

REPORT NUMBER: NCAP-KAR-11-008

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**FUI HEAVY INDUSTRIES
2011 SUBARU OUTBACK 2.5I AWD 5-DOOR MPV**

NHTSA NUMBER: MB5500

**PREPARED BY:
KARCO ENGINEERING, LLC.
9270 HOLLY ROAD
ADELANTO, CA 92301**



AUGUST 13, 2010

FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
SAFETY PERFORMANCE STANDARDS
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE, SE
ROOM W43-410
WASHINGTON, DC 20590**

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: 
Mr. Kelsey A. Chiu, Engineering Department Supervisor
KARCO Engineering, LLC.

Reviewed By: 
Ms. Angie Valenzuela, Quality Assurance Manager
KARCO Engineering, LLC.

Approved By: 
Mr. Frank D. Richardson, Program Manager
KARCO Engineering, LLC.

Approval Date: August 20, 2010

FINAL REPORT ACCEPTANCE BY OCWS:


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

Date: 


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

Date: 

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NCAP-KAR-11-008		2. Government Accession No.		3. Recipient's Catalog No.																																																					
4. Title and Subtitle Final Report of New Car Assessment Program Testing of a 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No. MB5500				5. Report Date August 20, 2010																																																					
				6. Performing Organization Code KAR																																																					
7. Authors Mr. Kelsey A. Chiu, Engineering Department Supervisor, KARCO Mr. Frank Richardson, Program Manager, KARCO				8. Performing Organization Report No. TR-P30001-04-NC																																																					
9. Performing Organization Name and Address KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA, 92301				10. Work Unit No.																																																					
				11. Contract or Grant No. DTNH22-06-D-00027																																																					
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C 20590				13. Type of Report and Period Covered Final Test Report, August 20, 2010																																																					
				14. Sponsoring Agency Code NPS-10																																																					
15. Supplementary Notes																																																									
16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2011 Subaru Outback 2.5i AWD 5-Door MPV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301 and foot well intrusion performance. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on August 13, 2010. The impact velocity of the vehicle was 56.14 km/h and the ambient temperature at the barrier face at the time of impact was 37.2 deg. C. The target vehicle's maximum post-test maximum crush was 503 mm at DPD 3. The test vehicle's performance is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700.0</td> <td>226.1</td> <td>700.0</td> <td>261.8</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>32</td> <td>52</td> <td>17</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.23</td> <td>1</td> <td>0.45</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1120.8</td> <td>2620</td> <td>510.5</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>265.6</td> <td>2520</td> <td>330.9</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>903.1</td> <td>6805</td> <td>931.3</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>570.9</td> <td>6805</td> <td>2005.2</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700.0	226.1	700.0	261.8	Maximum Chest Compression	mm	63	32	52	17	Nij	N/A	1	0.23	1	0.45	Neck Tension	N	4170	1120.8	2620	510.5	Neck Compression	N	4000	265.6	2520	330.9	Left Femur Force	N	10008	903.1	6805	931.3	Right Femur Force	N	10008	570.9	6805	2005.2
Measurement Description	Units	Driver ATD		Passenger ATD																																																					
		Threshold	Result	Threshold	Result																																																				
Head Injury Criteria (HIC ₁₅)	N/A	700.0	226.1	700.0	261.8																																																				
Maximum Chest Compression	mm	63	32	52	17																																																				
Nij	N/A	1	0.23	1	0.45																																																				
Neck Tension	N	4170	1120.8	2620	510.5																																																				
Neck Compression	N	4000	265.6	2520	330.9																																																				
Left Femur Force	N	10008	903.1	6805	931.3																																																				
Right Femur Force	N	10008	570.9	6805	2005.2																																																				
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)				18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Admin. Technical Reference Division 1200 New Jersey Ave., SE Washington, DC 20590																																																					
19. Security Classification of this report UNCLASSIFIED		20. Security Classification of this page UNCLASSIFIED		21. No. of Pages 110																																																					
				22. Price																																																					

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of the Test	1
2	Occupant and Vehicle Information / Data Sheets	3
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Seat Adjustment, Fuel Systems, and Steering Wheel Data	8
3	Dummy Longitudinal Clearance Dimensions	10
4	Dummy Lateral Clearance Dimensions	11
5	Seat Belt Positioning Data	12
6	High-Speed Camera Locations and Data	13
7	Vehicle Accelerometer Locations	15
8	Photographic Reference Target Locations	16
9	Load Cell Locations on Fixed Barrier	17
10	Test Vehicle Camera and Instrumentation Summary	18
11	Post-Test Observations	19
12	Vehicle Profile Measurements	20
13	Accident Investigation Division Data	22
14	Vehicle Intrusion Measurements	23
15	Summary of FMVSS 212 and FMVSS 219 (Partial) Data	28
16	FMVSS 301 Fuel System Integrity Post-Impact Data	29
17	FMVSS 301 Fuel Static Rollover Data	30
18	Dummy / Vehicle Temperature Stabilization	31
<u>Appendix</u>		<u>Page No.</u>
A	Photographs	A
B	Dummy Response Data Traces	B
C	Dummy Calibration and Performance Verification Data	C

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program, sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-06-D-00027. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure, dated January, 2010.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2011 Subaru Outback 2.5i AWD 5-Door MPV at a velocity of 56.1 km/h. The test was performed at KARCO Engineering, LLC. on August 13, 2010. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

Three (3) real-time camera and sixteen (16) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E 50th percentile male anthropomorphic test device (ATD) was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck force transducers, right / left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure the dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 035) and the right-front passenger (position 2) ATD (Serial No. 141) were calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 128 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces.

There was 100% windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the test vehicle was 503 mm located at the vehicle centerline. Both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver ATD's head contacted the airbag and the headrest. The upper torso contacted the airbag. Both the left and right knees contacted the knee bolster.

The passenger's visible contact points were as follows: The passenger ATD's head contacted the airbag and headrest. The upper torso contacted the airbag. Both the left and right knees contacted the glovebox.

The occupant data is summarized below:

ATD Position	HIC ₁₅	T ¹	T ²	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50th)	226.1	66.1	81.1	-32.4	0.22	1120.8	-265.6	-903.1	-570.9
Passenger (5th)	261.8	59.3	74.3	-17.4	0.45	510.5	-330.9	-931.3	-2005.2

SECTION 2
DATA SHEETS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

CONVERSION FACTORS

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

DATA SHEET NO. 1**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MB5500
Make	Subaru
Model	Outback
Body Style	5-Door MPV
VIN	4S4BRBAC8B1316760
Body Color	Graphite Gray Metallic
Delivery Date	7/26/2010
Odometer Reading (mi)	8
Odometer Reading (km)	12.9
Dealer	Irvine Subaru
Transmission	6-Speed Manual
Final Drive	AWD
Type / No. of Cylinders	Horizontally-Opposed 4
Engine Displacement (L)	2.5
Engine Placement	Longitudinal
Roof Rack	Yes
Sunroof / T-Top	No
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes

Anti-Lock Brakes	Yes
All Wheel Drive	Yes
Power Steering	Yes
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	No
Pre-Tensioners	Yes
Load Limiters	Yes
Automatic Door Locks	No
Tilt Steering	Yes
Other	n/a

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

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Fuji Heavy Industries Ltd.
Date of Manufacture	May-10

GVWR (kg)	2080
GAWR Front (kg)	1070
GAWR Rear (kg)	1060

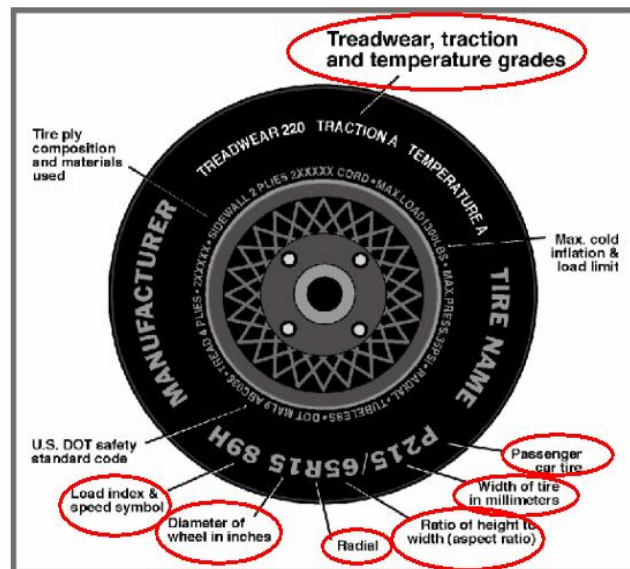
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Weight (VCW) (kg)				406.0
Cargo Weight (RCLW) (kg)				65.8

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	210
Recommended Tire Size	P215/70R16	P215/70R16
Tire Size on Vehicle	P215/70R16	P215/70R16
Tire Manufacturer	Continental	Continental
Tire Model	Conti Pro Contact	Conti Pro Contact
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index / Speed Symbol	99S	9S
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	A309 3PK 1910	A309 3PK 1910
DOT Safety Code Right	A309 3PK 1910	A309 3PK 1910

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

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	439.0	347.5		460.0	434.0	
Right	kg	402.0	331.5		419.5	408.5	
Ratio	%	55.3%	44.7%	100.0%	51.1%	48.9%	100.0%
Total	kg	841.0	679.0	1520.0	879.5	842.5	1722.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1520.0	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	67.8	C
Calculated Vehicle Target Weightt (TVTW)	kg	1728.8	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	790	798	811	821	1231
As Tested	mm	778	785	780	792	1348
Post-Test	mm	810	838	768	790	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2755
Total Vehicle Length at Left Side	mm	4031
Total Vehicle Length at Centerline	mm	4782
Total Vehicle Length at Right Side	mm	4023
Weight of Ballast in Cargo Area	kg	85
Weight of Vehicle Components Removed	kg	28
Amount of Stoddard Solvent in Fuel Tank	L	65.15

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Hub Caps (2.0 kg), Trunk Liner (2.5 kg), Spare tire and tools (16.5 kg), Trunk lining and foam (7.0 kg)

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

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length	4782	4287	-495
2	Total Width	1813	1945	132
3	Bumper Top Height	623	710	87
4	Bumper Bottom Height	488	600	112
5	Longitudinal Member Top Height	580	680	100
6	Distance Between Longitudinal Members	855	915	60
7	Longitudinal Member Width	50	70	20
8	Engine Top Height	875	947	72
9	Engine Bottom Height	253	331	78
10	Engine and Gearbox Width	750	750	0
11	Front Bumper to Engine Distance	525	275	-250
12	Front Shock Absorber Fixing Height	952	985	33
13	Bonnet Leading Edge Height	745	885	140
14	Front Shock Absorber Fixing Width	1140	1130	-10
15	Front Bumper to Front Axle Distance	960	645	-315
16	Front Axle to A-Pillar Distance	485	480	-5
17	A-Pillar to B-Pillar Distance	1028	1026	-2
18	B-Pillar to Rear Axle Distance	1160	1145	-15
19	B-Pillar to C-Pillar Distance	918	921	3
20	Roof Sill Bottom Height	1423	1478	55
21	Roof Sill Top Height	1525	1568	43
22	Floor Sill Bottom Height	183	296	113
23	Floor Sill Top Height	450	468	18

All measurements in millimeters.

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

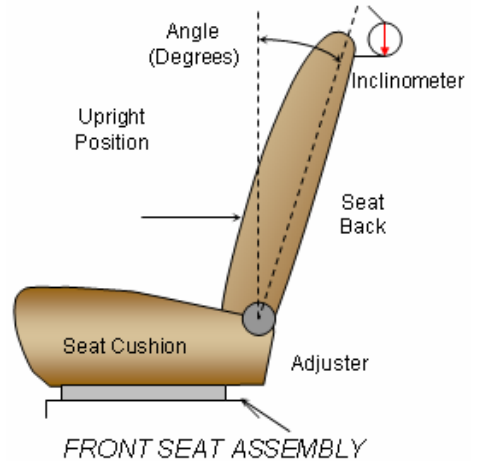
NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10

NOMINAL DESIGN RIDING POSITION

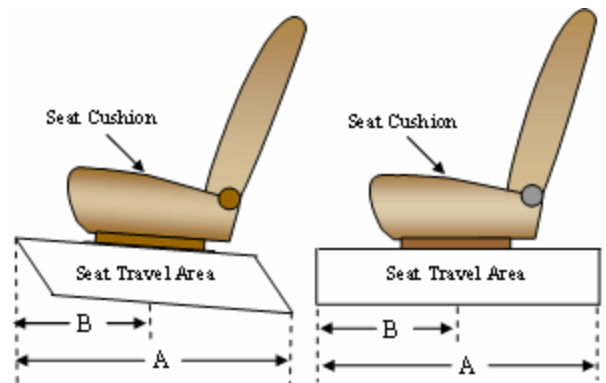
The procedure for the driver is as follows: the seat back is set to the manufacturer's designated angle; seat back angle is measured at the headrest post using a digital inclinometer. The procedure for the passenger is as follows: the seat back is set to position the transverse instrumentation platform of the dummy's head at $0^\circ \pm 0.5^\circ$; seat back angle is measured at the headrest post using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	9.9
Passenger Seat Back Angle	1.9

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 at the manufacturer's designated cushion angle, full down for this test. The passenger's seat is set to the forward most position where the ATD will not contact any interior panels. The passenger's seat was not height adjustable, and there was no cushion angle adjustment.



Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	305 mm	153 mm
Passenger Seat	252 mm	0 mm

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer's design position for a 50th percentile adult male ATD for the driver, and a 5th percentile adult female ATD for the passenger. Position one (1) is the uppermost position.

Seating Position	Total No. of Positions	Placed in Position
Driver Seat	5	2
Passenger Seat	5	3

DATA SHEET NO. 2 ... (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

NHTSA No.: MB5500

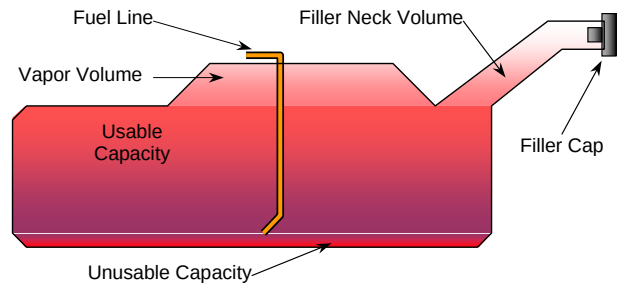
Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	70.02
Usable Capacity of "Optional Tank"	
92 - 94% of Usable Capacity	64.42 to 65.82
Actual Amount of Stoddard Solvent Used	65.15
1/3 of Usable Capacity	23.34

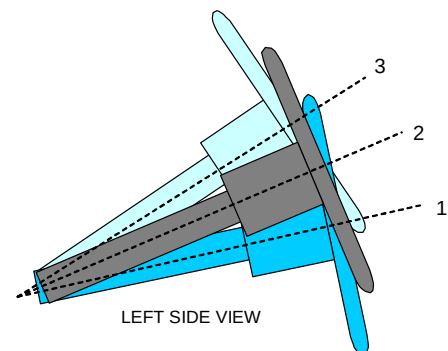
The test vehicle is equipped with an electric fuel pump. The fuel pump will operate for a few seconds after the ignition switch is turned on. After that, the pump operates only while the engine is running. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area under the rear seat.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. A digital inclinometer is used to measure a plate which is placed across the rim of the steering wheel for angular measurements. A tape measure is used with a reference mark on the steering column to measure telescoping travel.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	20.7	76
Geometric Center Position, No. 2	22.4	95
Uppermost Position, No. 3	24.2	114
Telescoping Steering Wheel Travel		38
Test Position	22.4	95

DATA SHEET NO. 3

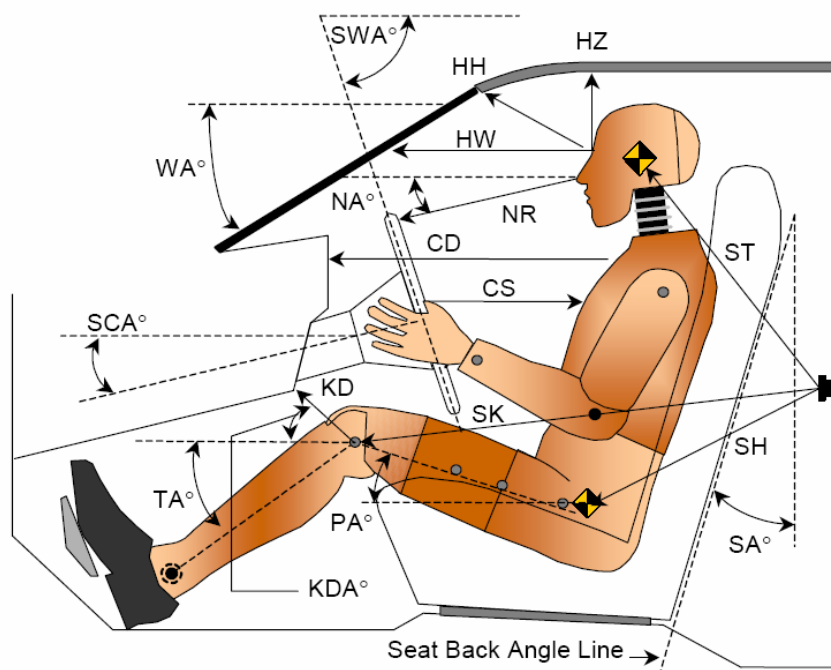
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10



Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		28.6		
SWA°	Steering Wheel Angle		67.6		
SCA°	Steering Column Angle		22.4		
SA°	Seat Back Angle (On Headrest Post)		9.9		1.9
HZ	Head to Roof	232	90.0	234	90.0
HH	Head to Header	380	28.4	300	53.9
HW	Head to Windshield	695	0.0	602	0.0
HR	Head to Side Header	285		305	
NR	Nose to Rim	424	9.5	482	22.5
CD	Chest to Dash	541	14.2	439	16.5
CS	Chest to Steering Hub	355	7.0		
RA	Rim to Abdomen	221	0.0		
KDL	Left Knee to Dash	196	32.0	107	38.5
KDR	Right Knee to Dash	186	29.0	122	38.4
PA°	Pelvic Angle		24.4		21.9
TA°	Tibia Angle		39.8		47.3
SK	Striker to Knee	601	8.8	712	6.3
ST	Striker to Head	477	85.5	471	60.8
SH	Striker to H-Point	281	48.7	408	23.6

DATA SHEET NO. 4

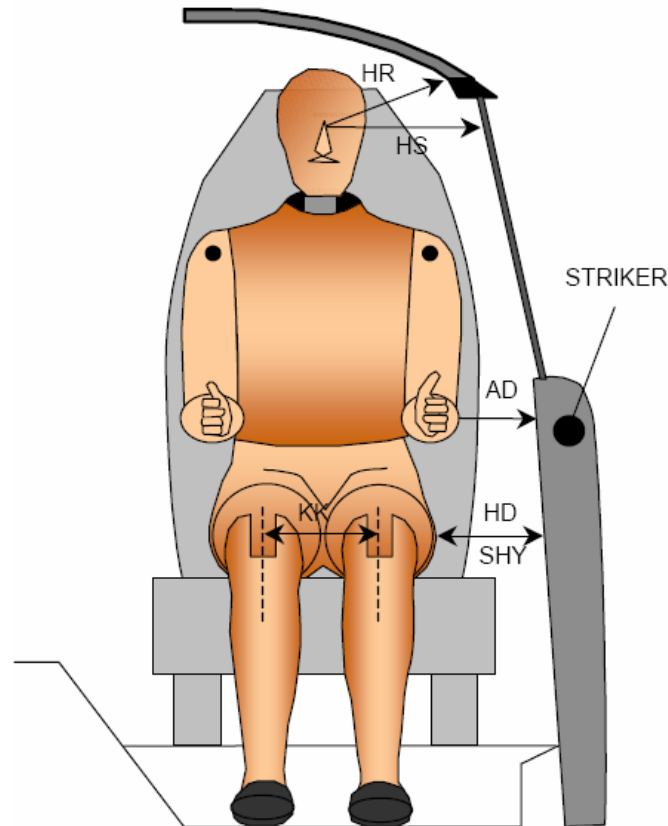
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10



Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	130	80
HD	H-Point to Door	147	181
HR	Head to Side Header	285	305
HS	Head to Side Window	355	363
KK	Knee to Knee	290	301
SHY	Striker to H-Point (Y-Direction)	240	270
AA	Ankle to Ankle	265	175

DATA SHEET NO. 5

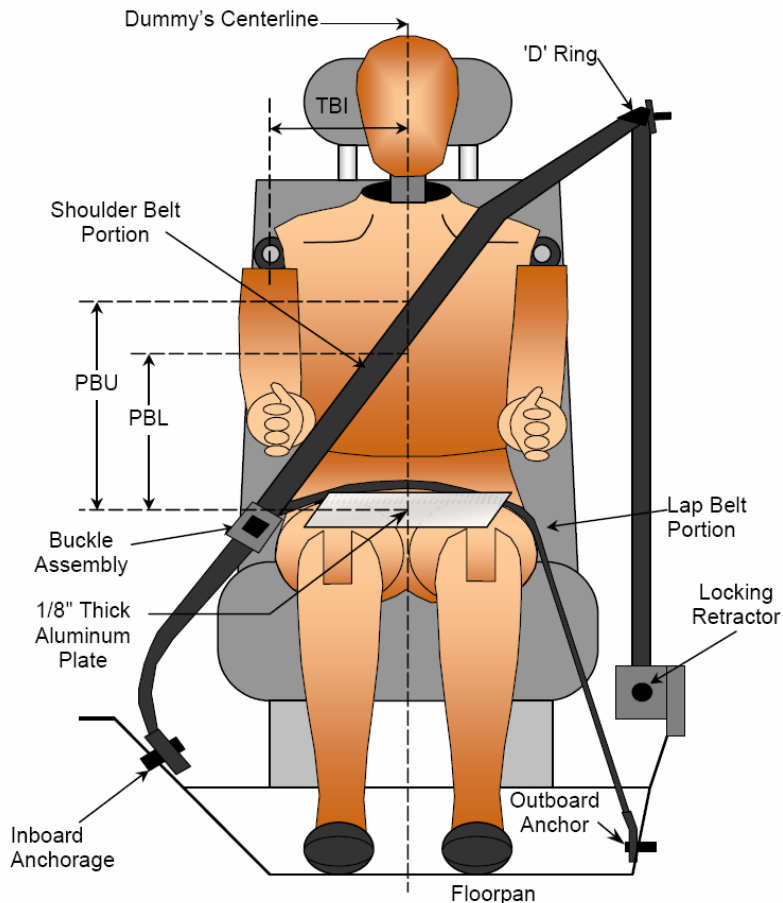
SEAT BELT POSITIONING DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10



