

REPORT NUMBER: SINCAP-KAR-20-004

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

**SUBARU CORPORATION
2020 SUBARU OUTBACK 5-DOOR MPV**

NHTSA No: O20205504

**PREPARED BY:
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ADELANTO, CA 92301**



DECEMBER 2, 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**

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December 2, 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-KAR-20-004	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 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504		5. Report Date December 2, 2019																																																			
		6. Performing Organization Code KAR																																																			
7. Authors Mr. Eduard Lucas Caba, Project Engineer, Applus IDIADA KARCO Mr. Steven D. Matsusaka, Engineering Manager, Applus IDIADA KARCO		8. Performing Organization Report No. TR-P39301-01-NC																																																			
9. Performing Organization Name and Address Applus IDIADA KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA 92301		10. Work Unit No.																																																			
		11. Contract or Grant No. DTNH22-14-D-00355L																																																			
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, D.C. 20590		13. Type of Report and Period Covered Final Test Report, November 14, 2019 - December 2, 2019																																																			
		14. Sponsoring Agency Code NRM-110																																																			
15. Supplementary Notes																																																					
16. Abstract A 55 / 28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2020 Subaru Outback 5-door MPV in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on November 14, 2019. The impact velocity of the Moving Deformable Barrier was 62.07 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 23.9°C. The target vehicle's maximum post-test static crush was 165 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (ES-2re)</th> </tr> <tr> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>28.3</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>44</td> <td>12</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>448</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1098</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>116.1</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>51</td> </tr> <tr> <td>Total Pelvic Force (Sum of Acetubular and Iliac Forces)</td> <td>N</td> <td>5525</td> <td>2825</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>7</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>9</td> </tr> </tbody> </table> Both the left front driver and left rear passenger doors were jammed shut. The doors on the struck side of the vehicle did not separate from the body at the hinges or latches. The opposite side doors did not open during the side impact event.				Measurement Description	Driver ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC ₃₆)		1000	28.3	Maximum Thoracic Rib Deflection	mm	44	12	Total Abdominal Force	N	2500	448	Pubic Symphysis Force	N	6000	1098	Measurement Description	Passenger ATD (SID-IIs)			Units	IARV	Result	Head Injury Criteria (HIC ₃₆)		1000	116.1	Resultant Lower Spine Acceleration	g	82	51	Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	2825	Maximum Thoracic Rib Deflection	mm	38*	7	Maximum Abdominal Rib Deflection	mm	45*	9
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New Car Assessment Program (NCAP) Side Impact Moving Deformable Barrier (MDB) ES-2re SID-IIs		Copies of this report are available from: National Highway Traffic Safety Admin. Technical Reference Division 1200 New Jersey Ave., SE Room W43-410 Washington, DC 20590																																																			
19. Security Classification of this report UNCLASSIFIED	20. Security Classification of this page UNCLASSIFIED	21. No. of Pages 154	22. Price																																																		

* Proposed IARV

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2020 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-14-D-00355L. The purpose of this test is to generate comparative side impact performance in a 2020 Subaru Outback 5-door MPV. 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 2020 Subaru Outback 5-door MPV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.07 km/h (38.57 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 Applus IDIADA KARCO Engineering, LLC. in Adelanto, California, on November 14, 2019. Pre- and post-test photographs of the test vehicle, the MDB and the dummy (ES-2re and SID-IIs) are included in Appendix A of this report.

The dummies were placed in the driver and left rear designated seating position 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 Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

Primary and redundant head CG tri-axial accelerometers

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

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

Lower spine (12) tri-axial accelerometers

Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)

Primary and redundant head CG tri-axial accelerometers

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

Abdomen upper rib and lower rib y-axis displacement potentiometers

Lower spine (12) tri-axial accelerometers

Acetabulum and iliac wing y-axis load cells

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

Dummy injury readings were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	28.3
Maximum Thoracic Rib Deflection	mm	44	12
Combined Abdominal Force	N	2500	448
Pubic Symphysis Force	N	6000	1098

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	116.1
Lower Spine (T12) Resultant Acceleration	g	82	51
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2825
Maximum Thoracic Rib Deflection	mm	38*	7
Maximum Abdominal Rib Deflection	mm	45*	9

*Proposed IARV

Supplemental restraint information is given below:

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

GENERAL COMMENTS

The doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. The doors on the non-struck side remained closed and latched. There was no ATD value that exceeded its limit.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20205504
Model Year	2020
Make	Subaru
Model	Outback
Body Style	5-Door MPV
VIN	4S4BTACC8L3113771
Body Color	Silver
Odometer Reading (km / mi)	8 / 5
Engine Displacement (L)	2.5
Type / No. of Cylinders	Inline 4
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	Yes
Sunroof / T-Top	No
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	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	Yes
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	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Other Safety Restraint	Yes, Seat Pan Airbag

Does Owner's Manual provide instructions to turn off automatic door locks?

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Subaru Corporation
Date of Manufacture	Aug-19
Vehicle Type	MPV

GVWR (kg)	2200
GAWR Front (kg)	1250
GAWR Rear (kg)	1220

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				408.0	A
DSC x 68.04 (kg)				340.2	B
Cargo Weight (RCLW) (kg)				67.8	A-B

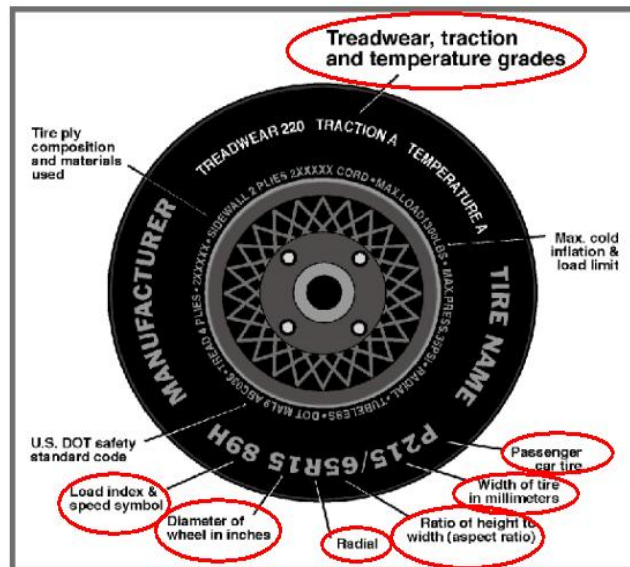
VEHICLE SEAT TYPE

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Cold Pressure (kPa)	240	230
Recommended Tire Size	225/65R17	225/65R17
Tire Size on Vehicle	225/65R17	225/65R17
Tire Manufacturer	Yokohoma	Yokohoma
Tire Model	Avid GT	Avid GT
Treadware	400	400
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	102H	102H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	4UE5 6JK 0219	4UE5 6JK 0219
DOT Safety Code Right	4UE5 6JK 0219	4UE5 6JK 0219

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	240	240	230	230
Tire Placard	kPa	240	240	230	230
Owner's Manual	kPa	240	240	230	230
As Tested	kPa	240	240	230	230

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/60R16	P205/60R16	P205/60R16	P205/60R16	P205/60R16
Tire Pressure	kPa	230 ± 21	230	230	230	230

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	474.0	373.5		519.0	459.0		520.0	470.5	
Right	kg	458.0	351.0		456.0	408.5		454.0	405.5	
Ratio	%	56.3%	43.7%	100.0%	52.9%	47.1%	100.0%	52.6%	47.4%	100.0%
Total	kg	932.0	724.5	1656.5	975.0	867.5	1842.5	974.0	876.0	1850.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1656.5	A
Actual Weight of 2 P572 ATD Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	67.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1849.3	A+B+C

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

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

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement***
LF	mm	884	874	Yes
RF	mm	890	890	Yes
LR	mm	873	863	Yes
RR	mm	867	874	Yes
Vehicle CG (Aft of Front Axle)	mm	1293	1286	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	55	48	

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504

Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trim	6.5
Ballast / Equipment Added	67.0

Test Height Adjustable Setting (If Applicable)	
--	--

DATA SHEET NO. 2**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA**Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19**SEAT POSITIONING**

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	6.7	0.0	3.8
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	3.8	276	Max	305	296	314
			Mid	285	276	295
			Min	165	256	276
Front Passenger Seat	Fixed	287	Max			
			Mid	294	287	277
			Min			
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

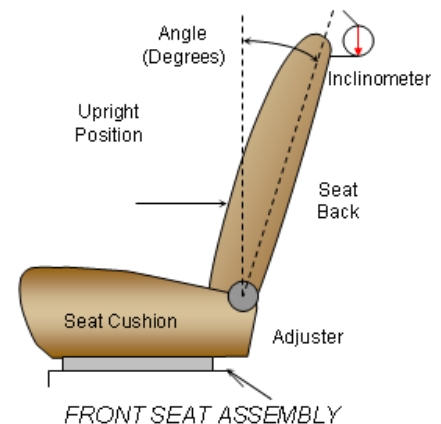
DATA SHEET NO. 2 ... (CONTINUED)**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA**Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19**SEAT FORE/AFT POSITION**

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	250		125	
Front Passenger Seat	250	26	125	12
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

*Detent zero (0) is the forward most detent

SEAT BACK ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The right front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck side rear seat back. Seat back angle is measured using the outboard head restraint post.

**SEAT BACK POSITION**

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/ Seated Dummy	75.4		9.3	
Front Passenger Seat	71.2	32	9.3	9
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

*Detent zero (0) is the forward most detent

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. The positions are marked H, M2, M1, L from top to bottom.

	Total No. of Positions	Placed in Position
Driver Seat	4	M2
Rear Seat	Fixed	Fixed

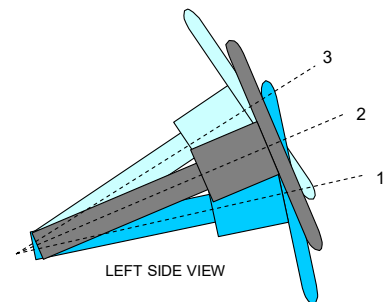
HEAD RESTRAINT ADJUSTMENT

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

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

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	21.1	115
Geometric Center - Position 2	23.0	143
Uppermost - Position 3	25.0	170
Telescoping Steering Wheel Travel		55
Test Position	23.0	143

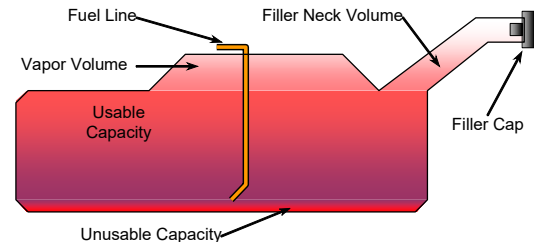
DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

FUEL PUMP

The fuel pump operates a few seconds after the ignition switch is turned to the ON position after that the pump operates only when the engine is running.



FUEL TANK CAPACITY

VEHICLE FUEL TANK ASSEMBLY

Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	70.03
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	70.03
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	65.13
Actual amount of Solvent Used in Test	65.13
1/3 of Usable Capacity	23.34

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

DATA SHEET NO. 3

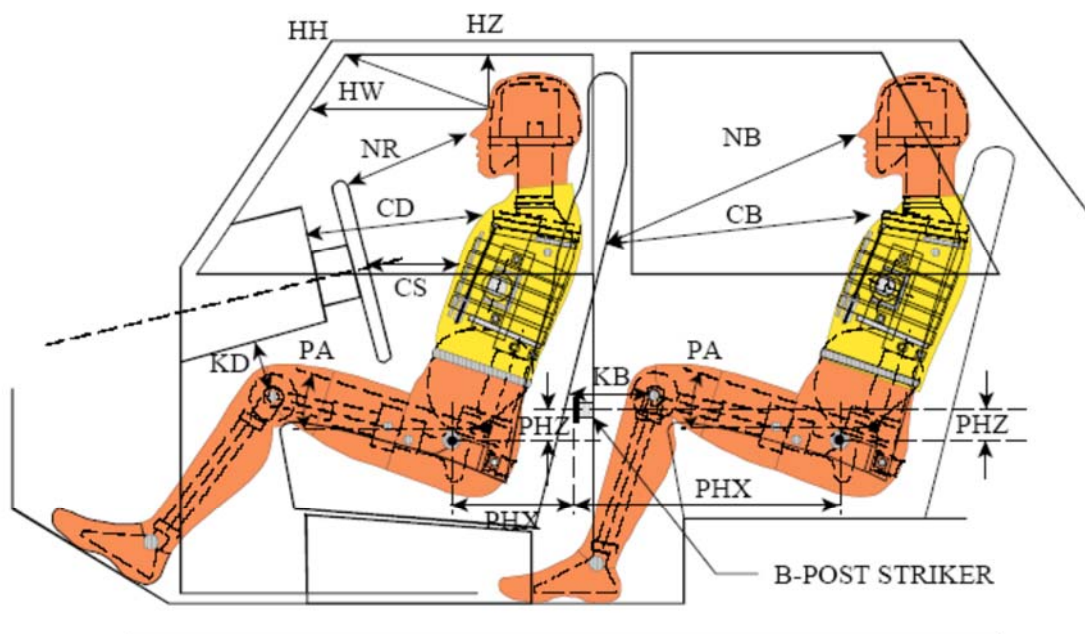
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No. O20205504

Test Program: NCAP MDB Side Impact Test

Test Date: 11/14/19



LEFT SIDE VIEW

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

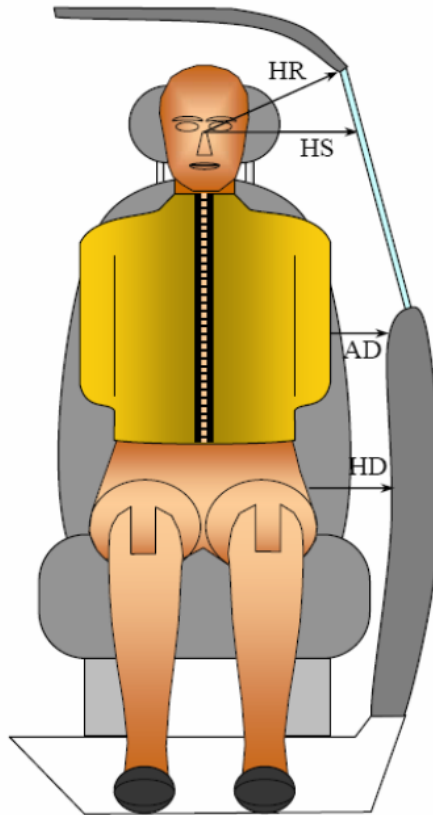
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	355			
HW		Head to Windshield	600			
HZ	HZ	Head to Roof	191		292	
NR	NB	Nose to Rim/Seat Back	443		578	
CD	CB	Chest to Dash/Seat Back	559		562	
CS		Chest to Steering Wheel	318			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	188	30.7	300	11.2
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	145	27.4	295	12.2
PAX°	PAX°	Pelvic Tilt Angle X		22.5		21.5
	PAY°	Pelvic Tilt Angle Y		0.1		0.1
PHX	PHX	Hip Point to Striker (x-axis)	203		293	
PHZ	PHZ	Hip Point to Striker (z-axis)	225		297	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



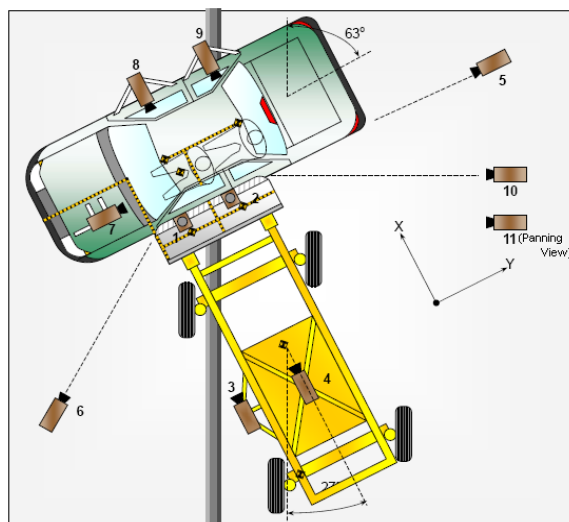
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	210	255
HS	Head to Side Window	mm	395	360
AD	Arm to Door	mm	97	174
HD	H-Point to Door	mm	154	180

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



CAMERA LOCATIONS AND DATA

No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1220	2287	-5486	14	1000
2	Overhead Close-Up	609	2287	-5102	35	1000
3	Left Impact Point (MDB)	-2134	0	-1143	25	1000
4	Side Overall (MDB)	-3912	838	-1829	12.5	1000
5	Rear	-64	2485	-1348	85	1000
6	Left Front	-2266	-3564	-1475	24	1000
7	Driver Front (On-Board)	362	-121	598	12.5	1000
8	Driver Side (On-Board)	1682	763	364	8.5	1000
9	Passenger Side (On-Board)	1666	1618	401	8.5	1000
10	Real Time Overall				Zoom	30
11	Real Time Inrun				Zoom	30

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

*All measurements accurate to ± 6 mm

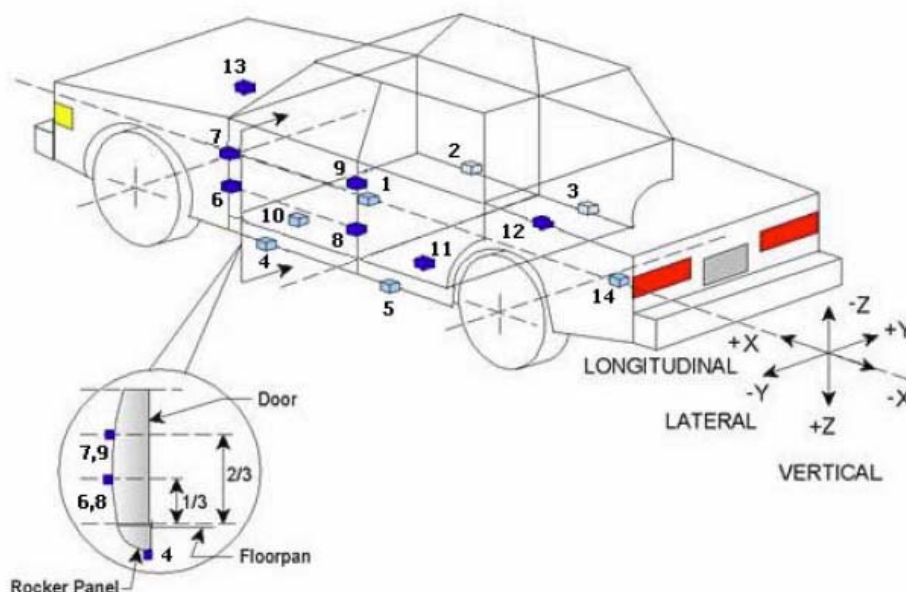
INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	19
Vehicle Structure Accelerometers	23
MDB Channels	7
Total	65

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

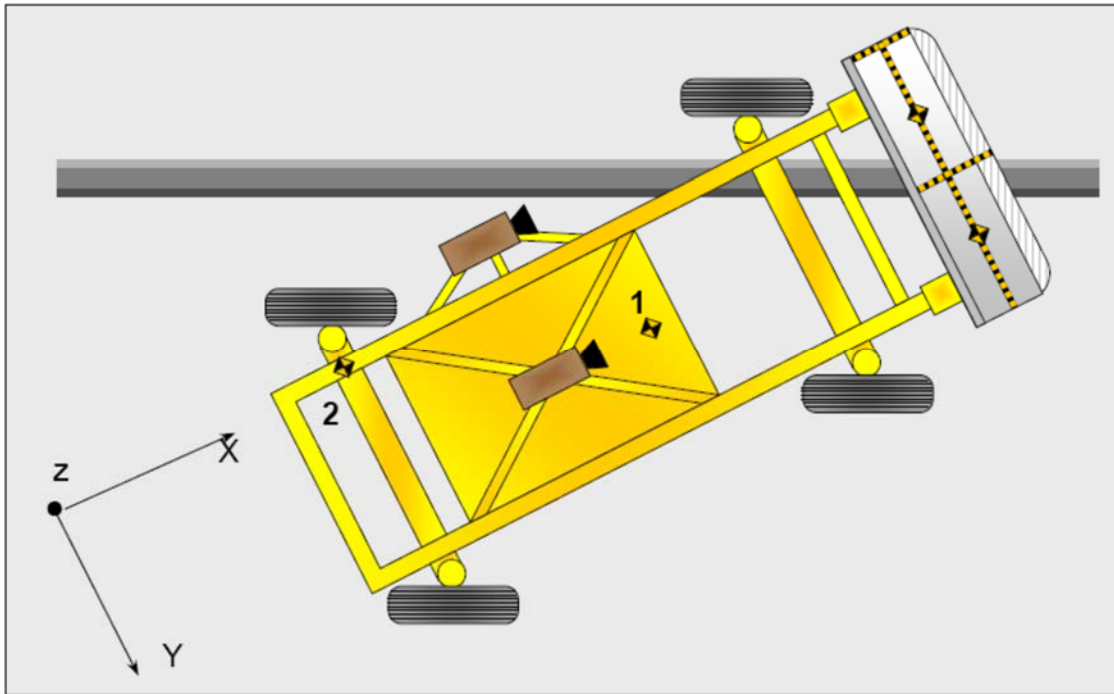
Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2340	0	-500
2	Right Sill at Front Seat	2620	710	-450
3	Right Sill at Rear Seat	1720	725	-460
4	Left Sill at Front Door	2600	-790	-270
5	Left Sill at Rear Door	1901	-780	-280
6	A-Pillar Lower	3350	-870	-530
7	A-Pillar Middle	3370	-870	-860
8	B-Pillar Lower	2220	-740	-600
9	B-Pillar Middle	2250	-740	-1090
10	Front Seat Track	2280	-580	-500
11	Rear Seat Structure	1900	-380	-480
12	Right Rear Occupant Compartment	1908	380	-450
13	Engine Block	3760	100	-650
14	Rear Floorpan Above Axle	1260	0	-690

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: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



MDB ACCELEROMETER LOCATIONS

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

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

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Side Header	Curtain Airbag
Left Side of Head	Curtain Airbag, Side Header	Curtain Airbag
Back of Head	Headrest, Curtain Airbag, Side Header	Curtain Airbag, Headrest
Left Shoulder	Side Airbag, Door Panel	Door Panel
Upper Torso	Side Airbag, Seat	Door Panel, Seat
Lower Torso	Side Airbag, Seat	Door Panel, Seat
Left Hip	Side Airbag, Seat, Door Panel	Door Panel, Seat
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

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

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

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

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2731
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		427
Actual Impact Point (Aft of Front Axle)	mm		440
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	-13
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	5

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length including Honeycomb Face	4115
Wheel Base of Framework Carriage	2595
CG location aft of Front Axle	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	402.0	297.5	699.5
Right	kg	377.0	290.0	667.0
Ratio	%	57.0%	43.0%	100.0%
Totals	kg	779.0	587.5	1366.5

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.07
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.02
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.9
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.1
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.5

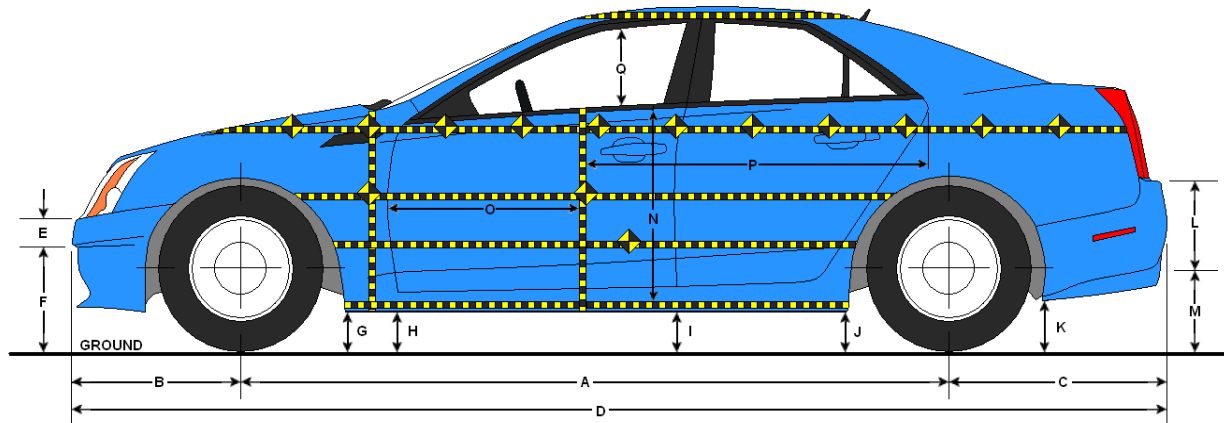
MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	235
B	Top of Bumper	533	800	Right	164
C	Mid Level	686	800	Left	164
D	Top of Stack	813	800	Left	174

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2731	2731	0
B	Front Axle to FSOV	1009	1019	10
C	Rear Axle to RSOV	1112	1102	-10
D	Total Length at Centerline	4851	4852	1
E	Front Bumper Thickness	112	113	1
F	Front Bumper Bottom to Ground	626	620	-6
G	Sill Height at Front Wheel Well	498	486	-12
H	Sill Height at Front Door Leading Edge	495	480	-15
I	Sill Height at B-Pillar	477	463	-14
J1	Sill Height at Rear Wheel Well	449	447	-2
J2	Pinch Weld Height at Rear Wheel Well	425	421	-4
K	Sill Height Aft of Rear Wheel Well	582	576	-6
L	Rear Bumper Thickness	88	88	0
M	Rear Bumper Bottom to Ground	678	679	1
N	Sill Height to Bottom of Front Window Sill	671	663	-8
O	Front Door Leading Edge to Impact CL	786	780	-6
P	Rear Door Trailing Edge to Impact CL	1428	1401	-27
Q	Front Window Opening	420	448	28
R	Right Side Length	3415	3422	7
S	Left Side Length	3415	3405	-10
T	Vehicle Width at B-Pillar	1824	1783	-41

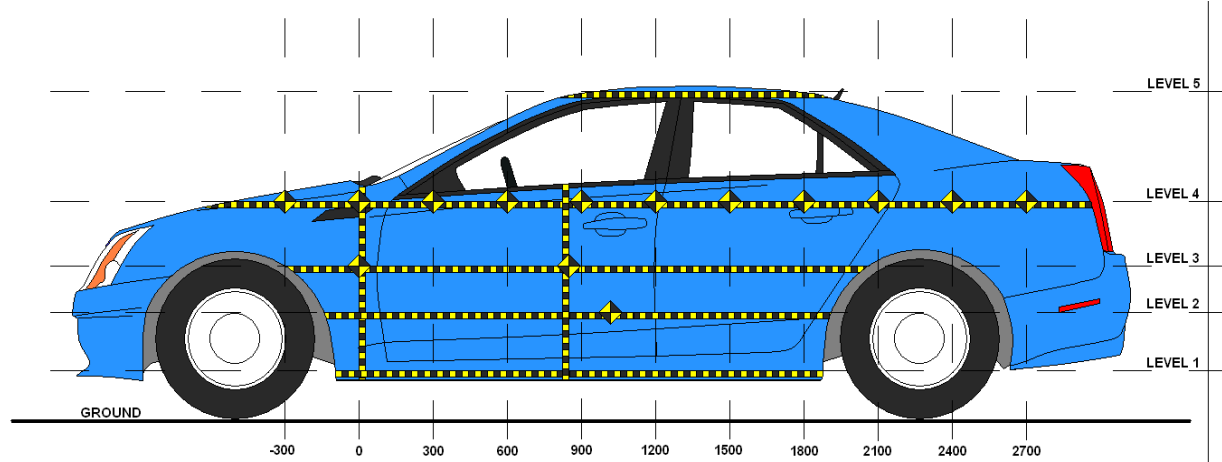
All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504

Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	456	13	1500
2	Occupant H-Point	757	133	1650
3	Mid-Door	870	165	1650
4	Window Sill	1155	80	1350
5	Window Top	1683	2	2400

