REPORT NUMBER: TR-P29003-01-NC

VALIDATION
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

TOYOTA MOTOR CORPORATION

2010 LEXUS RX350

5-DOOR MPV

NHTSA NUMBER: MA5104

PREPARED BY:

KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

APRIL 23, 2009

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF CRASHWORTHINESS STANDARDS

1200 NEW JERSEY AVE, SE

ROOM W43-410

WASHINGTON, DC 20590

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Approval Date: April 23, 2009

FINAL REPORT ACCEPTANCE BY OCWS:

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Date:

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16. Abstract

A 55/28 km/h 90 deg. Moving Deformable Barrier Validation Side Impact Test was conducted on the subject 2010 Lexus RX350 5-Door MPV 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 April 23, 2009.

The impact velocity of the Moving Deformable Barrier was 61.85 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 23.9 deg. C. The target vehicle's maximum post-test static crush was 252 mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)	Passenger ATD (SID-IIs)
Head Injury Criteria (HIC_{36})	82.0	89.8
Maximum Chest Deflection	18	
Total Abdominal Force	993	
Pubic Symphysis Force	1452	
Lower Spine Resultant Acceleration		50
Total Pelvic Force (Sum of Acetubular and Iliac Forces)		4703

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
Validation Testing
Side Impact
Moving Deformable Barrier (MDB)
ES-2re
SID-IIs

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the FY2009 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-03-D-32005. The purpose of this test is to generate comparative side impact performance in a 2010 Lexus RX350 5-Door MPV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated April 2009.

SUMMARY

A 2010 Lexus RX350 5-Door MPV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.85 km/h (38.43 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 April 23, 2009. Pre-test and post-test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in 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 April 2009. The side impact event was documented by ten (10) high-speed and two (2) real-time cameras. Camera locations are included in Data Sheet 5 on page 11 of this report.

The dummies were instrumented in the following manner:

- Driver ATD (ES-2re)
  - Head Accelerometers
  - Chest Rib 1 to Rib 3 Potentiometers
  - Abdomen Forward, Middle, and Rear Load Cells
  - Pubic Load Cell
  - Lower Spine Accelerometers
- Passenger ATD (SID-IIs)
  - Head Accelerometers
  - Upper Neck Load Cells
  - Shoulder Potentiometer
  - Thorax Upper, Middle and Lower Rib Potentiometers

Abdomen Upper and Lower Rib Potentiometers

Acetabulum Load Cell

Iliac Load Cell

Lower Spine Accelerometers

Dummy injury values were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC_{36})	N/A	1000	82.0
Maximum Chest Deflection	mm	44	18
Total Abdominal Force	N	2500	993
Pubic Symphysis Force	N	6000	1452

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC_{36})	N/A	1000	89.8
Lower Spine Resultant Acceleration	G	82	50
Total Pelvic Force (Sum of acetubular and iliac forces)	N	5525	4703

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver)		Left Rear (Passenger)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Torso Airbag	Yes	Yes	Yes	Yes
Head / Torso Airbag	No		No	
Side Curtain / Tube Airbag	Yes	Yes	Yes	Yes
Pretensioner	Yes	Yes	Yes	No
Load Limiter	Yes		Yes	

GENERAL COMMENTS

Both the driver and left rear passenger doors remained closed and latched during the impact event. No Stoddard solvent was observed to be leaking at any point after the impact or during the FMVSS 301 static rollover test. All dummy injury values were below the established thresholds.

SECTION 2

DATA SHEETS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

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: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MA5104	Anti-Lock Brakes	Yes
Model Year	2010	All Wheel Drive	No
Make	Lexus	Power Steering	Yes
Model	RX350	Driver Front Airbag	Yes
Body Style	5-Door MPV	Driver Side Torso Airbag	Yes
VIN	JTJZK1BA7A2400816	Driver Side Head Airbag	No
Body Color	Blue	Driver Curtain Airbag	Yes
Delivery Date	4/13/2009	Driver Knee Airbag	Yes
Odometer Reading (km / mi)	309 / 192	Driver Head / Torso Airbag	No
Dealer	Riverside Lexus	Rear Pass. Front Airbag	No
Transmission	6-Speed Automatic	Rear Pass. Side Torso Airbag	Yes
Final Drive	Front	Rear Pass. Side Head Airbag	No
Type / No. of Cylinders	V6	Rear Pass. Curtain Airbag	Yes
Engine Displacement (L)	3.5	Rear Pass. Head / Torso Airbag	No
Engine Placement	Transverse	Pre-Tensioners	Yes
Roof Rack	Yes	Load Limiters	Yes
Sunroof / T-Top	Yes	Air Conditioning	Yes
Tinted Glass	Yes	AM / FM CD	Yes
Traction Control	Yes	Tilt Steering	Yes
Power Brakes	Yes	Automatic Door Locks	Yes
Front Disc	Yes	Power Windows	Yes
Rear Disc	Yes	Power Seats	Yes
Other	Back-Up Camera	Other	n/a

Does Owner's Manual provide instructions to turn off automatic door locks? No

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	2520
Date of Manufacture	Dec-08	GAWR Front (kg)	1360
		GAWR Rear (kg)	1385

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				370	*A*
DSC x 68.04 (kg)				340	*B*
Cargo Weight (RCLW) (kg)				30	*A-B*

VEHICLE SEAT TYPE

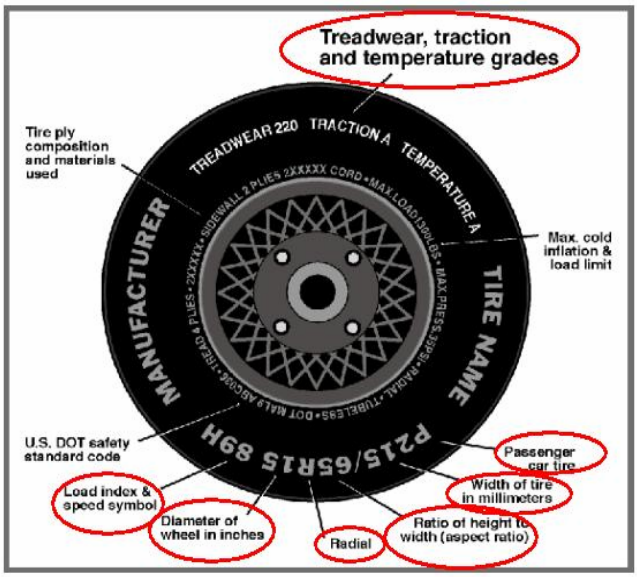
Seating Location	Type of Seat Pan				Type of Seat Back		
					Fixed	Adjustable	
	Bucket	Bench	Split Bench	Contoured		w/ Lever	w/ Knob
Front Seat	Yes						Yes
Rear or Second Row Seat			Yes			Yes	
Third Row Seat							

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	220
Recommended Tire Size	P235/60R18	P235/60R18
Tire Size on Vehicle	P235/60R18	P235/60R18
Tire Manufacturer	Michelin	Michelin
Tire Model	Latitude	Latitude
Treadwear	440	440
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	102B	102B
Tire Material	Polyester, Polyamide, Steel	Polyester, Polyamide, Steel
DOT Safety Code Right	B9XF RPNX 0709	B9XF RPNX 0709
DOT Safety Code Left	B9XF RPNX 0709	B9XF RPNX 0709

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	539.0	419.0		574.0	466.5	
Right	kg	551.5	381.5		574.5	423.5	
Ratio	%	57.7%	42.3%	100.0%	56.3%	43.7%	100.0%
Total	kg	1090.5	800.5	1891.0	1148.5	890.0	2038.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1891.0	A
Sum of Actual Weight of 2 P572 ATDs Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	30.0	C
Calculated Vehicle Target Wt (TVTW)	kg	2046.0	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
Fully Loaded	mm	799	815	802	809	
As Tested	mm	798	816	802	809	1198

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2744
Right Side Length	mm	3277
Length at Centerline	mm	4757
Left Side Length	mm	3276
Weight of Ballast in Cargo Area	kg	0
Amount of Stoddard Solvent Added	L	67.58

Vehicle components removed to make target vehicle test weight:

Non-struck side door panels, non-struck side windows, spare tire and tools.

Total 16.0 kg

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	428
Actual Impact Point Aft of Front Axle	mm	439

DATA SHEET NO. 2

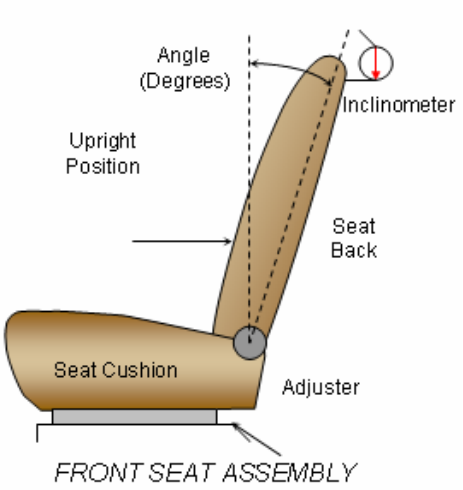
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

NOMINAL DESIGN RIDING POSITION

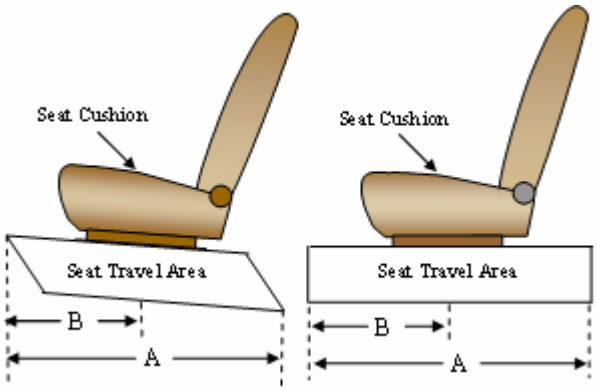
The procedure for the driver is as follows: the seat back is set to the manufacturer's designated angle; seat back angle is measured at the headrest post using a digital inclinometer. The procedure for the passenger is as follows: the seat back is fixed.



Seating Position	Degrees
Driver Seat Back Angle	3.0 @ Headrest
Passenger Seat Back Angle	6.7 @ Headrest

SEAT FORE / AFT POSITIONS

The total seat travel is measured from the forward most possible position to the rearmost possible position. The driver's seat is set to the mid travel longitudinal position with the seat in the full down height position. The passenger's seat is fixed.



Seating Position	Total Fore-Aft Travel	Placed in Position	Cushion Range	Placed in Position
Driver Seat	260 mm	130 mm	1.7° to 5.6°	4.3°
Passenger Seat	115 mm	0 mm	0.2° to 0.4°	0.3°

SEAT BELT UPPER ANCHORAGE

Position number one (1) is the uppermost position.

Seating Position	Total No. of Positions	Placed in Position
Driver Seat	4	1
Passenger Seat	Fixed	Fixed

DATA SHEET NO. 2 … (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

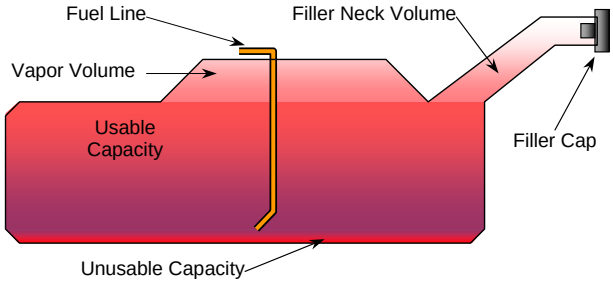
Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	72.68
Usable Capacity of "Optional Tank"	
Usable Capacity Used for FMVSS 301	67.58
Actual Amount of Stoddard Solvent Used	67.58

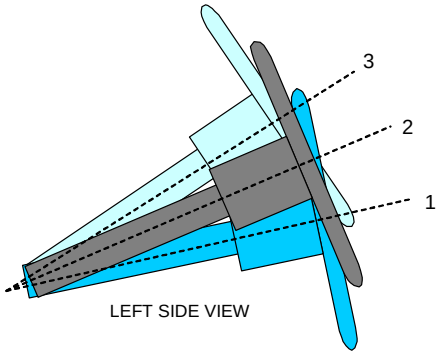
The test vehicle is equipped with an electric fuel pump. The fuel pump will operate for approximately two (2) seconds with the ignition in the “ON” position, after which the fuel pump automatically shuts off. The fuel filler door is located on the left rear fender. The standard fuel tank occupies the 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.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

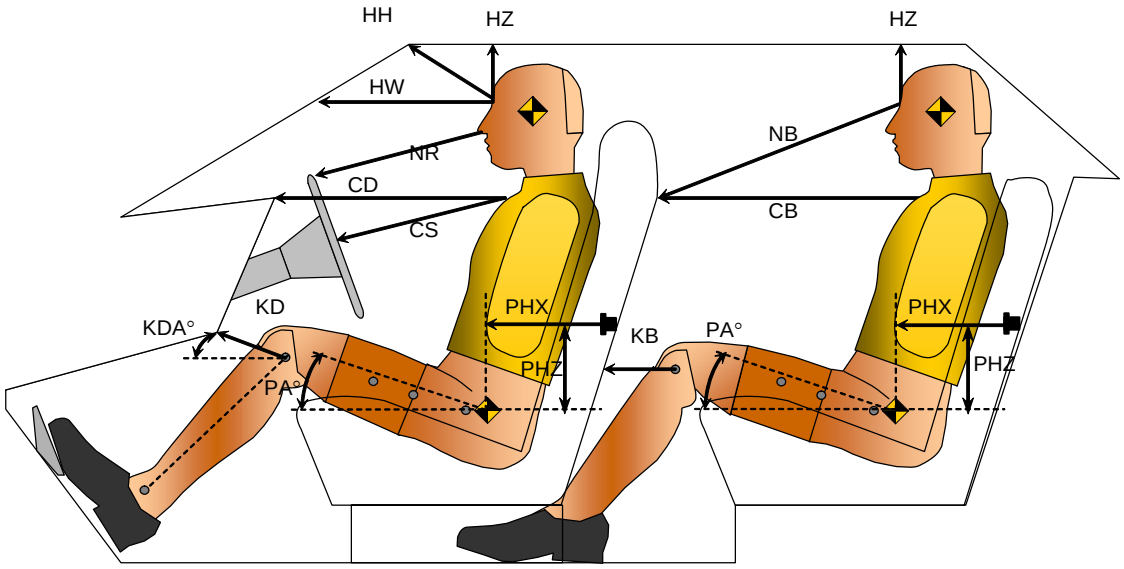
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	24.4	225
Geometric Center Position, No. 2	26.5	246
Uppermost Position, No. 3	28.6	263
Telescoping Steering Wheel Travel		38
Test Position	26.4	247

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

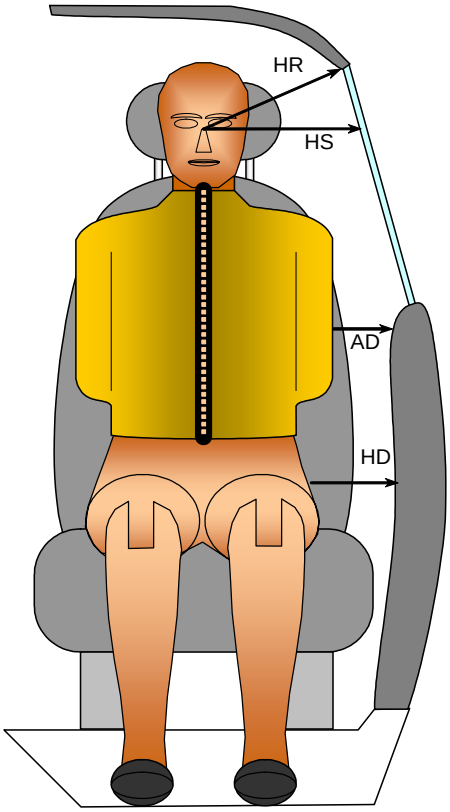
Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (º)	Length (mm)	Angle (º)
HH		Head to Header	513	14.0		
HW		Head to Windshield	805	0.0		
HZ	HZ	Head to Roof	194	90.0	291	90.0
NR	NB	Nose to Rim / Seat Back	527	13.4	542	15.3
CD	CB	Chest to Dash / Seat Back	626	2.9	509	0.0
CS		Steering Wheel to Chest	408	11.6		
KDL	KBL	Left Knee to Dash / Seat Back	170	26.9	297	8.6
KDR	KBR	Right Knee to Dash / Seat Back	145		296	8.4
PA	PA	Pelvic Angle		20.5		20.6
PHX	PHX	H-Point to Striker (x-direction)	211	0.0	345	0.0
PHZ	PHZ	H-Point to Striker (z-direction)	168	90.0	270	90.0
SA	SA	Seat Back Angle		3.6		6.7

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

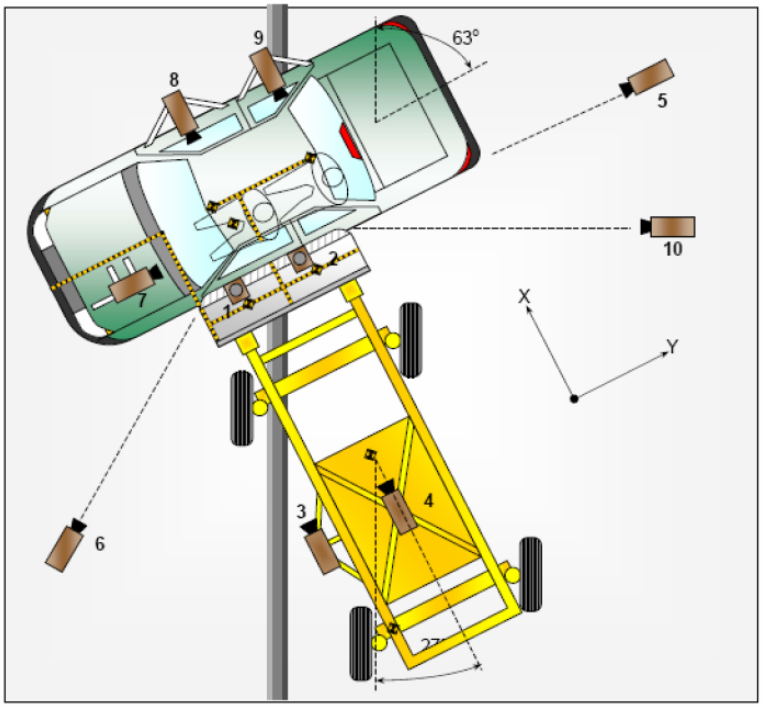
Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	245	300
HS	Head to Side Window	mm	350	380
AD	Arm to Door	mm	89	150
HD	H-Point to Door	mm	141	192

DATA SHEET NO. 5

CAMERA LOCATIONS AND DATA

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



CAMERA LOCATIONS AND DATA

No.	Description	Position			Lens (mm)	Film Speed (fps)
		X	Y	Z		
Doc.	Real Time Inrun	-2484	-3958	-1506	ZOOM	30
Doc.	Real Time Left Front	-2266	3549	-1475	ZOOM	30
1	Overhead Overall	1220	2287	-5486	14	1000
2	Overhead Close-Up	609	2287	-5102	ZOOM	1000
3	Left Impact Point (MDB)	-2134	0	-1143	12	1000
4	Side Overall (MDB)	-3912	838	-1829	12	1000
5	Rear	-64	2485	-1348	105	1000
6	Left Front	-2266	-3564	-1475	24	1000
7	Driver Front On-Board	531	-899	-628	35	1000
8	Driver Side On-Board	1948	661	-575	20	1000
9	Passegner Side On-Board	1901	1467	-608	20	1000
10	Left Rear	1930	1600	-1295	85	N/A

DATA SHEET NO. 6

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

VEHICLE ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2760	280	480
2	Right Sill at Rear Seat	1800	720	478
3	Rear Floorpan Above Axle	1010	-150	600
4	Left Sill at Rear Door	1570	-800	265
5	Left Sill at Front Door	2575	-800	265
6	Rt. Rear Occ. Compartment	2050	360	400
7	B-Post Lower	2015	-740	690
8	B-Post Middle	2015	-740	940
9	A-Post Lower	3120	-710	675
10	A-Post Middle	3120	-710	925
11	Front Seat Track	2760	-630	500
12	Rear Seat Structure	1690	580	515
13	Vehicle CG	2980	700	390

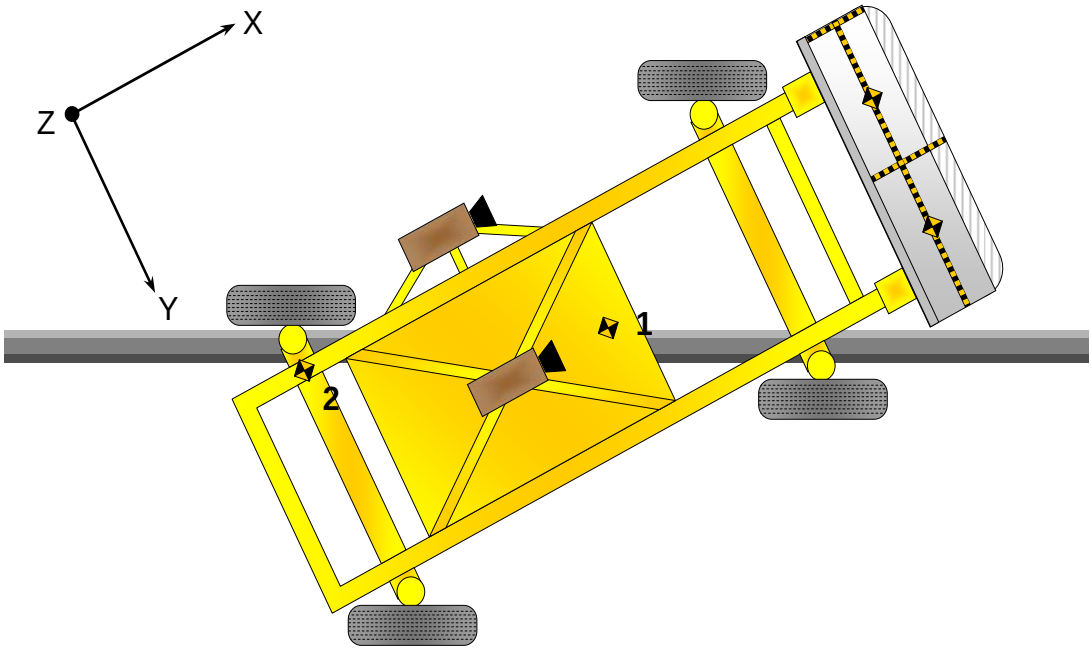
Reference Planes: X=From Rear Surface of Vehicle, Y=Vehicle Centerline, Z=Ground Plane

DATA SHEET NO. 7

MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Locations	Measurements (mm)		
		X	Y	Z
1	MDB CG	-1195	0	430
2	MDB Rear	-2642	-593	608

All measurements in mm.

Reference: +X = Rearward

+Y = To Right

+Z = Up

DATA SHEET NO. 8

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measured Parameter	Units	Maximum Crush	Above Ground
Level 1	Sill Top Height	mm	104	395
Level 2	Occupant H-Point	mm	252	732
Level 3	Mid Door	mm	241	693
Level 4	Window Sill	mm	103	1101
Level 5	Window top	mm	19	1625
N/A	Maximum Penetration	mm	252	

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	23
Vehicle Structure Accelerometers	21
MDB Accelerometers	5
Contact Switches	9
Airbag Timing Sensors	4
Total	78

CAMERA COVERAGE

High-Speed Vehicle On-Board	3
High-Speed Offboard	5
High-Speed MDB On-Board	2
Real Time	2
Total	12

DATA SHEET NO. 9

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length including Honeycomb Face	4115
Wheel Base of Framework Carriage	2590
C.G. location aft of Front Axle	1127

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	384	308	
Right	kg	385	284	
Ratio	%	56.5	43.5	
Totals	kg	769	592	1361

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1-62.7	61.85
Trap No. 2 Velocity (Redundant)	km/h	61.1-62.7	61.96
MDB CL to Target Vehicle CL	degrees	88.5-91.5	89.5

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	251
B	Top of Bumper	533	800	Left	136
C	Mid Level	686	800	Right	113
D	Top of Stack	813	800	Right	136

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	6
Contact Switches	2
High Speed Cameras	2

DATA SHEET NO. 10

POST-TEST OBSERVATIONS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy	Rear Seat Dummy
Dummy Type/Serial No.	ES-2re, S/N F035	SID-IIs, S/N 299
Head Contact	Curtain Airbag, Headliner, Headrest	Curtain Airbag, Headrest
Upper Torso Contact	Curtain Airbag, Side Airbag, Door Panel	Side Airbag
Lower Torso Contact	Side Airbag	Side Airbag, Door Panel
Left Knee Contact	Door Panel	Door Panel
Right Knee Contact	None	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	No separation occurred
Windshield Damage	None
Window Damage	Left rear door side window broken
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 2	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No	No	
Side Airbag	Yes	Yes	Yes	Yes
Head / Torso Airbag	No		No	
Curtain Airbag	Yes	Yes	Yes	Yes
Knee Airbag	Yes	No	No	
Pre-Tensioners	Yes	Yes	Yes	No
Load Limiters	Yes			

MDB LEFT EDGE IMPACT DATA

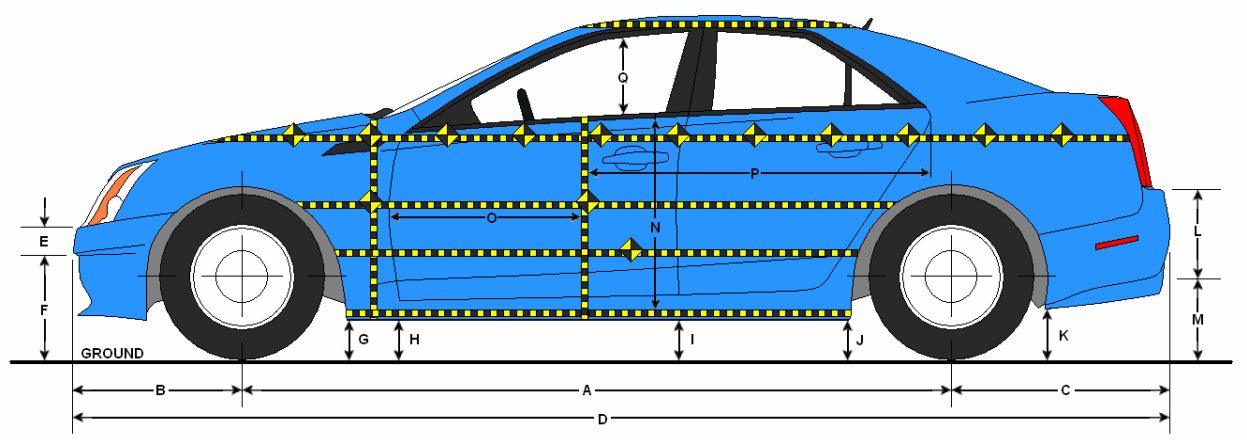
Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	+11 (Right)
Vertical Offset	mm	+/-20	+5 (Up)

