

**FINAL REPORT NUMBER: SINCAP-TRC-19-001**

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

**BAYERISCHE MOTOREN WERKE AG  
2019 BMW X5 5-DR SUV  
NHTSA NUMBER: M20194105**

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



**Report Date: March 13, 2019**

**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
Mail Code: NRM-110  
1200 New Jersey Ave, SE, Room W43-410  
Washington, D.C. 20590**

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof.

If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement.

Report Prepared By: ILO Project Operations Group

Report Approved By: 

John Shultz

Approval Date: March 13, 2019

FINAL REPORT ACCEPTANCE BY OCWS:

---

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

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

---

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

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

Technical Report Documentation Page

1. Report No. SINCAP-TRC-19-001	2. Government Accession No.	3. Recipient's Catalog No.																																																									
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of a 2019 BMW X5 5-DR SUV, NHTSA No.: M20194105		5. Report Date March 13, 2019																																																									
		6. Performing Organization Code TRC Inc.																																																									
7. Author(s) John Shultz, Project Manager		8. Performing Organization Report Number 190109																																																									
9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319		10. Work Unit No.																																																									
		11. Contract or Grant No. DTNH22-14-D-00354																																																									
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE, Room W43-410 Washington, DC 20590		13. Type of Report and Period Covered Final Test Report January 9, 2019 – March 13, 2019																																																									
		14. Sponsoring Agency Code NRM-110																																																									
15. Supplemental Notes																																																											
16. Abstract <p>This 55 / 28 km/h 90° Moving Deformable Barrier SINCAP Side Impact Test was conducted on the subject 2019 BMW X5 5-DR SUV, 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 9, 2019.</p> <p>The impact velocity of the Moving Deformable Barrier (MDB) was 61.98 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 21.3° C. The target vehicle post-test maximum crush was 182 mm at Level 3. The test vehicle's performance was as follows:</p> <table border="1"> <thead> <tr> <th colspan="4">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>36</sub>)</td> <td>N/A</td> <td>1000</td> <td>72</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>44</td> <td>15.7</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>579.8</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>-1241.0</td> </tr> <tr> <td>Lower Spine Acceleration</td> <td>G</td> <td>82*</td> <td>14.3</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="4">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>36</sub>)</td> <td>N/A</td> <td>1000</td> <td>48</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td>g's</td> <td>82</td> <td>30.1</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2597.1</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>11.3</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>6.6</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>				Driver ATD (ES-2re)				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC <sub>36</sub> )	N/A	1000	72	Maximum Thoracic Rib Deflection	mm	44	15.7	Total Abdominal Force	N	2500	579.8	Pubic Symphysis Force	N	6000	-1241.0	Lower Spine Acceleration	G	82*	14.3	Passenger ATD (SID-IIs)				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC <sub>36</sub> )	N/A	1000	48	Lower Spine Resultant Acceleration	g's	82	30.1	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2597.1	Maximum Thoracic Rib Deflection	mm	38*	11.3	Maximum Abdominal Rib Deflection	mm	45*	6.6
Driver ATD (ES-2re)																																																											
Measurement Description	Units	IARV	Result																																																								
Head Injury Criteria (HIC <sub>36</sub> )	N/A	1000	72																																																								
Maximum Thoracic Rib Deflection	mm	44	15.7																																																								
Total Abdominal Force	N	2500	579.8																																																								
Pubic Symphysis Force	N	6000	-1241.0																																																								
Lower Spine Acceleration	G	82*	14.3																																																								
Passenger ATD (SID-IIs)																																																											
Measurement Description	Units	IARV	Result																																																								
Head Injury Criteria (HIC <sub>36</sub> )	N/A	1000	48																																																								
Lower Spine Resultant Acceleration	g's	82	30.1																																																								
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2597.1																																																								
Maximum Thoracic Rib Deflection	mm	38*	11.3																																																								
Maximum Abdominal Rib Deflection	mm	45*	6.6																																																								
17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 e-mail: <a href="mailto:tis@nhtsa.dot.gov">tis@nhtsa.dot.gov</a> FAX: 202-493-2833																																																									
19. Security Classification (of this report) Unclassified	20. Security Classification (of this page) Unclassified	21. Number of Pages 215	22. Price																																																								

## TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Test Purpose and Procedure	1
2	Summary of Test Results	2
3	Occupant and Vehicle Information	4
<u>Appendix</u>		
A	Photographs	A-1
B	Vehicle and Dummy Response Data Plots	B-1
C	Dummy Performance Calibration Test Data	C-1
D	Test Equipment and Instrumentation Calibration Data	D-1
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	5
2	Seat, Seat Belt, Steering Wheel Adjustment and Fuel Systems Data	8
3	Dummy Longitudinal Clearance Dimensions	11
4	Dummy Lateral Clearance Dimensions	12
5	Camera and Instrumentation Data	13
6	Test Vehicle Accelerometer Locations	14
7	MDB Accelerometer Locations	15
8	Post-Test Observations	16
9	MDB Summary of Results	18
10	Test Vehicle Profile Measurements	19
11	Test Vehicle Exterior Crush Measurements	20
12	MDB Exterior Static Crush Measurements	23
13	Vehicle and MDB Damage Distances	24
14	FMVSS No. 301 Static Rollover Results	25
15	Dummy/Vehicle Temperature and Humidity Stabilization	26

**SECTION 1**  
**TEST PURPOSE AND PROCEDURE**

**TEST PURPOSE AND PROCEDURE**

This moving deformable barrier side impact test was conducted as part of the MY 2019 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00354. The purpose of this test is to generate comparative side impact performance in a 2019 BMW X5 5-DR SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

## SECTION 2

### SUMMARY OF TEST RESULTS

A 2019 BMW X5 5-DR SUV 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 61.98 km/h (38.51 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, Ohio, on January 9, 2019. 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 October 2015. The side impact event was documented by 11 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. APPENDIX D of this report contains the test equipment and instrumentation calibration data.

Dummy injury readings were recorded as follows:

Measurement Description	Driver ATD (ES-2-re)		
	Units	Threshold	Result
Head Injury Criteria (HIC <sub>36</sub> )	N/A	1000	72
Maximum Thoracic Rib Deflection	mm	44	15.7
Combined Abdominal Force	N	2500	579.8
Pubic Symphysis Force	N	6000	-1241.0
Lower Spine (T12) Resultant Acceleration	G	82*	14.3

\* Proposed IARV

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC <sub>36</sub> )	N/A	1000	48
Lower Spine (T12) Resultant Acceleration	G	82	30.1
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2597.1
Maximum Thoracic Rib Deflection	mm	38*	11.3
Maximum Abdominal Rib Deflection	mm	45*	6.6

\* 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		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Side Pelvis Airbag	No	N/A	No	N/A
Knee Airbag	Yes	No	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Unknown	Yes	Unknown
Other Safety Restraint	No	N/A	No	N/A

### GENERAL COMMENTS

All doors remained closed throughout the test. No fuel spillage occurred during the impact or the static rollover test which followed. Injury values for both ATDs were within the established performance thresholds.

The images have 5-DR Hatchback instead of 5-DR SUV

Left Lower A-Post Acceleration (Y); Channel failed at 10.0 ms

Left Lower B-Post Acceleration (Y); Channel failed at 29.0 ms

Left Middle B-Post Acceleration (Y); Channel failed at 24.0 ms

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

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M20194105
Model Year	2019
Make	BMW
Model	X5
Body Style	MPV
VIN	5UXCR6C57KLK79699
Body Color	Arctic Grey Metallic
Odometer Reading (km/mi)	9 mi
Engine Displacement (L)	3.0
Type/No. Cylinders	Gas/ 6
Engine Placement	Front/ Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

Does owner's manual provide instructions to turn off automatic door locks? No

**DATA FROM CERTIFICATION LABEL**

Manufactured By	BAYERISCHE MOTOREN WERKE AG
Date of Manufacture	10/18
Vehicle Type	MPV

GVWR (kg)	2795
GAWR Front (kg)	1325
GAWR Rear (kg)	1640

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	N/A	5
Capacity Weight (VCW) (kg)				385
DSC x 68.04 (kg)				340.2
Cargo Weight (RCLW) (kg)				44.8

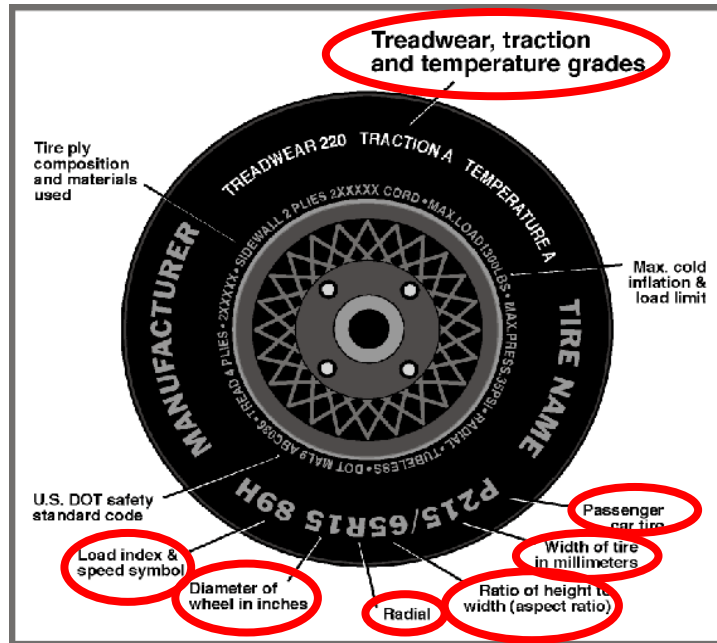
**VEHICLE SEAT TYPE**

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

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019



**DATA FROM TIRE PLACARD**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	230	280
Recommended Tire Size	265/50R19 XL	265/50R19 XL
Tire Size on Vehicle	265/50R19 XL	265/50R19 XL
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy MXM4	Primacy MXM4
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index/Speed Symbol	110 H	110 H
Tire Material	Rayon, Steel, Polyamide	Rayon, Steel, Polyamide
DOT Safety Code Left	B9 RU 009X 0218	B9 RU 009X 3118
DOT Safety Code Right	B9 RU 009X 3118	B9 RU 009X 0218

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019

**TIRE PRESSURES**

	Units	LF	RF	LR	RR
As Delivered	kPa	245	250	300	295
Tire Placard	kPa	230	230	280	280
Owner's Manual	kPa	230	230	280	280
As Tested	kPa	230	230	280	280

**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 kPa	207	207	207	207

**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	530.0	549.0		577.6	612.2		572.2	631.8	
Right	kg	543.2	536.4		542.8	590.6		543.4	581.4	
Ratio	%	49.7	50.3		48.2	51.8		47.9	52.1	
Totals	kg	1073.2	1085.4	2158.6	1120.4	1202.8	2323.2	1115.6	1213.2	2328.8

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	2158.6	(A)
Actual Weight of 1 P572V ATD (SID-IIs) Dummy Used	kg	125.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2328.4	(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

**TEST VEHICLE ATTITUDES AND CG**

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement
LF	mm	805	805	Yes
RF	mm	812	811	Yes
RR	mm	809	806	Yes
LR	mm	801	799	Yes
Vehicle CG (Aft of Front Axle)	mm	1550	1541	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	-28	-20	

\*\*\*The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirement".

Test height adjustable suspension setting, if applicable:

N/A

**WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW**

Component Description	Weight (kg)
Ballast: None	0.0
Removed: None	0.0

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019

**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	21.7	13.5	17.6
Front Passenger Seat	21.6	13.3	17.4
Front Center Seat*	N/A	N/A	N/A
Struck Side Rear Seat	N/A	N/A	14.6
Non-Struck Side Rear Seat	N/A	N/A	14.8
Rear Center Seat*	N/A	N/A	12.6

\* 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	17.6	235	Max	295	305	315
			Mid	262	270	277
			Min	230	235	240
Front Passenger Seat	17.4	233	Max	294	301	308
			Mid	261	267	274
			Min	227	233	240
Front Center Seat*	N/A	N/A	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A
Struck Side Rear Seat	14.6	225	Max	N/A	N/A	N/A
			Mid	N/A	225	N/A
			Min	N/A	N/A	N/A
Non-Struck Side Rear Seat	14.8	228	Max	N/A	N/A	N/A
			Mid	N/A	228	N/A
			Min	N/A	N/A	N/A
Rear Center Seat*	12.6	236	Max	N/A	N/A	N/A
			Mid	N/A	236	N/A
			Min	N/A	N/A	N/A

\* If applicable.

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019

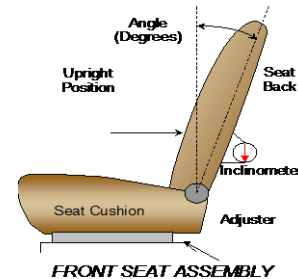
**SEAT FORE/AFT POSITION**

Seat	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	Detents	mm	Detent
Driver Seat	220	N/A	110	N/A
Front Passenger Seat	220	N/A	110	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	0	N/A	N/A	N/A
Non-Struck Side Rear Seat	0	N/A	N/A	N/A
Rear Center Seat*	0	N/A	N/A	N/A

\* 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	63.0	N/A	20.0	N/A
Front Passenger Seat	62.4	N/A	20.0	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat w/ Seated Dummy	0	N/A	25.3	N/A
Non-Struck Side Rear Seat	0	N/A	25.3	N/A
Rear Center Seat*	0	N/A	25.4	N/A

\* If applicable

**SEAT BELT ANCHORAGE ADJUSTMENT**

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

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

**HEAD RESTRAINT ADJUSTMENT**

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

	Total # of Positions	Placed in Position #
Driver Seat	78mm vertical; 6 notches fore/ aft	Full up. Full fwd
Rear Seat	4 notches vertical	4 <sup>th</sup> of 4

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

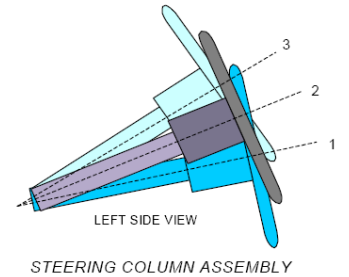
Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019

**STEERING COLUMN ADJUSTMENT**

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

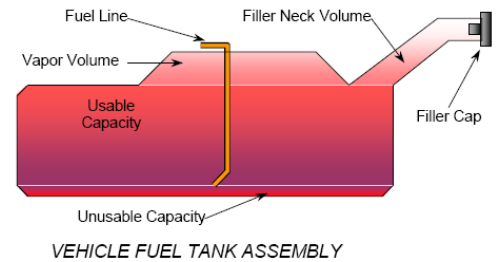
	Degrees	Fore/Aft Position (mm)
Lowermost, Position No. 1	21.0	300
Geometric Center, Position No. 2	22.8	330
Uppermost, Position No. 3	24.5	360
Telescoping Steering Wheel Travel		60
Test Position	22.8	330



**FUEL PUMP**

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

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



**FUEL TANK CAPACITY**

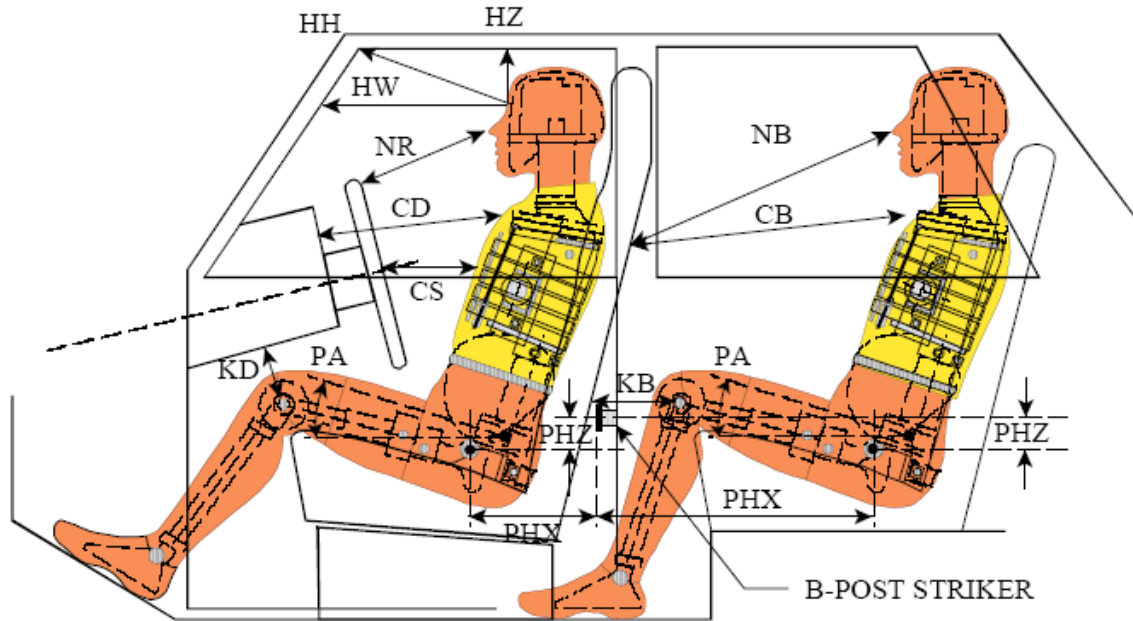
	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	82.9
Usable Capacity of "Optional Tank" (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	82.9
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	77.2
Actual Amount of Solvent Used in Test	77.2
1/3 of Usable Capacity	27.6

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

**DATA SHEET NO. 3  
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019



**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

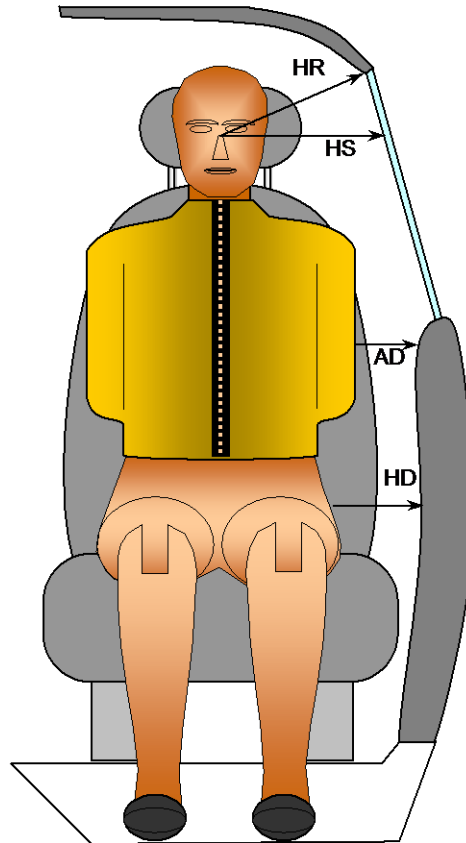
**DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION**

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	476			
HW		Header to Windshield	752			
HZ	HZ	Head to Roof Liner	214		346	
NR	NB	Nose to Rim/Seat Back	518		566	
CD	CB	Chest to Dash/Seat Back	618		520	
CS		Chest to Steering Wheel	396			
KD(L)/KDA(L) <sup>°</sup>	KB(L)/KBA(L) <sup>°</sup>	Left Knee to Dash/Seat Back	215	27.2	255	0.0
KD(R)/KDA(R) <sup>°</sup>	KB(R)/KBA(R) <sup>°</sup>	Right Knee to Dash/Seat Back	199	24.1	243	0.0
PAX <sup>°</sup>	PAX <sup>°</sup>	Pelvic Tilt Angle X		0.2		1.7
	PAY <sup>°</sup>	Pelvic Tilt Angle Y				21.7
PHX	PHX	Hip Point to Striker (X-Axis)	110		201	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	194		175	

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019



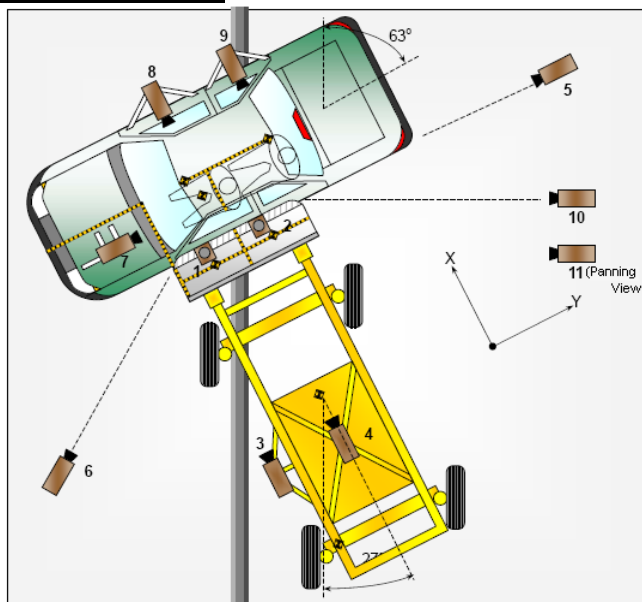
**FRONT VIEW OF DUMMY**

Code	Description	Units	Driver	Passenger
HR	Head to Side Header	mm	277	336
HS	Head to Side Window	mm	291	405
AD	Arm to Door	mm	119	99
HD	H-Point to Door	mm	155	196

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019



**CAMERA LOCATIONS AND DATA**

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	-160	1150	5692	8.5	1000
2	Overhead Close-up	0	770	5692	25	1000
3	Left Impact Point (MDB)	1811	890	860	25	1000
4	Side Overall (MDB)	2625	0	1500	12.5	1000
5	Rear	0	7949	1407	20	1000
6	Left Front	2015	-3765	1233	20	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	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: N/A

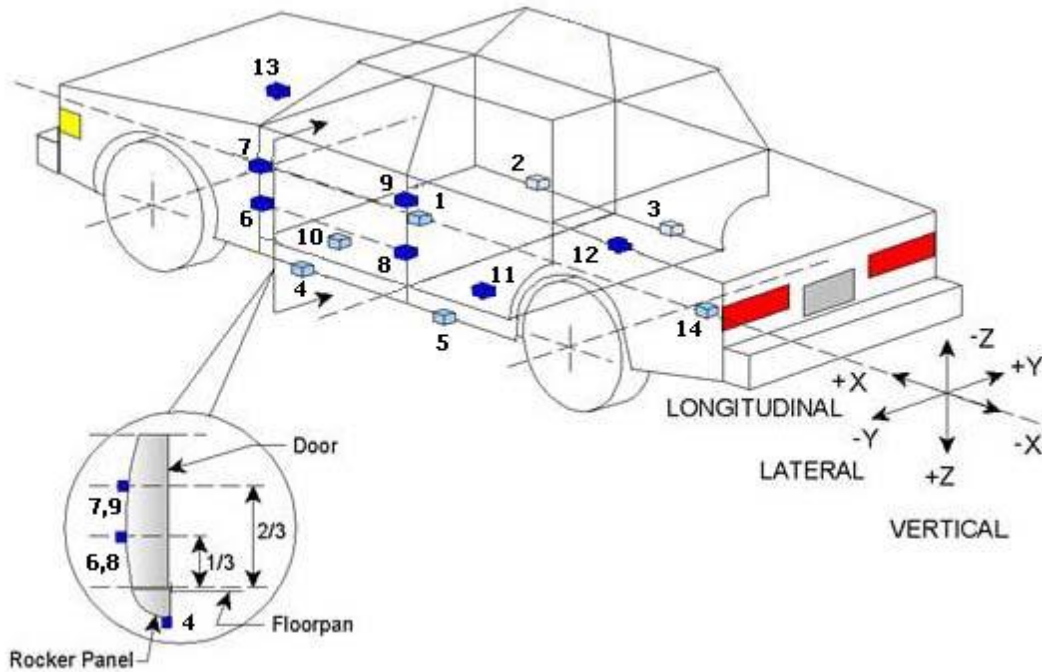
**INSTRUMENTATION**

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: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019



**TEST VEHICLE ACCELEROMETER LOCATIONS**

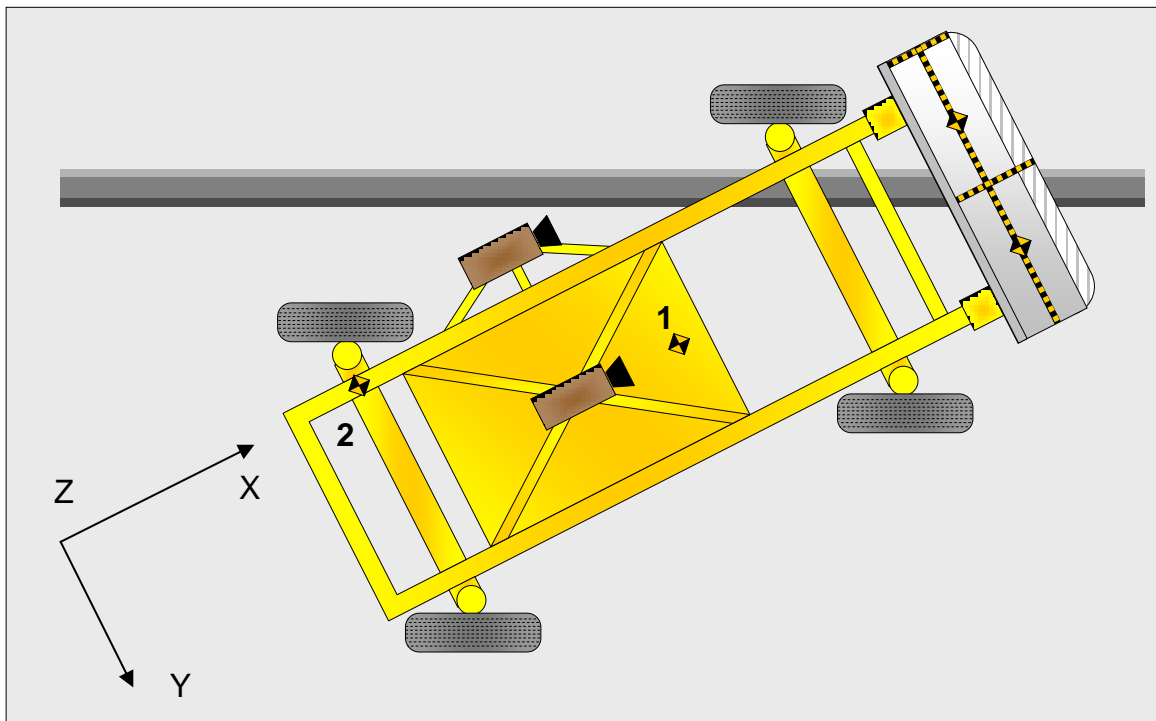
Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	3035	150	-486
2	Right Sill at Front Seat	2942	730	-444
3	Right Sill at Rear Seat	1900	725	-453
4	Left Sill at Front Door	2915	-734	-435
5	Left Sill at Rear Door	1900	-730	-447
6	A-Post Lower	3352	-872	-620
7	A-Post Middle	337	-856	-989
8	B-Post Lower	2253	-875	-655
9	B-Post Middle	2205	-872	-1026
10	Front Seat Track	2450	-614	-510
11	Rear Seat Structure	1775	-646	-548
12	Right Rear Occ. Compartment	1762	635	-548
13	Engine Block	4270	30	-889
14	Rear Above Axle	1155	0	-563

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: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019



**MDB ACCELEROMETER LOCATIONS**

Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	-2179	0	-505
2	MDB Rear	-3648	-650	-618

Reference : X - Face of MDB (+ forward)  
 Y - MDB Centerline (+ to right)  
 Z - Ground Plane (+ down)

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019

**TEST DUMMY INFORMATION AND CONTACT POINTS**

Dummy Body Part	Front Seat Dummy (ES2-re)	Rear Seat Dummy (SID-IIs)
Face	SCAB	SCAB
Top of Head	SCAB, Head liner	SCAB
Left Side of Head	SCAB	SCAB
Back of Head	SCAB	SCAB, Head rest
Left Shoulder	SCAB, SAB	SAB
Upper Torso	Seatback bolster, SAB	SAB
Lower Torso	Seatback bolster	SAB
Left Hip	SAB, Door panel	SAB
Left Knee	None	None

**POST-TEST DOOR PERFORMANCE**

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

**POST-TEST SEAT PERFORMANCE**

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	N/A	No	N/A
Seat Disengagement from Floor pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

**POST-TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	None
Windshield Damage	None
Side Window Damage	None
Other Notable Effects	None

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

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

**IMPACT POINT LOCATION DATA**

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2976
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		507
Horizontal Offset ( + forward / - rearward)	mm	+/- 50 of Intended Impact point	+1
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact point	-6

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019

**MDB SPECIFICATIONS**

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheel Base of Framework Carriage	2591
C.G. Location aft of Front Axle	1103

**MDB WEIGHTS**

	Units	Front Axle	Rear Axle	Total
Left	kg	413.0	265.6	678.6
Right	kg	370.0	314.8	684.8
Ratio	%	57.4	42.6	100.0
Totals	kg	783.0	580.4	1363.4

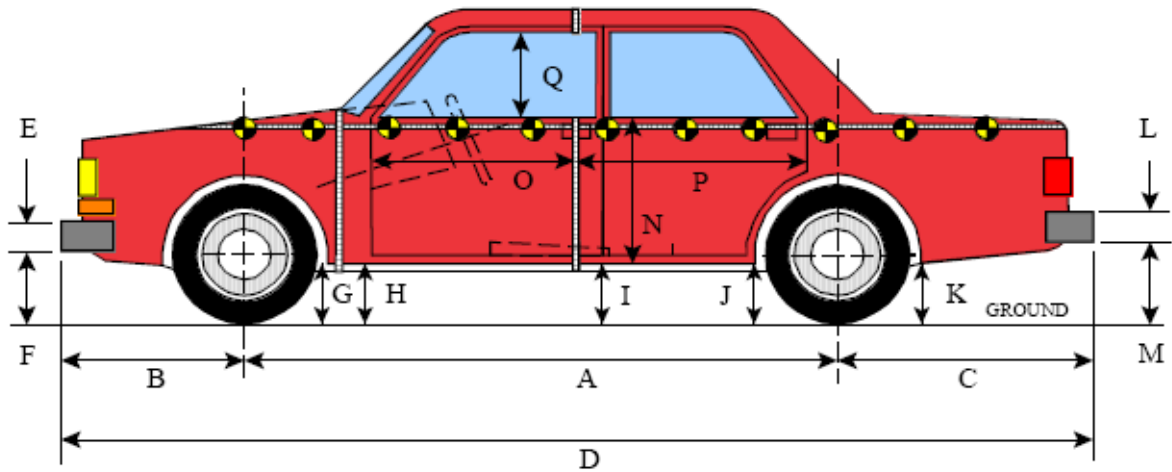
**SPEED AND IMPACT ANGLE DATA**

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.98
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.99
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

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

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019



**LEFT SIDE VIEW**

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

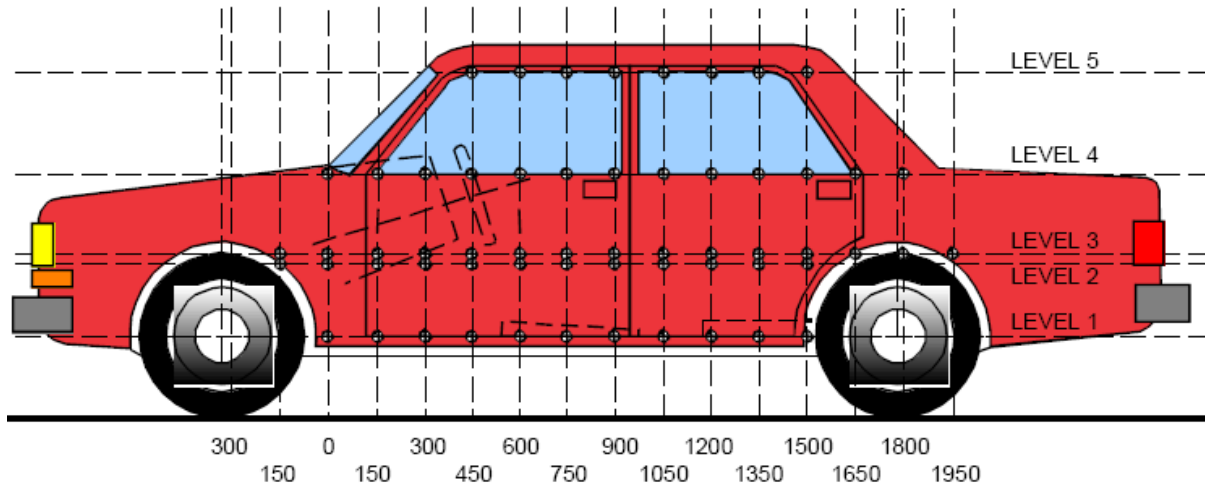
**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2976	2970	6
B	Front Axle to Front Surface of Vehicle	875	875	0
C	Rear Axle to Rear Surface of Vehicle	1050	1050	0
D	Total Length at Centerline	4920	4900	20
E	Front Bumper Thickness	100	100	0
F	Front Bumper Bottom to Ground	497	512	-15
G	Sill Height at Front Wheel Well	247	255	-8
H	Sill Height at Front Door Leading Edge	250	258	-8
I	Sill Height at B-Pillar	269	270	-1
J1	Sill Height at Rear Wheel Well	260	265	-5
J2	Pinch Weld Height at Rear Wheel Well	215	243	-28
K	Sill Height Aft of Rear Wheel Well	340	355	-15
L	Rear Bumper Thickness	176	176	0
M	Rear Bumper Bottom to Ground	390	405	-15
N	Sill Height to Window Bottom Sill	806	755	51
O	Front Door Leading Edge to Impact CL	688	680	8
P	Rear Door Trailing Edge to Impact CL	1585	1575	10
Q	Front Window Opening	518	520	-2
R	Right Side Length	4770	4760	10
S	Left Side Length	4770	4770	0
T	Vehicle Width	2010	2000	10

**DATA SHEET NO. 11**  
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019



**LEFT SIDE VIEW**

**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance From Impact
1	Sill Top	445	107	600
			107	750
2	Driver Hip Point	739	177	1800
3	Mid-Door	766	182	1800
4	Window Sill	1085	31	1350
5	Window Top	1690	-1	2250

**NOTE:** The above measurements were 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: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019

**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
<b>-300</b>	0	0	0	849	0	0	0	0	863	0	0	0	0	-14	0
<b>-150</b>	0	979	975	858	0	0	995	981	870	0	0	-16	-6	-12	0
<b>0</b>	956	969	970	868	0	940	943	949	878	0	16	26	21	-10	0
<b>150</b>	944	965	967	878	0	883	884	896	886	0	61	81	71	-8	0
<b>300</b>	948	965	967	888	0	853	856	865	893	0	95	109	102	-5	0
<b>450</b>	949	966	968	896	0	846	841	843	904	0	103	125	125	-8	0
<b>600</b>	950	967	969	904	0	843	828	826	916	0	107	139	143	-12	0
<b>750</b>	949	967	969	911	0	842	828	825	927	0	107	139	144	-16	0
<b>900</b>	947	966	968	918	0	843	835	830	932	0	104	131	138	-14	0
<b>1050</b>	946	966	968	923	0	845	839	837	932	0	101	127	131	-9	0
<b>1200</b>	943	966	969	927	622	841	862	862	931	628	102	104	107	-4	-6
<b>1350</b>	941	963	966	927	636	844	860	855	896	640	97	103	111	31	-4
<b>1500</b>	937	964	965	930	640	844	822	817	909	645	93	142	148	21	-5
<b>1650</b>	939	965	966	932	642	834	796	796	905	645	105	169	170	27	-3
<b>1800</b>	945	969	969	936	641	864	792	787	909	644	81	177	182	27	-3
<b>1950</b>	954	975	975	949	639	924	887	878	929	641	30	88	97	20	-2
<b>2100</b>	0	984	985	946	633	0	980	967	928	635	0	4	18	18	-2
<b>2250</b>	0	0	0	939	624	0	0	0	961	625	0	0	0	-22	-1
<b>2400</b>	0	0	0	934	609	0	0	0	975	609	0	0	0	-41	0
<b>2550</b>	0	0	0	929	0	0	0	0	928	0	0	0	0	1	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: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

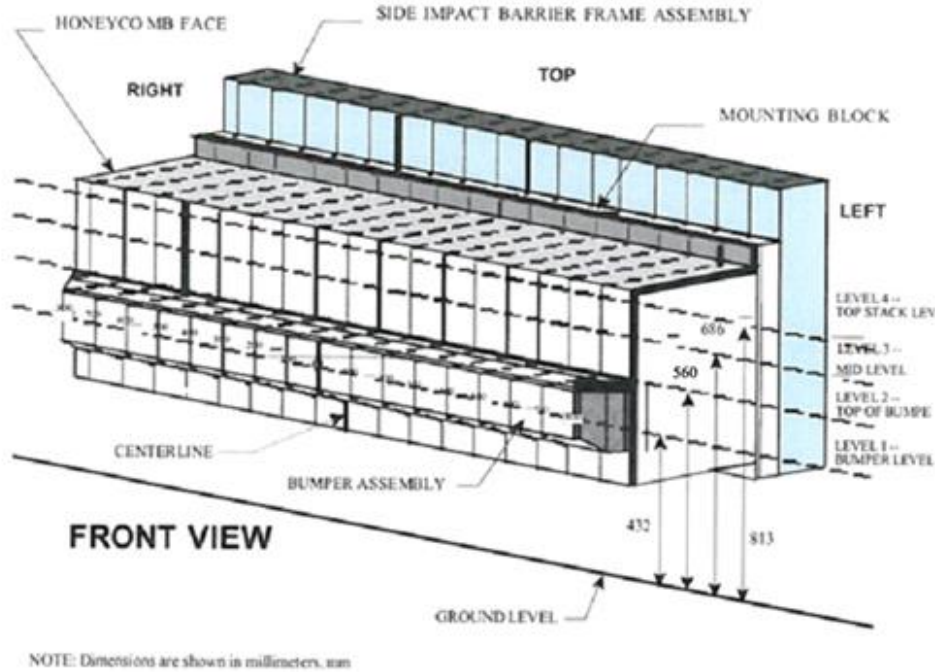
NHTSA No.: M20194105  
Test Date: 1/9/2019



**DATA SHEET NO. 12**  
**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2019 BMW X5 5-DR SUV  
 Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
 Test Date: 1/9/2019



**MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE**

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Right	257
B	Top of Bumper	560	800	Left	174
C	Mid-Level	686	800	Left	159
D	Top of Stack	813	800	Left	209

**DEFORMABLE BARRIER STATIC CRUSH**

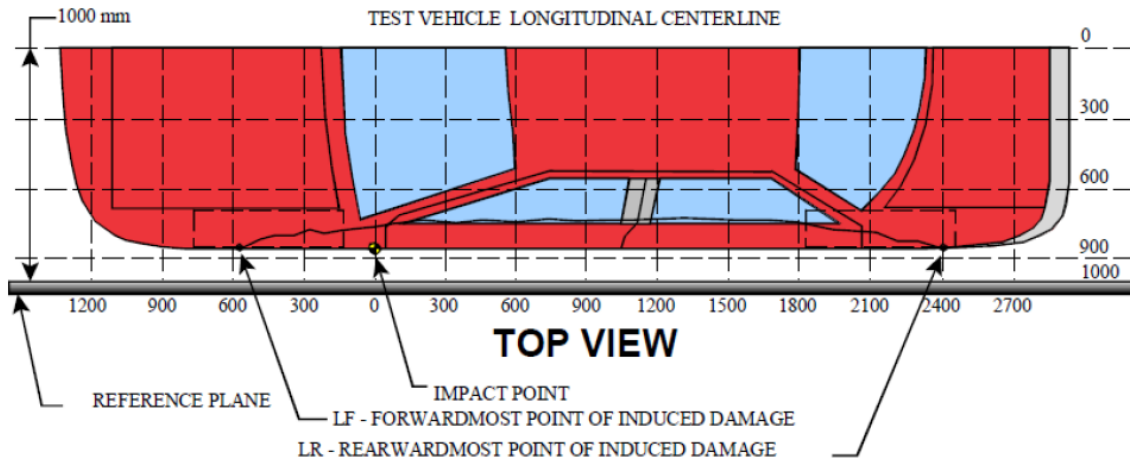
Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	257	255	252	250	248	245	242	238	235	232	230	227	224	222	219	220	219
2	168	171	171	---1	---1	---1	161	152	151	147	149	141	139	137	137	147	174
3	108	122	120	129	156	154	143	119	99	90	82	75	73	84	103	132	159
4	117	114	119	132	162	159	142	122	113	109	116	114	102	120	138	172	209

<sup>1</sup> Missing points 38,39 and 40.

**DATA SHEET NO. 13  
VEHICLE AND MDB DAMAGE PROFILE DISTANCES**

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019



**VEHICLE DAMAGE PROFILE DISTANCES**

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	2250	4	928	929	1
2	2100	3	967	985	18
		4	928	946	
3	1500	3	817	965	148
4	1050	3	837	968	131
5	450	2	841	966	125
		3	843	968	
6 <sup>1</sup>	0	2	943	969	0

**MDB DAMAGE PROFILE DISTANCES**

DPD	Distance From Center of MDB	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	800 mm Left of Center	1	250	469	219
2	500 mm Left of Center	1	264	486	222
3	200 mm Left of Center	1	256	486	230
4	200 mm Right of Center	1	245	487	242
5	500 mm Right of Center	1	237	487	250
6	800 mm Right of Center	1	220	477	257

<sup>1</sup> DPD 6 is defined as zero crush since the crush does not extend to the end of the vehicle.

