

REPORT NUMBER: SPNCAP-KAR-12-066

**NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST**

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

NHTSA No: MC0520

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



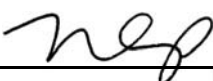
MAY 23, 2012

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Approval Date: May 23, 2012

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

Date: 


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

Date: 

TECHNICAL REPORT DOCUMENTATION PAGE

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15. Supplementary Notes																														
16. Abstract A 32.2 km/h (20 mph) 75 deg. oblique impact Side NCAP Test was conducted on the subject 2012 BMW 328i 4-door sedan in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on May 10, 2012. The impact velocity was 31.9 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 31.1 deg. C. The target vehicle's maximum post-test static crush was 427 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (ES-2re)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>290.7</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>37.9</td> </tr> <tr> <td>Total Pelvic Force (Sum of Acetabular and Iliac Forces)</td> <td>N</td> <td>5525</td> <td>2281</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>20</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45</td> <td>18</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches. The opposite doors did not open during the side impact event.				Measurement Description	Driver ATD (ES-2re)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	290.7	Resultant Lower Spine Acceleration	g	82	37.9	Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2281	Maximum Thoracic Rib Deflection	mm	38	20	Maximum Abdominal Rib Deflection	mm	45	18
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17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Admin. Technical Reference Division 1200 New Jersey Ave., SE Room W43-410 Washington, DC 20590																												
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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test is part of the MY 2012 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-09-D-00122. The purpose of this test is to generate comparative side impact performance in a 2012 BMW 328i 4-door sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated August 2011.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2012 BMW 328i 4-door sedan. The subject vehicle was towed into the rigid pole at an angle of 74.4° and a velocity of 31.9 km/h. The test was conducted by KARCO Engineering, LLC. in Adelanto, California on May 10, 2012. Pre- and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated August 2011. Camera locations and other pertinent camera information are included in this report.

The Part 572V (SID-IIs) was instrumented accordingly:

- Head CG tri-axial accelerometers
- Thorax upper, middle and lower rib displacement potentiometers
- Abdomen upper and lower rib displacement potentiometers
- Lower spine (12) tri-axial accelerometers
- Iliac load cell
- Acetabulum load cell

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

Injury readings for the SID-IIs dummy were recorded as follows:

Measurement Description	Units	Passenger ATD (SID-IIs)	
		IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	290.7
Lower Spine (T12) Resultant Acceleration	g	82	38
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2281
Maximum Thoracic Rib Deflection	mm	38*	20
Maximum Abdominal Rib Deflection	mm	45*	18

*Proposed IARV

Supplemental restraint information is given below:

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

GENERAL COMMENTS

Both the front and rear doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. Both doors on the non-struck side remained closed and latched. There were no ATD values that exceeded limits.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

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. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MC0520
Model Year	2012
Make	BMW
Model	328i
Body Style	4-Door Sedan
VIN	WBA3A5C58CF258473
Body Color	Mineral Grey Metallic
Odometer Reading (km / mi)	309 / 192
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	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
All Wheel Drive (AWD)	No

Traction Control System (TCS)	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
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
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	Jan-12
Vehicle Type	Passenger

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

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

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

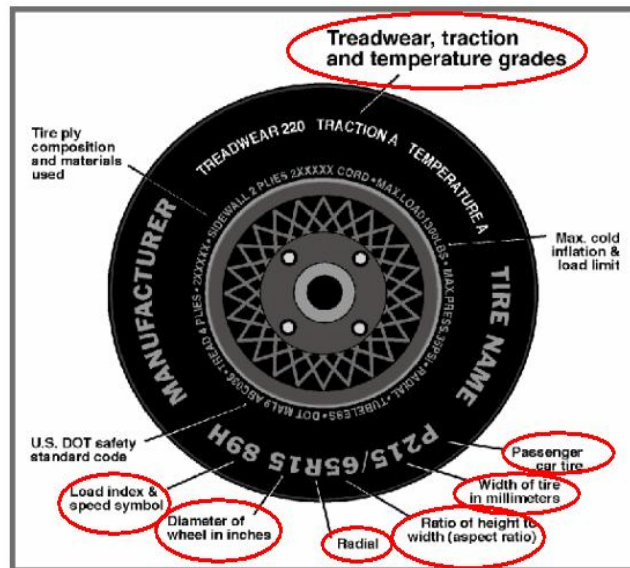
VEHICLE SEAT TYPE

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	220	220
Recommended Tire Size	P255/50R17	P255/50R17

VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Tire Size on Vehicle	P225/50R17	P225/50R17
Tire Manufacturer	Pirelli	Pirelli
Tire Name	Cinturato P7	Cinturato P7
Tire Type	Passenger	Passenger
Tire Width	225	225
Aspect Ratio	50	50
Radial	Yes	Yes
Wheel Diameter	17	17
Load Index/Speed Symbol	94V	94V
Treadware	500	500
Traction Grade	A	A
Temperature Grade	A	A
Tire Material	Rayon, Steel, Polyamide	Rayon, Steel, Polyamide

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	200	210	220	210
Tire Placard	kPa	220	220	220	220
Owner's Manual	kPa	220	220	220	220
As Tested	kPa	220	220	220	220

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	372.5	376.5		391.0	426.0		382.5	434.0	
Right	kg	388.0	383.0		399.0	415.5		388.0	432.5	
Ratio	%	50.0%	50.0%	100.0%	48.4%	51.6%	100.0%	47.1%	52.9%	100.0%
Total	kg	760.5	759.5	1520.0	790.0	841.5	1631.5	770.5	866.5	1637.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1520.0	A
Actual Weight of 1 P572 O ATD Used	kg	49.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	69.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1638.8	A+B+C

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e.

Calculated Test Vehicle Target Weight -4.5 kg to -9.0 kg)? ☒ Yes ☐ No

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Rear Bumper Cover	4.5
Tail Lights	2.0
Right Outboard Mirror	1.5
Right Side Door Panels and Glass	17.0
Trunk Liner	4.5
Ballast / Equipment Added	89.9

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

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	As Delivered	As Tested	Fully Loaded	Meets Requirement***
Driver Door Sill Angle (front-to-rear)*	°	-0.5	-0.5	-0.1	Yes
Front Passenger Sill Angle (front-to-rear)*	°	-0.6	-0.2	-0.2	Yes
Front Bumper-Line Angle (left-to-right)**	°	0.0	0.0	-0.1	Yes
Rear Bumper-Line Angle (left-to-right)**	°	-0.1	0.1	0.2	Yes
Vehicle CG (Aft of Front Axle)	mm	1406	1451	1489	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	-11	1	-2	

*ND=Nose Down (-), NU=Nose Up (+)

**LD=Left Down (-), LU=Left Up (+)

***The "As Tested" vehicle attitude angle measurements must be within "As Delivered" and the "Fully Loaded" vehicle attitude measurements at each location. Indicate "Yes" or "No" for "Meets Requirement"

DATA SHEET NO. 2**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

SEAT POSITIONING

The driver's seat is set to the forward most position where the ATD will not contact any interior panels at the mid-height and mid-angle position. The front center seat (if applicable) and right front passenger's seat should be set in a similar manner as the driver's seat. The struck side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rearmost, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	4.0	0.0	2.0
Front Passenger Seat	5	0	2.5
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle	As Tested SCRP Height	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	2.0	508	Max	480	493	508
			Mid	480	493	508
			Min	480	493	508
Front Passenger Seat	2.5	497	Max	473	485	497
			Mid	473	485	497
			Min	473	485	497
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed to LR	Fixed to LR	Max	Fixed to LR	Fixed to LR	Fixed to LR
			Mid	Fixed to LR	Fixed to LR	Fixed to LR
			Min	Fixed to LR	Fixed to LR	Fixed to LR

DATA SHEET NO. 2 ... (CONTINUED)**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**

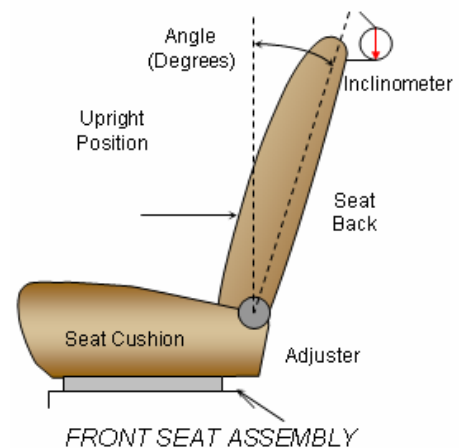
Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	248	37	0	0
Front Passenger Seat	248	37	0	0
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

SEAT BACK ADJUSTMENT

The driver's seat back is positioned such that the dummy's head is level. The right front passenger seat back is set to the same angle as the driver's seat.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/Seated Dummy	71.9	30	13.7	0
Front Passenger Seat	74.2	31	13.7	0
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. The positions are marked H, M1, ... , L from top to bottom.

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

DATA SHEET NO. 2 ... (CONTINUED)**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12**HEAD RESTRAINT ADJUSTMENT**

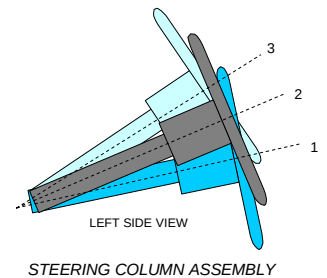
The driver's head restraint is adjusted to the lowest and most full forward in-use position.

	Total No. of Positions	Placed in Position
Driver Seat	3 Vertical, 3 Tilt	Full Down, Full Forward

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of the geometric locus it describes when it moves through its full range of motion.

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	21.7	125
Geometric Center - Position 2	19.9	97
Uppermost - Position 3	18.2	68
Telescoping Steering Wheel Travel		57
Test Position	19.9	97



DATA SHEET NO. 2 ... (CONTINUED)**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA**

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

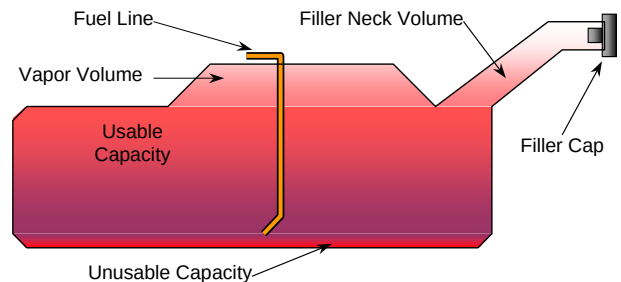
FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	59.80
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	55.62
Actual amount of Solvent Used in Test	55.63
1/3 of Usable Capacity	19.93

Is the Actual Amount of Solvent Used in the test equal to $93\% \pm 1\%$ of the Usable Capacity stated in the Form No. 1? ☒ **Yes** ☐ **No**

FUEL PUMP

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

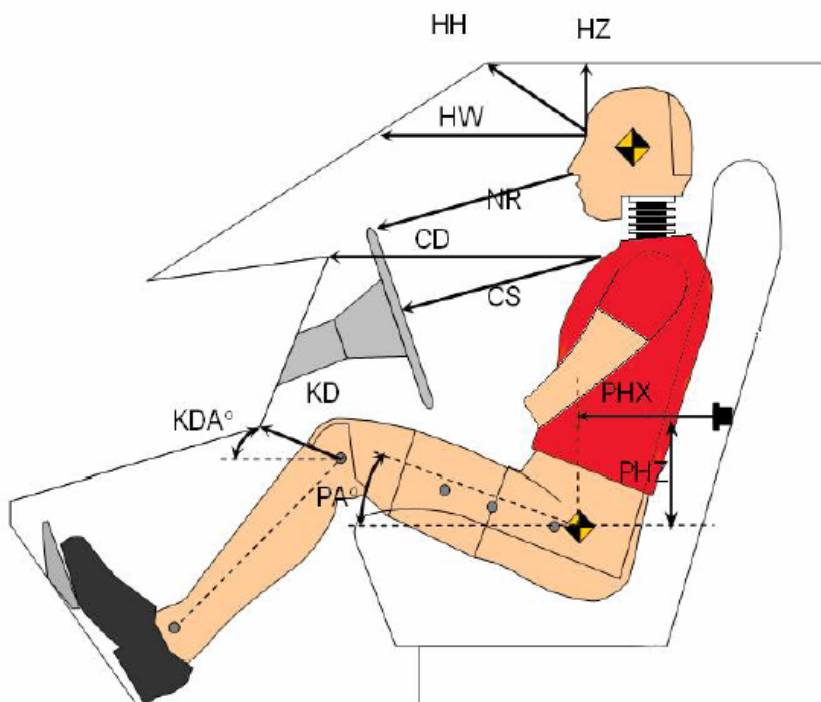


VEHICLE FUEL TANK ASSEMBLY

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



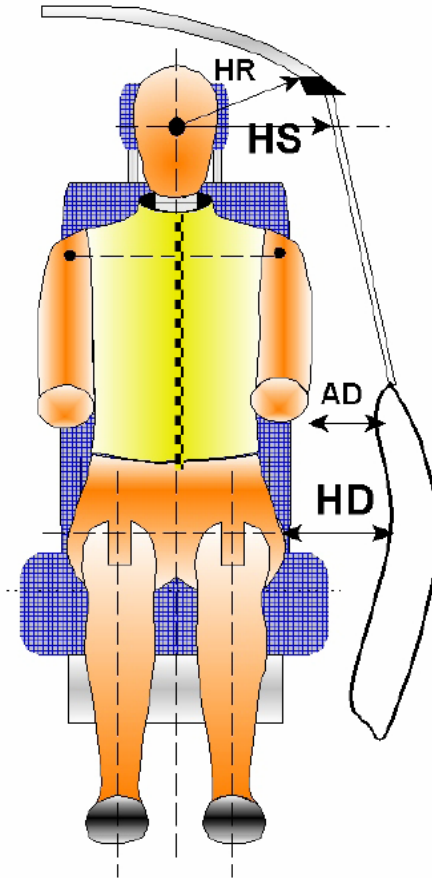
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	241	
HW	Head to Windshield	520	
HZ	Head to Roof	189	
NR	Nose to Rim	223	
CD	Chest to Dash	398	
CS	Chest to Steering Wheel	164	
KD(L)/KDA(L)°	Left Knee to Dash	146	32.5
KD(R)/KDA(R)°	Right Knee to Dash	128	32.8
PAX°	Pelvic Tilt Angle (x-axis)		20.7
PAY°	Pelvic Tilt Angle (y-axis)		0.2
PHX	Hip Point to Striker (x-axis)	315	
PHZ	Hip Point to Striker (z-axis)	258	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



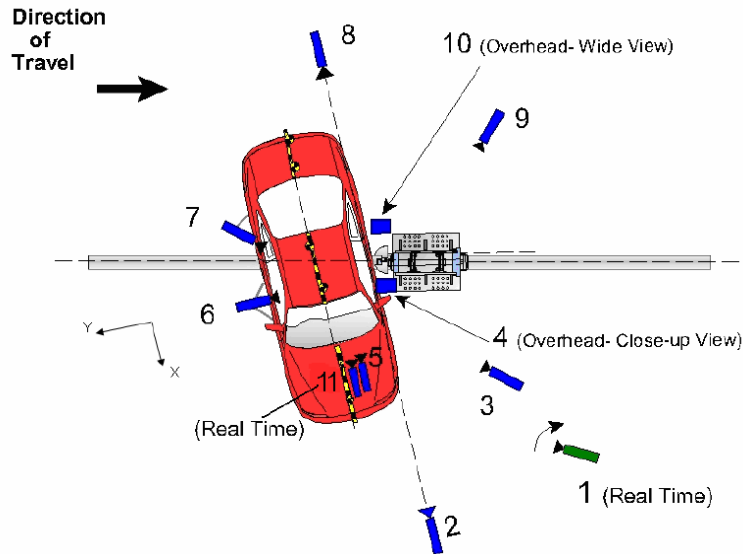
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	230
HS	Head to Side Window	mm	342
AD	Arm to Door	mm	167
HD	H-Point to Door	mm	170

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



CAMERA LOCATIONS AND DATA

Camera No.	View	Coordinates (m)			Lens (mm)	Film Speed (fps)
		X*	Y*	Z*		
1	Real Time Pan View of Impact	8.89	46.57	-3.04		30
2	Front Ground Level - Impact View	8.34	-0.05	-0.93	24	1000
3	Impact Side 45° - Forward Pole View	4.10	-2.15	-1.15	8.5	1000
4	Overhead Close-Up View of Impact	0.00	0.00	-5.79	12.5	1000
5	On-Board - Dummy Front View	1.31	0.49	-1.32	35	1000
6	On-Board - Dummy Side View	0.00	1.59	-1.04	14	1000
7	On-Board - Dummy Rear Oblique View	-0.87	1.57	-1.06	20	1000
8	Rear Ground Level - Impact View	-6.12	-6.23	-0.96	24	1000
9	Impact Side 45° - Rearward Pole View	-8.02	0.04	-1.01	35	1000
10	Overhead Wide View of Impact	-0.06	0.22	-5.79	14	1000
11	Real Time Dummy Front View	1.33	0.52	-1.32		30

Reference from Point of Impact for X and Y; from Ground for Z):

+X = Forward of Vehicle, +Y = Right of Vehicle, +Z = Down

*All measurements accurate to ± 6 mm

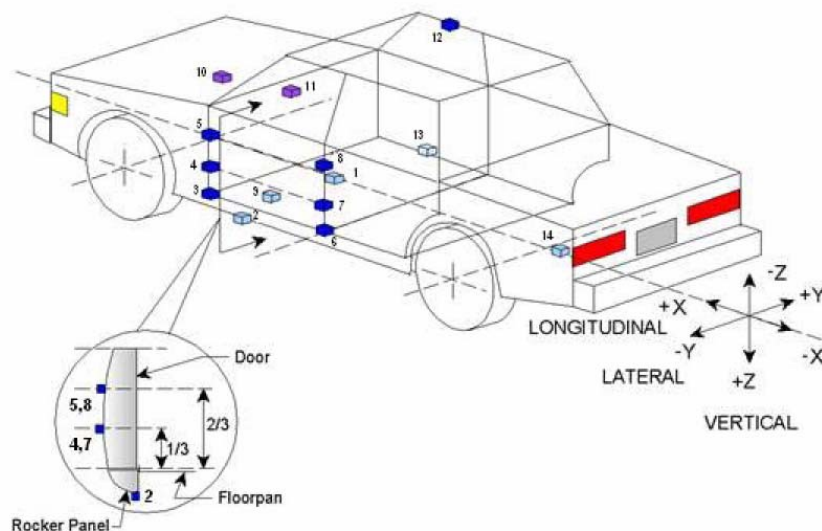
INSTRUMENTATION

Driver Dummy Channels	16
Vehicle Structure Accelerometers	18
Pole Load Cells	8
Total	42

