

REPORT NUMBER: NCAPSIDE-MGA-2006-001

**NEW CAR ASSESSMENT PROGRAM
SIDE IMPACT TEST**

**HYUNDAI MOTOR COMPANY
2005 HYUNDAI TUCSON
NHTSA NUMBER: M50509**

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



Test Date: August 31, 2005

Report Date: September 22, 2005

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
400 SEVENTH STREET, SW, ROOM 5311
WASHINGTON, D.C. 20590**

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

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Date: 9/22/05

Technical Report Documentation Page

1. Report No. NCAPSIDE-MGA-2006-001	2. Government Accession No. 	3. Recipient's Catalog No. 																						
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Testing of 2005 Hyundai Tucson NHTSA No.: M50509		5. Report Date September 22, 2005																						
		6. Performing Organization Code MGA																						
7. Author(s) Shefalika Naik, Project Engineer		8. Performing Organization Report No. NCAPSIDE-MGA-2006-001																						
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. Work Unit No. 																						
		11. Contract or Grant No. DTNH22-03-D-12005																						
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 400 Seventh Street, SW, Room 5311 Washington, D.C. 20590		13. Type of Report and Period Covered: <i>Final Report</i> 08/31/05 to 9/22/05																						
		14. Sponsoring Agency Code NVS-111																						
15. Supplementary Notes 																								
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP side impact was conducted on the subject 2005 Hyundai Tucson 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 31, 2005. The impact velocity of the Moving Deformable Barrier (MDB) was 62.4 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 288 mm at level 3. The test vehicle's occupant performance is as follows: <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th></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;">32.7</td> <td style="text-align: center;">32.4</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td style="text-align: center;">31.7</td> <td style="text-align: center;">43.5</td> </tr> <tr> <td>Lower Spine (T₁₂) Accel., g</td> <td style="text-align: center;">44.3</td> <td style="text-align: center;">55.0</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">38.5</td> <td style="text-align: center;">49.3</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td style="text-align: center;">50.8</td> <td style="text-align: center;">85.8</td> </tr> <tr> <td>HIC</td> <td style="text-align: center;">85.9</td> <td style="text-align: center;">137.9</td> </tr> </tbody> </table> 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.					<u>DRIVER</u>	<u>PASS.</u>	Left Upper Rib (LUR) Accel., g	32.7	32.4	Left Lower Rib (LLR) Accel., g	31.7	43.5	Lower Spine (T ₁₂) Accel., g	44.3	55.0	Thoracic Trauma Index (TTI)	38.5	49.3	Pelvis (PEV) Accel., g	50.8	85.8	HIC	85.9	137.9
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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																						
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 138	22. Price 																					

Form DOT F1700.7 (8-72)

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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 2005 Hyundai Tucson manufactured by Hyundai Motor Company.

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 2005 Hyundai Tucson was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.4 km/h. 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 1765.0 kg and the test weight of the MDB was 1360.8 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on August 31, 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-six (26) 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 288 mm at level 3, 1350 mm rearward of the left vertical impact point. The driver and passenger SID/HIIIs, Serial Nos. 271 and 904 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	85.9	45.1	77.2	38.5	50.8
Passenger	137.9	42.6	75.4	49.3	85.8

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	No		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 following channels did not collect valid data:

Passenger Lower Spine Yr after 42ms

LR Door Upper Centerline Y after 200ms

DATA SHEET NO. 1**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2005 Hyundai TucsonNHTSA No. M50509Test Program: NCAP Side ImpactTest Date: 08/31/2005**TEST VEHICLE INFORMATION**

Make	Hyundai
Model	Tucson
Body Style	MPV
NHTSA No.	M50509
VIN	KM8JM12B45U095882
Color	Silver
Delivery Date	8/23/05
Odometer Reading (mile)	96
Dealer	Arrow Hyundai
Transmission	Automatic
Final Drive	2WD
Number of Cylinders	4
Engine Displacement (L)	2.0
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	Yes
Tilt Wheel	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	No
Power Seats	No
Pretensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company, Korea
Date of Manufacture	November 29, 2004

GVWR (kg)	2030
GAWR Front (kg)	1150
GAWR Rear (kg)	1100

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				390
Cargo Wt. (RCLW) (kg)				49.9

DATA SHEET NO. 1 (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	468.0	304.0		539.0	391.0	
Right	kg	452.5	324.5		457.0	378.0	
Ratio	%	59.4	40.6		56.4	43.6	
Totals	kg	920.5	628.5	1549.0	996.0	769.0	1765.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1549.0
Weight of 2 P572E ATDs	kg	161.5
Rated Cargo/Luggage Weight (RCLW)	kg	49.9
Calculated Vehicle Target Weight (TVTW)	kg	1760.4

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

Weight of Ballast in Cargo Area: 20.4 kg

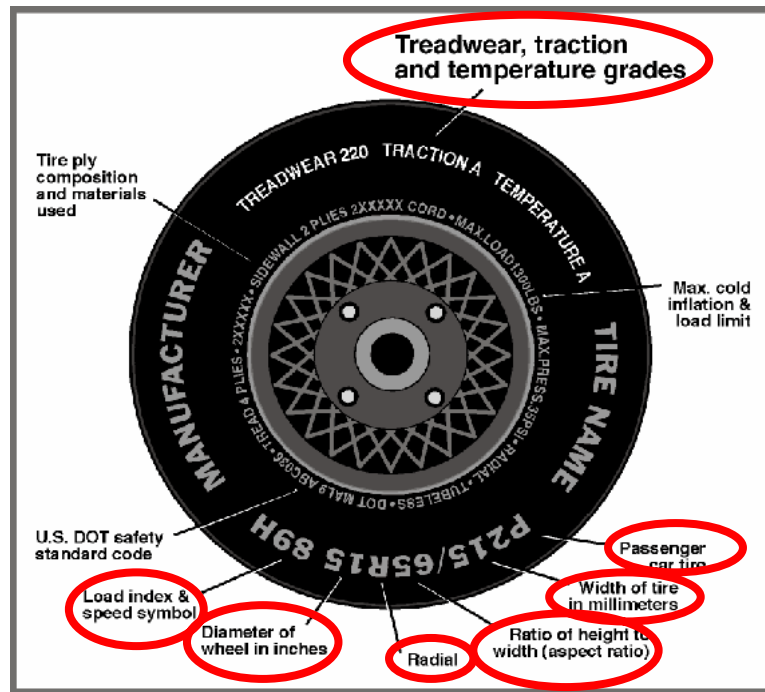
TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	763	763	802	796	1066
As Tested	mm	751	764	762	770	1145
Fully Loaded	mm	750	764	763	757	

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2628
Target Impact Point Aft of Front Axle	mm	374
Actual Impact Point Aft of Front Axle	mm	381

**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)	210	210
Recommended Tire Size	P215/65R16	P215/65R16
Tire Size on Vehicle	P215/65R16	P215/65R16
Tire Manufacturer	Kumho	Kumho
Tire Name	Ecsta HP4	Ecsta HP4
Tire Type	P	P
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	96T	96T
Treadwear	360	360
Traction Grade	A	A
Temperature Grade	B	B

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

Test Vehicle: 2005 Hyundai Tucson
Test Program: NCAP Side Impact

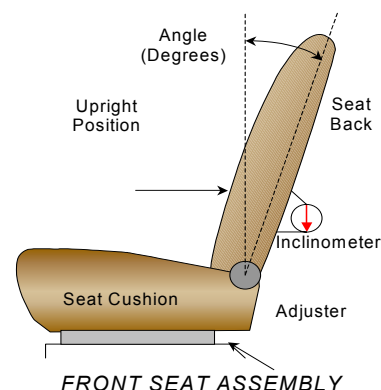
NHTSA No. M50509
Test Date: 08/31/2005

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The seat back angle can be measured if the inclinometer is attached to seat back plastic cover at the area of 90~200mm away from the top of the seat plastic cover = 21 degrees.

Driver seat back angle: 20.7° on seat back plastic cover

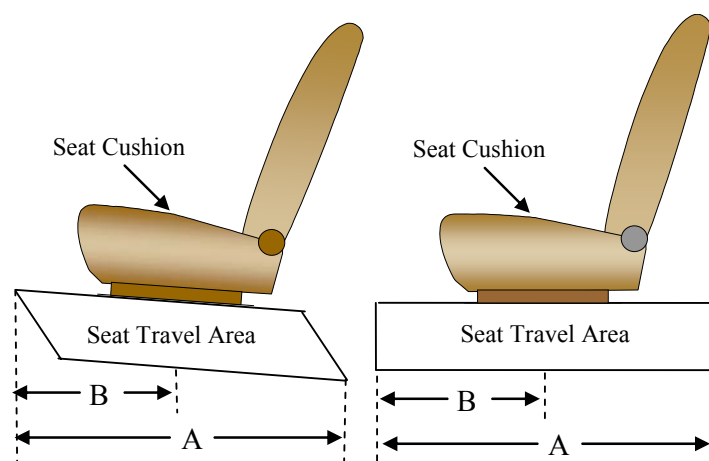
Passenger seat back angle: 9.3° on head rest post



SEAT FORE/AFT POSITIONS

The center of fore and aft seat travel can be detected if the seat is moved 12 steps (120mm) forward from the rearmost seat position. One step of seat adjustment is 10mm. The total distance of seat travel is 240mm (24 steps x 10mm).

SEAT FORE/AFT POSITIONS		
	Total Fore/Aft Travel	Placed in position #
Driver Seat	25 detents	13 detents
Rear Seat	Non adjustable	Non adjustable



DATA SHEET NO. 3 (CONTINUED)

TEST VEHICLE INFORMATION

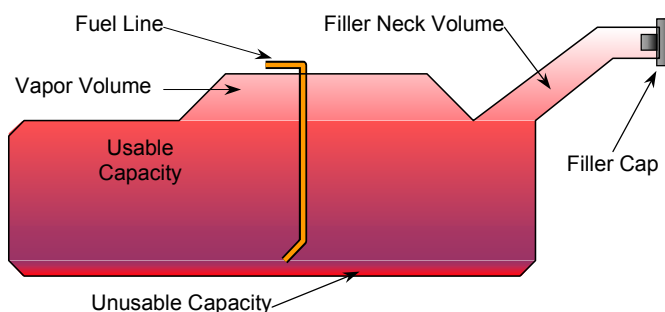
Test Vehicle: 2005 Hyundai Tucson
Test Program: NCAP Side Impact

NHTSA No. M50509
Test Date: 08/31/2005

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	65.0
Usable Capacity of "Optional" Tank	
92 to 94% of Usable Capacity	59.8 to 61.1
Actual Amount of Solvent used	60.2
1/3 of Usable Capacity	21.7

The test vehicle is equipped with an electric fuel pump. The fuel pump will operate when engine system is normally operating.

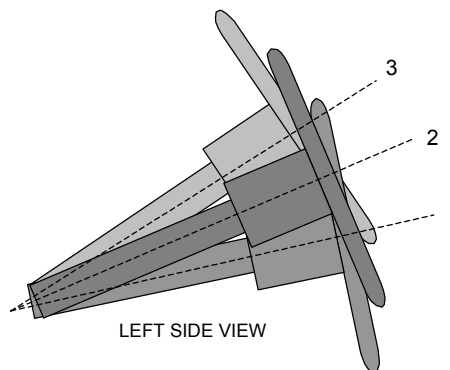


VEHICLE FUEL TANK ASSEMBLY

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.

Manufacturer's angle = 28°



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		25.5
Geometric center position No. 2		27.9*
Uppermost position No. 3		30.4

* Placed in the manufacturer's nominal design position.

DATA SHEET NO. 4**MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS**Test Vehicle: 2005 Hyundai TucsonNHTSA No. M50509Test Program: NCAP Side ImpactTest Date: 08/31/2005**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	62.4
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.4
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	7 mm Rear
Vertical Offset	mm	+/-20	13 mm Up

DATA SHEET NO. 5
POST TEST OBSERVATIONS

Test Vehicle: 2005 Hyundai Tucson
Test Program: NCAP Side Impact

NHTSA No. M50509
Test Date: 08/31/2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat SID/HIII	Rear Seat SID/HIII
Dummy Type / Serial No.	SID HIII / 271	SID HIII / 904
Head Contact	Curtain airbag, Headrest	Curtain airbag, Headrest
Upper Torso Contact	Side Airbag	Door Panel
Lower Torso Contact	Side Airbag	Door Panel
Left Knee Contact	Door Panel	Door Panel
Right Knee Contact	Left Knee	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
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 02	
	Installed	Operation	Installed	Operation
Front Airbag	Yes	No	No	
Side Airbag	Yes	Yes	No	
Head Airbag	No		No	
Curtain Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes		No	
Seat Belt Load Limiter	Yes		No	

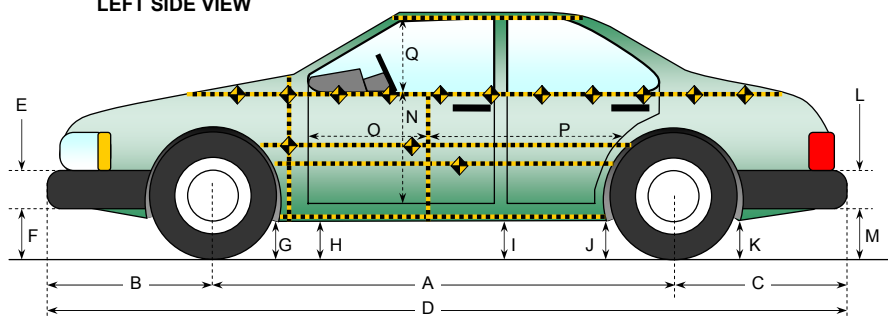
DATA SHEET NO. 6

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005

LEFT SIDE VIEW



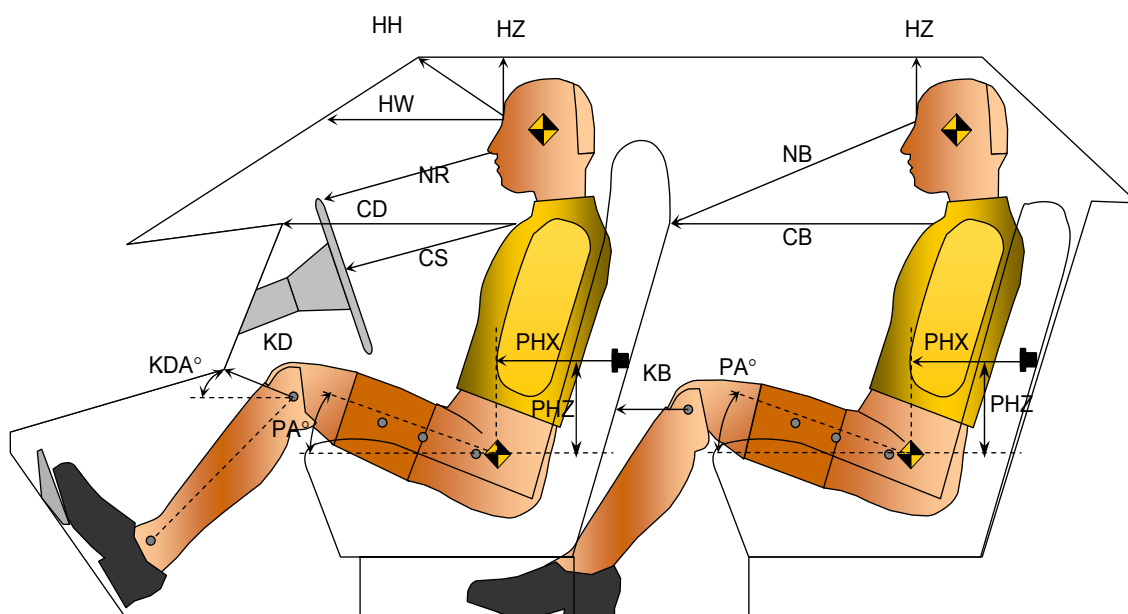
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2628	2620	8
B	Front Axle to FSOV	879	832	47
C	Rear Axle to RSOV	804	813	-9
D	Total Length at Centerline	4311	4265	46
E	Front Bumper Thickness	135	135	0
F	Front Bumper Bottom to Ground	407	412	-5
G	Sill Height at Front Wheel Well	277	284	-7
H	Sill Height at Front Door Leading Edge	269	285	-16
I	Sill Height at "B" Pillar	268	326	-58
J1	Sill Height at Rear Wheel Well	260	289	-29
J2	Pinch Weld Height at Rear Wheel Well	258	281	-23
K	Sill Height Aft of Rear Wheel Well	273	269	4
L	Rear Bumper Thickness	165	165	0
M	Rear Bumper Bottom to Ground	371	381	-10
N	Sill Height to Window Bottom Sill	784	728	56
O	Front Door Leading Edge to Impact CL	730	721	9
P	Rear Door Trailing Edge to Impact CL	1235	1119	116
Q	Front Window Opening	500	490	10
R	Right Side Length	3691	3694	-3
S	Left Side Length	3695	3647	48
T	Vehicle Width at "B" Post	1862	1489	373

DATA SHEET NO. 7
SID/HII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005

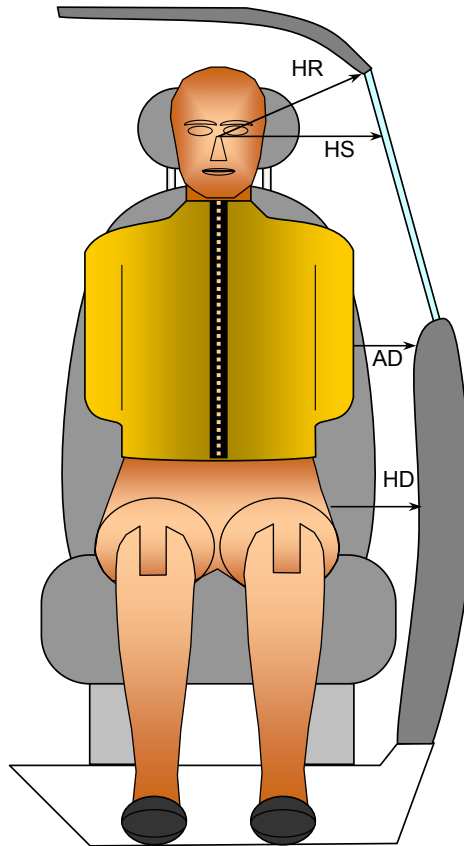


Driver Code	Pass. Code	Measurement Description	Driver S/N 271		Passenger S/N 904	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	386			
HW		Head to Windshield	595			
HZ	HZ	Head to Roof	189		175	
NR	NB	Nose to Rim/Nose to Seatback	421		665	
CD	CB	Chest to Dash or Seatback	517		597	
CS		Chest to Steering Wheel	295			
KDL	KBL	Left Knee to Dash or Seatback	106	19.0	252	114.6
KDR	KBR	Right Knee to Dash or Seatback	86	18.8	250	25.0
PA	PA	Pelvic Angle		24.1		24.6
PHX	PHX	H-Point to Striker (X-Axis)	215		277	
PHZ	PHZ	H-Point to Striker (Z-Axis)	89		227	

DATA SHEET NO. 8
SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005



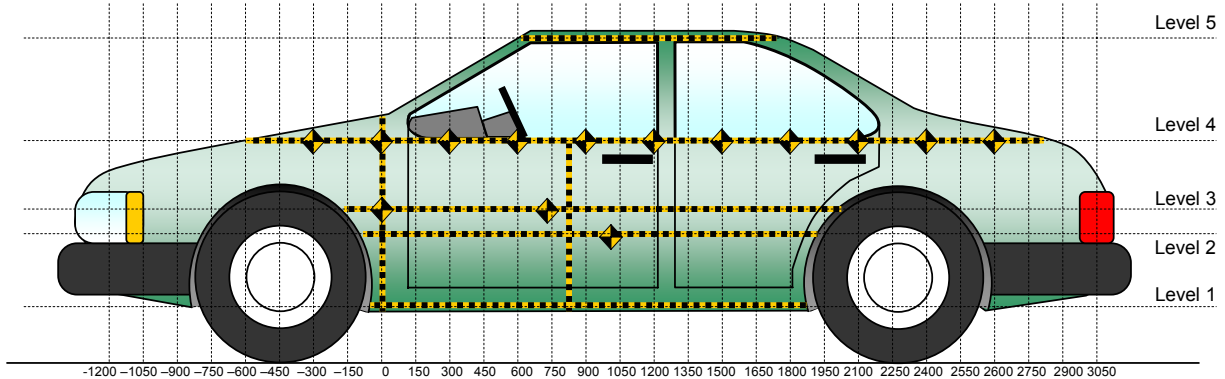
FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver S/N 271	Passenger S/N 904
HR	Head to Side Header	mm	222	203
HS	Head to Side Window	mm	352	335
AD	Arm to Door	mm	65	66
HD	H-Point to Door	mm	205	163

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

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005



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	10	1350	1564
4	Window Sill	215	1200	1082
3	Mid Door	288	1350	726
2	Occupant H-Point	287	1200	677
1	Sill Top	202	1350	342
	Maximum Penetration	288		

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-750				325					320					-5	
-600				320					311					-9	
-450				311					306					-5	
-300				306					306					0	
-150				301					306					5	
0		205	206	298			245	242	308			40	36	10	
150	284	227	224	294		401	412	402	315		117	185	178	21	
300	287	226	222	293		410	450	426	316		123	224	204	23	
450	285	226	222	295		426	455	440	326		141	229	218	31	
600	284	225	221	290		441	467	456	342		157	242	235	52	
750	284	225	220	290	491	453	468	464	363	490	169	243	244	73	-1
900	283	225	220	292	490	463	479	473	388	492	180	254	253	96	2
1050	283	225	220	295	490	476	485	485	416	494	193	260	265	121	4
1200	284	225	220	295	494	484	512	505	510	500	200	287	285	215	6
1350	284	228	222	298	494	486	500	510	491	504	202	272	288	193	10
1500	284	230	224	298	494	477	490	504	446	501	193	260	280	148	7
1650	285	231	227	303	495	460	481	497	407	500	175	250	270	104	5
1800	283	234	229	308	498	425	471	458	369	498	142	237	229	61	0
1950		216	228	312	502		348	345	335	500		132	117	23	-2
2100			204	317	504			290	314	500			86	-3	-4
2250				324	511				335	505				11	-6
2400				329	517				332	511				3	-6
2550				339					332					-7	
2700				350					345					-5	

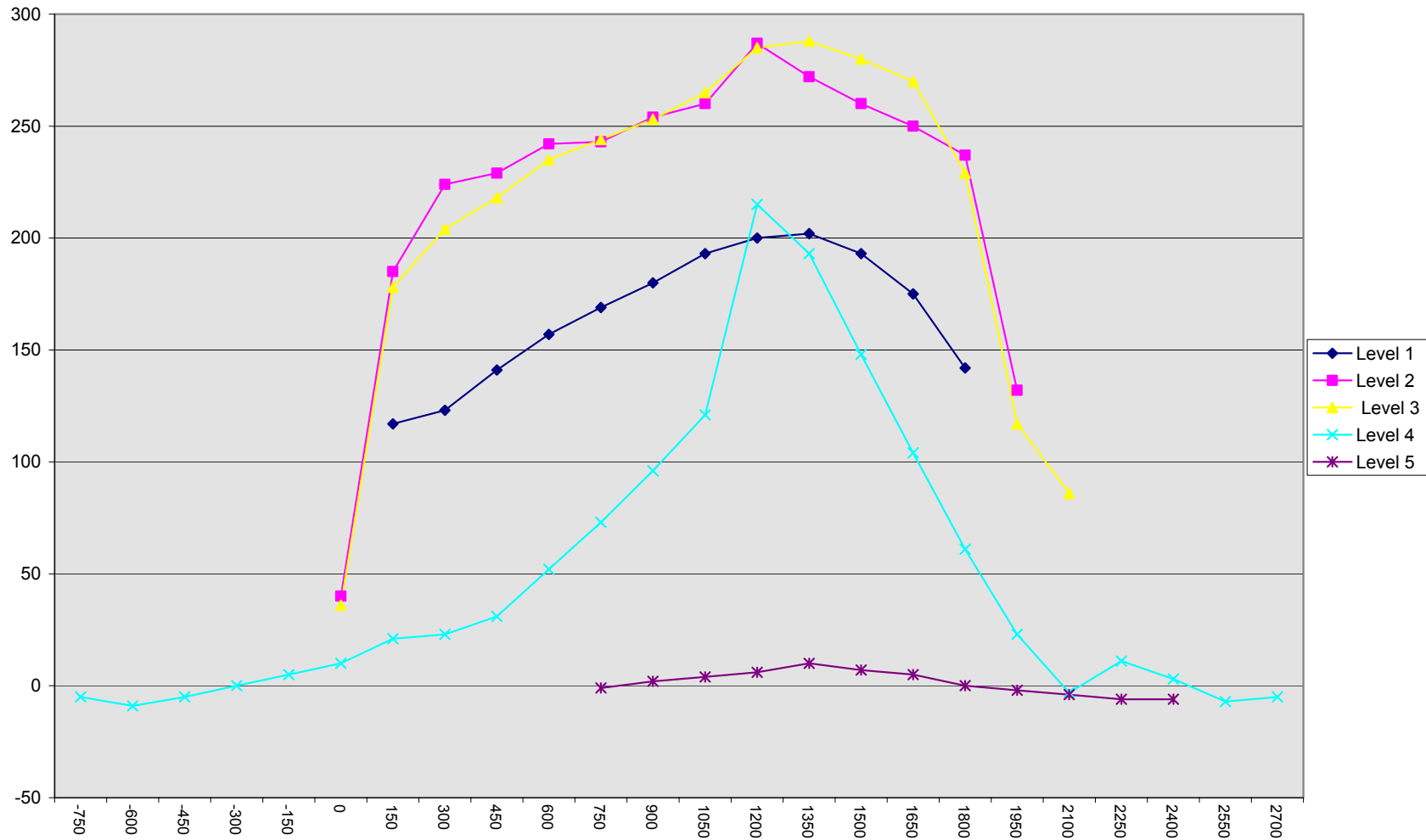
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body

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

Test Vehicle: 2005 Hyundai Tucson
Test Program: NCAP Side Impact

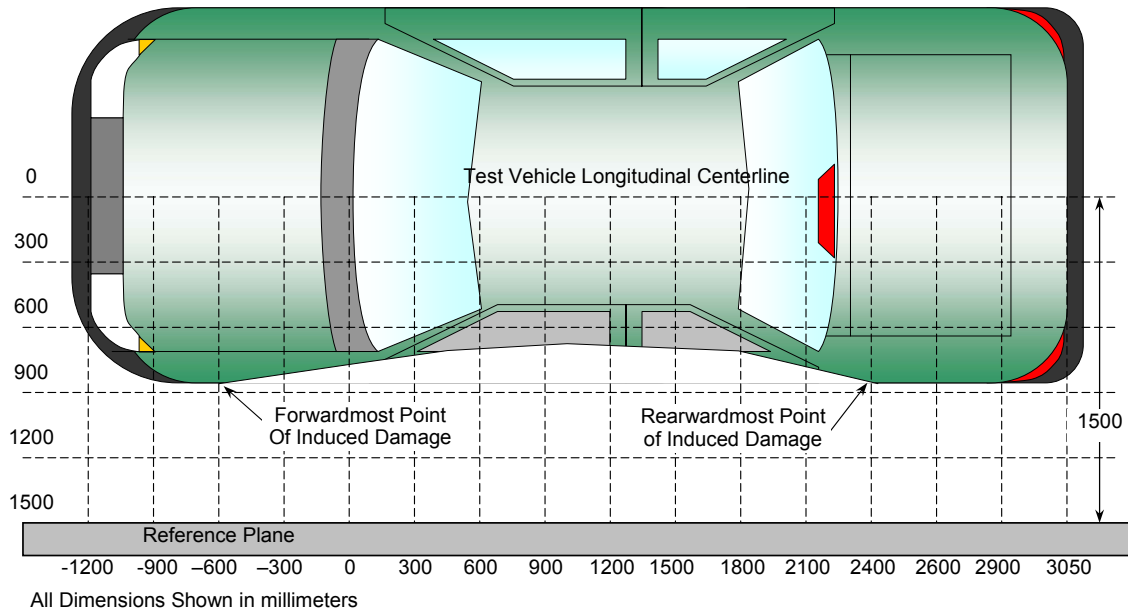
NHTSA No. M50509
Test Date: 08/31/2005



DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005



TOP VIEW

DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2100 mm	4	317	314	-3
2	1575 mm	3	224	500	276
3	1085 mm	2	225	491	266
4	610 mm	2	225	468	243
5	142 mm	2	227	411	184
6	-300 mm	4	306	306	0

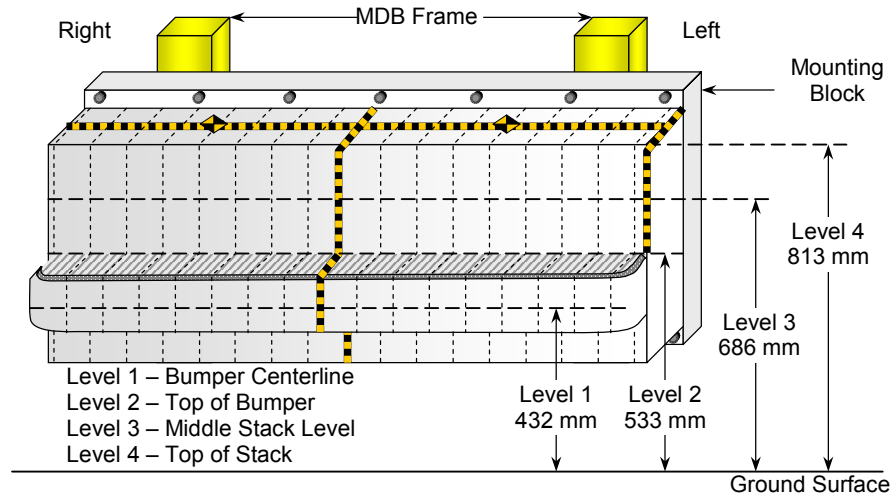
Reference plane is parallel to test vehicle longitudinal centerline.
 Given dimensions = Reference plane to car body.

