

REPORT NUMBER: SINCAP-KAR-12-065

**NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

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

NHTSA No: MC0519

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



MAY 23, 2012

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
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OFFICE OF CRASHWORTHINESS STANDARDS
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15. Supplementary Notes

16. Abstract

A 55/28 km/h 90 deg. Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2012 BMW 328i 4-door sedan in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on May 9, 2012.

The impact velocity of the Moving Deformable Barrier was 62.5 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 27.8 deg. C. The target vehicle's maximum post-test static crush was 229 mm located at level 3. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	257.7
Maximum Thorax Rib Deflection	mm	44	27
Total Abdominal Force	N	2500	1034
Pubic Symphysis Force	N	6000	819

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	326.3
Resultant Lower Spine Acceleration	g	82	64
Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	3061
Maximum Thoracic Rib Deflection	mm	38*	34
Maximum Abdominal Rib Deflection	mm	45*	11

The doors on the struck side of the vehicle did not separate from the body at the hinges or latches, and the opposite side doors did not open during the side impact event.

* Proposed IARV

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SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier 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 2012 BMW 328i 4-door sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.5 km/h (38.8 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by KARCO Engineering, LLC. in Adelanto, California, on May 9, 2012. Pre- and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in Appendix A of this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated August 2011. The side impact event was documented by 11 cameras. Camera locations are included in Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib and lower rib y-axis displacement potentiometers

Abdomen forward, middle, and rear y-axis load cells

Lower spine (12) tri-axial accelerometers

Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib and lower rib y-axis displacement potentiometers

Abdomen upper rib and lower rib y-axis displacement potentiometers

Lower spine (12) tri-axial accelerometers

Acetabulum and iliac wing y-axis load cells

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

Dummy injury readings were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	257.7
Maximum Thorax Rib Deflection	mm	44	27
Combined Abdominal Force	N	2500	1034
Pubic Symphysis Force	N	6000	819

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	326.3
Lower Spine (T12) Resultant Acceleration	g	82	64
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3061
Maximum Thoracic Rib Deflection	mm	38*	34
Maximum Abdominal Rib Deflection	mm	45*	11

*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	No		No	

GENERAL COMMENTS

The doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. The 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. MC0519

Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

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. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MC0519
Model Year	2012
Make	BMW
Model	328i
Body Style	4-Door Sedan
VIN	WBA3A5C51CF259173
Body Color	Mineral Gray Metallic
Odometer Reading (km / mi)	11 / 7
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	Yes
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	Feb-11
Vehicle Type	Passenger Car

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	
Capacity Weight (VCW) (kg)				410.0	A
DSC x 68.04 (kg)				340.2	B
Cargo Weight (RCLW) (kg)				69.8	A-B

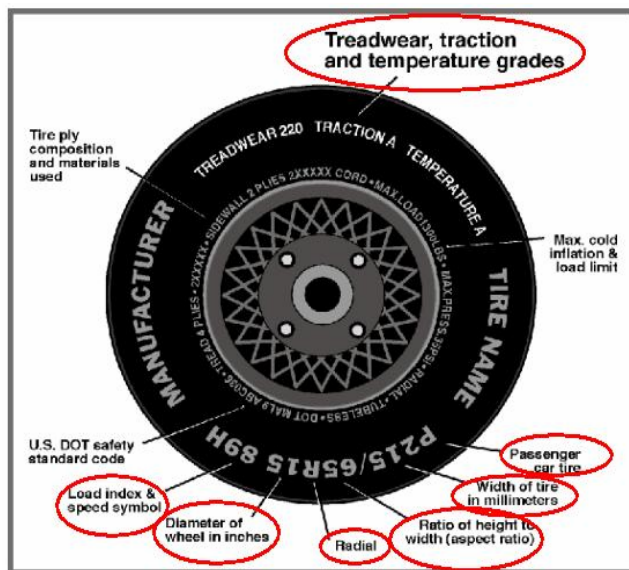
VEHICLE SEAT TYPE

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. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	220	220
Recommended Tire Size	225/50R17	225/50R17

VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Tire Size on Vehicle	225/50R17	225/50R17
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. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

TIRE PRESSURES

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

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	200	200	200	200

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	367.5	375.5		416.0	457.0		402.5	470.0	
Right	kg	393.5	393.0		395.0	449.0		391.0	458.0	
Ratio	%	49.8%	50.2%	100.0%	47.2%	52.8%	100.0%	46.1%	53.9%	100.0%
Total	kg	761.0	768.5	1529.5	811.0	906.0	1717.0	793.5	928.0	1721.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1529.5	A
Actual Weight of 2 P572 ATDs Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	69.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1724.3	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)
Non-Struck Outboard Mirror	1.5
Non-Struck Door Panels and Windows	12.0
Tail Lights	2.0
Bumper	7.5
Boot Lid	15.5
Ballast / Equipment Added	130.0

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519

Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement***
LF	mm	697	693	Yes
RF	mm	704	694	Yes
RR	mm	670	672	Yes
LR	mm	681	678	Yes
Vehicle CG (Aft of Front Axle)	mm	1515	1483	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	11	13	

***The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. 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. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	11.7	0.0	5.9
Front Passenger Seat	11.8	0.0	5.9
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	5.9	472	Max	519	531	546
			Mid	490	502	513
			Min	460	472	480
Front Passenger Seat	5.9	475	Max	523	535	550
			Mid	493	505	520
			Min	463	475	490
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	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

DATA SHEET NO. 2 ... (CONTINUED)

SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

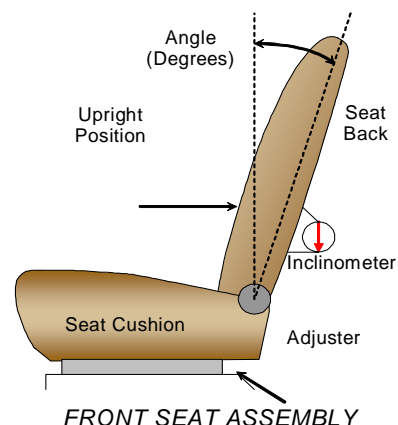
Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	248		124	
Front Passenger Seat	248		124	
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 to the manufacturer's designated design angle. The right front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck side rear seat back. Seat back angle is measured at the seat back using a digital inclinometer.



SEAT BACK POSITION

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/Seated Dummy	45.0		25.9	
Front Passenger Seat	45.1		25.9	
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

DATA SHEET NO. 2 ... (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

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
Rear Seat	Fixed	Fixed

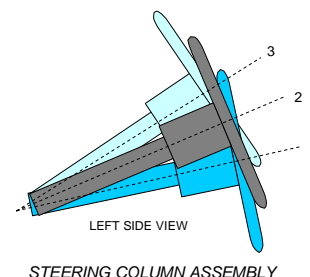
HEAD RESTRAINT ADJUSTMENT

The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger'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 Up, Full Forward
Rear Seat	Fixed	Fixed

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	17.7	70
Geometric Center - Position 2	19.4	99
Uppermost - Position 3	21.1	127
Telescoping Steering Wheel Travel		57
Test Position	19.4	99

DATA SHEET NO. 2 ... (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

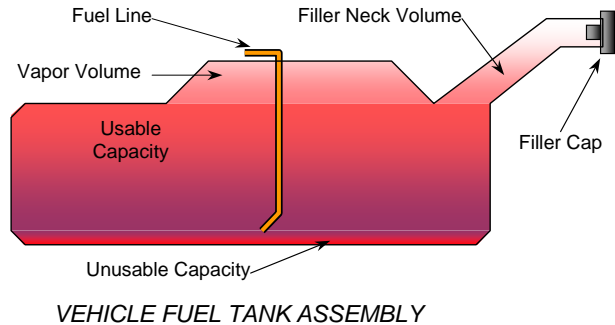
FUEL TANK CAPACITY

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	55.62
1/3 of Usable Capacity	19.93

Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1? **Yes** **No**

FUEL PUMP

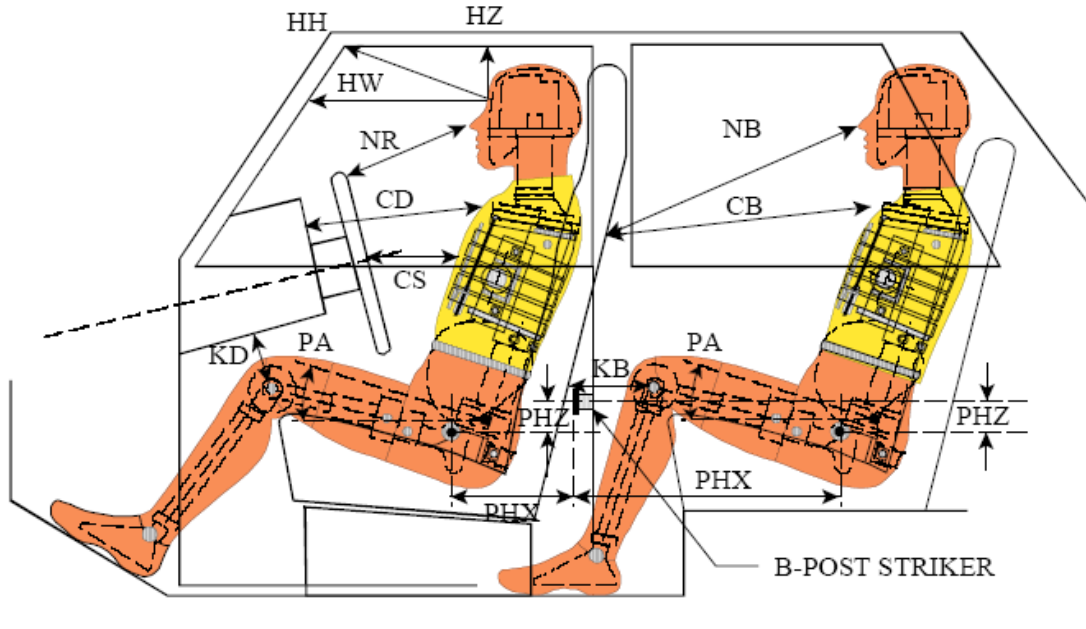
The vehicle is equipped with an electric fuel pump. The fuel pump starts when the ignition is turned on and will operate for 5 seconds. After pressure has been built up, the fuel pump switches to sleep mode until the engine is started or the pressure decreases.



DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

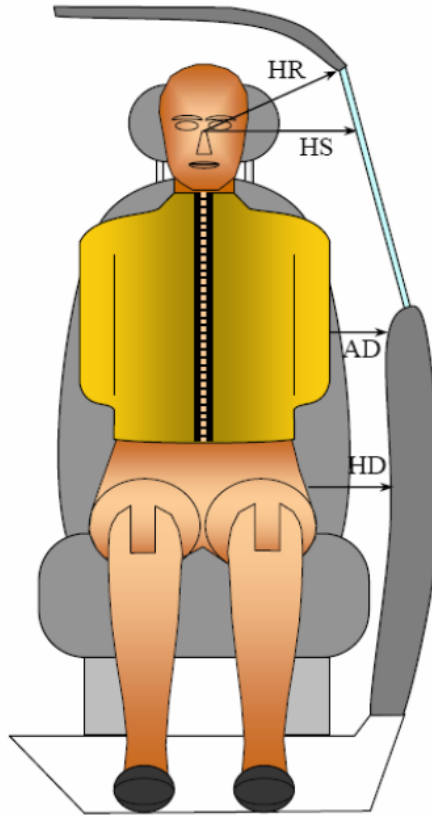
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	384			
HW		Head to Windshield	600			
HZ	HZ	Head to Roof	184		270	
NR	NB	Nose to Rim/Seat Back	464		520	
CD	CB	Chest to Dash/Seat Back	590		482	
CS		Chest to Steering Wheel	339			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	216	38.1	230	32.7
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	202	27.8	223	27.2
PAX°	PAX°	Pelvic Tilt Angle X		17.7		26.1
	PAY°	Pelvic Tilt Angle Y				0.3
PHX	PHX	Hip Point to Striker (x-axis)	133		175	
PHZ	PHZ	Hip Point to Striker (z-axis)	262		269	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



FRONT VIEW OF DUMMY

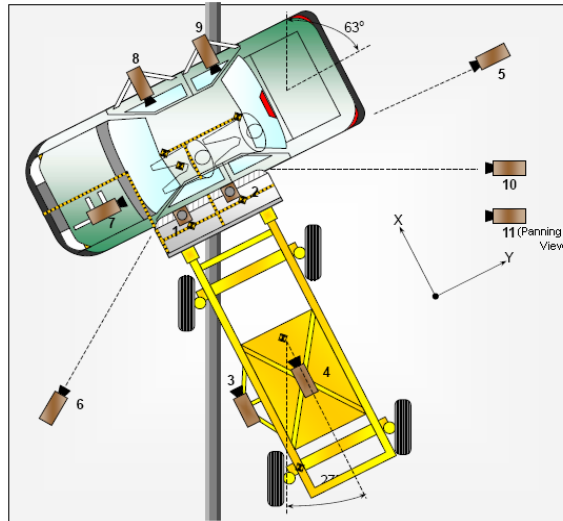
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	185	274
HS	Head to Side Window	mm	291	405
AD	Arm to Door	mm	104	174
HD	H-Point to Door	mm	151	231

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



CAMERA LOCATIONS AND DATA

No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1220	2287	-5486	14	1000
2	Overhead Close-Up	609	2287	-5102	35	1000
3	Left Impact Point (MDB)	-2134	0	-1143	25	1000
4	Side Overall (MDB)	-3912	838	-1829	12.5	1000
5	Rear	-64	2485	-1348	85	1000
6	Left Front	-2266	-3564	-1475	24	1000
7	Driver Front (On-Board)	453	-339	-716	35	1000
8	Driver Side (On-Board)	1561	848	-435	14	1000
9	Passenger Side (On-Board)	1647	1766	-484	14	1000
10	Real Time Overall				Zoom	30
11	Real Time Inrun				Zoom	30

Reference: Impact Point Projected to Ground; +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

*All measurements accurate to ±6 mm

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	5
Total	60

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	1900	0	-400
2	Right Sill at Front Seat	2680	720	-370
3	Right Sill at Rear Seat	1885	730	-370
4	Left Sill at Front Door	2575	-780	-185
5	Left Sill at Rear Door	2010	-775	-195
6	A-Pillar Lower	3220	-835	-470
7	A-Pillar Middle	3220	-835	-795
8	B-Pillar Lower	2120	-730	-410
9	B-Pillar Middle	2120	-730	-670
10	Front Seat Track	2390	-600	-320
11	Rear Seat Structure			
12	Right Rear Occupant Compartment	2005	470	-215
13	Engine Block	3705	-35	-810
14	Rear Floorpan Above Axle	530	-405	-530

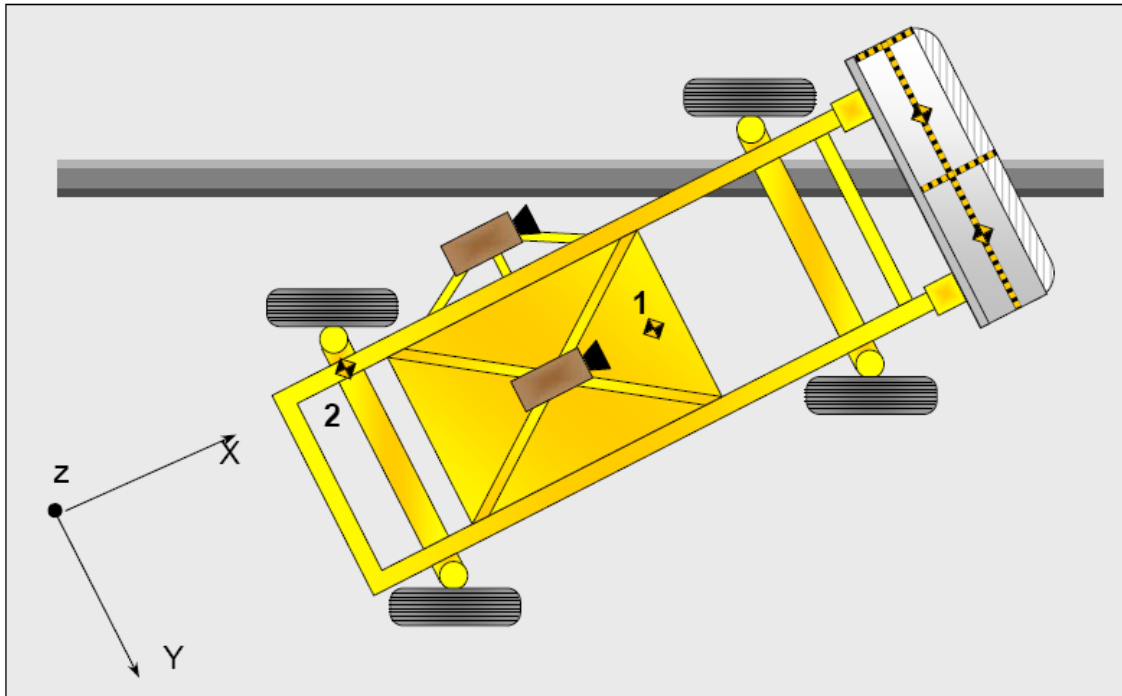
Reference: X – Rear surface of vehicle (+ forward)
 Y – Vehicle centerline (+ to right)
 Z – Ground plane (+ down)

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519

Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurement		
		X	Y	Z
1	MDB CG	-1195	0	-430
2	MDB Rear	-2642	-593	-608

Reference: X – Face of MDB (+ forward)
 Y – MDB centerline (+ to right)
 Z – Ground plane (+ down)

DATA SHEET NO. 8

POST-TEST OBSERVATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Side Header, Curtain Airbag	Curtain Airbag, Headrest
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag	Headrest
Left Shoulder	None	Curtain Airbag, Door Panel
Upper Torso	Seat, Torso Airbag	None
Lower Torso	Seat, Torso Airbag	Door Panel
Left Hip	Seat, Torso Airbag, Door Panel	Seat
Left Knee	Door Panel, Right Knee	Door Panel, Right Knee

POST-TEST DOOR PERFORMANCE

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

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	None
Side Window Damage	Both struck side windows broken
Other Notable Effects	None

DATA SHEET NO. 8 ... (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	No		No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2810
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		466
Actual Impact Point (Aft of Front Axle)	mm		464
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	2
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	-2

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length including Honeycomb Face	4023
Wheel Base of Framework Carriage	2595
CG location aft of Front Axle	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	402	298	700
Right	kg	377	292	669
Ratio	%	56.9%	43.1%	100.0%
Totals	kg	779	590	1369

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.46
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.43
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.8
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.3
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.5

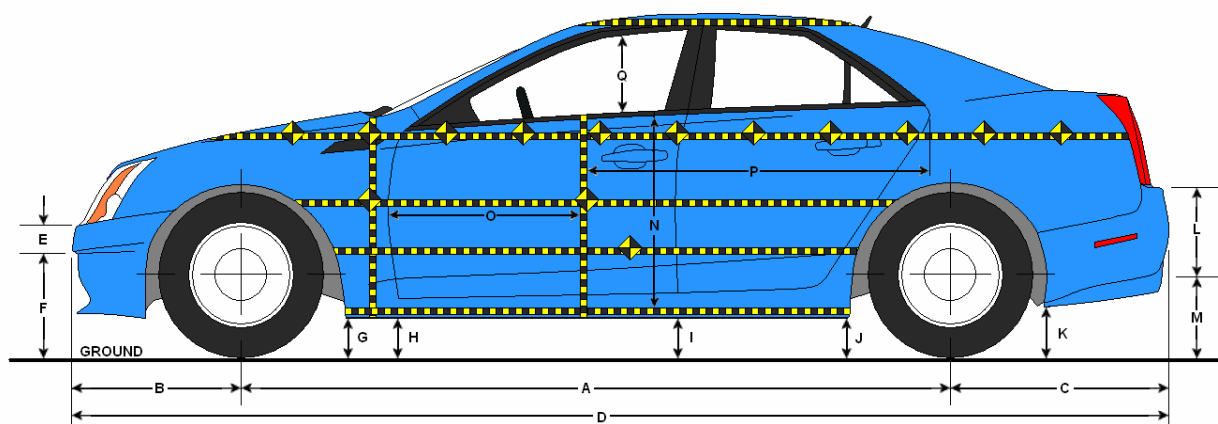
MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	400	Left	268
B	Top of Bumper	533	300	Left	196
C	Mid Level	686	800	Right	214
D	Top of Stack	813	800	Right	204

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

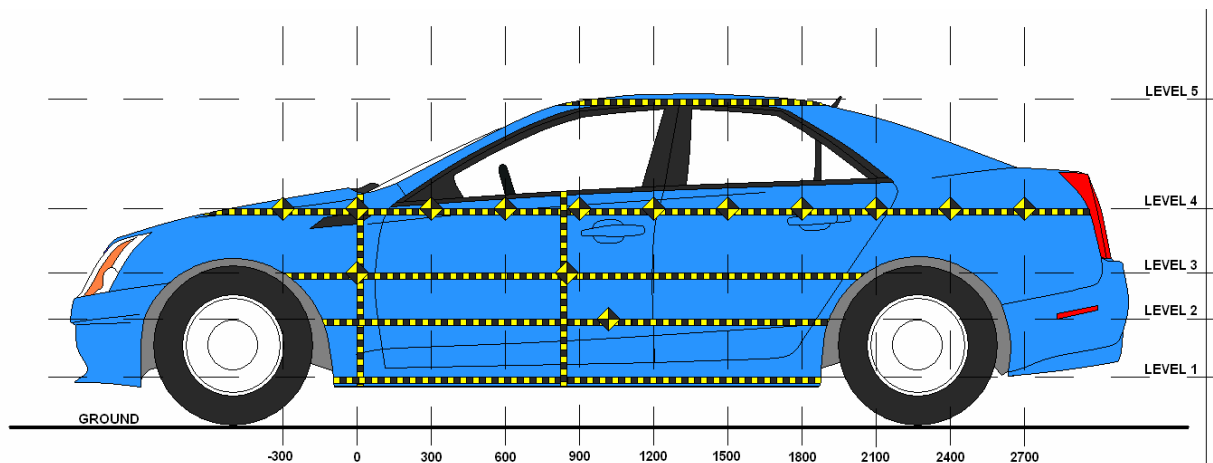
Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2810	2789	-21
B	Front Axle to FSOV	752	765	13
C	Rear Axle to RSOV	1019	1020	1
D	Total Length at Centerline	4580	4574	-6
E	Front Bumper Thickness	159	160	1
F	Front Bumper Bottom to Ground	348	337	-11
G	Sill Height at Front Wheel Well	165	182	17
H	Sill Height at Front Door Leading Edge	171	193	22
I	Sill Height at B-Pillar	173	222	49
J1	Sill Height at Rear Wheel Well	190	258	68
J2	Pinch Weld Height at Rear Wheel Well	156	212	56
K	Sill Height Aft of Rear Wheel Well	427	501	74
L	Rear Bumper Thickness	114	114	0
M	Rear Bumper Bottom to Ground	399	480	81
N	Sill Height to Bottom of Front Window Sill	567	651	84
O	Front Door Leading Edge to Impact CL	671	655	-16
P	Rear Door Trailing Edge to Impact CL	1471	1423	-48
Q	Front Window Opening	388	400	12
R	Right Side Length	3867	3873	6
S	Left Side Length	3868	3855	-13
T	Vehicle Width at B-Pillar	1805	1698	-107

All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	199	20	1200
2	Occupant H-Point	455	218	1650
3	Mid-Door	617	229	1650
4	Window Sill	895	165	1800
5	Window Top	1376	83	1500

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519

Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

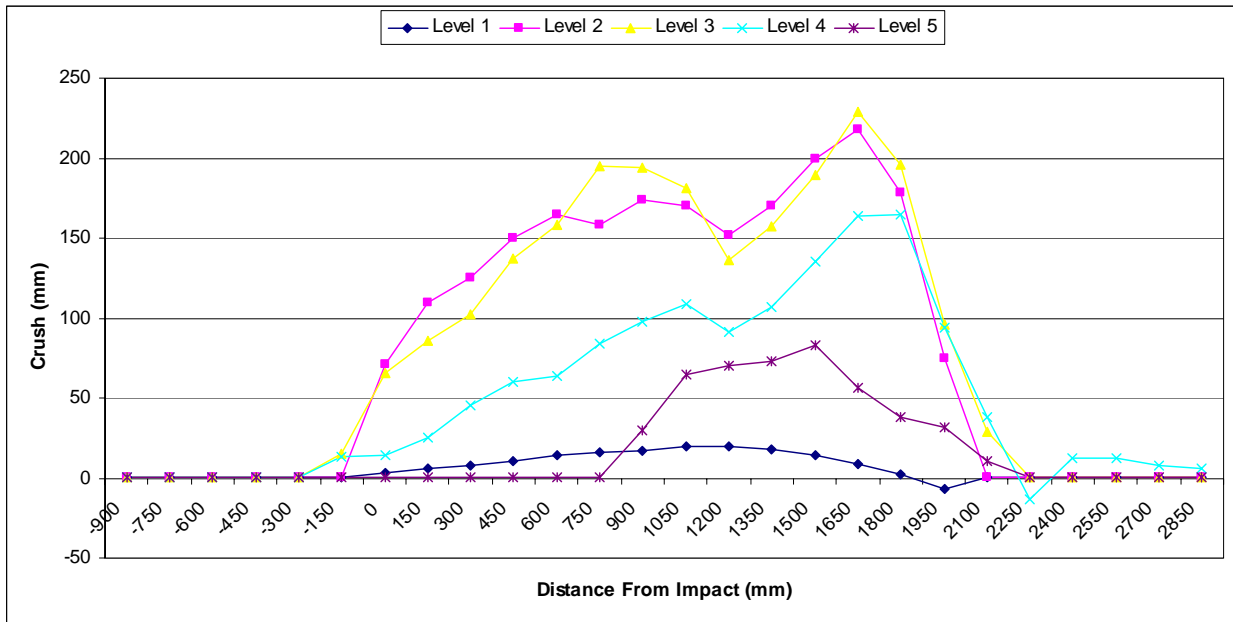
	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150			612	745				627	758				15	13	
0	660	621	616	728		663	692	682	742		3	71	66	14	
150	662	627	611	714		668	737	697	739		6	110	86	25	
300	663	627	608	698		671	752	710	743		8	125	102	45	
450	661	622	604	683		672	772	741	743		11	150	137	60	
600	659	616	602	676		673	781	760	740		14	165	158	64	
750	657	612	600	665		673	770	795	749	949	16	158	195	84	
900	657	609	599	664	918	674	783	793	762	948	17	174	194	98	30
1050	656	607	598	664	909	676	777	779	773	974	20	170	181	109	65
1200	656	605	597	663	918	676	757	733	754	988	20	152	136	91	70
1350	656	606	599	665	924	674	776	756	772	997	18	170	157	107	73
1500	656	607	601	664	921	670	807	790	799	1004	14	200	189	135	83
1650	654	609	603	665	920	663	827	832	829	976	9	218	229	164	56
1800	651	611	605	663	918	653	789	801	828	956	2	178	196	165	38
1950	641	607	605	668	918	634	682	701	762	950	-7	75	96	94	32
2100			599	671	923			628	709	934			29	38	11
2250				675					662					-13	
2400				686					698					12	
2550				694					706					12	
2700				708					716					8	
2850				726					732					6	

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519

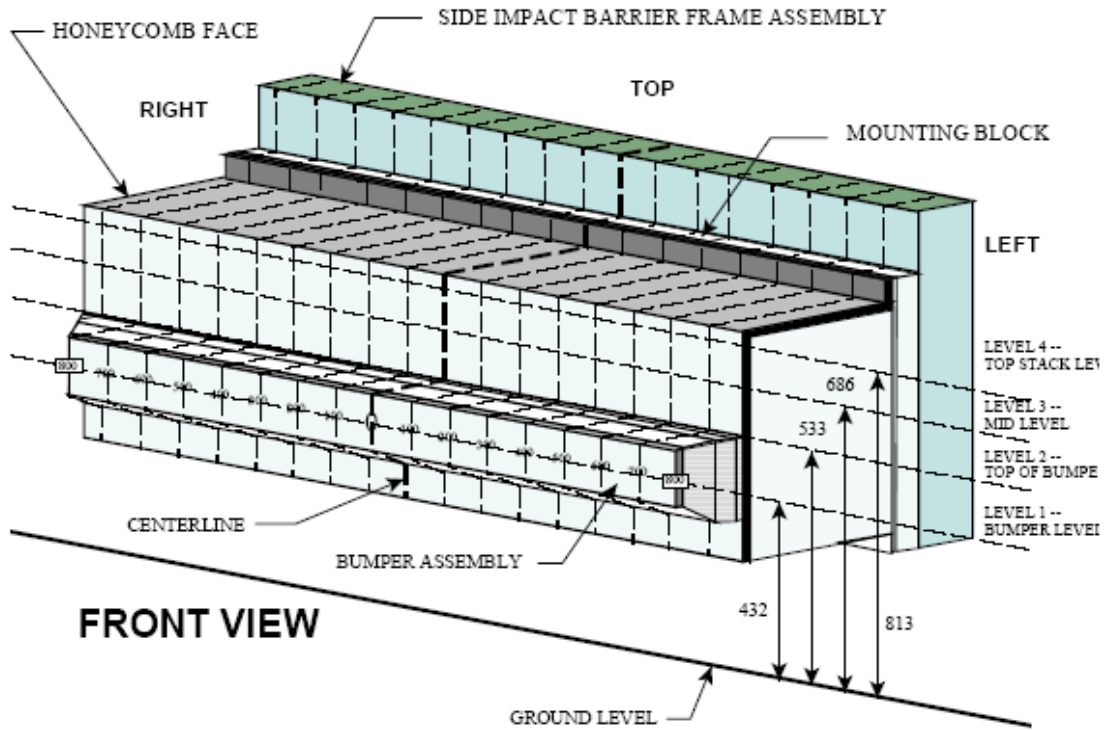
Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	232	232	220	209	209	203	202	203	207	222	241	259	268	246	240	235	249
2	171	163	154	153	151	149	146	144	146	158	174	196	187	177	171	171	171
3	214	186	144	111	89	78	73	74	83	100	136	158	148	110	94	79	91
4	204	178	146	123	101	86	75	60	64	96	143	159	139	96	70	56	70

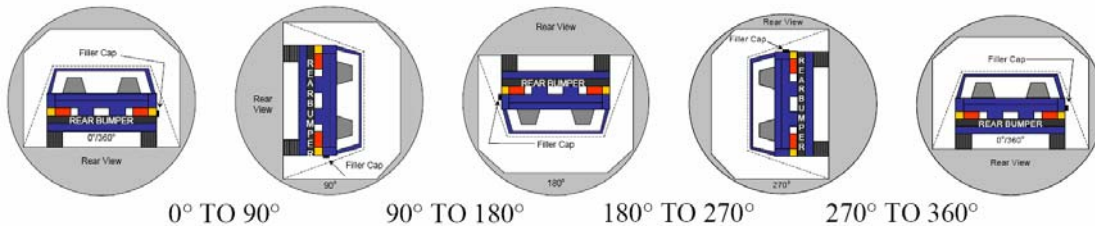
All dimensions in millimeters.

