

REPORT NUMBER: NCAP-KAR-12-064

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

**BAYERISCHE MOTOREN WERKE AG
2012 BMW 328i 4-DOOR SEDAN**

NHTSA NUMBER: MC0518

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




MAY 22, 2012


FINAL REPORT

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

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Date: 


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16. Abstract <p>A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2012 BMW 328i 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 footwell intrusion performance. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on May 8, 2012.</p> <p>The impact velocity of the vehicle was 56.74 km/h and the ambient temperature at the barrier face at the time of impact was 27.8 deg. C. The target vehicle's post-test maximum crush was 382 mm at DPD 5 to the right of the vehicle's centerline. The test vehicle's performance is as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700.0</td> <td>231.5</td> <td>700.0</td> <td>150.0</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-27</td> <td>52</td> <td>-16</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.36</td> <td>1</td> <td>0.32</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1532.8</td> <td>2620</td> <td>513.0</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>-502.4</td> <td>2520</td> <td>-197.9</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>-1428.4</td> <td>6805</td> <td>-775.2</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>-1932.6</td> <td>6805</td> <td>-1325.4</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700.0	231.5	700.0	150.0	Maximum Chest Compression	mm	63	-27	52	-16	Nij	N/A	1	0.36	1	0.32	Neck Tension	N	4170	1532.8	2620	513.0	Neck Compression	N	4000	-502.4	2520	-197.9	Left Femur Force	N	10008	-1428.4	6805	-775.2	Right Femur Force	N	10008	-1932.6	6805	-1325.4
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

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

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure, dated August, 2011.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2012 BMW 328i 4-door sedan at a velocity of 56.74 km/h. The test was performed at KARCO Engineering, LLC. on May 8, 2012. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

Three (3) real-time cameras 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 installed on the driver's and the passenger's shoulder and lap 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 136 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 382 mm located at DPD 5 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. 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 the 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)	231.5	64.4	79.4	-27	0.36	1532.8	-502.4	-1428.4	-1932.6
Passenger (5th)	150.0	54.1	69.1	-16	0.32	513.0	-197.9	-775.2	-1325.4

SECTION 2
DATA SHEETS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

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	29.574
Pressure	Tire Pressures	lbf/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
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: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MC0518
Model Year	2012
Make	BMW
Model	328i
Body Style	4-Door Sedan
VIN	WBA3A5C57CF340100
Body Color	Mineral Grey Metallic
Odometer Reading (km / mi)	124 / 77
Engine Displacement (L)	2.0
Type / No. of Cylinders	Inline 4
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	Rear
Roof Rack	No
Sunroof / T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
All Wheel Drive (AWD)	No
Traction Control System	Yes

Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	None
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	Yes
Driver Torso/Pelvis Airbag	No
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	Yes
Driver Seat Belt Pretensioner	Yes
Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Pass. Load Limiter	Yes
Other Safety Restraint	None

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Bayerische Motoren Werke AG
Date of Manufacture	Feb-12

GVWR (kg)	2020
GAWR Front (kg)	935
GAWR Rear (kg)	1140

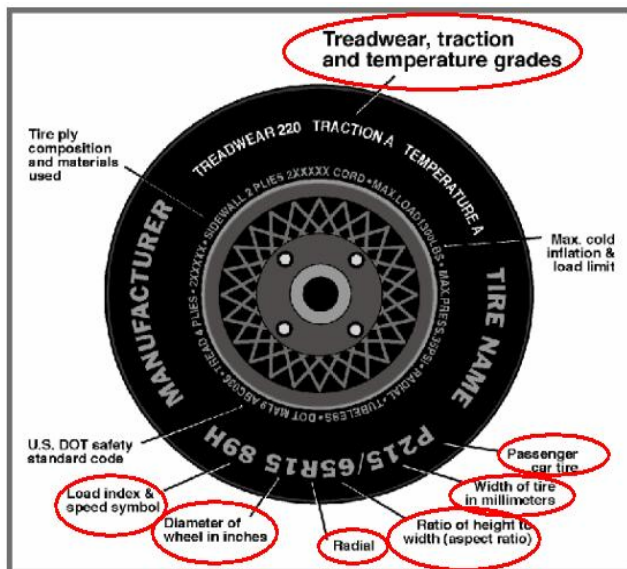
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				410.0	A
DSC x 68.04 (kg)				340.2	B
Cargo Weight (RCLW) (kg)				69.8	A-B

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	220
Recommended Tire Size	P225/50R17	P225/50R17
Tire Size on Vehicle	P225/50R17	P225/50R17
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Cinturato P7	Cinturato P7
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Rayon	1 Rayon
Tire Plies Body	1 Rayon, 2 Steel, 1 Polyamide	1 Rayon, 2 Steel, 1 Polyamide
Load Index / Speed Symbol	94V	94V
Tire Material	Rayon, Steel, Polyamide	Rayon, Steel, Polyamide
DOT Safety Code Left	93NU M411 0312	93NU M411 0312
DOT Safety Code Right	93NU M411 0312	93NU M411 0312

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	379.5	385.5		404.0	471.5	
Right	kg	388.5	391.0		404.0	467.5	
Ratio	%	49.7%	50.3%	100.0%	46.3%	53.7%	100.0%
Total	kg	768.0	776.5	1544.5	808.0	939.0	1747.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1544.5	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	69.8	C
Calculated Vehicle Target Weight (TVTW)	kg	1755.3	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	710	706	700	698	1414
As Tested	mm	696	698	675	674	1512
Post-Test	mm	731	761	674	684	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2813
Total Vehicle Length at Left Side	mm	4048
Total Vehicle Length at Centerline	mm	4625
Total Vehicle Length at Right Side	mm	4038
Weight of Ballast in Cargo Area	kg	69.0
Weight of Vehicle Components Removed	kg	10.5
Amount of Stoddard Solvent in Fuel Tank	L	55.62

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Rear door panels (5.0 kg), Trunk trim (4.5 kg), Rear speakers (1.0 kg)

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

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length	4625	4275	-350
2	Total Width	1780	1810	30
3	Bumper Top Height	535	428	-107
4	Bumper Bottom Height	240	145	-95
5	Longitudinal Member Top Height	530	580	50
6	Distance Between Longitudinal Members	825	1060	235
7	Longitudinal Member Width	75	90	15
8	Engine Top Height	840	863	23
9	Engine Bottom Height	208	185	-23
10	Engine and Gearbox Width	600	600	0
11	Front Bumper to Engine Distance	640	375	-265
12	Front Shock Absorber Fixing Height	838	871	33
13	Bonnet Leading Edge Height	730	776	46
14	Front Shock Absorber Fixing Width	1130	1095	-35
15	Front Bumper to Front Axle Distance	770	555	-215
16	Front Axle to A-Pillar Distance	638	565	-73
17	A-Pillar to B-Pillar Distance	969	970	1
18	B-Pillar to Rear Axle Distance	1115	1113	-2
19	B-Pillar to C-Pillar Distance	839	843	4
20	Roof Sill Bottom Height	1288	1317	29
21	Roof Sill Top Height	1395	1418	23
22	Floor Sill Bottom Height	168	191	23
23	Floor Sill Top Height	340	360	20

All measurements in millimeters.

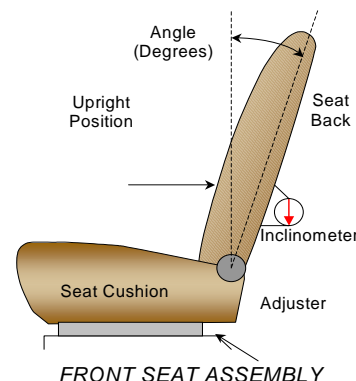
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

NOMINAL DESIGN RIDING POSITION

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

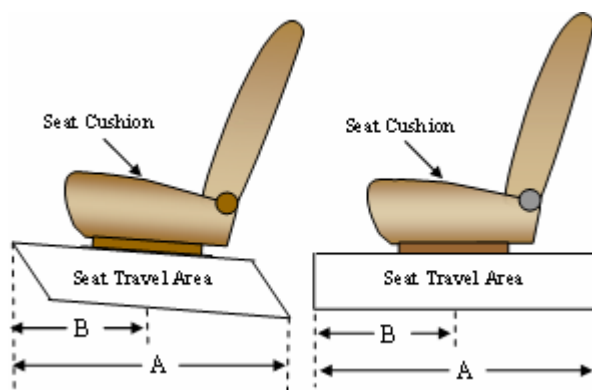


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	24.3
Passenger Seat Back Angle	19.1

SEAT FORE / AFT POSITIONING

The total seat travel is measured from the forward most possible position to the rear most possible position. The driver's seat is set to the middle of the fore-aft travel. The passenger's seat is set to the forward most position where the ATD will not contact any interior panels.



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	308 mm	155 mm (14th detent)
Passenger Seat	248 mm	0 mm (1st detent)

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 "H" is the uppermost position, followed by position "M1". Position "L" is the lowermost position.

SEAT BELT UPPER ANCHORAGES

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

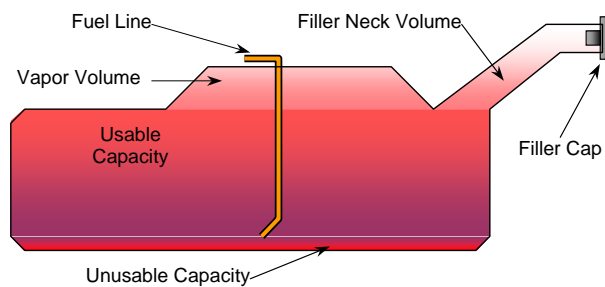
Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	59.80
Usable Capacity of "Optional Tank"	
92 - 94% of Usable Capacity	55.02 to 56.21
Actual Amount of Stoddard Solvent Used	55.62
1/3 of Usable Capacity	19.93

FUEL PUMP

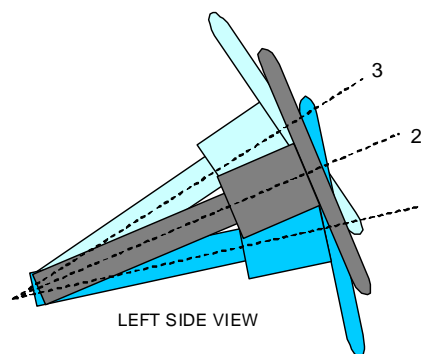
The vehicle is equipped with an electric fuel pump. The fuel pump starts when the ignition is turned on and will operate for 5 seconds. After pressure has been built up, the fuel pump switches to sleep mode until the engine is started or the pressure decreases.



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 to measure telescoping steering wheel travel.



STEERING COLUMN ASSEMBLY

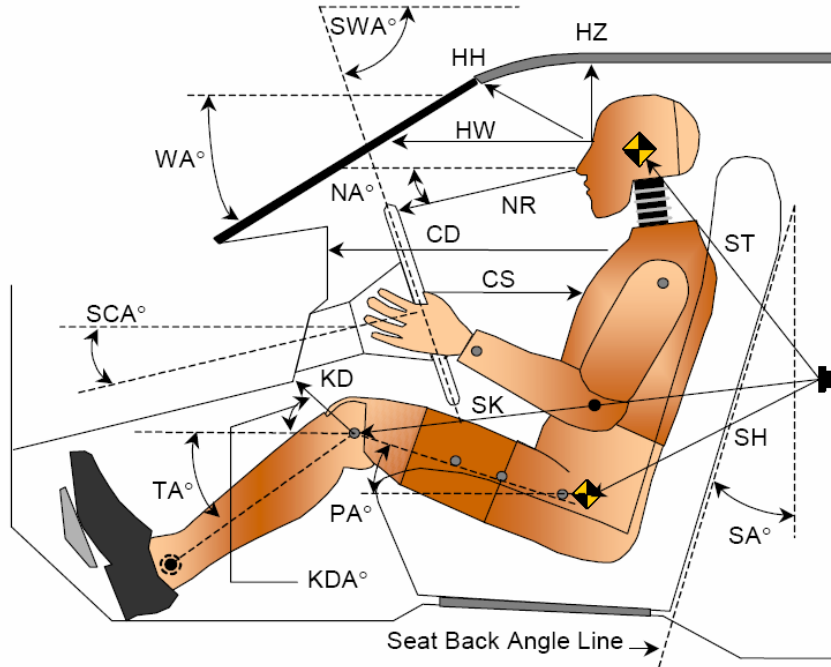
STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	17.8	70
Geometric Center Position, No. 2	19.5	100
Uppermost Position, No. 3	21.3	130
Telescoping Steering Wheel Travel		60
Test Position	19.5	100

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



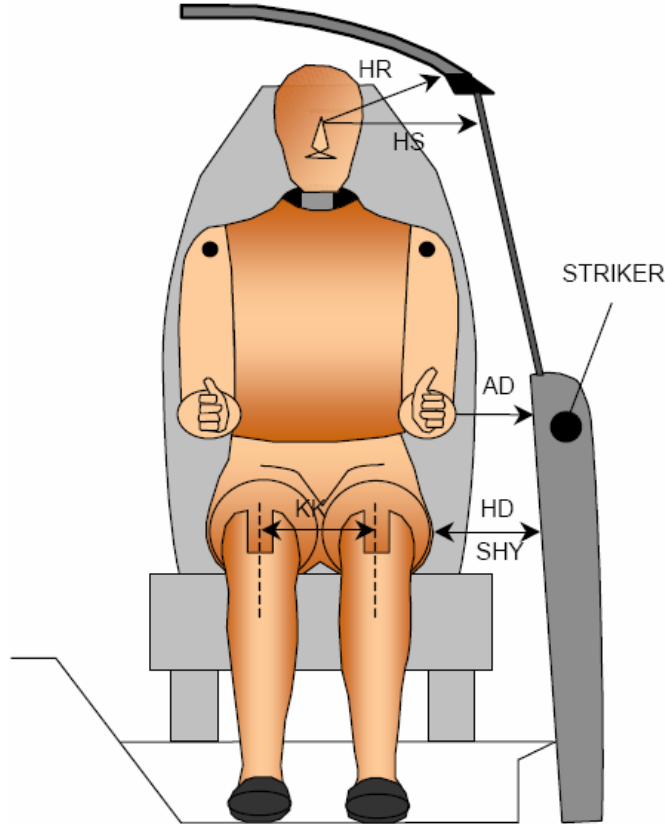
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		28.1		
SWA°	Steering Wheel Angle		70.5		
SCA°	Steering Column Angle		19.5		
SA°	Seat Back Angle (On Headrest Post)		24.3		19.1
HZ	Head to Roof	197	90.0	200	90.0
HH	Head to Header	365	26.1	282	50.0
HW	Head to Windshield	599	0.0	544	0.0
NR	Nose to Rim	380	4.5	415	27.1
CD	Chest to Dash	528	16.7	394	2.2
CS	Chest to Steering Hub	305	0.0		
RA	Rim to Abdomen	214	0.0		
KDL	Left Knee to Dash	217	38.9	113	50.0
KDR	Right Knee to Dash	175	31.5	133	36.1
PA°	Pelvic Angle		25.0		20.4
TA°	Tibia Angle		33.1		40.6
SK	Striker to Knee	554	17.0	652	14.0
ST	Striker to Head	381	80.6	364	62.9
SH	Striker to H-Point	317	59.3	389	37.7

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	116	138
HD	H-Point to Door	143	175
HR	Head to Side Header	210	236
HS	Head to Side Window	323	342
KK	Knee to Knee	327	224
SHY	Striker to H-Point (Y-Direction)	231	255
AA	Ankle to Ankle	294	186

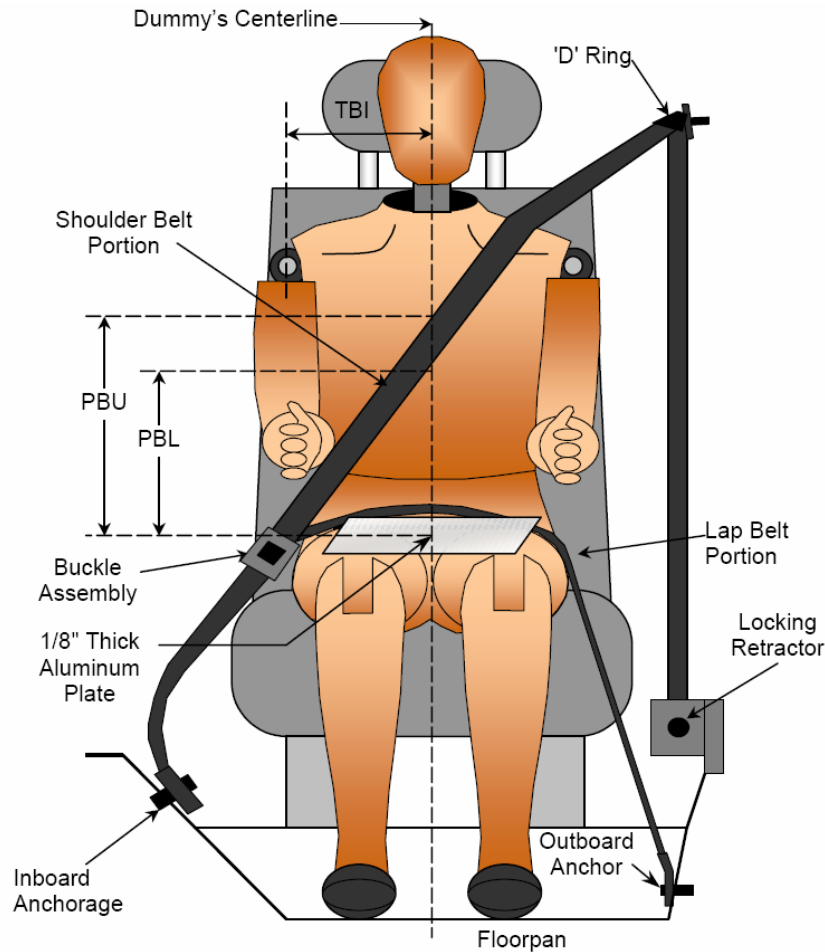
DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan

NHTSA No.: MC0518

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 05/08/12



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Code	Measurement Description	Units	Driver	Passenger
PBU	Top Surface of Aluminum Plate to Belt Upper Edge	mm	364	336
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	278	247

BELT LENGTH DATA

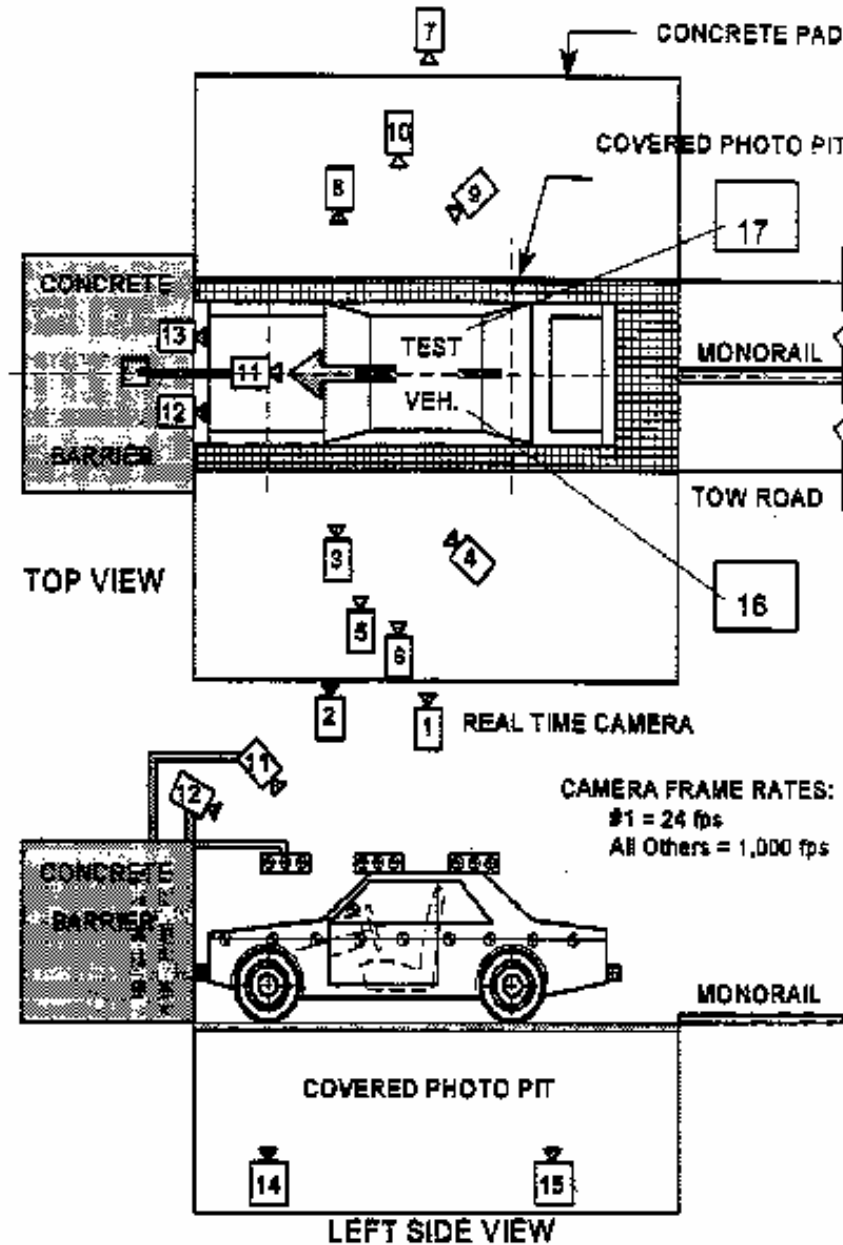
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	864	926
Lap Belt Length as Measured on ATD	mm	566	521
Remainder of Belt on Reel	mm	951	932
Total Belt Length for Continuous Webbing Systems	mm	2381	2379

DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 ... (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

CAMERA LOCATIONS

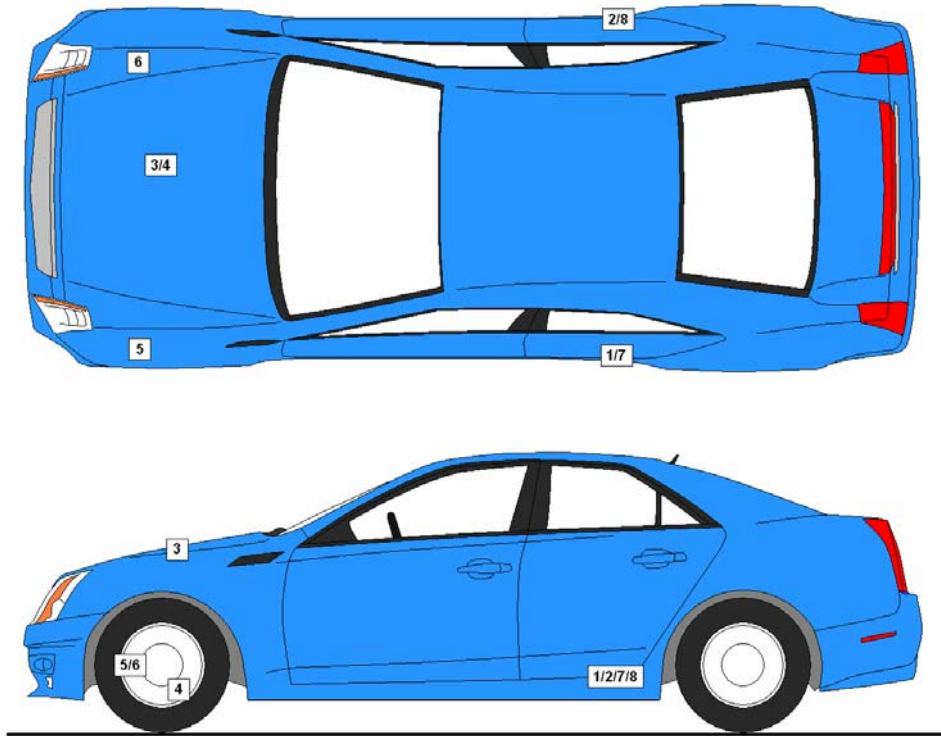
No.	Description	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-11412	-8150	-1484		30
2	Driver Close-Up	-2590	-7950	-1371	24	1000
3	Left Front Half	-1701	-6197	-1701	50	1000
4	Left Angle	-6696	-10308	-3211	ZOOM	1000
5	Steering Column - Top	-1966	-10412	-3688	50	1000
6	Steering Column - Bottom	-1972	-10412	-3379	50	1000
7	Right Overall	-2336	7569	-1012	24	1000
8	Passenger Close-Up	-1733	7581	-1408	50	1000
9	Right Front Half	-1600	8214	-1811	ZOOM	1000
10	Right Angle	-6217	9516	-4830	ZOOM	1000
11	Windshield	-354	0	-5749	12	1000
12	Driver Windshield	297	-366	-2460	12	1000
13	Passenger Windshield	297	366	-2460	24	1000
14	Pit Front	-756	0	1495	12	1000
15	Pit Rear	-3398	0	1495	8	1000
16	Onboard Driver Airbag (Optional)	-3125	250	-1300	12	1000
17	Onboard Passenger Airbag (Optional)	-3125	-250	-1300	12	1000
18	Real-Time Left View of Impact					
19	Real-Time Right View of Impact					

Coordinates: +X = forward impact plane
 +Y = right of monorail center
 +Z = into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	1870	-739	-343
2	Right Rear Accelerometer X-Direction	1870	739	-343
3	Engine Top X	3705	-70	-822
4	Engine Bottom X	3600	-86	-191
5	Left Brake Caliper X	3720	-842	-326
6	Right Brake Caliper X	3720	842	-326
7	Left Rear Accelerometer Z-Direction	1870	-739	-343
8	Right Rear Accelerometer Z-Direction	1870	739	-343

Reference Points: X – Rear Surface of Vehicle (+ forward)
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

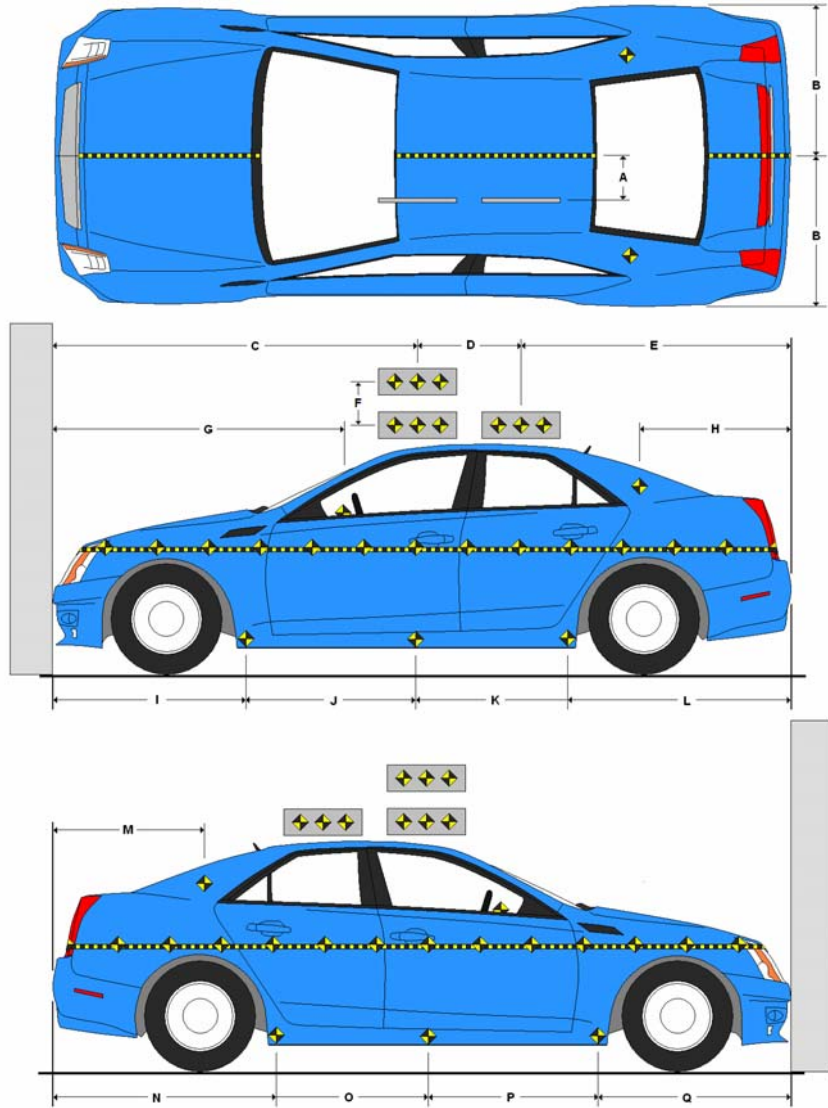
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

Item	Value
A	
B	890
C	2255
D	610
E	1764
F	305
G	1835
H	880
I	1213
J	968
K	968
L	1470
M	880
N	1465
O	971
P	971
Q	1220



All measurements in millimeters.