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

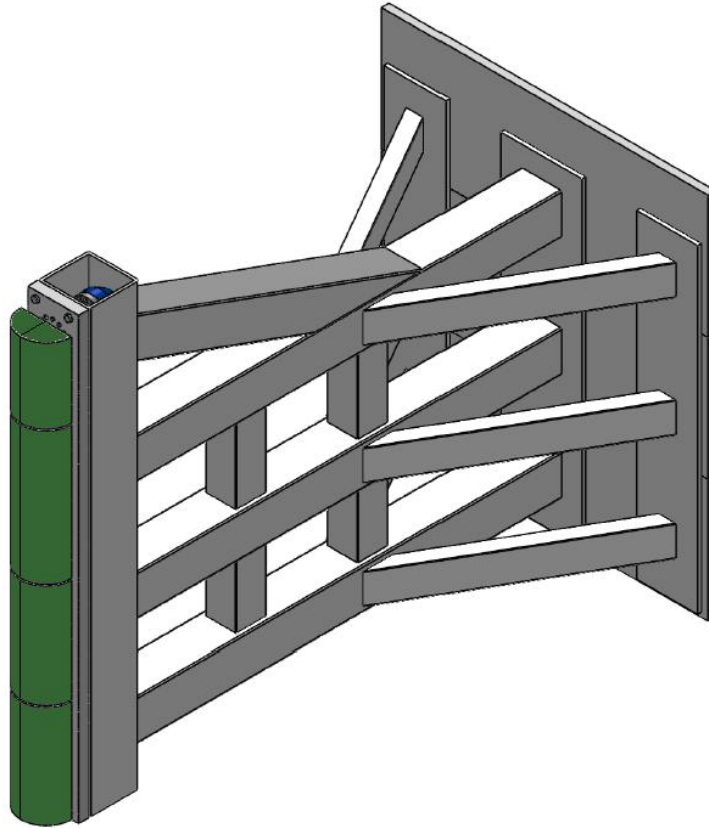
Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	1859	0	-401
2	Left Floor Sill	2737	-758	-174
3	A-Pillar Sill	3181	-794	-310
4	A-Pillar Low	3181	-794	-508
5	A-Pillar Mid	3181	2	-786
6	B-Pillar Sill	2105	-725	-361
7	B-Pillar Low	2105	-725	-625
8	B-Pillar Mid	2105	725	-918
9	Driver Seat Track	2399	-576	-241
10	Engine Top	3522	203	-916
11	Firewall	3370	-309	-898
12	Right Roof	2198	428	-1384
13	Right Floor Sill	1872	732	-317
14	Rear Floorpan	870	340	-522

Reference: X – Rear surface of vehicle (+ forward)
 Y – Vehicle centerline (+ to right)
 Z – Ground plane (+ down)

DATA SHEET NO. 7

RIGID POLE LOAD CELL DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



RIGID POLE LOAD CELL LOCATIONS

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

DATA SHEET NO. 8**POST-TEST OBSERVATIONS**

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver SID-IIs Dummy
Face	Curtain Airbag
Top of Head	Curtain Airbag, Head Restraint
Left Side of Head	Curtain Airbag
Back of Head	Head Restraint
Left Shoulder	Side Header, Door Panel
Upper Torso	Seat, Torso Airbag
Lower Torso	Torso Airbag
Left Hip	Seat, Torso Airbag, Door Panel
Left Knee	Door Panel, Right Knee

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/Other Door
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge System Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	n/a	n/a	n/a	n/a	n/a

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	No Separation
Windshield Damage	Broken
Side Window Damage	Left Front Window Broken
Other Notable Effects	Left Front Door Skin Separation

DATA SHEET NO. 8 ... (CONTINUED)**POST-TEST OBSERVATIONS**

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	
Other				

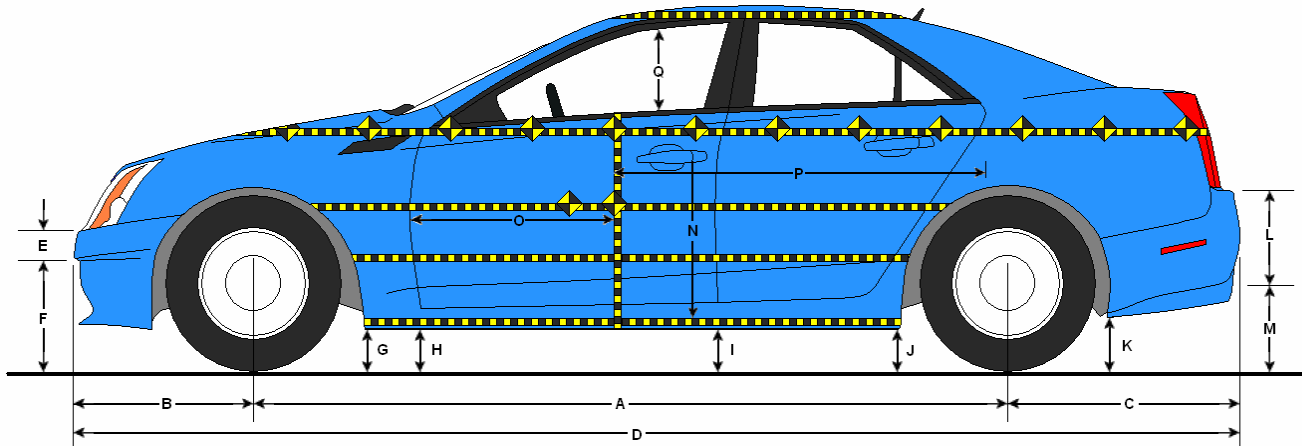
IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		1318
Actual Impact Point (Aft of Front Axle)	mm		1298
Horizontal Offset (+ forward / - rearward)	mm	± 38 of Intended Impact Point	20
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	°	75 ± 3	74.4
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	31.9
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	31.9

DATA SHEET NO. 9

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

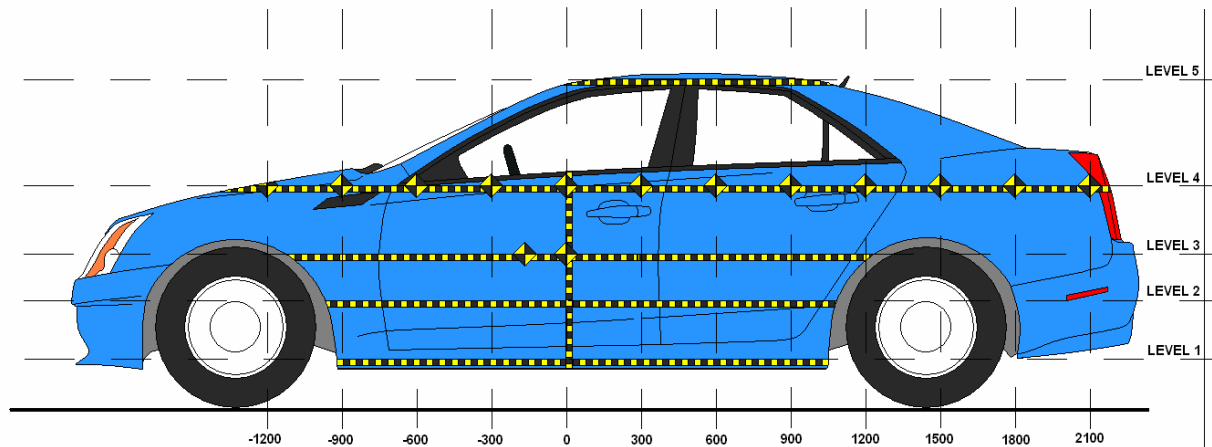
Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2813	2739	-74
B	Front Axle to FSOV	768	797	29
C	Rear Axle to RSOV	1022	1042	20
D	Total Length at Centerline	4553	4579	26
E	Front Bumper Thickness	290	290	0
F	Front Bumper Bottom to Ground	248	300	52
G	Sill Height at Front Wheel Well	151	165	14
H	Sill Height at Front Door Leading Edge	151	175	24
I	Sill Height at B-Pillar	160	210	50
J1	Sill Height at Rear Wheel Well	162	290	128
J2	Pinch Weld Height at Rear Wheel Well	152	221	69
K	Sill Height Aft of Rear Wheel Well	414	500	86
L	Rear Bumper Thickness	118	126	8
M	Rear Bumper Bottom to Ground	391	449	58
N	Sill Height to Bottom of Front Window Sill	563	640	77
O	Front Door Leading Edge to Impact CL	627	543	-84
P	Rear Door Trailing Edge to Impact CL	1383	1300	-83
Q	Front Window Opening	398	433	35
R	Right Side Length	3863	3873	10
S	Left Side Length	3860	3766	-94
T	Vehicle Width at B-Pillar	1807	1716	-91

All measurements in mm with tolerance of $\pm 3\text{mm}$

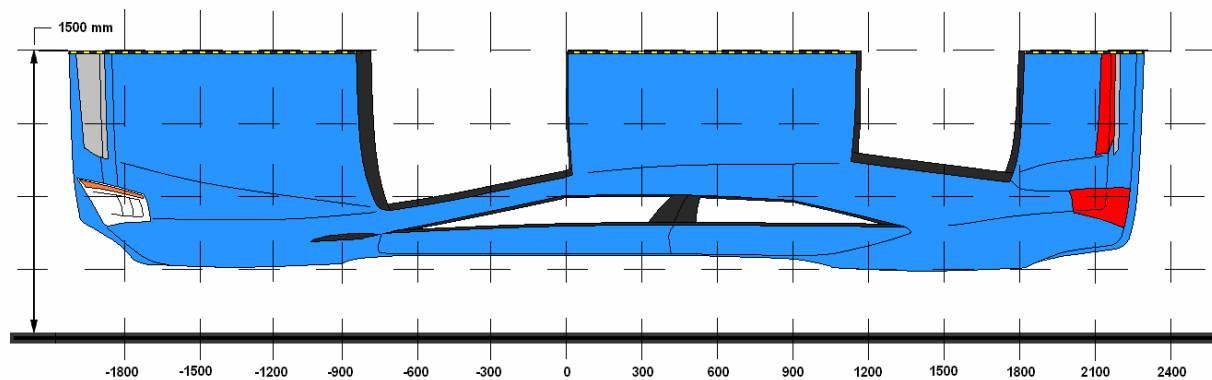
DATA SHEET NO. 10

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



LEFT SIDE VIEW



OVERHEAD VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	215	335	0
2	Occupant H-Point	483	402	0
3	Mid-Door	630	427	0
4	Window Sill	887	373	0
5	Window Top	1361	174	0

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520

Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900	649	609	609	724		627	685	685	771		-22	76	76	47	
-750	649	617	607	708		682	708	690	774		33	91	83	66	
-600	652	617	603	692		742	732	710	764		90	115	107	72	
-450	652	613	600	681		795	790	780	811		143	177	180	130	
-300	649	609	598	673		848	867	864	873		199	258	266	200	
-150	649	606	596	665		911	951	956	957		262	345	360	292	
0	648	604	595	661	916	983	1006	1022	1034	1090	335	402	427	373	174
150	649	603	594	661	926	876	924	943	973	1053	227	321	349	312	127
300	650	602	594	661	924	814	791	809	857	1027	164	189	215	196	103
450	650	604	595	660	925	766	735	723	790	1013	116	131	128	130	88
600	652	606	597	659	928	723	713	702	765	1008	71	107	105	106	80
750	651	608	600	659	933	680	690	682	745	1007	29	82	82	86	74
900	648	611	602	660	939	637	666	662	725	1005	-11	55	60	65	66
1050	637	609	604	662	944	588	645	643	706	992	-49	36	39	44	48
1200			600	667				616	687				16	20	
1350				673					671					-2	
1500				681					716					35	
1650				690					723					33	
1800				704					730					26	
1950				720					743					23	
2100				741					757					16	
2250															
2400															
2550															
2700															
2850															

DATA SHEET NO. 10 ... (CONTINUED)

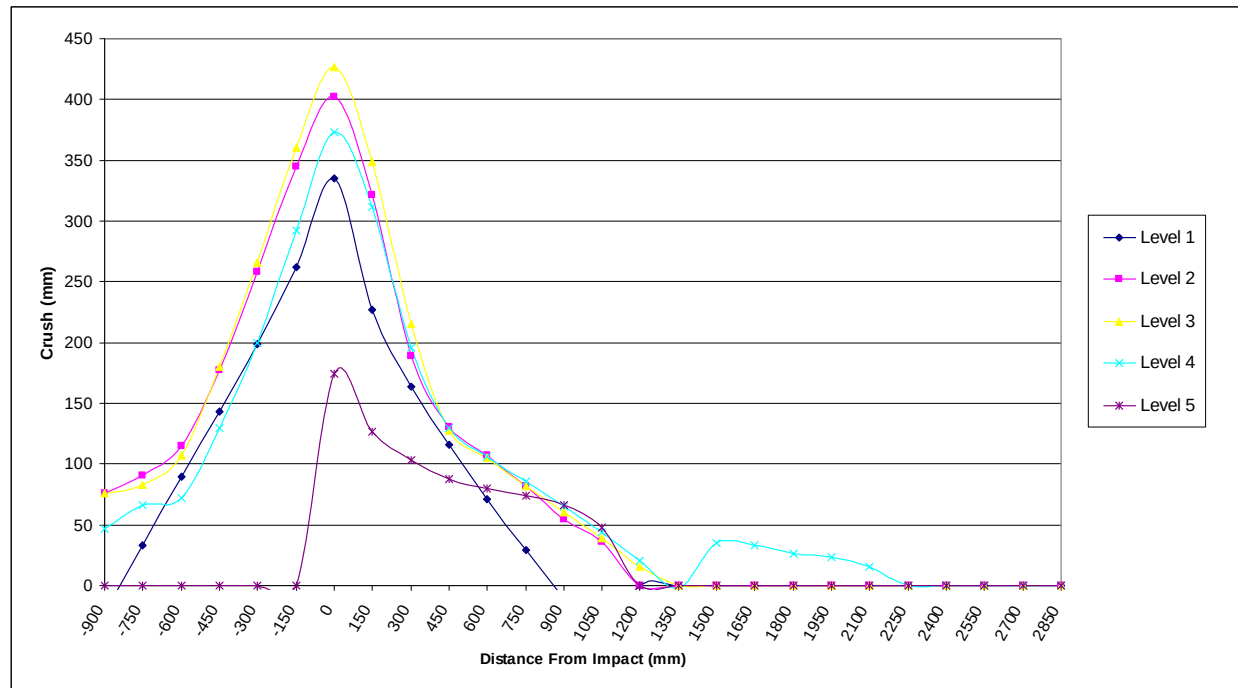
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan

NHTSA No. MC0520

Test Program: NCAP Side Pole Impact Test

Test Date: 5/10/12

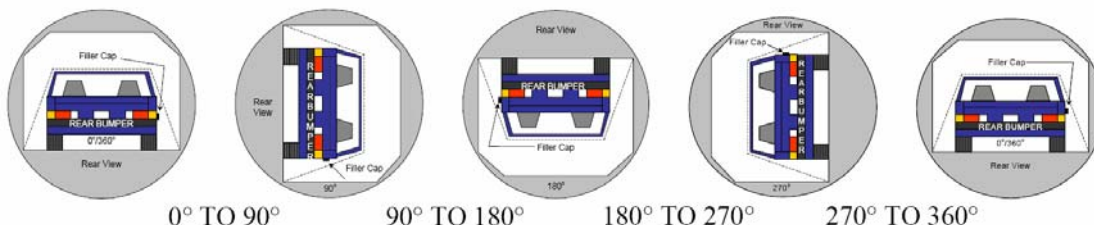


DATA SHEET NO. 11

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
 Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12
 Temperature at Time of Impact: 31.1 ° C Test Time: 2:15 PM

- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
 (Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
 (Maximum allowable = 1 oz./minute)
- D. Spillage Details: No spillage occurred



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	84	300	384
90° To 180°	82	300	382
180° To 270°	78	300	378
270° To 360°	80	300	380

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			

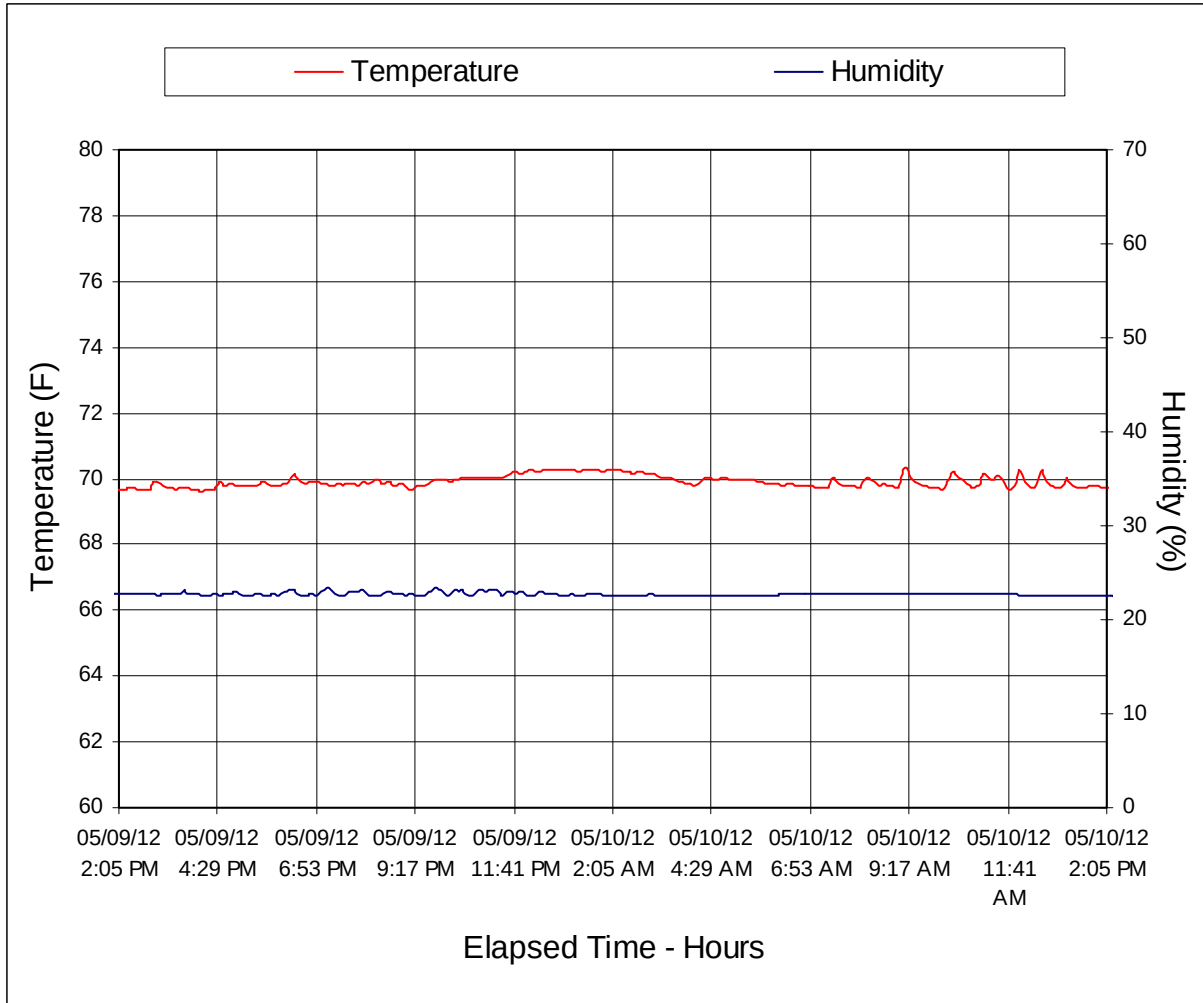
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	No Spillage Occurred
90° To 180°	No Spillage Occurred
180° To 270°	No Spillage Occurred
270° To 360°	No Spillage Occurred

DATA SHEET NO. 14

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0520
Test Program: NCAP Side Pole Impact Test Test Date: 5/10/12



APPENDIX A
PHOTOGRAPHS

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FIGURE 1. As-Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 2. As-Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 3. Pre-Test Frontal View of Test Vehicle