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

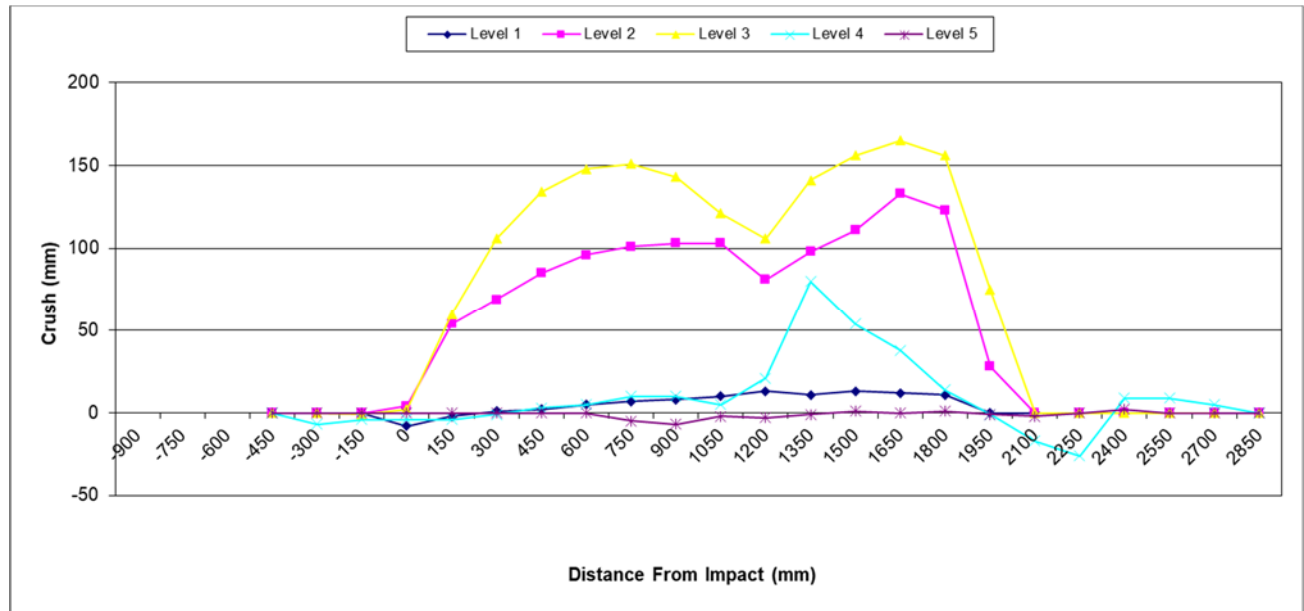
	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300				674					667					-7	
-150			573	672				572	668				-1	-4	
0	610	587	584	671		602	591	586	667		-8	4	2	-4	
150	617	591	586	668		615	645	646	664		-2	54	60	-4	
300	615	591	584	641		616	660	690	640		1	69	106	-1	
450	651	590	582	653		653	675	716	656		2	85	134	3	
600	648	590	581	647		653	686	729	652		5	96	148	5	
750	646	590	581	641	874	653	691	732	651	869	7	101	151	10	-5
900	648	590	582	636	885	656	693	725	646	878	8	103	143	10	-7
1050	645	591	582	631	887	655	694	703	636	885	10	103	121	5	-2
1200	646	592	584	626	892	659	673	690	647	889	13	81	106	21	-3
1350	655	594	586	625	894	666	692	727	705	893	11	98	141	80	-1
1500	655	593	586	622	894	668	704	742	676	895	13	111	156	54	1
1650	657	590	583	620	895	669	723	748	658	895	12	133	165	38	0
1800	609	585	580	616	893	620	708	736	630	894	11	123	156	14	1
1950		577	578	615	892		605	653	614	891		28	75	-1	-1
2100				616	891				599	889				-17	-2
2250				617	887				591	887				-26	0
2400				619	884				628	886				9	2
2550				621					630					9	
2700				626					631					5	
2850															

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504

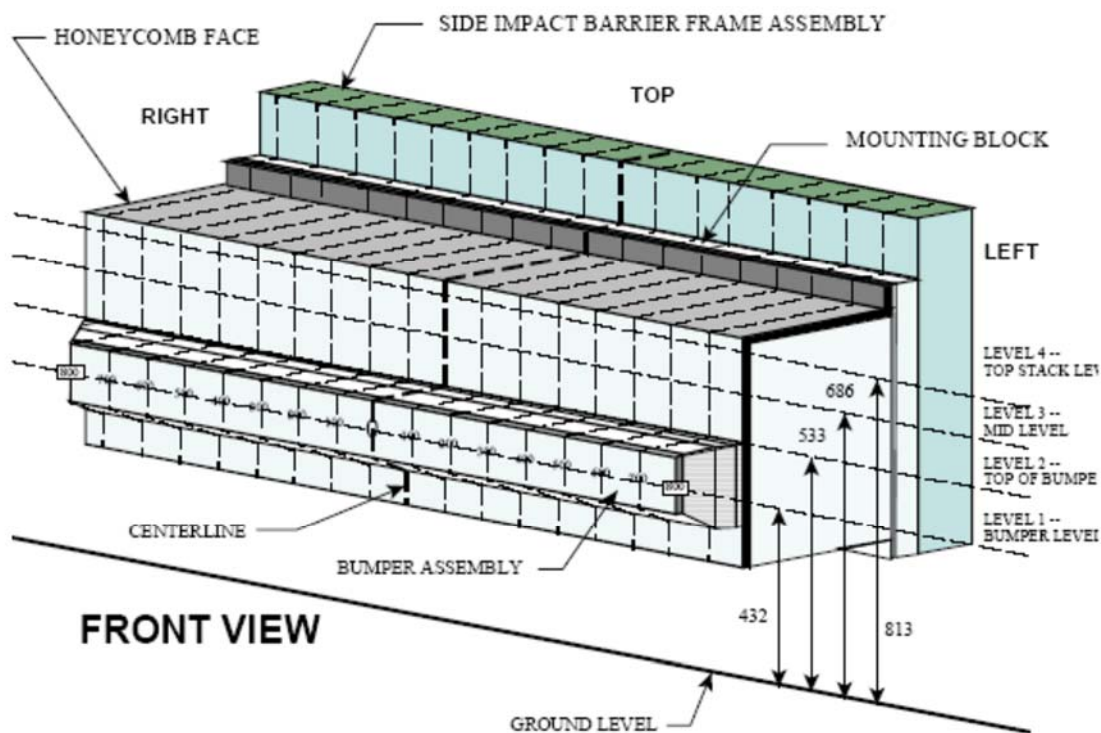
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

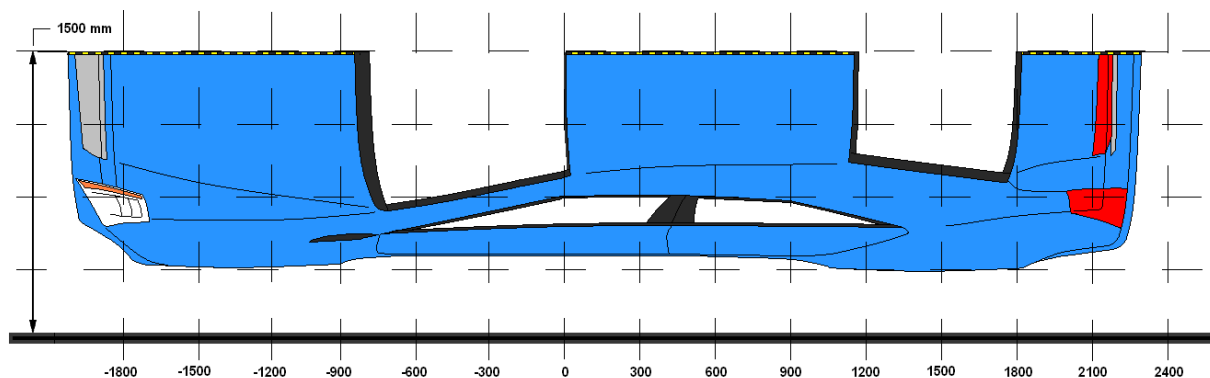
Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	235	225	226	216	213	211	205	204	205	196	194	191	191	185	181	181	195
2	164	154	147	138	129	132	129	122	115	116	118	119	121	122	123	125	137
3	105	93	91	98	107	120	122	108	90	79	72	78	72	84	99	122	164
4	117	92	82	87	98	122	144	129	106	93	87	84	85	95	113	134	174

All dimensions in millimeters.

DATA SHEET NO. 13

VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
 Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2700	1	626	631	5
2	2100	2	891	889	-2
3	1500	3	586	742	156
4	900	4	582	725	143
5	300	5	584	690	106
6	-300	6	674	667	-7

MDB DAMAGE PROFILE DISTANCES

DPD	From MDB Centerline		Level	Crush (mm)
	Distance (mm)	Direction		
1	800	Left	1	195
2	500	Left	1	185
3	200	Left	1	194
4	200	Right	1	205
5	500	Right	1	216
6	800	Right	1	235

DATA SHEET NO. 14

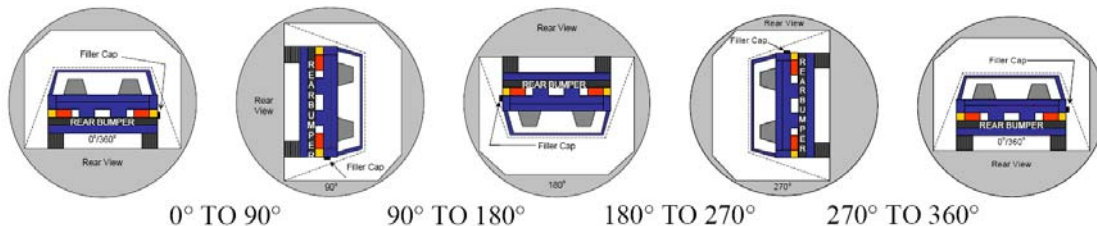
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504

Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19

Temperature at Time of Impact: 23.9 °C Test Time: 1:33 P.M.

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



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	81	300	381
90° To 180°	80	300	380
180° To 270°	83	300	383
270° To 360°	78	300	378

FMVSS 301 SPILLAGE TABLE

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

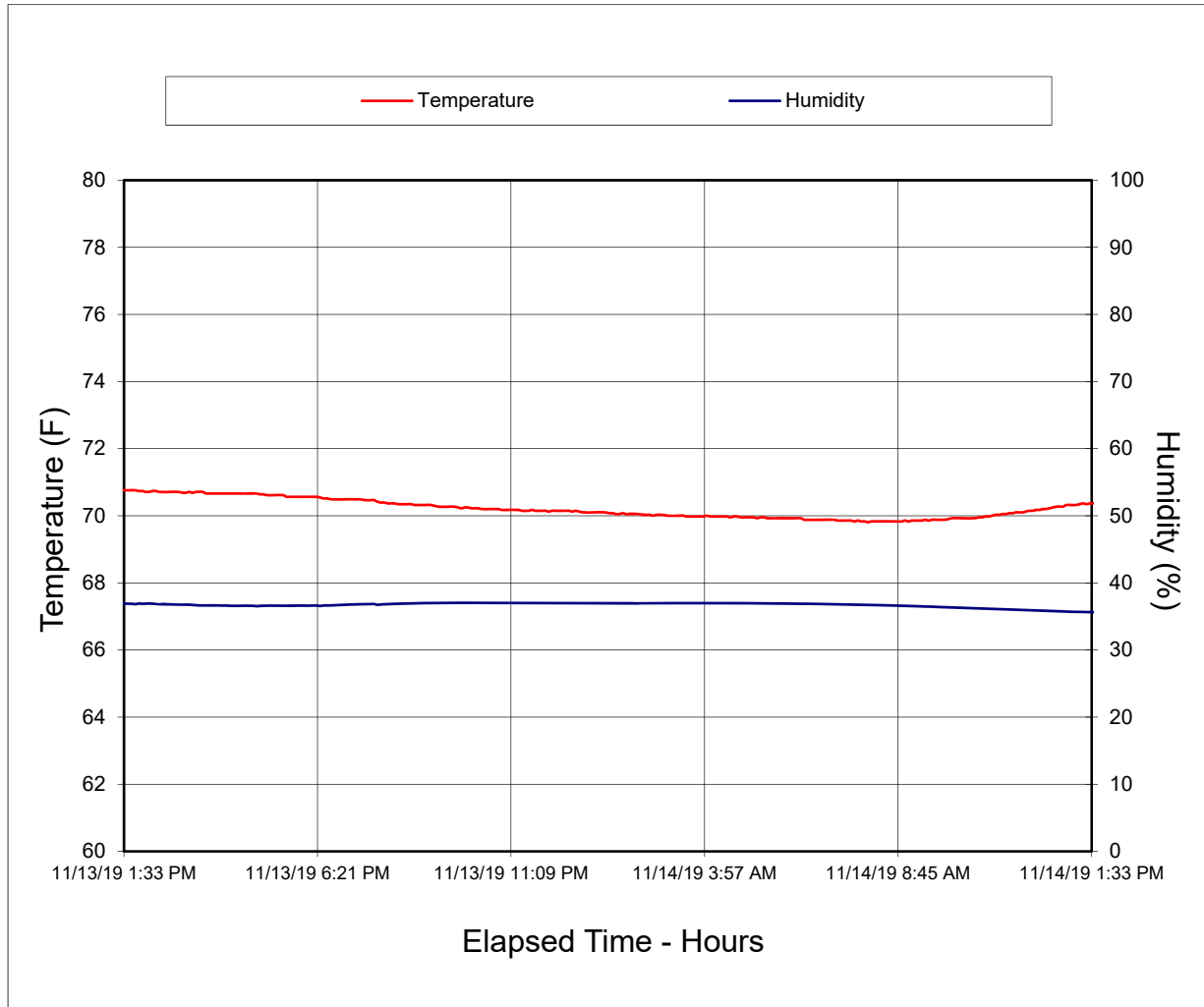
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	N/A
90° To 180°	N/A
180° To 270°	N/A
270° To 360°	N/A

DATA SHEET NO. 15

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205504
Test Program: NCAP MDB Side Impact Test Test Date: 11/14/19



APPENDIX A
PHOTOGRAPHS

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



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



FIGURE 3. Pre-Test Frontal View of Test Vehicle



FIGURE 4. Post-Test Frontal View of Test Vehicle



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



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



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



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



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



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



FIGURE 11. Pre-Test Rear View of Test Vehicle



FIGURE 12. Post-Test Rear View of Test Vehicle



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



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



FIGURE 15. Pre-Test Overhead View of Test Area



FIGURE 16. Post-Test Overhead View of Test Area



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



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



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

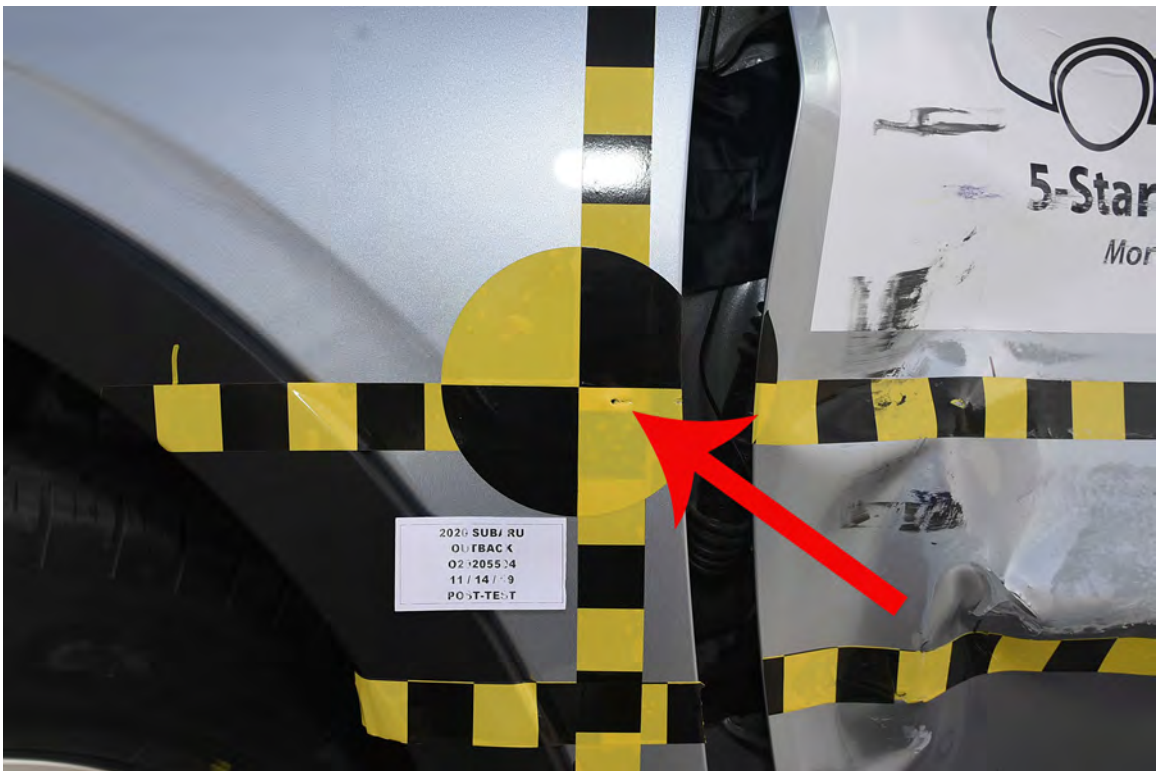


FIGURE 20. Post-Test Close-Up View of Impact Point Target



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



FIGURE 37. View of Disengaged Parking Brake



FIGURE 38. Pre-Test View of Parking Brake

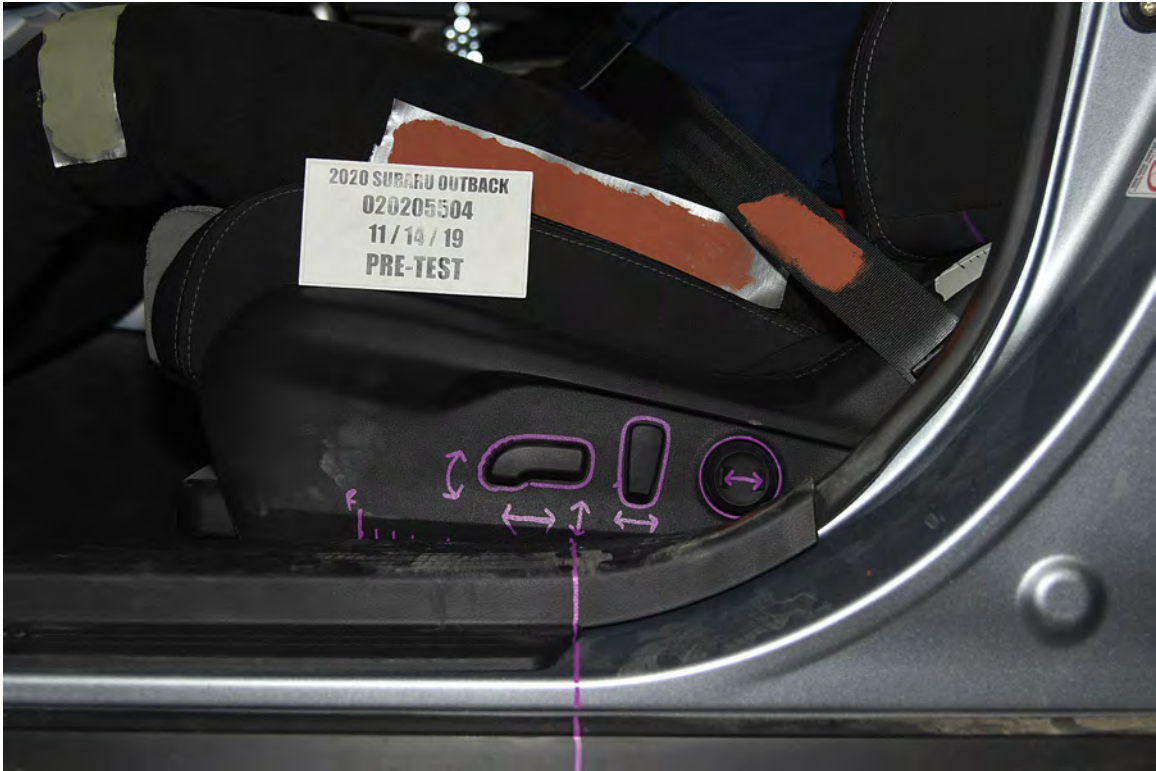


FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Track



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



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



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



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



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



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



FIGURE 46. Pre-Test Driver Inner Door Panel View



FIGURE 47. Post-Test Driver Inner Door Panel View
Showing Driver Dummy Contact Locations



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



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



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



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



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



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



FIGURE 54. Post-Test Driver Dummy Close-Up Knee Contact View



FIGURE 55. Pre-Test Left Side View of Rear Passenger Dummy
Showing Belt and Chalking



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



FIGURE 57. Post-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View



FIGURE 58. Pre-Test Frontal View of Rear Passenger Seat Back
Prior to Dummy Positioning



FIGURE 59. Pre-Test Frontal View of Rear Passenger Dummy
Head and Shoulders in Relation to Head Restraint



FIGURE 60. Pre-Test Overhead View of Rear Passenger
Seat Pan Prior to Dummy Positioning



FIGURE 61. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

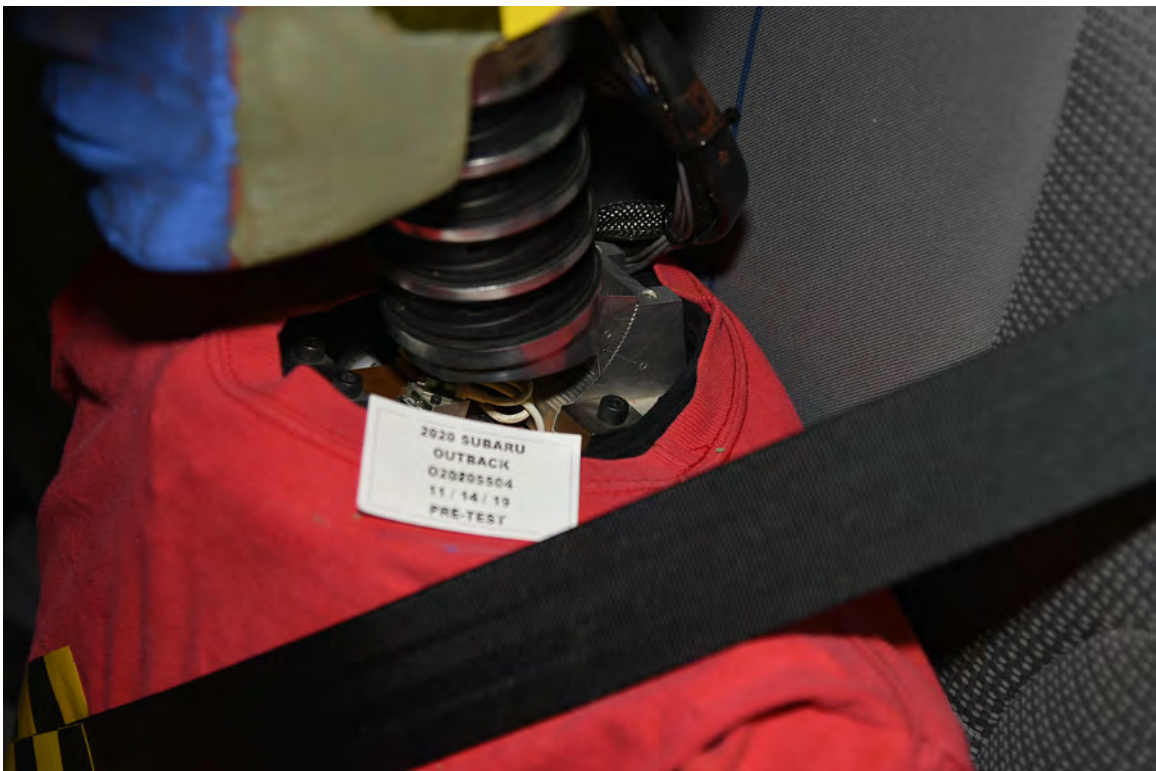


FIGURE 62. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket

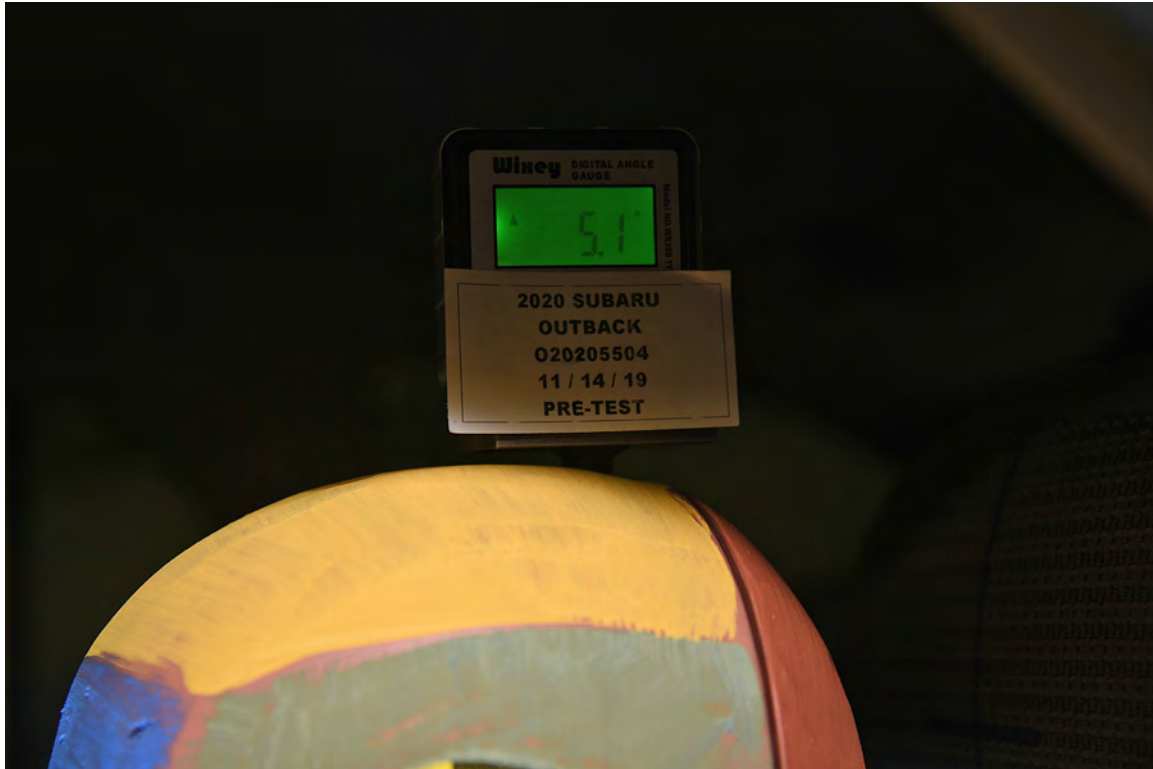


FIGURE 63. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy's Head is Level



FIGURE 64. Pre-Test Placement of Rear Passenger Dummy's Feet



FIGURE 65. Pre-Test View of Belt Anchorage for Rear Passenger Dummy



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



FIGURE 67. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



FIGURE 68. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



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



FIGURE 70. Post-Test Rear Passenger Dummy and Door Clearance View



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



FIGURE 72. Post-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment



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



FIGURE 74. Post-Test Rear Passenger Inner Door Panel View
Showing Rear Passenger Dummy Contact Locations



FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle Interior View



FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Side Airbag View



FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with
Rear Passenger Side Airbag

FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View



FIGURE 79. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with
Rear Passenger Side Airbag

FIGURE 80. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View



FIGURE 81. Post-Test Rear Passenger Dummy Close-Up Knee Contact View



FIGURE 82. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 83. Post-Test View of Fuel Filler Cap or Fuel Filler Neck