DATA SHEET NO. 13

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519
 Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12
 Temperature at Time of Impact: 27.8° C Test Time: 11:12 AM

- 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°	83	300	383
90° To 180°	80	300	380
180° To 270°	80	300	380
270° To 360°	82	300	382

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

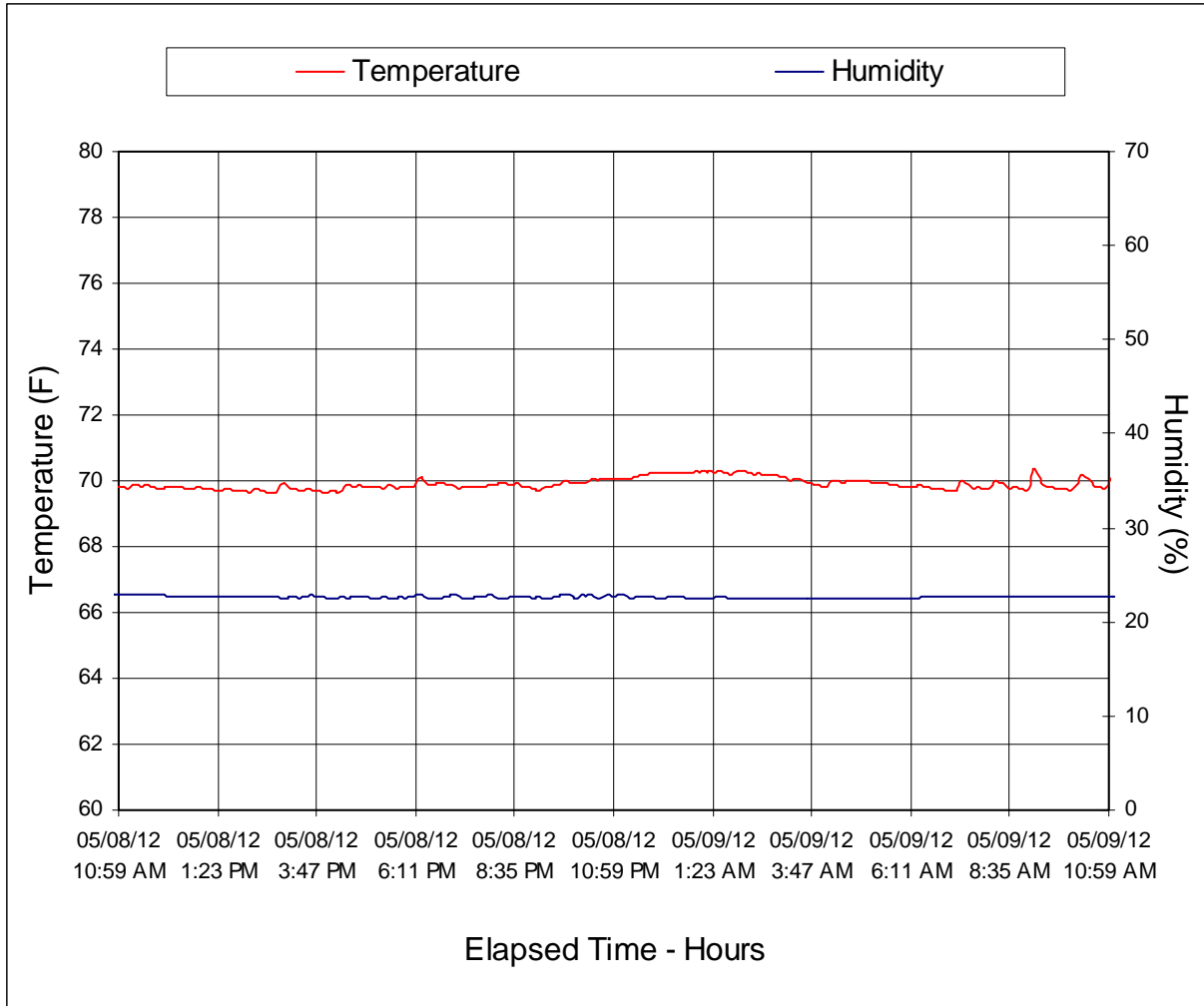
Test Phase	Spillage Location
0° To 90°	No Spillage Occurred
90° To 180°	No Spillage Occurred
180° To 270°	No Spillage Occurred
270° To 360°	No Spillage Occurred

DATA SHEET NO. 14

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2012 BMW 328i 4-Door Sedan NHTSA No. MC0519

Test Program: NCAP MDB Side Impact Test Test Date: 05/09/12



**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 the Test Vehicle



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



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

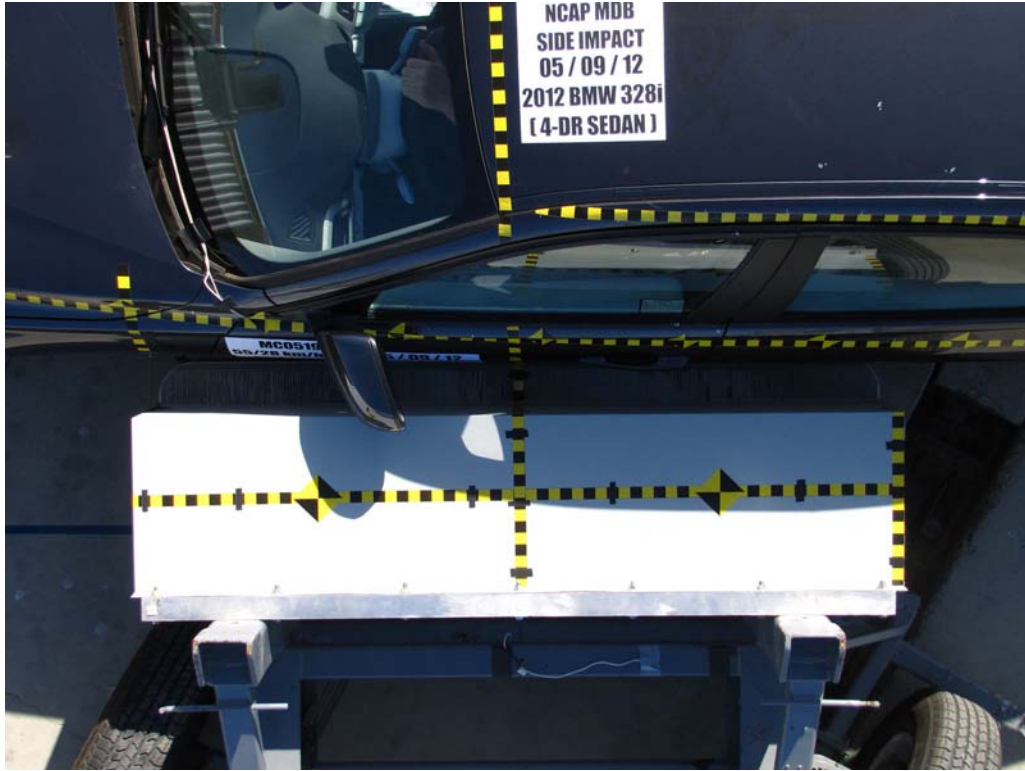


FIGURE 15. Pre-Test Overhead View of Test Area

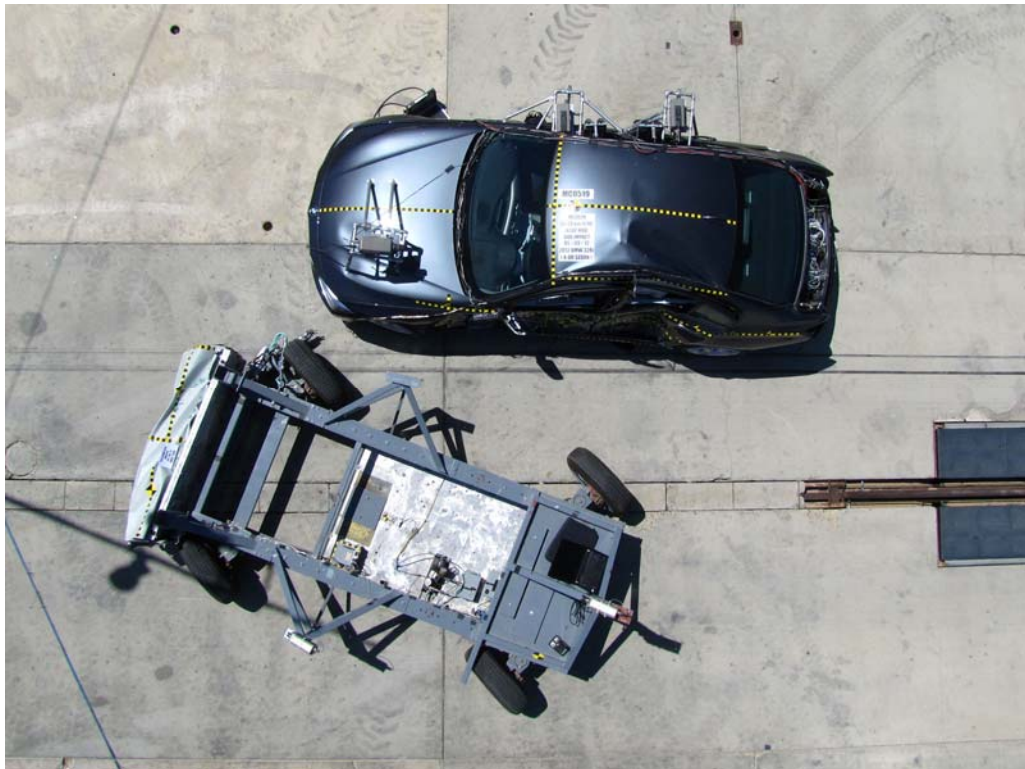


FIGURE 16. Post-Test Overhead View of Test Area



FIGURE 17. Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



FIGURE 18. Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



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



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



FIGURE 21. Pre-Test Left Front Door Latch Close-Up



FIGURE 22. Post-Test Left Front Door Latch Close-Up



FIGURE 23. Pre-Test Left Rear Door Latch Close-Up



FIGURE 24. Post-Test Left Rear Door Latch Close-Up



FIGURE 25. Pre-Test Front Close-Up View of Driver Dummy



FIGURE 26. Post-Test Front Close-Up View of Driver Dummy



FIGURE 27. Pre-Test Left Side View of Driver Dummy
Showing Belt and Chalking



FIGURE 28. Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



FIGURE 31. Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



FIGURE 32. Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



FIGURE 33. Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



FIGURE 34. Pre-Test Placement of Driver Dummy's Feet



FIGURE 35. Pre-Test View of Belt Anchorage for Driver Dummy



FIGURE 36. Pre-Test Left Side View of Steering Wheel



FIGURE 37. View of Disengaged Parking Brake



FIGURE 38. Pre-Test View of Parking Brake



FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Track



FIGURE 40. Pre-Test Close-Up Left Side View of Driver Seat Back



FIGURE 41. Pre-Test Close-Up View of Driver Seat Back or Head Restraint



FIGURE 42. Pre-Test Driver Dummy and Door Clearance View



FIGURE 43. Post-Test Driver Dummy and Door Clearance View



FIGURE 44. Pre-Test Right Side View of Driver Dummy and Front Seat Occupant Compartment



FIGURE 45. Post-Test Right Side View of Driver Dummy and Front Seat Occupant Compartment



FIGURE 46. Pre-Test Driver Inner Door Panel View



FIGURE 47. Post-Test Driver Inner Door Panel View



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



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



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



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



FIGURE 52. Post-Test Driver Dummy Close-Up Pelvis Contact with Vehicle Interior View



FIGURE 53. Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View



FIGURE 54. Pre-Test Left Side View of Rear Passenger Dummy
Showing Belt and Chalking



FIGURE 55. Pre-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View



FIGURE 56. Post-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View



FIGURE 57. Pre-Test Frontal View of Rear Passenger Seat Back
Prior to Dummy Positioning



FIGURE 58. Pre-Test Frontal View of Rear Passenger Dummy
Head and Shoulders in Relation to Head Restraint



FIGURE 59. Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



FIGURE 60. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



FIGURE 61. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket



FIGURE 62. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy's Head is Level



FIGURE 63. Pre-Test Placement of Rear Passenger Dummy's Feet



FIGURE 64. Pre-Test View of Belt Anchorage for Rear Passenger Dummy



FIGURE 65. Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



FIGURE 66. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



FIGURE 67. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



FIGURE 68. Pre-Test Rear Passenger Dummy and Door Clearance View



FIGURE 69. Post-Test Rear Passenger Dummy and Door Clearance View



FIGURE 70. Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



FIGURE 71. Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



FIGURE 72. Pre-Test Rear Passenger Inner Door Panel View



FIGURE 73. Post-Test Rear Passenger Inner Door Panel View



FIGURE 74. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle Interior View



FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Side Airbag View



FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View



FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View



FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped With Rear Passenger Side Airbag

FIGURE 79. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View



FIGURE 80. Pre-Test View of Fuel Filler Neck



FIGURE 81. Post-Test View of Fuel Filler Neck



FIGURE 82. Pre-Test Front View of MDB Impactor Face



FIGURE 83. Post-Test Front View of MDB Impactor Face



FIGURE 84. Pre-Test Top View of MDB Impactor Face



FIGURE 85. Post-Test Top View of MDB Impactor Face



FIGURE 86. Pre-Test Left Side View of MDB Impactor Face



FIGURE 87. Post-Test Left Side View of MDB Impactor Face



FIGURE 88. Pre-Test Right Side View of MDB Impactor Face



FIGURE 89. Post-Test Right Side View of MDB Impactor Face



FIGURE 90. Close-Up View of Vehicle's Certification Label



FIGURE 91. Close-Up View of Vehicle's Tire Information Placard or Label

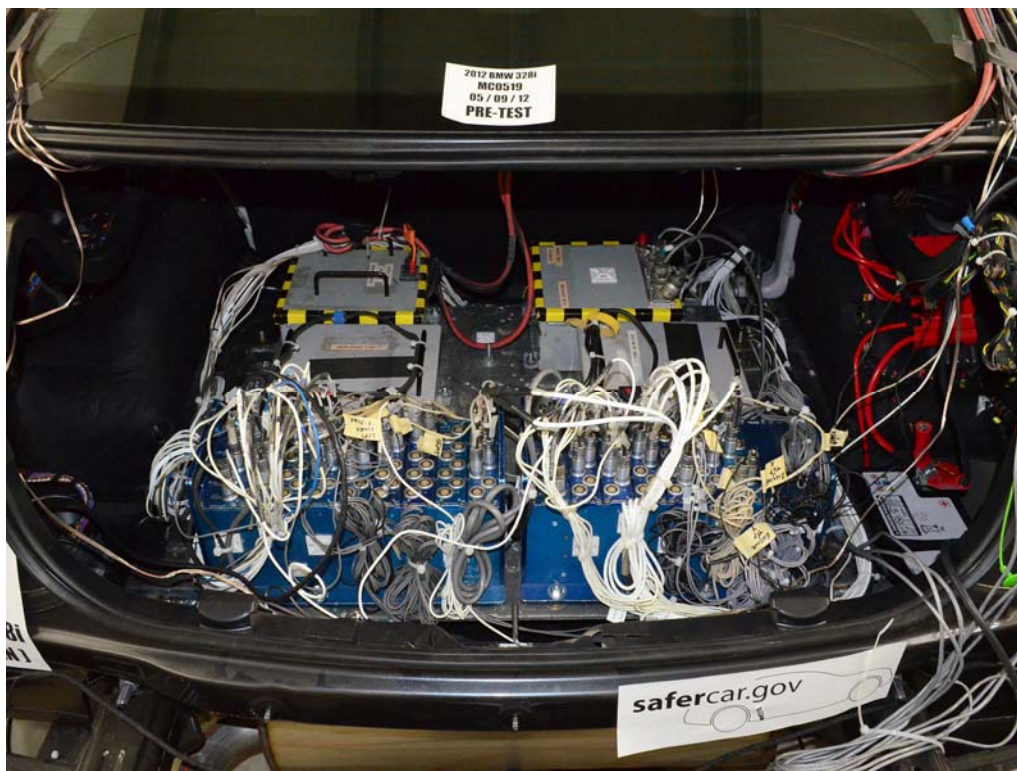


FIGURE 92. Pre-Test Ballast View

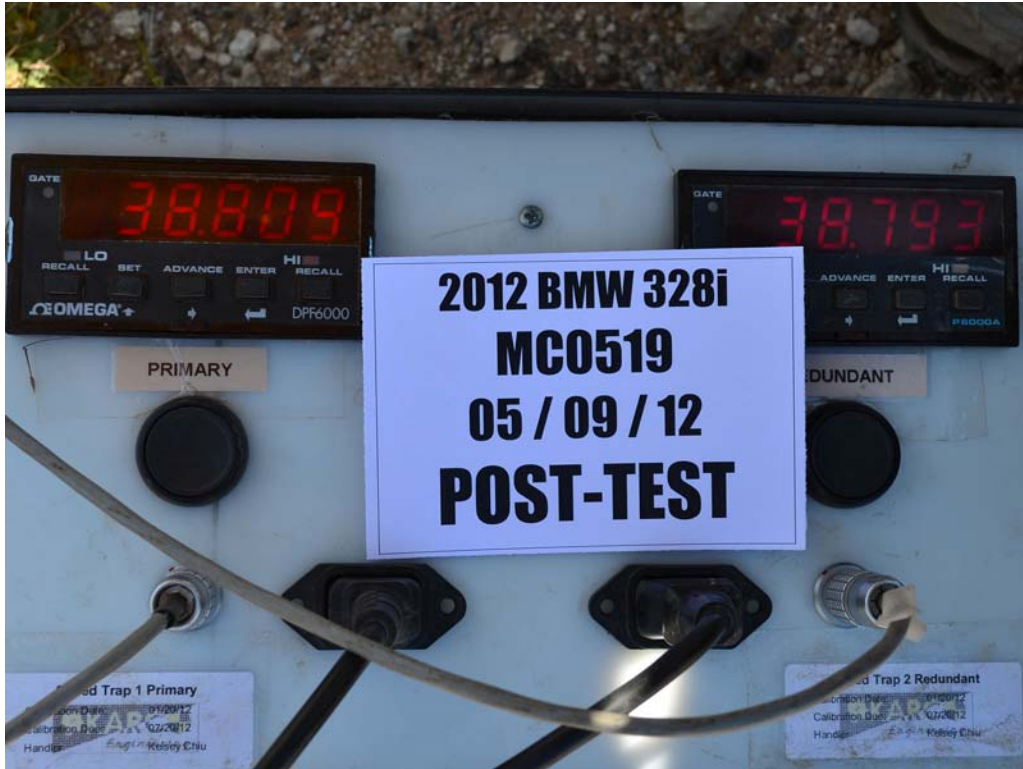


FIGURE 93. Post-Test Primary and Redundant Speed Trap Read-Out



FIGURE 94. FMVSS No. 301 Rollover 0 Degrees



FIGURE 95. FMVSS No. 301 Rollover 90 Degrees



FIGURE 96. FMVSS No. 301 Rollover 180 Degrees



FIGURE 99. 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 dealer.)

- Mineral Grey Metallic \$ 550.00
- Black Leatherette \$ 550.00
- STEPTRONIC automatic trans. \$ 955.00
- 17" light alloy wheels \$ 650.00
- Power front seats \$ 895.00
- BMW Assist enhanced BT & USB \$ 895.00
- Destination Charge \$ 37,990.00

Standard Features

- 2.0 liter, dual overhead cam (DOHC), 16-valve, inline 4-cylinder engine with aluminum engine block, Twin-Power Turbo technology, High Precision Direct Injection, Valvetronic, and Double-VANOS steplessly variable valve timing
- Driving Dynamics Control with ECO PRO, Comfort and Sport settings (and Sport+ with selected features)
- Dynamic Stability Control (DSC), including Brake Slip 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 free-form front foglights
- 3-spoke leather-wrapped multi-function steering wheel
- Drive system with 6.5-inch full color flat-screen display, Controller and 8 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

PARTS CONTENT INFORMATION

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

Note: Parts content does not include final assembly, distribution, or other non-parts costs.

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

BMW Delivery Quality Assurance

This BMW vehicle has been designed, engineered and manufactured under strict quality control guidelines. It has been inspected 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

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash	Driver	Passenger	Not Rated
<small>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</small>			
Side Crash	Front seat	Rear seat	Not Rated
<small>Based on the risk of injury in a side impact.</small>			
Rollover	Not Rated		
<small>Based on the risk of rollover in a single-vehicle crash.</small>			

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

EPA Fuel Economy Estimates

CITY MPG	Estimated Annual Fuel Cost	HIGHWAY MPG
24	\$2,115	36
<small>Expected range for most drivers 19 to 28 MPG</small>	<small>based on 15,000 miles at \$3.95 per gallon</small>	<small>Expected range for most drivers 29 to 43 MPG</small>
Combined Fuel Economy		
28		
<small>All Compact Cars</small>		

Your actual mileage will vary depending on how you drive and maintain your vehicle.

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

Environmental Performance

Protect the environment, choose vehicles with **higher scores!**

Global Warming Score	Smog Score
7	5
<small>1 Average 10 Cleanest</small>	<small>1 Average 10 Cleanest</small>

Using alternative fuels may improve scores. See www.DriveClean.ca

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

VIN: WBA3A5C51CF259173

Sold To: Dealer BMW, 1302 Auto Mall Dr, Santa Ana, CA

Ship To: Dealer BMW, 1500 Auto Mall Dr, Santa Ana, CA

This vehicle is equipped with bumpers that can withstand an impact of 23 miles per hour with no damage to the vehicle's body and safety systems, although the bumper and related components may sustain damage. The bumper system on this vehicle conforms to the current federal bumper standard of 23 miles per hour.

BMW of North America, LLC
Woodcliff Lake, NJ 07077

FIGURE 100. Monroney Label

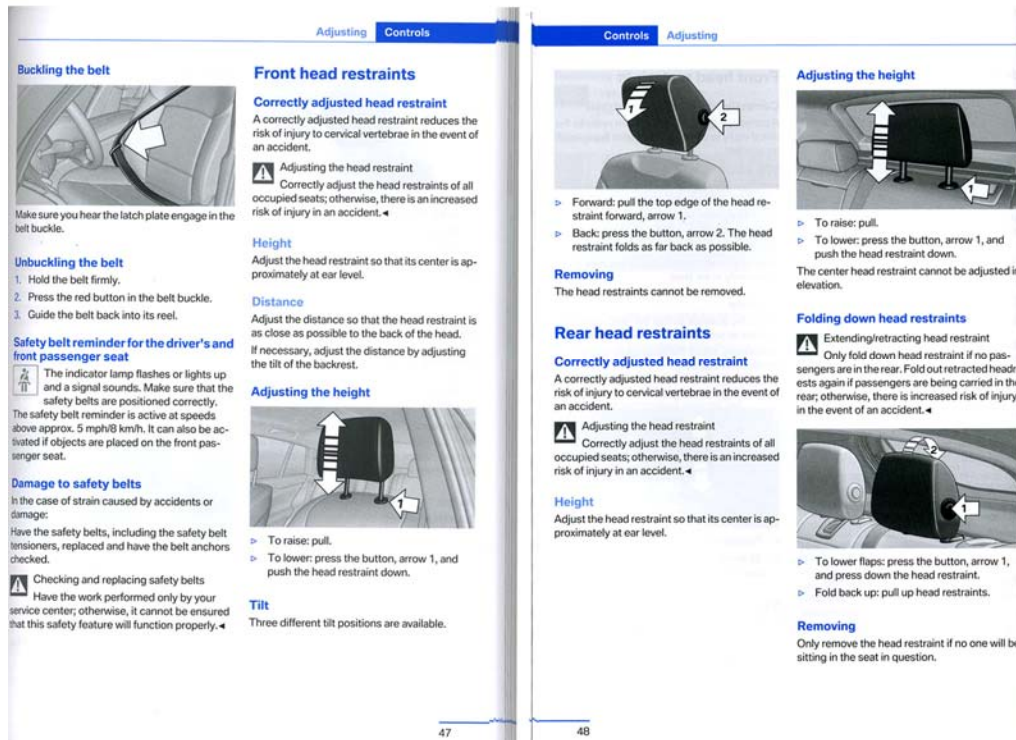


FIGURE 101. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

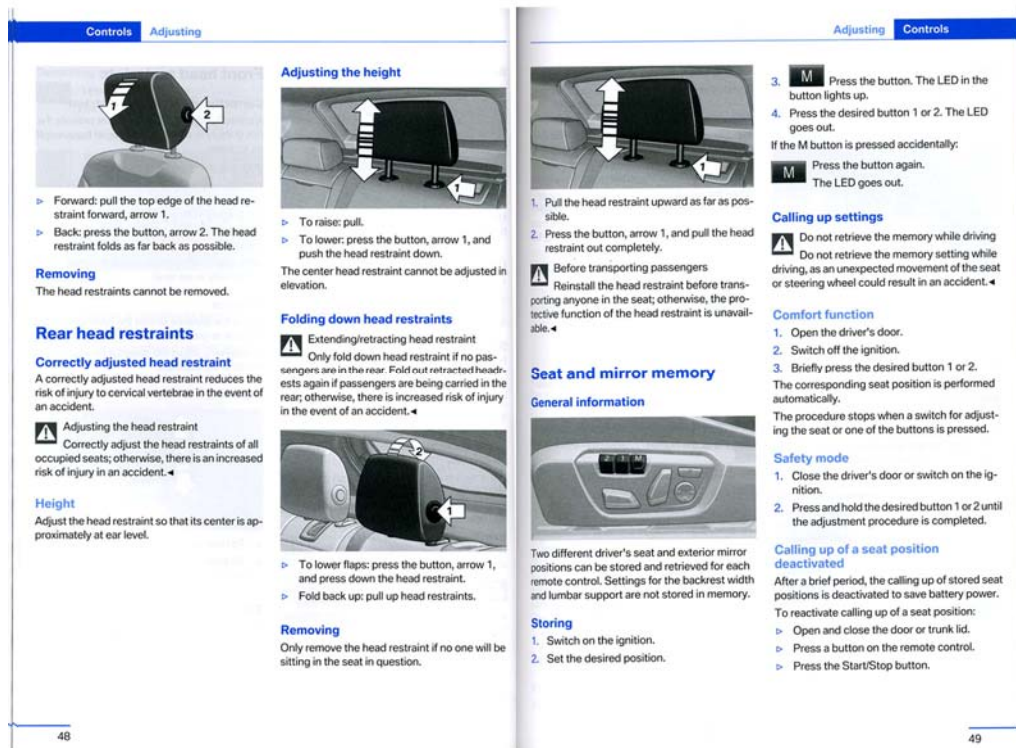


FIGURE 102. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

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 Upper Thorax Rib Deflection (Y) vs. Time	B-2
6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-2
8	Driver Thorax Rib Deflection Maximum vs. Time	B-2
9	Driver Anterior Abdominal Force (Y) vs. Time	B-3
10	Driver Middle Abdominal Force (Y) vs. Time	B-3
11	Driver Posterior Abdominal Force (Y) vs. Time	B-3
12	Driver Total Abdominal Force (Y) vs. Time	B-3
13	Driver Pubic Symphysis Force (Y) vs. Time	B-4
14	Passenger Head Acceleration (X) vs. Time Primary	B-5
15	Passenger Head Acceleration (Y) vs. Time Primary	B-5
16	Passenger Head Acceleration (Z) vs. Time Primary	B-5
17	Passenger Head Resultant Acceleration Primary vs. Time	B-5
18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-6
19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website (www.NHTSA.dot.gov)

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)

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

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

MDB Rear Acceleration (X)

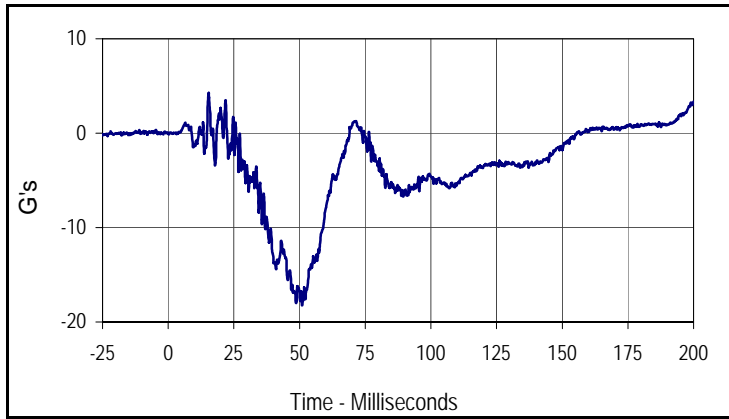
MDB Rear Acceleration (Y)

Left MDB Contact Switch

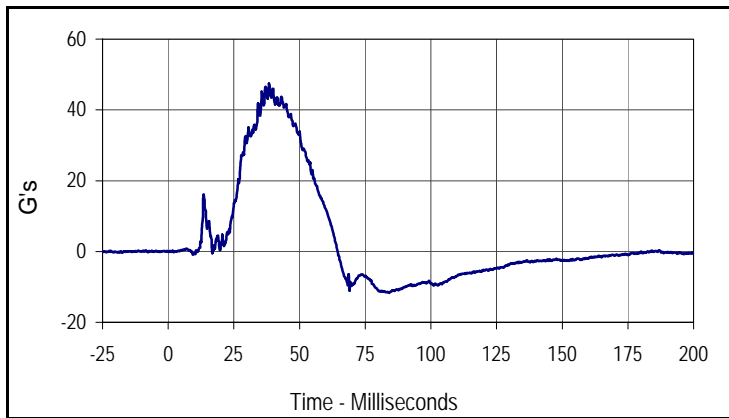
Right MDB Contact Switch

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

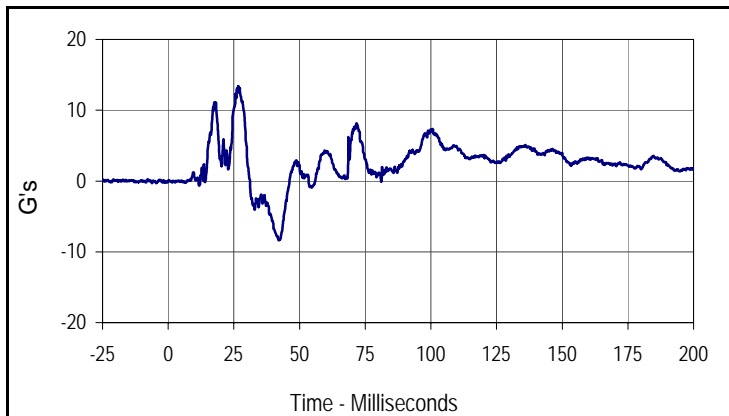
NHTSA No.: MC0519
 Test Date: 5/9/12



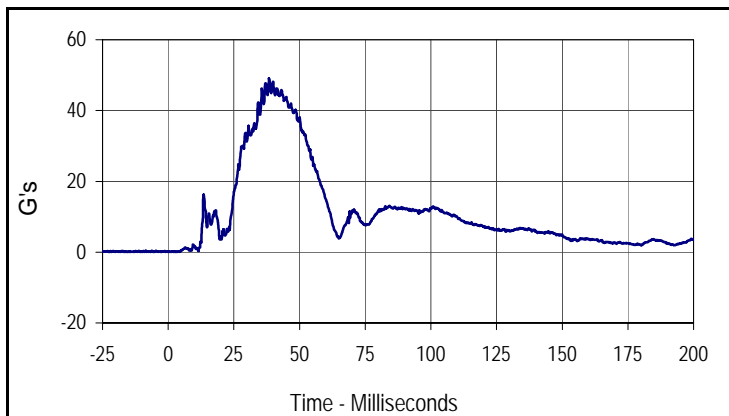
Curve Description			
Driver Head Acceleration X Primary			
Plot No.	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
4.3	15.4	-18.3	51.0



