REPORT NUMBER: SPNCAP-KAR-11-029

NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

VOLVO CAR CORPORATION
2011 VOLVO XC60 FWD 5-DOOR MPV

NHTSA No: MB5900

PREPARED BY:
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OCTOBER 18, 2010

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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NHTSA, Office of Crashworthiness Standards

Date: _____

_____

COTR, New Car Assessment Program
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Date: _____

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15. Supplementary Notes

16. Abstract

A 32.2 km/h (20 mph) 75° oblique impact Side NCAP test was conducted on the subject 2011 Volvo XC60 FWD 5-Door MPV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on October 18, 2010.

The impact velocity was 32.68 km/h and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 23.3° C. The test vehicle's post-test maximum crush was 462 mm at level 3. The test vehicle's performance was as follows:

Measurement Description	Passenger ATD		
	Units	Threshold	Result
Head Injury Criteria (HIC_{36})		1000	242.1
Resultant Lower Spine Acceleration	G	82	45
Combined Acetabulur and Iliac Pelvic Force	N	5525	3208

The two doors on the struck side of the vehicle did not separate from the vehicle at the hinges or latches. The opposite side doors did not open during the impact event.

17. Key Words	18. Distribution Statement
New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs	Copies of this report are available from: National Highway Traffic Safety Admin. Technical Reference Division 1200 New Jersey Ave., SE Washington, DC 20590

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SECTION 1
TEST PURPOSE AND PROCEDURE

This 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 No. DTNH22-09-D-00122. The purpose of this test is to generate comparative side impact performance in a 2011 Volvo XC60 FWD 5-Door MPV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated January 25, 2010.

SECTION 2
SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2011 Volvo XC60 FWD 5-Door MPV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.68 km/h. The test was conducted by KARCO Engineering, LLC. in Adelanto, California, on October 18, 2010. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated January 25, 2010. Camera location and other pertinent camera information are included in this report.

The Part 572V (SID-IIs) dummy was instrumented as follows:

Head CG Triaxial Accelerometers
Thorax Upper, Middle, and Lower Rib Displacement Potentiometers
Abdomen Upper and Lower Rib Displacement Potentiometers
Lower Spine Triaxial Accelerometers
Illiac Load Cell
Acetabulum Load Cell

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report.

The following table summarizes the results of the test:

Dummy	HIC (36ms)	Resultant Lower Spine Acceleration	Pelvic Force (N)	
SID-IIs 5th Percentile Adult Female	242	45	Iliac Wing	540
			Acetabulur	2791
			Sum	3208

SUPPLEMENTAL RESTRAINT INFORMATION

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

GENERAL COMMENTS

Both of the struck side doors of the test vehicle remained closed and latched and were jammed shut after the impact. There was no separation at the hinges or the latches. The non-struck side doors remained closed and latched. There were no driver injury values that exceeded their limits. There was no FMVSS 301 Stoddard solvent spillage as a result of the impact.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

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 PARAMATER DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MB5900	Anti-Lock Brakes	Yes
Model Year	2011	All Wheel Drive	No
Make	Volvo	Power Steering	Yes
Model	XC60 FWD	Driver Front Airbag	Yes
Body Style	5-Door MPV	Driver Curtain Airbag	Yes
VIN	YV4940DL5B2147757	Driver Head/Torso Airbag	No
Body Color	Prem Electric Silver	Driver Torso Airbag	No
Delivery Date	9/10/2010	Driver Torso/Pelvis Airbag	Yes
Odometer Reading (km / mi)	32 / 20	Driver Pelvis Airbag	No
Dealer	Galpin Volvo	Driver Knee Airbag	No
Transmission	6-Speed Automatic	Rear Pass. Curtain Airbag	Yes
Final Drive	Front	Rear Pass. Head/Torso Airbag	No
Type / No. of Cylinders	Inline 6	Rear Pass. Torso Airbag	No
Engine Displacement (L)	3.2	Rear Pass. Toso/Pelvis Airbag	No
Engine Placement	Transverse	Rear Pass. Pelvis Airbag	No
Roof Rack	No	Pretensioners	Yes
Sunroof / T-Top	Yes	Load Limiters	Yes
Tinted Glass	Yes	Automatic Door Locks	No
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?

DATA FROM CERTIFICATION LABEL

Manufactured By	Volvo Car Corporation	GVWR (kg)	2358
Date of Manufacture	Jul-10	GAWR Front (kg)	1243
		GAWR Rear (kg)	1154

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				430.0	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				89.8	*A-B*

VEHICLE SEAT TYPE

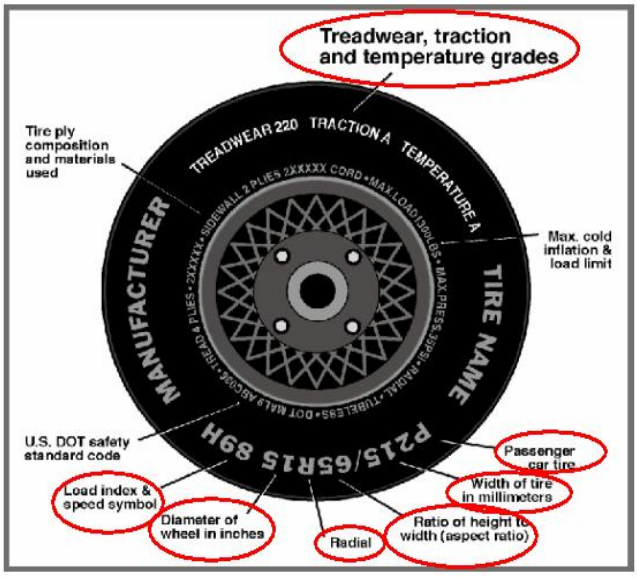
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable w/ Lever	Adjustable w/ Knob
Front Seat	Yes					Yes	
Rear or Second Row Seat		Yes			Yes		
Third Row Seat							

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMATER DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kpa)	240	240
Recommended Tire Size	235/65R17	235/65R17
Tire Size on Vehicle	235/65R17	235/65R17
Tire Model	Scorpion Zero	Scorpion Zero
Tire Manufacturer	Pirelli	Pirelli
Treadwear	520	520
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 2 Nylon	2 Rayon, 2 Steel, 2 Nylon
Load Index/Speed Symbol	104H	104H
Tire Material	Rayon, Steel, Nylon	Rayon, Steel, Nylon
DOT Safety Code Right	XND4 K206 1810	XND4 K206 1810
DOT Safety Code Left	XND4 K206 1810	XND4 K206 1810

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMATER DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	536.5	389.0		550.5	436.5		553.0	449.5	
Right	kg	524.0	355.5		532.5	417.5		528.0	415.0	
Ratio	%	58.8%	41.2%	100.0%	55.9%	44.1%	100.0%	55.6%	44.4%	100.0%
Total	kg	1060.5	744.5	1805.0	1083.0	854.0	1937.0	1081.0	864.5	1945.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1805.0	A
Actual Weight of 1 P572V ATD Used	kg	49.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	89.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1943.8	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	As Delivered	As Tested	Fully Loaded
Driver Door Sill Angle (front-to-rear)	Deg	-1.4	-1.4	-0.7
Front Passenger Sill Angle (front-to-rear)	Deg	-1.4	-1.4	-0.8
Front Bumper Angle (left-to-right)	Deg	-0.1	-0.1	-0.2
Rear Bumper Angle (left-to-right)	Deg	0.0	0.2	0.2
Vehicle CG (Aft of Front Axle)	mm	1144	1223	1232
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	20	15	25

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Weight of Ballast in Cargo Area	kg	84.5
Weight of Vehicle Components Removed	kg	34.5

Vehicle components removed to make Target Vehicle Test Weight:

Spare Tire and Tools (17.0 kg), Trunk Liner (7.0 kg), Right Side Door Panels (6.5 kg), Right Side Door Glass (4.0 kg)

TEST VEHICLE IMPACT POINT DATA

Measurement Description	Units	Value
Vertical Impact Reference Line (Aft of Front Axle)	mm	1134
Actual Impact Point (Aft of Front Axle)	mm	1103
Impact Point Difference (- forward/+ rearward)	mm	-31

DATA SHEET NO. 2

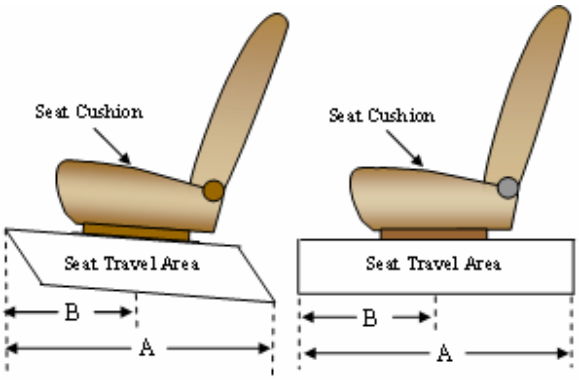
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

SEAT FORE / AFT POSITIONING

The total seat travel is measured from the forward most possible position to the rearmost possible position with the seat set at mid angle and lowest height. The driver's seat is set to the forward most position where the ATD will not contact any interior panels at the mid angle and mid height positions.

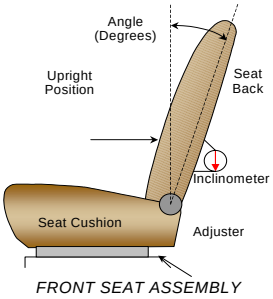


SEAT FORE/AFT POSITIONS

Seating Position	Total Fore-Aft Travel	Placed in Position	Cushion Range	Placed in Position
Driver Seat	250 mm	0 mm	14.6 - 20.7	17.7
Front Passenger Seat	219 mm	0 mm	13.6 - 19.6	16.6
Rear Seat - Struck Side	Fixed	Fixed	Fixed	Fixed
Rear Seat - Non-Struck Side	Fixed	Fixed	Fixed	Fixed

SEAT BACK ANGLE POSITIONING

The procedure for the driver is as follows: the seat back is set to level the driver ATD's (SID-IIs) head transverse instrumentation platform; seat back angle is measured at the seat back using a digital inclinometer.



SEAT BACK ANGLE POSITIONS

Seating Position	Degrees	Detent
Driver Seat Back Angle w/Seated Dummy	10.5	
Front Passenger Seat Back Angle	10.5	
Struck Side Rear Seat Back Angle	Fixed	Fixed
Non-Struck Side Rear Seat Back Angle	Fixed	Fixed

SEAT BELT UPPER ANCHORAGE POSITIONING

The seat belt upper anchorage is positioned to the manufacturer's design position for a 5th percentile adult female ATD. The seat belt upper anchorage is fixed.

SEAT BELT UPPER ANCHORAGES

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

DATA SHEET NO. 2 … (CONTINUED)

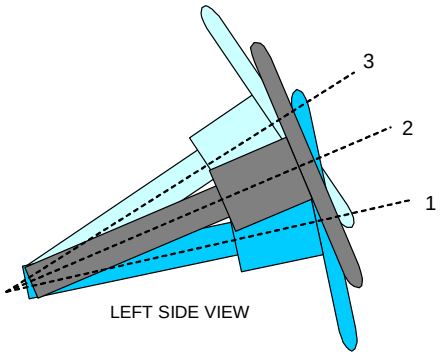
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

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 placed across the rim of the steering wheel for angle.



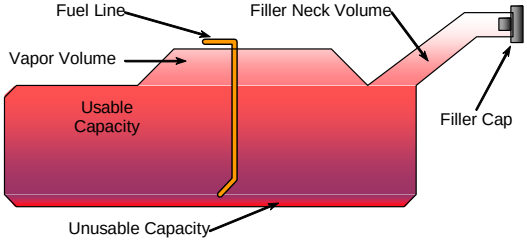
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

	Angle (°)	Fore-Aft Position (mm)
Lowermost Position, No. 1	22.6	0
Geometric Center Position, No. 2	25.3	24
Uppermost Position, No. 3	27.9	47
Steering Wheel Travel	5.3	47
Test Position	25.3	24

FUEL PUMP

The test vehicle is equipped with an electric fuel pump. The fuel pump operates when the engine is running. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area along the center of the vehicle in front of the rear axle.



VEHICLE FUEL TANK ASSEMBLY

FUEL CAPACITY DATA

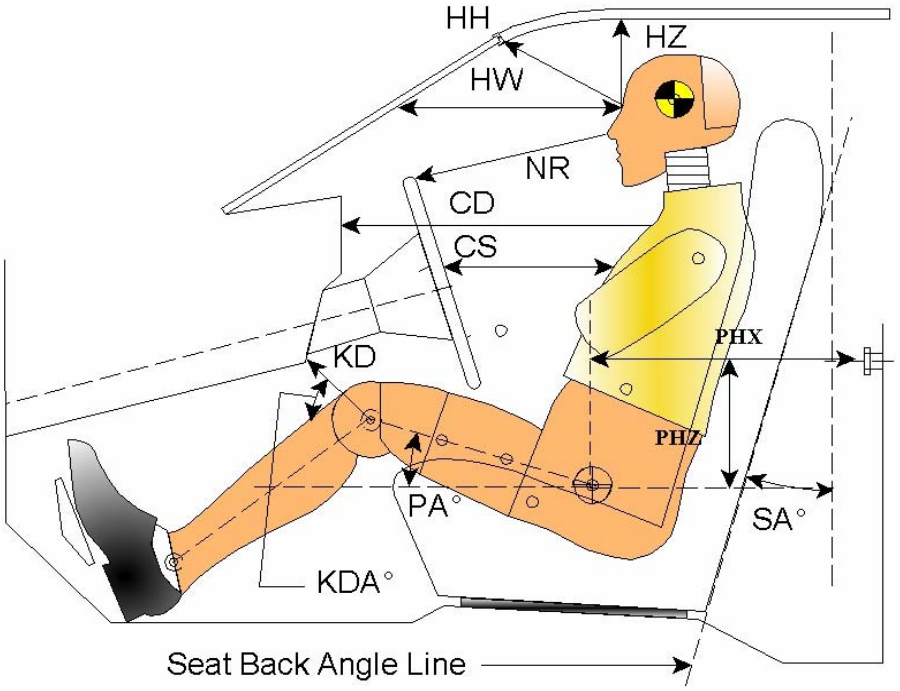
Description	Liters
Usable Capacity of "Standard Tank"	70.02
Usable Capacity of "Optional Tank"	
Usable Capacity of Standard Tank as Specified In Owner's Manual	
Usable Capacity of Optional Tank as Specified in Owner's Manual	
92 - 94% of Usable Capacity	64.42 to 65.82
Actual Amount of Stoddard Solvent Used	65.12
1/3 of Usable Capacity	23.34

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



DUMMY LONGITUDINAL CLEARANCE DIMENSIONS (S/N: 299)

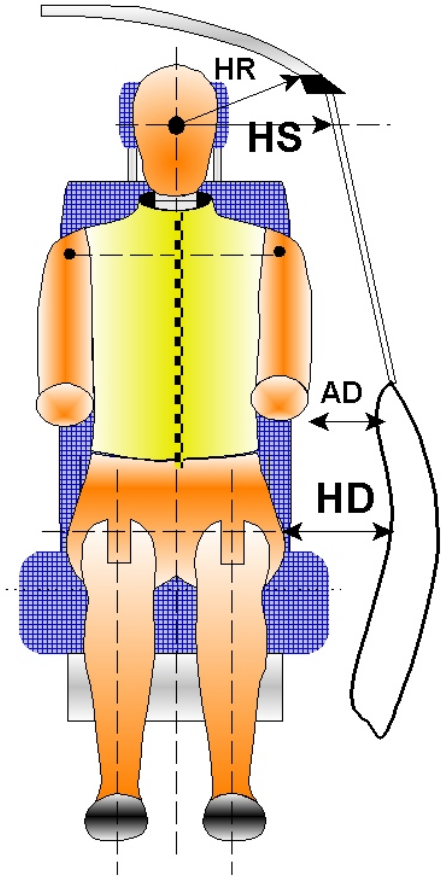
Driver Code	Description	Driver	
		Length (mm)	Angle (º)
HH	Head to Header	280	53.5
HW	Head to Windshield	653	0.0
HZ	Head to Roof	195	90.0
NR	Nose to Rim	240	6.7
CD	Chest to Dash	431	11.4
CS	Chest to Steering Wheel	188	8.4
KDL / KDAL°	Left Knee to Dash	111	33.2
KDR / KDAR°	Right Knee to Dash	109	
PA°	Pelvic Angle		23.0
PHX	H-Point to Striker (x-direction)	316	
PHZ	H-Point to Striker (z-direction)	43	
SA°	Seat Back Angle		11.3

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



DUMMY LATERAL CLEARANCE DIMENSIONS (S/N: 299)

Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	304
HS	Head to Side Window	mm	402
AD	Arm to Door	mm	183
HD	H-Point to Door	mm	181