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



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

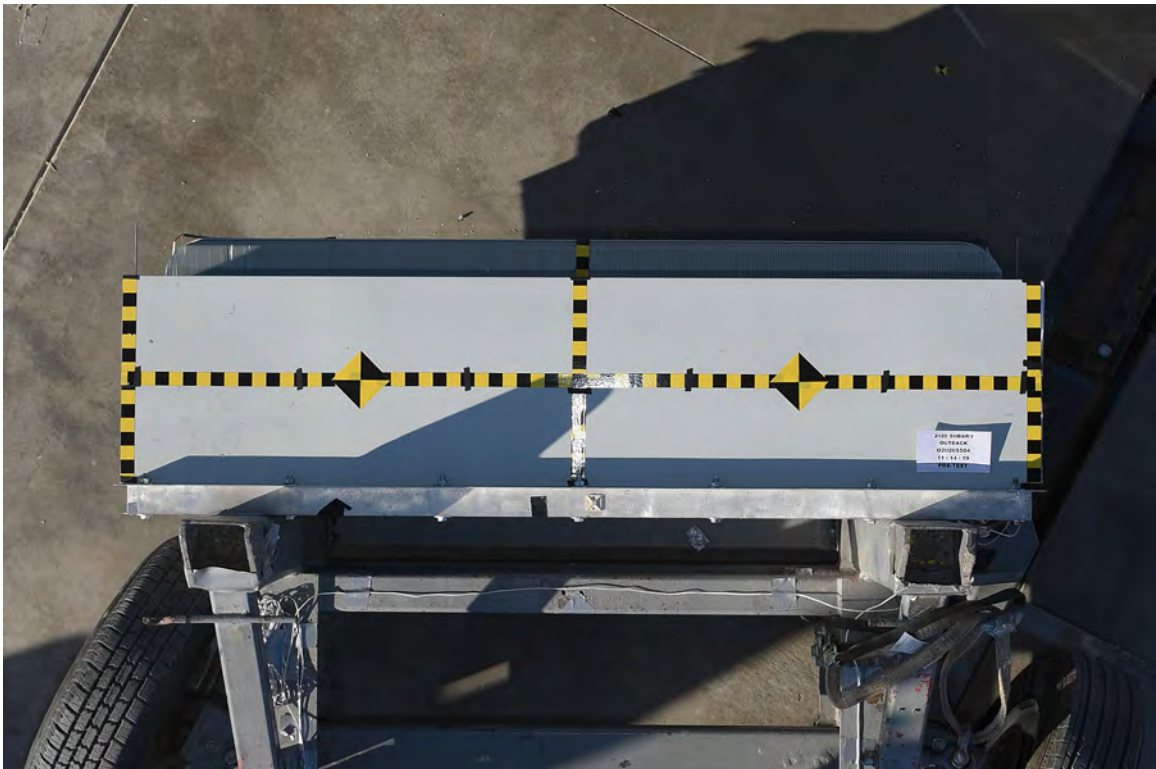


FIGURE 86. Pre-Test Top View of MDB Impactor Face



FIGURE 87. Post-Test Top View of MDB Impactor Face



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



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



FIGURE 90. Pre-Test Right Side View of MDB Impactor Face



FIGURE 91. Post-Test Right Side View of MDB Impactor Face



FIGURE 92. Close-Up View of Vehicle's Certification Label

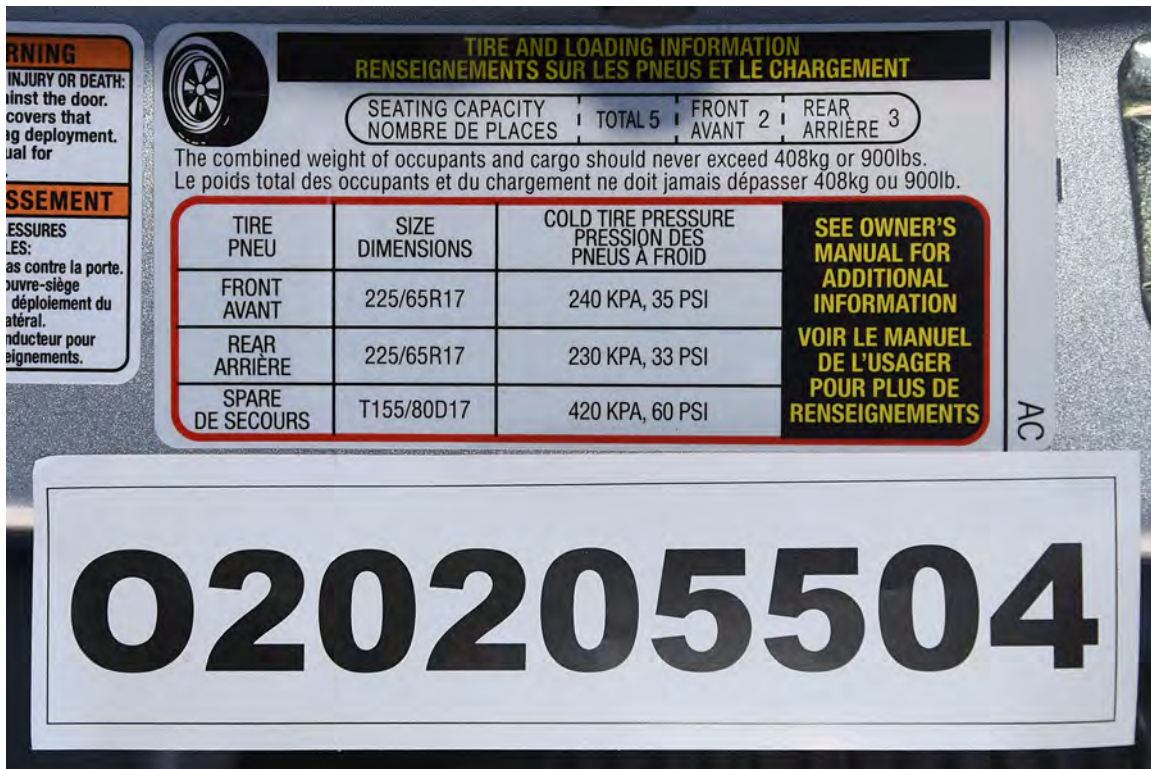


FIGURE 93. Close-Up View of Vehicle's Tire Information Placard or Label

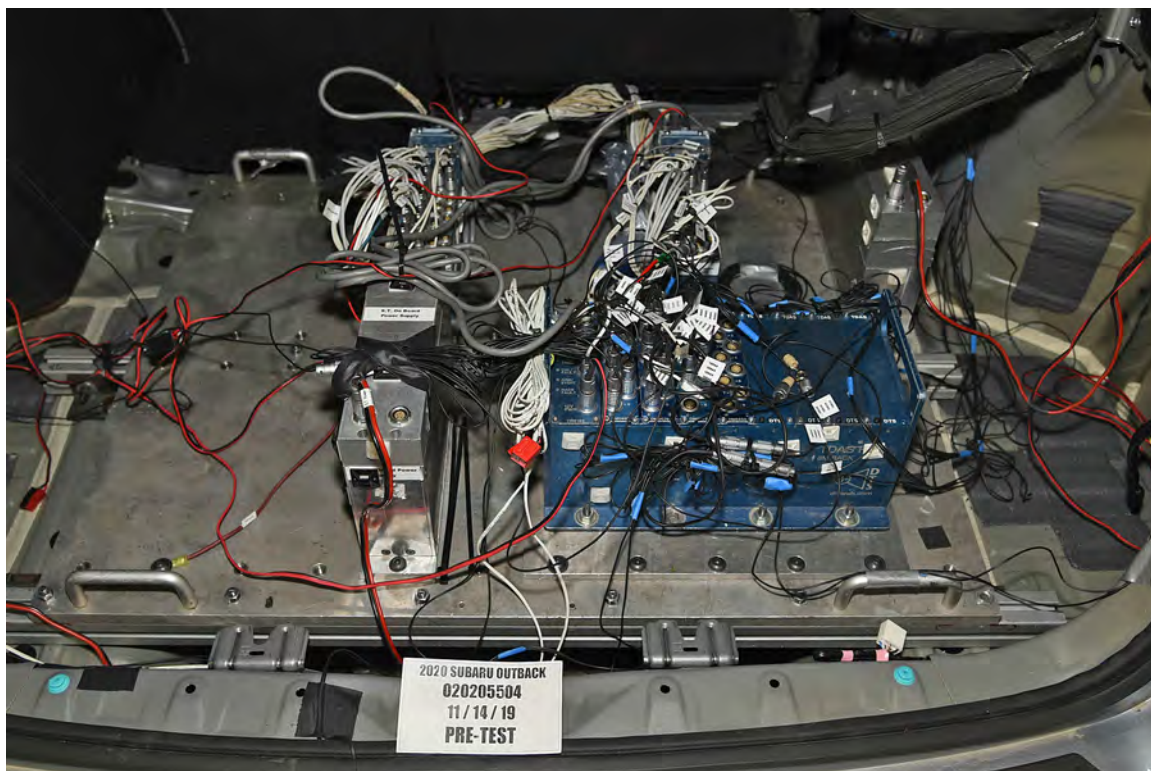


FIGURE 94. Pre-Test Ballast View



FIGURE 95. Post-Test Primary and Redundant Speed Trap Read-Out



FIGURE 96. FMVSS No. 301 Static Rollover 0 Degrees



FIGURE 97. FMVSS No. 301 Static Rollover 90 Degrees



FIGURE 98. FMVSS No. 301 Static Rollover 180 Degrees

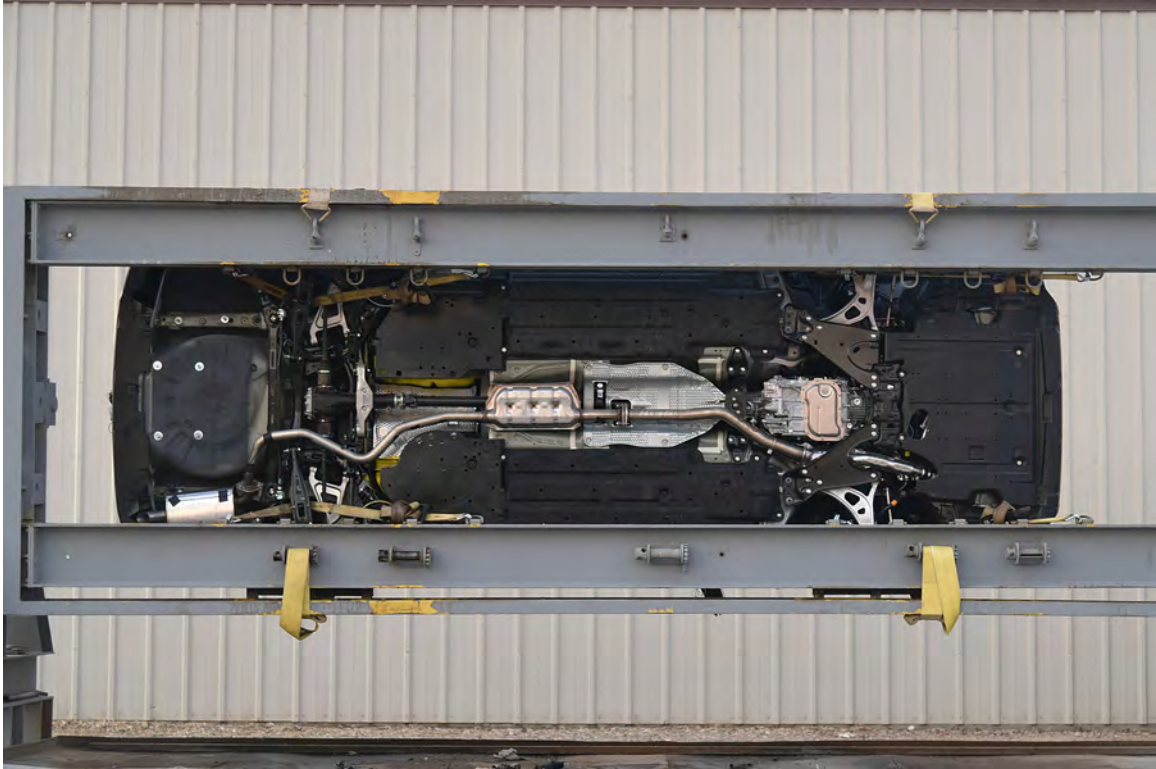


FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees



FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 101. Impact Event

OUTBACK™

VIN: 4548TACC6L3113771
Model/Code: 2020 SUBARU OUTBACK PREMIUM LEO
Port/Assembly: LAFAYETTE, MI
Deliver by Carrier: TRUCK / 430

SHIP TO: 401289
KENDISIA SUBARU
7000 120TH AVE
KENDISIA WI 53143

SOLD TO: 401289
KENDISIA SUBARU
7000 120TH AVE
KENDISIA WI 53143

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated
Based on the combined ratings of frontal, side and rollover. (Crash) ONLY has compared to other vehicles of similar base and weight.

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

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4238

STANDARD EQUIPMENT

Symmetrical All-Wheel Drive w/ Vehicle Dynamics Control
EyeSight Driver-Assist System w/ Automatic Emergency Braking
Advanced Adaptive Cruise Control w/ Lane Centering
Lane Departure and Sway Warning
Rear Vision Camera w/ Adaptive Guidelines
Anti-Lock Brakes (ABS)
4-Wheel Disc Brakes with Brake Assist
Subaru Advanced Frontal Airbag System
Driver Knee Airbag, Passenger Seat Cushion Airbag
Side Curtain Airbags with Roll-over Sensor and Side Side Airbags
3-Point Seatbelts, Front/Rear Load Limiters & Pretensioners
LATCH System for Child Safety Seats
Anti-Theft Alarm & Immobilizer System
Brake Override System
Whiplash Protection Front Seats
SUBARU STARLINK Safety Plus - 3 Years Free
PERFORMANCE AND EXTERIOR
2.5L Direct Injection 4-Cylinder DOHC 16 Valve Boxer Engine
Lineartronic CVT with 8-Speed Manual Mode
Auto Start - Stop
X-Mode, Traction Management System
Active Torque Vectoring with Quick Ratio Steering
Four-Wheel Independent Suspension
17" Aluminum Alloy Wheels: Black w/ Machine Finish
LED Headlights w/ High Beam Assist, LED Fog Lights
Integrated Roof Rack System with Swing-In Place Crossbars

OPTIONAL EQUIPMENT AND OTHER ITEMS

Manufacturer's Suggested Retail Price: \$28,995.00
Exterior Color: Ice Silver Metallic
Full Tank of Gas
Standard Option: 11
Popular Package #1
Mirror Compacts w/ Automatic LED Upgrade - Dome Light
Ext. Auto Dim Mirror
Rear Bumper Cover
All-Weather Floor Liners
Cargo Net
\$79.00

Fuel Economy and Environment

Fuel Economy
29 MPG
26 city 33 highway
3.4 gallons per 100 miles

You save \$500
in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,400

Fuel Economy & Greenhouse Gas Rating (city only) **Smog Rating** (city only)

fuelconomy.gov

Parts Content Information
FOR VEHICLES IN THIS COUNTRY:
U.S./CANADIAN PARTS CONTENT: 45%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN: 40%
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: Lafayette, IN
COUNTRY OF ORIGIN: JAPAN
ENGINE: JAPAN
TRANSMISSION: JAPAN
Note: Parts content does not include final assembly, distribution, or other non-parts costs.

Destination and Delivery \$1,010.00
Total Suggested Retail Price \$30,927.00

FIGURE 102. Monroney Label

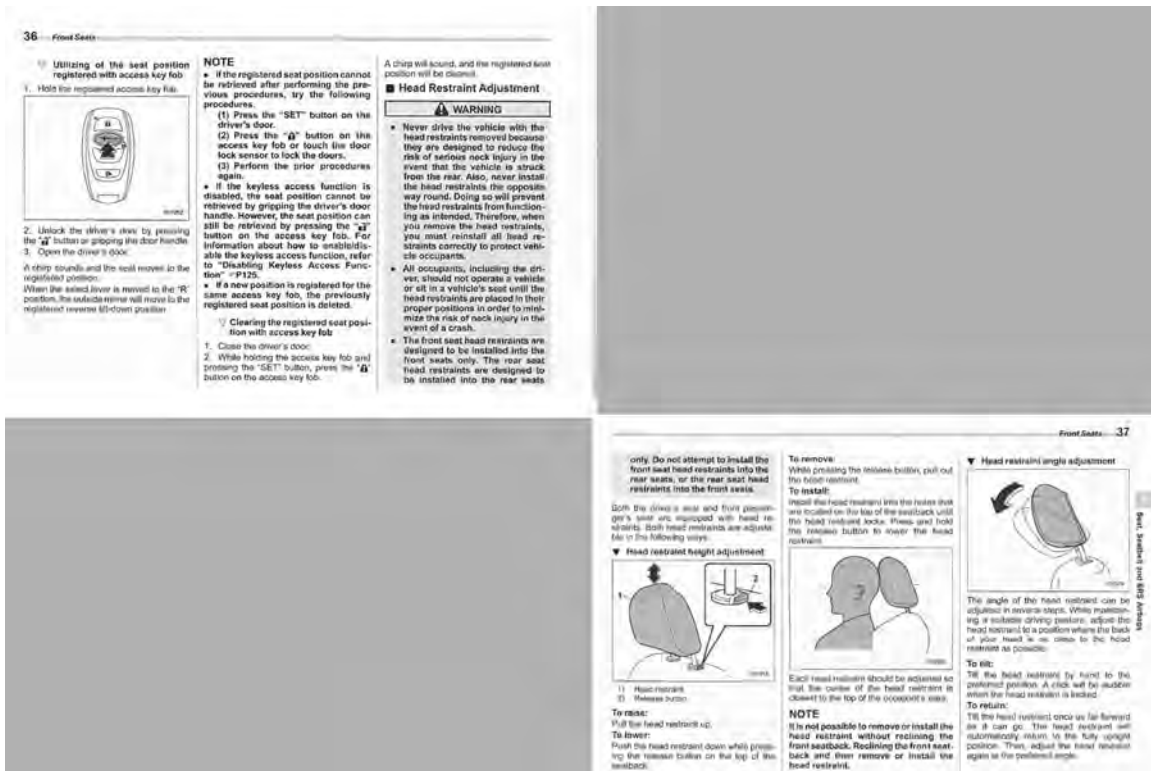


FIGURE 103. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

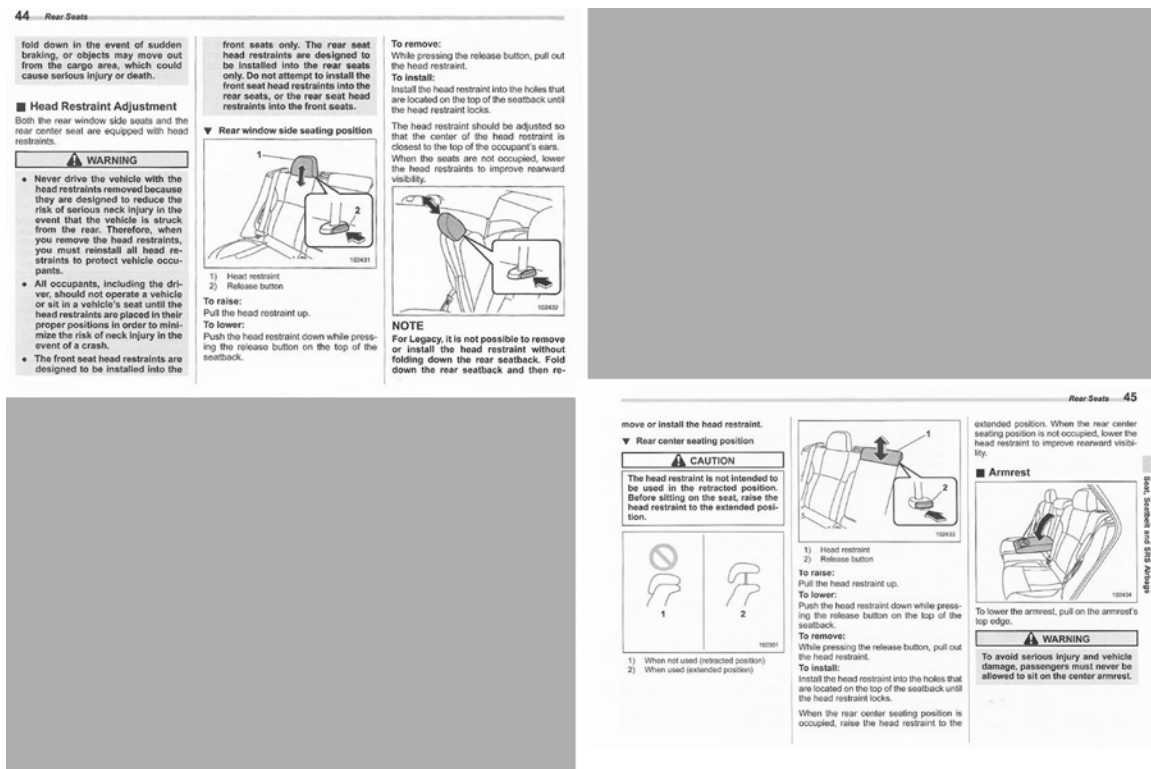


FIGURE 104. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Plot		Page
1	Driver Head Acceleration (X) Primary vs. Time	B-1
2	Driver Head Acceleration (Y) Primary vs. Time	B-1
3	Driver Head Acceleration (Z) Primary vs. Time	B-1
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6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-2
8	Driver Thorax Rib Deflection Maximum vs. Time	B-2
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10	Driver Middle Abdominal Force (Y) vs. Time	B-3
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22	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
23	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
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27	Passenger Lower Thorax Rib Deflection (Y) vs. Time	B-8
28	Passenger Upper Abdomen Rib Deflection (Y) vs. Time	B-8
29	Passenger Lower Abdomen Rib Deflection (Y) vs. Time	B-9

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website (www.NHTSA.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)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

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

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

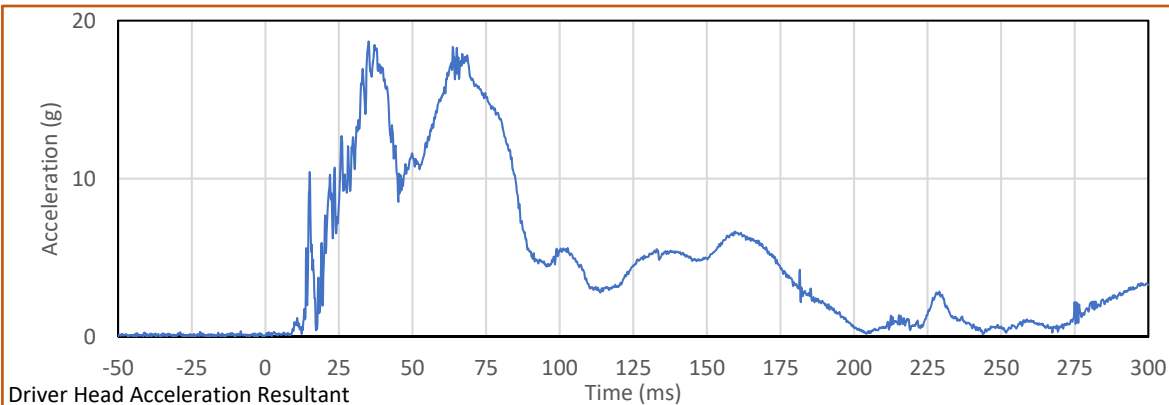
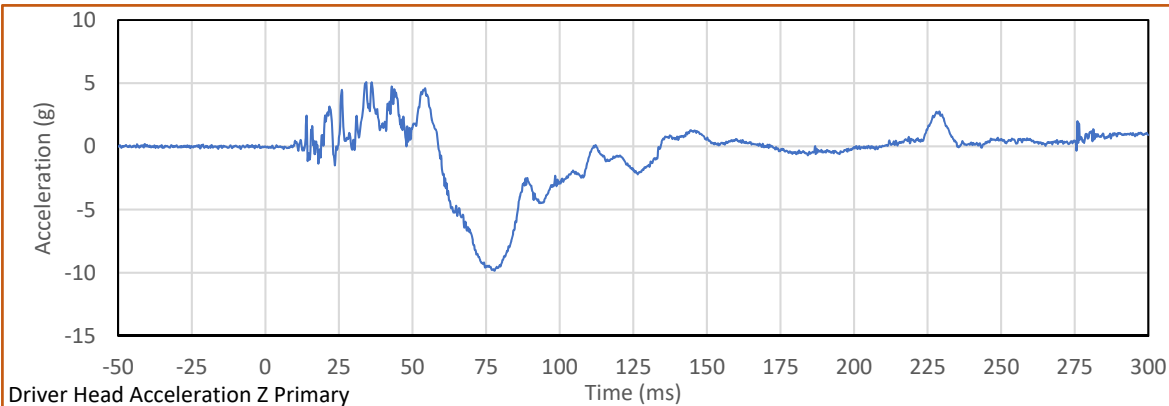
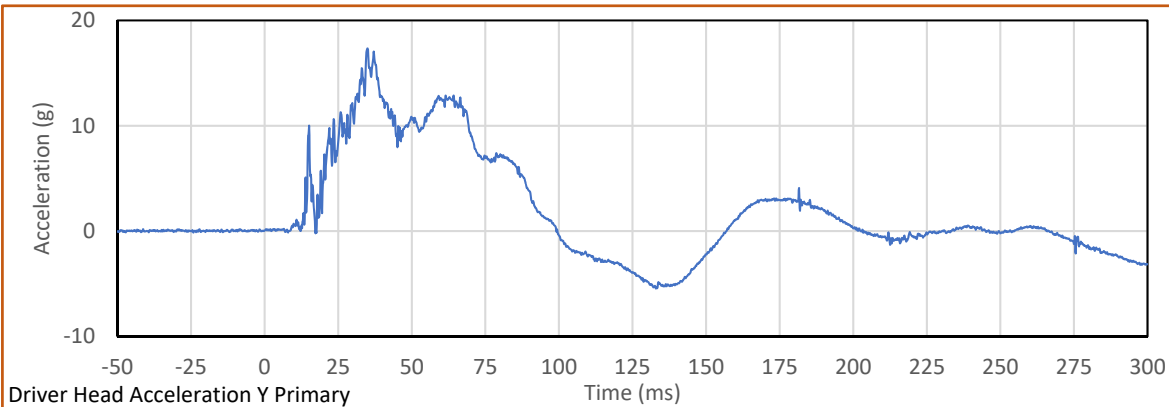
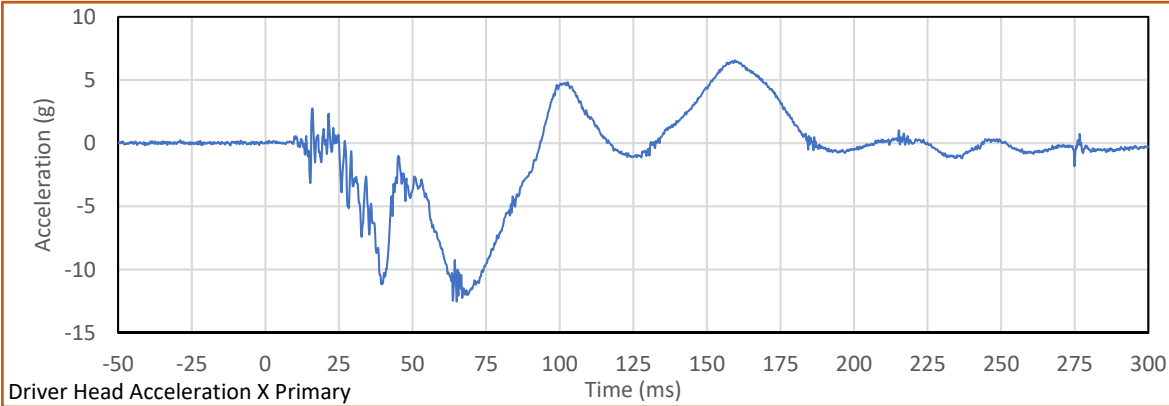
MDB Center of Gravity Acceleration (Z)