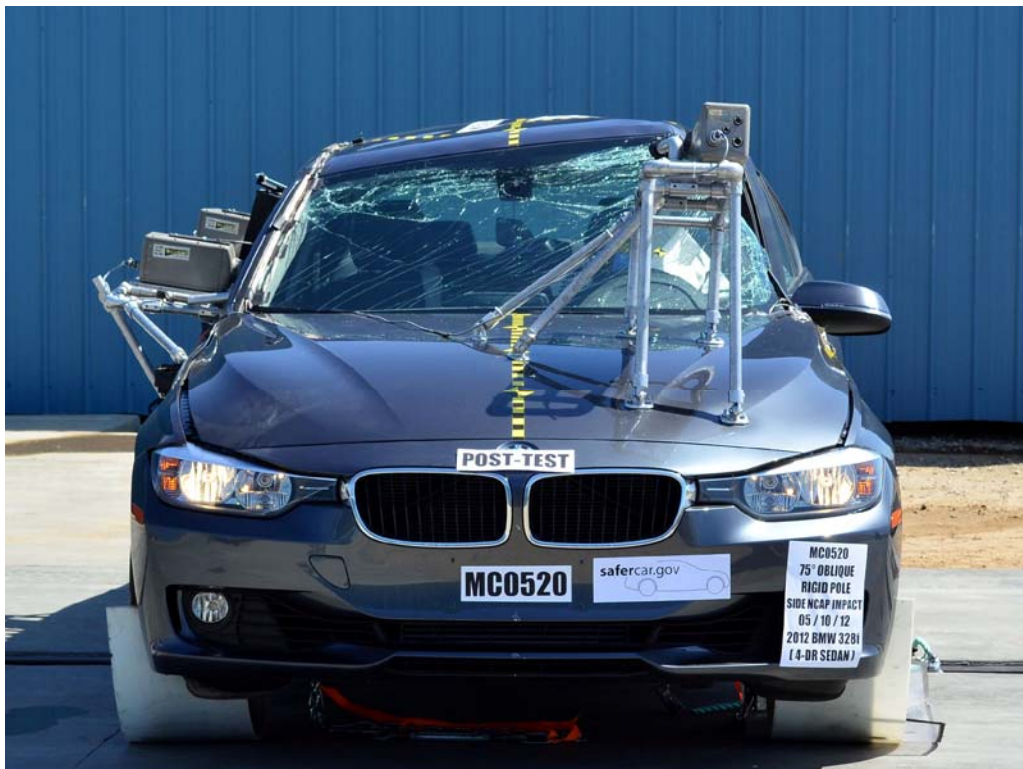


FIGURE 4. Post-Test Frontal View of Test Vehicle



FIGURE 5. Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 6. Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 7. Pre-Test Left Side View of Test Vehicle



FIGURE 8. Post-Test Left Side View of Test Vehicle



FIGURE 9. Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 10. Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 11. Pre-Test Rear View of Test Vehicle

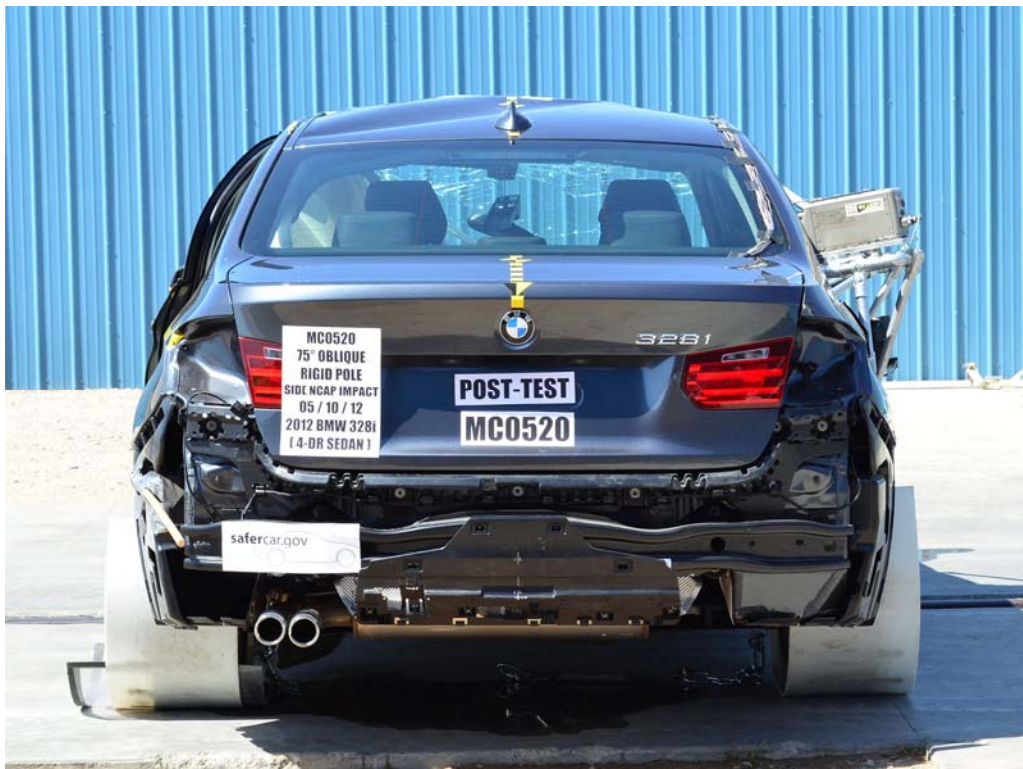


FIGURE 12. Post-Test Rear View of Test Vehicle



FIGURE 13. Pre-Test Right Side View of Test Vehicle



FIGURE 14. Post-Test Right Side View of Test Vehicle

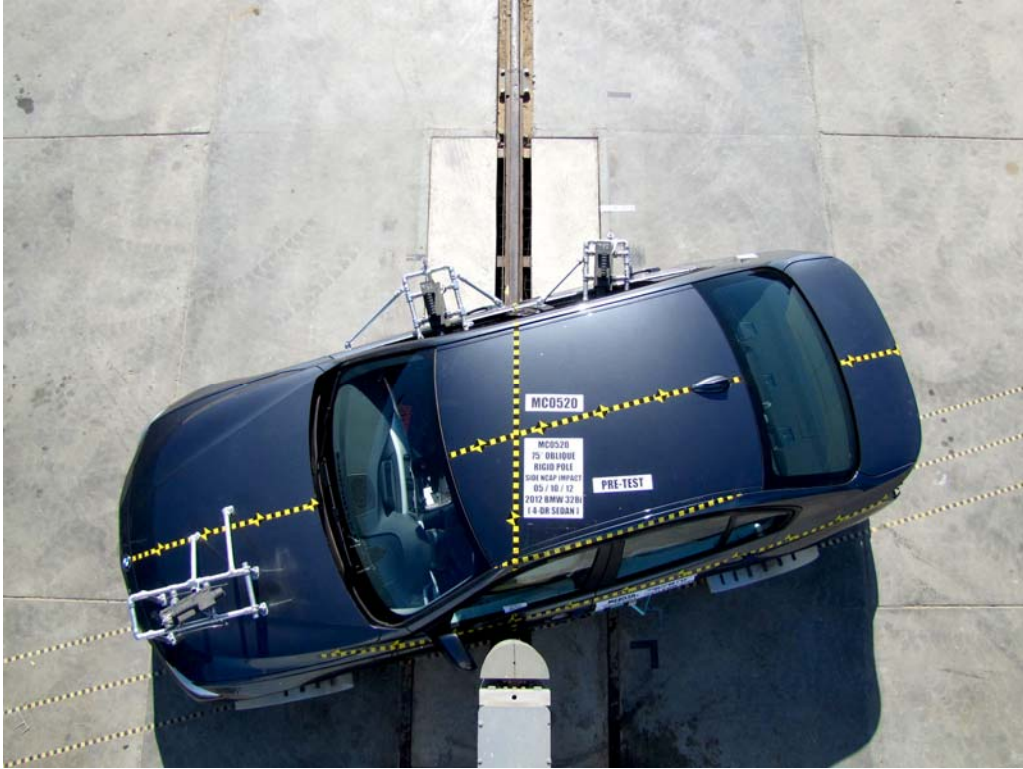


FIGURE 15. Pre-Test Overhead View of Test Vehicle and Pole



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



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



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



FIGURE 19. Pre-Test Close-Up View of Impact Point Target



FIGURE 20. Post-Test Close-Up View of Impact Point Target Showing Impact Location

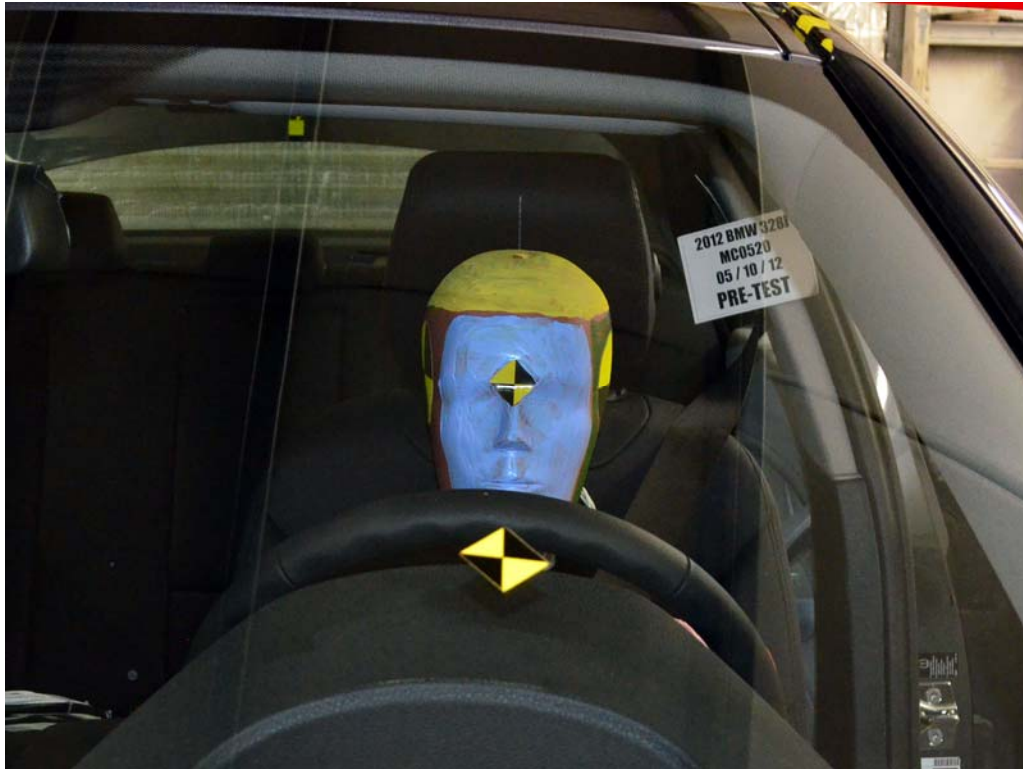


FIGURE 21. Pre-Test Front Close-Up View of Dummy



FIGURE 22. Post-Test Front Close-Up View of Dummy

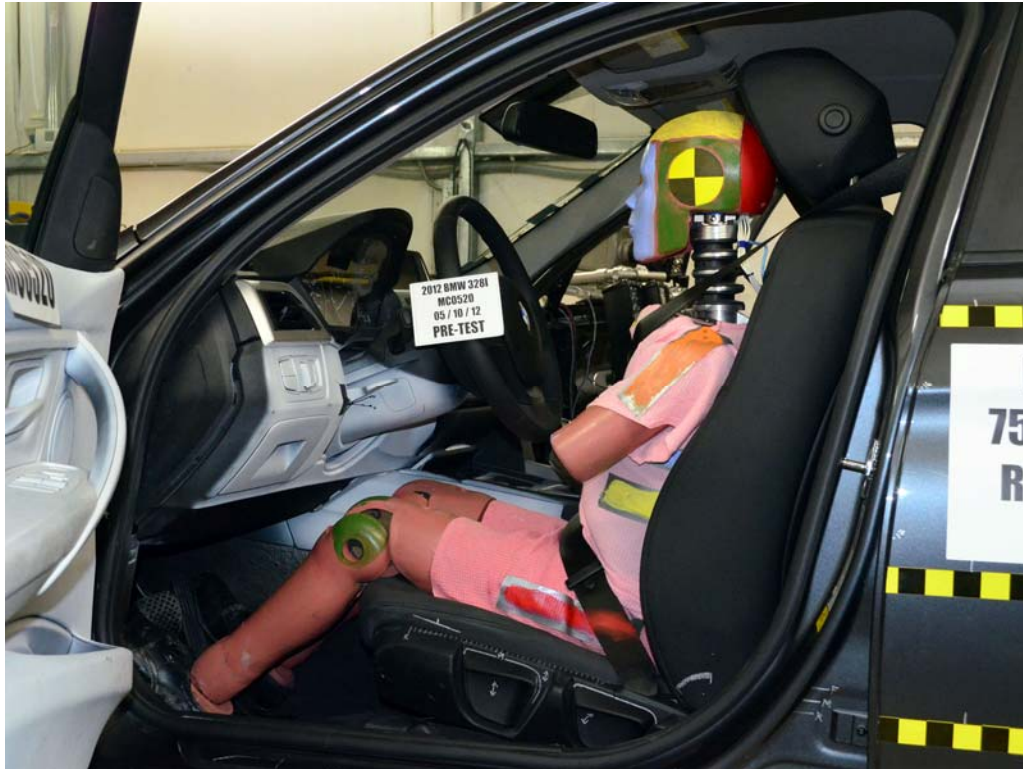


FIGURE 23. Pre-Test Left Side View of Dummy Showing Belt, Chalking, and Contact Switches



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



FIGURE 25. Post-Test Left Side View of Dummy Shoulder and Door Top View



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

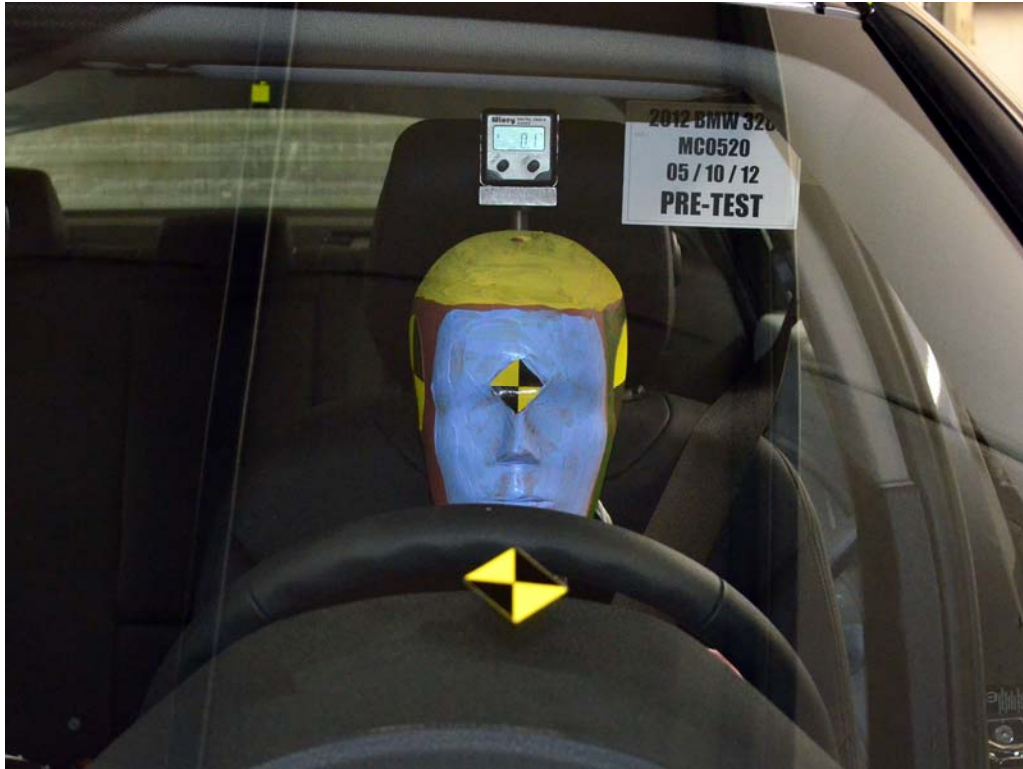


FIGURE 27. Pre-Test Frontal View of Dummy Head and Shoulders
in Relation to Head Restraint



FIGURE 28. Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning



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



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



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

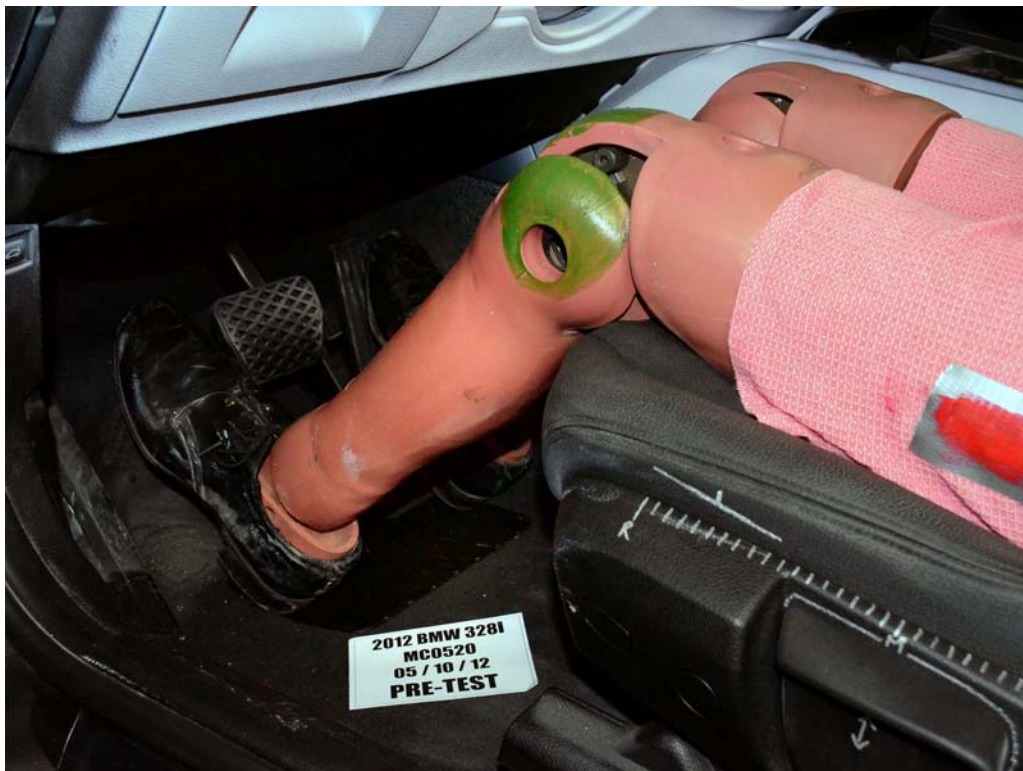


FIGURE 32. Pre-Test Placement of Dummy's Feet



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



FIGURE 34. Pre-Test Left Side View of Steering Wheel



FIGURE 35. View of Disengaged Parking Brake



FIGURE 36. Pre-Test View of Parking Brake



FIGURE 37. Pre-Test Close-Up Left Side View of Driver Seat Track



FIGURE 38. Pre-Test Close-Up Left Side View of Driver Seat Back



FIGURE 39. Pre-Test Close-Up View of Driver Seat Back or Head Restraint



FIGURE 40. Pre-Test Driver Dummy and Door Clearance



FIGURE 41. Post-Test Driver Dummy and Door Clearance



FIGURE 42. Pre-Test Right Side View of Dummy and Front Seat Occupant Compartment



FIGURE 43. Post-Test Right Side View of Dummy and Front Seat Occupant Compartment



FIGURE 44. Pre-Test Inner Driver Door Panel View



FIGURE 45. Post-Test Inner Driver Door Panel View
Showing Dummy Contact Locations



FIGURE 46. Post-Test Dummy Close-Up Head Contact with Vehicle Interior View



FIGURE 47. Post-Test Dummy Close-Up Head Contact with Side Airbag View



FIGURE 48. Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View



FIGURE 49. Post-Test Dummy Close-Up Torso Contact with Side Airbag View



FIGURE 50. Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View



FIGURE 51. Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View



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



FIGURE 53. Post-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 54. Close-Up View of Vehicle's Certification Label