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

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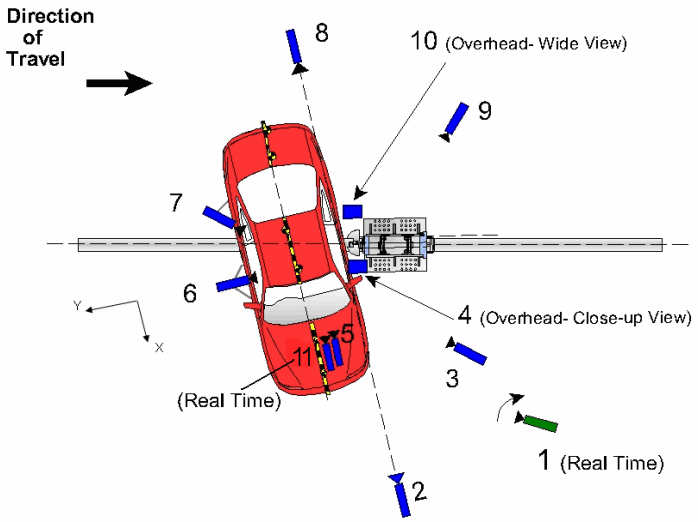


CAMERA LOCATIONS

Camera No.	View	Coordinates (m)			Lens (mm)	Film Speed (fps)
		X*	Y*	Z*		
1	Real Time Pan View of Impact	8.89	46.57	-3.04		30
2	Front Ground Level - Impact View	8.34	-0.05	-0.93	24	1000
3	Impact Side 45° - Forward Pole View	4.10	-2.15	-1.15	8.5	1000
4	Overhead Close-Up View of Impact	0.00	0.00	-5.79	12.5	1000
5	On-Board - Dummy Front View	1.19	0.54	-1.34	35	400
6	On-Board - Dummy Side View	-0.07	1.60	-1.20	14	1000
7	On-Board - Dummy Rear Oblique View	-0.97	1.67	-1.29	20	1000
8	Rear Ground Level - Impact View	-6.12	-6.23	-0.96	24	1000
9	Impact Side 45° - Rearward Pole View	-8.02	0.04	-1.01	35	1000
10	Overhead Wide View of Impact	-0.06	0.22	-5.79	14	1000
11	Real Time Dummy Front View	1.28	0.64	-1.30		30

Reference: +X = Forward of Vehicle
+Y = Right of Vehicle
+Z = Down

* All Measurements accurate to ± 6 mm

NOTE: Vehicle was at a 15° angle to the rigid pole

INSTRUMENTATION

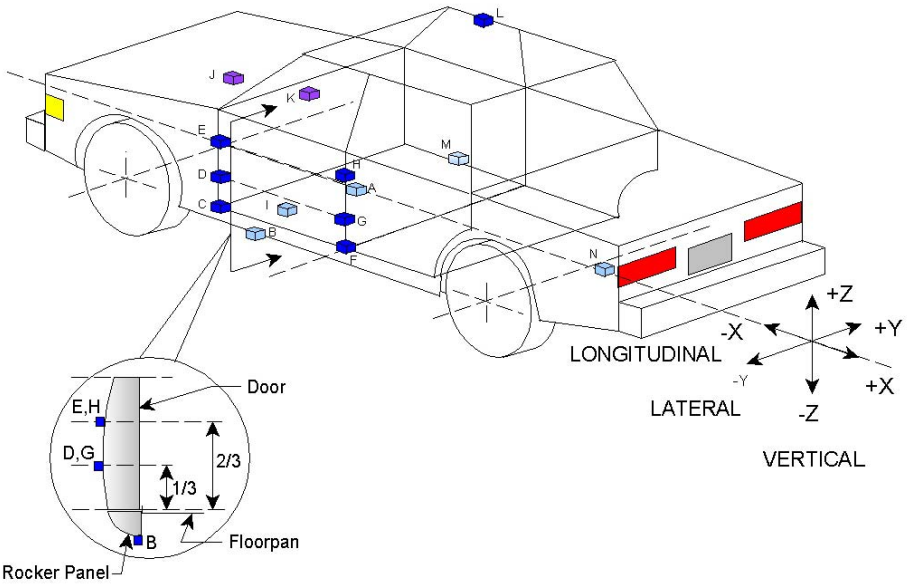
	Number of Channels
Driver Dummy	16
Vehicle Structure	21
Pole Load Cells	8
Contact Switches	3
Airbag Timing Sensor	2
Total No. of Data Channels	50

DATA SHEET NO. 6

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



VEHICLE ACCELEROMETER LOCATIONS

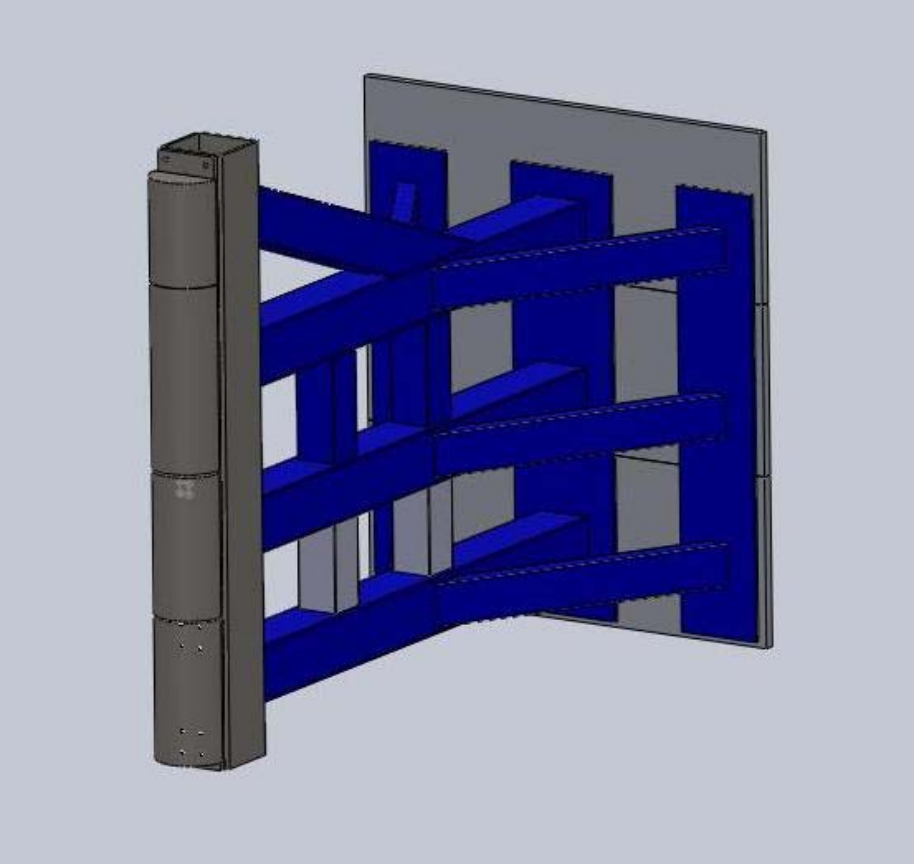
	Sensor Description	Coordinates (mm)		
		X	Y	Z
A	Vehicle CG Accelerometer	1985	0	-425
	Vehicle CG ARS	1985	0	-425
B	Left Floor Sill	2650	-690	-273
C	A-Pillar Sill	3195	-785	-459
D	A-Pillar Lower	3195	-785	-685
E	A-Pillar Mid	3195	-785	-887
F	B-Pillar Sill	2105	-715	-463
G	B-Pillar Lower	2105	-715	-762
H	B-Pillar Mid	2105	-715	-948
I	Driver Seat	2385	-563	-426
J	Engine Top	3785	-117	-902
K	Firewall	3695	502	-846
L	Right Roof Sill	2193	480	-1602
M	Right Floor Sill	2005	698	-423
N	Rear Floorpan	945	-485	-615

DATA SHEET NO. 7

RIGID POLE LOAD CELL DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



RIGID POLE LOAD CELL LOCATIONS

ID	Units	Height From Ground
1	mm	87
2	mm	468
3	mm	648
4	mm	978
5	mm	1168
6	mm	1651
7	mm	1816
8	mm	2057

DATA SHEET NO. 8

POST-TEST OBSERVATIONS

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Driver Dummy
Dummy Type/Serial No.	P572V (SID-IIs) / Serial No. 299
Head Contact	Torso/Pelvis Airbag, Curtain Airbag, Head Restraint, Door Panel
Upper Torso Contact	Torso/Pelvis Airbag, Door Panel
Lower Torso Contact	Door Panel
Left Knee Contact	None
Right Knee Contact	None

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
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	Separation under rear sill
Windshield Damage	Broken
Window Damage	Left front window 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	No		No	
Side Airbag 1 (Torso/Pelvis)	Yes	Yes	No	
Side Airbag 2 (Curtain)	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	
Other				

VEHICLE SPEED AND IMPACT DATA

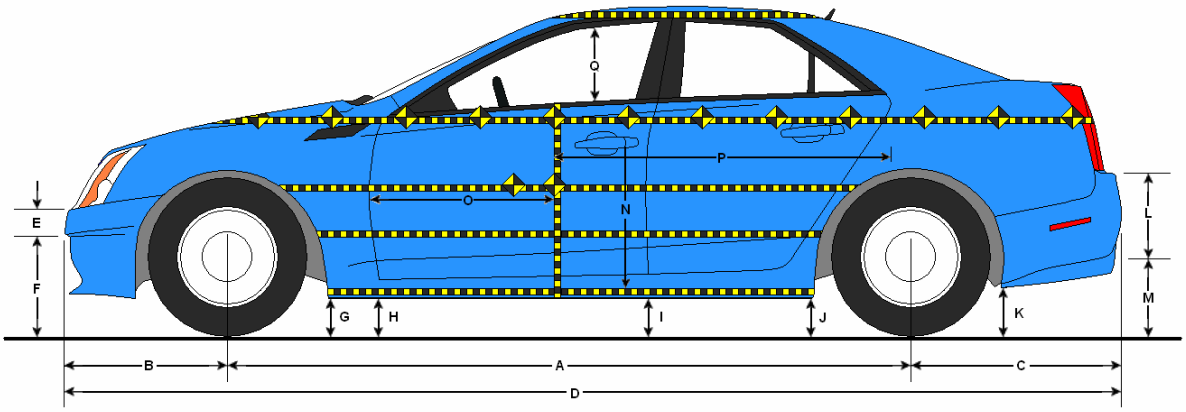
Measured Parameter	Units	Requirement	Value
Horizontal Offset From Vertical Reference Line	mm	+/- 38	-31 (Left)
Trap No. 1 Velocity (Primary)	km/h	30.4 to 33.0	32.68
Trap No. 2 Velocity (Redundant)	km/h	30.4 to 33.0	32.62

DATA SHEET NO. 9

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



LEFT SIDE VIEW

VEHICLE PRE-AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2773	2692	-81
B	Front Axle to FSOV	911	954	43
C	Rear Axle to RSOV	942	953	11
D1	Total Vehicle Length at Left Side	3252	3136	-116
D2	Total Vehicle Length at Centerline	4612	4600	-12
D3	Total Vehicle Length at Right Side	3249	3268	19
E	Front Bumper Thickness	149	147	-2
F	Front Bumper Bottom to Ground	468	535	67
G	Sill Height at Front Wheel Well	262	272	10
H	Sill Height at Front Door Leading Edge	268	281	13
I	Sill Height at B-Pillar	292	316	24
J1	Sill Height at Rear Wheel Well	267	338	71
J2	Pinch Weld Height at Rear Wheel Well	283	343	60
K	Sill Aft of Rear Wheel Well	359	423	64
L	Rear Bumper Thickness	185	185	0
M	Rear Bumper Bottom to Ground	509	558	49
N	Sill Height to Window Bottom Sill	650	634	-16
O	Front Door Leading Edge to Impact CL	650	520	-130
P	Rear Door Trailing Edge to Impact CL	1403	1294	-109
Q	Front Window Opening	424	461	37
R	Right Side Length	3249	3268	19
S	Left Side Length	3252	3136	-116
T	Vehicle Width at B-Pillar	1830	1697	-133

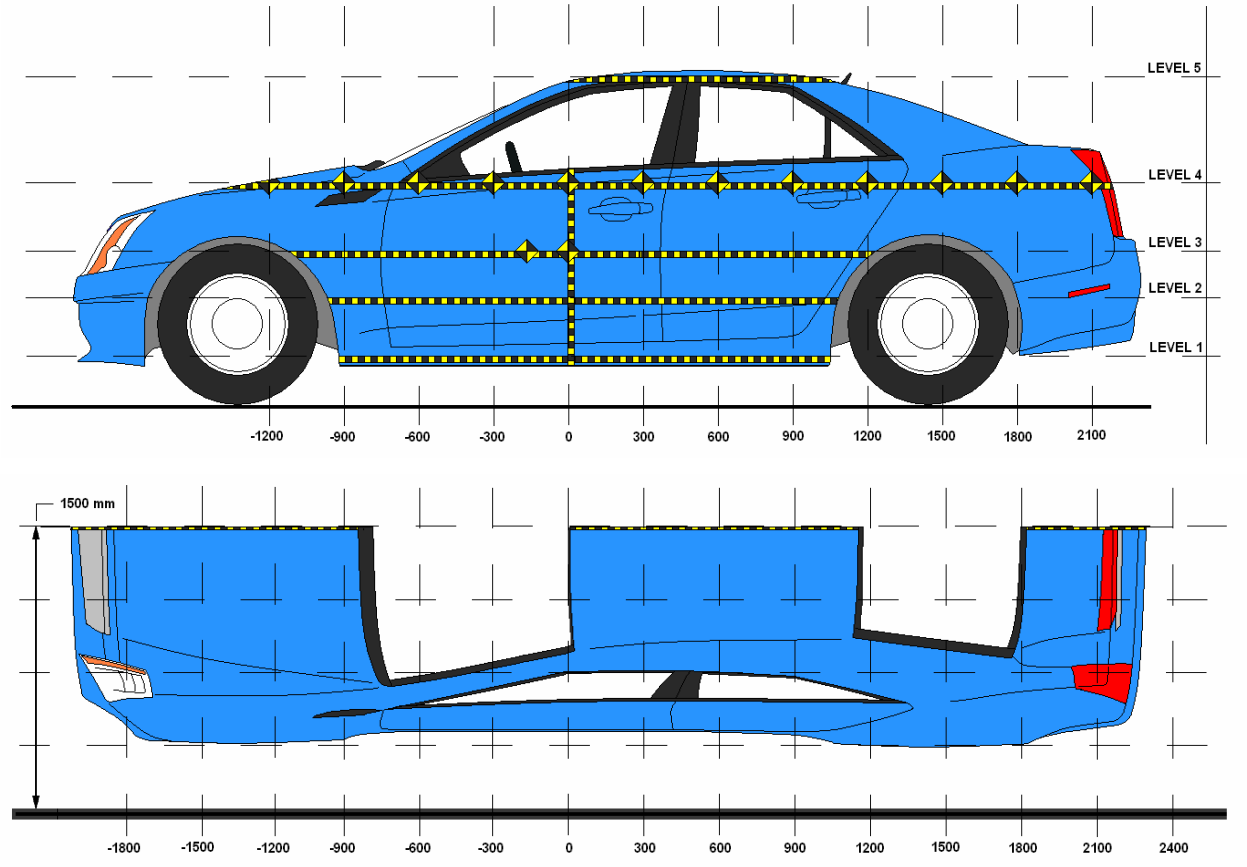
All measurements in mm accurate to ±3 mm

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



NOTE: All measurements are in millimeters (mm)

Level	Description	Height Above Ground (mm)
1	Sill Top Height	334
2	Occupant H-Point Height	686
3	Mid-Door Height	763
4	Window Sill Height	1035
5	Window Top Height	1557

DATA SHEET NO. 10 … (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900			558	716				633	781				75	65	
-750		565	574	687			646	653	760			81	79	73	
-600	620	586	589	659		736	692	695	749		116	106	106	90	
-450	626	588	589	637		802	782	786	817		176	194	197	180	
-300	629	586	586	620		875	874	877	877		246	288	291	257	
-150	633	585	584	610		957	969	975	951		324	384	391	341	
0	639	586	584	604		1038	1045	1046	1041		399	459	462	437	
150	642	587	585	602	901	968	989	997	1000	1078	326	402	412	398	177
300	646	589	586	603	896	899	865	871	886	1048	253	276	285	283	152
450	649	593	589	605	895	832	766	764	782	1028	183	173	175	177	133
600	649	597	594	609	896	777	737	735	754	1005	128	140	141	145	109
750	648	602	599	613	897	729	708	707	727	986	81	106	108	114	89
900	646	603	600	618	899	683	675	676	698	971	37	72	76	80	72
1050	644	598	596	620	902	645	635	637	667	957	1	37	41	47	55
1200		587	587	621	907		591	591	634	950		4	4	13	43
1350			575	619	913			600	601	950			25	-18	37
1500				619	920				641	952				22	32
1650				621	930				641	957				20	27
1800				625	946				640	969				15	23
1950				632	985				644	1004				12	19
2100				643					651					8	
2250															
2400															
2550															
2700															
2850															

