REPORT NUMBER: 214I-MGA-2008-005

SAFETY COMPLIANCE TESTING FOR FMVSS 214 INDICANT SIDE IMPACT PROTECTION

FUJI HEAVY INDUSTRIES LTD.
2009 SUBARU FORESTER
NHTSA NUMBER: C95500

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

Test Date: April 17, 2008

Report Date: April 24, 2008

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-07-D-00062.

Prepared by: _____ Date: 4/24/08
Ben Fischer, Project Engineer

Reviewed by: David Winkelbauer Date: 4/24/08
David Winkelbauer, Facility Director

FINAL REPORT ACCEPTED BY:

_____
COTR, Side Impact

6/19/08
Date of Acceptance

Technical Report Documentation Page

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7. Author(s) Ben Fischer, Project Engineer		*8. Performing Organization Report No.* 214I-MGA-2008-005
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-07-D-00062
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement, Office of Vehicle Safety Compliance 1200 New Jersey Ave, SE, Room W43-503, NVS-220 Washington, D.C. 20590		*13. Type of Report and Period Covered: Final Report* 4/17/2008 to 4/24/2008 *14. Sponsoring Agency Code* NVS-220

15. Supplementary Notes

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier side impact was conducted on the subject 2009 Subaru Forester 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 April 17, 2008. The impact velocity of the Moving Deformable Barrier (MDB) was 62.3 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 258 mm at level 3. The test vehicle's occupant performance is as follows:

	DRIVER	PASS.
Left Upper Rib (LUR) Accel., g	34.4	41.3
Left Lower Rib (LLR) Accel., g	29.5	33.7
Lower Spine (T_{12}) Accel., g	28.3	37.7
Thoracic Trauma Index (TTI)	31	40
Pelvis (PEV) Accel., g	48.0	46.4
HIC	110	193

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 FMVSS 214 Indicant 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, 1200 New Jersey Ave, SE Washington, D.C. 20590

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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' 2008 test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-07-D-00062. The purpose of this test was to evaluate side impact protection in a 2009 Subaru Forester manufactured by Fuji Heavy Industries Ltd.

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 FMVSS 214 INDICANT TEST

A model year 2009 Subaru Forester was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.3 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 1709.1 kg and the test weight of the MDB was 1360.8 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on April 17, 2008.

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

2.2 GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 258 mm at level 3, 1500 mm rearward of the 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	110	54.0	81.6	31	48.0
Passenger	193	48.0	84.0	40	46.4

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

TEST NOTES

There was no valid data collected for:

Floorpan @ Rear Axle X and Z after 38 msec.
Left Mid B-Post Y after 5 msec.
Left Lower A-Post Y after 10 msec.
Vehicle CG X, Y, and Z after 38 msec.

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: NCAP Side Impact Test Date: 4/17/2008

TEST VEHICLE INFORMATION

Make	Subaru
Model	Forester
Body Style	MPV
NHTSA No.	C95500
VIN	JF2SH61699H705208
Color	Silver Steel Metallic
Delivery Date	4/09/08
Odometer Reading (mile)	60
Dealer	Gentile Motor Group
Transmission	Automatic
Final Drive	AWD
Number of Cylinders	4
Engine Displacement (L)	2.5
Engine Placement	Longitudinal
Automatic Door Locks (ADL)	No
Owner's Manual Details Instructions on Disabling ADLs	N/A

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	Yes
Power Seats	No
Pretensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Fuji Heavy Industries Ltd.
Date of Manufacture	1/08

GVWR (kg)	2035
GAWR Front (kg)	1050
GAWR Rear (kg)	1095

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				408
Cargo Wt. (RCLW) (kg)				68

DATA SHEET NO. 1 (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	412.8	343.8		454.1	439.5	
Right	kg	404.1	326.6		413.2	402.3	
Ratio	%	54.9	45.1		50.7	49.3	
Totals	kg	816.9	670.4	1487.3	867.3	841.8	1709.1

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1487.3
Weight of 2 P572M ATDs	kg	161.5
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Vehicle Target Weight (TVTW)	kg	1716.8

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

Weight of Ballast on Rear Trunk Floor: 37 kg

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	783	791	777	784	1181
As Tested	mm	774	789	738	757	1290
Fully Loaded	mm	772	787	738	755	

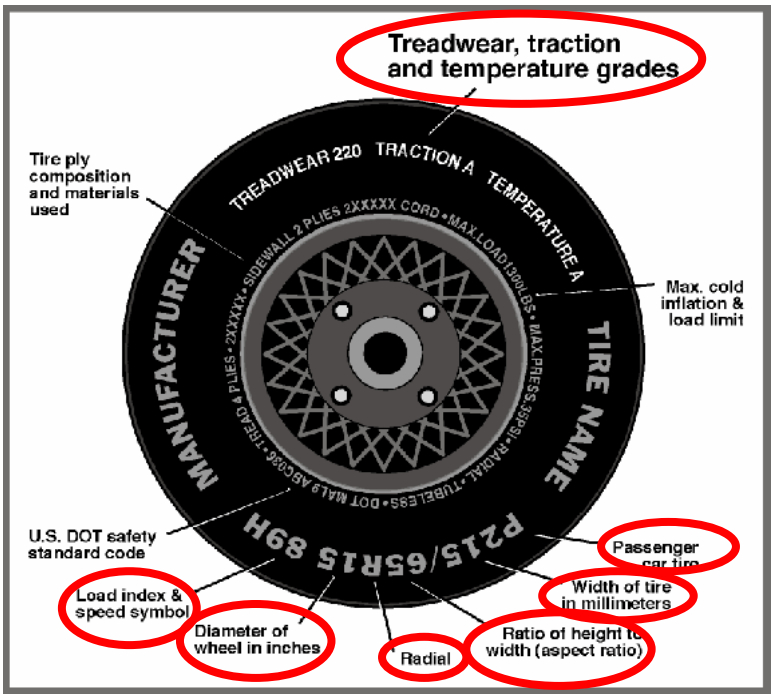
TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2619
Target Impact Point Aft of Front Axle	mm	370
Actual Impact Point Aft of Front Axle	mm	376

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



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	Bridgestone	Bridgestone
Tire Name	Dueler H/T	Dueler H/T
Tire Type	Passenger	Passenger
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	96H	96H
Treadwear	300	300
Traction Grade	B	B
Temperature Grade	A	A

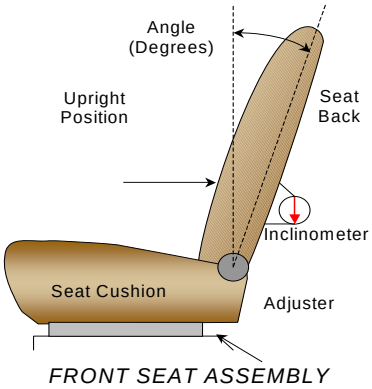
DATA SHEET NO. 3

TEST VEHICLE INFORMATION

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

NORMAL DESIGN RIDING POSITION

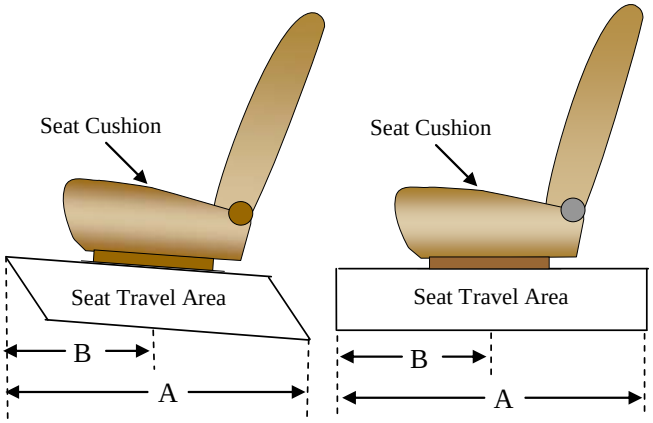
The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Set the driver's seat back angle at the 6th detent out of 41 detents total with forward-most detent defined as 0.



Driver seat back angle: 6th detent (forward-most as 0)
Passenger seat back angle: Fixed

SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in position #
Driver Seat	19 detents	8th detent
Rear Seat	Fixed	Fixed



DATA SHEET NO. 3 (CONTINUED)

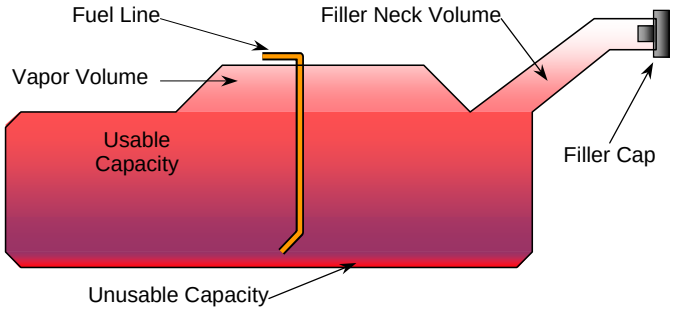
TEST VEHICLE INFORMATION

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	64.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	58.9 to 60.1
Actual Amount of Solvent used	59.1
1/3 of Usable Capacity	21.3

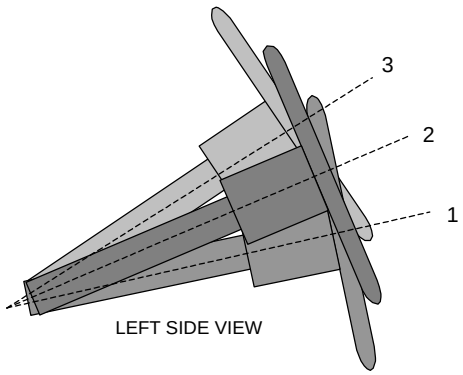
The test vehicle is equipped with an electric fuel pump. Pump operates a few seconds after an ignition switch is turned ON. After that, the pump operates only while engine is running.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Fore/Aft (mm)	Degrees
Lowermost position No. 1		62.1
Geometric center position No. 2		63.6
Uppermost position No. 3		65.1

DATA SHEET NO. 4

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

MDB SPECIFICATIONS

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

MDB WEIGHTS

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

SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.3
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.1
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.7

POST TEST OBSERVATIONS
MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	6 rearward
Vertical Offset	mm	+/-20	7 up

DATA SHEET NO. 5

POST TEST OBSERVATIONS

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

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	Struck side doors were unlocked	Struck side doors were unlocked
Left Side Door Opening	Door remained closed and latched	Door remained closed and latched
Right Side Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Movement	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

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

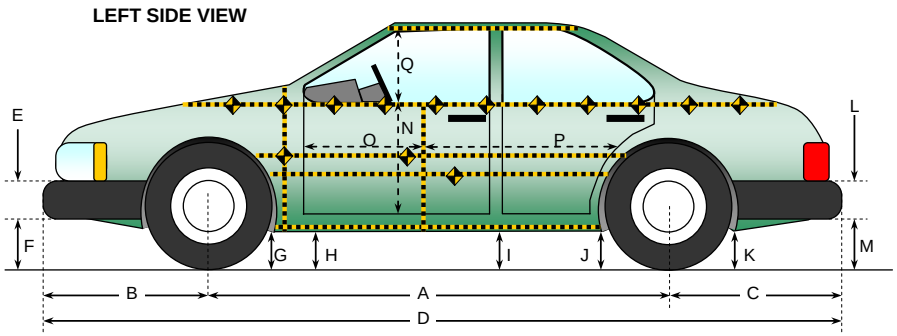
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 6

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



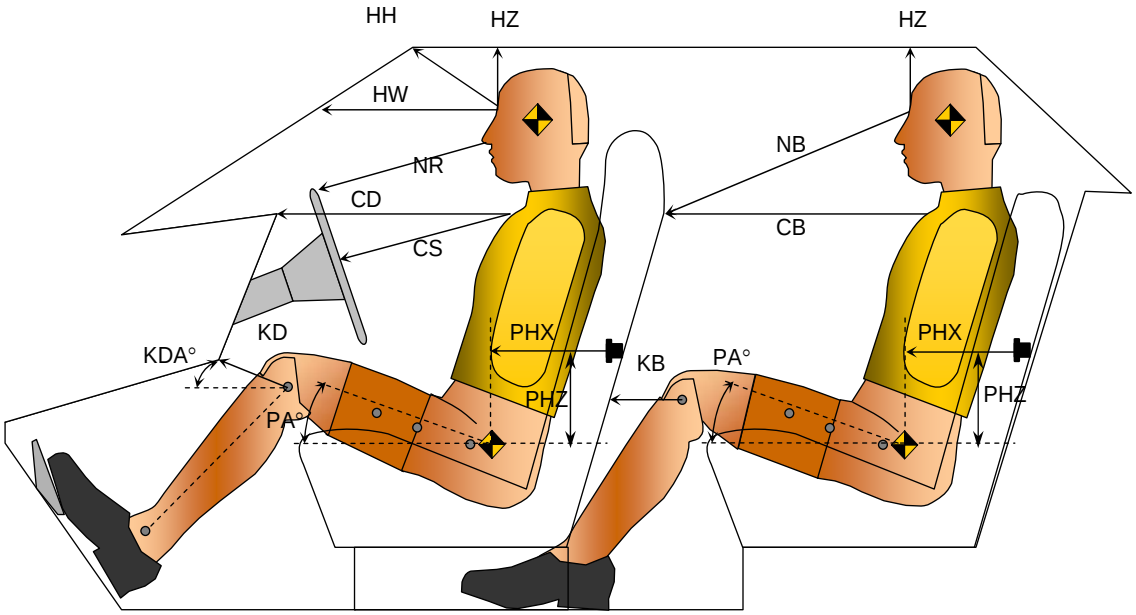
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2619	2589	-30
B	Front Axle to FSOV	932	936	4
C	Rear Axle to RSOV	993	995	2
D	Total Length at Centerline	4530	4541	11
E	Front Bumper Thickness	116	116	0
F	Front Bumper Bottom to Ground	465	476	11
G	Sill Height at Front Wheel Well	252	262	10
H	Sill Height at Front Door Leading Edge	257	287	30
I	Sill Height at "B" Pillar	243	295	52
J1	Sill Height at Rear Wheel Well	232	261	29
J2	Pinch Weld Height at Rear Wheel Well	234	267	33
K	Sill Height Aft of Rear Wheel Well	286	297	11
L	Rear Bumper Thickness	145	145	0
M	Rear Bumper Bottom to Ground	445	456	11
N	Sill Height to Window Bottom Sill	729	654	-75
O	Front Door Leading Edge to Impact CL	824	809	-15
P	Rear Door Trailing Edge to Impact CL	1240	1203	-37
Q	Front Window Opening	541	504	-37
R	Right Side Length	3829	3834	5
S	Left Side Length	3829	3786	-43
T	Vehicle Width at "B" Post	1762	1627	-135

DATA SHEET NO. 7

SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



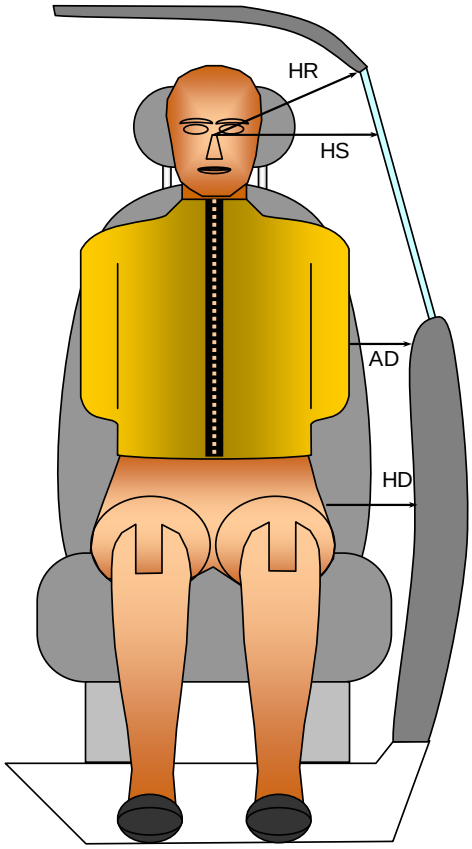
Driver Code	Pass. Code	Measurement Description	Driver S/N 271		Passenger S/N 904	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	368			
HW		Head to Windshield	603			
HZ	HZ	Head to Roof	210		224	
NR	NB	Nose to Rim/Nose to Seatback	434		665	
CD	CB	Chest to Dash or Seatback	498		577	
CS		Chest to Steering Wheel	299			
KDL	KBL	Left Knee to Dash or Seatback	163	28.6	232	36.5
KDR	KBR	Right Knee to Dash or Seatback	138	24.2	224	31.7
PA	PA	Pelvic Angle		23.6		23.4
PHX	PHX	H-Point to Striker (X-Axis)	199		227	
PHZ	PHZ	H-Point to Striker (Z-Axis)	165		260	

DATA SHEET NO. 8

SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2009 Subaru Forester
Test Program: FMVSS 214 Indicant

NHTSA No. C95500
Test Date: 4/17/2008



FRONT VIEW OF DUMMY

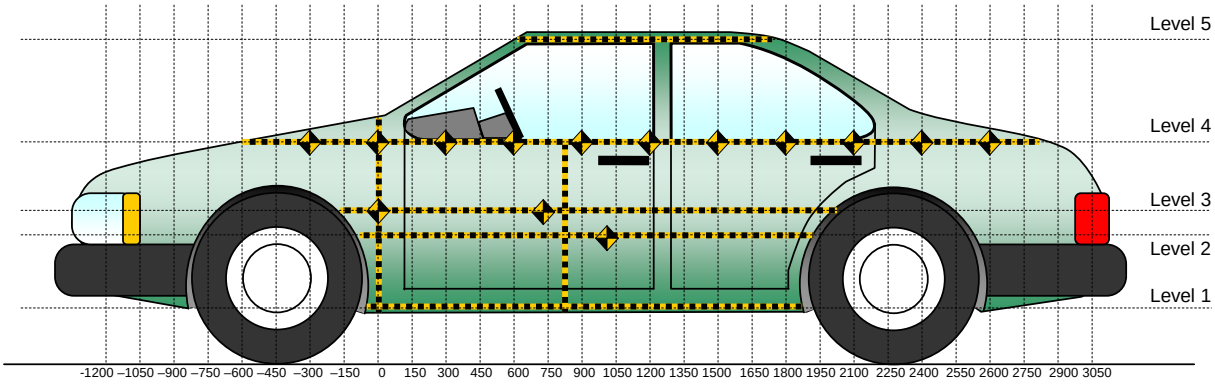
Code	Measurement Description	Units	Driver S/N 271	Passenger S/N 904
HR	Head to Side Header	mm	227	228
HS	Head to Side Window	mm	331	334
AD	Arm to Door	mm	134	192
HD	H-Point to Door	mm	152	183

DATA SHEET NO. 9

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2009 Subaru Forester
Test Program: FMVSS 214 Indicant

NHTSA No. C95500
Test Date: 4/17/2008



All Measurements Shown in mm

LEFT SIDE VIEW

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

Level	Measurement Description	Maximum Exterior Static Crush	Distance From Impact	Height Above Ground
5	Window	14	1350	1515
4	Window Sill	99	1350	1033
3	Mid Door	258	1500	702
2	Occupant H-Point	250	1500	681
1	Sill Top	153	750	360
	Maximum Penetration	258		

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-450				226					225					-1	
-300				215					225					10	
-150				208					228					20	
0		112	115	203			192	191	235			80	76	32	
150	165	135	134	199		297	280	272	222		132	145	138	23	
300	187	132	131	194		322	346	346	239		135	214	215	45	
450	184	129	128	194		335	345	351	255		151	216	223	61	
600	183	128	126	193		336	352	364	256		153	224	238	63	
750	183	126	124	193	385	336	360	367	257	391	153	234	243	64	6
900	183	125	124	193	380	334	368	374	261	390	151	243	250	68	10
1050	184	124	123	194	383	334	371	378	266	392	150	247	255	72	9
1200	185	126	124	195	387	332	347	355	274	399	147	221	231	79	12
1350	187	128	126	199	389	301	374	380	298	403	114	246	254	99	14
1500	191	130	128	200	390	293	380	386	280	403	102	250	258	80	13
1650	191	132	130	204	394	282	378	373	260	405	91	246	243	56	11
1800	156	134	133	206	396	265	362	349	243	407	74	228	216	37	13
1950		114	119	211	400		260	367	245	408		146	248	34	8
2100		111	111	215	400		193	192	243	409		82	81	28	9
2250			112	223	403			153	248	406			41	25	3
2400			114	228	409			138	246	410			24	18	1
2550			131	237	418			142	245	418			11	8	0
2700			162	245	436			166	249	431			4	4	-5
2850			176	260				180	258				4	-2	

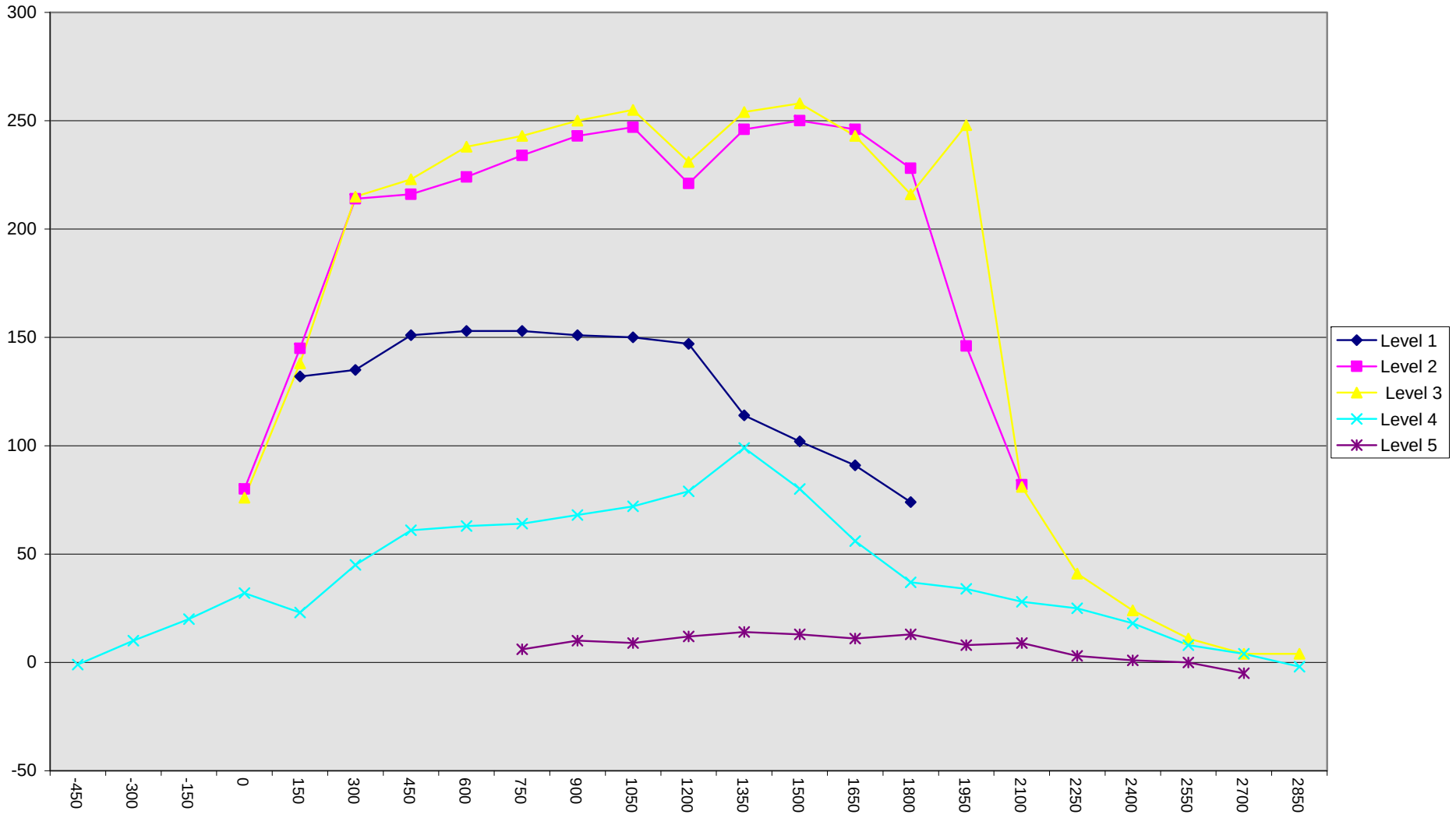
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body

DATA SHEET NO. 10... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

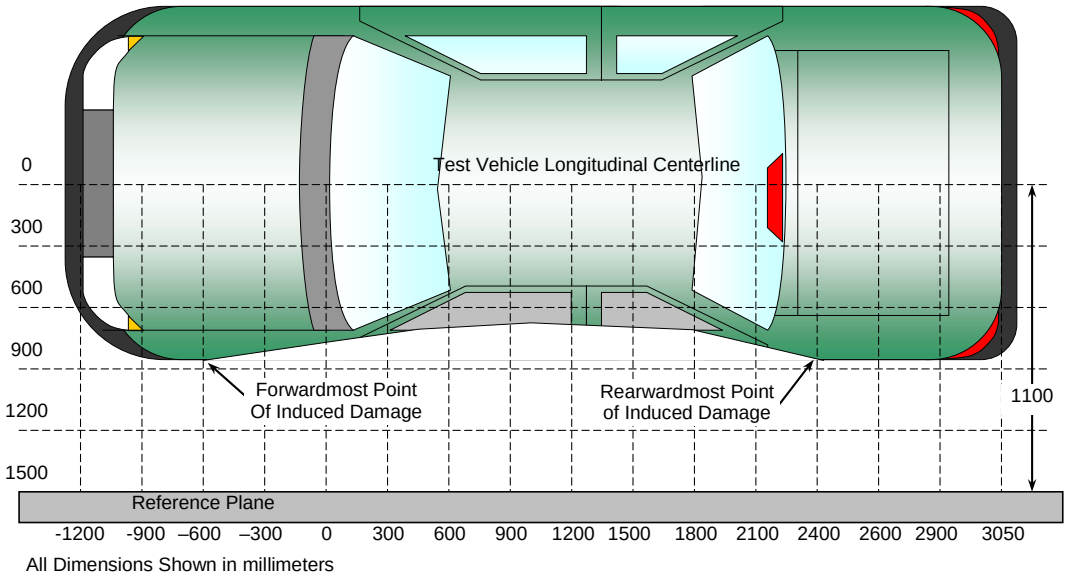
Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



TOP VIEW

DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2850	4	260	258	-2
2	2206	4	220	247	27
3	1548	3	128	386	258
4	863	2	125	364	239
5	186	2	133	300	167
6	-450	4	226	225	-1

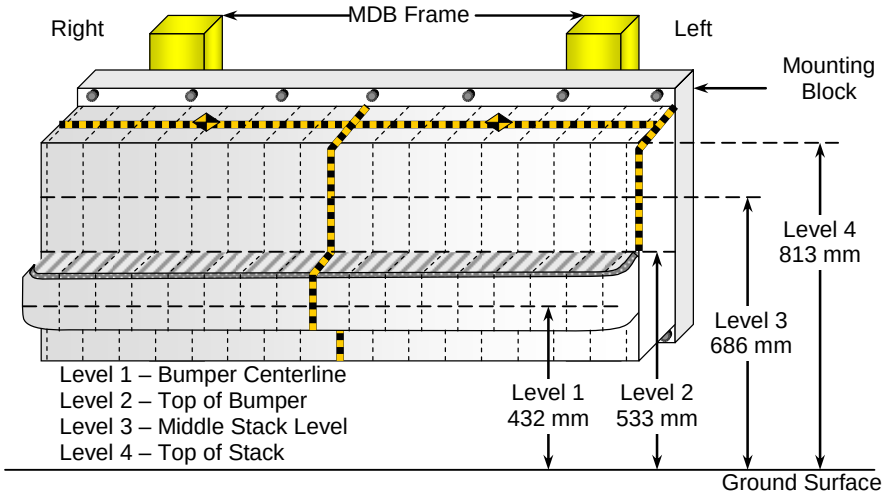
Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body.