**DATA SHEET NO. 14  
FMVSS NO. 301 STATIC ROLLOVER RESULTS**

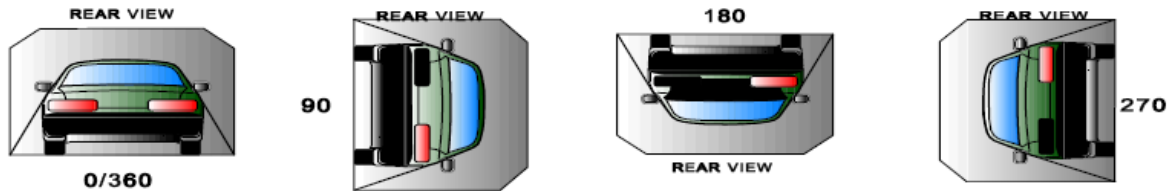
Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019

Test Time: 16:00 Temperature: 21.1°C

- 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	90	330	420
90 to 180	90	330	840
180 to 270	90	330	1260
270 to 360	90	330	1680

**FMVSS NO. 301 ROLLOVER SPILLAGE TABLE**

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0 to 90	0	0	0	N/A
90 to 180	0	0	0	N/A
180 to 270	0	0	0	N/A
270 to 360	0	0	0	N/A

**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

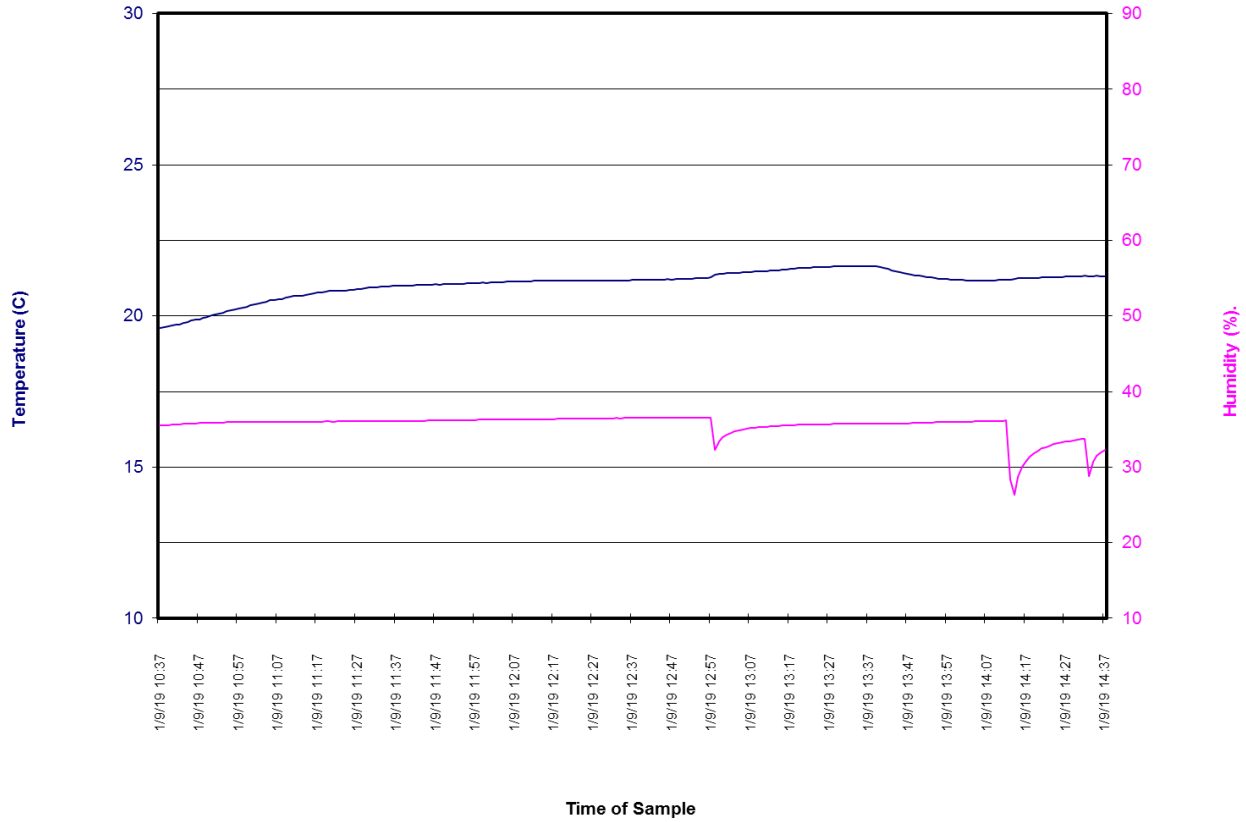
Test Phase	Spillage Location
0 to 90	None
90 to 180	None
180 to 270	None
270 to 360	None

**DATA SHEET NO. 15**  
**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

Test Vehicle: 2019 BMW X5 5-DR SUV  
Test Program: SINCAP Side Impact

NHTSA No.: M20194105  
Test Date: 1/9/2019

M20194105 2019 BMW X5 5-DR Hatchback Left MDB Impact 190109: Test Time 14:37



**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 Frontal View of Test Vehicle	<b>A-7</b>
<b>004</b>	Post-Test Frontal 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 Left Rear Door Latch Close-Up	<b>A-17</b>
<b>024</b>	Post-Test Left Rear 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-20</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-21</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-22</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-23</b>
<b>035</b>	Pre-Test View of Belt Anchorage for Driver Dummy	<b>A-23</b>
<b>036</b>	Pre-Test Left Side View of Steering Wheel	<b>A-24</b>

## TABLE OF PHOTOGRAPHS (CONTINUED)

<b>No.</b>	<b>Description</b>	<b>Page</b>
<b>037</b>	View of Disengaged Parking Brake	<b>A-24</b>
<b>038</b>	Pre-Test View of Parking Brake	<b>A-25</b>
<b>039</b>	Pre-Test Close-Up Left Side View of Driver Seat Track	<b>A-25</b>
<b>040</b>	Pre-Test Close-Up Left Side View of Driver Seat Back	<b>A-26</b>
<b>041</b>	Pre-Test Close-Up View of Driver Seat Back or Head Restraint	<b>A-26</b>
<b>042</b>	Pre-Test Driver Dummy and Door Clearance View	<b>A-27</b>
<b>043</b>	Post-Test Driver Dummy and Door Clearance View	<b>A-27</b>
<b>044</b>	Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment	<b>A-28</b>
<b>045</b>	Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment	<b>A-28</b>
<b>046</b>	Pre-Test Driver Inner Door Panel View	<b>A-29</b>
<b>047</b>	Post-Test Driver Inner Door Panel View Showing Driver Dummy Contact Locations	<b>A-29</b>
<b>048</b>	Post-Test Driver Dummy Close-Up Head Contact with Vehicle View	<b>A-30</b>
<b>049</b>	Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View	<b>A-30</b>
<b>050</b>	Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View	<b>A-31</b>
<b>051</b>	Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View	<b>A-31</b>
<b>052</b>	Post-Test Driver Dummy Close-Up Pelvis Contact View	<b>A-32</b>
<b>053</b>	Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View	<b>A-32</b>
<b>054</b>	Post-Test Driver Dummy Close-Up Knee Contact View	<b>A-33</b>
<b>055</b>	Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking	<b>A-33</b>
<b>056</b>	Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	<b>A-34</b>
<b>057</b>	Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	<b>A-34</b>
<b>058</b>	Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning	<b>A-35</b>
<b>059</b>	Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint	<b>A-35</b>
<b>060</b>	Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning	<b>A-36</b>
<b>061</b>	Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan	<b>A-36</b>
<b>062</b>	Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket	<b>A-37</b>
<b>063</b>	Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level	<b>A-37</b>

## TABLE OF PHOTOGRAPHS (CONTINUED)

<b>No.</b>	<b>Description</b>	<b>Page</b>
<b>064</b>	Pre-Test Placement of Rear Passenger Dummy's Feet	<b>A-38</b>
<b>065</b>	Pre-Test View of Belt Anchorage for Rear Passenger Dummy	<b>A-38</b>
<b>066</b>	Pre-Test Close-Up Left Side View of Rear Passenger Seat Track	<b>A-39</b>
<b>067</b>	Pre-Test Close-Up Left Side View of Rear Passenger Seat Back	<b>A-39</b>
<b>068</b>	Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint	<b>A-40</b>
<b>069</b>	Pre-Test Rear Passenger Dummy and Door Clearance View	<b>A-41</b>
<b>070</b>	Post-Test Rear Passenger Dummy and Door Clearance View	<b>A-41</b>
<b>071</b>	Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	<b>A-42</b>
<b>072</b>	Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	<b>A-42</b>
<b>073</b>	Pre-Test Rear Passenger Inner Door Panel View	<b>A-43</b>
<b>074</b>	Post-Test Rear Passenger Inner Door Panel View	<b>A-43</b>
<b>075</b>	Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View	<b>A-44</b>
<b>076</b>	Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Airbag View	<b>A-44</b>
<b>077</b>	Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View	<b>A-45</b>
<b>078</b>	Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View	<b>A-45</b>
<b>079</b>	Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View	<b>A-46</b>
<b>080</b>	Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View	<b>A-46</b>
<b>081</b>	Post-Test Rear Passenger Dummy Close-Up Knee Contact View	<b>A-47</b>
<b>082</b>	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	<b>A-48</b>
<b>083</b>	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	<b>A-48</b>
<b>084</b>	Pre-Test Front View of MDB Impactor Face	<b>A-49</b>
<b>085</b>	Post-Test Front View of MDB Impactor Face	<b>A-49</b>
<b>086</b>	Pre-Test Top View of MDB Impactor Face	<b>A-50</b>
<b>087</b>	Post-Test Top View of MDB Impactor Face	<b>A-50</b>
<b>088</b>	Pre-Test Left Side View of MDB Impactor Face	<b>A-51</b>
<b>089</b>	Post-Test Left Side View of MDB Impactor Face	<b>A-51</b>
<b>090</b>	Pre-Test Right Side View of MDB Impactor Face	<b>A-52</b>
<b>091</b>	Post-Test Right Side View of MDB Impactor Face	<b>A-52</b>

## TABLE OF PHOTOGRAPHS (CONTINUED)

<b>No.</b>	<b>Description</b>	<b>Page</b>
<b>092</b>	Close-Up View of Vehicle's Certification Label	<b>A-53</b>
<b>093</b>	Close-Up View of Vehicle's Tire Information Placard or Label	<b>A-53</b>
<b>094</b>	Pre-Test Ballast View	<b>A-54</b>
<b>095</b>	Post-Test Primary and Redundant Speed Trap Read-Out	<b>A-54</b>
<b>096</b>	FMVSS No. 301 Static Rollover 0 Degrees	<b>A-55</b>
<b>097</b>	FMVSS No. 301 Static Rollover 90 Degrees	<b>A-55</b>
<b>098</b>	FMVSS No. 301 Static Rollover 180 Degrees	<b>A-56</b>
<b>099</b>	FMVSS No. 301 Static Rollover 270 Degrees	<b>A-56</b>
<b>100</b>	FMVSS No. 301 Static Rollover 360 Degrees	<b>A-57</b>
<b>101</b>	Impact Event	<b>A-57</b>
<b>102</b>	Monroney Label	<b>A-58</b>
<b>103</b>	Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	<b>A-58</b>
<b>104</b>	Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	<b>A-59</b>



**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 Frontal View of Test Vehicle



**004** Post-Test Frontal 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



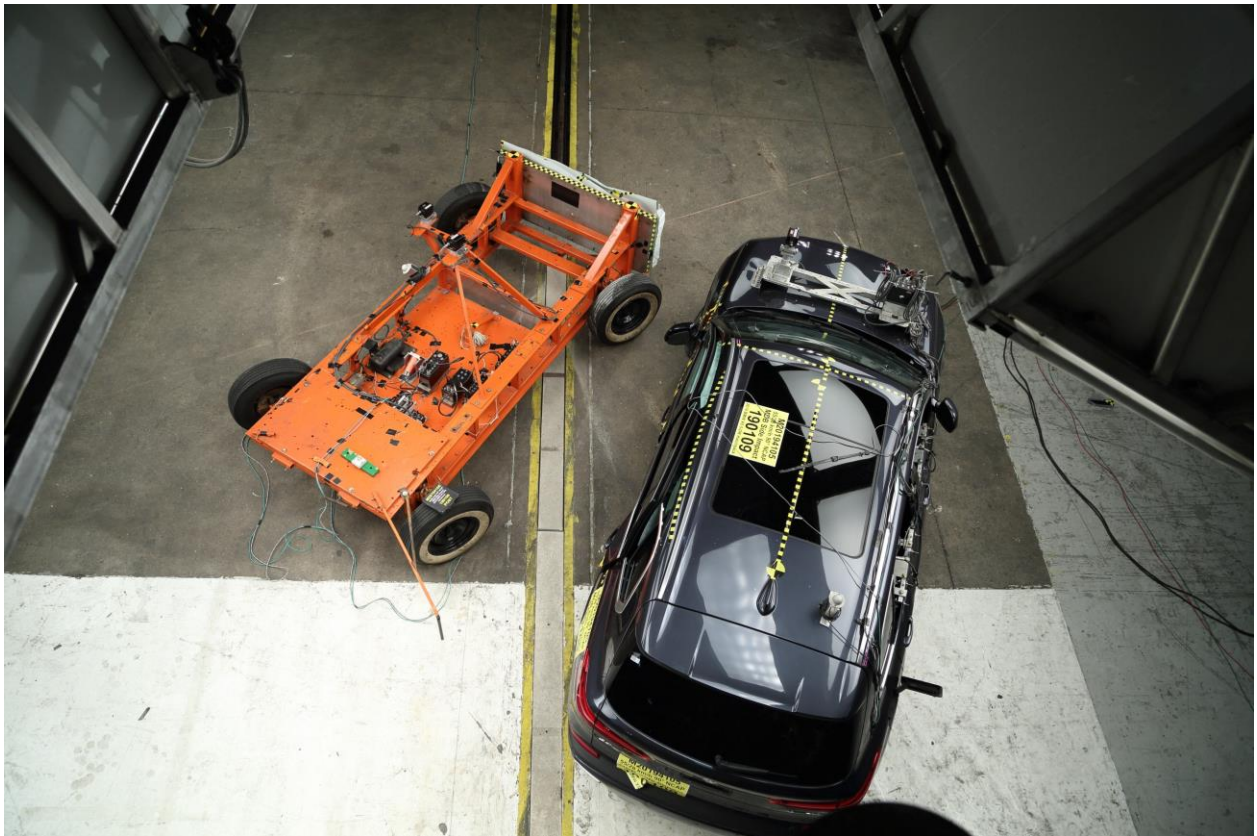
**013** Pre-Test Right Side View of Test Vehicle



**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



023 Pre-Test Left Rear Door Latch Close-Up



024 Post-Test Left Rear 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

Intentionally Left Blank



**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's Dummy Feet



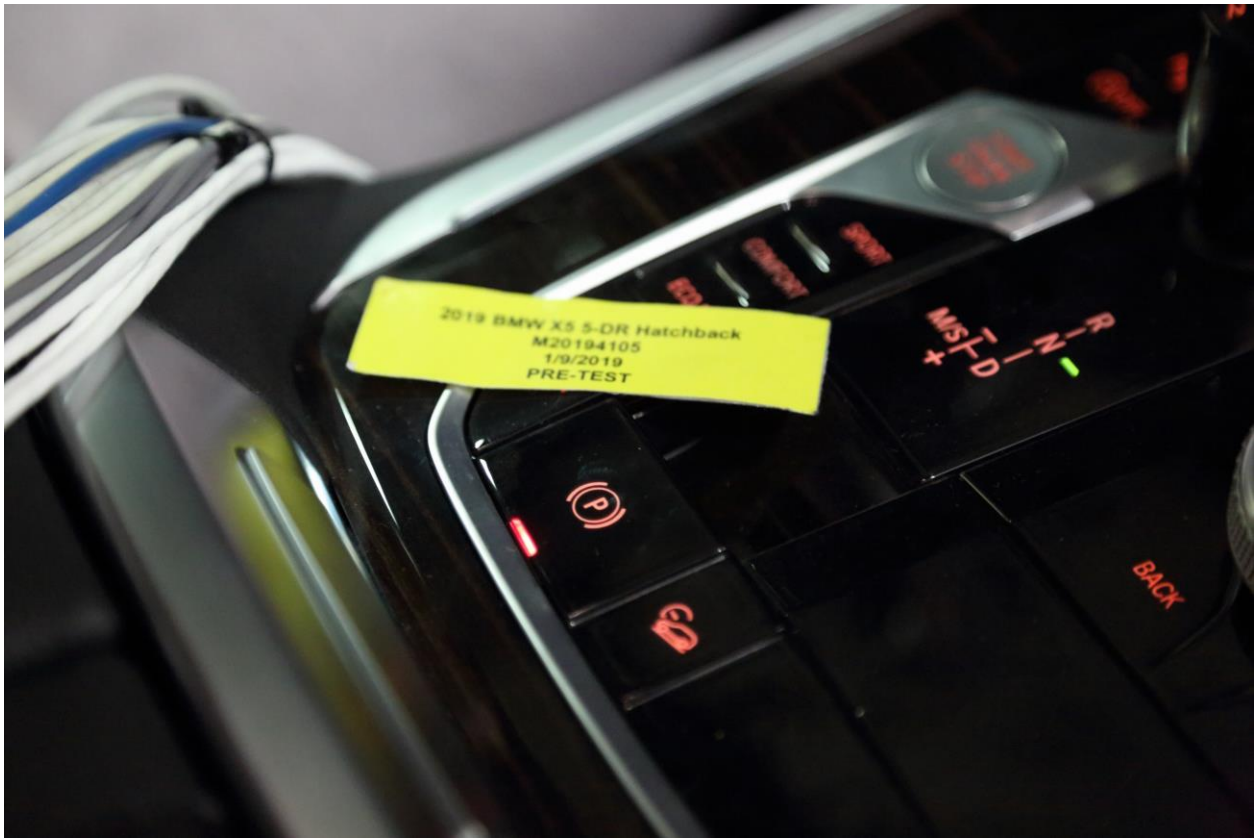
**035** Pre-Test View of Belt Anchorage for Driver Dummy



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



**037** View of Disengaged Parking Brake



**038** Pre-Test View of Parking Brake



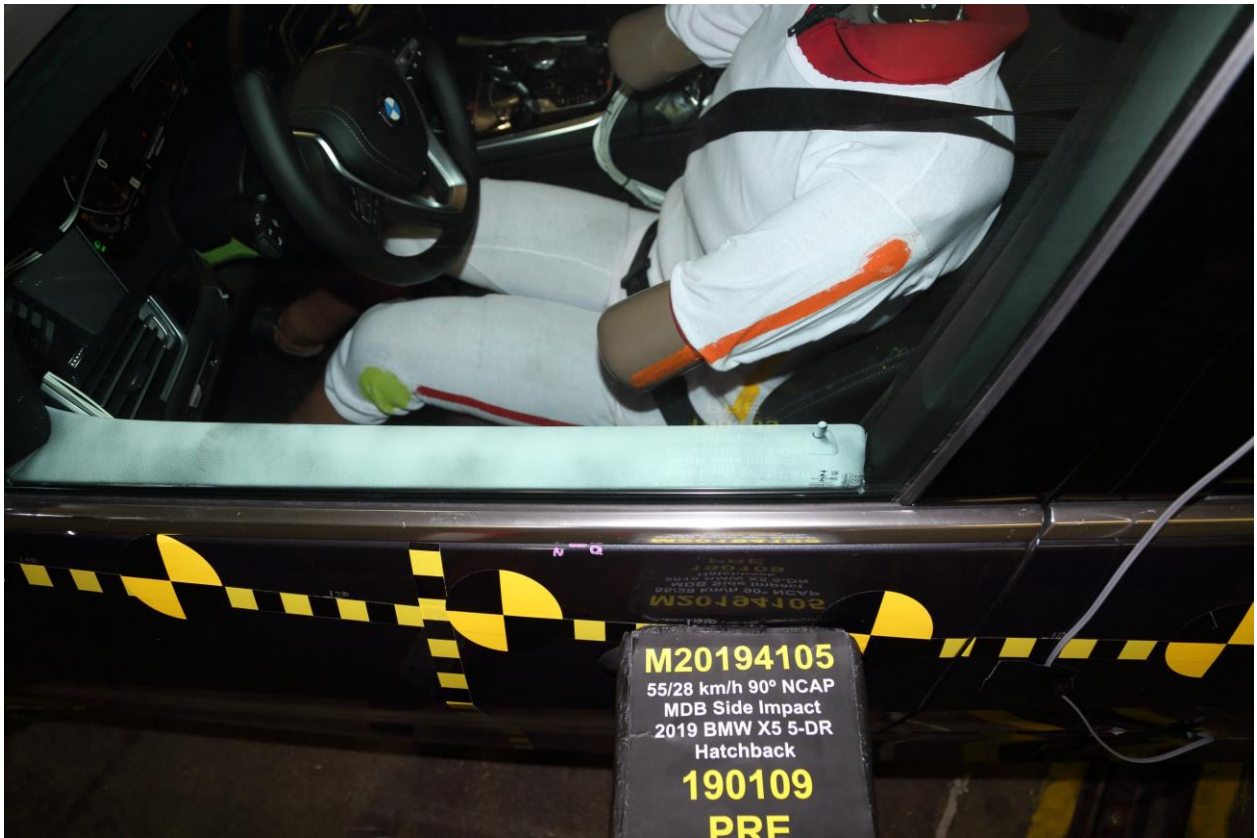
**039** Pre-Test Close-Up Left Side View of Driver Seat Track



**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



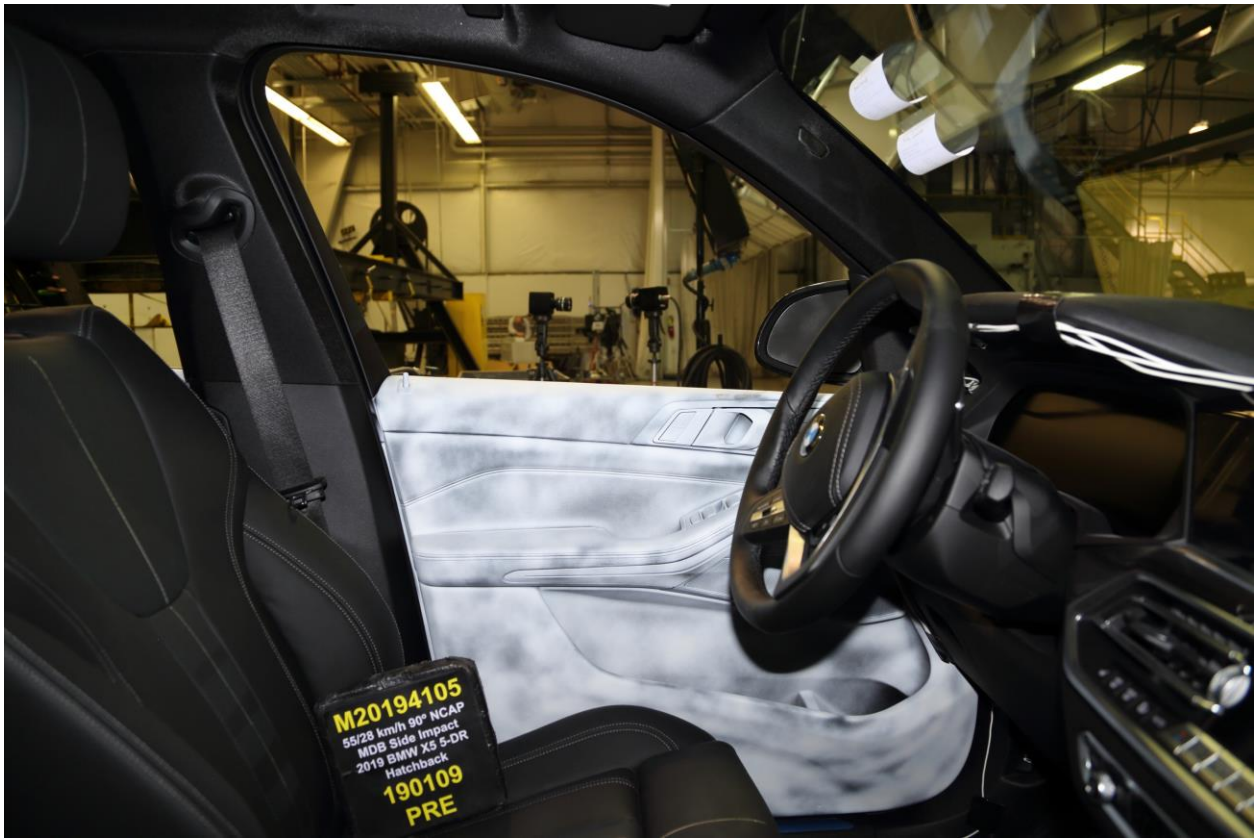
**043** Post-Test Driver Dummy and Door Clearance View



**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 Showing Driver Dummy Contact Locations



**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



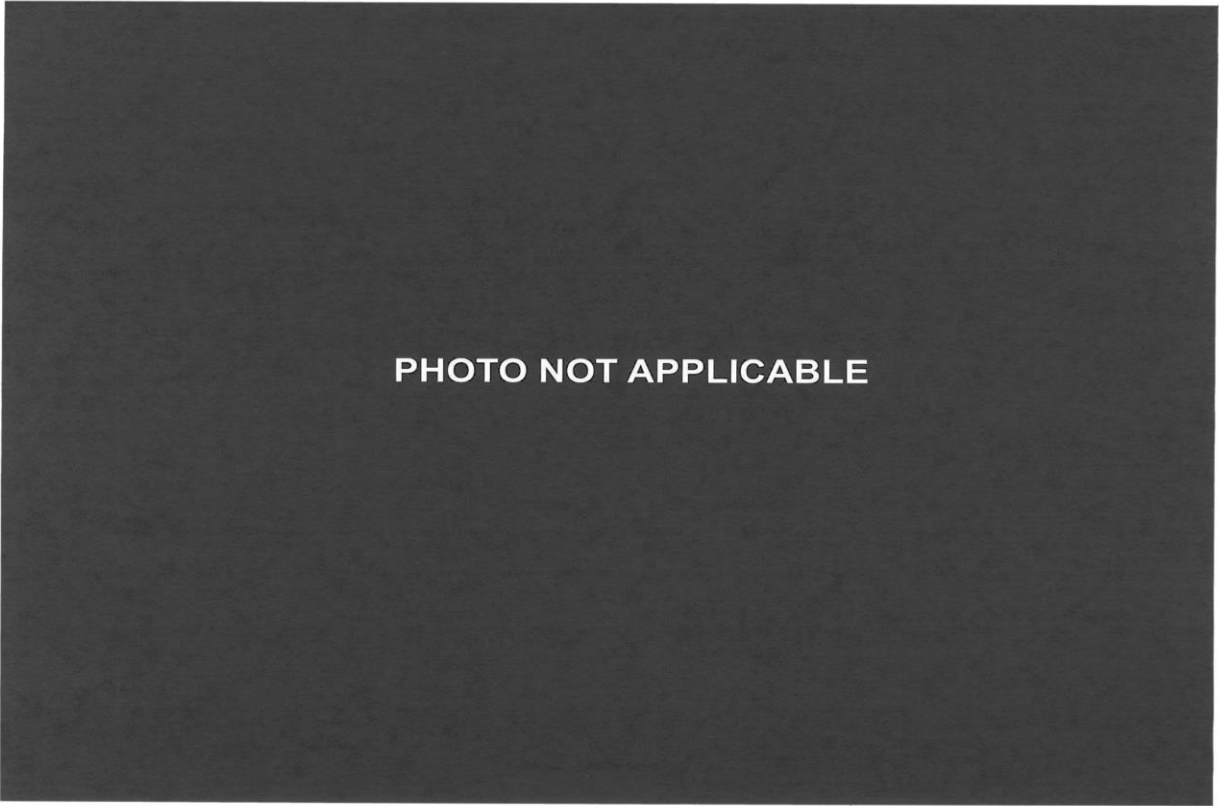
**051** Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



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



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



**054** Post-Test Driver Dummy Close-Up Knee Contact View



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



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



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



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



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



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



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



**062** Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



**063** Pre-Test View of Rear Passenger Dummy's Head Showing Dummy Head is Level



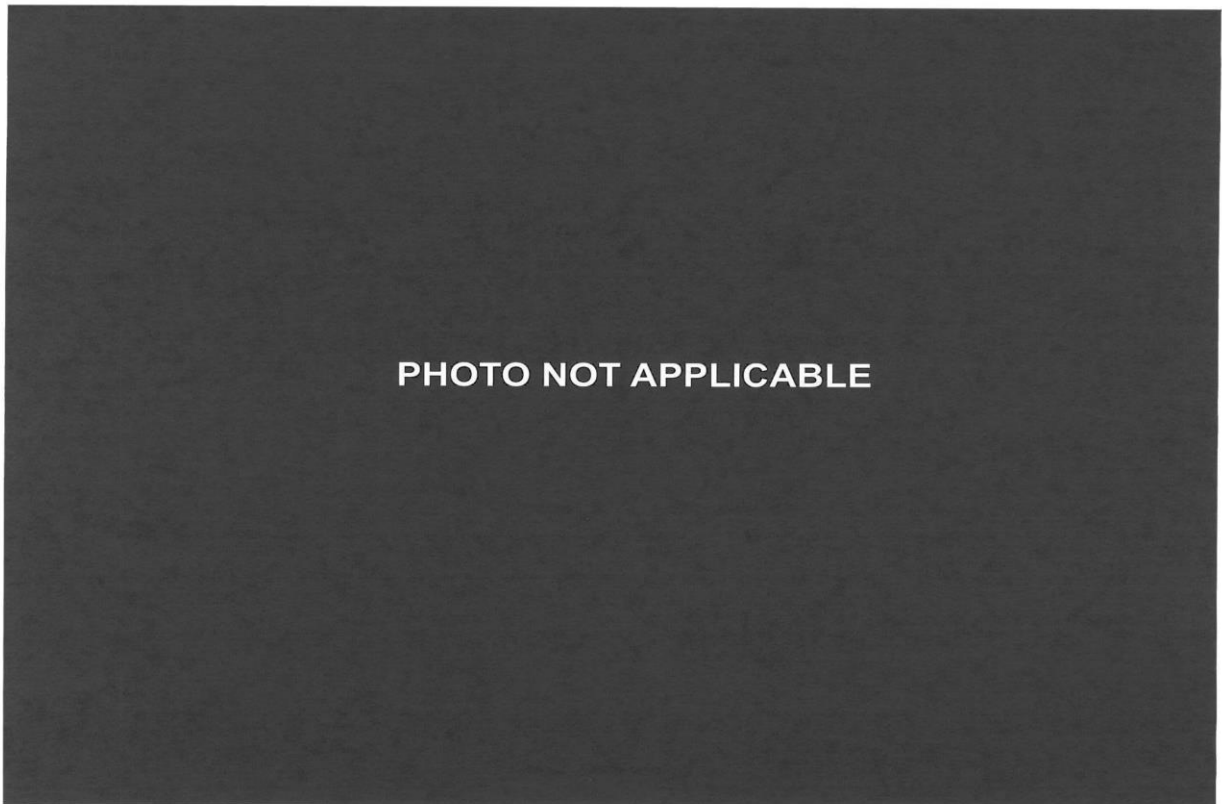
**064** Pre-Test Placement of Rear Passenger Dummy's Feet



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



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



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



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

Intentionally Left Blank



**069** Pre-Test Rear Passenger Dummy and Door Clearance View



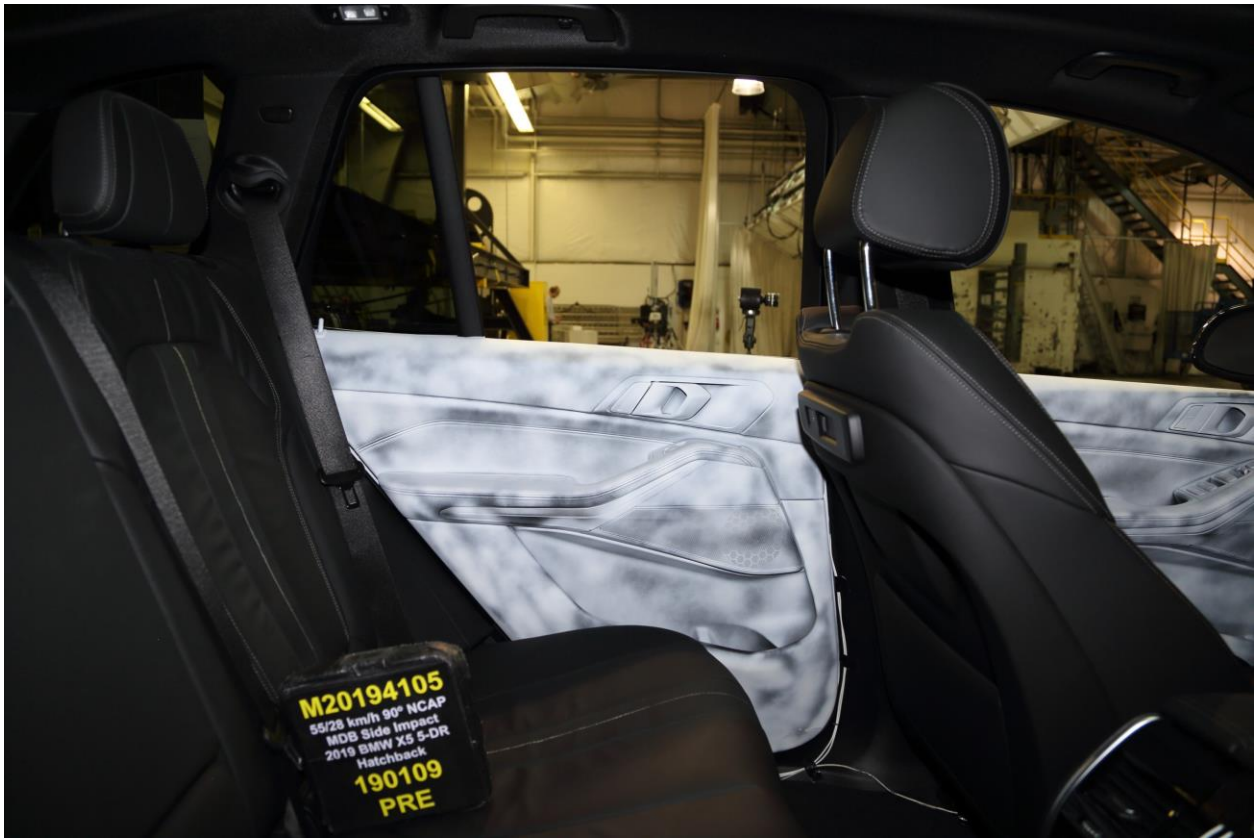
**070** Post-Test Rear Passenger Dummy and Door Clearance View



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



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



**073** Pre-Test Rear Passenger Inner Door Panel View



**074** Post-Test Rear Passenger Inner Door Panel View



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



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

PHOTO NOT APPLICABLE

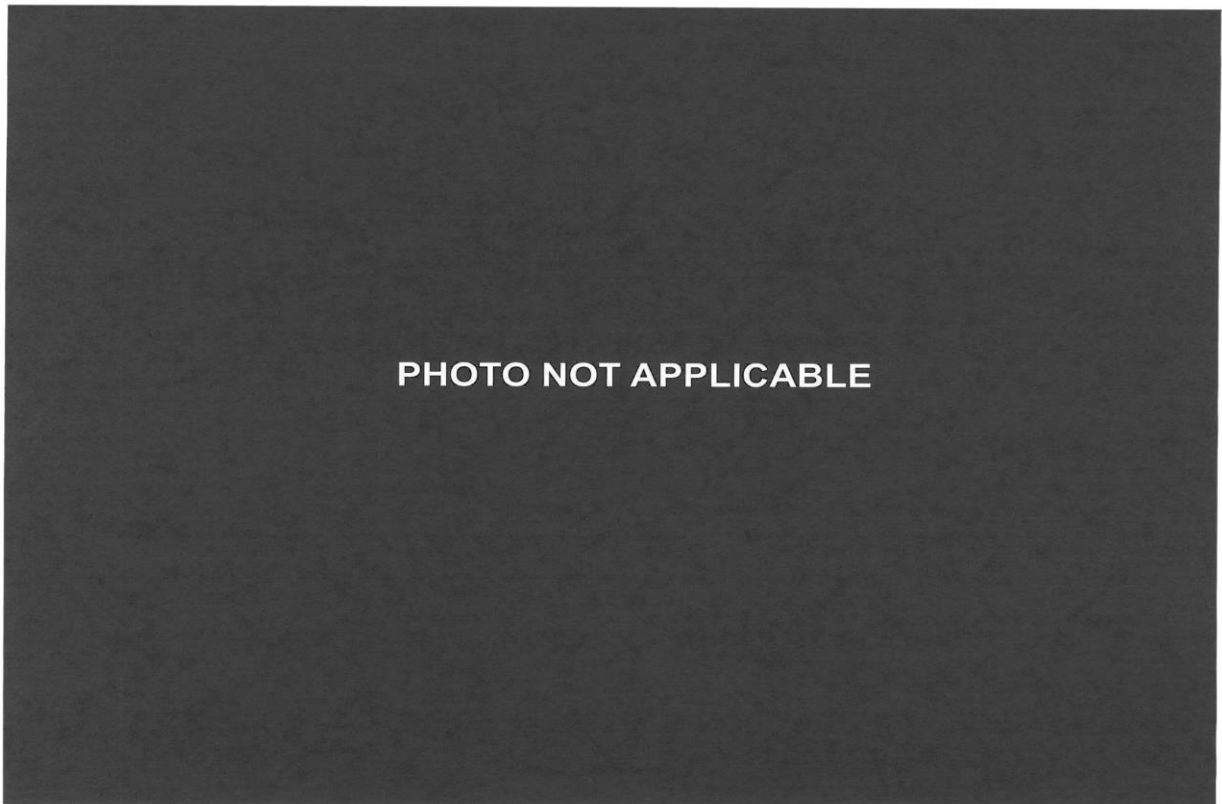
**077** Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View



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



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



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

PHOTO NOT APPLICABLE

**081** Post-Test Rear Passenger Dummy Close-Up Knee Contact View

Intentionally Left Blank



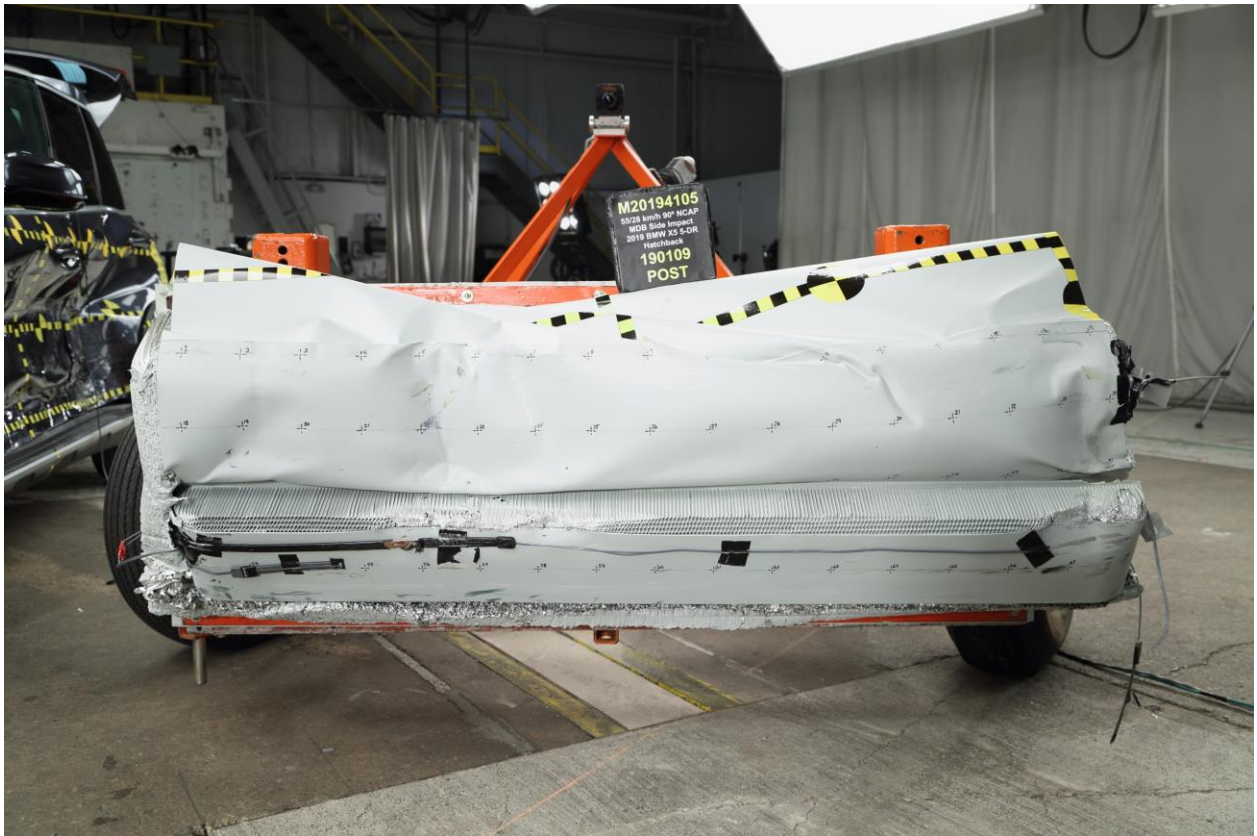
**082** Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