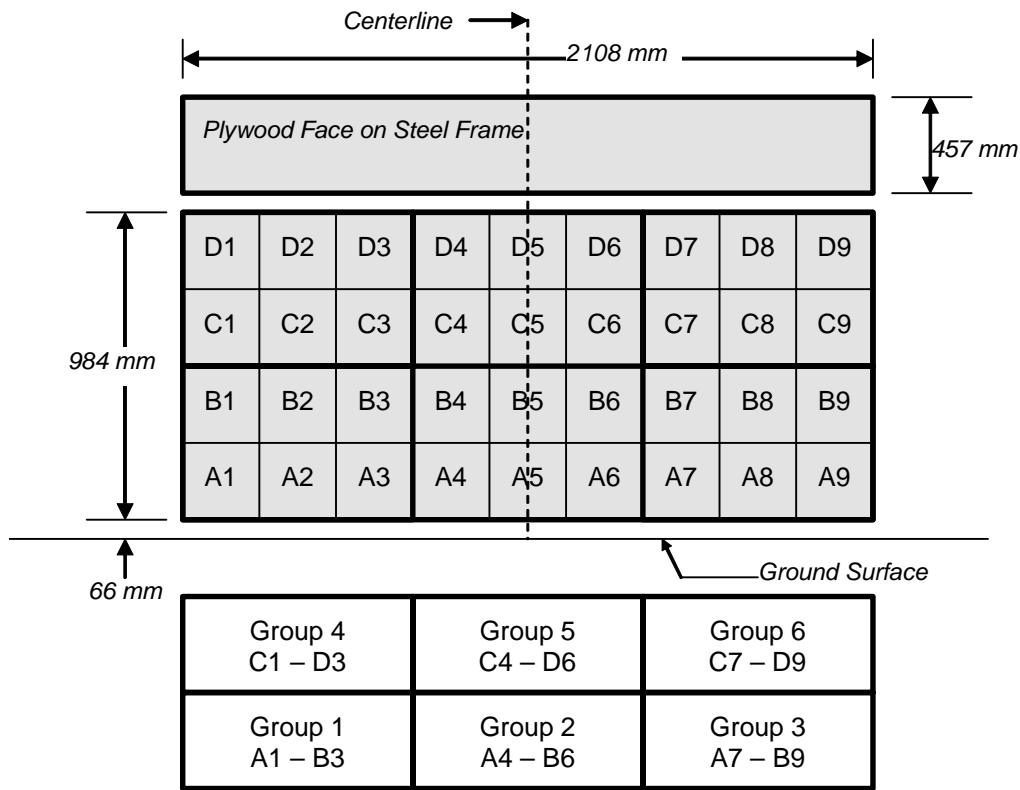
DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

**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: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

INSTRUMENTATION

Driver Dummy Accelerometers	44
Passenger Dummy Accelerometers	44
Vehicle Structure Accelerometers	8
Seat Belt Load Cells	4
Load Cell Barrier	36
Total	136

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

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	None	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)	4	0
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

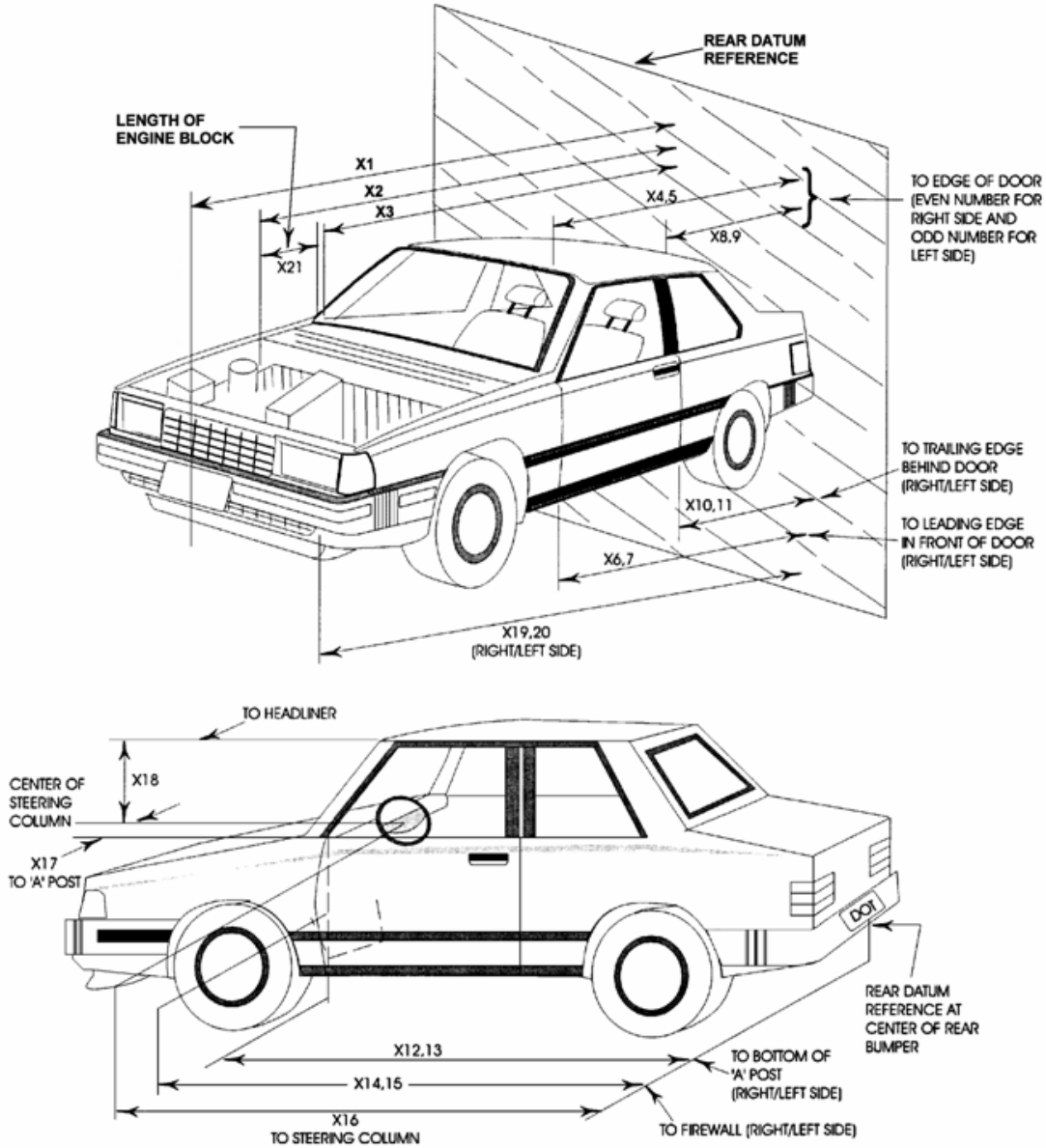
Measured Parameter	Units	Value
Left Side	mm	1030
Center	mm	975
Right Side	mm	1099
Average	mm	1035

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 (Curtain)	Yes	No	Yes	No
Side Airbag 2 (Torso)	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	No		No	

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



DATA SHEET NO. 12 ... (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4625	4275	-350
2	Rear Surface of Vehicle to Front of Engine	3985	3900	-85
3	RSOV to Firewall	3400	3475	75
4	RSOV to Upper Leading Edge of Right Door	3223	3217	-6
5	RSOV to Upper Leading Edge of Left Door	3234	3213	-21
6	RSOV to Lower Leading Edge of Right Door	3202	3200	-2
7	RSOV to Lower Leading Edge of Left Door	3208	3204	-4
8	RSOV to Upper Trailing Edge of Right Door	2107	2103	-4
9	RSOV to Upper Trailing Edge of Left Door	2113	2096	-17
10	RSOV to Lower Trailing Edge of Right Door	2152	2154	2
11	RSOV to Lower Trailing Edge of Left Door	2168	2157	-11
12	RSOV to Bottom of A-Pillar, Right Side	3123	3118	-5
13	RSOV to Bottom of A-Pillar, Left Side	3148	3116	-32
14	RSOV to Firewall, Right Side	3395	3435	40
15	RSOV to Firewall, Left Side	3395	3395	0
16	RSOV to Steering Column	2655	2730	75
17	Center of Steering Column to A-Pillar	425	435	10
18	Center of Steering Column to Headliner	395	385	-10
19	RSOV to Right Side of Front Bumper	4038	3914	-124
20	RSOV to Left Side of Front Bumper	4048	3953	-95
21	Length of Engine Block	580	580	0
RD	RSOV to Right Side of Dash Panel	2900	2875	-25
CD	RSOV to Center of Dash Panel	2805	2800	-5
LD	RSOV to Left Side of Dash Panel	2890	2890	0

All measurements in millimeters.

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

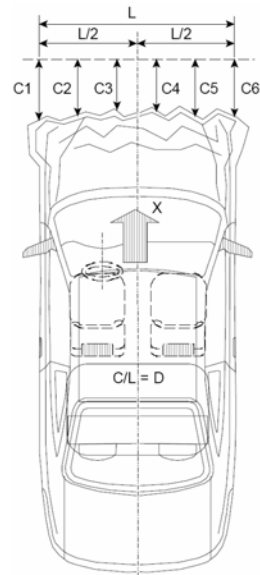
VEHICLE INFORMATION

VIN: WBA3A5C57CF340100 Wheelbase (mm): 2813
 Vehicle Size Category: 4-Door Sedan Test Weight (kg): 1747.0

ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember
 Cal. Procedure/Interval: Drop Test / 6 months
 Integration Algorithm: NHTSA Standard
 Impact Velocity (km/h): 56.74
 Velocity Change (km/h): 65.4
 Time of Separation (msec): 60.9

Linearity: Good



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
 Midpoint of Damage: Vehicle Centerline
 Damage Region Length (mm): 1636
 Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	284	423	139
C2	Crush Zone 2 at Left Side	mm	123	367	244
C3	Crush Zone 3 at Left Side	mm	20	343	323
C4	Crush Zone 4 at Right Side	mm	20	395	375
C5	Crush Zone 5 at Right Side	mm	123	505	382
C6	Crush Zone 6 at Right Side	mm	284	493	209
L	C1 to C6	mm	1636		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

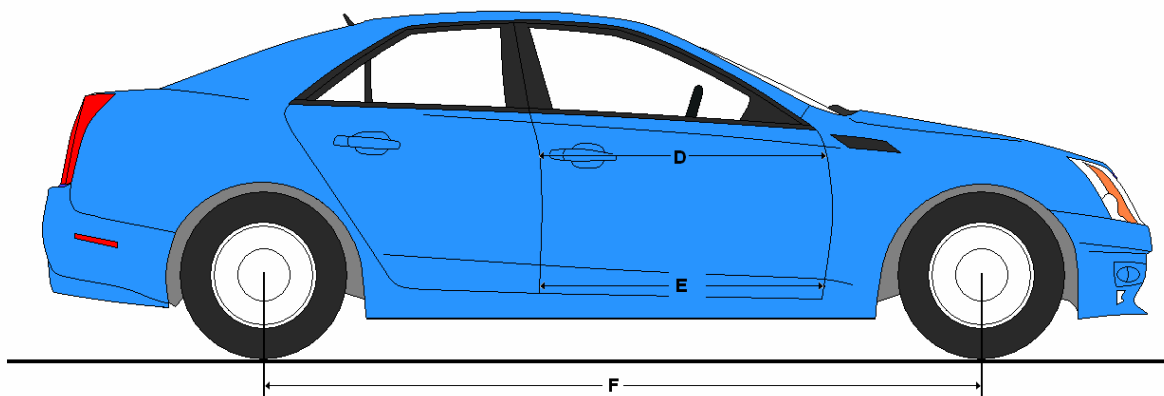
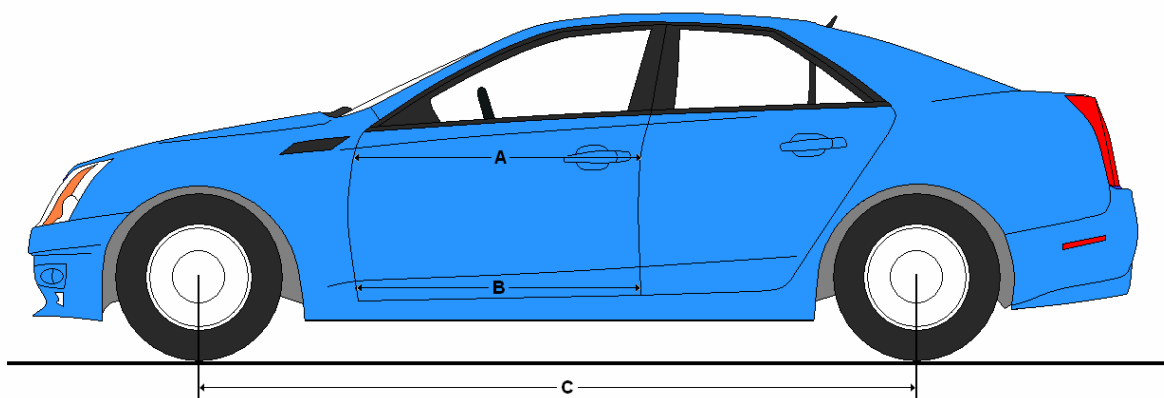
Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	969	970	-1
B	Left Side Lower	mm	866	867	-1
D	Right Side Upper	mm	963	964	-1
E	Right Side Lower	mm	886	888	-2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2813	2733	80
F	Right Side Wheelbase	mm	2813	2732	81



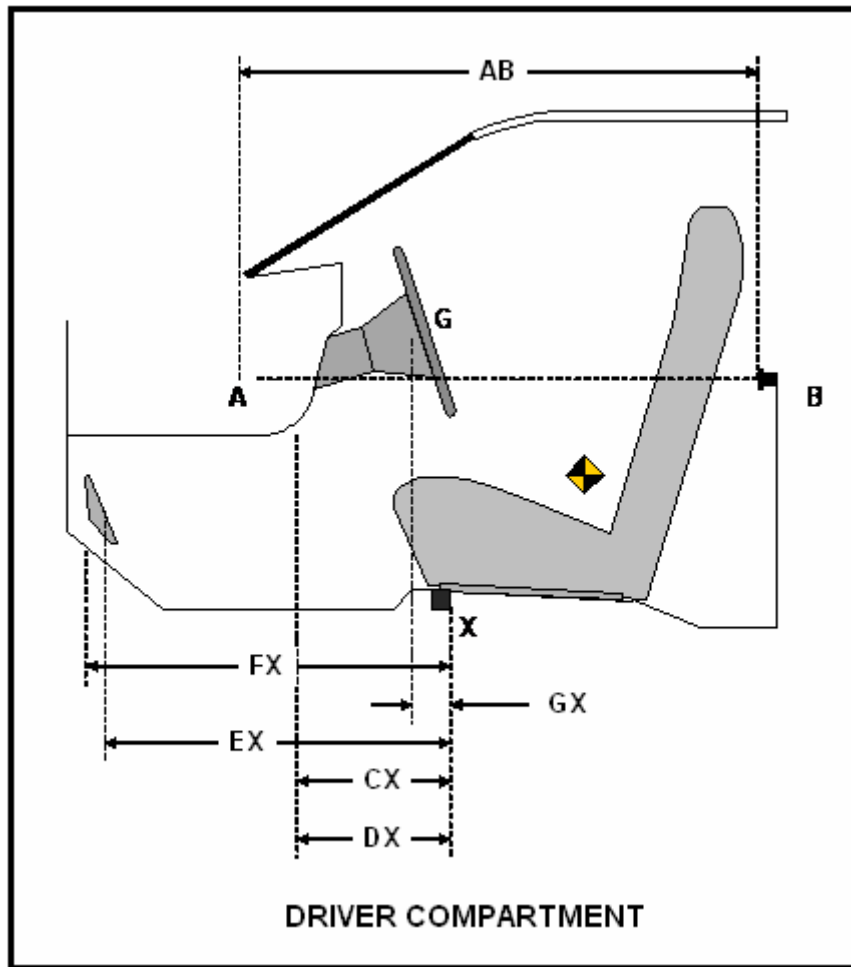
DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

DRIVER COMPARTMENT INTRUSION

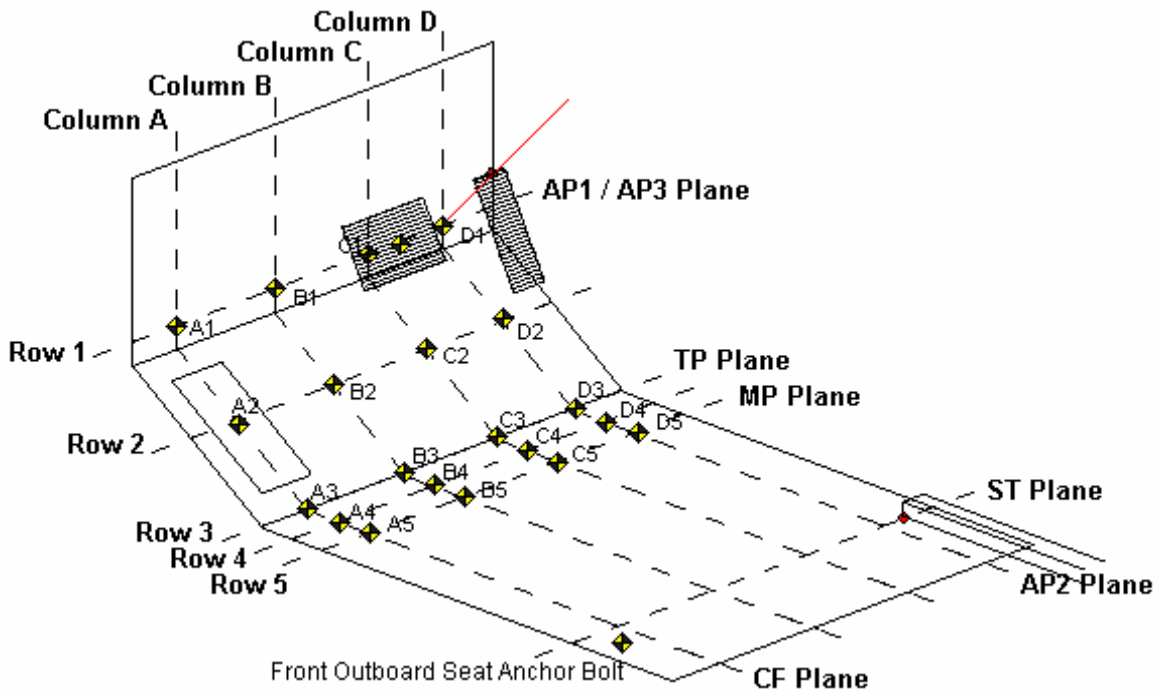
Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	796	798	-2
CX	Left Knee Bolster to X	mm	315	250	65
DX	Right Knee Bolster to X	mm	290	243	47
EX	Brake Pedal to X	mm	580	560	20
FX	Foot Rest to X	mm	605	670	-65
GX	Center of Steering Wheel Hub to X	mm	80	103	-23

X = Front of Seat Track (Stationary)



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

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



- 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: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

DRIVER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	767	768	768	768	761	759	756	758	6	9	12	10
2	670	671	669	673	667	667	667	670	3	4	2	3
3	549	549	547	547	549	547	546	545	0	2	1	2
4	451	454	455	454	451	450	451	452	0	4	4	2
5	352	354	357	359	349	353	354	357	3	1	3	2

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	22	-84	-197	-286	23	-82	-197	-284	-1	-2	0	-2
2	25	-84	-199	-286	24	-83	-199	-286	1	-1	0	0
3	27	-83	-197	-281	27	-81	-194	-278	0	-2	-3	-3
4	26	-83	-196	-280	27	-81	-196	-279	-1	-2	0	-1
5	26	-83	-195	-274	26	-81	-195	-272	0	-2	0	-2

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	51	54	56	57	55	59	61	63	-4	-5	-5	-6
2	-33	-31	-31	-30	-30	-30	-33	-28	-3	-1	2	-2
3	-60	-60	-62	-35	-56	-60	-63	-37	-4	0	1	2
4	-62	-62	-67	-65	-71	-61	-68	-65	9	-1	1	0
5	-63	-63	-56	-50	-66	-67	-57	-51	3	4	1	1

All measurements in millimeters

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

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
 Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

PASSENGER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	735	770	769	767	722	760	762	764	13	10	7	3
2	682	695	694	691	670	689	686	689	12	6	8	2
3	562	558	560	560	557	554	554	553	5	4	6	7
4	461	459	457	452	457	452	451	450	4	7	6	2
5	370	366	361	361	365	361	356	355	5	5	5	6

PASSENGER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	317	223	112	2	319	226	116	3	-2	-3	-4	-1
2	326	230	122	2	327	232	123	4	-1	-2	-1	-2
3	333	234	123	2	333	236	123	1	0	-2	0	1
4	335	235	122	6	335	236	123	6	0	-1	-1	0
5	342	236	118	4	342	236	118	4	0	0	0	0

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	80	58	60	56	70	46	48	43	10	12	12	13
2	15	-20	-22	-25	3	-32	-31	-37	12	12	9	12
3	-40	-59	-58	-66	-55	-75	-73	-66	15	16	15	0
4	-45	-65	-65	-67	-55	-78	-74	-86	10	13	9	19
5	-39	-56	-73	-67	-49	-67	-85	-81	10	11	12	14

All measurements in millimeters

DATA SHEET NO. 15

SUMMARY OF FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518

Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

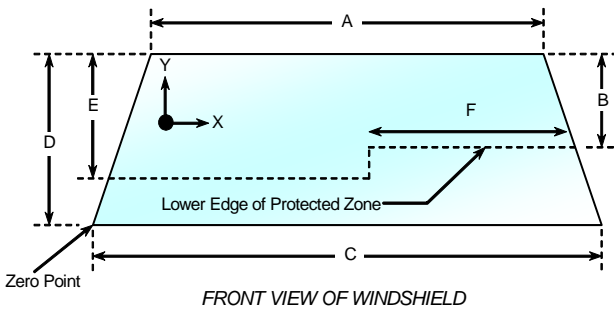
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber cement.

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: 20.8 ° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2105	2105	100.0%
Right Side	2105	2105	100.0%
Total	4210	4210	100.0%



Item	Units	Value
A	mm	1170
B	mm	271
C	mm	1420
D	mm	810
E	mm	423
F	mm	530

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. 15 ... (CONTINUED)

SUMMARY OF FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 27.8° C Test Time: 2:27 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: There was no Stoddard solvent spillage.

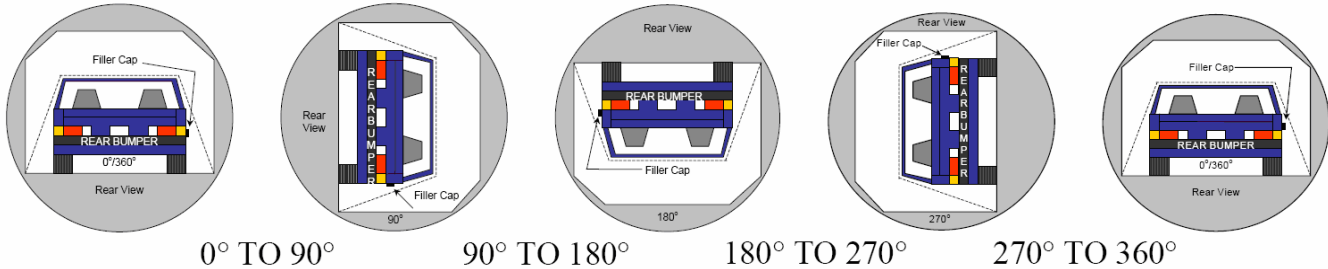
DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER

Test Vehicle: 2012 BMW 328i 4-Door Sedan

NHTSA No.: MC0518

Test Program: 56 km/h Frontal Impact NCAP Test

Test Date: 05/08/12



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: There was no Stoddard solvent spillage.

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	83	300	383
90° To 180°	82	300	382
180° To 270°	80	300	380
270° To 360°	81	300	381

FMVSS 301 SPILLAGE TABLE

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

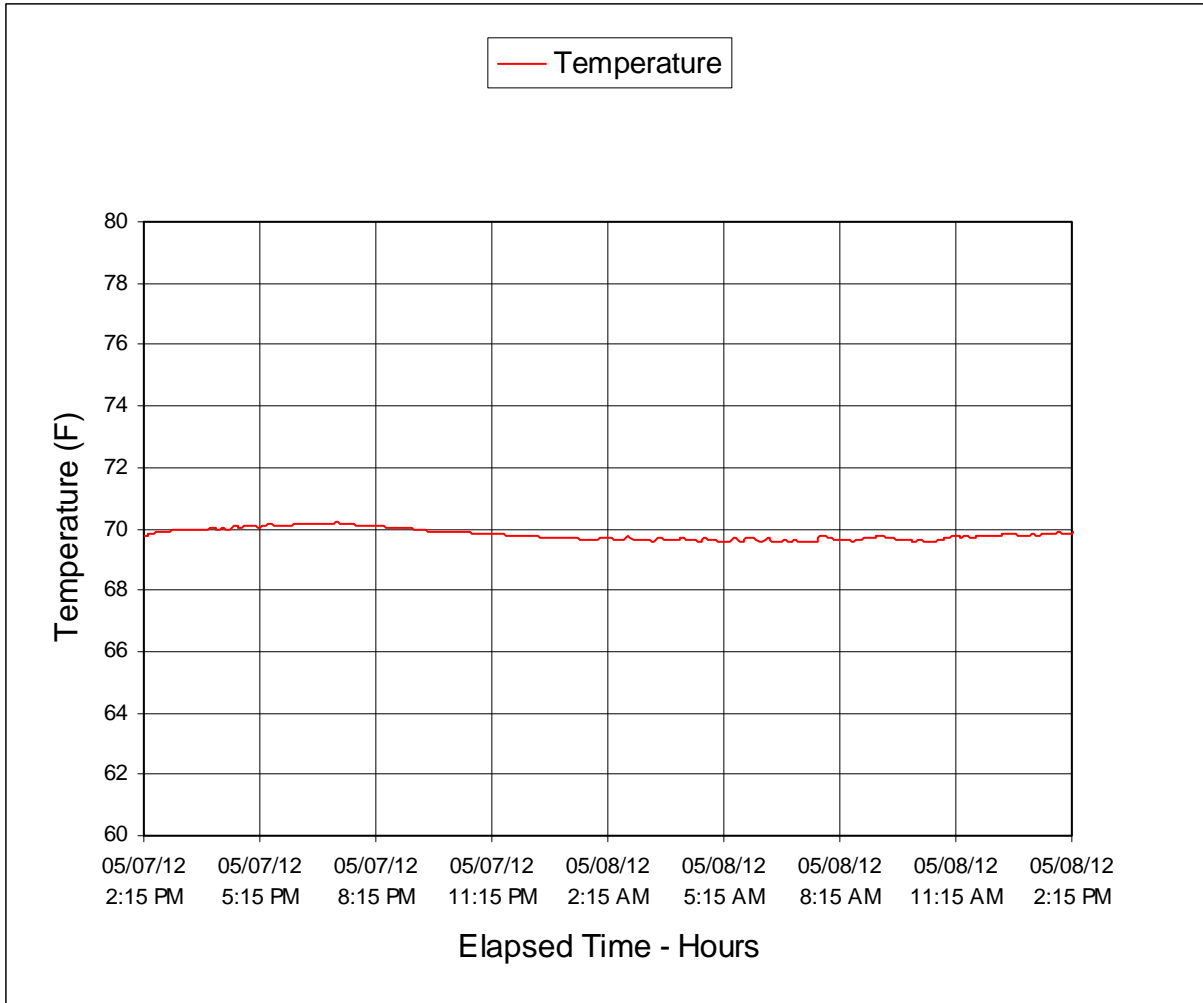
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 17

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No.: MC0518
Test Program: 56 km/h Frontal Impact NCAP Test Test Date: 05/08/12



**APPENDIX A
PHOTOGRAPHS**

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FIGURE 1. Load Cell Location