DATA SHEET NO. 12

DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005



DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C _L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	92	75	62	54	52	53	53	54	55	57	61	66	71	78	88	105	120
2	60	52	43	39	36	16	20	39	33	43	46	50	52	56	60	67	76
3	62	46	35	25	14	7	17	19	15	13	13	18	20	32	48	62	106
4	85	58	40	20	31	32	42	29	31	39	45	54	63	75	89	119	168

All Dimensions in mm

DATA SHEET NO. 13

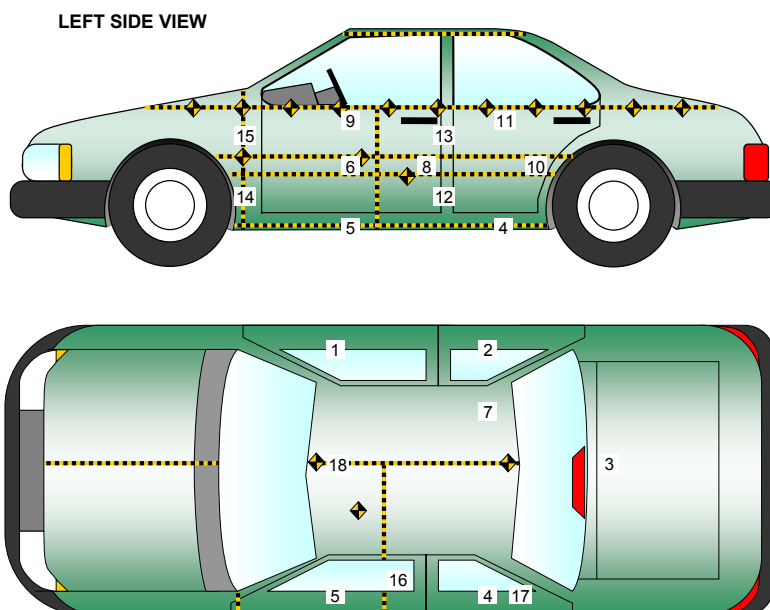
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2005 Hyundai Tucson

NHTSA No. M50509

Test Program: NCAP Side Impact

Test Date: 08/31/2005



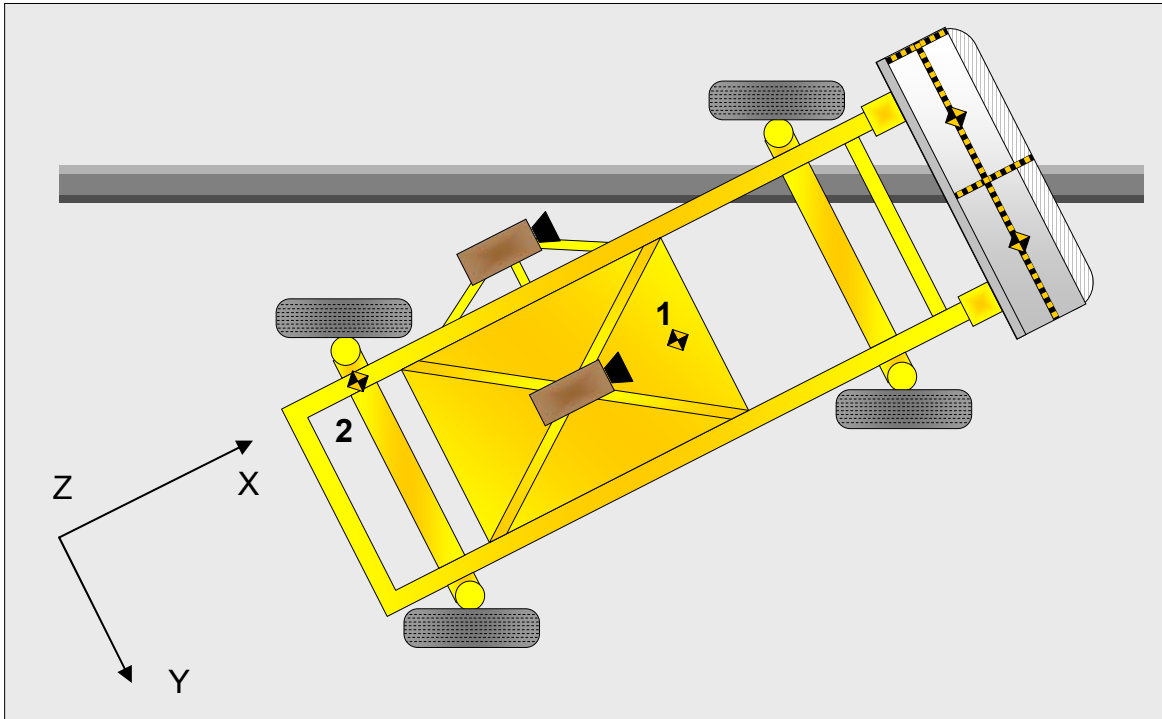
Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2247	700	321
2	Right Sill at Rear Seat	1502	700	324
3	Rear Floorpan Above Axle	886	-35	613
4	Left Sill at Rear Door	1514	-700	327
5	Left Sill at Front Door	2226	-700	325
6	Left Front Door C/L	2170	-738	853
7	Rear Occupant Compartment	1725	0	443
8	Left Front Door Mid-Rear	2059	-721	846
9	Left Front Door Upper C/L	2396	-732	1085
10	Left Rear Door Mid-Rear	1061	-730	1120
11	Left Rear Door Upper C/L	1498	-742	1106
12	Left Lower B-Post	1861	-715	712
13	Left Middle B-Post	1867	-712	1005
14	Left Lower A-Post	2906	-702	670
15	Left Middle A-Post	2922	-784	1016
16	Front Seat Track	1903	-576	463
17	Rear Seat Track or Structure	1447	-478	525
18	Vehicle CG	2241	0	376

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: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005



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: 2005 Hyundai Tucson
Test Program: NCAP Side Impact

NHTSA No. M50509
Test Date: 08/31/2005

	Elements	Pre-Test (mm)
1	Total Length	4311
2	Total Width	1862
3	Bumper Top Height	770
4	Bumper Bottom Height	280
5	Longitudinal Member Top Height	595
6	Distance between Longitudinal Members	1080
7	Longitudinal Member Width	95
8	Engine Top Height	840
9	Engine Bottom Height	245
10	Engine and gearbox width	830
11	Front bumper-engine distance	585
12	Front shock absorber fixing height	890
13	Bonnet leading edge height	780
14	Front shock absorber fixing width	1145
15	Front bumper – front axle distance	880
16	Front axle – a pillar distance	387
17	A-pillar – B-pillar distance	1145
18	B-Pillar – rear axle distance	1098
19	B-pillar – C-pillar distance	710
20	Roof sill bottom height	1560
21	Roof sill top height	1625
22	Floor sill bottom height	305
23	Floor sill top height	432

DATA SHEET NO. 16

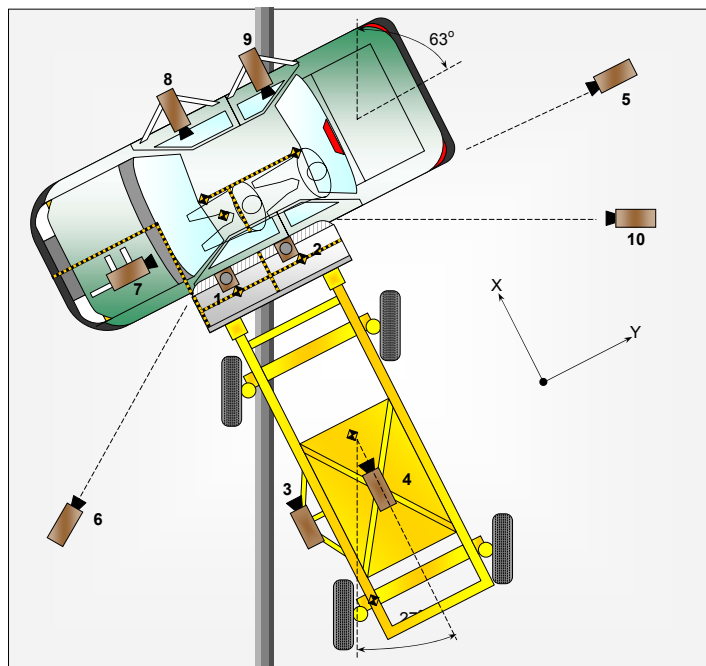
HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2005 Hyundai Tucson

NHTSA No. M50509

Test Program: NCAP Side Impact

Test Date: 08/31/2005



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Close-up	925	-100	4240	50	1000
2	Overhead Overall	90	560	5430	14	1000
3	MDB Onboard, Impact Point Close-up				50	1000
4	MDB Onboard, Centerline of Impact				25	1000
5	Right Side, Ground Level, Overall	-760	8135	1580	35	1000
6	Left Side, Ground Level, Overall	2540	-3700	1470	24	1000
7	Vehicle Onboard Front SID/HIII, Front				12.5	500
8	Vehicle Onboard Front SID/HIII, Side				8	500
9	Vehicle Onboard Rear SID/HIII, Side				8	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: 2005 Hyundai Tucson
 Test Program: NCAP Side Impact

NHTSA No. M50509
 Test Date: 08/31/2005

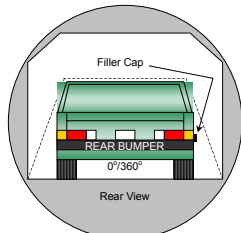
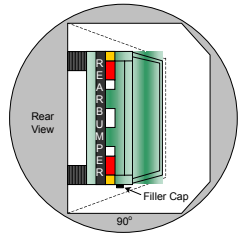
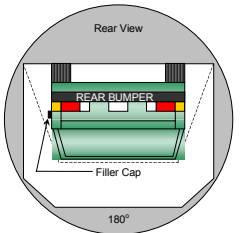
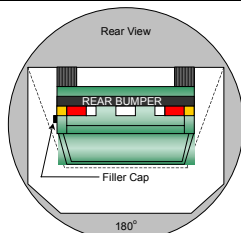
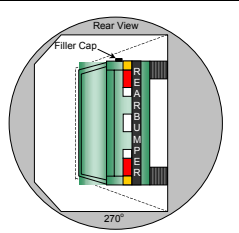
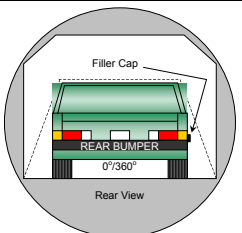
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 12:25 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
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°	162	300	First 5	0
90° to 180°	152	300	First 5	0
180° to 270°	149	300	First 5	0
270° to 360°	161	300	First 5	0

APPENDIX A
PHOTOGRAPHS

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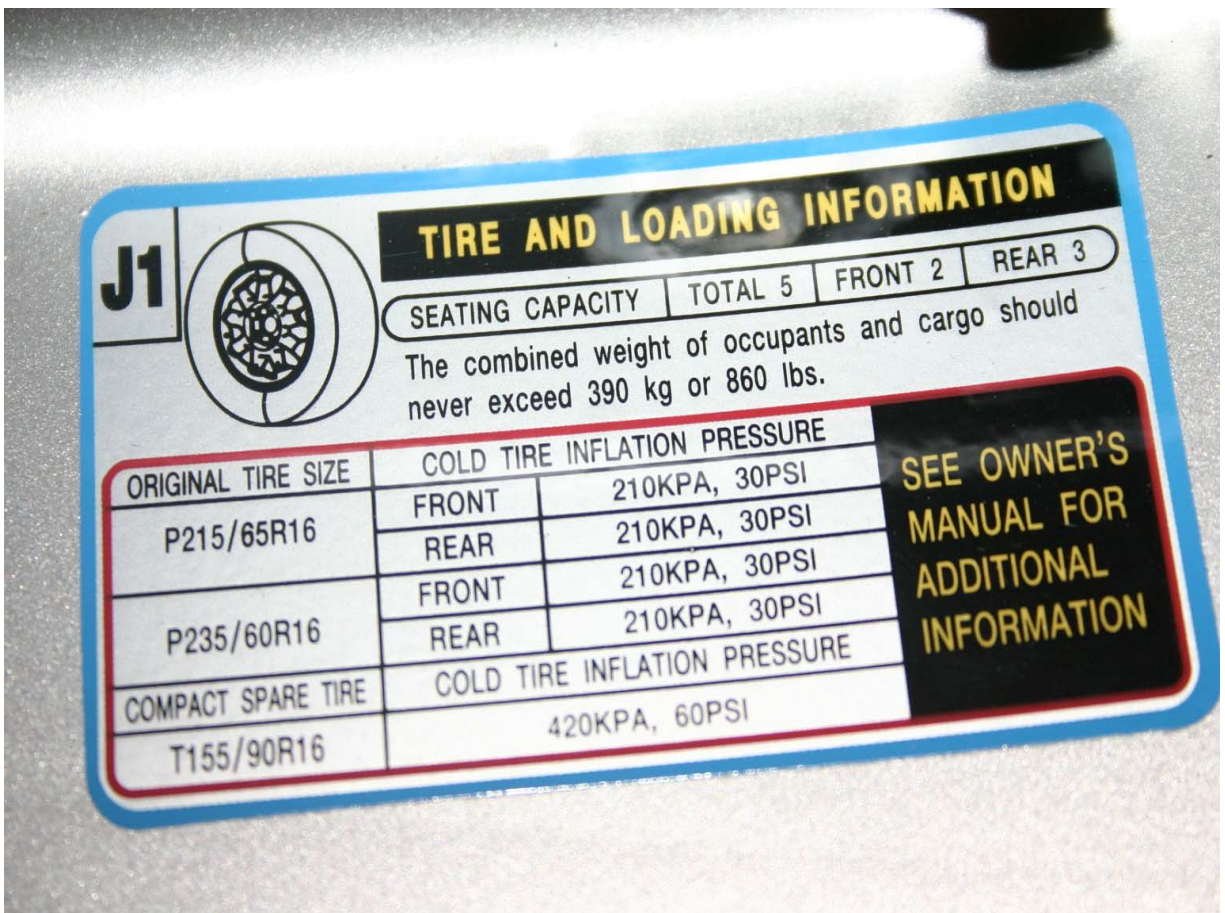
Left Front $\frac{3}{4}$ View, As Received



Right Rear $\frac{3}{4}$ View, As Received



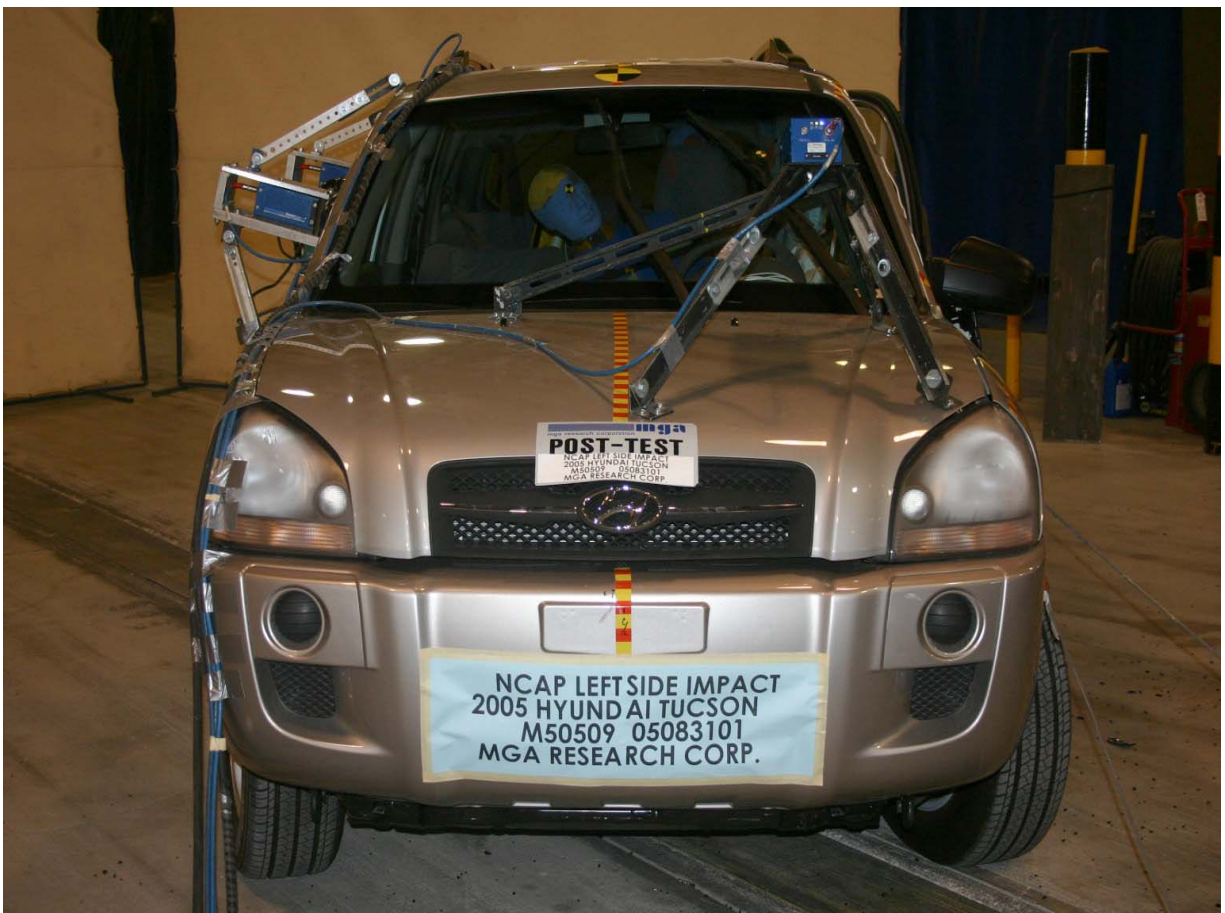
Manufacturer's Label



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 $\frac{3}{4}$ View



Post-Test Left Rear $\frac{3}{4}$ 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 Overhead Close-up View



Post-Test Overhead Close-up View



Pre-Test Left Impact Point



Post-Test Left Impact Point



Pre-Test 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



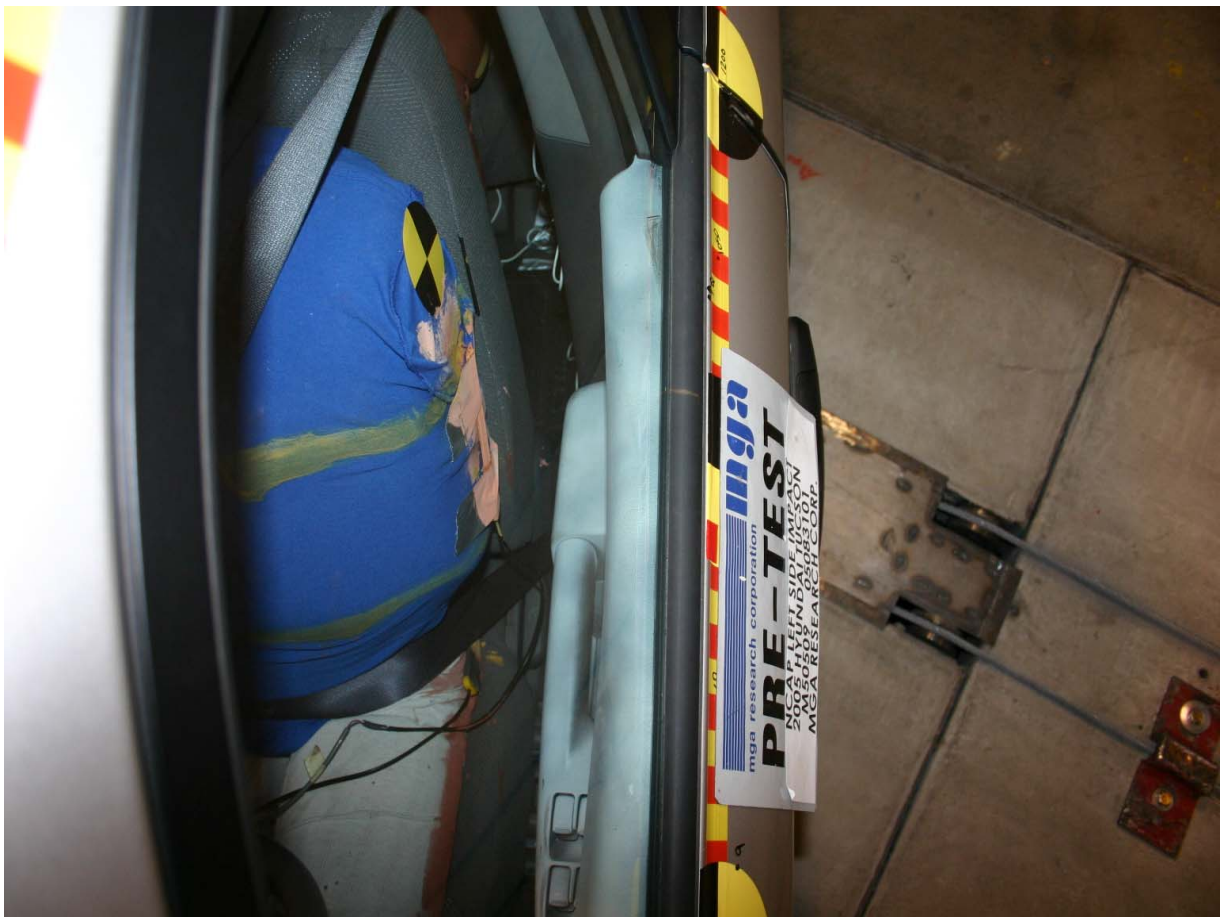
Pre-Test Driver Dummy (Door Open)



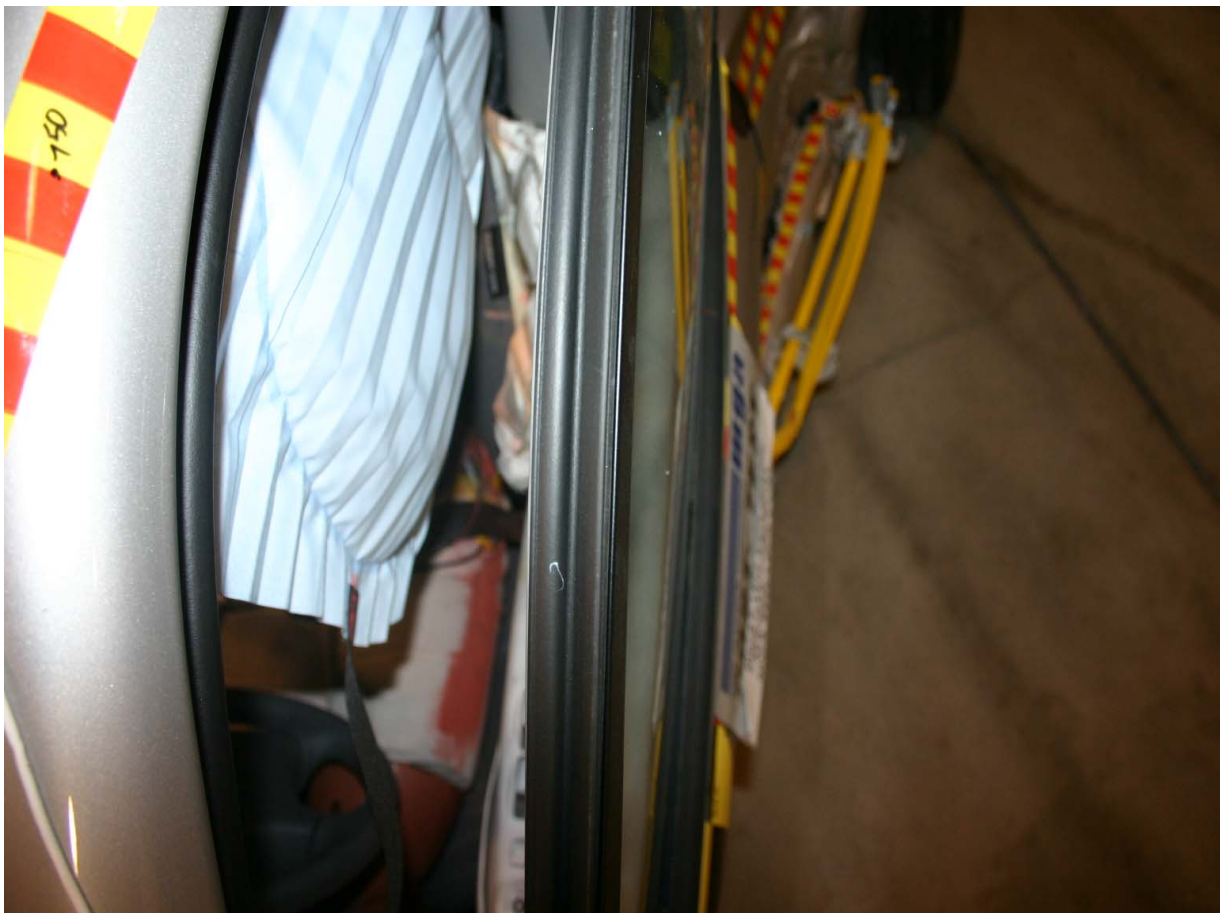
Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy Clearance From Door



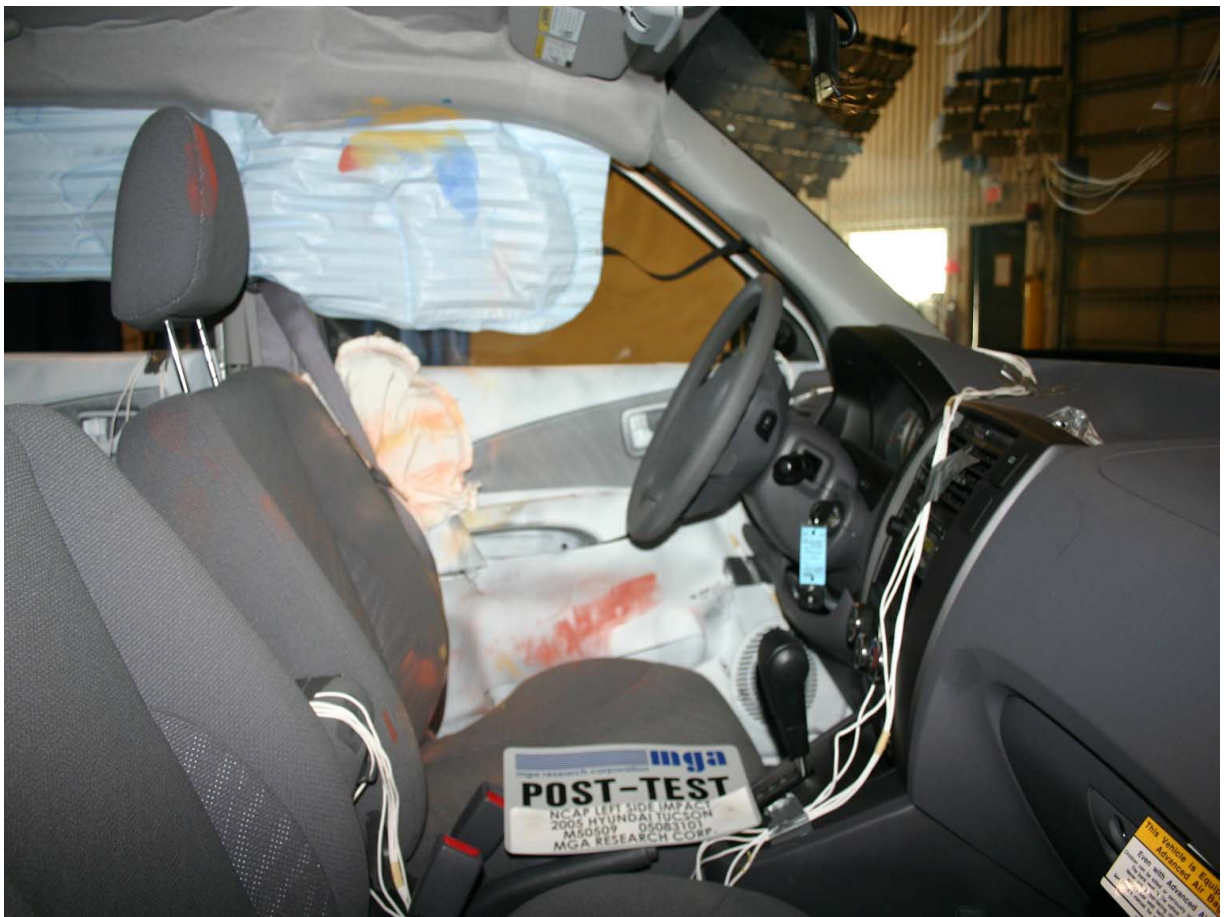
Post-Test Driver Dummy Clearance From Door



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View



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



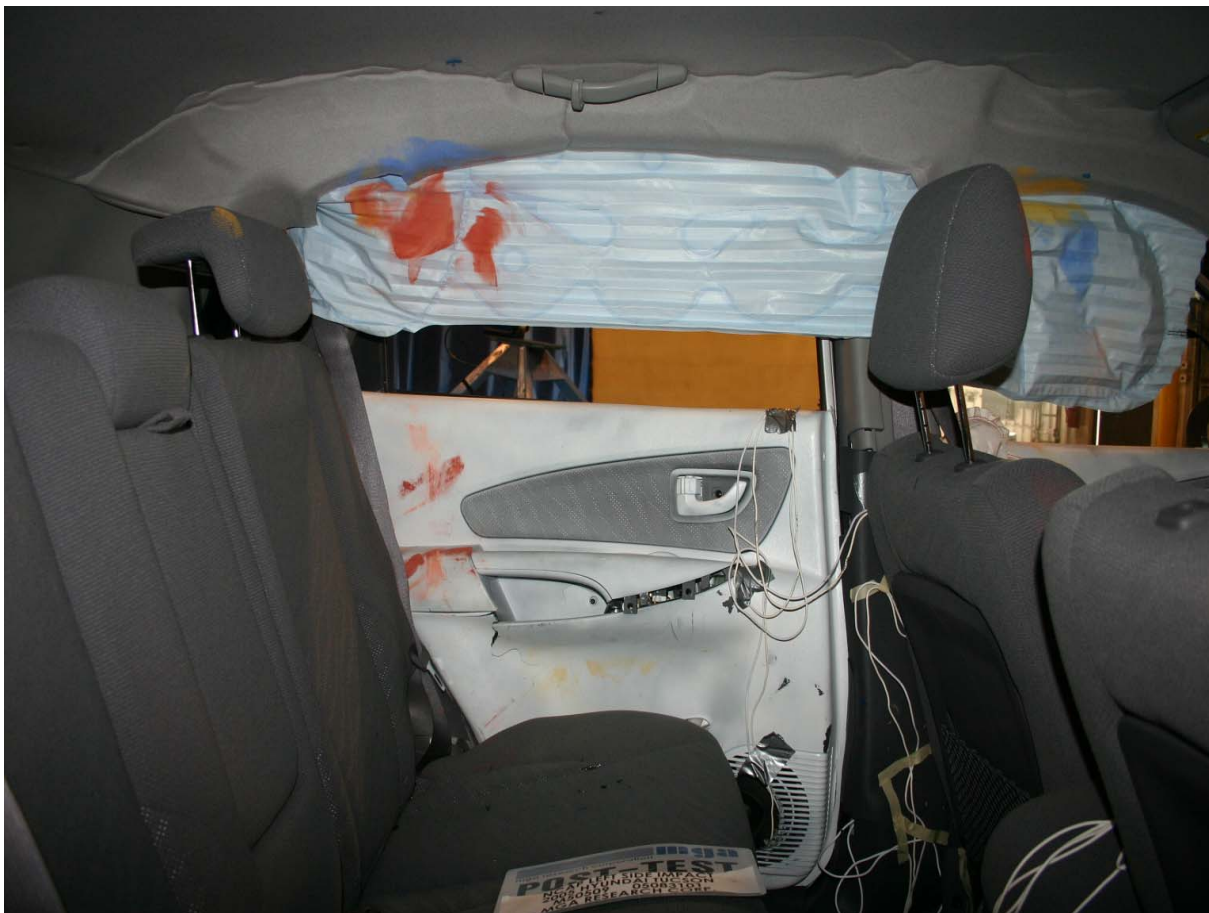
Post-Test Passenger Dummy Clearance From Door



Pre-Test Passenger Dummy Right Side View



Post-Test Passenger Dummy Right Side View



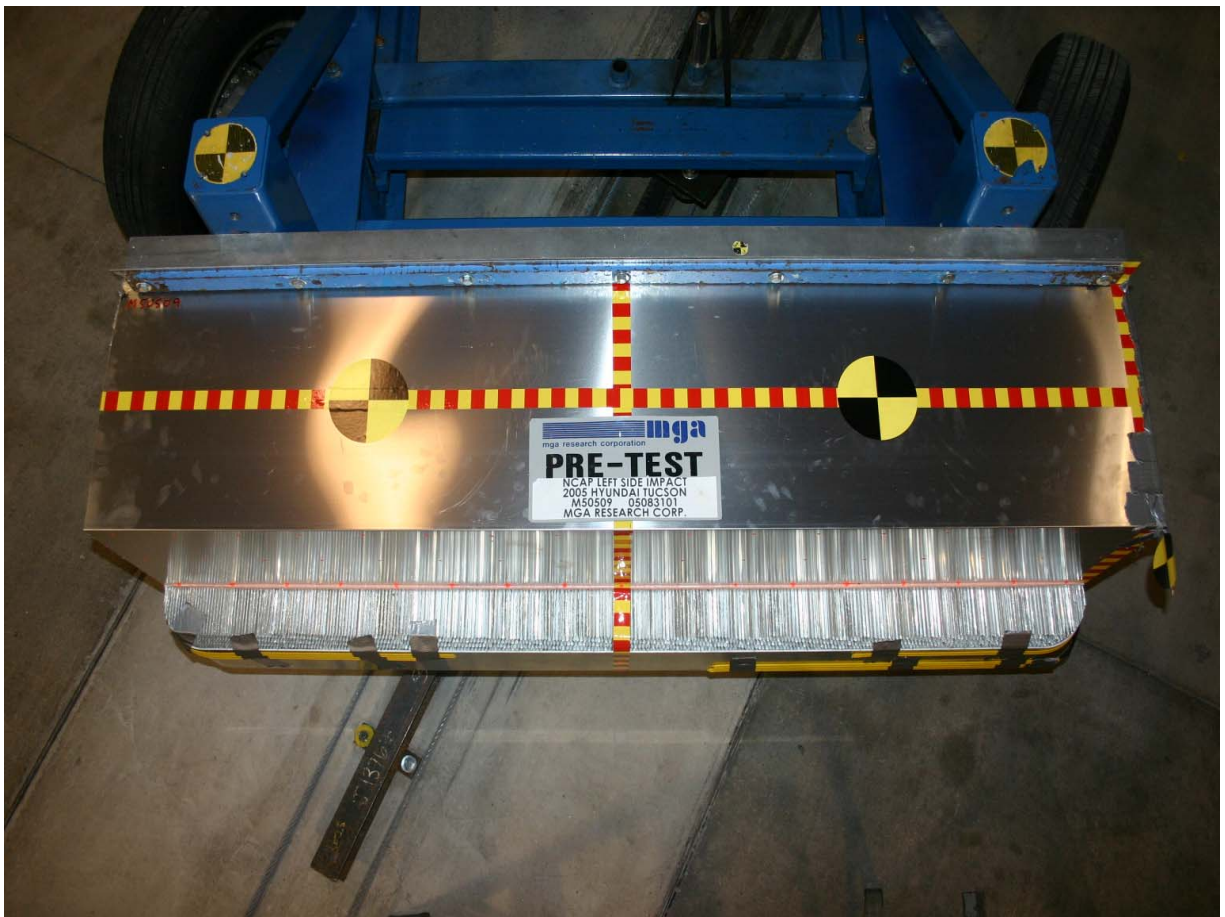
Post-Test Rear Door Panel (Interior)



Pre-Test Front View of Deformable Barrier



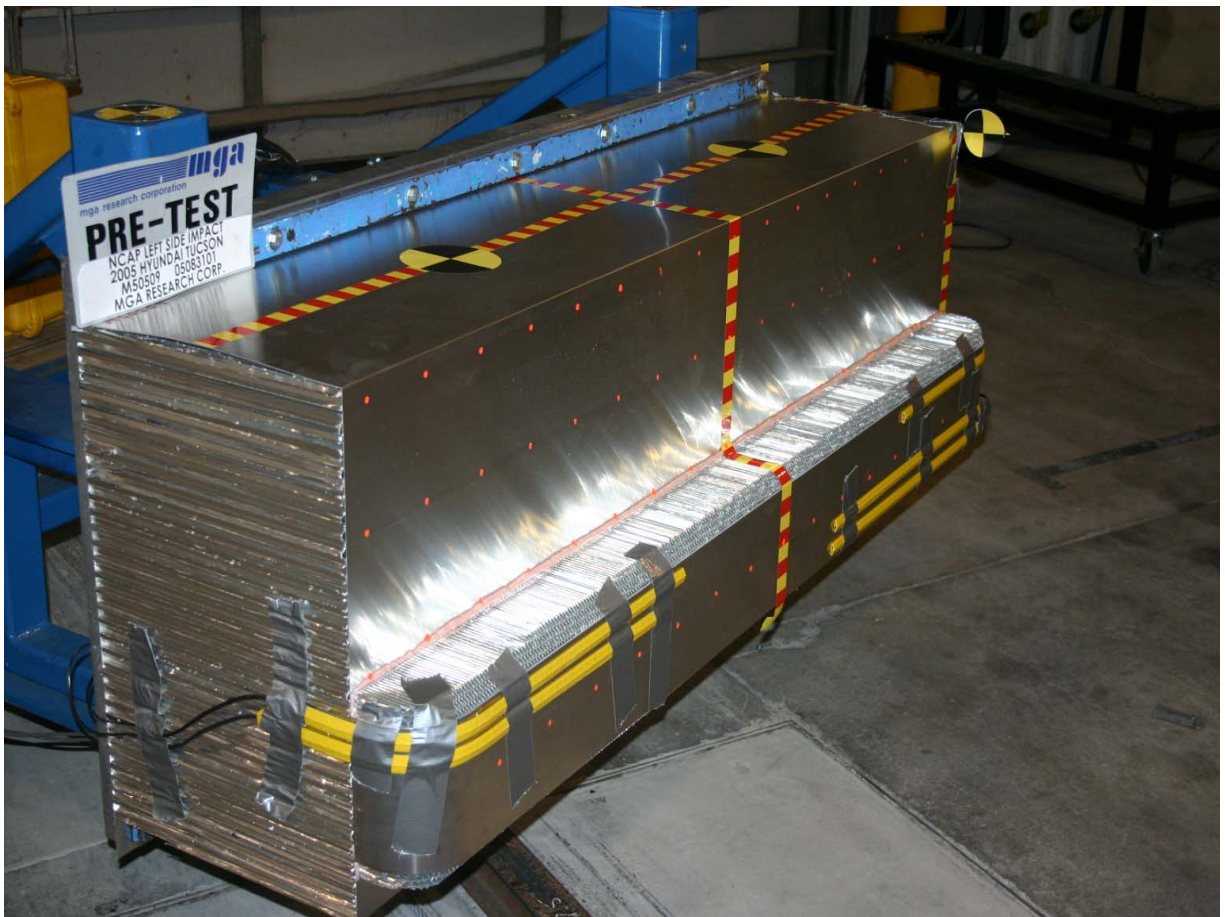
Post-Test Front View of Deformable Barrier