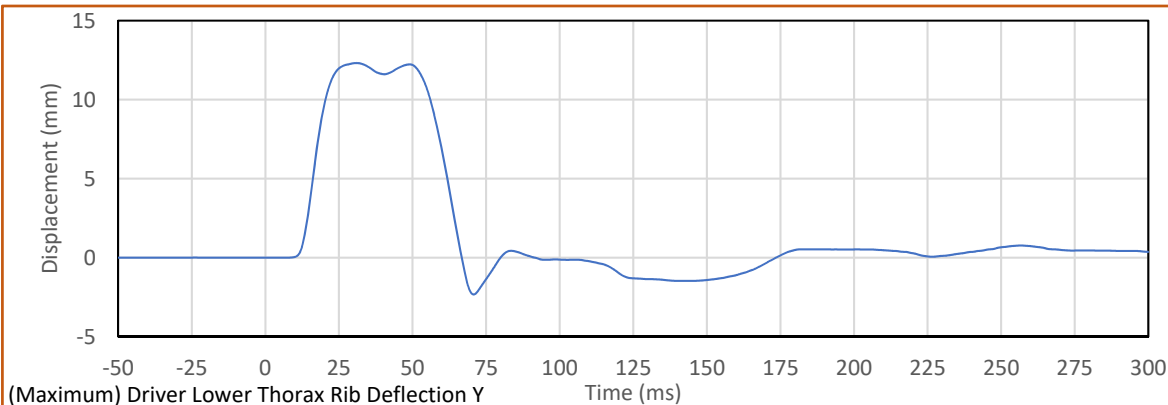
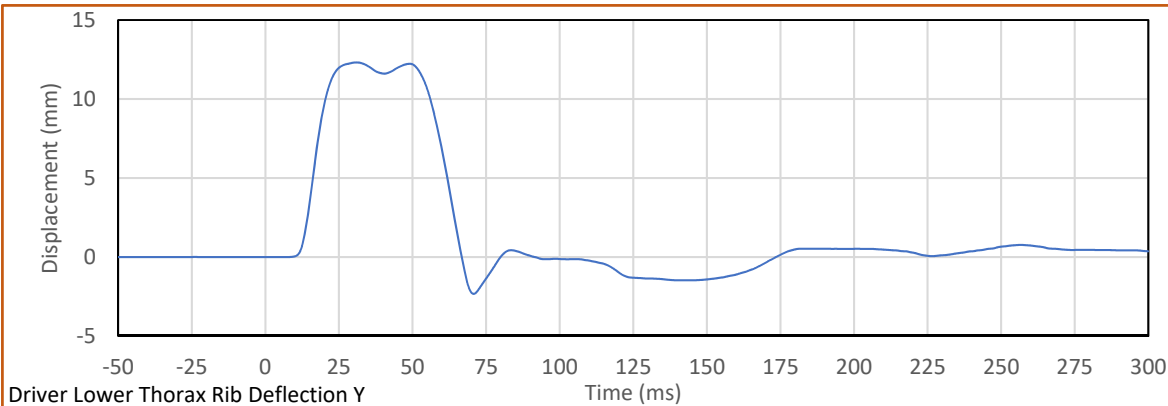
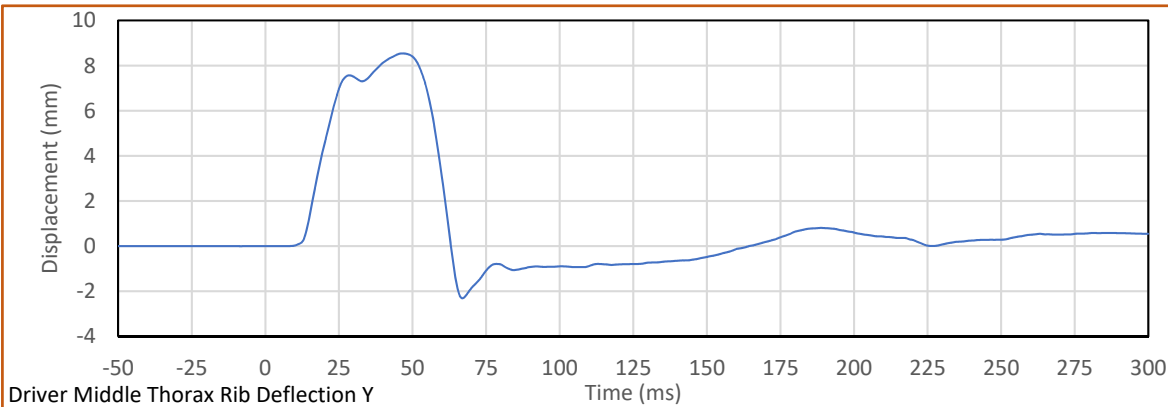
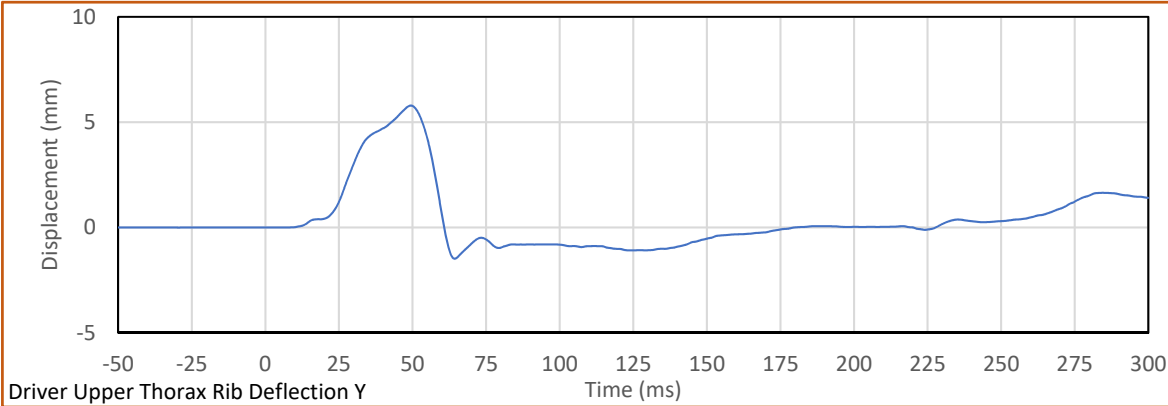
MDB Rear Acceleration (X)

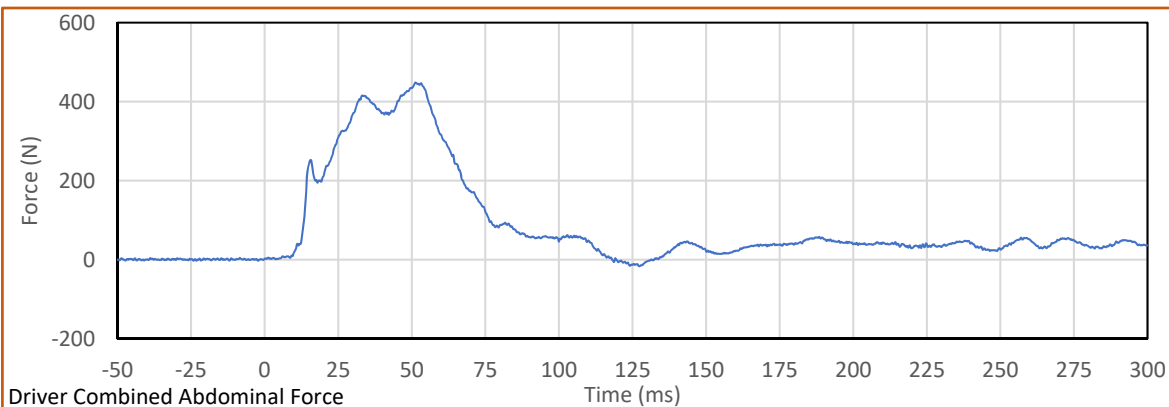
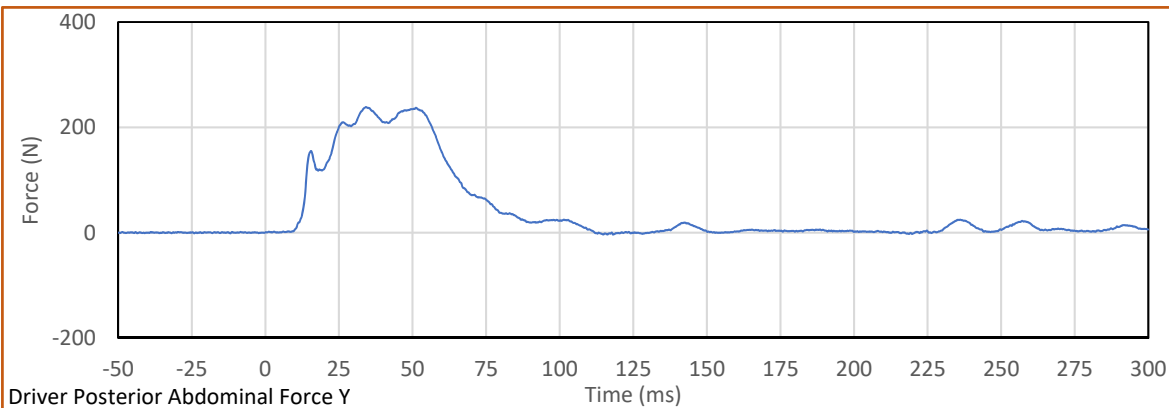
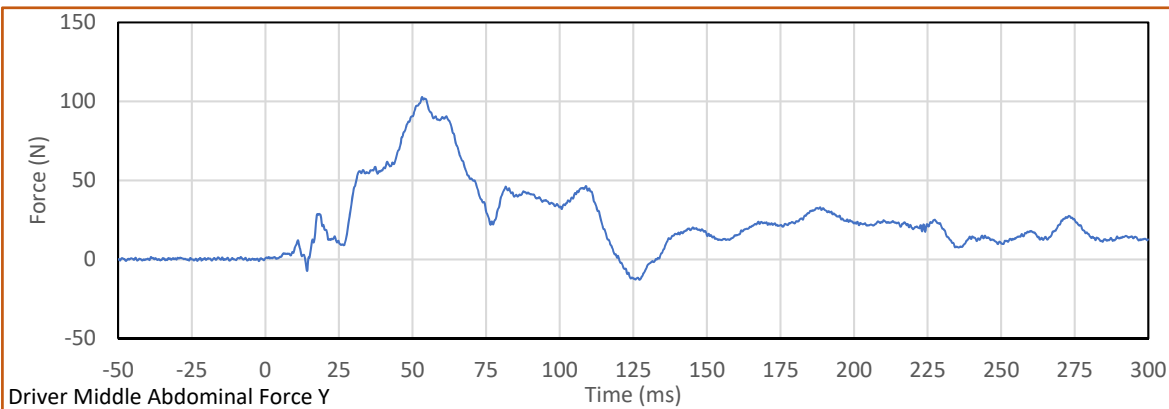
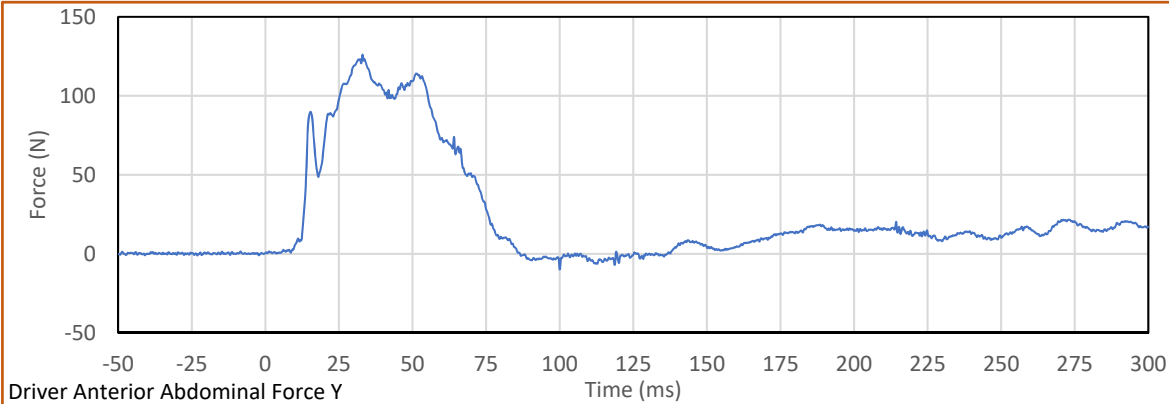
MDB Rear Acceleration (Y)

Left MDB Contact Switch

Right MDB Contact Switch

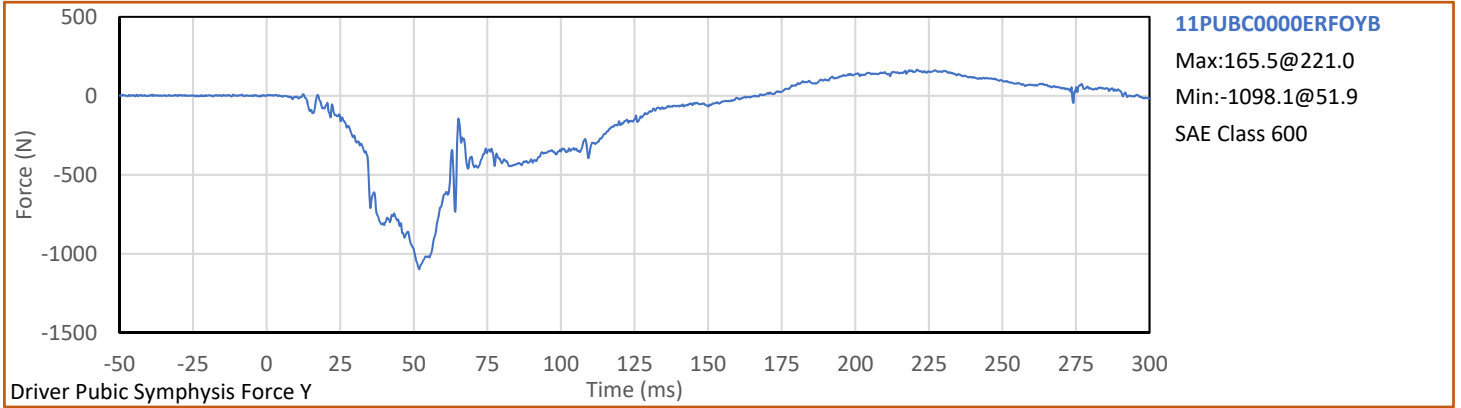


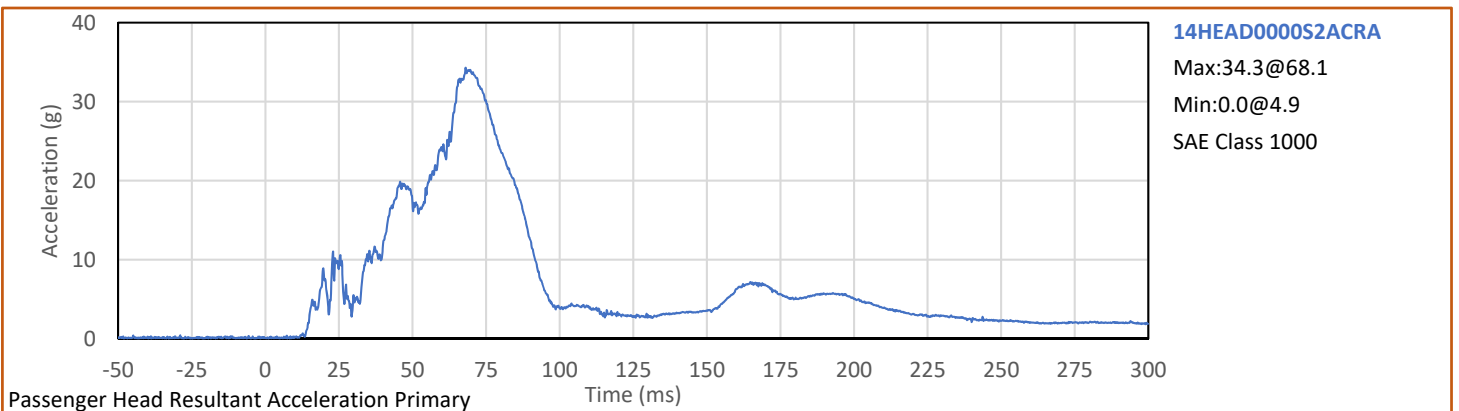
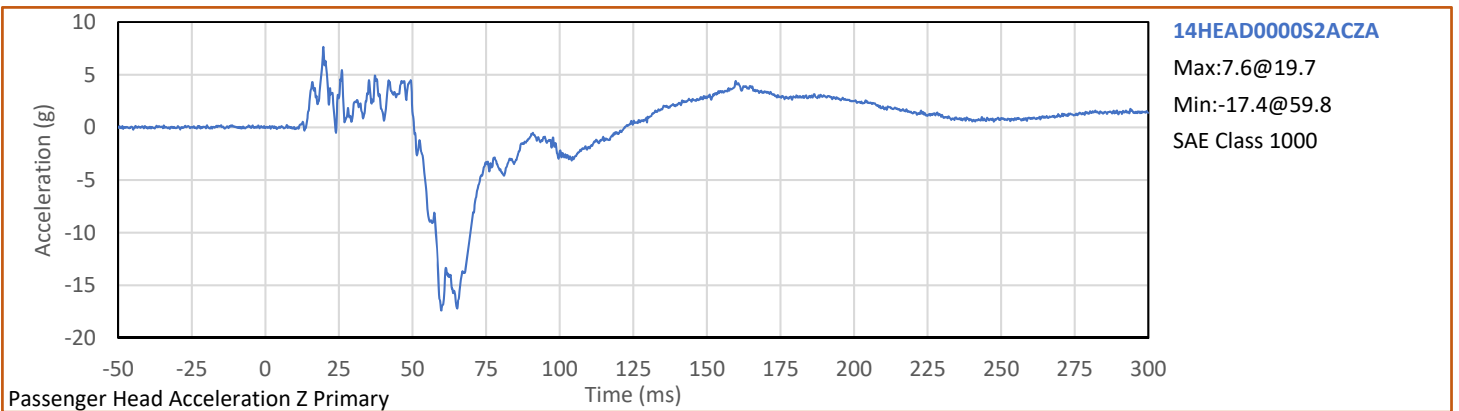
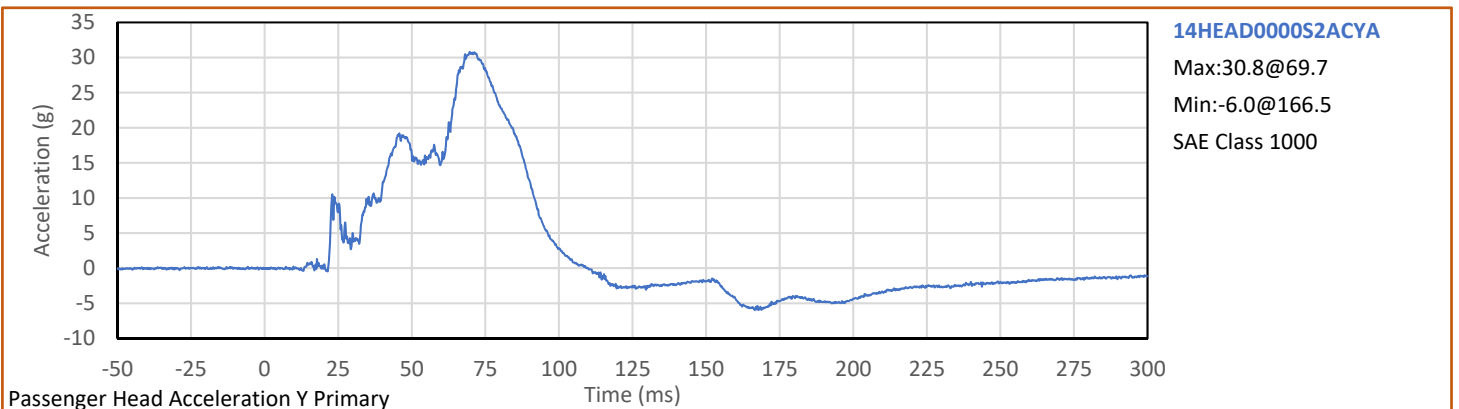
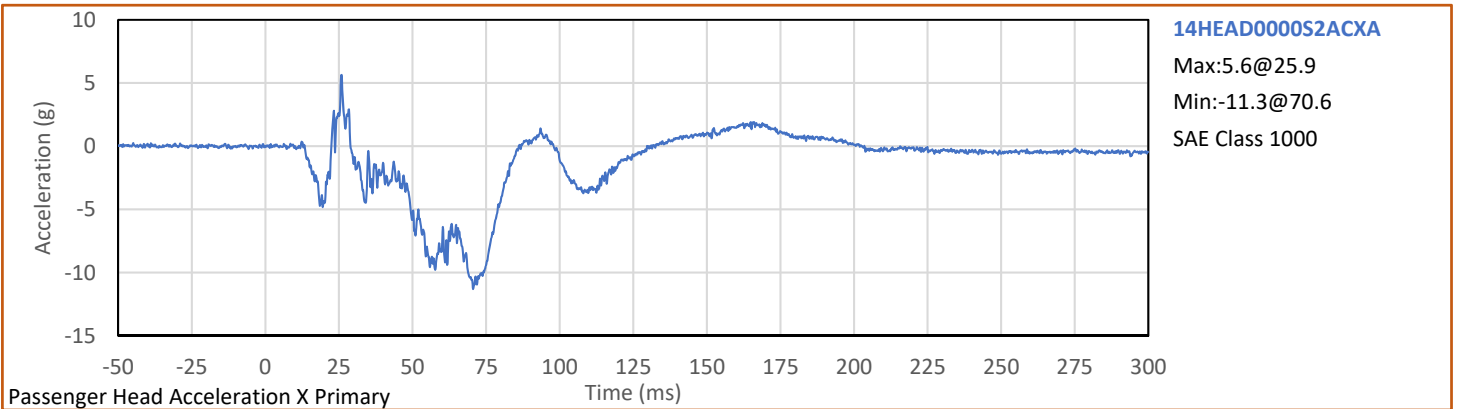




Test Vehicle: 2020 Subaru Outback 5-Door MPV
Test Program: NCAP MDB Side Impact Test

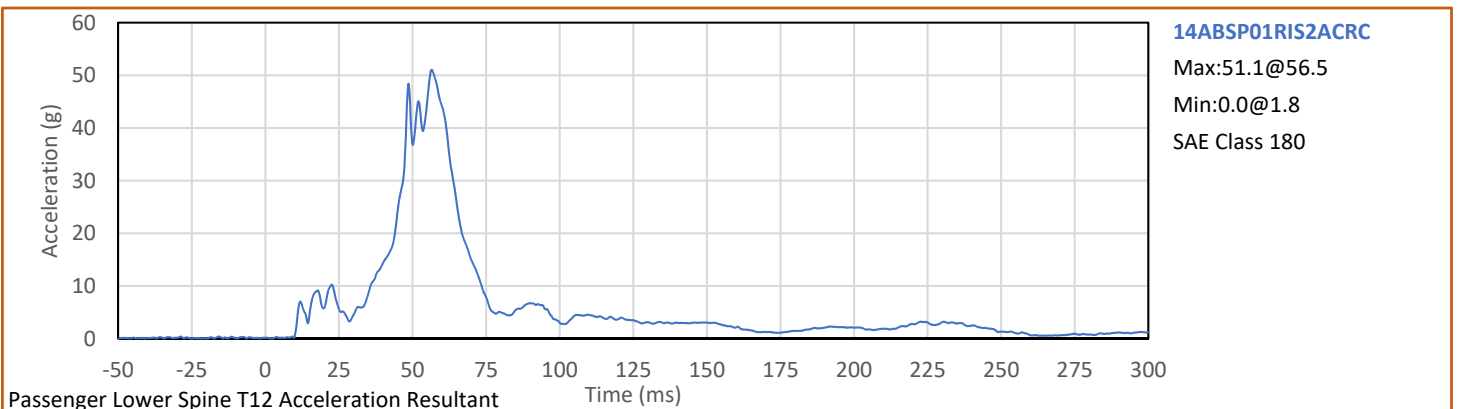
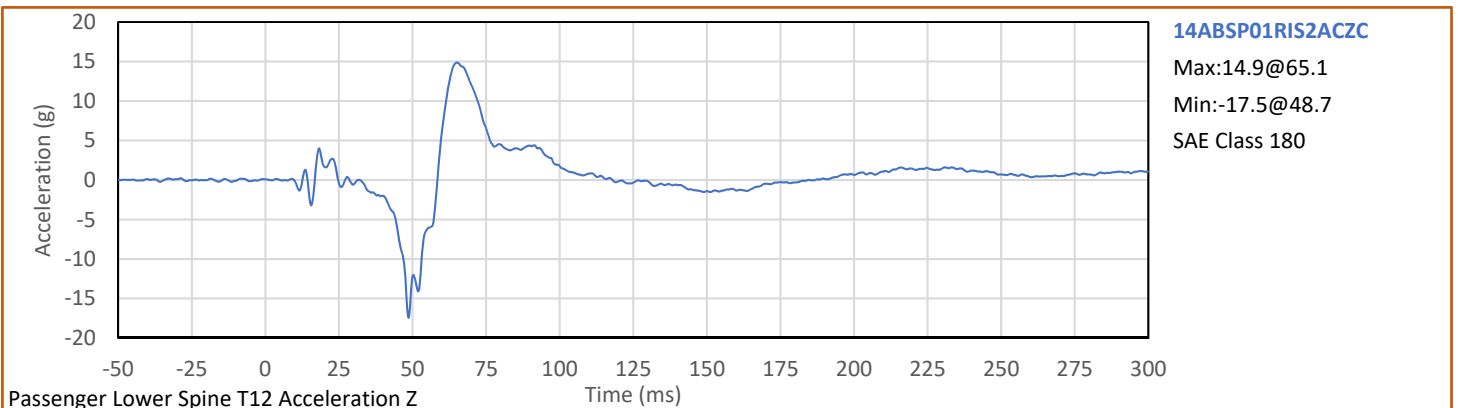
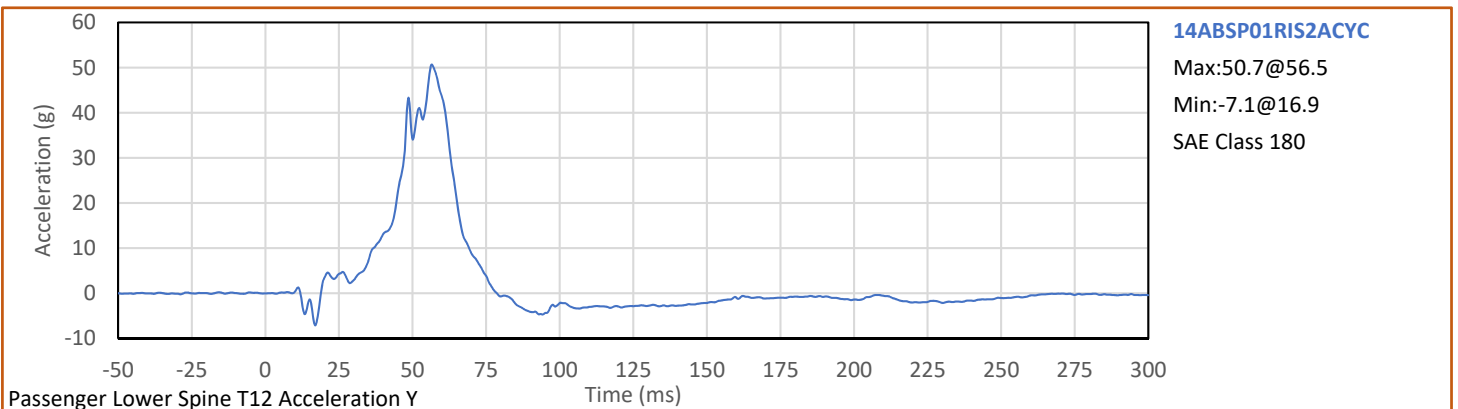
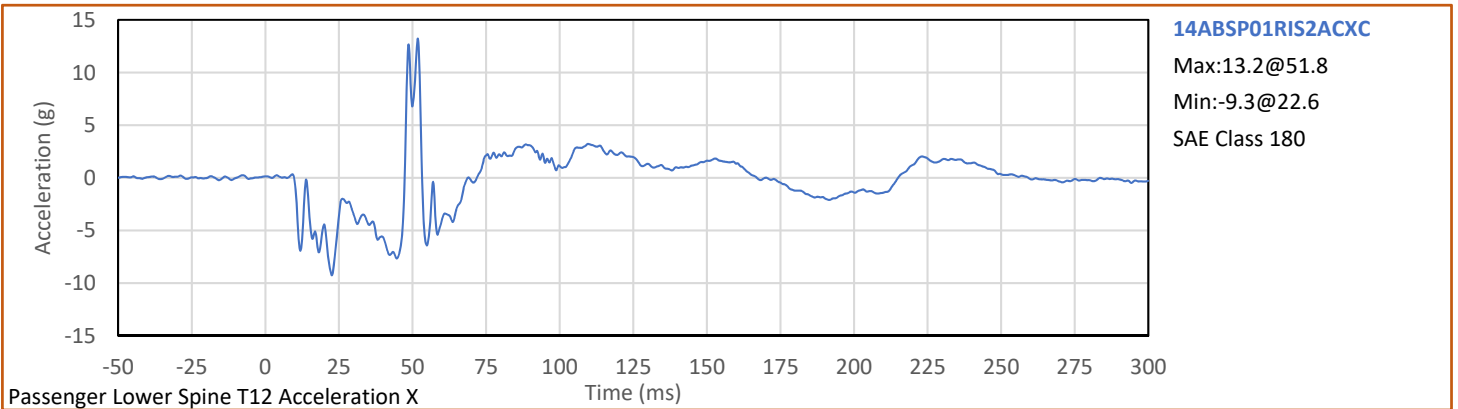
NHTSA No.: O20205504
Test Date: 11/14/2019





