REPORT NUMBER: NCAP-KAR-11-014

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

BAYERISCHE MOTORENWERKE AG

2011 BMW 535I 4-DOOR SEDAN

NHTSA NUMBER: MB0508

PREPARED BY:

KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

SEPTEMBER 2, 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

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Approval Date: September 14, 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

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16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2011 BMW 535i 4-Door Sedan 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 September 2, 2010.

The impact velocity of the vehicle was 55.92 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 227 mm at DPD 4, to the right of the vehicle's centerline. The test vehicle's performance is as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700.0	130.2	700.0	273.5
Maximum Chest Compression	mm	63	32	52	19
Nij	N/A	1	0.29	1	0.39
Neck Tension	N	4170	1040.8	2620	716.4
Neck Compression	N	4000	40.2	2520	177.2
Left Femur Force	N	10008	1899.6	6805	2274.3
Right Femur Force	N	10008	2420.5	6805	2274.5

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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/n 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 BMW 535i 4-Door Sedan at a velocity of 55.9 km/h. The test was performed at KARCO Engineering, LLC. on September 2, 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 227 mm located at DPD 4, to the right of the vehicle's 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. The lower torso contacted the steering wheel rim. Both the left and right knees contacted the knee airbag.

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 knee airbag.

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)	130.2	57.0	72.0	-32	0.29	1040.8	-40.2	-1899.6	-2420.5
Passenger (5th)	273.5	52.2	67.2	-19	0.39	716.4	-177.2	-2274.3	-2274.5

SECTION 2

DATA SHEETS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

CONVERSION FACTORS

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

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MB0508	Anti-Lock Brakes	Yes
Make	BMW	All Wheel Drive	No
Model	535i	Power Steering	Yes
Body Style	4-Door Sedan	Driver Front Airbag	Yes
VIN	WBAFR7C58BC601641	Driver Curtain Airbag	Yes
Body Color	Space Gray Metallic	Driver Head/Torso Airbag	No
Delivery Date	7/26/2010	Driver Torso Airbag	Yes
Odometer Reading (mi)	18	Driver Torso/Pelvis Airbag	No
Odometer Reading (km)	29	Driver Pelvis Airbag	No
Dealer	Crevier BMW	Driver Knee Airbag	Yes
Transmission	8-Speed Automatic	Pass. Front Airbag	Yes
Final Drive	Rear	Pass. Curtain Airbag	Yes
Type / No. of Cylinders	Inline 6	Pass. Head/Torso Airbag	No
Engine Displacement (L)	3.0	Pass. Torso Airbag	Yes
Engine Placement	Longitudinal	Pass. Torso/Pelvis Airbag	No
Roof Rack	No	Pass. Pelvis Airbag	No
Sunroof / T-Top	Yes	Pass. Knee Airbag	Yes
Tinted Glass	No	Pre-Tensioners	Yes
Traction Control	Yes	Load Limiters	Yes
Power Brakes	Yes	Automatic Door Locks	Yes
Front Disc	Yes	Tilt Steering	Yes
Rear Disc	Yes	Other	Stability Control

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

DATA FROM CERTIFICATION LABEL

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

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

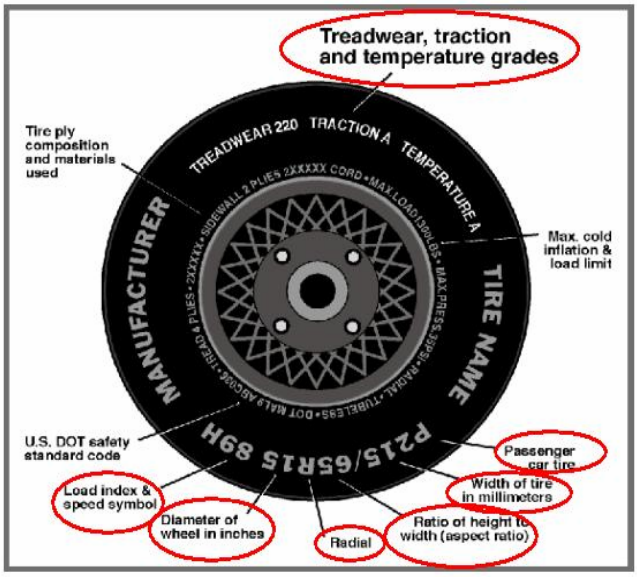
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Weight (VCW) (kg)				480.0
Cargo Weight (RCLW) (kg)				139.8

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	260
Recommended Tire Size	245/40R19	275/35R19
Tire Size on Vehicle	245/40R19	275/35R19
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Excellence Run Flat	Excellence Run Flat
Treadwear	240	240
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1	2
Tire Plies Body	4	5
Load Index / Speed Symbol	94Y	96Y
Tire Material	Rayon, Steel, Polyamide	Rayon, Steel, Polyamide
DOT Safety Code Left	NE66 1F1R 1910	NEBN JCIR 1910
DOT Safety Code Right	NE66 1F1R 1910	NEBN JCIR 1910

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	444.0	436.5		480.0	570.5	
Right	kg	462.0	450.0		460.5	556.0	
Ratio	%	50.5%	49.5%	100.0%	45.5%	54.5%	100.0%
Total	kg	906.0	886.5	1792.5	940.5	1126.5	2067.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1792.5	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	139.8	C
Calculated Vehicle Target Weight (TVTW)	kg	2073.3	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	718	715	712	717	1466
As Tested	mm	712	711	681	681	1616
Post-Test	mm	763	785	675	695	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2965
Total Vehicle Length at Left Side	mm	4309
Total Vehicle Length at Centerline	mm	4895
Total Vehicle Length at Right Side	mm	4309
Weight of Ballast in Cargo Area	kg	89
Weight of Vehicle Components Removed	kg	5
Amount of Stoddard Solvent in Fuel Tank	L	65.12

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk Liner and Trim (5.0 kg)

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length	4895	4670	-225
2	Total Width	1850	1917	67
3	Bumper Top Height	607	535	-72
4	Bumper Bottom Height	441	98	-343
5	Longitudinal Member Top Height	570	560	-10
6	Distance Between Longitudinal Members	792	895	103
7	Longitudinal Member Width	72	100	28
8	Engine Top Height	853	931	78
9	Engine Bottom Height	173	223	50
10	Engine and Gearbox Width	607	607	0
11	Front Bumper to Engine Distance	539	388	-151
12	Front Shock Absorber Fixing Height	864	913	49
13	Bonnet Leading Edge Height	789	790	1
14	Front Shock Absorber Fixing Width	928	930	2
15	Front Bumper to Front Axle Distance	824	655	-169
16	Front Axle to A-Pillar Distance	674	600	-74
17	A-Pillar to B-Pillar Distance	973	974	1
18	B-Pillar to Rear Axle Distance	1176	1178	2
19	B-Pillar to C-Pillar Distance	800	799	-1
20	Roof Sill Bottom Height	1292	1330	38
21	Roof Sill Top Height	1400	1488	88
22	Floor Sill Bottom Height	151	191	40
23	Floor Sill Top Height	380	408	28

All measurements in millimeters.

DATA SHEET NO. 2

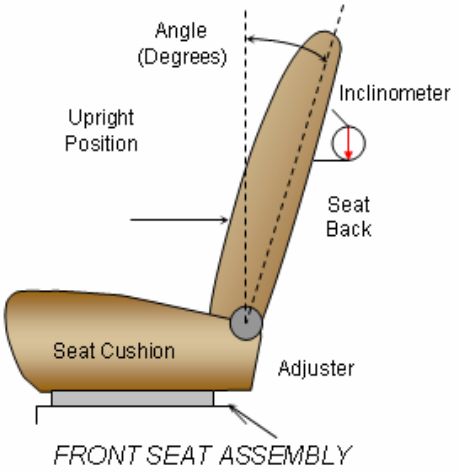
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

NOMINAL DESIGN RIDING POSITION

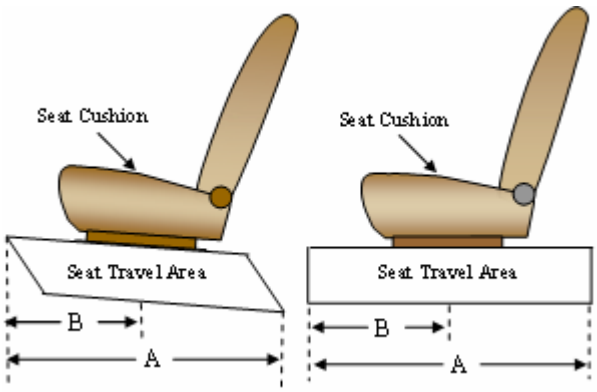
The procedure for the driver is as follows: the seat back is set to the manufacturer's designated angle; seat back angle is measured with a straightedge along the seatback using a digital inclinometer. The procedure for the passenger is as follows: the seat back is set to position the transverse instrumentation platform of the dummy's head at 0° ± 0.5°; seat back angle is measured using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	26.5
Passenger Seat Back Angle	21.0

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. The passenger's seat is set to the forward most position where the ATD will not contact any interior panels.



Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	330 mm	165 mm
Passenger Seat	240 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	Fixed	Fixed
Passenger Seat	Fixed	Fixed

DATA SHEET NO. 2 … (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

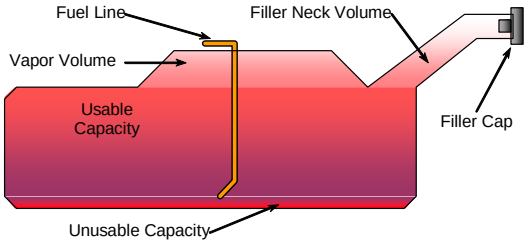
Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

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	65.12
1/3 of Usable Capacity	23.34

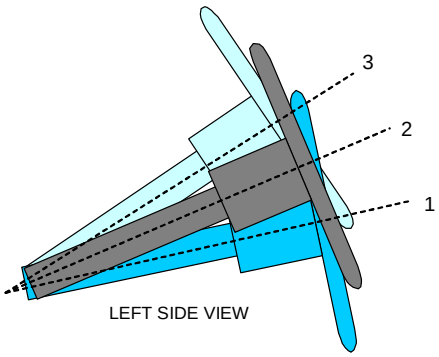
The test vehicle is equipped with an electric fuel pump. The fuel pump starts when the ignition is on. The fuel pump will operate for 5 seconds. After pressure has been built up, the fuel pump switches to sleep mode until the engine will be started or the pressure decreases. The fuel filler door is located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



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

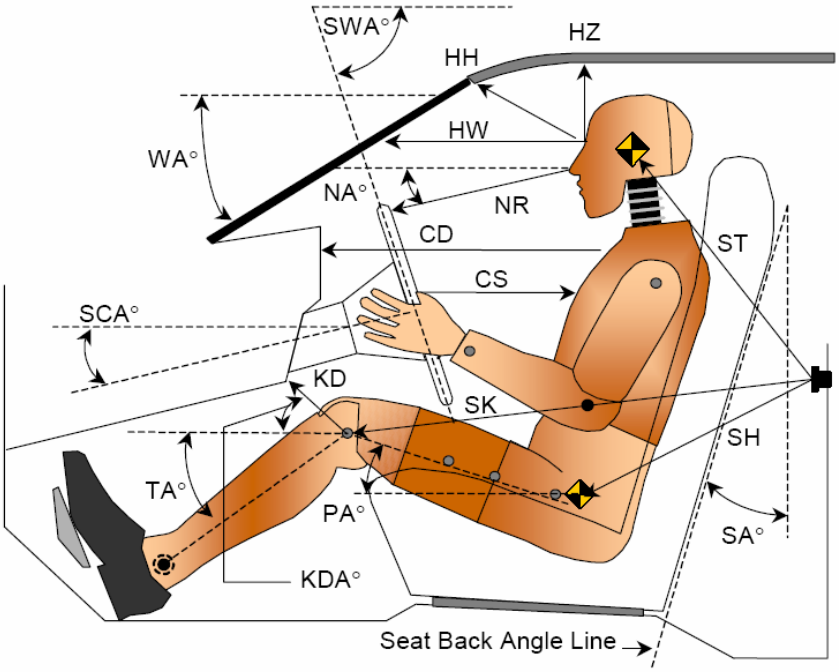
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	19.4	80
Geometric Center Position, No. 2	21.2	109
Uppermost Position, No. 3	23.0	137
Telescoping Steering Wheel Travel		57
Test Position	21.2	109

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



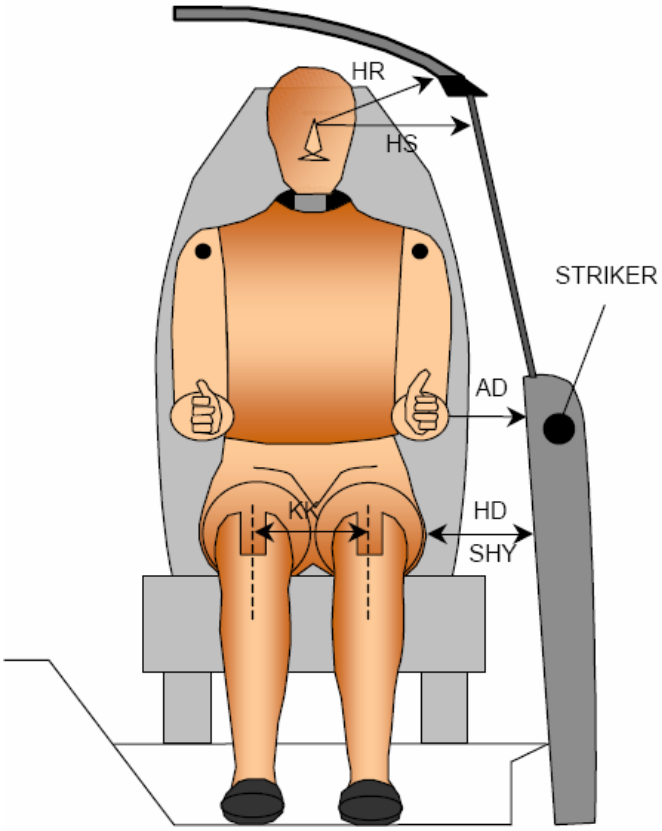
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		27.0		
SWA°	Steering Wheel Angle		68.0		
SCA°	Steering Column Angle		22.0		
SA°	Seat Back Angle (On Headrest Post)		26.5		17.6
HZ	Head to Roof	201	90.0	185	90.0
HH	Head to Header	345	31.1	275	51.0
HW	Head to Windshield	664	0.0	570	0.0
HR	Head to Side Header	242		253	
NR	Nose to Rim	397	4.3	408	30.5
CD	Chest to Dash	545	17.0	364	
CS	Chest to Steering Hub	321	3.4		
RA	Rim to Abdomen	210	0.0		
KDL	Left Knee to Dash	212	40.9	70	
KDR	Right Knee to Dash	153		108	47.0
PA°	Pelvic Angle		24.3		21.5
TA°	Tibia Angle		37.1		49.9
SK	Striker to Knee	552	10.6	643	9.7
ST	Striker to Head	381	90.0	381	66.0
SH	Striker to H-Point	307	56.8	359	33.9

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



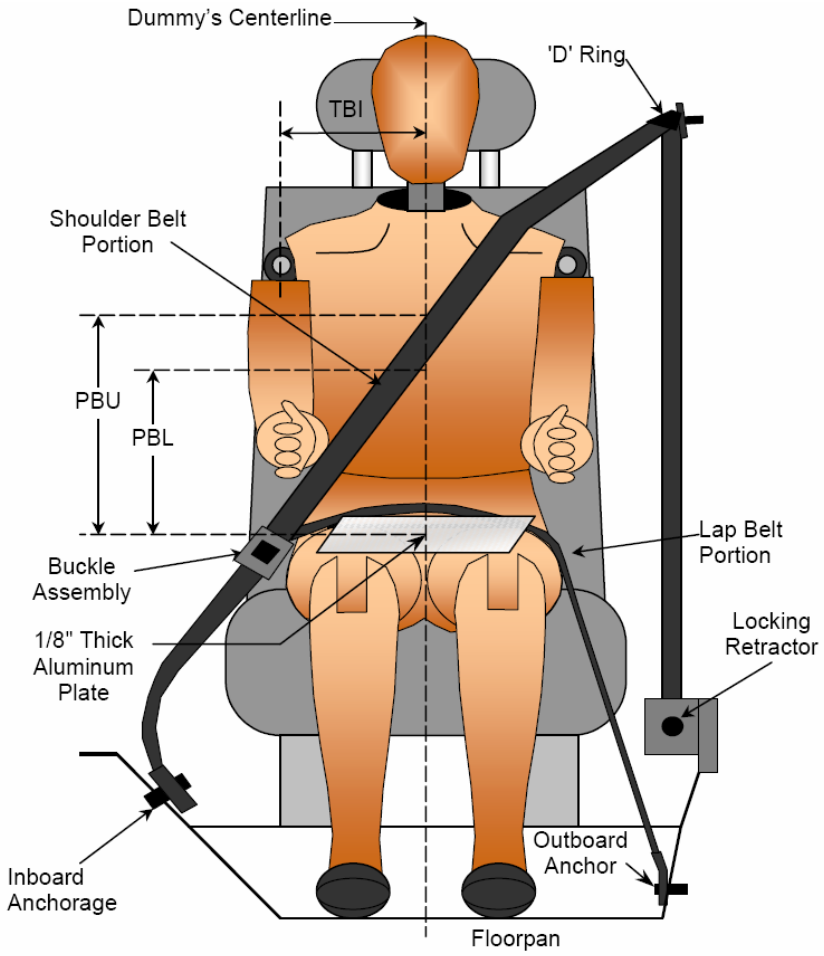
Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	70	106
HD	H-Point to Door	148	196
HR	Head to Side Header	242	253
HS	Head to Side Window	330	350
KK	Knee to Knee	320	220
SHY	Striker to H-Point (Y-Direction)	225	275
AA	Ankle to Ankle	310	180

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



SEAT BELT POSITIONING MEASUREMENTS

Code	Measurement Description	Units	Driver	Passenger
PBU	Top Surface of Aluminum Plate to Belt Upper Edge	mm	355	293
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	275	210

BELT LENGTH DATA

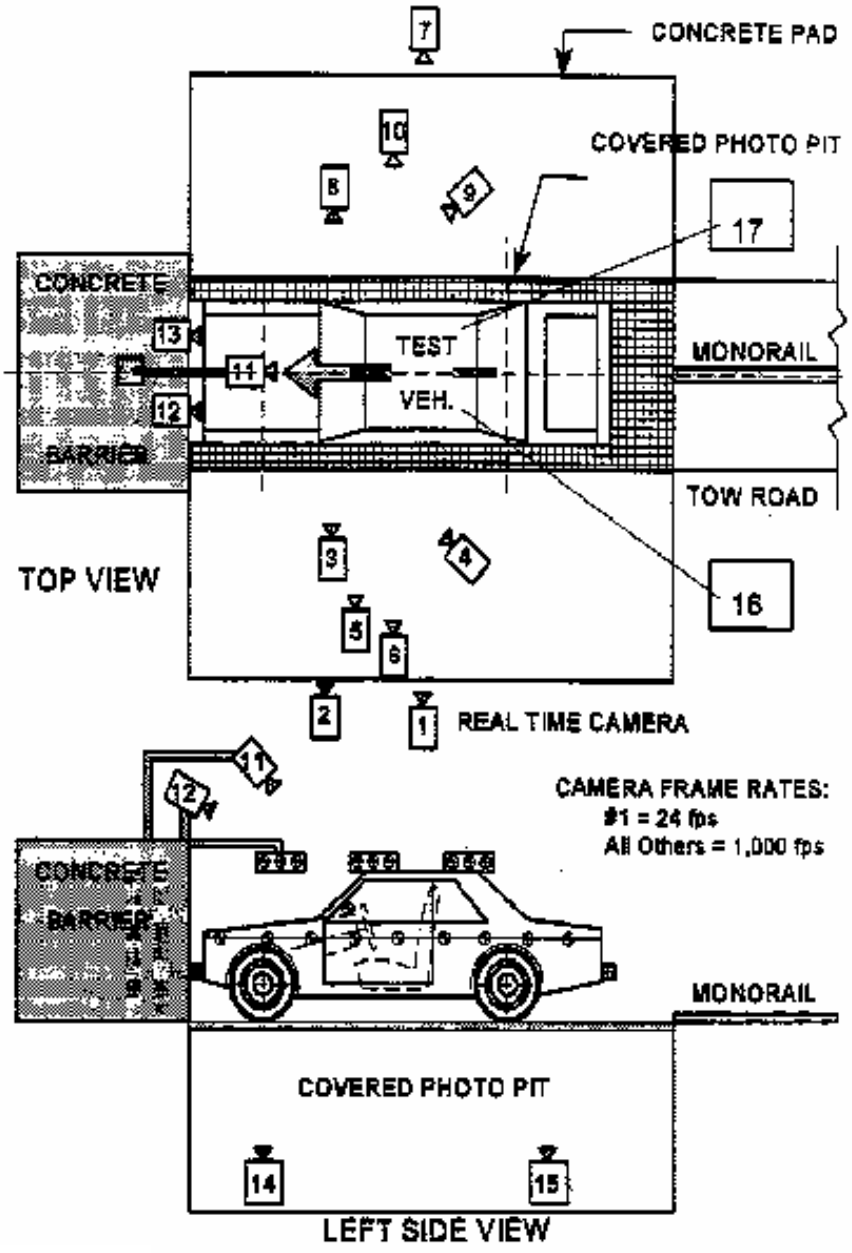
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	826	919
Lap Belt Length as Measured on ATD	mm	508	539
Remainder of Belt on Reel	mm	1052	999
Total Belt Length for Continuous Webbing Systems	mm	2386	2457

DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2011 BMW 535i 4-Door Sedan	NHTSA No.:	MB0508
Test Program:	56 km/h Frontal Impact NCAP Test	Test Date:	09/02/10

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 … (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

CAMERA LOCATIONS

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 Windshield View	297	366	-2460	-34		12	1000
12	Overhead Driver View	297	-366	-2460	-34		12	1000
13	Overhead Passenger 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 On Board View	-3514	296	1316	-22		12	1000
17	Passenger's On Board View	-3512	-322	1316	-22		12	1000