DATA SHEET NO. 11

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



VEHICLE PRE AND POST-TEST MEASUREMENT INFORMATION

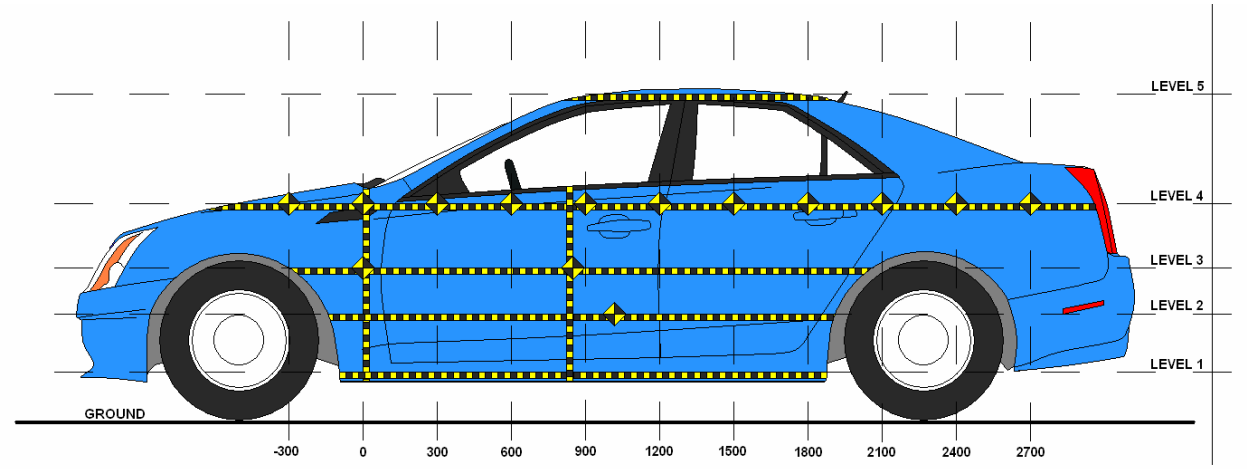
Code	Dimension	Measurement (mm)		
		Pre	Post	Difference
A	Wheelbase	2744	2726	-18
B	Front Axle to FSOV	988	997	9
C	Rear Axle to RSOV	1025	1031	6
D	Total Length at Centerline	3729	3726	-3
E	Front Bumper Thickness	305	305	0
F	Front Bumper Bottom to Ground	368	380	12
G	Sill Height af Front Wheel Well	249	259	10
H	Sill Height at Front Door Leading Edge	260	284	24
I	Sill Height at B-Pillar	287	328	41
J1	Sill Height at Rear Wheel Well	262	315	53
J2	Pinch Weld Height at Rear Wheel Well	295	318	23
K	Sill Height Aft of Rear Wheel Well	305	324	19
L	Rear Bumper Thickness	132	134	2
M	Bottom of Rear Bumper to Ground	616	631	15
N	Sill Height to Window Bottom Sill	751	702	-49
O	Front Door Leading Edge to Impact CL	93	104	11
P	Rear Door Trailing Edge to Impact CL	2167	2163	-4
Q	Front Window Opening	400	431	31
R	Right Side Length	3277	3277	0
S	Left Side Length	3276	3275	-1
T	Vehicle Width at B-Pillar	1877	1760	-117

DATA SHEET NO. 12

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)
1	Sill Top Height	395
2	Occupant H-Point Height	732
3	Mid-Door Height	693
4	Window Sill Height	1101
5	Window Top Height	1625

DATA SHEET NO. 12 … (CONTINUED)

VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

	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				681					716					35	
-150		546		665			577		685			31		20	
0		545	545	653			556	554	671			11	9	18	
150	565	547	547	601		636	669	665	598		72	122	118	-3	
300	571	547	548	632		675	733	727	654		104	186	179	22	
450	569	547	548	630		668	751	742	656		99	204	194	26	
600	570	546	548	628		665	764	749	665		94	218	201	37	
750	572	546	548	625		663	769	755	669		92	223	207	44	
900	573	546	549	620		664	772	759	674		91	226	210	54	
1050	573	547	550	618		665	760	750	676		92	213	200	58	
1200	574	549	552	617	870	663	753	737	682	889	90	204	186	65	19
1350	573	551	554	616	866	663	789	778	695	875	90	238	224	79	9
1500	572	552	555	612	866	664	798	785	705	877	91	246	230	93	11
1650	570	551	552	613	874	666	803	793	716	874	96	252	241	103	-1
1800	567	546	546	613	880	660	783	775	672	874	93	237	229	59	-6
1950		541	541	607	898		653	636	630	880		113	94	23	-19
2100				604					611					7	
2250				596					614					18	
2400				599					615					17	
2550				597					606					9	
2700				609					620					11	
2850															

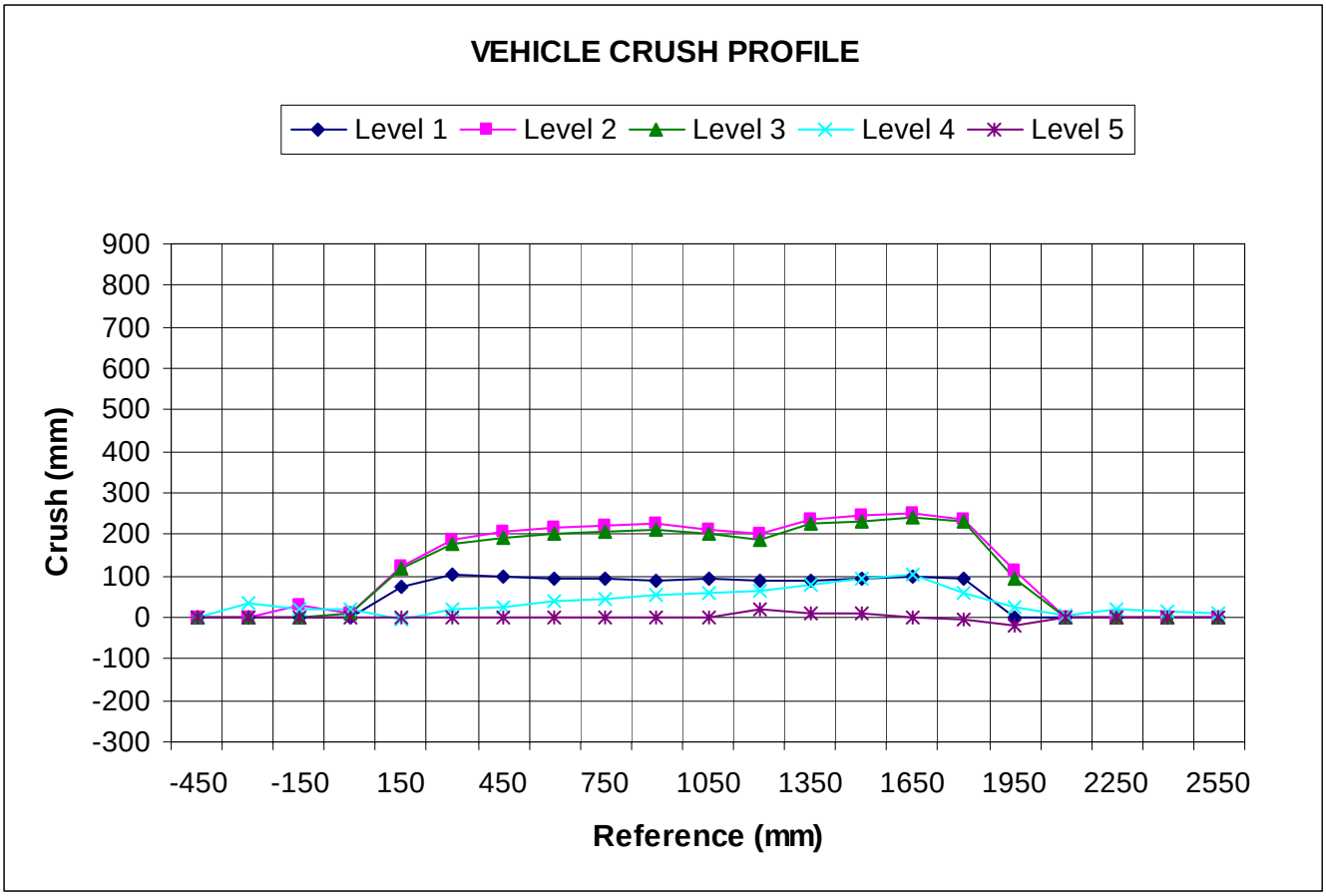
MAXIMUM CRUSH DATA

	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	104	252	241	103	19
Distance from Impact (mm)	300	1650	1650	1650	1200

DATA SHEET NO. 12 … (CONTINUED)

Vehicle Exterior Crush Measurements

Test Vehicle:	2010 Lexus RX350 5-Door MPV	NHTSA No.:	MA5104
Test Program:	Side Validation Testing	Test Date:	04/23/09

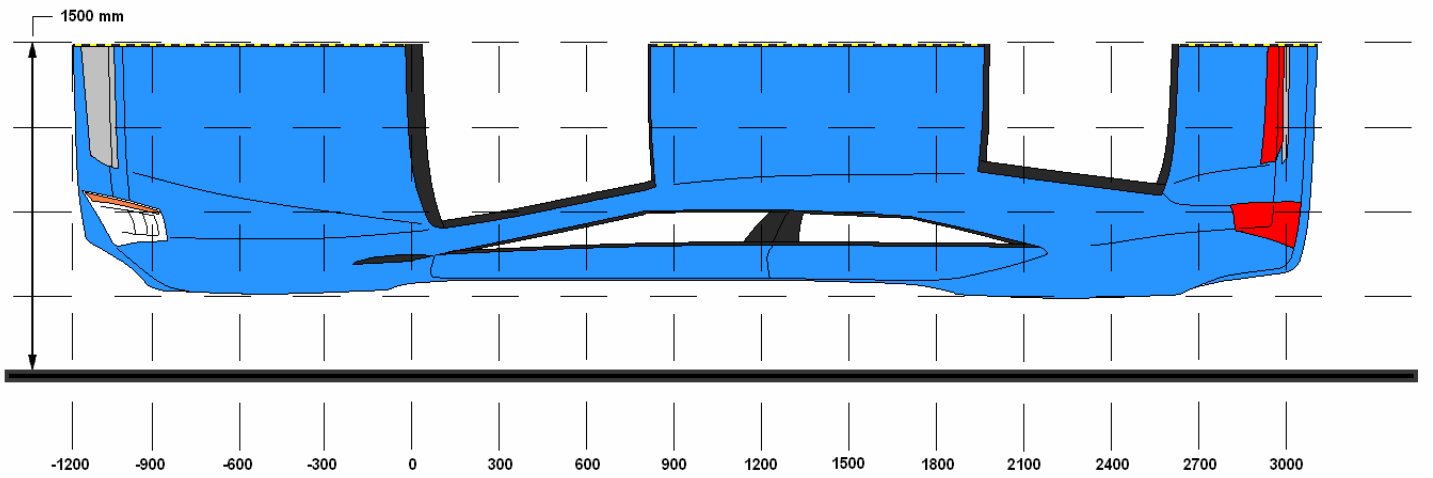


DATA SHEET NO. 13

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



TOP VIEW

DAMAGE PROFILE DISTANCES

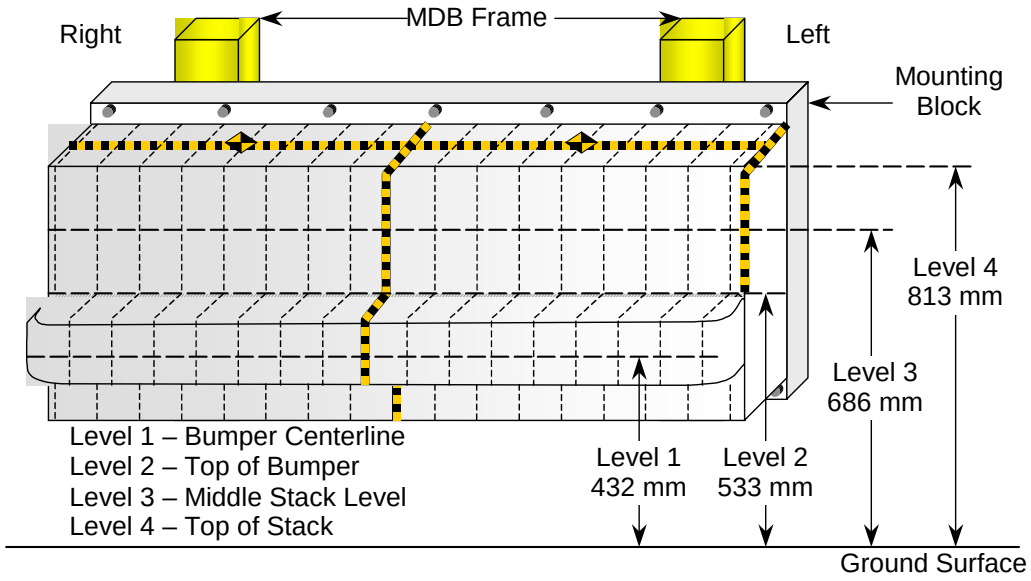
DPD	Distance From Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max. Static Crush (mm)
1	2100	4	604	611	7
2	1650	2	551	803	252
3	1200	2	549	753	204
4	750	2	546	769	223
5	300	2	547	733	186
6	-150	2	546	577	31

DATA SHEET NO. 14

EXTERIOR STATIC CRUSH FOR IMPACTOR FACE

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



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	769	757	753	753	755	751	749	744	740	741	738	736	737	736	734	738	757
2	756	744	644	738	730	725	728	733	726	722	724	733	734	733	735	738	747
3	676	669	672	674	676	703	720	689	680	663	662	661	664	670	681	696	733
4	664	656	651	658	670	695	720	724	690	672	670	670	679	695	708	721	756

All Dimensions in mm

DATA SHEET NO. 15

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 23.9° Test Time: 2:40 PM

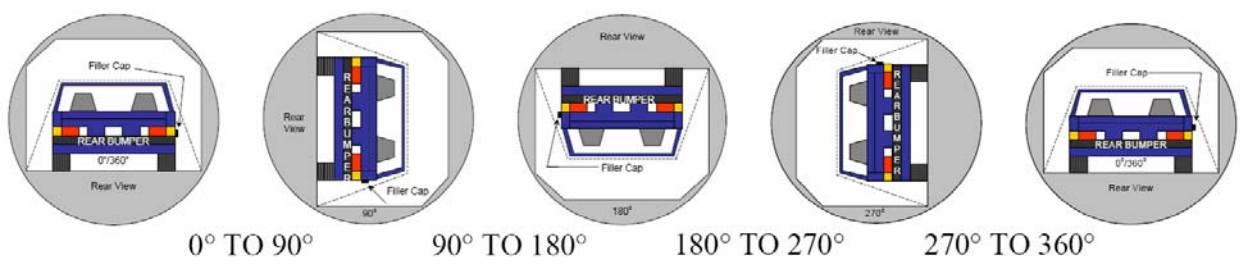
t Spillage Measurements

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: No spillage occurred



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	83	310	393
90° To 180°	81	300	381
180° To 270°	76	300	376
270° To 360°	81	300	381

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	0		

SOLVENT SPILLAGE LOCATION TABLE

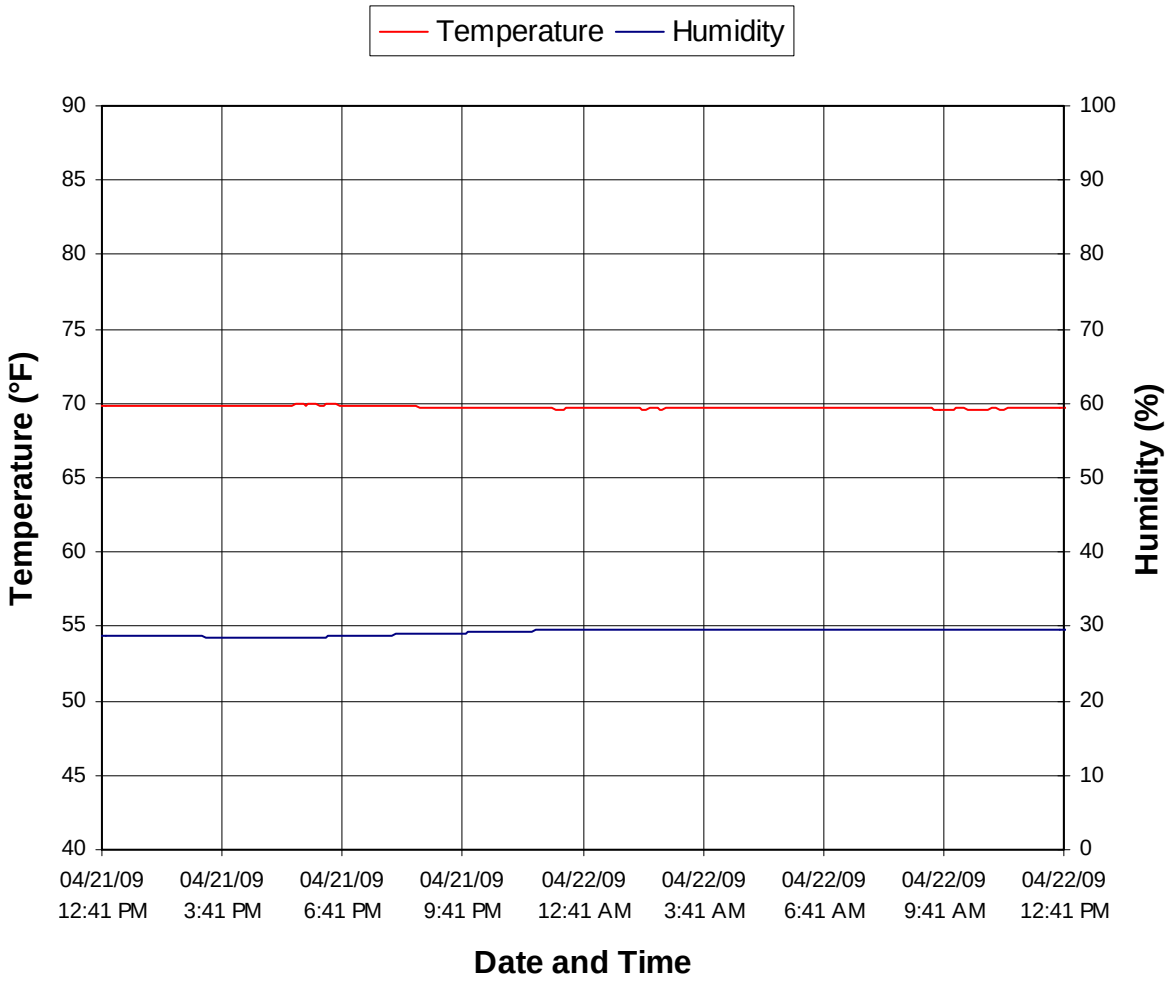
Test Phase	Spillage Location
0° To 90°	None
90° To 180°	None
180° To 270°	None
270° To 360°	None

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2010 Lexus RX350 5-Door MPV NHTSA No.: MA5104

Test Program: Side Validation Testing Test Date: 04/23/09



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

Figure A-1: As-Delivered Right Front ¾ View of Test Vehicle

Figure A-2: As Delivered Left Rear ¾ View of Test Vehicle

Figure A-3: Pre-Test Frontal View of Test Vehicle

Figure A-4: Post-Test Frontal View of Test Vehicle

Figure A-5: Pre-Test Left ¾ Front View of Vehicle

Figure A-6: Post-Test Left ¾ Front View of Impact Zone

Figure A-7: Pre-Test Left Side View of Test Vehicle

Figure A-8: Post-Test Left Side View of Test Vehicle

Figure A-9: Pre-Test Left ¾ Rear View of Test Vehicle

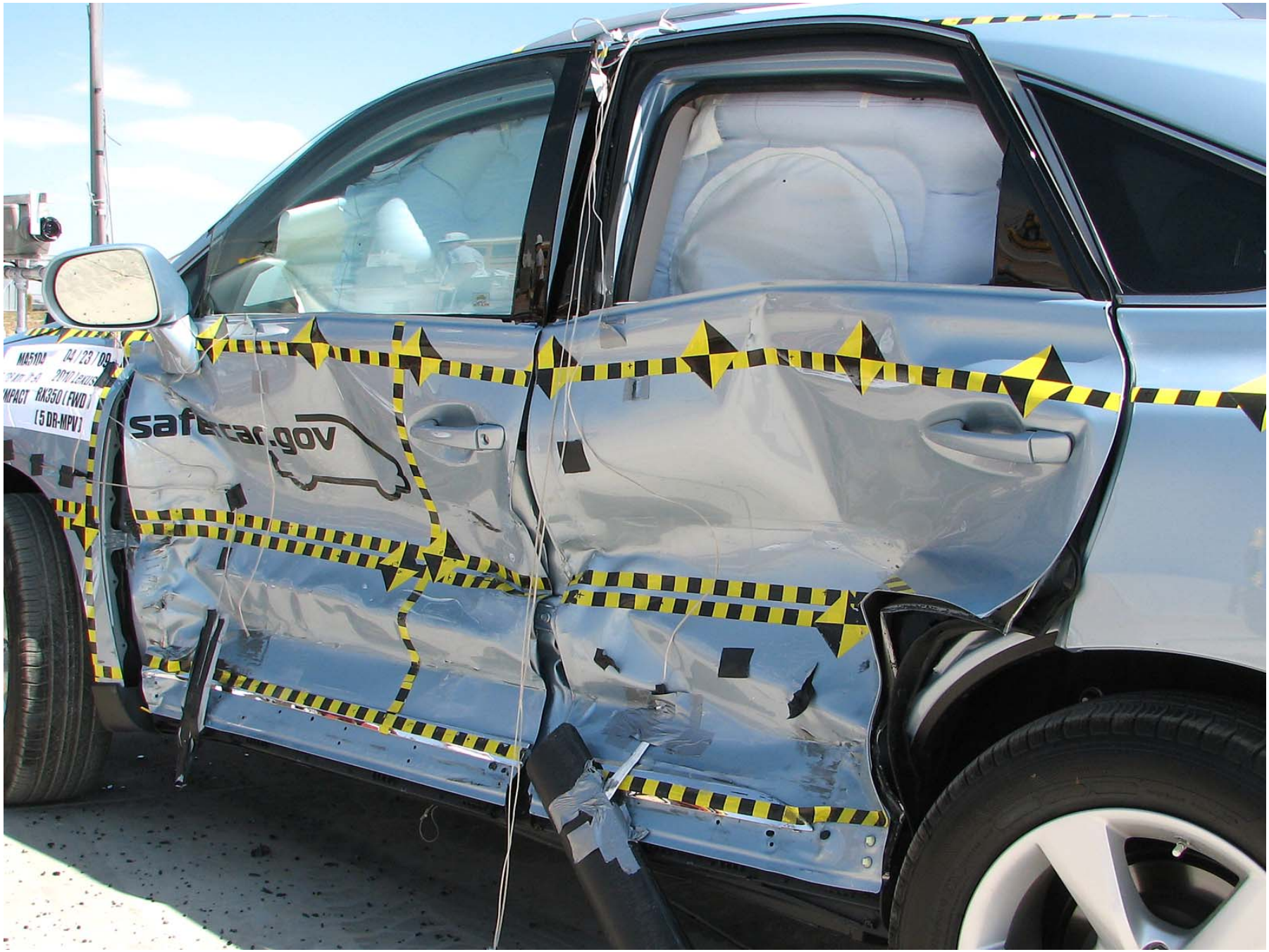


Figure A-10: Post-Test Left ¾ Rear View of Impact Zone

Figure A-11: Pre-Test Rear View of Test Vehicle

Figure A-12: Post-Test Rear View of Test Vehicle

Figure A-13: Pre-Test Right Side View of Test Vehicle

Figure A-14: Post-Test Right Side View of Test Vehicle

Figure A-15: Pre-Test Overhead View of MDB Positioned Against Impact Side of Test Vehicle at Impact Location

Figure A-16: Post-Test Overhead View of Test Vehicle and MDB

Figure A-17: Pre-Test Left Side View of MDB Positioned Against the Side of the Test Vehicle at the Ideal Impact Point

Figure A-18: Pre-Test Right Side View of MDB Positioned Against the Side of the Test Vehicle at the Ideal Impact Point

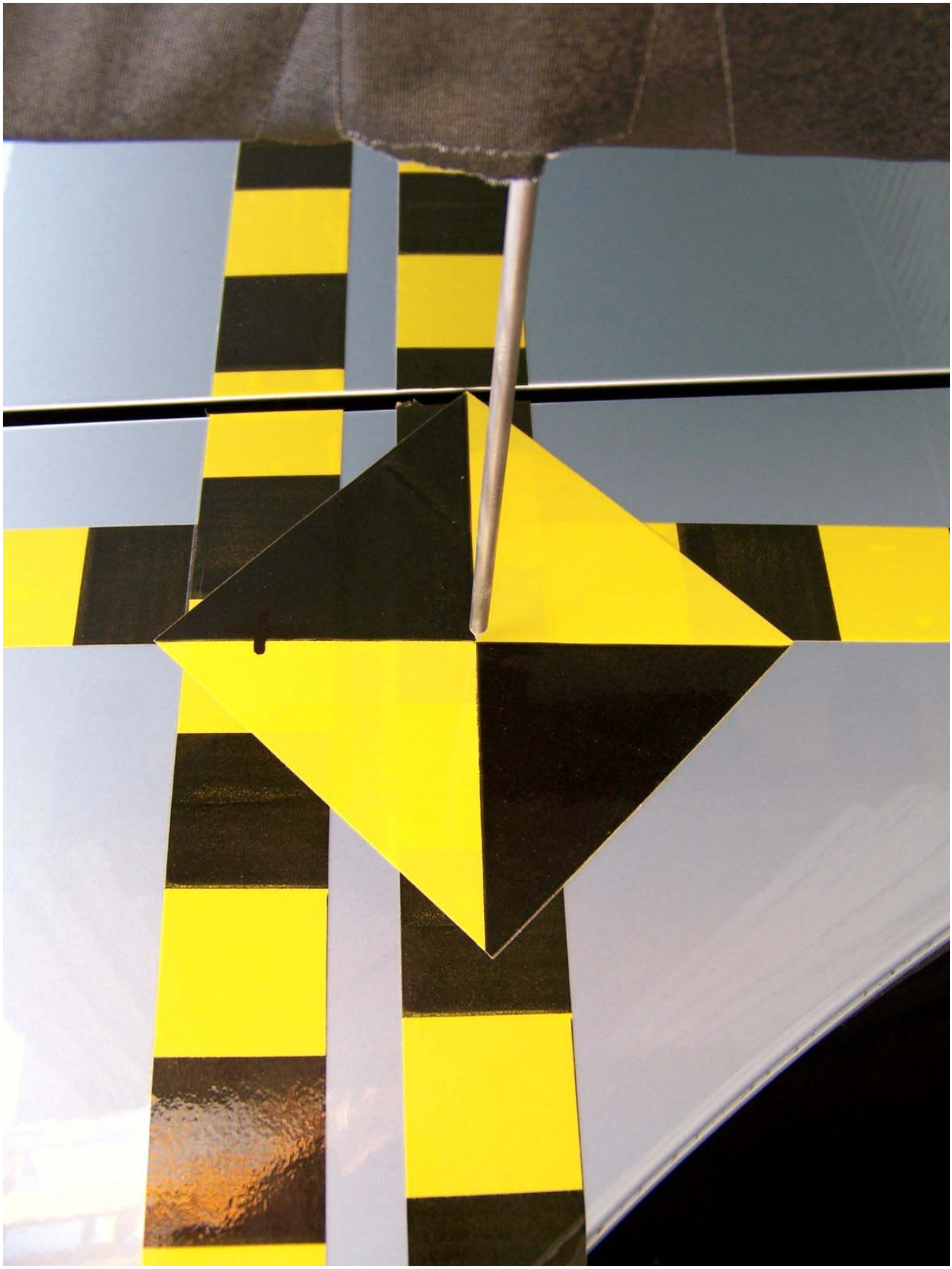


Figure A-19: Pre-Test Close-Up View of the Impact Point Target

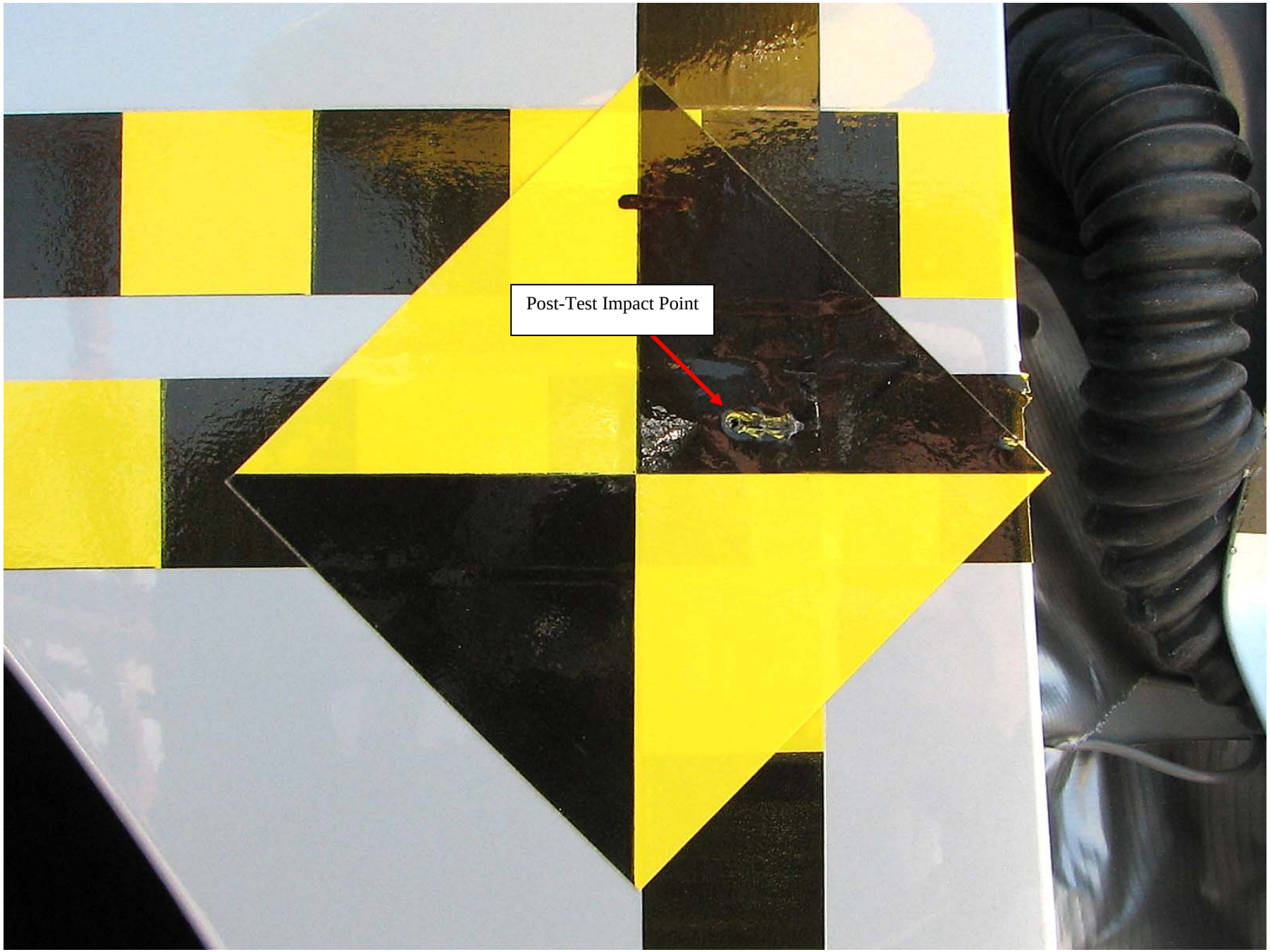


Figure A-20: Post-Test Close-Up View of the Impact Point Target Showing Impact Point Location