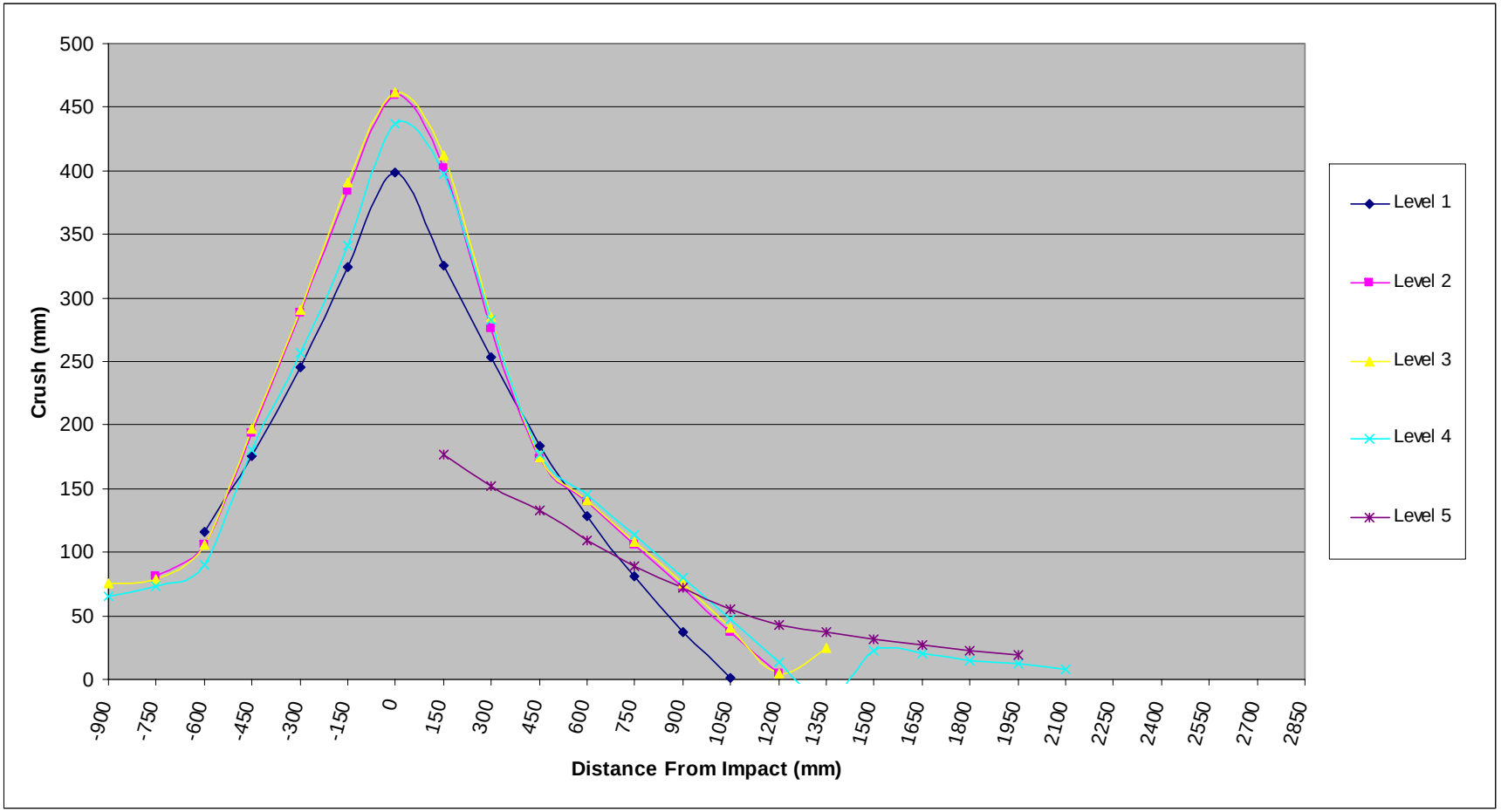
MAXIMUM CRUSH DATA

	Units	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush	mm	399	459	462	437	177
Distance From Impact	mm	0	0	0	0	150

DATA SHEET NO. 10 … (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2011 Volvo XC60 FWD 5-Door MPV	NHTSA No.	MB5900
Test Program:	32 km/h (20 mph) Side Impact NCAP 75° Rigid Pole	Test Date:	10/18/10



DATA SHEET NO. 11

FMVSS NO. 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

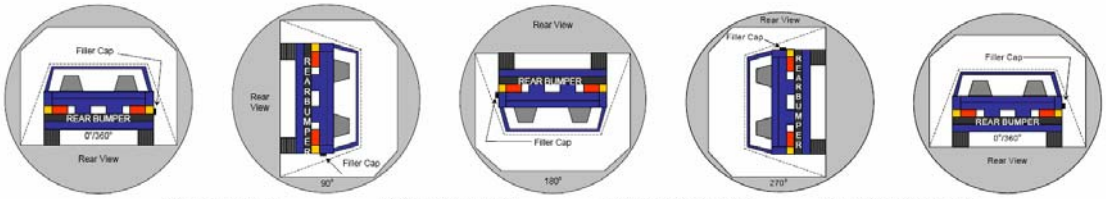
Temperature at Time of Impact: 23.3° C Test Time: 2:04 PM

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°	81	320	401
90° To 180°	82	305	387
180° To 270°	77	300	377
270° To 360°	77	300	377

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			
270° To 360°	0			

SOLVENT SPILLAGE LOCATION TABLE

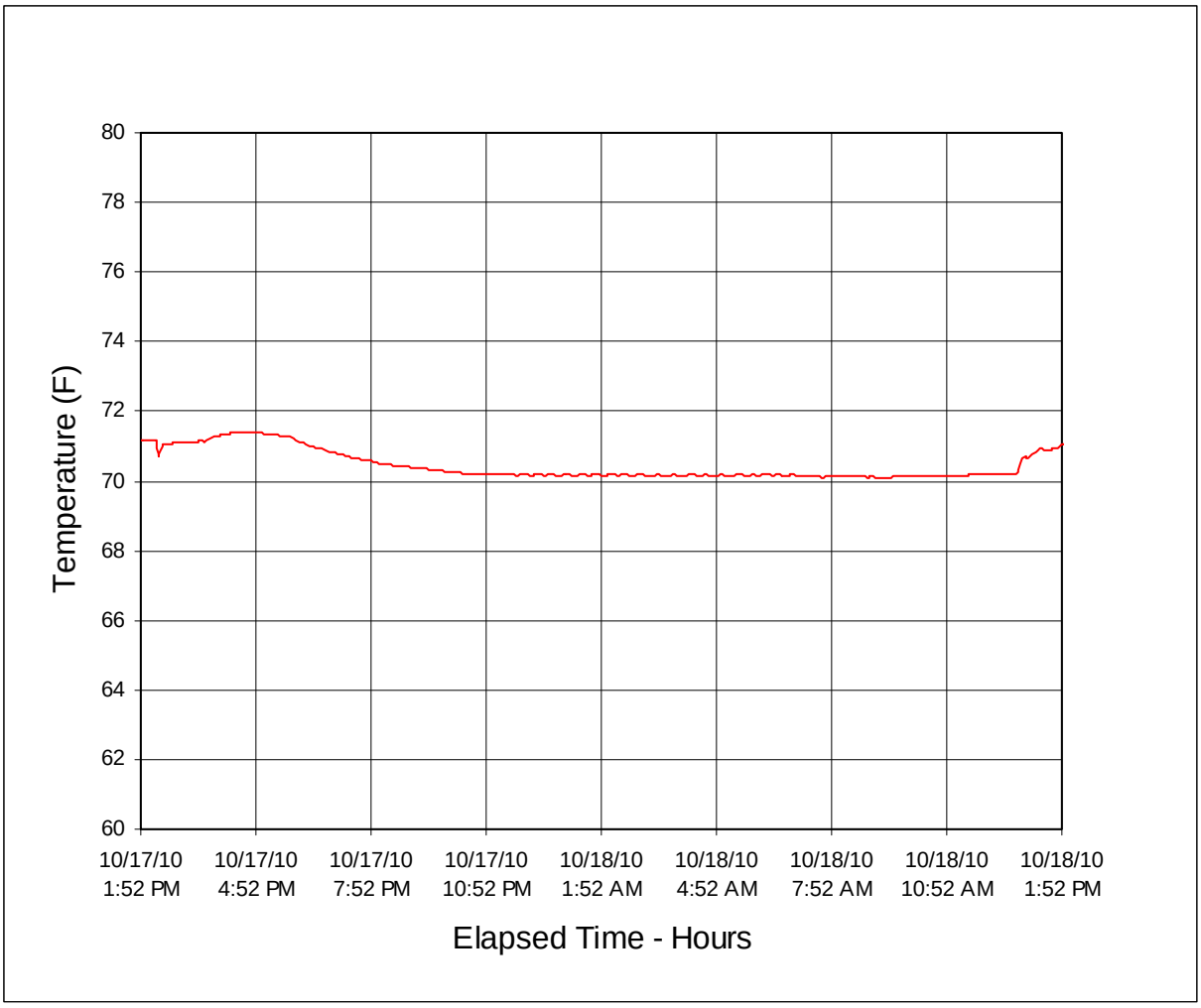
Test Phase	Spillage Location
0° To 90°	None
90° To 180°	None
180° To 270°	None
270° To 360°	None

DATA SHEET NO. 12

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2011 Volvo XC60 FWD 5-Door MPV NHTSA No. MB5900

Test Program: 32 km/h (20 mph) Side Impact NCAP 75°Rigid Pole Test Date: 10/18/10



APPENDIX A

PHOTOGRAPHS

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FIGURE 1. As-Delivered Right Front Three-Quarter View of Test Vehicle

FIGURE 2. As-Delivered Left Rear Three-Quarter View of Test Vehicle

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 Test Vehicle

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

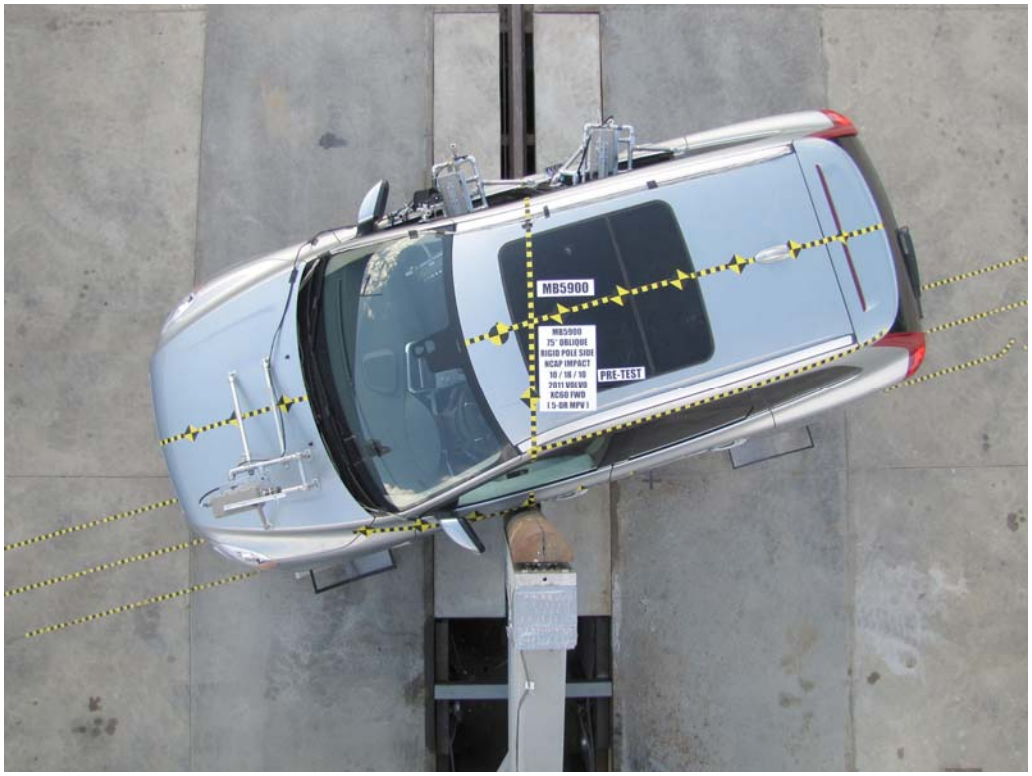

FIGURE 15. Pre-Test Overhead View of Test Vehicle and Pole

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

FIGURE 17. Pre-Test Left Side View of Pole
Positioned Against Side of Vehicle at Impact Point

FIGURE 18. Pre-Test Right Side View of Pole
Positioned Against Side of Vehicle at Ideal Impact Point

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FIGURE 23. Pre-Test Left Side View of Dummy
Showing Belt, Chalking, and Contact Switches

FIGURE 24. Pre-Test Left Side View of Dummy Shoulder and Driver Door Top View

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FIGURE 26. Pre-Test Frontal View of Seat Back Prior to Dummy

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FIGURE 29. Pre-Test Overhead View of Dummy Thighs on Seat Pan

FIGURE 30. Pre-Test View of Dummy's Neck Showing Position of Adjustable Neck Bracket

FIGURE 31. Pre-Test View of Dummy's Head Showing Dummy's Head Is Level

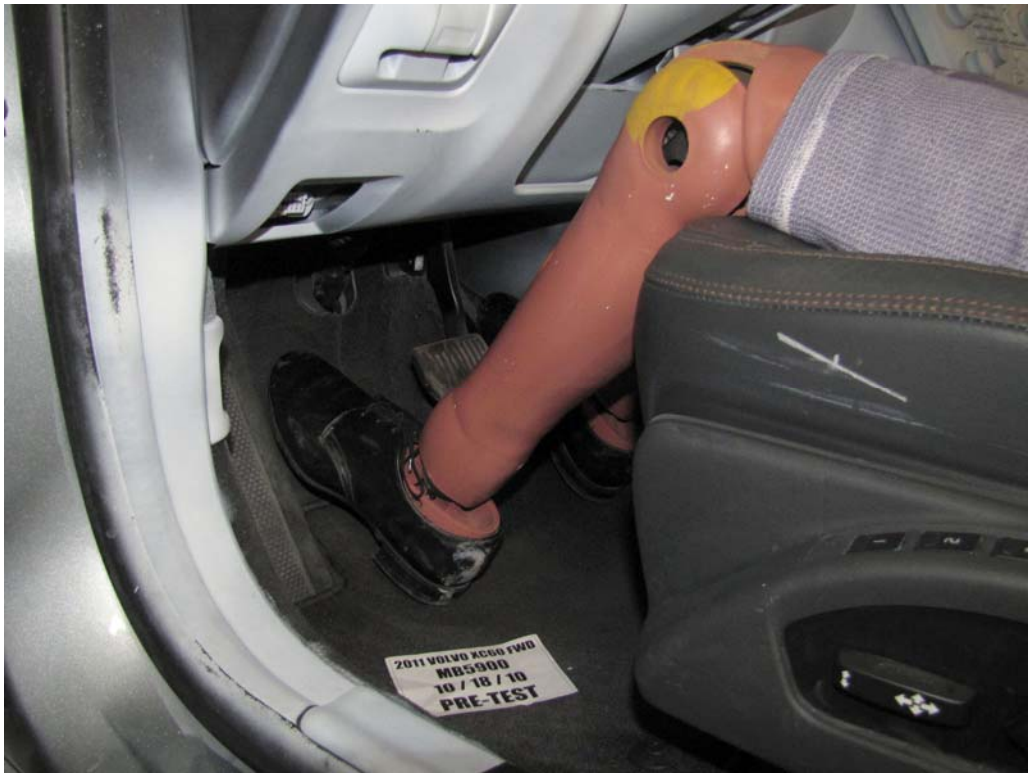

FIGURE 32. Pre-Test Placement of Dummy's Feet

FIGURE 33. Pre-Test View of Belt Anchorage for Dummy

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FIGURE 44. Post-Test Inner Driver Door Panel View
Showing Dummy Contact Locations

FIGURE 45. Post-Test Dummy Close-Up Head Contact with Vehicle Interior View

FIGURE 46. Post-Test Dummy Close-Up Head Contact with Side Airbag View

Photograph Not Applicable
No Dummy Torso Contact
with Vehicle

FIGURE 47. Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View

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

Photograph Not Applicable
No Dummy Pelvis Contact
with Vehicle Interior

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

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

FIGURE 51. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 52. Post-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 53. Close-Up View of Vehicle's Certification Label