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



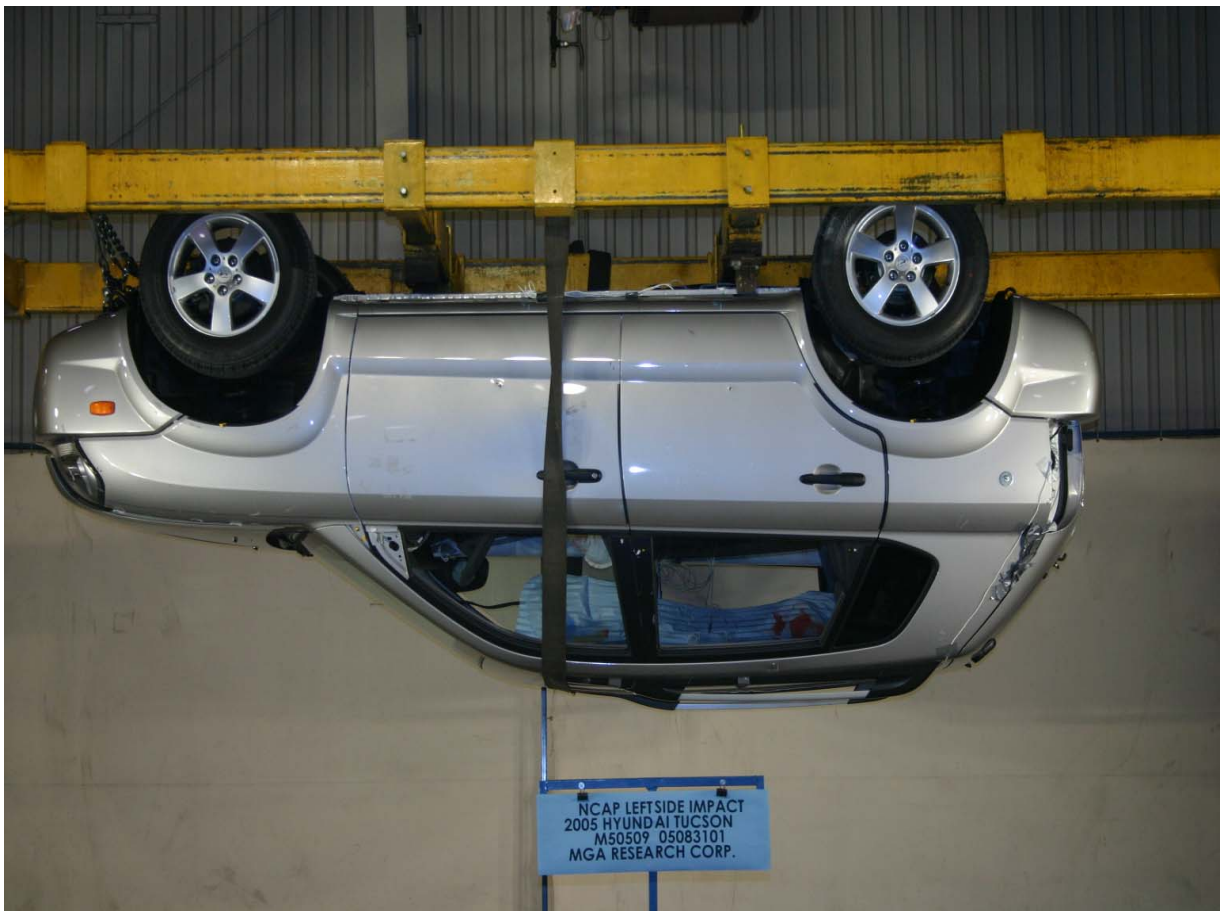
Pre-Test Left Side View of Deformable Barrier



Post-Test Left Side View of Deformable Barrier



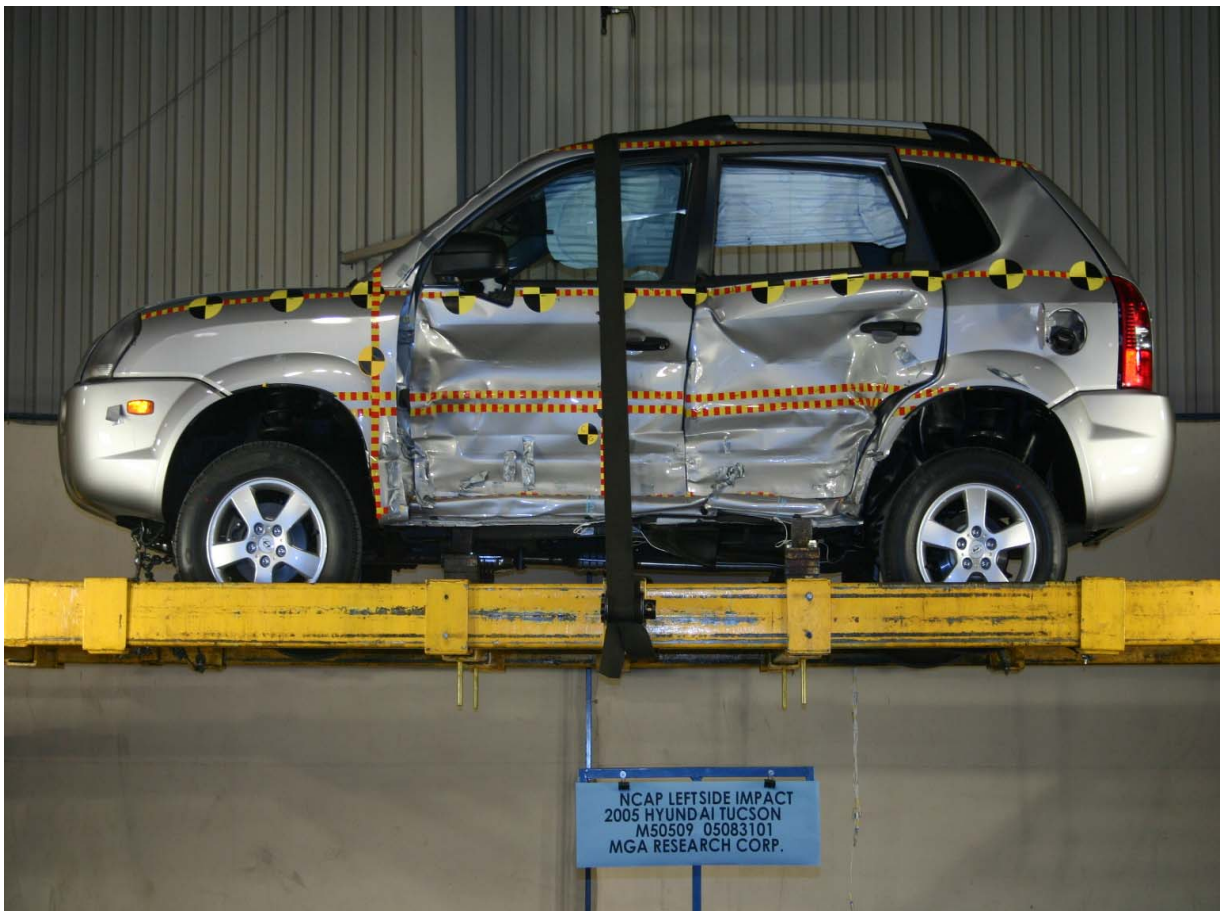
Vehicle on Rollover Device (0 Degrees)



Vehicle on Rollover Device (90 Degrees)



Vehicle on Rollover Device (180 Degrees)

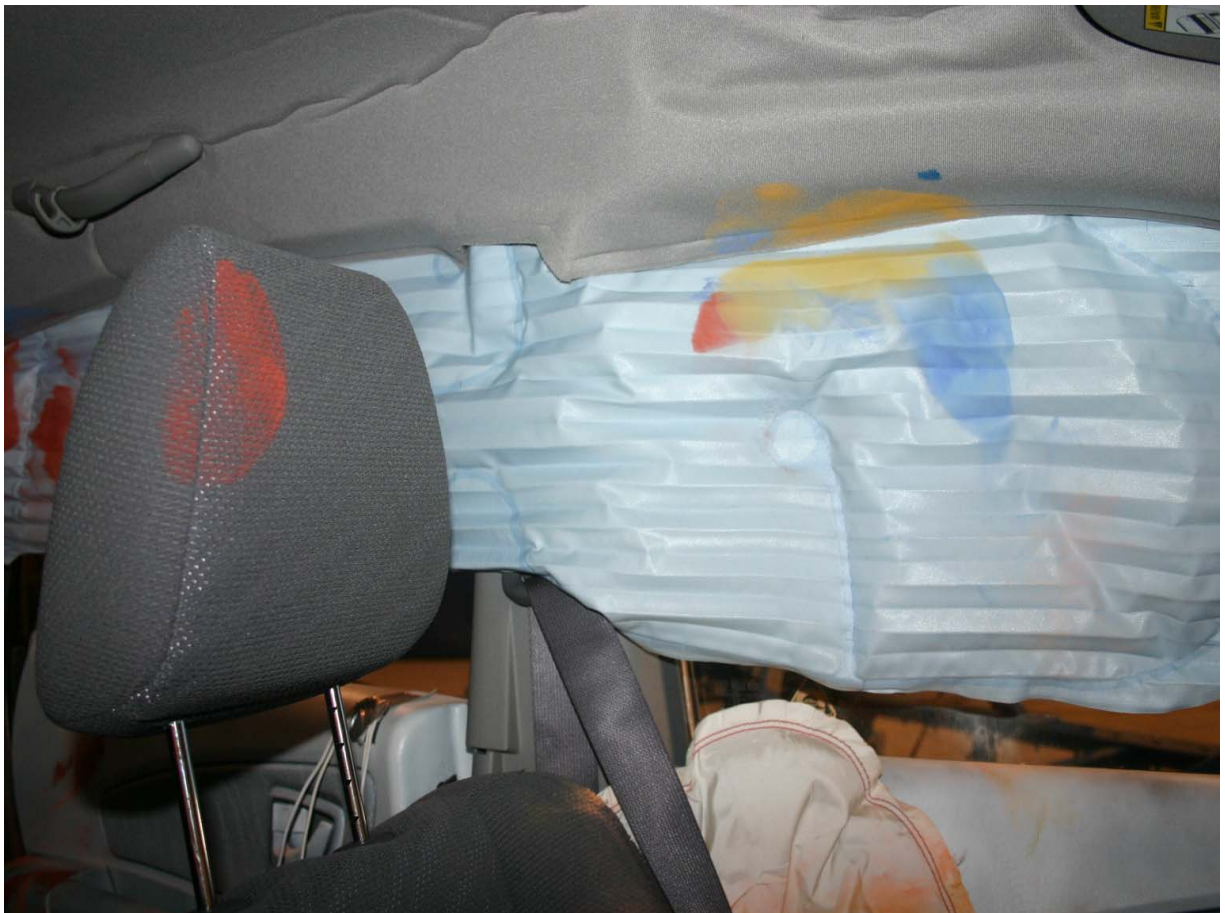


Vehicle on Rollover Device (360 Degrees)



78,00 ms • 31 Aug 2005 12:21 • T0: 0 • 1,000 fps • Frame: 78

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 Lower Torso Contact

APPENDIX B

SID/HIII RESPONSE DATA TRACES

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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

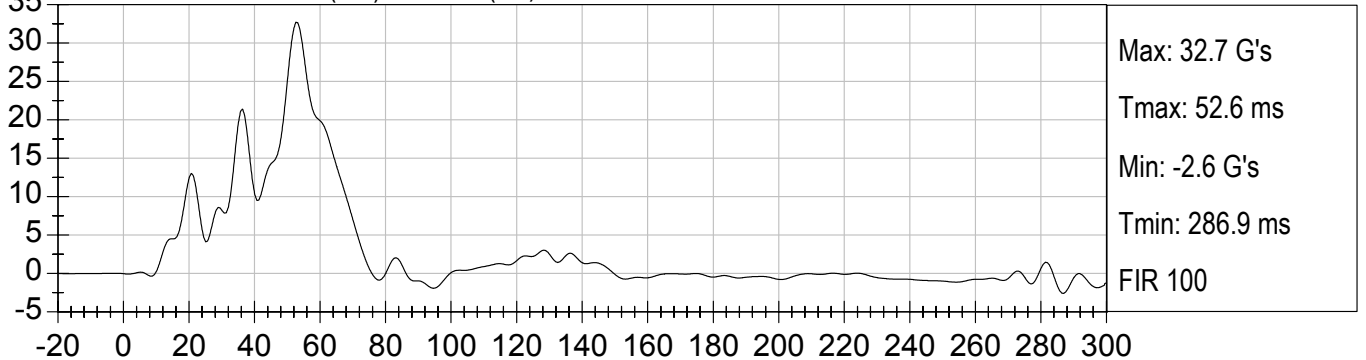
Driver Upper Neck Moment X

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

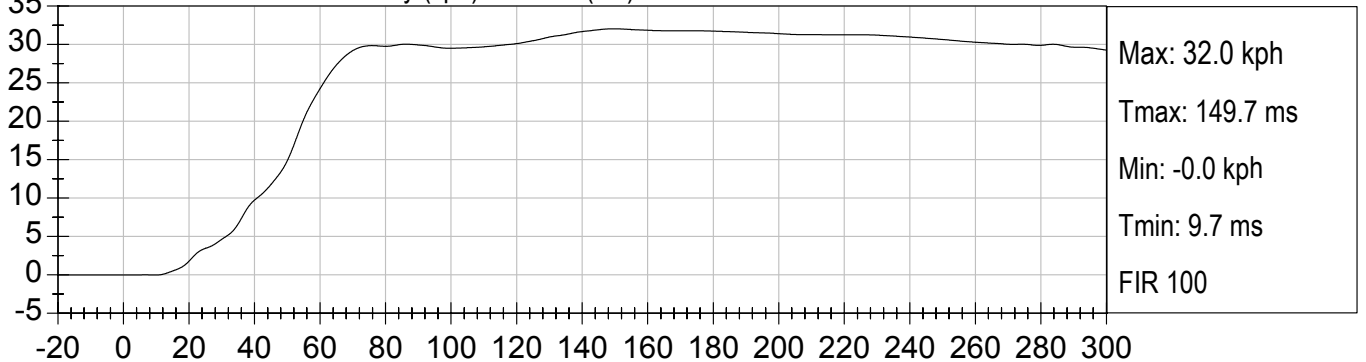
Vehicle Rear Floor Above Axle X
Vehicle Rear Floor Above Axle Y
Vehicle Rear Floor Above Axle Z
Vehicle Left Sill at Rear Door Y
Vehicle Left Sill at Front Door Y
Vehicle Left Front Door CL Y
Vehicle Right Rear Occupant Compartment
Vehicle Left Front Door Mid Rear Y
Vehicle Left Front Door Upper CL Y
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 Rear Seat Structure
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 Contact
MDB Right Contact



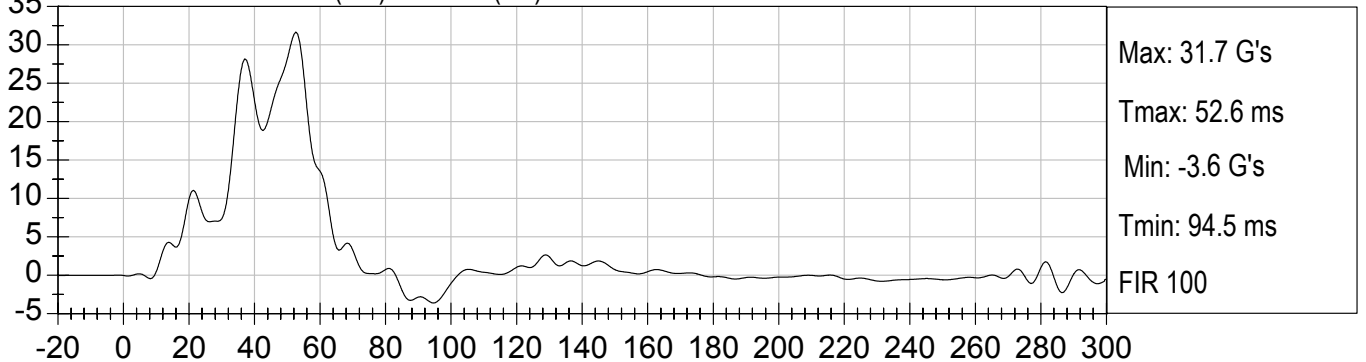
DRIVER UPPER RIB Y (G's) vs TIME (ms)



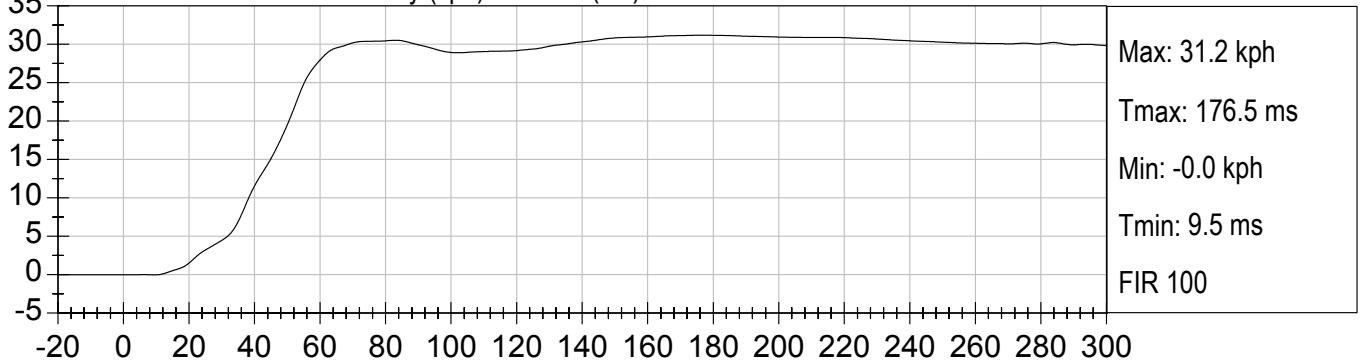
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)

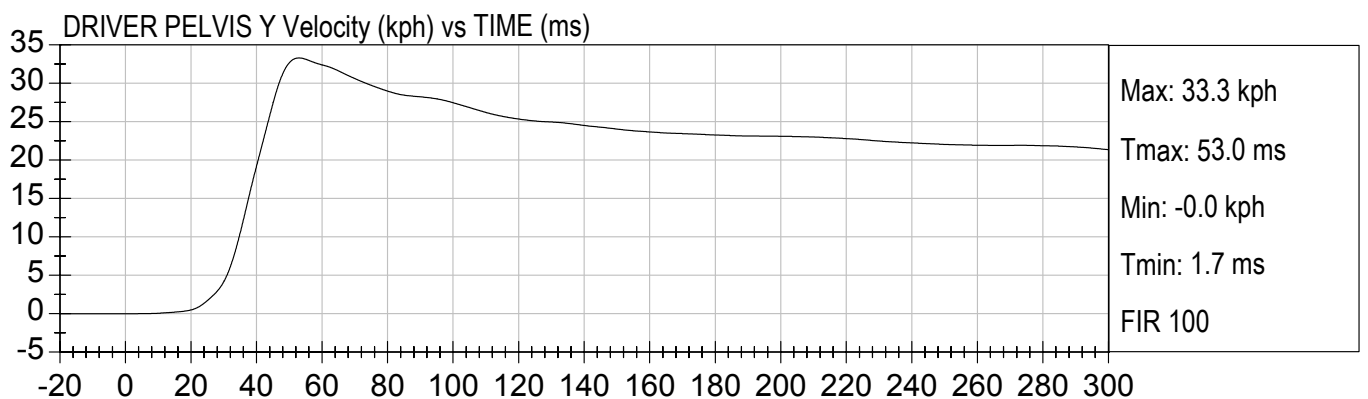
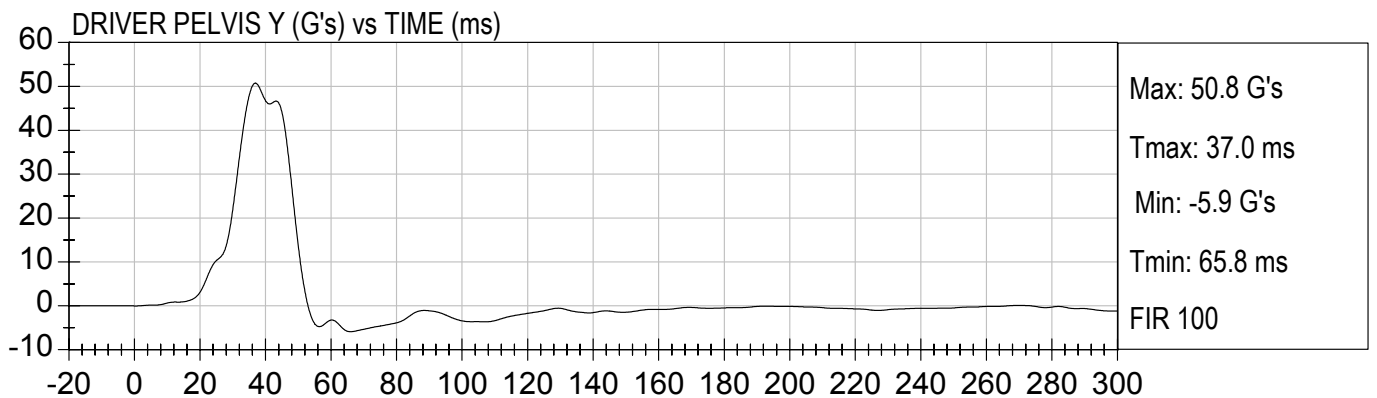
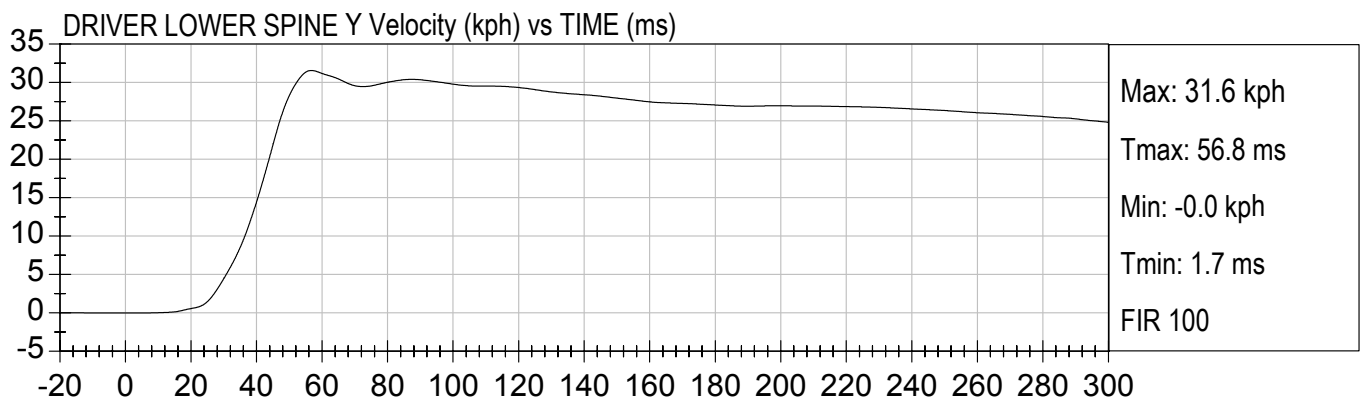
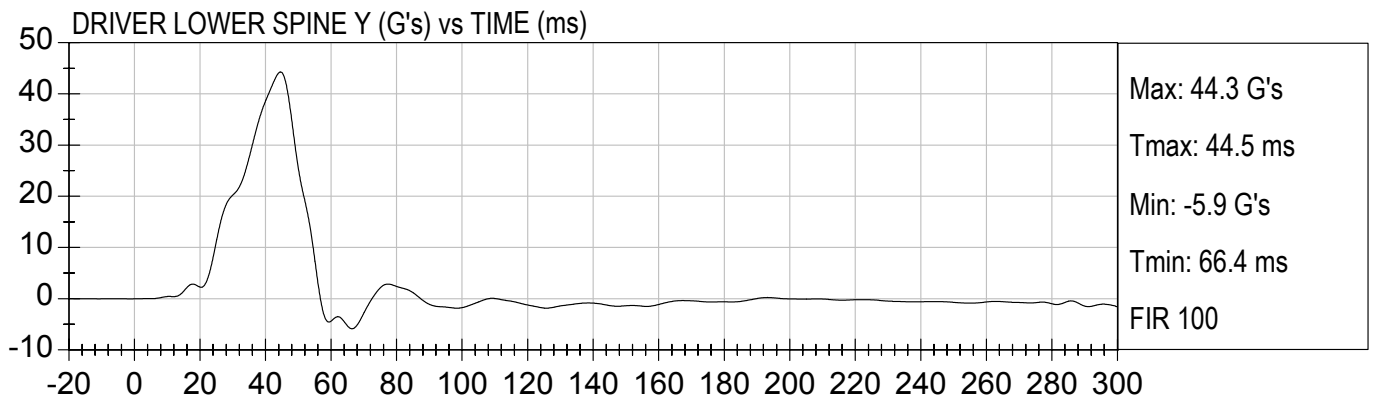


DRIVER LOWER RIB Y (G's) vs TIME (ms)



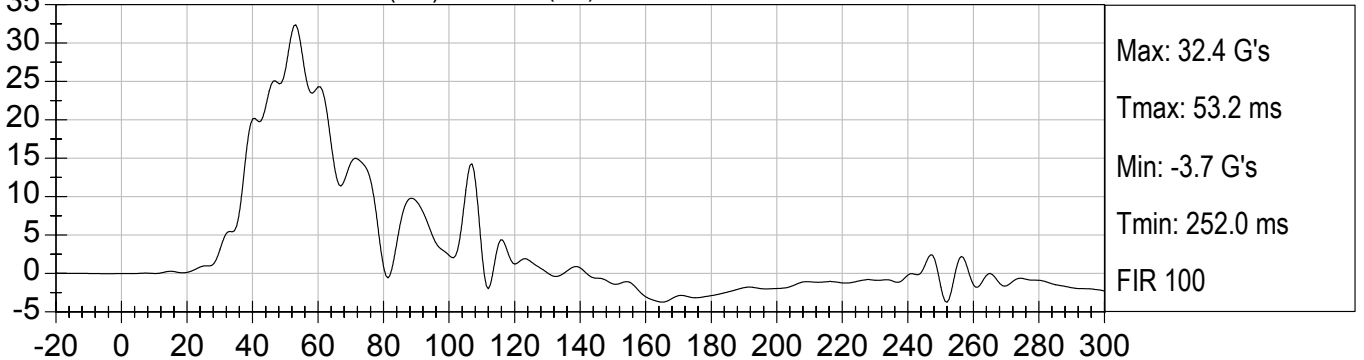
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



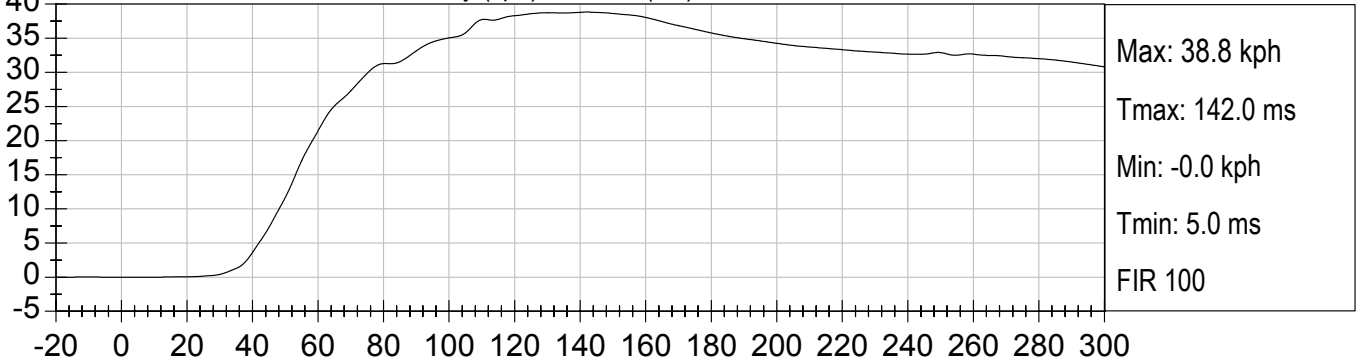




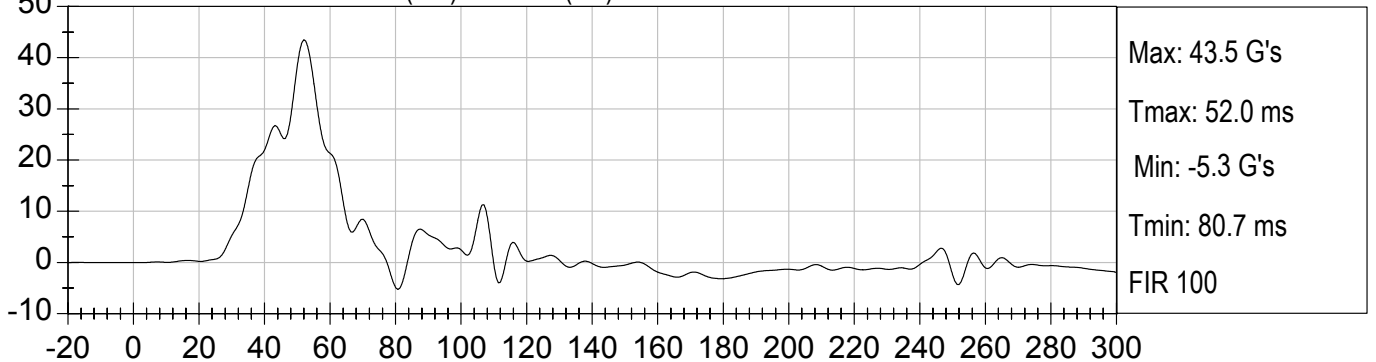
PASSENGER UPPER RIB Y (G's) vs TIME (ms)



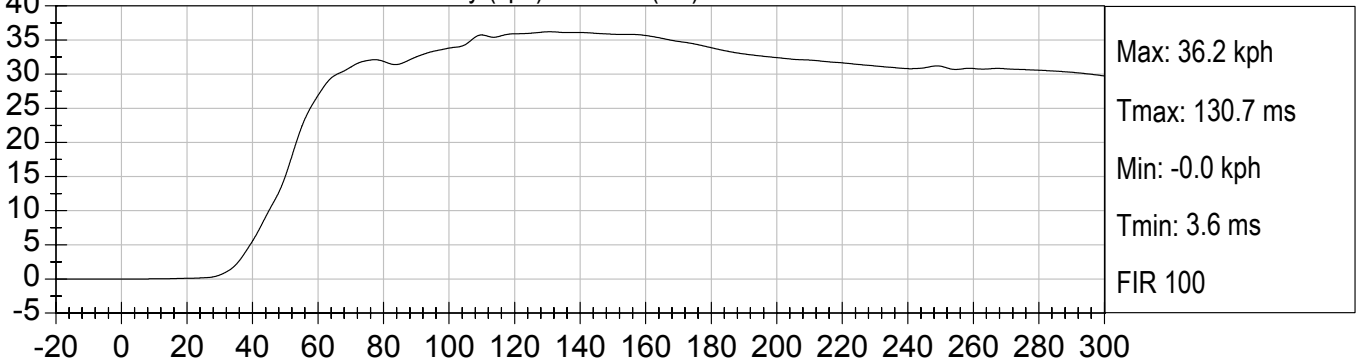
PASSENGER UPPER RIB Y Velocity (kph) vs TIME (ms)