DATA SHEET NO. 12

DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2009 Subaru Forester
Test Program: FMVSS 214 Indicant

NHTSA No. C95500
Test Date: 4/17/2008



DEFORMABLE BARRIER STATIC CRUSH

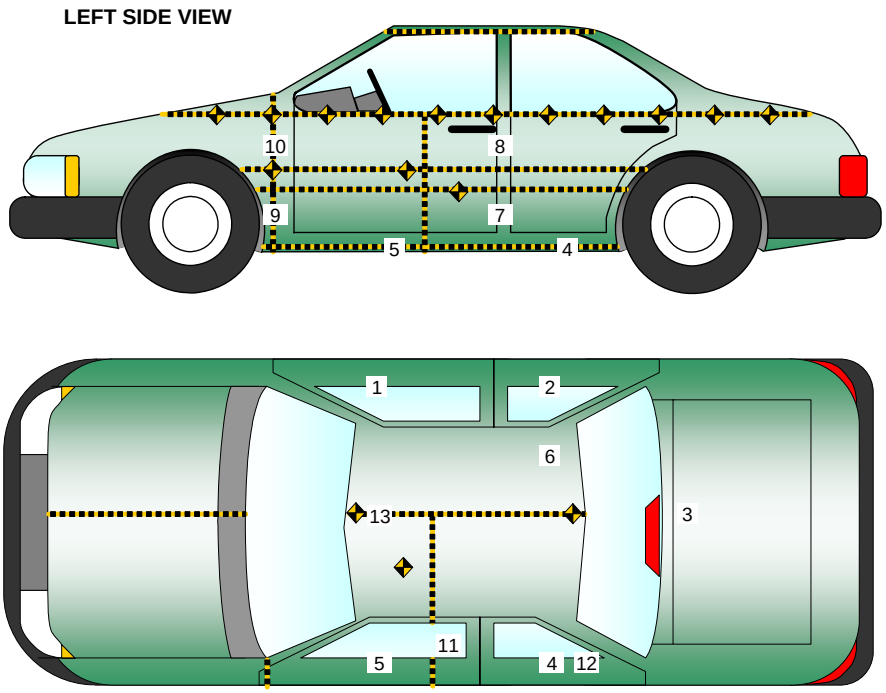
Stack Level	Distance Right of Center								C_L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	162	159	153	143	133	129	127	127	125	124	123	122	123	125	130	146	157
2	101	101	89	76	65	60	61	65	61	67	69	74	82	80	83	90	103
3	31	23	15	15	20	27	38	21	21	21	23	25	30	35	49	65	110
4	86	63	38	25	18	39	46	60	35	34	33	34	38	56	58	86	141

All Dimensions in mm

DATA SHEET NO. 13

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2269	700	-283
2	Right Sill at Rear Seat	1653	702	-276
3	Rear Floorpan Above Axle	856	0	-576
4	Left Sill at Rear Door	1611	-702	-275
5	Left Sill at Front Door	2334	-700	-275
6	Rear Occupant Compartment	1741	-298	-482
7	Left Lower B-Post	2011	-708	-547
8	Left Middle B-Post	2004	-716	-900
9	Left Lower A-Post	3018	-677	-581
10	Left Middle A-Post	3036	-708	-811
11	Front Seat Track	2181	-543	-449
12	Rear Seat Track or Structure			
13	Vehicle CG	2300	0	-515

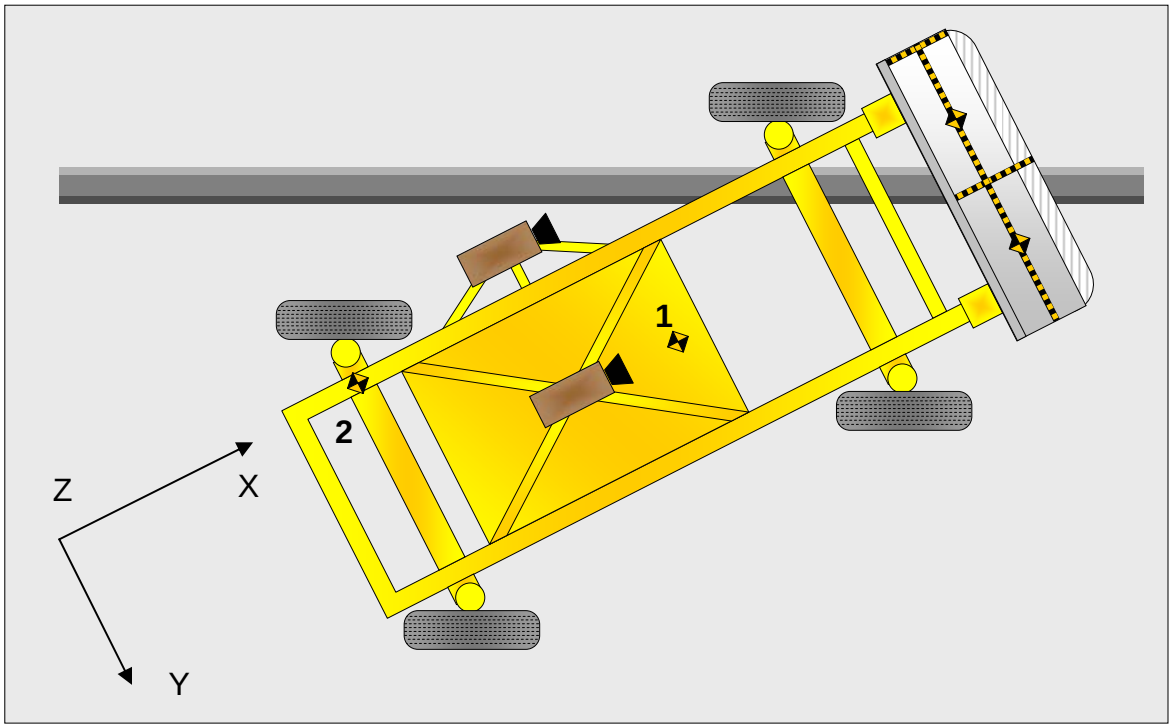
Reference Points X - Test Vehicle Rear Bumper (+ forward)
Y - Test Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 14

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2009 Subaru Forester
Test Program: FMVSS 214 Indicant

NHTSA No. C95500
Test Date: 4/17/2008



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

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

DATA SHEET NO. 15

VEHICLE STRUCTURAL MEASUREMENTS

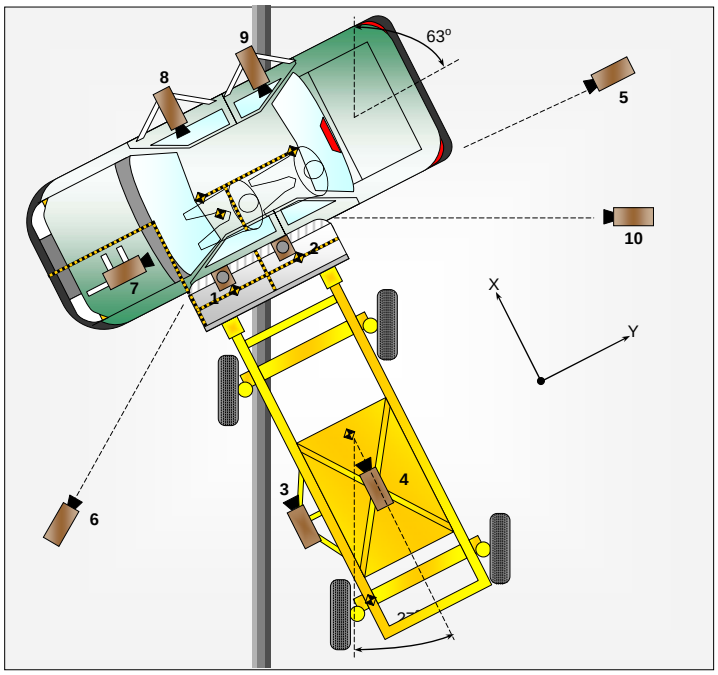
Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

	Elements	Pre-Test (mm)
1	Total Length	4530
2	Total Width	1762
3	Bumper Top Height	659
4	Bumper Bottom Height	562
5	Longitudinal Member Top Height	584
6	Distance between Longitudinal Members	1040
7	Longitudinal Member Width	70
8	Engine Top Height	909
9	Engine Bottom Height	270
10	Engine and gearbox width	740
11	Front bumper-engine distance	446
12	Front shock absorber fixing height	936
13	Bonnet leading edge height	902
14	Front shock absorber fixing width	1115
15	Front bumper – front axle distance	940
16	Front axle – a pillar distance	478
17	A-pillar – B-pillar distance	1063
18	B-Pillar – rear axle distance	1064
19	B-pillar – C-pillar distance	1000
20	Roof sill bottom height	1532
21	Roof sill top height	1599
22	Floor sill bottom height	298
23	Floor sill top height	382

DATA SHEET NO. 16

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Close-up	130	0	5050	50	1000
2	Overhead Overall	-340	0	5050	14	1000
3	MDB Onboard, Impact Point Close-up				50	1000
4	MDB Onboard, Centerline of Impact				16	1000
5	Right Side, Ground Level, Overall	-600	5310	1210	24	1000
6	Left Side, Ground Level, Overall	2225	-5395	1195	24	1000
7	Vehicle Onboard Front SID/HIII, Front				12.5	1000
8	Vehicle Onboard Front SID/HIII, Side				8	1000
9	Vehicle Onboard Rear SID/HIII, Side				8	1000
10	Real Time Coverage				13	24

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

DATA SHEET NO. 17

SUMMARY OF FMVSS 301 DATA

Test Vehicle: 2009 Subaru Forester NHTSA No. C95500
Test Program: FMVSS 214 Indicant Test Date: 4/17/2008

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 10:55 am

Stoddard Solvent Spillage Measurements

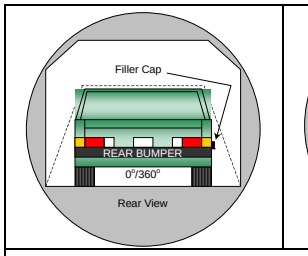
A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: None
(Maximum allowable = 5 ounces)

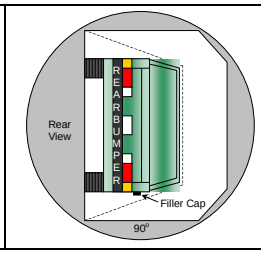
C. For the following 25 minutes: None
(Maximum allowable = 1 oz./minute)

D. Spillage Details: None

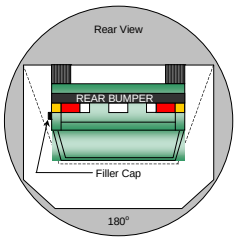
FMVSS 301 STATIC ROLLOVER DATA

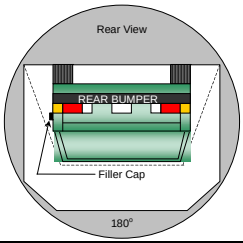


0° to 90°

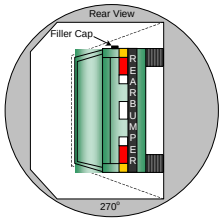


90° to 180°

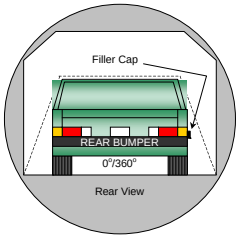




180° to 270°



270° to 360°



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°	123	300	First 5	0
90° to 180°	115	300	First 5	0
180° to 270°	110	300	First 5	0
270° to 360°	114	300	First 5	0

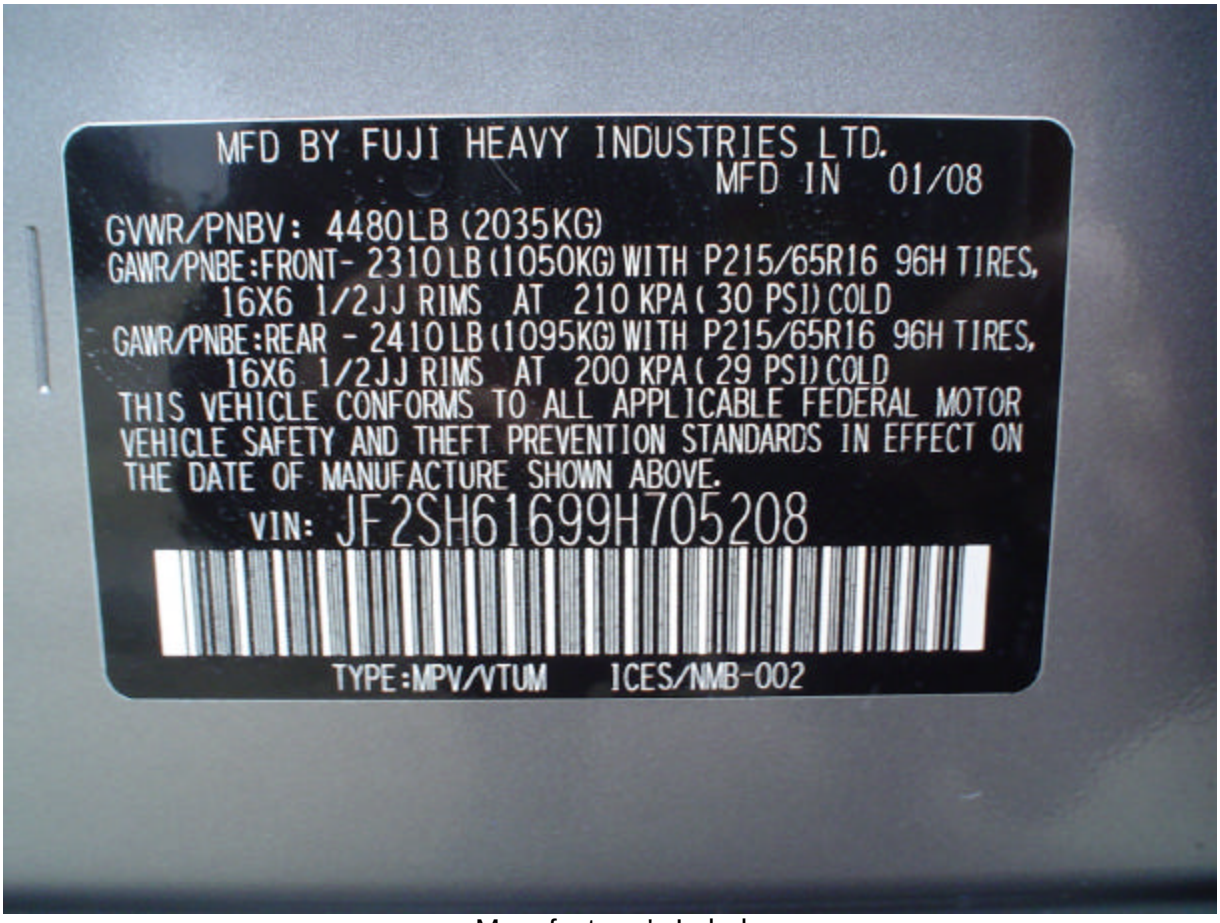
APPENDIX A

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

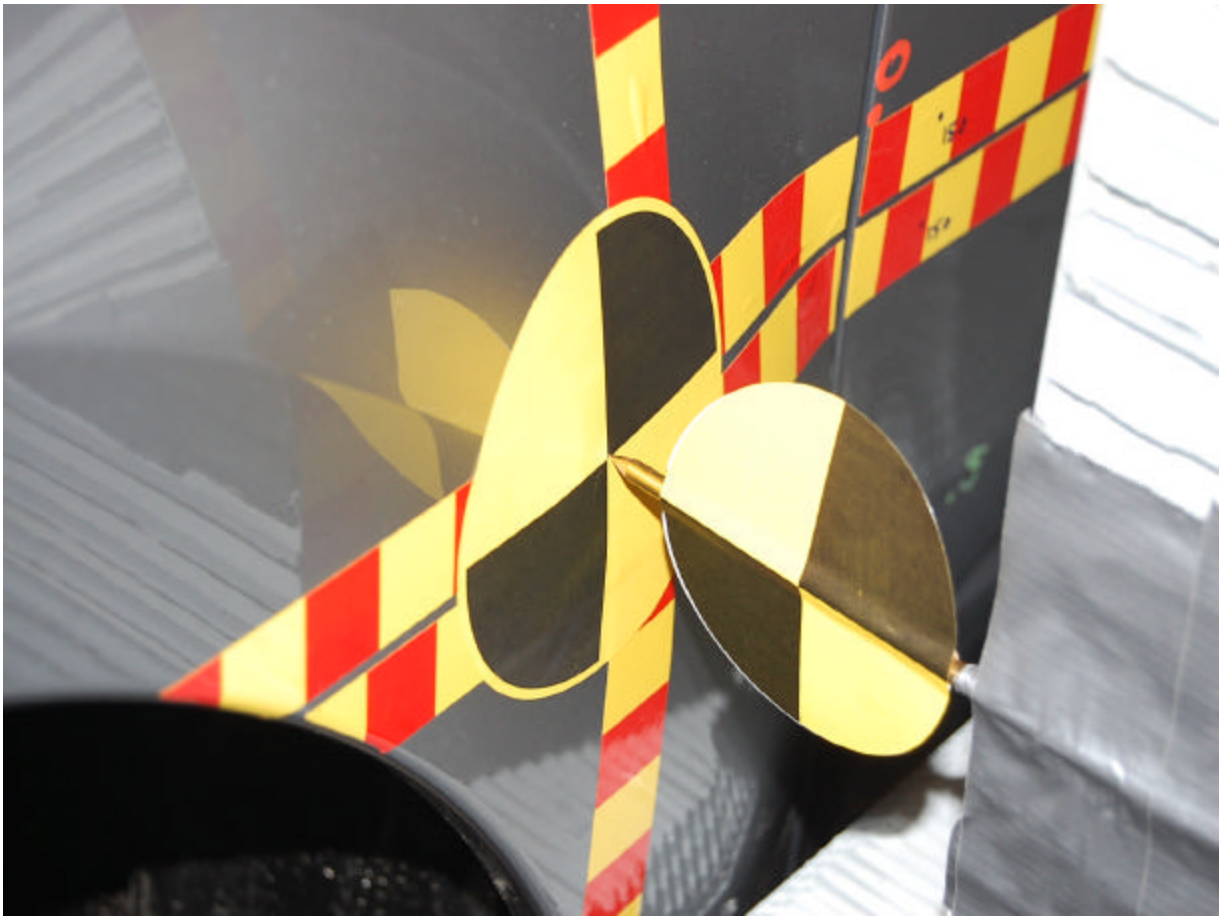
Post-Test Right Rear ¾ View

Pre-Test Right Side View

Post-Test Right Side View

Pre-Test Right Front ¾ View

Post-Test Right Front ¾ View



Pre-Test Left Impact Point

Post-Test Left Impact Point

Pre-Test Front ¾ View of Left Side Doors

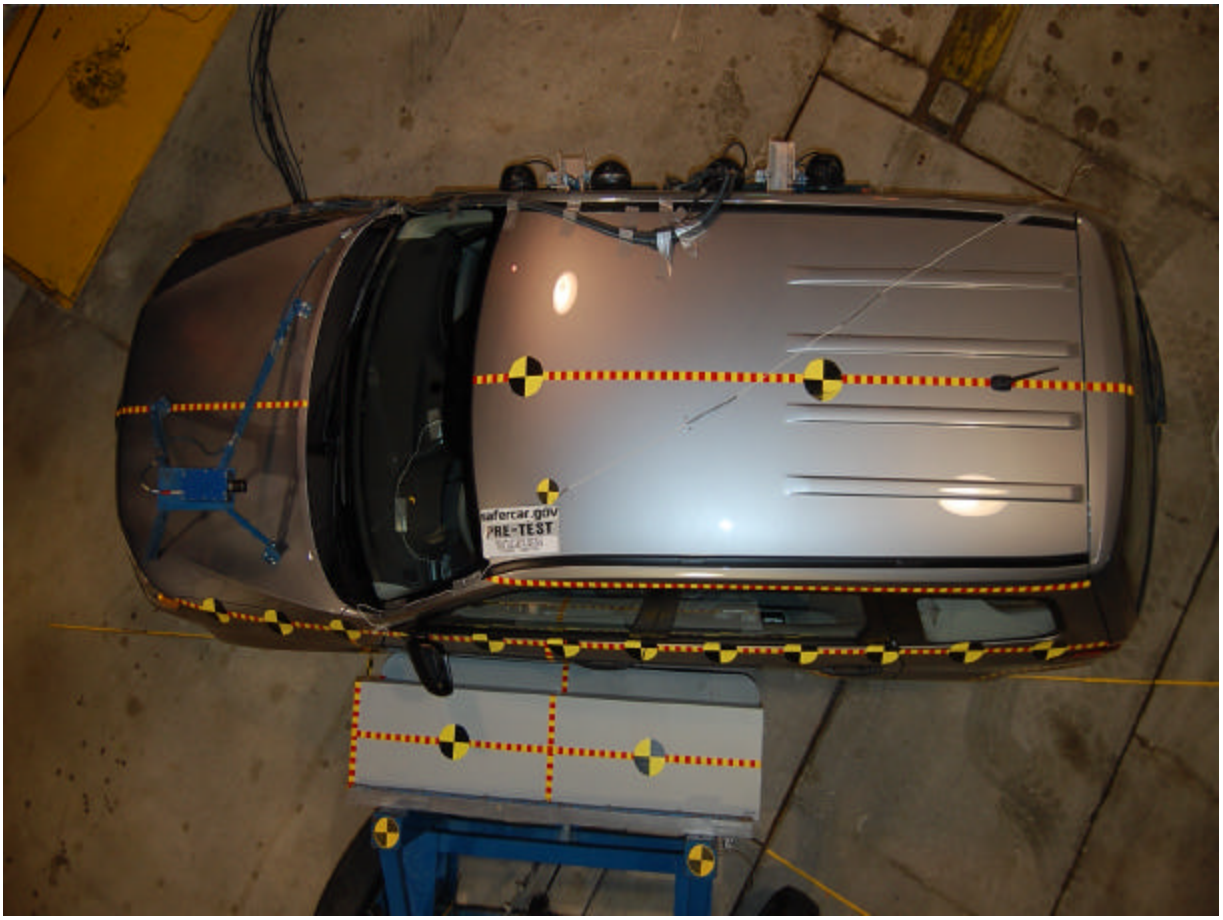

Post-Test Front ¾ View of Left Side Doors

Pre-Test Rear ¾ View of Left Side Doors

Post-Test Rear ¾ View of Left Side Doors

Pre-Test Left Side Impact Close-Up View

Post-Test Left Side Impact Close-Up View



Pre-Test Overhead View

Post-Test Overhead View

Pre-Test Overhead Close-up View

Post-Test Overhead Close-up View

Pre-Test Driver Dummy (Door Open)

Pre-Test Driver Dummy Clearance From Door

Pre-Test Driver Dummy (Through Window)

Pre-Test Driver Dummy Right Side View

Post-Test Driver Dummy Right Side View

Pre-Test Passenger Dummy (Door Open)

Pre-Test Passenger Dummy Clearance From Door

Pre-Test Passenger Dummy (Through Window)

Pre-Test Passenger Dummy Right Side View

Post-Test Passenger Dummy Right Side View

Pre-Test Front View of Deformable Barrier

Post-Test Front View of Deformable Barrier

Pre-Test Top View of Deformable Barrier

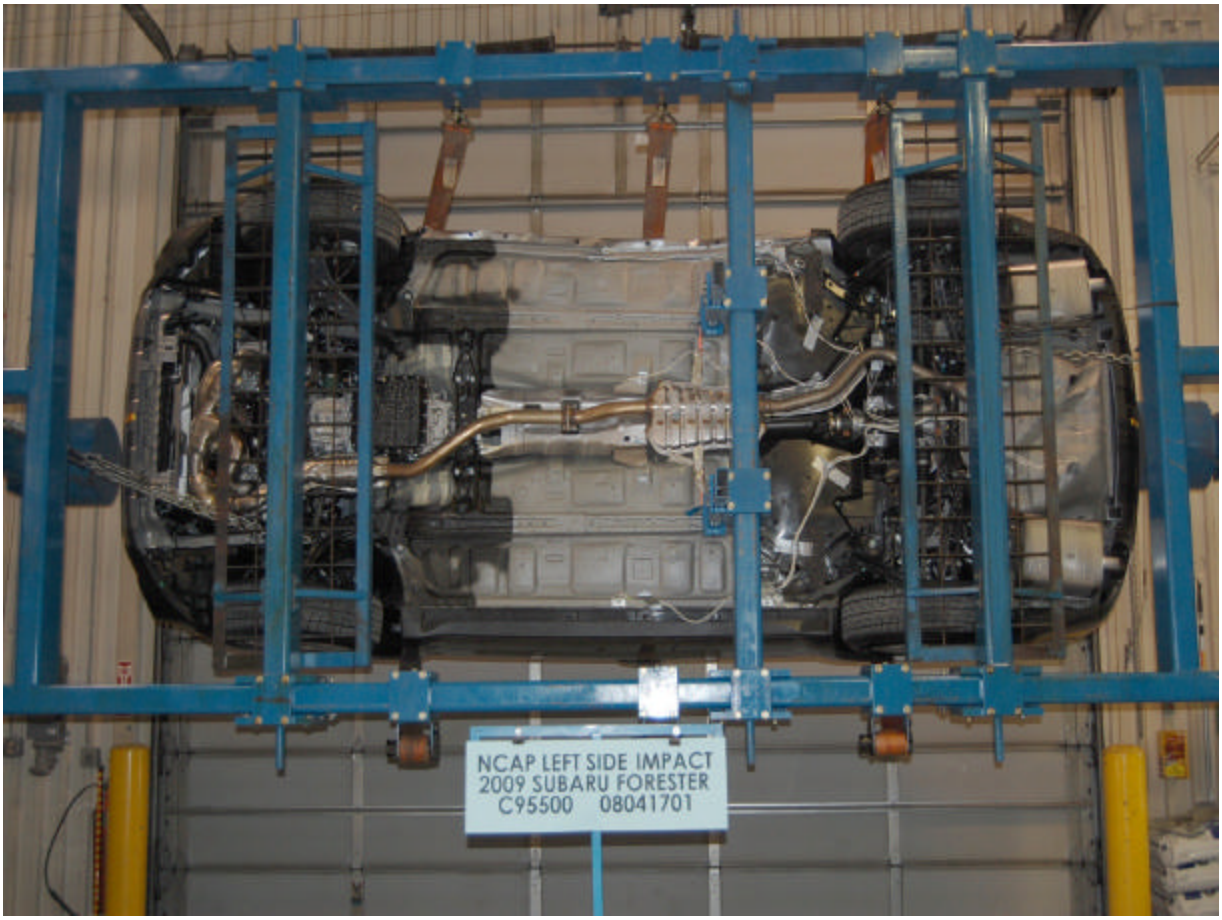

Post-Test Top View of Deformable Barrier

Pre-Test Right Side View of Deformable Barrier

Post-Test Right Side View of Deformable Barrier

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 Torso Contact View 1

Post-Test Driver Dummy Torso Contact View 2

Post-Test Driver Dummy Contact

Post-Test Passenger Dummy Head Contact

Post-Test Passenger Dummy Torso Contact

Post-Test Passenger Dummy Contact

APPENDIX B

SID/HIII RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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 Right Rear Occupant Compartment

Vehicle B-Post Lower Y

Vehicle B-Post Middle Y

Vehicle A-Post Lower Y

Vehicle A-Post Middle Y

Vehicle Left Front Seat Track

Vehicle Rear Seat Track

Vehicle CG X

Vehicle CG Y

Vehicle CG Z

MDB CG X

MDB CG Y

MDB CG Z

MDB Rear X

MDB Rear Y

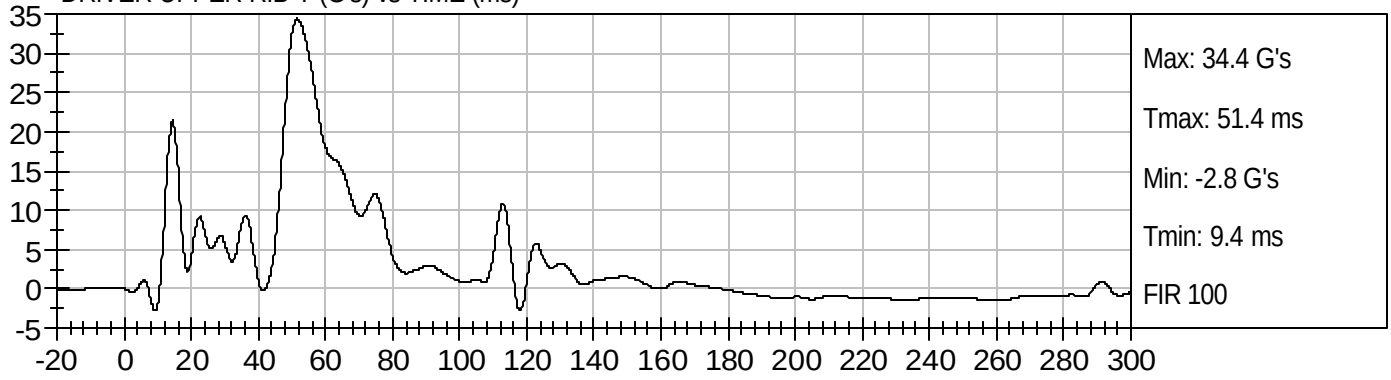
MDB Left Bumper Contact

MDB Right Bumper Contact

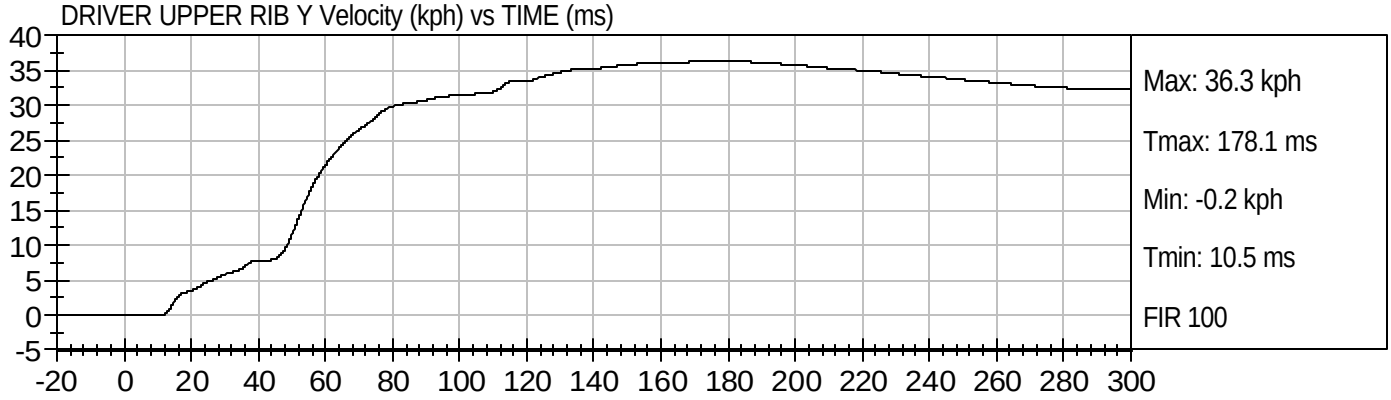
NCAP LEFT SIDE
2009 SUBARU FORESTER C95500

Test Date: 04/17/2008
Speed: 38.7 mph (62.3 km/h)

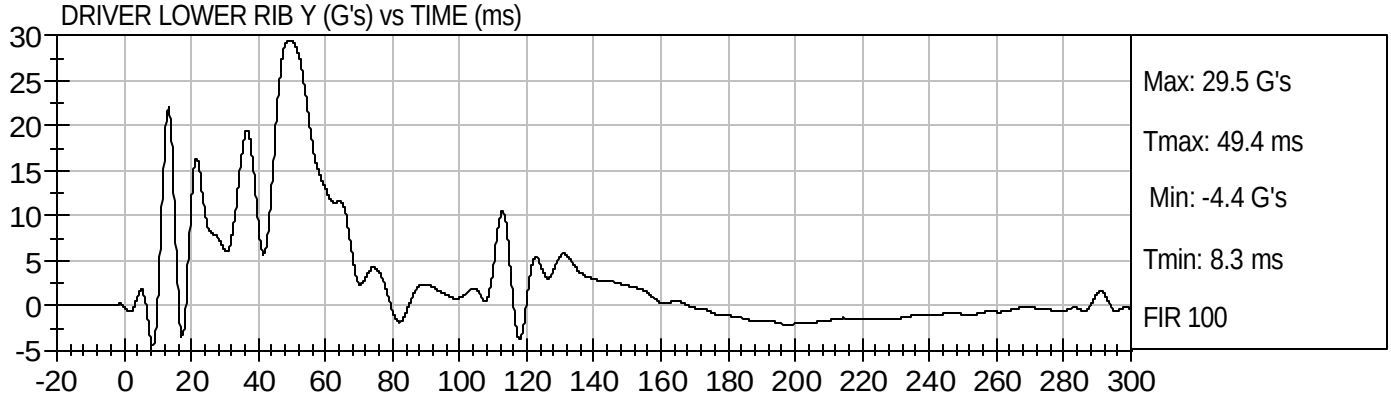
DRIVER UPPER RIB Y (G's) vs TIME (ms)



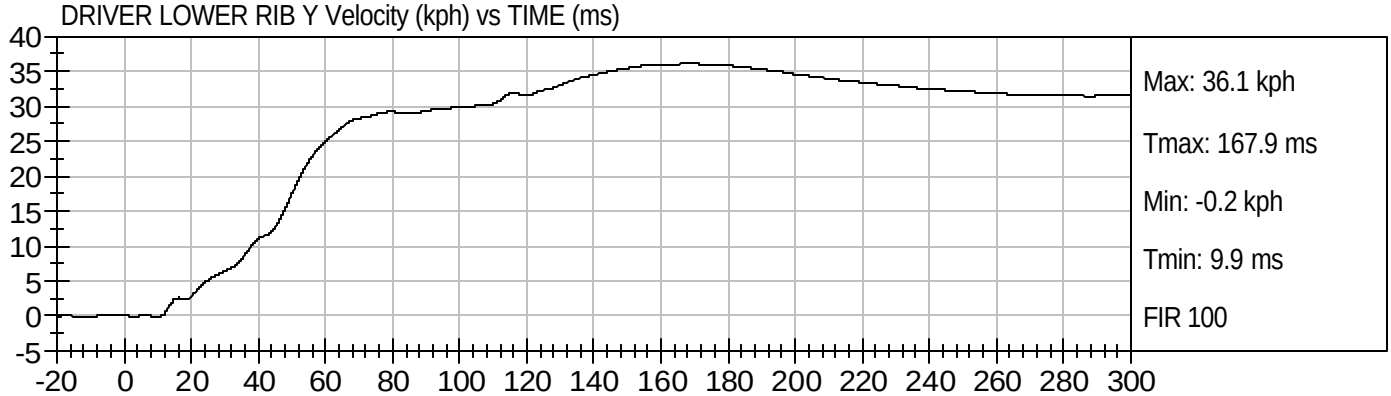
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