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



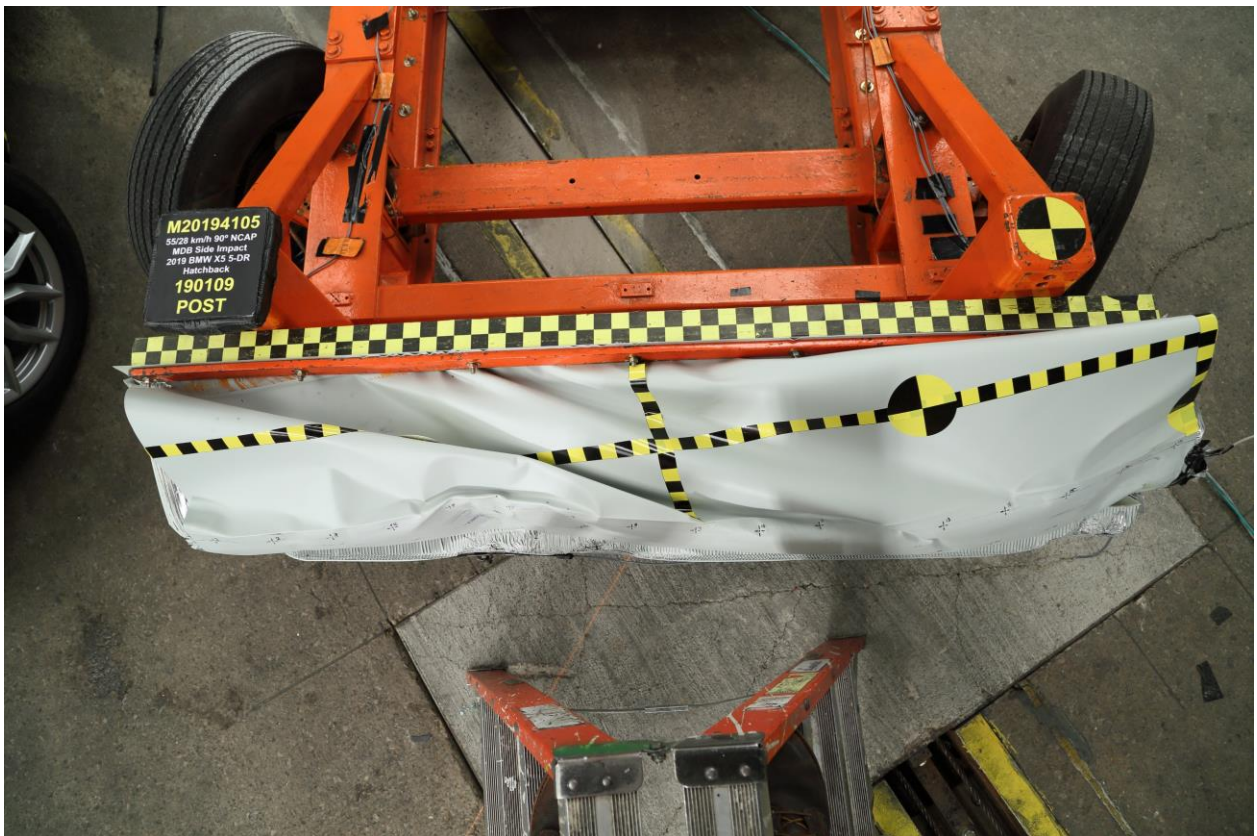
**084** Pre-Test Front View of MDB Impactor Face



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



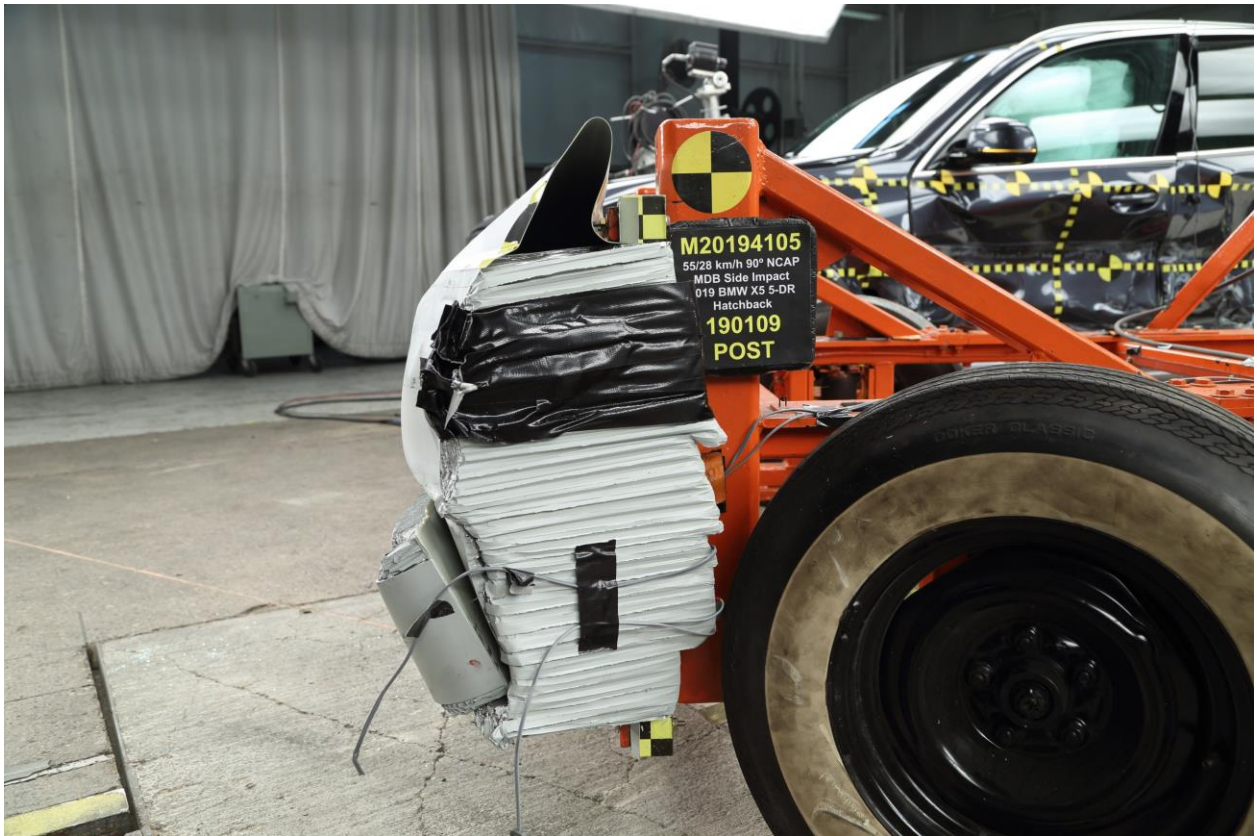
**086** Pre-Test Top View of MDB Impactor Face



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



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



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



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



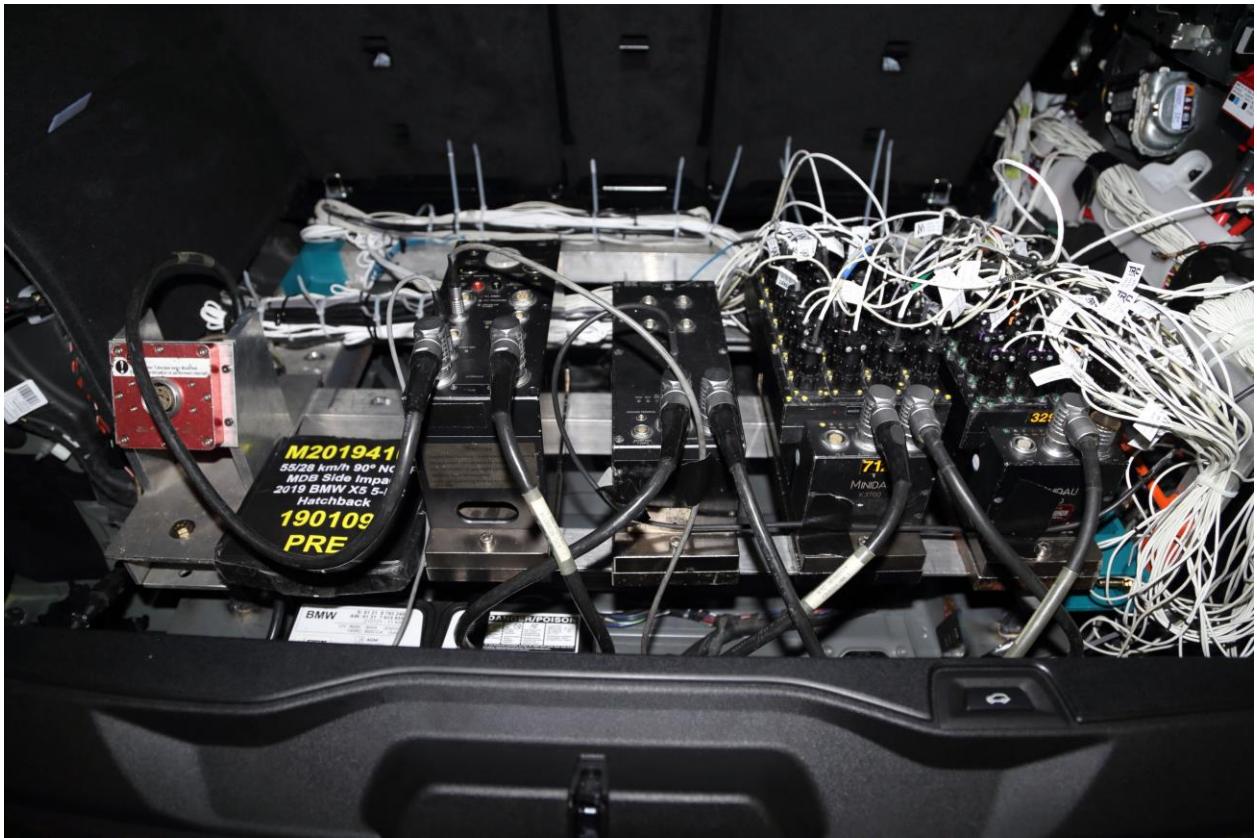
**091** Post-Test Right Side View of MDB Impactor Face



092 Close-Up View of Vehicle's Certification Label



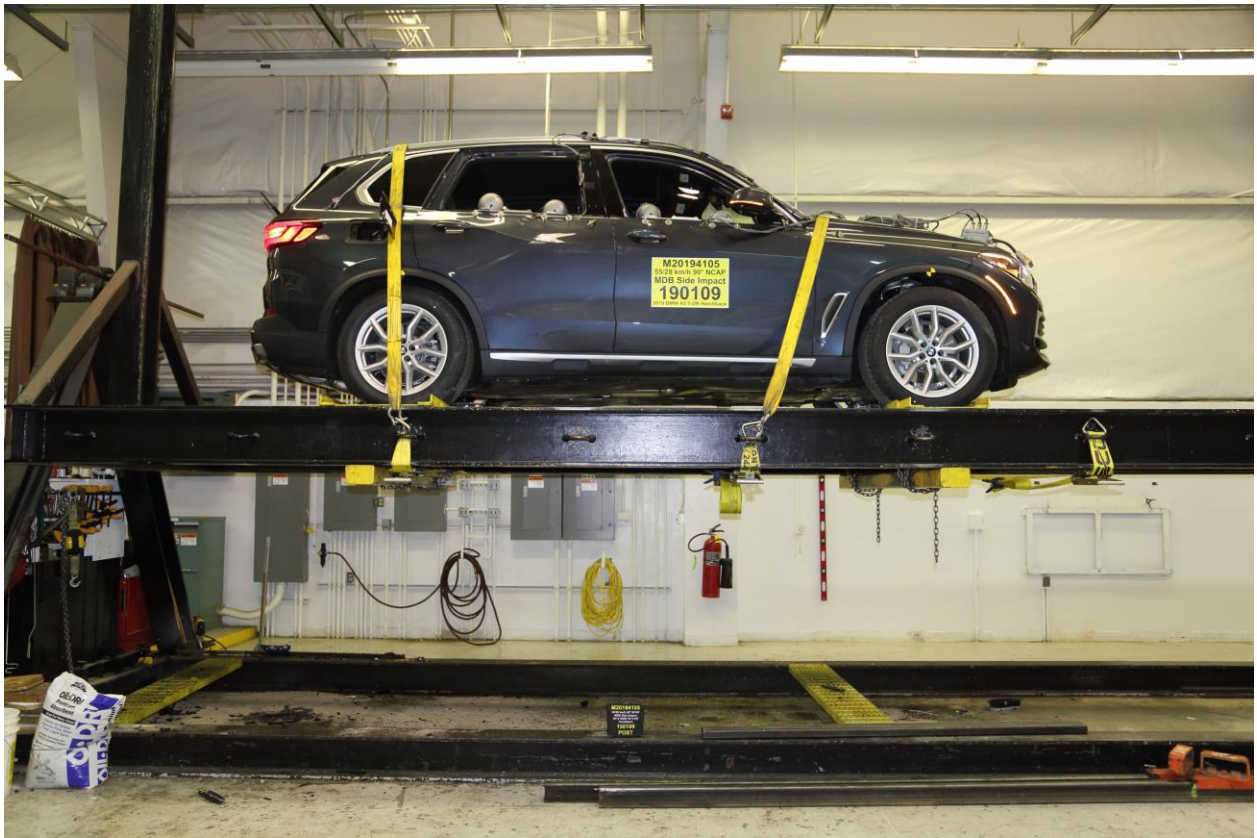
093 Close-Up View of Vehicle's Tire Information Placard or Label



094 Pre-Test Ballast View



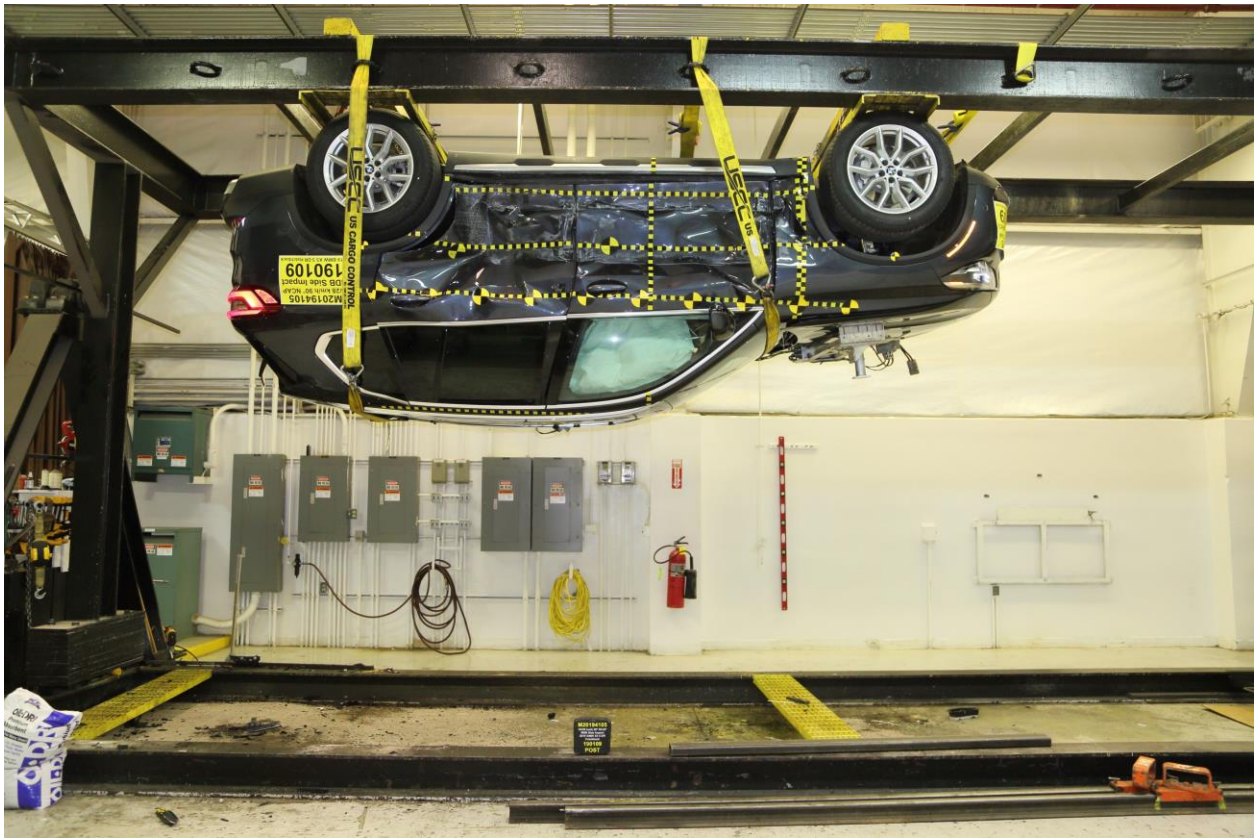
095 No. Post-Test Primary and Redundant Speed Trap Read-Out



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



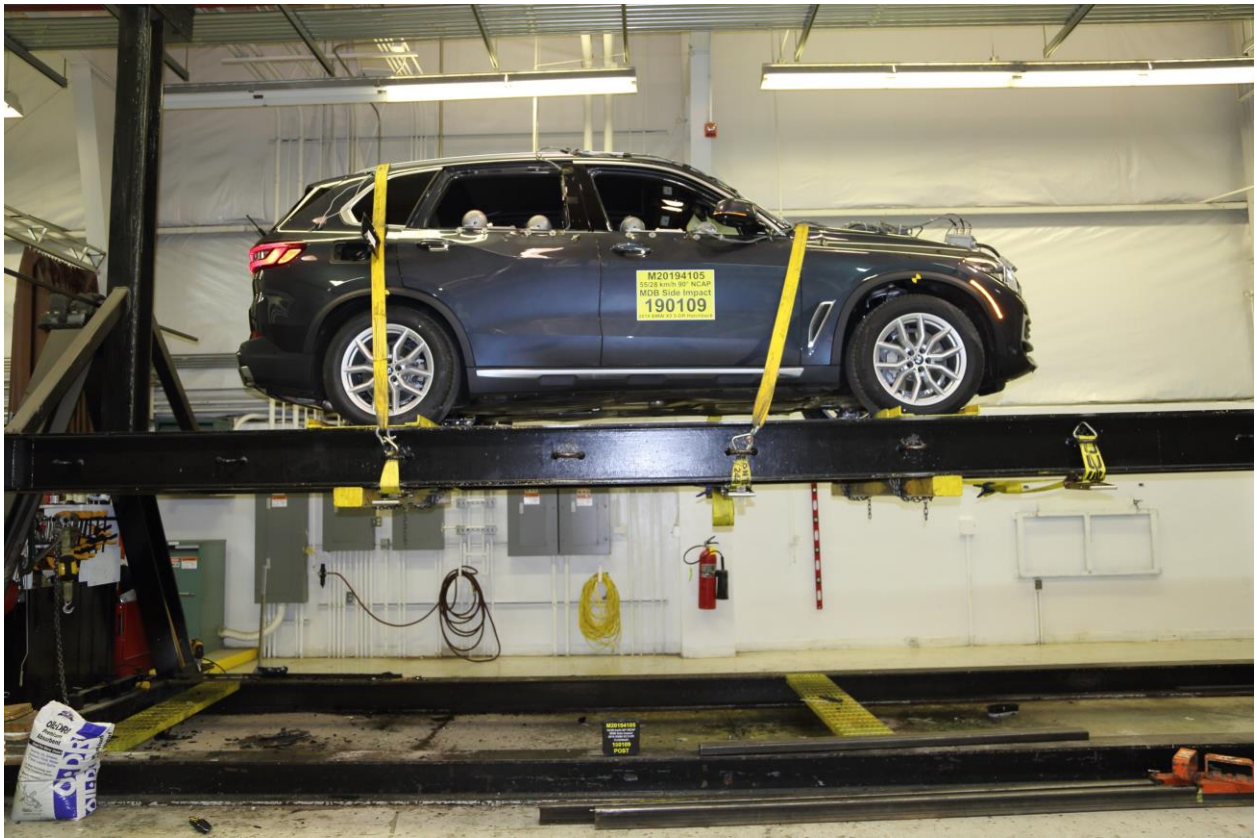
**097** FMVSS No. 301 Static Rollover 90 Degrees



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



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



100 FMVSS No. 301 Static Rollover 360 Degrees



101 Impact Event

# The Ultimate Driving Machine®

## 2019 BMW X5 xDrive40i

<b>Manufacturer's Suggested Retail Price</b>	\$ 60,700.00
<b>Options and Additional Charges:</b> (Optional equipment may supersede standard equipment; check with your authorized BMW center)	
Arctic Grey Metallic	\$ 550.00
Black Vernice Leather	\$ 1,450.00
<b>Convenience Package</b>	\$ 1,150.00
- Comfort Access keyless entry	
- 4-zone climate control	
- SiriusXM Radio w/ 1 year sub.	
<b>Parking Assistance Package</b>	\$ 700.00
- Parking Assistant Plus	
- Rear view camera	
- Surround View w/ 3D View	
Leather Upholstery Credit	\$ -1,450.00
Region Spec	Included
Gesture Control Option Credit	\$ -190.00
Park Distance Control	Included
Remote Engine Start	\$ 300.00
19" wheel 734 w/ as fit	Included
Sport Automatic Transmission	Included
Sport leather steering wheel	Included
Runflat tires	Included
Roof rails in Satin Aluminum	Included
Satin aluminum exterior trim	Included
Universal garage-door opener	Included
Travel and Comfort System	Included
Hot Fr Seats Armrests (S WH)	\$
Fineline Brown Wood Trim	Included
Auto dimming driver ext mirror	Included
Ambient Lighting	Included
Panoramic moonroof	Included
Power Front Seats	Included
Sport seats	Included
Lumbar support	Included
Automatic High Beams	Included
Active Protection	Included
Decoding for no-dazzle hgh bm	Included
Active Driving Assistant	Included
Active Guard	Included
LED Fog Lights	Included
Adaptive LED Headlights	Included
Apple CarPlay Compatibility	Included
Connected Package Pro	\$ 190.00
Live Cockpit Pro (incl. Nav)	Included
Gesture Control	Included
CD Player Prep	Included
Antracite headliner	Included
Refrigerant	\$ 995.00
Destination Charge	\$
<b>Total Suggested Retail Price</b>	\$ 64,645.00

VIN: 5UXCR6C57KLG79699

<b>Standard Features</b>	<b>Audio system</b>
<b>Performance and efficiency</b>	- HiFi Sound System with HD Radio
- 3.0-liter BMW TwinPower Turbo inline 6-cylinder, 24-valve engine with variable valve control (Double VANOS) and intelligent high-precision direct injection	<b>Instrumentation and controls</b>
- Driving Dynamics Control with ECO PRO, COMFORT, and SPORT modes	- Apple CarPlay Compatibility with 1-year trial
- 8-speed Sport Automatic transmission with Sport and Manual shift modes and steering wheel-mounted paddle shifters and Launch Control	- BMW Live Cockpit featuring Navigation with Drive 7.0, 12.3" touchscreens, 12.3" digital instrument cluster, natural voice control, and Traffic and On-Street Parking Info (select markets)
<b>Handling, ride and braking</b>	<b>Comfort and convenience</b>
- Dynamic Stability Control (DSC), including Brake Fade Compensation, Start-Off Assistant, Brake Drying, and Brake Stand-by feature, with Dynamic Traction Control (DTC) and Dynamic Brake Control	- Remote Software Upgrade capable
- 4-wheel ventilated disc brakes with anti-lock braking system (ABS), Dynamic Brake Control (DBC), brake-pad wear indicator and cornering brake control	- Panoramic moonroof
- Drive all-wheel-drive system	- Rain-sensing windshield wipers with adjustable speed and automatic headlight control
<b>Exterior</b>	- Power tailgate
- Adaptive LED Headlights/LED fog lights	- Park Distance Control, front and rear, and Rear-view Camera
- Heated 16-way power front sport seats including 4-way lumbar support and driver's seat memory	<b>Safety and security</b>
<b>Interior seating and trim</b>	- Front and rear Head Protection System (HPS) with side-impact airbags
- Heated 16-way power front sport seats including 4-way lumbar support and driver's seat memory	- Active Driving Assistant including Frontal Collision Warning, Lane Departure Warning, and Active Blind Spot Detection
	<b>Warranty</b>
	- 4-year/50,000-mile New Vehicle Limited Warranty for Passenger Cars and Light Trucks 2019 Models
	- 12-year Unlimited Mileage Rust Perforation Limited Warranty
	- 4-year Unlimited Mileage Roadside Assistance Program

<b>BMW Ultimate Care™</b>	<b>Your Maintenance Costs:</b>
Maintenance Program For the first 3 years or 36,000 miles, whichever comes first on scheduled maintenance*	Engine Oil Services: \$0 Air Filter: \$0
<b>\$0</b>	Cabin Microfilter: \$0 Spark Plugs: \$0
	Vehicle Checks: \$0 Brake Fluid: \$0
	*Coverage is not transferable to subsequent purchasers. Coverage or fees may vary. Please see <a href="http://bmwusa.com/ultimatecare">bmwusa.com/ultimatecare</a> or ask your authorized BMW center for details.

<b>EPA DOT Fuel Economy and Environment</b>	<b>Gasoline Vehicle</b>
<b>Fuel Economy</b>	<b>You spend</b>
<b>22</b> MPG combined city/hwy	<b>\$3,250</b> more in fuel costs over 5 years compared to the average new vehicle.
Standard SUVs range from 11 to 93 MPG. The best vehicle rates 138 MPG/city.	
4.5 gallons per 100 miles	

<b>Annual fuel cost</b>	<b>Fuel Economy &amp; Greenhouse Gas Rating</b> (tailpipe only)	<b>Smog Rating</b> (tailpipe only)
<b>\$2,050</b>	1 2 3 4 5 6 7 8 9 10 Best	1 2 3 4 5 6 7 8 9 10 Best

Actual results may vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$2,050 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.00 per gallon. MPG is miles per gallon and CO<sub>2</sub> is grams per mile. Vehicle emissions are a significant cause of climate change and smog.

**fuel economy.gov**  
Calculate personalized estimates and compare vehicles

<b>PARTS CONTENT INFORMATION</b>
For Vehicles in this Car Line:
US/Canadian Parts Content: 25%
Major Source of Foreign Parts Content:
GERMANY: 50%
MEXICO: 15%
Note: Parts content does not include final assembly, distribution, or other non-parts costs.
For this Vehicle:
Final Assembly Point: SPARTANBURG, SC, USA
Country of Origin:
Engine: AUSTRIA
Transmission: GERMANY

<b>GOVERNMENT 5-STAR SAFETY RATINGS</b>		
<b>Overall Vehicle Score</b>	<b>Not Rated</b>	
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.		
<b>Frontal Crash</b>	<b>Driver Passenger</b>	<b>Not Rated</b>
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
<b>Side Crash</b>	<b>Front seat</b>	<b>Not Rated</b>
Based on the risk of injury in a side impact.	<b>Rear seat</b>	<b>Not Rated</b>
<b>Rollover</b>	<b>Not Rated</b>	
Based on the risk of rollover in a single-vehicle crash.		

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

This vehicle is equipped with a front bumper that has been tested at an impact speed of 2.5 miles per hour and a rear bumper that has been tested at an impact speed of 2.5 miles per hour, and has sustained no damage to the vehicle's body and minimal damage to the bumper and attachment hardware. Minimal damage to the bumper means damage that can be repaired with the use of common repair materials and without replacing any parts. The stronger the bumper, the less likely the car will require repair after a low-speed collision.

BMW of North America, LLC  
Woodcliff Lake, NJ 07877  
VPC Location: S. CAROLINA  
Port of Entry: GREENVILLE-SPARTANBURG  
Carrier: MOTOR CAR AUTO CARRIERS

Sold To:  
Perillo BMW, Inc.  
1035 N Clark St.  
Chicago, IL  
(312) 961-0000 60610-2909

Ship To:  
Perillo BMW, Inc.  
1388 N North Branch St.  
Chicago, IL  
(312) 961-0000 60622-2412

### 102 Monroney Label

### SEATS, MIRRORS, AND STEERING WHEEL

**WARNING**  
Body parts can be jammed when moving the head restraint. There is a risk of injury. Make sure that the area of movement is clear when moving the head restraint.

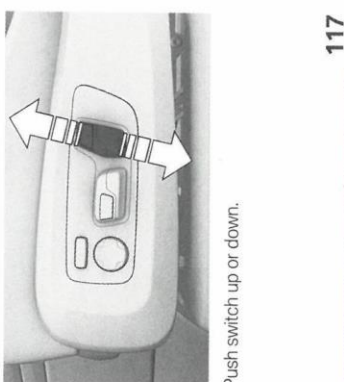
**WARNING**  
Objects on the head restraint reduce the protective effect in the head and neck area. There is a risk of injury.

- Do not use seat or head restraint covers.
- Do not hang objects, for instance clothes hangers, directly on the head restraint.
- Only use accessories that have been determined to be safe for attachment to a head restraint.
- Do not use any accessories, for instance pillows, while driving.

**Active head restraint**  
In the event of a rear-end collision with a certain severity, the active head restraint automatically reduces the distance from the head. Have the active head restraint checked and if necessary replaced in the case of damage or if it was exposed to an accident.

**Adjusting the height**  
Push switch up or down.

**Adjusting the height**  
Push switch up or down.



### 103 Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

**Symbol Description**  
Green: the safety belt is buckled on the corresponding rear seat.  
Red: the safety belt is not buckled on the corresponding rear seat.

**Safety mode**  
In critical situations, for instance during an emergency stop, the front safety belts tighten automatically.

**Front head restraints**  
If the situation passes without an accident occurring, the belt tension relaxes. If the belt tension does not loosen automatically, stop the vehicle and unbuckle the safety belt using the red button in the safety belt buckle. Fasten the safety belt before continuing on your trip.

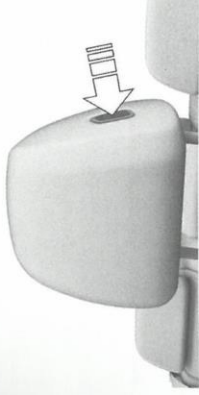
**General information**  
The current head restraint position can be stored using the memory function, refer to page 122.

**Safety information**

**WARNING**  
A missing protective effect due to removed or not correctly adjusted head restraints can cause injuries in the head and neck area. There is a risk of injury.

- Before driving, install the removed head restraints on the occupied seats.
- Adjust the head restraint so its center supports the back of the head at as close to eye level as possible.
- Adjust the distance so that the head restraint is as close as possible to the back of the head. Adjust the distance via the backrest tilt as needed.

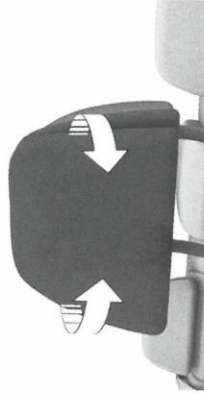
## Adjusting the distance



- ▷ Back: press the button and push the head restraint toward the rear.
- ▷ Forward: pull the head restraint toward the front.

After setting the distance, move the head restraint forward or backward slightly, making sure it engages properly.

## Adjusting the side extensions



Fold the side extensions on the head restraint forward for increased lateral support in the resting position.

## Removing

The head restraints cannot be removed.

## Rear head restraints

### Safety information

#### ⚠ WARNING

A missing protective effect due to removed or not correctly adjusted head restraints can cause injuries in the head and neck area. There is a risk of injury.

- ▷ Before driving, install the removed head restraints on the occupied seats.
- ▷ Adjust the head restraint so its center supports the back of the head at as close to eye level as possible.
- ▷ Adjust the distance so that the head restraint is as close as possible to the back of the head. Adjust the distance via the backrest tilt as needed.

#### ⚠ WARNING

Body parts can be jammed when moving the head restraint. There is a risk of injury. Make sure that the area of movement is clear when moving the head restraint.

#### ⚠ WARNING

Objects on the head restraint reduce the protective effect in the head and neck area. There is a risk of injury.

- ▷ Do not use seat or head restraint covers.
- ▷ Do not hang objects, for instance clothes hangers, directly on the head restraint.
- ▷ Only use accessories that have been determined to be safe for attachment to a head restraint.
- ▷ Do not use any accessories, for instance pillows, while driving.

**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) Primary vs. Time	B-9
15	Passenger Head Acceleration (Y) Primary vs. Time	B-9
16	Passenger Head Acceleration (Z) Primary vs. Time	B-9
17	Passenger Head Resultant Acceleration Primary vs. Time	B-9
18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-10
19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-10
20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-10
21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-10
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-11
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-11
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-11

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)  
Passenger Head Angular Velocity (X)  
Passenger Head Angular Velocity (Y)  
Passenger Head Angular Velocity (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**

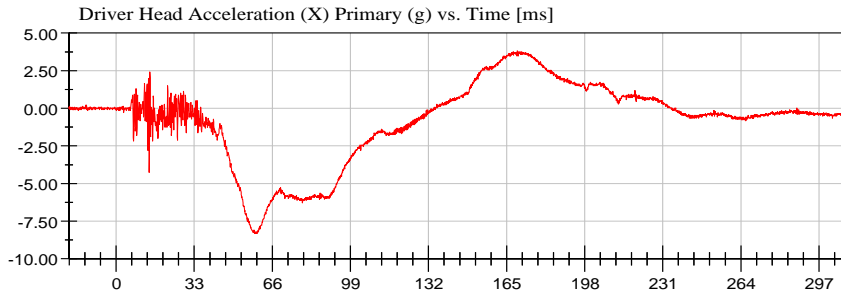
Test Lab: CTF

Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



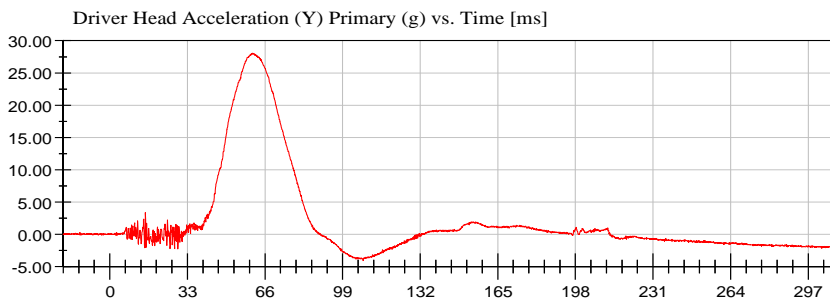
**<Max>**

3.83 g at 169.52 ms

**<Min>**

-8.32 g at 58.48 ms

CFC\_1000



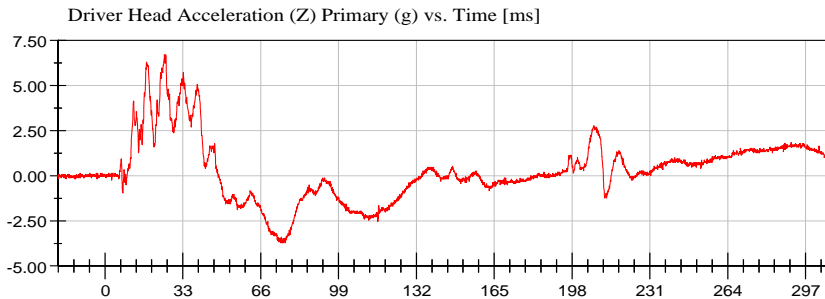
**<Max>**

28.07 g at 60.72 ms

**<Min>**

-4.10 g at 107.76 ms

CFC\_1000



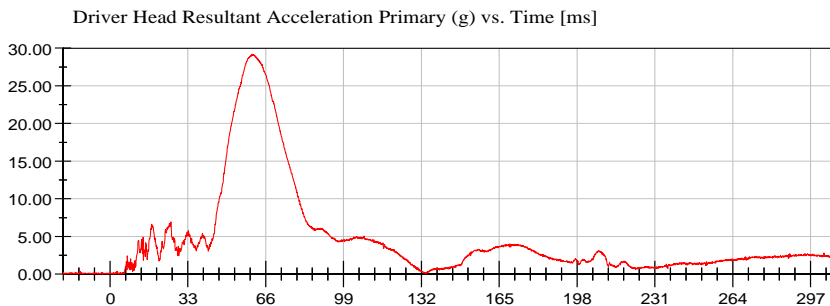
**<Max>**

6.70 g at 25.20 ms

**<Min>**

-3.72 g at 74.56 ms

CFC\_1000



**<Max>**

29.19 g at 60.16 ms

**<Min>**

0.04 g at -19.76 ms

CFC\_1000



**NHTSA**

Test Lab: CTF

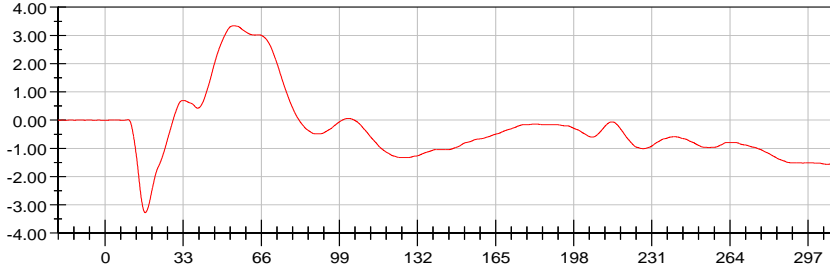
Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)

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



<Max>

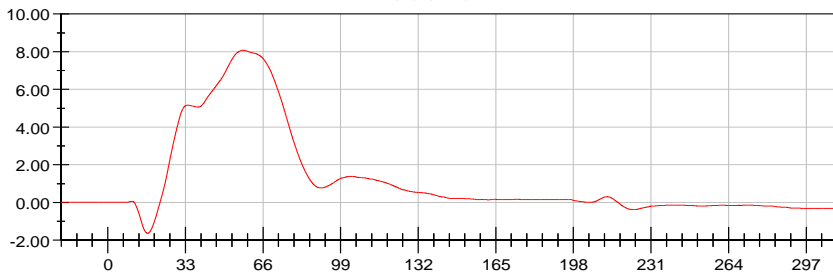
3.34 mm at 54.40 ms

<Min>

-3.27 mm at 16.96 ms

CFC\_180

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



<Max>

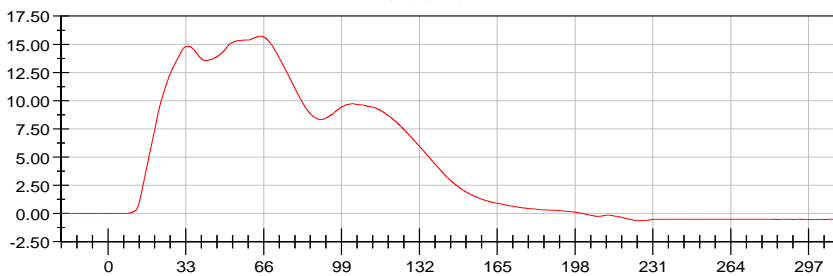
8.07 mm at 57.52 ms

<Min>

-1.65 mm at 16.96 ms

CFC\_180

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



<Max>

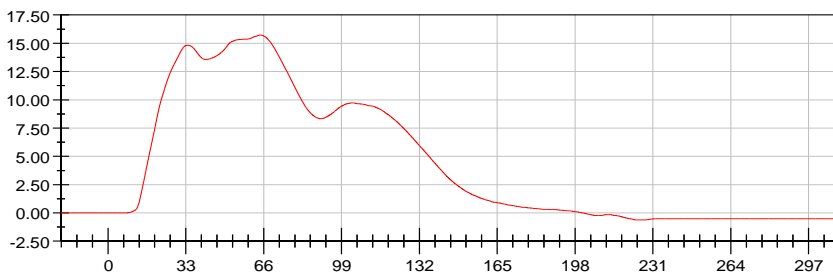
15.72 mm at 64.64 ms

<Min>

-0.62 mm at 224.24 ms

CFC\_180

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



<Max>

15.72 mm at 64.64 ms

<Min>

-0.62 mm at 224.24 ms

CFC\_180



**NHTSA**

Test Lab: CTF

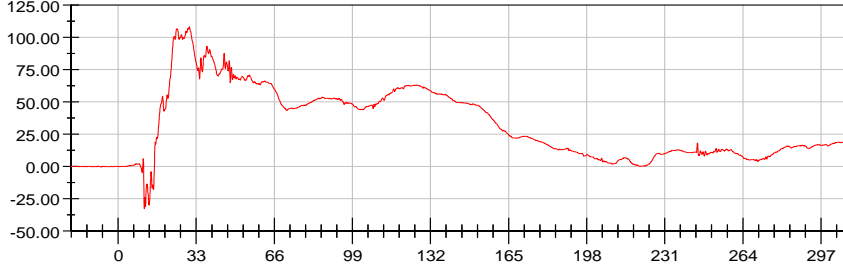
Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)

Driver Anterior Abdominal Force (Y) (N) vs. Time [ms]



<Max>

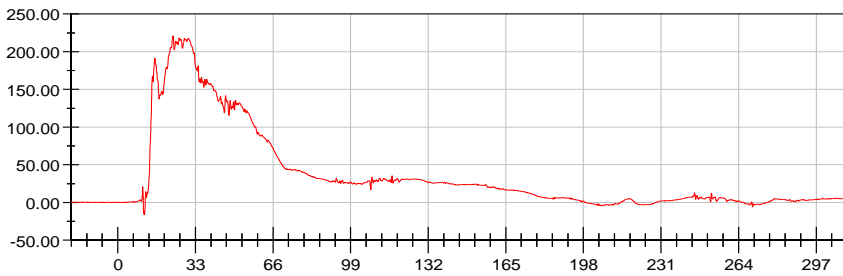
108.23 N at 30.08 ms

<Min>

-32.59 N at 11.04 ms

CFC\_600

Driver Middle Abdominal Force (Y) (N) vs. Time [ms]



<Max>

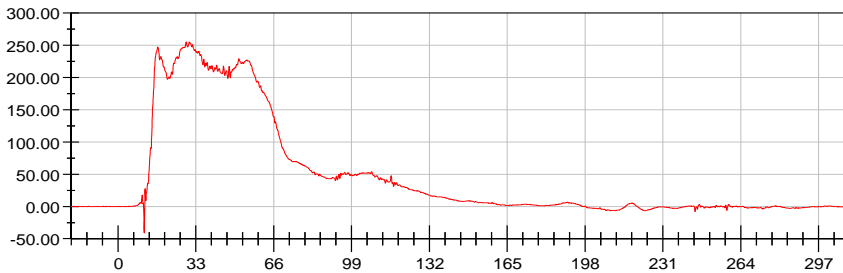
221.13 N at 23.52 ms

<Min>

-16.22 N at 11.36 ms

CFC\_600

Driver Posterior Abdominal Force (Y) (N) vs. Time [ms]



<Max>

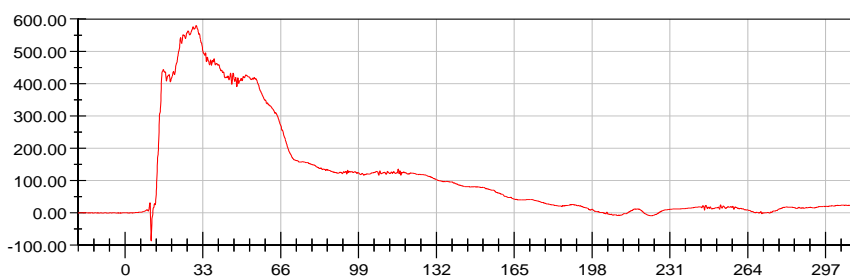
255.30 N at 30.24 ms

<Min>

-41.25 N at 11.12 ms

CFC\_600

Driver Total Abdominal Force (Y) (N) vs. Time [ms]