Front View of Dummy

SEAT BELT POSITIONING MEASUREMENTS

Code	Measurement Description	Units	Driver	Passenger
PBU	Top Surface of Aluminum Plate to Belt Upper Edge	mm	400	330
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	320	240

BELT LENGTH DATA

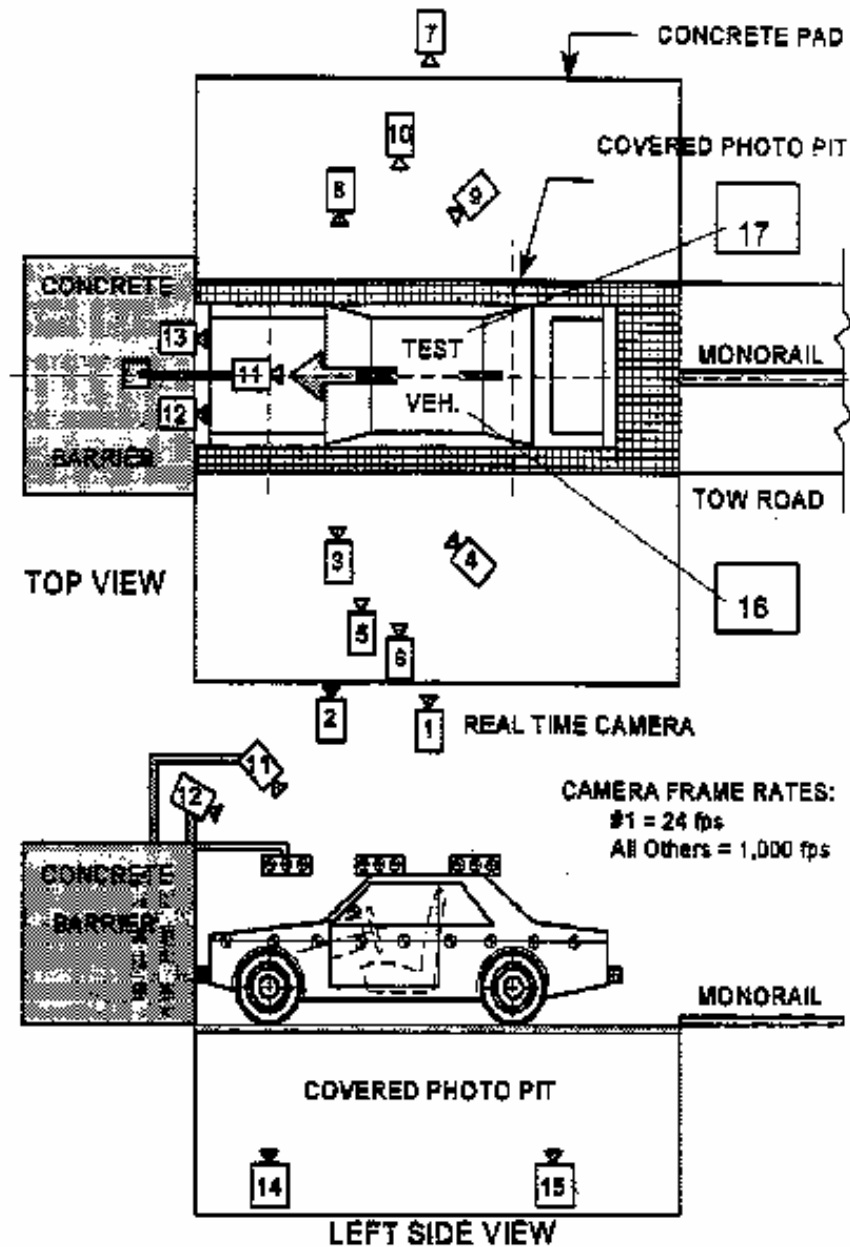
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	843	940
Lap Belt Length as Measured on ATD	mm	747	845
Remainder of Belt on Reel	mm	985	746
Total Belt Length for Continuous Webbing Systems	mm	2575	2531

DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 ... (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

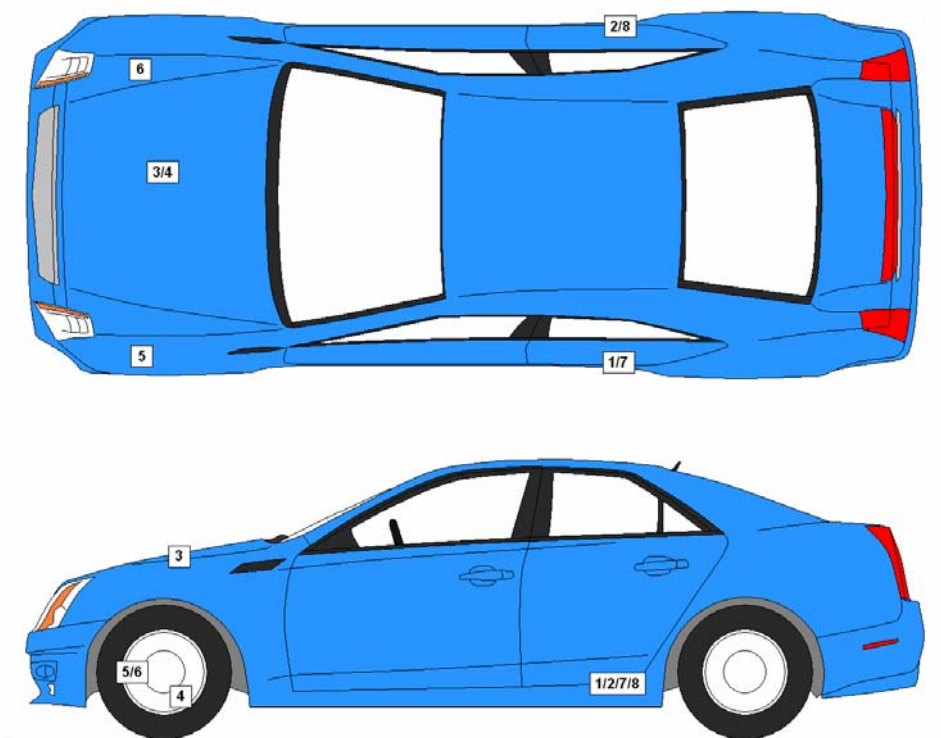
No.	Description	Location			Angle (°)	Film Plane to Head Target	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Real-Time Camera	-11412	-8150	-1484				30
2	Overall Left Side	-2590	-7950	-1371	0	9881	24	1000
3	Left Side A-Pillar	-1701	-6197	-1701	0	7921	85	1000
4	Left Side B-Pillar	-6696	-10308	-3211	-17	11281	ZOOM	1000
5	Steering Column Upper	-1966	-10412	-3688	-13	9887	35	1000
6	Steering Column Lower	-1972	-10412	-3379	-13	9870	35	1000
7	Overall Right Side	-2336	7569	-1012	0	9417	24	1000
8	Right Side A-Pillar	-1733	7581	-1408	0	7789	70	1000
9	Passenger IP View	-1600	8214	-1811	0	7795	ZOOM	1000
10	Right Side B-Pillar	-6217	9516	-4830	-10	12626	ZOOM	1000
11	Overhead Passenger View	297	366	-2460	-34		12	1000
12	Overhead Driver View	297	-366	-2460	-34		12	1000
13	Overhead Windshield View	-354	0	-5749	-90		24	1000
14	Pit View of Engine Compartment	-756	0	1495	90		12	1000
15	Pit View of Fuel Tank	-3398	0	1495	90		8	1000
16	Driver's Seat Belt	-1500	185	-1465	-23		12	1000
17	Passenger's Seat Belt	-1535	-254	-1470	-22		12	1000

Reference Points: X – Front Surface of Vehicle (+ Forward)
 Y – Vehicle Centerline (+ Passenger Side)
 Z – Ground Plane (+ Down)

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Cross Member X	2110	-705	-450
2	Right Rear Cross Member X	2115	705	-445
3	Engine Top X	4265	-878	-935
4	Engine Bottom X	4200	-900	-228
5	Left Brake Caliper X	3885	-740	-310
6	Right Brake Caliper X	885	740	-310
7	Left Rear Cross Member Z	2110	-705	-450
8	Right Rear Cross Member Z	2115	705	-445

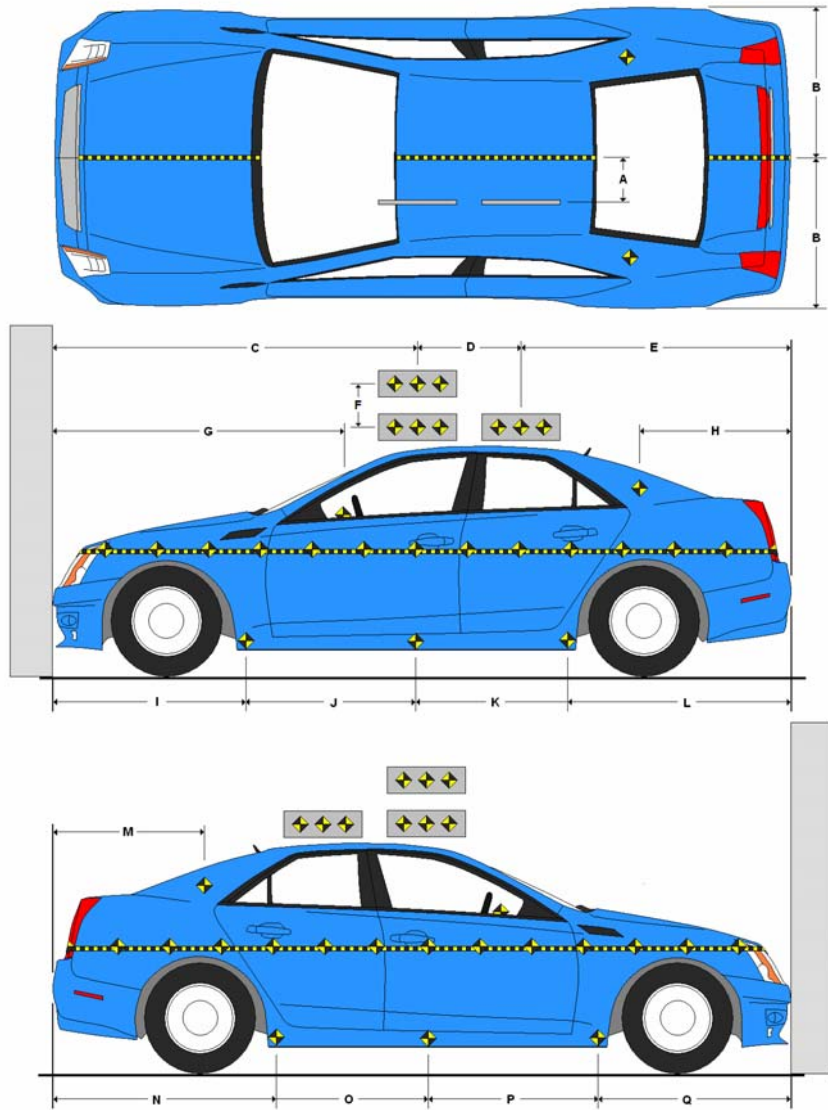
Reference Points: X – Rear Surface of Vehicle (+ Forward)
Y – Vehicle Centerline (+ Passenger Side)
Z – Ground Plane (+ Down)

DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

Item	Value
A	365
B	907
C	2263
D	611
E	1910
F	263
G	1775
H	615
I	1406
J	922
K	922
L	1517
M	605
N	1510
O	925
P	925
Q	1410



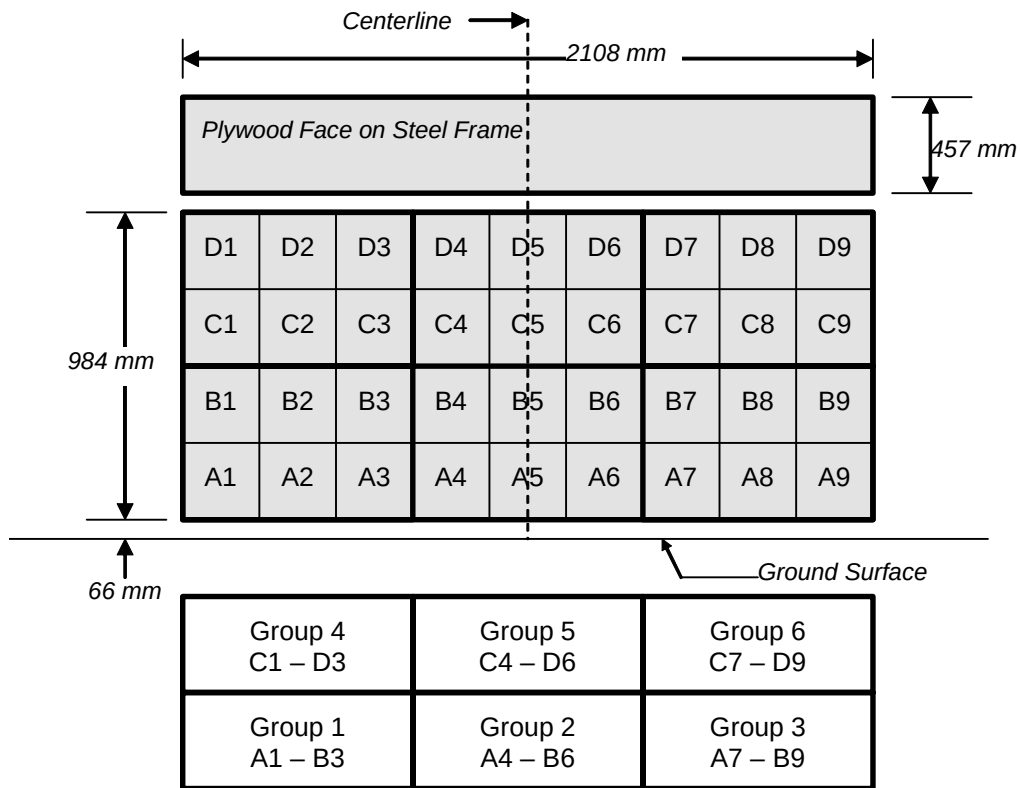
All measurements in millimeters.

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

36 Load Cell Rigid Barrier (NHTSA Standard) Load Cell Locations on Fixed Barrier



6 Groups of 6 Load Cells Each

DATA SHEET NO. 10

TEST VEHICLE CAMERA AND INSTRUMENTATION SUMMARY

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

INSTRUMENTATION

Driver Dummy Accelerometers	44
Passenger Dummy Accelerometers	44
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
Total	132

CAMERA COVERAGE

High-Speed Vehicle On-Board	2
High-Speed Offboard	14
Real Time	3
Total	19

DATA SHEET NO. 11**POST-TEST OBSERVATIONS**Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPVNHTSA No.: MB5500Test Program: 56 km/h Frontal Impact NCAP TestTest Date: 08/13/10**TEST DUMMY INFORMATION AND CONTACT**

Description	Driver	Passenger
Dummy Type/Serial No.	P572E 50th Percentile Male ATD / 035	P572O 5th Percentile Female ATD / 141
Head Contact	Airbag, Headrest	Airbag, Headrest, Seat Back
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glovebox
Right Knee Contact	Knee Bolster	Glovebox

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Remained closed and latched, operational	Remained closed and latched, operational
Rear Door Opening	Remained closed and latched, operational	Remained closed and latched, operational
Seat Track Shift (mm)	10 mm	2 mm
Seat Back Failure	None	None
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	775
Center	mm	815
Right Side	mm	810
Average	mm	800

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Curtain Airbag	Yes	No	Yes	No
Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	No
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

DATA SHEET NO. 12

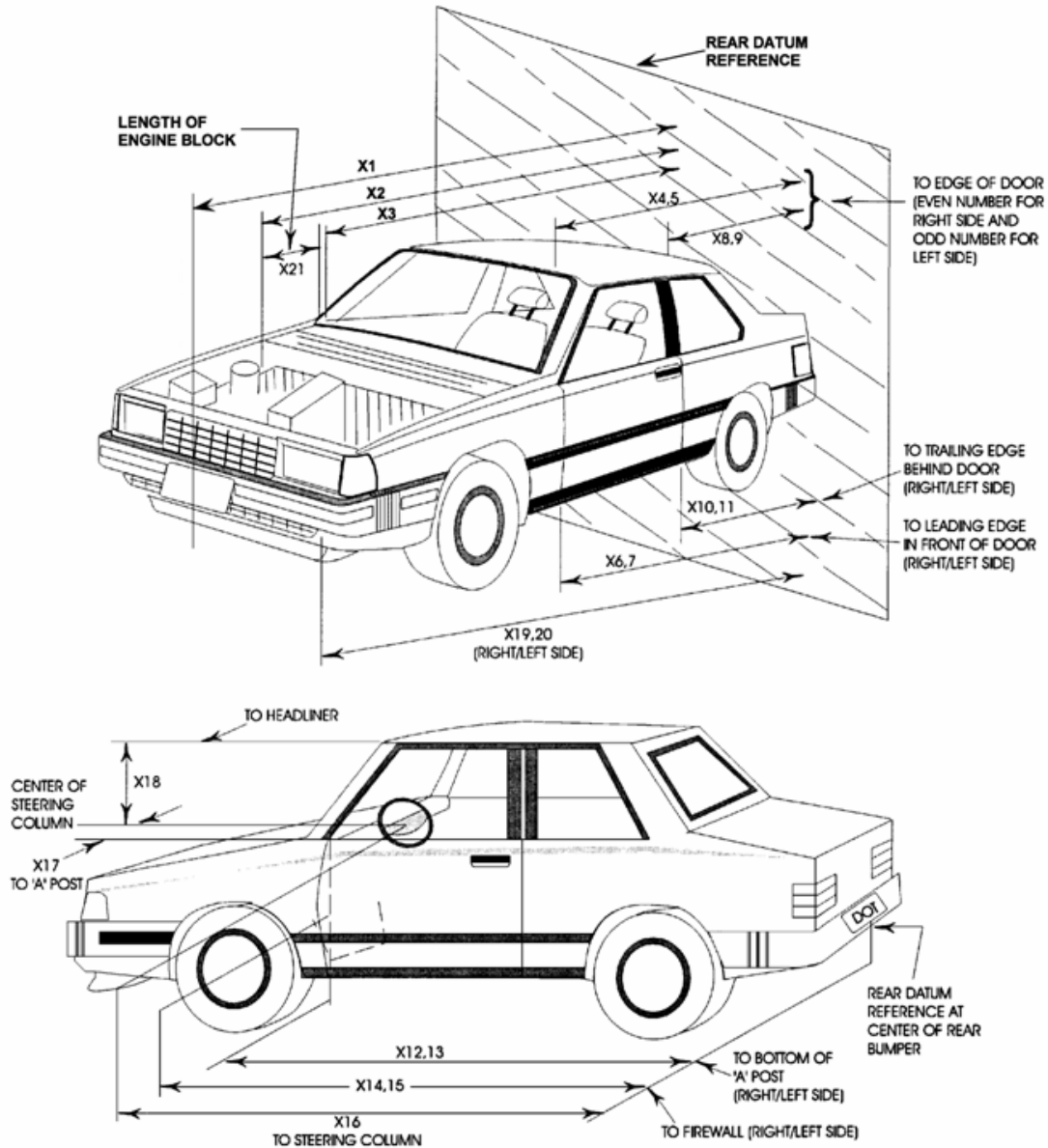
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10

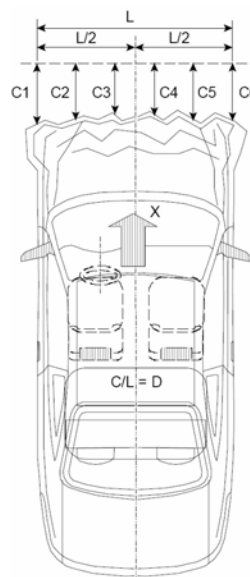


DATA SHEET NO. 12 ... (CONTINUED)**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4782	4287	-495
2	Rear Surface of Vehicle to Front of Engine	4257	4002	-255
3	RSOV to Firewall	3642	3610	-32
4	RSOV to Upper Leading Edge of Right Door	3337	3331	-6
5	RSOV to Upper Leading Edge of Left Door	3345	3333	-12
6	RSOV to Lower Leading Edge of Right Door	3318	3308	-10
7	RSOV to Lower Leading Edge of Left Door	3327	3310	-17
8	RSOV to Upper Trailing Edge of Right Door	2210	2207	-3
9	RSOV to Upper Trailing Edge of Left Door	2217	2207	-10
10	RSOV to Lower Trailing Edge of Right Door	2212	2202	-10
11	RSOV to Lower Trailing Edge of Left Door	2220	2204	-16
12	RSOV to Bottom of A-Pillar of Right Side	3303	3303	0
13	RSOV to Bottom of A-Pillar Left Side	3306	3305	-1
14	RSOV to Firewall, Right Side	3627	3605	-22
15	RSOV to Firewall, Left Side	3639	3615	-24
16	RSOV to Steering Column	2815	2820	5
17	Center of Steering Column to A-Pillar	430	410	-20
18	Center of Steering Column to Headliner	445	435	-10
19	RSOV to Right Side of Front Bumper	4023	3773	-250
20	RSOV to Left Side of Front Bumper	4031	4050	19
21	Length of Engine Block	560	560	0
RD	RSOV to Right Side of Dash Panel	3051	3040	-11
CD	RSOV to Center of Dash Panel	2970	3005	35
LD	RSOV to Left Side of Dash Panel	3040	3042	2

All measurements in millimeters.