Coordinates: +X = Forward impact plane

+Y = right of monorail center

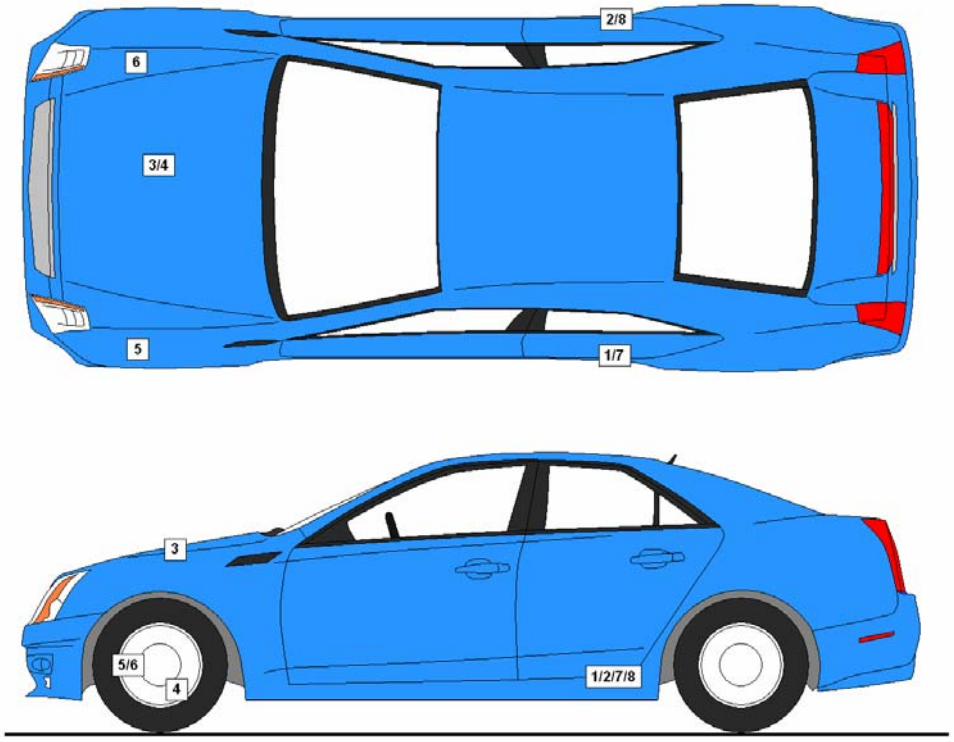
+Z = into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Cross Member X	2023	-750	-400
2	Right Rear Cross Member X	2023	750	-400
3	Engine Top X	4037	-111	-865
4	Engine Bottom X	4037	-113	-153
5	Left Brake Caliper X	3907	-780	-320
6	Right Brake Caliper X	3907	780	-320
7	Left Rear Cross Member Z	2023	-750	-400
8	Right Rear Cross Member Z	2023	-750	-400

Reference Points: X – Rear Surface of Vehicle (+ Forward)

Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ down)

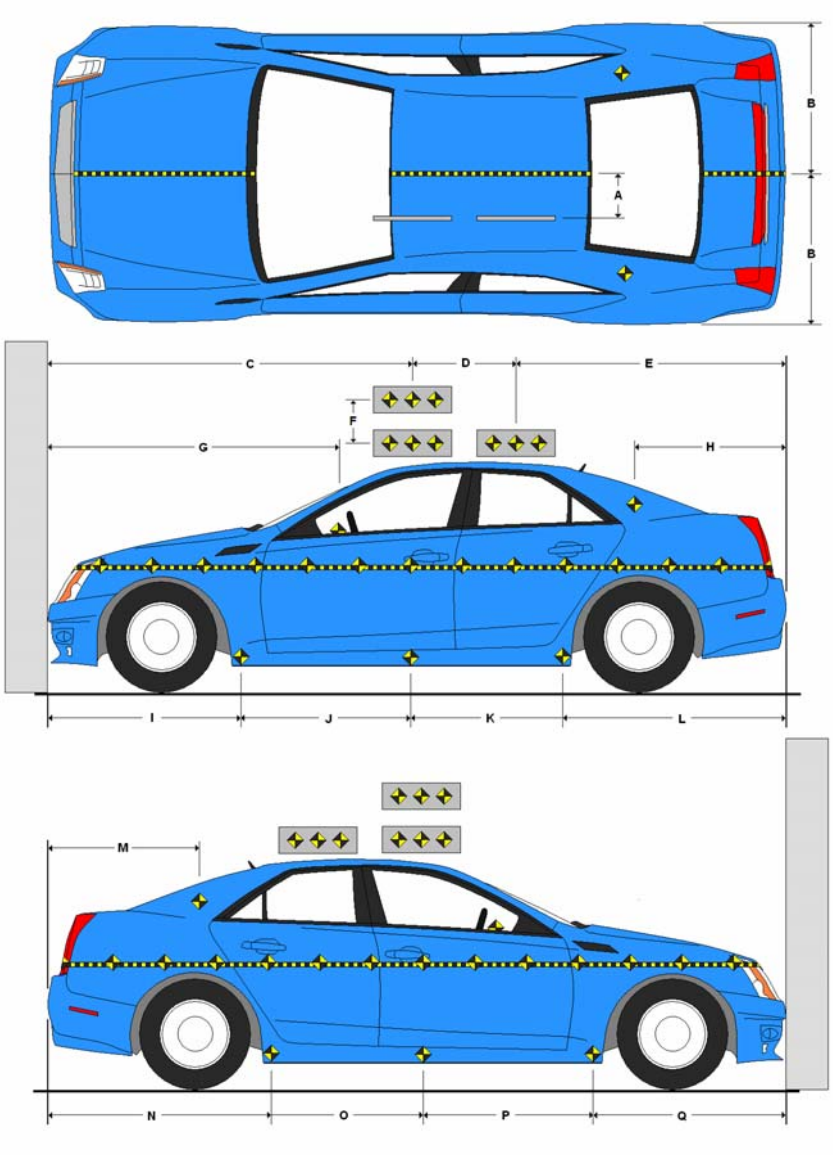
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

Item	Value
A	
B	
C	
D	
E	
F	
G	1915
H	1030
I	1283
J	1021
K	1021
L	1563
M	953
N	1572
O	1016
P	1016
Q	1273



All measurements in millimeters.

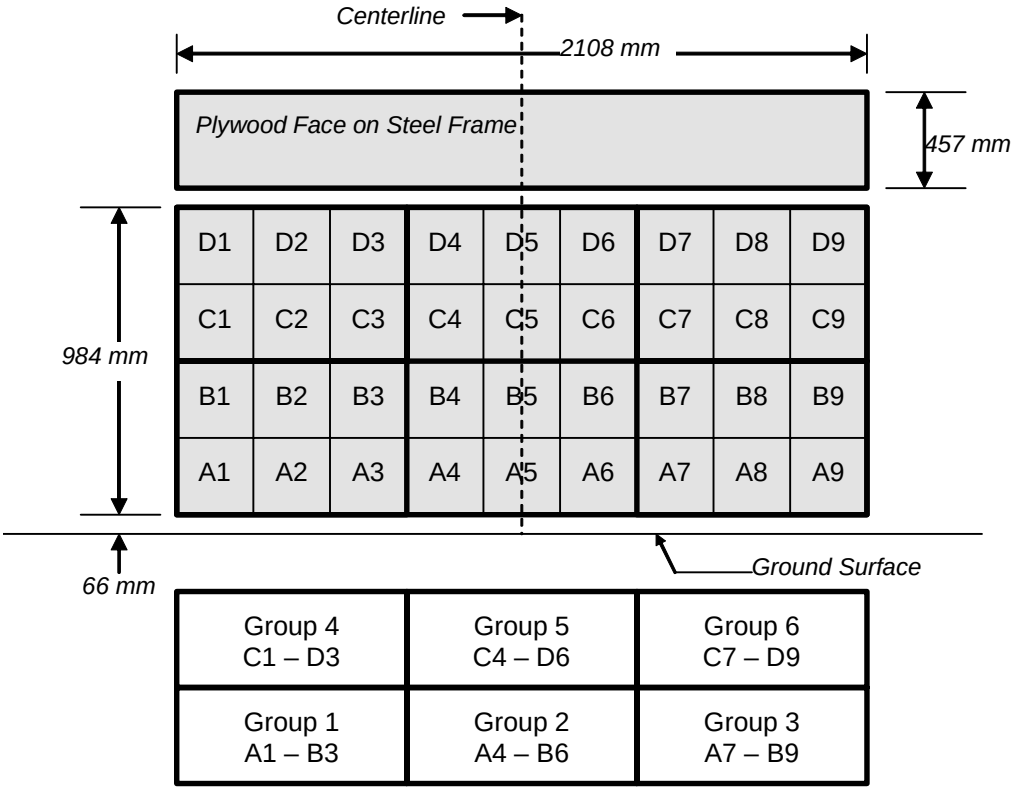
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

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 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

INSTRUMENTATION

Driver Dummy Accelerometers	42
Passenger Dummy Accelerometers	42
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
Total	128

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 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

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
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	Steering Wheel Rim	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

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)	17 mm	4 mm
Seat Back Failure	None	None
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	945
Center	mm	885
Right Side	mm	930
Average	mm	920

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

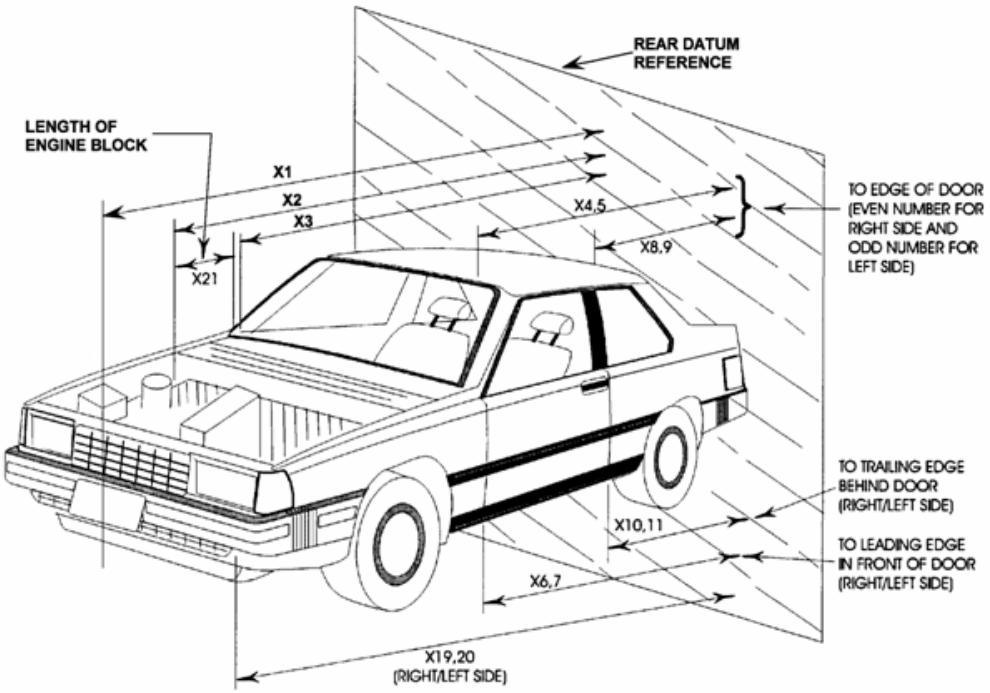
Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Curtain Airbag	Yes	No	Yes	No
Torso Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

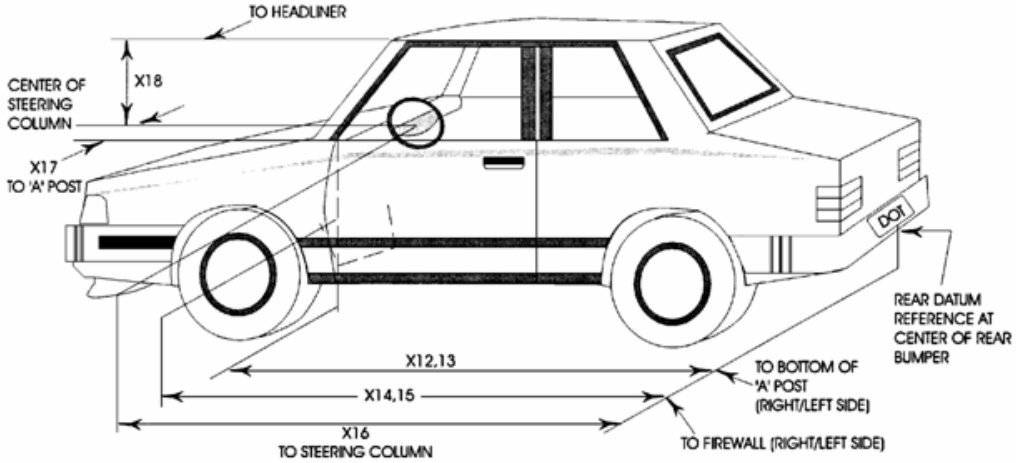
DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10





DATA SHEET NO. 12 … (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4895	4670	-225
2	Rear Surface of Vehicle to Front of Engine	4351	4235	-116
3	RSOV to Firewall	3675	3685	10
4	RSOV to Upper Leading Edge of Right Door	3387	3383	-4
5	RSOV to Upper Leading Edge of Left Door	3384	3384	0
6	RSOV to Lower Leading Edge of Right Door	3386	3382	-4
7	RSOV to Lower Leading Edge of Left Door	3374	3377	3
8	RSOV to Upper Trailing Edge of Right Door	2242	2238	-4
9	RSOV to Upper Trailing Edge of Left Door	2234	2233	-1
10	RSOV to Lower Trailing Edge of Right Door	2287	2284	-3
11	RSOV to Lower Trailing Edge of Left Door	2278	2278	0
12	RSOV to Bottom of A-Pillar of Right Side	3288	3297	9
13	RSOV to Bottom of A-Pillar Left Side	3283	3286	3
14	RSOV to Firewall, Right Side	3851	3850	-1
15	RSOV to Firewall, Left Side	3851	3833	-18
16	RSOV to Steering Column	2800	2797	-3
17	Center of Steering Column to A-Pillar	420	403	-17
18	Center of Steering Column to Headliner	393	424	31
19	RSOV to Right Side of Front Bumper	4309	4159	-150
20	RSOV to Left Side of Front Bumper	4309	4157	-152
21	Length of Engine Block	656	656	0
RD	RSOV to Right Side of Dash Panel	3040	3028	-12
CD	RSOV to Center of Dash Panel	2870	2970	100
LD	RSOV to Left Side of Dash Panel	3032	3025	-7

All measurements in millimeters.

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

VEHICLE INFORMATION

VIN: WBAFR7C58BC601641 Wheelbase (mm): 2965

Vehicle Size Category: 4-Door Sedan Test Weight (kg): 2067.0

ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember

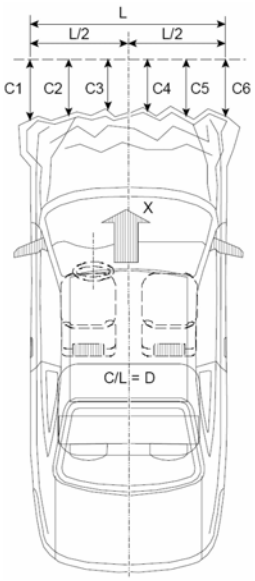
Cal. Procedure/Interval: Drop Test / 6 months

Integration Algorithm: NHTSA Standard Linearity: Good

Impact Velocity (km/h): 55.92

Velocity Change (km/h): 64.5

Time of Separation (msec): 61.0



CRUSH PROFILE

Collision Deformation Classification: 12FCEW1

Midpoint of Damage: Vehicle Centerline

Damage Region Length (mm): 1831

Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	600	725	-125
C2	Crush Zone 2 at Left Side	mm	85	296	-211
C3	Crush Zone 3 at Left Side	mm	3	227	-224
C4	Crush Zone 4 at Right Side	mm	3	230	-227
C5	Crush Zone 5 at Right Side	mm	85	293	-208
C6	Crush Zone 6 at Right Side	mm	600	740	-140
L	C1 to C6	mm	1831		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

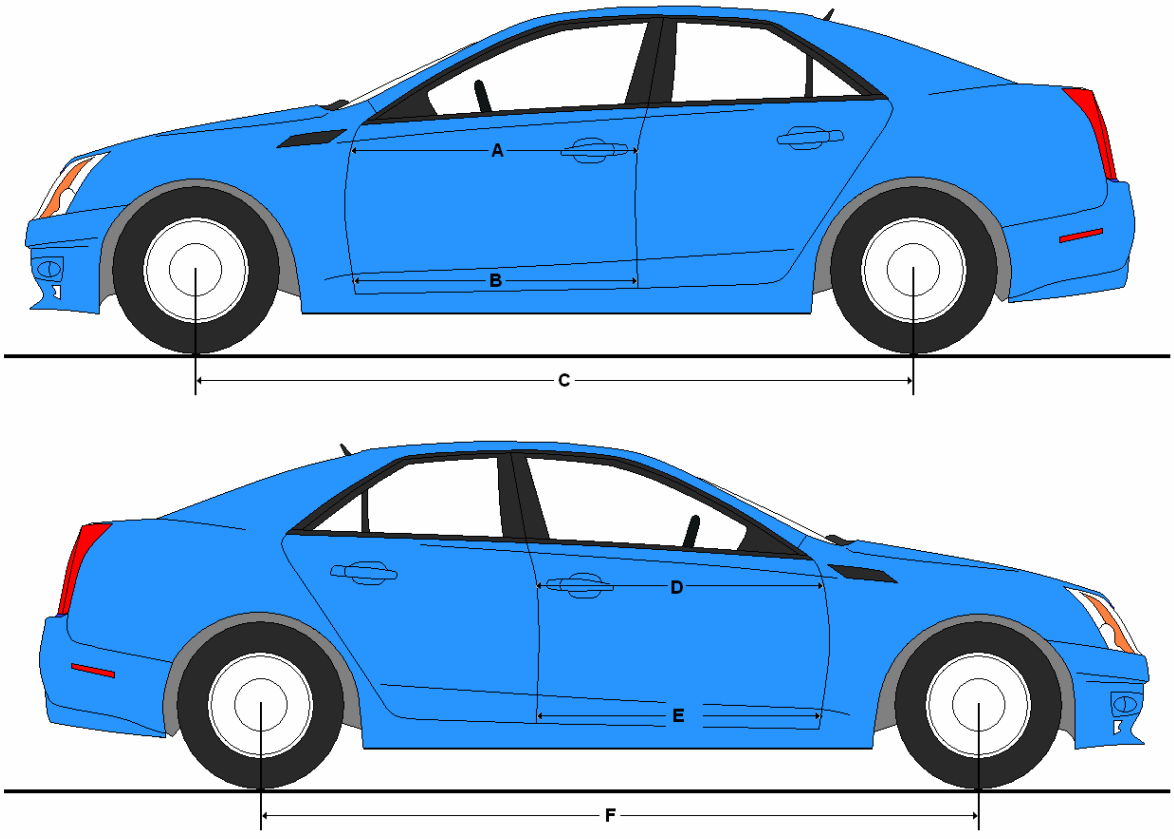
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	974	974	0
B	Left Side Lower	mm	813	819	6
D	Right Side Upper	mm	979	981	2
E	Right Side Lower	mm	851	856	5

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2965	2888	-77
F	Right Side Wheelbase	mm	2965	2876	-89



DATA SHEET NO. 14 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

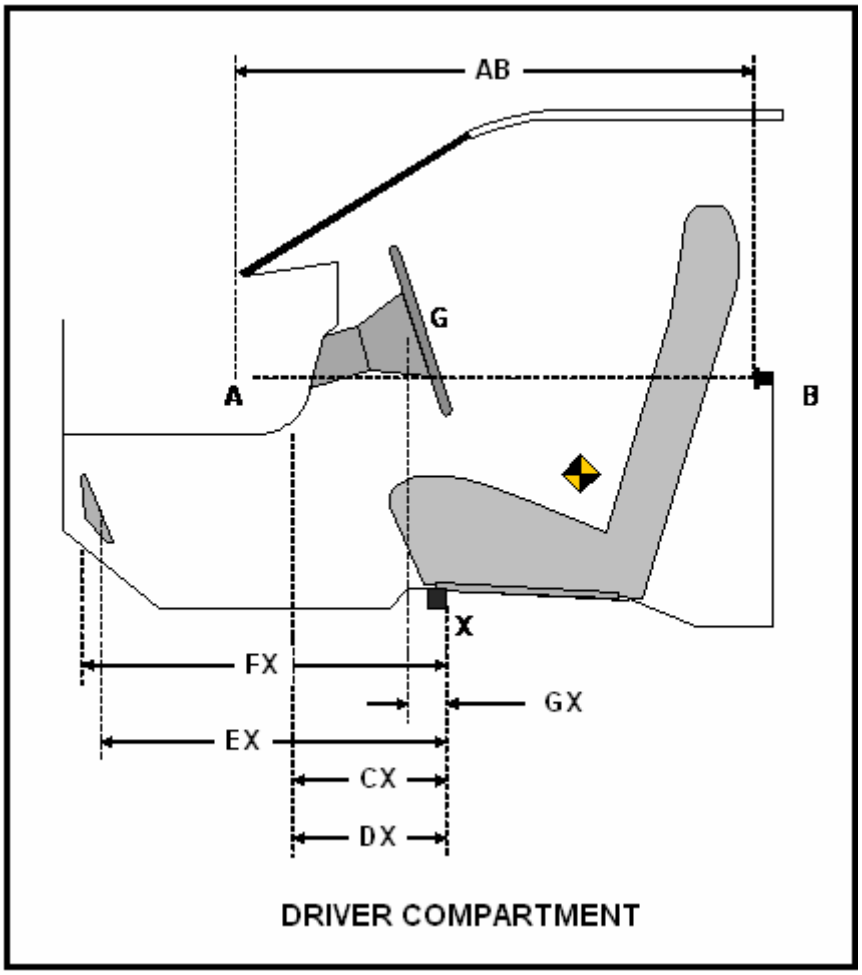
Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	974	974	0
CX	Left Knee Bolster to X	mm	293	258	-35
DX	Right Knee Bolster to X	mm	296	268	-28
EX	Brake Pedal to X	mm	563	520	-43
FX	Foot Rest to X	mm	610	561	-49
GX	Center of Steering Wheel Hub to X	mm	50	-35	-85

X = Front of Seat Track (Stationary)

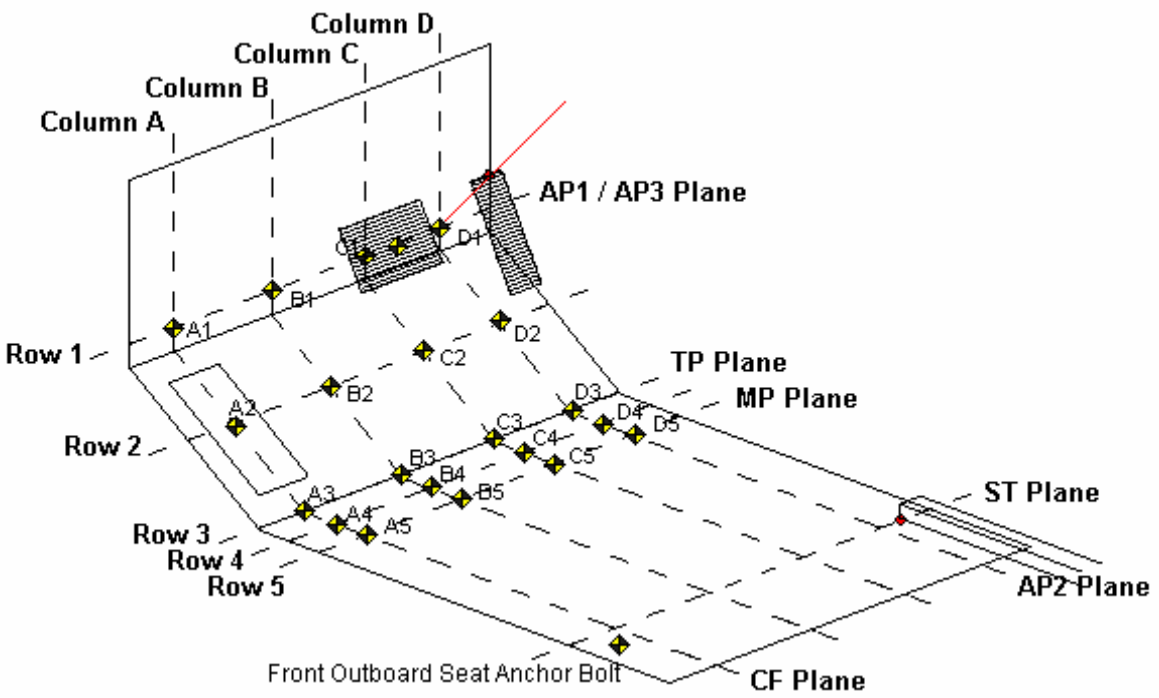


DATA SHEET NO. 14 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



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 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