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
47.5	38.4	-11.7	84.2



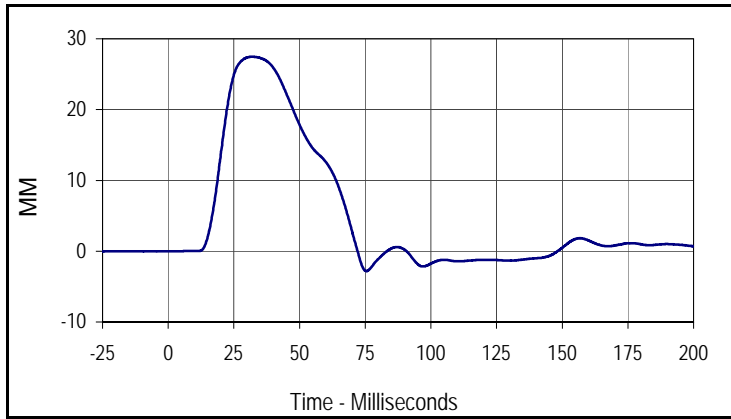
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
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Max	Time	Min	Time
13.4	26.7	-8.4	42.1



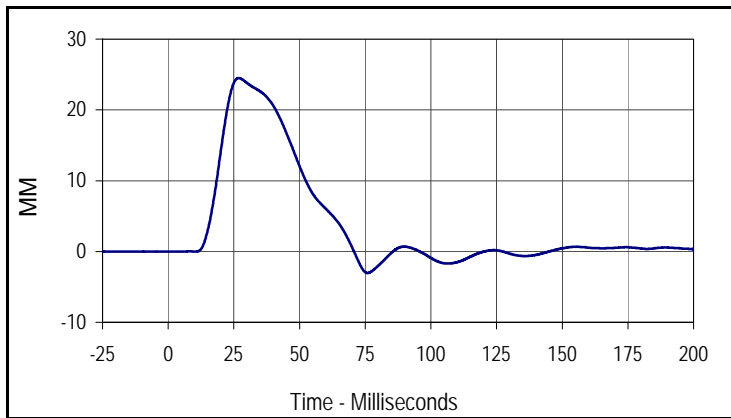
Curve Description			
Driver Head Resultant Acceleration Primary			
Plot No.	Type	SAE Class	Units
004	RES	1000	G's
Max	Time	Min	Time
49.1	38.4	0.0	0.5

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

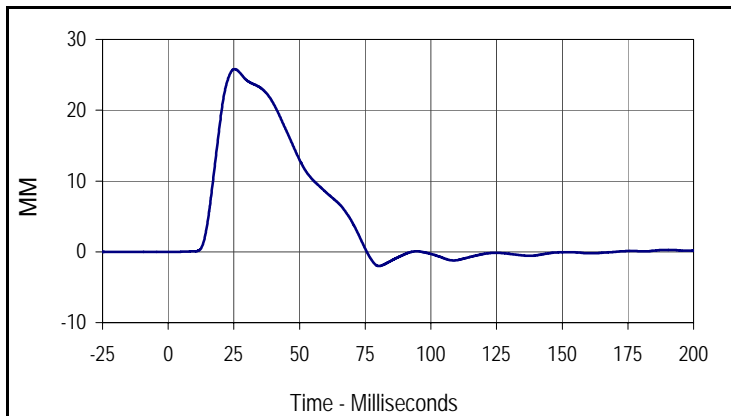
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 Test Date: 5/9/12



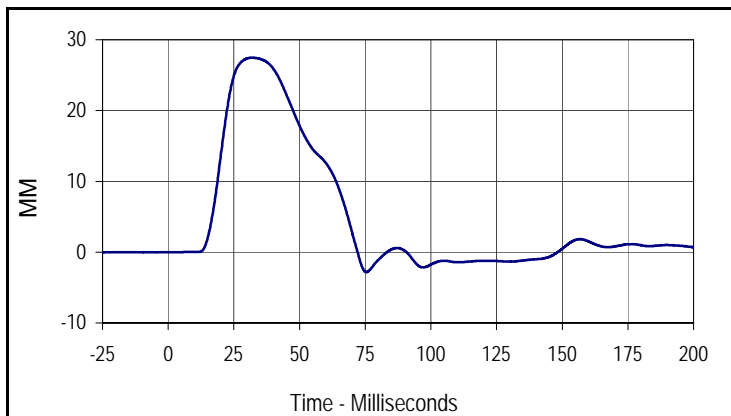
Curve Description			
Driver Upper Thorax Rib Deflection Y			
Plot No.	Type	SAE Class	Units
005	FIL	180	MM
Max	Time	Min	Time
27.5	32.0	-2.8	75.4



Curve Description			
Driver Middle Thorax Rib Deflection Y			
Plot No.	Type	SAE Class	Units
006	FIL	180	MM
Max	Time	Min	Time
24.5	26.9	-3.0	75.9



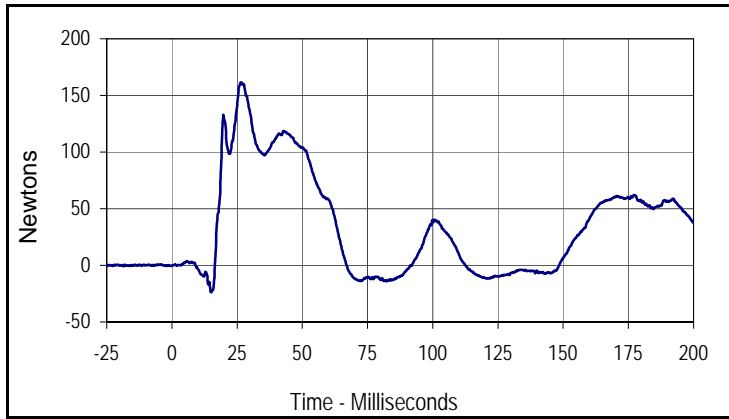
Curve Description			
Driver Lower Thorax Rib Deflection Y			
Plot No.	Type	SAE Class	Units
007	FIL	180	MM
Max	Time	Min	Time
25.8	25.3	-2.0	80.0



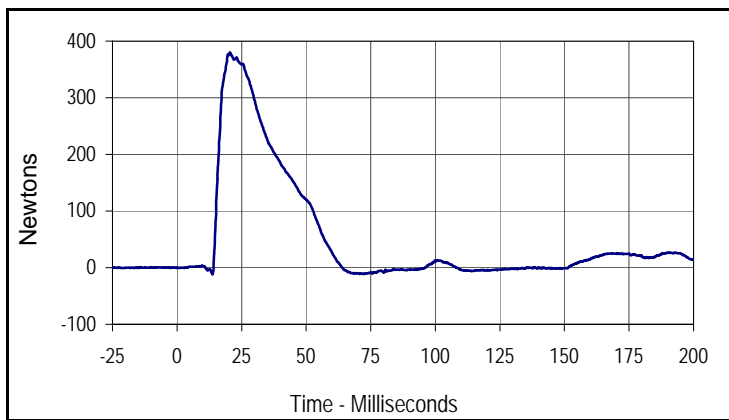
Curve Description			
Driver Thorax Rib Deflection Maximum			
Plot No.	Type	SAE Class	Units
010	FIL	180	MM
Max	Time	Min	Time
27.5	32.0	-2.8	75.4

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

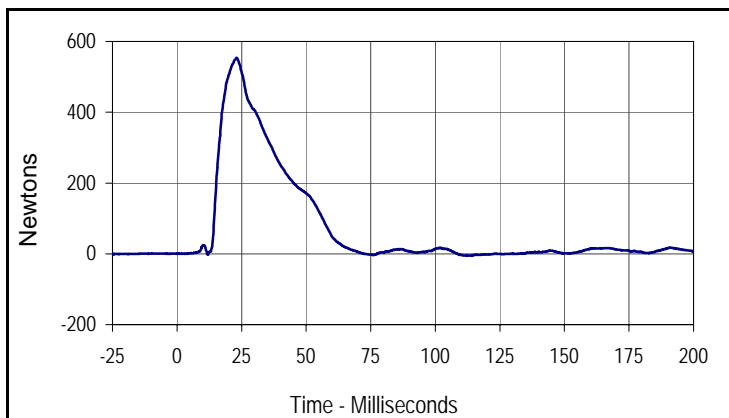
NHTSA No.: MC0519
 Test Date: 5/9/12



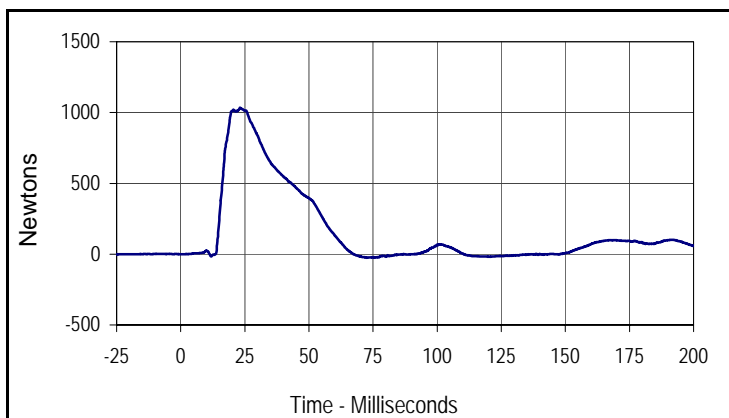
Curve Description			
Driver Anterior Abdominal Force Y			
Plot No.	Type	SAE Class	Units
008	FIL	600	Newtons
Max	Time	Min	Time
161.6	26.6	-23.8	15.0



Curve Description			
Driver Middle Abdominal Force Y			
Plot No.	Type	SAE Class	Units
009	FIL	600	Newtons
Max	Time	Min	Time
380.0	20.5	-12.1	13.7



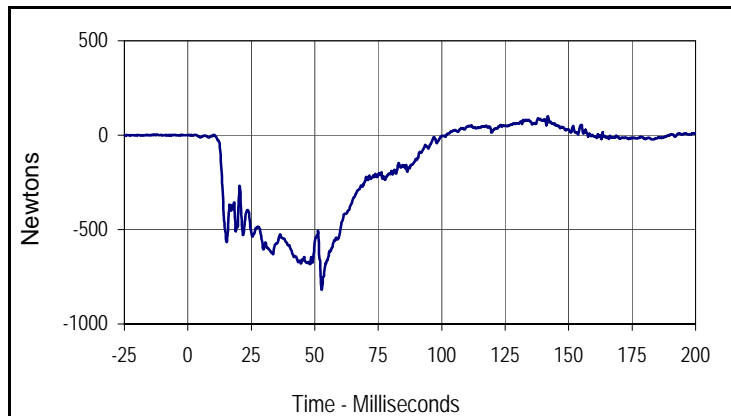
Curve Description			
Driver Posterior Abdominal Force Y			
Plot No.	Type	SAE Class	Units
011	FIL	600	Newtons
Max	Time	Min	Time
553.8	23.1	-5.4	112.3



Curve Description			
Driver Total Abdominal Force			
Plot No.	Type	SAE Class	Units
012	SUM	600	Newtons
Max	Time	Min	Time
1033.8	23.1	-25.6	72.4

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

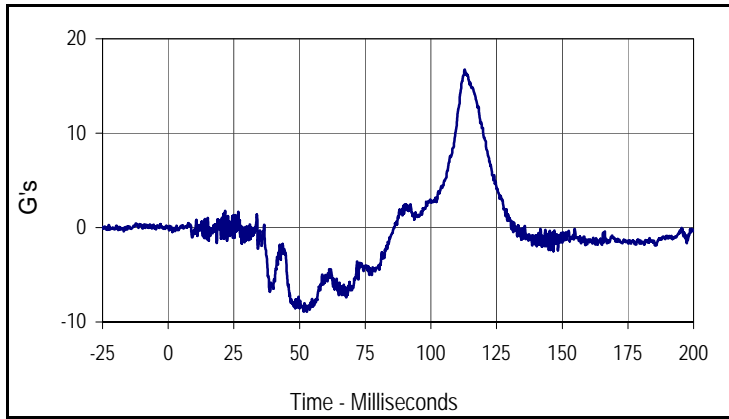
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 Test Date: 5/9/12



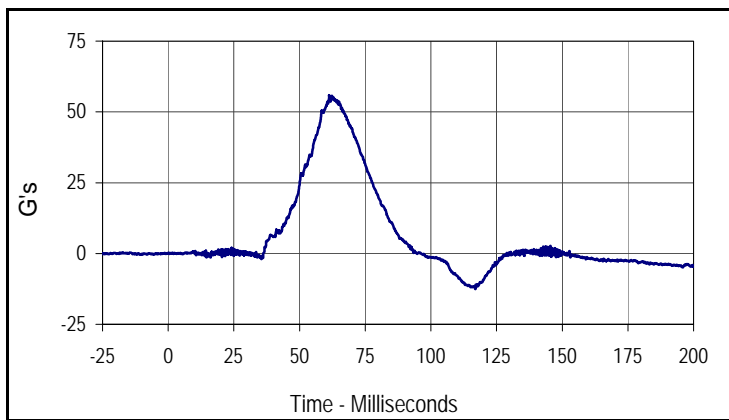
Curve Description			
Driver Pubic Symphysis Force Y			
Plot No.	Type	SAE Class	Units
013	FIL	600	Newtons
Max	Time	Min	Time
100.8	141.8	-818.8	52.7

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

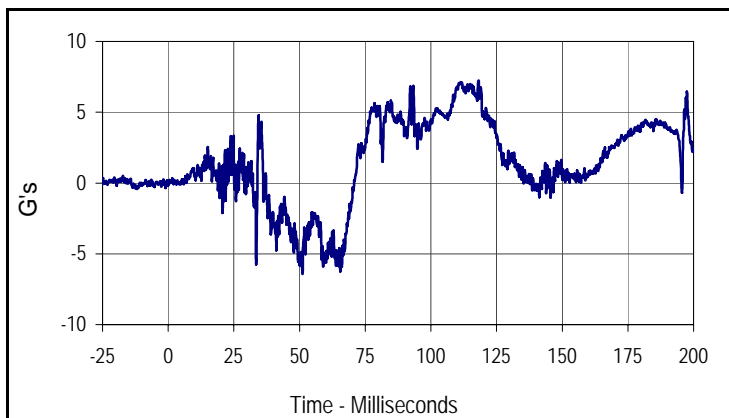
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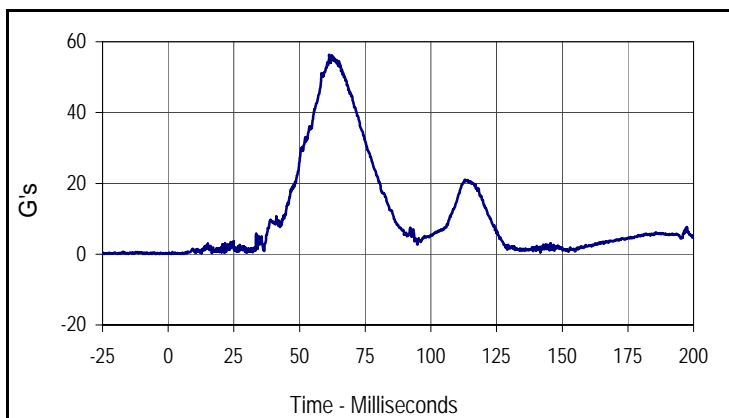
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.	Type	SAE Class	Units
014	FIL	1000	G's
Max	Time	Min	Time
16.7	112.9	-8.9	51.6



Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
015	FIL	1000	G's
Max	Time	Min	Time
55.9	61.3	-12.6	116.9



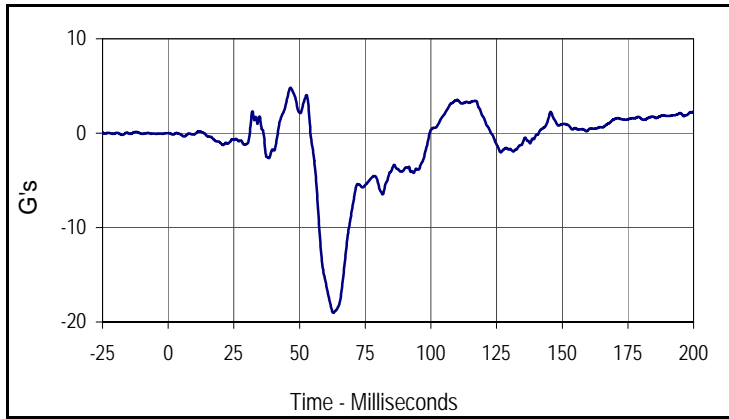
Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
016	FIL	1000	G's
Max	Time	Min	Time
7.2	118.1	-6.4	51.1



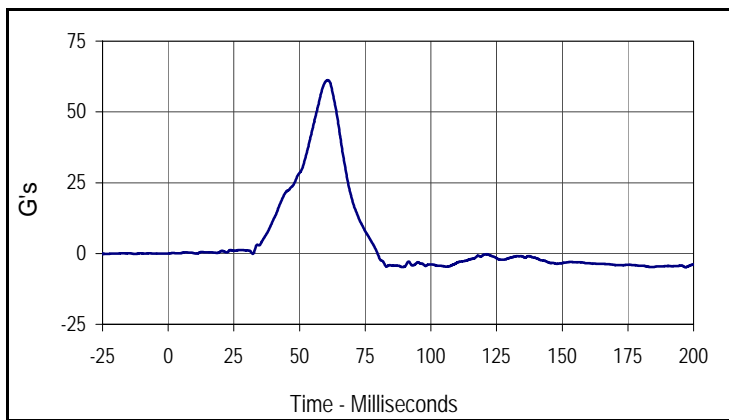
Curve Description			
Passenger Head Acceleration Resultant Primary			
Plot No.	Type	SAE Class	Units
017	RES	1000	G's
Max	Time	Min	Time
56.3	61.3	0.1	4.4

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

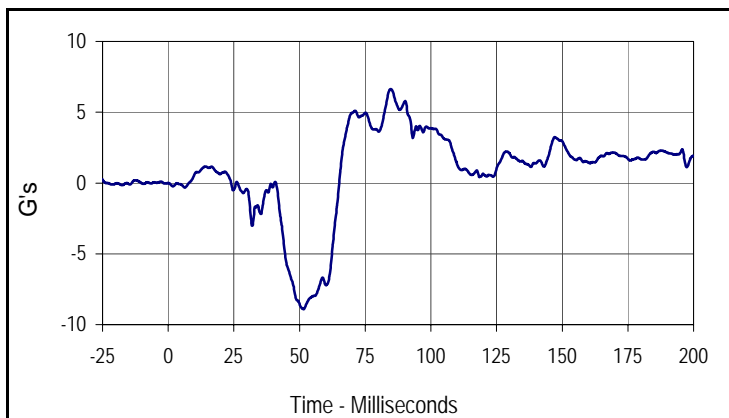
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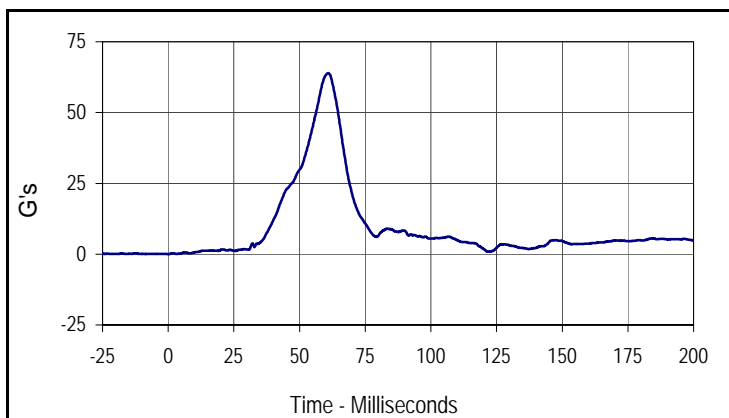
Curve Description			
Passenger Lower Spine T12 Acceleration X			
Plot No.	Type	SAE Class	Units
019	FIL	180	G's
Max	Time	Min	Time
4.8	46.5	-19.0	62.8



Curve Description			
Passenger Lower Spine T12 Acceleration Y			
Plot No.	Type	SAE Class	Units
020	FIL	180	G's
Max	Time	Min	Time
61.2	60.8	-4.8	197.0



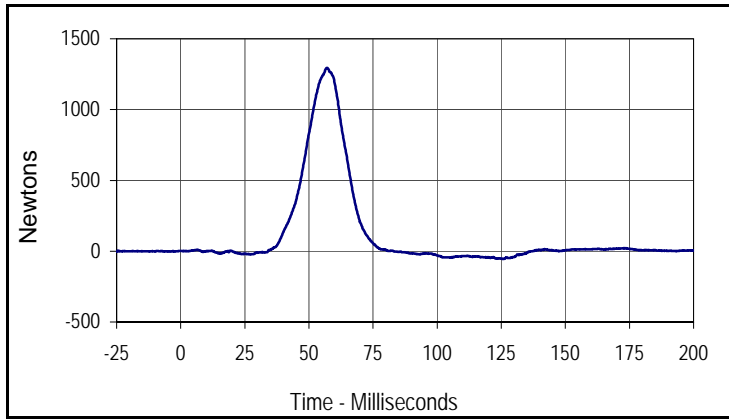
Curve Description			
Passenger Lower Spine T12 Acceleration Z			
Plot No.	Type	SAE Class	Units
021	FIL	180	G's
Max	Time	Min	Time
6.6	84.6	-8.9	51.5



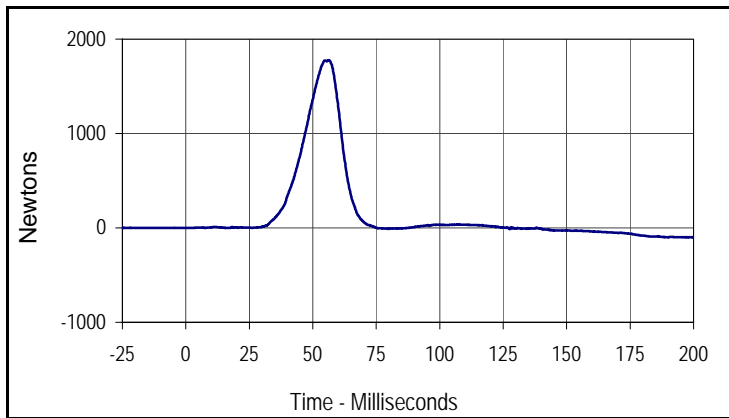
Curve Description			
Passenger Lower Spine T12 Acceleration Res.			
Plot No.	Type	SAE Class	Units
022	RES	180	G's
Max	Time	Min	Time
63.9	60.9	0.0	0.0

Test Vehicle: 2012 BMW 328i 4-Door Sedan
 Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test

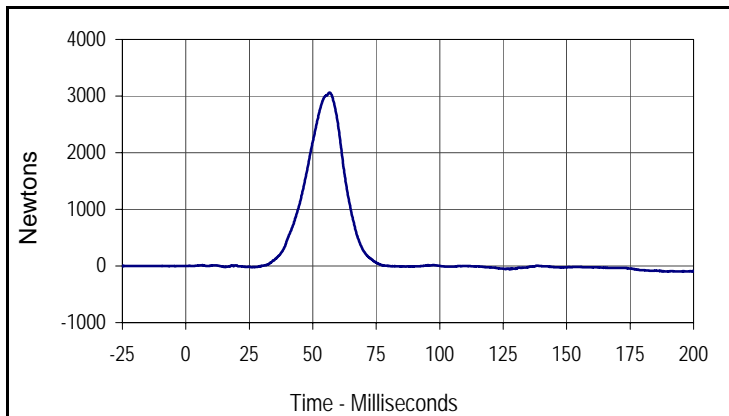
NHTSA No.: MC0519
 Test Date: 5/9/12



Curve Description			
Passenger Iliac Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
023	FIL	600	Newtons
Max	Time	Min	Time
1293.7	57.0	-55.9	125.4



Curve Description			
Passenger Acetabulum Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
024	FIL	600	Newtons
Max	Time	Min	Time
1777.3	56.2	-100.2	196.8



Curve Description			
Passenger Total Pelvic Force			
Plot No.	Type	SAE Class	Units
018	SUM	600	Newtons
Max	Time	Min	Time
3060.6	56.6	-98.7	193.8

APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

Test Program: ES2re External Measurements

Test Date: 5/7/12

ATD Serial No.: F035

Test I.D.: N/A



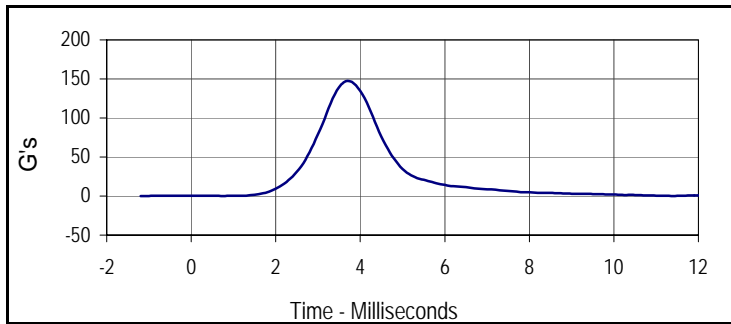
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
1 Sitting Height	mm	900 - 918	910	Pass
2 Seat to Shoulder Joint	mm	558 - 572	565	Pass
3 Seat to Lower Face of Thoracic Spine Box	mm	346 - 356	350	Pass
4 Seat to Hip Joint (Center of Bolt)	mm	97 - 103	100	Pass
5 Sole to Seat, Sitting	mm	333 - 451	393	Pass
6 Head Width	mm	152 - 158	156	Pass
7 Shoulder / Arm Width	mm	461 - 479	470	Pass
8 Thorax Width	mm	322 - 332	327	Pass
9 Abdomen Width	mm	273 - 287	280	Pass
10 Pelvis Lap Width	mm	359 - 373	363	Pass
11 Head Depth	mm	196 - 206	201	Pass
12 Thorax Depth	mm	262 - 272	270	Pass
13 Abdomen Width	mm	194 - 204	199	Pass
14 Pelvis Depth	mm	235 - 245	240	Pass
15 Back of Buttocks to Hip Joint (Center of Bolt)	mm	150 - 160	155	Pass
16 Back of Buttocks to Front Knee	mm	597 - 615	609	Pass
Overall Test Results				Pass

Test Program: ES2re Head Drop Test
 ATD Serial No.: F035

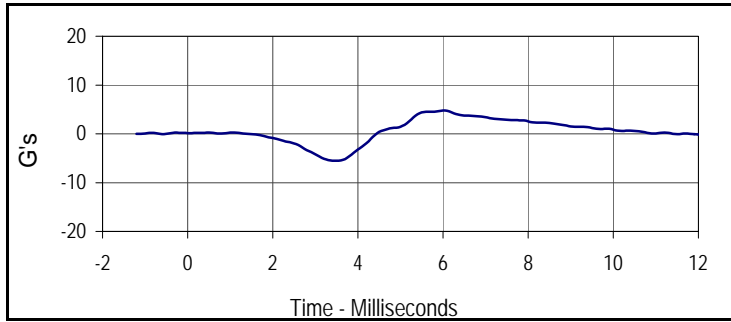
Test Date: 5/7/12
 Test I.D.: F035HD031



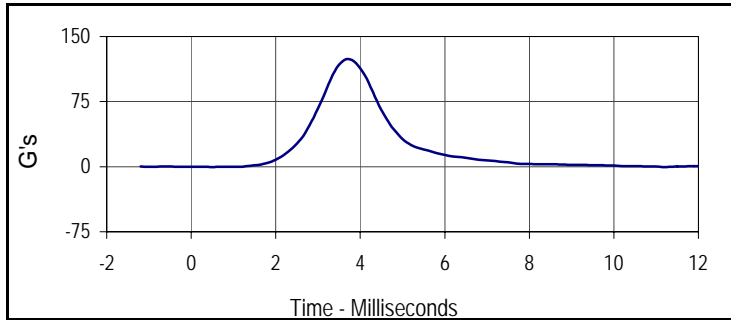
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	245	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.7	Pass
Peak Head Resultant Acceleration	G's	125 to 155	147.7	Pass
Peak Head X Acceleration	G's	≤15	5.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	11.2	Pass
Overall Test Results				Pass



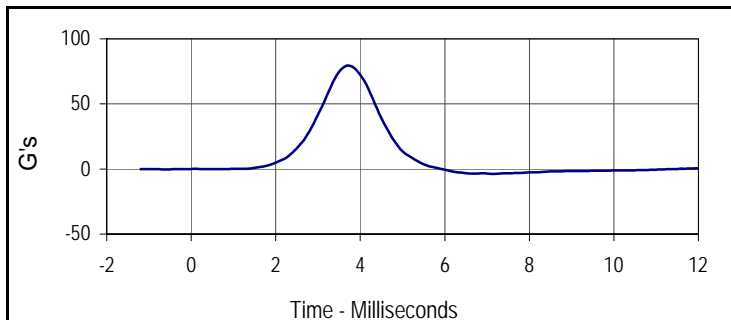
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
147.7	3.7	0.1	-1.1