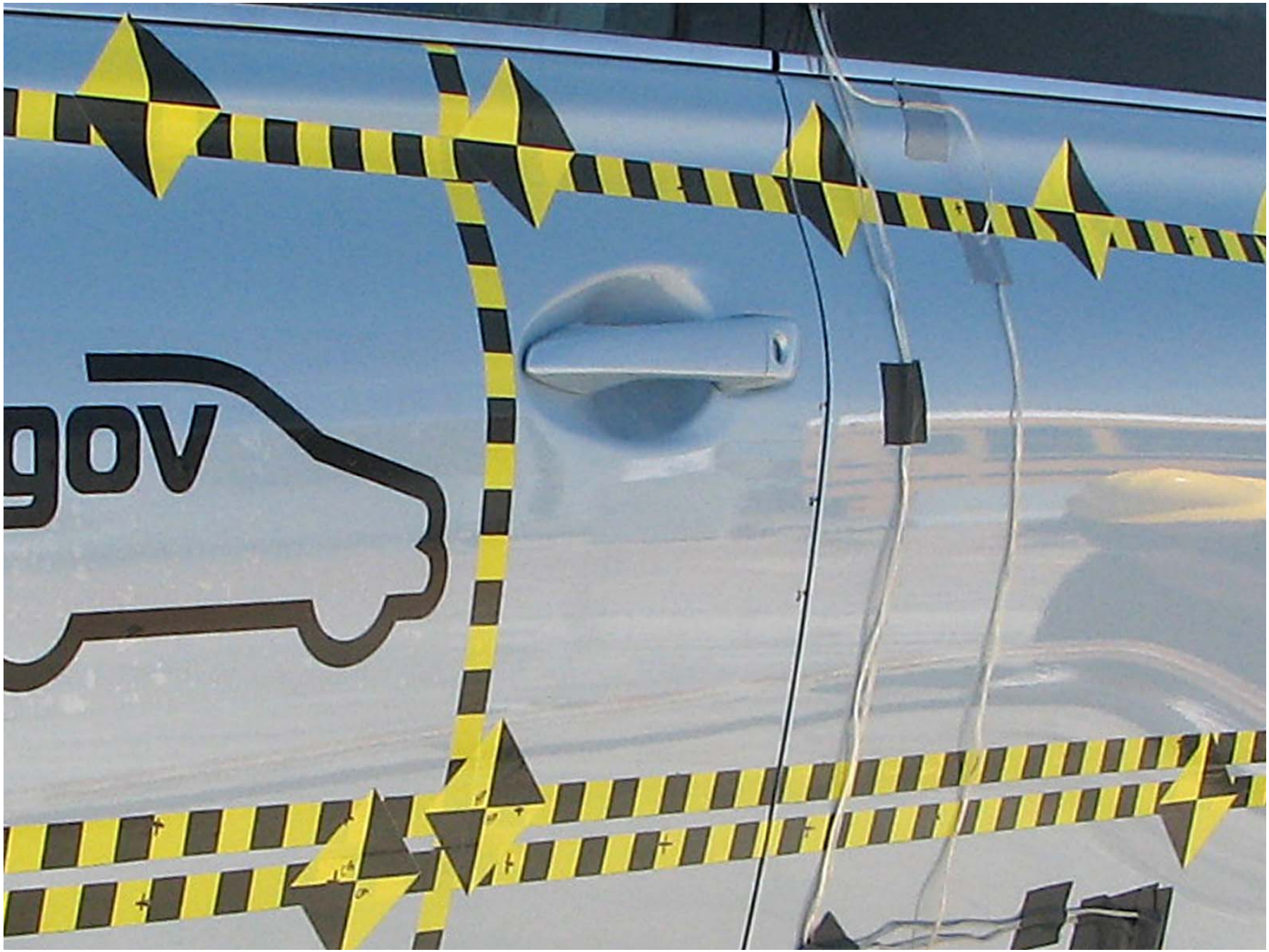


Figure A-21: Pre-Test Left Front Door Latch Close-Up

Figure A-22: Post-Test Left Front Door Latch Close-Up

Figure A-23: Pre-Test Left Rear Door Latch Close-Up

Figure A-24: Post-Test Left Rear Door Latch Close-Up

Figure A-25: Pre-Test Front Close-Up View of Driver Dummy (Through Front Window)

Figure A-26: Post-Test Front Close-Up View of Driver Dummy (Through Front Window)

Figure A-27: Pre-Test Left Side View of Driver Dummy Showing Belt, Chalking, and Contact Switches

Figure A-28: Pre-Test Close-Up Left Side View of Driver Dummy with Door Closed

Figure A-29: Pre-Test Close-Up Left Side View of Driver Seat Track Showing Seat Positioning

Figure A-30: Pre-Test Close-Up Left Side View of Driver Seat Back Showing Seat Back Positioning

Figure A-31: Pre-Test Driver Dummy Door and Clearance View

Figure A-32: Post-Test Driver Dummy Door and Clearance View

Figure A-33: Pre-Test Right Side View of Front Seat of Occupant Compartment (Through Window with Dummy)

Figure A-34: Post-Test Right Side View of Front Seat of Occupant Compartment (Through Window with Dummy)

Figure A-35: Pre-Test Driver Inner Door Panel View

Figure A-36: Post-Test Driver Inner Door Panel View (With Dummy Removed)

Figure A-37: Post-Test Driver Dummy Head Contact View

Figure A-38: Post-Test Driver Dummy Door Contact View

Figure A-39: Pre-Test Left Side View of Passenger Dummy Showing Belt, Chalking, and Contact Switches

Figure A-40: Pre-Test Close-Up Left Side View of Passenger Dummy with Door Closed

Figure A-41: Pre-Test Close-Up Left Side View of Passenger Seat Track Showing Seat Positioning

Figure A-42: Pre-Test Close-Up Left Side View of Passenger Seat Back Showing Seat Back Positioning

Figure A-43: Pre-Test Passenger Dummy and Door Clearance View

Figure A-44: Post-Test Passenger Dummy and Door Clearance View

Figure A-45: Pre-Test Right Side View of Rear Seat of Occupant Compartment (Through Window with Dummy)

Figure A-46: Post-Test Right Side View of Rear Seat of Occupant Compartment (Through Window with Dummy)

Figure A-47: Pre-Test Passenger Inner Door Panel View

Figure A-48: Post-Test Passenger Inner Door Panel View (With Dummy Removed)

Figure A-49: Post-Test Passenger Dummy Head Contact View

Figure A-50: Post-Test Passenger Dummy Door Contact View

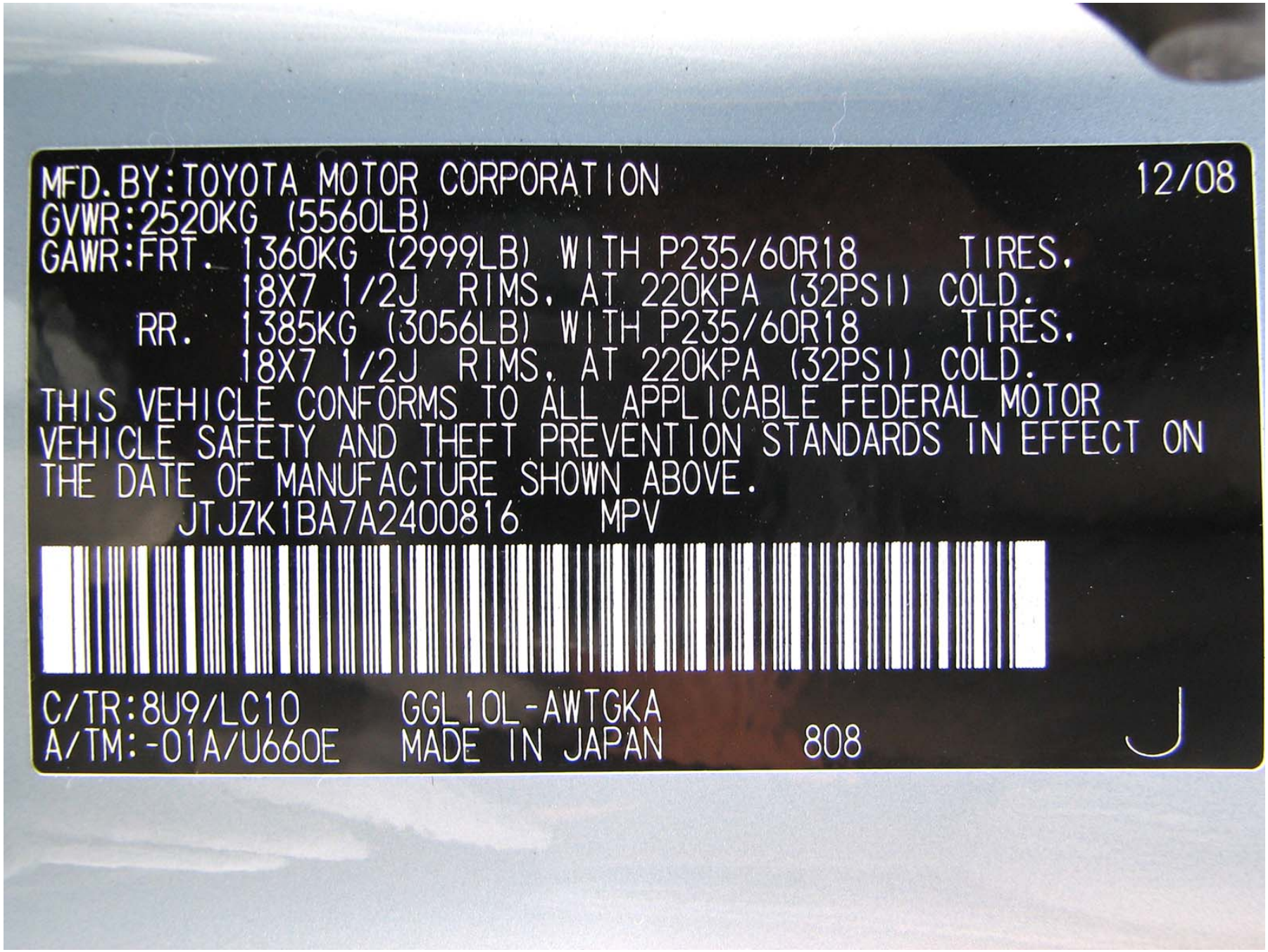


Figure A-51: Close-Up View of Vehicle's Certification Label

Figure A-52: Close-Up View of Vehicle's Tire Information Placard or Label

Figure A-53: Pre-Test Front View of MDB Impactor Face

Figure A-54: Post-Test Front View of MDB Impactor Face

Figure A-55: Pre-Test Left Side View of MDB Impactor Face

Figure A-56: Post-Test Left Side View of MDB Impactor Face

Figure A-57: Pre-Test Top View of MDB Impactor Face

Figure A-58: Post-Test Top View of MDB Impactor Face

Figure A-59: Pre-Test Right Side View of MDB Impactor Face

Figure A-60: Post-Test Right Side View of MDB Impactor Face

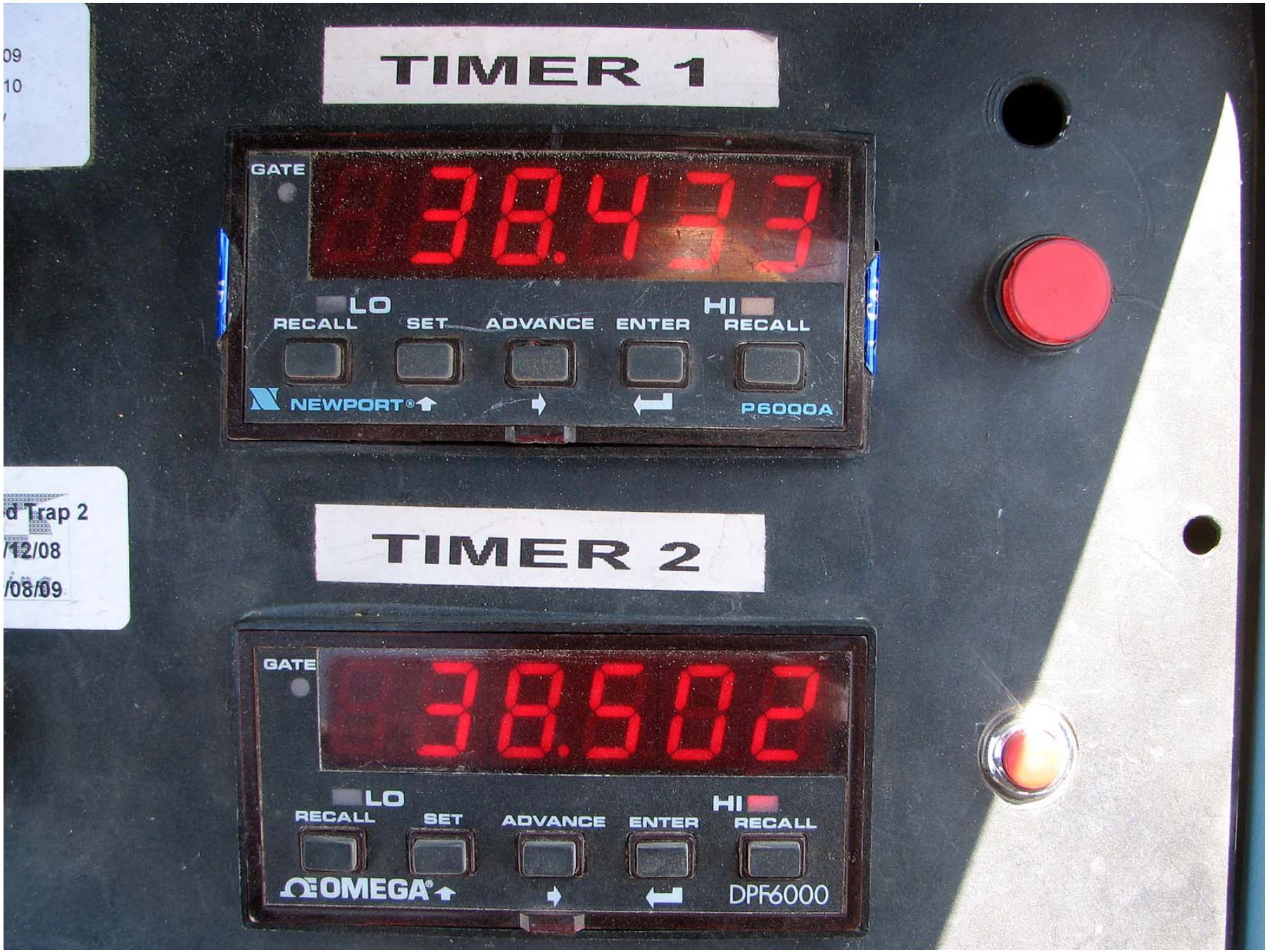


Figure A-61: Post-Test Primary and Redundant Speed Trap Velocity Readout

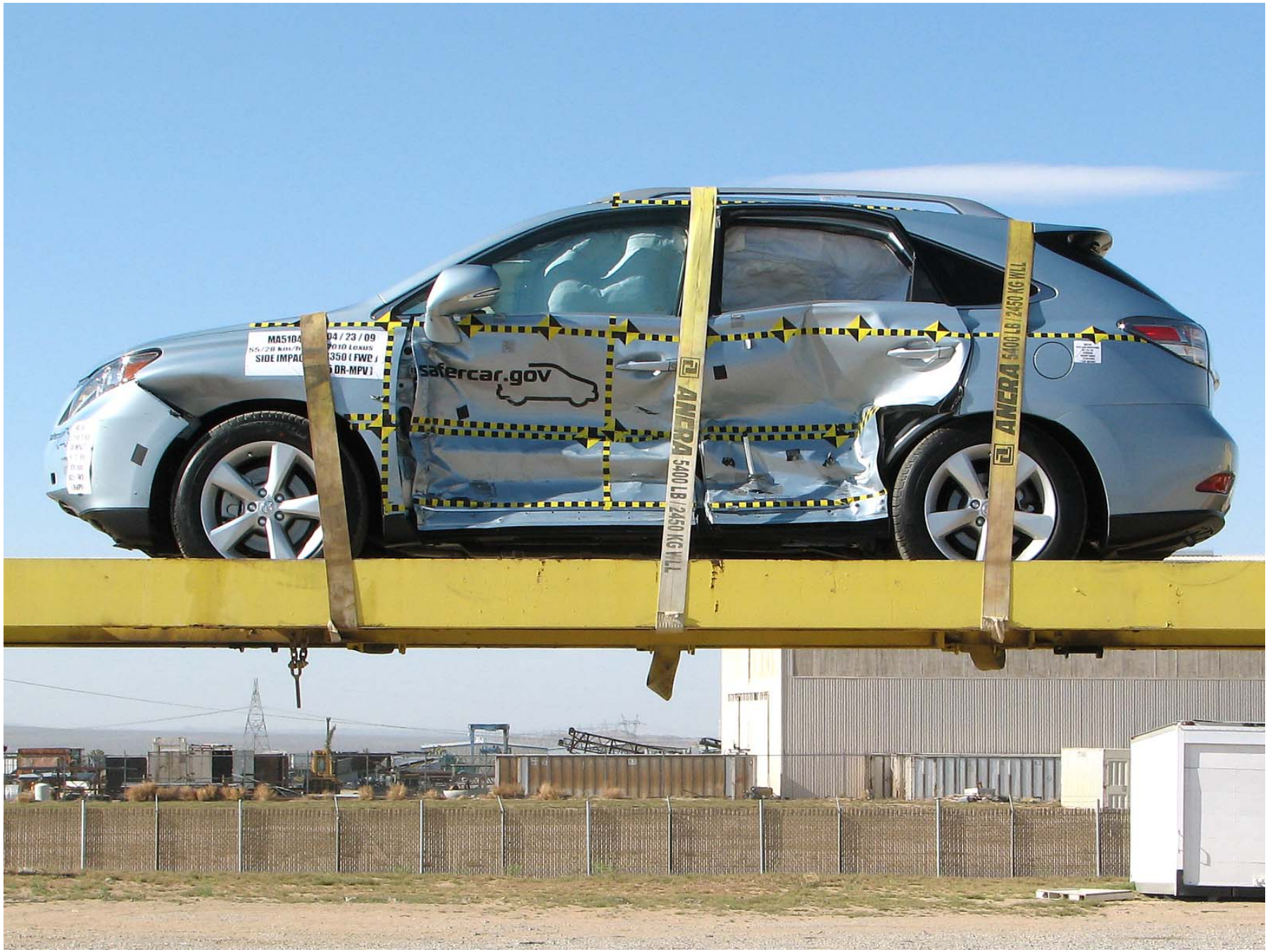


Figure A-62: FMVSS 301 / 305 Rollover 0°

Figure A-63: FMVSS 301 / 305 Rollover 90°

Figure A-64: FMVSS 301 / 305 Rollover 180°

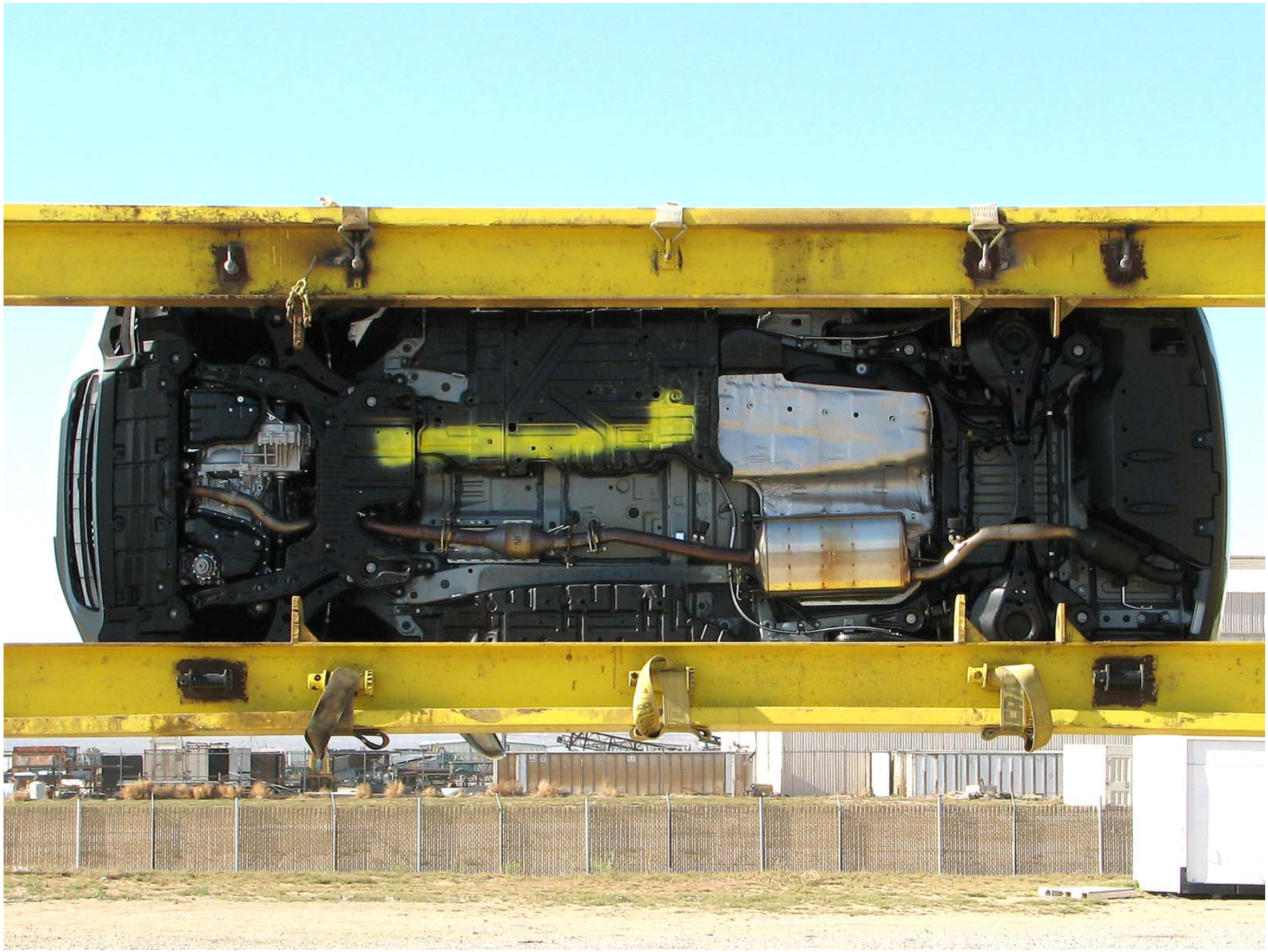


Figure A-65: FMVSS 301 / 305 Rollover 270°

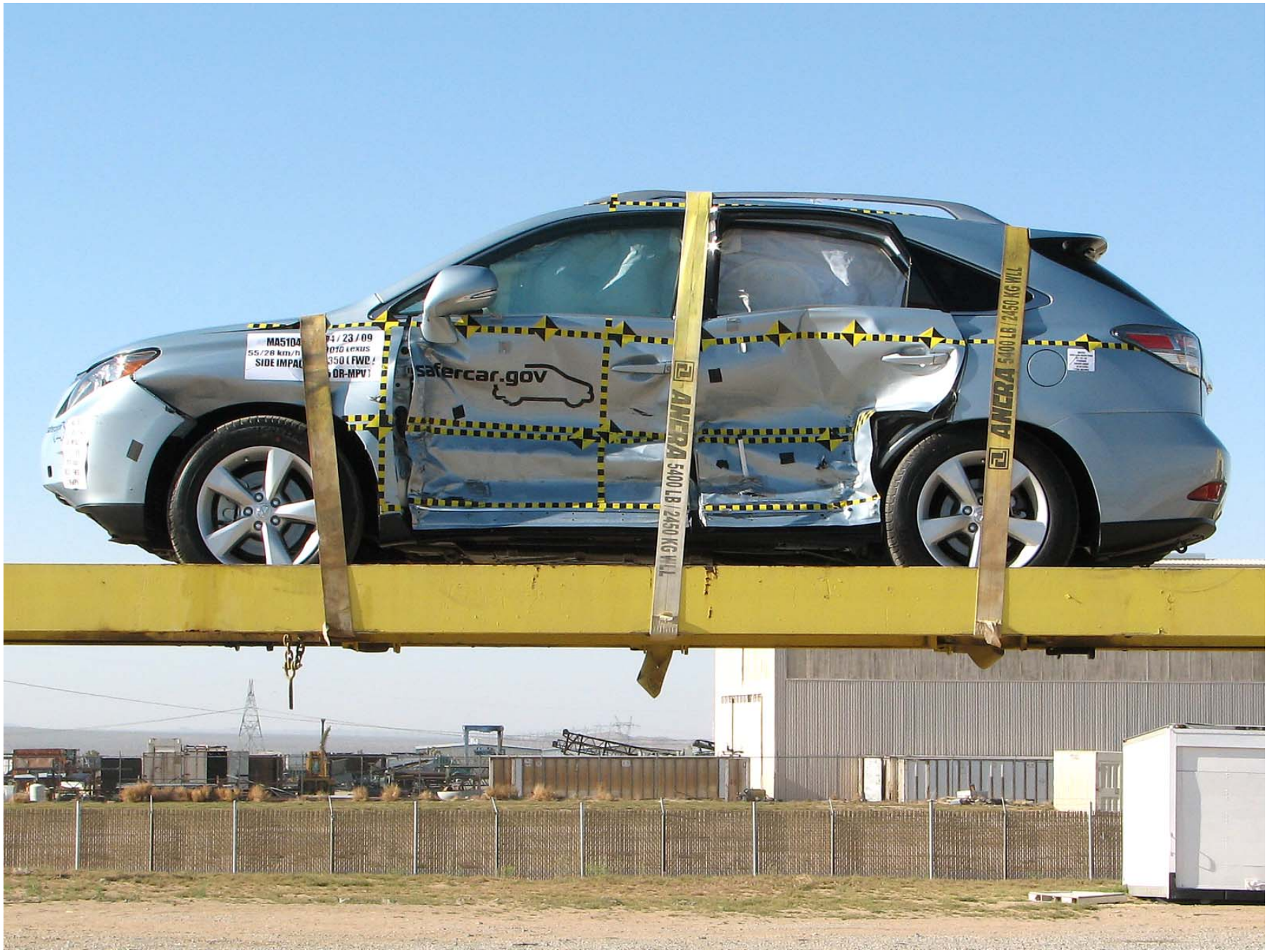


Figure A-66: FMVSS 301 / 305 Rollover 360°

Figure A-67: Impact Event

APPENDIX B

DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Driver and Passenger Dummy Instrumentation Plots