DATA SHEET NO. 13**ACCIDENT INVESTIGATION DATA**Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPVNHTSA No.: MB5500Test Program: 56 km/h Frontal Impact NCAP TestTest Date: 08/13/10**VEHICLE INFORMATION**VIN: 4S4BRBAC8B1316760Wheelbase (mm): 2755Vehicle Size Category: 5-Door MPVTest Weight (kg): 1722.0**ACCELEROMETER DATA**Accelerometer Locations: Left Rear CrossmemberCal. Procedure/Interval: Drop Test / 6 monthsIntegration Algorithm: NHTSA StandardImpact Velocity (km/h): 56.14Velocity Change (km/h): 64.2Time of Separation (msec): 70.8Linearity: Good**CRUSH PROFILE**Collision Deformation Classification: 12FCEW2Midpoint of Damage: Vehicle CenterlineDamage Region Length (mm): 1813Impact Mode: Full Frontal

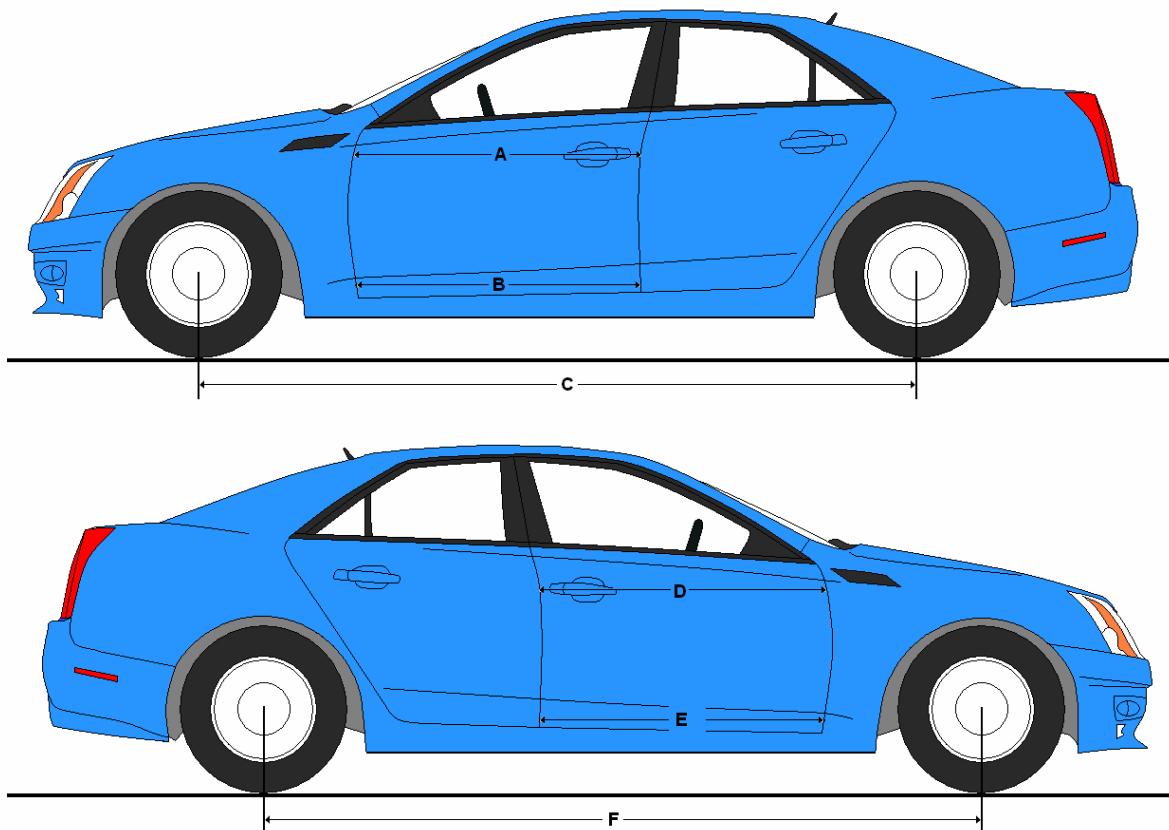
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	755	725	30
C2	Crush Zone 2 at Left Side	mm	59	475	-416
C3	Crush Zone 3 at Left Side	mm	2	505	-503
C4	Crush Zone 4 at Right Side	mm	2	500	-498
C5	Crush Zone 5 at Right Side	mm	59	495	-436
C6	Crush Zone 6 at Right Side	mm	757	990	-233
L	C1 to C6	mm	1813		

DATA SHEET NO. 14**VEHICLE INTRUSION MEASUREMENTS**Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPVNHTSA No.: MB5500Test Program: 56 km/h Frontal Impact NCAP TestTest Date: 08/13/10**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1028	1026	-2
B	Left Side Lower	mm	865	871	6
D	Right Side Upper	mm	1031	1033	2
E	Right Side Lower	mm	886	886	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2755	2729	-26
F	Right Side Wheelbase	mm	2755	2692	-63



DATA SHEET NO. 14 ... (CONTINUED)

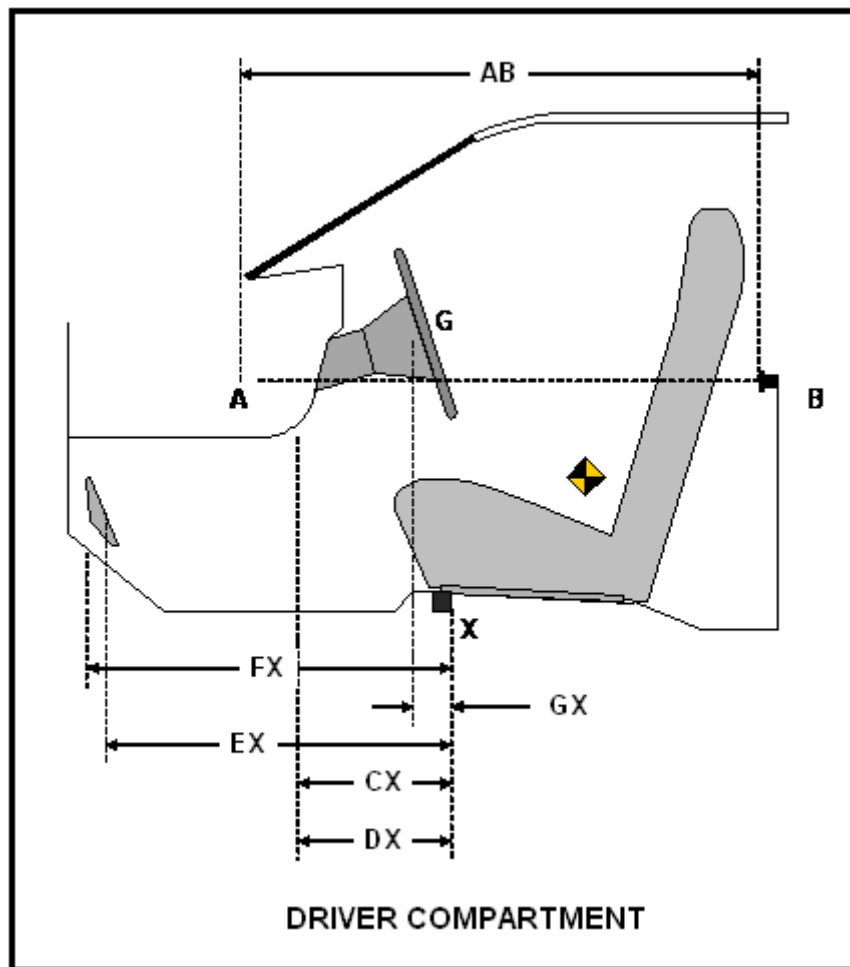
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

DRIVER COMPARTMENT INTRUSION

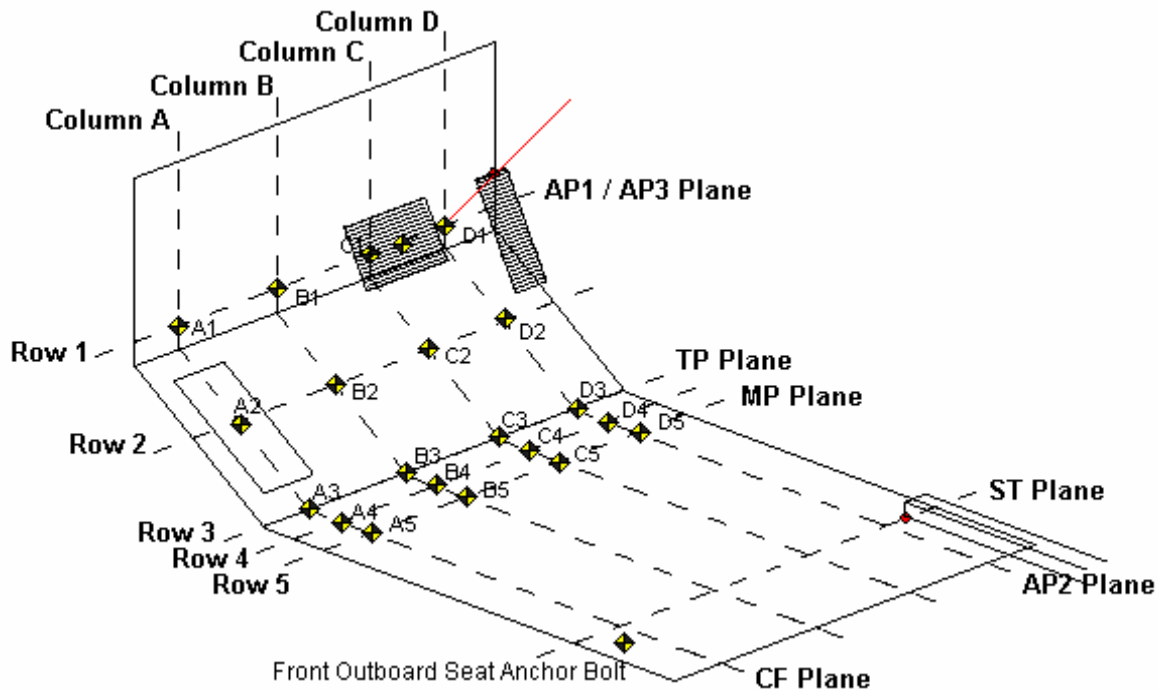
Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1028	1026	-2
CX	Left Knee Bolster to X	mm	258	265	7
DX	Right Knee Bolster to X	mm	258	255	-3
EX	Brake Pedal to X	mm	575	530	-45
FX	Foot Rest to X	mm	565	545	-20
GX	Center of Steering Wheel Hub to X	mm	65	40	-25

X = Front of Seat Track (Stationary)



DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle:	<u>2011 Subaru Outback 2.5i AWD 5-Door MPV</u>	NHTSA No.:	<u>MB5500</u>
Test Program:	<u>56 km/h Frontal Impact NCAP Test</u>	Test Date:	<u>08/13/10</u>



AP1: Y-Z Plane passing through D1

AP2: X-Z Plane passing through D1

AP3: X-Y plane passing through D1

MP: Y-Z plane, halfway between the ST plane and AP1 plane

CF Plane: X-Z plane passes through center of footrest.

BP Plane: X-Z plane passes through center of brake pedal

TP Plane: Y-Z plane, intersection of BP Plane and the intersection of the toe pan and floorboard

Column A: intersection of vehicle and CF plane

Column D: Intersection of vehicle and AP2 plane

Row 1: intersection of the vehicle and the AP3 Plane

Row 3: intersection of the vehicle and TP plane

Row 5: intersection of the vehicle and MP plane

Row 2: evenly spaced between row 1 and 3

Row 4: evenly spaced between row 3 and 5

DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

DRIVER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	666	713	721	712	656	696	705	685	-10	-17	-16	-27
2	597	644	644	643	589	635	635	632	-8	-9	-9	-11
3	540	558	555	560	536	557	554	560	-4	-1	-1	0
4	443	443	445	446	441	441	444	445	-2	-2	-1	-1
5	332	331	332	331	330	329	330	329	-2	-2	-2	-2

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-2	-85	-185	-353	8	-80	-182	-338	10	5	3	15
2	-8	-90	-184	-351	0	-85	-179	-345	8	5	5	6
3	-9	-93	-183	-354	-3	-88	-177	-350	6	5	6	4
4	-10	-97	-182	-353	-6	-92	-177	-349	4	5	5	4
5	-12	-102	-182	-352	-7	-98	-178	-348	5	4	4	4

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	130	98	89	97	136	111	103	108	6	13	14	11
2	76	35	34	43	79	40	39	50	3	5	5	7
3	-10	-30	-27	-21	-10	-32	-29	-27	0	-2	-2	-6
4	-52	-51	-40	-33	-54	-53	-43	-38	-2	-2	-3	-5
5	-48	-52	-42	-26	-49	-53	-45	-29	-1	-1	-3	-3

All measurements in millimeters

DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

PASSENGER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	711	728	721	673	705	720	713	668	-6	-8	-8	-5
2	634	641	640	643	628	636	635	637	-6	-5	-5	-6
3	555	555	557	561	552	553	554	560	-3	-2	-3	-1
4	435	448	455	452	433	448	454	451	-2	0	-1	-1
5	325	334	342	343	323	333	340	342	-2	-1	-2	-1

PASSENGER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	320	167	90	9	321	170	91	7	1	3	1	-2
2	320	162	80	2	322	163	81	3	2	1	1	1
3	324	160	75	-5	324	162	76	-4	0	2	1	1
4	327	160	74	-7	329	162	75	-6	2	2	1	1
5	328	162	71	-11	330	161	71	-9	2	-1	0	2

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	86	88	93	124	83	88	92	121	-3	0	-1	-3
2	26	25	28	34	21	21	24	31	-5	-4	-4	-3
3	-38	-34	-35	-34	-43	-41	-44	-43	-5	-7	-9	-9
4	-49	-47	-58	-57	-58	-53	-64	-63	-9	-6	-6	-6
5	-45	-48	-52	-50	-51	-54	-56	-54	-6	-6	-4	-4

All measurements in millimeters

DATA SHEET NO. 15

SUMMARY OF FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

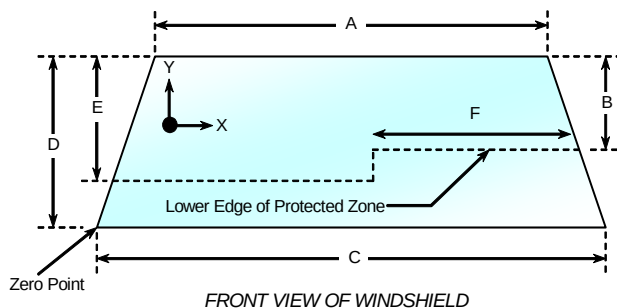
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber cement type adhesive and plastic molding.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.4° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2164	2164	
Right Side	2164	2164	
Total	4328	4328	100%



Item	Units	Value
A	mm	1240
B	mm	380
C	mm	1460
D	mm	814
E	mm	554
F	mm	620

AREAS OF PROTECTED ZONE FAILURES

- A. Provide Coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield.

X	Y

- B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y

DATA SHEET NO. 16

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10

FMVSS 301 FUEL SYSTEM INTEGRITY DATA

Temperature at Time of Impact: 37.2° Test Time: 4:14 PM

Stoddard Solvent 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

DATA SHEET NO. 17

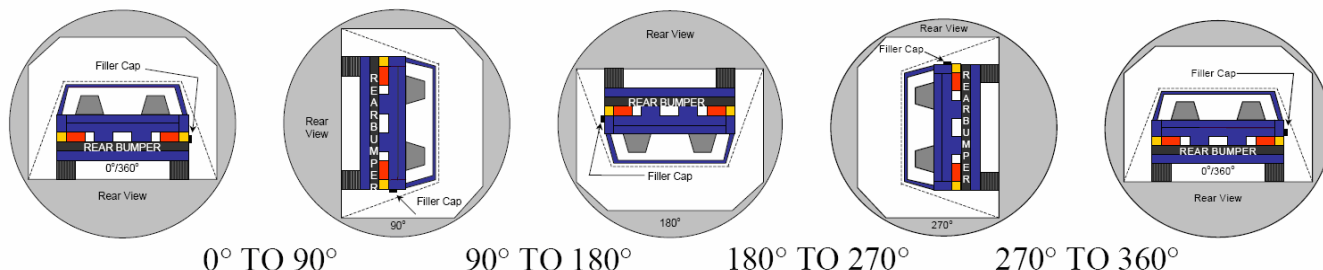
FMVSS 301 STATIC ROLLOVER

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

NHTSA No.: MB5500

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 08/13/10



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard solvent spillage: No spillage occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	85	304	389
90° To 180°	84	300	384
180° To 270°	81	301	382
270° To 360°	83	300	383

FMVSS 301 SPILLAGE TABLE

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

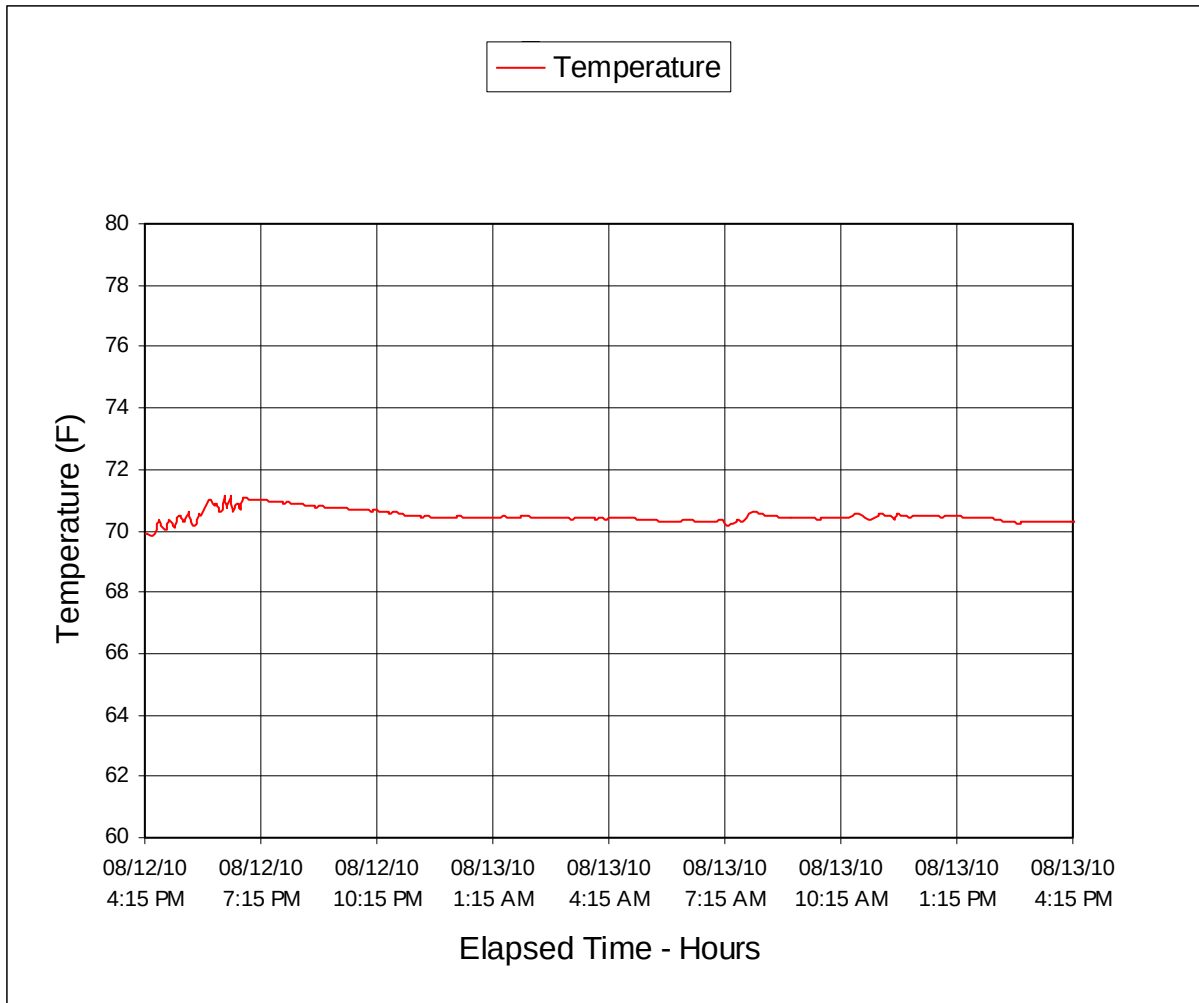
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 18

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV NHTSA No.: MB5500
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 08/13/10



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure		Page
1	Load Cell Location	A-1
2	Load Cell Wall	A-1
3	Manufacturer's Label	A-2
4	Tire Placard	A-2
5	Right Front $\frac{3}{4}$ View, as Received	A-3
6	Left Rear $\frac{3}{4}$ View, as Received	A-3
7	Pre-Test Front View of Test Vehicle	A-4
8	Post-Test Front View of Test Vehicle	A-4
9	Pre-Test Left View of Test Vehicle	A-5
10	Post-Test Left View of Test Vehicle	A-5
11	Pre-Test Right View of Test Vehicle	A-6
12	Post-Test Right View of Test Vehicle	A-6
13	Pre-Test Right Front $\frac{3}{4}$ View	A-7
14	Post-Test Right Front $\frac{3}{4}$ View	A-7
15	Pre-Test Left Rear $\frac{3}{4}$ View	A-8
16	Post-Test Left Rear $\frac{3}{4}$ View	A-8
17	Pre-Test Windshield View	A-9
18	Post-Test Windshield View	A-9
19	Pre-Test Engine Compartment View	A-10
20	Post-Test Engine Compartment View	A-10
21	Pre-Test Fuel Filler Cap View	A-11
22	Post-Test Fuel Filler Cap View	A-11
23	Pre-Test Front Underbody View1	A-12
24	Post-Test Front Underbody View1	A-12
25	Pre-Test Rear Underbody View1	A-13
26	Post-Test Rear Underbody View1	A-13
27	Pre-Test Dummy Cable Routing	A-14
28	Post-Test Dummy Cable Routing	A-14
29	Pre-Test Driver Dummy Front View	A-15
30	Post-Test Driver Dummy Front View	A-15
31	Pre-Test Driver Dummy Window View	A-16
32	Post-Test Driver Dummy Window View	A-16
33	Pre-Test Driver Dummy and Vehicle Interior View	A-17
34	Post-Test Driver Dummy and Vehicle Interior View	A-17
35	Pre-Test Driver's Seat Fore-Aft Markings	A-18

TABLE OF PHOTOGRAPHS --- (CONTINUED)

