

REPORT NUMBER: 214I-MGA-2010-001

**SAFETY COMPLIANCE TESTING FOR
FMVSS 214 INDICANT
SIDE IMPACT PROTECTION**

**BAYERISCHE MOTORENWERKE
2010 BMW 328i COUPE
NHTSA NUMBER: MA0516**

**PREPARED BY:
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BURLINGTON, WI 53105**



Test Date: November 18, 2009

Report Date: December 11, 2009

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVENUE, SE, ROOM W43-503
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 DTNH22-07-D-00062.

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Date of Acceptance

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16. Abstract A 55/28 km/h 90° Moving Deformable Barrier side impact was conducted on the subject 2010 BMW 328i Coupe 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 November 18, 2009. The impact velocity of the Moving Deformable Barrier (MDB) was 61.8 km/h, and the ambient temperature at the struck side (drivers) of the vehicle was 21°C. The target vehicle's maximum post test static crush was 210 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;">31.9</td> <td style="text-align: center;">44.6</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td style="text-align: center;">33.9</td> <td style="text-align: center;">46.4</td> </tr> <tr> <td>Lower Spine (T₁₂) Accel., g</td> <td style="text-align: center;">55.3</td> <td style="text-align: center;">40.6</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">44</td> <td style="text-align: center;">43</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td style="text-align: center;">65.3</td> <td style="text-align: center;">36.0</td> </tr> <tr> <td>HIC</td> <td style="text-align: center;">196</td> <td style="text-align: center;">224</td> </tr> </tbody> </table> The door on the struck side of the vehicle did not separate from the body at the hinges or latch and the opposite door did not open during the side impact event.					<u>DRIVER</u>	<u>PASS.</u>	Left Upper Rib (LUR) Accel., g	31.9	44.6	Left Lower Rib (LLR) Accel., g	33.9	46.4	Lower Spine (T ₁₂) Accel., g	55.3	40.6	Thoracic Trauma Index (TTI)	44	43	Pelvis (PEV) Accel., g	65.3	36.0	HIC	196	224
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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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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Test Procedure	1
2	Summary of FMVSS 214 Indicant Test	2
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Test Vehicle Tire Information	6
3	Test Vehicle Information	7
4	Moving Deformable Barrier (MDB) Summary of Results	9
5	Post Test Observations	10
6	Vehicle Pre-Test and Post Test Measurements	11
7	SID/HIII Longitudinal Clearance Dimensions	12
8	SID/HIII Lateral Clearance Dimensions	13
9	Vehicle Side Measurements	14
10	Vehicle Exterior Crush Profiles	15
11	Vehicle Damage Profile Distances	17
12	Deformable Barrier Honeycomb Face Static Crush	18
13	Vehicle Accelerometer Locations	19
14	MDB Accelerometer Locations	20
15	Vehicle Structural Measurements	21
16	High Speed Camera Locations and Data	22
17	Summary of FMVSS 301 Data	23
<u>Appendix</u>		
A	Photographs	A
B	SID/HIII Response Data Traces	B
C	Dummy Calibration Data	C

SECTION 1

PURPOSE AND TEST PROCEDURE

PURPOSE

This side impact test was conducted as part of the FY' 2009 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 2010 BMW 328i Coupe manufactured by Bayerische Motorenwerke.

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 2010 BMW 328i Coupe was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.8 km/h. The specified impact velocity range is from 61.1 to 62.7 km/h. The test (target) vehicle was stationary and positioned 63° to the line of forward motion. The weight of the vehicle as tested was 1778.1 kg and the test weight of the MDB was 1361.5 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on November 18, 2009.

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 210 mm at level 3, 1350 mm rearward of the vertical impact point. The driver and passenger SID/HIIIs, Serial Numbers 272 and 271 respectively, were calibrated just prior to this test.

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

The occupant data is summarized below:

ATD position	HIC	T ¹	T ²	TTI (G's)	Peak Pelvis (G's)
Driver	196	39.2	70.0	44	65.3
Passenger	224	45.7	65.7	43	36.0

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:

- Driver Upper Rib Y after 160 msec.
- Driver Lower Rib Y after 160 msec.
- Driver Upper Rib Y Redundant after 160 msec.
- Driver Lower Rib Y Redundant after 160 msec.
- Floorpan @ Rear Axle Z
- Left Mid B-Post Y
- Left Lower A-Post Y after 10 msec.
- Driver Seat Track Y after 20 msec.

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009

TEST VEHICLE INFORMATION

Make	BMW
Model	328i
Body Style	Coupe
NHTSA No.	MA0516
VIN	WBAWB3C51APU89981
Color	Titanium Silver Metallic
Delivery Date	10/30/2009
Odometer Reading (mile)	87
Dealer	Anderson
Transmission	Manual
Final Drive	Rear
Number of Cylinders	6
Engine Displacement (L)	3.0
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	No
Power Seats	Yes
Pretensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Bayerische Motorenwerke
Date of Manufacture	09/09

GVWR (kg)	1940
GAWR Front (kg)	935
GAWR Rear (kg)	1040

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	2		4
Capacity Wt. (VCW) (kg)				420
Cargo Wt. (RCLW) (kg)				148

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

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	359.3	363.8		394.6	512.1	
Right	kg	376.9	376.0		370.2	501.2	
Ratio	%	49.9	50.1		43.0	57.0	
Totals	kg	736.2	739.8	1476.0	764.8	1013.3	1778.1

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1476.0
Weight of 2 P572M ATDs	kg	161.5
Rated Cargo/Luggage Weight (RCLW)	kg	148
Calculated Vehicle Target Weight (TVTW)	kg	1785.5

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

Weight of Ballast in Trunk: 108.9 kg

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	675	670	655	653	1386
As Tested	mm	669	672	615	625	1576
Fully Loaded	mm	667	672	613	622	

TEST VEHICLE VERTICAL IMPACT LINE DATA

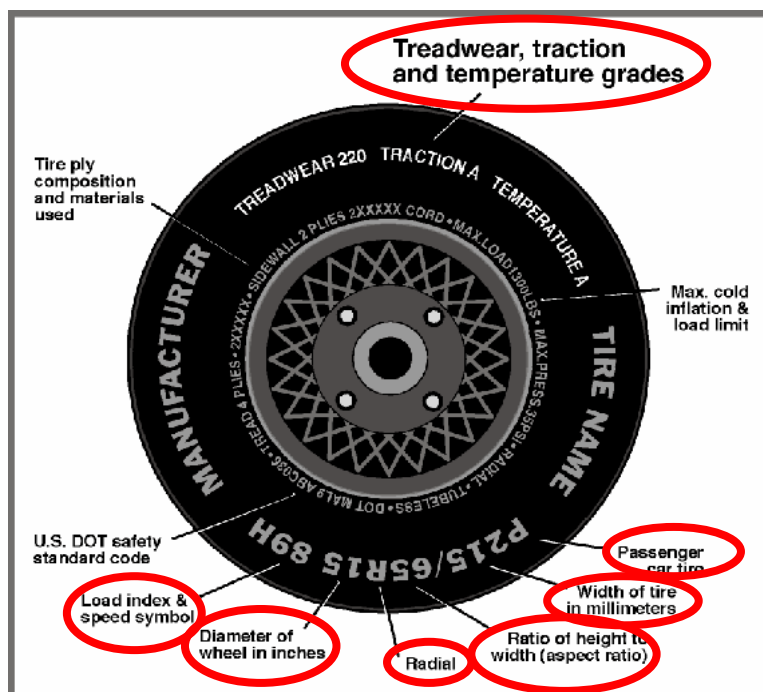
Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2765
Target Impact Point Aft of Front Axle	mm	443
Actual Impact Point Aft of Front Axle	mm	424

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Inducant

NHTSA No. MA0516
 Test Date: 11/18/2009



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold / Test Pressure (kPa)	220	240
Recommended Tire Size	P225/45R17	P225/45R17
Tire Size on Vehicle	P225/45R17	P225/45R17
Tire Manufacturer	Continental	Continental
Tire Name	ContiPro Contact	ContiPro Contact
Tire Type	Passenger	Passenger
Tire Width (mm)	225	225
Ratio of Height to Width (aspect ratio)	45	45
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	91H	91H
Treadwear	400	400
Traction Grade	AA	AA
Temperature Grade	A	A

DATA SHEET NO. 3
TEST VEHICLE INFORMATION

Test Vehicle: 2010 BMW 328i Coupe
Test Program: FMVSS 214 Indicant

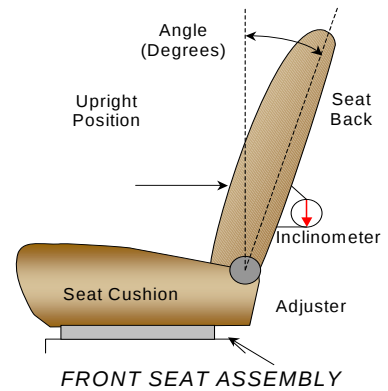
NHTSA No. MA0516
Test Date: 11/18/2009

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: For the driver, set the seat back angle in the 10th detent with the forward-most detent defined as 0. The passenger seat is non-adjustable.

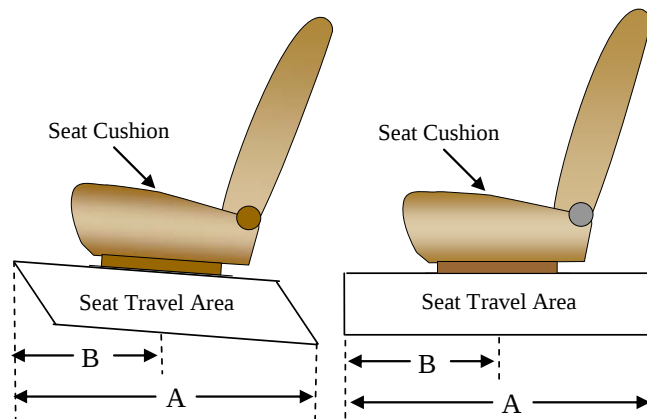
Driver seat back angle: 10th detent (forward-most as 0)

Passenger seat back angle: Fixed



SEAT FORE/AFT POSITIONS

	Total Fore/Aft Travel	Placed in position #
Driver Seat	57 detents	22 nd detent (forward-most as 0)
Rear Seat	Fixed	Fixed



DATA SHEET NO. 3 (CONTINUED)

TEST VEHICLE INFORMATION

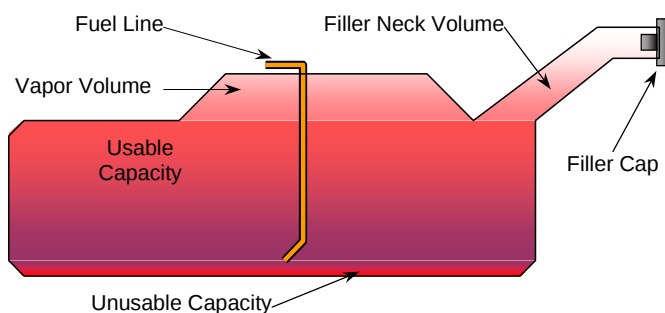
Test Vehicle: 2010 BMW 328i Coupe
Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
Test Date: 11/18/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	60.9
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	56.0 to 57.2
Actual Amount of Solvent used	56.4
1/3 of Usable Capacity	20.3

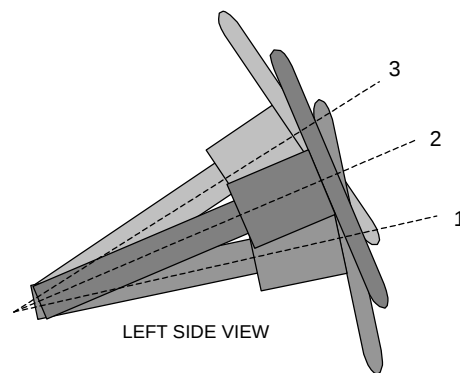
The test vehicle is equipped with an electric fuel pump. When the ignition is on, the fuel pump starts to work until the target pressure is reached. Then the fuel pump stops when the engine is started.



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	137	68.4
Geometric center position No. 2	152	70.4
Uppermost position No. 3	167	72.4

DATA SHEET NO. 4**MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS**

Test Vehicle: 2010 BMW 328i Coupe
Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
Test Date: 11/18/2009

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheel base of Framework Carriage	2592
C.G. Location aft of Front Axle	1129

MDB WEIGHTS

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

SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.8
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.8
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.9

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

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	19 forward
Vertical Offset	mm	+/-20	7 down

DATA SHEET NO. 5**POST TEST OBSERVATIONS**

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Inducant

NHTSA No. MA0516
 Test Date: 11/18/2009

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat SID/HIII	Rear Seat SID/HIII
Dummy Type / Serial No.	SID HIII / 272	SID HIII / 271
Head Contact	Curtain Airbag, RF Seatback	Curtain Airbag, Header, Headrest
Upper Torso Contact	Side Airbag, Door Panel	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 door was unlocked	
Left Side Door Opening	Door remained closed and latched	
Right Side Door Opening	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	Both Left Windows Broke
Other Notable Effects	None

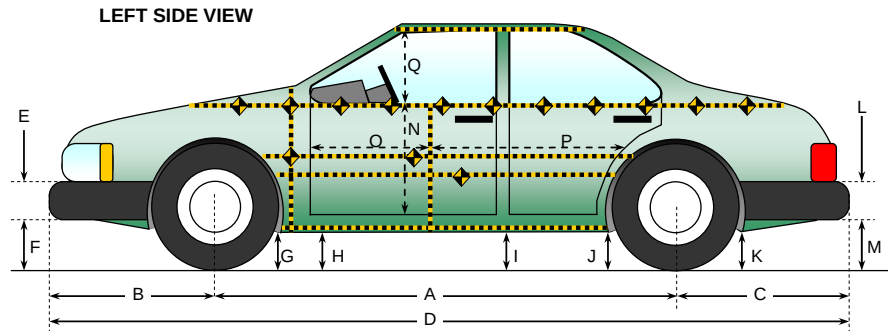
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 6
VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



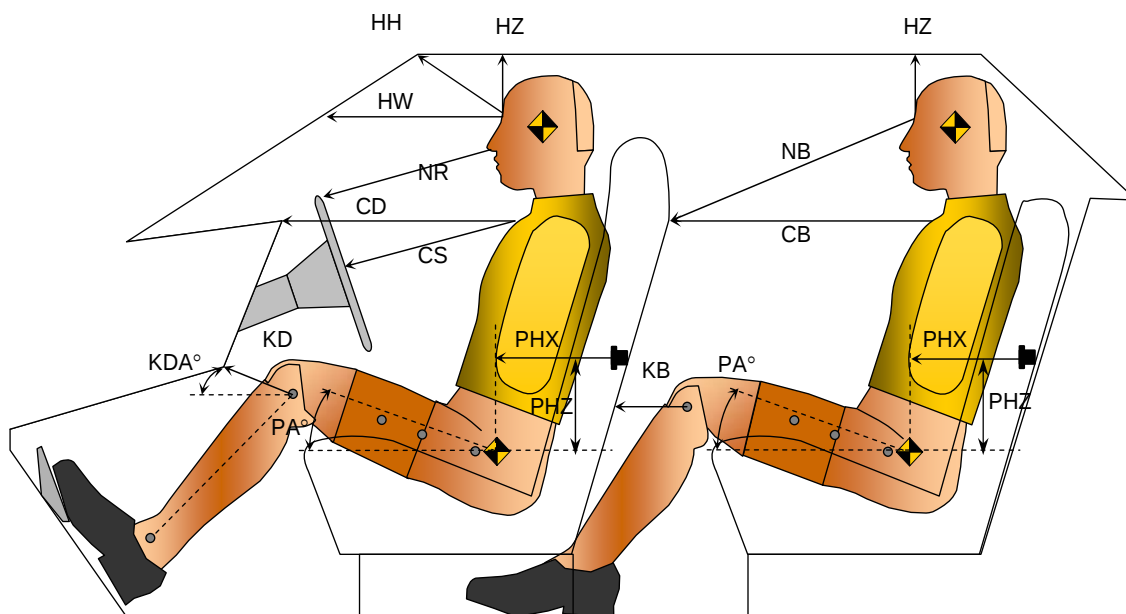
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2765	2752	-13
B	Front Axle to FSOV	744	741	-3
C	Rear Axle to RSOV	1034	1039	5
D	Total Length at Centerline	4543	4532	-11
E	Front Bumper Thickness	136	136	0
F	Front Bumper Bottom to Ground	208	233	25
G	Sill Height at Front Wheel Well	137	154	17
H	Sill Height at Front Door Leading Edge	126	151	25
I	Sill Height at "B" Pillar	124	102	-22
J1	Sill Height at Rear Wheel Well	123	124	1
J2	Pinch Weld Height at Rear Wheel Well	117	114	-3
K	Sill Height Aft of Rear Wheel Well	173	153	-20
L	Rear Bumper Thickness	146	146	0
M	Rear Bumper Bottom to Ground	280	266	-14
N	Sill Height to Window Bottom Sill	657	578	-79
O	Front Door Leading Edge to Impact CL	664	662	-2
P	Rear Door Trailing Edge to Impact CL	686	673	-13
Q	Front Window Opening	395	373	-22
R	Right Side Length	3685	3686	1
S	Left Side Length	3685	3655	-30
T	Vehicle Width at "B" Post	1780	1751	-29

DATA SHEET NO. 7
SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009

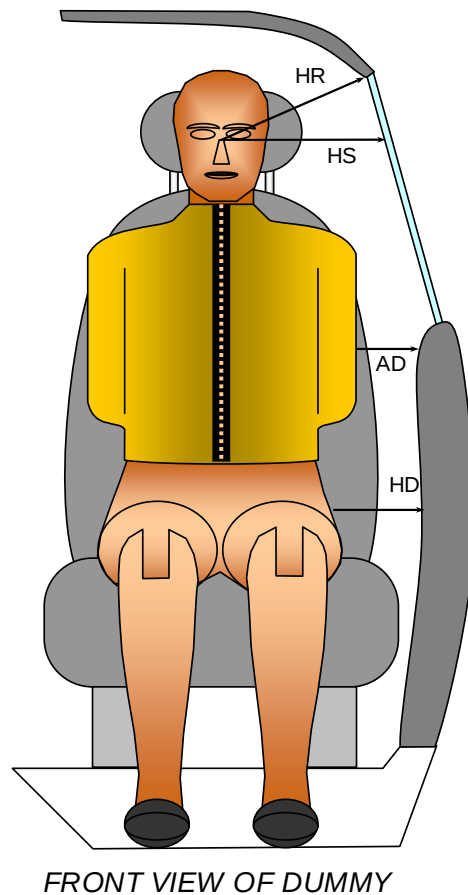


Driver Code	Pass. Code	Measurement Description	Driver S/N 272		Passenger S/N 271	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	375			
HW		Head to Windshield	620			
HZ	HZ	Head to Roof	140		113	
NR	NB	Nose to Rim/Nose to Seatback	458		541	
CD	CB	Chest to Dash or Seatback	539		481	
CS		Chest to Steering Wheel	350			
KDL	KBL	Left Knee to Dash or Seatback	222	30.7	150	20.6
KDR	KBR	Right Knee to Dash or Seatback	187	22.2	141	21.8
PA	PA	Pelvic Angle		23.8		24.8
PHX	PHX	H-Point to Striker (X-Axis)	446		516	
PHZ	PHZ	H-Point to Striker (Z-Axis)	290		278	

DATA SHEET NO. 8
SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009

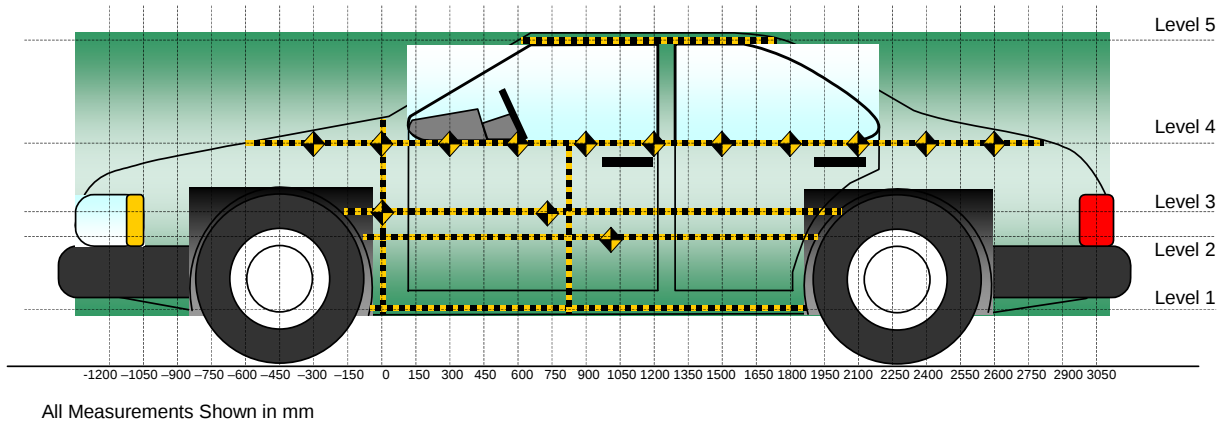


Code	Measurement Description	Units	Driver S/N 272	Passenger S/N 271
HR	Head to Side Header	mm	160	167
HS	Head to Side Window	mm	268	245
AD	Arm to Door	mm	95	88
HD	H-Point to Door	mm	150	168

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

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



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	1500	1285
4	Window Sill	148	1500	893
3	Mid Door	210	1350	597
2	Occupant H-Point	205	1050	425
1	Sill Top	95	1200	250
	Maximum Penetration	210		

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-300				350					347					-3	
-150			222	339				216	337				-6	-2	
0	236	229	230	331		265	251	275	335		29	22	45	4	
150	234	228	228	325		299	306	324	346		65	78	96	21	
300	231	224	224	320		307	401	371	366		76	177	147	46	
450	228	221	220	315		308	424	379	380		80	203	159	65	
600	225	219	217	310		309	422	386	391		84	203	169	81	
750	224	217	214	309		311	419	394	412		87	202	180	103	
900	221	216	212	309	549	312	419	404	419	551	91	203	192	110	2
1050	220	215	211	308	539	315	420	411	425	542	95	205	200	117	3
1200	219	215	212	309	534	314	411	417	433	542	95	196	205	124	8
1350	218	215	212	308	534	312	391	422	440	544	94	176	210	132	10
1500	219	218	214	312	535	290	360	360	460	549	71	142	146	148	14
1650	223	219	217	314	539	272	370	394	423	549	49	151	177	109	10
1800	229	221	221	319	544	259	335	392	395	551	30	114	171	76	7
1950		216	223	322	556		249	331	371	556		33	108	49	0
2100			219	332				265	355				46	23	
2250				340					345					5	
2400				345					345					0	

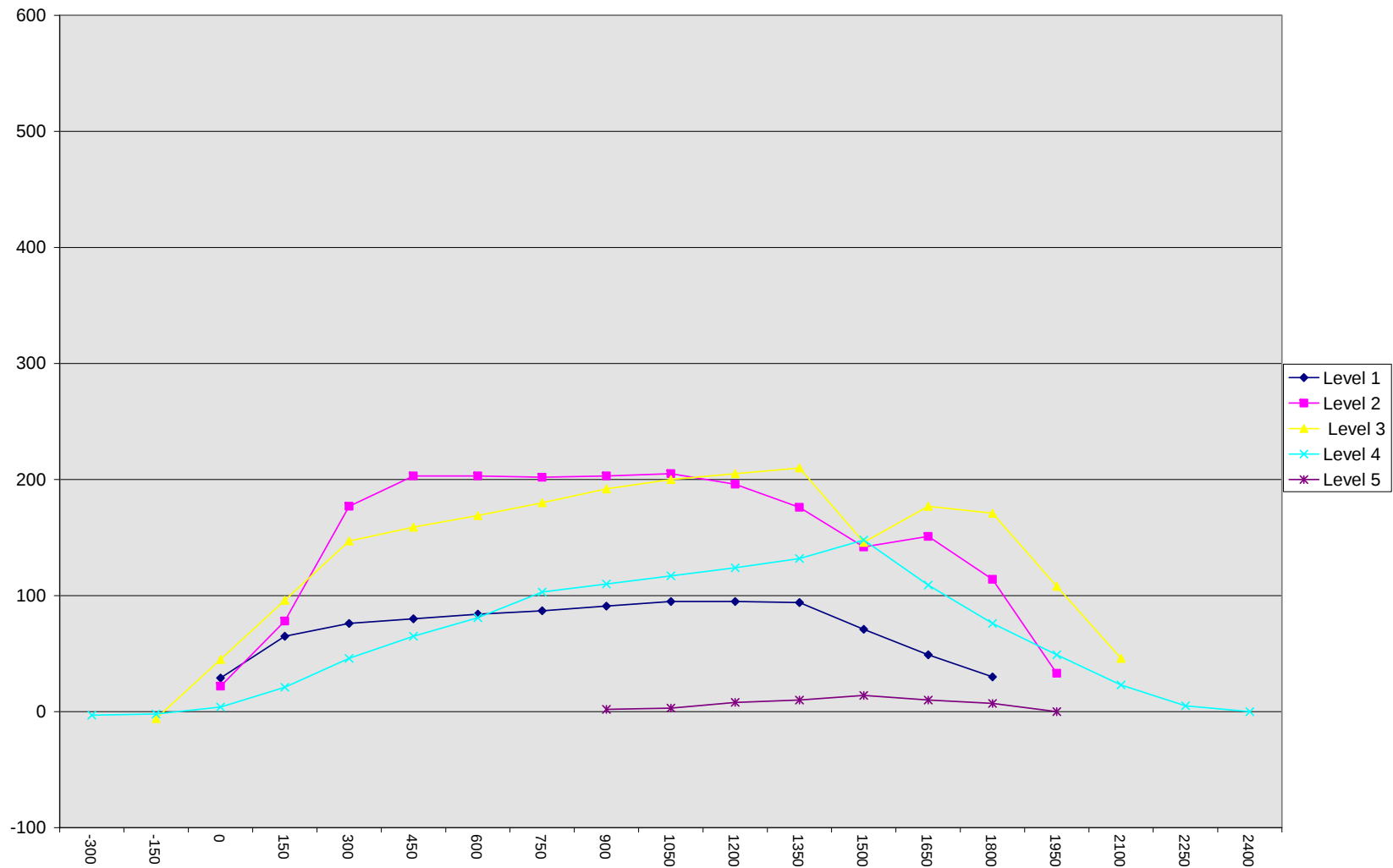
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body

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

Test Vehicle: 2010 BMW 328i Coupe
Test Program: FMVSS 214 Indicant

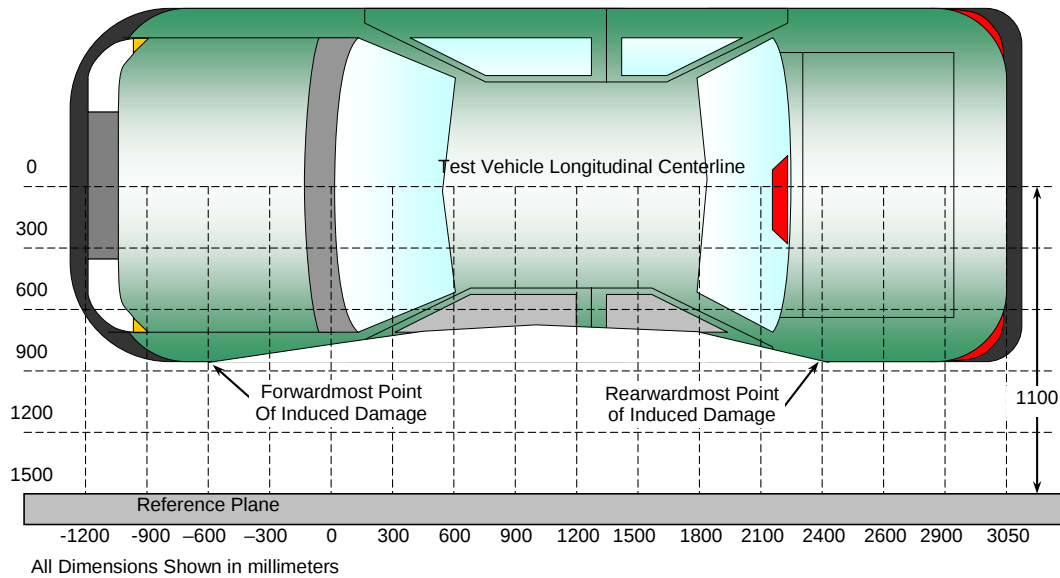
NHTSA No. MA0516
Test Date: 11/18/2009



DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



TOP VIEW

DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2400	4	345	345	0
2	1850	4	320	392	72
3	1220	3	212	441	229
4	730	3	215	444	229
5	200	3	227	420	193
6	-300	4	350	347	-3

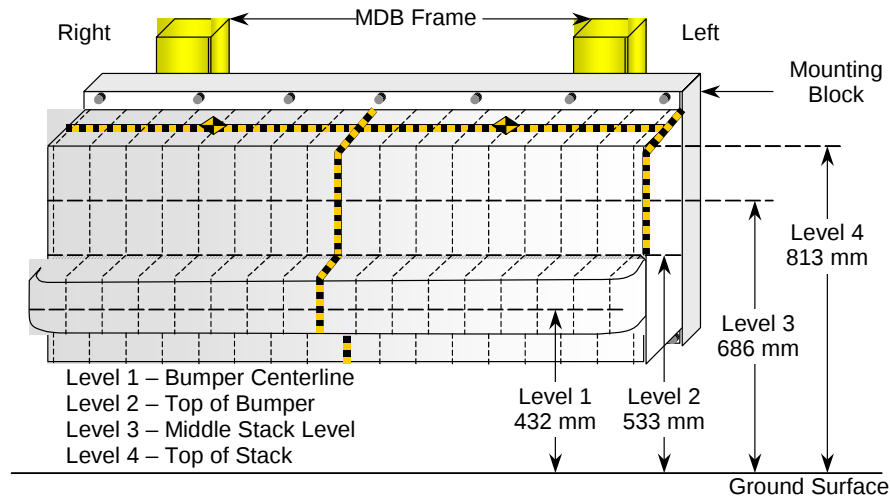
Reference plane is parallel to test vehicle longitudinal centerline.
 Given dimensions = Reference plane to car body.