Filtered Data

The following additional data plots 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 and Passenger Dummy Instrumentation Plots

Driver Lower Spine X Acceleration vs. Time

Driver Lower Spine Y Acceleration vs. Time

Driver Lower Spine Z Acceleration vs. Time

Driver Head Contact Switch vs. Time

Driver Shoulder Contact Switch vs. Time

Driver Torso Contact Switch vs. Time

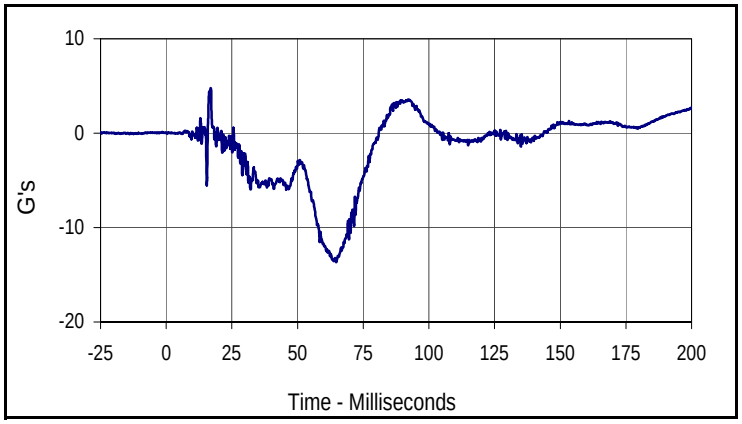
Driver Leg Contact Switch vs. Time

Driver Head X Acceleration vs. Time Redundant

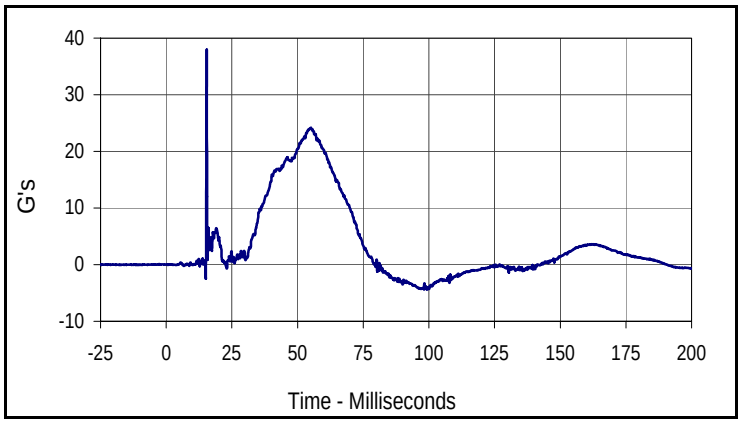
Vehicle Instrumentation Plots

MDB Instrumentation Plots

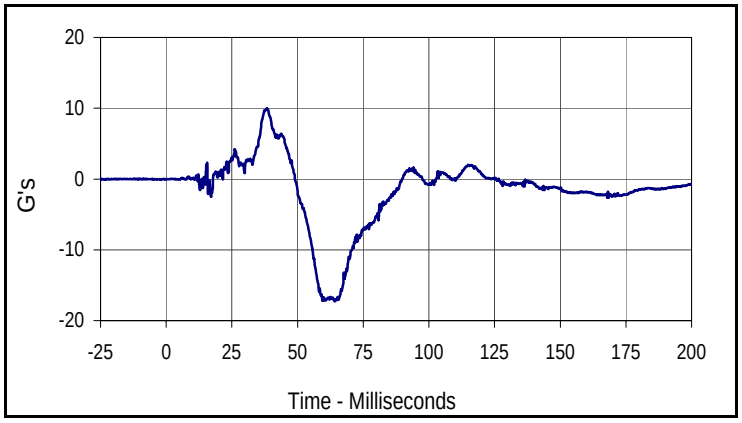
Test Vehicle:	2010 Lexus RX350 5-Door MPV	Test Date:	4/23/09
Test Program:	Side Validation Testing	NHTSA No.:	MA5104



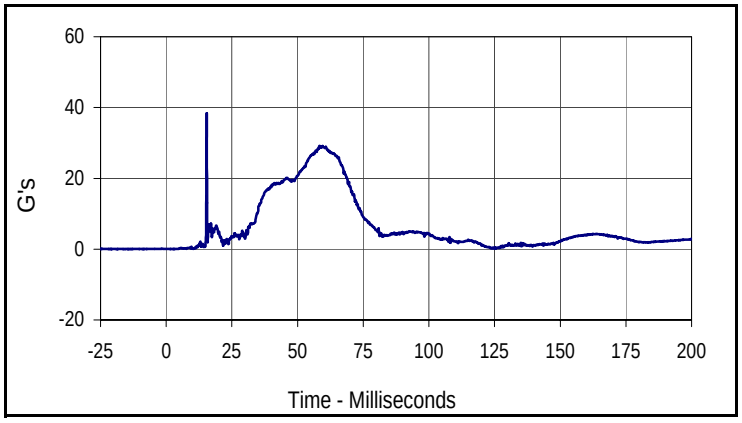
Curve Description			
Driver Head X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
4.8	16.9	-13.7	64.7



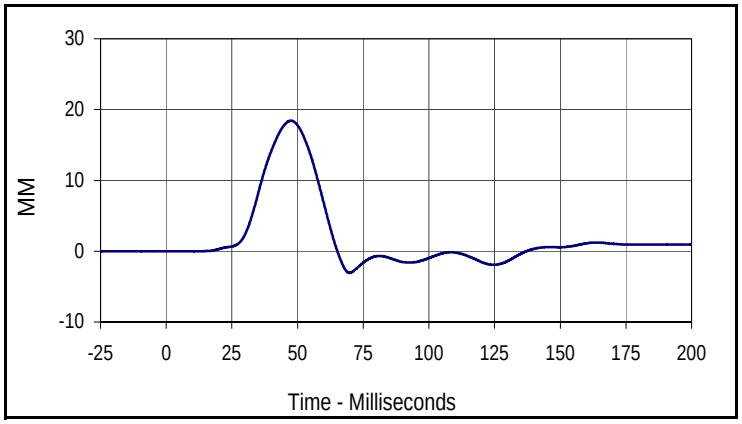
Curve Description			
Driver Head Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
37.8	15.4	-4.4	98.1



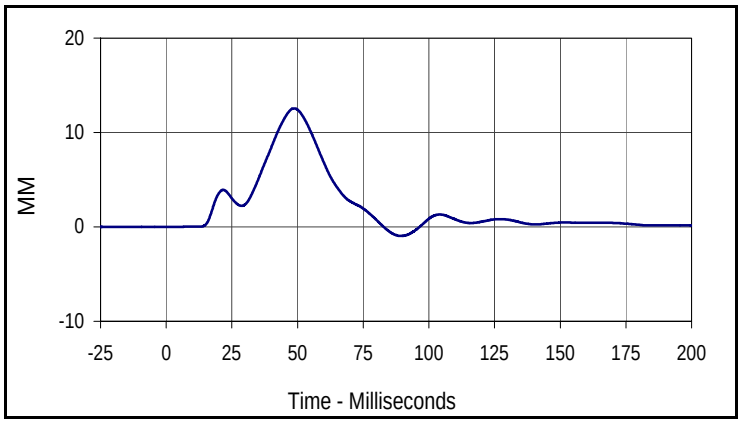
Curve Description			
Driver Head Z Primary			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
10.0	38.3	-17.3	64.2



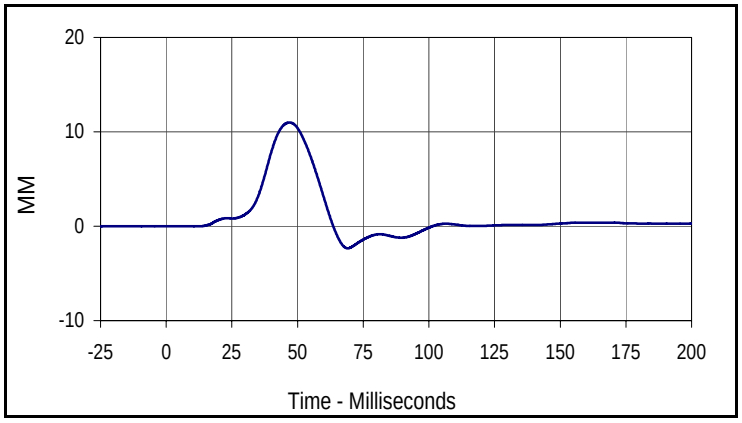
Curve Description			
Driver Head Resultant Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
38.2	15.4	0.0	1.6



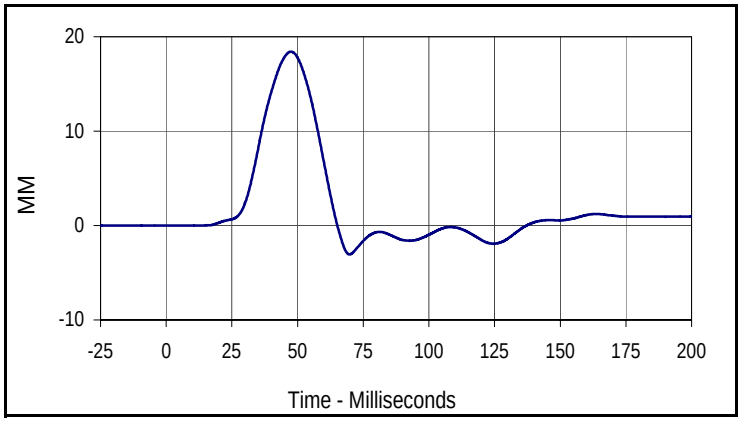
Curve Description			
Driver Chest Upper Rib Deflection			
CURNO	Type	SAE Class	Units
007	FIL	180	MM
Max	Time	Min	Time
18.4	47.5	-3.1	69.8



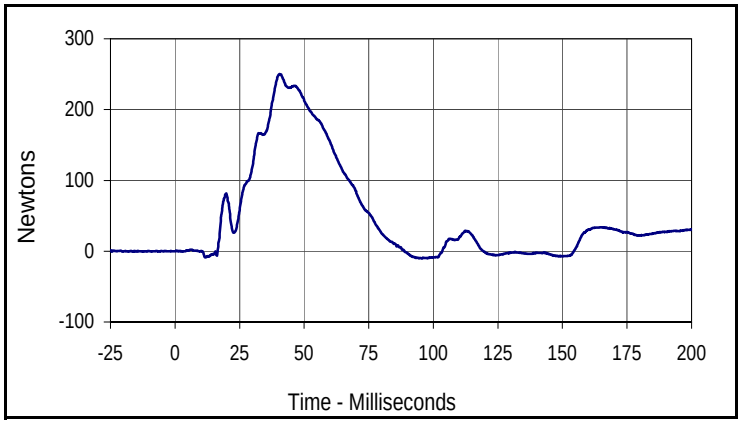
Curve Description			
Driver Chest Middle Rib Deflection			
CURNO	Type	SAE Class	Units
008	FIL	180	MM
Max	Time	Min	Time
12.6	48.7	-1.0	89.4



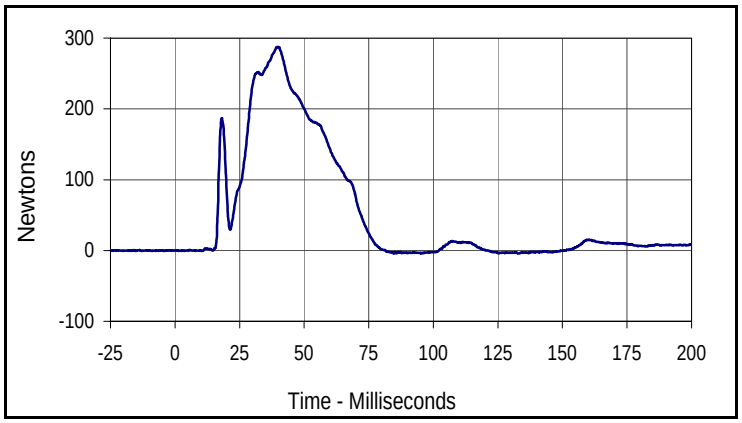
Curve Description			
Driver Chest Lower Rib Deflection			
CURNO	Type	SAE Class	Units
009	FIL	180	MM
Max	Time	Min	Time
11.0	47.0	-2.3	69.1



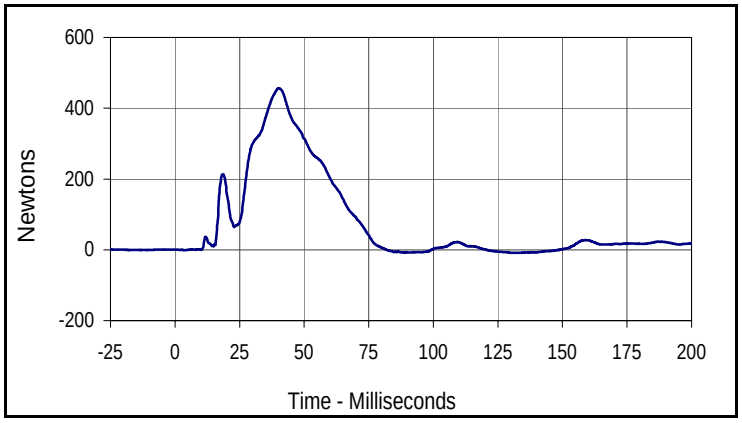
Curve Description			
Driver Chest Maximum Rib Deflection			
CURNO	Type	SAE Class	Units
010	FIL	180	MM
Max	Time	Min	Time
18.4	47.5	-3.1	69.8



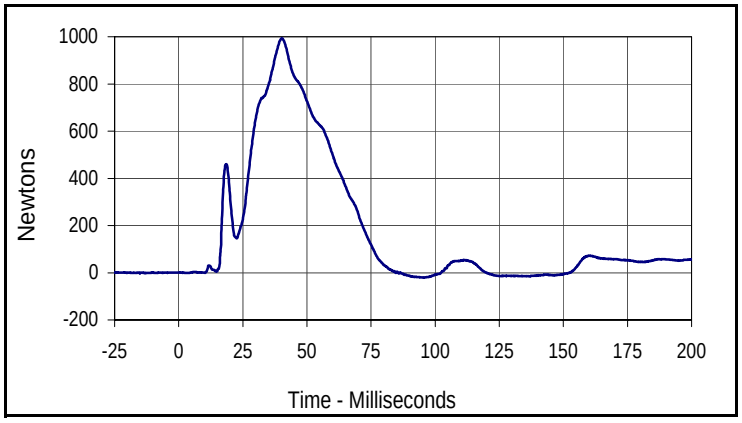
Curve Description			
Driver Front Abdomen FY			
CURNO	Type	SAE Class	Units
013	FIL	600	Newtons
Max	Time	Min	Time
250.1	40.5	-10.1	95.5



Curve Description			
Driver Middle Abdomen FY			
CURNO	Type	SAE Class	Units
014	FIL	600	Newtons
Max	Time	Min	Time
287.5	40.2	-4.6	84.7

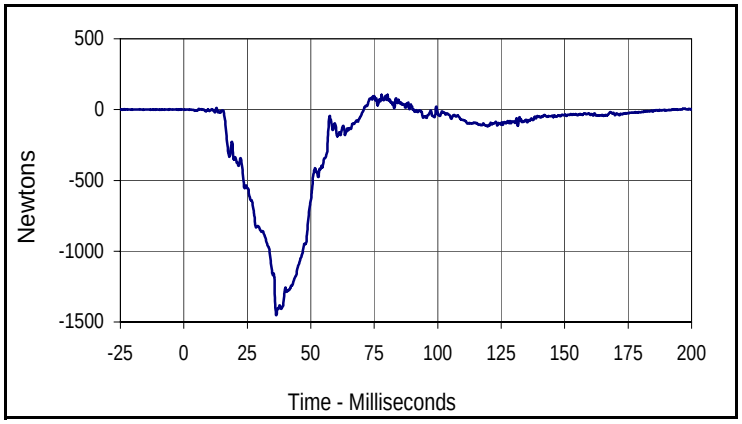


Curve Description			
Driver Rear Abdomen FY			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
456.2	40.4	-8.7	130.6

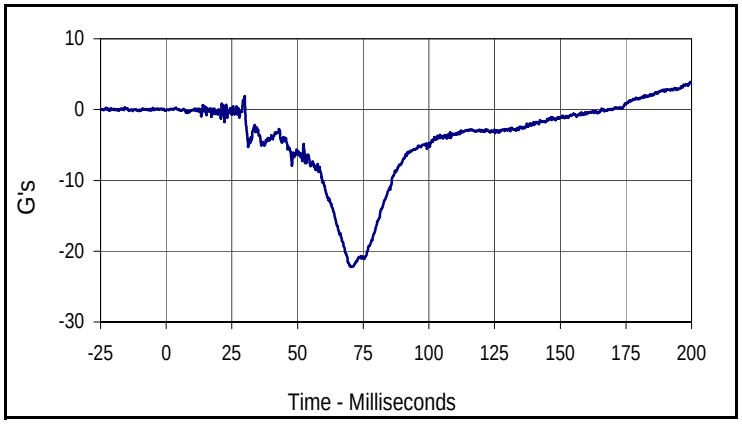


Curve Description			
Driver Total Abdominal Force			
CURNO	Type	SAE Class	Units
013	RES	600	Newtons
Max	Time	Min	Time
993.3	40.3	-20.6	95.5

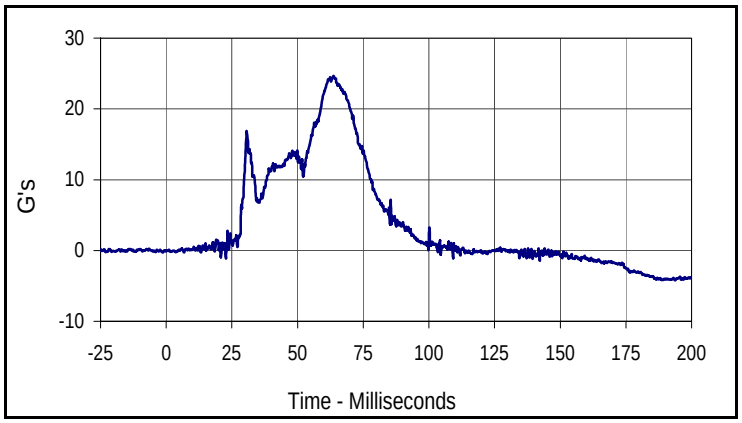
Test Vehicle:	2010 Lexus RX350 5-Door MPV	Test Date:	4/23/09
Test Program:	Side Validation Testing	NHTSA No.:	MA5104



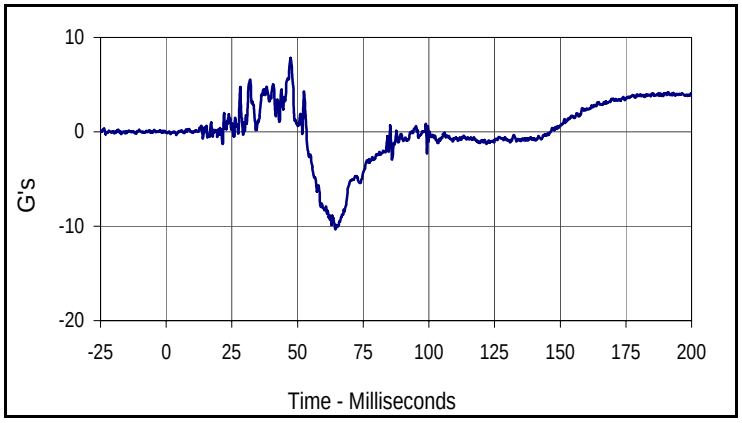
Curve Description			
Driver Pubic FY			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
105.0	80.3	-1452.1	36.4



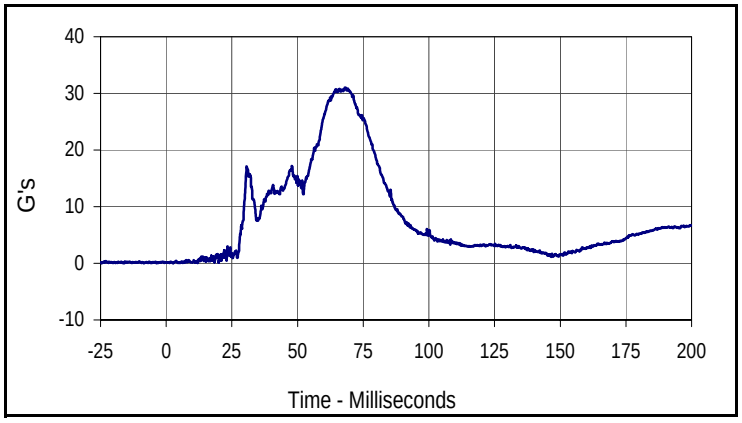
Curve Description			
Passenger Head X Primary			
CURNO	Type	SAE Class	Units
021	FIL	1000	G's
Max	Time	Min	Time
3.9	199.5	-22.2	70.2



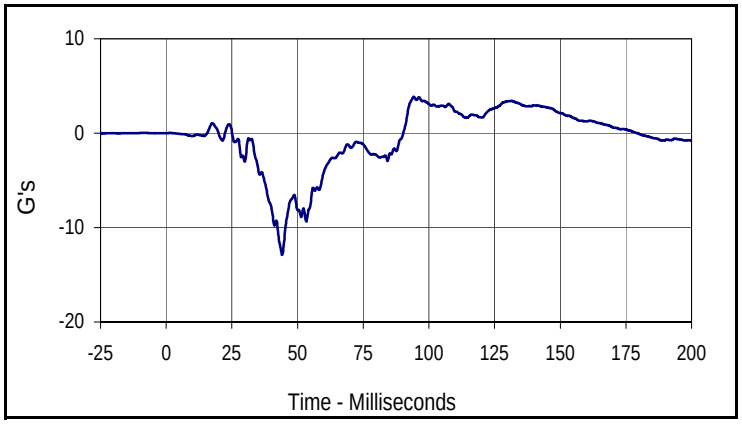
Curve Description			
Passenger Head Y Primary			
CURNO	Type	SAE Class	Units
022	FIL	1000	G's
Max	Time	Min	Time
24.7	63.7	-4.2	193.8



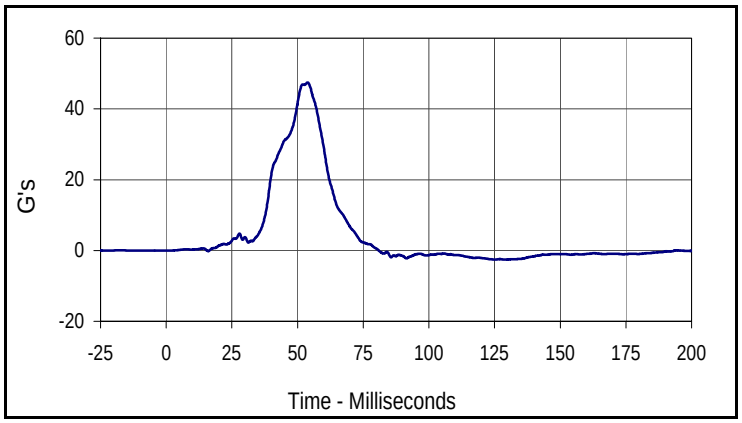
Curve Description			
Passenger Head Z Primary			
CURNO	Type	SAE Class	Units
023	FIL	1000	G's
Max	Time	Min	Time
7.8	47.4	-10.3	64.4



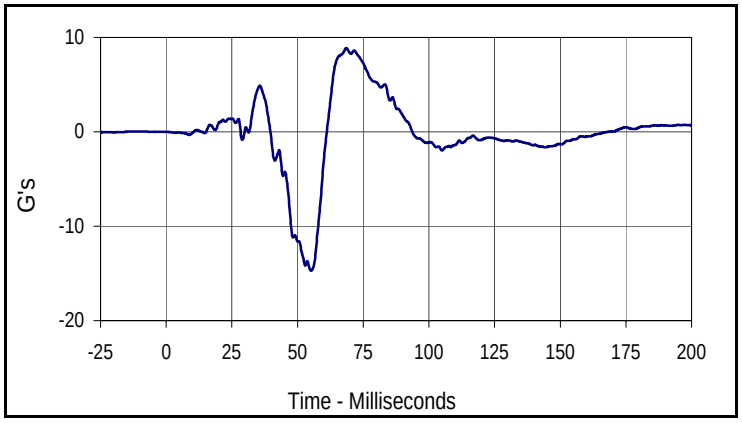
Curve Description			
Passenger Head Resultant Primary			
CURNO	Type	SAE Class	Units
021	RES	1000	G's
Max	Time	Min	Time
31.0	68.0	0.0	2.5



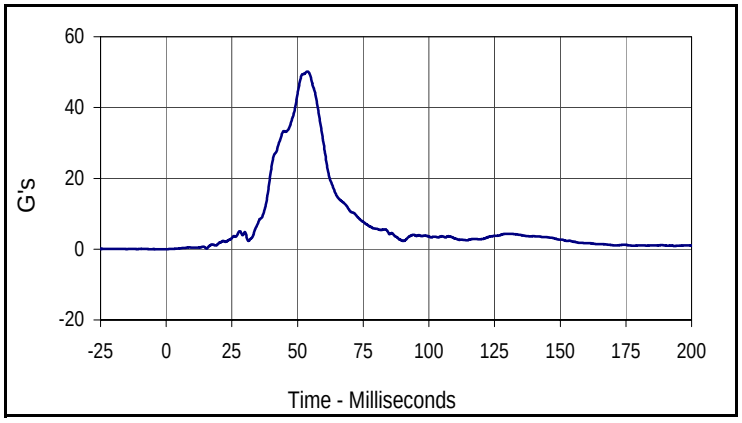
Curve Description			
Passenger Lower Spine X			
CURNO	Type	SAE Class	Units
037	FIL	180	G's
Max	Time	Min	Time
3.9	94.2	-12.9	44.1