Figure		Page
36	Post-Test Driver's Seat Fore-Aft Markings	A-18
37	Pre-Test Driver Dummy Feet	A-19
38	Post-Test Driver Dummy Feet	A-19
39	Pre-Test Driver's Side Knee Bolster	A-20
40	Post-Test Driver's Side Knee Bolster	A-20
41	Pre-Test Driver's Side Floorpan	A-21
42	Post-Test Driver's Side Floorpan	A-21
43	Post-Test Driver Dummy Contact With Airbag	A-22
43a	Post-Test Driver Dummy Contact With Headrest	A-22
43b	Post-Test Driver Dummy Contact With Knee Bolster	A-23
44	Pre-Test View of the Steering Column Shear Capsule	A-23
45	Post-Test View of the Steering Column Shear Capsule	A-24
46	Pre-Test Passenger Dummy Front View	A-24
47	Post-Test Passenger Dummy Front View	A-25
48	Pre-Test Passenger Dummy Window View	A-25
49	Post-Test Passenger Dummy Window View	A-26
50	Pre-Test Passenger Dummy and Vehicle Interior View	A-26
51	Post-Test Passenger Dummy and Vehicle Interior View	A-27
52	Pre-Test Passenger's Seat Fore-Aft Markings	A-27
53	Post-Test Passenger's Seat Fore-Aft Markings	A-28
54	Pre-Test Passenger Dummy Feet	A-28
55	Post-Test Passenger Dummy Feet	A-29
56	Pre-Test Passenger's Side Knee Bolster	A-29
57	Post-Test Passenger's Side Knee Bolster	A-30
58	Pre-Test Passenger's Side Floorpan	A-30
59	Post-Test Passenger's Side Floorpan	A-31
60	Post-Test Passenger Dummy Contact With Airbag	A-31
60a	Post-Test Passenger Dummy Contact With Headrest	A-32
60b	Post-Test Passenger Dummy Contact With Knee Bolster	A-32
61	Photograph of ballast installed in vehicle	A-33
62	Post-Test Stoddard Solvent Spillage Location	A-33
63	Post-Test Speed Trap Read-out	A-34
64	Vehicle at 0° on Static Rollover Device	A-34
65	Vehicle at 90° on Static Rollover Device	A-35
66	Vehicle at 180° on Static Rollover Device	A-35

TABLE OF PHOTOGRAPHS --- (CONTINUED)

Figure		Page
67	Vehicle at 270° on Static Rollover Device	A-36
68	Vehicle at 360° on Static Rollover Device	A-36
69	Impact Photograph (video still)	A-37
70	Monroney Label Photograph	A-37