DATA SHEET NO. 12

DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



DEFORMABLE BARRIER STATIC CRUSH

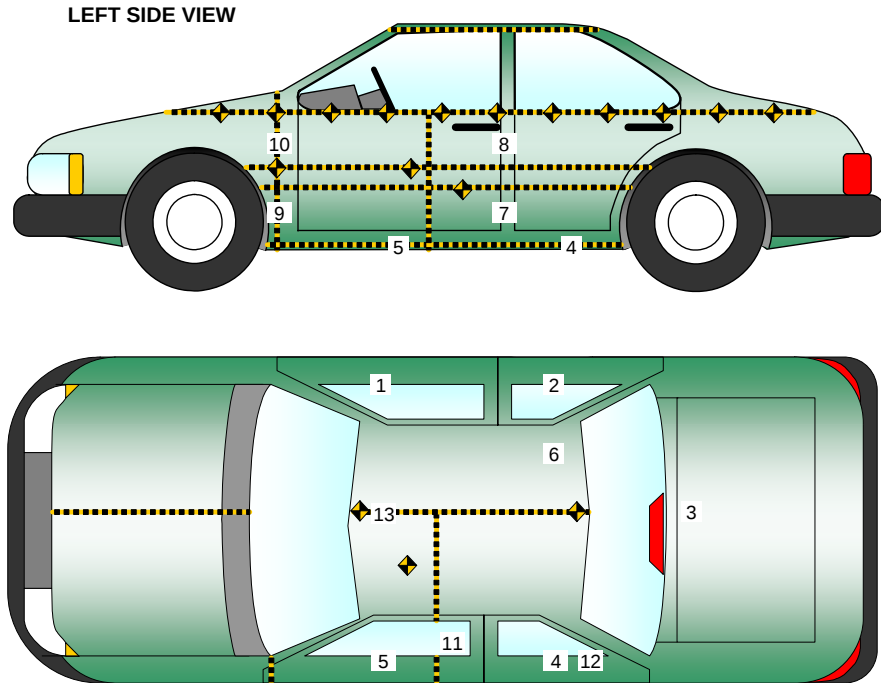
Stack Level	Distance Right of Center								C _L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	254	272	261	225	189	162	149	145	142	147	148	150	152	157	176	189	178
2	194	195	175	140	109	98	95	94	95	96	100	100	101	106	113	120	130
3	109	106	105	78	65	53	40	31	29	29	31	40	51	71	105	150	144
4	99	69	80	58	40	29	25	29	35	46	50	61	82	105	130	143	176

All Dimensions in mm

DATA SHEET NO. 13
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



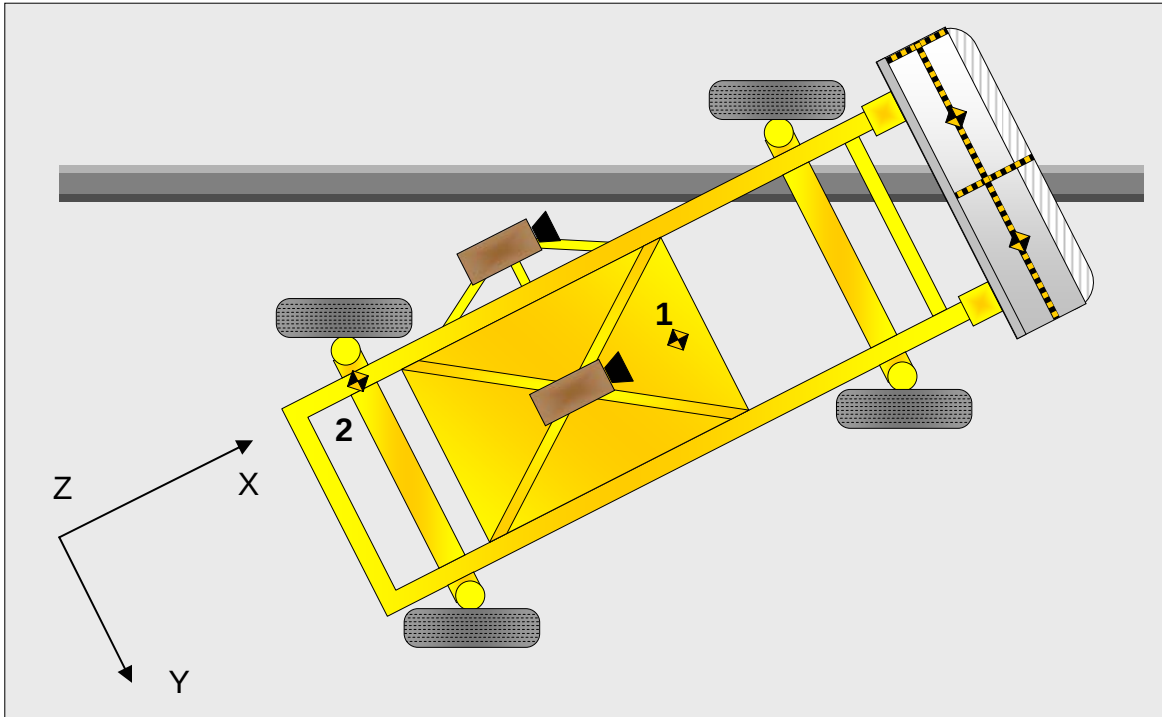
Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2590	705	-175
2	Right Sill at Rear Seat	1512	710	-170
3	Rear Floorpan Above Axle	906	0	-480
4	Left Sill at Rear Door	1520	-710	-170
5	Left Sill at Front Door	2592	-705	-175
6	Rear Occupant Compartment	1850	390	-305
7	Left Lower B-Post	1905	-710	-631
8	Left Middle B-Post	1864	-721	-804
9	Left Lower A-Post	3061	-755	-423
10	Left Middle A-Post	3111	-824	-769
11	Front Seat Track	2081	-590	-265
12	Rear Seat Track or Structure			
13	Vehicle CG	2341	0	-455

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: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



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: 2010 BMW 328i Coupe
Test Program: FMVSS 214 Indicant

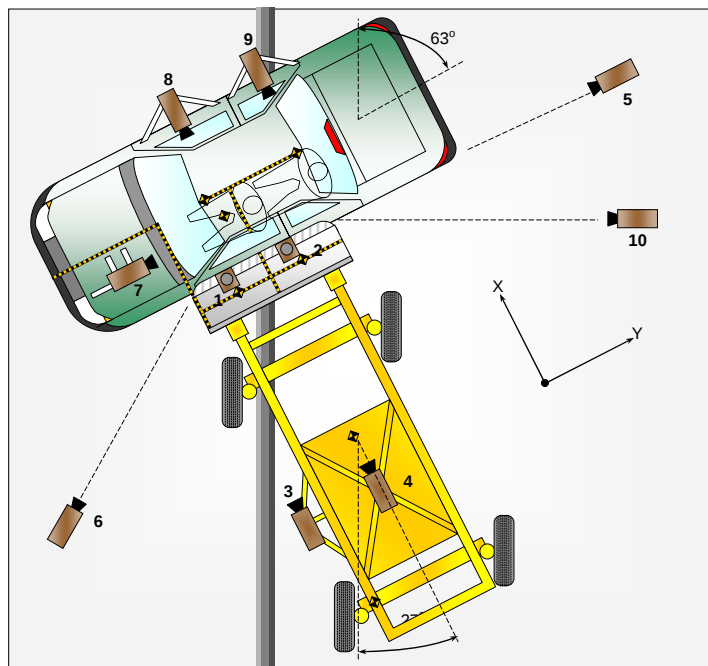
NHTSA No. MA0516
Test Date: 11/18/2009

	Elements	Pre-Test (mm)
1	Total Length	4543
2	Total Width	1780
3	Bumper Top Height	509
4	Bumper Bottom Height	371
5	Longitudinal Member Top Height	495
6	Distance between Longitudinal Members	870
7	Longitudinal Member Width	70
8	Engine Top Height	839
9	Engine Bottom Height	185
10	Engine and gearbox width	582
11	Front bumper-engine distance	475
12	Front shock absorber fixing height	816
13	Bonnet leading edge height	675
14	Front shock absorber fixing width	1100
15	Front bumper – front axle distance	765
16	Front axle – a pillar distance	650
17	A-pillar – B-pillar distance	1280
18	B-Pillar – rear axle distance	800
19	B-pillar – C-pillar distance	850
20	Roof sill bottom height	1254
21	Roof sill top height	1369
22	Floor sill bottom height	151
23	Floor sill top height	402

DATA SHEET NO. 16
HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Close-up	-530	-255	-5055	50	1000
2	Overhead Overall	650	1270	-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	60	7235	-1240	24	1000
6	Left Side, Ground Level, Overall	-1440	-5280	-1260	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: 2010 BMW 328i Coupe
 Test Program: FMVSS 214 Indicant

NHTSA No. MA0516
 Test Date: 11/18/2009

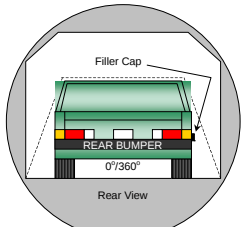
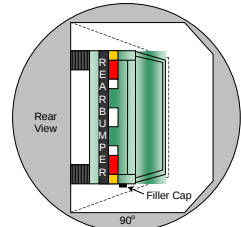
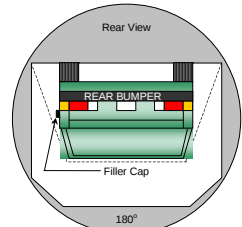
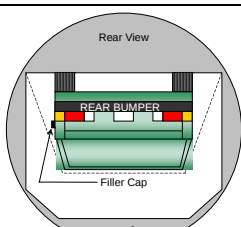
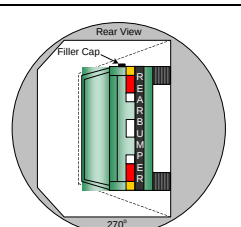
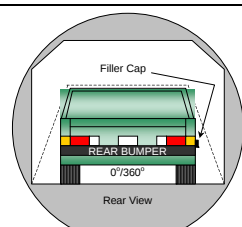
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 11:19 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

			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°	114	300	First 5	0
90° to 180°	112	300	First 5	0
180° to 270°	105	300	First 5	0
270° to 360°	115	300	First 5	0

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

	<u>Page No.</u>
Photo No. 1. Right Front $\frac{3}{4}$ View, As Received	A-1
Photo No. 2. Left Rear $\frac{3}{4}$ View, As Received	A-1
Photo No. 3. Manufacturer's Label	A-2
Photo No. 4. Tire Placard	A-2
Photo No. 5. Pre-Test Front View	A-3
Photo No. 6. Post-Test Front View	A-3
Photo No. 7. Pre-Test Left Front $\frac{3}{4}$ View	A-4
Photo No. 8. Post-Test Left Front $\frac{3}{4}$ View	A-4
Photo No. 9. Post-Test Left Side View	A-5
Photo No. 10. Pre-Test Left Rear $\frac{3}{4}$ View	A-6
Photo No. 11. Post-Test Left Rear $\frac{3}{4}$ View	A-6
Photo No. 12. Pre-Test Rear View	A-7
Photo No. 13. Post-Test Rear View	A-7
Photo No. 14. Pre-Test Right Rear $\frac{3}{4}$ View	A-8
Photo No. 15. Post-Test Right Rear $\frac{3}{4}$ View	A-8
Photo No. 16. Pre-Test Right Side View	A-9
Photo No. 17. Post-Test Right Side View	A-9
Photo No. 18. Pre-Test Right Front $\frac{3}{4}$ View	A-10
Photo No. 19. Post-Test Right Front $\frac{3}{4}$ View	A-10
Photo No. 20. Pre-Test Left Impact Point	A-11
Photo No. 21. Post-Test Left Impact Point	A-11
Photo No. 22. Pre-Test Front $\frac{3}{4}$ View of Left Side Doors	A-12
Photo No. 23. Post-Test Front $\frac{3}{4}$ View of Left Side Doors	A-12
Photo No. 24. Pre-Test Rear $\frac{3}{4}$ View of Left Side Doors	A-13
Photo No. 25. Post-Test Rear $\frac{3}{4}$ View of Left Side Doors	A-13
Photo No. 26. Pre-Test Left Side Impact Close-up	A-14
Photo No. 27. Post-Test Left Side Impact Close-up	A-14
Photo No. 28. Pre-Test Overhead View	A-15
Photo No. 29. Post-Test Overhead View	A-15
Photo No. 30. Pre-Test Overhead Close-up View	A-16
Photo No. 31. Post-Test Overhead Close-up View	A-16
Photo No. 32. Pre-Test Driver Dummy (Door Open)	A-17

		<u>Page No.</u>
Photo No. 33.	Pre-Test Driver Dummy Clearance From Door	A-18
Photo No. 34.	Post-Test Driver Dummy Clearance From Door	A-18
Photo No. 35.	Pre-Test Driver Dummy (Through Window)	A-19
Photo No. 36.	Post-Test Driver Dummy (Through Window)	A-19
Photo No. 37.	Pre-Test Driver Dummy Right Side View	A-20
Photo No. 38.	Post-Test Driver Dummy Right Side View	A-20
Photo No. 39.	Pre-Test Passenger Dummy Clearance From Door	A-21
Photo No. 40.	Post-Test Passenger Dummy Clearance From Door	A-21
Photo No. 41.	Pre-Test Passenger Dummy (Through Window)	A-22
Photo No. 42.	Post-Test Passenger Dummy (Through Window)	A-22
Photo No. 43.	Pre-Test Passenger Dummy Right Side View	A-23
Photo No. 44.	Post-Test Passenger Dummy Right Side View	A-23
Photo No. 45.	Pre-Test Front View of Deformable Barrier	A-24
Photo No. 46.	Post-Test Front View of Deformable Barrier	A-24
Photo No. 47.	Pre-Test Top View of Deformable Barrier	A-25
Photo No. 48.	Post-Test Top View of Deformable Barrier	A-25
Photo No. 49.	Pre-Test Right Side View of Deformable Barrier	A-26
Photo No. 50.	Post-Test Right Side View of Deformable Barrier	A-26
Photo No. 51.	Pre-Test Left Side View of Deformable Barrier	A-27
Photo No. 52.	Post-Test Left Side View of Deformable Barrier	A-27
Photo No. 53.	Vehicle on Rollover Device (90 Degrees)	A-28
Photo No. 54.	Vehicle on Rollover Device (180 Degrees)	A-28
Photo No. 55.	Vehicle on Rollover Device (270 Degrees)	A-29
Photo No. 56.	Vehicle on Rollover Device (360 Degrees)	A-29
Photo No. 57.	Vehicle Impact	A-30
Photo No. 58.	Post-Test Driver Dummy Head Contact View	A-31
Photo No. 59.	Post-Test Driver Dummy Head Contact View	A-31
Photo No. 60.	Post-Test Driver Dummy Torso Contact	A-32
Photo No. 61.	Post-Test Driver Dummy Contact	A-32
Photo No. 62.	Post-Test Passenger Dummy Head Contact View	A-33
Photo No. 63.	Post-Test Passenger Dummy Upper Torso Contact	A-33
Photo No. 64.	Post-Test Passenger Dummy Lower Torso Contact	A-34
Photo No. 65.	Post-Test Passenger Dummy Contact	A-34



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



Left 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



Post-Test Left Side View



Pre-Test Left Rear 3/4 View



Post-Test Left Rear 3/4 View



Pre-Test Rear View



Post-Test Rear View



Pre-Test Right Rear 3/4 View



Post-Test Right Rear 3/4 View



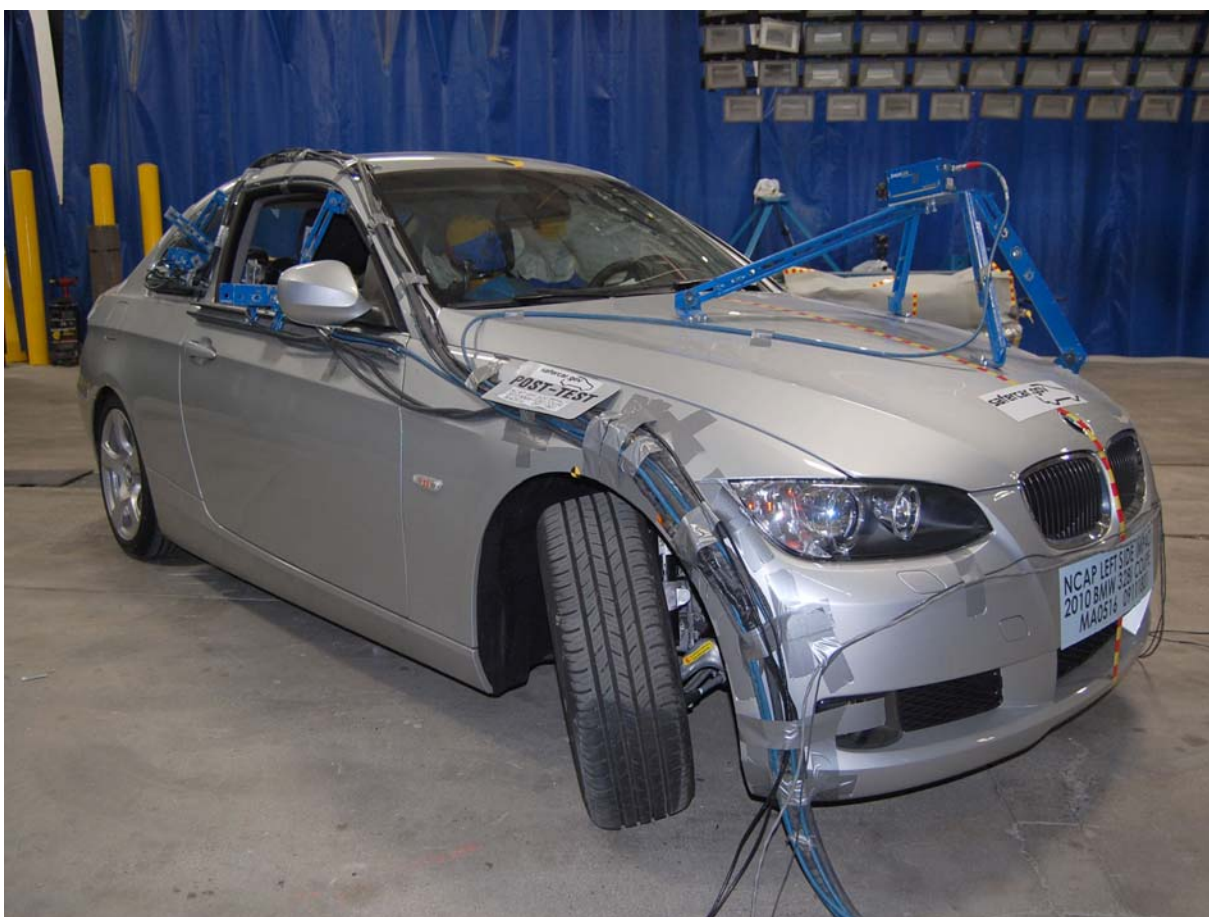
Pre-Test Right Side View



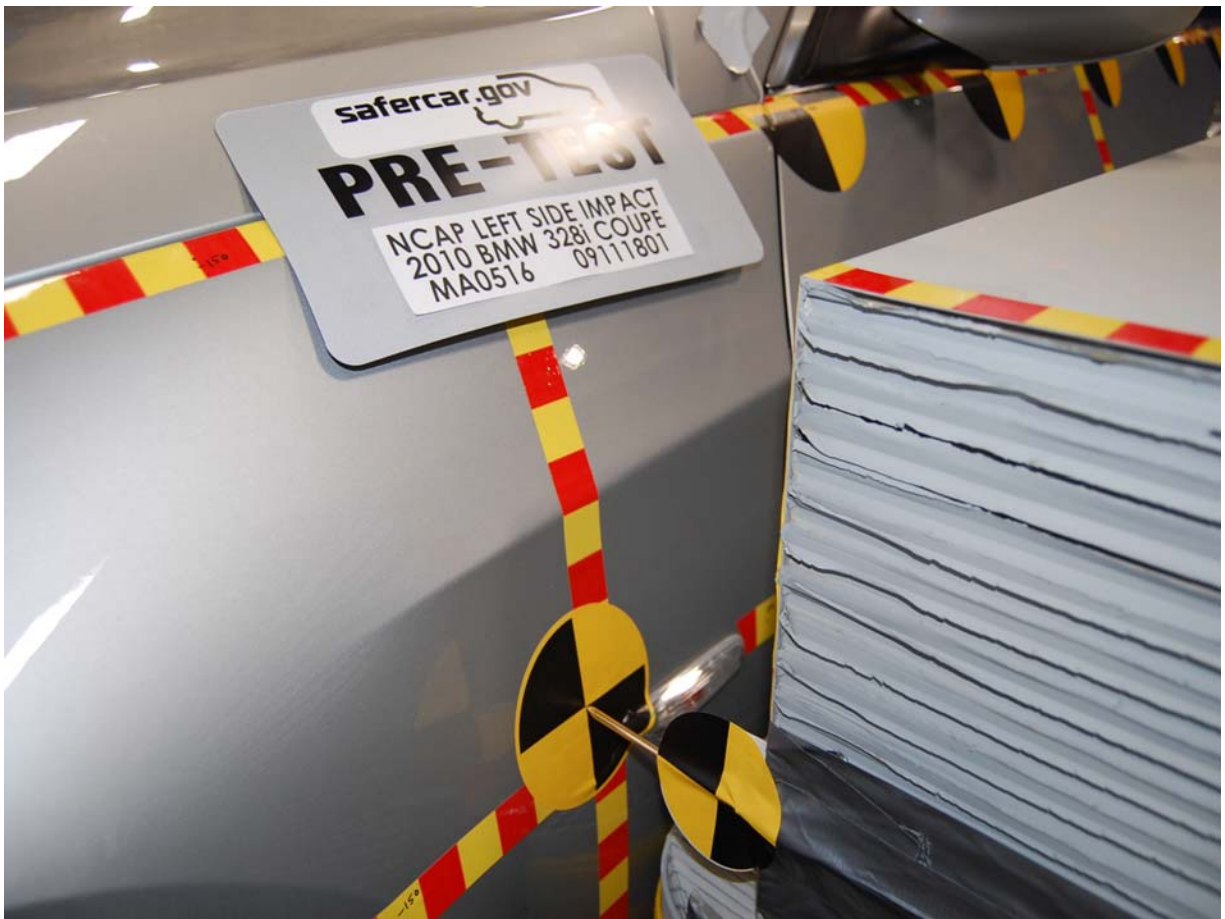
Post-Test Right Side View



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



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



Pre-Test Left Impact Point



Post-Test Left Impact Point



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



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



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



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



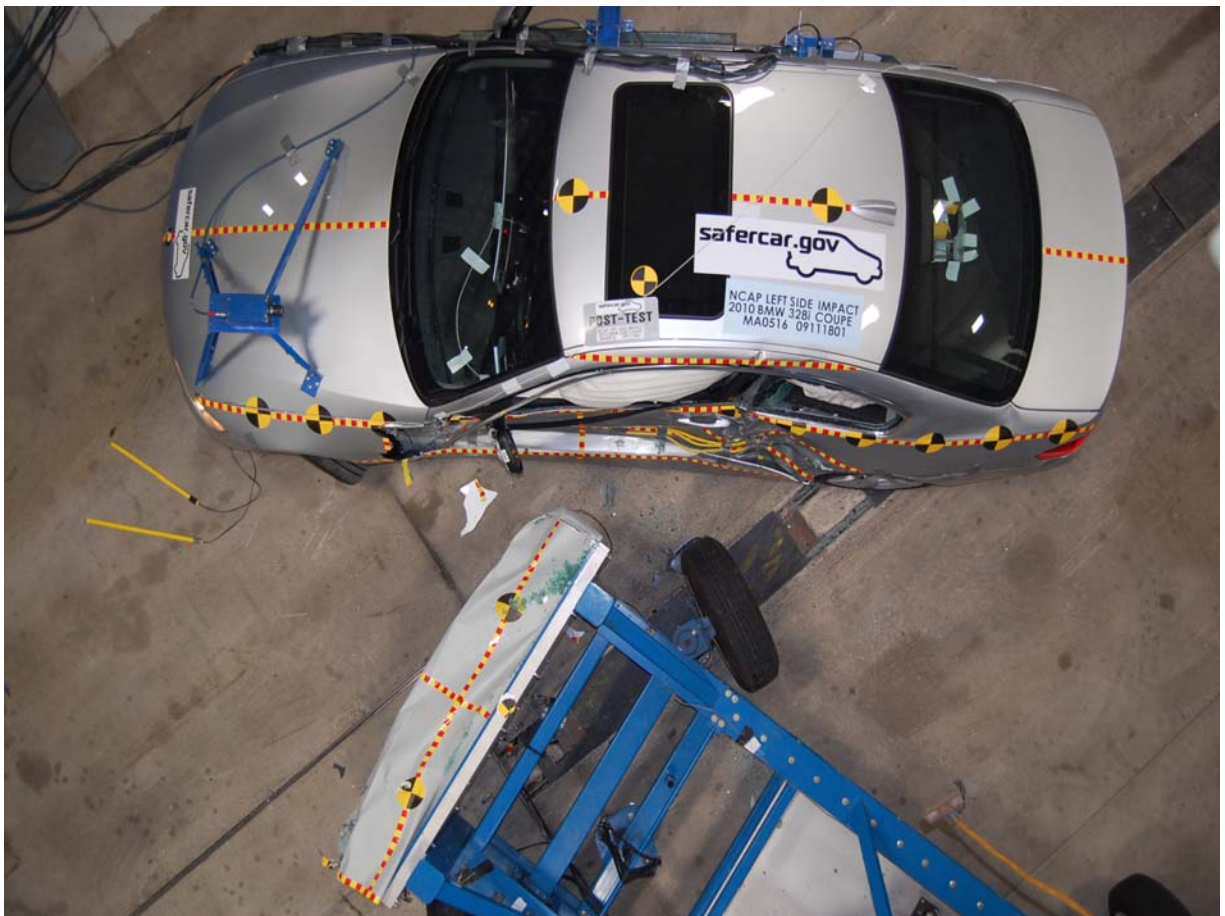
Pre-Test Left Side Impact Close-up



Post-Test Left Side Impact Close-up



Pre-Test Overhead View



Post-Test Overhead View



Pre-Test Overhead Close-up View



Post-Test Overhead Close-up View



Pre-Test Driver Dummy (Door Open)



Pre-Test Driver Dummy Clearance From Door



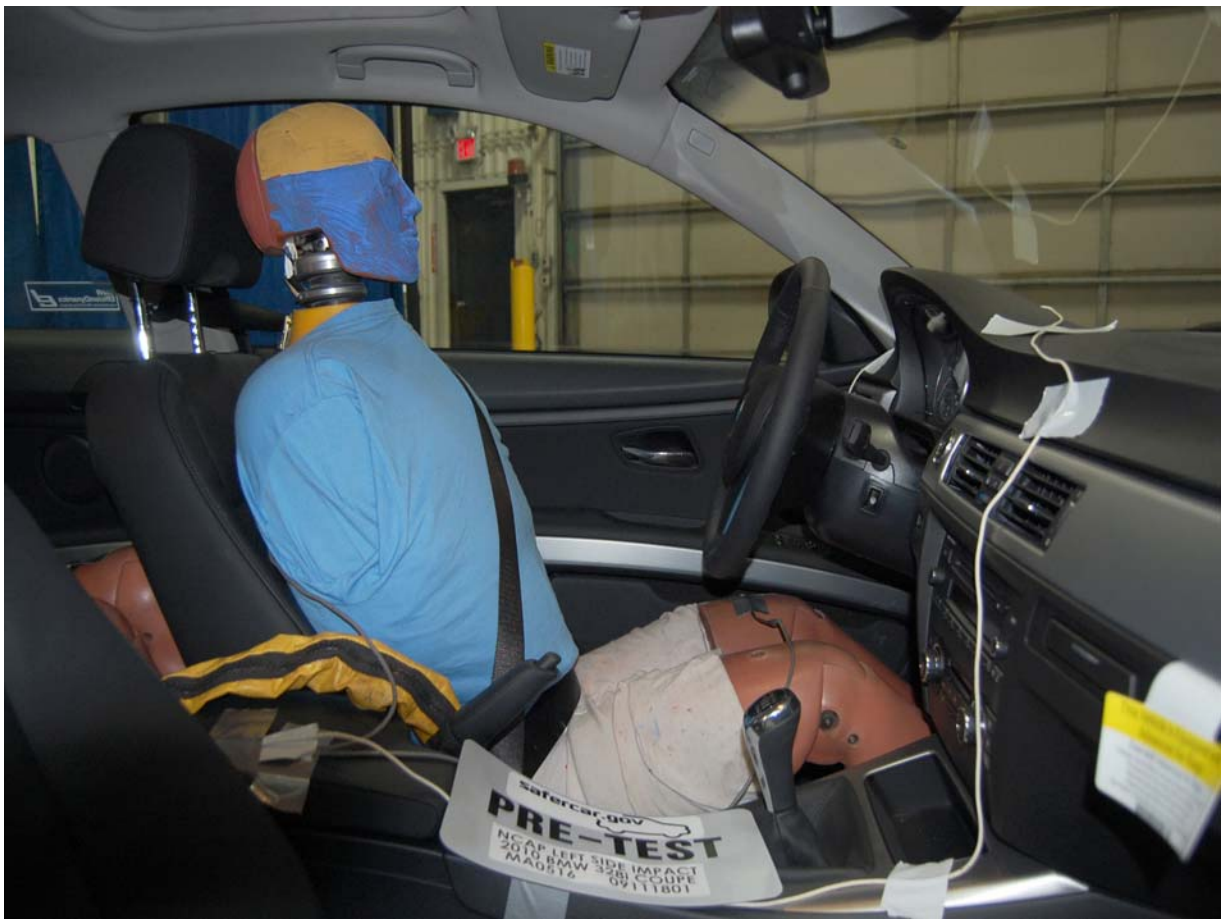
Post-Test Driver Dummy Clearance From Door



Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View



Pre-Test Passenger Dummy Clearance From Door



Post-Test Passenger Dummy Clearance From Door



Pre-Test Passenger Dummy (Through Window)



Post-Test Passenger Dummy (Through Window)



Pre-Test Passenger Dummy Right Side View



Post-Test Passenger Dummy Right Side View



Pre-Test Front View of Deformable Barrier



Post-Test Front View of Deformable Barrier



Pre-Test Top View of Deformable Barrier



Post-Test Top View of Deformable Barrier



Pre-Test Right Side View of Deformable Barrier



Post-Test Right Side View of Deformable Barrier



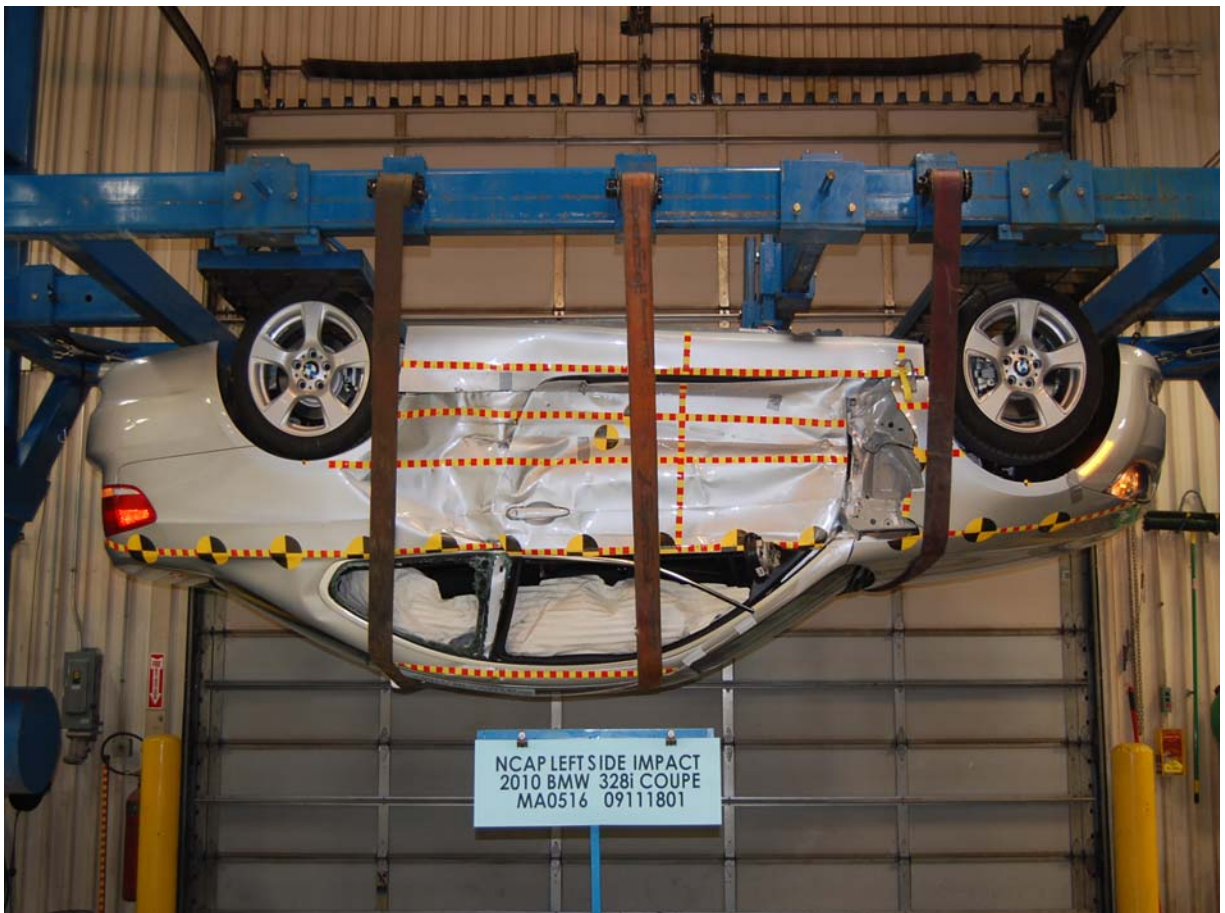
Pre-Test Left Side View of Deformable Barrier



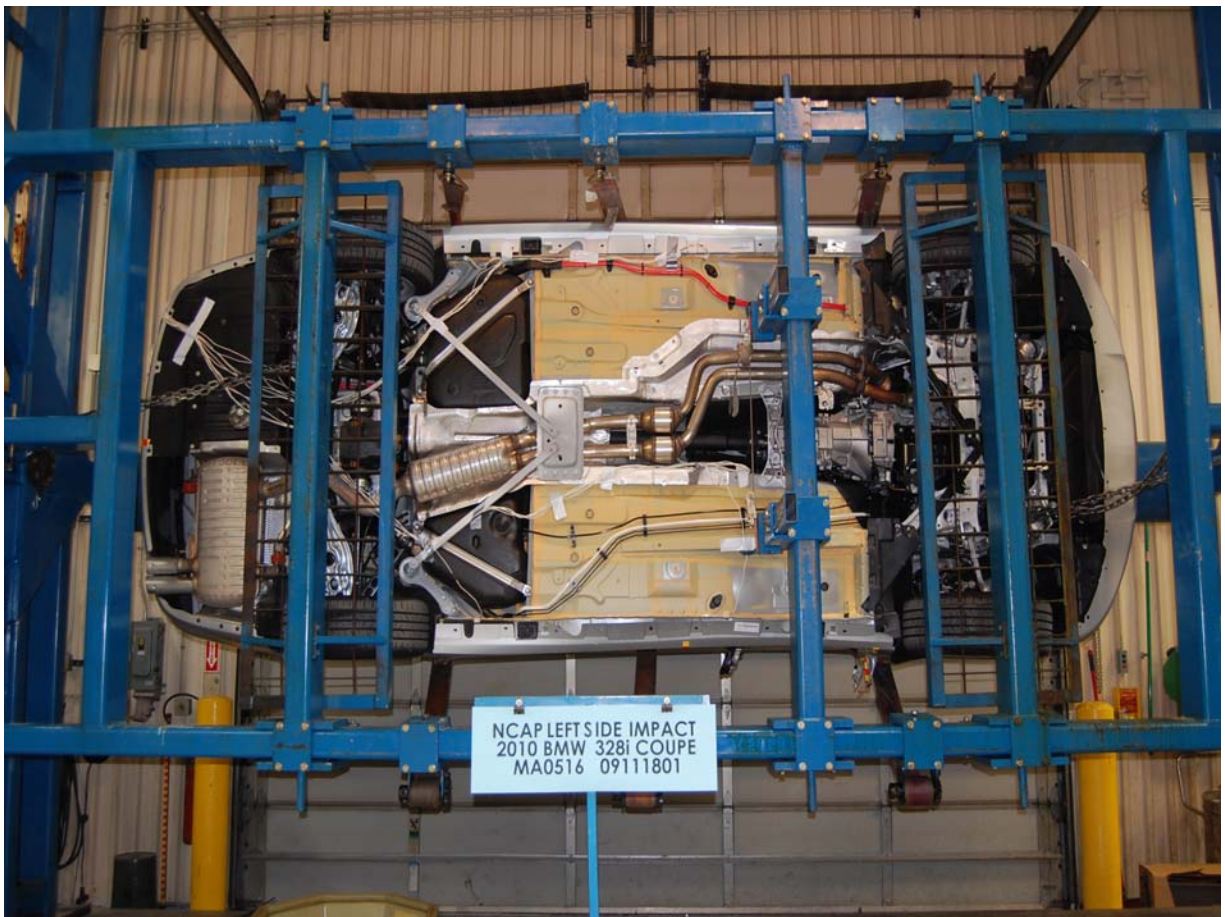
Post-Test Left Side View of Deformable Barrier



Vehicle on Rollover Device (90 Degrees)



Vehicle on Rollover Device (180 Degrees)



Vehicle on Rollover Device (270 Degrees)



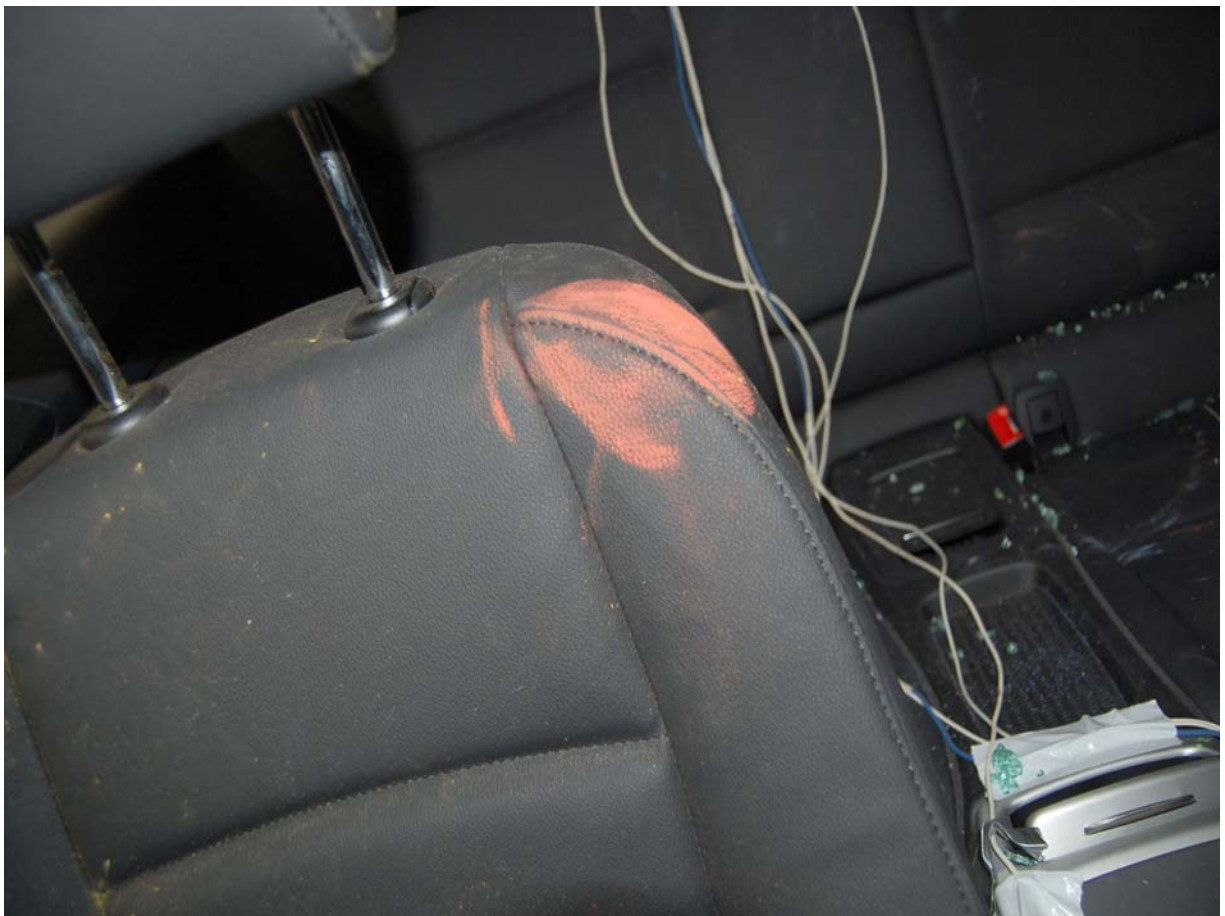
Vehicle on Rollover Device (360 Degrees)



Vehicle Impact



Post-Test Driver Dummy Head Contact View



Post-Test Driver Dummy Head Contact View



Post-Test Driver Dummy Torso Contact



Post-Test Driver Dummy Contact



Post-Test Passenger Dummy Head Contact View



Post-Test Passenger Dummy Upper Torso Contact



Post-Test Passenger Dummy Lower Torso Contact



Post-Test Passenger Dummy Contact

APPENDIX B
SID/HIII RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Page No.