<Max>

579.78 N at 30.16 ms

<Min>

-87.03 N at 11.12 ms

CFC\_600



**NHTSA**

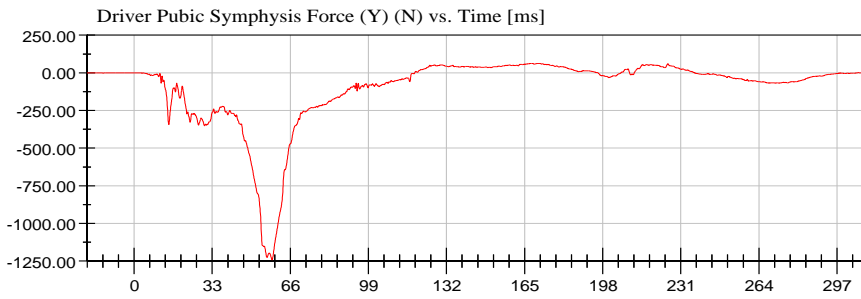
Test Lab: CTF

Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



<Max>

62.77 N at 168.24 ms

<Min>

-1,240.98 N at 58.32 ms

CFC\_600



# NHTSA

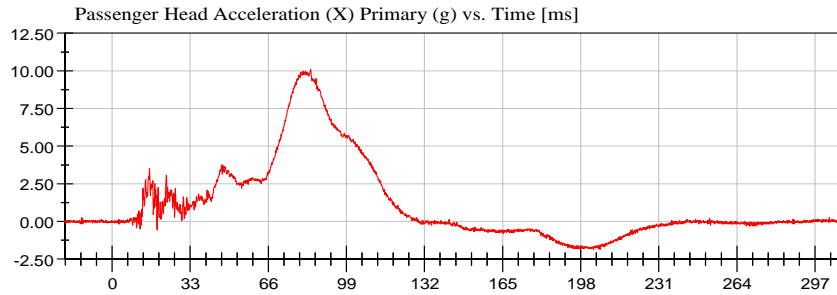
Test Lab: CTF

Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



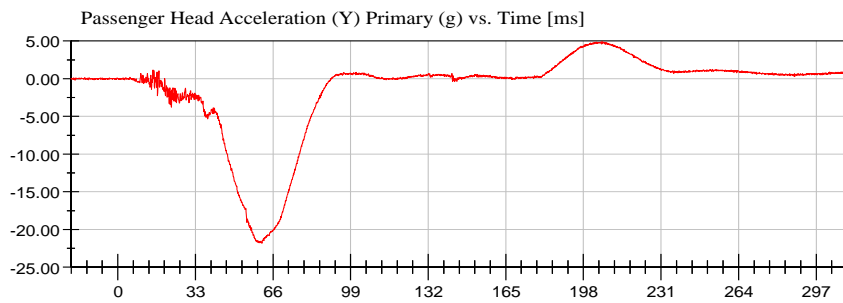
<Max>

10.11 g at 83.84 ms

<Min>

-1.87 g at 203.36 ms

CFC\_1000



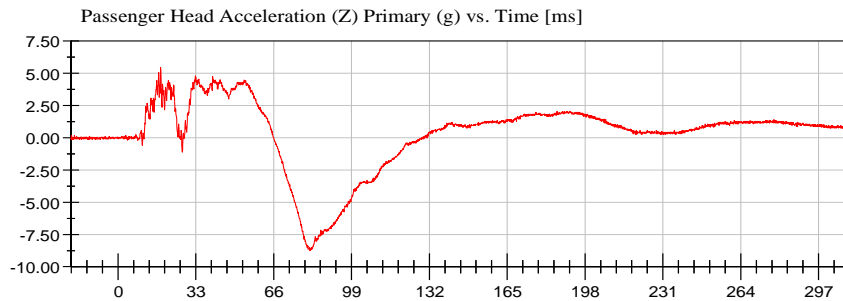
<Max>

4.93 g at 205.92 ms

<Min>

-21.85 g at 61.28 ms

CFC\_1000



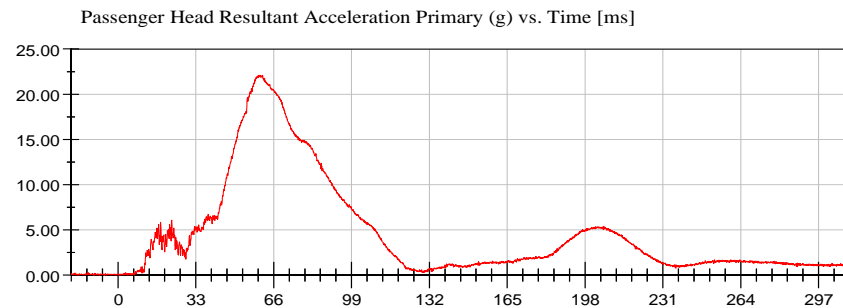
<Max>

5.46 g at 18.08 ms

<Min>

-8.77 g at 81.44 ms

CFC\_1000



<Max>

22.10 g at 61.28 ms

<Min>

0.03 g at -18.96 ms

CFC\_1000



# NHTSA

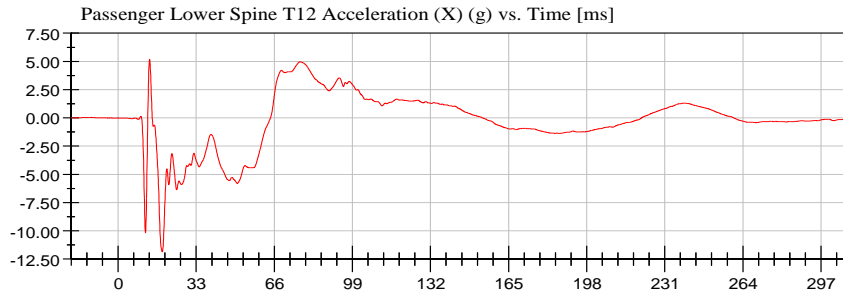
Test Lab: CTF

Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



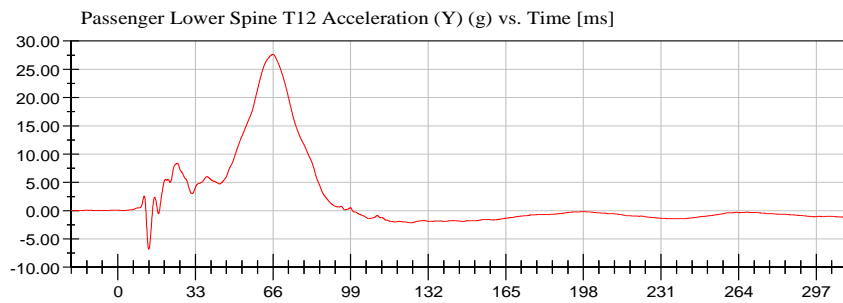
<Max>

5.18 g at 13.28 ms

<Min>

-11.86 g at 18.64 ms

CFC\_180



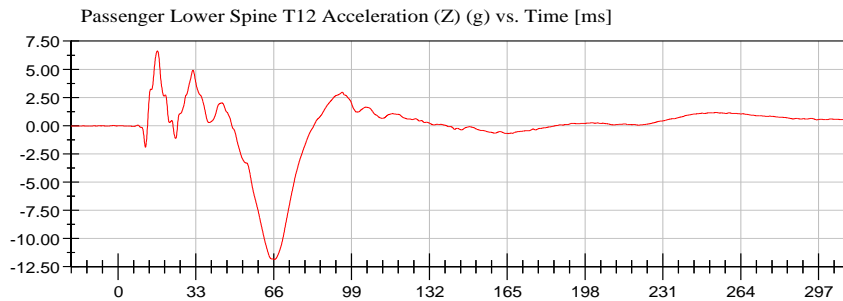
<Max>

27.63 g at 65.92 ms

<Min>

-6.85 g at 13.12 ms

CFC\_180



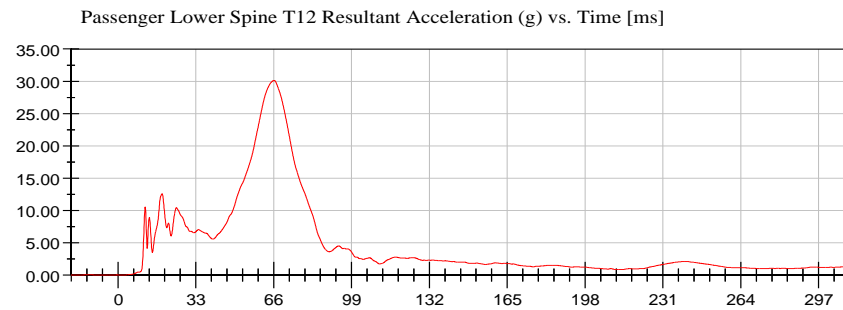
<Max>

6.62 g at 16.72 ms

<Min>

-11.85 g at 66.40 ms

CFC\_180



<Max>

30.12 g at 66.16 ms

<Min>

0.01 g at -6.48 ms

CFC\_180



# NHTSA

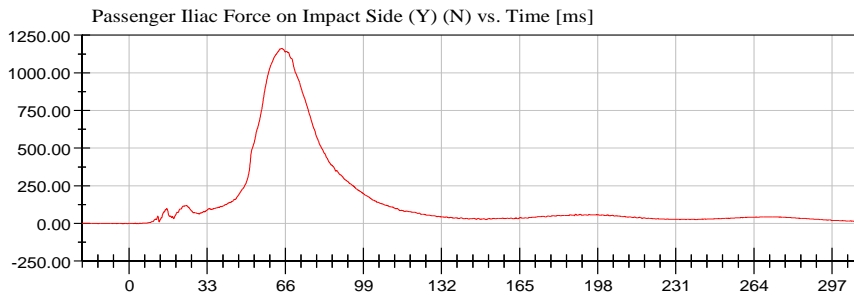
Test Lab: CTF

Test Number: 190109 (M20194105)

Test Date: 01/09/2019

Position #1 ES-2 Dummy with Rib Extension (F030)

Position #4 SID IIs Dummy (305)



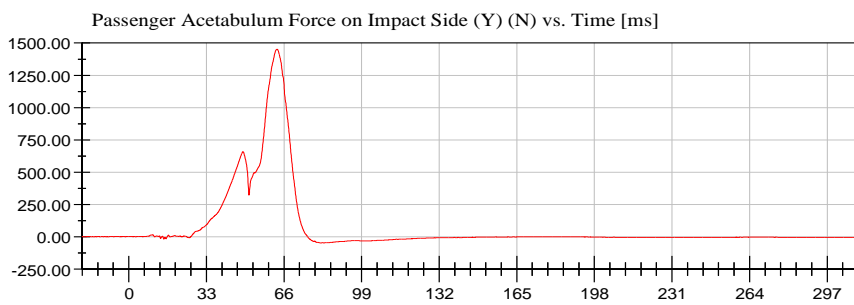
<Max>

1,161.39 N at 64.56 ms

<Min>

-1.02 N at 4.00 ms

CFC\_600



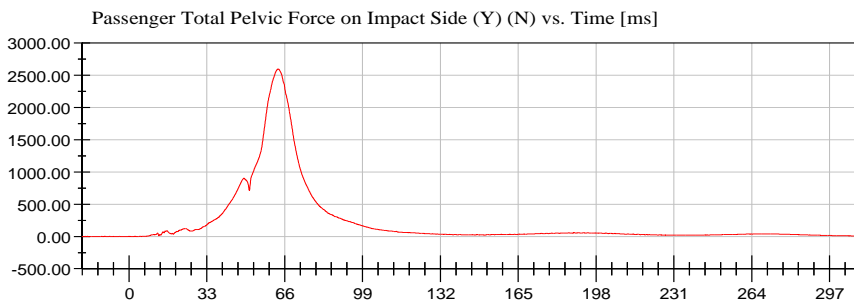
<Max>

1,452.15 N at 62.96 ms

<Min>

-48.48 N at 81.76 ms

CFC\_600



<Max>

2,597.08 N at 63.28 ms

<Min>

-0.90 N at 3.20 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

- Head (X) Acceleration (G's) vs. Time (ms)
- Head (Y) Acceleration (G's) vs. Time (ms)
- Head (Z) Acceleration (G's) vs. Time (ms)
- Resultant Head 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)
- Front Abdomen Force (kN) vs. Time (ms)
- Middle Abdomen Force (kN) vs. Time (ms)
- Rear Abdomen Force (kN) vs. Time (ms)
- Total 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

- Head (X) Acceleration (G's) vs. Time (ms)
- Head (Y) Acceleration (G's) vs. Time (ms)
- Head (Z) Acceleration (G's) vs. Time (ms)
- Resultant Head 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. 59**

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	347	Yes
4	Seat to Hip Joint (center of bolt)	97.0 - 103.0	97	Yes
5	Sole to Seat, Sitting	433.0 - 451.0	445	Yes
6	Head Width	152.0 - 158.0	155	Yes
7	Shoulder/Arm Width	461.0 - 479.0	475	Yes
8	Thorax Width	322.0 - 332.0	328	Yes
9	Abdomen Width	273.0 - 287.0	280	Yes
10	Pelvis Lap Width	359.0 - 373.0	367	Yes
11	Head Depth	196.0 - 206.0	201	Yes
12	Thorax Depth	262.0 - 272.0	262	Yes
13	Abdomen Depth	194.0 - 204.0	199	Yes
14	Pelvis Depth	235.0 - 245.0	242	Yes
15	Back of Buttocks to Hip Joint (center of bolt)	150.0 - 160.0	156	Yes
16	Back of Buttocks to Front of Knee	597.0 - 615.0	605	Yes

Baseline 10/07/05



## Transportation Research Center Inc.

Left Lateral Head Drop  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Peak Resultant Acceleration	125 - 155 g	134.1 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	13.8 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	Yes	Yes	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

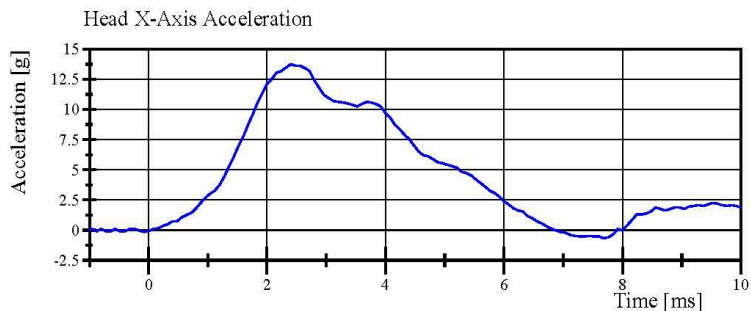
**Head Skin S/N: DP6812**

# Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 59-1

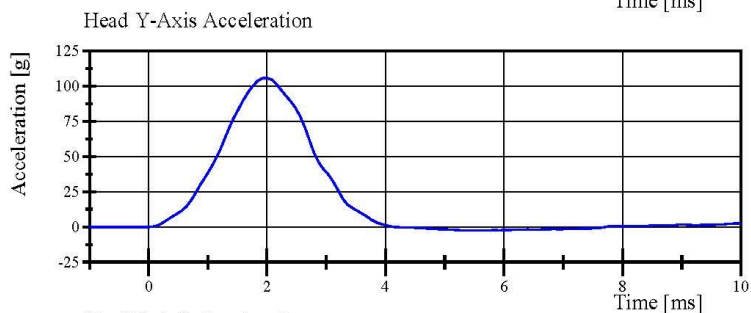
Test Date: 11/28/2018



Filter Class: CFC\_1000

Max: 13.8 g at 2.4 ms

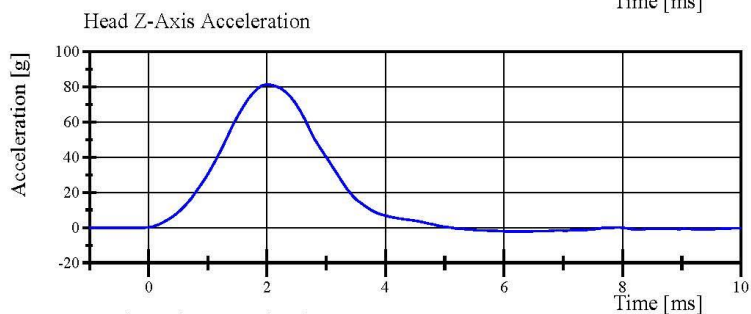
Min: -0.7 g at 7.7 ms



Filter Class: CFC\_1000

Max: 105.8 g at 2.0 ms

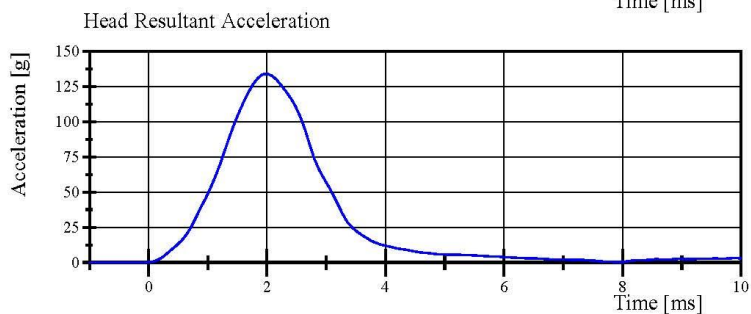
Min: -2.5 g at 5.6 ms



Filter Class: CFC\_1000

Max: 81.4 g at 2.0 ms

Min: -2.2 g at 6.2 ms



Filter Class: CFC\_1000

Max: 134.1 g at 2.0 ms

Min: 0.1 g at -0.2 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 10:21:20 363



## Transportation Research Center Inc.

Left Lateral Neck  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	40 %	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	-49.2 deg	Yes
Time of Peak	54 - 66 ms	58.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	55.8 ms	Yes

**Test meets specifications.**

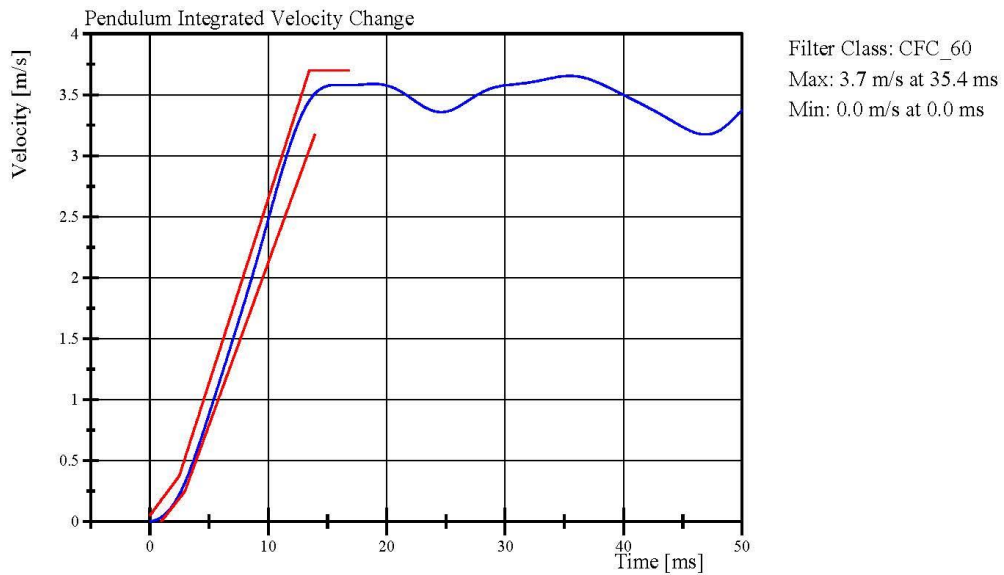
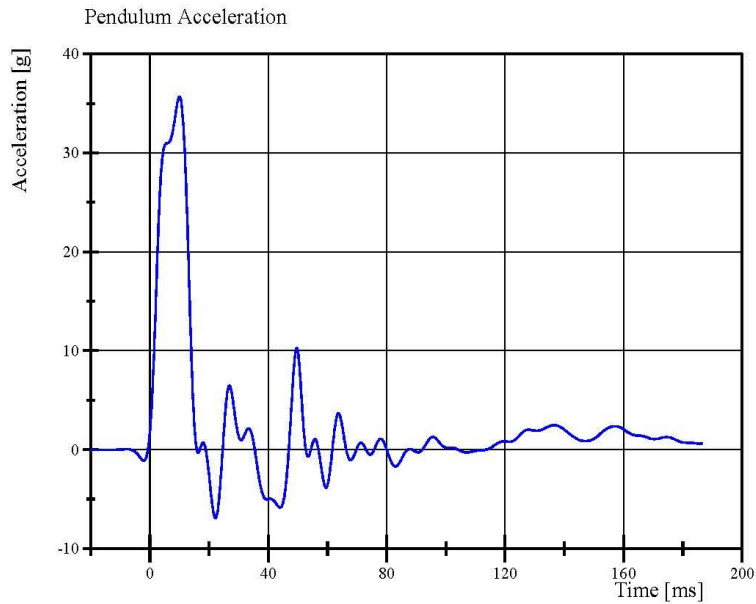
**Condition:** New

**Comments:**

**Neck S/N:** DS5463

# Transportation Research Center Inc.

Left Lateral Neck  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 11:58:22 1490

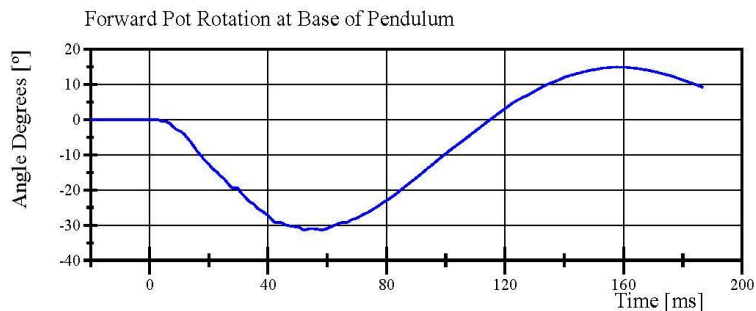


# Transportation Research Center Inc.

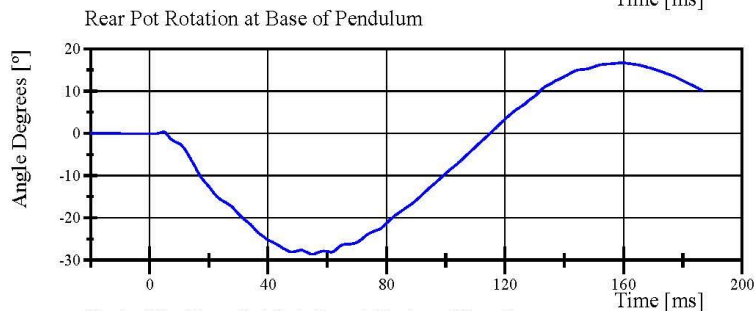
Left Lateral Neck

ES-2re Serial No. F030 Certification No. 59-1

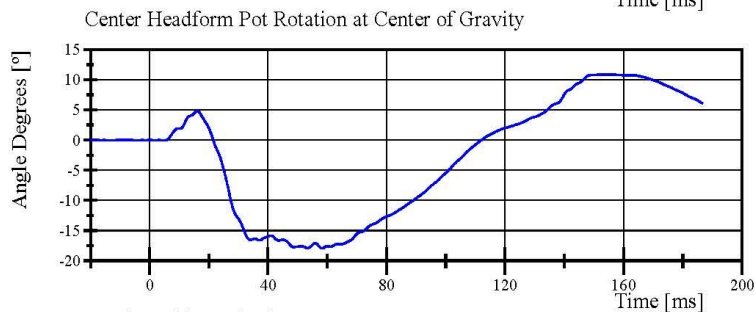
Test Date: 11/28/2018



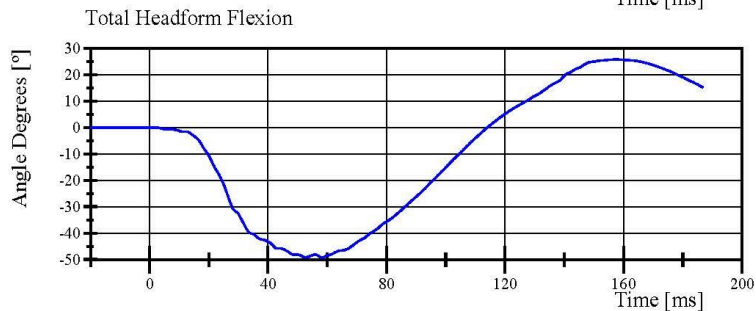
Filter Class: CFC\_180  
Max: 14.9 ° at 157.8 ms  
Min: -31.3 ° at 52.2 ms



Filter Class: CFC\_180  
Max: 16.7 ° at 159.5 ms  
Min: -28.6 ° at 54.9 ms



Filter Class: CFC\_180  
Max: 10.9 ° at 154.6 ms  
Min: -17.9 ° at 58.2 ms



Filter Class: CFC\_180  
Max: 25.8 ° at 157.5 ms  
Min: -49.2 ° at 58.2 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 11:58:23 1490



## Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.27 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-9.61 g	Yes

**Test meets specifications.**

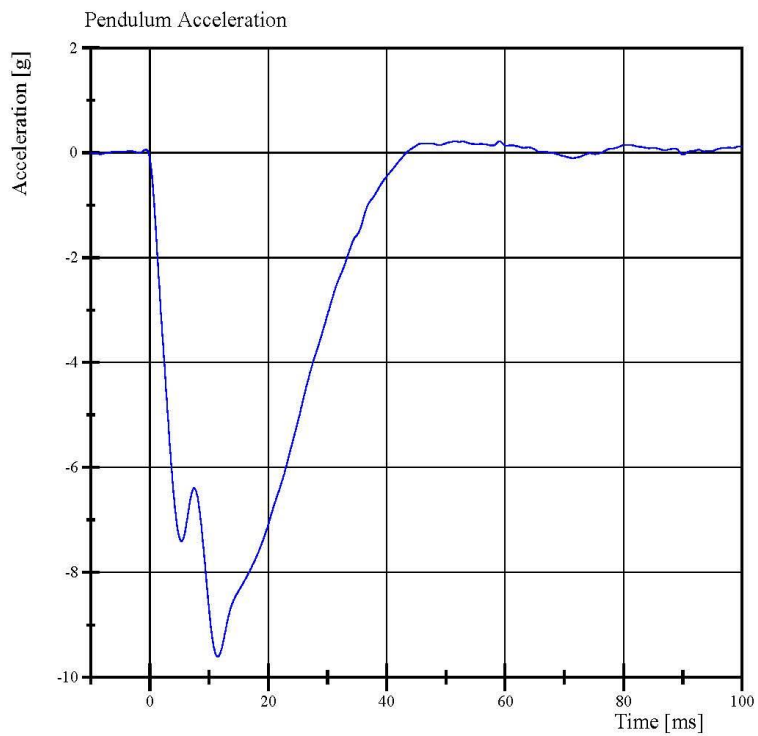
**Condition: Used**

**Comments:**

**Arm S/N: 175-3501-07014**

# Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 0.2 g at 59.0 ms  
Min: -9.6 g at 11.4 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 15:11:33 565



## Transportation Research Center Inc.

3.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.0 mm	Yes

**Test meets specifications.**

**Condition: Used**

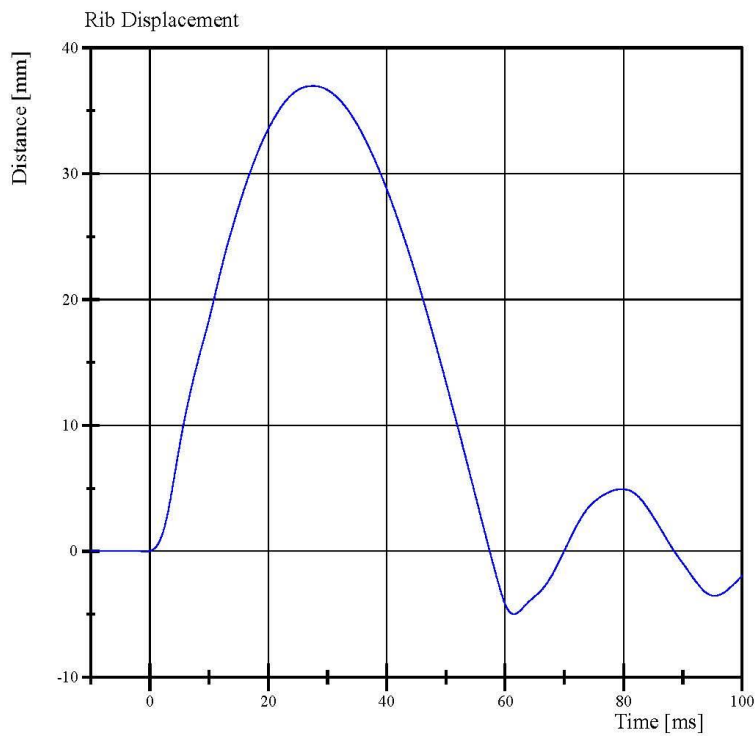
**Comments:**

**Drop Height: 462mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

3.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 37.0 mm at 27.6 ms  
Min: -5.0 mm at 61.4 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 06:57:20 560



## Transportation Research Center Inc.

4.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	46.2 mm	Yes

**Test meets specifications.**

**Condition: Used**

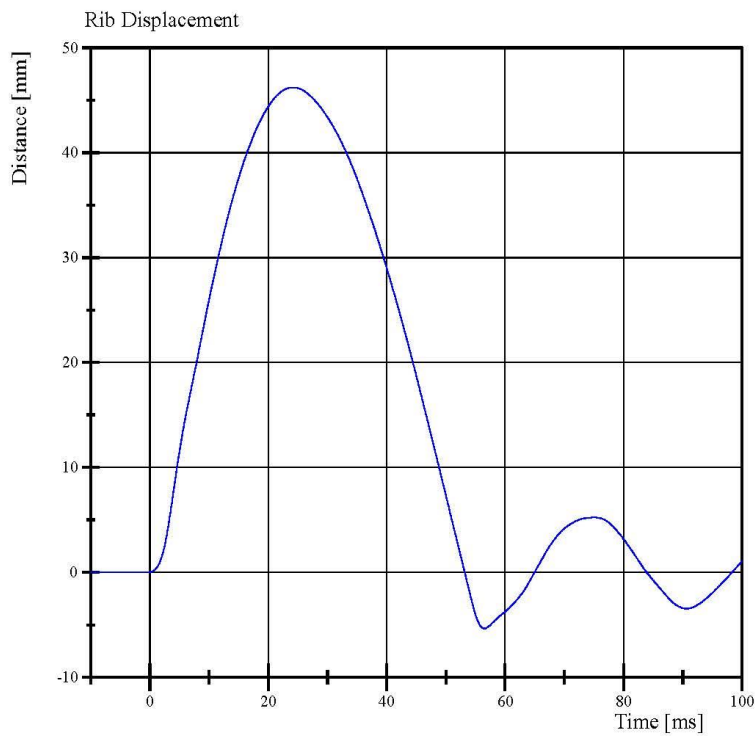
**Comments:**

**Drop Height: 816mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

4.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 46.2 mm at 24.2 ms  
Min: -5.4 mm at 56.5 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 06:51:51 483



## Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.6 mm	Yes

**Test meets specifications.**

**Condition: Used**

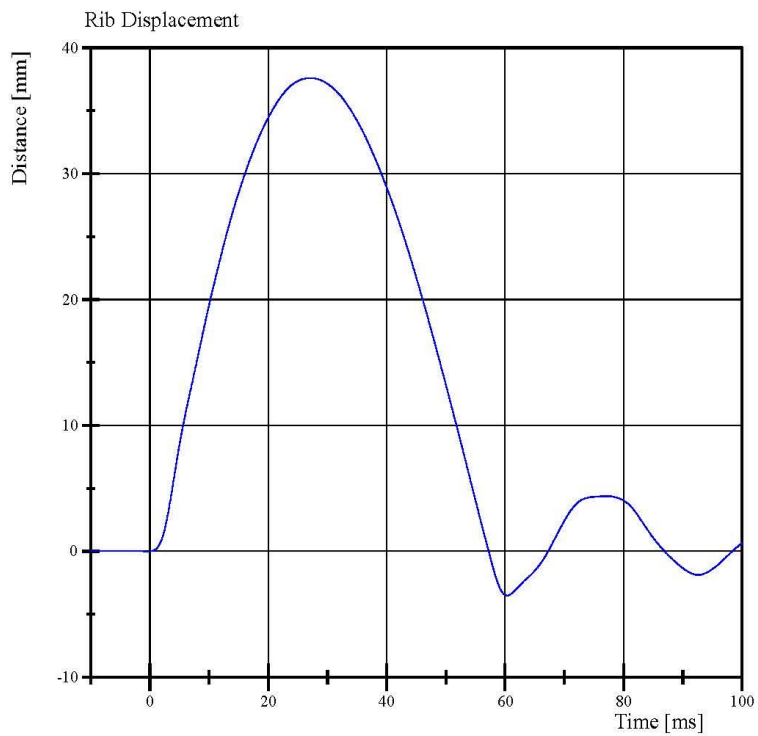
**Comments:**

**Drop Height: 462 mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 37.6 mm at 27.1 ms  
Min: -3.5 mm at 60.3 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 07:08:04 561



## Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	48.0 mm	Yes

**Test meets specifications.**

**Condition: Used**

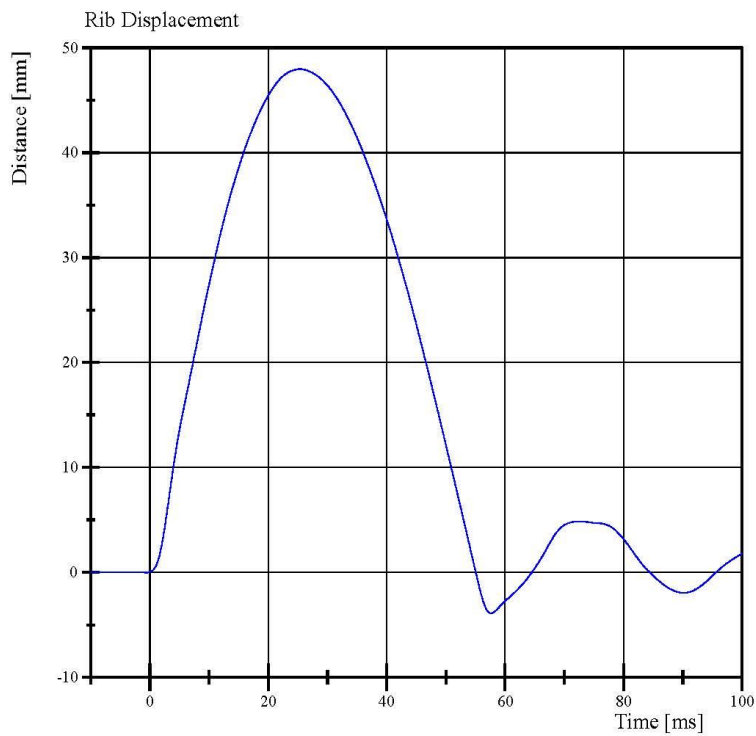
**Comments:**

**Drop Height: 816 mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 48.0 mm at 25.4 ms  
Min: -3.9 mm at 57.6 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 07:02:02 487



## Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.2 mm	Yes

**Test meets specifications.**

**Condition: Used**

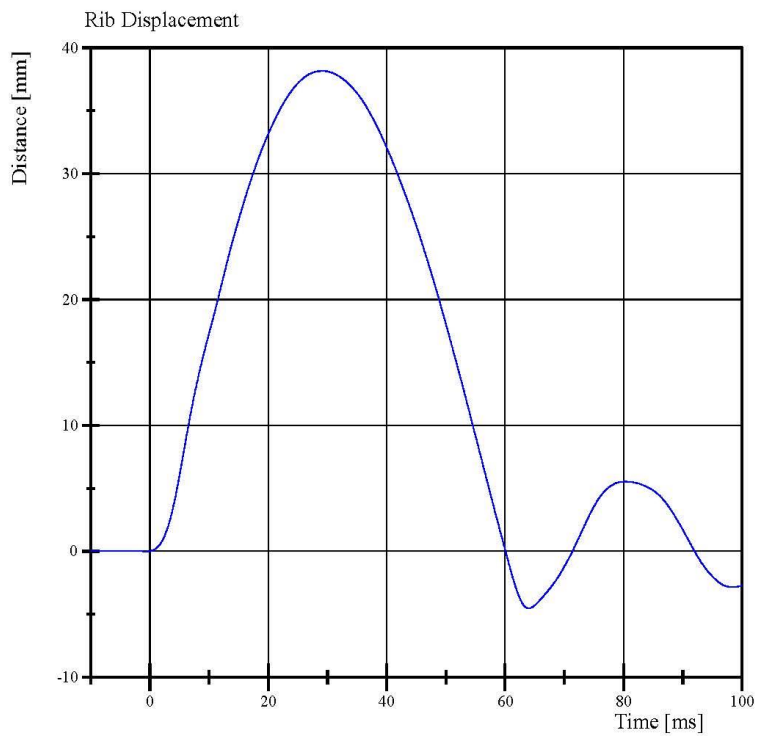
**Comments:**

**Drop Height: 462 mm**

**Rib Module: 175-4008-A-06-017**

# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 38.2 mm at 29.1 ms  
Min: -4.5 mm at 64.0 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 07:24:32 537



## Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	48.9 mm	Yes

**Test meets specifications.**

**Condition: Used**

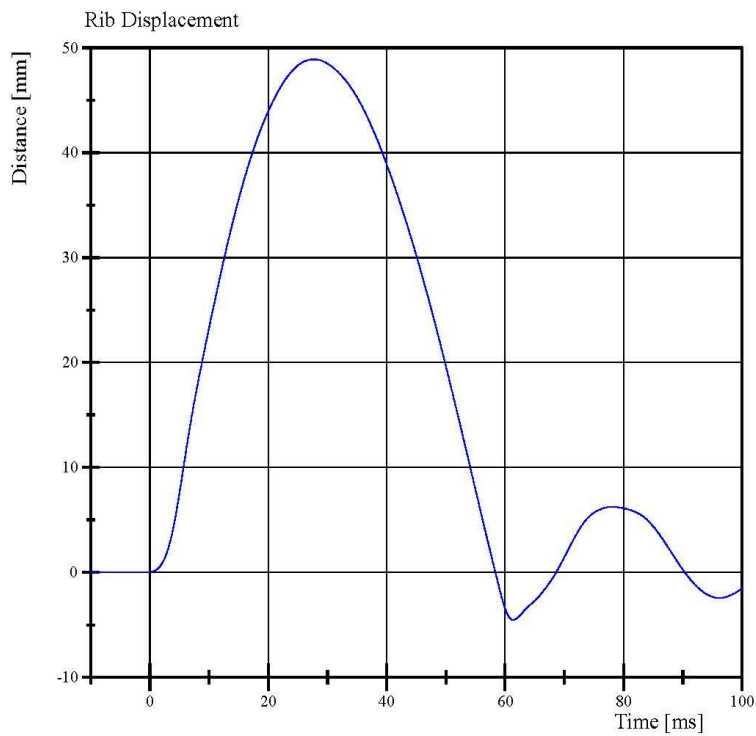
**Comments:**

**Drop Height: 816 mm**

**Rib Module: 175-4008-A-06-017**

# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 48.9 mm at 27.7 ms  
Min: -4.5 mm at 61.4 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 07:18:11 442



## Transportation Research Center Inc.

Left Lower Thorax  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.514 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,633.3 N	Yes
Upper Rib Displacement	34 - 41 mm	34.9 mm	Yes
Center Rib Displacement	37 - 45 mm	40.9 mm	Yes
Lower Rib Displacement	37 - 44 mm	41.4 mm	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

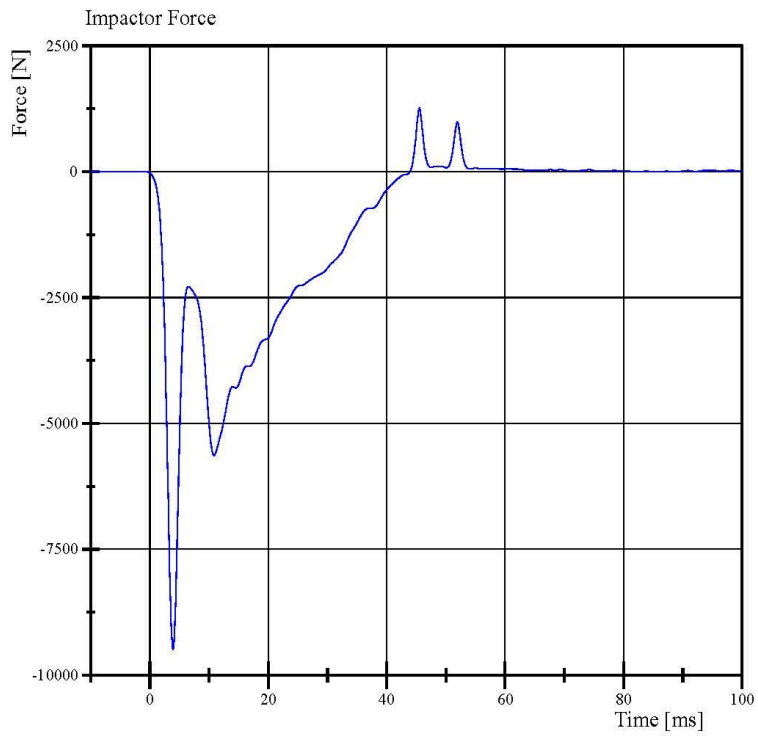
**Upper Rib Module S/N: 175-4008-A**

**Middle Rib Module S/N: 175-4008-A**

**Lower Rib Module S/N: 175-4008-A-06-017**

# Transportation Research Center Inc.

Left Lower Thorax  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 1,259.8 N at 45.5 ms  
Min: -9,489.7 N at 3.9 ms

