REPORT NUMBER: SNCAP-KAR-11-013

NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

BAYERISCHE MOTORENWERKE AG

2011 BMW 535I 4-DOOR SEDAN

NHTSA No: MB0507

PREPARED BY:

KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

SEPTEMBER 1, 2010

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF CRASHWORTHINESS STANDARDS

1200 NEW JERSEY AVE, SE

ROOM W43-410

WASHINGTON, D.C. 20590

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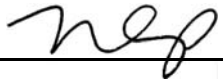
Reviewed By: 

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Approval Date: September 13, 2010

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date:

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date:

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Final Report of New Car Assessment Program Side Impact Testing of a 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507	September 13, 2010
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9. Performing Organization Name and Address KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA, 92301	**10. Work Unit No.**
	11. Contract or Grant No. DTNH22-09-D-00122
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C 20590	**13. Type of Report and Period Covered** Final Test Report, September 2010
	14. Sponsoring Agency Code NPS-10

15. Supplementary Notes

16. Abstract

A 55/28 km/h 90 deg. Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2011 BMW 535i 4-Door Sedan in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at KARCO Engineering, LLC in Adelanto, CA, on September 1, 2010.

The impact velocity of the Moving Deformable Barrier was 62.14 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 37.2 deg. C. The target vehicle's maximum post-test static crush was 217 mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC_{36})		1000	79.8
Maximum Thorax Rib Deflection	mm	44	30.4
Total Abdominal Force	N	2500	847
Pubic Symphysis Force	N	6000	1141

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC_{36})		1000	190.5
Lower Spine Resultant Acceleration	g	82	41
Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	1291

The two 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		18. Distribution Statement	
New Car Assessment Program (NCAP) Side Impact Moving Deformable Barrier (MDB) ES-2re SID-IIs		Copies of this report are available from: National Highway Traffic Safety Admin. Technical Reference Division 1200 New Jersey Ave., SE Room W43-410 Washington, DC 20590	
19. Security Classification of this report	**20. Security Classification of this page**	**21. No. of Pages**	**22. Price**
UNCLASSIFIED	UNCLASSIFIED	134	

TABLE OF CONTENTS

SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2011 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-09-D-00122. The purpose of this test is to generate comparative side impact performance in a 2011 BMW 535i 4-Door Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated January 2010.

SUMMARY

A 2011 BMW 535i 4-Door Sedan 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 62.14 km/h (38.61 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by KARCO Engineering, LLC. in Adelanto, California, on September 1, 2010. Pre- and post-test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in Appendix A of this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated January 2010. The side impact event was documented by 11 cameras. Camera locations are included in Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Head Accelerometers
Thorax Rib 1 to Rib 3 Potentiometers
Abdomen Forward, Middle, and Rear Load Cells
Lower Spine Accelerometers
Pubic Load Cell

PASSENGER ATD (SID-IIs)
Head Accelerometers
Thorax Upper, Middle and Lower Rib Potentiometers

Abdomen Upper and Lower Rib Potentiometers

Lower Spine Accelerometers

Illiac Load Cell

Acetabulum Load Cell

Dummy injury values were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	79.8
Maximum Thorax Rib Deflection	mm	44	30.4
Combined Abdominal Force	N	2500	847
Pubic Symphysis Force	N	6000	1141

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	190.5
Lower Spine (T12) Resultant Acceleration	g	82	41
Total Pelvic Force (sum of acetabular and illiac forces	N	5525	1291

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver)		Left Rear (Passenger)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Torso)	Yes	Yes	No	
Side Airbag 2 (Curtain)	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	No	No	
Seat Belt Load Limiter	Yes	No	No	
Other				

GENERAL COMMENTS

Both the front and rear doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. Both doors on the non-struck side remained closed and latched. There were no ATD values that exceeded limits.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressures	lbf/in^2	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	^oF	^oC	=(tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MB0507	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	BMW	Power Steering	Yes
Model	535i	Driver Front Airbag	Yes
Body Style	4-Door Sedan	Driver Curtain Airbag	Yes
VIN	WBAFR7C50BC600161	Driver Head/Torso Airbag	No
Body Color	Dark Graphite Metallic	Driver Torso Airbag	Yes
Delivery Date	7/26/2010	Driver Torso/Pelvis Airbag	No
Odometer Reading (km / mi)	243 / 161	Driver Pelvis Airbag	No
Dealer	Sterling BMW	Driver Knee Airbag	Yes
Transmission	8-Speed Automaitc	Rear Pass. Curtain Airbag	Yes
Final Drive	Rear	Rear Pass. Head/Torso Airbag	No
Type / No. of Cylinders	Turbo Inline 6	Rear Pass. Torso Airbag	No
Engine Displacement (L)	3.0	Rear Pass. Torso/Pelvis Airbag	No
Engine Placement	Longitudinal	Rear Pass. Pelvis Airbag	No
Roof Rack	No	Pretensioners	Yes
Sunroof / T-Top	Yes	Load Limiters	Yes
Tinted Glass	No	Automatic Door Locks	Yes
Traction Control	Yes	Bucket Seats	Yes
Power Brakes	Yes	Tilt Steering	Yes
Front Disc	Yes	Other	
Rear Disc	Yes	Other	

Does Owner's Manual provide instructions to turn off automatic door locks? Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Bayerische Motorenwerke AG	GVWR (kg)	2350
Date of Manufacture	Apr-10	GAWR Front (kg)	1130
		GAWR Rear (kg)	1320

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				480.0	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				139.8	*A-B*

VEHICLE SEAT TYPE

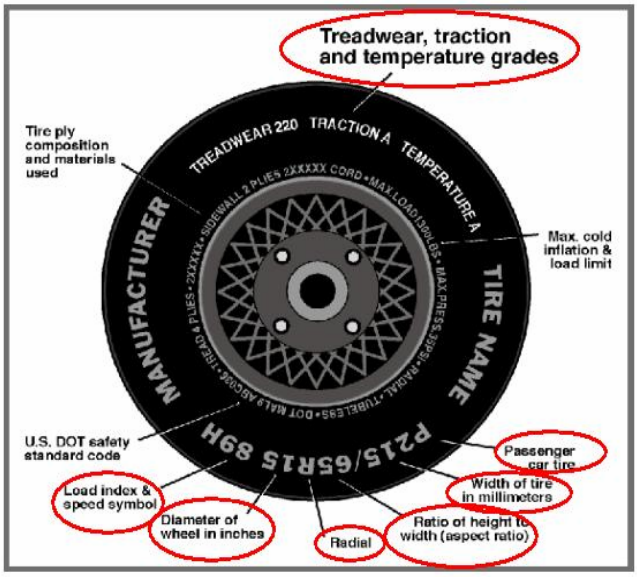
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable w/ Lever	Adjustable w/ Knob
Front Seat	Yes						Yes
Rear or Second Row Seat		Yes			Yes		
Third Row Seat							

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Cold Pressure (kpa)	240	240
Recommended Tire Size	245/40R19	275/35R19
Tire Size on Vehicle	245/40R19	275/35R19
Tire Model	Excellence	Excellence
Tire Manufacturer	Goodyear	Goodyear
Treadwear	240	240
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1	2
Tire Plies Body	4	5
Load Index/Speed Symbol	96Y	96Y
Tire Material	Rayon, Steel, Polyamide	Rayon, Steel, Polyamide
DOT Safety Code Right	NE66 JF1R 1310	NE66 JF1R 1710
DOT Safety Code Left	NE66 JF1R 1310	NE66 JF1R 1710

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	449.5	434.5		481.5	569.5		485.0	572.0	
Right	kg	464.5	450.0		456.0	551.0		455.5	555.0	
Ratio	%	50.8%	49.2%	100.0%	45.6%	54.4%	100.0%	45.5%	54.5%	100.0%
Total	kg	914.0	884.5	1798.5	937.5	1120.5	2058.0	940.5	1127.0	2067.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1798.5	A
Actual Weight of 2 P572 ATDs Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	139.8	C
Calculated Vehicle Target Wt (TVTW)	kg	2063.3	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG (Aft of Front Axle
Fully Loaded	mm	711	721	680	686	1618
As Tested	mm	712	711	680	683	1616

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheelbase	mm	2968
Total Vehicle Length at Left Side	mm	3439
Total Vehicle Length at Centerline	mm	4885
Total Vehicle Length at Right Side	mm	3435
Weight of Ballast in Cargo Area	kg	70.0
Weight of Vehicle Components Removed	kg	11.5
Amount of Stoddard Solvent in Fuel Tank	L	65.12

Vehicle components removed to make Target Vehicle Test Weight:

Non-struck side door panels (6.5 kg), Trunk liner and trim (5.0 kg)

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle (at level 3)	mm	509
Actual Impact Point Aft of Front Axle	mm	484

DATA SHEET NO. 2

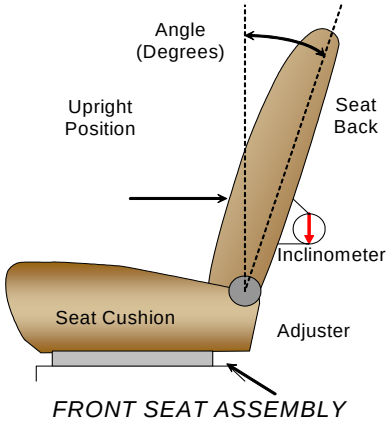
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

NOMINAL DESIGN RIDING POSITION

The driver's seat back is set to the manufacturer's designated seat angle, measured with a straight edge across the back of the seat back. The passenger's seat back is fixed and measured from the headrest post.



FRONT SEAT ASSEMBLY

SEAT BACK ANGLES

	Degrees (°)
Driver w/Seated Dummy	26.5
Passenger w/Seated Dummy	12.5

SEAT FORE/AFT POSITIONS

Driver seat travel is measured with the seat cushion at the mid angle and the lowermost position. The seat is set to the middle of the fore-aft travel. The passenger seat is fixed.

SEAT FORE/AFT POSITIONS

Seating Position	Total Fore/Aft Travel	Placed in Position
Driver Seat	243	122
Rear Seat	Fixed	Fixed

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer's design position, the driver for a 50th percentile adult male ATD, the left rear passenger for a 5th percentile adult female ATD. Both positions had a fixed seat belt upper anchorage.

SEAT BELT UPPER ANCHORAGES

Seating Position	Total No. of Positions	Placed in Position
Driver Seat	Fixed	Fixed
Rear Seat	Fixed	Fixed

DATA SHEET NO. 2 … (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

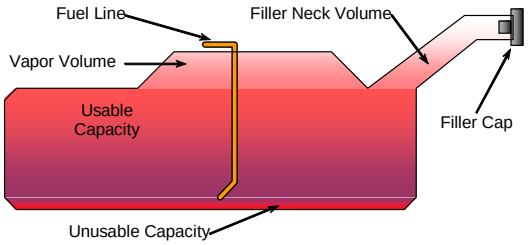
Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	70.02
Usable Capacity of "Optional Tank"	
Usable Capacity Used for FMVSS 301	70.02
Actual Amount of Stoddard Solvent Used	65.12

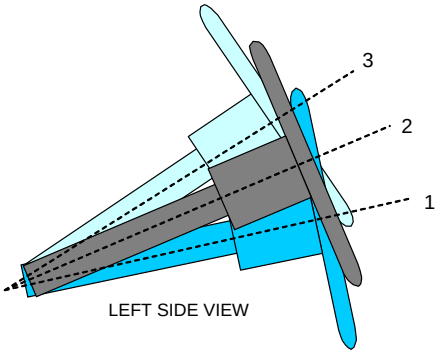
The test vehicle is equipped with an electric fuel pump. The fuel pump starts when the ignition is on. The fuel pump will operate for 5 seconds. After pressure has been built up, the fuel pump switches to sleep mode until the engine will be started or the pressure decreases. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area under the rear seat.



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. A digital inclinometer is used to measure a plate which is placed across the rim of the steering wheel for angular measurements. A tape measure is used with a reference mark on the steering column to measure telescoping travel.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

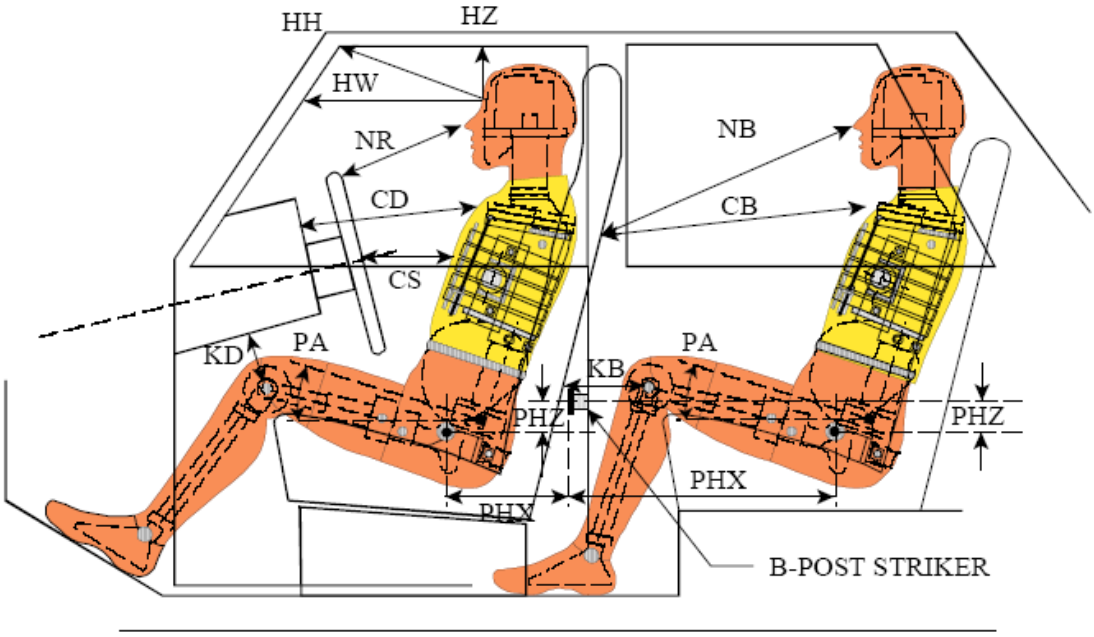
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	20.0	81
Geometric Center Position, No. 2	21.7	108
Uppermost Position, No. 3	23.3	135
Telescoping Steering Wheel Travel		54
Test Position	21.7	108

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



NOTE: 2-DOOR VEHICLE SHOWN. REAR DUMMY PHX & PHZ MEASUREMENTS FOR A 4-DOOR VEHICLE WOULD USE THE C-POST STRIKER AS A REFERENCE POINT

LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

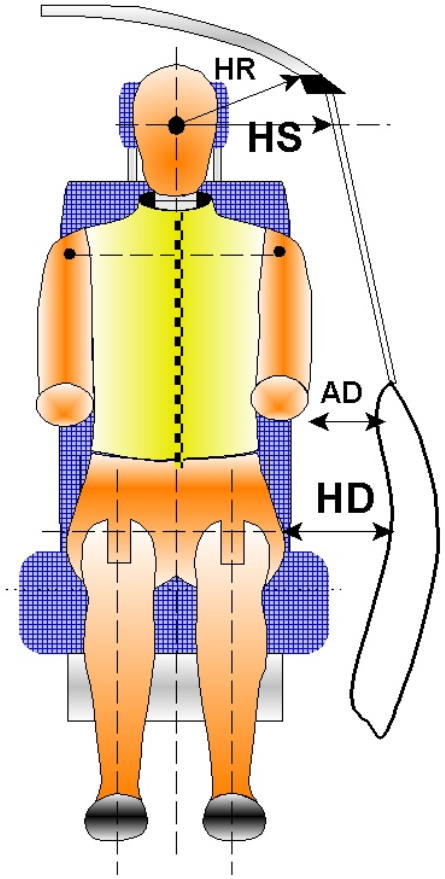
Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (º)	Length (mm)	Angle (º)
HH		Head to Header	433	14.9		
HW		Head to Windshield	688	0.0		
HZ	HZ	Head to Roof	165	90.0	275	90.0
NR	NB	Nose to Rim/Seat Back	518	9.5	483	7.5
CD	CB	Chest to Dash/Seat Back	603	9.6	483	10.5
CS		Chest to Steering Wheel	385	4.3		
KDL	KBL	Left Knee to Dash/Seat Back	199	40.9	206	30.4
KDR	KBR	Right Knee to Dash/Seat Back	168	40.5	209	35.3
PA	PA	Pelvic Angle		21.5		27.2
PHX	PHX	H-Point to Striker (x-axis)	142	0.0	164	0.0
PHZ	PHZ	H-Point to Striker (z-axis)	250	90.0	235	90.0
SA	SA	Seat Back Angle		26.5		12.5

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

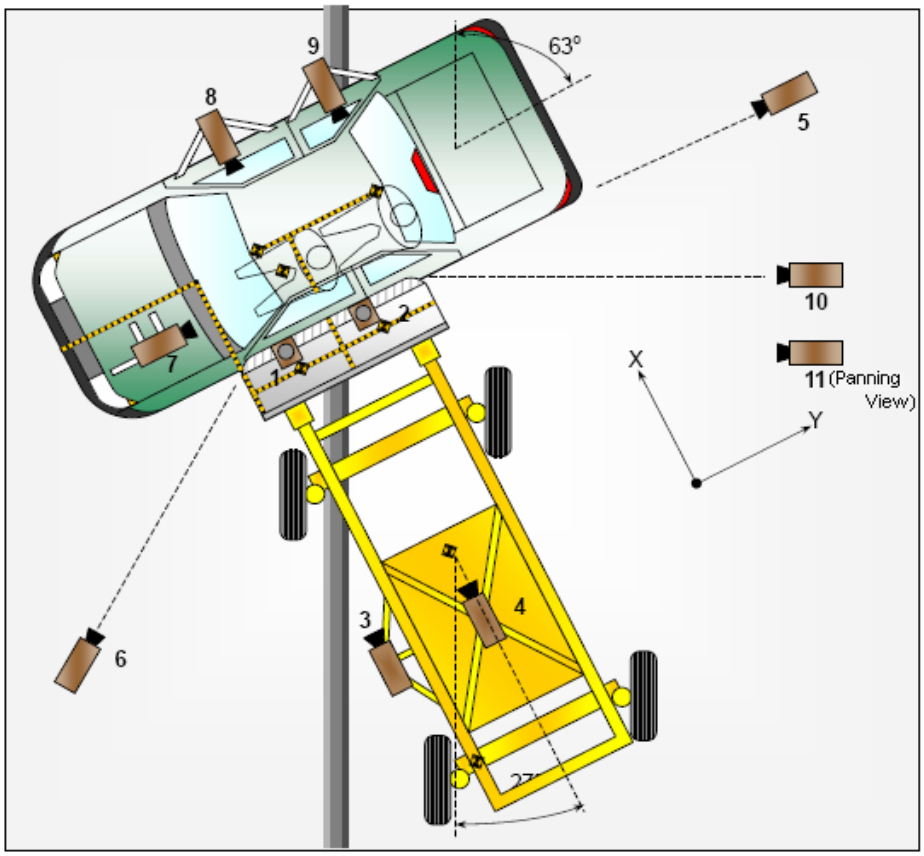
Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	207	273
HS	Head to Side Window	mm	305	380
AD	Arm to Door	mm	97	170
HD	H-Point to Door	mm	155	215

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



CAMERA LOCATIONS AND DATA

Camera No.	View	Coordinates (mm)			Angle	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Overhead Overall	1220	2287	-5486	90	14	1000
2	Overhead Close-Up	609	2287	-5102	90	Zoom	1000
3	Left Impact Point (MDB)	-2134	0	-1143	-4	25	1000
4	Side Overall (MDB)	-3912	838	-1829	-1	12	1000
5	Rear	-64	2485	-1348	0	105	1000
6	Left Front	-2266	-3564	-1475	0	24	1000
7	Driver Front (On-Board)	561	-474	591	-5	35	1000
8	Driver Side (On-Board)	1537	1000	453	-8	14	1000
9	Passenger Side (On-Board)	1624	1858	439	-12	20	1000
10	Real Time Left Rear					Zoom	30
11	Real Time Inrun	-2484	-3958	-1506		Zoom	30

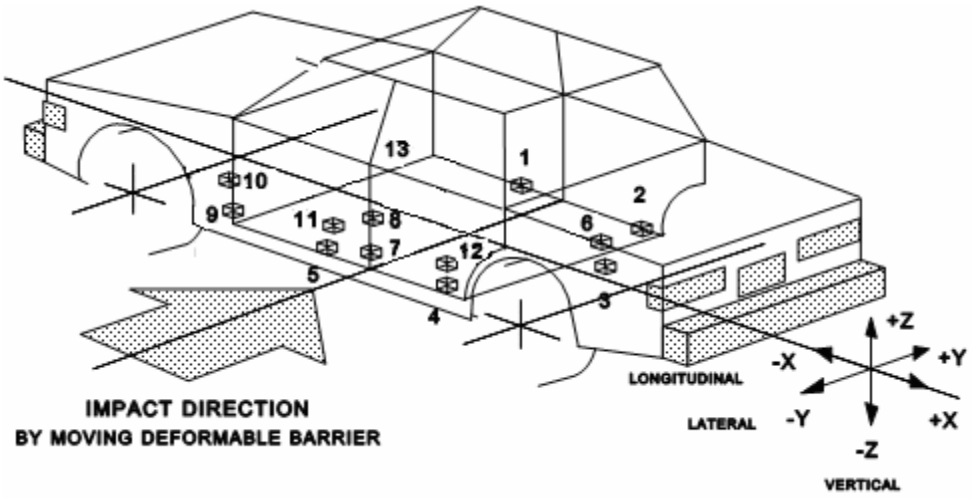
Reference: Impact Point Projected to Ground
+X = To Front of MDB, +Y = To Right of MDB, +Z = Down
*All measurements accurate to ±6 mm

DATA SHEET NO. 6

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2785	690	355
2	Right Sill at Rear Seat	1790	710	360
3	Rear Floorpan Above Axle	625	-405	490
4	Left Sill at Rear Door	2050	-660	160
5	Left Sill at Front Door	2610	-660	160
6	Right Rear Occupant Compartment	2095	340	210
7	B-Pillar Lower	2200	-710	370
8	B-Pillar Mid	2200	-710	760
9	A-Pillar Lower	3345	-835	370
10	A-Pillar Mid	3345	-835	835
11	Front Seat Track	2195	-600	215
12	Rear Seat Structure			[1]
13	Vehicle CG	2095	0	408

Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground Plane (+ up)

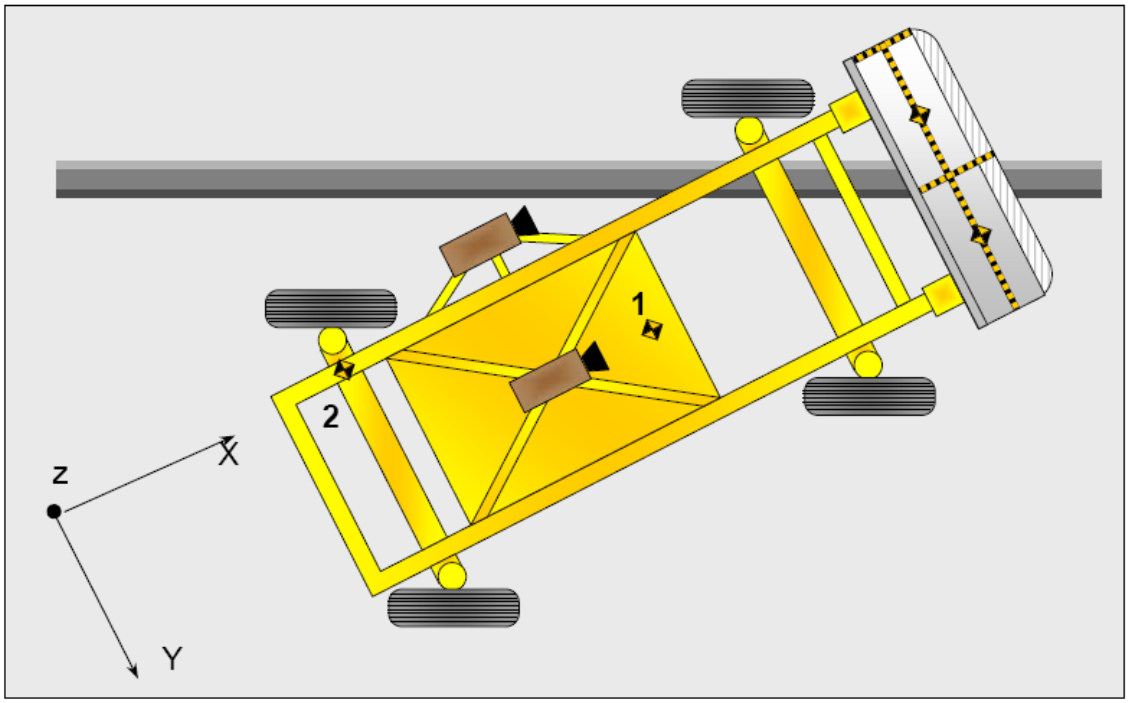
[1] – Not installed.