FIGURE 54. Close-Up View of Vehicle's Tire Information Placard

FIGURE 55. Pre-Test Pole Barrier Front View

FIGURE 56. Post-Test Pole Barrier Front View

FIGURE 57. Pre-Test Pole Barrier Side View

FIGURE 58. Post-Test Pole Barrier Side View

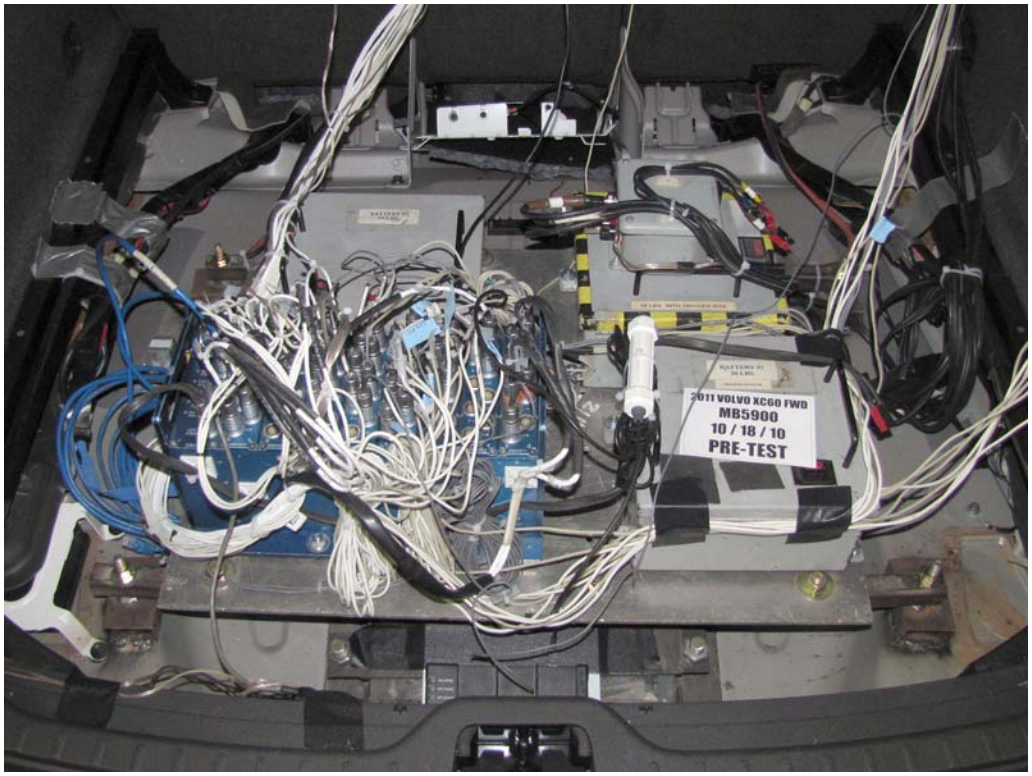

FIGURE 59. Pre-Test Ballast View

FIGURE 60. Post-Test Primary and Redundant Speed Trap Read-Out

FIGURE 61. FMVSS No. 301-305 Rollover 0 Degrees

FIGURE 62. FMVSS No. 301-305 Rollover 90 Degrees

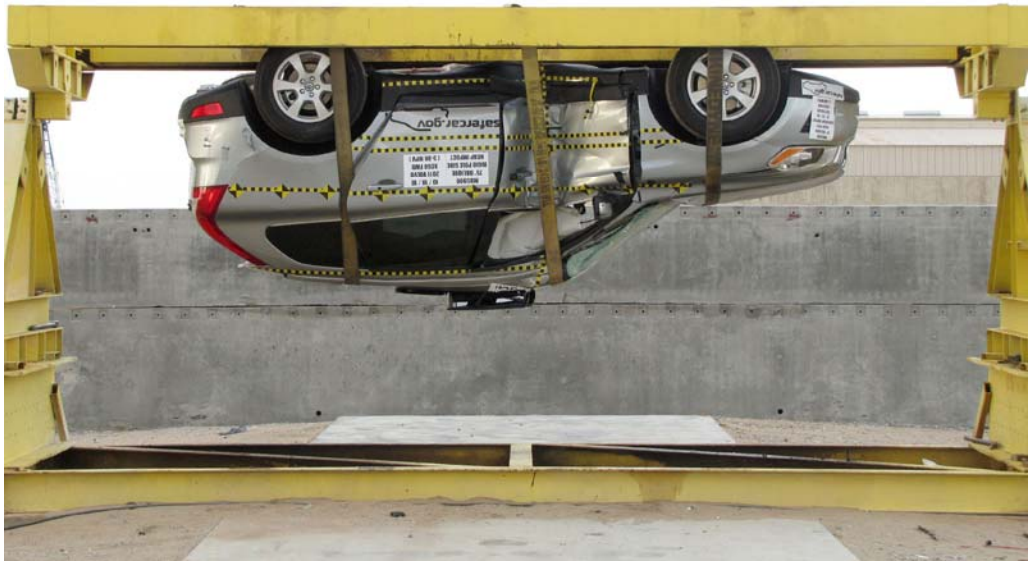

FIGURE 63. FMVSS No. 301-305 Rollover 180 Degrees

FIGURE 64. FMVSS No. 301-305 Rollover 270 Degrees

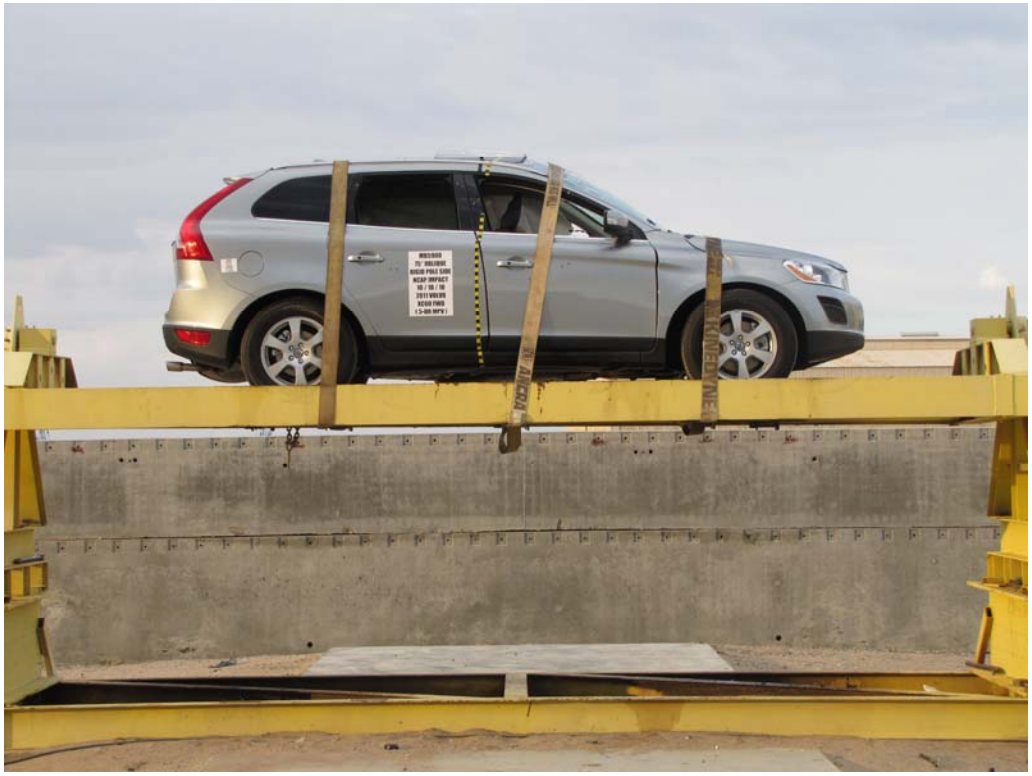

FIGURE 65. FMVSS No. 301-305 Rollover 360 Degrees

FIGURE 66. Impact Event

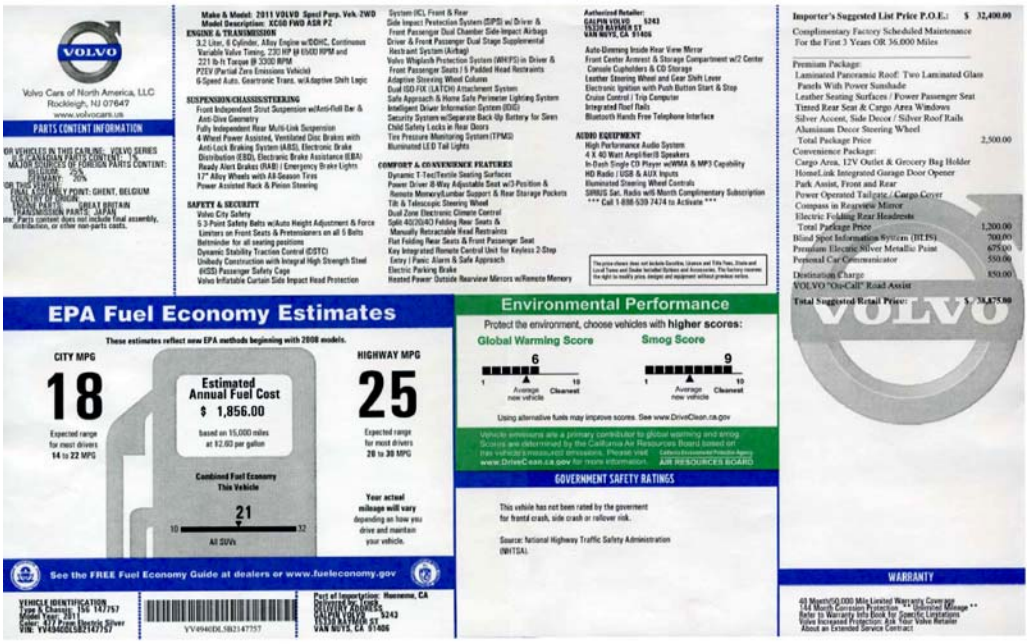

FIGURE 67. Monroney Label

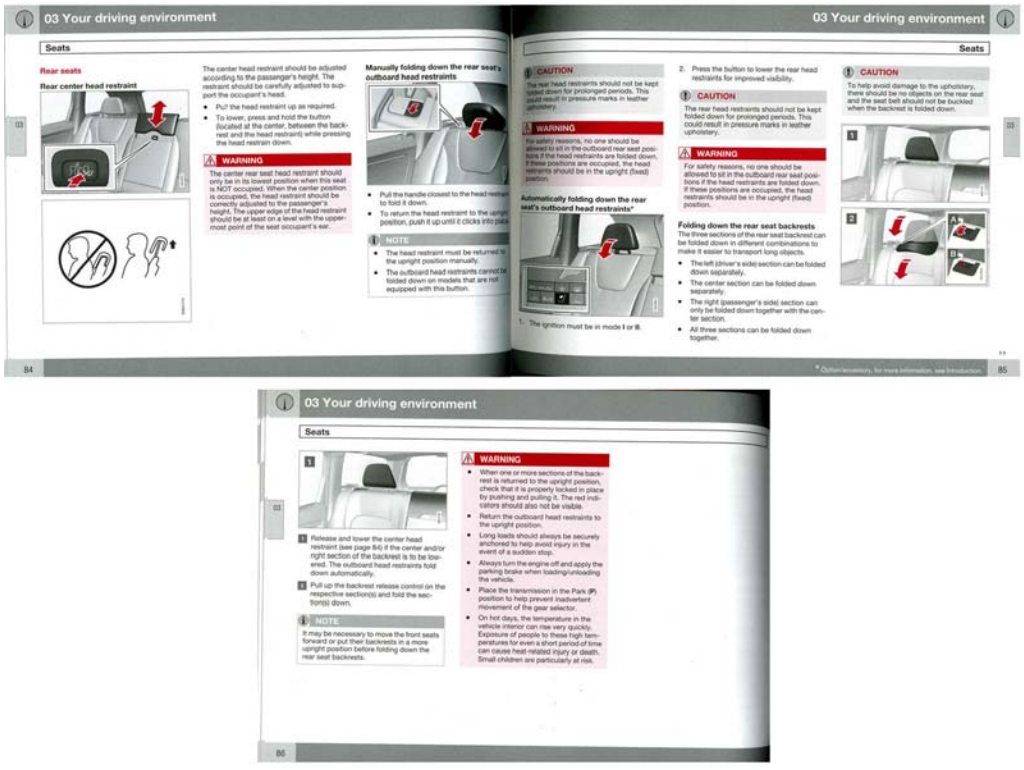

FIGURE 68. Head Restraint Use and Adjustment Information from Vehicle Manual

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

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11	Driver Total Pelvis Force on Impact Side (Y)	B-3

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.

Additional Driver Dummy Instrumentation Data

Driver Head Acceleration (X) Redundant
Driver Head Acceleration (Y) Redundant
Driver Head Acceleration (Z) Redundant
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection (Y)
Driver Shoulder Contact Switch
Driver Torso Contact Switch
Driver Pelvis Contact Switch
Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Vehicle Center of Gravity Angular Rate About X (Roll)
Vehicle Center of Gravity Angular Rate About Y (Pitch)
Vehicle Center of Gravity Angular Rate About Z (Yaw)

Left Floor Sill Acceleration (Y)

Left A-Pillar Sill Acceleration (Y)

Left Lower A-Pillar Acceleration (Y)

Left Mid A-Pillar Acceleration (Y)

Left B-Pillar Sill Acceleration (Y)

Left Lower B-Pillar Acceleration (Y)

Left Mid B-Pillar Acceleration (Y)

Driver Seat Track at Dummy H-Point Acceleration (Y)

Engine Top Acceleration (X)

Engine Top Acceleration (Y)

Firewall Center Acceleration (Y)

Right Roof at Vertical Impact Reference Line Acceleration (Y)

Right Sill at Vertical Impact Reference Line Acceleration (Y)

Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)

Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

Driver Side Airbag Timing

Driver Side Curtain Airbag Timing

Pole Instrumentation Data

Load Cell Pole Barrier #1 Force (Y)

Load Cell Pole Barrier #2 Force (Y)

Load Cell Pole Barrier #3 Force (Y)

Load Cell Pole Barrier #4 Force (Y)

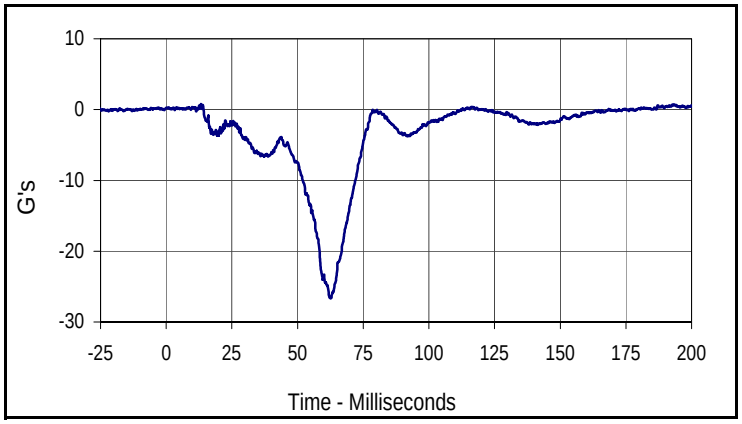
Load Cell Pole Barrier #5 Force (Y)

Load Cell Pole Barrier #6 Force (Y)

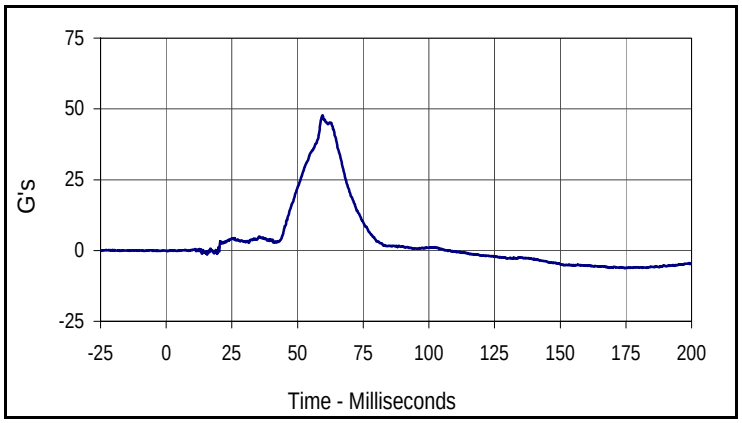
Load Cell Pole Barrier #7 Force (Y)

Load Cell Pole Barrier #8 Force (Y)