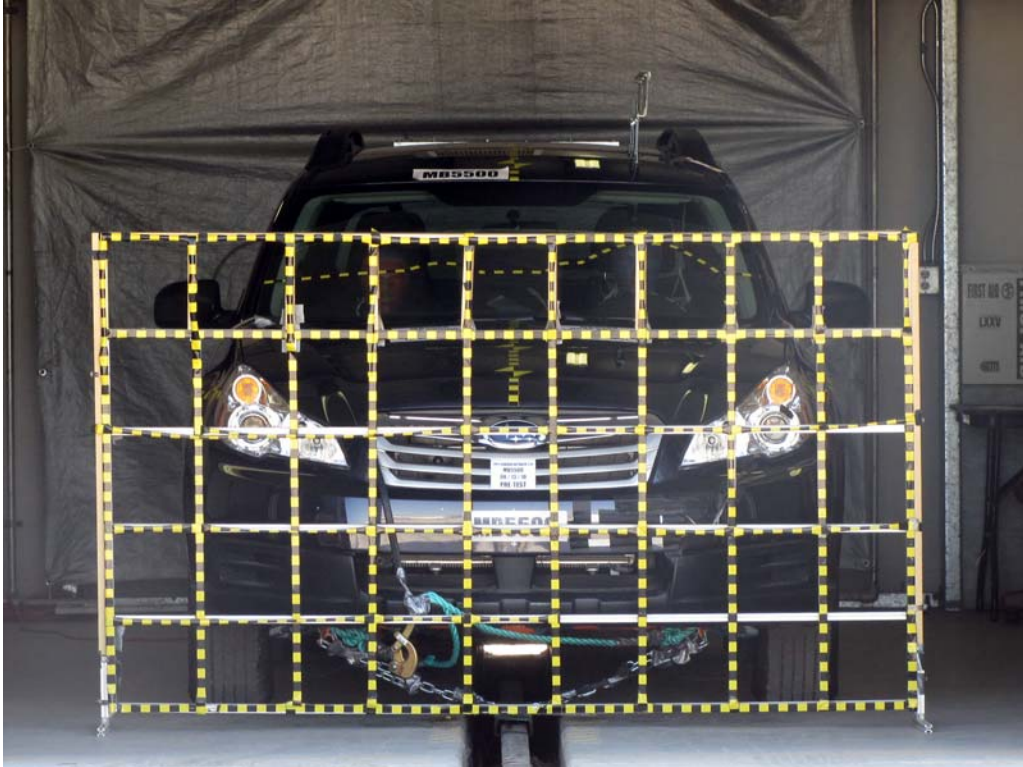


FIGURE 1. Load Cell Location



FIGURE 2. Load Cell Wall



FIGURE 3. Manufacturer's Label



FIGURE 4. Tire Placard



FIGURE 5. Right Front $\frac{3}{4}$ View, As Received



FIGURE 6. Left Rear $\frac{3}{4}$ View of Vehicle, As Received



FIGURE 7. Pre-Test Front View of Test Vehicle

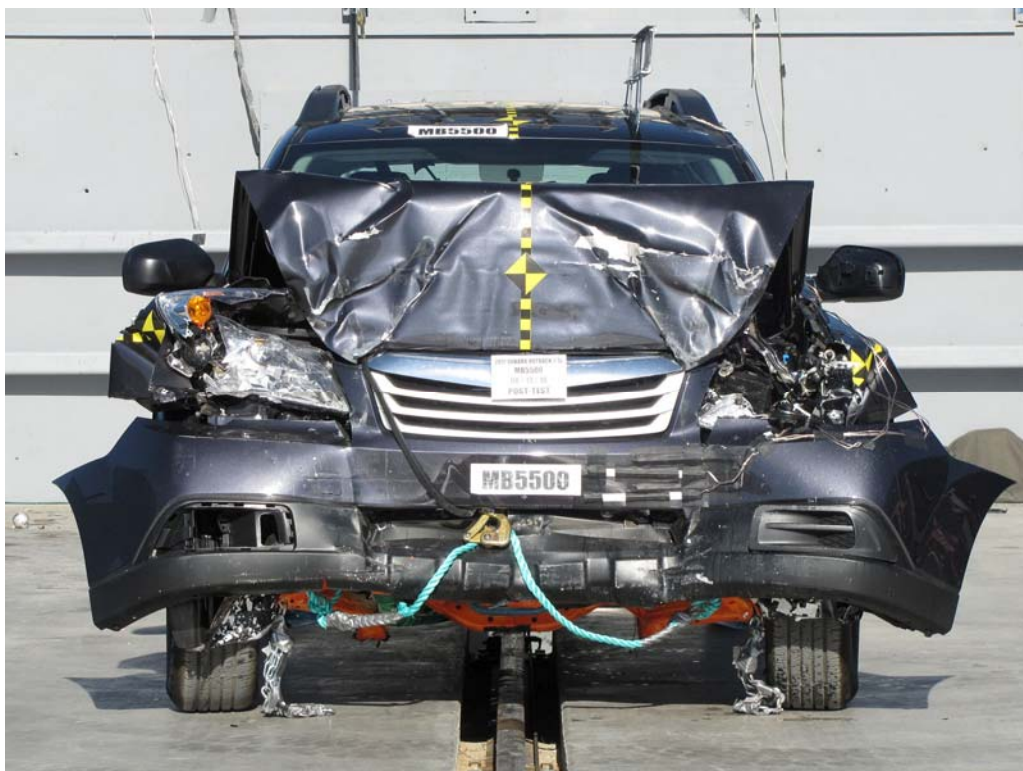


FIGURE 8. Post-Test Front View of Test Vehicle



FIGURE 9. Pre-Test Left View of Test Vehicle



FIGURE 10. Post-Test Left View of Test Vehicle



FIGURE 11. Pre-Test Right View of Test Vehicle



FIGURE 12. Post-Test Right View of Test Vehicle



FIGURE 13. Pre-Test Right Front $\frac{3}{4}$ View



FIGURE 14. Post-Test Right Front $\frac{3}{4}$ View



FIGURE 15. Pre-Test Left Rear $\frac{3}{4}$ View



FIGURE 16. Post-Test Left Rear $\frac{3}{4}$ View



FIGURE 17. Pre-Test Windshield View



FIGURE 18. Post-Test Windshield View

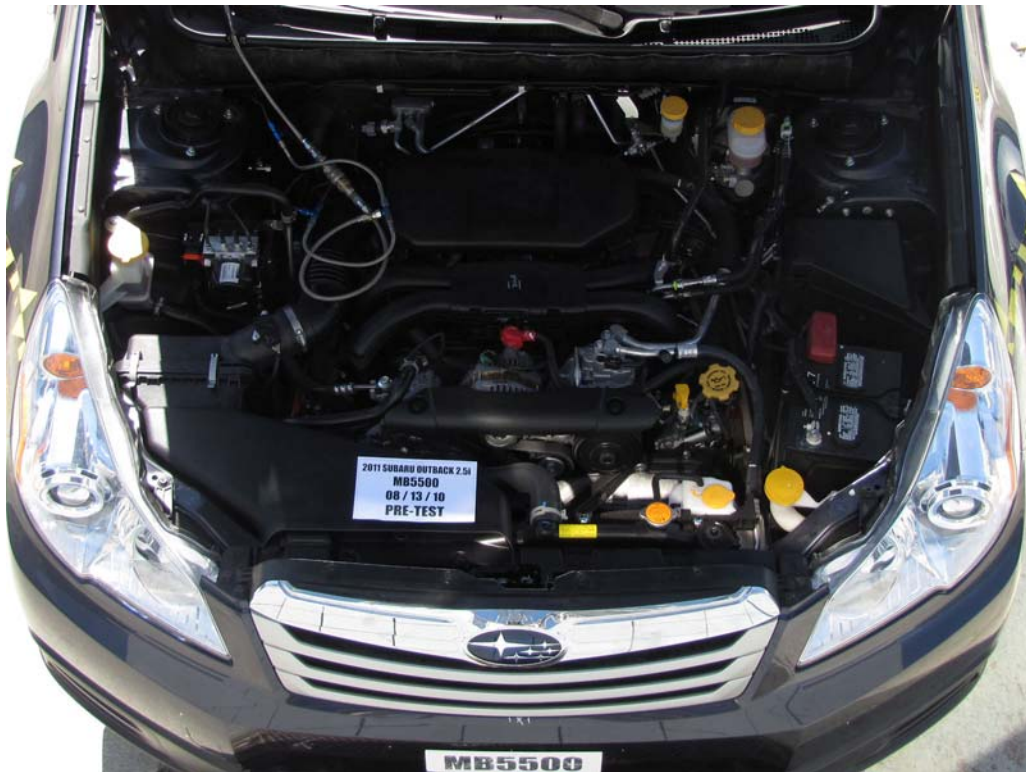


FIGURE 19. Pre-Test Engine Compartment View



FIGURE 20. Post-Test Engine Compartment View



FIGURE 21. Pre-Test Fuel Filler Cap View



FIGURE 22. Post-Test Fuel Filler Cap View

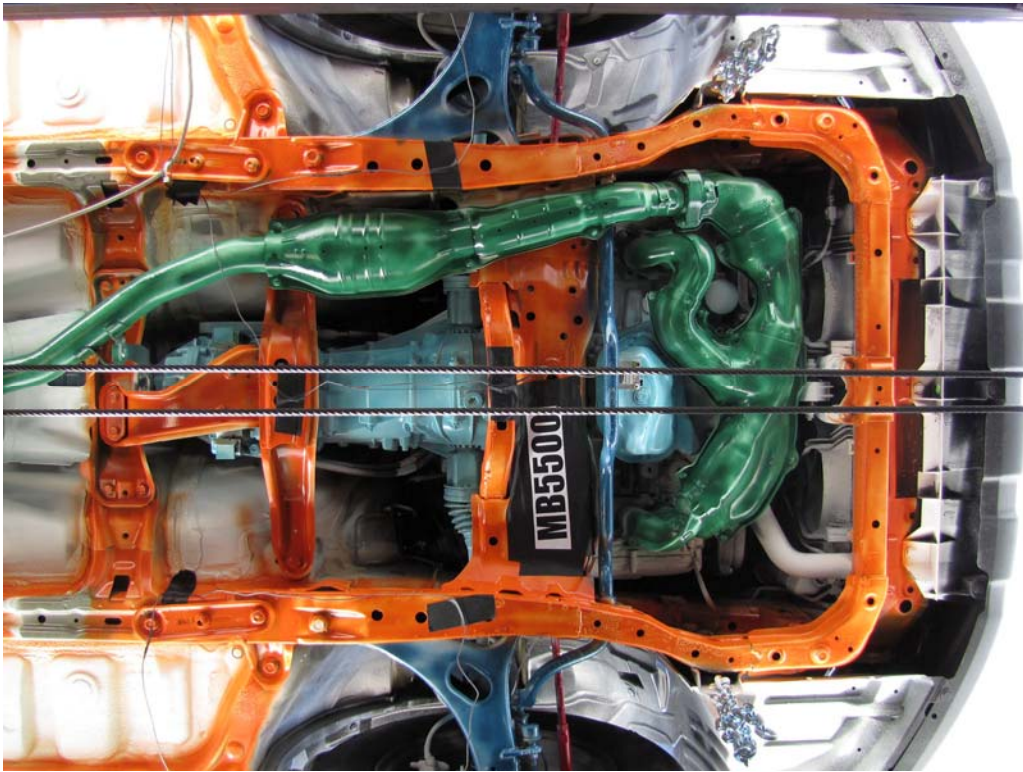


FIGURE 23. Pre-Test Front Underbody View

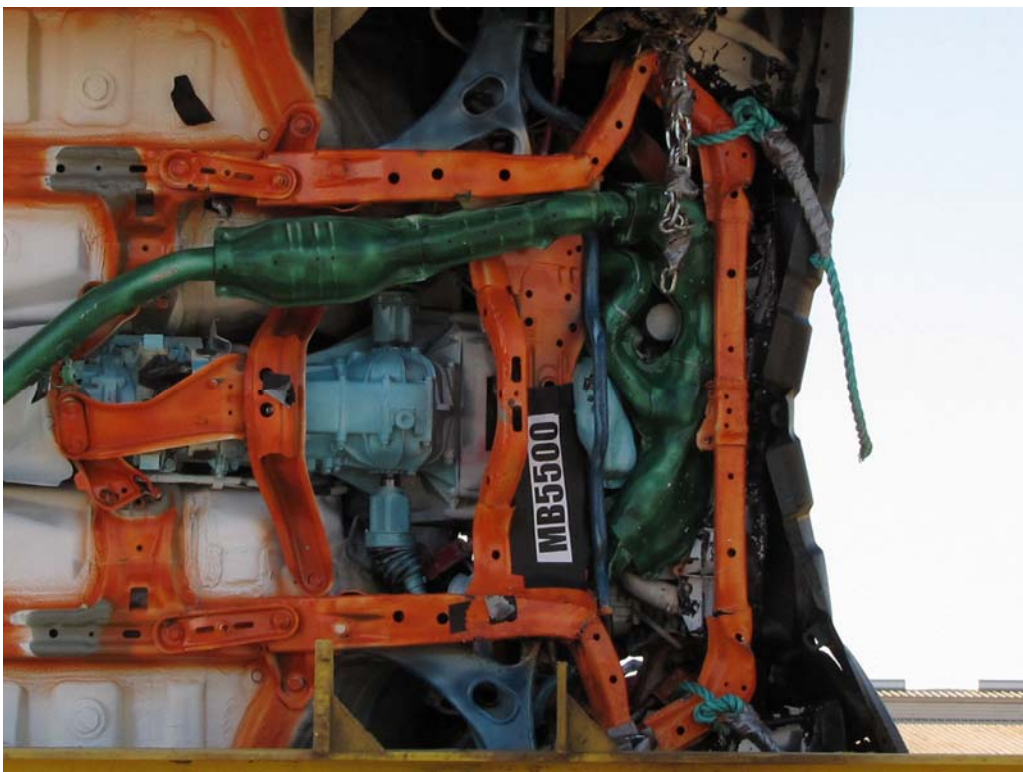


FIGURE 24. Post-Test Front Underbody View

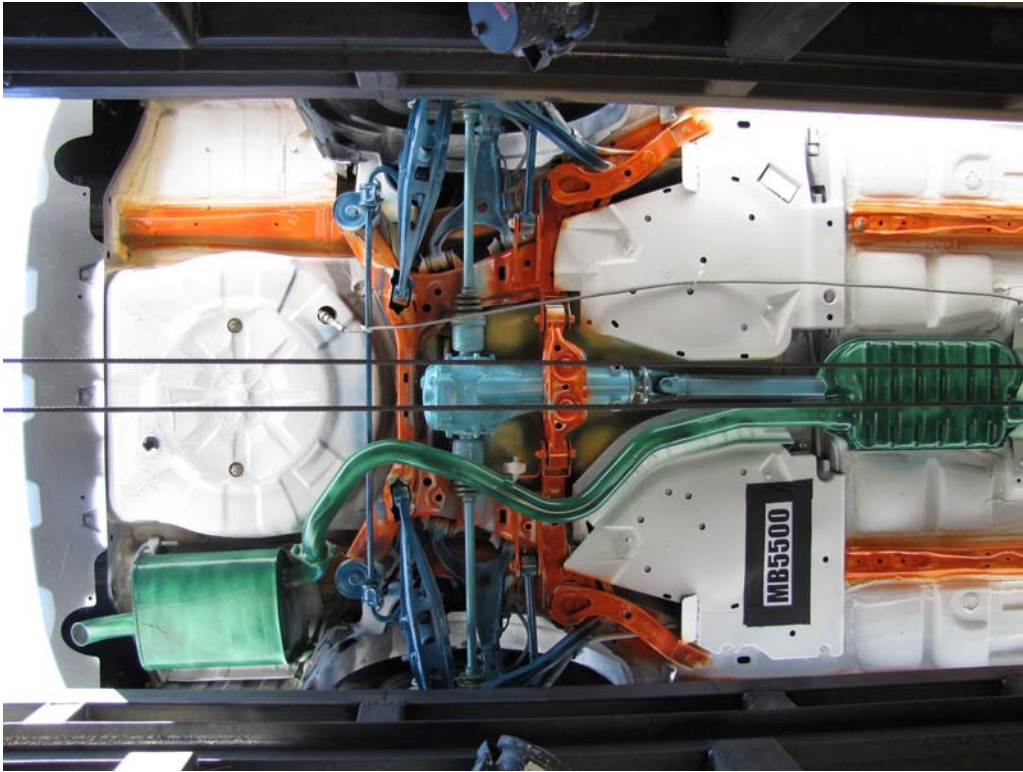


FIGURE 25. Pre-Test Rear Underbody View

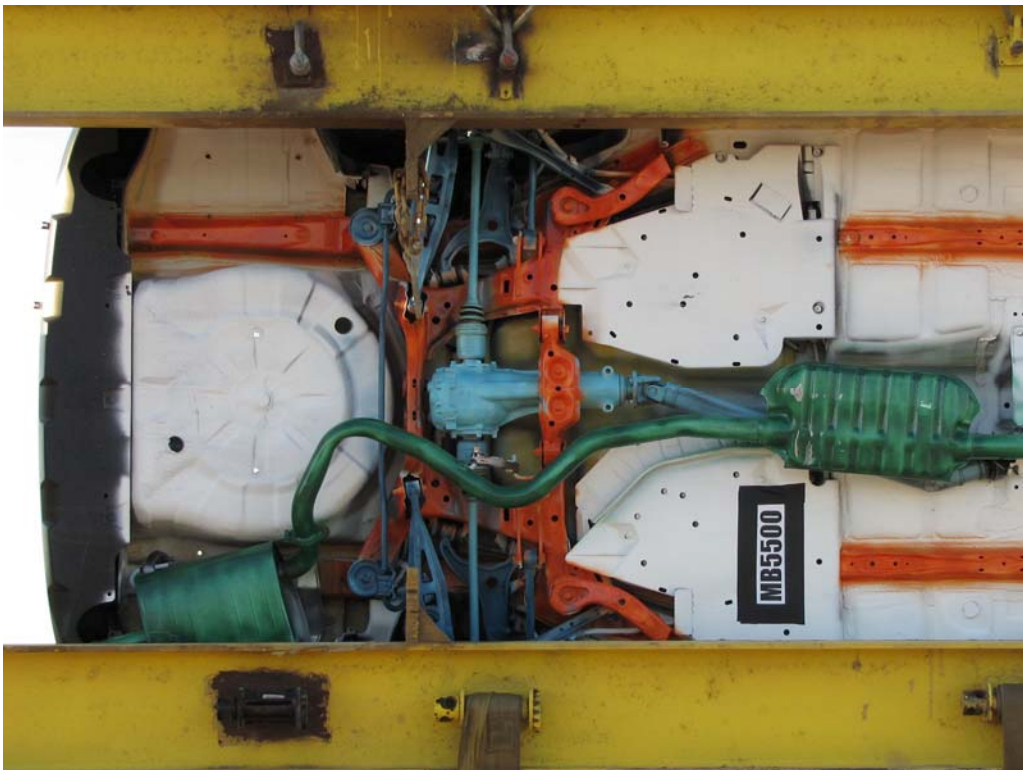


FIGURE 26. Post-Test Rear Underbody View



FIGURE 27. Pre-Test Dummy Cable Routing



FIGURE 28. Post-Test Dummy Cable Routing

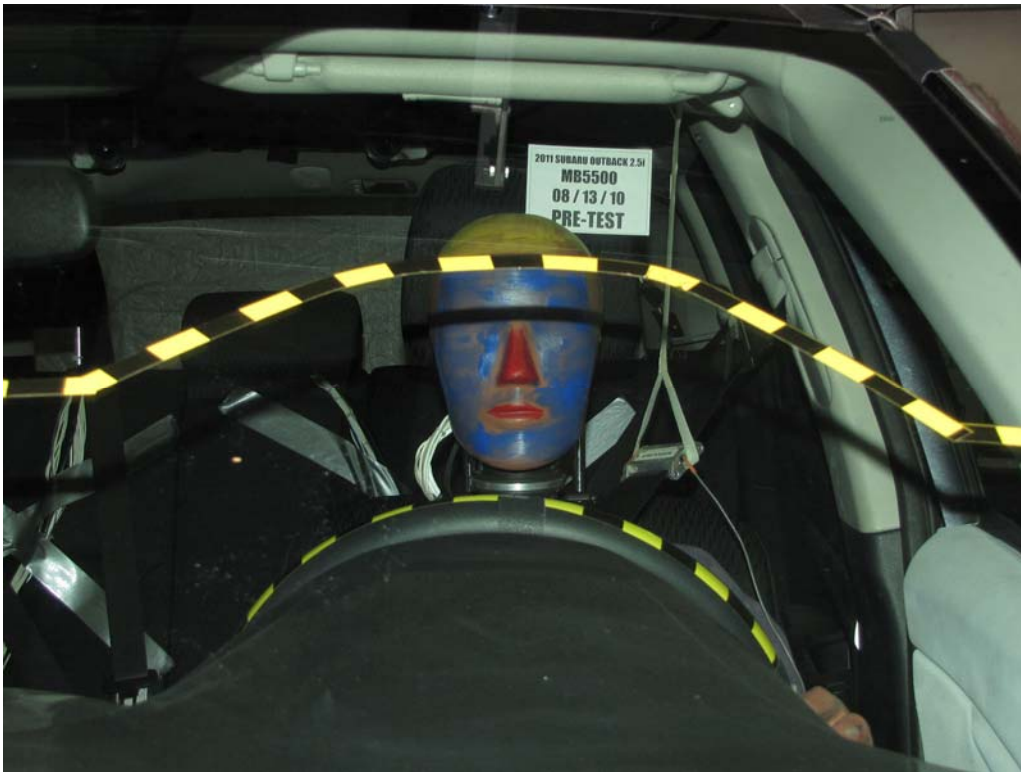


FIGURE 29. Pre-Test Driver Dummy Front View



FIGURE 30. Post-Test Driver Dummy Front View



FIGURE 31. Pre-Test Driver Dummy Window View



FIGURE 32. Post-Test Driver Dummy Window View



FIGURE 33. Pre-Test Driver Dummy and Vehicle Interior View



FIGURE 34. Post-Test Driver Dummy and Vehicle Interior View



FIGURE 35. Pre-Test Driver's Seat Fore-Aft Markings



FIGURE 36. Post-Test Driver's Seat Fore-Aft Markings



FIGURE 37. Pre-Test Driver Dummy Feet



FIGURE 38. Post-Test Driver Dummy Feet



FIGURE 39. Pre-Test Driver's Side Knee Bolster



FIGURE 40. Post-Test Driver's Side Knee Bolster



FIGURE 41. Pre-Test Driver's Side Floorpan



FIGURE 42. Post-Test Driver's Side Floorpan

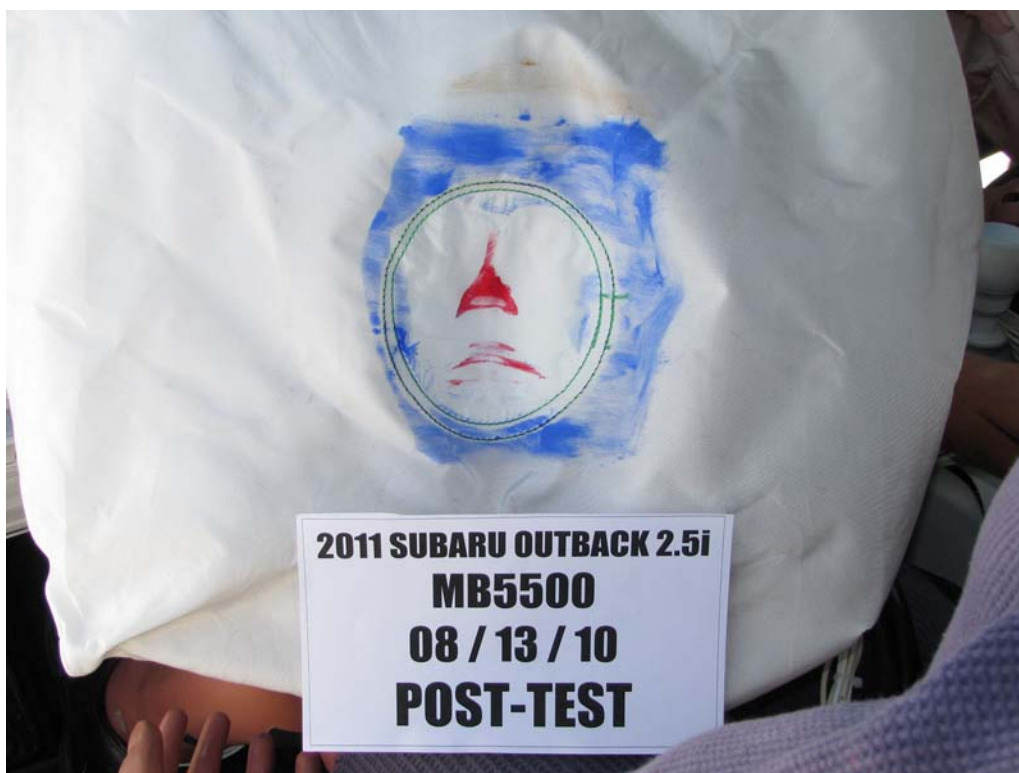


FIGURE 43. Post-Test Driver Dummy Contact With Airbag



FIGURE 43a. Post-Test Driver Dummy Contact With Headrest



FIGURE 43b. Post-Test Driver Dummy Contact With Knee Bolster



FIGURE 44. Pre-Test View of Steering Column Shear Capsule



FIGURE 45. Post-Test View of Steering Column Shear Capsule



FIGURE 46. Pre-Test Passenger Dummy Front View



FIGURE 47. Post-Test Passenger Dummy Front View



FIGURE 48. Pre-Test Passenger Dummy Window View



FIGURE 49. Post-Test Passenger Dummy Window View



FIGURE 50. Pre-Test Passenger Dummy and Vehicle Interior View



FIGURE 51. Post-Test Passenger Dummy and Vehicle Interior View



FIGURE 52. Pre-Test Passenger's Seat Fore-Aft Markings



FIGURE 53. Post-Test Passenger's Seat Fore-Aft Markings



FIGURE 54. Pre-Test Passenger Dummy Feet



FIGURE 55. Post-Test Passenger Dummy Feet



FIGURE 56. Pre-Test Passenger's Side Knee Bolster



FIGURE 57. Post-Test Passenger's Side Knee Bolster



FIGURE 58. Pre-Test Passenger's Side Floorpan



FIGURE 59. Post-Test Passenger's Side Floorpan



FIGURE 60. Post-Test Passenger Dummy Contact With Airbag



FIGURE 60a. Post-Test Passenger Dummy Contact With Headrest



FIGURE 60b. Post-Test Passenger Dummy Contact With Knee Bolster

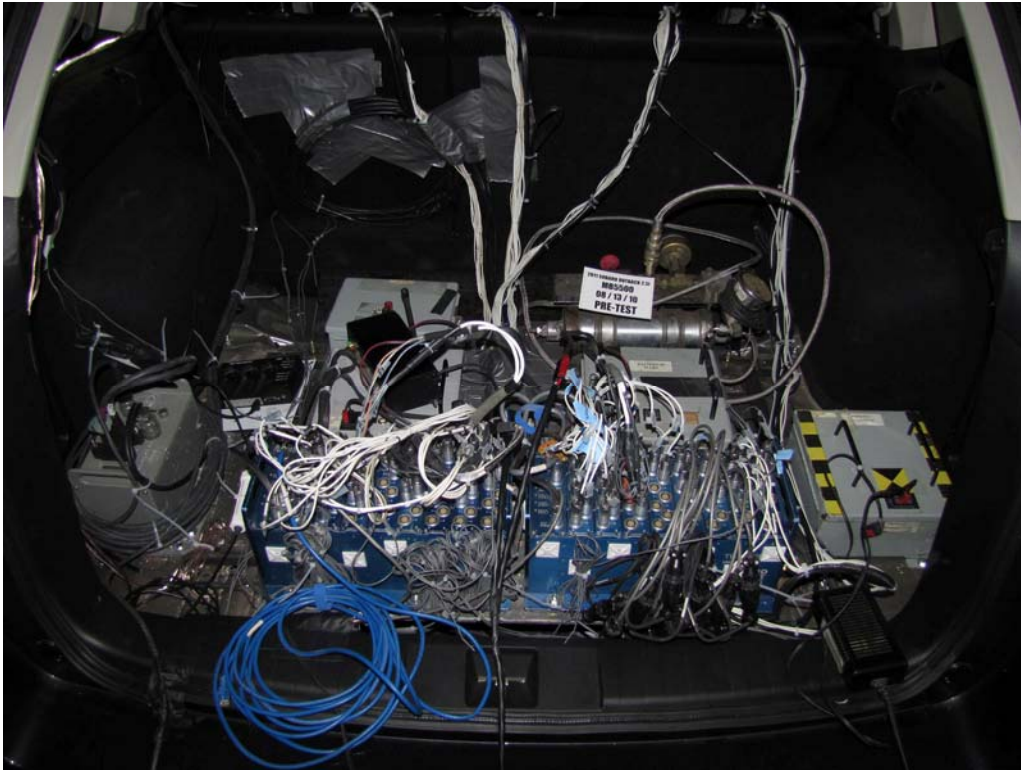


FIGURE 61. Pre-Test of Ballast Installed in Vehicle

Photograph Not Applicable
No Stoddard
Solvent Spillage

FIGURE 62. Post-Test Stoddard Solvent Spillage Location



FIGURE 63. Post-Test Speed Trap Read Out



FIGURE 64. Vehicle at 0°on Static Rollover Device



FIGURE 65. Vehicle at 90°on Static Rollover Device



FIGURE 66. Vehicle at 180°on Static Rollover Device

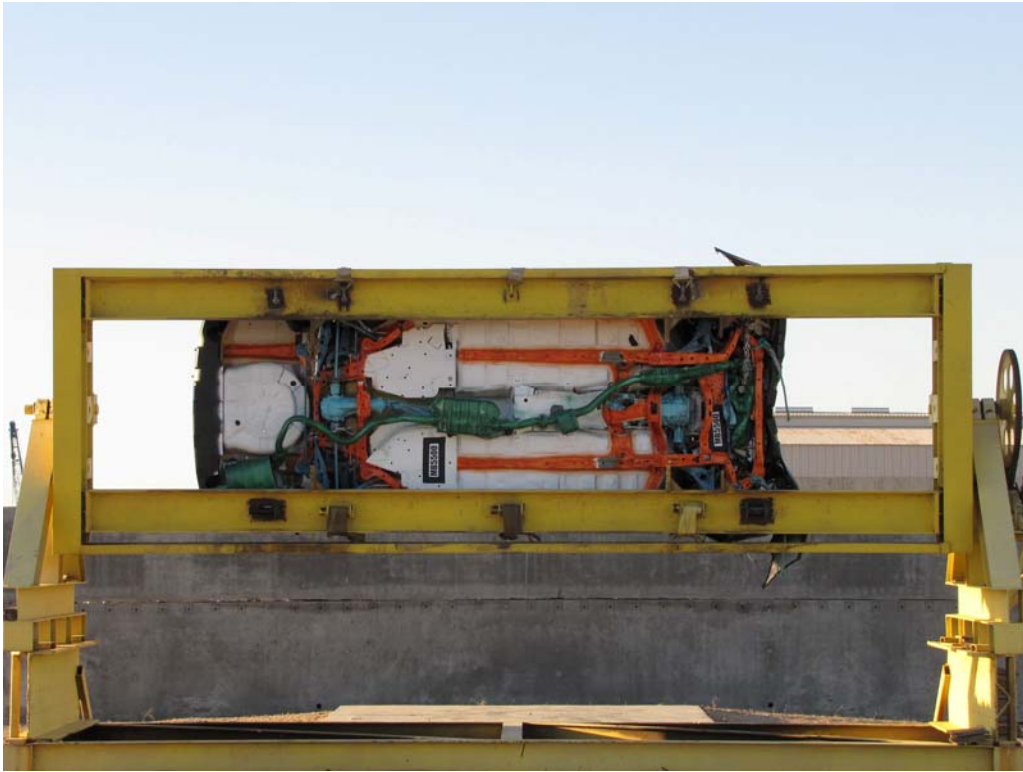


FIGURE 67. Vehicle at 270°on Static Rollover Device



FIGURE 68. Vehicle at 360°on Static Rollover Device



FIGURE 69. Impact Photograph

SUBARU

VIN: 4S4BRBAC8B1323045
Model/Code: 2011 Subaru Outback 2.5i / BDA
Exterior Color: Graphite Gray Metallic
Port / Assembly: Lafayette, IN
Truck / ROPS: 401136

OUTBACK

STANDARD FEATURES		GOVERNMENT SAFETY RATINGS	OPTIONAL EQUIPMENT AND OTHER ITEMS
SAFETY Symmetrical All-Wheel Drive (AWD) Vehicle Dynamics Control (VDC) Anti-Lock Brakes: 4-Wheel Disc Subaru Advanced Frontal Air Bag System Side-Curtain Airbags Front Seat Side-Impact Air Bags 3-Point Seatbelts, All Seating Positions LATCH System for Child Safety Seats Anti-Theft Alarm & Immobilizer System Tire Pressure Monitoring System (TPMS) Roller Sensor Brake Assist	COMFORT, CONVENIENCE AND INTERIOR 8 Cupholders AM/FM Stereo with CD Player Auxiliary Audio Jack Air Conditioning w/Air Filtration System Carpets Floor Mats, Cargo Area Mat Cruise Control Electronic Parking Brake Multi-Function Trip Computer Outside Temperature Gauge Power Windows, Door Locks and Mirrors Remote Keyless Entry System Steering Wheel Audio & Cruise Controls 60/40 Fold-Down/Recline Rear Seatback Tilt / Telescopic Steering Wheel	Frontal Driver Not Rated Crash Passenger Not Rated Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight. Side Front Seat Not Rated Crash Rear Seat Not Rated Star ratings based on the risk of injury in a side impact. Roller Not Rated Star ratings based on the risk of rollover in a single vehicle crash. Star ratings range from 1 to 5 stars (★★★★★), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA)	Manufacturer's Suggested Retail Price \$23,495.00 Full Tank of Gas INCLD Bluetooth Connect Kit \$460.00 Partial Zero Emission (Pzev) Base-Lite Low Emission Van Pzev Certified Where Required Pzev Warranty State Specific

EPA Fuel Economy Estimates

CITY MPG
19
Expected range for most drivers 15 to 23 MPG

Estimated Annual Fuel Cost
\$1,774
Based on 15,000 miles at \$2.60 per gallon

Highway MPG
27
Expected range for most drivers 22 to 32 MPG

Combined Fuel Economy
This Vehicle **22**
At 50% - 4WD
Calif. Emission Control Syst.

SAFETY
See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

GOVERNMENT SAFETY RATINGS
VISIT www.safercar.gov or 1-800-327-4236
PARTS CONTENT INFORMATION
FOR VEHICLES IN THIS COUNTRY:
U.S./CANADIAN PARTS CONTENT: 50%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN: 50%
Note: Parts content does not include final assembly, distribution, or other non-parts costs.
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: Lafayette, IN
COUNTRY OF ORIGIN: JAPAN
TRANSMISSION: JAPAN

DESTINATION AND DELIVERY
Destination and Delivery \$725.00
Total Suggested Retail Price \$24,680.00

ASK ABOUT ADDED SECURITY®
It could be the most important option you choose. After-assembly mechanical repair protection up to 100,000 miles. Nobody protects your Subaru like Subaru!

THE ONLY EXTENDED SERVICE CONTRACT BACKED BY SUBARU

LIMITED WARRANTY/ROADSIDE ASSISTANCE
3 Yrs / 36,000 Miles Basic
5 Yrs / 60,000 Miles Powertrain
5 Yrs/Unlimited Mileage Rust Perforation
3 Yrs / 36,000 24/7 Roadside Assistance
See Owner Info Kit & Warranty For Details

SHIP TO: 090694
IRVINE SUBARU
23663 ROCKFIELD BLVD
LAKE FOREST, CA 92630

SOLD TO: 090694
IRVINE SUBARU
23663 ROCKFIELD BLVD
LAKE FOREST, CA 92630

4S4BRBAC8B1323045
*What's a registered trademark? It's a symbol or design that identifies the goods or services of one company from those of another. It's a registered trademark of Subaru. ©2011 Subaru of America, Inc.

THIS LABEL HAS BEEN APPLIED PURSUANT TO FEDERAL LAW. DO NOT REMOVE OR ALTER PRIOR TO THE DELIVERY TO THE ULTIMATE PURCHASER.

FIGURE 70. Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Plot		Page
1	Driver Head X Acceleration vs. Time Primary	B-1
2	Driver Head Y Acceleration vs. Time Primary	B-1
3	Driver Head Z Acceleration vs. Time Primary	B-1
4	Driver Head Resultant Acceleration vs. Time Primary	B-1
5	Driver Chest X Deflection vs. Time	B-2
6	Driver Chest X Acceleration vs. Time Primary	B-3
7	Driver Chest Y Acceleration vs. Time Primary	B-3
8	Driver Chest Z Acceleration vs. Time Primary	B-3
9	Driver Chest Resultant Acceleration vs. Time Primary	B-3
10	Driver Upper Neck Force X vs. Time Primary	B-4
11	Driver Upper Neck Force Z vs. Time Primary	B-4
12	Driver Upper Neck Moment Y vs. Time Primary	B-4
13	Driver Nij vs. Time Primary	B-4
14	Driver Left Femur Force vs. Time	B-5
15	Driver Right Femur Force vs. Time	B-5
16	Passenger Head X Acceleration vs. Time Primary	B-6
17	Passenger Head Y Acceleration vs. Time Primary	B-6
18	Passenger Head Z Acceleration vs. Time Primary	B-6
19	Passenger Head Resultant Acceleration vs. Time Primary	B-6
20	Passenger Chest X Deflection vs. Time	B-7
21	Passenger Chest X Acceleration vs. Time Primary	B-8
22	Passenger Chest Y Acceleration vs. Time Primary	B-8
23	Passenger Chest Z Acceleration vs. Time Primary	B-8
24	Passenger Chest Resultant Acceleration vs. Time Primary	B-8
25	Passenger Upper Neck Force X vs. Time Primary	B-9
26	Passenger Upper Neck Force Z vs. Time Primary	B-9
27	Passenger Upper Neck Moment Y vs. Time Primary	B-9
28	Passenger Nij vs. Time Primary	B-9
29	Passenger Left Femur Force vs. Time	B-10
30	Passenger Right Femur Force vs. Time	B-10

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

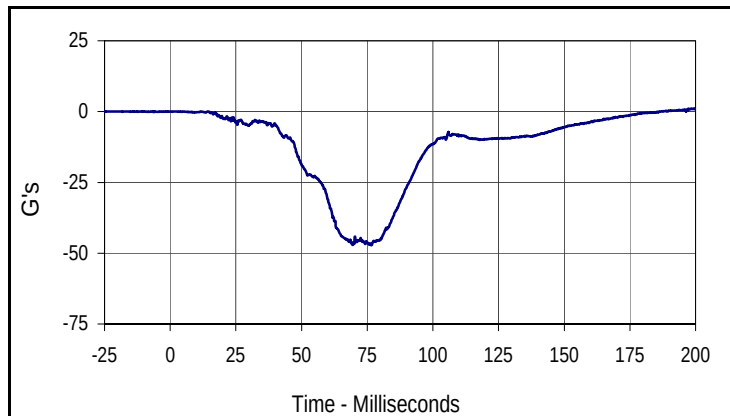
Driver Head X Acceleration Redundant
Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
Driver Pelvis X
Driver Pelvis Y
Driver Pelvis Z
Driver Shoulder Belt Force
Driver Lap Belt Force
Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Passenger Head X Acceleration Redundant

Passenger Head Y Acceleration Redundant
Passenger Head Z Acceleration Redundant
Passenger Upper Neck Force X
Passenger Upper Neck Force Z
Passenger Upper Neck Moment Y
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration Redundant
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X

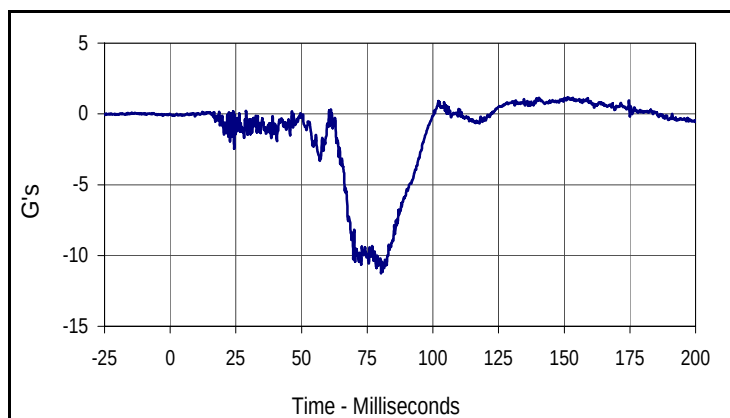
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Load Cell Barrier A1-A9
Load Cell Barrier B1-A9
Load Cell Barrier C1-A9
Load Cell Barrier D1-A9

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

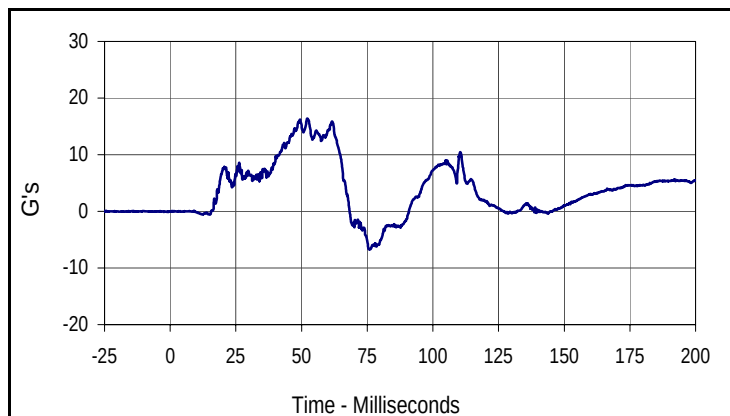
Test Date: 8/13/10
 NHTSA No.: MB5500



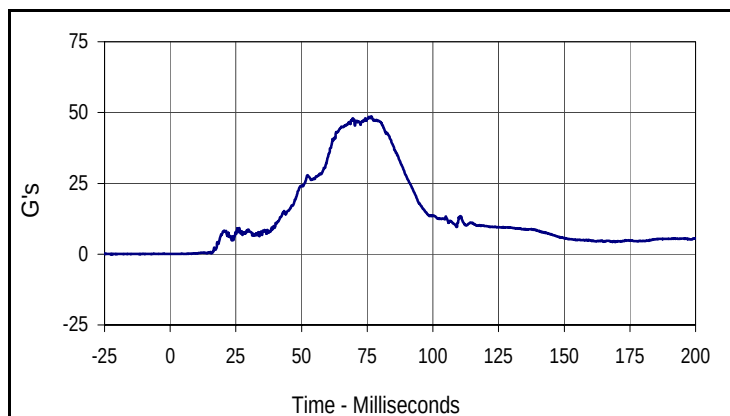
Curve Description			
Driver Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
1.1	197.3	-47.2	76.6