List of Data Plots Provided in the Test Report

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

The following dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

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

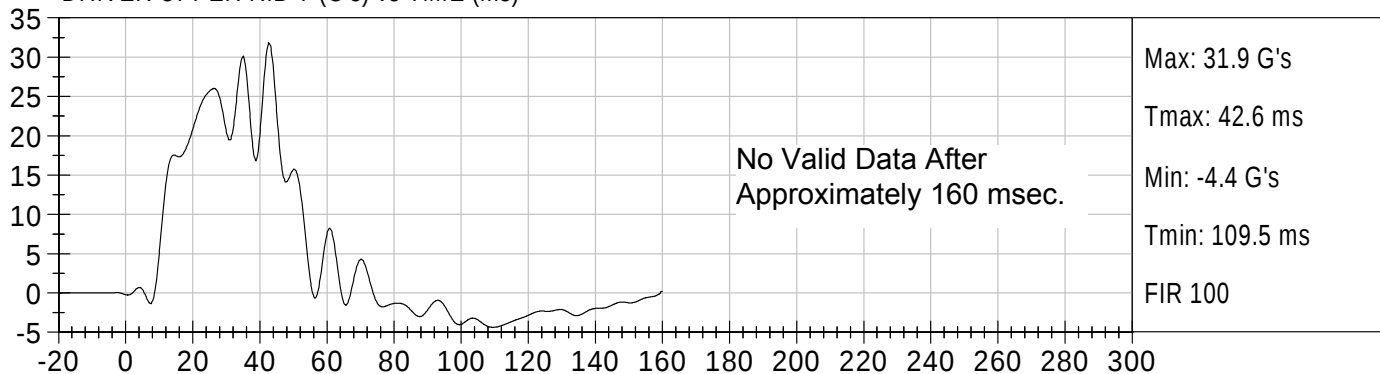
Driver Upper Neck Moment X

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

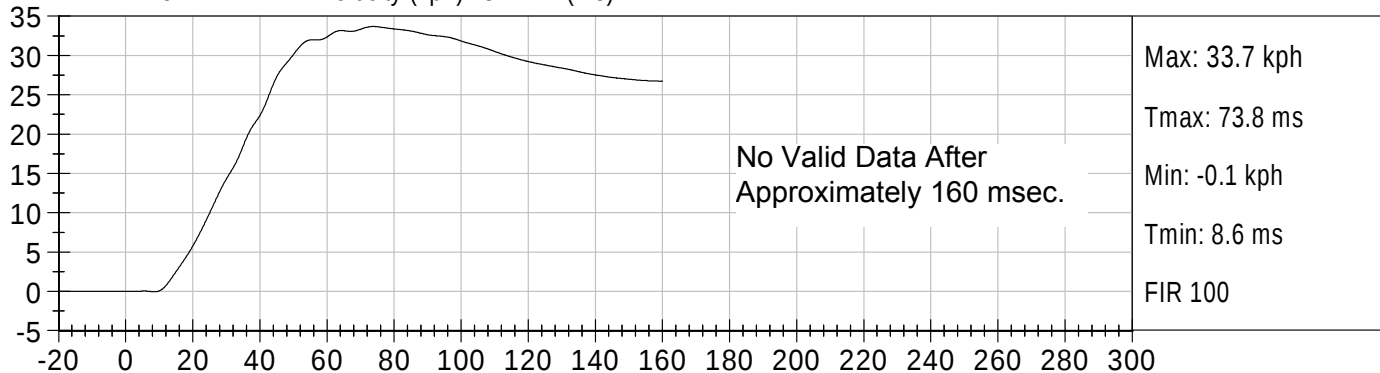
Vehicle Rear Floor Above Axle X
Vehicle Rear Floor Above Axle Y
Vehicle Rear Floor Above Axle Z
Vehicle Left Sill at Rear Door Y
Vehicle Left Sill at Front Door Y
Vehicle Right Rear Occupant Compartment
Vehicle B-Post Lower Y
Vehicle B-Post Middle Y
Vehicle A-Post Lower Y
Vehicle A-Post Middle Y
Vehicle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



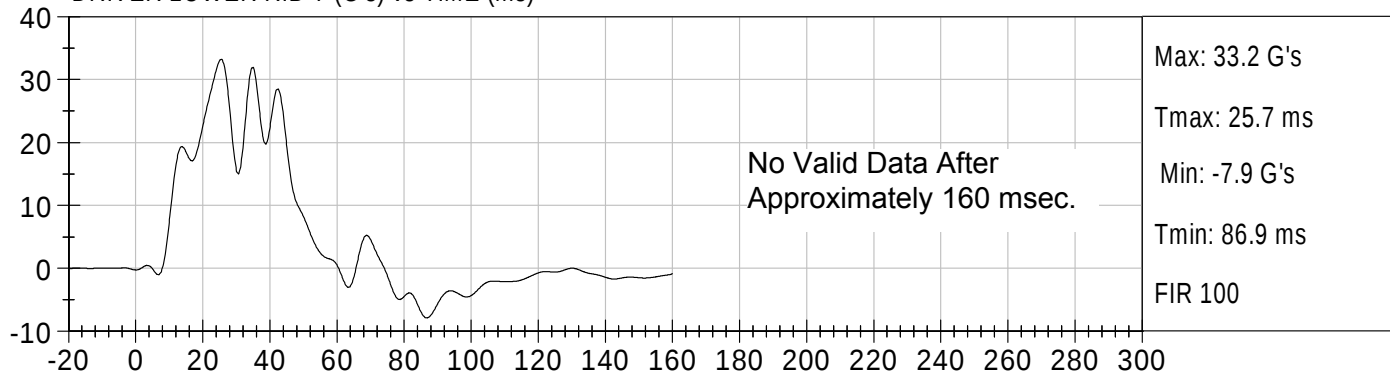
DRIVER UPPER RIB Y (G's) vs TIME (ms)



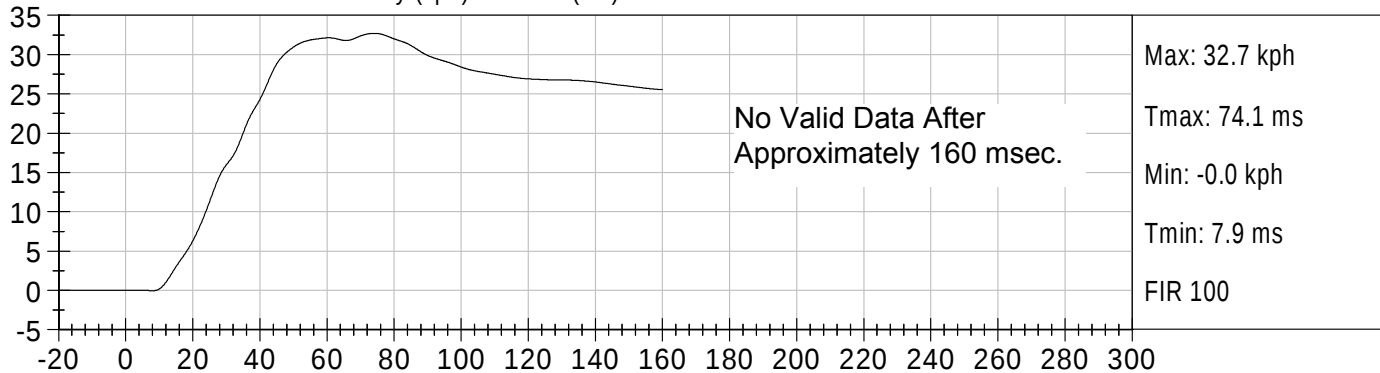
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)

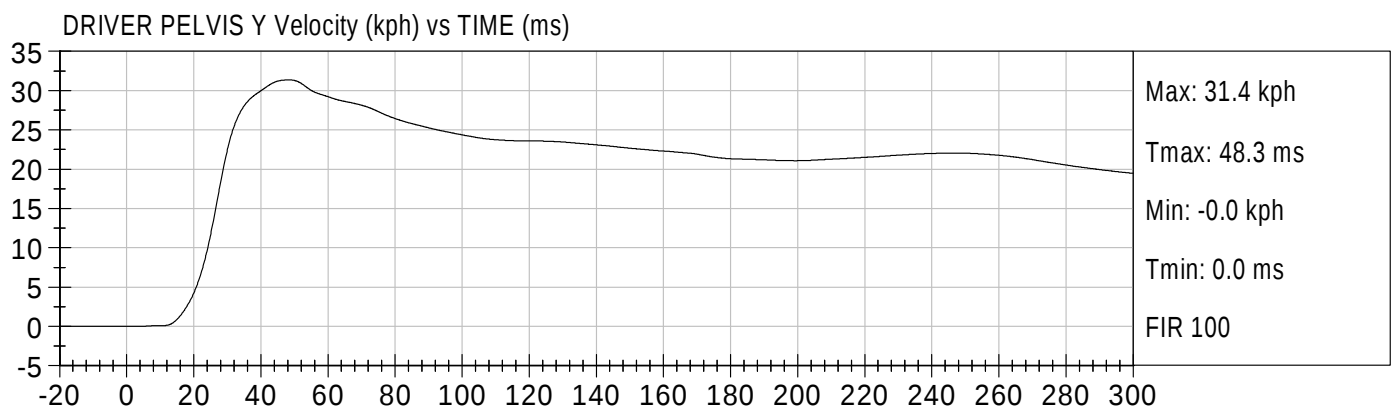
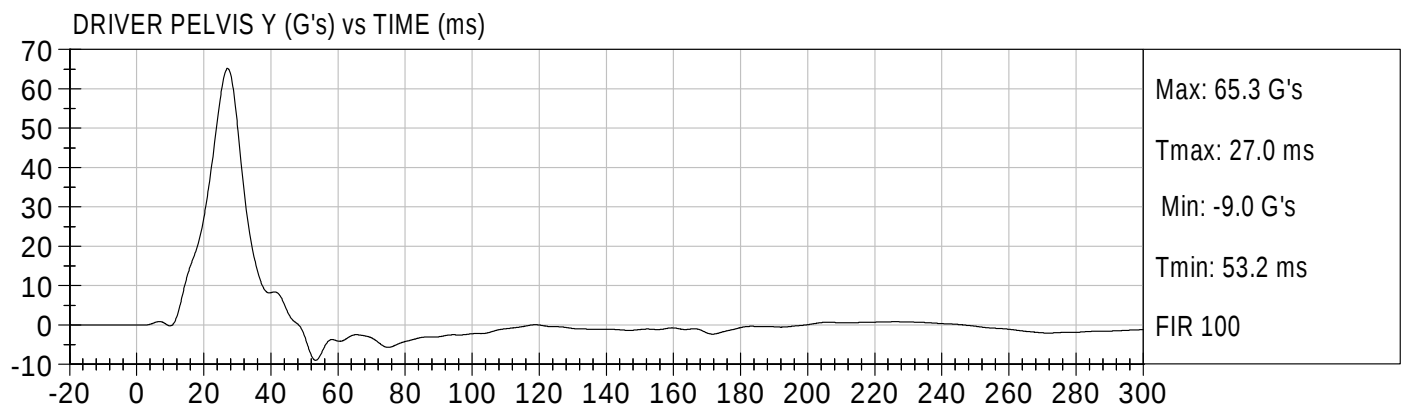
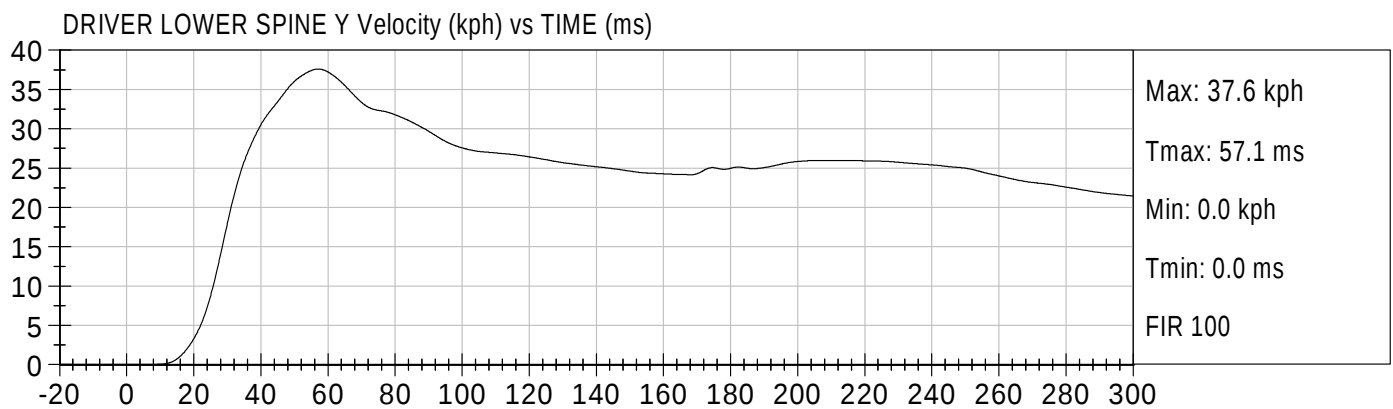
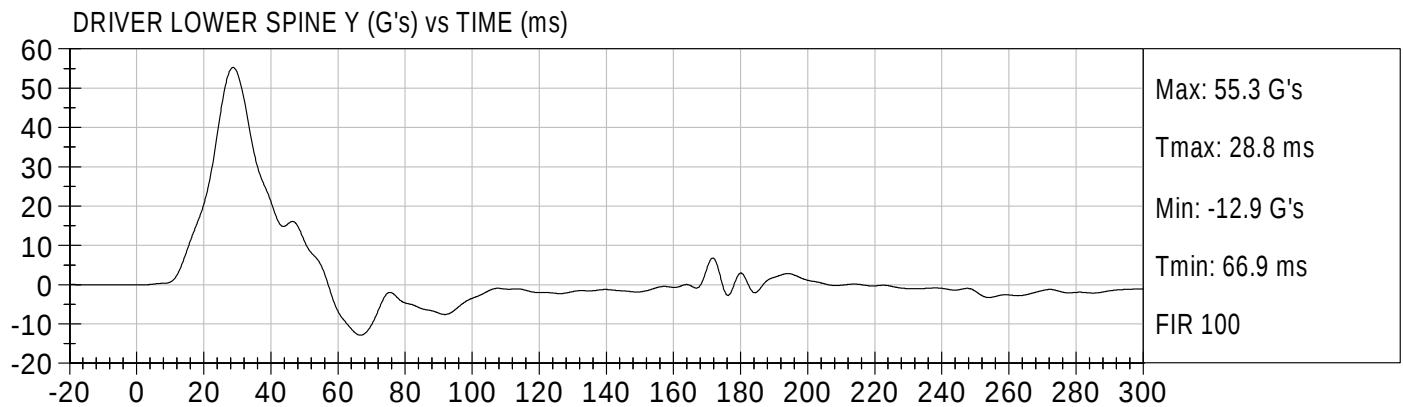


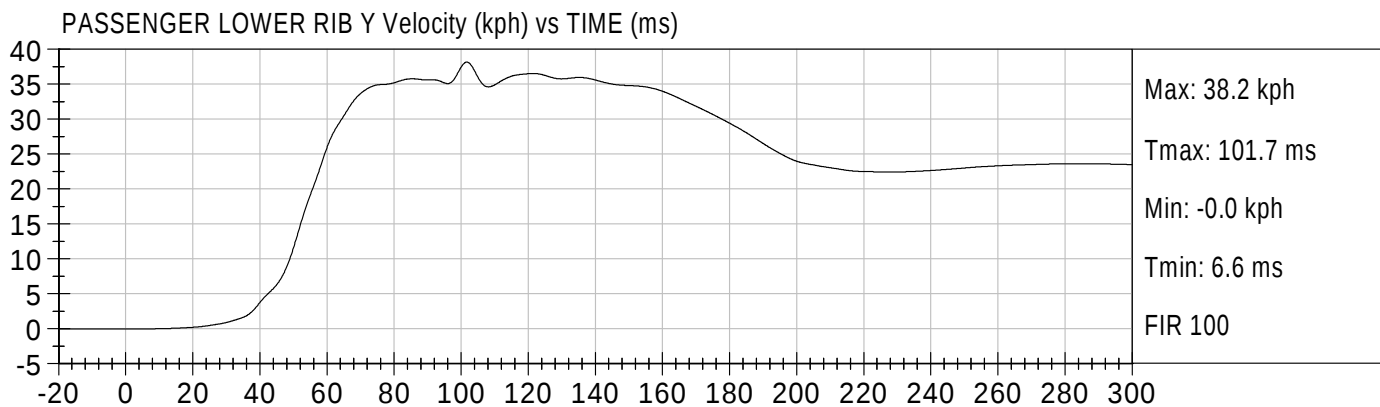
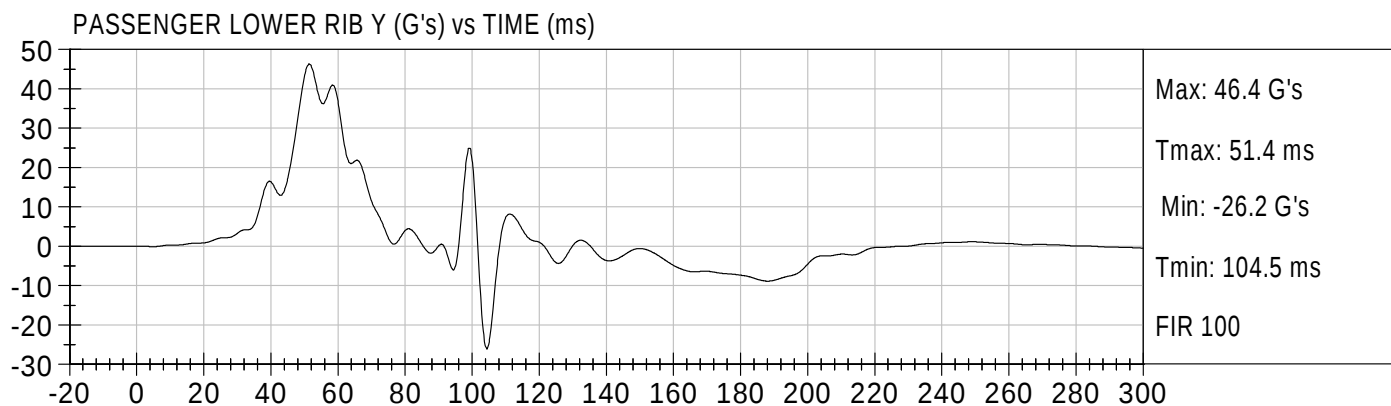
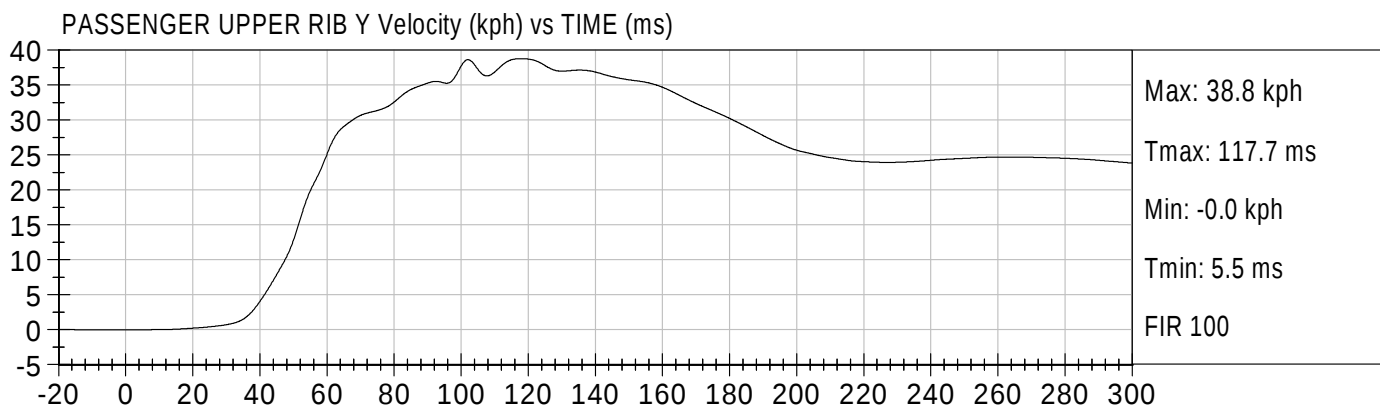
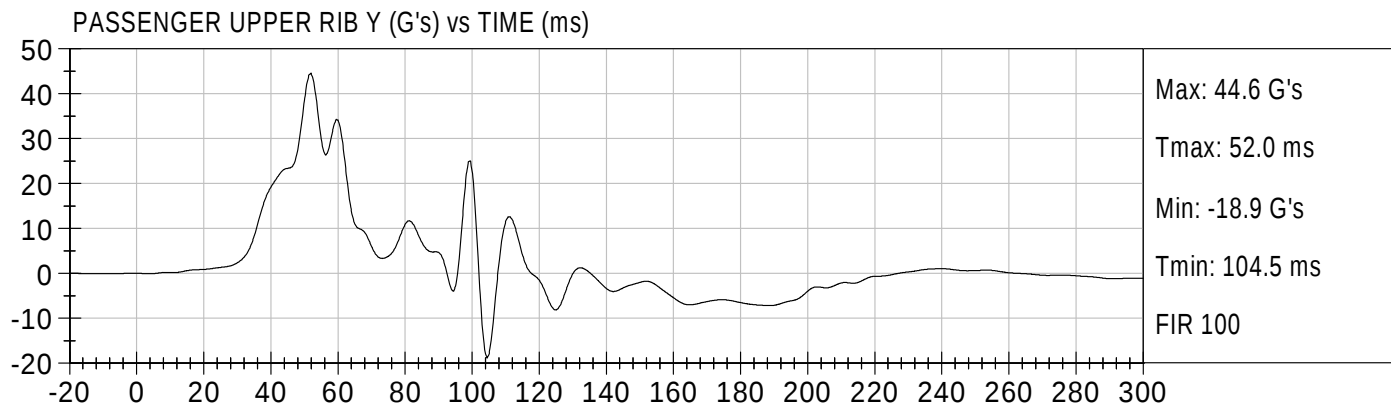
DRIVER LOWER RIB Y (G's) vs TIME (ms)

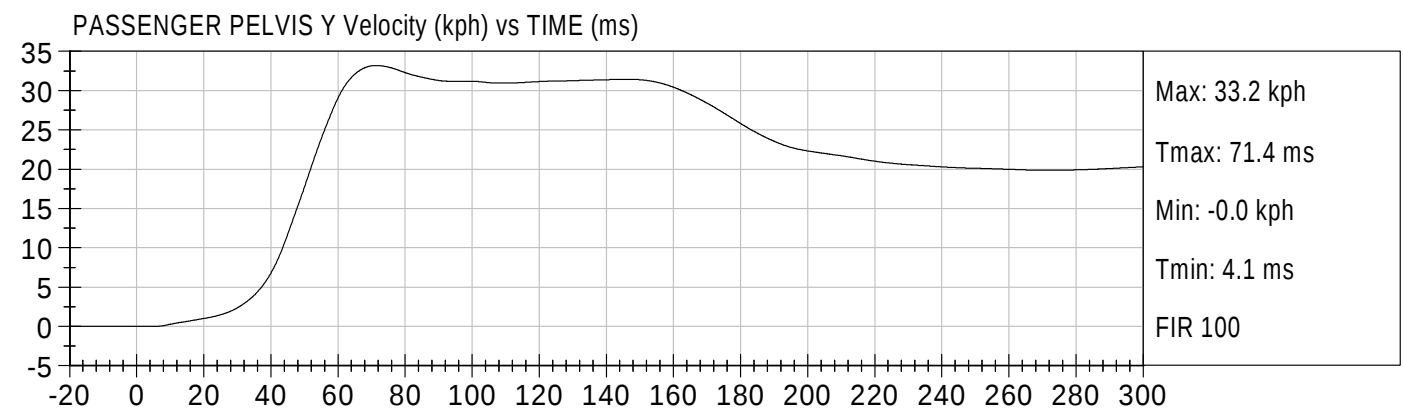
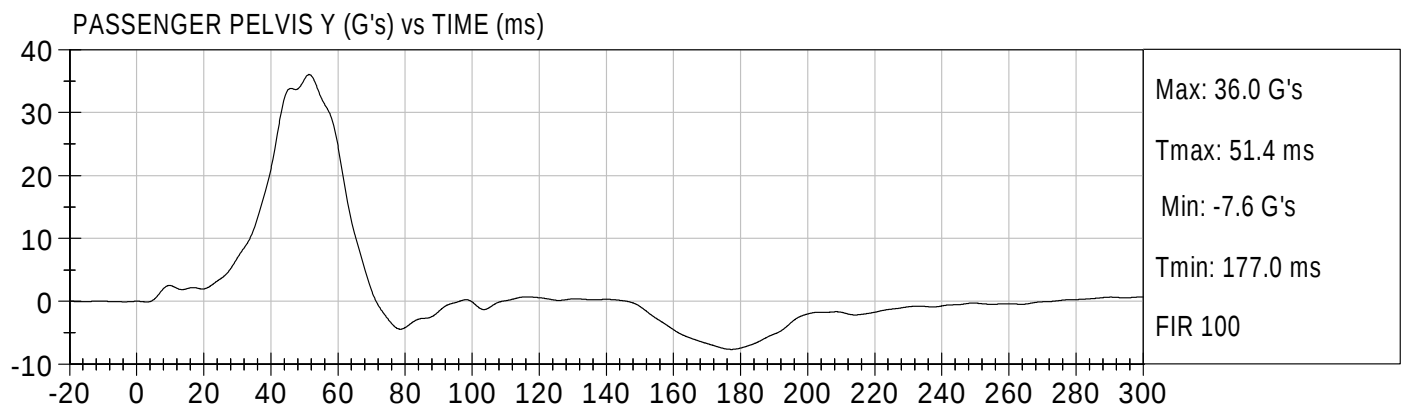
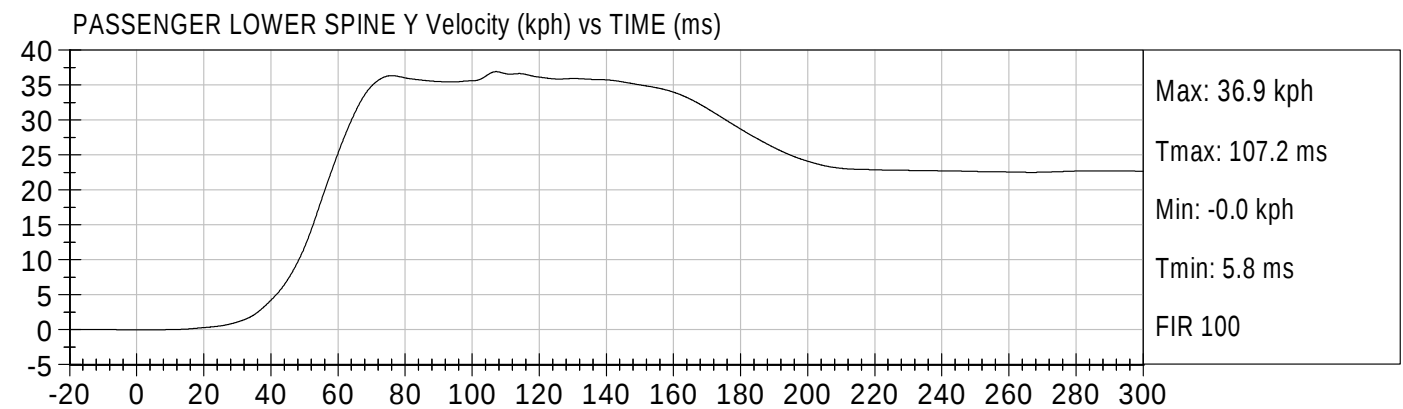
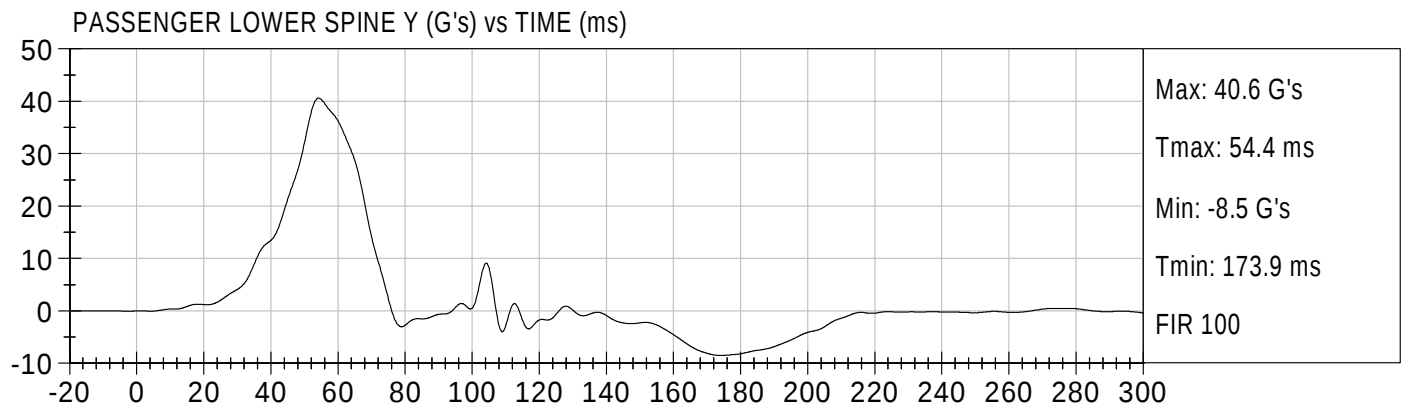


DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)









APPENDIX C
DUMMY CALIBRATION DATA

CERTIFICATION DATA

Dummy Serial Number: 272

Calibration Test Results Summary

Dummy Serial Number: 272

Pre-Test Calibration

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

SID/HIII Calibration Data Sheet
Side Impact Dummy
External Measurements

ATD Serial No: 272

Test I.D: D09267

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

Jessica Gall
Laboratory Technician

David Winkelbauer
Approved By

11/2/09

Test Date

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

ATD Serial No: 272

Test I.D: D092791

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	33	Pass
Peak Resultant Acceleration	G's	120 to 150	132	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-9.7	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

11/2/09
Test Date

David Winkelbauer
Approved By



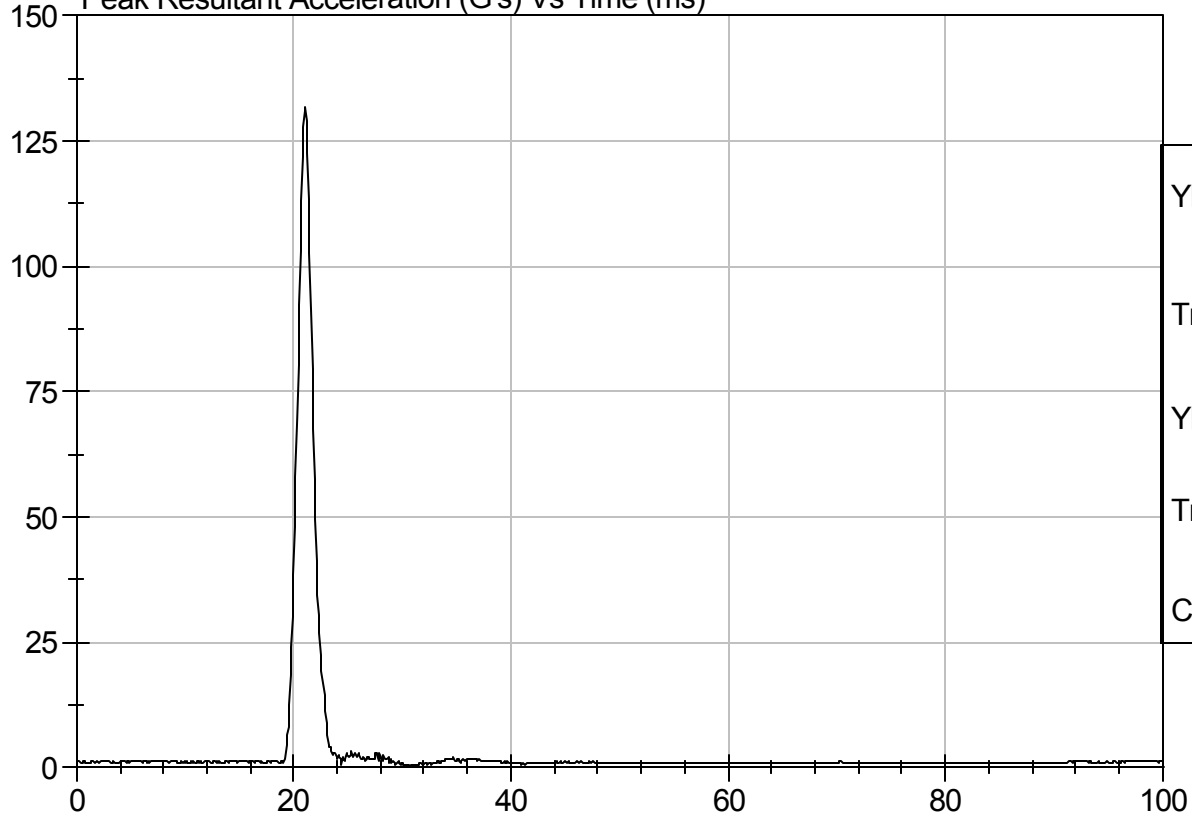
Test Description: Head Drop

Test Date: 11/2/09

Component: D092791

Speed: 0 ft/s, 0 m/s

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



YMax: 131.7 G

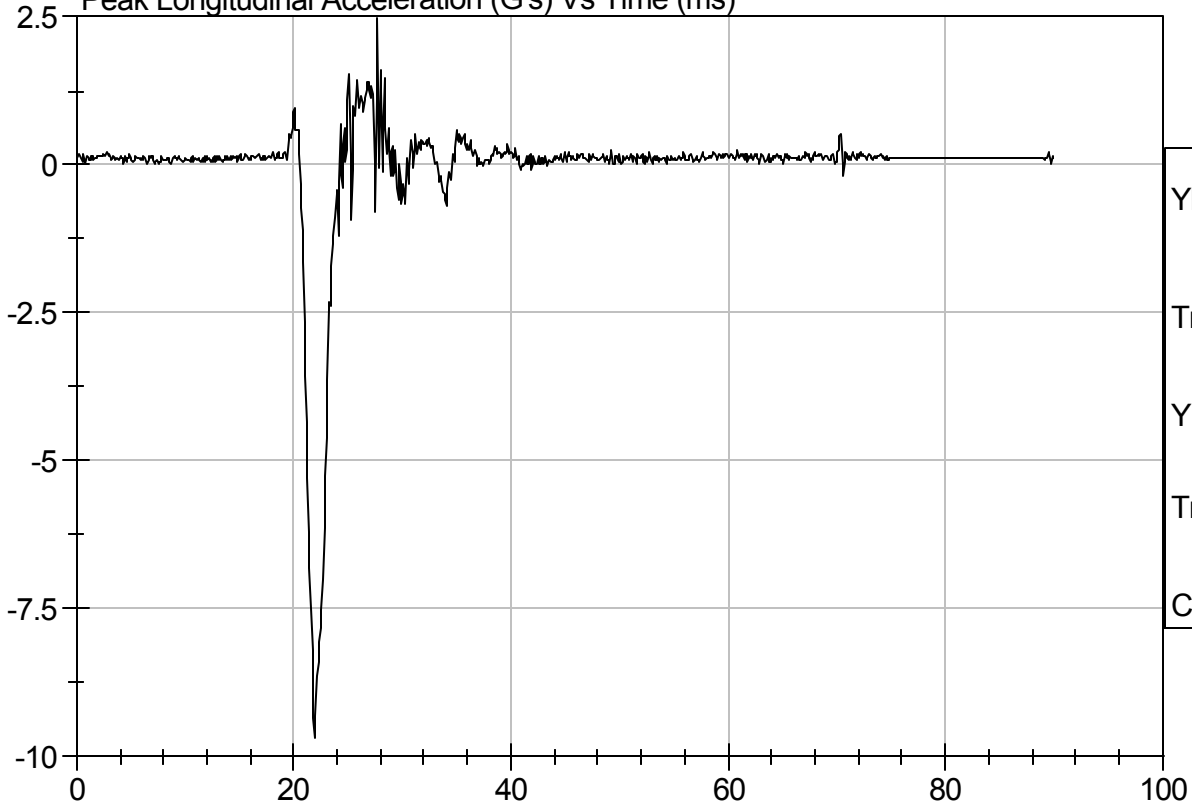
Tmax: 21.1 ms

YMin: 0.3 G

Tmin: 30.7 ms

CFC 1000

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



YMax: 2.5 G

Tmax: 27.7 ms

YMin: -9.7 G

Tmin: 21.9 ms

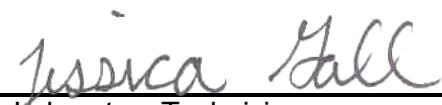
CFC 1000

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

ATD Serial No: 272

Test I.D: D092792

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	40	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	20	Pass
Overall Test Results				Pass


Laboratory Technician

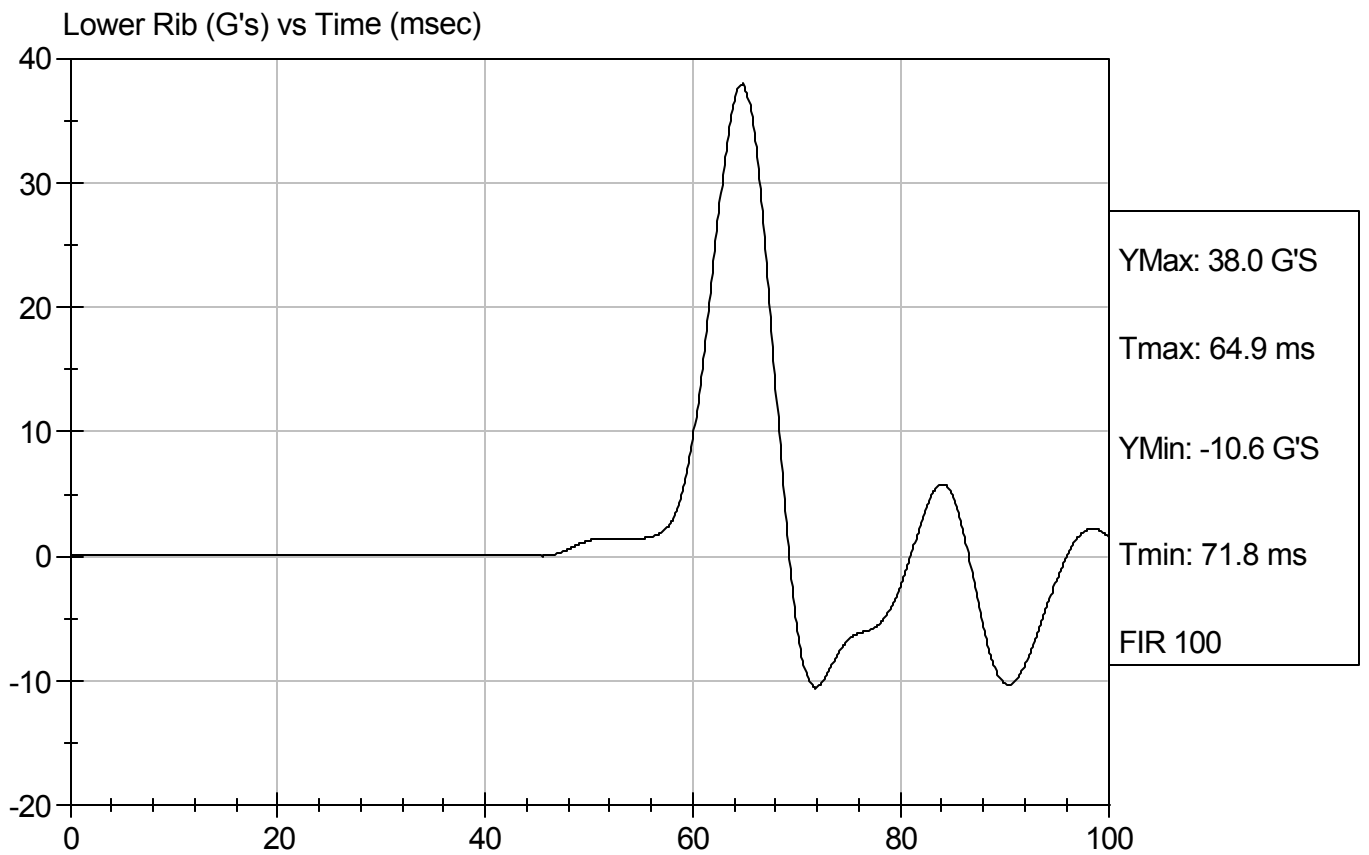
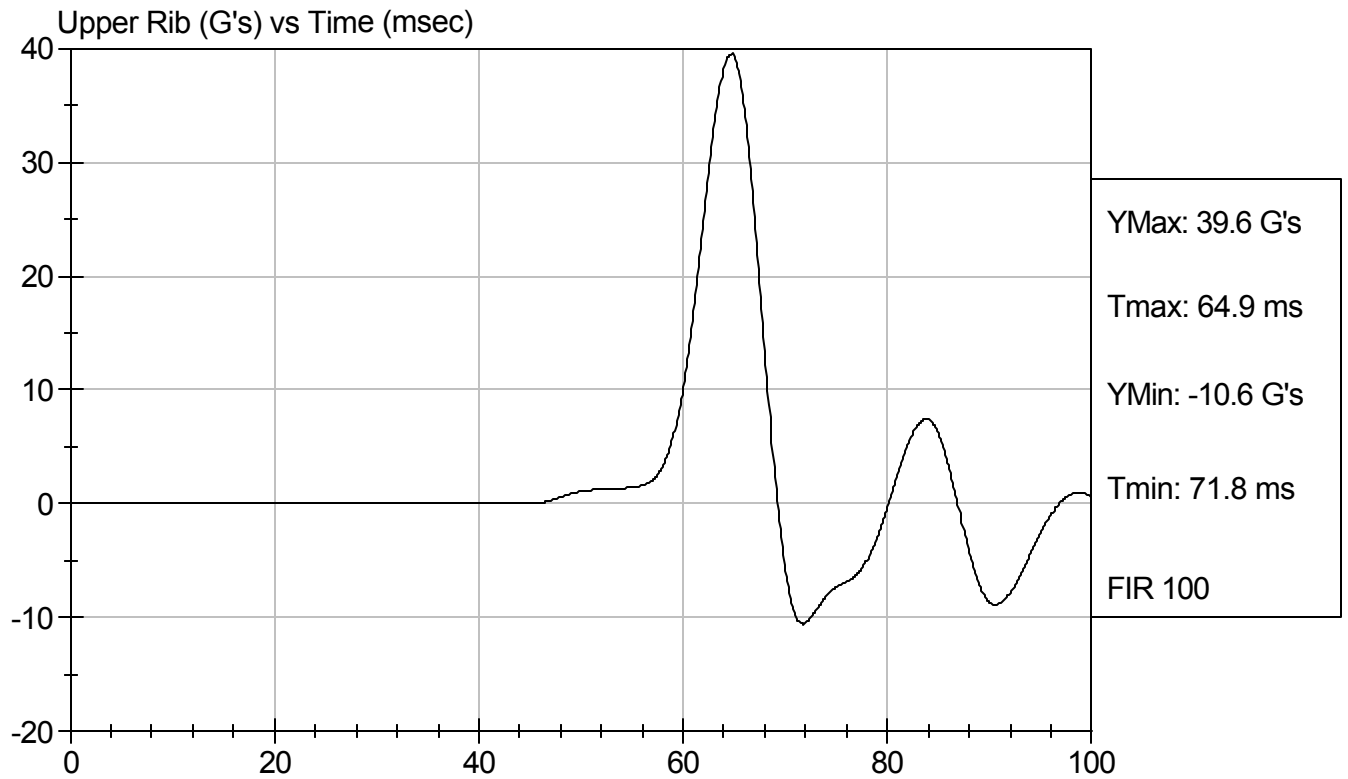

Approved By

11/2/09
Test Date



Test Desc: Pelvis Impact
Component ID: D092792

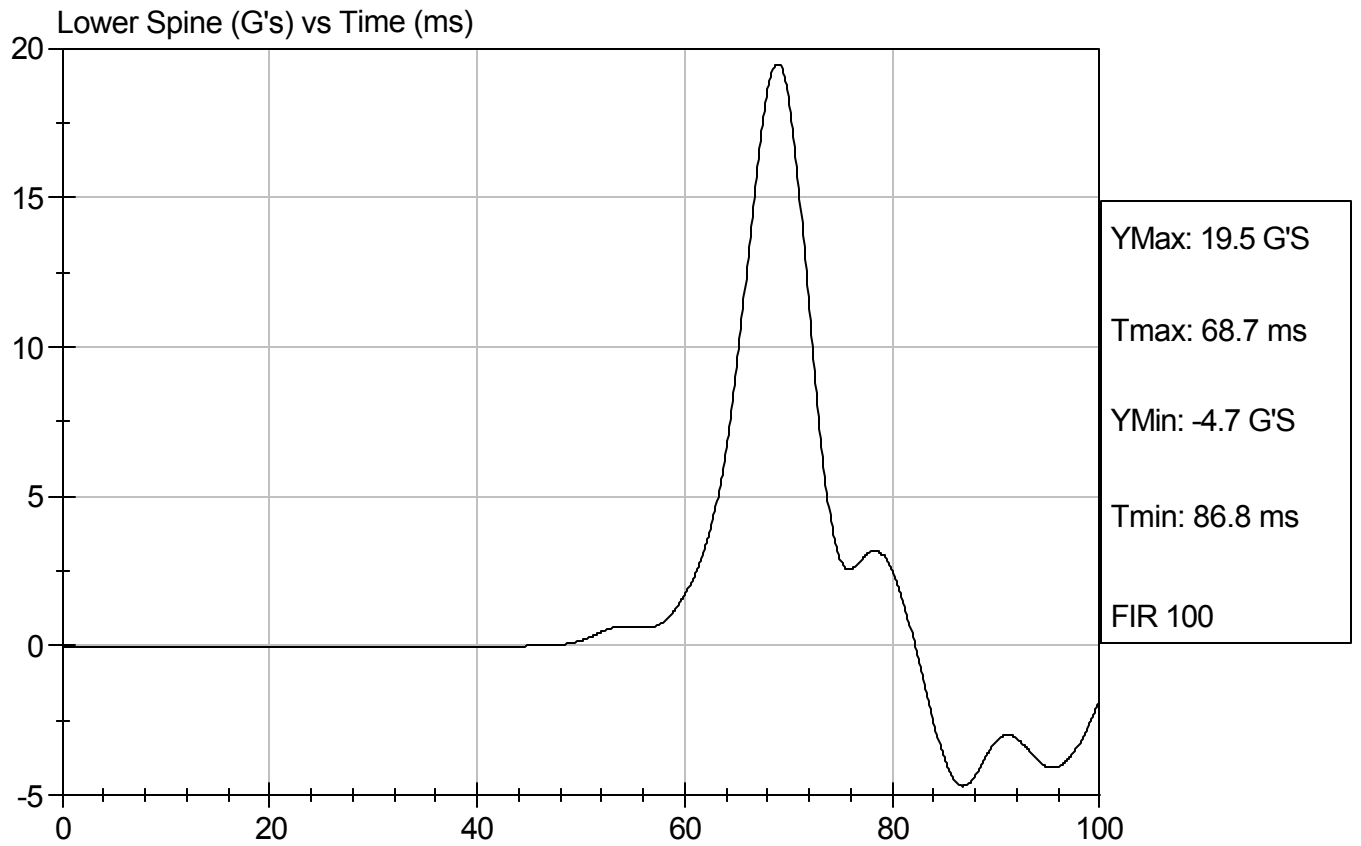
Test Date: 11/2/09
Speed: 14.12 ft/s, 4.30 m/s





Test Desc: Pelvis Impact
Component ID: D092792

Test Date: 11/2/09
Speed: 14.12 ft/s, 4.30 m/s



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

ATD Serial No: 272

Test I.D: D092793

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	42	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

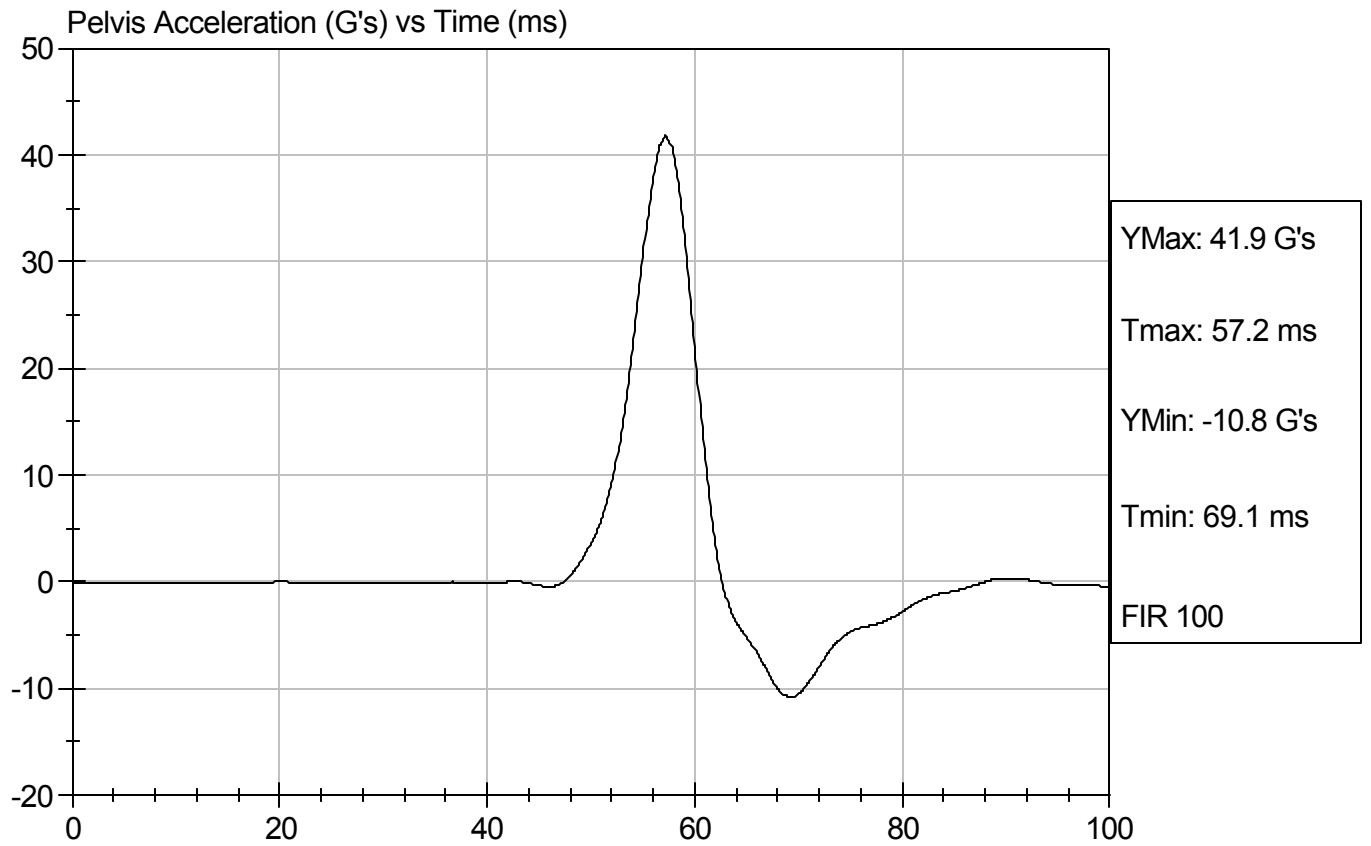
David Winkelbauer
Approved By

11/2/09
Test Date



Test Desc: Pelvis Impact
Component ID: D092793

Test Date: 11/2/09
Speed: 14.12 ft/s, 4.30 m/s



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

ATD Serial No: 272

Test I.D: D092794

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Force At 12.7 mm	N	104 -162	128	Pass
Force At 19 mm	N	163 - 222	188	Pass
Force At 25.4 mm	N	222 - 280	255	Pass
Force At 33 mm	N	325 - 391	352	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

11/2/09
Test Date

David Winkelbauer
Approved By

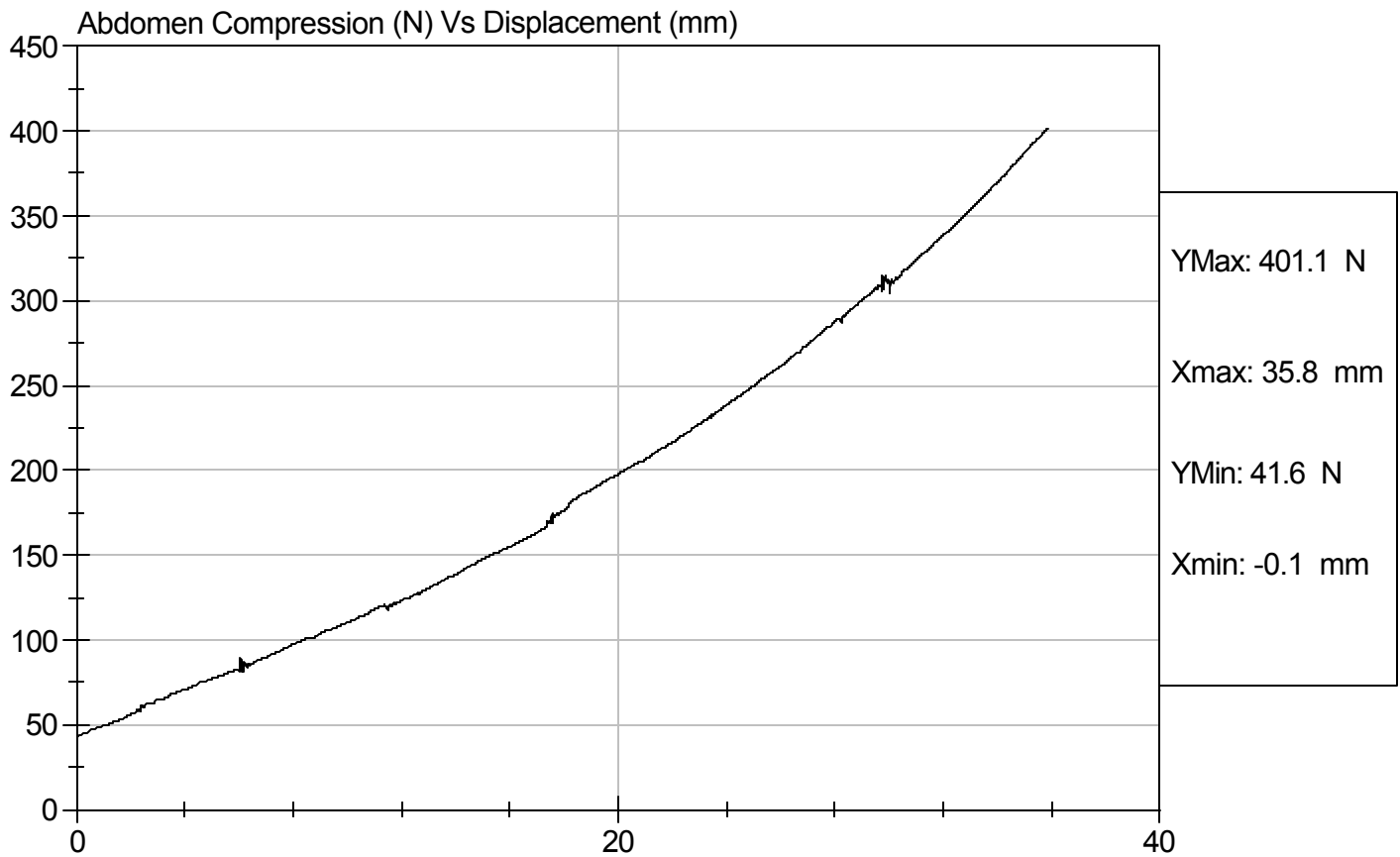


Test Description: Abdomen Compression

Test Date: 11/2/09

Component: D092794

Speed: 0 ft/s, 0 m/s



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

ATD Serial No: 272

Test I.D: D092795

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	130.8	Pass
Force At 30 deg	N	151.2 - 204.6	189.2	Pass
Force At 40 deg	N	204.6 - 258.0	245.6	Pass
Return Angle	Deg	12 Maximum	6	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

11/2/09
Test Date

David Winkelbauer
Approved By

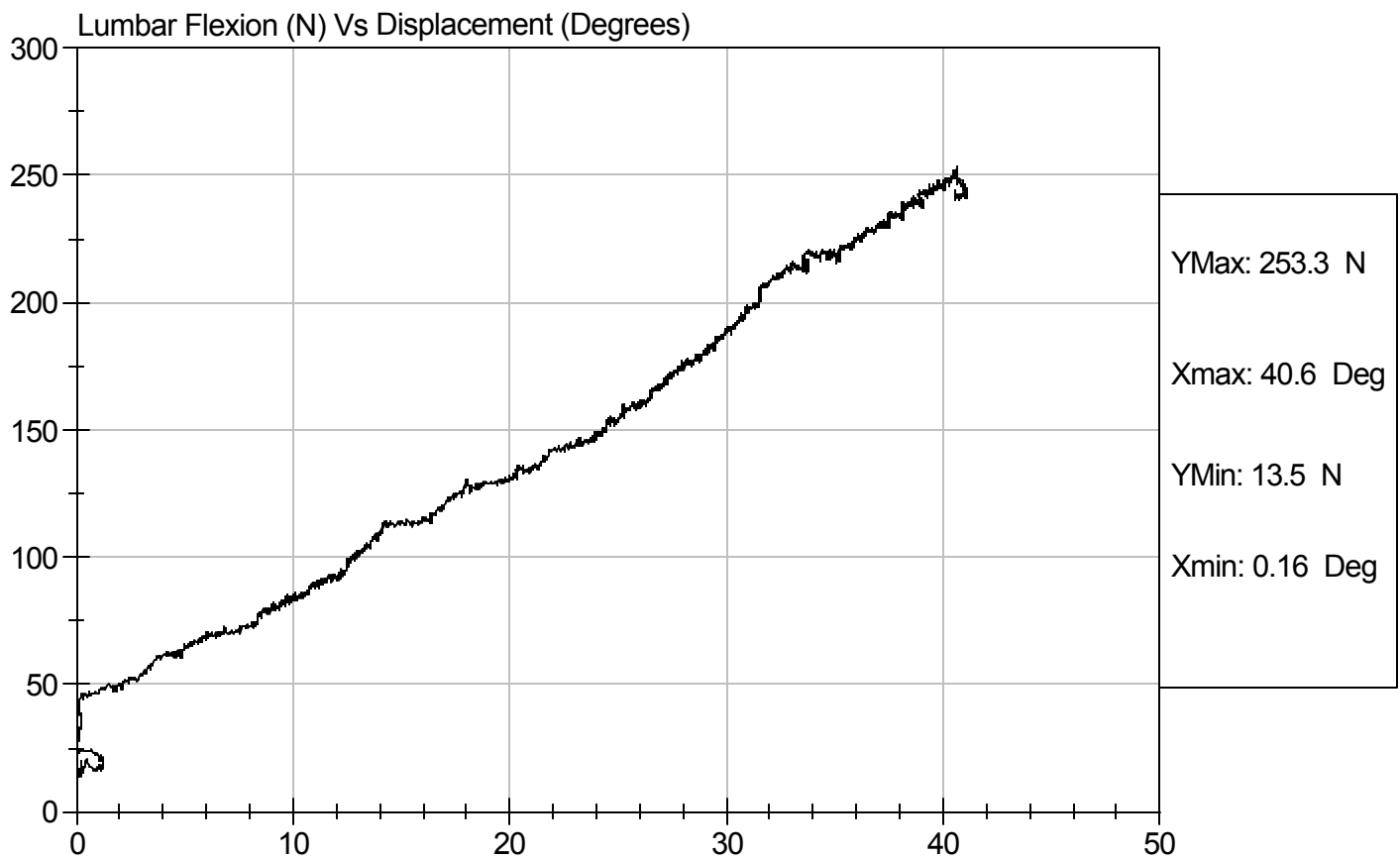


Test Description: Lumbar Flexion

Test Date: 11/2/09

Component: D092795

Speed: 0 ft/s, 0 m/s



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

ATD Serial No: 272

Test I.D: D092799

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	34	Pass
Impact Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 ms	m/s	1.96 to 2.55	2.34	Pass
	20 ms	m/s	4.12 to 5.10	4.51	Pass
	30 ms	m/s	5.73 to 7.01	6.25	Pass
	40 to 70 ms	m/s	6.27 to 7.64	6.71	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	74	Pass
Head Rotation Peak to Zero - Decay Time		ms	58 to 67	61	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	74	Pass
Mx Peak To Zero - Decay Time		ms	49 to 64	58	Pass
Mx Peak to Max. Head Rotation		ms	2 to 16	14	Pass