FIGURE 55. Close-Up View of Vehicle's Tire Information Placard



FIGURE 56. Pre-Test Pole Barrier Front View



FIGURE 57. Post-Test Pole Barrier Front View



FIGURE 58. Pre-Test Pole Barrier Side View



FIGURE 59. Post-Test Pole Barrier Side View

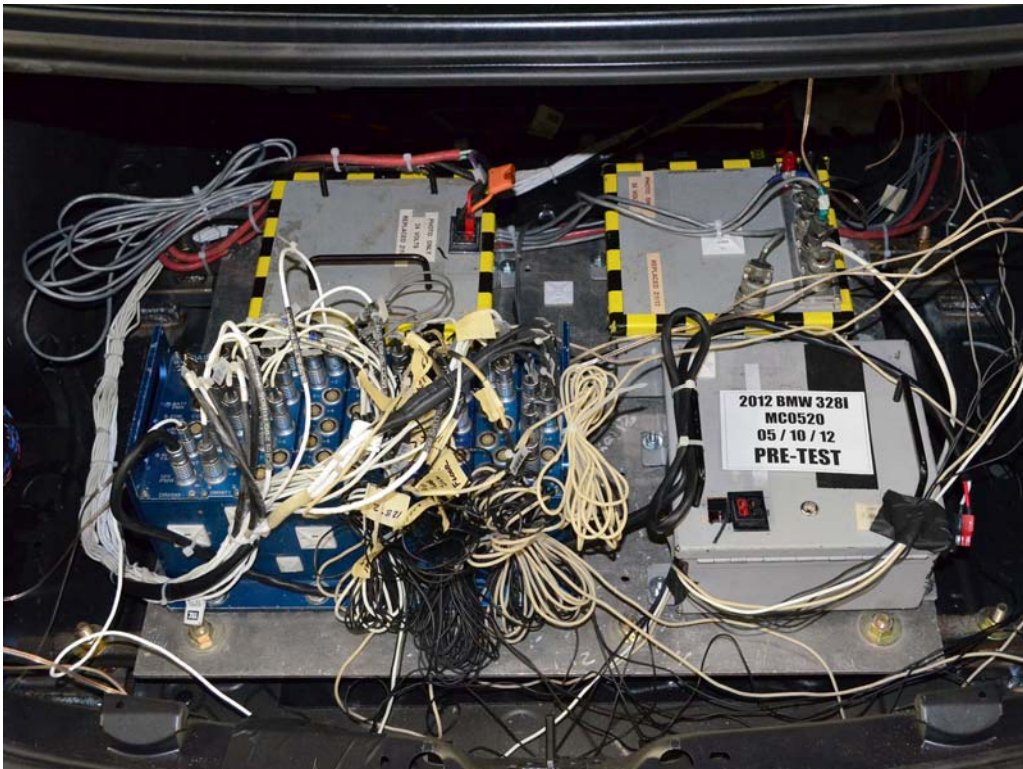


FIGURE 60. Pre-Test Ballast View



FIGURE 61. Post-Test Primary and Redundant Speed Trap Read-Out

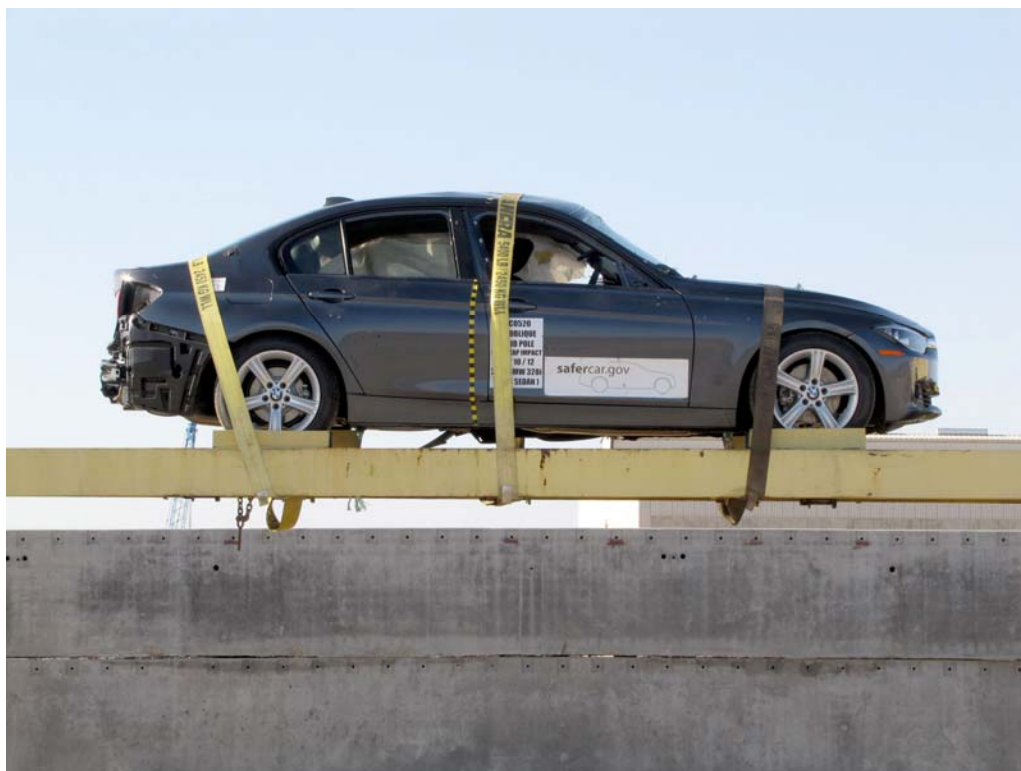


FIGURE 62. FMVSS No. 301-305 Rollover 0 Degrees



FIGURE 63. FMVSS No. 301-305 Rollover 90 Degrees



FIGURE 64. FMVSS No. 301-305 Rollover 180 Degrees



FIGURE 65. FMVSS No. 301-305 Rollover 270 Degrees



FIGURE 66. FMVSS No. 301-305 Rollover 360 Degrees



FIGURE 67. 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 vary by standard equipment; check with your authorized BMW center.)

Mineral Grey Metallic	\$ 550.00
Black Leatherette	Included
STEPTONIC automatic trans.	Included
17" light alloy wheels	Included
Auto-dimming rearview mirror	\$ 895.00
Destination Charge	\$ 36,345.00
Total Suggested Retail Price	

Standard Features

- 2.0-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 steers variable valve timing
- Driving Dynamics Control with ECO PRO, Comfort and Sport settings (and Sport+ with selected features)
- Dynamic Stability Control (DSC), including Brake Pedal Compensation, Start-off Assistant, Brake Drying, and Brake Steer by features, with Dynamic Traction Control (DTC)
- High-performance, lightweight 4-wheel ventilated disk 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 rear-form front foglights
- 3-spoke leather-wrapped multi-function steering wheel
- Drive system with 6.5-inch full color flat-screen display, Controller and 6 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 Brake/Lights
- 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 24 Expected range for most drivers 19 to 28 mpg	Estimated Annual Fuel Cost \$2,115 based on 15,000 miles at \$3.55 per gallon	HIGHWAY MPG 36 Expected range for most drivers 29 to 43 mpg
---	--	--

Combined Fuel Economy
This Vehicle
28
Your actual mileage will vary depending on how you drive and maintain your vehicle.
All Compact Cars

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

Global Warming Score 7 Average new vehicle	Smog Score 5 Average new vehicle
---	---

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated	Driver Not Rated	Passenger Not Rated
Frontal Crash Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.	Front seat Not Rated	Rear seat Not Rated
Side Crash Based on the risk of injury in a side impact.	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
Protect the environment, choose vehicles with higher scores:
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.

VIN: WBA3A5C58CF258473

BMW of North America, LLC
Woodcliff Lake, NJ 07877

FIGURE 68. Monroney Label

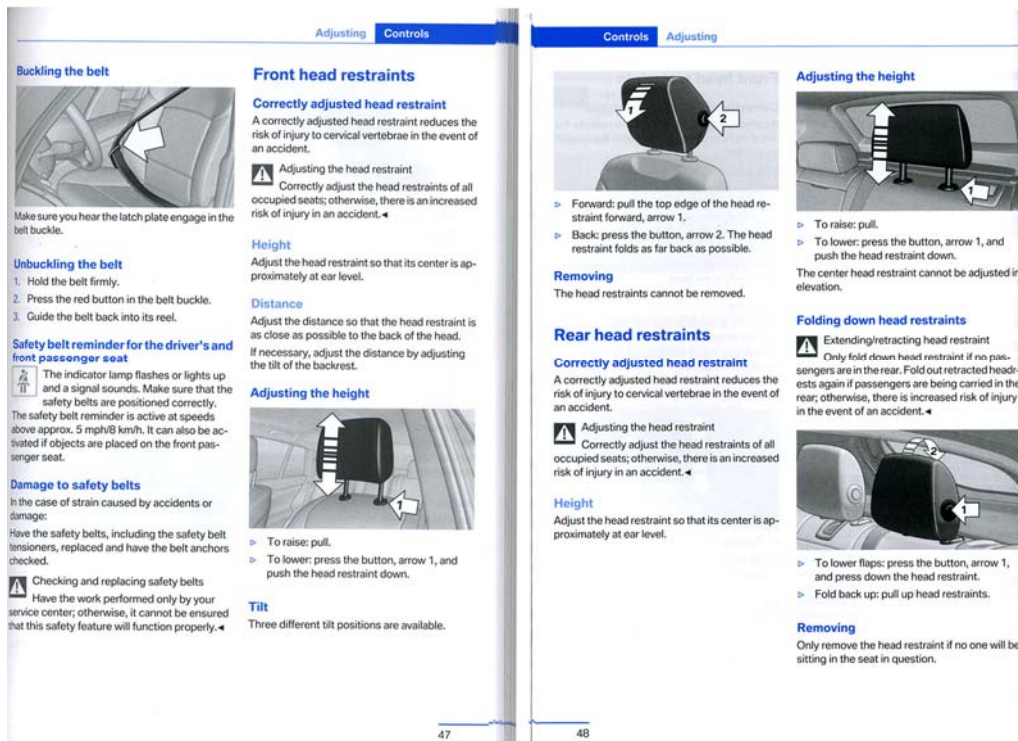


FIGURE 69. Head Restraint Use and Adjustment
Information from Vehicle Manual

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Plot		Page
1	Driver Head Acceleration (X) Primary vs. Time	B-1
2	Driver Head Acceleration (Y) Primary vs. Time	B-1
3	Driver Head Acceleration (Z) Primary vs. Time	B-1
4	Driver Head Resultant Acceleration Primary vs. Time	B-1
5	Driver Lower Spine T12 Acceleration (X) vs. Time	B-2
6	Driver Lower Spine T12 Acceleration (Y) vs. Time	B-2
7	Driver Lower Spine T12 Acceleration (Z) vs. Time	B-2
8	Driver Lower Spine T12 Resultant Acceleration vs. Time	B-2
9	Driver Iliac Wing Force on Impact Side (Y) vs. Time	B-3
10	Driver Acetabulum Force on Impact Side (Y) vs. Time	B-3
11	Driver Total Pelvis Force on Impact Side (Y) vs. Time	B-3

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at

www.NHTSA.dot.gov

Additional Driver Dummy Instrumentation Data

Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection (Y)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)

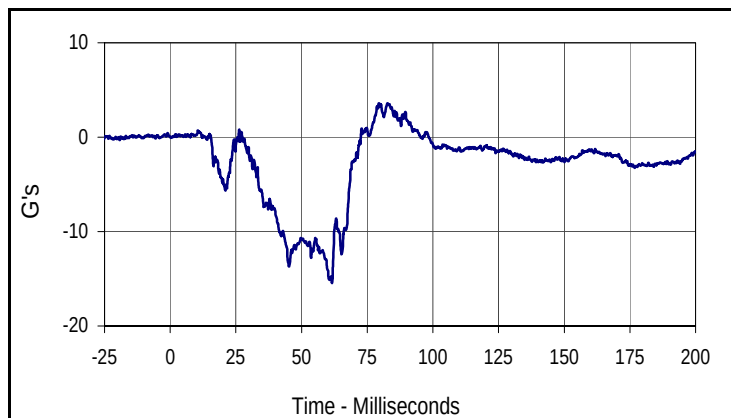
Left B-Pillar Sill Acceleration
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

Pole Instrumentation Data

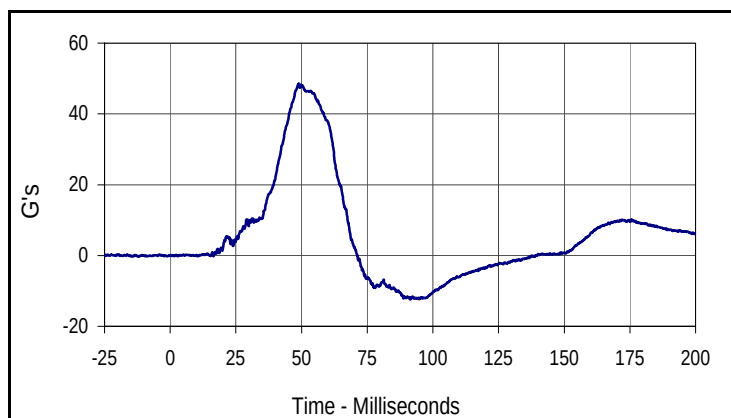
Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 32 km/h (20 mph) Side Impact NCAP 75° Rigid Pole Test

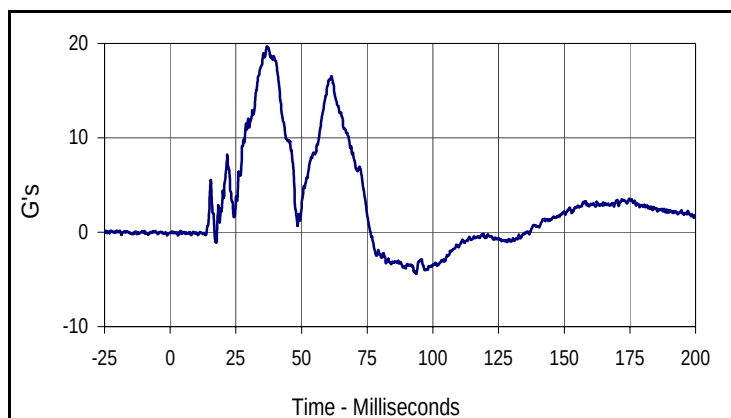
Test Date: 5/10/12
 NHTSA No.: MC0520



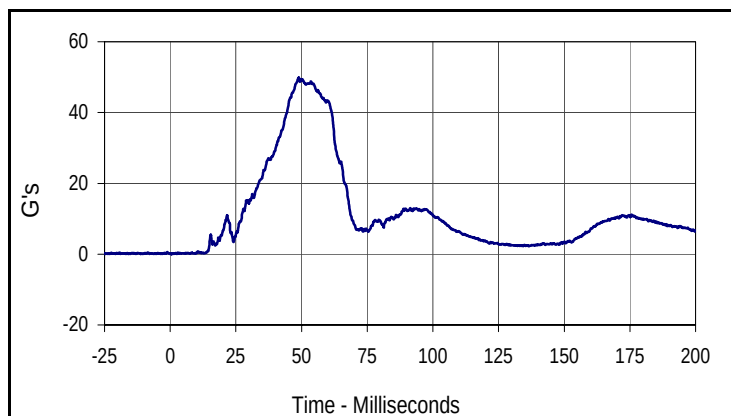
Curve Description			
Driver Head Acceleration X Primary			
Plot No.	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
3.6	79.5	-15.5	61.6



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
48.5	49.0	-12.4	91.3



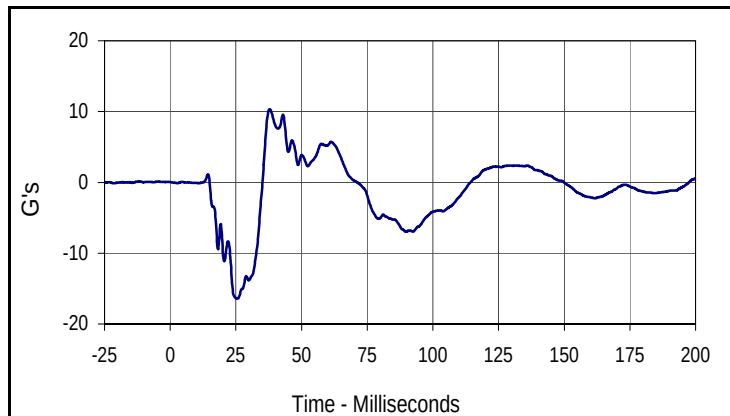
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
19.7	36.9	-4.4	93.7



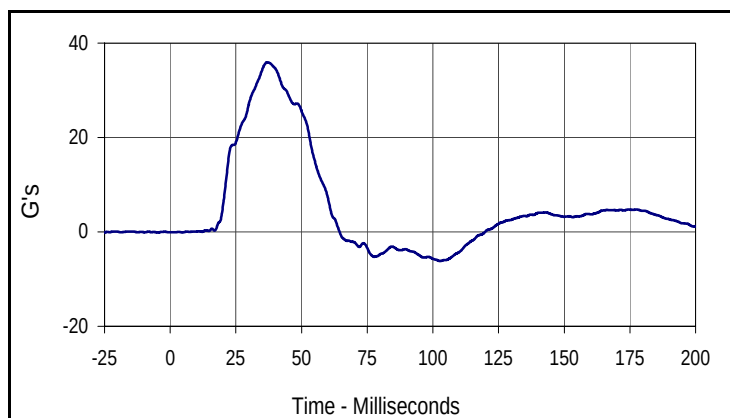
Curve Description			
Driver Head Acceleration Primary Res.			
Plot No.	Type	SAE Class	Units
004	RES	1000	G's
Max	Time	Min	Time
49.8	49.0	0.0	0.4

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 32 km/h (20 mph) Side Impact NCAP 75° Rigid Pole Test

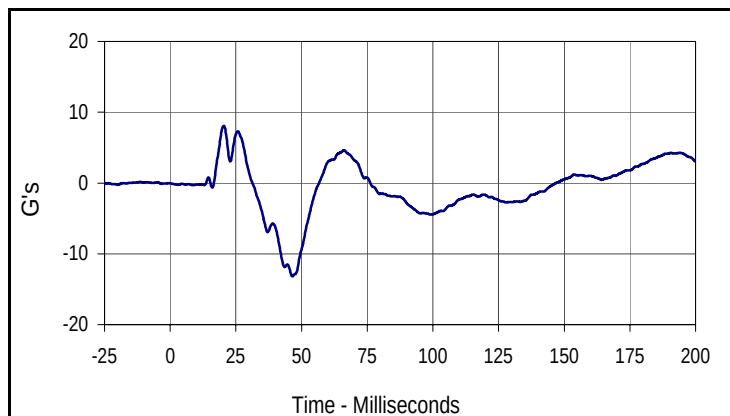
Test Date: 5/10/12
 NHTSA No.: MC0520



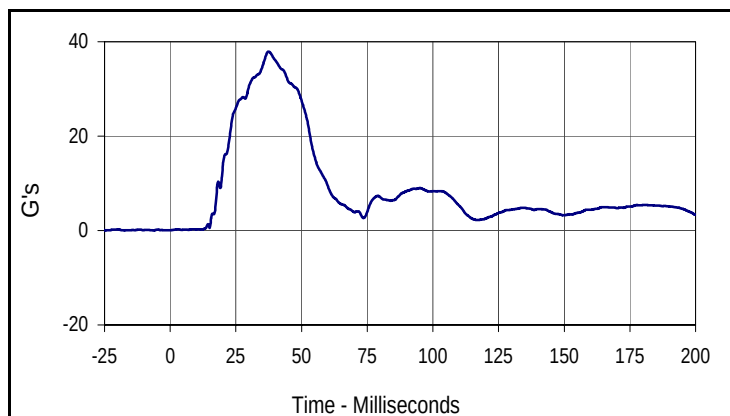
Curve Description			
Driver Lower Spine T12 Acceleration X			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
10.3	37.8	-16.4	25.2



Curve Description			
Driver Lower Spine T12 Acceleration Y			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
36.0	36.9	-6.2	102.8