Curve Description			
Driver Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
1.2	151.1	-11.3	80.3



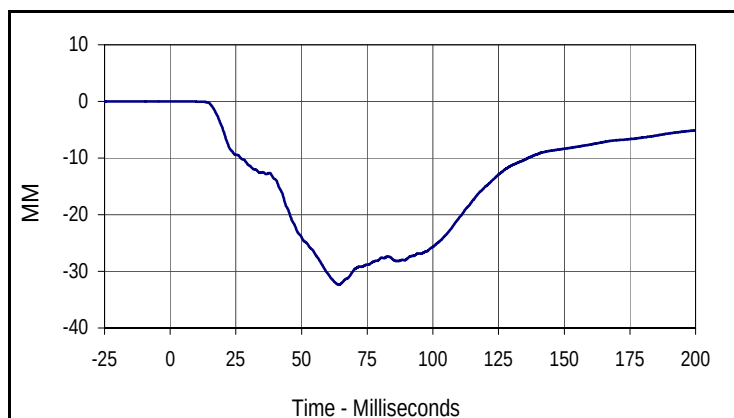
Curve Description			
Driver Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
16.4	52.2	-6.7	76.1



Curve Description			
Driver Head Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
48.7	76.6	0.0	2.4

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

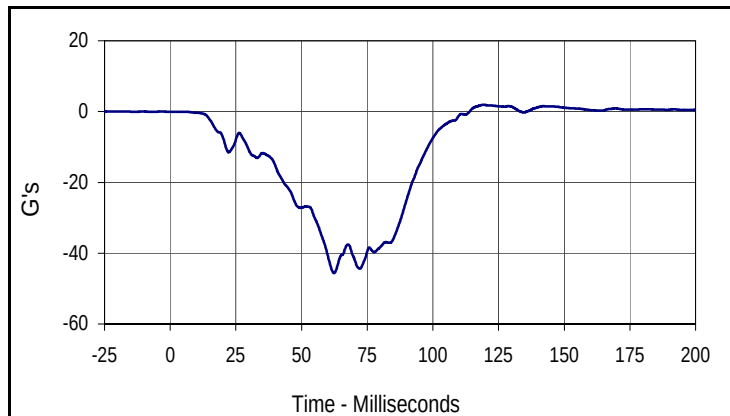
Test Date: 8/13/10
NHTSA No.: MB5500



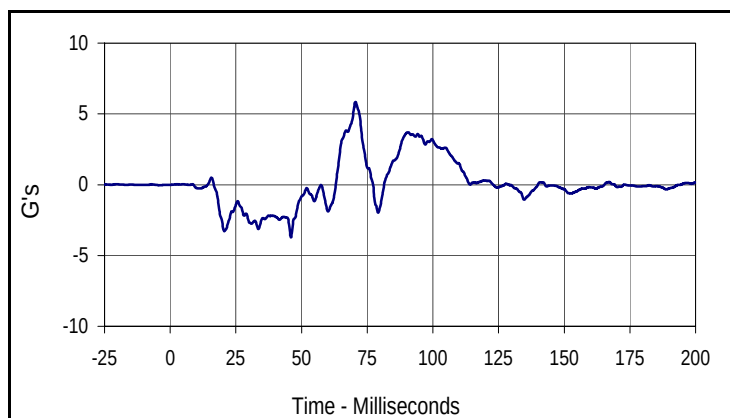
Curve Description			
Driver Chest Deflection			
CURNO	Type	SAE Class	Units
019	FIL	600	MM
Max	Time	Min	Time
0.0	5.0	-32.4	64.2

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

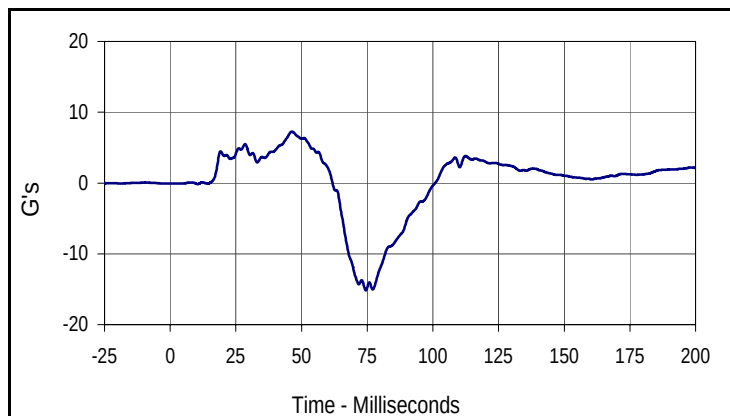
Test Date: 8/13/10
 NHTSA No.: MB5500



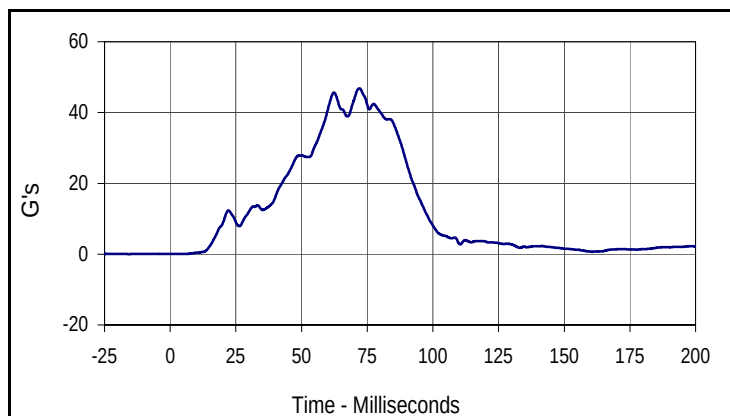
Curve Description			
Driver Chest Acceleration X Primary			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
1.9	119.4	-45.7	62.3



Curve Description			
Driver Chest Acceleration Y Primary			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
5.8	70.6	-3.7	46.0



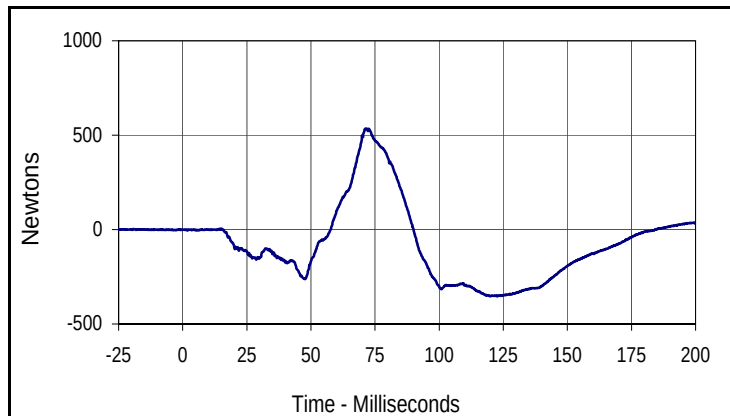
Curve Description			
Driver Chest Acceleration Z Primary			
CURNO	Type	SAE Class	Units
015	FIL	180	G's
Max	Time	Min	Time
7.3	46.3	-15.1	74.4



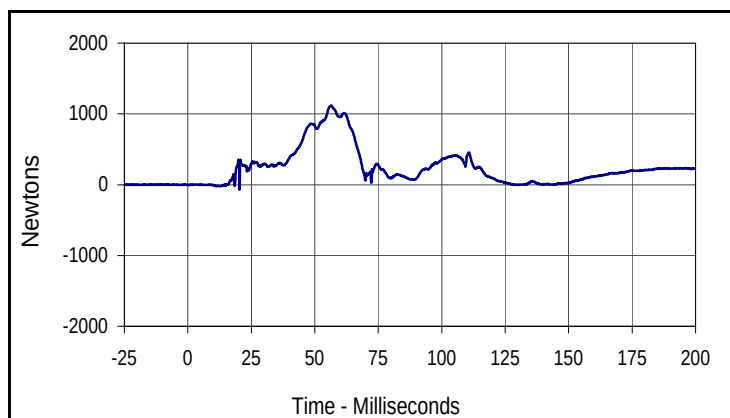
Curve Description			
Driver Chest Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
013	RES	180	G's
Max	Time	Min	Time
46.8	72.0	0.0	6.2

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

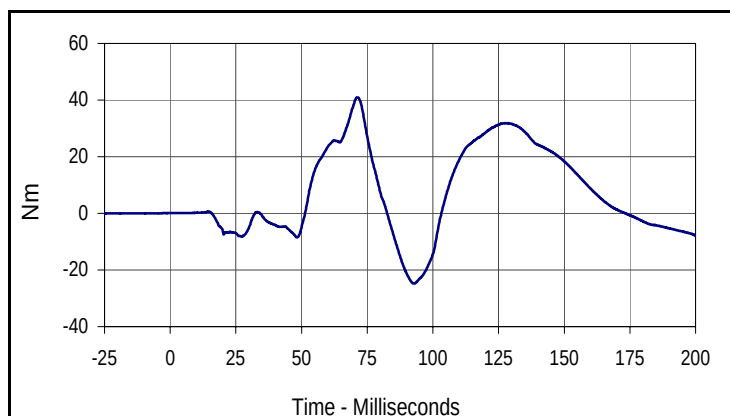
Test Date: 8/13/10
 NHTSA No.: MB5500



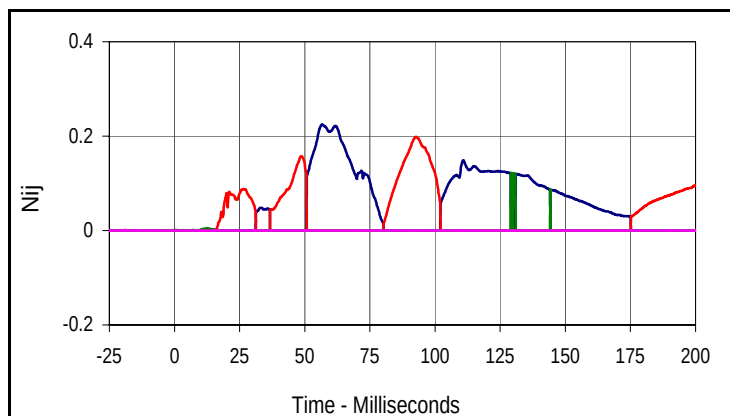
Curve Description			
Driver Upper Neck Force X			
CURNO	Type	SAE Class	Units
007	FIL	1000	Newtons
Max	Time	Min	Time
534.5	71.8	-352.2	120.1



Curve Description			
Driver Upper Neck Force Z			
CURNO	Type	SAE Class	Units
009	FIL	1000	Newtons
Max	Time	Min	Time
1120.8	56.5	-70.7	20.3



Curve Description			
Driver Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
011	FIL	600	Nm
Max	Time	Min	Time
40.9	71.4	-24.8	92.6



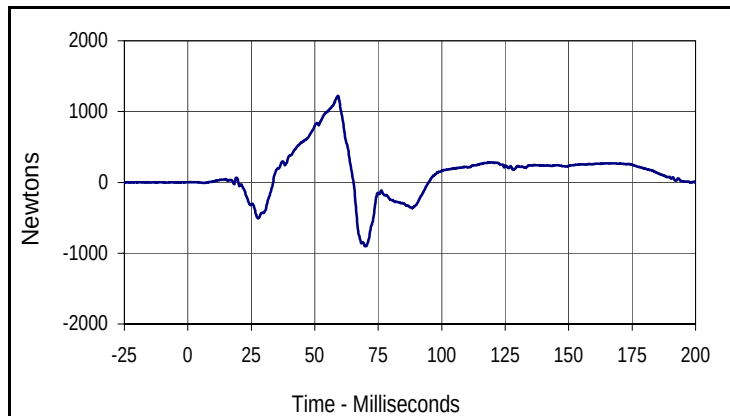
Curve Description			
Driver Nij			
Units	Type	Max	Time
Ntf	FIL	0.22	56.7
Units	Type	Max	Time
Nte	FIL	0.20	92.7
Units	Type	Max	Time
Ncf	FIL	0.12	129.2
Units	Type	Max	Time
Nce	FIL	0.13	276.4

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

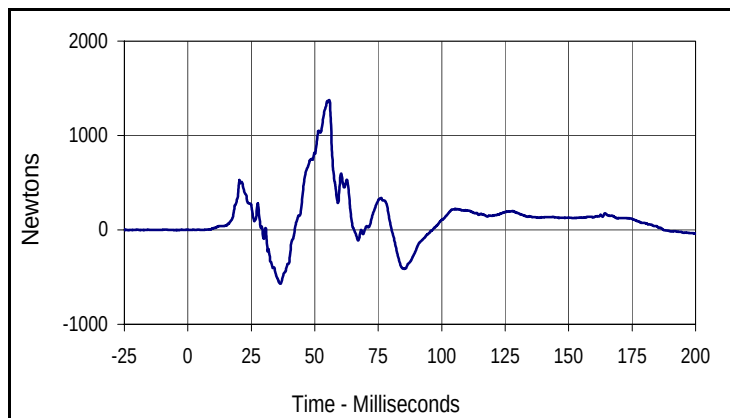
Test Date: 8/13/10

Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

NHTSA No.: MB5500



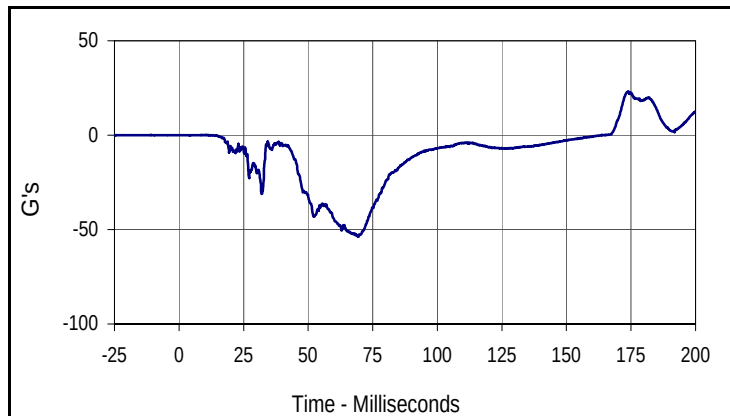
Curve Description			
Driver Left Femur Force Z			
CURNO	Type	SAE Class	Units
023	FIL	600	Newtons
Max	Time	Min	Time
1222.2	59.1	-903.1	70.0



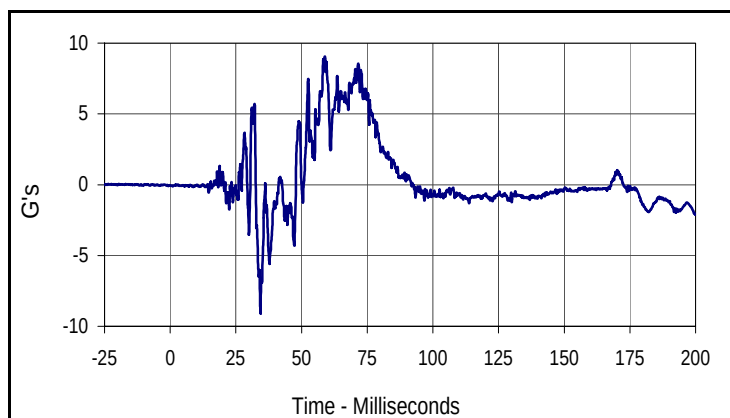
Curve Description			
Driver Right Femur Force Z			
CURNO	Type	SAE Class	Units
024	FIL	600	Newtons
Max	Time	Min	Time
1376.0	55.7	-570.9	36.5

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

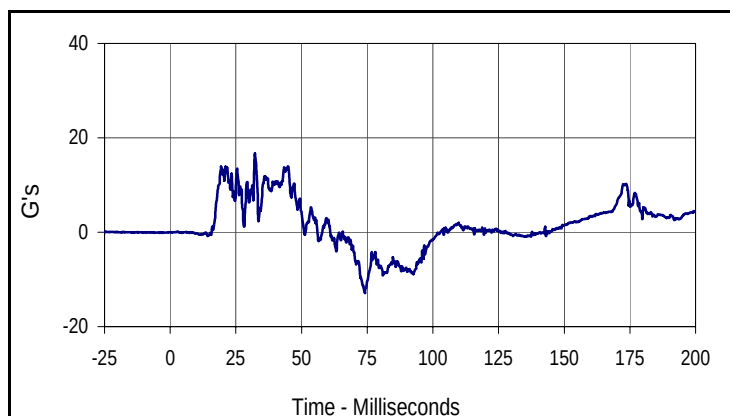
Test Date: 8/13/10
 NHTSA No.: MB5500



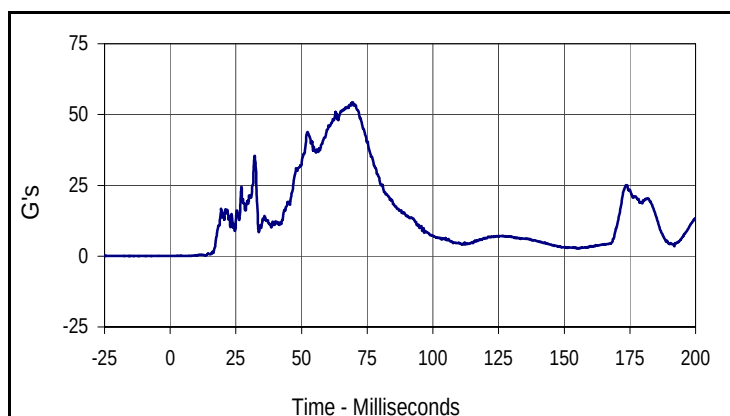
Curve Description			
Passenger Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
045	FIL	1000	G's
Max	Time	Min	Time
23.2	174.0	-53.8	69.5



Curve Description			
Passenger Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
046	FIL	1000	G's
Max	Time	Min	Time
9.0	58.9	-9.1	34.4



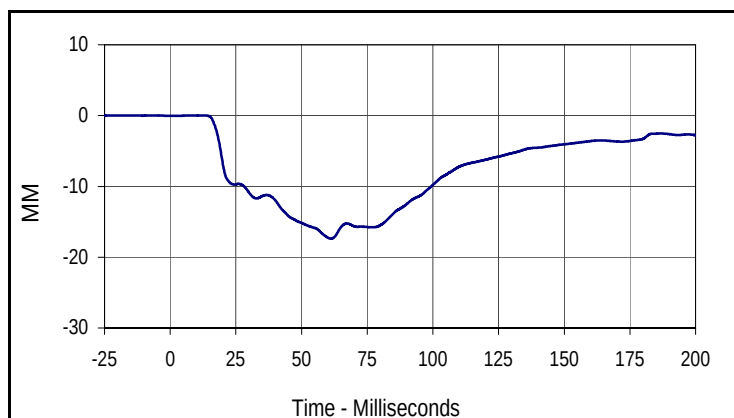
Curve Description			
Passenger Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
047	FIL	1000	G's
Max	Time	Min	Time
16.7	32.2	-12.9	74.1



Curve Description			
Passenger Head Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
045	RES	1000	G's
Max	Time	Min	Time
54.3	69.5	0.0	2.1

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

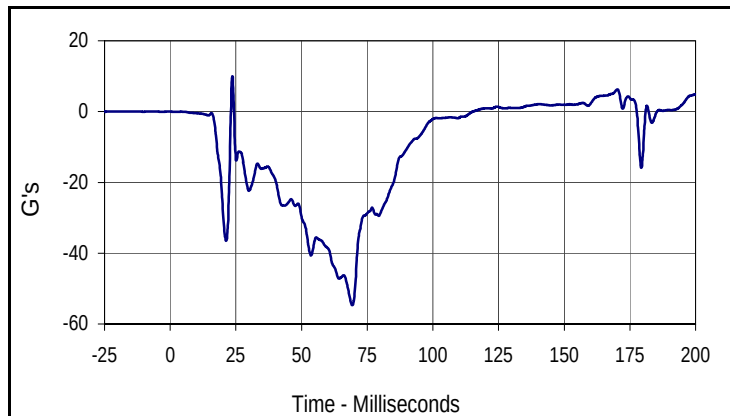
Test Date: 8/13/10
 NHTSA No.: MB5500



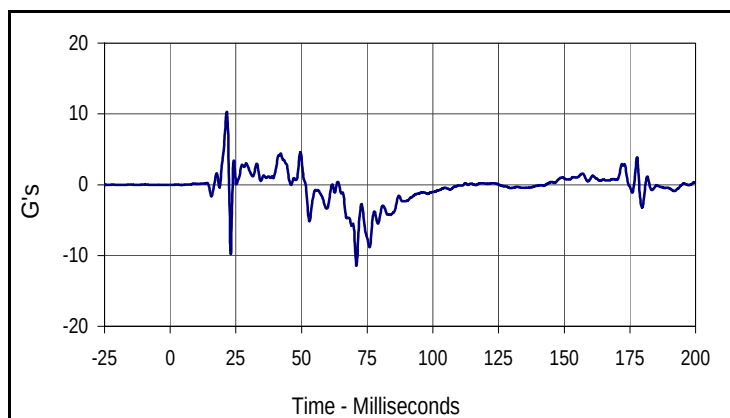
Curve Description			
Passenger Chest Deflection			
CURNO	Type	SAE Class	Units
063	FIL	180	MM
Max	Time	Min	Time
0.0	13.3	-17.4	61.2