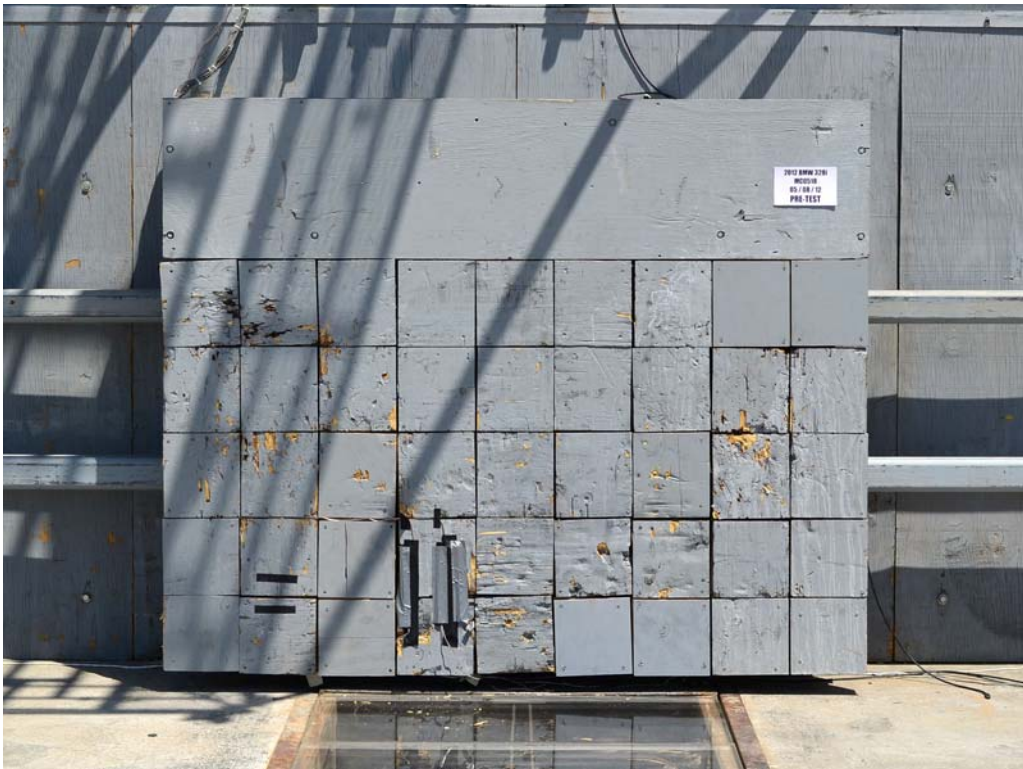


FIGURE 2. Load Cell Wall



FIGURE 3. Manufacturer's Label



FIGURE 4. Tire Placard



FIGURE 5. 2012 BMW 328i Frontal, As Delivered



FIGURE 6. Left Rear ¾ View, As Received



FIGURE 7. Pre-Test Front View of Test Vehicle



FIGURE 8. Post-Test Front View of Test Vehicle



FIGURE 9. Pre-Test Left View of Test Vehicle



FIGURE 10. Post-Test Left View of Test Vehicle



FIGURE 11. Pre-Test Right View of Test Vehicle



FIGURE 12. Post-Test Right View of Test Vehicle



FIGURE 13. Pre-Test Right Front 3/4 View



FIGURE 14. Post-Test Right Front 3/4 View



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



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

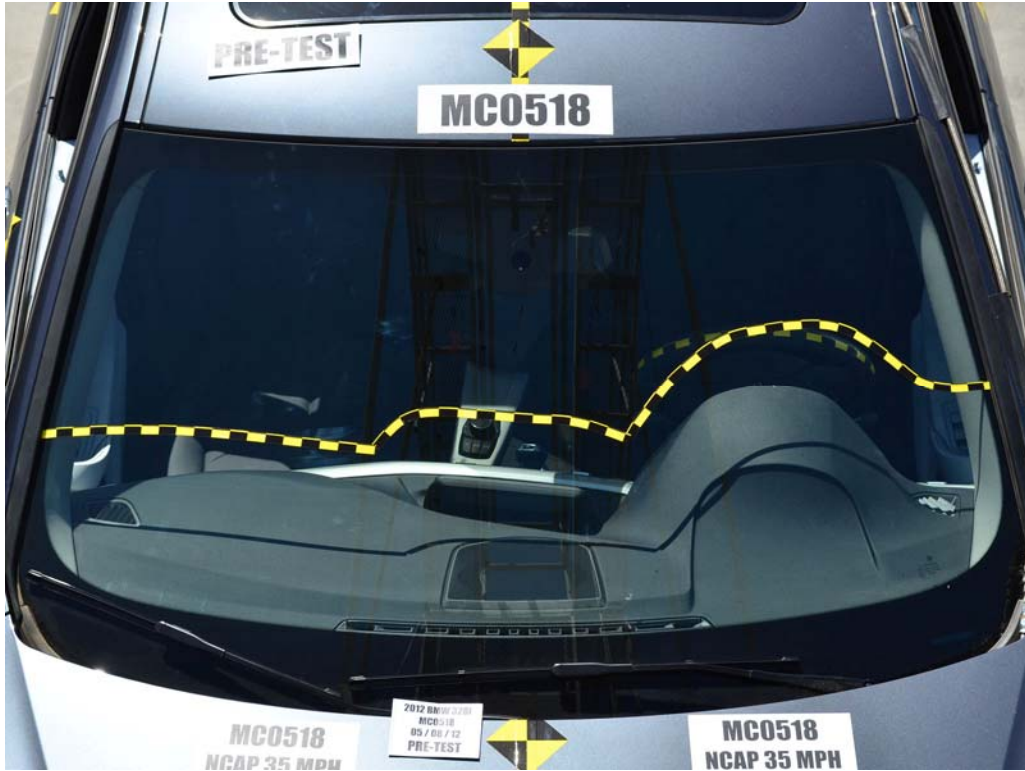


FIGURE 17. Pre-Test Windshield View



FIGURE 18. Post-Test Windshield View



FIGURE 19. Pre-Test Engine Compartment View

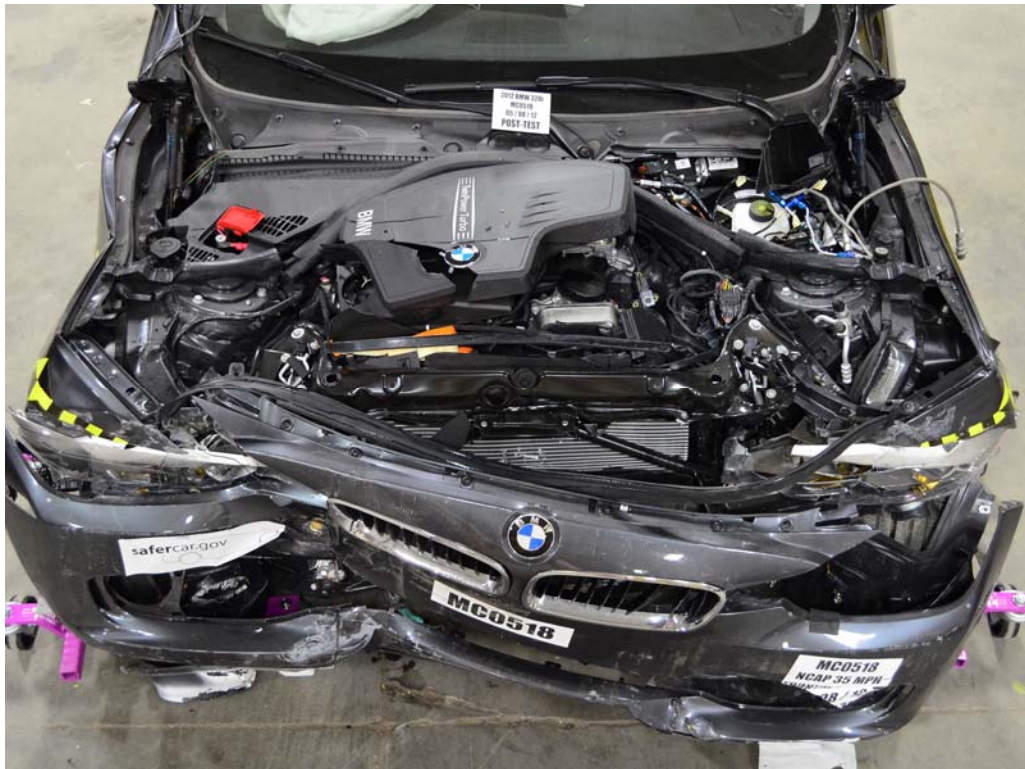


FIGURE 20. Post-Test Engine Compartment View



FIGURE 21. Pre-Test Fuel Filler Cap View



FIGURE 22. Post-Test Fuel Filler Cap View

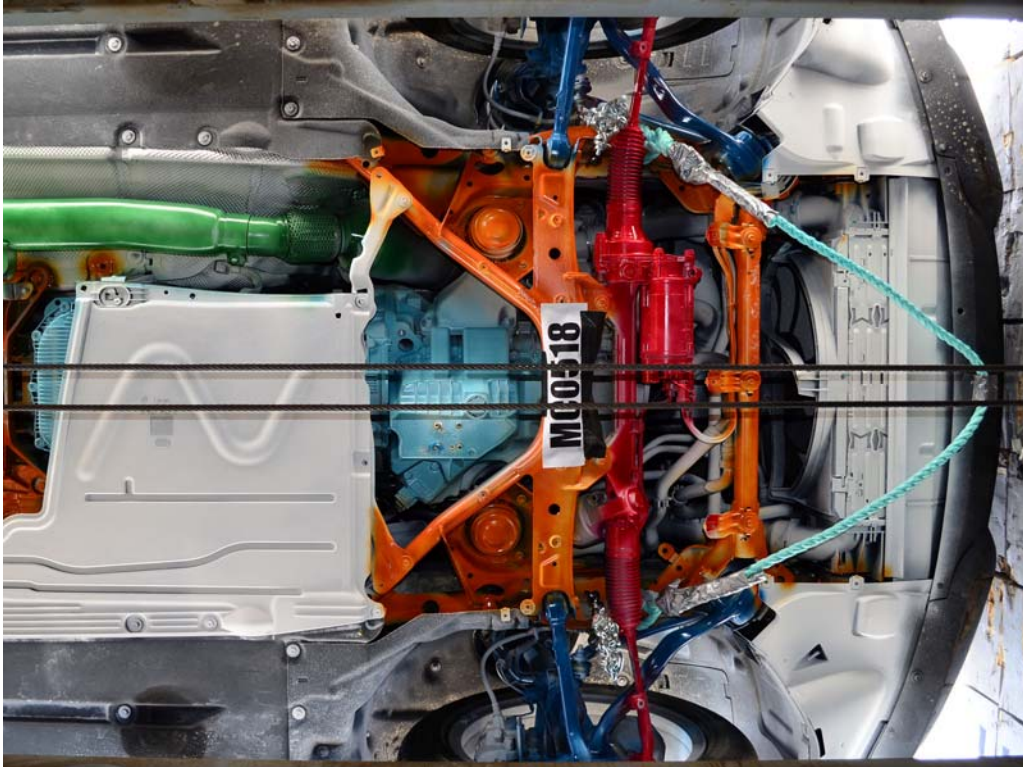


FIGURE 23. Pre-Test Front Underbody View

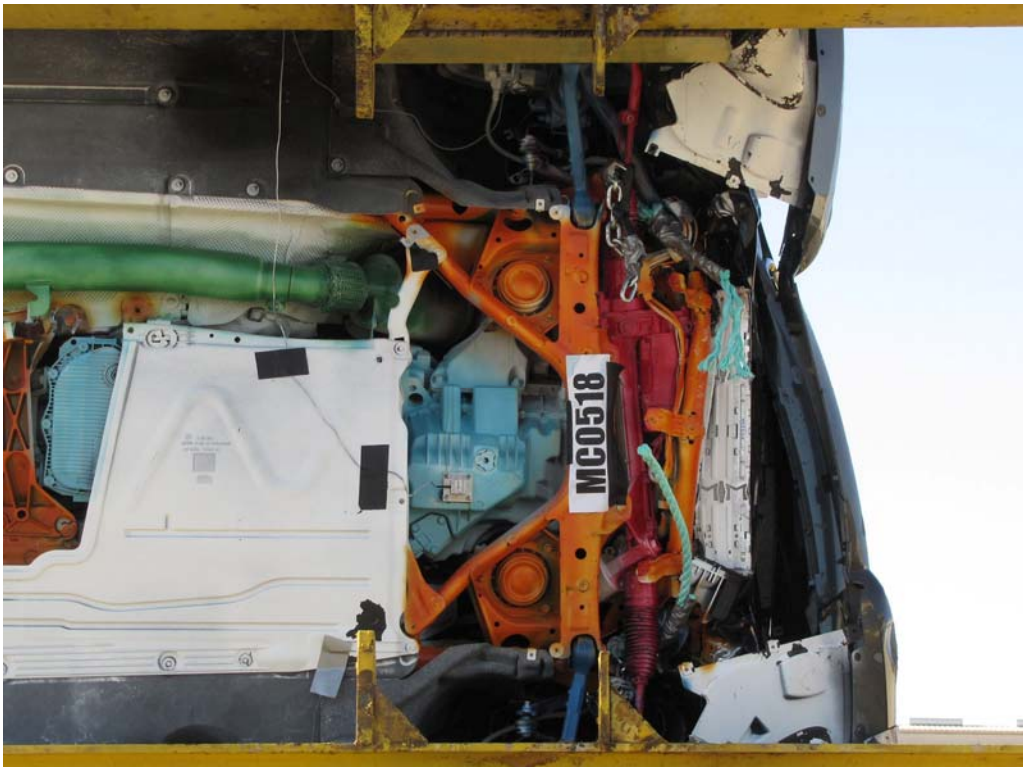


FIGURE 24. Post-Test Front Underbody View

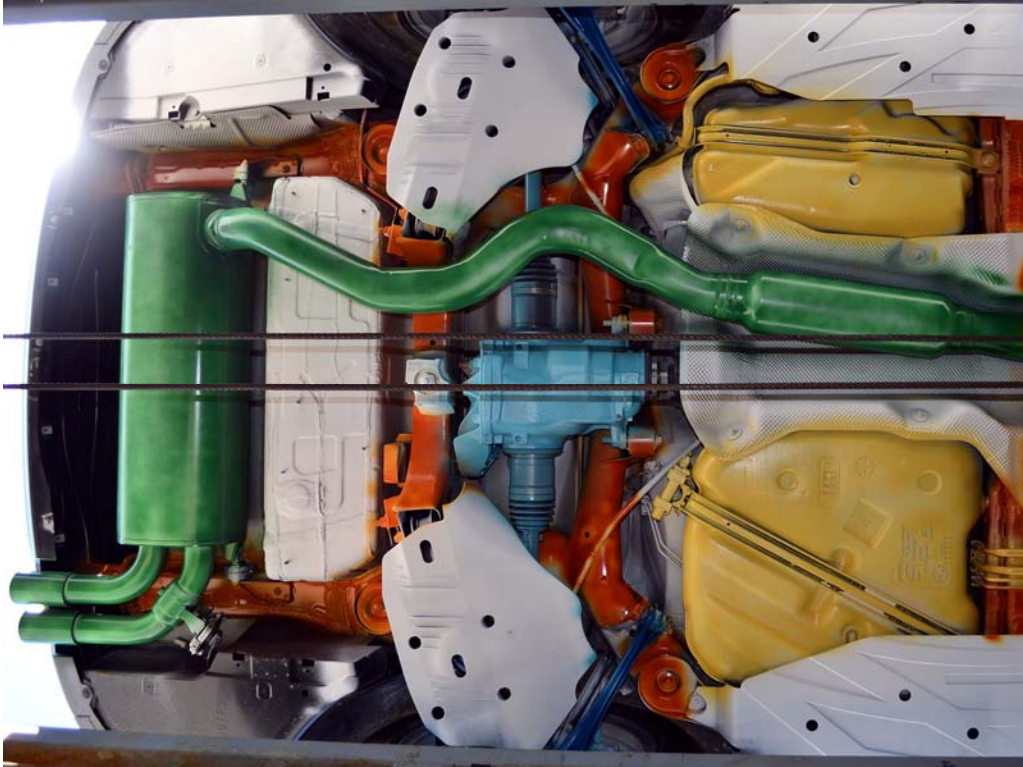


FIGURE 25. Pre-Test Rear Underbody View



FIGURE 26. Post-Test Rear Underbody View



FIGURE 27. Pre-Test Dummy Cable Routing



FIGURE 28. Post-Test Dummy Cable Routing

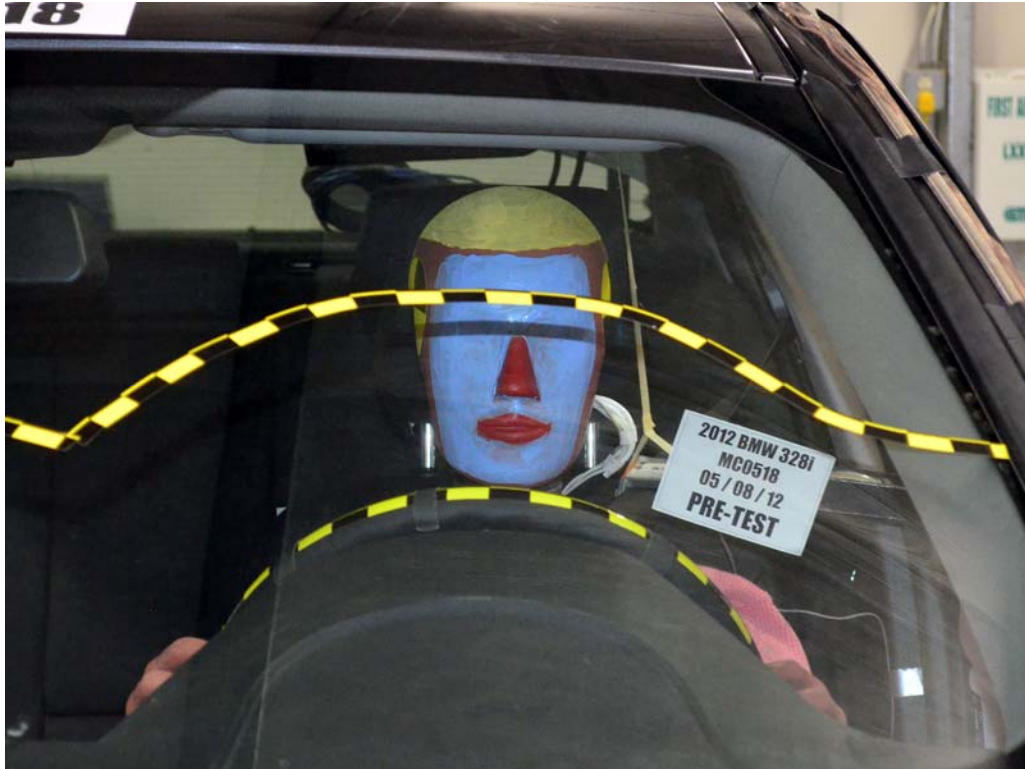


FIGURE 29. Pre-Test Driver Dummy Front View



FIGURE 30. Post-Test Driver Dummy Front View



FIGURE 31. Pre-Test Driver Dummy Window View



FIGURE 32. Post-Test Driver Dummy Window View

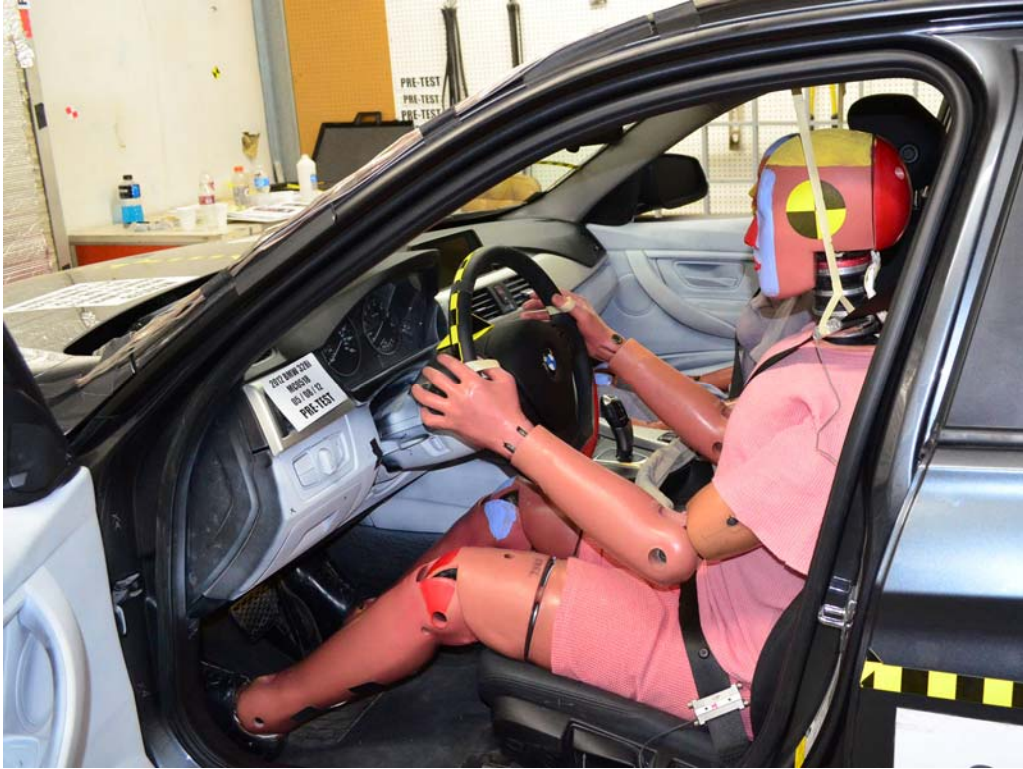


FIGURE 33. Pre-Test Driver Dummy and Vehicle Interior View



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



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



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



FIGURE 37. Pre-Test Driver Dummy Feet



FIGURE 38. Post-Test Driver Dummy Feet



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



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



FIGURE 41. Pre-Test Driver's Side Floorpan



FIGURE 42. Post-Test Driver's Side Floorpan



FIGURE 43. Post-Test Driver Dummy Face



FIGURE 44. Post-Test Driver Dummy Contact With Airbag



FIGURE 45. Post-Test Driver Dummy Contact With Headrest



FIGURE 45a. Post-Test Driver Dummy Contact With Knee Airbag



FIGURE 46. Pre-Test View Of Steering Wheel



FIGURE 47. Post-Test View Of Steering Wheel



FIGURE 48. Pre-Test Passenger Dummy Front View



FIGURE 49. Post-Test Passenger Dummy Front View



FIGURE 50. Pre-Test Passenger Dummy Window View



FIGURE 51. Post-Test Passenger Dummy Window View



FIGURE 52. Pre-Test Passenger Dummy and Vehicle Interior View



FIGURE 53. Post-Test Passenger Dummy and Vehicle Interior View

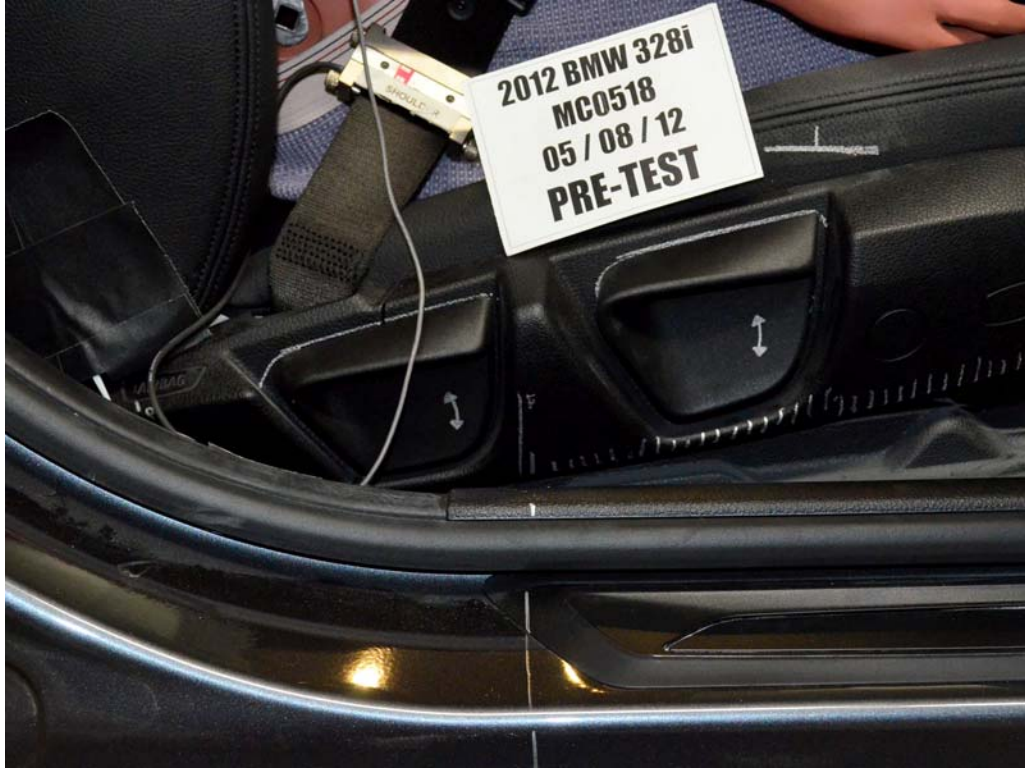


FIGURE 54. Pre-Test Passenger's Seat Fore-Aft Markings



FIGURE 55. Post-Test Passenger's Seat Fore-Aft Markings



FIGURE 56. Pre-Test Passenger Dummy Feet



FIGURE 57. Post-Test Passenger Dummy Feet



FIGURE 58. Pre-Test Passenger's Side Knee Bolster



FIGURE 59. Post-Test Passenger's Side Knee Bolster



FIGURE 60. Pre-Test Passenger's Side Floorpan



FIGURE 61. Post-Test Passenger's Side Floorpan



FIGURE 62. Post-Test Passenger Dummy Contact With Airbag



FIGURE 62a. Post-Test Passenger Dummy Contact With Headrest

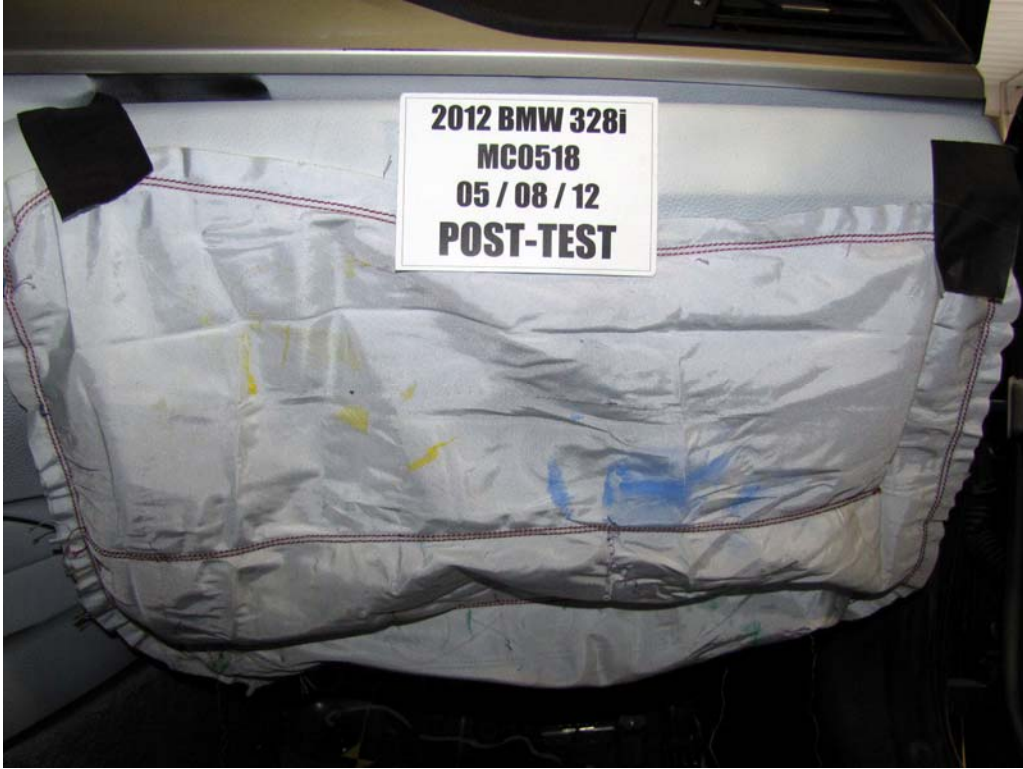


FIGURE 62b. Post-Test Passenger Dummy Contact With Airbag

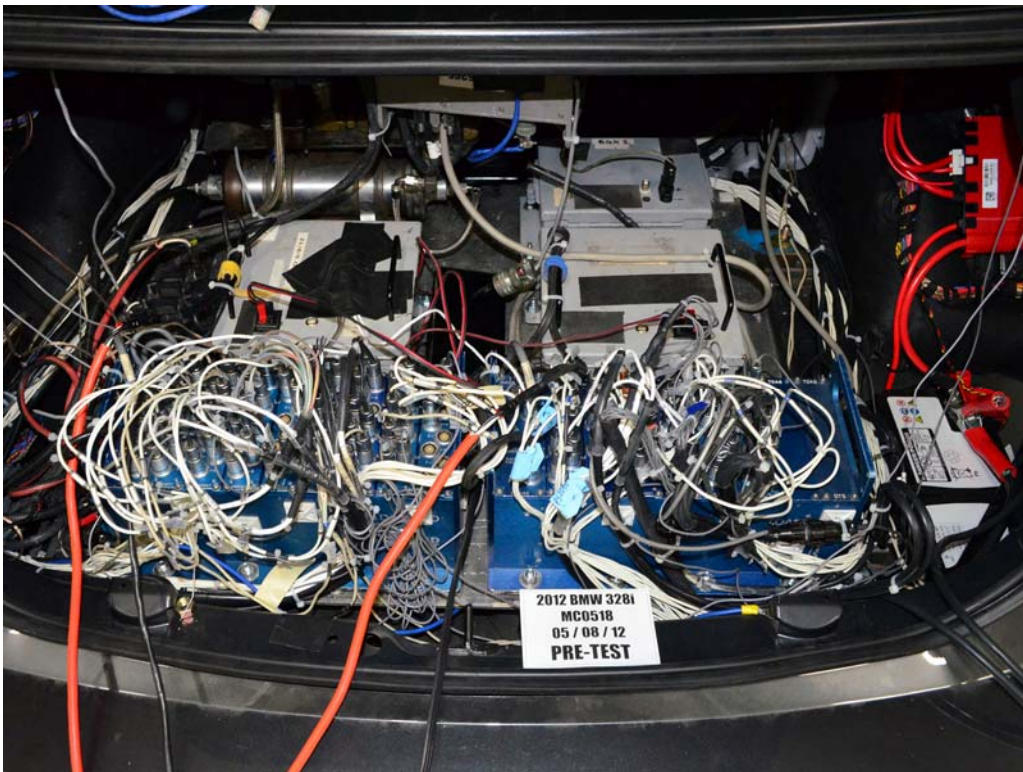


FIGURE 63. Pre-Test of Ballast Installed in Vehicle

Photograph Not Applicable No Stoddard Solvent Spillage

FIGURE 64. Post-Test Stoddard Solvent Spillage Location



FIGURE 65. Post-Test Speed Trap Read Out



FIGURE 66. Vehicle at 0°on Static Rollover Device



FIGURE 67. Vehicle at 90°on Static Rollover Device



FIGURE 68. Vehicle at 180°on Static Rollover Device

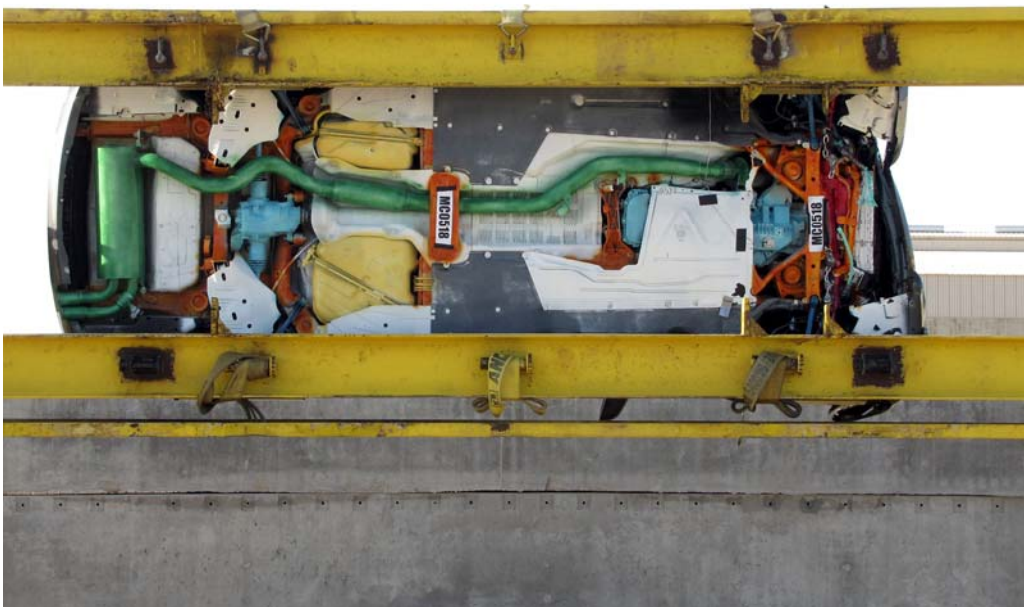


FIGURE 69. Vehicle at 270°on Static Rollover Device



FIGURE 70. Vehicle at 360° on Static Rollover Device



FIGURE 71. 2012 BMW 328i Frontal Impact Event

The Ultimate Driving Machine®
2012 BMW 328i Sedan

Manufacturer's Suggested Retail Price \$ 34,900.00
Options and Additional Charges: (Optional equipment may require standard equipment; check with your authorized BMW center).

Mineral Grey Metallic	\$ 550.00
Black Leatherette	Included
STEPTRONIC automatic trans.	Included
Heated Steering Wheel	\$ 190.00
17" light alloy wheels	Included
Moonroof	\$ 1,050.00
Heated front seats	\$ 500.00
BMW Assist with enhanced BT & USB	\$ 650.00
Destination Charge	\$ 895.00
Total Suggested Retail Price	\$ 38,735.00

Standard Features

- 2.2-liter, dual overhead cam (DOHC), 16-valve, inline 4-cylinder engine with aluminum engine block, TwinPower Turbo technology, High Precision Direct Injection, Valvetronic, and Double-VANOS precisely variable valve timing
- Driving Dynamics Control with ECO PRO, Comfort and Sport settings (and Sport+ with selected features)
- Dynamic Stability Control (DSC), including Brake Fade Compensation, Start-off Assistant, Brake Drying, and Brake Stand-by features with Dynamic Traction Control (DTC)
- High-performance, lightweight 4-wheel ventilated disc brakes with anti-lock braking system (ABS), Dynamic Brake Control (DBC) and Cornering Brake Control (CBC)
- Tire Pressure Monitor
- Halogen high- and low-beam headlights and halogen fog-form front foglights
- 3-spoke leather-strapped multi-function steering wheel
- Drive system with 8.5-inch full color flat-screen display, Controller and 9 programmable memory buttons
- Automatic climate control
- Rain-sensing windshield wipers and Automatic headlight control
- AM/FM/CD/MP3 player audio system with HD Radio
- iPod and USB adapter
- Adaptive BrakeLight
- BMW's Advanced Safety System
- Front and rear Head Protection System (HPS)
- Driver's and passenger's front airbag supplemental restraint system (SRS) with advanced technology