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.8	6.0	-5.5	3.5



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
124.3	3.7	-0.3	0.5



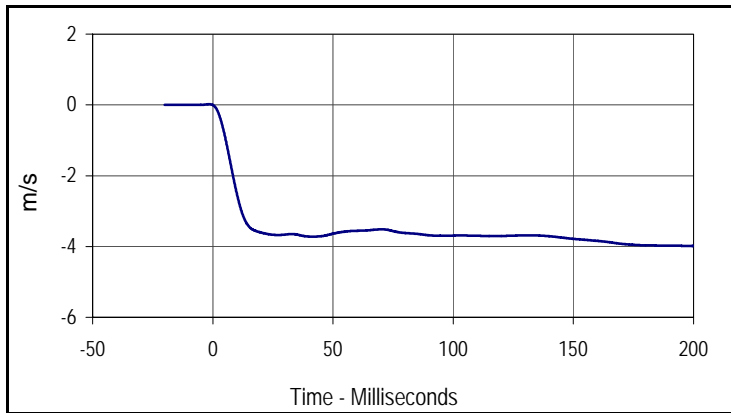
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
79.5	3.7	-3.7	7.2

Test Program: ES2re Neck Flexion Test
 ATD Serial No.: F035

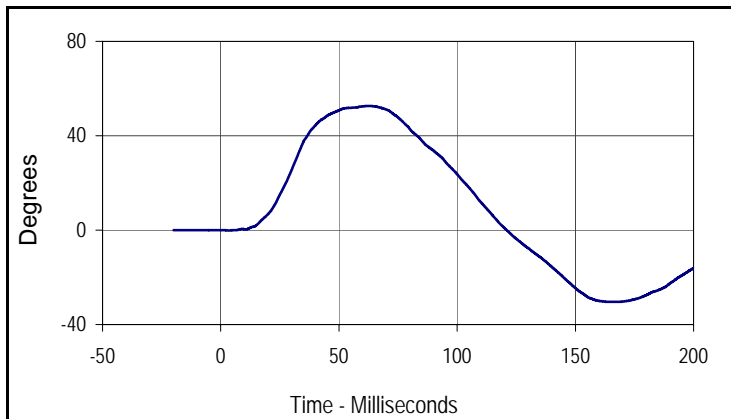
Test Date: 5/7/12
 Test I.D.: F035NB031



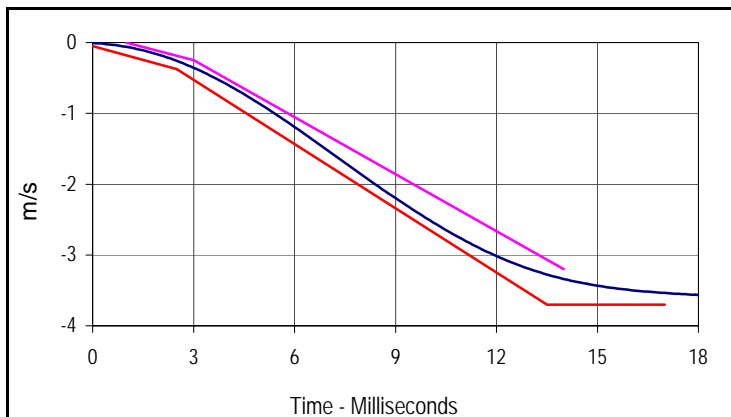
Tested Parameter	Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time	Minutes	≥240	260	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.8	Pass
Pendulum Velocity	m/s	3.3 to 3.5	3.4	Pass
Headform Flexion	Max	49 to 59	52.6	Pass
	Time	54 to 66	62.7	Pass
Headform Flexion Decay (Peak to Zero)	msec	53 to 88	58.3	Pass
Overall Test Results				Pass



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.5	-4.0	200.0



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
52.6	62.7	-30.4	165.0



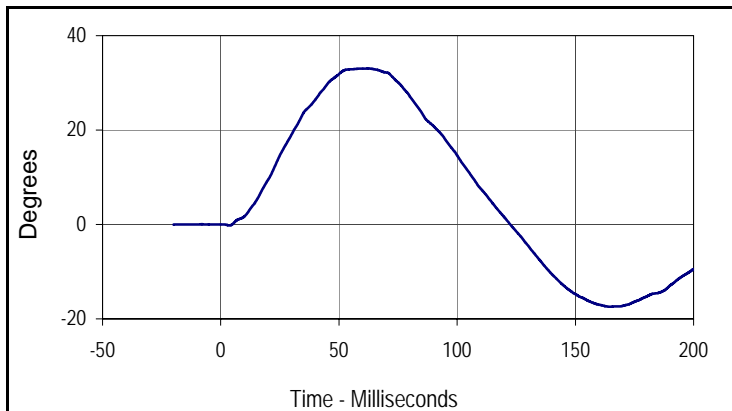
Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.5	-4.0	200.0

Velocity Corridors

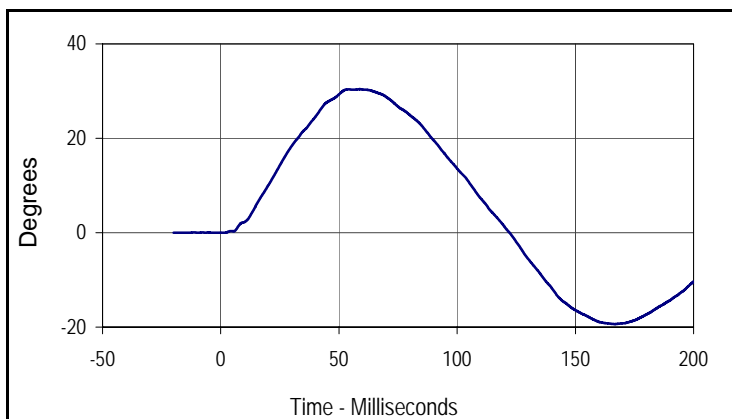
Upper Boundary		Lower Boundary	
Time (msec)	Velocity (m/s)	Time (msec)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.03	2.5	-0.375
14.0	-3.20	13.5	-3.70
		17.0	-3.70

Test Program: ES2re Neck Flexion Test
 ATD Serial No.: F035

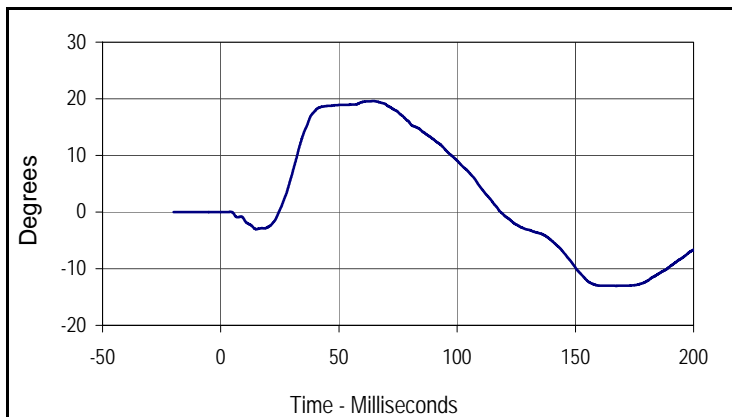
Test Date: 5/7/12
 Test I.D.: F035NB031



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
33.1	62.5	-17.4	164.9



Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
30.4	58.7	-19.4	166.7



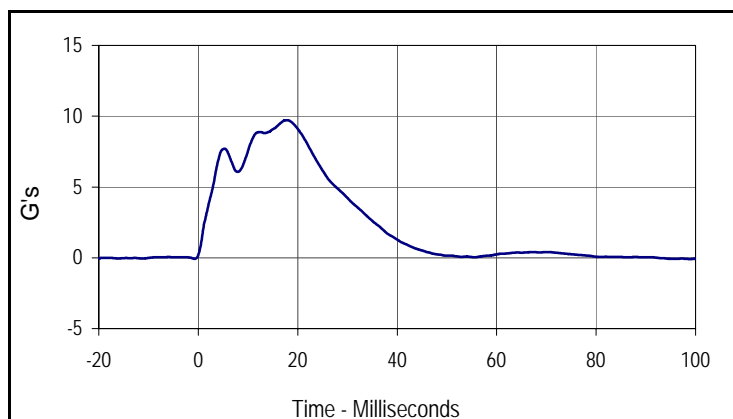
Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
19.6	64.7	-13.0	167.3

Test Program: ES2re Shoulder Impact Test
 ATD Serial No.: F035

Test Date: 5/7/12
 Test I.D.: F035SH031



Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy 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	21.4	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.6	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.7	Pass
Overall Test Results				Pass



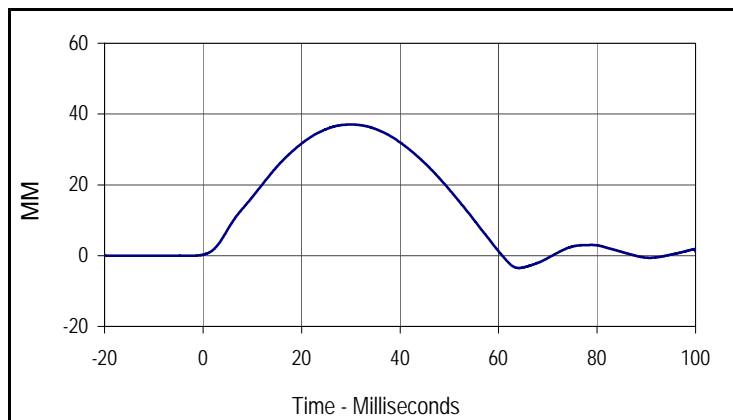
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
9.7	17.7	-0.1	98.7

Test Program: ES2re Thorax - Rib Drop Test
 ATD Serial No.: F035 Rib #1

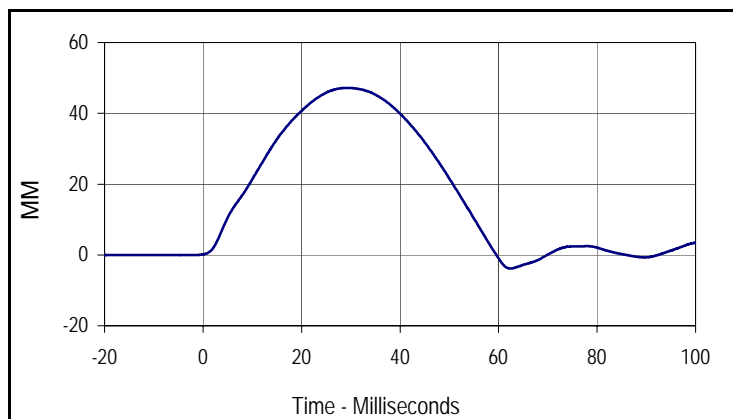
Test Date: 5/7/12
 Test I.D.: F035RB1031



Tested Parameter	Units	Specification	Result	Pass/Fail
Rib Module Soak Time	Minutes	≥240	320	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	21.4	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height	mm	36 to 40	37.0	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height	mm	46 to 51	47.2	Pass
Overall Test Results				Pass



Curve Description			
Upper Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.0	30.0	-3.5	64.1



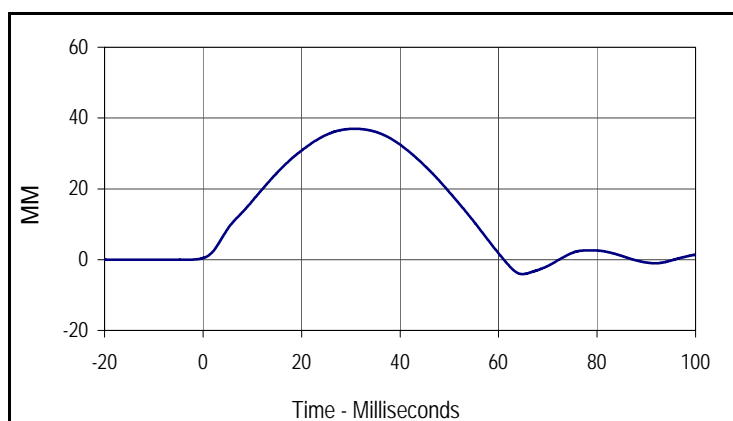
Curve Description			
Upper Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
47.2	29.4	-3.8	62.4

Test Program: ES2re Thorax - Rib Drop Test
 ATD Serial No.: F035 Rib #2

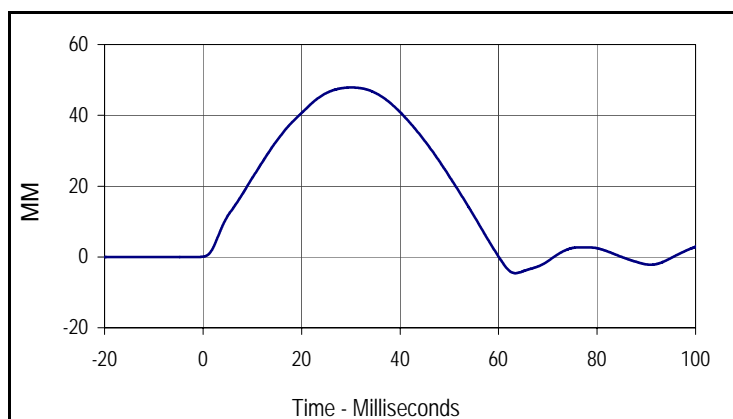
Test Date: 5/7/12
 Test I.D.: F035RB2031



Tested Parameter	Units	Specification	Result	Pass/Fail
Rib Module Soak Time	Minutes	≥240	340	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	20.7	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height	mm	36 to 40	37.0	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height	mm	46 to 51	47.9	Pass
Overall Test Results				Pass



Curve Description			
Middle Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.0	30.8	-4.1	64.8



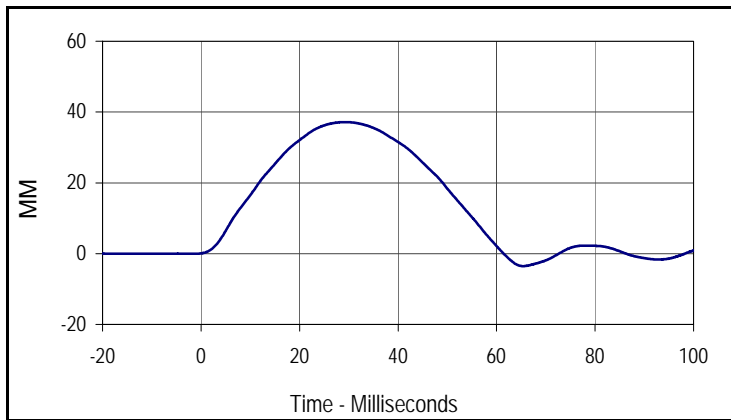
Curve Description			
Middle Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
47.9	30.1	-4.6	63.4

Test Program: ES2re Thorax - Rib Drop Test
 ATD Serial No.: F035 Rib # 3

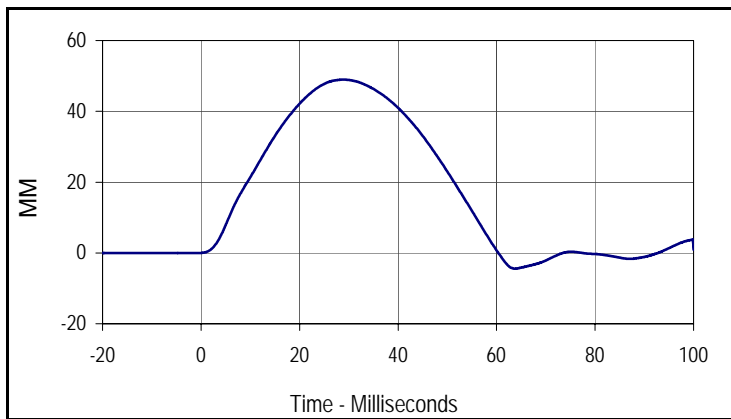
Test Date: 5/7/12
 Test I.D.: F035RB3031



Tested Parameter	Units	Specification	Result	Pass/Fail
Rib Module Soak Time	Minutes	≥240	360	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	30.2	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height	mm	36 to 40	37.2	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height	mm	46 to 51	49.0	Pass
Overall Test Results				Pass



Curve Description			
Lower Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.2	29.3	-3.5	65.4



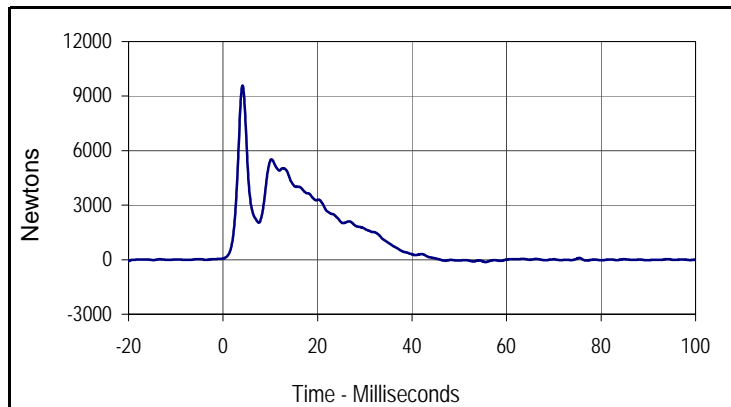
Curve Description			
Lower Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
49.0	28.9	-4.4	63.7

Test Program: ES2re Thorax - Full Body Impact Test
 ATD Serial No.: F035

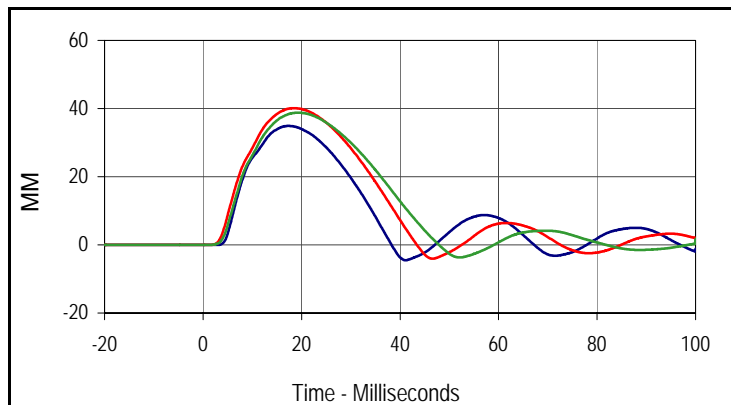
Test Date: 5/7/12
 Test I.D.: F035TH031



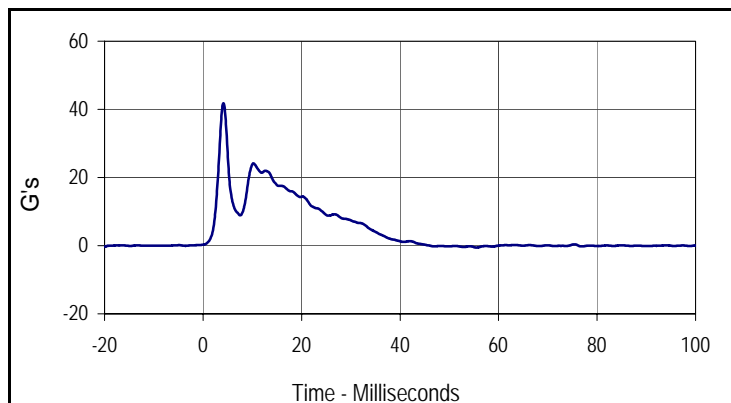
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	400	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.4	Pass
Peak Impactor Velocity	m/s	5.4 to 5.6	5.5	Pass
Peak Impactor Force	N	5100 to 6200	5518.6	Pass
	msec	> 6.0 msec	10.3	Pass
Peak Upper Rib Deflection	mm	34 to 41	34.9	Pass
Peak Middle Rib Deflection	mm	37 to 45	40.1	Pass
Peak Lower Rib Deflection	mm	37 to 44	38.8	Pass
Overall Test Results				Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
9581.9	4.1	-127.9	55.5



Curve Description			
Upper, Middle, Lower Rib Deflections			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
34.9	17.4	-4.5	41.1
Max (Middle)	Time	Min (Middle)	Time
40.1	18.4	-4.1	46.6
Max (Lower)	Time	Min (Lower)	Time
38.8	19.3	-3.7	52.1



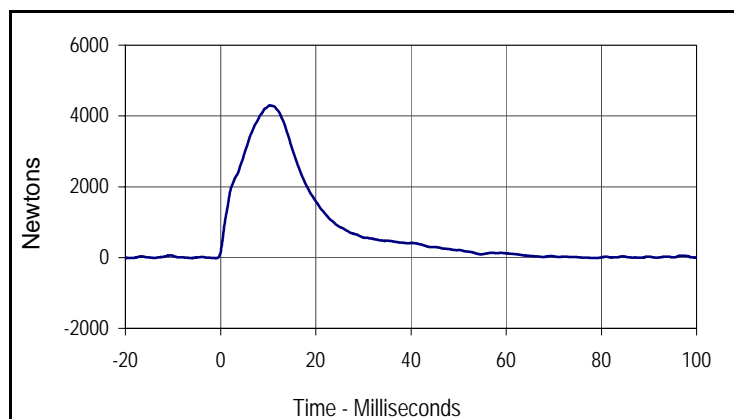
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
41.8	4.1	-0.6	55.5

Test Program: ES2re Abdomen Impact Test
 ATD Serial No.: F035

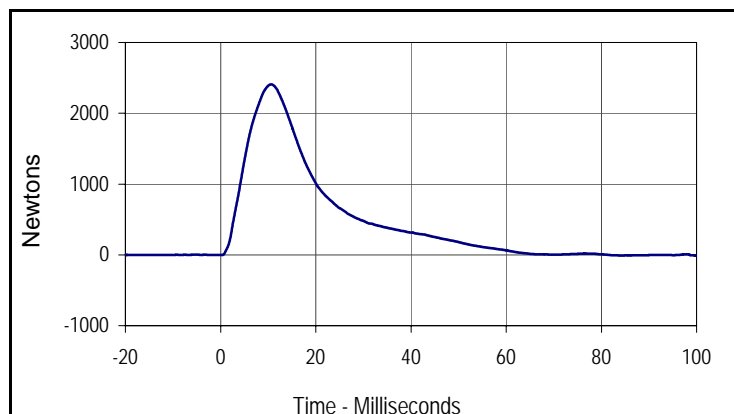
Test Date: 5/7/12
 Test I.D.: F035ABD031



Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	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	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass
Probe Velocity	m/s	3.9 to 4.1	4.0	Pass
Peak Impactor Force	N	4000 to 4800	4299.3	Pass
	msec	10.6 to 13.0	11.7	Pass
Sum of Abdominal Forces	N	2200 to 2700	2408.0	Pass
	msec	10.0 to 12.3	12.0	Pass
Overall Test Results				Pass



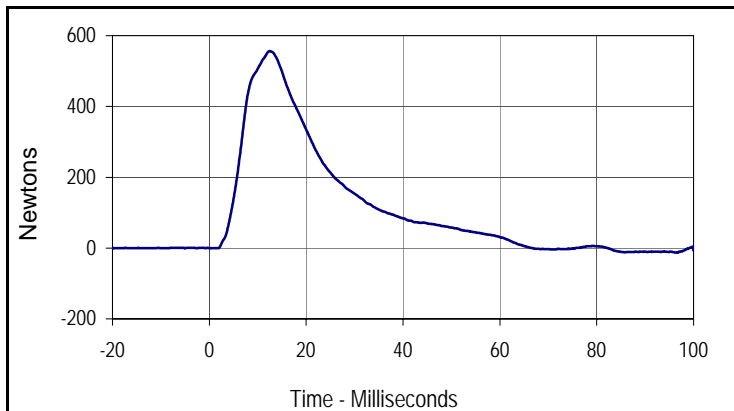
Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4299.3	11.7	-16.0	0.3



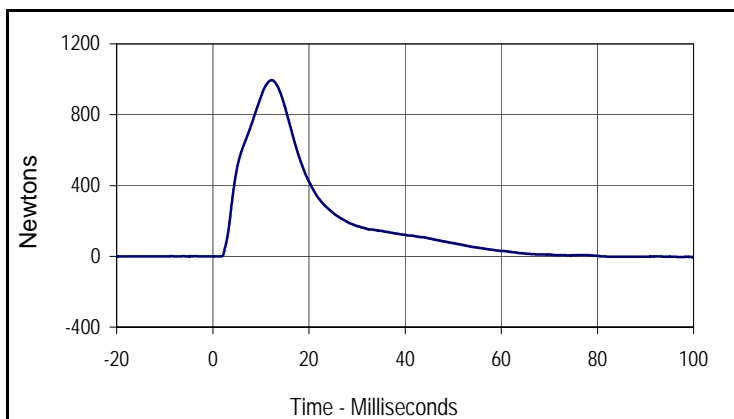
Curve Description			
Abdomen Sum Resultant			
Plot No.	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2408.0	12.0	-9.1	85.6

Test Program: ES2re Abdomen Impact Test
 ATD Serial No.: F035

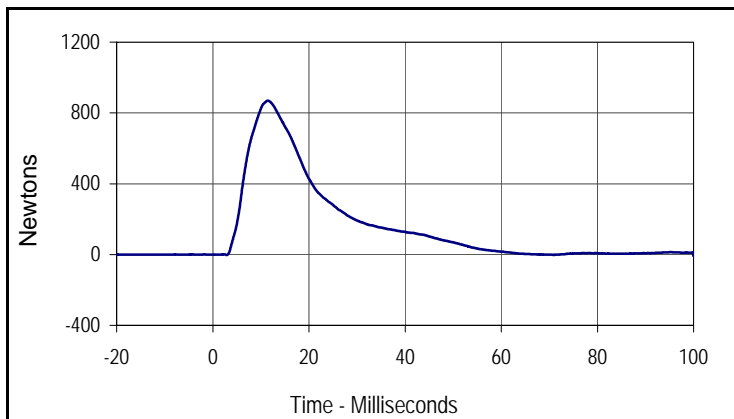
Test Date: 5/7/12
 Test I.D.: F035ABD031



Curve Description			
Front Abdomen Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
556.4	12.4	-13.0	96.4



Curve Description			
Middle Abdomen Force			
Plot No.	Type	SAE Class	Units
004	FIL	600	Newtons
Max	Time	Min	Time
995.6	12.2	-8.5	101.2



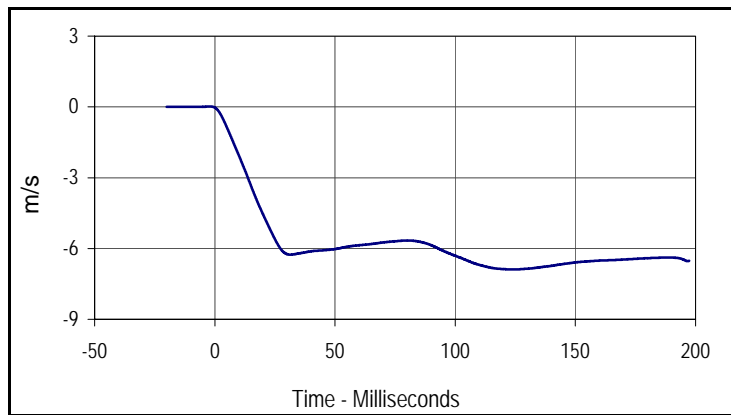
Curve Description			
Rear Abdomen Force			
Plot No.	Type	SAE Class	Units
005	FIL	600	Newtons
Max	Time	Min	Time
869.9	11.5	-8.5	101.2

Test Program: ES2re Lumbar Flexion Test
 ATD Serial No.: F035

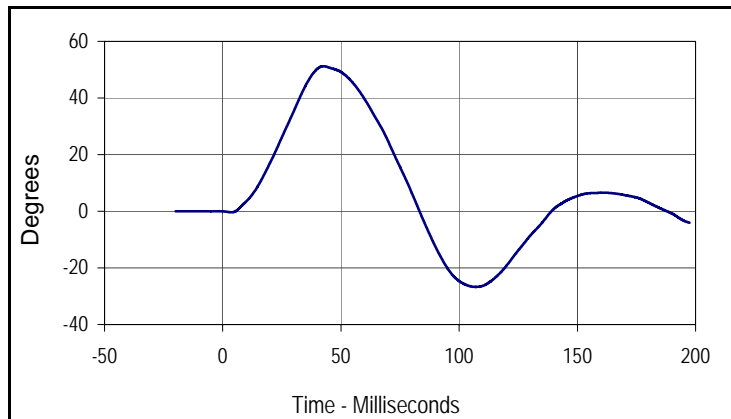
Test Date: 5/7/12
 Test I.D.: F035LB031



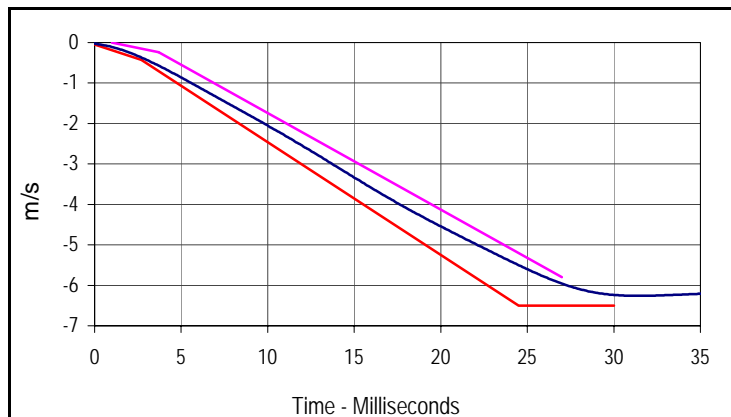
Tested Parameter	Units	Specification	Result	Pass/Fail
Lumbar Spine Assembly Soak Time	Minutes	≥240	400	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.6	Pass
Pendulum Velocity	m/s	5.95 to 6.15	6.04	Pass
Headform Rotation	Max	45 to 55	51.2	Pass
	Time	39 to 53	42.6	Pass
Time of Decay to Zero Angle from Peak	msec	37 to 57	40.7	Pass
Overall Test Results				Pass