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

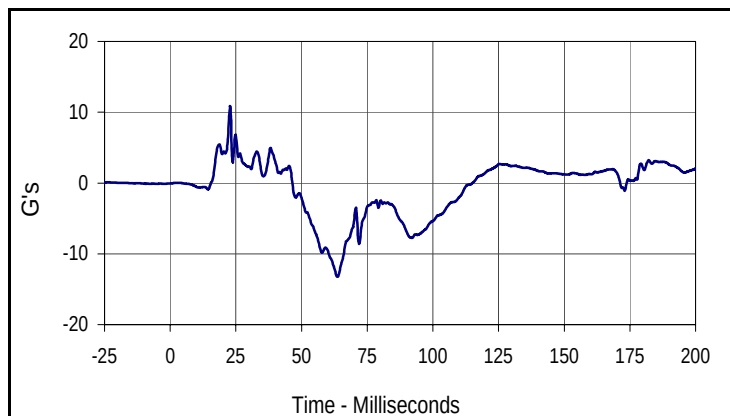
Test Date: 8/13/10
 NHTSA No.: MB5500



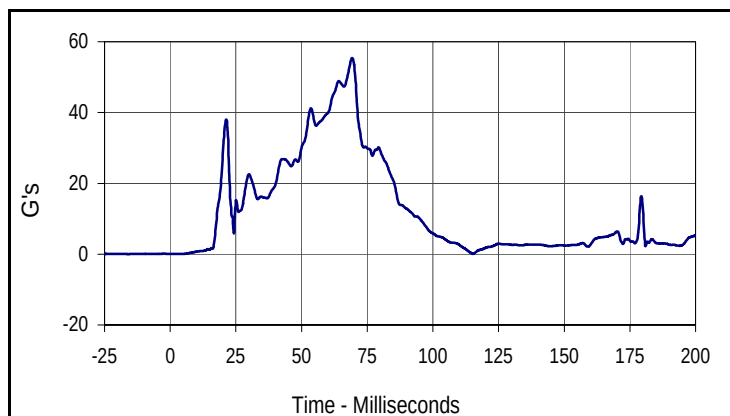
Curve Description			
Passenger Chest Acceleration X Primary			
CURNO	Type	SAE Class	Units
057	FIL	180	G's
Max	Time	Min	Time
10.0	23.7	-54.7	69.3



Curve Description			
Passenger Chest Acceleration Y Primary			
CURNO	Type	SAE Class	Units
058	FIL	180	G's
Max	Time	Min	Time
10.3	21.5	-11.5	70.9



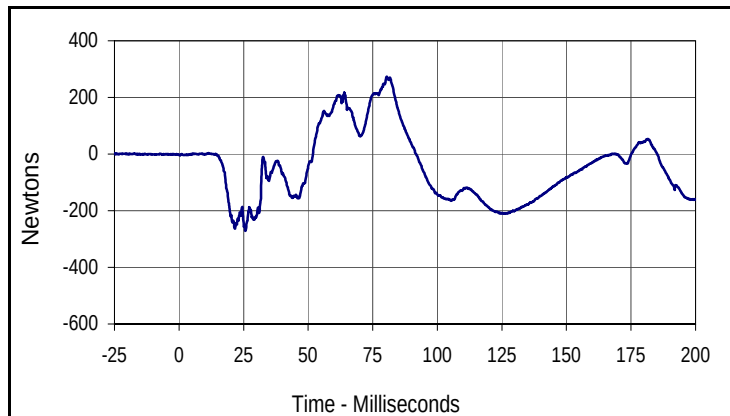
Curve Description			
Passenger Chest Acceleration Z Primary			
CURNO	Type	SAE Class	Units
059	FIL	180	G's
Max	Time	Min	Time
10.9	22.8	-13.2	63.6



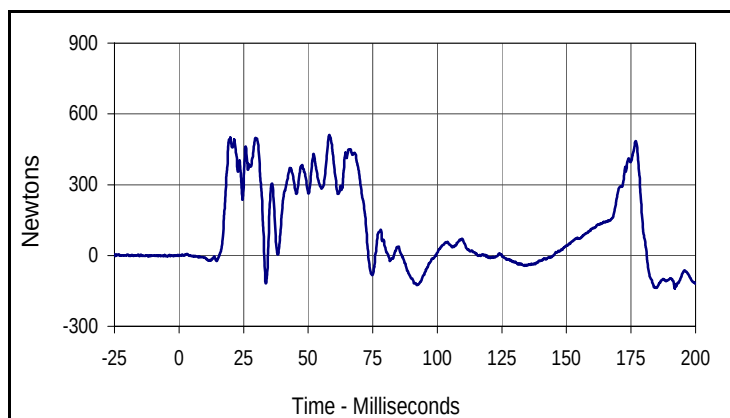
Curve Description			
Passenger Chest Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
057	RES	180	G's
Max	Time	Min	Time
55.4	69.3	0.0	3.3

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV
 Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

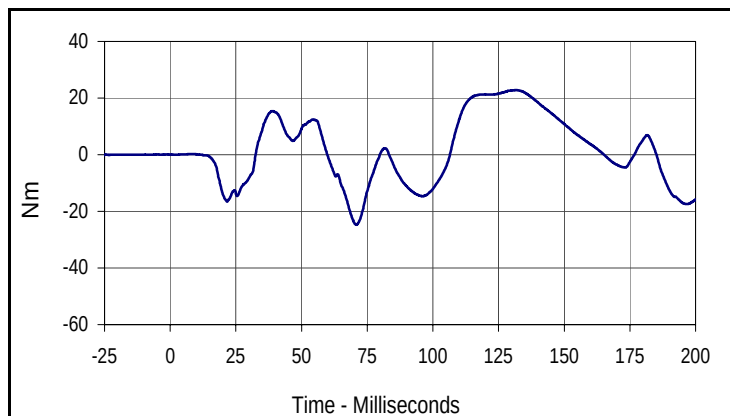
Test Date: 8/13/10
 NHTSA No.: MB5500



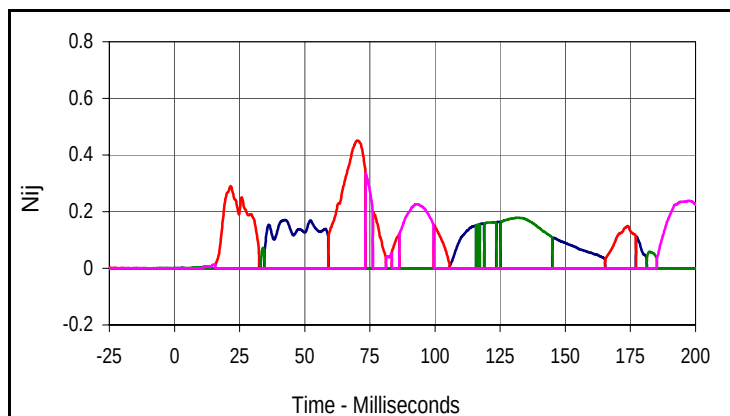
Curve Description			
Passenger Upper Neck Force X			
CURNO	Type	SAE Class	Units
051	FIL	1000	Newtons
Max	Time	Min	Time
273.2	80.4	-271.6	25.7



Curve Description			
Passenger Upper Neck Force Z			
CURNO	Type	SAE Class	Units
053	FIL	1000	Newtons
Max	Time	Min	Time
510.5	58.2	-140.4	191.9



Curve Description			
Passenger Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
055	FIL	600	Nm
Max	Time	Min	Time
22.8	131.9	-24.7	70.9



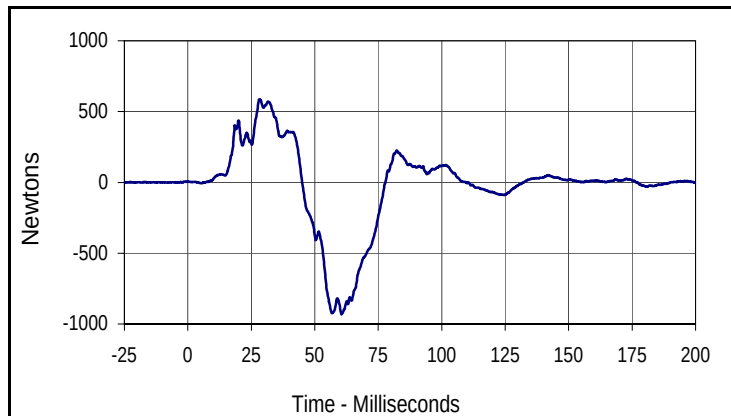
Curve Description			
Passenger Nij			
Units	Type	Max	Time
Ntf	FIL	0.17	42.5
Units	Type	Max	Time
Nte	FIL	0.45	70.4
Units	Type	Max	Time
Ncf	FIL	0.18	131.3
Units	Type	Max	Time
Nce	FIL	0.33	73.4

Test Vehicle: 2011 Subaru Outback 2.5i AWD 5-Door MPV

Test Date: 8/13/10

Test Program: 56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test

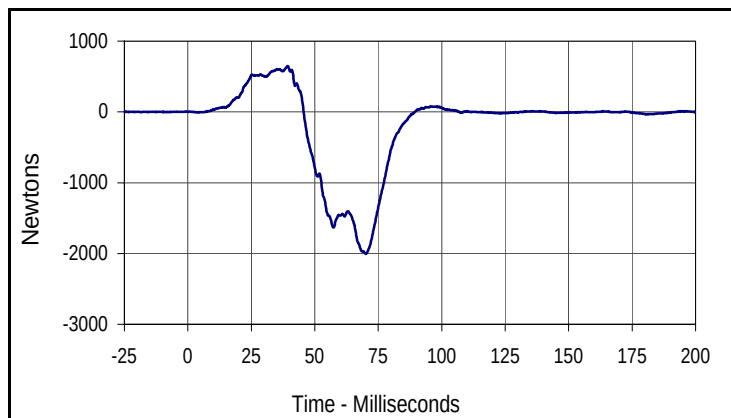
NHTSA No.: MB5500



Curve Description

Passenger Left Femur Force Z

CURNO	Type	SAE Class	Units
067	FIL	600	Newtons
Max	Time	Min	Time
586.3	28.4	-931.3	60.5



Curve Description

Passenger Right Femur Force Z

CURNO	Type	SAE Class	Units
068	FIL	600	Newtons
Max	Time	Min	Time
646.9	39.3	-2005.2	70.1

APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

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

Test Program: Hybrid III 50th Percentile Male Head Drop Test

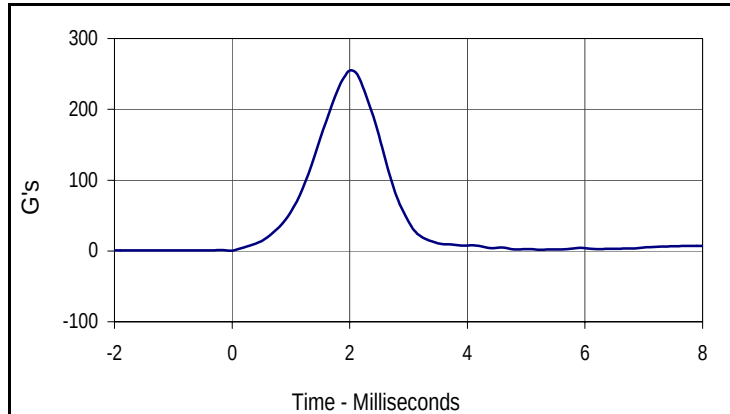
Test Date: 8/9/10

ATD Serial No.: 035

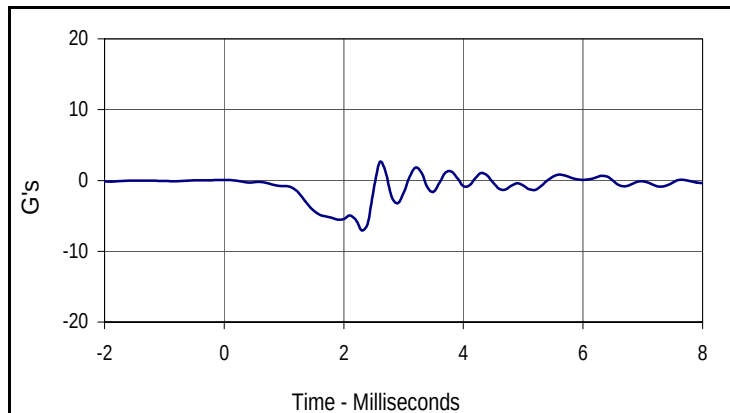
Test I.D.: HDM08A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	254.7	Pass
Peak Lateral Acceleration	G's	≤15.0	7.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
254.7	2.0	0.5	0.0



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.6	2.6	-7.1	2.3

Test Program: Hybrid III 50th Percentile Male Thorax Impact Test

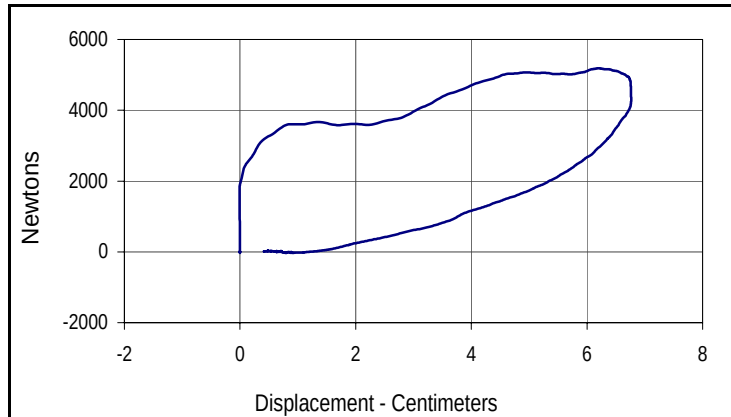
Test Date: 8/9/10

ATD Serial No.: 035

Test I.D.: CHM08A



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	6.58 to 6.82	6.64	Pass
Peak Probe Force	Newtons	5159 to 5893	5186	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.76	Pass
Internal Hysteresis	%	69 to 85	74.0	Pass
Overall Test Results				Pass



Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
001	FIL	180	74.0
Peak Probe Force		Peak Chest Deflection	
5186		6.76	

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test

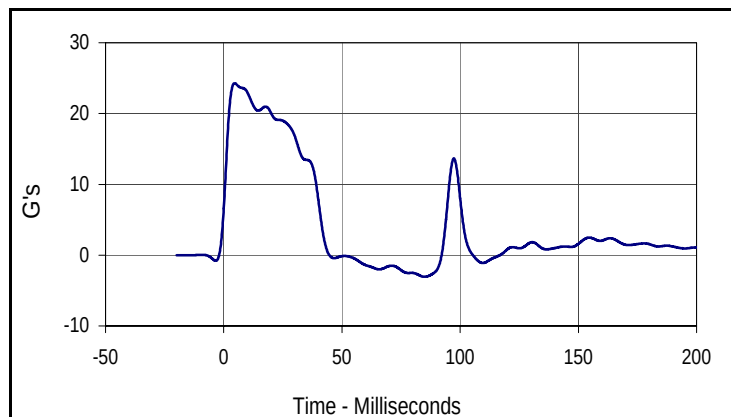
Test Date: 8/9/10

ATD Serial No.: 035

Test I.D.: NFM08A



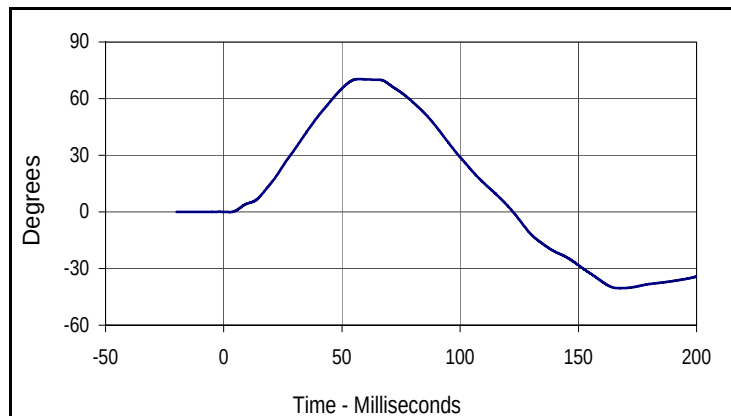
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.0	Pass
	20 Msec.	G's	17.6 to 22.6	20.1	Pass
	30 Msec.	G's	12.5 to 18.5	16.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	16.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	41.2	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	70.3	Pass
	Time	Msec.	57.0 to 64.0	57.1	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	122.4	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	89.0	Pass
	Time	Msec.	47.0 to 58.0	53.9	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	98.4	Pass
			Overall Test Results		Pass



Curve Description

Pendulum Deceleration

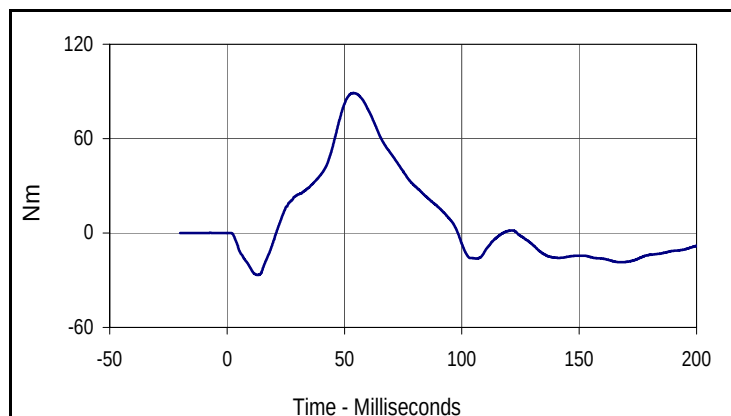
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
24.3	4.6	-3.1	84.9



Curve Description

"D" Plane Rotation

CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
70.3	57.1	-40.4	167.6



Curve Description

Moment About Occipital Condyle

CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
89.0	53.9	-26.7	13.3

Test Program: Hybrid III 50th Percentile Male Neck Extension Test

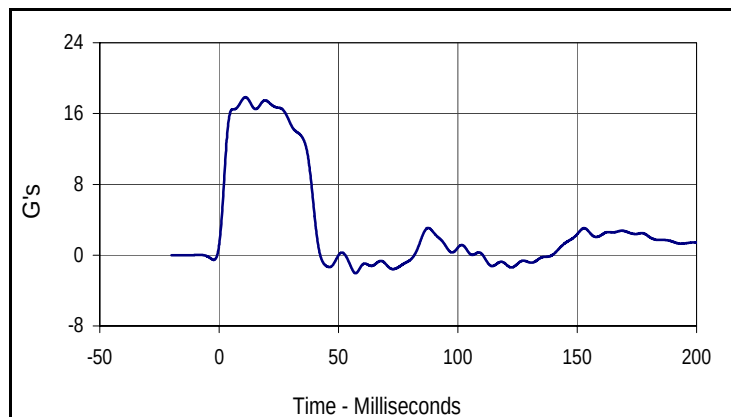
Test Date: 8/9/10

ATD Serial No.: 035

Test I.D.: NEM08A



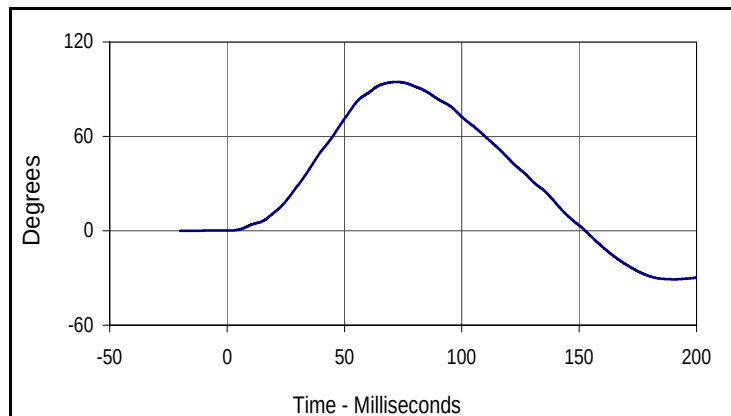
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.7	Pass
	20 Msec.	G's	14.0 to 19.0	17.4	Pass
	30 Msec.	G's	11.0 to 16.0	14.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	14.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	39.8	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	94.6	Pass
	Time	Msec.	72.0 to 82.0	72.2	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	152.7	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-74.5	Pass
	Time	Msec.	65.0 to 79.0	68.2	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	137.1	Pass
Overall Test Results					Pass



Curve Description

Pendulum Deceleration

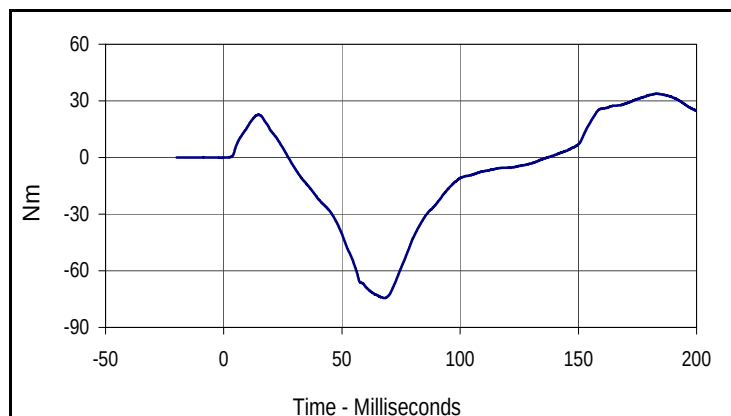
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
17.8	11.0	-2.0	57.2



Curve Description

"D" Plane Rotation

CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
94.6	72.2	-30.8	190.4



Curve Description

Moment About Occipital Condyle

CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
33.8	183.3	-74.5	68.2

Test Program: Hybrid III 50th Percentile Male Knee Impact Test

Test Date: 8/9/10

ATD Serial No.: 035

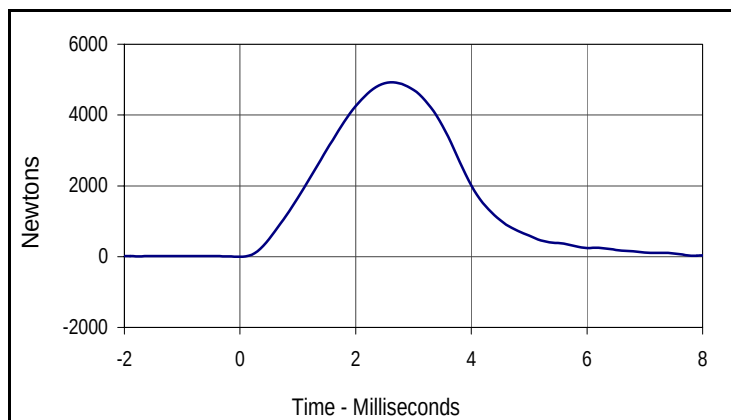
Test I.D.: LKM08A , RKM08A

**Left Knee**

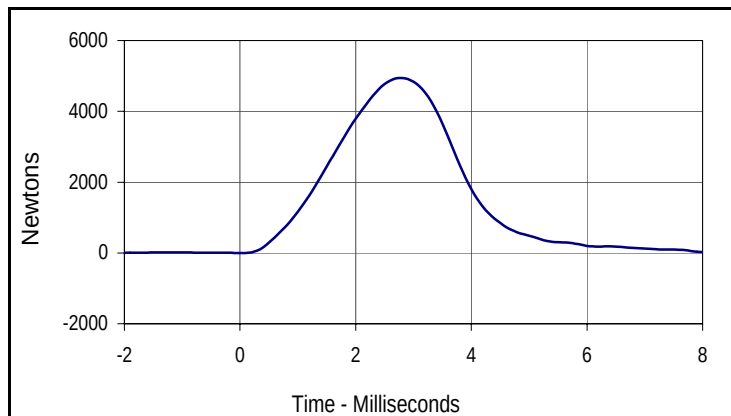
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	4922	Pass
Overall Test Results				Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	4944	Pass
Overall Test Results				Pass