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurement		
		X	Y	Z
1	MDB CG	-1195	0	430
2	MDB Rear	-2642	-593	608

Reference: X – Face of MDB (+ rearward)
Y – MDB Centerline (+ to right)
Z – Ground plane (+ up)

DATA SHEET NO. 8

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

MAXIMUM EXTERIOR CRUSH

Level	Description	Units	Maximum Crush	Above Ground
1	Sill Top Height	mm	21	197
2	Occupant H-Point Height	mm	217	469
3	Mid-Door Height	mm	215	602
4	Window Sill Height	mm	109	897
5	Window Top Height	mm	18	1371
	Maximum Penetration	mm	217	

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Airbag Timing Sensors	4
Vehicle Structure Accelerometers	21
MDB Accelerometers	5
Total No. of Contact Switches	8
Total	70

CAMERA COVERAGE

High-Speed Vehicle On-Board	3
High-Speed Vehicle Off-Board	5
High-Speed MDB On-Board	2
Real Time Panning	1
Total	11

DATA SHEET NO. 9

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length including Honeycomb Face	4023
Wheel Base of Framework Carriage	2595
C.G. location aft of Front Axle	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	402	298	
Right	kg	377	292	
Ratio	%	56.9%	43.1%	
Totals	kg	779	590	1368

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.14
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.10
MDB CL to Target Vehicle CL	degrees	88.5-91.5	90.5

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
1	Center of Bumper	432	700	Left	220
2	Top of Bumper	533	800	Left	156
3	Mid Level	686	800	Left	161
4	Top of Stack	813	800	Left	206

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Dummy Type/Serial No.	ES-2re, S/N: F035	SID-IIs, S/N: 307
Head Contact	Curtain Airbag	Curtain Airbag
Upper Torso Contact	Door Panel	Door Panel
Lower Torso Contact	Side Airbag, Door Panel	Door Panel
Left Knee Contact	Door Panel, Right Knee	Door Panel, Right Knee
Right Knee Contact	Left Knee	Left Knee

POST-TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Door Opening	Jammed shut	Jammed shut
Right Side Door Opening	Remained closed and operational	Remained closed and operational
Hatch and Other Doors	Remained closed and operational	Remained closed and operational
Seat Movement	None	None
Seatback Failure	No	No

POST-TEST STRUCUTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions	
Pillar Performance	No separation occurred	
Sill Seperation	No separation occurred	
Windshield Damage	None	
Window Damage	Broken	Broken
Other Notable Effects	None	

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Installed	Deployed	Installed	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Torso)	Yes	Yes	No	
Side Airbag 2 (Curtain)	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	No	No	
Seat Belt Load Limiter	Yes	No	No	
Other				

VEHICLE SPEED AND IMPACT DATA

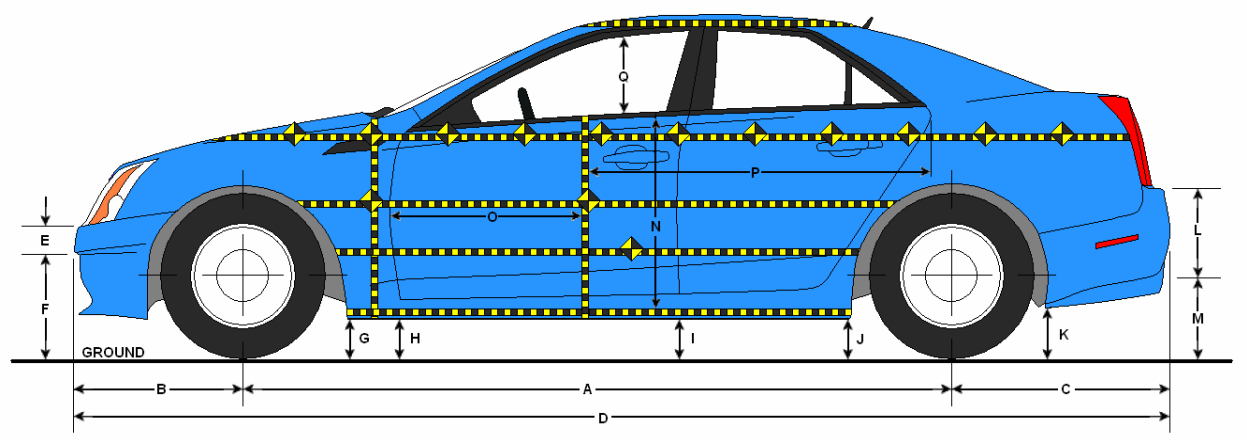
Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	-25 (Left)
Vertical Offset	mm	+/- 20	+8 (Up)

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

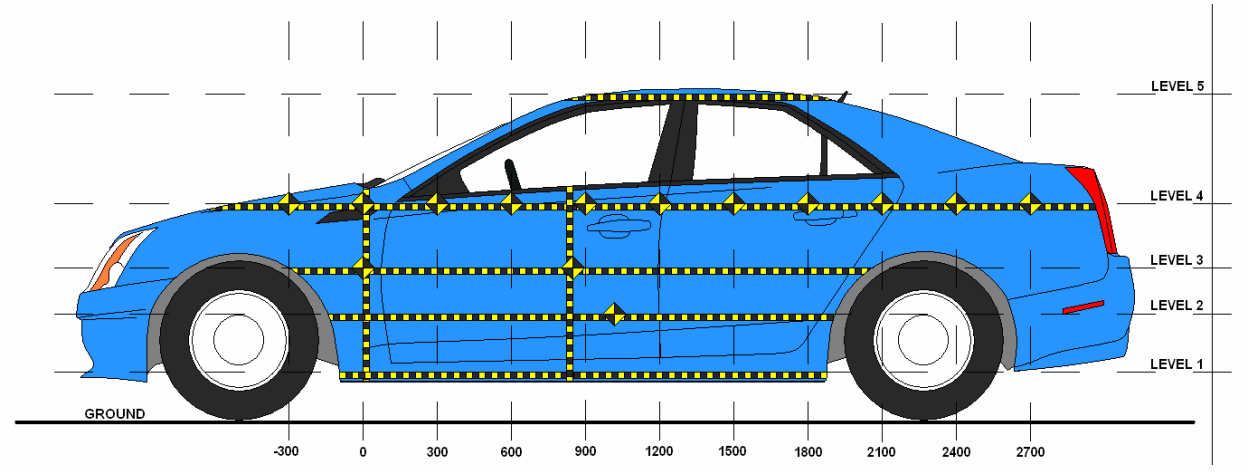
Code	Dimension	Measurement (mm)		
		Pre	Post	Difference
A	Wheelbase	2968	3388	420
B	Front Axle to FSOV	814	811	-3
C	Rear Axle to RSOV	1103	1104	1
D	Total Length at Centerline	4885	4878	-7
E	Front Bumper Thickness	155	154	-1
F	Front Bumper Bottom to Ground	364	394	30
G	Sill Height af Front Wheel Well	164	231	67
H	Sill Height at Front Door Leading Edge	161	240	79
I	Sill Height at B-Pillar	157	253	96
J1	Sill Height at Rear Wheel Well	145	238	93
J2	Pinch Weld Height at Rear Wheel Well	127	198	71
K	Sill Height Aft of Rear Wheel Well	181	263	82
L	Rear Bumper Thickness	116	115	-1
M	Bottom of Rear Bumper to Ground	435	530	95
N	Sill Height to Window Bottom Sill	618	645	27
O	Front Door Leading Edge to Impact CL	674	661	-13
P	Rear Door Trailing Edge to Impact CL	1551	1531	-20
Q	Front Window Opening	403	453	50
R	Right Side Length	3435	3488	53
S	Left Side Length	3439	3421	-18
T	Vehicle Width at B-Pillar	1863	1547	-316

DATA SHEET NO. 12

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)
1	Sill Top Height	197
2	Occupant H-Point Height	469
3	Mid-Door Height	602
4	Window Sill Height	897
5	Window Top Height	1371

DATA SHEET NO. 12 … (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150			583	702				591	702				8	0	
0	627	594	586	690		631	662	631	689		4	68	45	-1	
150	625	595	581	679		636	706	663	683		11	111	82	4	
300	623	594	581	667		637	722	684	681		14	128	103	14	
450	620	593	580	662		636	741	700	678		16	148	120	16	
600	619	591	579	655		635	747	718	685		16	156	139	30	
750	617	591	578	648		635	735	749	687		18	144	171	39	
900	615	590	578	645		635	733	760	702		20	143	182	57	
1050	613	590	577	640		634	726	746	691		21	136	169	51	
1200	612	591	577	637	926	633	729	739	688	937	21	138	162	51	11
1350	610	591	578	636	917	630	736	741	721	935	20	145	163	85	18
1500	609	590	579	634	915	627	783	776	743	933	18	193	197	109	18
1650	608	590	579	632	921	625	807	794	738	933	17	217	215	106	12
1800	607	589	579	633	928	620	732	756	706	938	13	143	177	73	10
1950	605	586	579	633	941	615	640	684	674	951	10	54	105	41	10
2100		578	576	644			586	586	660			8	10	16	
2250				642					634					-8	
2400				646					656					10	
2550				655					667					12	
2700				666					676					10	
2850				682					694					12	

MAXIMUM CRUSH DATA

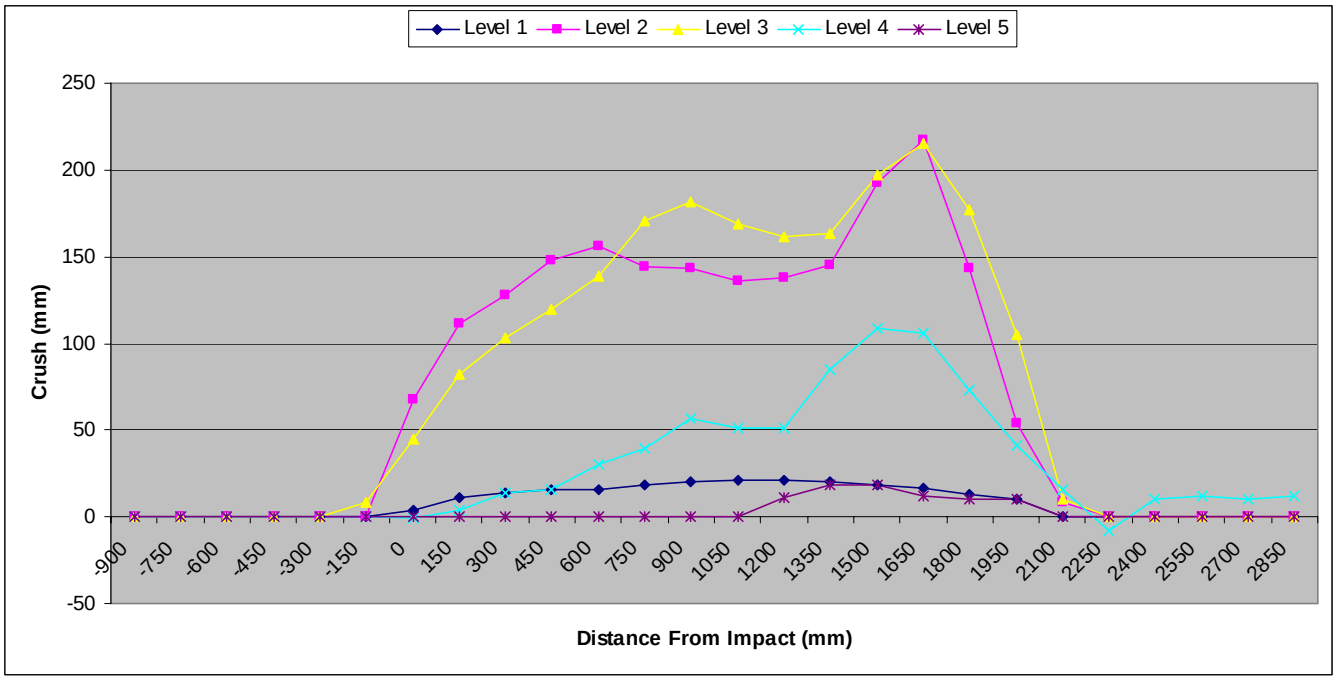
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	21	217	215	109	18
Distance from Impact (mm)	1050	1650	1650	1500	1350

DATA SHEET NO. 12 … (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

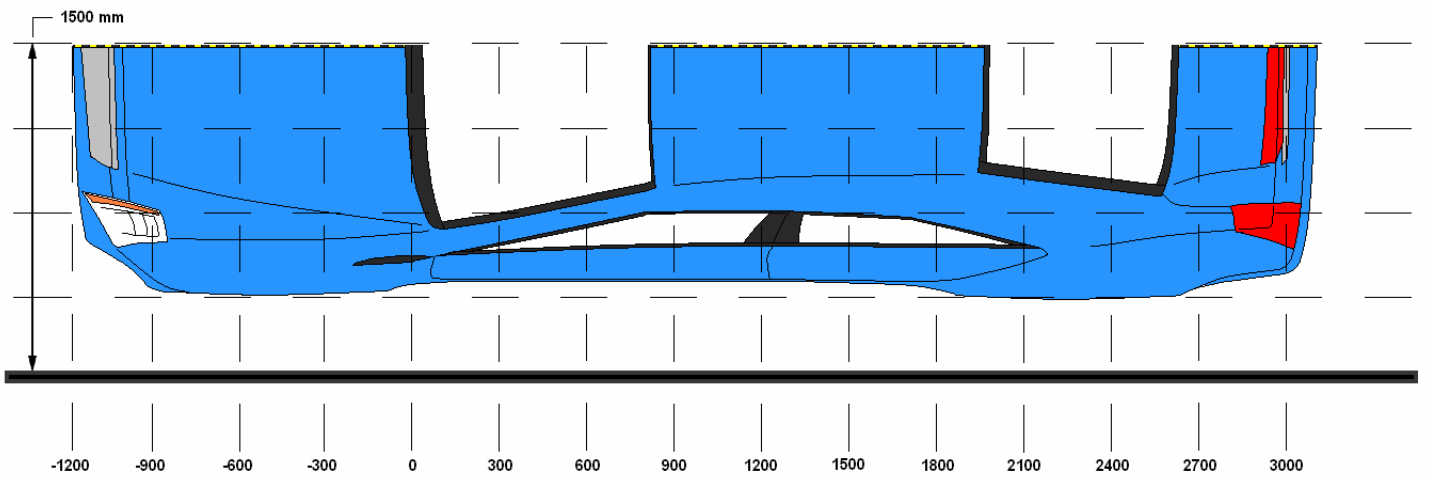


DATA SHEET NO. 13

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



TOP VIEW

DAMAGE PROFILE DISTANCES

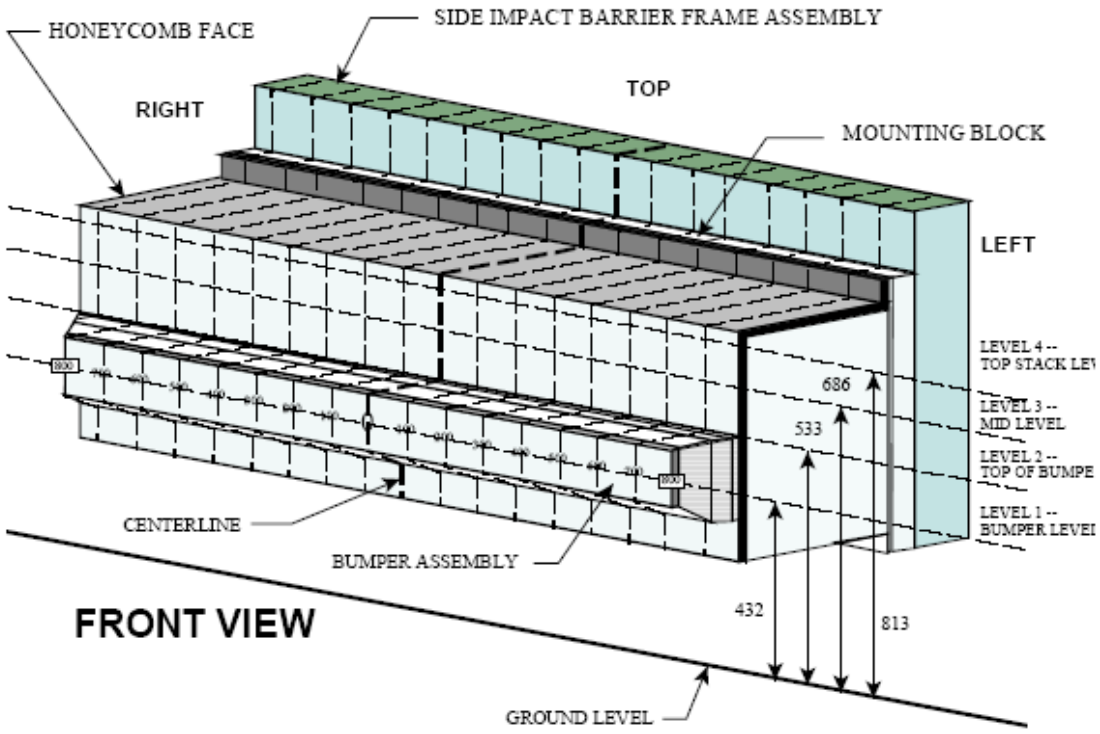
DPD	Distance From Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2100	4	644	660	16
2	1650	2	590	807	217
3	1200	3	577	739	162
4	750	3	578	749	171
5	300	2	594	722	128
6	-150	3	583	591	8

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



NOTE: Dimensions are shown in millimeters, mm

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	197	193	199	220	214	214	213	201	193	180	180	183	186	190	200	220	218
2	110	109	110	114	112	127	111	103	98	100	103	110	113	120	135	137	156
3	81	60	91	110	118	92	60	44	42	42	51	68	80	102	135	178	191
4	83	62	81	117	130	98	85	62	44	43	55	72	97	121	151	192	206

All dimensions in millimeters.

DATA SHEET NO. 15

FMVSS NO. 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

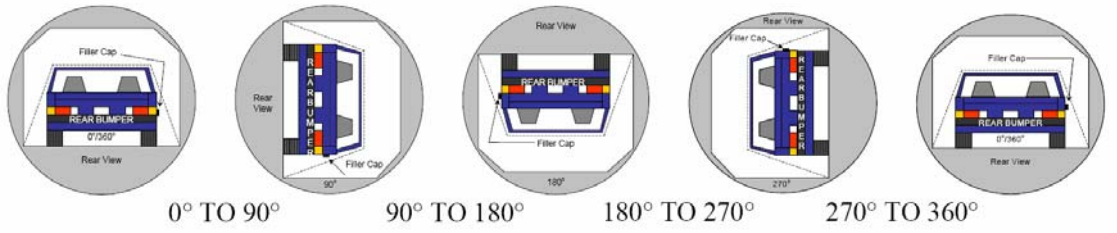
Temperature at Time of Impact: 37.2° C Test Time: 2:58 PM

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

B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)

C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)

D. Spillage Details: No spillage occurred



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	82	326	408
90° To 180°	3	311	314
180° To 270°	78	323	401
270° To 360°	82	300	382

FMVSS 301 SPILLAGE TABLE

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° To 90°	0	0		
90° To 180°	0	0		
180° To 270°	0	0		
270° To 360°	0			

SOLVENT SPILLAGE LOCATION TABLE

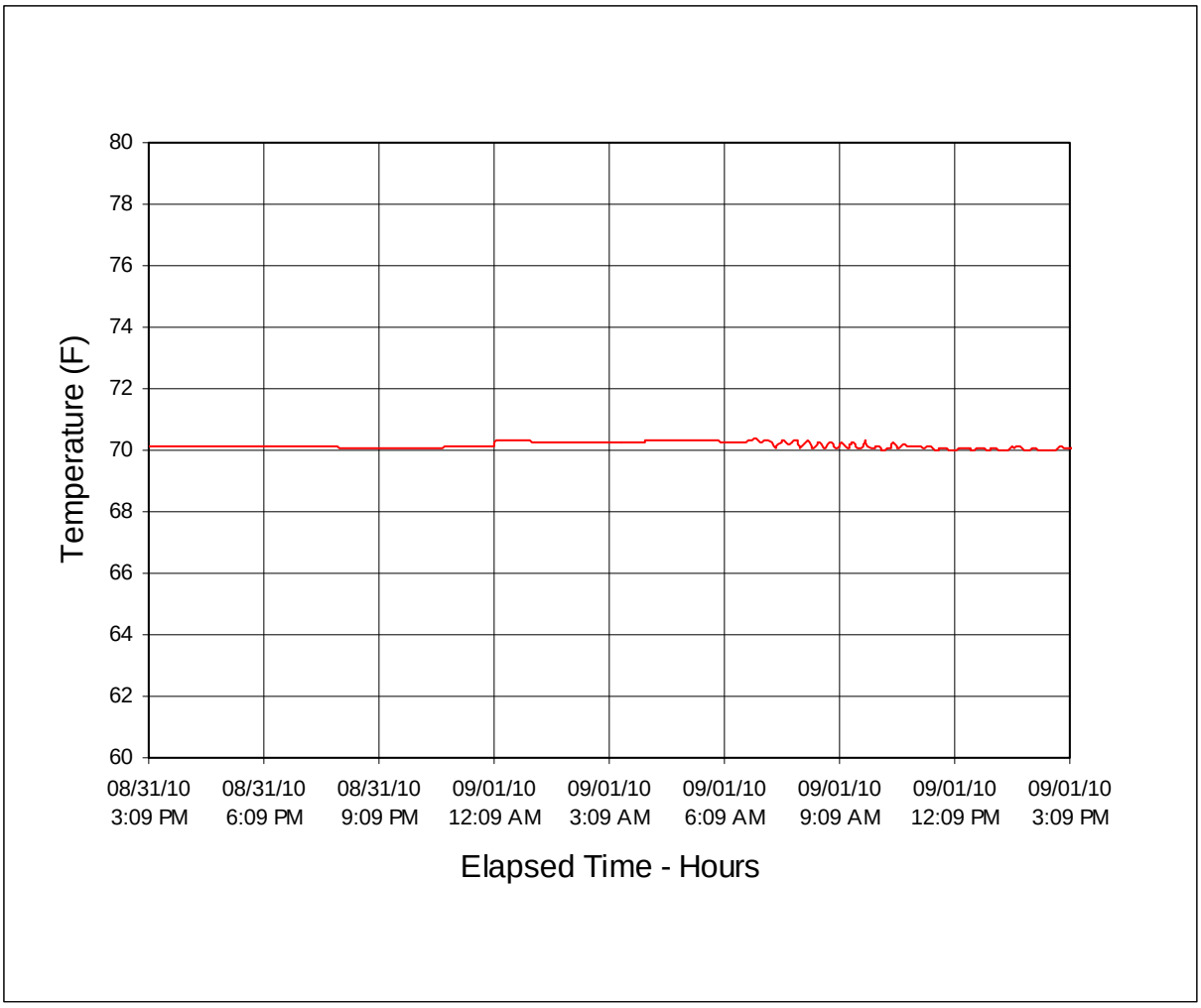
Test Phase	Spillage Location
0° To 90°	None
90° To 180°	None
180° To 270°	None
270° To 360°	None

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No. MB0507

Test Program: MDB Side Impact Test Test Date: 09/01/10



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

FIGURE 1. 2011 BMW 535i Side MDB As Delivered

FIGURE 2. 2011 BMW 535i Side MDB As Delivered

FIGURE 3. Pre-Test Frontal View of Test Vehicle

FIGURE 4. Post-Test Frontal View of Test Vehicle

FIGURE 5. Pre-Test Left Front Three-Quarter View of Test Vehicle

FIGURE 6. Post-Test Left Front Three-Quarter View of Test Vehicle

FIGURE 7. Pre-Test Left Side View of Test Vehicle

FIGURE 8. Post-Test Left Side View of Test Vehicle

FIGURE 9. Pre-Test Left Rear Three-Quarter View of Test Vehicle

FIGURE 10. Post-Test Left Rear Three-Quarter View of Impact Zone

FIGURE 11. Pre-Test Rear View of Test Vehicle

FIGURE 12. Post-Test Rear View of Test Vehicle

FIGURE 13. Pre-Test Right Side View of Test Vehicle

FIGURE 14. Post-Test Right Side View of Test Vehicle

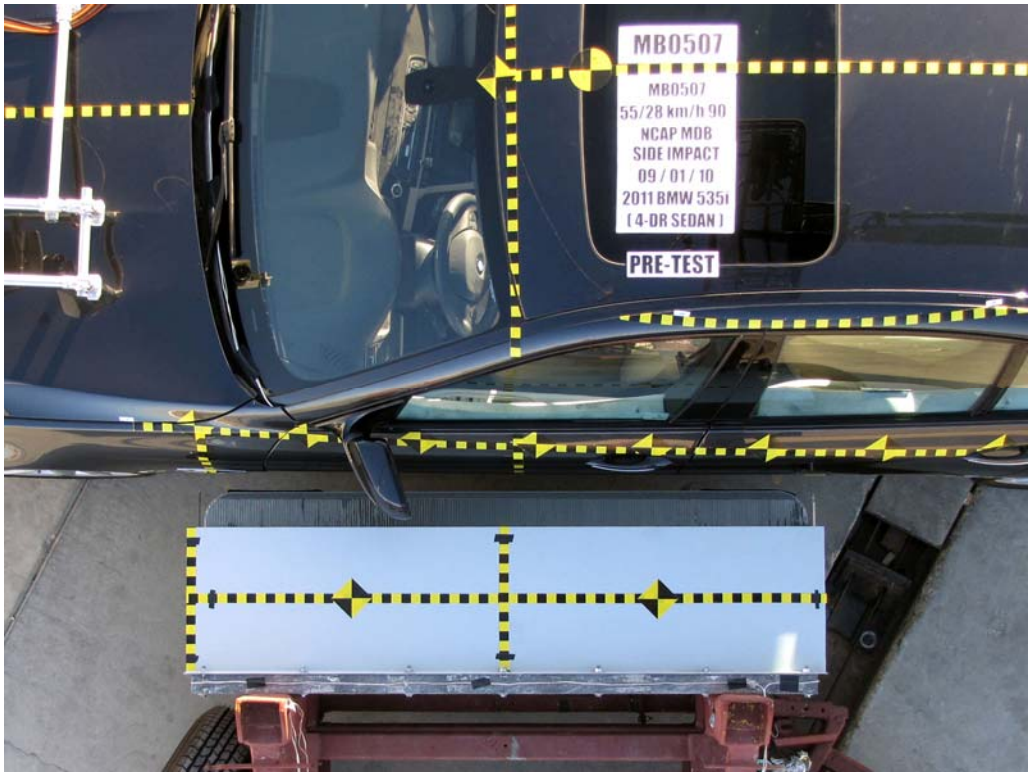


FIGURE 15. Pre-Test Overhead View of Test Vehicle
with MDB Positioned Against Side of Test Vehicle

FIGURE 16. Post-Test Overhead View of Test Vehicle and MDB

FIGURE 17. Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle

FIGURE 18. Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle

FIGURE 19. Pre-Test Close-Up View of Impact Point Target

FIGURE 20. Post-Test Close-Up View of Impact Point Target

FIGURE 21. Pre-Test Left Front Door Latch Close-Up

FIGURE 22. Post-Test Left Front Door Latch Close-Up

FIGURE 23. Pre-Test Left Rear Door Latch Close-Up

FIGURE 24. Post-Test Left Rear Door Latch Close-Up

FIGURE 25. Pre-Test Front Close-Up View of Driver Dummy

FIGURE 26. Post-Test Front Close-Up View of Driver Dummy

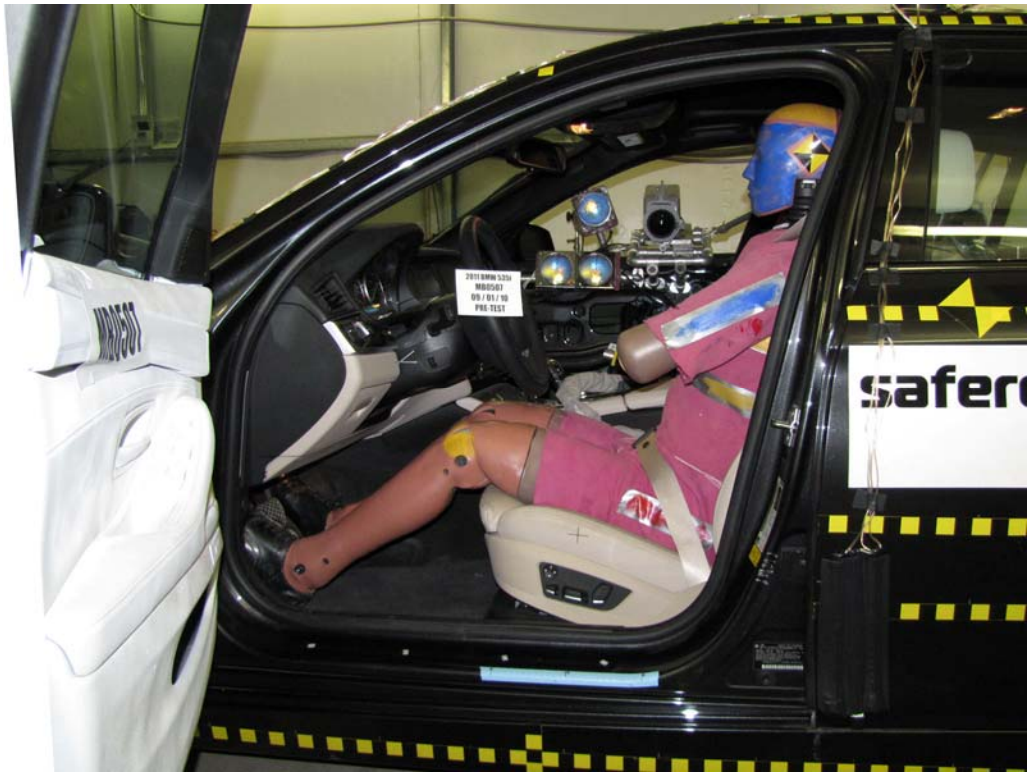


FIGURE 27. Pre-Test Left Side View of Driver Dummy
Showing Belt, Chalking, and Contact Switches