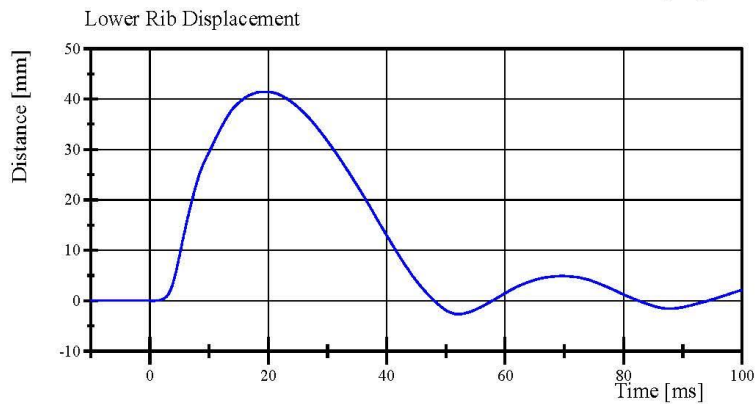
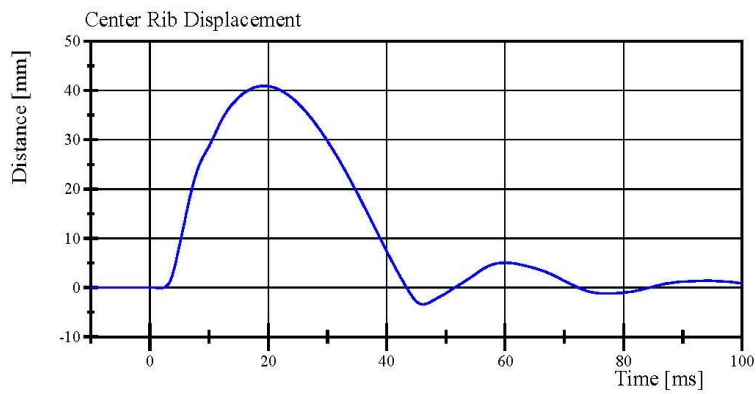
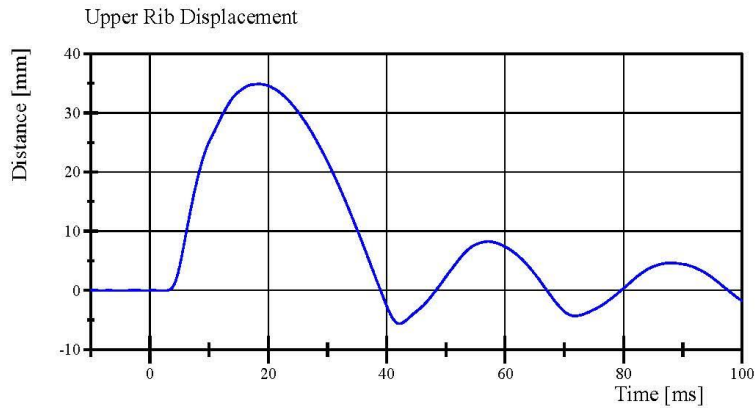
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 15:07:13 456



# Transportation Research Center Inc.

Left Lower Thorax  
ES-2re Serial No. F030 Certification No. 59-1  
Test Date: 11/28/2018



Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 15:07:15 456



## Transportation Research Center Inc.

Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 59-3  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.023 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-47.2 deg	Yes
Time of Peak	39 - 53 ms	44.1 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	38.0 ms	Yes

**Test meets specifications.**

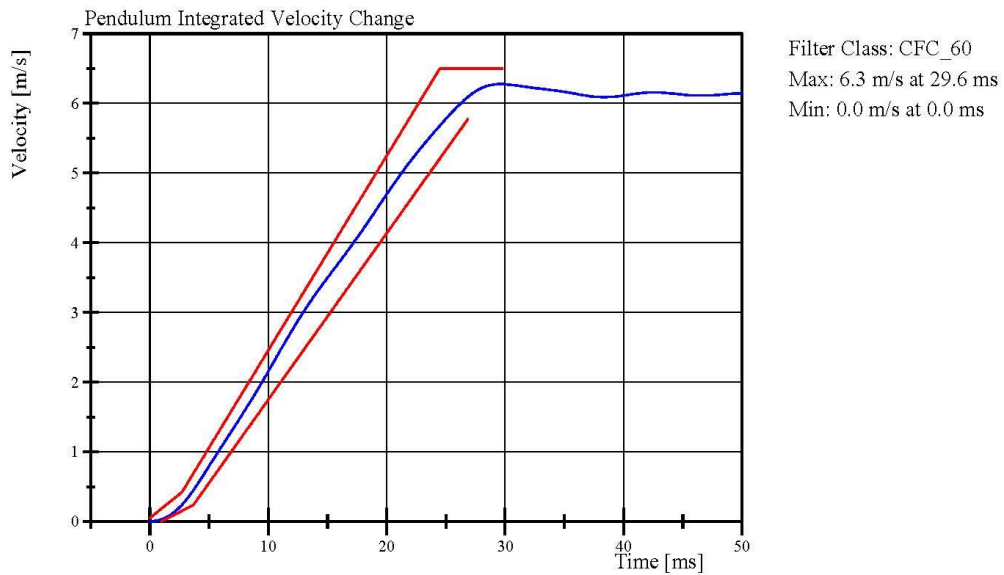
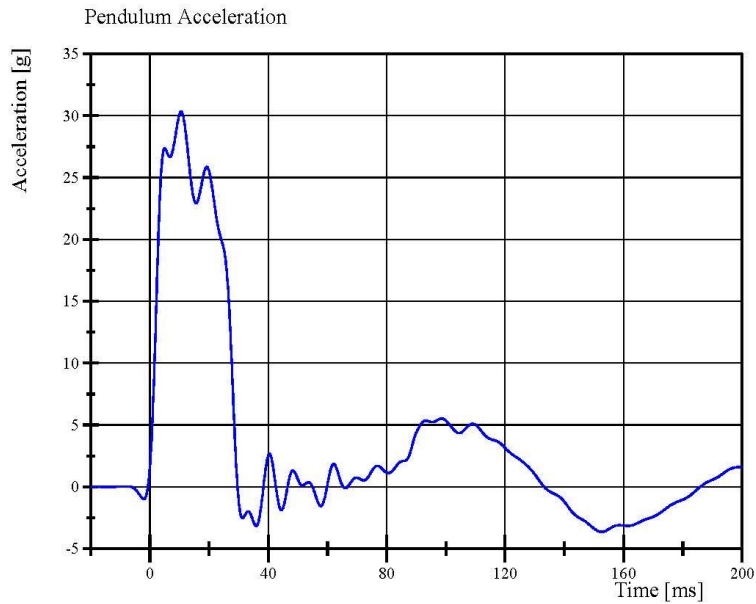
**Condition:** Used

**Comments:**

**Lumbar S/N:** DM3011

# Transportation Research Center Inc.

Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 59-3  
Test Date: 11/28/2018



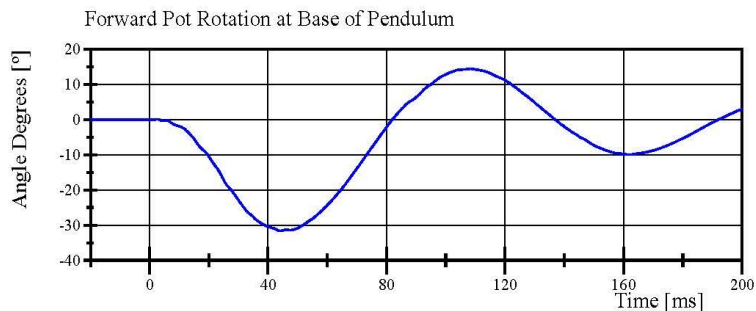
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 08:36:13 680

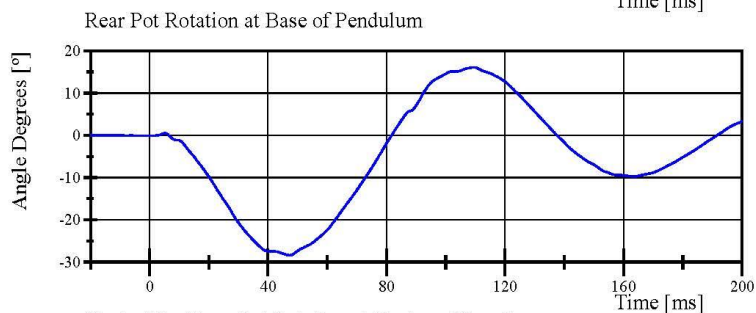


# Transportation Research Center Inc.

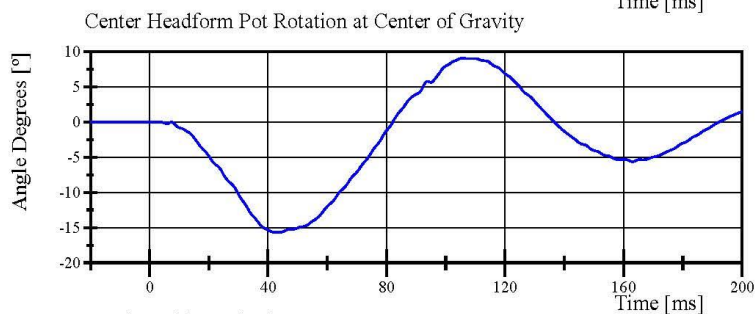
Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 59-3  
Test Date: 11/28/2018



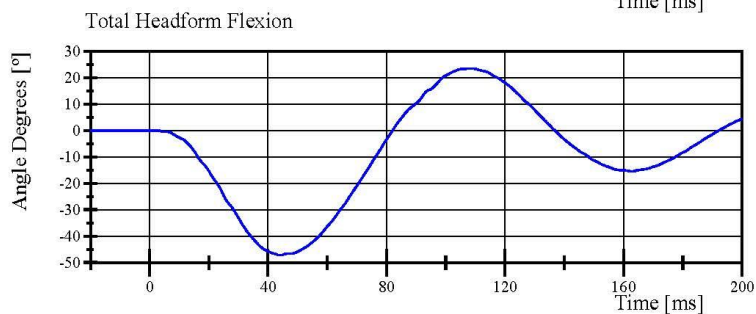
Filter Class: CFC\_180  
Max: 14.4 ° at 108.5 ms  
Min: -31.6 ° at 44.1 ms



Filter Class: CFC\_180  
Max: 16.1 ° at 109.5 ms  
Min: -28.4 ° at 47.2 ms



Filter Class: CFC\_180  
Max: 9.1 ° at 105.6 ms  
Min: -15.7 ° at 42.6 ms



Filter Class: CFC\_180  
Max: 23.5 ° at 108.5 ms  
Min: -47.2 ° at 44.1 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 08:36:14 680



## Transportation Research Center Inc.

Left Lateral Pelvis  
ES-2re Serial No. F030 Certification No. 59-2  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.34 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,229.6 N	Yes
Time of Peak	11.8 - 16.1 ms	12.80 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,377.9 N	Yes
Time of Peak	12.2 - 17.0 ms	12.88 ms	Yes

**Test meets specifications.**

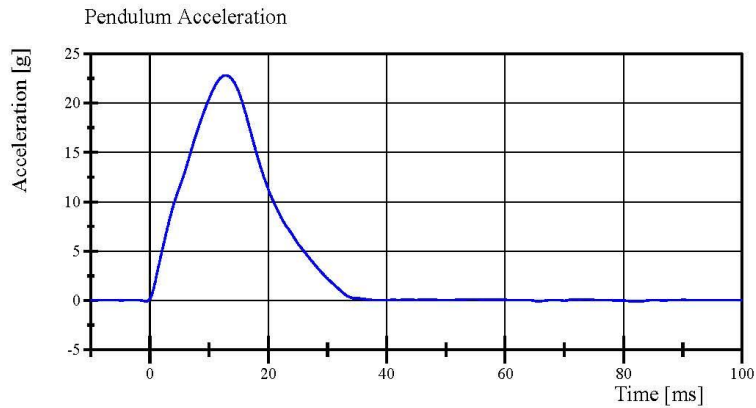
**Condition:** Used

**Comments:**

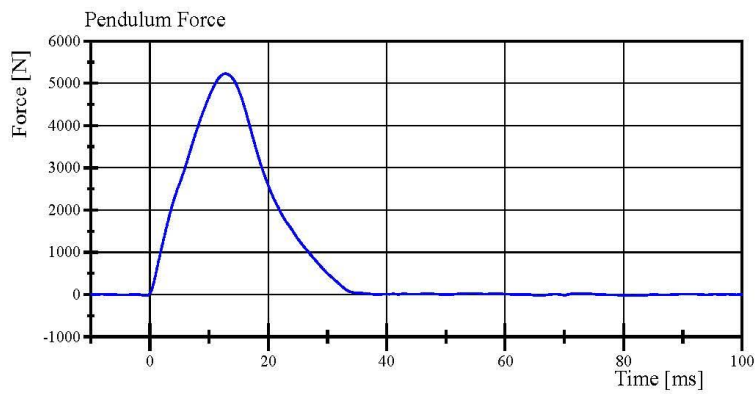
**Pelvis Skin S/N:** N/A

# Transportation Research Center Inc.

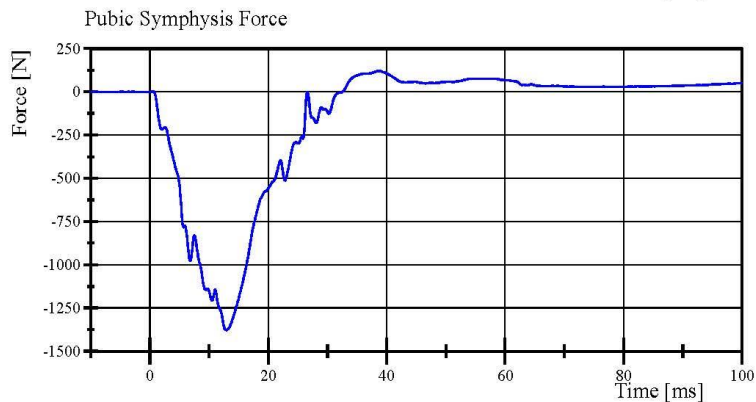
Left Lateral Pelvis  
ES-2re Serial No. F030 Certification No. 59-2  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 22.8 g at 12.8 ms  
Min: -0.1 g at -0.6 ms



Filter Class: CFC\_180  
Max: 5,229.6 N at 12.8 ms  
Min: -23.3 N at -0.6 ms



Filter Class: CFC\_600  
Max: 121.0 N at 38.6 ms  
Min: -1,377.9 N at 12.9 ms

## Transportation Research Center Inc.

Left Lateral Abdomen  
ES-2re Serial No. F030 Certification No. 59-2  
Test Date: 11/28/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	4.07 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,195.6 N	Yes
Time of Peak	10.6 - 13.0 ms	10.88 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,532.0 N	Yes
Time of Peak	10.0 - 12.3 ms	10.96 ms	Yes

**Test meets specifications.**

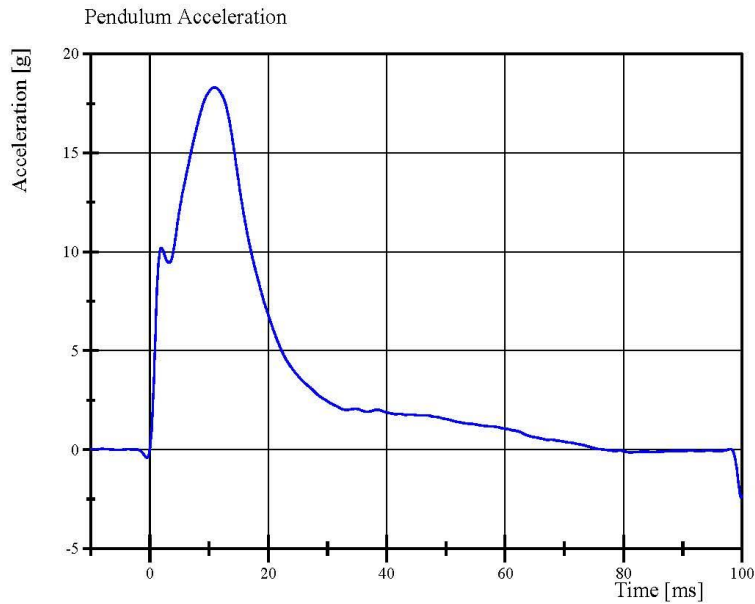
**Condition:** Used

**Comments:**

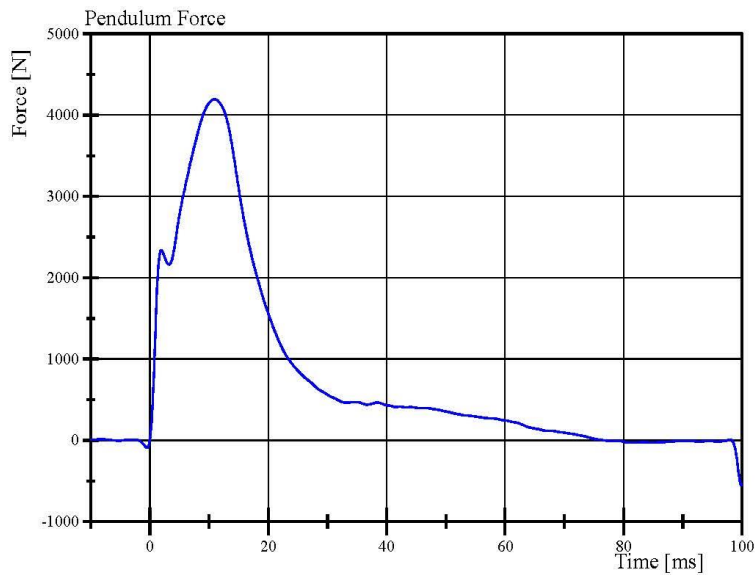
**Abdomen S/N: 1066**

# Transportation Research Center Inc.

Left Lateral Abdomen  
ES-2re Serial No. F030 Certification No. 59-2  
Test Date: 11/28/2018



Filter Class: CFC\_180  
Max: 18.3 g at 10.9 ms  
Min: -2.4 g at 99.8 ms



Filter Class: CFC\_180  
Max: 4,195.6 N at 10.9 ms  
Min: -552.3 N at 99.8 ms

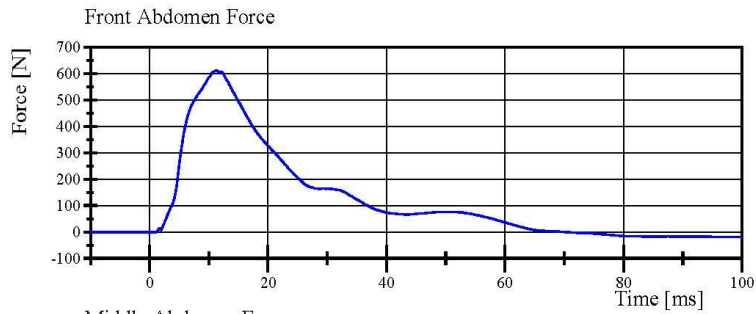
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 16:04:01 580

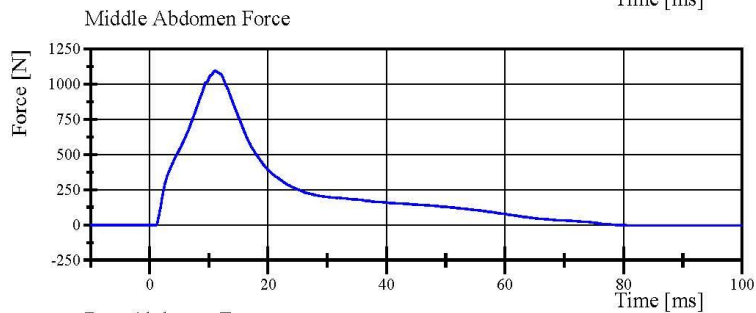


# Transportation Research Center Inc.

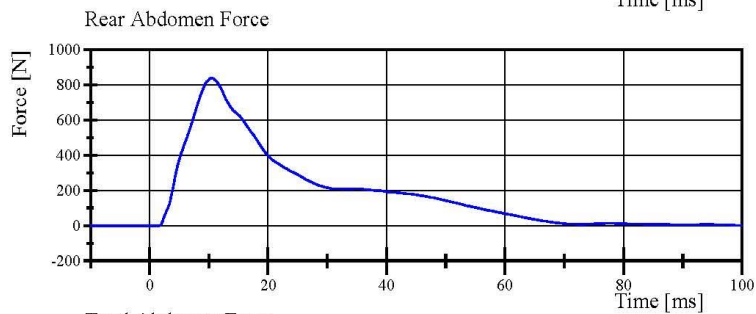
Left Lateral Abdomen  
ES-2re Serial No. F030 Certification No. 59-2  
Test Date: 11/28/2018



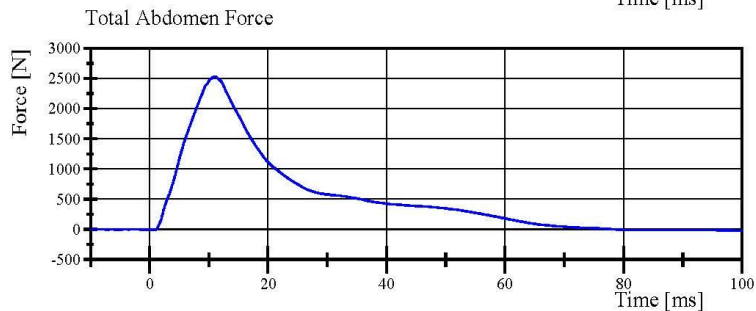
Filter Class: CFC\_600  
Max: 611.4 N at 11.2 ms  
Min: -19.1 N at 99.9 ms



Filter Class: CFC\_600  
Max: 1,093.8 N at 11.0 ms  
Min: -4.0 N at 98.6 ms



Filter Class: CFC\_600  
Max: 839.0 N at 10.4 ms  
Min: -0.2 N at -5.9 ms



Filter Class: CFC\_600  
Max: 2,532.0 N at 11.0 ms  
Min: -22.1 N at 100.0 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

11.28.2018 16:04:01 580



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

**Transportation Research Center Inc.**  
**572U ES-2re Dummy**  
**External Dimensions**  
**Serial No. F030 Calibration No. 60**

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	347	Yes
4	Seat to Hip Joint (center of bolt)	97.0 - 103.0	97	Yes
5	Sole to Seat, Sitting	433.0 - 451.0	445	Yes
6	Head Width	152.0 - 158.0	155	Yes
7	Shoulder/Arm Width	461.0 - 479.0	475	Yes
8	Thorax Width	322.0 - 332.0	328	Yes
9	Abdomen Width	273.0 - 287.0	280	Yes
10	Pelvis Lap Width	359.0 - 373.0	367	Yes
11	Head Depth	196.0 - 206.0	201	Yes
12	Thorax Depth	262.0 - 272.0	262	Yes
13	Abdomen Depth	194.0 - 204.0	199	Yes
14	Pelvis Depth	235.0 - 245.0	242	Yes
15	Back of Buttocks to Hip Joint (center of bolt)	150.0 - 160.0	156	Yes
16	Back of Buttocks to Front of Knee	597.0 - 615.0	605	Yes

Baseline 10/07/05



## Transportation Research Center Inc.

Left Lateral Head Drop  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Peak Resultant Acceleration	125 - 155 g	142.4 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	9.4 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	Yes	Yes	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Head Skin S/N: DP6812**

## Transportation Research Center Inc.

Left Lateral Neck  
ES-2re Serial No. F030 Certification No. 60-3  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.43 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-52.4 deg	Yes
Time of Peak	54 - 66 ms	59.5 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	57.0 ms	Yes

**Test meets specifications.**

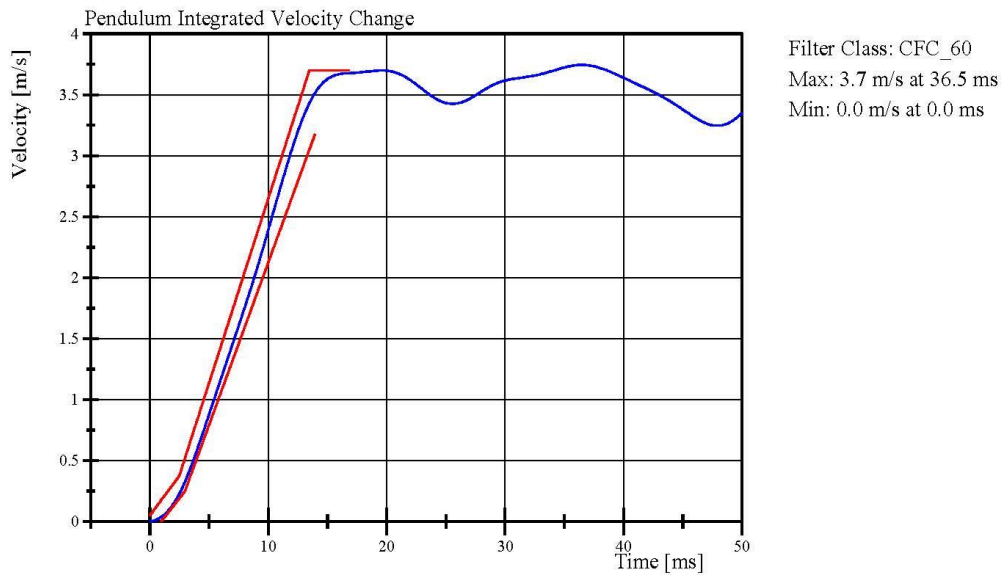
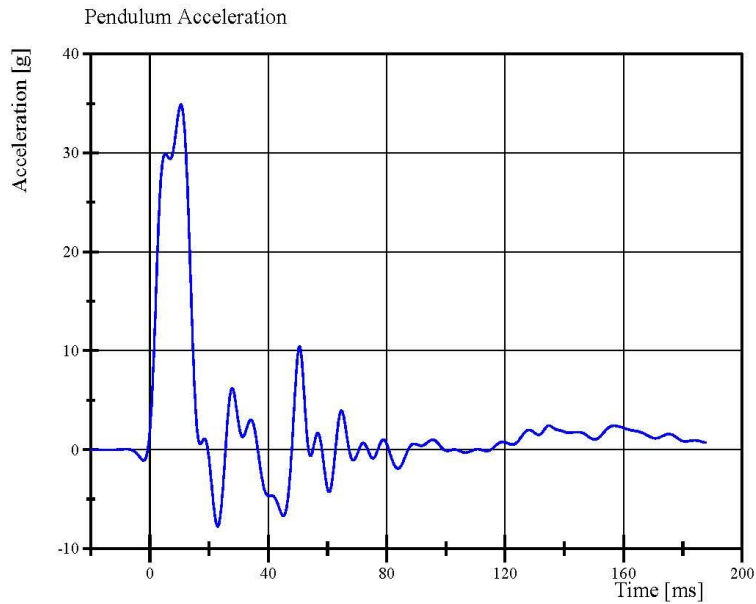
**Condition:** Used

**Comments:**

**Neck S/N:** DS5463

# Transportation Research Center Inc.

Left Lateral Neck  
ES-2re Serial No. F030 Certification No. 60-3  
Test Date: 1/10/2019



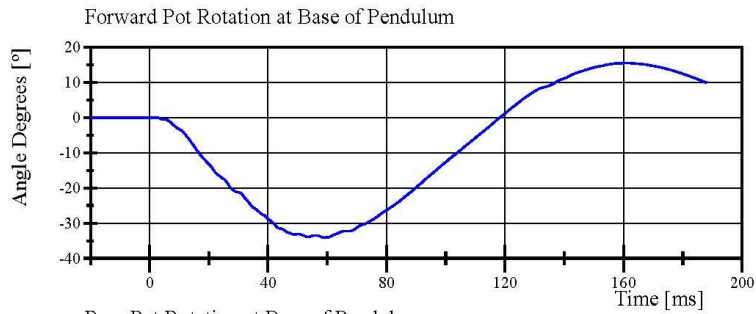
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 12:50:40 1474

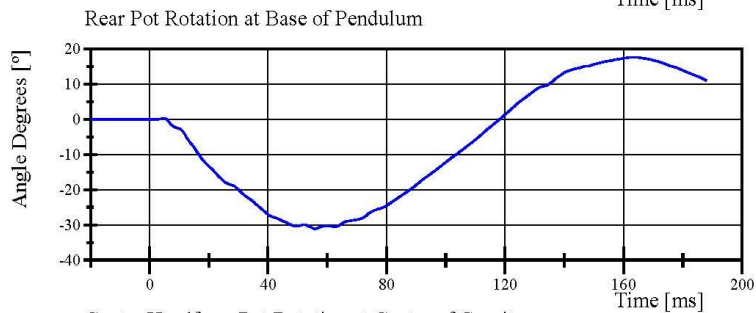


# Transportation Research Center Inc.

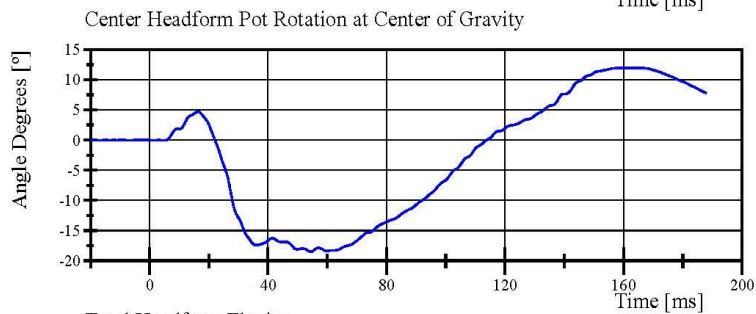
Left Lateral Neck  
ES-2re Serial No. F030 Certification No. 60-3  
Test Date: 1/10/2019



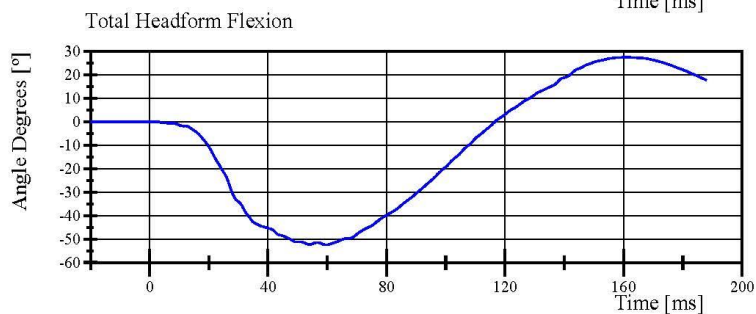
Filter Class: CFC\_180  
Max: 15.5 ° at 161.3 ms  
Min: -34.1 ° at 59.1 ms



Filter Class: CFC\_180  
Max: 17.7 ° at 163.4 ms  
Min: -31.1 ° at 55.8 ms



Filter Class: CFC\_180  
Max: 12.0 ° at 165.8 ms  
Min: -18.5 ° at 54.5 ms



Filter Class: CFC\_180  
Max: 27.5 ° at 161.3 ms  
Min: -52.4 ° at 59.5 ms

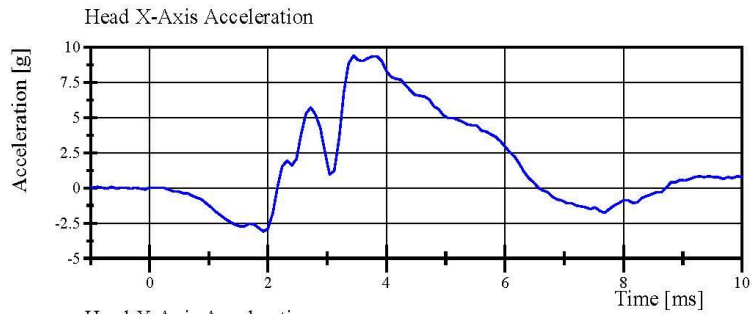
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 12:50:40 1474

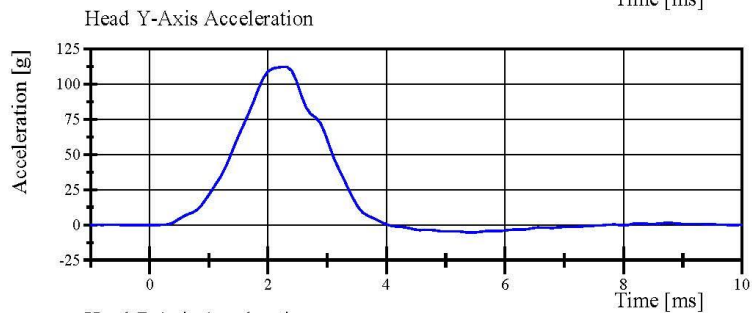


# Transportation Research Center Inc.

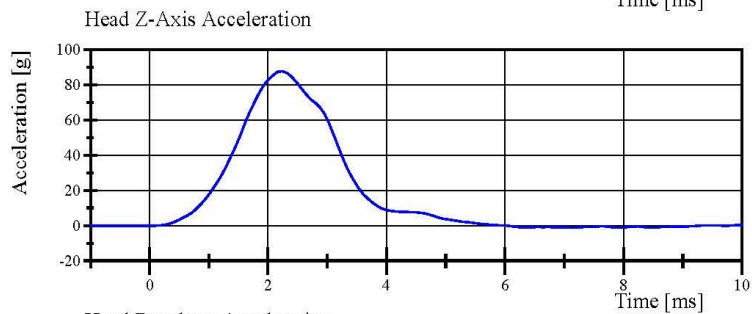
Left Lateral Head Drop  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



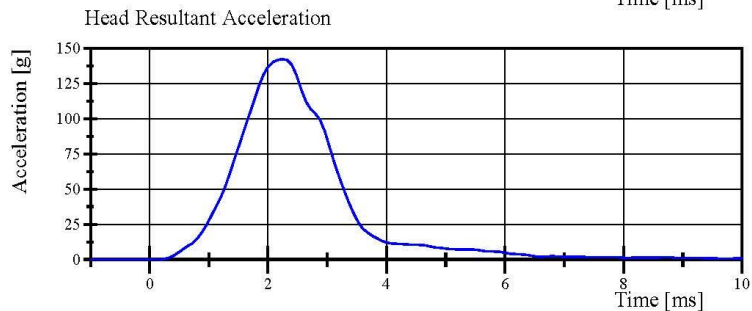
Filter Class: CFC\_1000  
Max: 9.4 g at 3.4 ms  
Min: -3.1 g at 1.9 ms



Filter Class: CFC\_1000  
Max: 112.2 g at 2.2 ms  
Min: -5.4 g at 5.4 ms



Filter Class: CFC\_1000  
Max: 87.7 g at 2.2 ms  
Min: -1.2 g at 7.9 ms



Filter Class: CFC\_1000  
Max: 142.4 g at 2.2 ms  
Min: 0.0 g at -1.0 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:15 359



## Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-10.44 g	Yes

**Test meets specifications.**

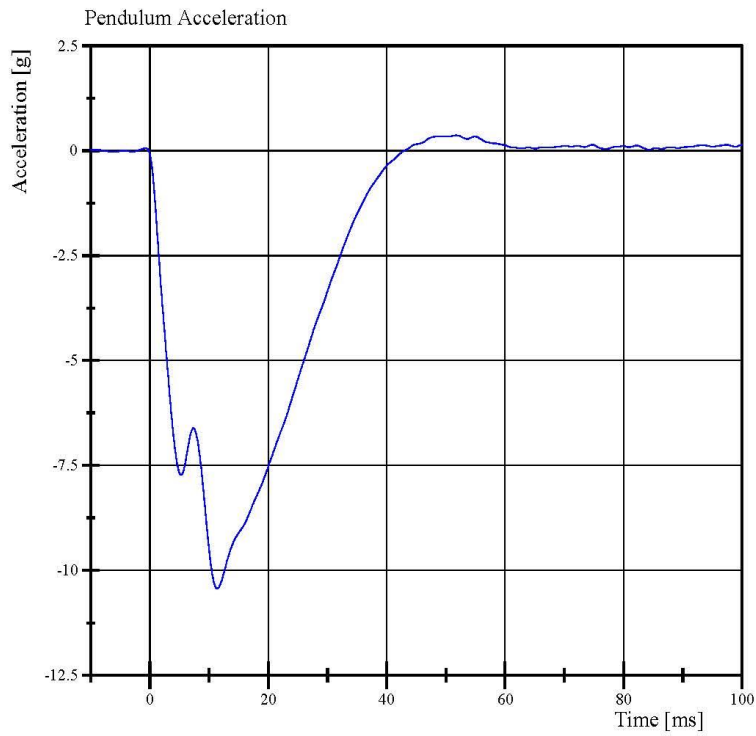
**Condition: Used**

**Comments:**

**Arm S/N: 175-3501-07014**

# Transportation Research Center Inc.

Left Lateral Shoulder  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019



Filter Class: CFC\_180  
Max: 0.4 g at 51.8 ms  
Min: -10.4 g at 11.4 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 09:18:38 577



## Transportation Research Center Inc.

3.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.2 mm	Yes

**Test meets specifications.**

**Condition: Used**

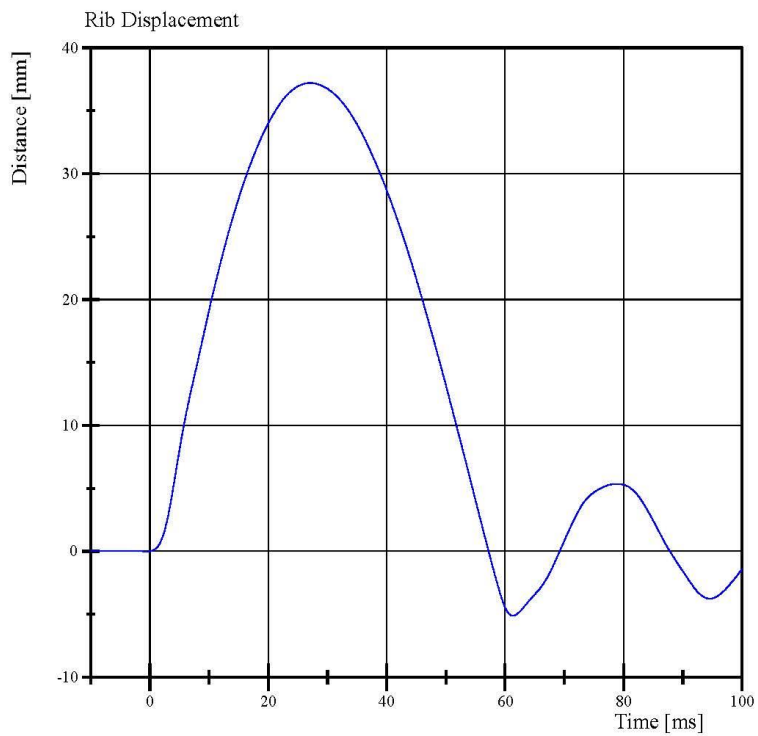
**Comments:**

**Drop Height: 462mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

3.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 37.2 mm at 27.1 ms  
Min: -5.1 mm at 61.3 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:27 584



## Transportation Research Center Inc.

4.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	46.2 mm	Yes

**Test meets specifications.**

**Condition: Used**

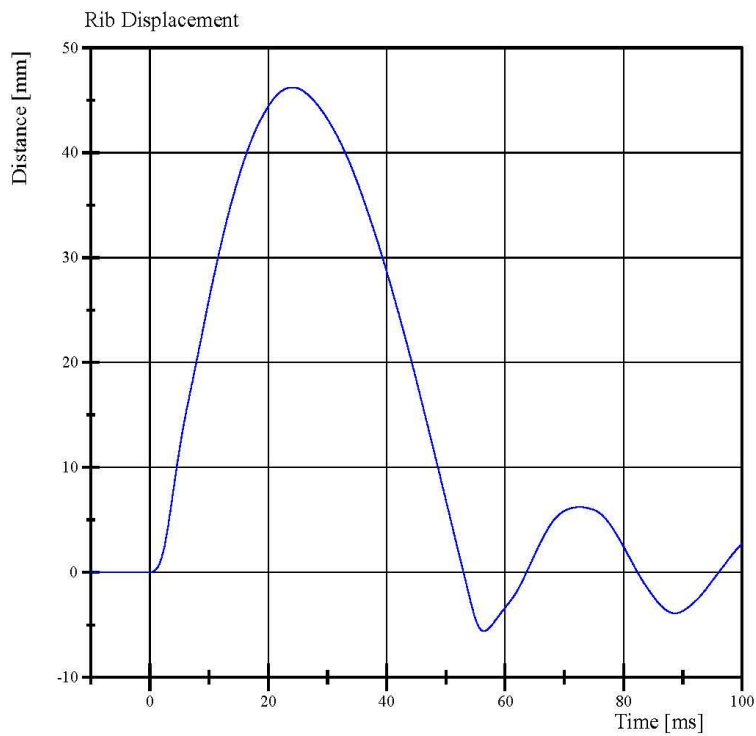
**Comments:**

**Drop Height: 816mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

4.0 m/s Upper Upper Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 46.2 mm at 24.1 ms  
Min: -5.6 mm at 56.4 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:20 477



## Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.7 mm	Yes

**Test meets specifications.**

**Condition: Used**

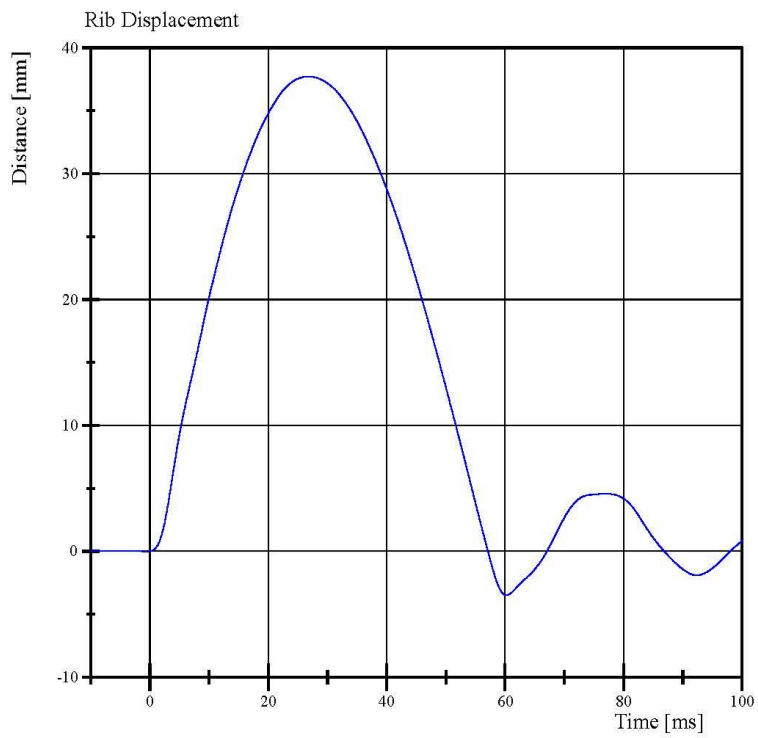
**Comments:**

**Drop Height: 462 mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

3.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 37.7 mm at 26.8 ms  
Min: -3.5 mm at 60.2 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:40 573



## Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	48.6 mm	Yes

**Test meets specifications.**

**Condition: Used**

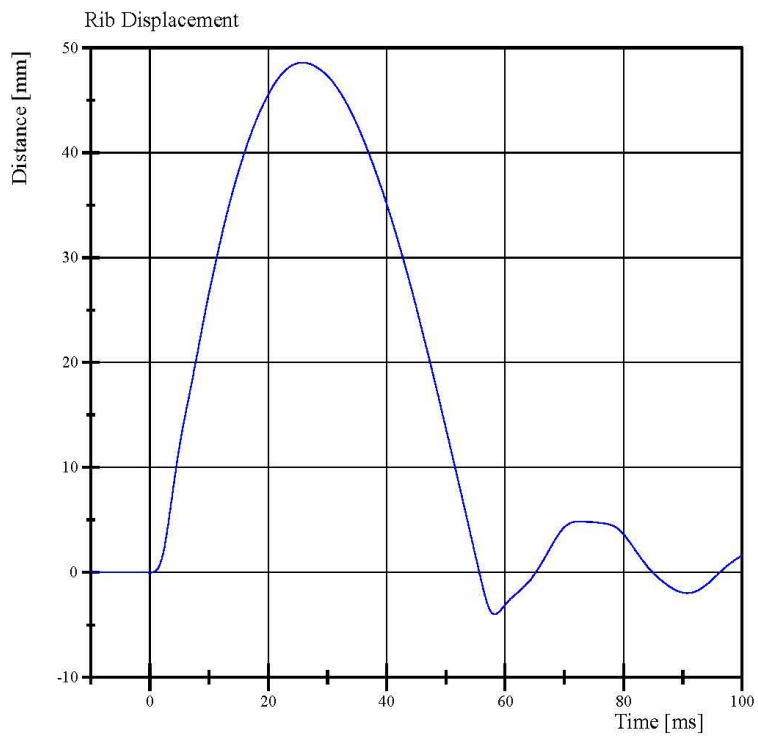
**Comments:**

**Drop Height: 816 mm**

**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

4.0 m/s Center Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 48.6 mm at 25.8 ms  
Min: -4.0 mm at 58.2 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:32 466



## Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.3 mm	Yes

**Test meets specifications.**

**Condition: Used**

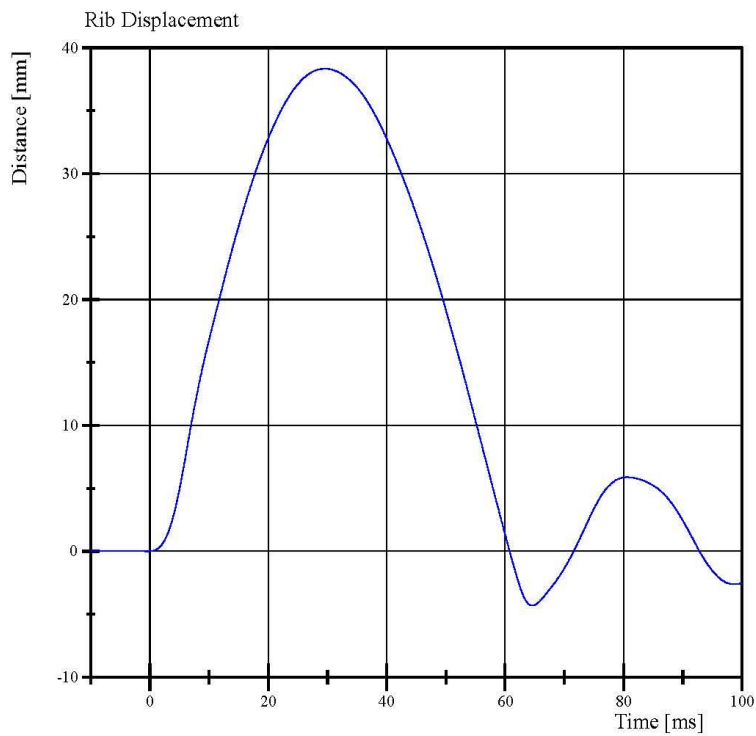
**Comments:**

**Drop Height: 462 mm**

**Rib Module: 175-4008-A-06-017**

# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 38.3 mm at 29.6 ms  
Min: -4.3 mm at 64.6 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:50 549



## Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	49.3 mm	Yes

**Test meets specifications.**

**Condition: Used**

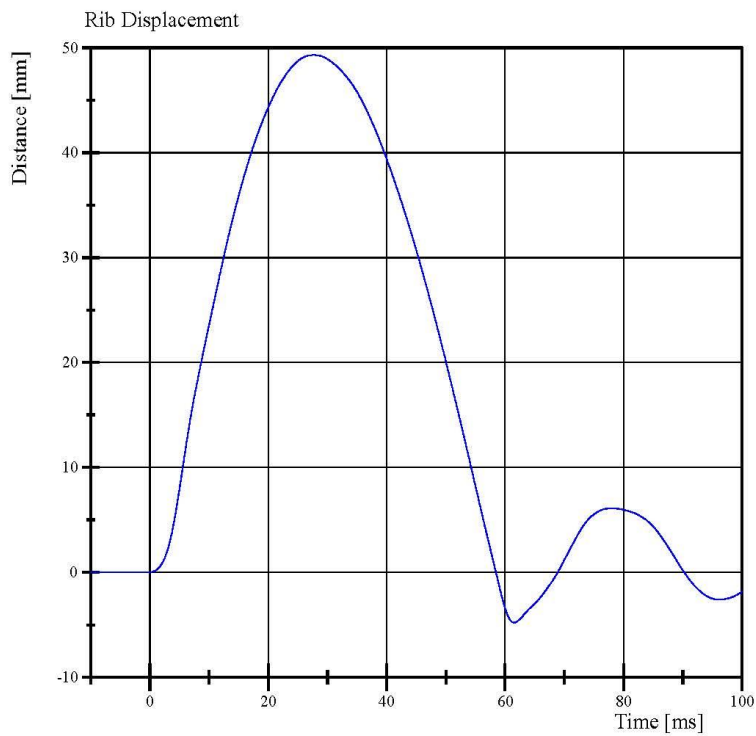
**Comments:**

**Drop Height: 816 mm**

**Rib Module: 175-4008-A-06-017**

# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 49.3 mm at 27.7 ms  
Min: -4.8 mm at 61.5 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.10.2019 08:44 451



## Transportation Research Center Inc.

Left Lower Thorax  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019

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	5.493 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,487.8 N	Yes
Upper Rib Displacement	34 - 41 mm	38.0 mm	Yes
Center Rib Displacement	37 - 45 mm	42.7 mm	Yes
Lower Rib Displacement	37 - 44 mm	41.7 mm	Yes

**Test meets specifications.**

**Condition:** Used

**Comments:**

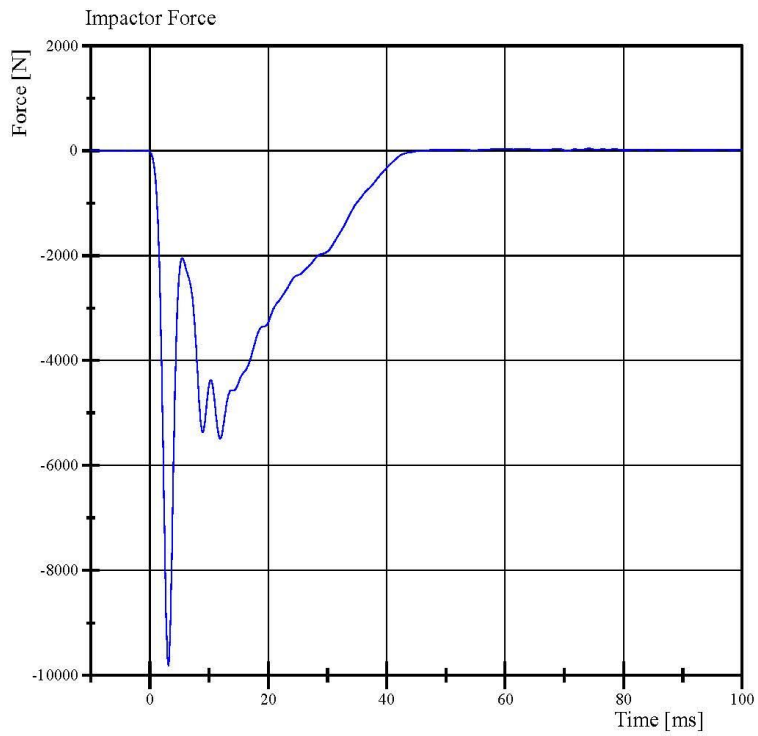
**Upper Rib Module S/N: 175-4008-A**

**Middle Rib Module S/N: 175-4008-A**

**Lower Rib Module S/N: 175-4008-A-06-017**

# Transportation Research Center Inc.

Left Lower Thorax  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019



Filter Class: CFC\_180  
Max: 40.2 N at 74.2 ms  
Min: -9,813.9 N at 3.1 ms

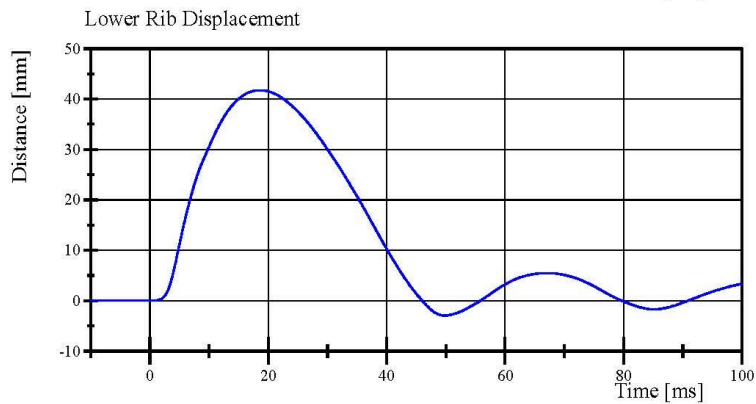
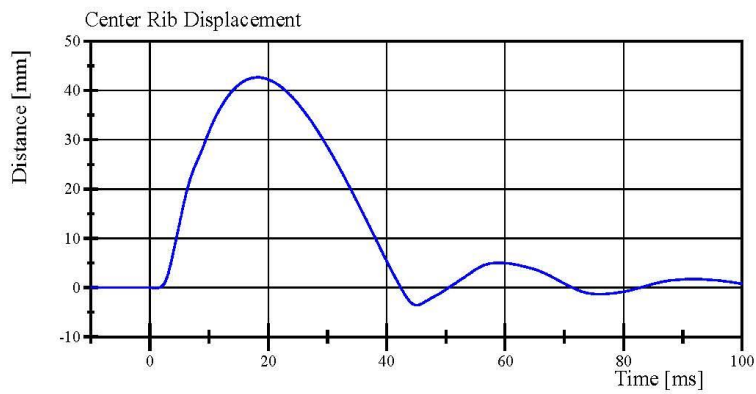
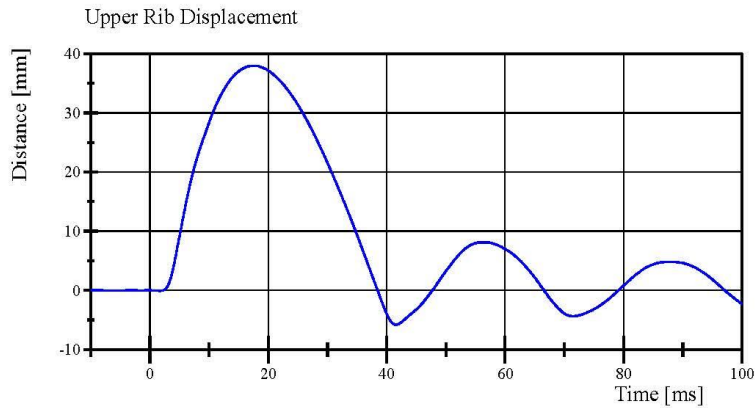
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 09:36:03 457



# Transportation Research Center Inc.

Left Lower Thorax  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019



Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 09:36:04 457



## Transportation Research Center Inc.

Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 60-5  
Test Date: 1/11/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.117 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-48.1 deg	Yes
Time of Peak	39 - 53 ms	45.0 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	37.9 ms	Yes

**Test meets specifications.**

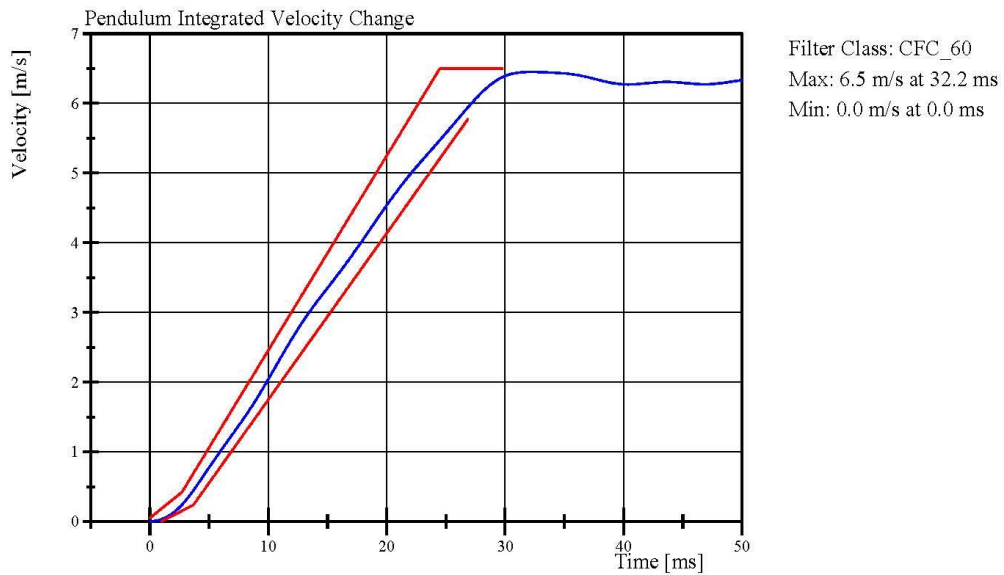
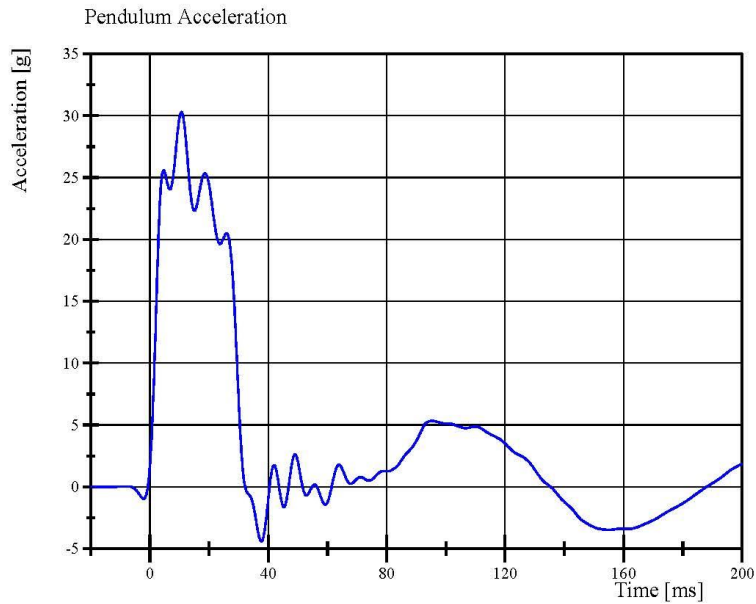
**Condition:** Used

**Comments:**

**Lumbar S/N: DM3011**

# Transportation Research Center Inc.

Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 60-5  
Test Date: 1/11/2019



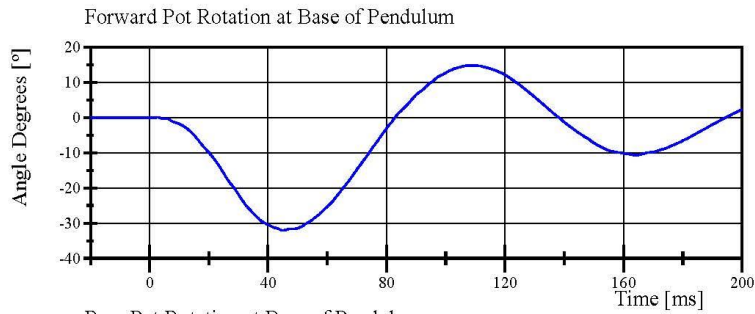
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 07:07:22 669

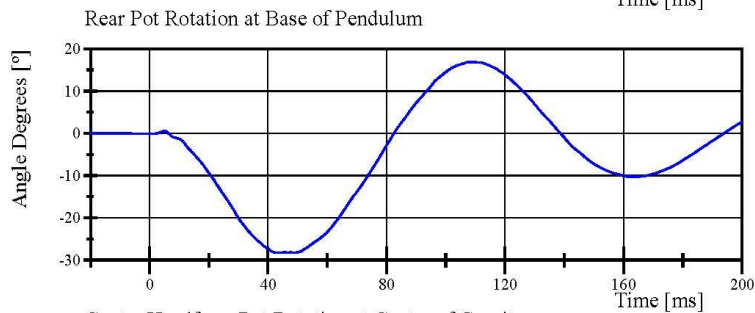


# Transportation Research Center Inc.

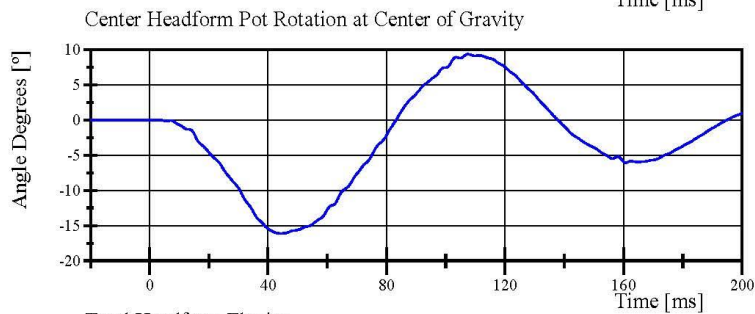
Left Lateral Lumbar  
ES-2re Serial No. F030 Certification No. 60-5  
Test Date: 1/11/2019



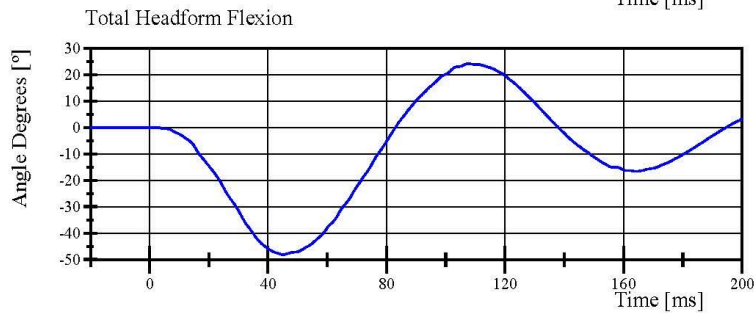
Filter Class: CFC\_180  
Max: 14.8 ° at 109.9 ms  
Min: -32.0 ° at 45.0 ms



Filter Class: CFC\_180  
Max: 16.9 ° at 108.4 ms  
Min: -28.2 ° at 43.3 ms



Filter Class: CFC\_180  
Max: 9.4 ° at 107.4 ms  
Min: -16.1 ° at 44.3 ms



Filter Class: CFC\_180  
Max: 24.2 ° at 107.5 ms  
Min: -48.1 ° at 45.0 ms

Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 07:07:23 669



## Transportation Research Center Inc.

Left Lateral Abdomen  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	4.07 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,248.1 N	Yes
Time of Peak	10.6 - 13.0 ms	11.60 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,480.5 N	Yes
Time of Peak	10.0 - 12.3 ms	10.80 ms	Yes

**Test meets specifications.**

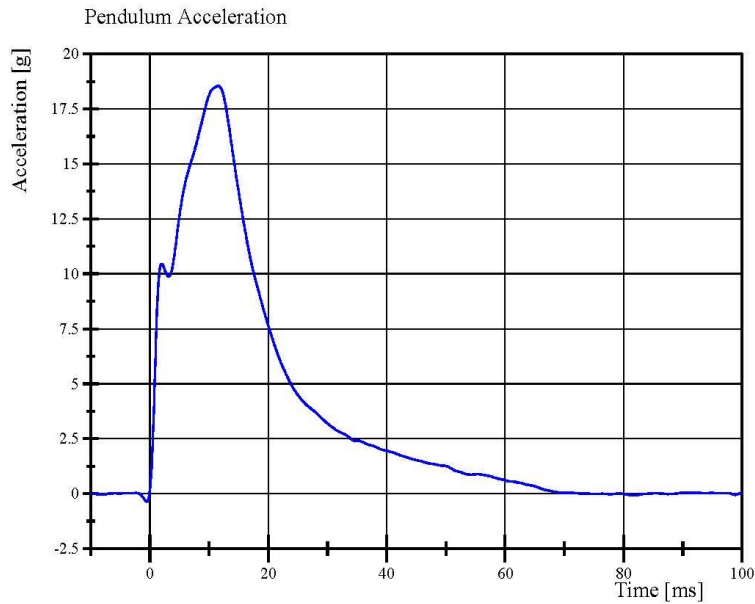
**Condition: Used**

**Comments:**

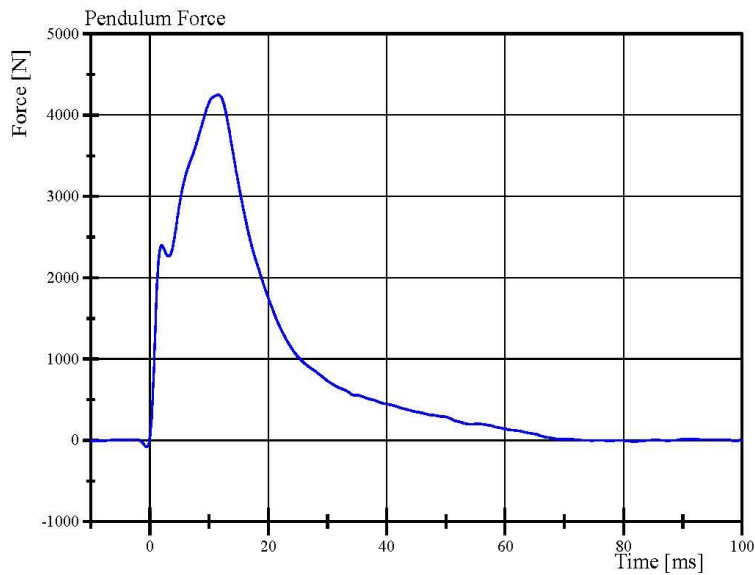
**Abdomen S/N: 1066**

# Transportation Research Center Inc.

Left Lateral Abdomen  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019



Filter Class: CFC\_180  
Max: 18.5 g at 11.6 ms  
Min: -0.4 g at -0.6 ms



Filter Class: CFC\_180  
Max: 4,248.1 N at 11.6 ms  
Min: -80.8 N at -0.6 ms

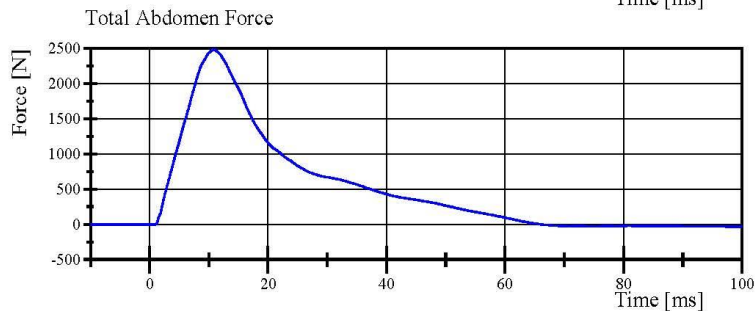
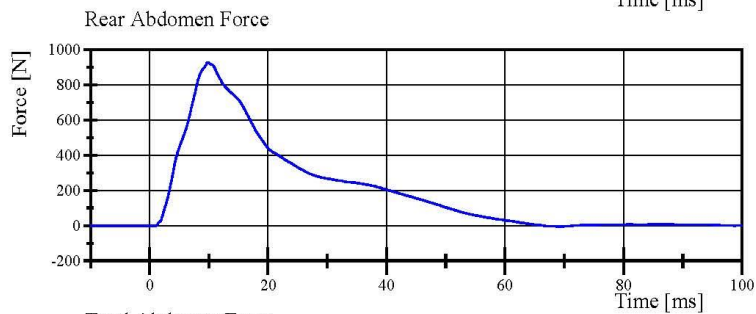
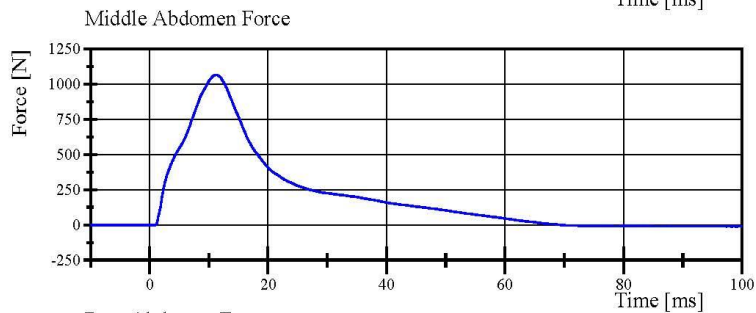
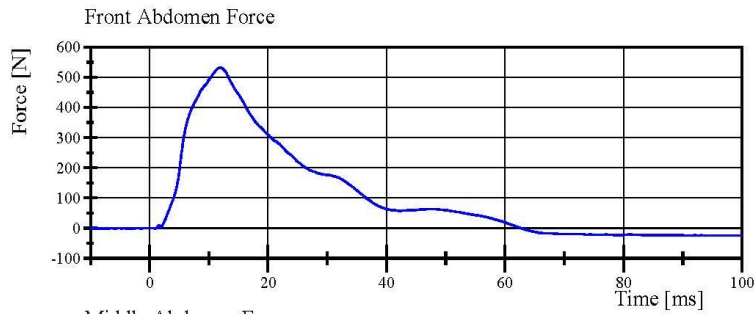
Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 10:00:13 596



# Transportation Research Center Inc.

Left Lateral Abdomen  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019



Specification Source: CFR49 Part 572 Subpart U  
with Polarity in accordance with J211

01.11.2019 10:00:14 596



## Transportation Research Center Inc.

Left Lateral Pelvis  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.36 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,236.9 N	Yes
Time of Peak	11.8 - 16.1 ms	12.64 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,286.5 N	Yes
Time of Peak	12.2 - 17.0 ms	13.52 ms	Yes

**Test meets specifications.**

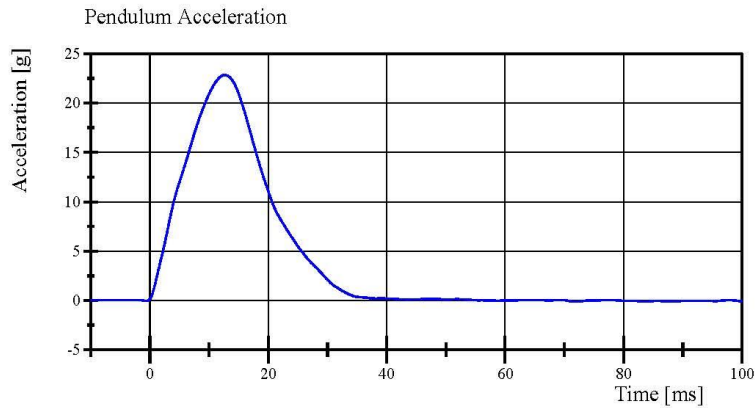
**Condition:** Used

**Comments:**

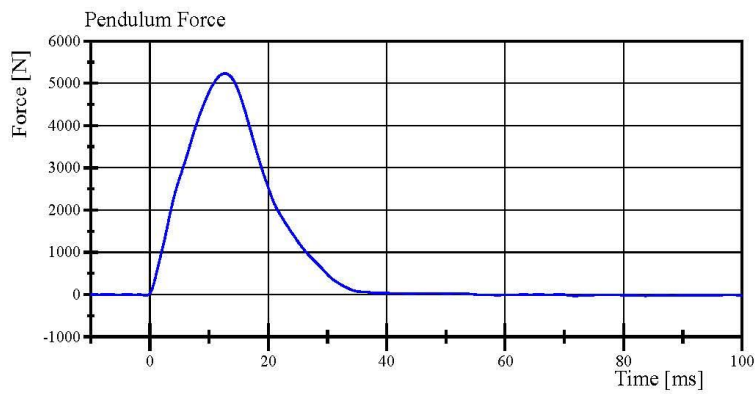
**Pelvis Skin S/N:** N/A

# Transportation Research Center Inc.

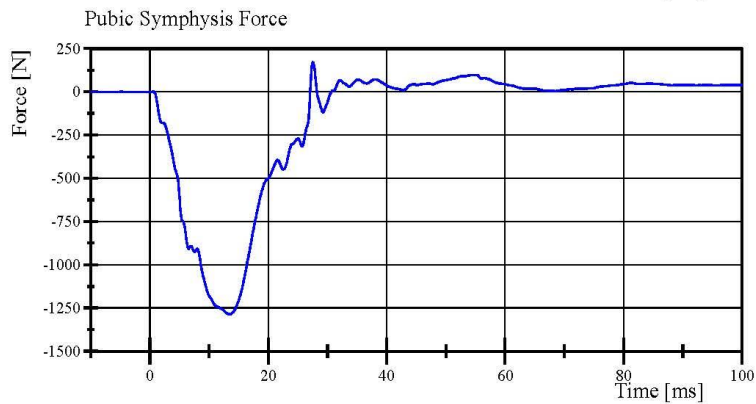
Left Lateral Pelvis  
ES-2re Serial No. F030 Certification No. 60-1  
Test Date: 1/11/2019



Filter Class: CFC\_180  
Max: 22.9 g at 12.6 ms  
Min: -0.1 g at 71.8 ms



Filter Class: CFC\_180  
Max: 5,236.9 N at 12.6 ms  
Min: -31.5 N at 71.8 ms



Filter Class: CFC\_600  
Max: 171.0 N at 27.5 ms  
Min: -1,286.5 N at 13.5 ms

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

**Transportation Research Center Inc.**  
**SIDI's Dummy - Level D**  
**External Dimensions**  
**Serial No. 305 Calibration No. 67**

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	782	Yes
B	Shoulder Pivot Height	437.0 - 453.0	448	Yes
C	H-Point Height	79.0 - 89.0	86	Yes
D	H-Point from Seat Back	141.0 - 151.0	146	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	101	Yes
F	Thigh Clearance	119.0 - 135.0	130	Yes
G	Head Breadth	140.0 - 148.0	143	Yes
H	Head Back from Backline	40.0 - 46.0	44	Yes
I	Head Depth	178.0 - 188.0	185	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	348	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	396	Yes
N	Buttock Popliteal Length	416.0 - 442.0	434	Yes
O	Chest Depth without Jacket	195.0 - 211.0	197	Yes
P	Foot Length (right)	216.0 - 232.0	222	Yes
P	Foot Length (left)	216.0 - 232.0	220	Yes
Q	Hip Breadth	313.0 - 323.0	320	Yes
R	Arm Length	249.0 - 259.0	252	Yes
S	Knee Joint to seat Back	478.0 - 493.0	482	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	351	Yes
W	Foot Width (right)	78.0 - 94.0	85	Yes
W	Foot Width (left)	78.0 - 94.0	85	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	877	Yes
Z	Waist Circumference	761.0 - 791.0	780	Yes

## Transportation Research Center Inc.

Left Lateral Head Drop  
SID IIS Serial No. 305 Certification No. 67-1  
Test Date: 11/30/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	121.6 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	2.9 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	Yes	Yes	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

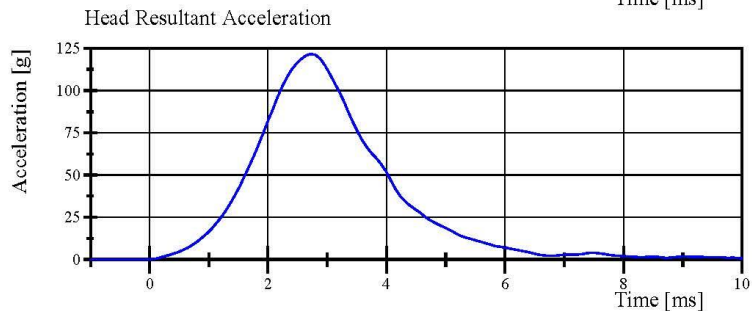
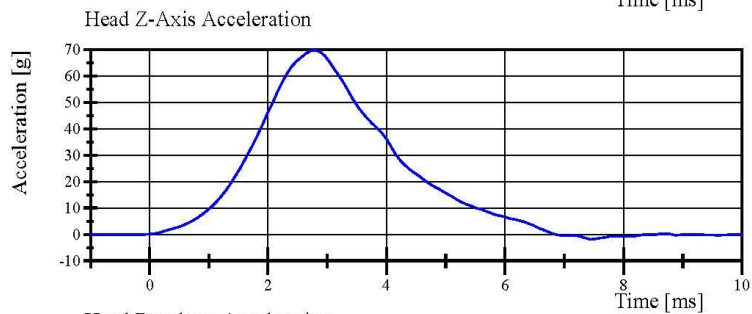
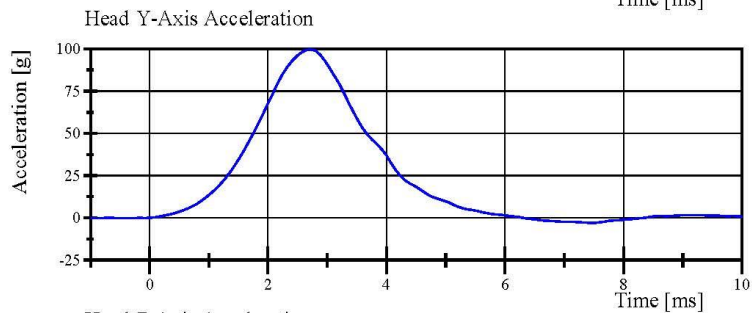
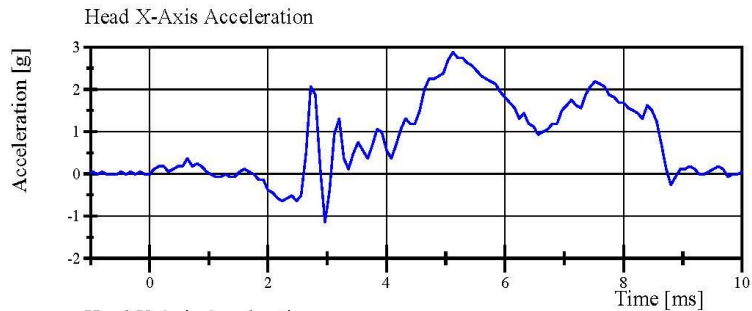
**Head Skin S/N: 1253**

# Transportation Research Center Inc.

Left Lateral Head Drop

SID IIS Serial No. 305 Certification No. 67-1

Test Date: 11/30/2018



Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

11.30.2018 07:28:29 233



## Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 305 Certification No. 67-3

Test Date: 11/30/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.569 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.552 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.805 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.010 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.856 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.862 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-72.5 deg	Yes
Time of Peak	50 - 70 ms	68.6 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	37.7 N·m	Yes
Total Neck Occipital Condyles Moment			
Decay Time to 0 N·m	102 - 126 ms	121.8 ms	Yes

**Test meets specifications.**

**Condition:** Used

**Comments:**

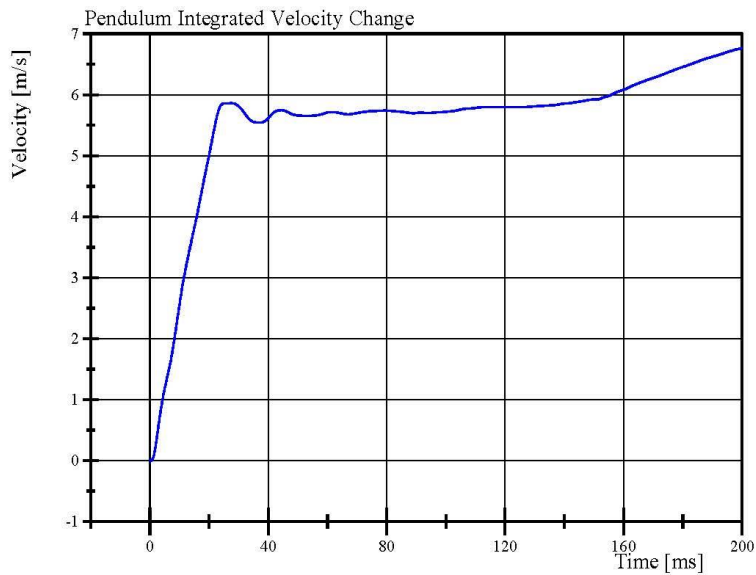
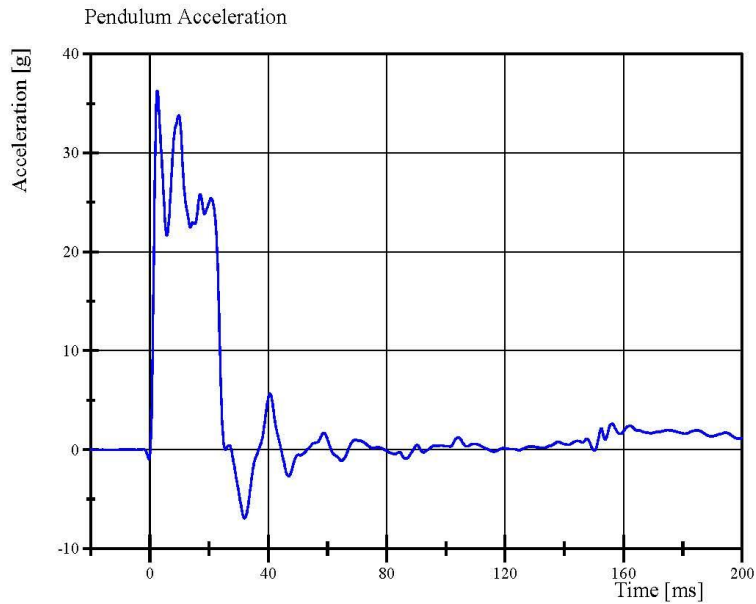
**Neck S/N: 180-2001-606**

# Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 305 Certification No. 67-3

Test Date: 11/30/2018



Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

11.30.2018 12:52:31 748

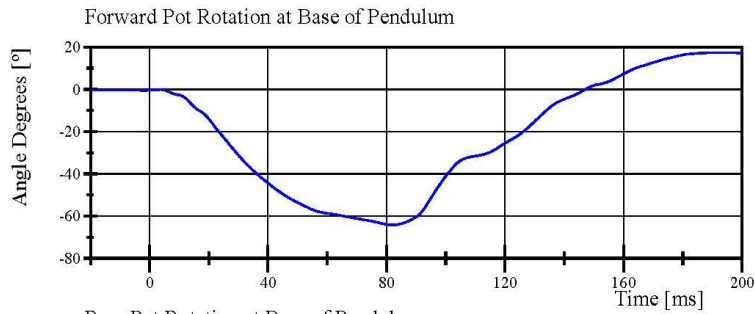


# Transportation Research Center Inc.

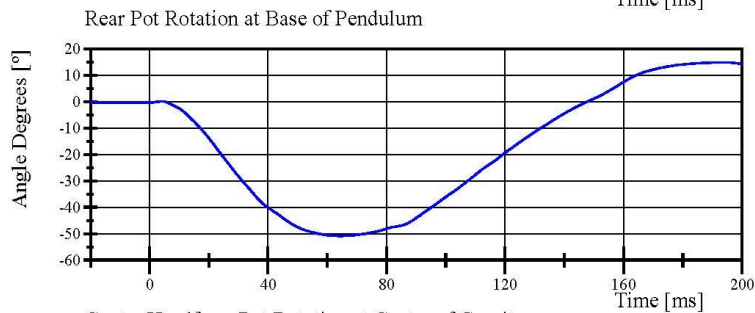
Left Lateral Neck

SID IIs Serial No. 305 Certification No. 67-3

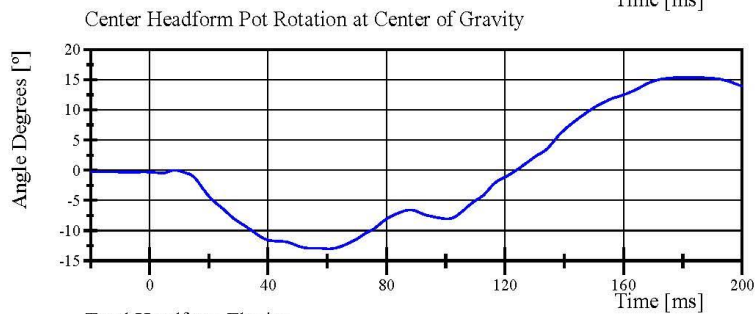
Test Date: 11/30/2018



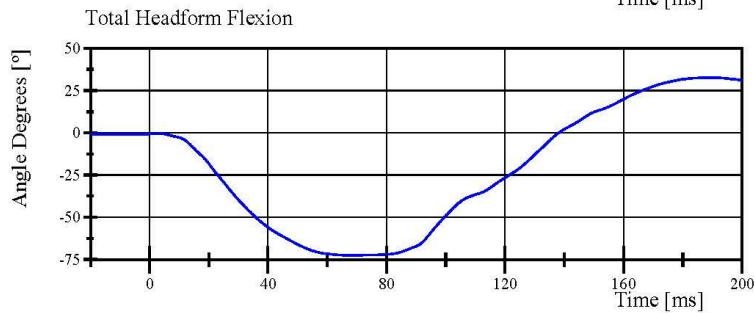
Filter Class: CFC\_60  
Max: 17.4 ° at 192.2 ms  
Min: -64.1 ° at 82.0 ms