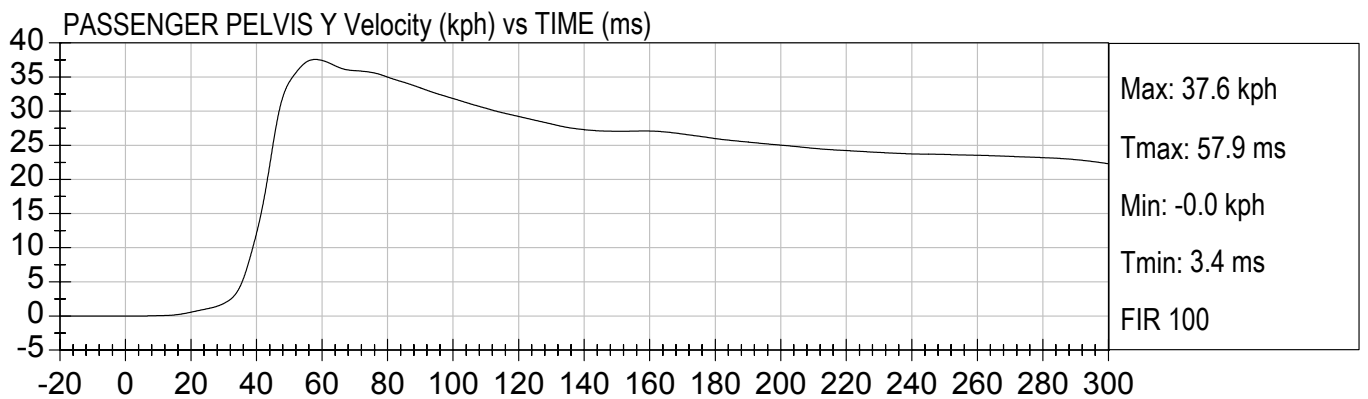
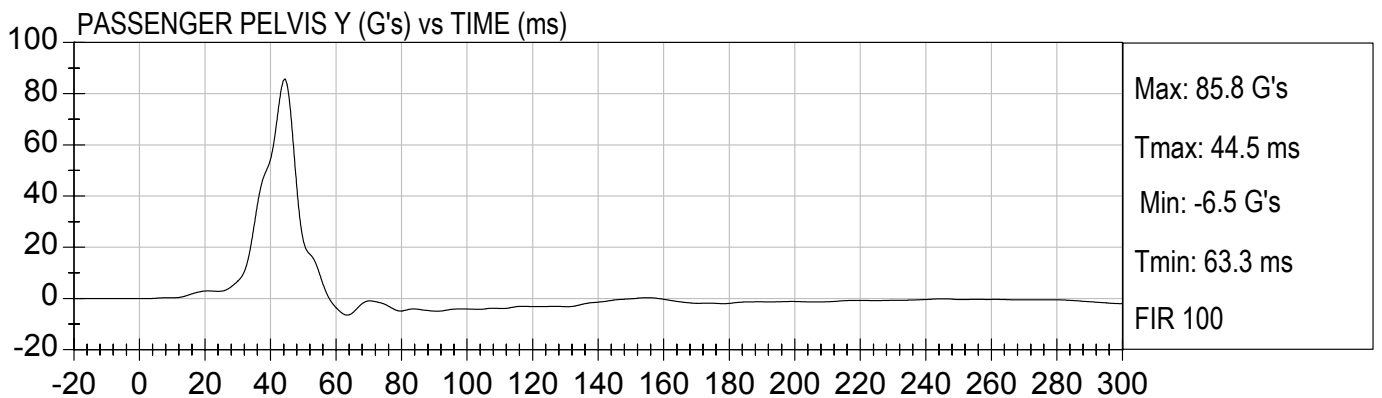
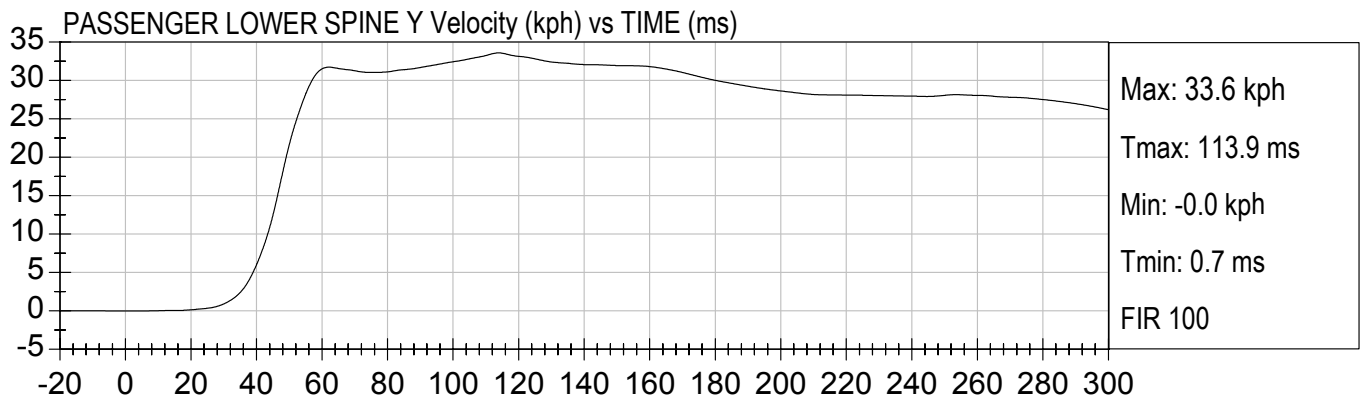
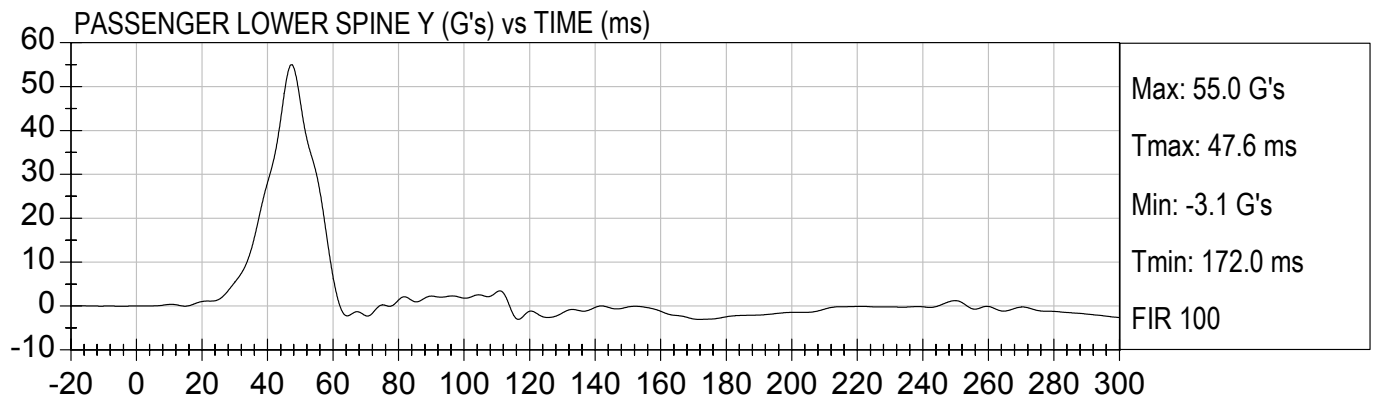


PASSENGER LOWER RIB Y (G's) vs TIME (ms)



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





APPENDIX C
DUMMY CALIBRATION DATA

CERTIFICATION DATA

Dummy Serial Number: 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 Gall
Laboratory Technician

David Winkelbauer
Approved By

08/23/2005

Test Date

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

ATD Serial No: 271

Test I.D: D052341

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	40	Pass
Peak Resultant Acceleration	G's	120 to 150	125	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-7	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

08/23/2005
Test Date

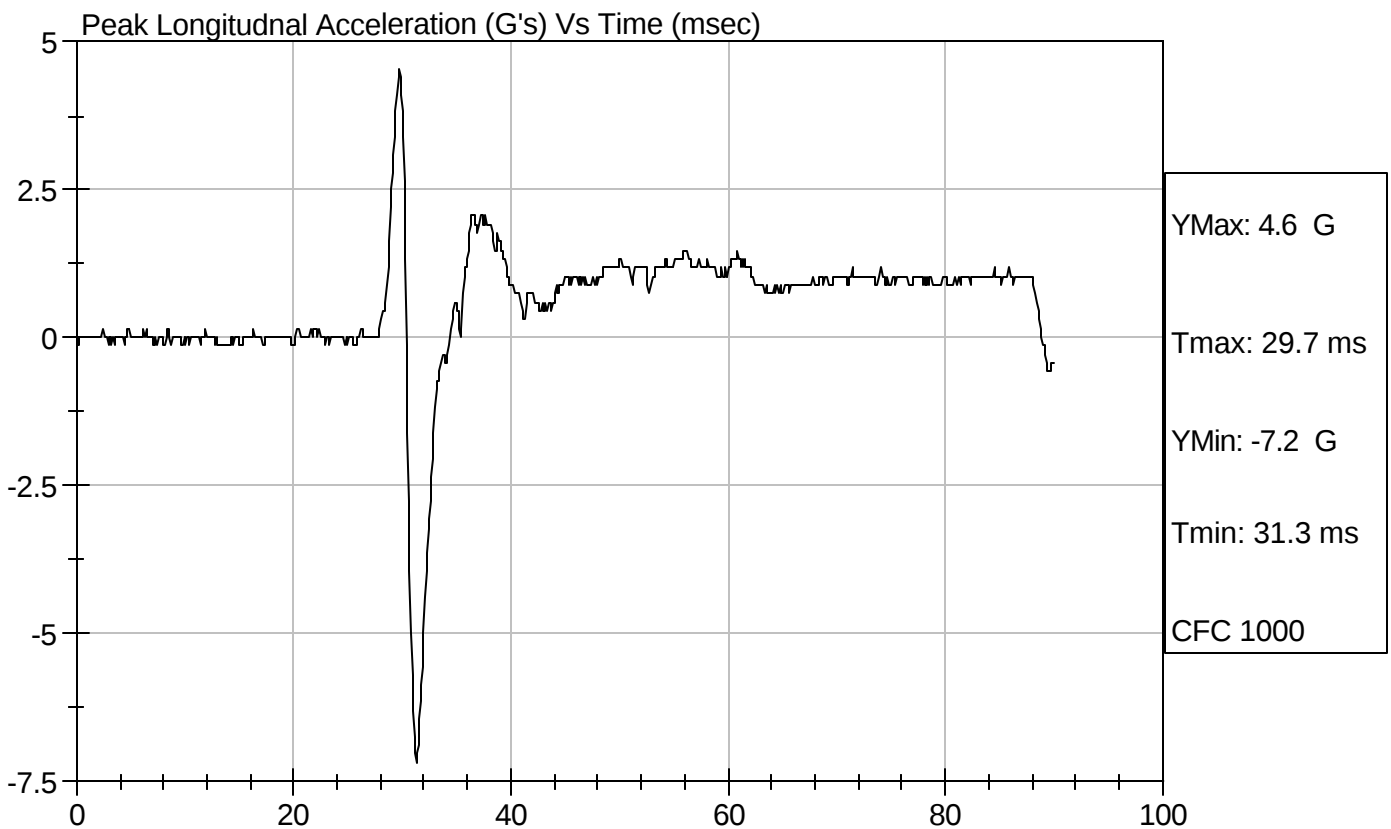
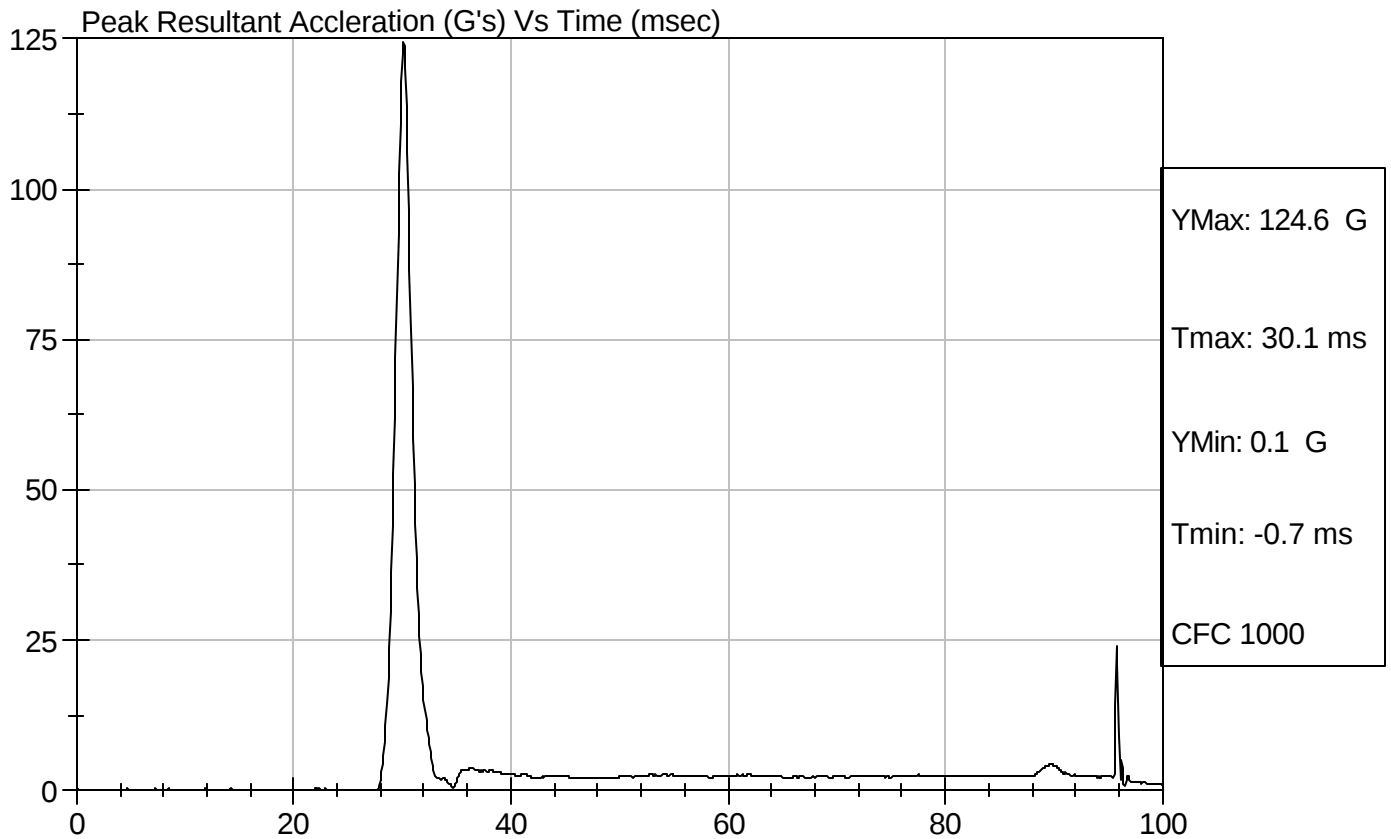


Test Description: Head Drop

Test Date: 08/23/2005

Component: D052341

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: D052342

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	4.22 - 4.31	4.29	Pass
Upper Rib	G's	37 - 46	38	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	17	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

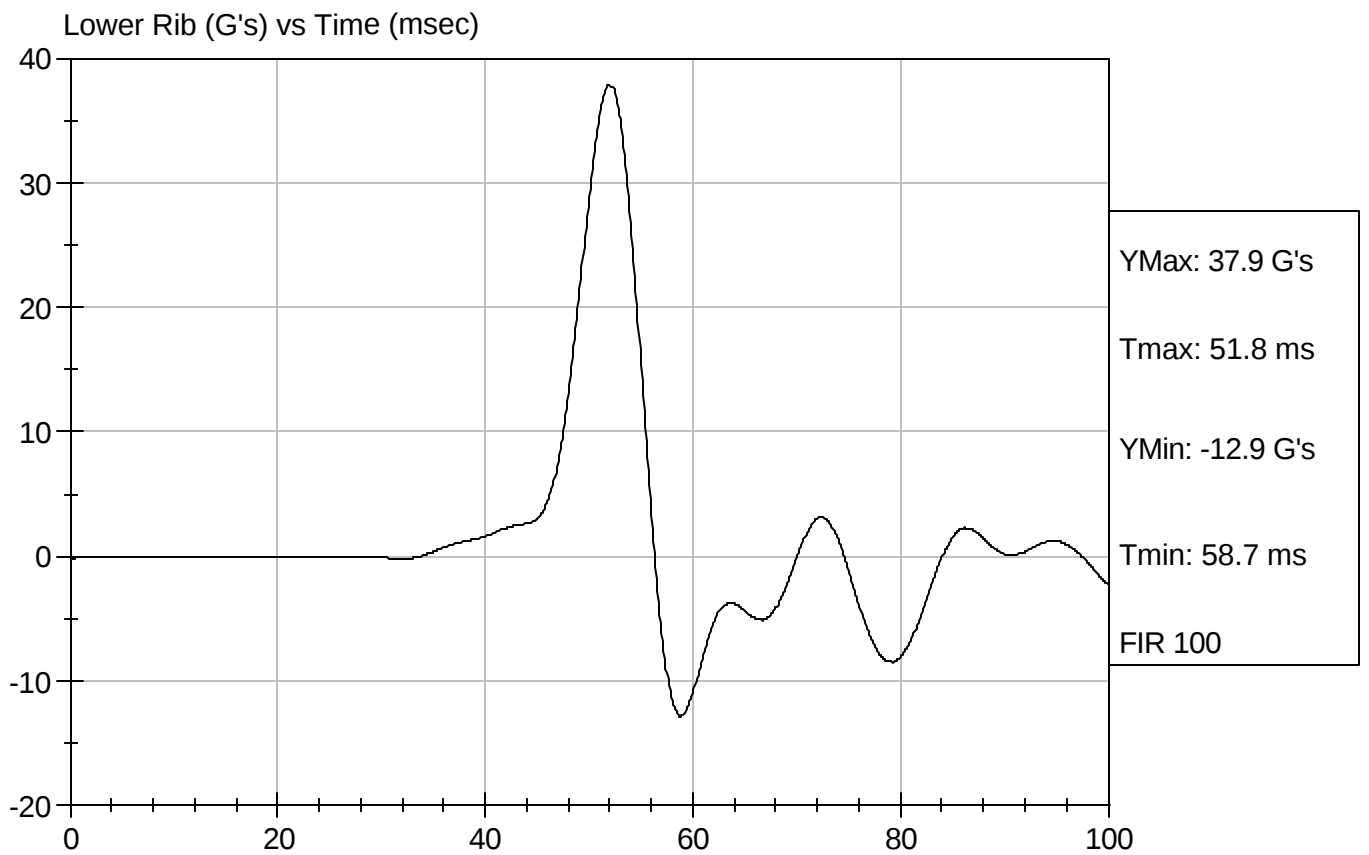
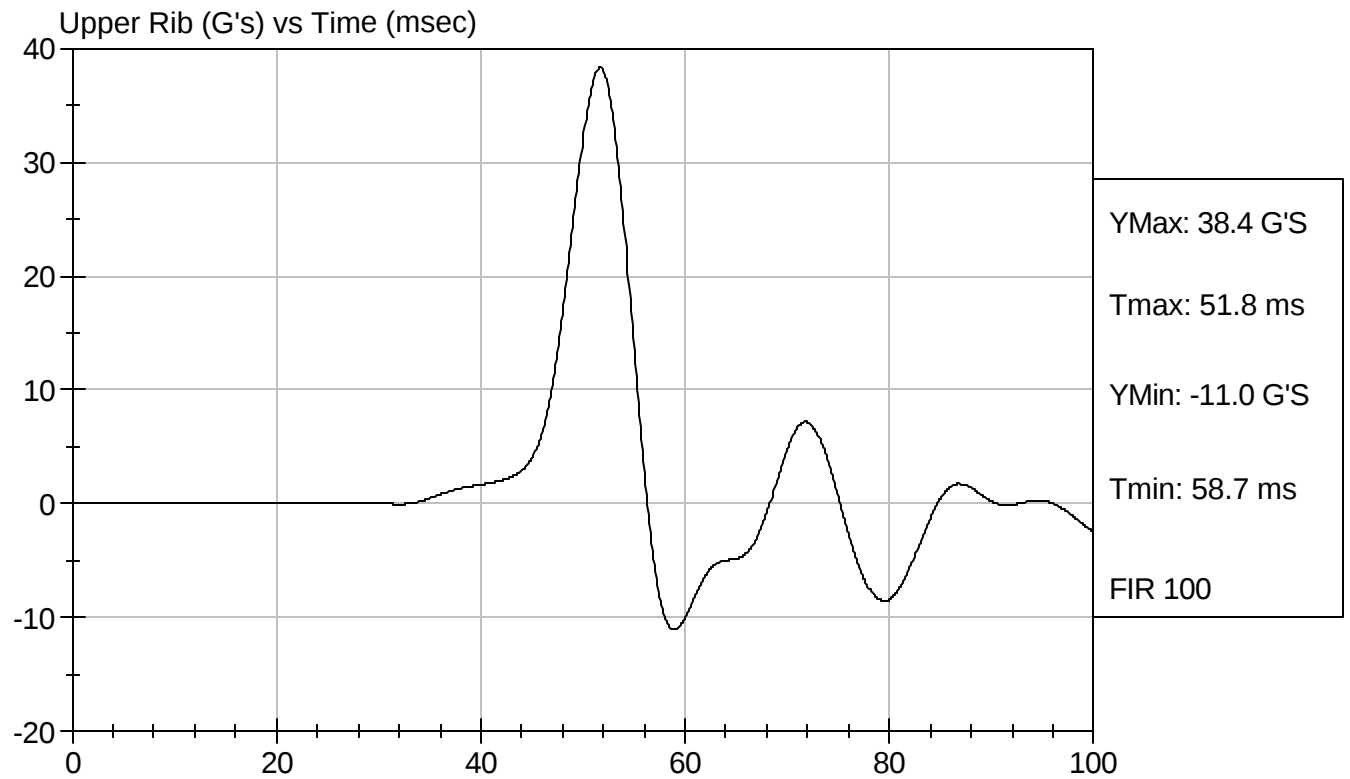
David Winkelbauer
Approved By

08/22/2005
Test Date



Test Desc: Thorax Impact
Component ID: D052342

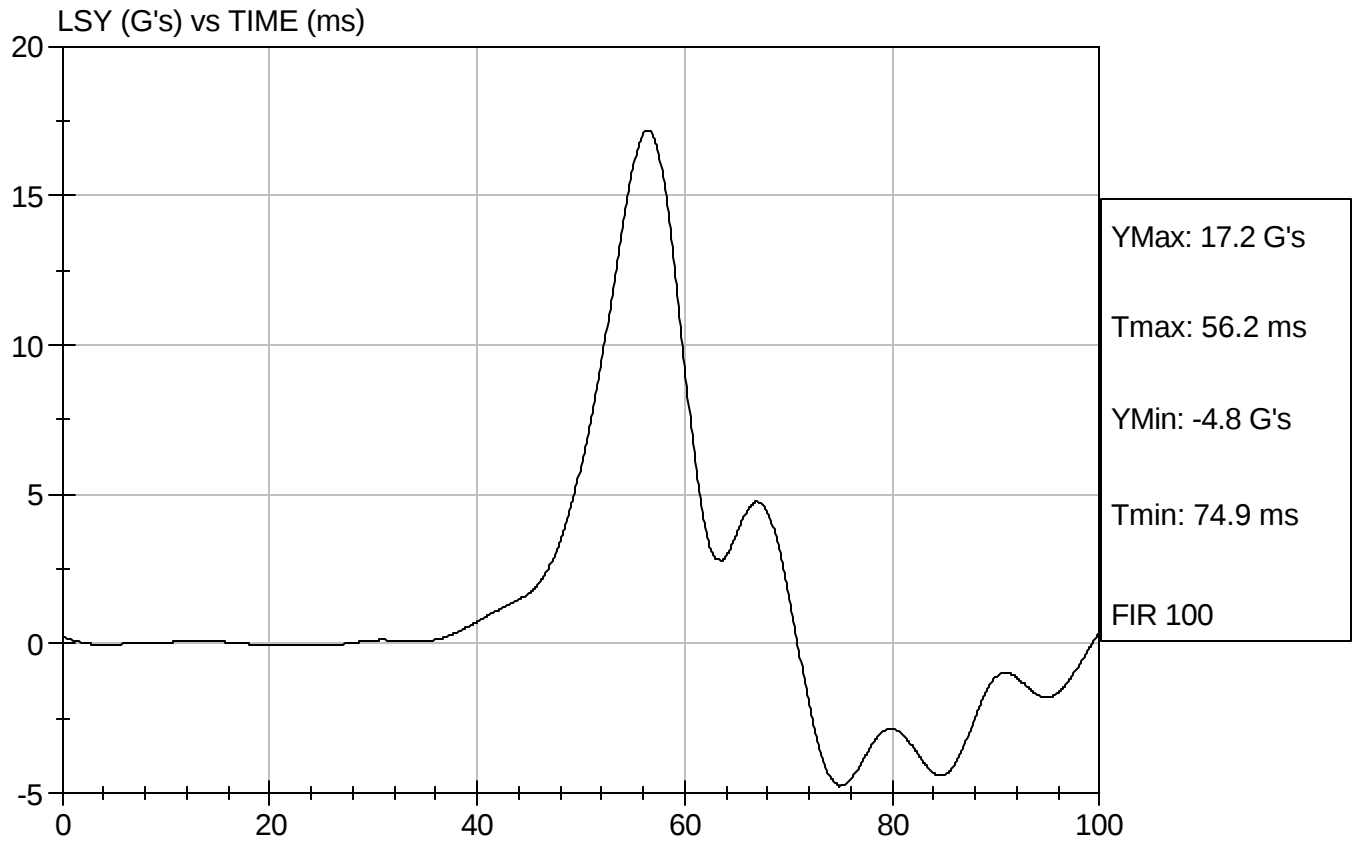
Test Date: 08/22/2005
Speed: 14.06 ft/sec, 4.29 m/sec





Test Desc: Thorax Impact
Component ID: D052342

Test Date: 08/22/2005
Speed: 14.06 ft/sec, 4.29 m/sec



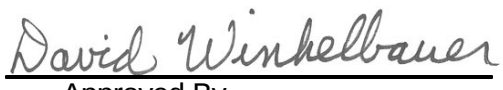
SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 271

Test I.D: D052343

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	38	Pass
Probe Velocity	m/s	4.27 - 4.33	4.28	Pass
Pelvis Acceleration	G's	40 - 60	41	Pass
			Overall Test Results	Pass


Laboratory Technician

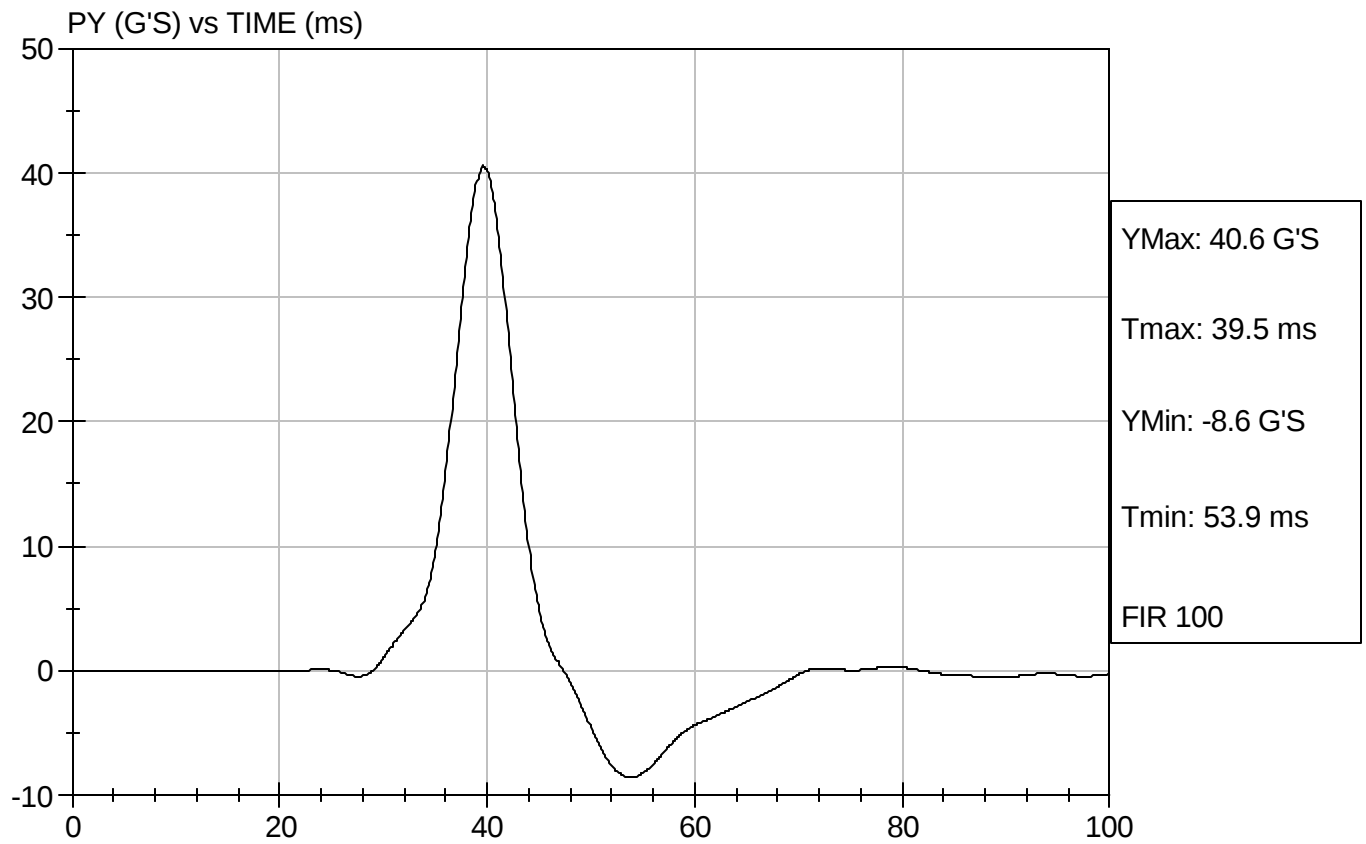

Approved By

08/22/2005
Test Date



Test Desc: Pelvis Impact
Component ID: D052343

Test Date: 08/22/2005
Speed: 14.054 ft/sec, 4.28 m/sec



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

ATD Serial No: 271

Test I.D: D052344

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Force At 12.7 mm	N	104 -162	144	Pass
Force At 19 mm	N	163 - 222	200	Pass
Force At 25.4 mm	N	222 - 280	262	Pass
Force At 33 mm	N	325 - 391	363	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

08/22/2005
Test Date

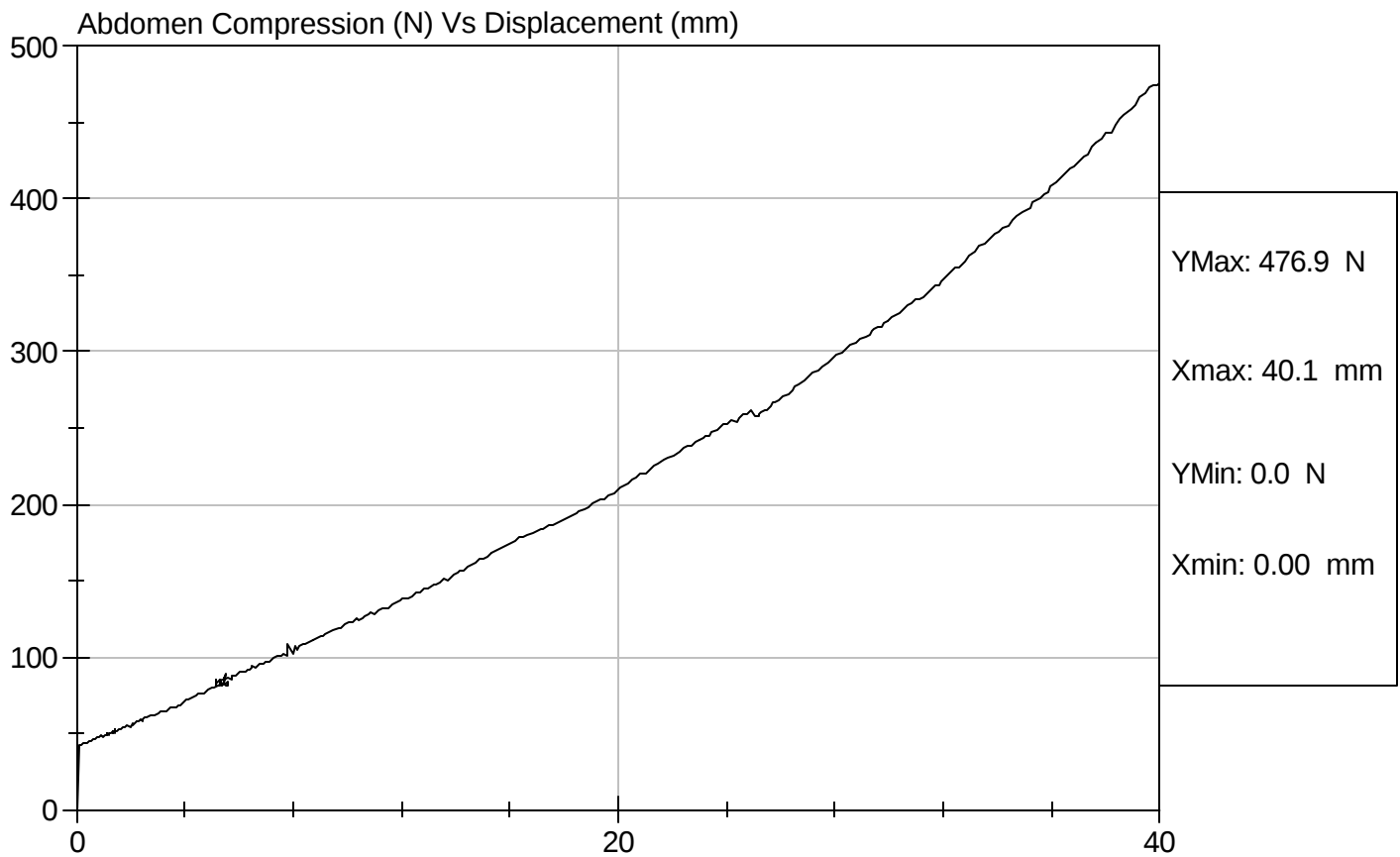


Test Description: Abdomen Compression

Test Date: 08/22/2005

Component: D052344

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 271

Test I.D: D052345

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	103.5	Pass
Force At 30 deg	N	151.2 - 204.6	181.3	Pass
Force At 40 deg	N	204.6 - 258.0	209.1	Pass
Return Angle	Deg	12 Maximum	4	Pass
			Overall Test Results	Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

08/22/2005
Test Date

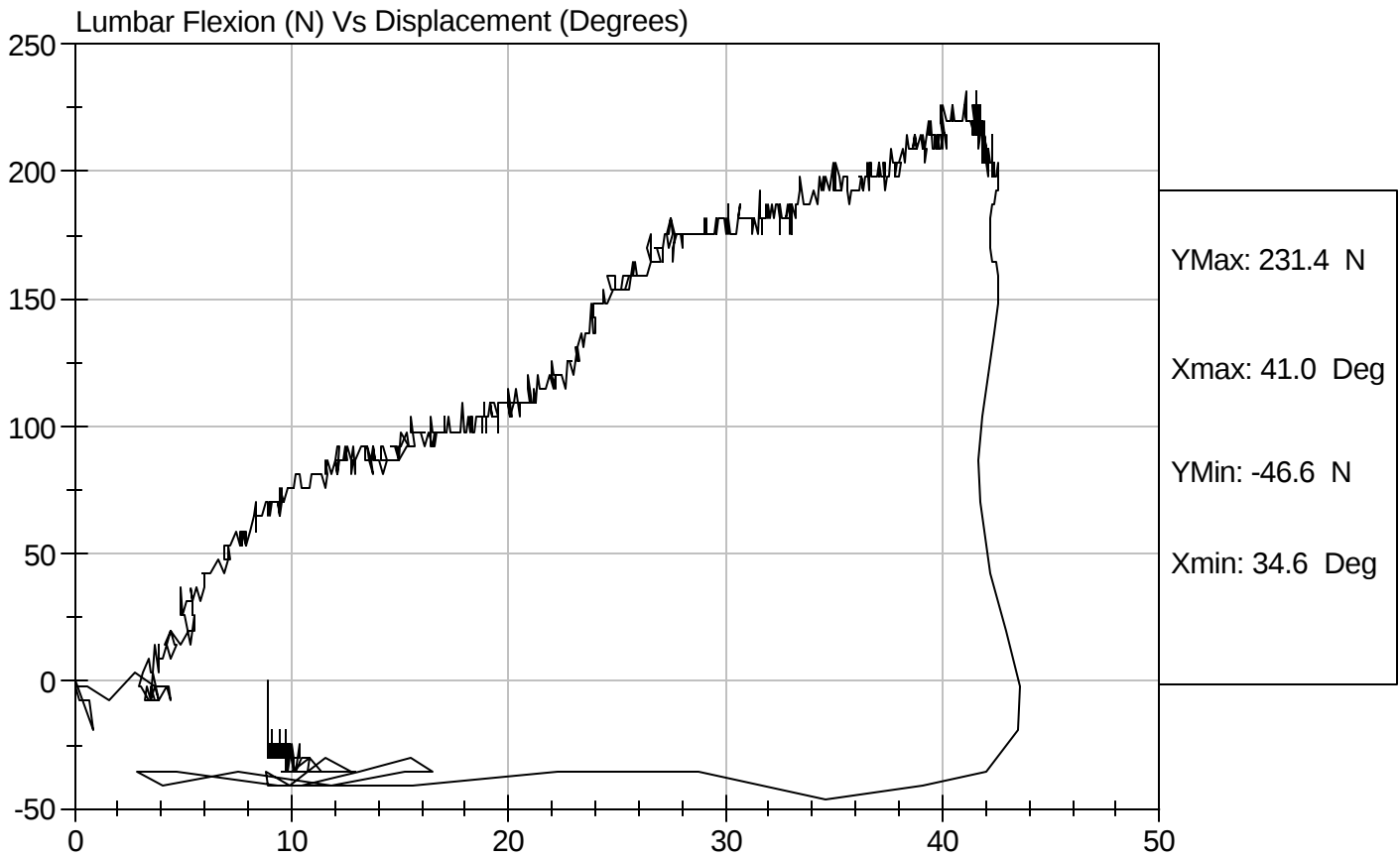


Test Description: Lumbar Flexion

Test Date: 08/22/2005

Component: D052345

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet
Side Impact Dummy (SID)
Neck Pendulum Test