FIGURE 28. Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View

FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning

FIGURE 31. Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint

FIGURE 32. Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning

FIGURE 33. Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan

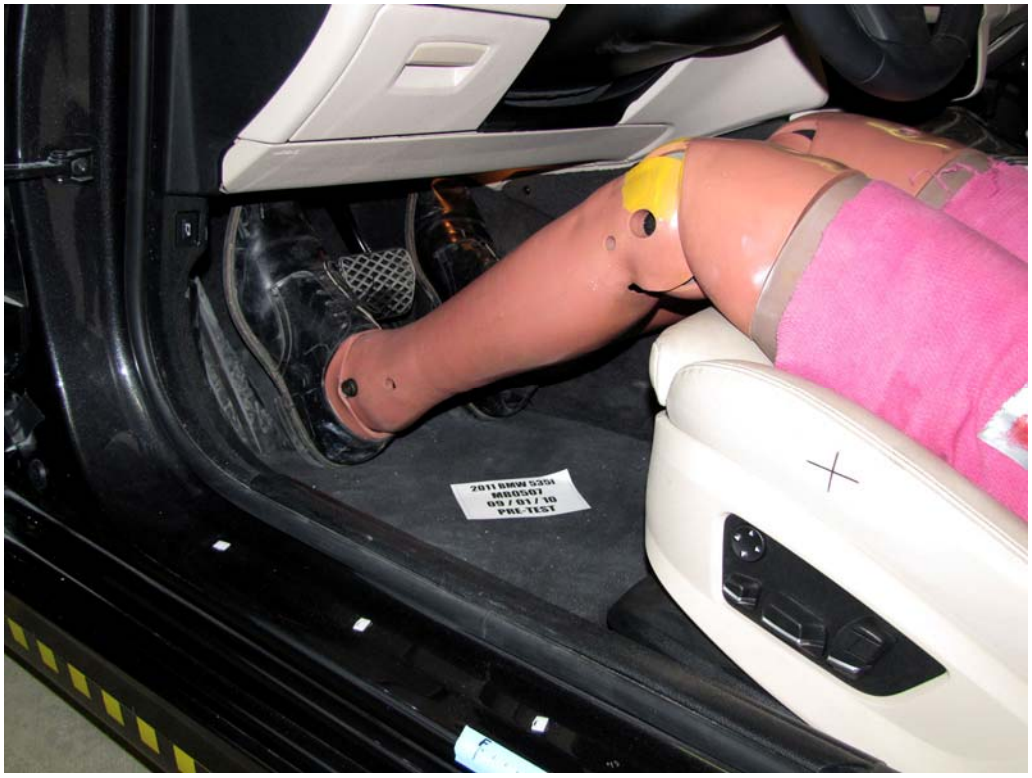


FIGURE 34. Pre-Test Placement of Driver Dummy's Feet

FIGURE 35. Pre-Test View of Belt Anchorage for Driver Dummy

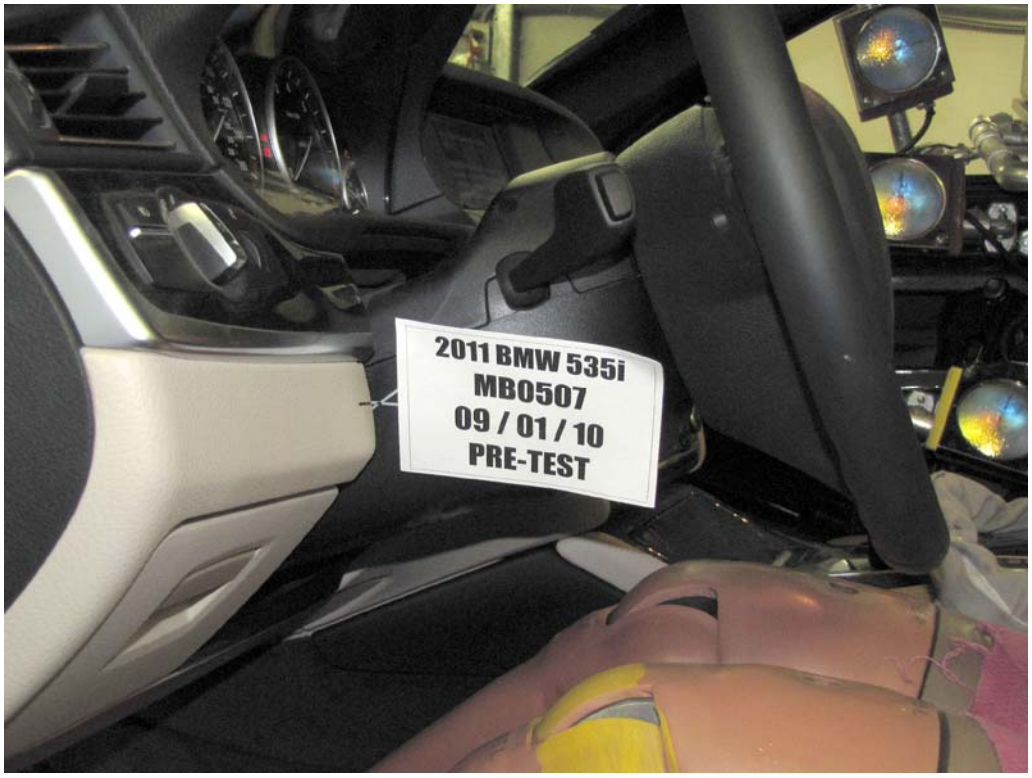


FIGURE 36. Pre-Test Left Side View of Steering Wheel

FIGURE 37. Pre-Test View of Parking Brake

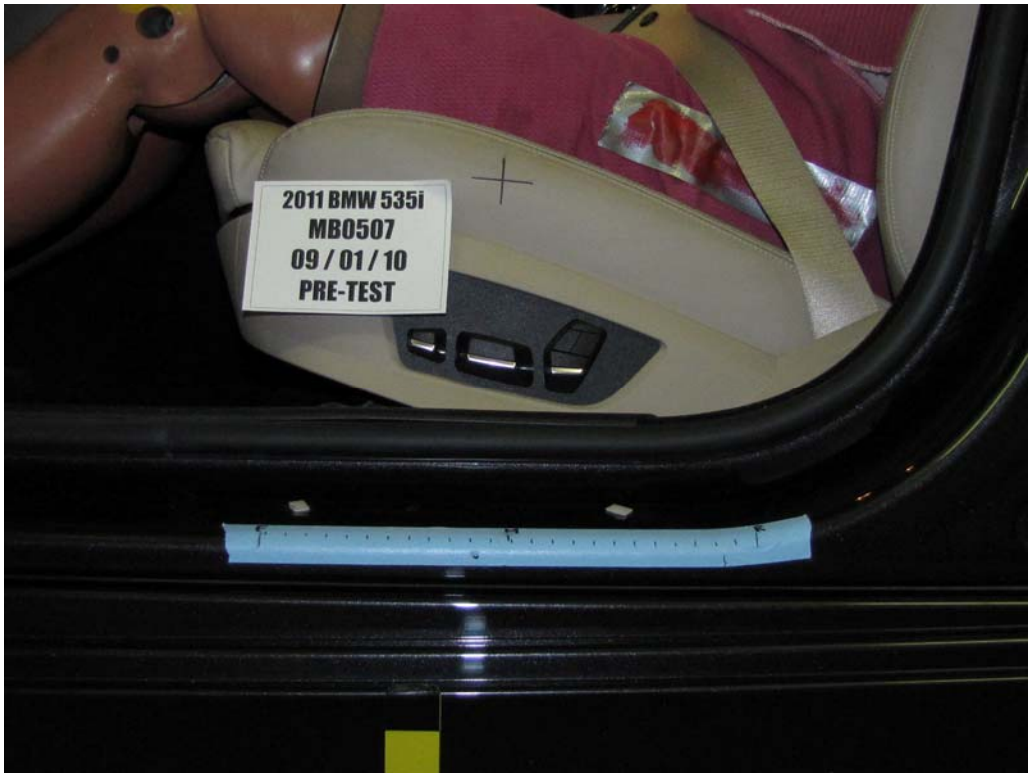


FIGURE 38. Pre-Test Close-Up Left Side View of Driver Seat Track

FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Back

FIGURE 40. Pre-Test Close-Up View of Driver Seat Back or Head Restraint

FIGURE 41. Pre-Test Driver Dummy and Door Clearance View

FIGURE 42. Post-Test Driver Dummy and Door Clearance View

FIGURE 43. Pre-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment

FIGURE 44. Post-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment

FIGURE 45. Pre-Test Driver Inner Door Panel View

FIGURE 46. Post-Test Driver Inner Door Panel View
Showing Driver Dummy Contact Locations

Photograph Not Applicable
No Dummy Head Contact
With Vehicle Interior

FIGURE 47. Post-Test Driver Dummy Close-Up Head Contact with Vehicle

FIGURE 48. Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View

FIGURE 49. Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View

FIGURE 50. Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View

FIGURE 51. Post-Test Driver Dummy Close-Up Pelvis Contact

Photograph Not Applicable
No Dummy Pelvis Contact
With Side Airbag

FIGURE 52. Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View

FIGURE 53. Pre-Test Left Side View of Rear Passenger Dummy
Showing Belt, Chalking, and Contact Switches

FIGURE 54. Pre-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View

FIGURE 55. Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

FIGURE 56. Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning

FIGURE 57. Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

FIGURE 58. Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning

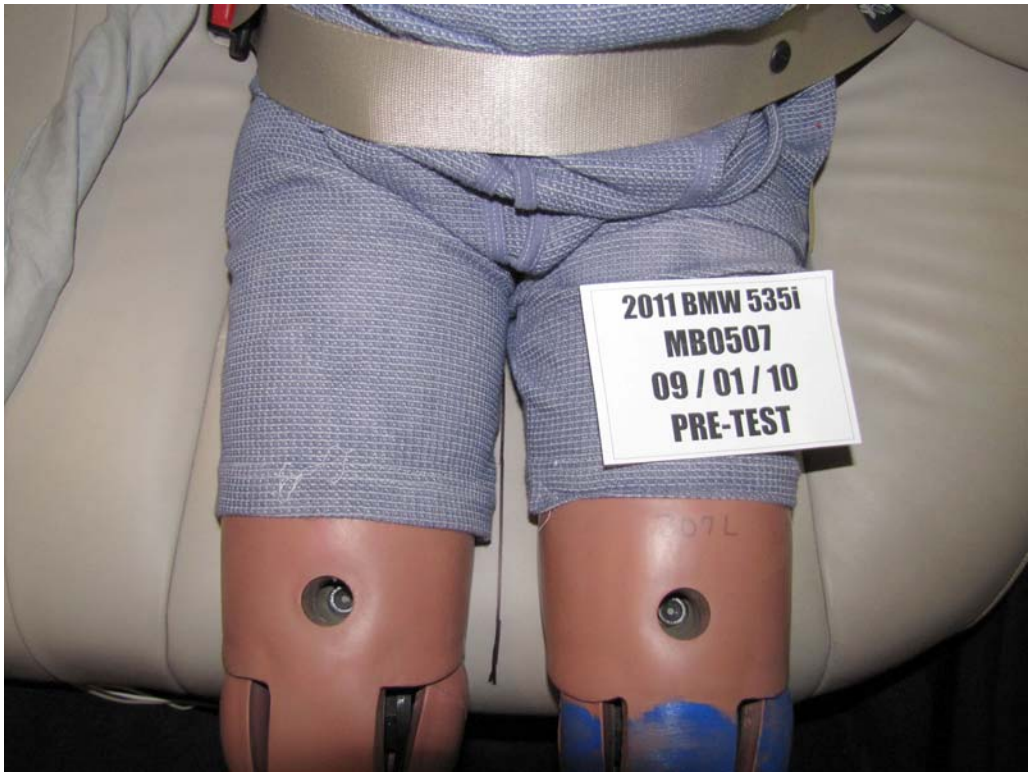


FIGURE 59. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

FIGURE 60. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket

FIGURE 61. Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head Showing Dummy's Head is Level

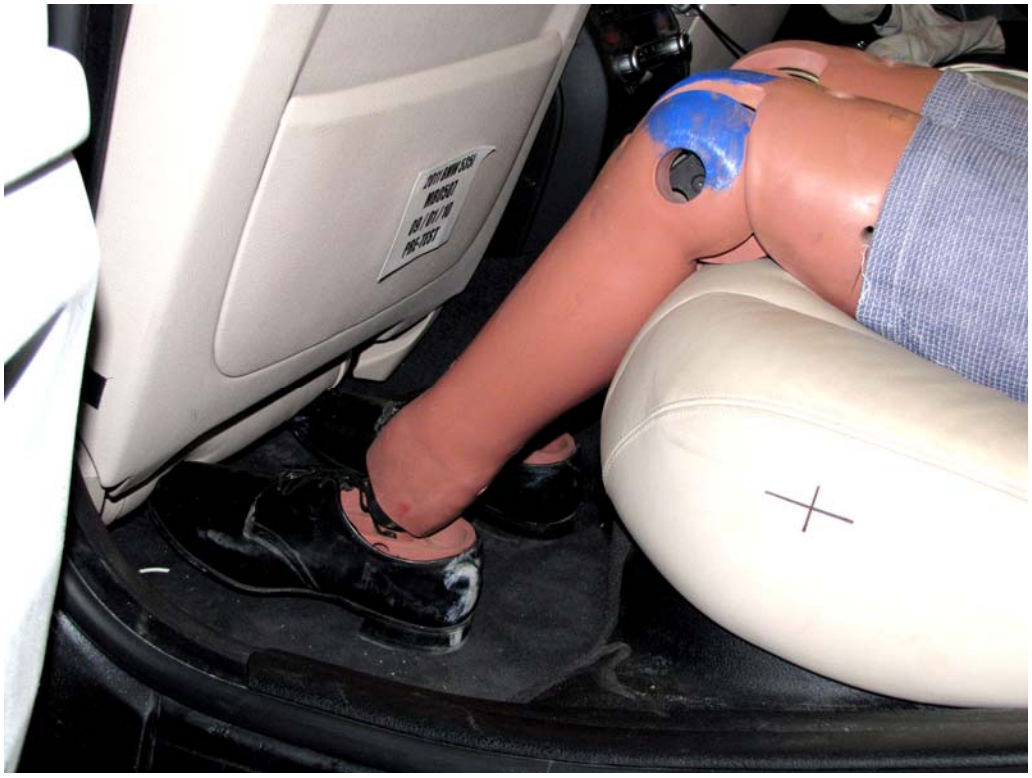


FIGURE 62. Pre-Test Placement of Rear Passenger Dummy's Feet

FIGURE 63. Pre-Test View of Belt Anchorage for Rear Passenger Dummy

FIGURE 64. Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

FIGURE 65. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back

FIGURE 66. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

FIGURE 67. Pre-Test Rear Passenger Dummy and Door Clearance View

FIGURE 68. Post-Test Rear Passenger Dummy and Door Clearance View

FIGURE 69. Pre-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment

FIGURE 70. Post-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment

FIGURE 71. Pre-Test Rear Passenger Inner Door Panel View

FIGURE 72. Post-Test Rear Passenger Inner Door Panel View
Showing Dummy Contact Locations

Photograph Not Applicable
No Dummy Head Contact
With Vehicle Interior

FIGURE 73. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle View

FIGURE 74. Post-Test Rear Passenger Dummy Close-Up
Head Contact With Side Airbag View

FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View

Photograph Not Applicable
No Dummy Torso Contact
With Side Airbag

FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View

FIGURE 77. Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View

Photograph Not Applicable
No Dummy Pelvis Contact
With Side Airbag

FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View

FIGURE 79. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 80. Post-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 81. Pre-Test Front View of MDB Impactor Face

FIGURE 82. Post-Test Front View of MDB Impactor Face

FIGURE 83. Pre-Test Top View of MDB Impactor Face

FIGURE 84. Post-Test Top View of MDB Impactor Face

FIGURE 85. Pre-Test Left Side View of MDB Impactor Face

FIGURE 86. Post-Test Left Side View of MDB Impactor Face

FIGURE 87. Pre-Test Right Side View of MDB Impactor Face

FIGURE 88. Post-Test Right Side View of MDB Impactor Face

FIGURE 89. Close-Up View of Vehicle's Certification Label

FIGURE 90. Close-Up View of Vehicle's Tire Information Placard

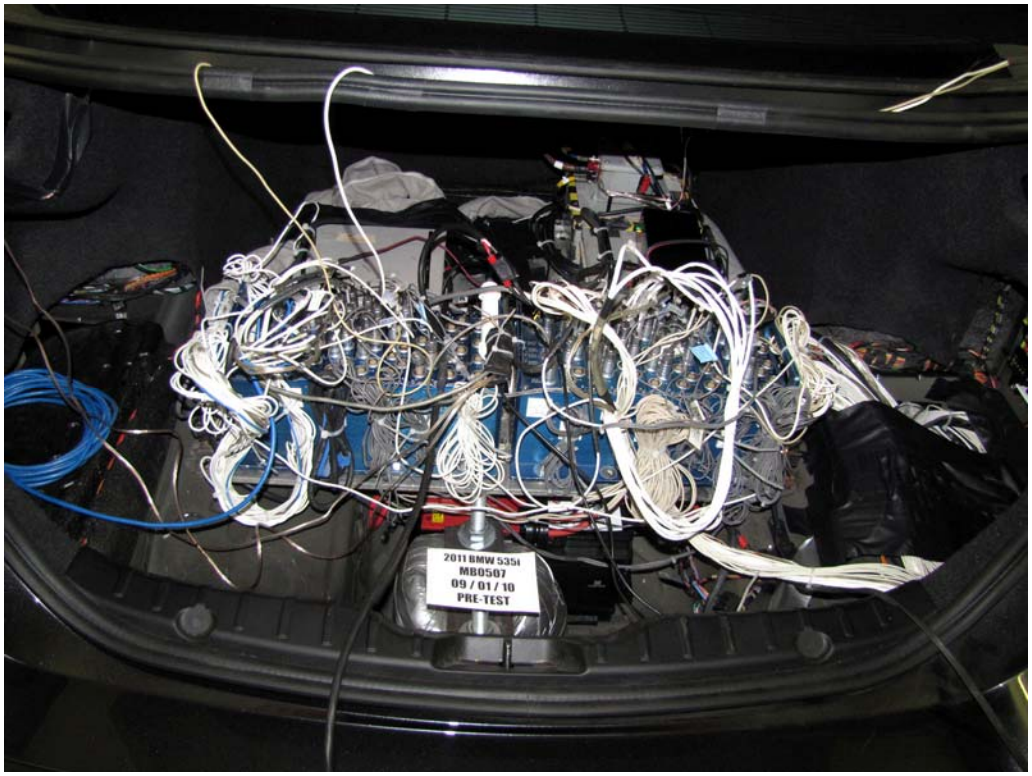


FIGURE 91. Pre-Test Ballast View

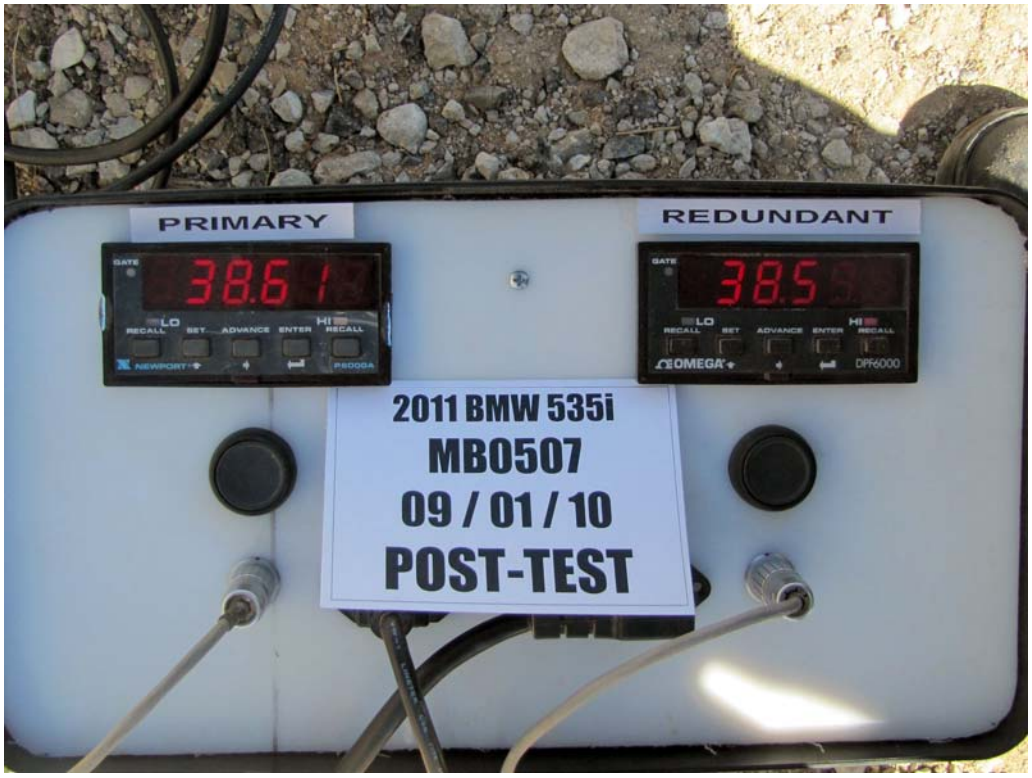


FIGURE 92. Post-Test Primary and Redundant Speed Trap Read-Out

FIGURE 93. FMVSS No. 301-305 Rollover 0 Degrees

FIGURE 94. FMVSS No. 301-305 Rollover 90 Degrees

FIGURE 95. FMVSS No. 301-305 Rollover 180 Degrees

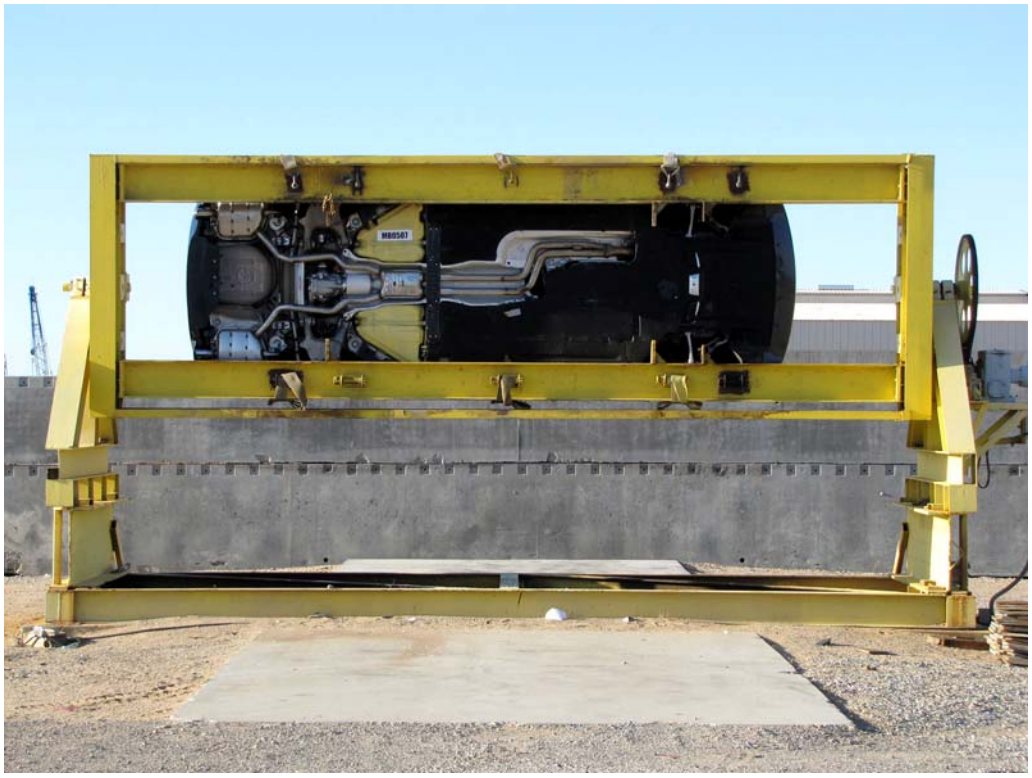


FIGURE 96. FMVSS No. 301-305 Rollover 270 Degrees

FIGURE 97. FMVSS No. 301-305 Rollover 360 Degrees

FIGURE 98. 2011 BMW 535i Side MDB Impact Event

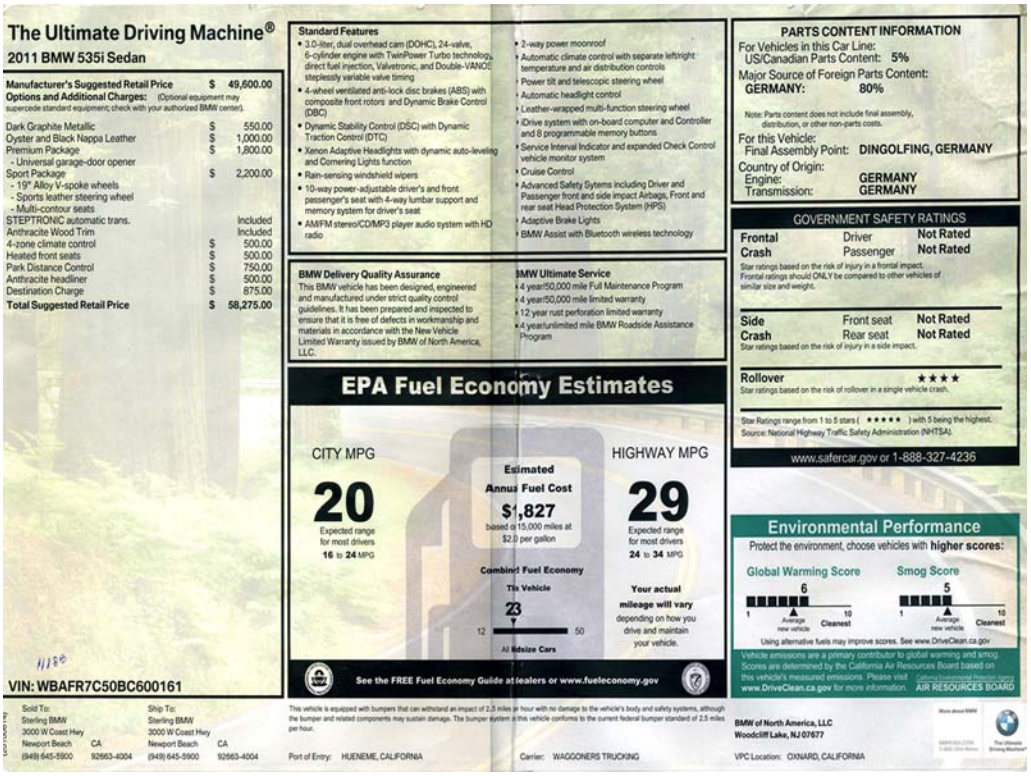
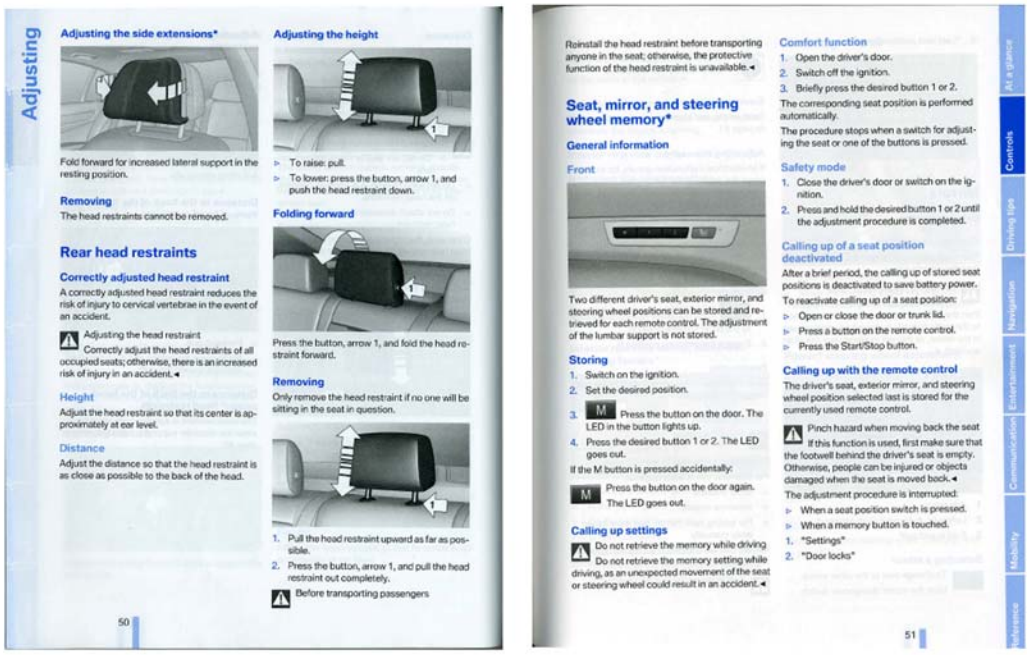


FIGURE 99. Monroney Label

FIGURE 100. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Adjusting

Adjusting the side extensions*

Fold forward for increased lateral support in the resting position.

