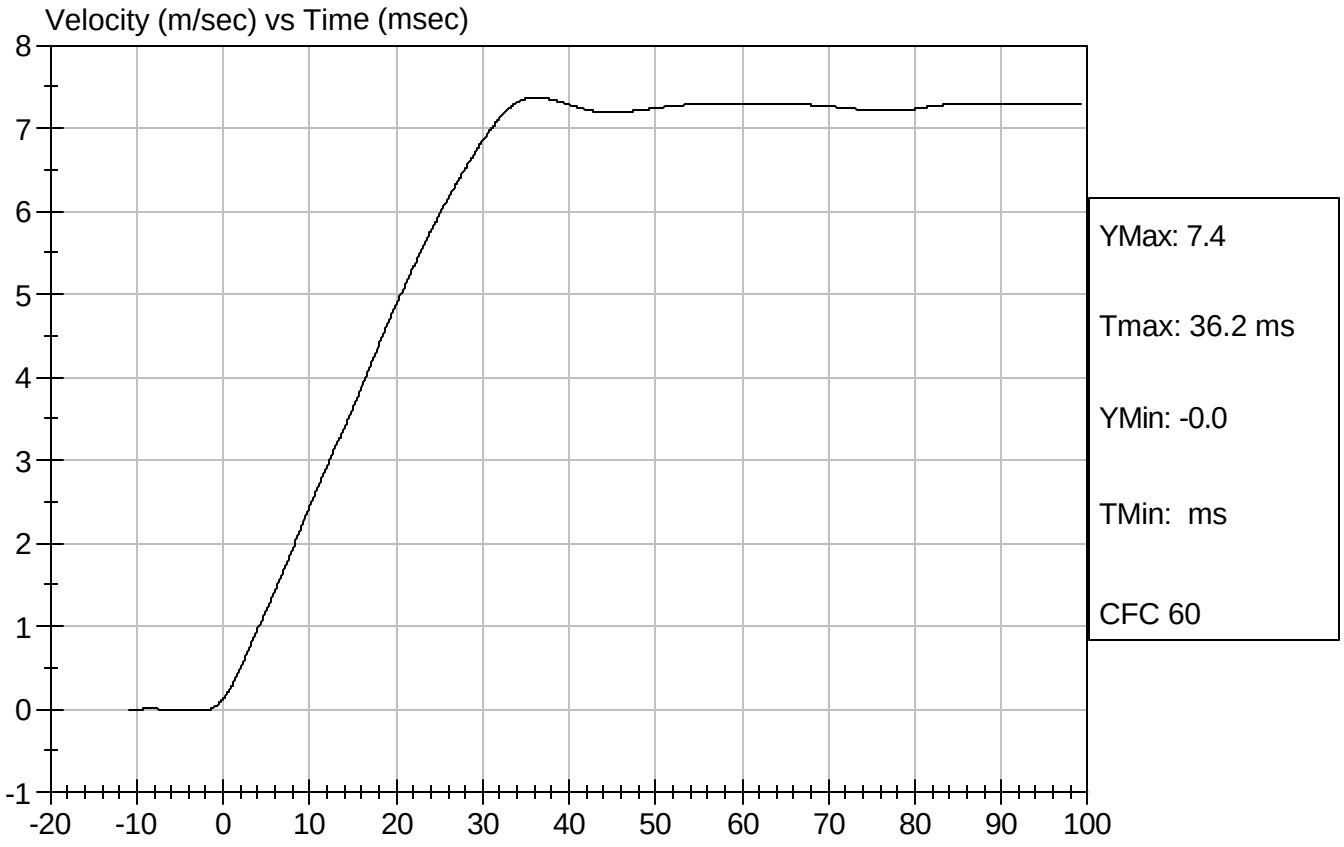
Jessica Hall
Laboratory Technician

10/04/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Bending
Component ID: D052719

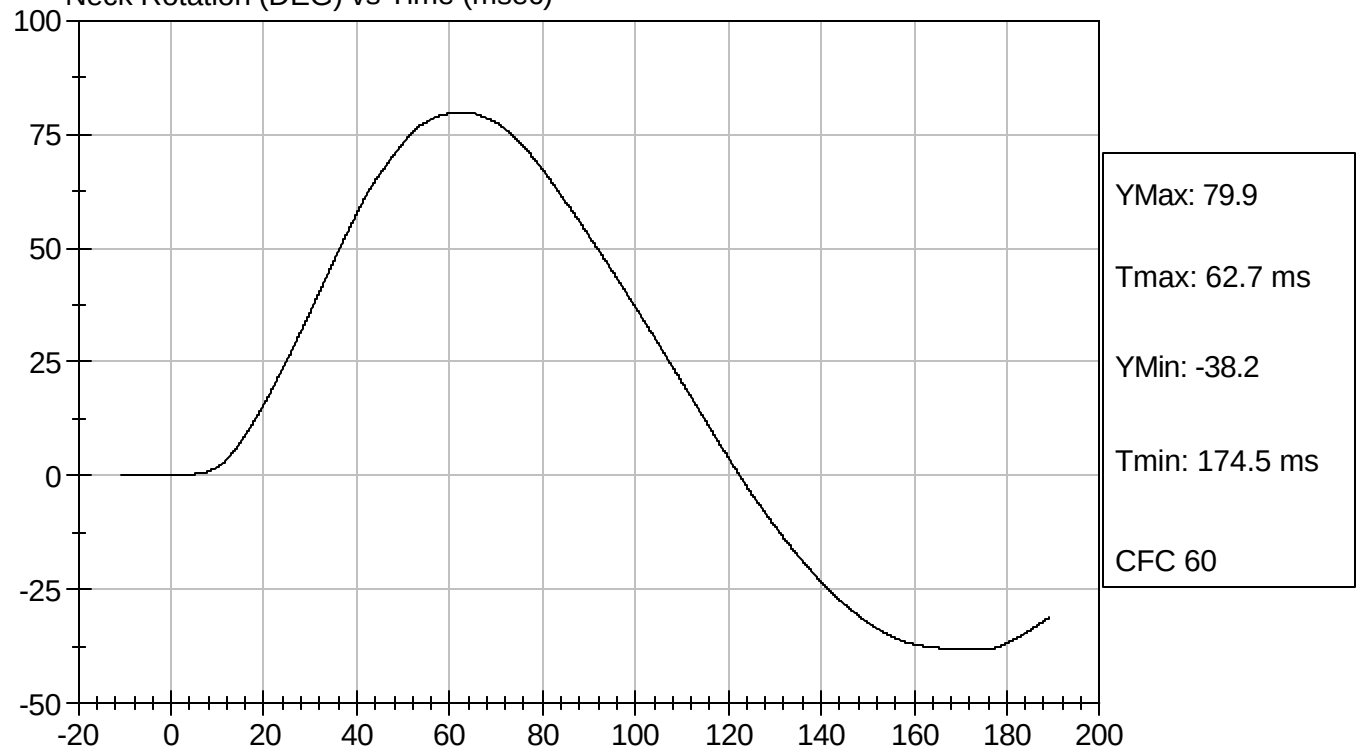
Test Date: 10/04/2005
Speed: 23.04 ft/sec, 7.02 m/sec