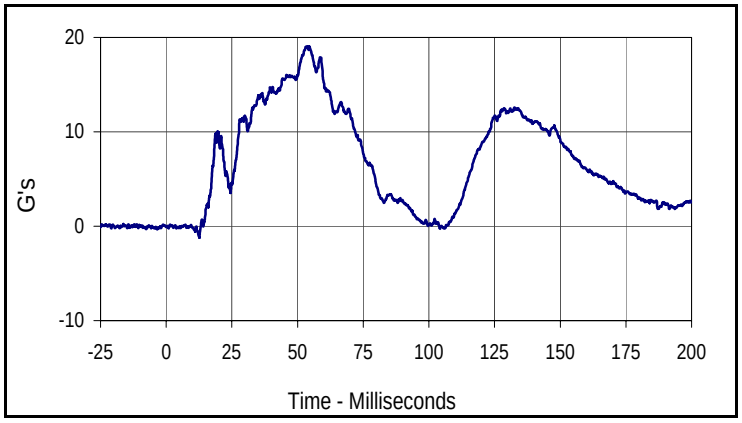
Test Vehicle:	2011 Volvo XC60 5-Door MPV	Test Date:	10/18/10
Test Program:	32 km/h (20 mph) Side Impact NCAP 75° Rigid Pole Test	NHTSA No.:	MB5900



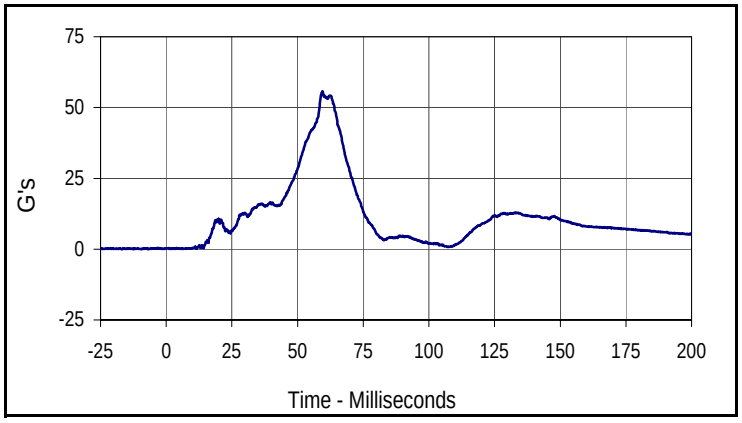
Curve Description			
Driver Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
0.8	13.3	-26.6	62.7



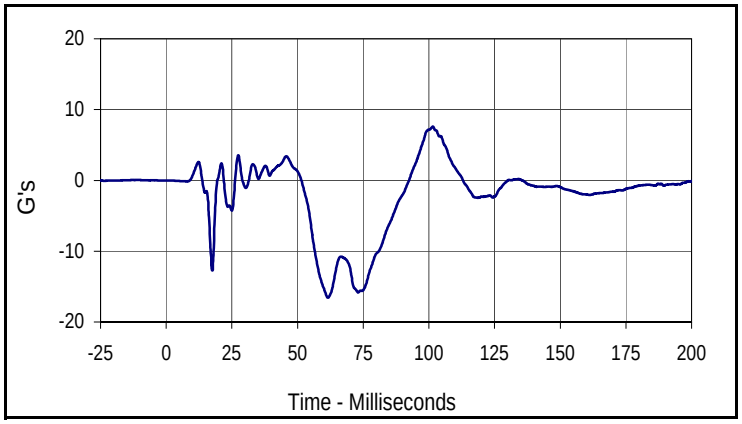
Curve Description			
Driver Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
47.7	59.5	-6.3	174.7



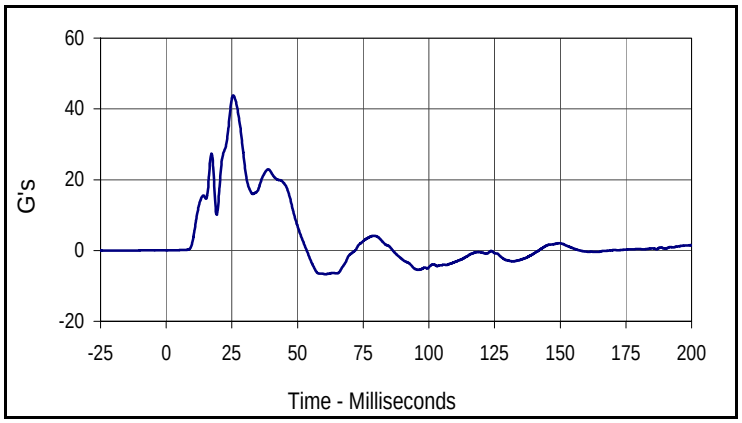
Curve Description			
Driver Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
19.1	53.9	-1.2	12.6



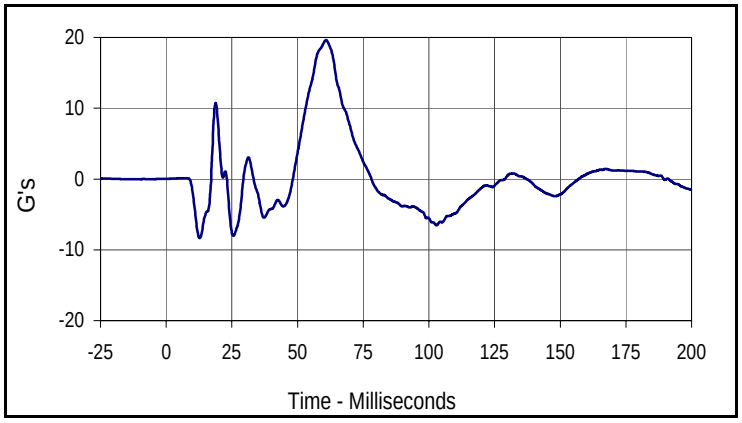
Curve Description			
Driver Head Acceleration Primary Res.			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
55.8	59.5	0.0	3.2



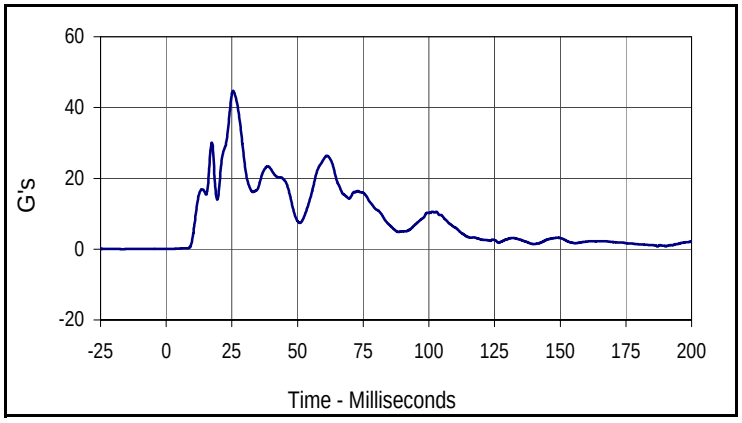
Curve Description			
Driver Lower Spine T12 Acceleration X			
CURNO	Type	SAE Class	Units
012	FIL	180	G's
Max	Time	Min	Time
7.6	101.5	-16.6	61.6



Curve Description			
Driver Lower Spine T12 Acceleration Y			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
43.9	25.5	-6.7	60.6

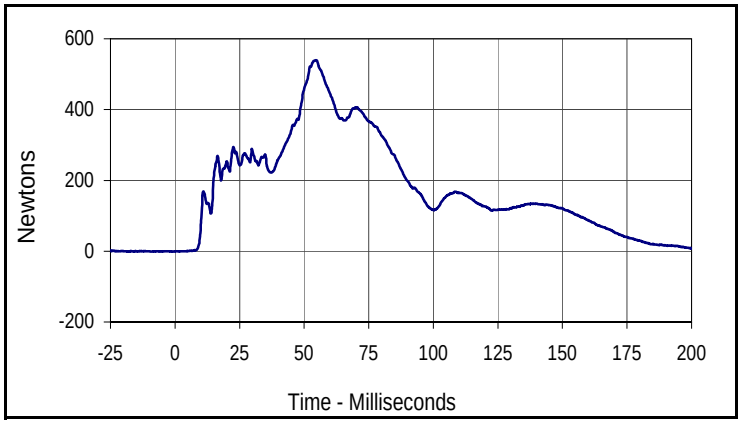


Curve Description			
Driver Lower Spine T12 Acceleration Z			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
19.6	60.8	-8.3	12.7

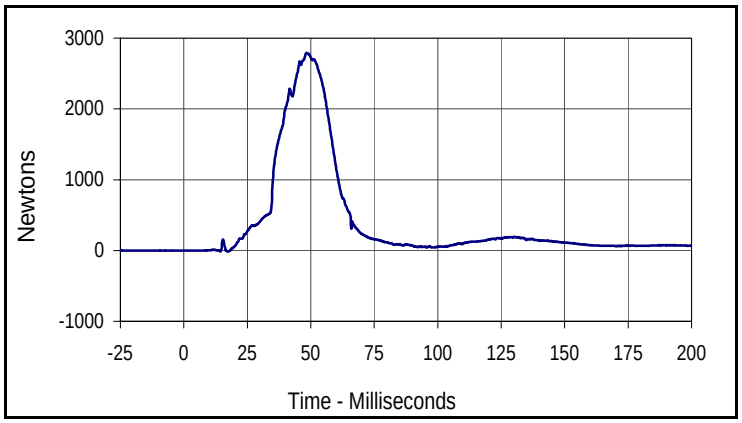


Curve Description			
Driver Lower Spine T12 Acceleration Res.			
CURNO	Type	SAE Class	Units
012	RES	180	G's
Max	Time	Min	Time
44.7	25.5	0.1	0.2

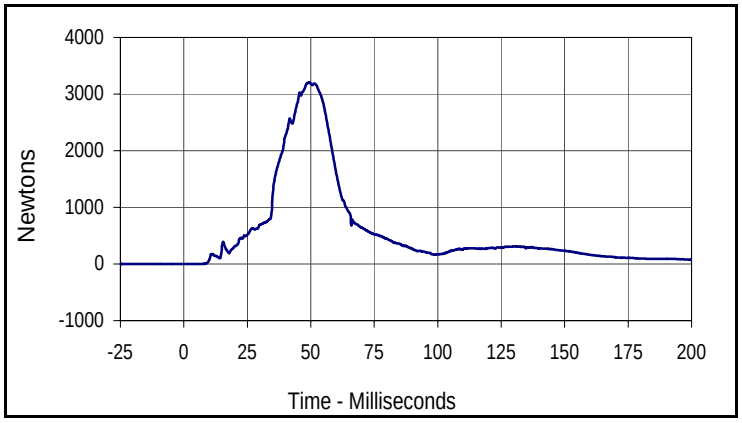
Test Vehicle:	2011 Volvo XC60 5-Door MPV	Test Date:	10/18/10
Test Program:	32 km/h (20 mph) Side Impact NCAP 75° Rigid Pole Test	NHTSA No.:	MB5900



Curve Description			
Driver Iliac Wing Force on Impact Side Y			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
539.6	54.6	-0.9	1.5



Curve Description			
Driver Acetabulum Force on Impact Side Y			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
2790.8	48.4	-13.8	17.3



Curve Description			
Driver Total Pelvic Force on Impact Side Y			
CURNO	Type	SAE Class	Units
015	SUM	600	Newtons
Max	Time	Min	Time
3208.0	49.5	-1.9	0.4

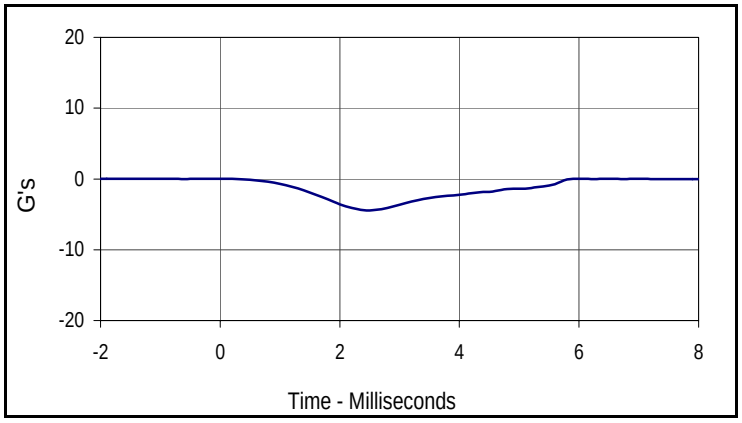
APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

Test Program:	SID IIs Lateral Head Drop Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	HDP10B

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	132.2	Pass
Peak Longitudinal Acceleration	G's	≤15	4.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	8.0	Pass
		Overall Test Results		Pass

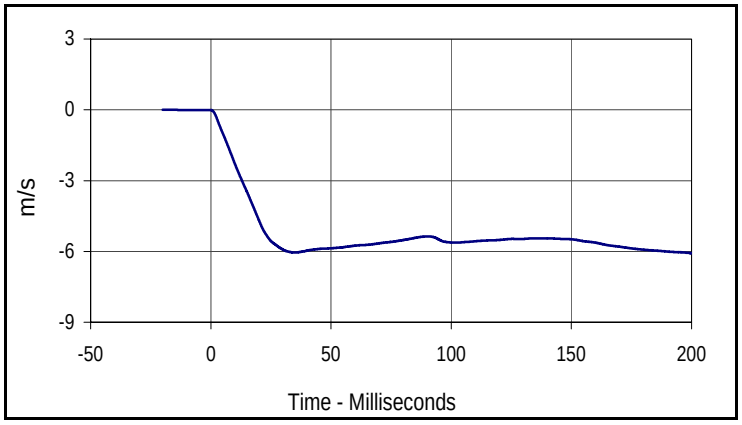
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
132.2	2.3	0.0	-2.0



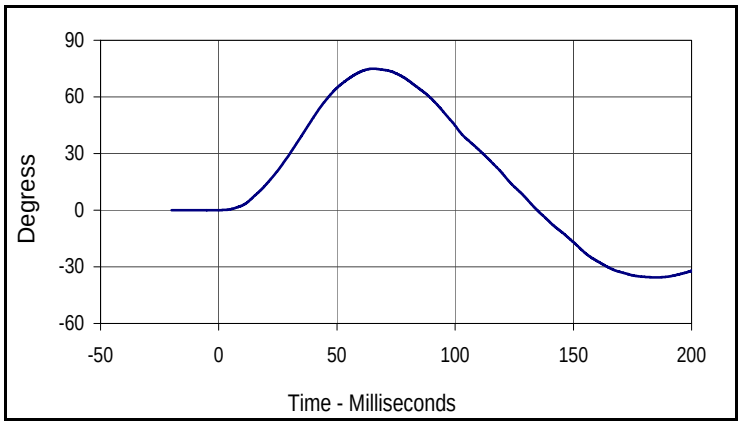
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.0	-0.2	-4.4	2.5

Test Program:	SID IIs Neck Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	NBP10B

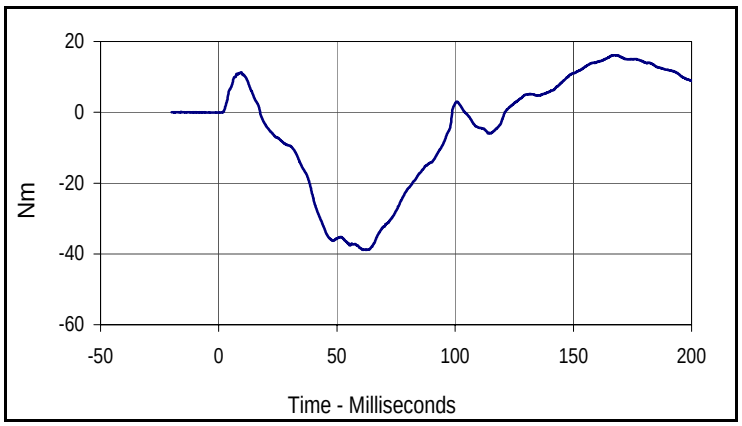
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.5	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.3	Pass
	15 msec	m/s	-3.30 to -4.10	-3.5	Pass
	20 msec	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	-6.0	Pass
Translation-Rotation	Max	Degrees	71.0 to 81.0	74.9	Pass
	Time	msec	50.0 to 70.0	65.4	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	121.1	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	-20.0	-6.1	200.0



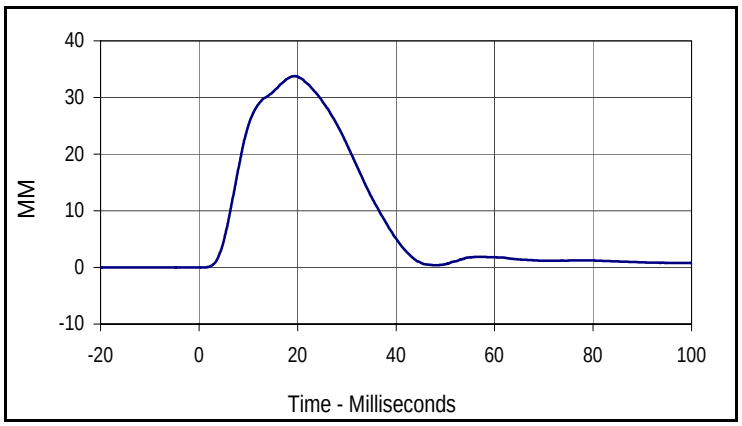
Curve Description			
Maximum Translation Rotation			
CURNO	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
74.9	65.4	-35.6	184.9