- 17" light alloy wheels with run-flat all-season tires

BMW Delivery Quality Assurance
 This BMW vehicle has been designed, engineered and manufactured under strict quality control guidelines. It has been prepared and inspected to ensure that it is free of defects in workmanship and materials in accordance with the New Vehicle Limited Warranty issued by BMW of North America, LLC.

BMW Ultimate Service

- 4 year/50,000 mile Full Maintenance Program
- 4 year/50,000 mile limited warranty
- 12 year rust perforation limited warranty
- 4 year/unlimited mile BMW Roadside Assistance Program

EPA Fuel Economy Estimates

CITY MPG	23	Expected range for most drivers 19 to 27 mpg
Estimated Annual Fuel Cost	\$2,281	based on 15,000 miles at \$3.95 per gallon
Combined Fuel Economy	26	This Vehicle
HIGHWAY MPG	33	Expected range for most drivers 27 to 39 mpg

Environmental Performance
 Protect the environment, choose vehicles with higher scores:

Global Warming Score	7
Smog Score	5

Parts Content Information
 For Vehicles in this Car Line:
 US/Canadian Parts Content: 5%
 Major Source of Foreign Parts Content: GERMANY: 70%

For this Vehicle:
 Final Assembly Point: MUNICH, GERMANY
 Country of Origin: GERMANY
 Engine: GERMANY
 Transmission: GERMANY

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score	Not Rated
Frontal Crash	Not Rated
Side Crash	Not Rated
Rollover	Not Rated

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236

Environmental Performance
 Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on this vehicle's measured emissions. Please visit www.DriveClean.ca.gov for more information. AIR RESOURCES BOARD

BMW of North America, LLC
 Woodcliff Lake, NJ 07677

VIN: WBA3A5C57CF340100

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

SALES
 Santa Ana, CA

SALES
 Santa Ana, CA

FIGURE 72. Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

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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

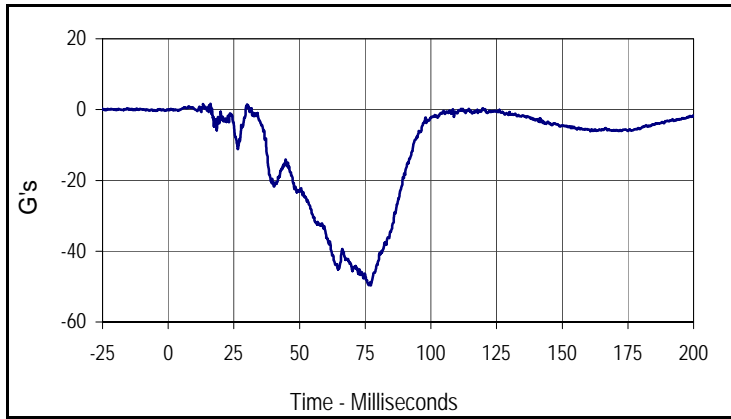
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Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration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

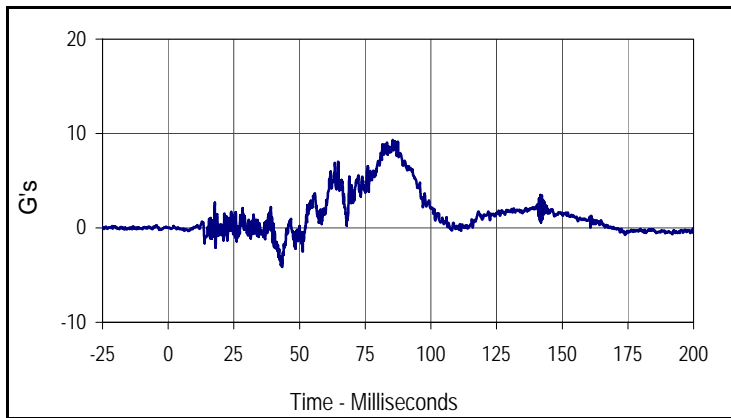
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Load Cell Barrier A1-A9
Load Cell Barrier B1-B9
Load Cell Barrier C1-C9
Load Cell Barrier D1-D9

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

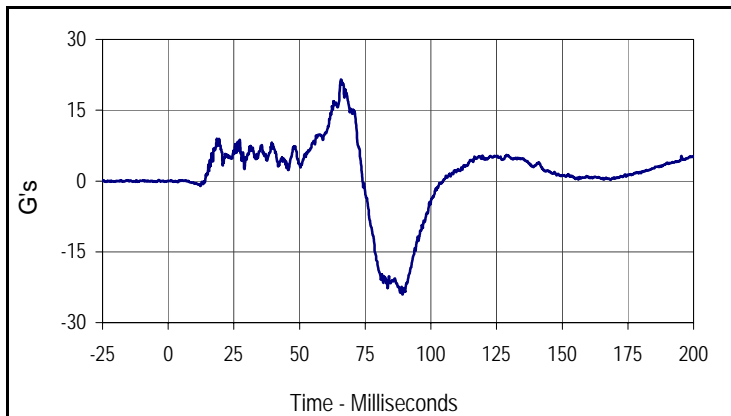
NHTSA No.: MC0518
 Test Date: 5/8/12



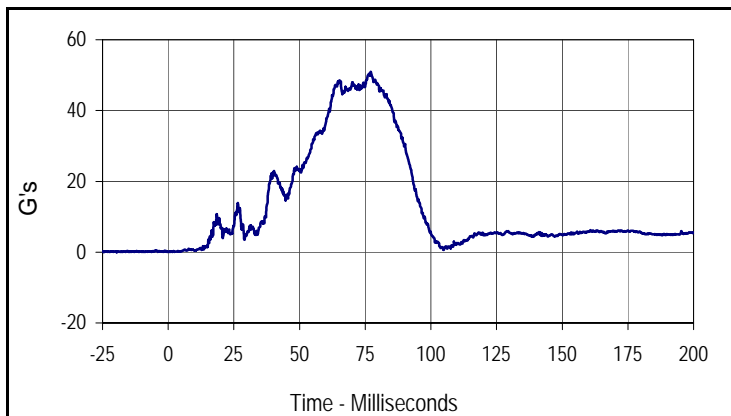
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001	FIL	1000	G's
Max	Time	Min	Time
1.7	16.1	-49.7	77.1



Curve Description			
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Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
9.3	85.5	-4.1	43.4



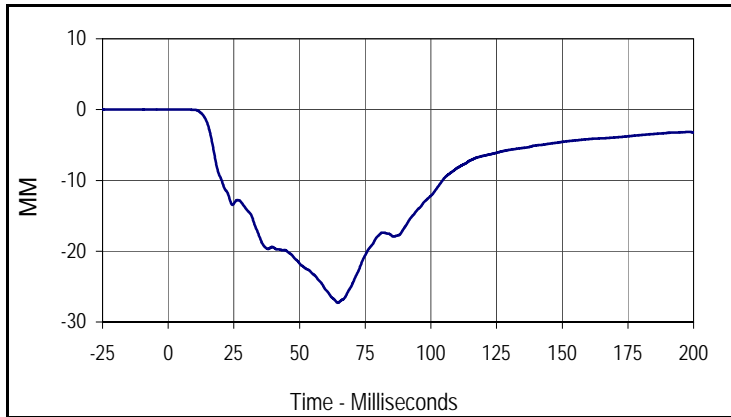
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Curve Description			
Driver Head Resultant Acceleration Primary			
Plot No.	Type	SAE Class	Units
004	RES	1000	G's
Max	Time	Min	Time
50.9	77.1	0.0	0.2

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

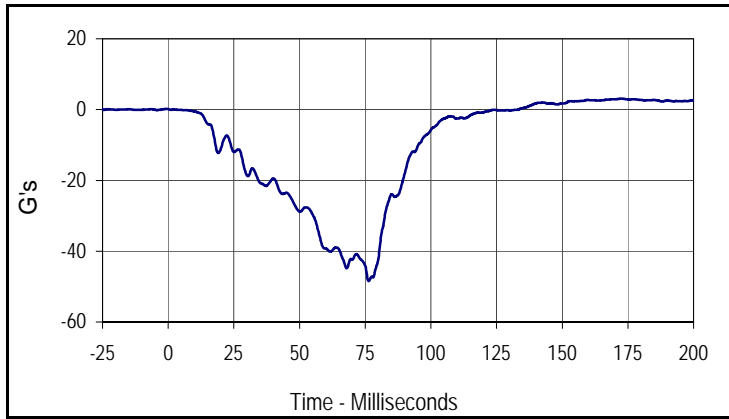
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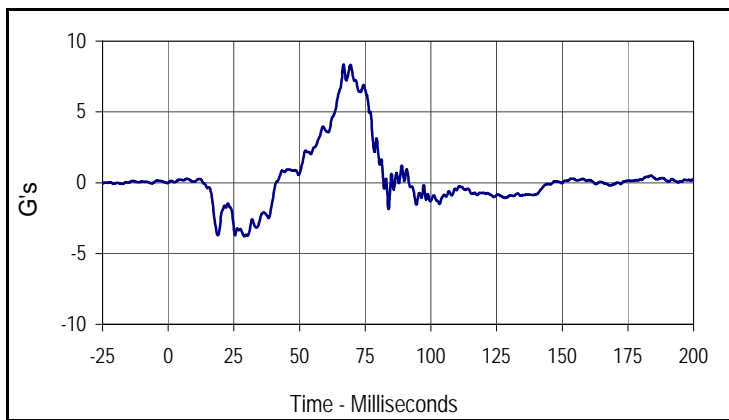
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Driver Chest Deflection			
Plot No.	Type	SAE Class	Units
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Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

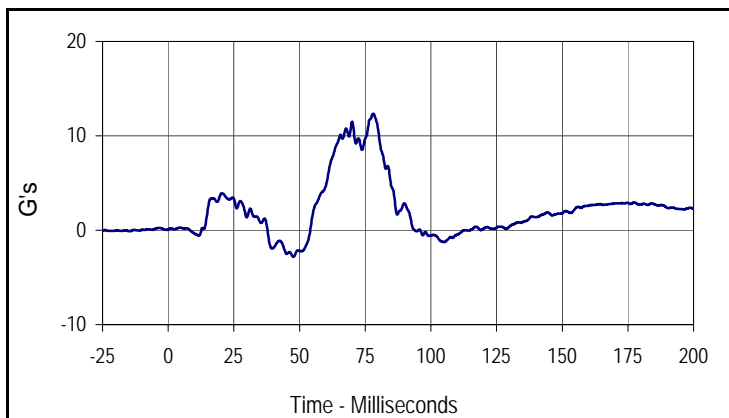
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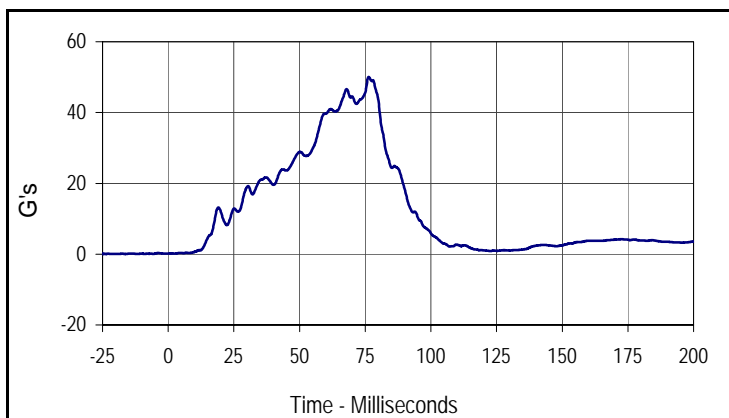
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Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
3.1	172.2	-48.4	76.3



Curve Description			
Driver Chest Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
007	FIL	180	G's
Max	Time	Min	Time
8.3	66.8	-3.8	29.0



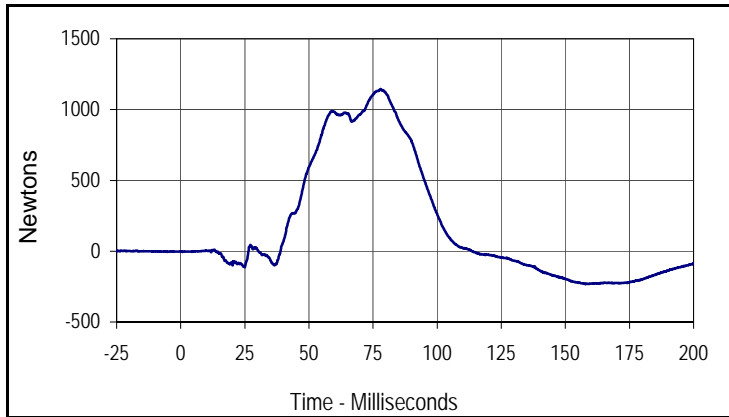
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Max	Time	Min	Time
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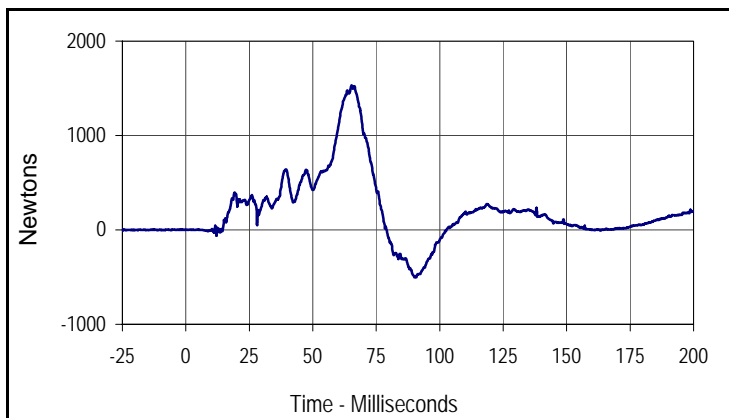
Curve Description			
Driver Chest Resultant Acceleration Primary			
Plot No.	Type	SAE Class	Units
009	RES	180	G's
Max	Time	Min	Time
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Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

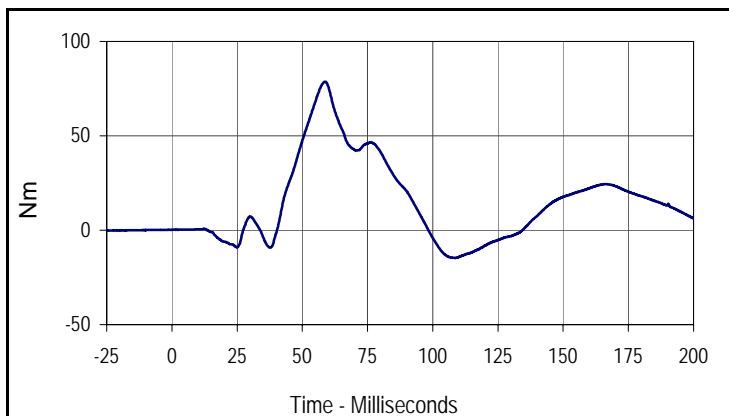
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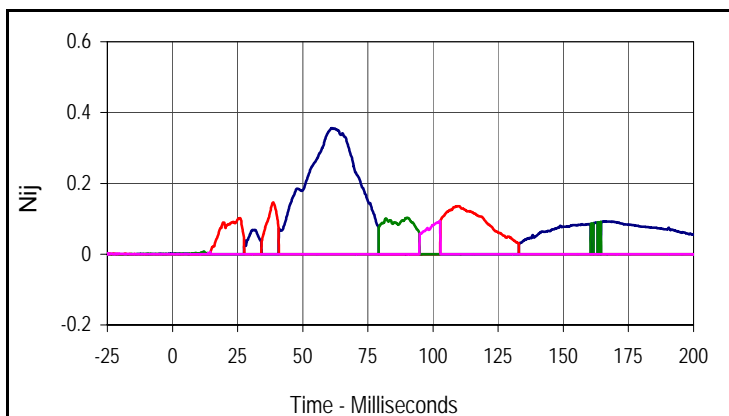
Curve Description			
Driver Upper Neck Force X			
Plot No.	Type	SAE Class	Units
010	FIL	1000	Newtons
Max	Time	Min	Time
1146.1	78.0	-232.4	157.9



Curve Description			
Driver Upper Neck Force Z			
Plot No.	Type	SAE Class	Units
011	FIL	1000	Newtons
Max	Time	Min	Time
1532.8	65.3	-502.4	90.1



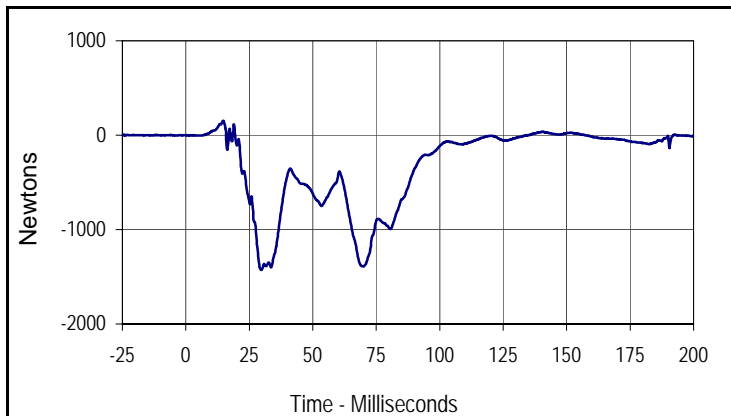
Curve Description			
Driver Upper Neck Moment Y			
Plot No.	Type	SAE Class	Units
012	FIL	600	Nm
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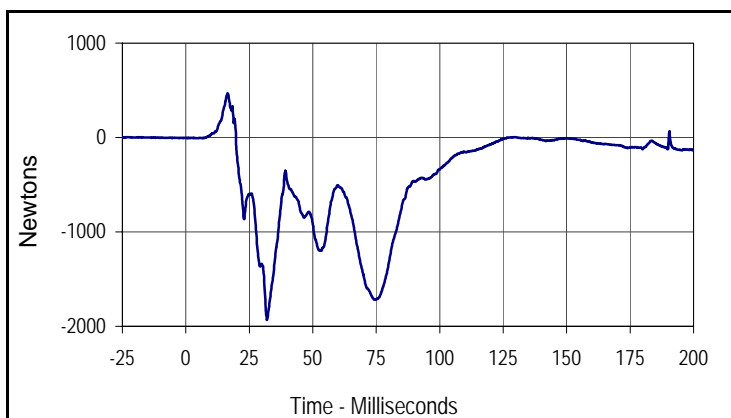
Curve Description			
Driver Nij			
Units	Type	Max	Time
Ntf	FIL	0.36	61.2
Units	Type	Max	Time
Nte	FIL	0.15	38.6
Units	Type	Max	Time
Ncf	FIL	0.10	90.1
Units	Type	Max	Time
Nce	FIL	0.09	102.7

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

NHTSA No.: MC0518
 Test Date: 5/8/12



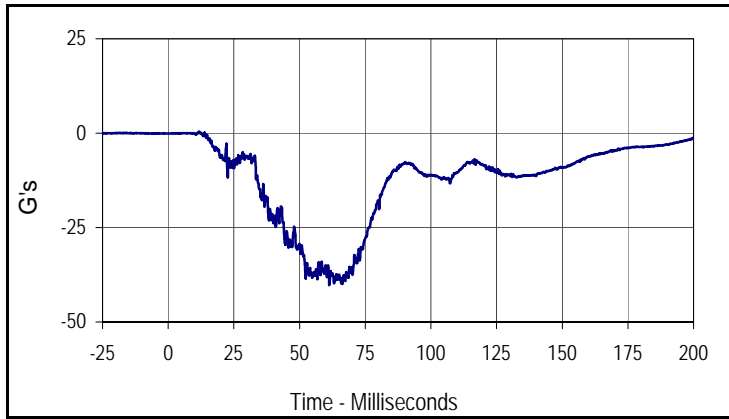
Curve Description			
Driver Left Femur Force Z			
Plot No.	Type	SAE Class	Units
013	FIL	600	Newtons
Max	Time	Min	Time
151.2	14.8	-1428.4	29.7



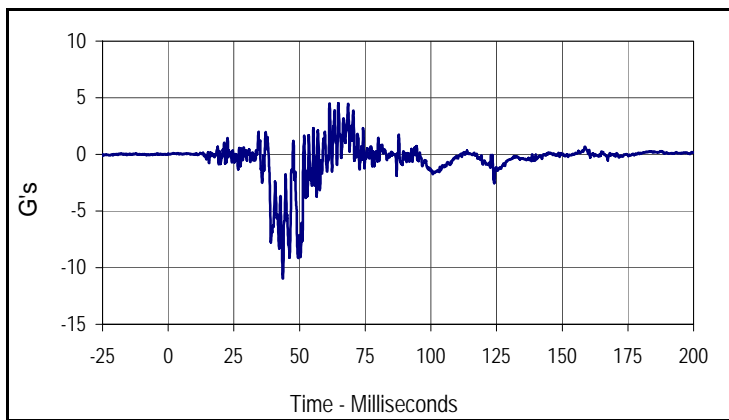
Curve Description			
Driver Right Femur Force Z			
Plot No.	Type	SAE Class	Units
014	FIL	600	Newtons
Max	Time	Min	Time
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Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

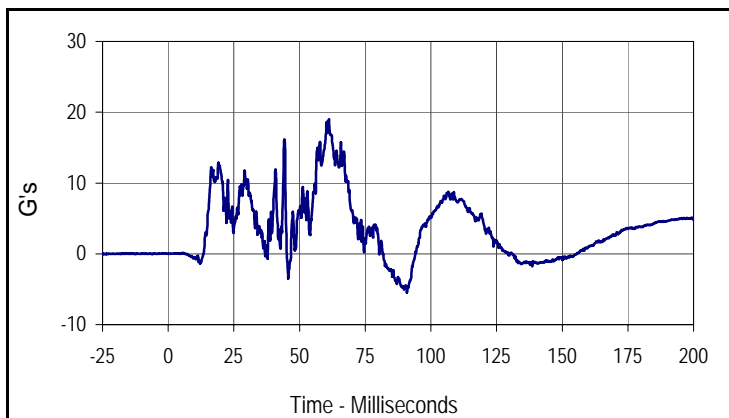
NHTSA No.: MC0518
 Test Date: 5/8/12



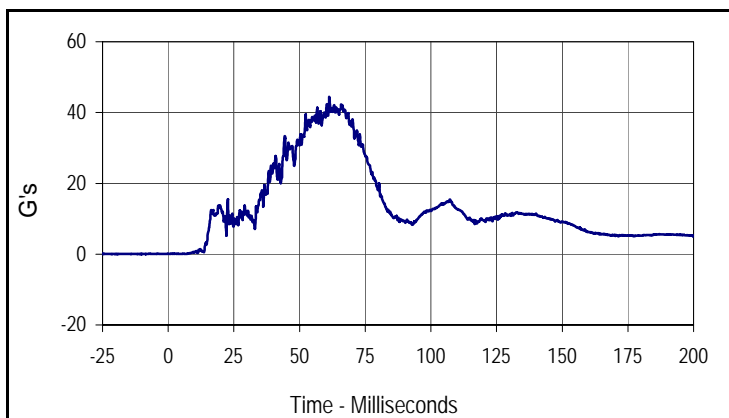
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.	Type	SAE Class	Units
015	FIL	1000	G's
Max	Time	Min	Time
0.4	11.7	-40.2	61.3



Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
016	FIL	1000	G's
Max	Time	Min	Time
4.5	64.8	-11.0	43.7



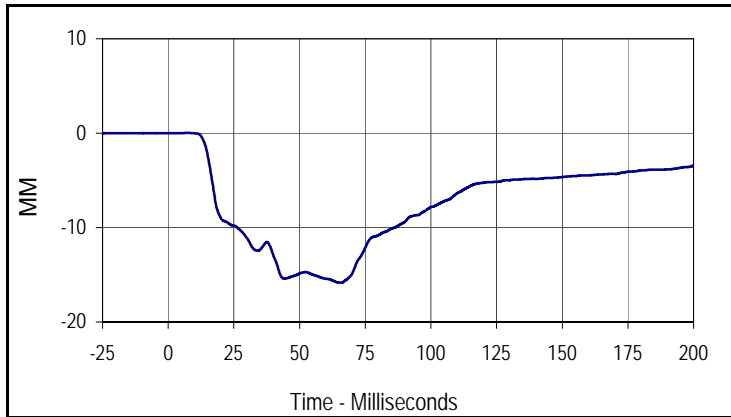
Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
017	FIL	1000	G's
Max	Time	Min	Time
19.0	61.2	-5.5	90.9



Curve Description			
Passenger Head Resultant Acceleration Primary			
Plot No.	Type	SAE Class	Units
018	RES	1000	G's
Max	Time	Min	Time
44.5	61.3	0.0	3.2

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

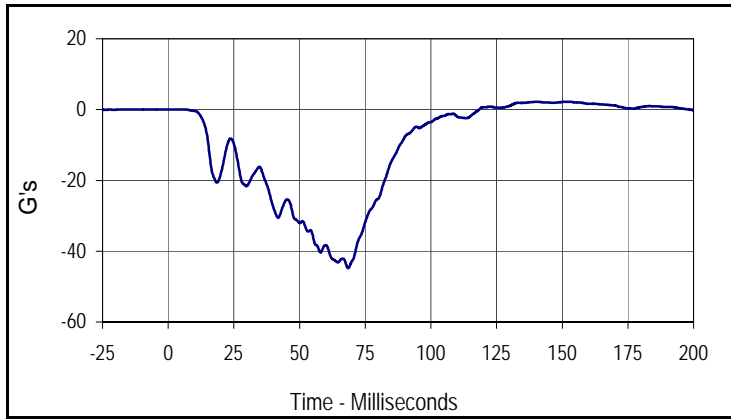
NHTSA No.: MC0518
 Test Date: 5/8/12



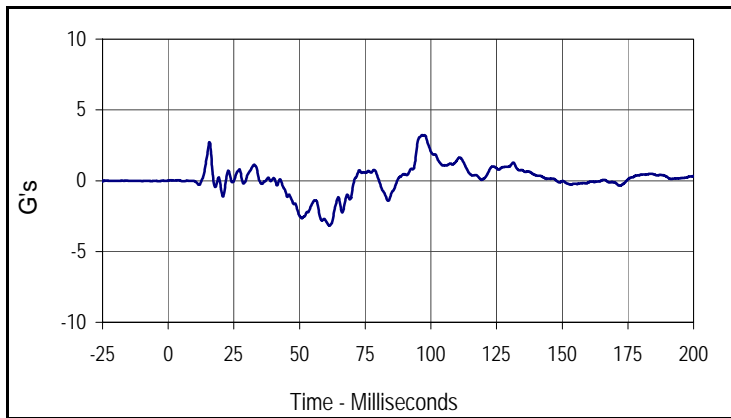
Curve Description			
Passenger Chest Deflection			
Plot No.	Type	SAE Class	Units
019	FIL	180	MM
Max	Time	Min	Time
0.0	7.2	-15.8	65.6

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

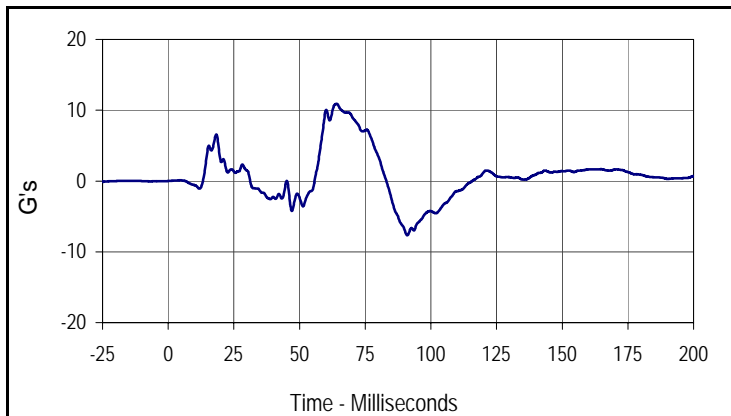
NHTSA No.: MC0518
 Test Date: 5/8/12



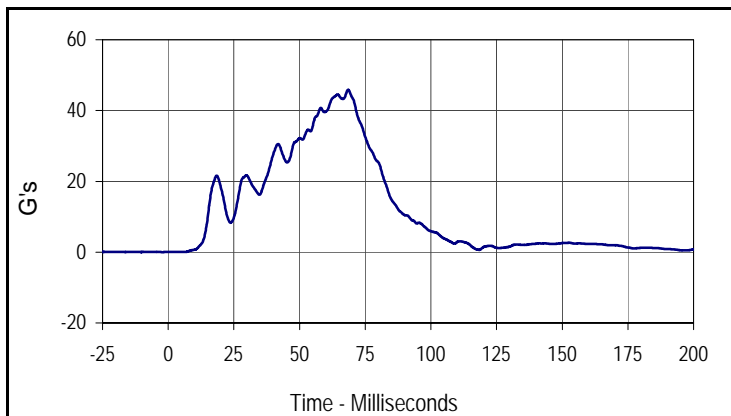
Curve Description			
Passenger Chest Acceleration X Primary			
Plot No.	Type	SAE Class	Units
020	FIL	180	G's
Max	Time	Min	Time
2.2	150.8	-44.8	68.5



Curve Description			
Passenger Chest Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
021	FIL	180	G's
Max	Time	Min	Time
3.2	96.7	-3.2	61.4



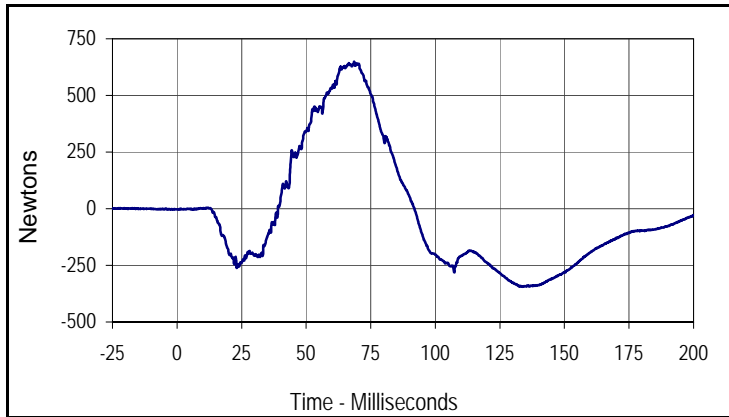
Curve Description			
Passenger Chest Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
022	FIL	180	G's
Max	Time	Min	Time
10.9	64.1	-7.7	91.0



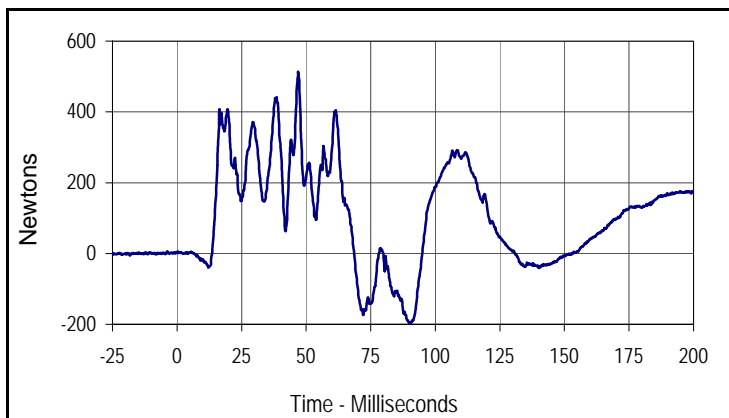
Curve Description			
Passenger Chest Resultant Acceleration Primary			
Plot No.	Type	SAE Class	Units
023	RES	180	G's
Max	Time	Min	Time
45.9	68.5	0.0	0.0

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

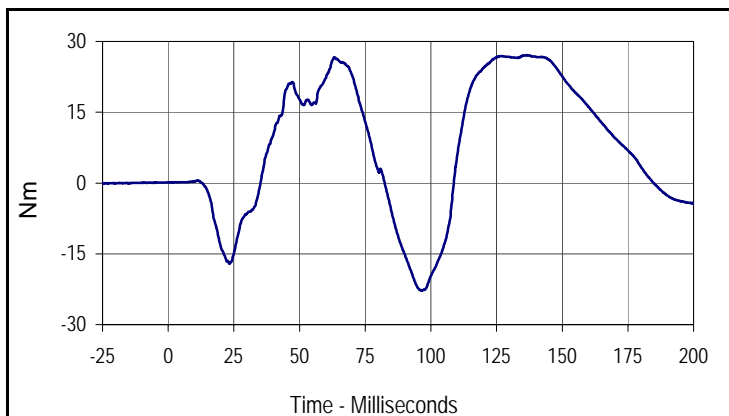
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 Test Date: 5/8/12



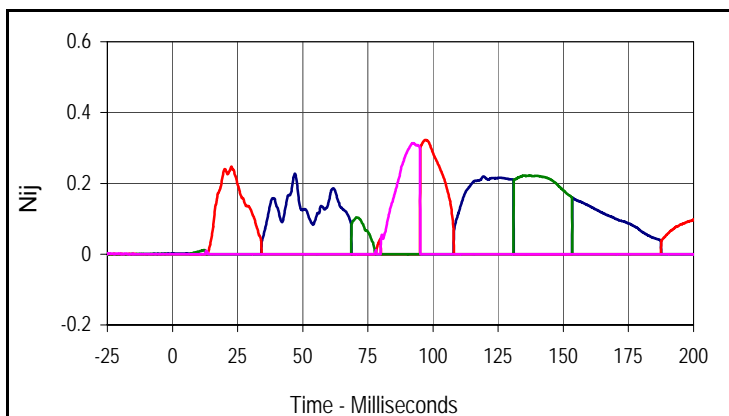
Curve Description			
Passenger Upper Neck Force X			
Plot No.	Type	SAE Class	Units
024	FIL	1000	Newtons
Max	Time	Min	Time
648.3	68.6	-344.4	133.8



Curve Description			
Passenger Upper Neck Force Z			
Plot No.	Type	SAE Class	Units
025	FIL	1000	Newtons
Max	Time	Min	Time
513.0	46.9	-197.9	90.2



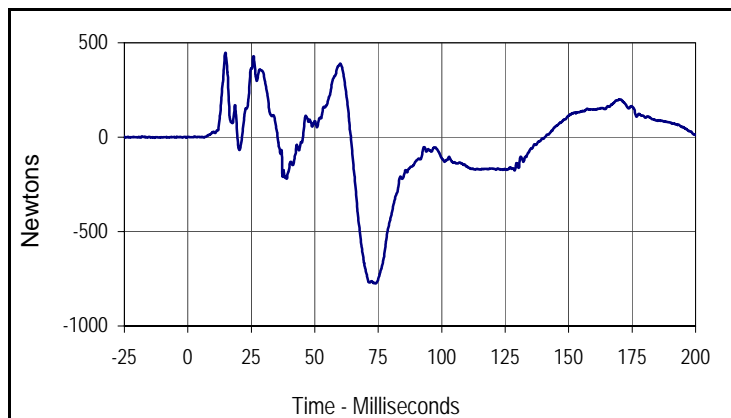
Curve Description			
Passenger Upper Neck Moment Y			
Plot No.	Type	SAE Class	Units
026	FIL	600	Nm
Max	Time	Min	Time
27.1	136.8	-22.8	96.3



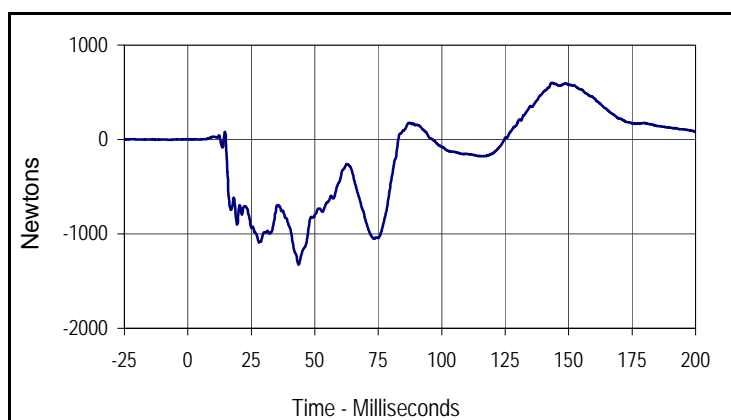
Curve Description			
Passenger Nij			
Units	Type	Max	Time
Ntf	FIL	0.23	47.0
Units	Type	Max	Time
Nte	FIL	0.32	97.1
Units	Type	Max	Time
Ncf	FIL	0.22	135.0
Units	Type	Max	Time
Nce	FIL	0.31	92.2

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 56 km/h Frontal Impact NCAP Test

NHTSA No.: MC0518
 Test Date: 5/8/12



Curve Description			
Passenger Left Femur Force Z			
Plot No.	Type	SAE Class	Units
027	FIL	600	Newtons
Max	Time	Min	Time
446.8	14.8	-775.2	73.9



Curve Description			
Passenger Right Femur Force Z			
Plot No.	Type	SAE Class	Units
028	FIL	600	Newtons
Max	Time	Min	Time
600.9	143.4	-1325.4	43.6

APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

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

Test Program: Hybrid III 50th Percentile Male Dummy Damage Checklist

Test Date: 5/3/12

ATD Serial No.: 035

Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

Describe the repair on repair or replacement of parts:

Test Program: Hybrid III 50th Percentile Male External Measurements

Test Date: 5/3/12

ATD Serial No.: 035

Test I.D.: N/A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.40	Pass
Laboratory Relative Humidity	%	10 to 70	30.7	Pass
A - Total sitting height	mm	879 to 889	884	Pass
B - Shoulder pivot height	mm	505 to 521	514	Pass
C - H point height	mm	84 to 89	86	Pass
D - H point location from backline	mm	135 to 140	138	Pass
E - Shoulder pivot from backline	mm	84 to 94	87	Pass
F - Thigh clearance	mm	140 to 155	147	Pass
G - Back of elbow to wrist pivot	mm	290 to 305	298	Pass
H - Head back to backline	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	336	Pass
J - Elbow rest height	mm	190 to 211	200	Pass
K - Buttock to knee length	mm	579 to 604	586	Pass
L - Popliteal length	mm	429 to 455	438	Pass
M - Knee pivot height	mm	485 to 500	491	Pass
N - Buttock popliteal length	mm	452 to 477	472	Pass
O - Chest depth without jacket	mm	213 to 229	225	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	433	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference (with chest jacket)	mm	970 to 1001	985	Pass
Z - Waist circumference	mm	836 to 866	865	Pass
AA - Location for chest circumference	mm	429 to 434	431	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
Overall Test Results				Pass

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

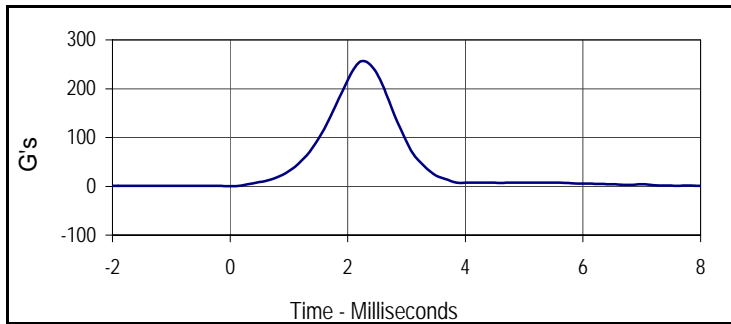
Test Date: 5/3/12

ATD Serial No.: 035

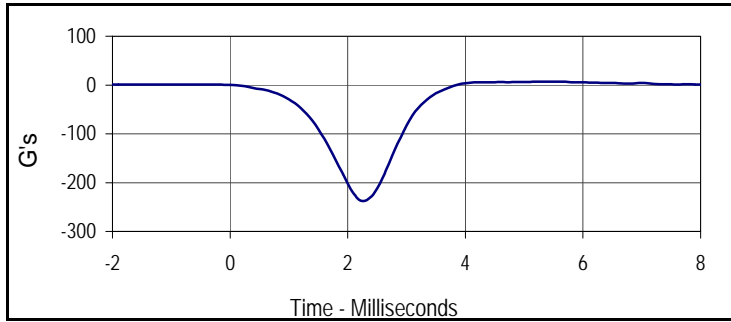
Test I.D.: M035HD037



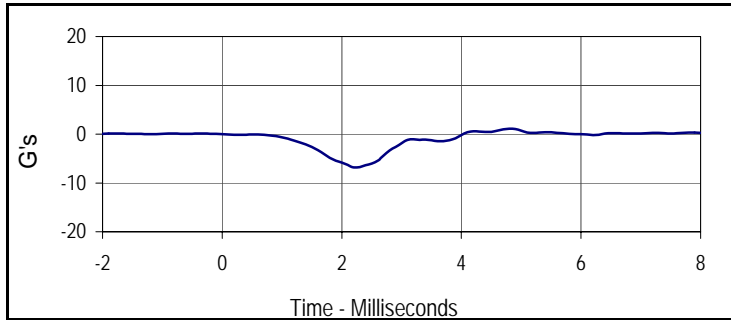
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	250	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.7	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	256.2	Pass
Peak Lateral Acceleration	G's	≤15.0	6.8	Pass
Oscillations After Main Pulse	%	<10% of peak Res. Acceleration	3.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



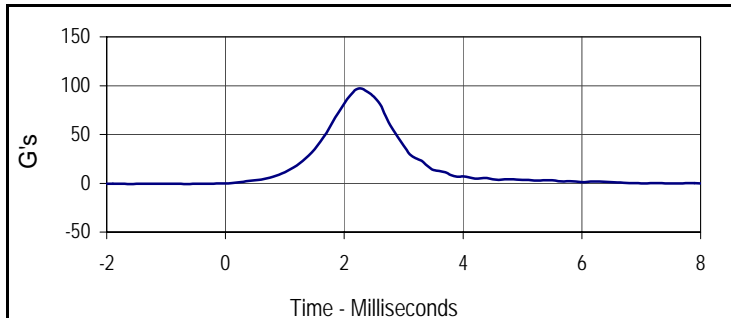
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
256.2	2.3	0.2	0.0



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
7.1	5.6	-237.0	2.3



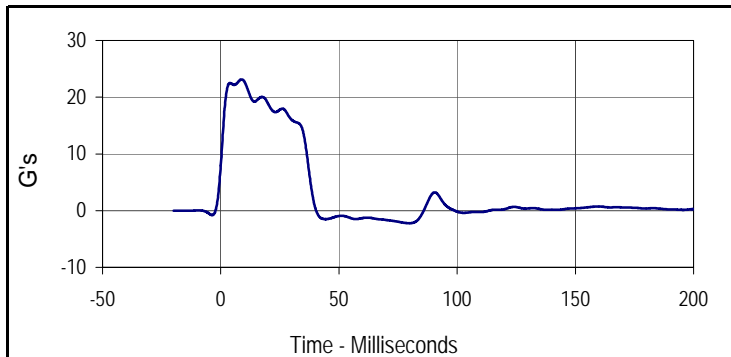
Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
1.1	4.8	-6.8	2.2



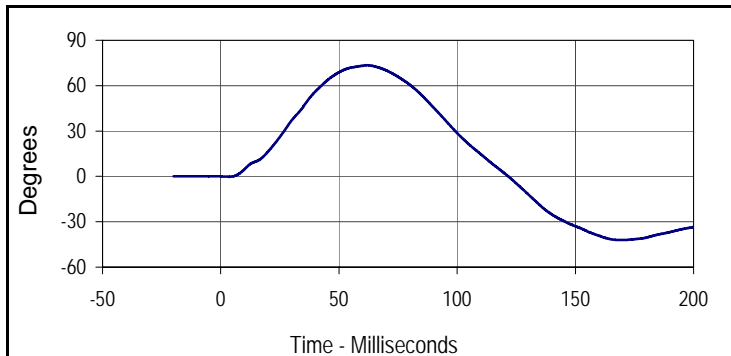
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
97.0	2.3	-0.8	-0.6



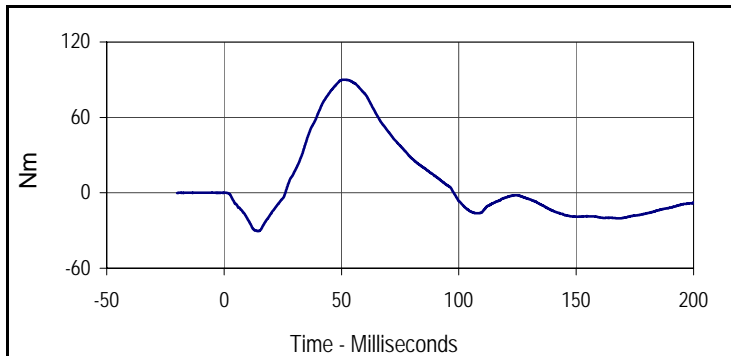
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	280	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.5	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass	
Pendulum Velocity	m/s	6.89 to 7.13	7.06	Pass	
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.7	Pass
	20 Msec.	G's	17.6 to 22.6	18.9	Pass
	30 Msec.	G's	12.5 to 18.5	16.0	Pass
Peak Pendulum Decel. after 30 Msec.	G's	≤ 29.0	16.0	Pass	
Deceleration Decay, Time to Cross 5 G's	Msec.	34.0 to 42.0	38	Pass	
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	73.4	Pass
	Time	Msec.	57.0 to 64.0	62.0	Pass
"D" Plane Rotation Decay, Time To Zero Crossing	Msec.	113.0 to 128.0	121.7	Pass	
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	90.1	Pass
	Time	Msec.	47.0 to 58.0	51.4	Pass
Positive Moment Decay, Time To Zero Crossing	Msec.	97.0 to 107.0	97.9	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
23.1	8.8	-2.2	79.8



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
73.4	62.0	-42.0	169.4



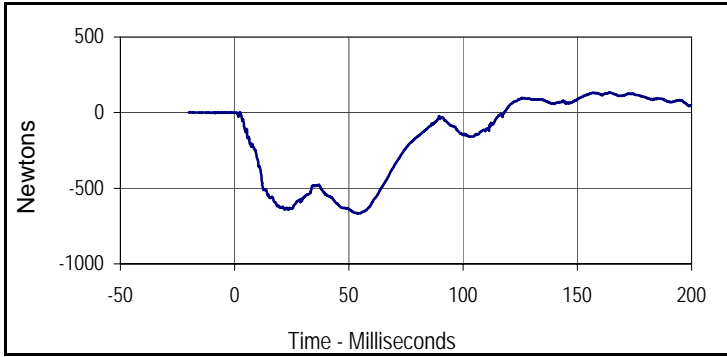
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
90.1	51.4	-30.5	14.3

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

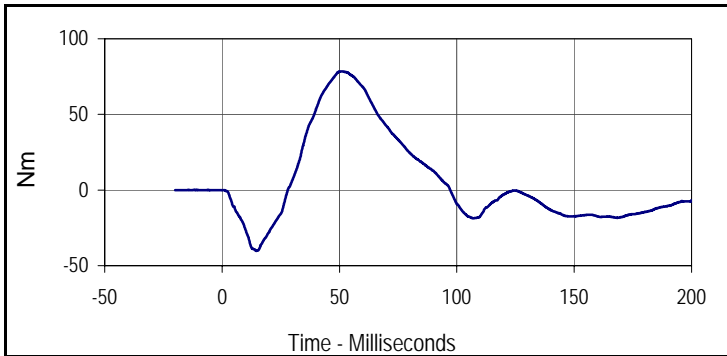
Test Date: 5/3/12

ATD Serial No.: 035

Test I.D.: M035NF037



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
133.1	164.2	-666.6	55.0



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
78.5	51.1	-40.2	14.5

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

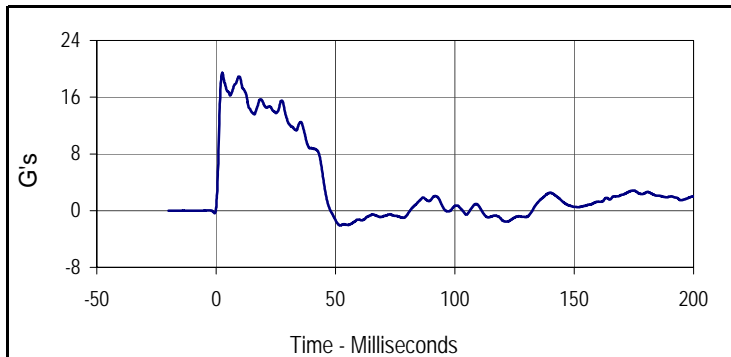
Test Date: 5/3/12

ATD Serial No.: 035

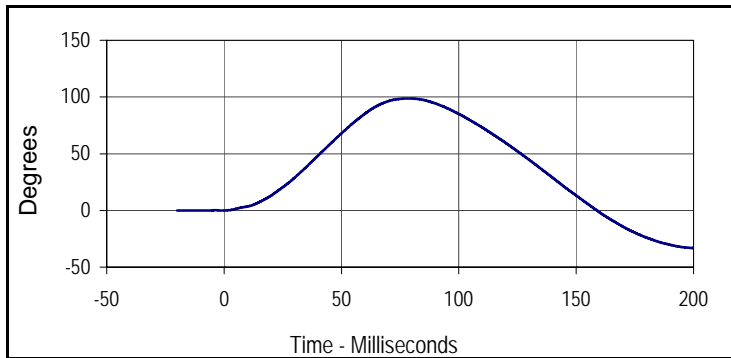
Test I.D.: M035NE037



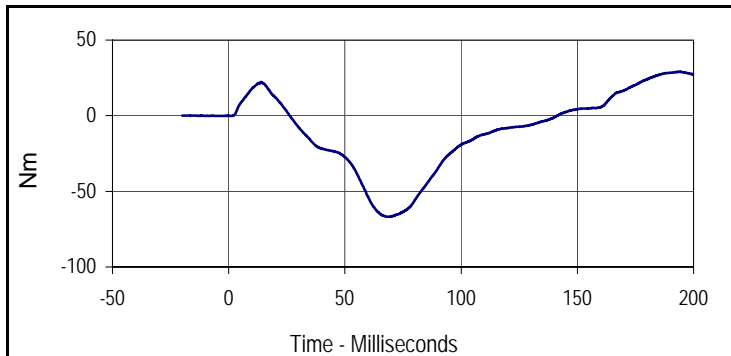
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	310	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.3	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass	
Pendulum Velocity	m/s	5.94 to 6.19	6.11	Pass	
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.8	Pass
	20 Msec.	G's	14.0 to 19.0	15.0	Pass
	30 Msec.	G's	11.0 to 16.0	12.5	Pass
Peak Pendulum Decel. after 30 Msec.	G's	≤ 22.0	12.5	Pass	
Deceleration Decay, Time to Cross 5 G's	Msec.	38.0 to 46.0	44.7	Pass	
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	98.7	Pass
	Time	Msec.	72.0 to 82.0	78.6	Pass
"D" Plane Rotation Decay, Time To Zero Crossing	Msec.	147.0 to 174.0	158.8	Pass	
Moment About Occ. Condyle	Max	Nm	-52.9 to -79.9	-66.9	Pass
	Time	Msec.	65.0 to 79.0	68.5	Pass
Positive Moment Decay, Time To Zero Crossing	Msec.	120.0 to 148.0	141.4	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
19.4	2.6	-2.1	52.0



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
98.7	78.6	-33.1	200.0



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
29.0	194.2	-66.9	68.5

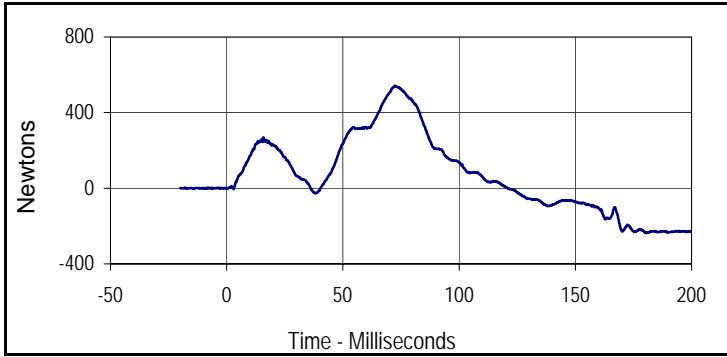
Test Program: Hybrid III 50th Percentile Male Neck Extension Test

