REPORT NUMBER: SINCAP-KAR-12-009

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

HYUNDAI MOTOR COMPANY

2012 HYUNDAI TUCSON GLS 5-DOOR MPV

NHTSA No: MC0507

PREPARED BY:

KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

NOVEMBER 1, 2011

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF CRASHWORTHINESS STANDARDS

MAIL CODE: NVS-111

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Approval Date: November 1, 2011

FINAL REPORT ACCEPTANCE BY OCWS:

_____

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

Date: _____

_____

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

Date: _____

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Final Report of New Car Assessment Program Side Impact MDB Testing of 2012 Hyundai Tucson GLS 5-Door MPV NHTSA No. MC0507	November 1, 2011
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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 Hyundai Tucson GLS 5-door MPV 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 October 18, 2011.

The impact velocity of the Moving Deformable Barrier was 61.9 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 28.3 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	115.7
Maximum Thorax Rib Deflection	mm	44	30
Total Abdominal Force	N	2500	920
Pubic Symphysis Force	N	6000	1774

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})		1000	213.9
Resultant Lower Spine Acceleration	g	82	46
Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	2625
Maximum Thoracic Rib Deflection	mm	38*	27
Maximum Abdominal Rib Deflection	mm	45*	20

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

** Proposed IARV*

17. Key Words		18. Distribution Statement	
New Car Assessment Program (NCAP) Side Impact Moving Deformable Barrier (MDB) ES-2re SID-IIs		Copies of this report are available from: National Highway Traffic Safety Admin. Technical Information Services Division, NPO-411 1200 New Jersey Ave., SE, Room E12-100 Washington, DC 20590	
19. Security Classification of this report	**20. Security Classification of this page**	**21. No. of Pages**	**22. Price**
UNCLASSIFIED	UNCLASSIFIED	154	

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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 Hyundai Tucson GLS 5-door MPV. 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 Hyundai Tucson GLS 5-door MPV 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 61.9 km/h (38.6 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 October 18, 2011. 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	115.7
Maximum Thorax Rib Deflection	mm	44	30
Combined Abdominal Force	N	2500	920
Pubic Symphysis Force	N	6000	1774

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	213.9
Lower Spine (T12) Resultant Acceleration	g	82	46
Total Pelvic Force (sum of acetabular and iliac forces	N	5525	2625
Maximum Thoracic Rib Deflection	mm	38*	27
Maximum Abdominal Rib Deflection	mm	45*	20

**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	No		No	
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	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 but the driver's door skin partially separated. 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 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

CONVERSION FACTORS

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

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	MC0507
Model Year	2012
Make	Hyundai
Model	Tucson GLS
Body Style	5-Door MPV
VIN	KM8JU3AC1CU345114
Body Color	Garnet Red
Odometer Reading (km / mi)	130 / 81
Engine Displacement (L)	2.4
Type / No. of Cylinders	Inline 4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	Front
Roof Rack	Yes
Sunroof / T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
All Wheel Drive (AWD)	No

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	n/a
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
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 Pretensione	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	Active Head Restraint

Does Owner's Manual provide instructions to turn off automatic door locks? No

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company
Date of Manufacture	Jun-11
Vehicle Type	MPV

GVWR (kg)	2040
GAWR Front (kg)	1055
GAWR Rear (kg)	1125

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				420.0	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				79.8	*A-B*

VEHICLE SEAT TYPE

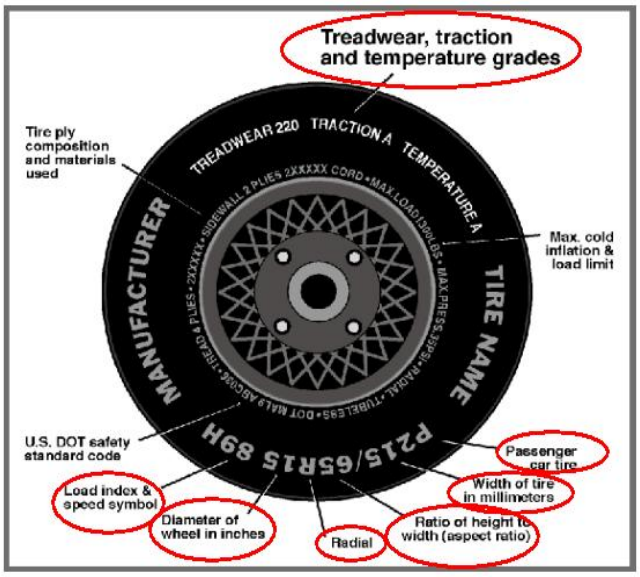
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable w/ Lever	Adjustable w/ Knob
Front Seat	Yes					Yes	
Rear or Second Row Seat		Yes			Yes		
Third Row Seat							

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	230	230
Recommended Tire Size	225/60R17	225/60R17

VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Tire Size on Vehicle	225/60R17	225/60R17
Tire Manufacturer	Kumho	Kumho
Tire Name	Solus KL21	Solus KL21
Tire Type	Passenger	Passenger
Tire Width	225	225
Aspect Ratio	60	60
Radial	Yes	Yes
Wheel Diameter	17	17
Load Index/Speed Symbol	99H	99H
Treadware	500	500
Traction Grade	A	A
Temperature Grade	A	A
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	200	200	200	210
Tire Placard	kPa	230	230	230	230
Owner's Manual	kPa	230	230	230	230
As Tested	kPa	230	230	230	230

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	451.0	312.5		491.0	399.0		482.5	384.5	
Right	kg	428.5	296.5		436.5	358.5		456.0	365.5	
Ratio	%	59.1%	40.9%	100.0%	55.0%	45.0%	100.0%	55.6%	44.4%	100.0%
Total	kg	879.5	609.0	1488.5	927.5	757.5	1685.0	938.5	750.0	1688.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1488.5	A
Actual Weight of 2 P572 ATDs Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	79.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1693.3	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 kg)? ☒ **Yes** ☐ **No**

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Liner	2.0
Spare Tire and Tools	18.5
Rear Cover	2.5
Non Struck Side Door Panels	5.5
Ballast / Equipment Added	95.0

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement***
LF	mm	740	743	Yes
RF	mm	744	739	Yes
RR	mm	726	717	Yes
LR	mm	724	719	Yes
Vehicle CG (Aft of Front Axle)	mm	1175	1190	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	21	45	

***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 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

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	3.0	0.0	1.5
Front Passenger Seat	Fixed	Fixed	Fixed
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	1.5	700	Max	689	700	712
			Mid	689	700	712
			Min	689	700	712
Front Passenger Seat	Fixed	670	Max	660	670	685
			Mid	660	670	685
			Min	660	670	685
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 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

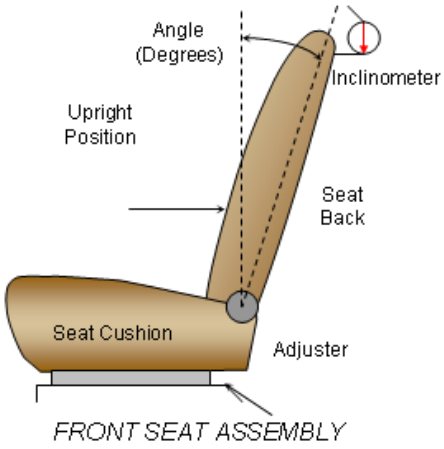
Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	240	25	120	12
Front Passenger Seat	220	23	110	11
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 front center and front passenger's seat backs are 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	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/Seated Dummy	63.2	33	8.0	11
Front Passenger Seat	63.7	33	8.0	11
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 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

	Total No. of Positions	Placed in Position
Driver Seat	4	H
Rear Seat	Fixed	Fixed

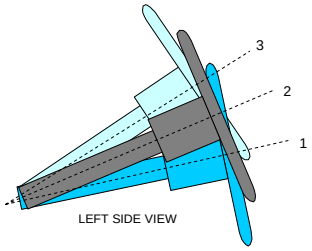
HEAD RESTRAINT ADJUSTMENT

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	7 Vertical, 4 Horizontal	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.



STEERING COLUMN ASSEMBLY

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	26.0	0
Geometric Center - Position 2	27.7	20
Uppermost - Position 3	29.5	40
Telescoping Steering Wheel Travel		40
Test Position	27.7	20

DATA SHEET NO. 2 … (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	57.99
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	53.93
Actual amount of Solvent Used in Test	53.90
1/3 of Usable Capacity	19.33

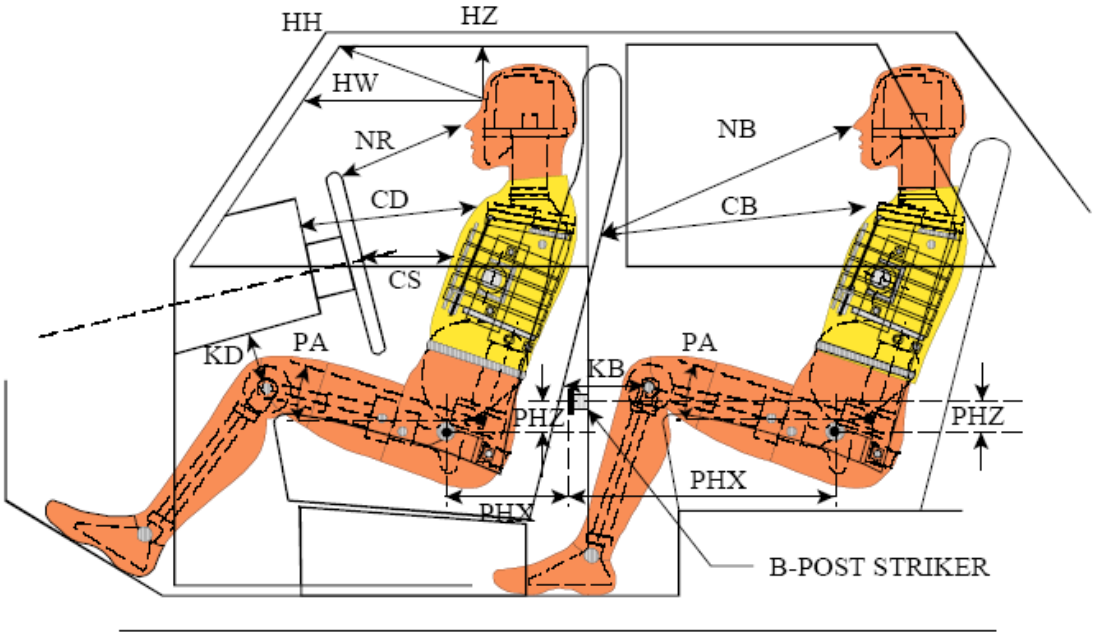
Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1? ☒ **Yes** ☐ **No**

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



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

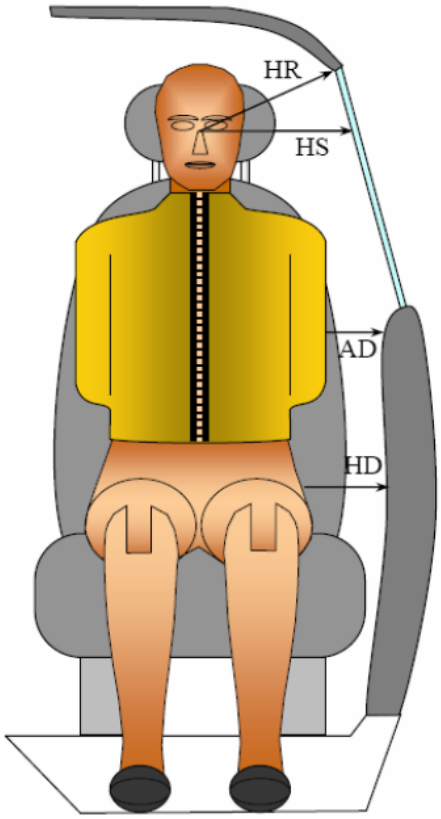
Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (º)	Length (mm)	Angle (º)
HH		Head to Header	395			
HW		Head to Windshield	638			
HZ	HZ	Head to Roof	183		282	
NR	NB	Nose to Rim/Seat Back	508		534	
CD	CB	Chest to Dash/Seat Back	634		531	
CS		Chest to Steering Wheel	344			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	185	21.8	275	26.9
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	137	32.1	276	33.4
PAX°	PAX°	Pelvic Tilt Angle X		19.6		21.9
	PAY°	Pelvic Tilt Angle Y				0.4
PHX	PHX	Hip Point to Striker (x-axis)	194		275	
PHZ	PHZ	Hip Point to Striker (z-axis)	188		302	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

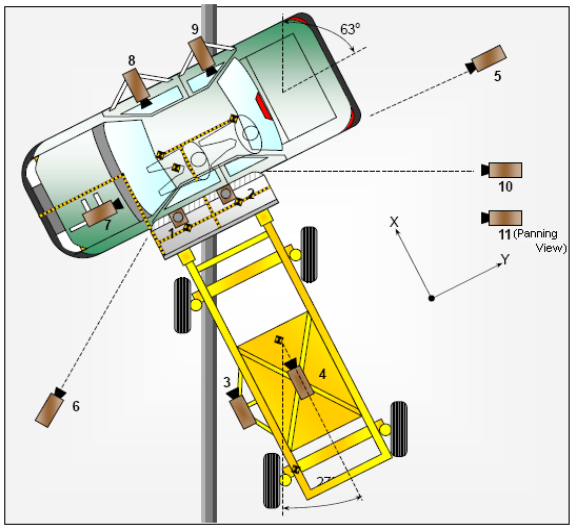
Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	190	241
HS	Head to Side Window	mm	313	343
AD	Arm to Door	mm	114	160
HD	H-Point to Door	mm	166	186

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



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)	446	-830	-696	35	1000
8	Driver Side (On-Board)	1657	757	-500	14	1000
9	Passenger Side (On-Board)	1593	1608	-543	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

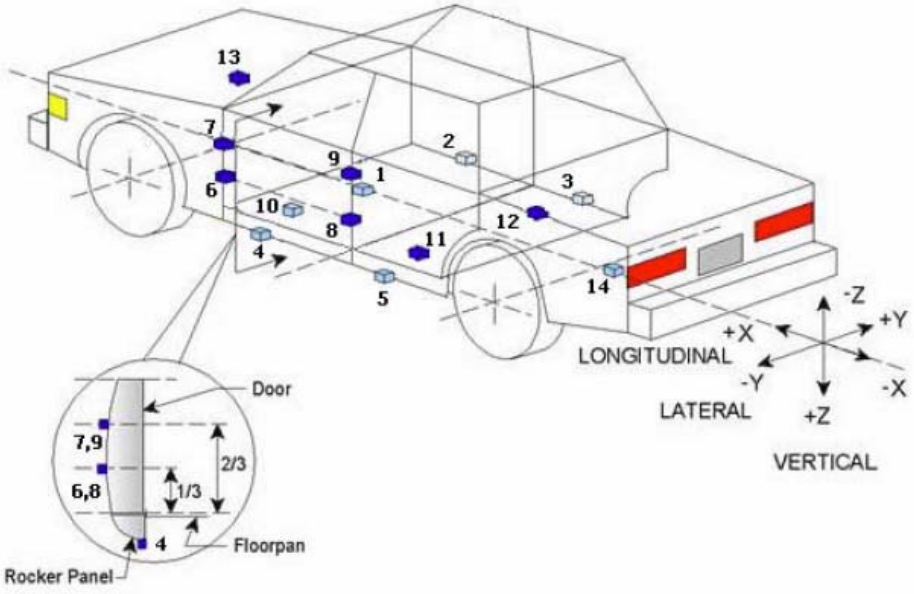
Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	5
Total	60

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	1779	0	-435
2	Right Sill at Front Seat	2415	734	-435
3	Right Sill at Rear Seat	1561	751	-428
4	Left Sill at Front Door	2288	-550	-272
5	Left Sill at Rear Door	1525	-690	-308
6	A-Pillar Lower	2982	-823	-668
7	A-Pillar Middle	2982	-823	-872
8	B-Pillar Lower	1964	-745	-780
9	B-Pillar Middle	1964	-745	-970
10	Front Seat Track	2219	-598	-439
11	Rear Seat Structure			
12	Right Rear Occupant Compartment	1785	398	-402
13	Engine Block	3675	250	-945
14	Rear Floorpan Above Axle	648	-472	-533

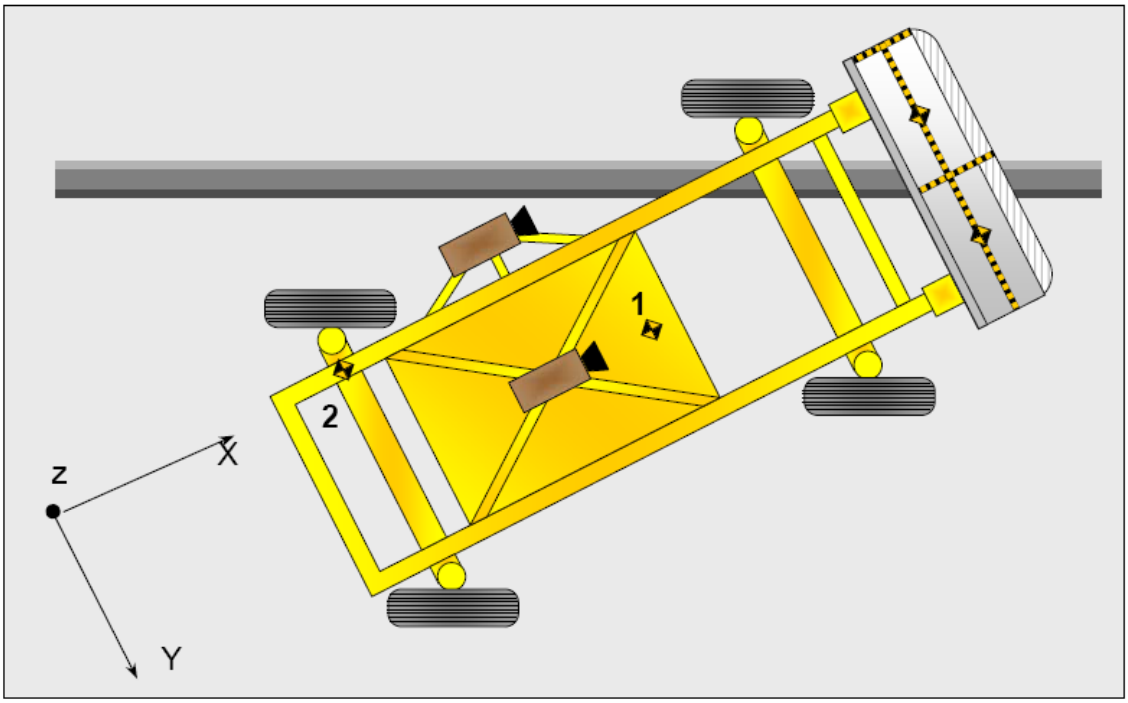
Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



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 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

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	Curtain Airbag, Side Header, Headrest	Curtain Airbag, Headrest
Left Side of Head	Curtain Airbag, Side Header	Curtain Airbag
Back of Head	Curtain Airbag, Headrest	Curtain Airbag, Headrest
Left Shoulder	Torso/Pelvis Airbag	Door Panel
Upper Torso	Torso/Pelvis Airbag	Door Panel
Lower Torso	Torso/Pelvis Airbag	Door Panel
Left Hip	Torso/Pelvis Airbag	Door Panel
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	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge System Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	n/a	n/a	n/a	n/a	n/a

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	No Separation
Windshield Damage	None
Side Window Damage	None
Other Notable Effects	Driver's Side Door Skin Partial Separation

DATA SHEET NO. 8 … (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2646
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		381
Actual Impact Point (Aft of Front Axle)	mm		387
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	-6
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	-5

DATA SHEET NO. 9

MDB SUMMARY OF RESULTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

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	1368

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.94
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.89
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.7
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.3

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

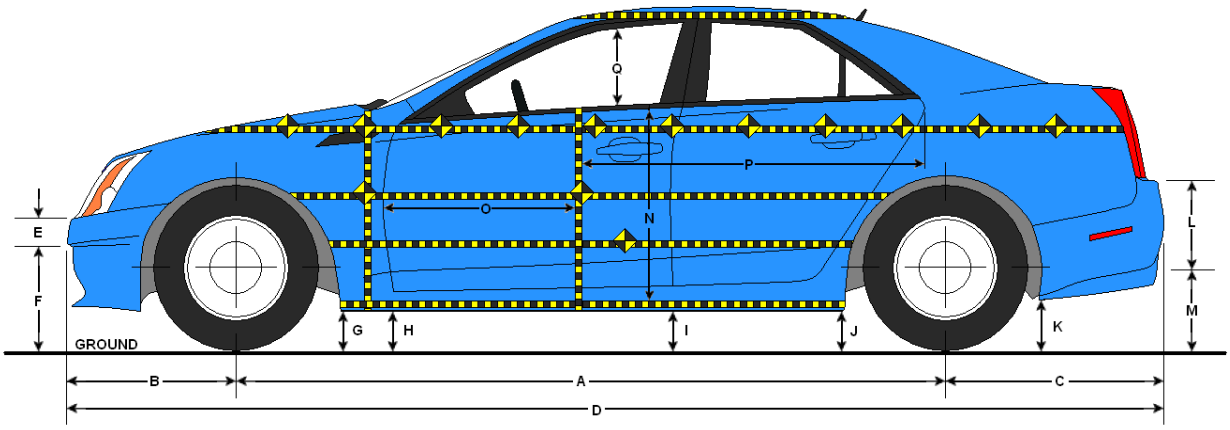
Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	235
B	Top of Bumper	533	700	Right	108
C	Mid Level	686	800	Right	122
D	Top of Stack	813	800	Left	150

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2646	2665	19
B	Front Axle to FSOV	865	845	-20
C	Rear Axle to RSOV	886	884	-2
D	Total Length at Centerline	4398	4395	-3
E	Front Bumper Thickness	225	225	0
F	Fromt Bumper Bottom to Ground	545	498	-47
G	Sill Height at Front Wheel Well	256	215	-41
H	Sill Height at Front Door Leading Edge	273	221	-52
I	Sill Height at B-Pillar	276	329	53
J1	Sill Height at Rear Wheel Well	270	355	85
J2	Pinch Weld Height at Rear Wheel Well	253	254	1
K	Sill Height Aft of Rear Wheel Well	309	319	10
L	Rear Bumper Thickness	108	108	0
M	Rear Bumper Bottom to Ground	524	572	48
N	Sill Height to Bottom of Front Window Sill	670	653	-17
O	Front Door Leading Edge to Impact CL	723	698	-25
P	Rear Door Trailing Edge to Impact CL	1386	1348	-38
Q	Front Window Opening	445	475	30
R	Right Side Length	2953	2955	2
S	Left Side Length	2953	2930	-23
T	Vehicle Width at B-Pillar	1810	1689	-121

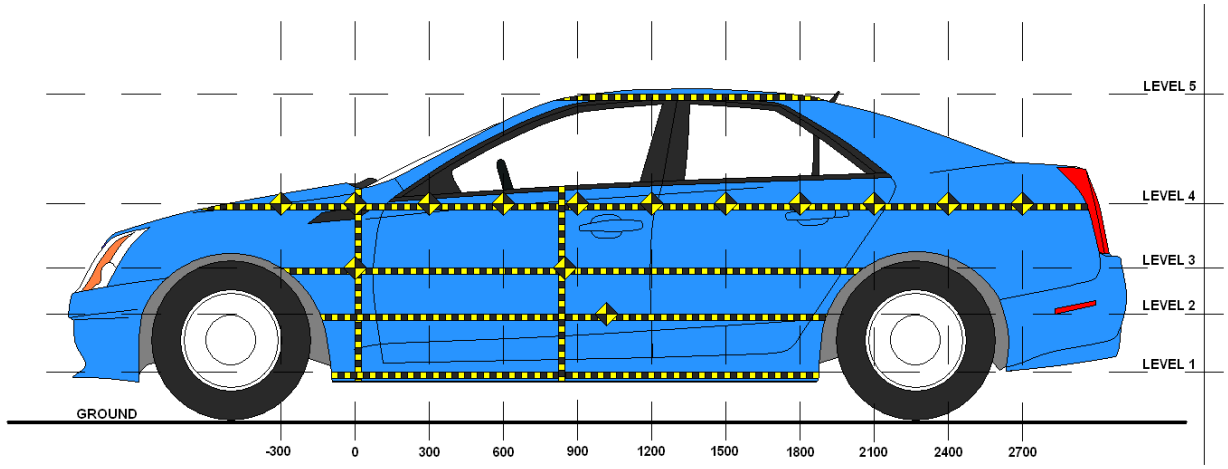
All measurements in mm with tolerance of ± 3mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact	
1	Sill Top	332	90	450	*
2	Occupant H-Point	690	216	1050	
3	Mid-Door	767	229	900	
4	Window Sill	1074	85	1350	
5	Window Top	1585	-22	1200	

*-Level 1 points were on a plastic molding piece that separated from the vehicle after impact.

DATA SHEET NO. 11 … (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

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			589	718				600	704				11	-14	
-150		590	590	699			607	605	697			17	15	-2	
0		594	597	690			628	629	696			34	32	6	
150	624	603	602	687		676	732	706	677		52	129	104	-10	
300	626	605	603	684		706	758	771	689		80	153	168	5	
450	628	605	603	679		718	775	798	686		90	170	195	7	
600	631	605	603	675		714	794	813	692		83	189	210	17	
750	632	605	602	672	894	711	808	823	696	871	79	203	221	24	-23
900	633	605	602	670	893	706	814	831	695	869	73	209	229	25	-24
1050	632	605	602	668	893	700	821	826	700	871	68	216	224	32	-22
1200	632	606	603	666	896	694	806	814	745	874	62	200	211	79	-22
1350	632	608	605	668	899	688	817	832	753	876	56	209	227	85	-23
1500	631	610	608	669	901	680	799	823	742	878	49	189	215	73	-23
1650	631	612	610	671	904	667	781	804	733	880	36	169	194	62	-24
1800	631	608	610	665	907	645	758	779	699	881	14	150	169	34	-26
1950		594	601	655	913		674	682	656	885		80	81	1	-28
2100		589	590	654	918		622	629	631	891		33	39	-23	-27
2250			588	656	927			594	657	899			6	1	-28
2400			590	661				593	651				3	-10	
2550															
2700															
2850															

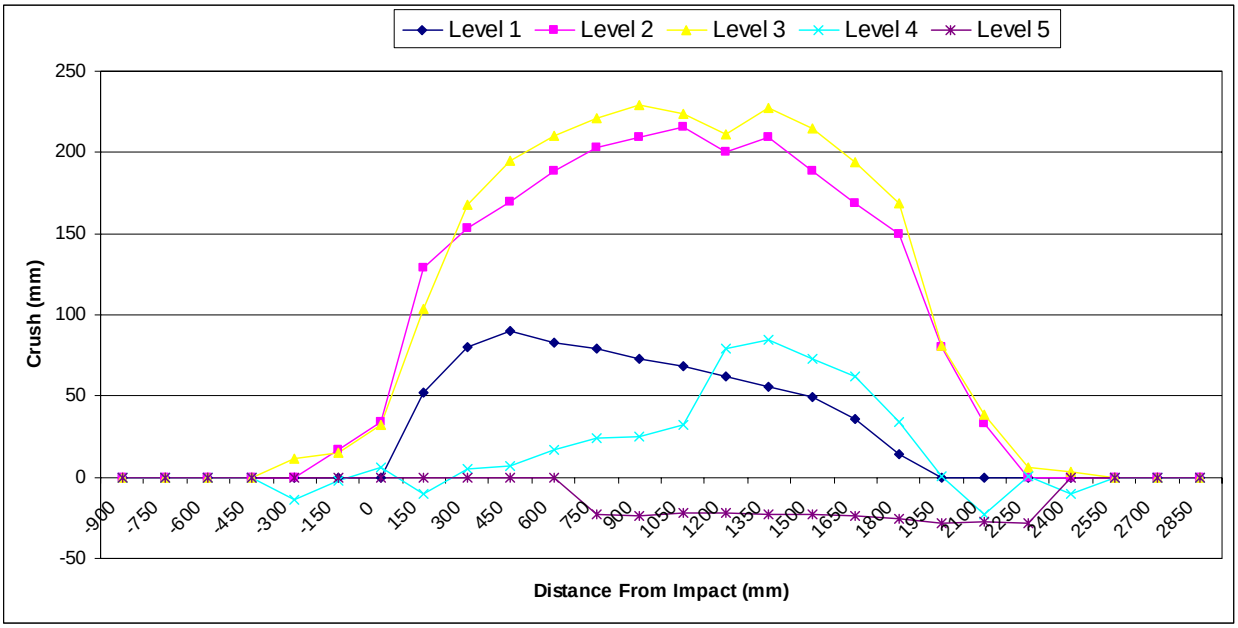
*-Level 1 points were on a plastic molding piece that separated from the vehicle after impact.

DATA SHEET NO. 11 … (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



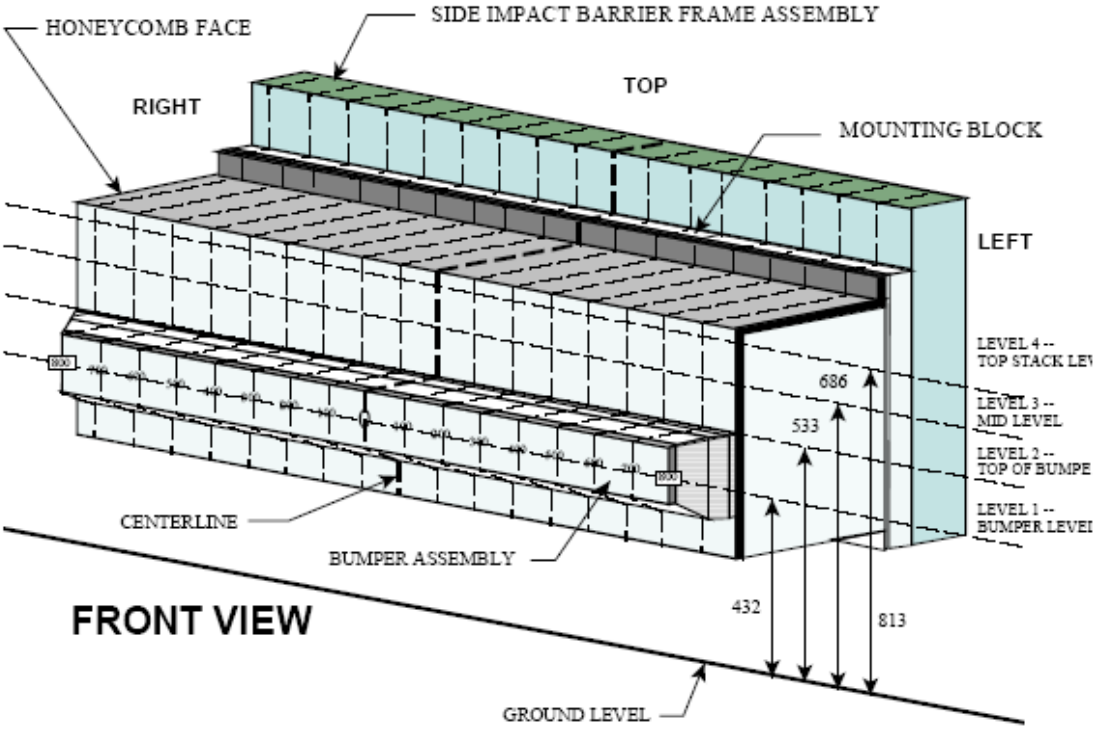
*-Level 1 points were on a plastic molding piece that separated from the vehicle after impact.

DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



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	0	100	200	300	400	500	600	700	800
1	235	224	222	217	216	212	207	206	207	202	201	199	197	182	193	193	199
2	100	108	105	105	97	92	93	81	82	84	86	89	87	87	85	85	98
3	122	92	67	55	47	43	60	40	29	25	25	27	33	44	62	87	109
4	107	71	51	49	57	67	77	59	42	40	40	47	49	64	82	104	150

All dimensions in millimeters.

DATA SHEET NO. 13

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11

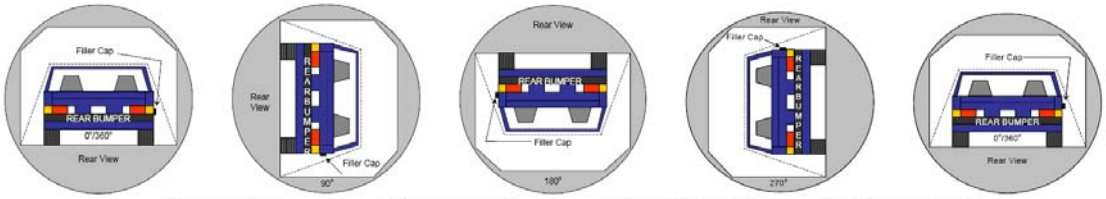
Temperature at Time of Impact: 28.3° C Test Time: 12:15 PM

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)

B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)

C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)

D. Spillage Details: No spillage occurred



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

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	81	300	381
90° To 180°	80	300	380
180° To 270°	77	300	377
270° To 360°	80	300	380

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

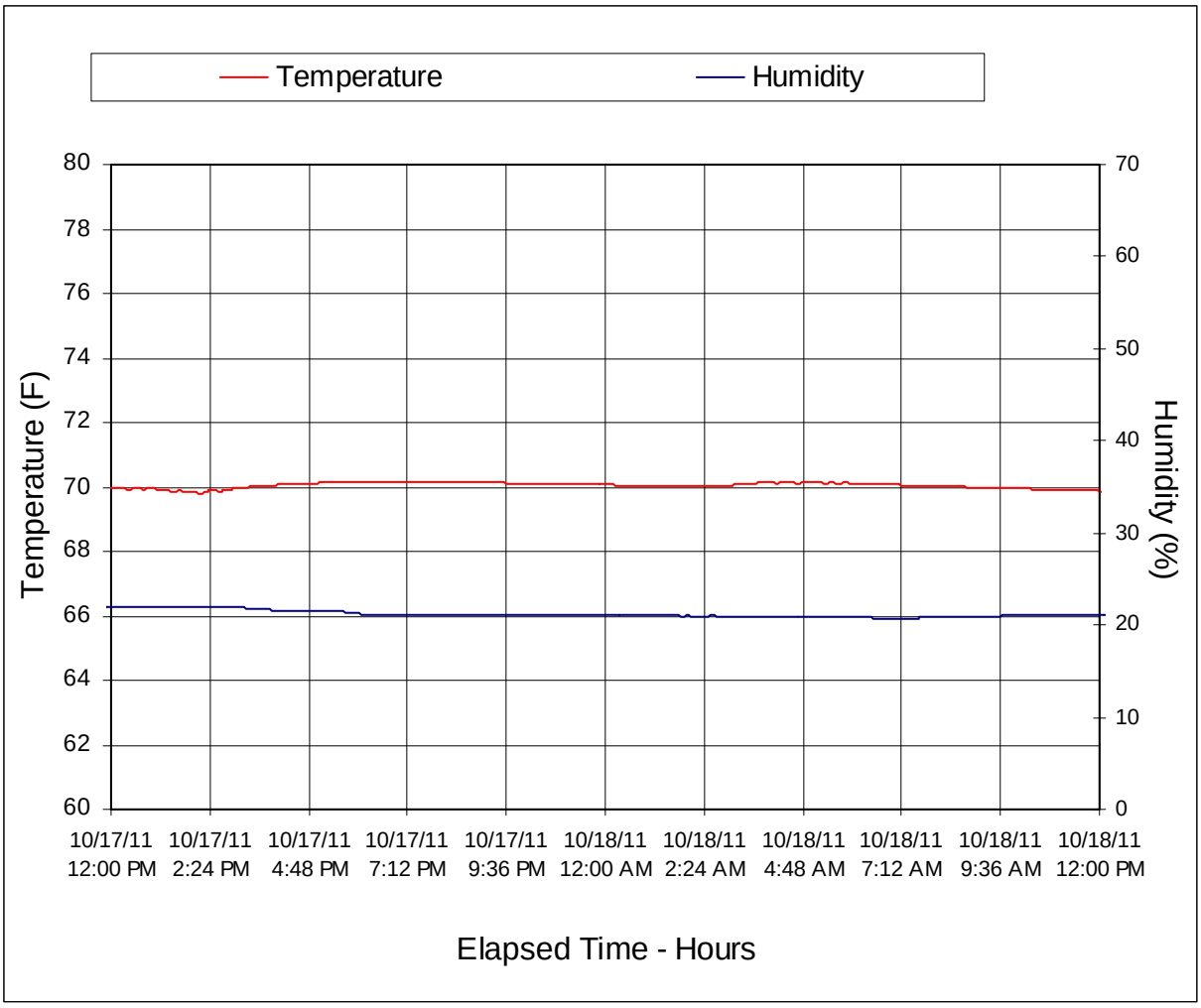
Test Phase	Spillage Location
0° To 90°	No Spillage Occurred
90° To 180°	No Spillage Occurred
180° To 270°	No Spillage Occurred
270° To 360°	No Spillage Occurred

DATA SHEET NO. 14

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2012 Hyundai Tucson GLS 5-door MPV NHTSA No. MC0507

Test Program: NCAP MDB Side Impact Test Test Date: 10/18/11



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

FIGURE 1. As-Delivered Right Front ¾ View of Test Vehicle

FIGURE 2. As-Delivered Left Rear ¾ 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 ¾ View of the Test Vehicle

FIGURE 6. Post-Test Left Front ¾ 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 ¾ View of Test Vehicle

FIGURE 10. Post-Test Left Rear ¾ 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 at Ideal Impact Point

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

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

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

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, Chalking, and Contact Switches

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

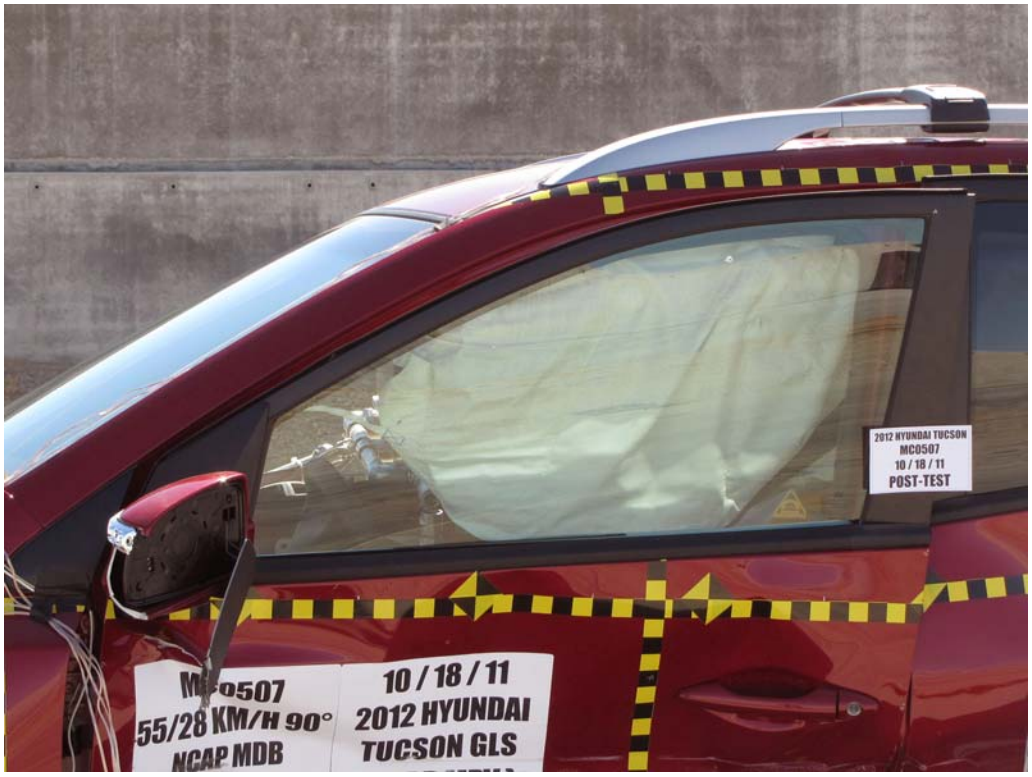


FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

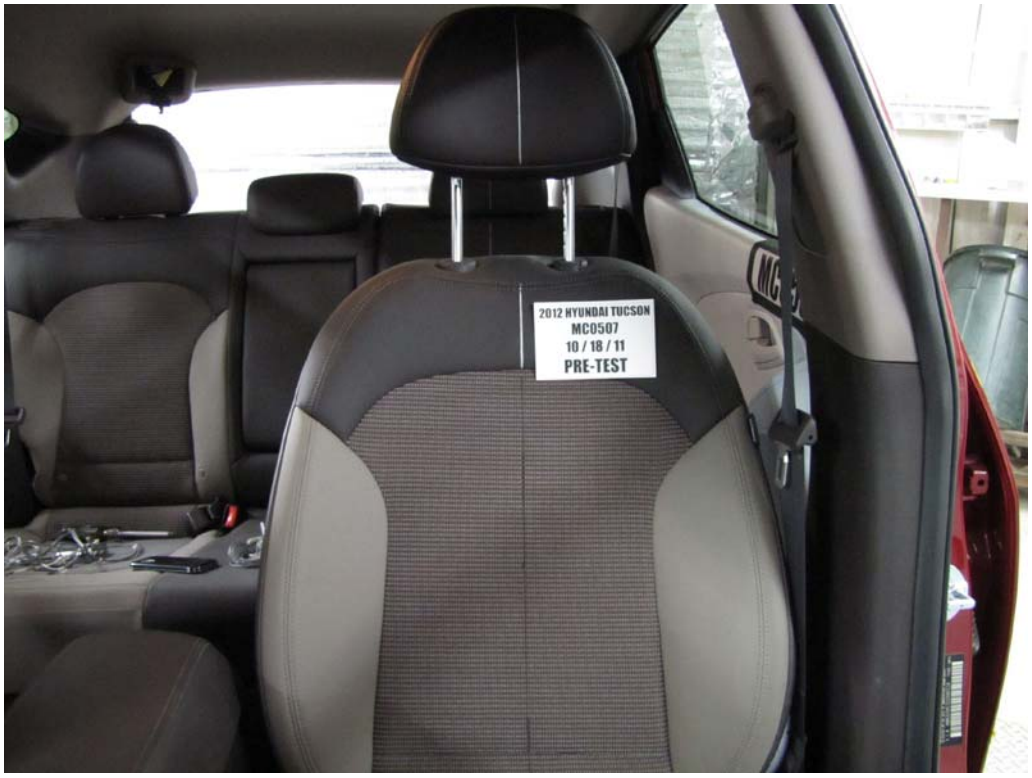


FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning

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

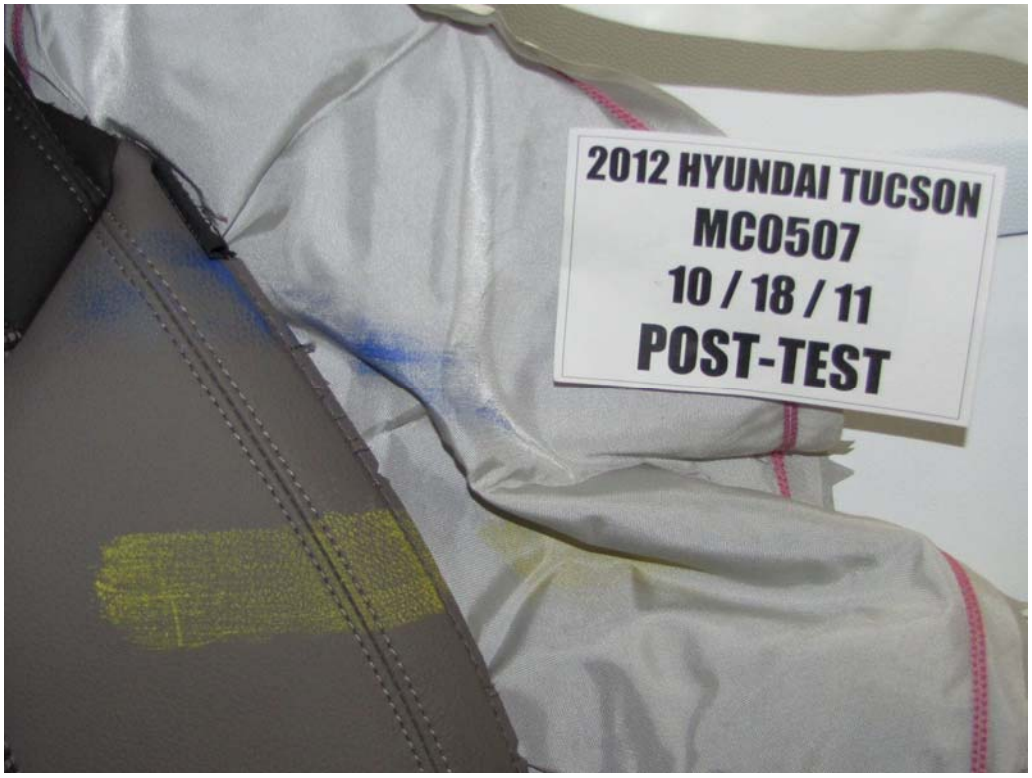


FIGURE 50. Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View

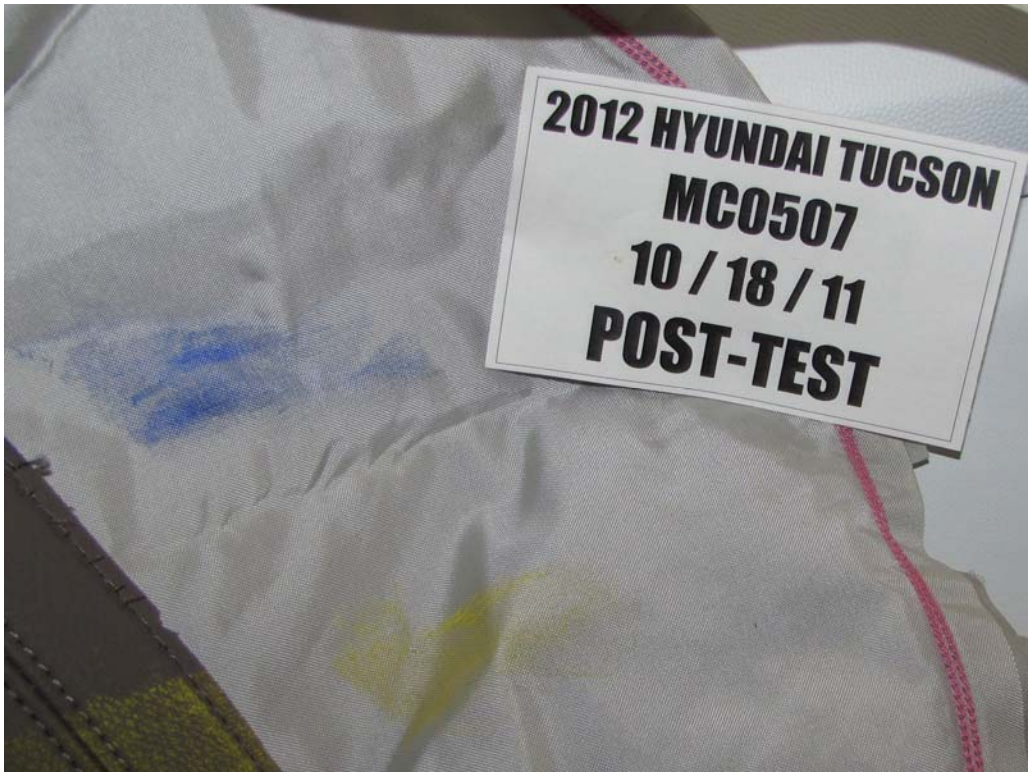


FIGURE 51. Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View

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, Chalking, and Contact Switches

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

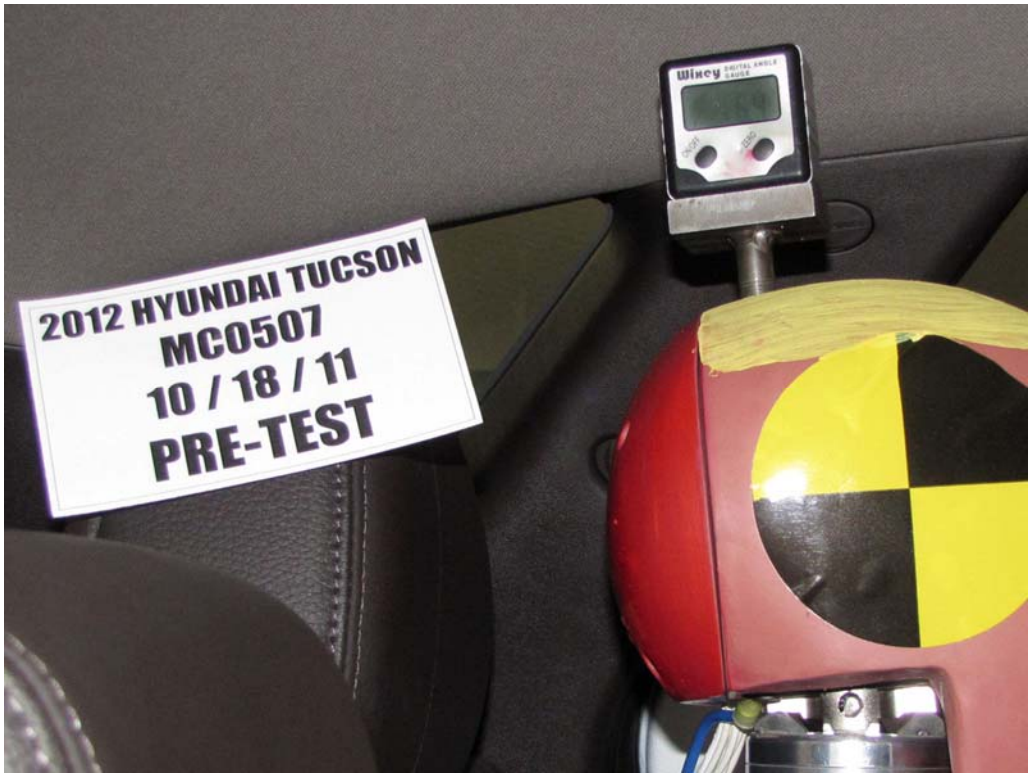


FIGURE 62. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy's Head is Level

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

Photograph Not Applicable

Vehicle Not Equipped with Rear Passenger Side Airbag

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 Cap

FIGURE 81. Post-Test View of Fuel Filler Cap

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

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

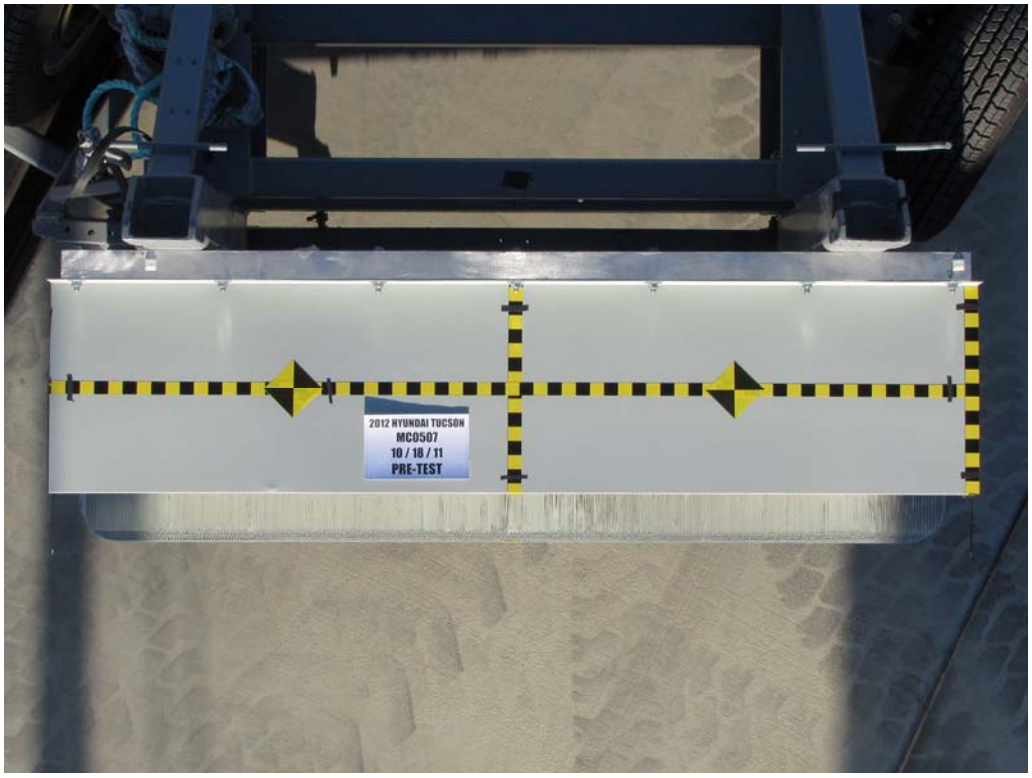


FIGURE 84. Pre-Test Top View of MDB Impactor Face

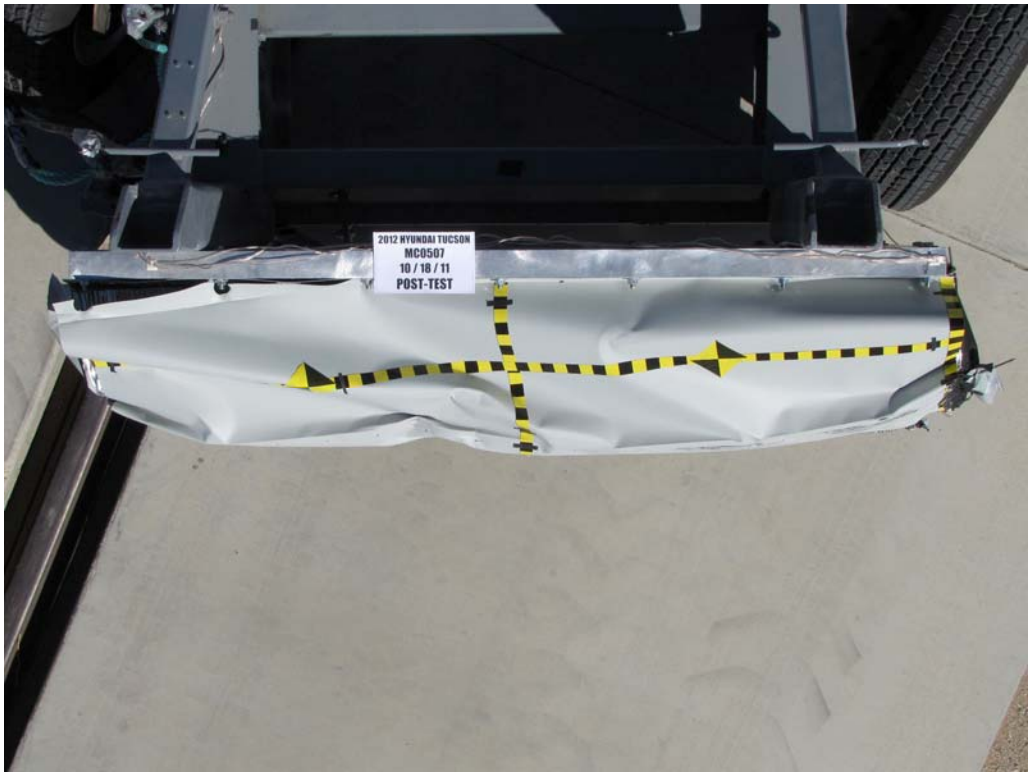


FIGURE 85. Post-Test Top View of MDB Impactor Face

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

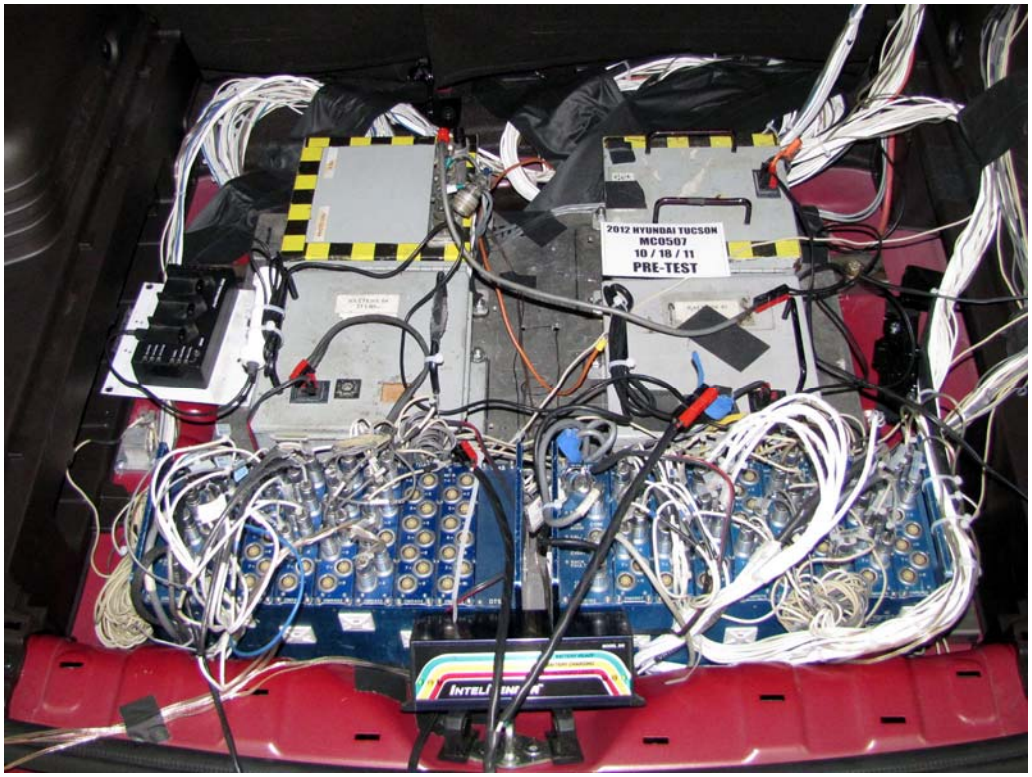


FIGURE 92. Pre-Test Ballast View

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

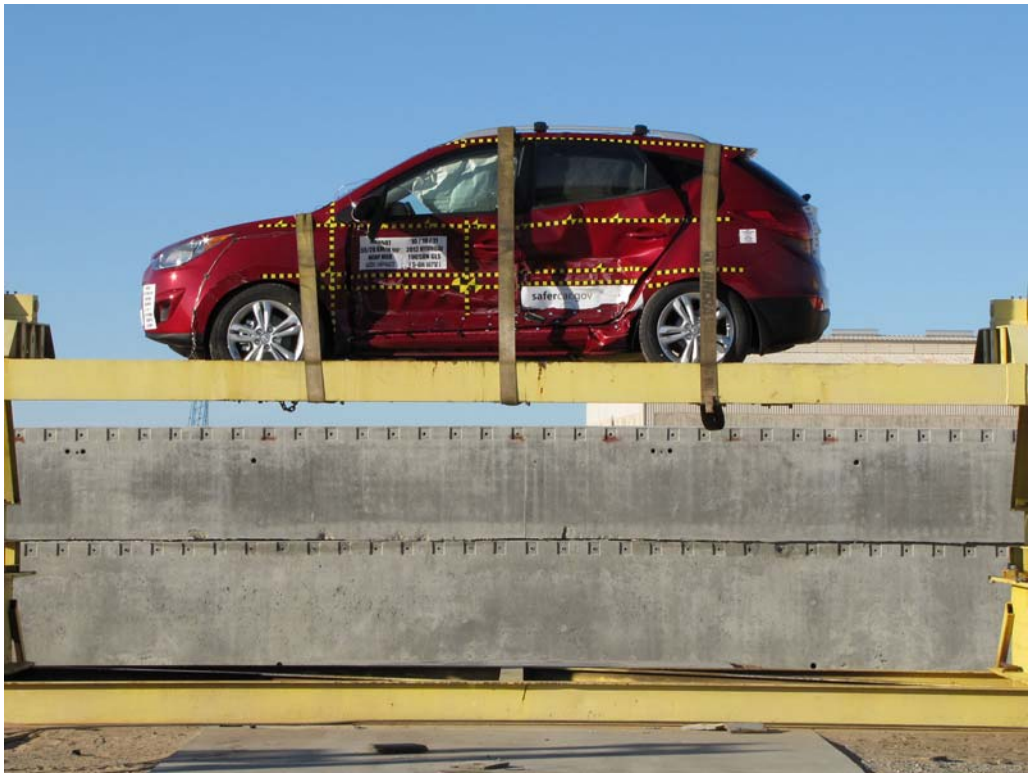


FIGURE 94. FMVSS No. 301 Static Rollover 0 Degrees

FIGURE 95. FMVSS No. 301 Static Rollover 90 Degrees

FIGURE 96. FMVSS No. 301 Static Rollover 180 Degrees

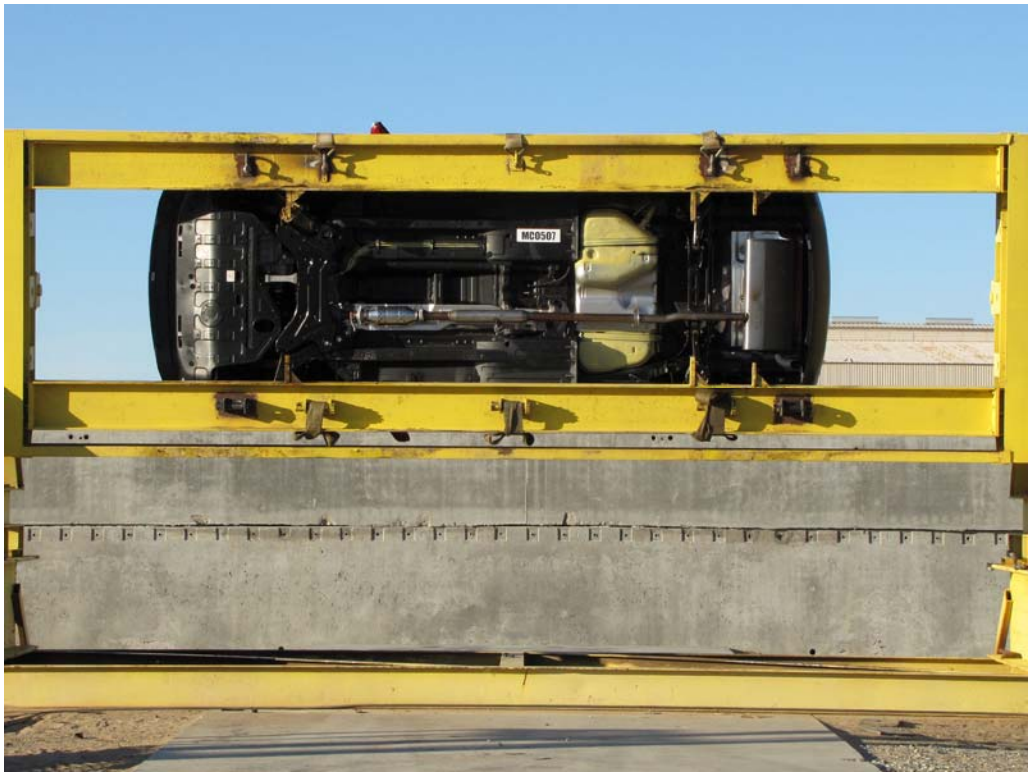


FIGURE 97. FMVSS No. 301 Static Rollover 270 Degrees

FIGURE 98. FMVSS No. 301 Static Rollover 360 Degrees

FIGURE 99. Impact Event

FIGURE 100. Monroney Label

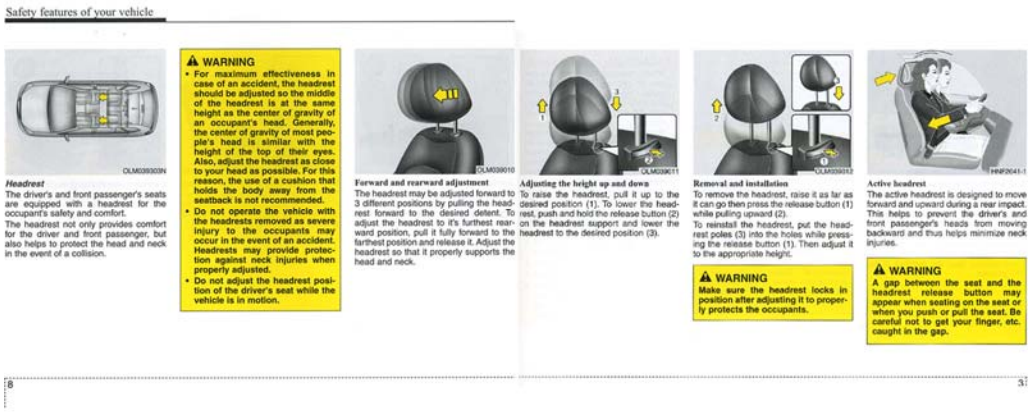


FIGURE 101. Driver Head Restraint Use and Adjustment
Information from Vehicle Owner's Manual

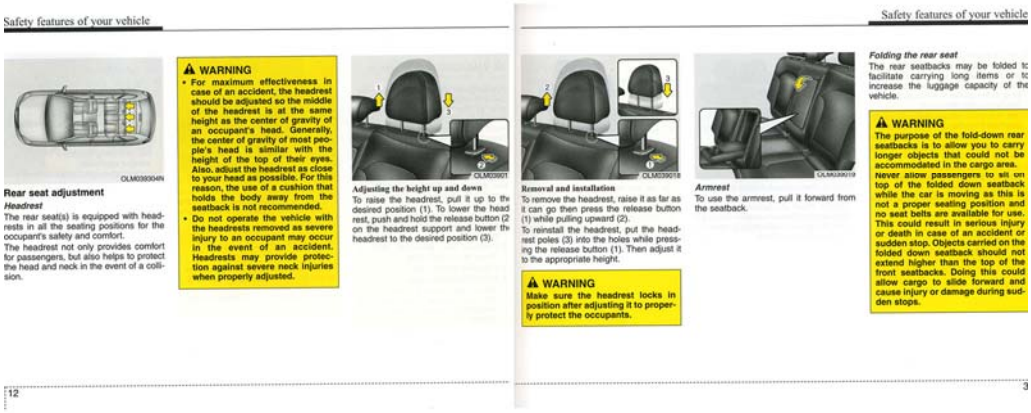


FIGURE 102. Left Rear Passenger Head Restraint
Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B

DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

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)

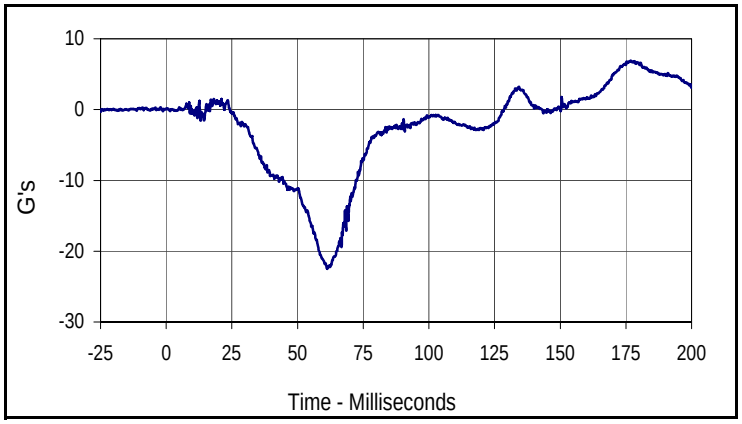
MDB Rear Acceleration (Y)

Left MDB Contact Switch

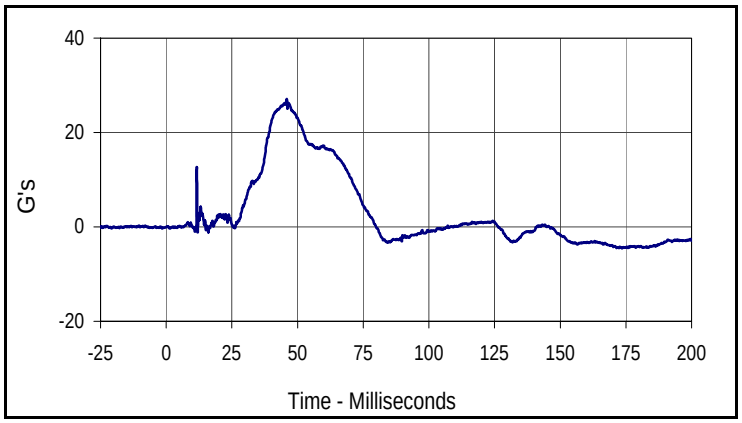
Right MDB Contact Switch

Test Vehicle: 2012 Hyundai Tucson GLS 5-Door MPV | Test Date: 10/18/11

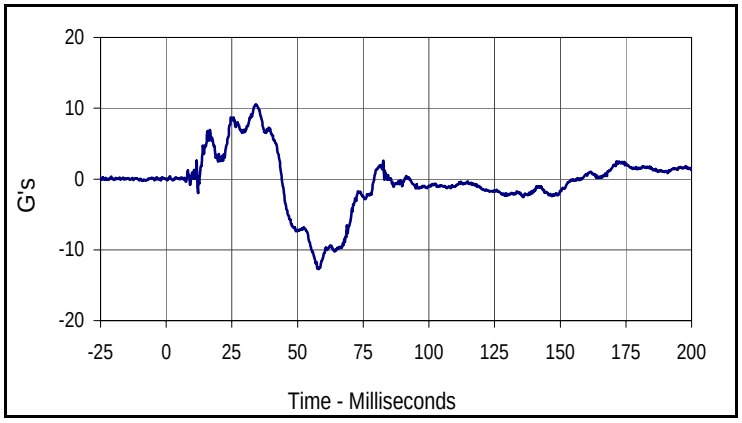
Test Program: 61 km/h (38 mph) Side Impact NCAP 27° Moving Deformable Barrier Test | NHTSA No.: MC0507



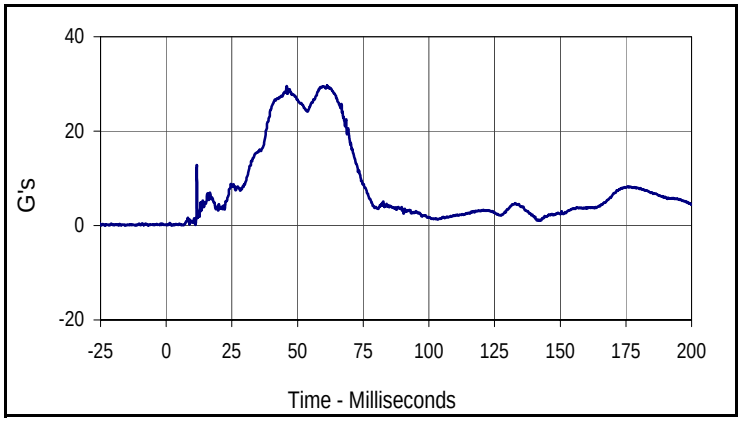
Curve Description			
Driver Head Acceleration X Primary			
Plot No.	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
6.9	176.8	-22.5	61.2



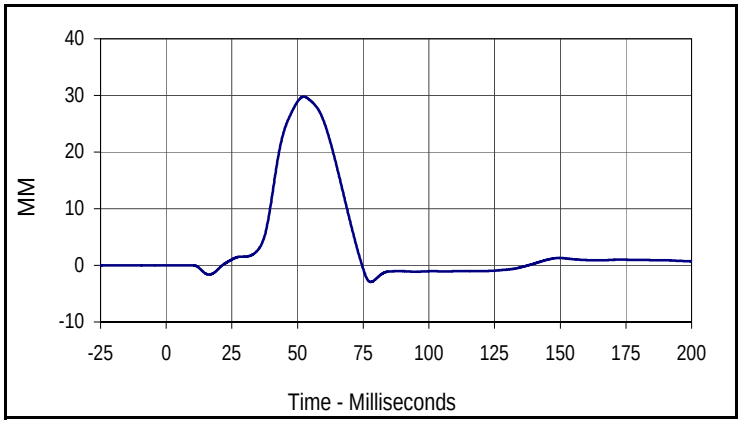
Curve Description			
Driver Head Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
27.1	45.9	-4.5	173.6



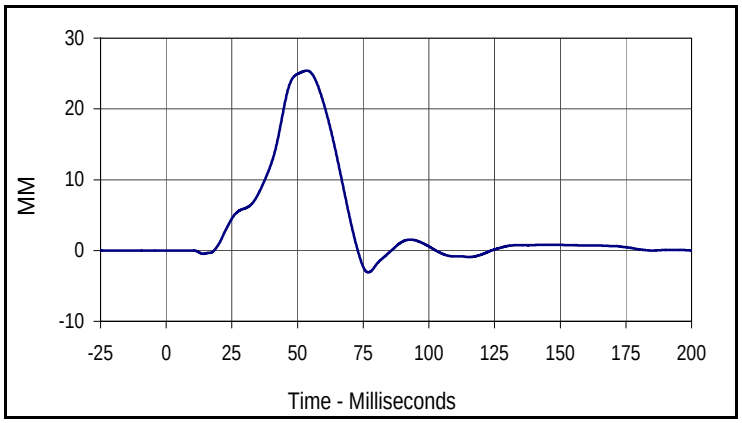
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
10.6	34.2	-12.7	58.1



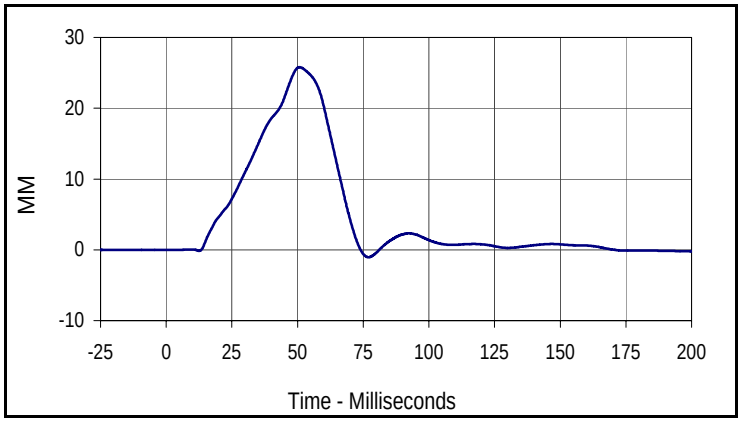
Curve Description			
Driver Head Resultant Accerlation Primary			
Plot No.	Type	SAE Class	Units
004	RES	1000	G's
Max	Time	Min	Time
29.7	61.2	0.0	6.4



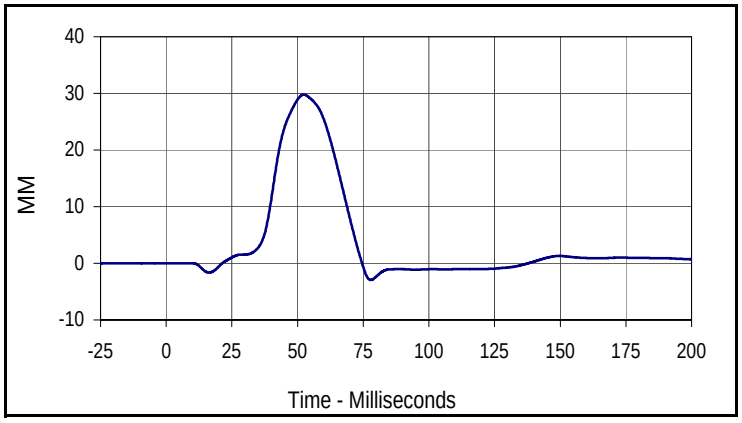
Curve Description			
Driver Upper Thorax Rib Deflection Y			
Plot No.	Type	SAE Class	Units
005	FIL	180	MM
Max	Time	Min	Time
29.8	52.4	-2.9	77.9



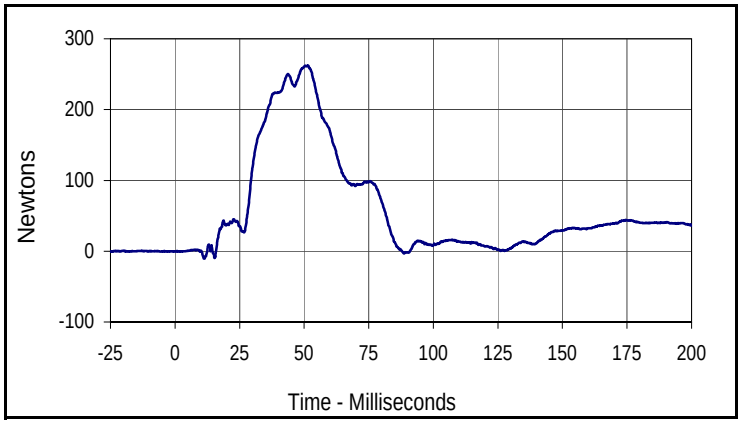
Curve Description			
Driver Middle Thorax Rib Deflection Y			
Plot No.	Type	SAE Class	Units
006	FIL	180	MM
Max	Time	Min	Time
25.4	53.5	-3.1	76.9



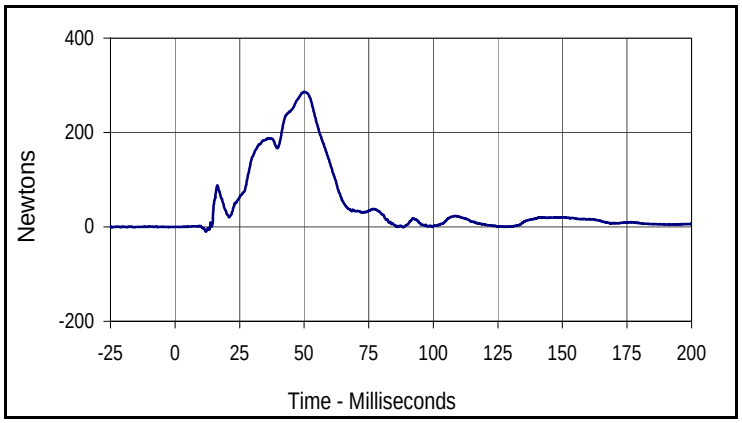
Curve Description			
Driver Lower Thorax Rib Deflection Y			
Plot No.	Type	SAE Class	Units
007	FIL	180	MM
Max	Time	Min	Time
25.8	50.8	-1.1	77.0



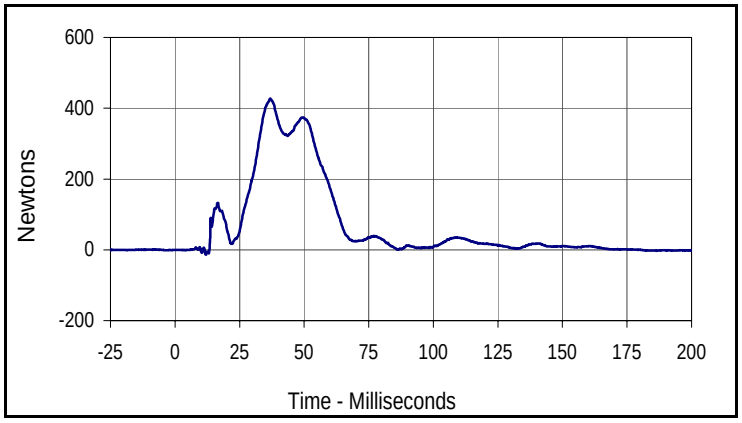
Curve Description			
Driver Thorax Rib Deflection Maximum			
Plot No.	Type	SAE Class	Units
010	FIL	180	MM
Max	Time	Min	Time
29.8	52.4	-2.9	77.9



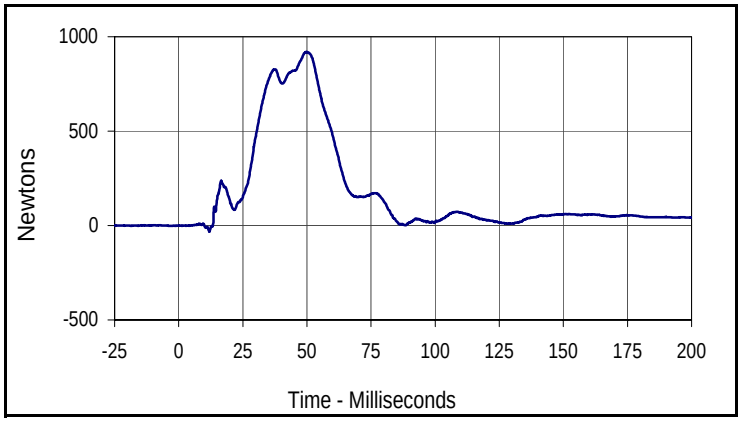
Curve Description			
Driver Anterior Abdominal Force Y			
Plot No.	Type	SAE Class	Units
008	FIL	600	Newtons
Max	Time	Min	Time
262.3	51.5	-10.5	11.3



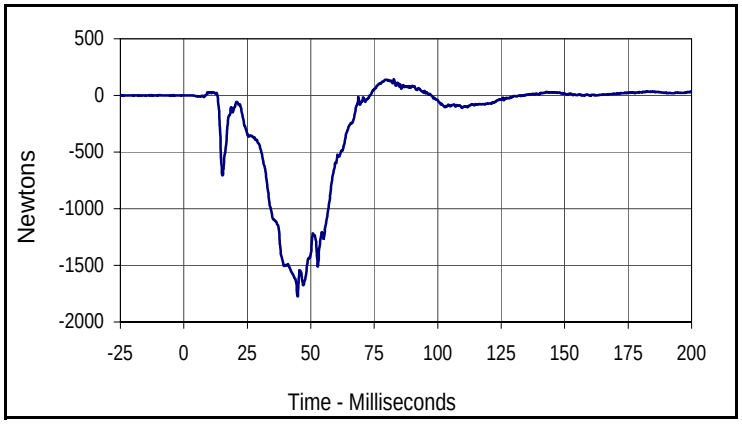
Curve Description			
Driver Middle Abdominal Force Y			
Plot No.	Type	SAE Class	Units
009	FIL	600	Newtons
Max	Time	Min	Time
286.1	50.0	-10.5	11.9



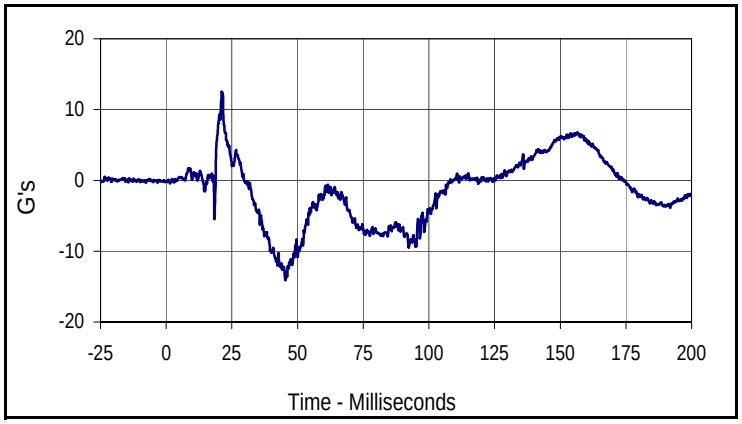
Curve Description			
Driver Posterior Abdominal Force Y			
Plot No.	Type	SAE Class	Units
011	FIL	600	Newtons
Max	Time	Min	Time
427.8	36.8	-13.7	11.9



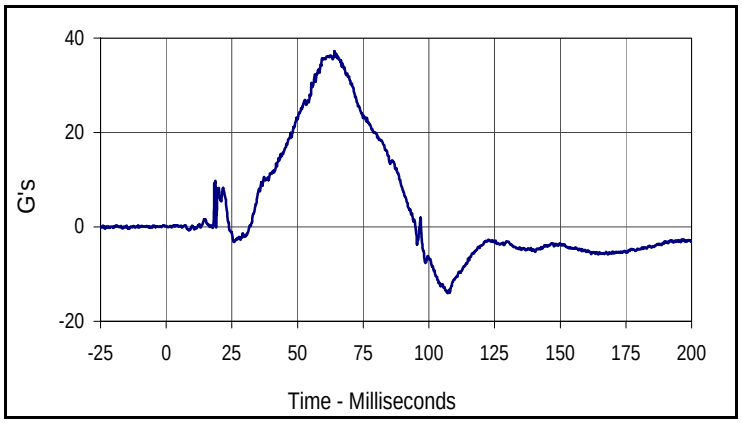
Curve Description			
Driver Total Abdominal Force			
Plot No.	Type	SAE Class	Units
012	SUM	600	Newtons
Max	Time	Min	Time
919.5	49.9	-31.5	11.9



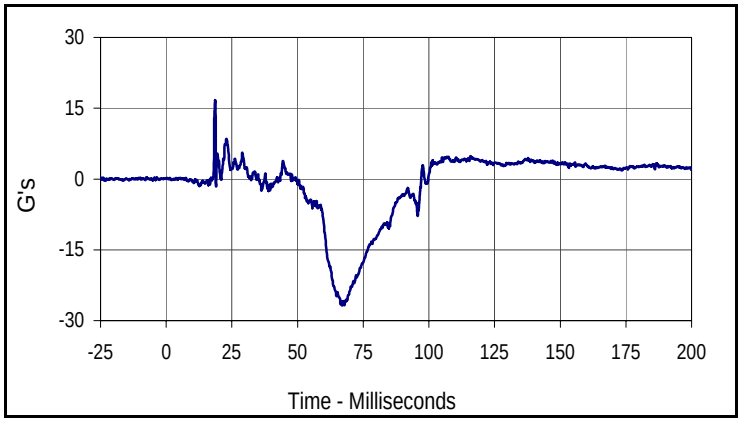
Curve Description			
Driver Pubic Symphysis Force Y			
Plot No.	Type	SAE Class	Units
013	FIL	600	Newtons
Max	Time	Min	Time
145.0	82.7	-1774.0	44.8



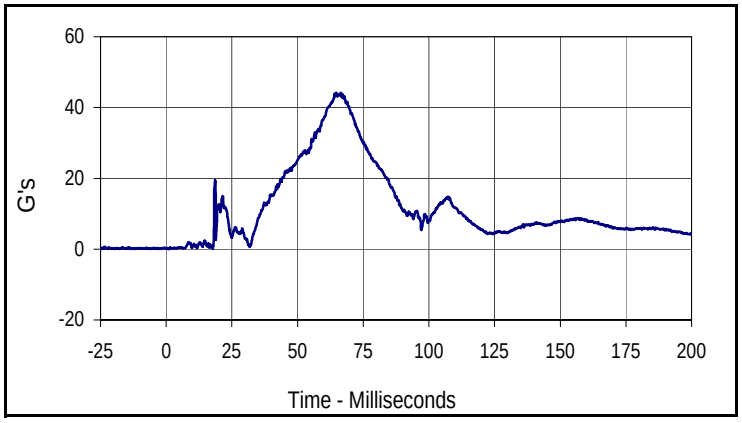
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.	Type	SAE Class	Units
014	FIL	1000	G's
Max	Time	Min	Time
12.5	21.2	-14.1	45.4



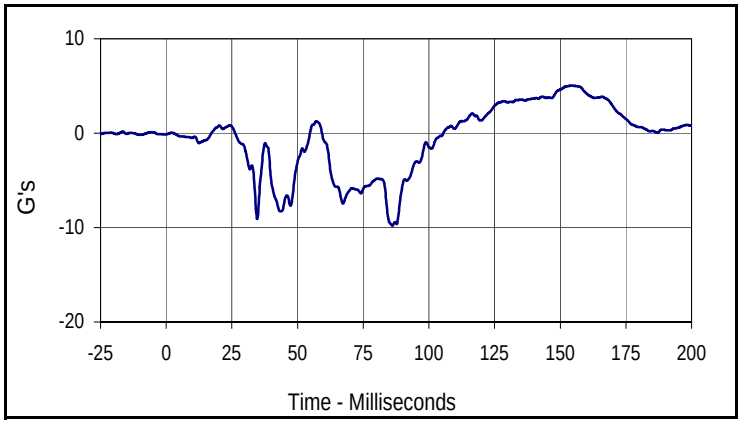
Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.	Type	SAE Class	Units
015	FIL	1000	G's
Max	Time	Min	Time
37.2	64.1	-14.0	107.3



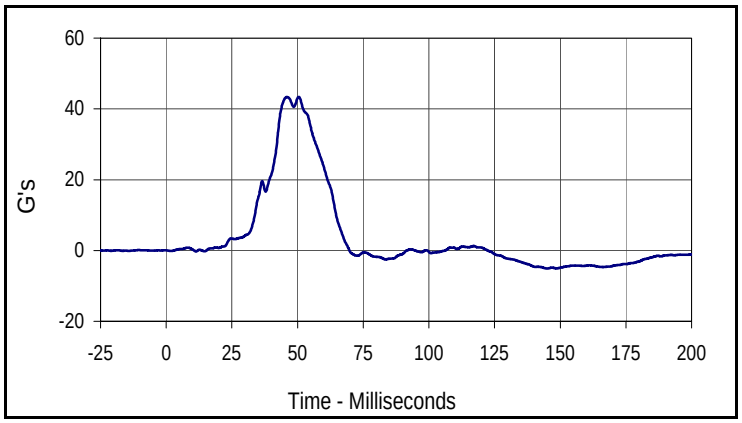
Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.	Type	SAE Class	Units
016	FIL	1000	G's
Max	Time	Min	Time
16.7	18.6	-26.8	67.0



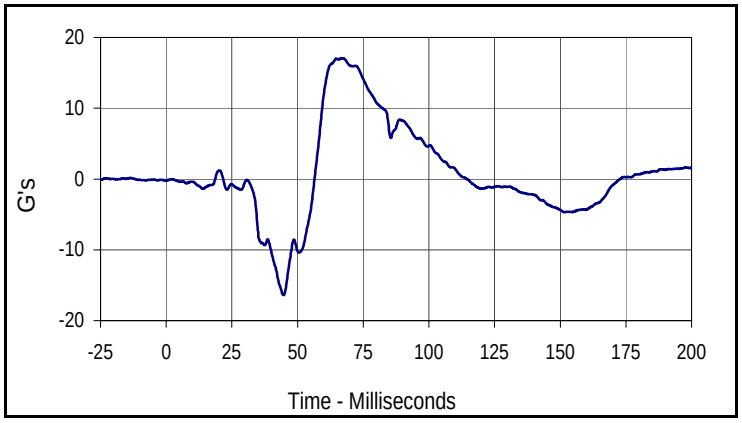
Curve Description			
Passenger Head Acceleration Resultant Primary			
Plot No.	Type	SAE Class	Units
017	RES	1000	G's
Max	Time	Min	Time
44.2	64.7	0.0	0.9



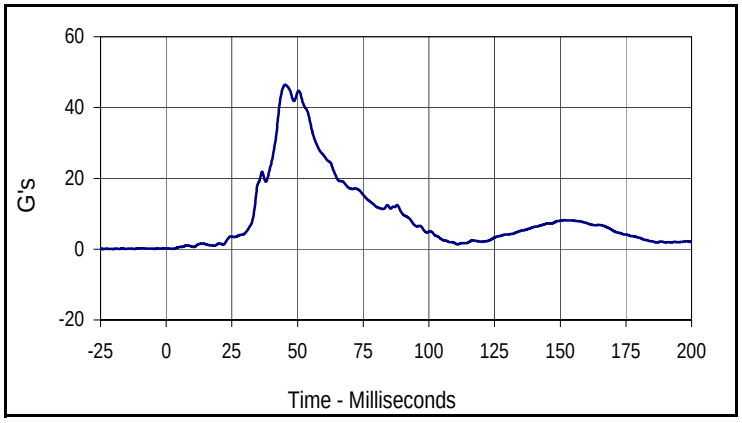
Curve Description			
Passenger Lower Spine T12 Acceleration X			
Plot No.	Type	SAE Class	Units
019	FIL	180	G's
Max	Time	Min	Time
5.1	154.2	-9.8	86.1



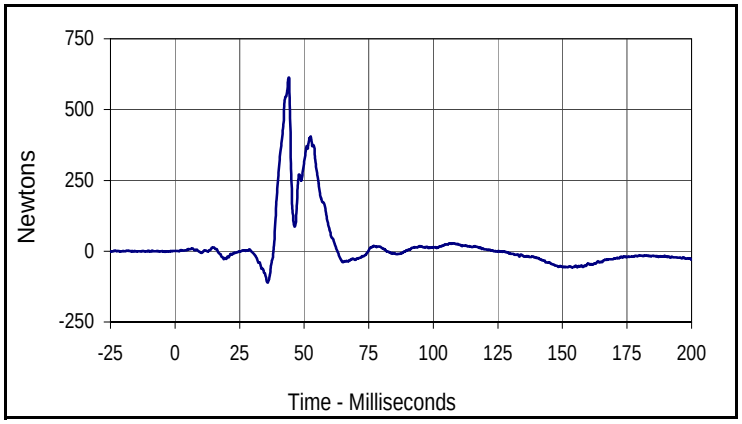
Curve Description			
Passenger Lower Spine T12 Acceleration Y			
Plot No.	Type	SAE Class	Units
020	FIL	180	G's
Max	Time	Min	Time
43.4	50.5	-5.1	145.0



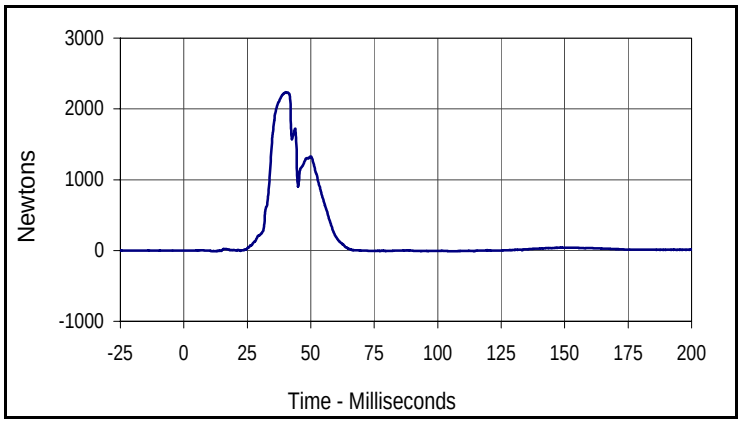
Curve Description			
Passenger Lower Spine T12 Acceleration Z			
Plot No.	Type	SAE Class	Units
021	FIL	180	G's
Max	Time	Min	Time
17.1	67.2	-16.4	44.6



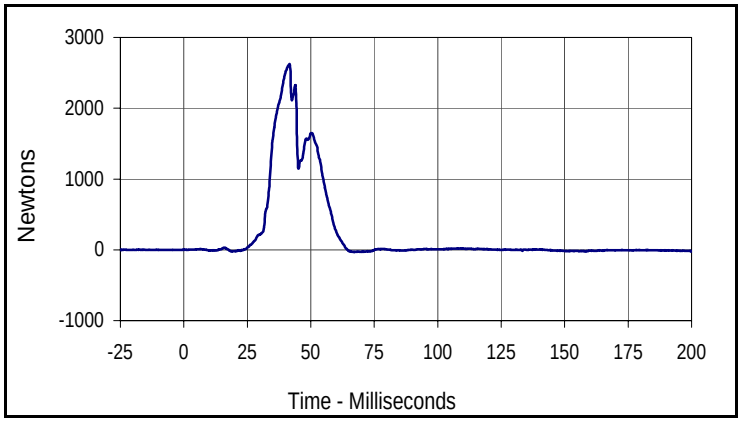
Curve Description			
Passenger Lower Spine T12 Acceleration Resultant			
Plot No.	Type	SAE Class	Units
022	RES	180	G's
Max	Time	Min	Time
46.4	45.3	0.1	2.7



Curve Description			
Passenger Iliac Wing Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
023	FIL	600	Newtons
Max	Time	Min	Time
613.6	44.0	-110.9	35.8



Curve Description			
Passenger Acetabulum Force on Impact Side Y			
Plot No.	Type	SAE Class	Units
024	FIL	600	Newtons
Max	Time	Min	Time
2235.2	40.1	-11.3	104.1



Curve Description			
Passenger Total Pelvic Force			
Plot No.	Type	SAE Class	Units
018	SUM	600	Newtons
Max	Time	Min	Time
2625.0	41.6	-31.3	67.1

APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

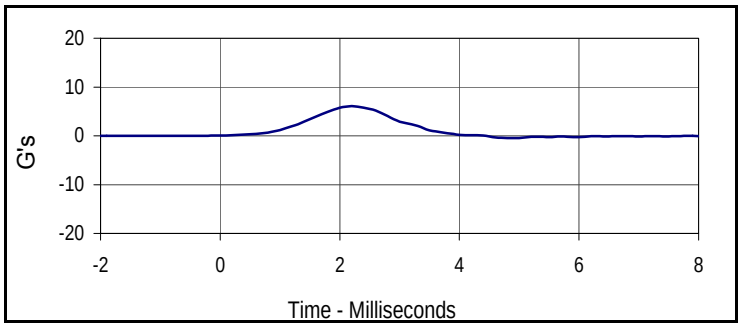
Test Program:	ES2re External Measurements	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	N/A

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
1	Sitting Height	mm	900 - 918	906	Pass
2	Seat to Shoulder Joint	mm	558 - 572	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	mm	346 - 356	352	Pass
4	Seat to Hip Joint (Center of Bolt)	mm	97 - 103	100	Pass
5	Sole to Seat, Sitting	mm	333 - 451	376	Pass
6	Head Width	mm	152 - 158	156	Pass
7	Shoulder / Arm Width	mm	461 - 479	471	Pass
8	Thorax Width	mm	322 - 332	328	Pass
9	Abdomen Width	mm	273 - 287	276	Pass
10	Pelvis Lap Width	mm	359 - 373	360	Pass
11	Head Depth	mm	196 - 206	203	Pass
12	Thorax Depth	mm	262 - 272	268	Pass
13	Abdomen Width	mm	194 - 204	199	Pass
14	Pelvis Depth	mm	235 - 245	244	Pass
15	Back of Buttocks to Hip Joint (Center of Bolt)	mm	150 - 160	154	Pass
16	Back of Buttocks to Front Knee	mm	597 - 615	603	Pass
			Overall Test Results		Pass

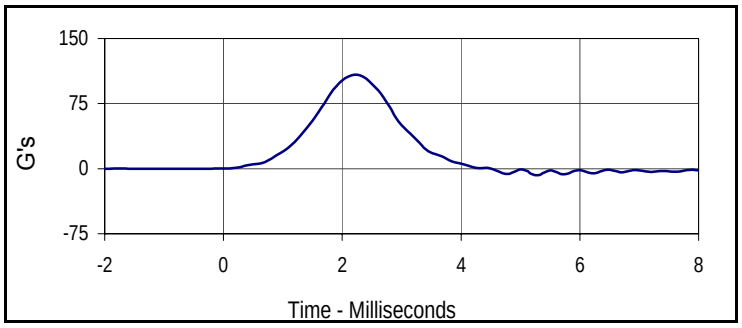
Test Program:	ES2re Head Drop Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035HD016

Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	240	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.7	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.0	Pass
Peak Head Resultant Acceleration		G's	125 to 155	135.0	Pass
Peak Head X Acceleration		G's	≤15	6.1	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse		%	<15	6.8	Pass
			Overall Test Results		Pass

Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
135.0	2.2	0.0	-1.3



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
6.1	2.2	-0.5	4.9

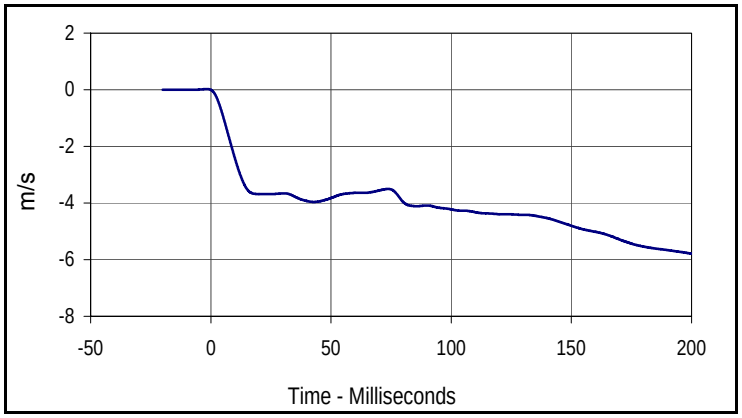


Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
108.4	2.2	-7.5	5.3

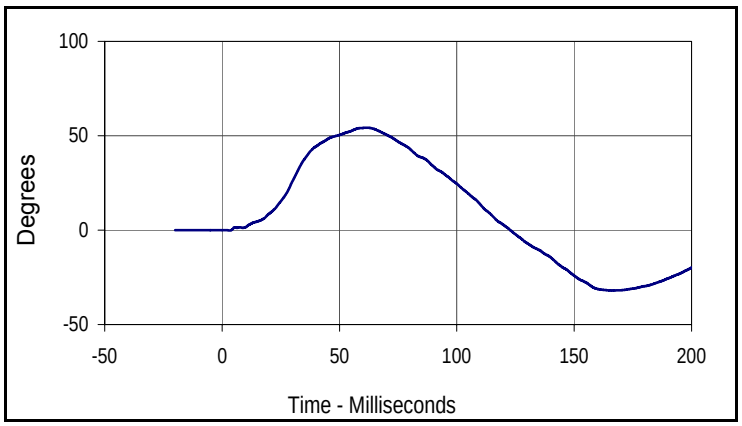
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
80.2	2.2	-0.4	0.0

Test Program:	ES2re Neck Flexion Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035NB016

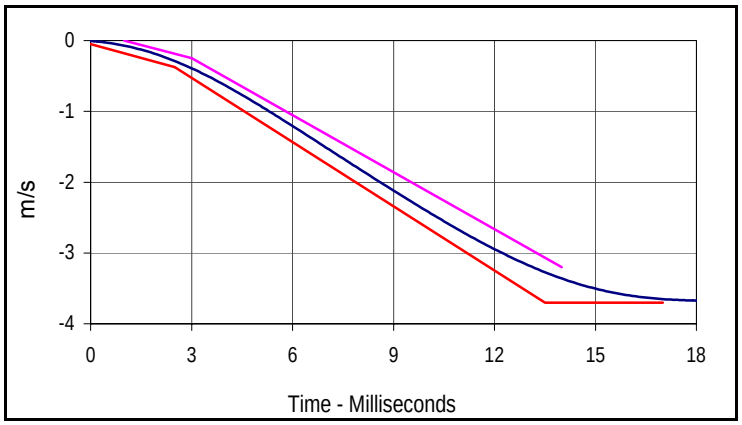
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	270	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Velocity		m/s	3.3 to 3.5	3.4	Pass
Headform Flexion	Max	Degrees	49 to 59	54.2	Pass
	Time	msec	54 to 66	61.8	Pass
Headform Flexion Decay (Peak to Zero)		msec	53 to 88	61.0	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	-1.6	-5.8	200.0



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
54.2	61.8	-32.0	165.2

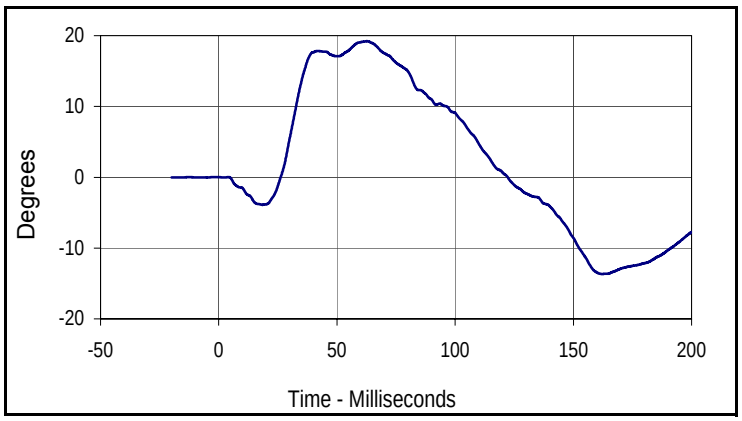


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.6	-5.8	200.0

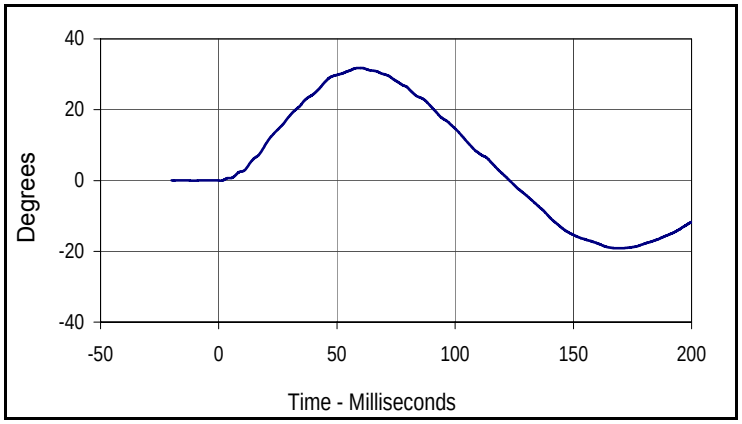
Velocity Corridors

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

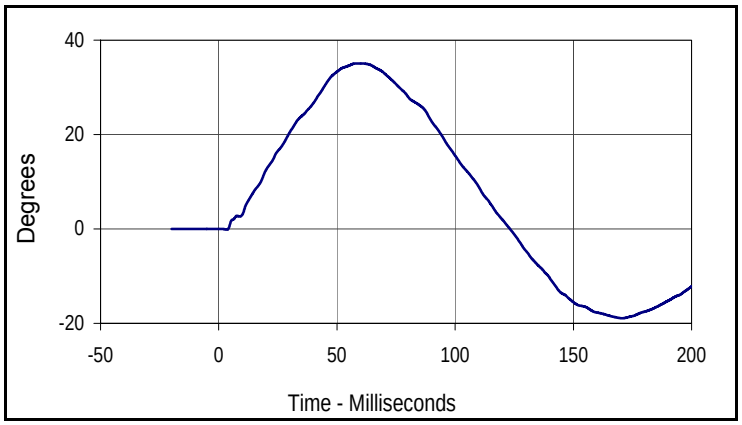
Test Program:	ES2re Neck Flexion Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035NB016



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
19.2	62.7	-13.7	162.2



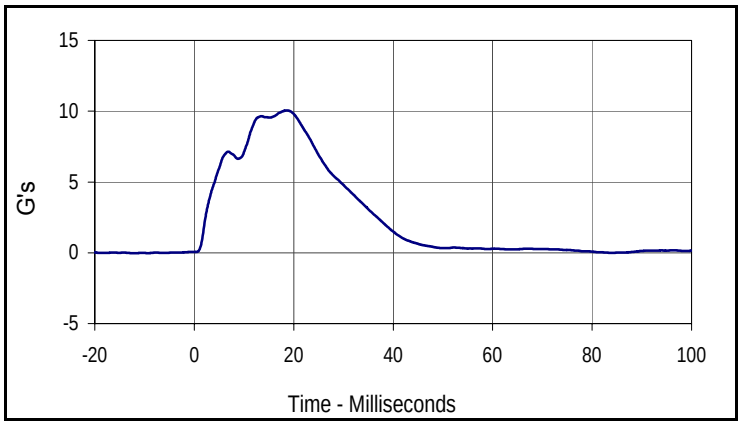
Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
31.8	60.0	-19.1	169.4



Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
35.1	58.2	-18.9	170.7

Test Program:	ES2re Shoulder Impact Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035SH016

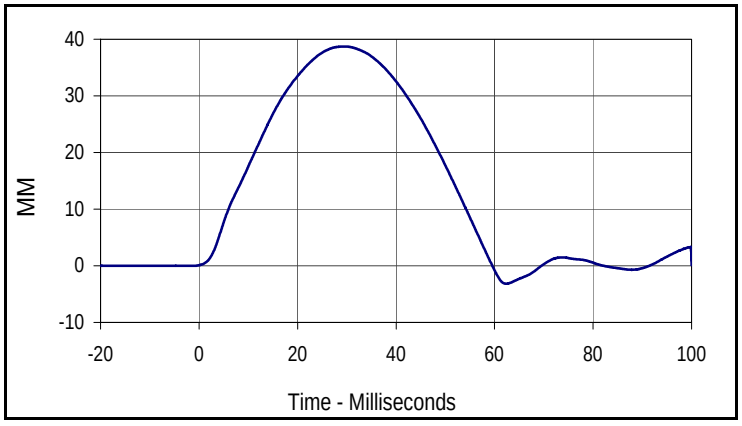
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	260	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Speed		m/s	4.2 to 4.4	4.3	Pass
Peak Impactor Acceleration		G's	7.5 to 10.5	10.0	Pass
			Overall Test Results		Pass



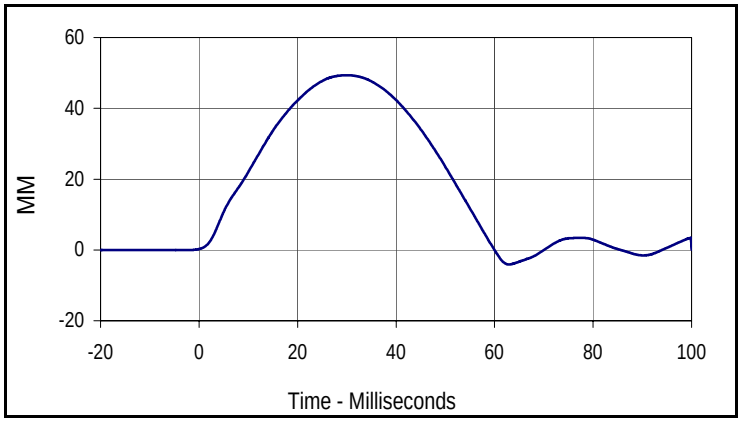
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
10.0	18.6	0.0	-12.4

Test Program:	ES2re Thorax - Rib Drop Test	Test Date:	10/10/11
ATD Serial No.:	F035 Rib #1	Test I.D.:	F035RB1016

Tested Parameter		Units	Specification	Result	Pass/Fail
Rib Module Soak Time		Minutes	≥240	300	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.6	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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	30.0	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height		mm	36 to 40	38.7	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height		mm	46 to 51	49.4	Pass
			Overall Test Results		Pass



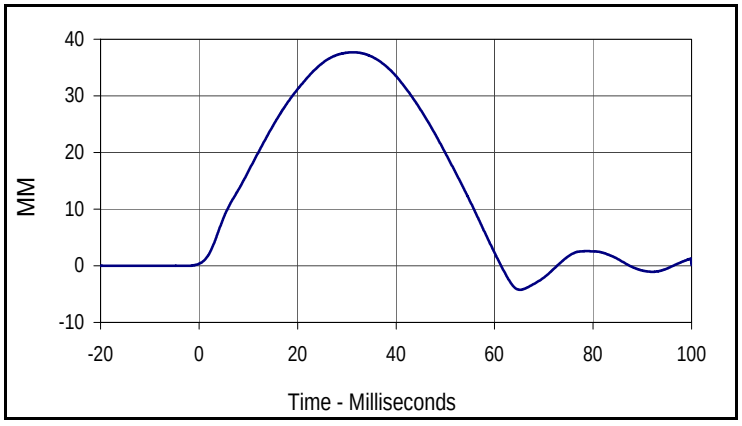
Curve Description			
Middle Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
38.7	29.5	-3.2	62.4



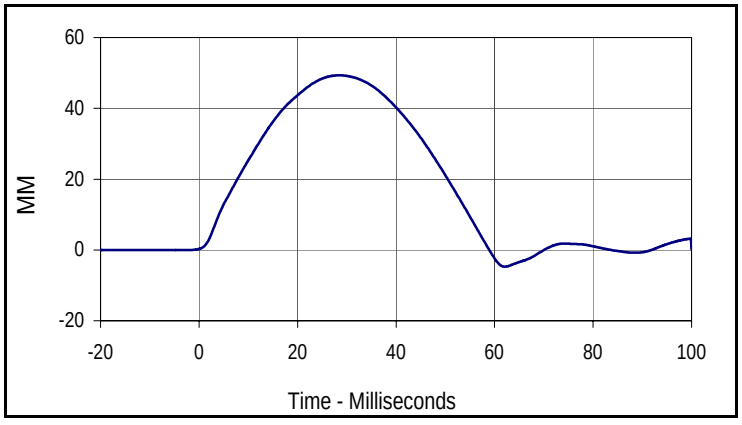
Curve Description			
Middle Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
49.4	30.0	-4.1	62.9

Test Program:	ES2re Thorax - Rib Drop Test	Test Date:	10/10/11
ATD Serial No.:	F035 Rib #2	Test I.D.:	F035RB2016

Tested Parameter		Units	Specification	Result	Pass/Fail
Rib Module Soak Time		Minutes	≥240	340	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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
Peak Rib Deflection at 459 +/- 5 mm Drop Height		mm	36 to 40	37.7	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height		mm	46 to 51	49.3	Pass
			Overall Test Results		Pass



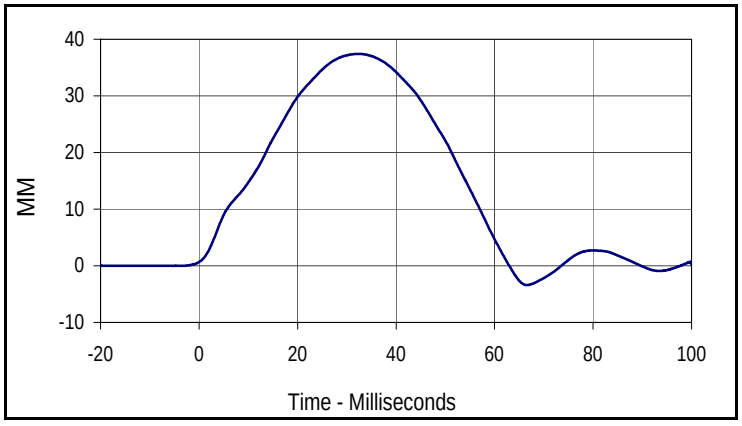
Curve Description			
Middle Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.7	31.3	-4.2	65.2



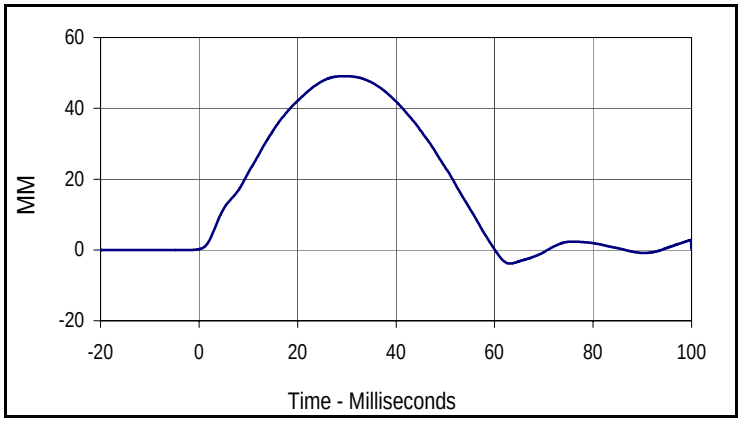
Curve Description			
Middle Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
49.3	28.5	-4.7	62.1

Test Program:	ES2re Thorax - Rib Drop Test	Test Date:	10/10/11
ATD Serial No.:	F035 Rib # 3	Test I.D.:	F035RB3016

Tested Parameter		Units	Specification	Result	Pass/Fail
Rib Module Soak Time		Minutes	≥240	390	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.5	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height		mm	36 to 40	37.4	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height		mm	46 to 51	49.1	Pass
			Overall Test Results		Pass



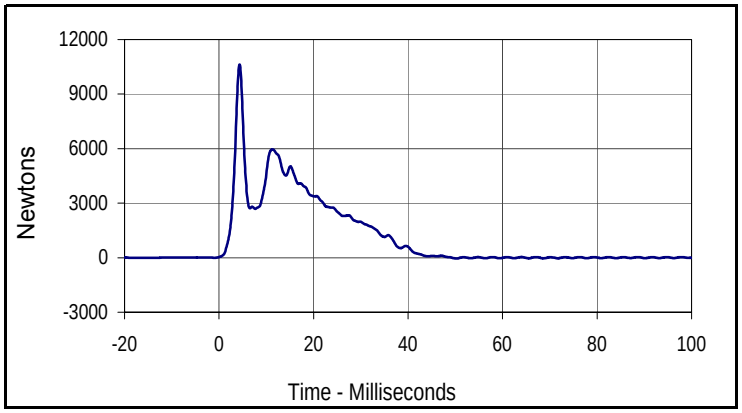
Curve Description			
Lower Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.4	32.3	-3.4	66.6



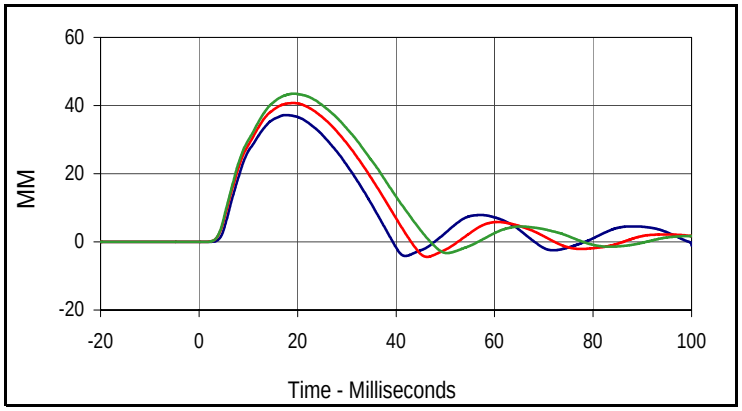
Curve Description			
Lower Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
49.1	29.5	-3.9	63.2

Test Program:	ES2re Thorax - Full Body Impact Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035TH016

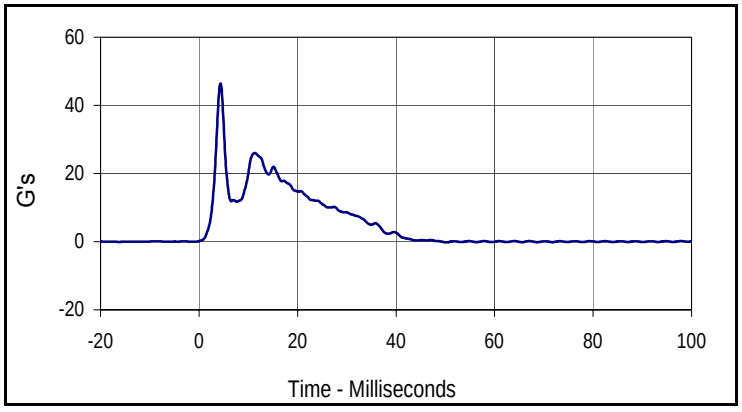
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	300	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Peak Impactor Velocity		m/s	5.4 to 5.6	5.5	Pass
Peak Impactor Force		N	5100 to 6200	5957.3	Pass
		msec	> 6.0 msec	11.3	Pass
Peak Upper Rib Deflection		mm	34 to 41	37.2	Pass
Peak Middle Rib Deflection		mm	37 to 45	40.7	Pass
Peak Lower Rib Deflection		mm	37 to 44	43.5	Pass
			Overall Test Results		Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
10622.0	4.4	-44.7	50.3



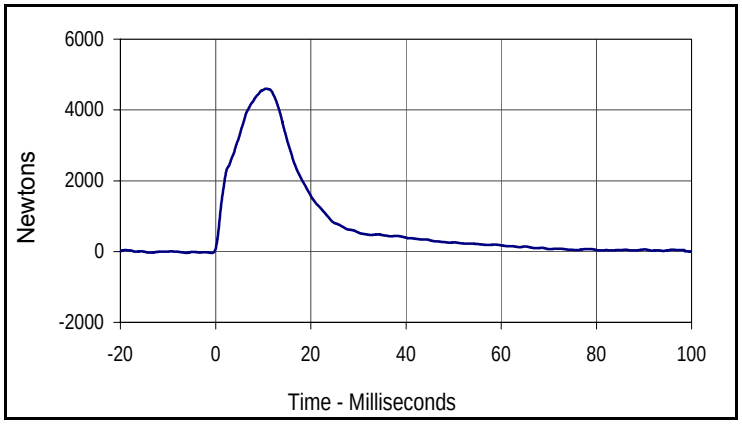
Curve Description			
Upper, Middle, Lower Rib Deflections			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
37.2	17.6	-4.2	41.9
Max (Middle)	Time	Min (Middle)	Time
40.7	19.1	-4.4	46.3
Max (Lower)	Time	Min (Lower)	Time
43.5	19.3	-3.3	50.4



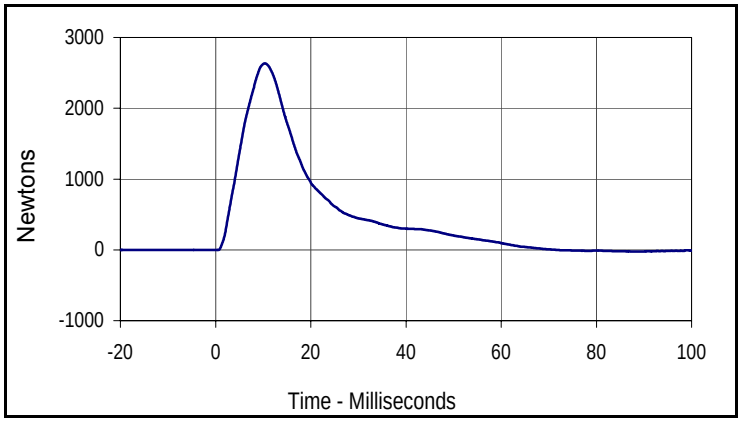
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
46.4	4.4	-0.2	50.3

Test Program:	ES2re Abodomen Impact Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035ABD016

Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	340	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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	30.0	Pass
Probe Velocity		m/s	3.9 to 4.1	4.0	Pass
Peak Impactor Force		N	4000 to 4800	4601.1	Pass
		msec	10.6 to 13.0	12.0	Pass
Sum of Abdominal Forces		N	2200 to 2700	2634.4	Pass
		msec	10.0 to 12.3	11.7	Pass
			Overall Test Results		Pass

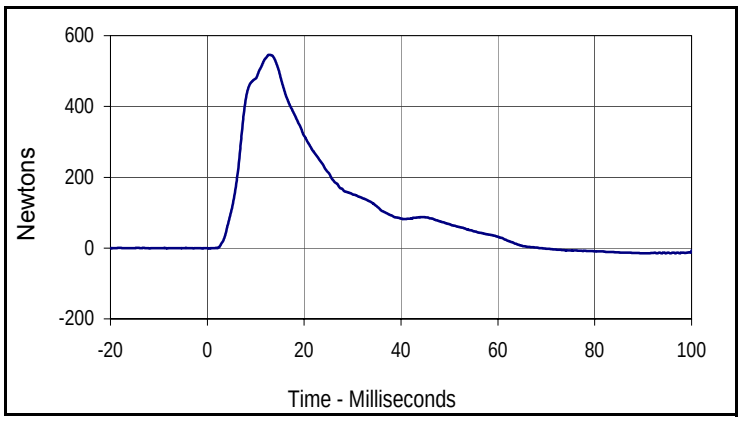


Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4601.1	12.0	-39.2	0.6

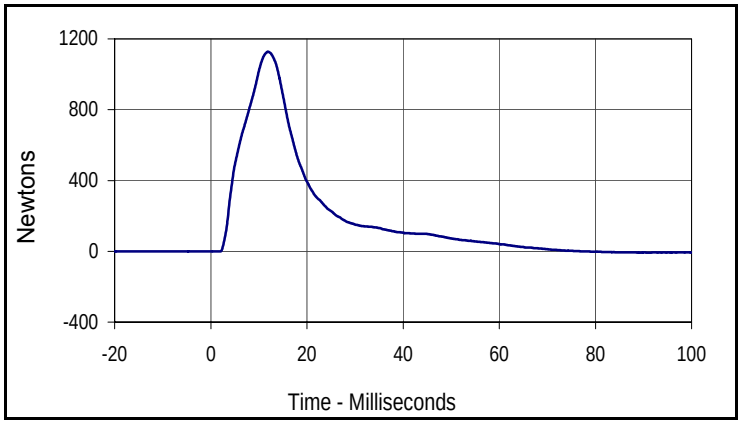


Curve Description			
Abdomen Sum Resultant			
Plot No.	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2634.4	11.7	-24.1	89.5

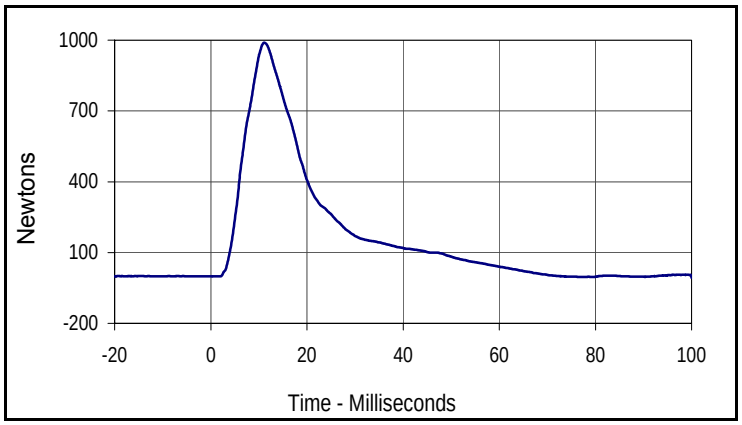
Test Program:	ES2re Abodomen Impact Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035ABD016



Curve Description			
Front Abdomen Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
546.2	12.8	-15.0	92.9



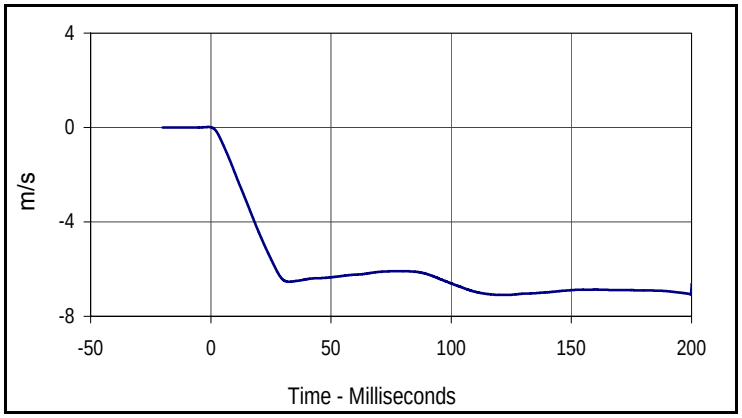
Curve Description			
Middle Abdomen Force			
Plot No.	Type	SAE Class	Units
004	FIL	600	Newtons
Max	Time	Min	Time
1127.1	11.9	-8.5	0.0



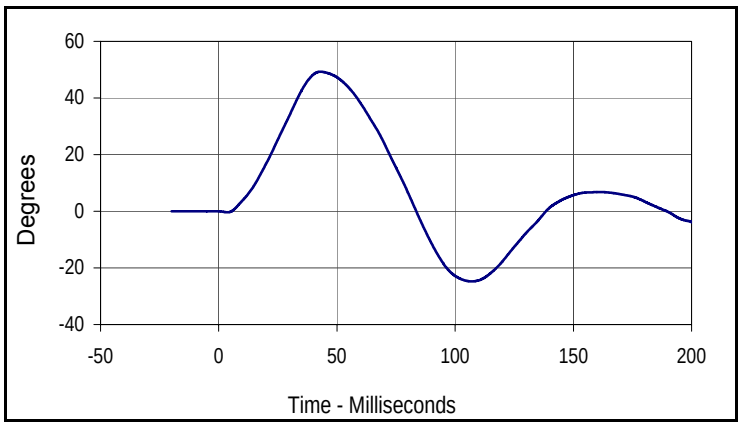
Curve Description			
Rear Abdomen Force			
Plot No.	Type	SAE Class	Units
005	FIL	600	Newtons
Max	Time	Min	Time
989.0	11.1	-8.5	0.0

Test Program:	ES2re Lumbar Flexion Test	Test Date:	10/10/11
ATD Serial No.:	F035	Test I.D.:	F035LB016

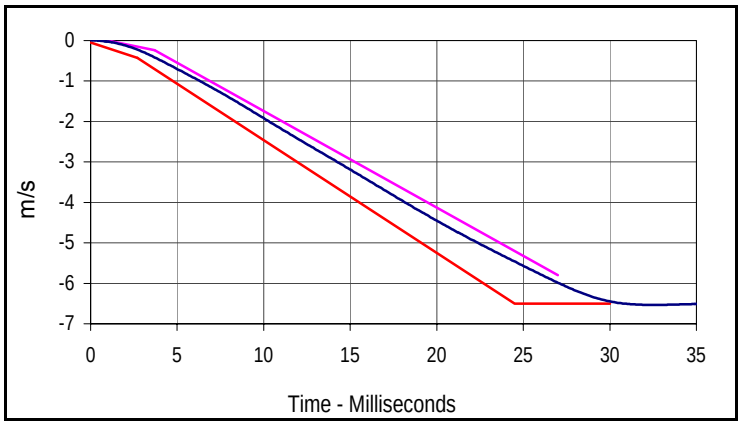
Tested Parameter		Units	Specification	Result	Pass/Fail
Lumbar Spine Assembly Soak Time		Minutes	≥240	370	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Velocity		m/s	5.95 to 6.15	6.00	Pass
Headform Rotation	Max	Degrees	45 to 55	49.3	Pass
	Time	msec	39 to 53	43.1	Pass
Time of Decay to Zero Angle from Peak		msec	37 to 57	40.5	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	-7.1	122.1



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
49.3	43.1	-24.8	107.0

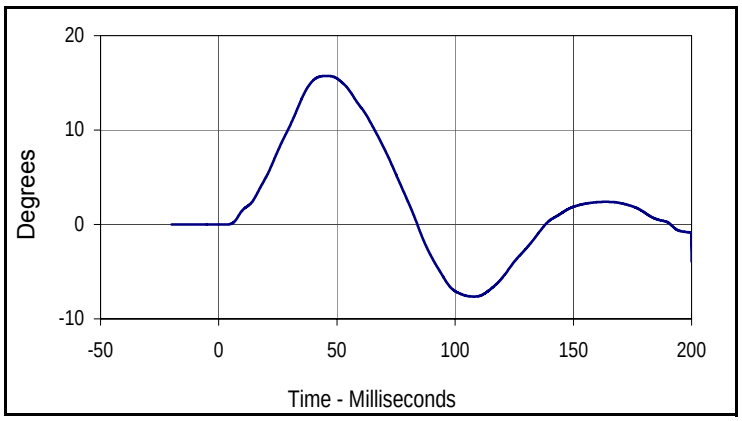


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.0	-7.1	122.1

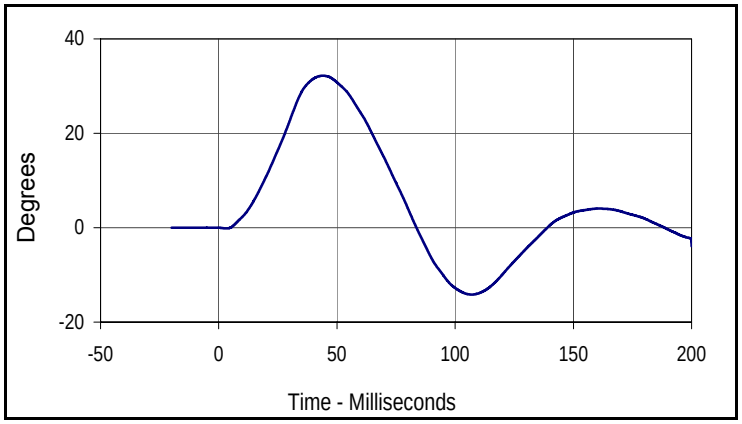
Velocity Corridors

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

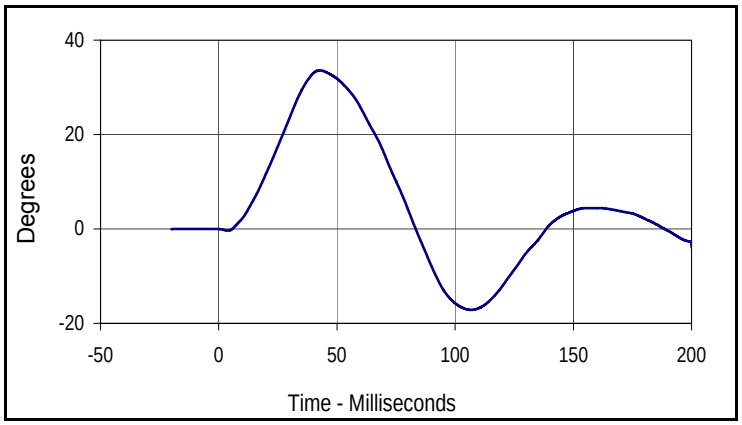
Test Program:	ES2re Lumbar Flexion Test	Test Date:	10/10/11
ATD Serial No.:	F035	Test I.D.:	F035LB016



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
15.7	45.6	-7.6	107.9



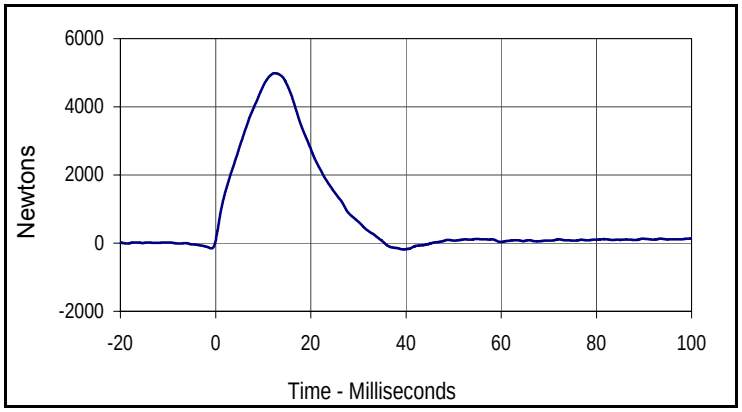
Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
32.2	44.0	-14.2	107.0



Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
33.6	42.7	-17.1	106.7

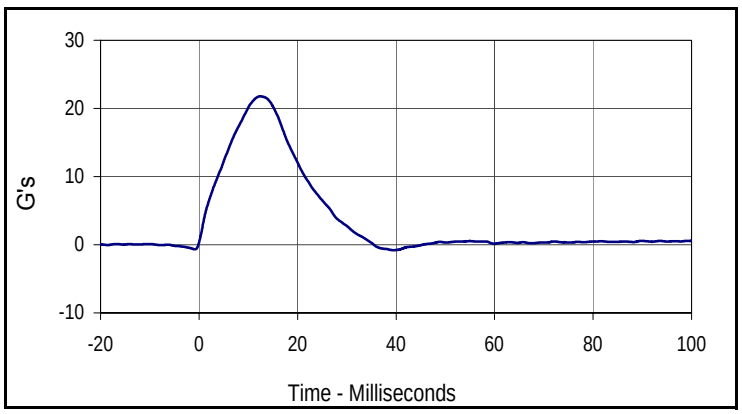
Test Program:	ES2re Pelvis Impact Test	Test Date:	10/8/11
ATD Serial No.:	F035	Test I.D.:	F035PL016

Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	400	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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	4.2 to 4.4	4.3	Pass
Peak Impactor Force		N	4700 to 5400	4989.1	Pass
		msec	11.8 to 16.1	12.4	Pass
Peak Pubic Symphysis Load		N	-1230 to -1590	-1369.0	Pass
		msec	12.2 to 17.0	13.7	Pass
			Overall Test Results		Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4989.1	12.4	-184.4	39.5

Curve Description			
Pubic Symphysis Force Y			
Plot No.	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
93.6	36.2	-1369.0	13.7



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
21.8	12.4	-0.8	39.5

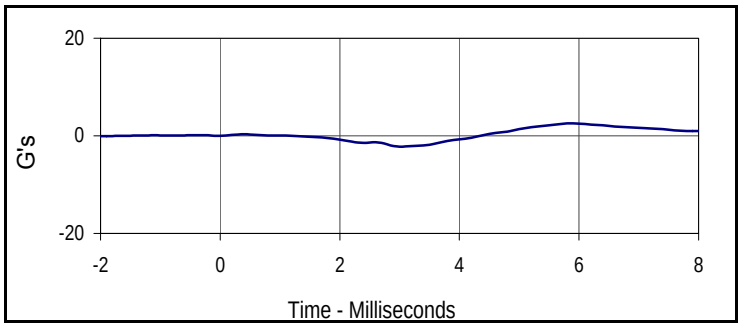
Test Program:	SID IIs External Measurements	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	N/A

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
A	Sitting Height	mm	772 - 788	776	Pass
B	Shoulder Pivot Height	mm	437 - 453	442	Pass
C	H-Point Height	mm	79 - 89	81	Pass
D	H-Point from Seatback	mm	141 - 151	149	Pass
E	Shoulder Pivot from Backline	mm	97 - 107	102	Pass
F	Thigh Clearance	mm	119 - 135	126	Pass
G	Head Breadth	mm	140 - 148	145	Pass
H	Head Back from Backline	mm	40 - 46	44	Pass
I	Head Depth	mm	178 - 188	183	Pass
J	Head Circumference	mm	541 - 551	548	Pass
K	Buttock to Knee Length	mm	514 - 540	525	Pass
L	Popliteal Height	mm	343 - 369	349	Pass
M	Knee Pivot to Floor Height	mm	392 - 409	400	Pass
N	Buttock Popliteal Length	mm	416 - 442	430	Pass
O	Chest Depth w/o Jacket	mm	195 - 211	205	Pass
P	Foot Length	mm	216 - 232	219	Pass
Q	Hip Breadth with Pelvic Plug	mm	313 -323	316	Pass
R	Arm Length	mm	249 - 259	251	Pass
S	Knee Joint to Seatback	mm	477 - 493	481	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	875	Pass
Z	Waist Circumference	mm	760 - 791	773	Pass
			Overall Test Results		Pass

Test Program:	SID IIs Head Drop Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307HD017

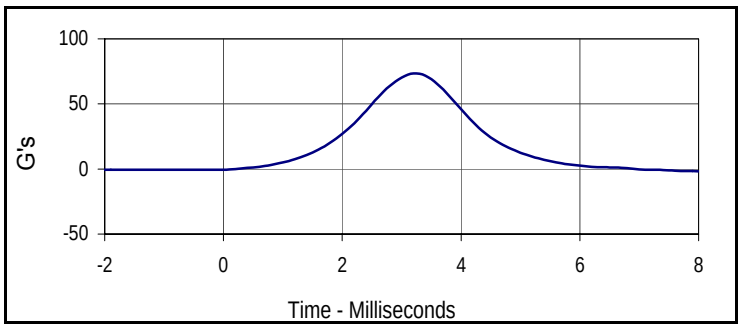
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	350	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Peak Head Resultant Acceleration		G's	115 to 137	126.6	Pass
Peak Head X Acceleration		G's	<15	2.6	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse		%	<15	13.2	Pass
			Overall Test Results		Pass

Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
126.6	3.2	0.2	0.2



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.6	5.9	-2.2	3.0

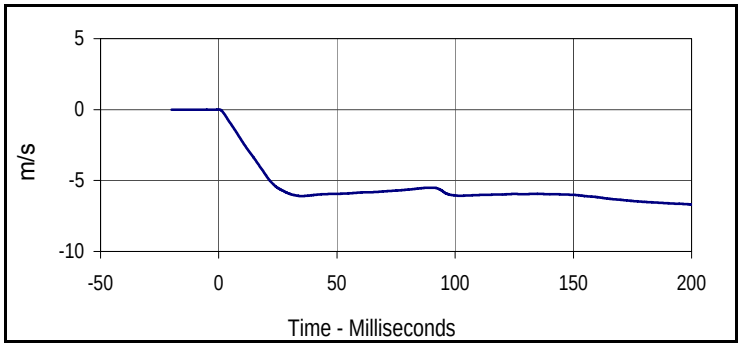
Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
103.0	3.2	-5.3	7.2



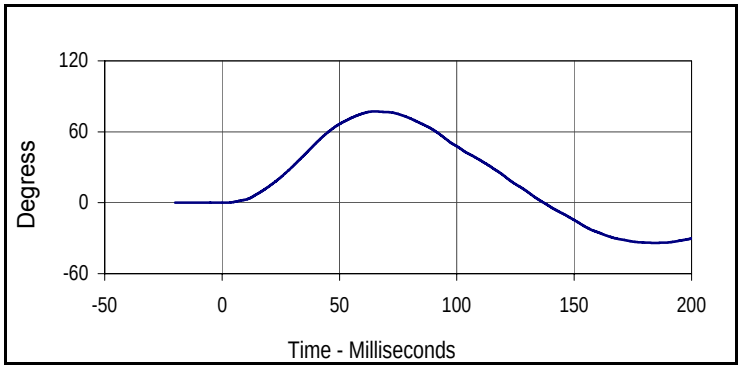
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
73.5	3.2	-2.7	0.0

Test Program:	SID IIs Neck Flexion Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307NB017

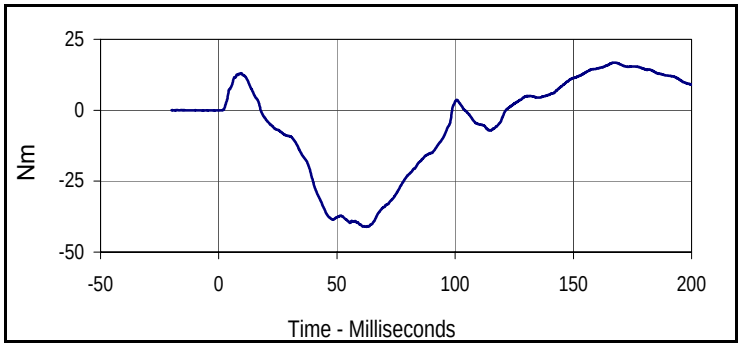
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	400	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.57	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	77.3	Pass
	Time	msec	50 to 70	65.0	Pass
Peak Occipital Condyle Moment		Nm	-36 to -44	-41.1	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



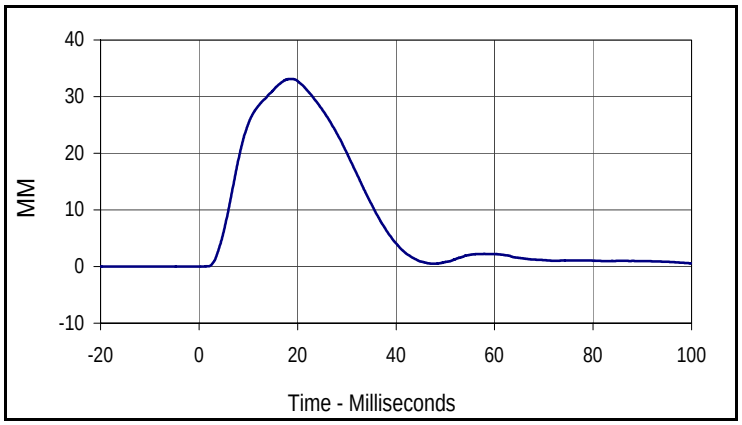
Curve Description			
Maximum Translation Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
77.3	65.0	-33.9	184.5



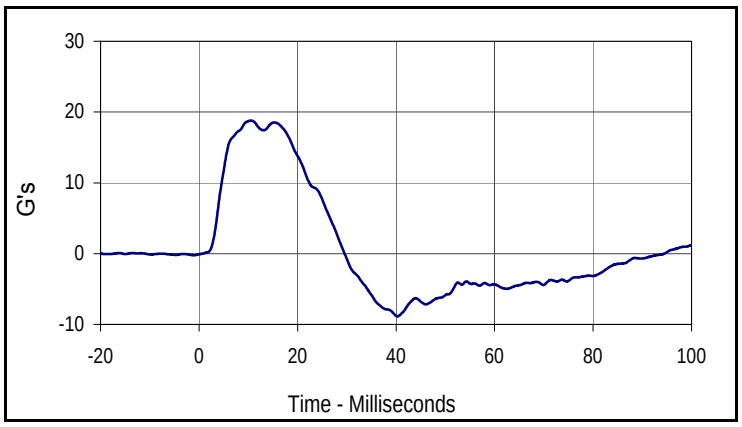
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
16.8	167.2	-41.1	62.5

Test Program:	SID IIs Shoulder Impact Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307SH017

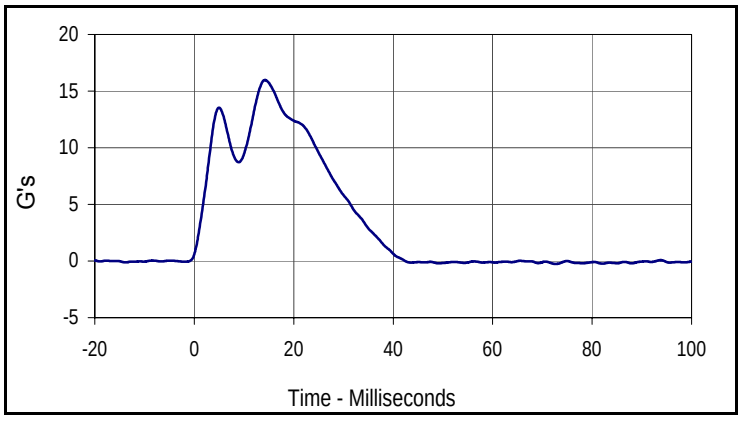
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	220	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	4.20 to 4.40	4.33	Pass
Peak Shoulder Deflection		mm	28 to 37	33.1	Pass
Peak Lateral Spine Acceleratrion Y		G's	17 to 22	18.8	Pass
Peak Impactor Acceleration		G's	13 to 18	16.0	Pass
			Overall Test Results		Pass



Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
33.1	18.5	0.0	-19.6



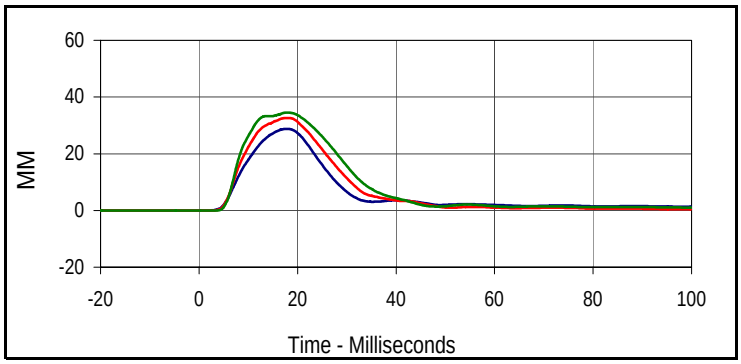
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
18.8	10.6	-8.9	40.2



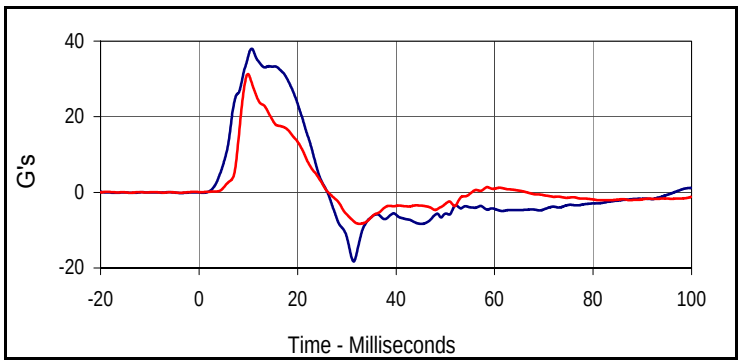
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
16.0	14.2	-0.3	72.7

Test Program:	SID IIs Thorax with Arm Impact Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307TWA017

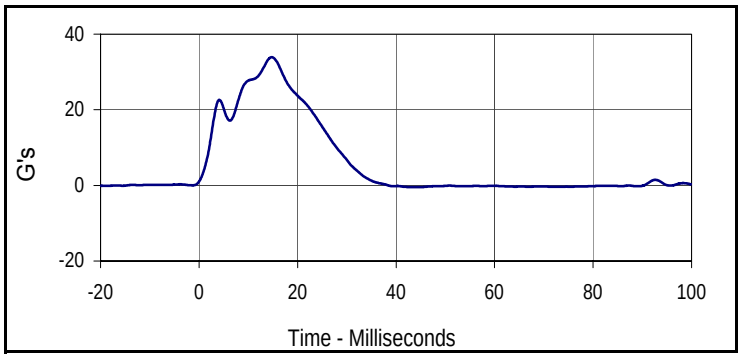
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	260	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	6.6 to 6.8	6.7	Pass
Peak Shoulder Deflection		mm	31 to 40	34.1	Pass
Peak Upper Thorax Rib Deflection		mm	25 to 32	28.8	Pass
Peak Middle Thorax Rib Deflection		mm	30 to 36	32.6	Pass
Peak Lower Thorax Rib Deflection		mm	32 to 38	34.5	Pass
Peak Upper Spine Y Acceleration		G's	34 to 43	38.0	Pass
Peak Lower Spine Y Acceleration		G's	29 to 37	31.3	Pass
Peak Impactor Acceleration		G's	30 to 36	33.9	Pass
			Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
28.8	17.9	0.0	-18.4
Middle Thorax Deflection			
Max	Time	Min	Time
32.6	17.7	0.0	-17.5
Lower Thorax Deflection			
Max	Time	Min	Time
34.5	18.1	0.0	-16.1

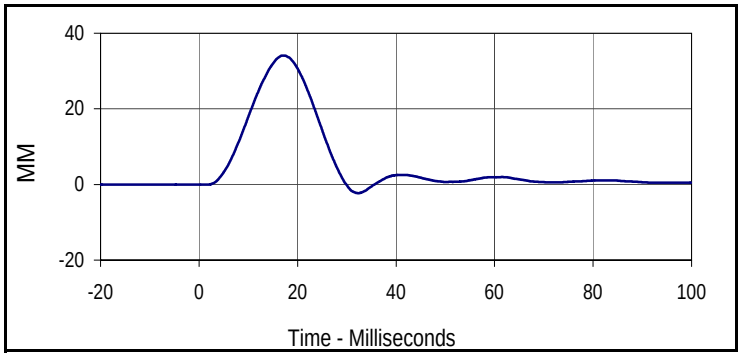


Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
38.0	10.7	-18.3	31.4
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
31.3	9.9	-8.3	32.6



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
33.9	14.8	-0.5	43.2

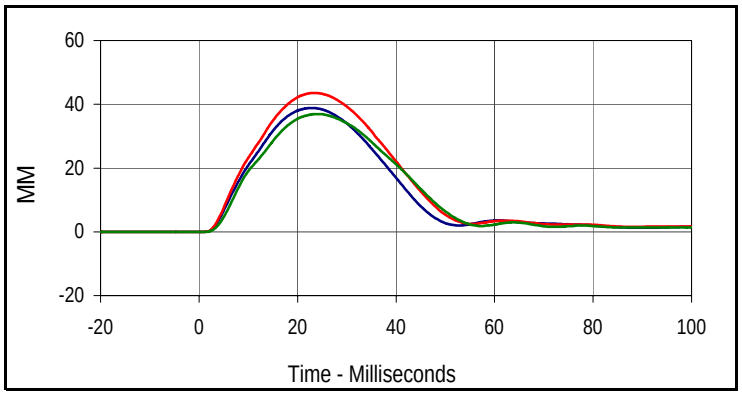
Test Program:	SID IIs Thorax with Arm Impact Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307TWA017



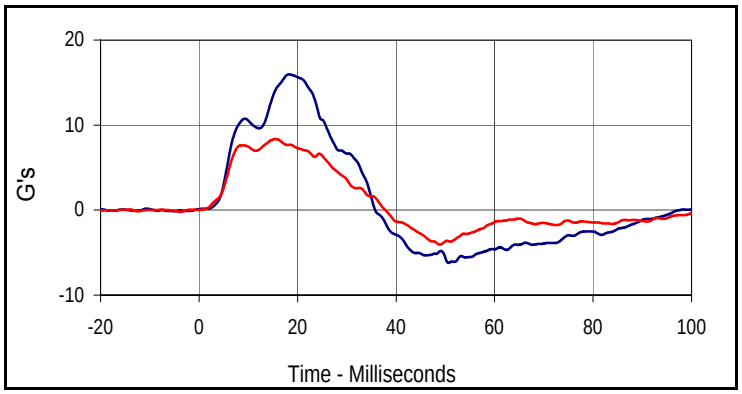
Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
007	FIL	600	MM
Max	Time	Min	Time
34.1	17.1	-2.3	32.4

Test Program:	SID IIs Thorax without Arm Impact Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307TWOA017

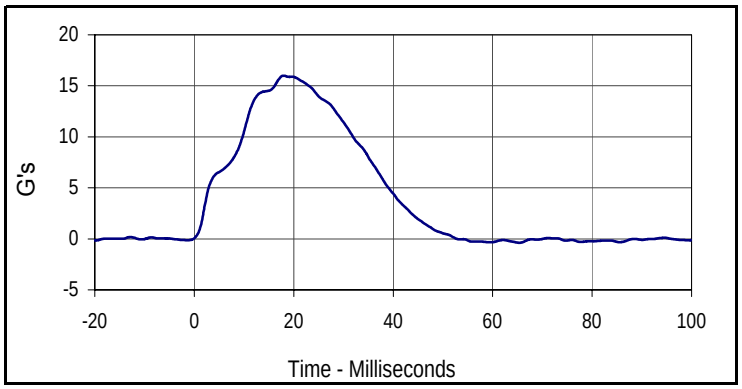
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	300	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Upper Thorax Rib Deflection		mm	32 to 40	38.9	Pass
Peak Middle Thorax Rib Deflection		mm	39 to 45	43.6	Pass
Peak Lower Thorax Rib Deflection		mm	35 to 43	36.9	Pass
Peak Upper Spine Y Acceleration		G's	13 to 17	16.0	Pass
Peak Lower Spine Y Acceleration		G's	7 to 11	8.4	Pass
Peak Impactor Acceleration		G's	14 to 18	16.0	Pass
			Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
38.9	22.7	0.0	0.0
Middle Thorax Deflection			
Max	Time	Min	Time
43.6	23.6	0.0	-2.8
Lower Thorax Deflection			
Max	Time	Min	Time
36.9	24.2	0.0	-17.6



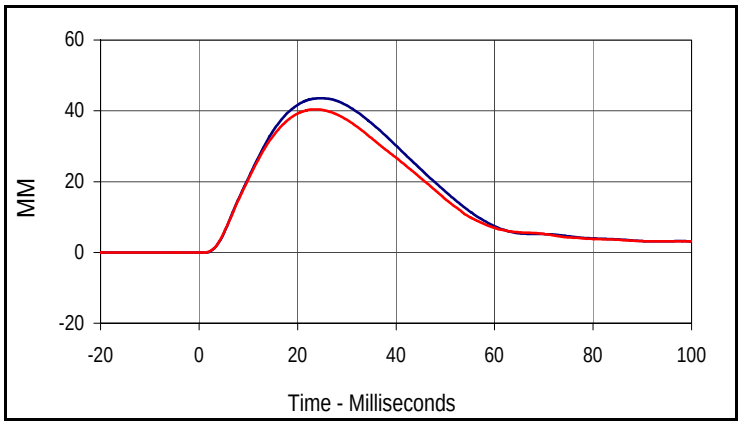
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
16.0	18.3	-6.2	50.6
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
8.4	15.5	-4.1	48.9



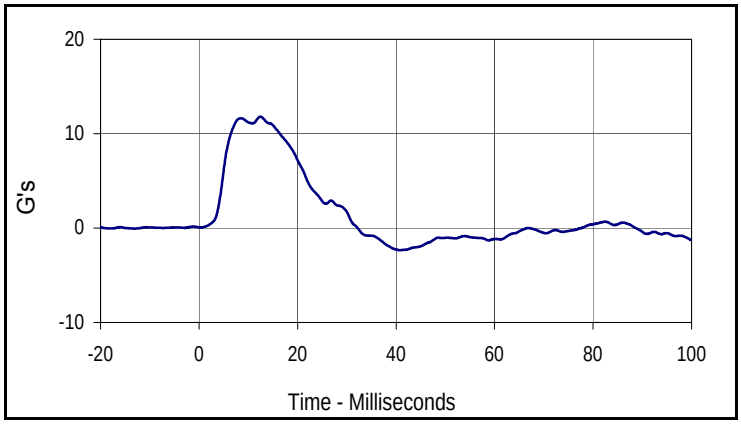
Curve Description			
Impactor Accleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.0	18.0	-0.4	65.4

Test Program:	SID IIs Abdomen Impact Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307ABD017

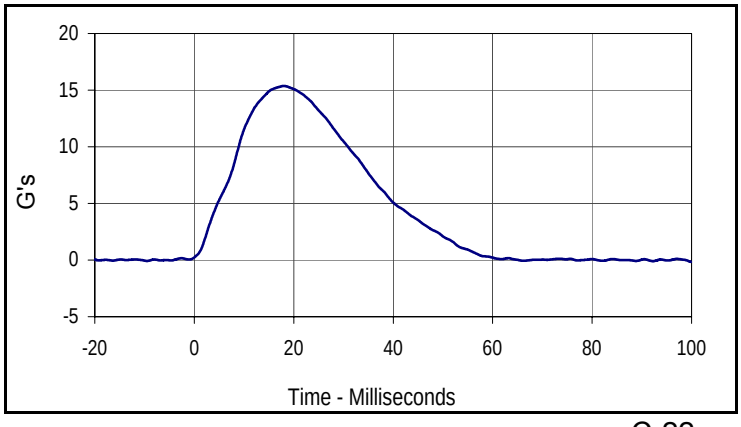
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	340	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Upper Abdominal Rib Deflection		mm	36 to 47	43.5	Pass
Peak Lower Abdominal Rib Deflection		mm	33 to 44	40.4	Pass
Peak Lower Spine Y Acceleration		G's	9 to 14	11.8	Pass
Peak Impactor Acceleration		G's	12 to 16	15.4	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
43.5	24.7	0.0	-4.3
Curve Description			
Lower Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
40.4	23.5	0.0	-9.1

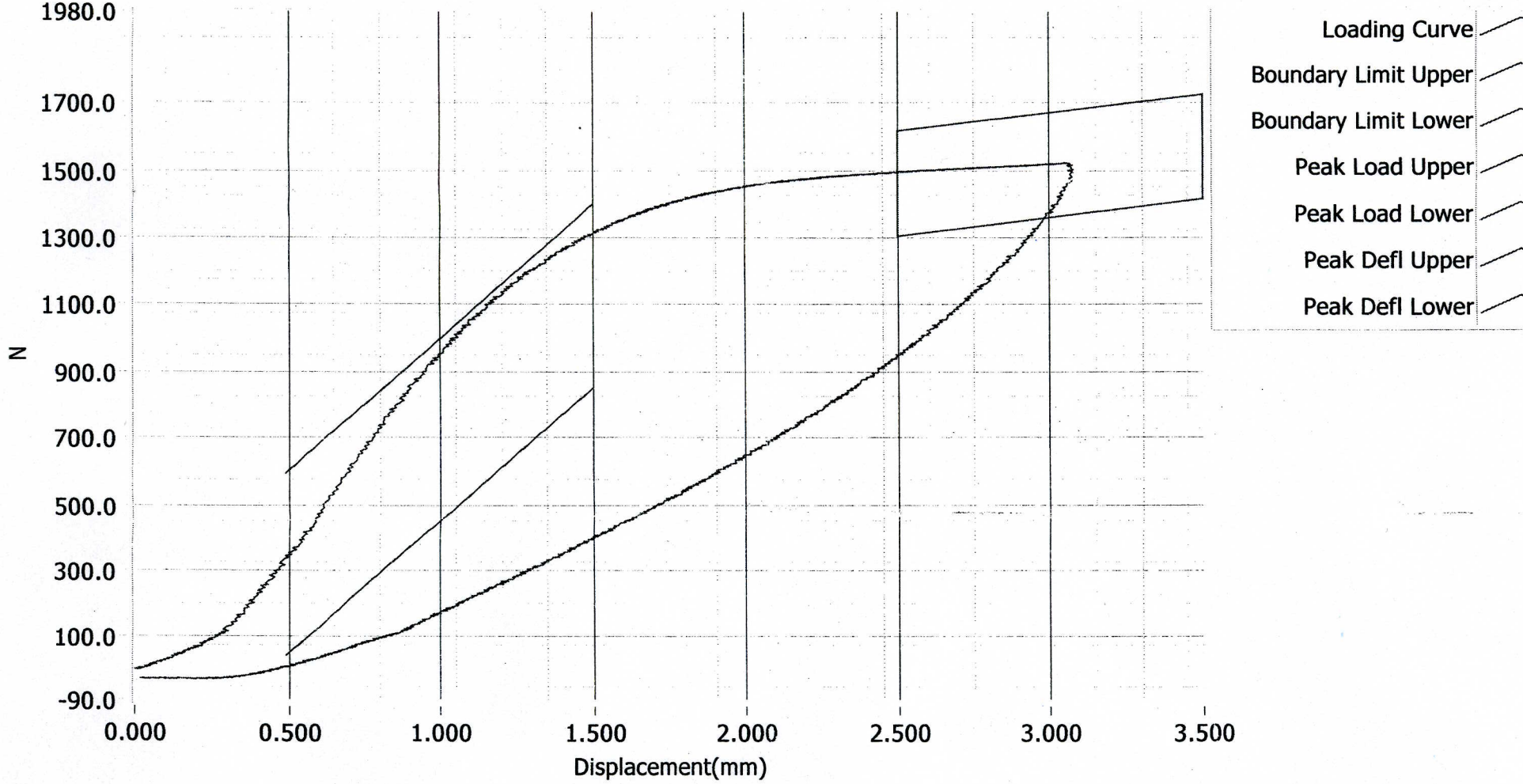


Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
11.8	12.4	-2.4	0.0



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.4	18.0	-0.2	99.9

Resultant Data - SIDIIs Plug Compression



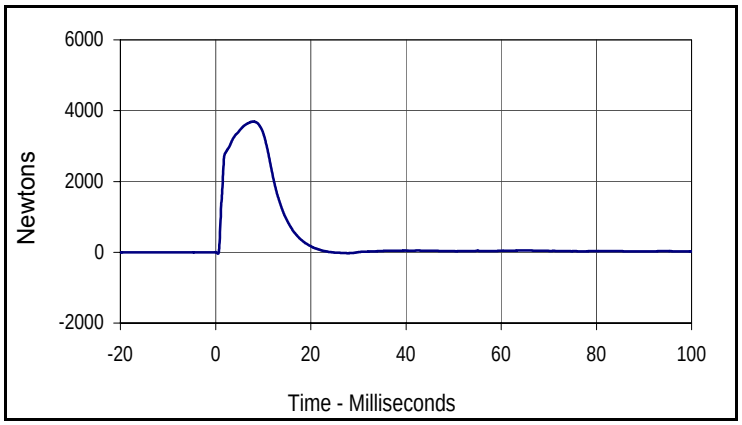
ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
		9/22/2010	12:09 PM
Cert ID	ATD Serial Number	ATD Type	
	36296	SIDIIs	

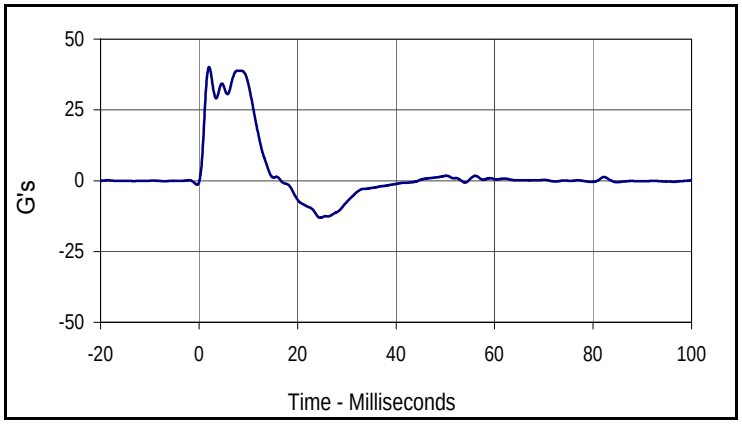
Current Date : 9/22/2010 Current Time : 12:10:21

Test Program:	SID IIs Pelvis Acetabulum Impact Test	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307ACE017

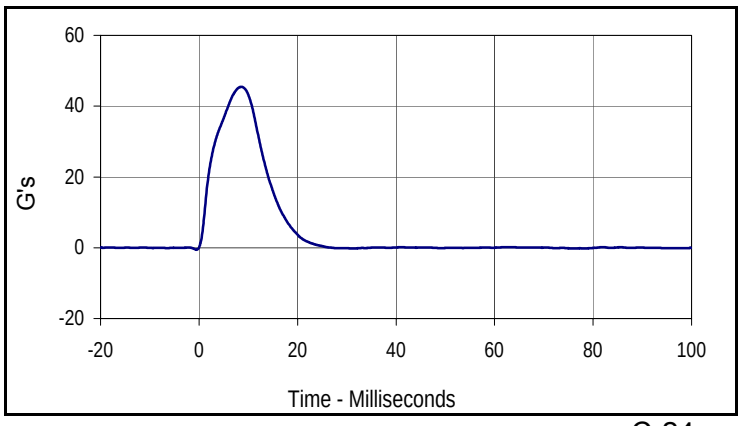
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	400	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	6.6 to 6.8	6.7	Pass
Peak Acetabulum Force Y		Newtons	3400 to 4200	3691.8	Pass
Peak Pelvis Y Acceleration After 6 msec.		G's	34 to 42	38.8	Pass
Peak Impactor Acceleration		G's	38 to 47	45.5	Pass
			Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3691.8	7.9	-39.3	0.5



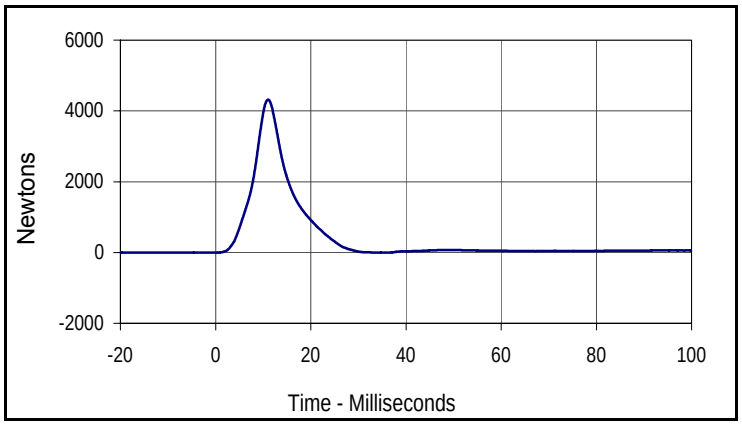
Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
40.1	2.0	-13.1	24.6



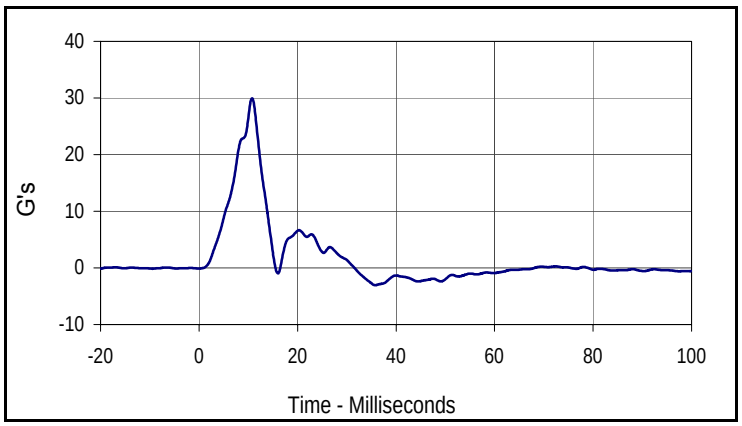
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
45.5	8.6	-0.5	-0.5

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	10/10/11
ATD Serial No.:	307	Test I.D.:	307PL017

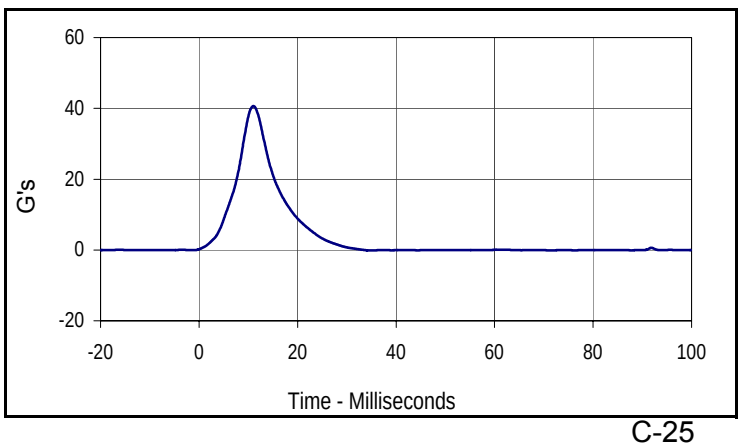
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	480	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Illiac Force		Newtons	4100 to 5100	4319.1	Pass
Peak Pelvis Y Acceleration		G's	28 to 39	30.0	Pass
Peak Impactor Acceleration		G's	36 to 45	40.7	Pass
			Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4319.1	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
30.0	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
40.7	11.0	-0.1	76.4

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

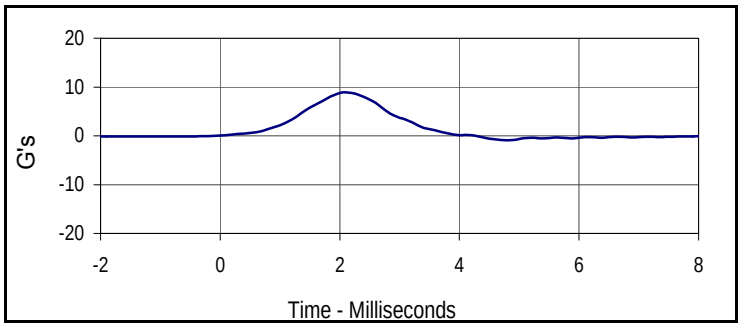
Test Program:	ES2re External Measurements	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	N/A

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
1	Sitting Height	mm	900 - 918	908	Pass
2	Seat to Shoulder Joint	mm	558 - 572	564	Pass
3	Seat to Lower Face of Thoracic Spine Box	mm	346 - 356	353	Pass
4	Seat to Hip Joint (Center of Bolt)	mm	97 - 103	100	Pass
5	Sole to Seat, Sitting	mm	333 - 451	376	Pass
6	Head Width	mm	152 - 158	156	Pass
7	Shoulder / Arm Width	mm	461 - 479	472	Pass
8	Thorax Width	mm	322 - 332	328	Pass
9	Abdomen Width	mm	273 - 287	276	Pass
10	Pelvis Lap Width	mm	359 - 373	360	Pass
11	Head Depth	mm	196 - 206	203	Pass
12	Thorax Depth	mm	262 - 272	268	Pass
13	Abdomen Width	mm	194 - 204	199	Pass
14	Pelvis Depth	mm	235 - 245	244	Pass
15	Back of Buttocks to Hip Joint (Center of Bolt)	mm	150 - 160	154	Pass
16	Back of Buttocks to Front Knee	mm	597 - 615	603	Pass
			Overall Test Results		Pass

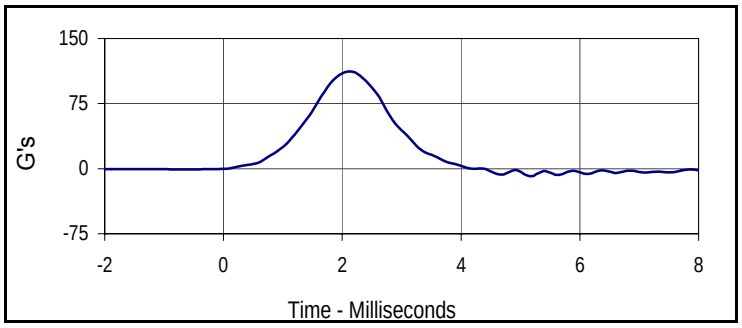
Test Program:	ES2re Head Drop Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035HD017

Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	240	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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	29.0	Pass
Peak Head Resultant Acceleration		G's	125 to 155	139.4	Pass
Peak Head X Acceleration		G's	≤15	8.9	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse		%	<15	7.0	Pass
			Overall Test Results		Pass

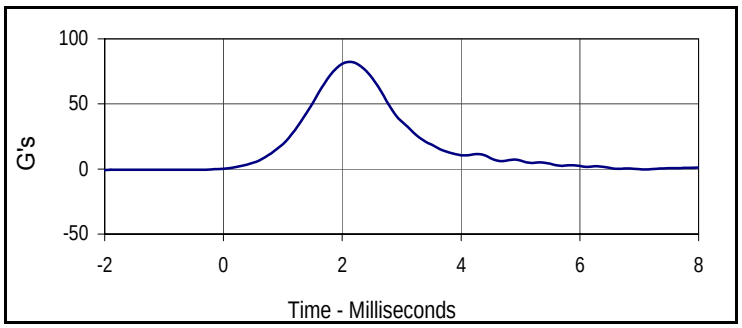
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
139.4	2.1	0.3	0.0



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
8.9	2.1	-0.9	4.8



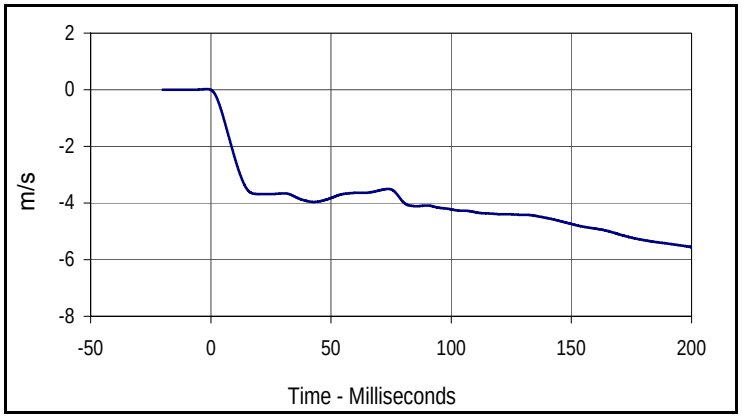
Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
112.2	2.1	-8.6	5.2



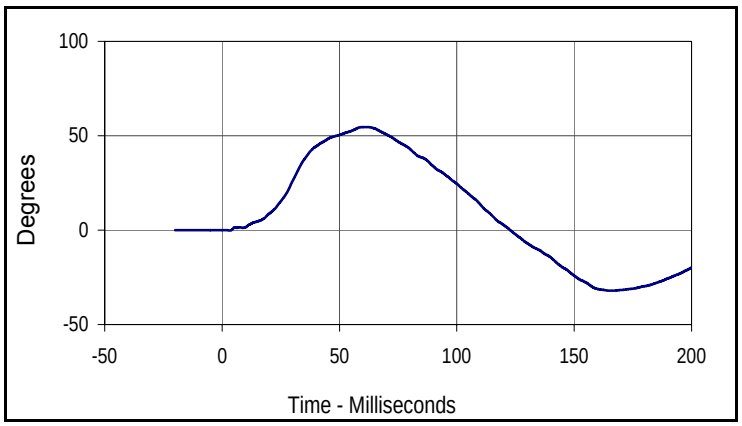
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
82.3	2.1	-0.7	-2.0

Test Program:	ES2re Neck Flexion Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035NB017

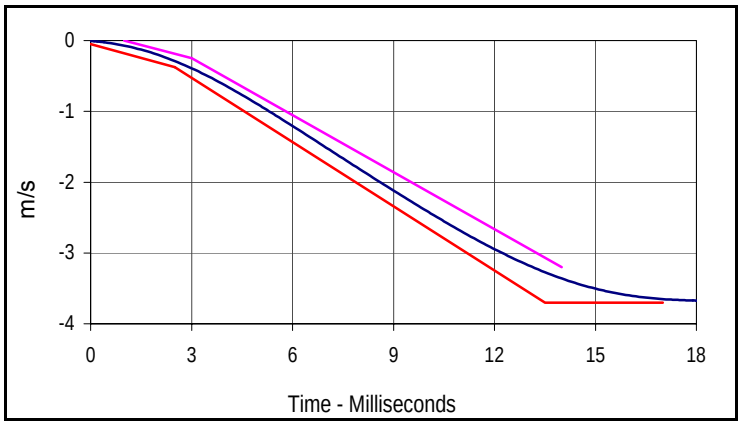
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	270	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.5	Pass
Pendulum Velocity		m/s	3.3 to 3.5	3.3	Pass
Headform Flexion	Max	Degrees	49 to 59	54.7	Pass
	Time	msec	54 to 66	61.1	Pass
Headform Flexion Decay (Peak to Zero)		msec	53 to 88	61.7	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	-1.6	-5.6	200.0



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
54.7	61.1	-32.1	165.2

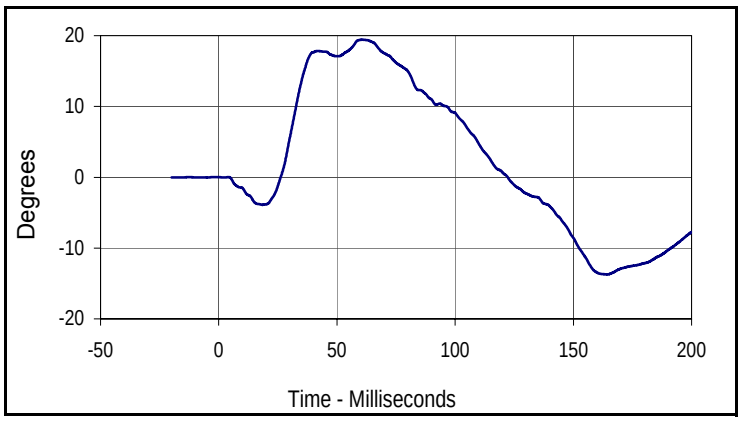


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.6	-5.6	200.0

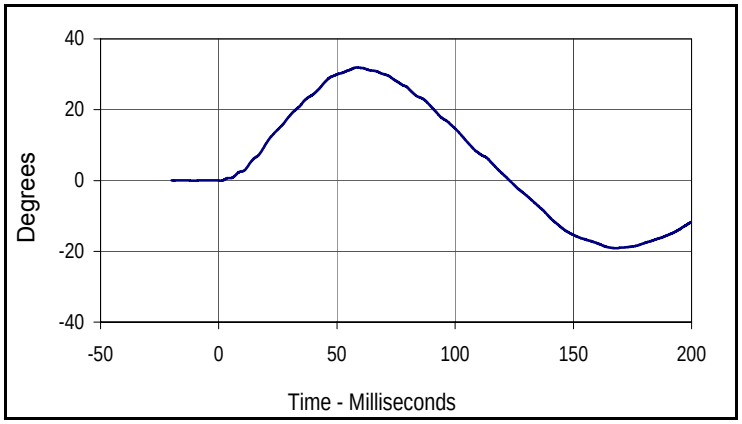
Velocity Corridors

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

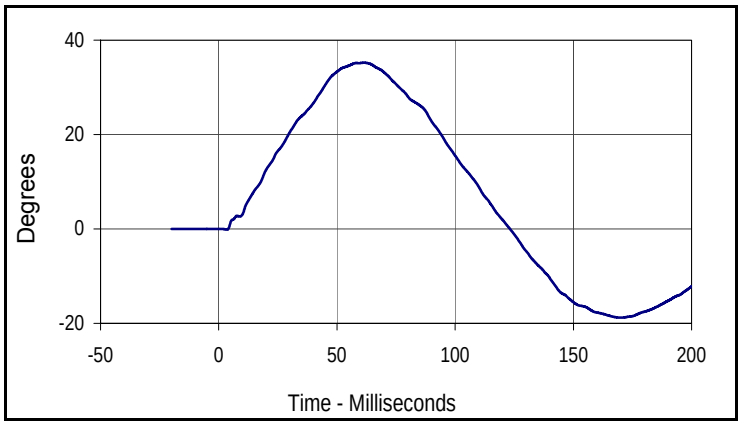
Test Program:	ES2re Neck Flexion Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035NB017



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
19.4	60.7	-13.7	164.3



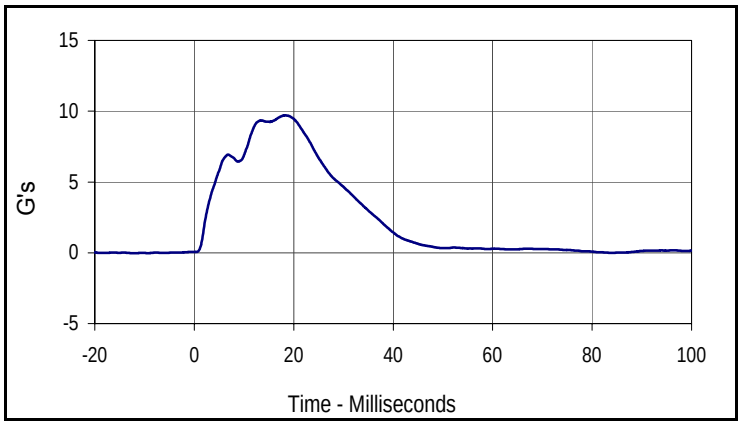
Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
31.9	58.5	-19.1	168.2



Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
35.2	61.5	-18.8	170.8

Test Program:	ES2re Shoulder Impact Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035SH017

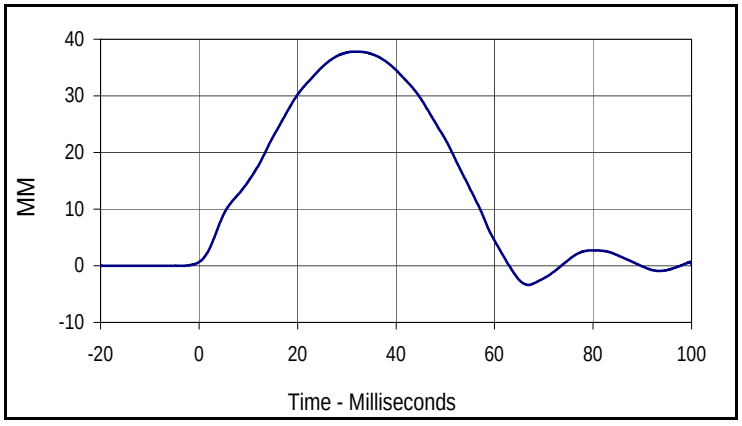
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	260	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	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



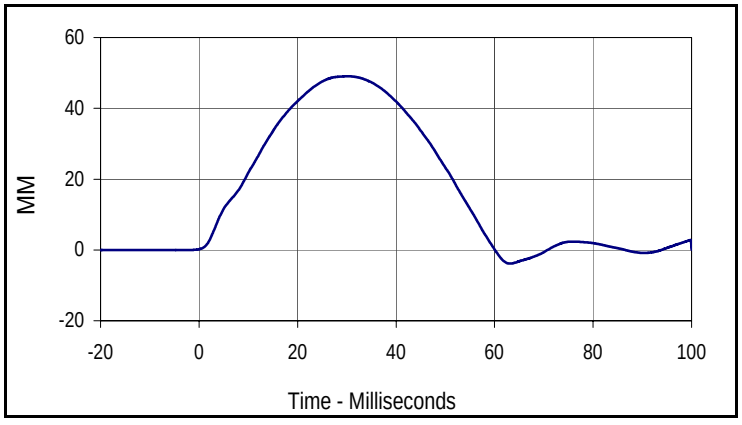
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
001	FIL	180	G's
Max	Time	Min	Time
9.7	18.3	0.0	-12.4

Test Program:	ES2re Thorax - Rib Drop Test	Test Date:	10/19/11
ATD Serial No.:	F035 Rib #1	Test I.D.:	F035RB1017

Tested Parameter		Units	Specification	Result	Pass/Fail
Rib Module Soak Time		Minutes	≥240	300	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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	30.0	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height		mm	36 to 40	37.8	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height		mm	46 to 51	49.1	Pass
			Overall Test Results		Pass



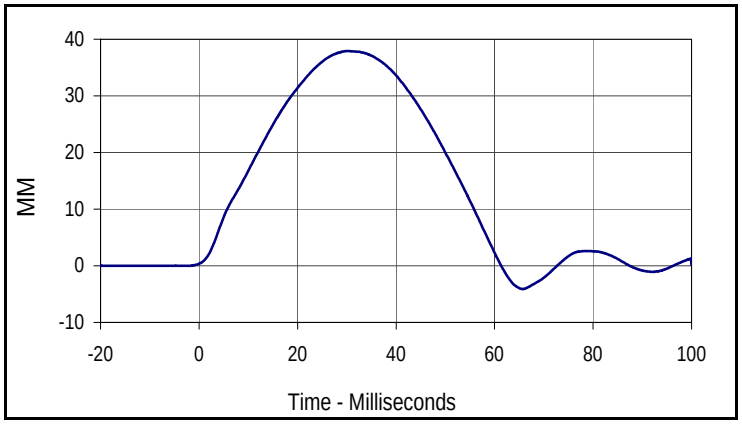
Curve Description			
Upper Rib Deflection (459 mm Drop Height)			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.8	31.4	-3.4	66.9



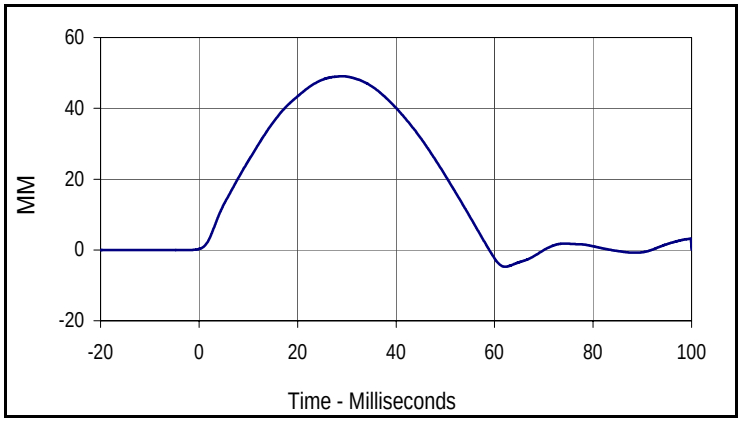
Curve Description			
Upper Rib Deflection (815 mm Drop Height)			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
49.1	30.2	-3.9	63.2

Test Program:	ES2re Thorax - Rib Drop Test	Test Date:	10/19/11
ATD Serial No.:	F035 Rib #2	Test I.D.:	F035RB2017

Tested Parameter		Units	Specification	Result	Pass/Fail
Rib Module Soak Time		Minutes	≥240	340	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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
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	49.1	Pass
			Overall Test Results		Pass



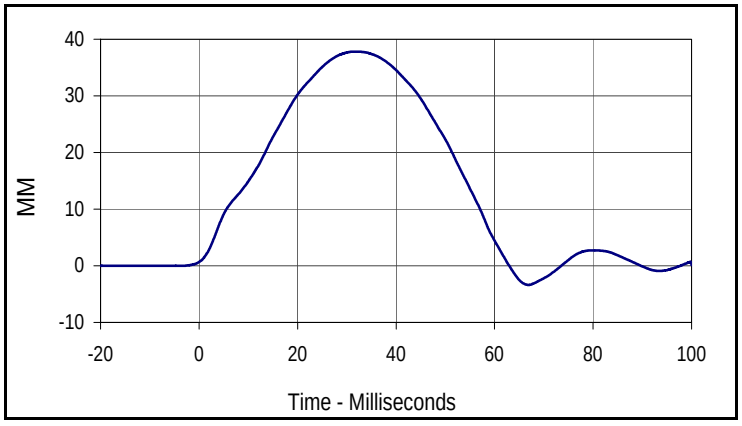
Curve Description			
Middle Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.9	30.2	-4.1	65.7



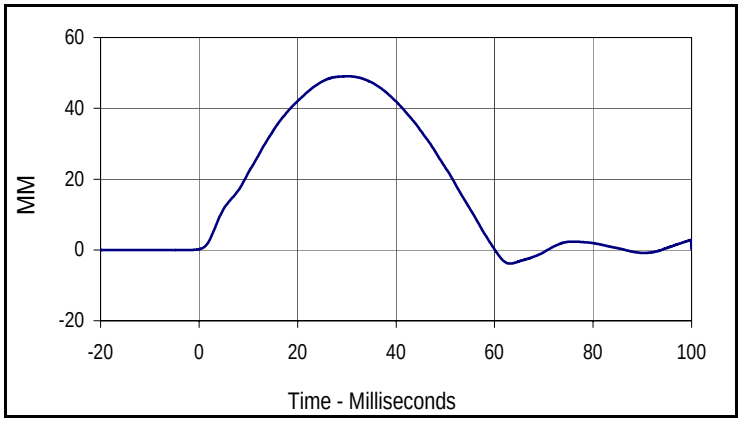
Curve Description			
Middle Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max	Time	Min	Time
49.1	29.1	-4.8	62.2

Test Program:	ES2re Thorax - Rib Drop Test	Test Date:	10/19/11
ATD Serial No.:	F035 Rib # 3	Test I.D.:	F035RB3017

Tested Parameter		Units	Specification	Result	Pass/Fail
Rib Module Soak Time		Minutes	≥240	390	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.5	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Peak Rib Deflection at 459 +/- 5 mm Drop Height		mm	36 to 40	37.8	Pass
Peak Rib Deflection at 815 +/- 8 mm Drop Height		mm	46 to 51	49.1	Pass
			Overall Test Results		Pass



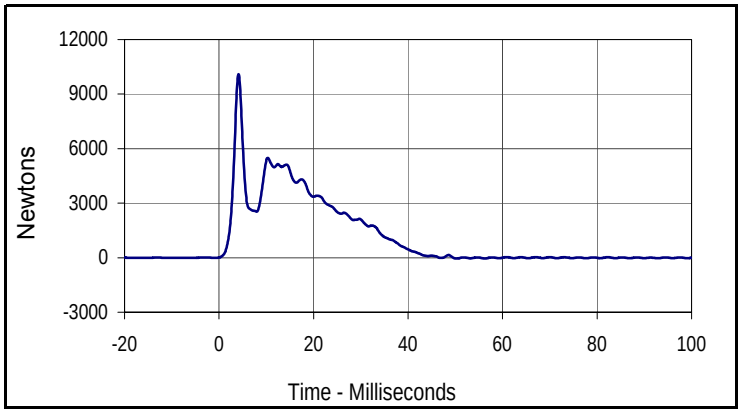
Curve Description			
Lower Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
37.8	31.4	-3.4	66.9



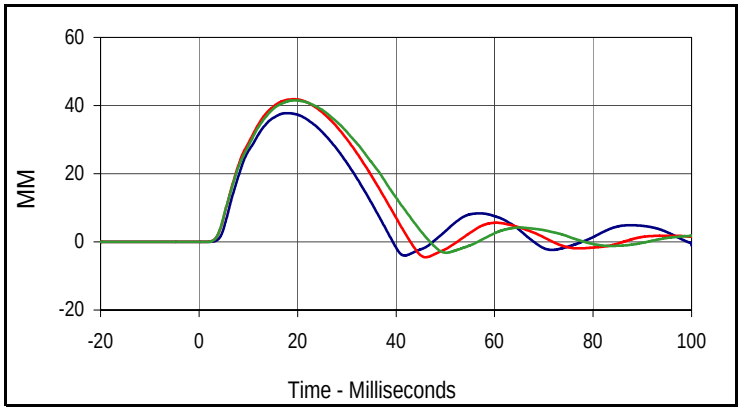
Curve Description			
Lower Rib Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	180	MM
Max	Time	Min	Time
49.1	30.2	-3.9	63.2

Test Program:	ES2re Thorax - Full Body Impact Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035TH017

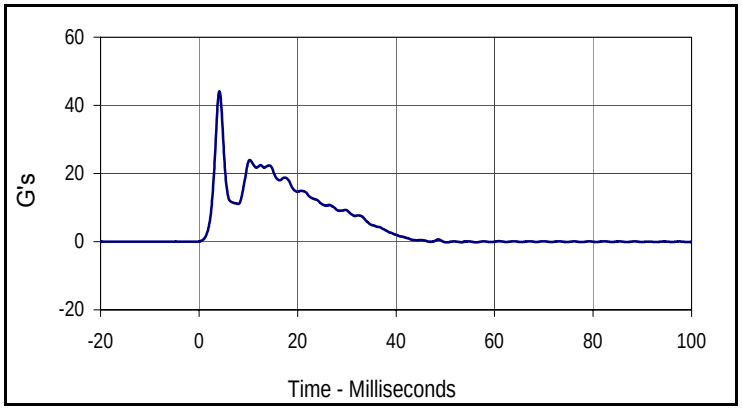
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	300	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Peak Impactor Velocity		m/s	5.4 to 5.6	5.5	Pass
Peak Impactor Force		N	5100 to 6200	5492.0	Pass
		msec	> 6.0 msec	10.3	Pass
Peak Upper Rib Deflection		mm	34 to 41	37.8	Pass
Peak Middle Rib Deflection		mm	37 to 45	41.8	Pass
Peak Lower Rib Deflection		mm	37 to 44	41.5	Pass
			Overall Test Results		Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
10104.4	4.1	-49.8	50.2



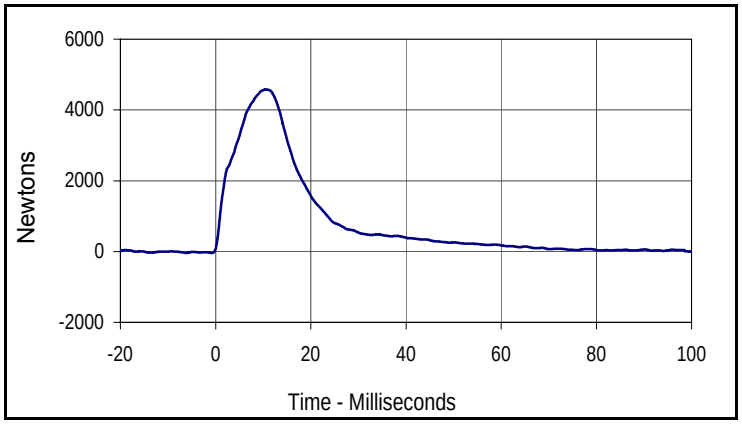
Curve Description			
Upper, Middle, Lower Rib Deflections			
Plot No.	Type	SAE Class	Units
002	FIL	180	MM
Max (Upper)	Time	Min (Upper)	Time
37.8	17.8	-4.0	41.8
Max (Middle)	Time	Min (Middle)	Time
41.8	19.2	-4.5	46.0
Max (Lower)	Time	Min (Lower)	Time
41.5	19.3	-3.2	50.2



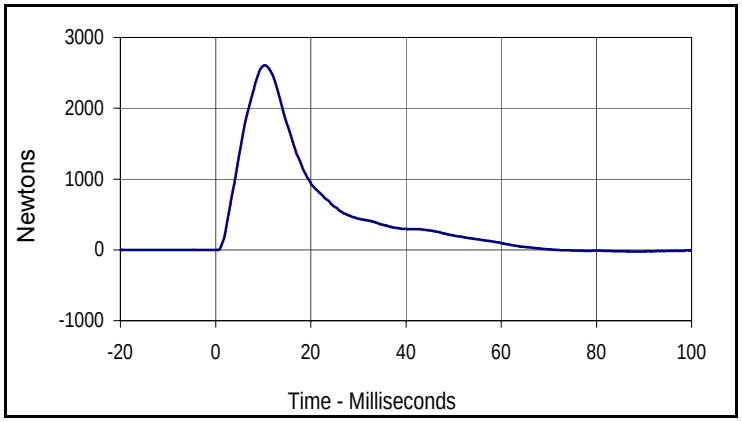
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
44.1	4.1	-0.2	50.2

Test Program:	ES2re Abodomen Impact Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035ABD017

Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	340	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	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	30.0	Pass
Probe Velocity		m/s	3.9 to 4.1	4.0	Pass
Peak Impactor Force		N	4000 to 4800	4582.9	Pass
		msec	10.6 to 13.0	11.9	Pass
Sum of Abdominal Forces		N	2200 to 2700	2607.2	Pass
		msec	10.0 to 12.3	11.7	Pass
			Overall Test Results		Pass

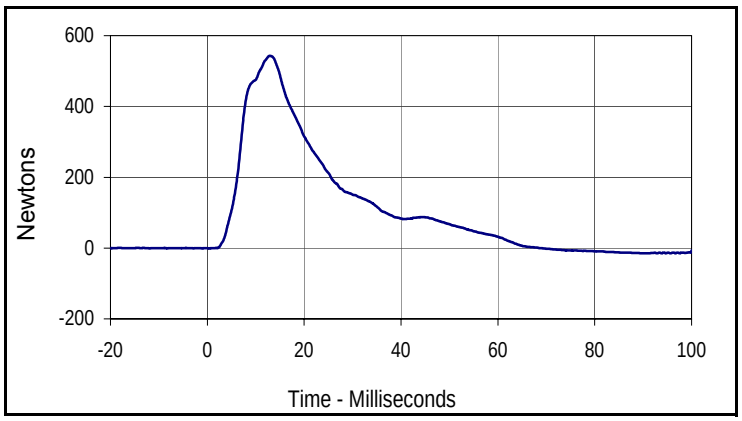


Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4582.9	11.9	-39.2	0.6

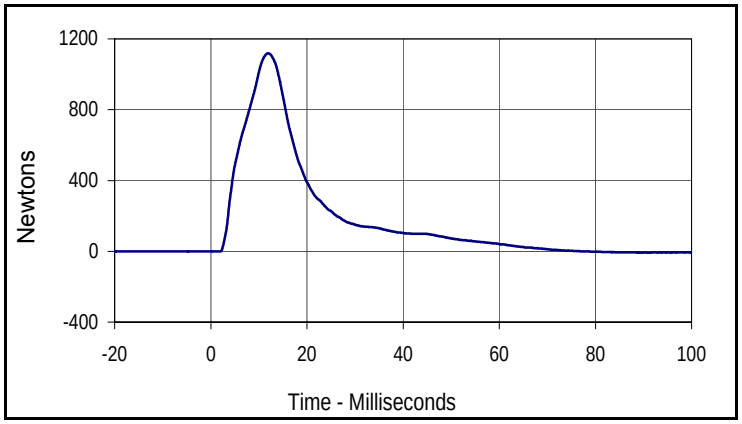


Curve Description			
Abdomen Sum Resultant			
Plot No.	Type	SAE Class	Units
002	RES	600	Newtons
Max	Time	Min	Time
2607.2	11.7	-24.1	89.5

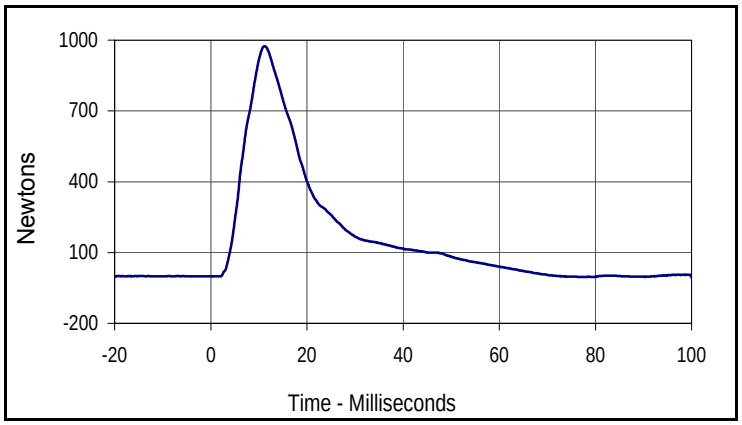
Test Program:	ES2re Abodomen Impact Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035ABD017



Curve Description			
Front Abdomen Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	Newtons
Max	Time	Min	Time
543.0	12.9	-15.0	92.9



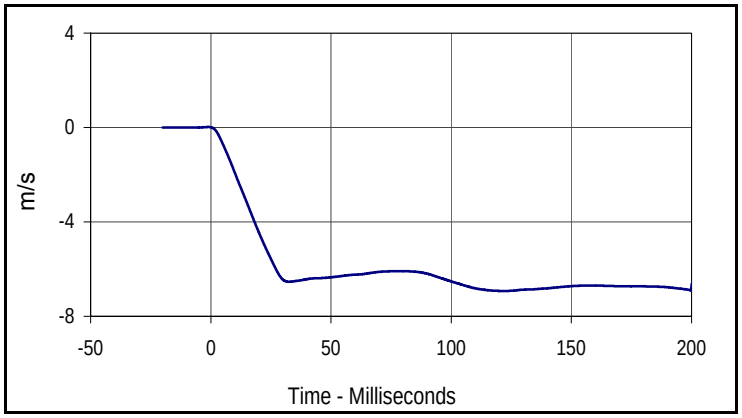
Curve Description			
Middle Abdomen Force			
Plot No.	Type	SAE Class	Units
004	FIL	600	Newtons
Max	Time	Min	Time
1118.8	11.9	-8.5	0.0



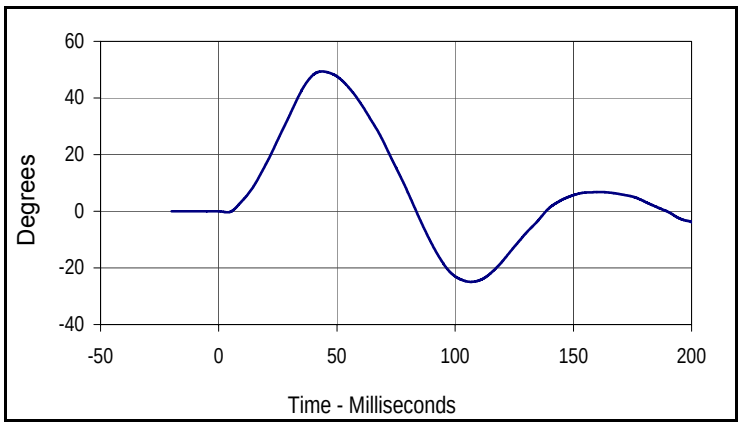
Curve Description			
Rear Abdomen Force			
Plot No.	Type	SAE Class	Units
005	FIL	600	Newtons
Max	Time	Min	Time
974.5	11.2	-8.5	0.0

Test Program:	ES2re Lumbar Flexion Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035LB017

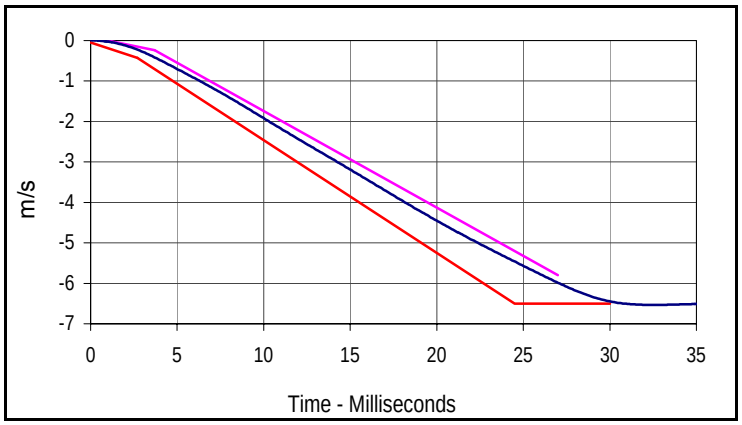
Tested Parameter		Units	Specification	Result	Pass/Fail
Lumbar Spine Assembly Soak Time		Minutes	≥240	370	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Velocity		m/s	5.95 to 6.15	6.05	Pass
Headform Rotation	Max	Degrees	45 to 55	49.4	Pass
	Time	msec	39 to 53	43.7	Pass
Time of Decay to Zero Angle from Peak		msec	37 to 57	39.9	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	-1.0	-6.9	122.2



Curve Description			
Headform Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	180	Degrees
Max	Time	Min	Time
49.4	43.7	-24.9	106.7

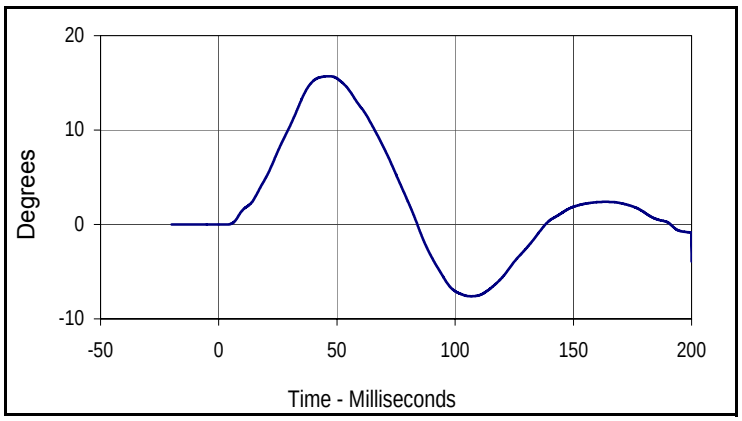


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	60	m/s
Max	Time	Min	Time
0.0	-1.0	-6.9	122.2

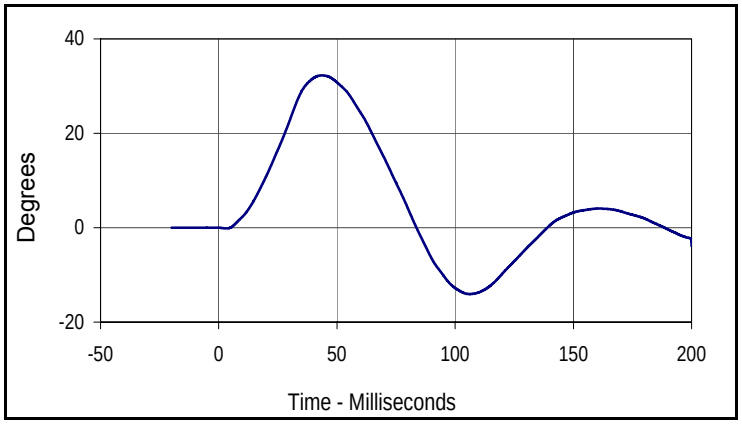
Velocity Corridors

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

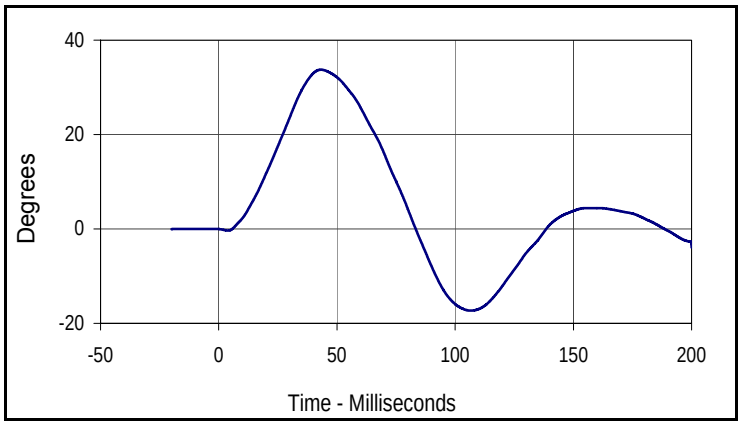
Test Program:	ES2re Lumbar Flexion Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035LB017



Curve Description			
Potentiometer A			
Plot No.	Type	SAE Class	Units
003	FIL	180	Degrees
Max	Time	Min	Time
15.7	46.5	-7.6	106.8



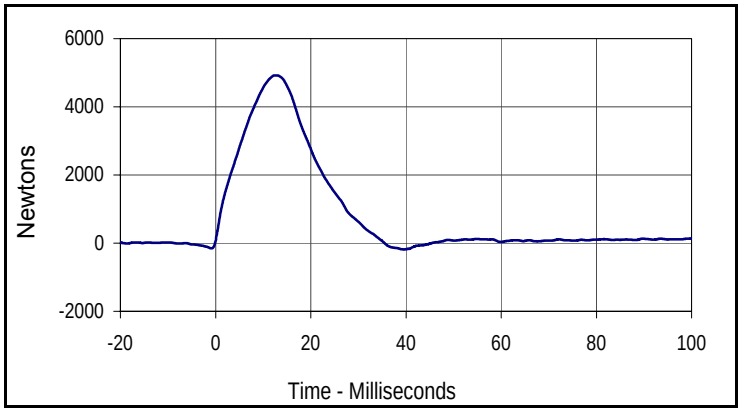
Curve Description			
Potentiometer B			
Plot No.	Type	SAE Class	Units
004	FIL	180	Degrees
Max	Time	Min	Time
32.3	43.6	-14.1	106.1



Curve Description			
Potentiometer C			
Plot No.	Type	SAE Class	Units
005	FIL	180	Degrees
Max	Time	Min	Time
33.7	43.3	-17.3	106.7

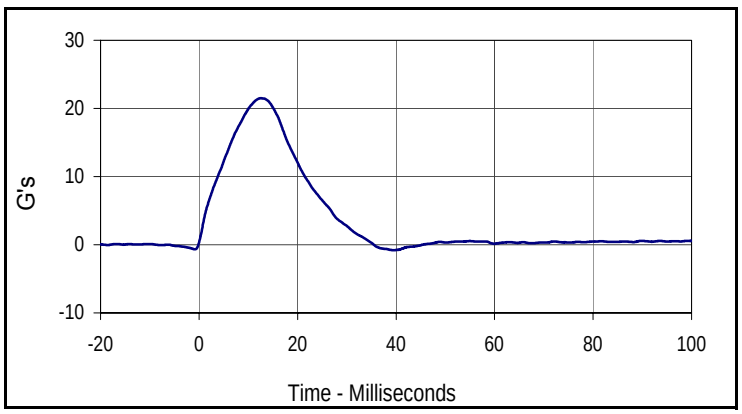
Test Program:	ES2re Pelvis Impact Test	Test Date:	10/19/11
ATD Serial No.:	F035	Test I.D.:	F035PL017

Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	400	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Impactor Force		N	4700 to 5400	4921.9	Pass
		msec	11.8 to 16.1	12.5	Pass
Peak Pubic Symphysis Load		N	-1230 to -1590	-1358.3	Pass
		msec	12.2 to 17.0	13.8	Pass
			Overall Test Results		Pass



Curve Description			
Impactor Force			
Plot No.	Type	SAE Class	Units
001	FIL	180	Newtons
Max	Time	Min	Time
4921.9	12.5	-184.4	39.5

Curve Description			
Pubic Symphysis Force Y			
Plot No.	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
93.6	36.2	-1358.3	13.8



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
21.5	12.5	-0.8	39.5

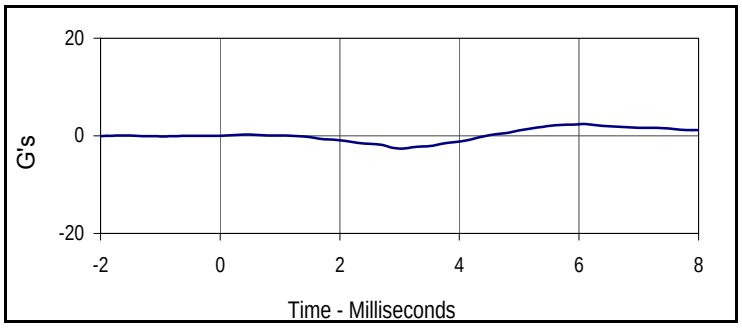
Test Program:	SID IIs External Measurements	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	N/A

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
A	Sitting Height	mm	772 - 788	776	Pass
B	Shoulder Pivot Height	mm	437 - 453	441	Pass
C	H-Point Height	mm	79 - 89	80	Pass
D	H-Point from Seatback	mm	141 - 151	149	Pass
E	Shoulder Pivot from Backline	mm	97 - 107	102	Pass
F	Thigh Clearance	mm	119 - 135	125	Pass
G	Head Breadth	mm	140 - 148	145	Pass
H	Head Back from Backline	mm	40 - 46	43	Pass
I	Head Depth	mm	178 - 188	182	Pass
J	Head Circumference	mm	541 - 551	548	Pass
K	Buttock to Knee Length	mm	514 - 540	525	Pass
L	Popliteal Height	mm	343 - 369	348	Pass
M	Knee Pivot to Floor Height	mm	392 - 409	399	Pass
N	Buttock Popliteal Length	mm	416 - 442	430	Pass
O	Chest Depth w/o Jacket	mm	195 - 211	205	Pass
P	Foot Length	mm	216 - 232	219	Pass
Q	Hip Breadth with Pelvic Plug	mm	313 -323	316	Pass
R	Arm Length	mm	249 - 259	251	Pass
S	Knee Joint to Seatback	mm	477 - 493	480	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	875	Pass
Z	Waist Circumference	mm	760 - 791	773	Pass
			Overall Test Results		Pass

Test Program:	SID IIs Head Drop Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307HD018

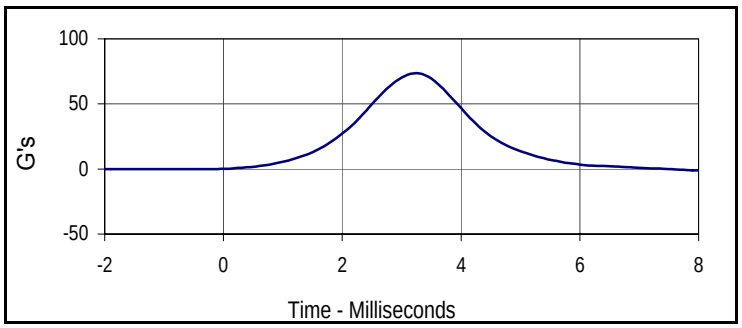
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	375	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.9	Pass
Peak Head Resultant Acceleration		G's	115 to 137	127.4	Pass
Peak Head X Acceleration		G's	<15	2.7	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse		%	<15	14.3	Pass
			Overall Test Results		Pass

Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
127.4	3.2	0.0	-0.6



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.4	6.0	-2.7	3.0

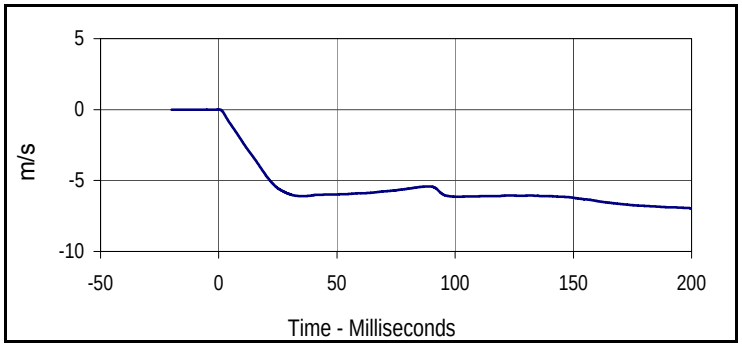
Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
104.1	3.2	-4.4	7.3



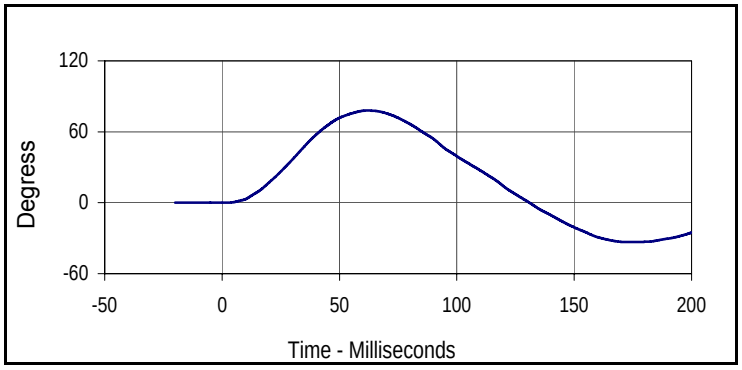
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	G's
Max	Time	Min	Time
73.5	3.2	-2.0	0.0

Test Program:	SID IIs Neck Flexion Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307NB018

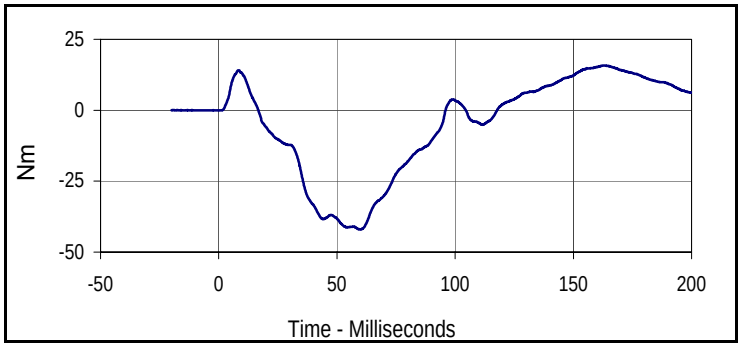
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	395	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.60	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.27	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	-5.55	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.14	Pass
D-Plane Rotation	Max	Degrees	71 to 81	78.0	Pass
	Time	msec	50 to 70	61.8	Pass
Peak Occipital Condyle Moment		Nm	-36 to -44	-42.0	Pass
Decaying Moment Time to Cross 0 Nm		msec	102 to 126	117.8	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
0.0	-0.1	-6.9	200.0



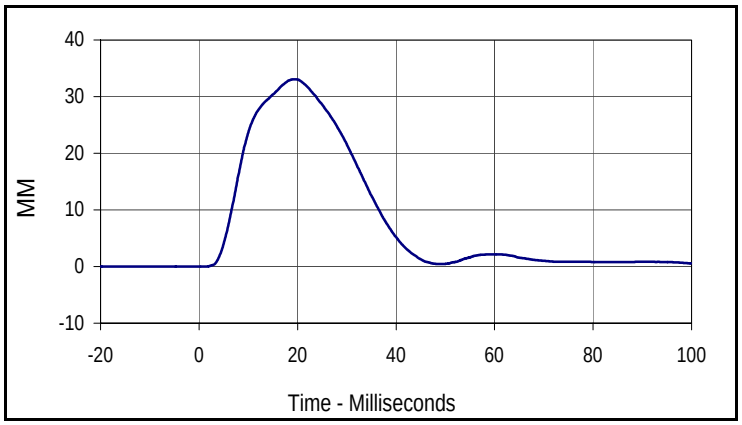
Curve Description			
Maximum Translation Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	Degress
Max	Time	Min	Time
78.0	61.8	-33.3	172.1



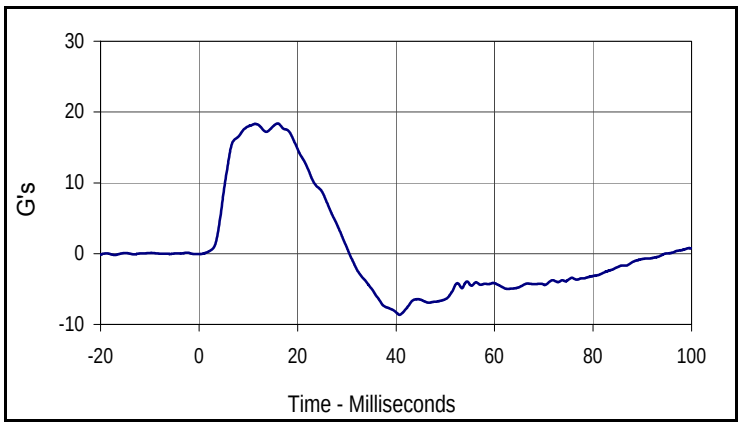
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
15.8	162.8	-42.0	59.6

Test Program:	SID IIs Shoulder Impact Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307SH018

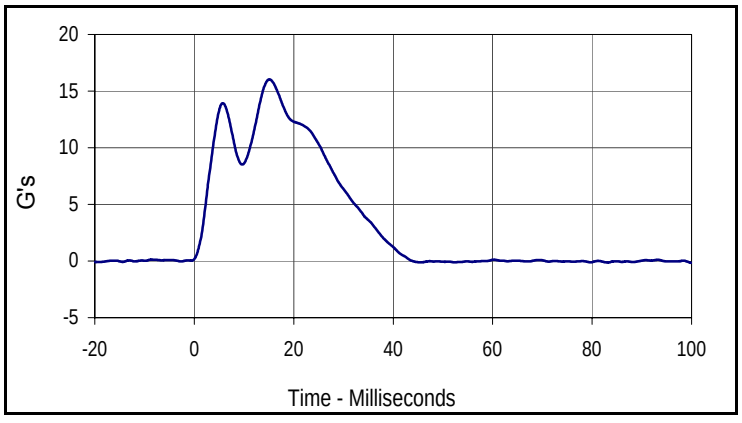
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	440	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.7	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.7	Pass
Impactor Velocity		m/s	4.20 to 4.40	4.33	Pass
Peak Shoulder Deflection		mm	28 to 37	33.1	Pass
Peak Lateral Spine Acceleratrion Y		G's	17 to 22	18.4	Pass
Peak Impactor Acceleration		G's	13 to 18	16.0	Pass
			Overall Test Results		Pass



Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
33.1	19.2	0.0	-19.7



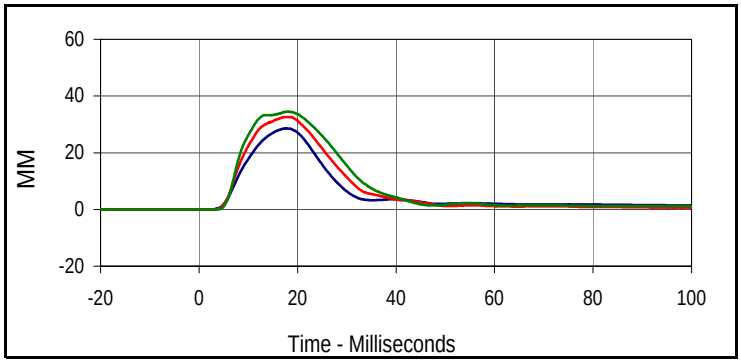
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
18.4	16.0	-8.6	40.7



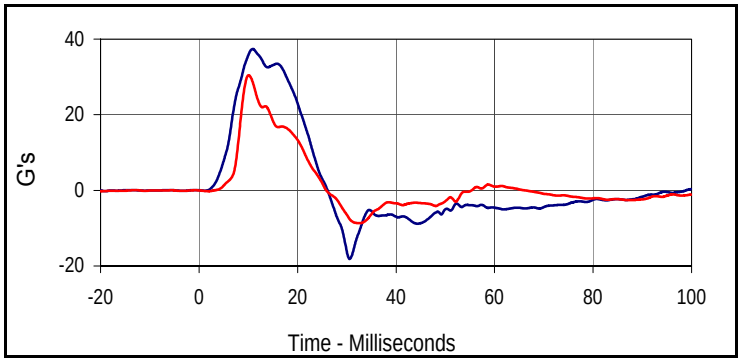
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
16.0	15.1	-0.2	99.9

Test Program:	SID IIs Thorax with Arm Impact Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307TWA018

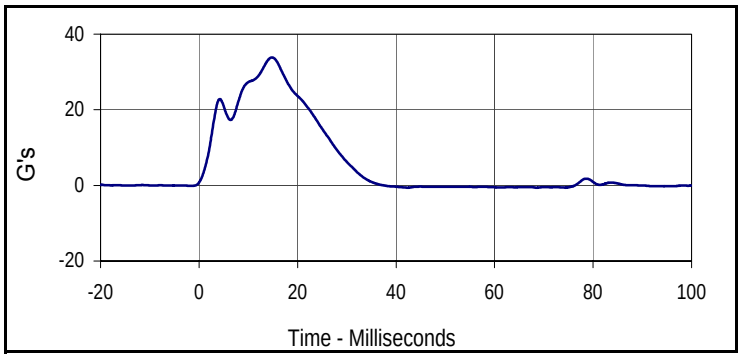
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	470	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	30.0	Pass
Impactor Velocity		m/s	6.6 to 6.8	6.7	Pass
Peak Shoulder Deflection		mm	31 to 40	33.5	Pass
Peak Upper Thorax Rib Deflection		mm	25 to 32	28.6	Pass
Peak Middle Thorax Rib Deflection		mm	30 to 36	32.6	Pass
Peak Lower Thorax Rib Deflection		mm	32 to 38	34.5	Pass
Peak Upper Spine Y Acceleration		G's	34 to 43	37.4	Pass
Peak Lower Spine Y Acceleration		G's	29 to 37	30.5	Pass
Peak Impactor Acceleration		G's	30 to 36	33.8	Pass
			Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
28.6	17.8	0.0	-6.1
Middle Thorax Deflection			
Max	Time	Min	Time
32.6	17.8	0.0	-4.1
Lower Thorax Deflection			
Max	Time	Min	Time
34.5	18.2	0.0	2.3

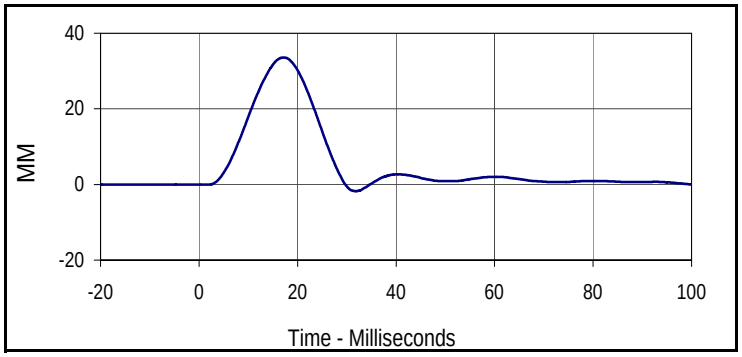


Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
37.4	10.9	-18.1	30.6
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
30.5	10.1	-8.7	32.7



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
33.8	14.8	-0.6	42.4

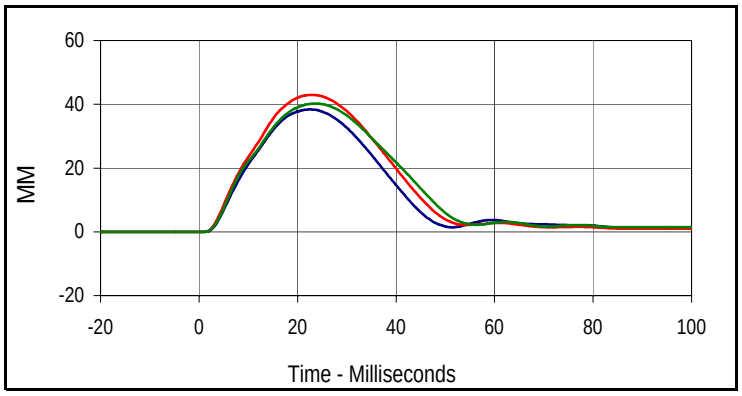
Test Program:	SID IIs Thorax with Arm Impact Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307TWA018



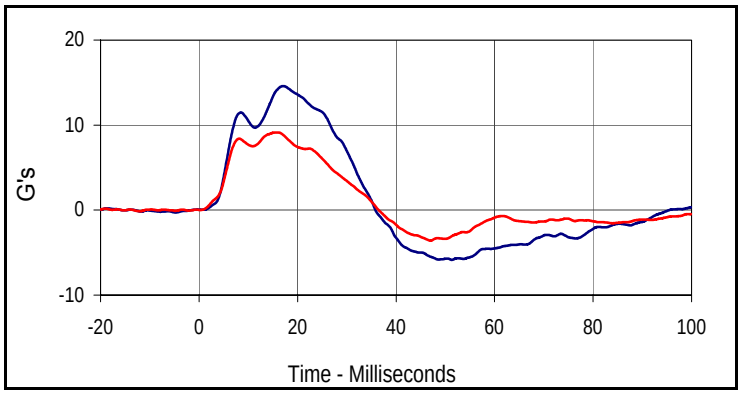
Curve Description			
Shoulder Deflection			
Plot No.	Type	SAE Class	Units
007	FIL	600	MM
Max	Time	Min	Time
33.5	17.1	-1.8	31.8

Test Program:	SID IIs Thorax without Arm Impact Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307TWOA018

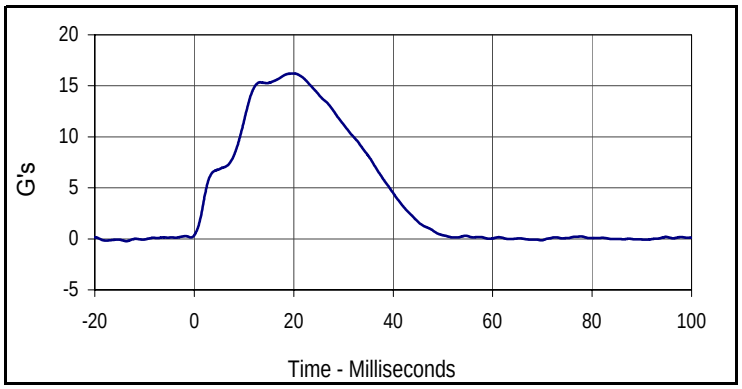
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	490	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.7	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.6	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Upper Thorax Rib Deflection		mm	32 to 40	38.4	Pass
Peak Middle Thorax Rib Deflection		mm	39 to 45	43.0	Pass
Peak Lower Thorax Rib Deflection		mm	35 to 43	40.2	Pass
Peak Upper Spine Y Acceleration		G's	13 to 17	14.6	Pass
Peak Lower Spine Y Acceleration		G's	7 to 11	9.1	Pass
Peak Impactor Acceleration		G's	14 to 18	16.2	Pass
			Overall Test Results		Pass



Curve Description			
Upper Thorax Deflection			
Plot No.	Type	SAE Class	Units
001	FIL	600	MM
Max	Time	Min	Time
38.4	22.6	0.0	-9.8
Middle Thorax Deflection			
Max	Time	Min	Time
43.0	22.9	0.0	-10.7
Lower Thorax Deflection			
Max	Time	Min	Time
40.2	23.5	0.0	-17.1



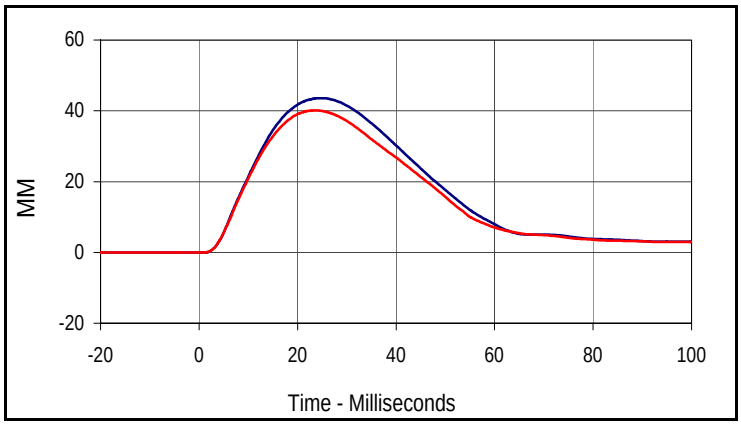
Curve Description			
Upper Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
14.6	17.1	-5.9	51.3
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
9.1	15.6	-3.6	47.0



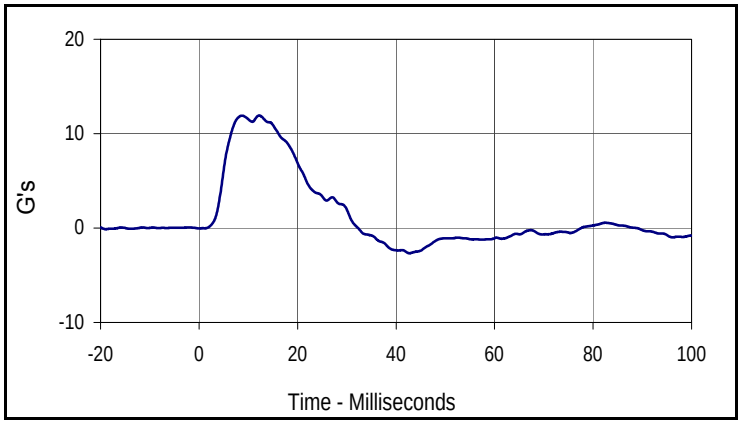
Curve Description			
Impactor Accleration			
Plot No.	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
16.2	19.9	-0.2	-13.6

Test Program:	SID IIs Abdomen Impact Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307ABD018

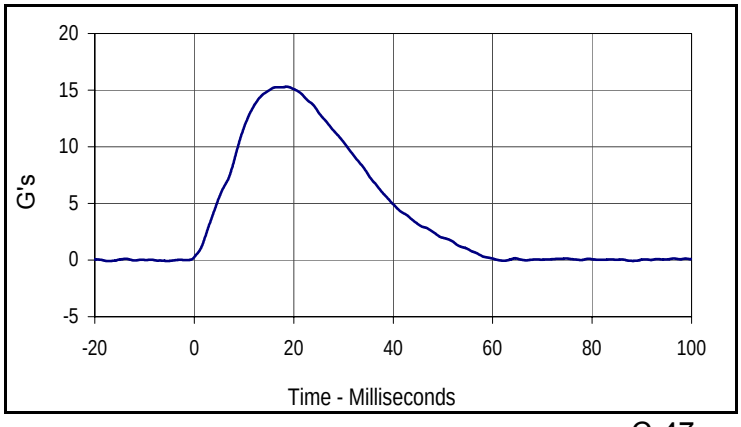
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	495	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.6	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.7	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Upper Abdominal Rib Deflection		mm	36 to 47	43.6	Pass
Peak Lower Abdominal Rib Deflection		mm	33 to 44	40.1	Pass
Peak Lower Spine Y Acceleration		G's	9 to 14	11.9	Pass
Peak Impactor Acceleration		G's	12 to 16	15.3	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
43.6	24.5	0.0	-1.7
Curve Description			
Lower Abdominal Rib Deflection			
Plot No.	Type	SAE Class	Units
002	FIL	600	MM
Max	Time	Min	Time
40.1	23.6	0.0	-12.7



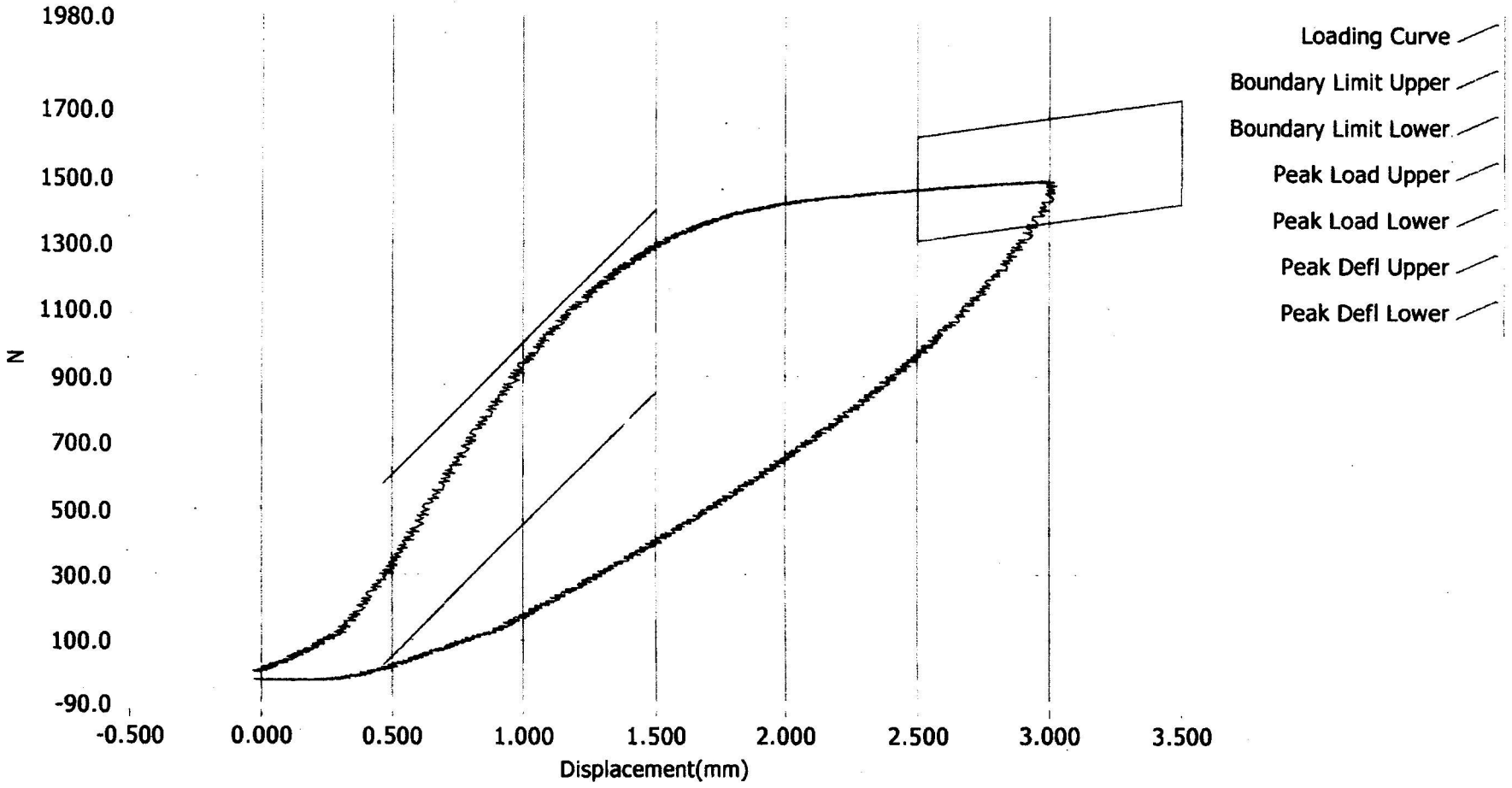
Curve Description			
Lower Spine Y Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
11.9	12.2	-2.7	42.7



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
15.3	18.6	-0.1	-5.4

MC0507 POST CAL

Resultant Data - SIDIIs Plug Compression



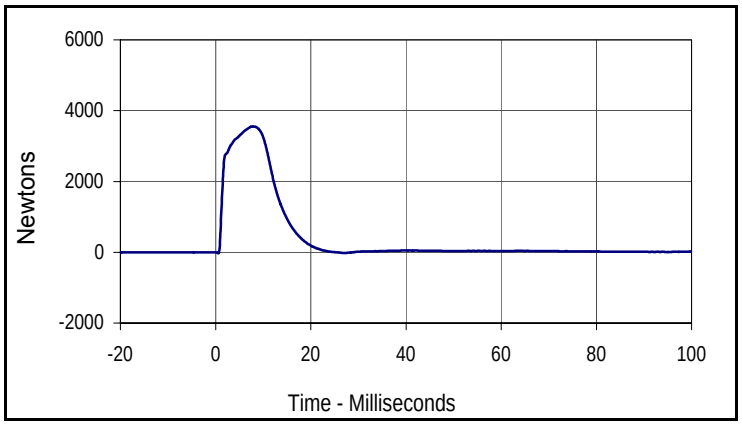
ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
		9/27/2010	5:43 PM
Cert ID	ATD Serial Number	ATD Type	
	36611	SIDIIs	

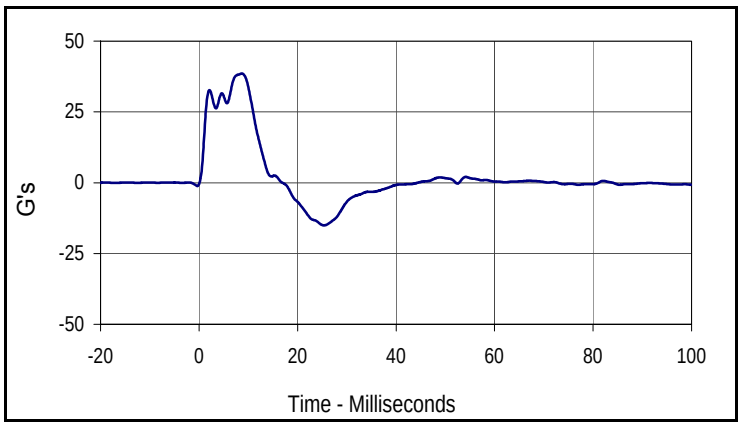
Current Date : 9/27/2010 Current Time : 17:44:01

Test Program:	SID IIs Pelvis Acetabulum Impact Test	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307ACE018

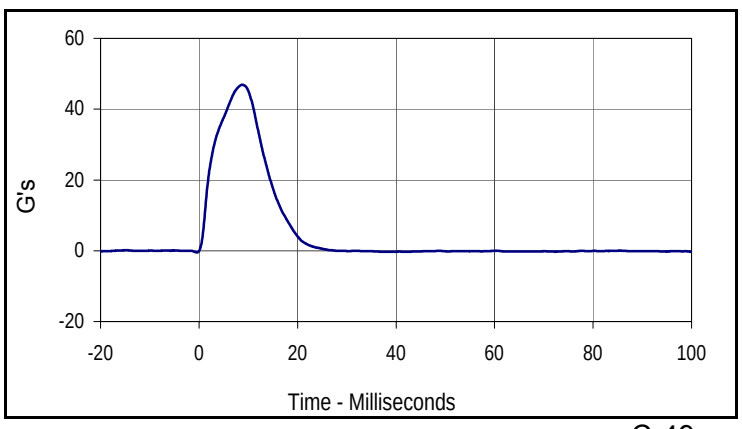
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	520	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.8	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.7	Pass
Impactor Velocity		m/s	6.6 to 6.8	6.7	Pass
Peak Acetabulum Force Y		Newtons	3400 to 4200	3555.0	Pass
Peak Pelvis Y Acceleration After 6 msec.		G's	34 to 42	38.5	Pass
Peak Impactor Acceleration		G's	38 to 47	46.9	Pass
			Overall Test Results		Pass



Curve Description			
Pelvis Acetabulum Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
3555.0	7.8	-32.9	0.6



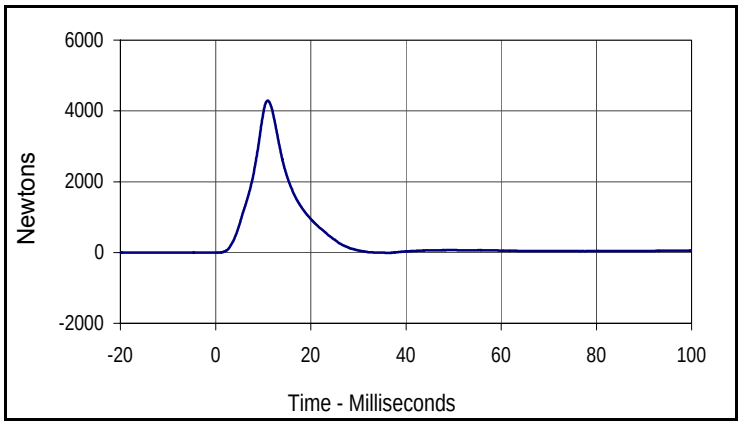
Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
38.5	8.7	-15.1	25.4



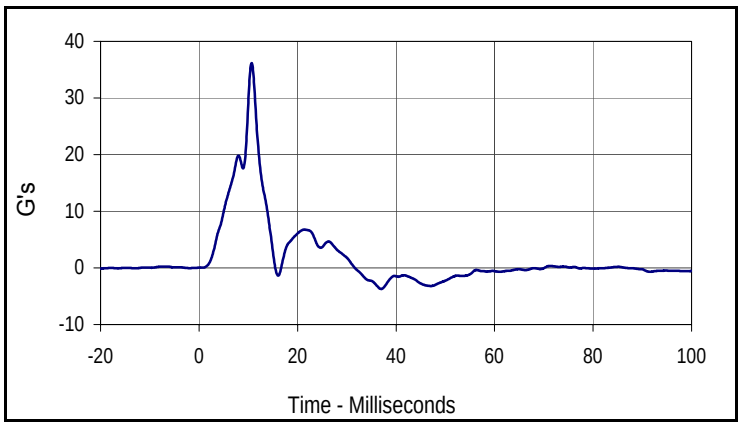
Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
46.9	8.8	-0.5	-0.4

Test Program:	SID IIs Pelvis Iliac Calibration	Test Date:	10/19/11
ATD Serial No.:	307	Test I.D.:	307PL018

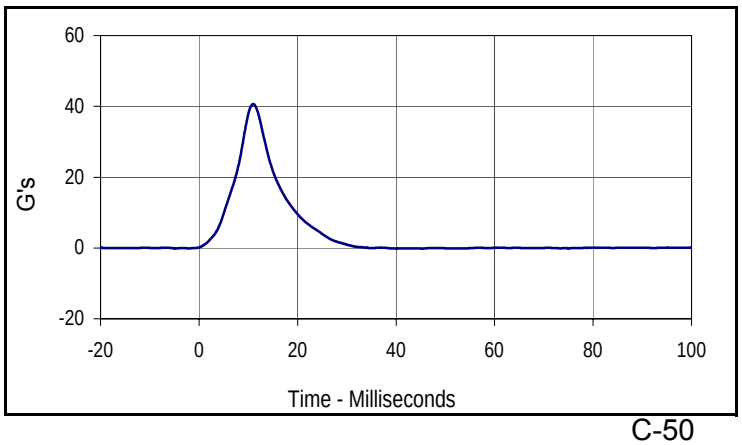
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥180	550	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.7	Pass
	Min	°C		20.8	Pass
Humidity During Soak	Max	%	10.0 to 70.0	30.0	Pass
	Min	%		29.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.7	Pass
Impactor Velocity		m/s	4.2 to 4.4	4.3	Pass
Peak Illiac Force		Newtons	4100 to 5100	4291.2	Pass
Peak Pelvis Y Acceleration		G's	28 to 39	36.1	Pass
Peak Impactor Acceleration		G's	36 to 45	40.7	Pass
			Overall Test Results		Pass



Curve Description			
Pelvis Iliac Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4291.2	11.0	-9.5	35.8



Curve Description			
Pelvis Y Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	180	G's
Max	Time	Min	Time
36.1	10.7	-3.7	37.0



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
003	FIL	180	G's
Max	Time	Min	Time
40.7	11.0	-0.2	45.3

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N F035		
			Serial Number	Manufacturer	Calibration
Head Accelerometers		X	P58760	Endevco	9/12/11
		Y	P58763	Endevco	9/12/11
		Z	P52093	Endevco	9/9/11
Thorax Rib Displacement Potentiometers	Upper	Y	180	FTSS	7/20/11
	Middle	Y	177	FTSS	7/20/11
	Lower	Y	186	FTSS	7/20/11
Abdomen Load Cells	Forward	Y	1514	Denton	7/22/11
	Middle	Y	1510	Denton	7/22/11
	Rear	Y	1515	Denton	7/22/11
Lower Spine Accelerometers (T12)		X	P49165	Endevco	9/12/11
		Y	P49212	Endevco	9/12/11
		Z	P52113	Endevco	9/12/11
Pubic Symphysis Load Cell		Y	506	Denton	7/22/11

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 307		
				Serial Number	Manufacturer	Calibration
Head Accelerometers			X	P58900	Endevco	7/5/11
			Y	P58902	Endevco	7/5/11
			Z	P58983	Endevco	7/5/11
Displacement Potentiometers	Shoulder		Y	1244	FTSS	7/1/11
	Thoracic Rib	Upper	Y	1249	FTSS	7/1/11
		Middle	Y	1265	FTSS	7/1/11
		Lower	Y	1277	FTSS	7/1/11
	Abdominal Rib	Upper	Y	1286	FTSS	7/1/11
		Lower	Y	1290	FTSS	7/1/11
Lower Spine Accelerometers (T12)			X	P59007	Endevco	7/1/11
			Y	P59015	Endevco	7/1/11
			Z	P59016	Endevco	7/1/11
Acetabulum Load Cell			Y	277	Denton	6/10/11
Iliac Wing Load Cell			Y	289	Denton	6/10/11
Pelvis Plug (Struck Side)				36443	FTSS	9/23/10
Pelvis Plug (Non-Struck Side)				36445	FTSS	9/23/10

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	Ketx5a	ICSensor	6/20/11
	Vehicle Center of Gravity	Y	Ketx5b	ICSensor	6/20/11
	Vehicle Center of Gravity	Z	Ketx5c	ICSensor	6/20/11
2	Right Sill at Front Seat	X	Ketx11a	ICSensor	7/19/11
	Right Sill at Front Seat	Y	Ketx11b	ICSensor	7/19/11
	Right Sill at Front Seat	Z	Ketx11c	ICSensor	7/19/11
3	Right Sill at Rear Seat	X	Ketx12a	ICSensor	7/20/11
	Right Sill at Rear Seat	Y	P12444	Endevco	10/17/06
	Right Sill at Rear Seat	Z	Ketx12c	ICSensor	7/21/11
4	Left Sill at Front Door	Y	J27055	Endevco	4/29/11
5	Left Sill at Rear Door	Y	J36724	Endevco	3/30/11
6	Left A-Post Lower	Y	BY98H	Endevco	3/15/11
7	Left A-Post Middle	Y	J24288	Endevco	3/22/11
8	Left B-Post Lower	Y	CY06H	Endevco	3/15/11
9	Left B-Post Middel	Y	AK96	Endevco	3/15/11
10	Front Seat Track	Y	J21907	Endevco	3/30/11
11	Rear Seat Structure	Y	N/A	N/A	N/A
12	Right Rear Occ. Compartment	Y	Keva004	ICSensor	5/8/11
13	Engine Block	X	BI60H	Endevco	7/22/11
	Engine Block	Y	AR17	Endevco	7/22/11
14	Rear Floorpan Above Axle	X	BF83H	Endevco	3/31/11
	Rear Floorpan Above Axle	Y	BG78H	Endevco	5/3/11
	Rear Floorpan Above Axle	Z	BJ54H	Endevco	8/25/11

TABLE 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	00L13-F37	Entrans	10/12/11
MDB Center of Gravity	Y	02I10-N16	Entrans	10/14/11
MDB Center of Gravity	Z	03J13_Z09	Entrans	10/14/11
Left Frame at Rear Axle Centerline	X	01J02-F13	Entrans	10/12/11
Left Frame at Rear Axle Centerline	Y	05616-L03	Entrans	10/14/11