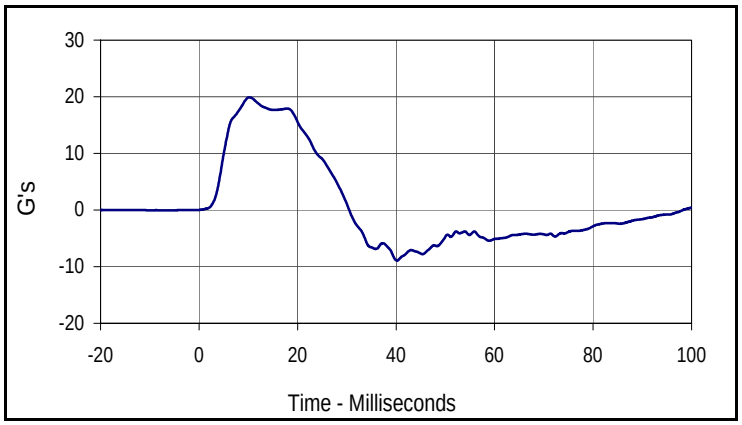
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.1	167.2	-38.9	62.5

Test Program:	SID IIs Shoulder Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	SHP10B

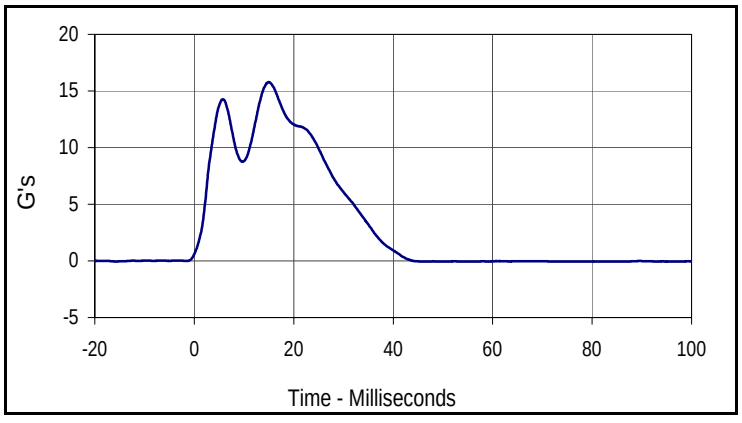
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.38	Pass
Shoulder Deflection	MM	28 to 37	33.8	Pass
Peak Upper Spine Y Acceleration	G's	17 to 22	19.9	Pass
Peak Impactor Acceleration	G's	13 to 18	15.8	Pass
		Overall Test Results		Pass



Curve Description			
Shoulder Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
33.8	19.4	0.0	-19.6



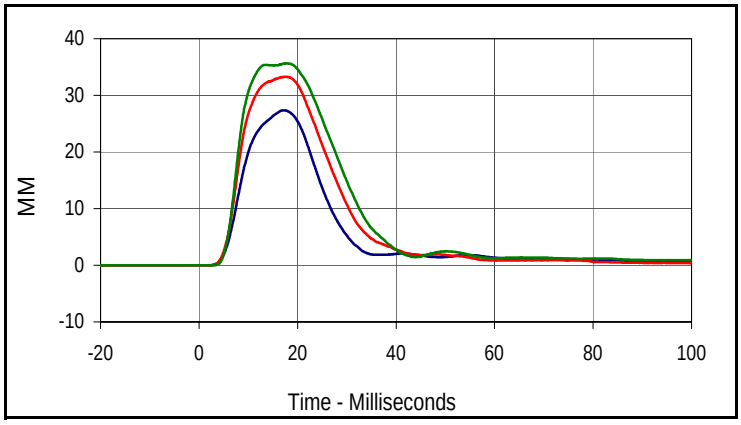
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
19.9	10.2	-8.9	40.2



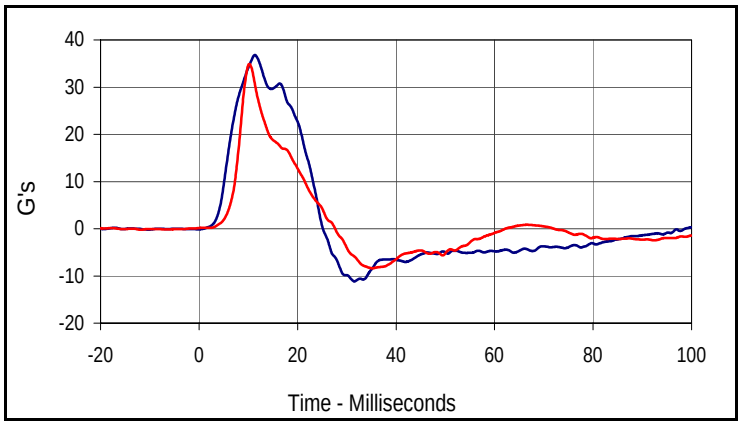
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.8	15.0	-0.1	50.8

Test Program:	SID IIs Thorax with Arm Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	TWAP10B

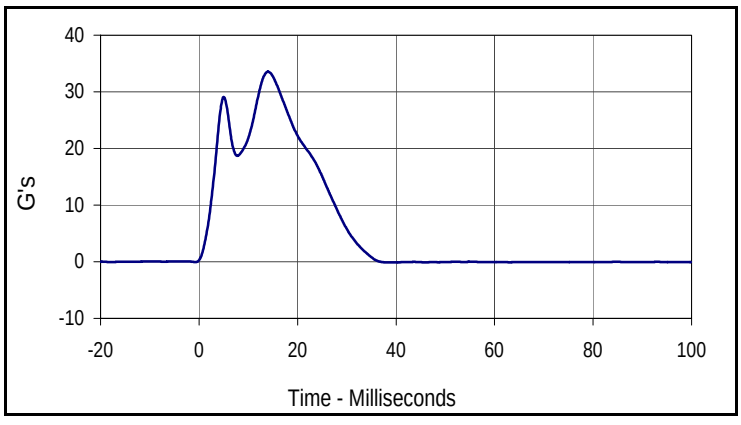
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.62	Pass
Shoulder Deflection	MM	31 to 40	36.5	Pass
Upper Thorax Rib Deflection	MM	25 to 32	27.4	Pass
Middle Thorax Rib Deflection	MM	30 to 36	33.3	Pass
Lower Thorax Rib Deflection	MM	32 to 38	35.7	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	36.8	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	34.9	Pass
Peak Impactor Acceleration After 5 msec.	G's	30 to 36	33.5	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.4	17.2	0.0	-16.6
Middle Thorax Deflection			
Max	Time	Min	Time
33.3	17.7	0.0	-18.9
Lower Thorax Deflection			
Max	Time	Min	Time
35.7	17.7	0.0	-18.0



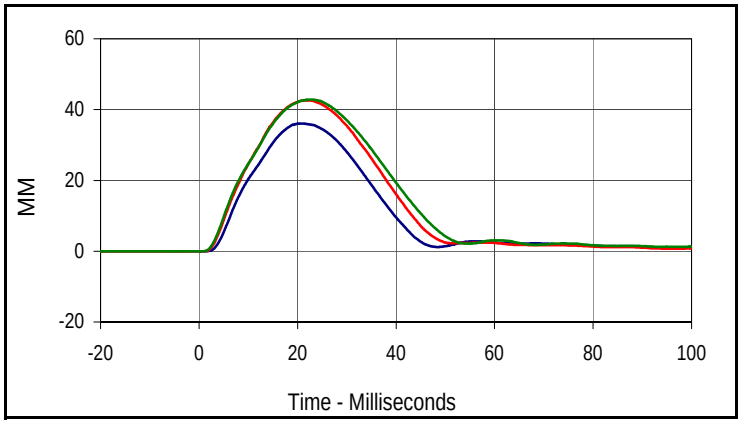
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
36.8	11.3	-11.2	31.5
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
34.9	10.2	-8.4	35.2



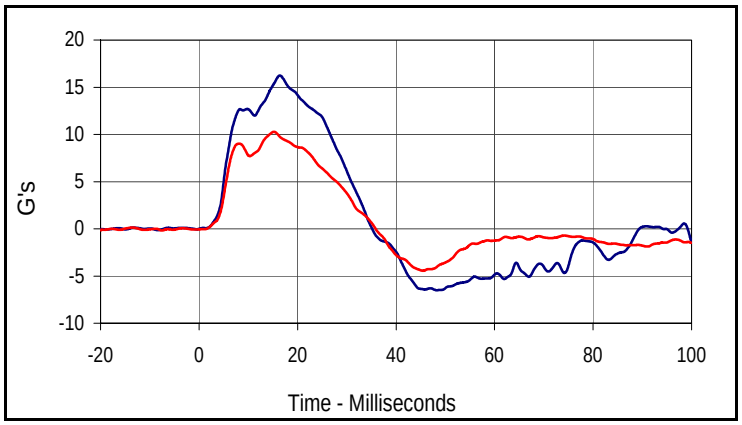
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
33.5	14.0	-0.1	40.2

Test Program:	SID IIs Thorax w/o Arm Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	TOAP10B

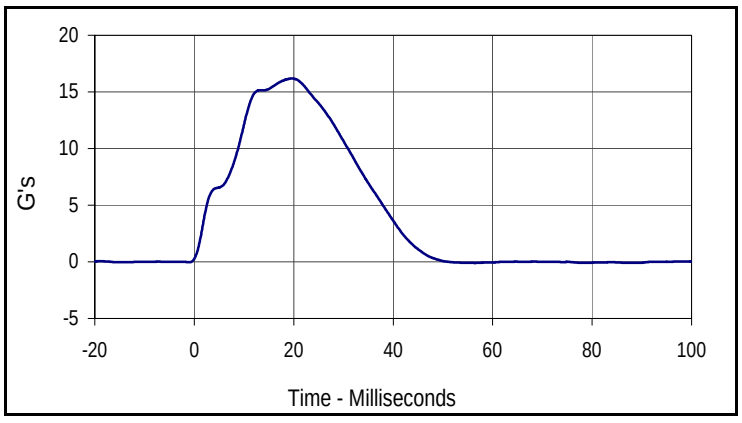
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.30	Pass
Upper Thorax Rib Deflection	MM	32 to 40	36.1	Pass
Middle Thorax Rib Deflection	MM	39 to 45	42.6	Pass
Lower Thorax Rib Deflection	MM	35 to 43	42.8	Pass
Peak Upper Spine Y Acceleration	G's	13 to 17	16.2	Pass
Peak Lower Spine Y Acceleration	G's	7 to 11	10.3	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
36.1	20.7	0.0	-4.1
Middle Thorax Deflection			
Max	Time	Min	Time
42.6	22.0	0.0	-13.4
Lower Thorax Deflection			
Max	Time	Min	Time
42.8	22.5	0.0	-3.3



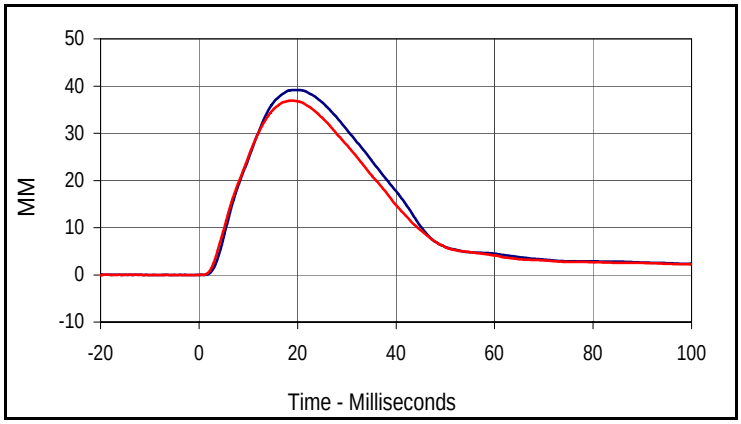
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
16.2	16.4	-6.5	48.2
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
10.3	15.2	-4.4	45.4



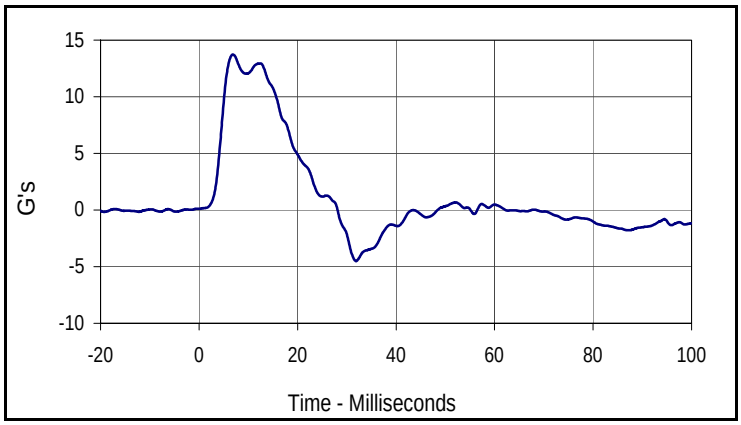
Curve Description			
Impactor Accleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.2	19.7	-0.1	0.0

Test Program:	SID IIs Abdomen Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	ABDP10B

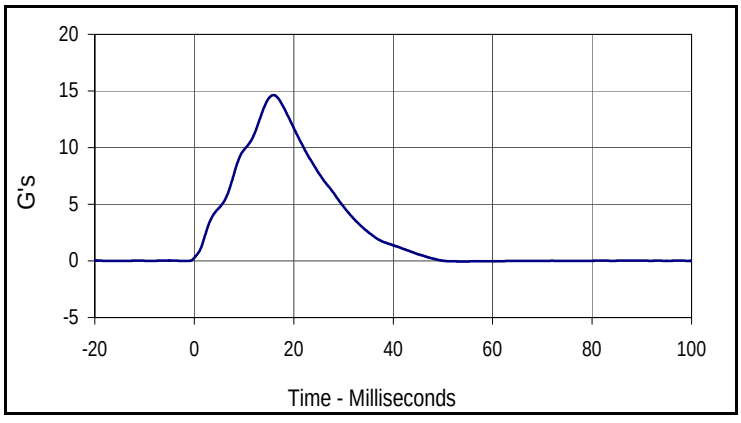
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.27	Pass
Upper Abdominal Rib Deflection	MM	36 to 47	39.2	Pass
Lower Abdominal Rib Deflection	MM	33 to 44	36.9	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	13.7	Pass
Peak Impactor Acceleration	G's	12 to 16	14.6	Pass
		Overall Test Results		Pass



Curve Description			
Upper Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
39.2	19.3	0.0	-5.8
Curve Description			
Lower Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
36.9	18.8	0.0	-3.0



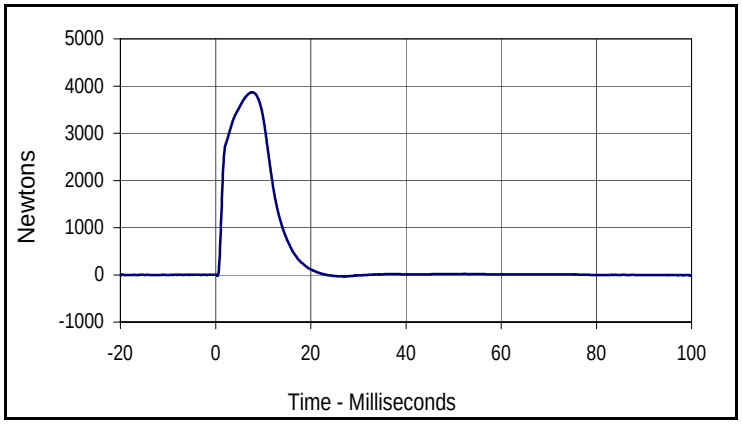
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
13.7	6.9	-4.5	31.9



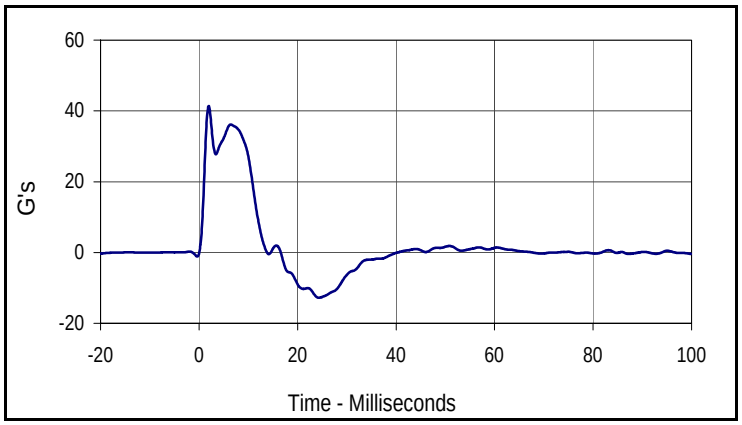
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
14.6	15.9	-0.1	54.3