Filter Class: CFC\_60  
Max: 14.9 ° at 193.5 ms  
Min: -50.9 ° at 64.3 ms



Filter Class: CFC\_60  
Max: 15.4 ° at 180.6 ms  
Min: -13.0 ° at 60.4 ms



Filter Class: CFC\_60  
Max: 32.7 ° at 189.7 ms  
Min: -72.5 ° at 68.6 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

11.30.2018 12:52:32 748

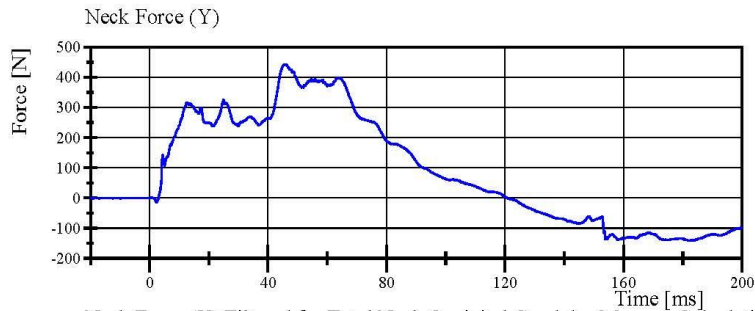


# Transportation Research Center Inc.

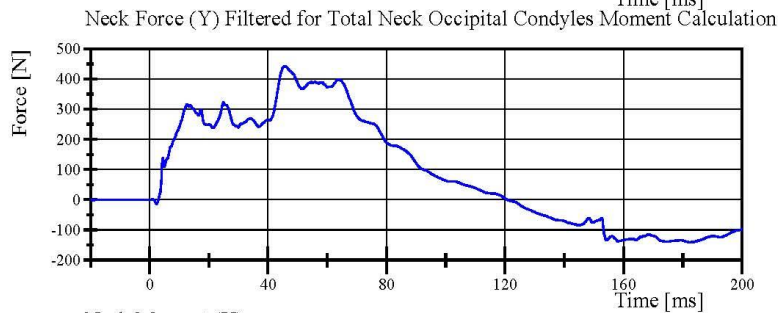
Left Lateral Neck

SID IIS Serial No. 305 Certification No. 67-3

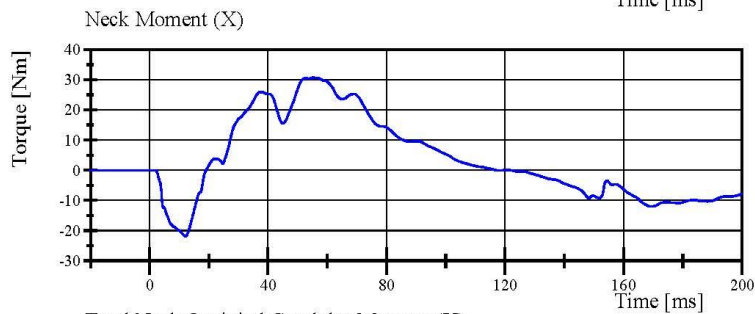
Test Date: 11/30/2018



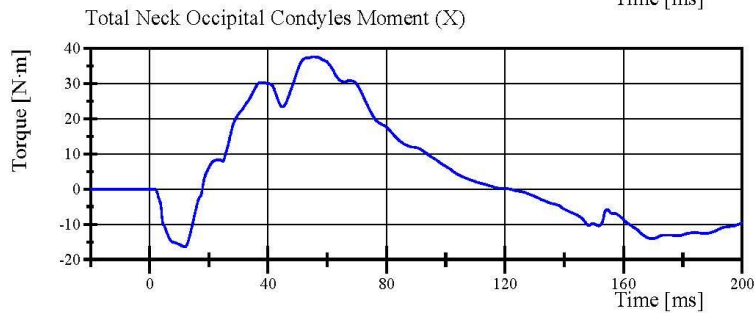
Filter Class: CFC\_1000  
Max: 443.0 N at 45.7 ms  
Min: -141.3 N at 182.6 ms



Filter Class: CFC\_600  
Max: 442.3 N at 45.6 ms  
Min: -140.6 N at 182.5 ms



Filter Class: CFC\_600  
Max: 30.8 Nm at 55.1 ms  
Min: -21.8 Nm at 12.1 ms



Filter Class: Without\_(Consta  
Max: 37.7 N.m at 55.2 ms  
Min: -16.4 N.m at 11.9 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

11.30.2018 12:52:33 748



## Transportation Research Center Inc.

Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 67-1  
Test Date: 11/30/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.29 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.7 g	Yes
Shoulder Displacement	28 - 37 mm	28.9 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	19.7 g	Yes

**Test meets specifications.**

**Condition: Used**

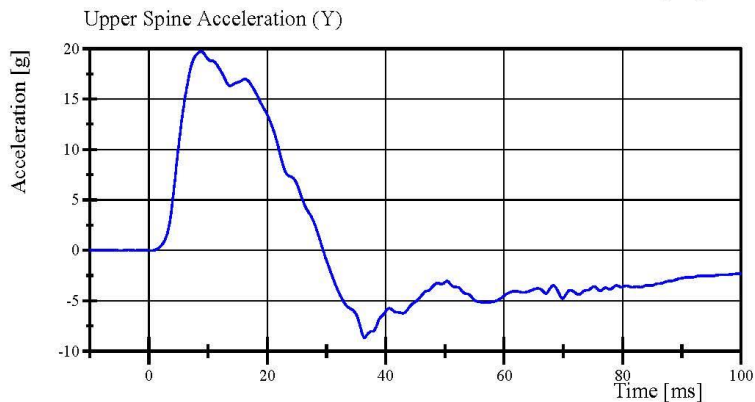
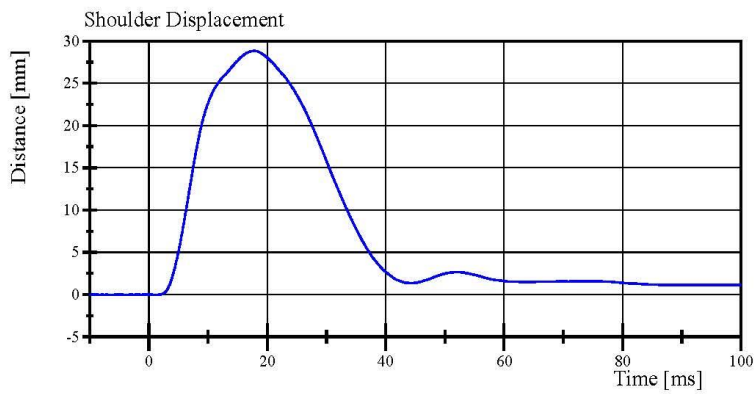
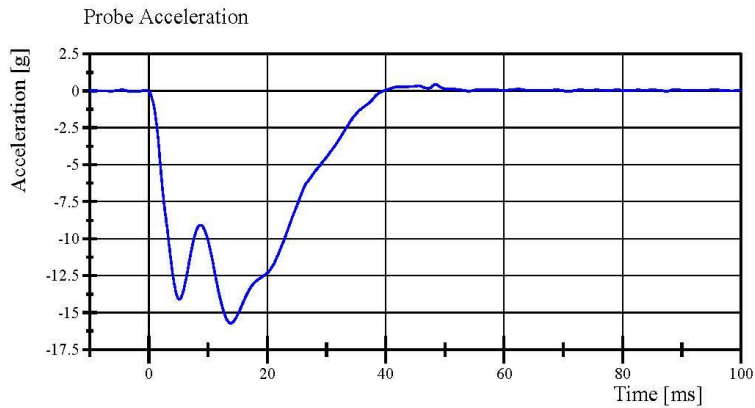
**Comments:**

**Left Arm S/N: 952**

**Shoulder Rib S/N: 180-3355 169**

# Transportation Research Center Inc.

Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 67-1  
Test Date: 11/30/2018



Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

12.03.2018 10:07:37 843



## Transportation Research Center Inc.

Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 67-2  
Test Date: 12/3/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.749 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-32.7 g	Yes
Shoulder Displacement	31 - 40 mm	33.2 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	26.9 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	32.9 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	36.1 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	39.1 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	32.3 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Left Arm S/N: 952**

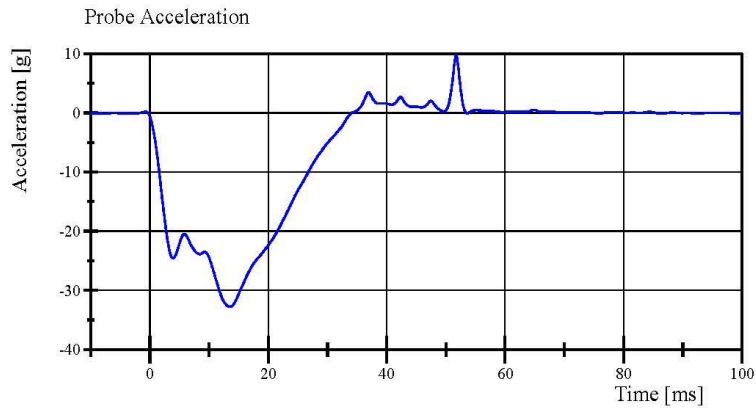
**Upper Thorax Rib S/N: 2135**

**Middle Thorax Rib S/N: 2136**

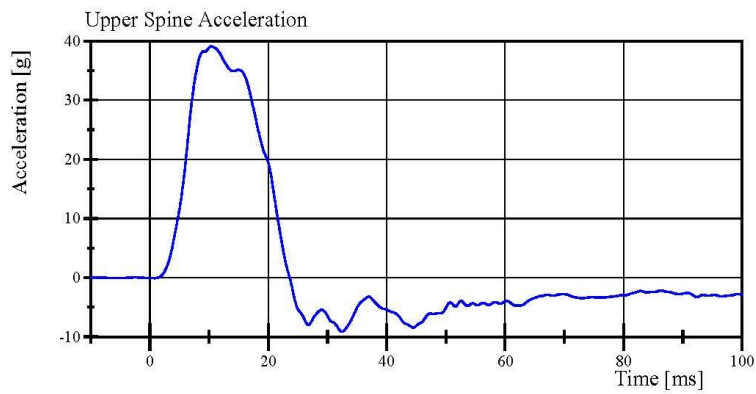
**Lower Thorax Rib S/N: 2137**

# Transportation Research Center Inc.

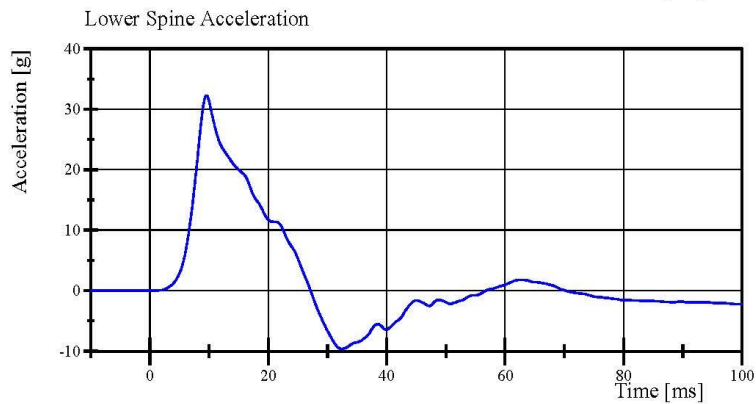
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 67-2  
Test Date: 12/3/2018



Filter Class: CFC\_180  
Max: 9.8 g at 51.8 ms  
Min: -32.7 g at 13.5 ms



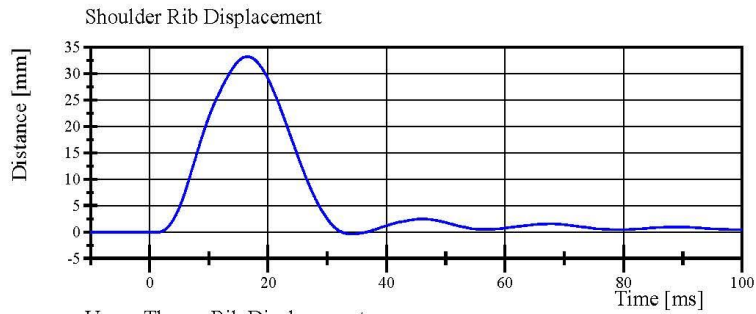
Filter Class: CFC\_180  
Max: 39.1 g at 10.4 ms  
Min: -9.1 g at 32.5 ms



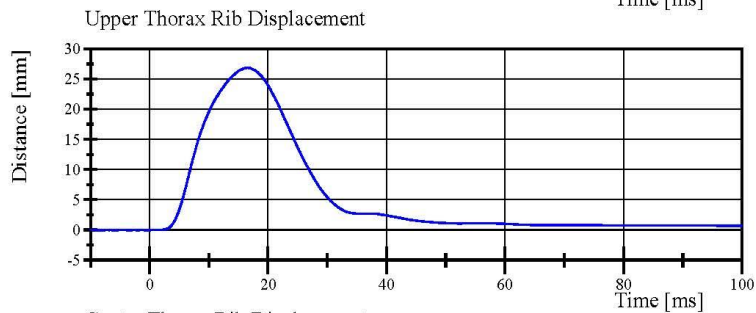
Filter Class: CFC\_180  
Max: 32.3 g at 9.5 ms  
Min: -9.6 g at 32.5 ms

# Transportation Research Center Inc.

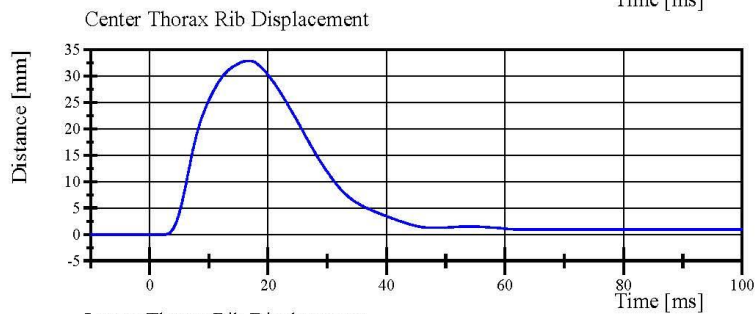
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 67-2  
Test Date: 12/3/2018



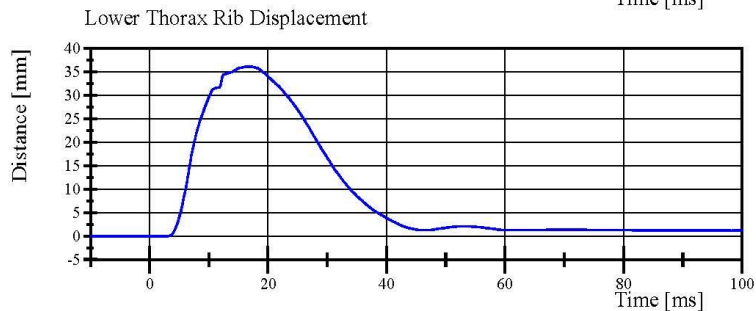
Filter Class: CFC\_600  
Max: 33.2 mm at 16.5 ms  
Min: -0.4 mm at 34.2 ms



Filter Class: CFC\_600  
Max: 26.9 mm at 16.5 ms  
Min: -0.0 mm at -8.1 ms



Filter Class: CFC\_600  
Max: 32.9 mm at 16.8 ms  
Min: -0.0 mm at -5.8 ms



Filter Class: CFC\_600  
Max: 36.1 mm at 16.4 ms  
Min: -0.0 mm at -2.0 ms

## Transportation Research Center Inc.

Left Lateral Thorax without Arm  
SID IIS Serial No. 305 Certification No. 67-1  
Test Date: 11/30/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.346 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.4 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	32.7 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	39.7 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	38.8 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	14.6 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	10.9 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

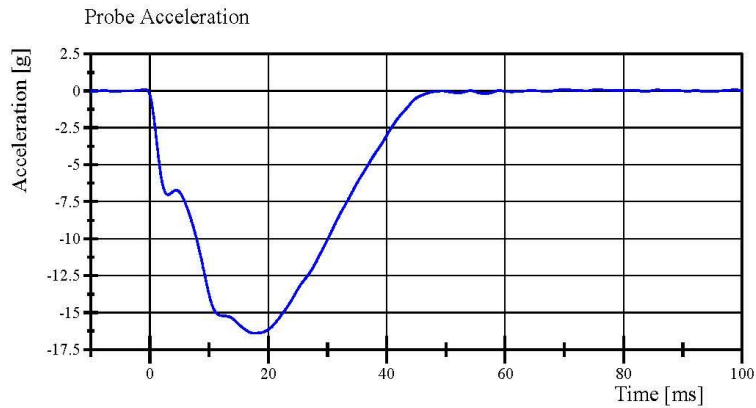
**Upper Thorax Rib S/N: 2135**

**Middle Thorax Rib S/N: 2136**

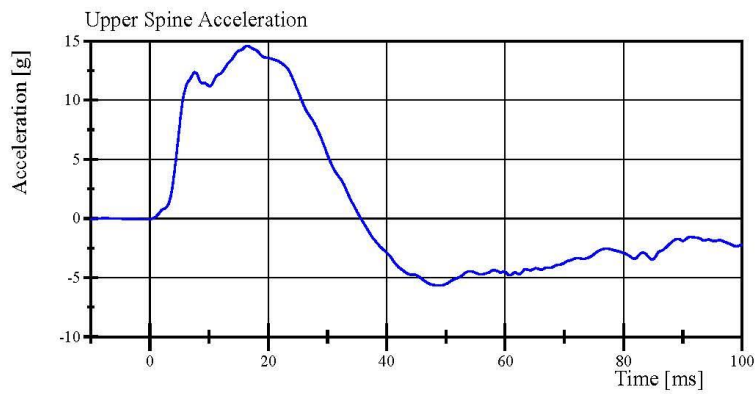
**Lower Thorax Rib S/N: 2137**

# Transportation Research Center Inc.

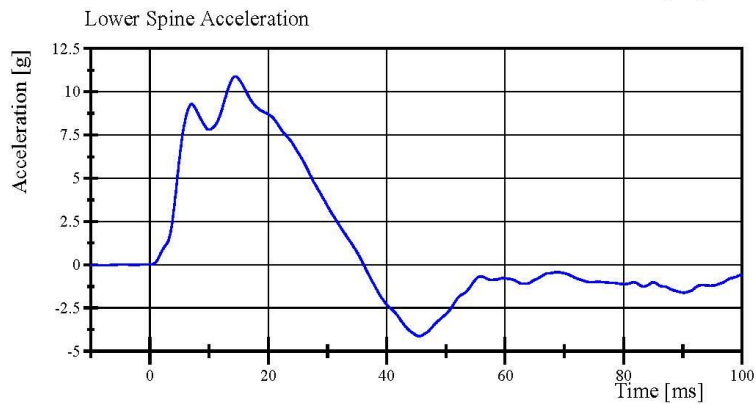
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 67-1  
Test Date: 11/30/2018



Filter Class: CFC\_180  
Max: 0.1 g at -0.8 ms  
Min: -16.4 g at 17.5 ms



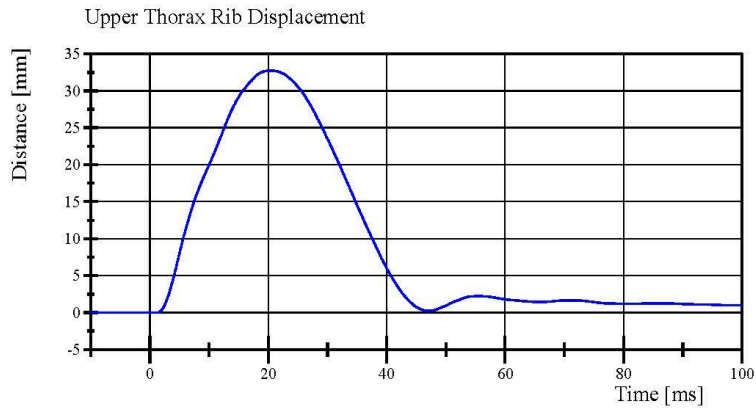
Filter Class: CFC\_180  
Max: 14.6 g at 16.5 ms  
Min: -5.6 g at 49.0 ms



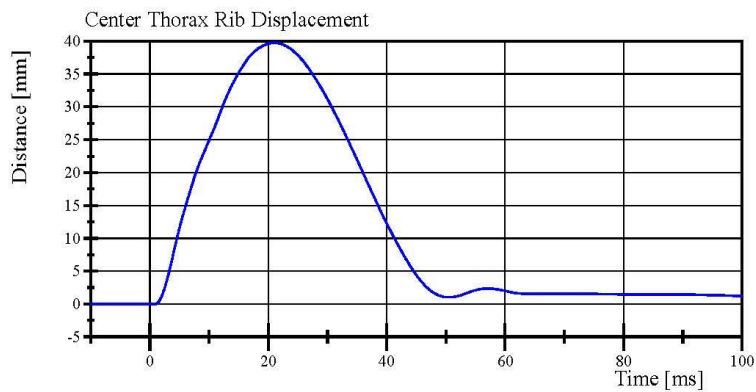
Filter Class: CFC\_180  
Max: 10.9 g at 14.5 ms  
Min: -4.1 g at 45.4 ms

# Transportation Research Center Inc.

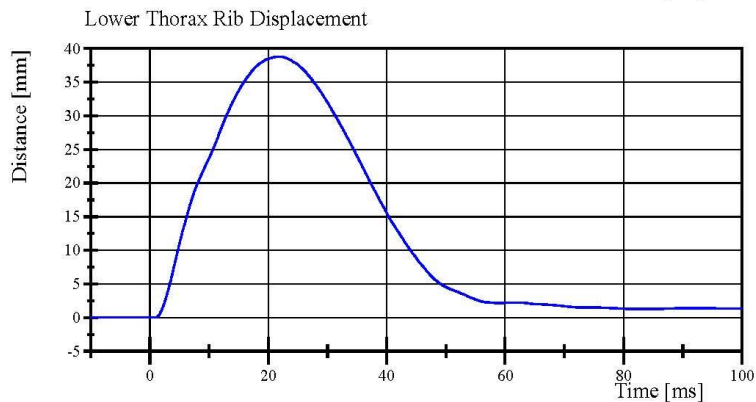
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 67-1  
Test Date: 11/30/2018



Filter Class: CFC\_600  
Max: 32.7 mm at 20.2 ms  
Min: -0.0 mm at 1.1 ms



Filter Class: CFC\_600  
Max: 39.7 mm at 21.0 ms  
Min: -0.0 mm at 0.8 ms



Filter Class: CFC\_600  
Max: 38.8 mm at 21.8 ms  
Min: -0.0 mm at -5.3 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

11.30.2018 15:59:08 829



## Transportation Research Center Inc.

Left Lateral Abdomen  
SID IIS Serial No. 305 Certification No. 67-2  
Test Date: 12/3/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.25 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-12.9 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	45.9 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	42.2 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	9.82 g	Yes

**Test meets specifications.**

**Condition:** Used

**Comments:**

**Upper Abdominal Rib S/N:** 1997

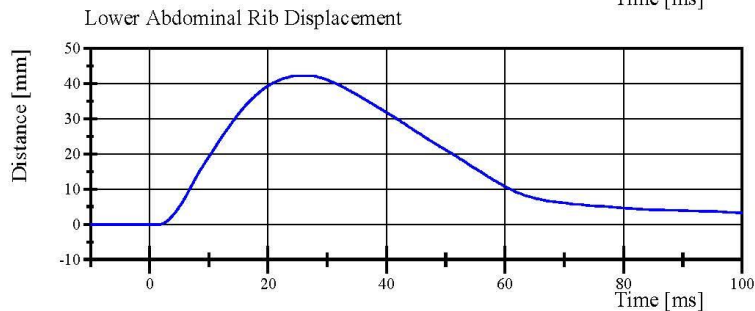
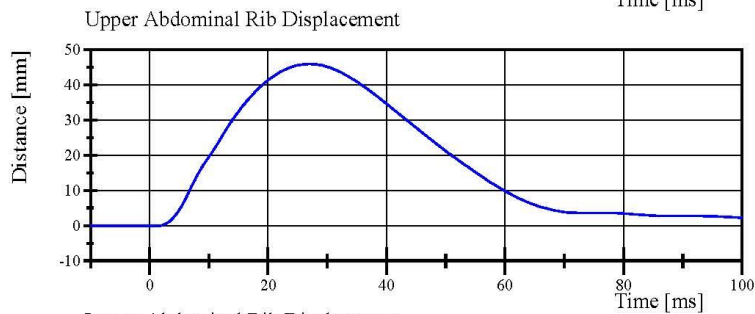
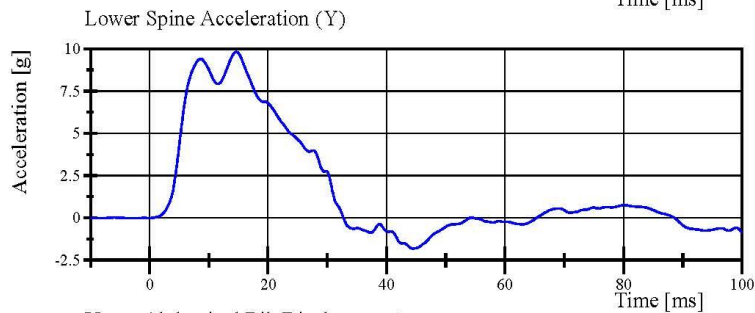
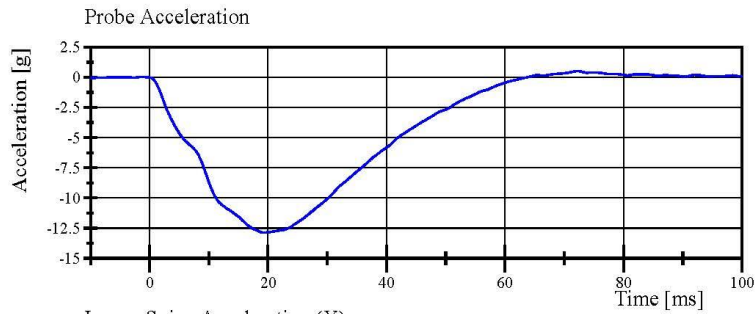
**Lower Abdominal Rib S/N:** DS1234

# Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. 305 Certification No. 67-2

Test Date: 12/3/2018



Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

12.03.2018 06:56:38 688



## Transportation Research Center Inc.

Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 67-1  
Test Date: 12/3/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.63 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-43.44 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	36.9 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,185.5 N	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Pelvis Skin S/N: 884**

**Pelvis Plug Info:**

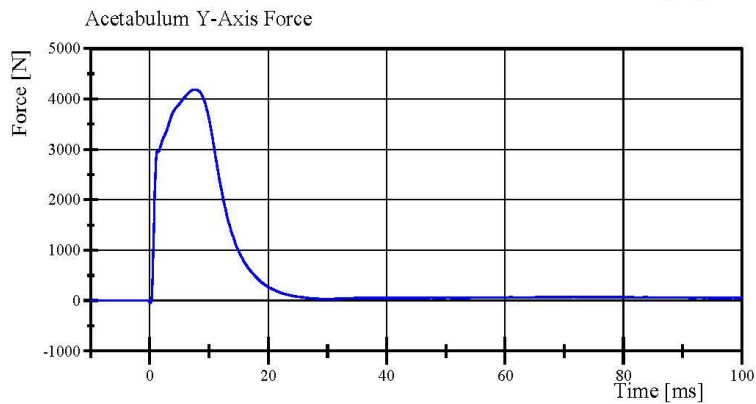
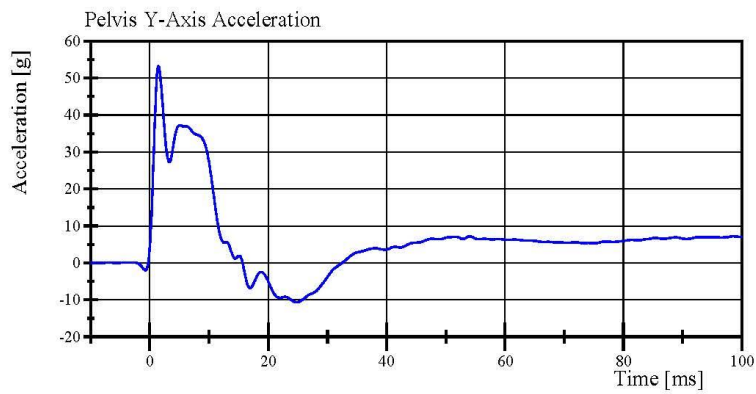
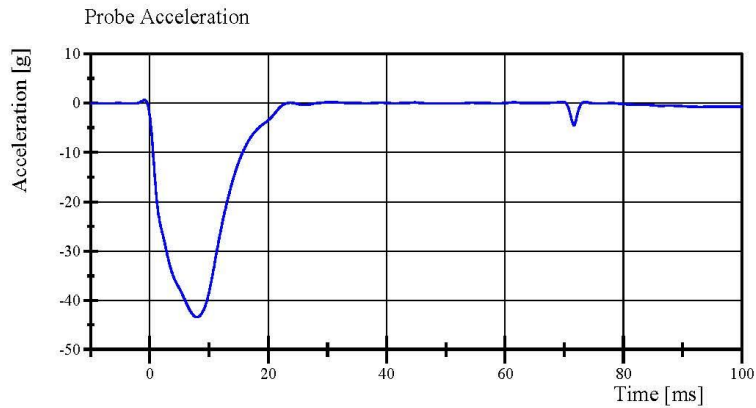
**Manufacturer: SACO**

**S/N: 12153**

**Cal Date: 20180228**

# Transportation Research Center Inc.

Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 67-1  
Test Date: 12/3/2018



Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

12.03.2018 09:58:16 487



## Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 67-1

Test Date: 11/30/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-39.0 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	31.8 g	Yes
Iliac Force	4,100 - 5,100 N	4,608.4 N	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

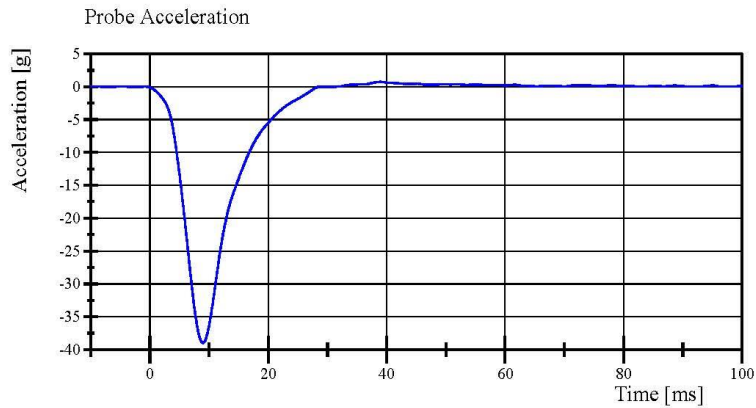
**Pelvis Skin S/N: 884**

# Transportation Research Center Inc.

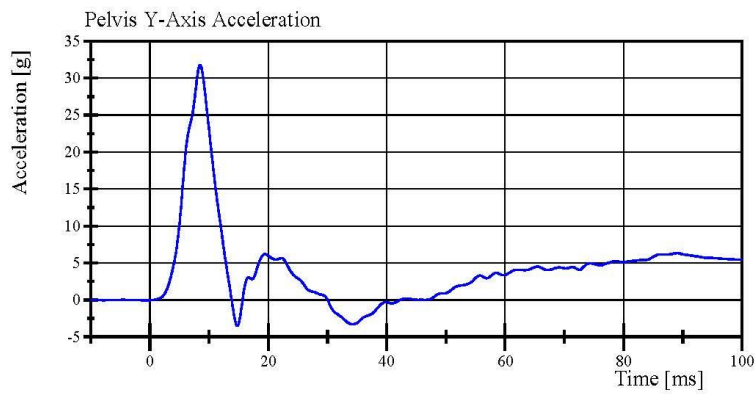
Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 67-1

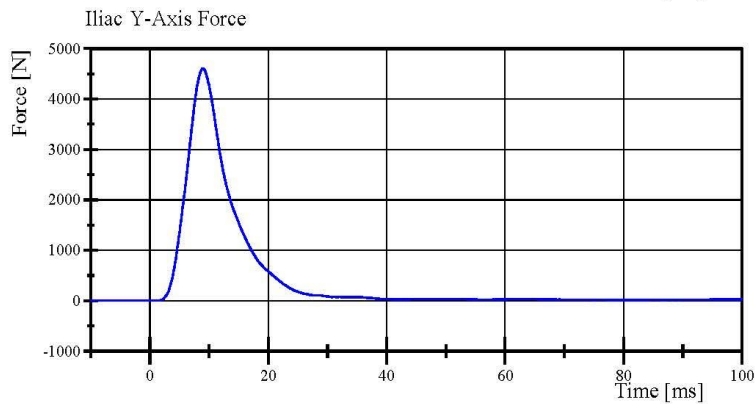
Test Date: 11/30/2018



Filter Class: CFC\_180  
Max: 0.7 g at 38.9 ms  
Min: -39.0 g at 9.0 ms



Filter Class: CFC\_180  
Max: 31.8 g at 8.5 ms  
Min: -3.5 g at 14.8 ms



Filter Class: CFC\_600  
Max: 4,608.4 N at 9.0 ms  
Min: -1.0 N at -7.7 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

11.30.2018 15:11:39 679



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

**Transportation Research Center Inc.**  
**SIDIIs Dummy - Level D**  
**External Dimensions**  
**Serial No. 305 Calibration No. 68**

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	782	Yes
B	Shoulder Pivot Height	437.0 - 453.0	448	Yes
C	H-Point Height	79.0 - 89.0	86	Yes
D	H-Point from Seat Back	141.0 - 151.0	146	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	101	Yes
F	Thigh Clearance	119.0 - 135.0	130	Yes
G	Head Breadth	140.0 - 148.0	143	Yes
H	Head Back from Backline	40.0 - 46.0	44	Yes
I	Head Depth	178.0 - 188.0	185	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	348	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	396	Yes
N	Buttock Popliteal Length	416.0 - 442.0	434	Yes
O	Chest Depth without Jacket	195.0 - 211.0	197	Yes
P	Foot Length (right)	216.0 - 232.0	222	Yes
P	Foot Length (left)	216.0 - 232.0	220	Yes
Q	Hip Breadth	313.0 - 323.0	320	Yes
R	Arm Length	249.0 - 259.0	252	Yes
S	Knee Joint to seat Back	478.0 - 493.0	482	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	351	Yes
W	Foot Width (right)	78.0 - 94.0	85	Yes
W	Foot Width (left)	78.0 - 94.0	85	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	877	Yes
Z	Waist Circumference	761.0 - 791.0	780	Yes

Revised 9/29/2005



## Transportation Research Center Inc.

Left Lateral Head Drop

SID IIS Serial No. 305 Certification No. 68-1

Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	117.8 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-2.4 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	Yes	Yes	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

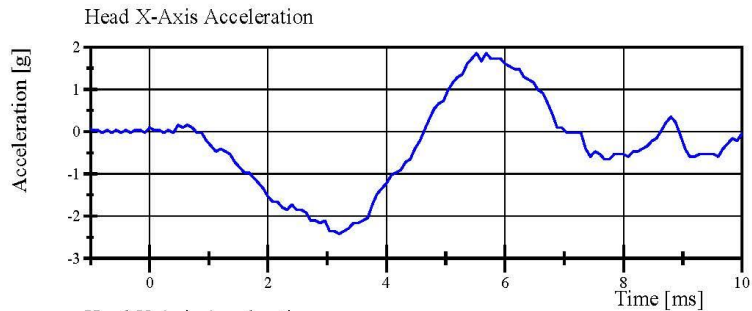
**Head Skin S/N: 1253**

# Transportation Research Center Inc.

Left Lateral Head Drop

SID IIS Serial No. 305 Certification No. 68-1

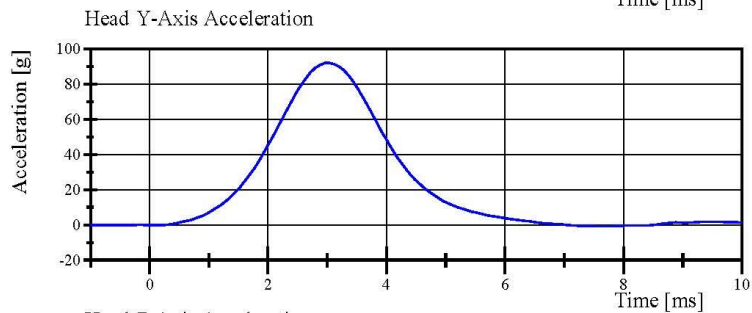
Test Date: 1/10/2019



Filter Class: CFC\_1000

Max: 1.9 g at 5.5 ms

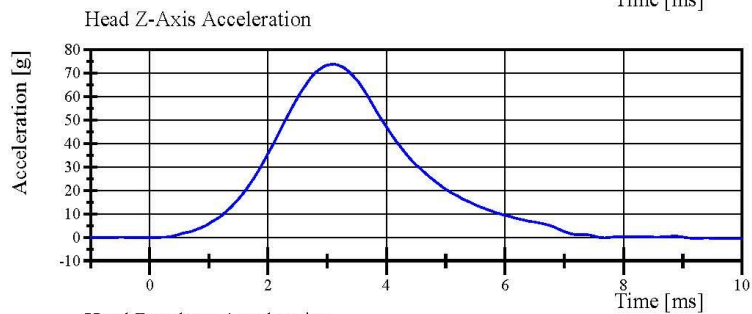
Min: -2.4 g at 3.2 ms



Filter Class: CFC\_1000

Max: 92.0 g at 3.0 ms

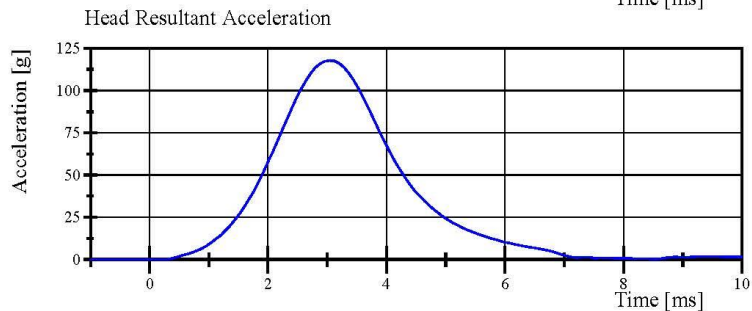
Min: -0.8 g at 7.7 ms



Filter Class: CFC\_1000

Max: 73.8 g at 3.1 ms

Min: -0.6 g at 9.8 ms



Filter Class: CFC\_1000

Max: 117.8 g at 3.0 ms

Min: 0.0 g at 0.8 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.10.2019 14:04:35 230



## Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 305 Certification No. 68-1

Test Date: 1/11/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.617 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.683 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.834 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.082 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.988 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	6.024 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-71.6 deg	Yes
Time of Peak	50 - 70 ms	67.5 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	37.2 N·m	Yes
Total Neck Occipital Condyles Moment			
Decay Time to 0 N·m	102 - 126 ms	123.6 ms	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

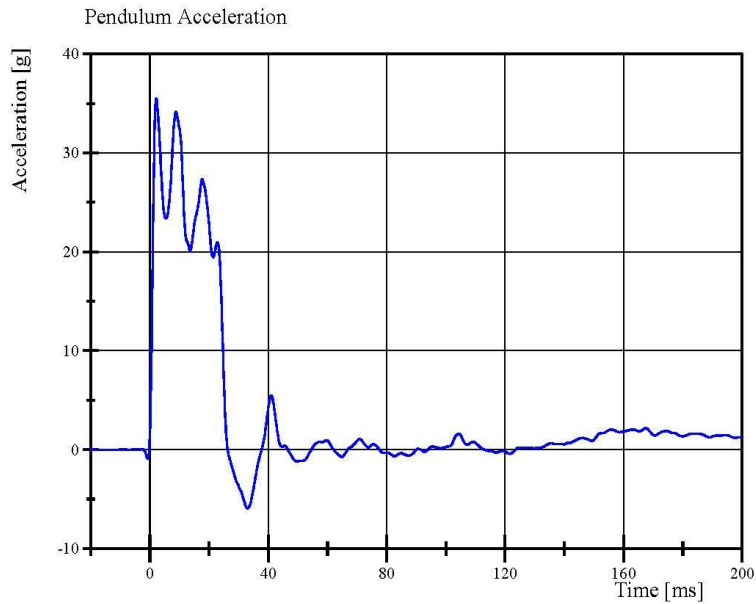
**Neck S/N: 180-2001-606**

# Transportation Research Center Inc.

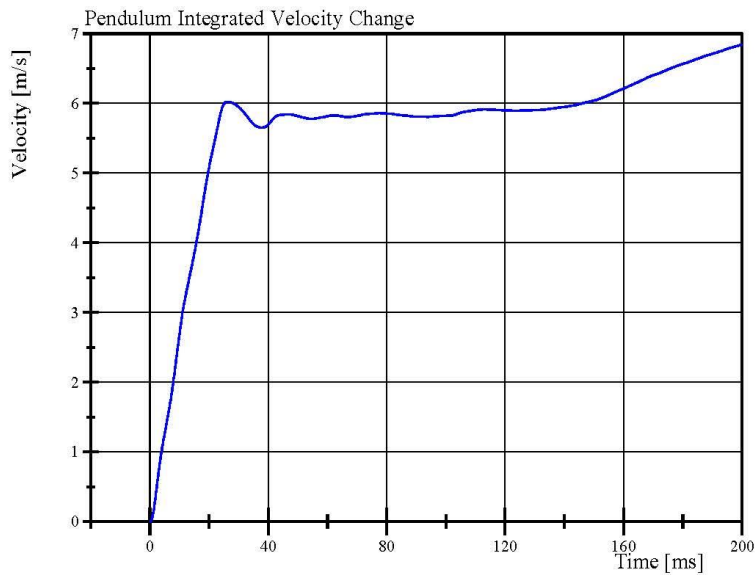
Left Lateral Neck

SID IIS Serial No. 305 Certification No. 68-1

Test Date: 1/11/2019



Filter Class: CFC\_180  
Max: 35.5 g at 2.2 ms  
Min: -5.9 g at 33.0 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: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.11.2019 07:50:47 748