ATD Serial No: 271

Test I.D: D052349

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	41	Pass
Impact Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.12	Pass
	20 msec	m/s	4.12 to 5.10	4.25	Pass
	30 msec	m/s	5.73 to 7.01	6.09	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.19	Pass
Midsagittal 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	76	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	61	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	13	Pass


 Laboratory Technician

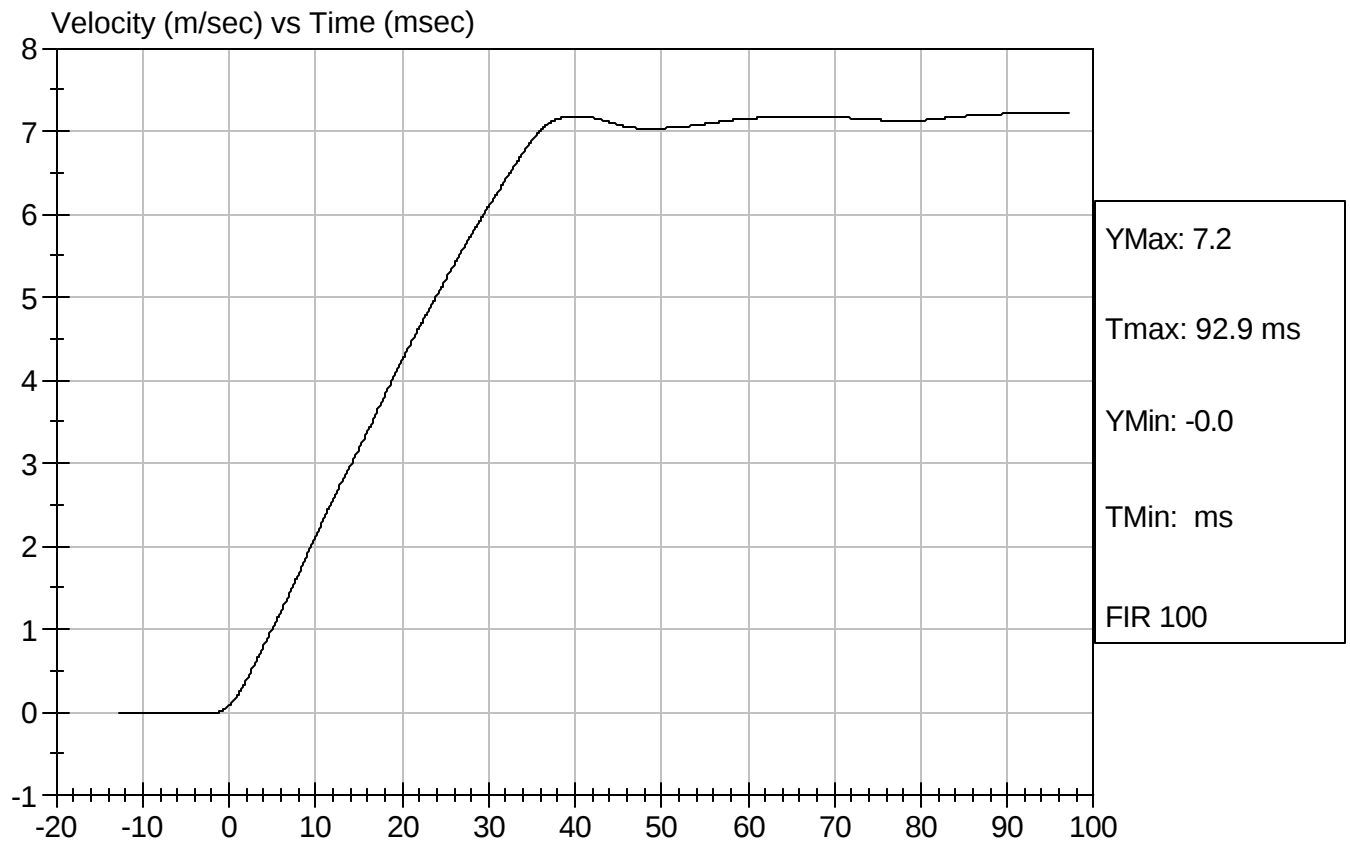

 Approved By

08/23/2005
 Test Date



Test Desc: Neck Bending
Component ID: D052349

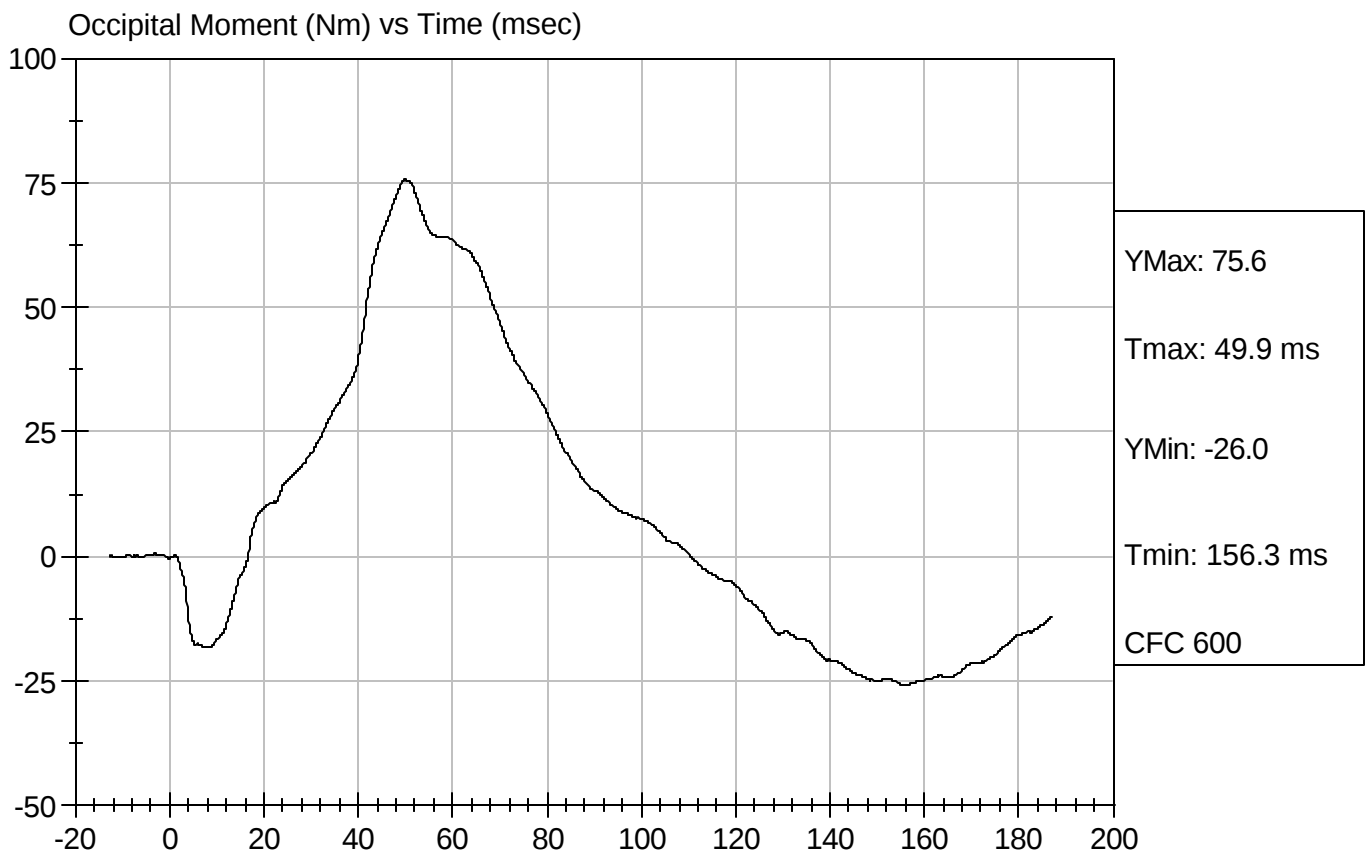
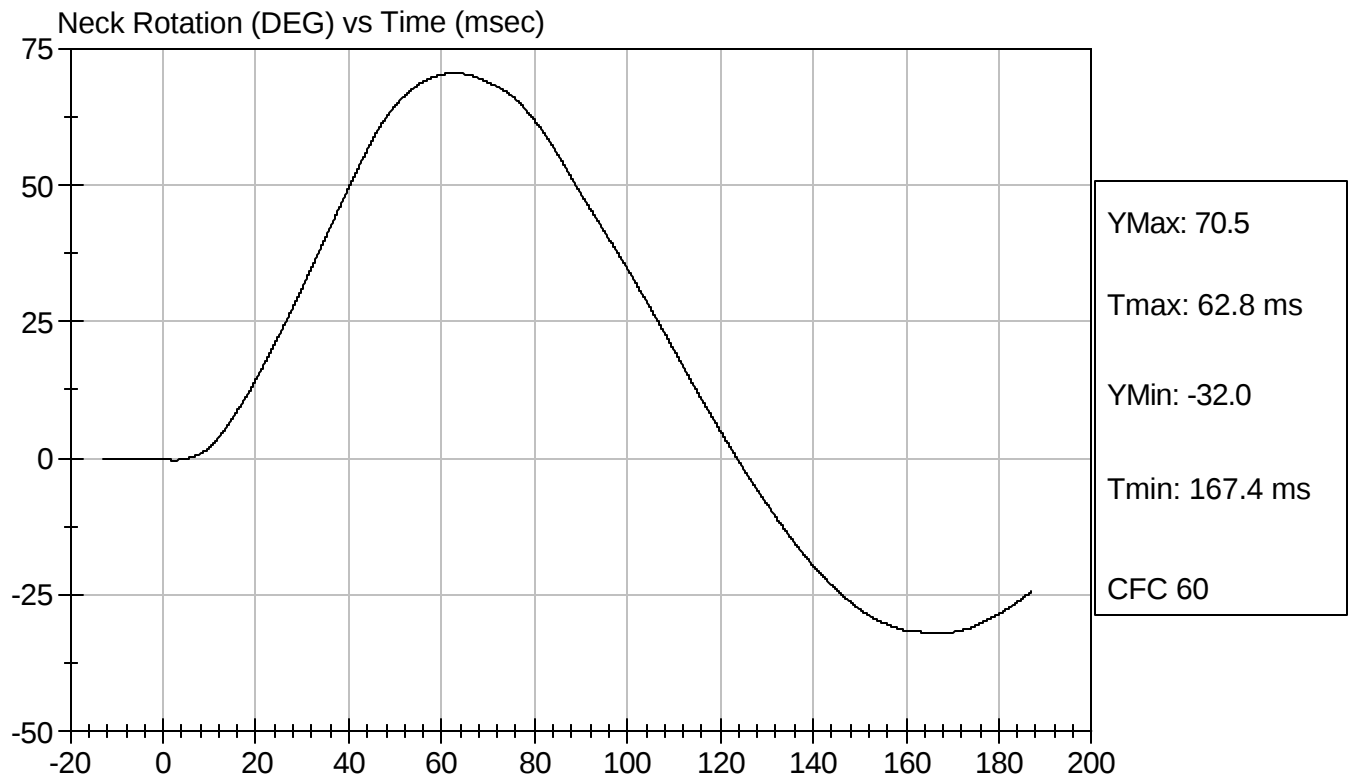
Test Date: 08/23/2005
Speed: 22.89 ft/sec, 6.98 m/sec





Test Desc: Neck Bending
Component ID: D052349

Test Date: 08/23/2005
Speed: 22.89 ft/sec, 6.98 m/sec



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: D052421

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	46	Pass
Peak Resultant Acceleration	G's	120 to 150	125	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-11	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

09/01/2005
Test Date



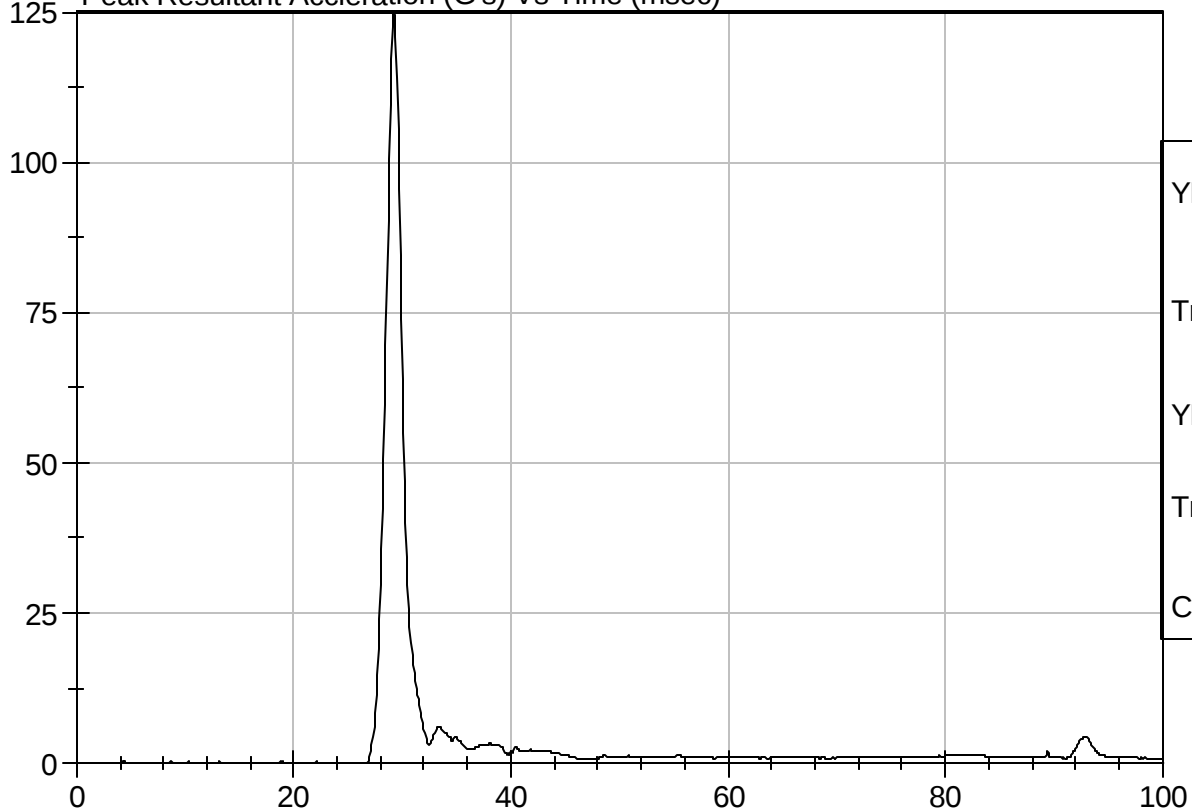
Test Description: Head Drop

Test Date: 09/01/2005

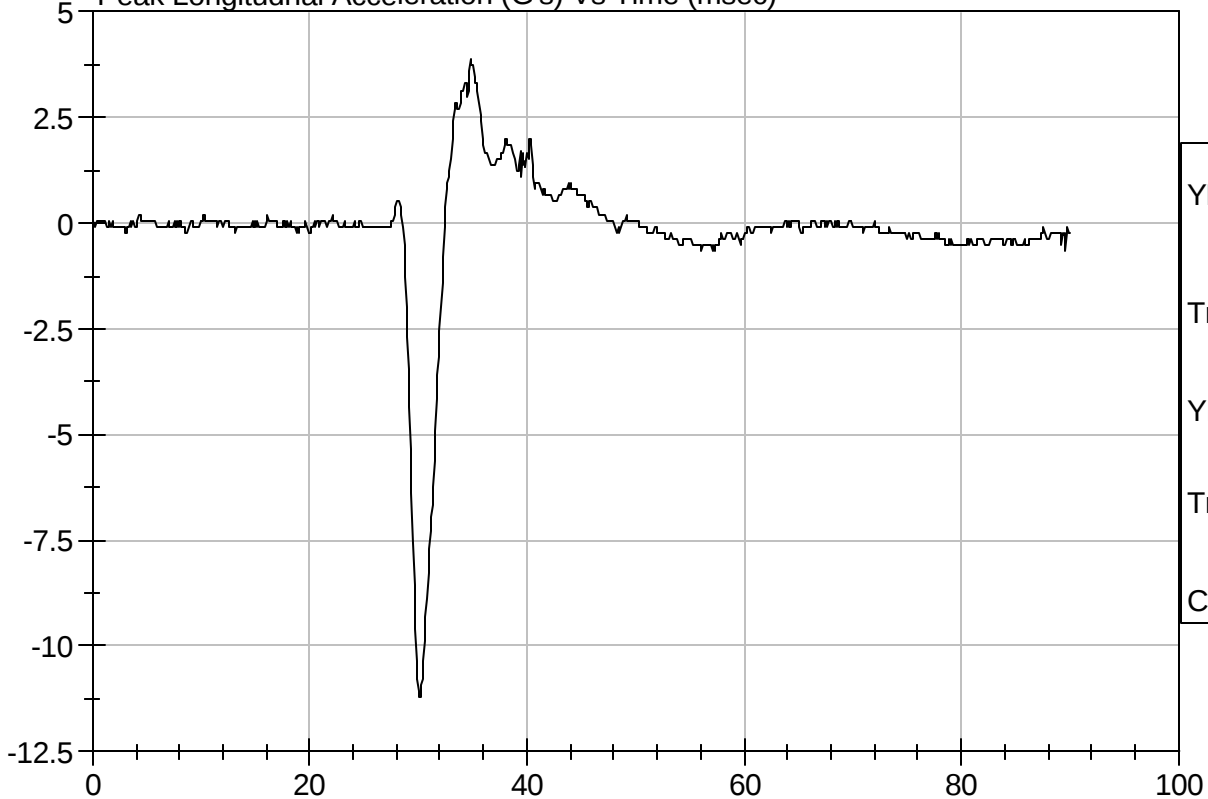
Component: D052421

Speed: 0 ft/s, 0.00 m/s

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



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

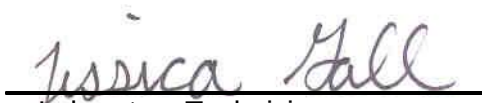


SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Test

ATD Serial No: 271

Test I.D: D052422

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	44	Pass
Lower Rib	G's	37 - 46	45	Pass
Lower Spine	G's	15 - 22	21	Pass
Overall Test Results				Pass


Laboratory Technician

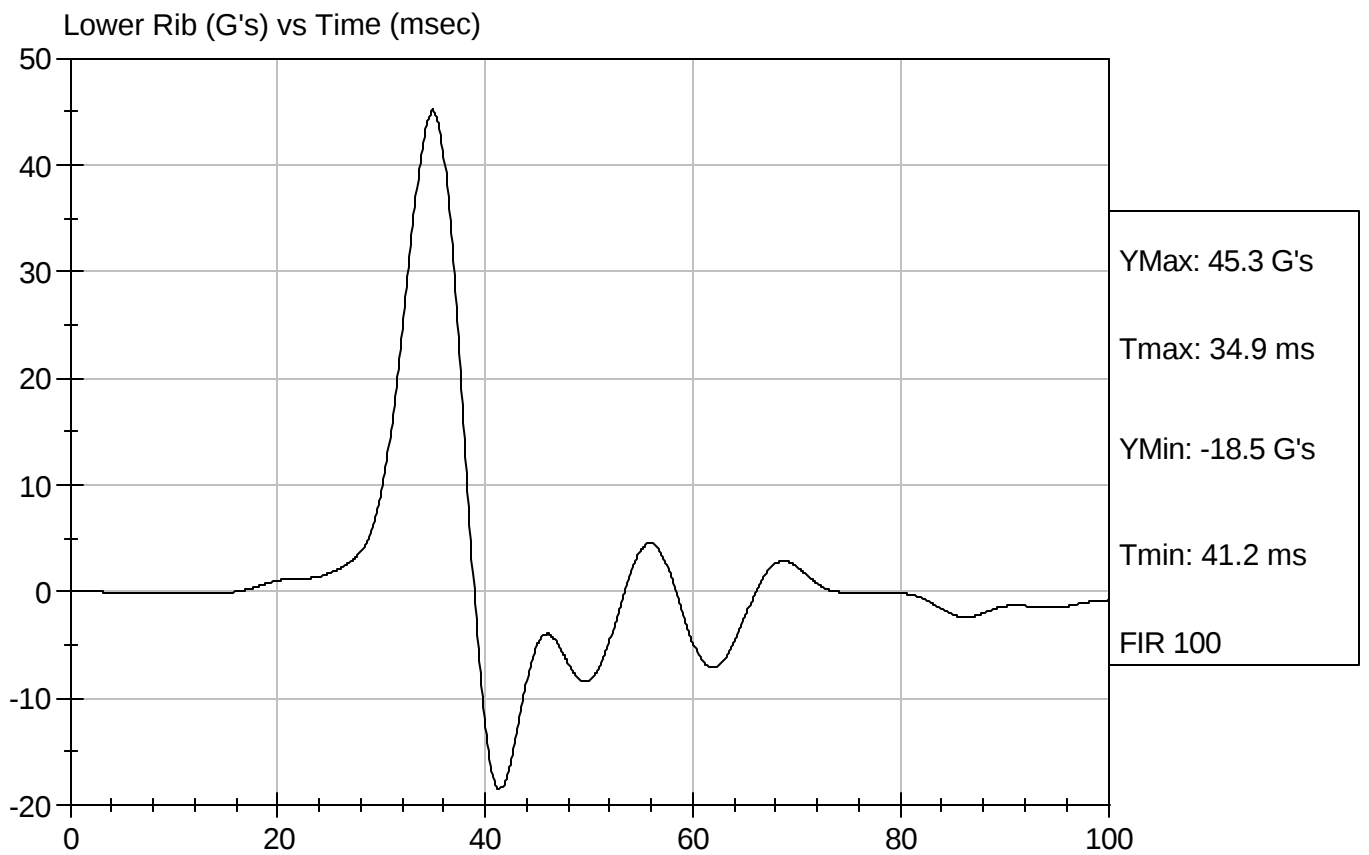
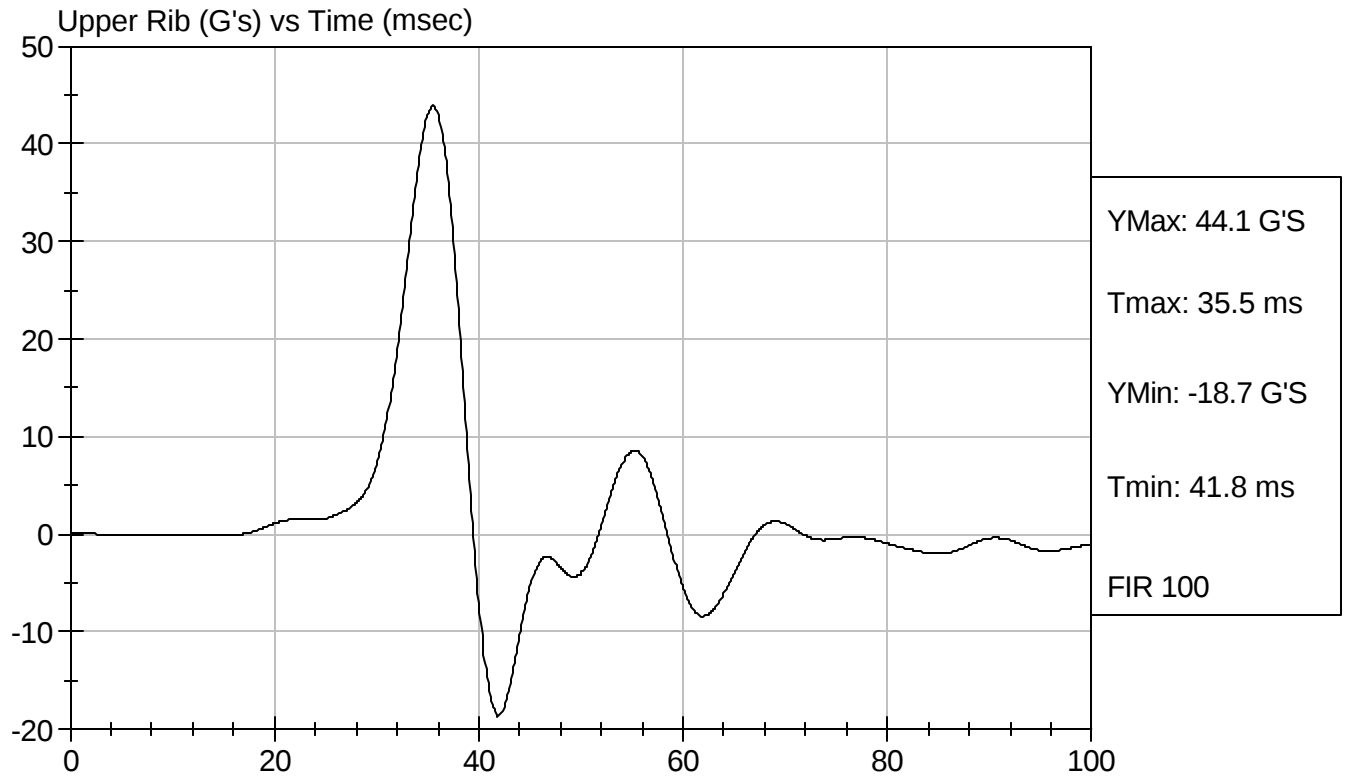

Approved By

09/02/2005
Test Date



Test Desc: Thorax Impact
Component ID: D052422

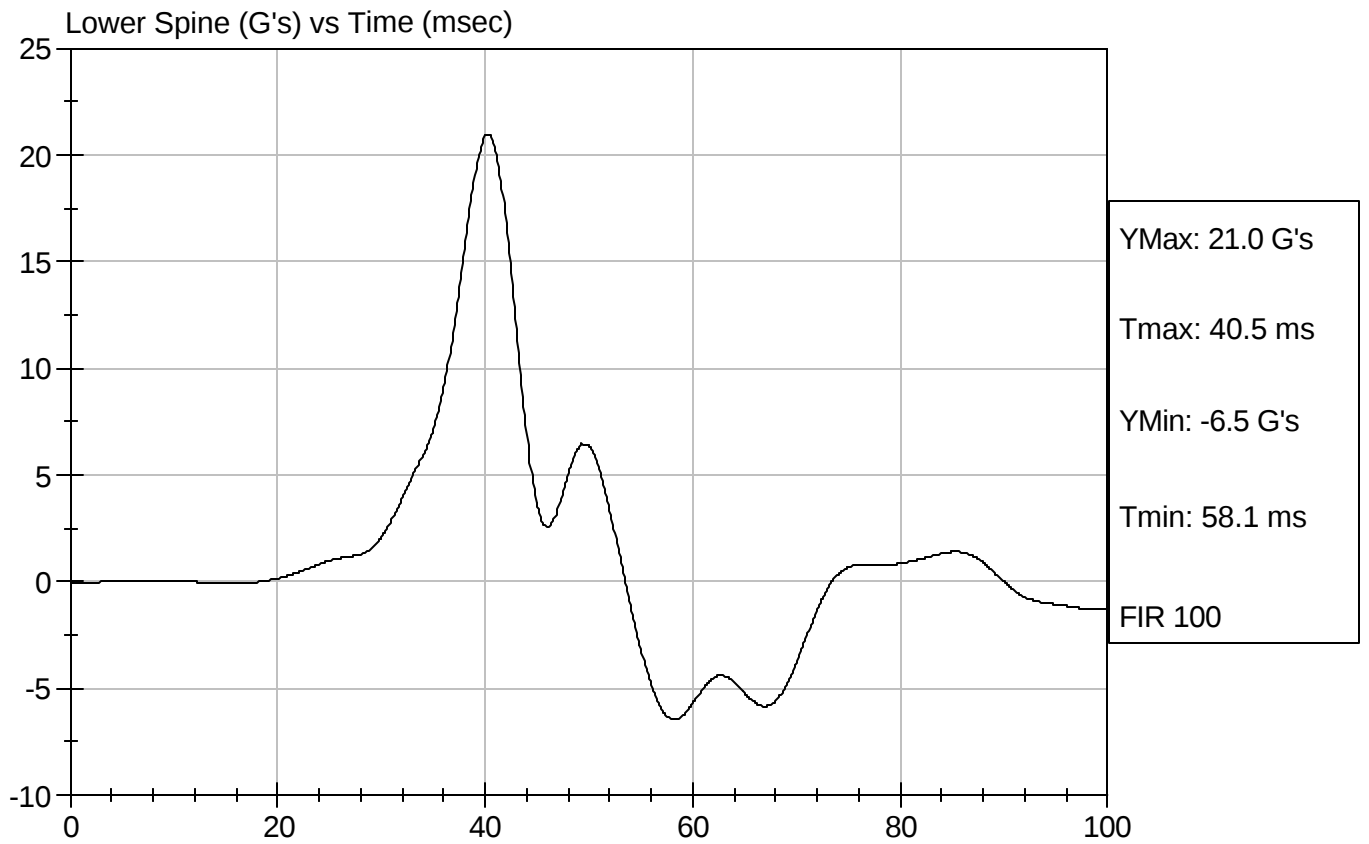
Test Date: 09/02/2005
Speed: 14.1 ft/sec, 4.30 m/sec





Test Desc: Thorax Impact
Component ID: D052422

Test Date: 09/02/2005
Speed: 14.1 ft/sec, 4.30 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 271

Test I.D: D052423

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	40	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 Gall
Laboratory Technician

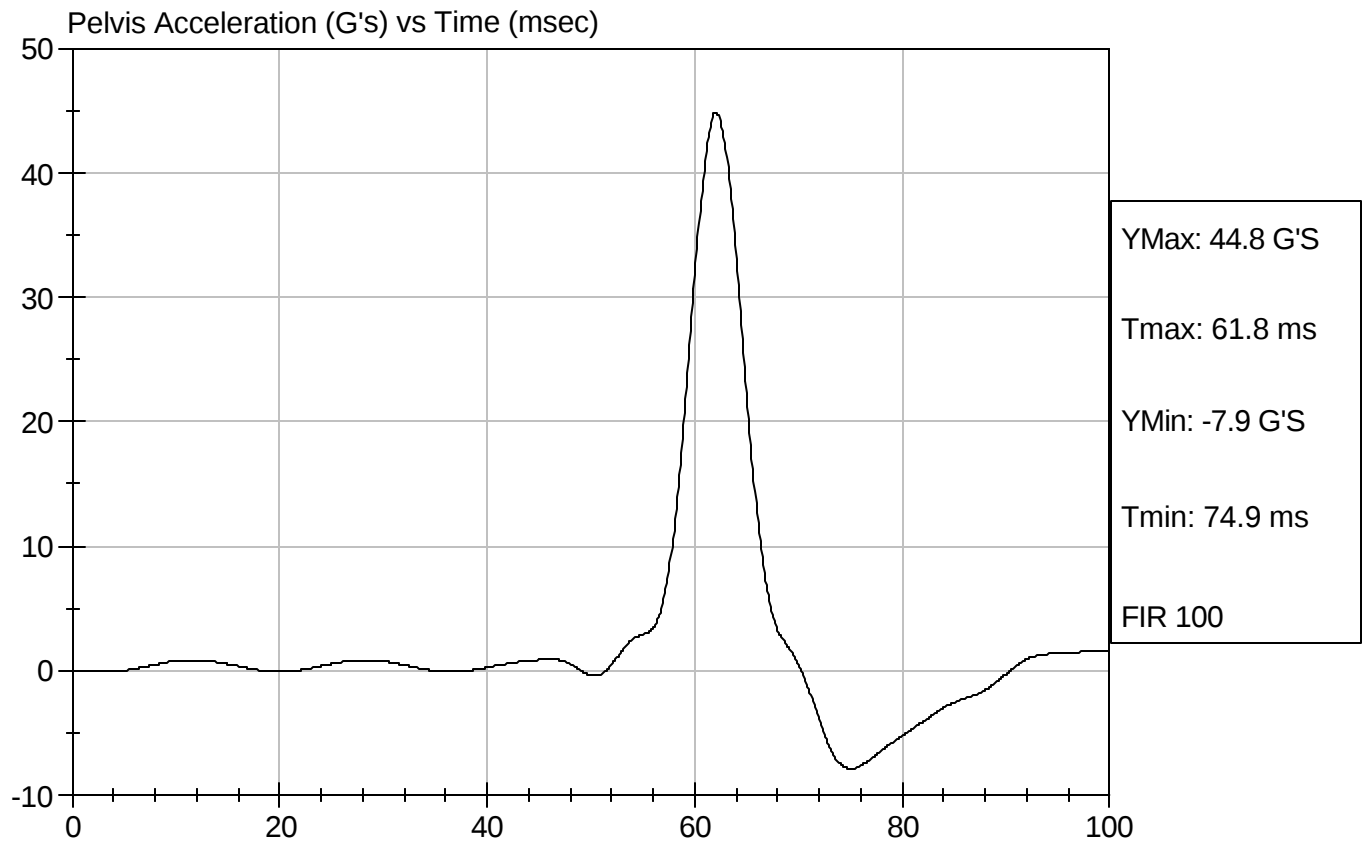
David Winkelbauer
Approved By

09/01/2005
Test Date



Test Desc: Pelvis Impact
Component ID: D052423

Test Date: 09/01/2005
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: 271

Test I.D: D052424

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Force At 12.7 mm	N	104 -162	137	Pass
Force At 19 mm	N	163 - 222	194	Pass
Force At 25.4 mm	N	222 - 280	266	Pass
Force At 33 mm	N	325 - 391	373	Pass
			Overall Test Results	Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