Removing

The head restraints cannot be removed.

Rear head restraints

Correctly adjusted head restraint

A correctly adjusted head restraint reduces the risk of injury to cervical vertebrae in the event of an accident.

Adjusting the head restraint

Correctly adjust the head restraints of all occupied seats; otherwise, there is an increased risk of injury in an accident.◂

Height

Adjust the head restraint so that its center is approximately at ear level.

Distance

Adjust the distance so that the head restraint is as close as possible to the back of the head.

Adjusting the height

- To raise: pull.
- To lower: press the button, arrow 1, and push the head restraint down.

Folding forward

Press the button, arrow 1, and fold the head restraint forward.

Removing

Only remove the head restraint if no one will be sitting in the seat in question.

1. Pull the head restraint upward as far as possible.
2. Press the button, arrow 1, and pull the head restraint out completely.

Before transporting passengers

50

Reinstall the head restraint before transporting anyone in the seat; otherwise, the protective function of the head restraint is unavailable.◂

Seat, mirror, and steering wheel memory*

General information

Front

Two different driver's seat, exterior mirror, and steering wheel positions can be stored and retrieved for each remote control. The adjustment of the lumbar support is not stored.

Storing

1. Switch on the ignition.
2. Set the desired position.
3. M Press the button on the door. The LED in the button lights up.
4. Press the desired button 1 or 2. The LED goes out.

If the M button is pressed accidentally:

M Press the button on the door again. The LED goes out.

Calling up settings

Do not retrieve the memory while driving

Do not retrieve the memory setting while driving, as an unexpected movement of the seat or steering wheel could result in an accident.◂

Comfort function

1. Open the driver's door.
2. Switch off the ignition.
3. Briefly press the desired button 1 or 2.

The corresponding seat position is performed automatically.

The procedure stops when a switch for adjusting the seat or one of the buttons is pressed.

Safety mode

1. Close the driver's door or switch on the ignition.
2. Press and hold the desired button 1 or 2 until the adjustment procedure is completed.

Calling up of a seat position deactivated

After a brief period, the calling up of stored seat positions is deactivated to save battery power.

To reactivate calling up of a seat position:

- Open or close the door or trunk lid.
- Press a button on the remote control.
- Press the Start/Stop button.

Calling up with the remote control

The driver's seat, exterior mirror, and steering wheel position selected last is stored for the currently used remote control.

Pinch hazard when moving back the seat

If this function is used, first make sure that the footwell behind the driver's seat is empty. Otherwise, people can be injured or objects damaged when the seat is moved back.◂

The adjustment procedure is interrupted:

- When a seat position switch is pressed.
- When a memory button is touched.

1. "Settings"
2. "Door locks"

51

At a glance | Controls | Driving tips | Navigation | Entertainment | Communication | Mobility | Reference

FIGURE 101. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Manual

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Passenger Upper Thorax Rib Deflection (Y)

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Driver Shoulder Contact Switch

Driver Torso Contact Switch

Driver Pelvis Contact Switch

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Passenger Shoulder Contact Switch

Passenger Torso Contact Switch

Passenger Pelvis Contact Switch

Vehicle Instrumentation Data

Driver Side Airbag Timing

Driver Side Curtain Airbag Timing

Passenger Side Airbag Timing (if applicable)

Passenger Side Curtain Airbag Timing (if different from Driver)

Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)

Right Side Sill at Front Seat Acceleration (Z)

Right Side Sill at Rear Seat Acceleration (X)

Right Side Sill at Rear Seat Acceleration (Y)

Right Side Sill at Rear Seat Acceleration (Z)

Rear Floorpan Above Axle Acceleration (X)

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

Left Side Sill at Front Seat Acceleration (Y)

Left Side Sill at Rear Seat Acceleration (Y)

Right Rear Occupant Compartment Acceleration (Y)

Lower A-Post Acceleration (Y)

Upper A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Upper B-Post Acceleration (Y)

Front Seat Track Acceleration (Y)

Rear Seat Track Acceleration (Y)

Vehicle Center of Gravity Acceleration (X)

Vehicle Center of Gravity Acceleration (Y)

Vehicle Center of Gravity Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

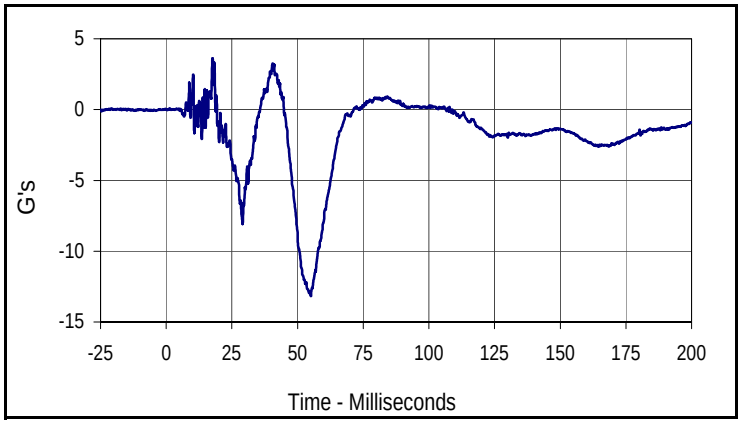
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

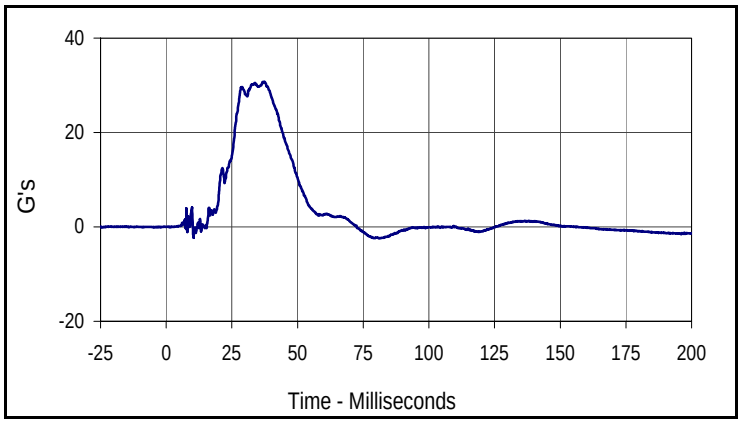
Left MDB Contact Switch

Right MDB Contact Switch

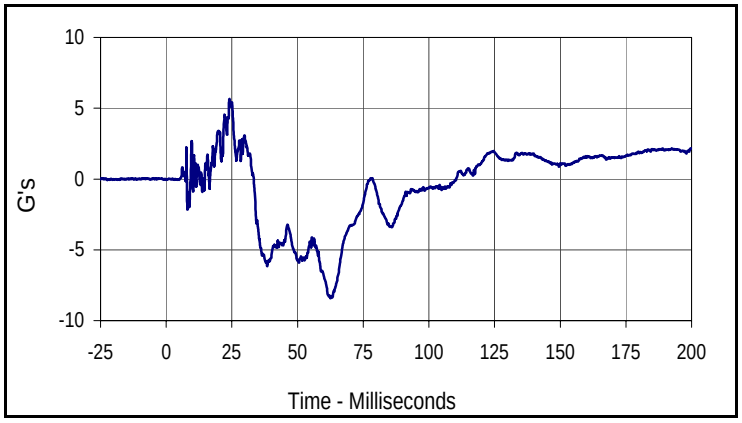
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/1/10
Test Program:	61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test	NHTSA No.:	MB0507



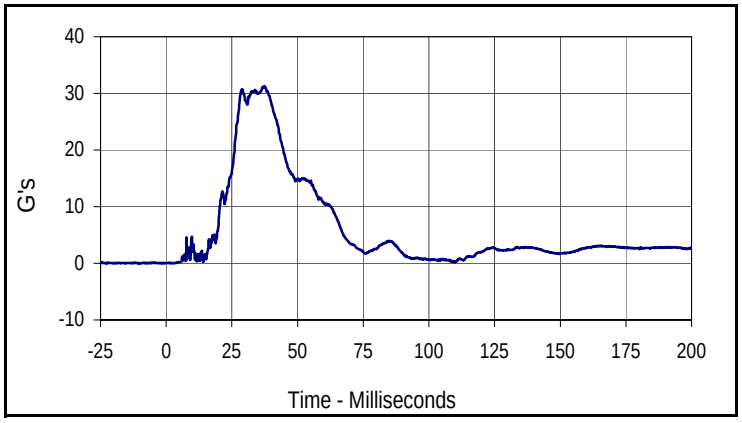
Curve Description			
Driver Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
3.6	17.6	-13.2	55.0



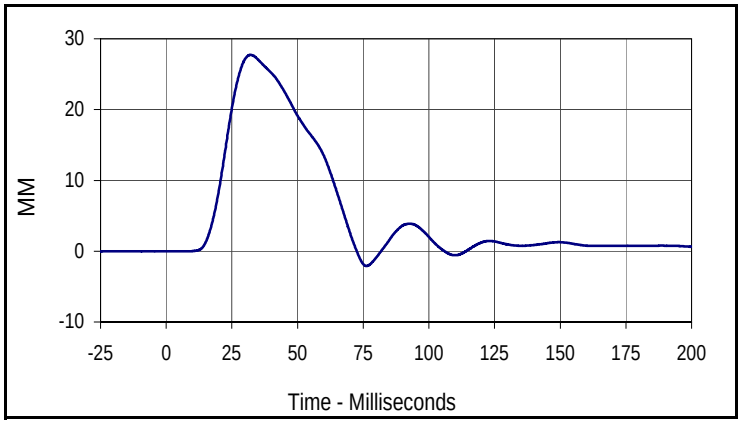
Curve Description			
Driver Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
30.8	37.4	-2.4	81.2



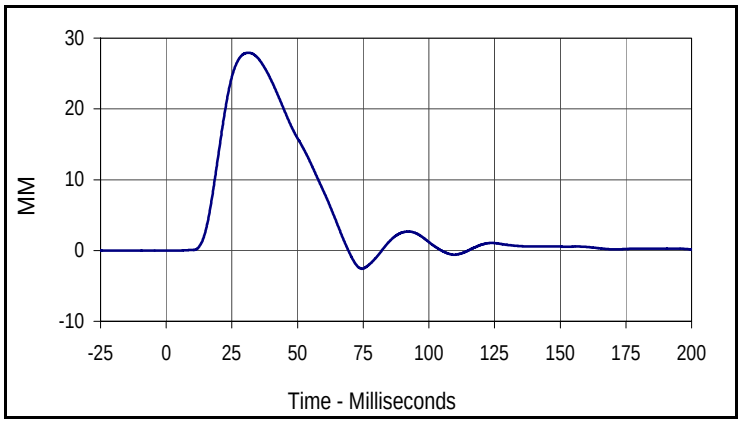
Curve Description			
Driver Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
5.7	24.1	-8.4	62.6



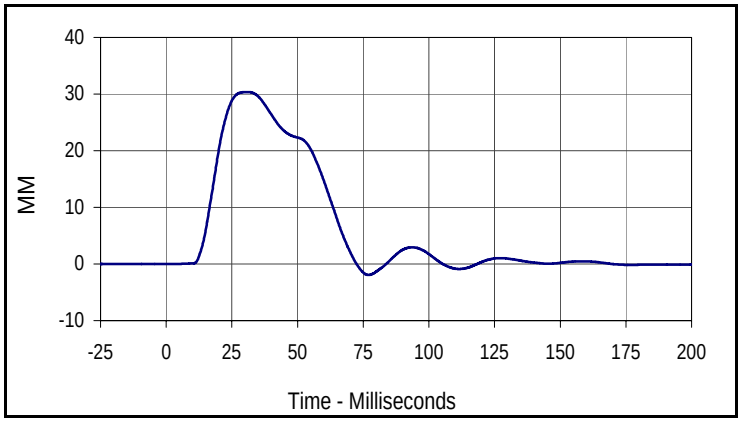
Curve Description			
Driver Head Resultant Accerlation Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
31.3	37.4	0.0	2.8



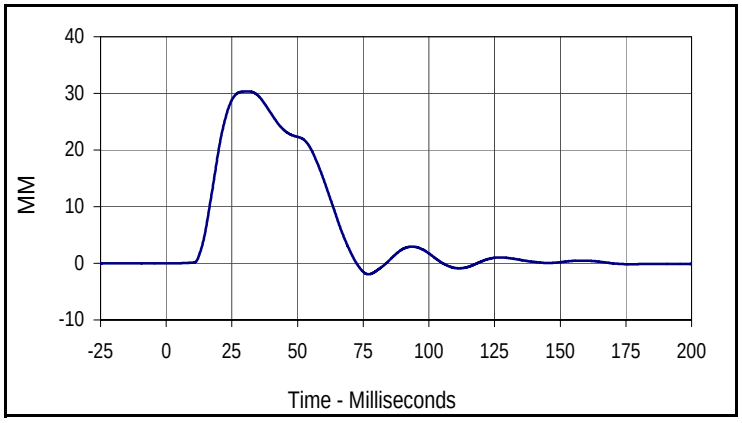
Curve Description			
Driver Upper Thorax Rib Deflection Y			
CURNO	Type	SAE Class	Units
007	FIL	180	MM
Max	Time	Min	Time
27.7	32.1	-2.1	76.2



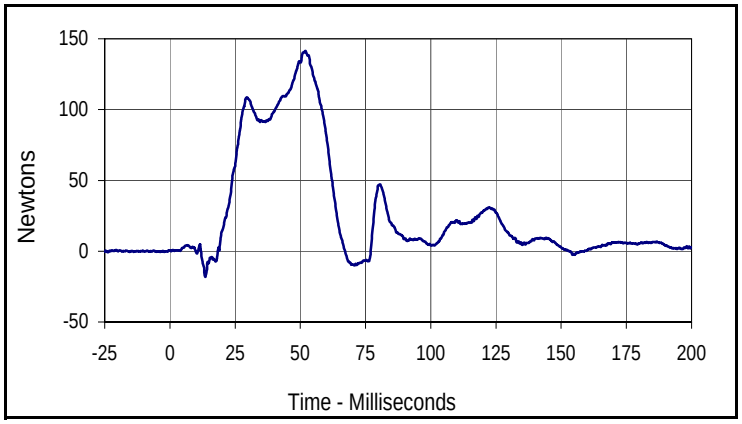
Curve Description			
Driver Middle Thorax Rib Deflection Y			
CURNO	Type	SAE Class	Units
008	FIL	180	MM
Max	Time	Min	Time
27.9	31.2	-2.6	74.5



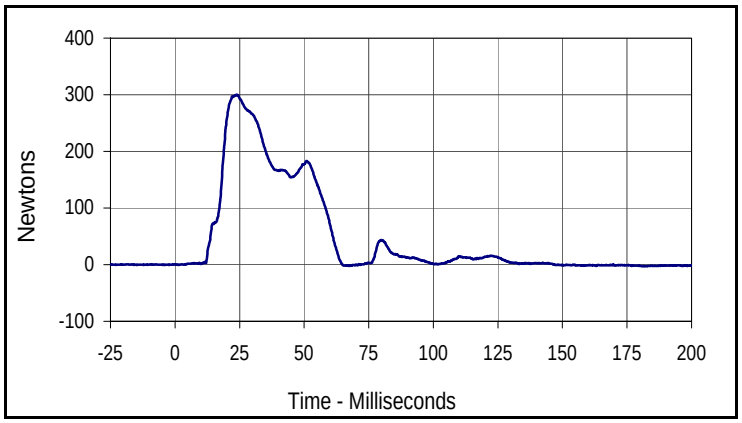
Curve Description			
Driver Lower Thorax Rib Deflection Y			
CURNO	Type	SAE Class	Units
009	FIL	180	MM
Max	Time	Min	Time
30.4	31.1	-1.9	77.1



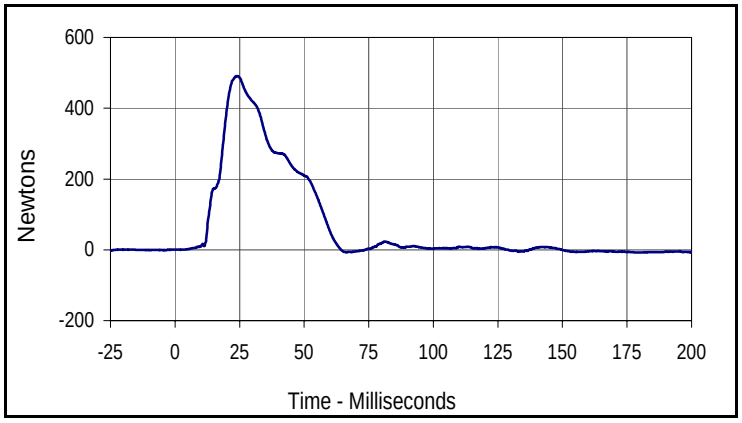
Curve Description			
Driver Thorax Rib Deflection Maximum			
CURNO	Type	SAE Class	Units
010	FIL	180	MM
Max	Time	Min	Time
30.4	31.1	-1.9	77.1



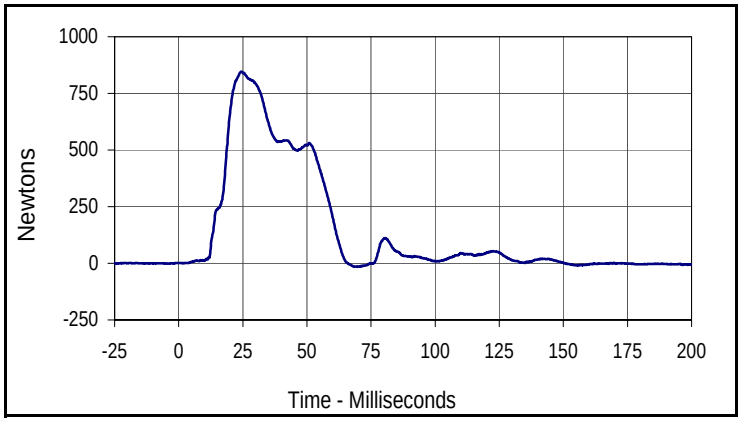
Curve Description			
Driver Anterior Abdminal Force Y			
CURNO	Type	SAE Class	Units
013	FIL	600	Newtons
Max	Time	Min	Time
141.3	51.9	-18.2	13.5



Curve Description			
Driver Middle Abdminal Force Y			
CURNO	Type	SAE Class	Units
014	FIL	600	Newtons
Max	Time	Min	Time
299.9	23.8	-2.8	182.3

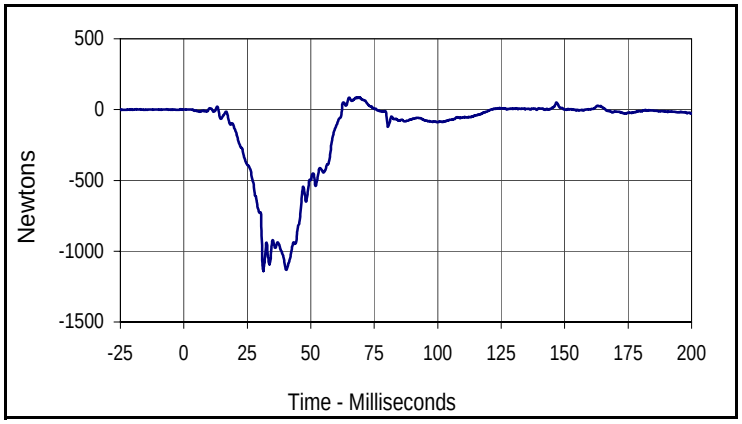


Curve Description			
Driver Posterior Abdminal Force Y			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
490.6	24.4	-7.8	179.2

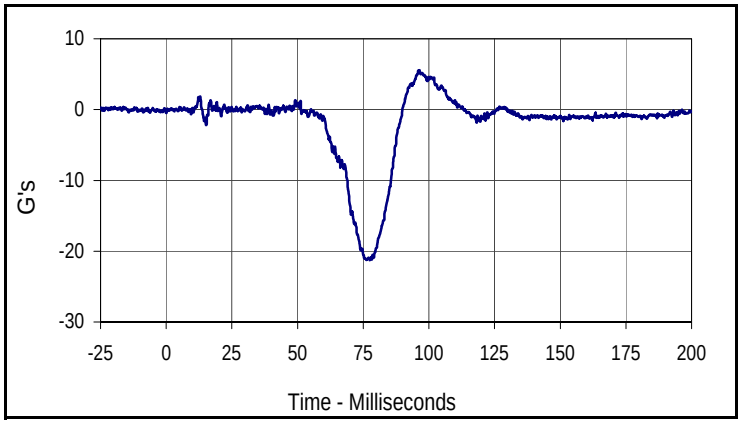


Curve Description			
Driver Total Abdominal Force			
CURNO	Type	SAE Class	Units
013	RES	600	Newtons
Max	Time	Min	Time
846.5	24.4	-15.7	69.6

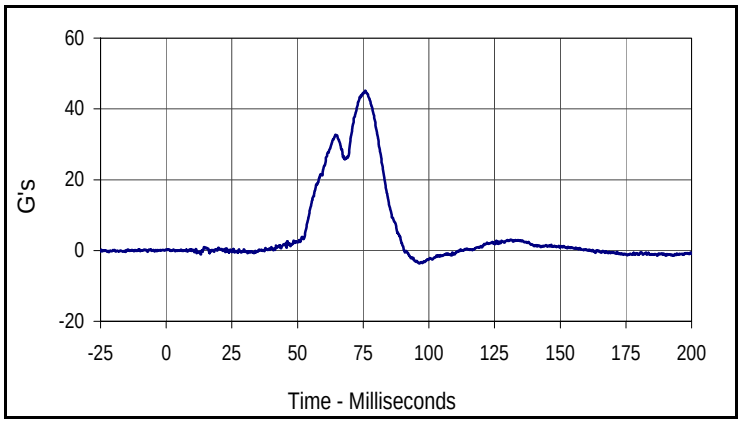
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/1/10
Test Program:	61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test	NHTSA No.:	MB0507



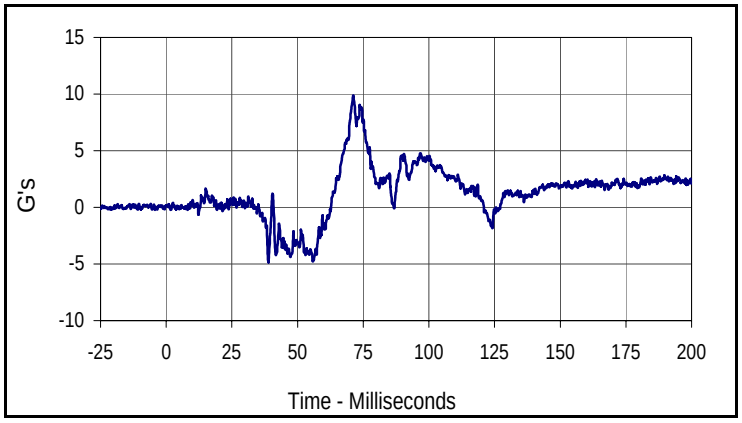
Curve Description			
Driver Pubic Symphysis Force Y			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
86.4	68.5	-1140.9	31.3



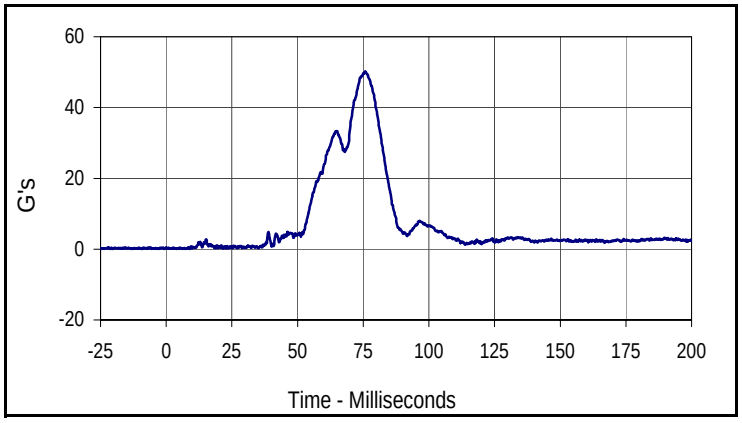
Curve Description			
Passenger Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
021	FIL	1000	G's
Max	Time	Min	Time
5.6	96.4	-21.3	77.5



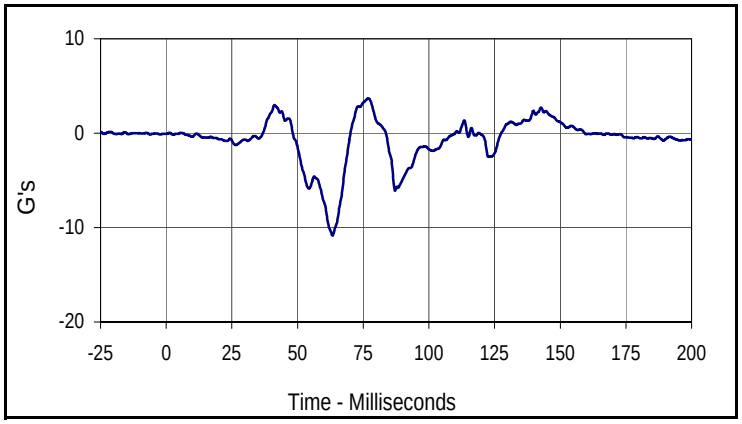
Curve Description			
Passenger Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
022	FIL	1000	G's
Max	Time	Min	Time
45.1	75.8	-3.7	96.2



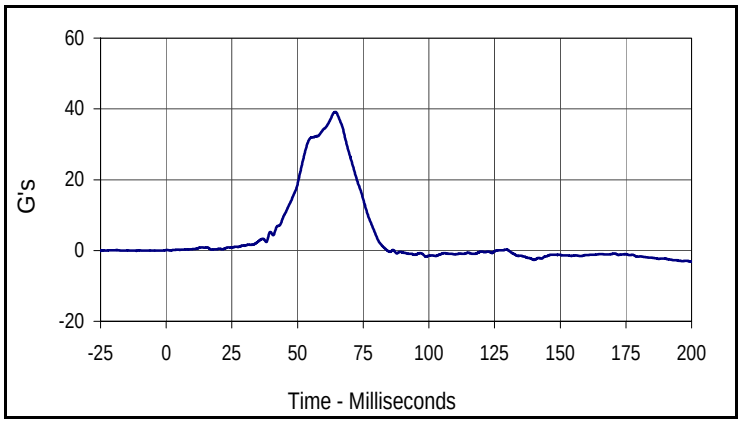
Curve Description			
Passenger Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
023	FIL	1000	G's
Max	Time	Min	Time
9.9	71.2	-4.8	38.9



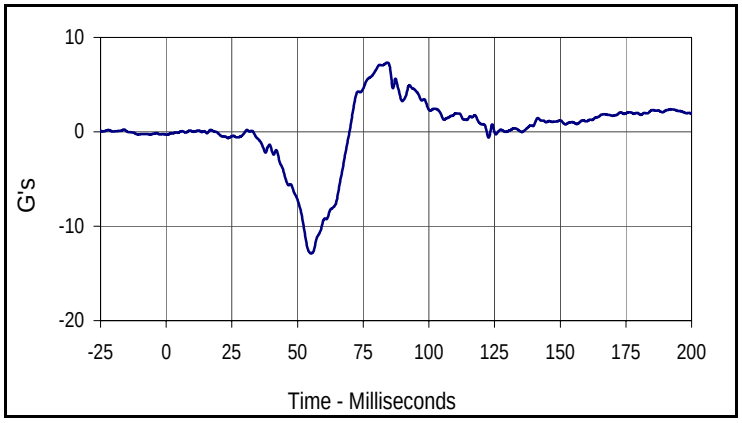
Curve Description			
Passenger Head Acceleration Resultant Primary			
CURNO	Type	SAE Class	Units
021	RES	1000	G's
Max	Time	Min	Time
50.2	75.8	0.1	7.3