DRIVER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	636	652	653	612	620	635	637	612	-16	-17	-16	0
2	546	553	552	516	532	535	535	515	-14	-18	-17	-1
3	451	451	446	444	437	434	428	424	-14	-17	-18	-20
4	350	349	347	348	334	331	329	330	-16	-18	-18	-18
5	248	248	244	240	233	230	442	222	-15	-18	198	-18

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-32	-139	-243	-384	-34	-147	-249	-386	-2	-8	-6	-2
2	-29	-134	-245	-376	-35	-141	-251	-376	-6	-7	-6	0
3	-27	-133	-244	-394	-35	-141	-251	-387	-8	-8	-7	7
4	-26	-138	-247	-387	-33	-145	-253	-393	-7	-7	-6	-6
5	-23	-143	-250	-394	-30	-149	-254	-400	-7	-6	-4	-6

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	20	-8	-17	50	-23	-46	-51	35	-43	-38	-34	-15
2	-33	-48	-53	-13	-18	-83	-89	-34	15	-35	-36	-21
3	-93	-74	-60	-63	-138	-117	-98	-94	-45	-43	-38	-31
4	-99	-75	-65	-64	-146	-120	-104	-98	-47	-45	-39	-34
5	-102	-80	-66	-61	-152	-126	-107	-97	-50	-46	-41	-36

All measurements in millimeters

DATA SHEET NO. 14 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

PASSENGER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	640	642	644	636	559	562	563	561	-81	-80	-81	-75
2	543	543	545	537	464	465	470	461	-79	-78	-75	-76
3	432	436	439	441	352	359	362	368	-80	-77	-77	-73
4	332	337	339	342	253	258	264	268	-79	-79	-75	-74
5	223	226	229	231	145	149	153	157	-78	-77	-76	-74

PASSENGER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	364	228	113	11	367	230	115	11	3	2	2	0
2	367	228	113	7	370	228	113	7	3	0	0	0
3	365	225	116	9	365	223	115	8	0	-2	-1	-1
4	366	225	116	4	365	222	116	3	-1	-3	0	-1
5	364	224	114	7	362	220	111	3	-2	-4	-3	-4

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-10	-21	-22	-10	51	-62	-57	-47	61	-41	-35	-37
2	-49	-55	-61	-55	-96	-98	-104	-87	-47	-43	-43	-32
3	-54	-55	-74	-75	-102	-102	-113	-114	-48	-47	-39	-39
4	-58	-61	-81	-99	-107	-110	-123	-140	-49	-49	-42	-41
5	-57	-63	-85	-100	-109	-115	-131	-145	-52	-52	-46	-45

All measurements in millimeters

DATA SHEET NO. 15

SUMMARY OF FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

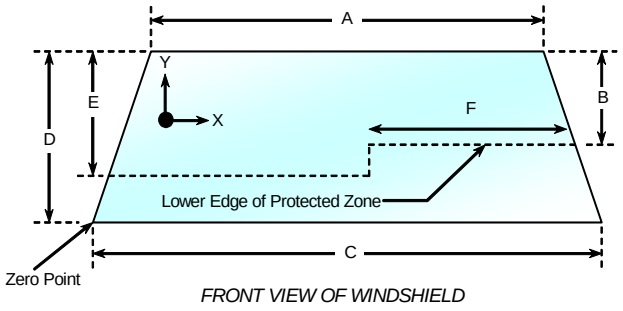
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber cement type adhesive and plastic molding.

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: 21.2° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2103.5	2103.5	
Right Side	2103.5	2103.5	
Total	4207	4207	100%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1195
B	mm	305
C	mm	1480
D	mm	766
E	mm	430
F	mm	506

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 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10

FMVSS 301 FUEL SYSTEM INTEGRITY DATA

Temperature at Time of Impact: 37.2° Test Time: 1:50 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)

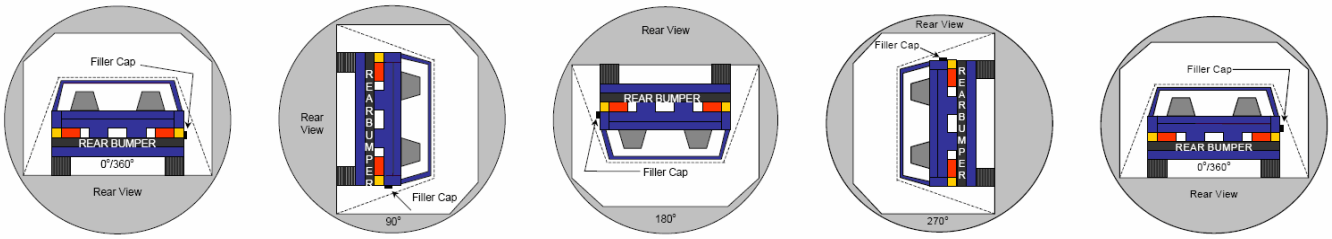
D. Spillage: No spillage occurred

DATA SHEET NO. 17

FMVSS 301 STATIC ROLLOVER

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

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	300	385
90° To 180°	86	300	386
180° To 270°	80	300	380
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			
90° To 180°	0			
180° To 270°	0			
270° To 360°	0			

SOLVENT SPILLAGE LOCATION TABLE

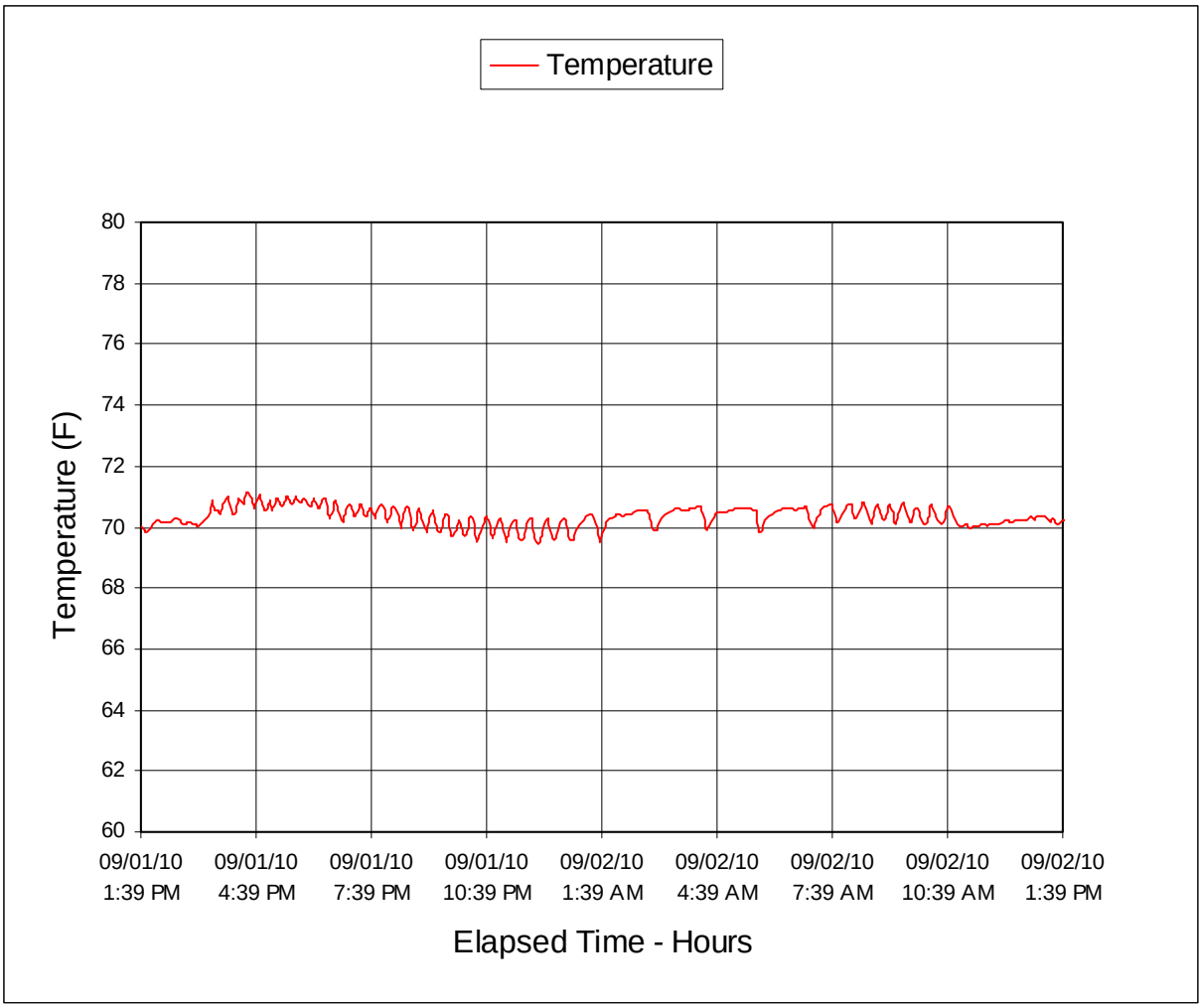
Test Phase	Spillage Location
0° To 90°	None
90° To 180°	None
180° To 270°	None
270° To 360°	None

DATA SHEET NO. 18

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2011 BMW 535i 4-Door Sedan NHTSA No.: MB0508