09/01/2005
Test Date

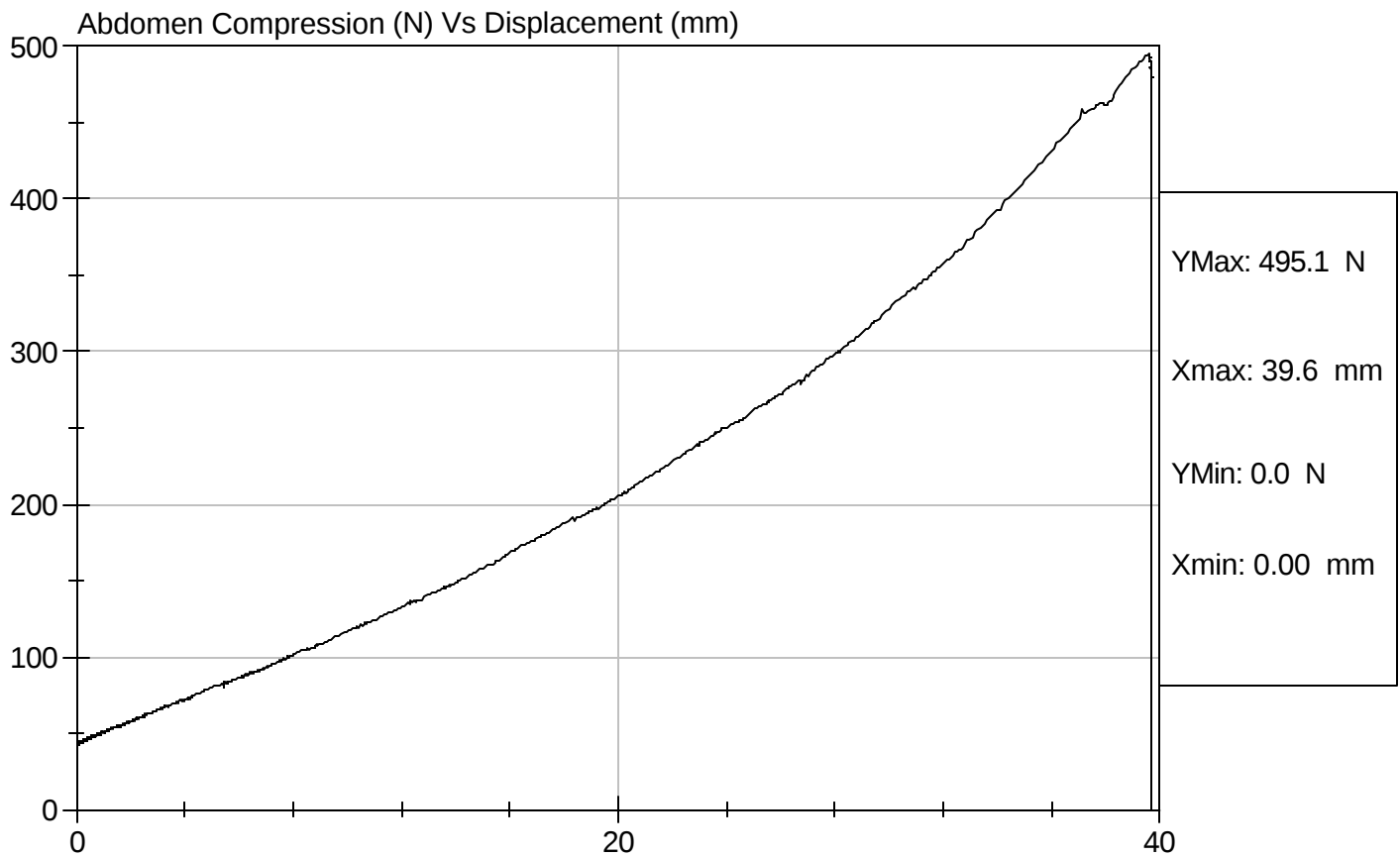


Test Description: Abdomen Compression

Test Date: 09/01/2005

Component: D052424

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 037

Test I.D: D052425

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	125.7	Pass
Force At 30 deg	N	151.2 - 204.6	166.3	Pass
Force At 40 deg	N	204.6 - 258.0	222.2	Pass
Return Angle	Deg	12 Maximum	4	Pass
			Overall Test Results	Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

09/01/2005
Test Date

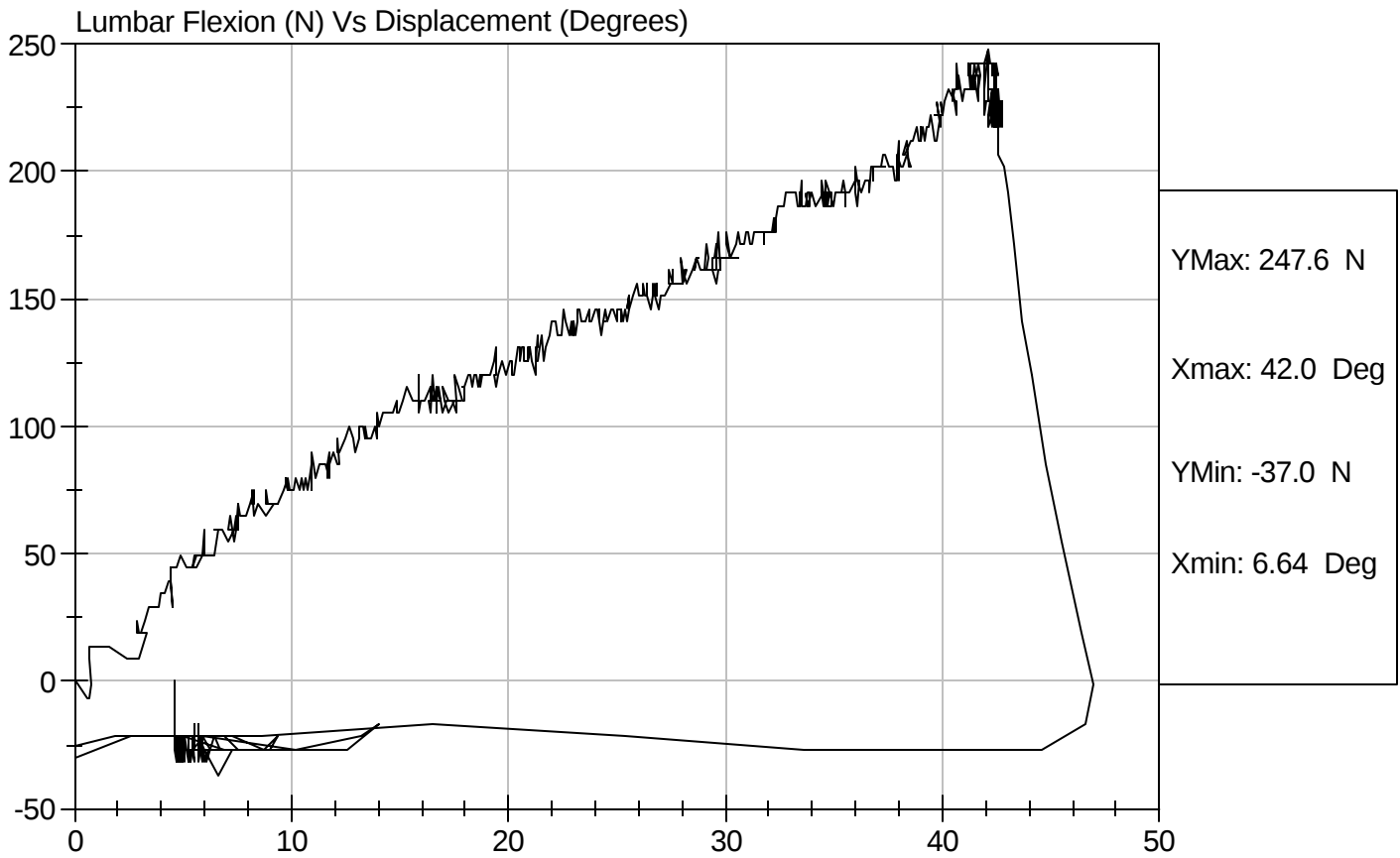


Test Description: Lumbar Flexion

Test Date: 09/01/2005

Component: D052425

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet
Side Impact Dummy (SID)
Neck Pendulum Test

ATD Serial No: 271

Test I.D: D052429

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Impact Velocity		m/s	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.35	Pass
	20 msec	m/s	4.12 to 5.10	4.69	Pass
	30 msec	m/s	5.73 to 7.01	6.62	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.24	Pass
Midsagittal 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	75	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	61	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	12	Pass


 Laboratory Technician


 Approved By

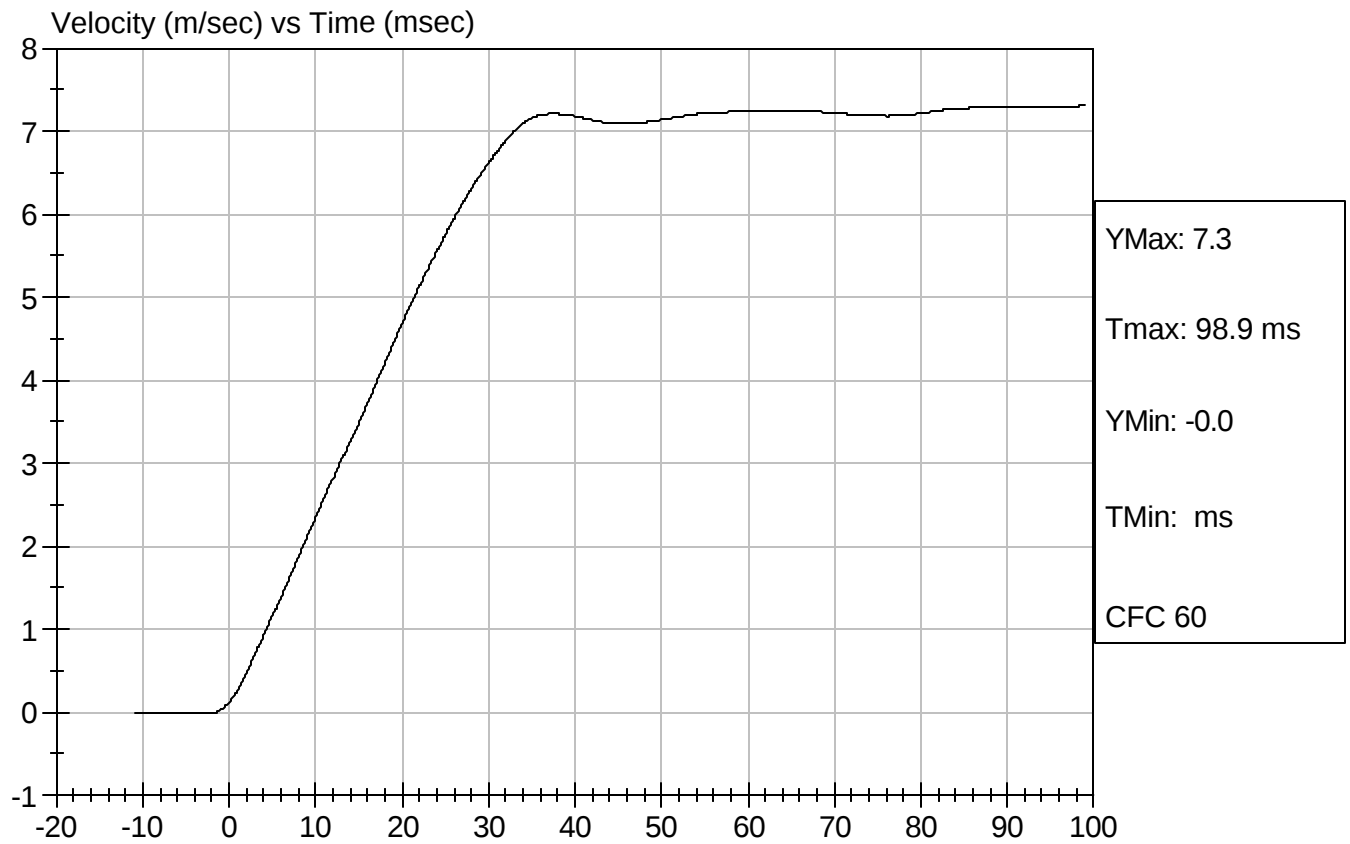
09/01/2005

Test Date



Test Desc: Neck Bending
Component ID: D052429

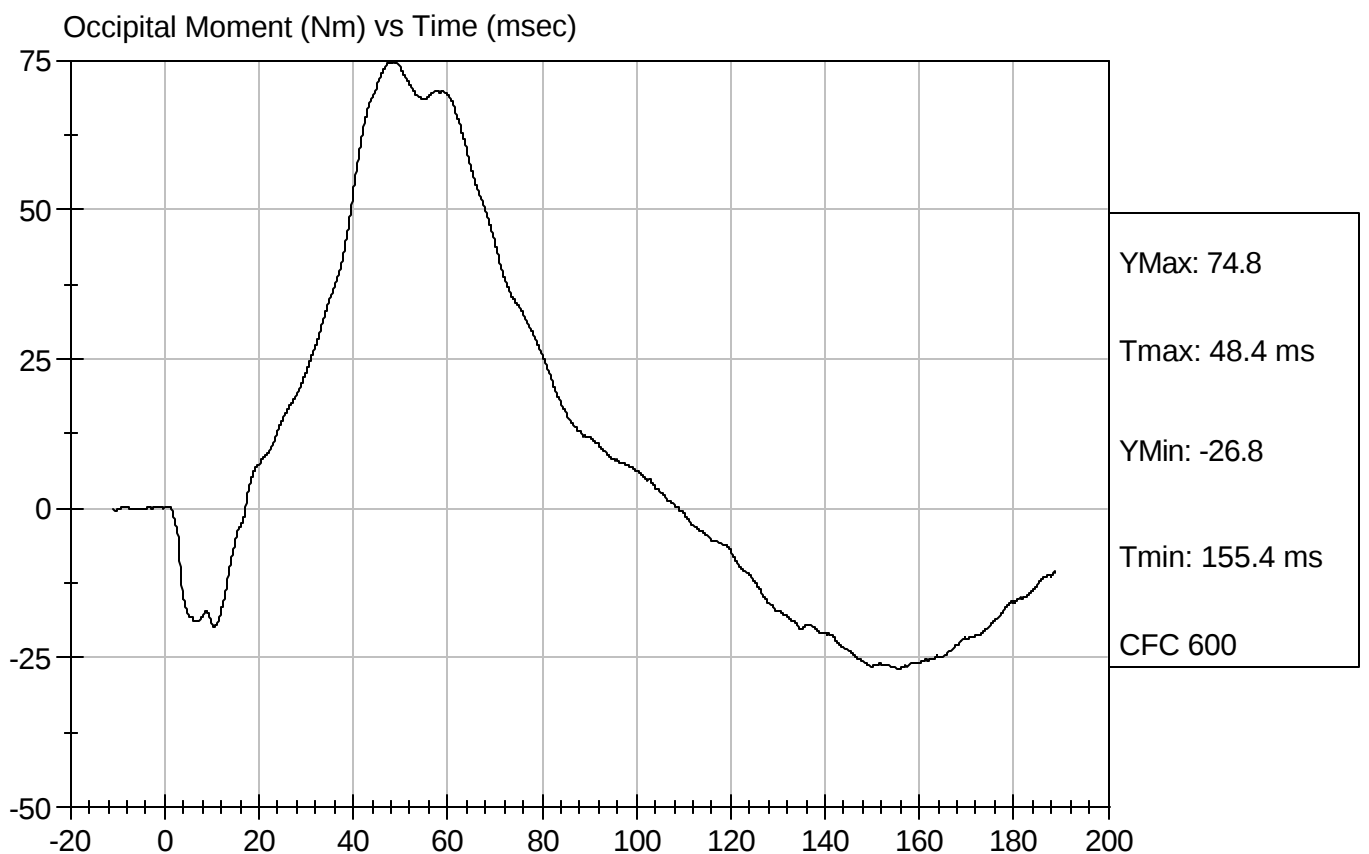
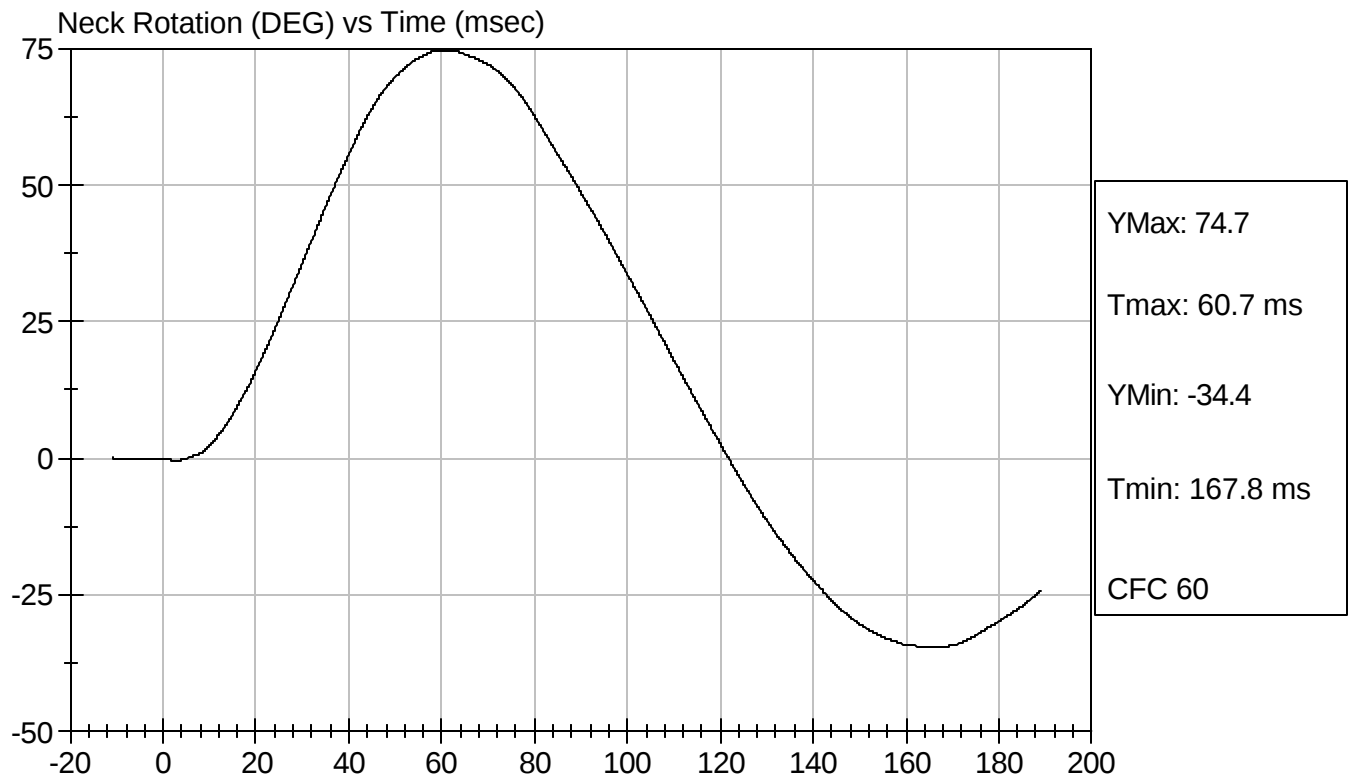
Test Date: 09/01/2005
Speed: 23.19 ft/sec, 7.07 m/sec





Test Desc: Neck Bending
Component ID: D052429

Test Date: 09/01/2005
Speed: 23.19 ft/sec, 7.07 m/sec



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

09/02/2005
Test Date

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

David Winkelbauer
Approved By

08/23/2005
Test Date

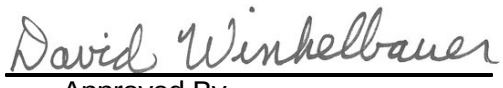
SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration (Lateral)

ATD Serial No: 904

Test I.D: D052351

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	39	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	-9	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

08/23/2005

Test Date



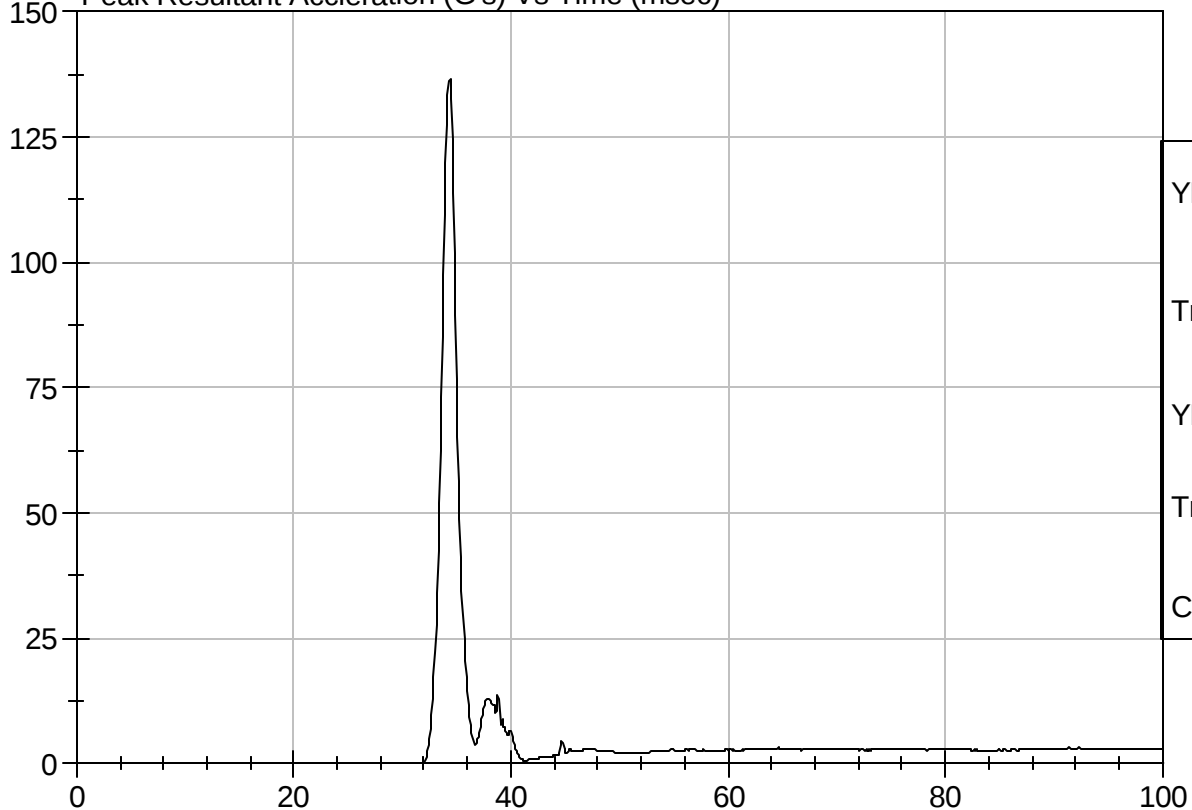
Test Description: Head Drop

Test Date: 08/23/2005

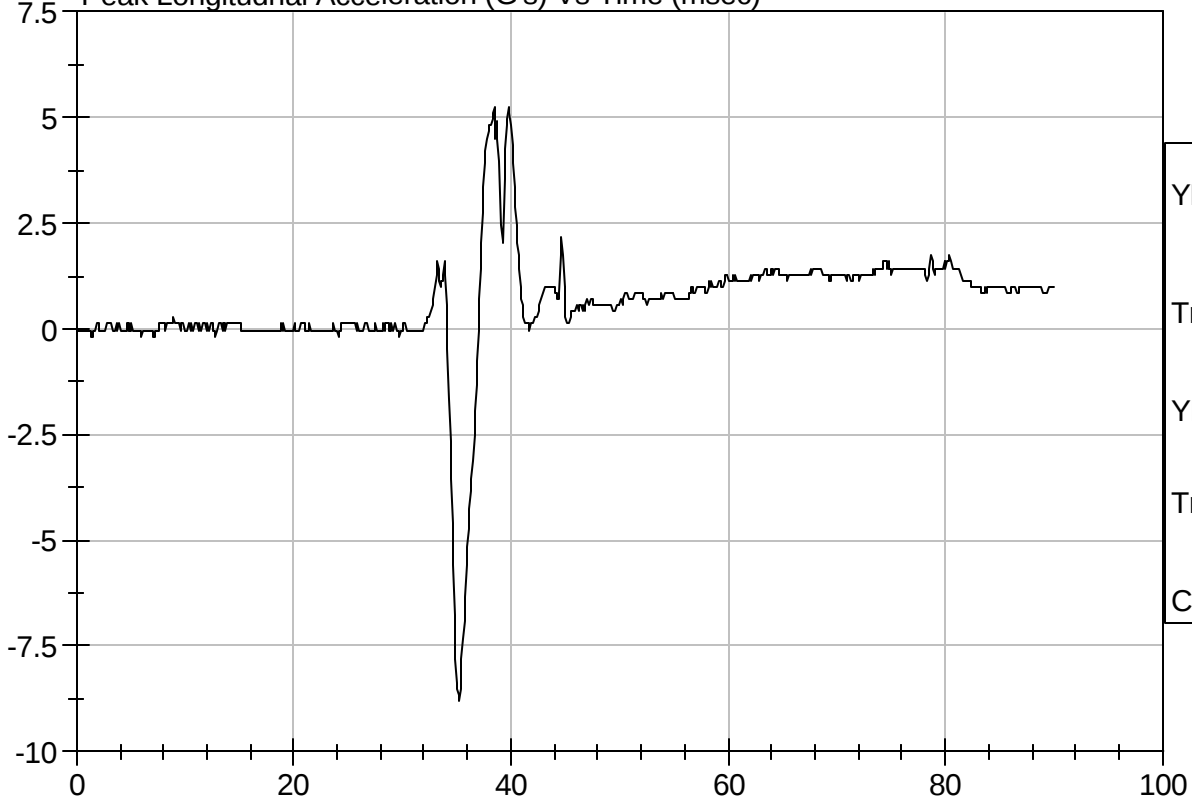
Component: D052351

Speed: 0 ft/s, 0.00 m/s

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



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



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Test

ATD Serial No: 904

Test I.D: D052352

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	4.22 - 4.31	4.28	Pass
Upper Rib	G's	37 - 46	40	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	21	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

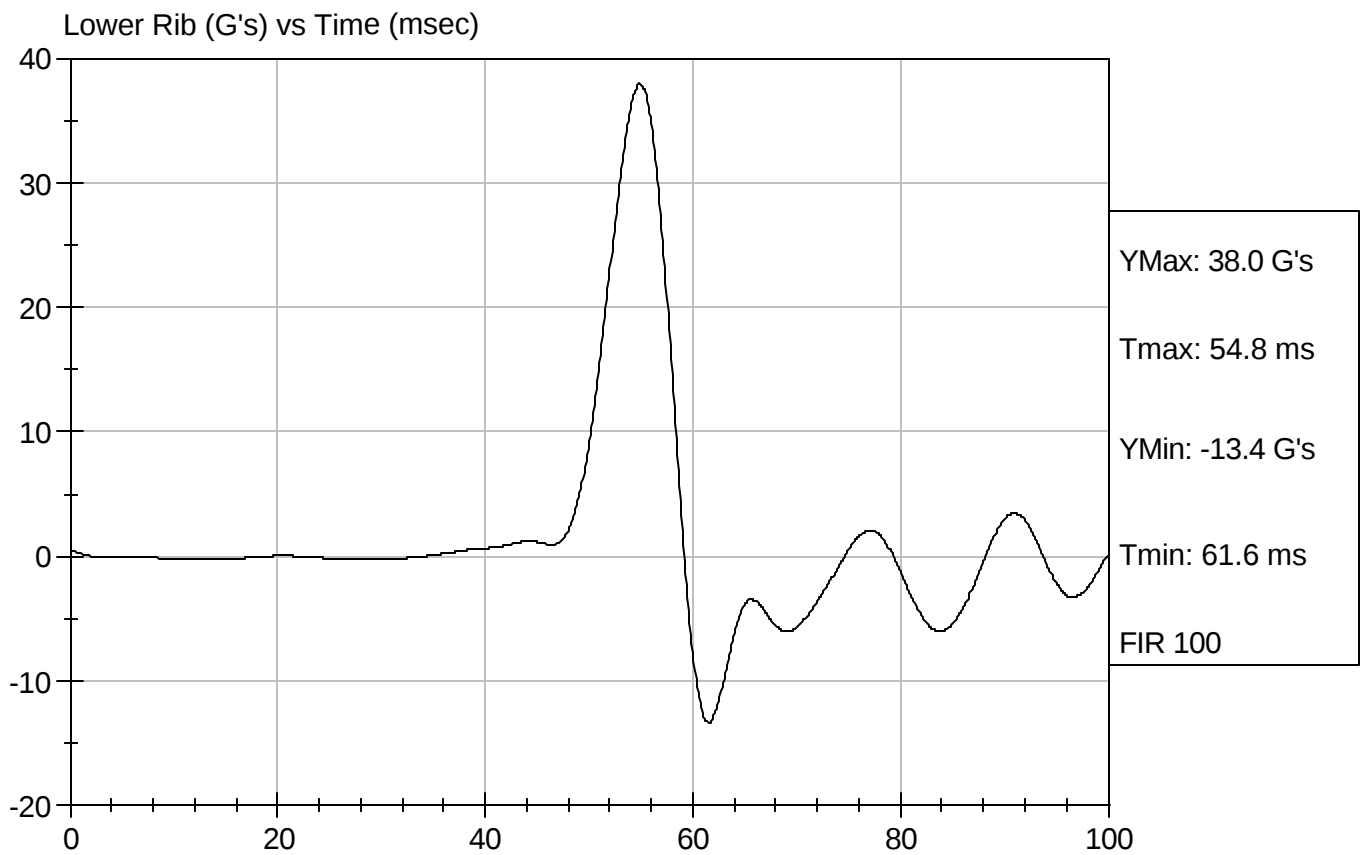
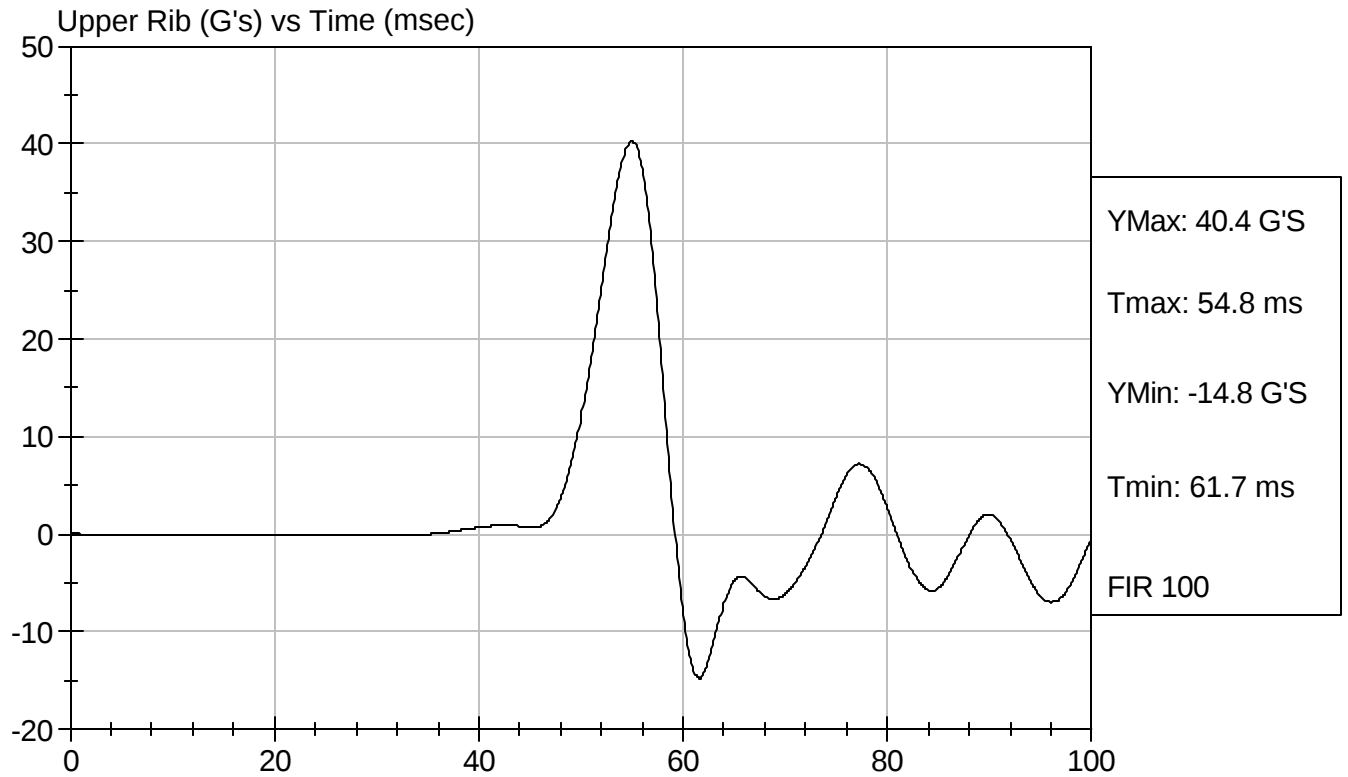
David Winkelbauer
Approved By