 Laboratory Technician

11/2/09

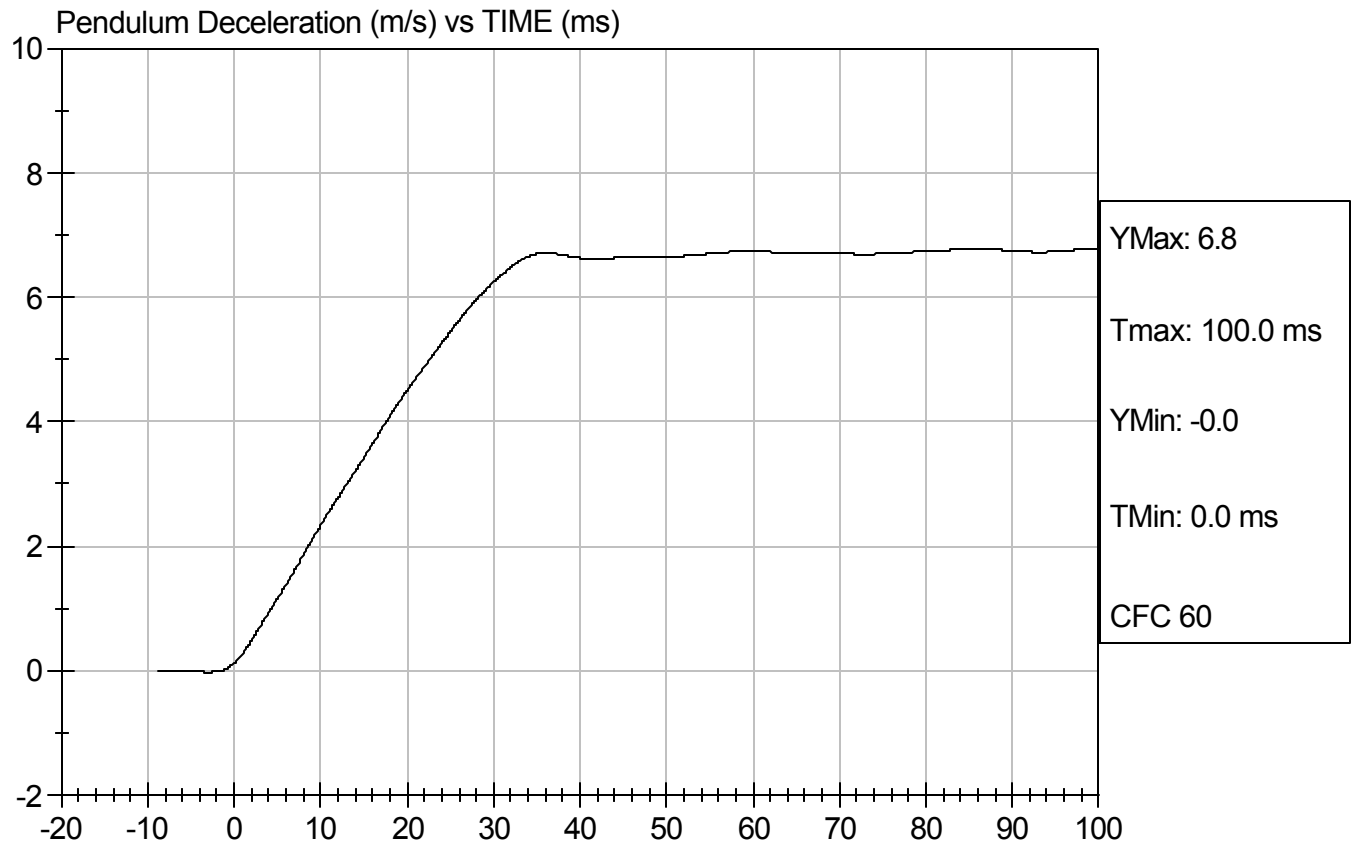
Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D092799

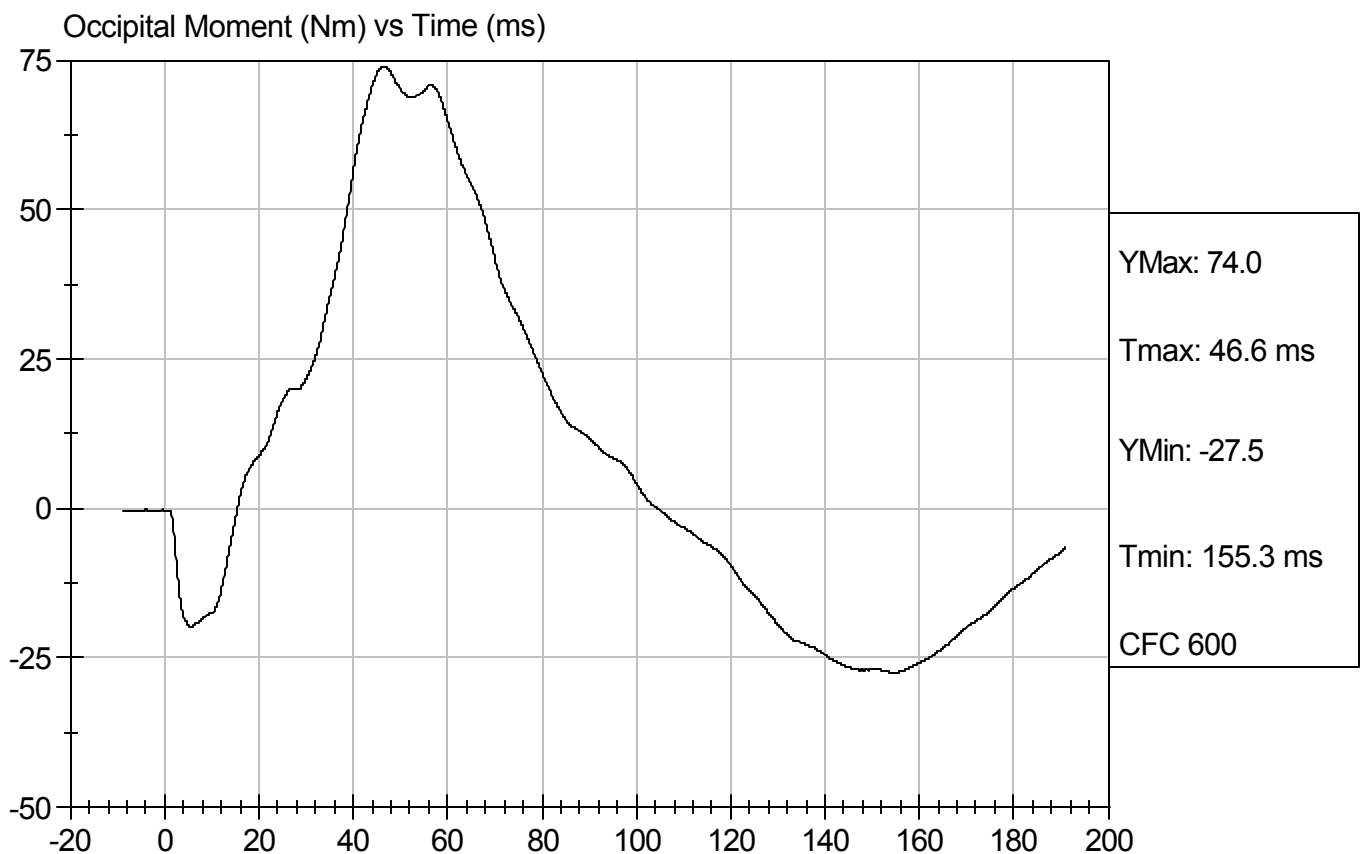
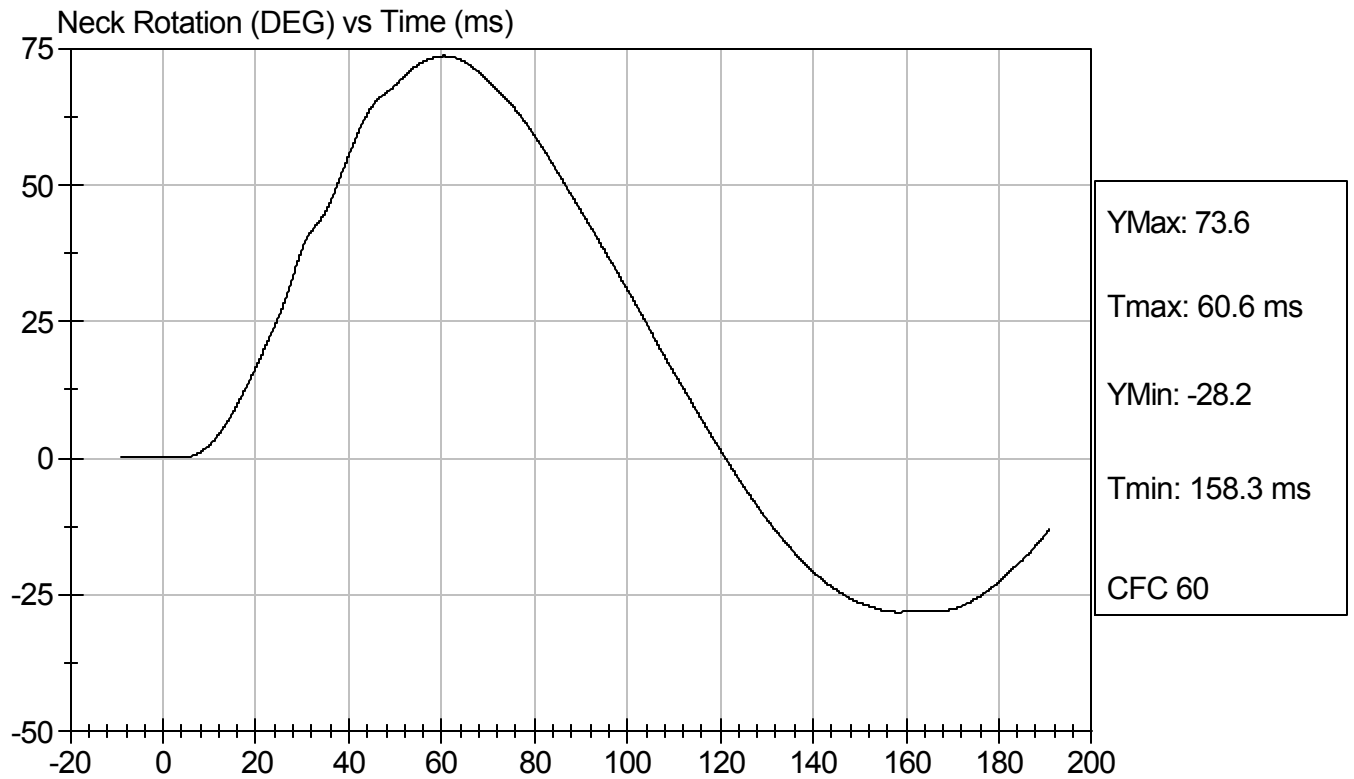
Test Date: 11/2/09
Speed: 23.14 ft/s, 7.05 m/s





Test Desc: Neck Bending
Component ID: D092799

Test Date: 11/2/09
Speed: 23.14 ft/s, 7.05 m/s



Calibration Test Results Summary

Dummy Serial Number: 272

Post-Test Calibration

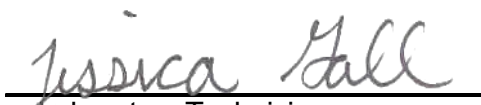
External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis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

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

ATD Serial No: 272

Test I.D: D092911

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	120 to 150	128	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


Laboratory Technician


Approved By

11/19/09
Test Date



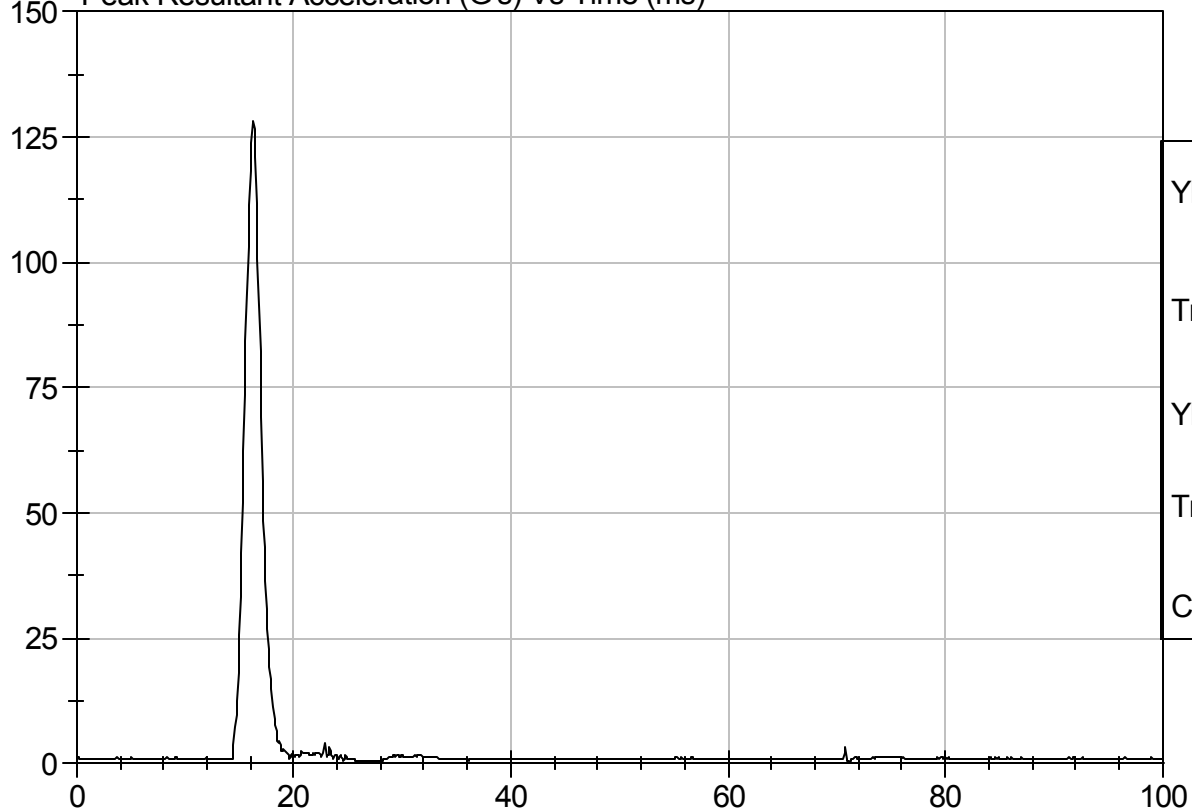
Test Description: Head Drop

Test Date: 11/19/09

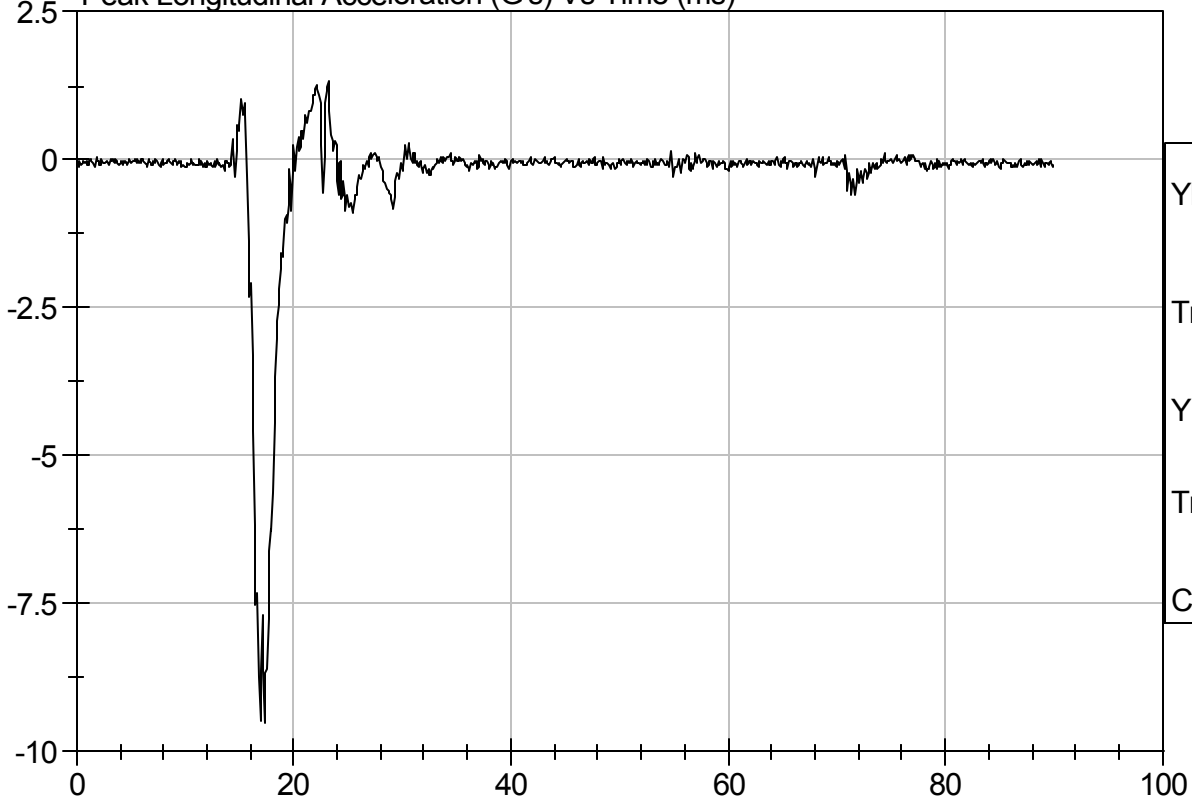
Component: D092911

Speed: 0 ft/s, 0 m/s

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



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



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

ATD Serial No: 272

Test I.D: D092912

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Velocity	m/s	4.22 - 4.31	4.23	Pass
Upper Rib	G's	37 - 46	38	Pass
Lower Rib	G's	37 - 46	37	Pass
Lower Spine	G's	15 - 22	19	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

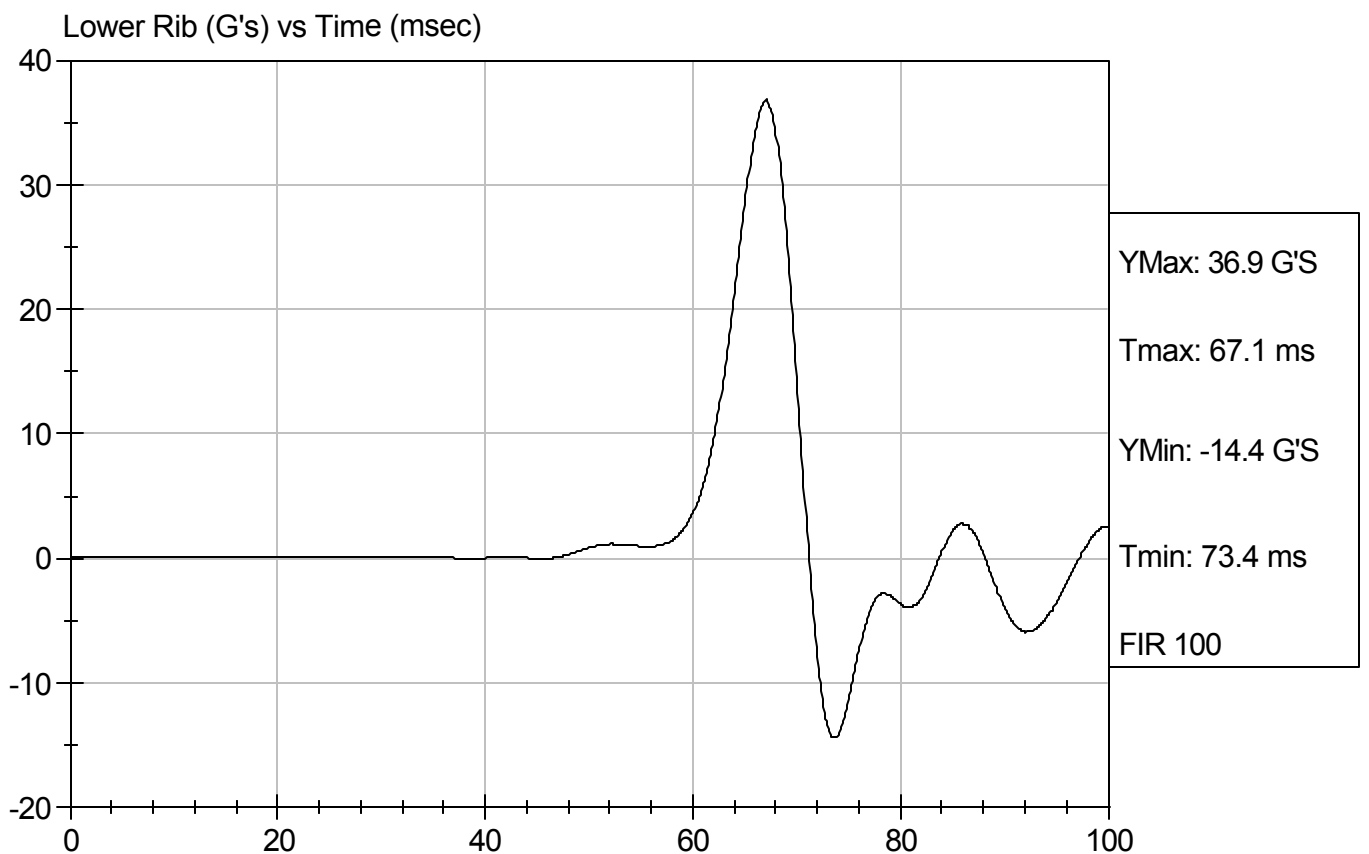
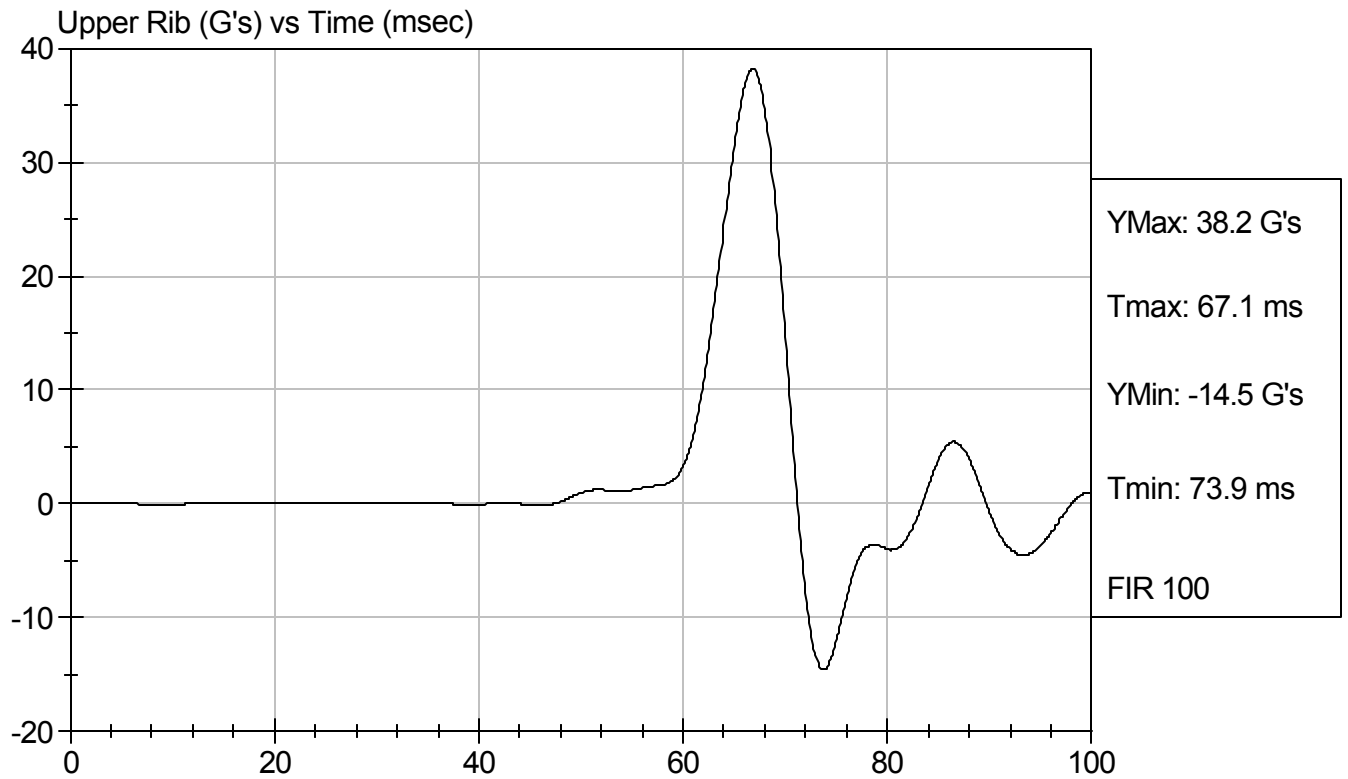
David Winkelbauer
Approved By

11/19/09
Test Date



Test Desc: Thorax Impact
Component ID: D092912

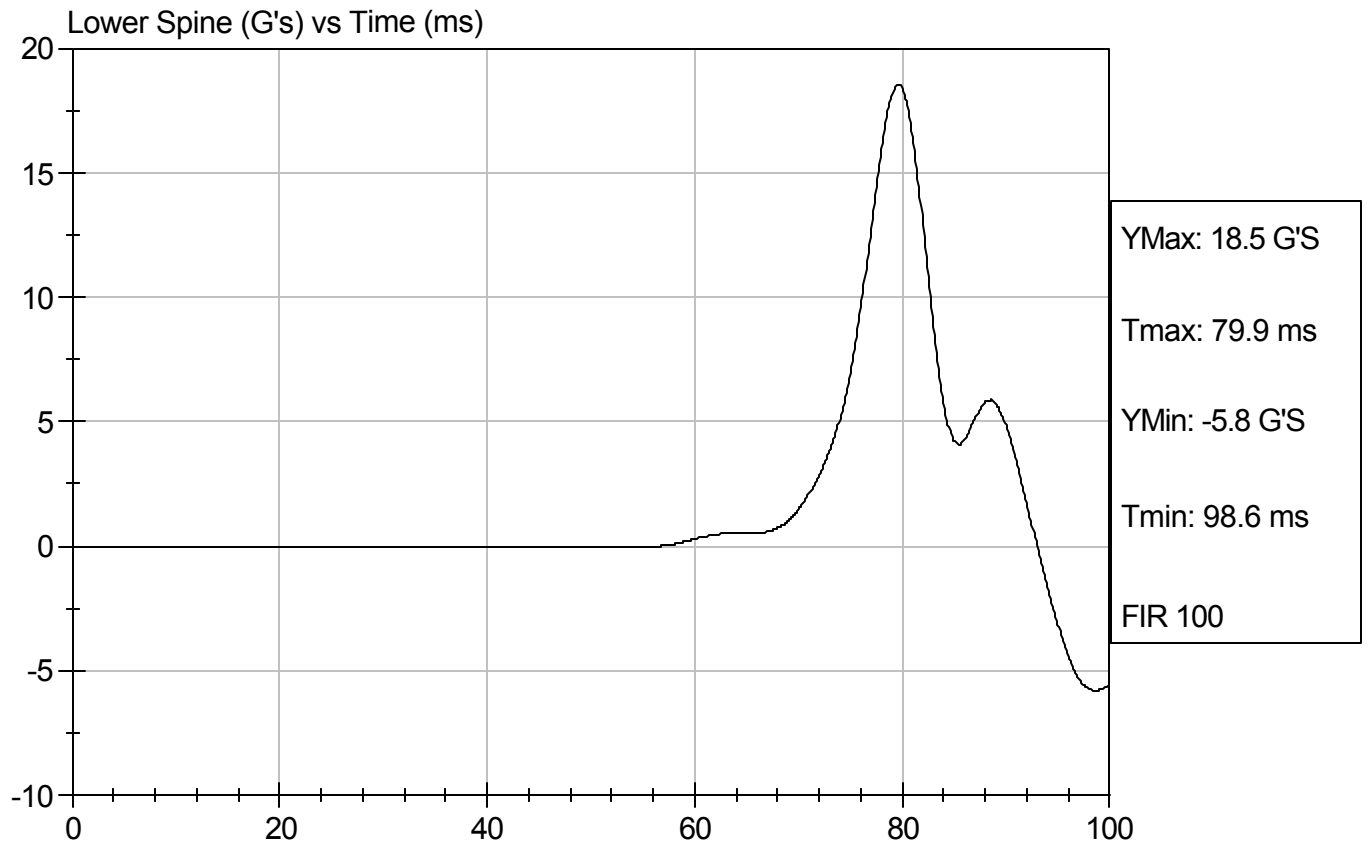
Test Date: 11/19/09
Speed: 13.89 ft/s, 4.23 m/s





Test Desc: Thorax Impact
Component ID: D092912

Test Date: 11/19/09
Speed: 13.89 ft/s, 4.23 m/s



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

ATD Serial No: 272

Test I.D: D092913

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	41	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

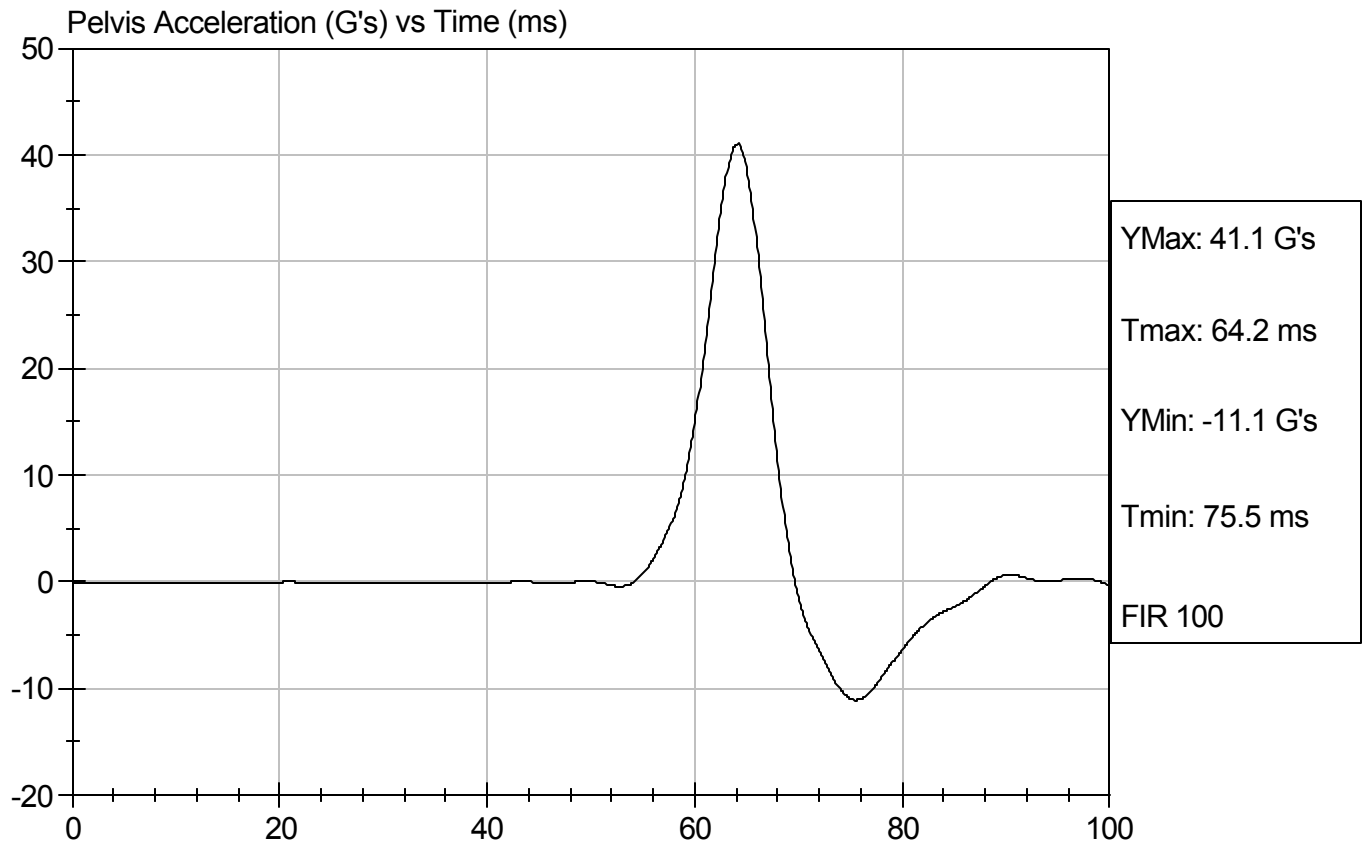
David Winkelbauer
Approved By

11/19/09
Test Date



Test Desc: Pelvis Impact
Component ID: D092913

Test Date: 11/19/09
Speed: 14.12 ft/s, 4.30 m/s



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

ATD Serial No: 272

Test I.D: D092914

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Force At 12.7 mm	N	104 -162	137	Pass
Force At 19 mm	N	163 - 222	187	Pass
Force At 25.4 mm	N	222 - 280	253	Pass
Force At 33 mm	N	325 - 391	347	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

David Winkelbauer
Approved By

11/19/09
Test Date

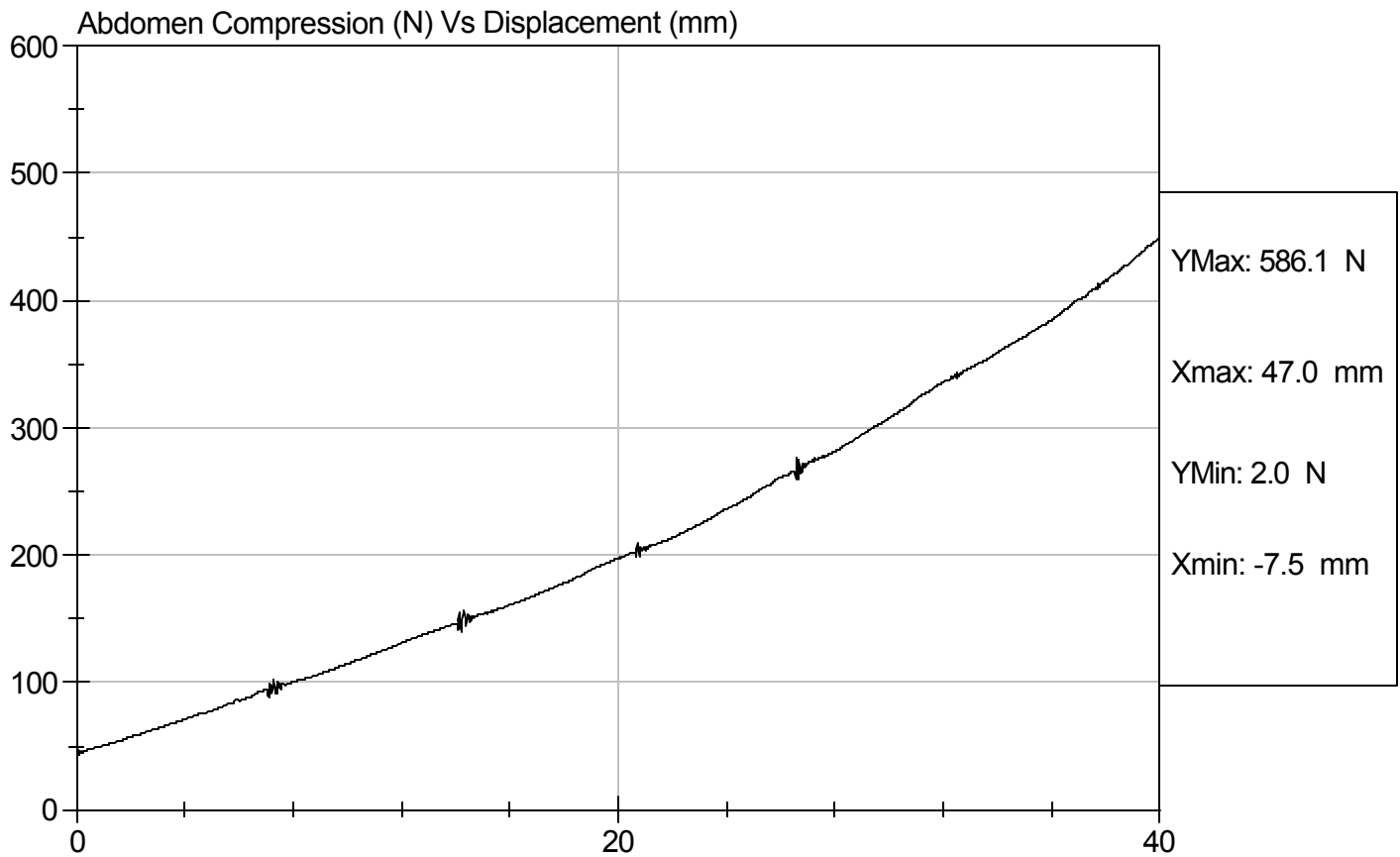


Test Description: Abdomen Compression

Test Date: 11/19/09

Component: D092914

Speed: 0 ft/s, 0 m/s



SID/Hiii Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 272

Test I.D: D092915

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	142.2	Pass
Force At 30 deg	N	151.2 - 204.6	179.3	Pass
Force At 40 deg	N	204.6 - 258.0	224.4	Pass
Return Angle	Deg	12 Maximum	3	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