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 09/02/10



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

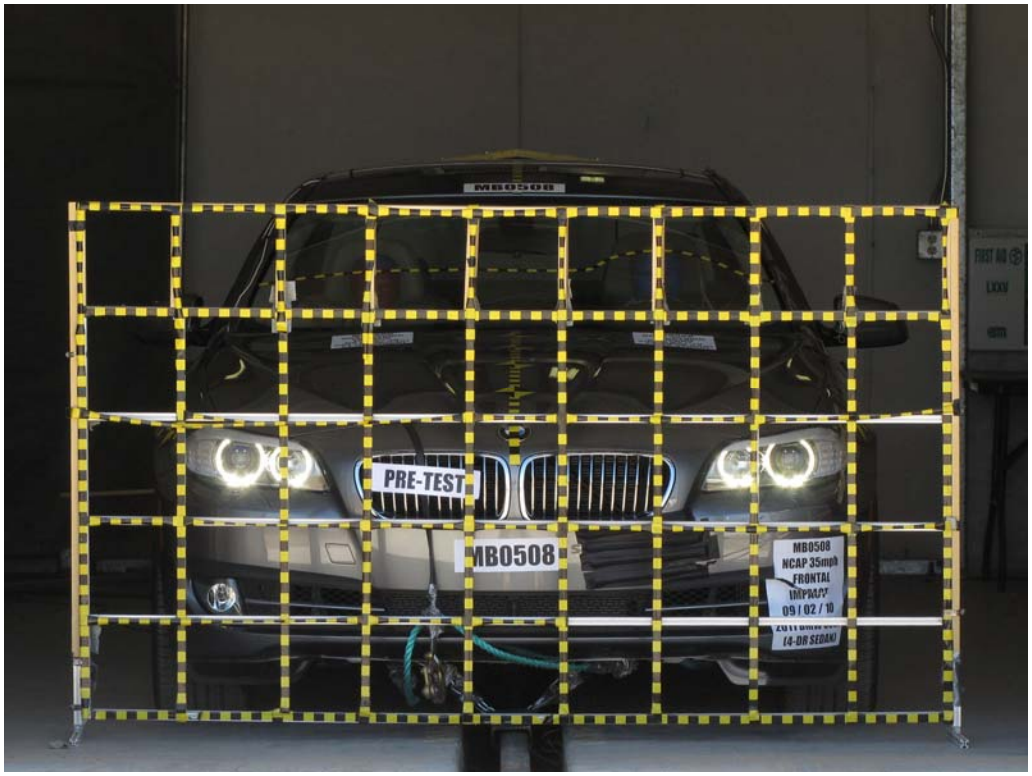


FIGURE 1. Load Cell Location

FIGURE 2. Load Cell Wall

FIGURE 3. Manufacturer's Label

FIGURE 4. Tire Placard

FIGURE 5. Right Front 3/4 As Delivered

FIGURE 6. Left Rear 3/4 As Delivered

FIGURE 7. Pre-Test Front View of Test Vehicle

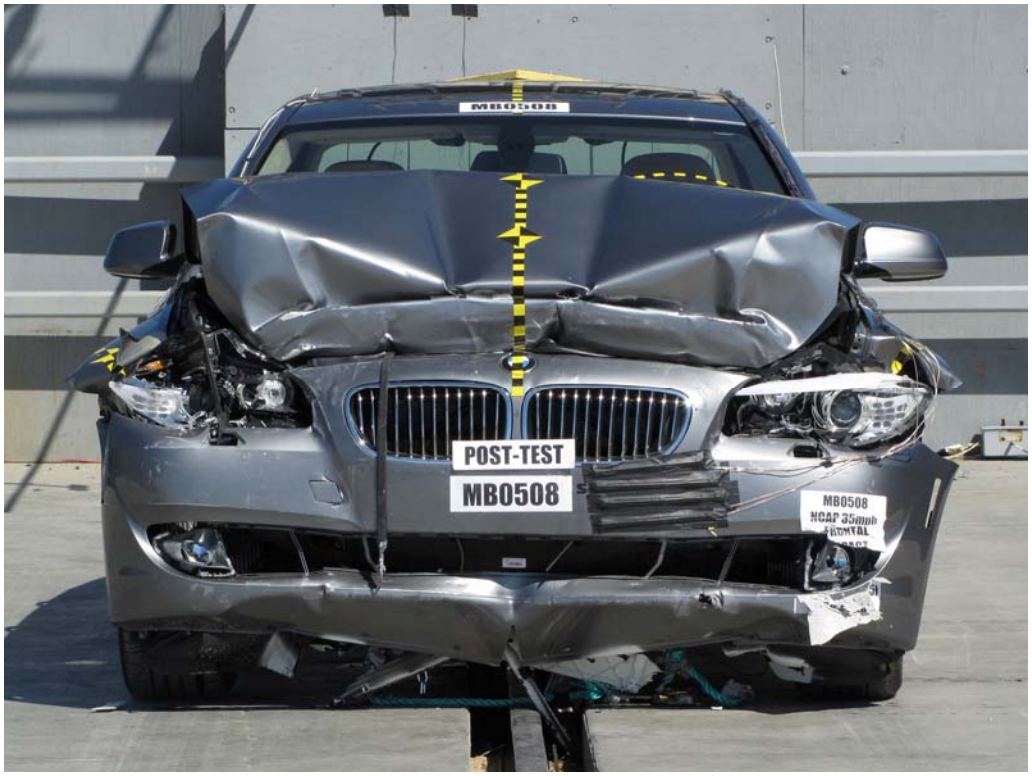


FIGURE 8. Post-Test Front View of Test Vehicle

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 ¾ View

FIGURE 14. Post-Test Right Front ¾ View

FIGURE 15. Pre-Test Left Rear ¾ View

FIGURE 16. Post-Test Left Rear ¾ View

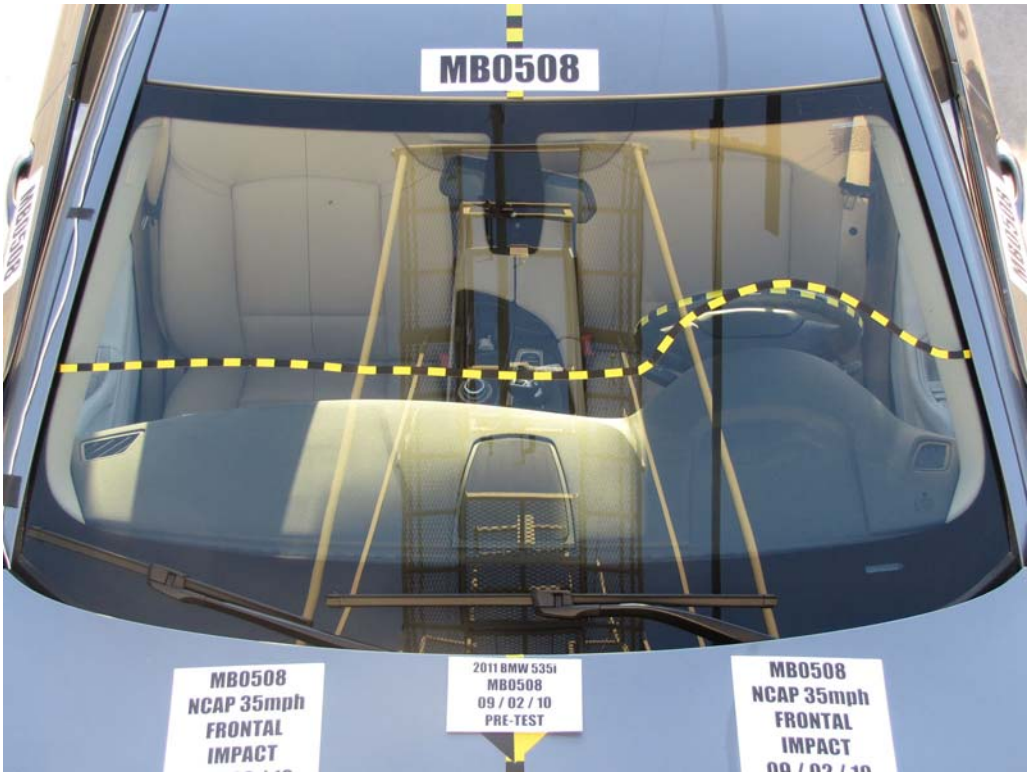


FIGURE 17. Pre-Test Windshield View

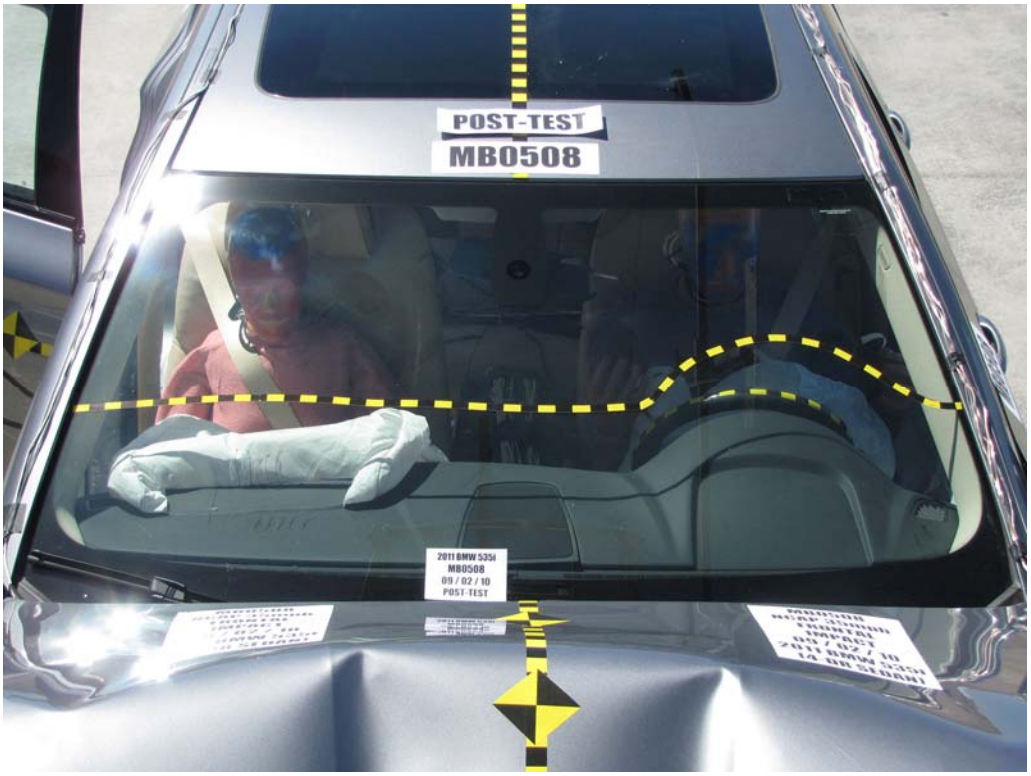


FIGURE 18. Post-Test Windshield View

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

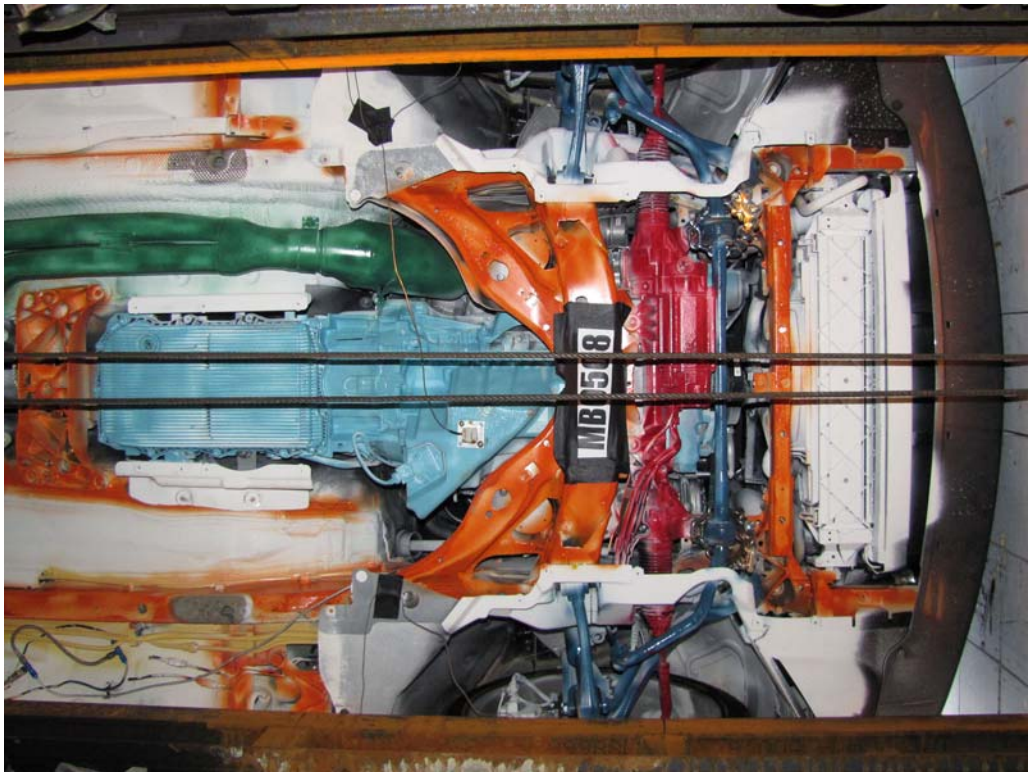


FIGURE 23. Pre-Test Front Underbody View

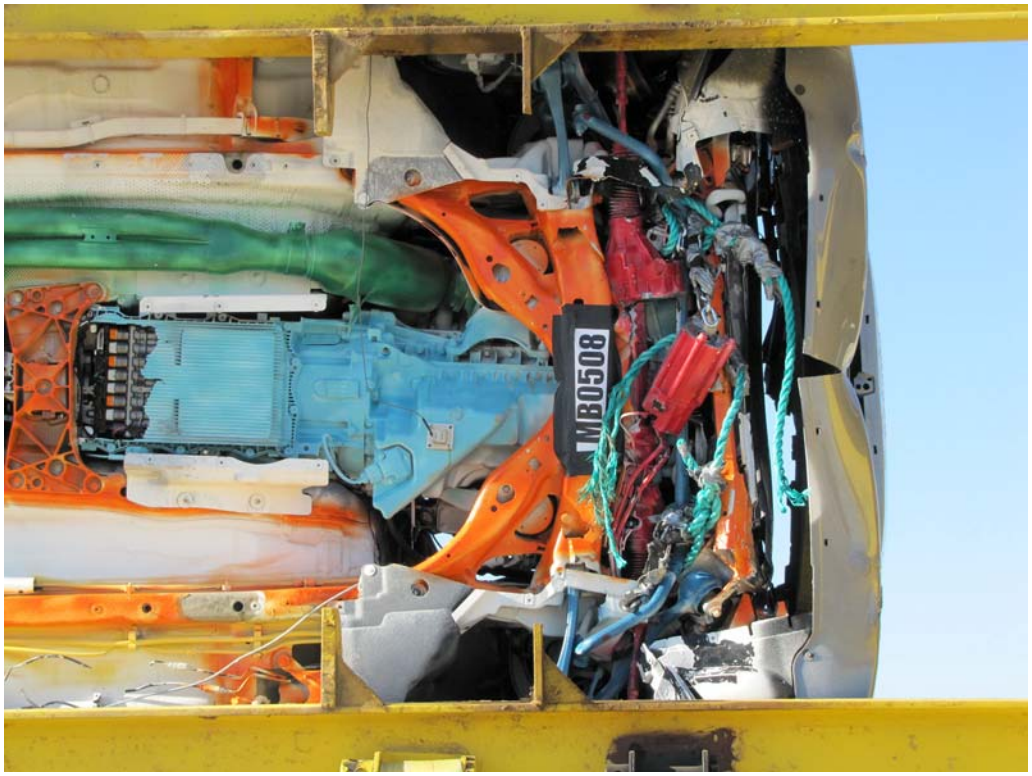


FIGURE 24. Post-Test Front Underbody View

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 Airbag

FIGURE 43c. Post-Test Driver Dummy Contact With Knee Airbag

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

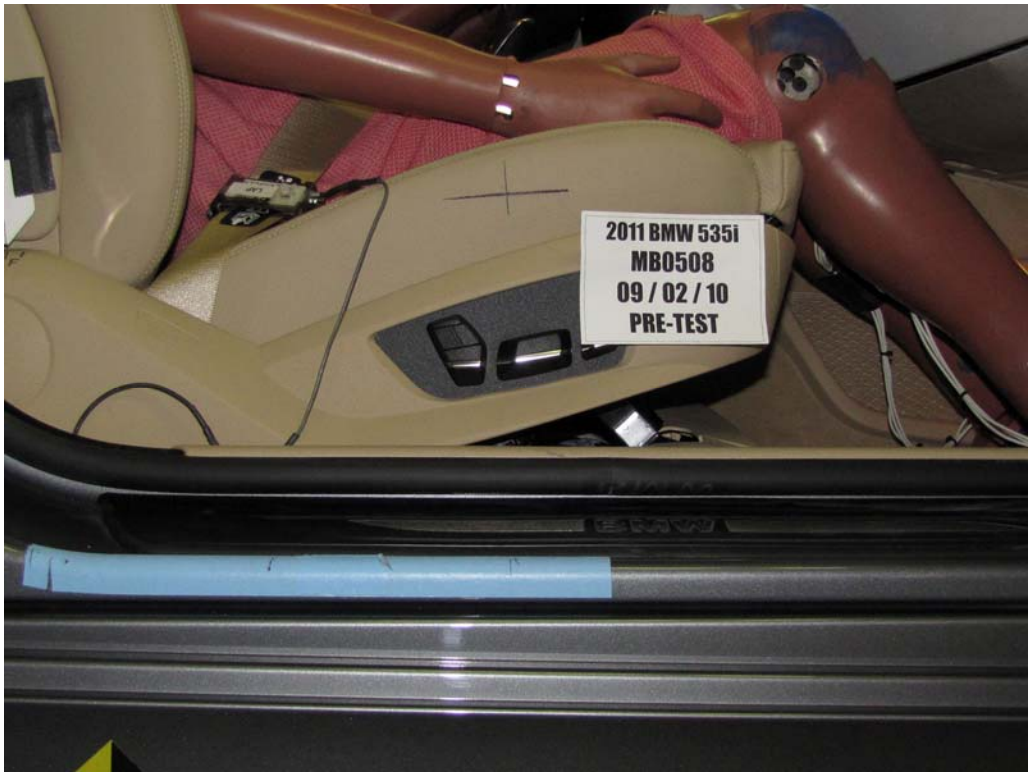


FIGURE 52. Pre-Test Passenger's Seat Fore-Aft Markings

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

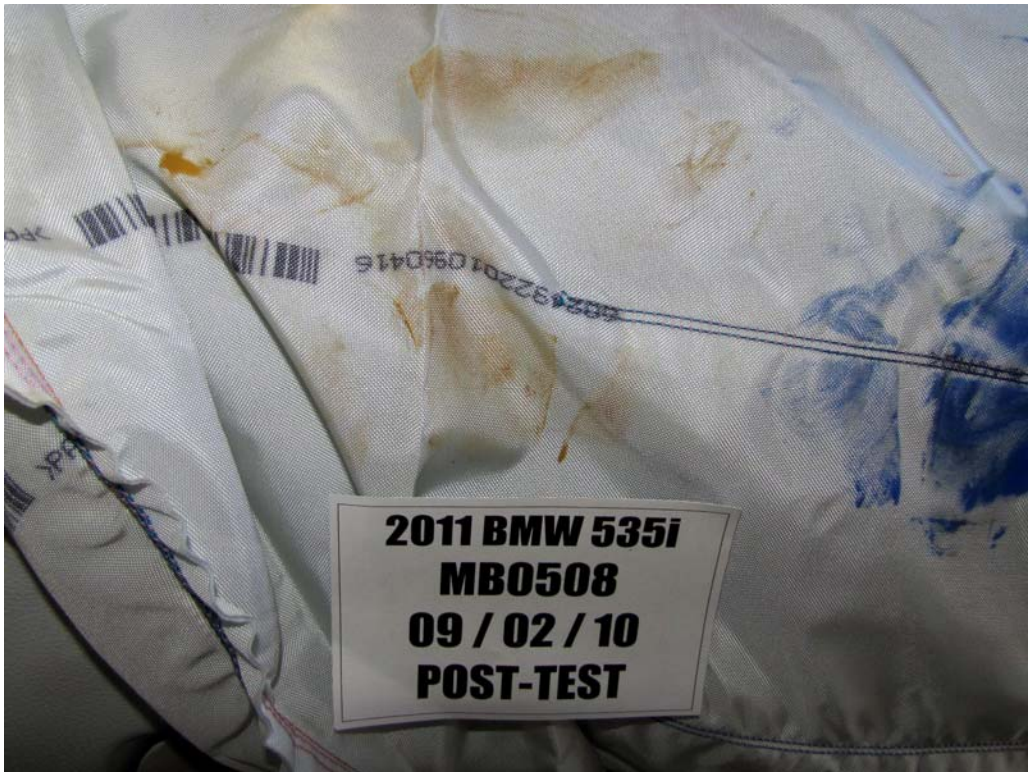


FIGURE 60b. Post-Test Passenger Dummy Contact With Knee Airbag

FIGURE 60c. Post-Test Passenger Dummy Contact With Knee Airbag

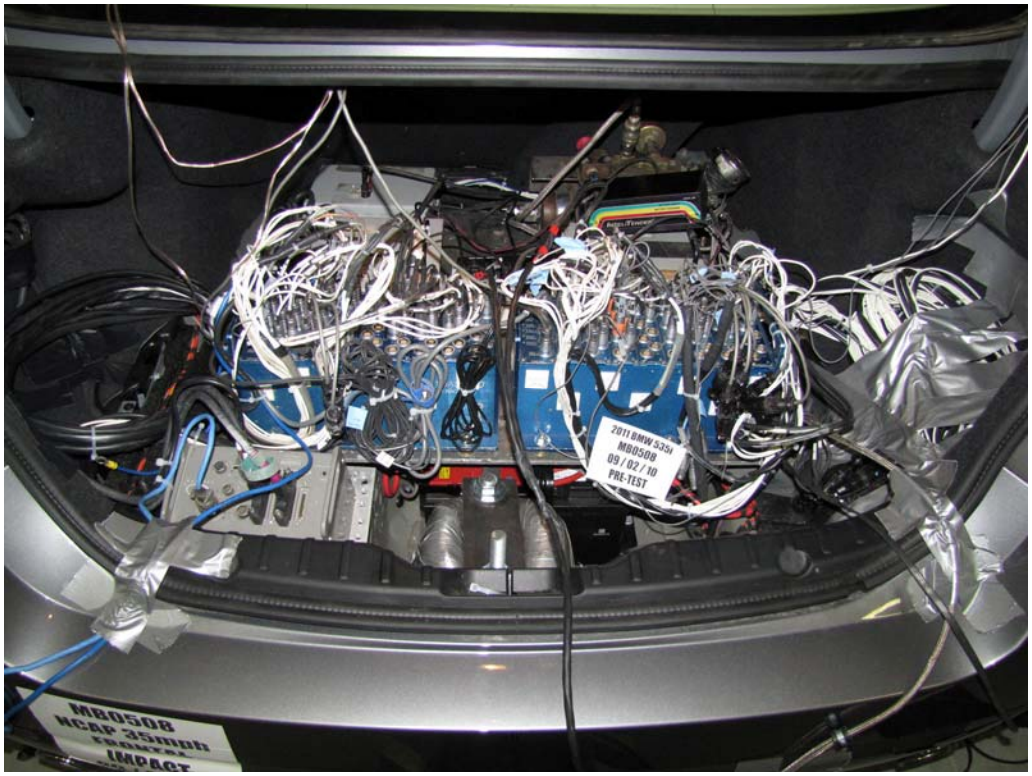


FIGURE 61. Pre-Test of Ballast Installed in Vehicle

Photograph Not Applicable
No Stoddard
Solvent Spillage

FIGURE 62. Post-Test Stoddard Solvent Spillage Location View

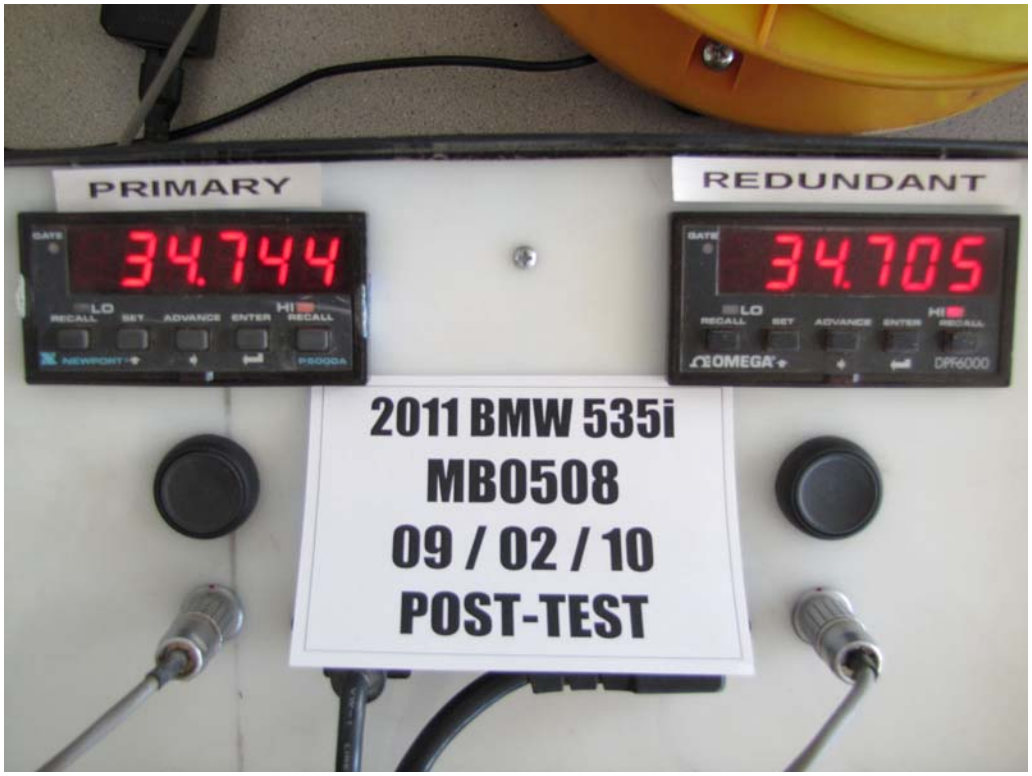


FIGURE 63. Post-Test Speed Trap Read Out

FIGURE 64. Vehicle at 0 Degrees on Static Rollover Device

FIGURE 65. Vehicle at 90 Degrees on Static Rollover Device

FIGURE 66. Vehicle at 180 Degrees on Static Rollover Device

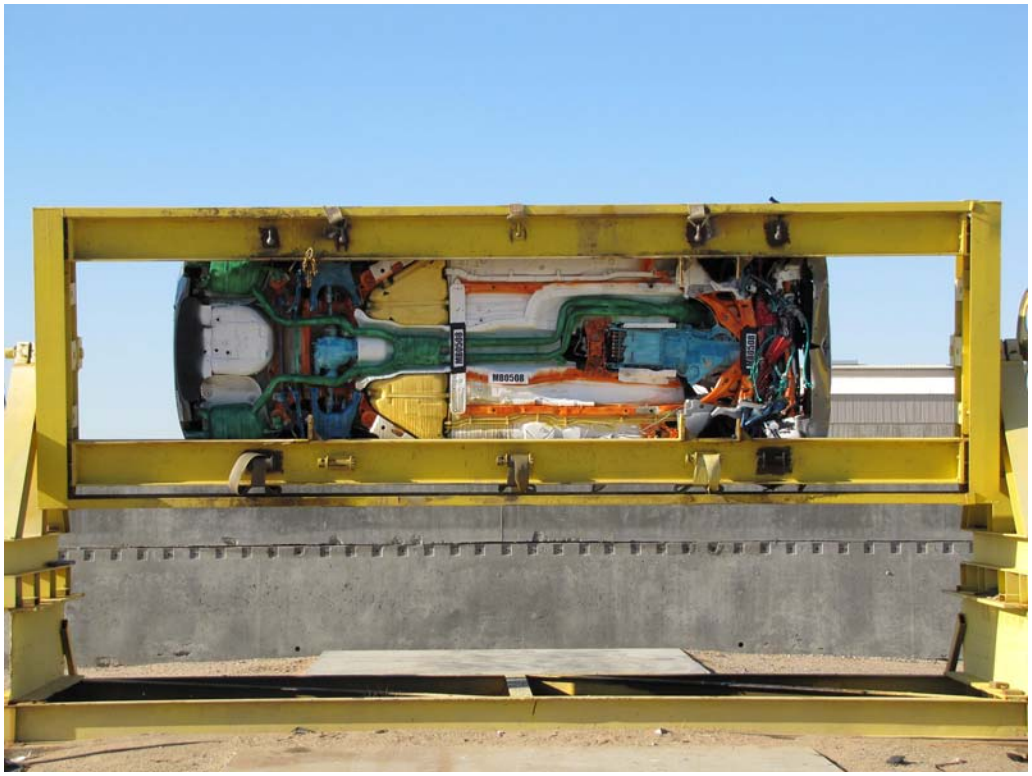


FIGURE 67. Vehicle at 270 Degrees on Static Rollover Device

FIGURE 68. Vehicle at 360 Degrees on Static Rollover Device

FIGURE 69. 2011 BMW 535i Frontal Impact Event

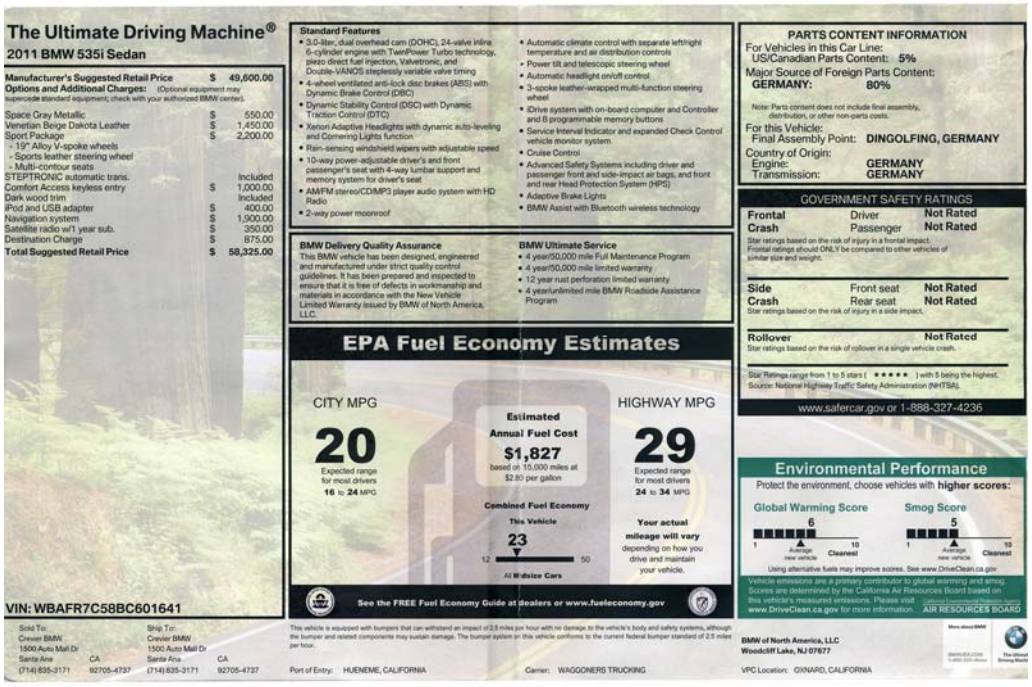


FIGURE 70. Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

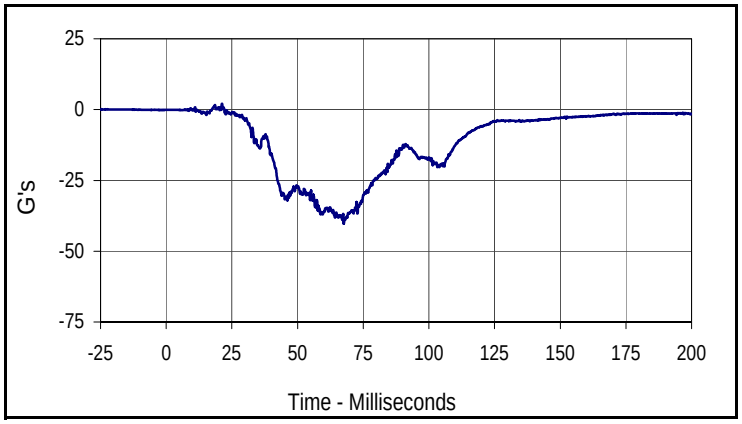
TABLE OF DATA PLOTS

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

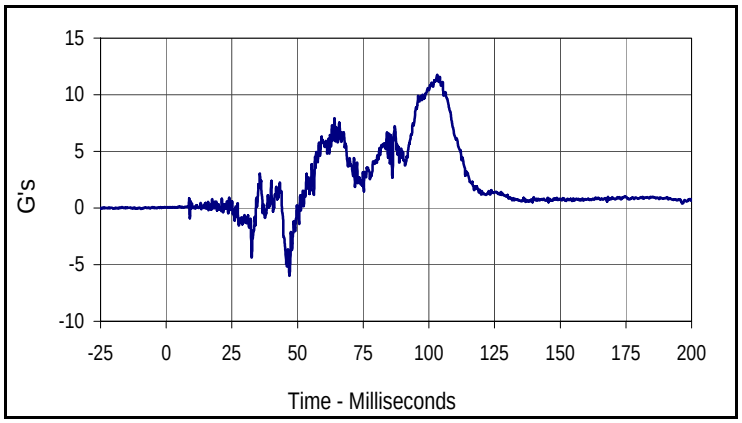
Driver Head X Acceleration Redundant
Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
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 Food 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

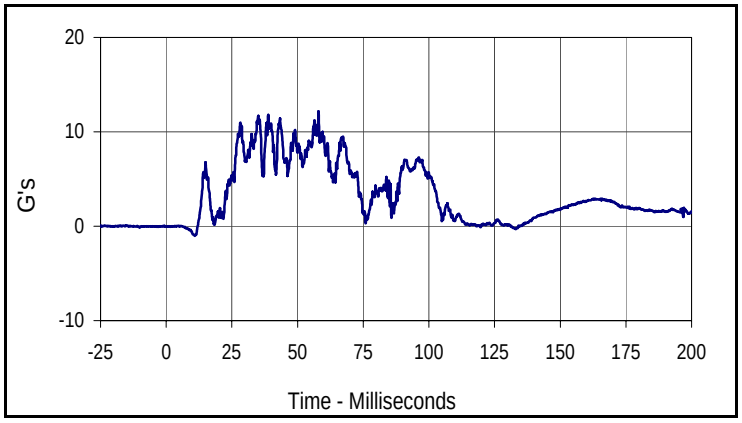
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/2/10
Test Program:	56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test	NHTSA No.:	MB0508



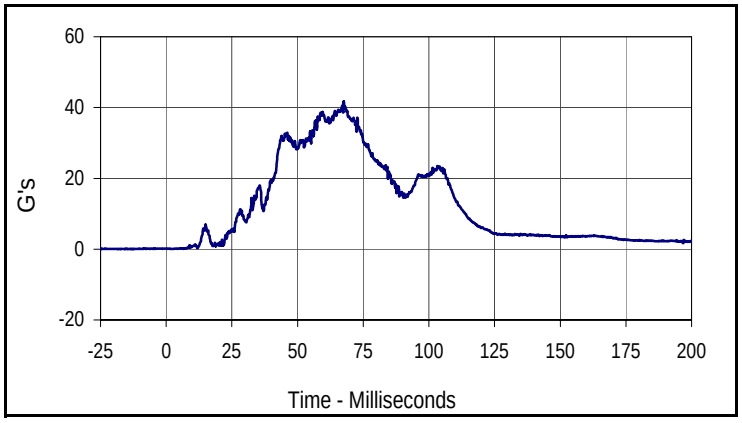
Curve Description			
Driver Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
2.1	21.3	-40.3	67.6



Curve Description			
Driver Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
11.7	103.1	-6.0	46.9

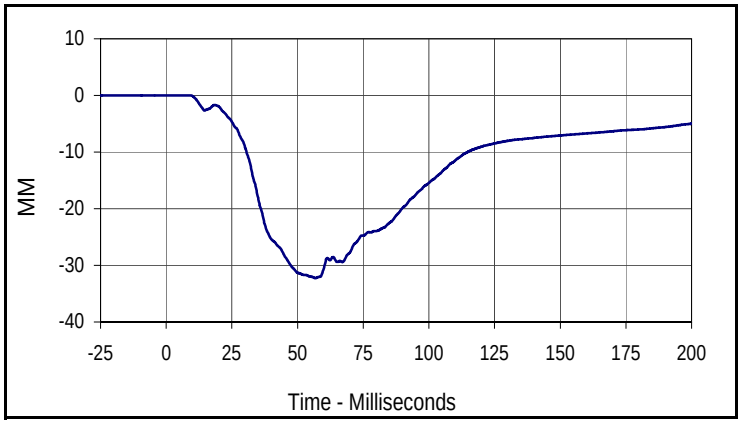


Curve Description			
Driver Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
12.2	58.0	-1.0	10.9