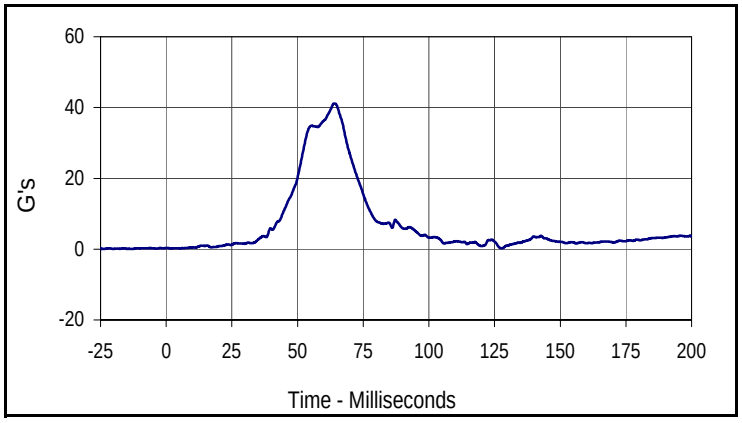
Curve Description			
Passenger Lower Spine T12 Acceleration X			
CURNO	Type	SAE Class	Units
037	FIL	180	G's
Max	Time	Min	Time
3.7	77.0	-10.8	63.3



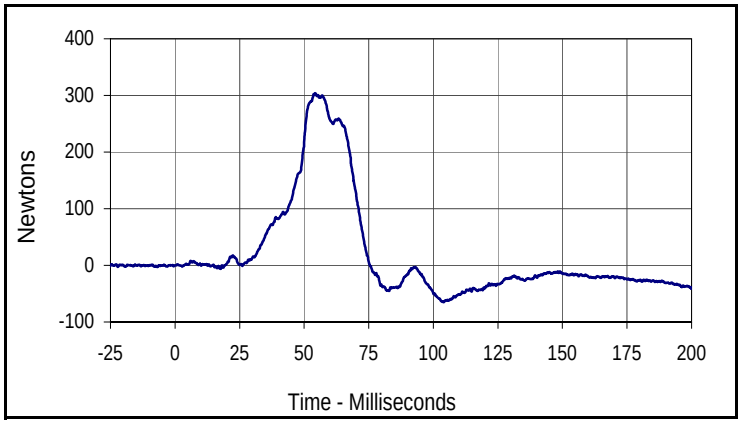
Curve Description			
Passenger Lower Spine T12 Acceleration Y			
CURNO	Type	SAE Class	Units
038	FIL	180	G's
Max	Time	Min	Time
39.1	64.4	-3.1	199.6



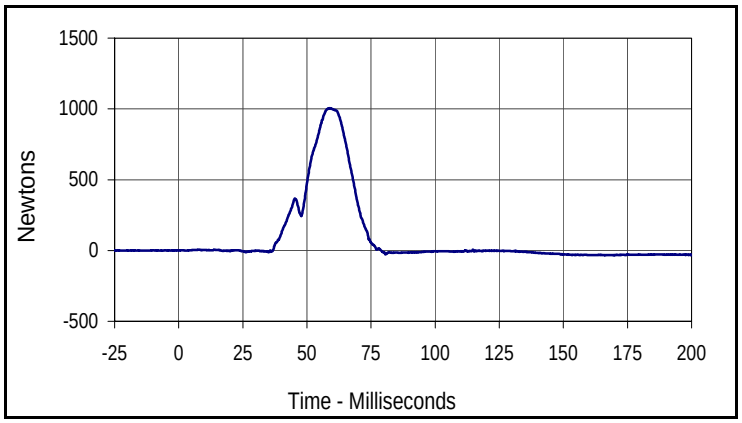
Curve Description			
Passenger Lower Spine T12 Acceleration Z			
CURNO	Type	SAE Class	Units
039	FIL	180	G's
Max	Time	Min	Time
7.3	84.2	-12.9	55.1



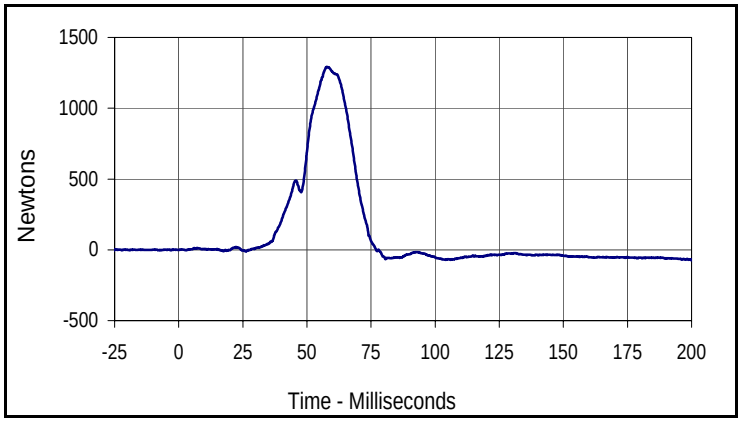
Curve Description			
Passenger Lower Spine T12 Acceleration Resultant			
CURNO	Type	SAE Class	Units
037	RES	180	G's
Max	Time	Min	Time
41.1	64.1	0.2	1.8



Curve Description			
Passenger Iliac Wing Force on Impact Side Y			
CURNO	Type	SAE Class	Units
043	FIL	600	Newtons
Max	Time	Min	Time
303.7	54.3	-65.1	104.0



Curve Description			
Passenger Acetabulum Force on Impact Side Y			
CURNO	Type	SAE Class	Units
042	FIL	600	Newtons
Max	Time	Min	Time
1005.6	58.9	-33.4	166.3



Curve Description			
Passenger Total Pelvic Force			
CURNO	Type	SAE Class	Units
042	SUM	600	Newtons
Max	Time	Min	Time
1291.2	57.8	-73.5	200.0

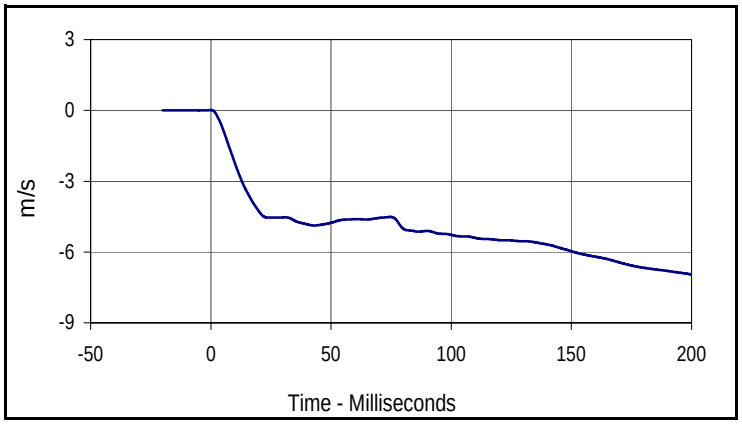
APPENDIX C

DUMMY CALIBRATION DATA

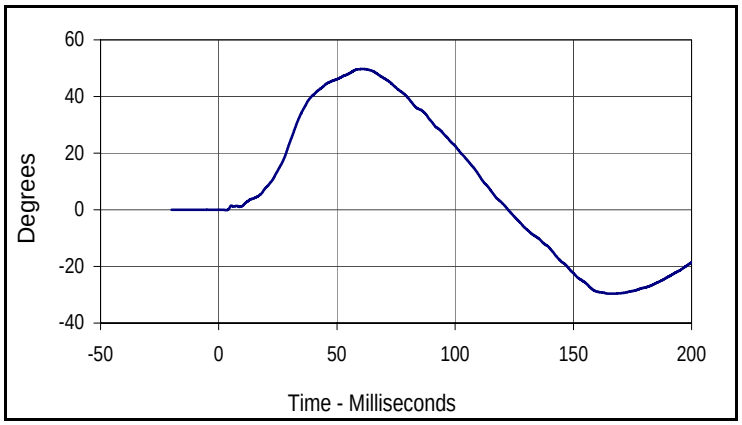
APPENDIX C
PRE-TEST / HIII CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program:	ES2re Neck Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	NB08C

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	3.30 to 3.50	3.35	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.007	Pass
	3 msec	m/s	-.250 to -.375	-0.309	Pass
	14 msec	m/s	-3.20 to -3.70	-3.25	Pass
Headform Rotation	Max	Degrees	49.0 to 58.0	49.7	Pass
	Time	msec	54.0 to 66.0	59.8	Pass
Maximum Rotation To Time Zero Crossing		msec	53.0 to 88.0	61.3	Pass
			Overall Test Results		Pass



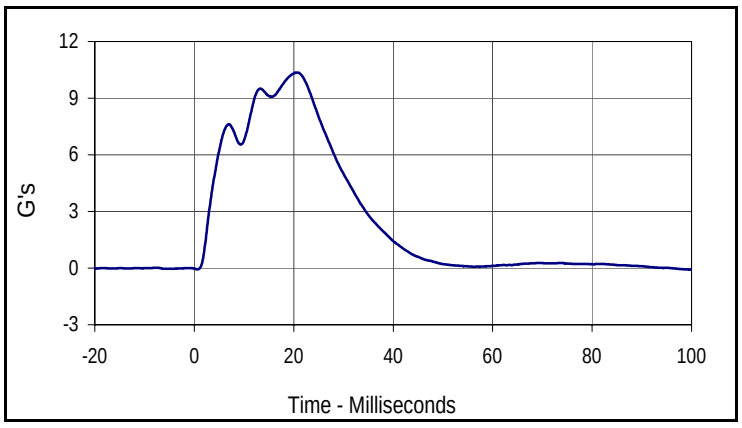
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	0.1	-7.0	200.0



Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
49.7	60.9	-29.6	164.9

Test Program:	ES2re Shoulder Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	SH08C

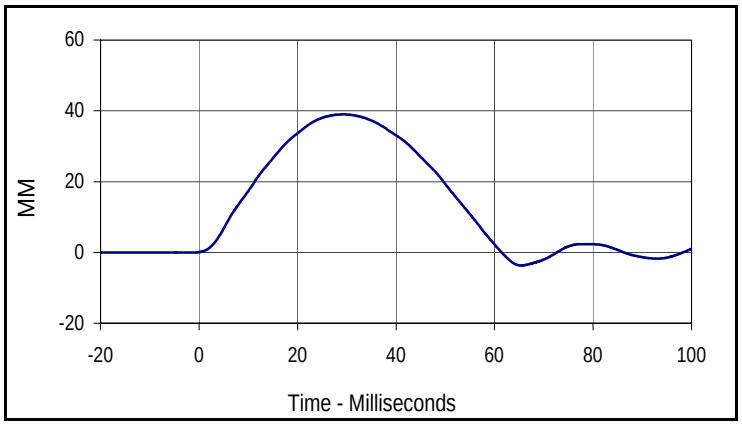
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	10.4	Pass
		Overall Test Results		Pass



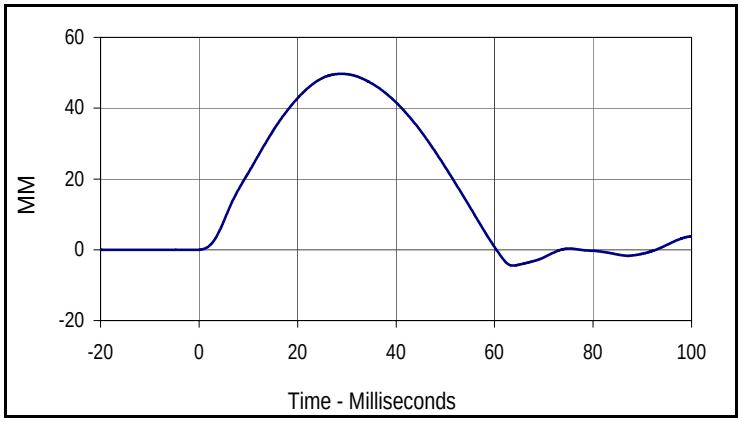
Curve Description			
Probe Impactor Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
10.4	20.7	-0.1	99.9

Test Program:	ES2re Rib Module Calibration	Test Date:	8/19/10
ATD Serial No.:	F035 Rib #1	Test I.D.:	RIB08D

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Rib Deflection at 459 MM Drop Height	MM	36 to 40	39.0	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	49.7	Pass
		Overall Test Results		Pass



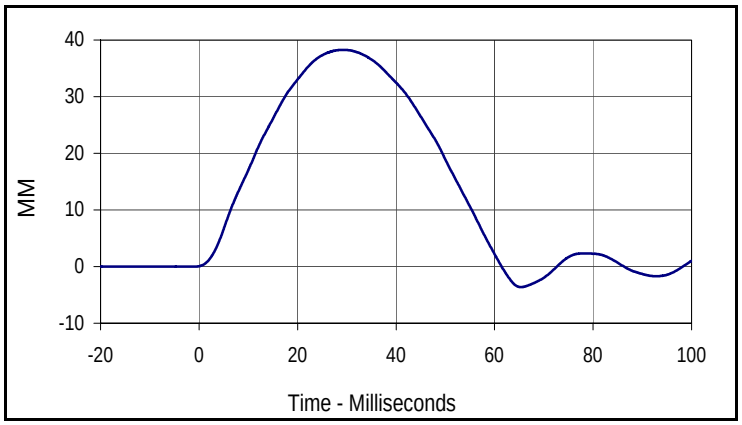
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
39.0	29.3	-3.7	65.4



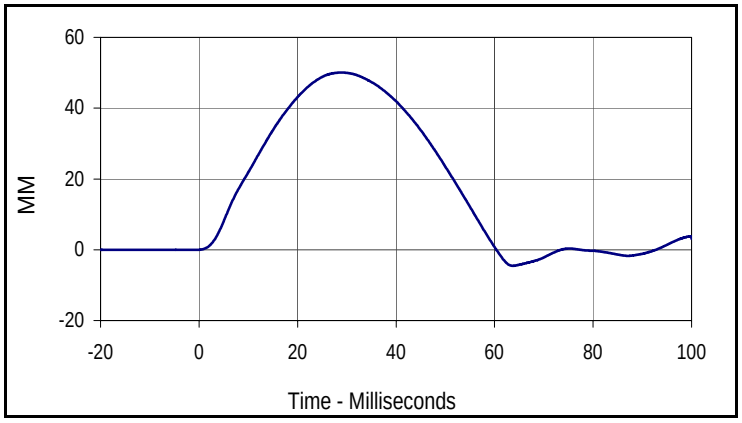
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
49.7	28.9	-4.5	63.7

Test Program:	ES2re Rib Module Calibration	Test Date:	8/19/10
ATD Serial No.:	F035 Rib #2	Test I.D.:	RIB08E

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Rib Deflection at 459 MM Drop Height	MM	36 to 40	38.3	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	50.1	Pass
		Overall Test Results		Pass



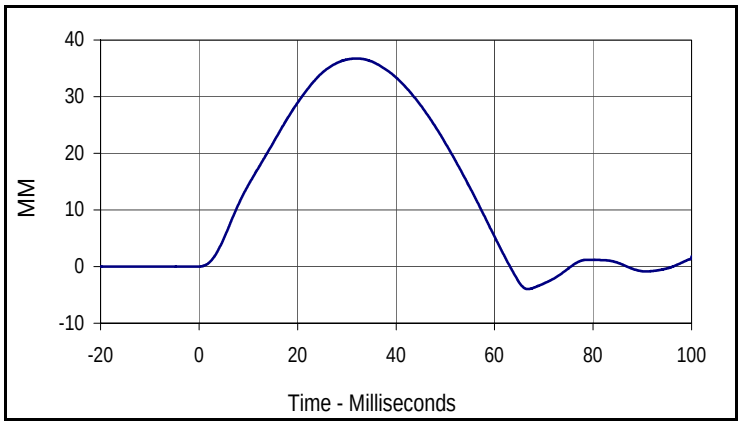
Curve Description			
Middle Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
38.3	29.3	-3.6	65.4



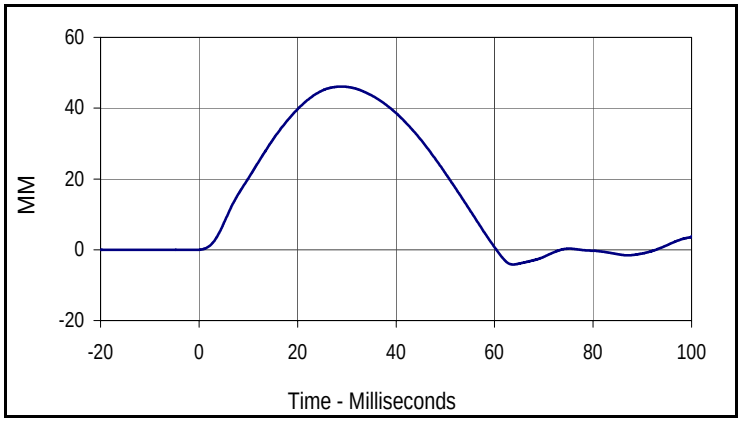
Curve Description			
Middle Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
50.1	28.9	-4.5	63.7

Test Program:	ES2re Rib Module Calibration	Test Date:	8/19/10
ATD Serial No.:	F035 Rib #3	Test I.D.:	RIB08F

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Rib Deflection at 459 MM Drop Height	MM	36 to 40	36.7	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	46.1	Pass
		Overall Test Results		Pass



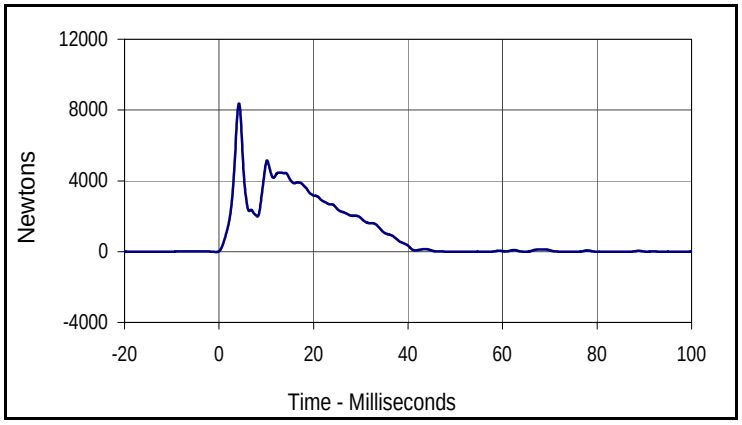
Curve Description			
Lower Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
36.7	32.0	-4.0	66.8



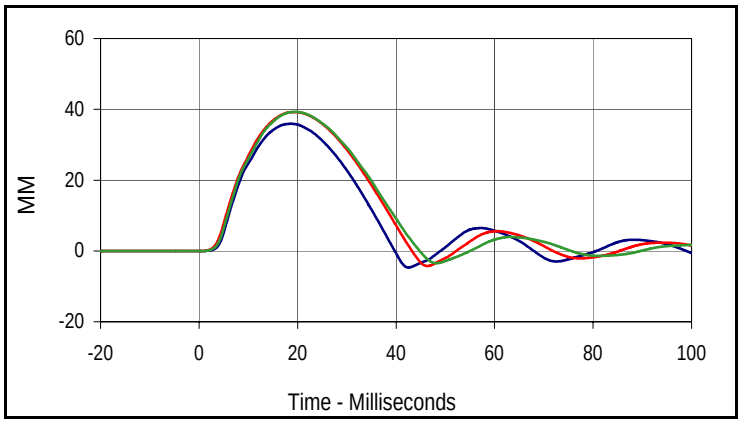
Curve Description			
Lower Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
46.1	28.9	-4.2	63.8

Test Program:	ES2re Thorax Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	TH08B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	5.40 to 5.60	5.42	Pass
Impactor Force	N	5100 to 6200	5146.3	Pass
	msec	> 6.0 msec	9.9	Pass
Upper Rib Deflection	MM	34 to 41	35.9	Pass
Middle Rib Deflection	MM	37 to 45	39.2	Pass
Lower Rib Deflection	MM	37 to 44	39.3	Pass
		Overall Test Results		Pass



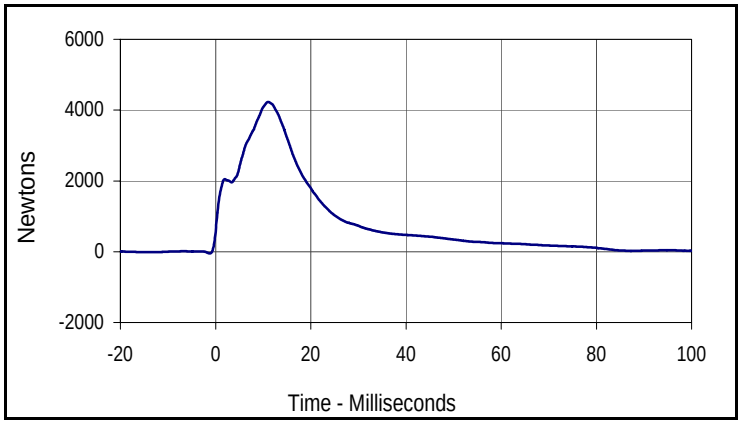
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
8369.9	4.2	-25.0	-0.5



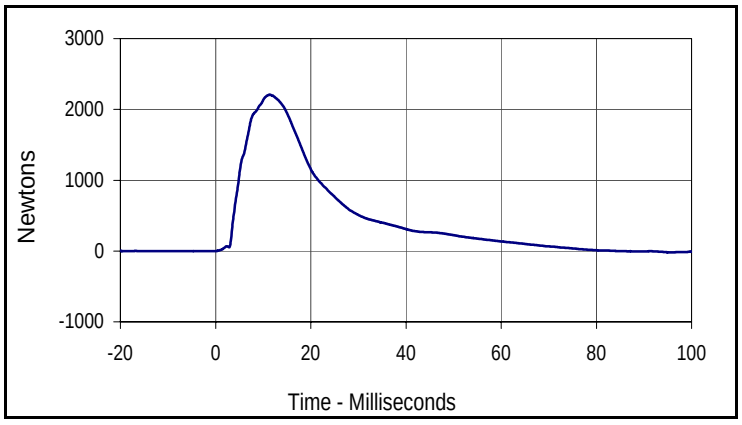
Curve Description			
Upper, Middle, Lower Rib Deflections			
CURNO(s)	Type	SAE Class	Units
002-003-004	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
35.9	18.7	-4.7	42.5
Max (Middle)	Time	Min (Middle)	Time
39.2	19.4	-4.3	46.4
Max (Lower)	Time	Min (Lower)	Time
39.3	19.5	-3.5	48.2

Test Program:	ES2re Abodomen Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	ABD08C

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	3.90 to 4.10	3.95	Pass
Impactor Force	N	4000 to 4800	4230.8	Pass
	msec	10.6 to 13.0	11.0	Pass
Abdominal Force	N	2200 to 2700	2206.8	Pass
	msec	10.0 to 12.3	11.4	Pass
		Overall Test Results		Pass



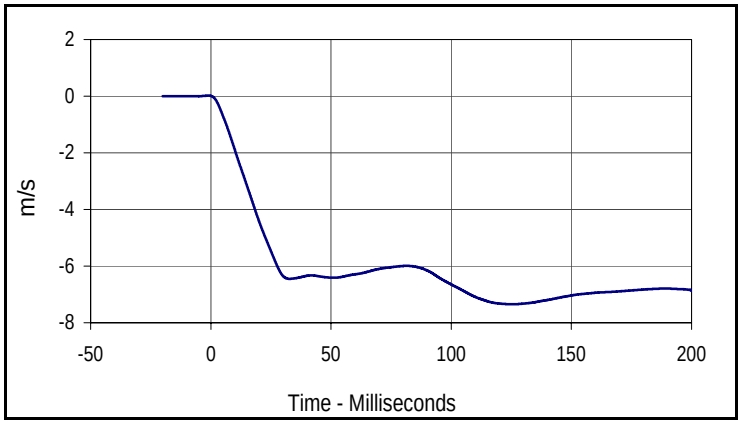
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4230.8	11.0	-50.0	-1.2



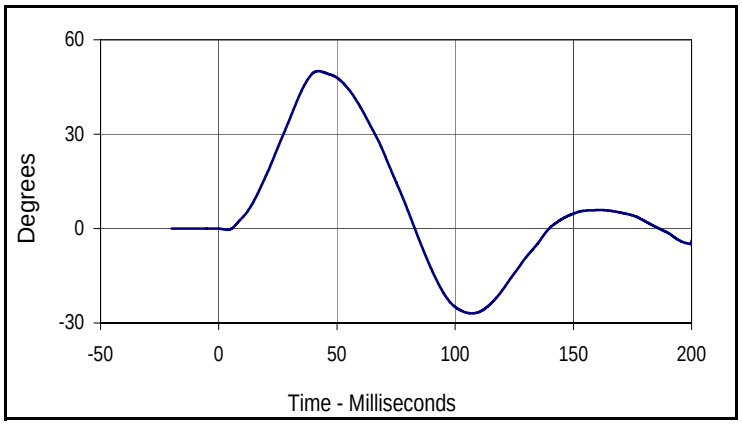
Curve Description			
Abdomen Sum Resultant			
CURNO	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2206.8	11.4	-18.9	95.8

Test Program:	ES2re Lumbar Spine Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	SP08C

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.15	6.00	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.030	Pass
	3.7 msec	m/s	-.240 to -.425	-0.411	Pass
	27 msec	m/s	-5.80 to -6.50	-5.87	Pass
	30 msec	m/s	< -6.50	-6.35	Pass
Headform Rotation	Max	Degrees	45.0 to 55.0	50.0	Pass
	Time	msec	39.0 to 53.0	42.1	Pass
Maximum Rotation To Time Zero Crossing		msec	37.0 to 57.0	40.9	Pass
			Overall Test Results		Pass



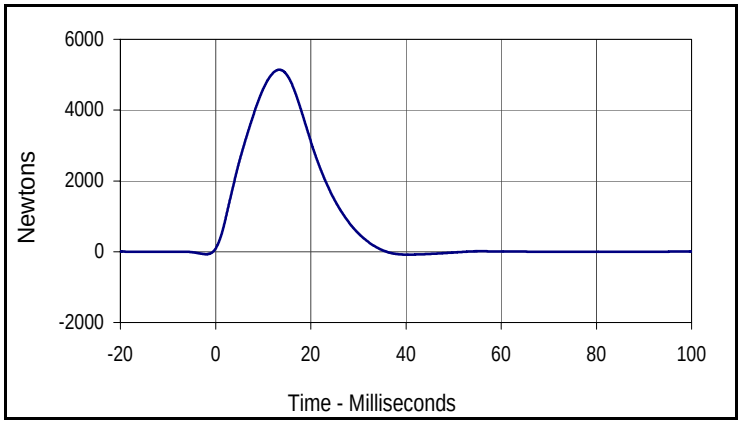
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.0	-7.3	125.4



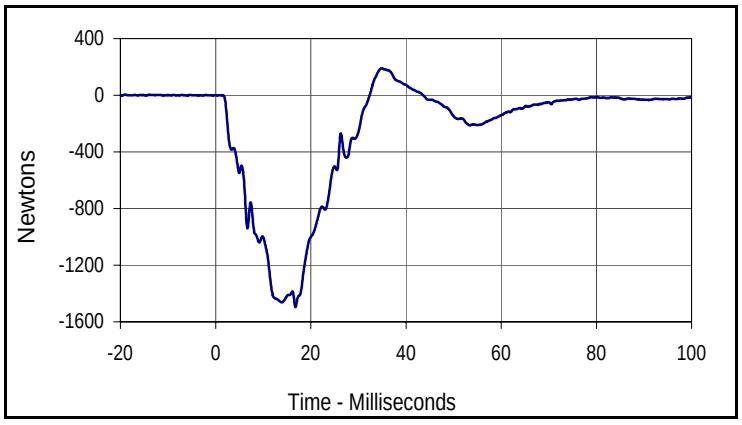
Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
50.0	42.1	-26.9	107.0