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



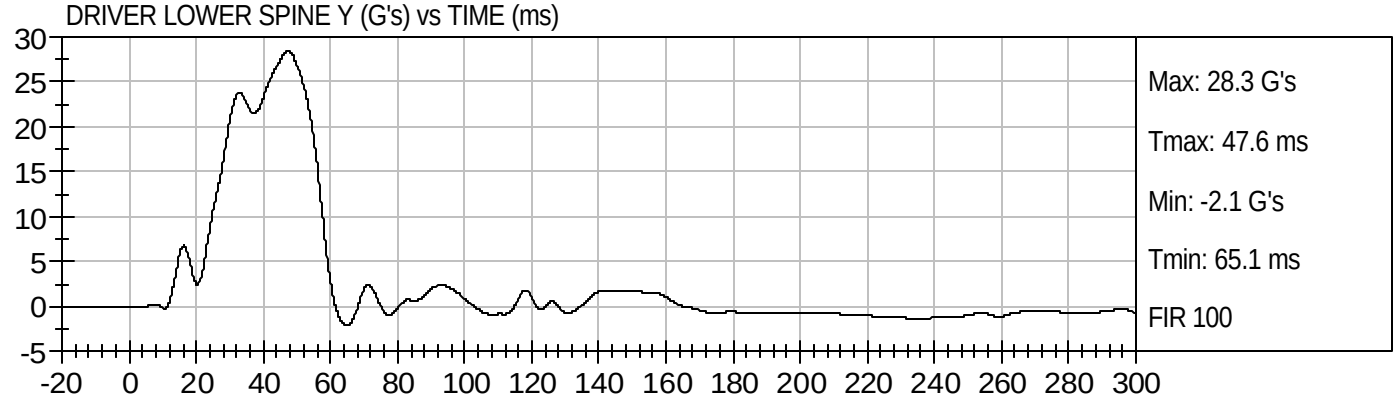
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



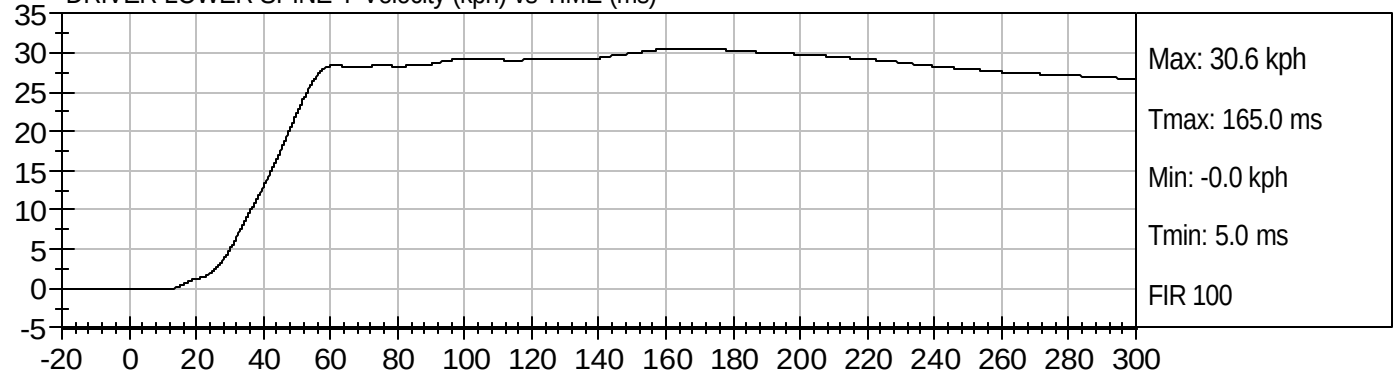
NCAP LEFT SIDE
2009 SUBARU FORESTER C95500

Test Date: 04/17/2008
Speed: 38.7 mph (62.3 km/h)

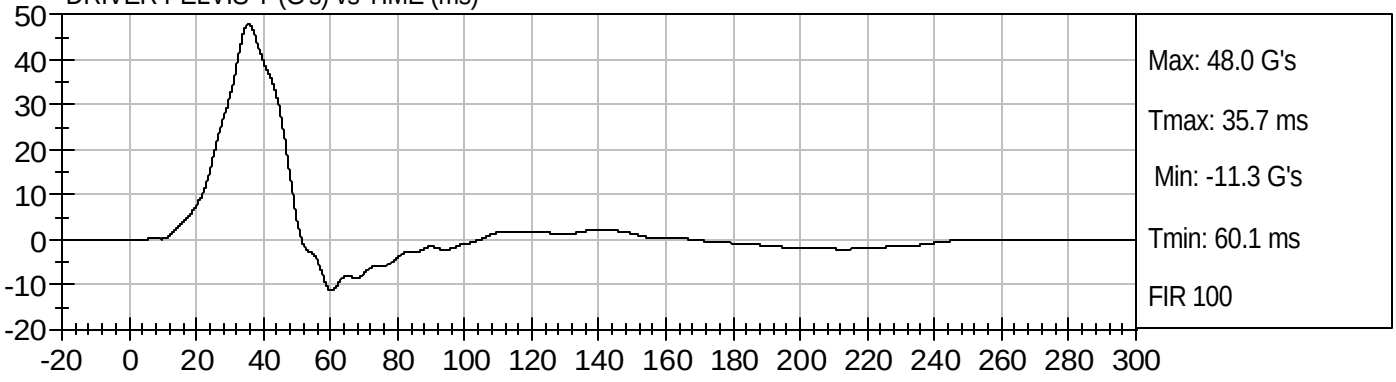
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



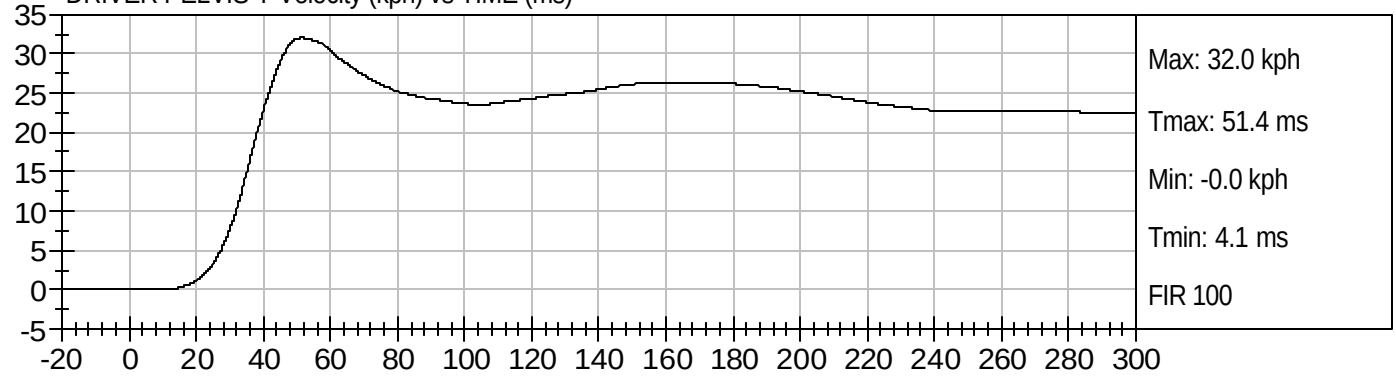
DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



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



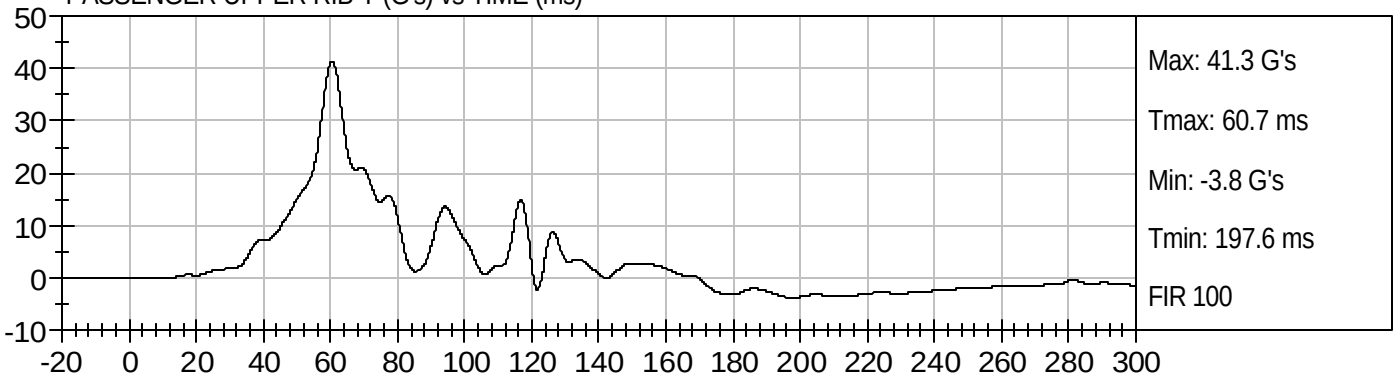
DRIVER PELVIS Y Velocity (kph) vs TIME (ms)



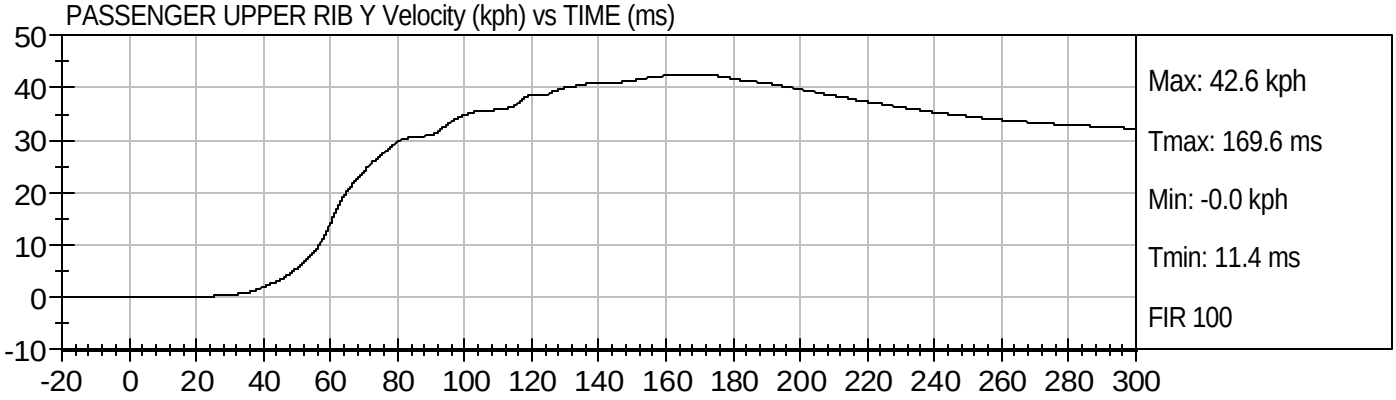
NCAP LEFT SIDE
2009 SUBARU FORESTER C95500

Test Date: 04/17/2008
Speed: 38.7 mph (62.3 km/h)

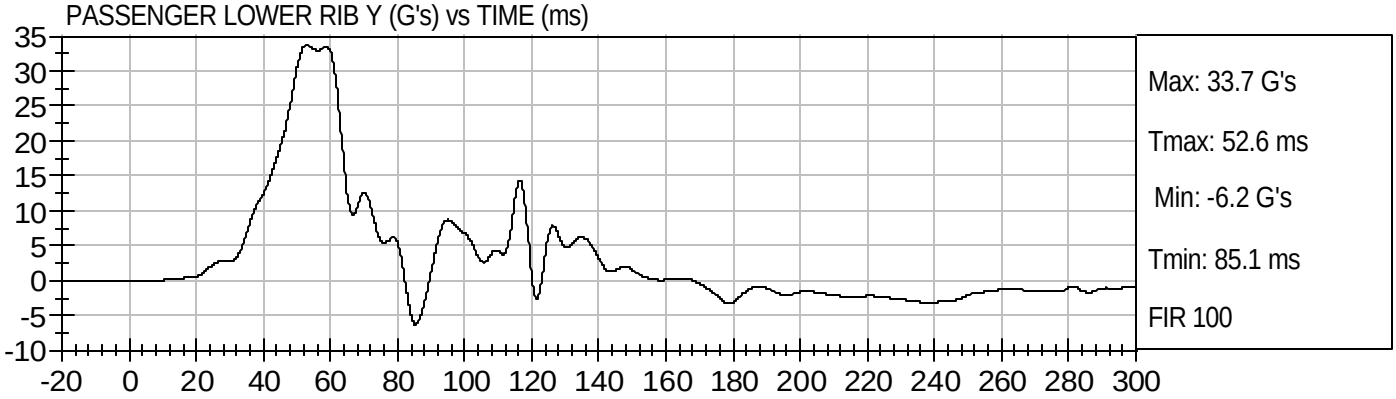
PASSENGER UPPER RIB Y (G's) vs TIME (ms)



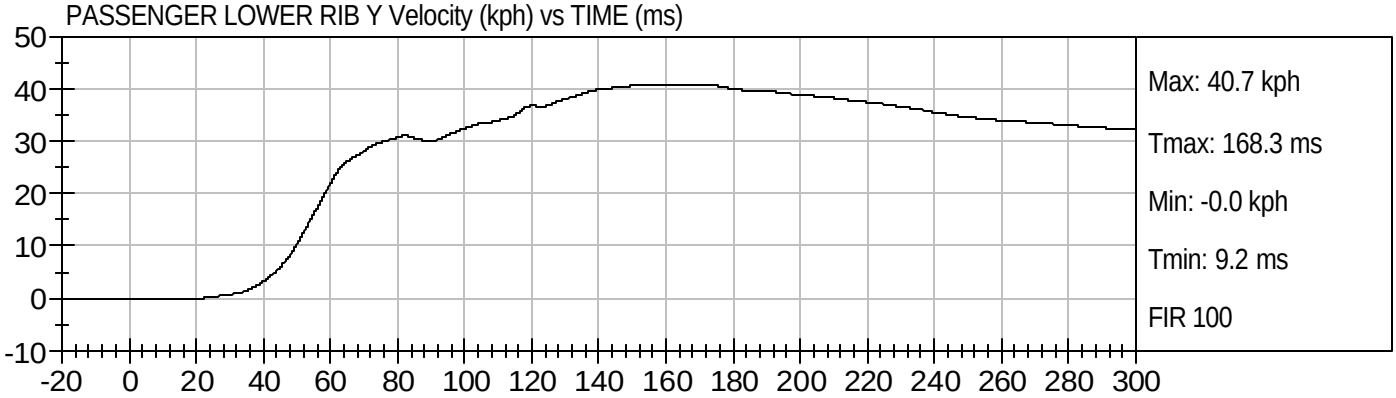
PASSENGER UPPER RIB Y Velocity (kph) vs TIME (ms)



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

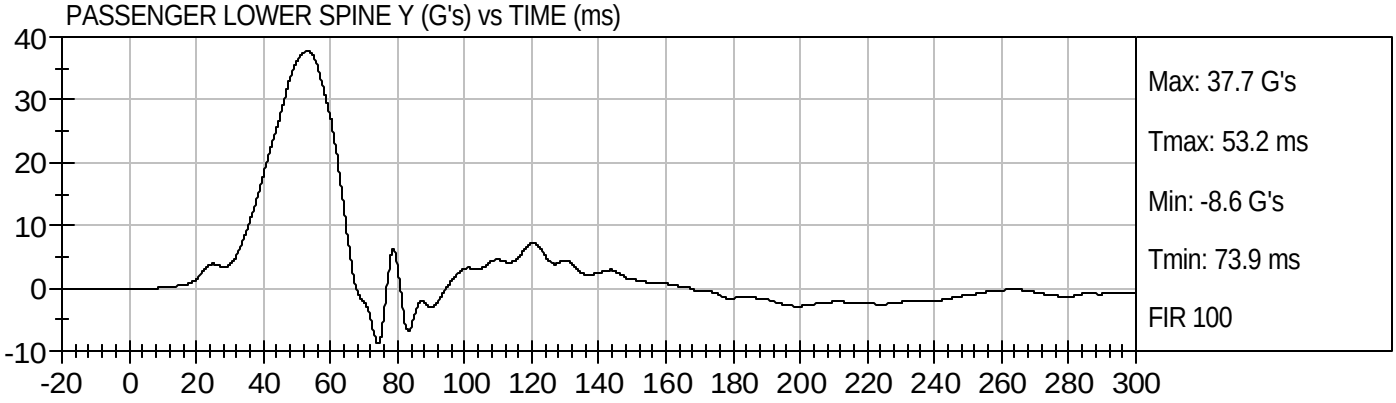


PASSENGER LOWER RIB Y Velocity (kph) vs TIME (ms)

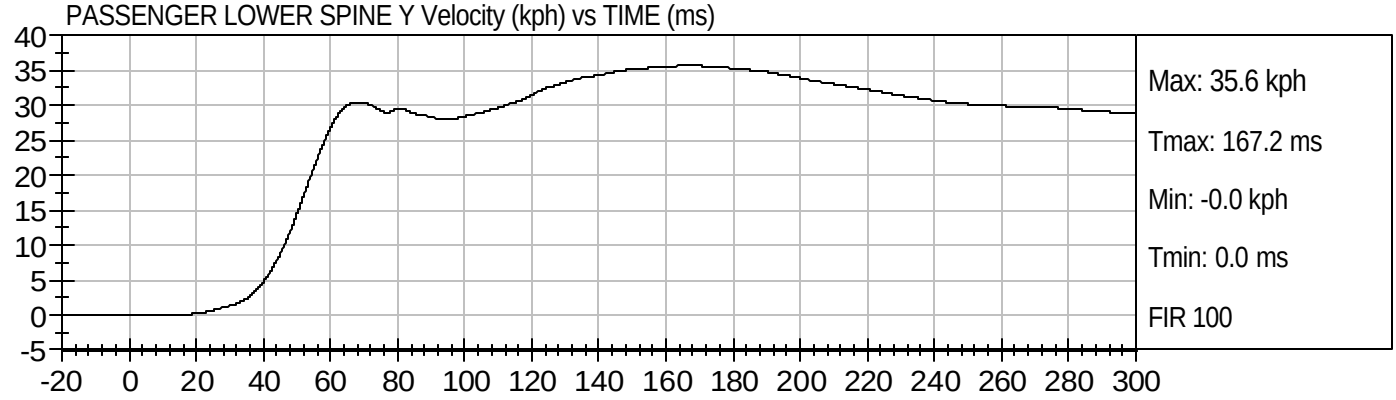


NCAP LEFT SIDE
2009 SUBARU FORESTER C95500
Test Date: 04/17/2008
Speed: 38.7 mph (62.3 km/h)

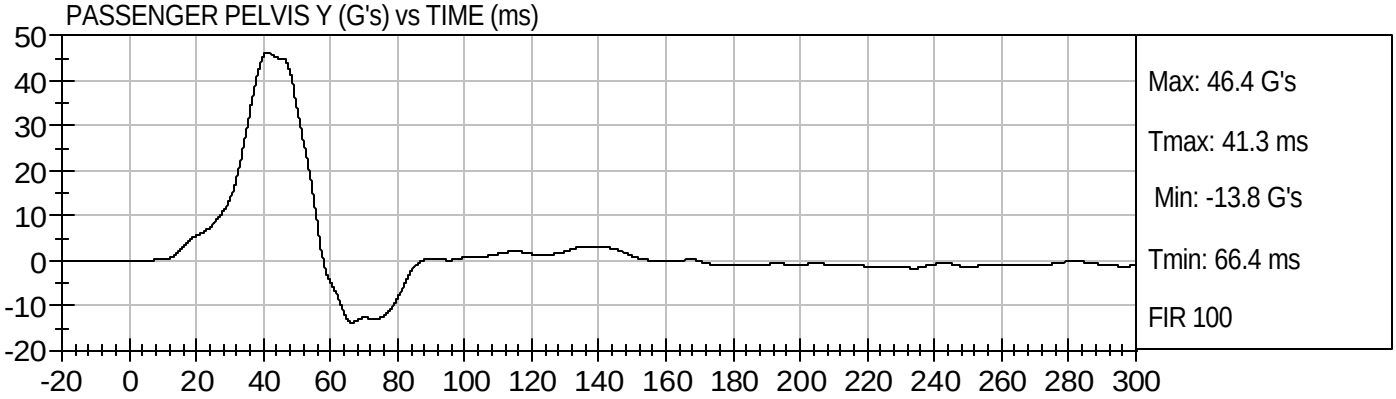
PASSENGER LOWER SPINE Y (G's) vs TIME (ms)



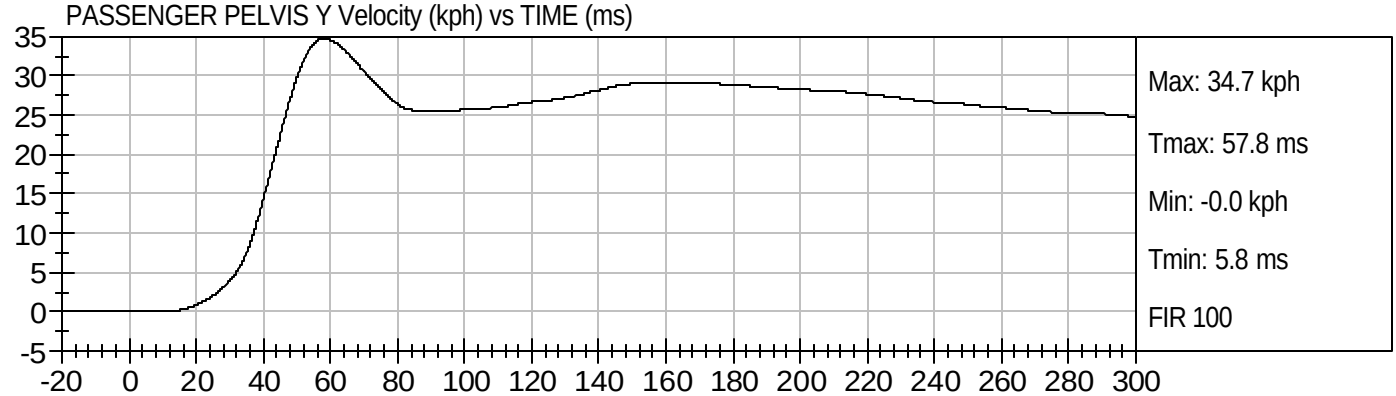
PASSENGER LOWER SPINE Y Velocity (kph) vs TIME (ms)



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: 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/HIII Calibration Data Sheet

Side Impact Dummy

External Measurements

ATD Serial No: 271 **Test I.D:** D0891

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

3/27/2008
Test Date

David Winkelbauer
Approved By

SID/HIII Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 271 **Test I.D:** D08911

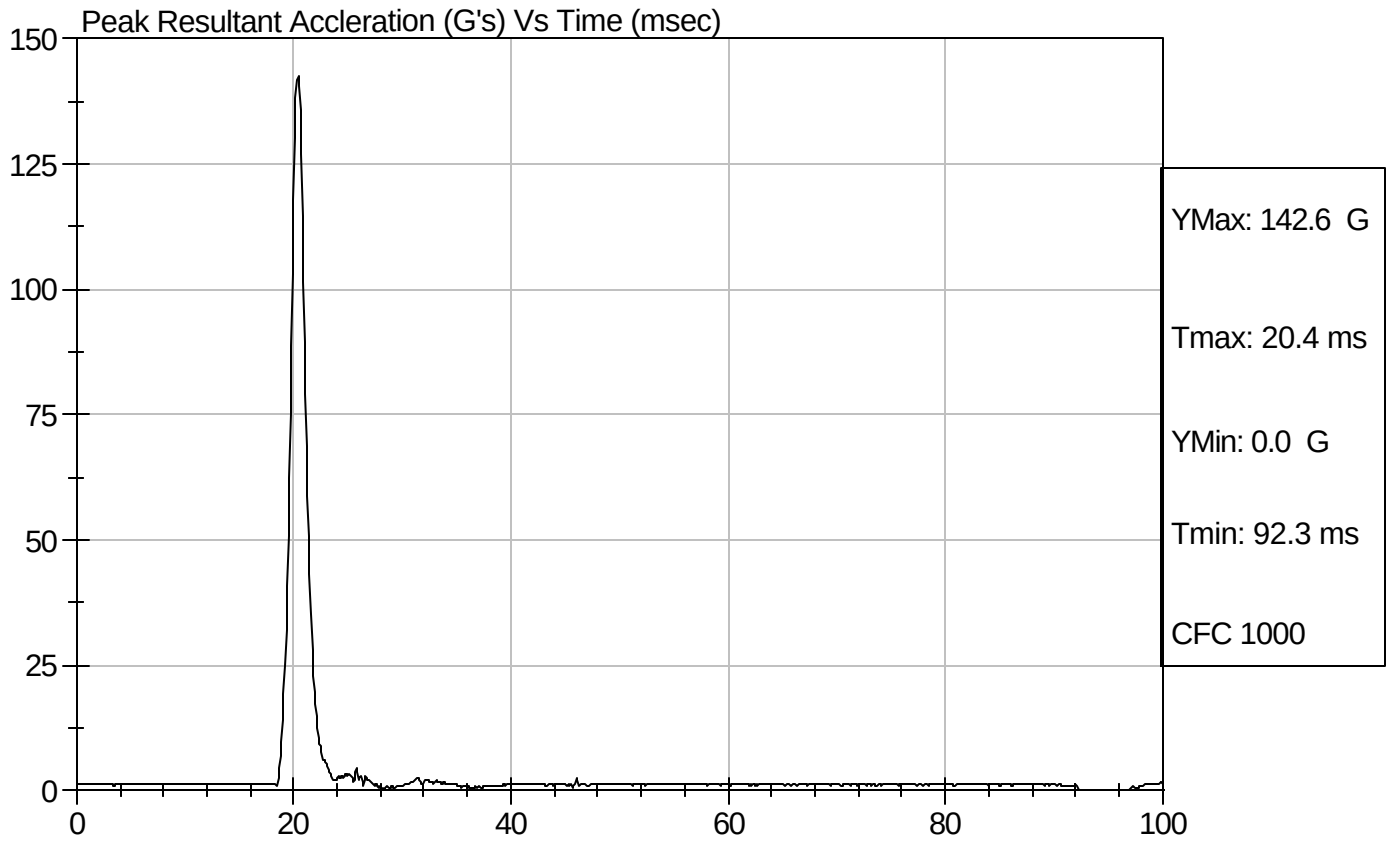
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	120 to 150	143	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-8.3	Pass
		Overall Test Results		Pass

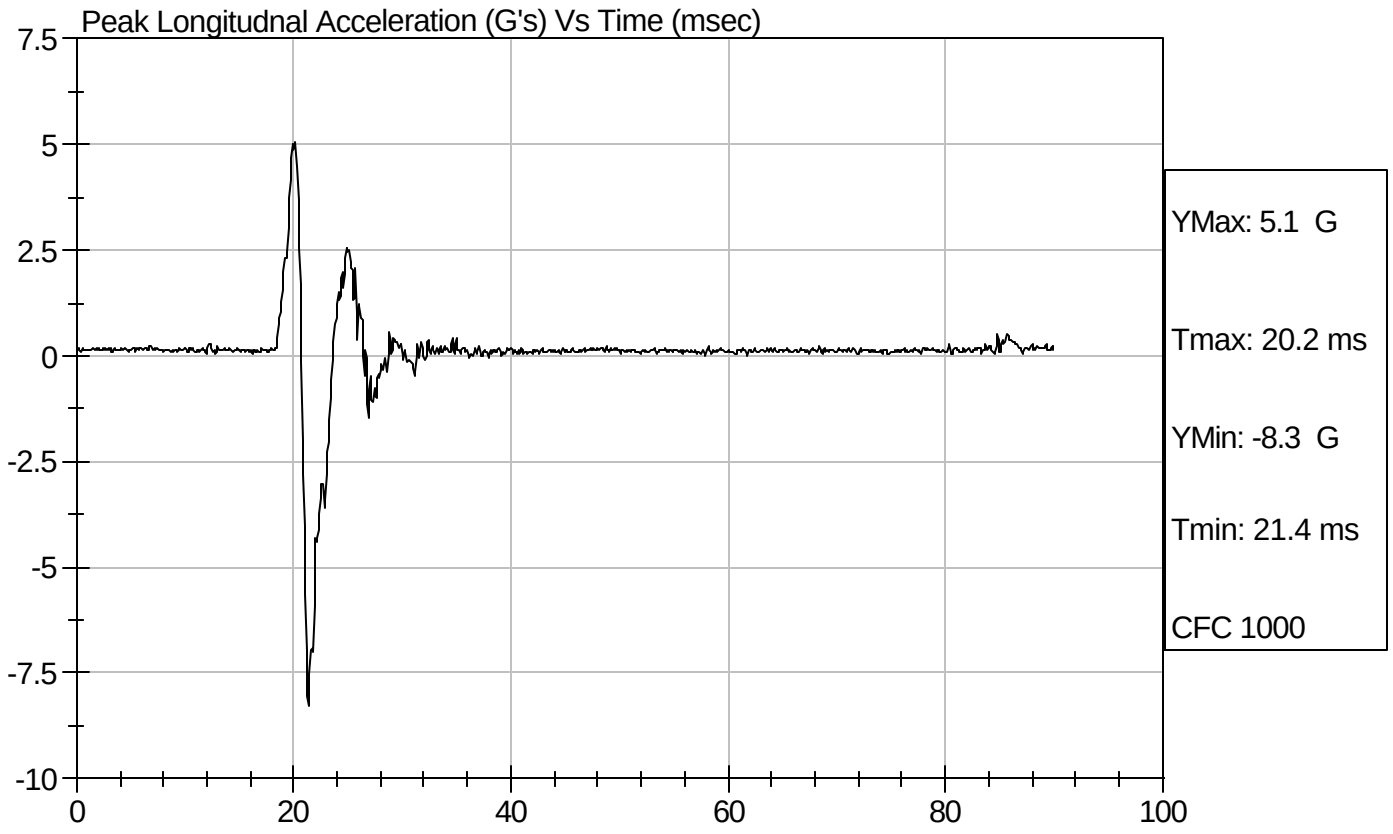
Jessica Gall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

mga	Test Description: Head Drop	Test Date: 3/27/08
	Component: D08911	Speed: 0 ft/s, 0 m/s





SID/HIII Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 271 **Test I.D:** D08912

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	4.22 - 4.31	4.23	Pass
Upper Rib	G's	37 - 46	43	Pass
Lower Rib	G's	37 - 46	42	Pass
Lower Spine	G's	15 - 22	21	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