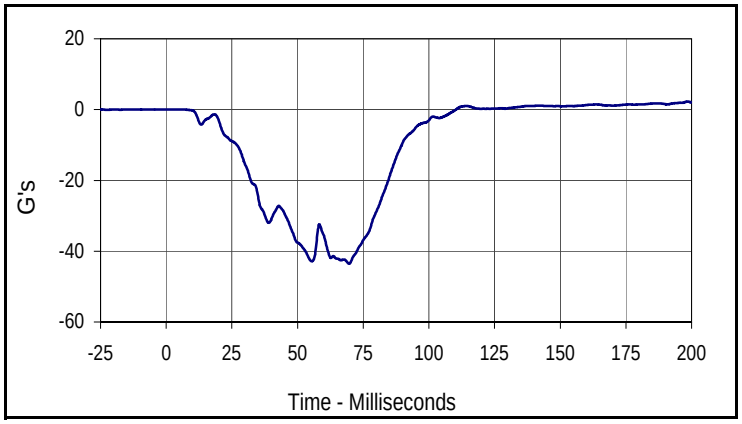
Curve Description			
Driver Head Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
41.7	67.6	0.1	2.0

Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/2/10
Test Program:	56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test	NHTSA No.:	MB0508

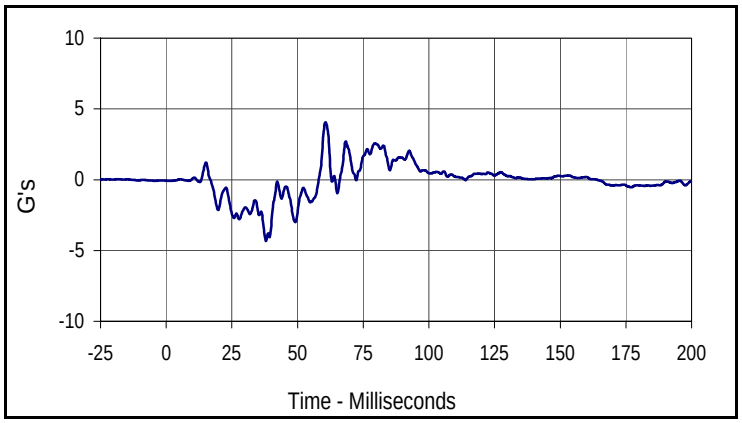


Curve Description			
Driver Chest Deflection			
CURNO	Type	SAE Class	Units
019	FIL	600	MM
Max	Time	Min	Time
0.0	5.1	-32.3	56.8

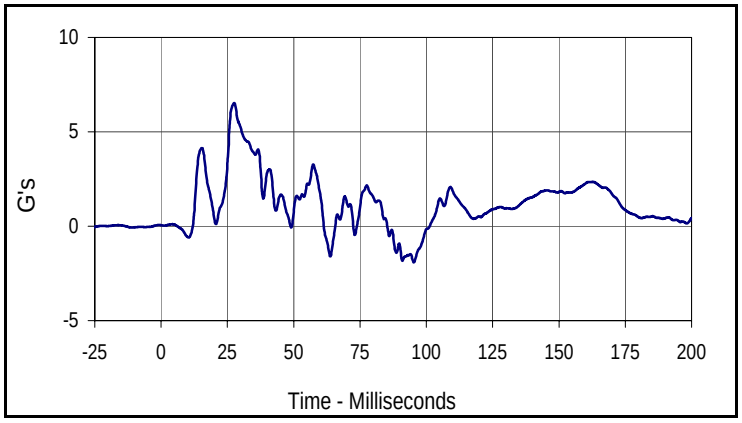
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/2/10
Test Program:	56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test	NHTSA No.:	MB0508



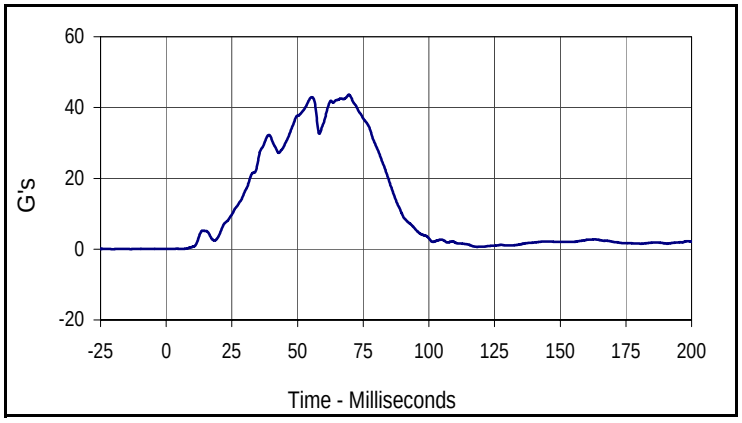
Curve Description			
Driver Chest Acceleration X Primary			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
2.3	198.5	-43.5	69.6



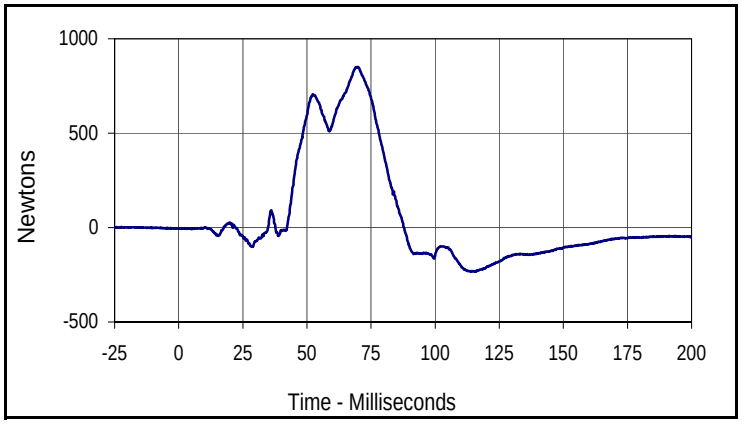
Curve Description			
Driver Chest Acceleration Y Primary			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
4.1	60.7	-4.3	38.0



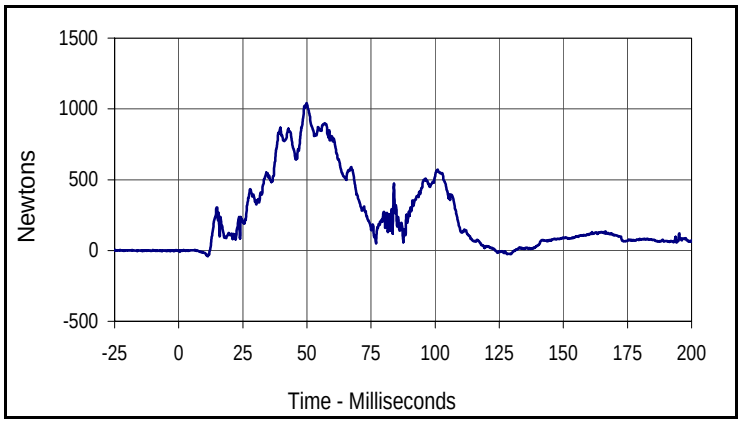
Curve Description			
Driver Chest Acceleration Z Primary			
CURNO	Type	SAE Class	Units
015	FIL	180	G's
Max	Time	Min	Time
6.5	27.6	-1.9	95.3



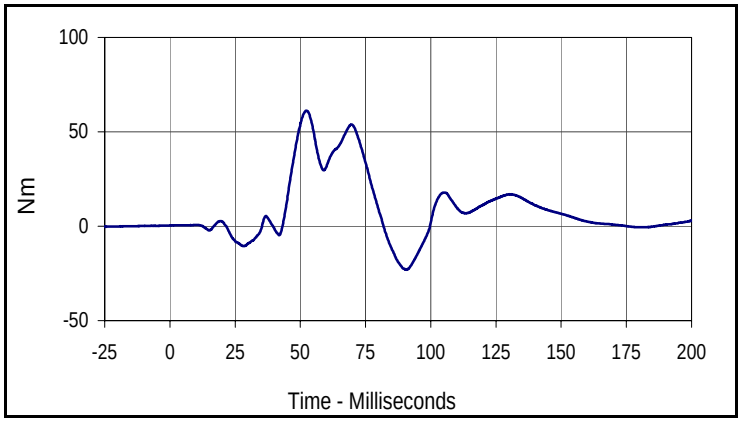
Curve Description			
Driver Chest Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
013	RES	180	G's
Max	Time	Min	Time
43.6	69.5	0.0	6.2



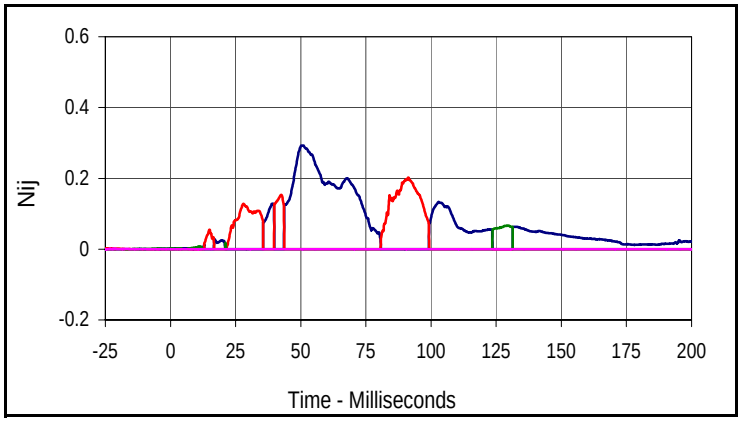
Curve Description			
Driver Upper Neck Force X			
CURNO	Type	SAE Class	Units
007	FIL	1000	Newtons
Max	Time	Min	Time
851.6	69.9	-234.3	115.2



Curve Description			
Driver Upper Neck Force Z			
CURNO	Type	SAE Class	Units
009	FIL	1000	Newtons
Max	Time	Min	Time
1040.8	49.9	-40.2	11.3

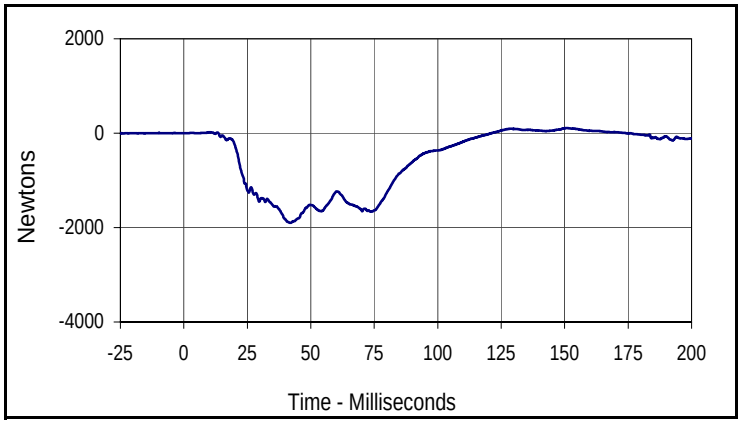


Curve Description			
Driver Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
011	FIL	600	Nm
Max	Time	Min	Time
61.2	52.3	-23.0	90.8

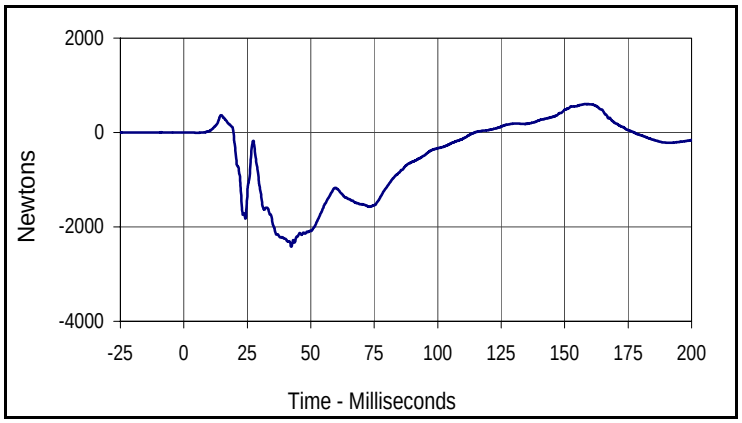


Curve Description			
Driver Nij			
Units	Type	Max	Time
Ntf	FIL	0.29	50.8
Units	Type	Max	Time
Nte	FIL	0.20	91.3
Units	Type	Max	Time
Ncf	FIL	0.07	129.6
Units	Type	Max	Time
Nce	FIL	0.10	295.1

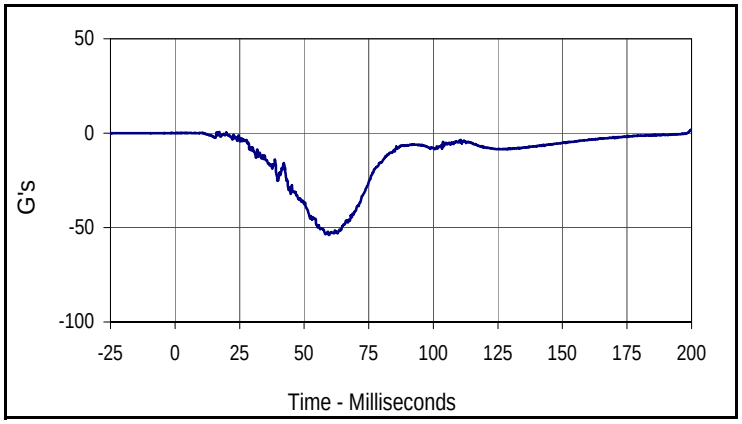
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/2/10
Test Program:	56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test	NHTSA No.:	MB0508



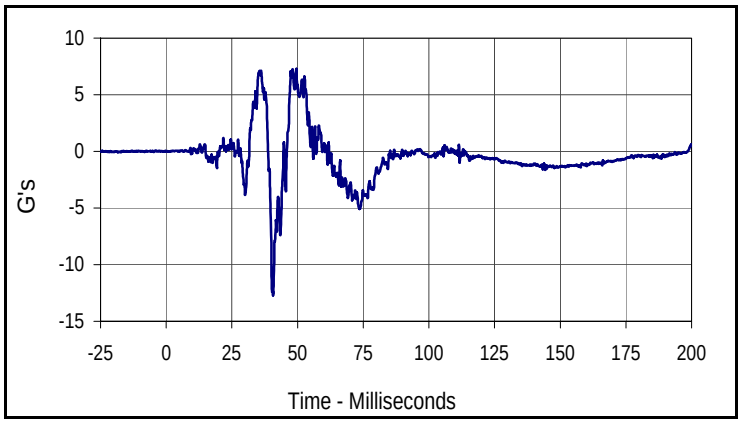
Curve Description			
Driver Left Femur Force Z			
CURNO	Type	SAE Class	Units
023	FIL	600	Newtons
Max	Time	Min	Time
107.5	150.3	-1899.6	42.1



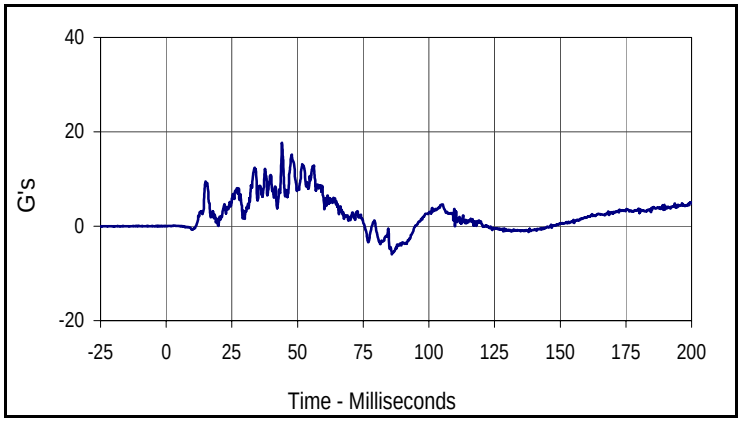
Curve Description			
Driver Right Femur Force Z			
CURNO	Type	SAE Class	Units
024	FIL	600	Newtons
Max	Time	Min	Time
605.4	157.9	-2420.5	42.3



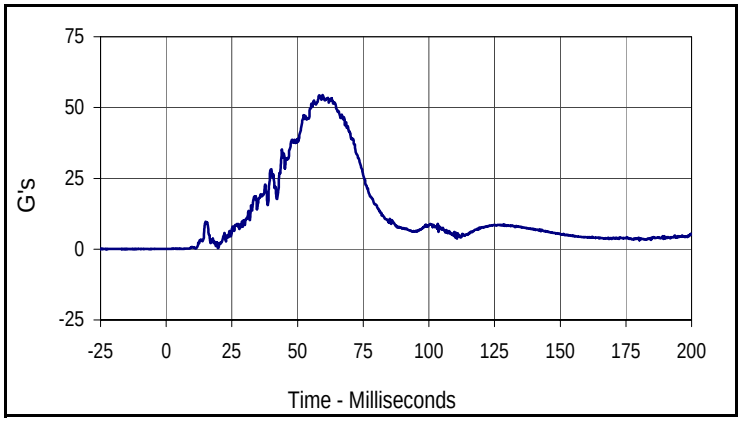
Curve Description			
Passenger Head Acceleration X Primary			
CURNO	Type	SAE Class	Units
045	FIL	1000	G's
Max	Time	Min	Time
1.8	200.0	-53.9	59.6



Curve Description			
Passenger Head Acceleration Y Primary			
CURNO	Type	SAE Class	Units
046	FIL	1000	G's
Max	Time	Min	Time
7.3	49.5	-12.7	40.7

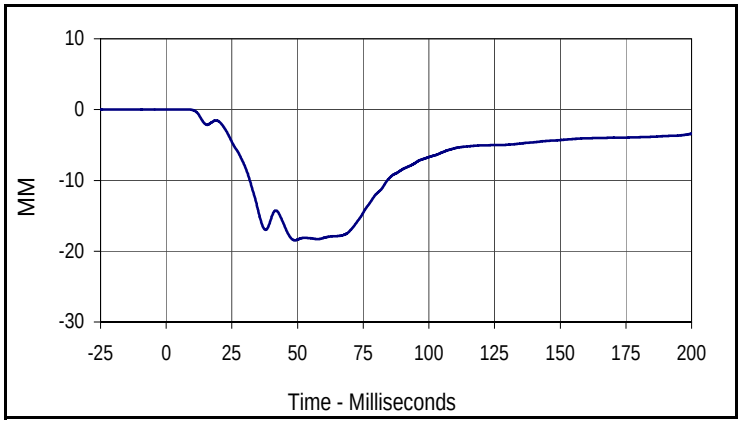


Curve Description			
Passenger Head Acceleration Z Primary			
CURNO	Type	SAE Class	Units
047	FIL	1000	G's
Max	Time	Min	Time
17.7	44.1	-6.0	85.9

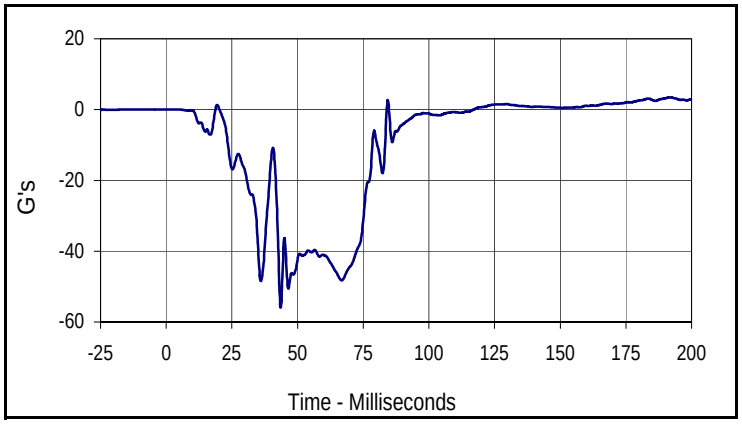


Curve Description			
Passenger Head Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
045	RES	1000	G's
Max	Time	Min	Time
54.4	59.5	0.0	0.1

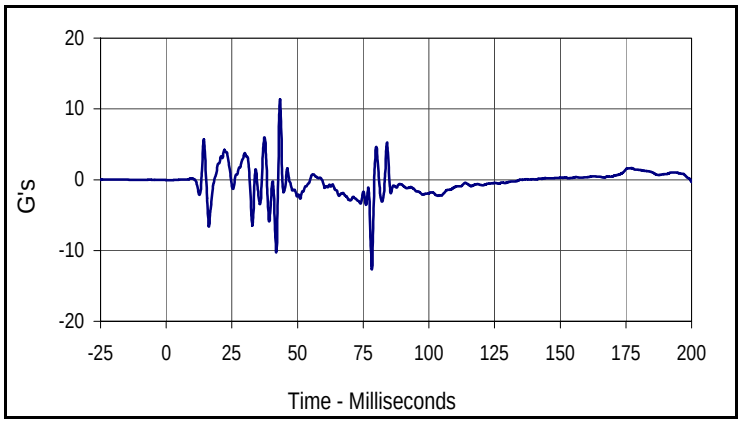
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/2/10
Test Program:	56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test	NHTSA No.:	MB0508



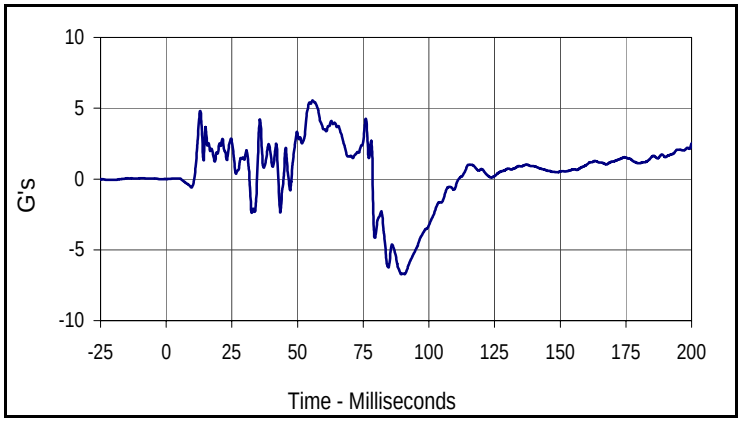
Curve Description			
Passenger Chest Deflection			
CURNO	Type	SAE Class	Units
063	FIL	180	MM
Max	Time	Min	Time
0.0	6.2	-18.5	49.0



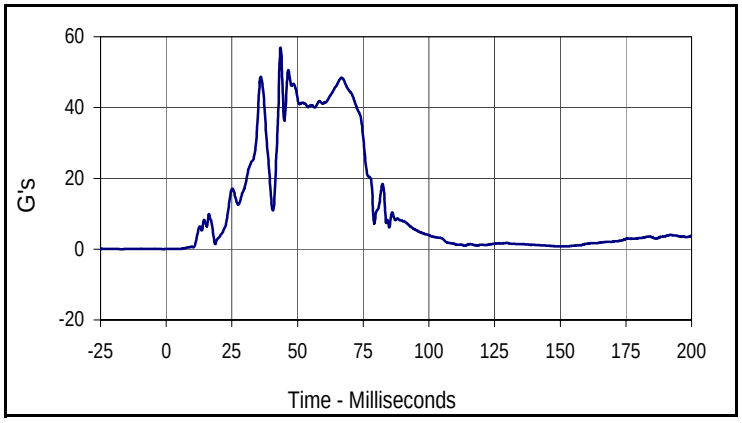
Curve Description			
Passenger Chest Acceleration X Primary			
CURNO	Type	SAE Class	Units
057	FIL	180	G's
Max	Time	Min	Time
3.5	192.0	-56.0	43.6