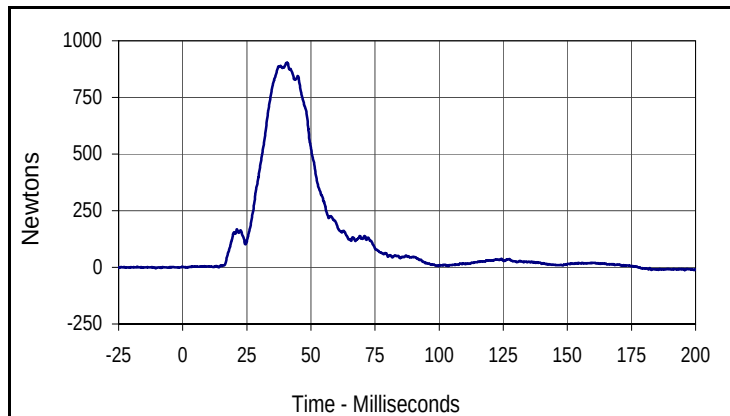
Curve Description			
Driver Lower Spine T12 Acceleration Z			
Plot No.	Type	SAE Class	Units
007	FIL	180	G's
Max	Time	Min	Time
8.1	20.4	-13.2	46.5



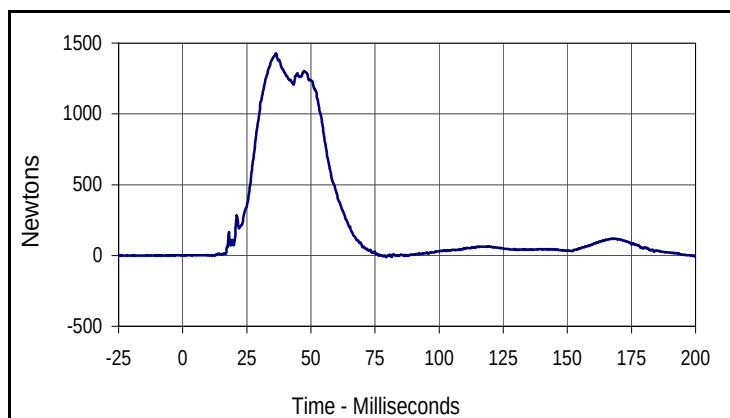
Curve Description			
Driver Lower Spine T12 Acceleration Res.			
Plot No.	Type	SAE Class	Units
008	RES	180	G's
Max	Time	Min	Time
37.9	37.4	0.1	0.1

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 32 km/h (20 mph) Side Impact NCAP 75° Rigid Pole Test

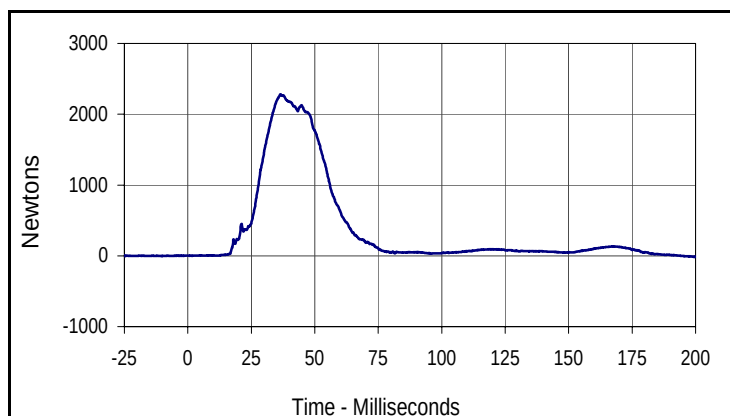
Test Date: 5/10/12
 NHTSA No.: MC0520



Curve Description			
Driver Iliac Wing Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
009	FIL	600	Newtons
Max	Time	Min	Time
903.4	40.6	-12.0	195.8



Curve Description			
Driver Acetabulum Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
010	FIL	600	Newtons
Max	Time	Min	Time
1427.7	36.3	-12.2	79.3



Curve Description			
Driver Total Pelvic Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
011	SUM	600	Newtons
Max	Time	Min	Time
2281.4	36.5	-15.7	200.0

APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

Test Program: SID IIs External Measurements
 ATD Serial No.: 299

Test Date: 5/2/12
 Test I.D.: N/A



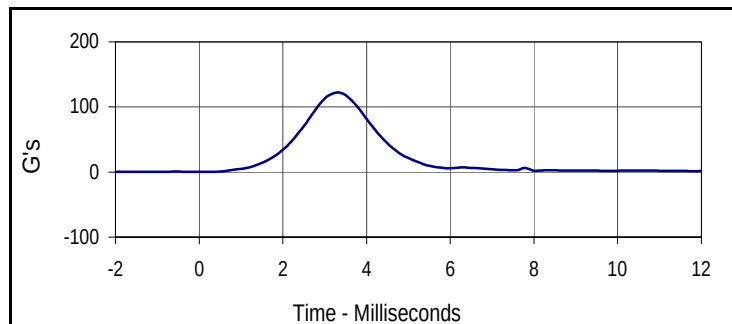
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
A	Sitting Height	mm	772 - 788	783	Pass
B	Shoulder Pivot Height	mm	437 - 453	446	Pass
C	H-Point Height	mm	79 - 89	84	Pass
D	H-Point from Seatback	mm	141 - 151	148	Pass
E	Shoulder Pivot from Backline	mm	97 - 107	102	Pass
F	Thigh Clearance	mm	119 - 135	125	Pass
G	Head Breadth	mm	140 - 148	145	Pass
H	Head Back from Backline	mm	40 - 46	43	Pass
I	Head Depth	mm	178 - 188	182	Pass
J	Head Circumference	mm	541 - 551	546	Pass
K	Buttock to Knee Length	mm	514 - 540	528	Pass
L	Popliteal Height	mm	343 - 369	354	Pass
M	Knee Pivot to Floor Height	mm	392 - 409	400	Pass
N	Buttock Popliteal Length	mm	416 - 442	429	Pass
O	Chest Depth w/o Jacket	mm	195 - 211	202	Pass
P	Foot Length	mm	216 - 232	219	Pass
Q	Hip Breadth with Pelvic Plug	mm	313 - 323	318	Pass
R	Arm Length	mm	249 - 259	256	Pass
S	Knee Joint to Seatback	mm	477 - 493	484	Pass
V	Shoulder Width	mm	341 - 357	350	Pass
W	Foot Width	mm	78 - 94	92	Pass
Y	Chest Circumference with Jacket	mm	851 - 881	875	Pass
Z	Waist Circumference	mm	760 - 791	773	Pass
Overall Test Results				Pass	

Test Program: SID IIs Head Drop Test
 ATD Serial No.: 299

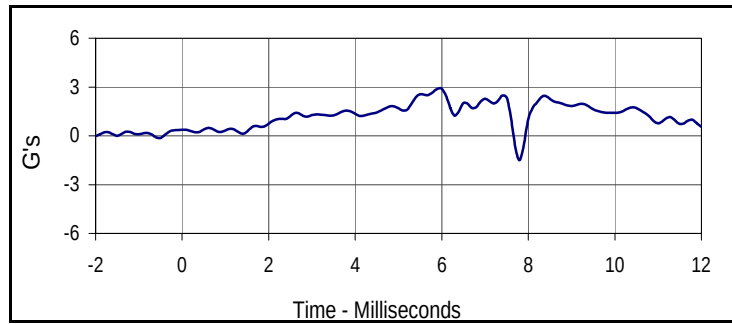
Test Date: 5/2/12
 Test I.D.: 299HD039



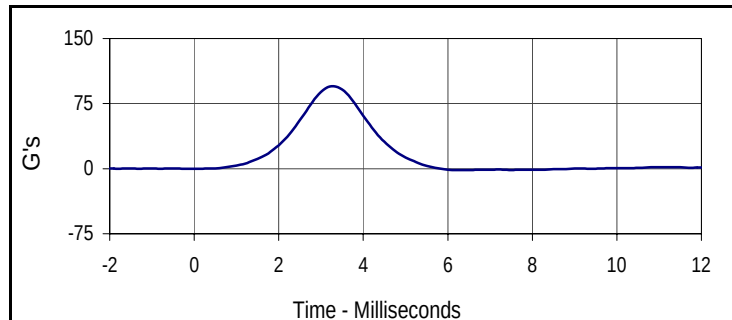
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	245	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.7	Pass
Peak Head Resultant Acceleration	G's	115 to 137	122.1	Pass
Peak Head X Acceleration	G's	<15	2.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	5.2	Pass
Overall Test Results				Pass



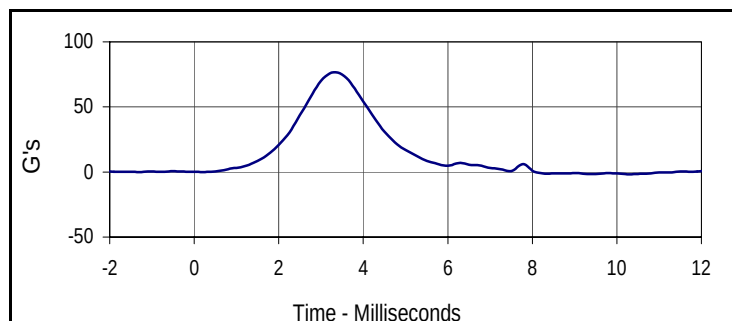
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
122.1	3.3	0.2	-1.4



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.9	5.9	-0.1	-0.5



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
95.0	3.3	-1.8	6.5



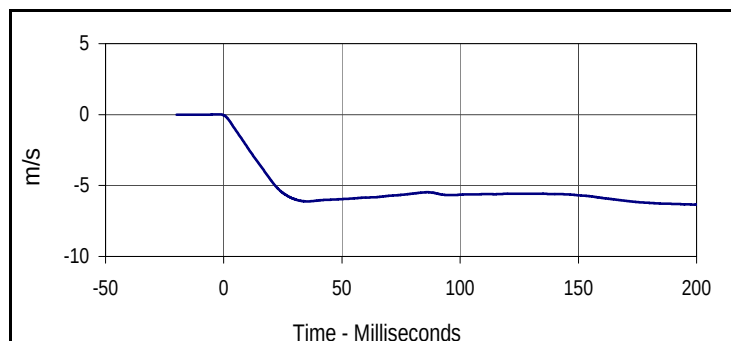
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
76.6	3.3	-1.7	9.4

Test Program: SID IIs Neck Flexion Test
 ATD Serial No.: 299

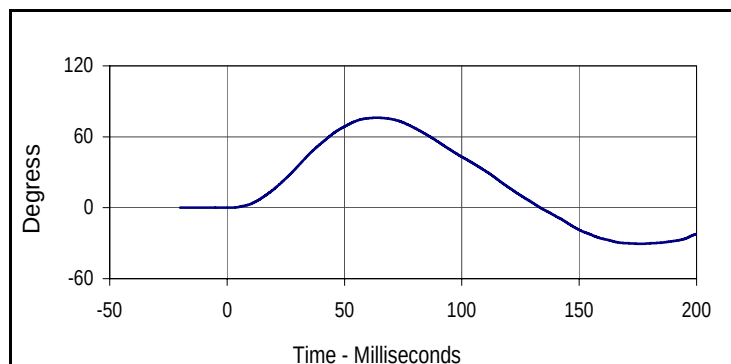
Test Date: 5/2/12
 Test I.D.: 299NB039



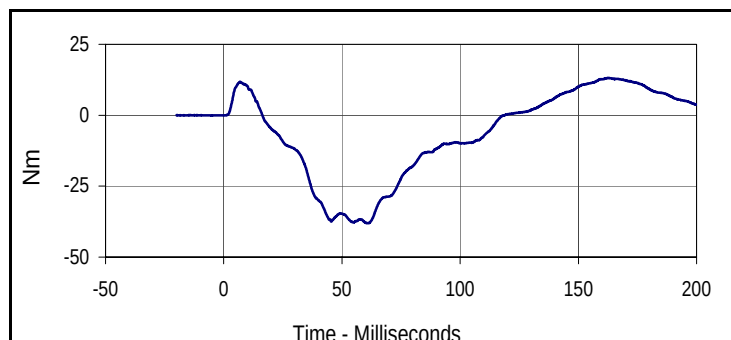
Tested Parameter	Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time	Minutes	≥240	270	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	20.9	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.8	Pass
Pendulum Velocity	m/s	5.51 to 5.63	5.57	Pass
Pendulum Deceleration	10 msec	-2.20 to -2.80	-2.30	Pass
	15 msec	-3.30 to -4.10	-3.48	Pass
	20 msec	-4.40 to -5.40	-4.64	Pass
	25 msec	-5.40 to -6.10	-5.52	Pass
	25-100 msec	-5.50 to -6.20	-6.12	Pass
D-Plane Rotation	Max	71 to 81	76.1	Pass
	Time	50 to 70	63.8	Pass
Peak Occipital Condyle Moment	Nm	-36 to -44	-38.1	Pass
Decaying Moment Time to Cross 0 Nm	msec	102 to 126	118.9	Pass
Overall Test Results			Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-2.2	-6.3	200.0



Curve Description			
Maximum Translation Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
76.1	63.8	-30.5	176.1



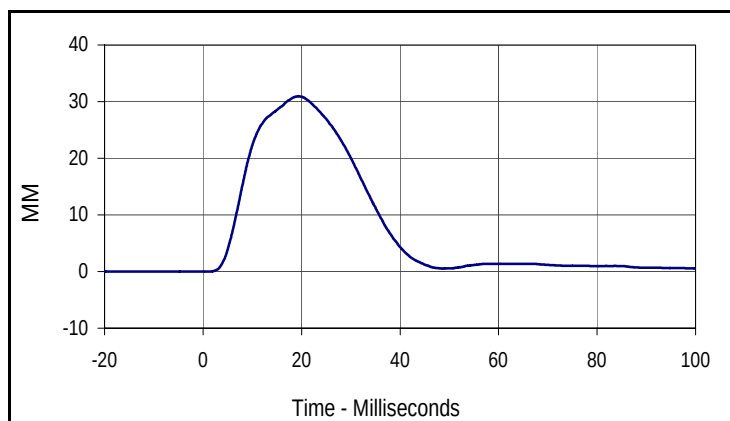
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
13.2	162.7	-38.1	60.8

Test Program: SID IIs Shoulder Impact Test
 ATD Serial No.: 299

Test Date: 5/2/12
 Test I.D.: 299SH039



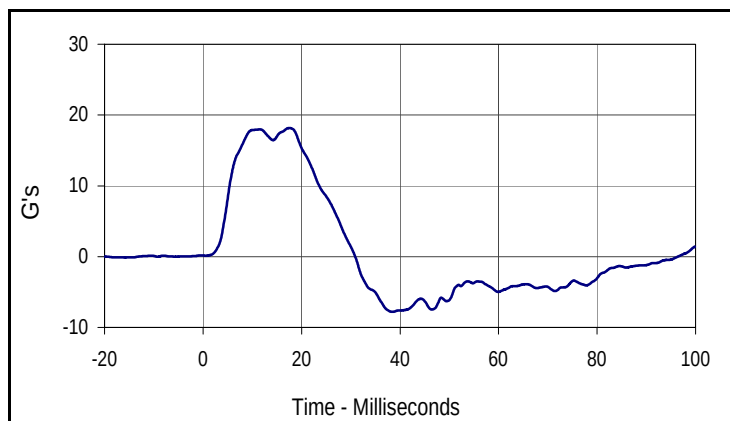
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	310	Pass
Temperature During Soak	Max °C	20.6 to 22.2	21.7	Pass
	Min °C		20.7	Pass
Humidity During Soak	Max %	10.0 to 70.0	31.0	Pass
	Min %		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.6	Pass
Impactor Velocity	m/s	4.20 to 4.40	4.25	Pass
Peak Shoulder Deflection	mm	28 to 37	30.9	Pass
Peak Lateral Spine Acceleration Y	G's	17 to 22	18.2	Pass
Peak Impactor Acceleration	G's	13 to 18	15.6	Pass
Overall Test Results			Pass	



Curve Description

Shoulder Deflection

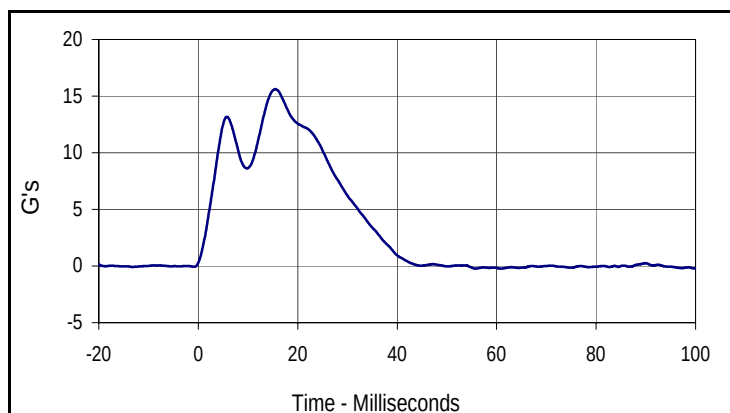
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
30.9	19.4	0.0	-20.0



Curve Description

Upper Spine Y Acceleration

Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
18.2	17.5	-7.8	38.5



Curve Description

Impactor Acceleration

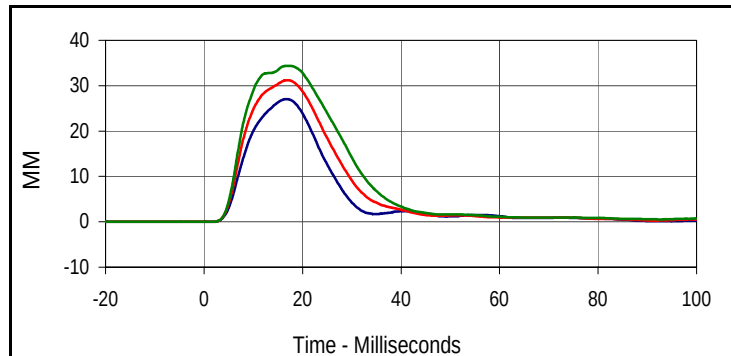
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.6	15.5	-0.2	60.8

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 299

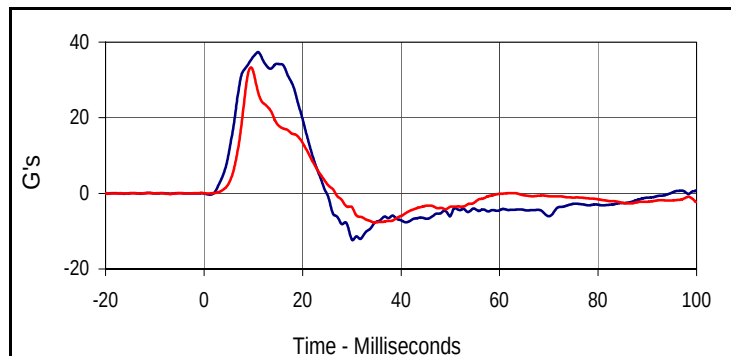
Test Date: 5/2/12
 Test I.D.: 299TWA039



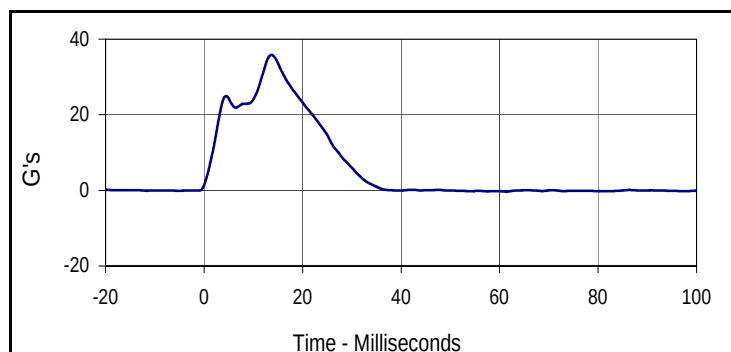
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	330	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.8	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Shoulder Deflection	mm	31 to 40	34.2	Pass
Peak Upper Thorax Rib Deflection	mm	25 to 32	27.1	Pass
Peak Middle Thorax Rib Deflection	mm	30 to 36	31.2	Pass
Peak Lower Thorax Rib Deflection	mm	32 to 38	34.3	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	37.4	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	33.3	Pass
Peak Impactor Acceleration	G's	30 to 36	35.9	Pass
Overall Test Results			Pass	