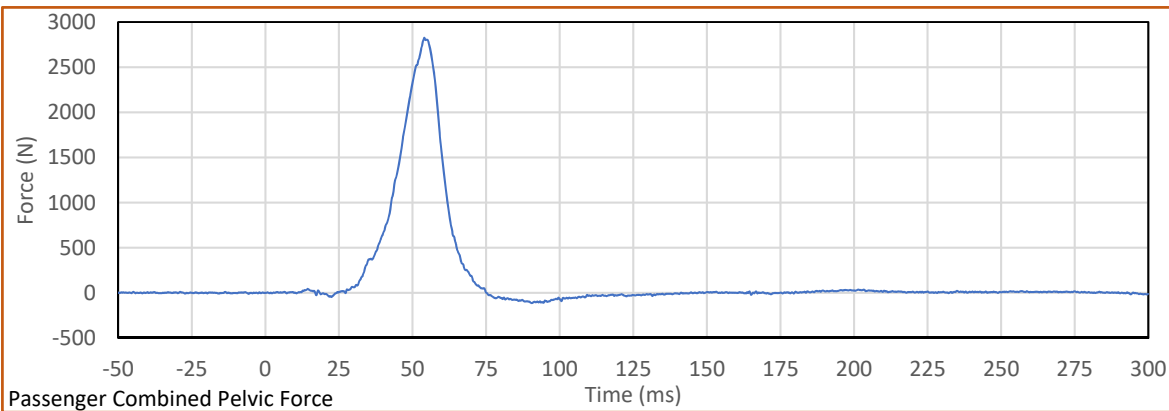
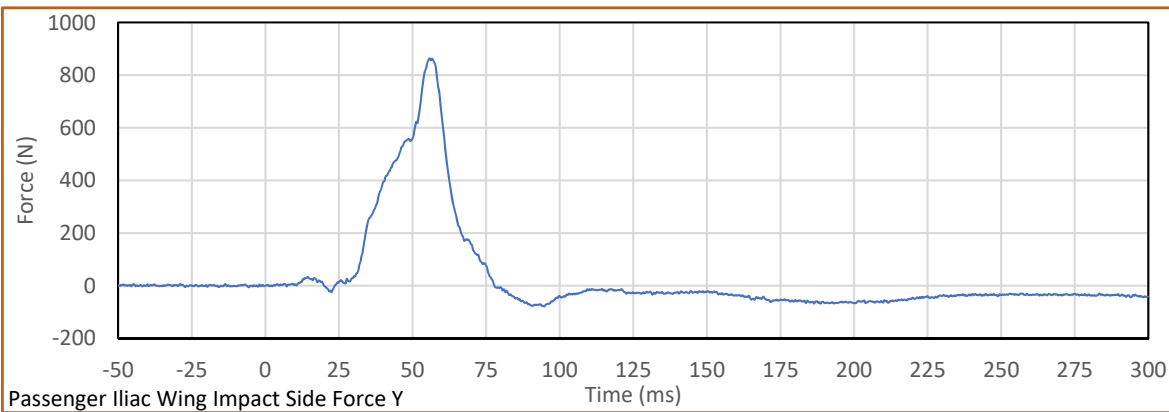
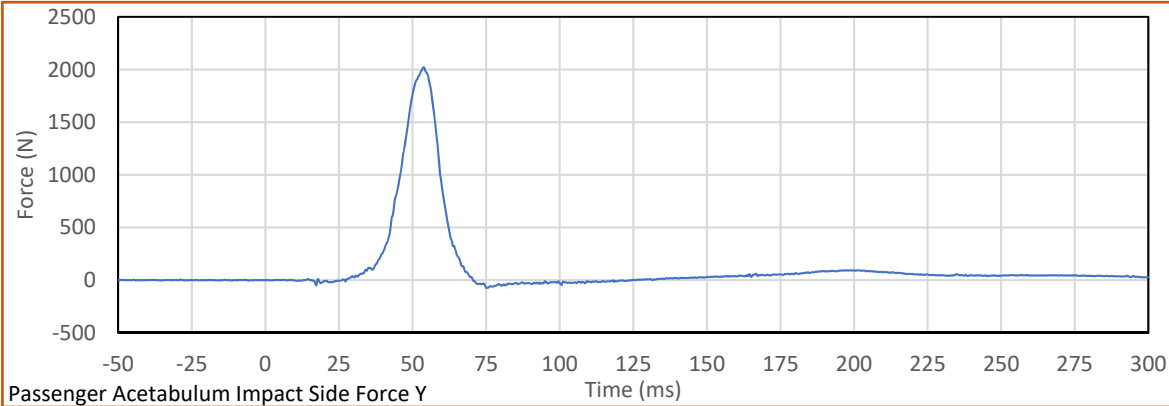
Test Vehicle: 2020 Subaru Outback 5-Door MPV
Test Program: NCAP MDB Side Impact Test

NHTSA No.: O20205504
Test Date: 11/14/2019



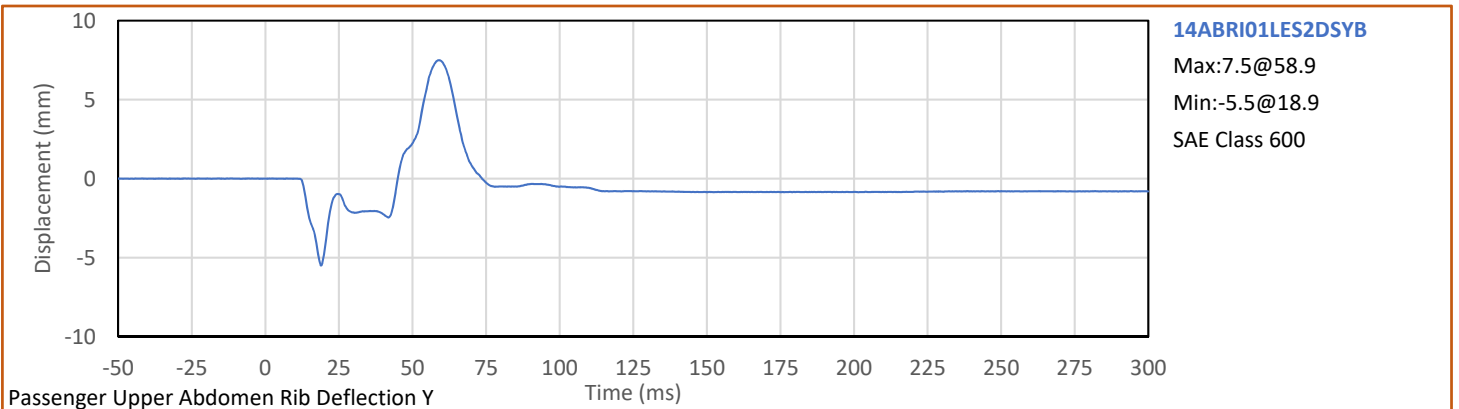
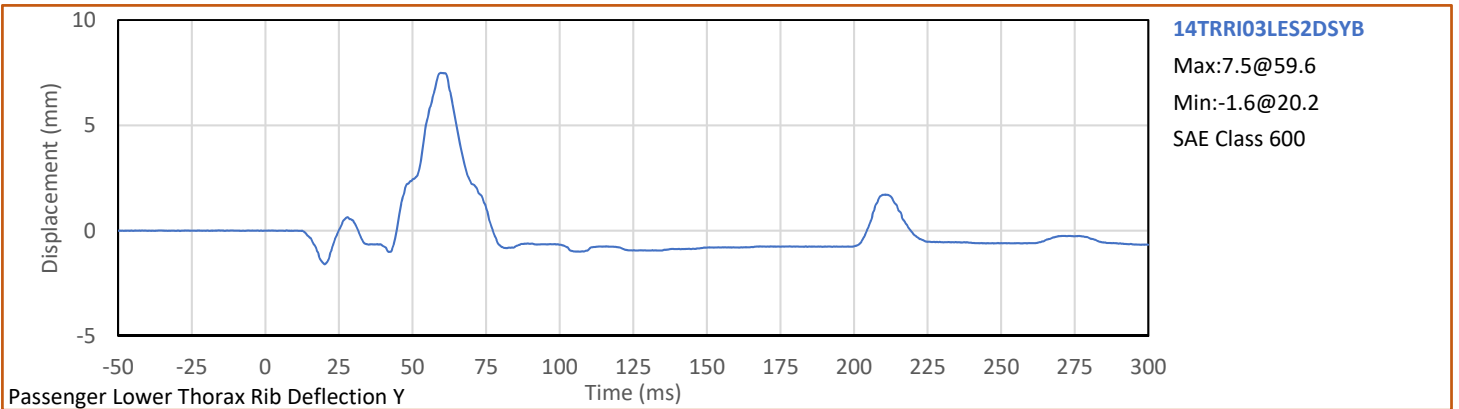
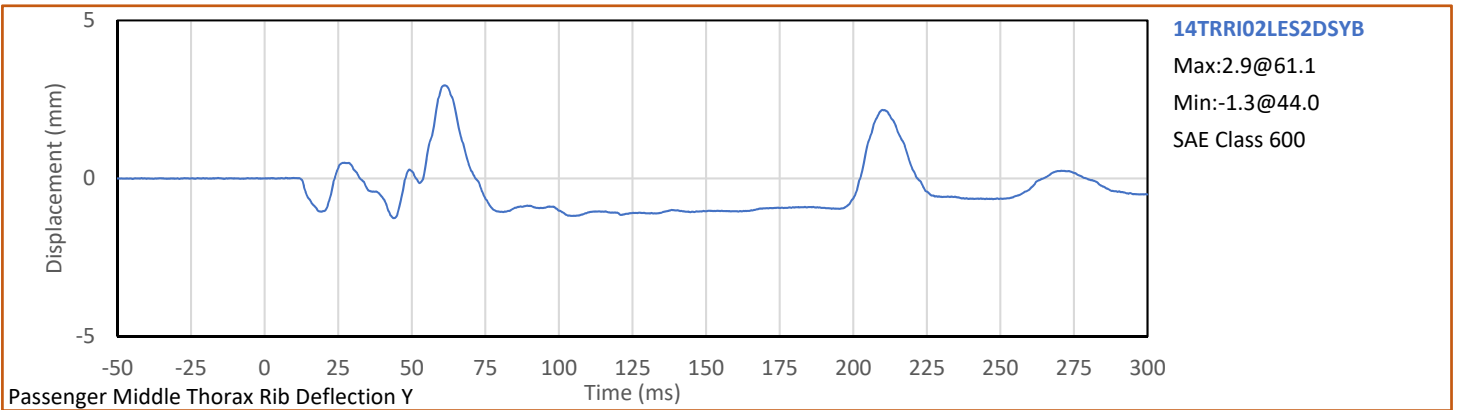
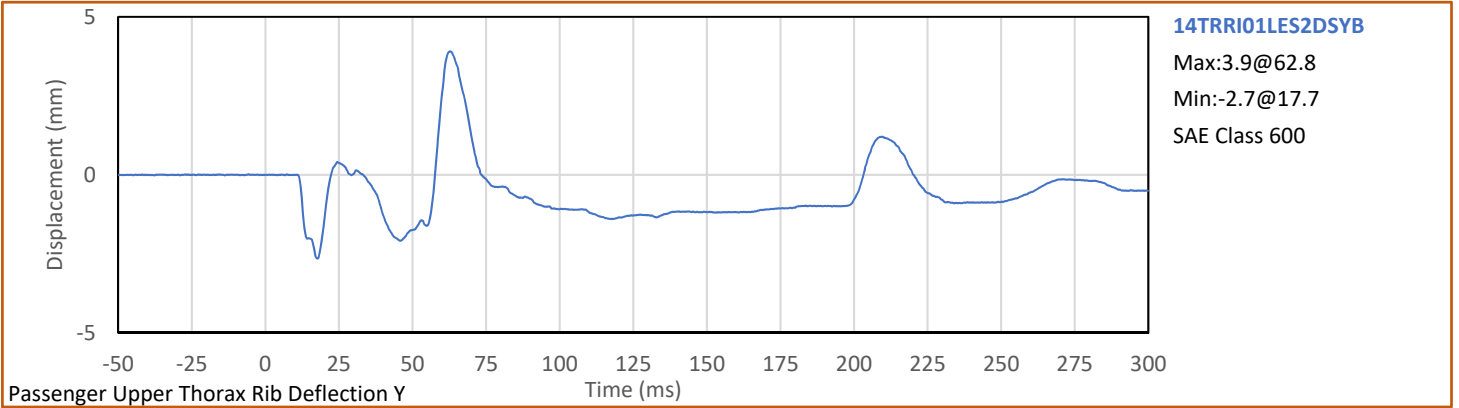
Test Vehicle: 2020 Subaru Outback 5-Door MPV
Test Program: NCAP MDB Side Impact Test

NHTSA No.: O20205504
Test Date: 11/14/2019



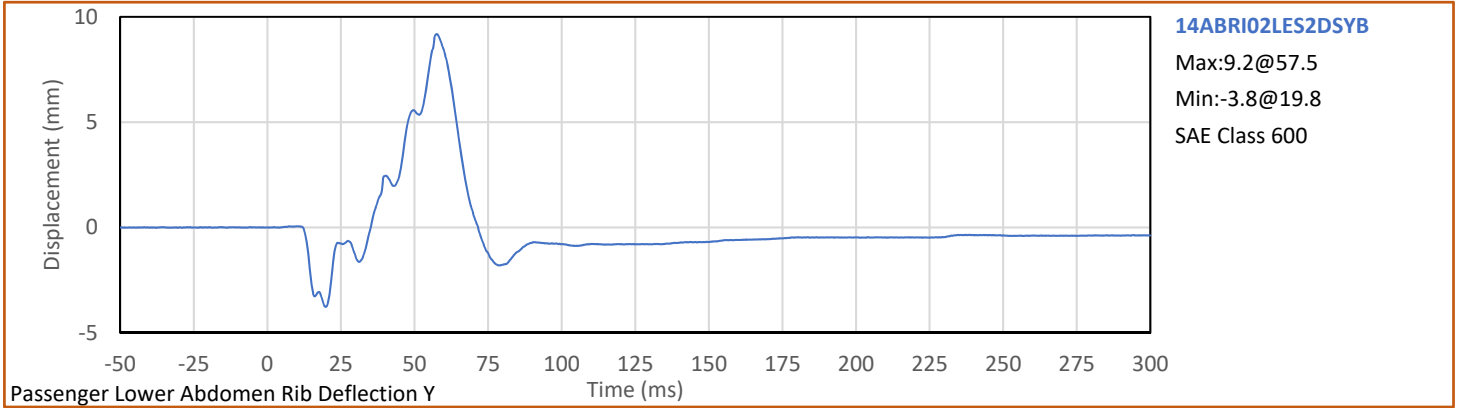
Test Vehicle: 2020 Subaru Outback 5-Door MPV
Test Program: NCAP MDB Side Impact Test

NHTSA No.: O20205504
Test Date: 11/14/2019



Test Vehicle: 2020 Subaru Outback 5-Door MPV
Test Program: NCAP MDB Side Impact Test

NHTSA No.: O20205504
Test Date: 11/14/2019



APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
Pre-Test ATD Qualification and Performance Verification
ES-2re 50th Male Side Impact ATD
S/N: F037

ATD Serial No.: F037

Test Date: 2019-11-05

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
1 - Sitting Height	mm	900	918	907	Pass
2 - Seat to Shoulder Joint	mm	558	572	563	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	351	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	100	Pass
5 - Sole to Seat, Sitting	mm	433	451	440	Pass
6 - Head Width	mm	152	158	154	Pass
7 - Shoulder/Arm Width	mm	461	479	468	Pass
8 - Thorax Width	mm	322	332	330	Pass
9 - Abdomen Width	mm	273	287	282	Pass
10 - Pelvis Lap Width	mm	359	373	370	Pass
11 - Head Depth	mm	196	206	199	Pass
12 - Thorax Depth	mm	262	272	267	Pass
13 - Abdomen Depth	mm	194	204	202	Pass
14 - Pelvis Depth	mm	235	245	240	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	157	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	611	Pass
				Overall Test Results	Pass

Technician:



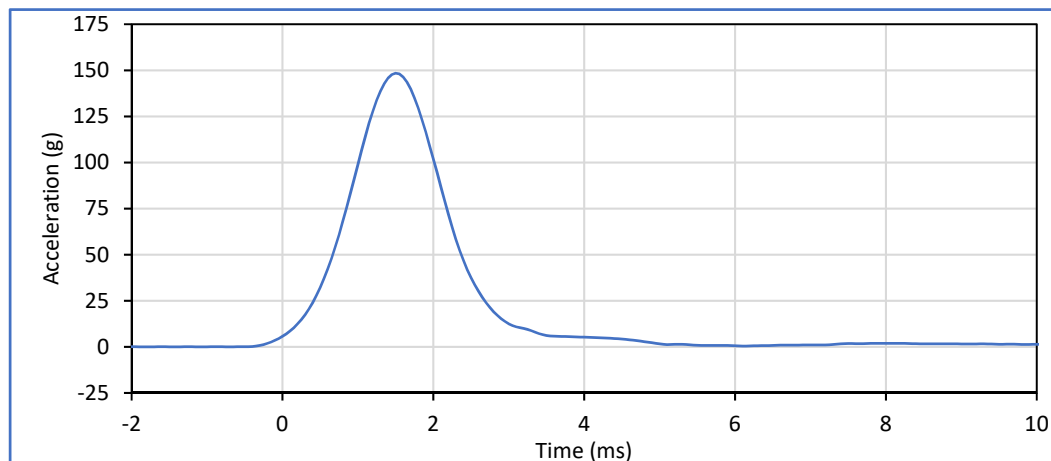
J. Hernandez

Approved By:



P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	22.2	Pass
Laboratory Humidity	%	10	70	18	Pass
Peak Resultant Acceleration	g	125.0	155.0	148.4	Pass
Peak Head Ax	g	-15.0	15.0	6.8	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass

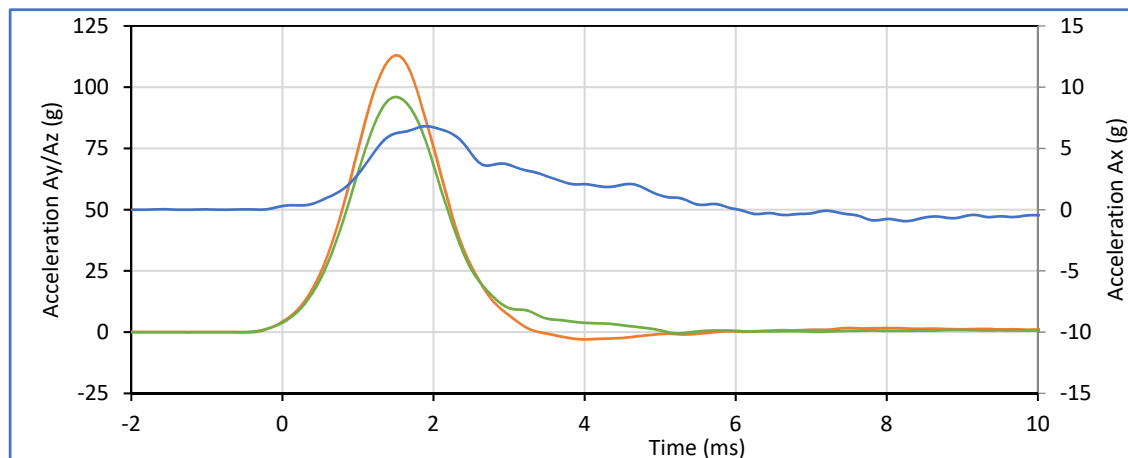


Head Resultant

Max:148.4@1.5

Min:0.4@6.2

SAE Class 1000



Head Ax

Max:6.8@1.9

Min:-0.9@8.3

SAE Class 1000

Head Ay

Max:113.0@1.5

Min:-3.0@4.0

SAE Class 1000

Head Az

Max:96.0@1.5

Min:-0.5@5.3

SAE Class 1000

Technician:

J. Hernandez

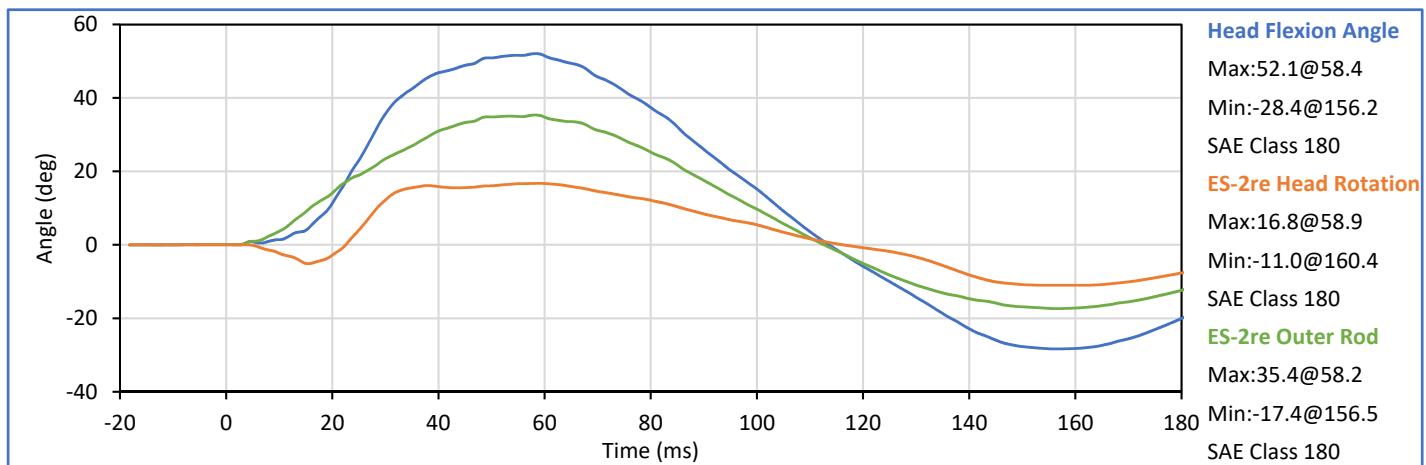
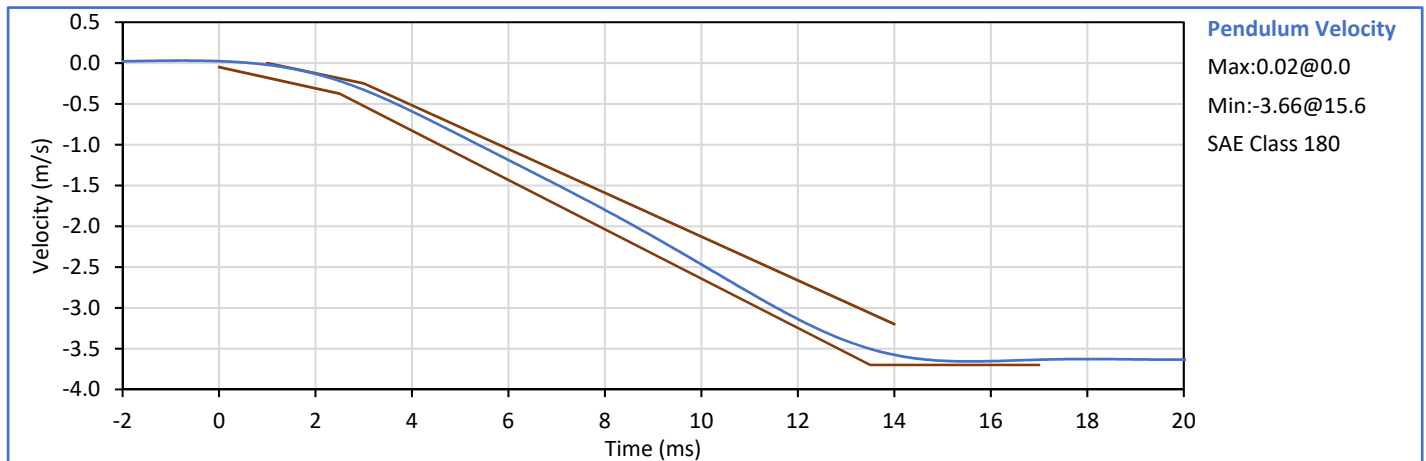
J. Hernandez

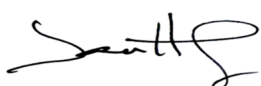
Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	19	Pass
Pendulum Velocity	m/s	3.30	3.50	3.47	Pass
Peak Headform Flexion	deg	49.0	59.0	52.1	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	58.4	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	55.3	Pass
Overall Test Results				Pass	



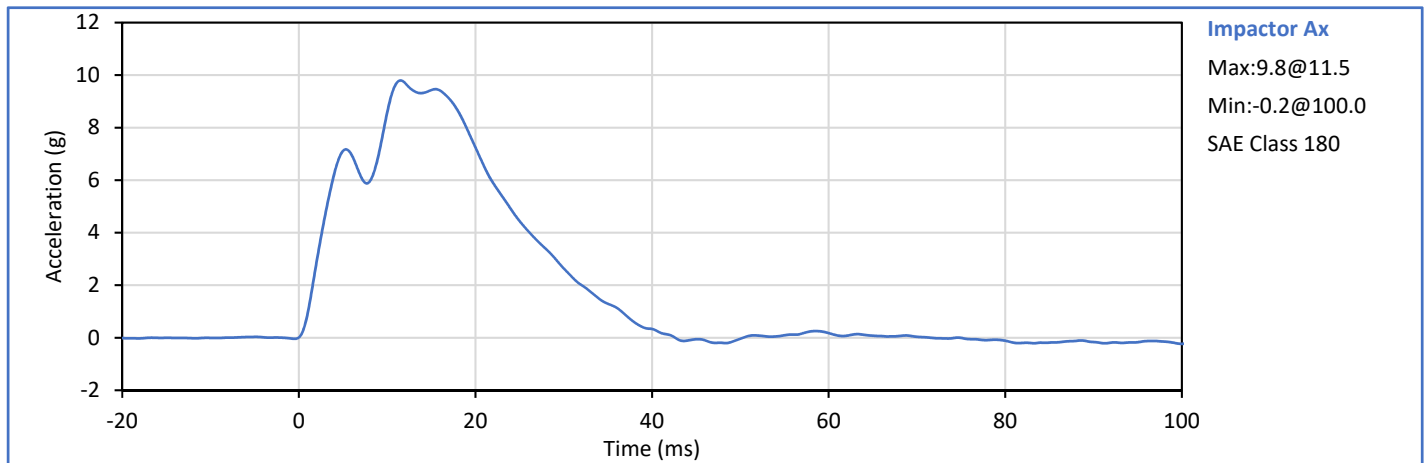
Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