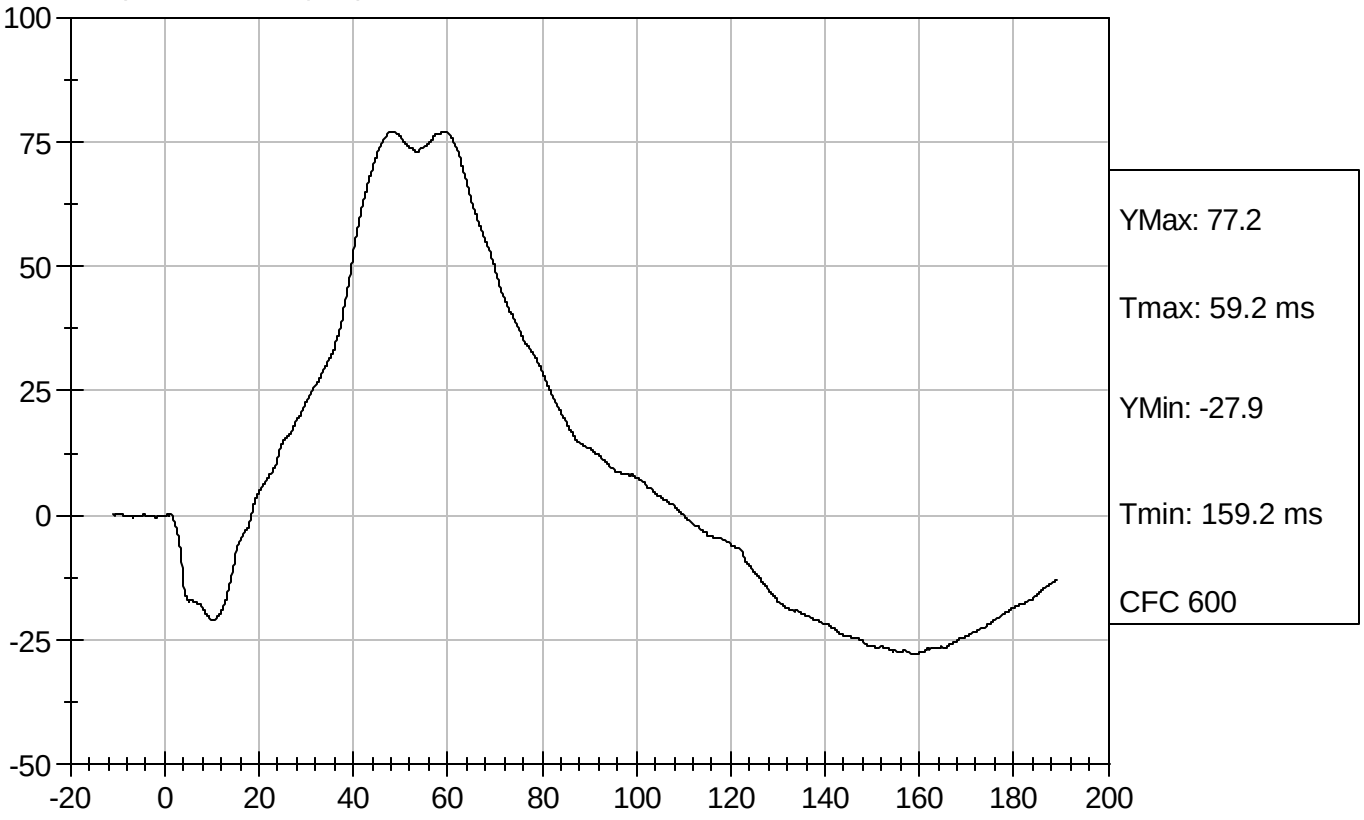
Test Desc: Neck Bending
Component ID: D052719

Test Date: 10/04/2005
Speed: 23.04 ft/sec, 7.02 m/sec

Neck Rotation (DEG) vs Time (msec)



Occipital Moment (Nm) vs Time (msec)



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

10/04/2005
Test Date

David Winkelbauer
Approved By