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.1	16.7	0.0	-5.1
Middle Thorax Deflection			
Max	Time	Min	Time
31.2	17.0	0.0	-4.9
Lower Thorax Deflection			
Max	Time	Min	Time
34.3	17.0	0.0	-16.5



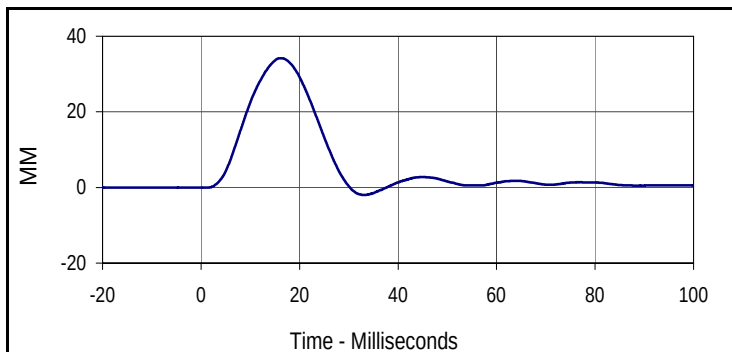
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
37.4	10.9	-12.4	30.2
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
33.3	9.5	-7.7	34.7



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
35.9	13.7	-0.4	0.0

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 299

Test Date: 5/2/12
 Test I.D.: 299TWA039



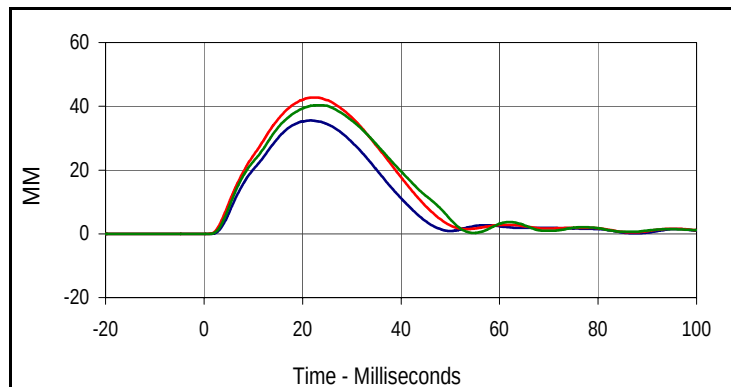
Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
007	FIL	600	MM
Max	Time	Min	Time
34.2	16.1	-2.0	33.1

Test Program: SID IIs Thorax without Arm Impact Test
 ATD Serial No.: 299

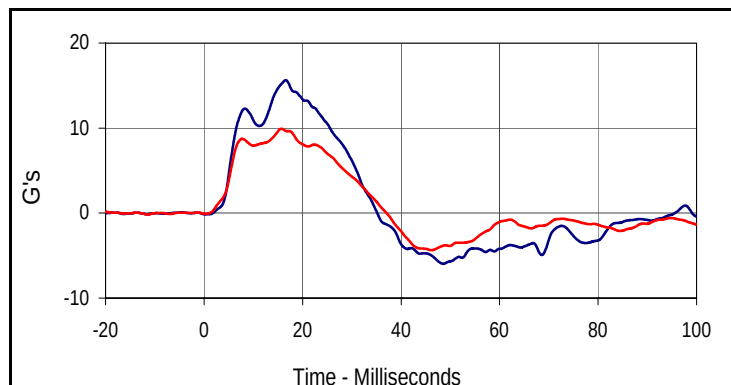
Test Date: 5/2/12
 Test I.D.: 299TWOA039



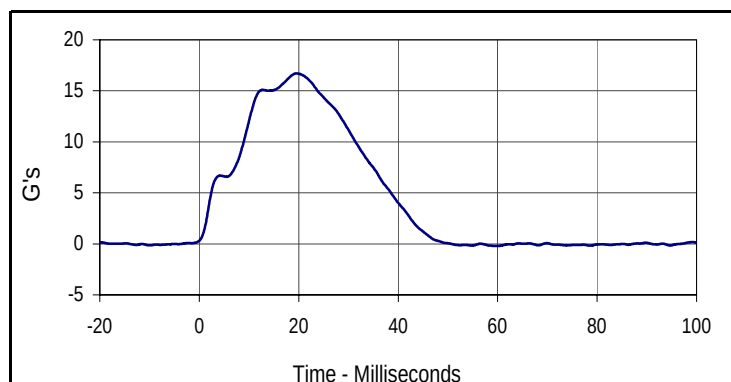
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	360	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.7	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.29	Pass
Peak Upper Thorax Rib Deflection		mm	32 to 40	35.6	Pass
Peak Middle Thorax Rib Deflection		mm	39 to 45	42.8	Pass
Peak Lower Thorax Rib Deflection		mm	35 to 43	40.3	Pass
Peak Upper Spine Y Acceleration		G's	13 to 17	15.7	Pass
Peak Lower Spine Y Acceleration		G's	7 to 11	9.9	Pass
Peak Impactor Acceleration		G's	14 to 18	16.7	Pass
Overall Test Results				Pass	



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
35.6	21.6	0.0	-6.1
Middle Thorax Deflection			
Max	Time	Min	Time
42.8	22.7	0.0	-5.3
Lower Thorax Deflection			
Max	Time	Min	Time
40.3	23.3	0.0	-14.2



Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.7	16.6	-6.0	48.6
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
9.9	15.7	-4.4	46.2



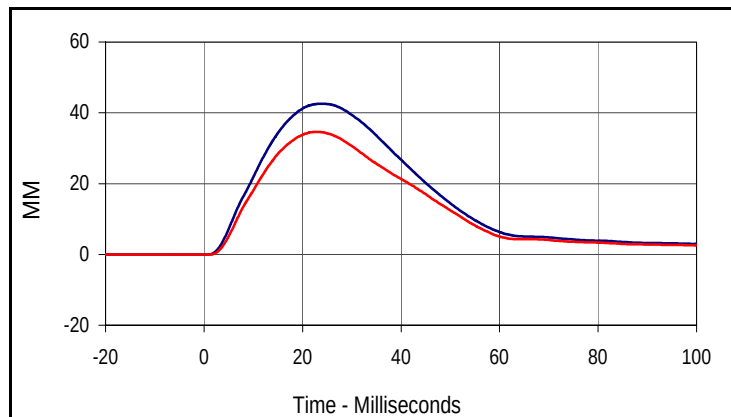
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.7	19.5	-0.2	0.0

Test Program: SID IIs Abdomen Impact Test
 ATD Serial No.: 299

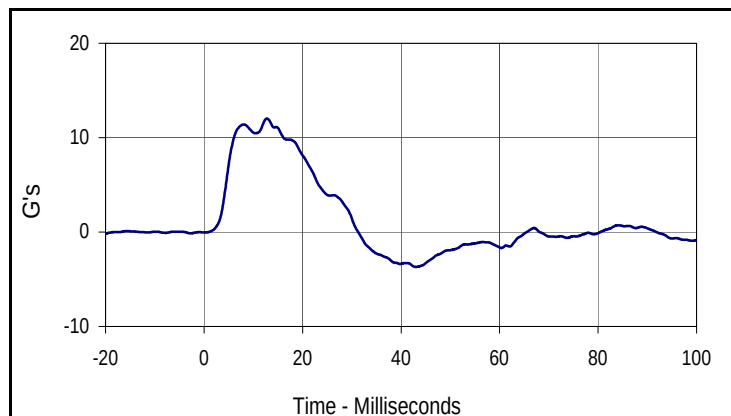
Test Date: 5/2/12
 Test I.D.: 299ABD039



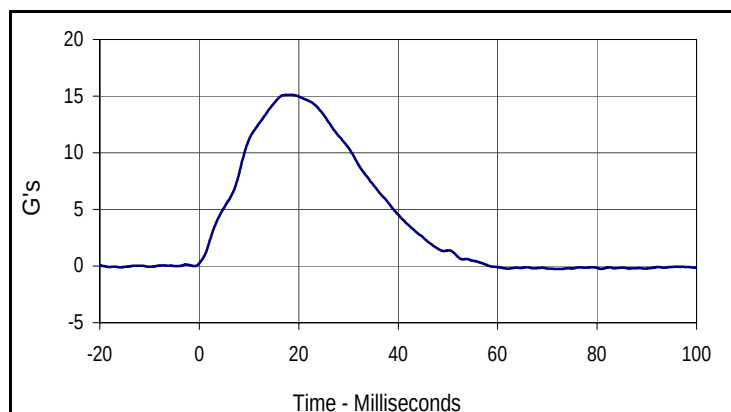
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	390	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Upper Abdominal Rib Deflection	mm	36 to 47	42.6	Pass
Peak Lower Abdominal Rib Deflection	mm	33 to 44	34.6	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	12.0	Pass
Peak Impactor Acceleration	G's	12 to 16	15.1	Pass
Overall Test Results			Pass	



Curve Description			
Upper Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
42.6	24.1	0.0	-9.1
Curve Description			
Lower Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
34.6	22.8	0.0	-17.4



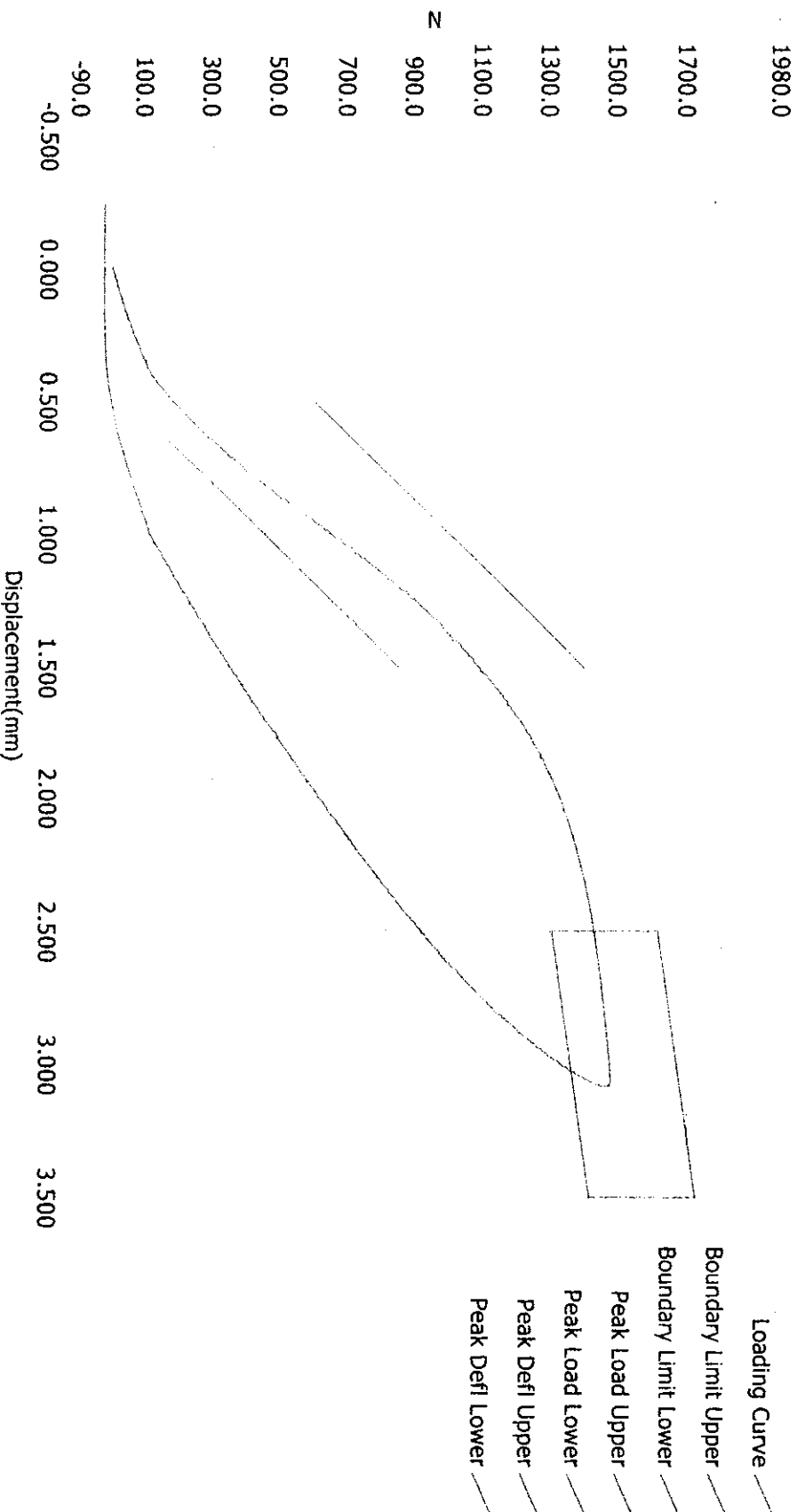
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
12.0	12.7	-3.7	43.0



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.1	17.7	-0.3	71.8

MC0520 PRE TEST

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

<u>Test ID</u>	<u>Part Serial Number</u>	<u>Test Date</u>	<u>Test Time</u>
	45955	9/20/2011	8:15 PM
<u>Cert ID</u>	<u>ATD Serial Number</u>	<u>ATD Type</u>	
	N/A	SIDIIs	

Current Date : 9/20/2011

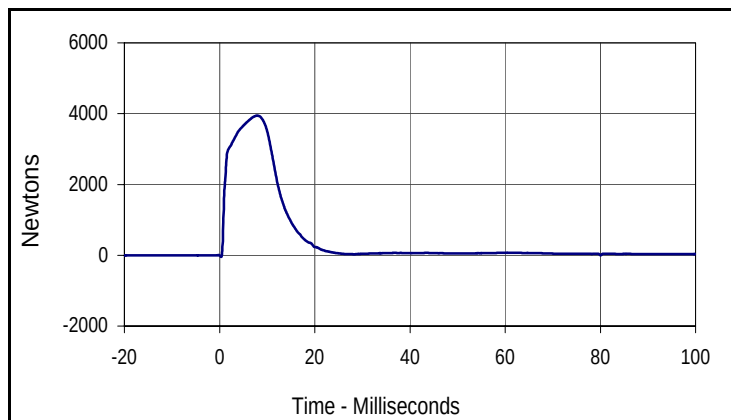
Current Time : 20:16:18

Test Program: SID IIs Pelvis Acetabulum Impact Test
 ATD Serial No.: 299

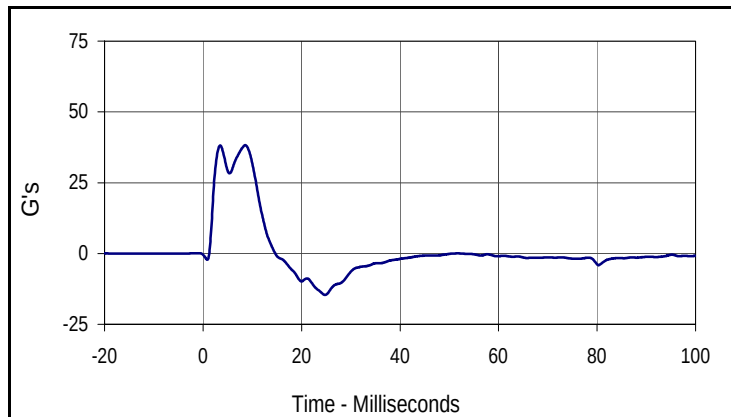
Test Date: 5/2/12
 Test I.D.: 299ACET039



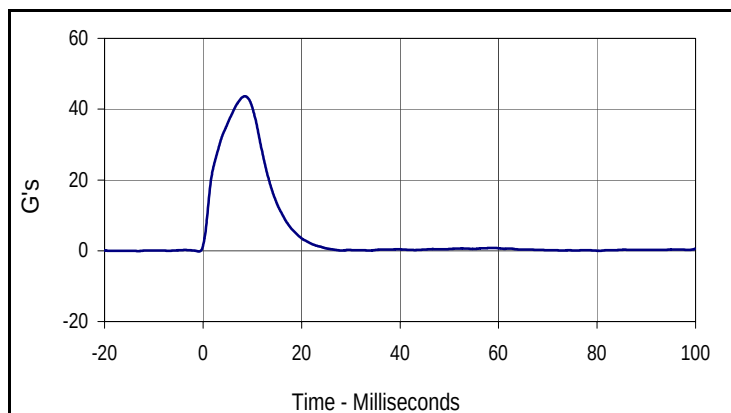
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	420	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Acetabulum Force Y	Newtons	3600 to 4300	3945.6	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	38.3	Pass
Peak Impactor Acceleration	G's	38 to 47	43.6	Pass
Overall Test Results			Pass	



Curve Description			
Pelvis Acetabulum Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3945.6	7.8	-44.2	0.3



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
38.3	8.6	-14.6	24.8



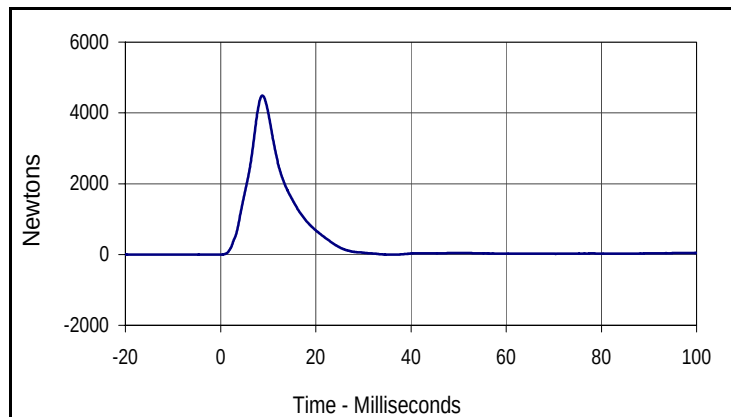
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
43.6	8.5	-0.2	-0.8

Test Program: SID IIs Pelvis Iliac Calibration
 ATD Serial No.: 299

Test Date: 5/2/12
 Test I.D.: 299PL039



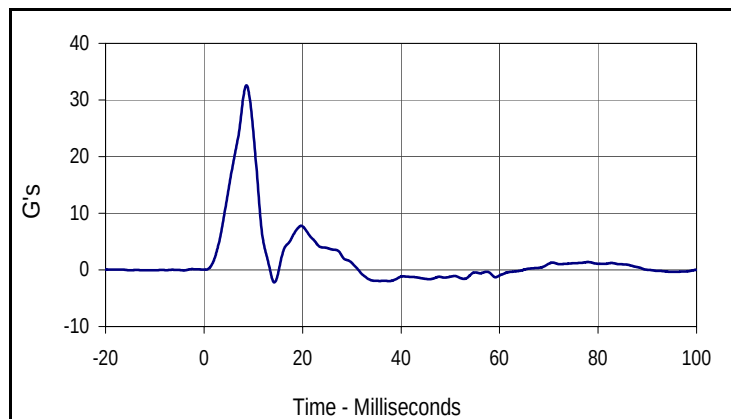
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	450	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.3	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Iliac Force	Newtons	4100 to 5100	4489.6	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	32.6	Pass
Peak Impactor Acceleration	G's	36 to 45	39.9	Pass
Overall Test Results			Pass	



Curve Description

Pelvis Iliac Force

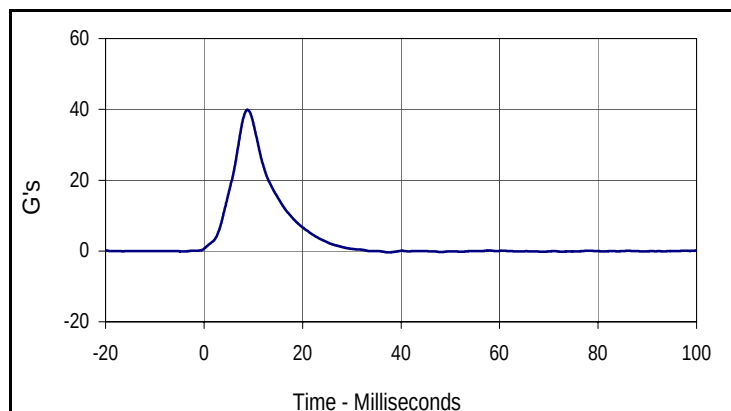
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4489.6	8.8	-3.4	36.1