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-2.0	-6.9	124.1



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
51.2	42.6	-26.7	107.0

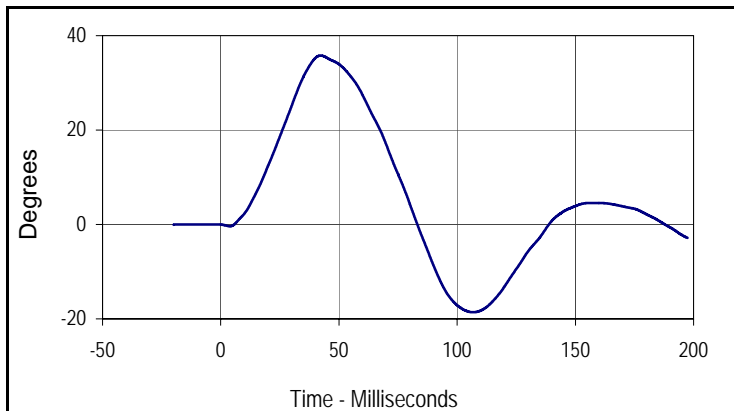


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-2.0	-6.9	124.1

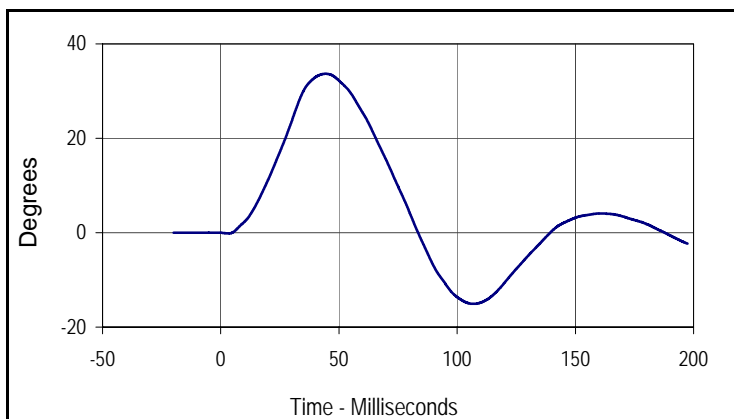
Upper Boundary		Lower Boundary	
Time (msec)	Velocity (m/s)	Time (msec)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.50
		30.0	-6.50

Test Program: ES2re Lumbar Flexion Test
 ATD Serial No.: F035

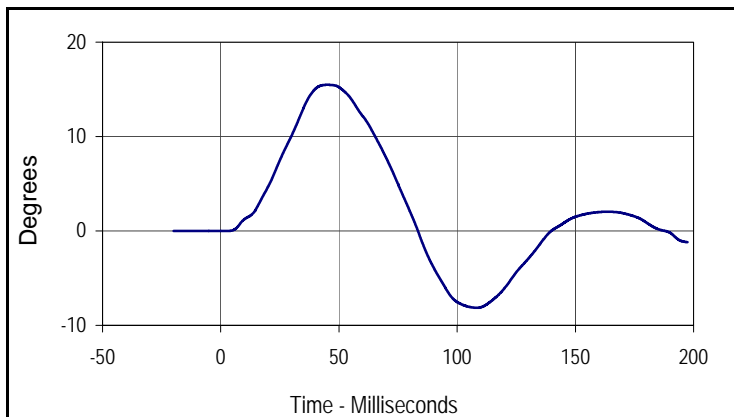
Test Date: 5/7/12
 Test I.D.: F035LB031



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
35.8	42.3	-18.6	106.7



Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
33.7	44.3	-15.1	106.8



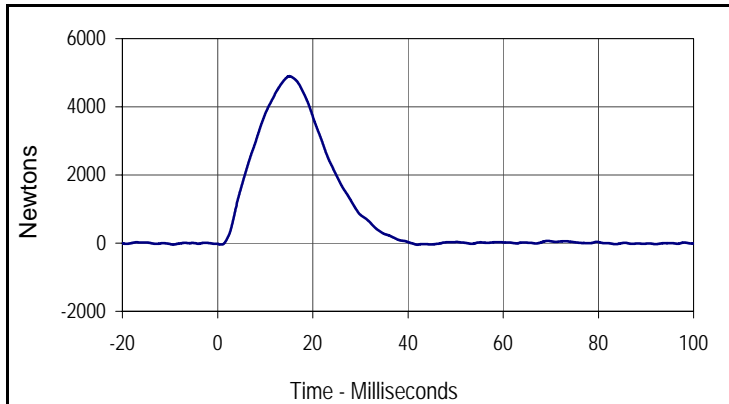
Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
15.5	45.1	-8.1	108.3

Test Program: ES2re Pelvis Impact Test
 ATD Serial No.: F035

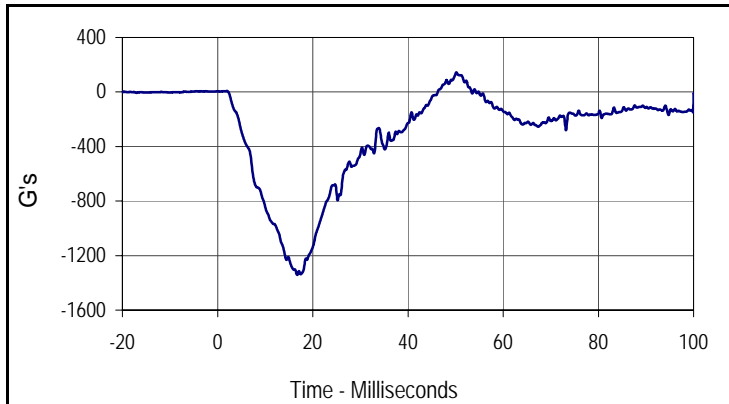
Test Date: 5/7/12
 Test I.D.: F035PL031



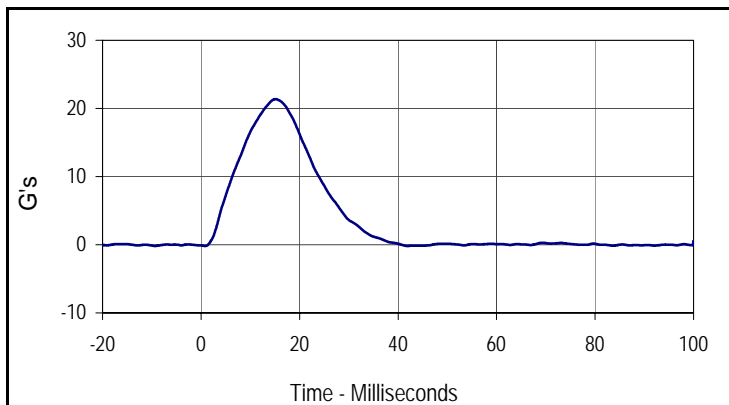
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	450	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.1	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Impactor Force	N	4700 to 5400	4897.3	Pass
	msec	11.8 to 16.1	15.1	Pass
Peak Pubic Symphysis Load	N	-1230 to -1590	-1342.0	Pass
	msec	12.2 to 17.0	16.7	Pass
Overall Test Results				Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4897.3	15.1	-44.8	42.0



Curve Description			
Pubic Symphysis Force Y			
Plot No.	Type	SAE Class	Units
002	FIL	600	G's
Max	Time	Min	Time
143.1	50.2	-1342.0	16.7



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
21.4	15.1	-0.2	42.0

Test Program: SID IIs External Measurements

Test Date: 5/7/12

ATD Serial No.: 307

Test I.D.: N/A



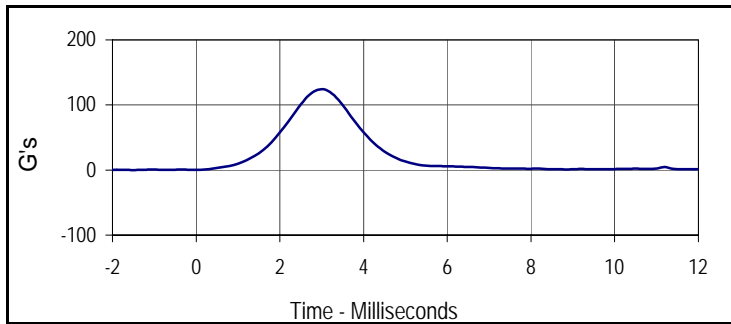
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
A Sitting Height	mm	772 - 788	779	Pass
B Shoulder Pivot Height	mm	437 - 453	445	Pass
C H-Point Height	mm	79 - 89	84	Pass
D H-Point from Seatback	mm	141 - 151	145	Pass
E Shoulder Pivot from Backline	mm	97 - 107	103	Pass
F Thigh Clearance	mm	119 - 135	127	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	183	Pass
J Head Circumference	mm	541 - 551	546	Pass
K Buttock to Knee Length	mm	514 - 540	527	Pass
L Popliteal Height	mm	343 - 369	350	Pass
M Knee Pivot to Floor Height	mm	392 - 409	402	Pass
N Buttock Popliteal Length	mm	416 - 442	430	Pass
O Chest Depth w/o Jacket	mm	195 - 211	204	Pass
P Foot Length	mm	216 - 232	221	Pass
Q Hip Breadth with Pelvic Plug	mm	313 - 323	318	Pass
R Arm Length	mm	249 - 259	252	Pass
S Knee Joint to Seatback	mm	477 - 493	484	Pass
V Shoulder Width	mm	341 - 357	351	Pass
W Foot Width	mm	78 - 94	89	Pass
Y Chest Circumference with Jacket	mm	851 - 881	873	Pass
Z Waist Circumference	mm	760 - 791	775	Pass
Overall Test Results				Pass

Test Program: SID IIs Head Drop Test
 ATD Serial No.: 307

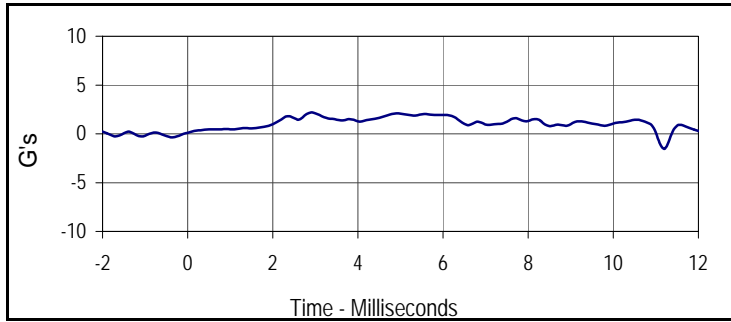
Test Date: 5/7/12
 Test I.D.: 307HD036



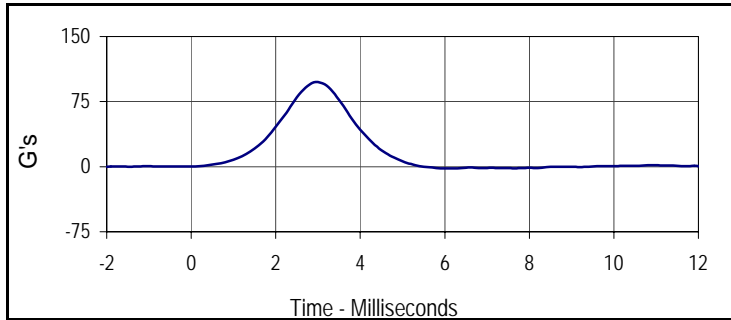
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	240	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass
Peak Head Resultant Acceleration	G's	115 to 137	124.3	Pass
Peak Head X Acceleration	G's	<15	2.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	3.7	Pass
Overall Test Results				Pass



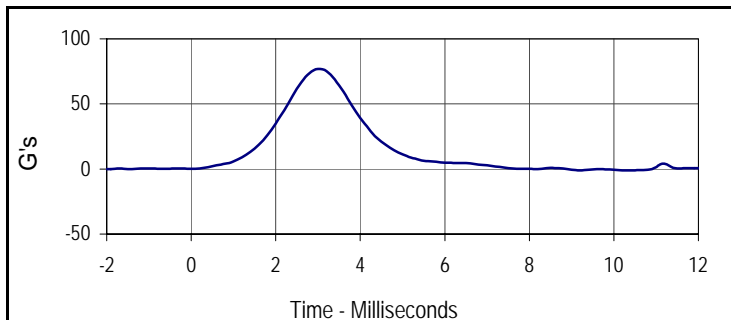
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
124.3	3.0	0.1	-1.5



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.2	2.9	-0.4	-0.4



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
97.6	3.0	-2.0	6.1



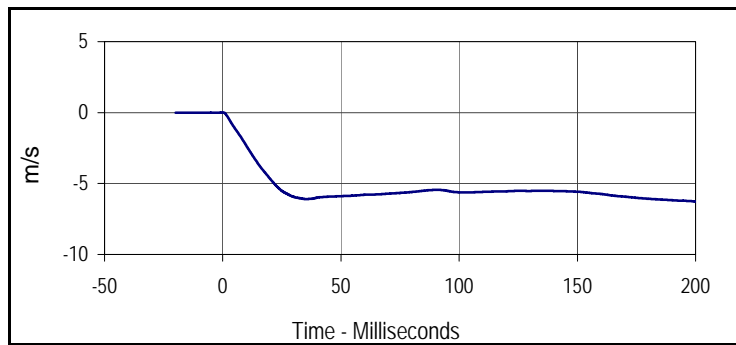
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
76.9	3.0	-1.0	9.2

Test Program: SID IIs Neck Flexion Test
 ATD Serial No.: 307

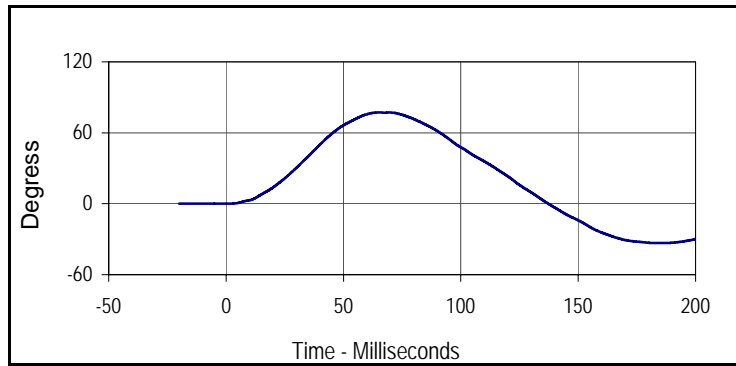
Test Date: 5/7/12
 Test I.D.: 307NB036



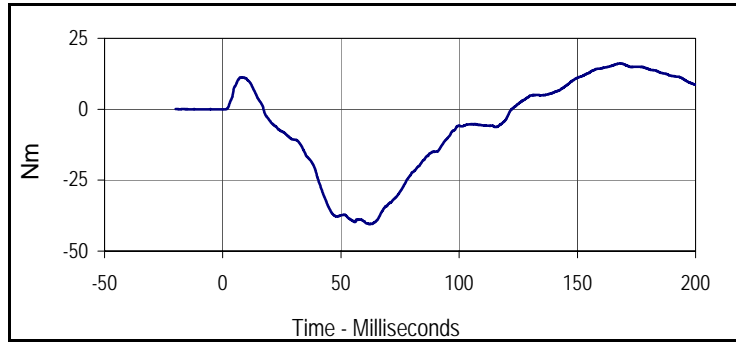
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	265	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.3	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass	
Pendulum Velocity	m/s	5.51 to 5.63	5.54	Pass	
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.34	Pass
	15 msec	m/s	-3.30 to -4.10	-3.61	Pass
	20 msec	m/s	-4.40 to -5.40	-4.66	Pass
	25 msec	m/s	-5.40 to -6.10	-5.52	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.10	Pass
D-Plane Rotation	Max	Degrees	71 to 81	77.2	Pass
	Time	msec	50 to 70	64.9	Pass
Peak Occipital Condyle Moment	Nm	-36 to -44	-40.5	Pass	
Decaying Moment Time to Cross 0 Nm	msec	102 to 126	122.3	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	-0.2	-6.3	200.0



Curve Description			
Maximum Translation Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degree
Max	Time	Min	Time
77.2	64.9	-33.3	182.6



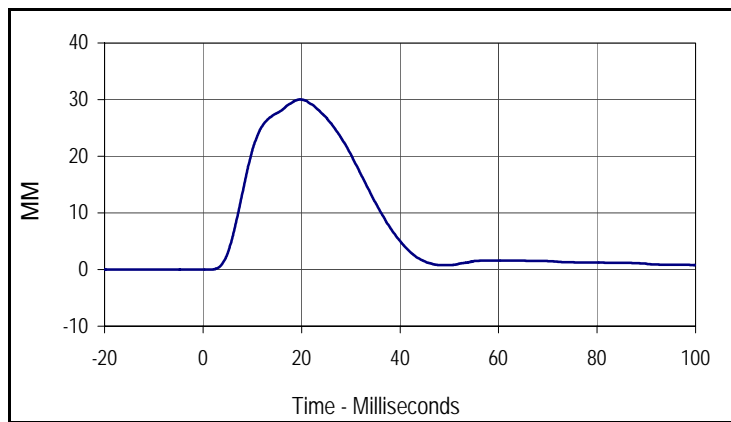
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.2	168.3	-40.5	61.9

Test Program: SID IIs Shoulder Impact Test
 ATD Serial No.: 307

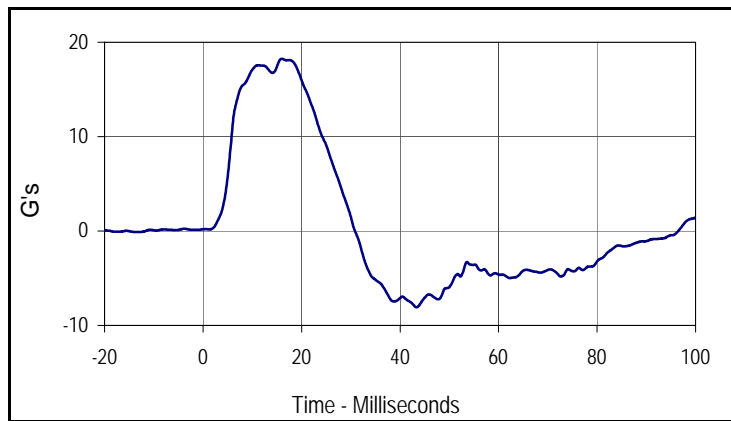
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 Test I.D.: 307SH036



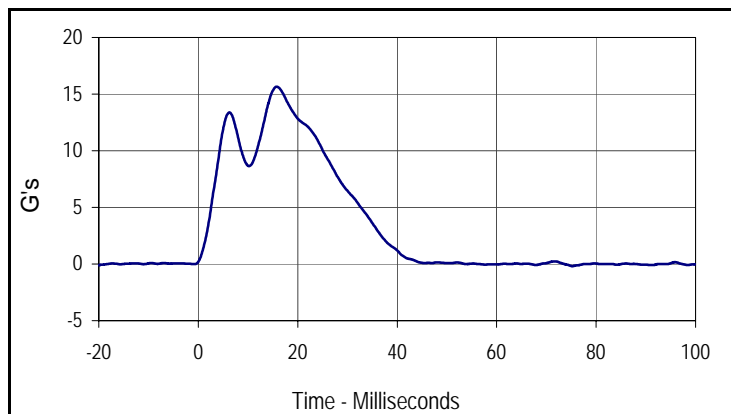
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	300	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	20.9	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass
Impactor Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Shoulder Deflection	mm	28 to 37	30.0	Pass
Peak Lateral Spine Acceleration Y	G's	17 to 22	18.2	Pass
Peak Impactor Acceleration	G's	13 to 18	15.7	Pass
Overall Test Results			Pass	Pass



Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
30.0	19.7	0.0	0.5



Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
18.2	16.0	-8.1	43.3



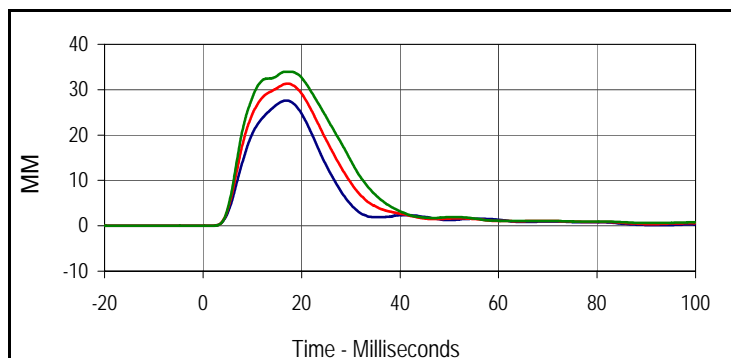
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.7	15.8	-0.2	75.2

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 307

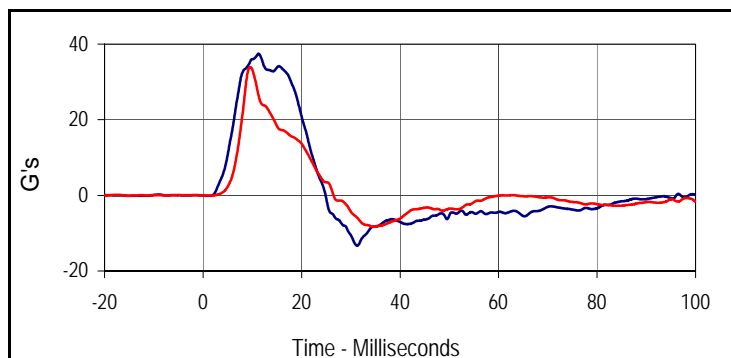
Test Date: 5/7/12
 Test I.D.: 307TWA036



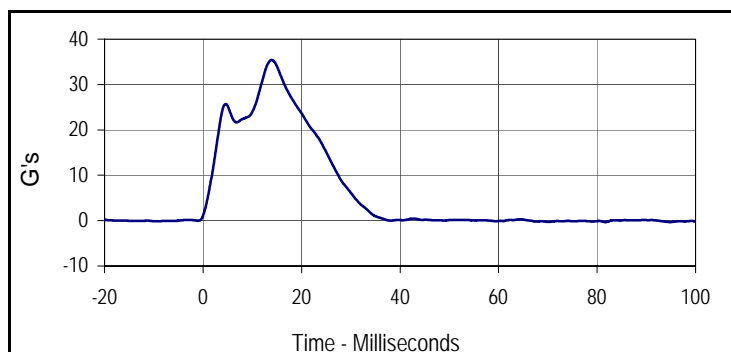
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	330	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.8	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Shoulder Deflection	mm	31 to 40	35.4	Pass
Peak Upper Thorax Rib Deflection	mm	25 to 32	27.6	Pass
Peak Middle Thorax Rib Deflection	mm	30 to 36	31.3	Pass
Peak Lower Thorax Rib Deflection	mm	32 to 38	34.0	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	37.5	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	33.9	Pass
Peak Impactor Acceleration	G's	30 to 36	35.4	Pass
Overall Test Results				Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
27.6	16.9	0.0	-16.2
Middle Thorax Deflection			
Max	Time	Min	Time
31.3	17.2	0.0	-6.8
Lower Thorax Deflection			
Max	Time	Min	Time
34.0	16.8	0.0	-6.2



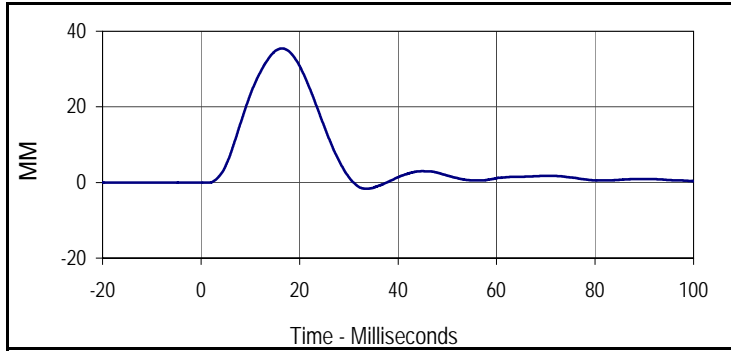
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
37.5	11.3	-13.3	31.3
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
33.9	9.6	-8.3	34.5



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
35.4	13.9	-0.3	81.7

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 307

Test Date: 5/7/12
 Test I.D.: 307TWA036



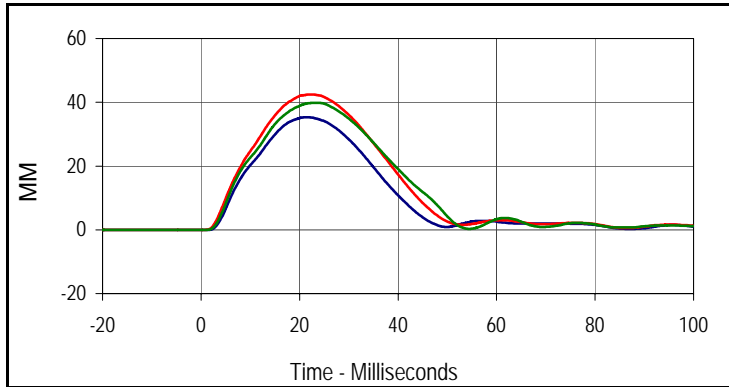
Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
007	FIL	600	MM
Max	Time	Min	Time
35.4	16.3	-1.7	33.5

Test Program: SID IIs Thorax without Arm Impact Test
 ATD Serial No.: 307

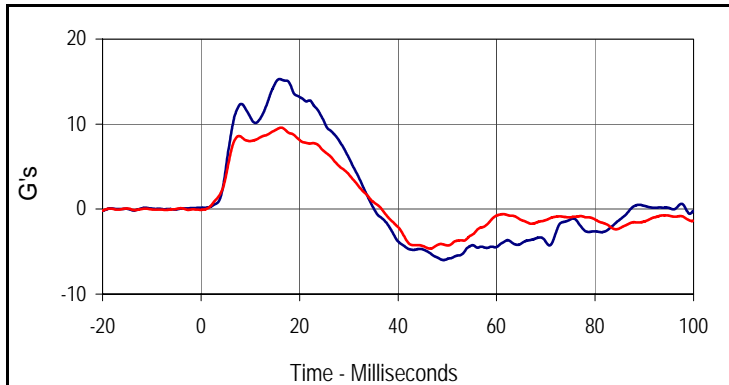
Test Date: 5/7/12
 Test I.D.: 307TWOA036



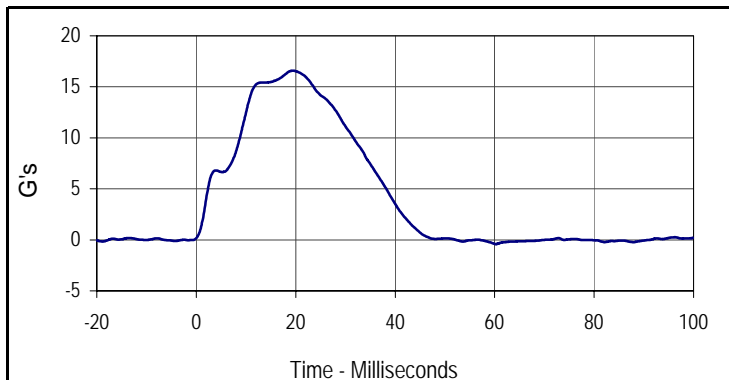
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	360	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.9	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.5	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Upper Thorax Rib Deflection	mm	32 to 40	35.3	Pass
Peak Middle Thorax Rib Deflection	mm	39 to 45	42.5	Pass
Peak Lower Thorax Rib Deflection	mm	35 to 43	39.8	Pass
Peak Upper Spine Y Acceleration	G's	13 to 17	15.3	Pass
Peak Lower Spine Y Acceleration	G's	7 to 11	9.6	Pass
Peak Impactor Acceleration	G's	14 to 18	16.6	Pass
Overall Test Results				Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
35.3	21.6	0.0	-4.3
Middle Thorax Deflection			
Max	Time	Min	Time
42.5	22.4	0.0	0.7
Lower Thorax Deflection			
Max	Time	Min	Time
39.8	23.0	0.0	-20.0



Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.3	16.0	-6.0	49.2
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
9.6	16.3	-4.6	46.5



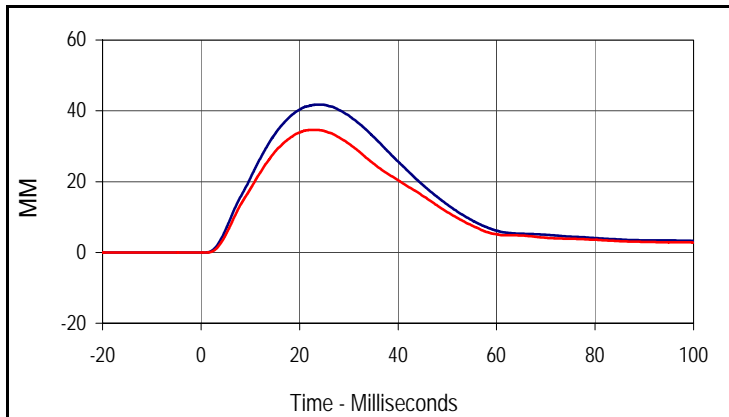
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.6	19.4	-0.4	60.3

Test Program: SID IIs Abdomen Impact Test
 ATD Serial No.: 307

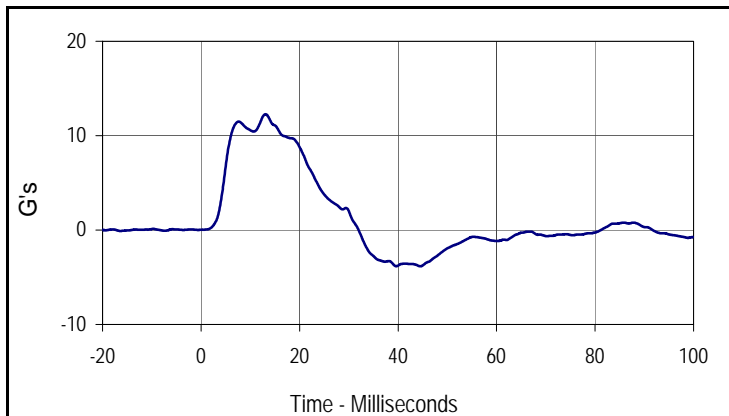
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 Test I.D.: 307ABD036



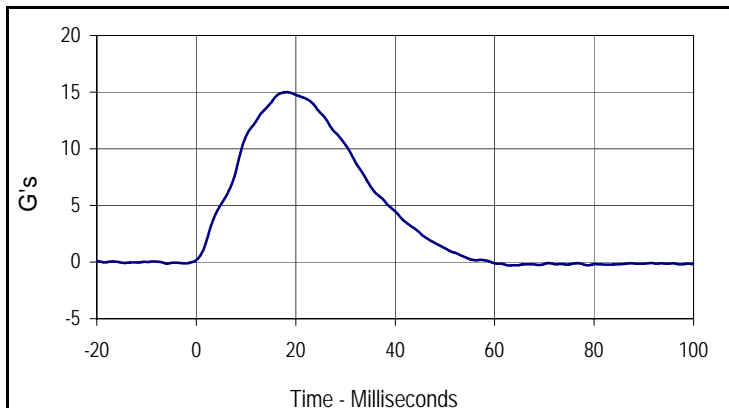
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	390	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.9	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.2	Pass
Peak Upper Abdominal Rib Deflection	mm	36 to 47	41.7	Pass
Peak Lower Abdominal Rib Deflection	mm	33 to 44	34.6	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	12.3	Pass
Peak Impactor Acceleration	G's	12 to 16	15.0	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
41.7	24.1	0.0	-10.3
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	-8.4