Curve Description			
Passenger Chest Acceleration Y Primary			
CURNO	Type	SAE Class	Units
058	FIL	180	G's
Max	Time	Min	Time
11.3	43.3	-12.7	78.3

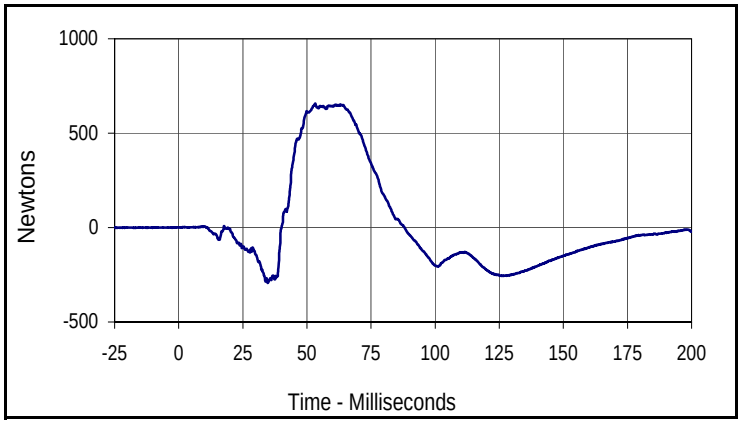


Curve Description			
Passenger Chest Acceleration Z Primary			
CURNO	Type	SAE Class	Units
059	FIL	180	G's
Max	Time	Min	Time
5.6	55.8	-6.7	89.5

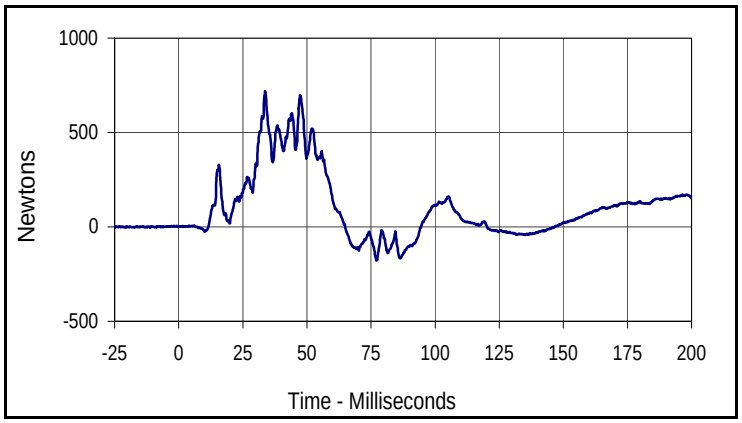


Curve Description			
Passenger Chest Resultant Acceleration Primary			
CURNO	Type	SAE Class	Units
057	RES	180	G's
Max	Time	Min	Time
56.9	43.5	0.0	5.5

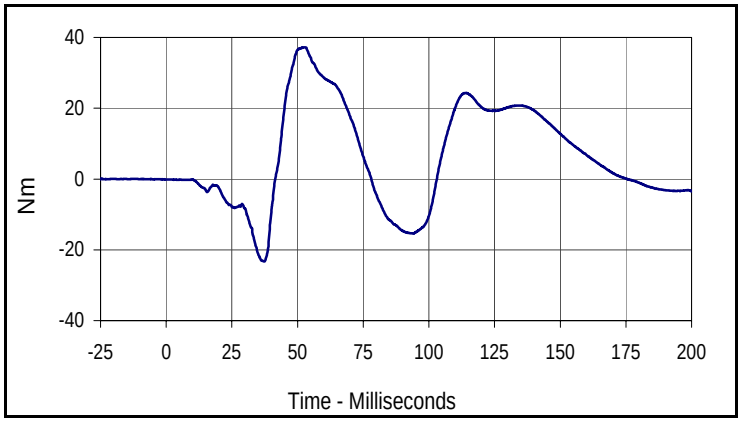
Test Vehicle:	2011 BMW 535i 4-Door Sedan	Test Date:	9/2/10
Test Program:	56 km/h (35 mph) Frontal Impact NCAP Rigid Barrier Test	NHTSA No.:	MB0508



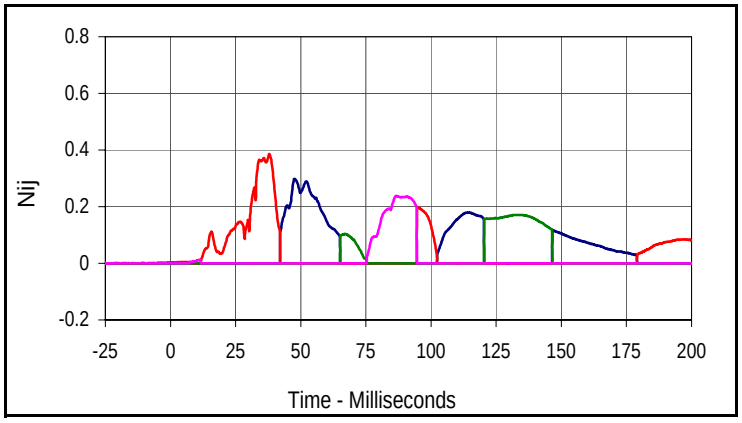
Curve Description			
Passenger Upper Neck Force X			
CURNO	Type	SAE Class	Units
051	FIL	1000	Newtons
Max	Time	Min	Time
658.2	53.3	-293.3	34.7



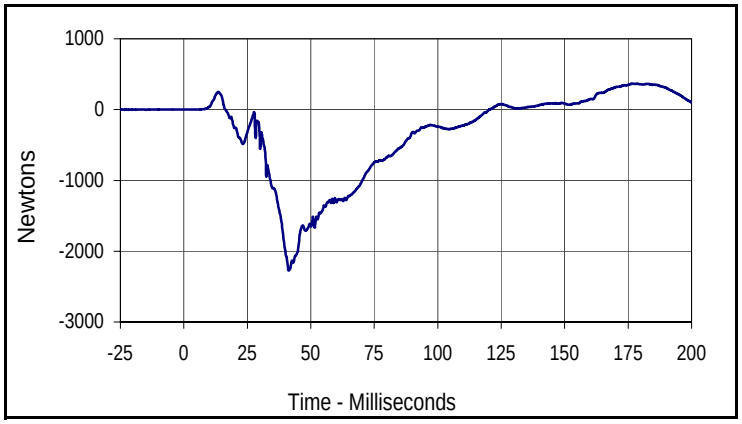
Curve Description			
Passenger Upper Neck Force Z			
CURNO	Type	SAE Class	Units
053	FIL	1000	Newtons
Max	Time	Min	Time
716.4	33.7	-177.2	77.1



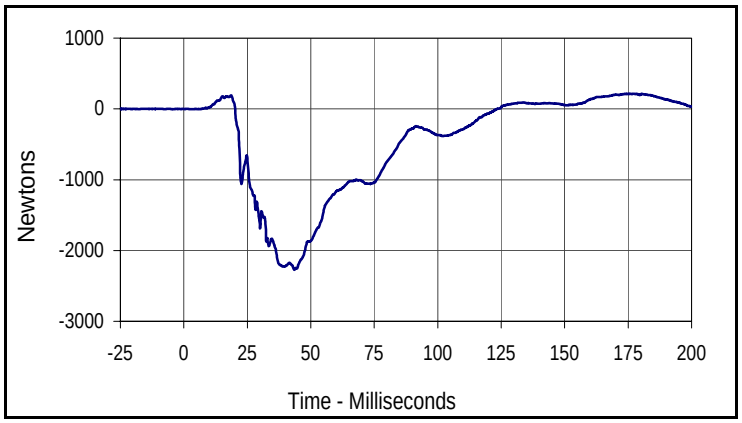
Curve Description			
Passenger Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
055	FIL	600	Nm
Max	Time	Min	Time
37.2	52.4	-23.3	37.3



Curve Description			
Passenger Nij			
Units	Type	Max	Time
Ntf	FIL	0.30	47.6
Units	Type	Max	Time
Nte	FIL	0.39	37.9
Units	Type	Max	Time
Ncf	FIL	0.17	132.0
Units	Type	Max	Time
Nce	FIL	0.24	86.7



Curve Description			
Passenger Left Femur Force Z			
CURNO	Type	SAE Class	Units
067	FIL	600	Newtons
Max	Time	Min	Time
366.5	176.5	-2274.3	41.3



Curve Description			
Passenger Right Femur Force Z			
CURNO	Type	SAE Class	Units
068	FIL	600	Newtons
Max	Time	Min	Time
214.8	177.3	-2274.5	43.5

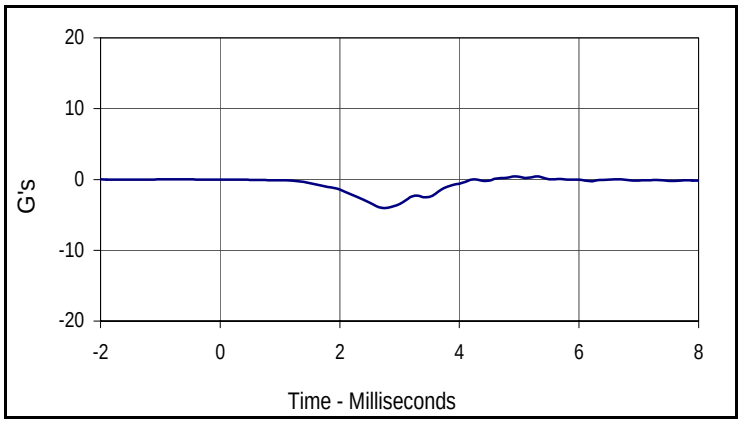
APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

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

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	8/19/10
ATD Serial No.:	035	Test I.D.:	HDM08C

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	242.2	Pass
Peak Lateral Acceleration	G's	≤15.0	4.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

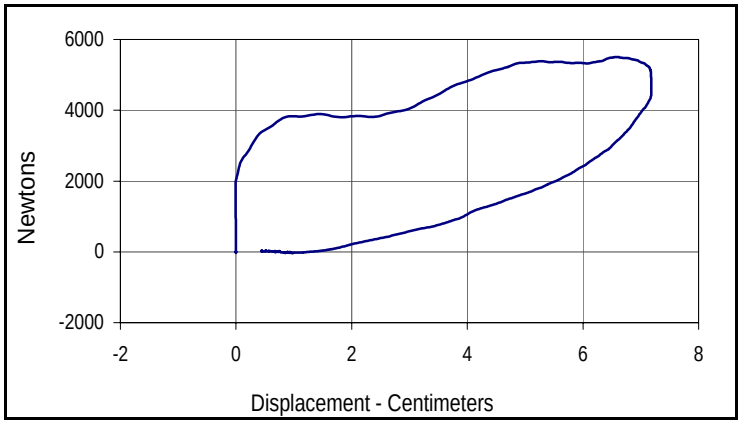
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
242.2	2.7	0.0	-1.6



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.4	5.3	-4.0	2.7

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	8/19/10
ATD Serial No.:	035	Test I.D.:	CHM08C

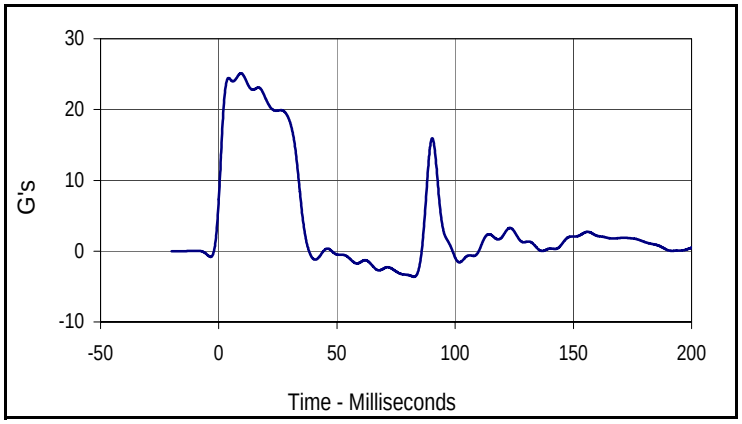
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.67	Pass
Peak Probe Force	Newtons	5159 to 5893	5506	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	7.18	Pass
Internal Hysterysis	%	69 to 85	74.0	Pass
		Overall Test Results		Pass



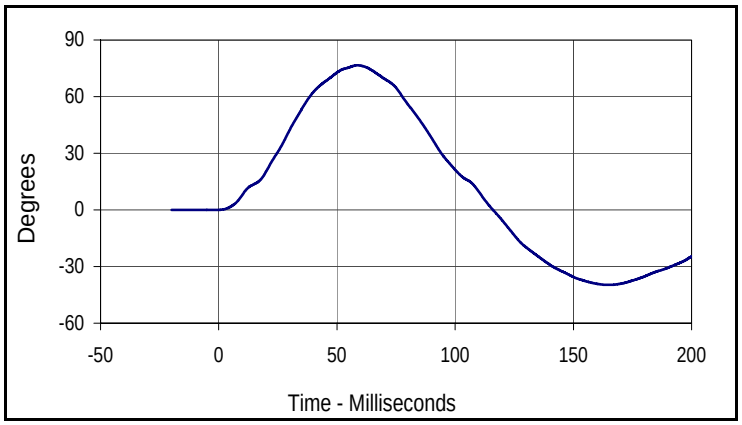
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	74.0
Peak Probe Force		Peak Chest Deflection	
5506		7.18	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	8/19/10
ATD Serial No.:	035	Test I.D.:	NFM08C

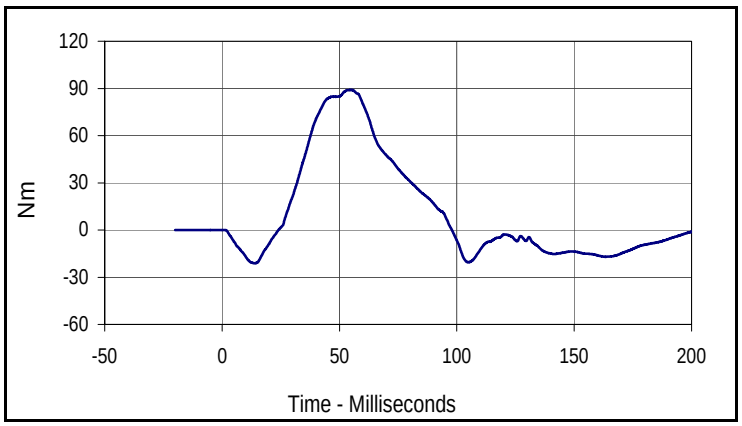
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.89	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	25.0	Pass
	20 Msec.	G's	17.6 to 22.6	21.4	Pass
	30 Msec.	G's	12.5 to 18.5	18.4	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	18.4	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	35.4	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	76.6	Pass
	Time	Msec.	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	116	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	89.1	Pass
	Time	Msec.	47.0 to 58.0	54.5	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	98.0	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
25.1	9.4	-3.6	82.6



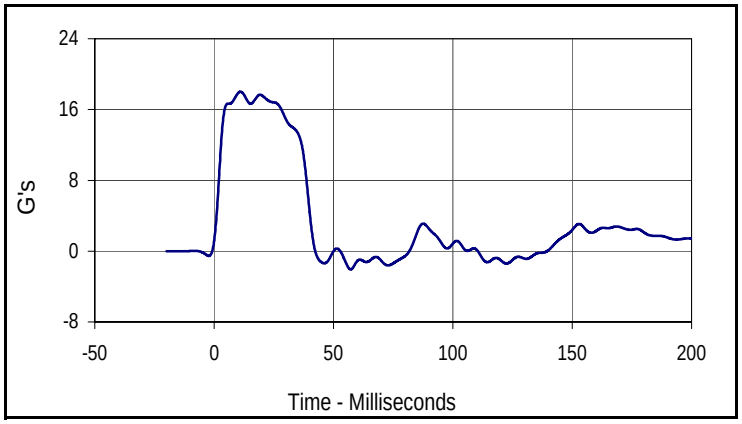
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
76.6	58.6	-39.7	164.8



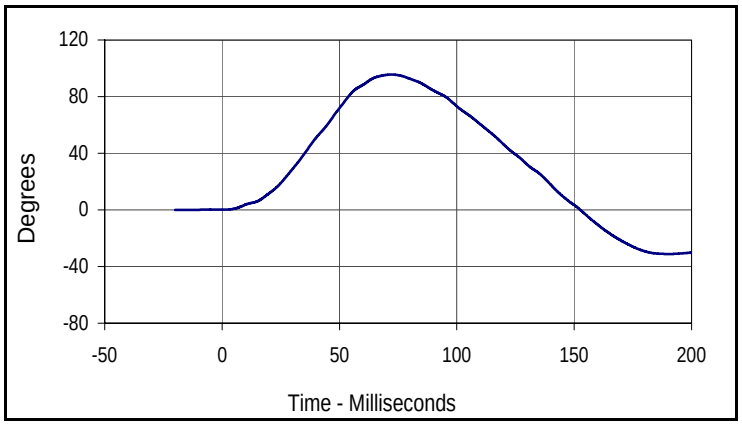
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
89.1	54.5	-21.2	13.8

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	8/19/10
ATD Serial No.:	035	Test I.D.:	NEM08C

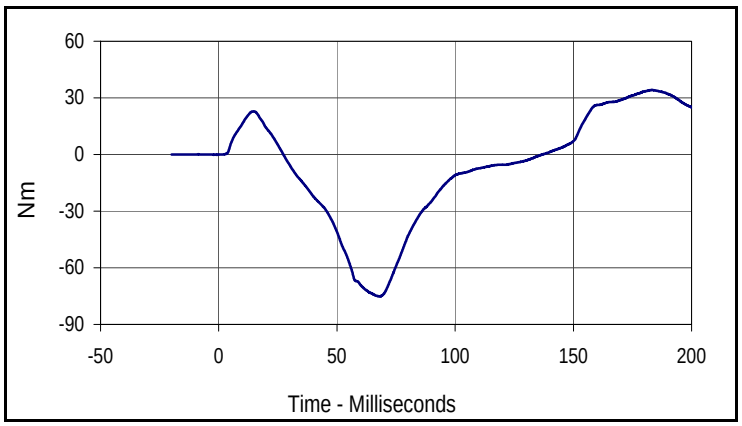
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	5.96	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.9	Pass
	20 Msec.	G's	14.0 to 19.0	17.6	Pass
	30 Msec.	G's	11.0 to 16.0	14.9	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	14.9	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	95.6	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	-75.2	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
18.0	11.0	-2.1	57.2



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
95.6	72.2	-31.1	190.4



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
34.2	183.3	-75.2	68.2

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	8/19/10
ATD Serial No.:	035	Test I.D.:	LKM08C , RKM08C

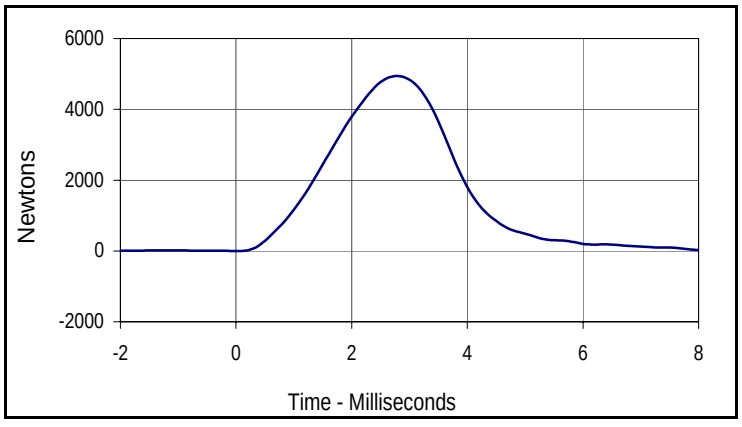
Left Knee

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	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4860	Pass
		Overall Test Results		Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4943	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4859.8	2.8	-12.6	8.7



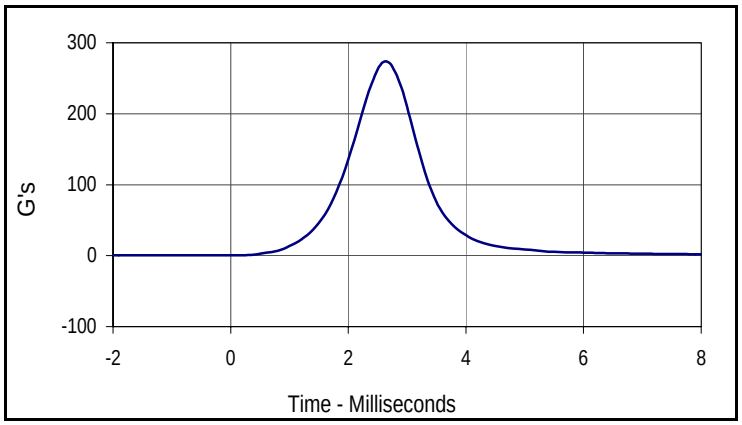
Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
4943.0	2.8	-44.0	10.0

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	8/19/10
ATD Serial No.:	035	Test I.D.:	N/A

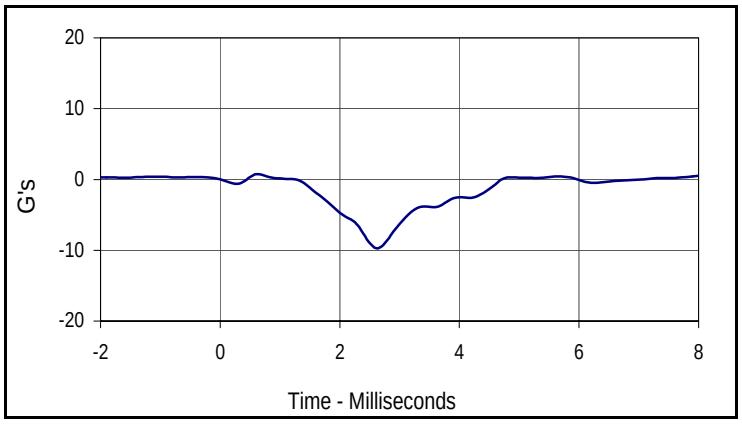
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	881	Pass
B - Shoulder pivot height	mm	505 to 521	517	Pass
C - "H" point height	mm	84 to 89	85	Pass
D - "H" point from seat back	mm	135 to 140	139	Pass
E - Shoulder pivot from back	mm	84 to 94	84	Pass
F - Thigh clearance	mm	140 to 155	149	Pass
G - Elbow back to wrist pivot	mm	290 to 305	301	Pass
H - Skull cap to back line	mm	41 to 46	43	Pass
I - Shoulder to elbow length	mm	330 to 345	335	Pass
J - Elbow rest height	mm	190 to 211	210	Pass
K - Buttock to knee length	mm	579 to 604	590	Pass
L - Poplipteal length	mm	429 to 455	432	Pass
M - Knee pivot height	mm	485 to 500	487	Pass
N - Buttock poplipteal length	mm	452 to 477	470	Pass
O - Chest depth	mm	213 to 229	215	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	431	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference	mm	970 to 1001	986	Pass
Z - Waist circumference	mm	836 to 866	864	Pass
AA - Location for chest circumference	mm	429 to 434	431	Pass
BB - Location for waist circumference	mm	226 to 231	231	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 5th Percentile Female Head Drop Test		Test Date:	8/20/10	
ATD Serial No.:	141		Test I.D.:	HDF08C	