Curve Description

Pelvis Y Acceleration

Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
32.6	8.6	-2.2	14.3



Curve Description

Impactor Acceleration

Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
39.9	8.8	-0.4	37.4

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

Test Program: SID IIs External Measurements
 ATD Serial No.: 299

Test Date: 5/15/12
 Test I.D.: N/A



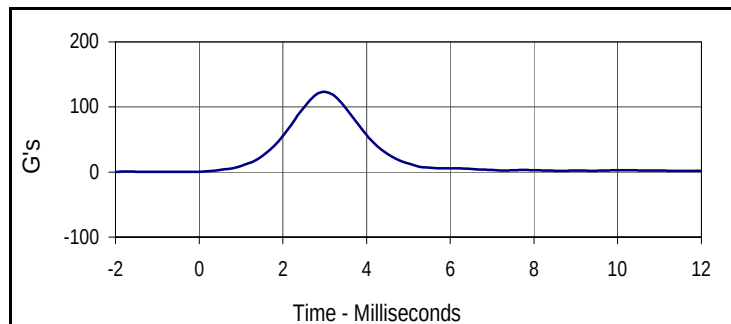
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
A	Sitting Height	mm	772 - 788	779	Pass
B	Shoulder Pivot Height	mm	437 - 453	445	Pass
C	H-Point Height	mm	79 - 89	84	Pass
D	H-Point from Seatback	mm	141 - 151	148	Pass
E	Shoulder Pivot from Backline	mm	97 - 107	103	Pass
F	Thigh Clearance	mm	119 - 135	125	Pass
G	Head Breadth	mm	140 - 148	145	Pass
H	Head Back from Backline	mm	40 - 46	43	Pass
I	Head Depth	mm	178 - 188	182	Pass
J	Head Circumference	mm	541 - 551	546	Pass
K	Buttock to Knee Length	mm	514 - 540	528	Pass
L	Popliteal Height	mm	343 - 369	355	Pass
M	Knee Pivot to Floor Height	mm	392 - 409	402	Pass
N	Buttock Popliteal Length	mm	416 - 442	429	Pass
O	Chest Depth w/o Jacket	mm	195 - 211	202	Pass
P	Foot Length	mm	216 - 232	219	Pass
Q	Hip Breadth with Pelvic Plug	mm	313 - 323	318	Pass
R	Arm Length	mm	249 - 259	256	Pass
S	Knee Joint to Seatback	mm	477 - 493	485	Pass
V	Shoulder Width	mm	341 - 357	350	Pass
W	Foot Width	mm	78 - 94	92	Pass
Y	Chest Circumference with Jacket	mm	851 - 881	874	Pass
Z	Waist Circumference	mm	760 - 791	773	Pass
Overall Test Results					Pass

Test Program: SID IIs Head Drop Test
 ATD Serial No.: 299

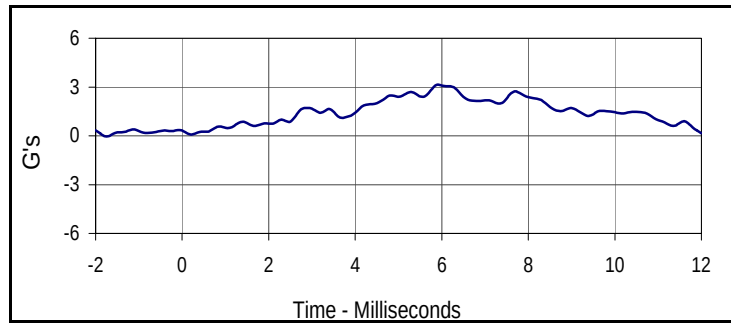
Test Date: 5/15/12
 Test I.D.: 299HD040



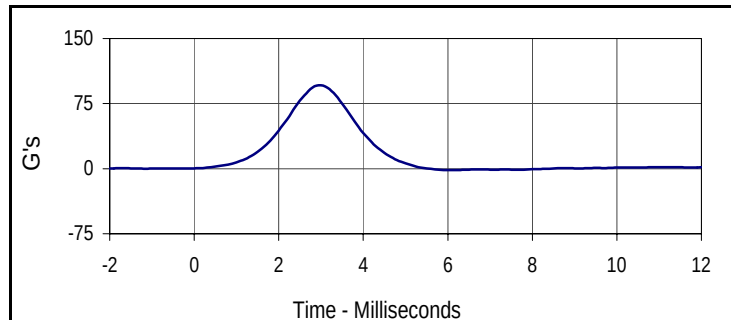
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	250	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.6	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.8	Pass
Peak Head Resultant Acceleration		G's	115 to 137	123.3	Pass
Peak Head X Acceleration		G's	<15	3.1	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse		%	<15	10.5	Pass
Overall Test Results				Pass	



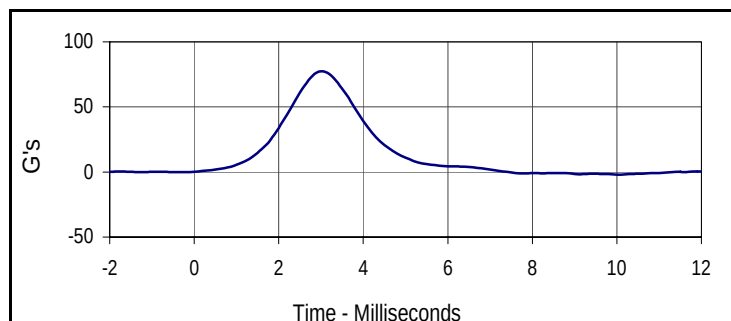
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
123.3	3.0	0.3	-1.3



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
3.1	5.9	0.0	-1.7



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
96.1	3.0	-1.7	6.2



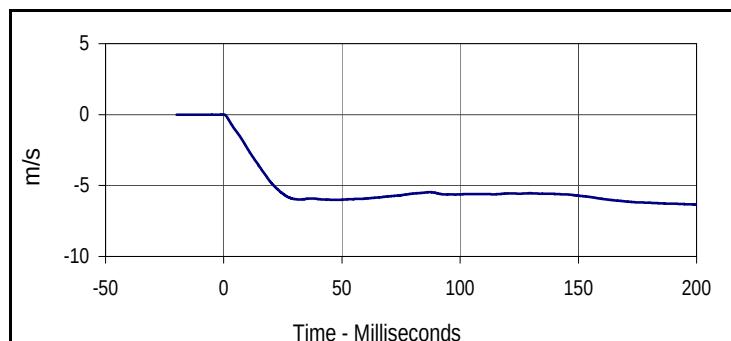
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
77.3	3.0	-2.0	10.0

Test Program: SID IIs Neck Flexion Test
 ATD Serial No.: 299

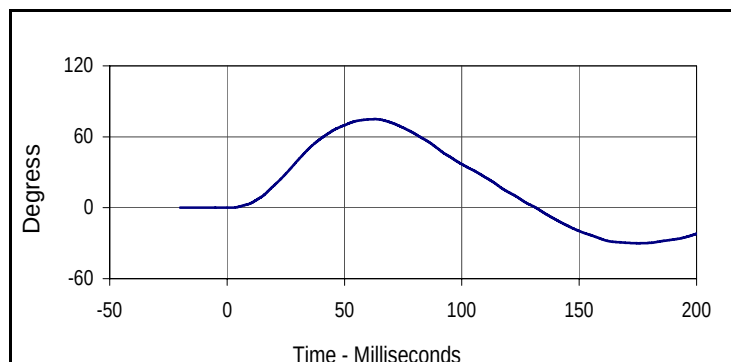
Test Date: 5/15/12
 Test I.D.: 299NB040



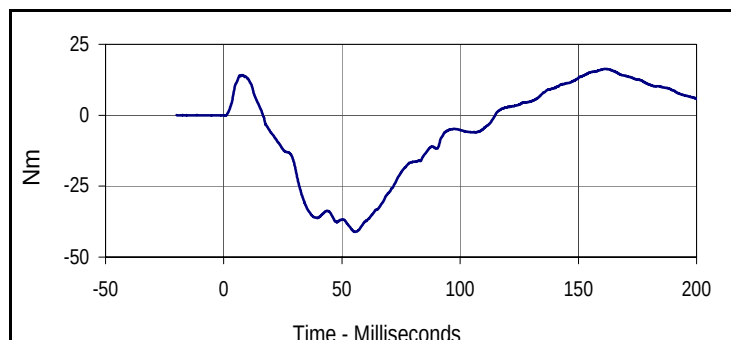
Tested Parameter	Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time	Minutes	≥240	280	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.0	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Pendulum Velocity	m/s	5.51 to 5.63	5.55	Pass
Pendulum Deceleration	10 msec	-2.20 to -2.80	-2.38	Pass
	15 msec	-3.30 to -4.10	-3.63	Pass
	20 msec	-4.40 to -5.40	-4.79	Pass
	25 msec	-5.40 to -6.10	-5.58	Pass
	25-100 msec	-5.50 to -6.20	-6.00	Pass
D-Plane Rotation	Max	71 to 81	74.9	Pass
	Time	50 to 70	63.1	Pass
Peak Occipital Condyle Moment	Nm	-36 to -44	-41.1	Pass
Decaying Moment Time to Cross 0 Nm	msec	102 to 126	114.9	Pass
Overall Test Results			Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-0.4	-6.3	200.0



Curve Description			
Maximum Translation Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
74.9	63.1	-30.1	175.3



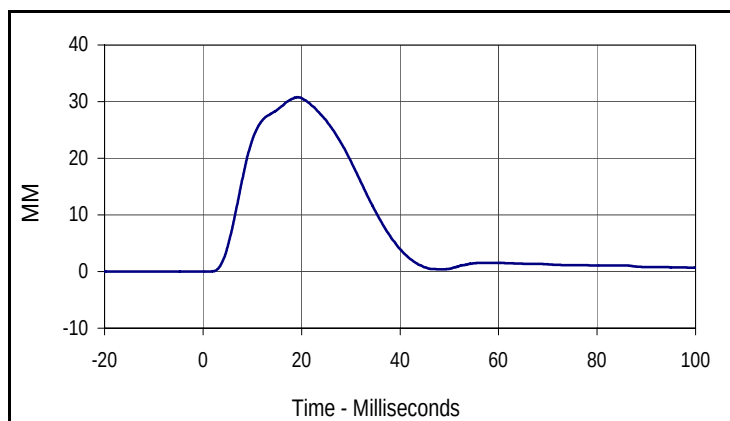
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.4	161.7	-41.1	55.5

Test Program: SID IIs Shoulder Impact Test
 ATD Serial No.: 299

Test Date: 5/15/12
 Test I.D.: 299SH040



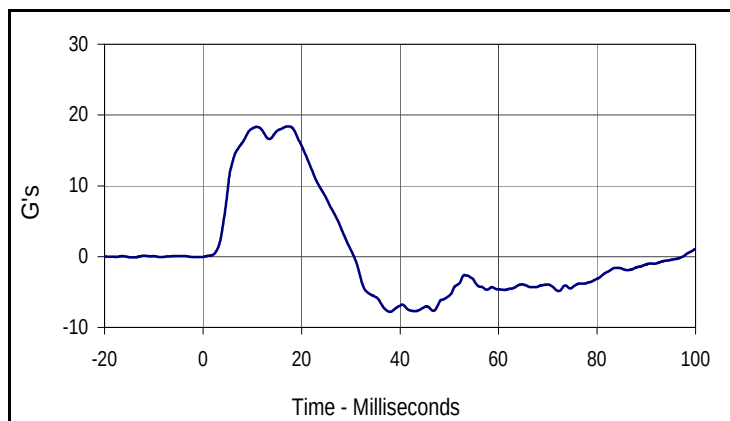
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	320	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	4.20 to 4.40	4.23	Pass
Peak Shoulder Deflection		mm	28 to 37	30.8	Pass
Peak Lateral Spine Acceleration Y		G's	17 to 22	18.4	Pass
Peak Impactor Acceleration		G's	13 to 18	16.0	Pass
Overall Test Results				Pass	



Curve Description

Shoulder Deflection

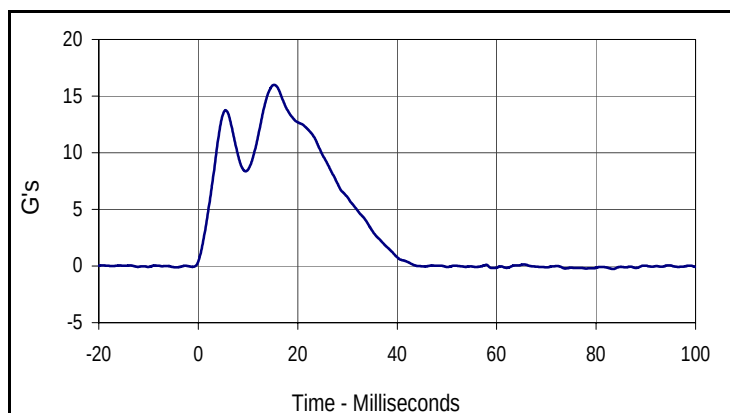
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
30.8	19.2	0.0	-12.7



Curve Description

Upper Spine Y Acceleration

Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
18.4	17.2	-7.8	38.0



Curve Description

Impactor Acceleration

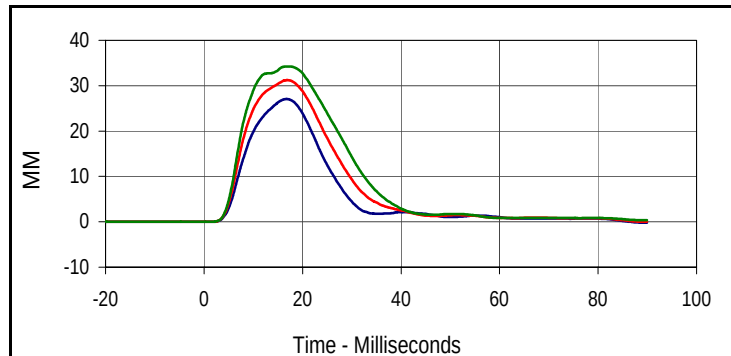
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
16.0	15.3	-0.3	83.4

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 299

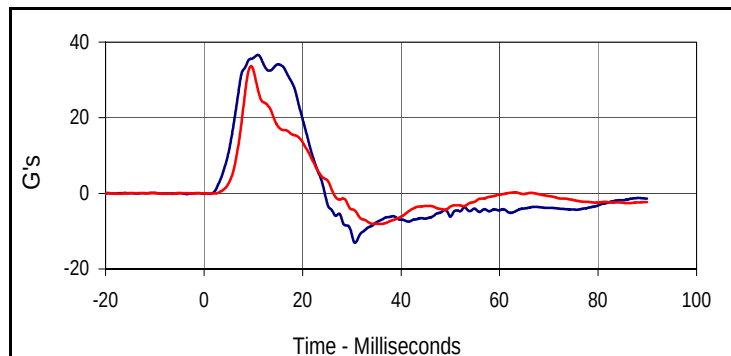
Test Date: 5/15/12
 Test I.D.: 299TWA040



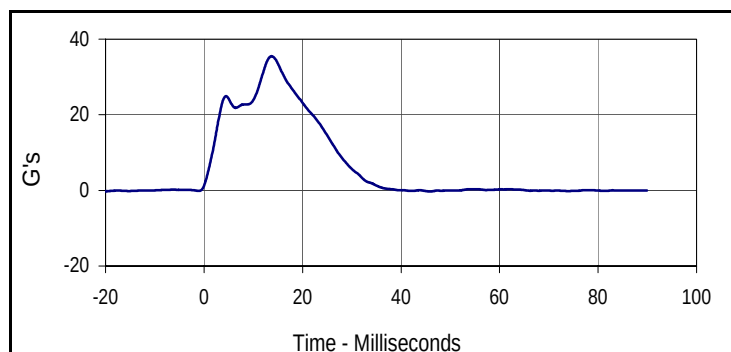
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	350	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.8	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Shoulder Deflection	mm	31 to 40	34.8	Pass
Peak Upper Thorax Rib Deflection	mm	25 to 32	27.1	Pass
Peak Middle Thorax Rib Deflection	mm	30 to 36	31.2	Pass
Peak Lower Thorax Rib Deflection	mm	32 to 38	34.2	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	36.6	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	33.6	Pass
Peak Impactor Acceleration	G's	30 to 36	35.5	Pass
Overall Test Results			Pass	



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.1	16.8	-0.2	91.0
Middle Thorax Deflection			
Max	Time	Min	Time
31.2	16.9	0.0	-14.1
Lower Thorax Deflection			
Max	Time	Min	Time
34.2	16.7	0.0	-12.5



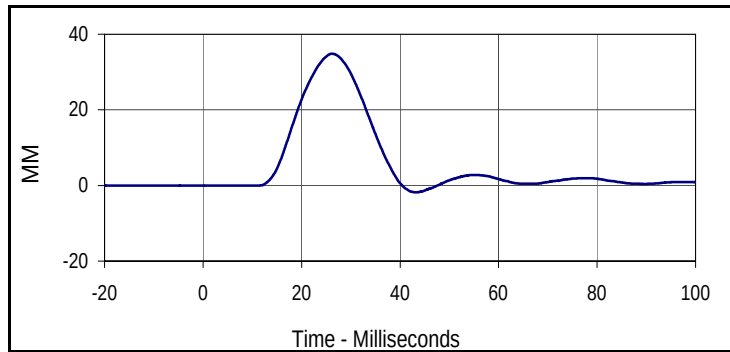
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
36.6	10.9	-13.1	30.7
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
33.6	9.5	-8.1	35.8



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
35.5	13.7	-0.3	45.9

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 299

Test Date: 5/15/12
 Test I.D.: 299TWA040



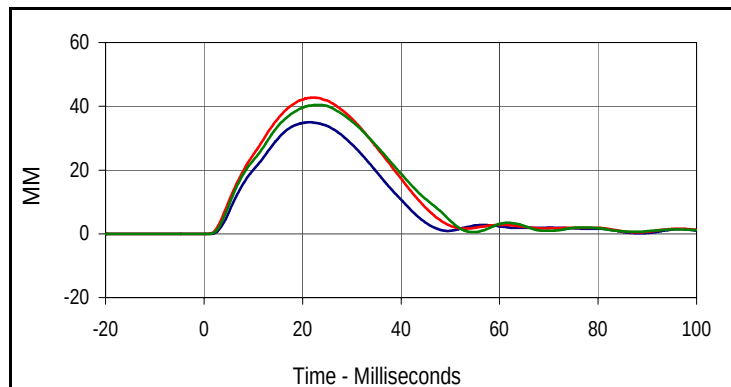
Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
007	FIL	600	MM
Max	Time	Min	Time
34.8	26.1	-1.8	43.2

Test Program: SID IIs Thorax without Arm Impact Test
 ATD Serial No.: 299

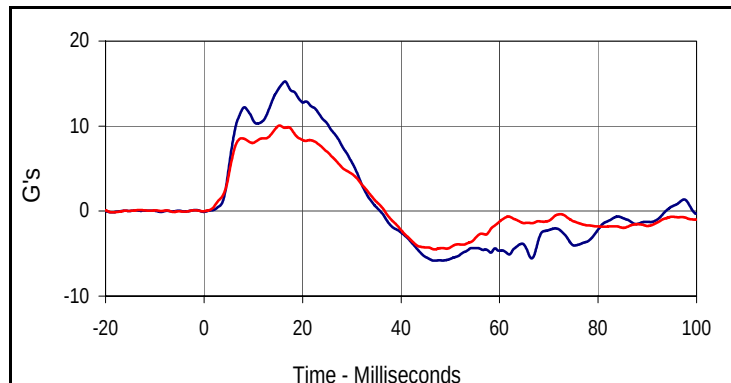
Test Date: 5/15/12
 Test I.D.: 299TWOA040