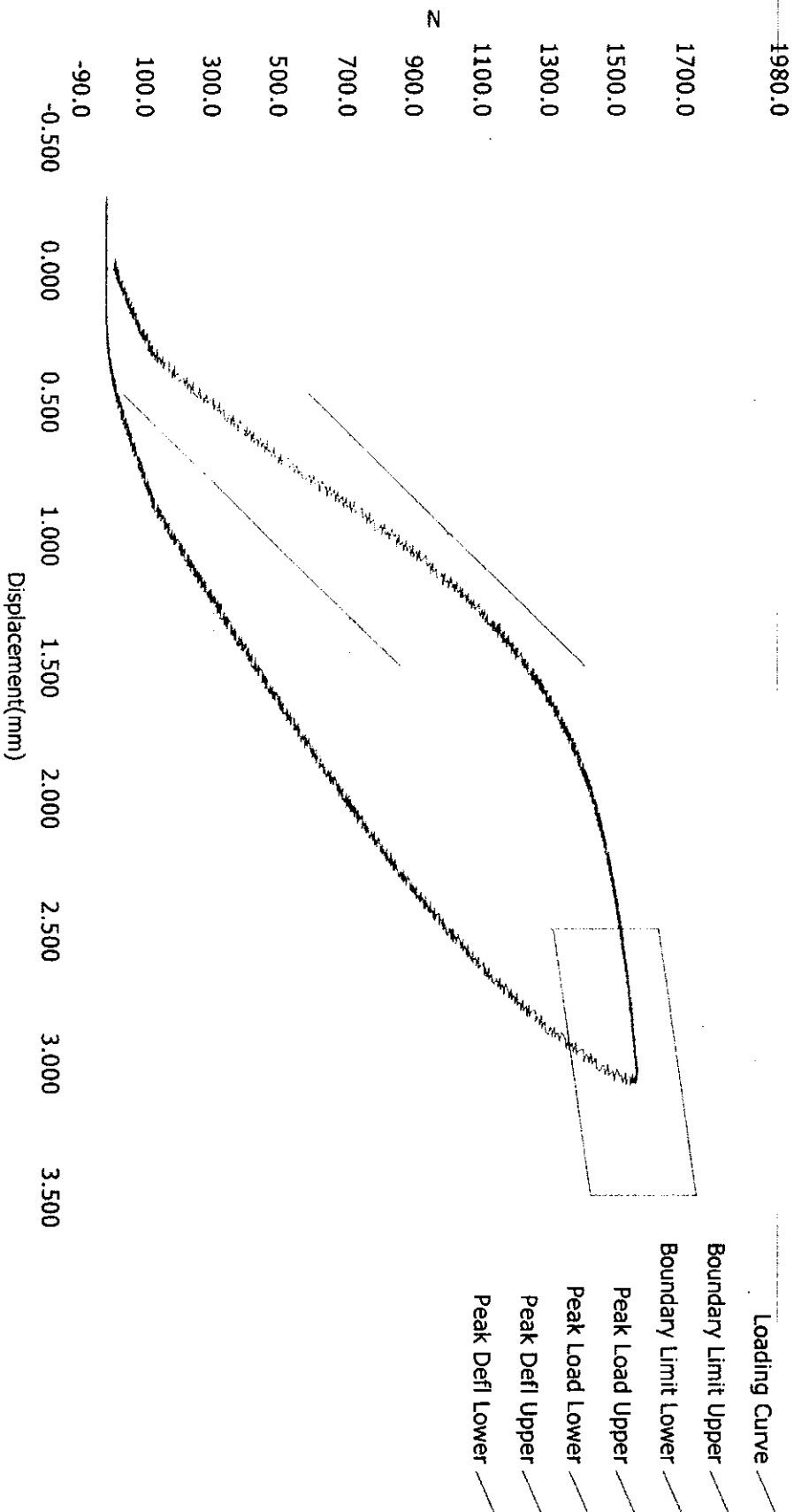
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
12.3	13.1	-3.8	44.5



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.0	18.1	-0.3	63.0

MC0519 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>
46809	10/4/2011	6:28 PM	
<u>Cert ID</u>	<u>ATD Serial Number</u>	<u>ATD Type</u>	
N/A	SIDIIs		

Current Date : 10/4/2011

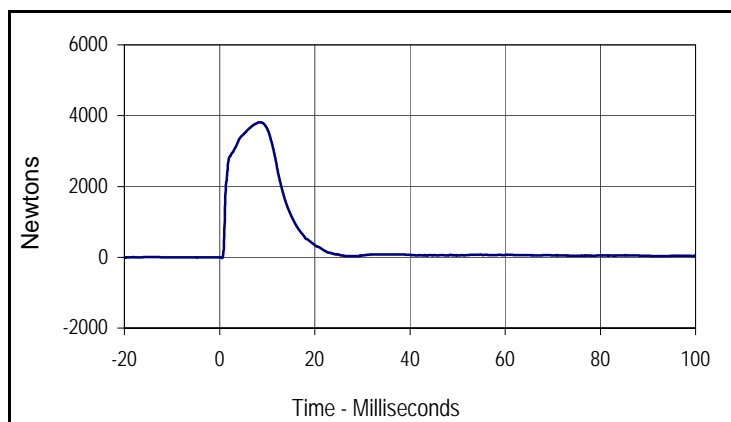
Current Time : 18:29:31

Test Program: SID IIs Pelvis Acetabulum Impact Test
 ATD Serial No.: 307

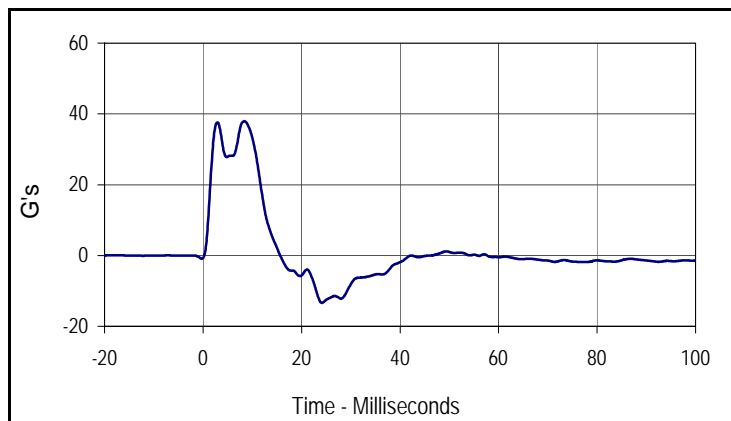
Test Date: 5/7/12
 Test I.D.: 307ACET036



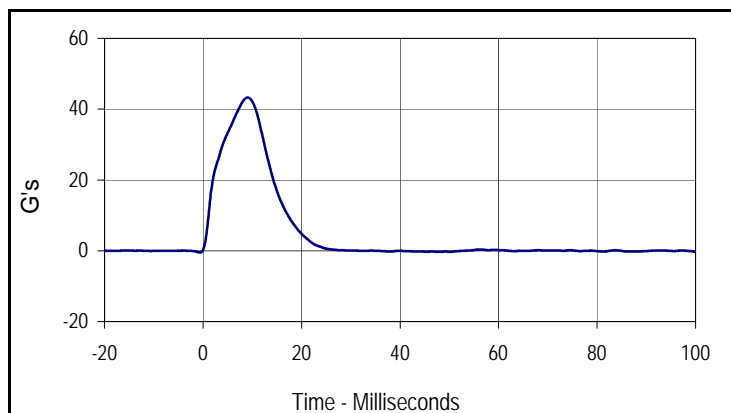
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	420	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Acetabulum Force Y	Newtons	3600 to 4300	3814.7	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	37.9	Pass
Peak Impactor Acceleration	G's	38 to 47	43.3	Pass
Overall Test Results				Pass



Curve Description			
Pelvis Acetabulum Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3814.7	8.4	-24.6	0.6



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
37.9	8.4	-13.4	24.1



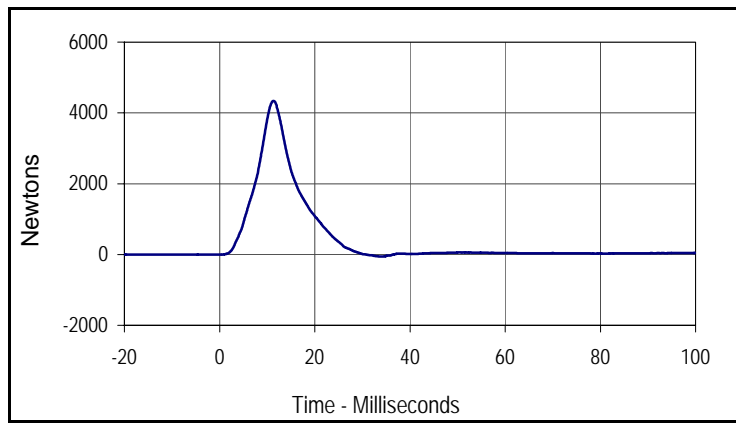
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
43.3	9.0	-0.5	-0.6

Test Program: SID IIs Pelvis Iliac Calibration
 ATD Serial No.: 307

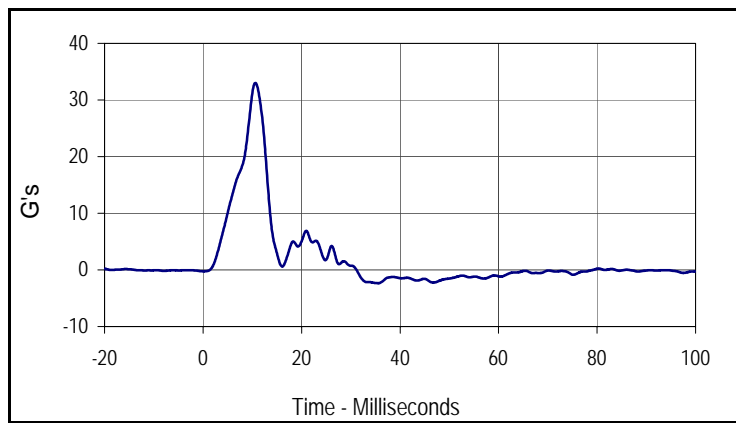
Test Date: 5/7/12
 Test I.D.: 307PL036



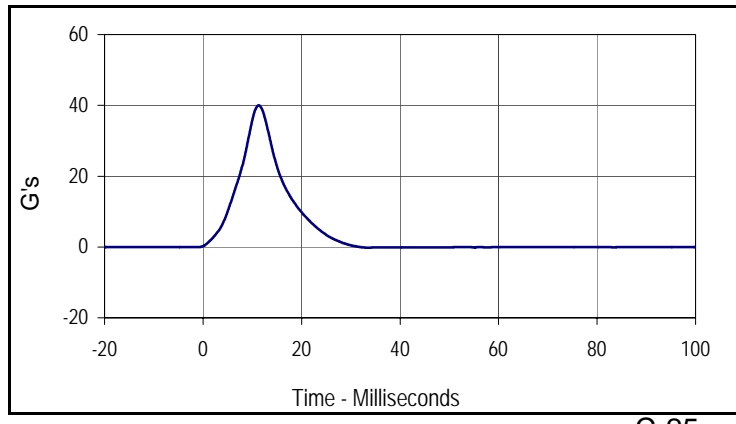
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	450	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.6	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Iliac Force	Newtons	4100 to 5100	4338.0	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	33.0	Pass
Peak Impactor Acceleration	G's	36 to 45	40.0	Pass
Overall Test Results				Pass



Curve Description			
Pelvis Iliac Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4338.0	11.3	-58.5	34.4



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
33.0	10.6	-2.3	35.6



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
40.0	11.3	-0.2	33.3

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

Test Program: ES2re External Measurements

Test Date: 5/11/12

ATD Serial No.: F035

Test I.D.: N/A



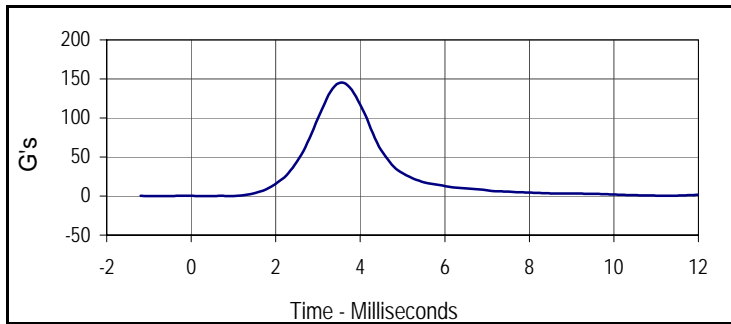
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
1 Sitting Height	mm	900 - 918	909	Pass
2 Seat to Shoulder Joint	mm	558 - 572	565	Pass
3 Seat to Lower Face of Thoracic Spine Box	mm	346 - 356	350	Pass
4 Seat to Hip Joint (Center of Bolt)	mm	97 - 103	100	Pass
5 Sole to Seat, Sitting	mm	333 - 451	392	Pass
6 Head Width	mm	152 - 158	156	Pass
7 Shoulder / Arm Width	mm	461 - 479	470	Pass
8 Thorax Width	mm	322 - 332	327	Pass
9 Abdomen Width	mm	273 - 287	280	Pass
10 Pelvis Lap Width	mm	359 - 373	363	Pass
11 Head Depth	mm	196 - 206	201	Pass
12 Thorax Depth	mm	262 - 272	270	Pass
13 Abdomen Width	mm	194 - 204	199	Pass
14 Pelvis Depth	mm	235 - 245	240	Pass
15 Back of Buttocks to Hip Joint (Center of Bolt)	mm	150 - 160	155	Pass
16 Back of Buttocks to Front Knee	mm	597 - 615	608	Pass
Overall Test Results				Pass

Test Program: ES2re Head Drop Test
 ATD Serial No.: F035

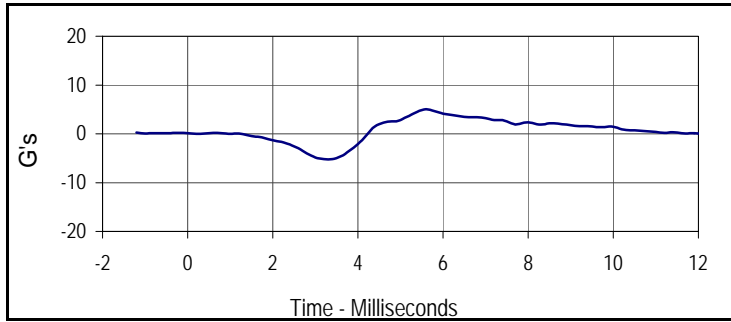
Test Date: 5/11/12
 Test I.D.: F035HD032



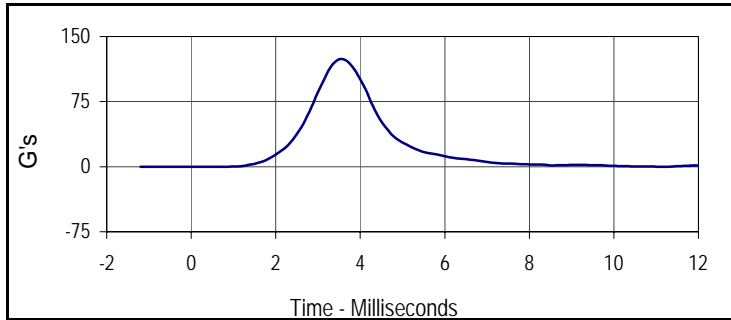
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	240	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.8	Pass
Peak Head Resultant Acceleration	G's	125 to 155	145.1	Pass
Peak Head X Acceleration	G's	≤15	5.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	10.2	Pass
Overall Test Results				Pass



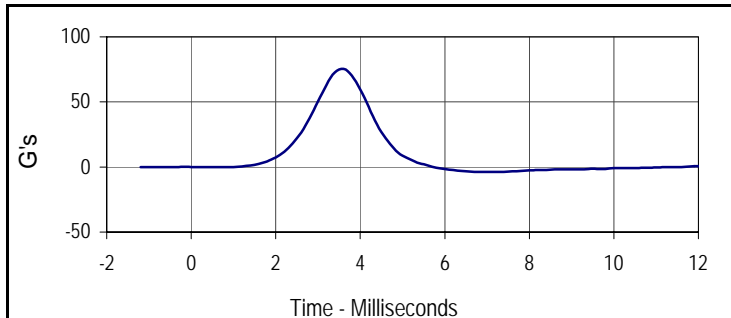
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
145.1	3.6	0.1	0.9



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
5.0	5.6	-5.3	3.3



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
123.9	3.6	-0.3	-0.1



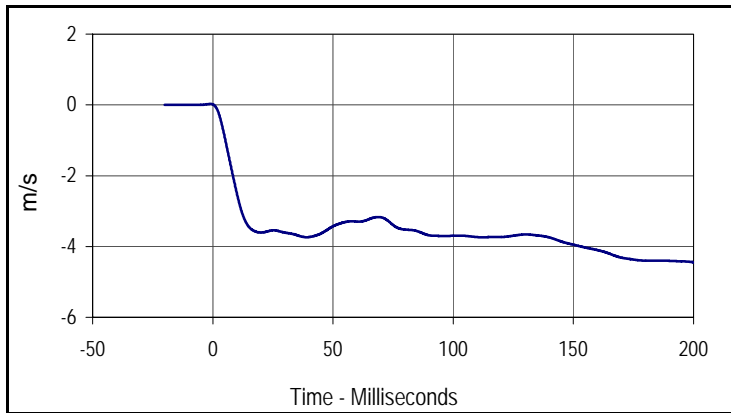
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
75.3	3.6	-3.8	6.9

Test Program: ES2re Neck Flexion Test
 ATD Serial No.: F035

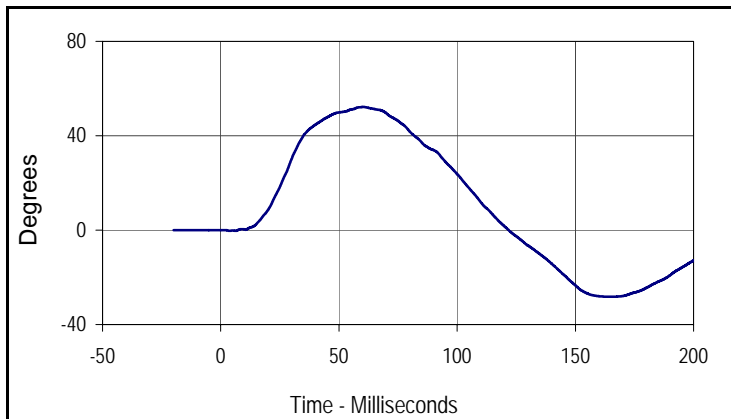
Test Date: 5/11/12
 Test I.D.: F035NB032



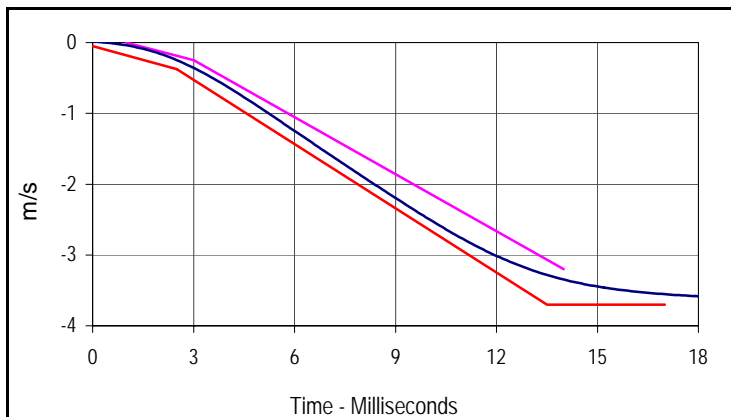
Tested Parameter	Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time	Minutes	≥240	260	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	20.9	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.5	Pass
Pendulum Velocity	m/s	3.3 to 3.5	3.4	Pass
Headform Flexion	Max	49 to 59	52.2	Pass
	Time	54 to 66	60.3	Pass
Headform Flexion Decay (Peak to Zero)	msec	53 to 88	61.5	Pass
Overall Test Results				Pass



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.0	-4.4	200.0



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
52.2	60.3	-28.3	164.6



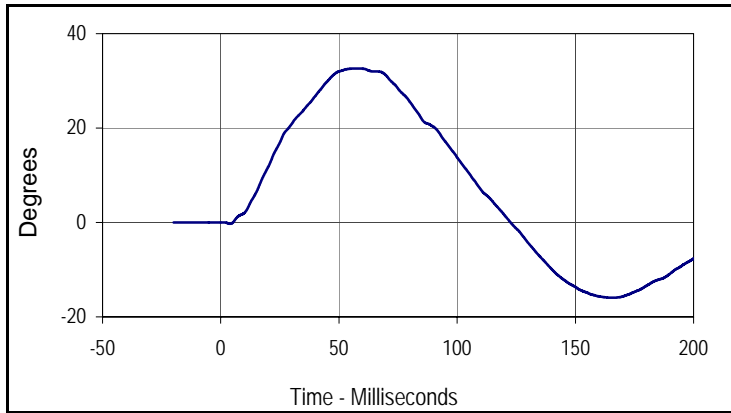
Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.0	-4.4	200.0

Velocity Corridors

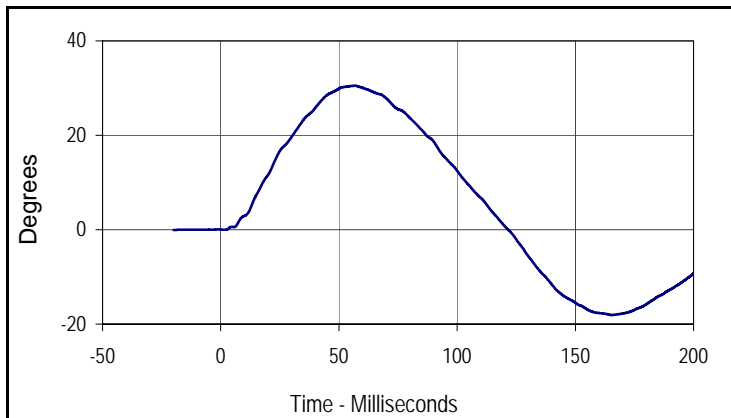
Upper Boundary		Lower Boundary	
Time (msec)	Velocity (m/s)	Time (msec)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.03	2.5	-0.375
14.0	-3.20	13.5	-3.70
		17.0	-3.70

Test Program: ES2re Neck Flexion Test
 ATD Serial No.: F035

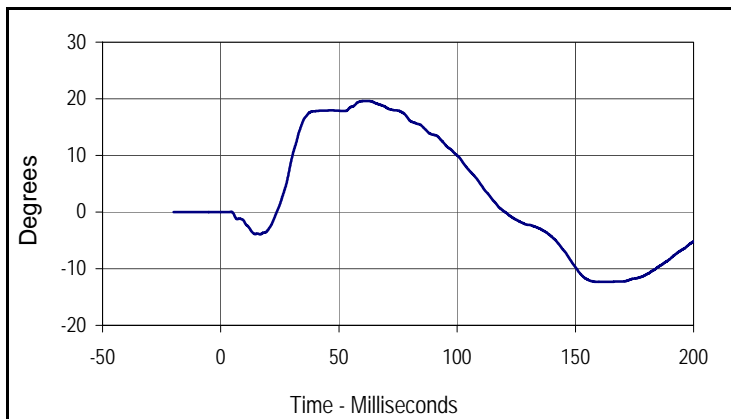
Test Date: 5/11/12
 Test I.D.: F035NB032



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
32.6	56.7	-15.9	164.9



Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
30.5	56.8	-18.1	165.3



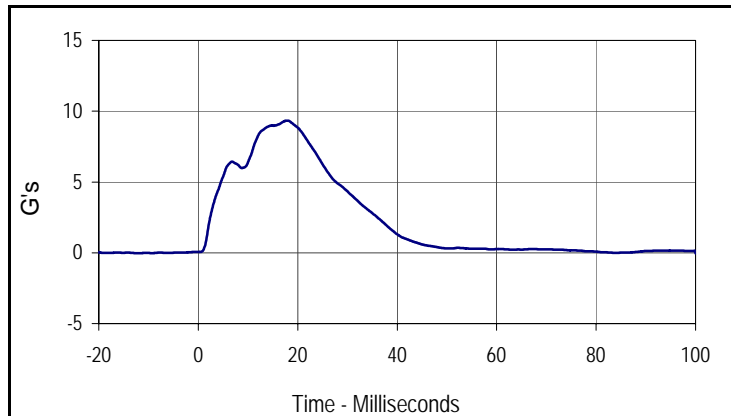
Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
19.6	61.3	-12.3	162.1

Test Program: ES2re Shoulder Impact Test
 ATD Serial No.: F035

Test Date: 5/11/12
 Test I.D.: F035SH032



Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy 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	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.3	Pass
Overall Test Results				Pass



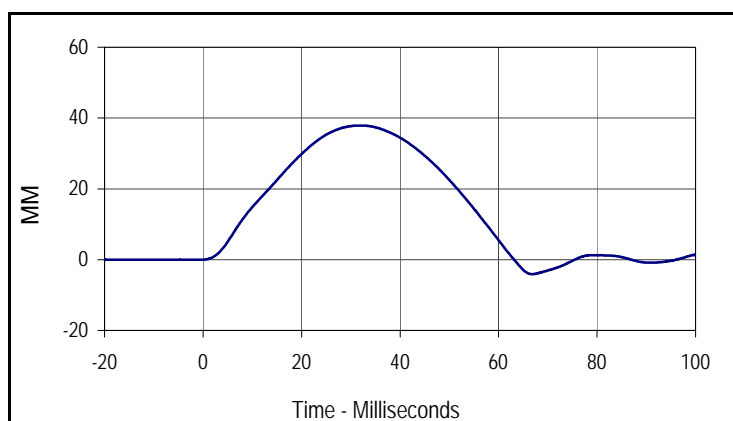
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
9.3	17.9	0.0	-12.4

Test Program: ES2re Thorax - Rib Drop Test
 ATD Serial No.: F035 Rib #1

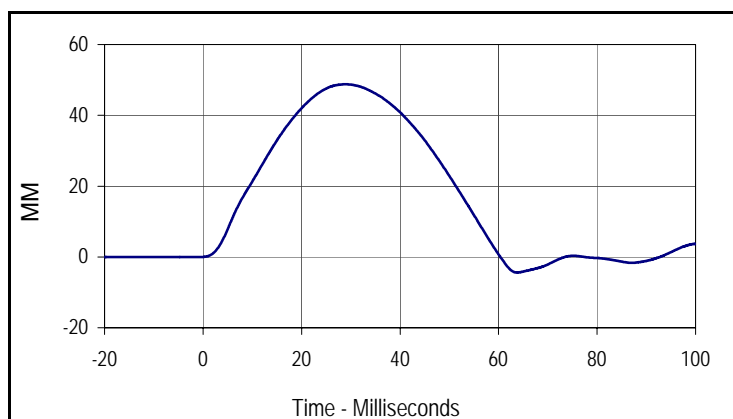
Test Date: 5/11/12
 Test I.D.: F035RB1032



Tested Parameter	Units	Specification	Result	Pass/Fail
Rib Module Soak Time	Minutes	≥240	340	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
Peak Rib Deflection at 459 +/- 5 mm Drop Height	mm	36 to 40	37.9	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height	mm	46 to 51	48.8	Pass
Overall Test Results				Pass



Curve Description			
Upper Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.9	32.0	-4.1	66.8



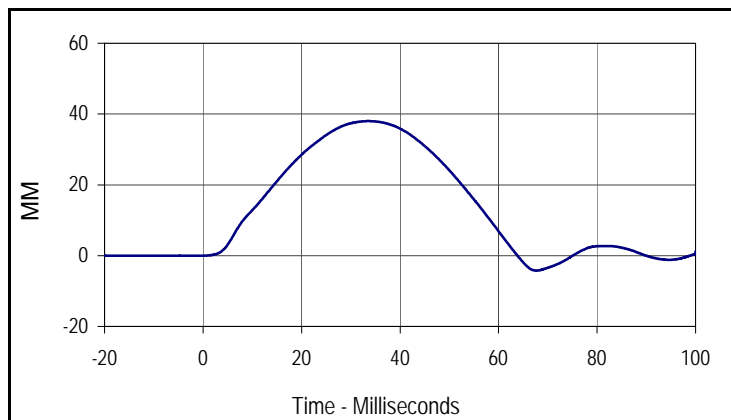
Curve Description			
Upper Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
48.8	28.9	-4.4	63.7

Test Program: ES2re Thorax - Rib Drop Test
 ATD Serial No.: F035 Rib #2

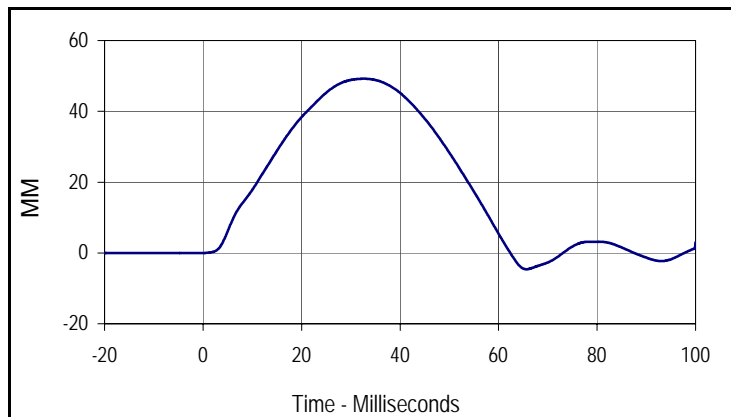
Test Date: 5/11/12
 Test I.D.: F035RB2032



Tested Parameter	Units	Specification	Result	Pass/Fail
Rib Module 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	21.5	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.2	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height	mm	36 to 40	38.0	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height	mm	46 to 51	49.2	Pass
Overall Test Results				Pass



Curve Description			
Middle Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
38.0	33.5	-4.2	67.7



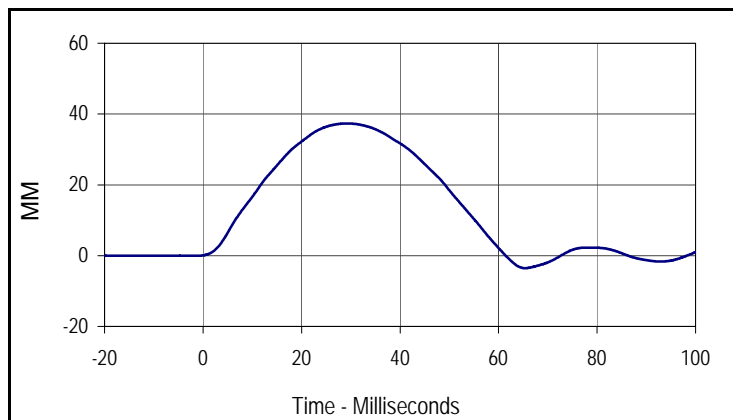
Curve Description			
Middle Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
49.2	32.8	-4.6	65.7