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	273.1	Pass
Peak Lateral Acceleration	G's	≤15.0	9.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



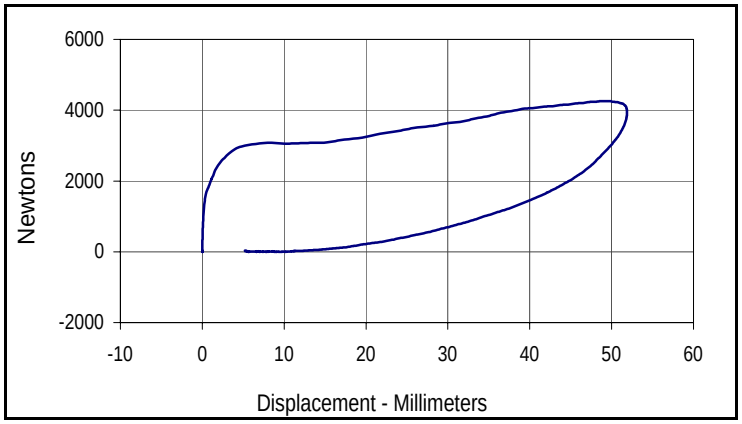
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
273.1	2.6	0.6	-1.5



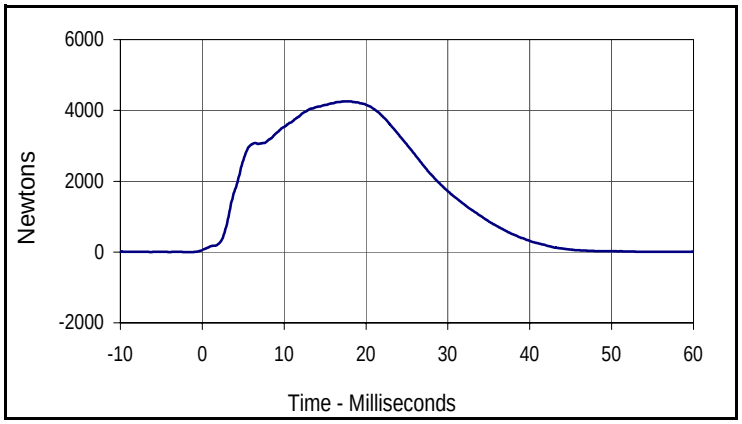
Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.7	0.6	-9.7	2.6

Test Program:	Hybrid III 5th Percentile Female Thorax Impact Test	Test Date:	8/20/10
ATD Serial No.:	141	Test I.D.:	CHF08C

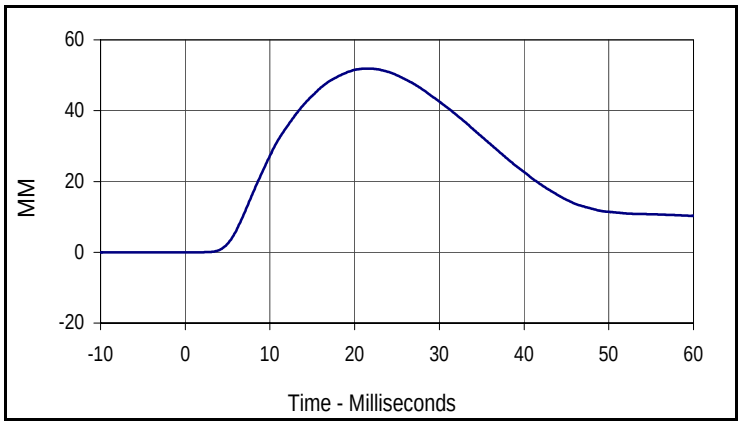
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.59 to 6.83	6.81	Pass
Peak Chest Deflection	MM	50.0 to 58.0	51.9	Pass
Peak Force Between 50 and 58 MM	Newtons	3900 to 4400	4258	Pass
Peak Force Between 18 and 50 MM	Newtons	≤4600	4241	Pass
Internal Hysterysis	%	69 to 85	76.3	Pass
		Overall Test Results		Pass



Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
003	FIL	180	76.3
Peak Probe Force		Peak Chest Displ.	
4257.6		51.9	



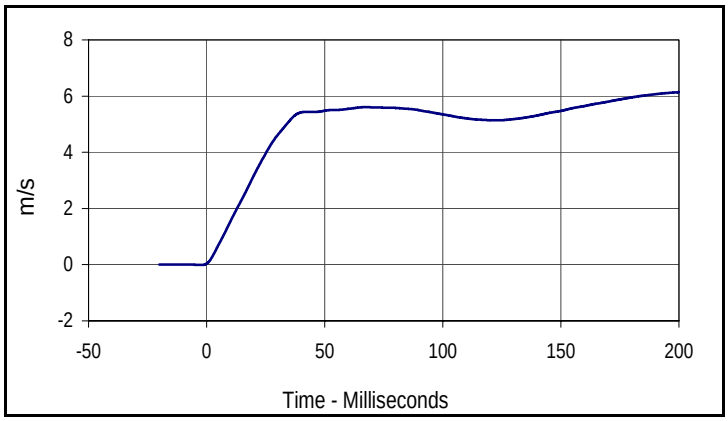
Curve Description			
Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	180	Newtons
Max	Time	Min	Time
4257.6	17.3	-5.8	155.4



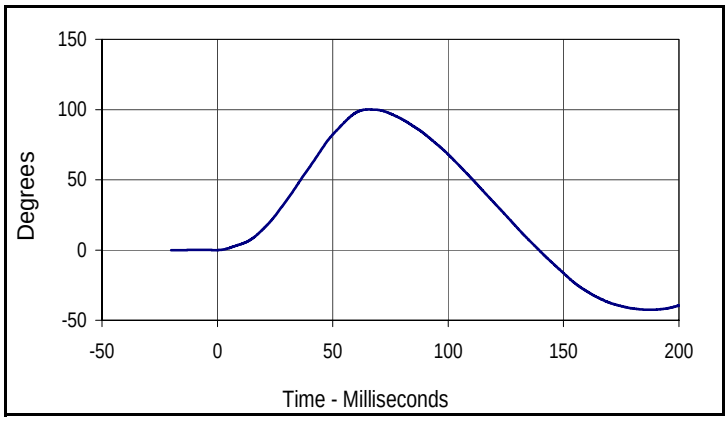
Curve Description			
Chest Deflection			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
51.9	21.6	0.0	-10.0

Test Program:	Hybrid III 5th Percentile Female Neck Extension Test	Test Date:	8/20/10
ATD Serial No.:	141	Test I.D.:	NE08C

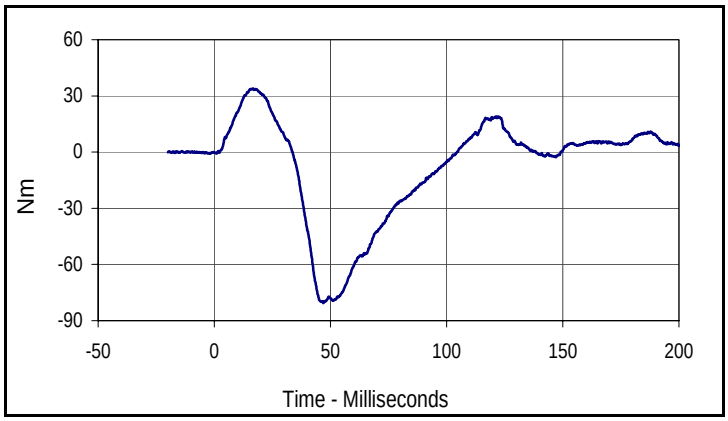
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.5	Pass
	20 Msec.	m/s	3.1 to 3.9	3.2	Pass
	30 Msec.	m/s	4.6 to 5.6	4.6	Pass
"D" Plane Rotation	Max	Degrees	99.0 to 114.0	100.0	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-54.1	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
6.1	200.0	0.0	-2.2



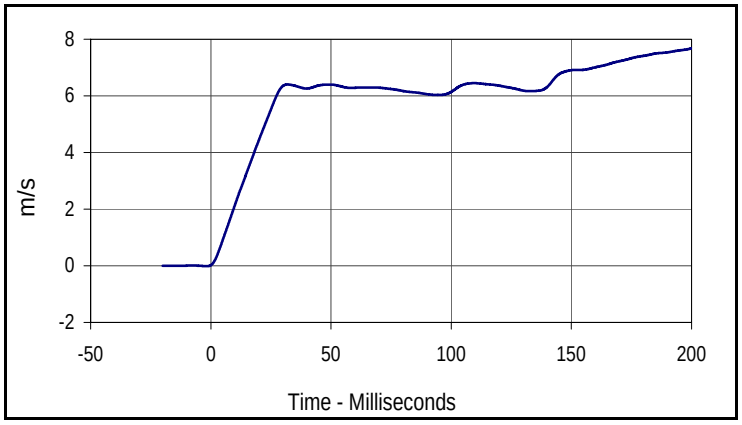
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
100.0	65.4	-42.6	187.9



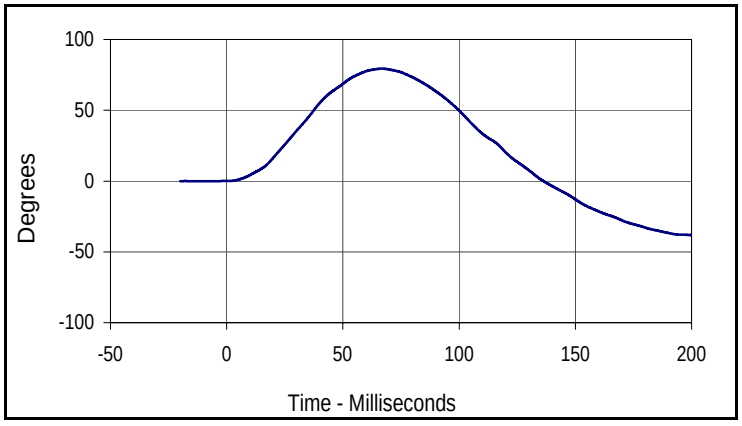
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
34.0	16.7	-80.6	46.9

Test Program:	Hybrid III 5th Percentile Female Neck Flexion Test	Test Date:	8/20/10
ATD Serial No.:	141	Test I.D.:	NF08C

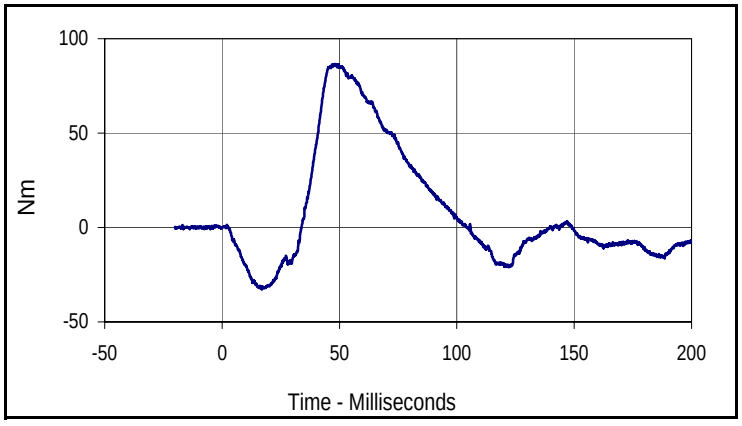
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.10	Pass
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.1	Pass
	20 Msec.	m/s	4.0 to 5.0	4.4	Pass
	30 Msec.	m/s	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	73.1	Pass
Positive Moment Decay, Time To 10 Nm		Msec.	80.0 to 100.0	95.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
7.7	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
86.5	48.0	-32.9	16.9

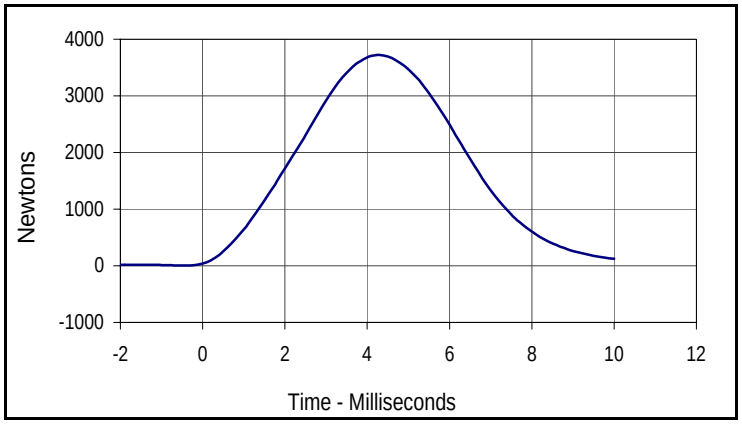
Test Program:	Hybrid III 5th Percentile Female Knee Impact Test	Test Date:	8/20/10
ATD Serial No.:	141	Test I.D.:	LKF08C , RKB08C

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	2.09	Pass
Peak Probe Force	Newtons	3450 to 4060	3721	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	3450 to 4060	3692	Pass
		Overall Test Results		Pass



Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3721.5	4.3	3.2	-0.4

Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
3692.3	4.3	-2.4	-0.4

Test Program:	Hybrid III 5th Percentile Female Torso Flexion Test	Test Date:	8/14/10
ATD Serial No.:	141	Test I.D.:	TF08B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	^{o}C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial reference plane angle	Degrees	≤20.0	2.0	Pass
Peak Force at 45 +/-0.5 degrees	Newtons	320.0 to 390.0	320.5	Pass
Torso rotation rate	deg/sec	0.5 to 1.5	1.2	Pass
Final reference plane angle	Degrees	+/-8	3.2	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 5th Percentile Female External Measurements	Test Date:	8/20/10
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	783	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	441	Pass
C - "H" point height (Reference)	mm	81.3 to 86.3	84	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	79	Pass
F - Thigh clearance	mm	119.4 to 134.6	129	Pass
G - Back of elbow to wrist pivot	mm	243.9 to 259.1	253	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	286	Pass
J - Elbow rest heignt	mm	182.8 to 203.2	202	Pass
K - Buttock to knee length	mm	520.7 to 546.1	540	Pass
L - Poplipteal height	mm	355.6 to 376.0	361	Pass
M - Knee pivot height	mm	393.7 to 419.1	414	Pass
N - Buttock poplipteal length	mm	414.0 to 439.4	415	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	182	Pass
P - Foot length	mm	218.5 to 233.7	231	Pass
R - Buttock to knee pivot length	mm	457.2 to 482.6	465	Pass
S - Head breadth	mm	137.1 to 147.3	143	Pass
T - Head depth	mm	177.8 to 188.0	181	Pass
U - Hip breadth	mm	299.7 to 314.9	309	Pass
V - Shoulder breadth	mm	350.5 to 365.7	362	Pass
W - Foot breadth	mm	78.8 to 94.0	90	Pass
X - Head circumference	mm	528.3 to 548.7	543	Pass
Y - Chest circumference with jacket	mm	850.8 to 881.3	853	Pass
Z - Waist circumference	mm	759.5 to 789.9	779	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	304	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	167	Pass
		Overall Test Results		Pass

Test Program:	Dummy Damage Checklist	Test Date:	8/19/10
ATD Serial No.:	035	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	Test Date:	8/20/10
ATD Serial No.:	141	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

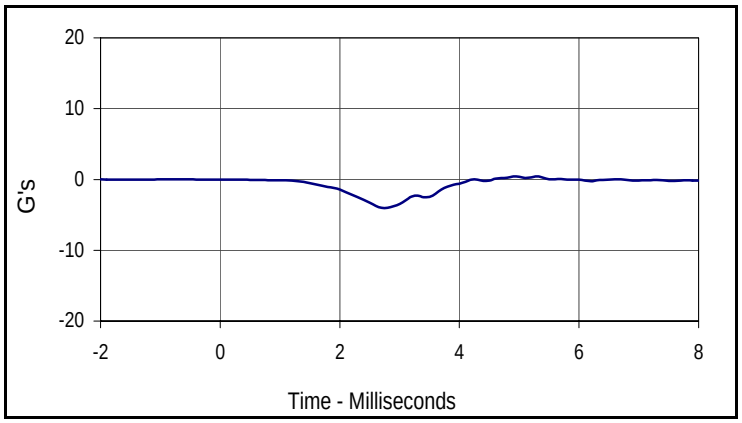
Comments on repair or replacement parts:

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

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	9/4/10
ATD Serial No.:	035	Test I.D.:	HDM09

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	242.2	Pass
Peak Lateral Acceleration	G's	≤15.0	4.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

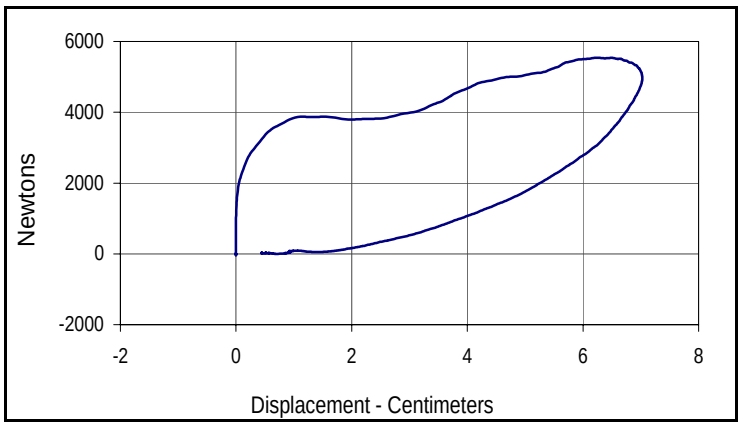
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
242.2	2.7	0.0	-1.6



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.4	5.3	-4.0	2.7

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	9/4/10
ATD Serial No.:	035	Test I.D.:	CHM09A

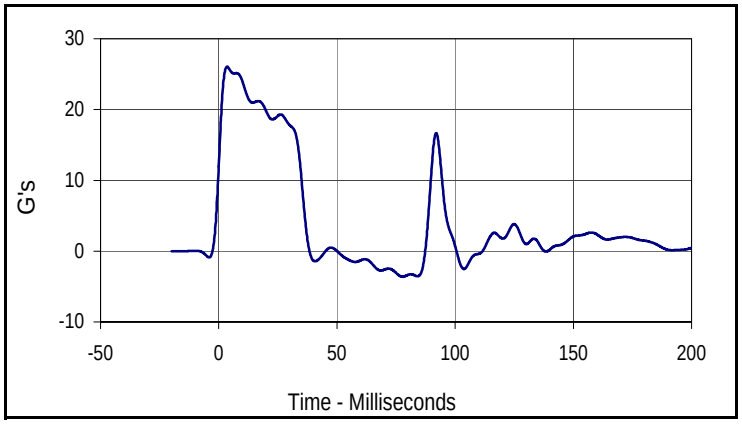
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.63	Pass
Peak Probe Force	Newtons	5159 to 5893	5537	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	7.03	Pass
Internal Hysterysis	%	69 to 85	72.3	Pass
		Overall Test Results		Pass



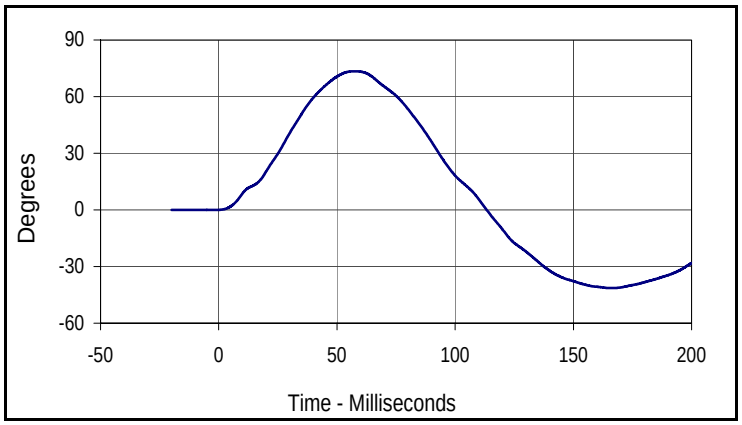
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	72.3
Peak Probe Force		Peak Chest Deflection	
5537		7.03	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	9/4/10
ATD Serial No.:	035	Test I.D.:	NFM009A

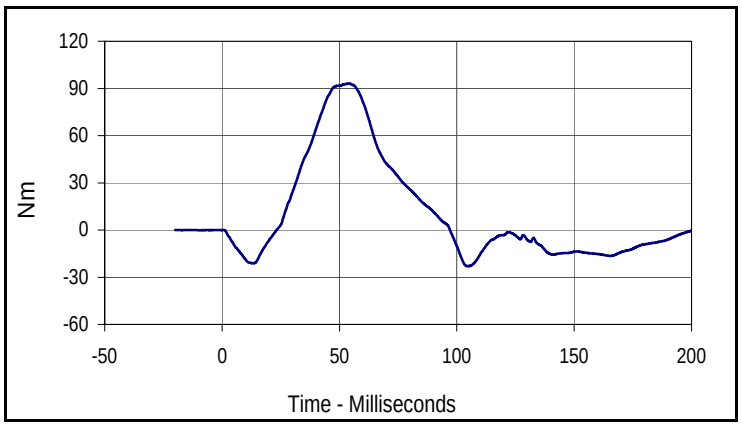
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	24.0	Pass
	20 Msec.	G's	17.6 to 22.6	19.8	Pass
	30 Msec.	G's	12.5 to 18.5	17.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	36.4	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	73.5	Pass
	Time	Msec.	57.0 to 64.0	57.5	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	113.4	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	93.1	Pass
	Time	Msec.	47.0 to 58.0	54.1	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	97.1	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
26.1	3.5	-3.6	77.8



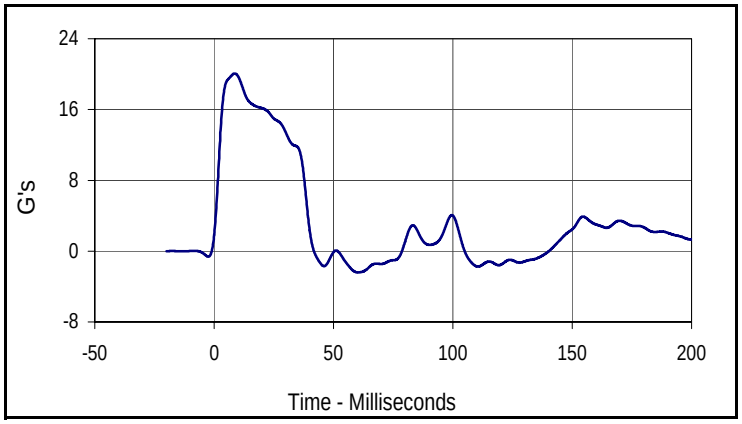
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
73.5	57.5	-41.4	166.1



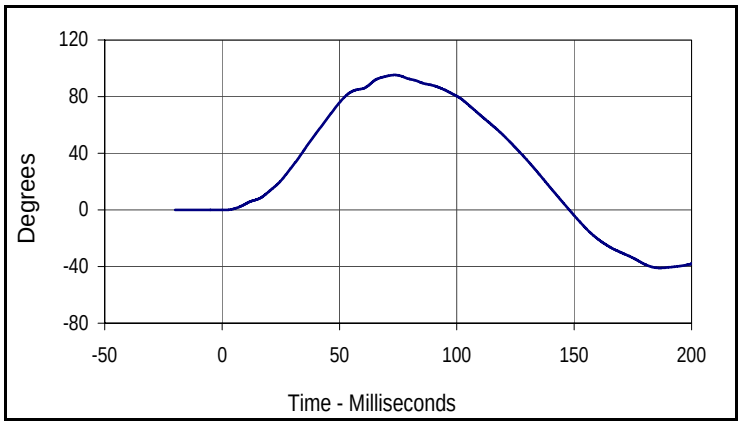
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
93.1	54.1	-23.0	104.6