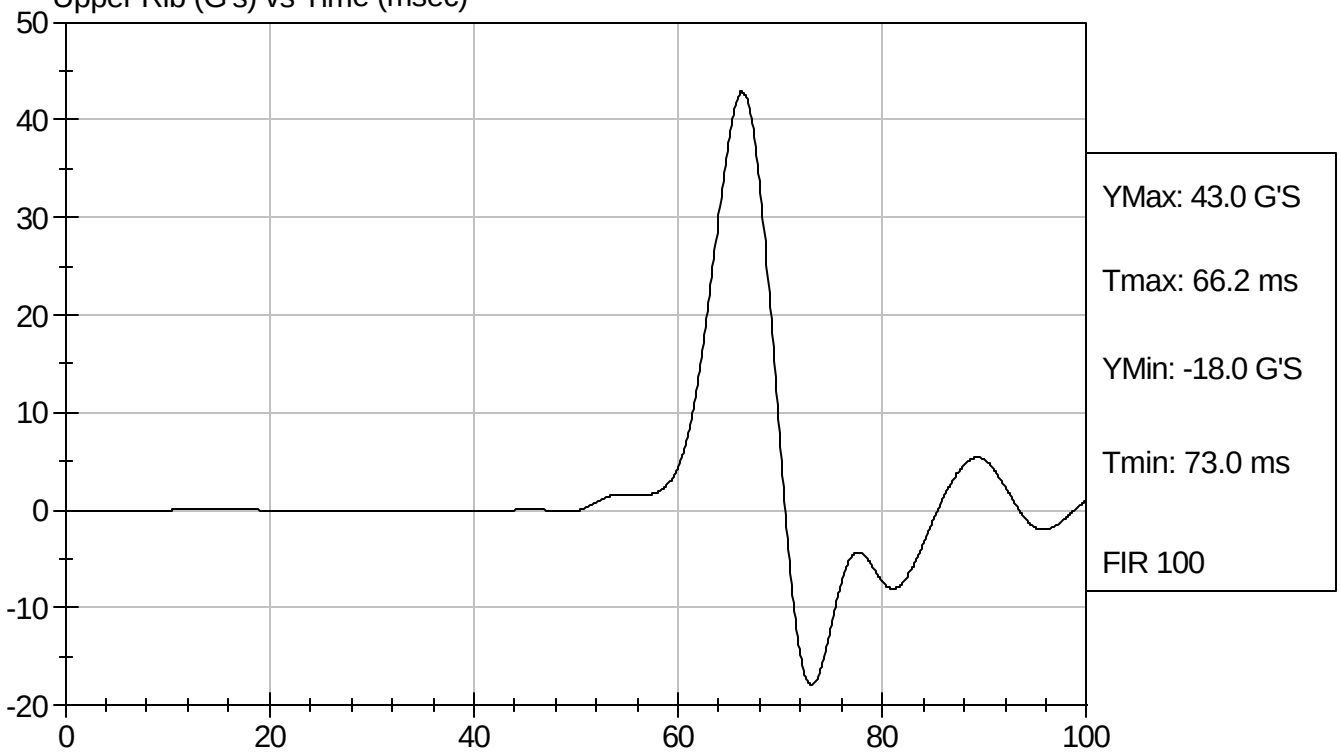
3/26/08
Test Date

David Winkelbauer
Approved By

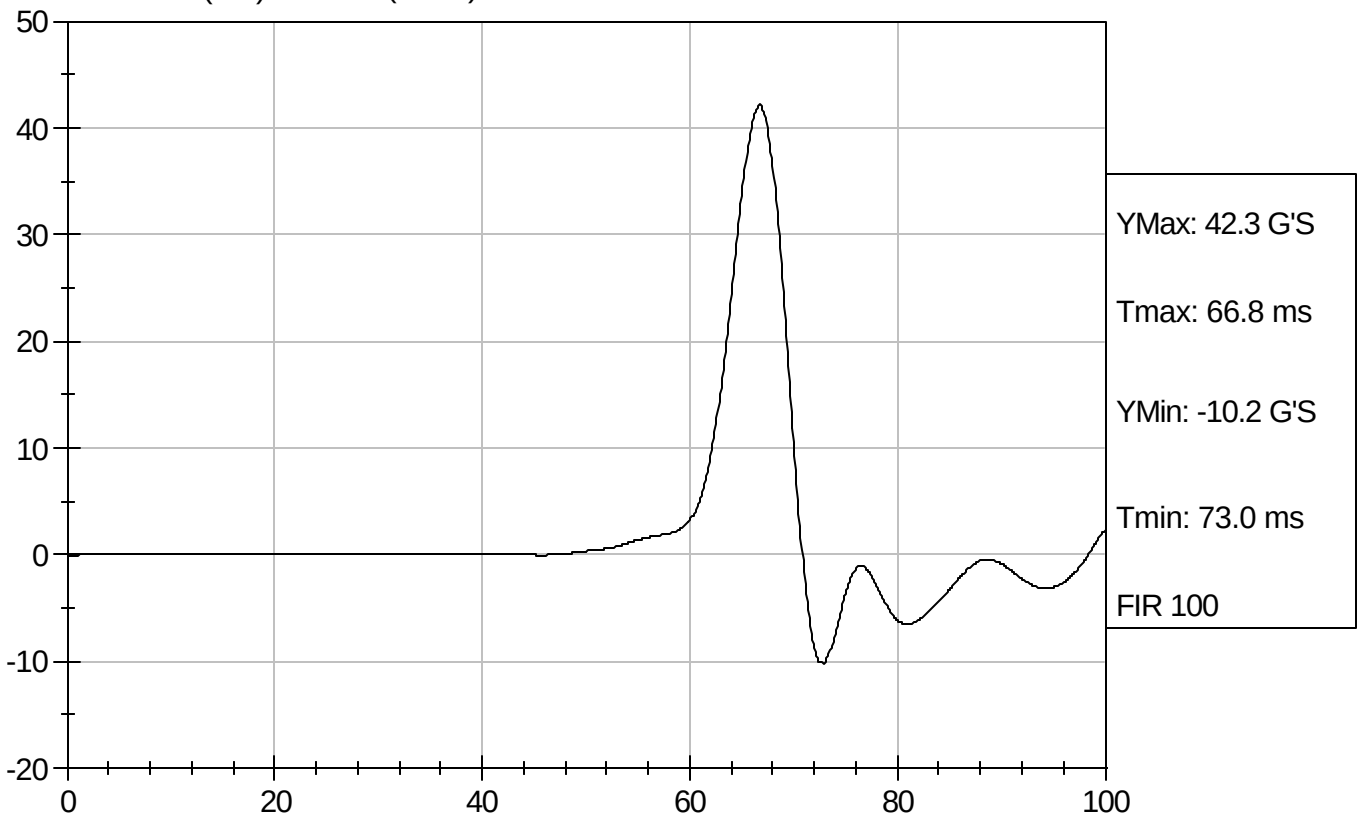
Test Desc: Pelvis Impact
Component ID: D08912

Test Date: 3/26/08
Speed: 13.88 ft/sec, 4.23 m/sec

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

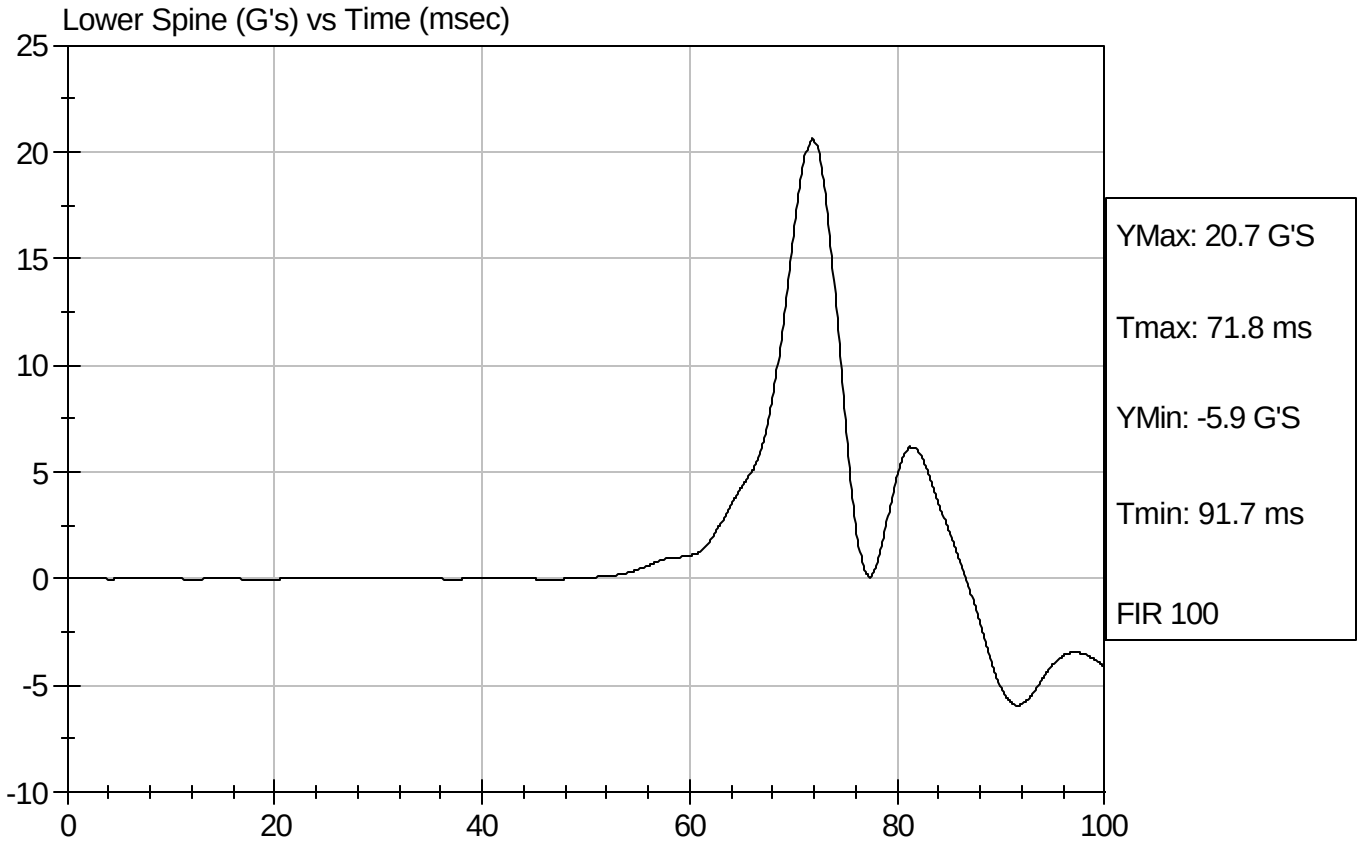


Lower Rib (G's) vs Time (msec)



Test Desc: Pelvis Impact
Component ID: D08912

Test Date: 3/26/08
Speed: 13.88 ft/sec, 4.23 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 271 **Test I.D:** D08913

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

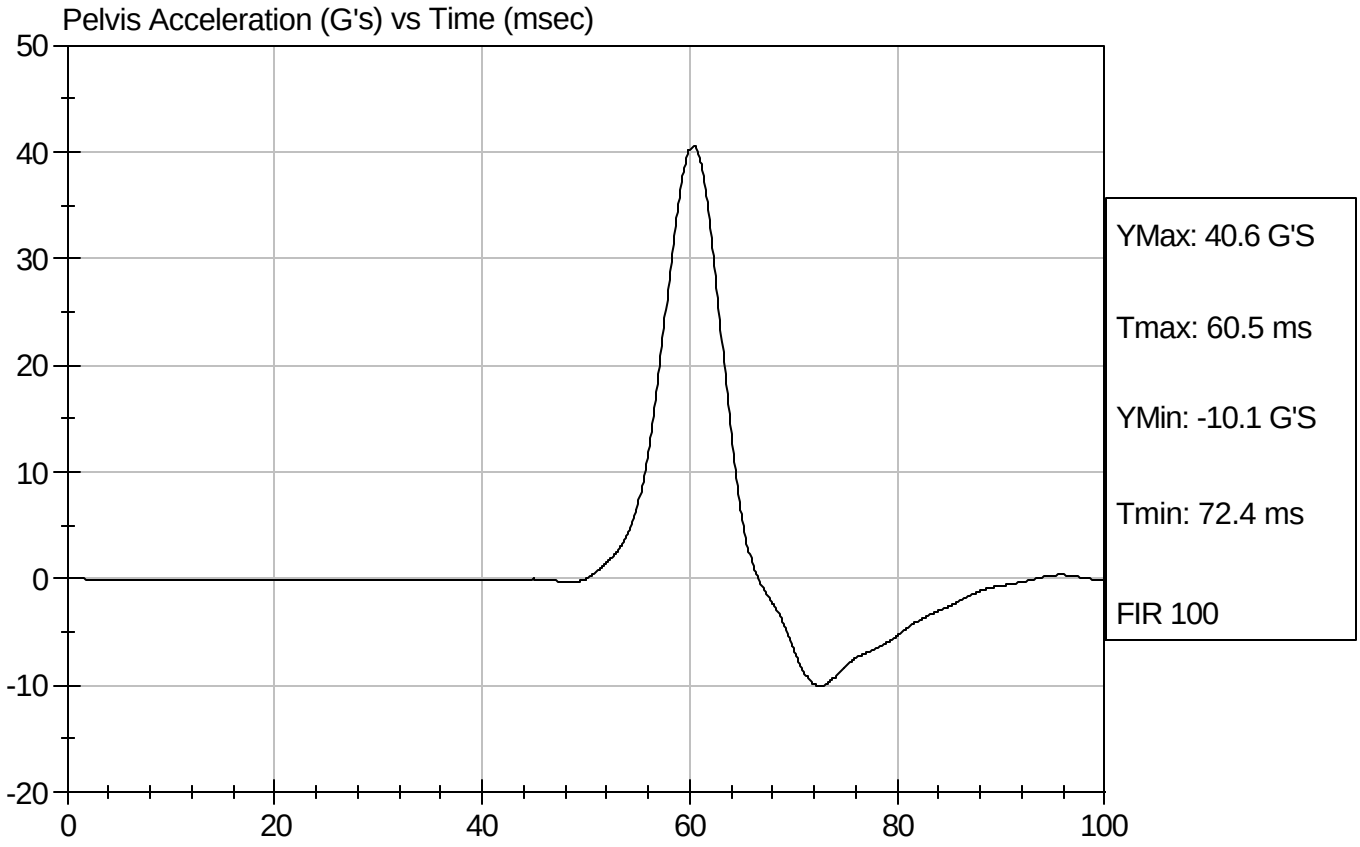
Jessica Gall
Laboratory Technician

3/26/08
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D08913

Test Date: 3/26/08
Speed: 14.01 ft/sec, 4.27 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 271 **Test I.D:** D08914

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force At 12.7 mm	N	104 -162	143	Pass
Force At 19 mm	N	163 - 222	200	Pass
Force At 25.4 mm	N	222 - 280	279	Pass
Force At 33 mm	N	325 - 391	378	Pass
		Overall Test Results		Pass

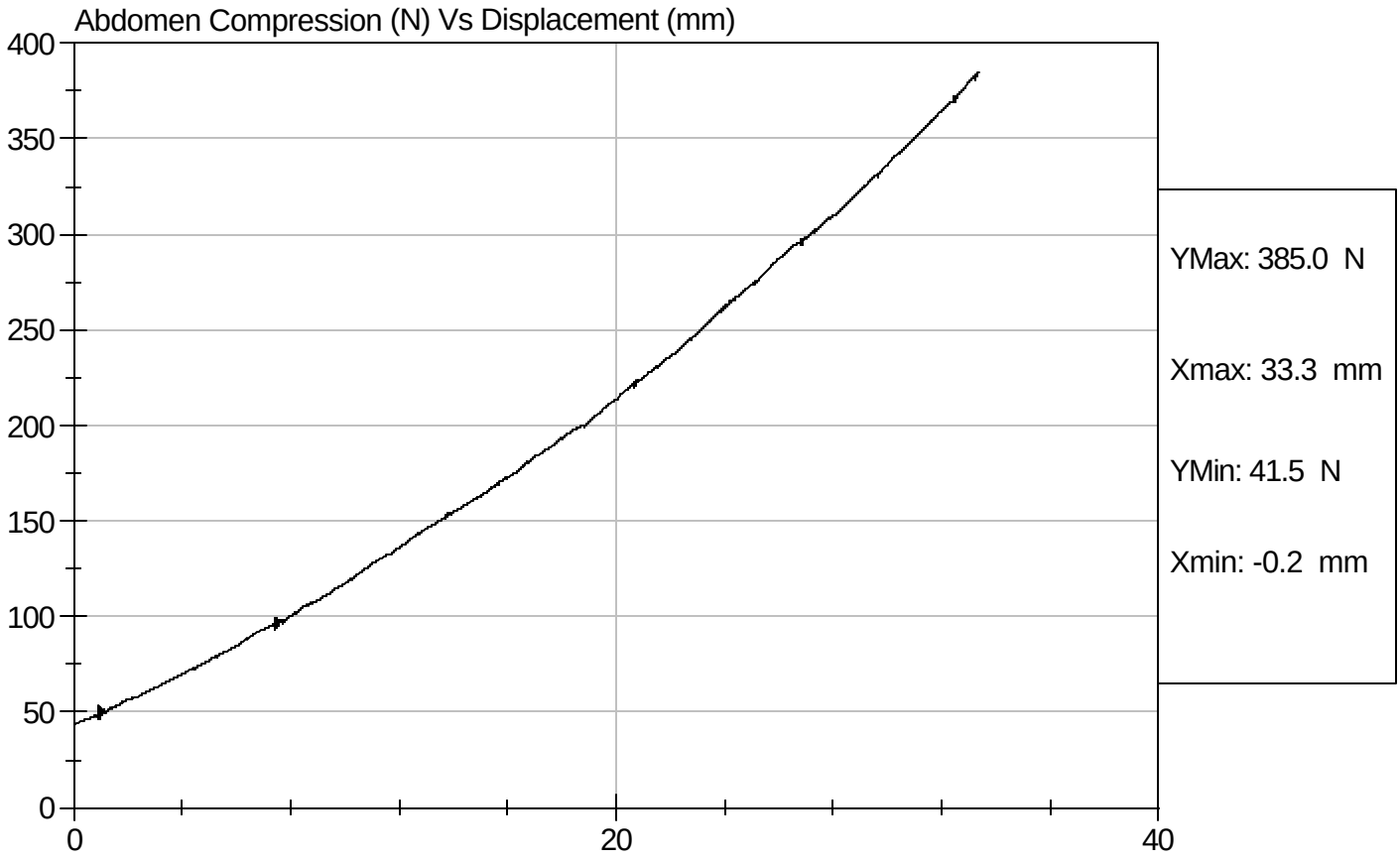
Jessica Gall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 3/27/08

Component: D08914 Speed: 0 ft/sec, 0 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 271 **Test I.D:** D08915

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	113.3	Pass
Force At 30 deg	N	151.2 - 204.6	163.2	Pass
Force At 40 deg	N	204.6 - 258.0	217.3	Pass
Return Angle	Deg	12 Maximum	6	Pass
		Overall Test Results		Pass

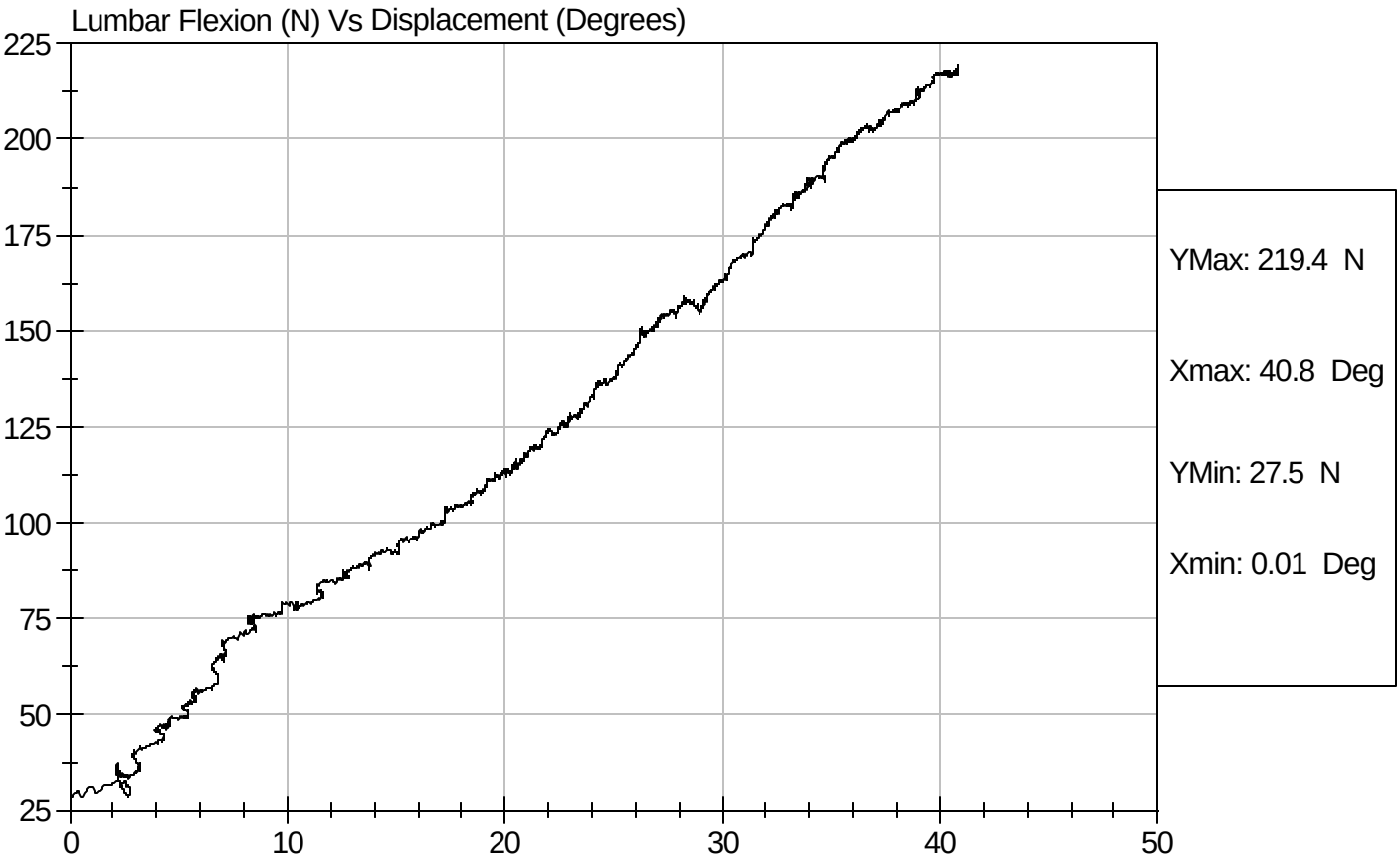
Jessica Gall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 3/27/08

Component: D08915 | Speed: 0 ft/sec, 0 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Neck Pendulum Test

ATD Serial No: 271 **Test I.D:** D08919

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Impact Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.54	Pass
	20 msec	m/s	4.12 to 5.10	4.91	Pass
	30 msec	m/s	5.73 to 7.01	6.66	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.70	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	73	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	59	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	76	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	50	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	4	Pass

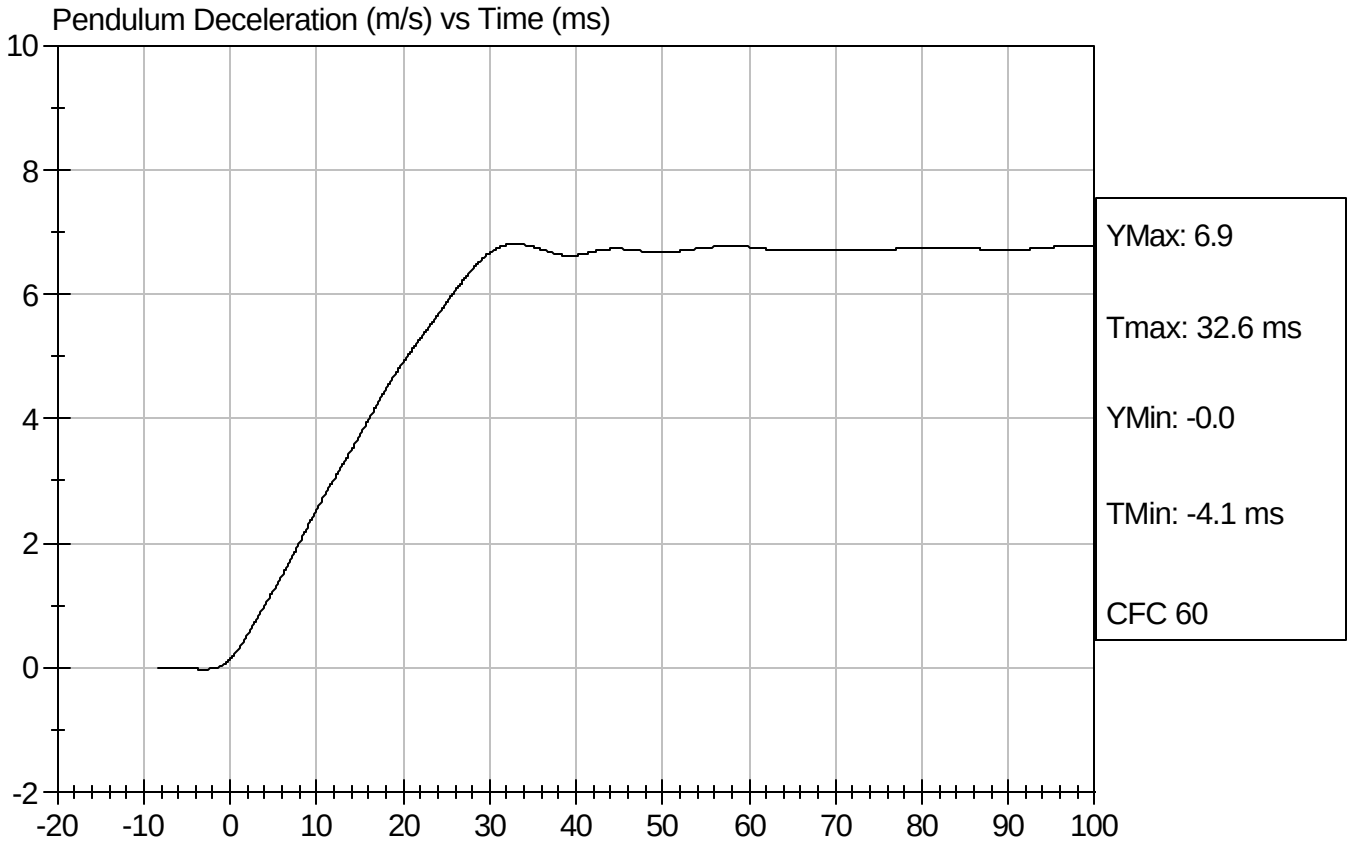
Jessica Hall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Bending
Component ID: D08919

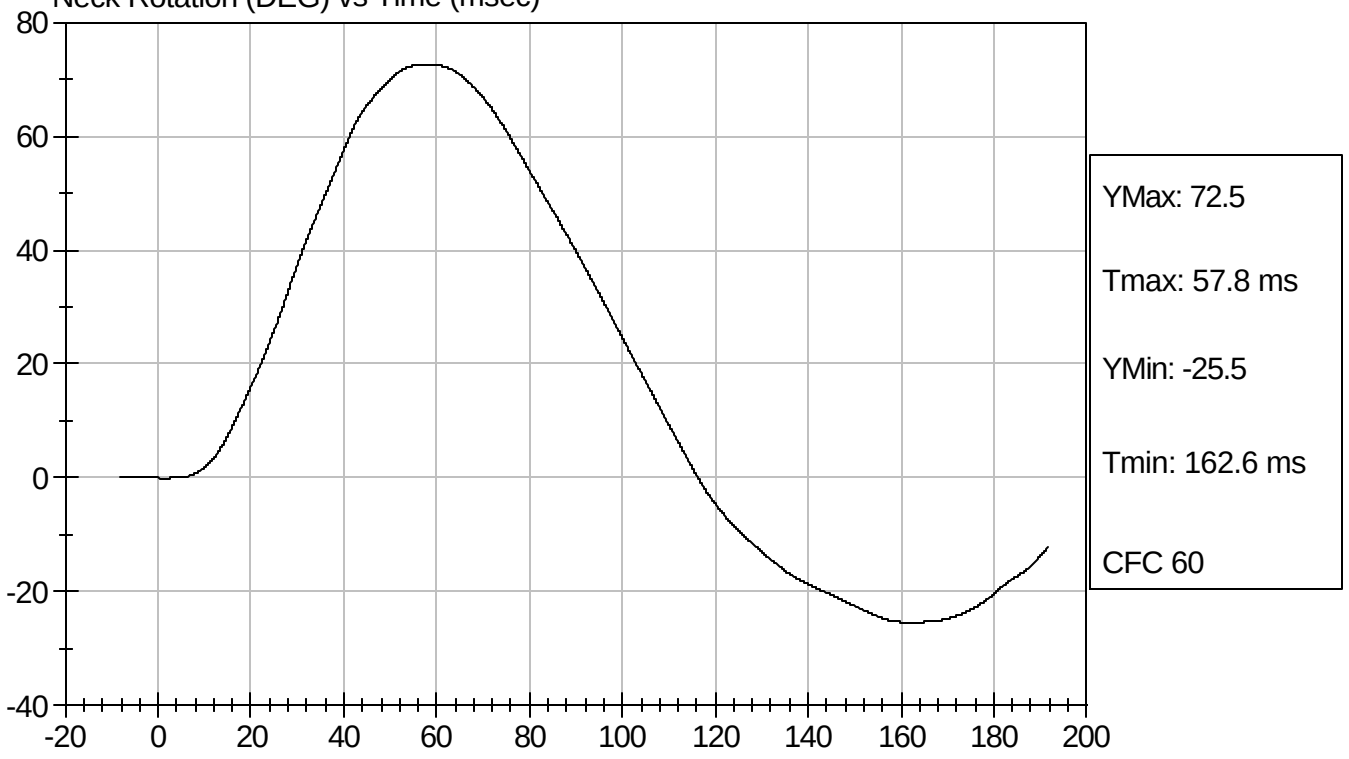
Test Date: 3/27/08
Speed: 23.15 ft/sec, 7.06 m/sec



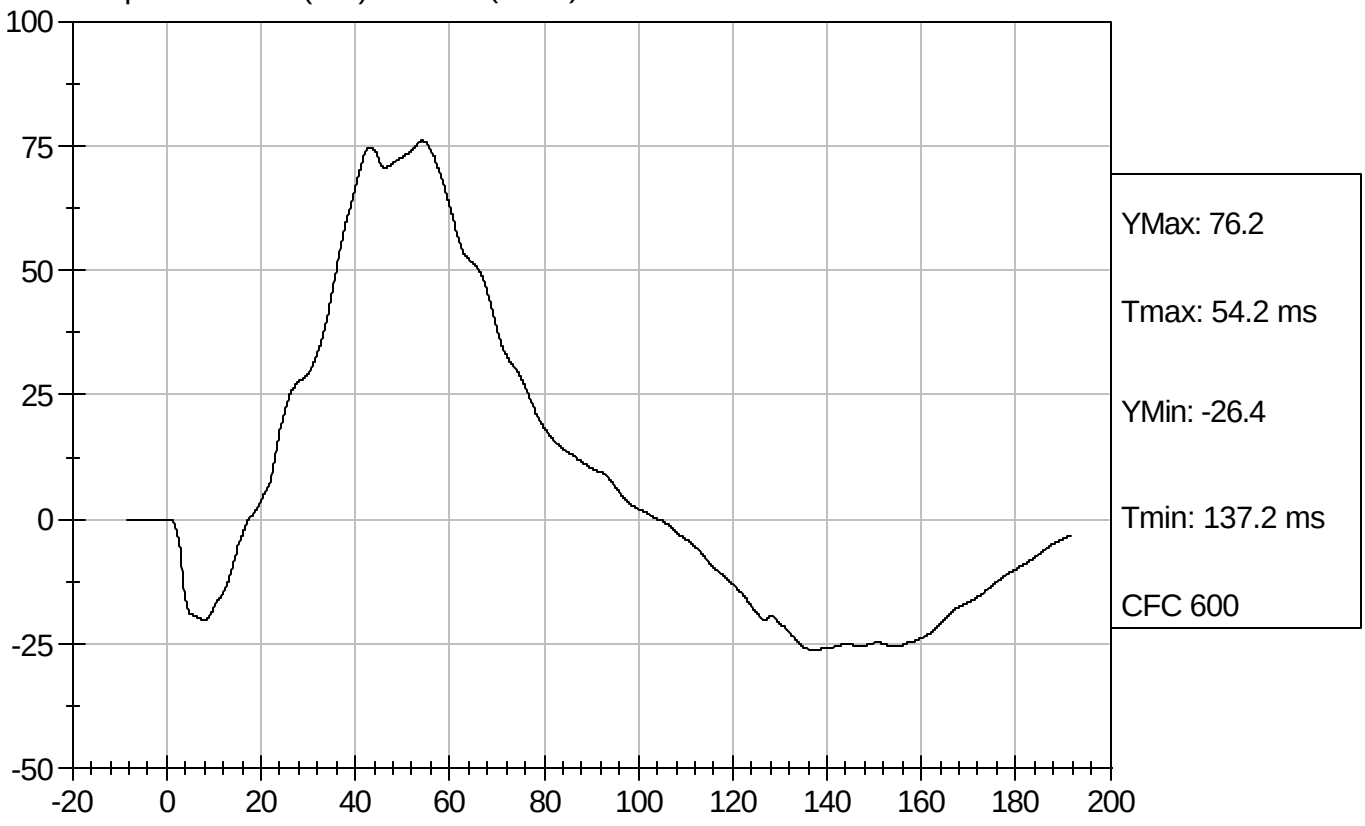
Test Desc: Neck Bending
Component ID: D08919