11/19/09
Test Date

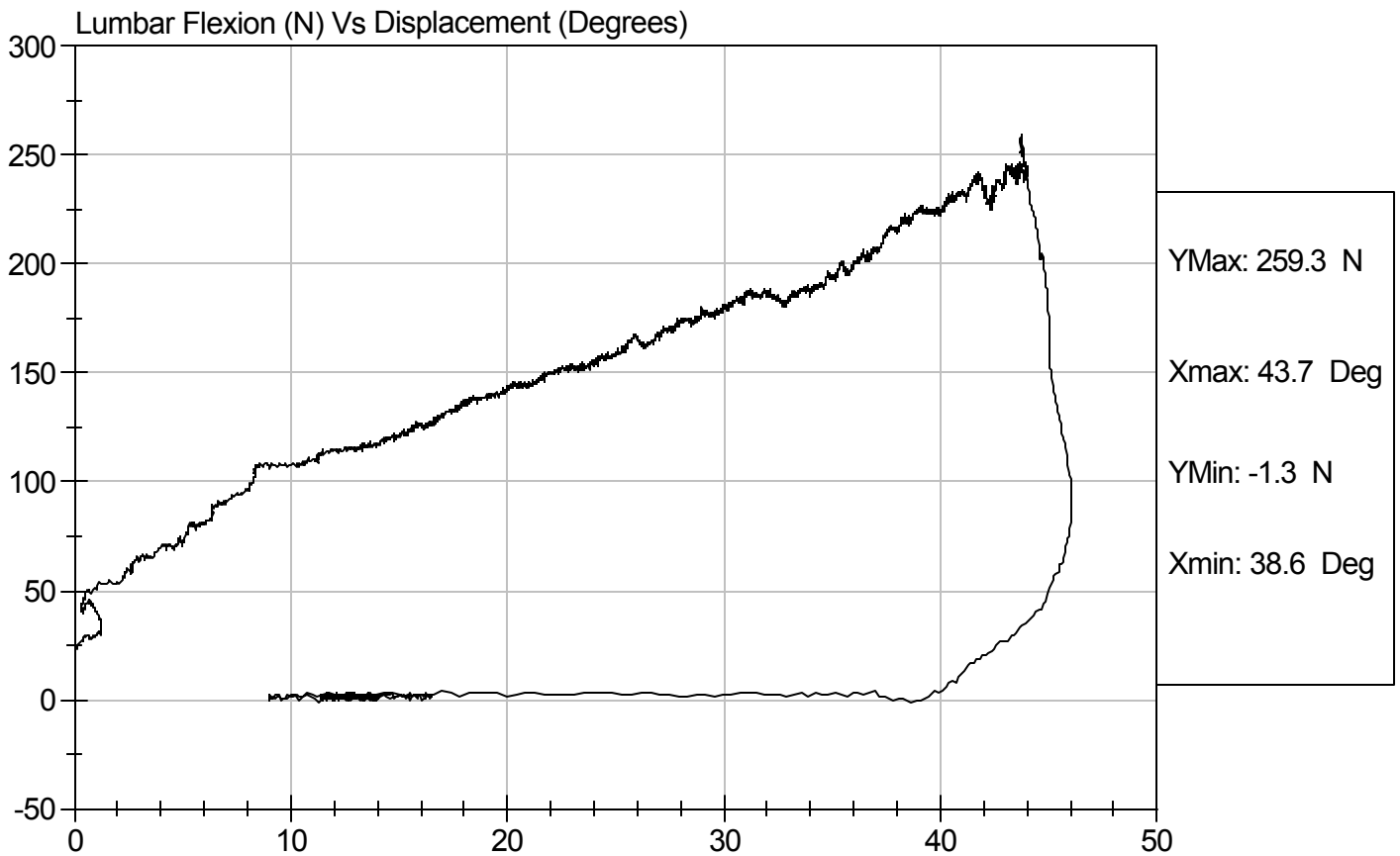


Test Description: Lumbar Flexion

Test Date: 11/19/09

Component: D092915

Speed: 0 ft/s, 0 m/s

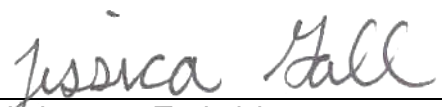


SID/HIII Calibration Data Sheet
Side Impact Dummy
Neck Pendulum Test

ATD Serial No: 272

Test I.D: D092919

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Impact Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	1.96 to 2.55	2.32	Pass
	20 ms	m/s	4.12 to 5.10	4.53	Pass
	30 ms	m/s	5.73 to 7.01	6.18	Pass
	40 to 70 ms	m/s	6.27 to 7.64	6.91	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	73	Pass
Head Rotation Peak to Zero - Decay Time		ms	58 to 67	59	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	79	Pass
Mx Peak To Zero - Decay Time		ms	49 to 64	55	Pass
Mx Peak to Max. Head Rotation		ms	2 to 16	12	Pass


 Laboratory Technician

11/19/09

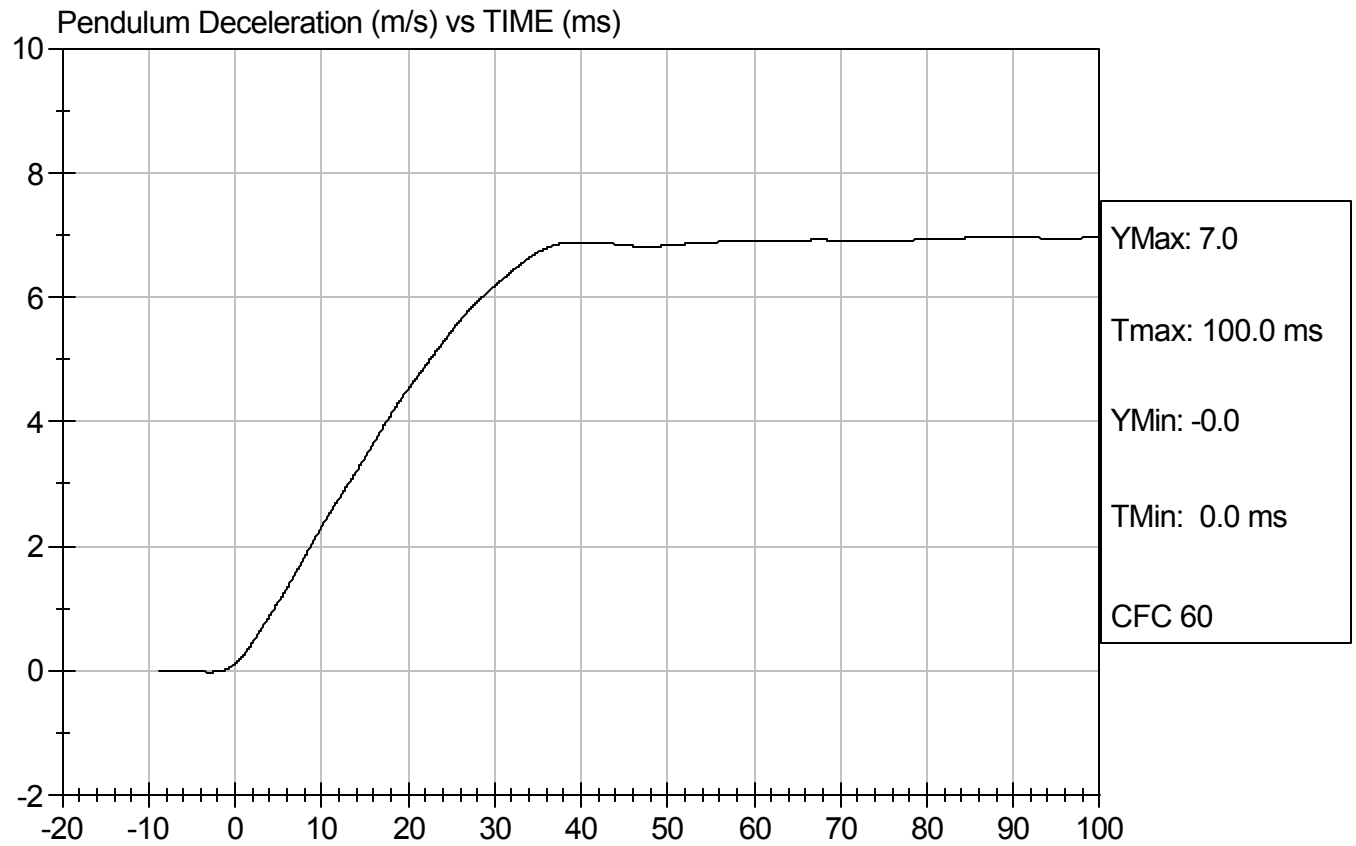
Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D092919

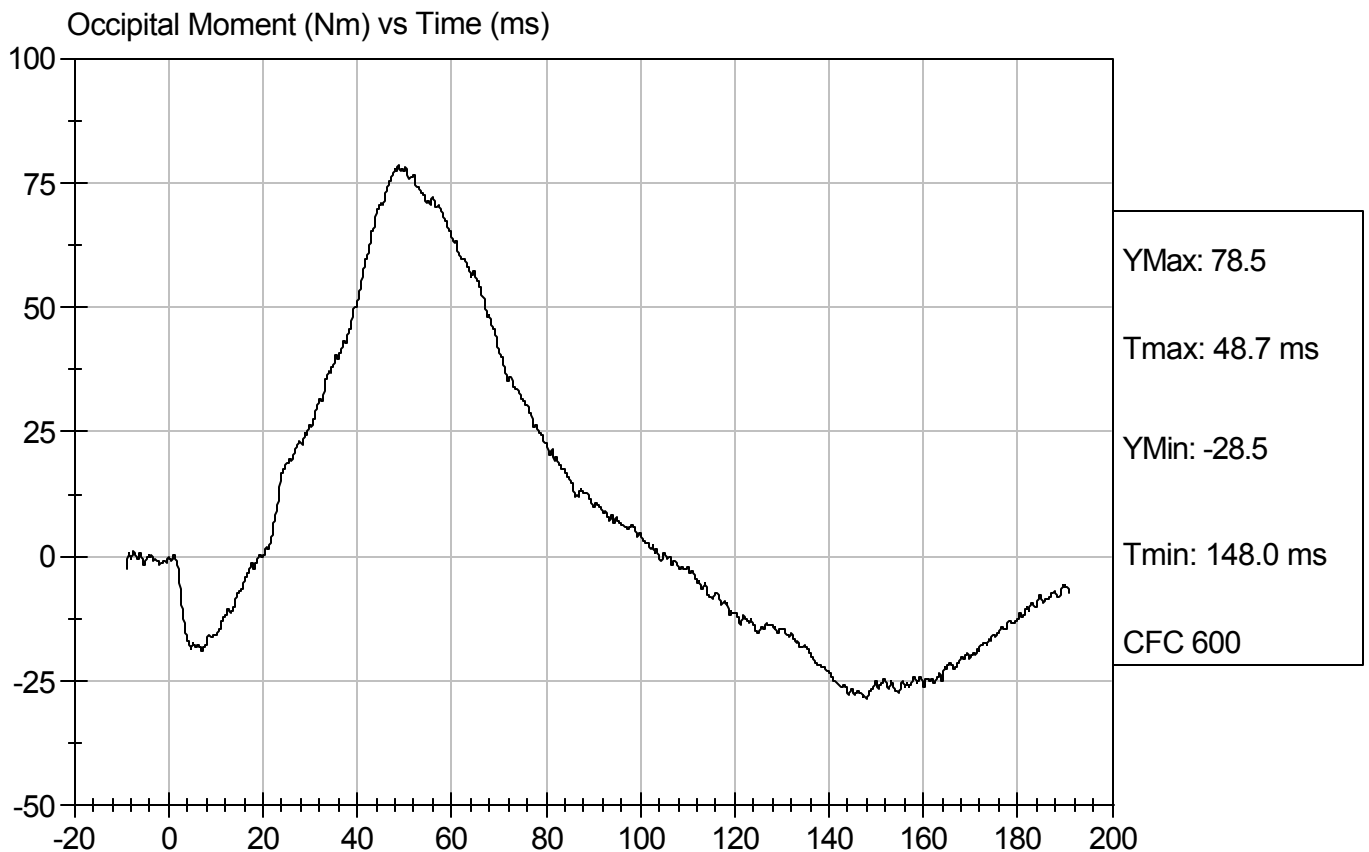
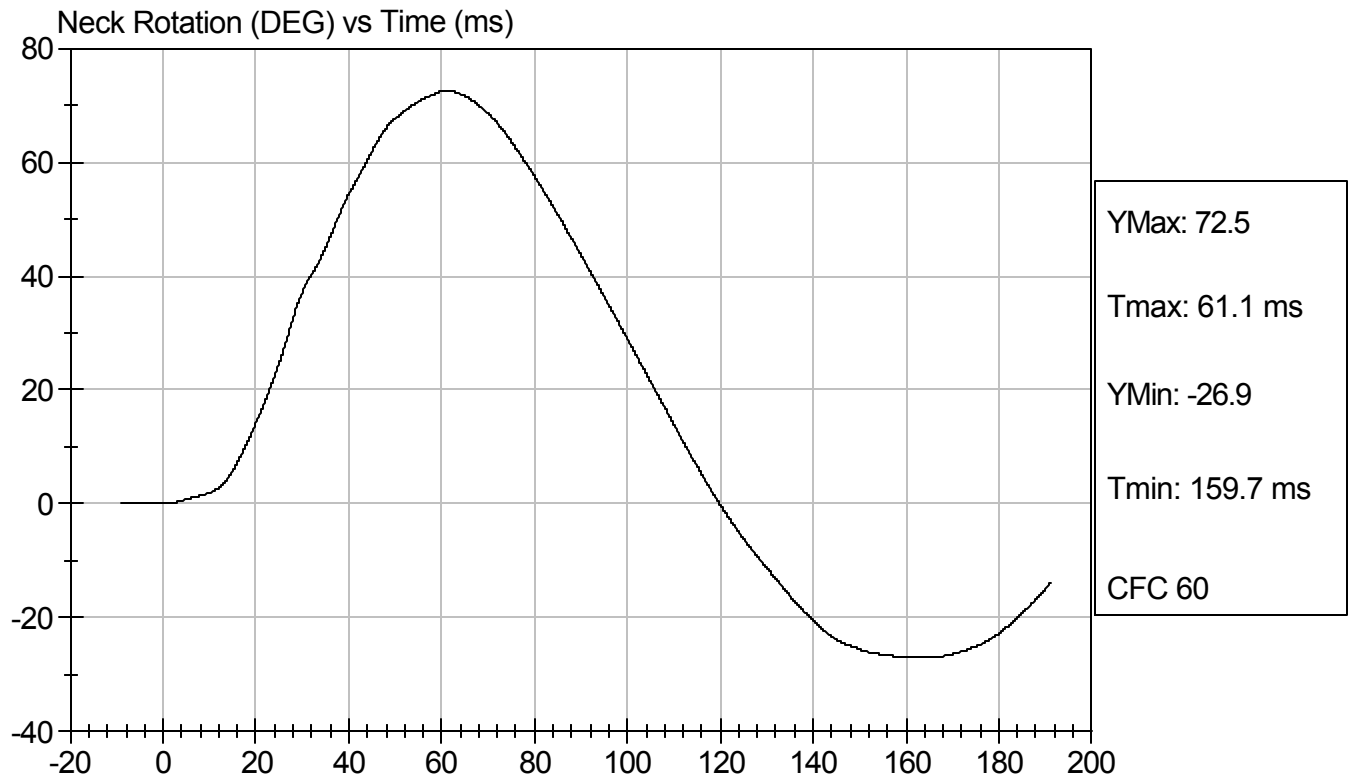
Test Date: 11/19/09
Speed: 23.15 ft/sec, 7.06 m/sec





Test Desc: Neck Bending
Component ID: D092919

Test Date: 11/19/09
Speed: 23.15 ft/sec, 7.06 m/sec



SID/HIII Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No: 272

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

Jessica Hall
Laboratory Technician
David Winkelbauer
Approved By

11/19/09

Test Date

CERTIFICATION DATA

Dummy Serial Number: 271

Calibration Test Results Summary

Dummy Serial Number: 271

Pre-Test Calibration

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

SID/HIII Calibration Data Sheet
Side Impact Dummy
External Measurements

ATD Serial No: 271

Test I.D: D09278

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

David Winkelbauer
Approved By

11/2/2009
Test Date

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

ATD Serial No: 271

Test I.D: D092801

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	28	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	8.8	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

11/3/09
Test Date

David Winkelbauer
Approved By



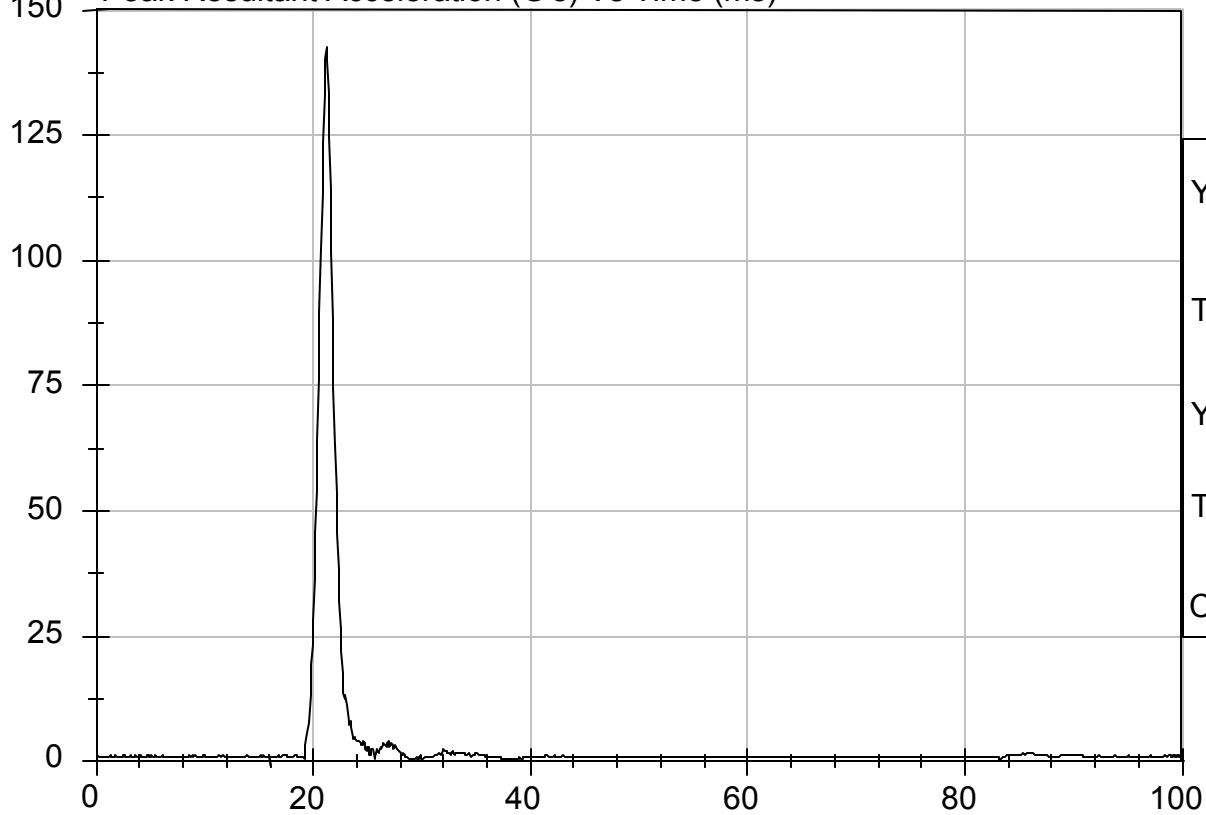
Test Description: Head Drop

Test Date: 11/3/09

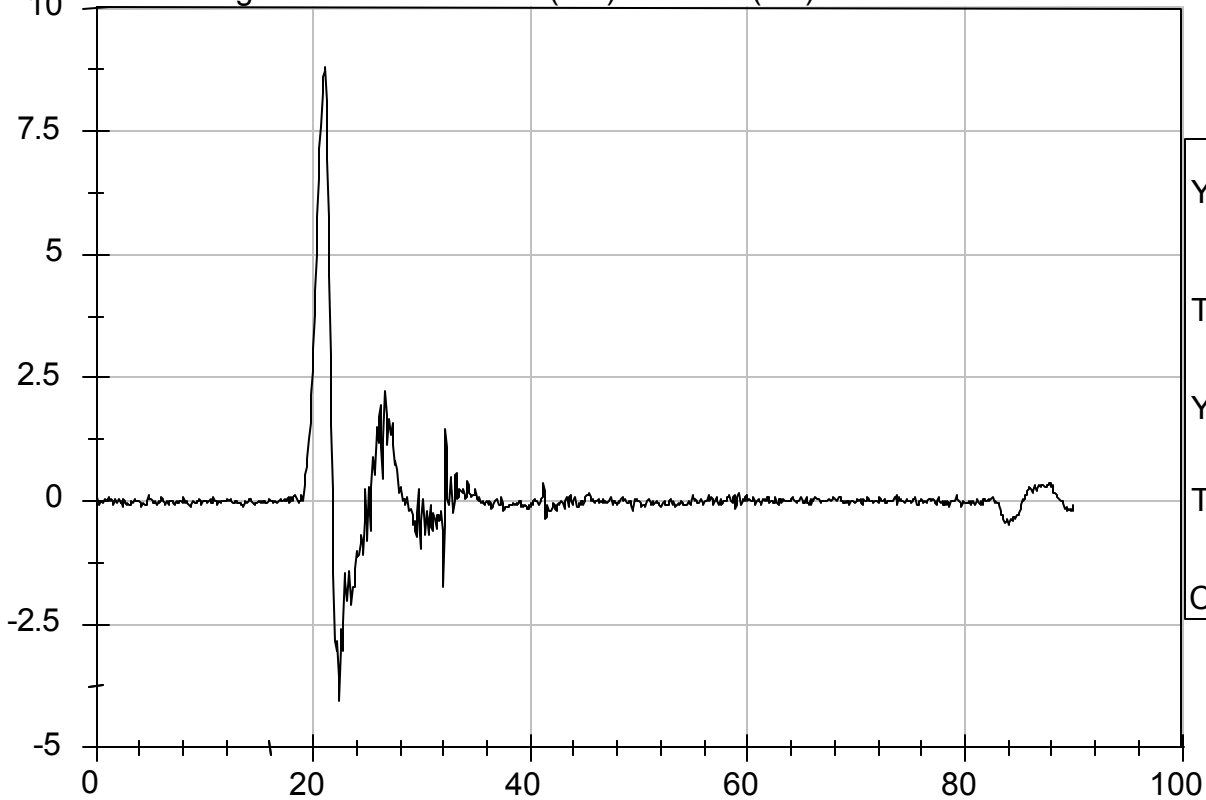
Component: D092801

Speed: 0 ft/s, 0 m/s

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



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



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

ATD Serial No: 271

Test I.D: D092802

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	40	Pass
Lower Rib	G's	37 - 46	40	Pass
Lower Spine	G's	15 - 22	20	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

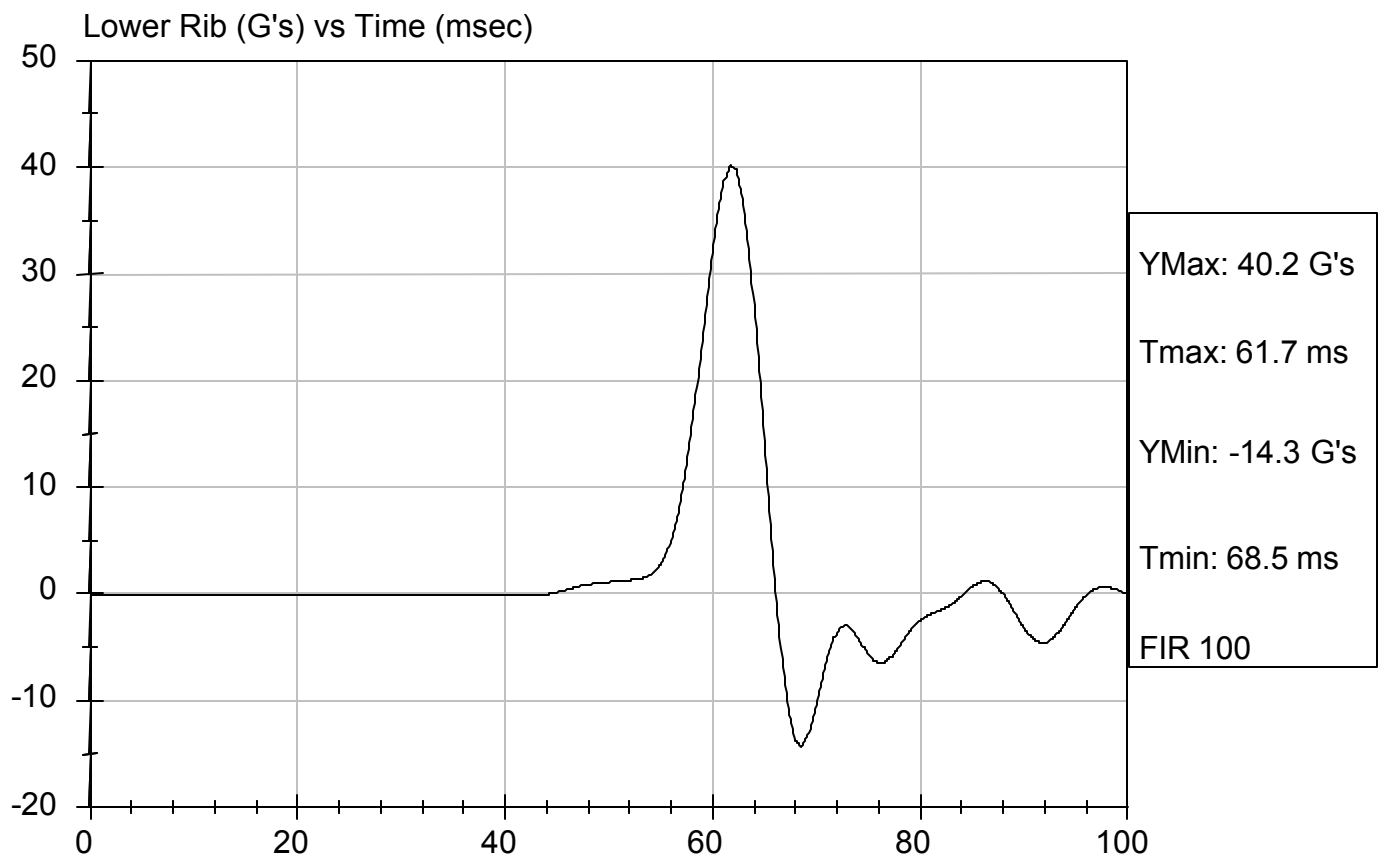
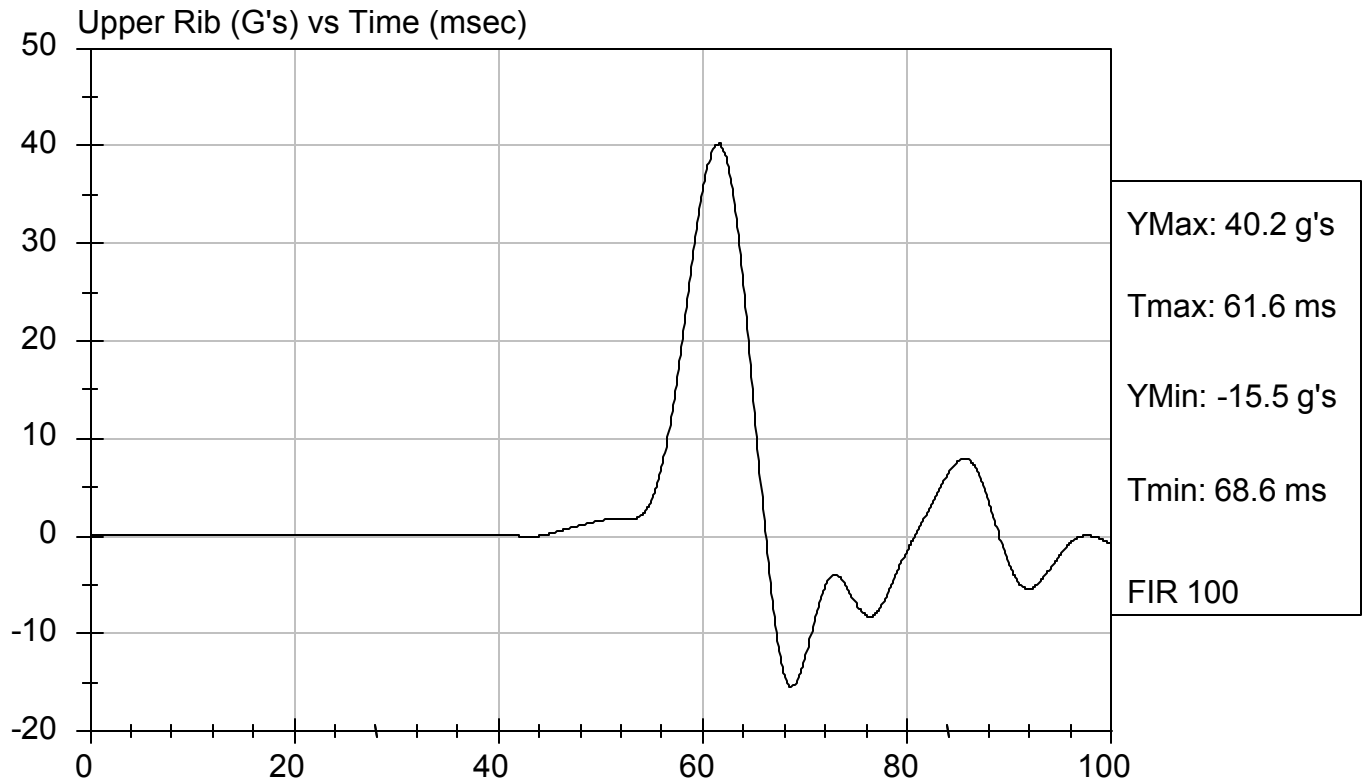
David Winkelbauer
Approved By