Test Program:	ES2re Pelvis Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	PL08A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	4.20 to 4.40	4.27	Pass
Impactor Force	N	4700 to 5400	5139.7	Pass
	msec	11.8 to 16.1	13.4	Pass
Pubic Symphysis Load	N	-1230 to -1590	-1495.9	Pass
	msec	12.2 to 17.0	16.8	Pass
		Overall Test Results		Pass



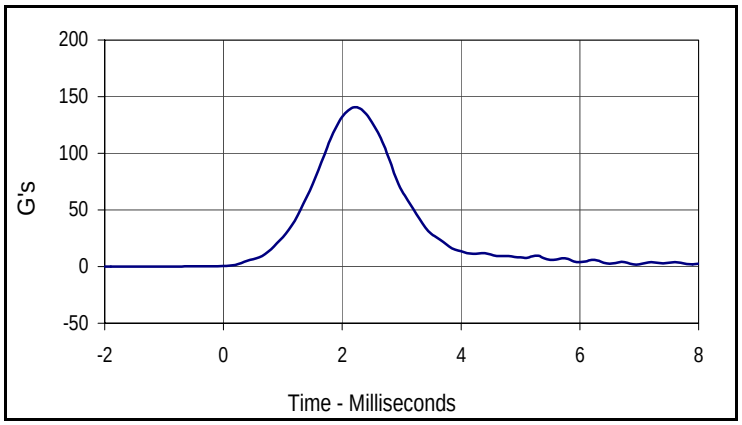
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	60	Newtons
Max	Time	Min	Time
5139.7	13.4	-82.0	40.4



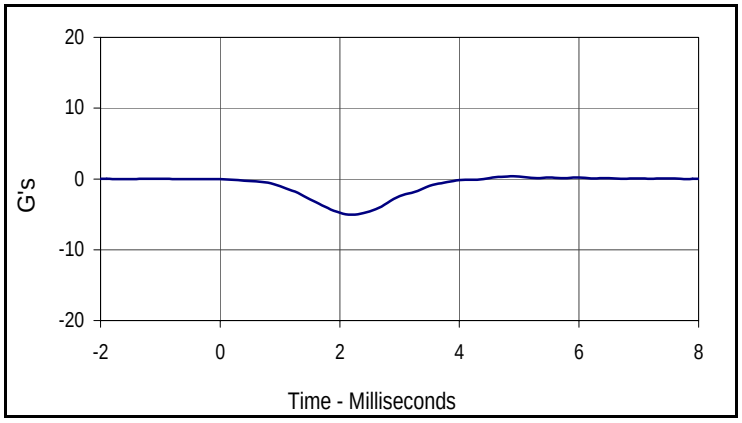
Curve Description			
Pubic FY			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
190.1	34.8	-1495.9	16.8

Test Program:	ES2re Lateral Head Drop Calibration	Test Date:	8/19/10
ATD Serial No.:	F035	Test I.D.:	HD08A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	125 to 155	140.5	Pass
Peak Longitudinal Acceleration	G's	≤15	5.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	6.8	Pass
		Overall Test Results		Pass



Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
140.5	2.2	0.0	-2.0

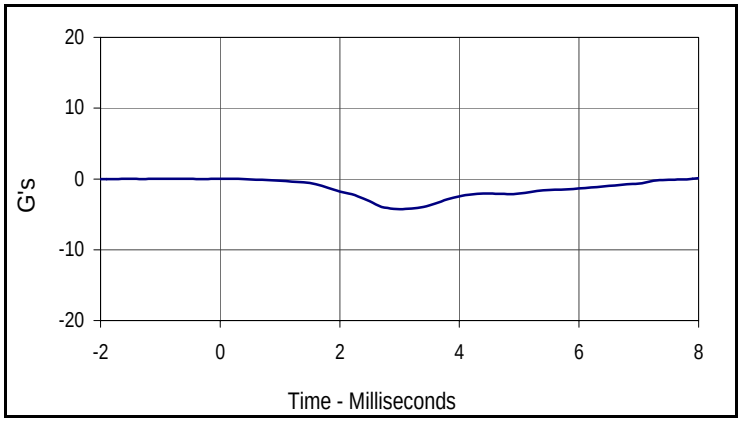


Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.4	4.9	-5.0	2.2

Test Program:	SID IIs Lateral Head Drop Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	HD08C

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	115 to 137	135.8	Pass
Peak Longitudinal Acceleration	G's	≤15	4.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	8.6	Pass
		Overall Test Results		Pass

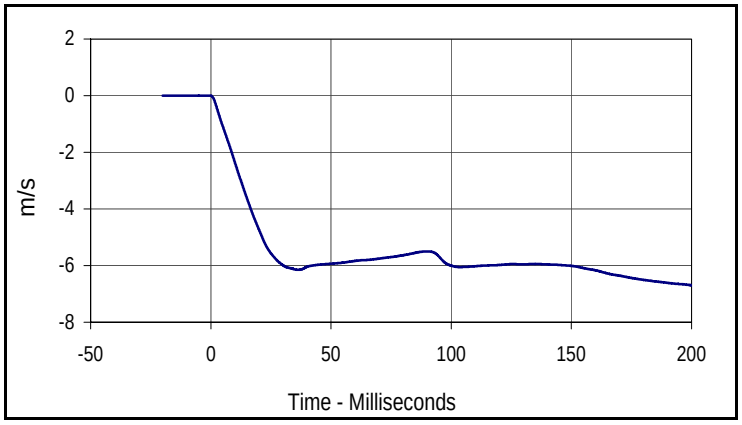
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
135.8	2.9	0.0	-1.2



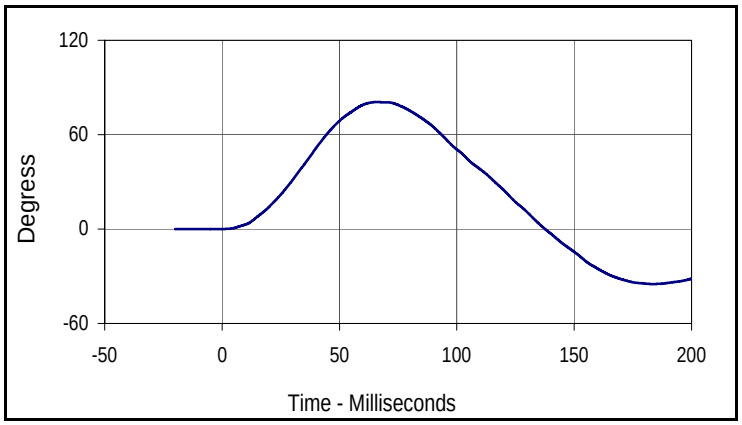
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.0	0.1	-4.3	3.0

Test Program:	SID IIs Neck Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	NB08D

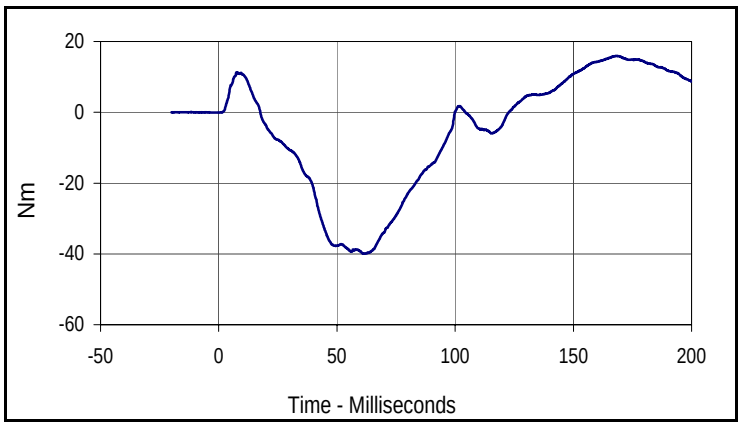
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.57	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.3	Pass
	15 msec	m/s	-3.30 to -4.10	-3.6	Pass
	20 msec	m/s	-4.40 to -5.40	-4.7	Pass
	25 msec	m/s	-5.40 to -6.10	-5.6	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.1	Pass
Translation-Rotation	Max	Degrees	71.0 to 81.0	80.7	Pass
	Time	msec	50.0 to 70.0	65.8	Pass
Peak Occipital Condyle Moment		Nm	-36.0 to -44.0	-39.9	Pass
Decaying Moment Time to Cross 0 Nm		msec	102.0 to 126.0	122.7	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-0.5	-6.7	200.0



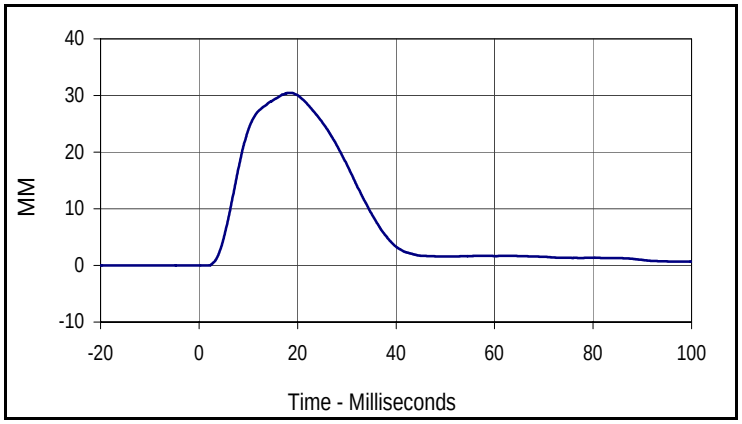
Curve Description			
Maximum Translation Rotation			
CURNO	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
80.7	65.8	-34.9	183.5



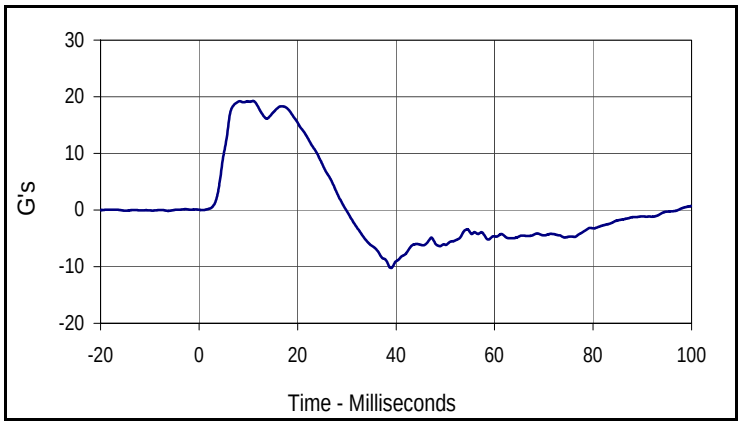
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
15.9	168.5	-39.9	62.0

Test Program:	SID IIs Shoulder Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	SH08D

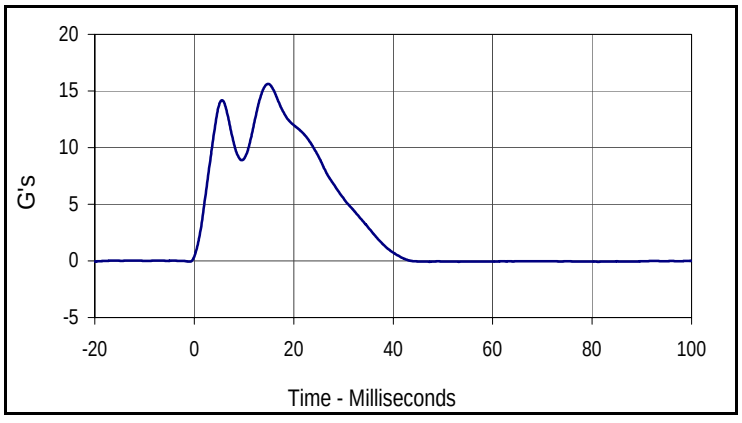
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.28	Pass
Shoulder Deflection	MM	28 to 37	30.5	Pass
Peak Upper Spine Y Acceleration	G's	17 to 22	19.3	Pass
Peak Impactor Acceleration	G's	13 to 18	15.6	Pass
		Overall Test Results		Pass



Curve Description			
Shoulder Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
30.5	18.6	0.0	1.0



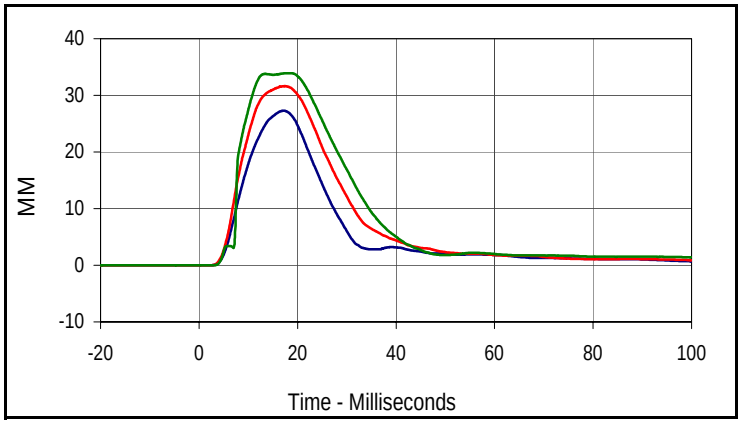
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
19.3	11.0	-10.2	39.0



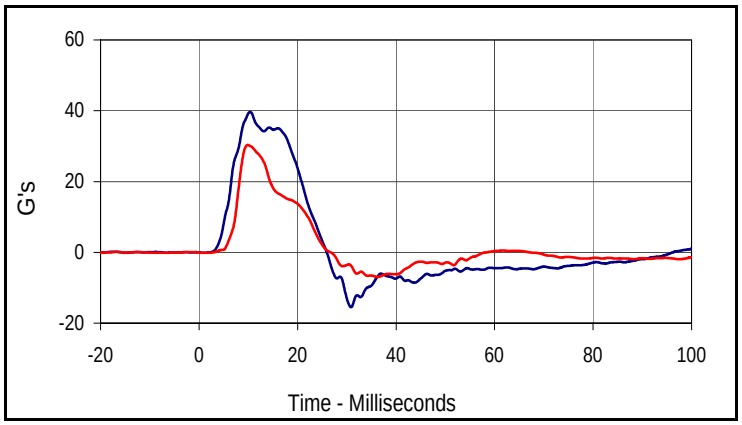
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.6	14.8	-0.1	81.3

Test Program:	SID IIs Thorax with Arm Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	TH08D

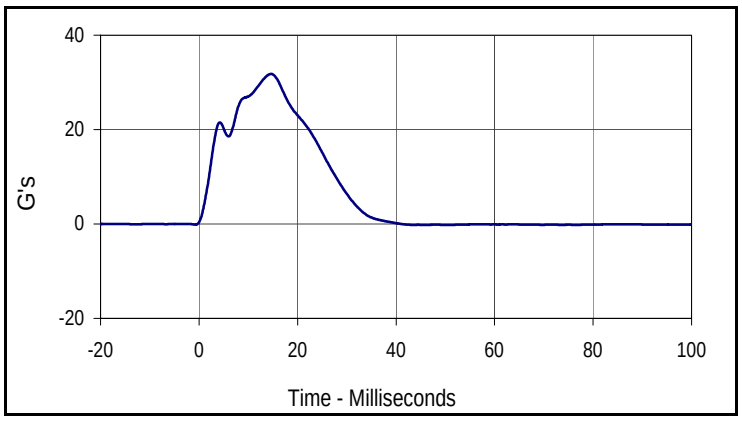
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.75	Pass
Shoulder Deflection	MM	31 to 40	33.4	Pass
Upper Thorax Rib Deflection	MM	25 to 32	27.3	Pass
Middle Thorax Rib Deflection	MM	30 to 36	31.6	Pass
Lower Thorax Rib Deflection	MM	32 to 38	33.9	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	39.7	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	30.3	Pass
Peak Impactor Acceleration After 5 msec.	G's	30 to 36	31.8	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.3	17.2	0.0	-12.8
Middle Thorax Deflection			
Max	Time	Min	Time
31.6	17.4	0.0	-3.0
Lower Thorax Deflection			
Max	Time	Min	Time
33.9	18.4	0.0	-17.7



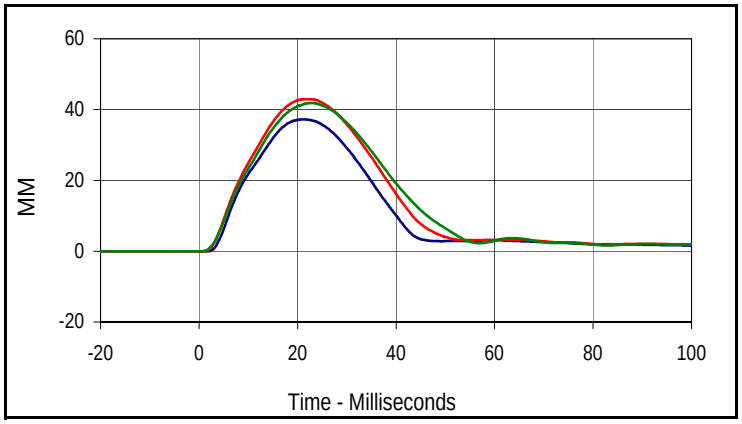
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
39.7	10.4	-15.5	30.8
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
30.3	9.9	-7.0	36.2



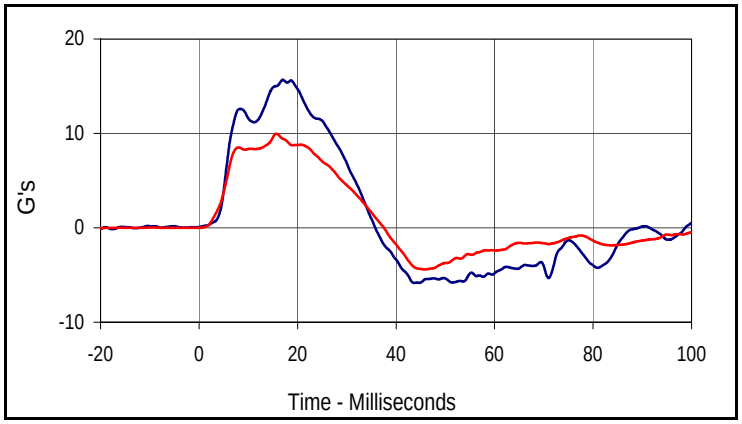
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
31.8	14.6	-0.2	50.4

Test Program:	SID IIs Thorax w/o Arm Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	TOA08D

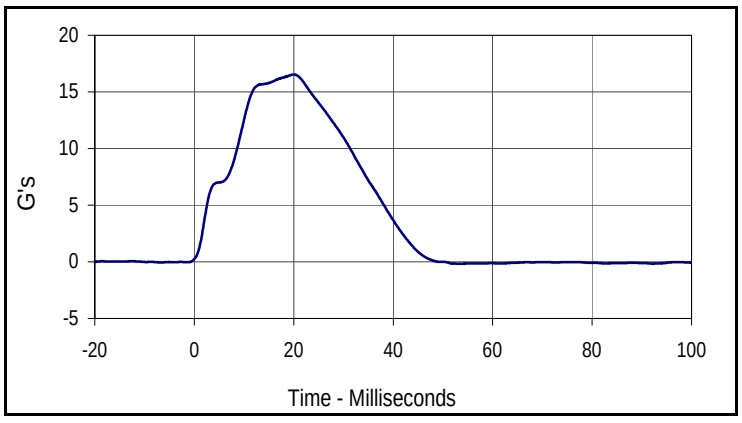
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.25	Pass
Upper Thorax Rib Deflection	MM	32 to 40	37.2	Pass
Middle Thorax Rib Deflection	MM	39 to 45	42.9	Pass
Lower Thorax Rib Deflection	MM	35 to 43	41.8	Pass
Peak Upper Spine Y Acceleration	G's	13 to 17	15.7	Pass
Peak Lower Spine Y Acceleration	G's	7 to 11	10.0	Pass
Peak Impactor Acceleration	G's	14 to 18	16.5	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
37.2	21.3	0.0	1.0
Middle Thorax Deflection			
Max	Time	Min	Time
42.9	22.1	0.0	-3.0
Lower Thorax Deflection			
Max	Time	Min	Time
41.8	22.8	0.0	-4.7



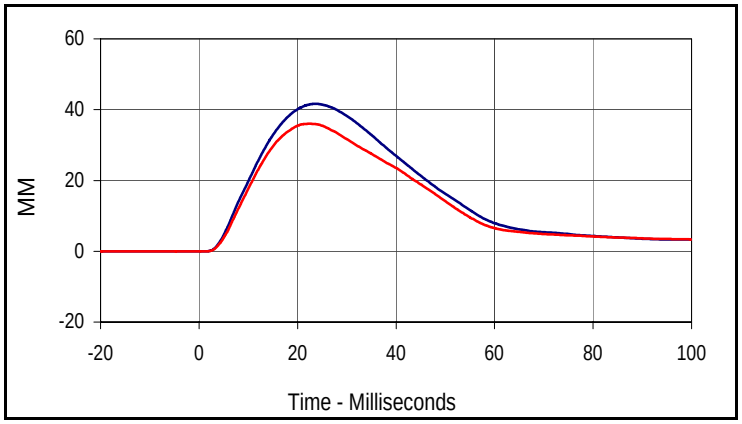
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.7	17.0	-5.8	43.7
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
10.0	15.7	-4.4	45.9



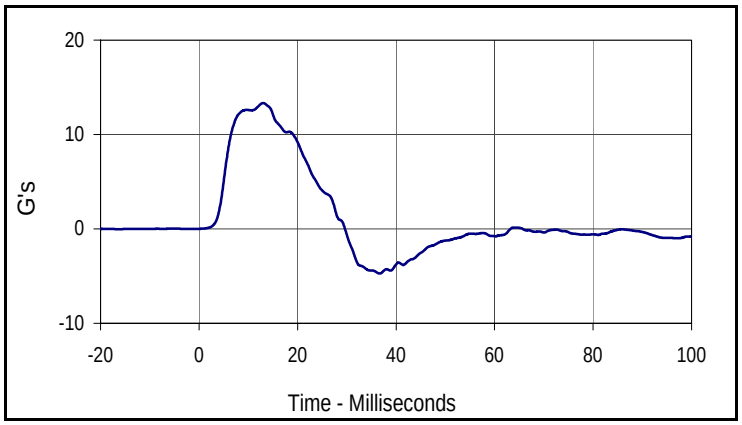
Curve Description			
Impactor Accleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.5	20.0	-0.2	53.5

Test Program:	SID IIs Abdomen Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	AB08D

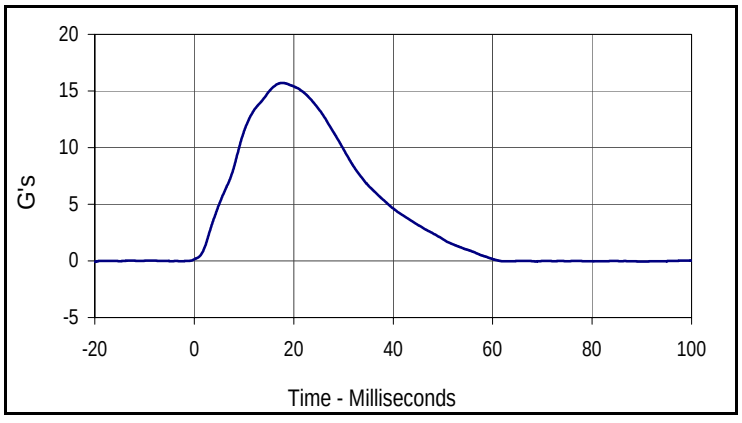
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.24	Pass
Upper Abdominal Rib Deflection	MM	36 to 47	41.6	Pass
Lower Abdominal Rib Deflection	MM	33 to 44	36.0	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	13.3	Pass
Peak Impactor Acceleration	G's	12 to 16	15.7	Pass
		Overall Test Results		Pass



Curve Description			
Upper Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
41.6	23.5	0.0	-6.3
Curve Description			
Lower Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
36.0	22.3	0.0	-5.6



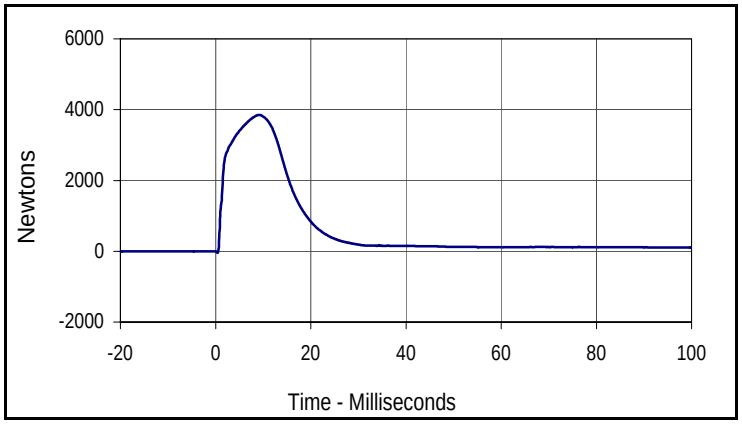
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
13.3	13.0	-4.7	36.7



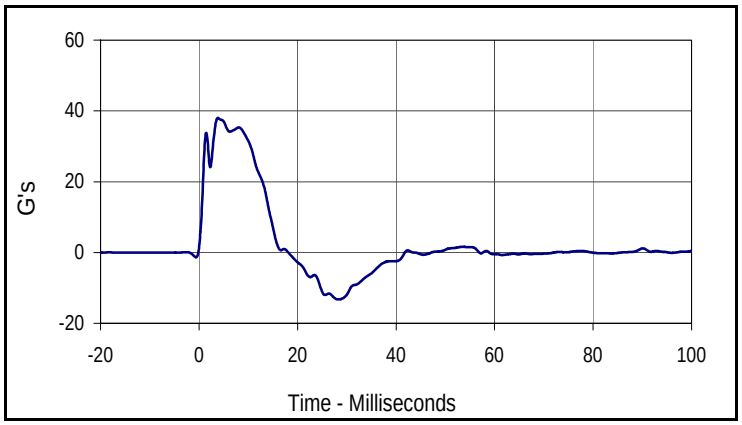
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.7	17.7	-0.1	-20.0

Test Program:	SID IIs Pelvis Acetabulum Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	PA08D

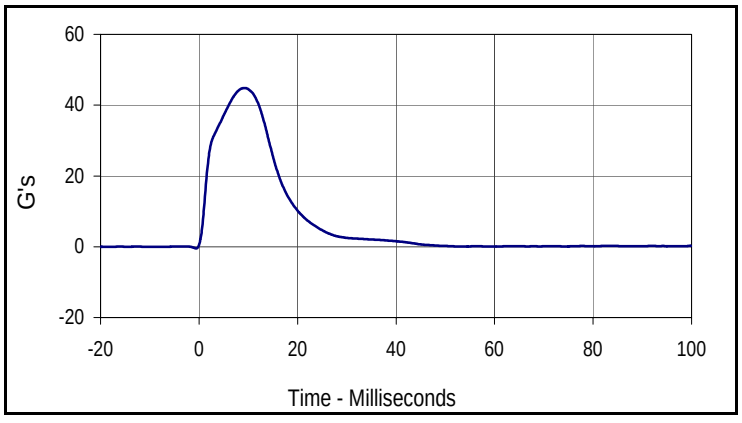
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.66	Pass
Peak Acetabulum Force	Newtons	3600 to 4300	3852.3	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	35.3	Pass
Peak Impactor Acceleration	G's	38 to 47	44.8	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3852.3	9.0	-41.5	0.4



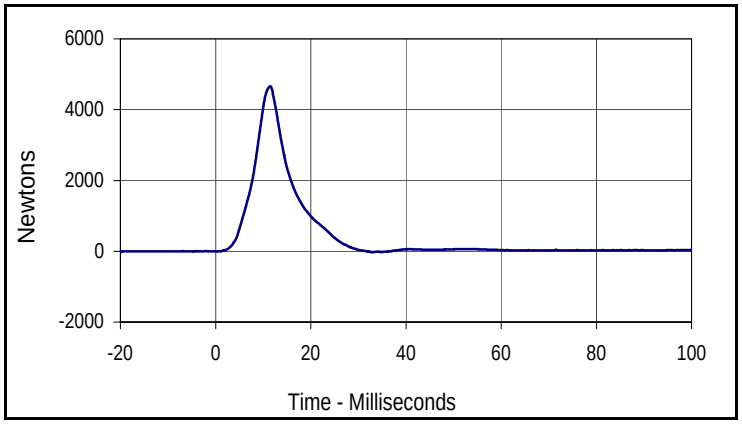
Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
38.0	3.8	-13.2	28.2