ATD Serial No.: F037

Test Date: 2019-11-11

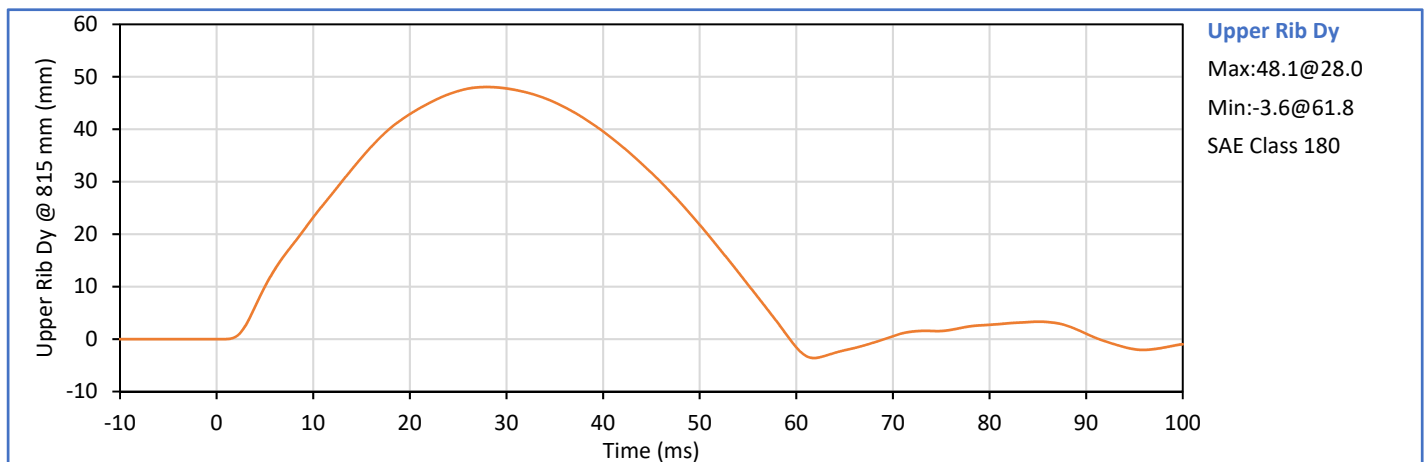
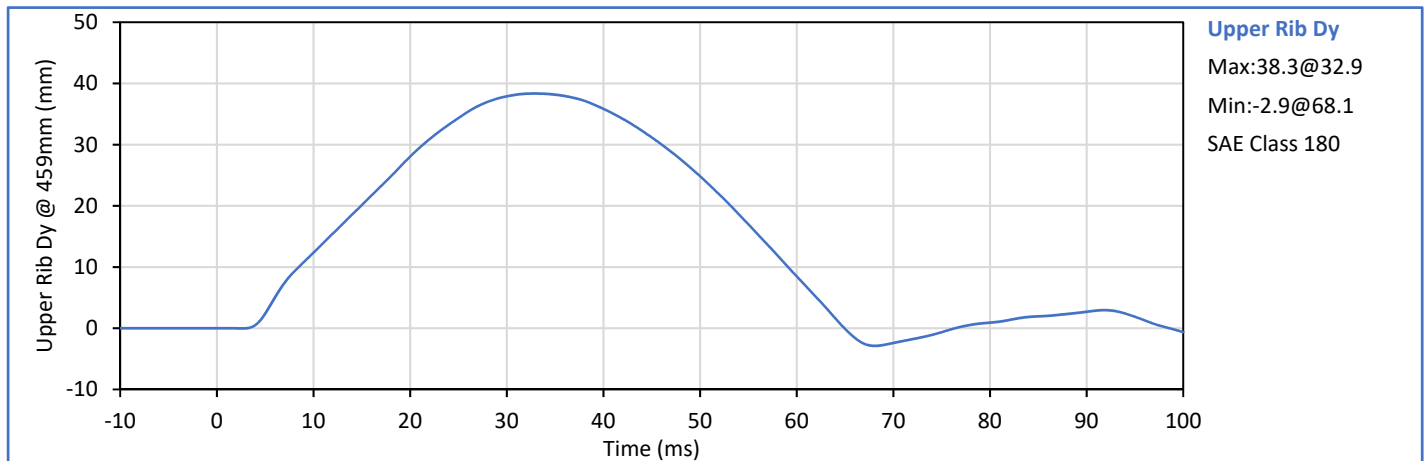
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	15	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	9.8	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

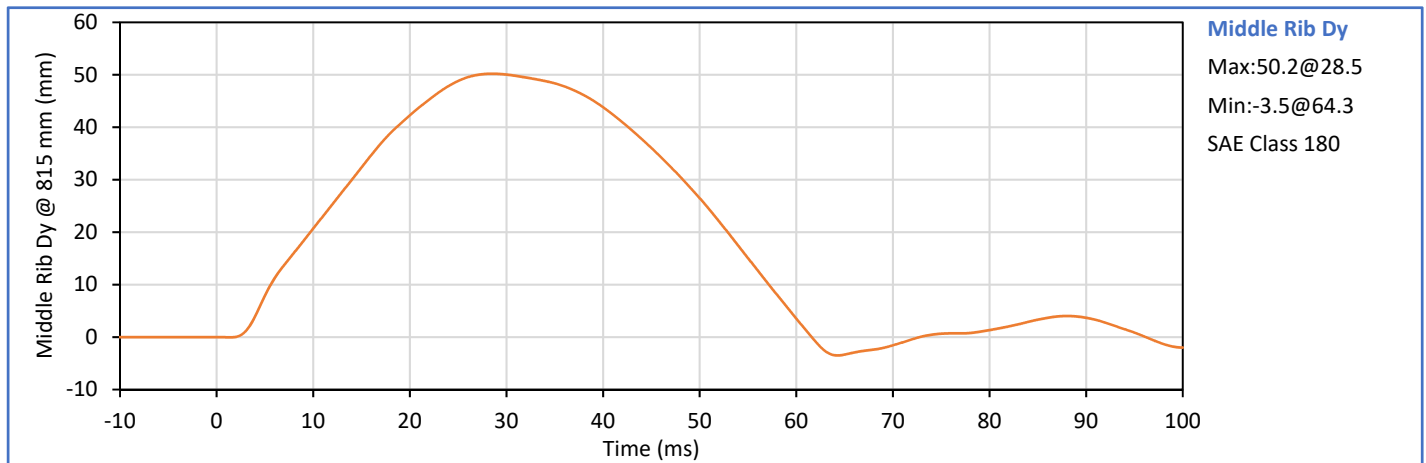
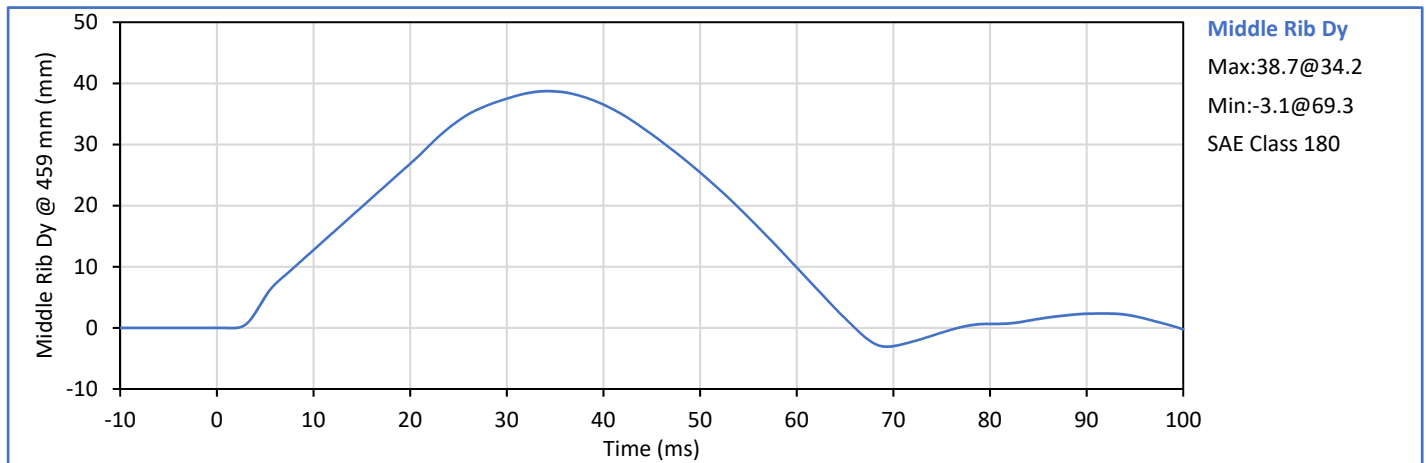
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	38.3	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.1	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

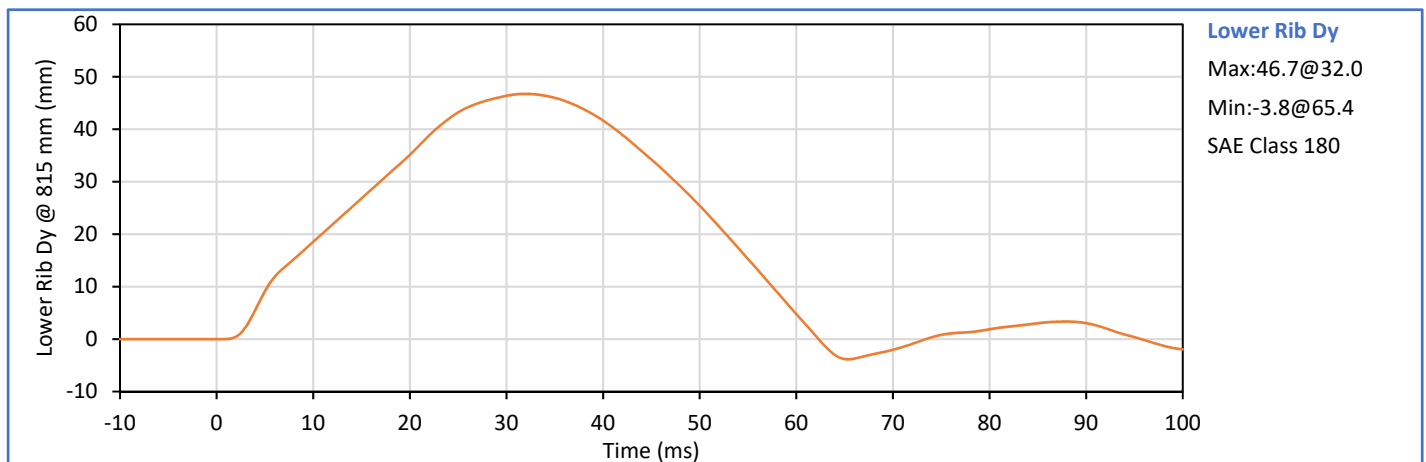
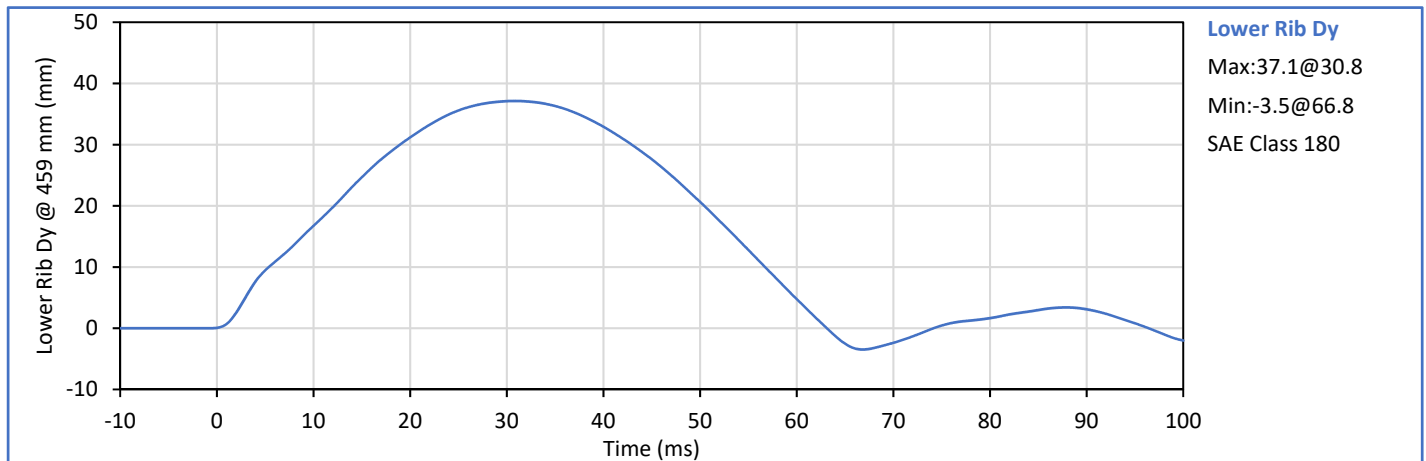
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	21	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	38.7	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	50.2	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

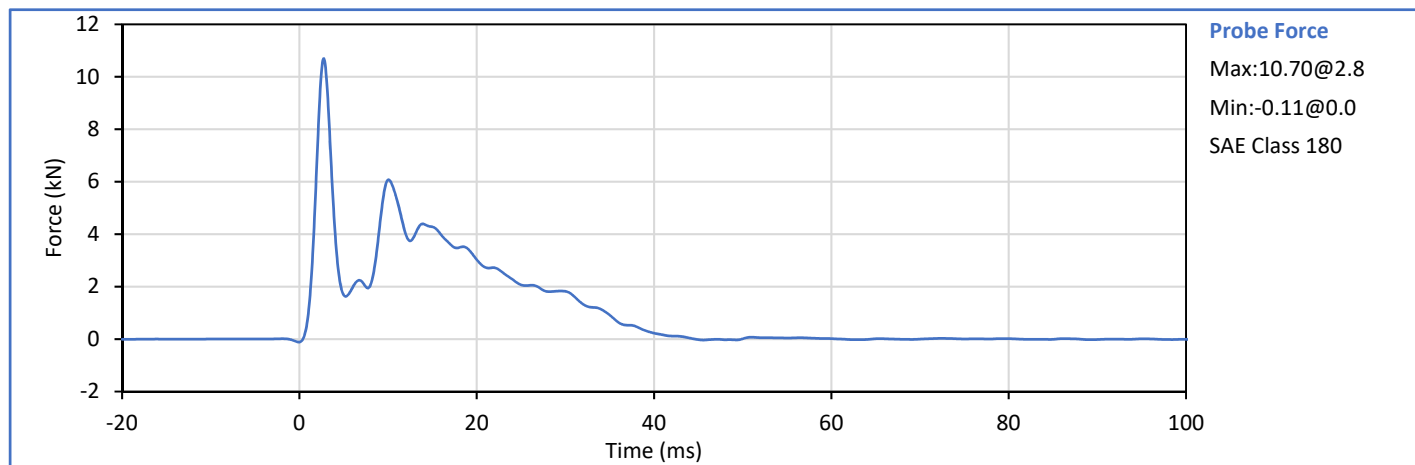
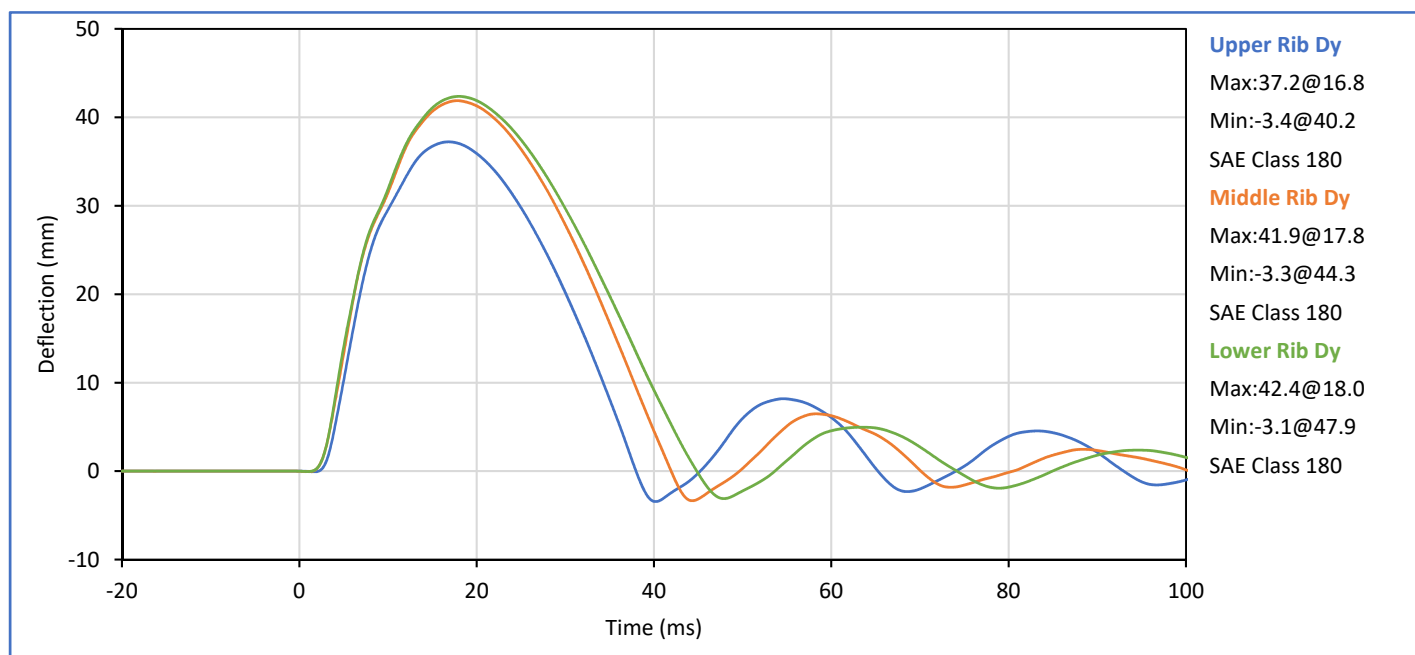
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.1	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	46.7	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

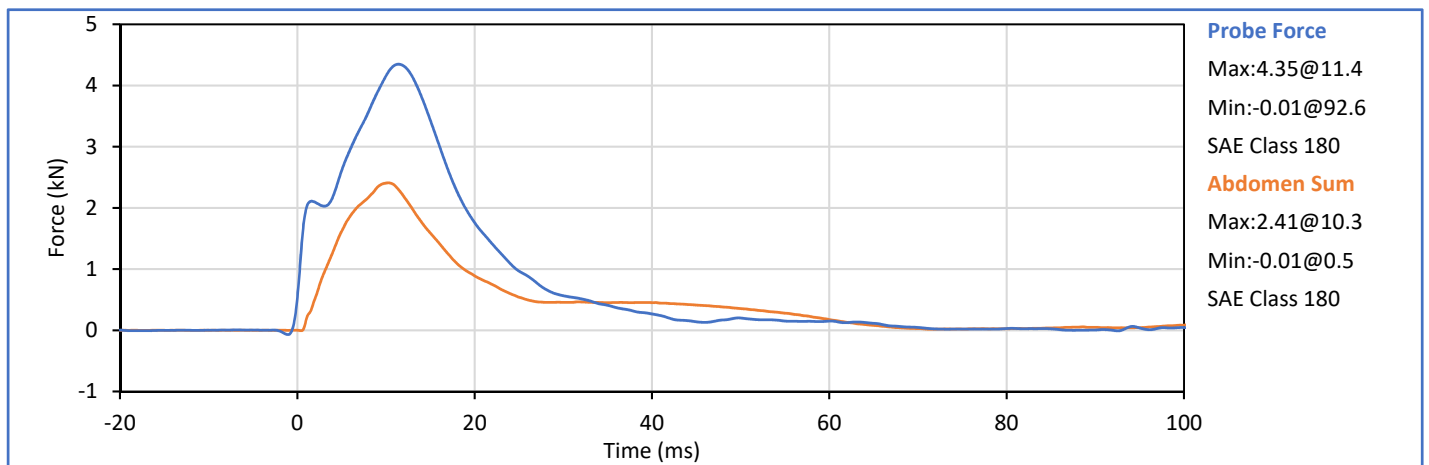
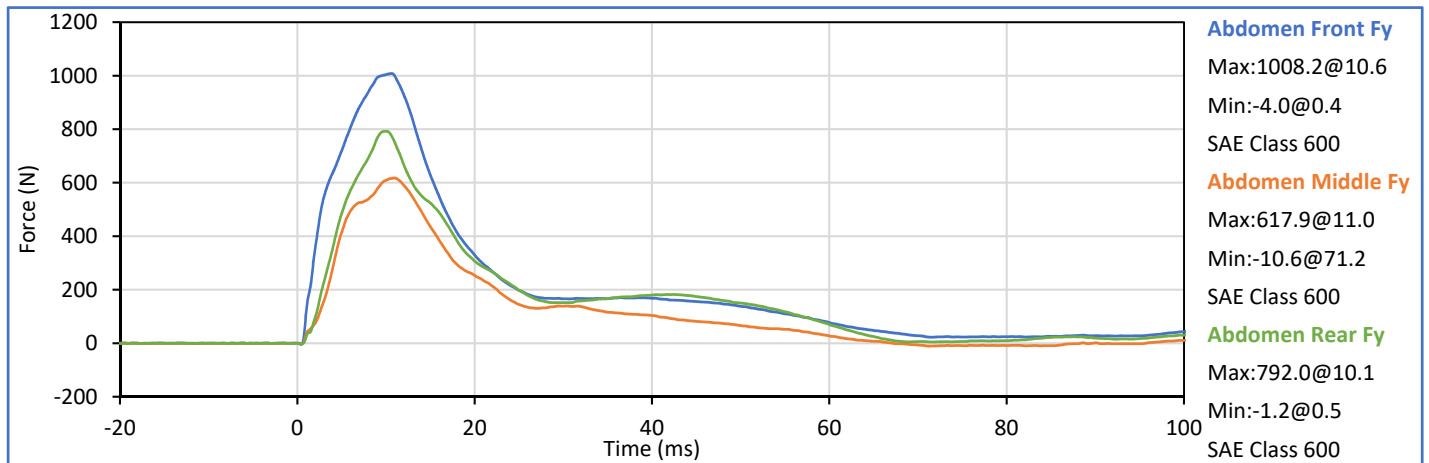
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	16	Pass
Impactor Velocity	m/s	5.40	5.60	5.51	Pass
Peak Upper Rib Dy	mm	34.0	41.0	37.2	Pass
Peak Middle Rib Dy	mm	37.0	45.0	41.9	Pass
Peak Lower Rib Dy	mm	37.0	44.0	42.4	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	6.08	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

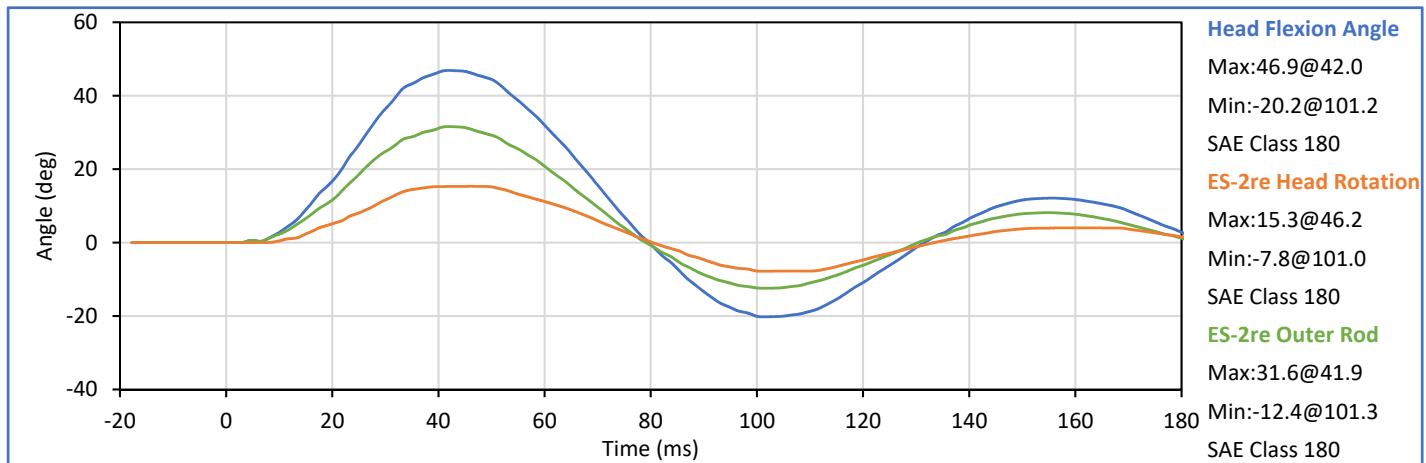
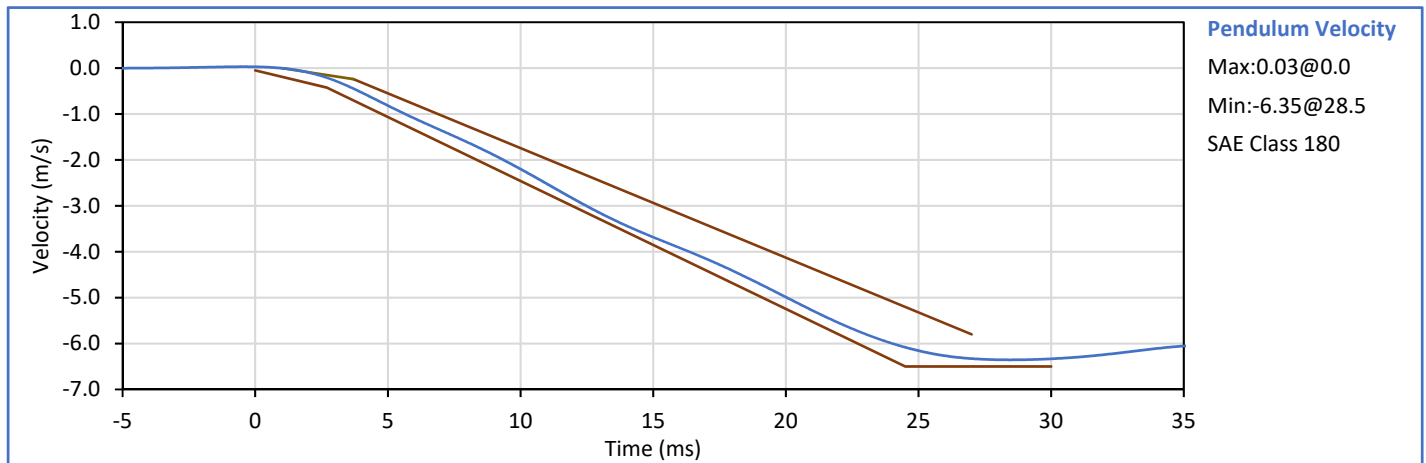
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	15	Pass
Impactor Velocity	m/s	3.90	4.10	4.02	Pass
Peak Impactor Force	kN	4.00	4.80	4.35	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.4	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.41	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.3	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