11/3/09
Test Date



Test Desc: Thorax Impact
Component ID: D092802

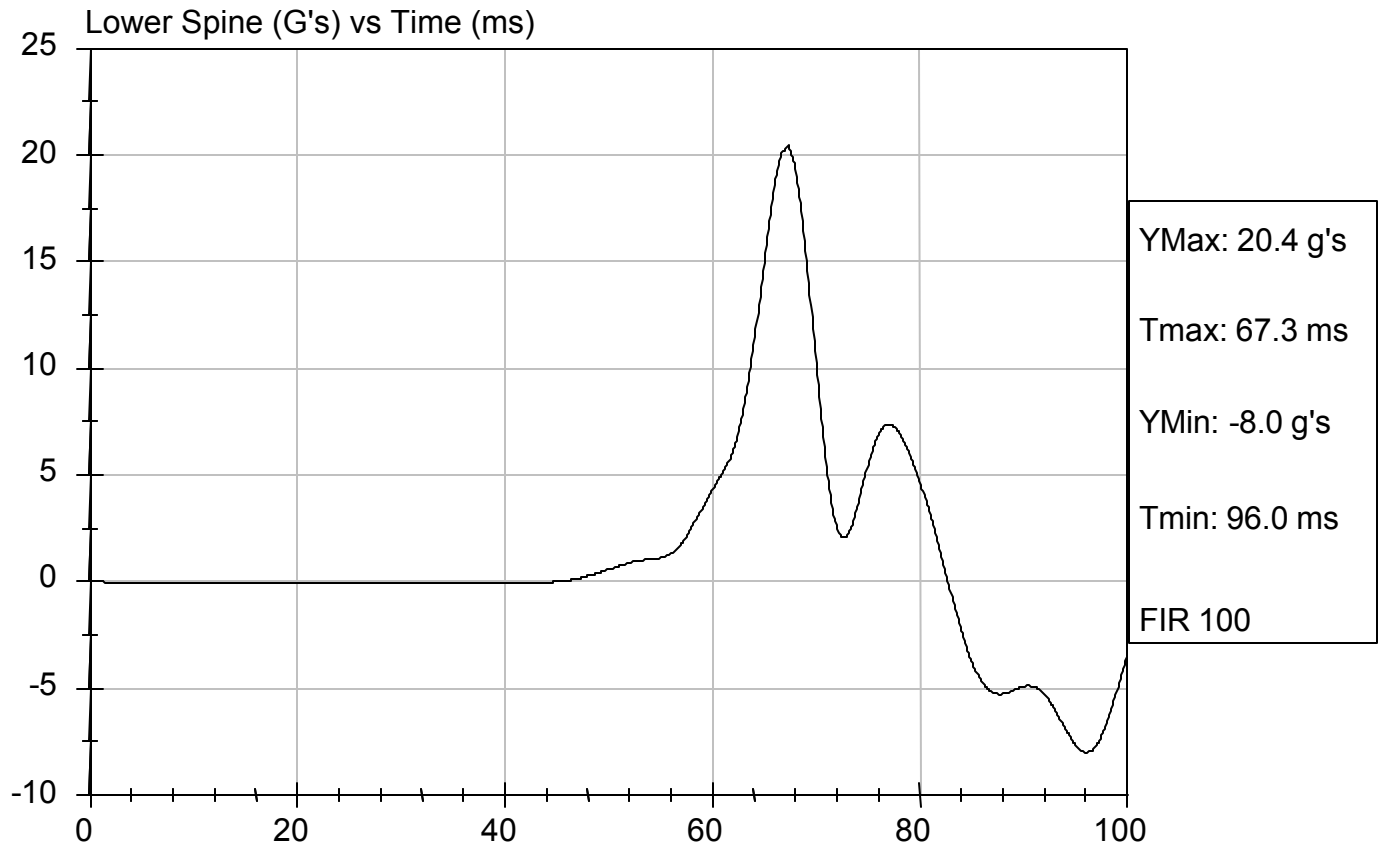
Test Date: 11/3/09
Speed: 14.12 ft/s, 4.30 m/s





Test Desc: Thorax Impact
Component ID: D092802

Test Date: 11/3/09
Speed: 14.12 ft/s, 4.30 m/s



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

ATD Serial No: 271

Test I.D: D092803

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	31	Pass
Probe Velocity	m/s	4.27 - 4.33	4.27	Pass
Pelvis Acceleration	G's	40 - 60	46	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

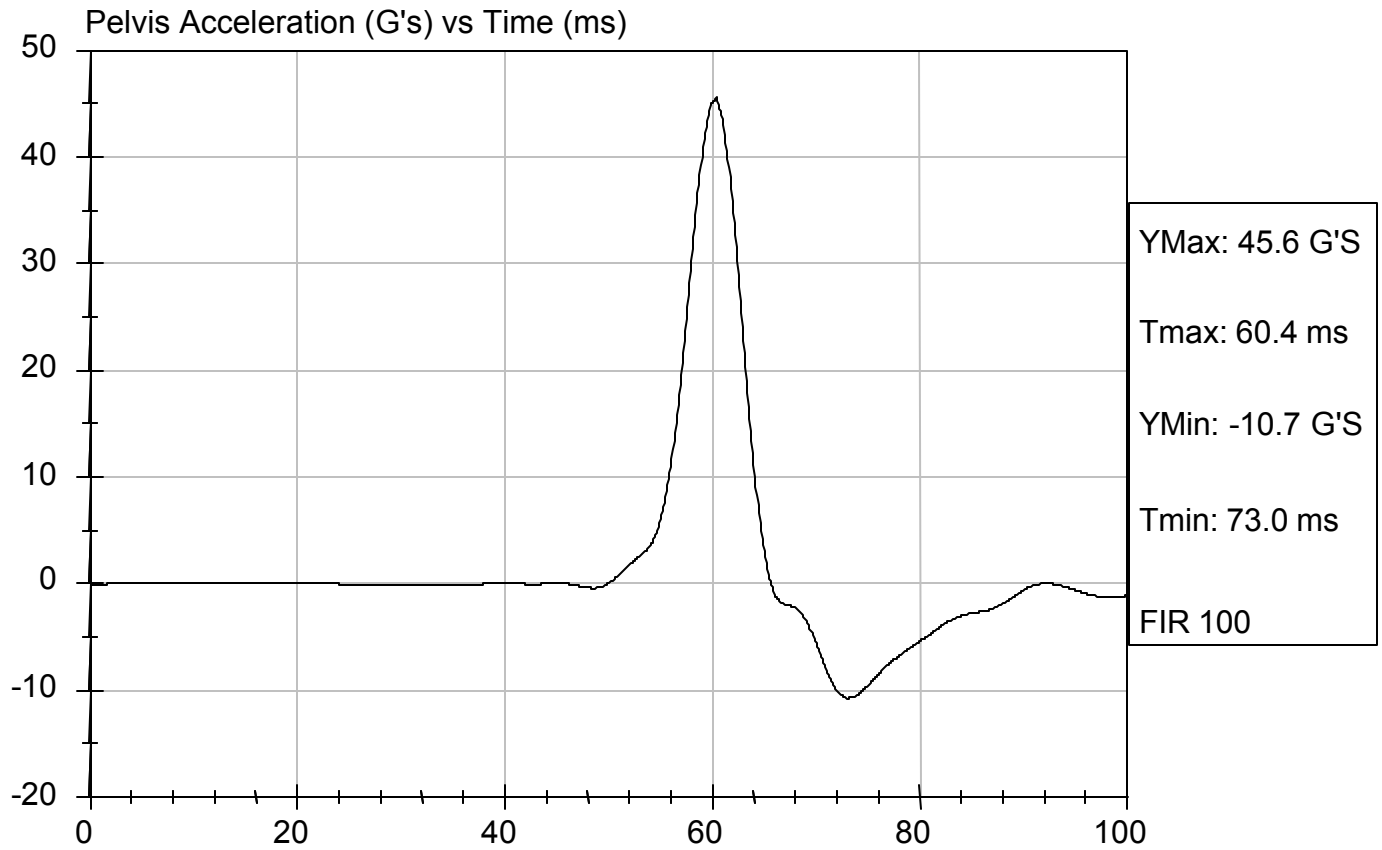
David Winkelbauer
Approved By

11/3/09
Test Date



Test Desc: Pelvis Impact
Component ID: D092803

Test Date: 11/3/09
Speed: 14.01 ft/s, 4.27 m/s



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

ATD Serial No: 271

Test I.D: D092804

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	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	203	Pass
Force At 25.4 mm	N	222 - 280	274	Pass
Force At 33 mm	N	325 - 391	376	Pass
Overall Test Results				Pass


Laboratory Technician

11/3/09
Test Date

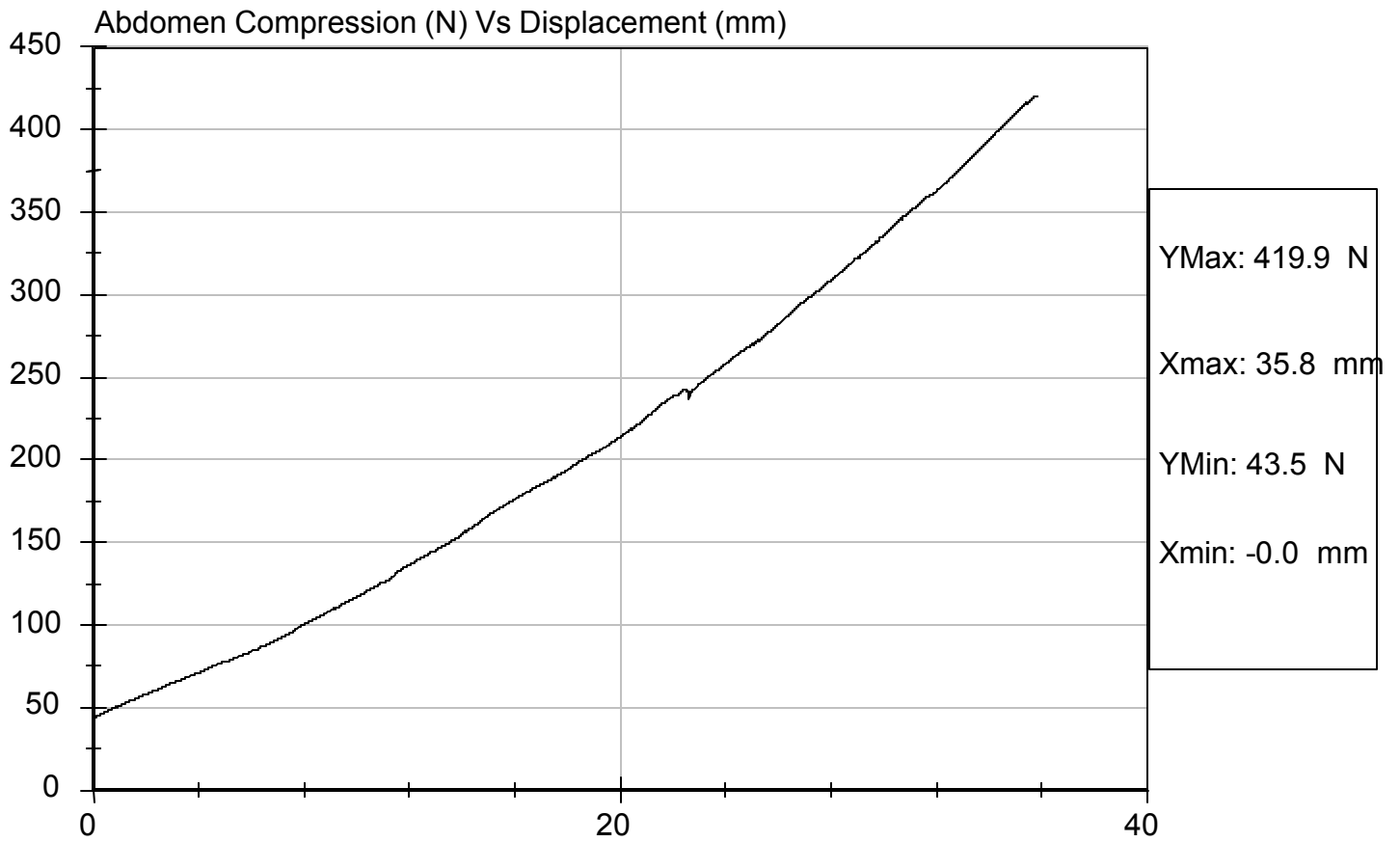

Approved By



Test Description: Abdomen Compression Test Date: 11/3/09

Component: D092804

Speed: 0 ft/s, 0 m/s



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

ATD Serial No: 271

Test I.D: D092805

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	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	113.1	Pass
Force At 30 deg	N	151.2 - 204.6	159.5	Pass
Force At 40 deg	N	204.6 - 258.0	212.3	Pass
Return Angle	Deg	12 Maximum	5	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

11/3/09
Test Date

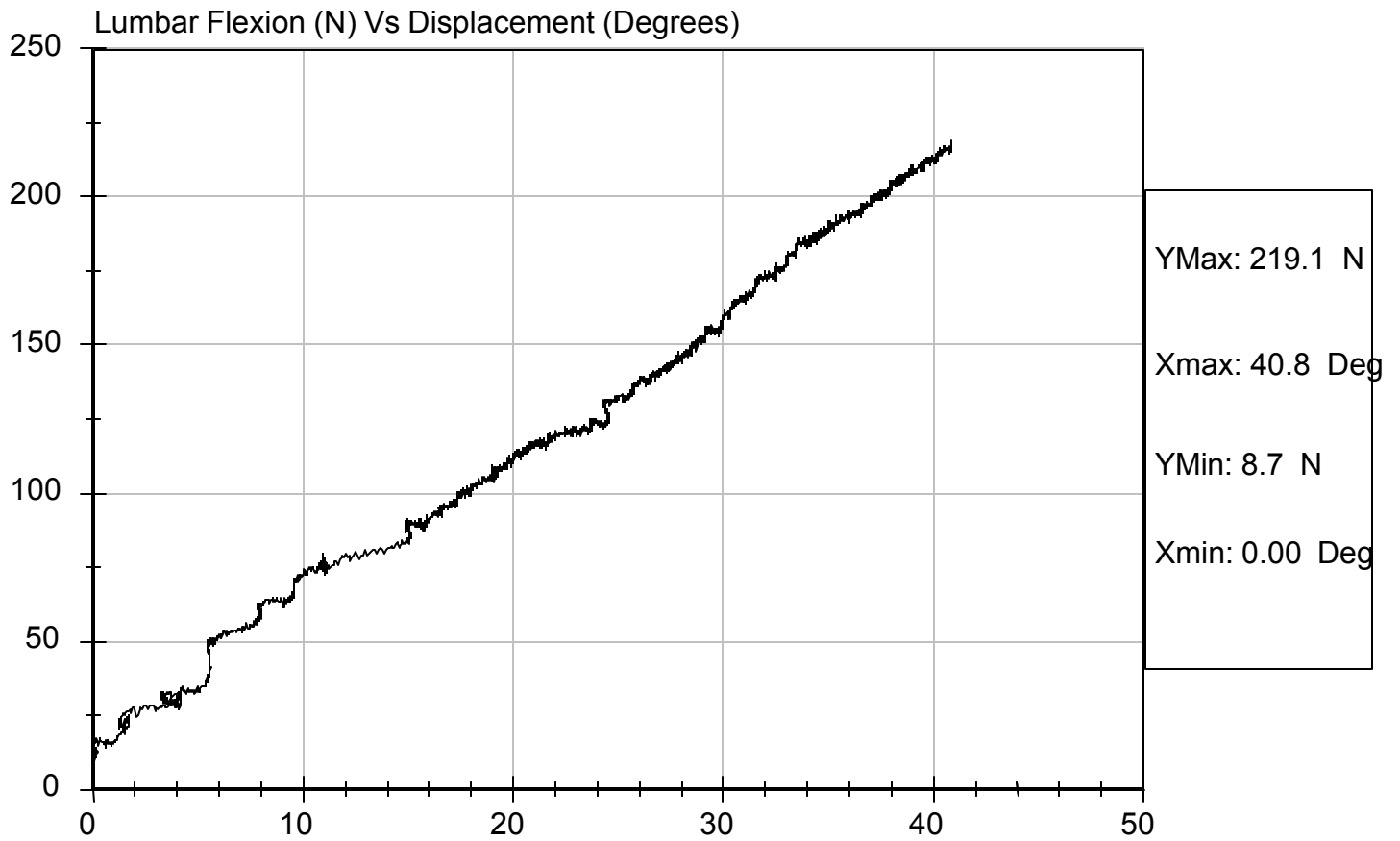


Test Description: Lumbar Flexion

Test Date: 11/3/09

Component: D092805

Speed: 0 ft/s, 0 m/s



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

ATD Serial No: 271

Test I.D: D092809

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	25	Pass
Impact Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 ms	m/s	1.96 to 2.55	2.35	Pass
	20 ms	m/s	4.12 to 5.10	4.54	Pass
	30 ms	m/s	5.73 to 7.01	6.34	Pass
	40 to 70 ms	m/s	6.27 to 7.64	6.71	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	72	Pass
Head Rotation Peak to Zero - Decay Time		ms	58 to 67	62	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	82	Pass
Mx Peak To Zero - Decay Time		ms	49 to 64	62	Pass
Mx Peak to Max. Head Rotation		ms	2 to 16	2	Pass


 Laboratory Technician

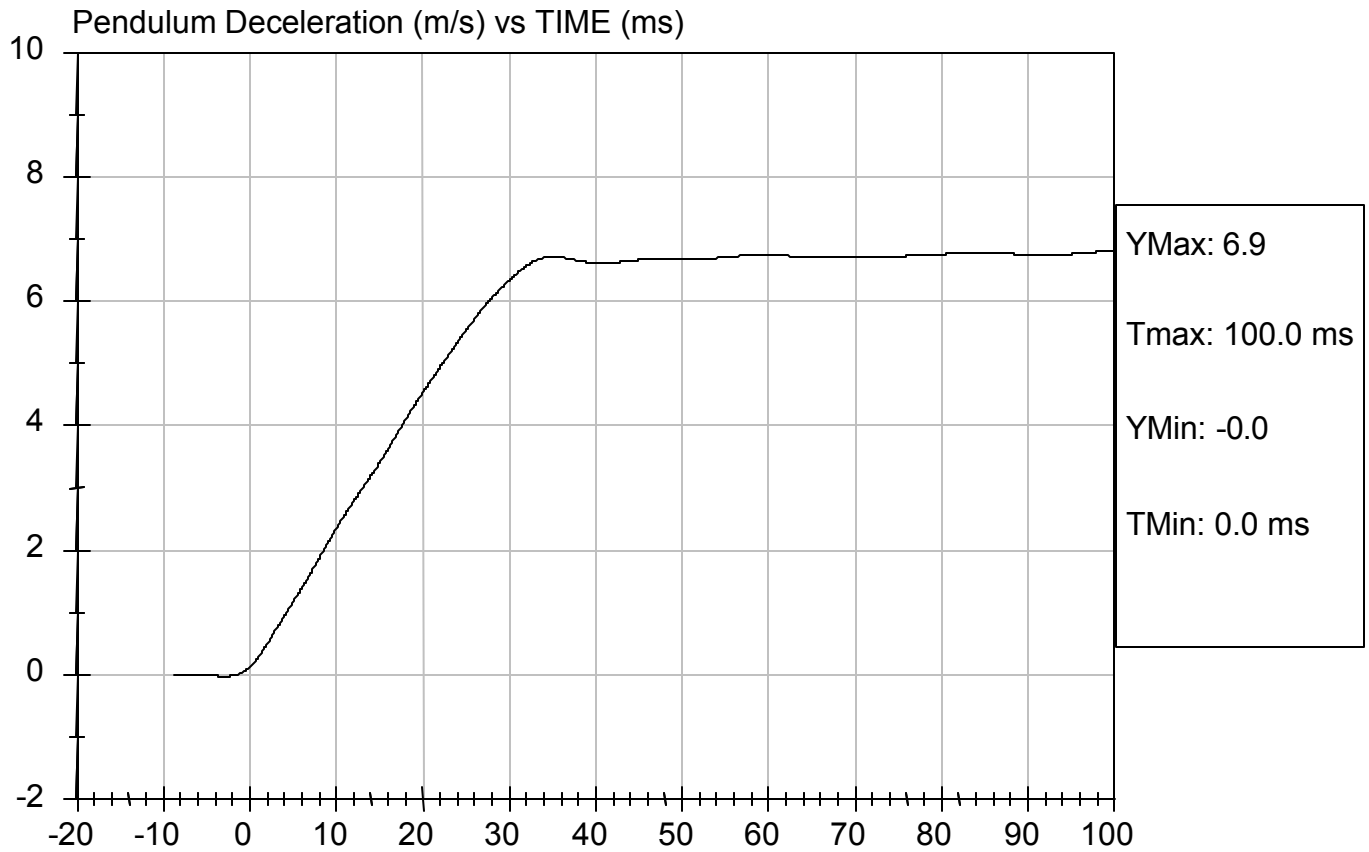

 Approved By

11/3/09
 Test Date



Test Desc: Neck Bending
Component ID: D092809

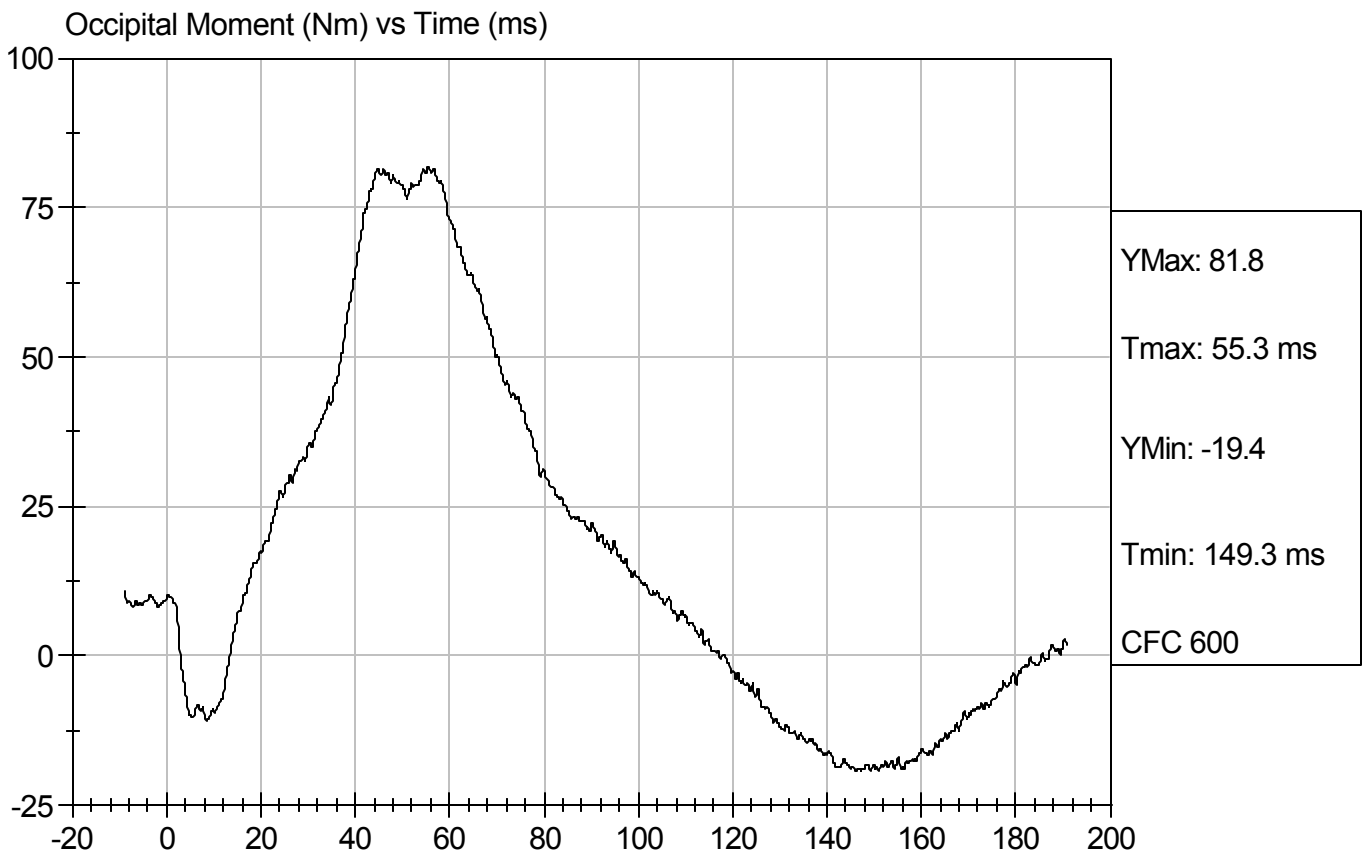
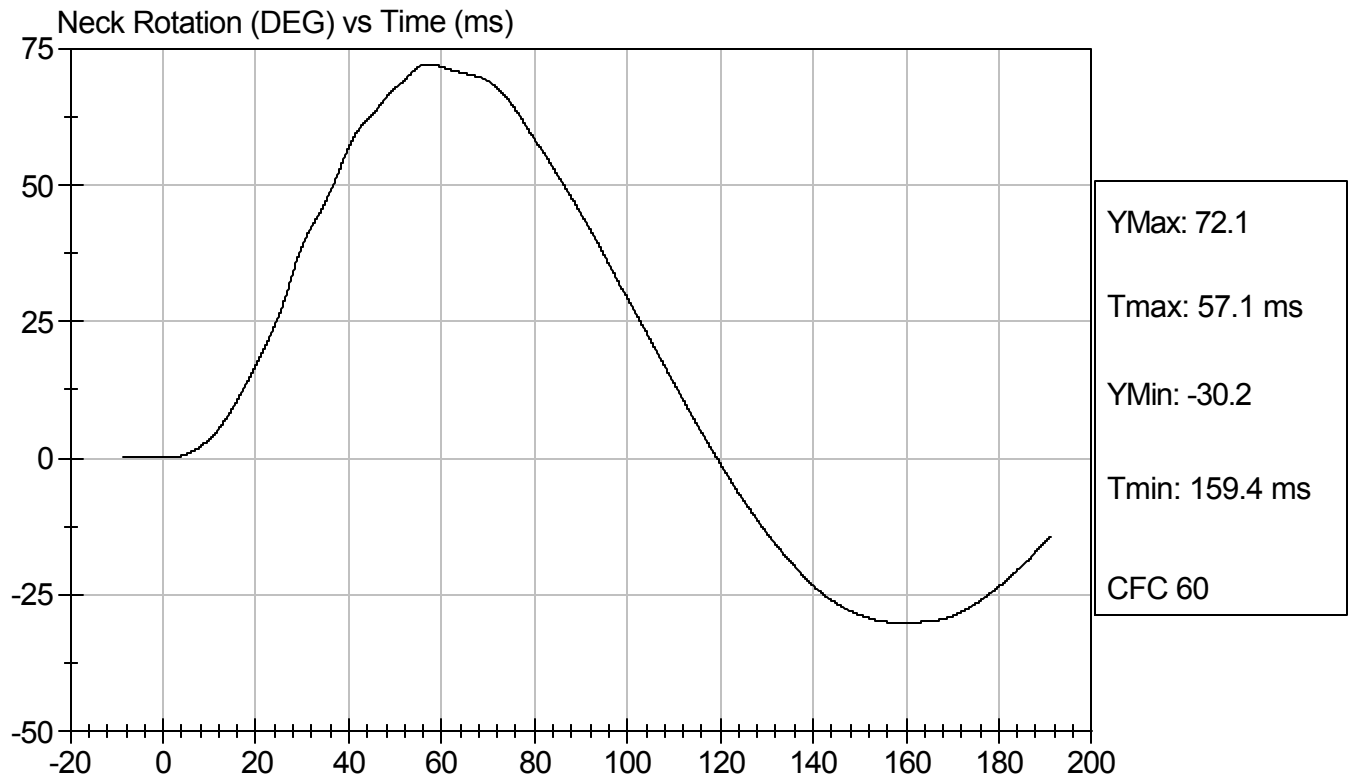
Test Date: 11/3/09
Speed: 23.14 ft/sec, 7.05 m/sec





Test Desc: Neck Bending
Component ID: D092809

Test Date: 11/3/09
Speed: 23.14 ft/sec, 7.05 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/HIII Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration (Lateral)

ATD Serial No: 271

Test I.D: D092901

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	120 to 150	135	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-6.6	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

11/19/09
Test Date

David Winkelbauer
Approved By



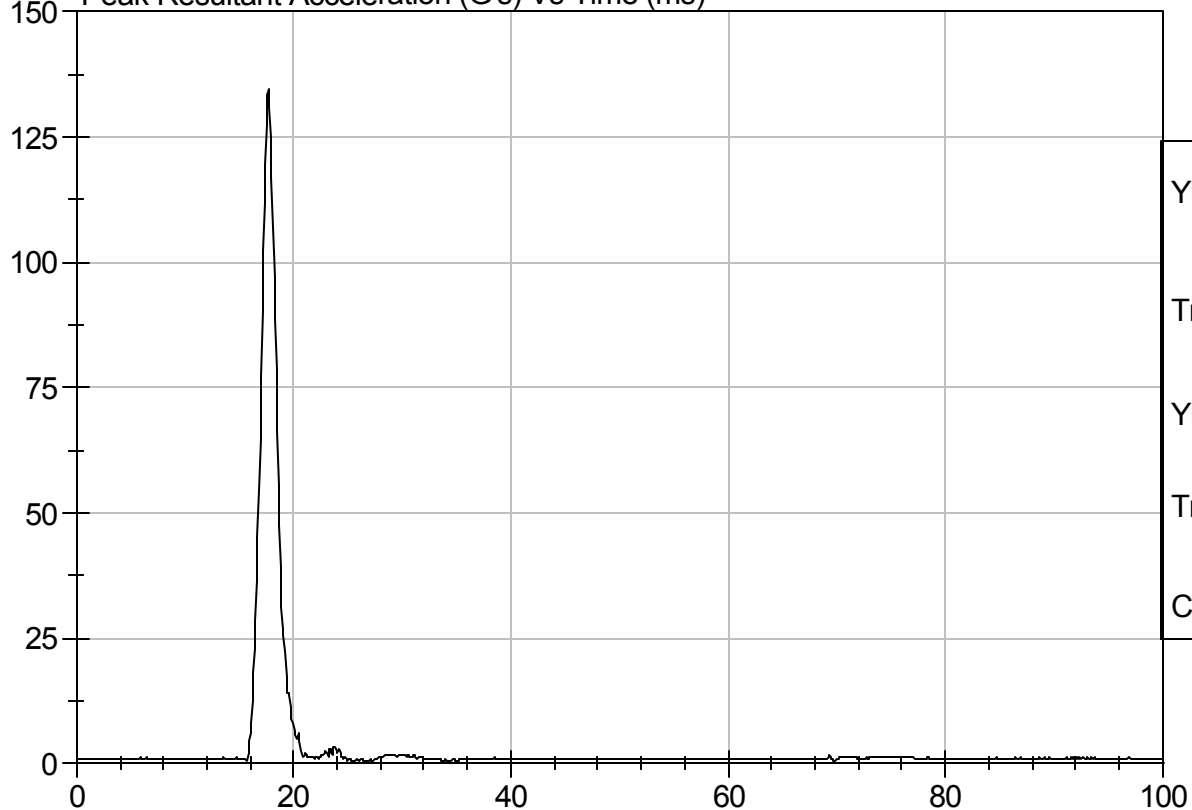
Test Description: Head Drop

Test Date: 11/19/09

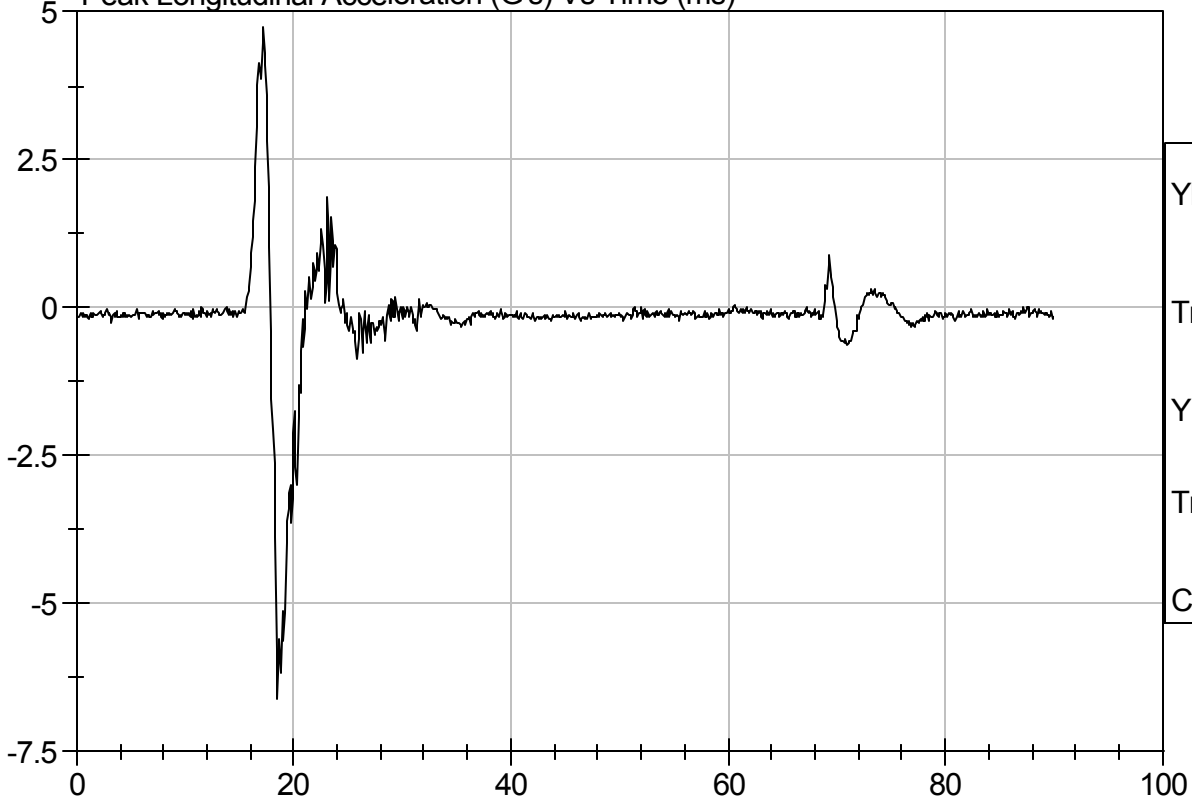
Component: D092901

Speed: 0 ft/s, 0 m/s

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



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



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

ATD Serial No: 271

Test I.D: D092902

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Velocity	m/s	4.22 - 4.31	4.23	Pass
Upper Rib	G's	37 - 46	37	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	18	Pass
Overall Test Results				Pass