Test Program:	SID IIs Pelvis Acetabulum Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	PAP10B

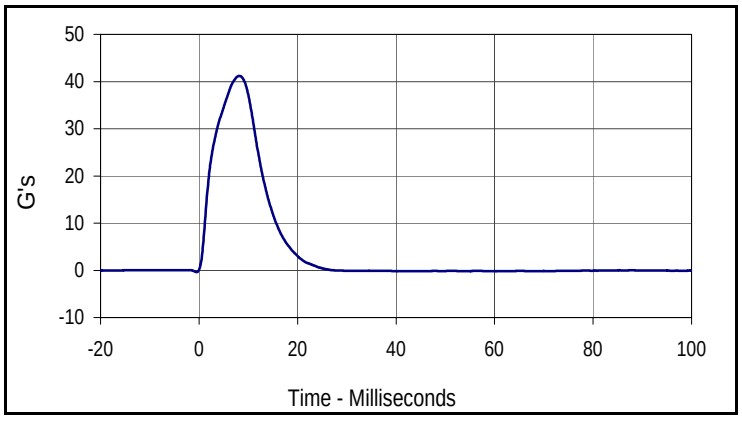
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.62	Pass
Peak Acetabulum Force	Newtons	3600 to 4300	3868.9	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	36.2	Pass
Peak Impactor Acceleration	G's	38 to 47	41.2	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3868.9	7.7	-34.5	27.0



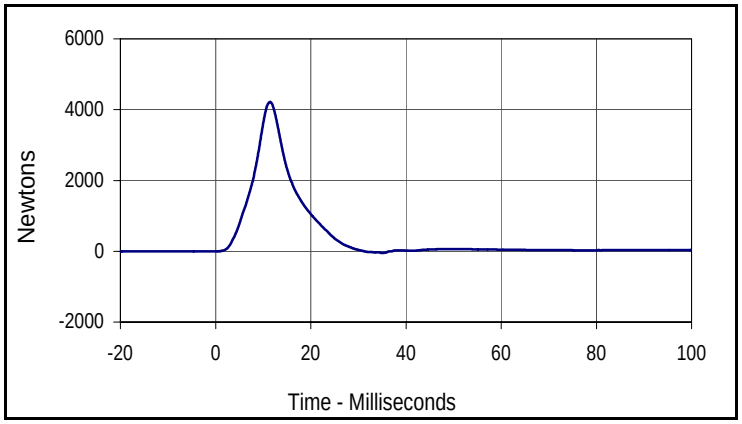
Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
41.4	2.0	-12.8	24.3



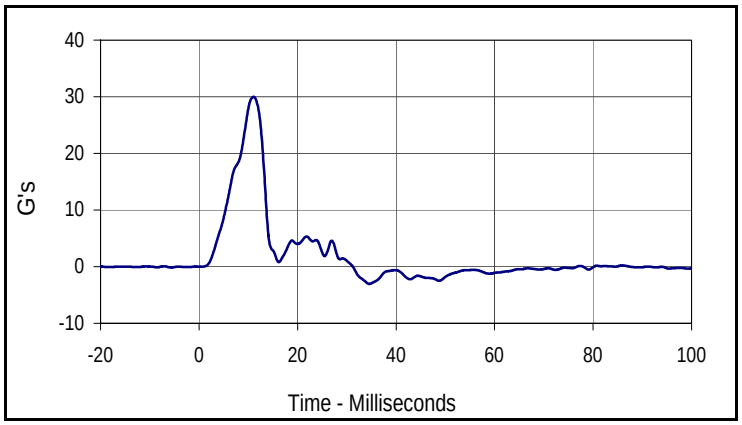
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
41.2	8.2	-0.4	-0.5

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	10/12/10
ATD Serial No.:	299	Test I.D.:	PLP10B

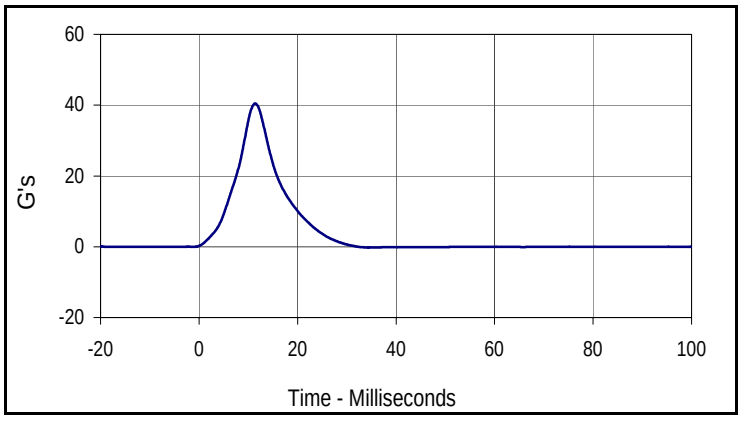
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.28	Pass
Peak Iliac Force	Newtons	4100 to 5100	4217.3	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	30.0	Pass
Peak Impactor Acceleration	G's	36 to 45	40.5	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4217.3	11.4	-46.1	34.9



Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
30.0	11.0	-3.1	34.6



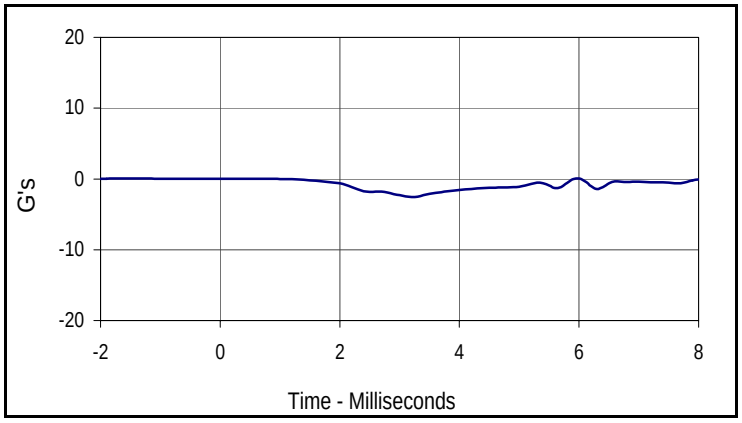
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
40.5	11.4	-0.2	35.5

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

Test Program:	SID IIs Lateral Head Drop Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	HDP10C

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	124.0	Pass
Peak Longitudinal Acceleration	G's	≤15	2.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	5.8	Pass
		Overall Test Results		Pass

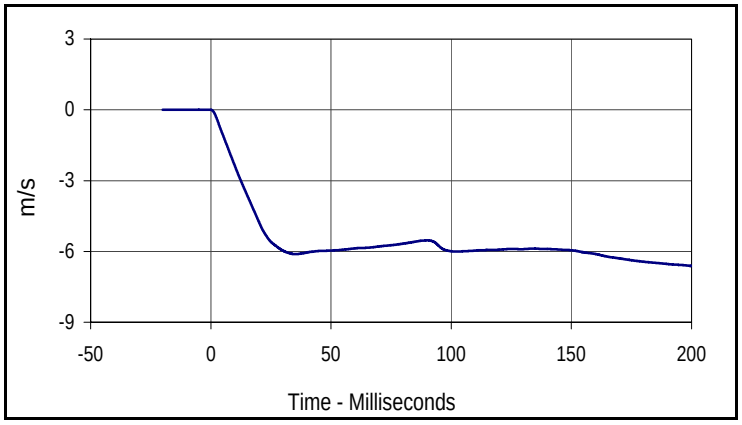
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
124.0	2.8	0.0	-2.0



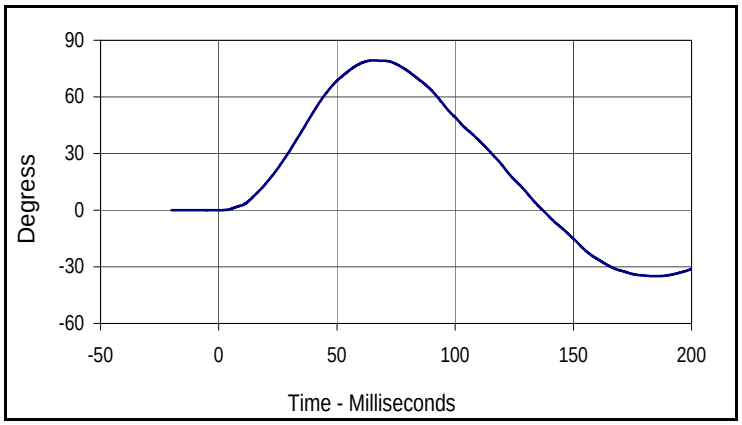
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.1	-1.5	-2.6	3.2

Test Program:	SID IIs Neck Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	NBP10C

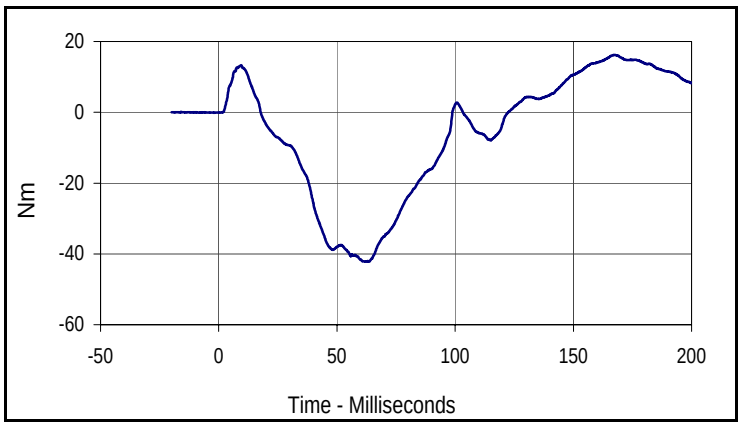
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.6	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.4	Pass
	15 msec	m/s	-3.30 to -4.10	-3.6	Pass
	20 msec	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	79.3	Pass
	Time	msec	50.0 to 70.0	65.5	Pass
Peak Occipital Condyle Moment		Nm	-36.0 to -44.0	-42.2	Pass
Decaying Moment Time to Cross 0 Nm		msec	102.0 to 126.0	122.5	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	-0.4	-6.6	200.0



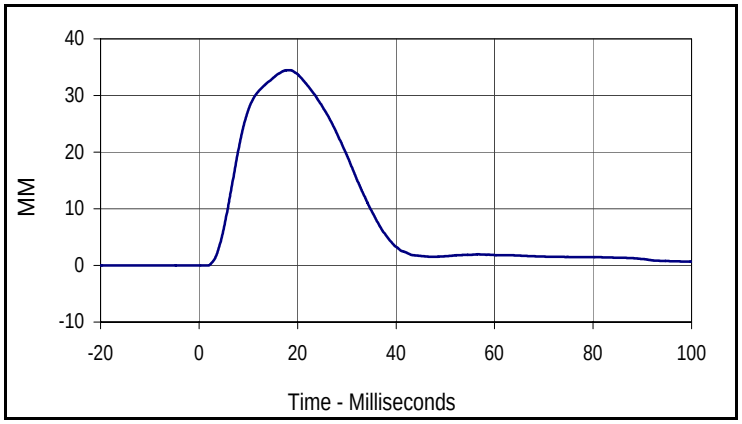
Curve Description			
Maximum Translation Rotation			
CURNO	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
79.3	65.5	-34.9	184.8



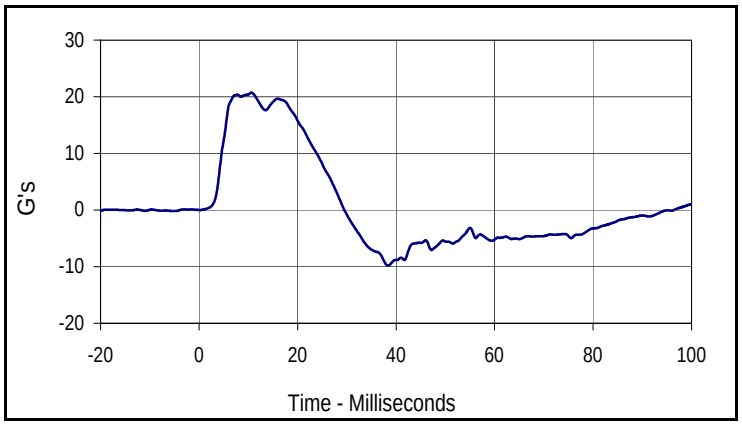
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.2	167.2	-42.2	62.5

Test Program:	SID IIs Shoulder Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	SHP10C

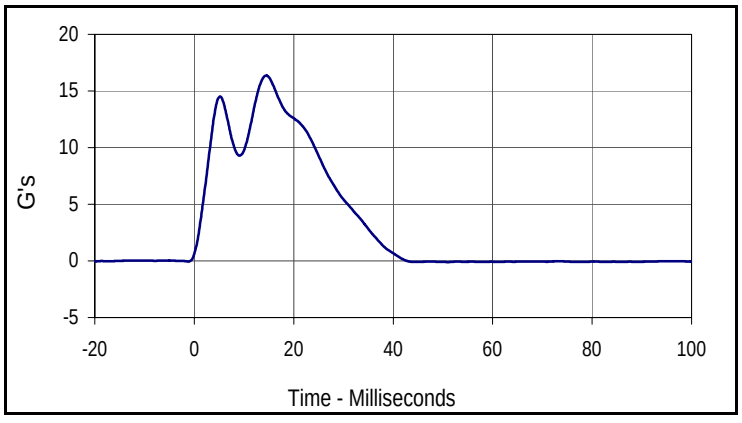
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.39	Pass
Shoulder Deflection	MM	28 to 37	34.5	Pass
Peak Upper Spine Y Acceleration	G's	17 to 22	20.7	Pass
Peak Impactor Acceleration	G's	13 to 18	16.4	Pass
		Overall Test Results		Pass



Curve Description			
Shoulder Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
34.5	18.3	0.0	1.8



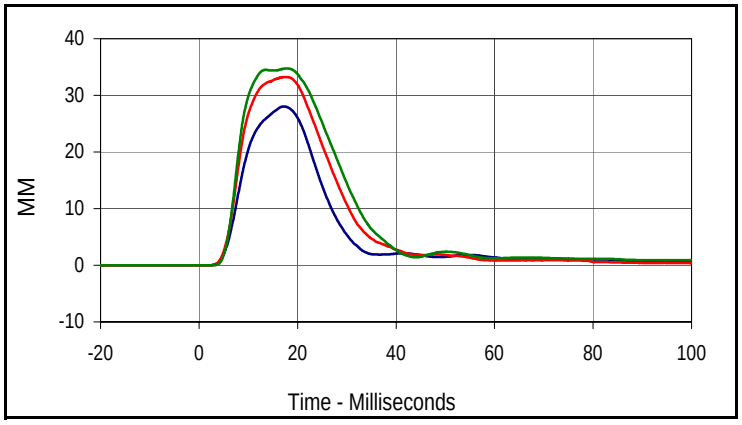
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
20.7	10.6	-9.8	38.4



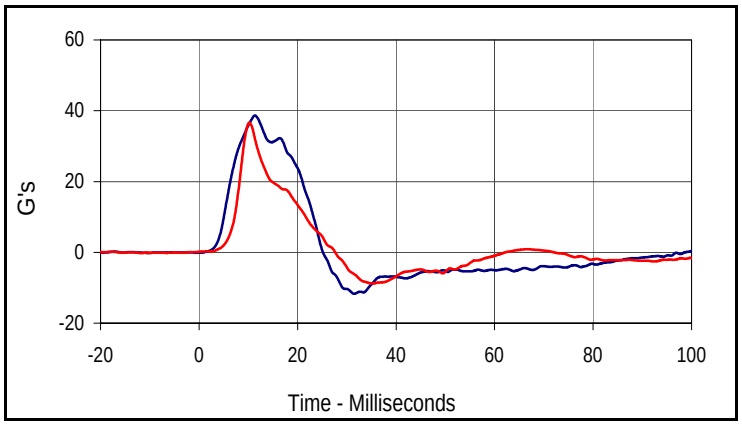
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
16.4	14.5	-0.1	51.1

Test Program:	SID IIs Thorax with Arm Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	TWAP10C