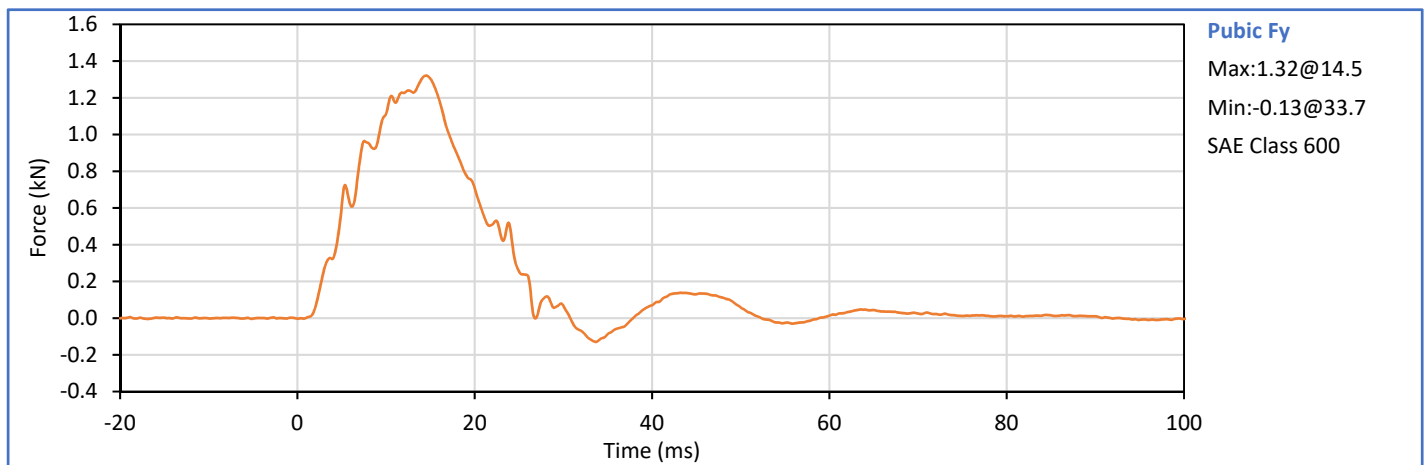
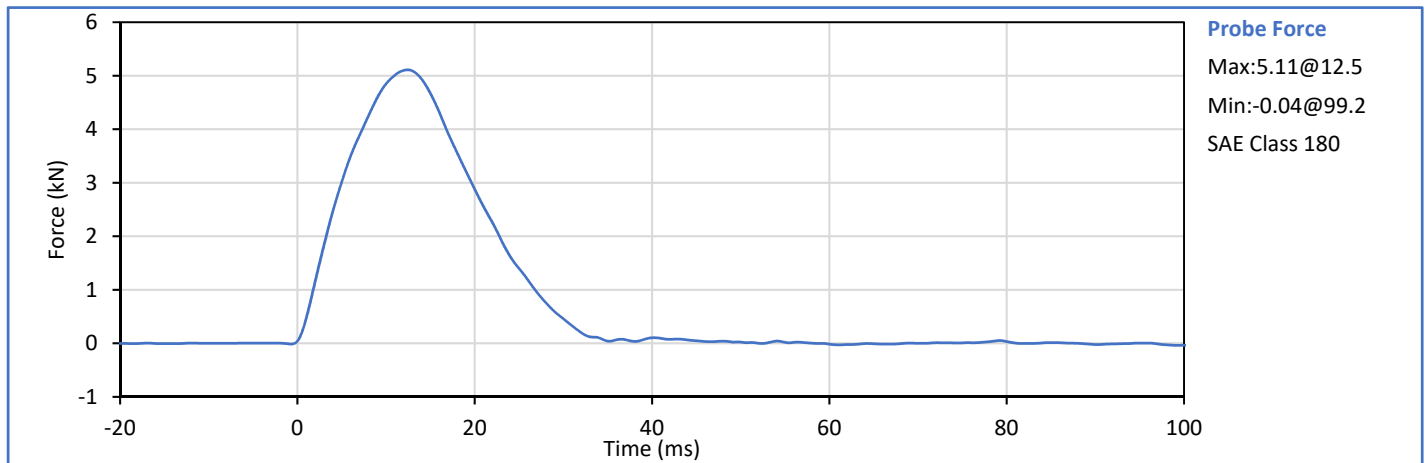
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	5.95	6.15	6.10	Pass
Peak Headform Flexion	deg	45.0	55.0	46.9	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	42.0	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	37.6	Pass
Overall Test Results				Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	15	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Force	kN	4.70	5.40	5.11	Pass
Time of Peak Impactor Force	ms	11.8	16.1	12.5	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.32	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.5	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Pre-Test ATD Qualification and Performance Verification
SID-IIs Small Side Impact ATD
S/N: 308

ATD Serial No.: 308

Test Date: 2019-11-12

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	20	Pass
A - Sitting Height	mm	772	788	786	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	84	Pass
D - H Point From Seatback	mm	141	151	149	Pass
E - Shoulder Pivot From Backline	mm	97	107	105	Pass
F - Thigh Clearance	mm	119	135	124	Pass
G - Head Breadth	mm	140	148	145	Pass
H - Head Back From Backline	mm	40	46	42	Pass
I - Head Depth	mm	178	188	182	Pass
J - Head Circumference	mm	541	551	546	Pass
K - Buttock To Knee Length	mm	514	540	532	Pass
L - Popliteal Height	mm	343	369	357	Pass
K - Knee Pivot To Floor Height	mm	392	409	401	Pass
N - Buttock Popliteal Length	mm	416	442	429	Pass
O - Chest Depth W/O Jacket	mm	195	211	200	Pass
P - Foot Length	mm	216	232	227	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	319	Pass
R - Arm Length	mm	249	259	258	Pass
S - Knee Joint To Seatback	mm	477	493	487	Pass
V - Shoulder Width	mm	341	357	348	Pass
W - Foot Width	mm	78	94	82	Pass
Y - Chest Circumference W/Jacket	mm	851	881	866	Pass
Z - Waist Circumference	mm	761	791	775	Pass
			Overall Test Results		Pass

Technician:



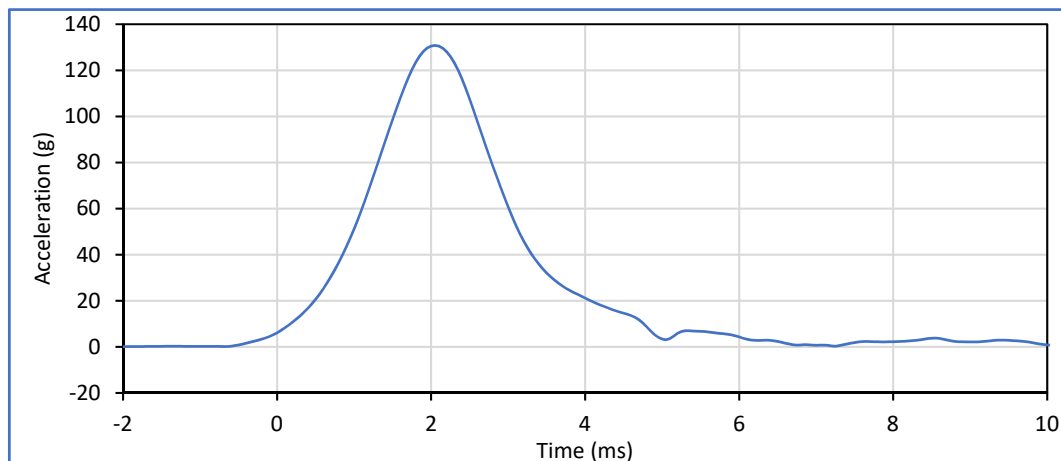
J. Hernandez

Approved By:



P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Peak Resultant Acceleration	g	115.0	137.0	130.8	Pass
Peak Head Ax	g	-15.0	15.0	-1.2	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass

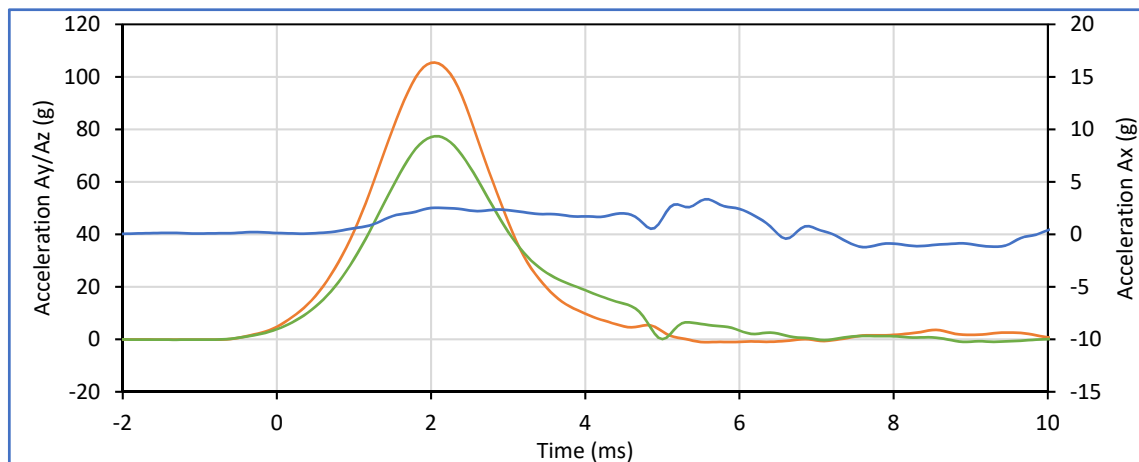


Head Resultant

Max:130.8@2.1

Min:0.3@7.3

SAE Class 1000



Head Ax

Max:3.3@5.6

Min:-1.2@7.7

SAE Class 1000

Head Ay

Max:105.5@2.1

Min:-1.1@5.6

SAE Class 1000

Head Az

Max:77.4@2.1

Min:-1.0@9.0

SAE Class 1000

Technician:

J. Hernandez

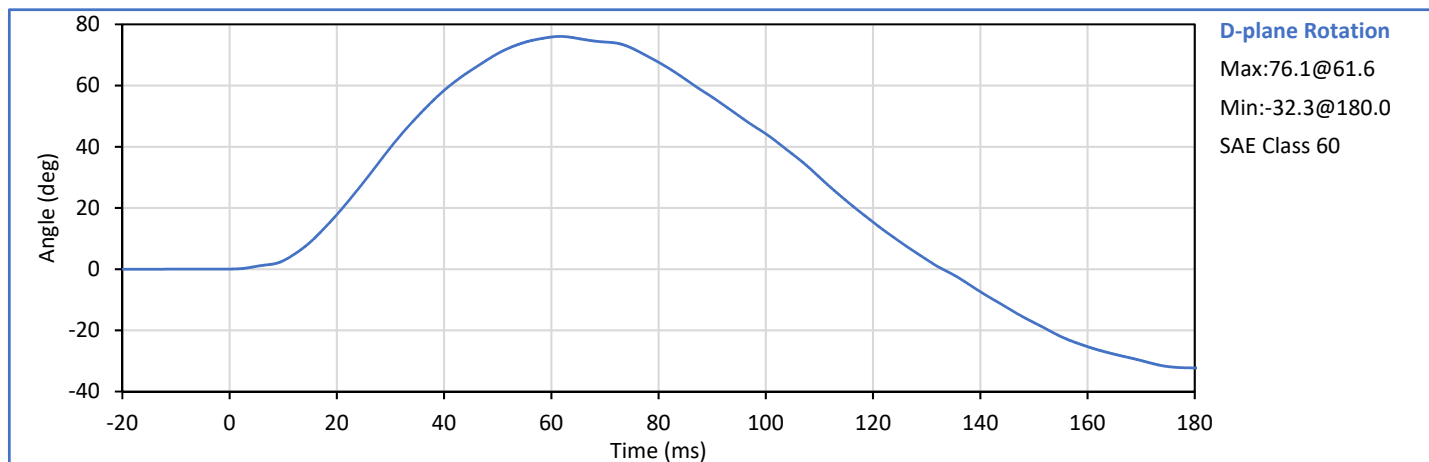
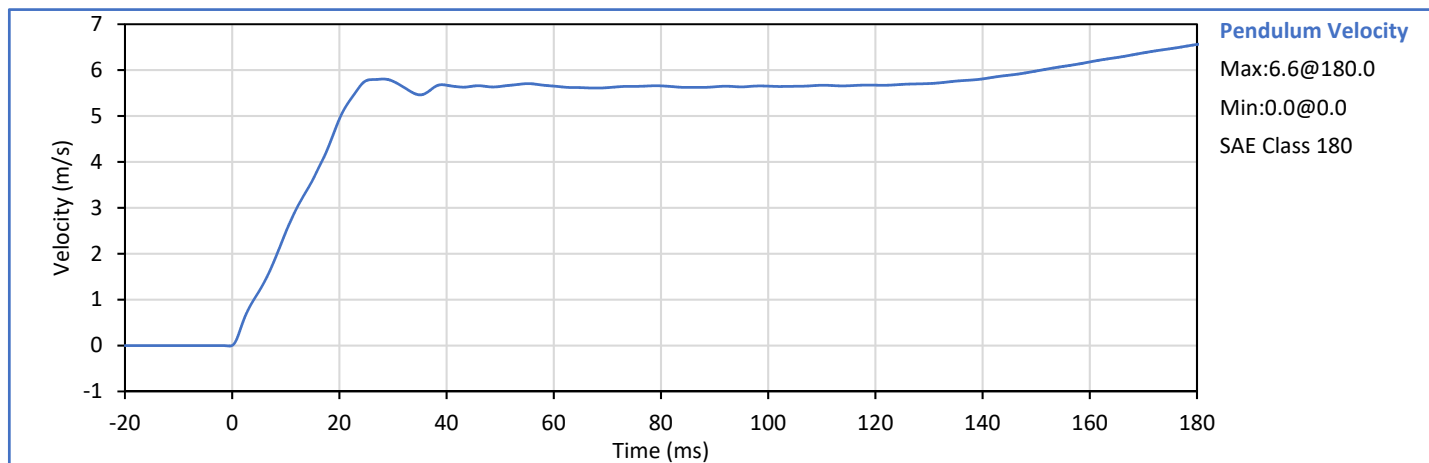
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	19	Pass
Pendulum Velocity	m/s	5.51	5.63	5.57	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.47	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.60	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.93	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.77	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.81	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	76.1	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	61.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-42.7	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	115.5	Pass
Overall Test Results				Pass	



Technician:

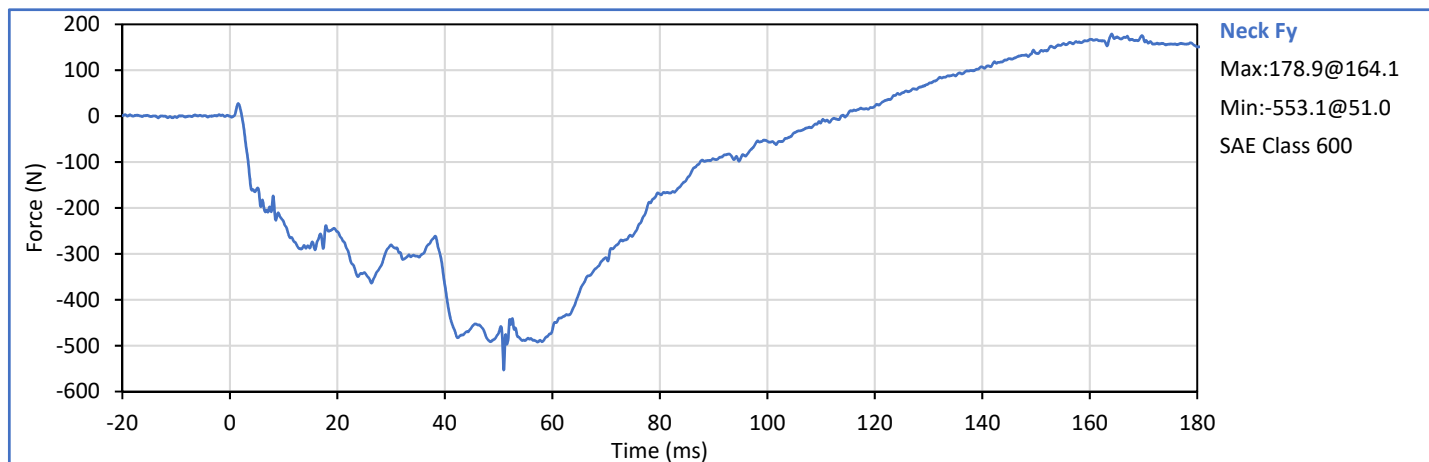
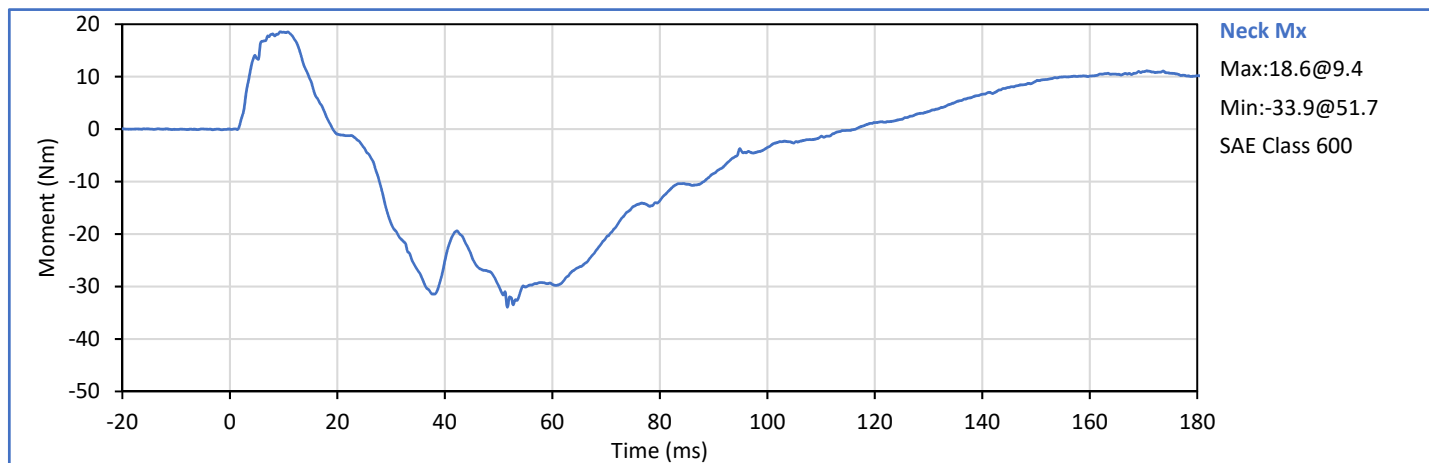
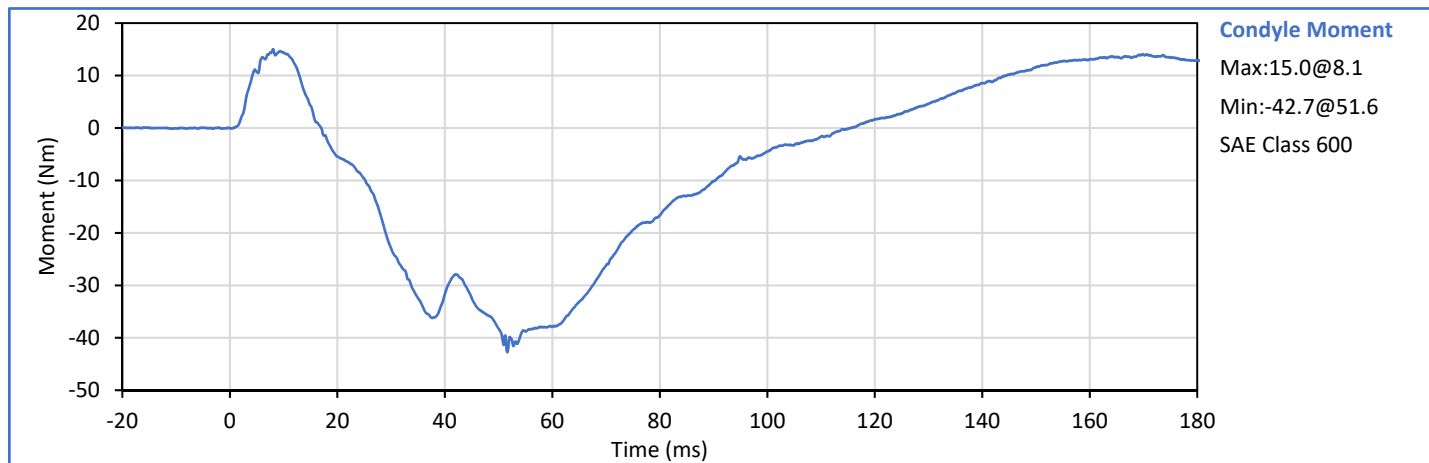
J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

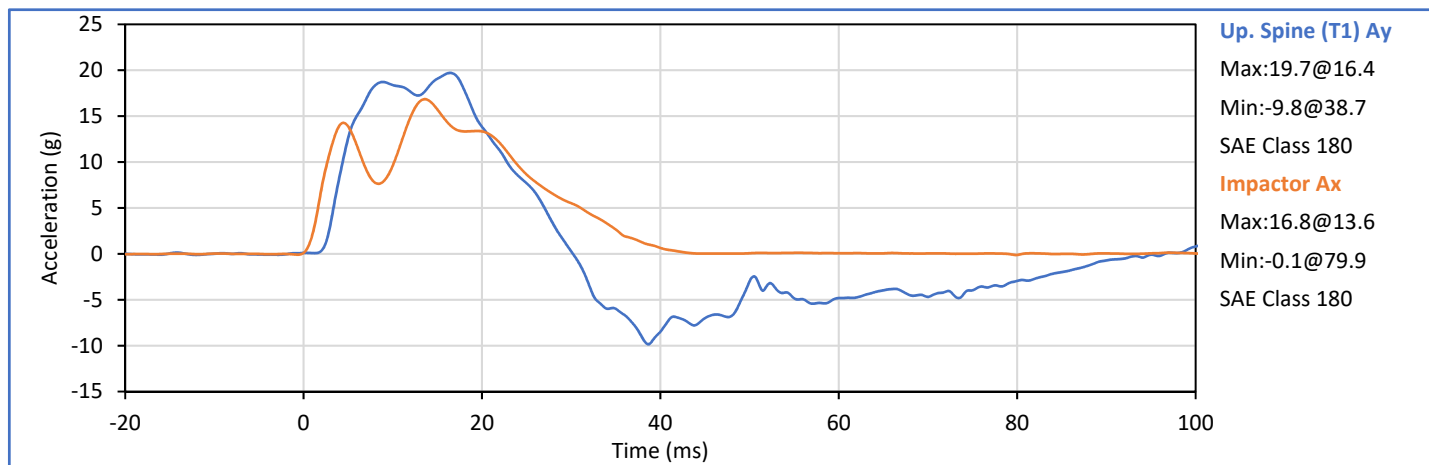
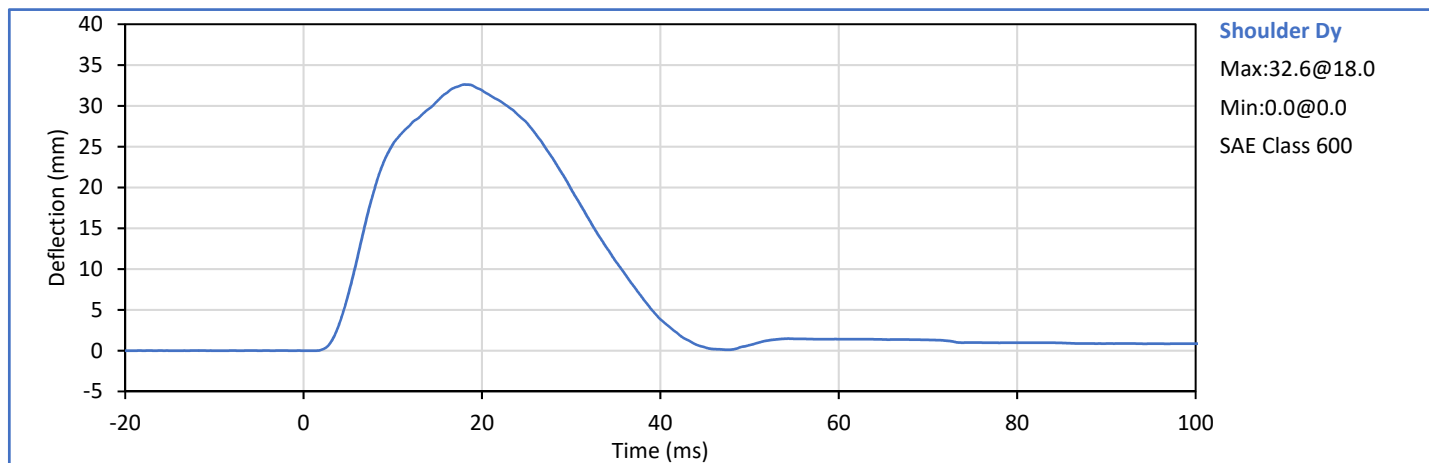
P. Puzzuto



ATD Serial No.: 308

Test Date: 2019-11-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.6	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	19.7	Pass
Peak Impactor Ax	g	13.0	18.0	16.8	Pass
Overall Test Results					Pass



Technician:

J. Hernandez

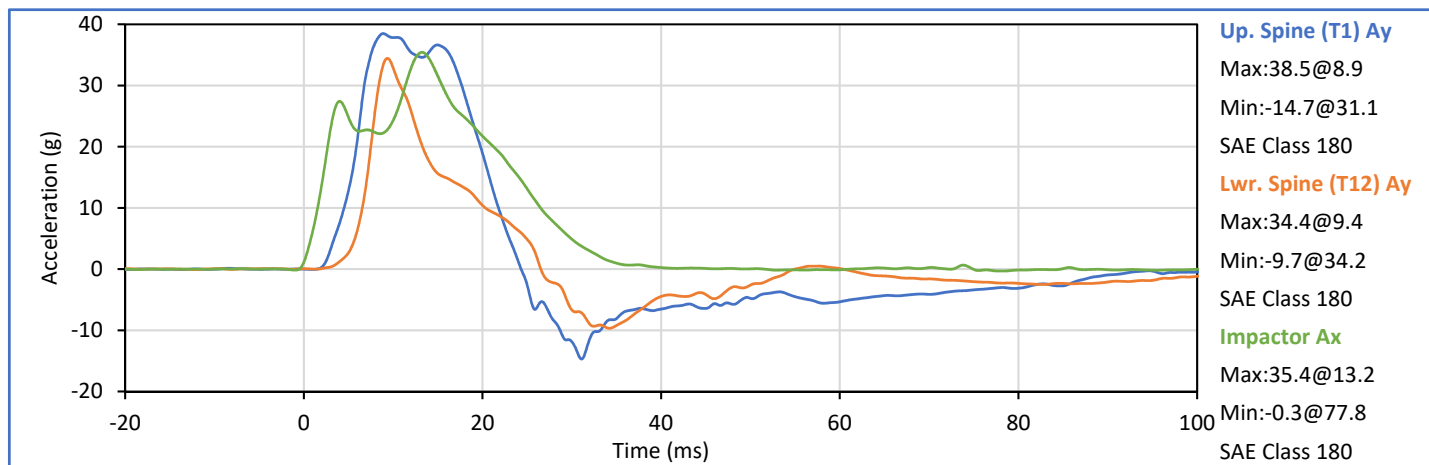
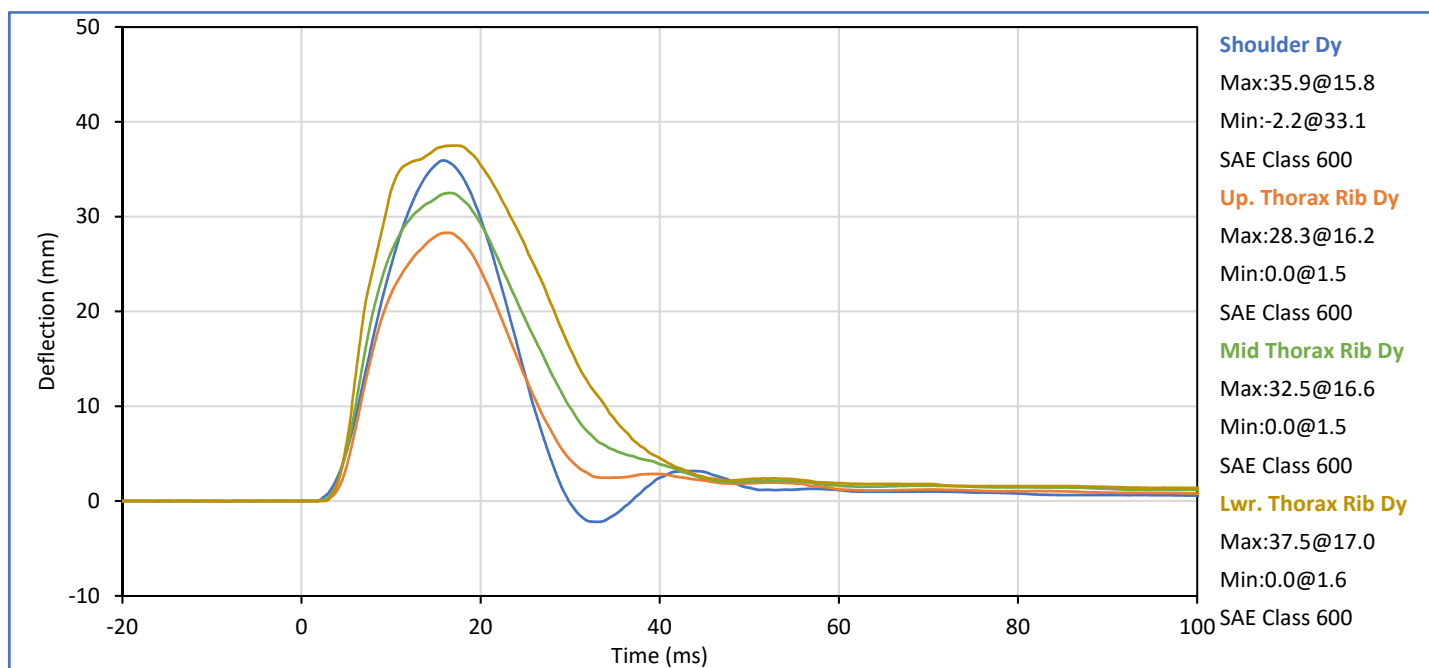
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	19	Pass
Impactor Velocity	m/s	6.60	6.80	6.70	Pass
Peak Shoulder Dy	mm	31.0	40.0	35.9	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.3	Pass
Peak Middle Rib Dy	mm	30.0	36.0	32.5	Pass
Peak Lower Rib Dy	mm	32.0	38.0	37.5	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	38.5	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	34.4	Pass
Peak Impactor Ax	g	30.0	36.0	35.4	Pass
Overall Test Results					Pass