Test Date: 5/3/12

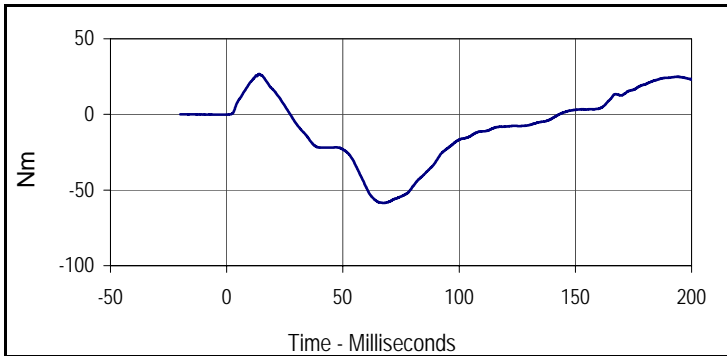


ATD Serial No.: 035

Test I.D.: M035NE037



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
543.5	72.3	-237.1	180.5



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
26.7	13.9	-58.5	67.8

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

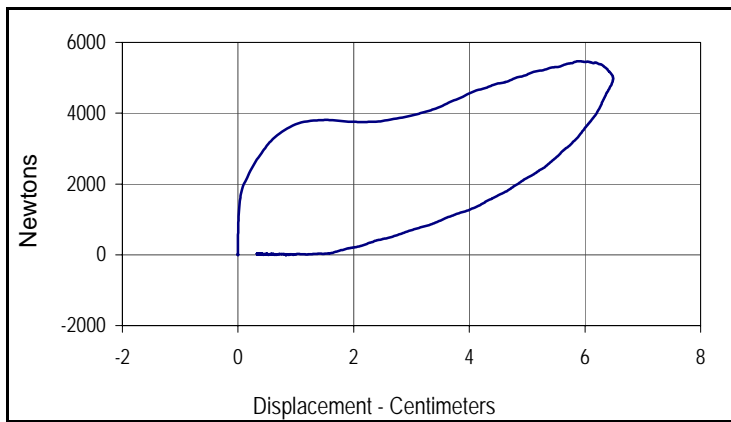
Test Date: 5/3/12

ATD Serial No.: 035

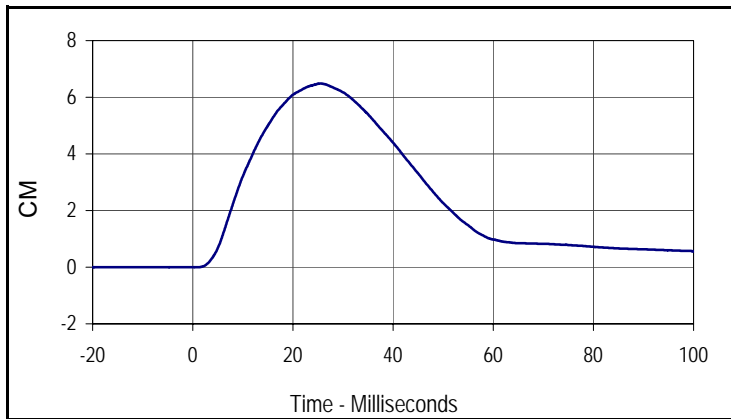
Test I.D.: M035CH037



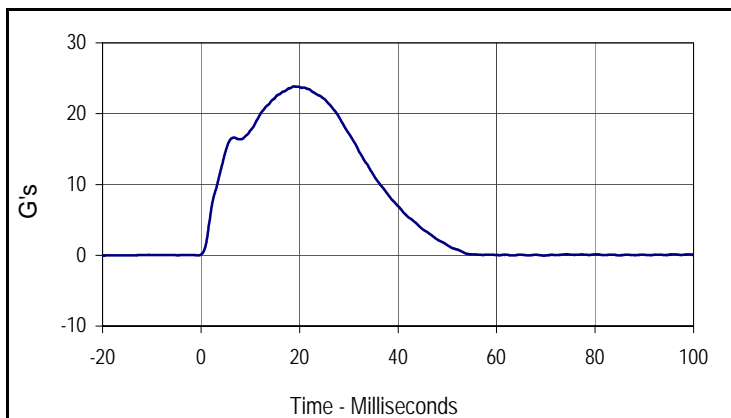
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	370	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Probe Velocity	m/s	6.58 to 6.82	6.70	Pass
Peak Probe Force	Newtons	5159 to 5893	5467	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.49	Pass
Internal Hysteresis	%	69 to 85	70.9	Pass
Overall Test Results				Pass



Curve Description			
Probe Force vs. Chest Deflection			
Plot No.	Type	SAE Class	Hysteresis
001	FIL	180	70.9
Peak Probe Force		Peak Chest Deflection	
5467		6.49	



Curve Description			
Chest Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	180	CM
Max	Time	Min	Time
6.5	25.5	0.0	0.8



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
23.9	18.8	-0.1	-20.0



Left Knee

Tested Parameter	Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time	Minutes	≥240	330	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5048	Pass
Overall Test Results				Pass

Right Knee

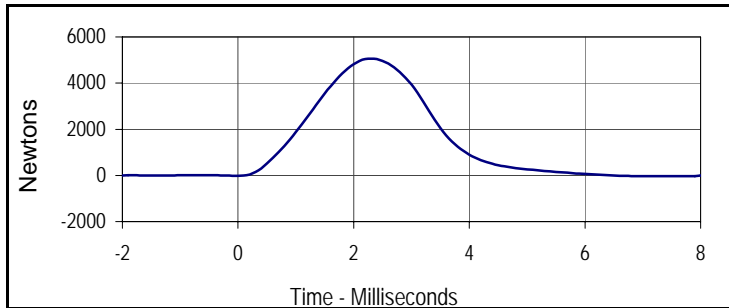
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5063	Pass
Overall Test Results				Pass



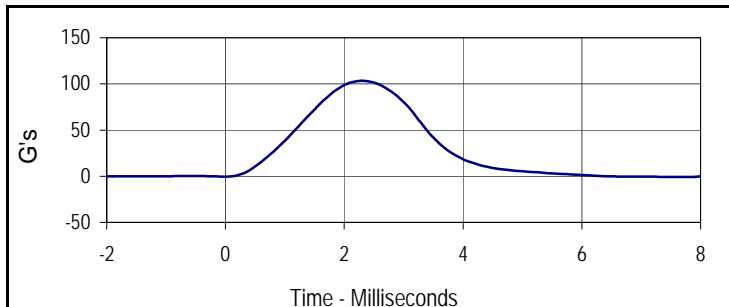
Curve Description			
Left Knee Probe Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5047.5	2.6	-39.0	7.8



Curve Description			
Left Knee Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	600	G's
Max	Time	Min	Time
103.2	2.6	-0.8	7.8



Curve Description			
Right Knee Probe Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
5063.3	2.3	-33.9	7.6



Curve Description			
Right Knee Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	600	G's
Max	Time	Min	Time
103.5	2.3	-0.7	7.6

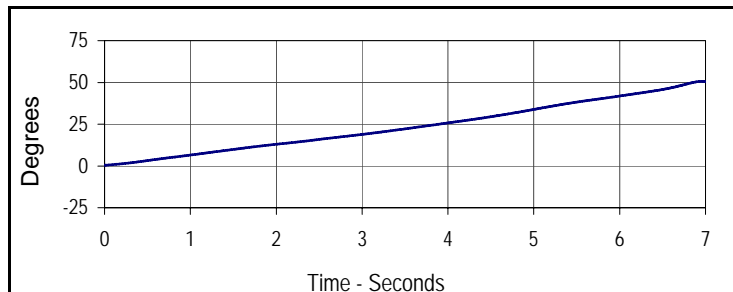


Left Hip Joint-Femur Results

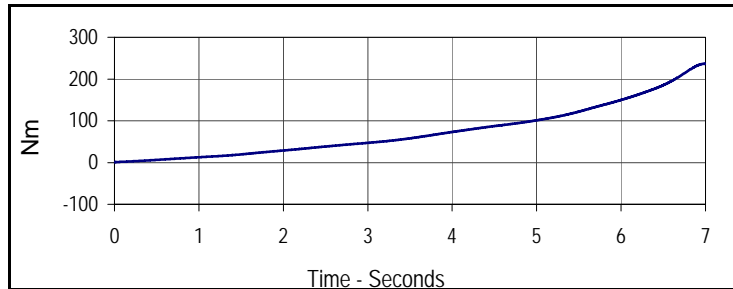
Tested Parameter	Units	Specification	Result	Pass/Fail
Hip Joint-Femur Assembly Soak Time	Minutes	≥240	405	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.4	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass
Rotation Rate	deg/sec	5 to 10	7.3	Pass
Femur Torque at 30°	Nm	≤ 95	89.0	Pass
Rotation at 203 Nm	Degrees	40.0 to 50.0	47.6	Pass
Overall Test Results				Pass

Right Hip Joint-Femur Results

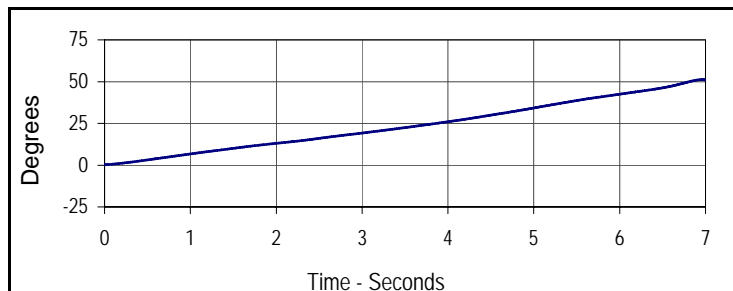
Rotation Rate	deg/sec	5 to 10	7.4	Pass
Femur Torque at 30°	Nm	≤ 95	87.0	Pass
Rotation at 203 Nm	Degrees	40.0 to 50.0	48.1	Pass
Overall Test Results				Pass



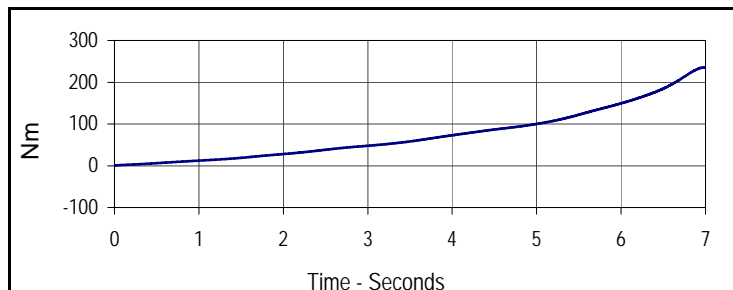
Curve Description			
Left Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
001	FIL	60	Degrees
Max	Time	Min	Time
50.6	7.0	0.4	0.0



Curve Description			
Left Femur Torque			
Plot No.	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
236.7	7.0	1.0	0.0



Curve Description			
Right Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
51.2	7.0	0.2	0.0



Curve Description			
Right Femur Torque			
Plot No.	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
235.7	7.0	1.0	0.0

Test Program: Hybrid III 5th Percentile Female Dummy Damage Checklist

Test Date: 5/3/12

ATD Serial No.: 141

Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

Describe the repair on repair or replacement of parts:

Test Program: Hybrid III 5th Percentile Female External Measurements

Test Date: 5/3/12

ATD Serial No.: 141

Test I.D.: N/A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.22	Pass
Laboratory Relative Humidity	%	10 to 70	30.7	Pass
A - Total sitting height	mm	774.7 to 800.1	787	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	452	Pass
C - H point height	mm	81.3 to 86.3	84	Pass
D - H point location from backline	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	126	Pass
G - Back of elbow to wrist pivot	mm	243.9 to 259.1	250	Pass
H - Head back to backline	mm	40.7 to 45.7	44	Pass
I - Shoulder to elbow length	mm	276.8 to 297.2	285	Pass
J - Elbow rest height	mm	182.8 to 203.2	194	Pass
K - Buttock to knee length	mm	520.7 to 546.1	530	Pass
L - Popliteal length	mm	355.6 to 376.0	372	Pass
M - Knee pivot height	mm	393.7 to 419.1	400	Pass
N - Buttock popliteal length	mm	414.0 to 439.4	420	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	186	Pass
P - Foot length	mm	218.5 to 233.7	221	Pass
R - Buttock to Knee Pivot Length	mm	457.2 to 482.6	475	Pass
S - Head Breadth	mm	137.1 to 147.3	144	Pass
T - Head Depth	mm	177.8 to 188.0	180	Pass
U - Hip Breadth	mm	299.7 to 314.9	302	Pass
V - Shoulder breadth	mm	350.5 to 365.7	359	Pass
W - Foot breadth	mm	78.8 to 94.0	90	Pass
X - Head circumference	mm	528.3 to 548.7	541	Pass
Y - Chest circumference (with chest jacket)	mm	850.8 to 881.3	861	Pass
Z - Waist circumference	mm	759.5 to 789.9	766	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	300	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	164	Pass
Overall Test Results				Pass

Test Program: Hybrid III 5th Percentile Female Head Drop Test

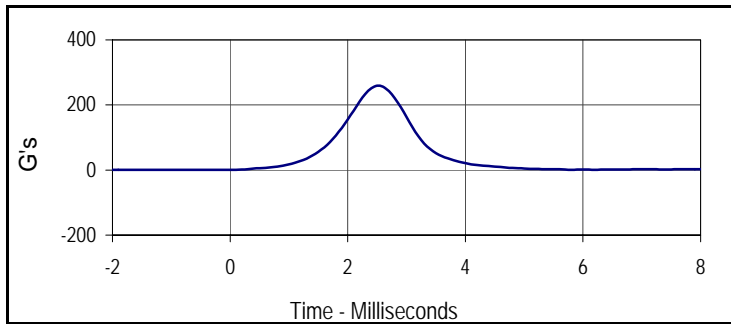
Test Date: 5/3/12

ATD Serial No.: 141

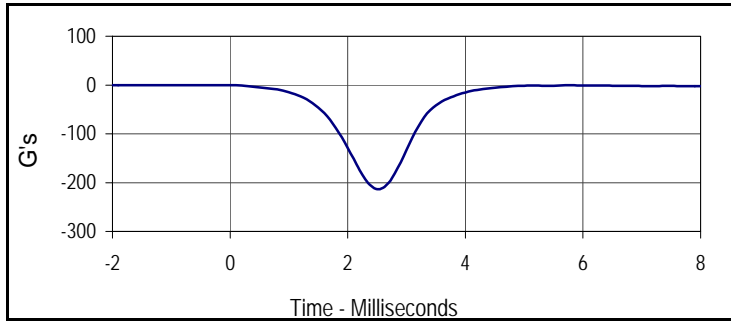
Test I.D.: F141HD039



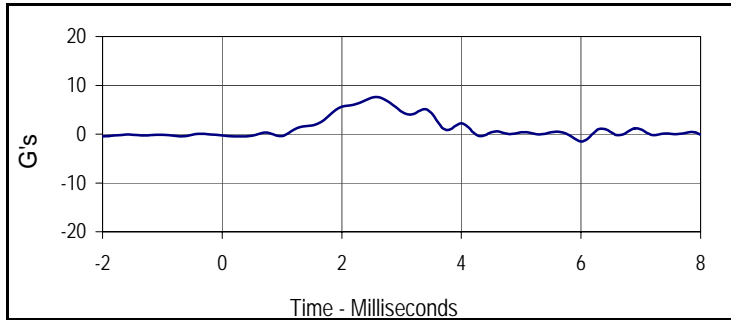
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	250	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.7	Pass
Peak Resultant Acceleration	G's	250.0 to 300.0	259.4	Pass
Peak Lateral Acceleration	G's	≤15.0	7.6	Pass
Oscillations After Main Pulse	%	<10% of peak Res. Acceleration	1.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



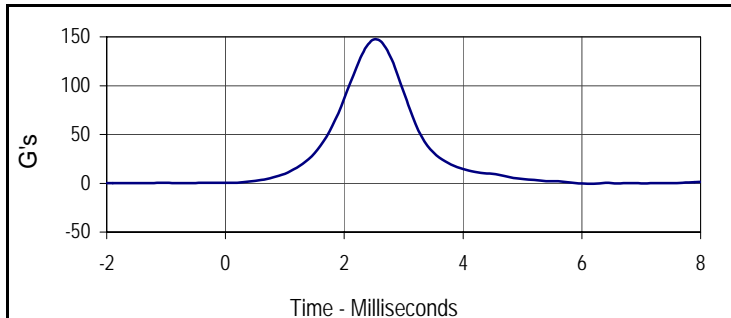
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
259.4	2.5	0.3	-1.4



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.0	-2.0	-213.3	2.5



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
7.6	2.6	-1.5	6.0



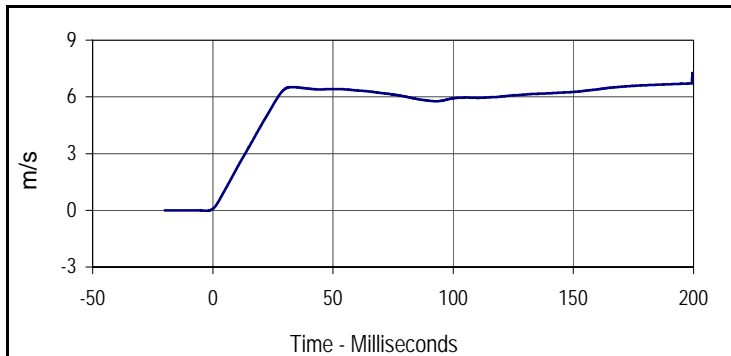
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
147.4	2.5	-0.1	6.0

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

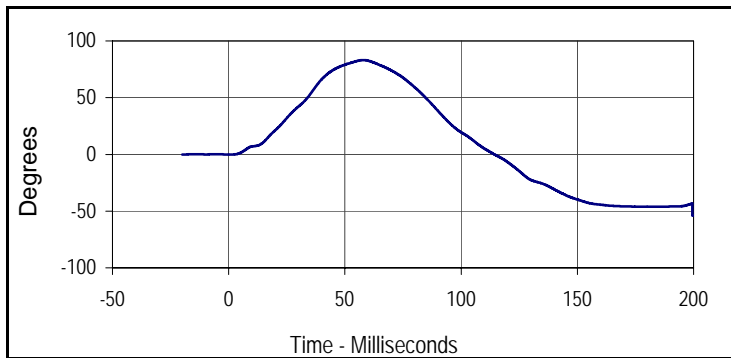
Test Date: 5/3/12
 Test I.D.: F141NF039



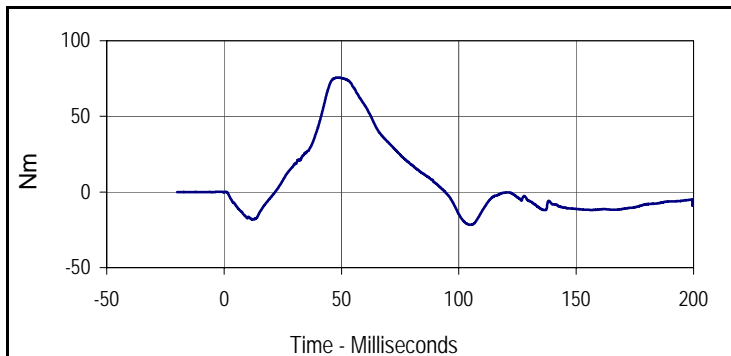
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	260	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.1	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	30.7	Pass	
Pendulum Velocity	m/s	6.89 to 7.13	7.04	Pass	
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.2	Pass
	20 Msec.	m/s	4.0 to 5.0	4.5	Pass
	30 Msec.	m/s	5.8 to 7.0	6.4	Pass
"D" Plane Rotation	Max	Degrees	77.0 to 91.0	83.1	Pass
Peak Moment in Rotation	Max	Nm	69.0 to 83.0	75.7	Pass
Positive Moment Decay, Time To 10 Nm	Msec.	80.0 to 100.0	85.8	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
7.3	200.0	0.0	-2.6



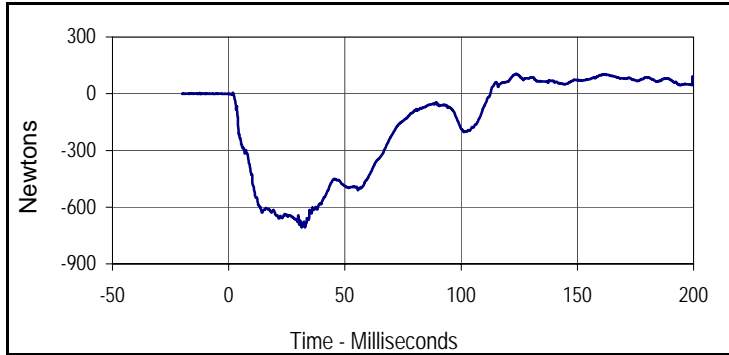
Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
83.1	57.9	-53.8	199.5



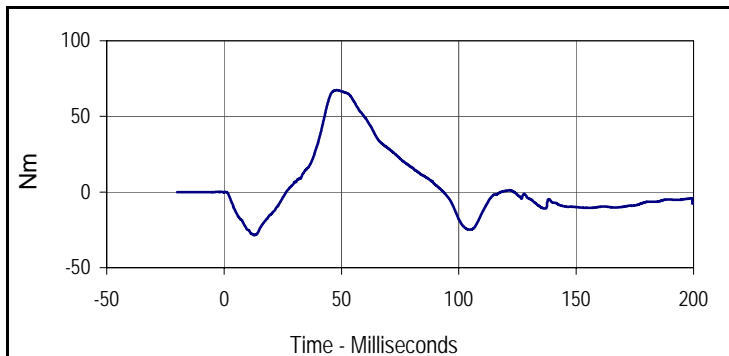
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
75.7	48.3	-21.7	104.9

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

Test Date: 5/3/12
 Test I.D.: F141NF039



Curve Description			
Upper Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
104.6	123.6	-707.8	31.5



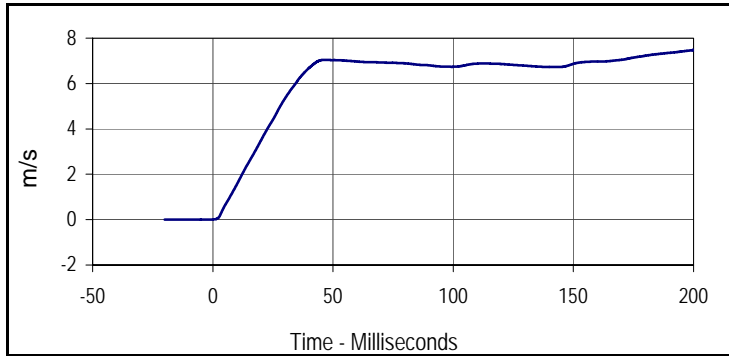
Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
67.4	47.9	-28.5	12.9

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

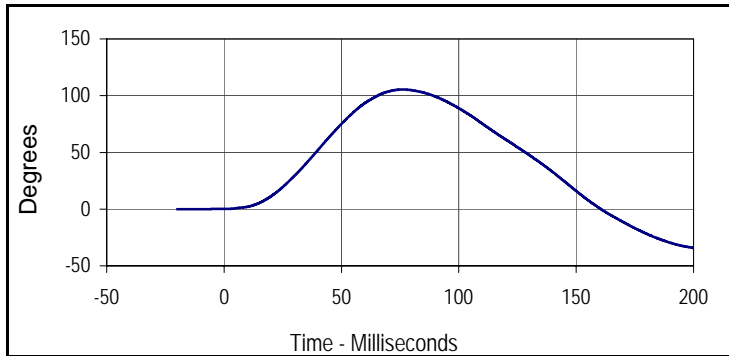
Test Date: 5/3/12
 Test I.D.: F141NE039



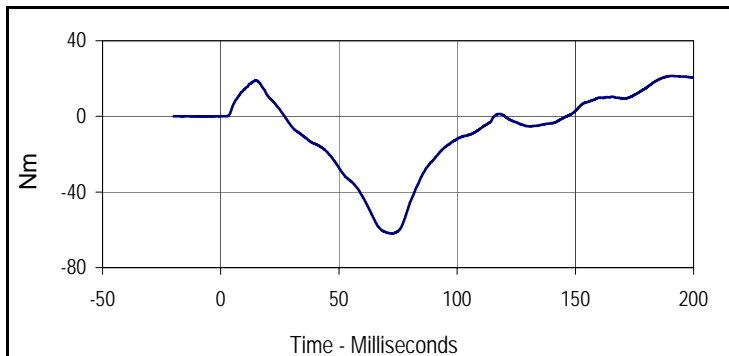
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	300	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.3	Pass	
Pendulum Velocity	m/s	5.95 to 6.19	6.11	Pass	
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.6	Pass
	20 Msec.	m/s	3.1 to 3.9	3.5	Pass
	30 Msec.	m/s	4.6 to 5.6	5.3	Pass
"D" Plane Rotation	Max	Degrees	99.0 to 114.0	105.4	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-62.0	Pass
Positive Moment Decay, Time To -10 Nm	Msec.	94.0 to 114.0	104.4	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
7.5	200.0	0.0	-14.0



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
105.4	76.3	-34.2	200.0



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
21.5	191.0	-62.0	72.6

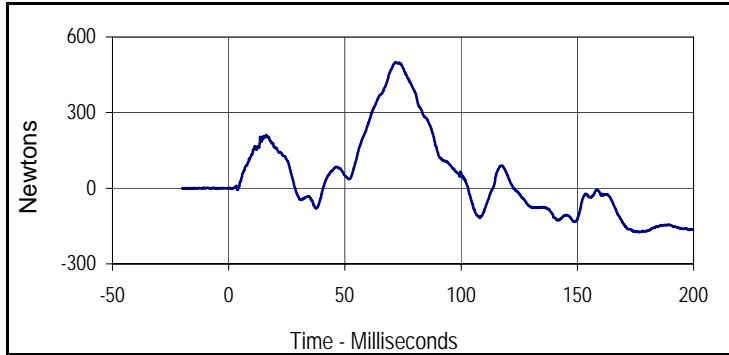
Test Program: Hybrid III 5th Percentile Female Neck Extension Test

Test Date: 5/3/12

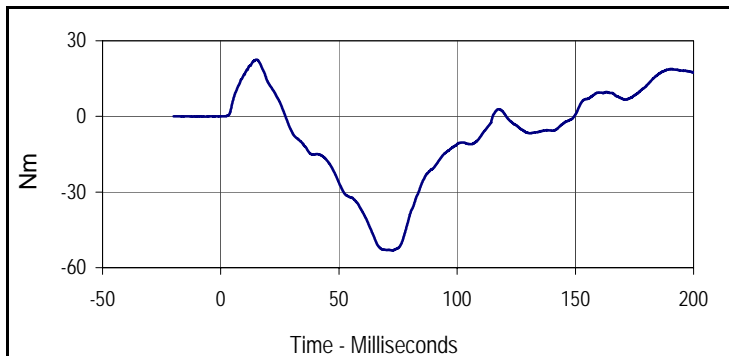


ATD Serial No.: 141

Test I.D.: F141NE039



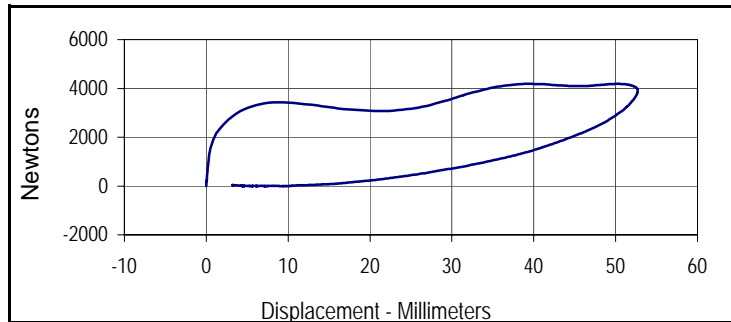
Curve Description			
Upper Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
499.8	72.0	-174.9	176.6



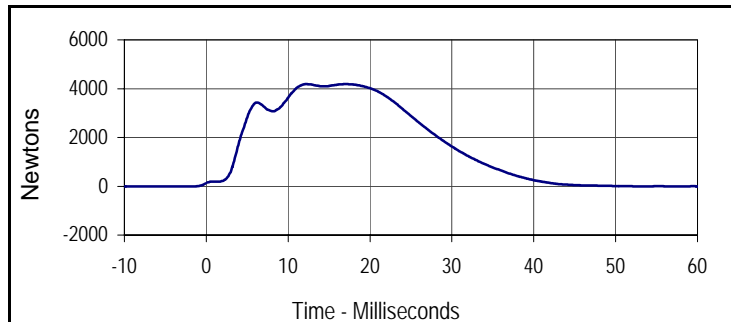
Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
22.6	15.1	-53.2	72.6