Test Program: ES2re Thorax - Rib Drop Test
 ATD Serial No.: F035 Rib # 3

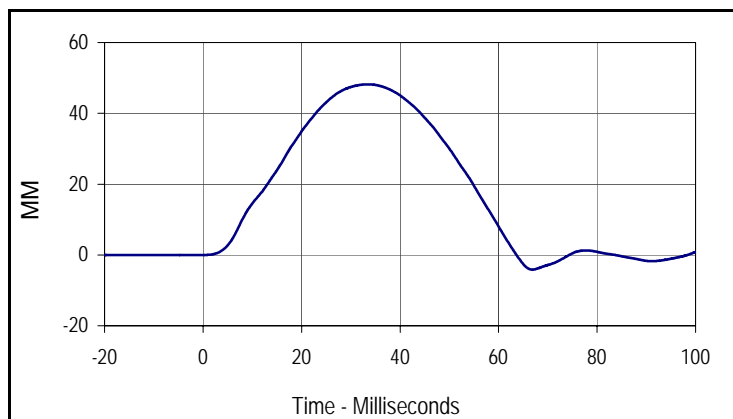
Test Date: 5/11/12
 Test I.D.: F035RB3032



Tested Parameter	Units	Specification	Result	Pass/Fail
Rib Module 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	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.7	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height	mm	36 to 40	37.3	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height	mm	46 to 51	48.2	Pass
Overall Test Results				Pass



Curve Description			
Lower Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.3	29.3	-3.5	65.4



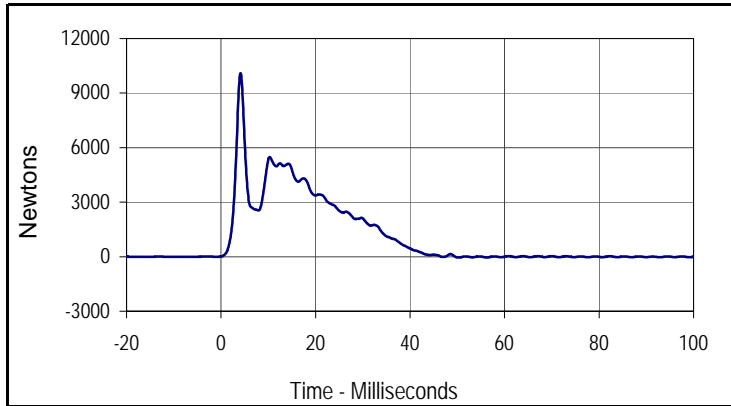
Curve Description			
Lower Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
48.2	33.4	-4.1	66.9

Test Program: ES2re Thorax - Full Body Impact Test
 ATD Serial No.: F035

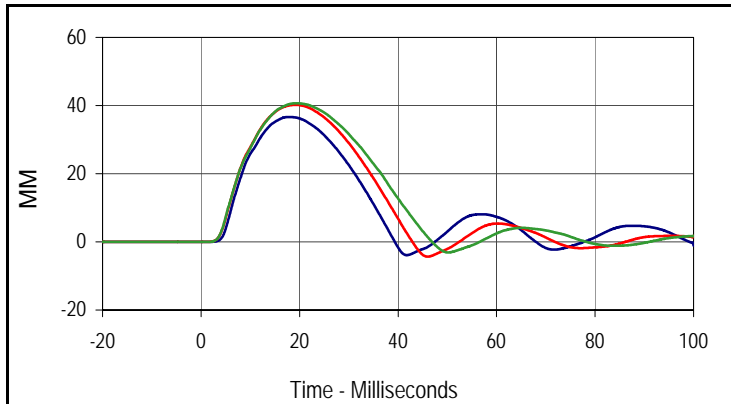
Test Date: 5/11/12
 Test I.D.: F035TH032



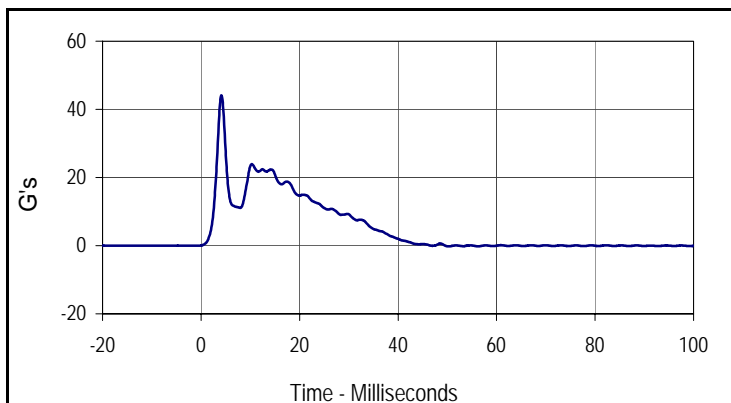
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	420	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.6	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.6	Pass
Peak Impactor Velocity	m/s	5.4 to 5.6	5.5	Pass
Peak Impactor Force	N	5100 to 6200	5481.9	Pass
	msec	> 6.0 msec	10.3	Pass
Peak Upper Rib Deflection	mm	34 to 41	36.6	Pass
Peak Middle Rib Deflection	mm	37 to 45	40.2	Pass
Peak Lower Rib Deflection	mm	37 to 44	40.7	Pass
Overall Test Results				Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
10103.6	4.1	-49.8	50.2



Curve Description			
Upper, Middle, Lower Rib Deflections			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
36.6	17.8	-3.9	41.8
Max (Middle)	Time	Min (Middle)	Time
40.2	19.2	-4.3	46.0
Max (Lower)	Time	Min (Lower)	Time
40.7	19.3	-3.1	50.2



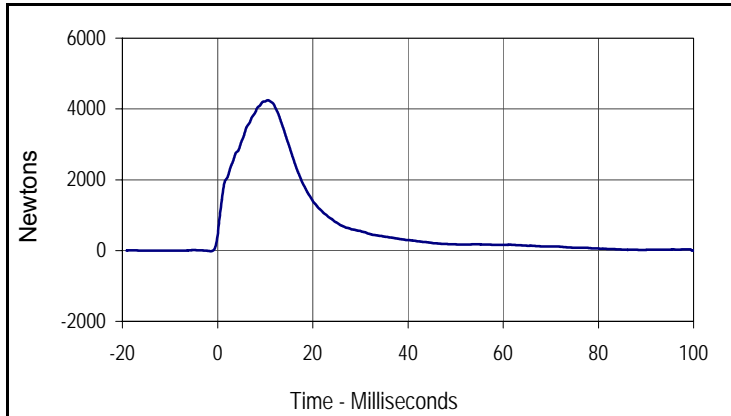
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
44.1	4.1	-0.2	50.2

Test Program: ES2re Abdomen Impact Test
 ATD Serial No.: F035

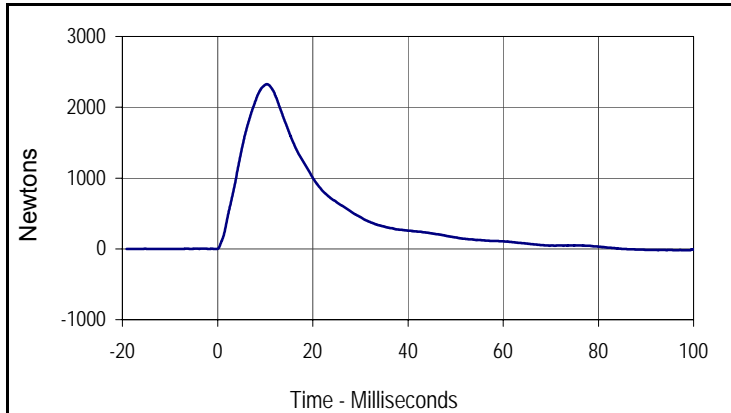
Test Date: 5/11/12
 Test I.D.: F035ABD032



Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	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	20.6 to 22.2	21.5	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.3	Pass
Probe Velocity	m/s	3.9 to 4.1	4.0	Pass
Peak Impactor Force	N	4000 to 4800	4248.4	Pass
	msec	10.6 to 13.0	12.0	Pass
Sum of Abdominal Forces	N	2200 to 2700	2325.0	Pass
	msec	10.0 to 12.3	11.8	Pass
Overall Test Results				Pass



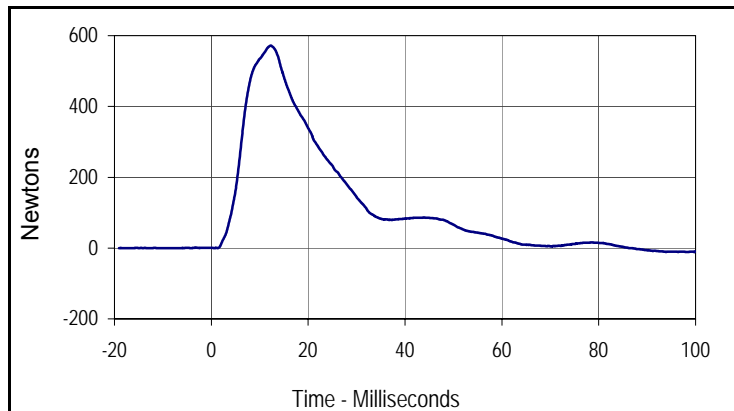
Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4248.4	12.0	-17.1	0.0



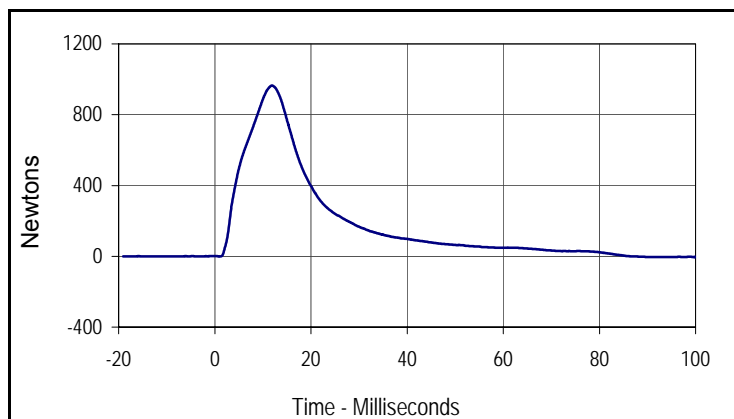
Curve Description			
Abdomen Sum Resultant			
Plot No.	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2325.0	11.8	-18.7	99.7

Test Program: ES2re Abdomen Impact Test
 ATD Serial No.: F035

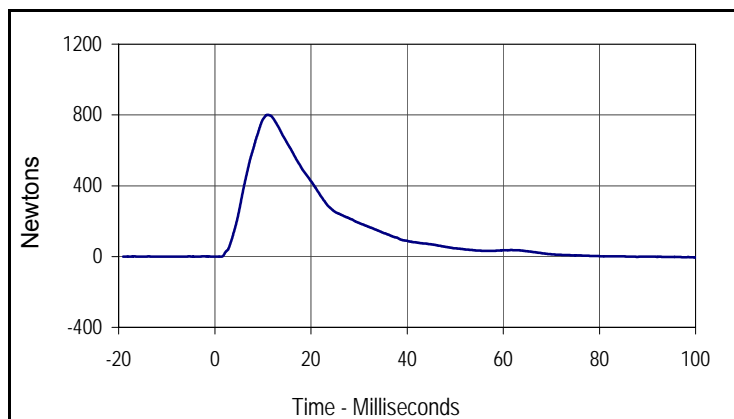
Test Date: 5/11/12
 Test I.D.: F035ABD032



Curve Description			
Front Abdomen Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
572.0	12.3	-11.0	98.5



Curve Description			
Middle Abdomen Force			
Plot No.	Type	SAE Class	Units
004	FIL	600	Newtons
Max	Time	Min	Time
964.7	11.9	-8.5	102.1



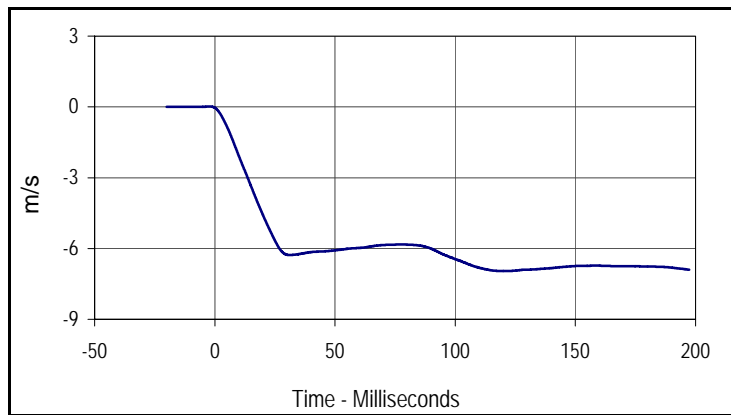
Curve Description			
Rear Abdomen Force			
Plot No.	Type	SAE Class	Units
005	FIL	600	Newtons
Max	Time	Min	Time
800.1	11.0	-8.5	102.1

Test Program: ES2re Lumbar Flexion Test
 ATD Serial No.: F035

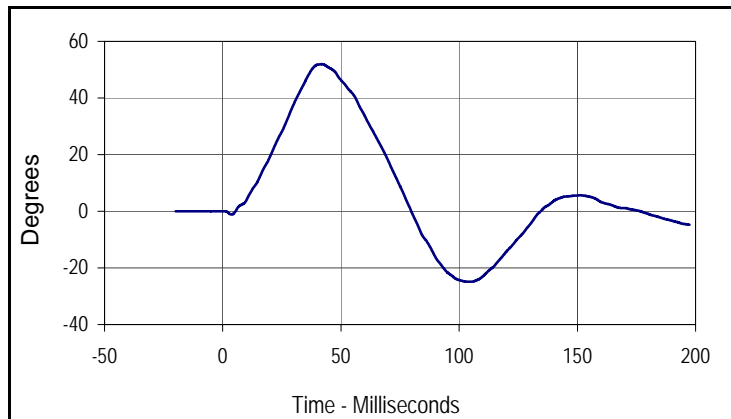
Test Date: 5/11/12
 Test I.D.: F035LB032



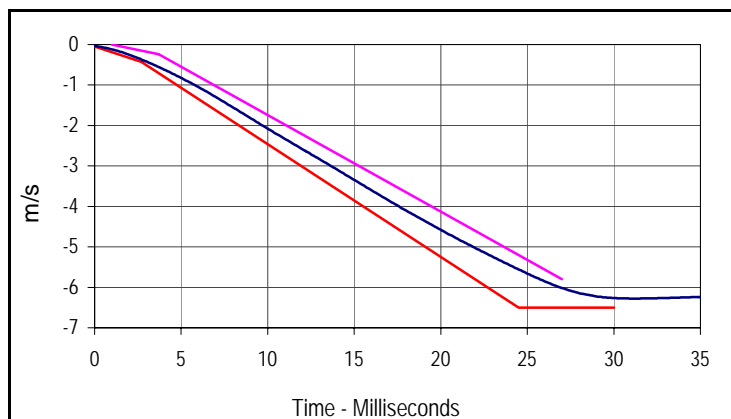
Tested Parameter	Units	Specification	Result	Pass/Fail
Lumbar Spine Assembly Soak Time	Minutes	≥240	430	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.0	Pass
Pendulum Velocity	m/s	5.95 to 6.15	6.00	Pass
Headform Rotation	Max	45 to 55	51.9	Pass
	Time	39 to 53	41.9	Pass
Time of Decay to Zero Angle from Peak	msec	37 to 57	37.9	Pass
Overall Test Results				Pass



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-2.2	-7.0	120.6



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
51.9	41.9	-24.9	105.2

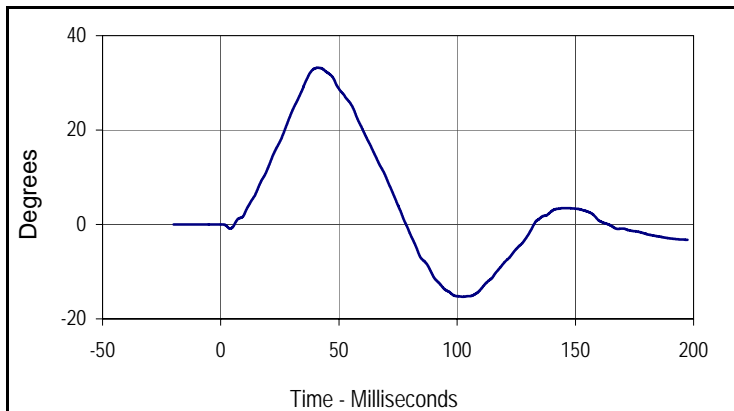


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-2.2	-7.0	120.6

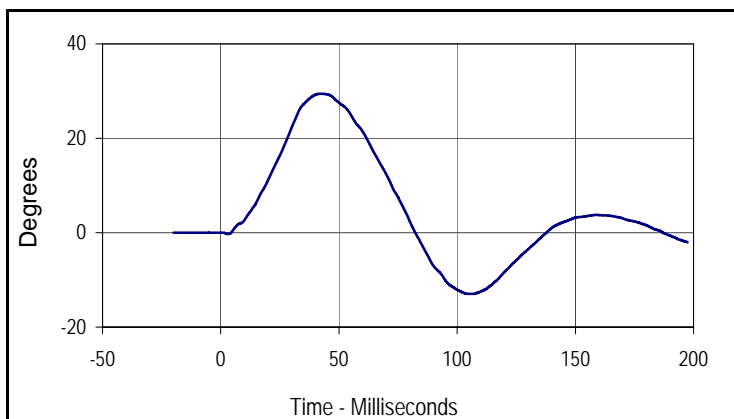
Upper Boundary		Lower Boundary	
Time (msec)	Velocity (m/s)	Time (msec)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.50
		30.0	-6.50

Test Program: ES2re Lumbar Flexion Test
 ATD Serial No.: F035

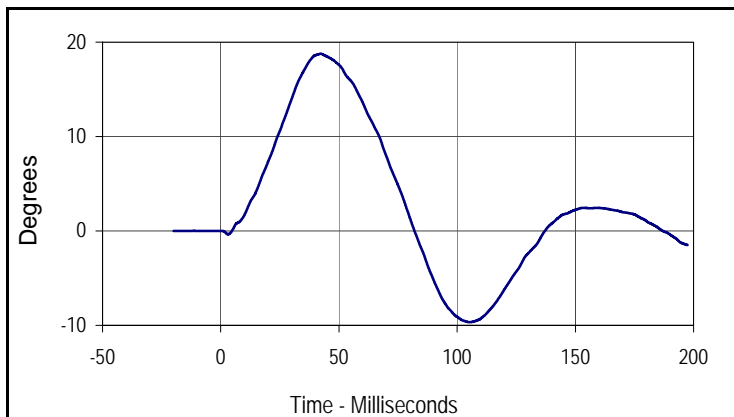
Test Date: 5/11/12
 Test I.D.: F035LB032



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
33.2	41.1	-15.3	102.6



Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
29.4	41.8	-13.0	106.2



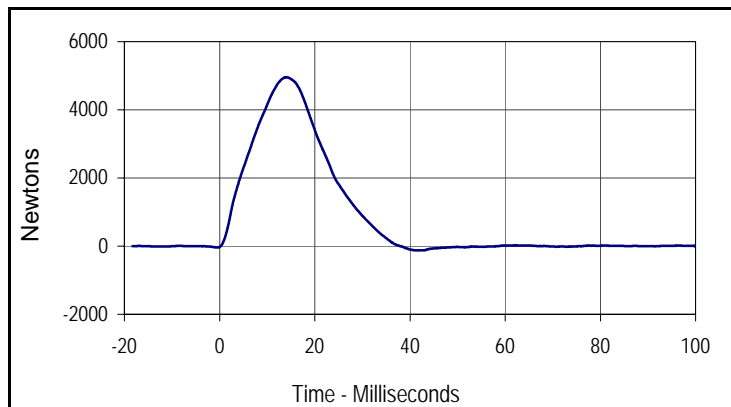
Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
18.8	42.2	-9.7	105.3

Test Program: ES2re Pelvis Impact Test
 ATD Serial No.: F035

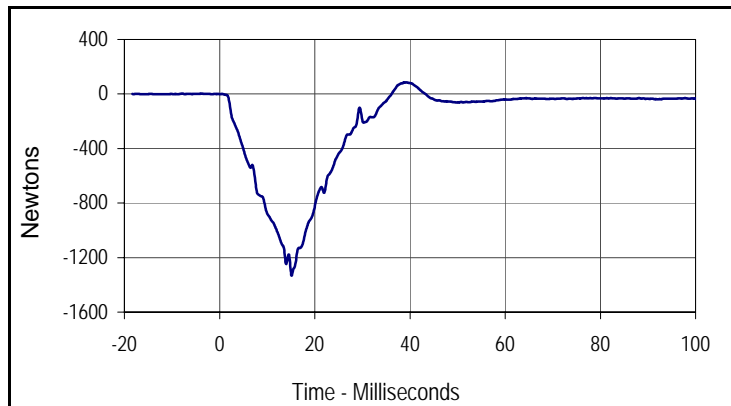
Test Date: 5/11/12
 Test I.D.: F035PL032



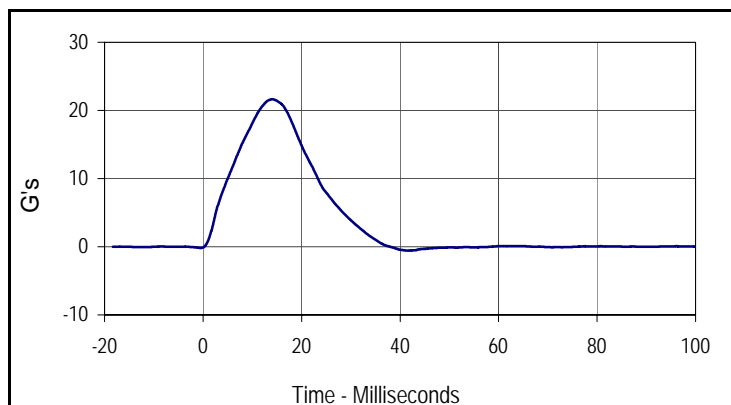
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥240	450	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.7	Pass
Pendulum Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Impactor Force	N	4700 to 5400	4958.1	Pass
	msec	11.8 to 16.1	14.1	Pass
Peak Pubic Symphysis Load	N	-1230 to -1590	-1332.0	Pass
	msec	12.2 to 17.0	15.1	Pass
Overall Test Results				Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4958.1	14.1	-125.5	42.0



Curve Description			
Pubic Symphysis Force Y			
Plot No.	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
85.3	39.1	-1332.0	15.1



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
21.6	14.1	-0.5	42.0

Test Program: SID IIs External Measurements

Test Date: 5/11/12

ATD Serial No.: 307

Test I.D.: N/A



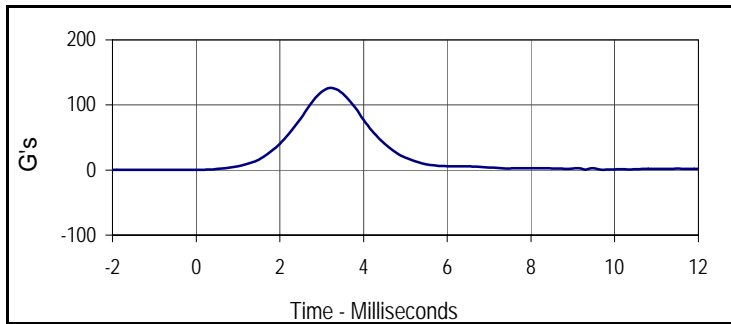
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A Sitting Height	mm	772 - 788	779	Pass
B Shoulder Pivot Height	mm	437 - 453	445	Pass
C H-Point Height	mm	79 - 89	84	Pass
D H-Point from Seatback	mm	141 - 151	145	Pass
E Shoulder Pivot from Backline	mm	97 - 107	103	Pass
F Thigh Clearance	mm	119 - 135	123	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	183	Pass
J Head Circumference	mm	541 - 551	546	Pass
K Buttock to Knee Length	mm	514 - 540	527	Pass
L Popliteal Height	mm	343 - 369	348	Pass
M Knee Pivot to Floor Height	mm	392 - 409	401	Pass
N Buttock Popliteal Length	mm	416 - 442	430	Pass
O Chest Depth w/o Jacket	mm	195 - 211	204	Pass
P Foot Length	mm	216 - 232	221	Pass
Q Hip Breadth with Pelvic Plug	mm	313 - 323	318	Pass
R Arm Length	mm	249 - 259	252	Pass
S Knee Joint to Seatback	mm	477 - 493	485	Pass
V Shoulder Width	mm	341 - 357	351	Pass
W Foot Width	mm	78 - 94	89	Pass
Y Chest Circumference with Jacket	mm	851 - 881	873	Pass
Z Waist Circumference	mm	760 - 791	775	Pass
Overall Test Results				Pass

Test Program: SID IIs Head Drop Test
 ATD Serial No.: 307

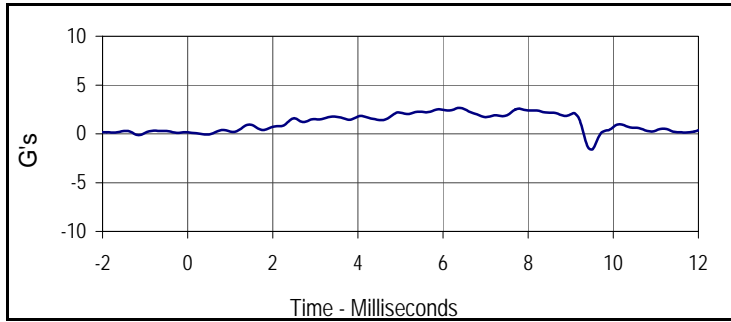
Test Date: 5/11/12
 Test I.D.: 307HD037



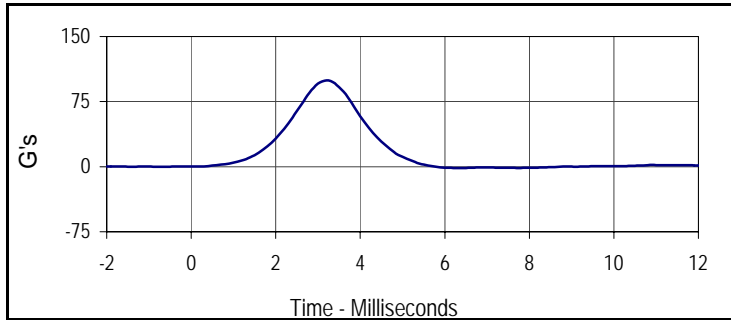
Tested Parameter	Units	Specification	Result	Pass/Fail
Head Assembly Soak Time	Minutes	≥240	245	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.8	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.2	Pass
Peak Head Resultant Acceleration	G's	115 to 137	126.1	Pass
Peak Head X Acceleration	G's	<15	2.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<15	3.1	Pass
Overall Test Results				Pass



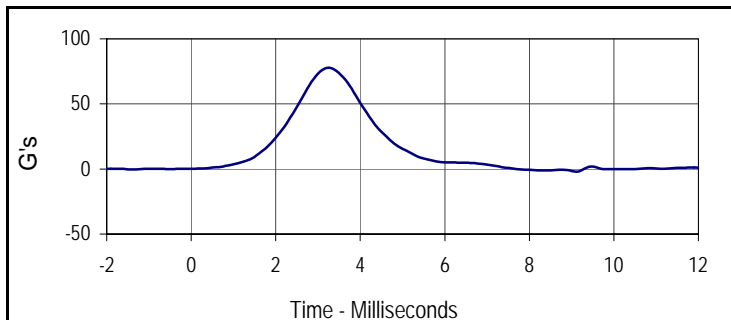
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
126.1	3.2	0.2	-1.0



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.5	5.9	-0.1	-1.2



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
99.4	3.2	-1.5	6.4



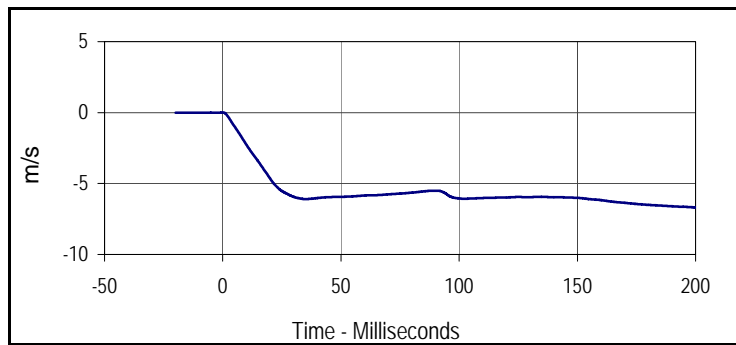
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
77.6	3.2	-2.0	9.1

Test Program: SID IIs Neck Flexion Test
 ATD Serial No.: 307

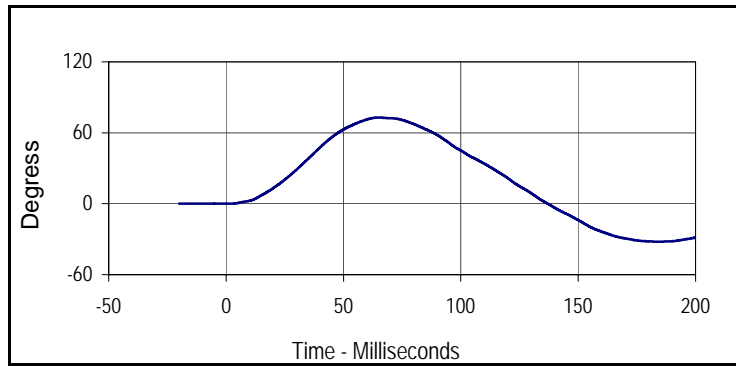
Test Date: 5/11/12
 Test I.D.: 307NB037



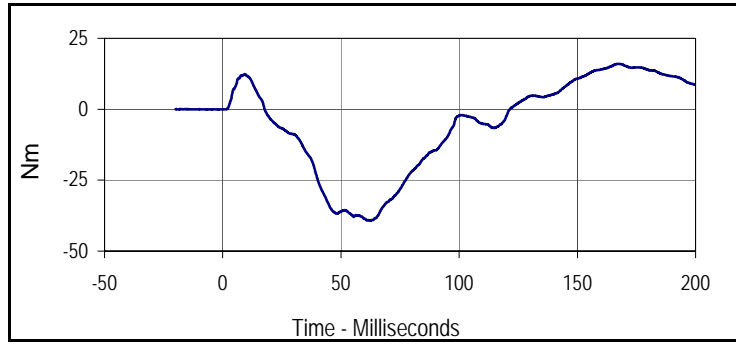
Tested Parameter	Units	Specification	Result	Pass/Fail	
Neck Assembly Soak Time	Minutes	≥240	270	Pass	
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass	
	Min		20.7	Pass	
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass	
	Min		29.0	Pass	
Laboratory Temperature During Test	°C	20.6 to 22.2	21.0	Pass	
Laboratory Humidity During Test	%	10.0 to 70.0	29.6	Pass	
Pendulum Velocity	m/s	5.51 to 5.63	5.59	Pass	
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.26	Pass
	15 msec	m/s	-3.30 to -4.10	-3.44	Pass
	20 msec	m/s	-4.40 to -5.40	-4.64	Pass
	25 msec	m/s	-5.40 to -6.10	-5.53	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.10	Pass
D-Plane Rotation	Max	Degrees	71 to 81	72.9	Pass
	Time	msec	50 to 70	65.0	Pass
Peak Occipital Condyle Moment	Nm	-36 to -44	-39.2	Pass	
Decaying Moment Time to Cross 0 Nm	msec	102 to 126	121.5	Pass	
Overall Test Results				Pass	



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-0.2	-6.7	200.0



Curve Description			
Maximum Translation Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
72.9	65.0	-32.0	184.0



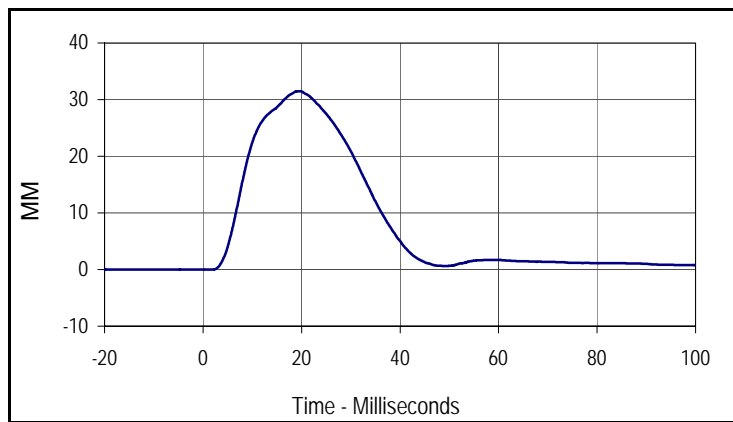
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.0	167.2	-39.2	62.5

Test Program: SID IIs Shoulder Impact Test
 ATD Serial No.: 307

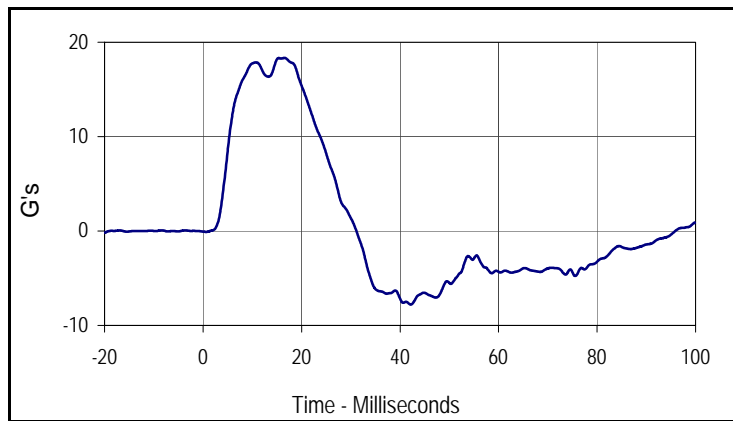
Test Date: 5/11/12
 Test I.D.: 307SH037



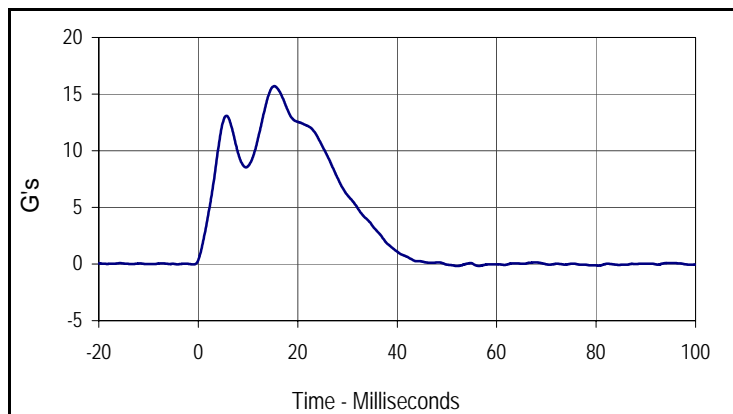
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	390	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	20.6 to 22.2	21.0	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.7	Pass
Impactor Velocity	m/s	4.20 to 4.40	4.36	Pass
Peak Shoulder Deflection	mm	28 to 37	31.5	Pass
Peak Lateral Spine Acceleration Y	G's	17 to 22	18.3	Pass
Peak Impactor Acceleration	G's	13 to 18	15.7	Pass
Overall Test Results			Pass	



Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
31.5	19.4	0.0	-5.5



Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
18.3	16.5	-7.8	42.2



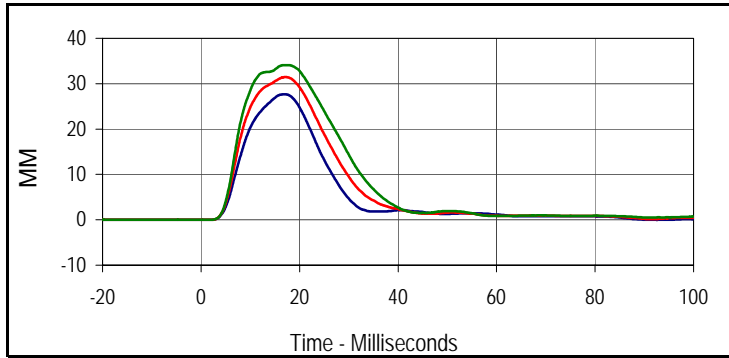
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
15.7	15.3	-0.2	52.1

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 307

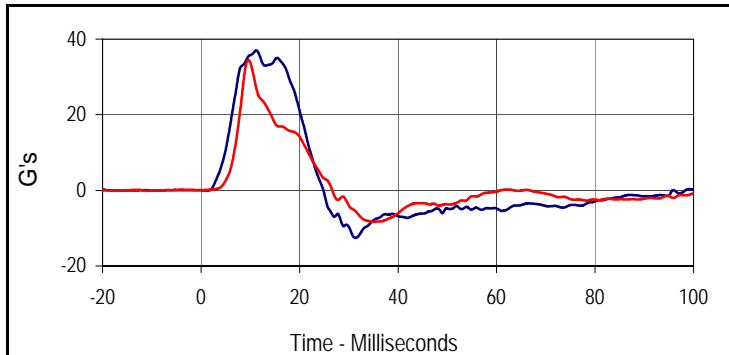
Test Date: 5/11/12
 Test I.D.: 307TWA037



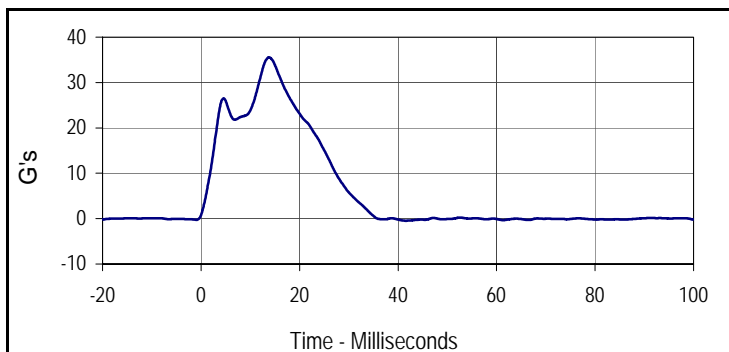
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	400	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.8	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.1	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Shoulder Deflection	mm	31 to 40	36.0	Pass
Peak Upper Thorax Rib Deflection	mm	25 to 32	27.7	Pass
Peak Middle Thorax Rib Deflection	mm	30 to 36	31.5	Pass
Peak Lower Thorax Rib Deflection	mm	32 to 38	34.1	Pass
Peak Upper Spine Y Acceleration	G's	34 to 43	37.0	Pass
Peak Lower Spine Y Acceleration	G's	29 to 37	34.4	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
27.7	16.9	0.0	92.6
Middle Thorax Deflection			
Max	Time	Min	Time
31.5	17.1	0.0	-19.4
Lower Thorax Deflection			
Max	Time	Min	Time
34.1	16.9	0.0	-5.2



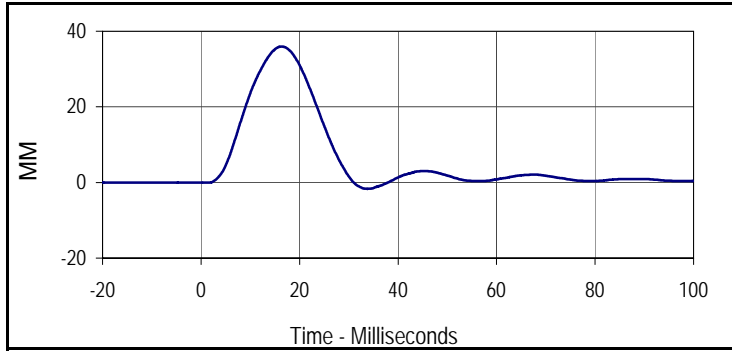
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
37.0	11.2	-12.6	31.3
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
34.4	9.6	-8.4	34.9



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
35.5	13.8	-0.5	41.6

Test Program: SID IIs Thorax with Arm Impact Test
 ATD Serial No.: 307

Test Date: 5/11/12
 Test I.D.: 307TWA037



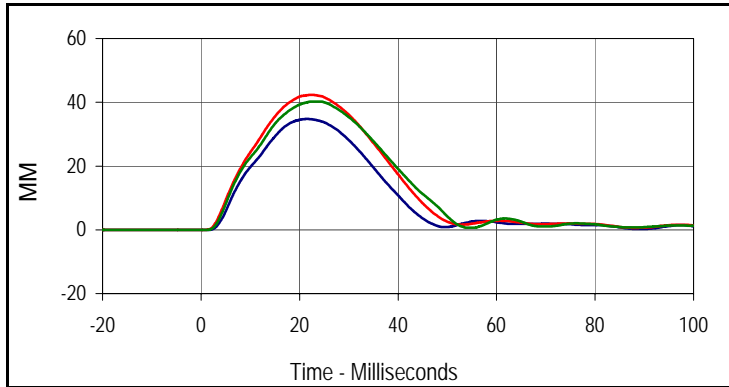
Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
007	FIL	600	MM
Max	Time	Min	Time
36.0	16.3	-1.7	33.7

Test Program: SID IIs Thorax without Arm Impact Test
 ATD Serial No.: 307

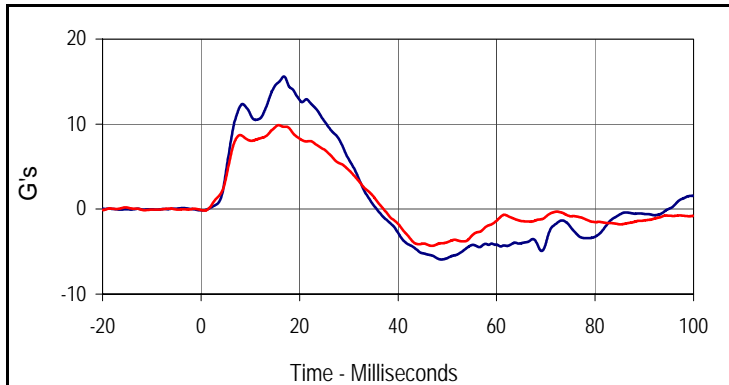
Test Date: 5/11/12
 Test I.D.: 307TWOA037



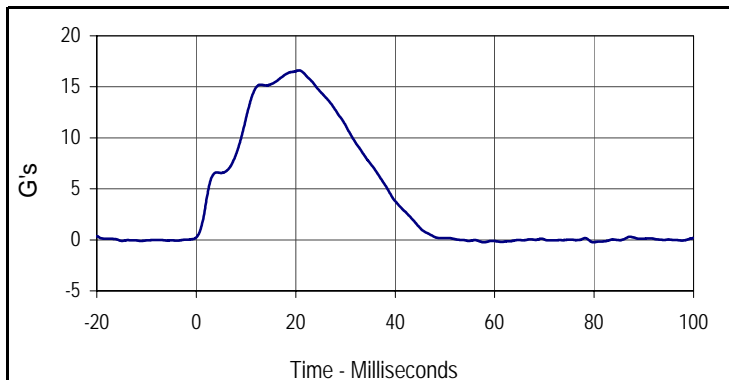
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	420	Pass
Temperature During Soak	Max	18.9 to 25.6	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	20.8	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.8	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Upper Thorax Rib Deflection	mm	32 to 40	34.8	Pass
Peak Middle Thorax Rib Deflection	mm	39 to 45	42.3	Pass
Peak Lower Thorax Rib Deflection	mm	35 to 43	40.3	Pass
Peak Upper Spine Y Acceleration	G's	13 to 17	15.6	Pass
Peak Lower Spine Y Acceleration	G's	7 to 11	9.9	Pass
Peak Impactor Acceleration	G's	14 to 18	16.6	Pass
Overall Test Results				Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
34.8	21.6	0.0	-4.8
Middle Thorax Deflection			
Max	Time	Min	Time
42.3	22.5	0.0	-9.6
Lower Thorax Deflection			
Max	Time	Min	Time
40.3	23.5	0.0	-4.8



Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.6	16.8	-5.9	48.8
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
9.9	15.7	-4.3	46.8



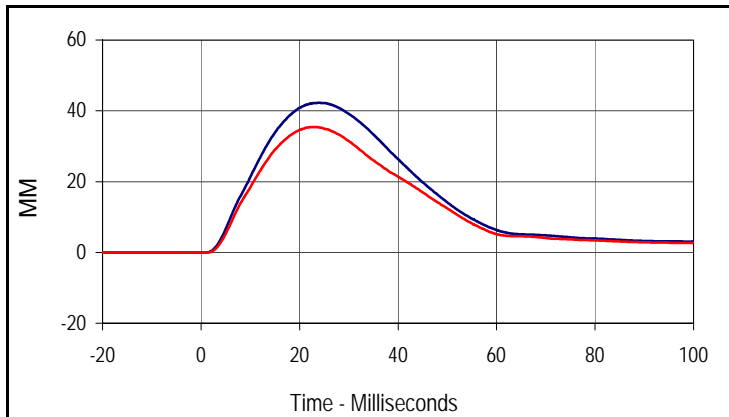
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.6	20.7	-0.2	57.8

Test Program: SID IIs Abdomen Impact Test
 ATD Serial No.: 307

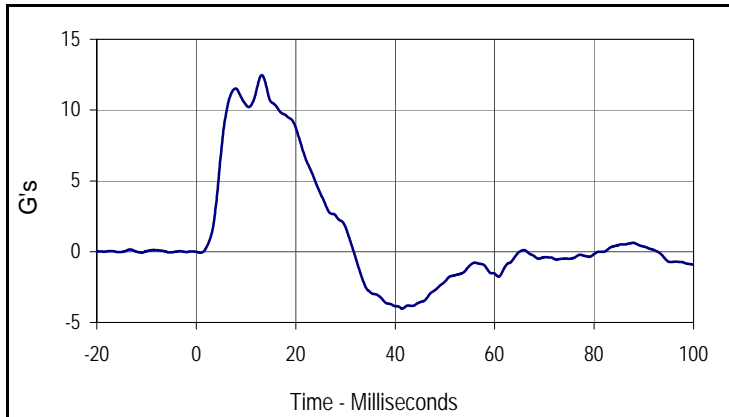
Test Date: 5/11/12
 Test I.D.: 307ABD037



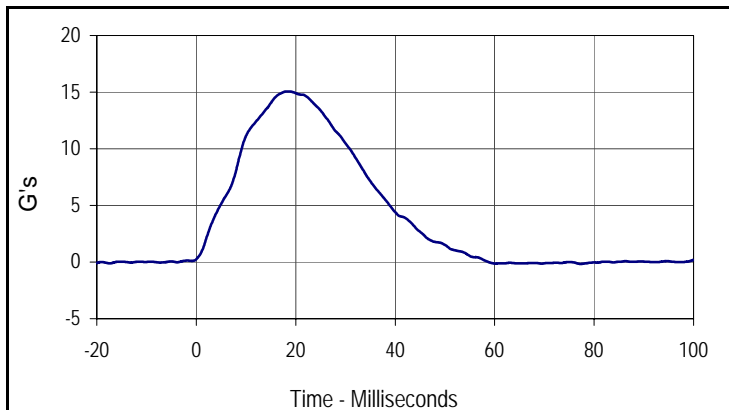
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	440	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.5	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.4	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Upper Abdominal Rib Deflection	mm	36 to 47	42.2	Pass
Peak Lower Abdominal Rib Deflection	mm	33 to 44	35.4	Pass
Peak Lower Spine Y Acceleration	G's	9 to 14	12.5	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
42.2	24.0	0.0	-12.3
Curve Description			
Lower Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
35.4	22.8	0.0	-12.6



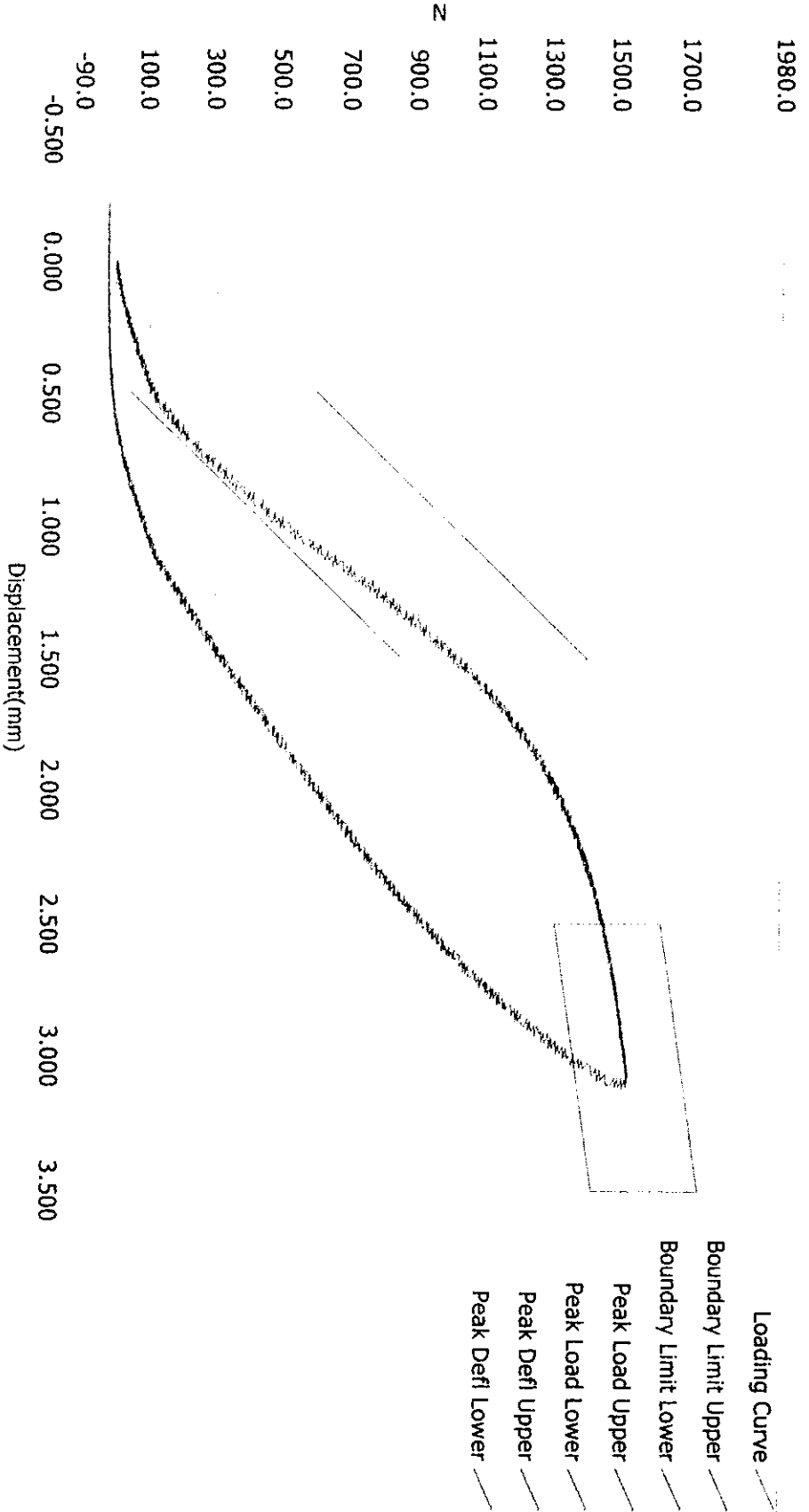
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
12.5	13.2	-4.0	41.4



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.1	18.4	-0.2	77.3

MC0519 POST 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>
46753	46753	10/4/2011	5:11 PM
<u>Cert ID</u>	<u>ATD Serial Number</u>	<u>ATD Type</u>	
N/A	N/A	SIDIIS	

Current Date : 10/4/2011

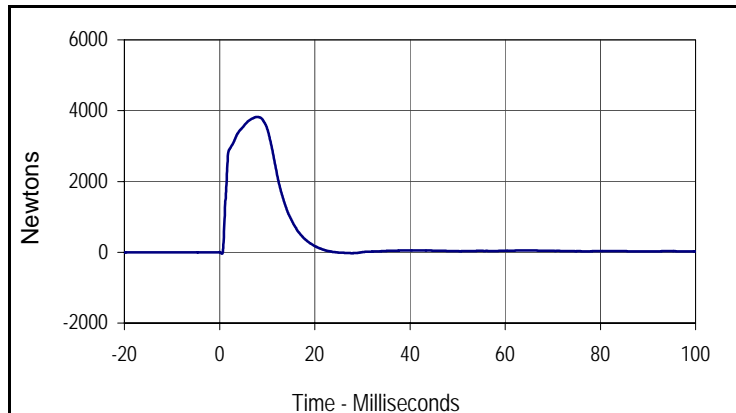
Current Time : 17:11:55

Test Program: SID IIs Pelvis Acetabulum Impact Test
 ATD Serial No.: 307

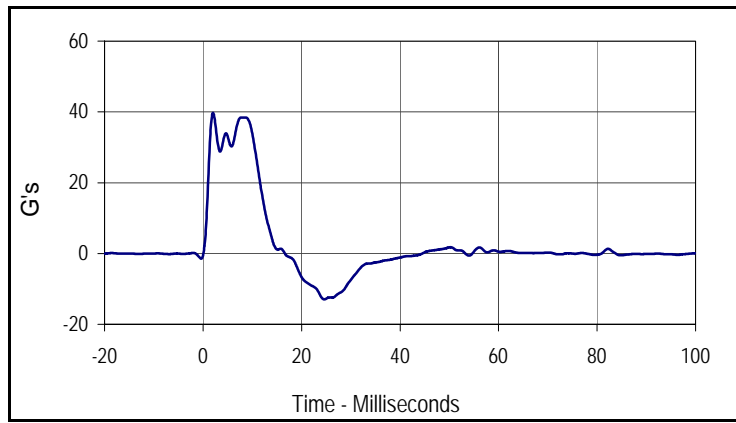
Test Date: 5/11/12
 Test I.D.: 307ACET037



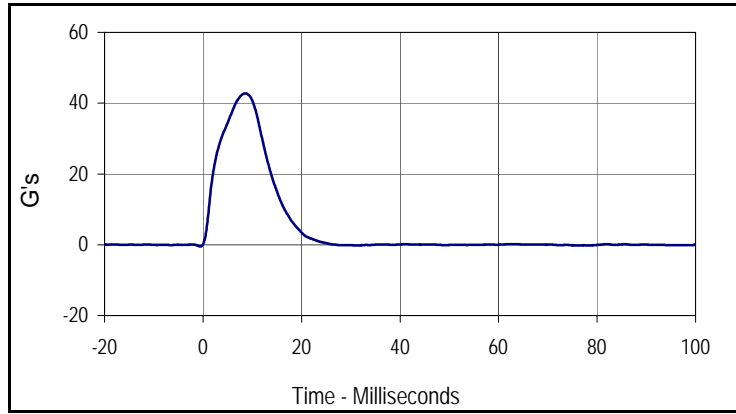
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	465	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	29.9	Pass
Impactor Velocity	m/s	6.6 to 6.8	6.7	Pass
Peak Acetabulum Force Y	Newtons	3600 to 4300	3822.6	Pass
Peak Pelvis Y Acceleration After 6 msec.	G's	34 to 42	38.4	Pass
Peak Impactor Acceleration	G's	38 to 47	42.8	Pass
Overall Test Results				Pass



Curve Description			
Pelvis Acetabulum Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3822.6	7.9	-40.7	0.5



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
39.7	2.0	-12.9	24.6



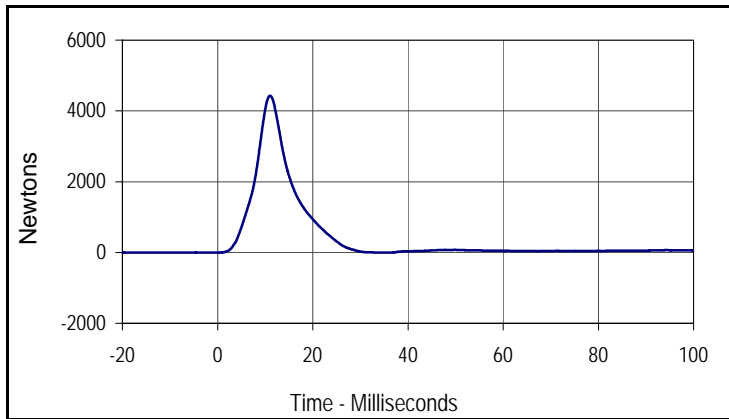
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
42.8	8.6	-0.5	-0.5

Test Program: SID IIs Pelvis Iliac Calibration
 ATD Serial No.: 307

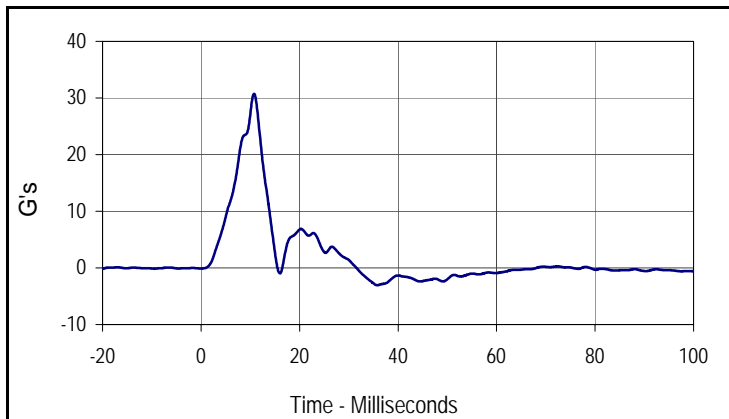
Test Date: 5/11/12
 Test I.D.: 307PL037



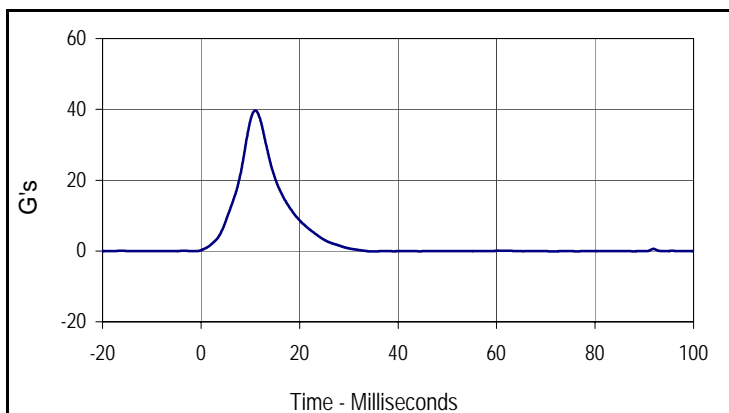
Tested Parameter	Units	Specification	Result	Pass/Fail
Dummy Soak Time	Minutes	≥180	490	Pass
Temperature During Soak	Max	20.6 to 22.2	21.7	Pass
	Min		20.7	Pass
Humidity During Soak	Max	10.0 to 70.0	31.0	Pass
	Min		29.0	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	30.4	Pass
Impactor Velocity	m/s	4.2 to 4.4	4.3	Pass
Peak Iliac Force	Newtons	4100 to 5100	4428.2	Pass
Peak Pelvis Y Acceleration	G's	28 to 39	30.7	Pass
Peak Impactor Acceleration	G's	36 to 45	39.7	Pass
Overall Test Results				Pass



Curve Description			
Pelvis Iliac Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4428.2	11.0	-6.1	36.3



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
30.7	10.8	-3.1	35.8



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
39.7	11.0	-0.1	76.4

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N		
			Serial Number	Manufacturer	Calibration
Head Accelerometers		X			
		Y			
		Z			
Thorax Rib Displacement Potentiometers	Upper	Y			
	Middle	Y			
	Lower	Y			
Abdomen Load Cells	Forward	Y			
	Middle	Y			
	Rear	Y			
Lower Spine Accelerometers (T12)		X			
		Y			
		Z			
Pubic Symphysis Load Cell		Y			

TABLE 2 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N		
			Serial Number	Manufacturer	Calibration
Head Accelerometers		X			
		Y			
		Z			
Displacement Potentiometers	Shoulder		Y		
	Thoracic Rib	Upper	Y		
		Middle	Y		
		Lower	Y		
	Abdominal Rib	Upper	Y		
		Lower	Y		
Lower Spine Accelerometers (T12)		X			
		Y			
		Z			
Acetabulum Load Cell		Y			
Iliac Wing Load Cell		Y			
Pelvis Plug (Struck Side)					
Pelvis Plug (Non-Struck Side)					

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X			
	Vehicle Center of Gravity	Y			
	Vehicle Center of Gravity	Z			
2	Right Sill at Front Seat	X			
	Right Sill at Front Seat	Y			
	Right Sill at Front Seat	Z			
3	Right Sill at Rear Seat	X			
	Right Sill at Rear Seat	Y			
	Right Sill at Rear Seat	Z			
4	Left Sill at Front Door	Y			
5	Left Sill at Rear Door	Y			
6	Left A-Post Lower	Y			
7	Left A-Post Middle	Y			
8	Left B-Post Lower	Y			
9	Left B-Post Middel	Y			
10	Front Seat Track	Y			
11	Rear Seat Structure	Y			
12	Right Rear Occ. Compartment	Y			
13	Engine Block	X			
	Engine Block	Y			
14	Rear Floorpan Above Axle	X			
	Rear Floorpan Above Axle	Y			
	Rear Floorpan Above Axle	Z			

TABLE 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X			
MDB Center of Gravity	Y			
MDB Center of Gravity	Z			
Left Frame at Rear Axle Centerline	X			
Left Frame at Rear Axle Centerline	Y			