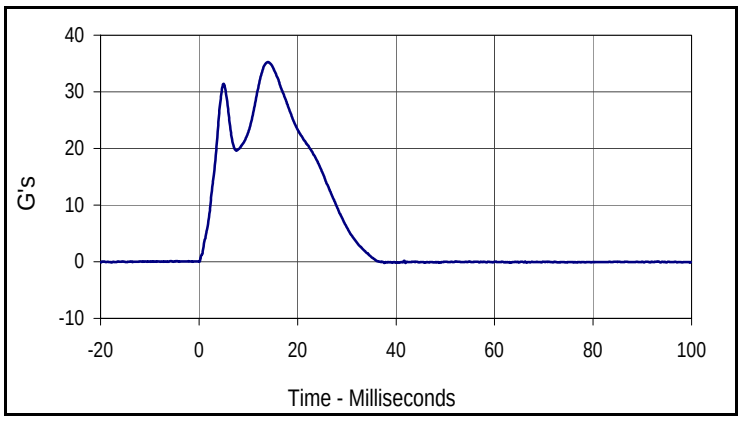
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.64	Pass
Shoulder Deflection	MM	31 to 40	38.4	Pass
Upper Thorax Rib Deflection	MM	25 to 32	28.0	Pass
Middle Thorax Rib Deflection	MM	30 to 36	33.2	Pass
Lower Thorax Rib Deflection	MM	32 to 38	34.8	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	38.6	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	36.6	Pass
Peak Impactor Acceleration After 5 msec.	G's	30 to 36	35.3	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
28.0	17.2	0.0	-16.6
Middle Thorax Deflection			
Max	Time	Min	Time
33.2	17.7	0.0	-18.9
Lower Thorax Deflection			
Max	Time	Min	Time
34.8	17.7	0.0	-18.0



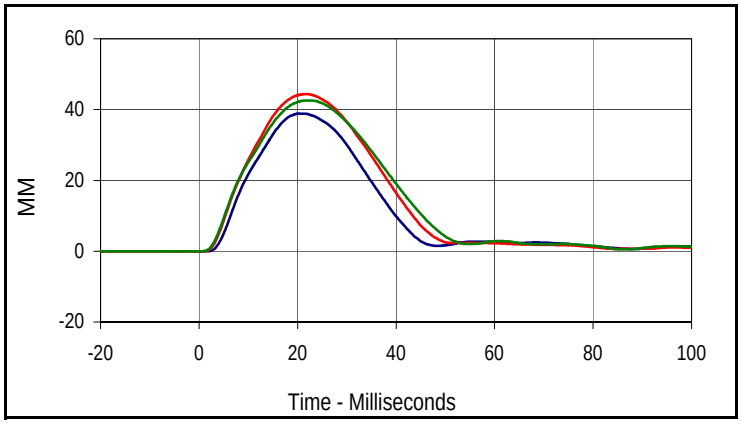
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
38.6	11.3	-11.7	31.5
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
36.6	10.2	-8.8	35.2



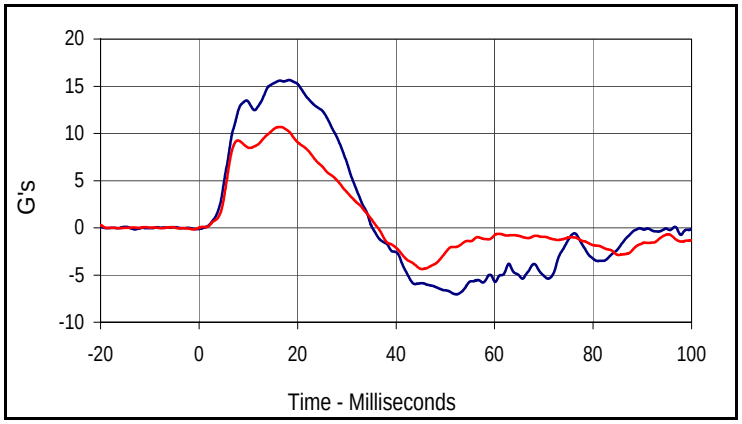
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
35.3	14.1	-0.2	37.6

Test Program:	SID IIs Thorax w/o Arm Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	TOAP10C

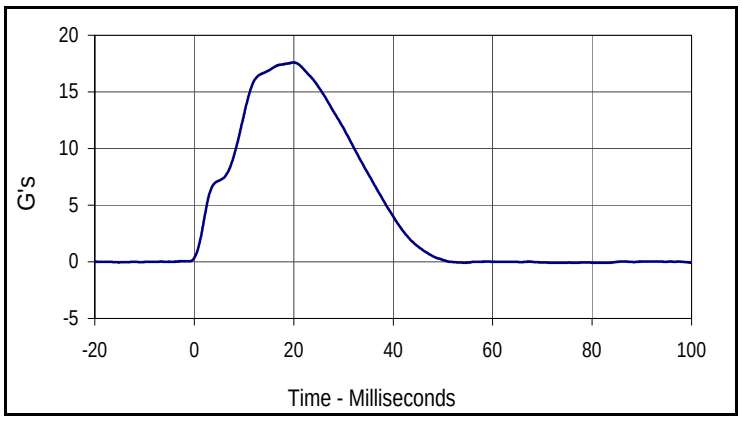
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.32	Pass
Upper Thorax Rib Deflection	MM	32 to 40	38.9	Pass
Middle Thorax Rib Deflection	MM	39 to 45	44.4	Pass
Lower Thorax Rib Deflection	MM	35 to 43	42.6	Pass
Peak Upper Spine Y Acceleration	G's	13 to 17	15.6	Pass
Peak Lower Spine Y Acceleration	G's	7 to 11	10.7	Pass
Peak Impactor Acceleration	G's	14 to 18	17.6	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
38.9	20.8	0.0	-10.4
Middle Thorax Deflection			
Max	Time	Min	Time
44.4	21.7	0.0	-15.8
Lower Thorax Deflection			
Max	Time	Min	Time
42.6	22.2	0.0	-10.1



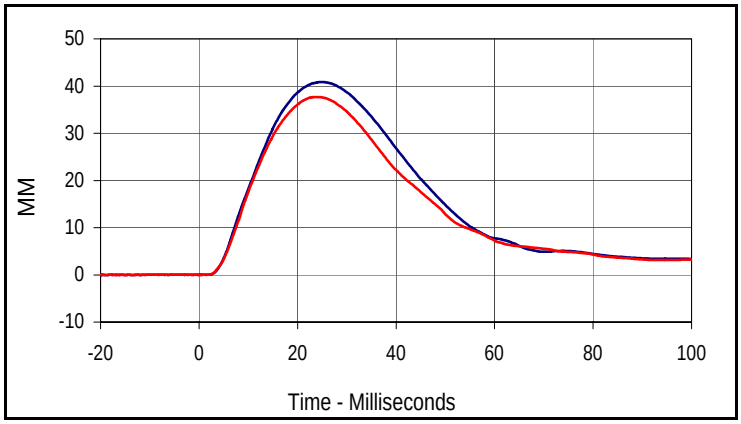
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.6	18.3	-7.0	52.2
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
10.7	16.5	-4.4	45.2



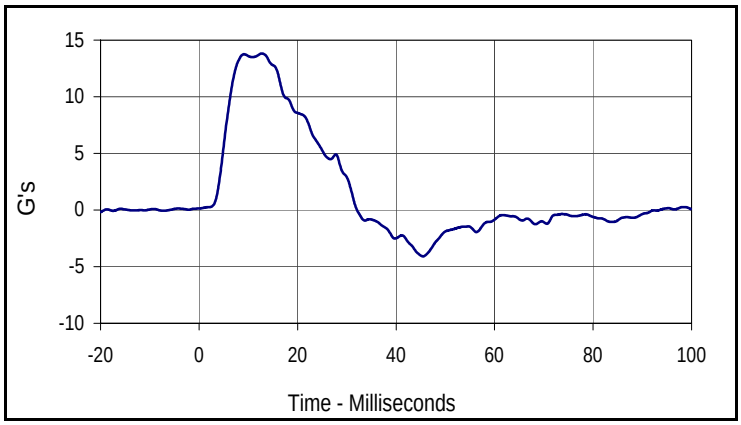
Curve Description			
Impactor Accleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
17.6	19.9	-0.1	0.0

Test Program:	SID IIs Abdomen Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	ABDP10C

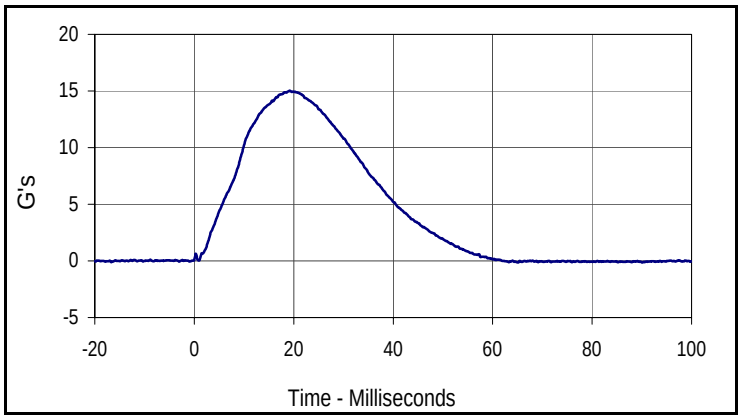
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.28	Pass
Upper Abdominal Rib Deflection	MM	36 to 47	40.9	Pass
Lower Abdominal Rib Deflection	MM	33 to 44	37.7	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	13.8	Pass
Peak Impactor Acceleration	G's	12 to 16	15.0	Pass
		Overall Test Results		Pass



Curve Description			
Upper Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
40.9	25.0	0.0	-20.0
Curve Description			
Lower Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
37.7	23.8	0.0	-19.1



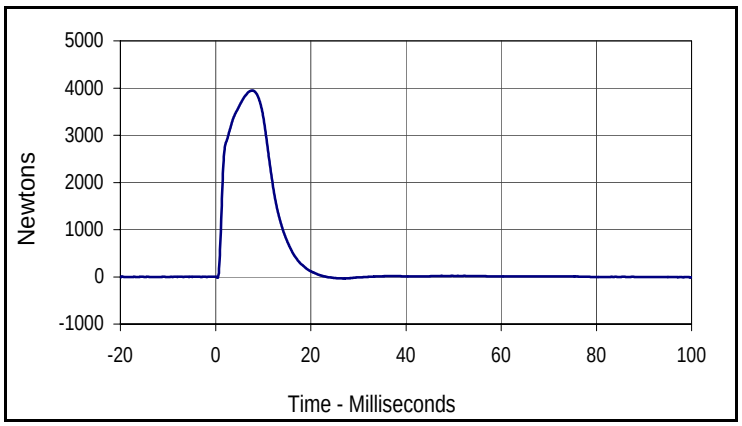
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
13.8	12.7	-4.1	45.5



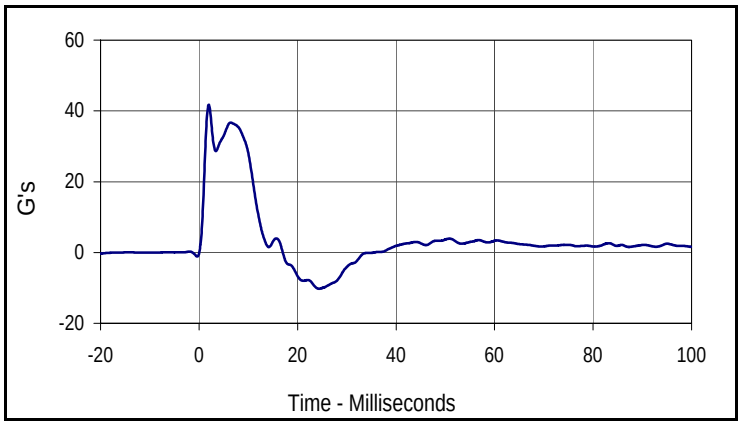
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
15.0	19.2	-0.1	90.1

Test Program:	SID IIs Pelvis Acetabulum Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	PAP10C

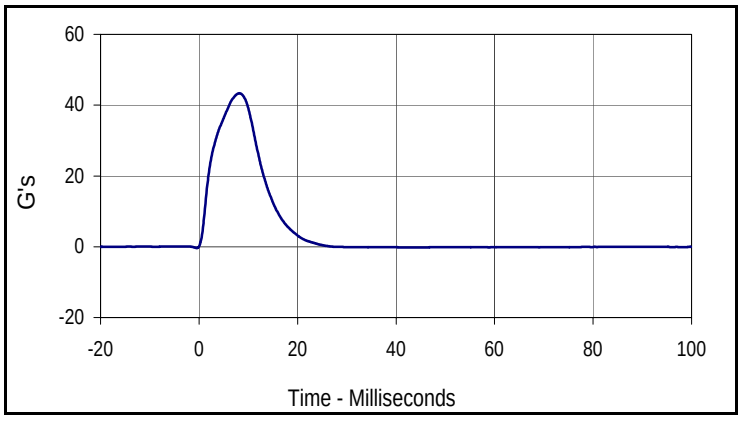
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.65	Pass
Peak Acetabulum Force	Newtons	3600 to 4300	3947.8	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	36.7	Pass
Peak Impactor Acceleration	G's	38 to 47	43.3	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3947.8	7.7	-35.3	27.0



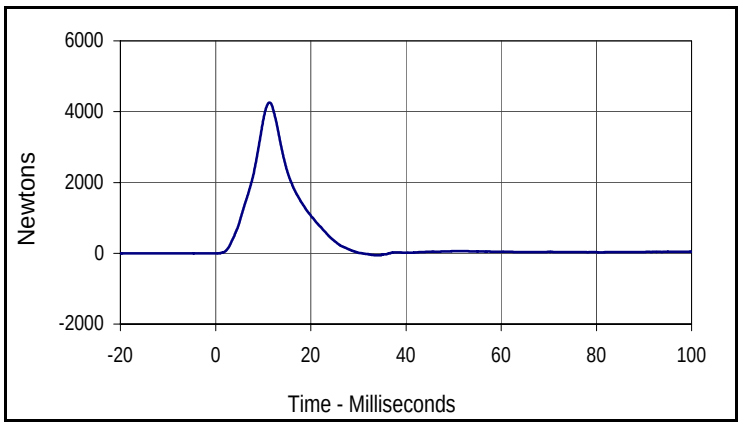
Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
41.7	2.0	-10.2	24.3



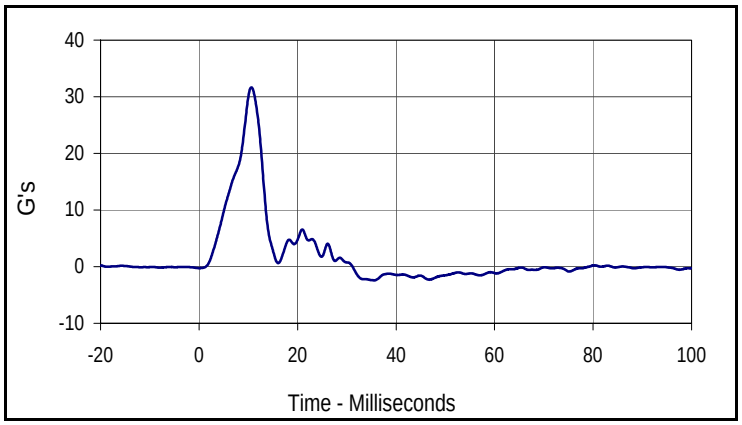
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
43.3	8.2	-0.4	-0.5

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	10/18/10
ATD Serial No.:	299	Test I.D.:	PLP10C

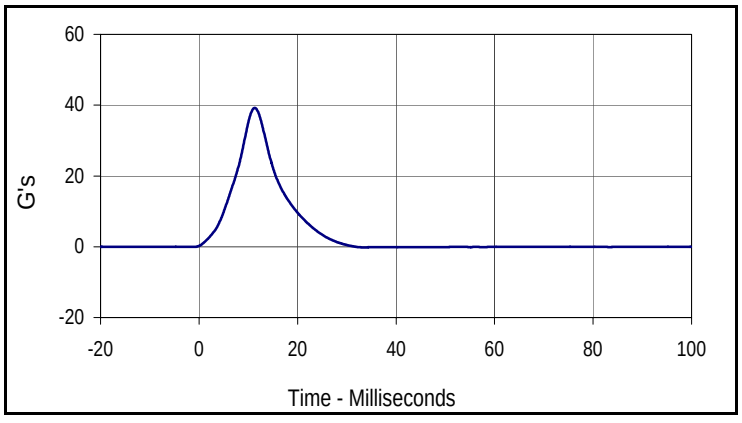
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.29	Pass
Peak Iliac Force	Newtons	4100 to 5100	4258.0	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	31.7	Pass
Peak Impactor Acceleration	G's	36 to 45	39.2	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4258.0	11.3	-59.6	34.4



Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
31.7	10.6	-2.4	35.6



Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
39.2	11.3	-0.2	33.3