Test Date: 3/27/08
Speed: 23.15 ft/sec, 7.06 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/HIII Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 271 **Test I.D:** D081081

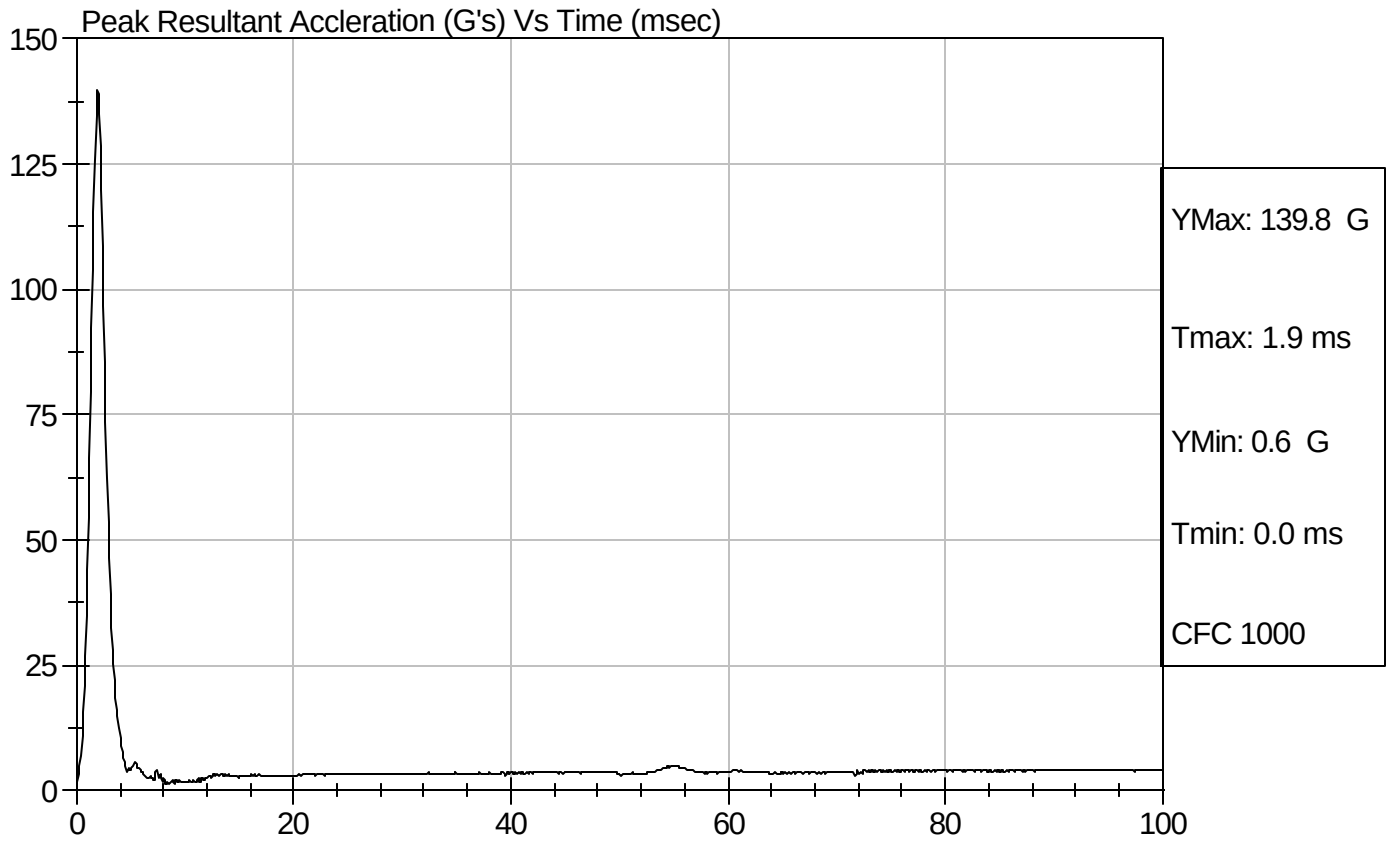
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	120 to 150	140	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-10.0	Pass
		Overall Test Results		Pass

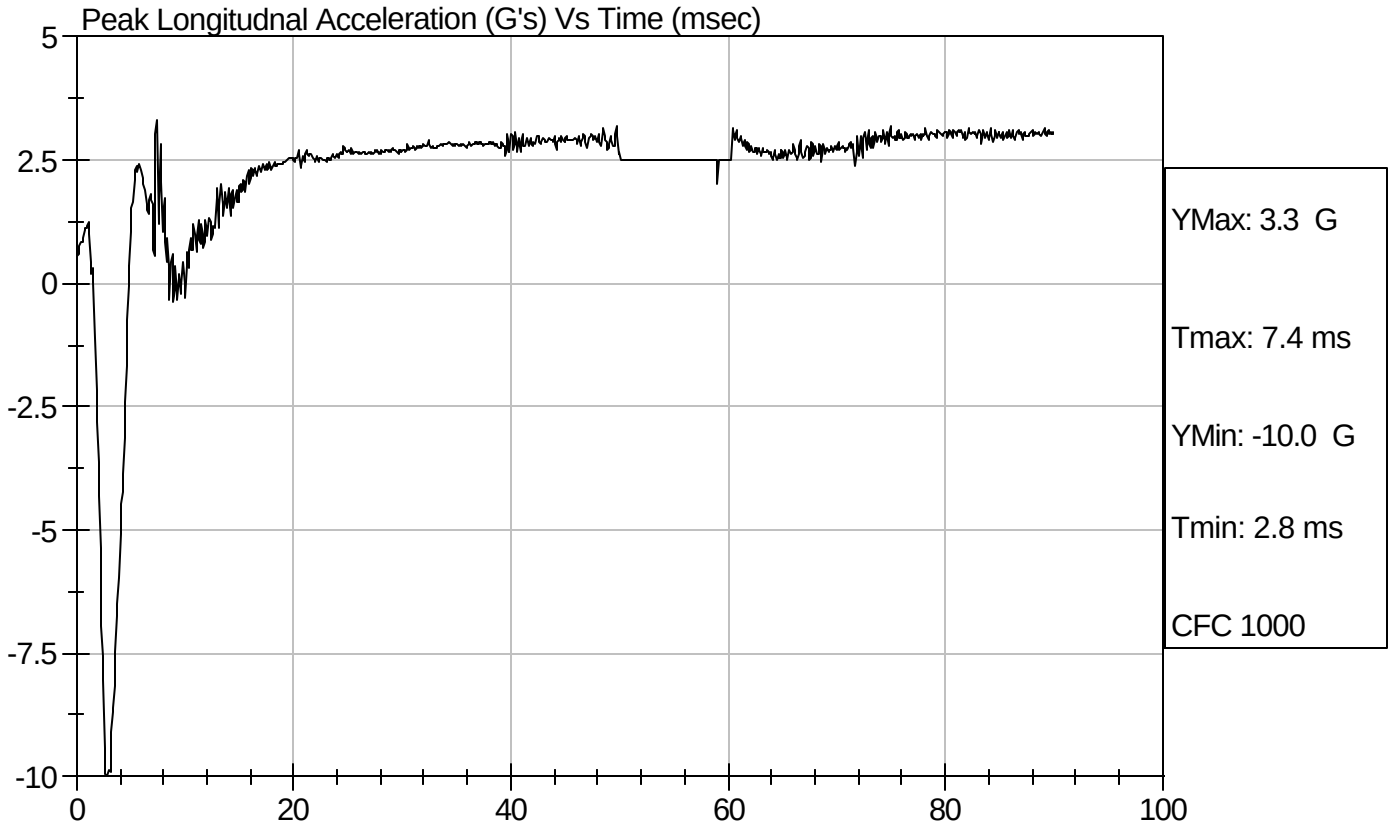
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

mga	Test Description: Head Drop	Test Date: 4/21/08
	Component: D081081	Speed: 0 ft/s, 0 m/s





SID/HIII Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 271 **Test I.D:** D081082

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	4.22 - 4.31	4.27	Pass
Upper Rib	G's	37 - 46	45	Pass
Lower Rib	G's	37 - 46	45	Pass
Lower Spine	G's	15 - 22	21	Pass
		Overall Test Results		Pass

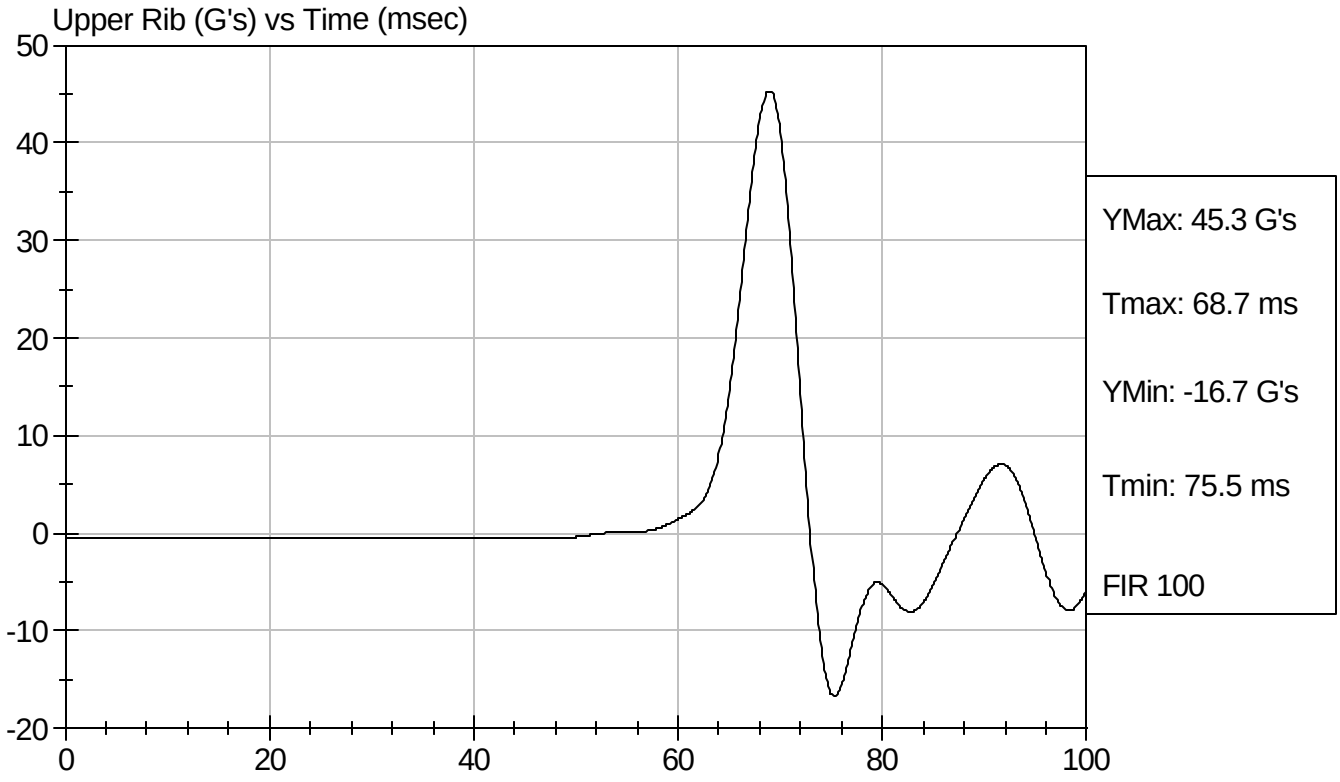
Jessica Gall
Laboratory Technician

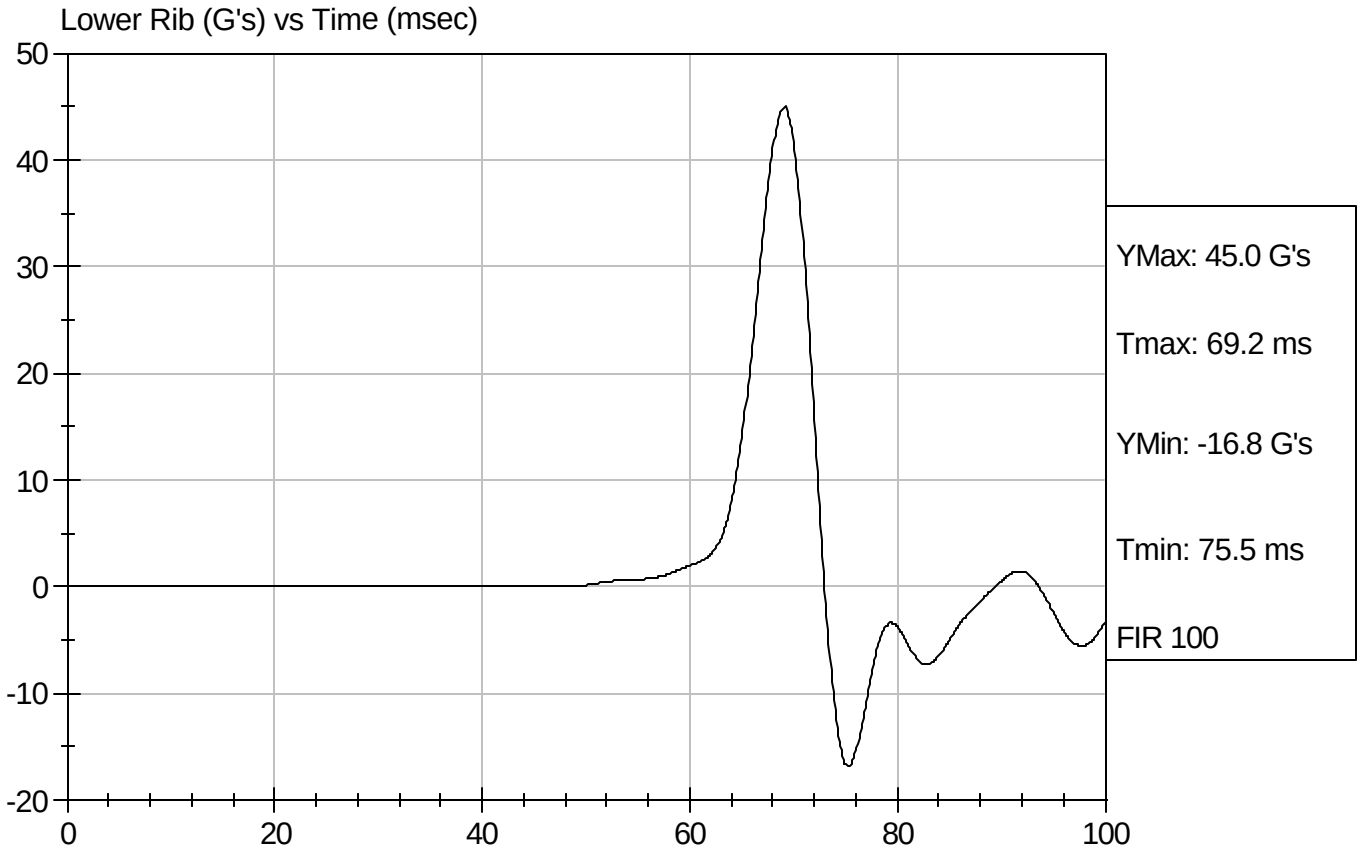
4/21/08
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D081082

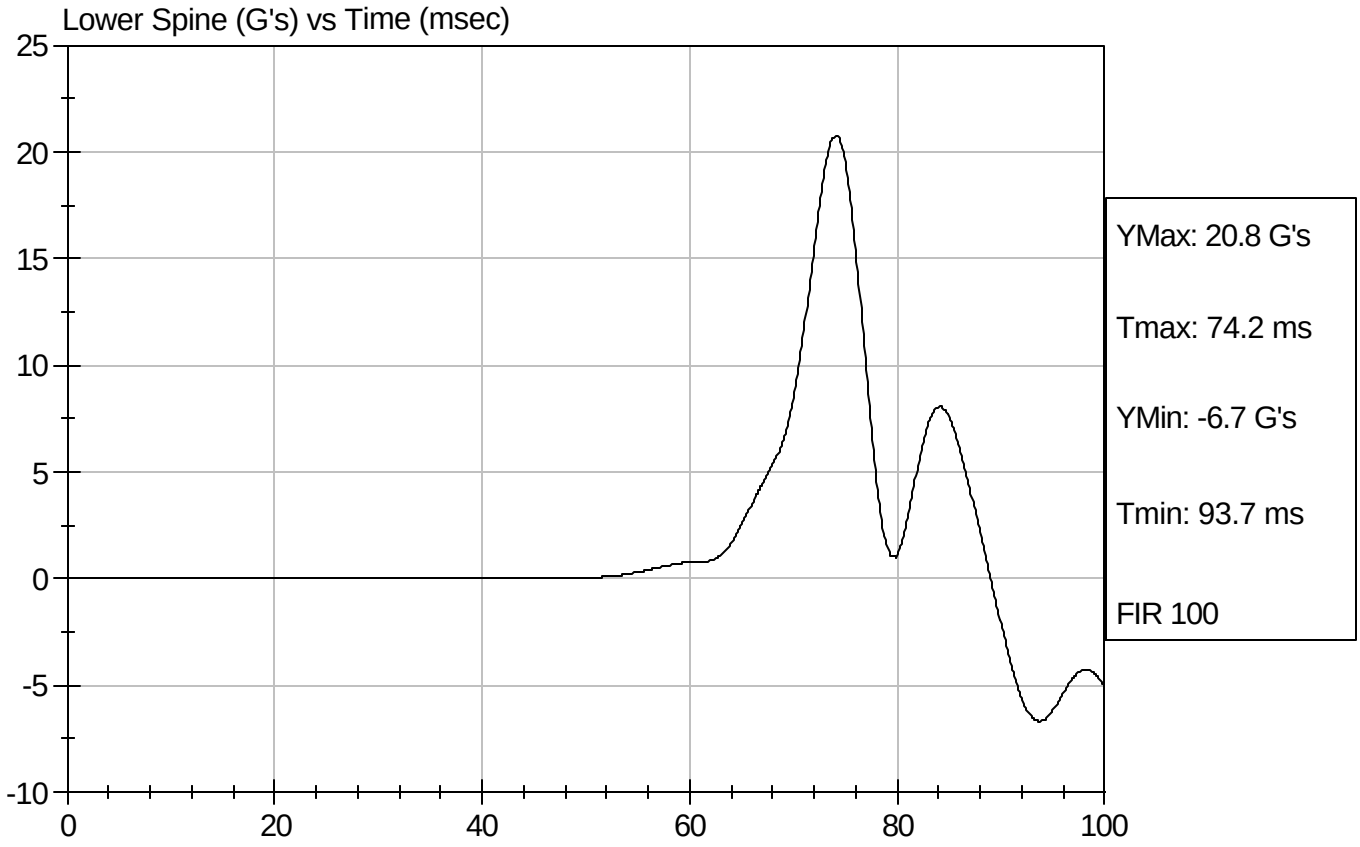
Test Date: 4/21/08
Speed: 14.01 ft/sec, 4.27 m/sec





Test Desc: Thorax Impact
Component ID: D081082

Test Date: 4/21/08
Speed: 14.01 ft/sec, 4.27 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 271 **Test I.D:** D081083

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

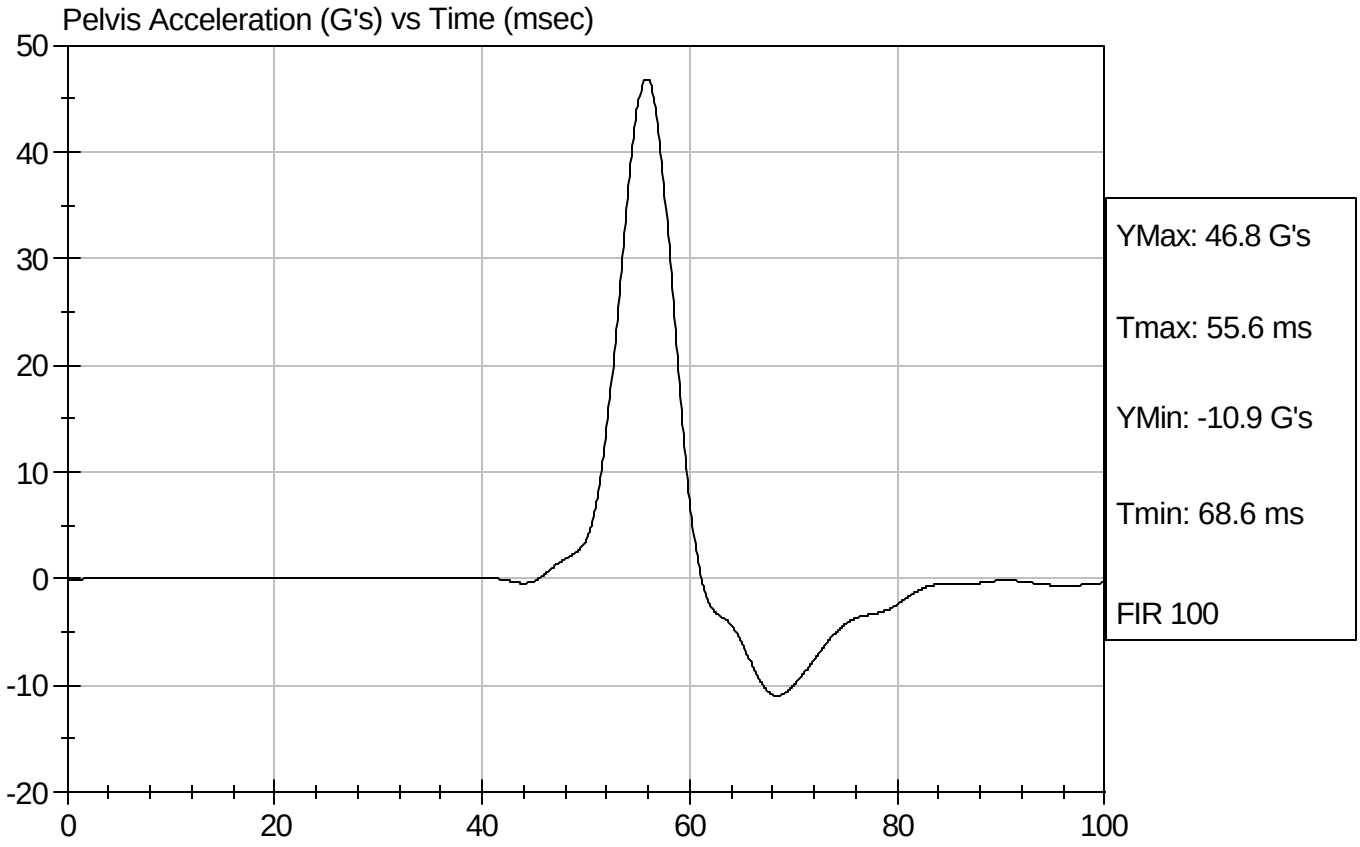
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D081083

Test Date: 4/21/08
Speed: 14.12 ft/sec, 4.30 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 271 **Test I.D:** D081084

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Force At 12.7 mm	N	104 -162	138	Pass
Force At 19 mm	N	163 - 222	196	Pass
Force At 25.4 mm	N	222 - 280	273	Pass
Force At 33 mm	N	325 - 391	380	Pass
		Overall Test Results		Pass

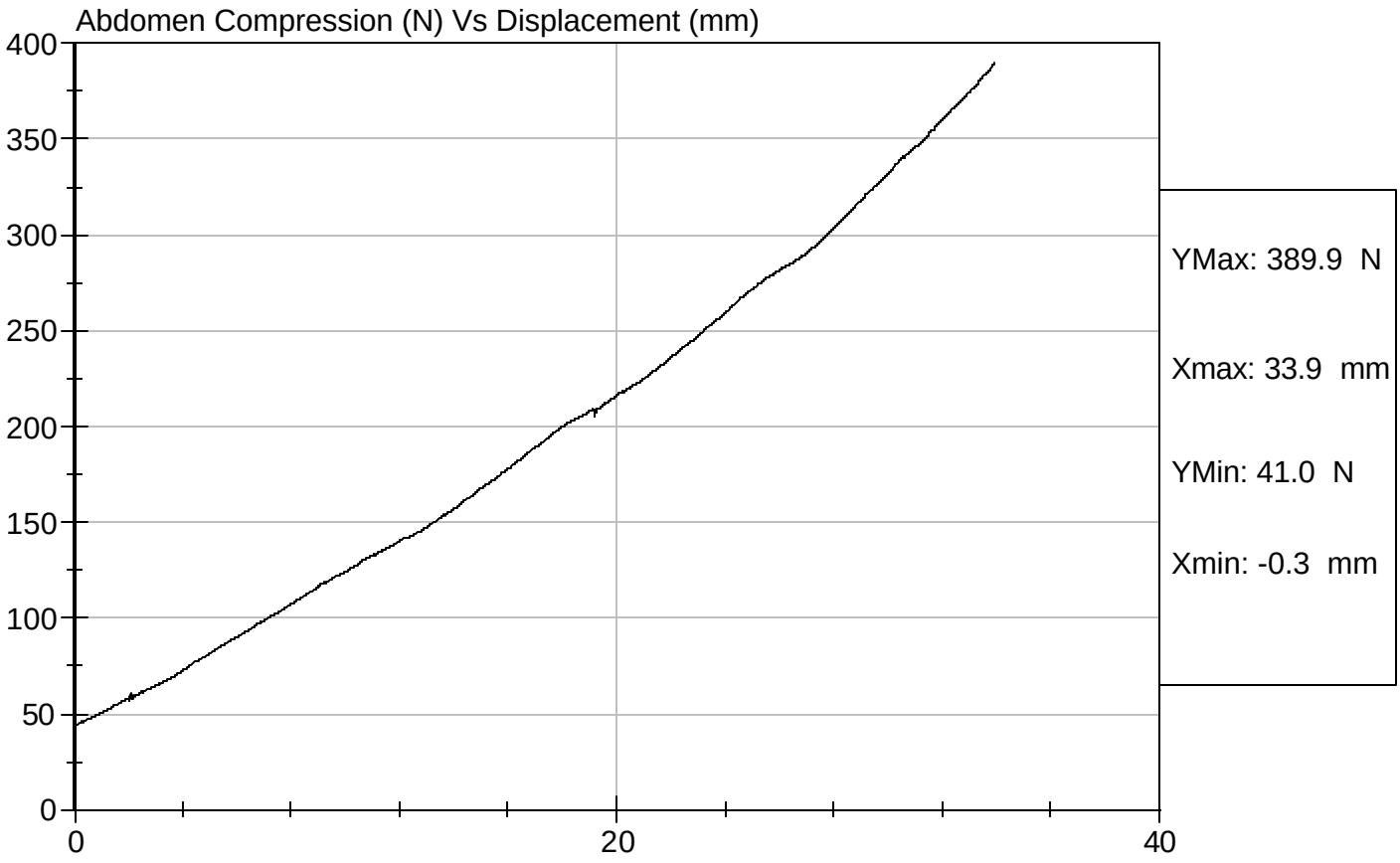
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 4/21/08

Component: D081094 Speed: 0 ft/sec, m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 271 **Test I.D:** D081085

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	122.0	Pass
Force At 30 deg	N	151.2 - 204.6	154.0	Pass
Force At 40 deg	N	204.6 - 258.0	224.4	Pass
Return Angle	Deg	12 Maximum	6	Pass
		Overall Test Results		Pass

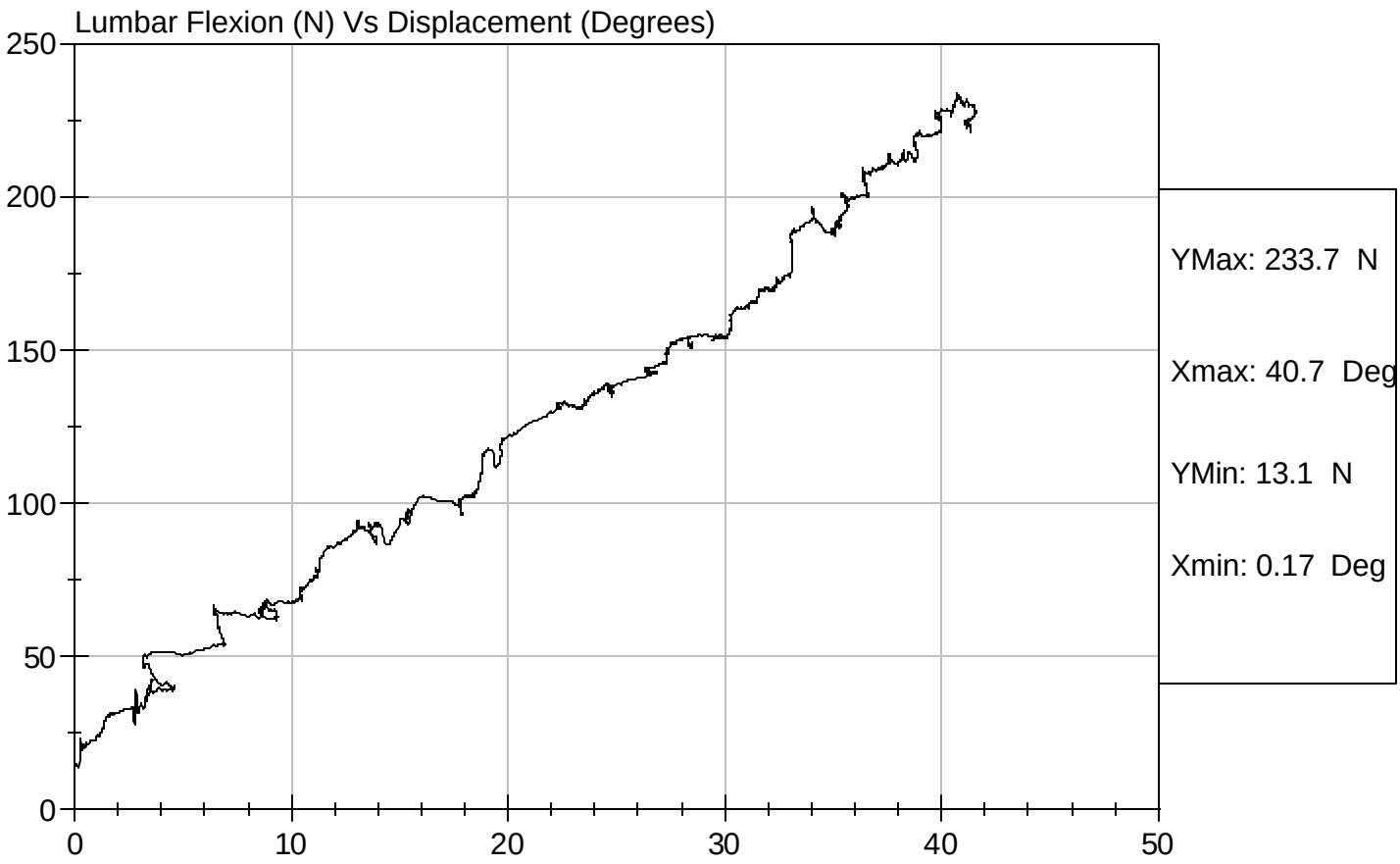
Jessica Hall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 4/21/08

Component: D081085 | Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Neck Pendulum Test

ATD Serial No: 271 **Test I.D:** D081089

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.49	Pass
	20 msec	m/s	4.12 to 5.10	4.83	Pass
	30 msec	m/s	5.73 to 7.01	6.57	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.56	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	78	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	51	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	5	Pass