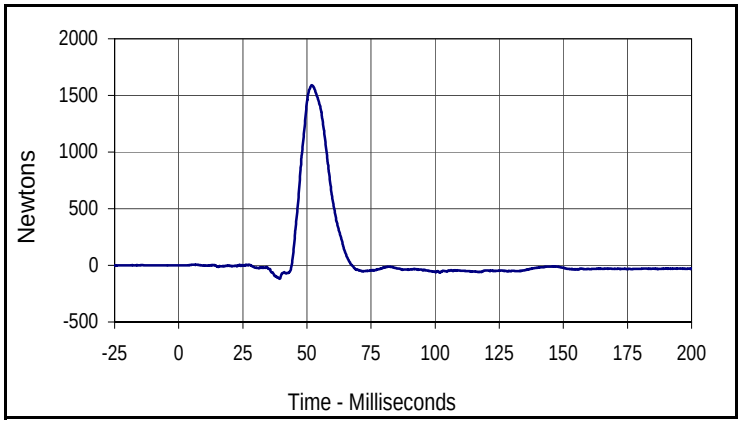
Curve Description			
Passenger Lower Spine Y			
CURNO	Type	SAE Class	Units
038	FIL	180	G's
Max	Time	Min	Time
47.5	53.8	-2.6	129.0



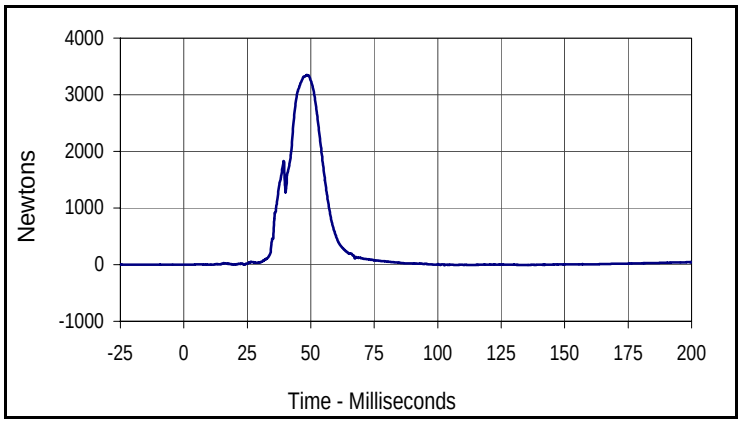
Curve Description			
Passenger Lower Spine Z			
CURNO	Type	SAE Class	Units
039	FIL	180	G's
Max	Time	Min	Time
8.9	68.6	-14.7	55.1



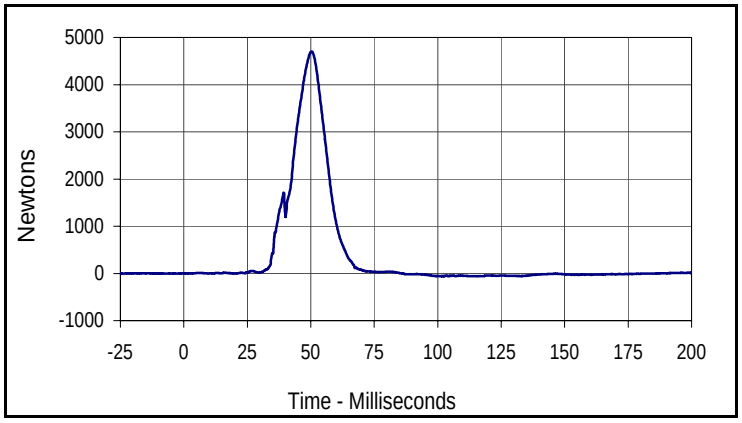
Curve Description			
Passenger Lower Spine Resultant			
CURNO	Type	SAE Class	Units
037	RES	180	G's
Max	Time	Min	Time
50.2	53.6	0.0	0.0



Curve Description			
Passenger Left Iliac Wing			
CURNO	Type	SAE Class	Units
043	FIL	600	Newtons
Max	Time	Min	Time
1589.5	51.9	-118.4	39.3



Curve Description			
Passenger Left Acetabulum			
CURNO	Type	SAE Class	Units
042	FIL	600	Newtons
Max	Time	Min	Time
3348.6	48.4	-9.4	102.7



Curve Description			
Passenger Total Pelvic Force			
CURNO	Type	SAE Class	Units
042	SUM	600	Newtons
Max	Time	Min	Time
4703.4	50.3	-62.2	102.6

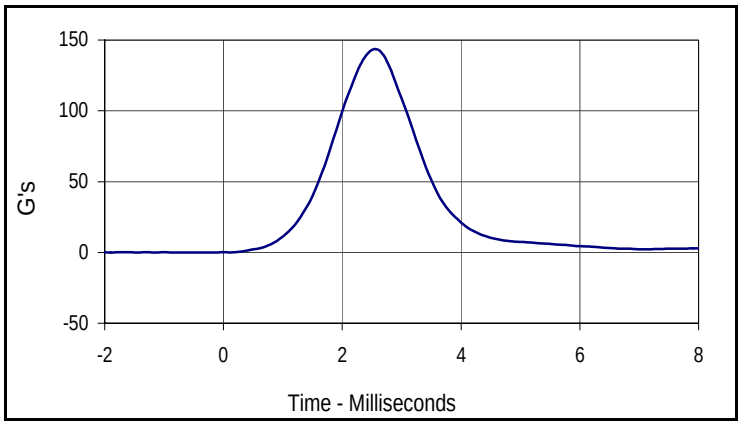
APPENDIX C

DUMMY CALIBRATION DATA

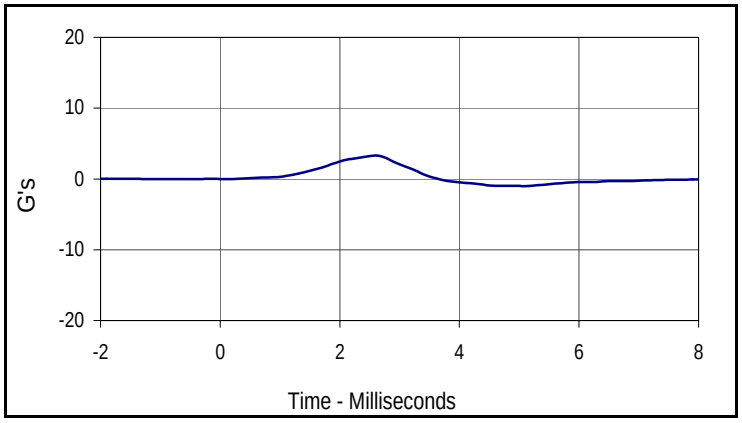
APPENDIX C
PRE-TEST CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program:	ES2re Lateral Head Drop Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	HD04A

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	143.3	Pass
Peak Longitudinal Acceleration	G's	≤15	3.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	5.2	Pass
		Overall Test Results		Pass



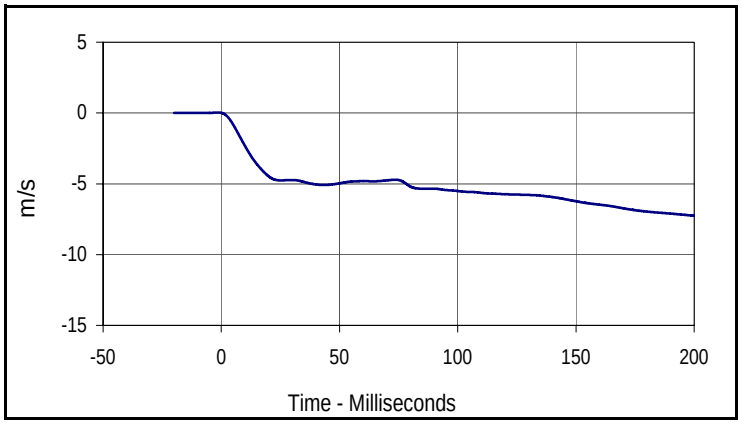
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
143.3	2.6	0.0	-0.2



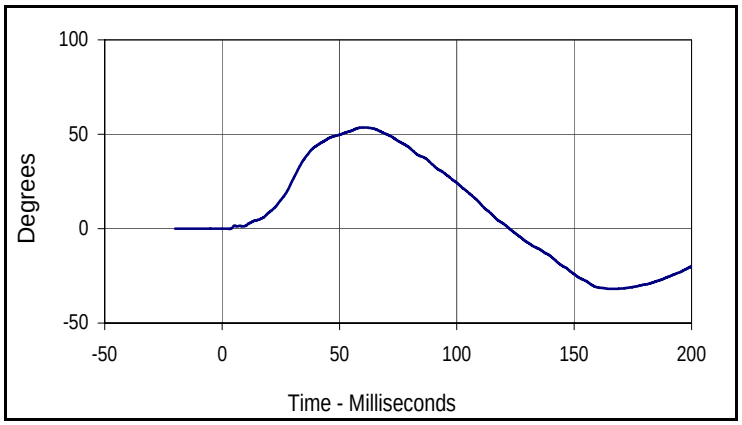
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
3.3	2.6	-1.0	5.1

Test Program:	ES2re Neck Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	NB04A

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	3.38	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.048	Pass
	3 msec	m/s	-.250 to -.375	-0.330	Pass
	14 msec	m/s	-3.20 to -3.70	-3.39	Pass
Headform Rotation	Max	Degrees	49.0 to 58.0	53.6	Pass
	Time	msec	54.0 to 66.0	61.0	Pass
Maximum Rotation To Time Zero Crossing		msec	53.0 to 88.0	61.5	Pass
			Overall Test Results		Pass



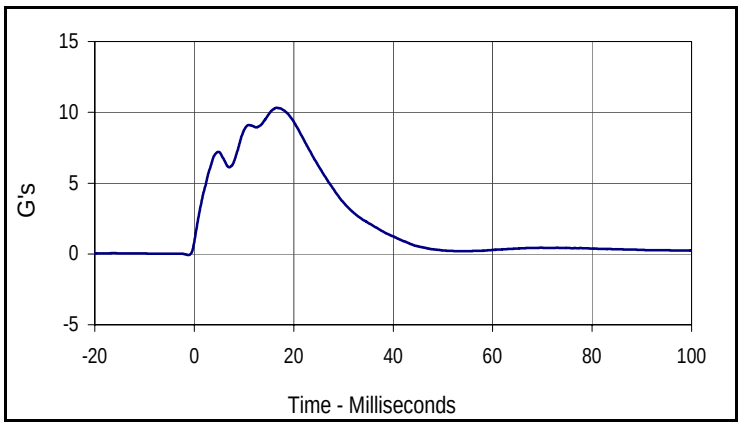
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-1.4	-7.3	200.0



Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
53.6	61.0	-31.9	164.9

Test Program:	ES2re Shoulder Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	SH04A

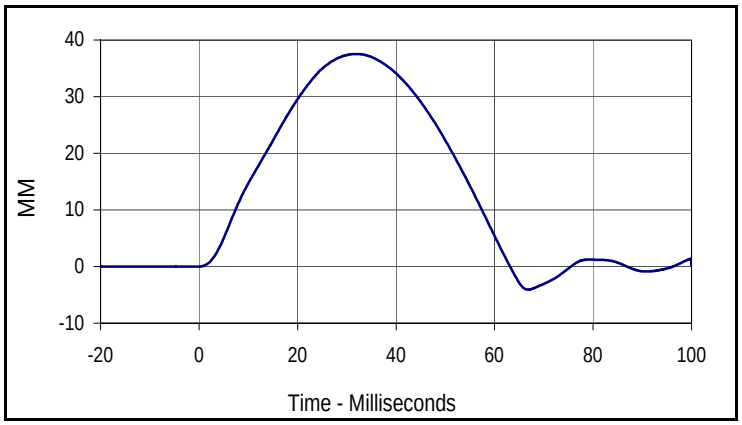
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	4.20 to 4.40	4.25	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	10.3	Pass
		Overall Test Results		Pass



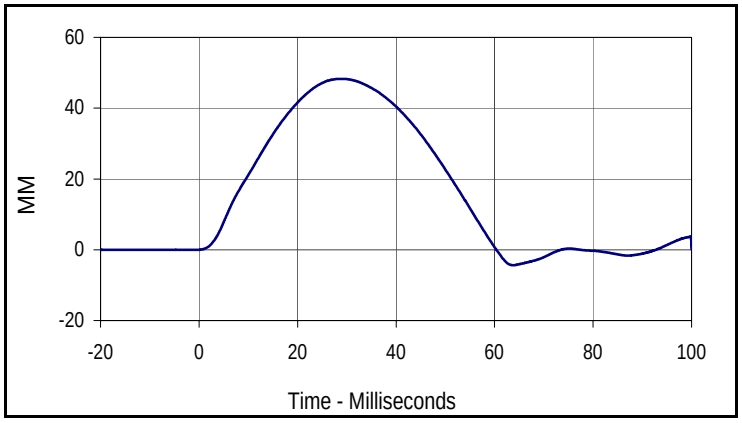
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
10.3	16.6	-0.1	-1.2

Test Program:	ES2re Rib Module Calibration	Test Date:	4/16/09
ATD Serial No.:	F035 Rib #1	Test I.D.:	RIB04A, RIB04B

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	37.5	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	48.3	Pass
		Overall Test Results		Pass



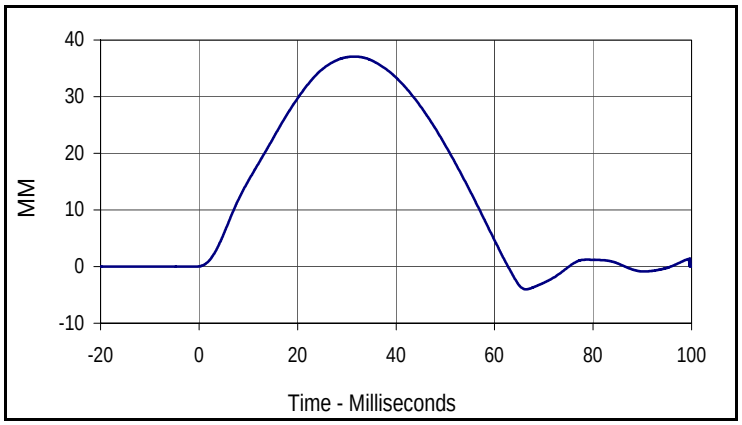
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.5	32.0	-4.1	66.8



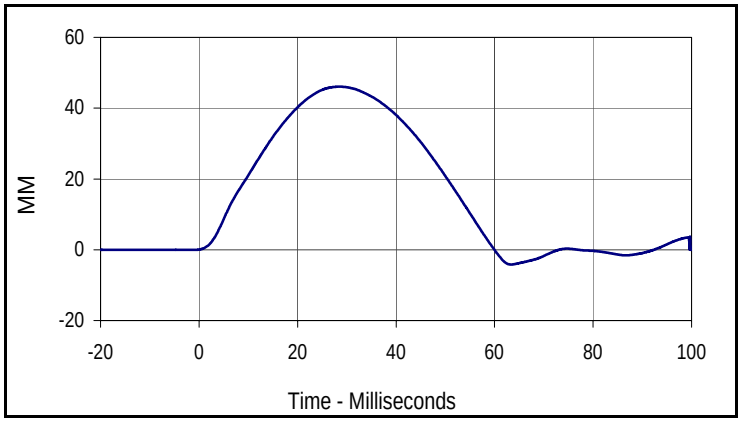
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
48.3	28.9	-4.4	63.7

Test Program:	ES2re Rib Module Calibration	Test Date:	4/16/09
ATD Serial No.:	F035 Rib #2	Test I.D.:	RIB04C, RIB04D

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	37.1	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	46.1	Pass
		Overall Test Results		Pass



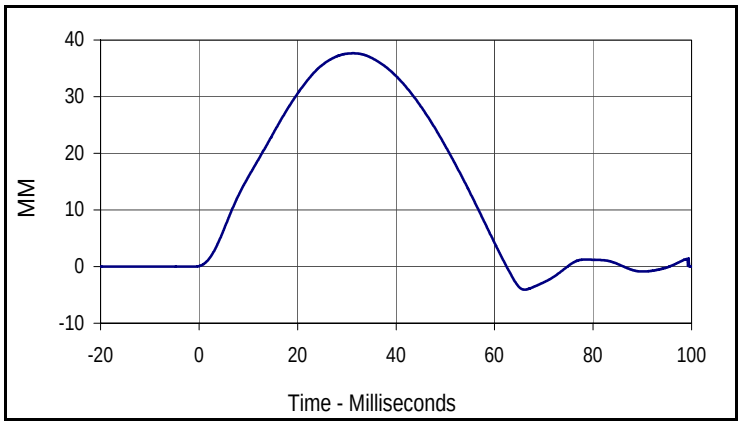
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.1	31.8	-4.0	66.6



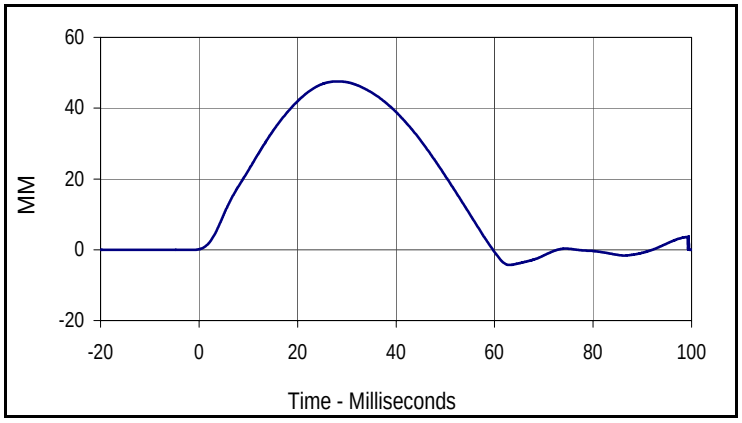
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
46.1	28.7	-4.2	63.5

Test Program:	ES2re Rib Module Calibration	Test Date:	4/16/09
ATD Serial No.:	F035 Rib #3	Test I.D.:	RIB04E, RIB04F

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	37.7	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	47.6	Pass
		Overall Test Results		Pass



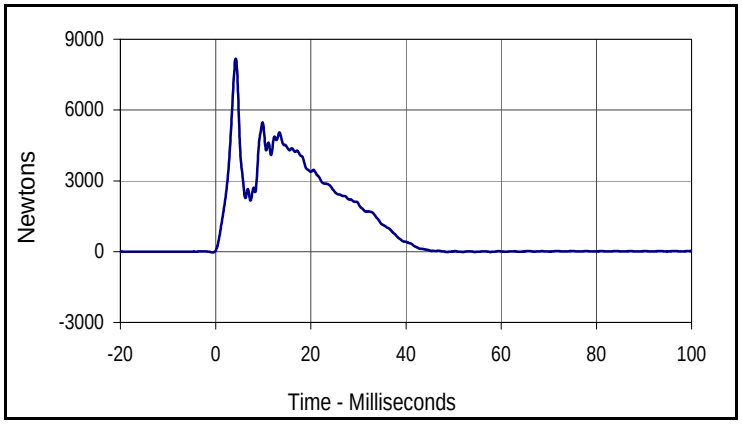
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.7	31.5	-4.1	66.3



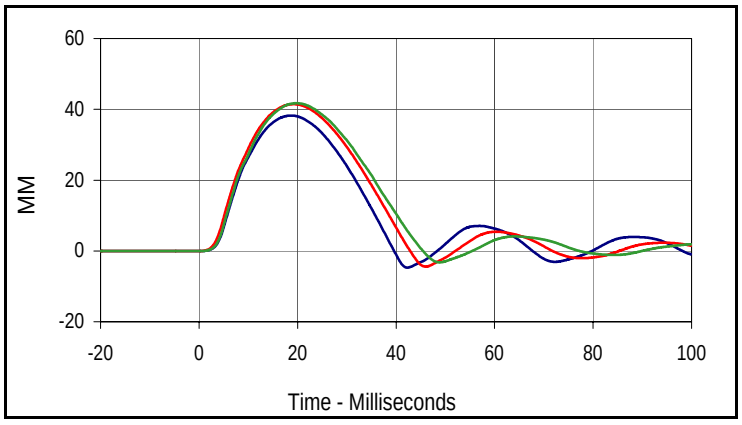
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
47.6	28.4	-4.3	63.2

Test Program:	ES2re Thorax Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	TH04A

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	5.50	Pass
Impactor Force	N	5100 to 6200	5476.5	Pass
	msec	> 6.0 msec	9.9	Pass
Upper Rib Deflection	MM	34 to 41	38.2	Pass
Middle Rib Deflection	MM	37 to 45	41.4	Pass
Lower Rib Deflection	MM	37 to 44	41.7	Pass
		Overall Test Results		Pass



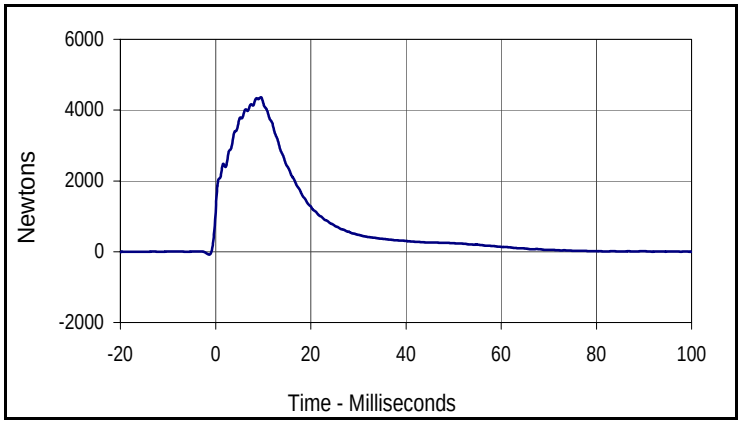
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
8178.0	4.2	-33.6	-0.6



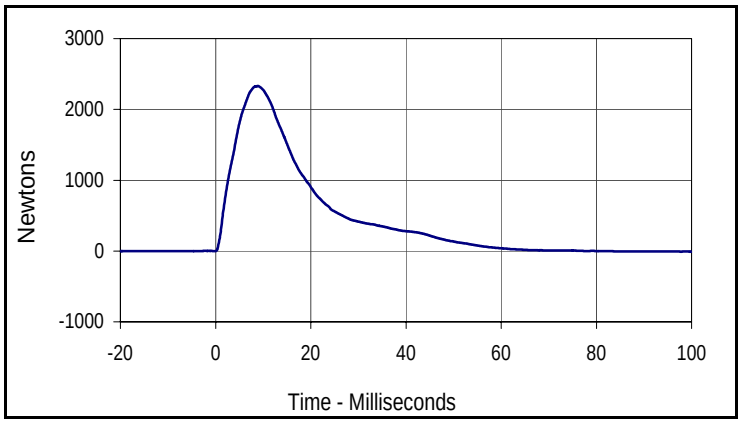
Curve Description			
Upper, Middle, Lower Rib Deflections			
CURNO(s)	Type	SAE Class	Units
002-003-004	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
38.2	18.7	-4.7	42.3
Max (Middle)	Time	Min (Middle)	Time
41.4	19.3	-4.4	46.0
Max (Lower)	Time	Min (Lower)	Time
41.7	19.8	-3.2	48.8

Test Program:	ES2re Abodomen Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	AB04A

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	3.92	Pass
Impactor Force	N	4000 to 4800	4366.3	Pass
	msec	10.6 to 13.0	10.7	Pass
Abdominal Force	N	2200 to 2700	2330.5	Pass
	msec	10.0 to 12.3	10.1	Pass
		Overall Test Results		Pass



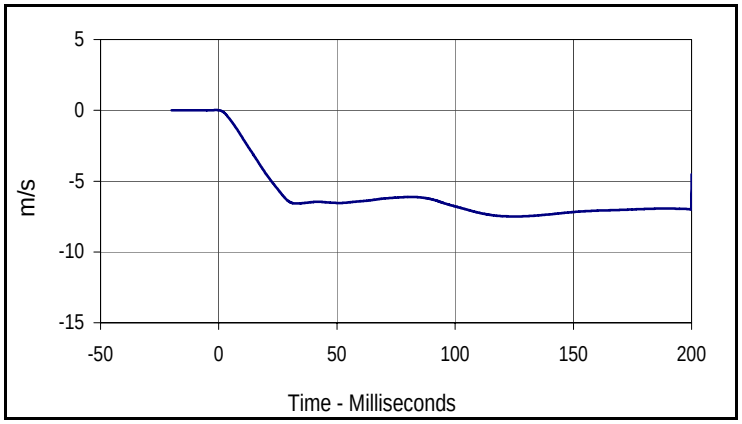
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4366.3	10.7	-80.4	-0.1



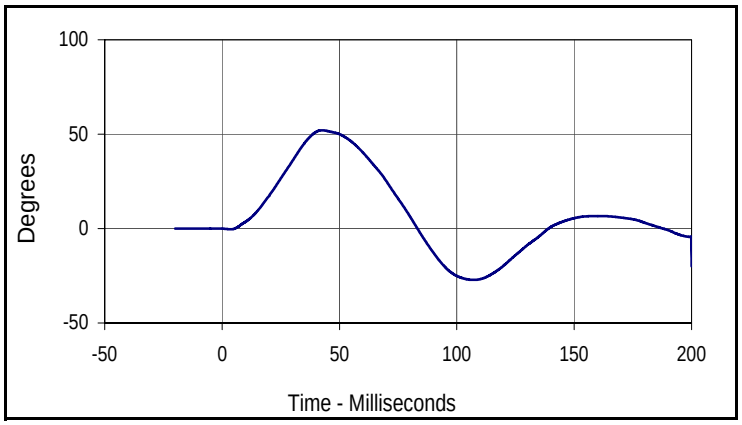
Curve Description			
Abdominal Force			
CURNO	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2330.5	10.1	-8.5	99.1

Test Program:	ES2re Lumbar Spine Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	LS04A

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	6.08	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.031	Pass
	3.7 msec	m/s	-.240 to -.425	-0.419	Pass
	27 msec	m/s	-5.80 to -6.50	-5.99	Pass
	30 msec	m/s	< -6.50	-6.47	Pass
Headform Rotation	Max	Degrees	45.0 to 55.0	52.1	Pass
	Time	msec	39.0 to 53.0	42.6	Pass
Maximum Rotation To Time Zero Crossing		msec	37.0 to 57.0	40.7	Pass
			Overall Test Results		Pass



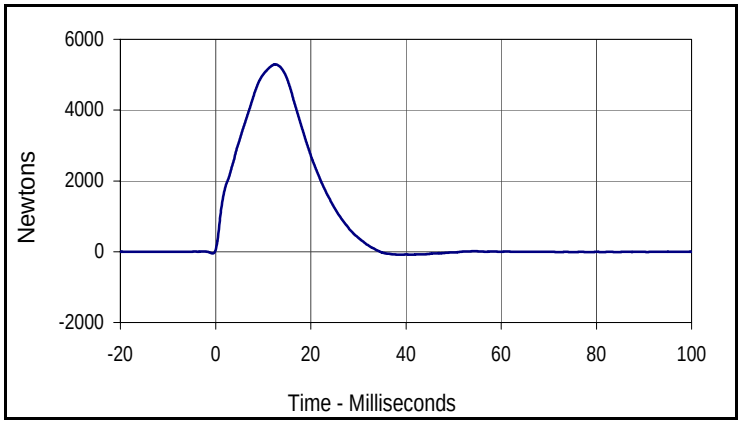
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-1.0	-7.5	125.4



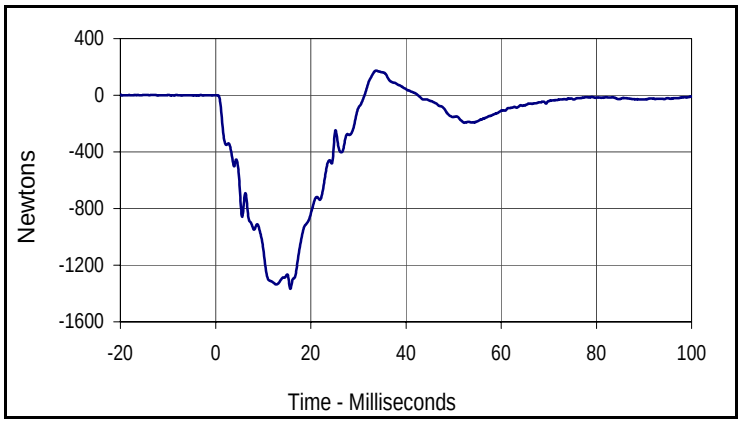
Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
52.1	42.6	-27.2	107.0