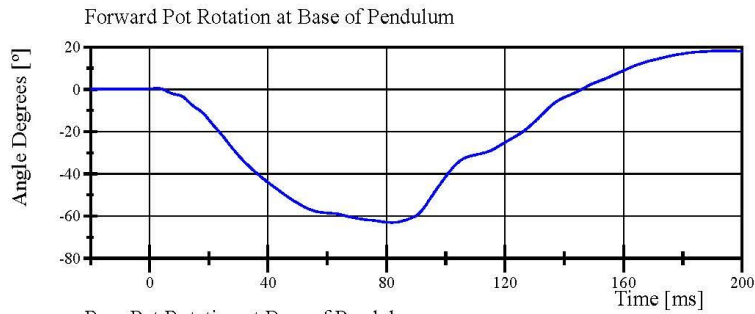


# Transportation Research Center Inc.

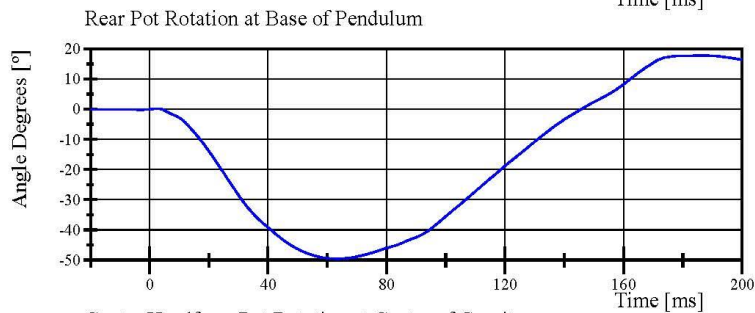
Left Lateral Neck

SID IIs Serial No. 305 Certification No. 68-1

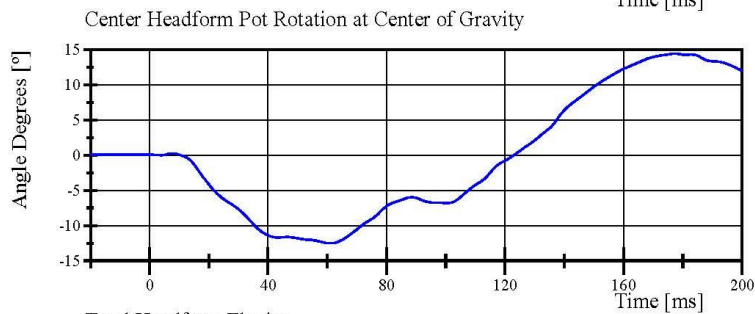
Test Date: 1/11/2019



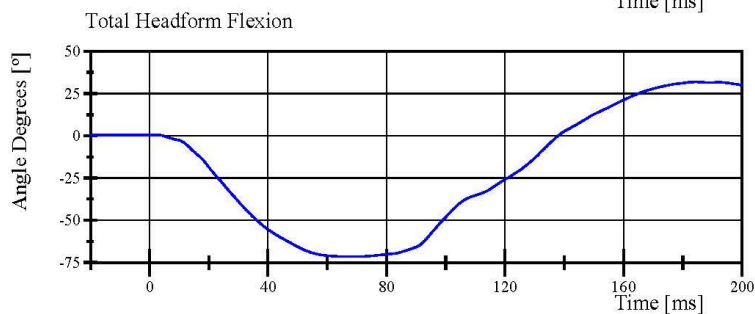
Filter Class: CFC\_60  
Max: 18.4 ° at 193.9 ms  
Min: -63.0 ° at 81.8 ms



Filter Class: CFC\_60  
Max: 17.9 ° at 186.2 ms  
Min: -49.5 ° at 63.4 ms



Filter Class: CFC\_60  
Max: 14.4 ° at 177.4 ms  
Min: -12.5 ° at 61.1 ms



Filter Class: CFC\_60  
Max: 32.0 ° at 184.2 ms  
Min: -71.6 ° at 67.5 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.11.2019 07:50:48 748

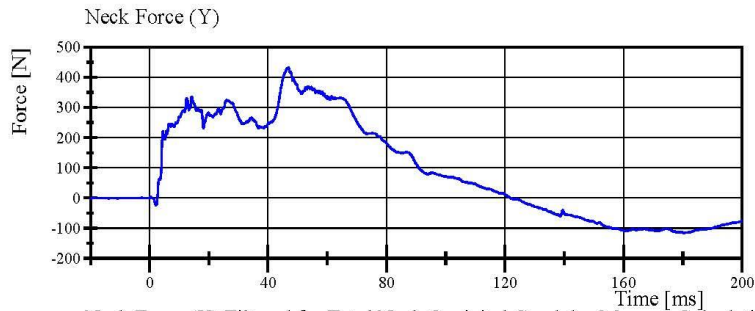


# Transportation Research Center Inc.

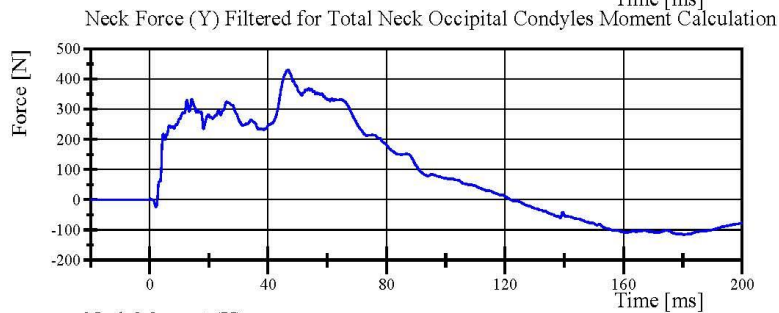
Left Lateral Neck

SID IIS Serial No. 305 Certification No. 68-1

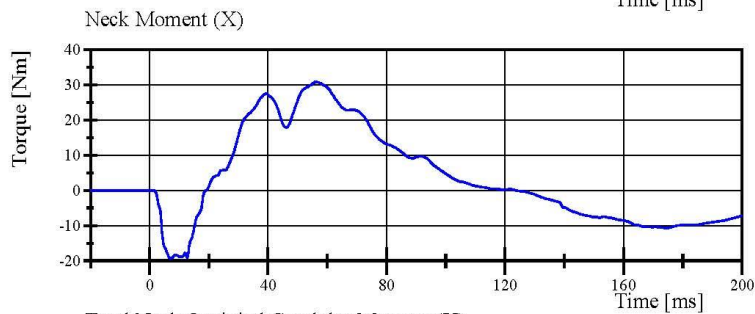
Test Date: 1/11/2019



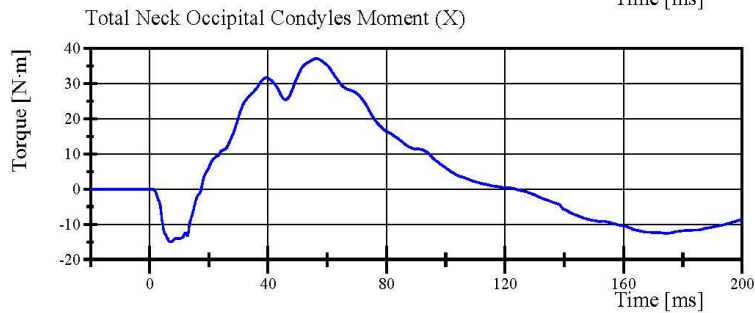
Filter Class: CFC\_1000  
Max: 432.3 N at 47.0 ms  
Min: -116.1 N at 180.3 ms



Filter Class: CFC\_600  
Max: 430.8 N at 46.9 ms  
Min: -115.8 N at 180.4 ms



Filter Class: CFC\_600  
Max: 30.9 Nm at 56.1 ms  
Min: -19.3 Nm at 6.8 ms



Filter Class: Without\_(Consta  
Max: 37.2 N.m at 56.2 ms  
Min: -15.0 N.m at 7.0 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.11.2019 07:50:50 748



## Transportation Research Center Inc.

Left Lateral Shoulder  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-16.2 g	Yes
Shoulder Displacement	28 - 37 mm	30.1 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	19.9 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Left Arm S/N: 952**

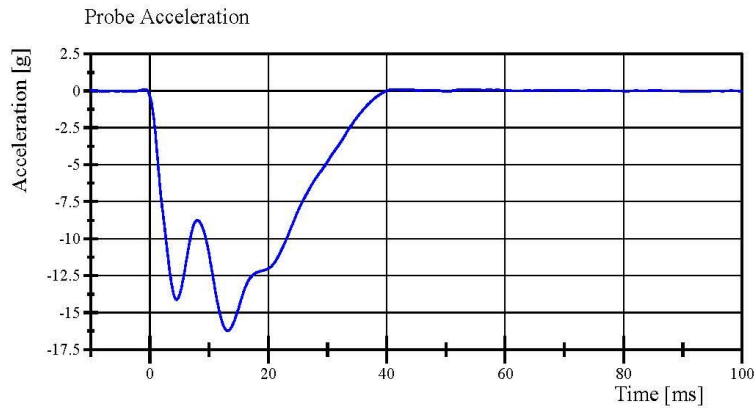
**Shoulder Rib S/N: 180-3355 169**

# Transportation Research Center Inc.

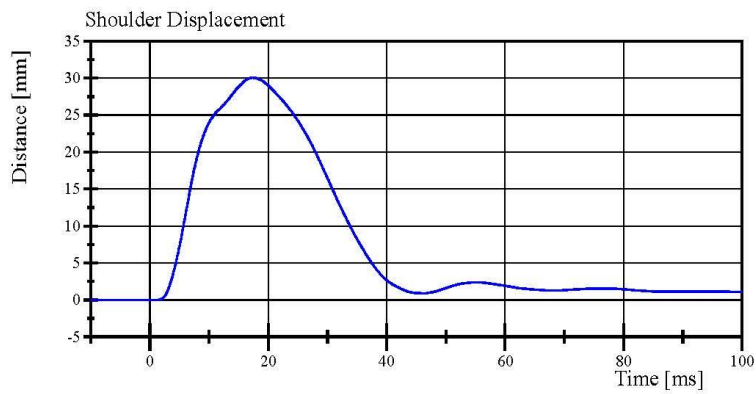
Left Lateral Shoulder

SID IIs Serial No. 305 Certification No. 68-1

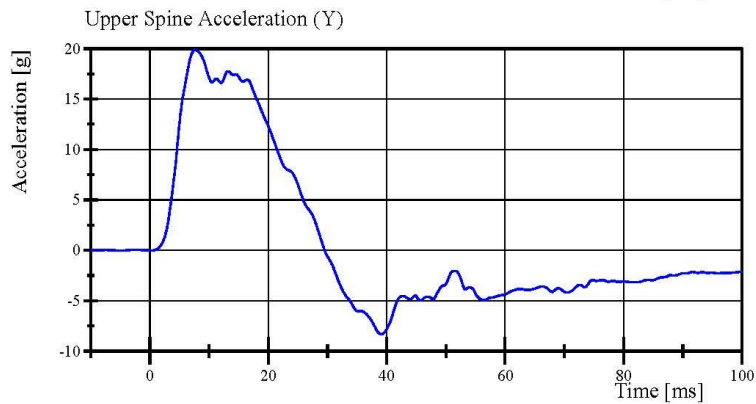
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 0.1 g at 54.5 ms  
Min: -16.2 g at 13.1 ms



Filter Class: CFC\_600  
Max: 30.1 mm at 17.3 ms  
Min: -0.0 mm at -3.8 ms



Filter Class: CFC\_180  
Max: 19.9 g at 7.6 ms  
Min: -8.3 g at 39.1 ms

## Transportation Research Center Inc.

Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.755 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-32.5 g	Yes
Shoulder Displacement	31 - 40 mm	33.2 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	26.3 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	31.5 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	34.6 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	39.0 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	32.2 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Left Arm S/N: 952**

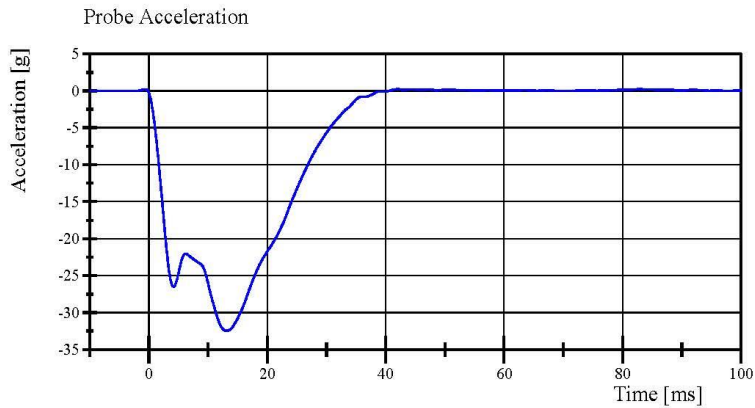
**Upper Thorax Rib S/N: 2135**

**Middle Thorax Rib S/N: 2136**

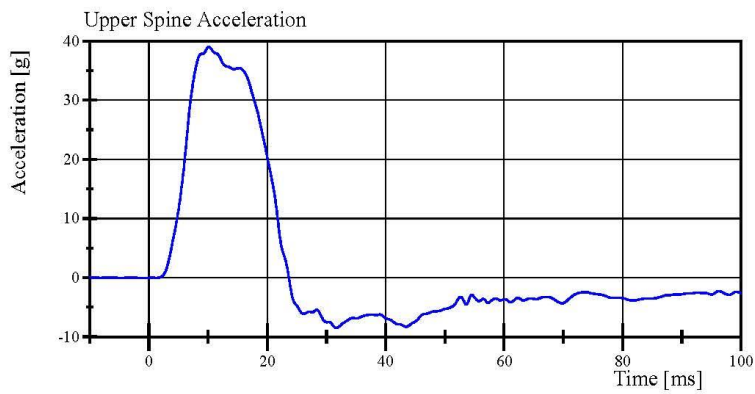
**Lower Thorax Rib S/N: 2137**

# Transportation Research Center Inc.

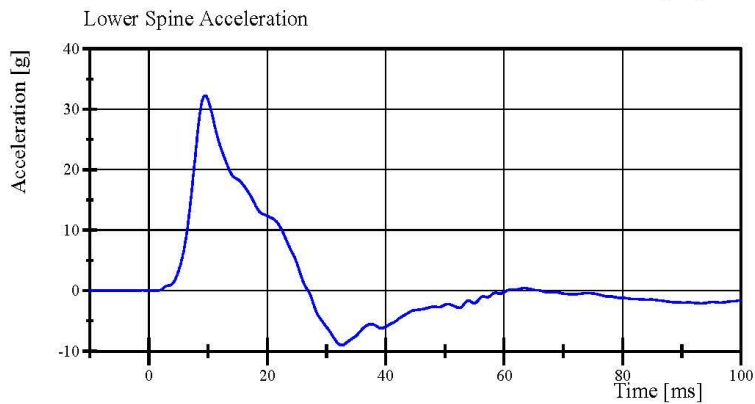
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 0.2 g at 82.8 ms  
Min: -32.5 g at 13.2 ms



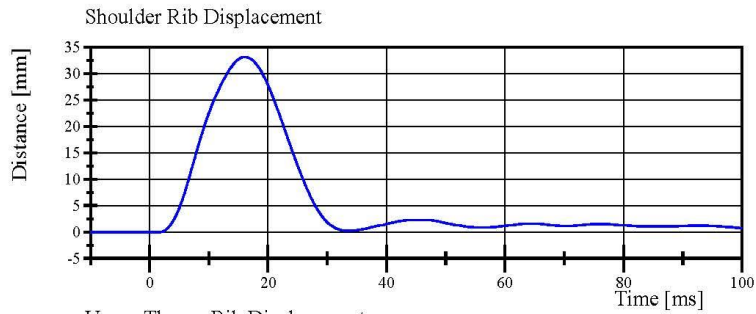
Filter Class: CFC\_180  
Max: 39.0 g at 10.2 ms  
Min: -8.5 g at 31.6 ms



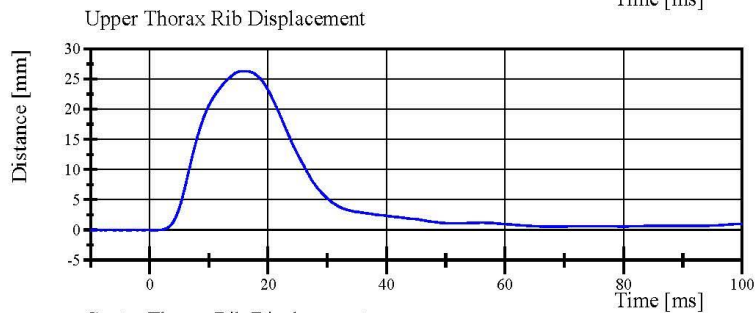
Filter Class: CFC\_180  
Max: 32.2 g at 9.5 ms  
Min: -9.0 g at 32.5 ms

# Transportation Research Center Inc.

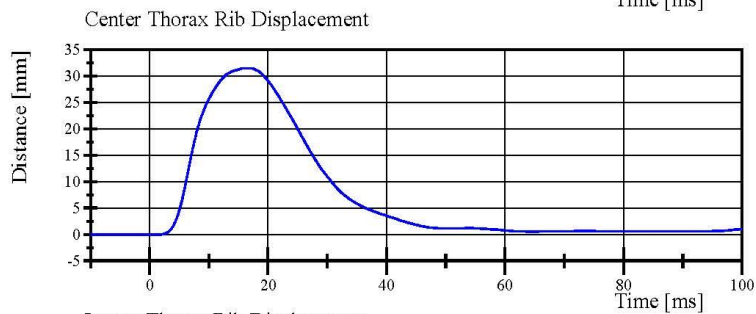
Left Lateral Thorax with Arm  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019



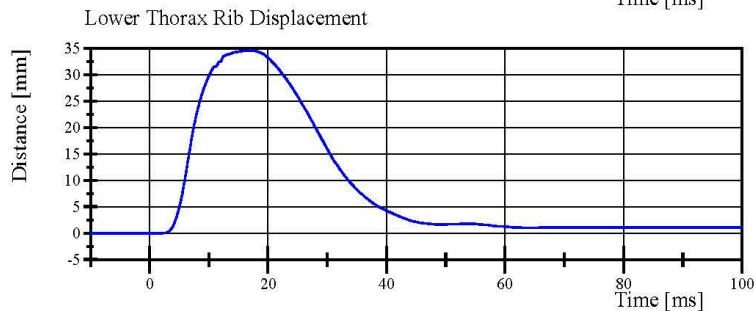
Filter Class: CFC\_600  
Max: 33.2 mm at 16.1 ms  
Min: -0.0 mm at -10.0 ms



Filter Class: CFC\_600  
Max: 26.3 mm at 16.2 ms  
Min: -0.0 mm at -1.0 ms



Filter Class: CFC\_600  
Max: 31.5 mm at 16.6 ms  
Min: -0.0 mm at -4.4 ms



Filter Class: CFC\_600  
Max: 34.6 mm at 17.0 ms  
Min: -0.0 mm at -0.6 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.10.2019 12:36:19 639



## Transportation Research Center Inc.

Left Lateral Thorax without Arm  
SID IIS Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.344 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.0 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	36.0 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	40.7 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	37.2 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	15.7 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.9 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

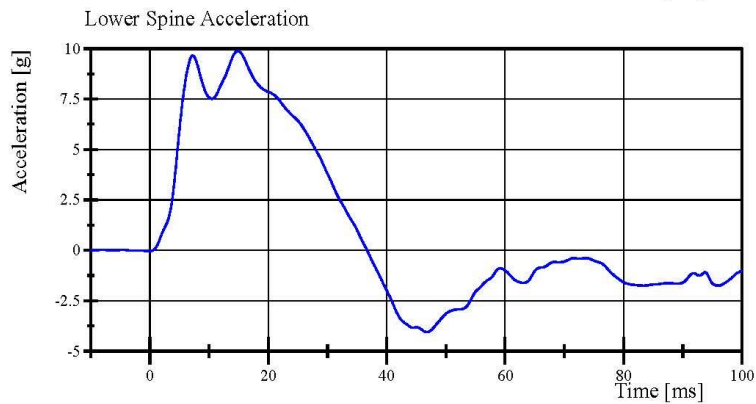
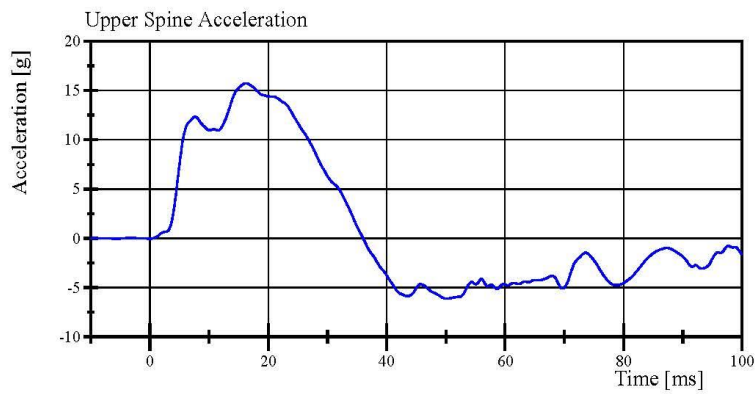
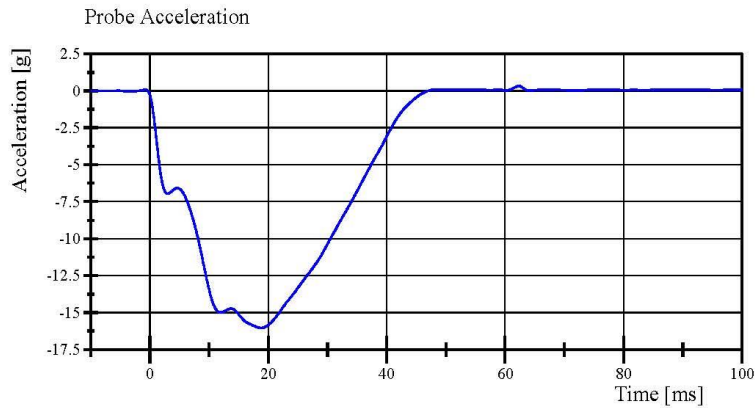
**Upper Thorax Rib S/N: 2135**

**Middle Thorax Rib S/N: 2136**

**Lower Thorax Rib S/N: 2137**

# Transportation Research Center Inc.

Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019



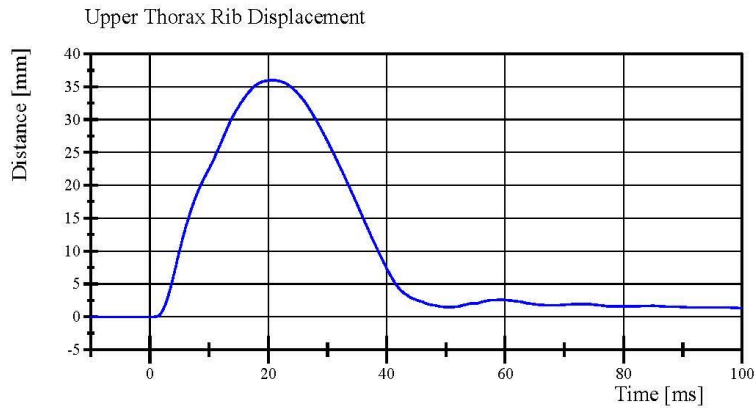
Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.10.2019 11:27 849

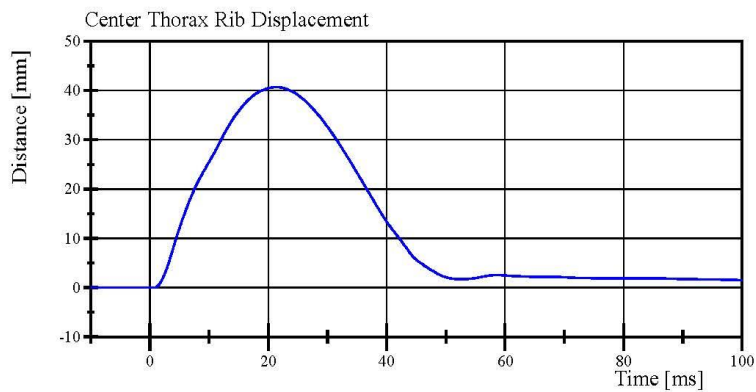


# Transportation Research Center Inc.

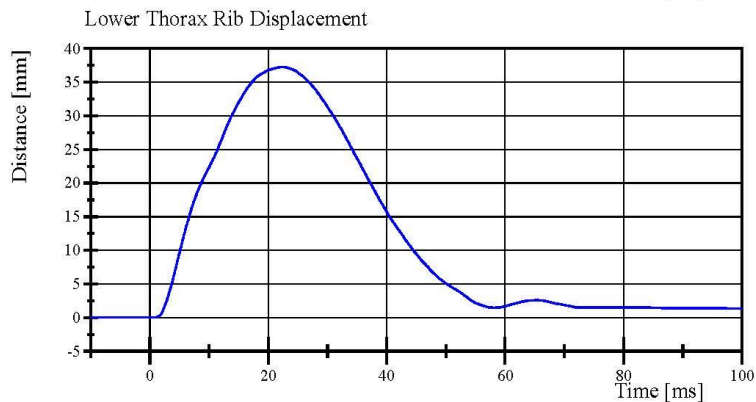
Left Lateral Thorax without Arm  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019



Filter Class: CFC\_600  
Max: 36.0 mm at 20.6 ms  
Min: -0.0 mm at -8.5 ms



Filter Class: CFC\_600  
Max: 40.7 mm at 21.5 ms  
Min: -0.0 mm at 0.6 ms



Filter Class: CFC\_600  
Max: 37.2 mm at 22.4 ms  
Min: -0.0 mm at -2.6 ms

## Transportation Research Center Inc.

Left Lateral Abdomen  
SID IIS Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-13.0 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	46.6 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	39.7 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	10.21 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Upper Abdominal Rib S/N: 1997**

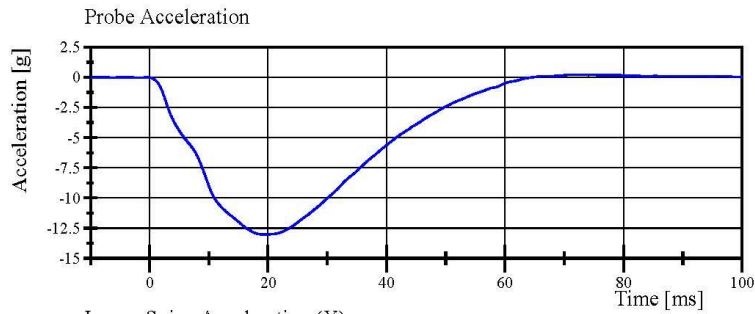
**Lower Abdominal Rib S/N: DS1234**

# Transportation Research Center Inc.

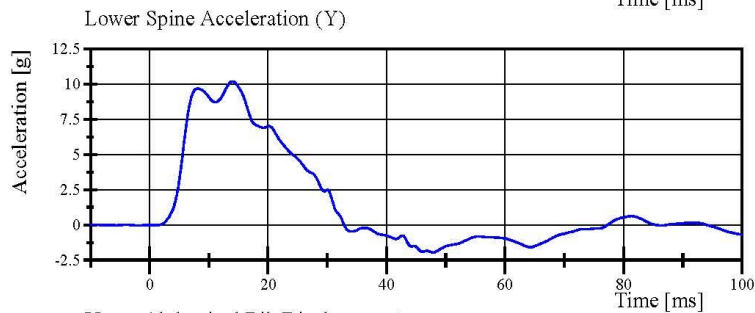
Left Lateral Abdomen

SID IIs Serial No. 305 Certification No. 68-1

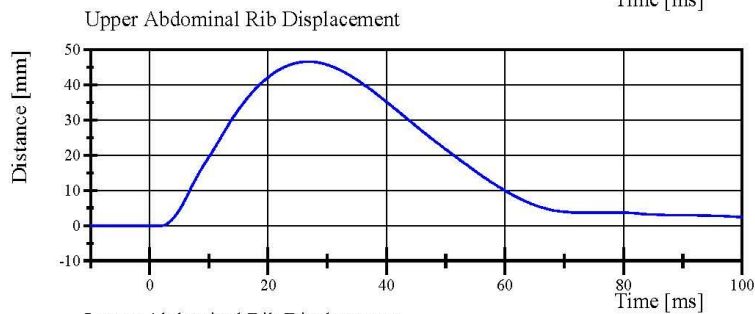
Test Date: 1/10/2019



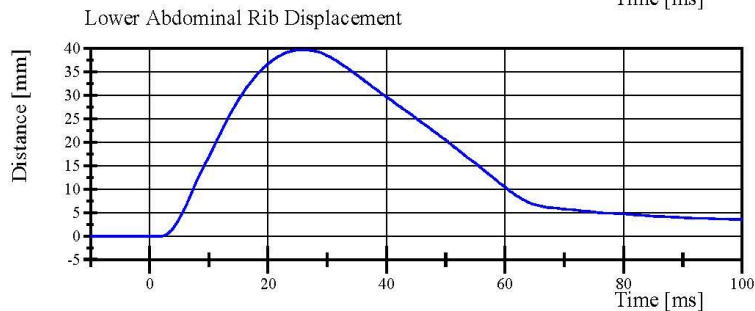
Filter Class: CFC\_180  
Max: 0.2 g at 71.2 ms  
Min: -13.0 g at 19.4 ms



Filter Class: CFC\_180  
Max: 10.2 g at 14.0 ms  
Min: -2.0 g at 47.8 ms



Filter Class: CFC\_600  
Max: 46.6 mm at 26.6 ms  
Min: -0.0 mm at -1.9 ms



Filter Class: CFC\_600  
Max: 39.7 mm at 25.8 ms  
Min: -0.0 mm at -6.6 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.10.2019 11:13 684



## Transportation Research Center Inc.

Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.63 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-42.54 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	38.2 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,043.5 N	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Pelvis Skin S/N: 884**

**Pelvis Plug Info:**

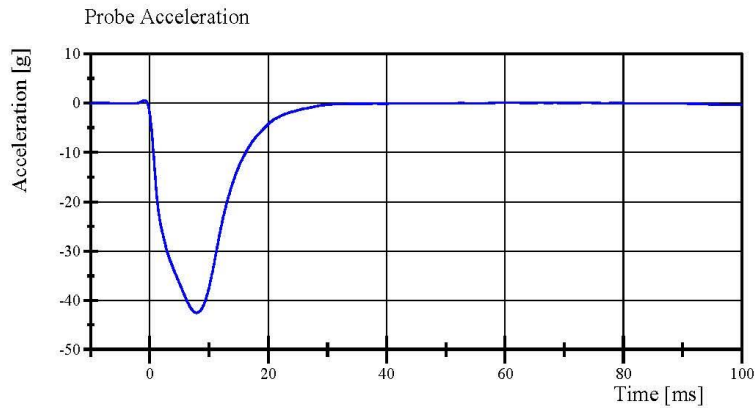
**Manufacturer: SACO**

**S/N: 12143**

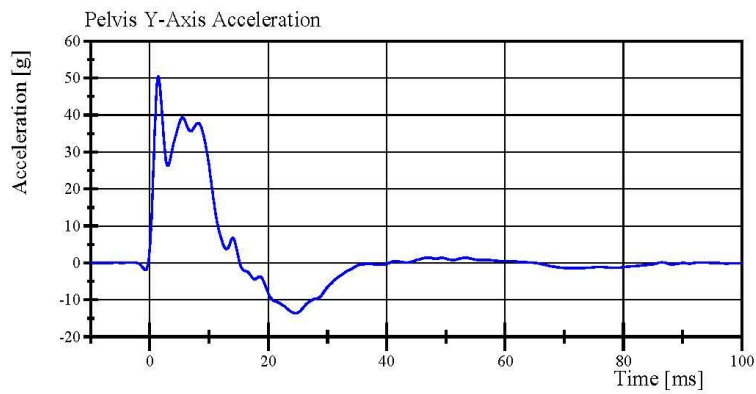
**Cal Date: 20180228**

# Transportation Research Center Inc.

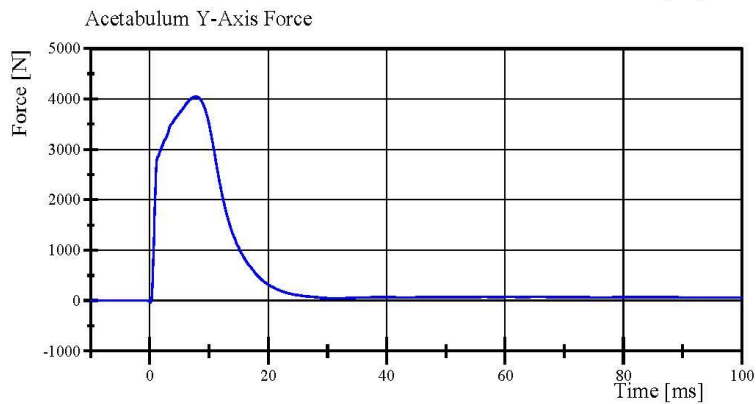
Left Lateral Pelvis  
SID IIs Serial No. 305 Certification No. 68-1  
Test Date: 1/10/2019



Filter Class: CFC\_180  
Max: 0.6 g at -0.9 ms  
Min: -42.5 g at 7.9 ms



Filter Class: CFC\_180  
Max: 50.5 g at 1.4 ms  
Min: -13.6 g at 24.6 ms



Filter Class: CFC\_600  
Max: 4,043.5 N at 7.8 ms  
Min: -34.6 N at 0.1 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.10.2019 12:59:14 480



## Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 305 Certification No. 68-1

Test Date: 1/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-37.9 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	28.8 g	Yes
Iliac Force	4,100 - 5,100 N	4,374.6 N	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

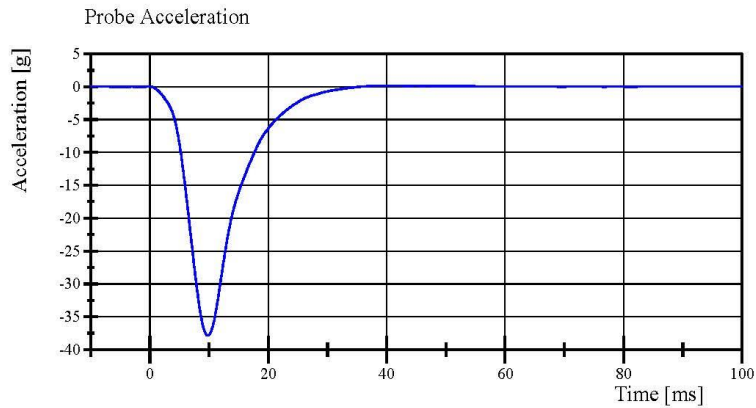
**Pelvis Skin S/N: 884**

# Transportation Research Center Inc.

Left Lateral Iliac

SID IIS Serial No. 305 Certification No. 68-1

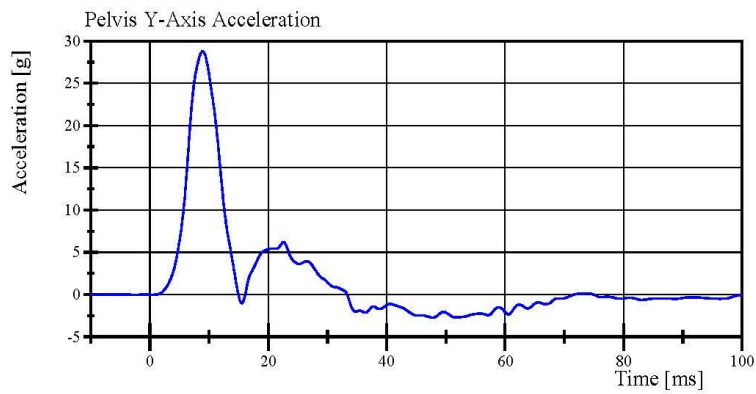
Test Date: 1/10/2019



Filter Class: CFC\_180

Max: 0.2 g at 38.1 ms

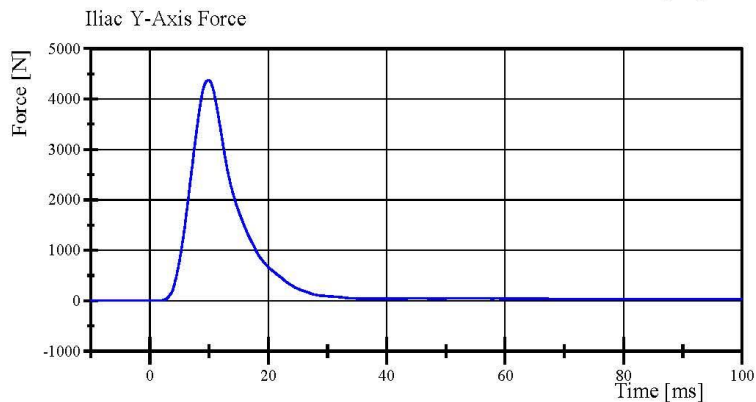
Min: -37.9 g at 9.8 ms



Filter Class: CFC\_180

Max: 28.8 g at 8.9 ms

Min: -2.7 g at 47.8 ms



Filter Class: CFC\_600

Max: 4,374.6 N at 9.9 ms

Min: -0.7 N at -7.8 ms

Specification Source: CFR49 Part 572 Subpart V  
with Polarity in accordance with J211

01.10.2019 10:46 689



**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	P87680	Endevco	28-Nov-2018	
	Y	T10352	Endevco	28-Nov-2018	
	Z	P91950	Endevco	28-Nov-2018	
Redundant Head Accelerometers	X	P94566	Endevco	28-Nov-2018	
	Y	P83368	Endevco	28-Nov-2018	
	Z	P94483	Endevco	28-Nov-2018	
Thoracic Rib Displacement Potentiometers	Upper	Y	111	Honeywell	11-Apr-2018
	Middle	Y	174	FTSS	11-Apr-2018
	Lower	Y	173	FTSS	11-Apr-2018
Abdomen Load Cells	Front	Y	1441	Denton	11-Apr-2018
	Middle	Y	1436	Denton	11-Apr-2018
	Rear	Y	1437	Denton	11-Apr-2018
Lower Spine Accelerometers (T12)	X	P89126	Endevco	28-Nov-2018	
	Y	P87139	Endevco	28-Nov-2018	
	Z	P64884	Endevco	28-Nov-2018	
Acetabulum Load Cell	Y	N/A	N/A	N/A	
Pubic Symphysis Load Cell	Y	457-FY	Denton	11-Apr-2018	

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

				SID-IIs S/N 305		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers			X	T11432	Endevco	30-Nov-2018
			Y	P93774	Endevco	30-Nov-2018
			Z	P91566	Endevco	30-Nov-2018
Redundant Head Accelerometers			X	P91615	Endevco	30-Nov-2018
			Y	P93762	Endevco	30-Nov-2018
			Z	P93761	Endevco	30-Nov-2018
Displacement Potentiometers	Shoulder		N/A	N/A	N/A	N/A
	Thoracic Rib	Upper	Y	007	Servo	17-Apr-2018
		Middle	Y	037	Servo	17-Apr-2018
		Lower	Y	1161	Servo	17-Apr-2018
	Abdominal Rib	Upper	Y	1295	Servo	17-Apr-2018
		Lower	Y	1136	Servo	17-Apr-2018
Lower Spine Accelerometers (T12)			X	P94545	Endevco	30-Nov-2018
			Y	P94647	Endevco	30-Nov-2018
			Z	P94530	Endevco	30-Nov-2018
Acetabulum Load Cell			Y	DK7483S-FY	FTSS	16-Apr-2018
Iliac Wing Load Cell			Y	287-FY	Denton	16-Apr-2018
Pelvis Plug (struck side)				11801	SACO	22-Jan-2018
Pelvis Plug (non-struck side)				36473	FTSS	23-Jul-2010

**TABLE 3 – Vehicle Instrumentation**

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	T11825	Endevco	8-Jan-2019
	Vehicle Center of Gravity	Y	T11833	Endevco	8-Jan-2019
	Vehicle Center of Gravity	Z	T11837	Endevco	8-Jan-2019
2	Right Sill at Front Seat	X	T11835	Endevco	8-Jan-2019
	Right Sill at Front Seat	Y	T11844	Endevco	8-Jan-2019
	Right Sill at Front Seat	Z	T11839	Endevco	8-Jan-2019
3	Right Sill at Rear Seat	X	T11820	Endevco	7-Jan-2019
	Right Sill at Rear Seat	Y	T11864	Endevco	7-Jan-2019
	Right Sill at Rear Seat	Z	T11452	Endevco	7-Jan-2019
4	Left Sill at Front Door	Y	P57192	Endevco	3-Jan-2019
5	Left Sill at Rear Door	Y	P88455	Endevco	3-Jan-2019
6	Left A-Post Lower	Y	T11836	Endevco	8-Jan-2019
7	Left A-Post Middle	Y	T11831	Endevco	8-Jan-2019
8	Left B-Post Lower	Y	T11449	Endevco	7-Jan-2019
9	B-Post Middle	Y	T11822	Endevco	7-Jan-2019
10	Front Seat Track	Y	P81065	Endevco	3-Jan-2019
11	Rear Seat Track or Structure	Y	P94426	Endevco	7-Jan-2019
12	Right Rear Occupant Compartment	Y	P94569	Endevco	7-Jan-2019
13	Engine Block	X	T11824	Endevco	7-Jan-2019
	Engine Block	Y	T11843	Endevco	7-Jan-2019
14	Rear Floorpan Above Axle	X	T11823	Endevco	7-Jan-2019
	Rear Floorpan Above Axle	Y	T11821	Endevco	7-Jan-2019
	Rear Floorpan Above Axle	Z	T11834	Endevco	7-Jan-2019

**TABLE 4 – MDB Instrumentation**

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	P76454	Endevco	24-Oct-18
MDB Center of Gravity	Y	P58611	Endevco	24-Oct-18
MDB Center of Gravity	Z	P61295	Endevco	24-Oct-18
Left Frame Rail at Rear Axle Centerline	X	P75115	Endevco	24-Oct-18
Left Frame Rail at Rear Axle Centerline	Y	P94567	Endevco	24-Oct-18