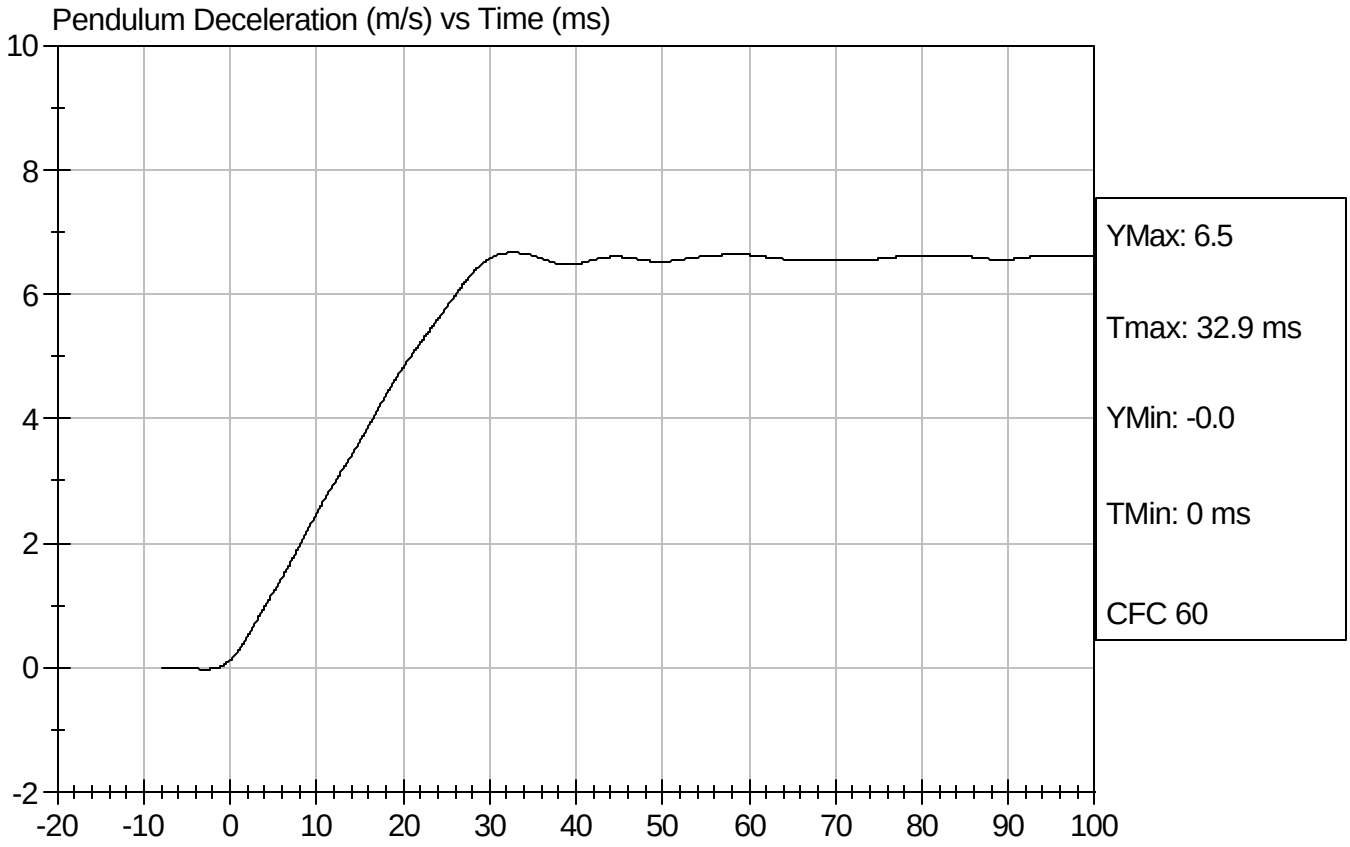
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

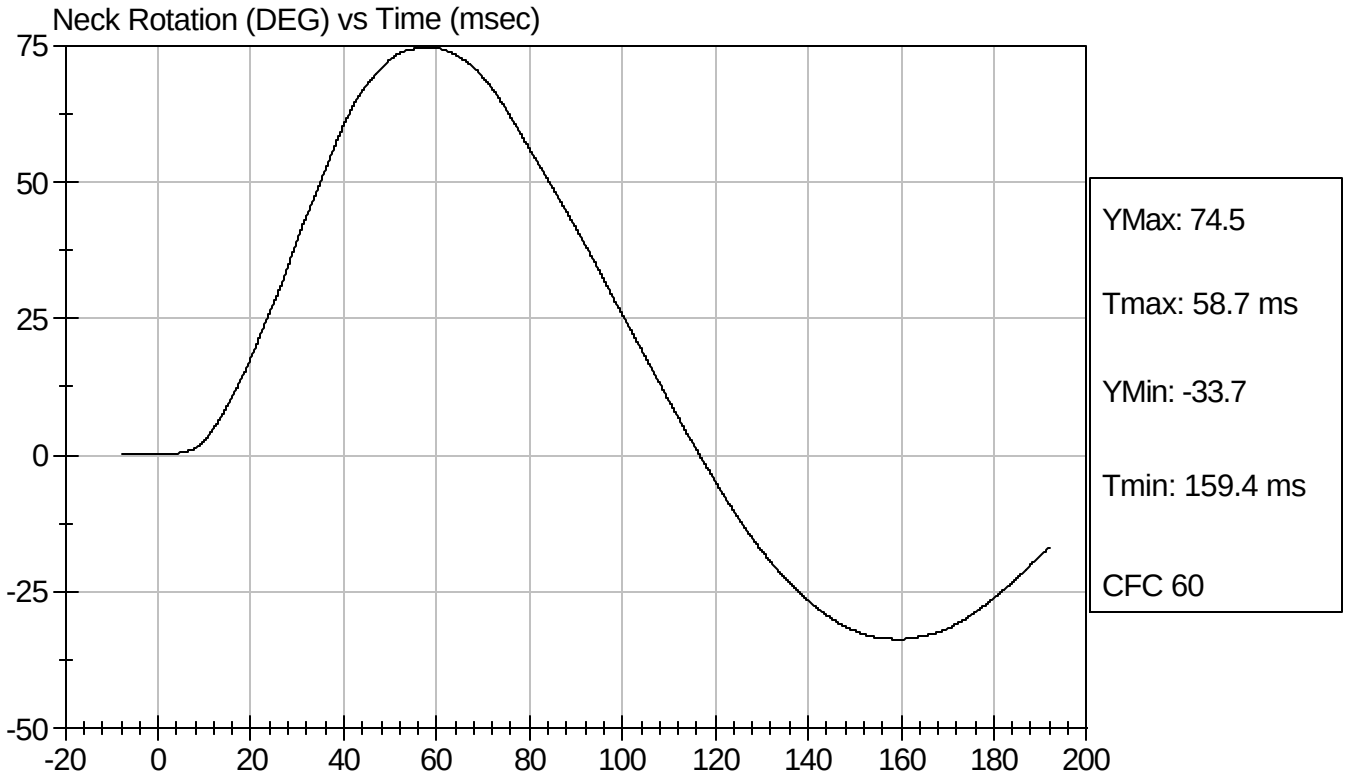
Test Desc: Neck Bending
Component ID: D081089

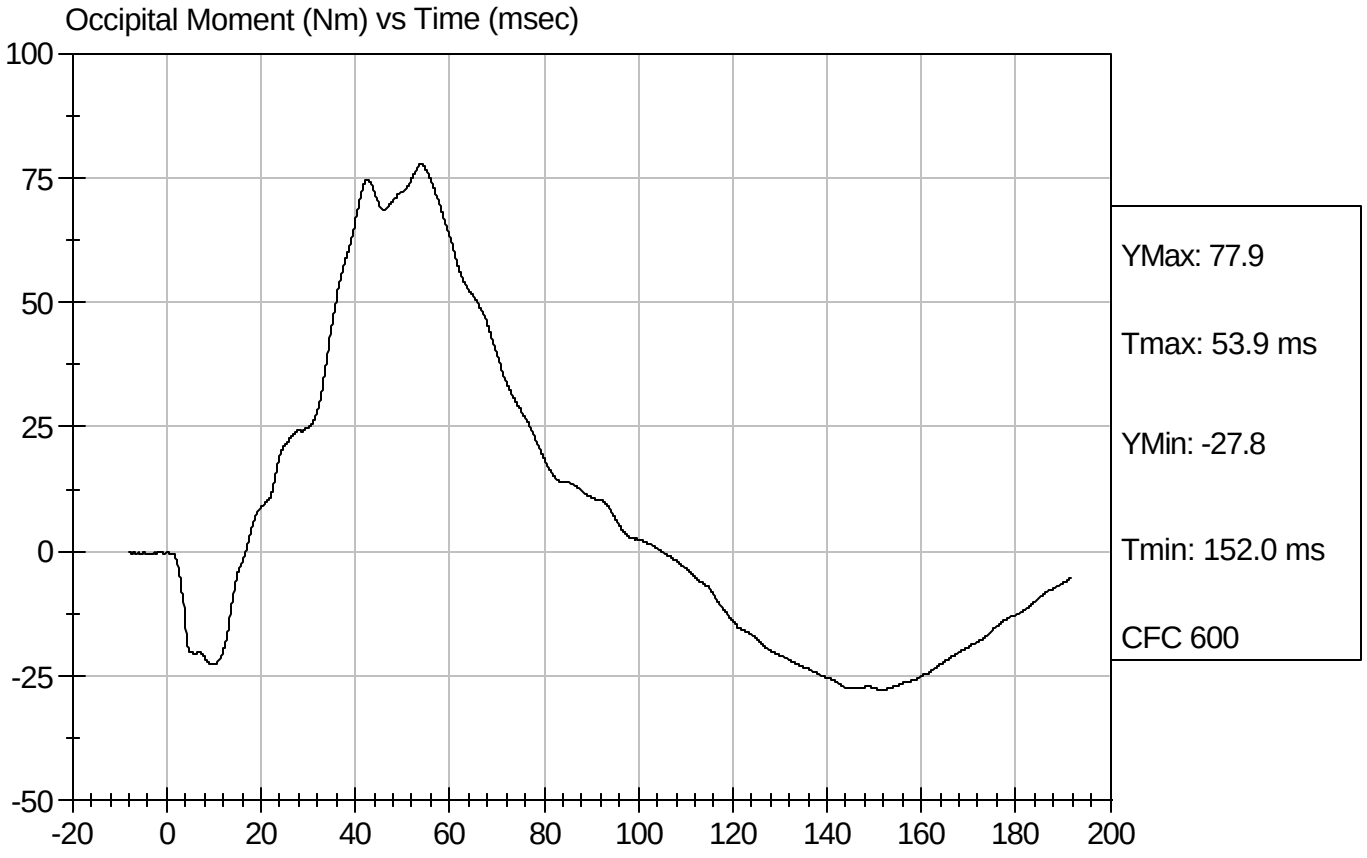
Test Date: 4/21/08
Speed: 22.831 ft/sec, 6.96 m/sec



Test Desc: Neck Bending
Component ID: D081089

Test Date: 4/21/08
Speed: 22.831 ft/sec, 6.96 m/sec





SID/HIII 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

4/21/2008

Test Date

David Winkelbauer

Approved By

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/HIII Calibration Data Sheet

Side Impact Dummy

External Measurements

ATD Serial No: 904 **Test I.D:** D0892

Tested Parameter	Units	Specification	Result	Pass/Fail
SH - Seated Height	mm	889 - 909	906	Pass
RH - Rib Height	mm	501 - 521	508	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	523	Pass
SW - Knee Pivot to Floor	mm	490 - 505	496	Pass
HW - Hip Width	mm	356 - 391	360	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

3/28/2008
Test Date

David Winkelbauer
Approved By

SID/HIII Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 904 **Test I.D:** D08921

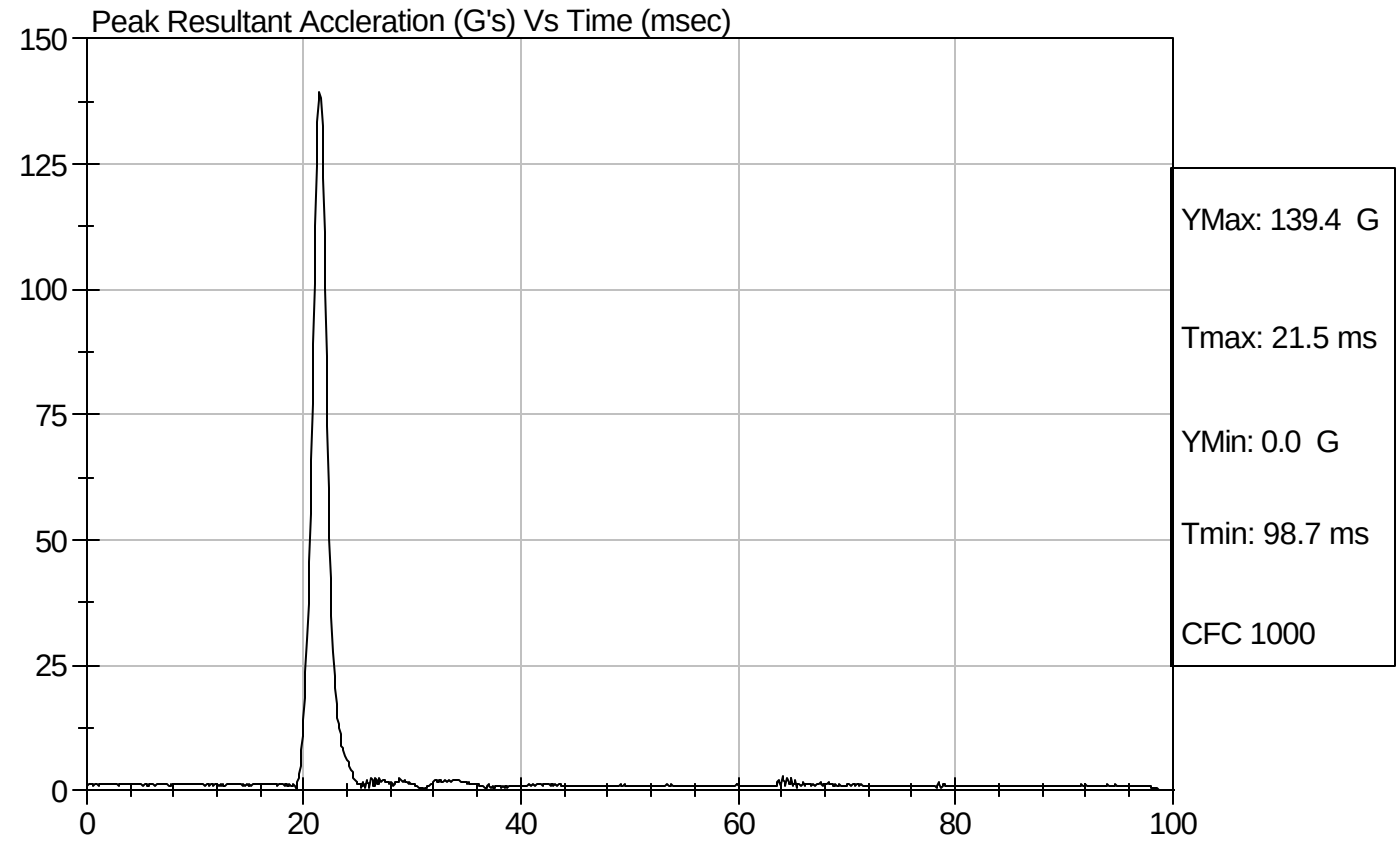
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	120 to 150	139	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-10.3	Pass
		Overall Test Results		Pass

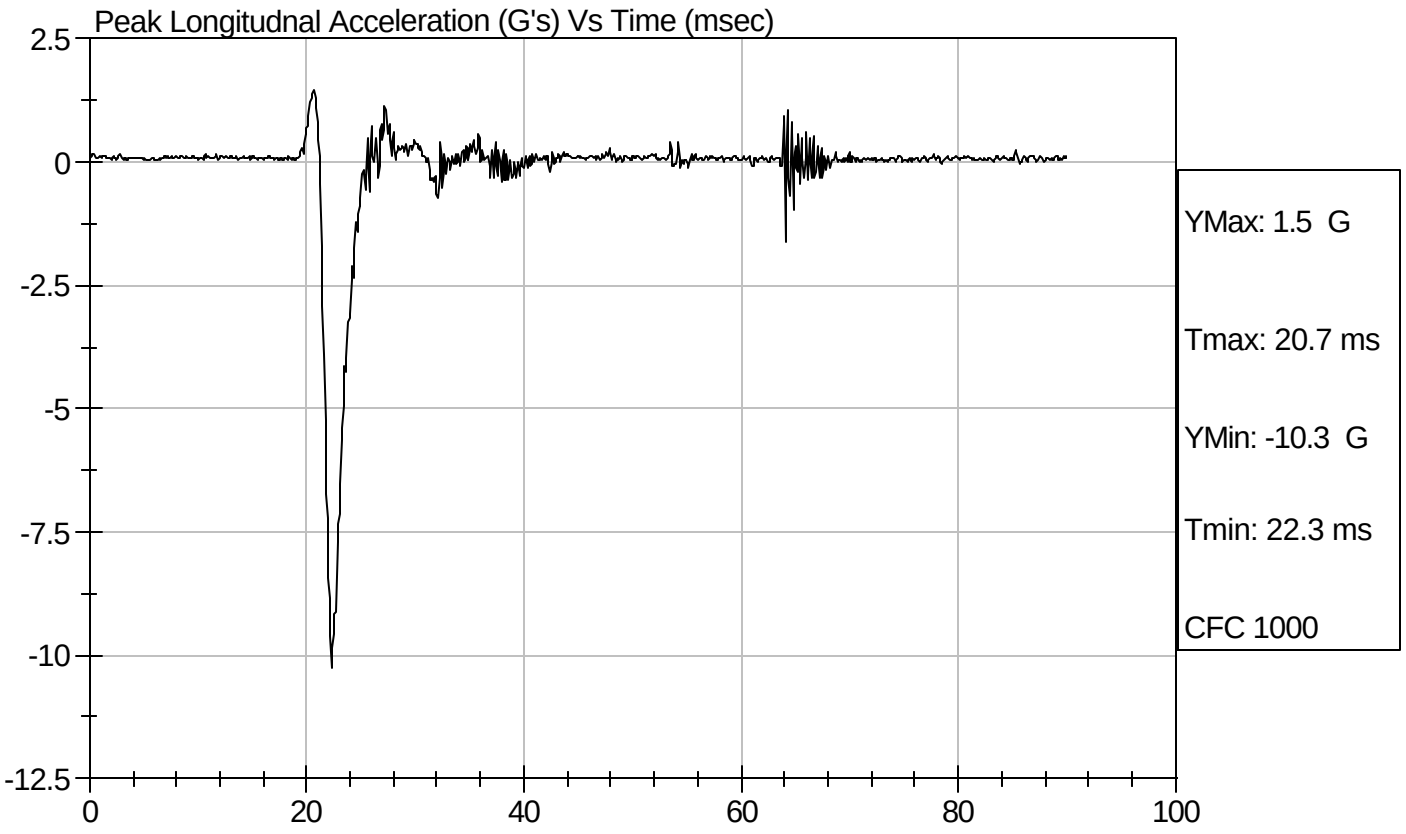
Jessica Gall
Laboratory Technician

3/28/08
Test Date

David Winkelbauer
Approved By

	Test Description: Head Drop	Test Date: 3/28/08
	Component: D08921	Speed: 0 ft/s, 0 m/s





SID/HIII Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 904 **Test I.D:** D08922

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	4.22 - 4.31	4.23	Pass
Upper Rib	G's	37 - 46	41	Pass
Lower Rib	G's	37 - 46	39	Pass
Lower Spine	G's	15 - 22	22	Pass
		Overall Test Results		Pass

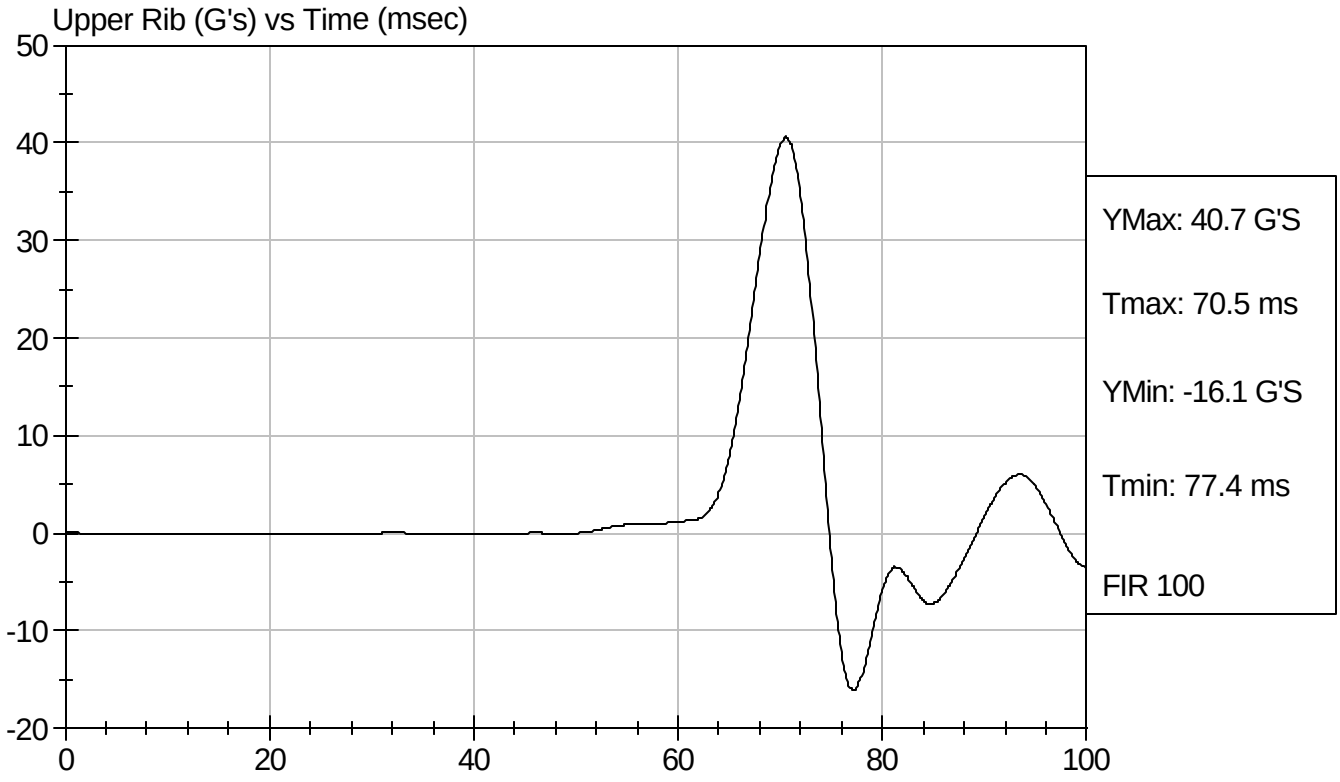
Jessica Gall
Laboratory Technician

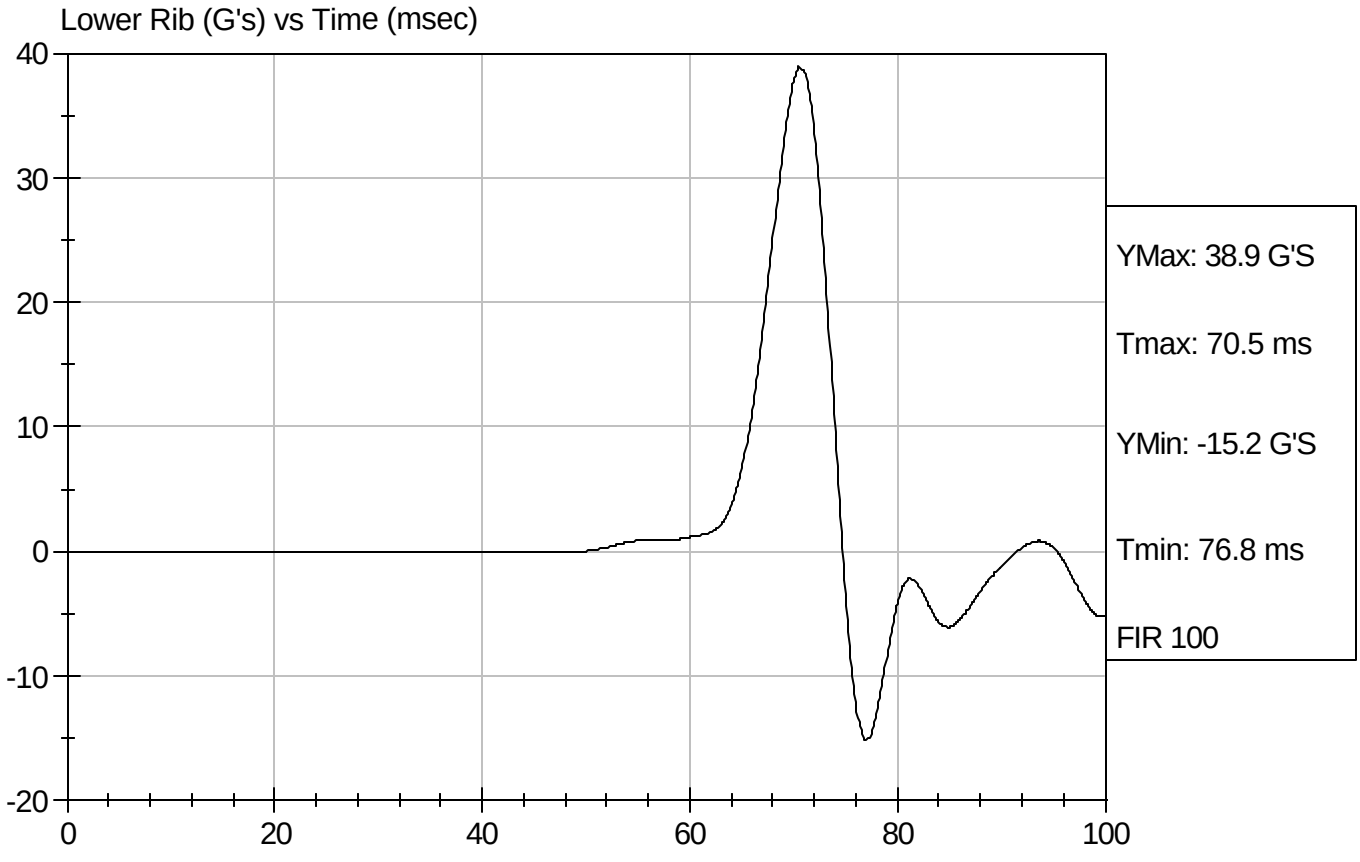
3/26/08
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D08922

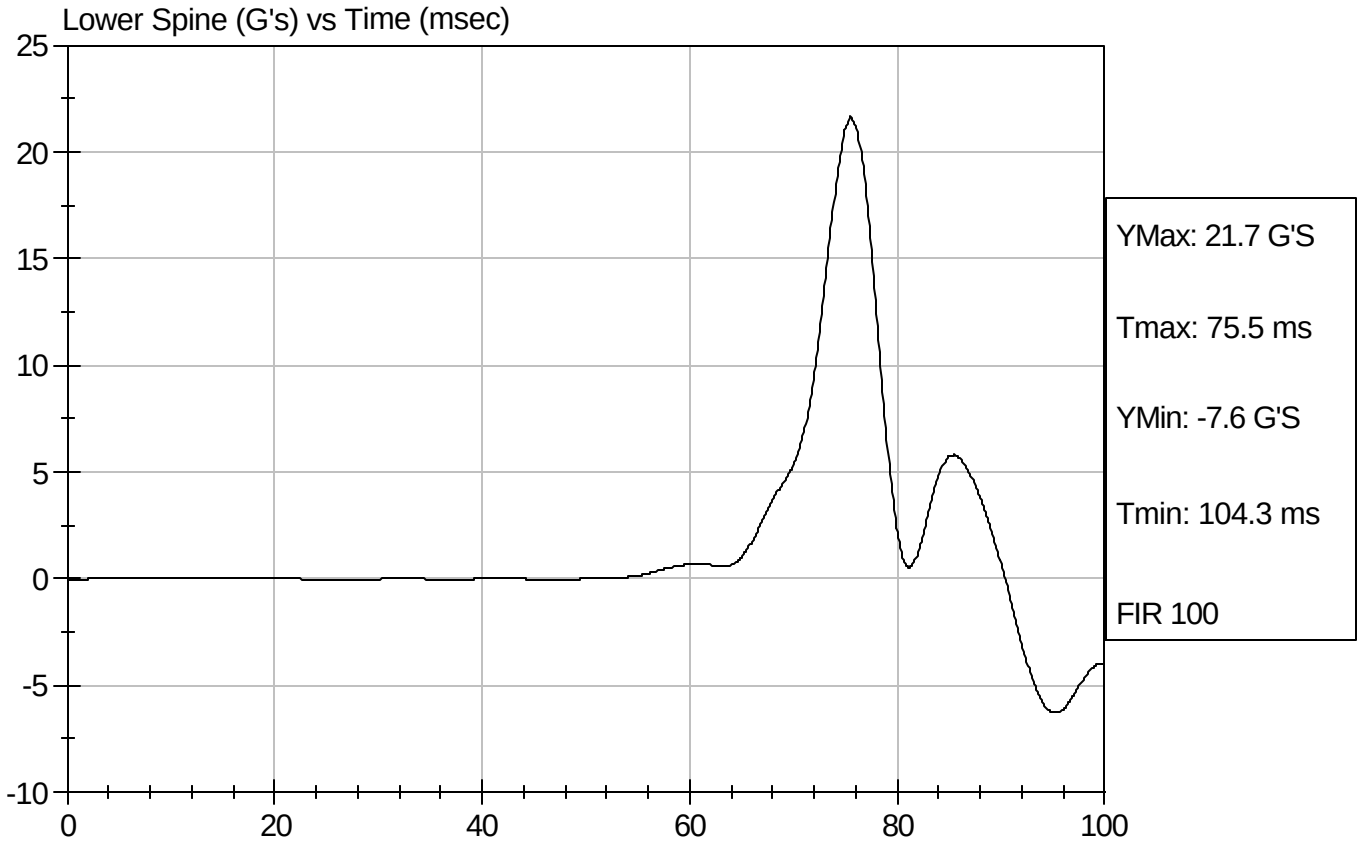
Test Date: 3/26/08
Speed: 13.88 ft/sec, 4.23 m/sec





Test Desc: Thorax Impact
Component ID: D08922

Test Date: 3/26/08
Speed: 13.88 ft/sec, 4.23 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 904 **Test I.D:** D08923

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

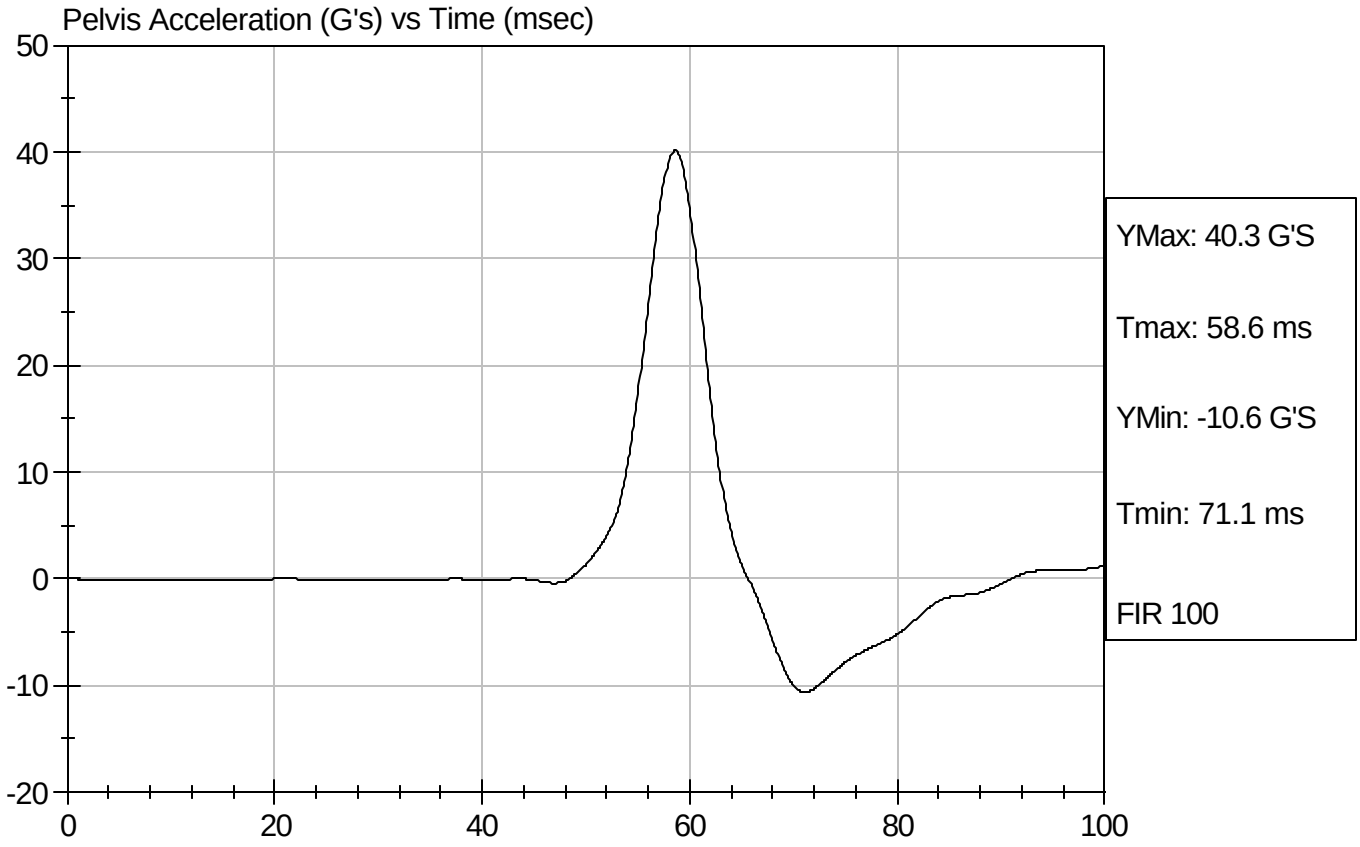
Jessica Gall
Laboratory Technician

3/26/08
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D08923

Test Date: 3/26/08
Speed: 14.124 ft/sec, 4.30 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 904 **Test I.D:** D08924