Test Program:	ES2re Pelvis Calibration	Test Date:	4/16/09
ATD Serial No.:	F035	Test I.D.:	PL04A

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	4.25	Pass
Impactor Force	N	4700 to 5400	5291.7	Pass
	msec	11.8 to 16.1	12.6	Pass
Pubic Symphysis Load	N	-1230 to -1590	-1366.7	Pass
	msec	12.2 to 17.0	15.7	Pass
		Overall Test Results		Pass



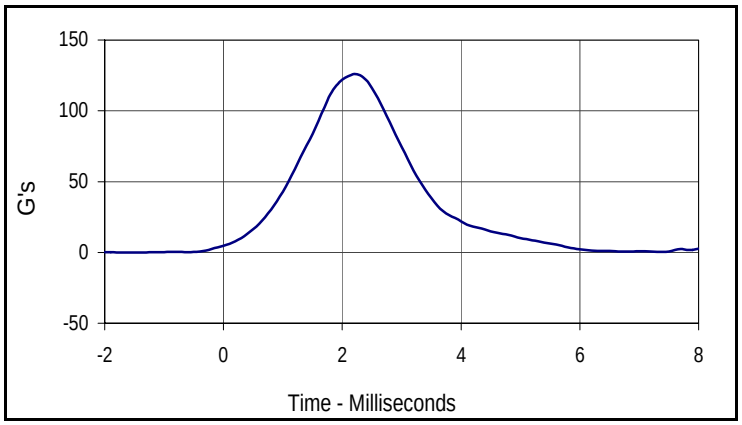
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
5291.7	12.6	-86.6	38.4



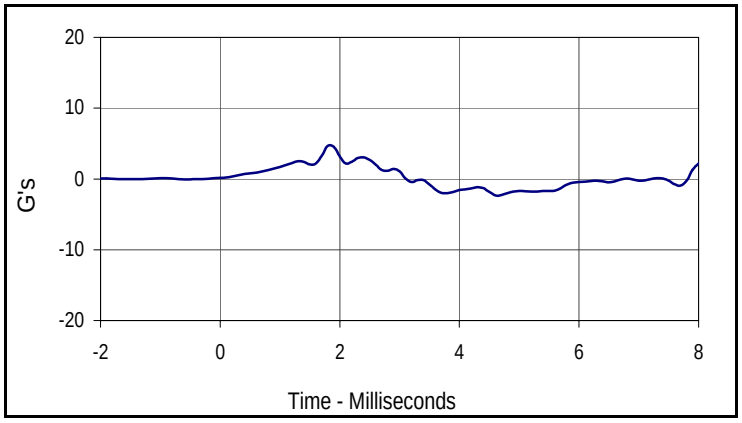
Curve Description			
Pubic Symphysis Load			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
173.8	33.7	-1366.7	15.7

Test Program:	SID IIs Lateral Head Drop Calibration	Test Date:	4/16/09
ATD Serial No.:	299	Test I.D.:	HDS4A

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	125.9	Pass
Peak Longitudinal Acceleration	G's	≤15	4.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	8.1	Pass
		Overall Test Results		Pass



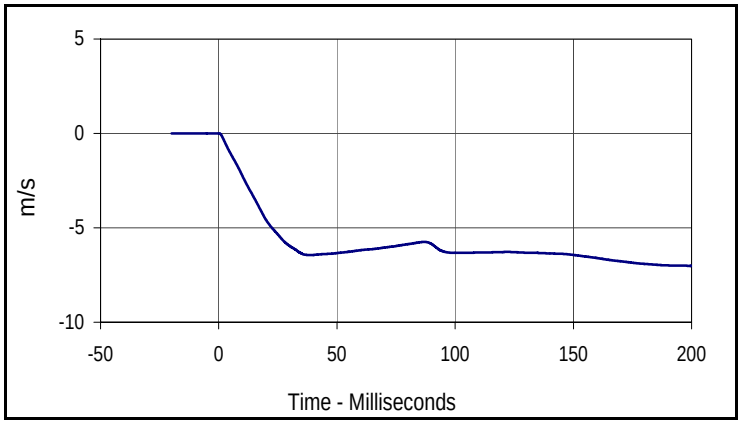
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
125.9	2.2	0.0	-1.6



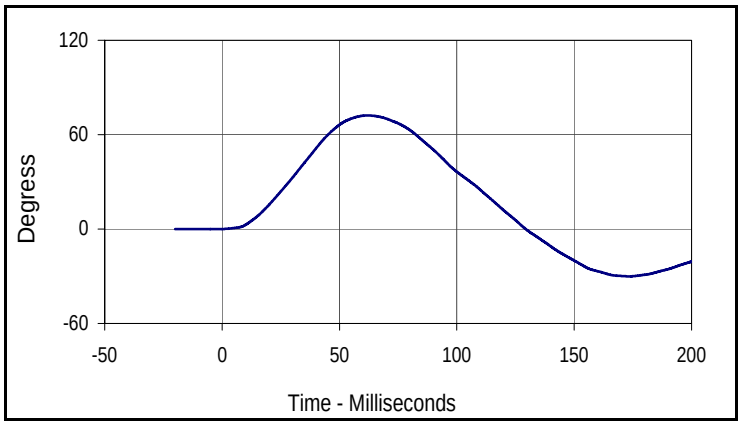
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.7	1.8	-2.3	4.6

Test Program:	SID IIs Neck Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	NB04B

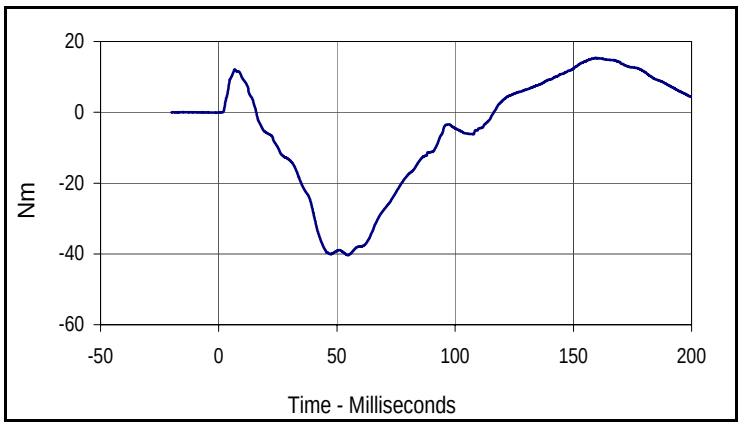
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.54	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.2	Pass
	15 msec	m/s	-3.30 to -4.10	-3.4	Pass
	20 msec	m/s	-4.40 to -5.40	-4.6	Pass
	25 msec	m/s	-5.40 to -6.10	-5.4	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.18	Pass
Translation-Rotation	Max	Degrees	71.0 to 81.0	72.2	Pass
	Time	msec	50.0 to 70.0	61.9	Pass
Peak Occipital Condyle Moment		Nm	-36.0 to -44.0	-40.4	Pass
Decaying Moment Time to Cross 0 Nm		msec	102.0 to 126.0	116.4	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	-7.0	200.0



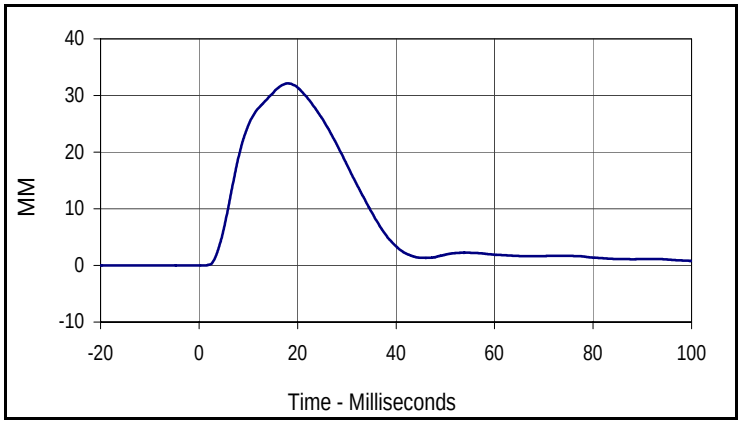
Curve Description			
Maximum Translation Rotation			
CURNO	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
72.2	61.9	-30.0	173.4



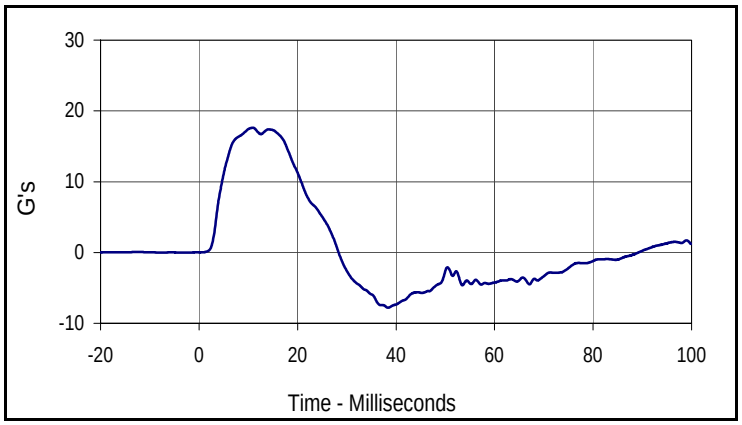
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
15.4	159.3	-40.4	54.7

Test Program:	SID IIs Shoulder Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	SH04A

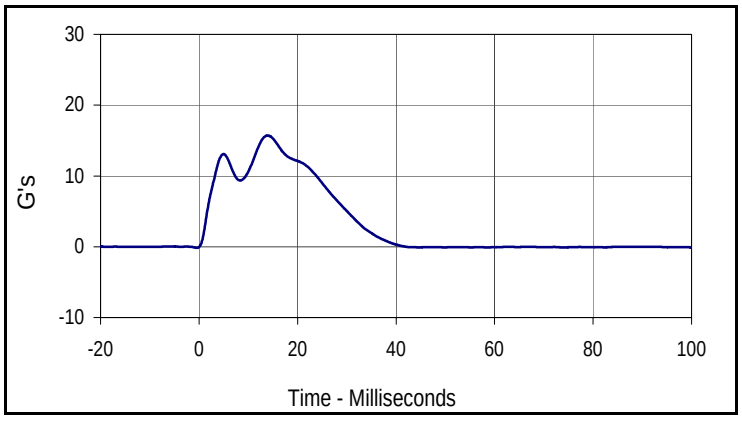
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.22	Pass
Shoulder Deflection	MM	28 to 37	32.1	Pass
Peak Upper Spine Y Acceleration	G's	17 to 22	17.6	Pass
Peak Impactor Acceleration	G's	13 to 18	15.7	Pass
		Overall Test Results		Pass



Curve Description			
Shoulder Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
32.1	18.0	0.0	-11.1



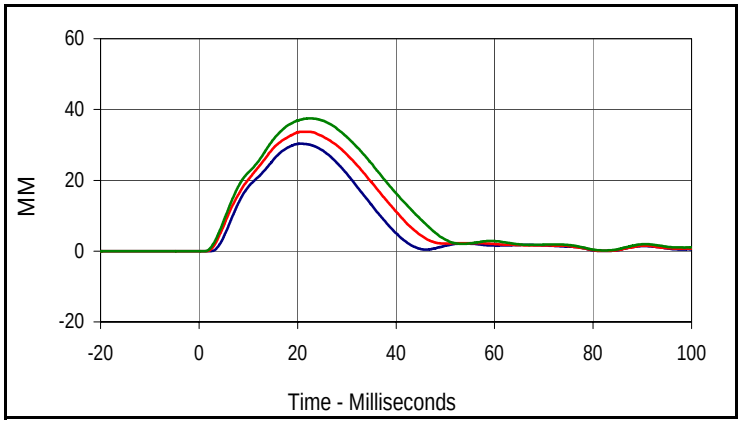
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
17.6	10.9	-7.8	38.4



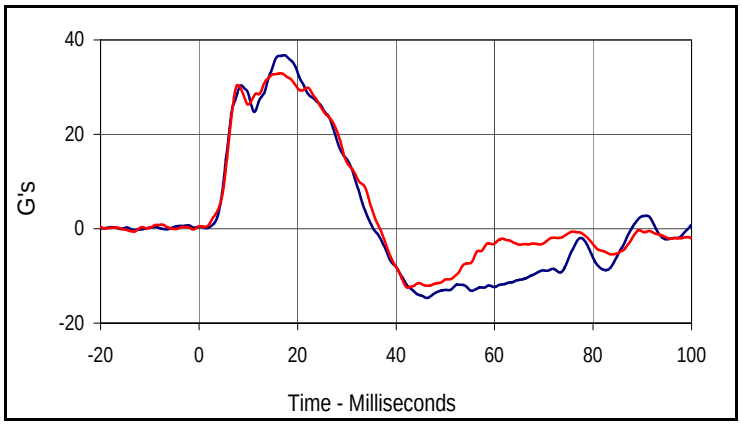
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.7	13.9	-0.1	-0.4

Test Program:	SID IIs Thorax with Arm Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	TH04A

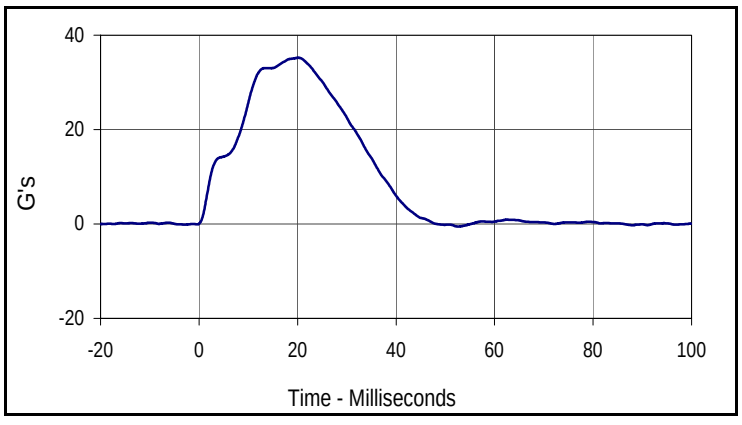
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.71	Pass
Shoulder Deflection	MM	31 to 40	37.5	Pass
Upper Thorax Rib Deflection	MM	26 to 32	30.3	Pass
Middle Abdominal Rib Deflection	MM	30 to 36	33.7	Pass
Lower Abdominal Rib Deflection	MM	32 to 38	37.5	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	36.8	Pass
Peak Lower Spine Y Acceleration	G's	28 to 35	32.9	Pass
Peak Impactor Acceleration	G's	31 to 36	35.2	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
30.3	20.7	0.0	-20.0
Middle Thorax Deflection			
Max	Time	Min	Time
33.7	21.5	0.0	-3.3
Lower Thorax Deflection			
Max	Time	Min	Time
37.5	22.4	0.0	-19.4



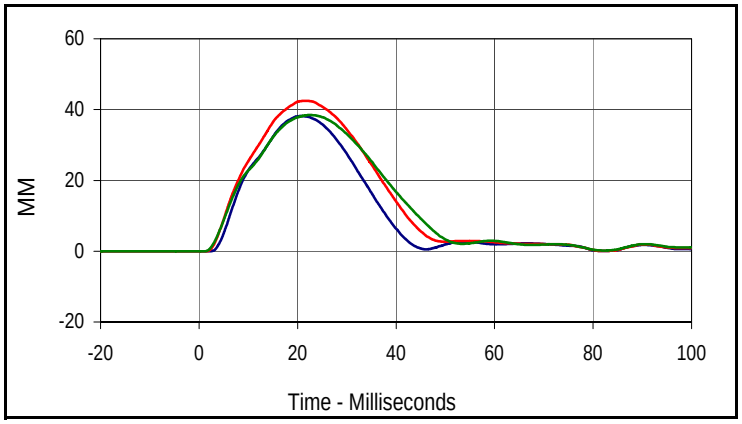
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
36.8	17.3	-14.7	46.2
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
32.9	16.6	-12.4	42.4



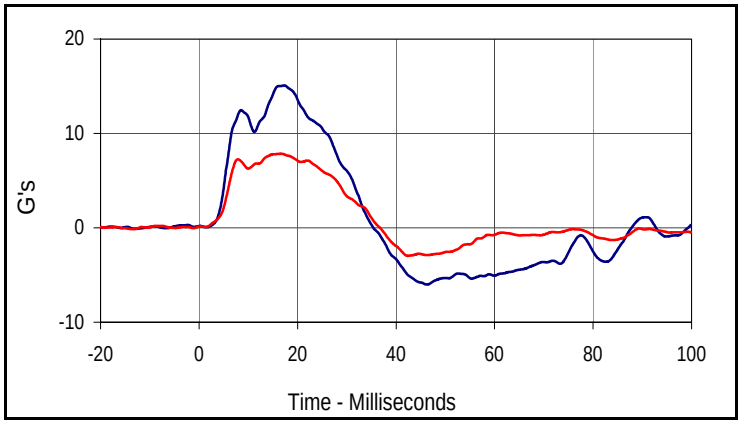
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
35.2	20.2	-0.6	52.6

Test Program:	SID IIs Thorax w/o Arm Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	TH04B

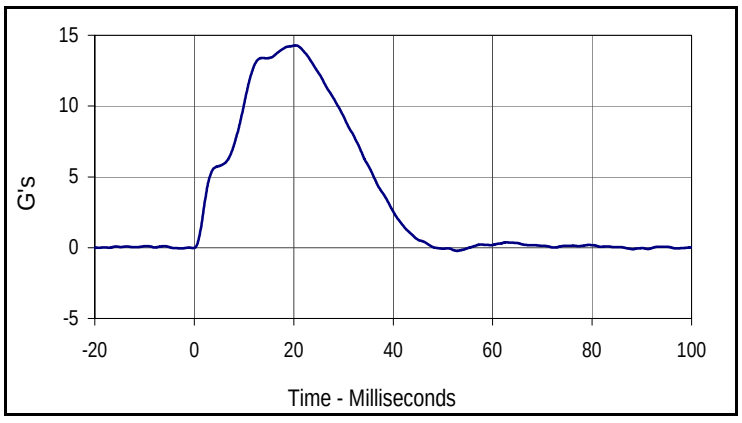
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.22	Pass
Upper Thorax Rib Deflection	MM	33 to 40	38.2	Pass
Middle Abdominal Rib Deflection	MM	39 to 45	42.5	Pass
Lower Abdominal Rib Deflection	MM	36 to 43	38.5	Pass
Peak Upper Spine Y Acceleration	G's	14 to 17	15.1	Pass
Peak Lower Spine Y Acceleration	G's	7 to 10	7.8	Pass
Peak Impactor Acceleration	G's	12 to 16	14.3	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
38.2	20.7	0.0	-20.0
Middle Thorax Deflection			
Max	Time	Min	Time
42.5	21.5	0.0	-3.3
Lower Thorax Deflection			
Max	Time	Min	Time
38.5	22.4	0.0	-19.4



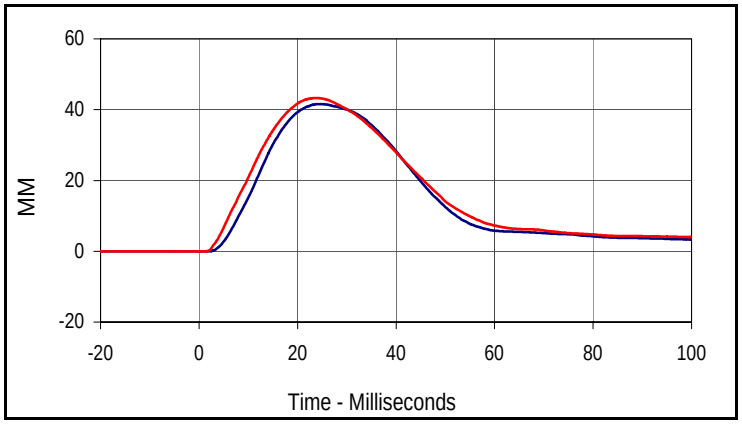
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.1	17.3	-6.0	46.2
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
7.8	16.6	-3.0	42.4



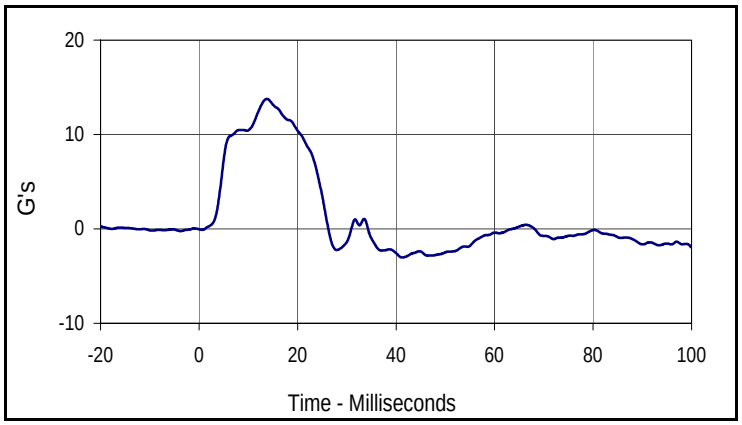
Curve Description			
Impactor Accleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
14.3	20.4	-0.2	52.8

Test Program:	SID IIs Abdomen Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	AB04A

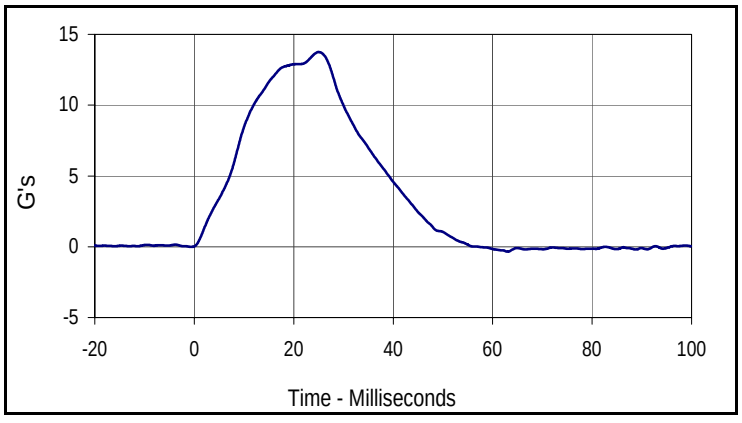
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.30 to 4.50	4.31	Pass
Upper Abdominal Rib Deflection	MM	39 to 47	41.6	Pass
Lower Abdominal Rib Deflection	MM	37 to 46	43.3	Pass
Peak Lower Spine Y Acceleration	G's	11 to 14	13.8	Pass
Peak Impactor Acceleration	G's	12 to 16	13.8	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	24.6	0.0	1.3
Curve Description			
Lower Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
43.3	24.0	0.0	-20.0



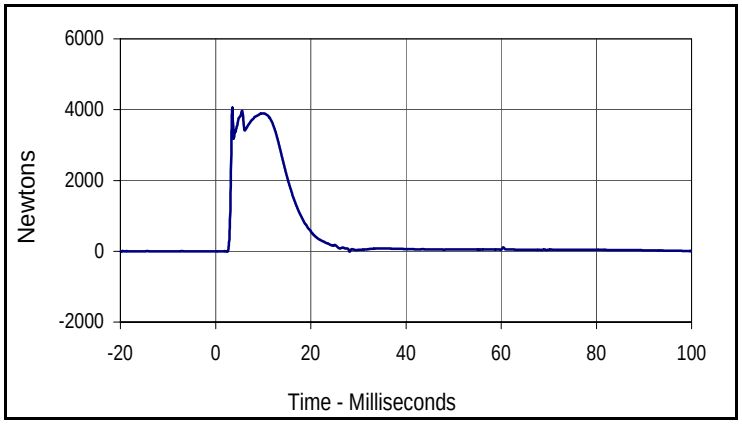
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
13.8	13.8	-3.0	41.3



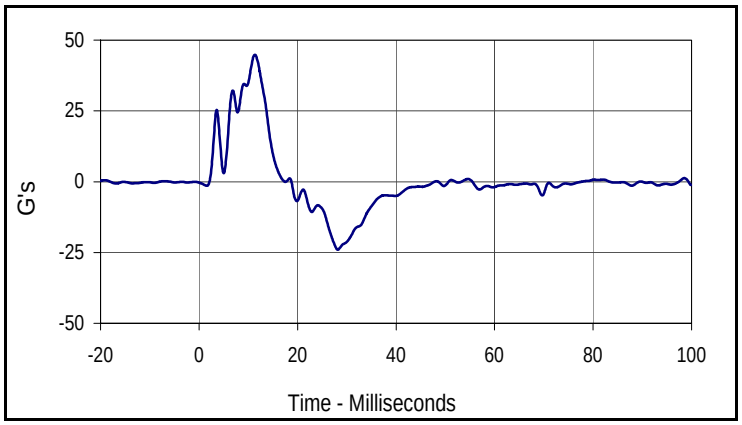
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
13.8	25.0	-0.3	63.0

Test Program:	SID IIs Pelvis Acetabulum Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	PA04A

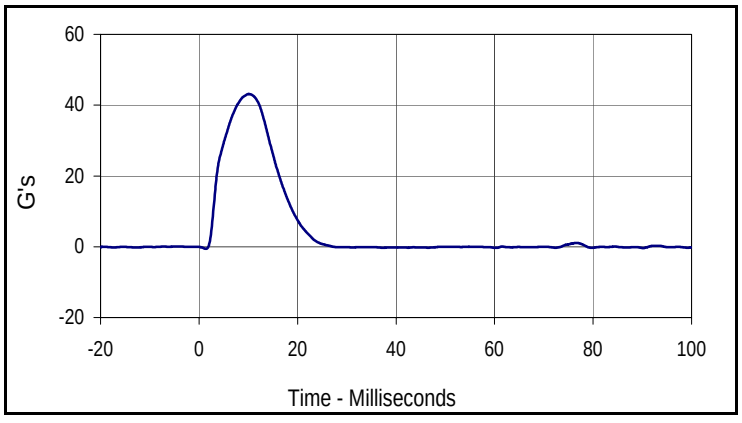
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.71	Pass
Peak Acetabulum Force	Newtons	3800 to 4600	4056.7	Pass
Peak Pelvis Y Acceleration	G's	41 to 50	44.9	Pass
Peak Impactor Acceleration	G's	38 to 47	43.1	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4056.7	3.5	-15.2	2.4



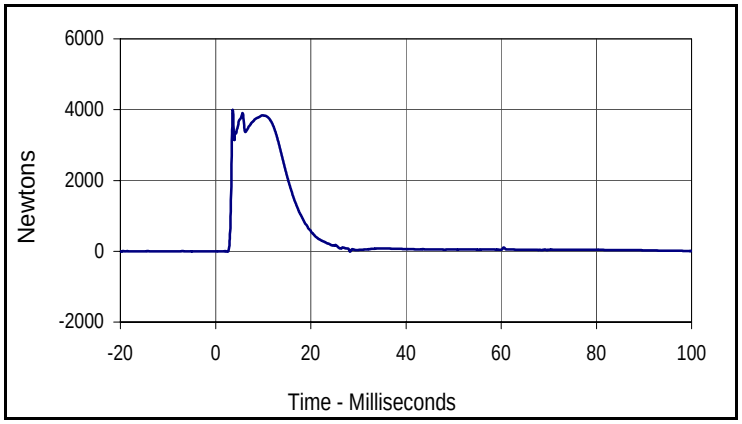
Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
44.9	11.3	-24.0	28.2



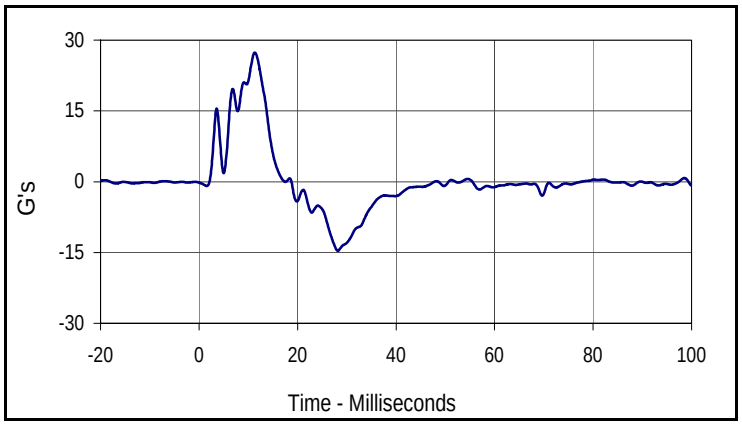
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
43.1	10.1	-0.6	1.4