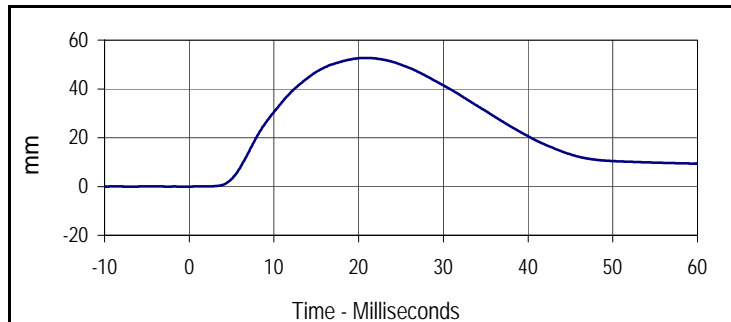
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	390	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.1	Pass
Probe Velocity	m/s	6.59 to 6.83	6.73	Pass
Peak Chest Deflection	mm	50.0 to 58.0	52.7	Pass
Peak Force Between 50 and 58 MM	Newtons	3900 to 4400	4188	Pass
Peak Force Between 18 and 50 MM	Newtons	≤4600	4190	Pass
Internal Hysteresis	%	69 to 85	75.3	Pass
Overall Test Results				Pass



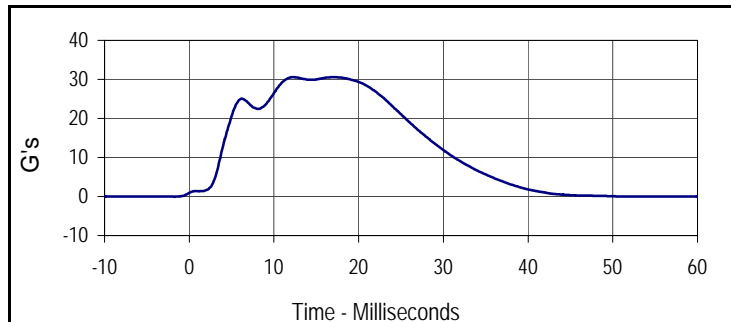
Curve Description			
Probe Force vs. Chest Deflection			
Plot No.	Type	SAE Class	Hysteresis
001	FIL	180	75.3
Peak Probe Force		Peak Chest Deflection	
4189.9		52.7	



Curve Description			
Probe Force			
Plot No.	Type	SAE Class	Units
002	FIL	180	Newtons
Max	Time	Min	Time
4189.9	17.1	-7.1	61.1



Curve Description			
Chest Deflection			
Plot No.	Type	SAE Class	Units
003	FIL	600	mm
Max	Time	Min	Time
52.7	20.8	0.0	-0.1



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
30.6	17.1	-0.1	61.1

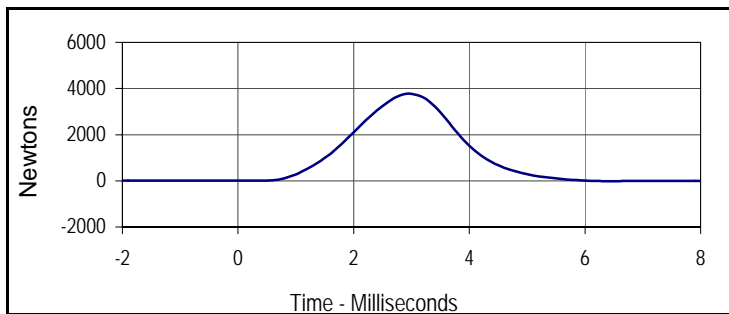


Left Knee

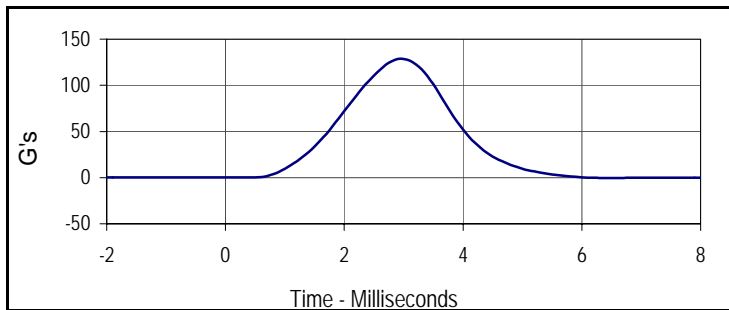
Tested Parameter	Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time	Minutes	≥240	460	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.7	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	3450 to 4060	3768	Pass
Overall Test Results				Pass

Right Knee

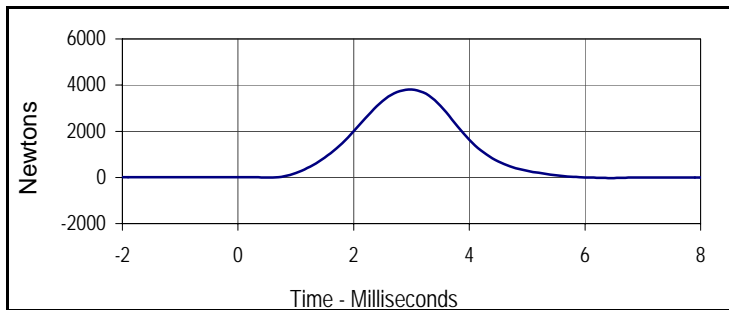
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	3450 to 4060	3806	Pass
Overall Test Results				Pass



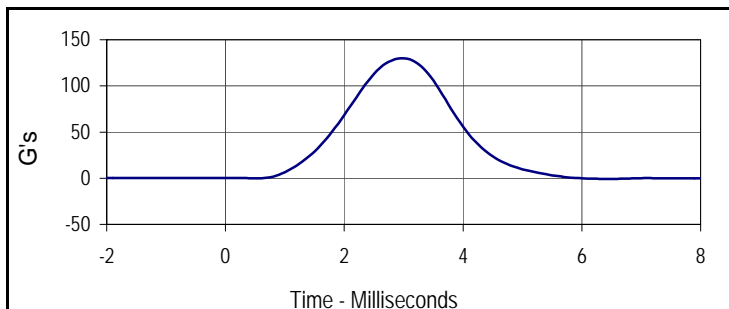
Curve Description			
Left Knee Probe Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3767.5	3.0	-16.8	9.7



Curve Description			
Left Knee Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	600	G's
Max	Time	Min	Time
128.5	3.0	-0.6	9.7



Curve Description			
Right Knee Probe Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
3806.4	3.0	-25.8	6.4



Curve Description			
Right Knee Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	600	G's
Max	Time	Min	Time
129.9	3.0	-0.9	6.4

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

Test Date: 5/3/12

ATD Serial No.: 141

Test I.D.: F141TF039



Left Hip Joint-Femur Results

Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	430	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.4	Pass
Initial Reference Plane Angle		Degrees	≤ 20	1.9	Pass
Peak Force at 45° +/-0.5°		Newtons	320.0 to 390.0	351.8	Pass
Torso Rotation Rate		deg/sec	0.5 to 1.5	1.0	Pass
Final Reference Plane Angle		Degrees	+/-8	1.0	Pass
Overall Test Results					Pass

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

Test Program: Hybrid III 50th Percentile Male Dummy Damage Checklist

Test Date: 5/10/12

ATD Serial No.: 035

Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

Describe the repair on repair or replacement of parts:

Test Program: Hybrid III 50th Percentile Male External Measurements

Test Date: 5/10/12

ATD Serial No.: 035

Test I.D.: N/A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.22	Pass
Laboratory Relative Humidity	%	10 to 70	30.0	Pass
A - Total sitting height	mm	879 to 889	884	Pass
B - Shoulder pivot height	mm	505 to 521	515	Pass
C - H point height	mm	84 to 89	86	Pass
D - H point location from backline	mm	135 to 140	138	Pass
E - Shoulder pivot from backline	mm	84 to 94	89	Pass
F - Thigh clearance	mm	140 to 155	147	Pass
G - Back of elbow to wrist pivot	mm	290 to 305	298	Pass
H - Head back to backline	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	335	Pass
J - Elbow rest height	mm	190 to 211	200	Pass
K - Buttock to knee length	mm	579 to 604	586	Pass
L - Popliteal length	mm	429 to 455	438	Pass
M - Knee pivot height	mm	485 to 500	493	Pass
N - Buttock popliteal length	mm	452 to 477	472	Pass
O - Chest depth without jacket	mm	213 to 229	225	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	433	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference (with chest jacket)	mm	970 to 1001	985	Pass
Z - Waist circumference	mm	836 to 866	865	Pass
AA - Location for chest circumference	mm	429 to 434	431	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
Overall Test Results				Pass

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

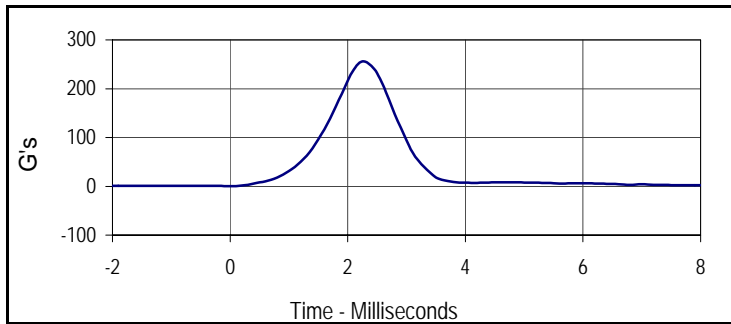
Test Date: 5/10/12

ATD Serial No.: 035

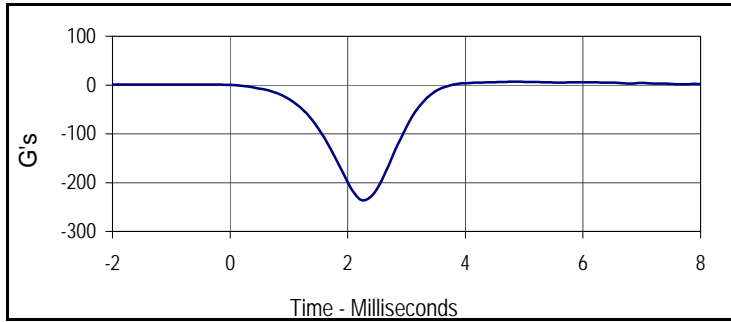
Test I.D.: M035HD038



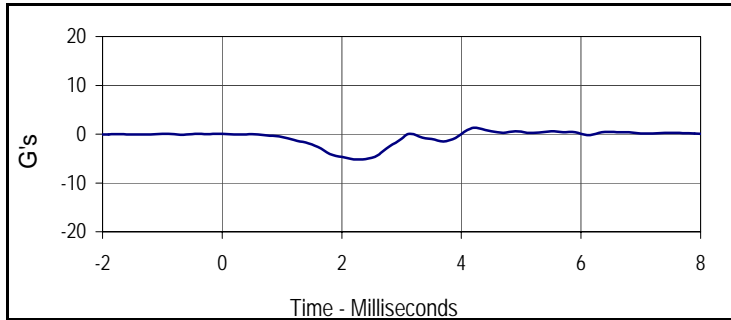
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	250	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.4	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	255.7	Pass
Peak Lateral Acceleration	G's	≤15.0	5.2	Pass
Oscillations After Main Pulse	%	<10% of peak Res. Acceleration	3.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



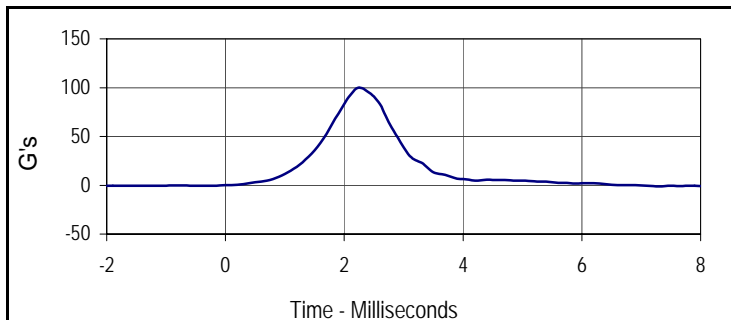
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
255.7	2.3	0.1	0.0



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
6.6	4.8	-235.4	2.3



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
1.3	4.2	-5.2	2.3



Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
99.6	2.3	-0.6	-1.2

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

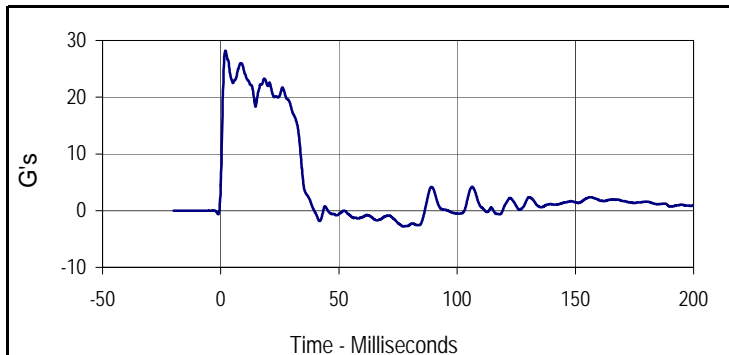
Test Date: 5/10/12

ATD Serial No.: 035

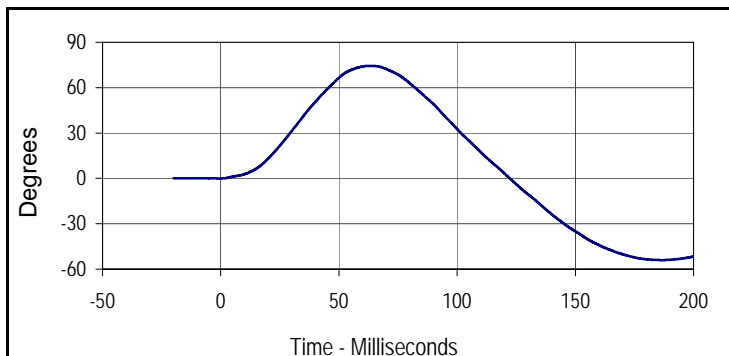
Test I.D.: M035NF038



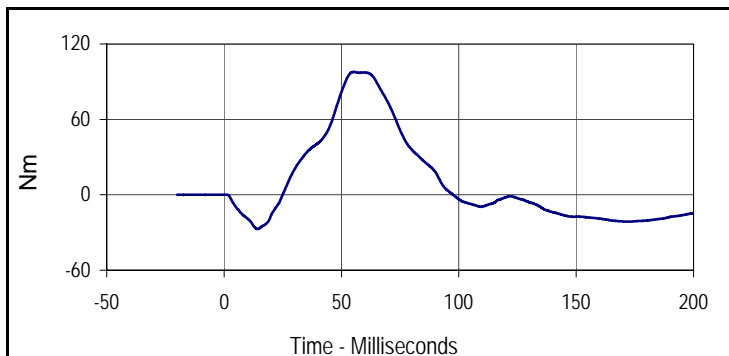
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	290	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.1	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.3	Pass	
Pendulum Velocity	m/s	6.89 to 7.13	7.02	Pass	
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	24.3	Pass
	20 Msec.	G's	17.6 to 22.6	22.0	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	34.9	Pass	
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	74.4	Pass
	Time	Msec.	57.0 to 64.0	63.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing	Msec.	113.0 to 128.0	122.3	Pass	
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	97.8	Pass
	Time	Msec.	47.0 to 58.0	55.4	Pass
Positive Moment Decay, Time To Zero Crossing	Msec.	97.0 to 107.0	97.6	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
28.2	2.0	-2.8	77.3



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
74.4	63.3	-54.0	186.8



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
97.8	55.4	-27.3	14.1

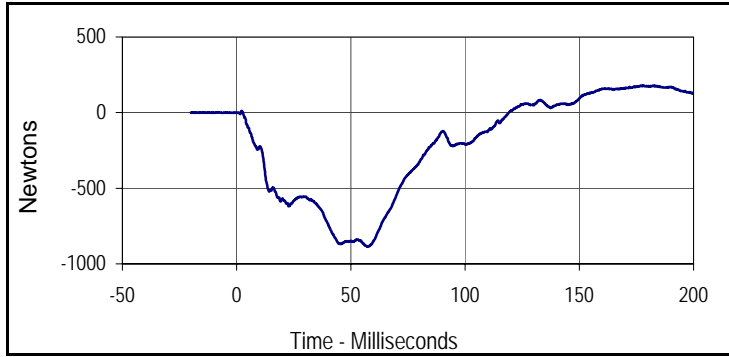
Test Program: Hybrid III 50th Percentile Male Neck Flexion Test

Test Date: 5/10/12

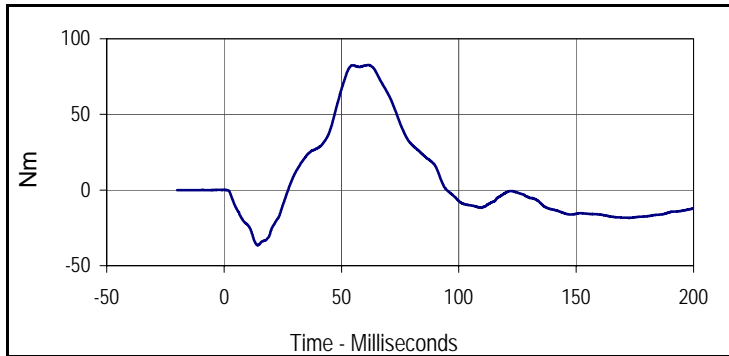


ATD Serial No.: 035

Test I.D.: M035NF038



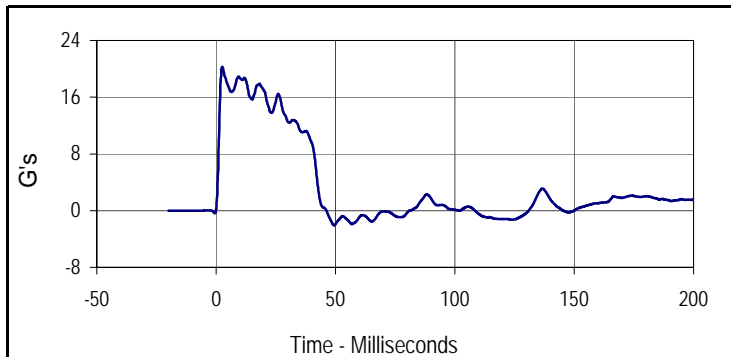
Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
181.2	177.9	-885.9	57.7



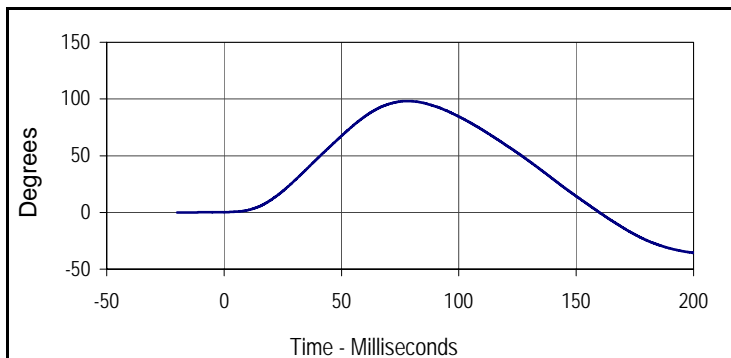
Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
82.6	61.7	-36.5	14.2



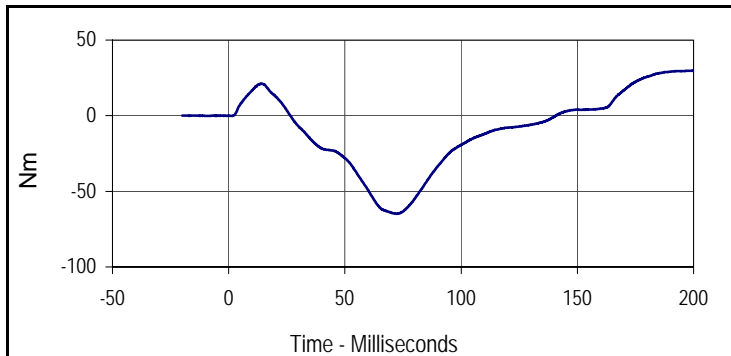
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	310	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	20.9	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	30.1	Pass	
Pendulum Velocity	m/s	5.94 to 6.19	6.07	Pass	
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.7	Pass
	20 Msec.	G's	14.0 to 19.0	16.9	Pass
	30 Msec.	G's	11.0 to 16.0	12.5	Pass
Peak Pendulum Decel. after 30 Msec.	G's	≤ 22.0	12.8	Pass	
Deceleration Decay, Time to Cross 5 G's	Msec.	38.0 to 46.0	42.1	Pass	
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	98.2	Pass
	Time	Msec.	72.0 to 82.0	78.0	Pass
"D" Plane Rotation Decay, Time To Zero Crossing	Msec.	147.0 to 174.0	159.9	Pass	
Moment About Occ. Condyle	Max	Nm	-52.9 to -79.9	-64.8	Pass
	Time	Msec.	65.0 to 79.0	72.4	Pass
Positive Moment Decay, Time To Zero Crossing	Msec.	120.0 to 148.0	140.8	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
20.3	2.6	-2.1	49.4



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
98.2	78.0	-35.6	200.0



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
29.8	198.7	-64.8	72.4

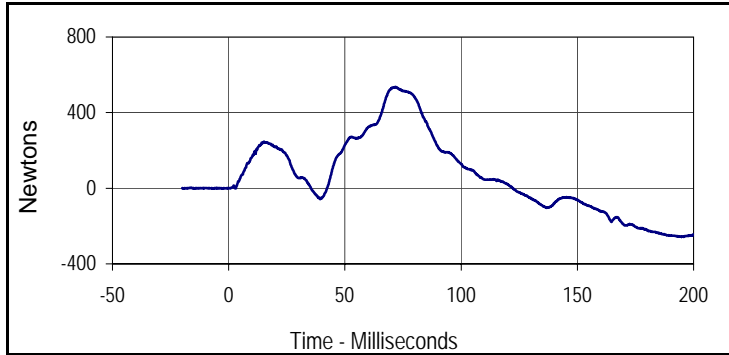
Test Program: Hybrid III 50th Percentile Male Neck Extension Test

Test Date: 5/10/12

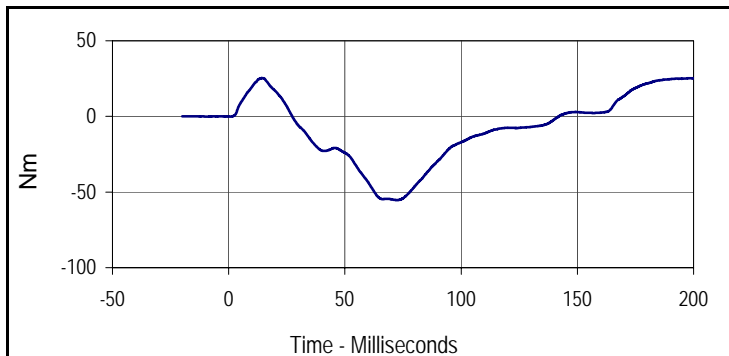


ATD Serial No.: 035

Test I.D.: M035NE038



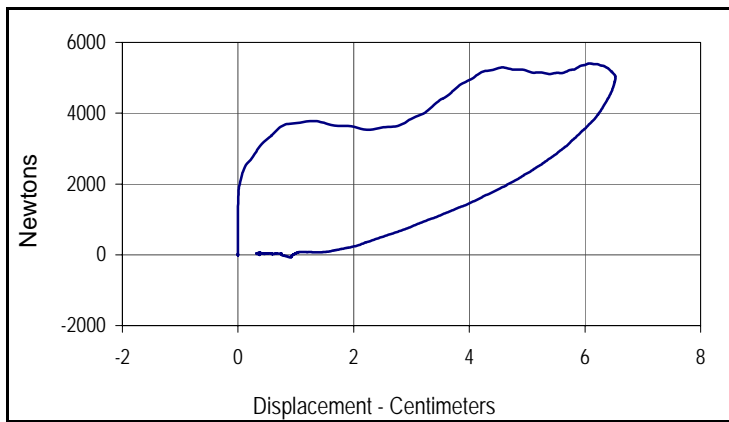
Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
536.5	71.6	-258.0	195.8



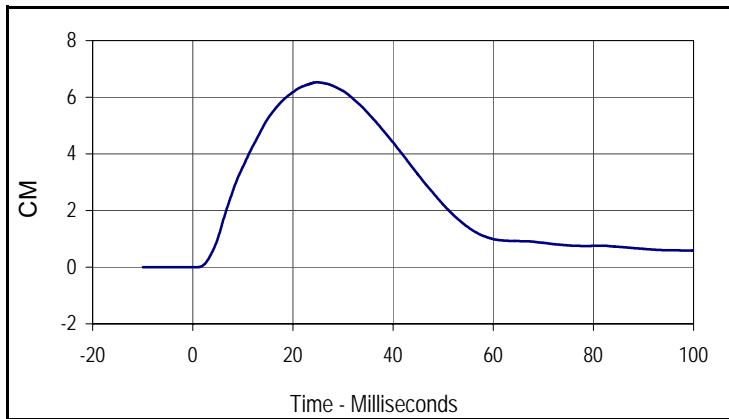
Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
25.4	14.2	-55.4	72.4



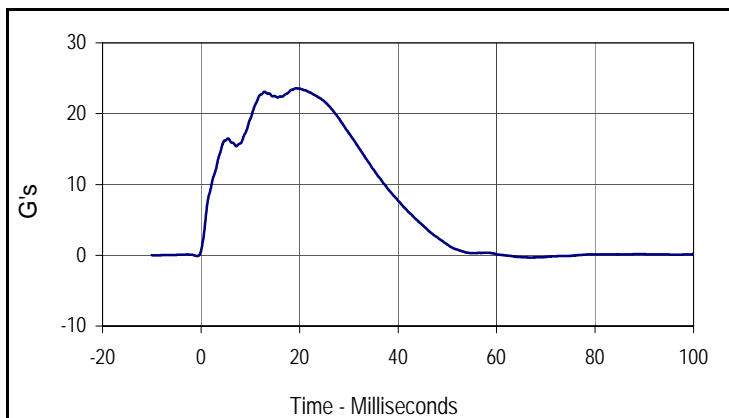
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	370	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.2	Pass
Probe Velocity		m/s	6.58 to 6.82	6.69	Pass
Peak Probe Force		Newtons	5159 to 5893	5406	Pass
Peak Sternum Deflection		CM	6.35 to 7.26	6.53	Pass
Internal Hysteresis		%	69 to 85	69.1	Pass
Overall Test Results					Pass



Curve Description			
Probe Force vs. Chest Deflection			
Plot No.	Type	SAE Class	Hysteresis
001	FIL	180	69.1
Peak Probe Force		Peak Chest Deflection	
5406		6.53	



Curve Description			
Chest Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	180	CM
Max	Time	Min	Time
6.5	24.9	0.0	0.5



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
23.6	19.3	-0.3	66.6

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

Test Date: 5/10/12

ATD Serial No.: 035

Test I.D.: M035LK038, M035RK038



Left Knee

Tested Parameter	Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time	Minutes	≥240	330	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5047	Pass
Overall Test Results				Pass

Right Knee

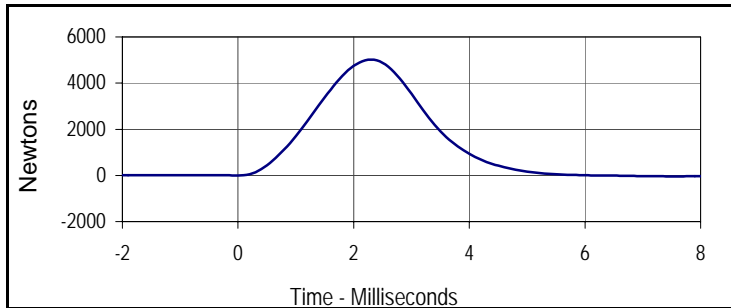
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5015	Pass
Overall Test Results				Pass



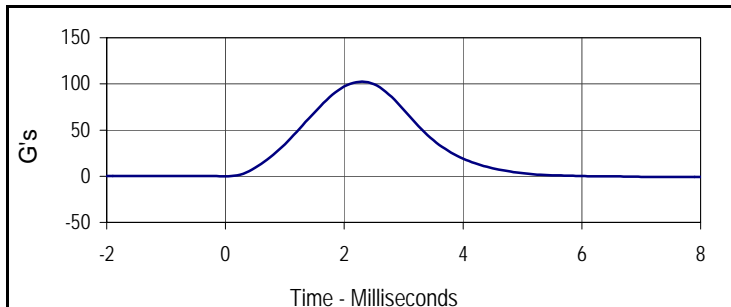
Curve Description			
Left Knee Probe Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5047.2	2.2	-27.4	7.4