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force At 12.7 mm	N	104 -162	137	Pass
Force At 19 mm	N	163 - 222	191	Pass
Force At 25.4 mm	N	222 - 280	258	Pass
Force At 33 mm	N	325 - 391	352	Pass
		Overall Test Results		Pass

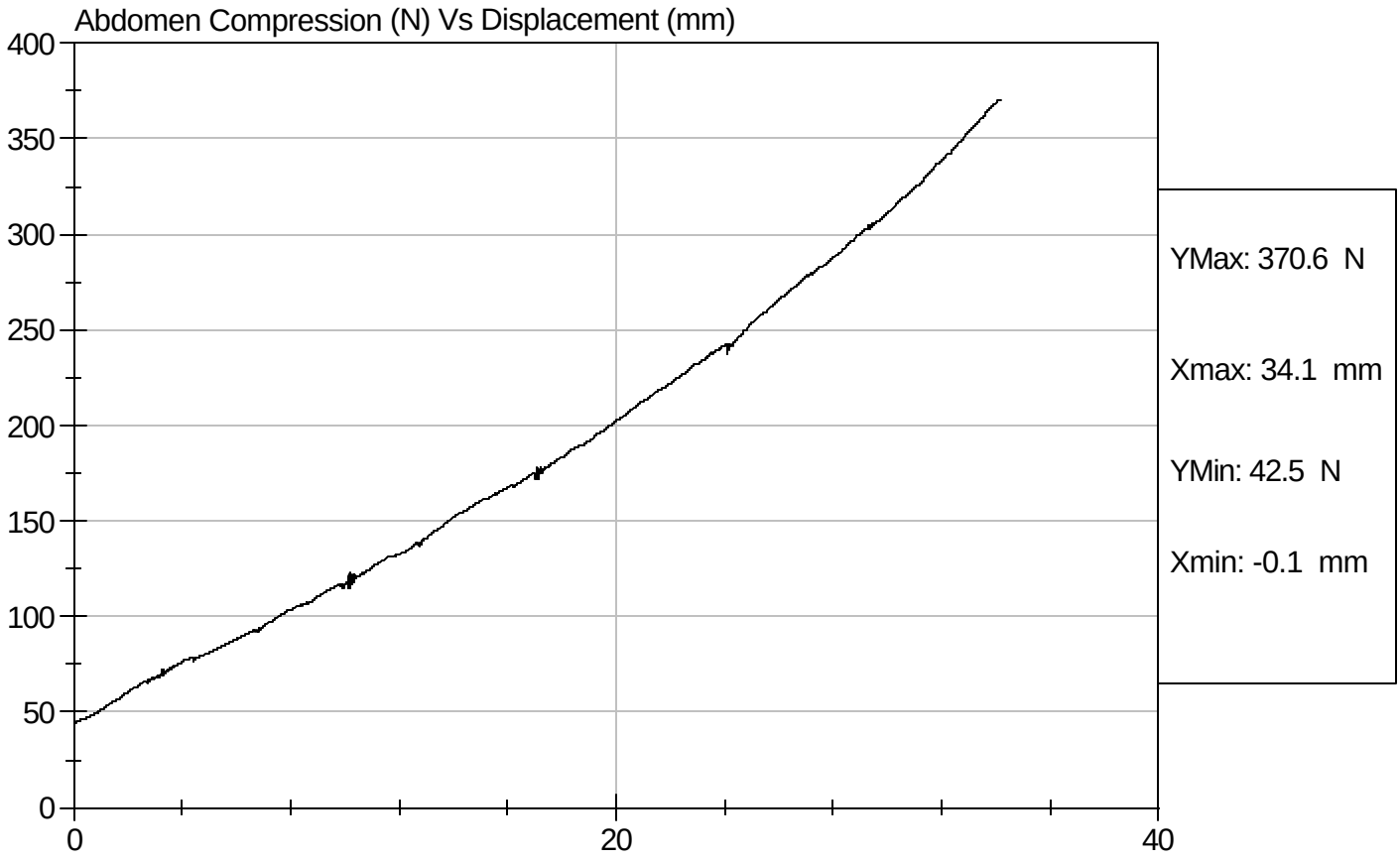
Jessica Gall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 3/27/08

Component: D08924 Speed: 0 ft/sec, 0 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 904 **Test I.D:** D08925

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	110.2	Pass
Force At 30 deg	N	151.2 - 204.6	165.3	Pass
Force At 40 deg	N	204.6 - 258.0	233.2	Pass
Return Angle	Deg	12 Maximum	8	Pass
		Overall Test Results		Pass

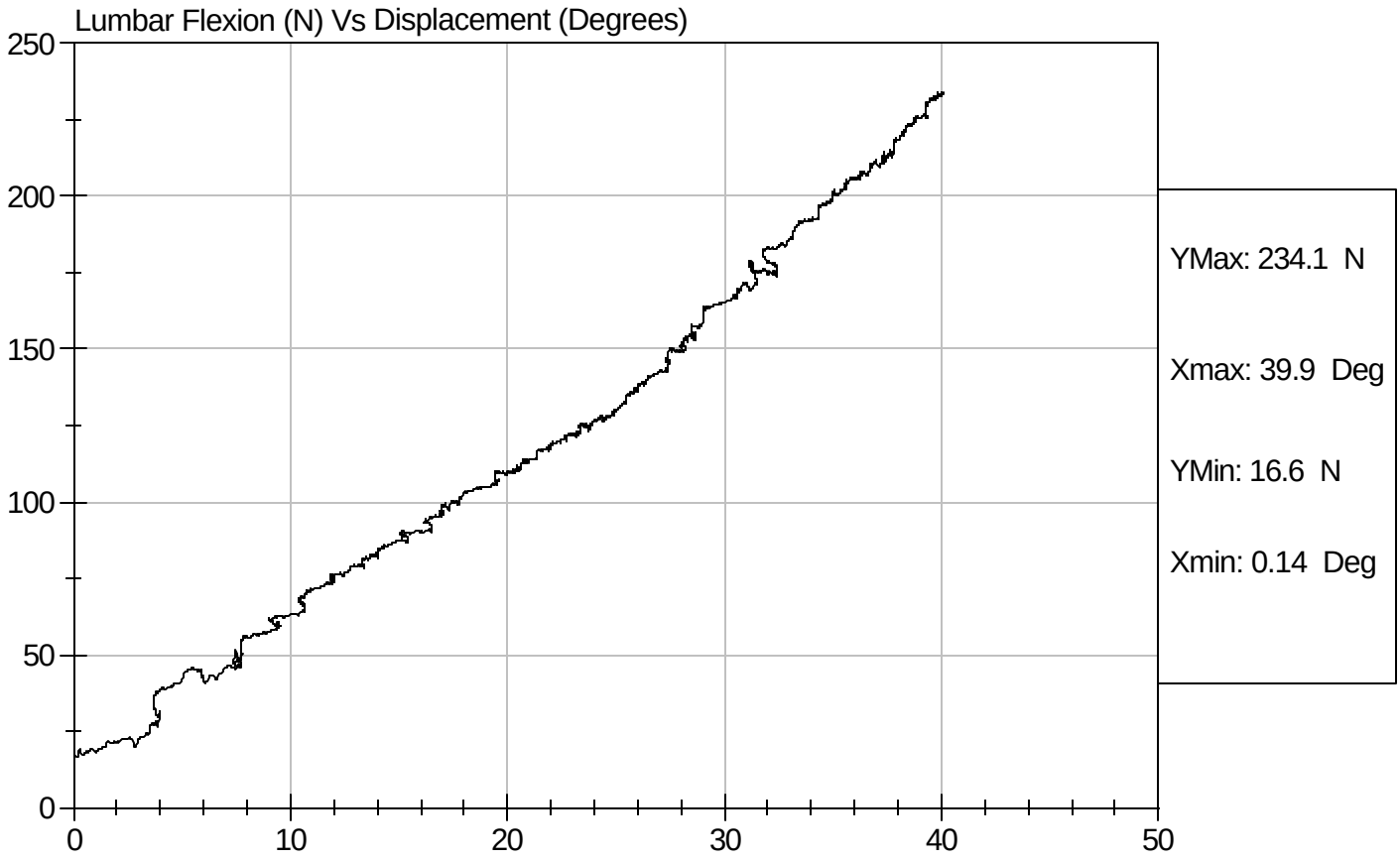
Jessica Gall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 3/27/08

Component: D08925 | Speed: 0 ft/sec, 0 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Neck Pendulum Test

ATD Serial No: 904 **Test I.D:** D08929

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	25	Pass
Impact Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.16	Pass
	20 msec	m/s	4.12 to 5.10	4.22	Pass
	30 msec	m/s	5.73 to 7.01	5.92	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.73	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	71	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	60	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	78	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	59	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	10	Pass

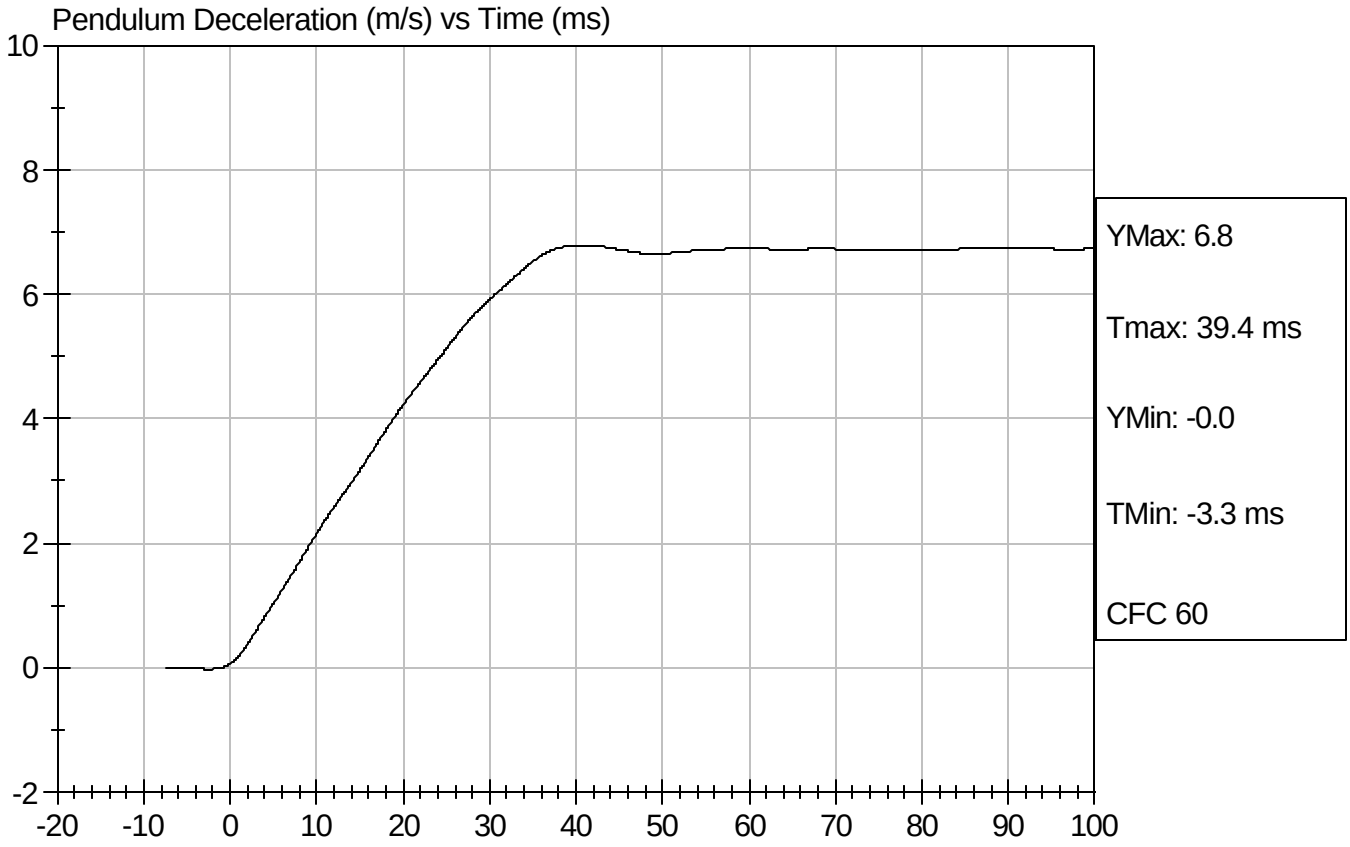
Jessica Hall
Laboratory Technician

3/27/08
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Bending
Component ID: D08929

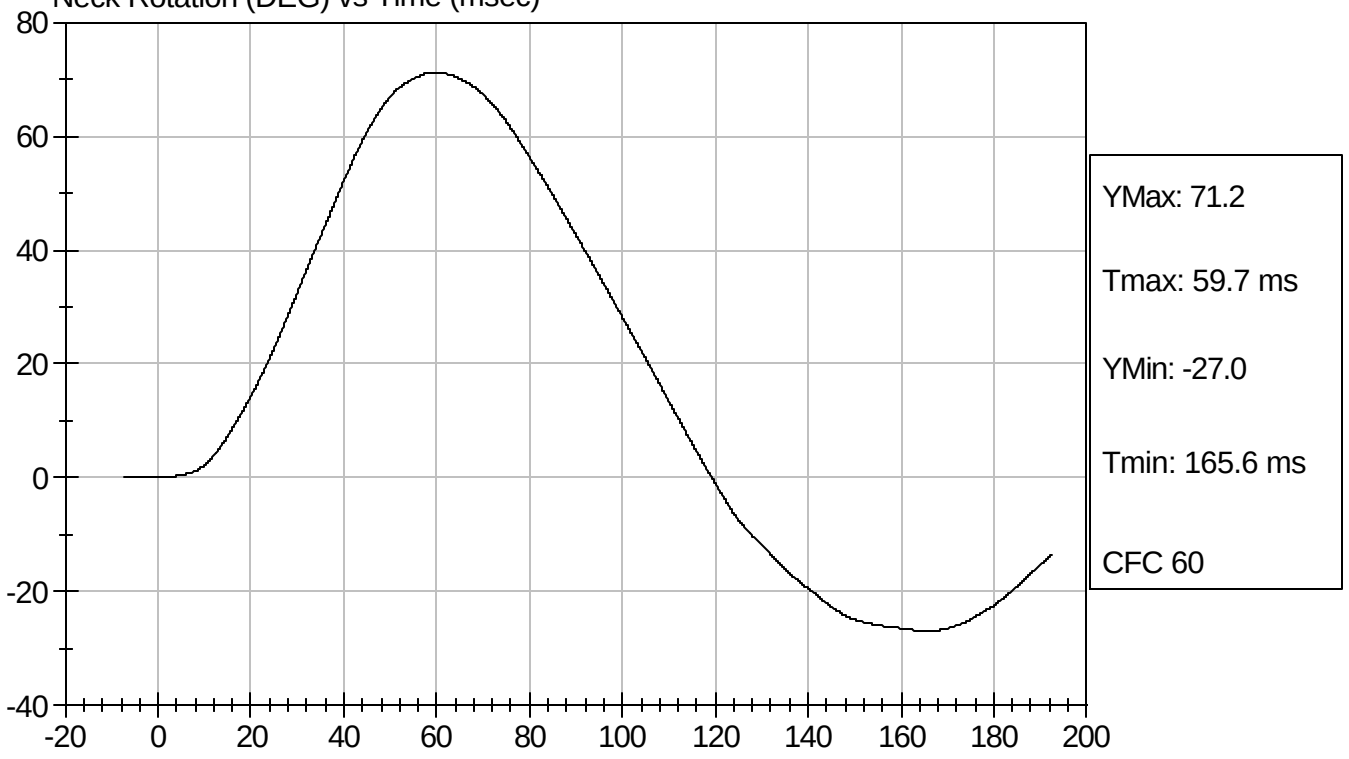
Test Date: 3/27/08
Speed: 23.15 ft/sec, 7.06 m/sec



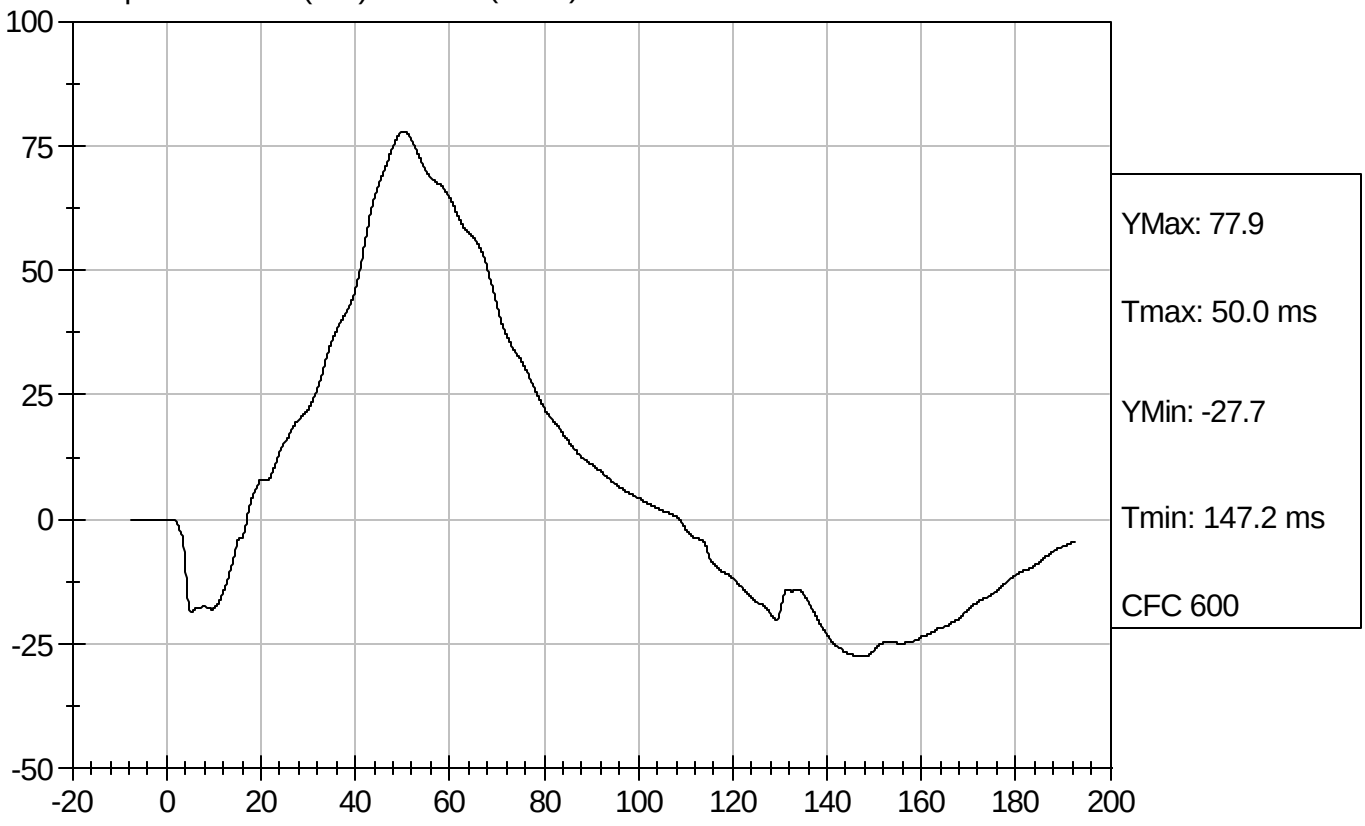
Test Desc: Neck Bending
Component ID: D08929

Test Date: 3/27/08
Speed: 23.15 ft/sec, 7.06 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/HIII Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 904 **Test I.D:** D081091

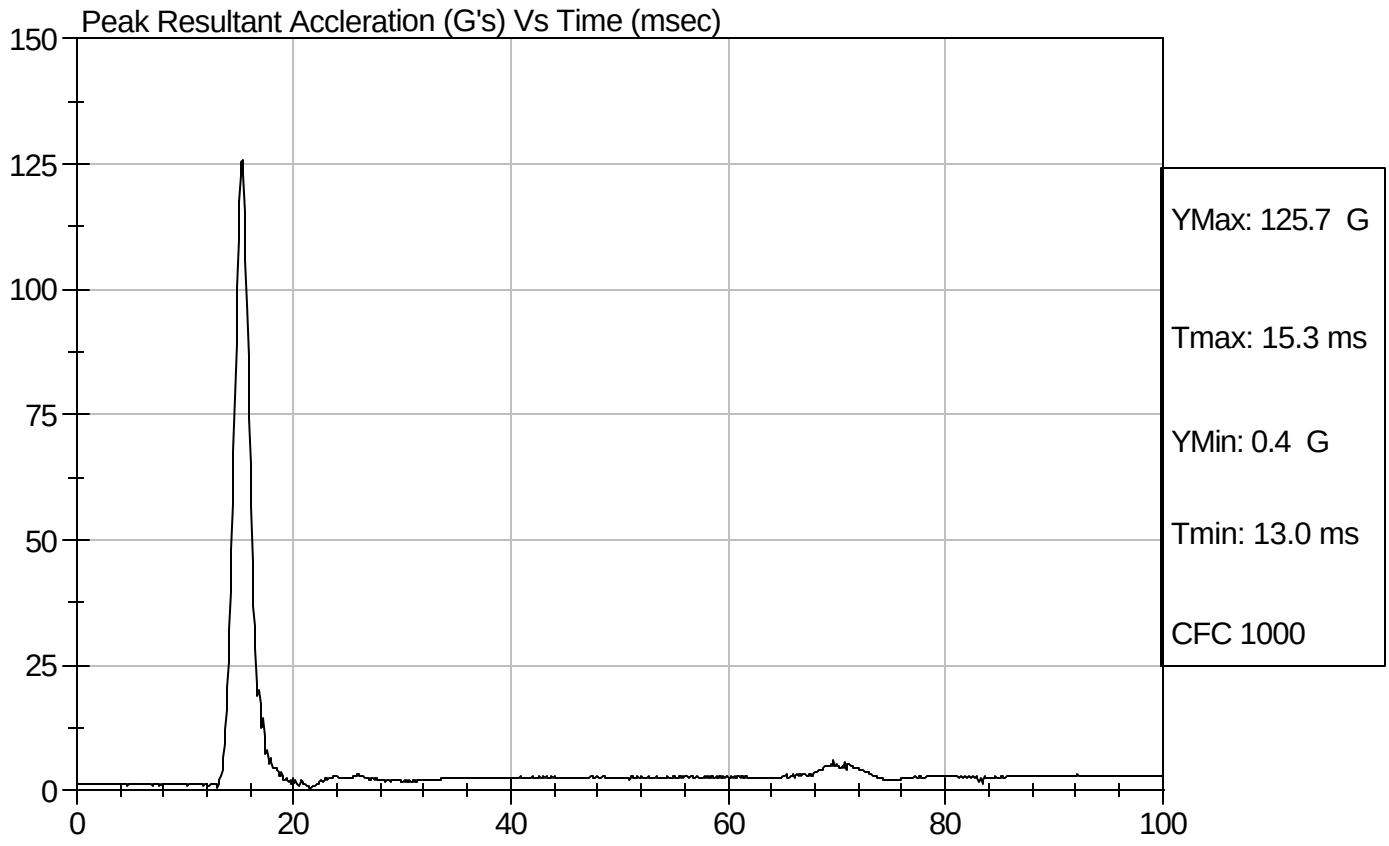
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	120 to 150	126	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-9.5	Pass
		Overall Test Results		Pass

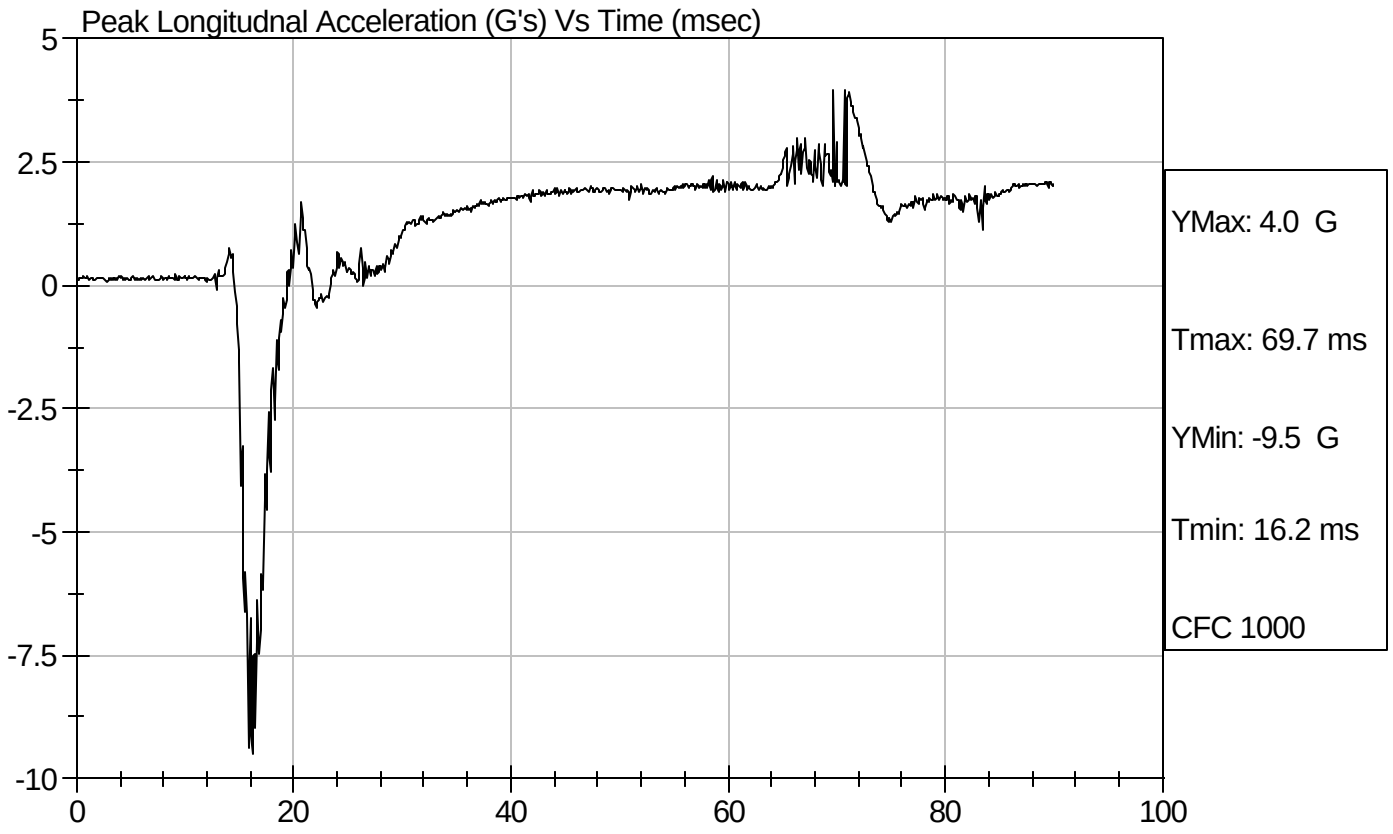
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

mga	Test Description: Head Drop	Test Date: 4/21/08
	Component: D081091	Speed: 0 ft/s, 0 m/s





SID/HIII Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 904 **Test I.D:** D081092

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	42	Pass
Lower Rib	G's	37 - 46	41	Pass
Lower Spine	G's	15 - 22	22	Pass
		Overall Test Results		Pass