**Curve Description****Left Knee Probe Force**

CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4922.2	2.6	-53.5	9.6

**Curve Description****Right Knee Probe Force**

CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
4944.3	2.8	-44.5	10.0

Test Program: Hybrid III 5th Percentile Female Head Drop TestTest Date: 8/10/10ATD Serial No.: 141Test I.D.: HDF08A

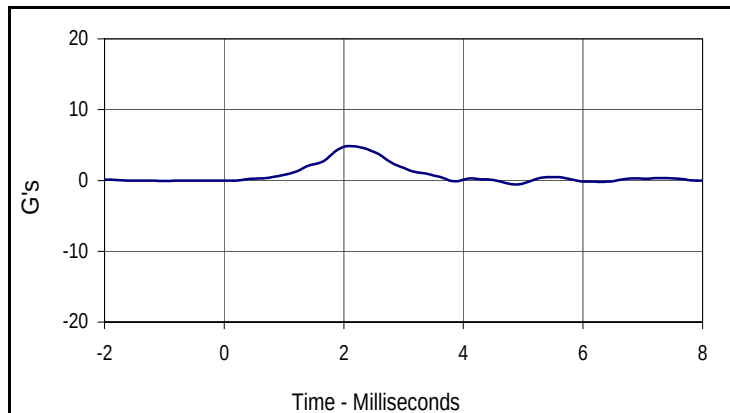
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	250.0 to 300.0	272.5	Pass
Peak Lateral Acceleration	G's	≤15.0	4.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



Curve Description

Head Resultant

CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
272.5	2.1	0.0	-1.7



Curve Description

Head Y

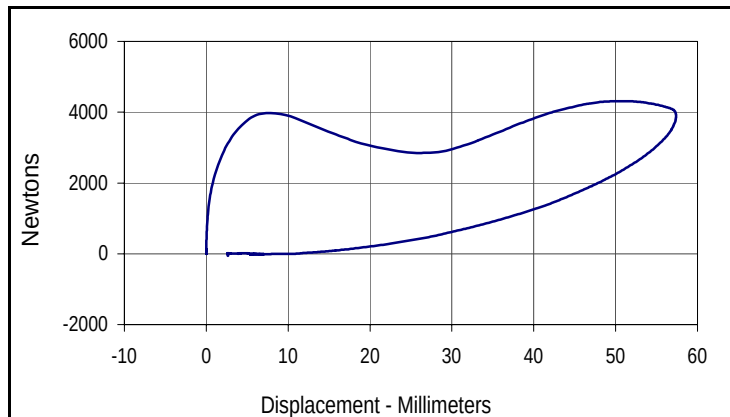
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.9	2.1	-0.6	4.9

Test Program: Hybrid III 5th Percentile Female Thorax Impact Test
 ATD Serial No.: 141

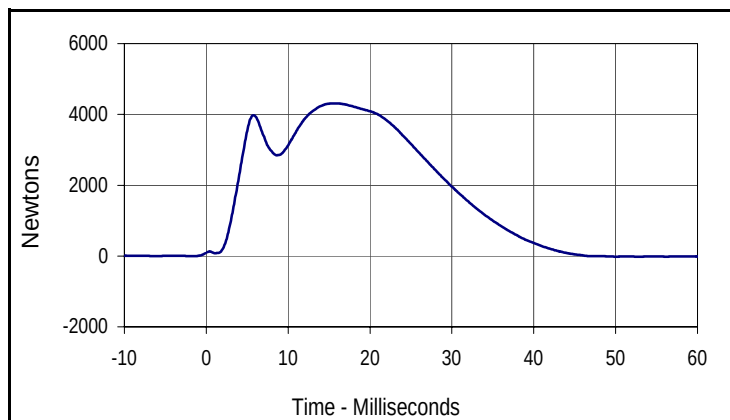
Test Date: 8/10/10
 Test I.D.: CHF08A



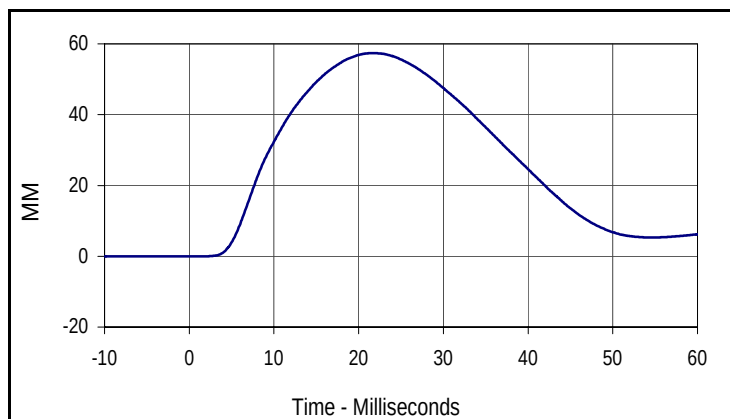
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.59 to 6.83	6.68	Pass
Peak Chest Deflection	MM	50.0 to 58.0	57.4	Pass
Peak Force Between 50 and 58 MM	Newtons	3900 to 4400	4313	Pass
Peak Force Between 18 and 50 MM	Newtons	≤4600	4313	Pass
Internal Hysteresis	%	69 to 85	74.4	Pass
Overall Test Results			Pass	



Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
003	FIL	180	74.4
Peak Probe Force		Peak Chest Displ.	
4313.2		57.4	



Curve Description			
Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	180	Newtons
Max	Time	Min	Time
4313.2	15.4	-55.1	187.8



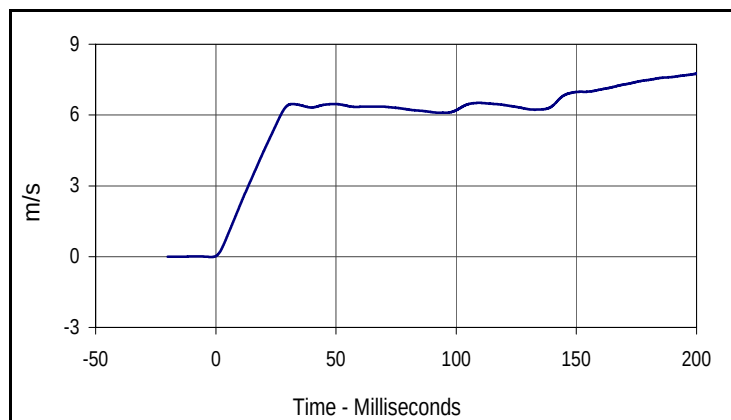
Curve Description			
Chest Deflection			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
57.4	21.7	0.0	-8.3

Test Program: Hybrid III 5th Percentile Female Neck Flexion Test
 ATD Serial No.: 141

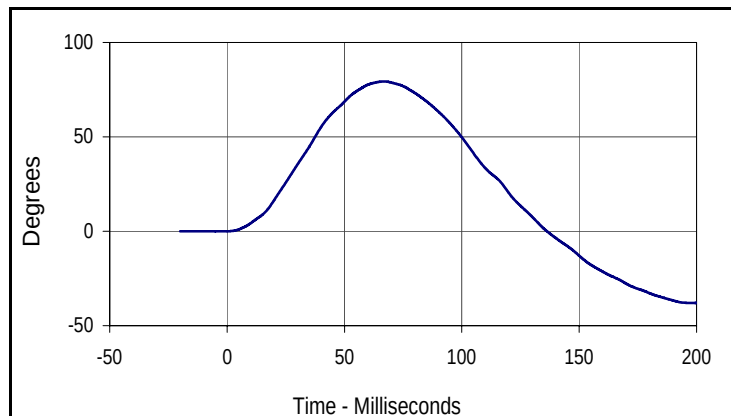
Test Date: 8/10/10
 Test I.D.: NF06A



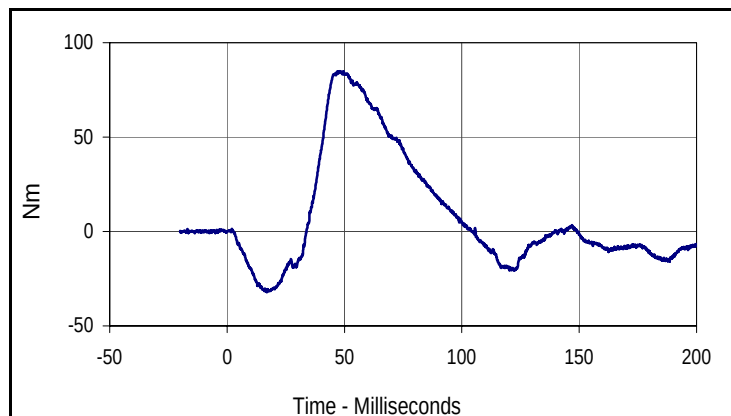
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.93	Pass
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.2	Pass
	20 Msec.	m/s	4.0 to 5.0	4.5	Pass
	30 Msec.	m/s	5.8 to 7.0	6.4	Pass
"D" Plane Rotation	Max	Degrees	77.0 to 91.0	79.4	Pass
Peak Moment in Rotation	Max	Nm	69.0 to 83.0	71.7	Pass
Positive Moment Decay, Time To 10 Nm		Msec.	80.0 to 100.0	95.2	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
7.8	200.0	0.0	-1.8



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
79.4	66.8	-38.0	200.0



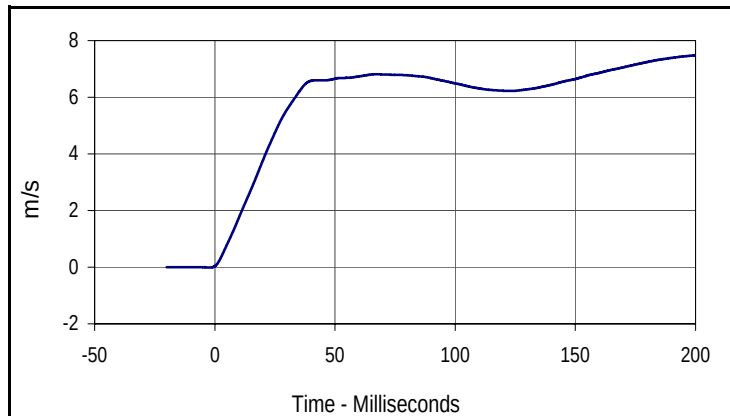
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
84.9	48.0	-32.2	16.9

Test Program: Hybrid III 5th Percentile Female Neck Extension Test
 ATD Serial No.: 141

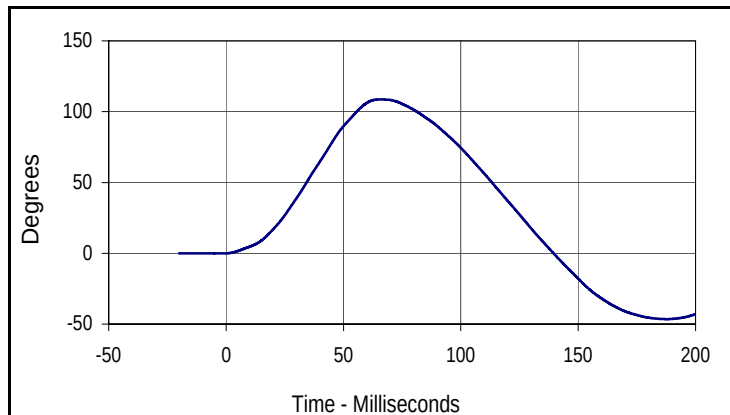
Test Date: 8/10/10
 Test I.D.: NE06C



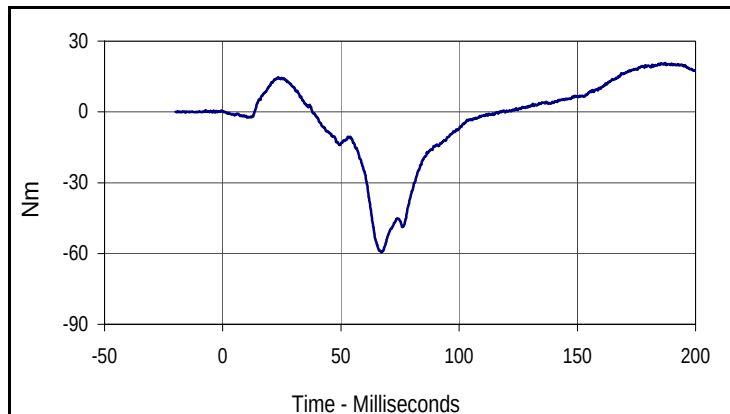
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.09	Pass
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.7	Pass
	20 Msec.	m/s	3.1 to 3.9	3.8	Pass
	30 Msec.	m/s	4.6 to 5.6	5.6	Pass
"D" Plane Rotation	Max	Degrees	99.0 to 114.0	108.6	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-56.6	Pass
Positive Moment Decay, Time To -10 Nm		Msec.	94.0 to 114.0	96.0	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
7.5	200.0	0.0	-2.2



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
108.6	65.3	-46.5	187.8



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
20.7	187.1	-59.5	67.1

Test Program: Hybrid III 5th Percentile Female Knee Impact Test
 ATD Serial No.: 141

Test Date: 8/10/10
 Test I.D.: LK06A , RK06B



Left Knee

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	3450 to 4060	3837	Pass
Overall Test Results			Pass	

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	3450 to 4060	3846	Pass
Overall Test Results			Pass	



Curve Description

Left Knee Probe Force

CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3837.3	4.3	3.6	-0.4



Curve Description

Right Knee Probe Force

CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
3846.2	4.3	-2.4	-0.4

Test Program: Hybrid III 5th Percentile Female Torso Flexion Test

Test Date: 8/10/10

ATD Serial No.: 141

Test I.D.: TF06A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial reference plane angle	Degrees	≤20.0	2.5	Pass
Peak Force at 45 +/-0.5 degrees	Newtons	320.0 to 390.0	331.2	Pass
Torso rotation rate	deg/sec	0.5 to 1.5	1.2	Pass
Final reference plane angle	Degrees	+/-8	2.0	Pass
Overall Test Results				Pass

Test Program: Hybrid III 5th Percentile Female External Measurements

Test Date: 8/10/10

ATD Serial No.: 141

Test I.D.: N/A



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
A - Total sitting height	mm	774.7 to 800.1	776	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	445	Pass
C - "H" point height (Reference)	mm	81.3 to 86.3	83	Pass
D - "H" point from seat back (Ref.)	mm	144.8 to 149.8	146	Pass
E - Shoulder pivot from backline	mm	68.6 to 83.8	75	Pass
F - Thigh clearance	mm	119.4 to 134.6	130	Pass
G - Back of elbow to wrist pivot	mm	243.9 to 259.1	251	Pass
H - Head to back line	mm	40.7 to 45.7	43	Pass
I - Shoulder to elbow length	mm	276.8 to 297.2	290	Pass
J - Elbow rest height	mm	182.8 to 203.2	200	Pass
K - Buttock to knee length	mm	520.7 to 546.1	541	Pass
L - Popliteal height	mm	355.6 to 376.0	365	Pass
M - Knee pivot height	mm	393.7 to 419.1	413	Pass
N - Buttock popliteal length	mm	414.0 to 439.4	420	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	180	Pass
P - Foot length	mm	218.5 to 233.7	229	Pass
R - Buttock to knee pivot length	mm	457.2 to 482.6	475	Pass
S - Head breadth	mm	137.1 to 147.3	140	Pass
T - Head depth	mm	177.8 to 188.0	180	Pass
U - Hip breadth	mm	299.7 to 314.9	312	Pass
V - Shoulder breadth	mm	350.5 to 365.7	360	Pass
W - Foot breadth	mm	78.8 to 94.0	89	Pass
X - Head circumference	mm	528.3 to 548.7	529	Pass
Y - Chest circumference with jacket	mm	850.8 to 881.3	860	Pass
Z - Waist circumference	mm	759.5 to 789.9	760	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	300	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	165	Pass
Overall Test Results				Pass

Test Program: Dummy Damage Checklist
 ATD Serial No.: 035

Test Date: 8/9/10
 Test I.D.: N/A



GENERAL	DAMAGED	OK
Outer skin on entire dummy		X
Head ballast secure		X
Gashes, rips, general appearance, etc.		X
Neck-Broken or cracks in rubber		X
Check that upper neck bracket is firmly attached to lwr neck bracket		X
Three rubber bumpers in place		X
Spine- Broken or cracks in rubber		X
Check for looseness at the condyle joint		X
Nodding blocks- cracked or out of position		X
Ribs- Check all ribs and rib supports for damage (bent or broken)		X
Check damping material or separation or cracks		X
OTHER		
CHEST DISPLACEMENT ASSEMBLY		
Bent shaft		X
Slider arm riding correctly, in track		X
TRANSDUCER LEADS		
Torn cables		X
ACCELEROMETER MOUNTINGS		
Check for secure mounting		X
KNEES		
Check outer skin, insert and casting (without removing insert)		X
Knee sliders - Wires intact		X
Knee sliders- Rubber returned to "at rest position"		X
LIMBS		
Check for normal movement and adjustment		X
PELVIS		
Inspect for breakage, especially at iliac crest		X

Comments on repair or replacement parts:

Test Program: Dummy Damage Checklist
 ATD Serial No.: 141

Test Date: 8/10/10
 Test I.D.: N/A



GENERAL	DAMAGED	OK
Outer skin on entire dummy		X
Head ballast secure		X
Gashes, rips, general appearance, etc.		X
Neck-Broken or cracks in rubber		X
Check that upper neck bracket is firmly attached to lwr neck bracket		X
Three rubber bumpers in place		X
Spine- Broken or cracks in rubber		X
Check for looseness at the condyle joint		X
Nodding blocks- cracked or out of position		X
Ribs- Check all ribs and rib supports for damage (bent or broken)		X
Check damping material or separation or cracks		X
OTHER		
CHEST DISPLACEMENT ASSEMBLY		
Bent shaft		X
Slider arm riding correctly, in track		X
TRANSDUCER LEADS		
Torn cables		X
ACCELEROMETER MOUNTINGS		
Check for secure mounting		X
KNEES		
Check outer skin, insert and casting (without removing insert)		X
Knee sliders - Wires intact		X
Knee sliders- Rubber returned to "at rest position"		X
LIMBS		
Check for normal movement and adjustment		X
PELVIS		
Inspect for breakage, especially at iliac crest		X

Comments on repair or replacement parts:

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

Test Program: Hybrid III 50th Percentile Male Head Drop Test

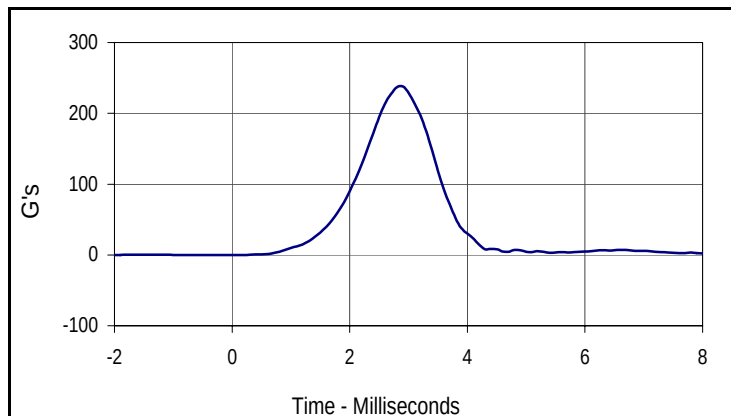
Test Date: 8/15/10

ATD Serial No.: 035

Test I.D.: HDM08B



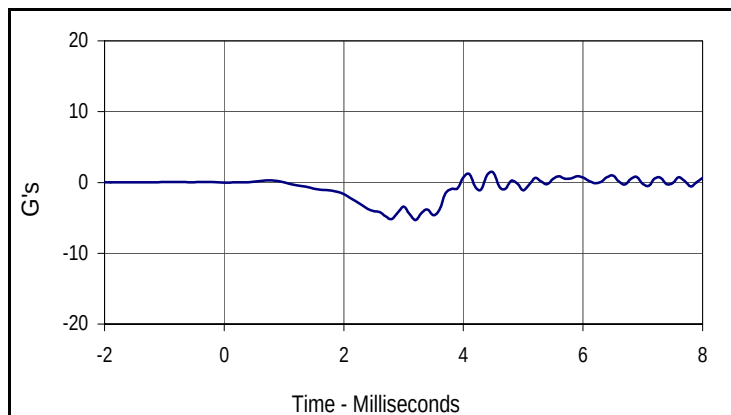
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	237.9	Pass
Peak Lateral Acceleration	G's	≤15.0	5.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



Curve Description

Head Resultant

CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
237.9	2.9	0.0	-2.0



Curve Description

Head Y

CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
1.4	4.5	-5.3	3.2

Test Program: Hybrid III 50th Percentile Male Thorax Impact Test

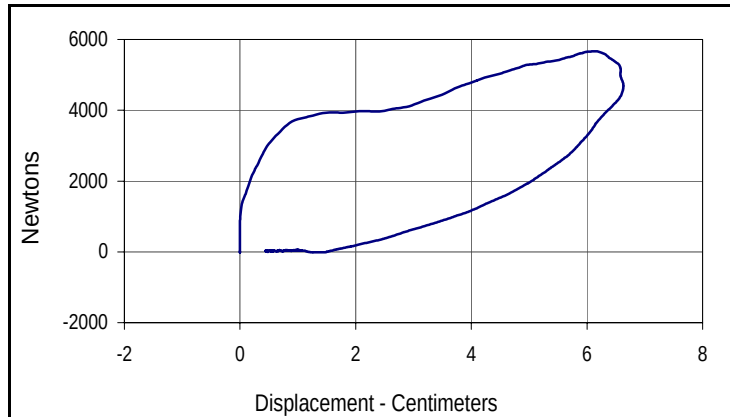
Test Date: 8/15/10

ATD Serial No.: 035

Test I.D.: CHM08B



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	6.58 to 6.82	6.60	Pass
Peak Probe Force	Newtons	5159 to 5893	5669	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.63	Pass
Internal Hysteresis	%	69 to 85	72.7	Pass
Overall Test Results				Pass



Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
001	FIL	180	72.7
Peak Probe Force		Peak Chest Deflection	
5669		6.63	