Laboratory Technician

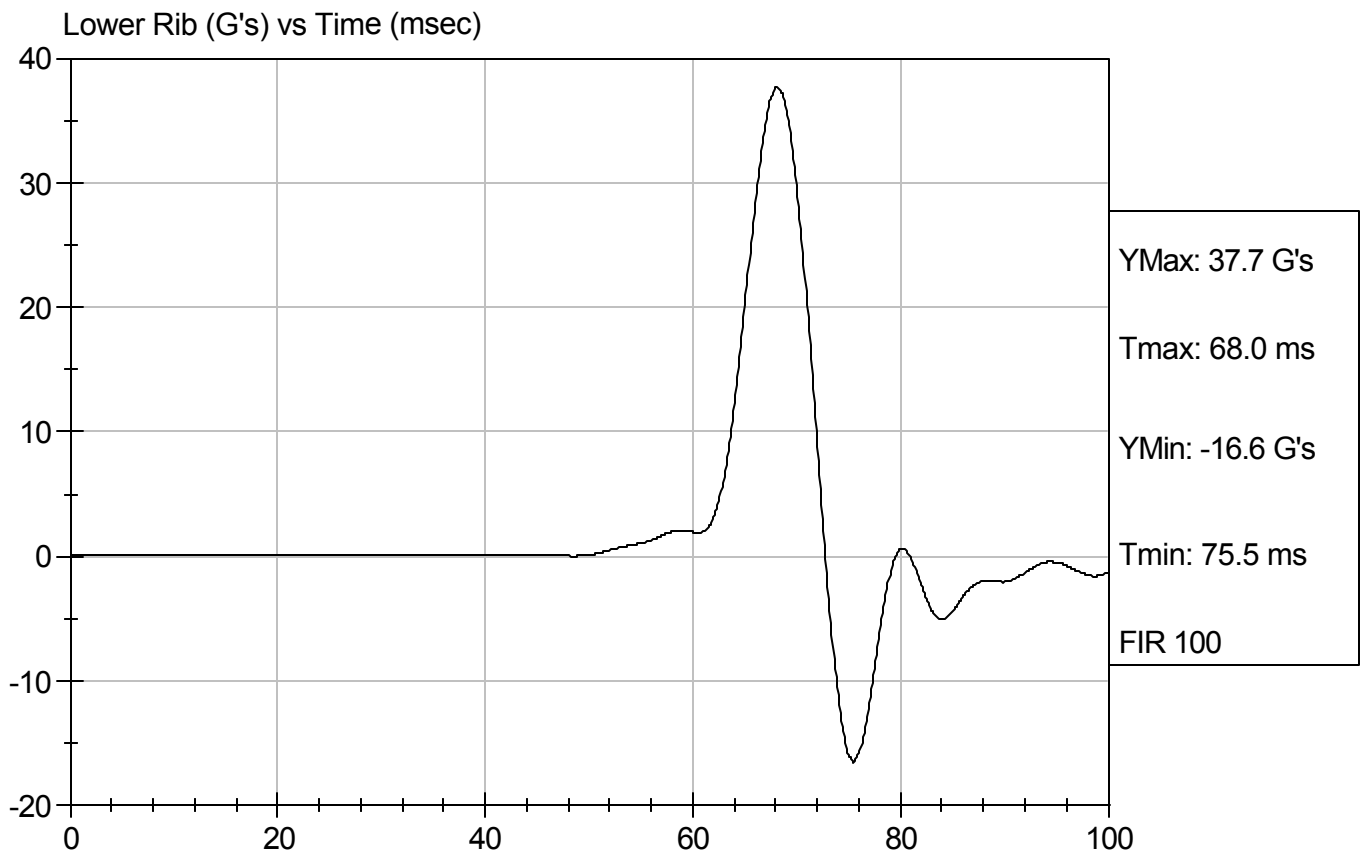
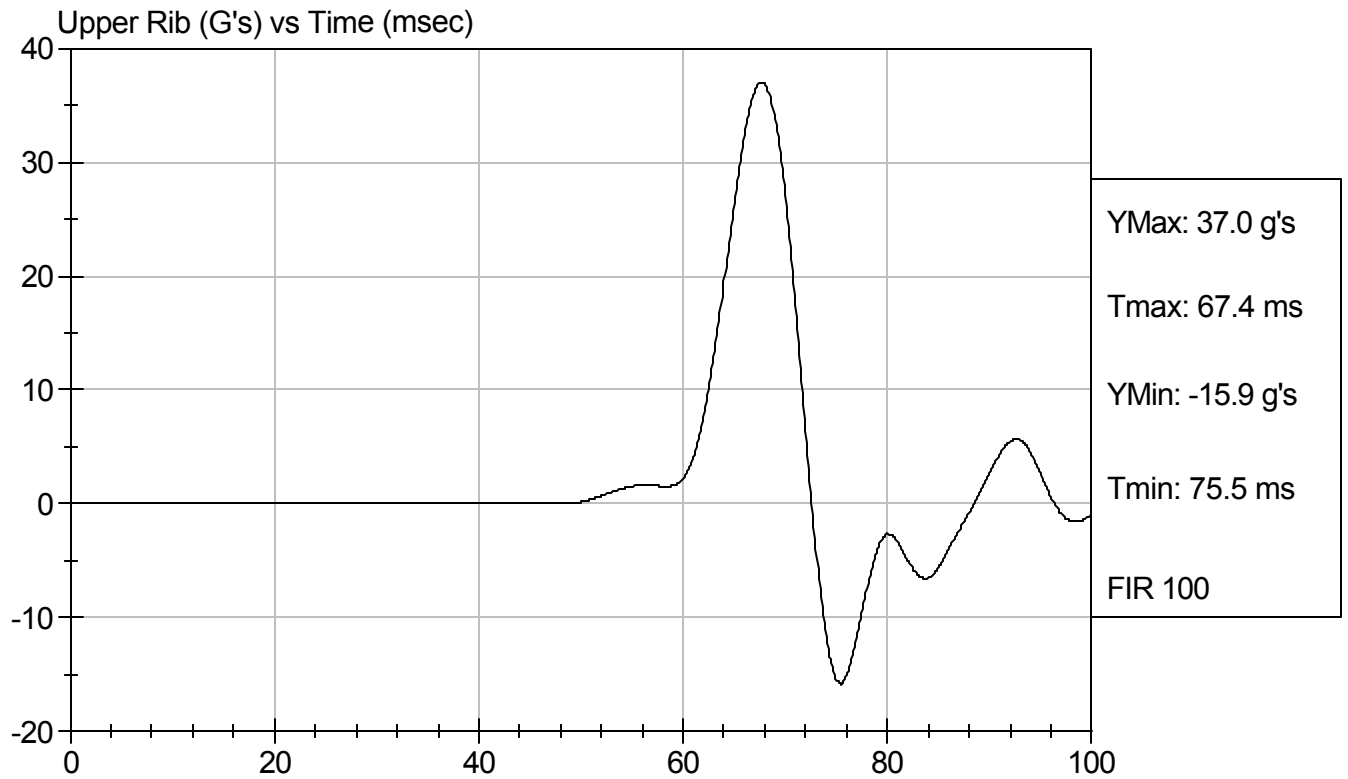

Approved By

11/19/09
Test Date



Test Desc: Thorax Impact
Component ID: D092902

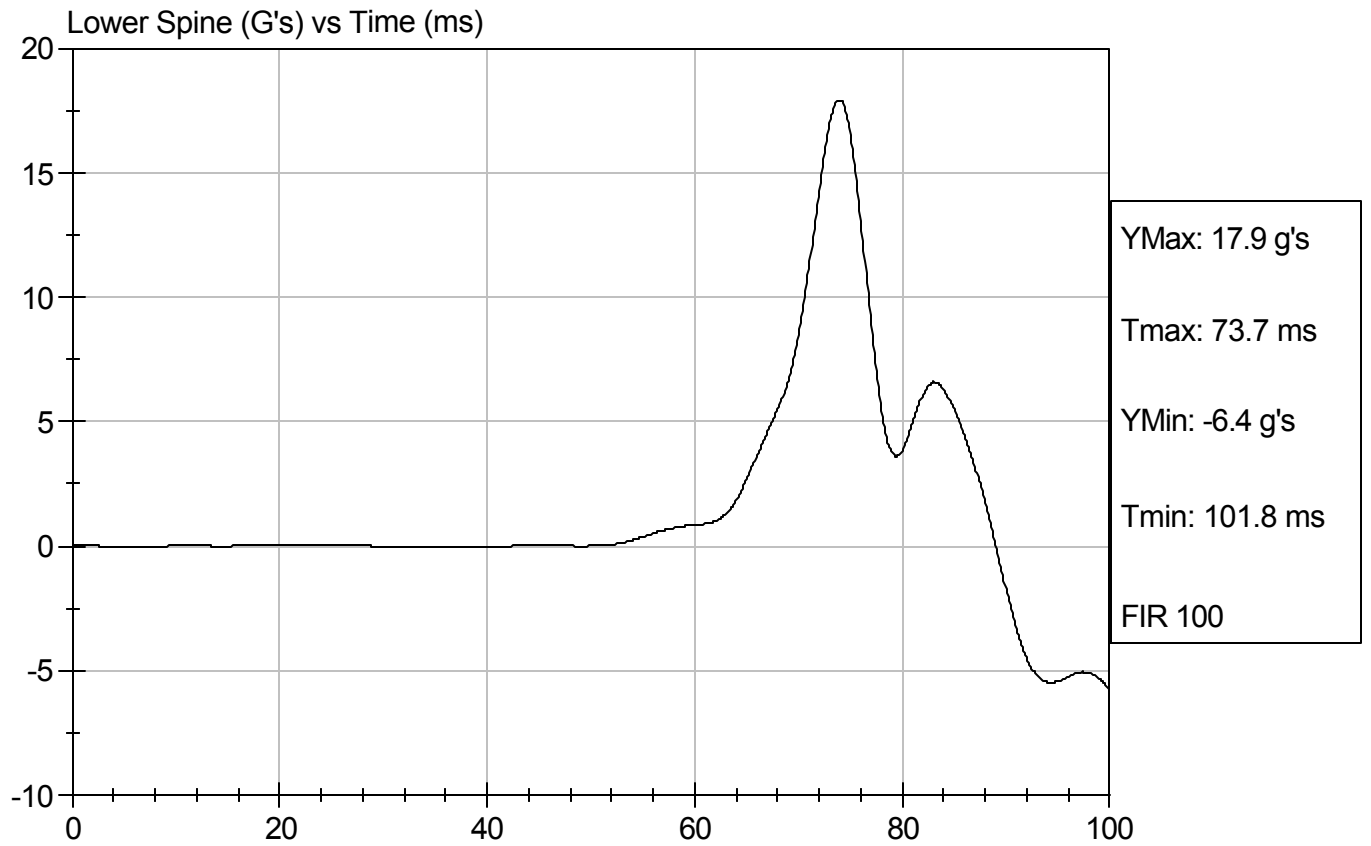
Test Date: 11/19/09
Speed: 13.89 ft/s, 4.23 m/s





Test Desc: Thorax Impact
Component ID: D092902

Test Date: 11/19/09
Speed: 13.89 ft/s, 4.23 m/s



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

ATD Serial No: 271

Test I.D: D092903

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	46	Pass
			Overall Test Results	Pass

Jessica Hall
Laboratory Technician

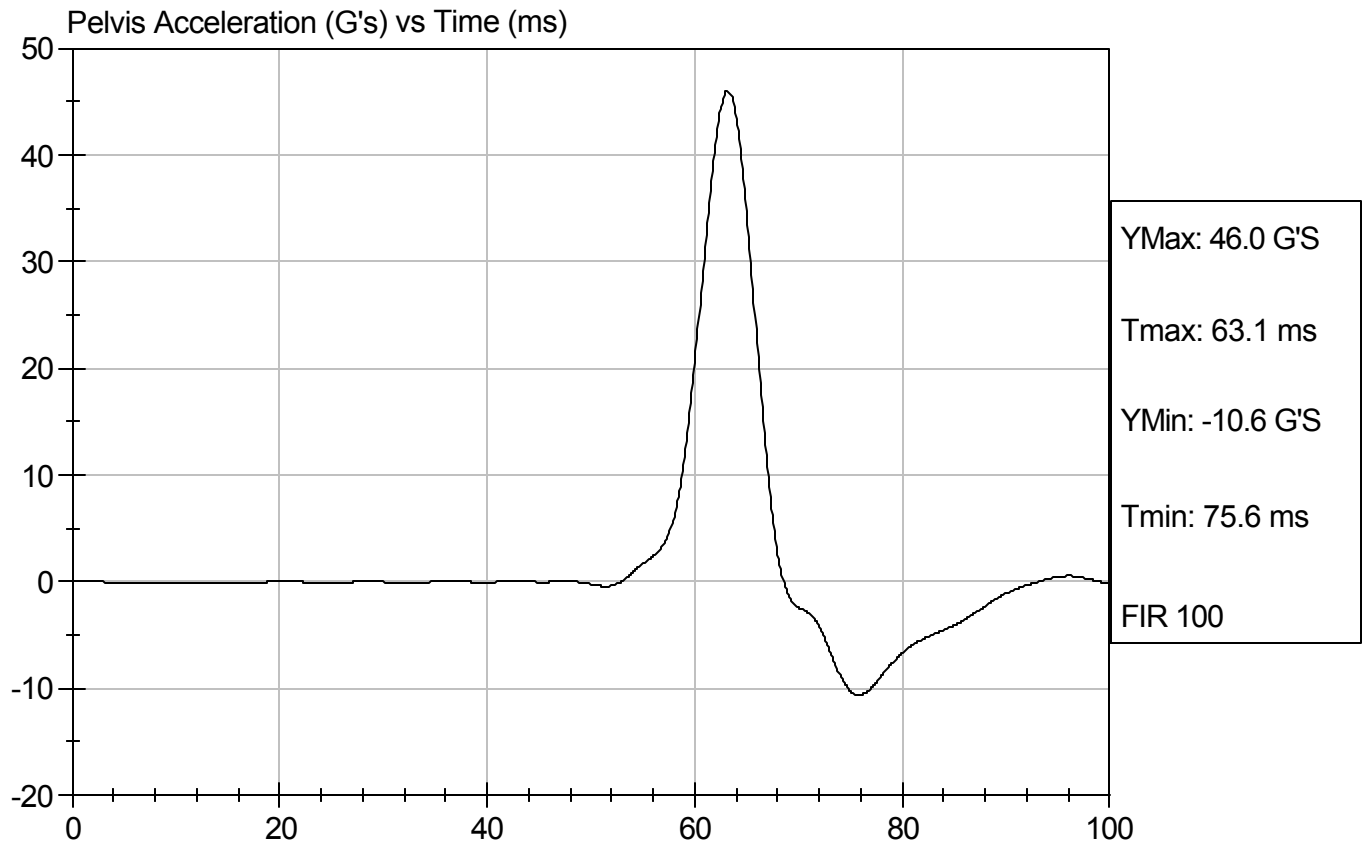
David Winkelbauer
Approved By

11/19/09
Test Date



Test Desc: Pelvis Impact
Component ID: D092903

Test Date: 11/19/09
Speed: 14.12 ft/s, 4.30 m/s



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

ATD Serial No: 271

Test I.D: D092904

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Force At 12.7 mm	N	104 -162	141	Pass
Force At 19 mm	N	163 - 222	193	Pass
Force At 25.4 mm	N	222 - 280	260	Pass
Force At 33 mm	N	325 - 391	352	Pass
Overall Test Results			Pass	

Jessica Hall
Laboratory Technician

11/18/09
Test Date

David Winkelbauer
Approved By

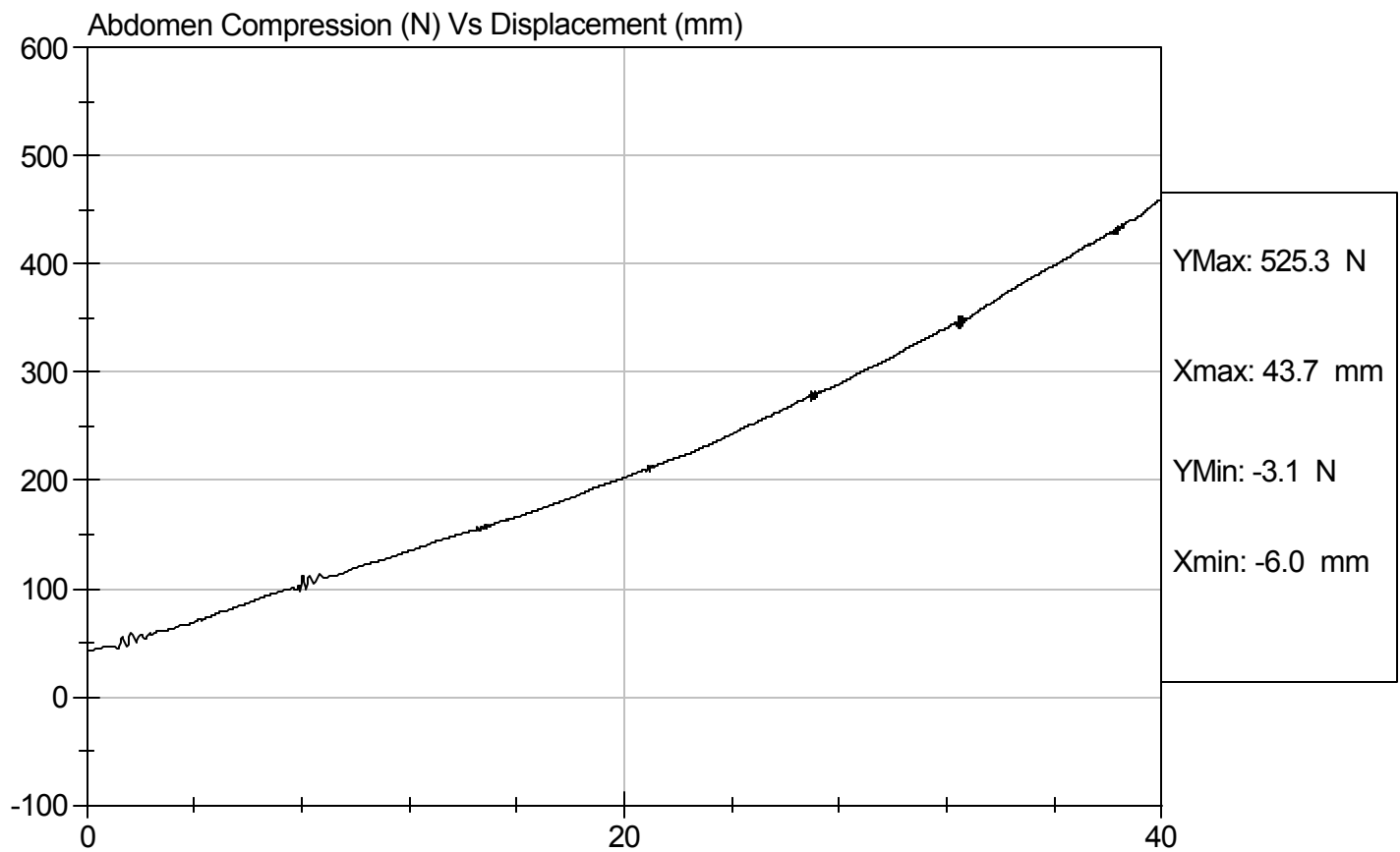


Test Description: Abdomen Compression

Test Date: 11/18/09

Component: D092904

Speed: 0 ft/s, 0 m/s



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

ATD Serial No: 271

Test I.D: D092905

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	110.1	Pass
Force At 30 deg	N	151.2 - 204.6	161.2	Pass
Force At 40 deg	N	204.6 - 258.0	211.0	Pass
Return Angle	Deg	12 Maximum	5	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

11/19/09
Test Date

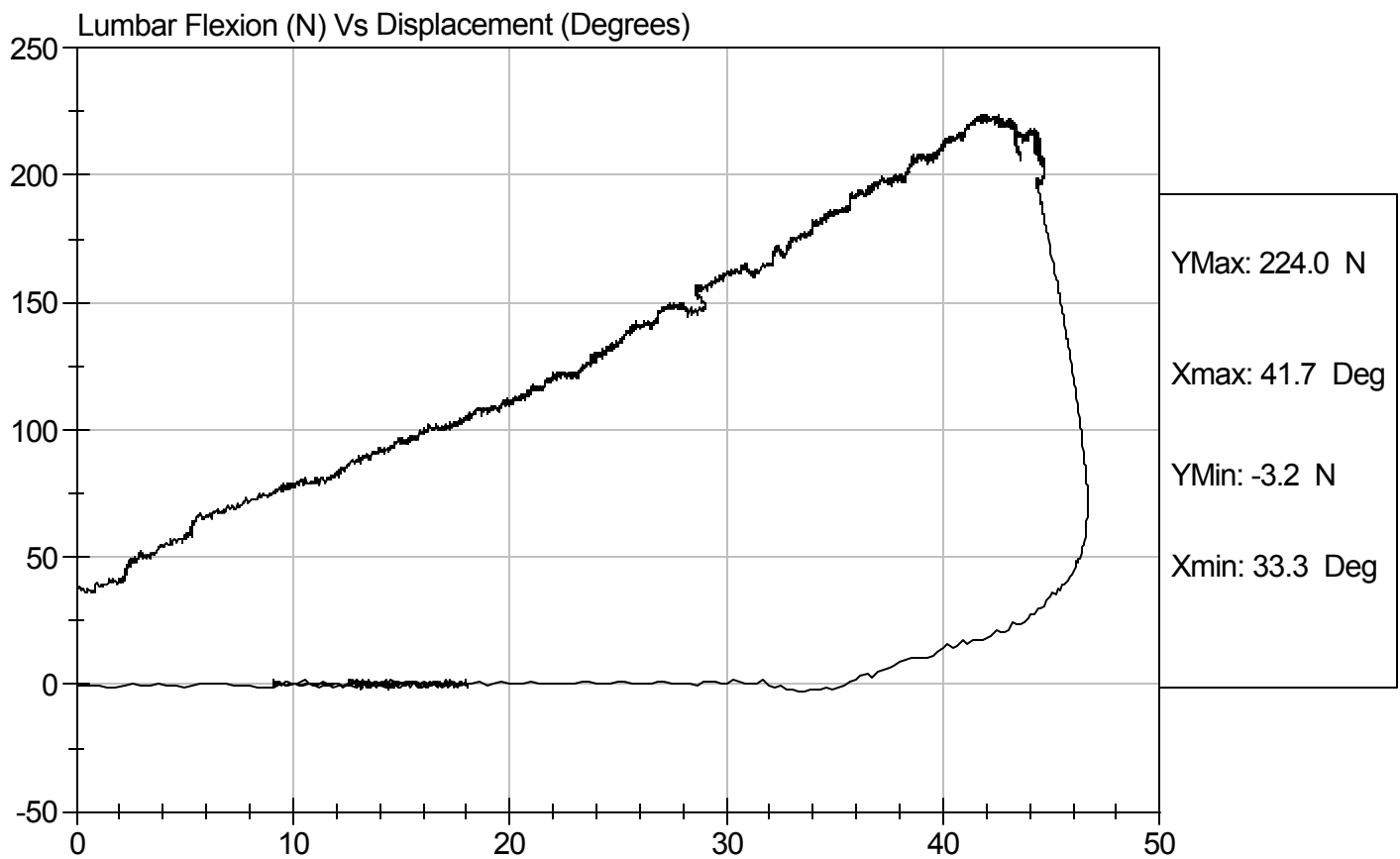


Test Description: Lumbar Flexion

Test Date: 11/19/09

Component: D092905

Speed: 0 ft/s, 0 m/s



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

ATD Serial No: 271

Test I.D: D092909

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Impact Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	m/s	1.96 to 2.55	2.32	Pass
	20 ms	m/s	4.12 to 5.10	4.62	Pass
	30 ms	m/s	5.73 to 7.01	6.41	Pass
	40 to 70 ms	m/s	6.27 to 7.64	6.86	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	76	Pass
Head Rotation Peak to Zero - Decay Time		ms	58 to 67	63	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	79	Pass
Mx Peak To Zero - Decay Time		ms	49 to 64	59	Pass
Mx Peak to Max. Head Rotation		ms	2 to 16	13	Pass


 Laboratory Technician


 Approved By

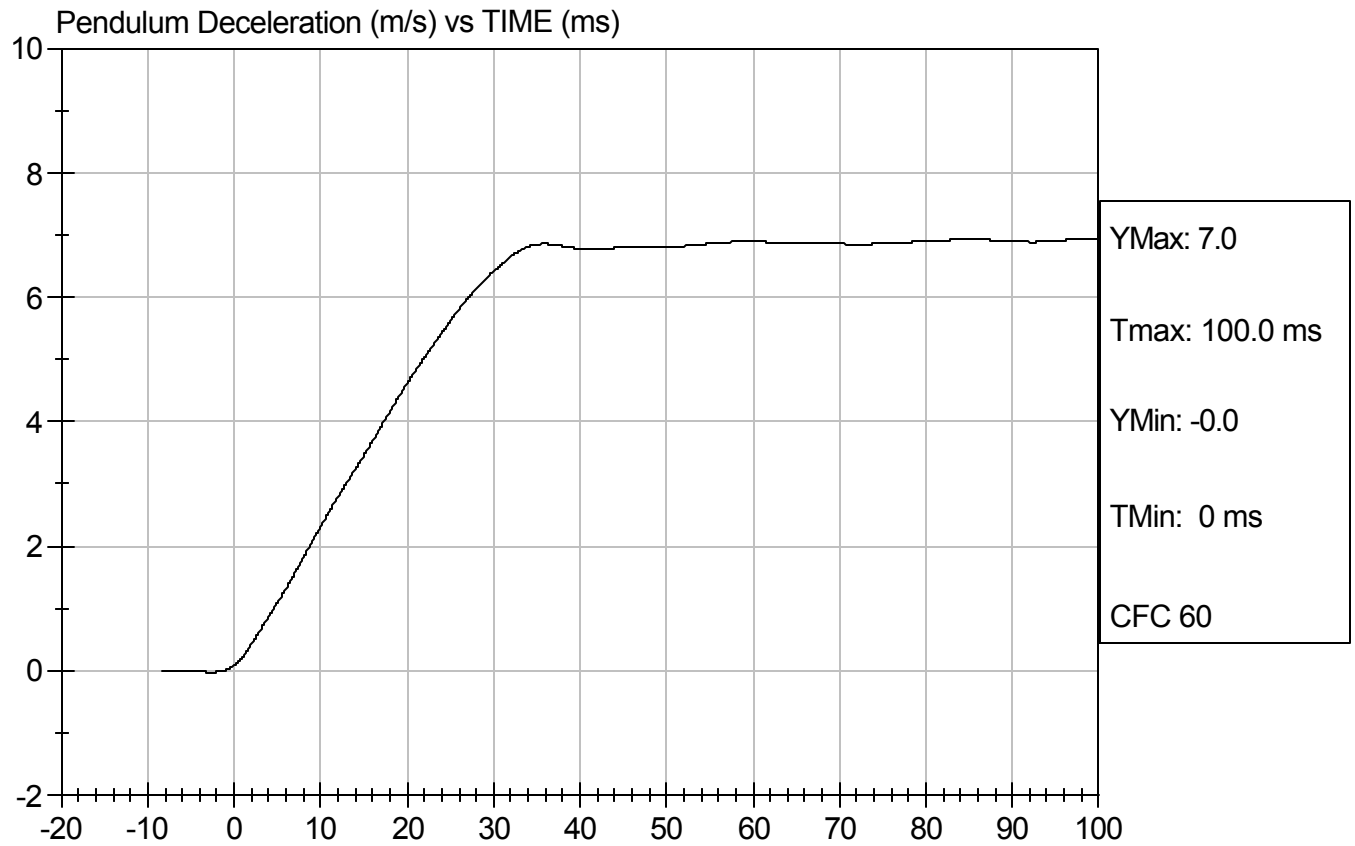
11/19/09

Test Date



Test Desc: Neck Bending
Component ID: D092909

Test Date: 11/19/09
Speed: 23.15 ft/sec, 7.06 m/sec

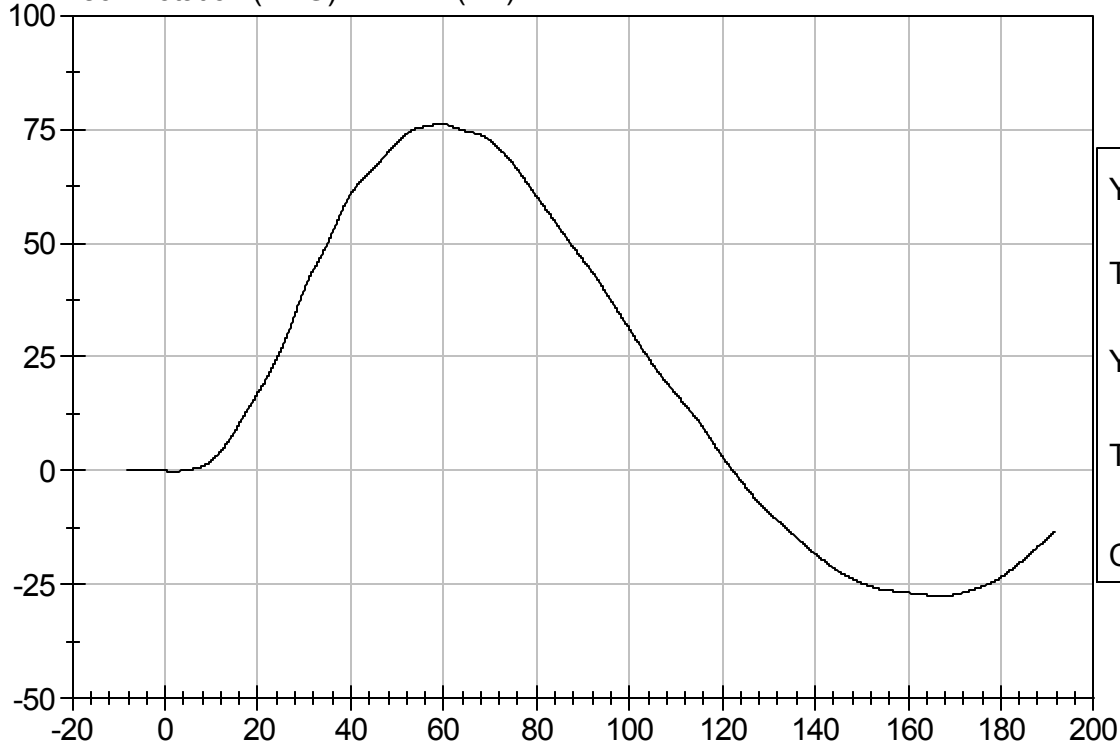




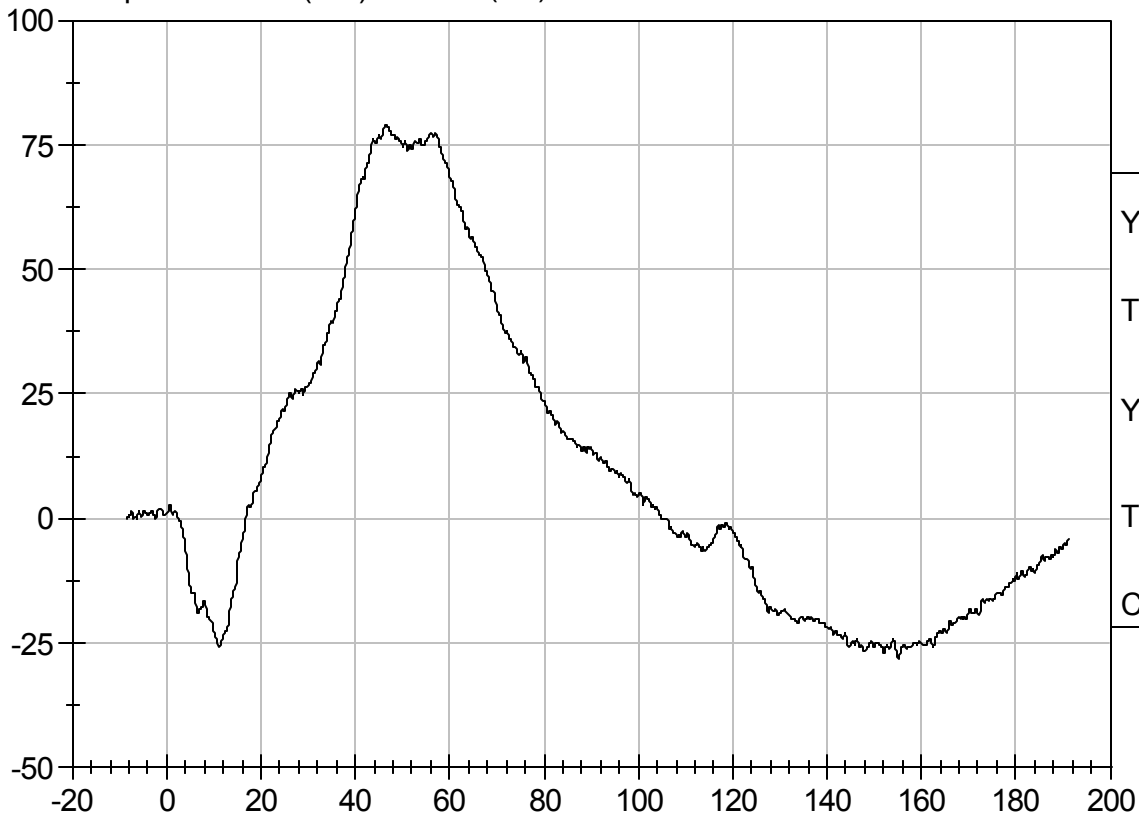
Test Desc: Neck Bending
Component ID: D092909

Test Date: 11/19/09
Speed: 23.15 ft/sec, 7.06 m/sec

Neck Rotation (DEG) vs Time (ms)



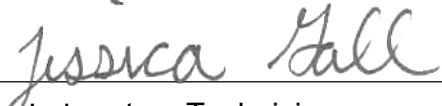
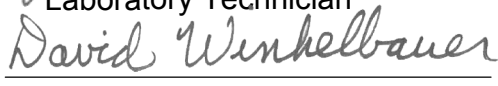
Occipital Moment (Nm) vs Time (ms)



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


Laboratory Technician

Approved By

11/19/09

Test Date