Curve Description			
Left Knee Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	600	G's
Max	Time	Min	Time
103.2	2.2	-0.6	7.4



Curve Description			
Right Knee Probe Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
5014.5	2.3	-39.8	7.5



Curve Description			
Right Knee Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	600	G's
Max	Time	Min	Time
102.5	2.3	-0.8	7.5

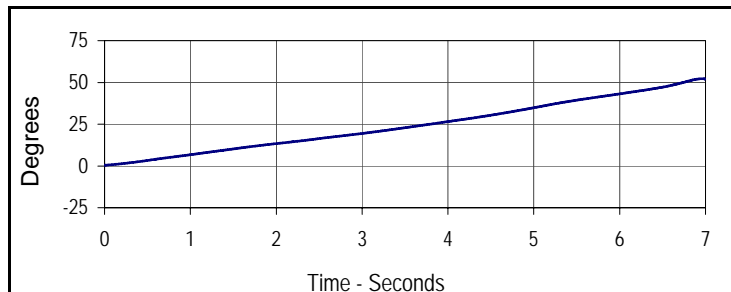


Left Hip Joint-Femur Results

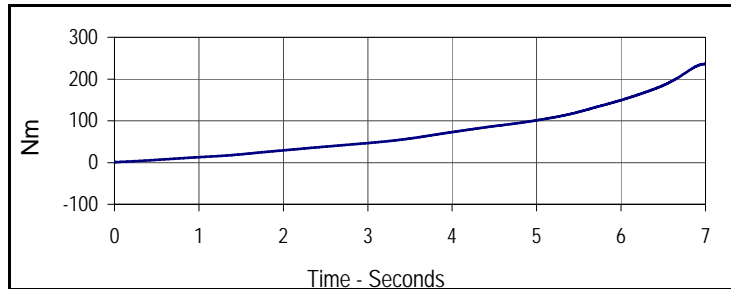
Tested Parameter	Units	Specification	Result	Pass/Fail
Hip Joint-Femur Assembly Soak Time	Minutes	≥240	405	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.5	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Rotation Rate	deg/sec	5 to 10	7.5	Pass
Femur Torque at 30°	Nm	≤ 95	86.2	Pass
Rotation at 203 Nm	Degrees	40.0 to 50.0	49.1	Pass
Overall Test Results				Pass

Right Hip Joint-Femur Results

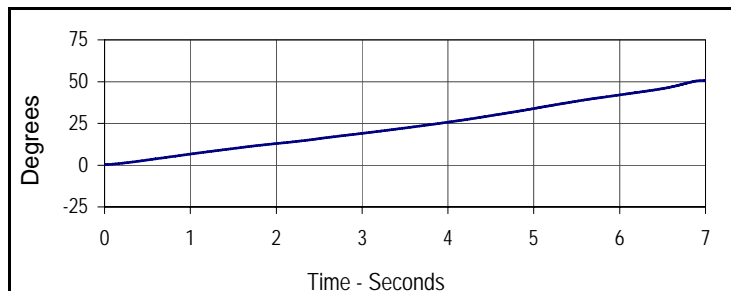
Rotation Rate	deg/sec	5 to 10	7.3	Pass
Femur Torque at 30°	Nm	≤ 95	88.5	Pass
Rotation at 203 Nm	Degrees	40.0 to 50.0	47.4	Pass
Overall Test Results				Pass



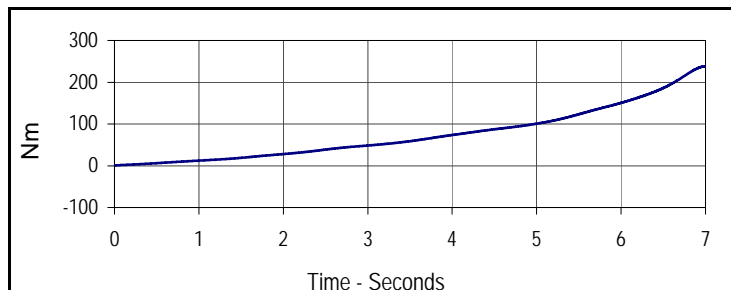
Curve Description			
Left Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
001	FIL	60	Degrees
Max	Time	Min	Time
52.2	7.0	0.4	0.0



Curve Description			
Left Femur Torque			
Plot No.	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
236.1	7.0	1.0	0.0



Curve Description			
Right Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
50.7	7.0	0.2	0.0



Curve Description			
Right Femur Torque			
Plot No.	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
237.6	7.0	1.0	0.0

Test Program: Hybrid III 5th Percentile Female Dummy Damage Checklist

Test Date: 5/10/12

ATD Serial No.: 141

Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

Describe the repair on repair or replacement of parts:

Test Program: Hybrid III 5th Percentile Female External Measurements

Test Date: 5/10/12

ATD Serial No.: 141

Test I.D.: N/A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.28	Pass
Laboratory Relative Humidity	%	10 to 70	30.2	Pass
A - Total sitting height	mm	774.7 to 800.1	780	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	452	Pass
C - H point height	mm	81.3 to 86.3	84	Pass
D - H point location from backline	mm	144.8 to 149.8	146	Pass
E - Shoulder pivot from backline	mm	68.6 to 83.8	78	Pass
F - Thigh clearance	mm	119.4 to 134.6	125	Pass
G - Back of elbow to wrist pivot	mm	243.9 to 259.1	250	Pass
H - Head back to backline	mm	40.7 to 45.7	44	Pass
I - Shoulder to elbow length	mm	276.8 to 297.2	285	Pass
J - Elbow rest height	mm	182.8 to 203.2	194	Pass
K - Buttock to knee length	mm	520.7 to 546.1	530	Pass
L - Popliteal length	mm	355.6 to 376.0	372	Pass
M - Knee pivot height	mm	393.7 to 419.1	399	Pass
N - Buttock popliteal length	mm	414.0 to 439.4	420	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	186	Pass
P - Foot length	mm	218.5 to 233.7	221	Pass
R - Buttock to Knee Pivot Length	mm	457.2 to 482.6	475	Pass
S - Head Breadth	mm	137.1 to 147.3	144	Pass
T - Head Depth	mm	177.8 to 188.0	180	Pass
U - Hip Breadth	mm	299.7 to 314.9	302	Pass
V - Shoulder breadth	mm	350.5 to 365.7	359	Pass
W - Foot breadth	mm	78.8 to 94.0	90	Pass
X - Head circumference	mm	528.3 to 548.7	541	Pass
Y - Chest circumference (with chest jacket)	mm	850.8 to 881.3	861	Pass
Z - Waist circumference	mm	759.5 to 789.9	766	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	300	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	164	Pass
Overall Test Results				Pass

Test Program: Hybrid III 5th Percentile Female Head Drop Test

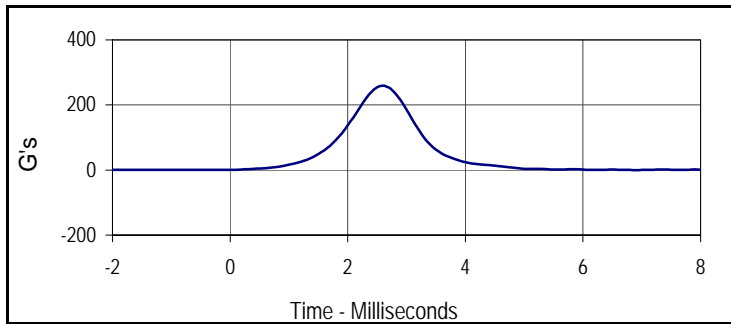
Test Date: 5/10/12

ATD Serial No.: 141

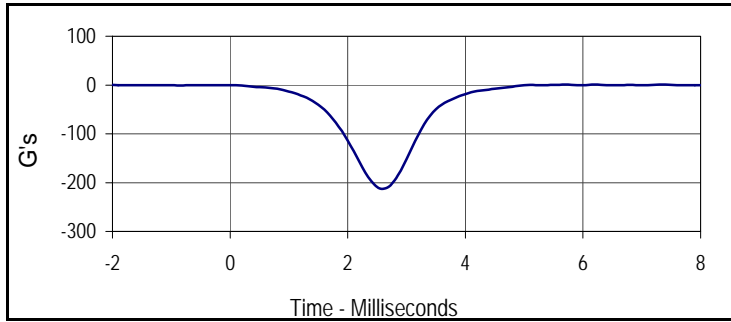
Test I.D.: F141HD040



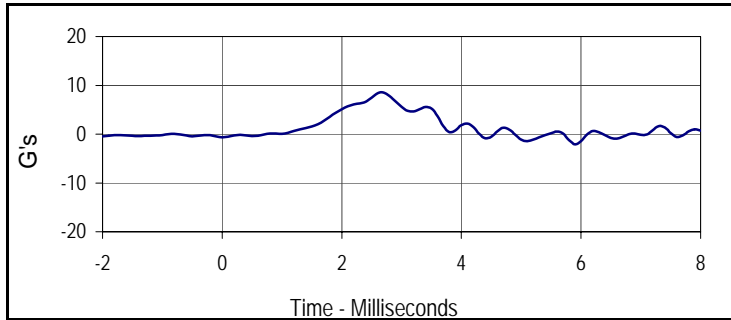
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	245	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Peak Resultant Acceleration	G's	250.0 to 300.0	259.3	Pass
Peak Lateral Acceleration	G's	≤15.0	8.6	Pass
Oscillations After Main Pulse	%	<10% of peak Res. Acceleration	0.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



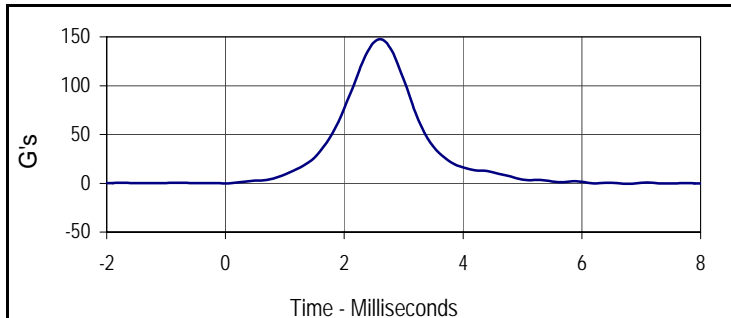
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
259.3	2.6	0.4	-1.9



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.7	5.7	-213.1	2.6



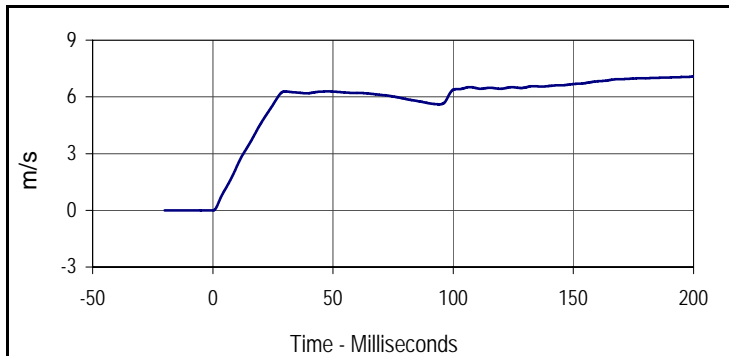
Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
8.6	2.7	-2.1	5.9



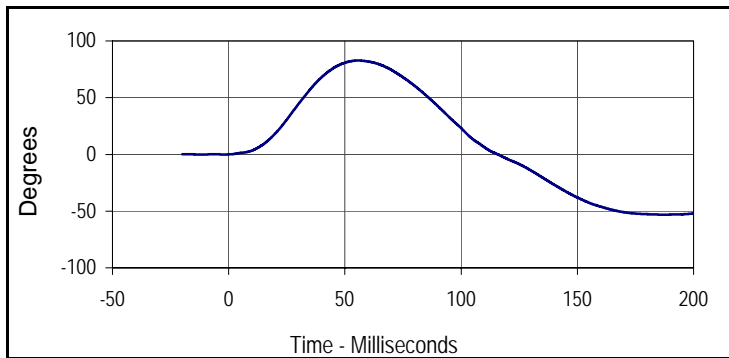
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
147.5	2.6	-0.1	0.0



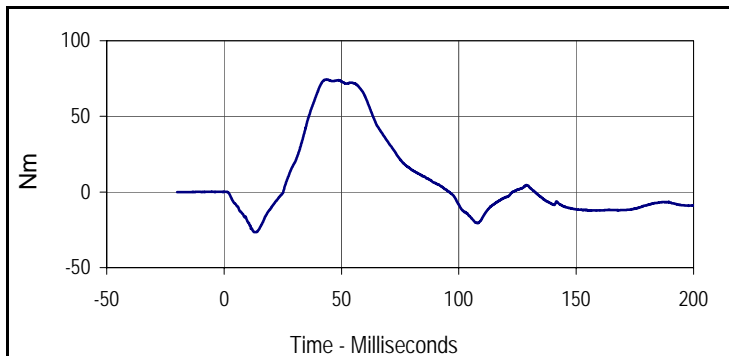
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	270	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.3	Pass	
Pendulum Velocity	m/s	6.89 to 7.13	7.07	Pass	
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.3	Pass
	20 Msec.	m/s	4.0 to 5.0	4.6	Pass
	30 Msec.	m/s	5.8 to 7.0	6.3	Pass
"D" Plane Rotation	Max	Degrees	77.0 to 91.0	82.7	Pass
Peak Moment in Rotation	Max	Nm	69.0 to 83.0	73.9	Pass
Positive Moment Decay, Time To 10 Nm	Msec.	80.0 to 100.0	83.8	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
7.1	200.0	0.0	-0.2



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
82.7	55.7	-53.1	186.7



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
74.3	44.0	-26.6	12.9

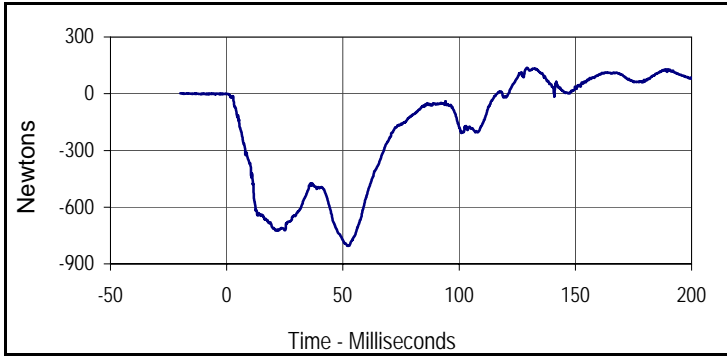
Test Program: Hybrid III 5th Percentile Female Neck Flexion Test

Test Date: 5/10/12

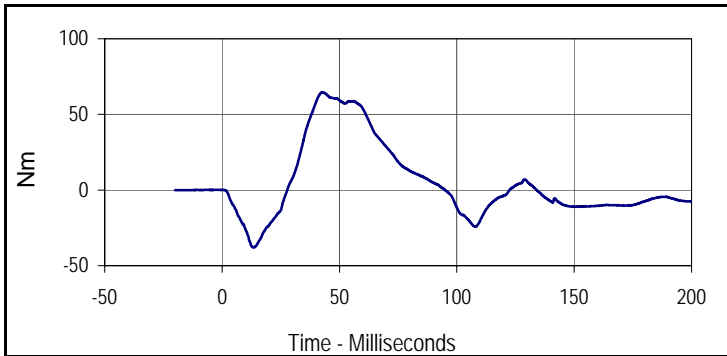


ATD Serial No.: 141

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Curve Description			
Upper Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
137.3	129.2	-804.6	52.3



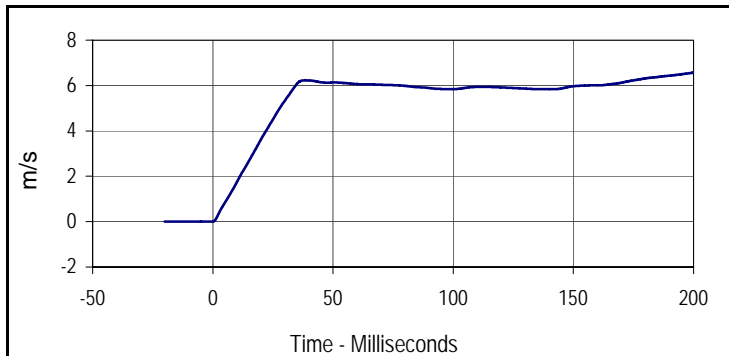
Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
64.6	42.9	-38.0	13.4

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

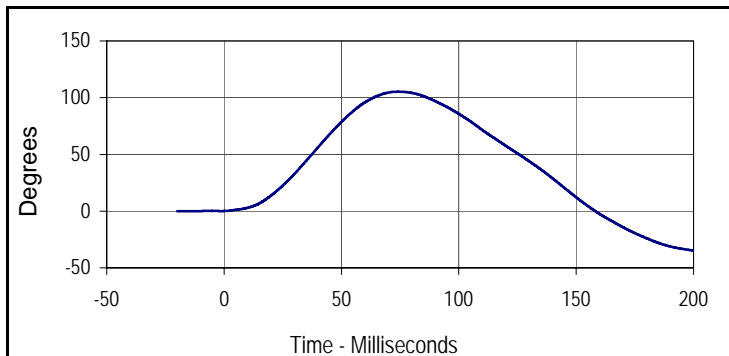
Test Date: 5/10/12
 Test I.D.: F141NE040



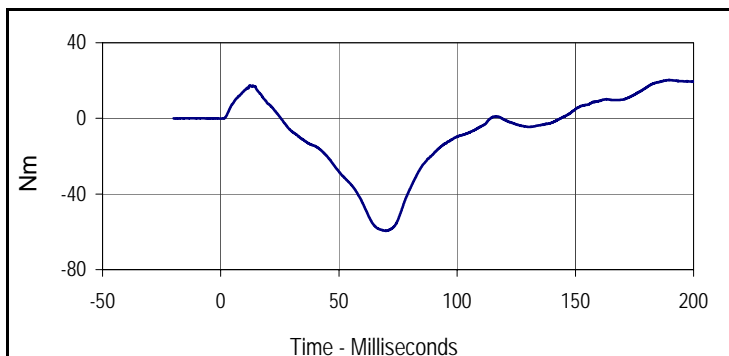
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	350	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.5	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass	
Pendulum Velocity	m/s	5.95 to 6.19	6.09	Pass	
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.7	Pass
	20 Msec.	m/s	3.1 to 3.9	3.6	Pass
	30 Msec.	m/s	4.6 to 5.6	5.3	Pass
"D" Plane Rotation	Max	Degrees	99.0 to 114.0	105.3	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-59.5	Pass
Positive Moment Decay, Time To -10 Nm	Msec.	94.0 to 114.0	99.5	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
6.6	200.0	0.0	-0.6



Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degrees
Max	Time	Min	Time
105.3	74.0	-34.7	200.0



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
20.3	189.7	-59.5	69.9

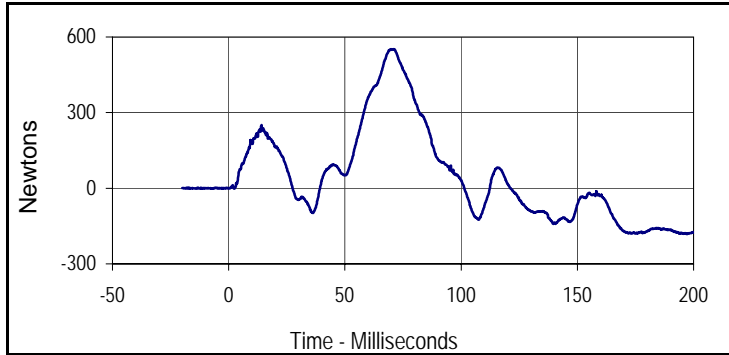
Test Program: Hybrid III 5th Percentile Female Neck Extension Test

Test Date: 5/10/12

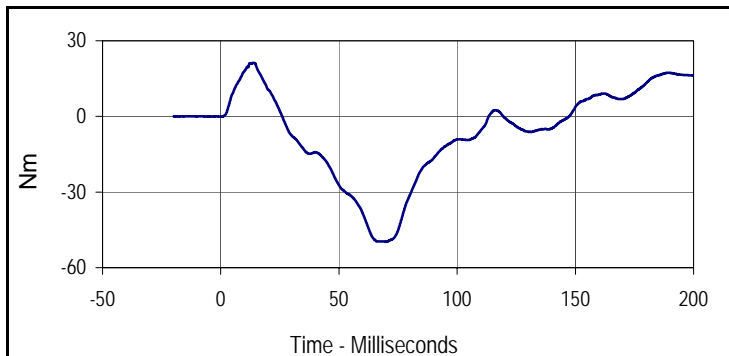


ATD Serial No.: 141

Test I.D.: F141NE040



Curve Description			
Upper Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	Newtons
Max	Time	Min	Time
551.4	69.8	-182.1	197.2



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
21.3	13.6	-49.7	69.9

Test Program: Hybrid III 5th Percentile Female Thorax Impact Test

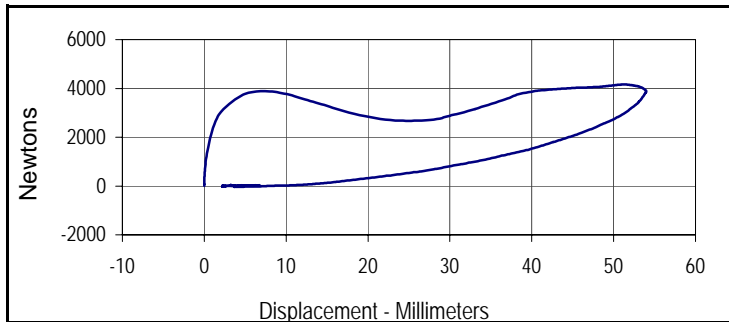
Test Date: 5/10/12

ATD Serial No.: 141

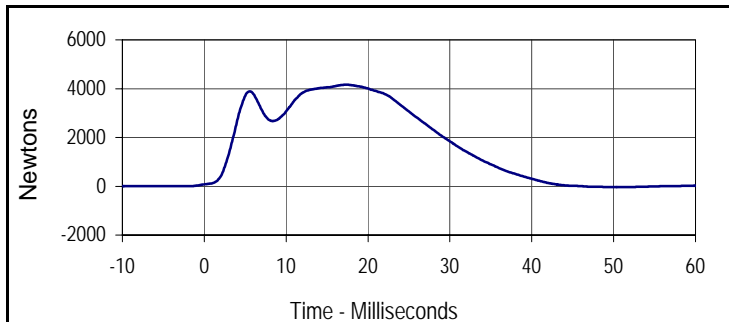
Test I.D.: F141CH040



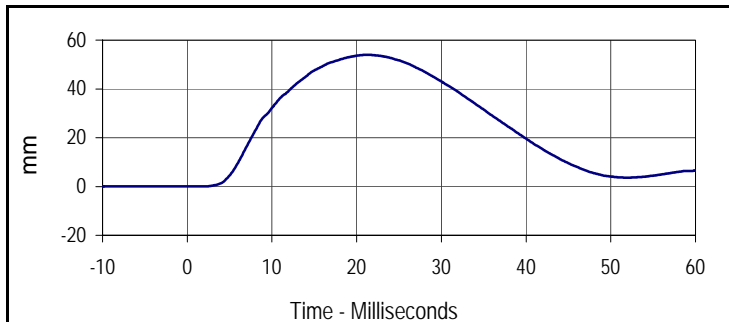
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	410	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Probe Velocity	m/s	6.59 to 6.83	6.68	Pass
Peak Chest Deflection	mm	50.0 to 58.0	54.0	Pass
Peak Force Between 50 and 58 MM	Newtons	3900 to 4400	4125	Pass
Peak Force Between 18 and 50 MM	Newtons	≤4600	4160	Pass
Internal Hysteresis	%	69 to 85	71.8	Pass
Overall Test Results				Pass



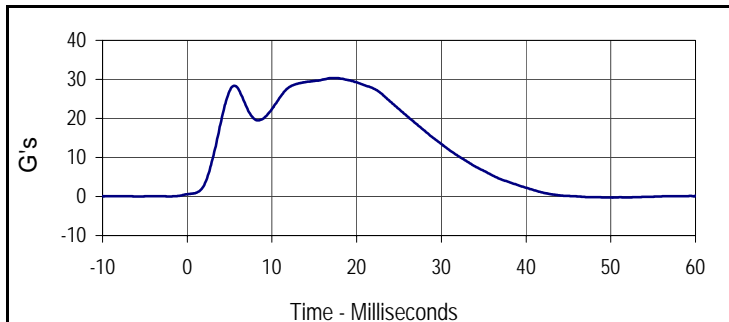
Curve Description			
Probe Force vs. Chest Deflection			
Plot No.	Type	SAE Class	Hysteresis
001	FIL	180	71.8
Peak Probe Force		Peak Chest Deflection	
4159.9		54.0	



Curve Description			
Probe Force			
Plot No.	Type	SAE Class	Units
002	FIL	180	Newtons
Max	Time	Min	Time
4159.9	17.4	-35.0	49.9



Curve Description			
Chest Deflection			
Plot No.	Type	SAE Class	Units
003	FIL	600	mm
Max	Time	Min	Time
54.0	21.1	0.0	-10.0



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
30.4	17.4	-0.3	49.9

Test Program: Hybrid III 5th Percentile Female Knee Impact Test

Test Date: 5/10/12

ATD Serial No.: 141

Test I.D.: F141LK040, F141RK040

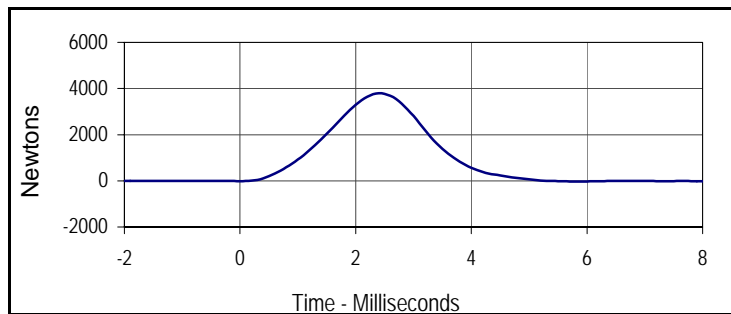


Left Knee

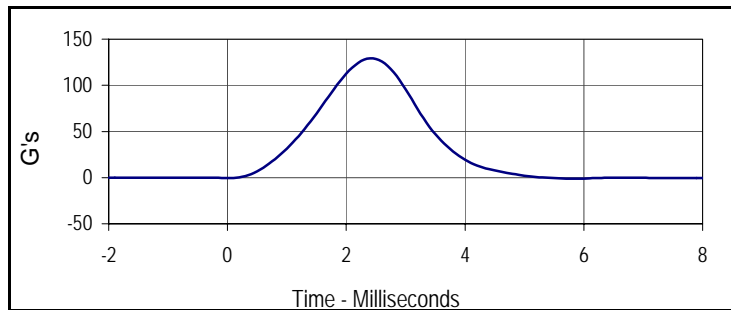
Tested Parameter	Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time	Minutes	≥240	430	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.5	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	3450 to 4060	3791	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	3825	Pass
Overall Test Results				Pass



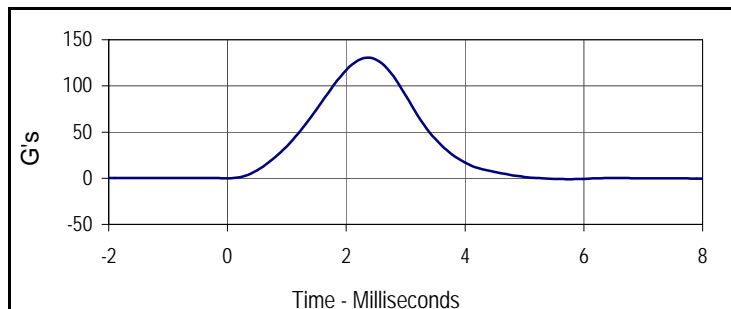
Curve Description			
Left Knee Probe Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3790.5	2.4	-32.0	5.9



Curve Description			
Left Knee Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	600	G's
Max	Time	Min	Time
129.3	2.4	-1.1	5.9



Curve Description			
Right Knee Probe Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
3824.6	2.4	-29.3	5.8



Curve Description			
Right Knee Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	600	G's
Max	Time	Min	Time
130.5	2.4	-1.0	5.8

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

Test Date: 5/10/12

ATD Serial No.: 141

Test I.D.: F141TF040



Left Hip Joint-Femur Results

Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	440	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.9	Pass
Initial Reference Plane Angle		Degrees	≤ 20	2.7	Pass
Peak Force at 45° +/-0.5°		Newtons	320.0 to 390.0	357.0	Pass
Torso Rotation Rate		deg/sec	0.5 to 1.5	1.1	Pass
Final Reference Plane Angle		Degrees	+/-8	-0.9	Pass
Overall Test Results					Pass