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	4/17/09
ATD Serial No.:	299	Test I.D.:	PI04A

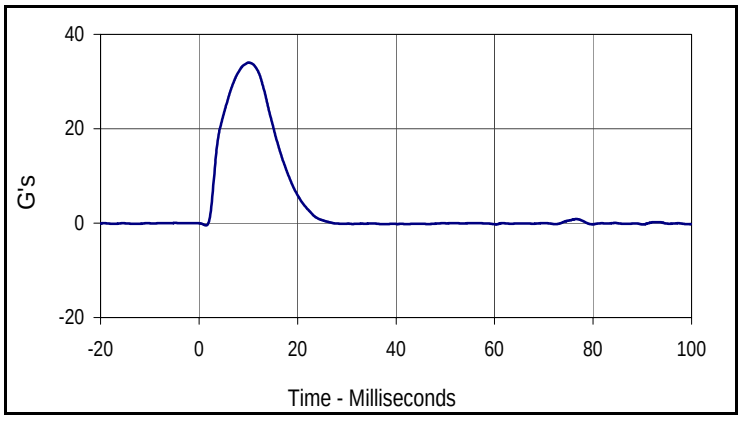
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.22	Pass
Peak Iliac Force	Newtons	3700 to 4500	3996.8	Pass
Peak Pelvis Y Acceleration	G's	27 to 33	27.3	Pass
Peak Impactor Acceleration	G's	34 to 40	34.0	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3996.8	3.6	-15.0	2.5



Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
27.3	11.3	-14.6	28.2



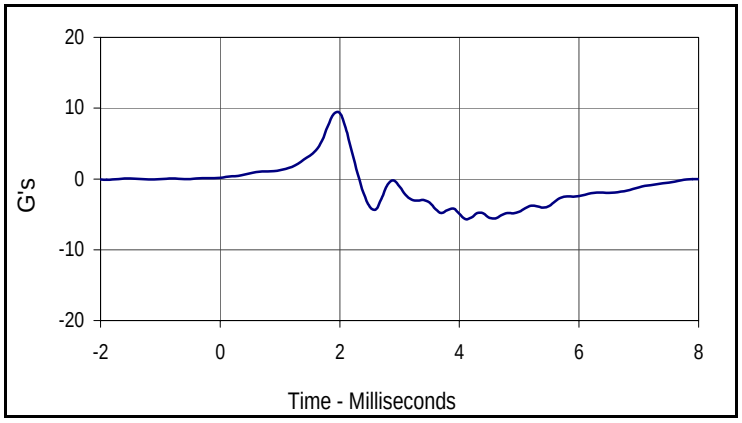
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
34.0	10.1	-0.5	1.4

APPENDIX C
POST-TEST CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program:	ES2re Lateral Head Drop Calibration	Test Date:	4/25/09
ATD Serial No.:	F035	Test I.D.:	HD04C

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	136.1	Pass
Peak Longitudinal Acceleration	G's	≤15	9.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	5.9	Pass
		Overall Test Results		Pass

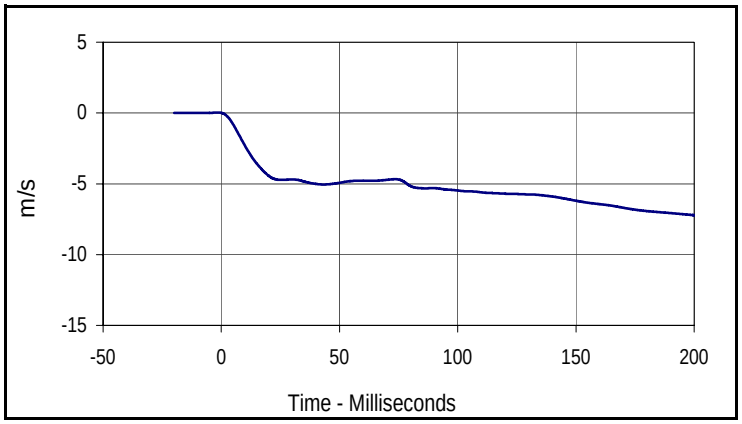
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
136.1	2.4	0.0	-1.0



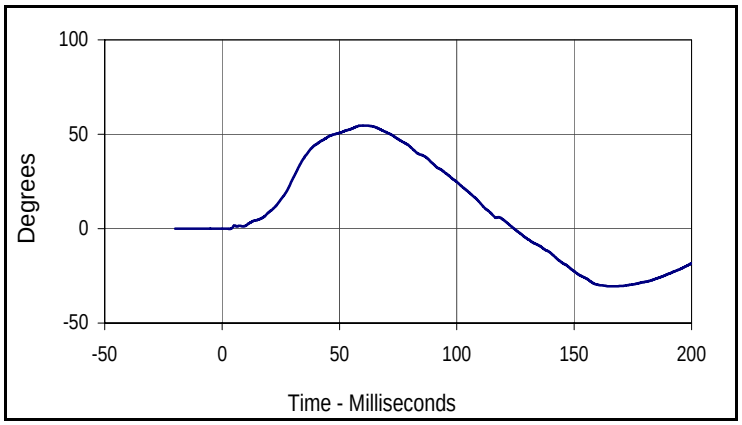
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
9.3	2.0	-5.7	4.1

Test Program:	ES2re Neck Calibration	Test Date:	4/25/09
ATD Serial No.:	F035	Test I.D.:	NB04B

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	3.50	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.047	Pass
	3 msec	m/s	-.250 to -.375	-0.326	Pass
	14 msec	m/s	-3.20 to -3.70	-3.36	Pass
Headform Rotation	Max	Degrees	49.0 to 58.0	54.6	Pass
	Time	msec	54.0 to 66.0	61.0	Pass
Maximum Rotation To Time Zero Crossing		msec	53.0 to 88.0	63.4	Pass
			Overall Test Results		Pass



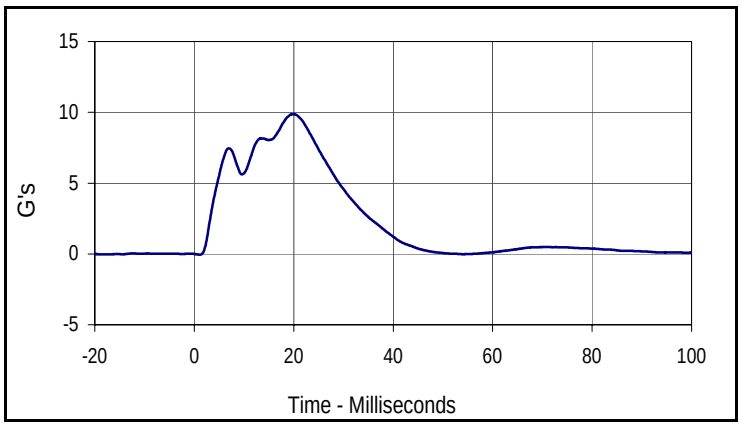
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-1.4	-7.2	200.0



Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
54.6	61.0	-30.5	164.9

Test Program:	ES2re Shoulder Calibration	Test Date:	4/25/09
ATD Serial No.:	F035	Test I.D.:	SH04B

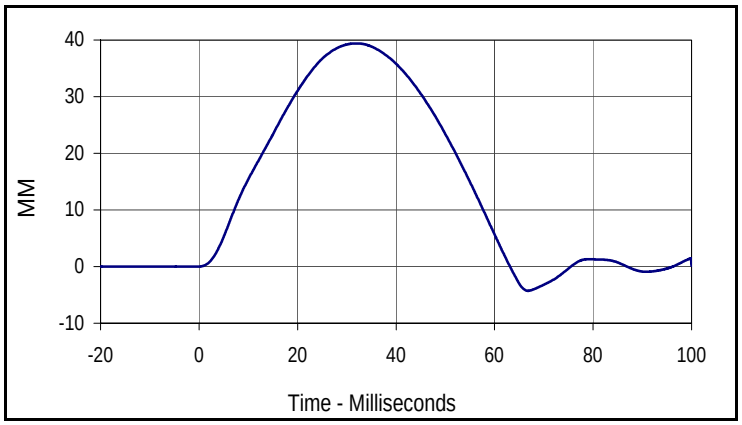
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	4.20 to 4.40	4.22	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.9	Pass
		Overall Test Results		Pass



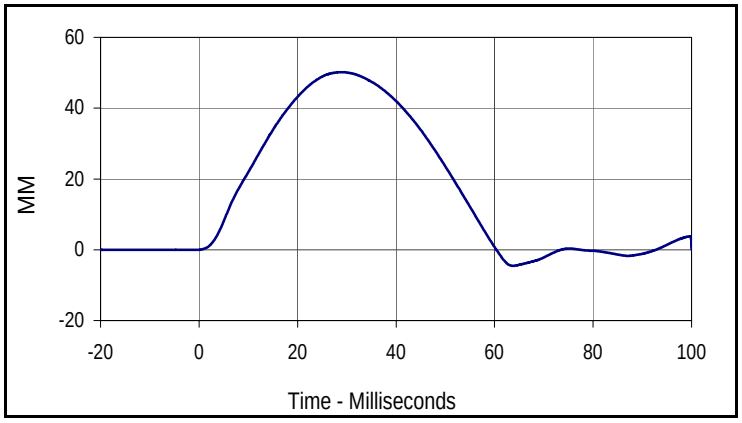
Curve Description			
Probe Impactor Acceleration			
CURNO	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
9.9	19.8	-0.1	1.1

Test Program:	ES2re Rib Module Calibration	Test Date:	4/25/09
ATD Serial No.:	F035 Rib #1	Test I.D.:	RIB04G, RIB04H

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	39.4	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	50.2	Pass
		Overall Test Results		Pass



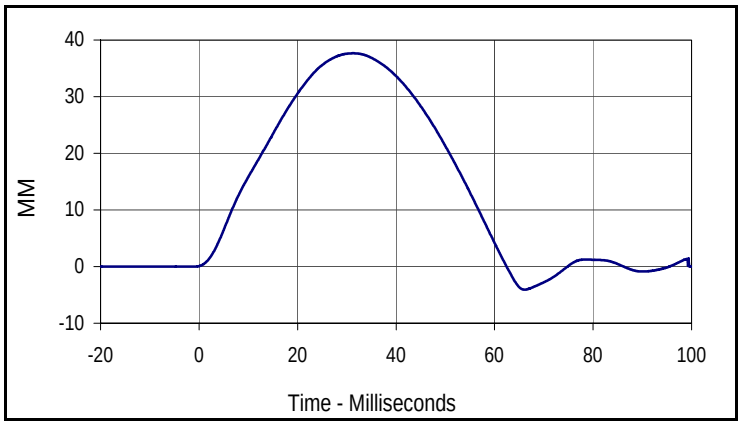
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
39.4	32.2	-4.3	67.0



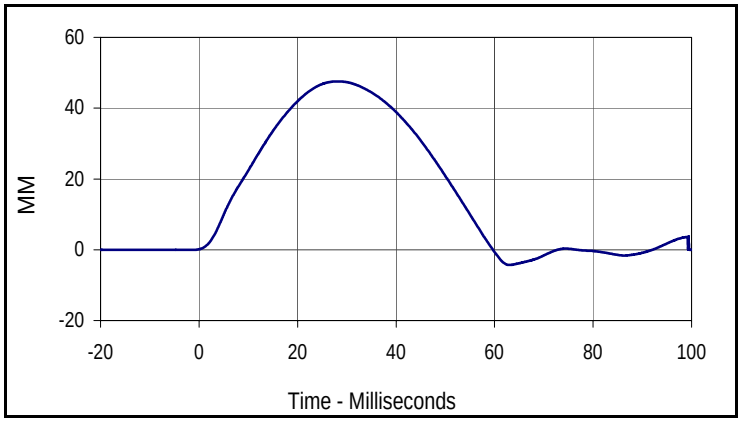
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
50.2	29.1	-4.5	63.9

Test Program:	ES2re Rib Module Calibration	Test Date:	4/25/09
ATD Serial No.:	F035 Rib #2	Test I.D.:	RIB04I, RIB04J

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	37.7	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	47.6	Pass
		Overall Test Results		Pass



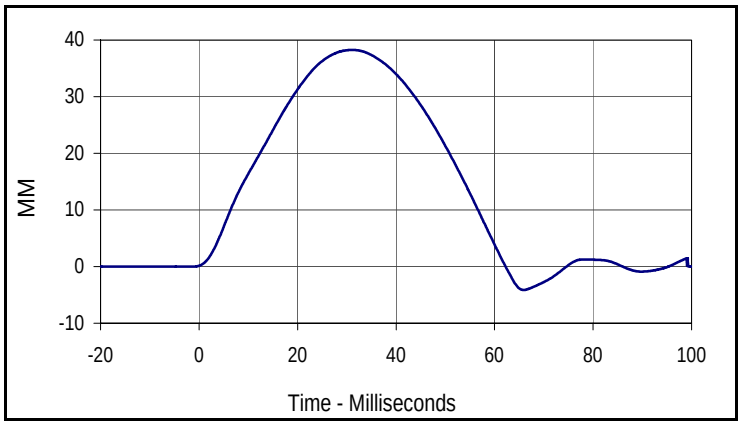
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.7	31.5	-4.1	66.3



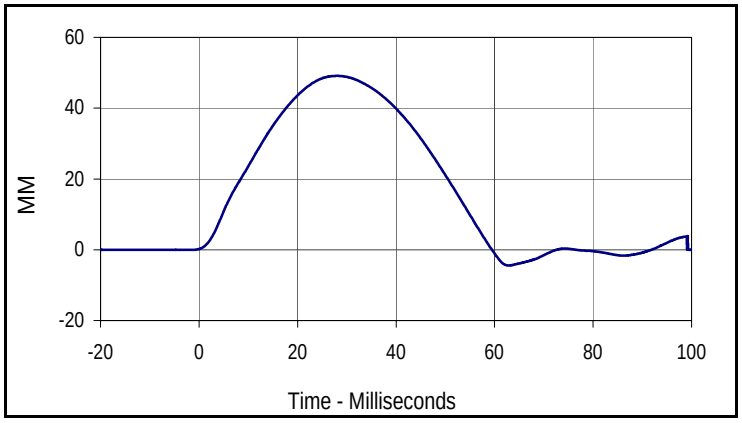
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
47.6	28.4	-4.3	63.2

Test Program:	ES2re Rib Module Calibration	Test Date:	4/25/09
ATD Serial No.:	F035 Rib #3	Test I.D.:	RIB04K, RIB04L

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	38.2	Pass
Peak Rib Deflection at 815 MM Drop Height	MM	46 to 51	49.1	Pass
		Overall Test Results		Pass



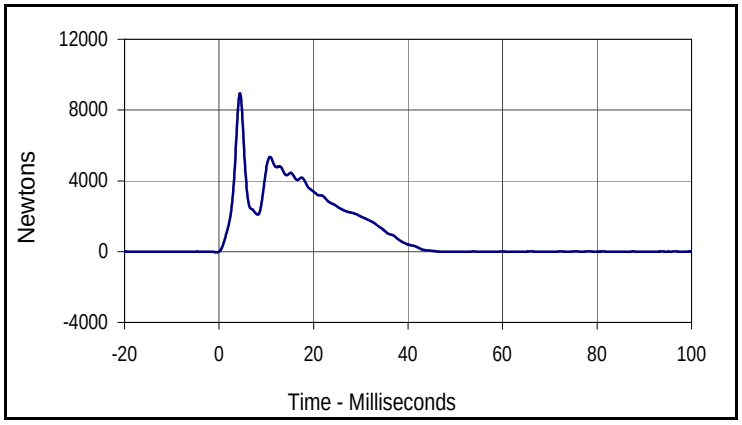
Curve Description			
Upper Rib Deflection (459 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
38.2	31.3	-4.1	66.1



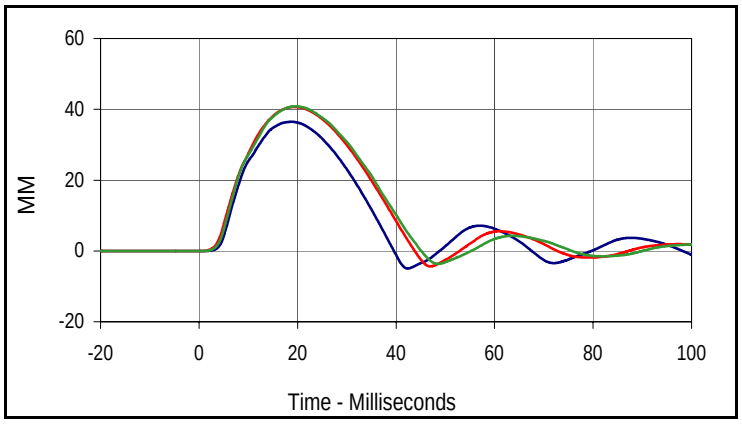
Curve Description			
Upper Rib Deflection (815 MM Drop Height)			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
49.1	28.2	-4.4	63.0

Test Program:	ES2re Thorax Calibration	Test Date:	4/25/09
ATD Serial No.:	F035	Test I.D.:	TH04B

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	5.52	Pass
Impactor Force	N	5100 to 6200	5351.8	Pass
	msec	> 6.0 msec	10.8	Pass
Upper Rib Deflection	MM	34 to 41	36.5	Pass
Middle Rib Deflection	MM	37 to 45	40.7	Pass
Lower Rib Deflection	MM	37 to 44	40.8	Pass
		Overall Test Results		Pass



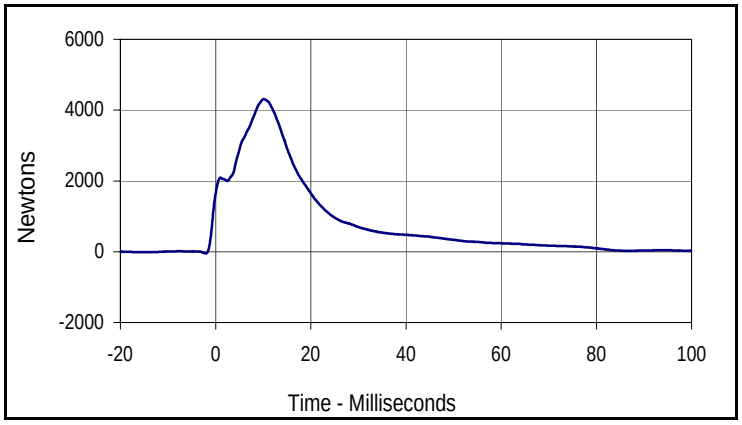
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
8944.0	4.4	-36.1	-0.5



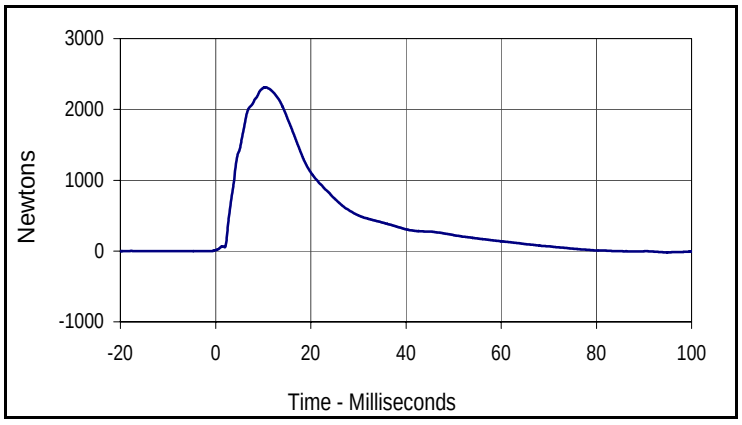
Curve Description			
Upper, Middle, Lower Rib Deflections			
CURNO(s)	Type	SAE Class	Units
002-003-004	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
36.5	18.8	-5.0	42.4
Max (Middle)	Time	Min (Middle)	Time
40.7	19.5	-4.4	47.0
Max (Lower)	Time	Min (Lower)	Time
40.8	19.6	-3.6	48.6

Test Program:	ES2re Abodomen Calibration	Test Date:	4/25/09
ATD Serial No.:	F035	Test I.D.:	Ab04B

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	3.94	Pass
Impactor Force	N	4000 to 4800	4312.5	Pass
	msec	10.6 to 13.0	11.1	Pass
Abdominal Force	N	2200 to 2700	2313.0	Pass
	msec	10.0 to 12.3	11.7	Pass
		Overall Test Results		Pass



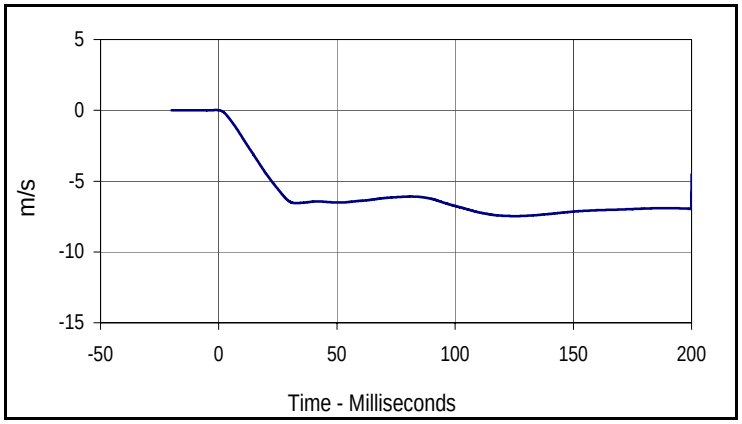
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4312.5	11.1	-51.1	-1.1



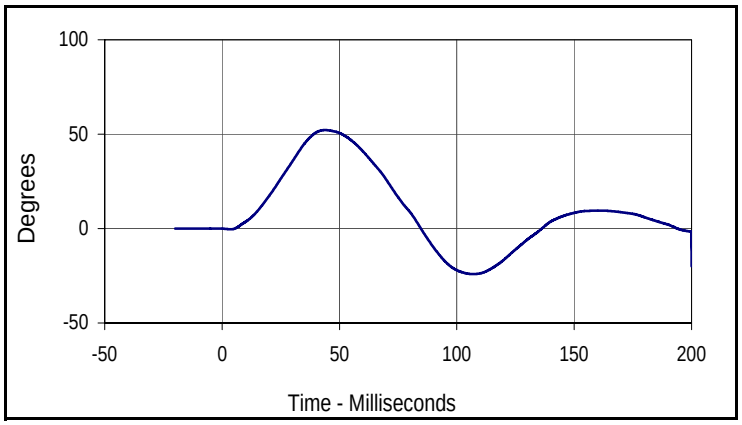
Curve Description			
Abdomen Sum Resultant			
CURNO	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2313.0	11.7	-19.0	96.1

Test Program:	ES2re Lumbar Spine Calibration	Test Date:	4/25/09
ATD Serial No.:	F035	Test I.D.:	LS04B

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	6.10	Pass
Pendulum Deceleration	1 msec	m/s	0.0 to -.050	-0.031	Pass
	3.7 msec	m/s	-.240 to -.425	-0.417	Pass
	27 msec	m/s	-5.80 to -6.50	-5.97	Pass
	30 msec	m/s	< -6.50	-6.45	Pass
Headform Rotation	Max	Degrees	45.0 to 55.0	52.2	Pass
	Time	msec	39.0 to 53.0	43.9	Pass
Maximum Rotation To Time Zero Crossing		msec	37.0 to 57.0	40.9	Pass
			Overall Test Results		Pass



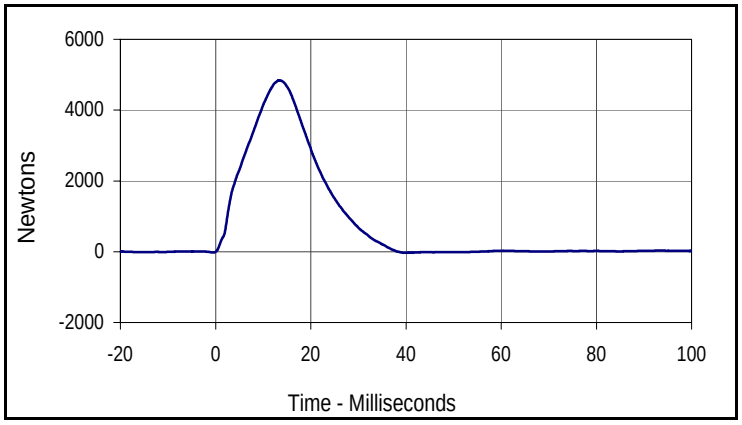
Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-1.0	-7.5	125.4



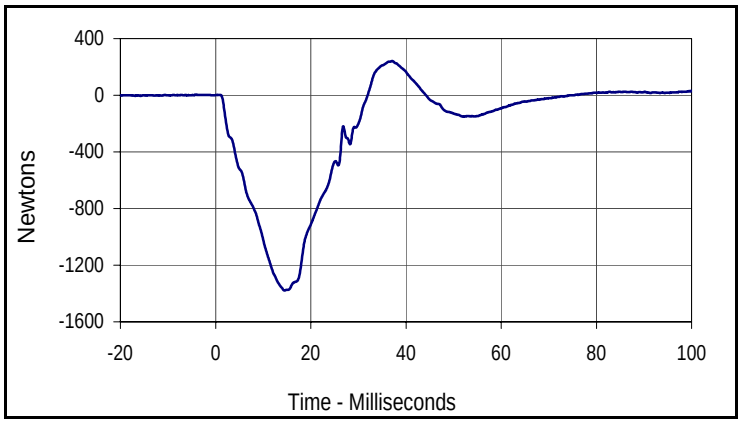
Curve Description			
Headform Rotation			
CURNO	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
52.2	43.9	-24.1	107.0

Test Program:	ES2re Pelvis Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	PL04B

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
Impactor Force	N	4700 to 5400	4842.1	Pass
	msec	11.8 to 16.1	13.4	Pass
Pubic Symphysis Load	N	-1230 to -1590	-1379.4	Pass
	msec	12.2 to 17.0	14.5	Pass
		Overall Test Results		Pass



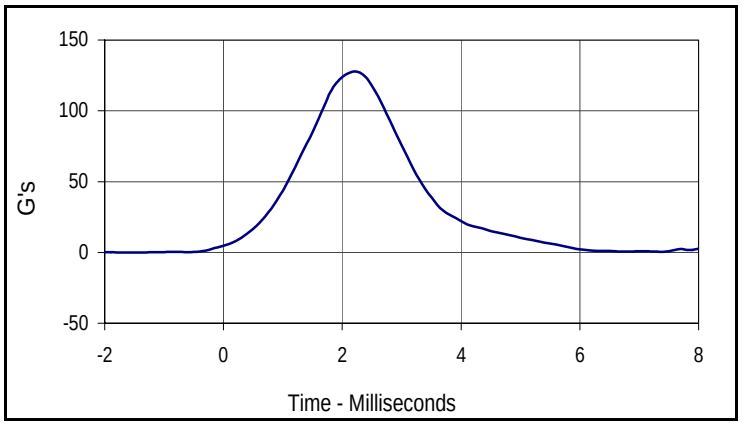
Curve Description			
Impactor Force			
CURNO	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4842.1	13.4	-29.5	40.2



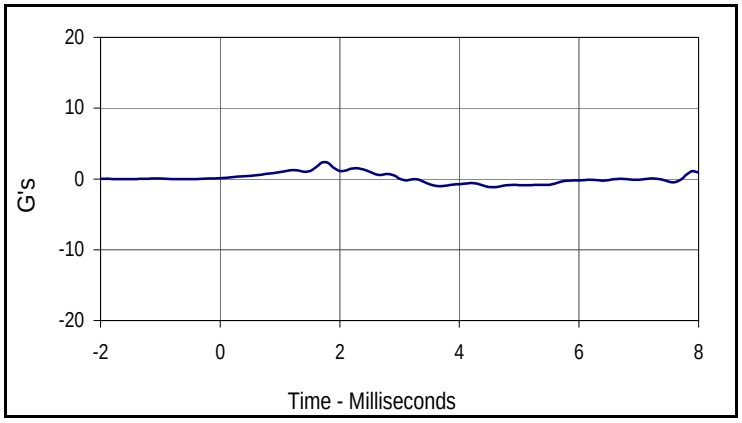
Curve Description			
Pubic FY			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
242.0	37.1	-1379.4	14.5