08/22/2005
Test Date



Test Desc: Thorax Impact
Component ID: D052352

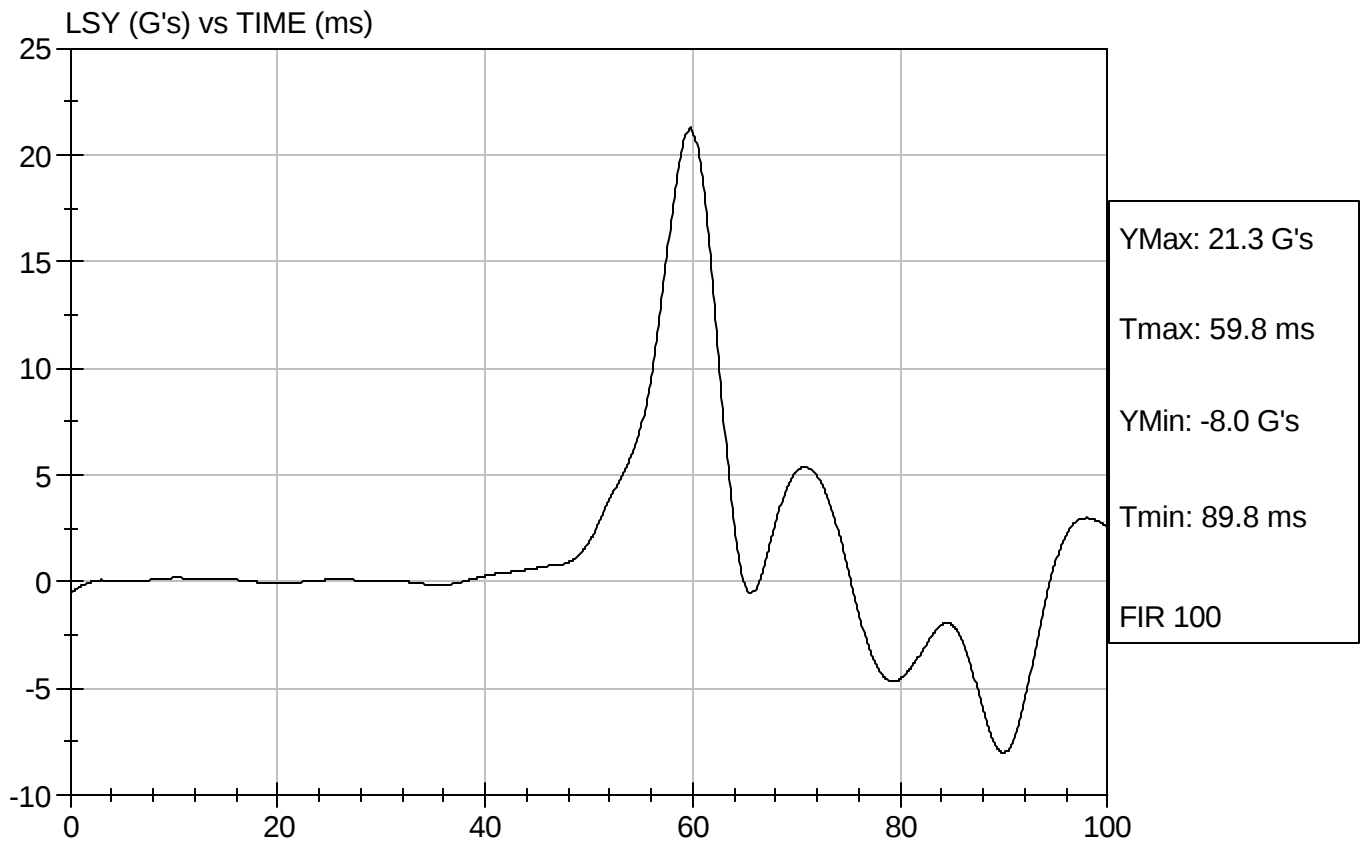
Test Date: 08/22/2005
Speed: 14.055 ft/sec, 4.28 m/sec





Test Desc: Thorax Impact
Component ID: D052352

Test Date: 08/22/2005
Speed: 14.055 ft/sec, 4.28 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 904

Test I.D: D052353

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	41	Pass
Probe Velocity	m/s	4.27 - 4.33	4.29	Pass
Pelvis Acceleration	G's	40 - 60	44	Pass
			Overall Test Results	Pass

Jessica Gall
Laboratory Technician

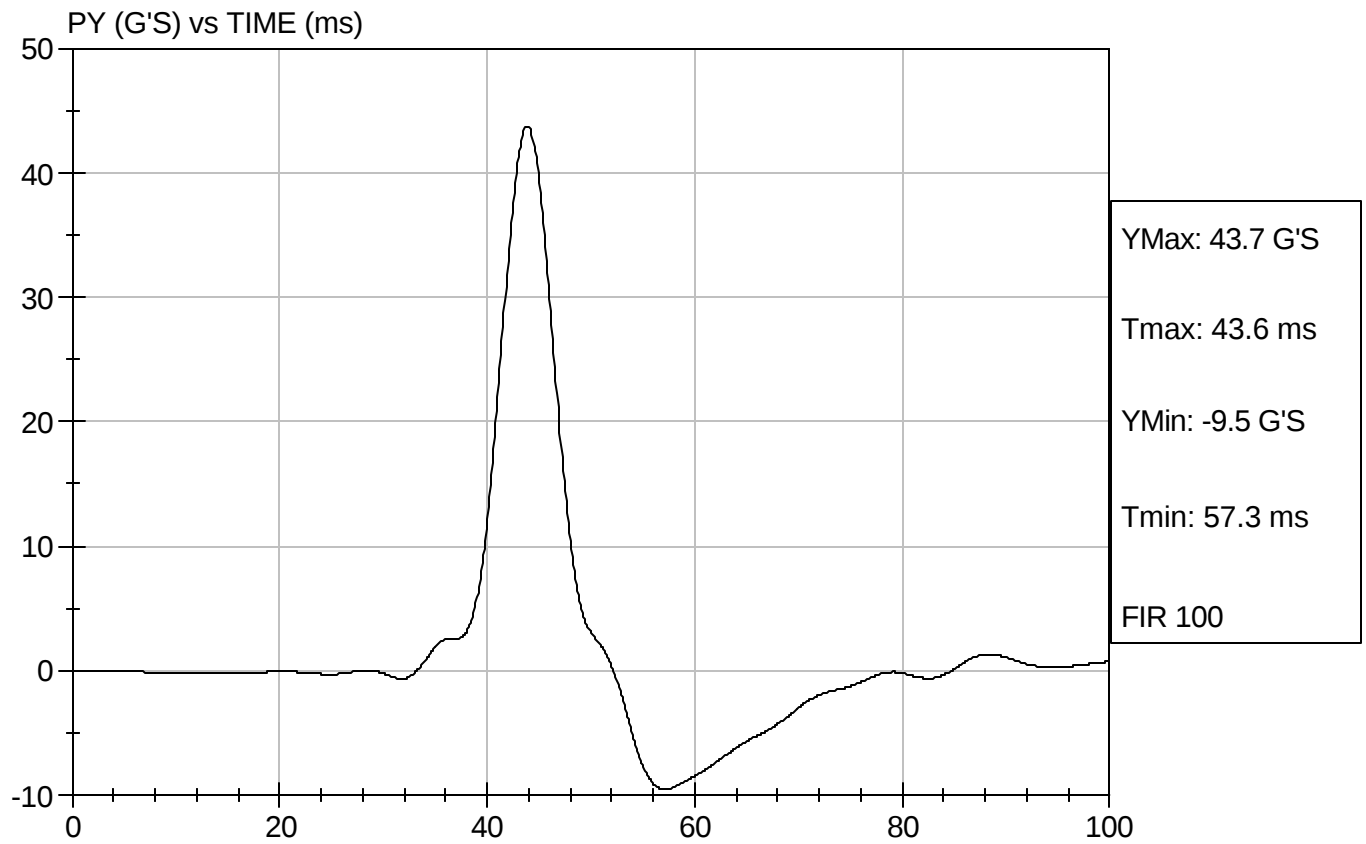
David Winkelbauer
Approved By

08/22/2005
Test Date



Test Desc: Pelvis Impact
Component ID: D052353

Test Date: 08/22/2005
Speed: 14.07 ft/sec, 4.29 m/sec



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

ATD Serial No: 904

Test I.D: D052354

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Force At 12.7 mm	N	104 -162	135	Pass
Force At 19 mm	N	163 - 222	186	Pass
Force At 25.4 mm	N	222 - 280	251	Pass
Force At 33 mm	N	325 - 391	343	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

08/22/2005
Test Date

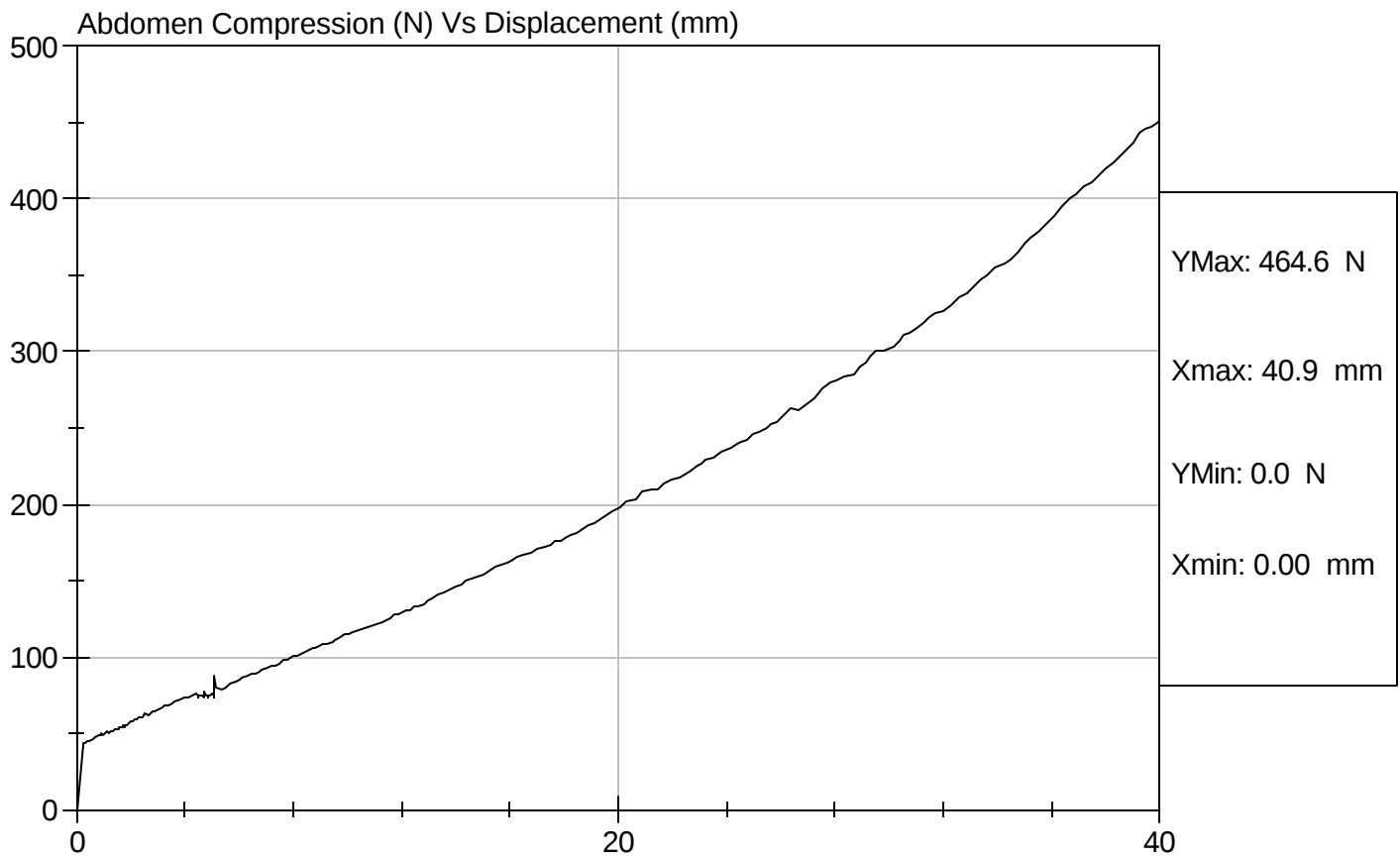


Test Description: Abdomen Compression

Test Date: 08/22/2005

Component: D052354

Speed: 0 ft/sec, 0 m/sec



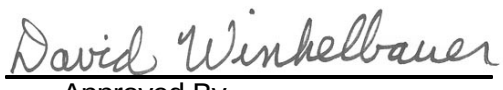
SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 904

Test I.D: D052355

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	98.4	Pass
Force At 30 deg	N	151.2 - 204.6	165.1	Pass
Force At 40 deg	N	204.6 - 258.0	237.4	Pass
Return Angle	Deg	12 Maximum	4	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

08/22/2005
Test Date

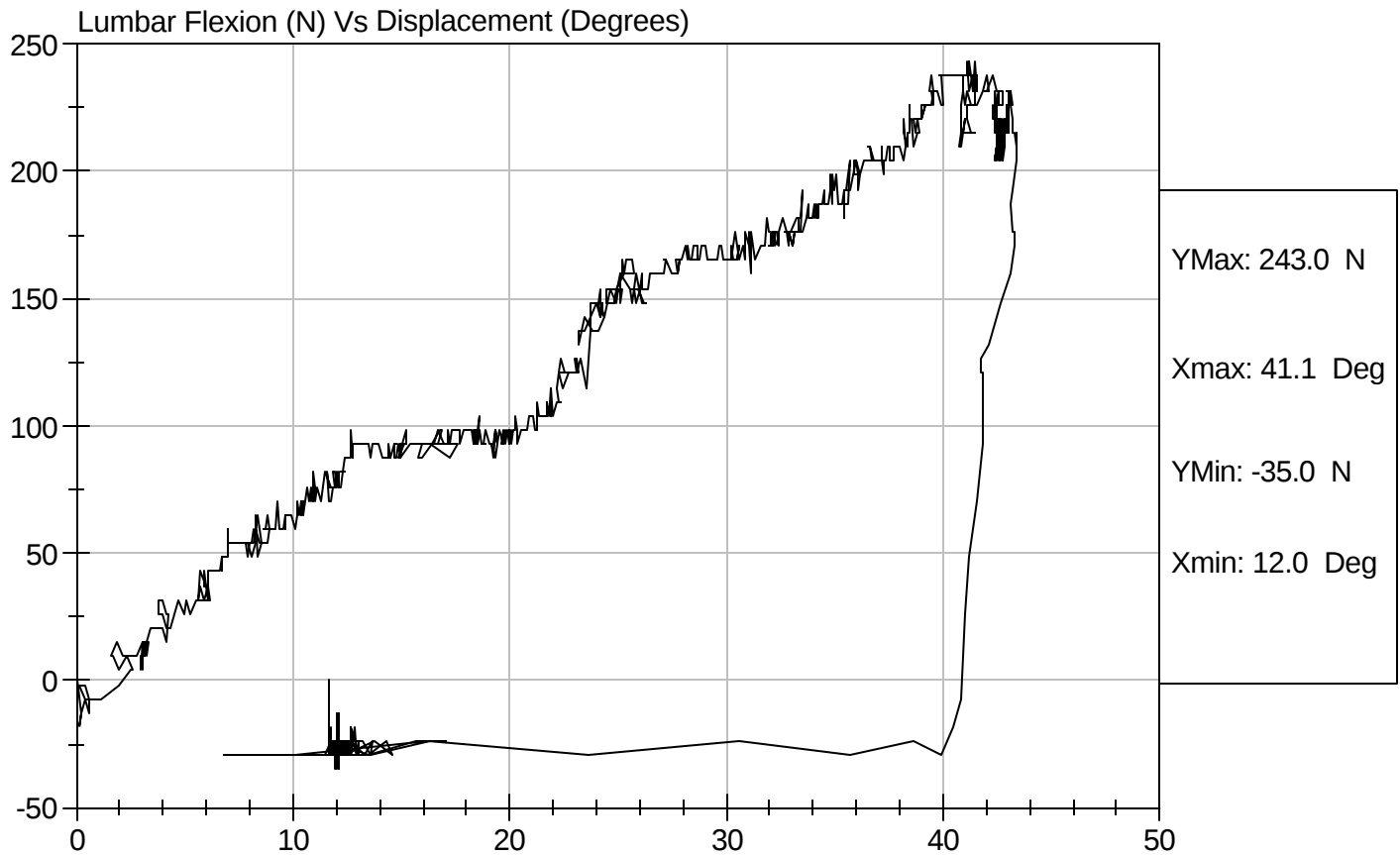


Test Description: Lumbar Flexion

Test Date: 08/22/2005

Component: D052355

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: D052359

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Impact Velocity		m/s	6.89 to 7.13	7.03	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.38	Pass
	20 msec	m/s	4.12 to 5.10	4.73	Pass
	30 msec	m/s	5.73 to 7.01	6.77	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.20	Pass
Midsagittal 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	78	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	61	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	16	Pass


 Laboratory Technician

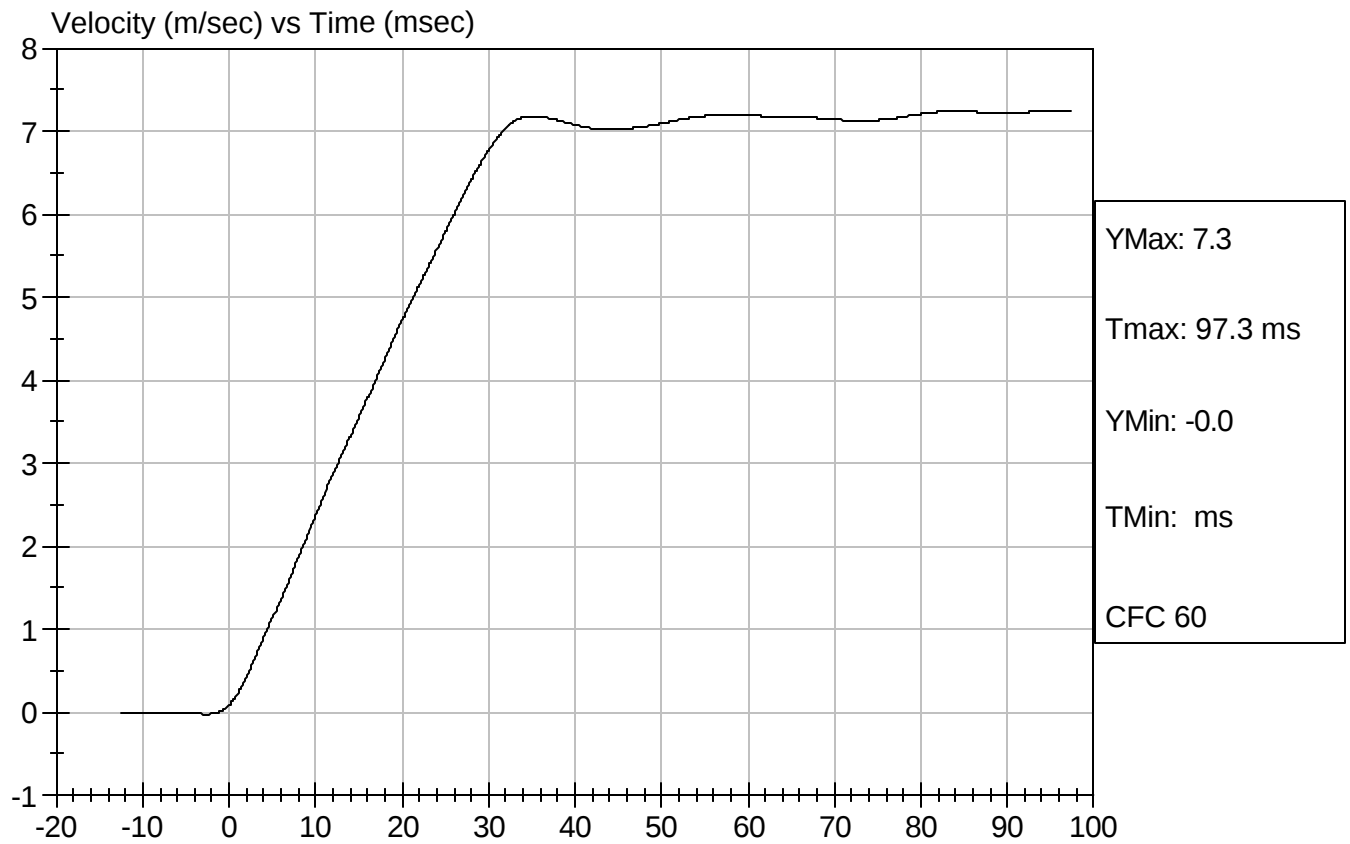

 Approved By

08/23/2005
 Test Date



Test Desc: Neck Bending
Component ID: D052359

Test Date: 08/23/2005
Speed: 23.06 ft/sec, 7.03 m/sec

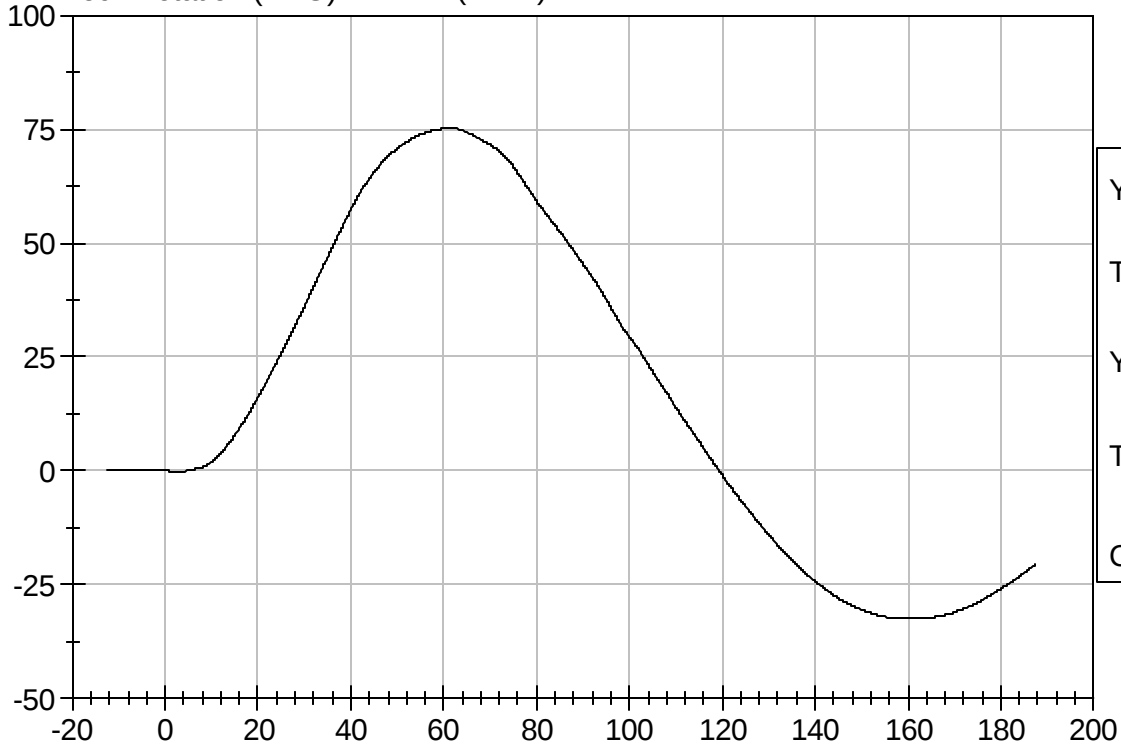




Test Desc: Neck Bending
Component ID: D052359

Test Date: 08/23/2005
Speed: 23.06 ft/sec, 7.03 m/sec

Neck Rotation (DEG) vs Time (msec)



YMax: 75.2

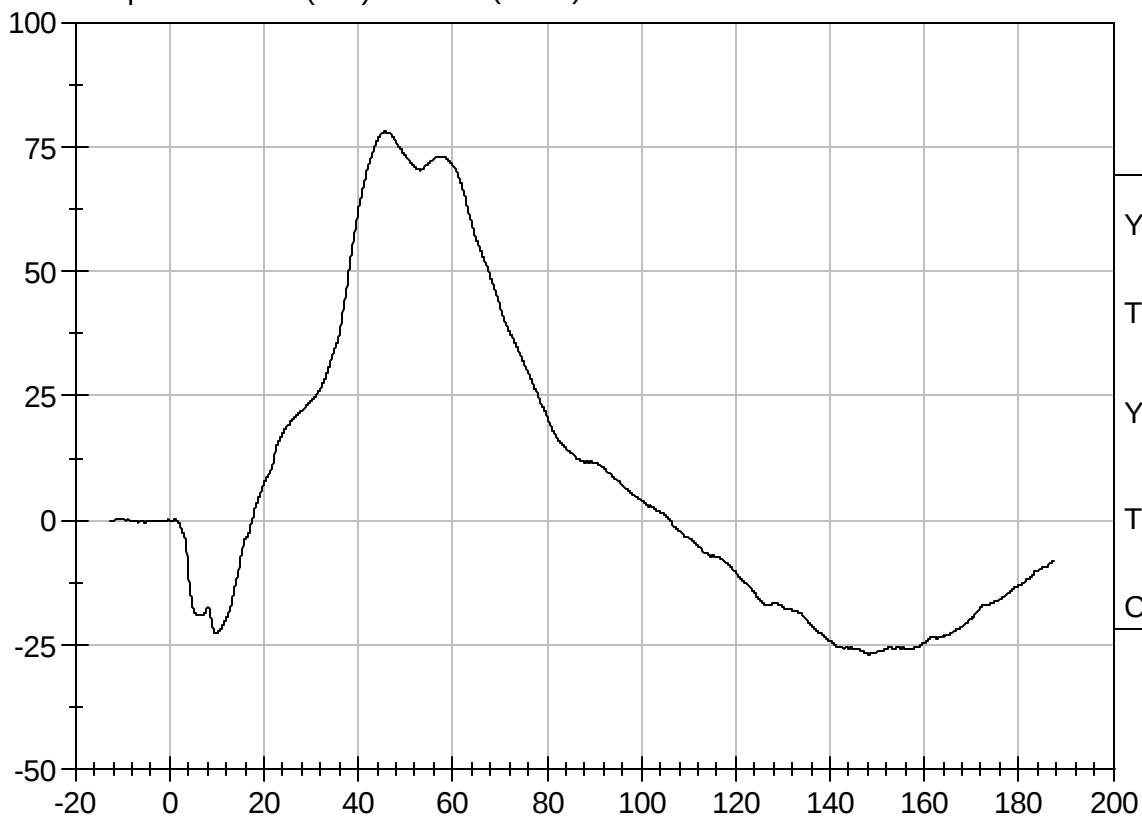
Tmax: 61.5 ms

YMin: -32.6

Tmin: 162.3 ms

CFC 60

Occipital Moment (Nm) vs Time (msec)



YMax: 78.1

Tmax: 45.6 ms

YMin: -26.9

Tmin: 148.3 ms

CFC 600

Calibration Test Results Summary

Dummy Serial Number: 904

Post-Test Calibration

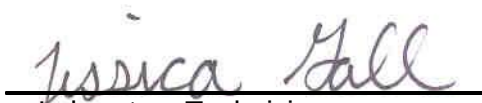
External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis 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: D052431

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Peak Resultant Acceleration	G's	120 to 150	138	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-9	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

09/01/2005
Test Date



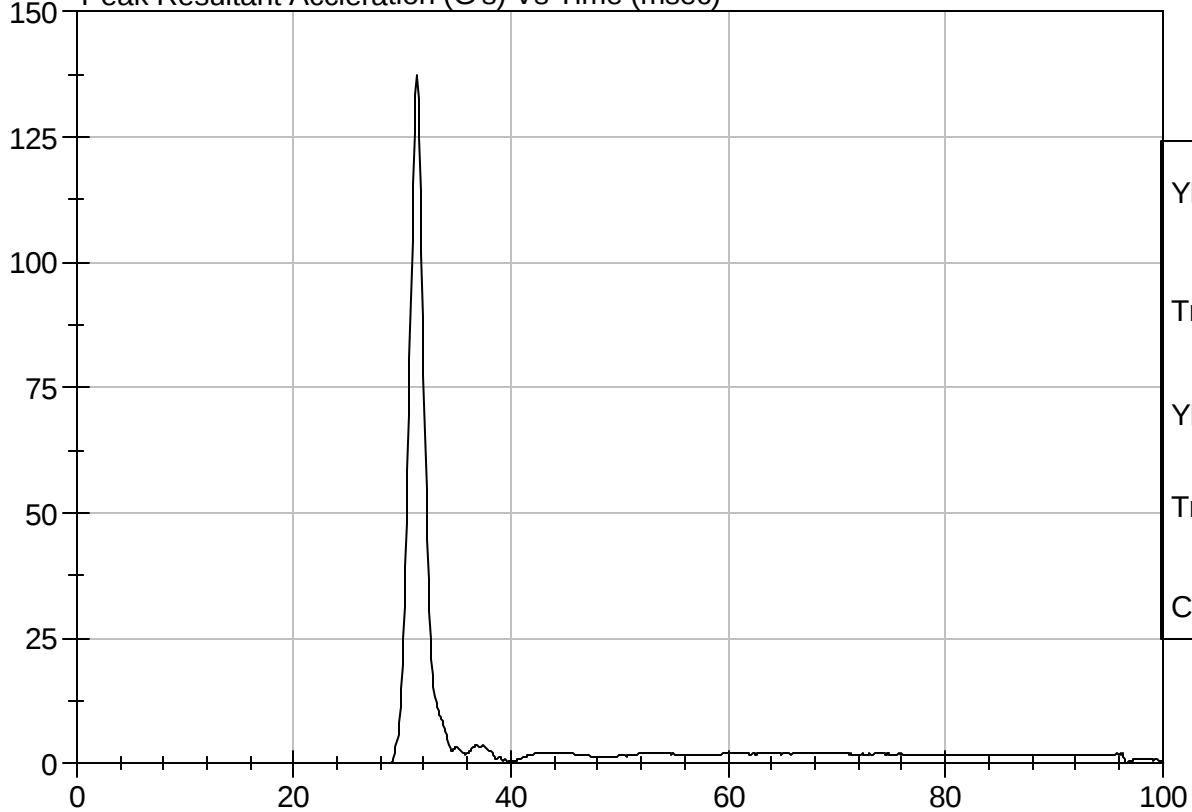
Test Description: Head Drop

Test Date: 09/01/2005

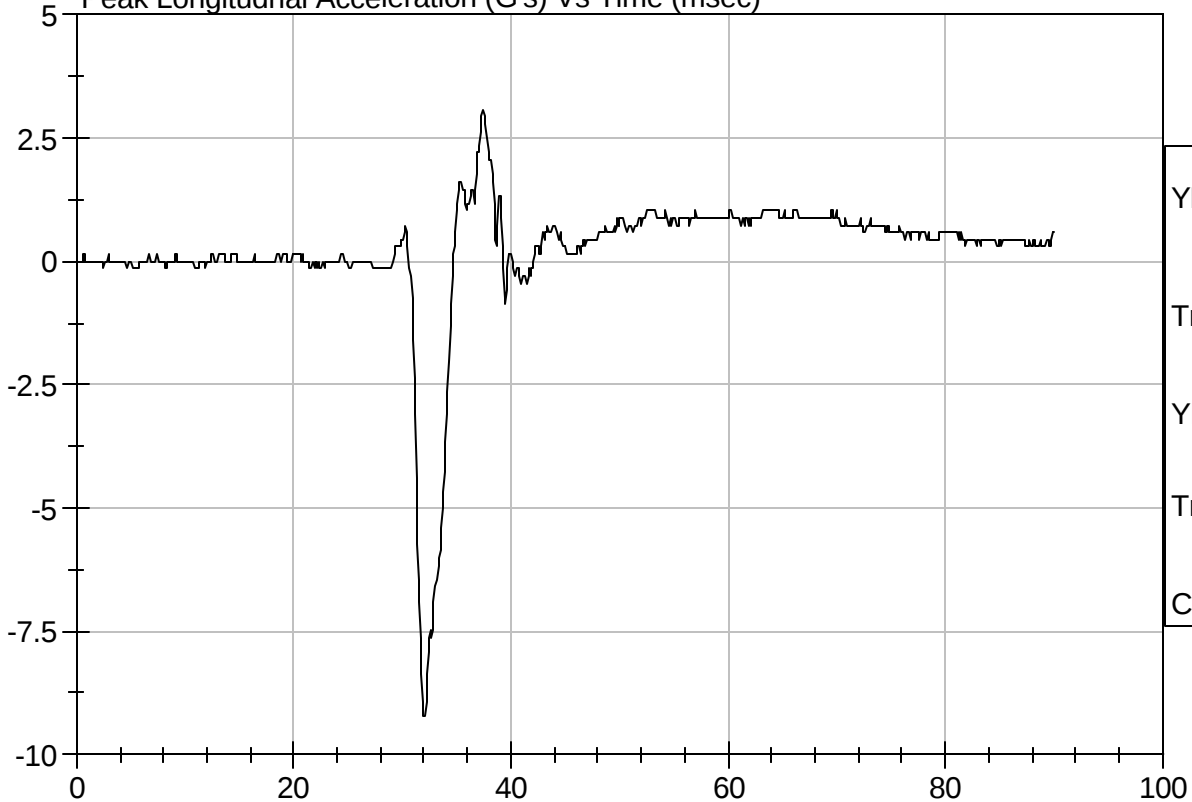
Component: D052431

Speed: 0 ft/s, 0.00 m/s

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



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



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Test

ATD Serial No: 904

Test I.D: D052432

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.22 - 4.31	4.29	Pass
Upper Rib	G's	37 - 46	42	Pass
Lower Rib	G's	37 - 46	39	Pass
Lower Spine	G's	15 - 22	22	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