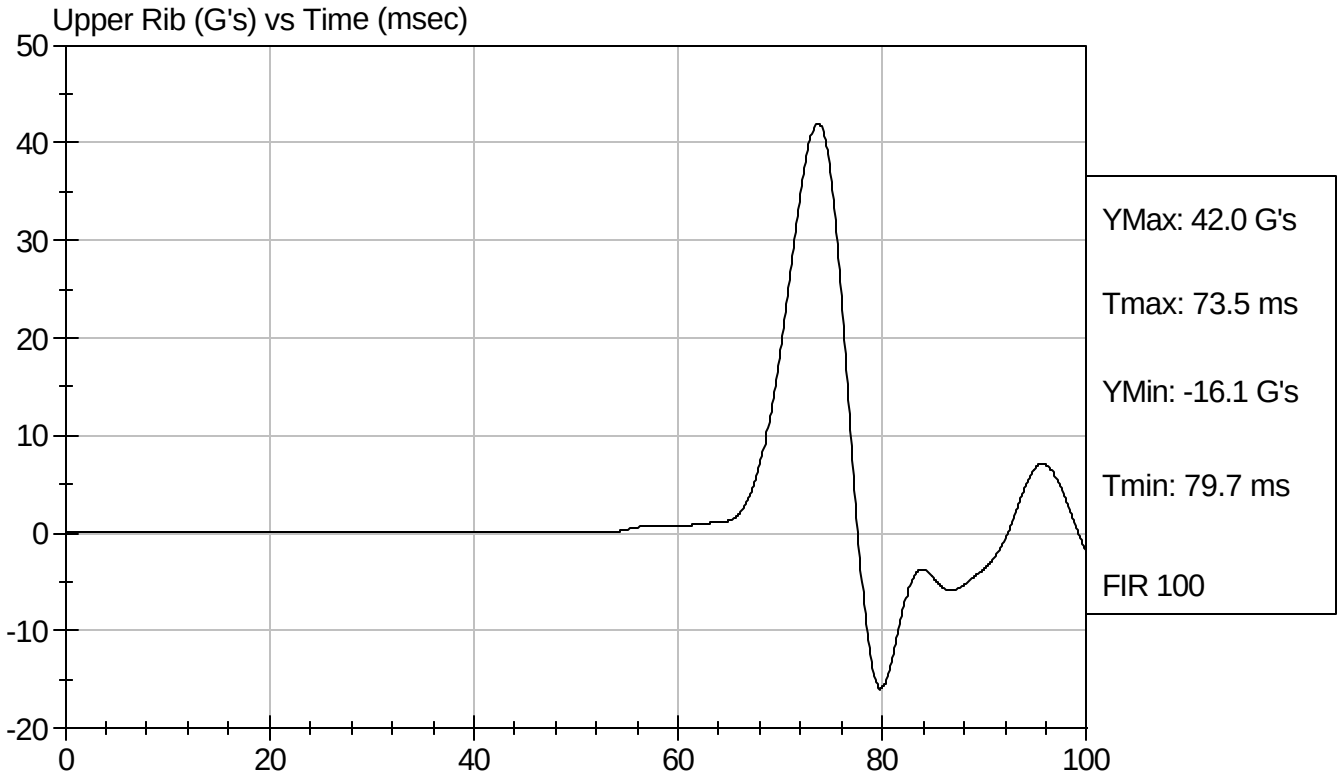
Jessica Gall
Laboratory Technician

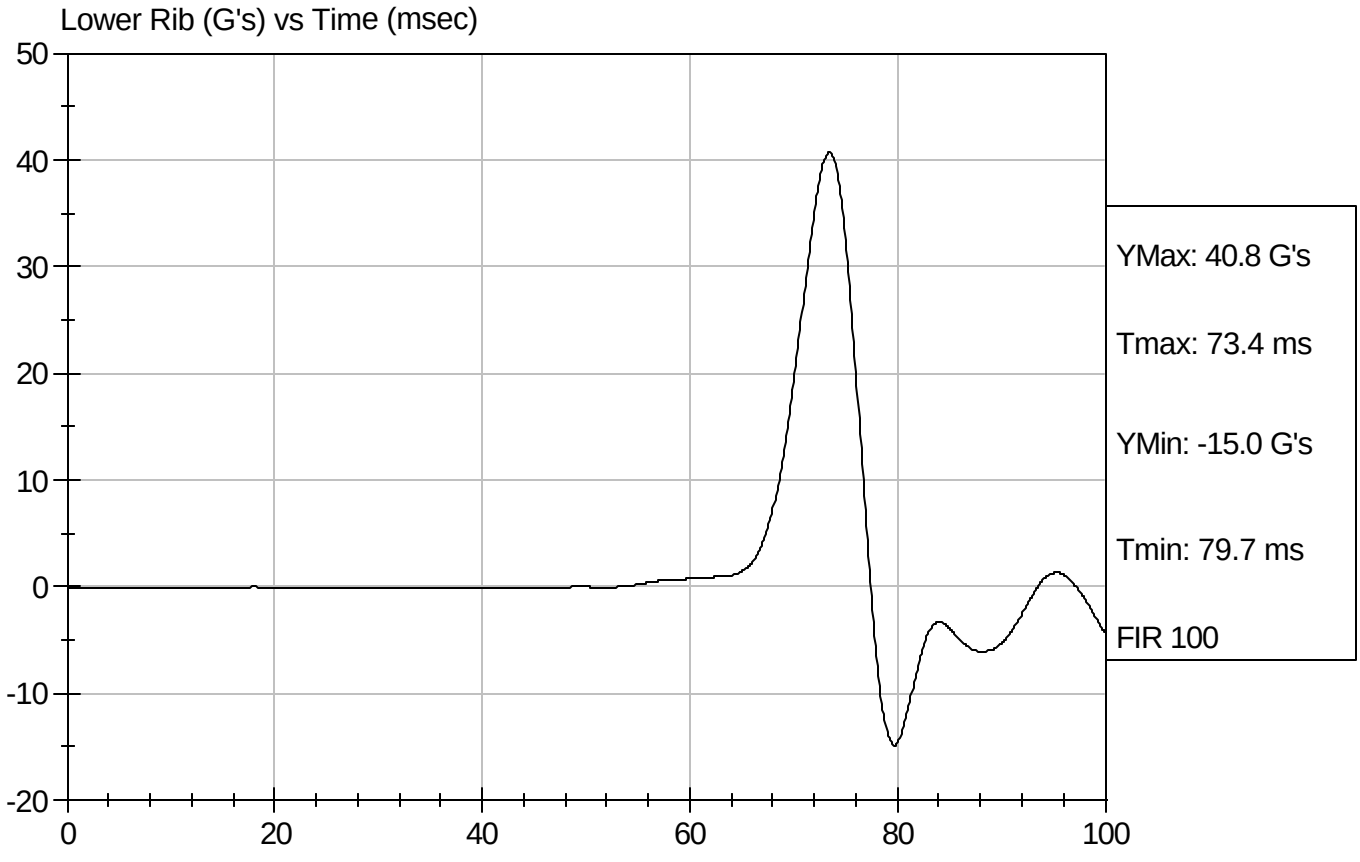
4/22/08
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D081092

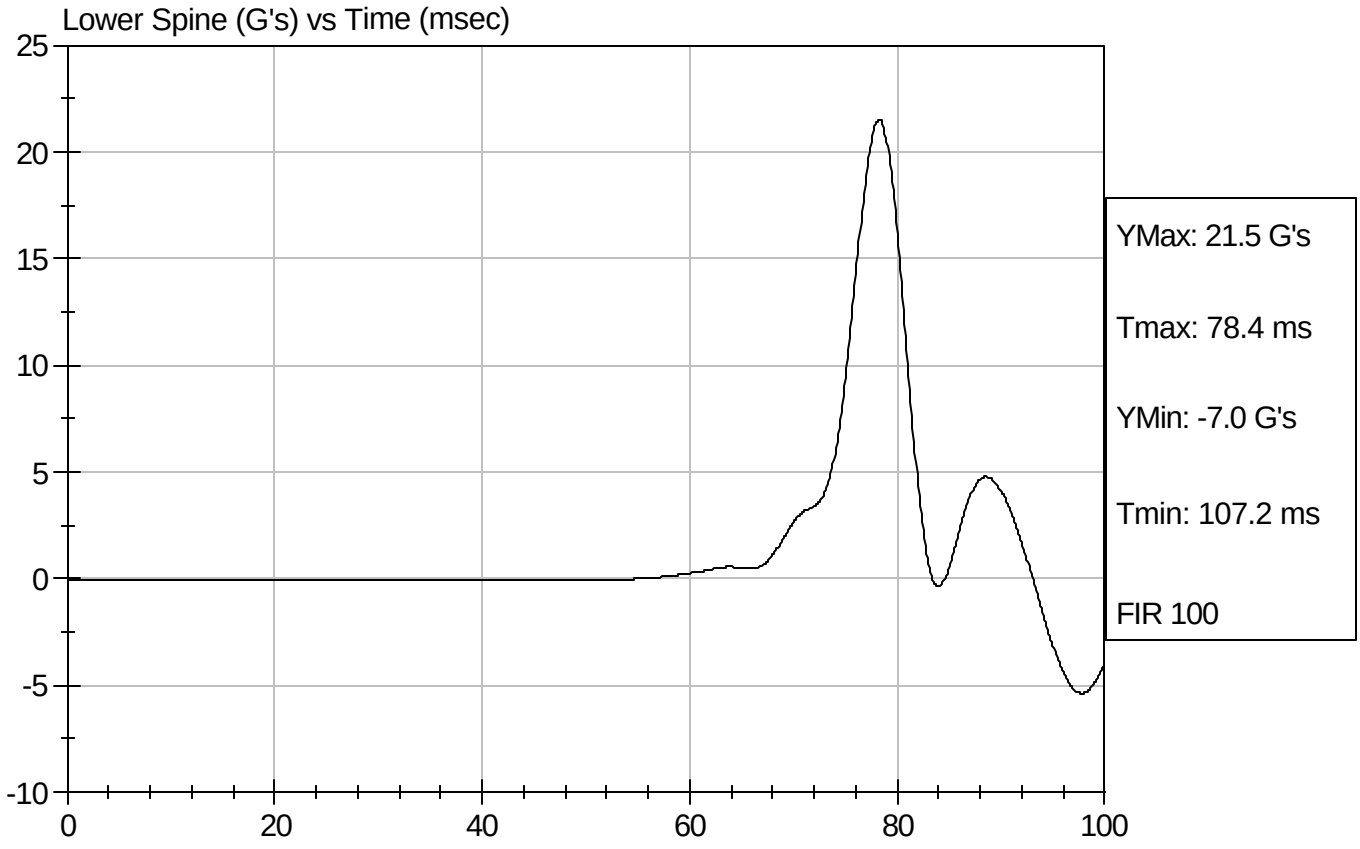
Test Date: 4/22/08
Speed: 14.12 ft/sec, 4.30 m/sec





Test Desc: Thorax Impact
Component ID: D081092

Test Date: 4/22/08
Speed: 14.12 ft/sec, 4.30 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 904 **Test I.D:** D081093

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

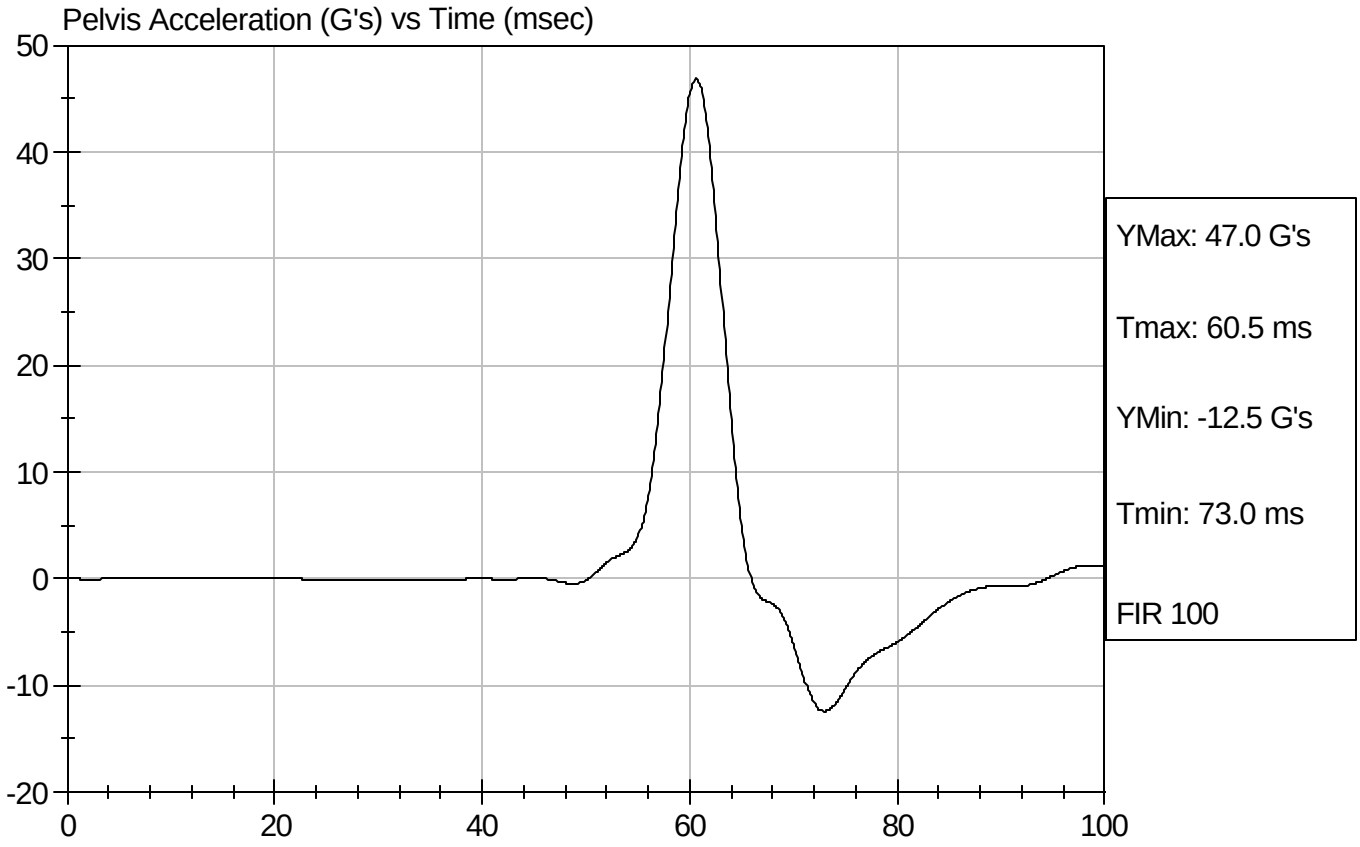
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D081093

Test Date: 4/21/08
Speed: 14.12 ft/sec, 4.30 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 904 **Test I.D:** D081094

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Force At 12.7 mm	N	104 -162	145	Pass
Force At 19 mm	N	163 - 222	206	Pass
Force At 25.4 mm	N	222 - 280	276	Pass
Force At 33 mm	N	325 - 391	373	Pass
		Overall Test Results		Pass

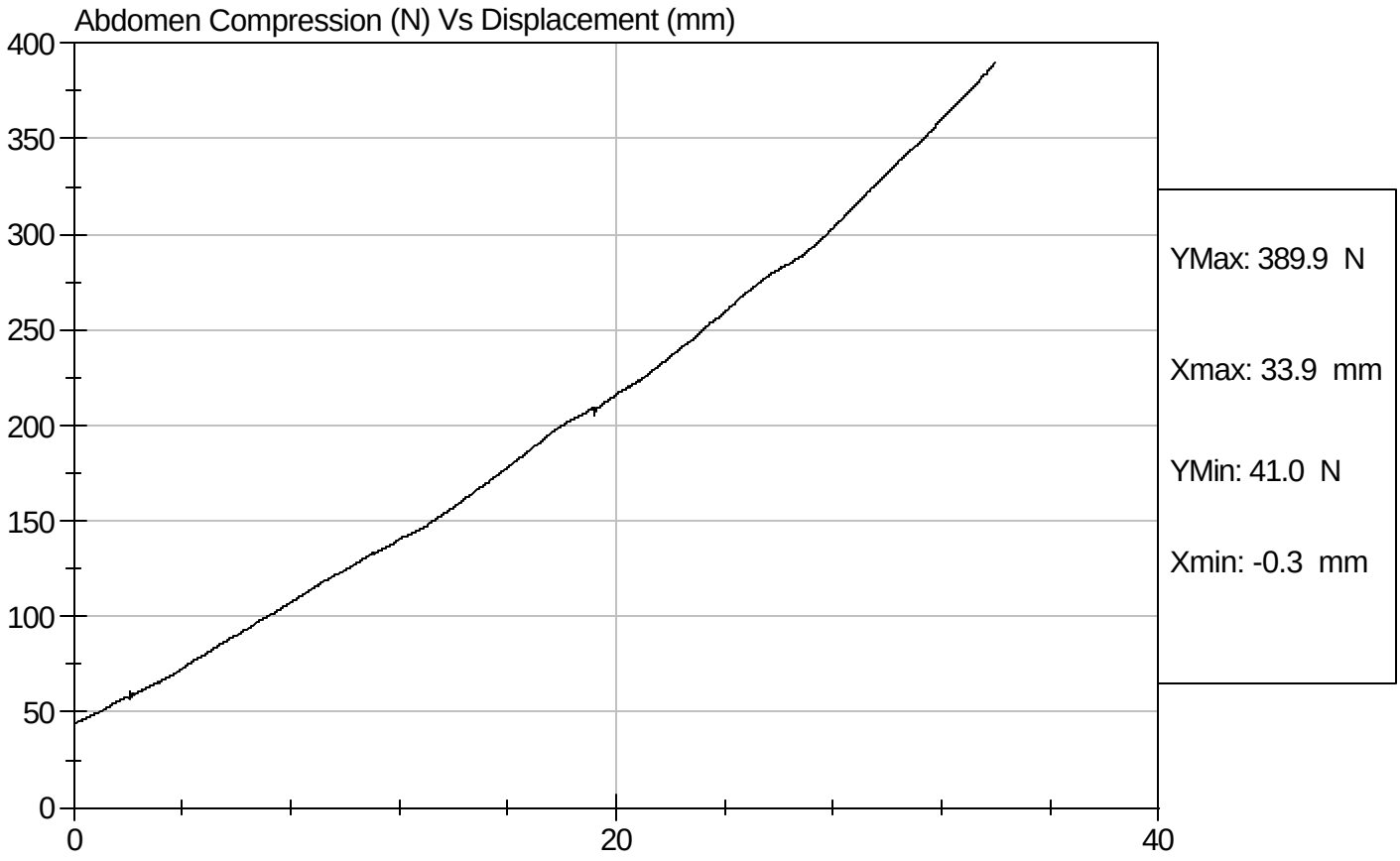
Jessica Gall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 4/21/08

Component: D081094 Speed: 0 ft/sec, 0 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 904 **Test I.D:** D081095

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	129.8	Pass
Force At 30 deg	N	151.2 - 204.6	178.1	Pass
Force At 40 deg	N	204.6 - 258.0	235.8	Pass
Return Angle	Deg	12 Maximum	8	Pass
		Overall Test Results		Pass

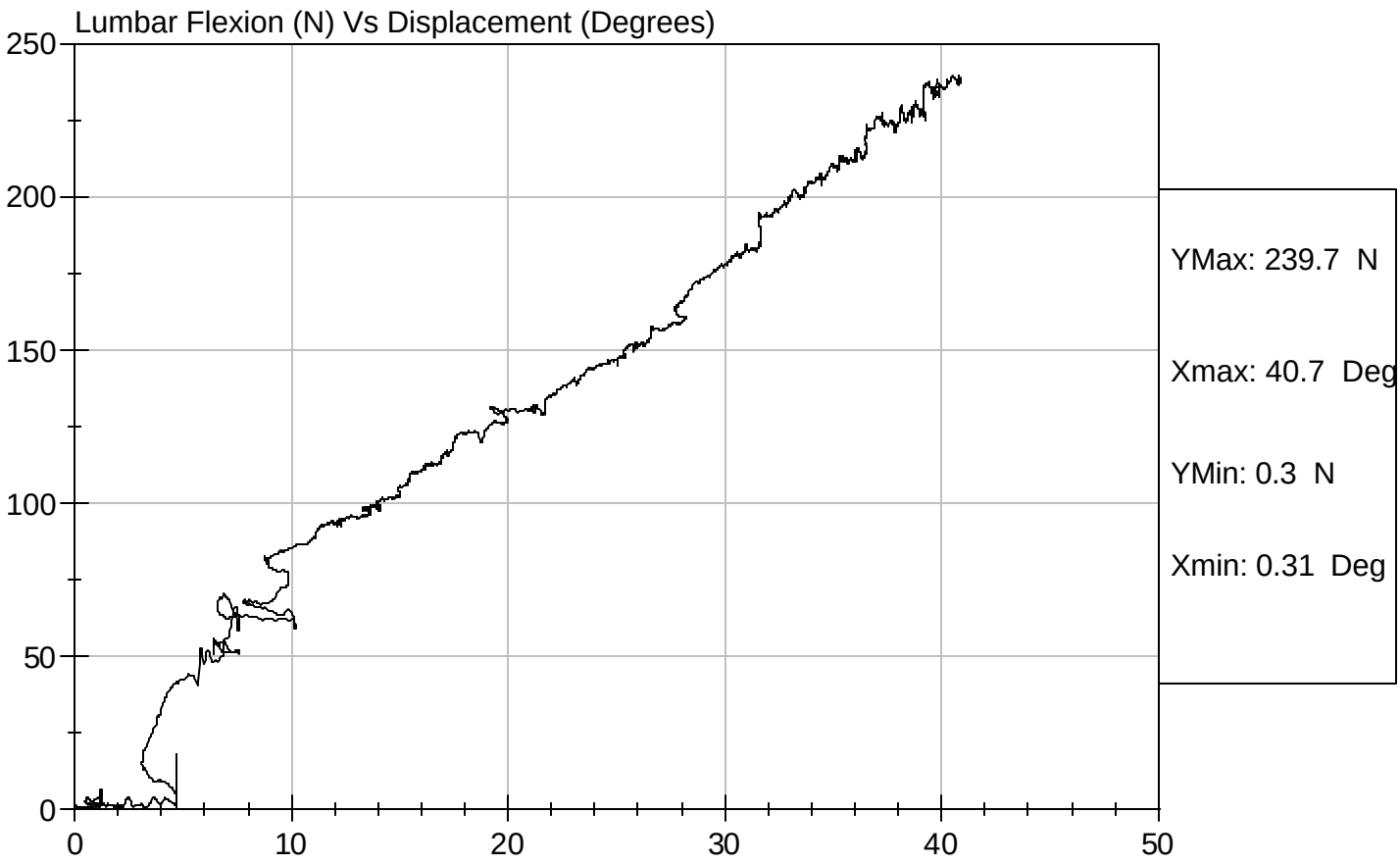
Jessica Hall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 4/21/08

Component: D081095 | Speed: 0 ft/sec, 0 m/sec



SID/HIII Calibration Data Sheet

Side Impact Dummy

Neck Pendulum Test

ATD Serial No: 904 **Test I.D:** D081099

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.47	Pass
	20 msec	m/s	4.12 to 5.10	4.74	Pass
	30 msec	m/s	5.73 to 7.01	6.52	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.67	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	72	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	58	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	76	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

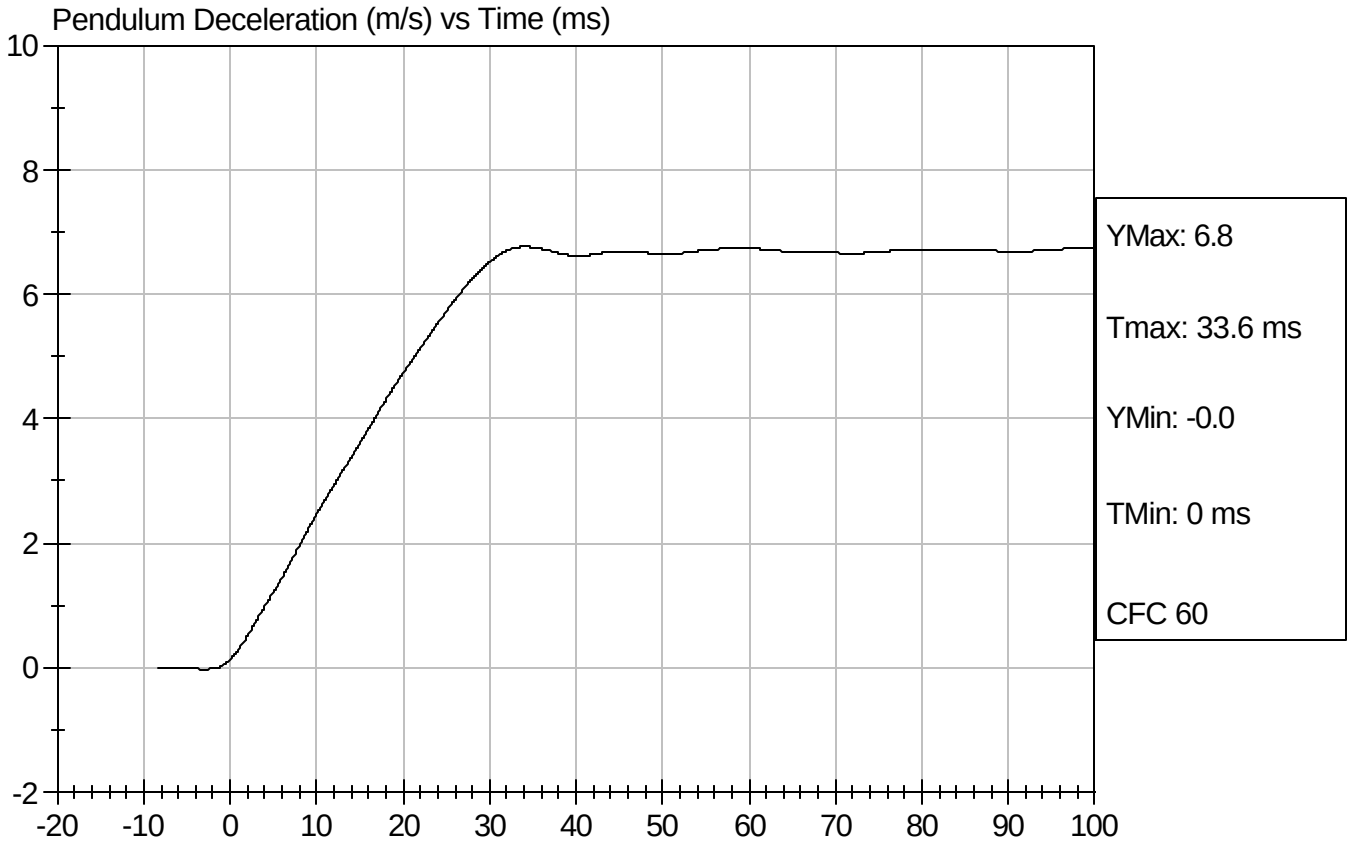
Jessica Hall
Laboratory Technician

4/21/08
Test Date

David Winkelbauer
Approved By

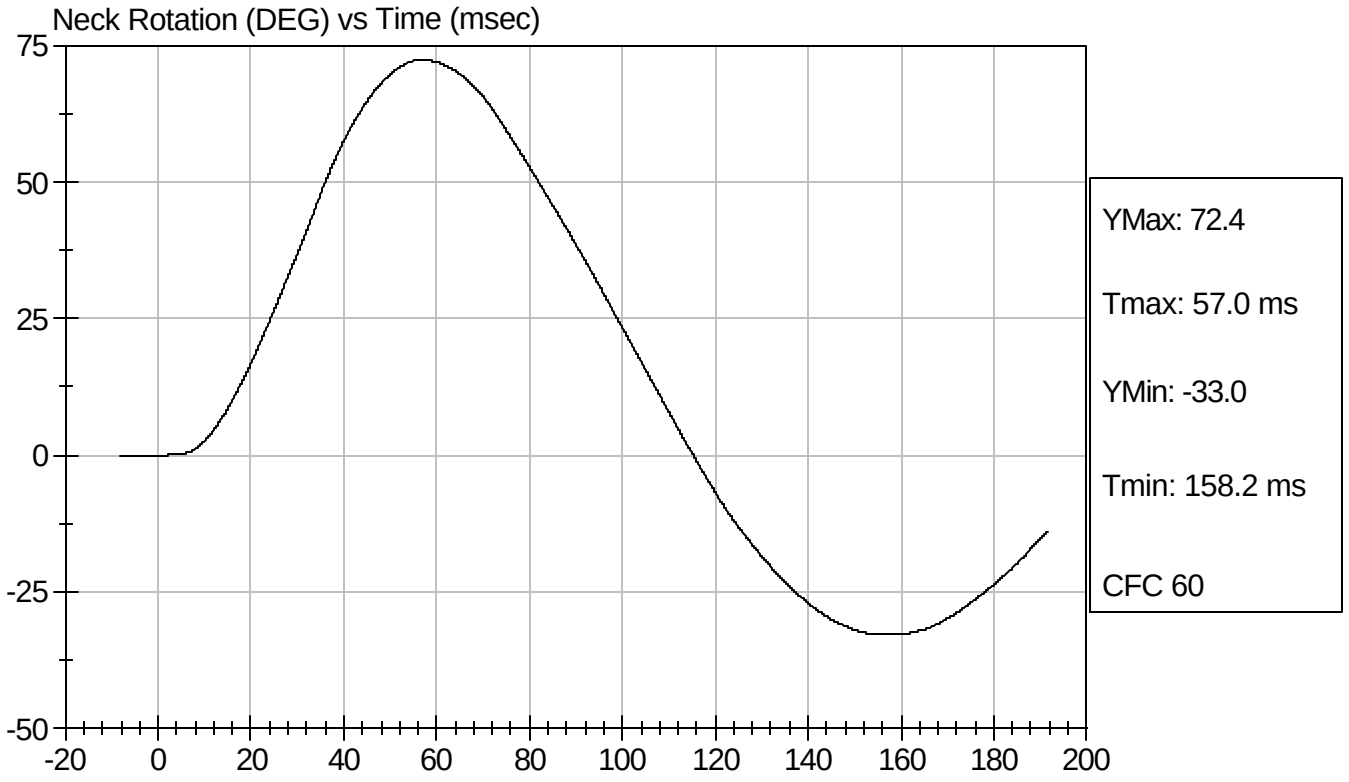
Test Desc: Neck Bending
Component ID: D081099

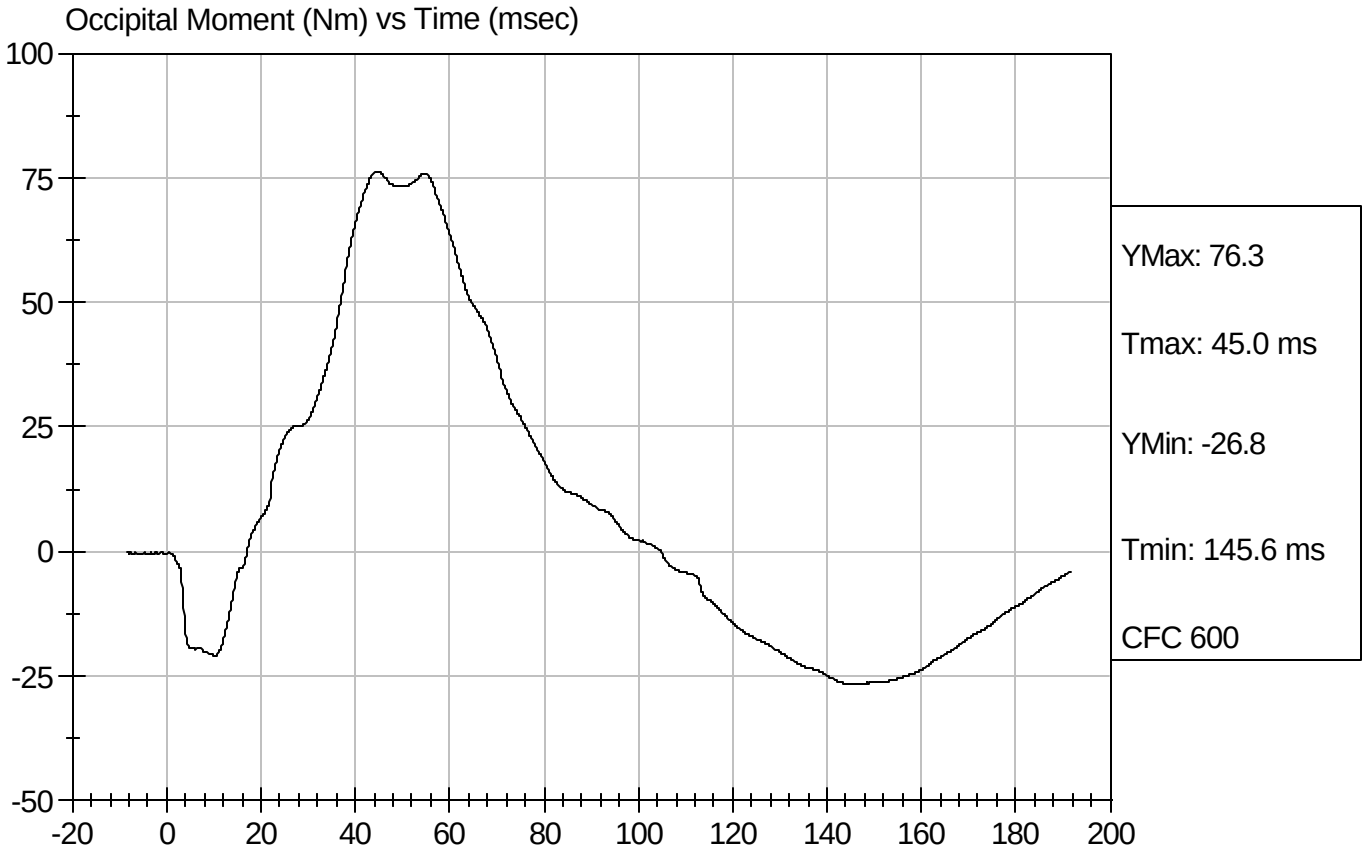
Test Date: 4/21/08
Speed: 23.148 ft/sec, 7.06 m/sec



Test Desc: Neck Bending
Component ID: D081099

Test Date: 4/21/08
Speed: 23.148 ft/sec, 7.06 m/sec





SID/HIII 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

4/22/2008

Test Date

David Winkelbauer

Approved By