Test Program:	SID IIs Lateral Head Drop Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	HDS04B

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	127.8	Pass
Peak Longitudinal Acceleration	G's	≤15	2.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	8.1	Pass
		Overall Test Results		Pass



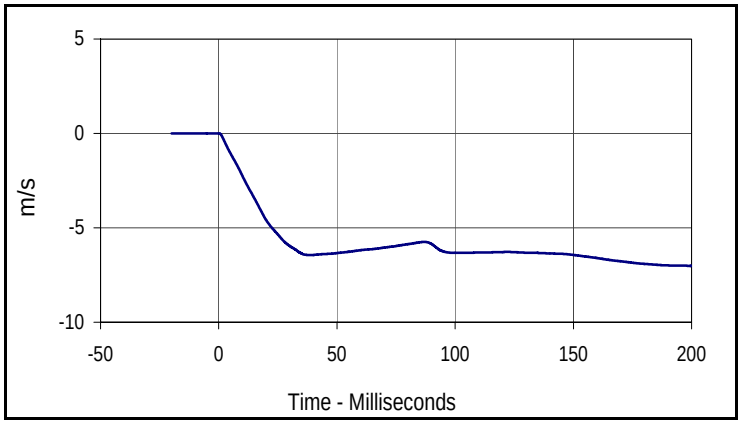
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
127.8	2.2	0.0	-1.6



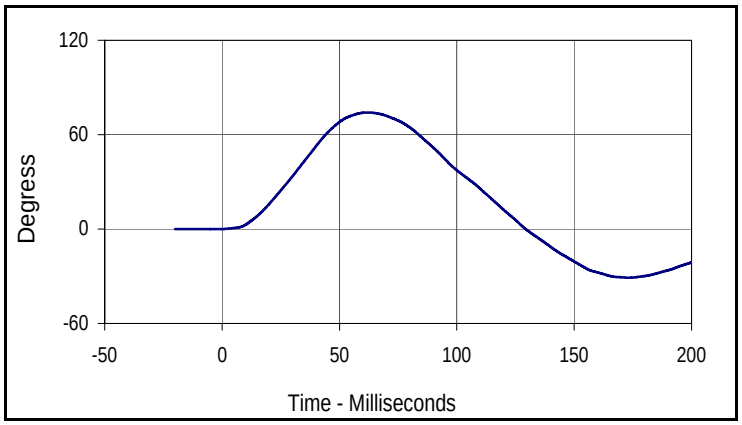
Curve Description			
Head X			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.3	1.7	-1.2	4.5

Test Program:	SID IIs Neck Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	NB04C

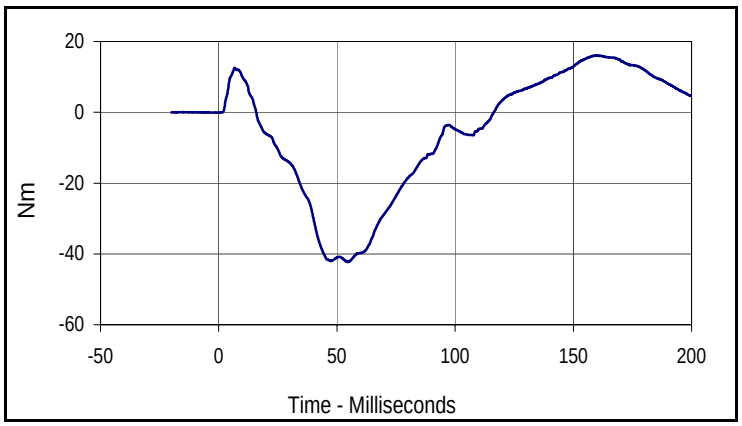
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.2	Pass
	15 msec	m/s	-3.30 to -4.10	-3.4	Pass
	20 msec	m/s	-4.40 to -5.40	-4.5	Pass
	25 msec	m/s	-5.40 to -6.10	-5.8	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.18	Pass
Translation-Rotation	Max	Degrees	71.0 to 81.0	74.1	Pass
	Time	msec	50.0 to 70.0	61.9	Pass
Peak Occipital Condyle Moment		Nm	-36.0 to -44.0	-42.3	Pass
Decaying Moment Time to Cross 0 Nm		msec	102.0 to 126.0	117.5	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	-0.3	-7.0	200.0



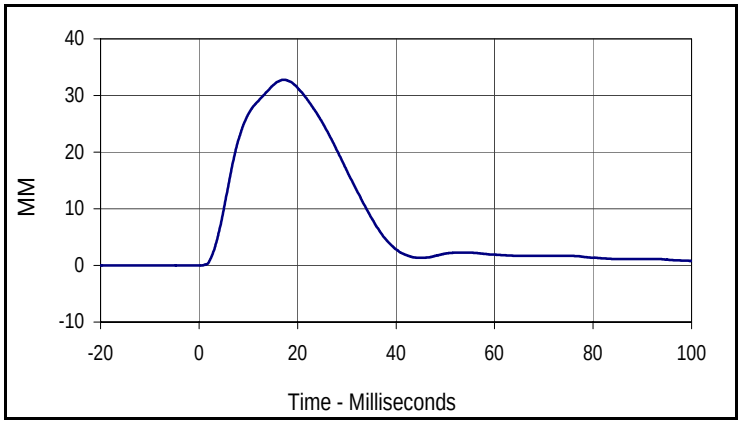
Curve Description			
Maximum Translation Rotation			
CURNO	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
74.1	61.9	-30.9	173.4



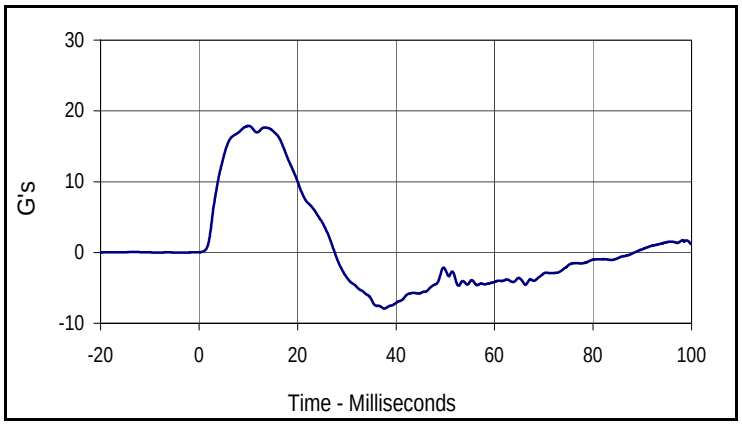
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.1	159.3	-42.3	54.7

Test Program:	SID IIs Shoulder Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	SH04B

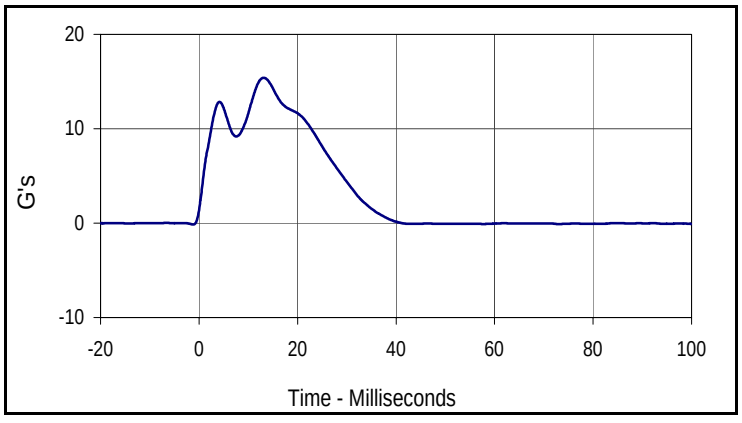
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.28	Pass
Shoulder Deflection	MM	28 to 37	32.8	Pass
Peak Upper Spine Y Acceleration	G's	17 to 22	17.9	Pass
Peak Impactor Acceleration	G's	13 to 18	15.4	Pass
		Overall Test Results		Pass



Curve Description			
Shoulder Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
32.8	17.2	0.0	-11.9



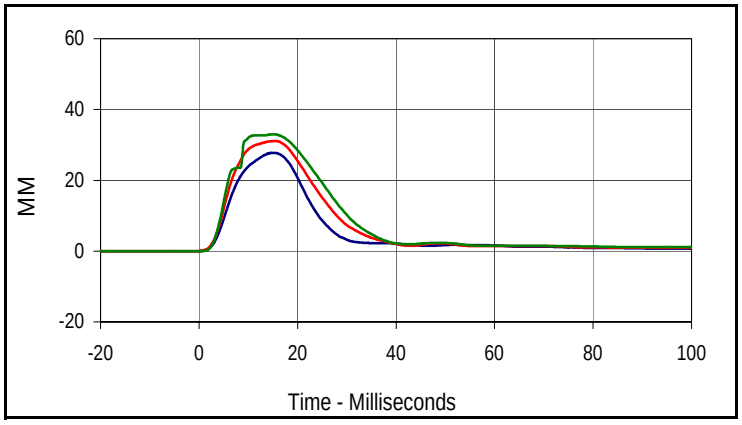
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
17.9	10.1	-7.9	37.6



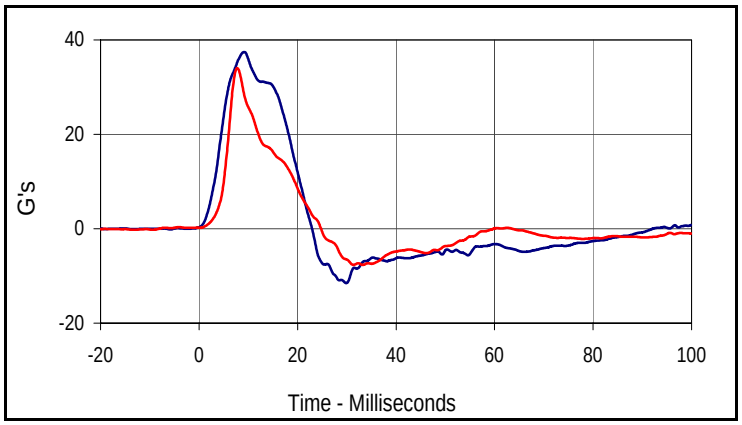
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.4	13.1	-0.1	-1.2

Test Program:	SID IIs Thorax with Arm Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	TH04C

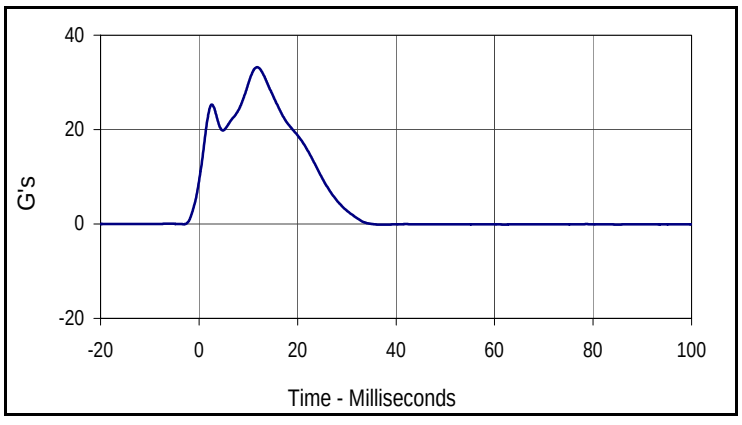
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.64	Pass
Shoulder Deflection	MM	31 to 40	32.9	Pass
Upper Thorax Rib Deflection	MM	26 to 32	27.7	Pass
Middle Abdominal Rib Deflection	MM	30 to 36	31.1	Pass
Lower Abdominal Rib Deflection	MM	32 to 38	33.0	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	37.5	Pass
Peak Lower Spine Y Acceleration	G's	28 to 35	34.0	Pass
Peak Impactor Acceleration	G's	31 to 36	33.2	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.7	15.1	0.0	-3.4
Middle Thorax Deflection			
Max	Time	Min	Time
31.1	15.2	0.0	-3.6
Lower Thorax Deflection			
Max	Time	Min	Time
33.0	15.3	0.0	-2.7



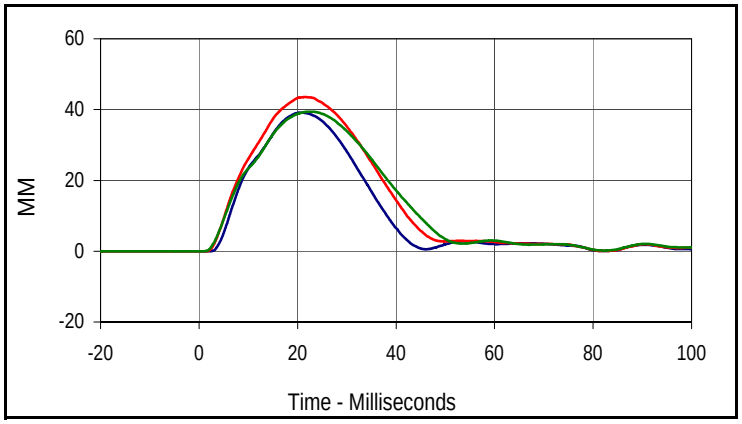
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
37.5	9.1	-11.5	29.9
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
34.0	7.7	-7.7	31.3



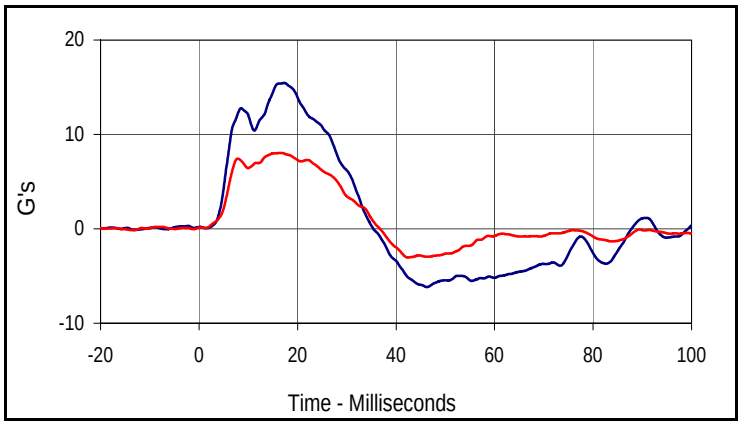
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
33.2	11.8	-0.1	36.7

Test Program:	SID IIs Thorax w/o Arm Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	TH04D

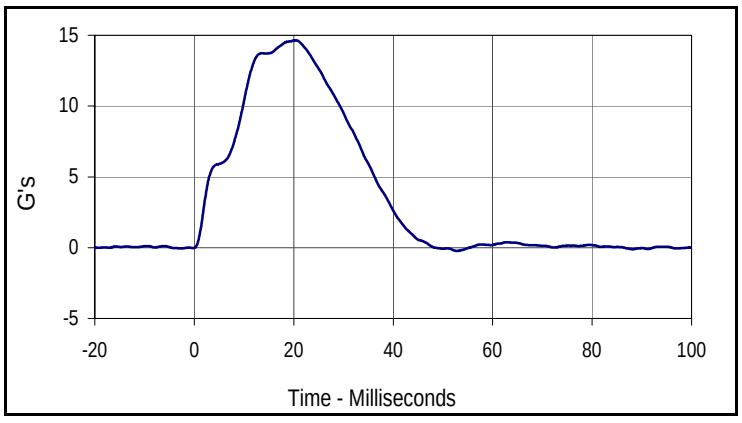
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.20 to 4.40	4.24	Pass
Upper Thorax Rib Deflection	MM	33 to 40	39.1	Pass
Middle Abdominal Rib Deflection	MM	39 to 45	43.5	Pass
Lower Abdominal Rib Deflection	MM	36 to 43	39.4	Pass
Peak Upper Spine Y Acceleration	G's	14 to 17	15.4	Pass
Peak Lower Spine Y Acceleration	G's	7 to 10	8.0	Pass
Peak Impactor Acceleration	G's	12 to 16	14.6	Pass
		Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
39.1	20.7	0.0	-20.0
Middle Thorax Deflection			
Max	Time	Min	Time
43.5	21.5	0.0	-3.3
Lower Thorax Deflection			
Max	Time	Min	Time
39.4	22.4	0.0	-19.4



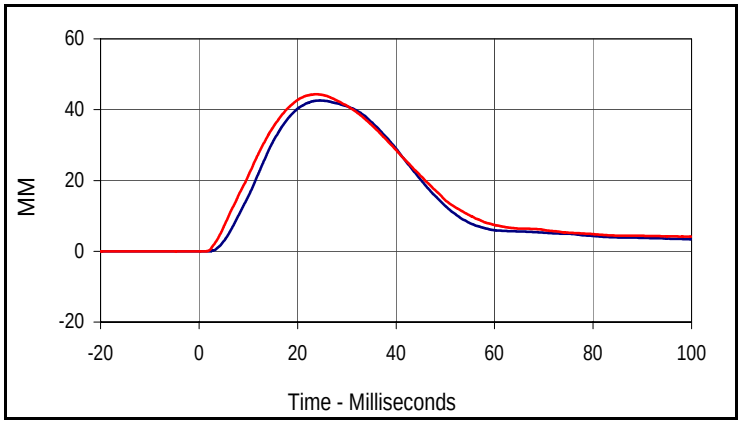
Curve Description			
Upper Spine Y Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.4	17.3	-6.2	46.2
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
8.0	16.6	-3.0	42.4



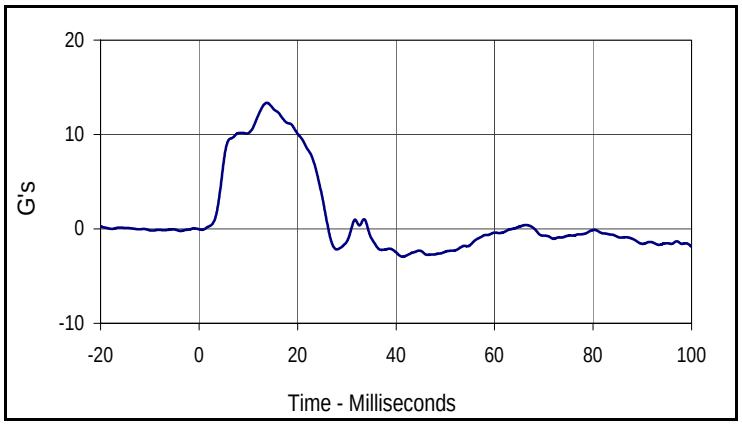
Curve Description			
Impactor Accleration			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
14.6	20.4	-0.2	52.8

Test Program:	SID IIs Abdomen Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	AB04B

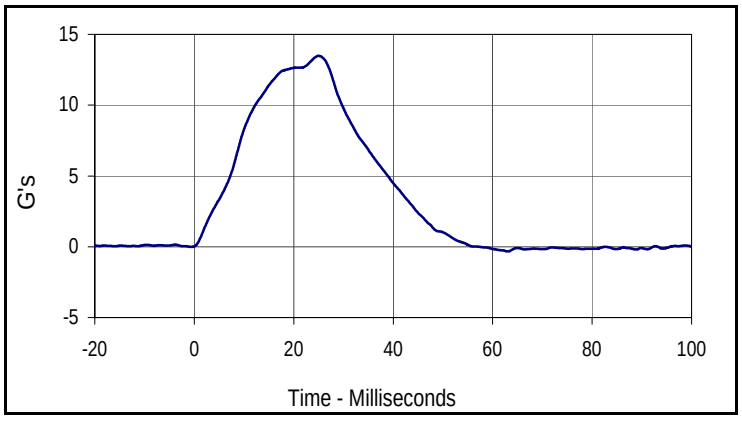
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.30 to 4.50	4.40	Pass
Upper Abdominal Rib Deflection	MM	39 to 47	42.6	Pass
Lower Abdominal Rib Deflection	MM	37 to 46	44.3	Pass
Peak Lower Spine Y Acceleration	G's	11 to 14	13.4	Pass
Peak Impactor Acceleration	G's	12 to 16	13.5	Pass
		Overall Test Results		Pass



Curve Description			
Upper Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
42.6	24.6	0.0	1.3
Curve Description			
Lower Abdominal Rib Deflection			
CURNO	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
44.3	24.0	0.0	-20.0



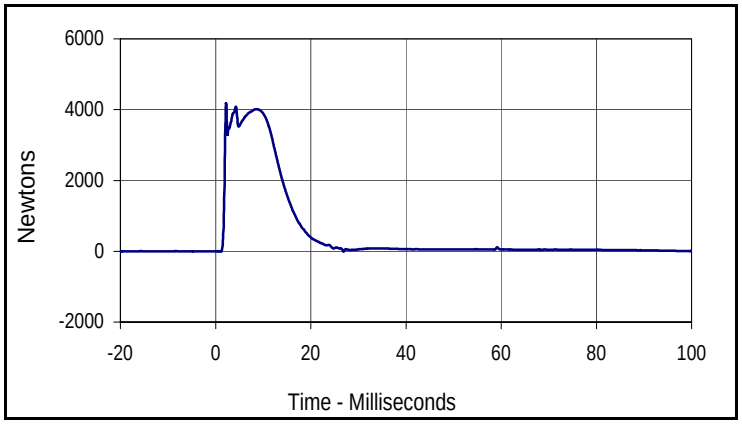
Curve Description			
Lower Spine Y Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
13.4	13.8	-2.9	41.3



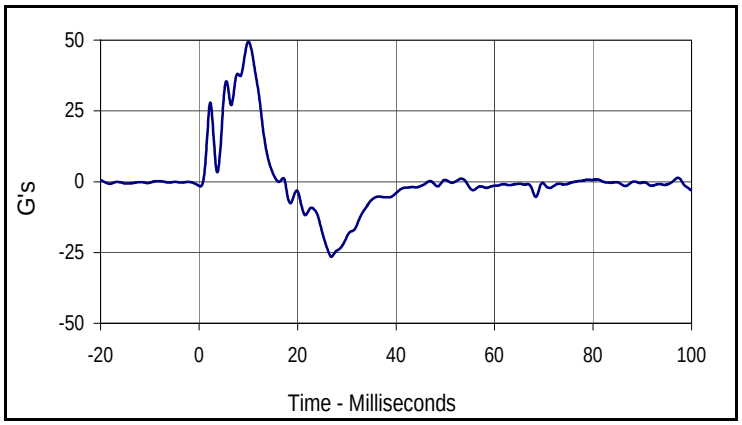
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
13.5	25.0	-0.3	63.0

Test Program:	SID IIs Pelvis Acetabulum Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	PA04B

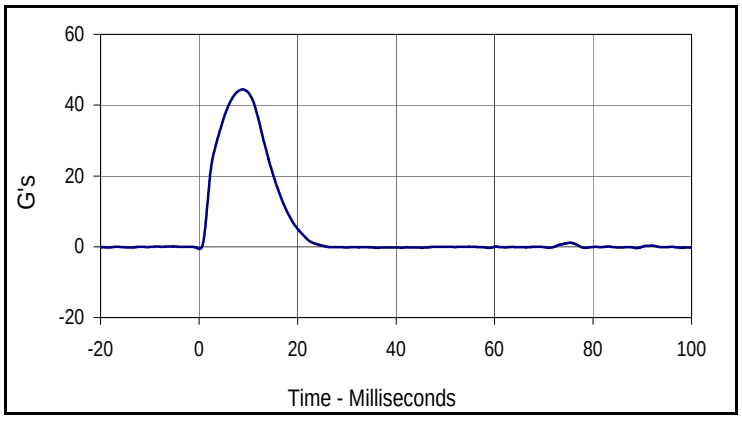
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	6.60 to 6.80	6.61	Pass
Peak Acetabulum Force	Newtons	3800 to 4600	4179.3	Pass
Peak Pelvis Y Acceleration	G's	41 to 50	49.4	Pass
Peak Impactor Acceleration	G's	38 to 47	44.5	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4179.3	2.2	-15.7	1.1



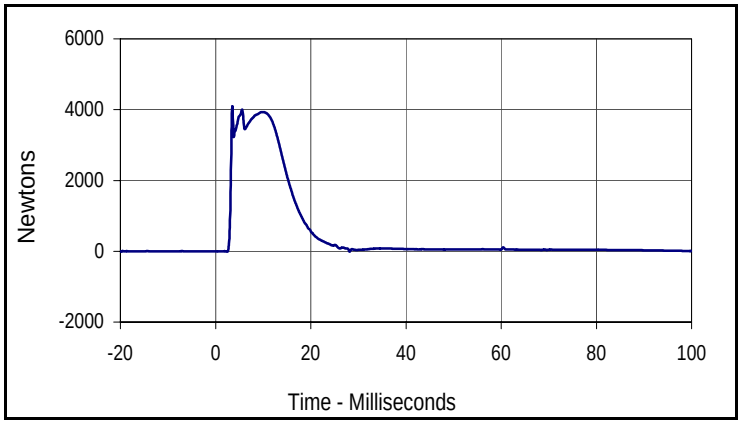
Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
49.4	10.0	-26.5	26.9



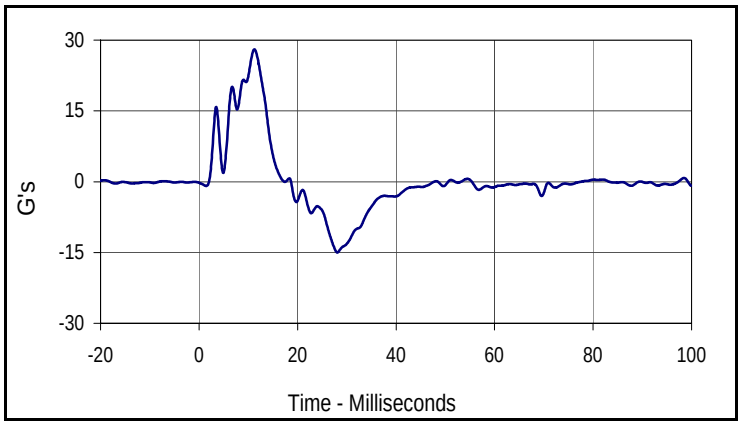
Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
44.5	8.8	-0.6	0.1

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	4/26/09
ATD Serial No.:	299	Test I.D.:	PI04B

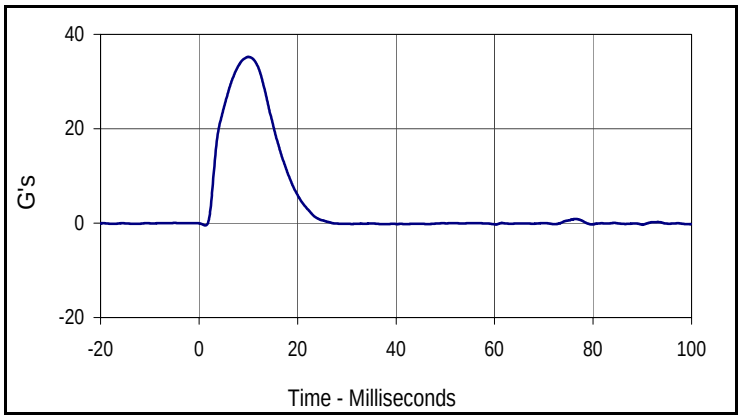
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.36	Pass
Peak Iliac Force	Newtons	3700 to 4500	4096.7	Pass
Peak Pelvis Y Acceleration	G's	27 to 33	28.0	Pass
Peak Impactor Acceleration	G's	34 to 40	35.2	Pass
		Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4096.7	3.5	-15.3	2.4



Curve Description			
Pelvis Y Acceleration			
CURNO	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
28.0	11.2	-15.0	28.1



Curve Description			
Impactor Acceleration			
CURNO	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
35.2	10.0	-0.5	1.3