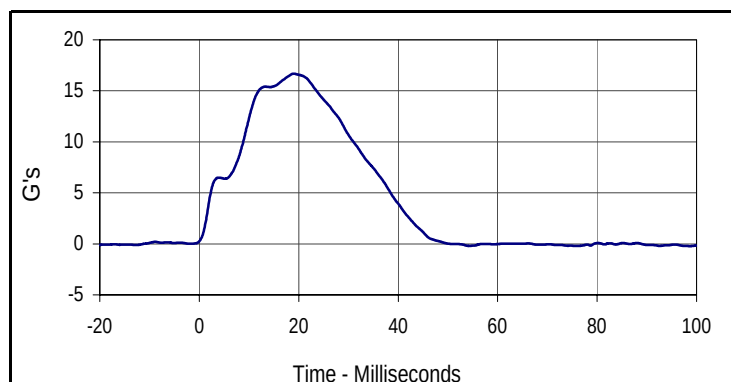
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	380	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	31.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.8	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.27	Pass
Peak Upper Thorax Rib Deflection		mm	32 to 40	35.0	Pass
Peak Middle Thorax Rib Deflection		mm	39 to 45	42.7	Pass
Peak Lower Thorax Rib Deflection		mm	35 to 43	40.4	Pass
Peak Upper Spine Y Acceleration		G's	13 to 17	15.2	Pass
Peak Lower Spine Y Acceleration		G's	7 to 11	10.1	Pass
Peak Impactor Acceleration		G's	14 to 18	16.7	Pass
Overall Test Results				Pass	



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
35.0	21.4	0.0	-14.3
Middle Thorax Deflection			
Max	Time	Min	Time
42.7	22.2	0.0	-12.5
Lower Thorax Deflection			
Max	Time	Min	Time
40.4	22.9	0.0	-13.9



Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.2	16.4	-5.8	46.8
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
10.1	15.3	-4.5	46.9



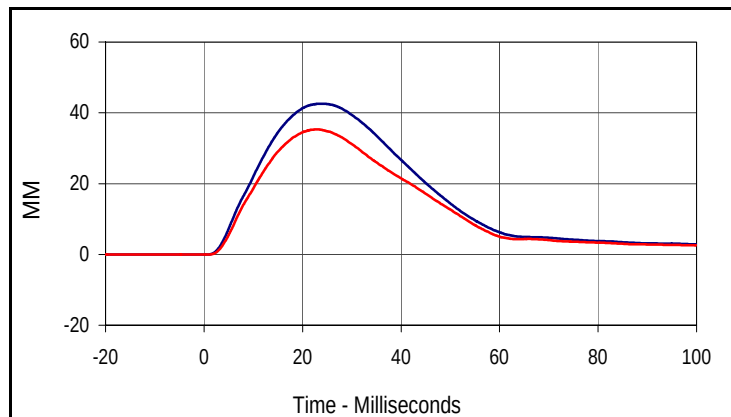
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.7	19.0	-0.2	98.6

Test Program: SID IIs Abdomen Impact Test
 ATD Serial No.: 299

Test Date: 5/15/12
 Test I.D.: 299ABD040

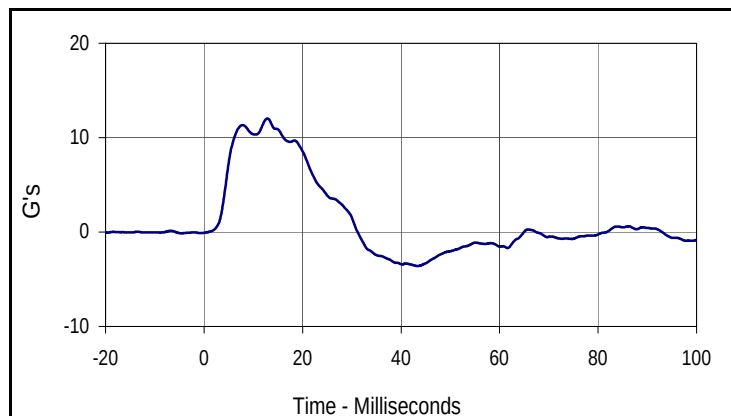


Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	410	Pass
Temperature During Soak	Max °C	20.6 to 22.2	21.7	Pass
	Min °C		20.7	Pass
Humidity During Soak	Max %	10.0 to 70.0	31.0	Pass
	Min %		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Upper Abdominal Rib Deflection	mm	36 to 47	42.6	Pass
Peak Lower Abdominal Rib Deflection	mm	33 to 44	35.3	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	12.0	Pass
Peak Impactor Acceleration	G's	12 to 16	15.2	Pass
Overall Test Results			Pass	

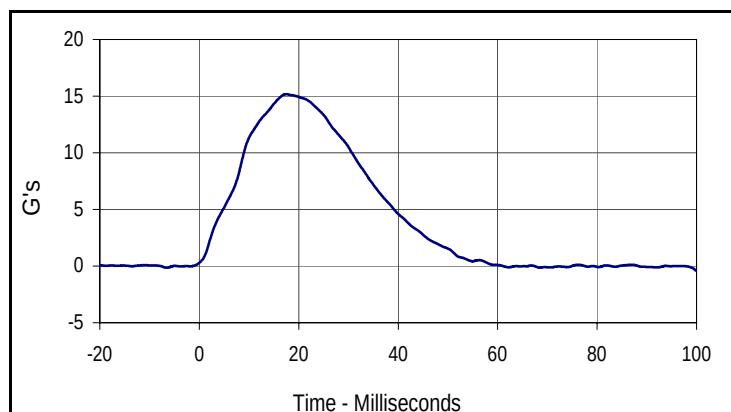


Curve Description			
Upper Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
42.6	23.6	0.0	-3.8

Curve Description			
Lower Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
35.3	22.9	0.0	-5.6



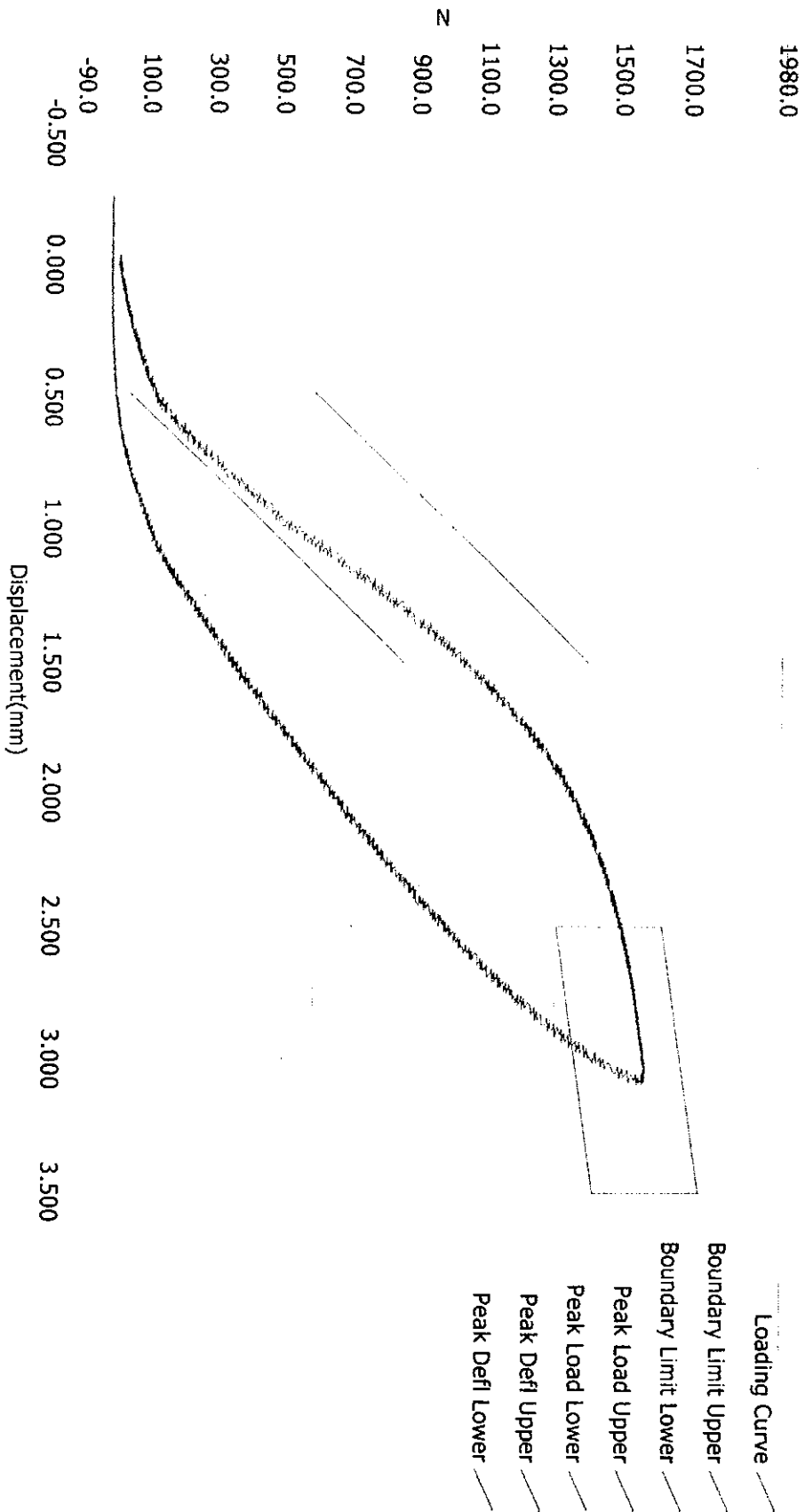
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
12.0	12.8	-3.6	43.4



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.2	17.5	-0.4	99.9

MC0520 POST TEST

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
46743		10/4/2011	5:01 PM
Cert ID	ATD Serial Number	ATD Type	
N/A		SIDIIs	

Current Date : 10/4/2011

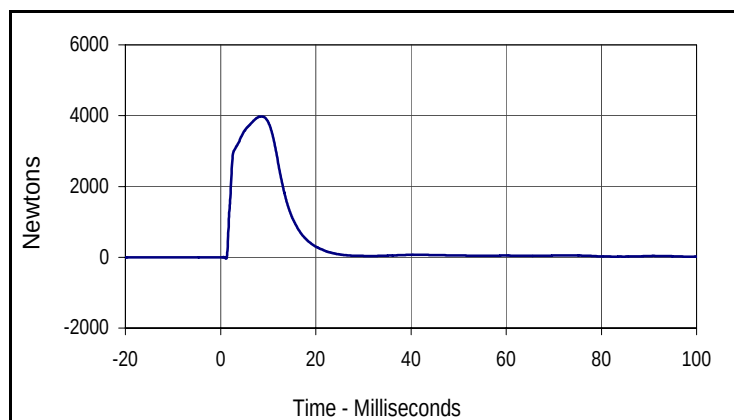
Current Time : 17:01:41

Test Program: SID IIs Pelvis Acetabulum Impact Test
 ATD Serial No.: 299

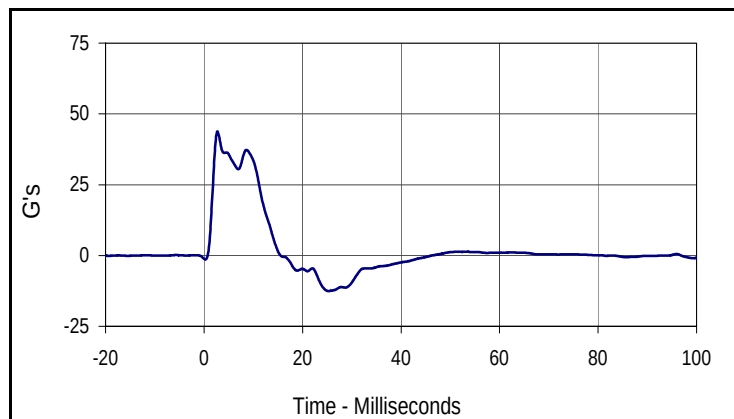
Test Date: 5/15/12
 Test I.D.: 299ACET040



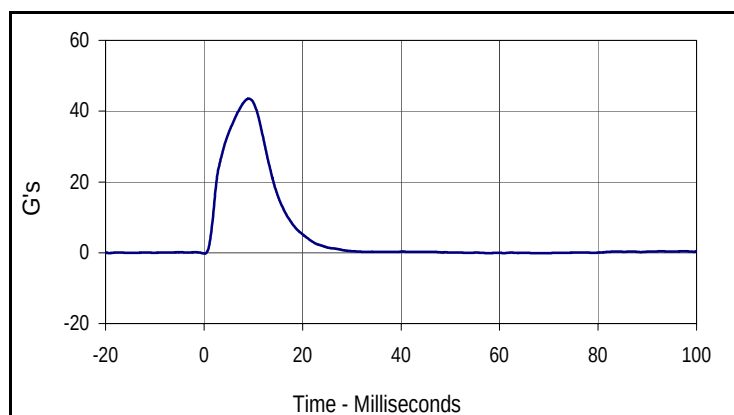
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	440	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.8	Pass
Peak Acetabulum Force Y	Newtons	3600 to 4300	3978.4	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	37.3	Pass
Peak Impactor Acceleration	G's	38 to 47	43.5	Pass
Overall Test Results			Pass	



Curve Description			
Pelvis Acetabulum Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3978.4	8.6	-38.9	1.2



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
43.8	2.7	-12.6	25.3



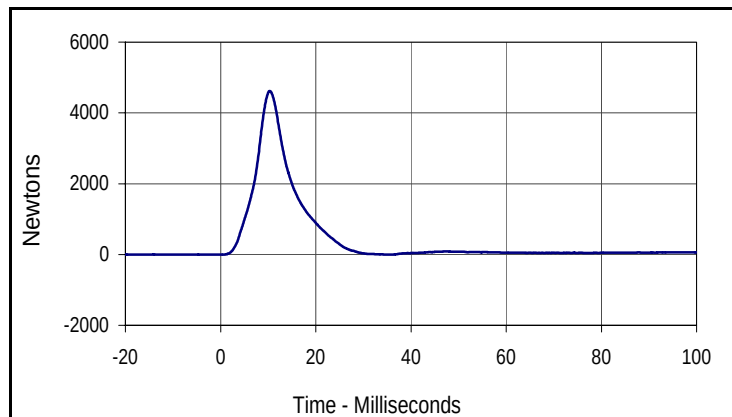
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
43.5	9.1	-0.2	0.1

Test Program: SID IIs Pelvis Iliac Calibration
 ATD Serial No.: 299

Test Date: 5/15/12
 Test I.D.: 299PL040



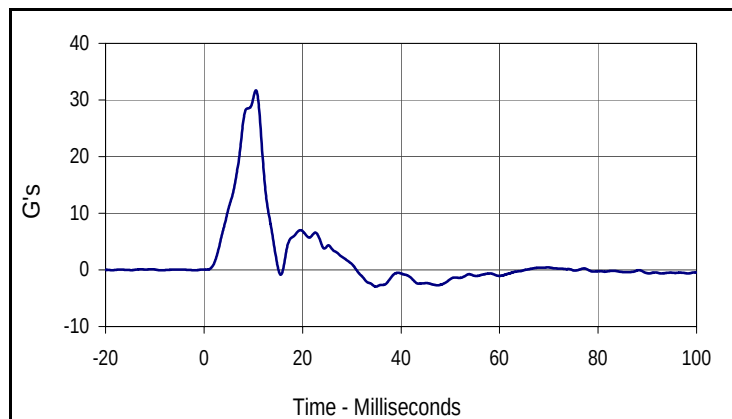
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	470	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.0	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.1	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Iliac Force	Newtons	4100 to 5100	4620.1	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	31.7	Pass
Peak Impactor Acceleration	G's	36 to 45	41.1	Pass
Overall Test Results			Pass	



Curve Description

Pelvis Iliac Force

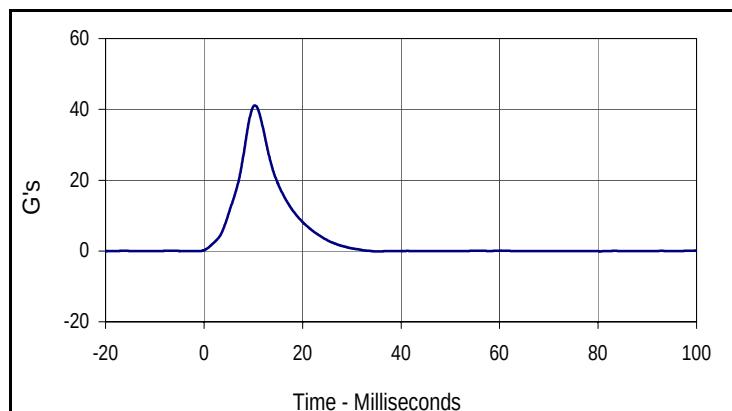
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4620.1	10.3	-2.8	35.8



Curve Description

Pelvis Y Acceleration

Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
31.7	10.5	-3.0	34.9



Curve Description

Impactor Acceleration

Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
41.1	10.3	-0.1	34.9

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 299		
				Serial Number	Manufacturer	Calibration
Head Accelerometers			X	P51926	Endevco	8/8/11
			Y	P51929	Endevco	8/8/11
			Z	P51934	Endevco	8/8/11
Displacement Potentiometers	Shoulder		Y	1074	FTSS	8/8/11
	Thoracic Rib	Upper	Y	1143	FTSS	8/8/11
		Middle	Y	1160	FTSS	8/8/11
		Lower	Y	1213	FTSS	8/8/11
	Abdominal Rib	Upper	Y	1218	FTSS	8/8/11
		Lower	Y	1234	FTSS	8/8/11
Lower Spine Accelerometers (T12)			X	P63999	Endevco	8/5/11
			Y	P58872	Endevco	8/4/11
			Z	P58795	Endevco	8/4/11
Acetabulum Load Cell			Y	272	Denton	7/22/11
Iliac Wing Load Cell			Y	284	Denton	7/22/11
Pelvis Plug (Struck Side)				46923	FTSS	10/6/11
Pelvis Plug (Non-Struck Side)				46893	FTSS	10/6/11

TABLE 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	Ketx11a	ICSensor	7/19/11
Vehicle Center of Gravity	Y	Ketx11b	ICSensor	7/19/11
Vehicle Center of Gravity	Z	Ketx11c	ICSensor	7/19/11
Left Floor Sill	Y	12872	Endevco	1/11/12
A-Pillar Sill	Y	J36641	Endevco	4/4/11
A-Pillar Low	Y	J21730	Endevco	4/13/12
A-Pillar Mid	Y	12995	Endevco	12/17/11
B-Pillar Sill	Y	12916	Endevco	2/29/12
B-Pillar Low	Y	12902	Endevco	1/11/12
B-Pillar Mid	Y	12869	Endevco	1/11/12
Driver Seat	Y	J23944	Endevco	4/16/12
Engine Top	X	12901	Endevco	1/11/12
Engine Top	Y	12883	Endevco	1/11/12
Firewall	Y	AE29	Endevco	4/4/12
Right Roof	Y	12996	Endevco	12/17/11
Right Floor Sill	Y	AJ4F8	Endevco	4/4/12
Rear Floorpan	X	12885	Endevco	1/11/12
Rear Floorpan	Y	12886	Endevco	1/11/12

TABLE 3 – Pole Instrumentation

	Serial Number	Manufacturer	Calibration Date
Load Cell 1	131822A	Interface	8/8/11
Load Cell 2	132304A	Interface	8/8/11
Load Cell 3	19477	Interface	8/8/11
Load Cell 4	19325	Interface	8/8/11
Load Cell 5	131827A	Interface	8/8/11
Load Cell 6	132302A	Interface	8/8/11
Load Cell 7	19267	Interface	8/8/11
Load Cell 8	19321	Interface	8/8/11