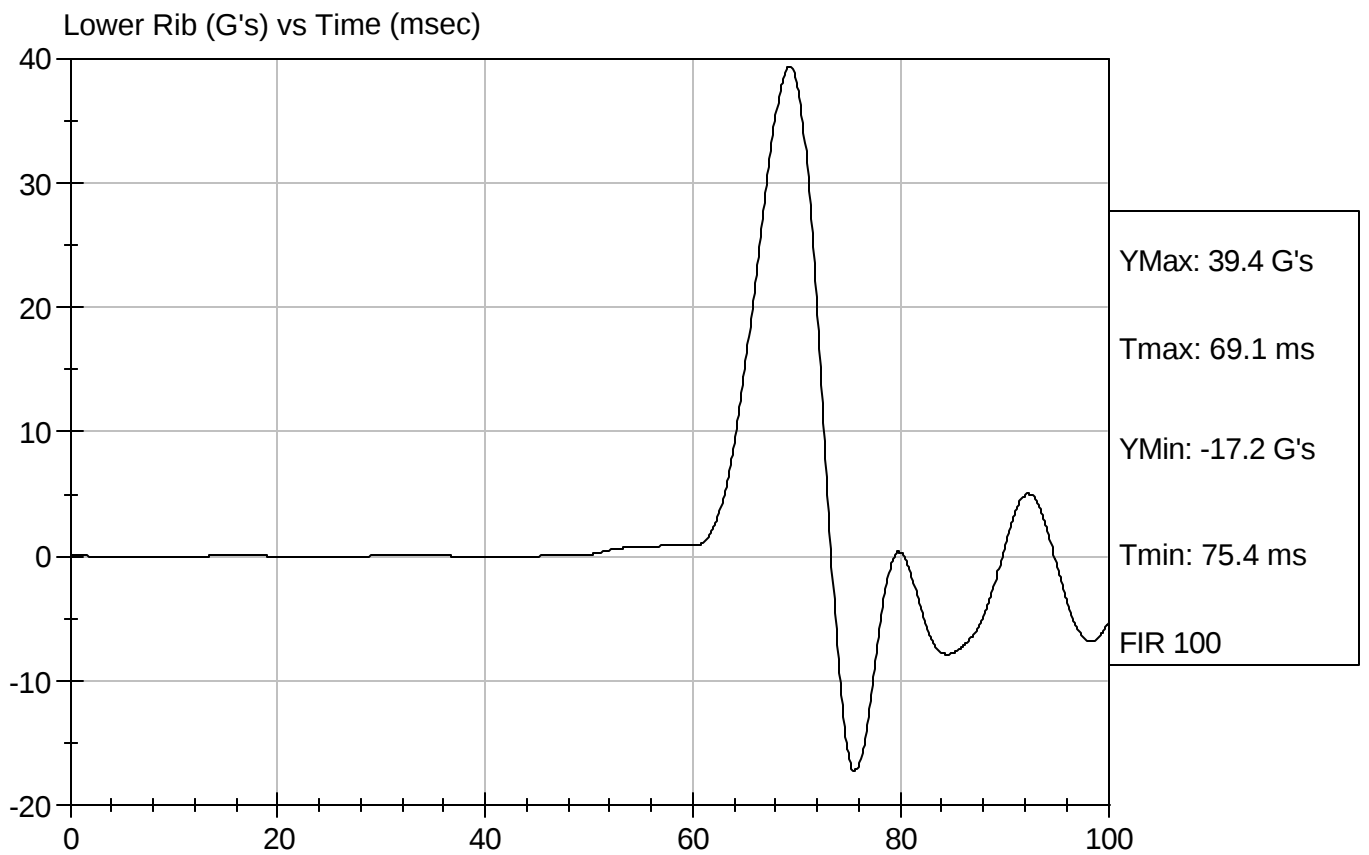
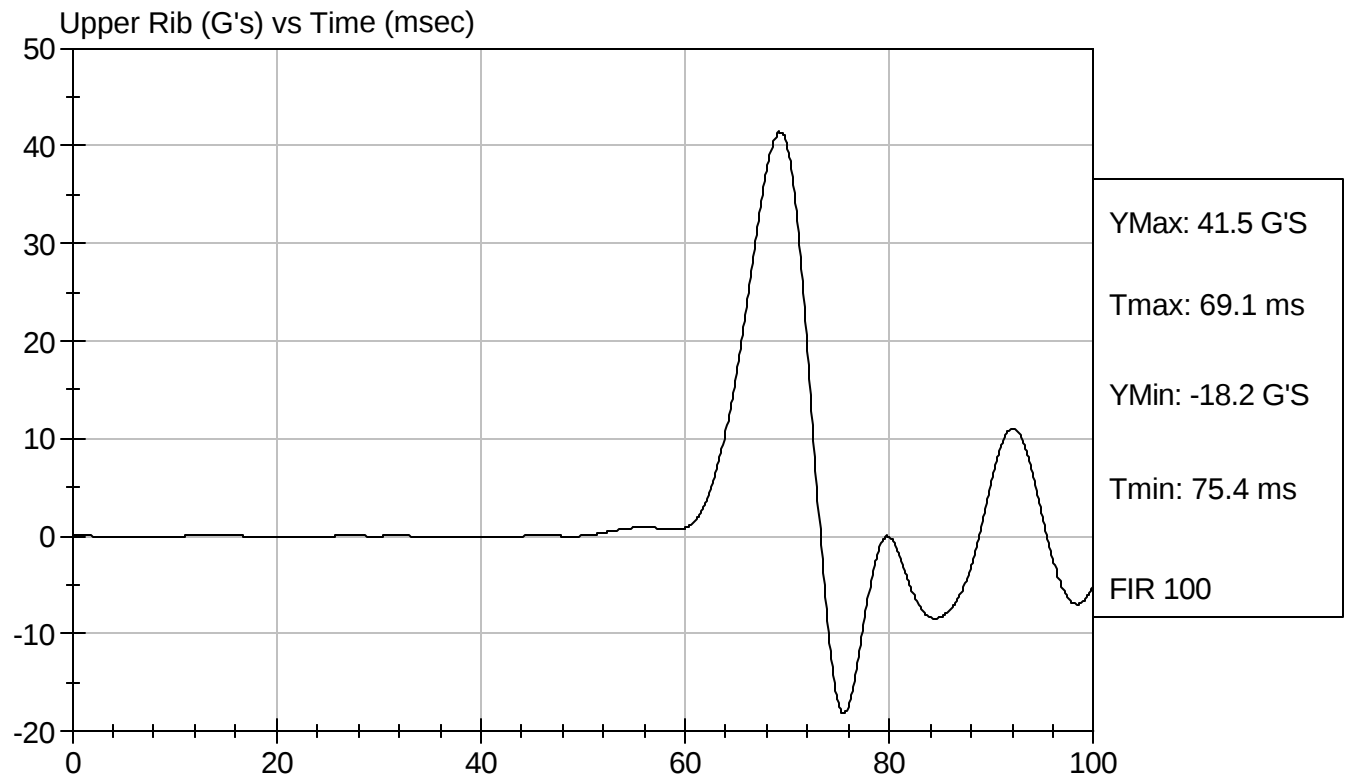
David Winkelbauer
Approved By

09/02/2005
Test Date



Test Desc: Thorax Impact
Component ID: D052432

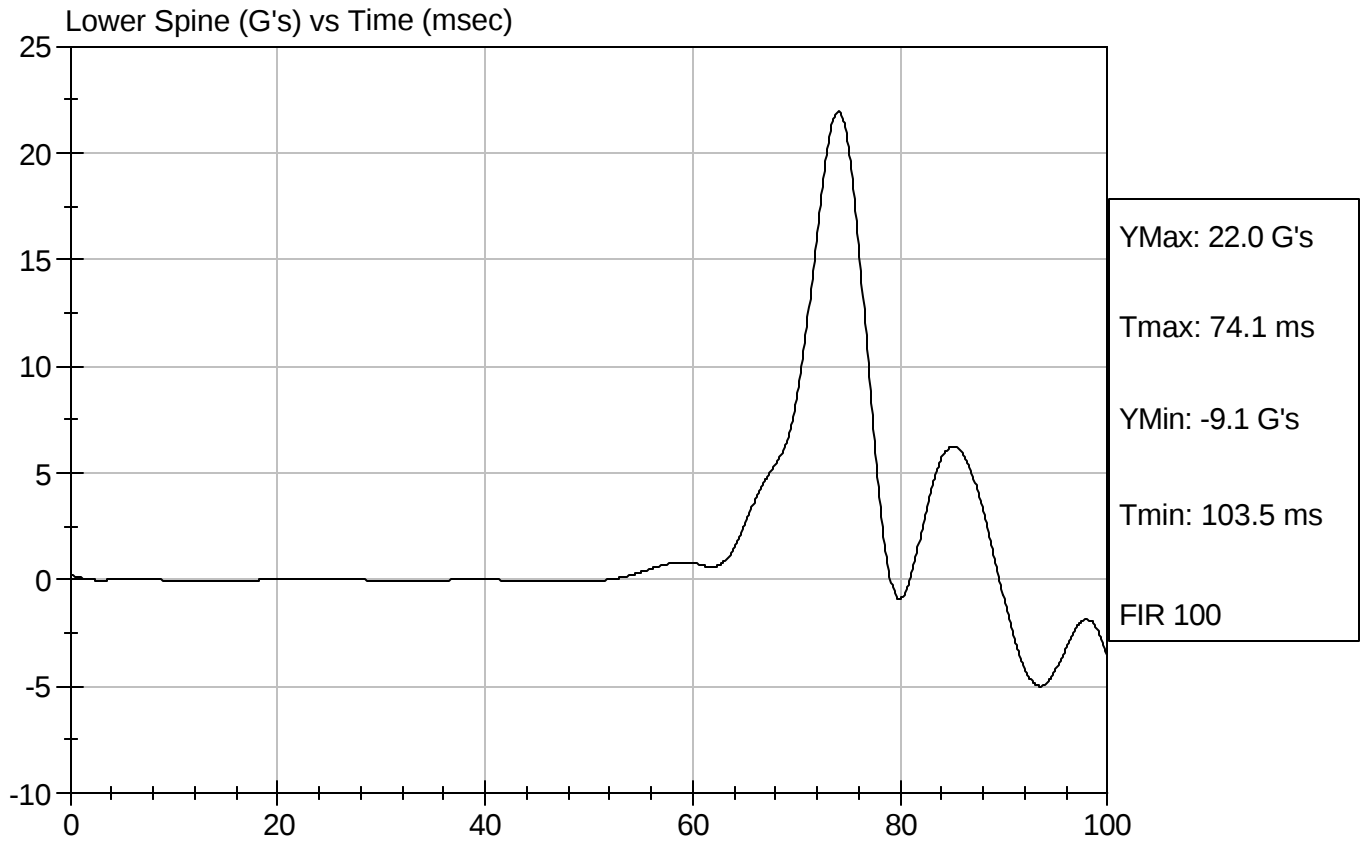
Test Date: 09/02/2005
Speed: 14.07 ft/sec, 4.29 m/sec





Test Desc: Thorax Impact
Component ID: D052432

Test Date: 09/02/2005
Speed: 14.07 ft/sec, 4.29 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 042

Test I.D: D052433

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	40	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	47	Pass
Overall Test Results			Pass	

Jessica Gall
Laboratory Technician

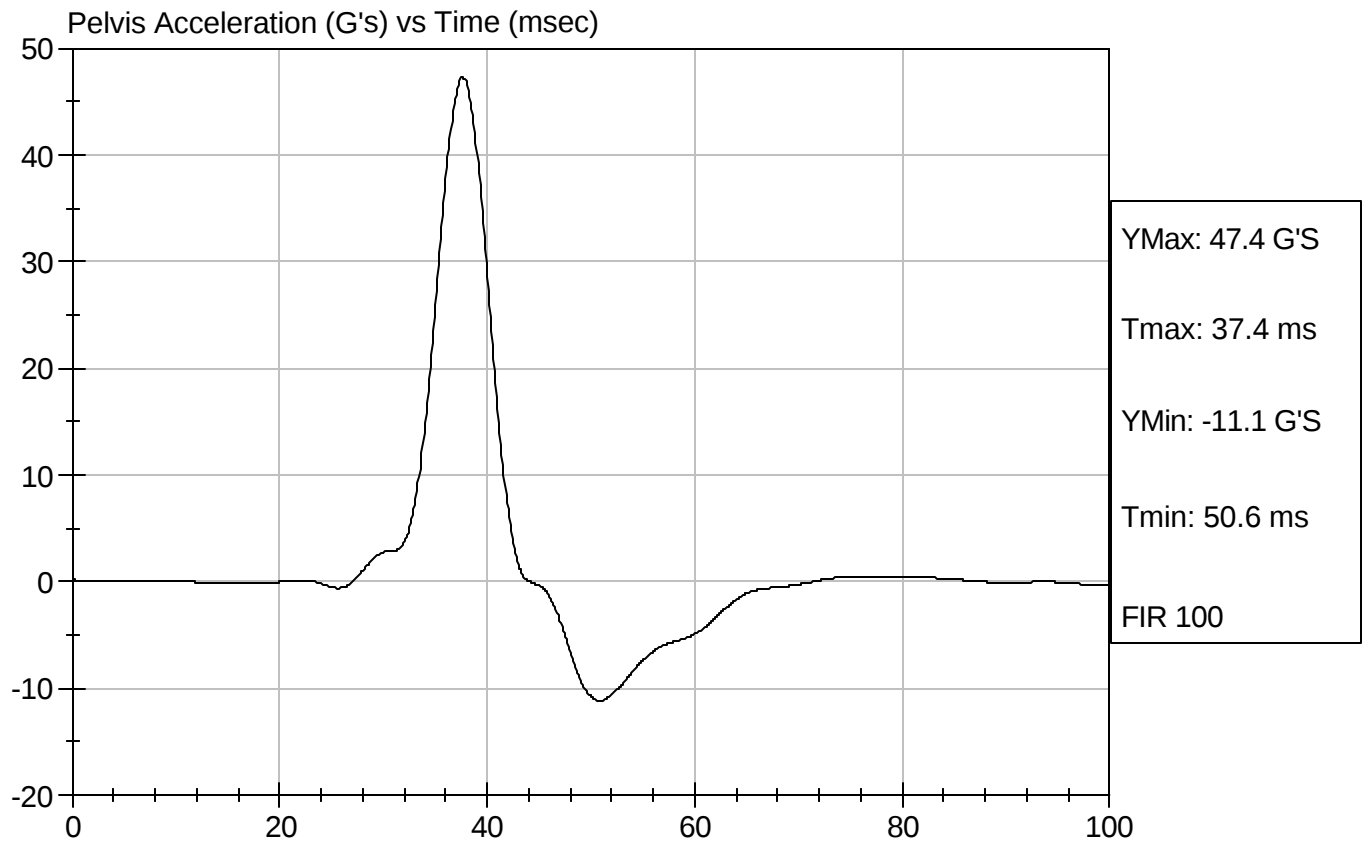
David Winkelbauer
Approved By

09/02/2005
Test Date



Test Desc: Thorax Impact
Component ID: D052433

Test Date: 09/02/2005
Speed: 14.10 ft/sec, 4.30 m/sec



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

ATD Serial No: 901

Test I.D: D052434

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Force At 12.7 mm	N	104 -162	137	Pass
Force At 19 mm	N	163 - 222	189	Pass
Force At 25.4 mm	N	222 - 280	256	Pass
Force At 33 mm	N	325 - 391	353	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

09/01/2005
Test Date

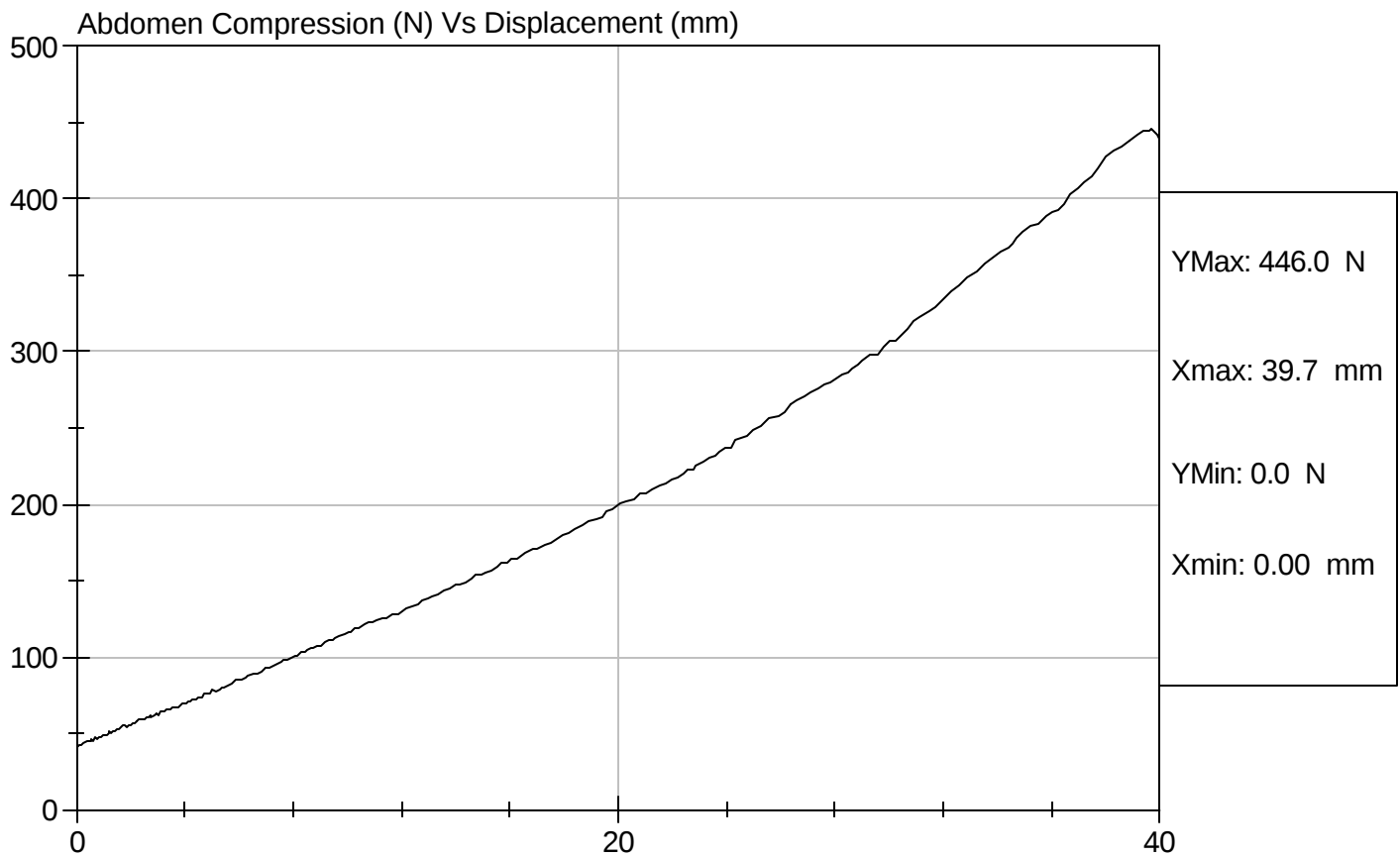


Test Description: Abdomen Compression

Test Date: 09/01/2005

Component: D052434

Speed: 0 ft/sec, 0 m/sec

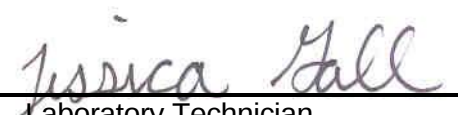


SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 904

Test I.D: D052435

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	126.9	Pass
Force At 30 deg	N	151.2 - 204.6	177.0	Pass
Force At 40 deg	N	204.6 - 258.0	249.3	Pass
Return Angle	Deg	12 Maximum	2	Pass
			Overall Test Results	Pass


Laboratory Technician


Approved By

09/01/2005

Test Date

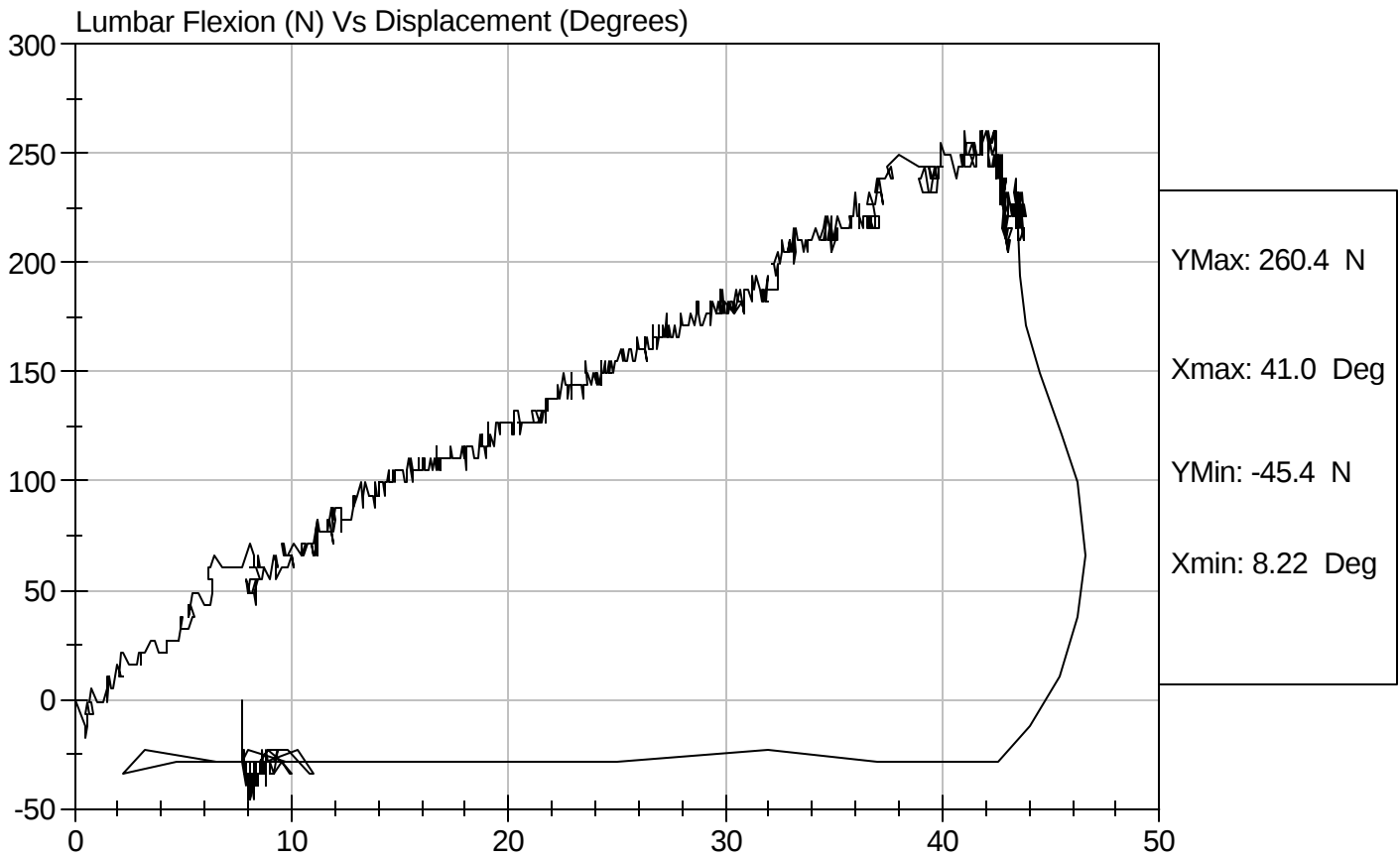


Test Description: Lumbar Flexion

Test Date: 09/01/2005

Component: D052435

Speed: 0 ft/sec, 0 m/sec

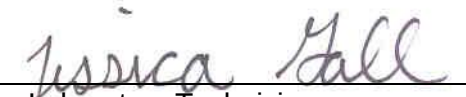


SID Calibration Data Sheet
Side Impact Dummy (SID)
Neck Pendulum Test

ATD Serial No: 904

Test I.D: D052439

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Impact Velocity		m/s	6.89 to 7.13	7.08	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.38	Pass
	20 msec	m/s	4.12 to 5.10	4.67	Pass
	30 msec	m/s	5.73 to 7.01	6.55	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.16	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	75	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	59	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	77	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	61	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	13	Pass


 Laboratory Technician

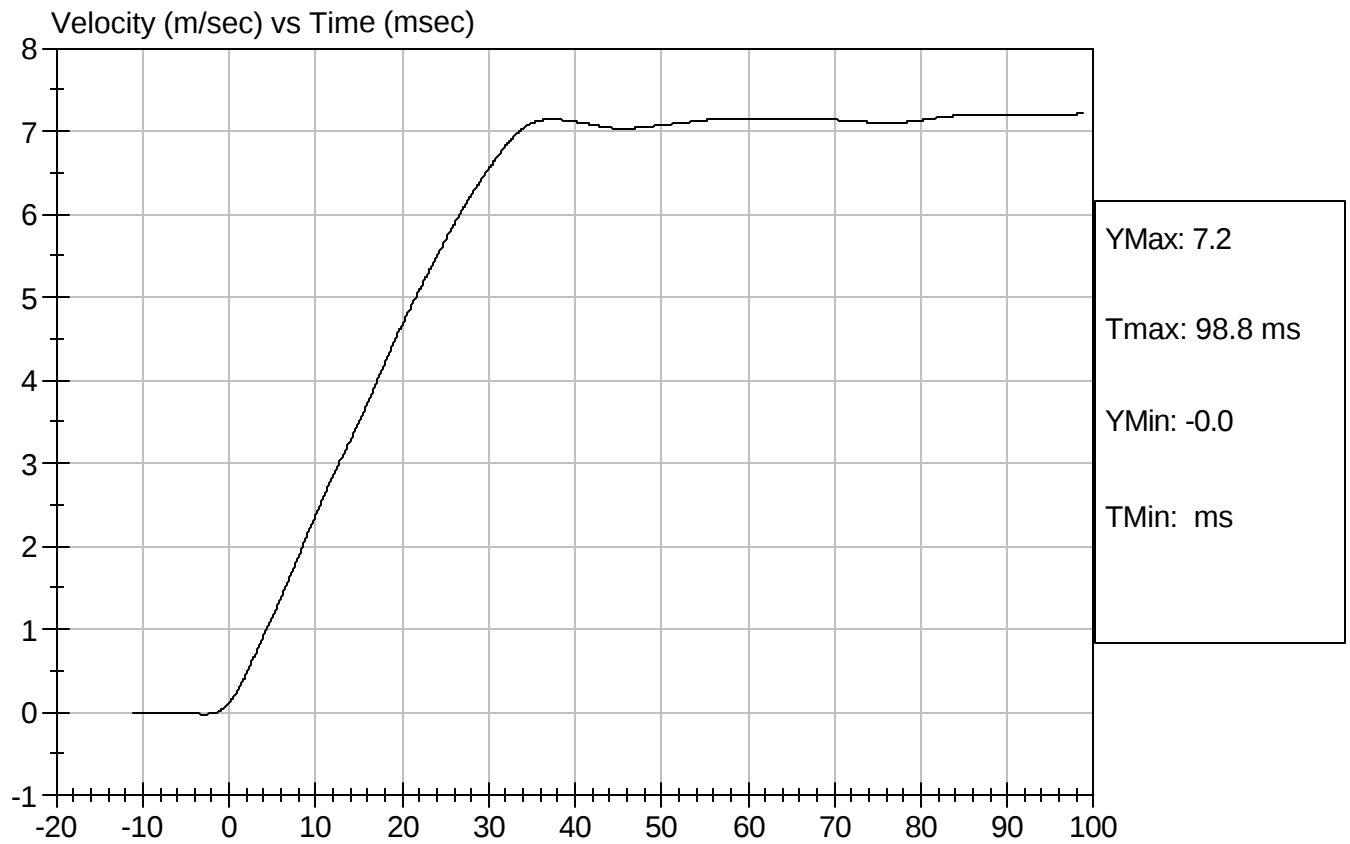

 Approved By

09/01/2005
 Test Date



Test Desc: Neck Bending
Component ID: D052439

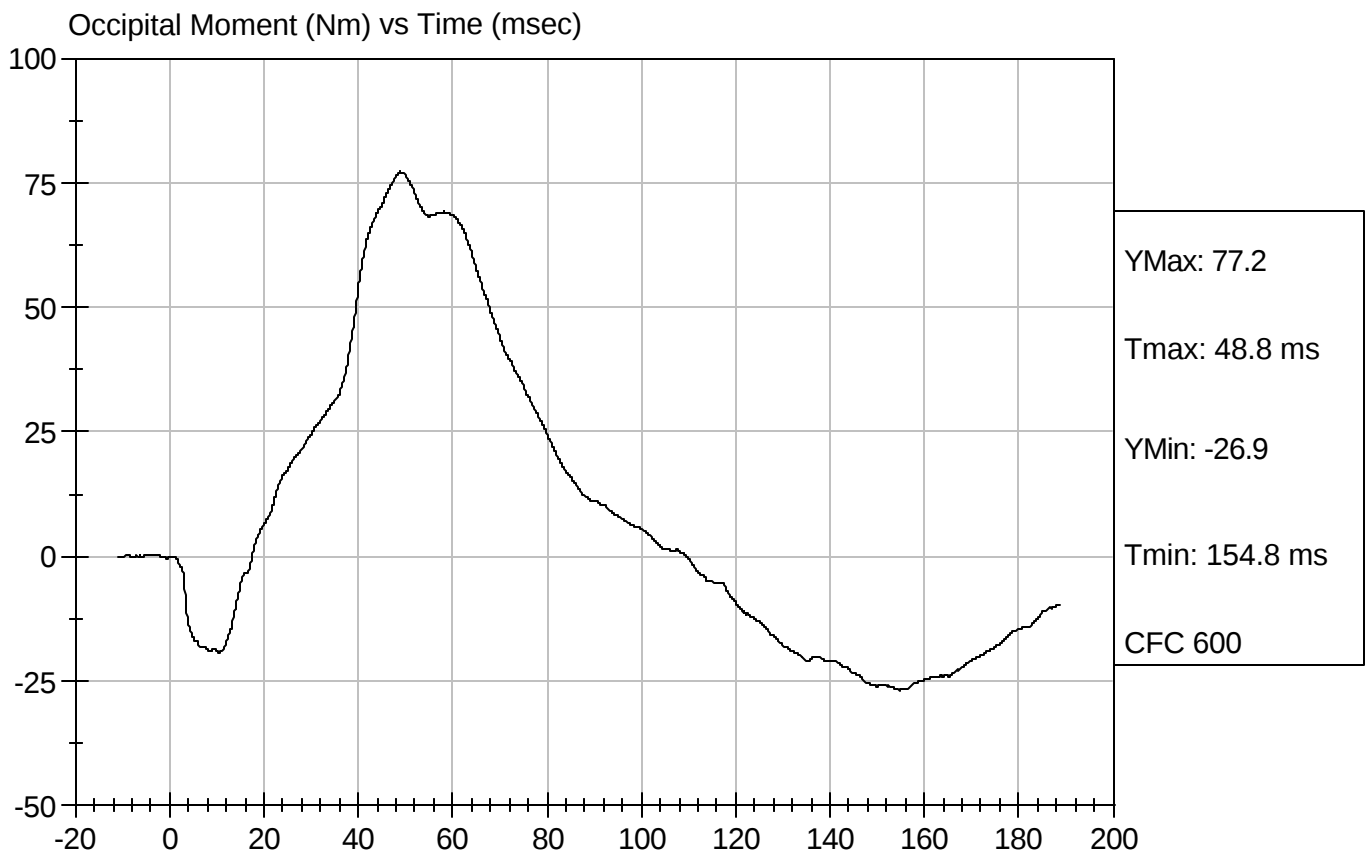
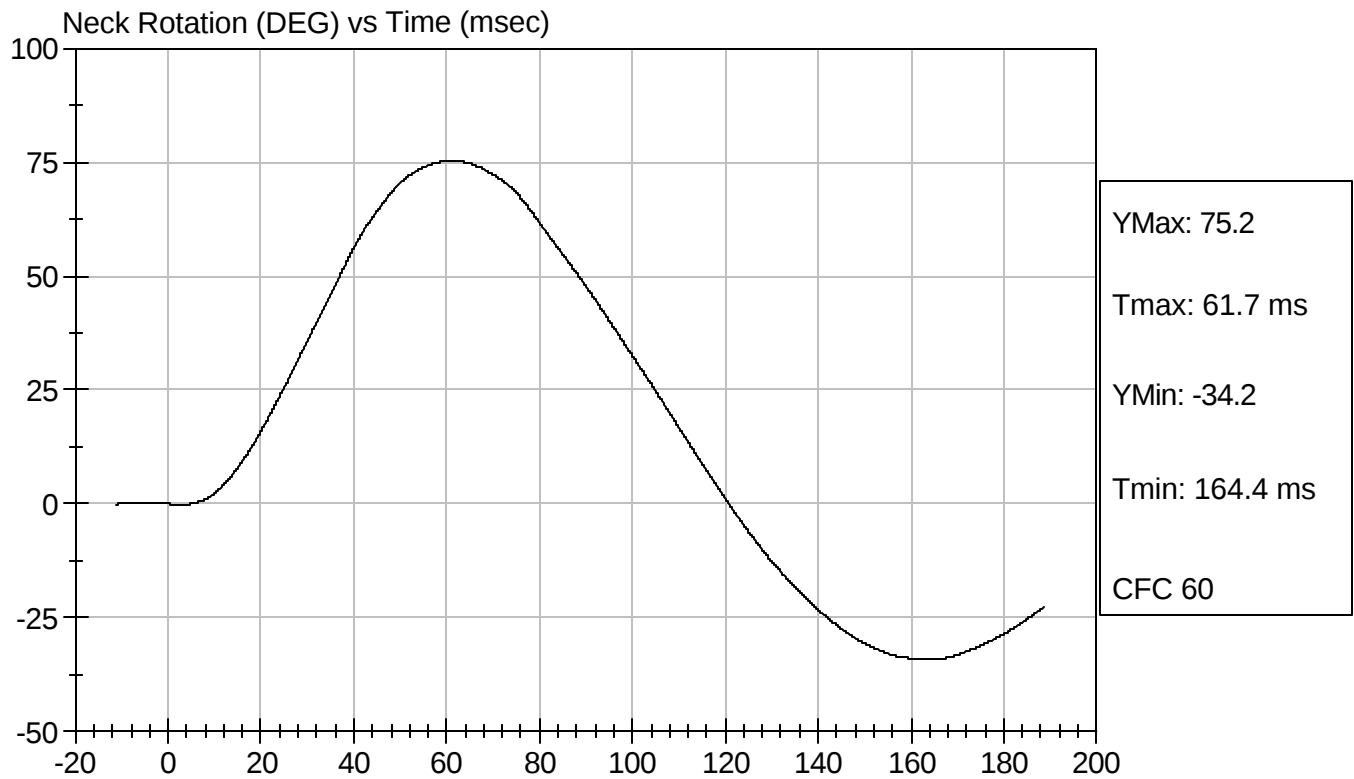
Test Date: 09/01/2005
Speed: 23.23 ft/sec, 7.08 m/sec





Test Desc: Neck Bending
Component ID: D052439

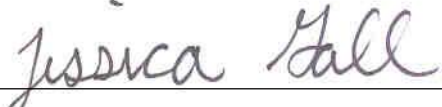
Test Date: 09/01/2005
Speed: 23.23 ft/sec, 7.08 m/sec



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


Laboratory Technician

Approved By

09/02/2005

Test Date