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	9/4/10
ATD Serial No.:	035	Test I.D.:	NEM09A

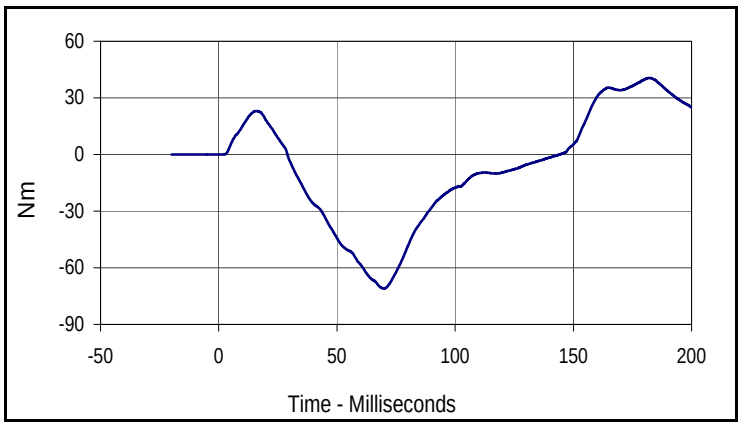
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	5.98	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	19.8	Pass
	20 Msec.	G's	14.0 to 19.0	16.2	Pass
	30 Msec.	G's	11.0 to 16.0	13.4	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	13.4	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	39.0	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	95.3	Pass
	Time	Msec.	72.0 to 82.0	73.5	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	148	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-71.0	Pass
	Time	Msec.	65.0 to 79.0	69.9	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	144.2	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
20.1	8.6	-2.4	60.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
95.3	73.5	-41.0	186.5



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
40.5	182.6	-71.0	69.9

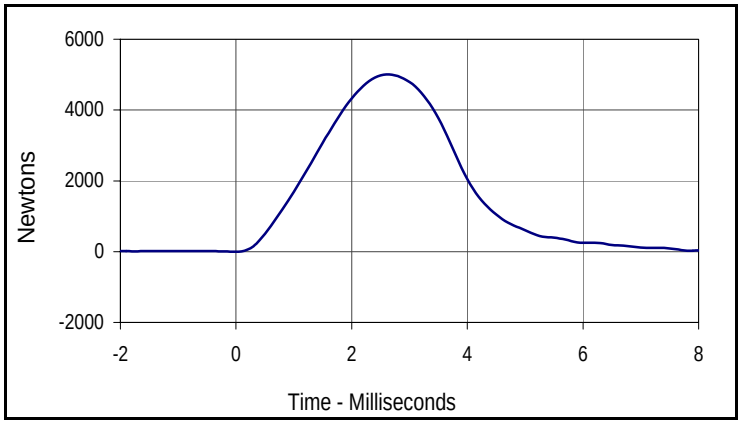
Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	9/4/10
ATD Serial No.:	035	Test I.D.:	LKM09A , RKM09A

Left Knee

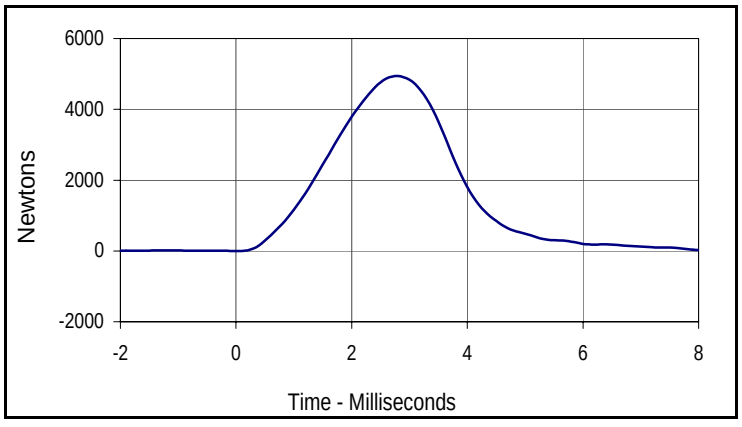
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5008	Pass
		Overall Test Results		Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4941	Pass
		Overall Test Results		Pass



Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5008.0	2.6	-53.7	9.6



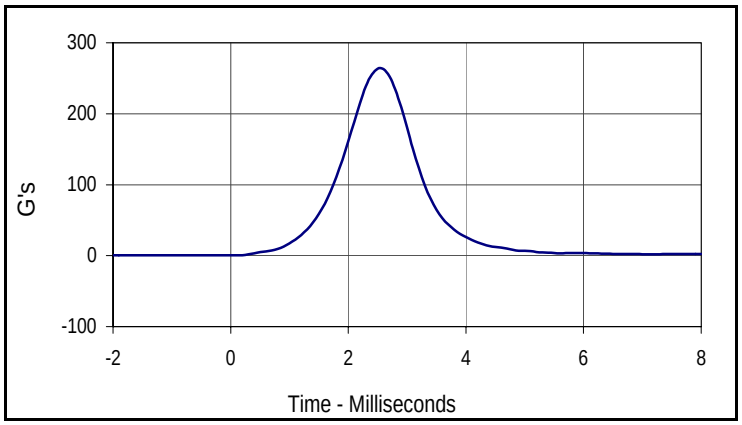
Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
4940.8	2.8	-44.0	10.0

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	9/4/10
ATD Serial No.:	035	Test I.D.:	N/A

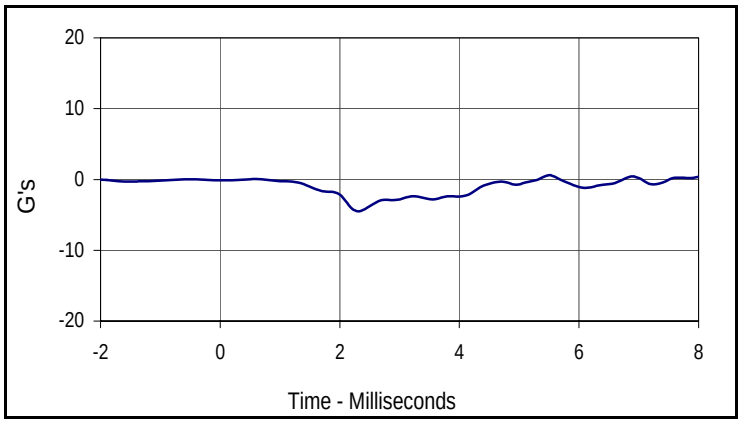
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	881	Pass
B - Shoulder pivot height	mm	505 to 521	518	Pass
C - "H" point height	mm	84 to 89	86	Pass
D - "H" point from seat back	mm	135 to 140	139	Pass
E - Shoulder pivot from back	mm	84 to 94	85	Pass
F - Thigh clearance	mm	140 to 155	149	Pass
G - Elbow back to wrist pivot	mm	290 to 305	300	Pass
H - Skull cap to back line	mm	41 to 46	43	Pass
I - Shoulder to elbow length	mm	330 to 345	335	Pass
J - Elbow rest height	mm	190 to 211	206	Pass
K - Buttock to knee length	mm	579 to 604	590	Pass
L - Poplipteal length	mm	429 to 455	432	Pass
M - Knee pivot height	mm	485 to 500	487	Pass
N - Buttock poplipteal length	mm	452 to 477	470	Pass
O - Chest depth	mm	213 to 229	215	Pass
P - Foot length	mm	251 to 267	259	Pass
V - Shoulder breadth	mm	422 to 437	432	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference	mm	970 to 1001	987	Pass
Z - Waist circumference	mm	836 to 866	863	Pass
AA - Location for chest circumference	mm	429 to 434	432	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 5th Percentile Female Head Drop Test	Test Date:	9/3/10
ATD Serial No.:	141	Test I.D.:	HDF09B

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	263.6	Pass
Peak Lateral Acceleration	G's	≤15.0	4.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



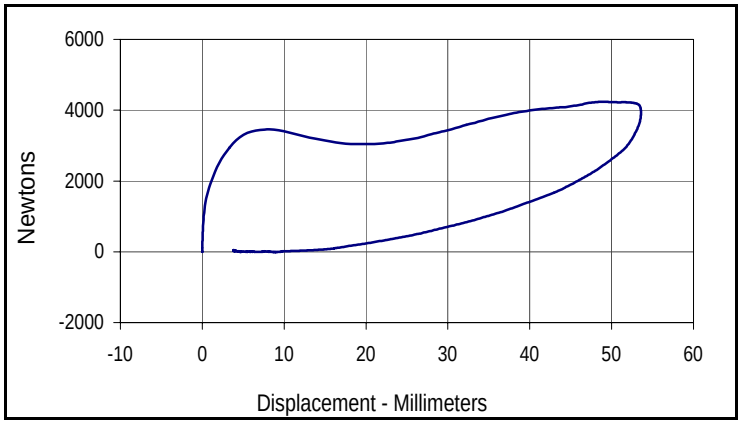
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
263.6	2.5	0.4	-1.3



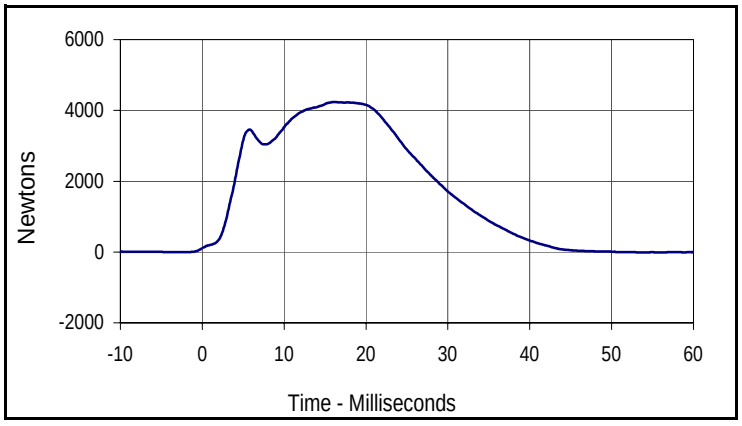
Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.6	5.5	-4.5	2.3

Test Program:	Hybrid III 5th Percentile Female Thorax Impact Test	Test Date:	9/3/10
ATD Serial No.:	141	Test I.D.:	CHF09B

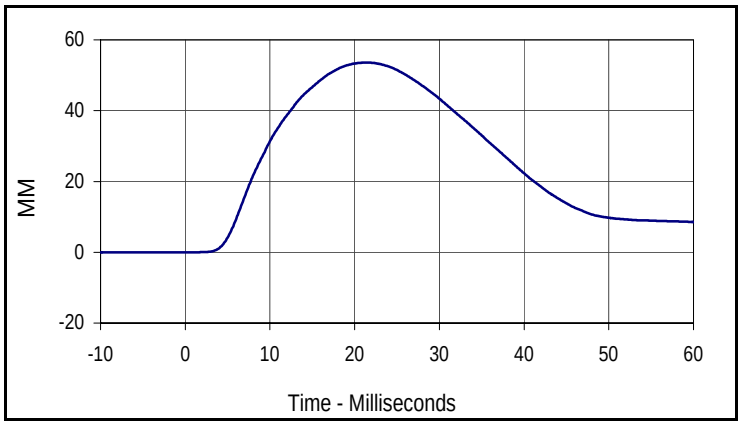
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.59 to 6.83	6.81	Pass
Peak Chest Deflection	MM	50.0 to 58.0	53.6	Pass
Peak Force Between 50 and 58 MM	Newtons	3900 to 4400	4242	Pass
Peak Force Between 18 and 50 MM	Newtons	≤4600	4230	Pass
Internal Hysterysis	%	69 to 85	75.4	Pass
		Overall Test Results		Pass



Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
003	FIL	180	75.4
Peak Probe Force		Peak Chest Displ.	
4241.6		53.6	



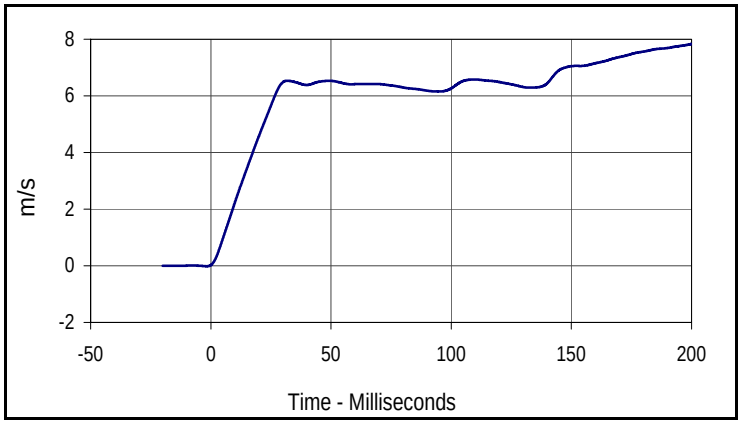
Curve Description			
Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	180	Newtons
Max	Time	Min	Time
4241.6	16.1	-8.9	56.2



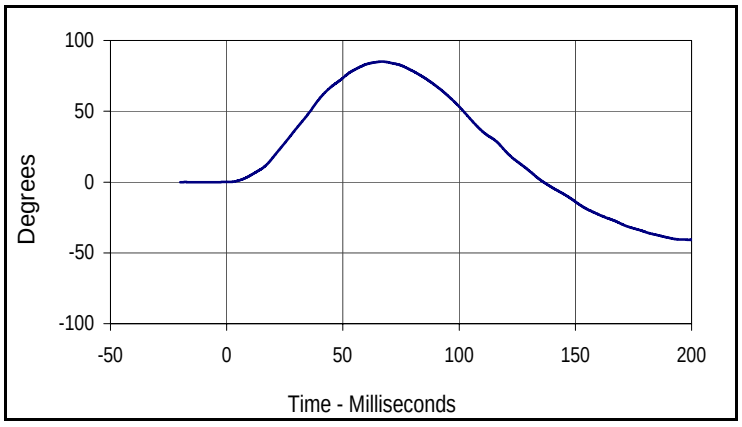
Curve Description			
Chest Deflection			
CURNO	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
53.6	21.4	0.0	-10.0

Test Program:	Hybrid III 5th Percentile Female Neck Flexion Test	Test Date:	9/3/10
ATD Serial No.:	141	Test I.D.:	NF09B

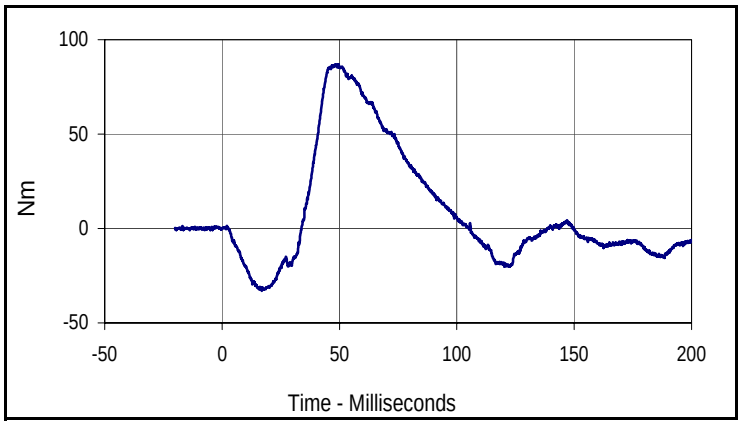
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.03	Pass
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.2	Pass
	20 Msec.	m/s	4.0 to 5.0	4.6	Pass
	30 Msec.	m/s	5.8 to 7.0	6.5	Pass
"D" Plane Rotation	Max	Degrees	77.0 to 91.0	85.1	Pass
Peak Moment in Rotation	Max	Nm	69.0 to 83.0	81.8	Pass
Positive Moment Decay, Time To 10 Nm		Msec.	80.0 to 100.0	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
7.8	200.0	0.0	-1.8



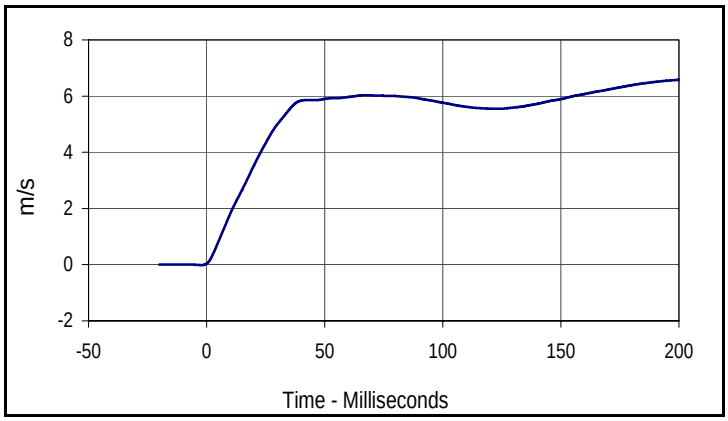
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
85.1	66.8	-40.7	200.0



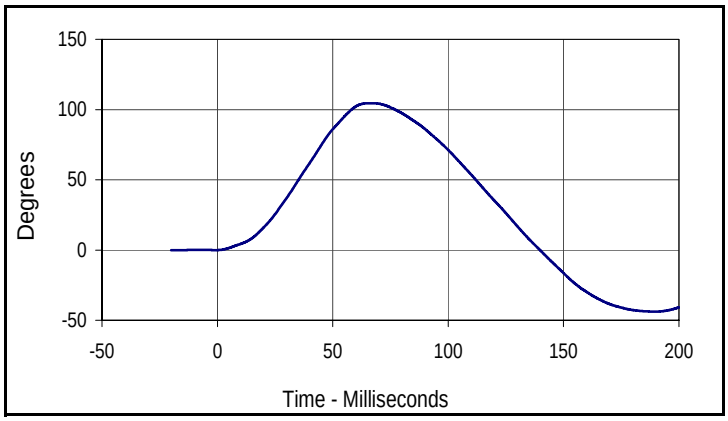
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
87.0	49.6	-33.0	16.9

Test Program:	Hybrid III 5th Percentile Female Neck Extension Test	Test Date:	9/3/10
ATD Serial No.:	141	Test I.D.:	NE09B

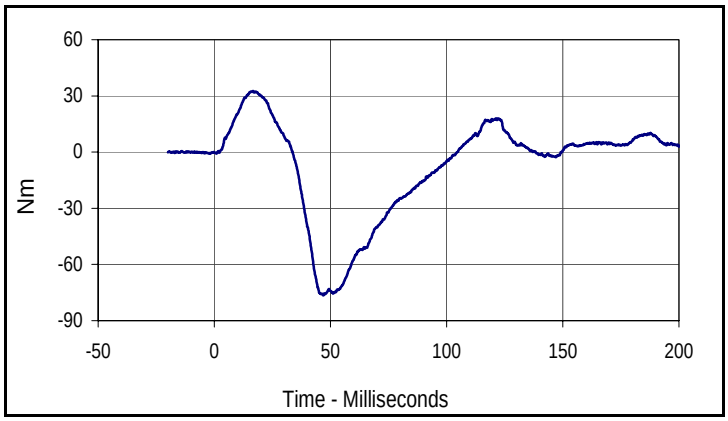
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.00	Pass
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.8	Pass
	20 Msec.	m/s	3.1 to 3.9	3.5	Pass
	30 Msec.	m/s	4.6 to 5.6	5.0	Pass
"D" Plane Rotation	Max	Degrees	99.0 to 114.0	104.5	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-64.4	Pass
Positive Moment Decay, Time To -10 Nm		Msec.	94.0 to 114.0	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
6.6	200.0	0.0	-2.2



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
104.5	65.4	-43.9	189.5



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
32.6	16.7	-76.5	46.9

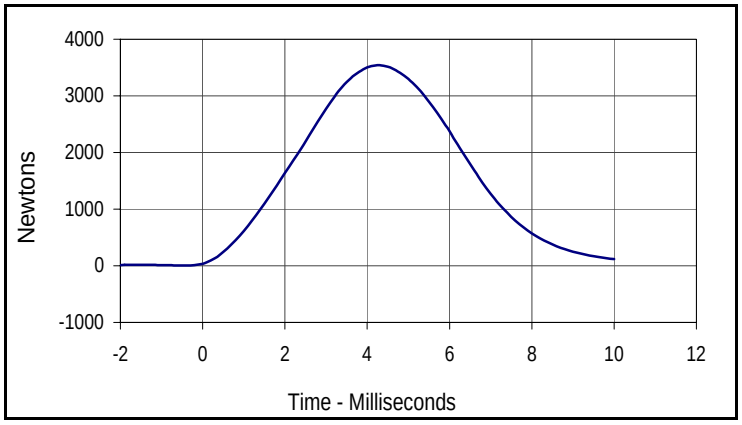
Test Program:	Hybrid III 5th Percentile Female Knee Impact Test	Test Date:	9/3/10
ATD Serial No.:	141	Test I.D.:	LKF09B , RKB09B

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	2.09	Pass
Peak Probe Force	Newtons	3450 to 4060	3540	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	3578	Pass
		Overall Test Results		Pass



Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3539.7	4.3	3.1	-0.4

Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
3578.5	4.3	-2.8	-0.4

Test Program:	Hybrid III 5th Percentile Female Torso Flexion Test	Test Date:	9/3/10
ATD Serial No.:	141	Test I.D.:	TF09B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	^{o}C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial reference plane angle	Degrees	≤20.0	1.7	Pass
Peak Force at 45 +/-0.5 degrees	Newtons	320.0 to 390.0	323.7	Pass
Torso rotation rate	deg/sec	0.5 to 1.5	1.3	Pass
Final reference plane angle	Degrees	+/-8	3.0	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 5th Percentile Female External Measurements	Test Date:	9/3/10
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	785	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	442	Pass
C - "H" point height (Reference)	mm	81.3 to 86.3	85	Pass
D - "H" point from seat back (Ref.)	mm	144.8 to 149.8	145	Pass
E - Shoulder pivot from backline	mm	68.6 to 83.8	81	Pass
F - Thigh clearance	mm	119.4 to 134.6	128	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	42	Pass
I - Shoulder to elbow length	mm	276.8 to 297.2	286	Pass
J - Elbow rest heignt	mm	182.8 to 203.2	202	Pass
K - Buttock to knee length	mm	520.7 to 546.1	539	Pass
L - Poplipteal height	mm	355.6 to 376.0	360	Pass
M - Knee pivot height	mm	393.7 to 419.1	413	Pass
N - Buttock poplipteal length	mm	414.0 to 439.4	418	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	183	Pass
P - Foot length	mm	218.5 to 233.7	230	Pass
R - Buttock to knee pivot length	mm	457.2 to 482.6	469	Pass
S - Head breadth	mm	137.1 to 147.3	145	Pass
T - Head depth	mm	177.8 to 188.0	185	Pass
U - Hip breadth	mm	299.7 to 314.9	309	Pass
V - Shoulder breadth	mm	350.5 to 365.7	362	Pass
W - Foot breadth	mm	78.8 to 94.0	90	Pass
X - Head circumference	mm	528.3 to 548.7	540	Pass
Y - Chest circumference with jacket	mm	850.8 to 881.3	853	Pass
Z - Waist circumference	mm	759.5 to 789.9	778	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	303	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	165	Pass
		Overall Test Results		Pass

Test Program:	Dummy Damage Checklist	Test Date:	9/4/10
ATD Serial No.:	035	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	Test Date:	9/3/10
ATD Serial No.:	141	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: