

**FINAL REPORT NUMBER: SINCAP-TRC-12-004**

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

**Volkswagen De Mexico S.A.  
2012 Volkswagen Beetle  
NHTSA NUMBER: MC5802**

**PREPARED BY:  
Transportation Research Center Inc.  
10820 State Route 347  
P. O. Box B-67  
East Liberty, OH 43319**



**Report Date: March 8, 2012**

**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
Mail Code: NVS-111  
1200 New Jersey Ave, SE, Room W43-410  
Washington, D.C. 20590**

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Report Prepared By: ILO Project Operations Group

Report Approved By: *Margaret Susan*  
Margaret Susan, Project Manager

Approval Date: 3/8/2012

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: \_\_\_\_\_

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

Date: \_\_\_\_\_

Technical Report Documentation Page

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16. Abstract <p>This 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2012 Volkswagen Beetle 2DR Coupe in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted by Transportation Research Center Inc. in East Liberty, Ohio, on January 10, 2012.</p> <p>The impact velocity of the Moving Deformable Barrier (MDB) was 61.7 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 22° C. The target vehicle post-test maximum crush was 221 mm at Level 2. The test vehicle's performance was as follows:</p> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th colspan="4" style="text-align: center;"><b>Driver ATD (ES-2re)</b></th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>36</sub>)</td> <td style="text-align: center;">NA</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">59</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">26.1</td> </tr> <tr> <td>Total Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">1063.2</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">1900.4</td> </tr> </tbody> </table> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th colspan="4" style="text-align: center;"><b>Passenger ATD (SID-IIs)</b></th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>36</sub>)</td> <td style="text-align: center;">NA</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">363</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td style="text-align: center;">g's</td> <td style="text-align: center;">82</td> <td style="text-align: center;">46.7</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">3406.0</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">38*</td> <td style="text-align: center;">38.9</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">45*</td> <td style="text-align: center;">29.9</td> </tr> </tbody> </table> <p>* Proposed IARV</p> <p>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.</p>				<b>Driver ATD (ES-2re)</b>				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC <sub>36</sub> )	NA	1000	59	Maximum Thoracic Rib Deflection	mm	44	26.1	Total Abdominal Force	N	2500	1063.2	Pubic Symphysis Force	N	6000	1900.4	<b>Passenger ATD (SID-IIs)</b>				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC <sub>36</sub> )	NA	1000	363	Resultant Lower Spine Acceleration	g's	82	46.7	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3406.0	Maximum Thoracic Rib Deflection	mm	38*	38.9	Maximum Abdominal Rib Deflection	mm	45*	29.9
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**SECTION 1**  
**TEST PURPOSE AND PROCEDURE**

**TEST PURPOSE AND PROCEDURE**

This moving deformable barrier side impact test was conducted as part of the MY 2012 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00125. The purpose of this test is to generate comparative side impact performance in a 2012 Volkswagen Beetle 2DR Coupe. 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 Volkswagen Beetle 2DR Coupe 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 61.7 km/h (38.32 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 the Transportation Research Center Inc. in East Liberty, OH, on January 10, 2012. Pre-test and post-test photographs of the test vehicle and the MDB and the dummies (ES-2-re and SID-IIs) are included in 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 10 cameras. Camera locations are included in 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 (T12) tri-axial accelerometers
- Pubic symphysis y-axis load cell

**PASSENGER ATD (SID-IIs)**

- Primary and redundant head CG triaxial 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 (T12) 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	Driver ATD (ES-2-re)		
	Units	Threshold	Result
Head Injury Criteria (HIC <sub>36</sub> )	NA	1000	59
Maximum Thoracic Rib Deflection	mm	44	26.1
Combined Abdominal Force	N	2500	1063.2
Pubic Symphysis Force	N	6000	1900.4

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC <sub>36</sub> )	NA	1000	363
Lower Spine (T12) Resultant Acceleration	G	82	46.7
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3406.0
Maximum Thoracic Rib Deflection	mm	38*	38.9
Maximum Abdominal Rib Deflection	mm	45*	29.9

\* 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		
Knee Airbag	NA	NA		
Side Airbag (Head/Torso)	Yes	Yes	NA	NA
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other	NA	NA	NA	NA

### GENERAL COMMENTS

The driver door remained latched and closed during impact. The fuel system remained intact during impact and no fuel leakage occurred throughout the test. The side airbag and seat belt pretensioners deployed as expected. The Rear Passenger Thoracic Rib deflection value exceeded the injury assessment values threshold.

**SECTION 3**  
**OCCUPANT AND VEHICLE INFORMATION**

**DATA SHEET NO. 1  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	MC5802	Traction Control System (TCS)	Yes
Model Year	2012	Auto-Leveling System	No
Make	Volkswagen	Automatic Door Locks (ADL)	Yes
Model	Beetle	Power Window Auto-Reverse	Yes
Body Style	2-door Coupe	Other Optional Feature	NA
VIN	3VWJP7AT5CM601081	Driver Frontal Airbag	Yes
Body Color	Red	Driver Curtain Airbag	No
Odometer Reading (miles)	83	Driver Head/Torso Airbag	Yes
Engine Displacement (L)	2.5	Driver Torso Airbag	No
Number of Cylinders	4	Driver Torso/Pelvis Airbag	No
Engine Placement	Transverse	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	6	Rear Passenger Curtain Airbag	No
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	FWD	Rear Passenger Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof / T-Top	No	Rear Passenger Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rr. Pass. Seat Belt Pretensioner	Yes
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Passenger Load Limiter	No
All-Wheel Drive (AWD)	No	Other Safety Restraint	NA

Does owner's manual provide instructions to turn off automatic door locks? **Yes**

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Volkswagen De Mexico S.A.	GVWR (lbs)	3924
Date of Manufacture	10/11	GAWR Front (lbs)	2227
Vehicle Type	2-door Coupe	GAWR Rear (lbs)	1808

Certification label states weight in pounds.

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	2	NA	4	
Capacity Weight (VCW) (kg)				370	(A)
DSC x 68.08 (kg)				272	(B)
Cargo Weight (RCLW) (kg)				98	(A-B)

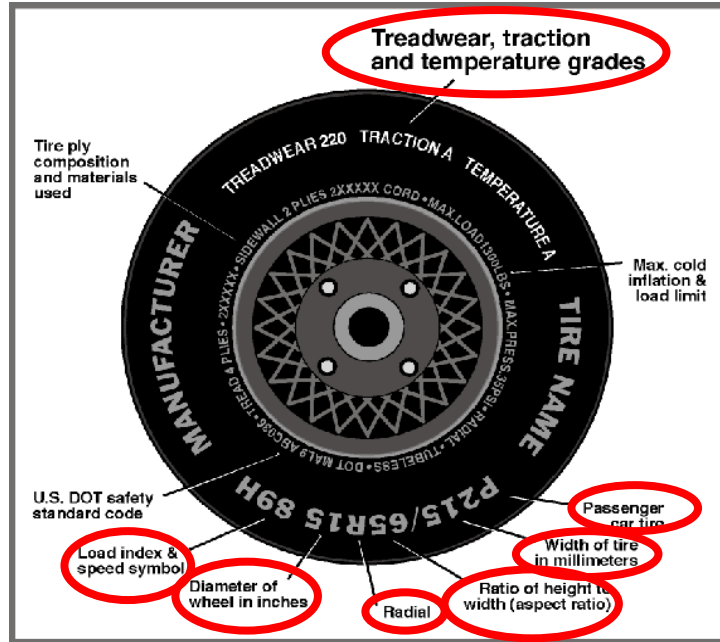
**VEHICLE SEAT TYPE**

Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	Yes	No	No		No	No	Yes
Rear or Second Row Seat	No	No	Yes	No	Yes	No	No
Third Row Seat	No	No	No	No	No	No	No

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

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12



**TIRE PLACARD INFORMATION**

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	200	200
Recommended Tire Size	215/55R17	215/55R17

**TIRE SIDEWALL INFORMATION**

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Tire Size on Vehicle	P215/55R17	P215/55R17
Tire Manufacturer	Continental	Continental
Tire Name	Contipro Contact	Contipro Contact
Tire Type	All-Season	All-Season
Tire Width	215	215
Aspect Ratio	55	55
Radial	Yes	Yes
Wheel Diameter	17	17
Load Index/ Speed Symbol	94H	94H
Treadwear	440	440
Traction Grade	A	A
Temperature Grade	A	A
Tire Material	Rubber	Rubber

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

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

**TIRE PRESSURES**

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

**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	221	221	221	221

**TEST VEHICLE AXLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	425.4	259.4		461.6	345.2		466.0	366.4	
Right	kg	439.0	253.8		460.2	327.4		441.8	329.4	
Ratio	%	62.7	37.3		57.8	42.2		56.6	43.4	
Totals	kg	864.4	513.2	1377.6	921.8	672.6	1594.4	907.8	695.8	1603.6

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1377.6	(A)
Actual Weight of 2 P572 ATDs Used	kg	125.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	98.0	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1600.6	(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)
Ballast (if any)	22.8

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

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

**TEST VEHICLE ATTITUDES AND CG**

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement***
LF	mm	684	686	Yes
RF	mm	685	689	Yes
RR	mm	692	693	Yes
LR	mm	684	690	Yes
Vehicle CG (Aft of Front Axle)	mm	1102	1072	
Vehicle CG (Left (+) / Right (-) from longitudinal Centerline)	mm	26	8	

\*\*\*The "As Tested" vehicle attitude measurements must be equal to or within  $\pm 10$  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 Volkswagen Beetle 2DR

NHTSA No.: MC5802

Test Program: NCAP Side Impact

Test Date: 01/10/12

**SEAT POSITIONING**

The driver 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	6.6	1.8	4.2
Front Passenger Seat	6.5	1.7	4.1
Front Center Seat*	NA	NA	NA
Struck Side Rear Seat	NA	NA	17.0
Non-Struck Side Rear Seat	NA	NA	16.7
Rear Center Seat*	NA	NA	NA

\* If applicable.

**SEAT HEIGHT AND ANGLE**

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore/Aft	Forward-Most
Driver Seat	4.2	73.5	Max.	104	111.5	121.7
			Mid	60	73.5	77.8
			Min.	54	63	71.3
Front Passenger Seat	4.1	72	Max.	101	108.5	118.8
			Mid	57	70.5	74.9
			Min.	51	60	68.4
Front Center Seat*	NA	NA	Max.	NA	NA	NA
			Mid	NA	NA	NA
			Min.	NA	NA	NA
Struck Side Rear Seat	Fixed	Fixed	Max.	NA	NA	NA
			Mid	NA	NA	NA
			Min.	NA	NA	NA
Non-Struck Side Rear Seat	Fixed	Fixed	Max.	NA	NA	NA
			Mid	NA	NA	NA
			Min.	NA	NA	NA
Rear Center Seat*	NA	NA	Max.	NA	NA	NA
			Mid	NA	NA	NA
			Min.	NA	NA	NA

\* If applicable.

**DATA SHEET NO. 2 (CONTINUED)**

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

Test Vehicle: 2012 Volkswagen Beetle 2DR

NHTSA No.: MC5802

Test Program: NCAP Side Impact

Test Date: 01/10/12

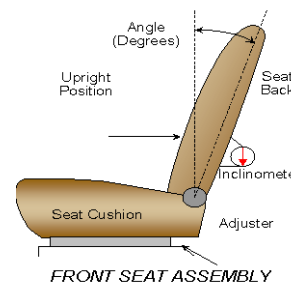
**SEAT FORE/AFT POSITION**

Seat	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	254	38	130	19
Front Passenger Seat	254	38	130	19
Front Center Seat*	NA	NA	NA	NA
Struck Side Rear Seat	NA	NA	NA	NA
Non-Struck Side Rear Seat	NA	NA	NA	NA
Rear Center Seat*	NA	NA	NA	NA

\* If applicable.

**SEAT BACK ANGLE ADJUSTMENT**

The driver's seat back is positioned to the manufacturer's designated seat back 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*	Degrees	Detent*
Driver Seat w/ Seated Dummy	76	NA	26.9	NA
Front Passenger Seat	76	NA	26.9	NA
Front Center Seat*	NA	NA	NA	NA
Struck Side Rear Seat w/ Seated Dummy	NA	NA	16.8	NA
Non-Struck Side Rear Seat	NA	NA	16.2	NA
Rear Center Seat*	NA	NA	NA	NA

\* If applicable.

**DATA SHEET NO. 2 (CONTINUED)**

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

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

**SEAT BELT ANCHORAGE ADJUSTMENT**

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

	Total # of Positions	Placed in Position #
Driver Seat	1	Fixed
Rear Seat	1	Fixed

**HEAD RESTRAINT ADJUSTMENT**

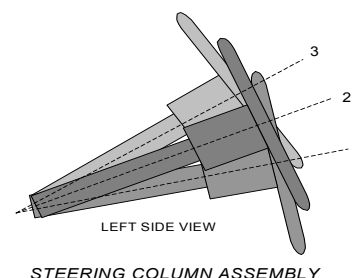
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	5	5
Rear Seat	2	1

**STEERING COLUMN ADJUSTMENT**

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

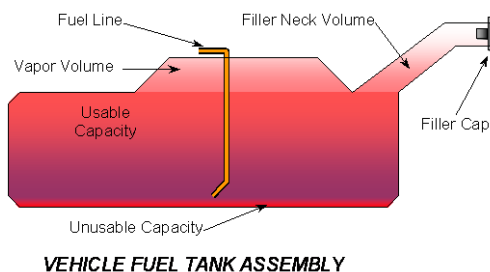
	Degrees	Fore/Aft Position, mm
Lowermost, Position 1	67.6	0
Geometric Center, Position 2	65.4	28
Uppermost, Position 3	63.1	57
Telescoping Steering Wheel Travel		57
Test Position	65.4	28



**FUEL PUMP**

Describe the fuel pump type, details about how it operates and the location of the fuel filler neck:

The fuel tank is located under the rear seat area. The fuel filler neck enters on the right rear corner of the fuel tank. The fuel cap is located on the right rear quarter panel. The fuel lines run forward under the right floor pan.



**DATA SHEET NO. 2 (CONTINUED)**

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

Test Vehicle: 2012 Volkswagen Beetle 2DR

NHTSA No.: MC5802

Test Program: NCAP Side Impact

Test Date: 01/10/12

**FUEL TANK CAPACITY**

	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	55.0
Usable Capacity of "Optional" Tank (see Form No. 1)	NA
Usable Capacity of Standard Tank (see Owner's Manual)	55.0
Usable Capacity of Optional Tank (see Owner's Manual)	NA
93% of Usable Capacity	51.1
Actual Amount of Solvent Used in Test	51.1
1/3 of Usable Capacity	18.2

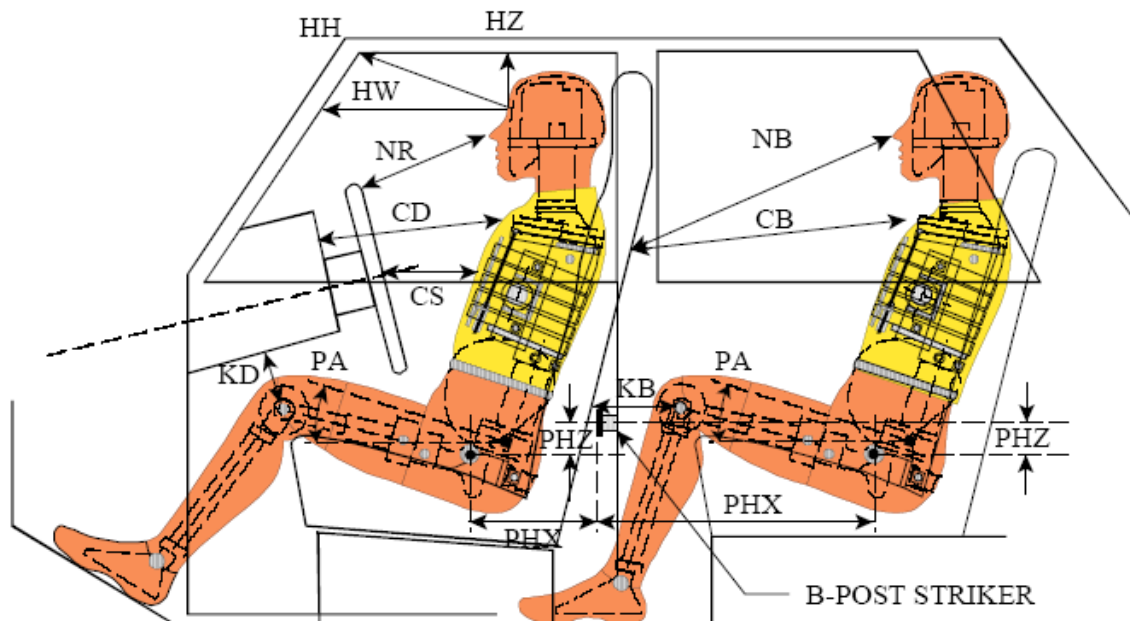
**Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated on Form No. 1?**       YES       NO

### DATA SHEET NO. 3

#### DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12



**LEFT SIDE VIEW**

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

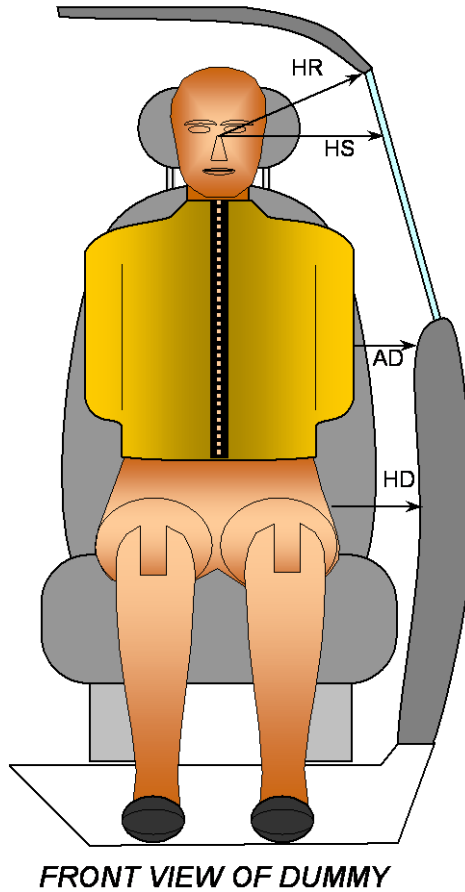
#### DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle	Length (mm)	Angle
HH		Head to Header	494			
HW		Head to Windshield	683			
HZ	HZ	Head to Roof Liner	196		238	
NR	NB	Nose to Rim/Seat Back	172		410	
CD	CB	Chest to Dash/Seat Back	563		418	
CS		Chest to Steering Wheel	129			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	111	24.4	103	0
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	107	24.4	109	0
PAX°	PAX°	Pelvic Tilt Angle X		23.5		18.9
	PHY°	Pelvic Tilt Angle Y				0.0
PHX	PHX	Hip Point to Striker (X-Axis)	435		354	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	180		218	

**DATA SHEET NO. 4  
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

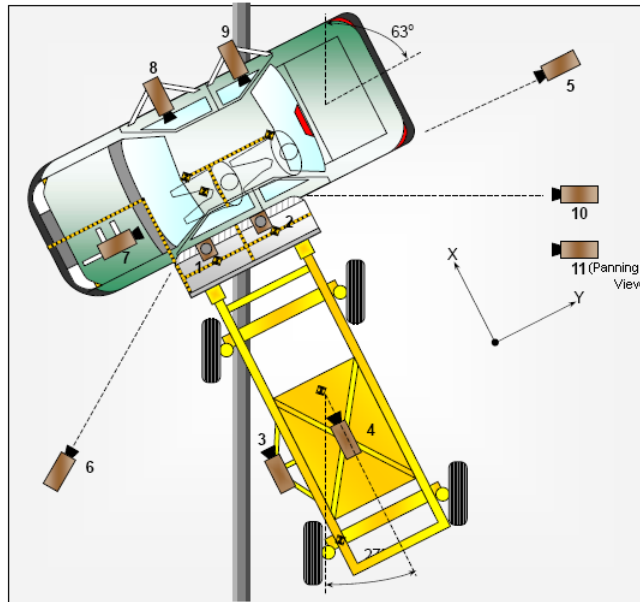


Code	Description	Units	Driver	Passenger
HR	Head to Side Header	mm	202	263
HS	Head to Side Window	mm	320	416
AD	Arm to Door	mm	79	130
HD	H-Point to Door	mm	43	125

**DATA SHEET NO. 5  
CAMERA AND INSTRUMENTATION DATA**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12



**CAMERA LOCATIONS AND DATA**

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	-305	2216	-5704	8.5	1000
2	Overhead Close-up	-305	1756	-5739	25	1000
3	Left Impact Point (MDB)	1929	0	-823	8.5	1000
4	Side Overall (MDB)	2731	890	-1378	8.5	1000
5	Rear	0	8134	-1025	12.5	1000
6	Left Front	2855	-4703	-1166	16	1000
7	Driver Front (OB)				16	1000
8	Driver Side (OB)				8.5	1000
9	Passenger Side (OB)				6	1000
10	Real-time Left Rear				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  $\pm 6$  mm.

If applicable, explain why camera(s) did not operate as intended:

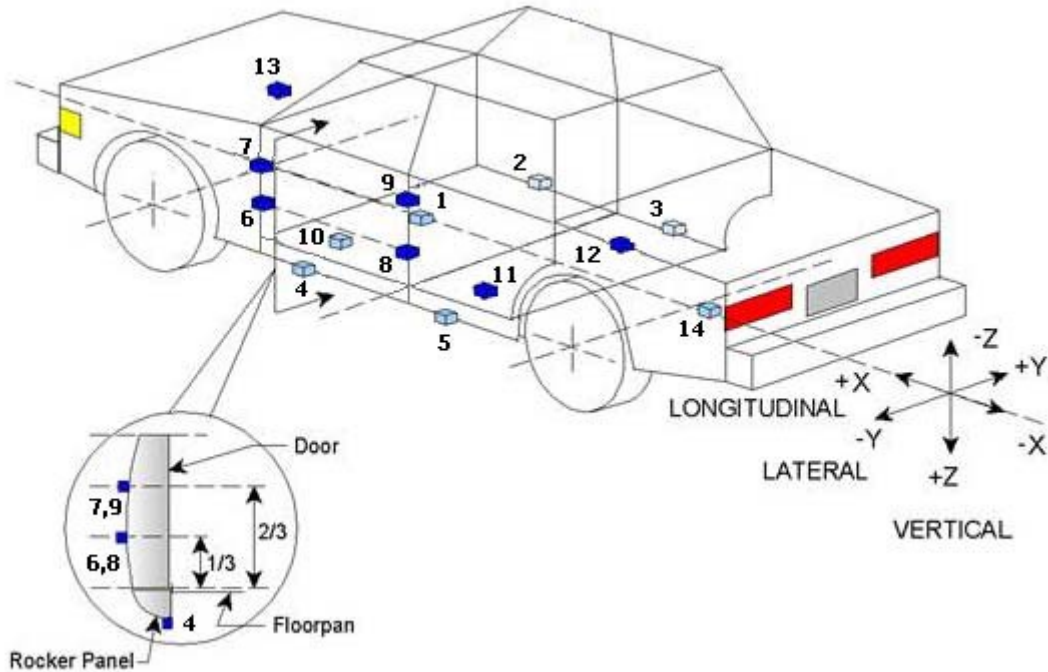
**INSTRUMENTATION**

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MBD Accelerometers	5
<b>TOTAL</b>	<b>60</b>

**DATA SHEET NO. 6**  
**TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12



**TEST VEHICLE ACCELEROMETER LOCATIONS**

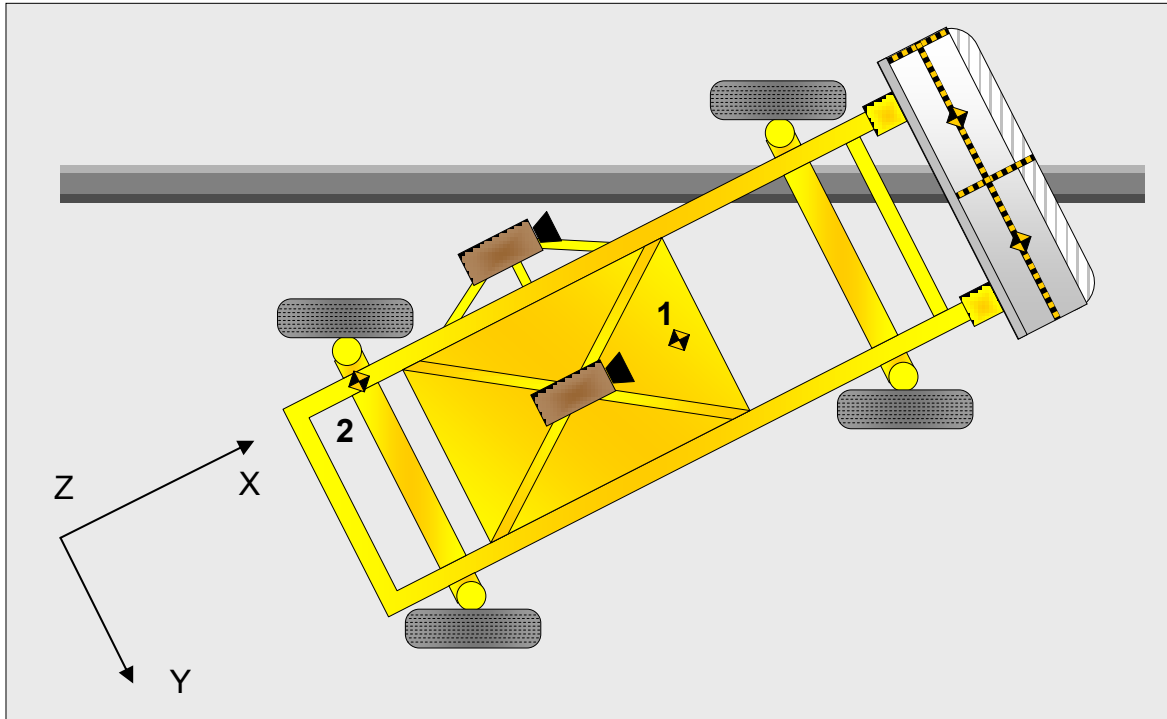
Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2590	75	-405
2	Right Sill at Front Seat	2855	710	-274
3	Right Sill at Rear Seat	1875	710	-225
4	Left Sill at Front Door	2800	-710	-245
5	Left Sill at Rear Door	1920	-710	-240
6	A-Post Lower	2955	-760	-498
7	A-Post Middle	2955	-760	-824
8	B-Post Lower	1775	-715	-649
9	B-Post Middle	1770	-710	-788
10	Front Seat Track	2080	-610	-285
11	Rear Seat Structure	1670	-520	-432
12	Right Rear Occ. Compartment	1581	555	-472
13	Engine Block	3694	345	-780
14	Rear Above Axle	1070	0	-455

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 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12



**MDB ACCELEROMETER LOCATIONS**

Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	-2260	0	-520
2	MDB Rear	-3703	-677	-625

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 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12

**TEST DUMMY INFORMATION AND CONTACT POINTS**

Dummy Body Part	Front Seat Dummy (ES2-re)	Rear Seat Dummy (SID-IIs)
Face	NA	NA
Top of Head	Side airbag	NA
Left Side of Head	Side airbag	Interior trim panel
Back of Head	Head restraint	Head restraint
Left Shoulder	Side airbag	Interior trim panel
Upper Torso	Side airbag, seat bolster	Interior trim panel
Lower Torso	Side airbag, seat bolster	Interior trim panel
Left Hip	Door trim panel	Interior trim panel
Left Knee	Door panel	Interior trim panel

**POST TEST DOOR PERFORMANCE**

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

\* Indicate "Yes", "No", or "NA".

**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

\* Indicate "Yes", "No", or "NA".

**POST TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Intact
Sill Separation	No
Windshield Damage	No Damage
Side Window Damage	Broken
Other Notable Effects	None

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

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

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

**IMPACT POINT LOCATION DATA**

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2540
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		330
Actual Impact Point (Aft of Front Axle)	mm		335
Horizontal Offset ( + forward / - rearward)	mm	+/- 50 of Intended Impact point	5 rearward
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact point	5 up

**DATA SHEET NO. 9  
MDB SUMMARY OF RESULTS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12

**MDB SPECIFICATIONS**

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheel Base of Framework Carriage	2587
C.G. Location aft of Front Axle	1097

**MDB WEIGHTS**

	Units	Front Axle	Rear Axle	Total
Left	kg	400.6	278.8	
Right	kg	385.2	300.0	
Ratio	%	57.6	42.4	
Totals	kg	785.8	578.8	1364.6

**SPEED AND IMPACT ANGLE DATA**

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.7
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.7
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	27

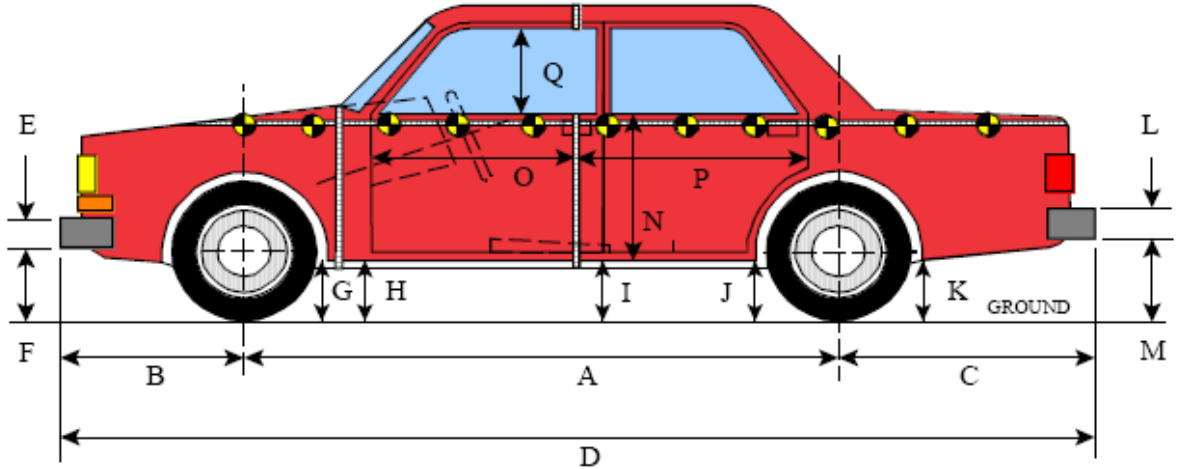
**MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE**

Row	Vertical Location		From Centerline		Maximum Crush
	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Left	200
B	Top of Bumper	533	800	Left	126
C	Mid-Level	686	800	Left	148
D	Top of Stack	813	800	Left	142

**DATA SHEET NO. 10  
TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12



**LEFT SIDE VIEW**

All MEASUREMENTS IN (mm) WITH TOLERANCE OF  $\pm 3$ mm

**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

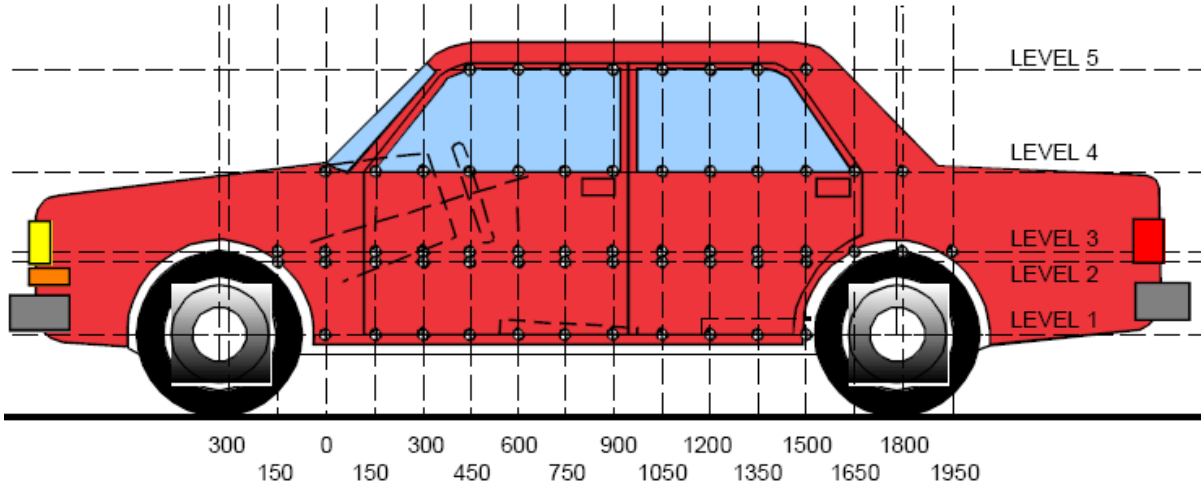
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2540	2535	5
B	Front Axle to Front Surface of Vehicle	870	870	0
C	Rear Axle to Rear Surface of Vehicle	860	860	0
D	Total Length at Centerline	4270	4260	10
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	395	396	-1
G	Sill Height at Front Wheel Well	217	244	-27
H	Sill Height at Front Door Leading Edge	220	273	-53
I	Sill Height at B-Pillar	242	287	-45
J1	Sill Height at Rear Wheel Well	260	252	8
J2	Pinch Weld Height at Rear Wheel Well	185	164	21
K	Sill Height Aft of Rear Wheel Well	327	304	23
L	Rear Bumper Thickness	246	246	0
M	Rear Bumper Bottom to Ground	367	345	22
N	Sill Height to Window Bottom Sill	NA	NA	NA
O	Front Door Leading Edge to Impact CL	661	629	32
P	Rear Door Trailing Edge to Impact CL	NA	NA	NA
Q	Front Window Opening	356	392	-36
R	Right Side Length	4040	4035	5
S	Left Side Length	4040	4030	10
T	Vehicle Width at B Pillar	1355	1262	93

**DATA SHEET NO. 11**

**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12



**LEFT SIDE VIEW**

**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance From Impact
1	Sill Top	379	138	1500
2	Driver Hip Point	539	221	600
3	Mid-Door	667	220	1050
4	Window Sill	950	124	1500
5	Window Top	1366	16	1350

**NOTE:** The above measurements should be taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.

**DATA SHEET NO. 11 (CONTINUED)**

**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

**EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL**

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-750	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-150	0	0	912	0	0	0	0	909	0	0	0	0	3	0	0
0	0	908	894	764	0	0	899	894	765	0	0	9	0	-1	0
150	883	866	845	784	0	802	804	766	770	0	81	62	79	14	0
300	846	853	852	785	0	752	671	713	739	0	94	182	139	46	0
450	848	857	858	796	0	731	644	669	732	0	117	213	189	64	0
600	850	860	862	805	603	725	639	668	724	598	125	221	194	81	5
750	852	861	864	811	620	717	641	665	729	611	135	220	199	82	9
900	852	861	864	816	619	724	643	662	741	608	128	218	202	75	11
1050	852	860	863	820	615	716	644	643	748	601	136	216	220	72	14
1200	850	857	860	819	610	713	649	661	745	596	137	208	199	74	14
1350	848	854	854	816	608	717	671	669	735	592	131	183	185	81	16
1500	845	850	849	810	605	707	678	683	686	591	138	172	166	124	14
1650	839	843	841	801	599	714	656	645	679	589	125	187	196	122	10
1800	888	880	853	789	584	894	850	813	679	575	-6	30	40	110	9
1950	0	0	891	774	0	0	0	919	675	0	0	0	-28	99	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2850	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**NOTE:** Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition.

Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

**DATA SHEET NO. 11 (CONTINUED)**  
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12

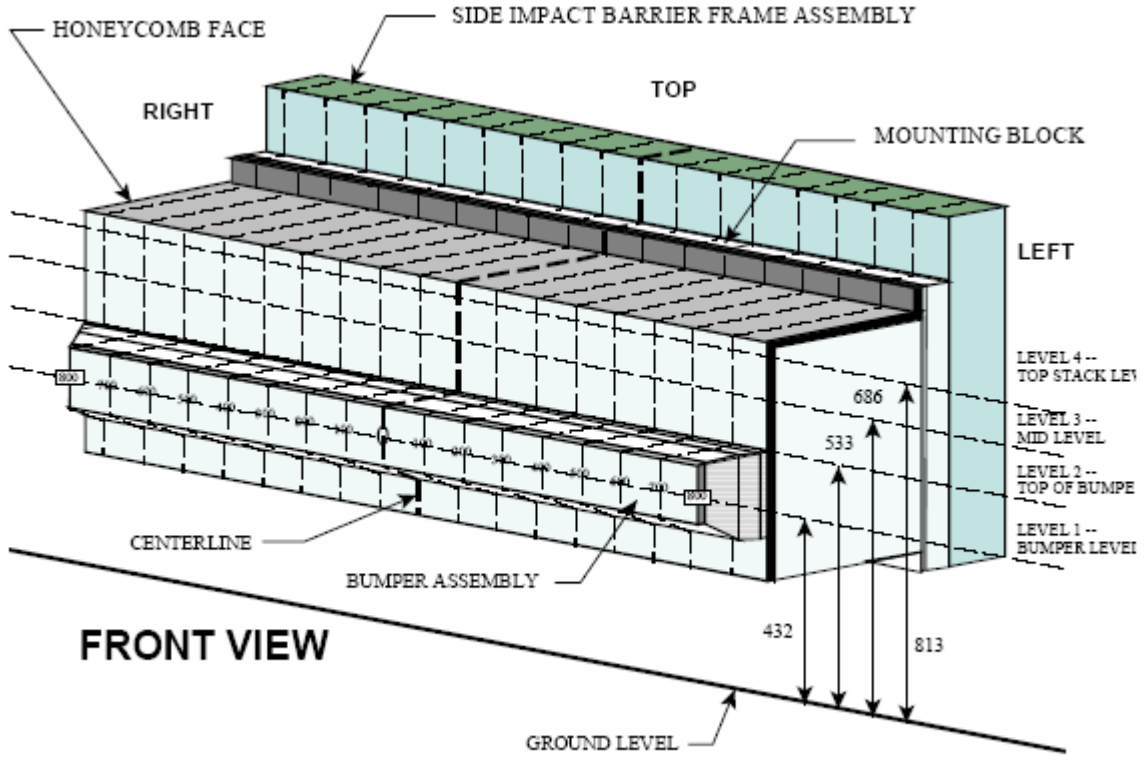


**DATA SHEET NO. 12**

**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12



NOTE: Dimensions are shown in millimeters, mm

**DEFORMABLE BARRIER STATIC CRUSH**

Stack Level	Distance Right of Center									C/L	Distance Left of Center								
	800	700	600	500	400	300	200	100	0		100	200	300	400	500	600	700	800	
1	-37	-22	-16	-50	-84	-68	-38	-50	-36	-33	-35	-40	-50	-74	-87	-109	-142		
2	-16	-10	-22	-44	-58	-36	-22	-19	-18	-21	-24	-29	-39	-54	-79	-115	-148		
3	-73	-77	-78	-75	-69	-63	-59	-60	-61	-62	-63	-65	-67	-70	-83	-109	-126		
4	-165	-168	-173	-167	-168	-159	-150	-151	-152	-152	-152	-154	-155	-158	-170	-197	-200		

**DATA SHEET NO. 13**  
**FMVSS NO. 301 STATIC ROLLOVER RESULTS**

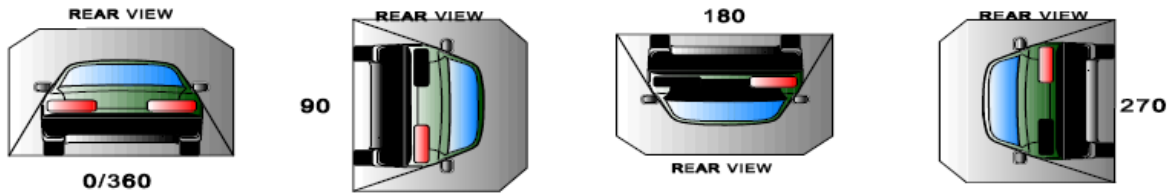
Test Vehicle: 2012 Volkswagen Beetle 2DR  
 Test Program: NCAP Side Impact

NHTSA No.: MC5802  
 Test Date: 01/10/12

Test Time: 15:12    Temperature: 22

- A. From impact until vehicle motion ceases: 0 oz.  
 (Maximum allowable is 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.  
 (Maximum allowable is 5 ounces)
- C. For the following 25 minutes: 0 oz.  
 (Maximum allowable is 1 ounce/minute)
- D. Spillage Details: None

**FMVSS 301 STATIC ROLLOVER DATA**



**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0 to 90	120	300	420
90 to 180	120	300	840
180 to 270	120	300	1260
270 to 360	120	300	1680

**FMVSS NO. 301 ROLLOVER SPILLAGE TABLE**

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0 to 90	0	0	0	NA
90 to 180	0	0	0	NA
180 to 270	0	0	0	NA
270 to 360	0	0	0	NA

**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

Test Phase	Spillage Location
0 to 90	0
90 to 180	0
180 to 270	0
270 to 360	0

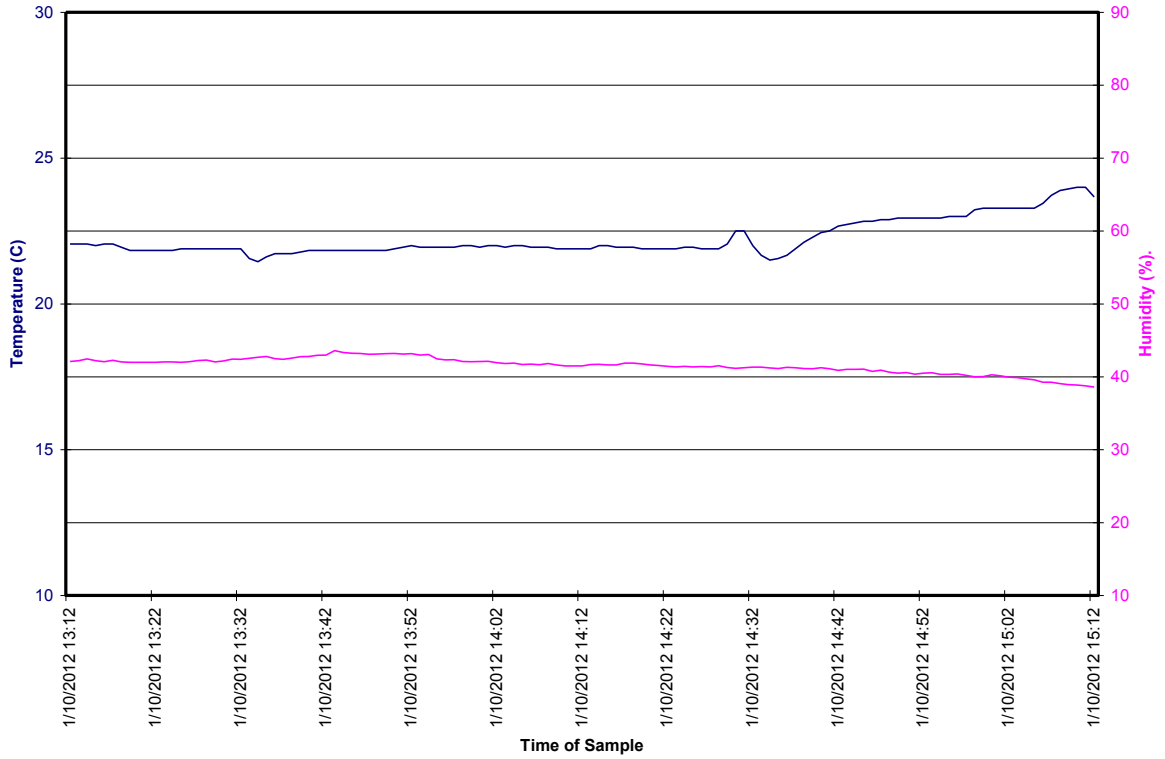
**DATA SHEET NO. 14**

**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

Test Vehicle: 2012 Volkswagen Beetle 2DR  
Test Program: NCAP Side Impact

NHTSA No.: MC5802  
Test Date: 01/10/12

MC5802 Moving Barrier Into Left Side of Volkswagen Beetle Sedan 2-door 120110; Test Time 15:12



**APPENDIX A  
PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

<b>No.</b>	<b>Description</b>	<b>Page</b>
<b>001</b>	As-Delivered Right Front $\frac{3}{4}$ View of Test Vehicle	<b>A-6</b>
<b>002</b>	As-Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle	<b>A-6</b>
<b>003</b>	Pre-Test Front View of Test Vehicle	<b>A-7</b>
<b>004</b>	Post-Test Front View of Test Vehicle	<b>A-7</b>
<b>005</b>	Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle	<b>A-8</b>
<b>006</b>	Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle	<b>A-8</b>
<b>007</b>	Pre-Test Left Side View of Test Vehicle	<b>A-9</b>
<b>008</b>	Post-Test Left Side View of Test Vehicle	<b>A-9</b>
<b>009</b>	Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	<b>A-10</b>
<b>010</b>	Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	<b>A-10</b>
<b>011</b>	Pre-Test Rear View of Test Vehicle	<b>A-11</b>
<b>012</b>	Post-Test Rear View of Test Vehicle	<b>A-11</b>
<b>013</b>	Pre-Test Right Side View of Test Vehicle	<b>A-12</b>
<b>014</b>	Post-Test Right Side View of Test Vehicle	<b>A-12</b>
<b>015</b>	Pre-Test Overhead View of Test Area	<b>A-13</b>
<b>016</b>	Post-Test Overhead View of Test Area	<b>A-13</b>
<b>017</b>	Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle	<b>A-14</b>
<b>018</b>	Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle	<b>A-14</b>
<b>019</b>	Pre-Test Close-up View of Impact Point Target	<b>A-15</b>
<b>020</b>	Post-Test Close-up View of Impact Point Target	<b>A-15</b>
<b>021</b>	Pre-Test Left Front Door Latch Close-up	<b>A-16</b>
<b>022</b>	Post-Test Left Front Door Latch Close-up	<b>A-16</b>
<b>023</b>	Pre-Test Right Front Door Latch Close-up	<b>A-17</b>
<b>024</b>	Post-Test Right Front Door Latch Close-up	<b>A-17</b>
<b>025</b>	Pre-Test Front Close-up View of Driver Dummy	<b>A-18</b>
<b>026</b>	Post-Test Front Close-up View of Driver Dummy	<b>A-18</b>
<b>027</b>	Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking	<b>A-19</b>
<b>028</b>	Pre-Test Left Side View of Driver Dummy Shoulder and Door Top	<b>A-19</b>
<b>029</b>	Post-Test Left Side View of Driver Dummy Shoulder and Door Top	<b>A-20</b>
<b>030</b>	Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning	<b>A-20</b>
<b>031</b>	Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint	<b>A-21</b>
<b>032</b>	Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning	<b>A-21</b>
<b>033</b>	Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan	<b>A-22</b>
<b>034</b>	Pre-Test Placement of Driver Dummy's Feet	<b>A-22</b>
<b>035</b>	Pre-Test View of Belt Anchorage for Driver Dummy	<b>A-23</b>
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<b>101</b>	Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	<b>A-56</b>
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**001** As-Delivered Right Front  $\frac{3}{4}$  View of Test Vehicle



**002** As-Delivered Left Rear  $\frac{3}{4}$  View of Test Vehicle



**003** Pre-Test Front View of Test Vehicle



**004** Post-Test Front View of Test Vehicle



**005** Pre-Test Left Front  $\frac{3}{4}$  View of Test Vehicle



**006** Post-Test Left Front  $\frac{3}{4}$  View of Test Vehicle



**007** Pre-Test Left Side View of Test Vehicle



**008** Post-Test Left Side View of Test Vehicle



**009** Pre-Test Left Rear  $\frac{3}{4}$  View of Test Vehicle



**010** Post-Test Left Rear  $\frac{3}{4}$  View of Test Vehicle



011 Pre-Test Rear View of Test Vehicle



012 Post-Test Rear View of Test Vehicle



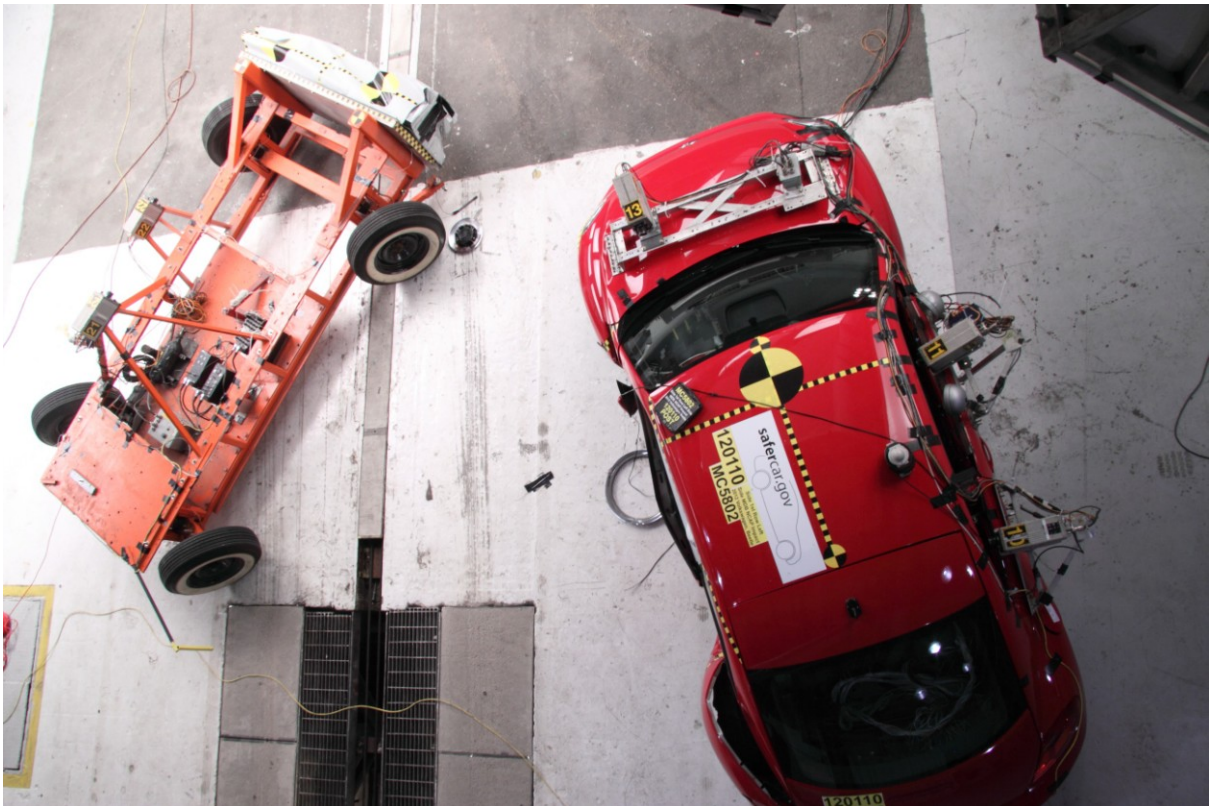
**013** Pre-Test Right Side View of Test Vehicle



**014** Post-Test Right Side View of Test Vehicle



**015** Pre-Test Overhead View of Test Area



**016** Post-Test Overhead View of Test Area



**017** Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



**018** Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



019 Pre-Test Close-up View of Impact Point Target



020 Post-Test Close-up View of Impact Point Target



021 Pre-Test Left Front Door Latch Close-up



022 Post-Test Left Front Door Latch Close-up



PHOTO NOT APPLICABLE

**023** Pre-Test Right Front Door Latch Close-up



PHOTO NOT APPLICABLE

**024** Post-Test Right Front Door Latch Close-up



**025** Pre-Test Front Close-up View of Driver Dummy



**026** Post-Test Front Close-up View of Driver Dummy



**027** Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



**028** Pre-Test Left Side View of Driver Dummy Shoulder and Door Top



**029** Post-Test Left Side View of Driver Dummy Shoulder and Door Top



**030** Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



**031** Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



**032** Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



**033** Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



**034** Pre-Test Placement of Driver Dummy Feet



**035** Pre-Test View of Belt Anchorage for Driver Dummy



**036** Pre-Test Left Side View of Steering Wheel

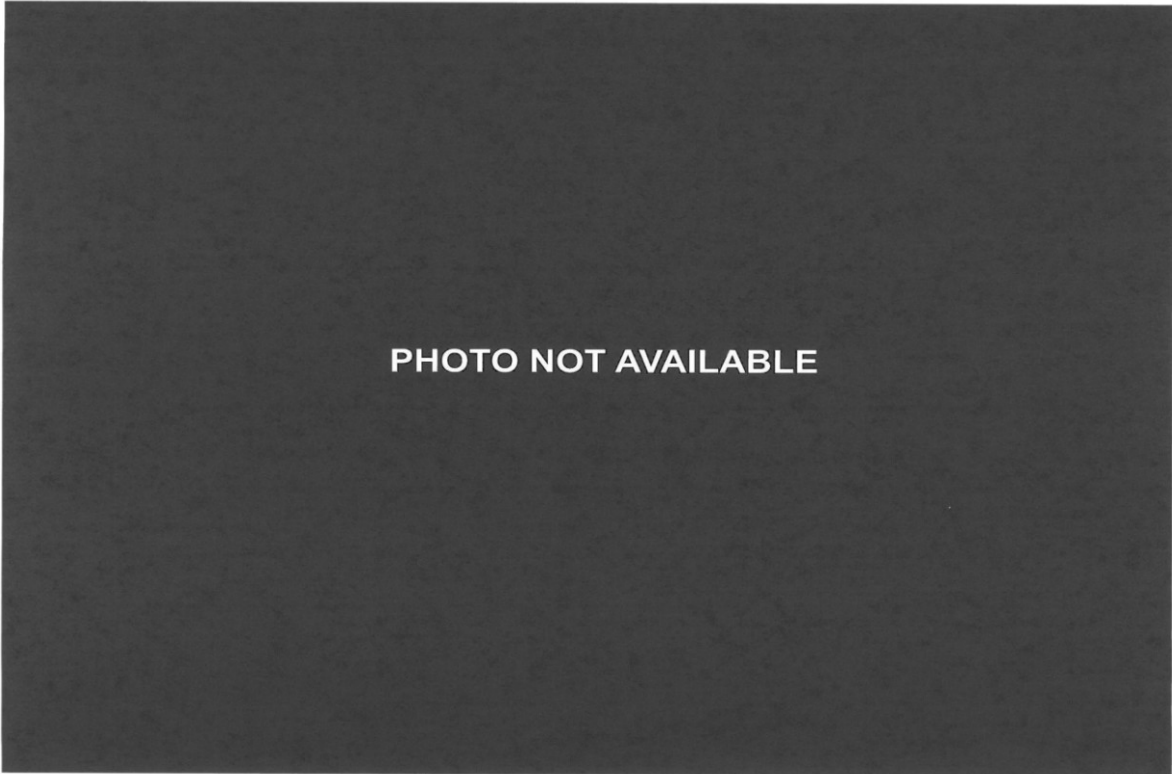


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037 View of Disengaged Parking Brake



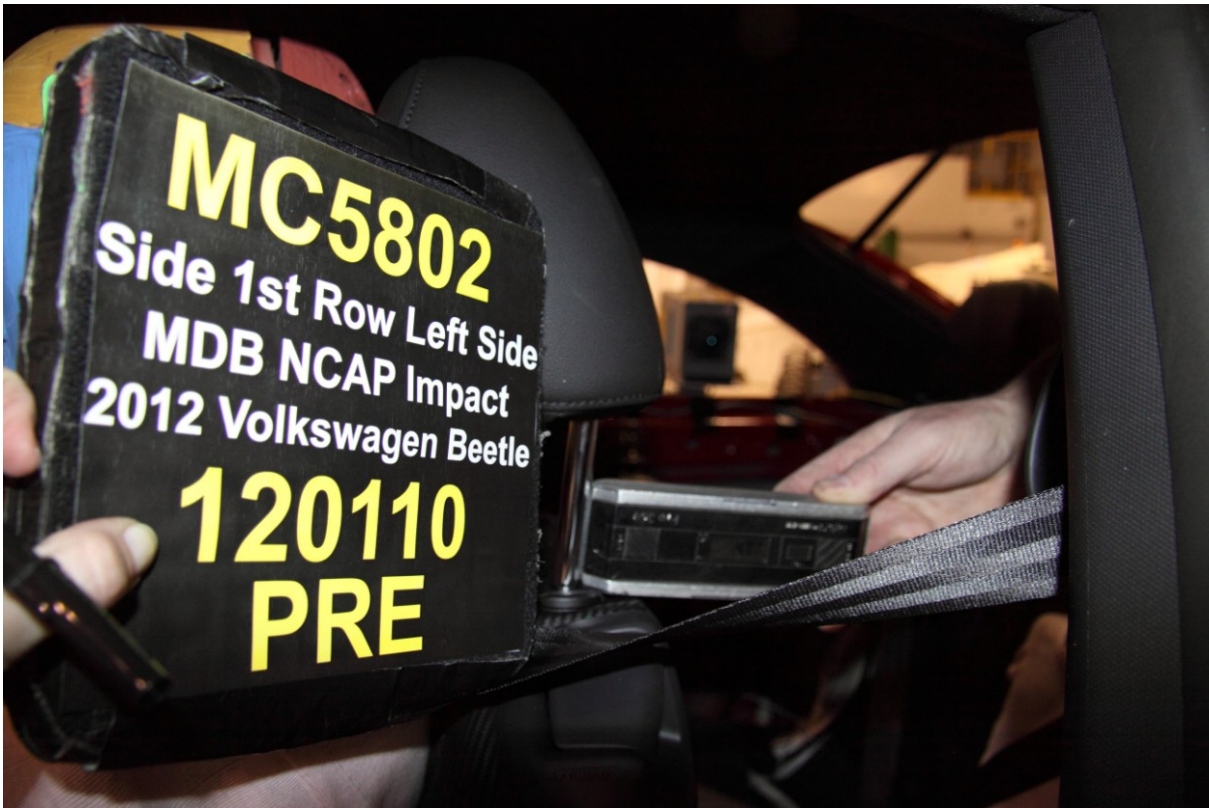
038 Pre-Test View of Parking Brake



039 Pre-Test Close-Up Left Side View of Driver Seat Track



040 Pre-Test Close-Up Left Side View of Driver Seat Back



041 Pre-Test Close-Up View of Driver Seat Back or Head Restraint



042 Pre-Test Driver Dummy and Door Clearance View



043 Post-Test Driver Dummy and Door Clearance View



044 Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



**045** Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



**046** Pre-Test Driver Inner Door Panel View



**047** Post-Test Driver Inner Door Panel View



**048** Post-Test Driver Dummy Close-Up Head Contact with Vehicle View



**049** Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View



**050** Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



**051** Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



**052** Post-Test Driver Dummy Close-Up Pelvis Contact with Vehicle Interior View

PHOTO NOT APPLICABLE

**053** Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View



**054** Pre-Test Left Side View of Passenger Dummy Showing Belt and Chalking



**055** Pre-Test Left Side View of Passenger Dummy Shoulder and Door Top View



**056** Post-Test Left Side View of Passenger Dummy Shoulder and Door Top View



**057** Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



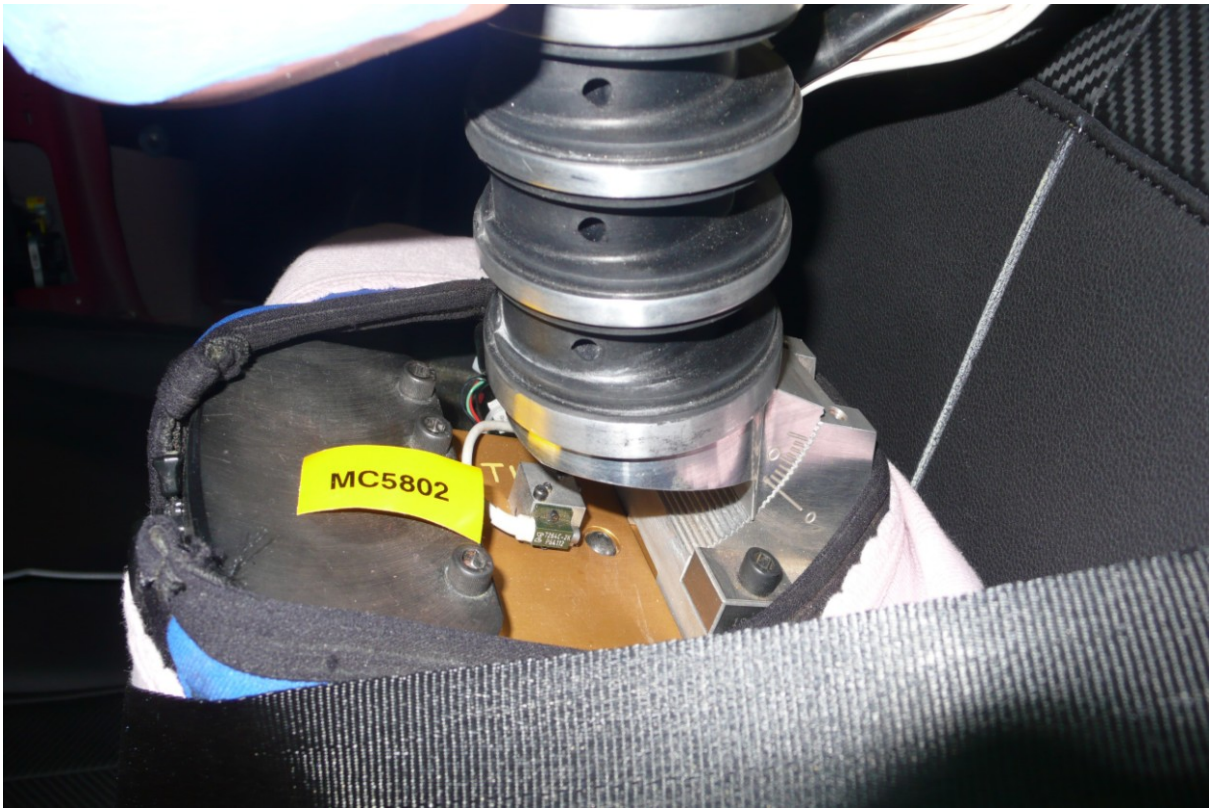
**058** Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



**059** Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



**060** Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



**061** Pre-Test View of Rear Passenger Dummy Neck Showing Position of Adjustable Neck Bracket



**062** Pre-Test View of Rear Passenger Dummy Head Showing Dummy Head is Level



**063** Pre-Test Placement of Rear Passenger Dummy Feet



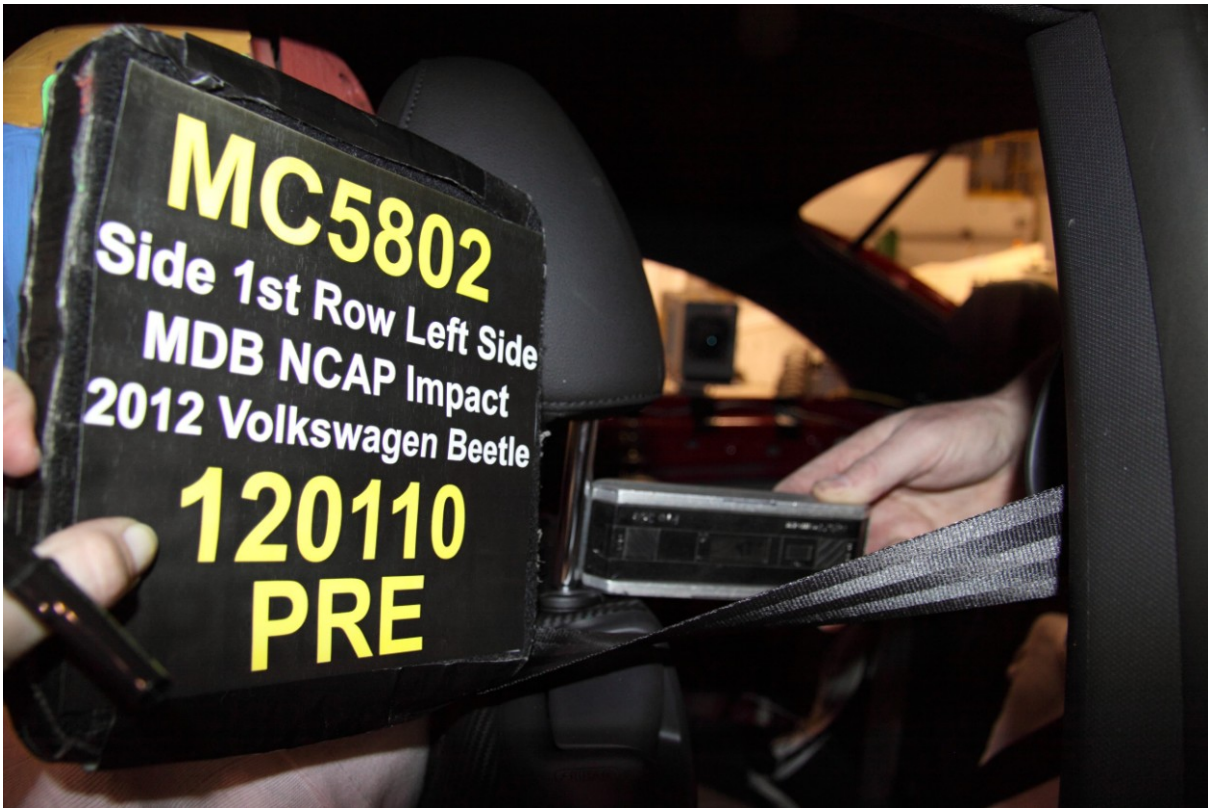
**064** Pre-Test View of Belt Anchorage for Rear Passenger Dummy

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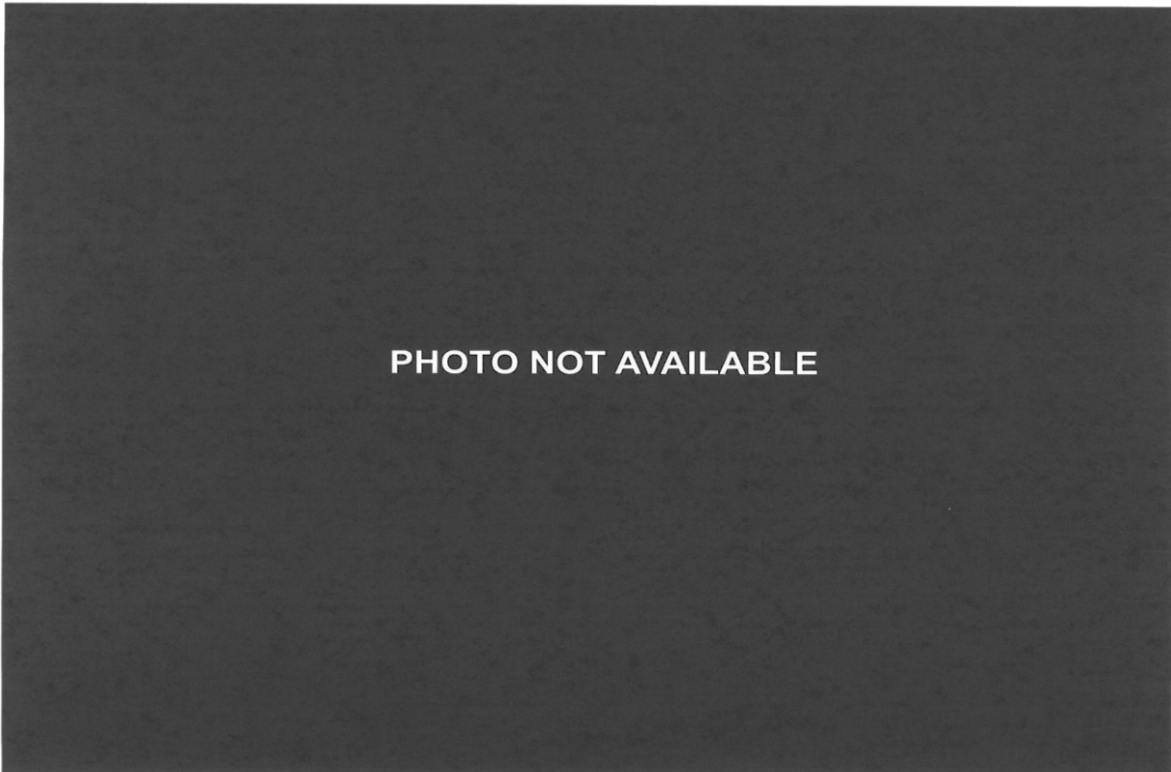
**065** Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

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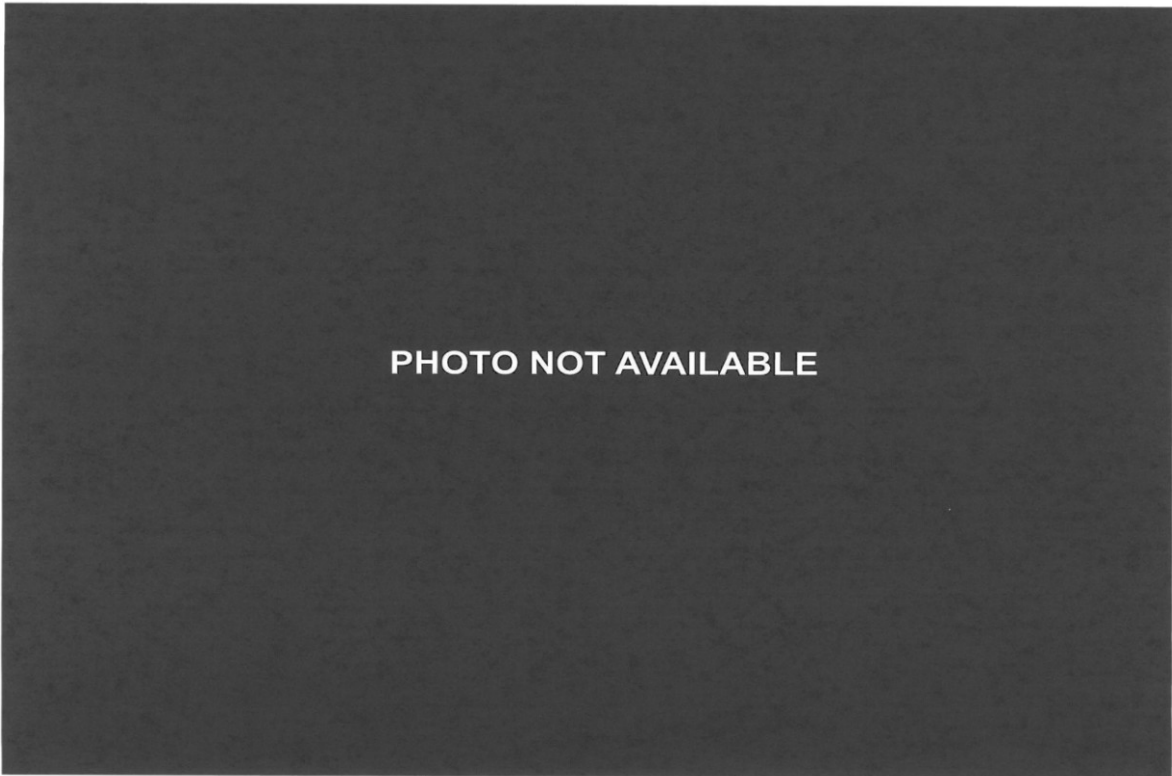
**066** Pre-test Close-Up Left Side View of Rear Passenger Seat Back



**067** Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



**068** Pre-Test Passenger Dummy and Door Clearance View



**069** Post-Test Passenger Dummy and Door Clearance View



**070** Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



**071** Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



**072** Pre-Test Passenger Inner Door Panel View



073 Post-Test Passenger Inner Door Panel View



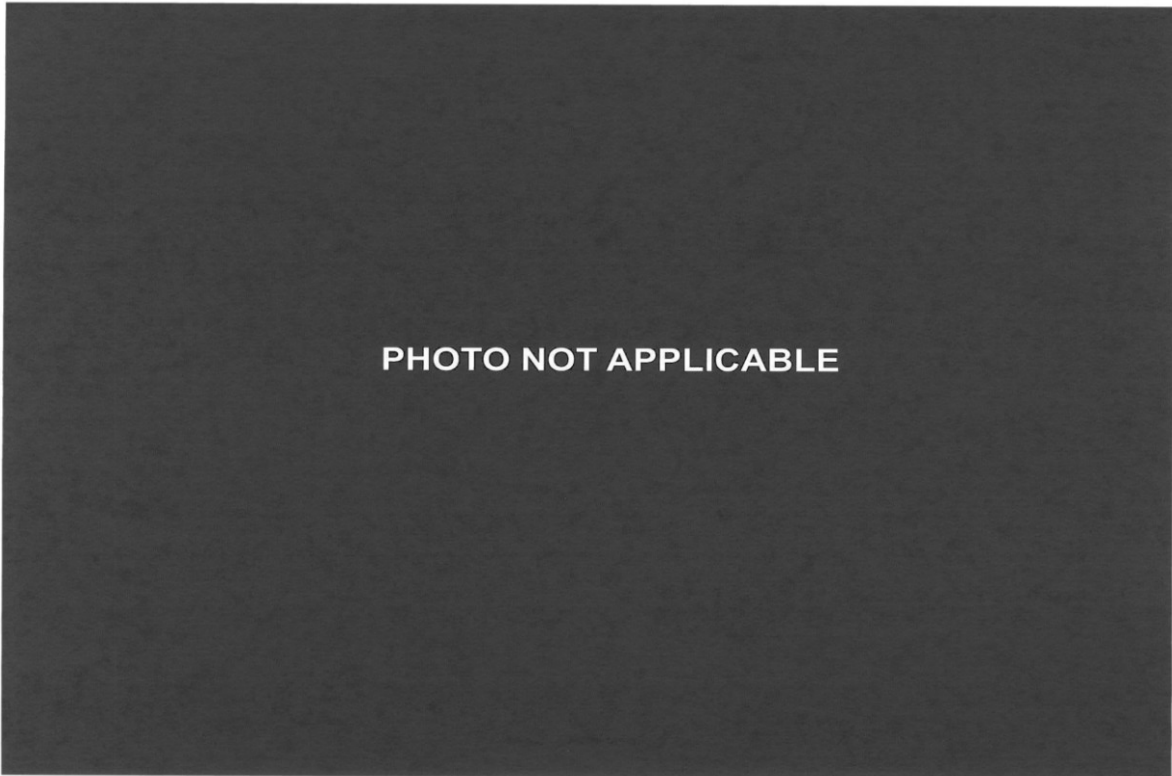
074 Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View

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**075** Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Airbag View



**076** Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View



**077** Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View



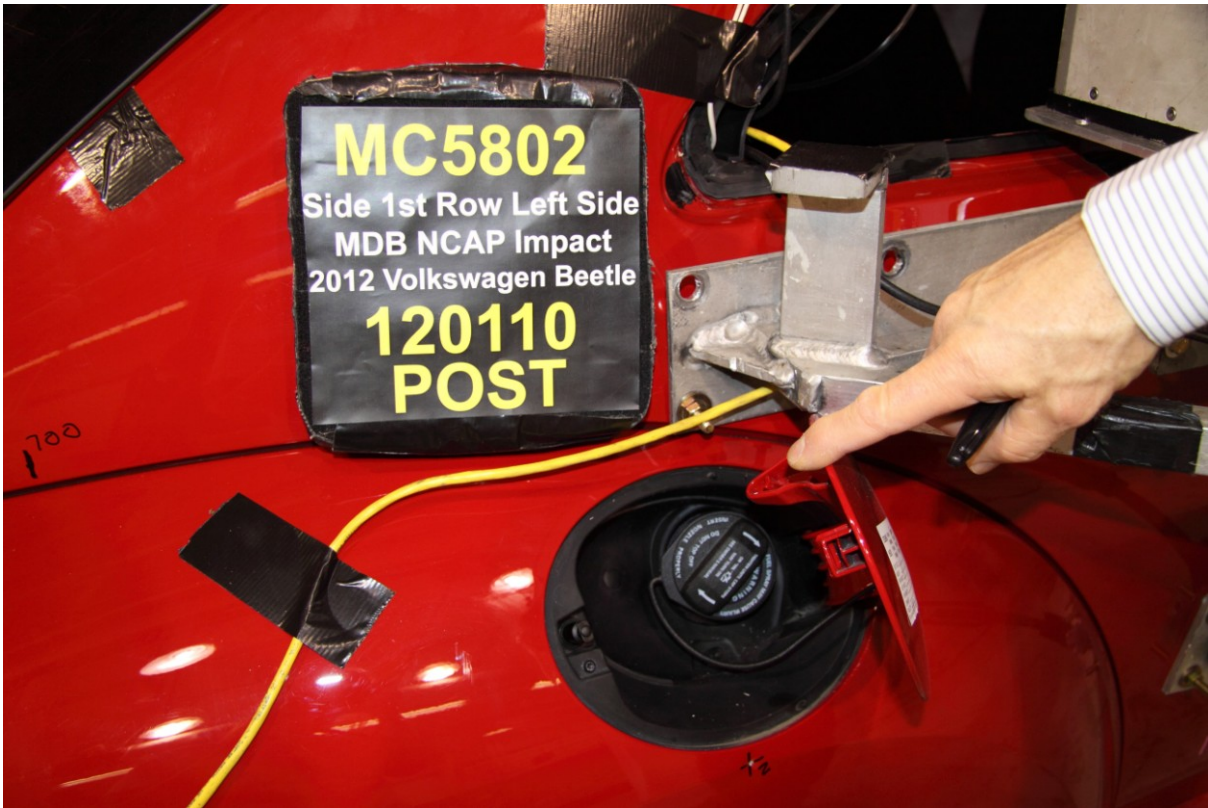
**078** Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Vehicle Interior View

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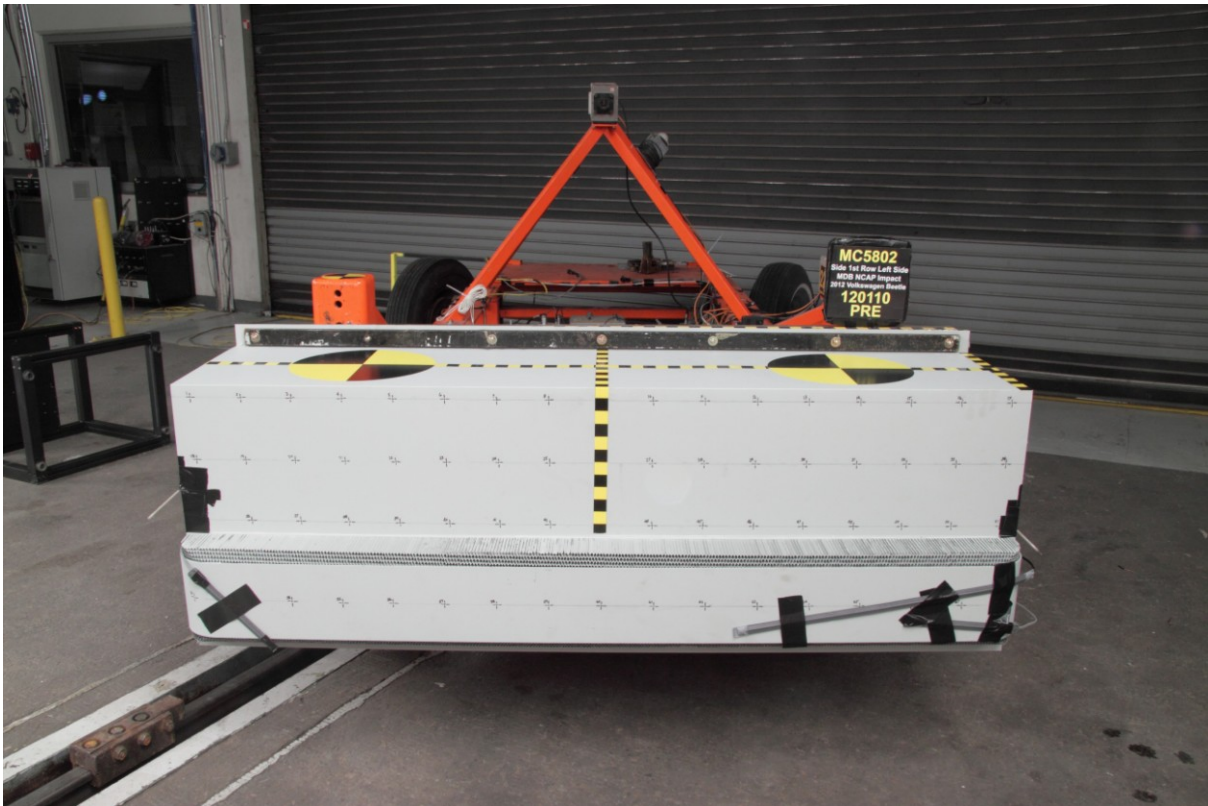
**079** Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View



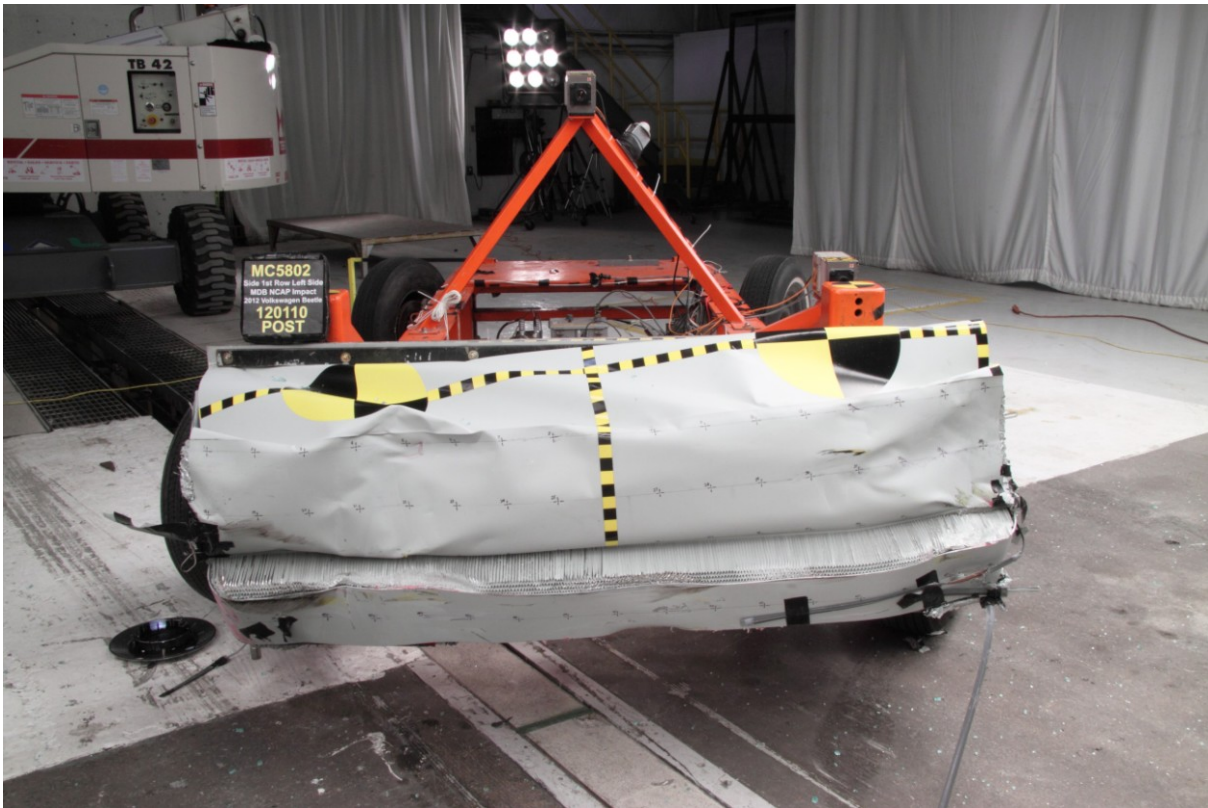
**080** Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



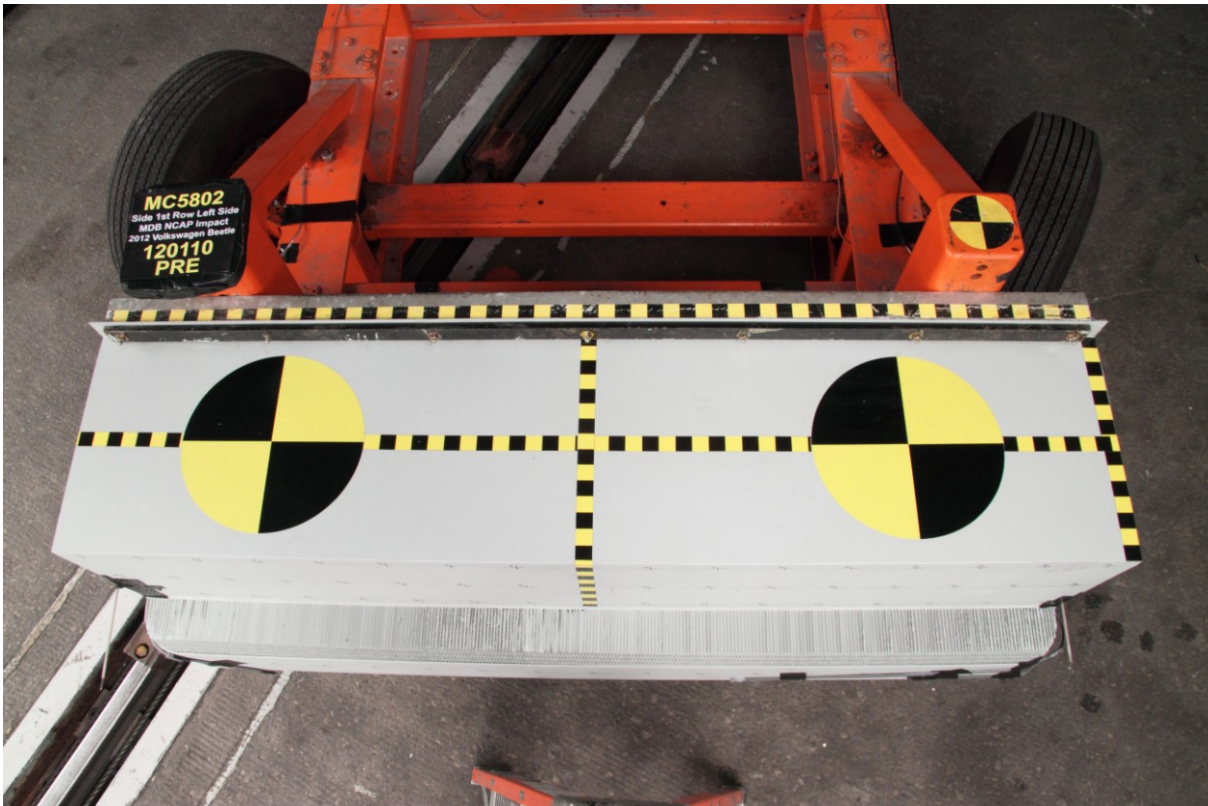
**081** Post-Test View of Fuel Filler Cap or Fuel Filler Neck



**082** Pre-Test Front View of MDB Impactor Face



**083** Post-Test Front View of MDB Impactor Face



**084** Pre-Test Top View of MDB Impactor Face



**085** Post-Test Top View of MDB Impactor Face



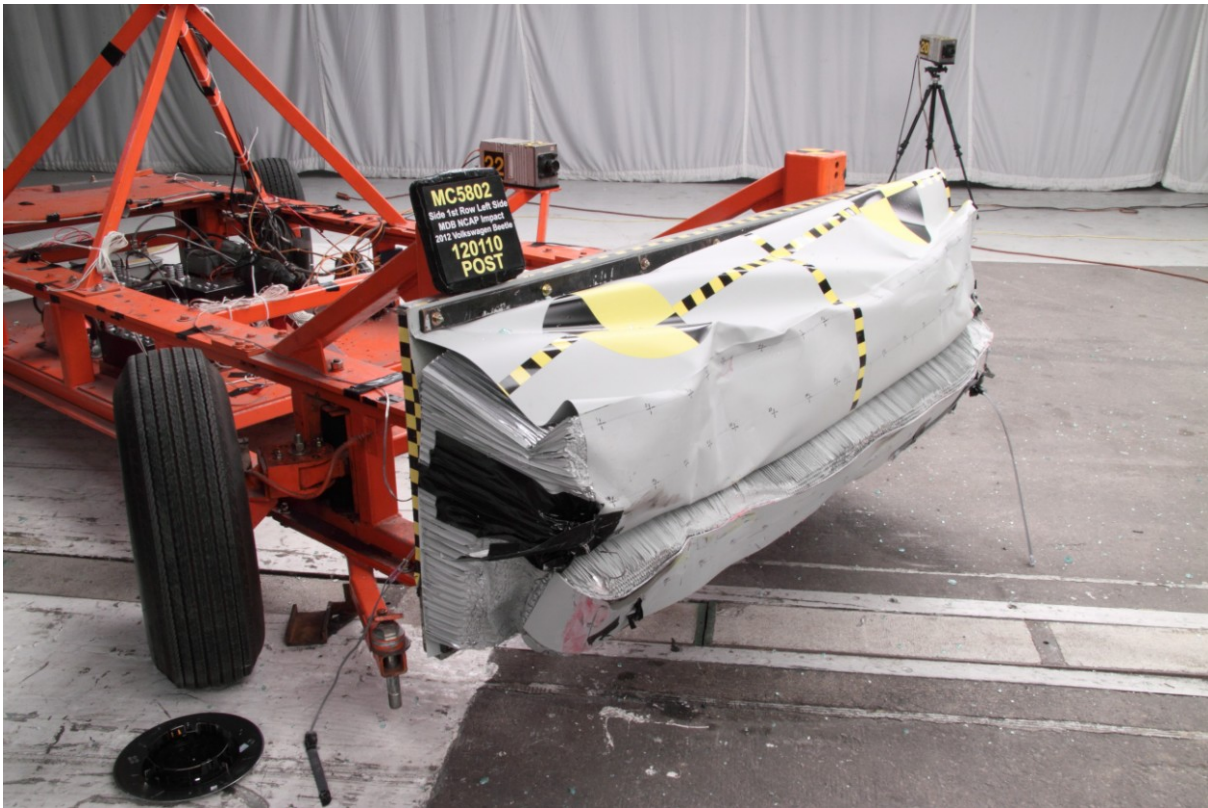
**086** Pre-Test Left Side View of MDB Impactor Face



**087** Post-Test Left Side View of MDB Impactor Face



**088** Pre-Test Right Side View of MDB Impactor Face



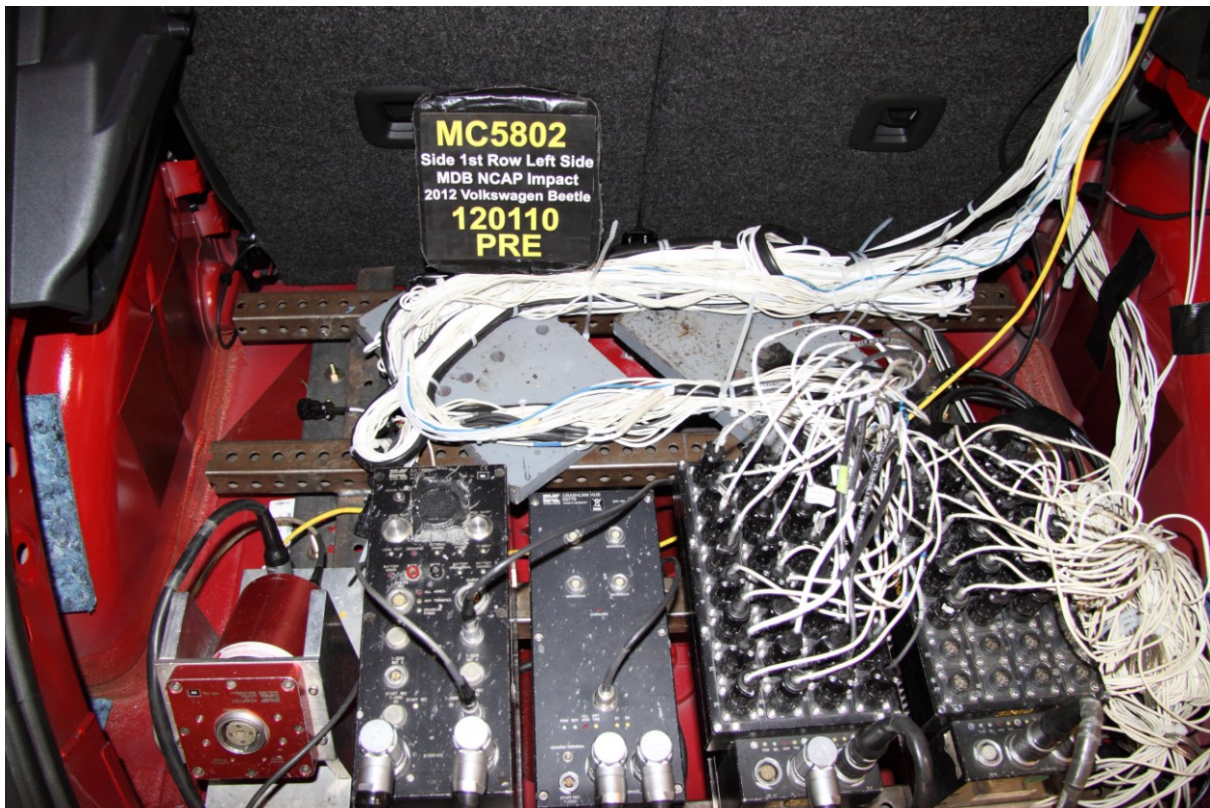
**089** Post-Test Right Side View of MDB Impactor Face



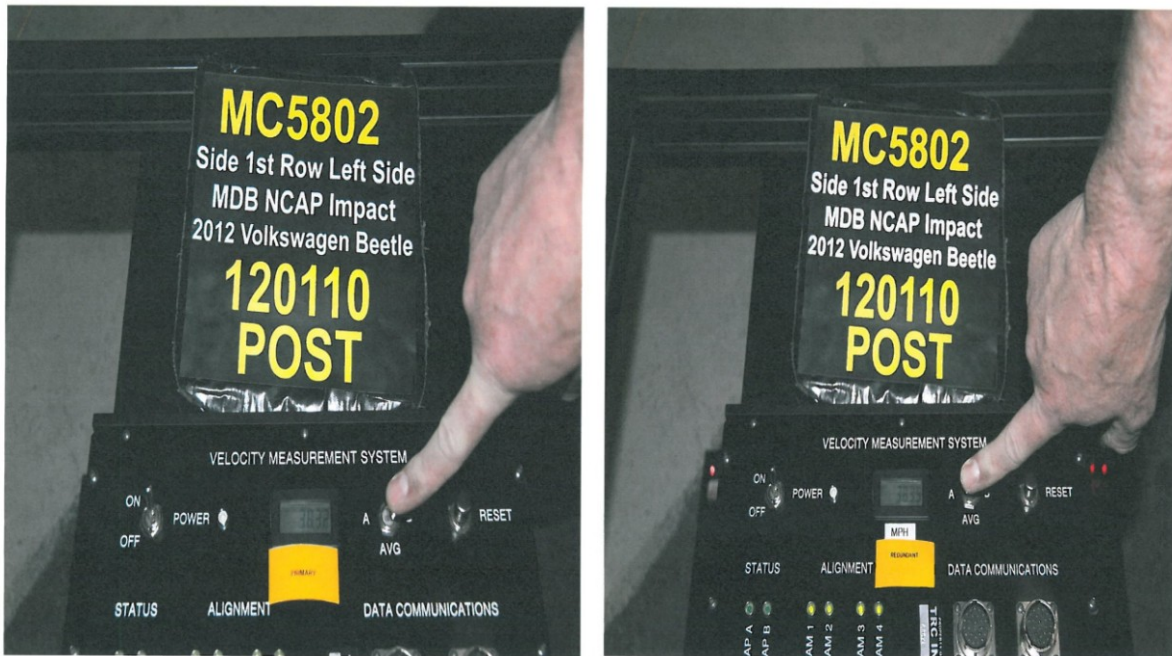
**090** Close-Up View of Vehicle Certification Label



091 Close-Up View of Vehicle Tire Information Placard or Label



092 Pre-Test Ballast View



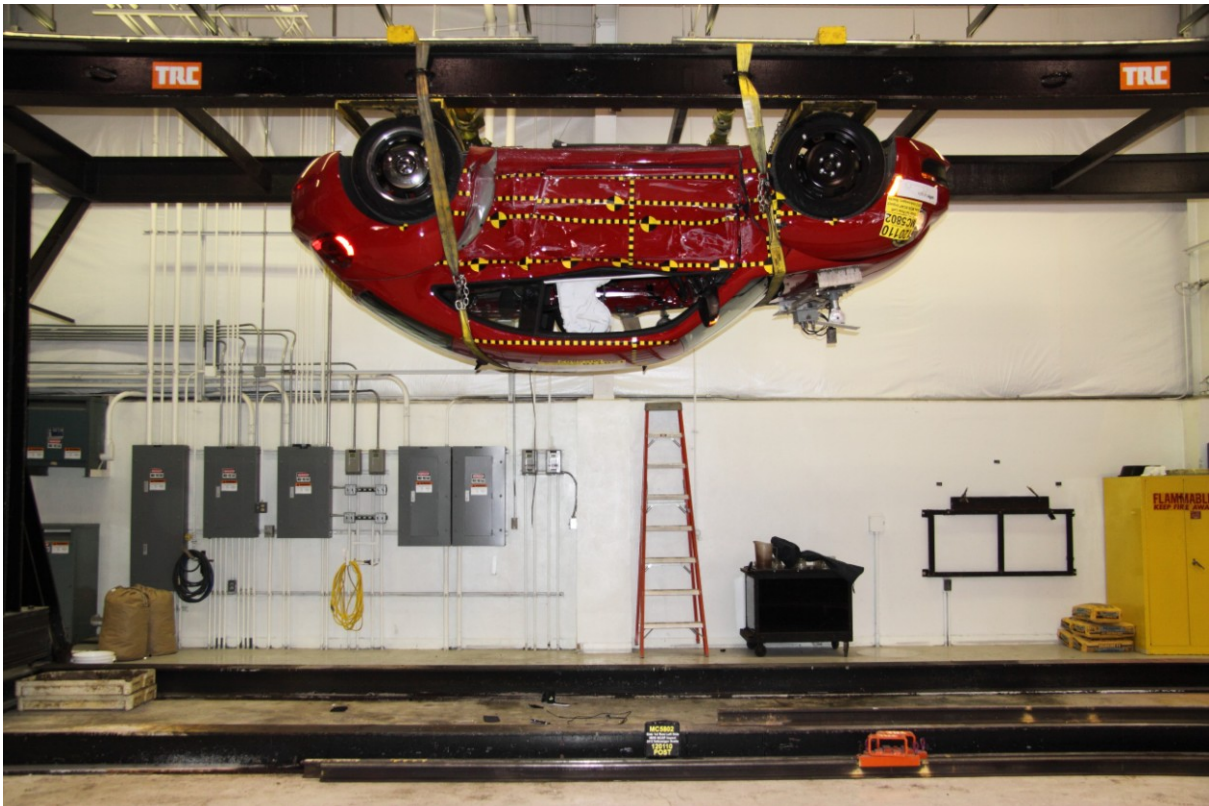
**093** Post-Test Primary and Redundant Speed Trap Read-Out



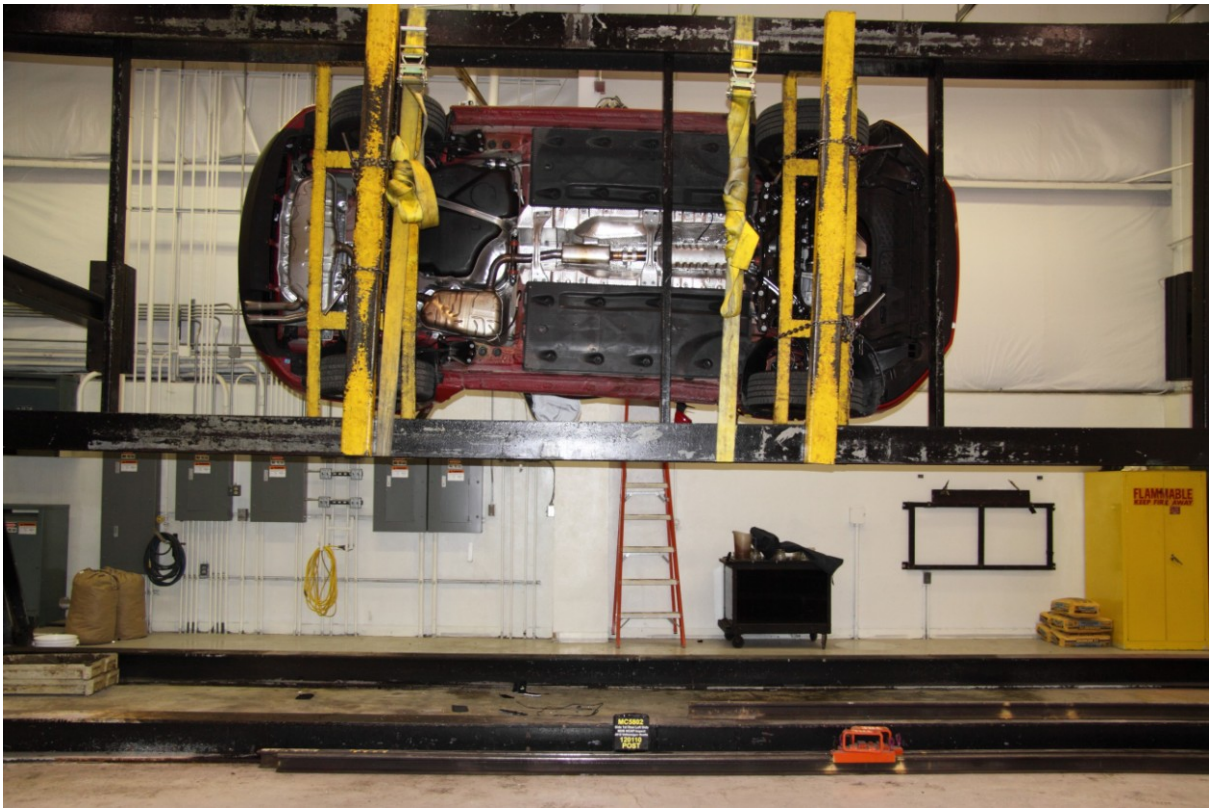
**094** FMVSS No. 301 Static Rollover 0 Degrees



**095** FMVSS No. 301 Static Rollover 90 Degrees



**096** FMVSS No. 301 Static Rollover 180 Degrees



**097** FMVSS No. 301 Static Rollover 270 Degrees



**098** FMVSS No. 301 Static Rollover 360 Degrees



099 Impact Event

**2012 Beetle**  
 Exterior: Tornado Red Exterior Interior: Titan Black Leatherette Interior

**STANDARD FEATURES** (unless indicated by options)

**PERFORMANCE/HANDLING**

- 2.5L 125-hp engine, 177-hp 8-speed, in-line 5-cylinder engine
- Partial-Crew Emission Vehicle
- Hydraulically assisted power rack & pinion steering
- Independent dual front suspension
- Electronic Stability Control (ESC)
- Anti-Slip Regulation (ASR)
- Electronic Brake Force Distribution (EBD)
- Anti-lock Braking System (ABS)
- 17" alloy wheels w/ all-season tires

**SAFETY/DURABILITY**

- Driver & front passenger side-impact supplemental restraint system
- Driver & front passenger side airbag supplemental restraint system
- 3-point safety belts, w/ seating positions
- Daytime Running Lights (DRL)
- Adjustable front seat head restraints
- Side-impact protection door beams
- Front & rear power assisted disc brakes
- Front & Rear Pressure Monitoring System (TPMS)

**COMFORT/CONVENIENCE**

- V-Tec Leatherette seating surfaces
- A/C conditioning, CFC-free
- Heatable front seats
- Media Device Interface (MDI) w/ iPod/iPad cable
- Power, heatable exterior mirrors
- Bluetooth® mobile telephone connectivity
- Climate control
- Height adjustable, telescoping steering wheel
- Remote keyless locking system
- Power windows w/ crash protection
- Split folding rear seat
- Height adjustable front seats w/ manual lumbar
- Front cup holders
- Leather wrapped steering wheel
- 12-volt power outlets
- Heated front leather needles
- Trip computer
- 6-speaker sound system w/ aux-in
- 3-color adjustable ambient lighting

**Manufacturer's Suggested Retail Price:** \$20,895.00

**DRIVER CARE PACKAGE**

**WARRANTY INFORMATION**

- Volkswagen New Vehicle Limited Warranty
- 3 years/50,000 miles whichever occurs first
- Powertrain Limited Warranty
- 5 years/80,000 miles whichever occurs first
- Linked Warranty against Corrosion Perforation
- 12 month/unlimited mileage
- 24-HOUR ROADSIDE ASSISTANCE (Towing, Jump Starts, Tire Changes, Oil & Lock-Out Provided by a third party supplier)
- 3 years/36,000 miles whichever occurs first

**VOLKSWAGEN CAREFREE MAINTENANCE**

Scheduled maintenance services described in the Volkswagen Maintenance booklets are covered at no charge for 3 years/36,000 miles (whichever occurs first)

**PACKAGES/OPTIONS**

- Tornado Red Exterior No Charge
- Titan Black Leatherette Interior No Charge
- Minor Mirrors (set of 4), Heavy Duty Trunk Liner w/ Cargo Blocks \$235.00
- First Aid Kit \$35.00
- Adapted Automatic Transmission No Charge

**EPA Fuel Economy Estimates**

**CITY MPG: 22** Expected range for most drivers 18 to 26 MPG

**HIGHWAY MPG: 29** Expected range for most drivers 24 to 34 MPG

**Estimated Annual Fuel Cost: \$2,220** based on 15,000 miles at \$3.70 per gallon

**Combined Fuel Economy: 25** This Vehicle

**GOVERNMENT SAFETY RATINGS**

Frontal Crash	Driver Passenger	Not Rated
Side Crash	Front Seat	Not Rated
	Rear Seat	Not Rated
Rollover		Not Rated

**Environmental Performance**

Protect the environment, choose vehicles with higher scores:

Global Warming Score: 7 (Average) / 9 (Cleanest)

Smog Score: 7 (Average) / 9 (Cleanest)

**PARTS CONTENT INFORMATION**

FOR VEHICLES IN THIS CARLINE:	FOR THIS VEHICLE:
U.S./CANADIAN	FINAL ASSEMBLY POINT:
PARTS CONTENT: 6%	PUEBLA, MEXICO
MAJOR SOURCES OF FOREIGN	COUNTRY OF ORIGIN:
PARTS CONTENT:	ENGINE: MEXICO
GERMANY: 45%	TRANSMISSION: JAPAN
MEXICO: 25%	

**Total Price:** \$21,935.00

**Environmental Performance**

Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on the vehicle's measured emissions. Please visit [www.DriveClean.ca.gov](http://www.DriveClean.ca.gov) for more information.

**Who better to get you into a Volkswagen than us? Volkswagen Credit**

100 Monroney Label

### Adjusting front or rear head restraints

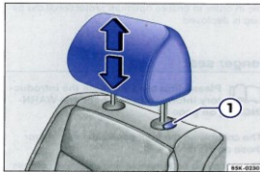




Fig. 32 Adjusting the front or rear head restraints.

Please first read and note the introductory information and heed the WARNINGS on page 54.

All seats are equipped with head restraints.

#### Adjusting the height

- Push the head restraint up in the direction of the arrow or down when the button  is pressed .
- The head restraint must lock securely in the position selected.

#### Proper head restraint adjustment

Adjust head restraints so that the upper edge of the head restraint is at least at eye level or higher. Position the back of the head as close as possible to the head restraint.

#### Adjusting the head restraint for short people

Push the head restraint down as far as it will go, even if this means the person's head is still below the top edge of the head restraint. A small gap may remain between the head restraint and the backrest when the head restraint is all the way down.



#### Adjusting the head restraint for tall people

Pull the head restraint up as far as it will go.

#### WARNING



Driving without head restraints or with improperly adjusted head restraints increases the risk of serious injuries in a collision.

- Always drive with the head restraints in place and properly adjusted to help minimize the risk of neck injury in a crash.
- Every person in the vehicle must have a properly adjusted head restraint to minimize the risk of neck injury in a crash. Each head restraint must be adjusted according to the occupants' size so that the upper edge is even with the top of the person's head, but no lower than eye level. Always sit so that the back of your head is as close as possible to the head restraint.
- Never adjust head restraint while driving.




- If necessary, slide a flat object such as a plastic card between the backrest cover and the cover cap of the head restraint guide rod  to unlock the head restraint.
- While pressing button , pull the head restraint out completely.


#### Installing the front head restraints

Position head restraint properly over the head restraint guides of the respective seat back and insert the head restraint into the guides.


- Push the head restraint down as far as it will go while pressing button .
- Move the seat backrest into an upright position using the adjusting wheel.
- Adjust the head restraint according to the occupant's size  page 58.

#### Removing the rear head restraint


- Unlock the backrest of the rear seat and fold it forward  page 132.
- Pull the head restraint all the way up .
- If necessary, slide a flat object such as a plastic card between the backrest cover and the cover cap of the head restraint guide rod  to unlock the head restraint.

- While pressing button , pull the head restraint out completely.
- Fold the backrest of the rear seat so that it locks securely.

#### Installing the rear head restraint

- Unlock the backrest of the rear seat and fold it forward  page 132.
- Position head restraint properly over the head restraint guides of the respective seat back and insert the head restraint into the guides.

- Push the head restraint down while pressing button .

- Fold the backrest of the rear seat so that it locks securely.
- Adjust the head restraint according to the occupant's size  page 58.

#### WARNING

Driving without head restraints or with improperly adjusted head restraints increases the risk of serious personal injuries or death in a collision.

- If a seat is occupied, always drive with the respective head restraint installed and properly adjusted.
- Always reinstall head restraints as soon as possible so that vehicle occupants are properly protected.

#### NOTICE

When removing or reinstalling the head restraint, take care that the head restraint does not strike the headliner or the back of the front seat. The headliner or other parts of the vehicle could otherwise be damaged.

### Removing and reinstalling front or rear head restraints

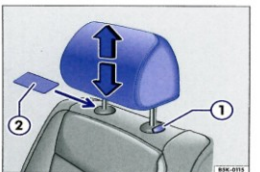



Fig. 33 Removing front or rear head restraints.

Please first read and note the introductory information and heed the WARNINGS on page 54.

All seats are equipped with head restraints.

#### Removing the front head restraints

- Move the seat backrest back using the adjusting wheel.
- Pull the head restraint all the way up .

58 Before driving

Sitting properly and safely 59

## 101 Driver Head Restraint Use and Adjustment Information from Vehicle Owner Manual

### Adjusting front or rear head restraints

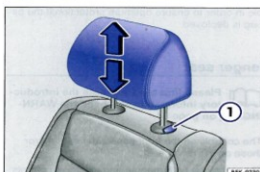




Fig. 32 Adjusting the front or rear head restraints.

Please first read and note the introductory information and heed the WARNINGS on page 54.

All seats are equipped with head restraints.

#### Adjusting the height

- Push the head restraint up in the direction of the arrow or down when the button  is pressed .
- The head restraint must lock securely in the position selected.

#### Proper head restraint adjustment

Adjust head restraints so that the upper edge of the head restraint is at least at eye level or higher. Position the back of the head as close as possible to the head restraint.

#### Adjusting the head restraint for short people

Push the head restraint down as far as it will go, even if this means the person's head is still below the top edge of the head restraint. A small gap may remain between the head restraint and the backrest when the head restraint is all the way down.



#### Adjusting the head restraint for tall people

Pull the head restraint up as far as it will go.

#### WARNING



Driving without head restraints or with improperly adjusted head restraints increases the risk of serious injuries in a collision.

- Always drive with the head restraints in place and properly adjusted to help minimize the risk of neck injury in a crash.
- Every person in the vehicle must have a properly adjusted head restraint to minimize the risk of neck injury in a crash. Each head restraint must be adjusted according to the occupants' size so that the upper edge is even with the top of the person's head, but no lower than eye level. Always sit so that the back of your head is as close as possible to the head restraint.
- Never adjust head restraint while driving.


- If necessary, slide a flat object such as a plastic card between the backrest cover and the cover cap of the head restraint guide rod  to unlock the head restraint.
- While pressing button , pull the head restraint out completely.



#### Installing the front head restraints


Position head restraint properly over the head restraint guides of the respective seat back and insert the head restraint into the guides.

- Push the head restraint down as far as it will go while pressing button .
- Move the seat backrest into an upright position using the adjusting wheel.
- Adjust the head restraint according to the occupant's size  page 58.


#### Removing the rear head restraint

Unlock the backrest of the rear seat and fold it forward  page 132.


- Pull the head restraint all the way up .
- If necessary, slide a flat object such as a plastic card between the backrest cover and the cover cap of the head restraint guide rod  to unlock the head restraint.

- While pressing button , pull the head restraint out completely.
- Fold the backrest of the rear seat so that it locks securely.

#### Installing the rear head restraint

- Unlock the backrest of the rear seat and fold it forward  page 132.
- Position head restraint properly over the head restraint guides of the respective seat back and insert the head restraint into the guides.

- Push the head restraint down while pressing button .

- Fold the backrest of the rear seat so that it locks securely.
- Adjust the head restraint according to the occupant's size  page 58.

#### WARNING

Driving without head restraints or with improperly adjusted head restraints increases the risk of serious personal injuries or death in a collision.

- If a seat is occupied, always drive with the respective head restraint installed and properly adjusted.
- Always reinstall head restraints as soon as possible so that vehicle occupants are properly protected.

#### NOTICE

When removing or reinstalling the head restraint, take care that the head restraint does not strike the headliner or the back of the front seat. The headliner or other parts of the vehicle could otherwise be damaged.

### Removing and reinstalling front or rear head restraints

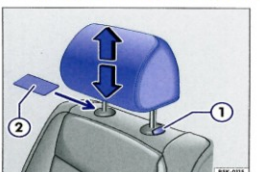



Fig. 33 Removing front or rear head restraints.

Please first read and note the introductory information and heed the WARNINGS on page 54.

All seats are equipped with head restraints.

#### Removing the front head restraints

- Move the seat backrest back using the adjusting wheel.
- Pull the head restraint all the way up .

58 Before driving

Sitting properly and safely 59

## 102 Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner Manual

**APPENDIX B**  
**VEHICLE AND DUMMY RESPONSE DATA PLOTS**

## TABLE OF DATA PLOTS

### Driver & Passenger Dummy Instrumentation Plots

<b>No.</b>	<b>Description</b>	<b>Page</b>
1	Driver Head Acceleration (X) Primary vs. Time	B-5
2	Driver Head Acceleration (Y) Primary vs. Time	B-5
3	Driver Head Acceleration (Z) Primary vs. Time	B-5
4	Driver Head Resultant Acceleration Primary vs. Time	B-5
5	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-6
6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-6
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-6
8	Driver Thorax Rib Deflection Maximum vs. Time	B-6
9	Driver Anterior Abdominal Force (Y) vs. Time	B-7
10	Driver Middle Abdominal Force (Y) vs. Time	B-7
11	Driver Posterior Abdominal Force (Y) vs. Time	B-7
12	Driver Total Abdominal Force (Y) vs. Time	B-7
13	Driver Pubic Symphysis Force (Y) vs. Time	B-8
14	Passenger Head Acceleration (X) vs. Time Primary	B-8
15	Passenger Head Acceleration (Y) vs. Time Primary	B-8
16	Passenger Head Acceleration (Z) vs. Time Primary	B-8
17	Passenger Head Resultant Acceleration Primary vs. Time	B-9
18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-9
19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-9
20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-9
21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-10
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-10
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-10
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-10

The following additional data can be obtained from the Research and Development section of the NHTSA website (<http://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)

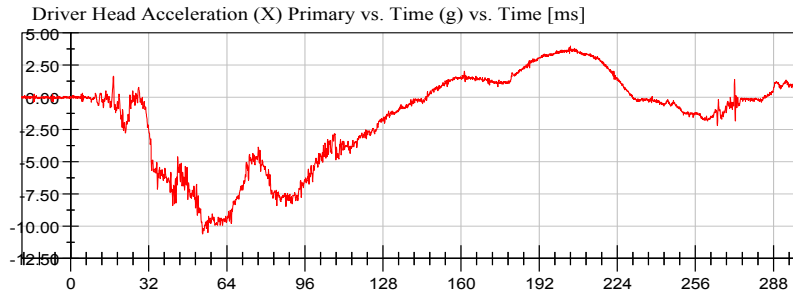
## MDB Instrumentation Data

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

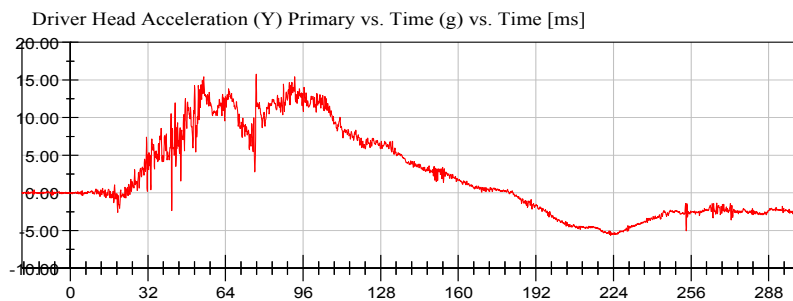
**NHTSA**

Test Lab: CTF  
Test Number: 120110 (MC5802)

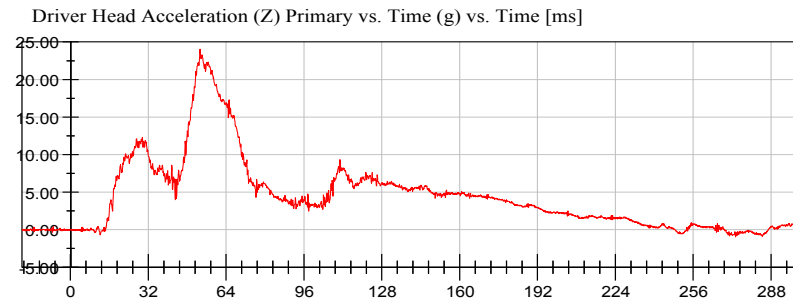
Test Date: 01/10/2012  
Position #1 ES-2 Dummy with Rib Extension (F030)  
Position #4 SID IIs Dummy (305)



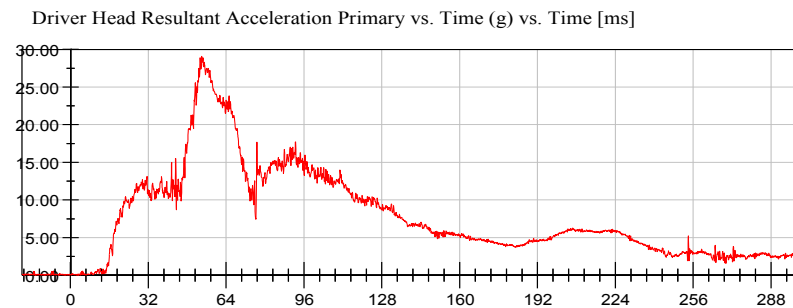
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4.00 g at 204.80 ms  
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-10.61 g at 54.08 ms  
CFC\_1000



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15.79 g at 76.64 ms  
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-5.67 g at 222.88 ms  
CFC\_1000



<Max>  
24.05 g at 53.28 ms  
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-0.96 g at 273.44 ms  
CFC\_1000



<Max>  
29.07 g at 53.92 ms  
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0.02 g at -19.28 ms  
CFC\_1000

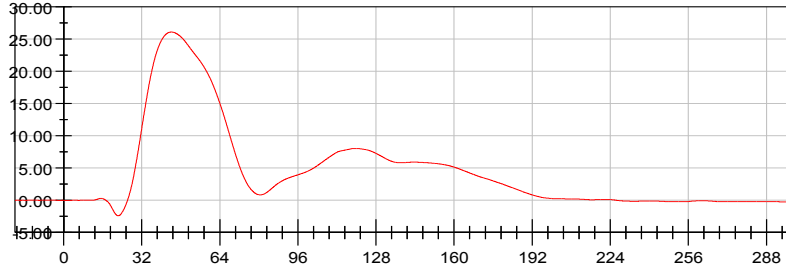


# NHTSA

Test Lab: CTF  
Test Number: 120110 (MC5802)

Test Date: 01/10/2012  
Position #1 ES-2 Dummy with Rib Extension (F030)  
Position #4 SID IIs Dummy (305)

Driver Upper Thorax Rib Deflection (Y) vs. Time (mm) vs. Time [ms]



<Max>

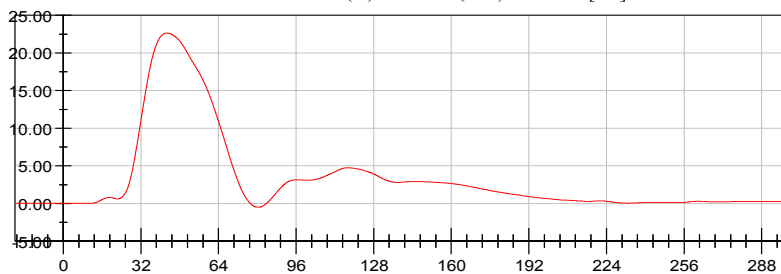
26.10 mm at 44.16 ms

<Min>

-2.40 mm at 22.40 ms

CFC\_180

Driver Middle Thorax Rib Deflection (Y) vs. Time (mm) vs. Time [ms]



<Max>

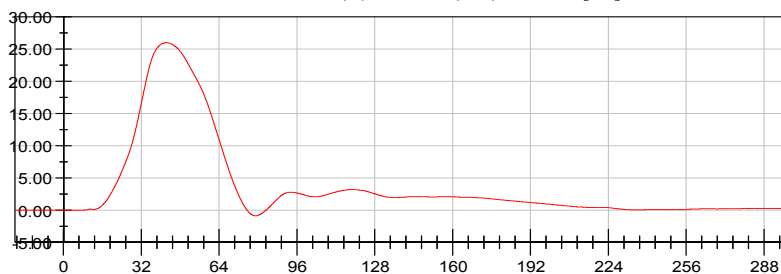
22.63 mm at 42.64 ms

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-0.51 mm at 80.32 ms

CFC\_180

Driver Lower Thorax Rib Deflection (Y) vs. Time (mm) vs. Time [ms]



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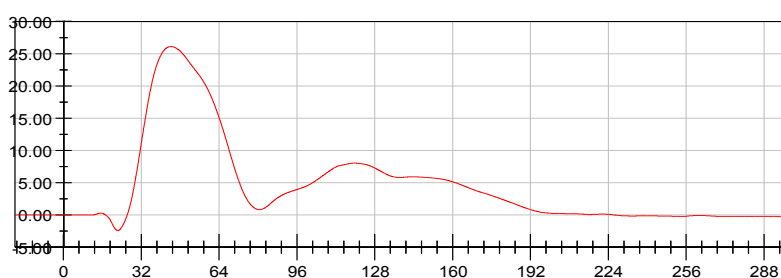
26.00 mm at 42.24 ms

<Min>

-0.89 mm at 78.96 ms

CFC\_180

Driver Thorax Rib Deflection Maximum vs. Time (mm) vs. Time [ms]



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26.10 mm at 44.16 ms

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-2.40 mm at 22.40 ms

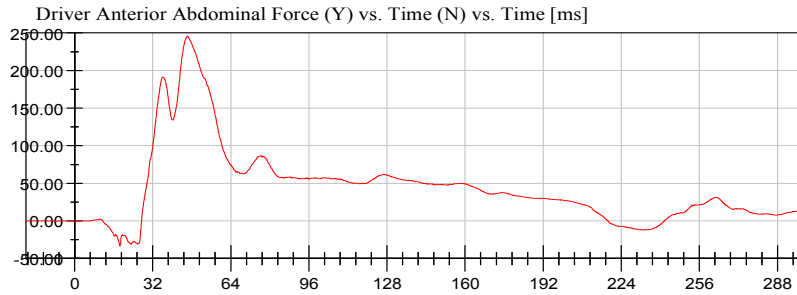
CFC\_180



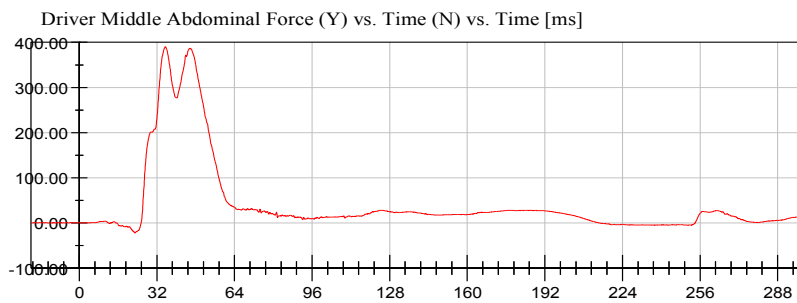
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Test Lab: CTF  
Test Number: 120110 (MC5802)

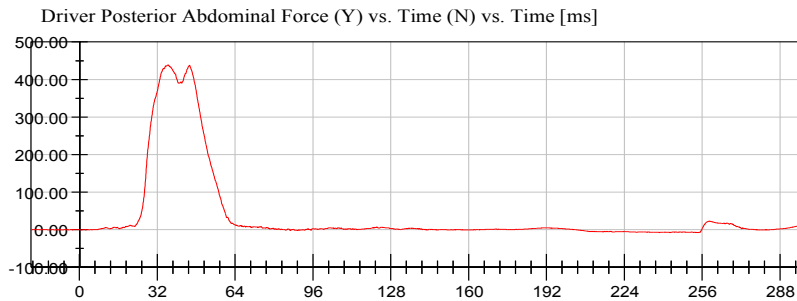
Test Date: 01/10/2012  
Position #1 ES-2 Dummy with Rib Extension (F030)  
Position #4 SID IIs Dummy (305)



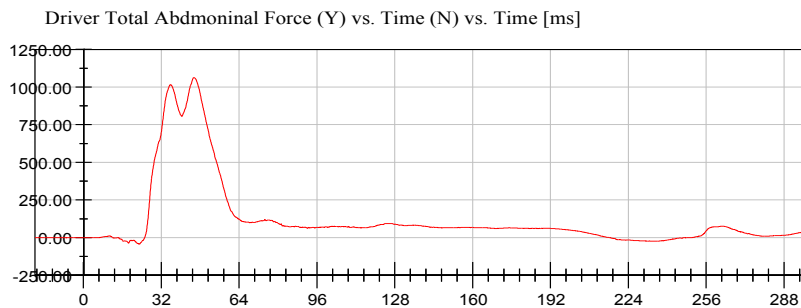
<Max>  
245.47 N at 46.16 ms  
<Min>  
-33.32 N at 18.56 ms  
CFC\_600



<Max>  
390.19 N at 35.52 ms  
<Min>  
-22.49 N at 23.04 ms  
CFC\_600



<Max>  
438.54 N at 36.40 ms  
<Min>  
-7.80 N at 254.00 ms  
CFC\_600



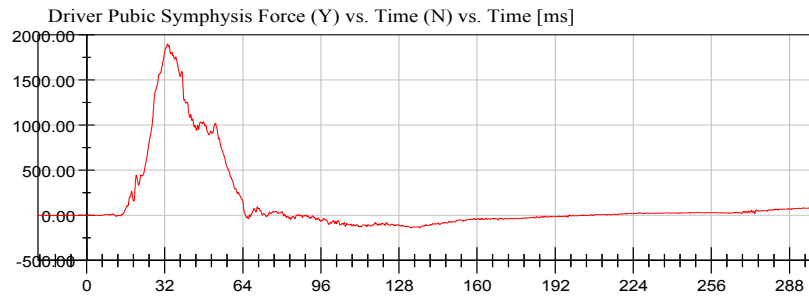
<Max>  
1,063.19 N at 45.36 ms  
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-43.30 N at 22.96 ms  
CFC\_600



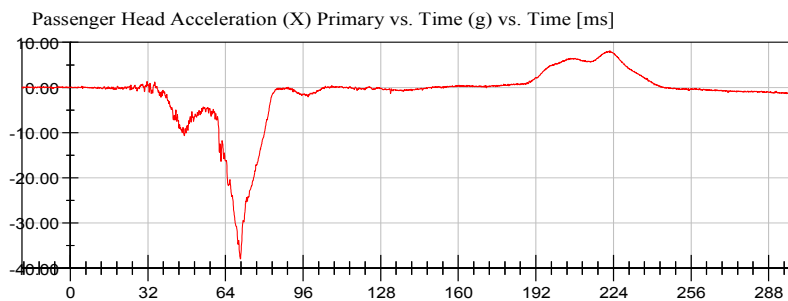
# NHTSA

Test Lab: CTF  
Test Number: 120110 (MC5802)

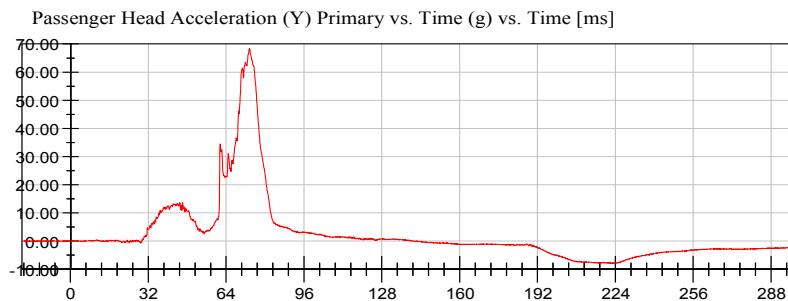
Test Date: 01/10/2012  
Position #1 ES-2 Dummy with Rib Extension (F030)  
Position #4 SID IIs Dummy (305)



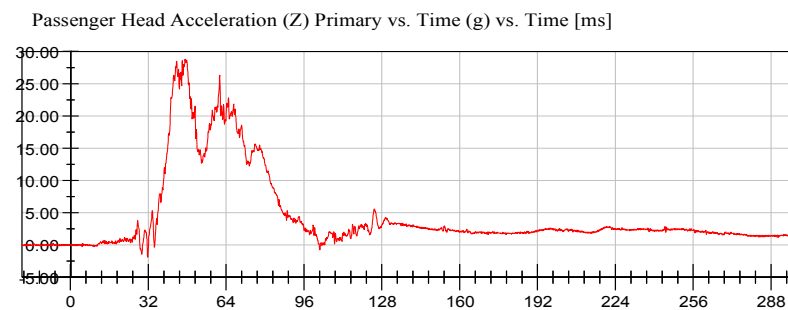
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1,900.45 N at 33.20 ms  
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-138.56 N at 136.56 ms  
CFC\_600



<Max>  
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-38.01 g at 70.08 ms  
CFC\_1000



<Max>  
68.44 g at 73.52 ms  
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-8.04 g at 222.64 ms  
CFC\_1000



<Max>  
28.81 g at 47.12 ms  
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-1.87 g at 31.76 ms  
CFC\_1000

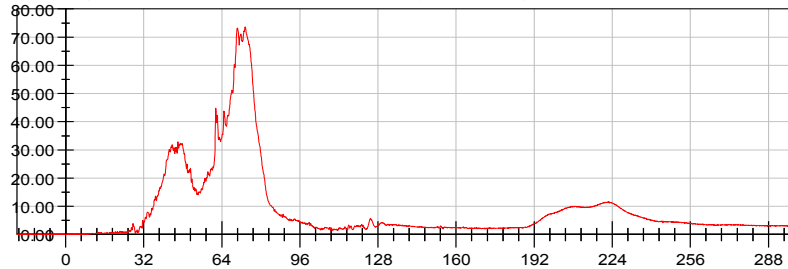


# NHTSA

Test Lab: CTF  
Test Number: 120110 (MC5802)

Test Date: 01/10/2012  
Position #1 ES-2 Dummy with Rib Extension (F030)  
Position #4 SID IIs Dummy (305)

Passenger Head Resultant Acceleration Primary vs. Time (g) vs. Time [ms]



<Max>

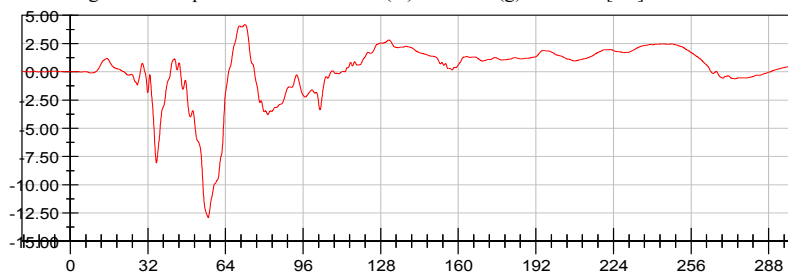
73.66 g at 73.52 ms

<Min>

0.03 g at -20.00 ms

CFC\_1000

Passenger Lower Spine T12 Acceleration (X) vs. Time (g) vs. Time [ms]



<Max>

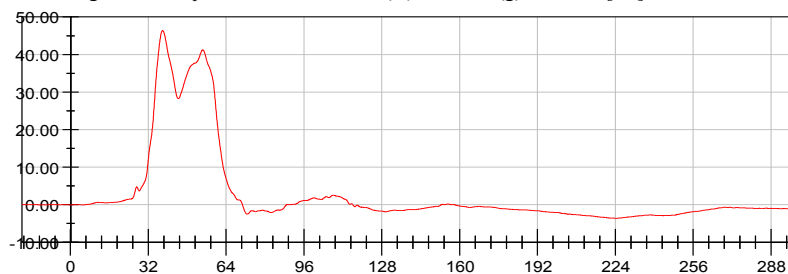
4.17 g at 72.00 ms

<Min>

-12.93 g at 56.88 ms

CFC\_180

Passenger Lower Spine T12 Acceleration (Y) vs. Time (g) vs. Time [ms]



<Max>

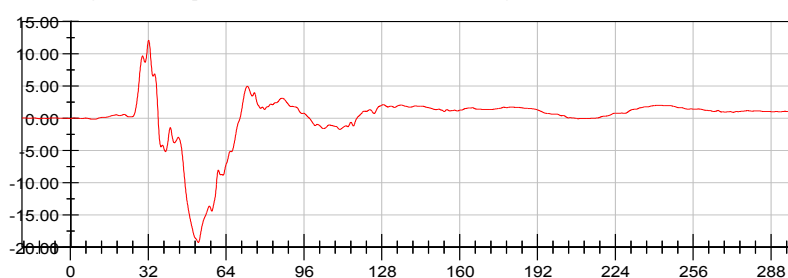
46.40 g at 37.92 ms

<Min>

-3.61 g at 224.32 ms

CFC\_180

Passenger Lower Spine T12 Acceleration (Z) vs. Time (g) vs. Time [ms]



<Max>

12.08 g at 32.16 ms

<Min>

-19.24 g at 52.56 ms

CFC\_180



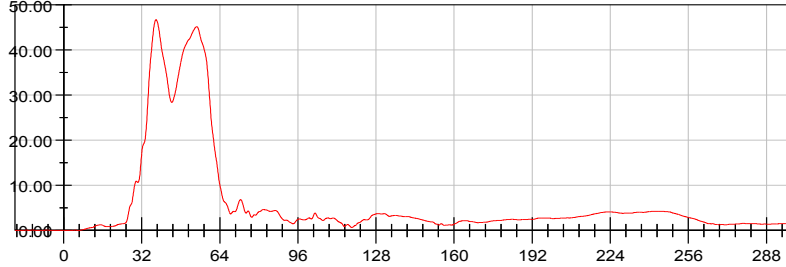
**NHTSA**

Test Lab: CTF  
Test Number: 120110 (MC5802)

Position #1 ES-2 Dummy with Rib Extension (F030)  
Position #4 SID IIs Dummy (305)

Test Date: 01/10/2012

Passenger Lower Spine T12 Resultant Acceleration vs. Time (g) vs. Time [ms]



**<Max>**

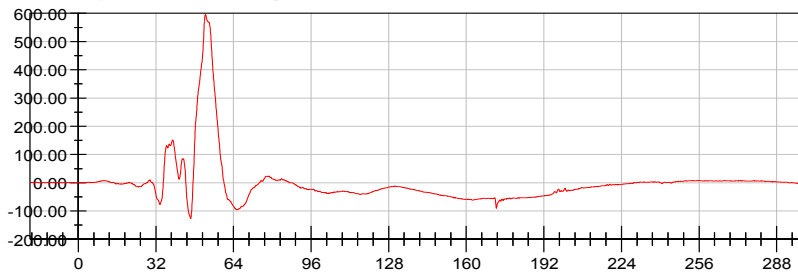
46.71 g at 37.84 ms

**<Min>**

0.01 g at -13.92 ms

CFC\_180

Passenger Iliac Force on Impact Side (Y) vs. Time (N) vs. Time [ms]



**<Max>**

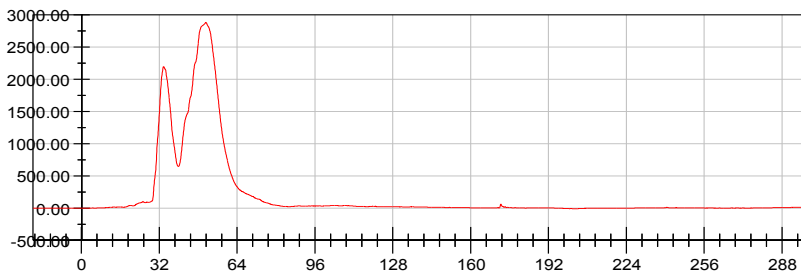
596.45 N at 52.40 ms

**<Min>**

-127.60 N at 46.32 ms

CFC\_600

Passenger Acetabulum Force on Impact Side (Y) vs. Time (N) vs. Time [ms]



**<Max>**

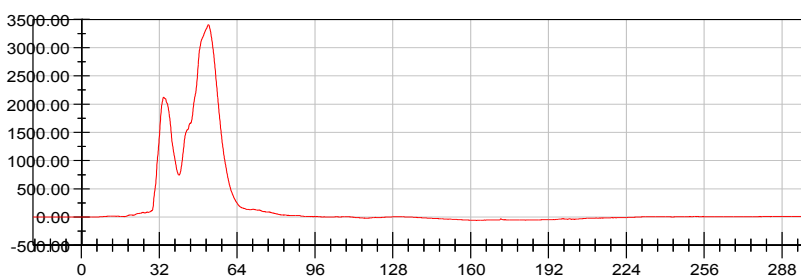
2,883.53 N at 51.12 ms

**<Min>**

-9.82 N at 203.04 ms

CFC\_600

Passenger Total Pelvic Force on Impact Side (Y) vs. Time (N) vs. Time [ms]



**<Max>**

3,406.00 N at 52.24 ms

**<Min>**

-59.34 N at 162.40 ms

CFC\_600



**APPENDIX C**  
**DUMMY PERFORMANCE CALIBRATION TEST DATA**

## TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

### ES-2re (Driver) Dummy

#### Description

**Table 1.** External Measurements

**Table 2.** Head Drop Test

Resultant Head Acceleration (G's) vs. Time (ms)

Head (X) Acceleration (G's) vs. Time (ms)

Head (Y) Acceleration (G's) vs. Time (ms)

Head (Z) Acceleration (G's) vs. Time (ms)

**Table 3** Neck Pendulum Test

Pendulum Velocity (m/s) vs. Time (ms)

Flexion Angle (°) vs. Time (ms)

Potentiometer A (°) vs. Time (ms)

Potentiometer B (°) vs. Time (ms)

Potentiometer C (°) vs. Time (ms)

**Table 4.** Shoulder Impact Test

Impactor Acceleration (G's) vs. Time (ms)

**Table 5.** Thorax – Upper Rib Drop Test

Upper Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)

Upper Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

**Table 6.** Thorax – Middle Rib Drop Test

Middle Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)

Middle Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

**Table 7.** Thorax – Lower Rib Drop Test

Lower Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)

Lower Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

**Table 8.** Thorax – Full Body Impact Test

Pendulum Acceleration (G's) vs. Time (ms)

Impactor Force (kN) vs. Time (ms)

Upper Rib Displacement (mm) vs. Time (ms)

Middle Rib Displacement (mm) vs. Time (ms)

Lower Rib Displacement (mm) vs. Time (ms)

**Table 9.** Abdomen Impact Test

Impactor Force (kN) vs. Time (ms)

Total Abdomen Force (kN) vs. Time (ms)

Front Abdomen Force (kN) vs. Time (ms)

Middle Abdomen Force (kN) vs. Time (ms)

Rear Abdomen Force (kN) vs. Time (ms)

**Table 10.** Lumbar Spine Flexion Test

Pendulum Velocity (m/s) vs. Time (ms)

Spine Flexion Angle (°) vs. Time (ms)

Potentiometer A (°) vs. Time (ms)

Potentiometer B (°) vs. Time (ms)

Potentiometer C (°) vs. Time (ms)

**Table 11.** Pelvis Impact Test

Pendulum Acceleration (G's) vs. Time (ms)

Impactor Force (kN) vs. Time (ms)

Pubic Symphysis (Y) Force (kN) vs. Time (ms)

## TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

### SID-IIs (Rear Passenger) Dummy

#### Description

**Table 1.** External Measurements

**Table 2.** Head Drop Test

- Resultant Head Acceleration (G's) vs. Time (ms)
- Head (X) Acceleration (G's) vs. Time (ms)
- Head (Y) Acceleration (G's) vs. Time (ms)
- Head (Z) Acceleration (G's) vs. Time (ms)

**Table 3.** Lateral Neck Pendulum Test

- Pendulum Velocity (m/s) vs. Time (ms)
- Flexion Angle (°) vs. Time (ms)
- Moment About Occipital Condyle (Nm) vs. Time (ms)

**Table 4.** Shoulder Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Shoulder Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)

**Table 5.** Thorax (With Arm) Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Shoulder Displacement (mm) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

**Table 6.** Thorax (Without Arm) Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

**Table 7.** Abdomen Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Upper Abdominal Rib Displacement (mm) vs. Time (ms)
- Lower Abdominal Rib Displacement (mm) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

**Table 8.** Pelvis Plug Quasi-Static Test (Optional\*)

**Table 9.** Pelvis Acetabulum Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Pelvis (Y) Acceleration (G's) vs. Time (ms)
- Acetabulum Force (N) vs. Time (ms)

**Table 10.** Pelvis Iliac Impact Test

- Impactor Acceleration (G's) vs. Time (ms)
- Pelvis (Y) Acceleration (G's) vs. Time (ms)
- Iliac Force (N) vs. Time (ms)

**Pre-Test Calibration Sheets**  
**Driver S/N F030**

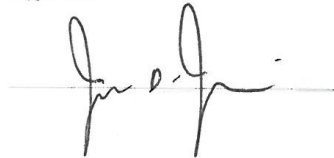
**Transportation Research Center Inc.**  
**572U ES-2re Dummy**  
**External Dimensions**  
**Serial No. F030 Calibration No. 03**  
**Date: 12/07/11**

Symbol	Description	Specification	Results	Pass
		mm	mm	
1	Sitting Height	900.0 - 918.0	910	Yes
2	Seat to Shoulder Joint	558.0 - 572.0	560	Yes
3	Seat to Lower Face of Thoracic Spine Box	346.0 - 356.0	350	Yes
4	Seat to Hip Joint (center of bolt)	97.0 - 103.0	97	Yes
5	Sole to Seat, Sitting	433.0 - 451.0	450	Yes
6	Head Width	152.0 - 158.0	153	Yes
7	Shoulder/Arm Width	461.0 - 479.0	470	Yes
8	Thorax Width	322.0 - 332.0	330	Yes
9	Abdomen Width	273.0 - 287.0	285	Yes
10	Pelvis Lap Width	359.0 - 373.0	365	Yes
11	Head Depth	196.0 - 206.0	200	Yes
12	Thorax Depth	262.0 - 272.0	265	Yes
13	Abdomen Depth	194.0 - 204.0	202	Yes
14	Pelvis Depth	235.0 - 245.0	240	Yes
15	Back of Buttocks to Hip Joint (center of bolt)	150.0 - 160.0	159	Yes
16	Back of Buttocks to Front of Knee	597.0 - 615.0	604	Yes

Technician



Approved



Baseline 10/07/05



# Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 3-1

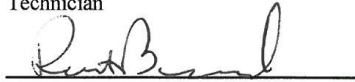
Test Date: 12/7/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Peak Resultant Acceleration	125 - 155 g	137.4 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	6.2 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	Yes	Yes	Yes

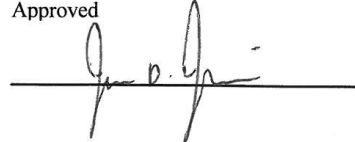
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: NHTSA Final Rule 8/15/2008

12.07.2011 07:46:06 359

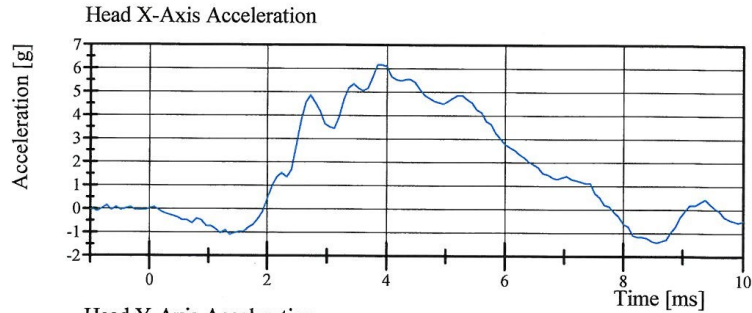


# Transportation Research Center Inc.

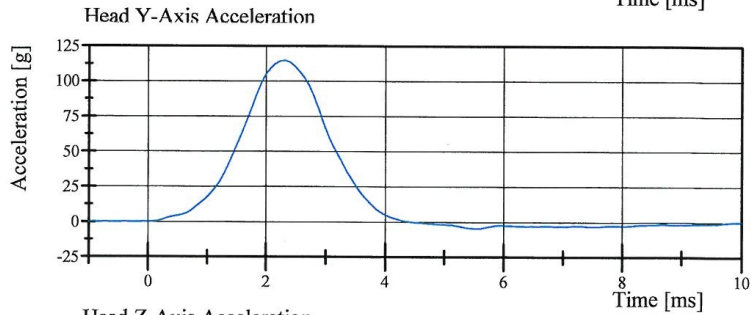
Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 3-1

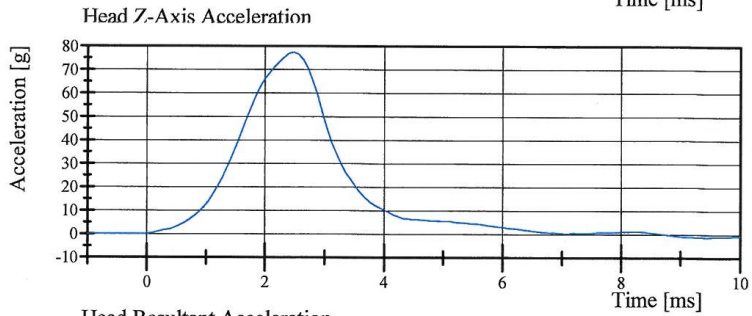
Test Date: 12/7/2011



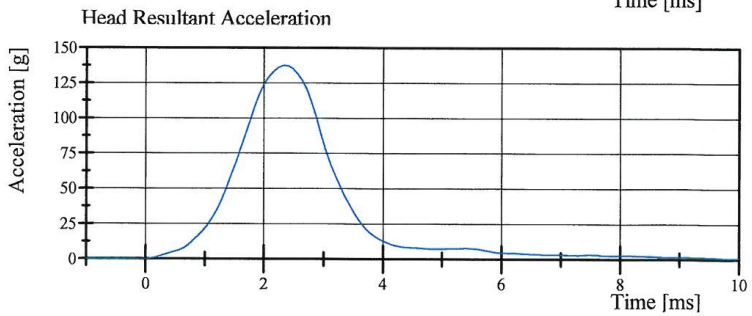
Filter Class: CFC\_1000  
Max: 6.2 gn at 3.8 ms  
Min: -1.4 gn at 8.6 ms



Filter Class: CFC\_1000  
Max: 114.9 gn at 2.3 ms  
Min: -4.6 gn at 5.5 ms



Filter Class: CFC\_1000  
Max: 77.5 gn at 2.5 ms  
Min: -1.2 gn at 9.4 ms



Filter Class: CFC\_1000  
Max: 137.4 gn at 2.3 ms  
Min: 0.0 gn at -0.8 ms

# Transportation Research Center Inc.

Left Lateral Neck

ES-2re Serial No. F030 Certification No. 3-1

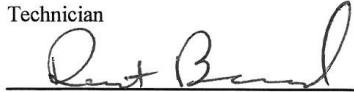
Test Date: 12/6/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.38 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-50.3 deg	Yes
Time of Peak	54 - 66 ms	58.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	57.4 ms	Yes

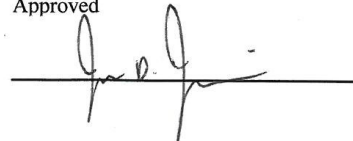
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 17:29:27 1304

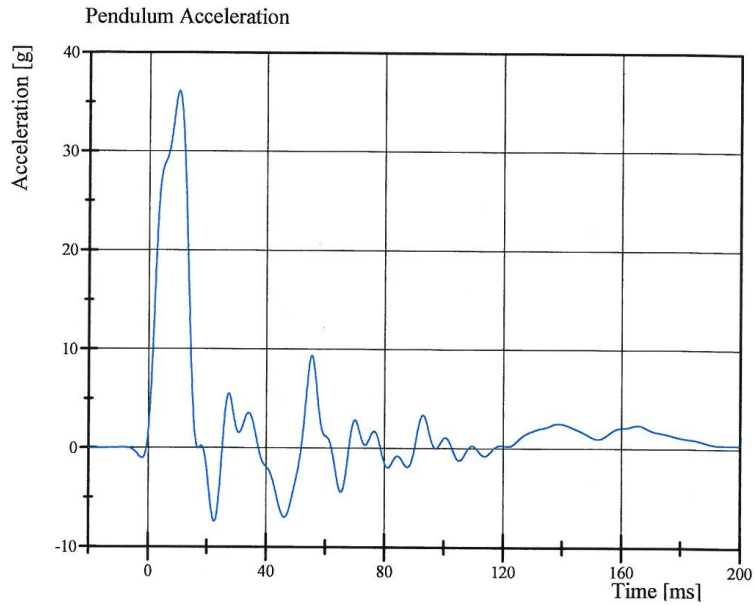


# Transportation Research Center Inc.

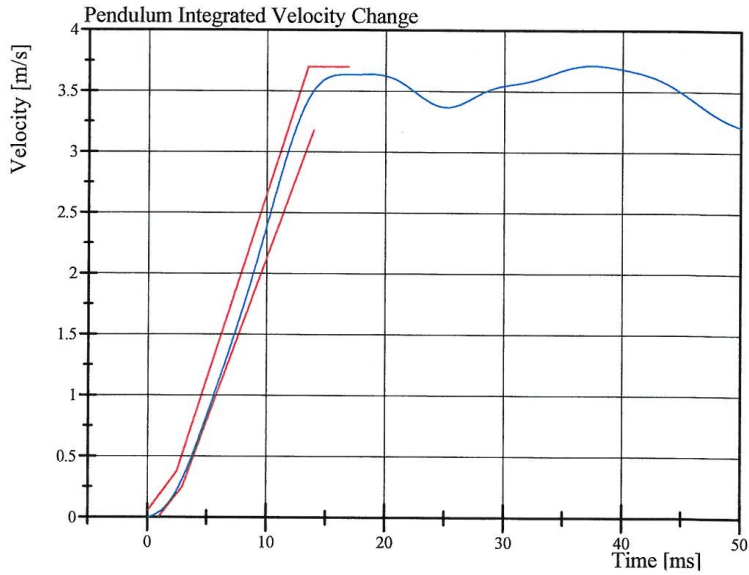
Left Lateral Neck

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/6/2011



Filter Class: CFC\_60  
Max: 36.1 gn at 10.2 ms  
Min: -7.4 gn at 22.5 ms



Filter Class: CFC\_60  
Max: 3.7 m/s at 37.4 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 17:29:35 1304

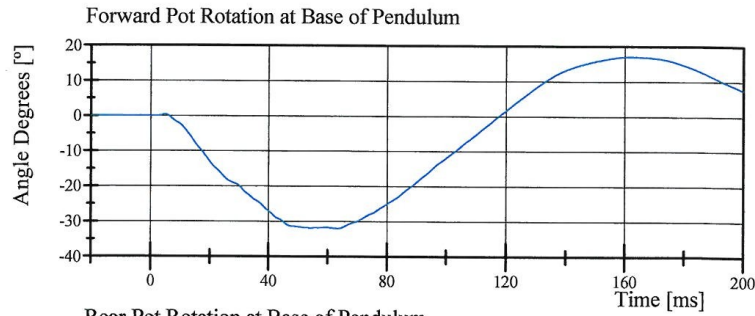


# Transportation Research Center Inc.

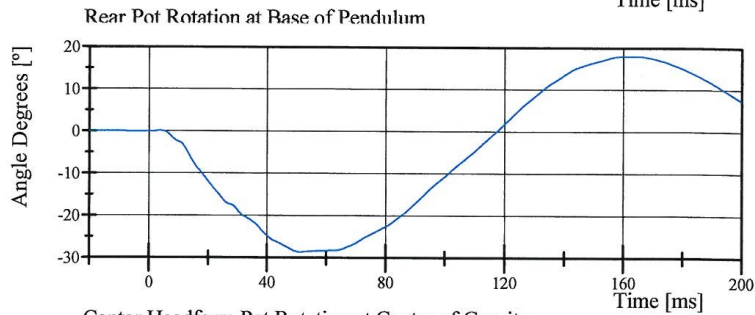
Left Lateral Neck

ES-2re Serial No. F030 Certification No. 3-1

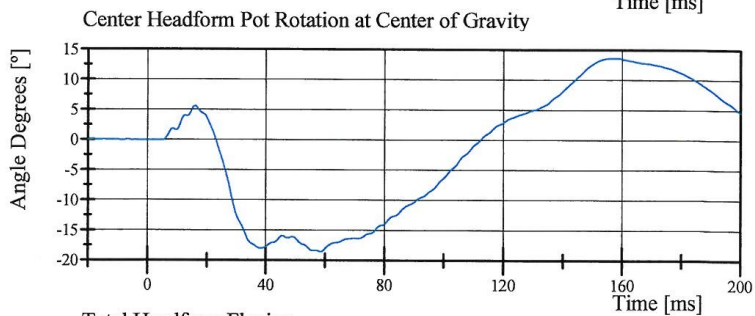
Test Date: 12/6/2011



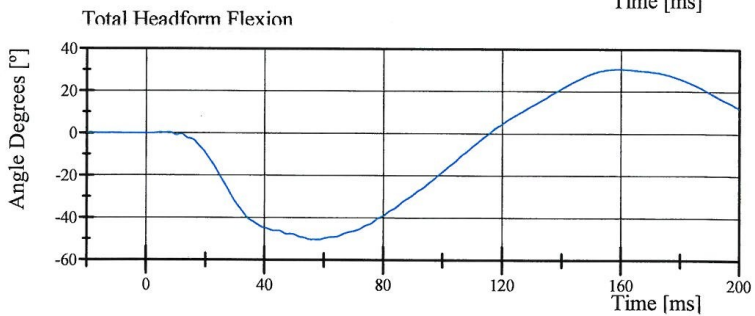
Filter Class: CFC\_180  
Max: 17.1 ° at 162.2 ms  
Min: -32.0 ° at 63.4 ms



Filter Class: CFC\_180  
Max: 18.0 ° at 164.8 ms  
Min: -28.6 ° at 51.0 ms



Filter Class: CFC\_180  
Max: 13.7 ° at 157.8 ms  
Min: -18.5 ° at 58.6 ms



Filter Class: CFC\_180  
Max: 30.7 ° at 159.1 ms  
Min: -50.3 ° at 58.2 ms

Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 17:29:35 1304



# Transportation Research Center Inc.

Left Lateral Shoulder

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/7/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-9.81 g	Yes

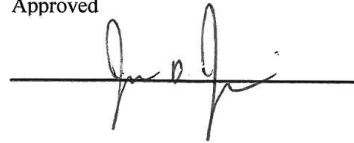
**Test meets specifications.**

**Comments:**

Technician



Approved



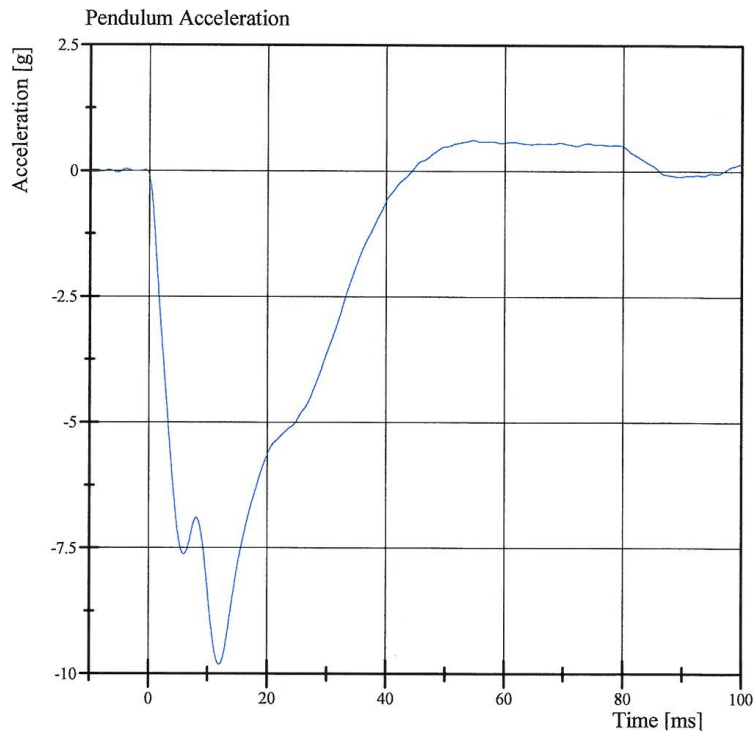
Specification Source: NHTSA final rule 8/15/2008

12.07.2011 08:14:09 543



# Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/7/2011



Filter Class: CFC\_180  
Max: 0.6 gn at 54.6 ms  
Min: -9.8 gn at 11.9 ms

Specification Source: NHTSA final rule 8/15/2008

12.07.2011 08:14:15 543



# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	48.0 mm	Yes

**Test meets specifications.**

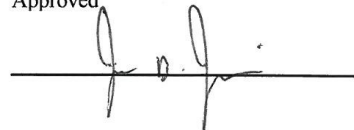
**Comments:**

Drop Height: 816

Technician



Approved



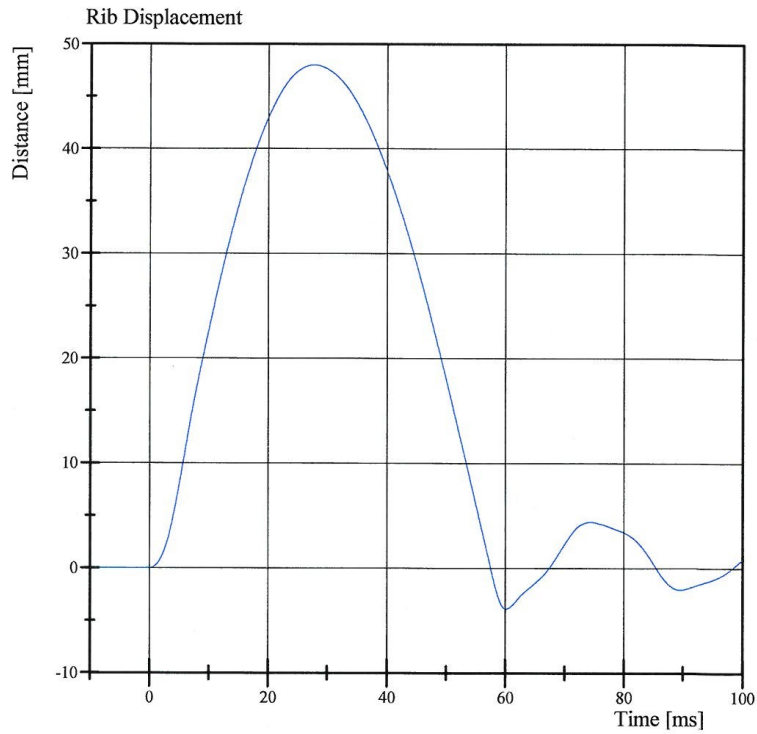
Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 12:20:17 695



# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011



Filter Class: CFC\_180  
Max: 48.0 mm at 27.8 ms  
Min: -3.9 mm at 60.2 ms



# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011

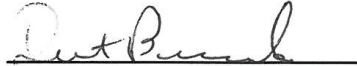
Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	36.4 mm	Yes

**Test meets specifications.**

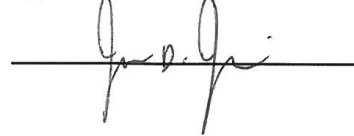
**Comments:**

Drop Height: 462

Technician



Approved



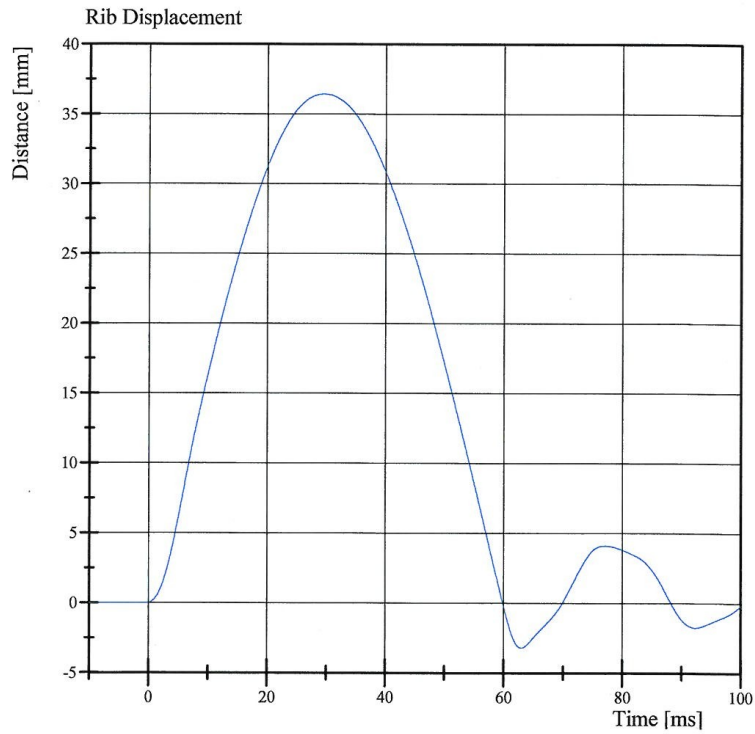
Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 12:27:08 885



# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011



Filter Class: CFC\_180  
Max: 36.4 mm at 29.5 ms  
Min: -3.2 mm at 63.0 ms

# Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011

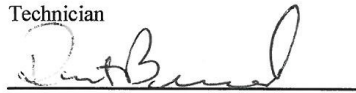
Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.7 mm	Yes

**Test meets specifications.**

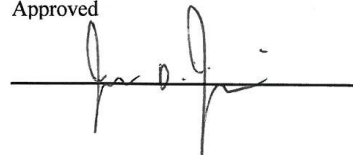
**Comments:**

Drop Height: 816

Technician



Approved



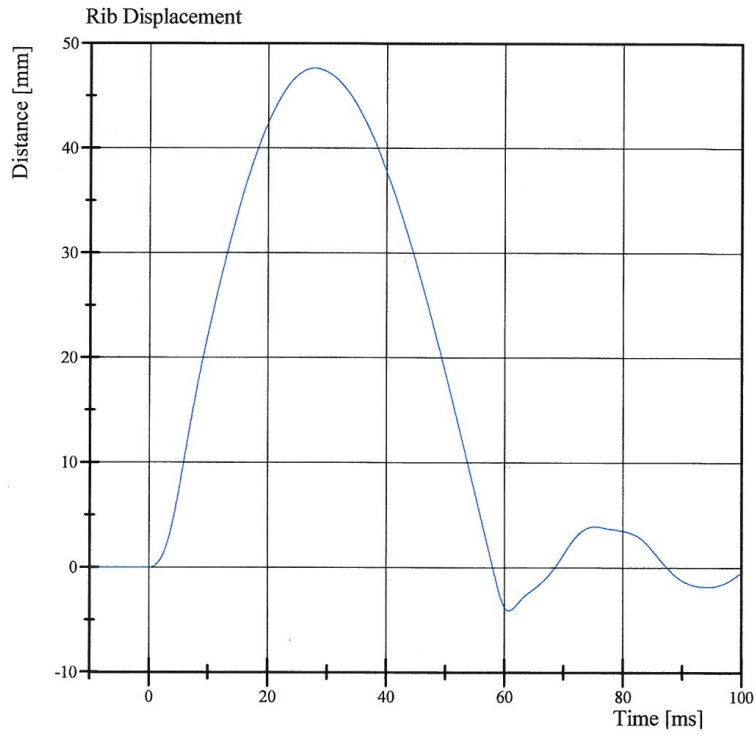
Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 12:39:43 696



# Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011



Filter Class: CFC\_180  
Max: 47.7 mm at 27.8 ms  
Min: -4.1 mm at 60.7 ms

# Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	36.4 mm	Yes

**Test meets specifications.**

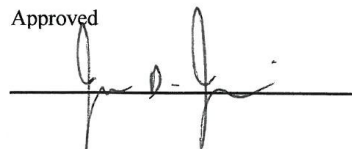
**Comments:**

Drop Height: 462

Technician



Approved



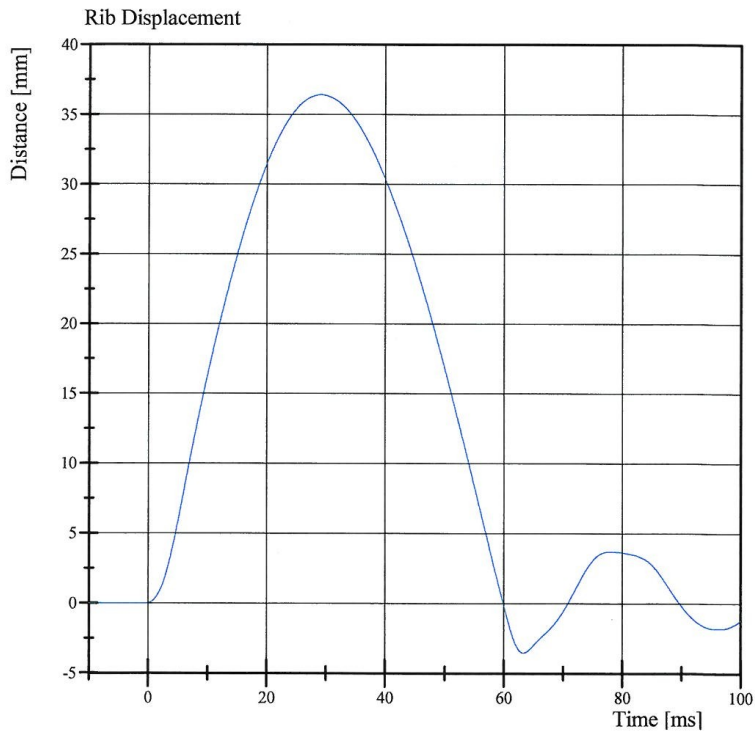
Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 12:49:33 888



# Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011



Filter Class: CFC\_180  
Max: 36.4 mm at 29.1 ms  
Min: -3.5 mm at 63.4 ms

# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.7 mm	Yes

**Test meets specifications.**

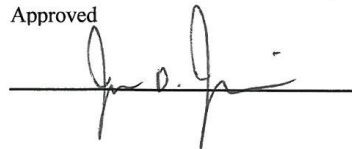
**Comments:**

Drop Height: 816

Technician



Approved



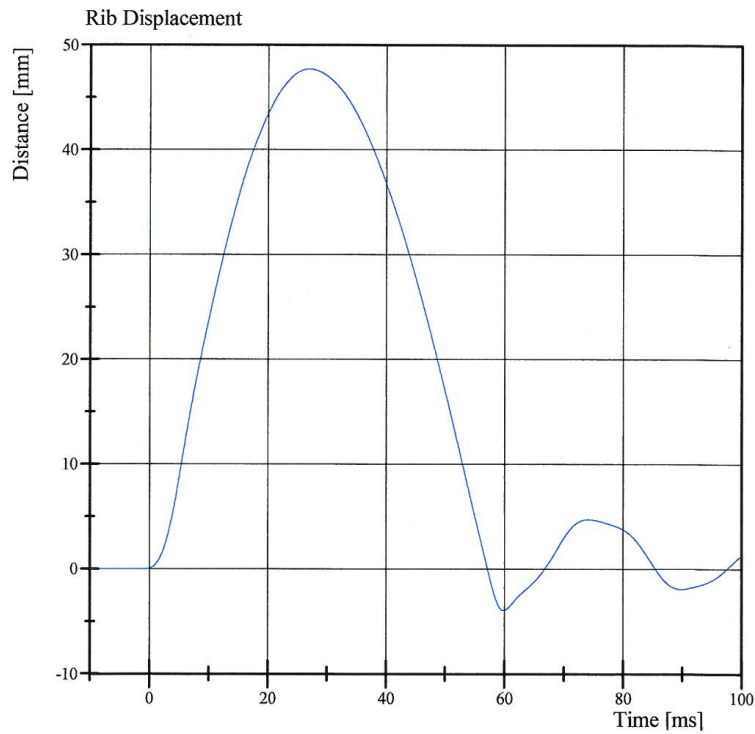
Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 12:56:38 707



# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011



Filter Class: CFC\_180  
Max: 47.7 mm at 27.0 ms  
Min: -3.9 mm at 59.8 ms



# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	36.6 mm	Yes

**Test meets specifications.**

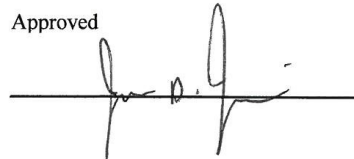
**Comments:**

Drop Height: 462

Technician



Approved



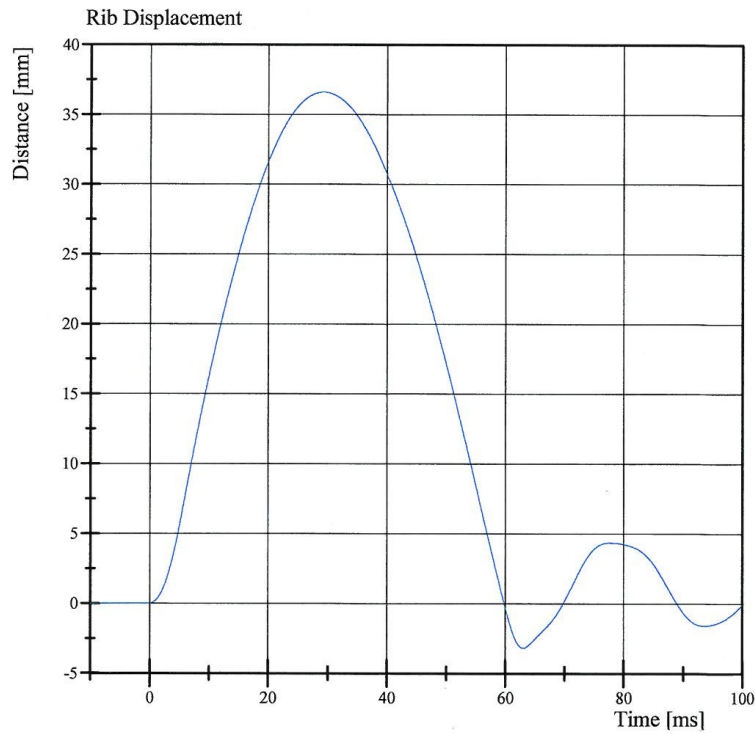
Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 13:06:09 882



# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 3-1  
Test Date: 12/6/2011



Filter Class: CFC\_180  
Max: 36.6 mm at 29.2 ms  
Min: -3.2 mm at 63.0 ms

# Transportation Research Center Inc.

Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 3-1

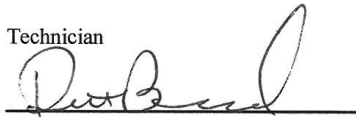
Test Date: 12/7/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.460 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,521.4 N	Yes
Upper Rib Displacement	34 - 41 mm	37.5 mm	Yes
Center Rib Displacement	37 - 45 mm	40.9 mm	Yes
Lower Rib Displacement	37 - 44 mm	41.5 mm	Yes

**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: Procedures based on Final Rule dated 8/15/2008.  
Polarity in accordance with SAE J211.

12.07.2011 08:33:34 431

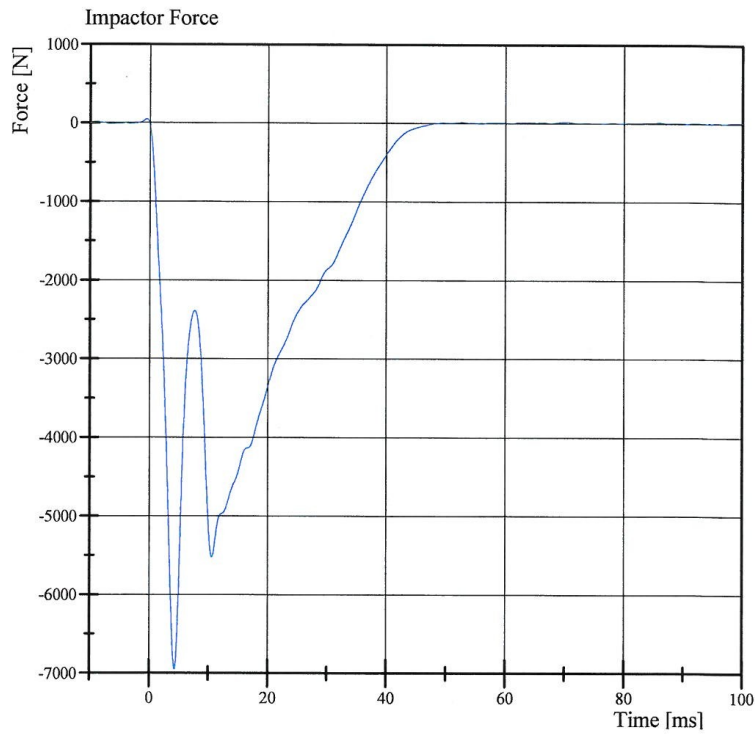


# Transportation Research Center Inc.

Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/7/2011



Filter Class: CFC\_180  
Max: 48.4 N at -0.6 ms  
Min: -6,952.5 N at 4.3 ms

Specification Source: Procedures based on Final Rule dated 8/15/2008.  
Polarity in accordance with SAE J211.

12.07.2011 08:33:58 431

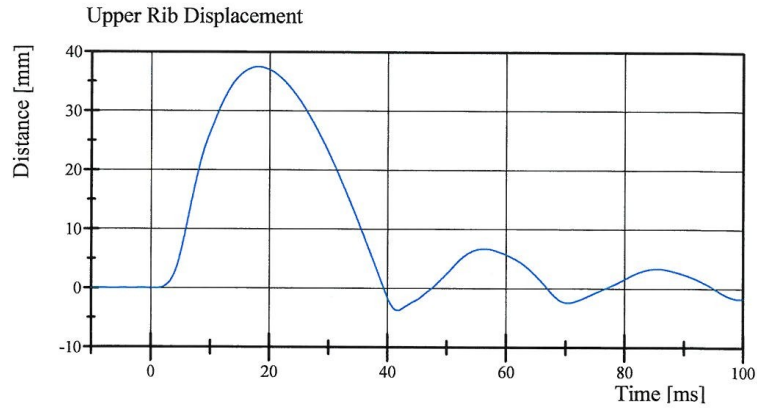


# Transportation Research Center Inc.

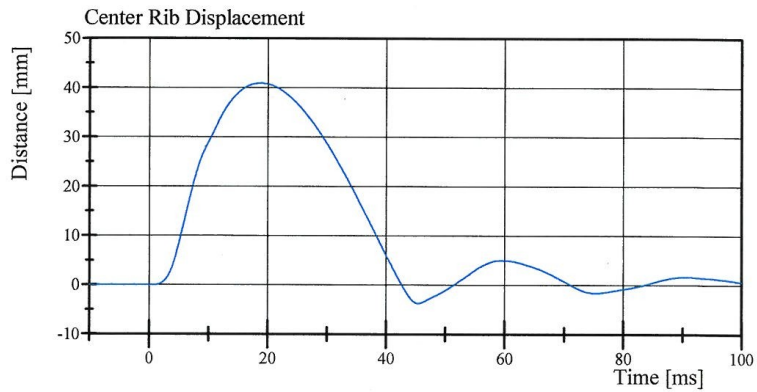
Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 3-1

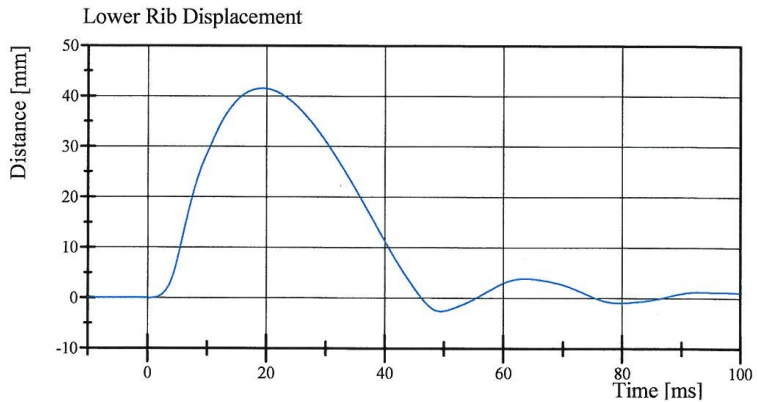
Test Date: 12/7/2011



Filter Class: CFC\_180  
Max: 37.5 mm at 18.1 ms  
Min: -3.7 mm at 41.7 ms



Filter Class: CFC\_180  
Max: 40.9 mm at 18.7 ms  
Min: -3.7 mm at 45.4 ms



Filter Class: CFC\_180  
Max: 41.5 mm at 19.3 ms  
Min: -2.6 mm at 49.4 ms

Specification Source: Procedures based on Final Rule dated 8/15/2008.  
Polarity in accordance with SAE J211.

12.07.2011 08:34:00 431



# Transportation Research Center Inc.

Left Lateral Lumbar

ES-2re Serial No. F030 Certification No. 3-1

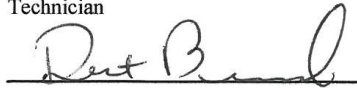
Test Date: 12/6/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.008 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-48.2 deg	Yes
Time of Peak	39 - 53 ms	45.7 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	37.4 ms	Yes

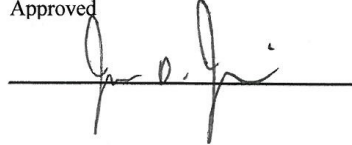
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 14:56:44 579

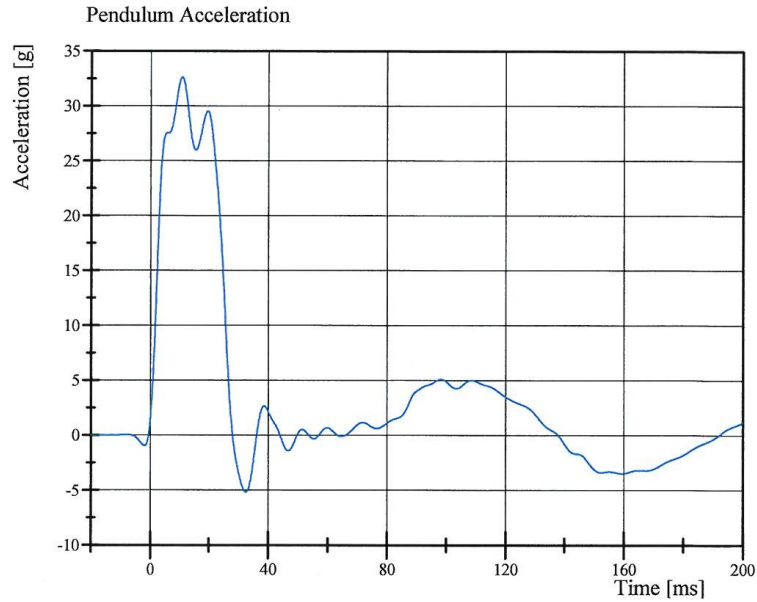


# Transportation Research Center Inc.

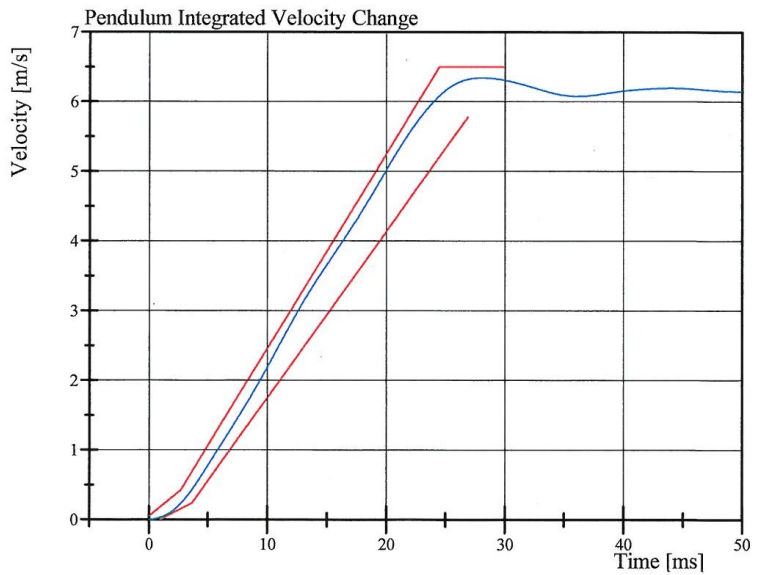
Left Lateral Lumbar

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/6/2011



Filter Class: CFC\_60  
Max: 32.6 gn at 10.8 ms  
Min: -5.2 gn at 32.5 ms



Filter Class: CFC\_60  
Max: 6.3 m/s at 28.1 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: NHTSA Final Rule 8/15/2008

12.06.2011 14:56:53 579

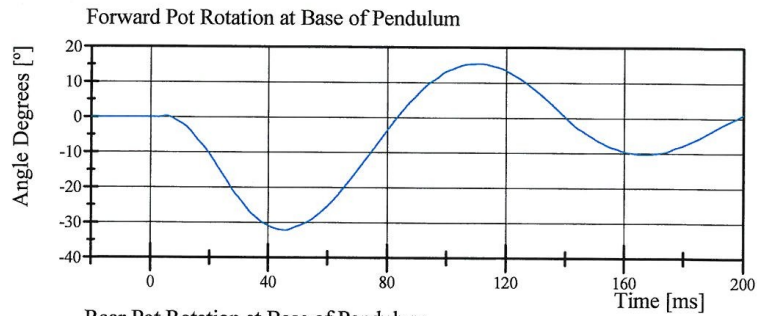


# Transportation Research Center Inc.

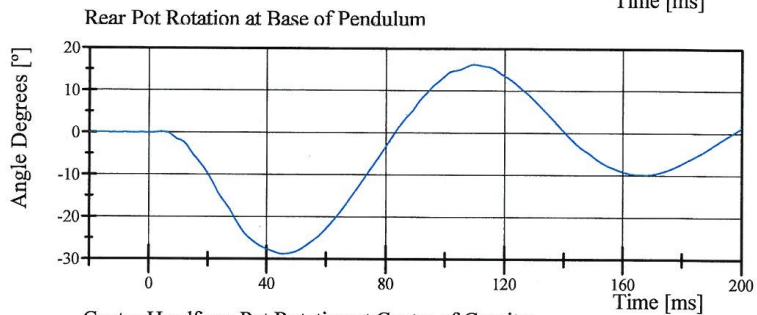
Left Lateral Lumbar

ES-2re Serial No. F030 Certification No. 3-1

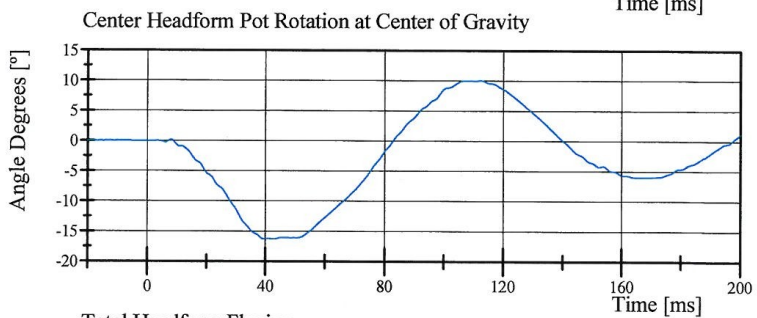
Test Date: 12/6/2011



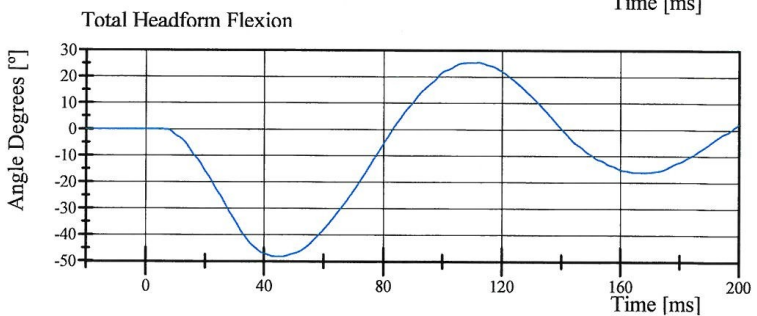
Filter Class: CFC\_180  
Max: 15.4 ° at 111.4 ms  
Min: -32.2 ° at 45.6 ms



Filter Class: CFC\_180  
Max: 16.2 ° at 109.8 ms  
Min: -28.7 ° at 45.4 ms



Filter Class: CFC\_180  
Max: 10.1 ° at 112.4 ms  
Min: -16.3 ° at 42.6 ms



Filter Class: CFC\_180  
Max: 25.5 ° at 112.1 ms  
Min: -48.2 ° at 45.7 ms

# Transportation Research Center Inc.

Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/7/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	3.92 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,163.1 N	Yes
Time of Peak	10.6 - 13.0 ms	10.88 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,596.9 N	Yes
Time of Peak	10.0 - 12.3 ms	10.32 ms	Yes

**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: NHTSA Final Rule 8/15/2008

12.07.2011 09:14:59 586

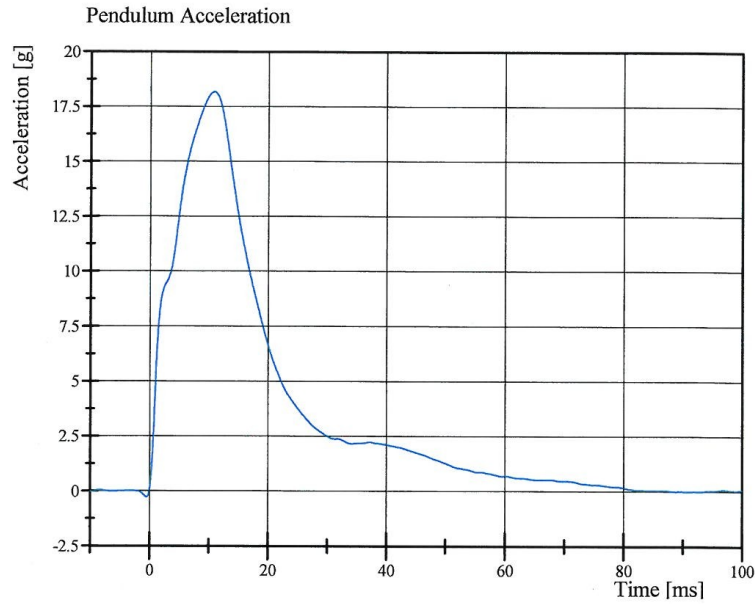


# Transportation Research Center Inc.

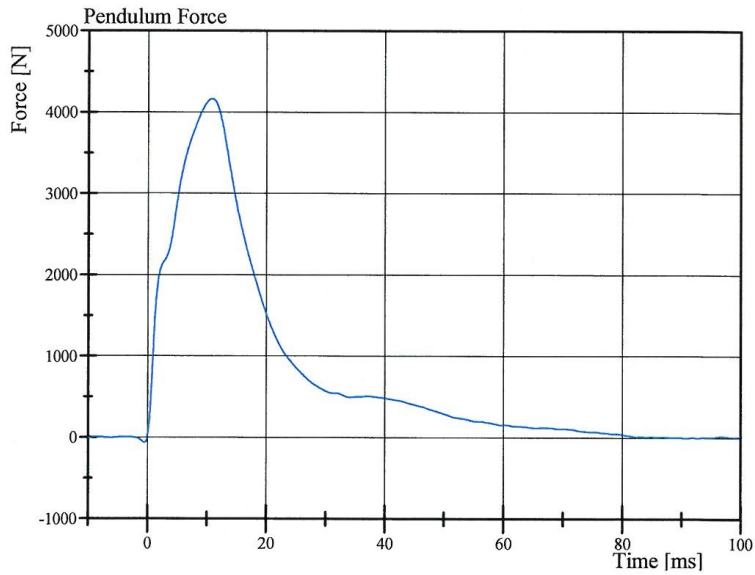
Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/7/2011



Filter Class: CFC\_180  
Max: 18.2 gn at 10.9 ms  
Min: -0.3 gn at -0.6 ms



Filter Class: CFC\_180  
Max: 4,163.1 N at 10.9 ms  
Min: -63.6 N at -0.6 ms

Specification Source: NHTSA Final Rule 8/15/2008

12.07.2011 09:15:06 586

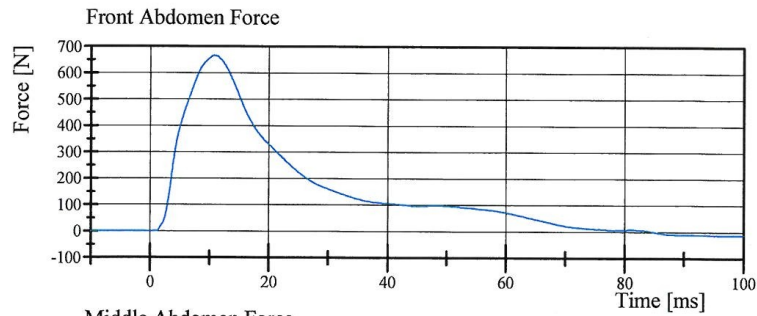


# Transportation Research Center Inc.

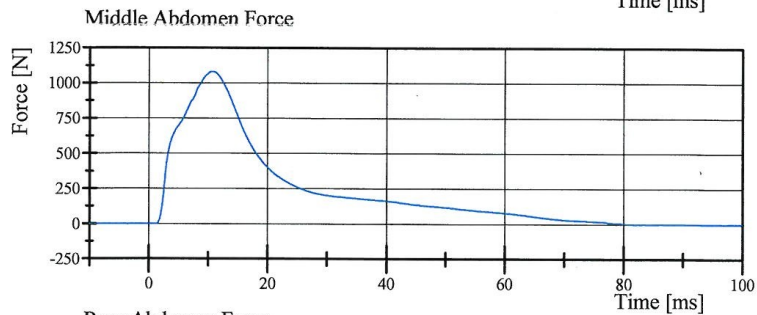
Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 3-1

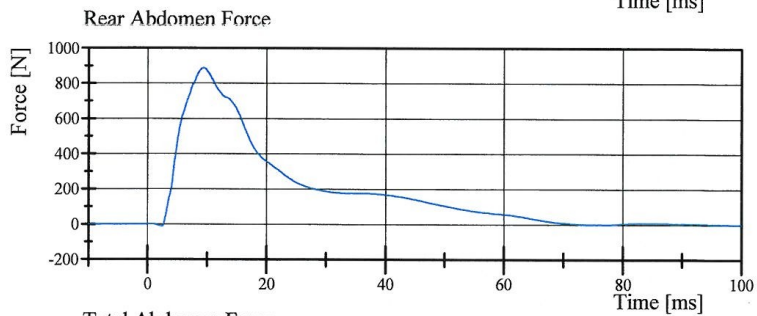
Test Date: 12/7/2011



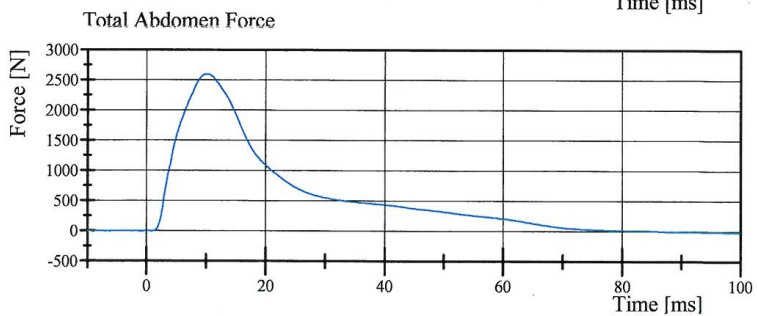
Filter Class: CFC\_600  
Max: 666.3 N at 10.7 ms  
Min: -11.7 N at 99.0 ms



Filter Class: CFC\_600  
Max: 1,082.5 N at 10.6 ms  
Min: -1.0 N at 99.0 ms



Filter Class: CFC\_600  
Max: 887.6 N at 9.4 ms  
Min: -11.4 N at 2.4 ms



Filter Class: CFC\_600  
Max: 2,596.9 N at 10.3 ms  
Min: -13.0 N at 99.0 ms

Specification Source: NHTSA Final Rule 8/15/2008

12.07.2011 09:15:06 586



# Transportation Research Center Inc.

Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 3-1

Test Date: 12/7/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.22 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,122.9 N	Yes
Time of Peak	11.8 - 16.1 ms	12.64 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,271.7 N	Yes
Time of Peak	12.2 - 17.0 ms	13.20 ms	Yes

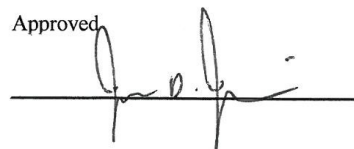
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: NHTSA Final Rule 8/15/2008

12.07.2011 09:32:28 551

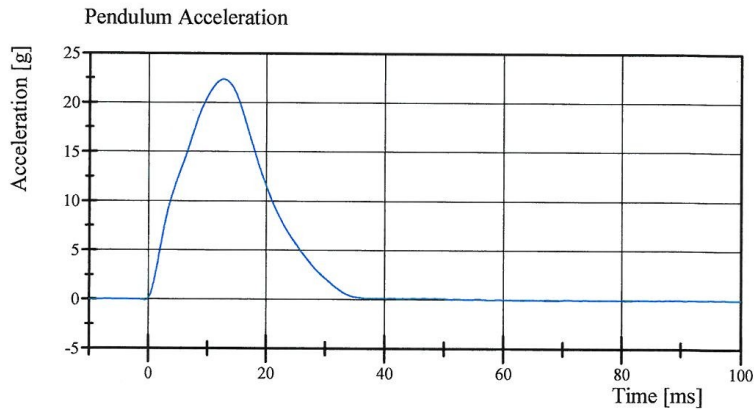


# Transportation Research Center Inc.

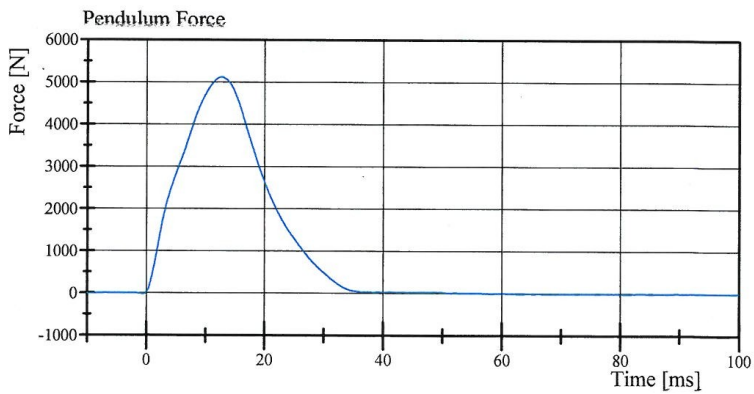
Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 3-1

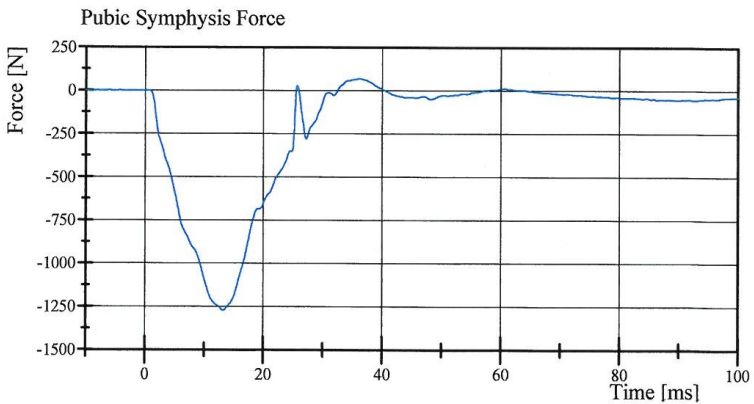
Test Date: 12/7/2011



Filter Class: CFC\_180  
Max: 22.4 gn at 12.6 ms  
Min: -0.1 gn at -0.6 ms



Filter Class: CFC\_180  
Max: 5,122.9 N at 12.6 ms  
Min: -17.5 N at -0.6 ms



Filter Class: CFC\_600  
Max: 70.3 N at 36.2 ms  
Min: -1,271.7 N at 13.2 ms

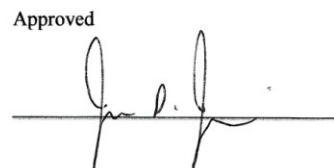
**Driver S/N F030**

**Post-Test Calibration Sheets**

**Transportation Research Center Inc.**  
**572U ES-2re Dummy**  
**External Dimensions**  
**Serial No. F030 Calibration No. 04**  
**Date: 01/12/12**

Symbol	Description	Specification	Results	Pass
		mm	mm	
1	Sitting Height	900.0 - 918.0	910	Yes
2	Seat to Shoulder Joint	558.0 - 572.0	560	Yes
3	Seat to Lower Face of Thoracic Spine Box	346.0 - 356.0	350	Yes
4	Seat to Hip Joint (center of bolt)	97.0 - 103.0	97	Yes
5	Sole to Seat, Sitting	433.0 - 451.0	450	Yes
6	Head Width	152.0 - 158.0	154	Yes
7	Shoulder/Arm Width	461.0 - 479.0	472	Yes
8	Thorax Width	322.0 - 332.0	325	Yes
9	Abdomen Width	273.0 - 287.0	284	Yes
10	Pelvis Lap Width	359.0 - 373.0	365	Yes
11	Head Depth	196.0 - 206.0	200	Yes
12	Thorax Depth	262.0 - 272.0	267	Yes
13	Abdomen Depth	194.0 - 204.0	202	Yes
14	Pelvis Depth	235.0 - 245.0	240	Yes
15	Back of Buttocks to Hip Joint (center of bolt)	150.0 - 160.0	159	Yes
16	Back of Buttocks to Front of Knee	597.0 - 615.0	604	Yes

Technician  


Approved  




Baseline 10/07/05

# Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 4-1

Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Peak Resultant Acceleration	125 - 155 g	139.9 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	7.0 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	Yes	Yes	Yes

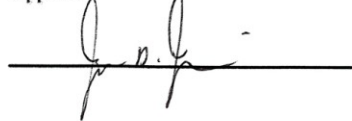
**Test meets specifications.**

**Comments:**

Technician



Approved



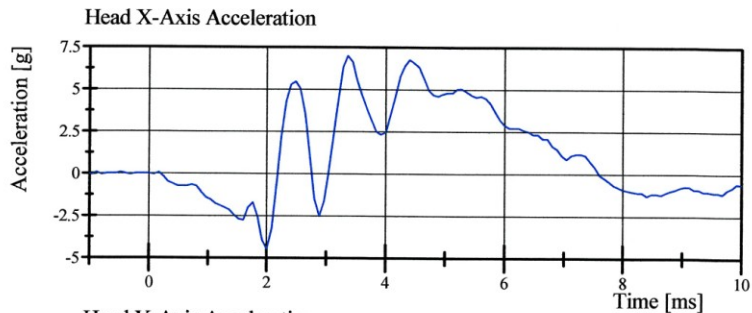
Specification Source: NHTSA Final Rule 8/15/2008

01.12.2012 07:20:14 359

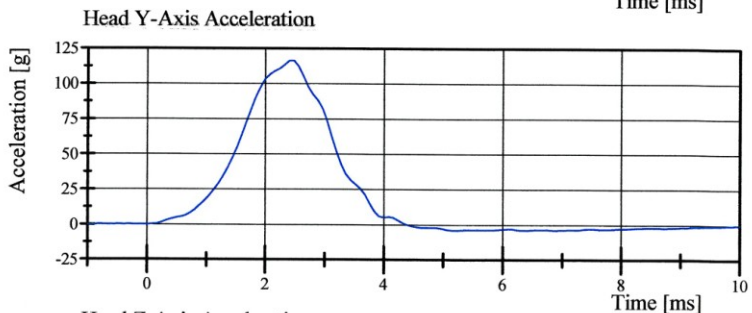


# Transportation Research Center Inc.

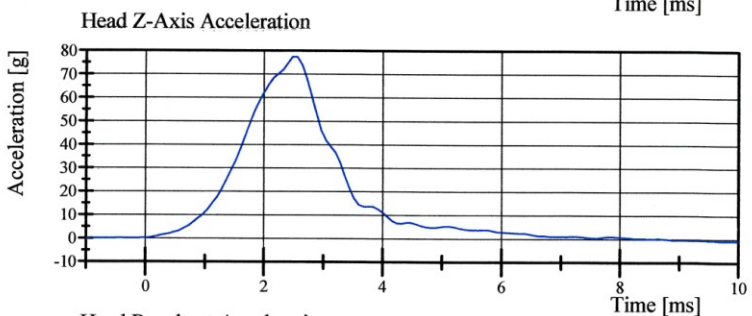
Left Lateral Head Drop  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/12/2012



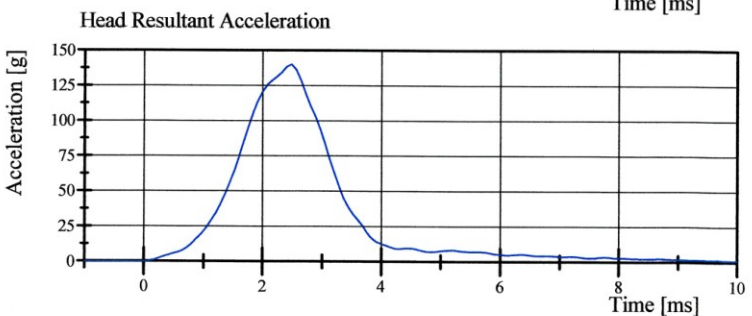
Filter Class: CFC\_1000  
Max: 7.0 gn at 3.4 ms  
Min: -4.5 gn at 2.0 ms



Filter Class: CFC\_1000  
Max: 116.4 gn at 2.5 ms  
Min: -4.2 gn at 5.2 ms



Filter Class: CFC\_1000  
Max: 77.5 gn at 2.5 ms  
Min: -0.9 gn at 10.0 ms



Filter Class: CFC\_1000  
Max: 139.9 gn at 2.5 ms  
Min: 0.0 gn at -0.6 ms

# Transportation Research Center Inc.

Left Lateral Neck

ES-2re Serial No. F030 Certification No. 4-1

Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.37 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-50.6 deg	Yes
Time of Peak	54 - 66 ms	58.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	57.9 ms	Yes

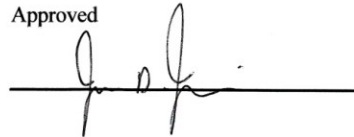
**Test meets specifications.**

**Comments:**

Technician



Approved



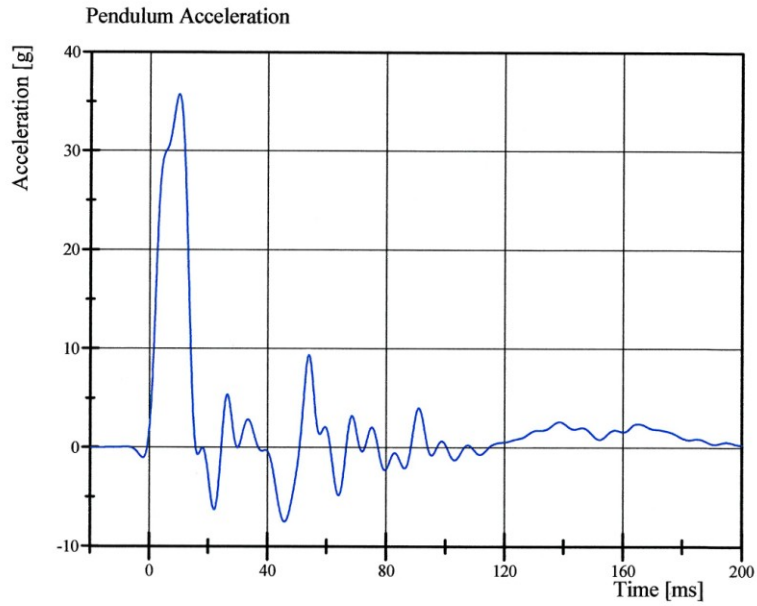
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 15:42:58 1308

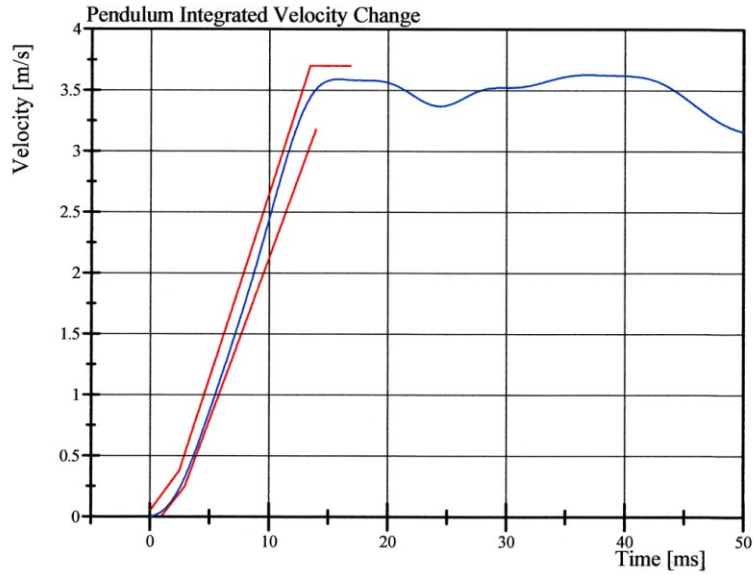


# Transportation Research Center Inc.

Left Lateral Neck  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_60  
Max: 35.7 gn at 10.1 ms  
Min: -7.5 gn at 45.8 ms



Filter Class: CFC\_60  
Max: 3.6 m/s at 36.9 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 15:43:05 1308

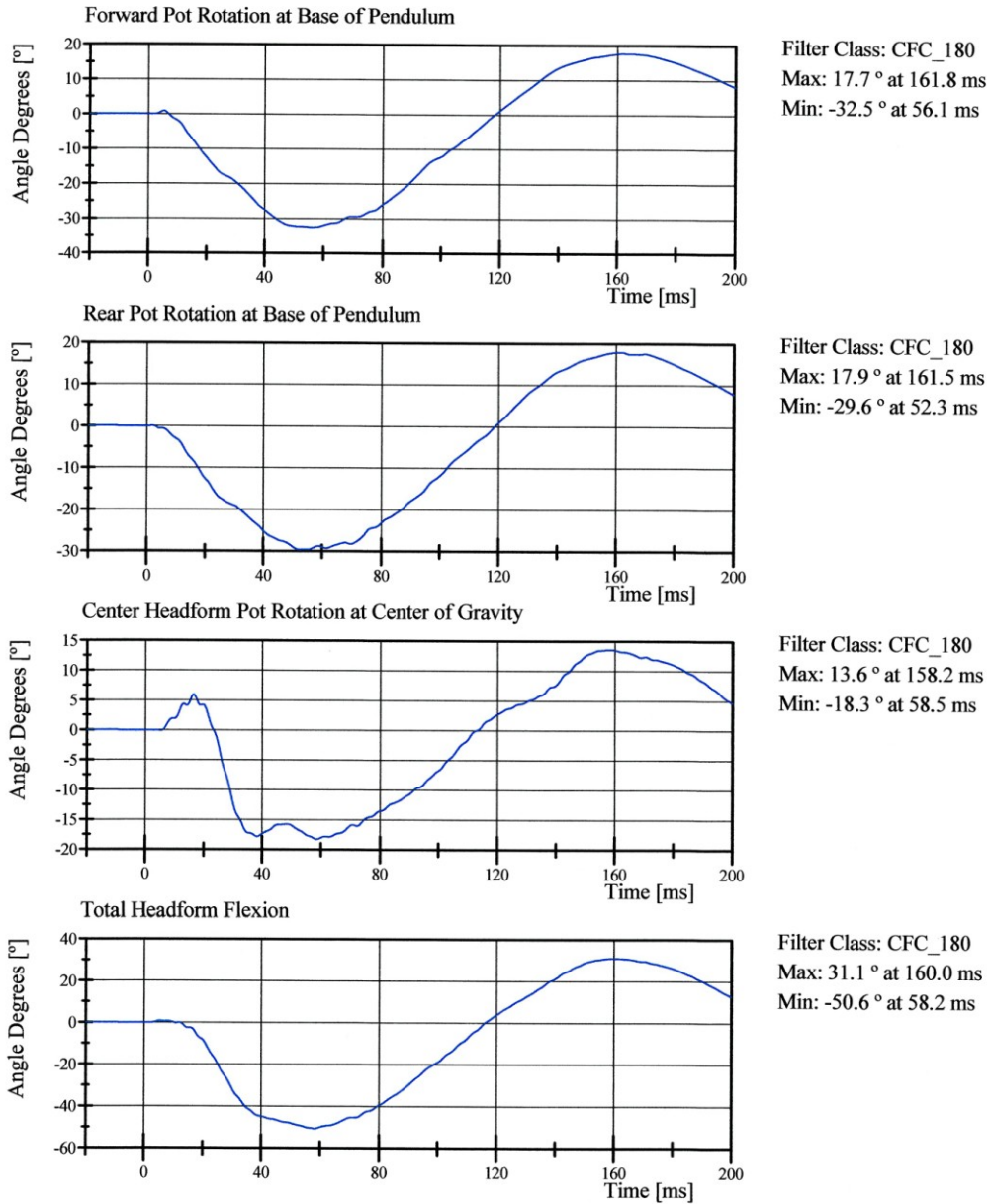


# Transportation Research Center Inc.

Left Lateral Neck

ES-2re Serial No. F030 Certification No. 4-1

Test Date: 1/11/2012



Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 15:43:06 1308



# Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 4-2  
Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.1 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.34 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-9.37 g	Yes

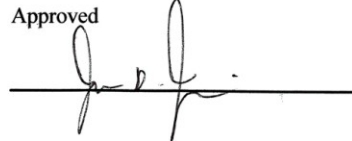
**Test meets specifications.**

**Comments:**

Technician



Approved



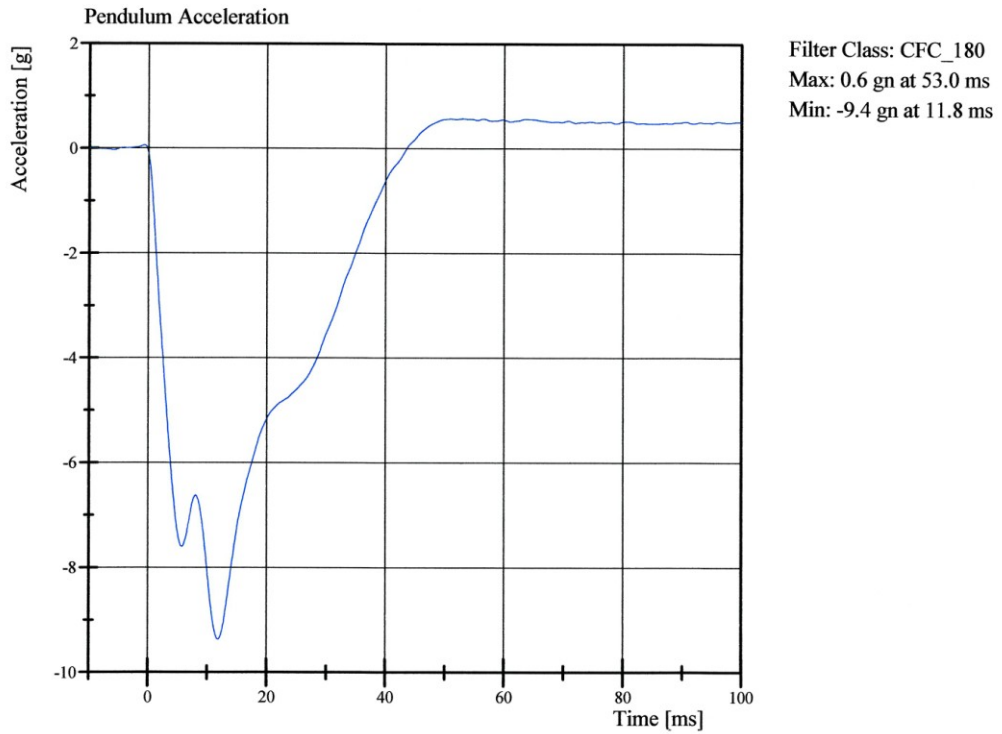
Specification Source: NHTSA final rule 8/15/2008

01.12.2012 08:58:44 566



# Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 4-2  
Test Date: 1/12/2012



Specification Source: NHTSA final rule 8/15/2008

01.12.2012 08:58:54 566



# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.9 mm	Yes

**Test meets specifications.**

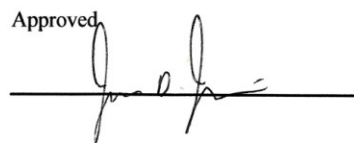
**Comments:**

Drop Height: 816

Technician



Approved



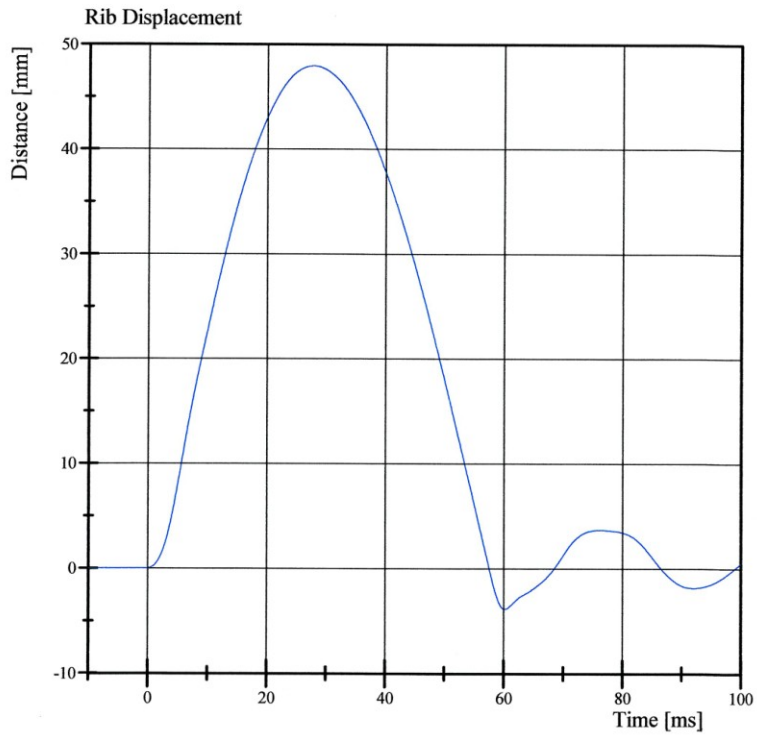
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 13:49:21 697



# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 47.9 mm at 27.8 ms  
Min: -3.9 mm at 60.2 ms

# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	36.6 mm	Yes

**Test meets specifications.**

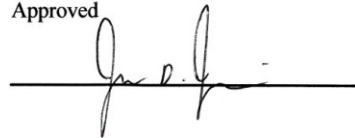
**Comments:**

Drop Height: 462

Technician



Approved



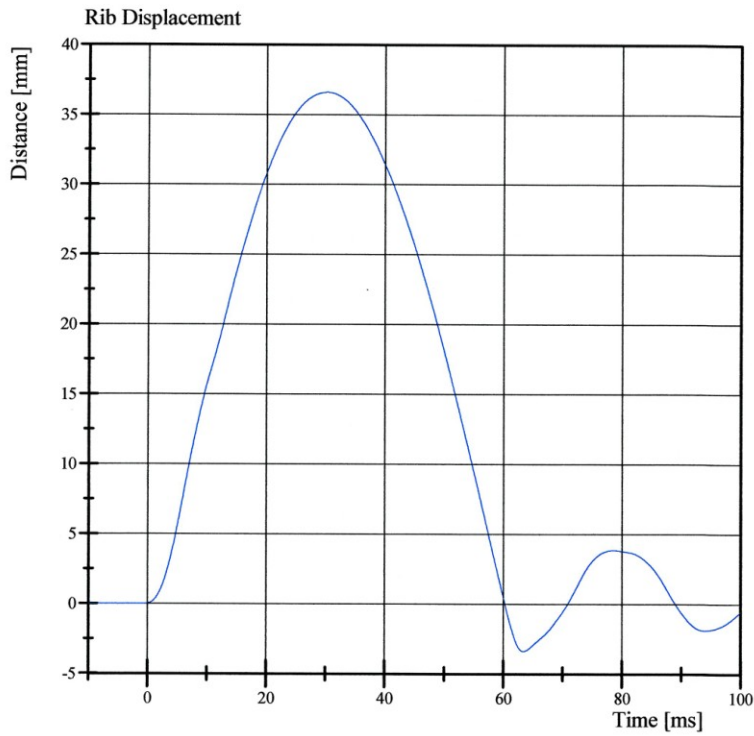
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 13:54:42 881



# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 36.6 mm at 30.2 ms  
Min: -3.4 mm at 63.4 ms



# Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.8 mm	Yes

**Test meets specifications.**

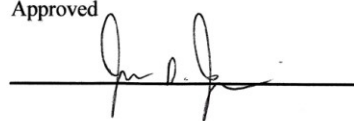
**Comments:**

Drop Height: 816

Technician



Approved



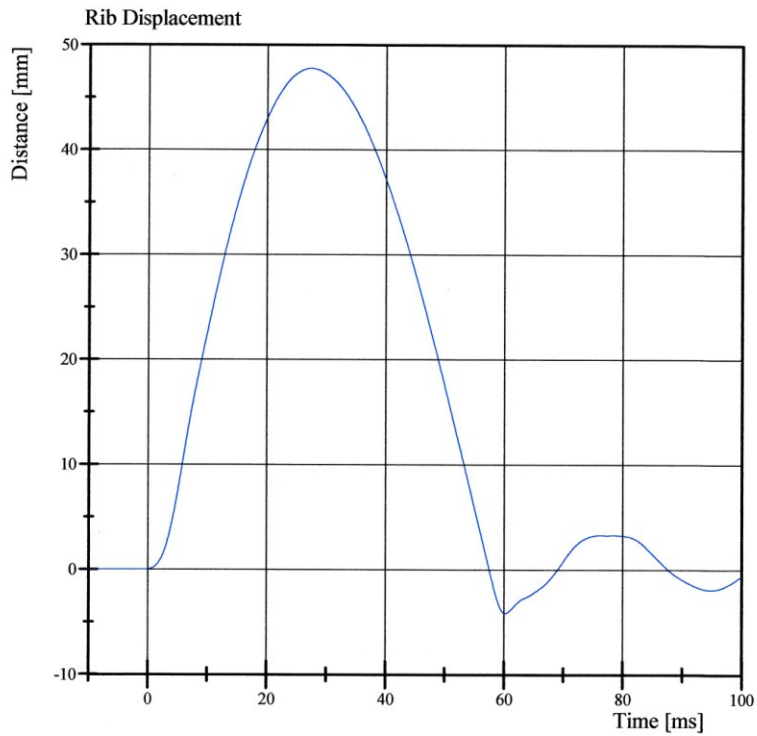
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 14:02:25 689



# Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 47.8 mm at 27.4 ms  
Min: -4.2 mm at 60.2 ms



# Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

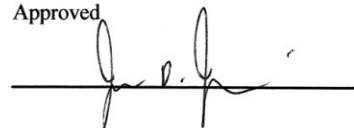
Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	36.5 mm	Yes

**Test meets specifications.**

**Comments:**

Drop Height: 816

Technician  


Approved  


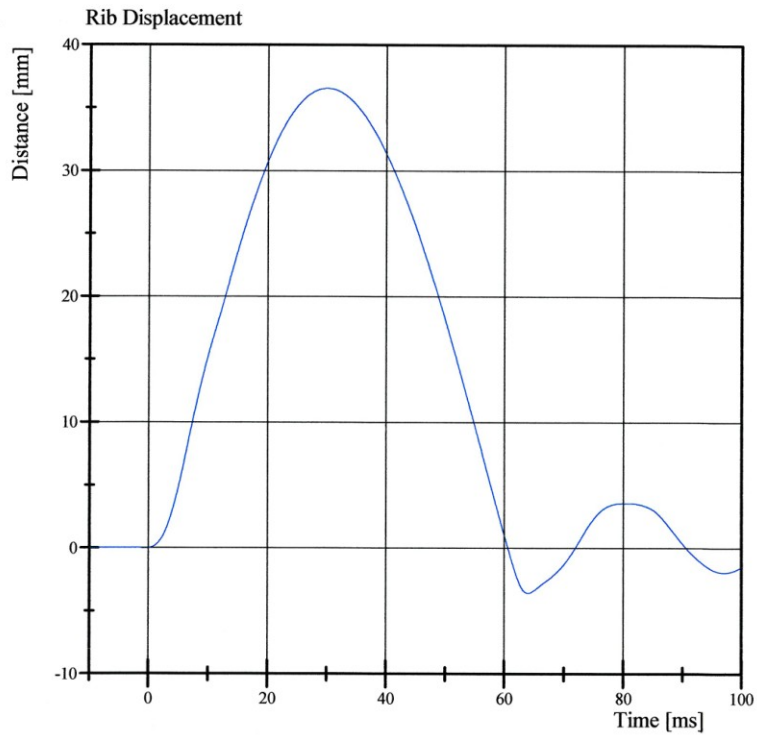
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 14:08:14 868



# Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 36.5 mm at 30.0 ms  
Min: -3.6 mm at 64.0 ms



# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.7 mm	Yes

**Test meets specifications.**

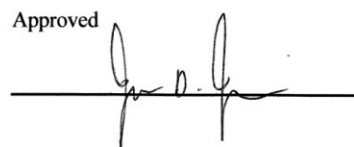
**Comments:**

Drop Height: 816

Technician



Approved



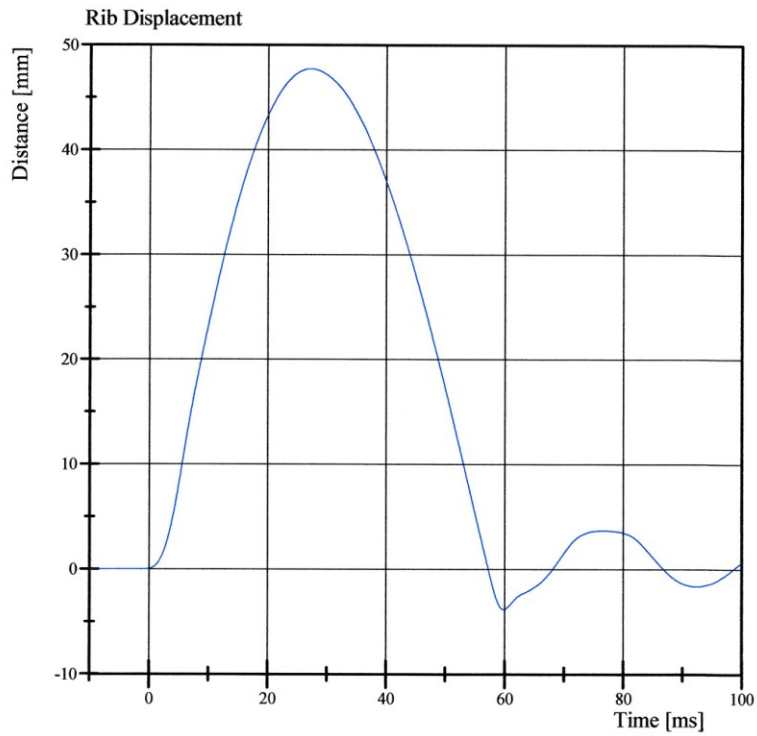
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 14:44:35 699



# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 47.7 mm at 27.2 ms  
Min: -3.8 mm at 59.8 ms

Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 14:44:46 699



# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.1 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	36.5 mm	Yes

**Test meets specifications.**

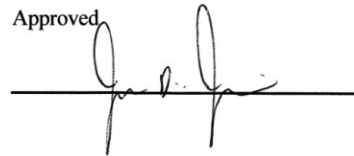
**Comments:**

Drop Height: 462

Technician



Approved



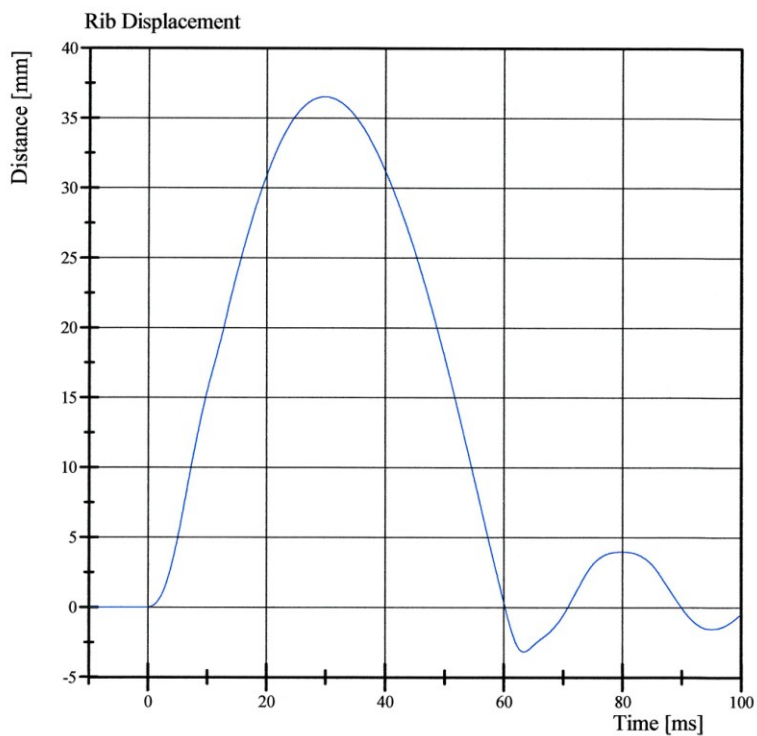
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 14:52:15 862



# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 36.5 mm at 29.8 ms  
Min: -3.2 mm at 63.4 ms



# Transportation Research Center Inc.

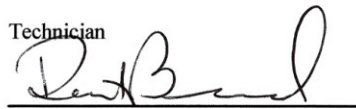
Left Lateral Thorax  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.464 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,407.3 N	Yes
Upper Rib Displacement	34 - 41 mm	36.7 mm	Yes
Center Rib Displacement	37 - 45 mm	40.6 mm	Yes
Lower Rib Displacement	37 - 44 mm	41.4 mm	Yes

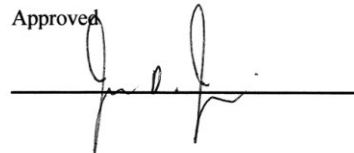
**Test meets specifications.**

**Comments:**

Technician



Approved



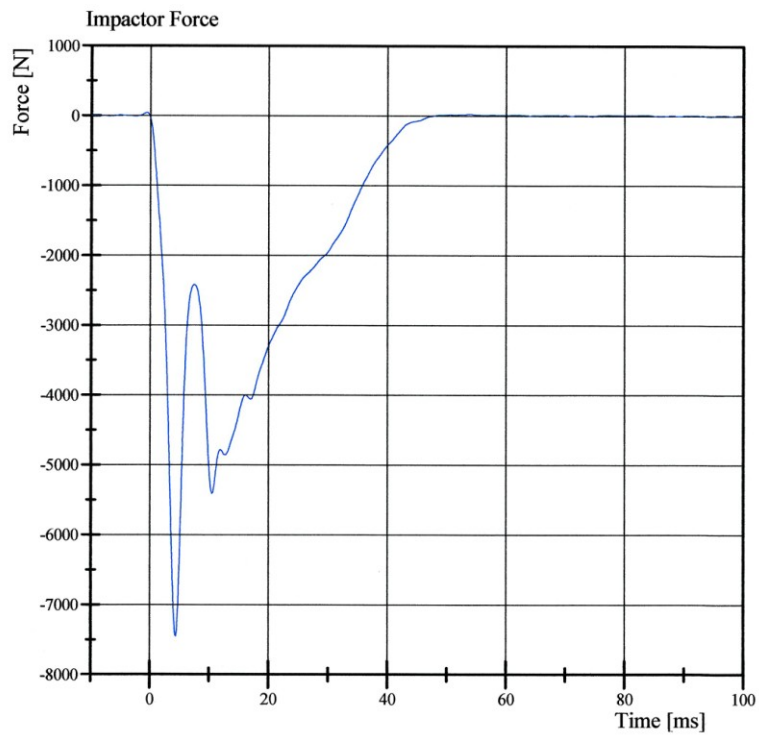
Specification Source: Procedures based on Final Rule dated 8/15/2008.  
Polarity in accordance with SAE J211.

01.12.2012 08:37:08 464



# Transportation Research Center Inc.

Left Lateral Thorax  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/12/2012



Filter Class: CFC\_180  
Max: 41.1 N at -0.6 ms  
Min: -7,453.2 N at 4.4 ms

Specification Source: Procedures based on Final Rule dated 8/15/2008.  
Polarity in accordance with SAE J211.

01.12.2012 08:37:23 464

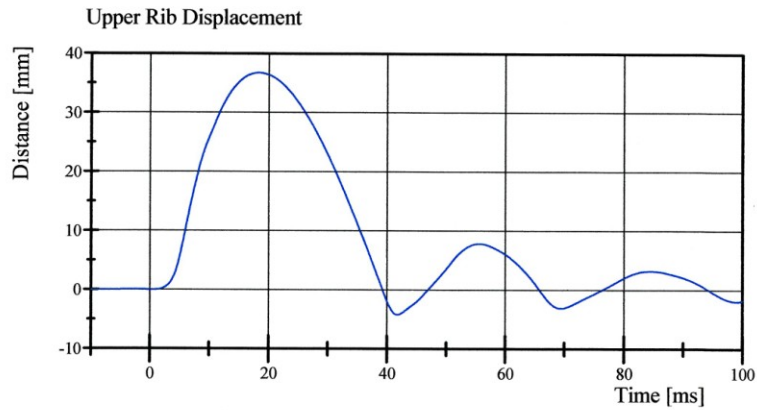


# Transportation Research Center Inc.

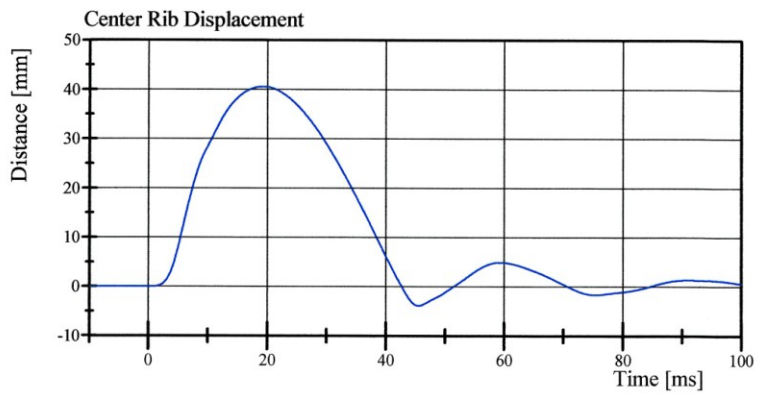
Left Lateral Thorax

ES-2re Serial No. F030 Certification No. 4-1

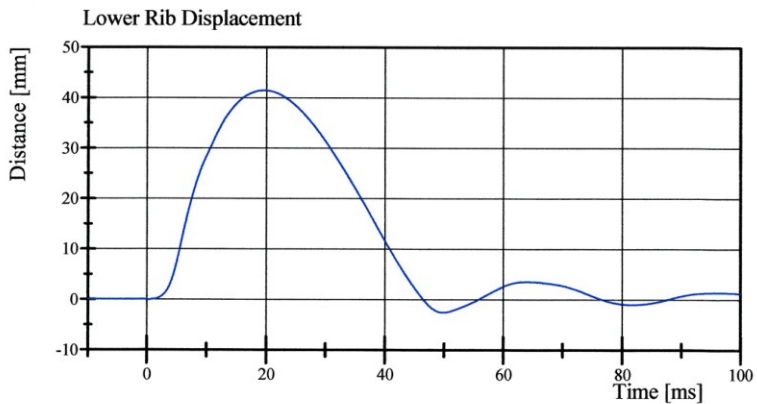
Test Date: 1/12/2012



Filter Class: CFC\_180  
Max: 36.7 mm at 18.3 ms  
Min: -4.2 mm at 41.7 ms



Filter Class: CFC\_180  
Max: 40.6 mm at 19.2 ms  
Min: -3.9 mm at 45.5 ms



Filter Class: CFC\_180  
Max: 41.4 mm at 19.6 ms  
Min: -2.6 mm at 49.8 ms

Specification Source: Procedures based on Final Rule dated 8/15/2008.  
Polarity in accordance with SAE J211.

01.12.2012 08:37:24 464



# Transportation Research Center Inc.

Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 4-1

Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	3.92 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,214.3 N	Yes
Time of Peak	10.6 - 13.0 ms	11.12 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,607.1 N	Yes
Time of Peak	10.0 - 12.3 ms	10.24 ms	Yes

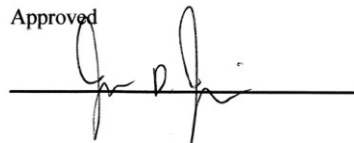
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: NHTSA Final Rule 8/15/2008

01.12.2012 10:13:36 618

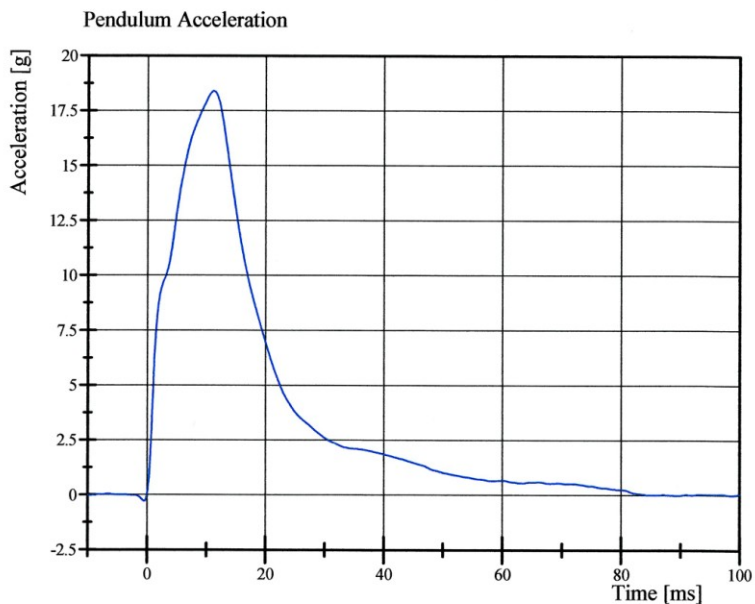


# Transportation Research Center Inc.

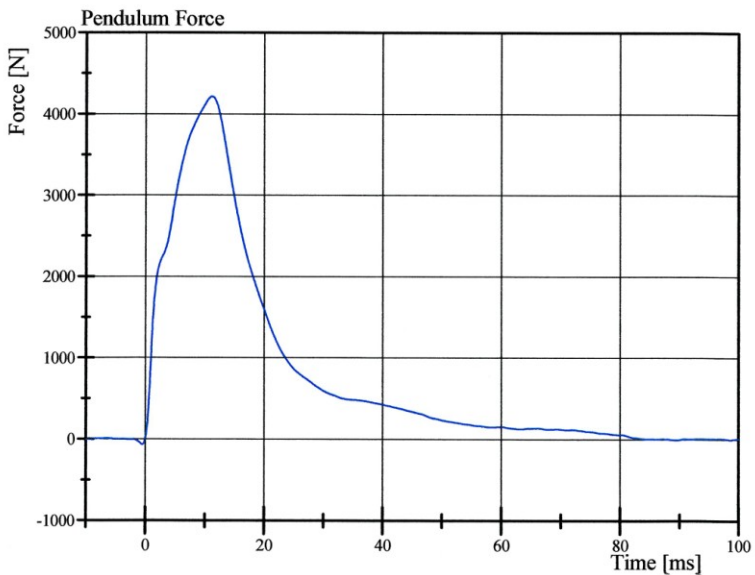
Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 4-1

Test Date: 1/12/2012



Filter Class: CFC\_180  
Max: 18.4 gn at 11.1 ms  
Min: -0.3 gn at -0.5 ms



Filter Class: CFC\_180  
Max: 4,214.3 N at 11.1 ms  
Min: -65.9 N at -0.5 ms

Specification Source: NHTSA Final Rule 8/15/2008

01.12.2012 10:13:45 618

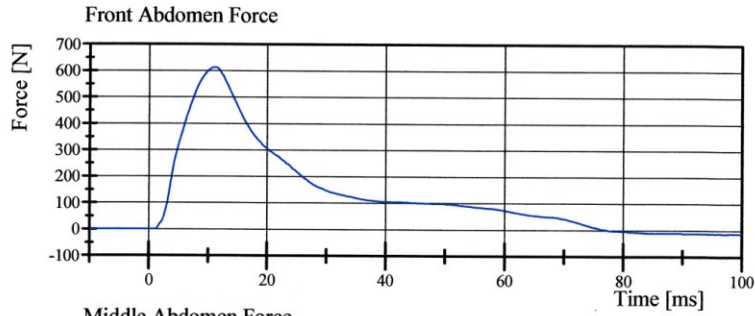


# Transportation Research Center Inc.

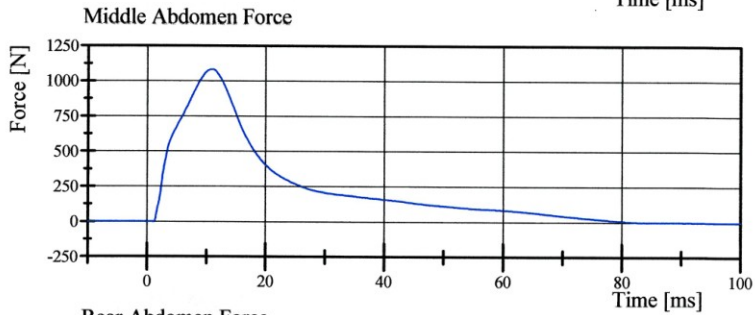
Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 4-1

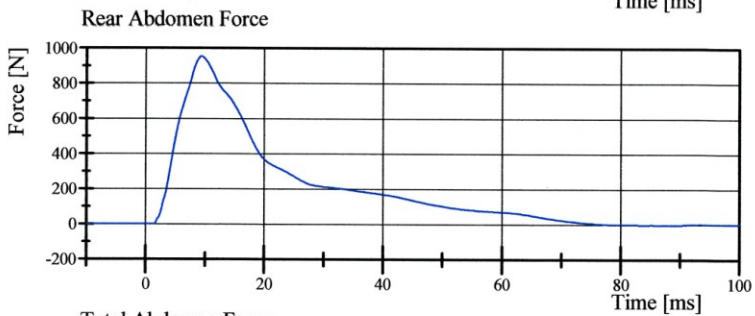
Test Date: 1/12/2012



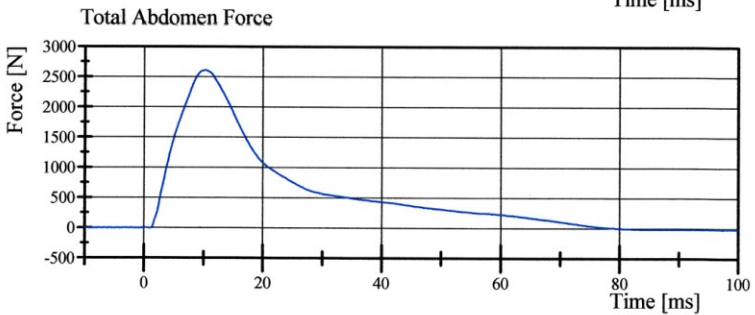
Filter Class: CFC\_600  
Max: 612.5 N at 11.0 ms  
Min: -12.6 N at 97.4 ms



Filter Class: CFC\_600  
Max: 1,081.8 N at 10.9 ms  
Min: -3.2 N at 97.4 ms



Filter Class: CFC\_600  
Max: 953.6 N at 9.4 ms  
Min: -1.9 N at 89.8 ms



Filter Class: CFC\_600  
Max: 2,607.1 N at 10.2 ms  
Min: -15.1 N at 97.4 ms

Specification Source: NHTSA Final Rule 8/15/2008

01.12.2012 10:13:46 618



## Transportation Research Center Inc.

Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-5.972 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-47.3 deg	Yes
Time of Peak	39 - 53 ms	45.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	37.3 ms	Yes

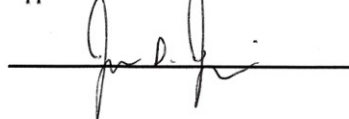
**Test meets specifications.**

**Comments:**

Technician



Approved



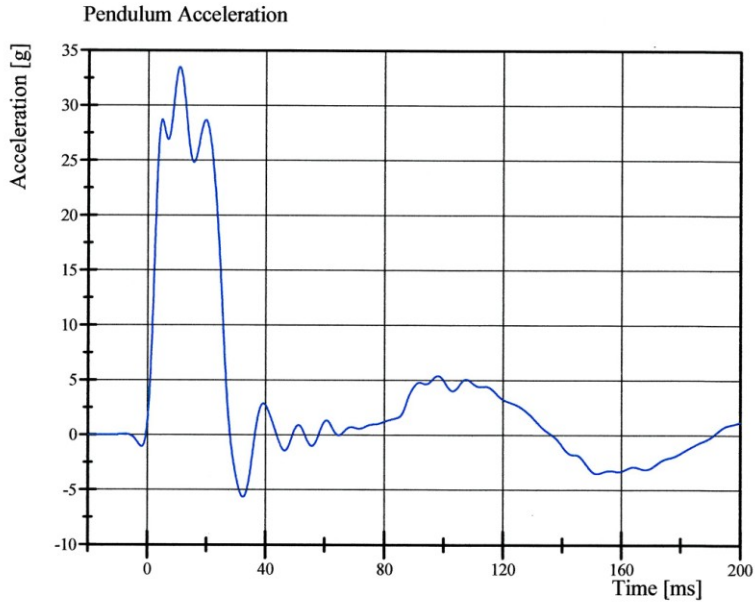
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 15:20:54 582

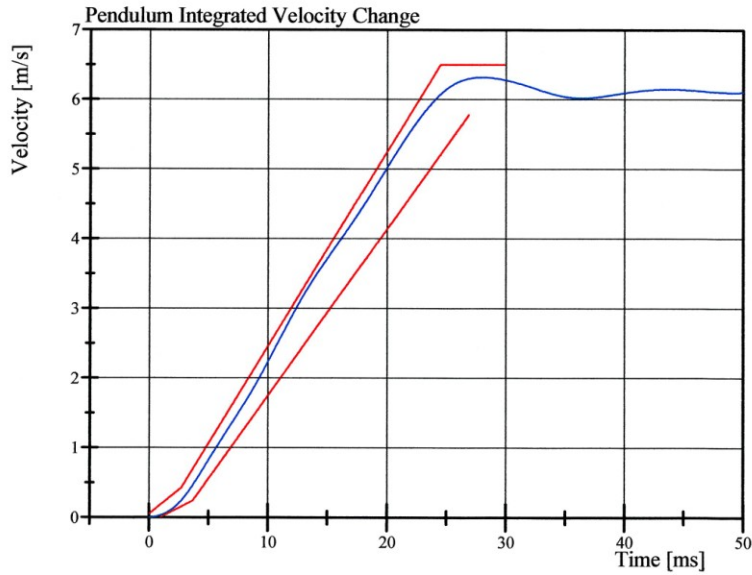


# Transportation Research Center Inc.

Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



Filter Class: CFC\_60  
Max: 33.5 gn at 10.7 ms  
Min: -5.7 gn at 32.4 ms



Filter Class: CFC\_60  
Max: 6.3 m/s at 28.0 ms  
Min: 0.0 m/s at 0.0 ms

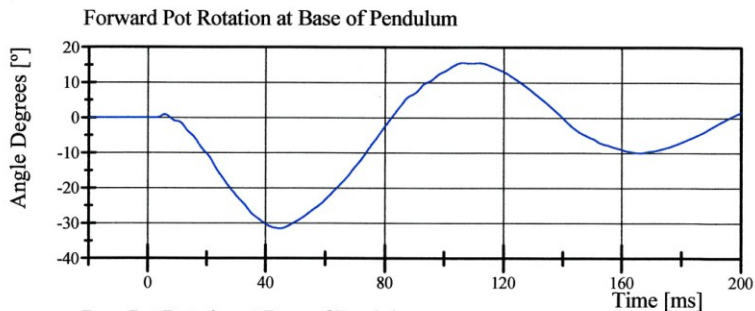
Specification Source: NHTSA Final Rule 8/15/2008

01.11.2012 15:21:09 582

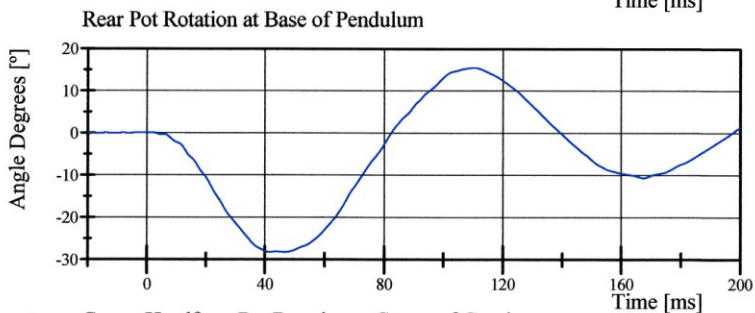


# Transportation Research Center Inc.

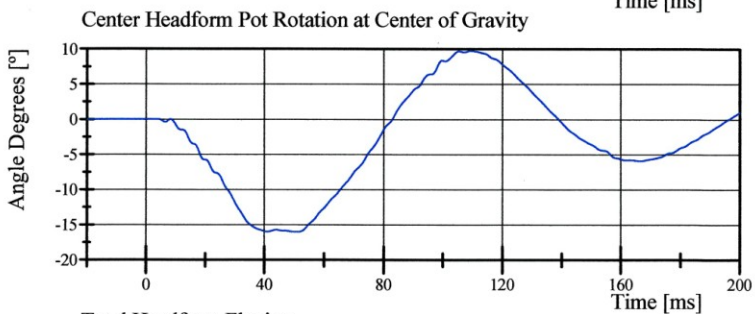
Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 4-1  
Test Date: 1/11/2012



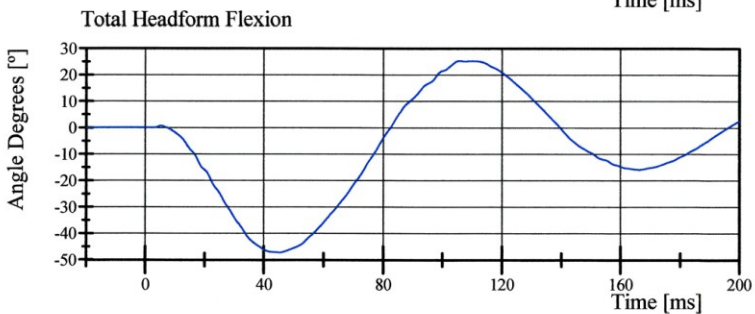
Filter Class: CFC\_180  
Max: 15.6 ° at 106.1 ms  
Min: -31.5 ° at 44.7 ms



Filter Class: CFC\_180  
Max: 15.5 ° at 110.4 ms  
Min: -28.2 ° at 41.6 ms



Filter Class: CFC\_180  
Max: 9.7 ° at 109.3 ms  
Min: -16.0 ° at 50.9 ms



Filter Class: CFC\_180  
Max: 25.3 ° at 105.7 ms  
Min: -47.3 ° at 45.2 ms



# Transportation Research Center Inc.

Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 4-1

Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.22 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,116.9 N	Yes
Time of Peak	11.8 - 16.1 ms	12.64 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,260.3 N	Yes
Time of Peak	12.2 - 17.0 ms	13.36 ms	Yes

**Test meets specifications.**

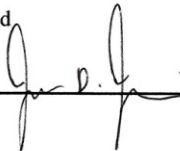
**Comments:**

Technician



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Approved



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Specification Source: NHTSA Final Rule 8/15/2008

01.12.2012 10:30:26 559

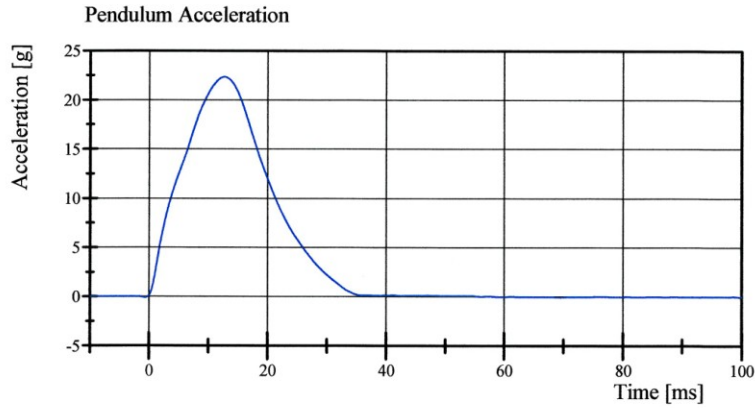


# Transportation Research Center Inc.

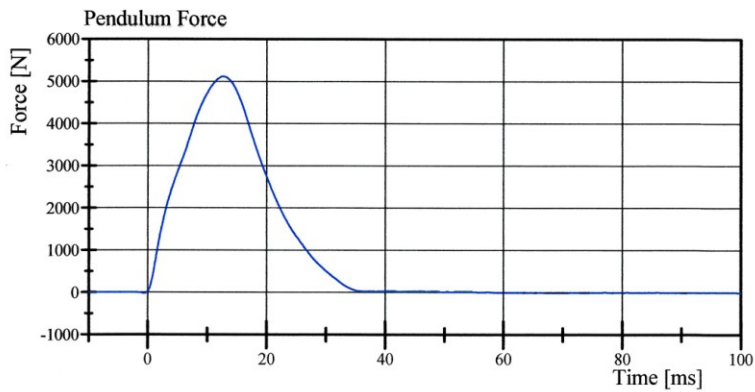
Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 4-1

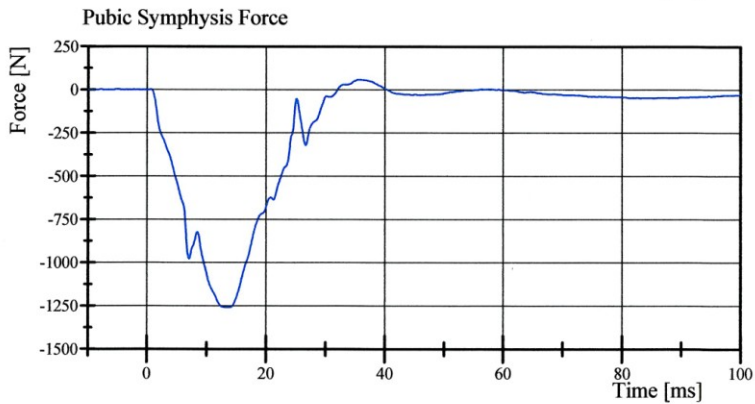
Test Date: 1/12/2012



Filter Class: CFC\_180  
Max: 22.3 gn at 12.6 ms  
Min: -0.1 gn at -0.6 ms



Filter Class: CFC\_180  
Max: 5,116.9 N at 12.6 ms  
Min: -19.4 N at -0.6 ms



Filter Class: CFC\_600  
Max: 57.0 N at 35.6 ms  
Min: -1,260.3 N at 13.4 ms

Specification Source: NHTSA Final Rule 8/15/2008

01.12.2012 10:30:33 559



**Pre-Test Calibration Sheets  
Passenger S/N 305**

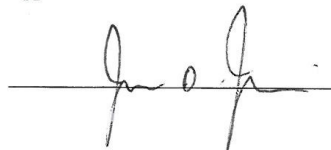
**Transportation Research Center Inc.**  
**SIDIIs Dummy - Level D**  
**External Dimensions**  
**Serial No. 305 Calibration No.08**  
**Date: 12/09/11**

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	778	Yes
B	Shoulder Pivot Height	437.0 - 453.0	442	Yes
C	H-Point Height	79.0 - 89.0	84	Yes
D	H-Point from Seat Back	141.0 - 151.0	144	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	101	Yes
F	Thigh Clearance	119.0 - 135.0	134	Yes
G	Head Breadth	140.0 - 148.0	145	Yes
H	Head Back from Backline	40.0 - 46.0	45	Yes
I	Head Depth	178.0 - 188.0	183	Yes
J	Head Circumference	541.0 - 551.0	543	Yes
K	Buttock to Knee Length	514.0 - 540.0	533	Yes
L	Popliteal Height	343.0 - 369.0	353	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	401	Yes
N	Buttock Popliteal Length	416.0 - 442.0	430	Yes
O	Chest Depth without Jacket	195.0 - 211.0	207	Yes
P	Foot Length (right)	216.0 - 232.0	220	Yes
P	Foot Length (left)	216.0 - 232.0	220	Yes
Q	Hip Breadth	313.0 - 323.0	313	Yes
R	Arm Length	249.0 - 259.0	253	Yes
S	Knee Joint to seat Back	478.0 - 493.0	482	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	350	Yes
W	Foot Width (right)	78.0 - 94.0	84	Yes
W	Foot Width (left)	78.0 - 94.0	84	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	868	Yes
Z	Waist Circumference	761.0 - 791.0	779	Yes

Technician



Approved



Revised 9/29/2005



# Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. 305 Certification No. 8-3

Test Date: 12/8/2011

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	115.3 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-2.3 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	Yes	Yes	Yes

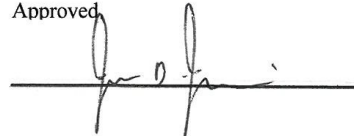
**Test meets specifications.**

**Comments:**

Technician



Approved



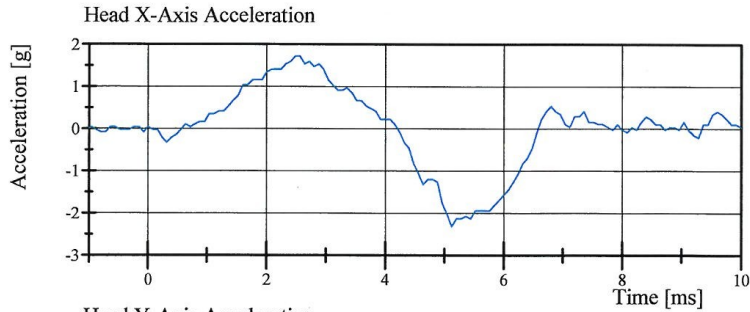
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.08.2011 15:13:36 233

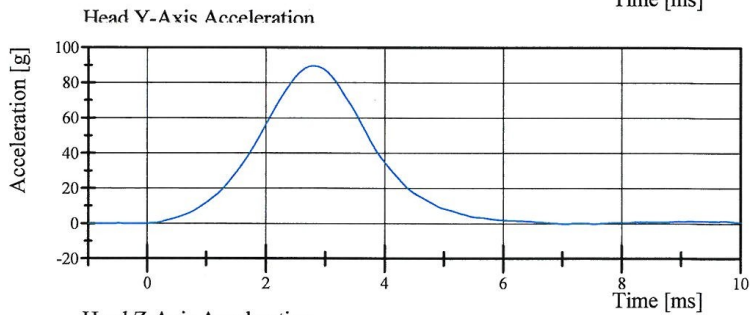


# Transportation Research Center Inc.

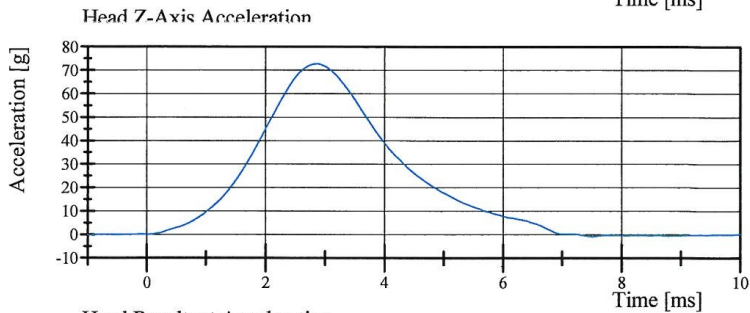
Left Lateral Head Drop  
SID IIs Serial No. 305 Certification No. 8-3  
Test Date: 12/8/2011



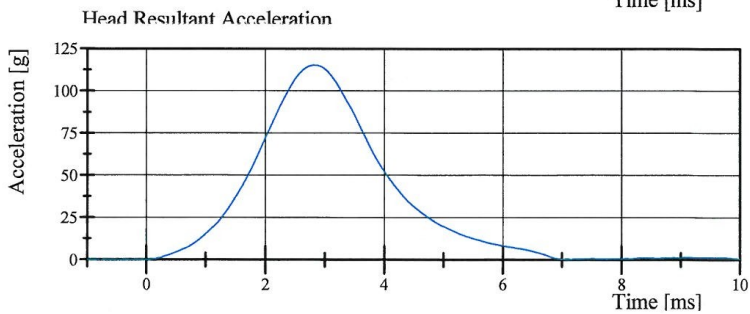
Filter Class: CFC\_1000  
Max: 1.7 gn at 2.5 ms  
Min: -2.3 gn at 5.1 ms



Filter Class: CFC\_1000  
Max: 89.6 gn at 2.8 ms  
Min: -0.2 gn at 7.0 ms



Filter Class: CFC\_1000  
Max: 72.8 gn at 2.9 ms  
Min: -0.7 gn at 7.5 ms



Filter Class: CFC\_1000  
Max: 115.3 gn at 2.8 ms  
Min: 0.0 gn at -0.6 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.08.2011 15:13:42 233



# Transportation Research Center Inc.

Left Lateral Neck  
SID IIs Serial No. 305 Certification No. 8-6  
Test Date: 12/8/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.611 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.305 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.467 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	4.697 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.668 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.909 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-77.3 deg	Yes
Time of Peak	50 - 70 ms	68.6 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	37.6 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	102 - 126 ms	125.4 ms	Yes

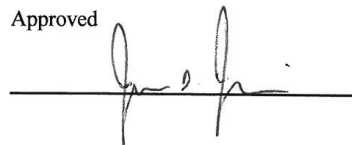
**Test meets specifications.**

**Comments:**

Technician



Approved



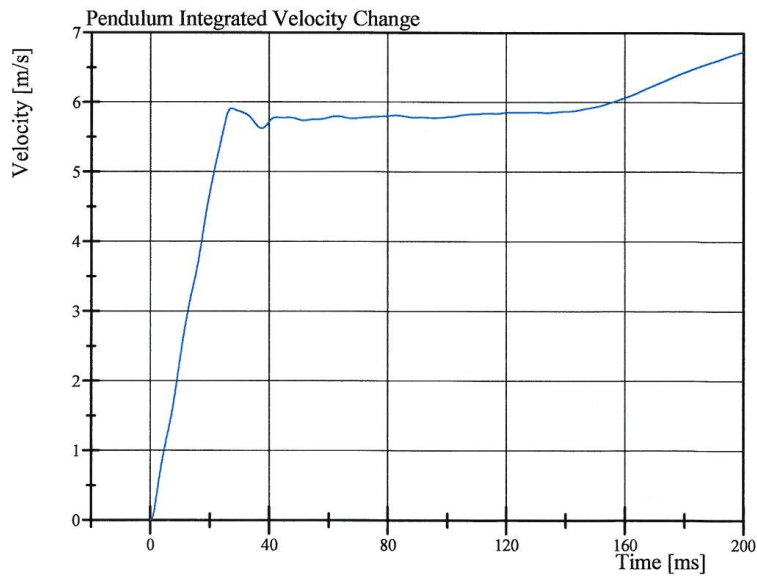
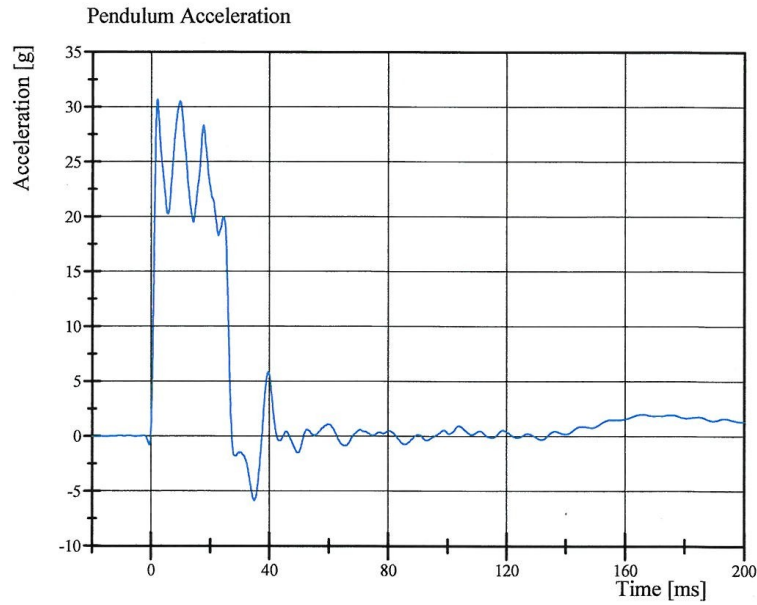
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.08.2011 13:49:55 634



# Transportation Research Center Inc.

Left Lateral Neck  
SID IIs Serial No. 305 Certification No. 8-6  
Test Date: 12/8/2011



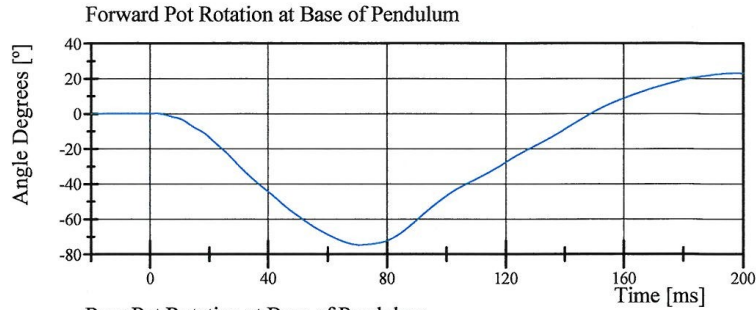
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.08.2011 13:50:03 634

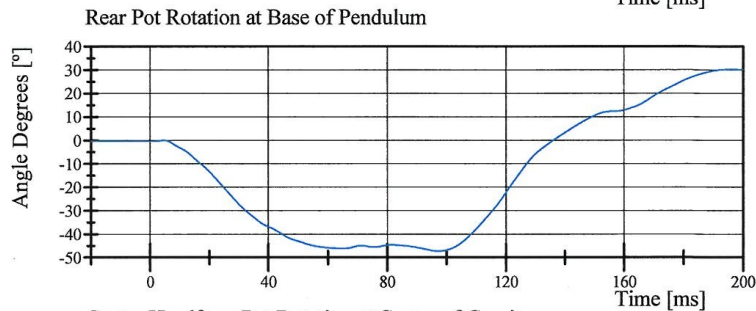


# Transportation Research Center Inc.

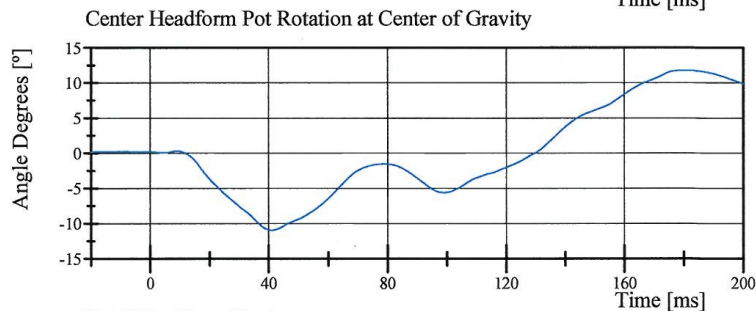
Left Lateral Neck  
SID IIs Serial No. 305 Certification No. 8-6  
Test Date: 12/8/2011



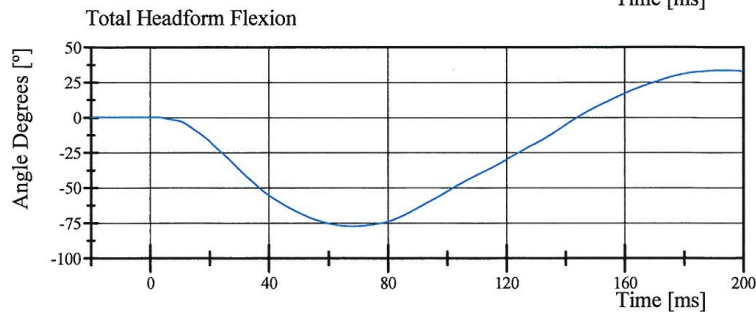
Filter Class: CFC\_60  
Max: 23.1 ° at 197.8 ms  
Min: -74.7 ° at 70.8 ms



Filter Class: CFC\_60  
Max: 30.3 ° at 196.0 ms  
Min: -47.4 ° at 97.0 ms



Filter Class: CFC\_60  
Max: 11.8 ° at 181.5 ms  
Min: -10.9 ° at 41.0 ms



Filter Class: CFC\_60  
Max: 33.7 ° at 192.8 ms  
Min: -77.3 ° at 68.6 ms

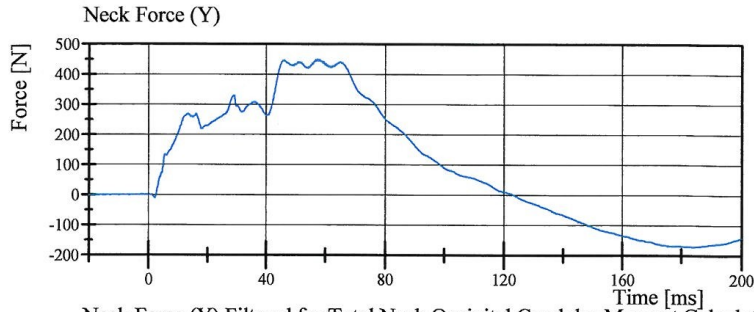
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.08.2011 13:50:04 634

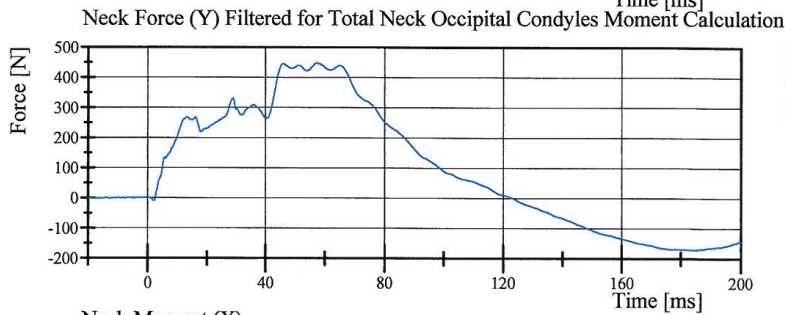


# Transportation Research Center Inc.

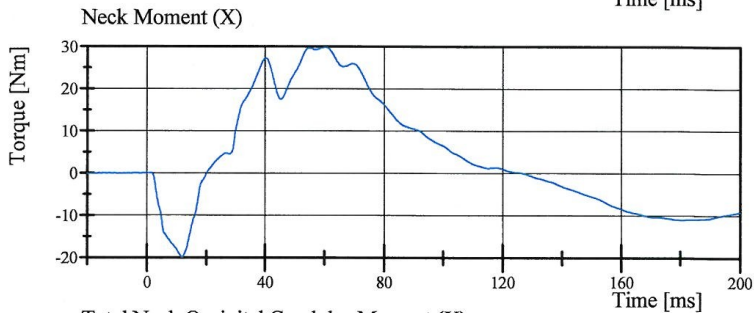
Left Lateral Neck  
SID IIs Serial No. 305 Certification No. 8-6  
Test Date: 12/8/2011



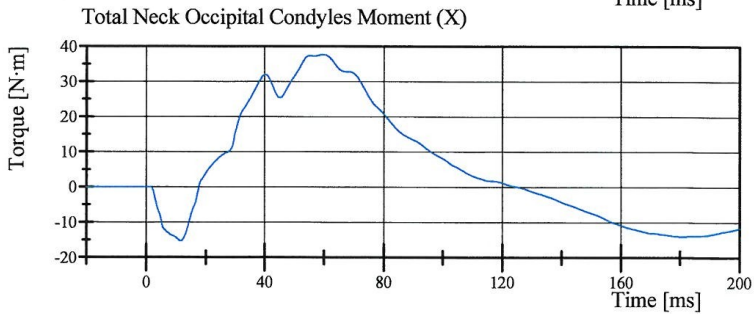
Filter Class: CFC\_1000  
Max: 450.2 N at 57.4 ms  
Min: -171.3 N at 183.4 ms



Filter Class: CFC\_600  
Max: 449.1 N at 57.4 ms  
Min: -170.5 N at 183.5 ms



Filter Class: CFC\_600  
Max: 29.9 Nm at 59.8 ms  
Min: -19.8 Nm at 11.8 ms



Filter Class: Without\_(Consta  
Max: 37.6 N·m at 59.8 ms  
Min: -15.3 N·m at 11.5 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.08.2011 13:50:04 634



# Transportation Research Center Inc.

Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.9 g	Yes
Shoulder Displacement	28 - 37 mm	29.7 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	20.1 g	Yes

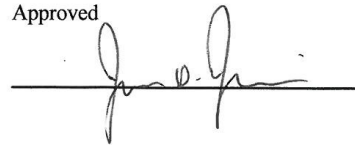
**Test meets specifications.**

**Comments:**

Technician



Approved



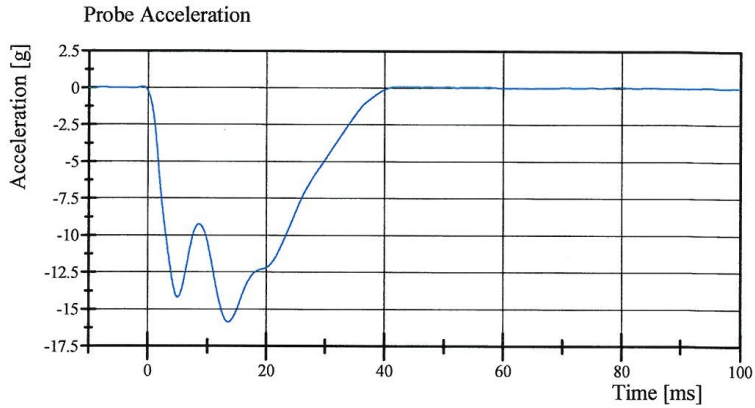
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 08:33:16 823

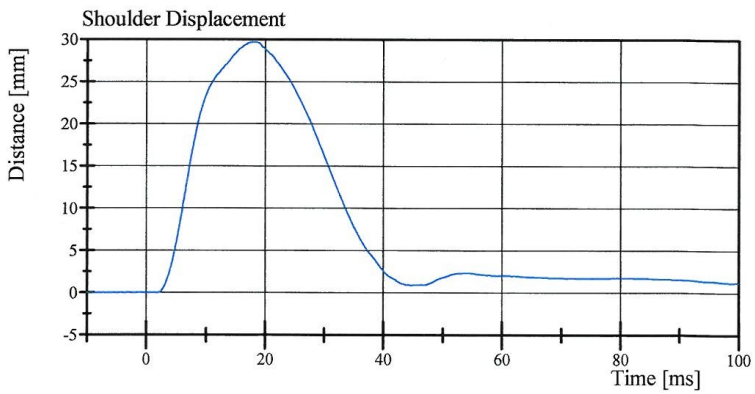


# Transportation Research Center Inc.

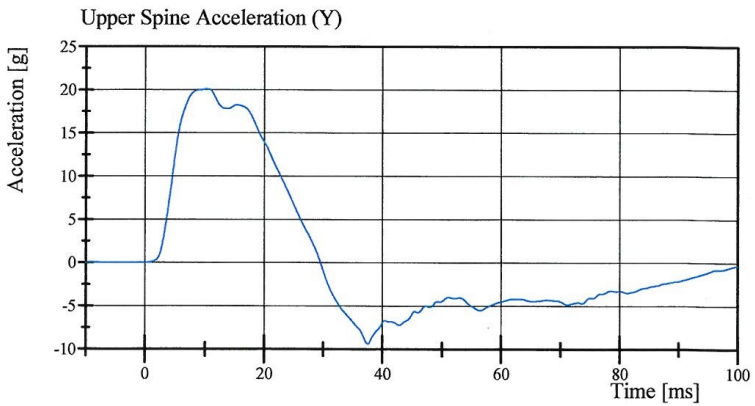
Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011



Filter Class: CFC\_180  
Max: 0.1 gn at 42.3 ms  
Min: -15.9 gn at 13.5 ms



Filter Class: CFC\_600  
Max: 29.7 mm at 17.8 ms  
Min: -0.0 mm at 1.8 ms



Filter Class: CFC\_180  
Max: 20.1 gn at 10.4 ms  
Min: -9.4 gn at 37.5 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 08:33:23 823



## Transportation Research Center Inc.

Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 8-2  
Test Date: 12/9/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.725 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-33.8 g	Yes
Shoulder Displacement	31 - 40 mm	34.6 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	27.0 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	30.9 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	32.6 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	38.9 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	36.9 g	Yes

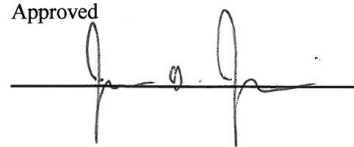
**Test meets specifications.**

**Comments:**

Technician



Approved



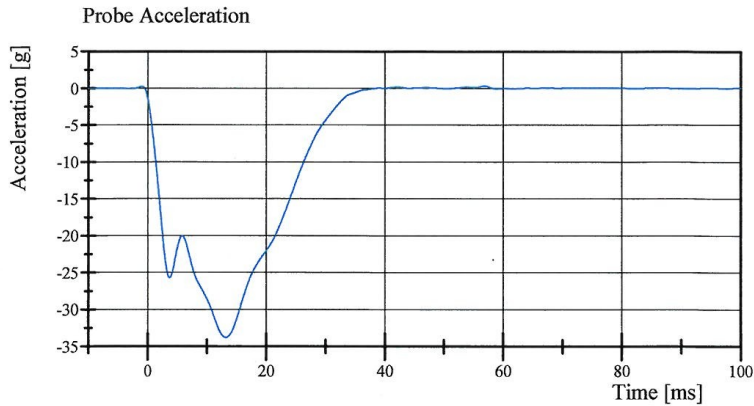
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 13:56:36 618

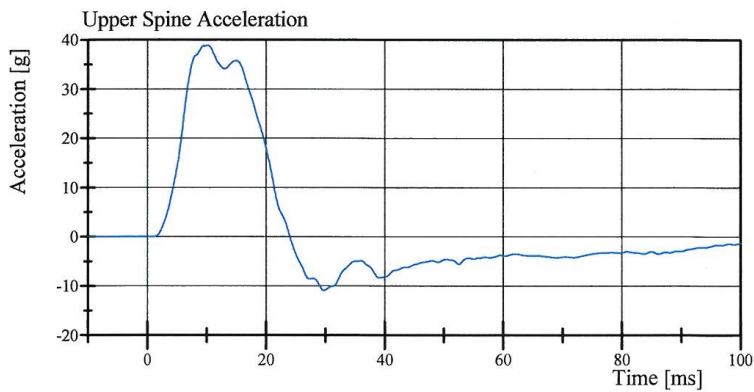


# Transportation Research Center Inc.

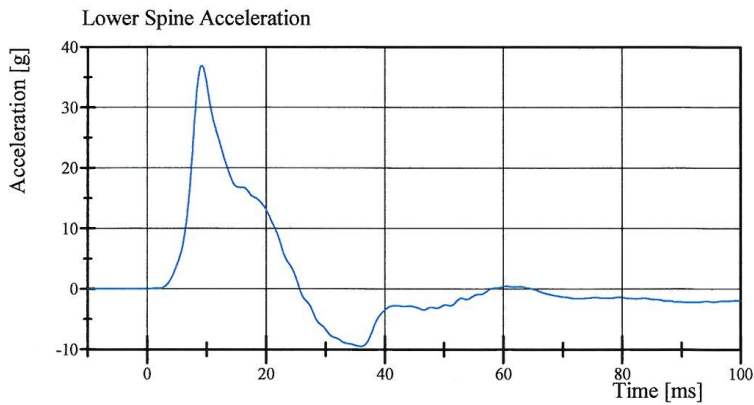
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 8-2  
Test Date: 12/9/2011



Filter Class: CFC\_180  
Max: 0.3 gn at 56.9 ms  
Min: -33.8 gn at 13.2 ms



Filter Class: CFC\_180  
Max: 38.9 gn at 10.2 ms  
Min: -10.9 gn at 29.8 ms



Filter Class: CFC\_180  
Max: 36.9 gn at 9.2 ms  
Min: -9.5 gn at 36.0 ms

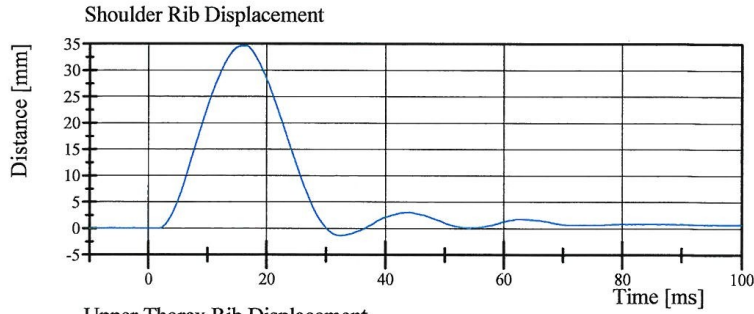
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 13:56:45 618

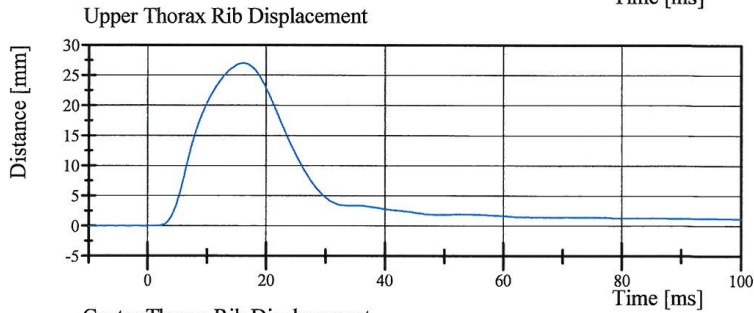


# Transportation Research Center Inc.

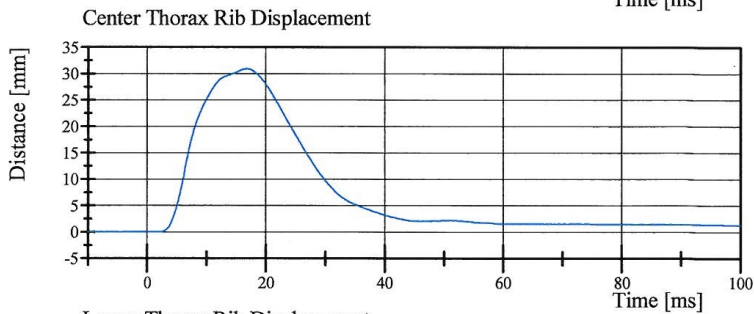
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 8-2  
Test Date: 12/9/2011



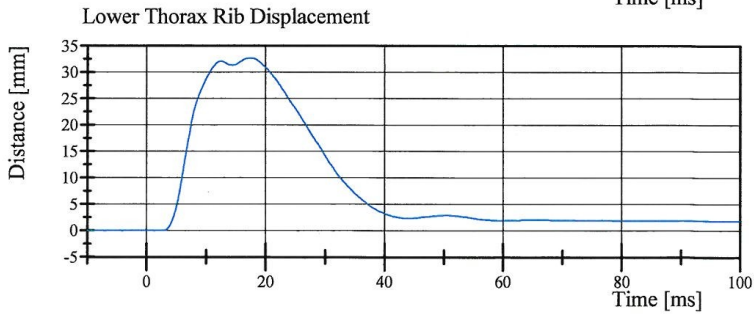
Filter Class: CFC\_600  
Max: 34.6 mm at 16.5 ms  
Min: -1.4 mm at 32.5 ms



Filter Class: CFC\_600  
Max: 27.0 mm at 16.2 ms  
Min: -0.0 mm at -9.1 ms



Filter Class: CFC\_600  
Max: 30.9 mm at 16.7 ms  
Min: -0.0 mm at -3.0 ms



Filter Class: CFC\_600  
Max: 32.6 mm at 17.5 ms  
Min: -0.0 mm at -3.1 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 13:56:45 618



## Transportation Research Center Inc.

Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.373 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.6 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	36.1 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	40.8 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	37.3 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	16.4 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	10.3 g	Yes

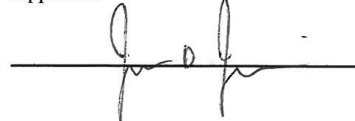
**Test meets specifications.**

**Comments:**

Technician



Approved



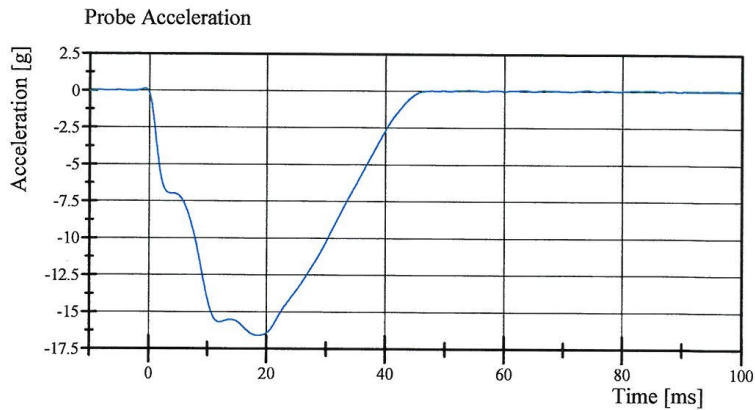
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 14:31:58 819

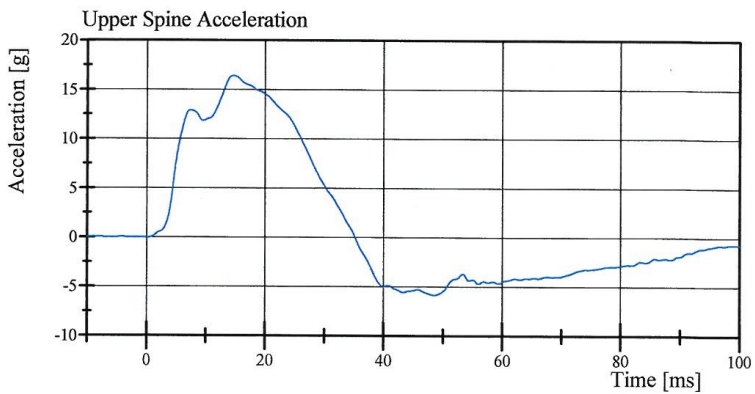


# Transportation Research Center Inc.

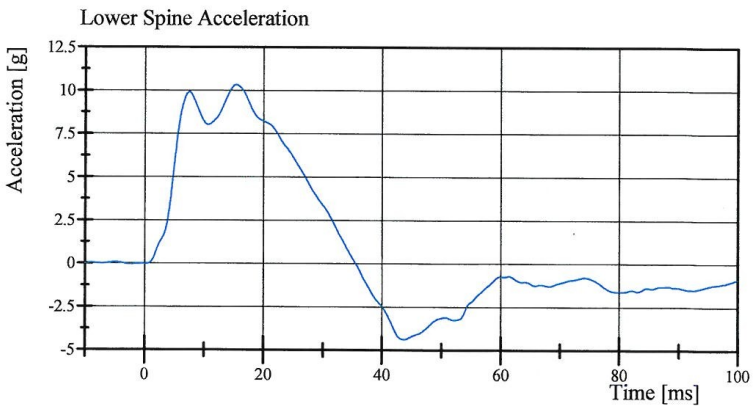
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011



Filter Class: CFC\_180  
Max: 0.1 gn at -0.6 ms  
Min: -16.6 gn at 18.6 ms



Filter Class: CFC\_180  
Max: 16.4 gn at 14.6 ms  
Min: -5.8 gn at 48.5 ms



Filter Class: CFC\_180  
Max: 10.3 gn at 15.4 ms  
Min: -4.4 gn at 43.7 ms

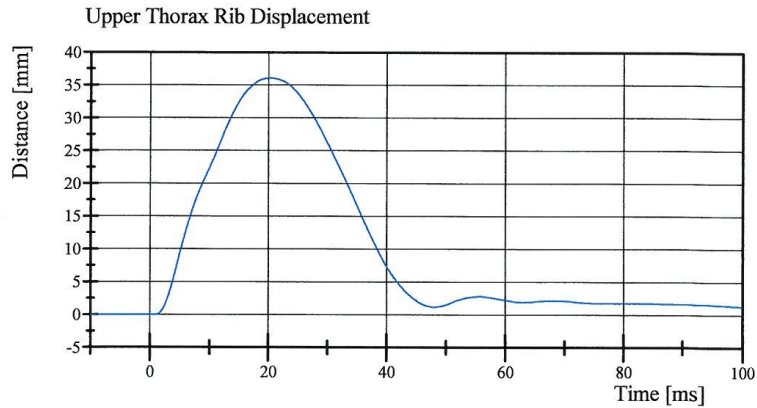
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 14:32:06 819

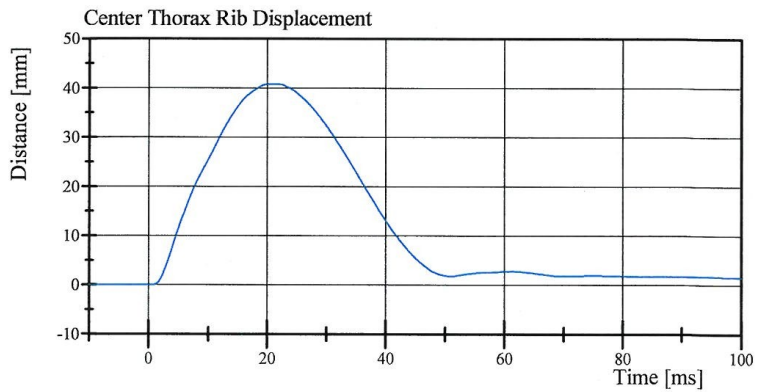


# Transportation Research Center Inc.

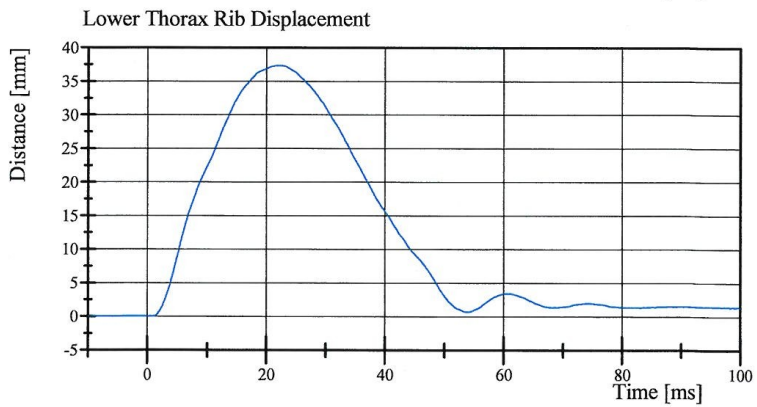
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011



Filter Class: CFC\_600  
Max: 36.1 mm at 20.2 ms  
Min: -0.0 mm at 1.0 ms



Filter Class: CFC\_600  
Max: 40.8 mm at 21.0 ms  
Min: -0.0 mm at -6.2 ms



Filter Class: CFC\_600  
Max: 37.3 mm at 22.2 ms  
Min: -0.0 mm at -7.1 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 14:32:06 819



## Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. 305 Certification No. 8-1

Test Date: 12/9/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-15.4 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	40.1 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	35.1 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	11.97 g	Yes

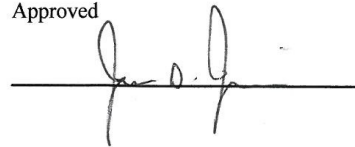
**Test meets specifications.**

**Comments:**

Technician



Approved



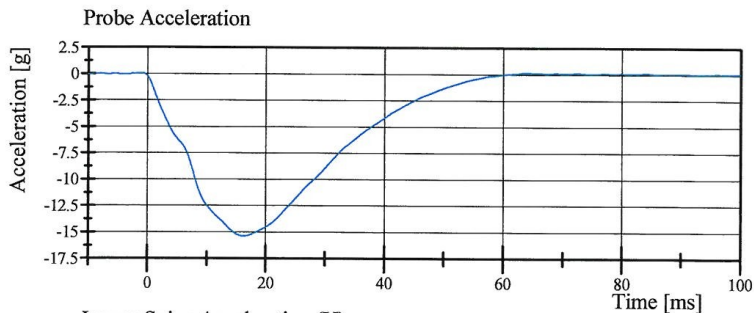
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 10:52:54 650

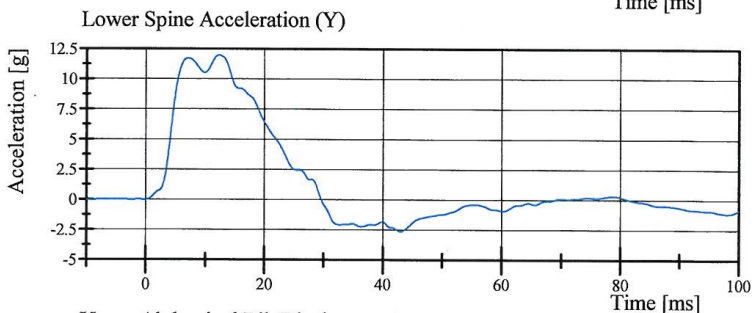


# Transportation Research Center Inc.

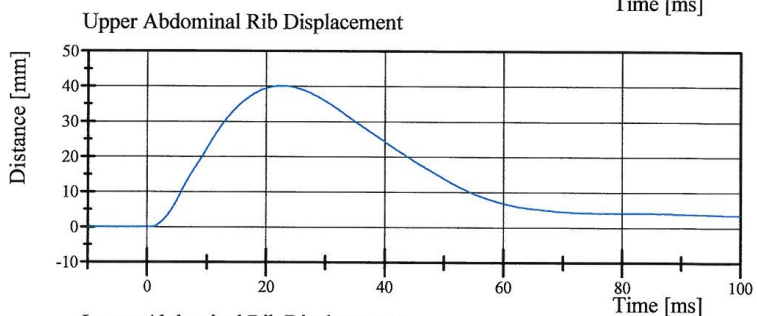
Left Lateral Abdomen  
SID IIa Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011



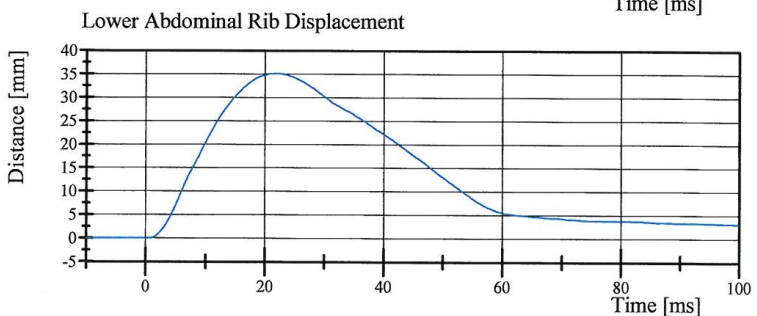
Filter Class: CFC\_180  
Max: 0.1 gn at 63.7 ms  
Min: -15.4 gn at 16.2 ms



Filter Class: CFC\_180  
Max: 12.0 gn at 12.2 ms  
Min: -2.6 gn at 43.0 ms



Filter Class: CFC\_600  
Max: 40.1 mm at 22.6 ms  
Min: -0.0 mm at 0.5 ms



Filter Class: CFC\_600  
Max: 35.1 mm at 22.1 ms  
Min: -0.0 mm at -6.9 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 10:53:01 650



# Transportation Research Center Inc.

Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.61 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-41.81 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	37.3 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,026.5 N	Yes

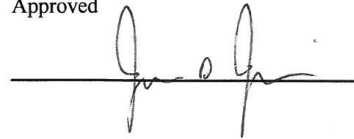
**Test meets specifications.**

**Comments:**

Technician



Approved



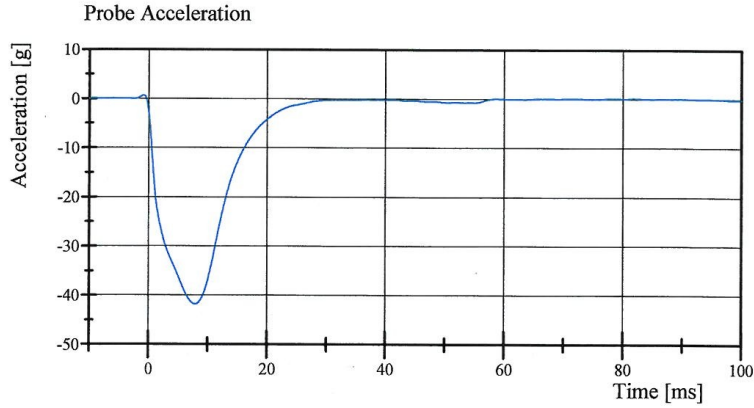
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 11:07:09 445

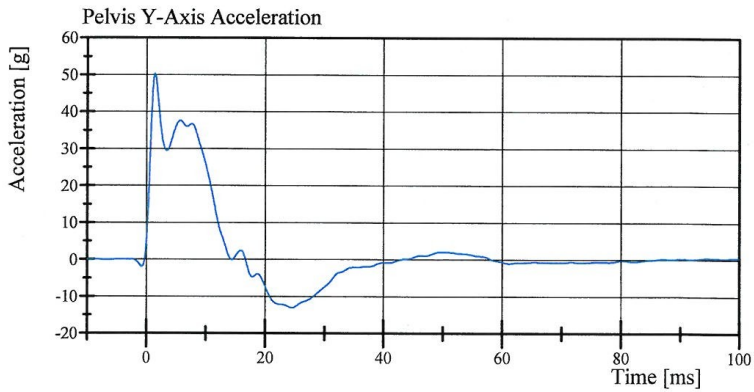


# Transportation Research Center Inc.

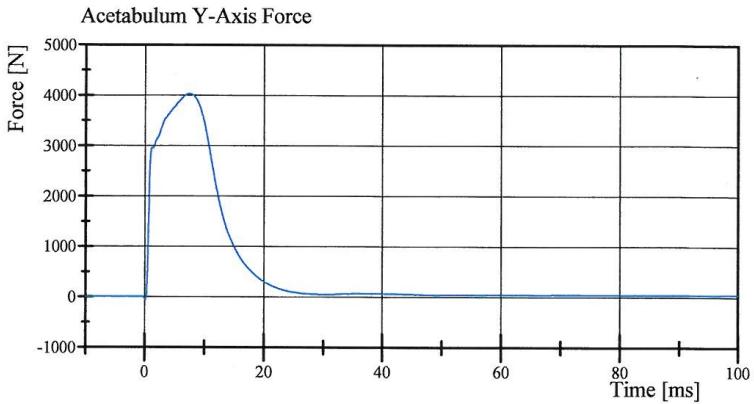
Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011



Filter Class: CFC\_180  
Max: 0.6 gn at -0.9 ms  
Min: -41.8 gn at 7.9 ms



Filter Class: CFC\_180  
Max: 50.2 gn at 1.4 ms  
Min: -13.1 gn at 24.6 ms



Filter Class: CFC\_600  
Max: 4,026.5 N at 7.4 ms  
Min: -63.1 N at 0.2 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 11:07:17 445



# Transportation Research Center Inc.

Left Lateral Iliac

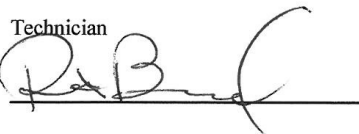
SID IIs Serial No. 305 Certification No. 8-1

Test Date: 12/9/2011

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.24 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-40.3 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	33.0 g	Yes
Iliac Force	4,100 - 5,100 N	4,853.8 N	Yes

**Test meets specifications.**

**Comments:**

Technician  


Approved  

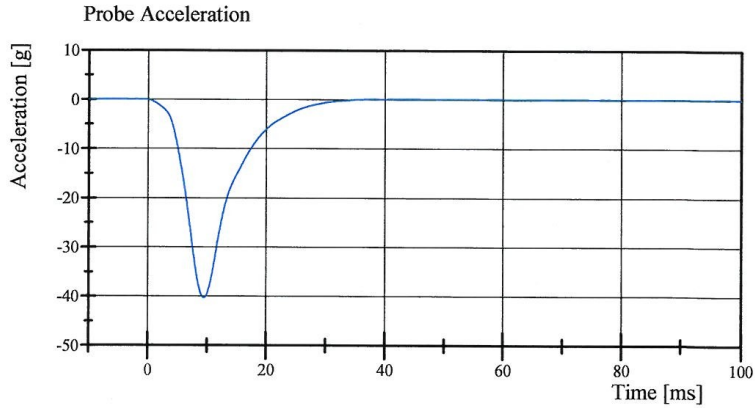

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 13:08:55 658

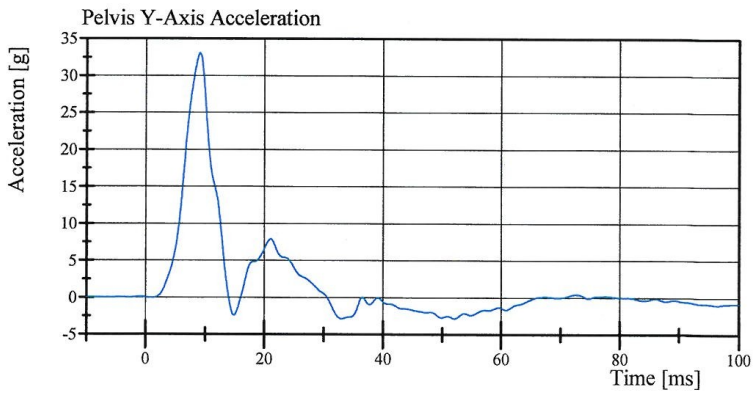


# Transportation Research Center Inc.

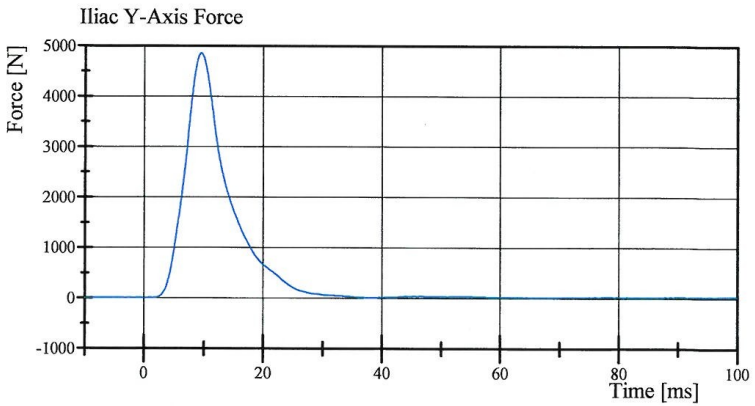
Left Lateral Iliac  
SID IIs Serial No. 305 Certification No. 8-1  
Test Date: 12/9/2011



Filter Class: CFC\_180  
Max: 0.1 gn at 44.5 ms  
Min: -40.3 gn at 9.4 ms



Filter Class: CFC\_180  
Max: 33.0 gn at 9.0 ms  
Min: -2.9 gn at 33.0 ms



Filter Class: CFC\_600  
Max: 4,853.8 N at 9.5 ms  
Min: -0.7 N at -6.7 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

12.09.2011 13:09:09 658

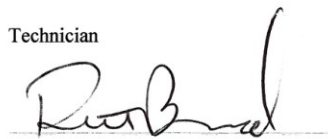


**Post-Test Calibration Sheets  
Passenger S/N 305**

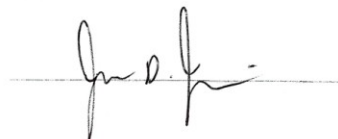
**Transportation Research Center Inc.**  
**SIDIIs Dummy - Level D**  
**External Dimensions**  
**Serial No. 305 Calibration No.09**  
**Date: 01/12/12**

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	778	Yes
B	Shoulder Pivot Height	437.0 - 453.0	440	Yes
C	H-Point Height	79.0 - 89.0	84	Yes
D	H-Point from Seat Back	141.0 - 151.0	144	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	101	Yes
F	Thigh Clearance	119.0 - 135.0	135	Yes
G	Head Breadth	140.0 - 148.0	145	Yes
H	Head Back from Backline	40.0 - 46.0	45	Yes
I	Head Depth	178.0 - 188.0	183	Yes
J	Head Circumference	541.0 - 551.0	543	Yes
K	Buttock to Knee Length	514.0 - 540.0	534	Yes
L	Popliteal Height	343.0 - 369.0	354	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	401	Yes
N	Buttock Popliteal Length	416.0 - 442.0	430	Yes
O	Chest Depth without Jacket	195.0 - 211.0	206	Yes
P	Foot Length (right)	216.0 - 232.0	220	Yes
P	Foot Length (left)	216.0 - 232.0	220	Yes
Q	Hip Breadth	313.0 - 323.0	313	Yes
R	Arm Length	249.0 - 259.0	253	Yes
S	Knee Joint to seat Back	478.0 - 493.0	481	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	350	Yes
W	Foot Width (right)	78.0 - 94.0	84	Yes
W	Foot Width (left)	78.0 - 94.0	84	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	868	Yes
Z	Waist Circumference	761.0 - 791.0	779	Yes

Technician



Approved




Revised 9/29/2005

# Transportation Research Center Inc.

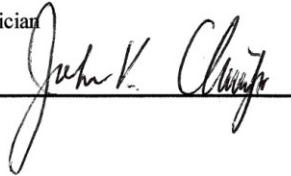
Left Lateral Head Drop  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	116.1 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	4.0 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	Yes	Yes	Yes


**Test meets specifications.**

**Comments:**

Technician



Approved



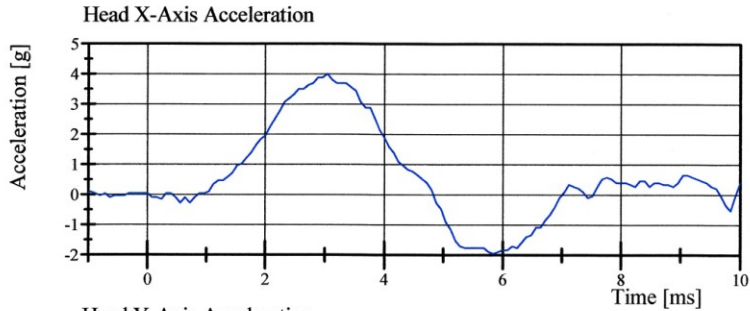
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.12.2012 12:08:57 229

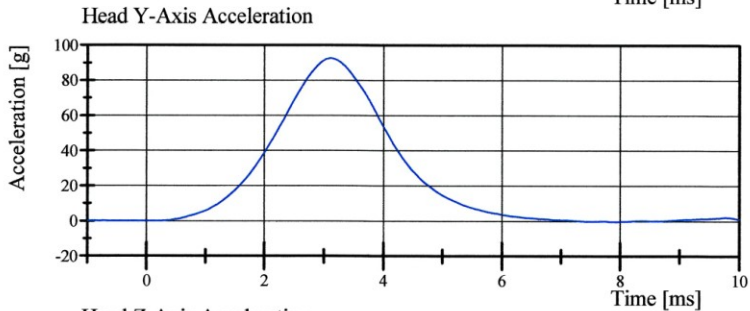


# Transportation Research Center Inc.

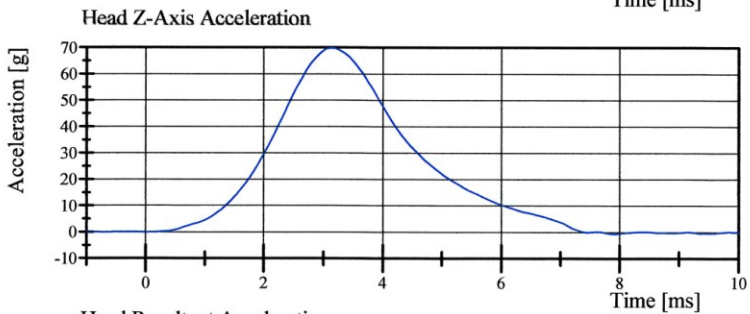
Left Lateral Head Drop  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/12/2012



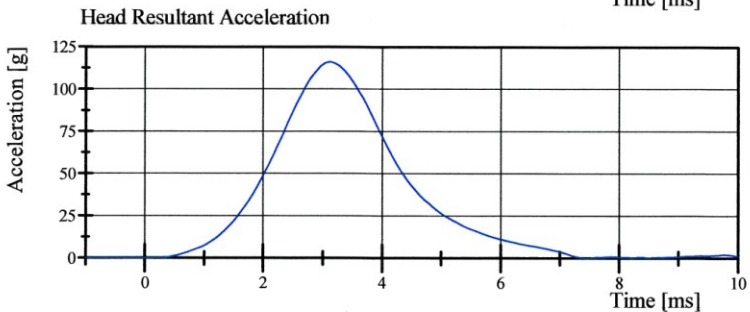
Filter Class: CFC\_1000  
Max: 4.0 gn at 3.0 ms  
Min: -2.0 gn at 5.8 ms



Filter Class: CFC\_1000  
Max: 92.7 gn at 3.1 ms  
Min: -0.3 gn at 7.8 ms



Filter Class: CFC\_1000  
Max: 69.9 gn at 3.1 ms  
Min: -0.7 gn at 7.9 ms



Filter Class: CFC\_1000  
Max: 116.1 gn at 3.1 ms  
Min: 0.0 gn at -0.8 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.12.2012 12:09:08 229



# Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 305 Certification No. 9-2

Test Date: 1/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.611 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.598 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.851 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.140 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.968 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.975 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-76.6 deg	Yes
Time of Peak	50 - 70 ms	65.2 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	40.3 N·m	Yes
Total Neck Occipital Condyles Moment			
Decay Time to 0 N·m	102 - 126 ms	122.9 ms	Yes

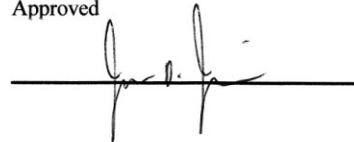
**Test meets specifications.**

**Comments:**

Technician



Approved



Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.12.2012 17:15:20 635

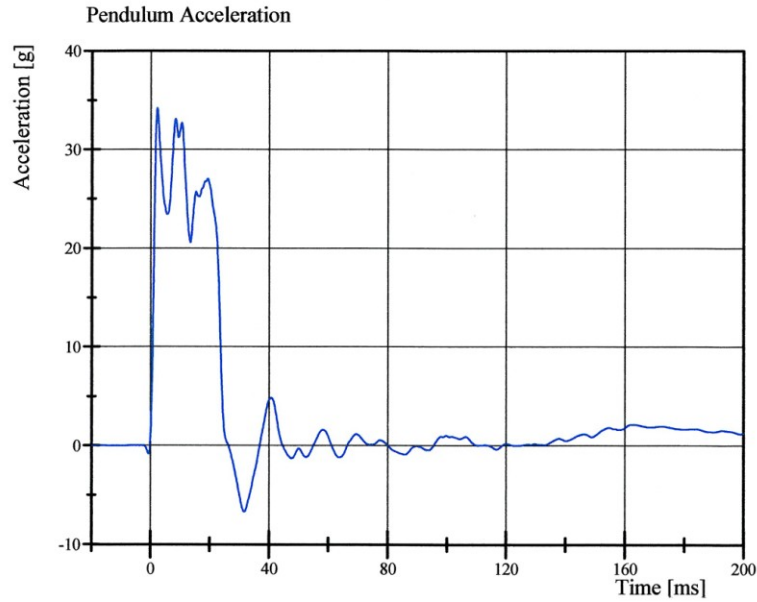


# Transportation Research Center Inc.

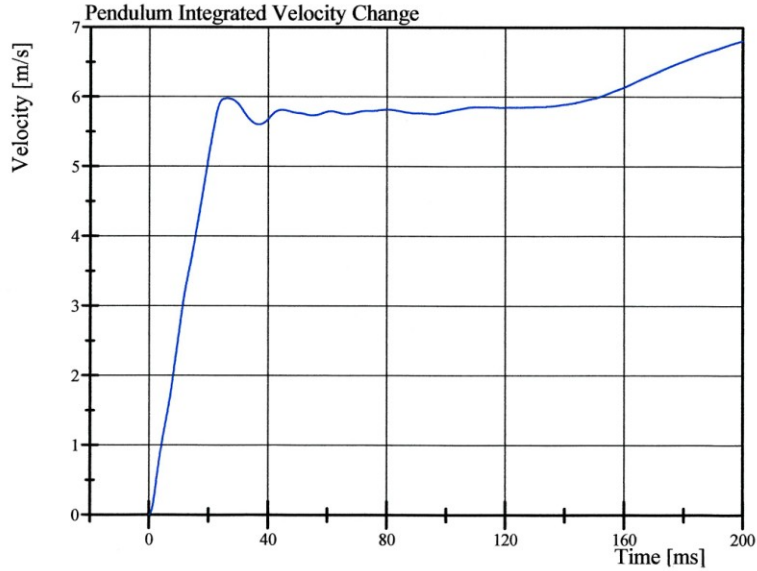
Left Lateral Neck

SID IIs Serial No. 305 Certification No. 9-2

Test Date: 1/12/2012



Filter Class: CFC\_180  
Max: 34.2 gn at 2.2 ms  
Min: -6.7 gn at 31.7 ms



Filter Class: CFC\_180  
Max: 6.8 m/s at 200.0 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.12.2012 17:15:27 635

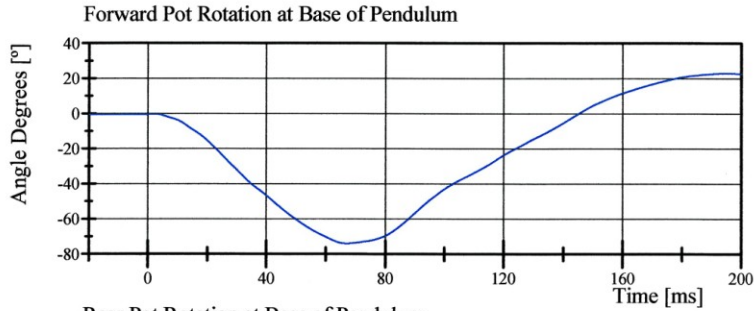


# Transportation Research Center Inc.

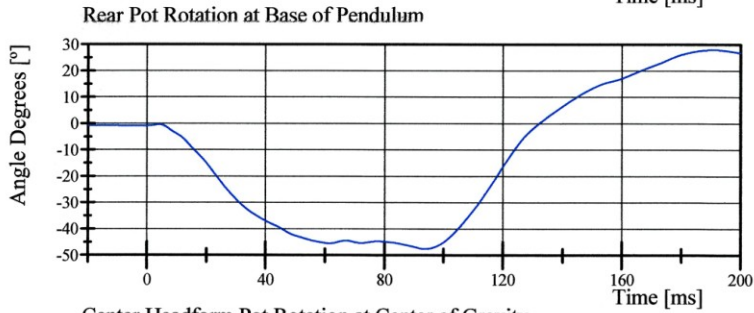
Left Lateral Neck

SID IIs Serial No. 305 Certification No. 9-2

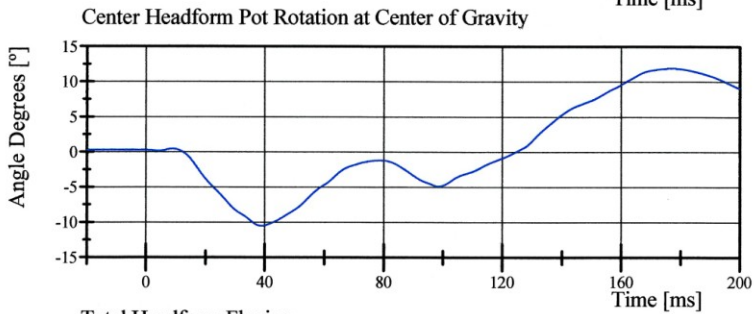
Test Date: 1/12/2012



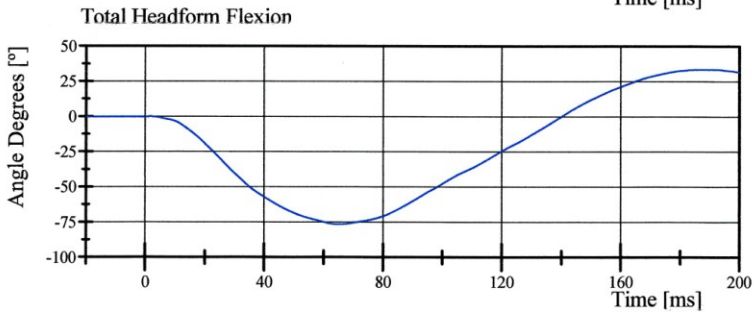
Filter Class: CFC\_60  
Max: 23.0 ° at 195.2 ms  
Min: -74.0 ° at 67.1 ms



Filter Class: CFC\_60  
Max: 28.0 ° at 190.9 ms  
Min: -47.6 ° at 93.7 ms



Filter Class: CFC\_60  
Max: 11.9 ° at 177.0 ms  
Min: -10.5 ° at 38.9 ms



Filter Class: CFC\_60  
Max: 33.5 ° at 189.8 ms  
Min: -76.6 ° at 65.2 ms

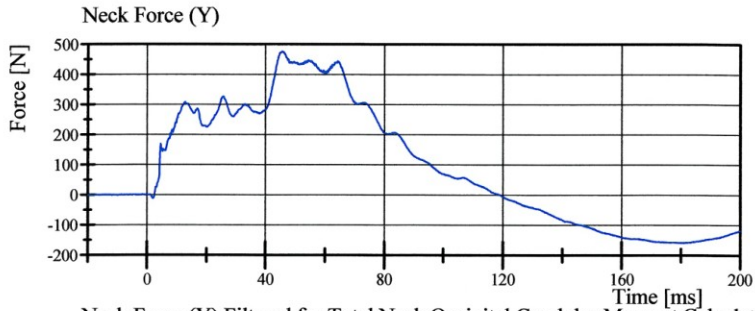
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.12.2012 17:15:27 635

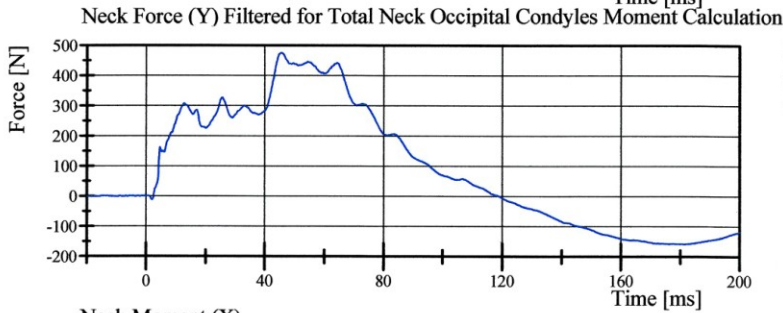


# Transportation Research Center Inc.

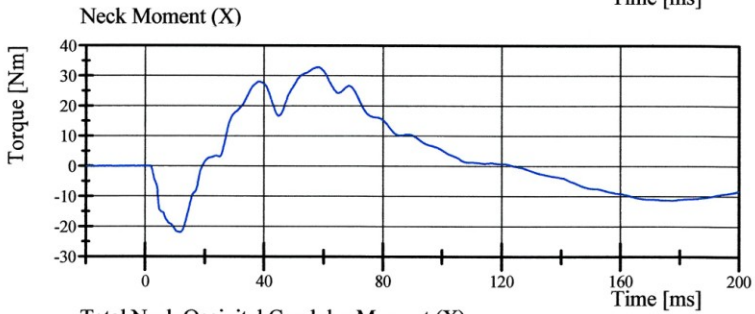
Left Lateral Neck  
SID IIs Serial No. 305 Certification No. 9-2  
Test Date: 1/12/2012



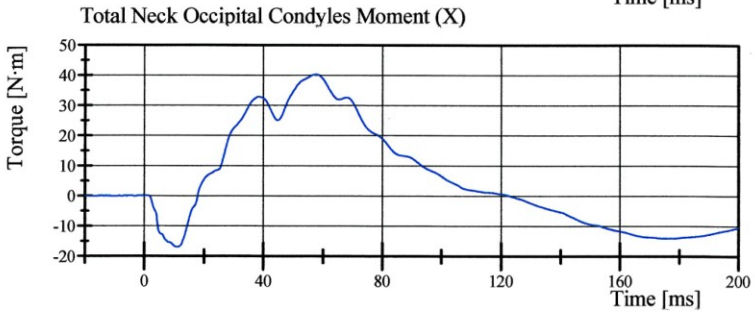
Filter Class: CFC\_1000  
Max: 476.2 N at 45.5 ms  
Min: -158.9 N at 181.4 ms



Filter Class: CFC\_600  
Max: 475.5 N at 45.5 ms  
Min: -158.3 N at 181.4 ms



Filter Class: CFC\_600  
Max: 32.9 Nm at 58.2 ms  
Min: -22.0 Nm at 11.6 ms



Filter Class: Without\_(Consta  
Max: 40.3 N·m at 57.4 ms  
Min: -16.9 N·m at 10.8 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.12.2012 17:15:28 635



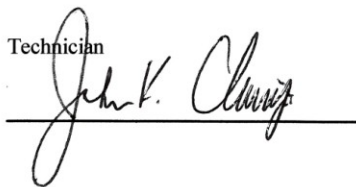
# Transportation Research Center Inc.

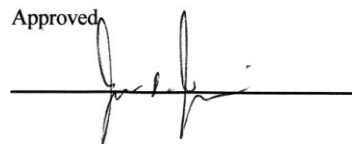
Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.32 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.8 g	Yes
Shoulder Displacement	28 - 37 mm	31.6 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	20.9 g	Yes

**Test meets specifications.**

**Comments:**

Technician  


Approved  


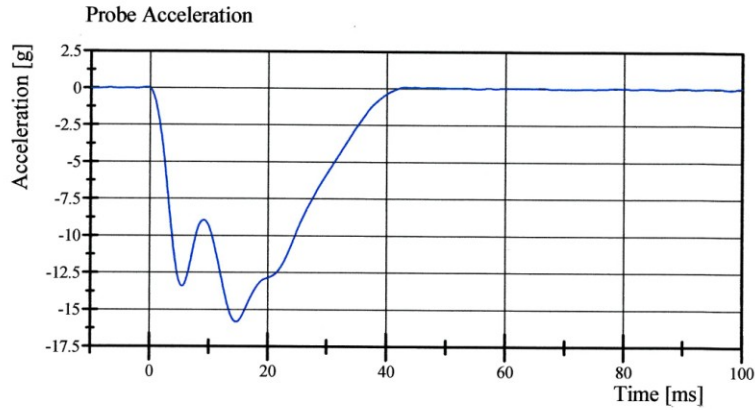
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 08:48:17 804

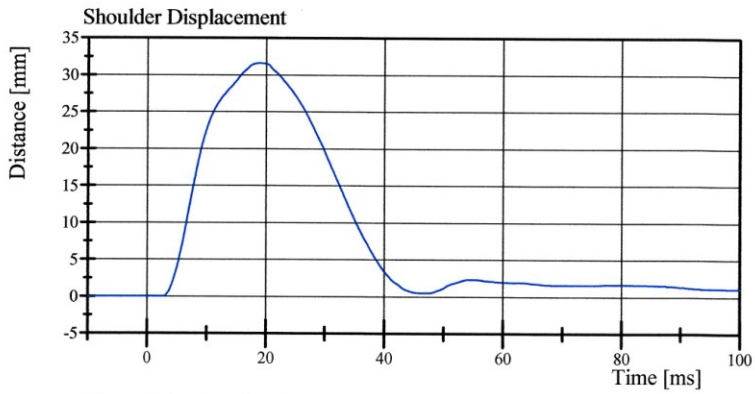


# Transportation Research Center Inc.

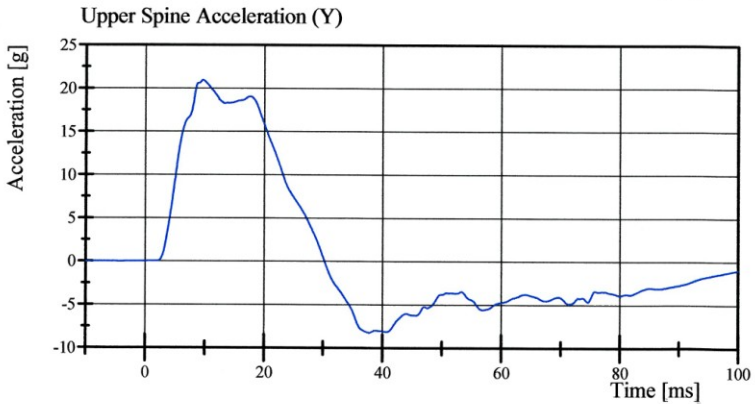
Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 0.1 gn at 43.1 ms  
Min: -15.8 gn at 14.6 ms



Filter Class: CFC\_600  
Max: 31.6 mm at 18.8 ms  
Min: -0.0 mm at 2.7 ms



Filter Class: CFC\_180  
Max: 20.9 gn at 9.6 ms  
Min: -8.2 gn at 37.8 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 08:48:35 804



# Transportation Research Center Inc.

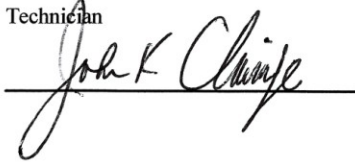
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.738 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-33.5 g	Yes
Shoulder Displacement	31 - 40 mm	34.0 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	26.6 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	31.1 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	33.3 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	39.1 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	34.7 g	Yes

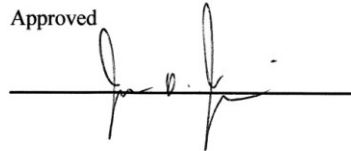
**Test meets specifications.**

**Comments:**

Technician



Approved



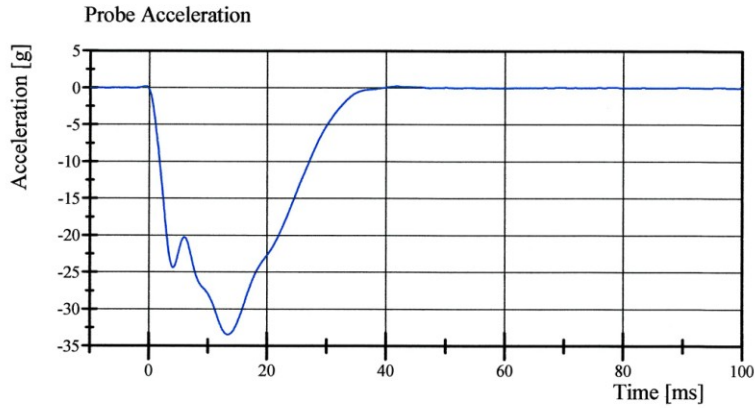
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 10:05:20 600

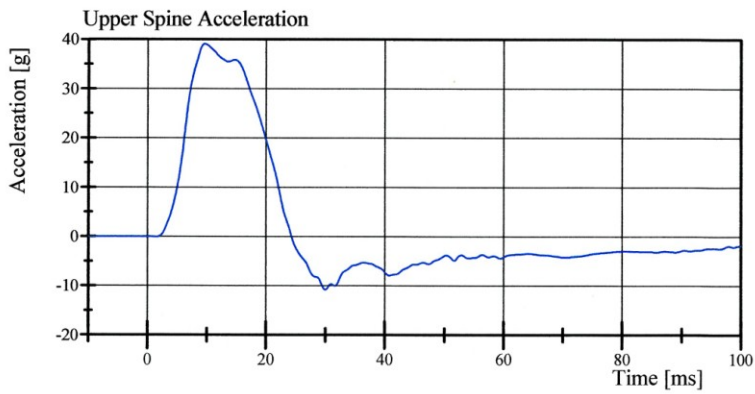


# Transportation Research Center Inc.

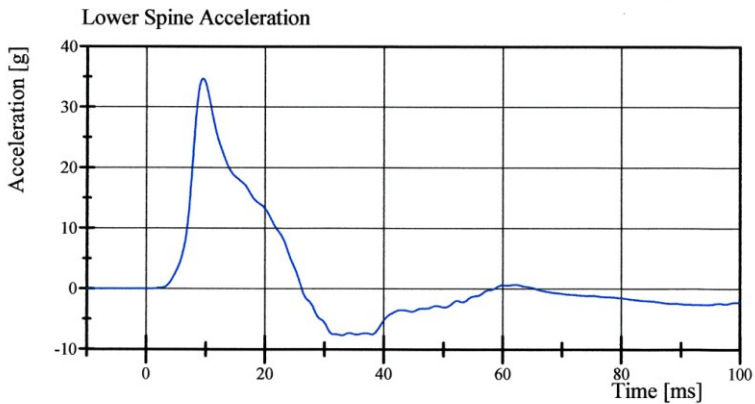
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 0.2 gn at 41.8 ms  
Min: -33.5 gn at 13.4 ms



Filter Class: CFC\_180  
Max: 39.1 gn at 9.6 ms  
Min: -10.8 gn at 30.0 ms



Filter Class: CFC\_180  
Max: 34.7 gn at 9.5 ms  
Min: -7.7 gn at 32.9 ms

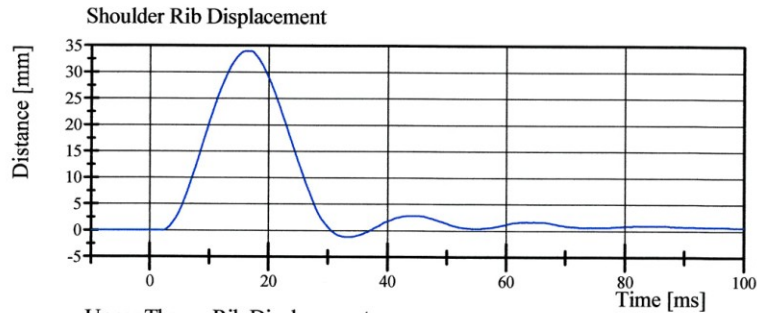
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 10:05:34 600

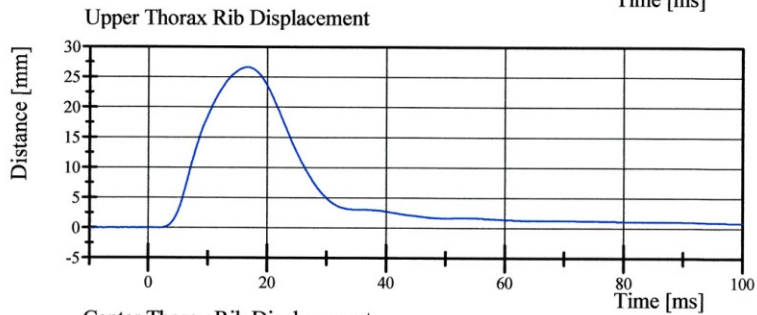


# Transportation Research Center Inc.

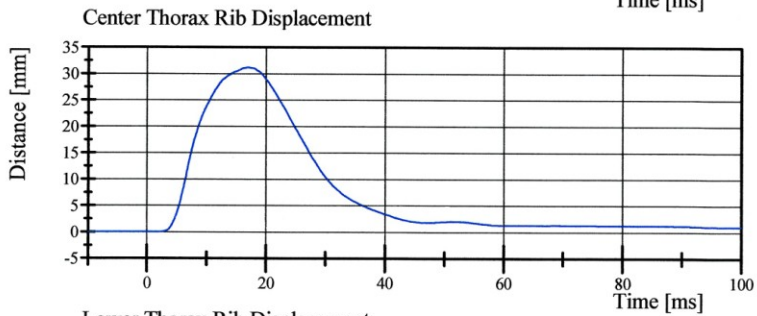
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012



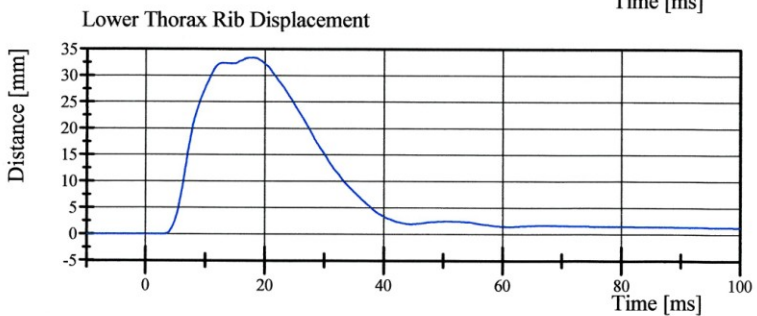
Filter Class: CFC\_600  
Max: 34.0 mm at 17.0 ms  
Min: -1.2 mm at 33.4 ms



Filter Class: CFC\_600  
Max: 26.6 mm at 16.6 ms  
Min: -0.0 mm at -8.7 ms



Filter Class: CFC\_600  
Max: 31.1 mm at 17.0 ms  
Min: -0.0 mm at 0.3 ms



Filter Class: CFC\_600  
Max: 33.3 mm at 18.0 ms  
Min: -0.0 mm at 1.7 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 10:05:35 600



# Transportation Research Center Inc.

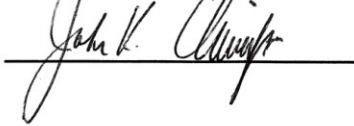
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 9-3  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.382 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.3 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	36.7 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	40.4 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	35.9 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	16.3 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.8 g	Yes

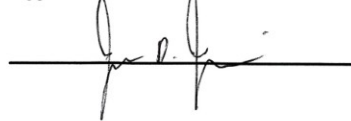
**Test meets specifications.**

**Comments:**

Technician



Approved



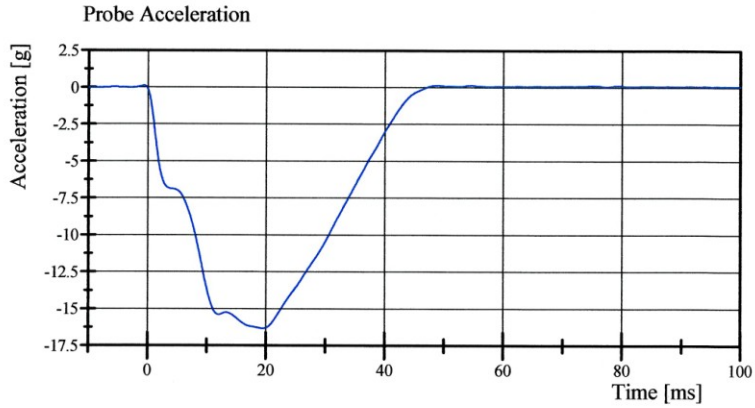
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 11:38:59 807

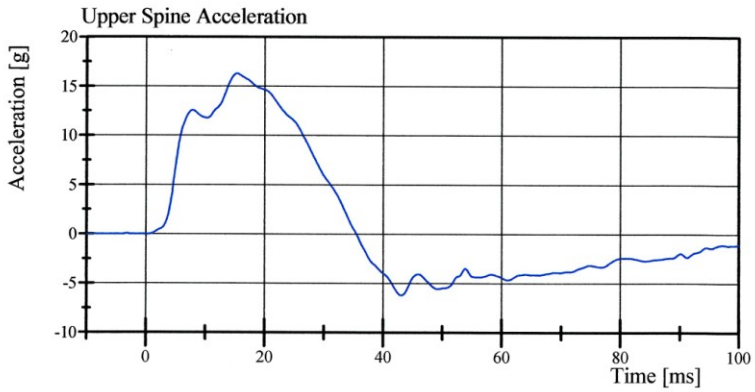


# Transportation Research Center Inc.

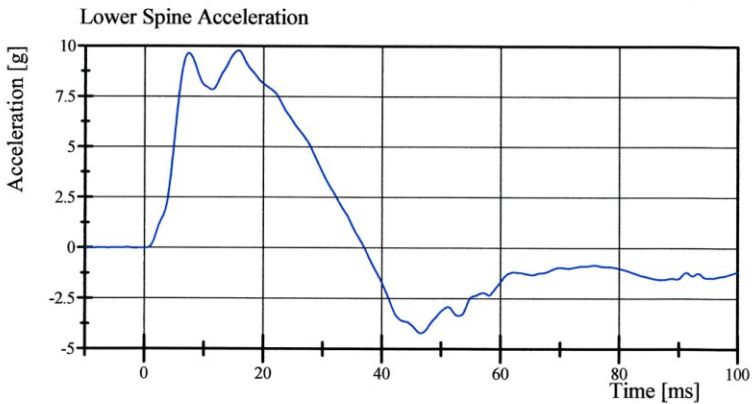
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 9-3  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 0.1 gn at 54.6 ms  
Min: -16.3 gn at 19.4 ms



Filter Class: CFC\_180  
Max: 16.3 gn at 15.4 ms  
Min: -6.2 gn at 43.0 ms



Filter Class: CFC\_180  
Max: 9.8 gn at 15.8 ms  
Min: -4.2 gn at 46.6 ms

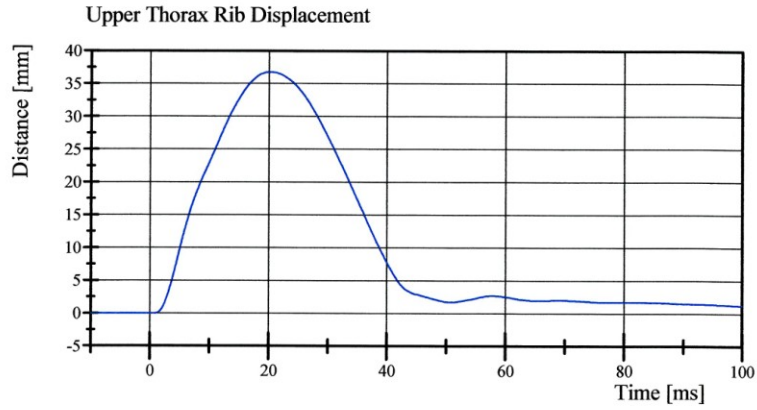
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 11:39:15 807

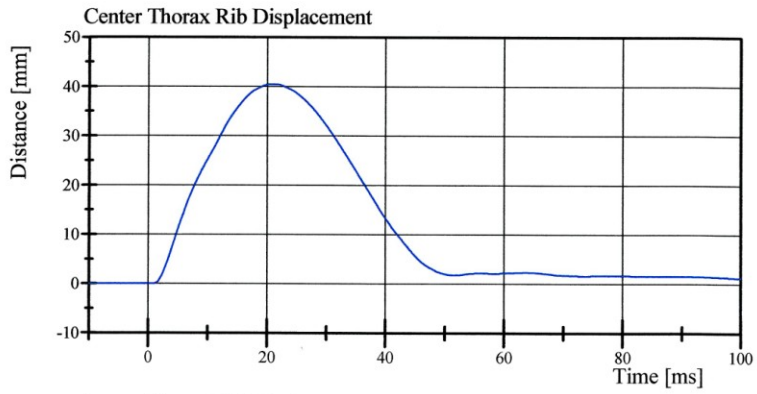


# Transportation Research Center Inc.

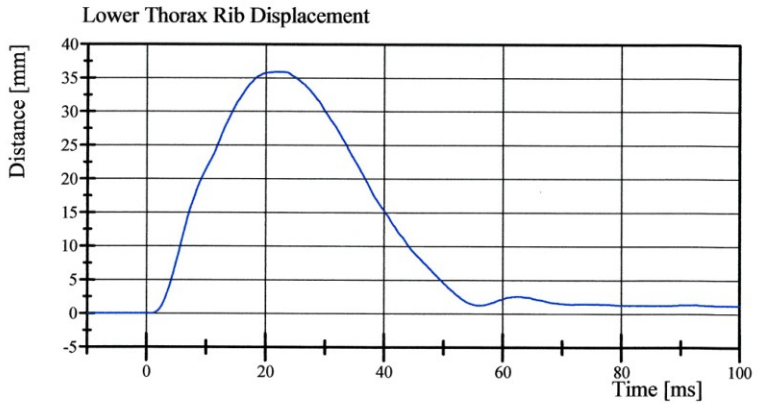
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 9-3  
Test Date: 1/11/2012



Filter Class: CFC\_600  
Max: 36.7 mm at 20.2 ms  
Min: -0.0 mm at 0.9 ms



Filter Class: CFC\_600  
Max: 40.4 mm at 21.0 ms  
Min: -0.0 mm at -1.2 ms



Filter Class: CFC\_600  
Max: 35.9 mm at 22.6 ms  
Min: -0.0 mm at -4.6 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 11:39:15 807



# Transportation Research Center Inc.

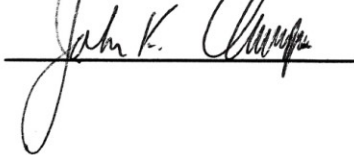
Left Lateral Abdomen  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.9 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	40.9 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	35.9 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	12.21 g	Yes

**Test meets specifications.**

**Comments:**

Technician



Approved



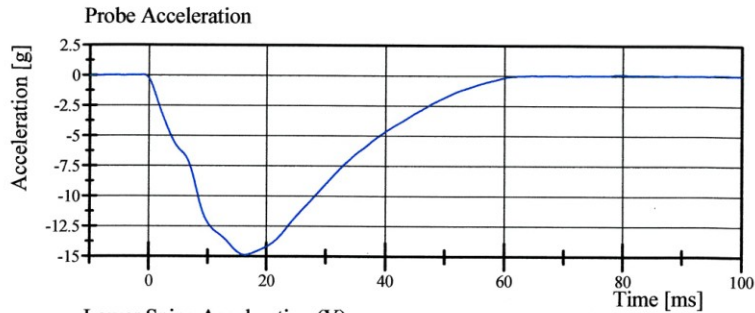
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 12:45:39 659

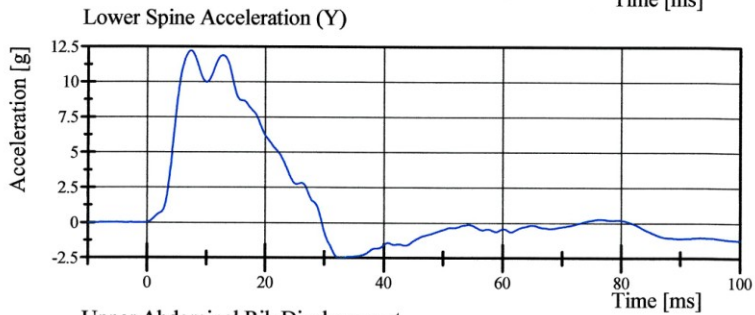


# Transportation Research Center Inc.

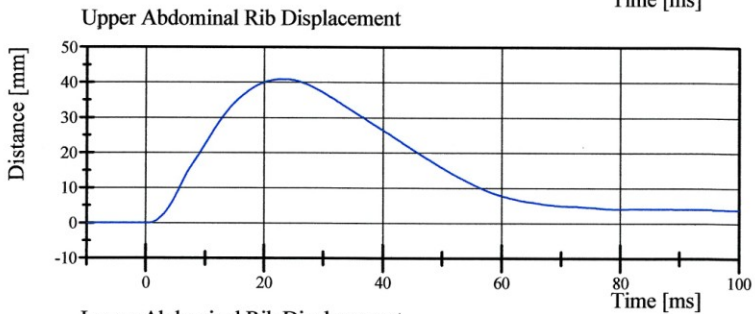
Left Lateral Abdomen  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012



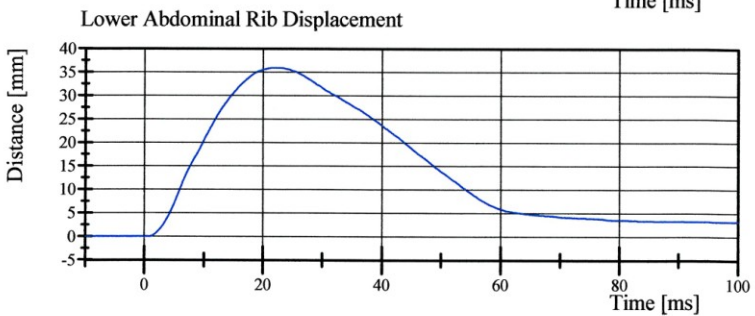
Filter Class: CFC\_180  
Max: 0.1 gn at 79.4 ms  
Min: -14.9 gn at 16.3 ms



Filter Class: CFC\_180  
Max: 12.2 gn at 7.4 ms  
Min: -2.5 gn at 32.6 ms



Filter Class: CFC\_600  
Max: 40.9 mm at 23.0 ms  
Min: -0.0 mm at 0.2 ms



Filter Class: CFC\_600  
Max: 35.9 mm at 22.2 ms  
Min: -0.0 mm at 0.8 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 12:45:54 659



# Transportation Research Center Inc.

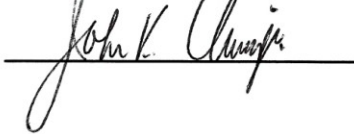
Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.62 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-41.27 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	36.7 g	Yes
Acetabulum Force	3,600 - 4,300 N	3,962.3 N	Yes

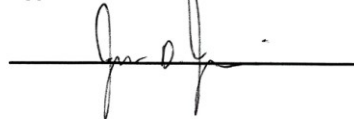
**Test meets specifications.**

**Comments:**

Technician



Approved



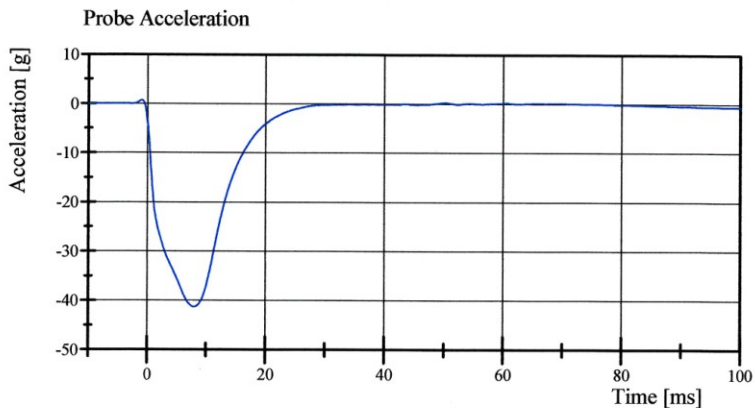
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 13:28:18 453

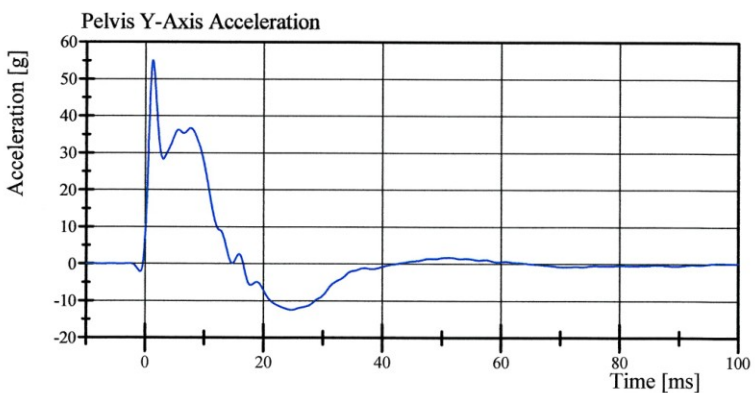


# Transportation Research Center Inc.

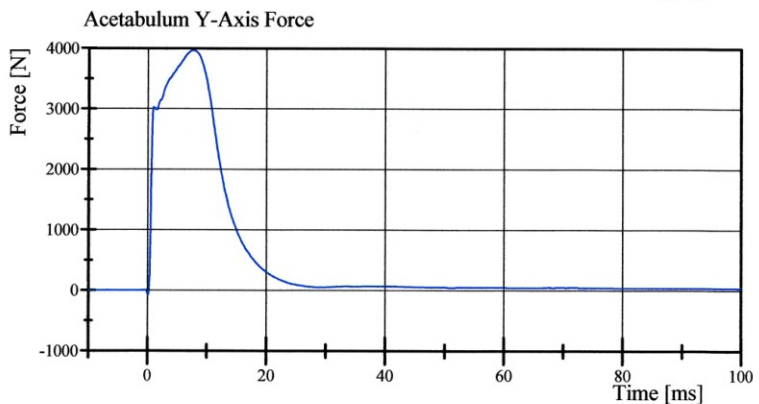
Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 0.7 gn at -1.0 ms  
Min: -41.3 gn at 8.0 ms



Filter Class: CFC\_180  
Max: 55.0 gn at 1.3 ms  
Min: -12.5 gn at 24.7 ms



Filter Class: CFC\_600  
Max: 3,962.3 N at 7.7 ms  
Min: -81.0 N at 0.1 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 13:28:30 453



# Transportation Research Center Inc.

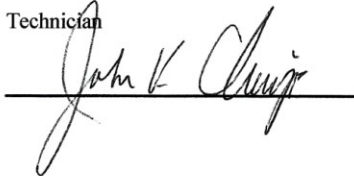
Left Lateral Iliac  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	22.1 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.24 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-41.0 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	34.4 g	Yes
Iliac Force	4,100 - 5,100 N	4,991.1 N	Yes

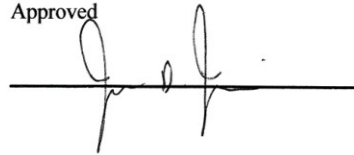
**Test meets specifications.**

**Comments:**

Technician



Approved



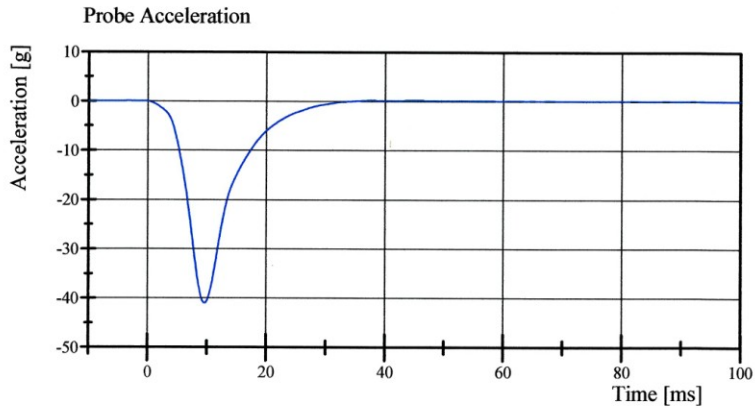
Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 15:34:36 635

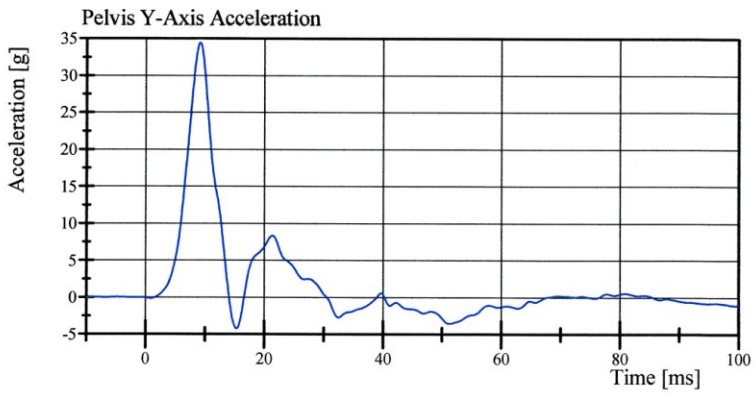


# Transportation Research Center Inc.

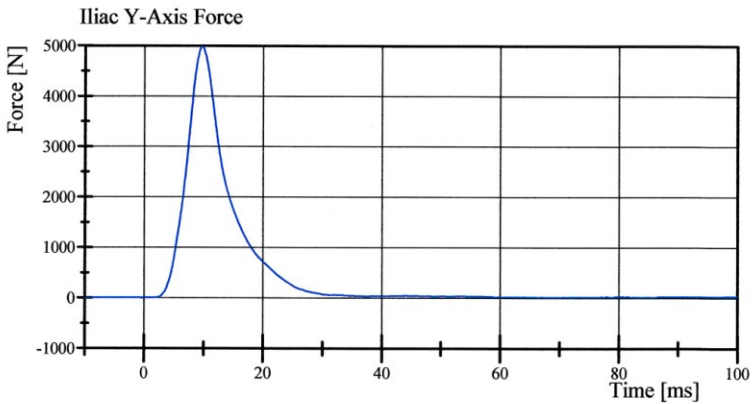
Left Lateral Iliac  
SID IIs Serial No. 305 Certification No. 9-1  
Test Date: 1/11/2012



Filter Class: CFC\_180  
Max: 0.2 gn at 37.5 ms  
Min: -41.0 gn at 9.6 ms



Filter Class: CFC\_180  
Max: 34.4 gn at 9.1 ms  
Min: -4.2 gn at 15.4 ms



Filter Class: CFC\_600  
Max: 4,991.1 N at 9.7 ms  
Min: -1.0 N at -0.4 ms

Specification Source: Procedures based on Final Rule effective 8/24/2009  
Polarity in accordance with SAE J211.

01.11.2012 15:34:49 635



**APPENDIX D**  
**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA**

**TABLE 1 – Dummy Instrumentation (ES-2re)**

			ES-2re S/N F030		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers		X	P58890	Endevco	16-Nov-11
		Y	P51702	Endevco	16-Nov-11
		Z	P52083	Endevco	16-Nov-11
Thoracic Rib Displacement Potentiometers	Upper	Y	MLT-38000203-175	FTSS	16-Nov-11
	Middle	Y	MLT-38000203-174	FTSS	16-Nov-11
	Lower	Y	MLT-38000203-173	FTSS	16-Nov-11
Abdomen Load Cells	Upper	Y	2631-1441	Denton	16-Nov-11
	Middle	Y	2631-1436	Denton	16-Nov-11
	Lower	Y	2631-1437	Denton	16-Nov-11
Lower Spine Accelerometers (T12)		X	P73381	Endevco	16-Nov-11
		Y	P73580	Endevco	16-Nov-11
		Z	P59005	Endevco	16-Nov-11
Acetabulum Load Cell		Y			
Pubic Symphysis Load Cell		Y	3096-457-FY	Denton	16-Nov-11

**TABLE 2 – Dummy Instrumentation (SID-IIs)**

			SID-IIs S/N 033			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers		X	P51719	Endevco	9-Nov-11	
		Y	P51272	Endevco	9-Nov-11	
		Z	P58862	Endevco	9-Nov-11	
Displacement Potentiometers	Shoulder		Y			
	Thoracic Rib	Upper	Y	180-3885-007	Servo	9-Nov-11
		Middle	Y	08TC1-3725-1161	Servo	9-Nov-11
		Lower	Y	08TC1-3725-1279	Servo	9-Nov-11
	Abdominal Rib	Upper	Y	08TC1-3725-1295	Servo	9-Nov-11
		Lower	Y	08TC1-3725-1136	Servo	9-Nov-11
Lower Spine Accelerometers (T12)		X	P50068	Endevco	9-Nov-11	
		Y	P52051	Endevco	9-Nov-11	
		Z	P51710	Endevco	9-Nov-11	
Acetabulum Load Cell		Y	IF-520-103-FY	FTSS	10-Nov-11	
Iliac Wing Load Cell		Y	3228J-287-FY	FTSS	10-Nov-11	
Pelvis Plug (struck side)						
Pelvis Plug (non-struck side)						

**TABLE 3 – Vehicle Instrumentation**

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	P46962	Endevco	17-Aug-11
	Vehicle Center of Gravity	Y	P63129	Endevco	23-Nov-11
	Vehicle Center of Gravity	Z	P61270	Endevco	17-Aug-11
2	Right Sill at Front Seat	X	P69048	Endevco	1-Jun-11
	Right Sill at Front Seat	Y	P73590	Endevco	22-Nov-11
	Right Sill at Front Seat	Z	P68774	Endevco	1-Jun-11
3	Right Sill at Rear Seat	X	P73388	Endevco	11-Aug-11
	Right Sill at Rear Seat	Y	P73621	Endevco	16-Aug-11
	Right Sill at Rear Seat	Z	P73380	Endevco	9-Aug-11
4	Left Sill at Front Door	Y	P63160	Endevco	17-Aug-11
5	Left Sill at Rear Door	Y	P73598	Endevco	22-Nov-11
6	Left A-Post Lower	Y	P67027	Endevco	31-Oct-11
7	Left A-Post Middle	Y	P57178	Endevco	6-Dec-11
8	Left B-Post Lower	Y	P68554	Endevco	6-Dec-11
9	B-Post Middle	Y	P69051	Endevco	6-Dec-11
10	Front Seat Track	Y	P73606	Endevco	22-Nov-11
11	Rear Seat Track or Structure	Y	P73677	Endevco	22-Nov-11
12	Right Rear Occupant Compartment	Y	P68548	Endevco	5-Dec-11
13	Engine Block	X	P61357	Endevco	6-Jan-12
	Engine Block	Y	P66894	Endevco	10-Nov-11
14	Rear Floorpan Above Axle	X	P73595	Endevco	9-Dec-11
	Rear Floorpan Above Axle	Y	P69381	Endevco	6-Dec-11
	Rear Floorpan Above Axle	Z	P73603	Endevco	23-Nov-11

**TABLE 4 – MDB Instrumentation**

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	P73283	Endevco	23-Nov-11
MDB Center of Gravity	Y	P73285	Endevco	23-Nov-11
MDB Center of Gravity	Z	P57176	Endevco	7-Dec-11
Left Frame Rail at Rear Axle Centerline	X	P73597	Endevco	22-Nov-11
Left Frame Rail at Rear Axle Centerline	Y	P73301	Endevco	22-Nov-11