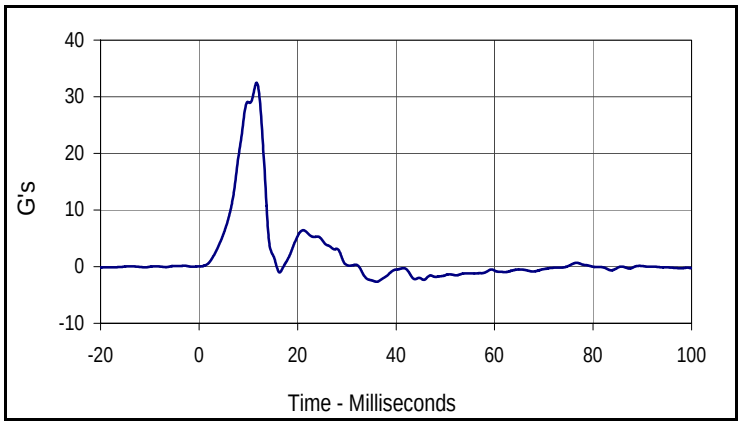
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
44.8	9.3	-0.5	-0.6

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	8/20/10
ATD Serial No.:	307	Test I.D.:	PL08C

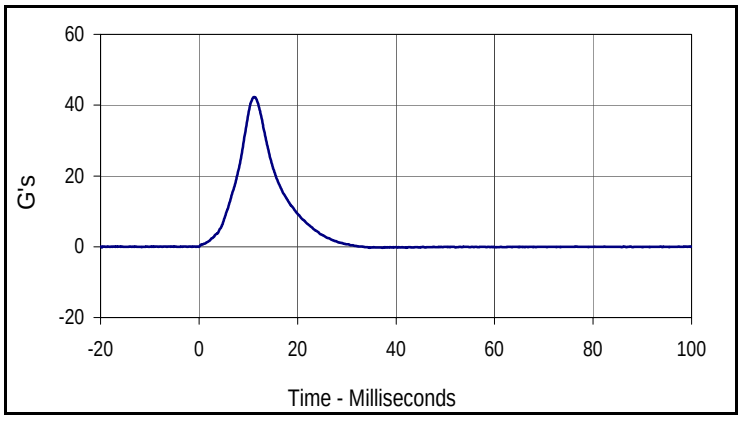
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.20	Pass
Peak Iliac Force	Newtons	4100 to 5100	4662.8	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	32.5	Pass
Peak Impactor Acceleration	G's	36 to 45	42.3	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4662.8	11.5	-26.2	32.9



Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
32.5	11.7	-2.7	36.0

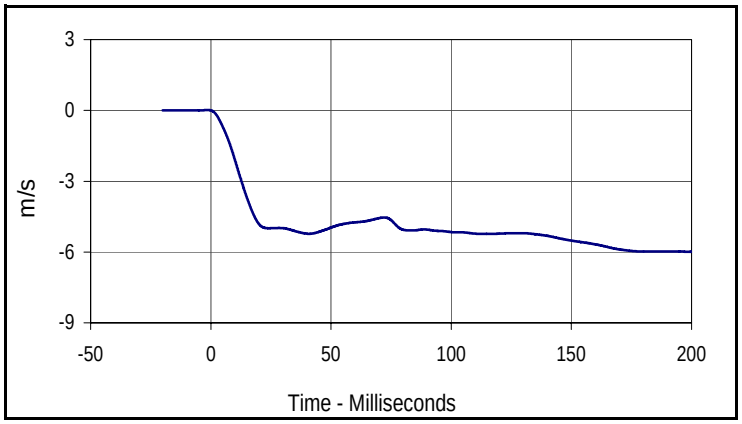


Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
42.3	11.2	-0.3	42.1

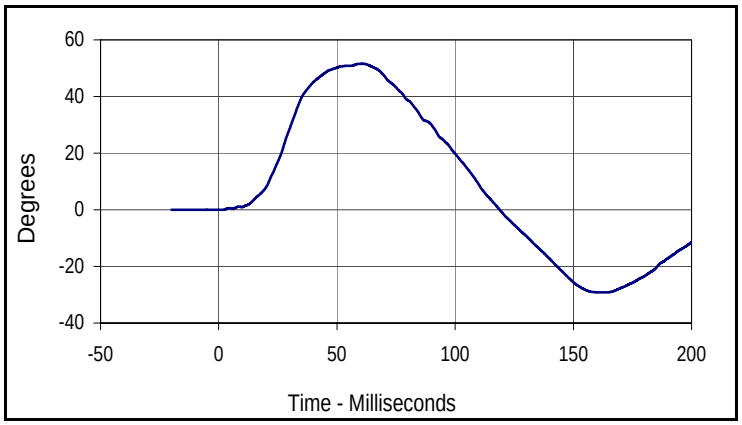
APPENDIX C
POST-TEST / HIII CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program:	ES2re Neck Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	NB09A

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	3.30 to 3.50	3.36	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.046	Pass
	3 msec	m/s	-.250 to -.375	-0.297	Pass
	14 msec	m/s	-3.20 to -3.70	-3.40	Pass
Headform Rotation	Max	Degrees	49.0 to 58.0	51.6	Pass
	Time	msec	54.0 to 66.0	60.8	Pass
Maximum Rotation To Time Zero Crossing		msec	53.0 to 88.0	58.1	Pass
			Overall Test Results		Pass



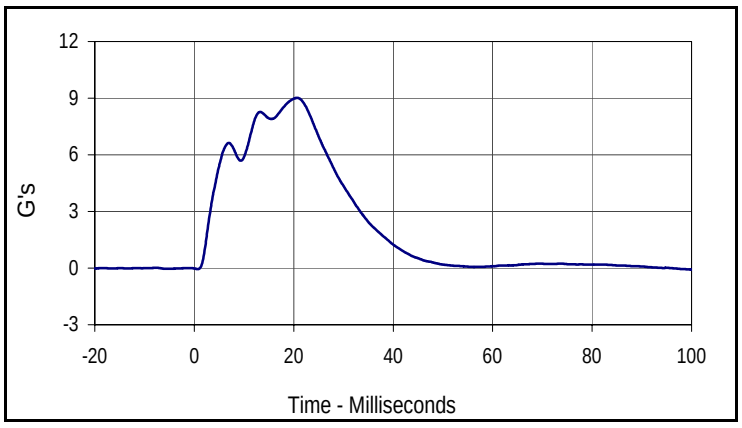
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.3	-6.0	200.0



Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
51.6	60.8	-29.2	162.5

Test Program:	ES2re Shoulder Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	SH09A

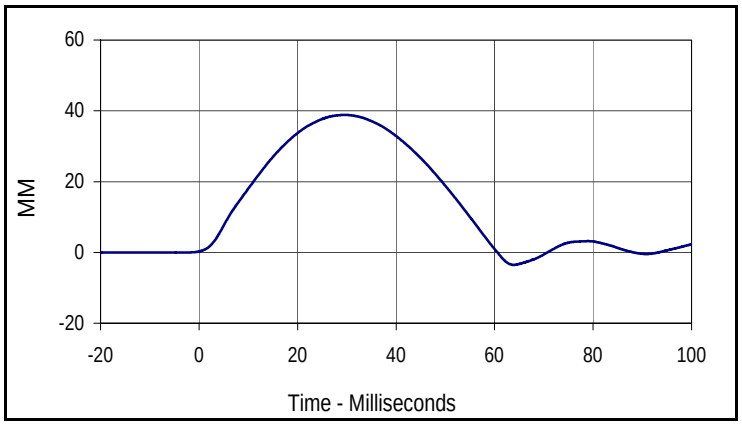
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	4.20 to 4.40	4.22	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.0	Pass
		Overall Test Results		Pass



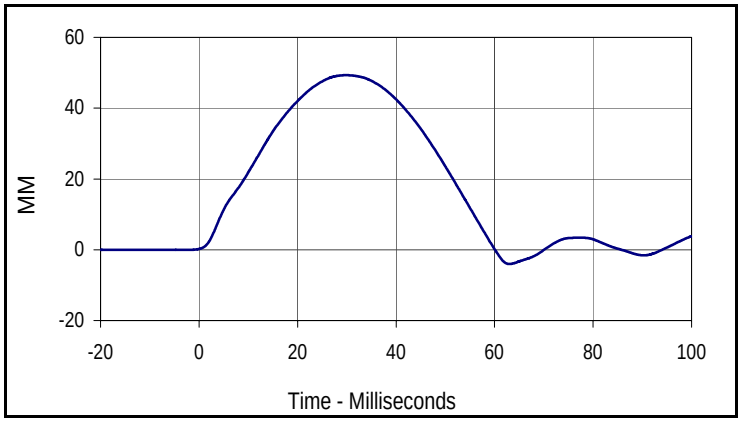
Curve Description			
Probe Impactor Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
9.0	20.7	-0.1	99.9

Test Program:	ES2re Rib Module Calibration	Test Date:	9/4/10
ATD Serial No.:	F035 Rib #1	Test I.D.:	RIB09A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Rib Deflection at 459 MM Drop Height	MM	36 to 40	38.8	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	49.3	Pass
		Overall Test Results		Pass



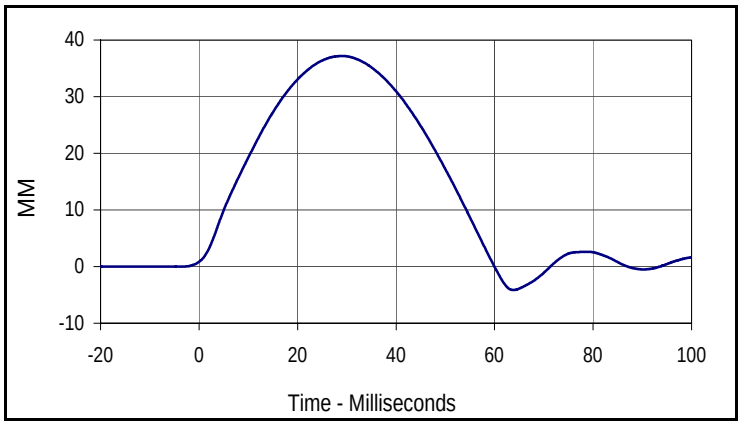
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
38.8	29.6	-3.5	63.9



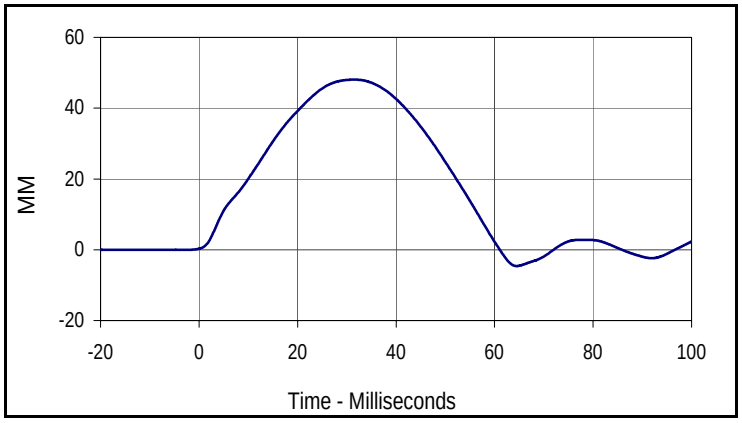
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
49.3	29.8	-4.0	63.0

Test Program:	ES2re Rib Module Calibration	Test Date:	9/4/10
ATD Serial No.:	F035 Rib #2	Test I.D.:	RIB09B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Rib Deflection at 459 MM Drop Height	MM	36 to 40	37.2	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	48.1	Pass
		Overall Test Results		Pass



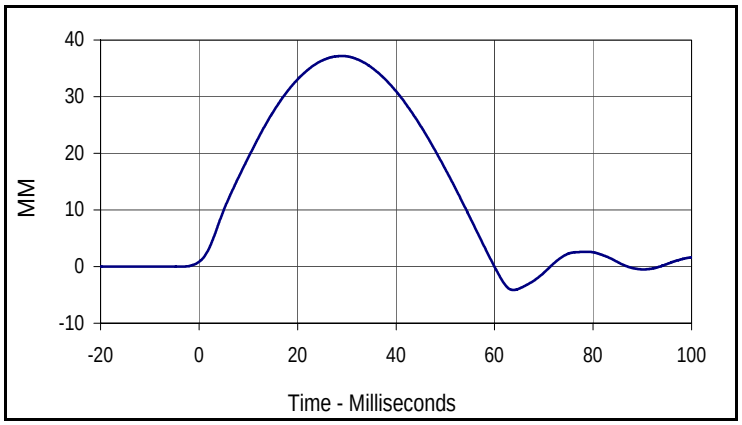
Curve Description			
Middle Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.2	29.0	-4.1	63.8



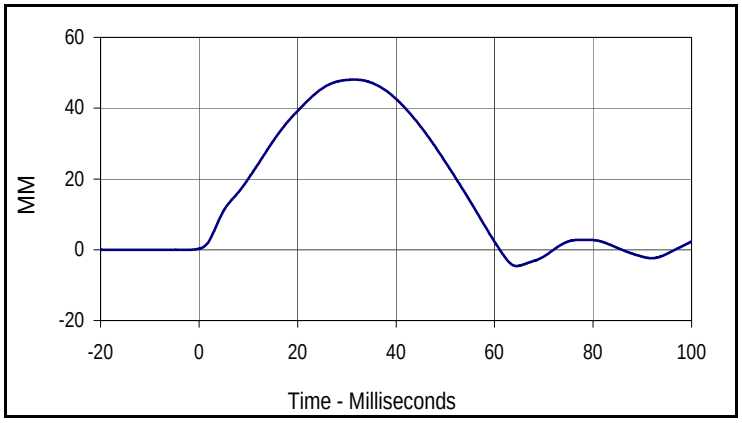
Curve Description			
Middle Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
48.1	31.5	-4.6	64.5

Test Program:	ES2re Rib Module Calibration	Test Date:	9/4/10
ATD Serial No.:	F035 Rib #2	Test I.D.:	RIB09B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Rib Deflection at 459 MM Drop Height	MM	36 to 40	37.2	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	48.1	Pass
		Overall Test Results		Pass



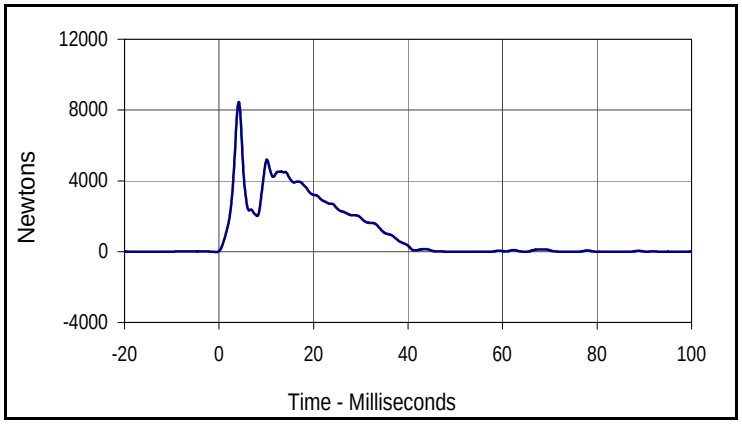
Curve Description			
Middle Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.2	29.0	-4.1	63.8



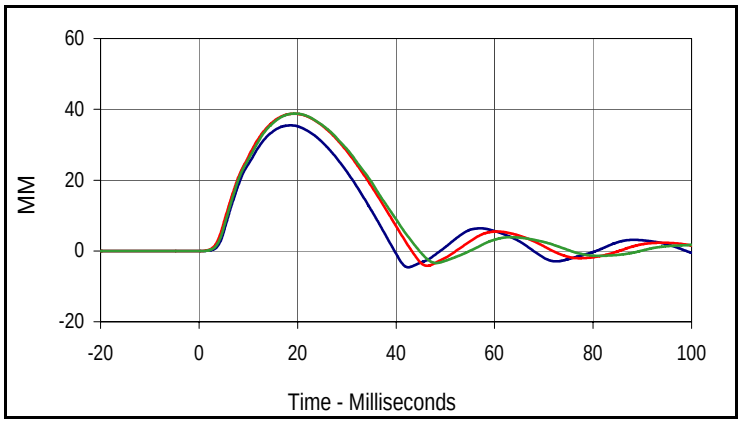
Curve Description			
Middle Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
48.1	31.5	-4.6	64.5

Test Program:	ES2re Thorax Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	TH09A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	5.40 to 5.60	5.41	Pass
Impactor Force	N	5100 to 6200	5205.8	Pass
	msec	> 6.0 msec	9.9	Pass
Upper Rib Deflection	MM	34 to 41	35.5	Pass
Middle Rib Deflection	MM	37 to 45	38.8	Pass
Lower Rib Deflection	MM	37 to 44	38.8	Pass
		Overall Test Results		Pass



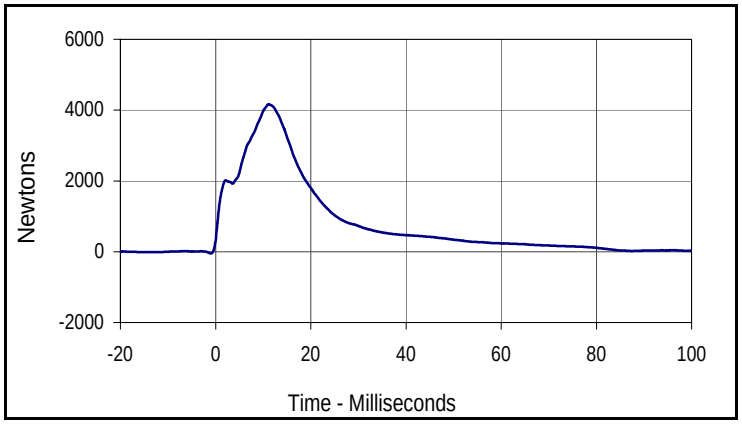
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
8460.7	4.2	-25.2	-0.6



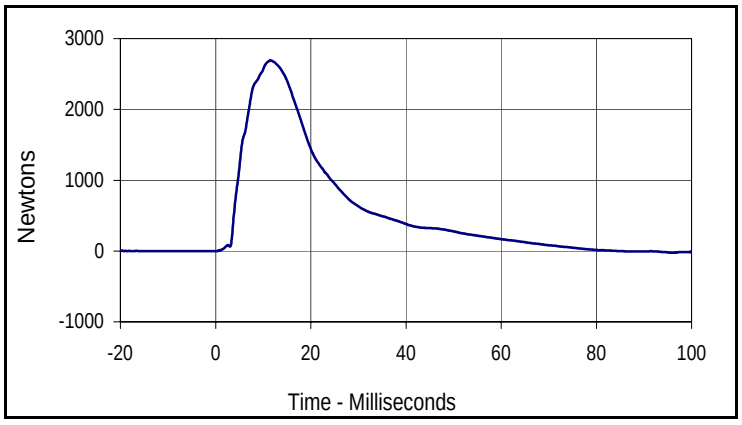
Curve Description			
Upper, Middle, Lower Rib Deflections			
CURNO(s)	Type	SAE Class	Units
002-003-004	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
35.5	18.6	-4.6	42.5
Max (Middle)	Time	Min (Middle)	Time
38.8	19.3	-4.2	46.3
Max (Lower)	Time	Min (Lower)	Time
38.8	19.4	-3.4	48.2

Test Program:	ES2re Abodomen Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	ABD09A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	3.90 to 4.10	3.90	Pass
Impactor Force	N	4000 to 4800	4162.2	Pass
	msec	10.6 to 13.0	11.2	Pass
Abdominal Force	N	2200 to 2700	2691.0	Pass
	msec	10.0 to 12.3	11.6	Pass
		Overall Test Results		Pass



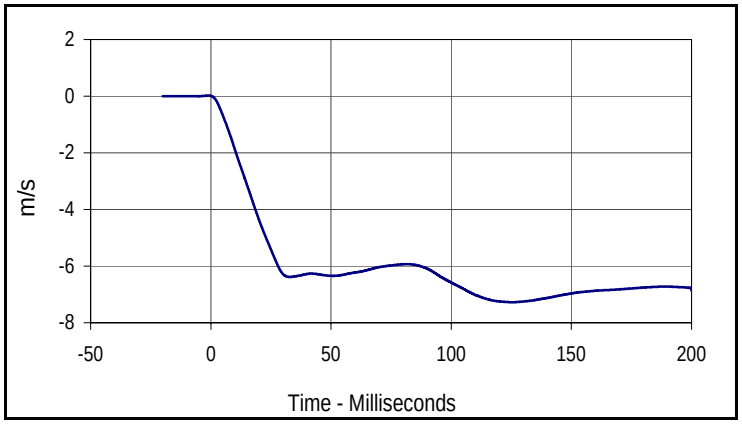
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4162.2	11.2	-48.5	-1.0



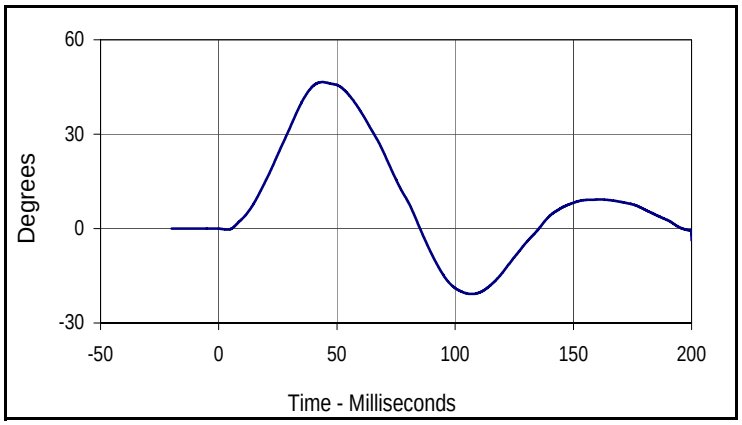
Curve Description			
Abdomen Sum Resultant			
CURNO	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2691.0	11.6	-22.8	96.0

Test Program:	ES2re Lumbar Spine Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	SP08C

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.15	6.07	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.030	Pass
	3.7 msec	m/s	-.240 to -.425	-0.407	Pass
	27 msec	m/s	-5.80 to -6.50	-5.81	Pass
	30 msec	m/s	< -6.50	-6.28	Pass
Headform Rotation	Max	Degrees	45.0 to 55.0	46.6	Pass
	Time	msec	39.0 to 53.0	43.9	Pass
Maximum Rotation To Time Zero Crossing		msec	37.0 to 57.0	41.3	Pass
			Overall Test Results		Pass



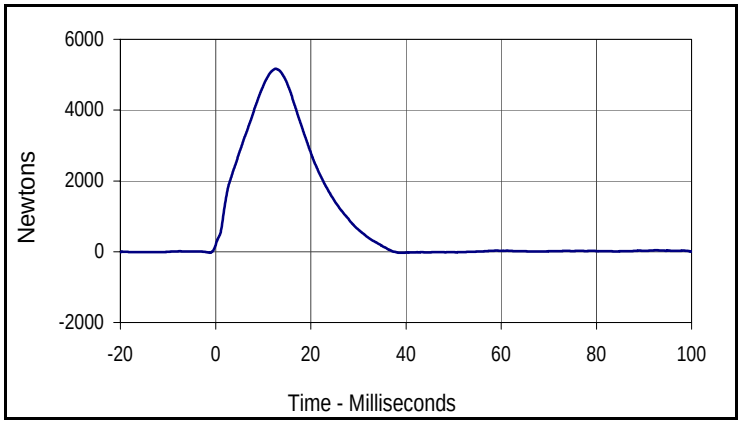
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.0	-7.3	125.4



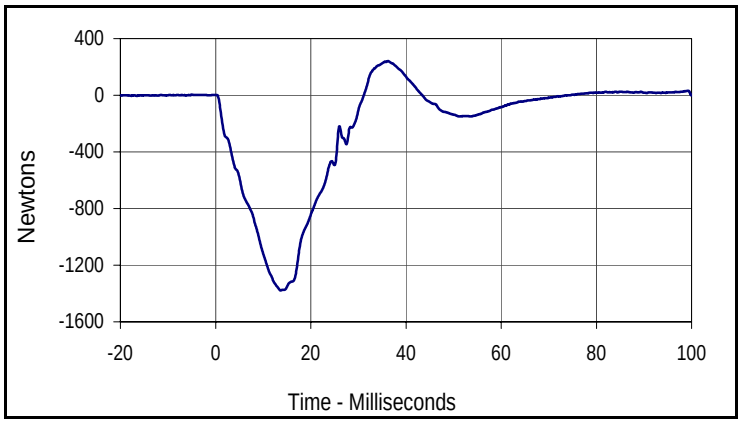
Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
46.6	43.9	-20.8	107.0

Test Program:	ES2re Pelvis Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	PL09A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	4.20 to 4.40	4.31	Pass
Impactor Force	N	4700 to 5400	5167.1	Pass
	msec	11.8 to 16.1	12.6	Pass
Pubic Symphysis Load	N	-1230 to -1590	-1378.6	Pass
	msec	12.2 to 17.0	13.7	Pass
		Overall Test Results		Pass



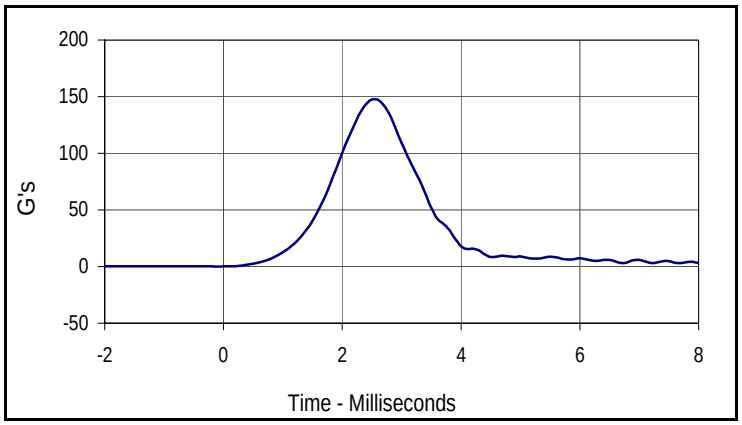
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
5167.1	12.6	-30.3	39.4



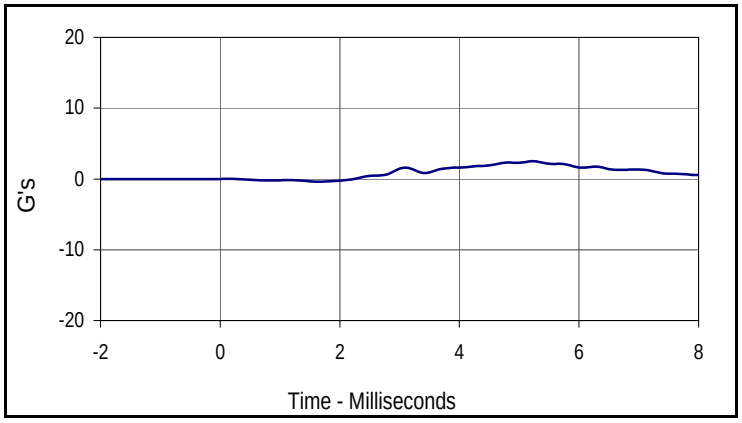
Curve Description			
Pubic FY			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
241.5	36.3	-1378.6	13.7

Test Program:	ES2re Lateral Head Drop Calibration	Test Date:	9/4/10
ATD Serial No.:	F035	Test I.D.:	HD09A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	125 to 155	147.5	Pass
Peak Longitudinal Acceleration	G's	≤15	2.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	6.1	Pass
		Overall Test Results		Pass



Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
147.5	2.5	0.1	-0.1

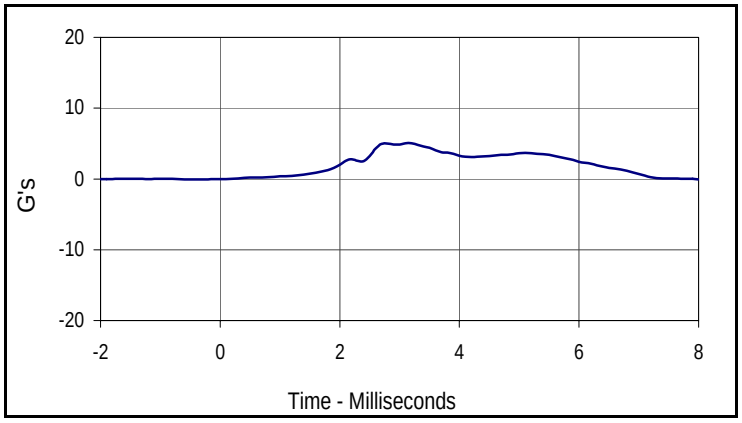


Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.5	5.2	-0.4	1.7

Test Program:	SID IIs Lateral Head Drop Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	HD09B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	115 to 137	121.3	Pass
Peak Longitudinal Acceleration	G's	≤15	5.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	10.7	Pass
		Overall Test Results		Pass

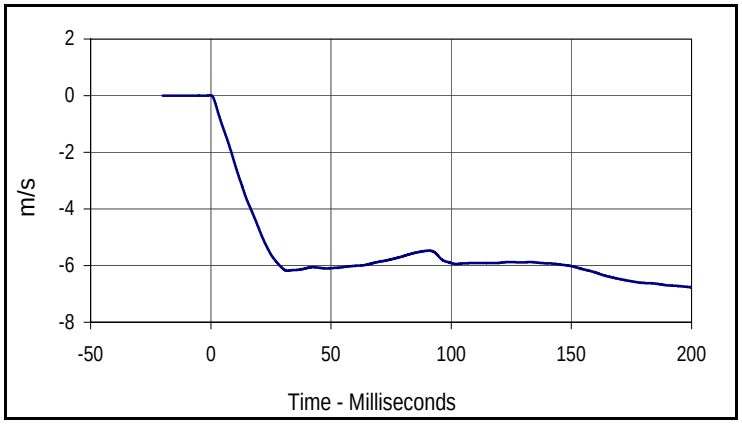
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
121.3	3.0	0.0	-1.8



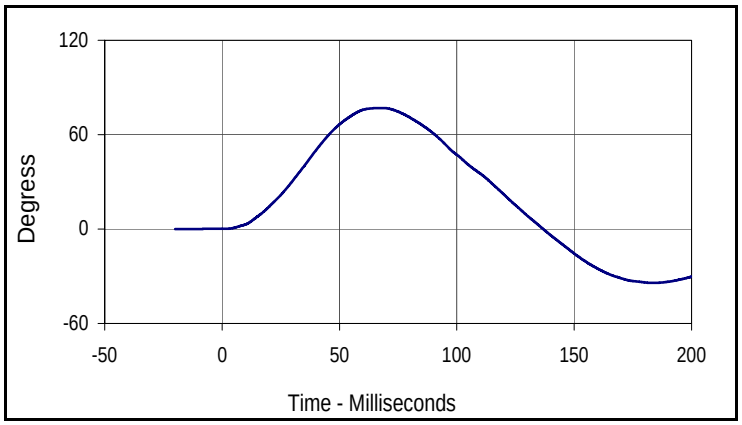
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
5.0	3.2	-0.1	-0.4

Test Program:	SID IIs Neck Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	NB09A

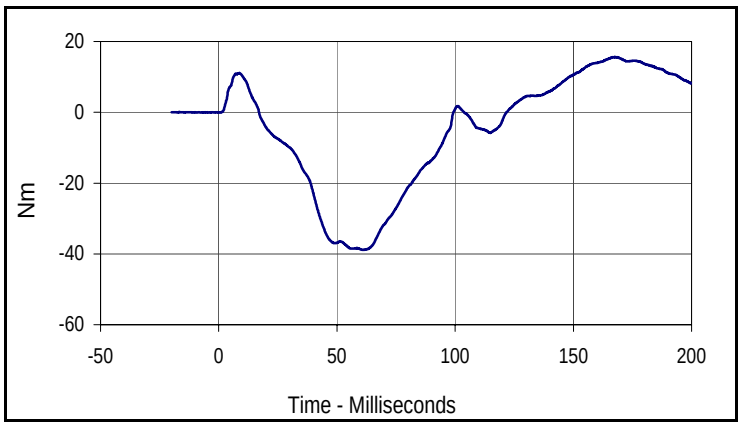
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.54	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.4	Pass
	15 msec	m/s	-3.30 to -4.10	-3.7	Pass
	20 msec	m/s	-4.40 to -5.40	-4.7	Pass
	25 msec	m/s	-5.40 to -6.10	-5.6	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.2	Pass
Translation-Rotation	Max	Degrees	71.0 to 81.0	76.9	Pass
	Time	msec	50.0 to 70.0	68.1	Pass
Peak Occipital Condyle Moment		Nm	-36.0 to -44.0	-38.9	Pass
Decaying Moment Time to Cross 0 Nm		msec	102.0 to 126.0	121.8	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-0.3	-6.8	200.0



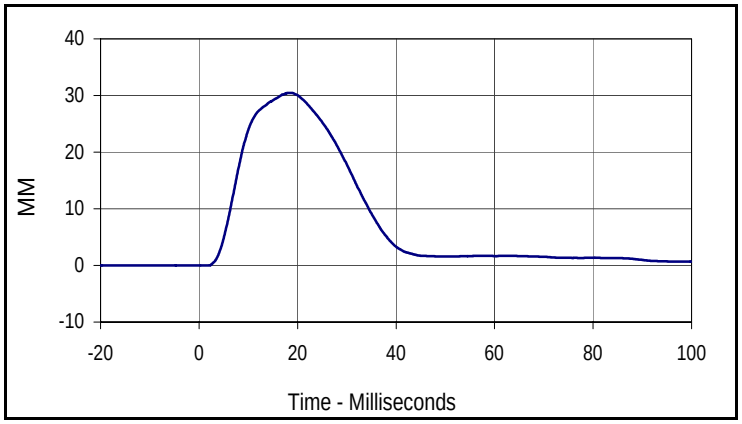
Curve Description			
Maximum Translation Rotation			
CURNO	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
76.9	68.1	-34.2	183.5



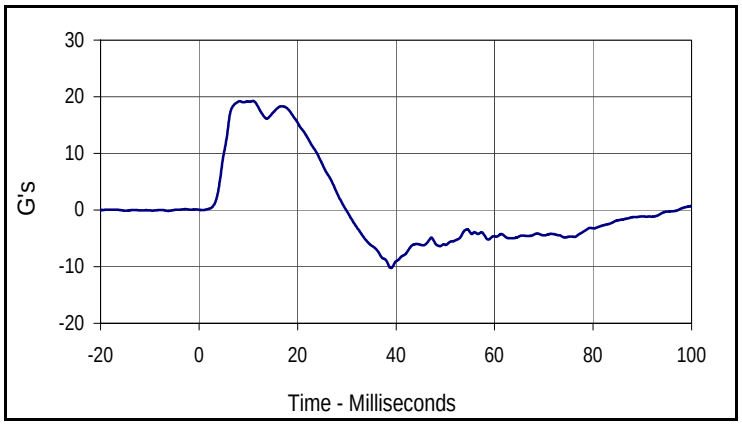
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
15.6	167.5	-38.9	61.2

Test Program:	SID IIs Shoulder Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	SH09A

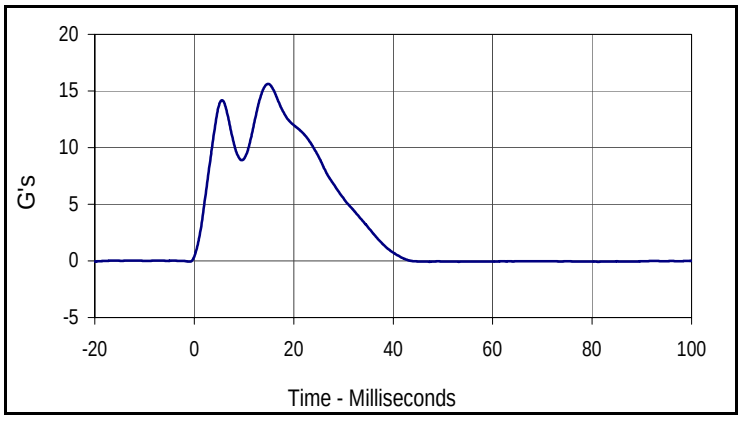
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.23	Pass
Shoulder Deflection	MM	28 to 37	30.5	Pass
Peak Upper Spine Y Acceleration	G's	17 to 22	19.3	Pass
Peak Impactor Acceleration	G's	13 to 18	15.6	Pass
		Overall Test Results		Pass



Curve Description			
Shoulder Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
30.5	18.6	0.0	1.0



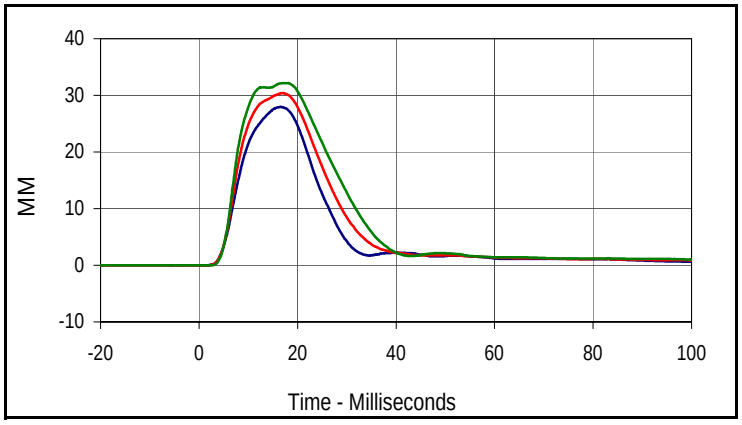
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
19.3	11.0	-10.2	39.0



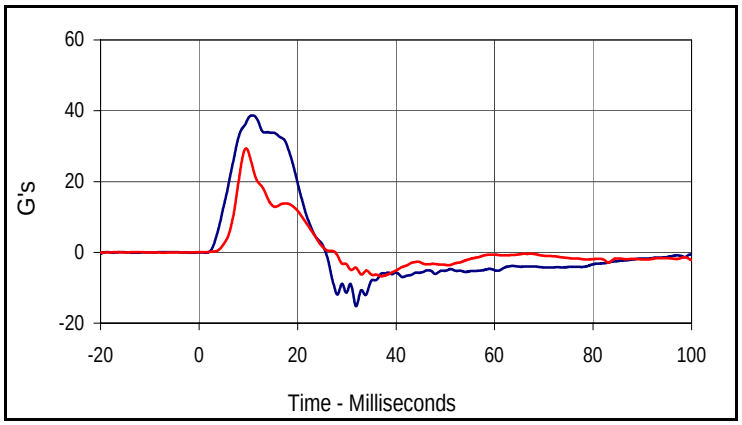
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.6	14.8	-0.1	81.3

Test Program:	SID IIs Thorax with Arm Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	TH09A

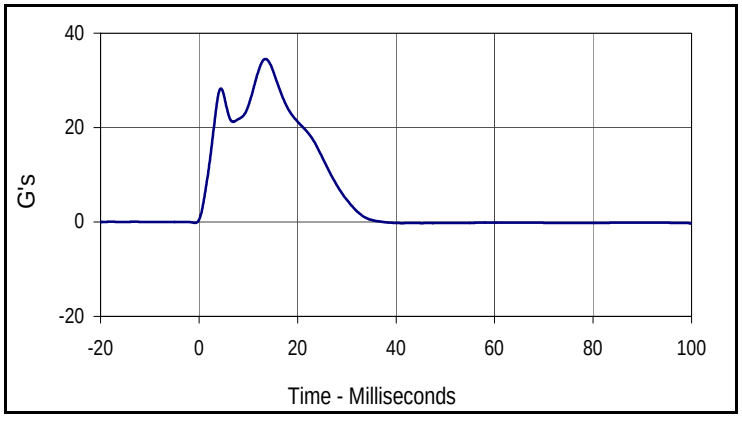
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.63	Pass
Shoulder Deflection	MM	31 to 40	37.3	Pass
Upper Thorax Rib Deflection	MM	25 to 32	27.9	Pass
Middle Thorax Rib Deflection	MM	30 to 36	30.4	Pass
Lower Thorax Rib Deflection	MM	32 to 38	32.2	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	38.6	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	29.4	Pass
Peak Impactor Acceleration After 5 msec.	G's	30 to 36	34.5	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.9	16.6	0.0	-2.0
Middle Thorax Deflection			
Max	Time	Min	Time
30.4	17.0	0.0	-6.7
Lower Thorax Deflection			
Max	Time	Min	Time
32.2	17.5	0.0	1.2



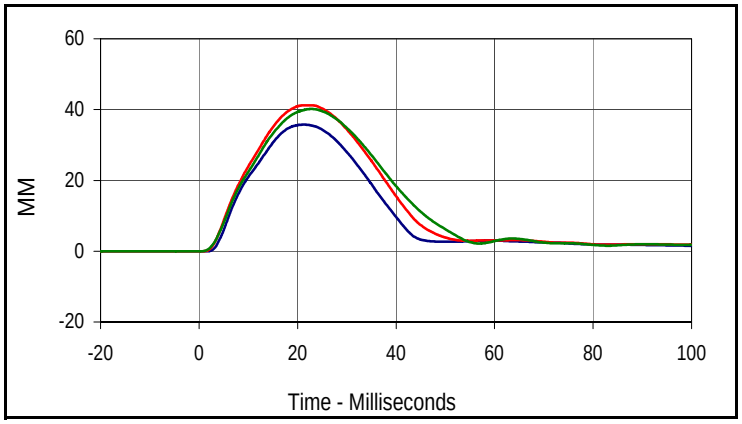
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
38.6	10.8	-15.2	31.9
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
29.4	9.6	-6.8	37.1



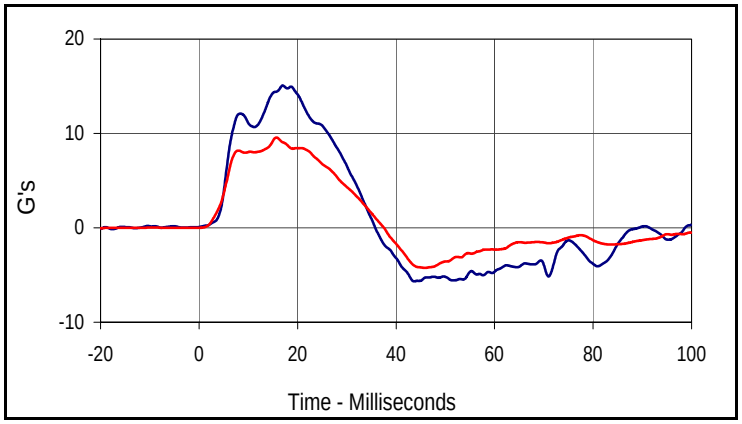
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
34.5	13.5	-0.3	99.9

Test Program:	SID IIs Thorax w/o Arm Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	TOA09B

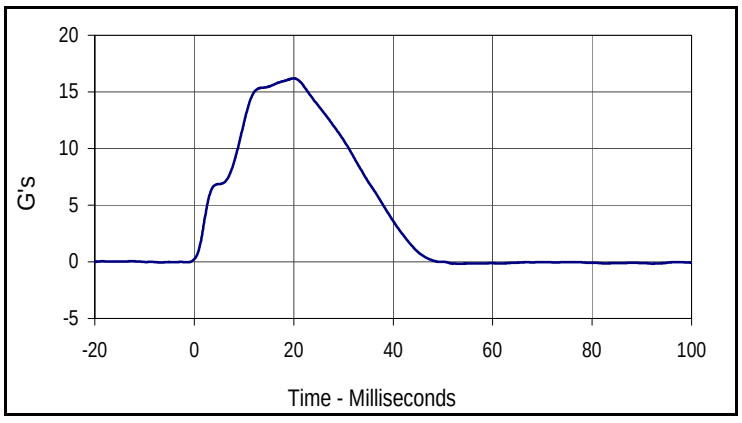
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.25	Pass
Upper Thorax Rib Deflection	MM	32 to 40	35.8	Pass
Middle Thorax Rib Deflection	MM	39 to 45	41.2	Pass
Lower Thorax Rib Deflection	MM	35 to 43	40.2	Pass
Peak Upper Spine Y Acceleration	G's	13 to 17	15.1	Pass
Peak Lower Spine Y Acceleration	G's	7 to 11	9.6	Pass
Peak Impactor Acceleration	G's	14 to 18	16.2	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
35.8	21.3	0.0	1.0
Middle Thorax Deflection			
Max	Time	Min	Time
41.2	22.1	0.0	-3.0
Lower Thorax Deflection			
Max	Time	Min	Time
40.2	22.8	0.0	-4.7



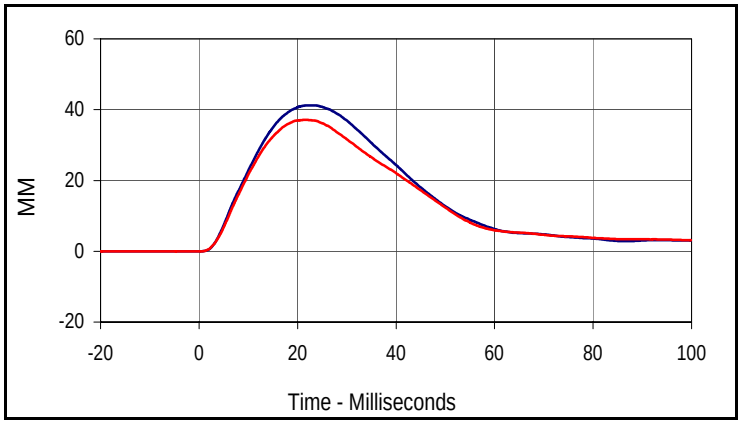
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.1	17.0	-5.7	43.7
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
9.6	15.7	-4.2	45.9



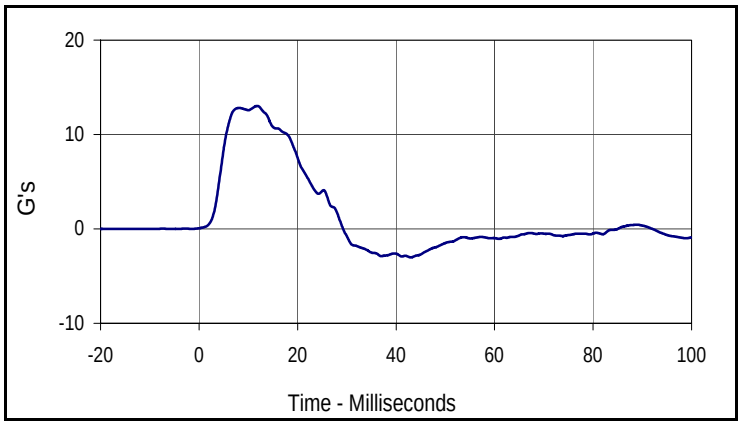
Curve Description			
Impactor Accleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.2	20.0	-0.2	53.5

Test Program:	SID IIs Abdomen Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	ABD09A

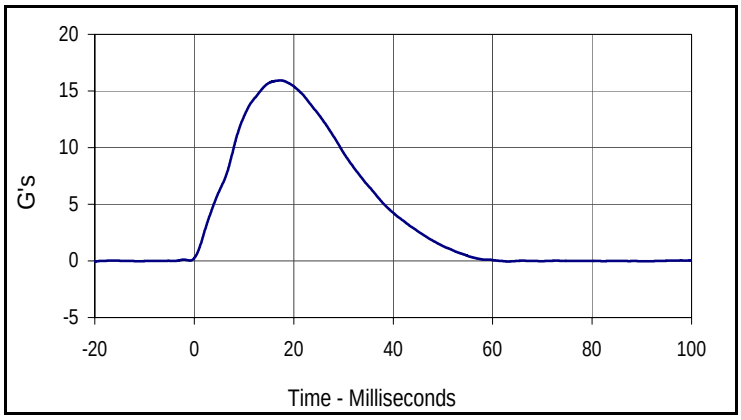
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.24	Pass
Upper Abdominal Rib Deflection	MM	36 to 47	41.2	Pass
Lower Abdominal Rib Deflection	MM	33 to 44	37.1	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	13.0	Pass
Peak Impactor Acceleration	G's	12 to 16	15.9	Pass
		Overall Test Results		Pass



Curve Description			
Upper Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
41.2	22.6	0.0	-6.5
Curve Description			
Lower Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
37.1	21.4	0.0	-0.4



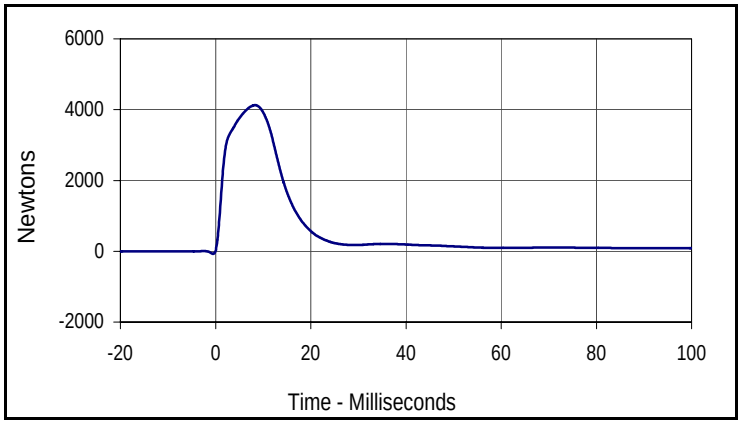
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
13.0	11.8	-3.0	43.0



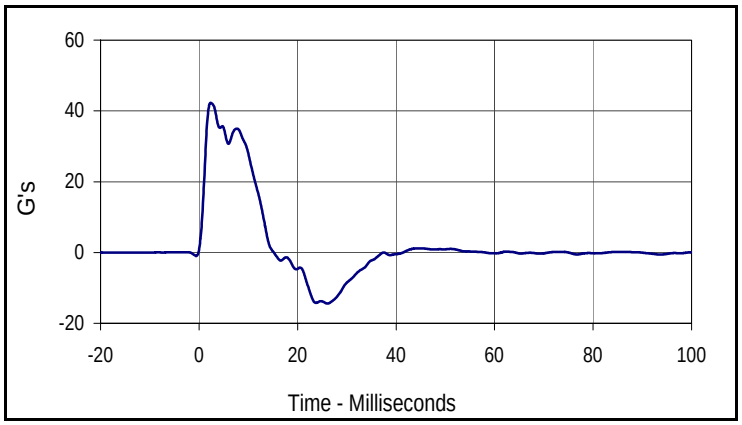
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.9	17.4	-0.1	-20.0

Test Program:	SID IIs Pelvis Acetabulum Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	PA09A

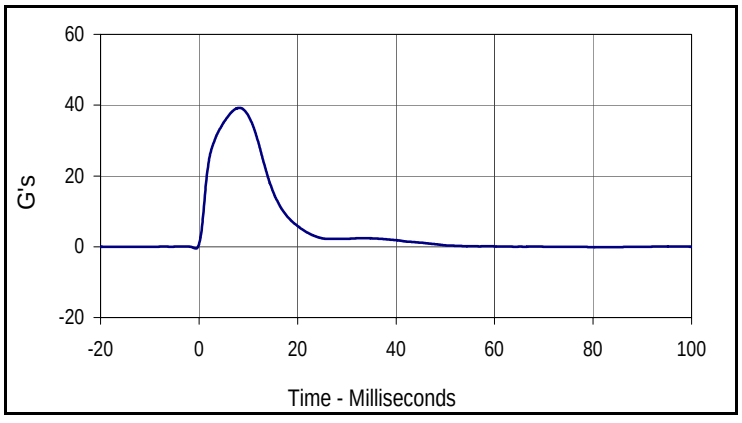
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.69	Pass
Peak Acetabulum Force	Newtons	3600 to 4300	4127.4	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	35.0	Pass
Peak Impactor Acceleration	G's	38 to 47	39.2	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4127.4	8.3	-72.1	-0.5



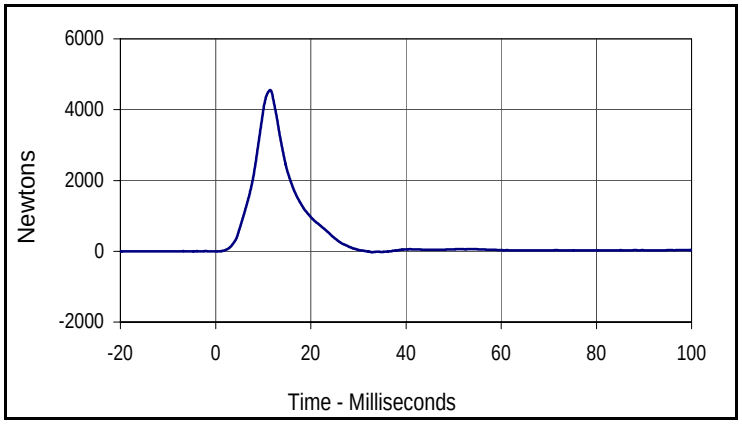
Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
42.3	2.4	-14.4	26.1



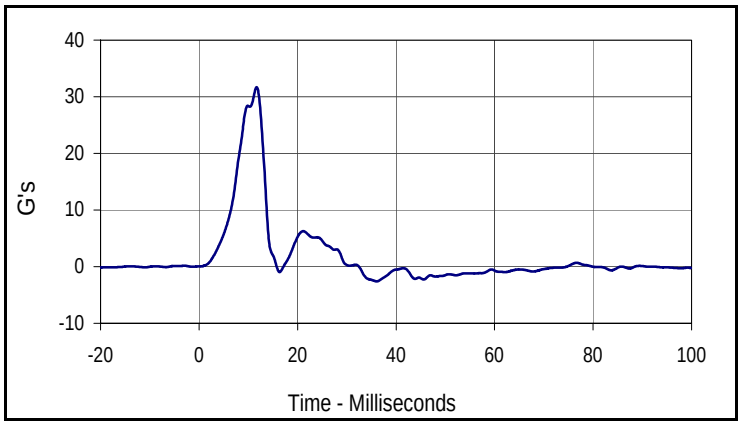
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
39.2	8.2	-0.5	-0.7

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	9/5/10
ATD Serial No.:	307	Test I.D.:	PL09B

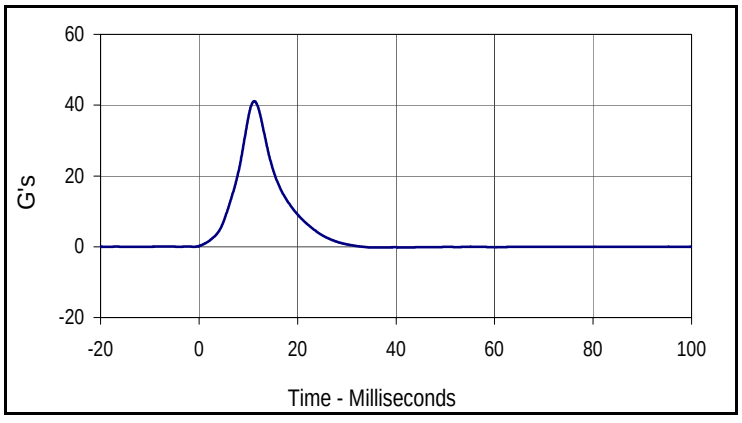
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.21	Pass
Peak Iliac Force	Newtons	4100 to 5100	4553.2	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	31.7	Pass
Peak Impactor Acceleration	G's	36 to 45	41.1	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4553.2	11.5	-25.7	32.9



Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
31.7	11.7	-2.6	36.0



Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
41.1	11.2	-0.2	37.1