Technician:

J. Hernandez

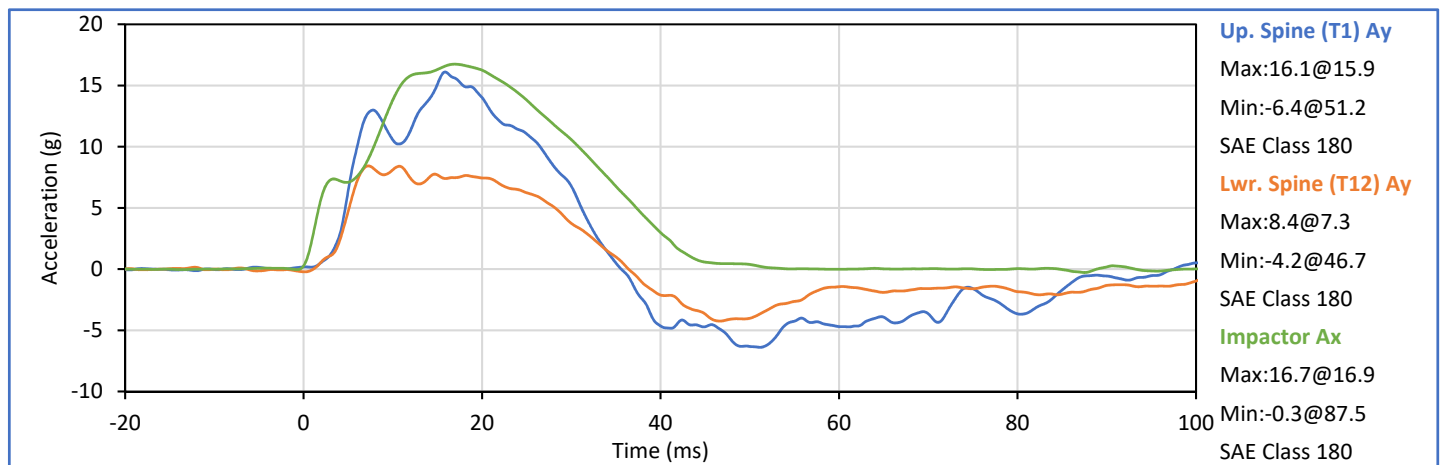
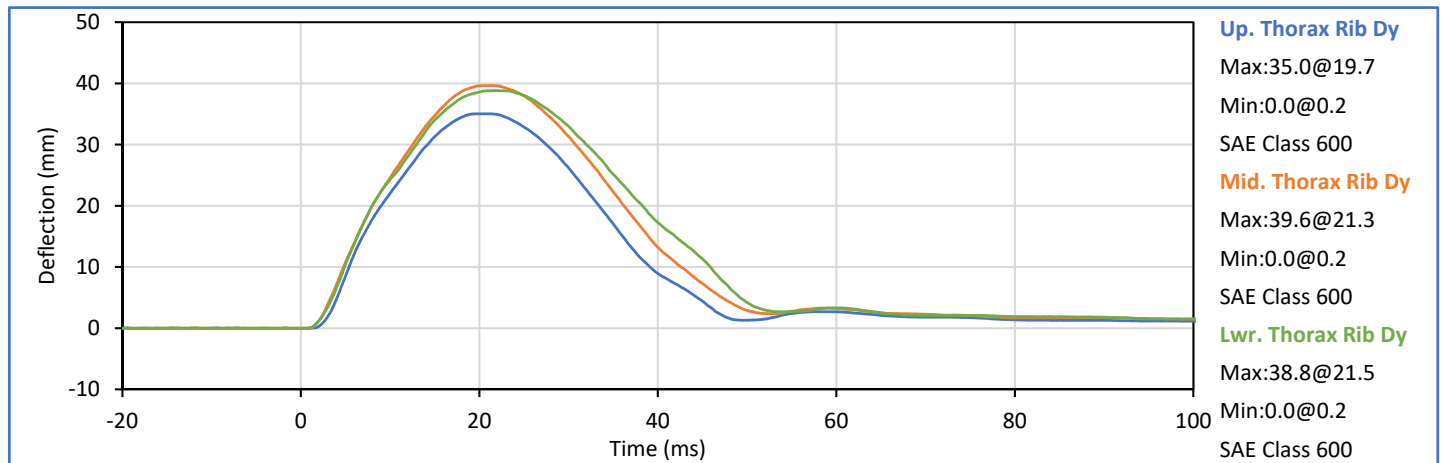
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	4.20	4.40	4.34	Pass
Peak Upper Rib Dy	mm	32.0	40.0	35.0	Pass
Peak Middle Rib Dy	mm	39.0	45.0	39.6	Pass
Peak Lower Rib Dy	mm	35.0	43.0	38.8	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	16.1	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.4	Pass
Peak Impactor Ax	g	14.0	18.0	16.7	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

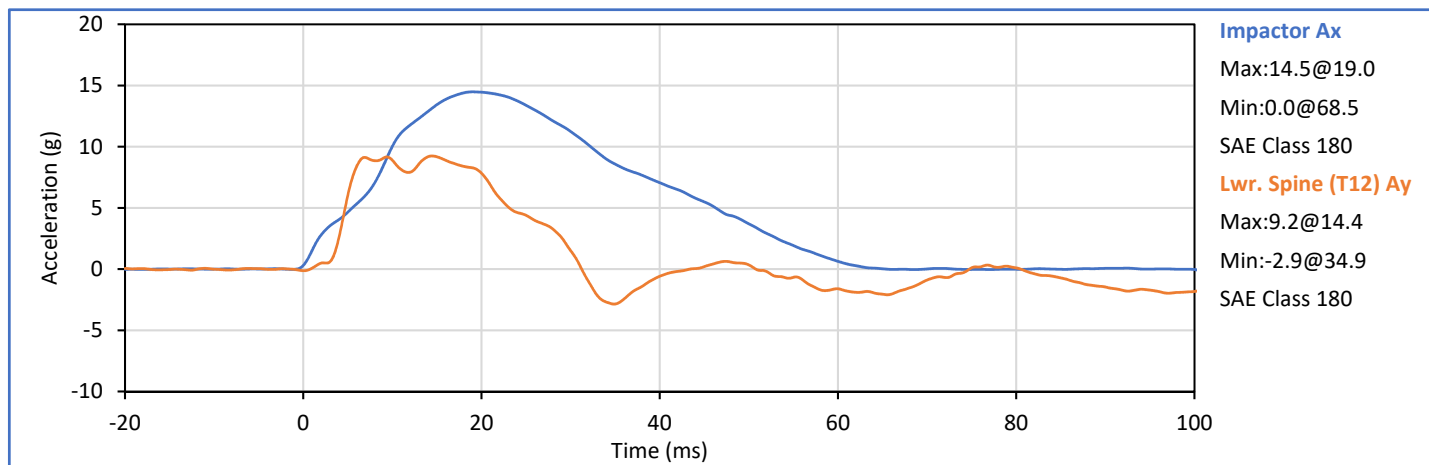
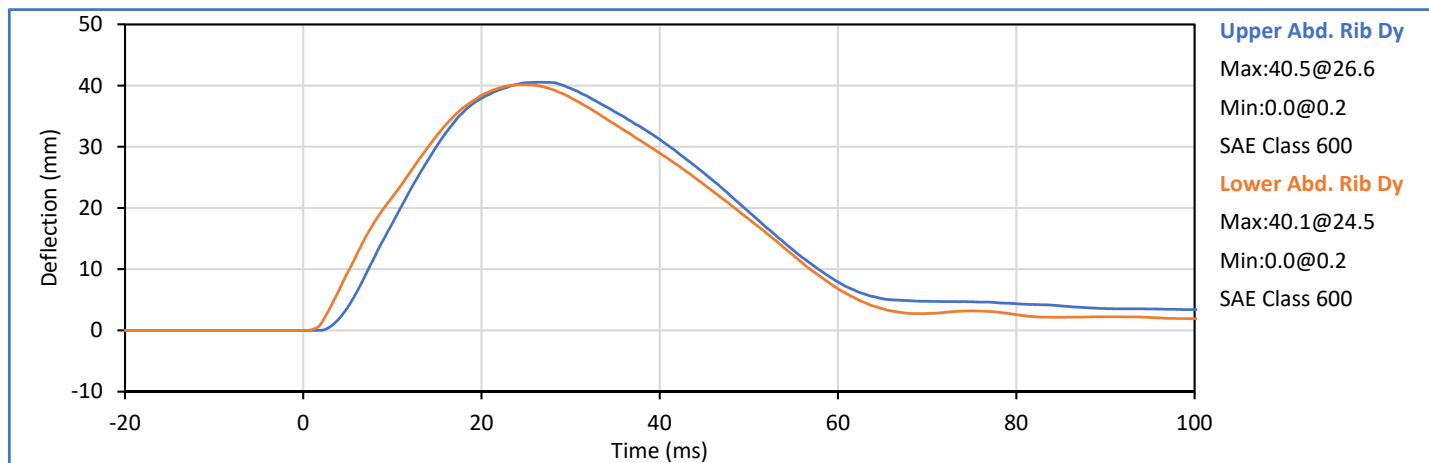
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	40.5	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	40.1	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	9.2	Pass
Peak Impactor Ax	g	12.0	16.0	14.5	Pass
Overall Test Results					Pass



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

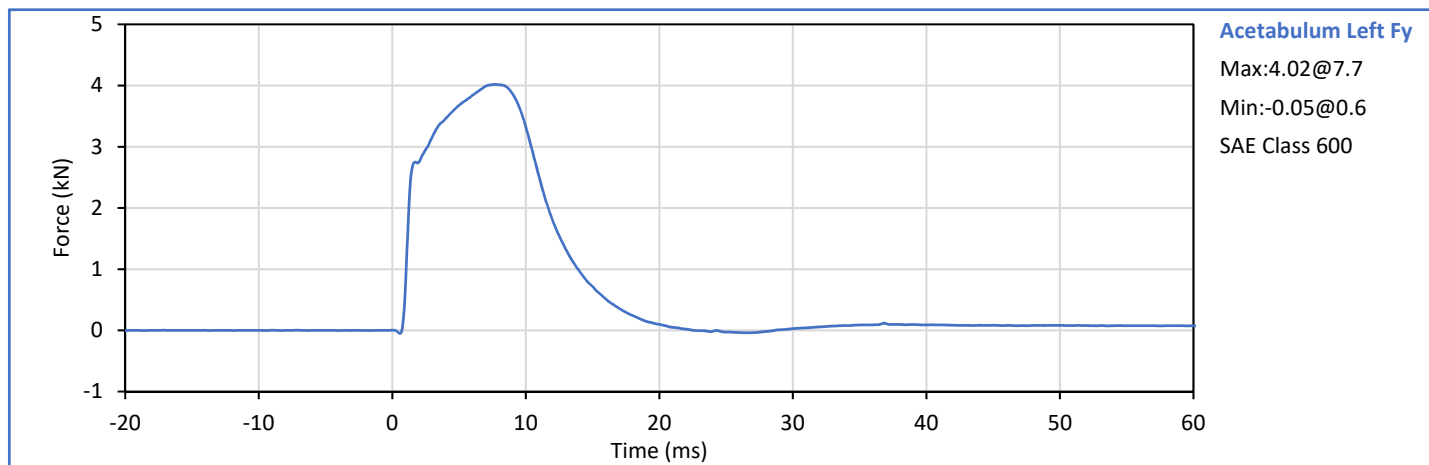
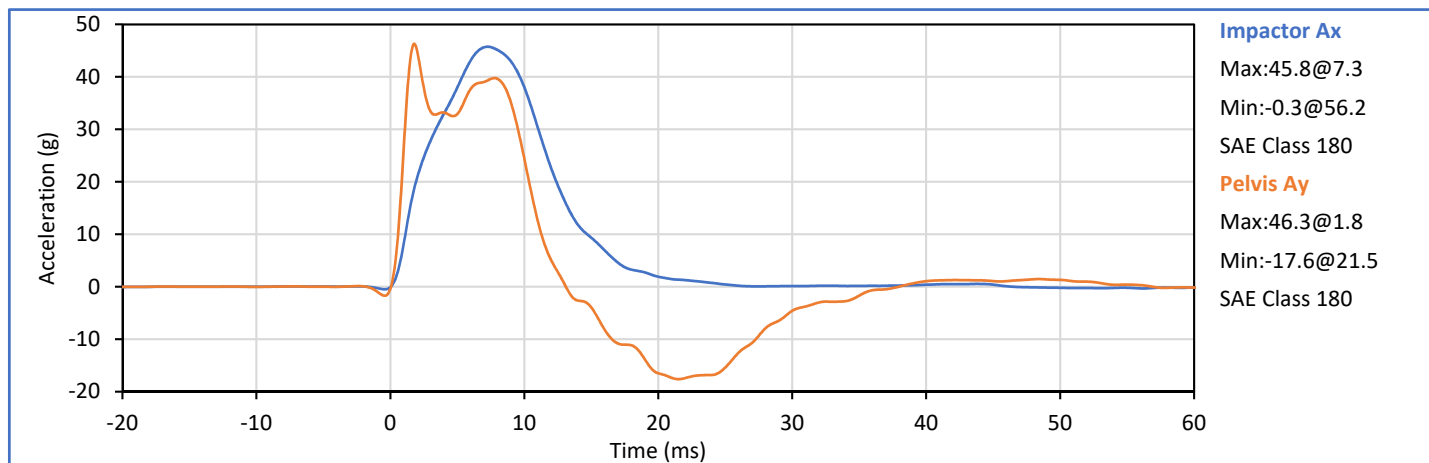
P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	19	Pass
Impactor Velocity	m/s	6.60	6.80	6.71	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.02	Pass
Pelvis Ay after 6ms	g	34.0	42.0	39.8	Pass
Peak Impactor Ax	g	38.0	47.0	45.8	Pass
Overall Test Results				Pass	Pass

Pelvis Plug S/N: 11695 (SACO)



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-13

Pelvis Plug S/N: 11695 (SACO)



SID-IIs Pelvis Plug Certification Test

Plug S/N 11695

Test Number 3437

Report Number 3430

Test Date 3/27/2017 12:33:06 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	255.78	50.00	600.00
Force @ 1.5 mm (N)	1,072.07	850.00	1,400.00
Force @ 2.5 mm (N)	1,355.45	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,403.41	1,361.00	1,673.00

Testing Machine STM-20 5965542

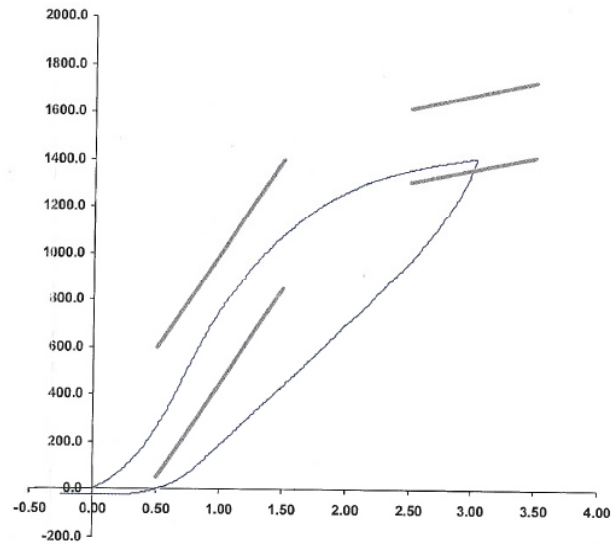
Load Cell S/N (TI240813), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 27-Mar-17
SACO Research

By: DC Date: 3/27/17

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

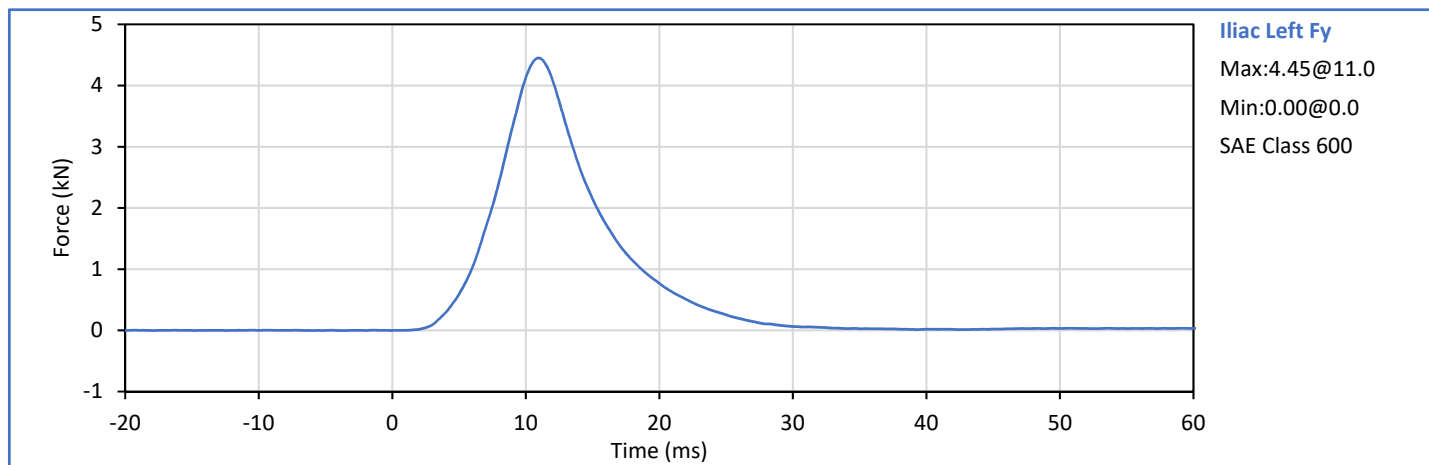
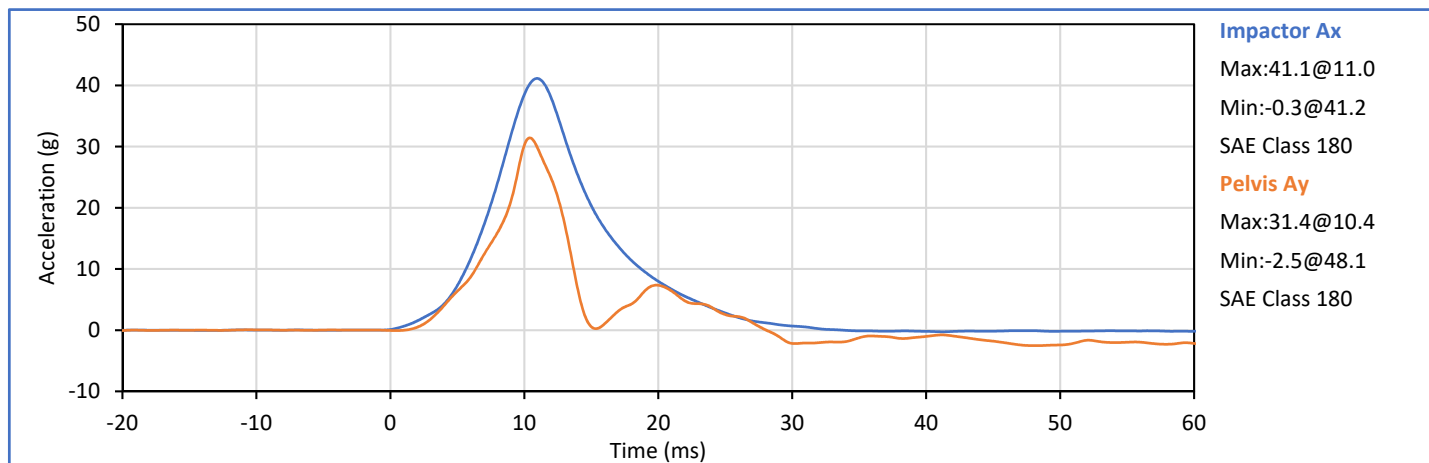
ATD Serial No.: 308

Test Date: 2019-11-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Iliac Fy	kN	4.10	5.10	4.45	Pass
Pelvis Ay after 6ms	g	28.0	39.0	31.4	Pass
Peak Impactor Ax	g	36.0	45.0	41.1	Pass
Overall Test Results				Pass	Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician:

J. Hernandez

J. Hernandez

Approved By:

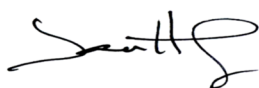
P. Puzzuto

P. Puzzuto

APPENDIX C
Post-Test ATD Qualification and Performance Verification
ES-2re 50th Male Side Impact ATD
S/N: F037

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
1 - Sitting Height	mm	900	918	904	Pass
2 - Seat to Shoulder Joint	mm	558	572	564	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	350	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	100	Pass
5 - Sole to Seat, Sitting	mm	433	451	441	Pass
6 - Head Width	mm	152	158	155	Pass
7 - Shoulder/Arm Width	mm	461	479	471	Pass
8 - Thorax Width	mm	322	332	327	Pass
9 - Abdomen Width	mm	273	287	278	Pass
10 - Pelvis Lap Width	mm	359	373	368	Pass
11 - Head Depth	mm	196	206	200	Pass
12 - Thorax Depth	mm	262	272	268	Pass
13 - Abdomen Depth	mm	194	204	201	Pass
14 - Pelvis Depth	mm	235	245	243	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	157	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	611	Pass
				Overall Test Results	Pass

Technician:



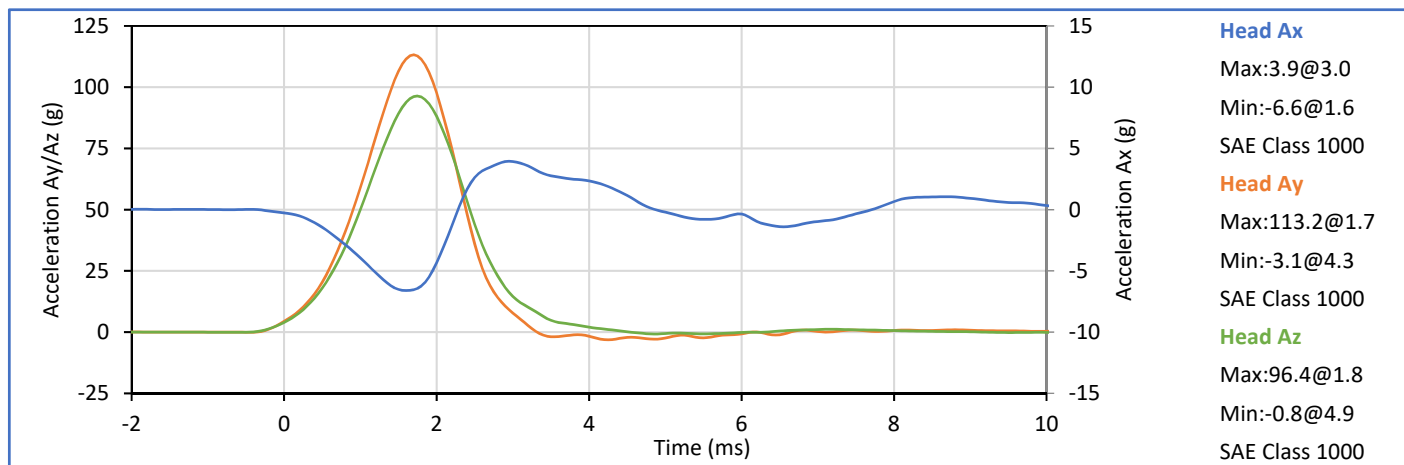
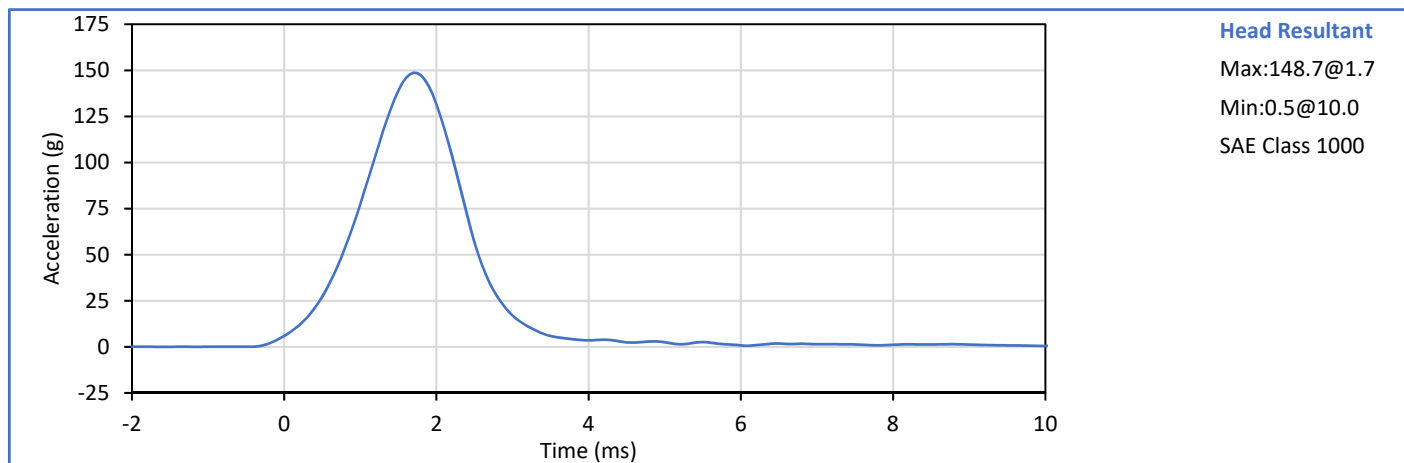
J. Hernandez

Approved By:



P. Puzzuto

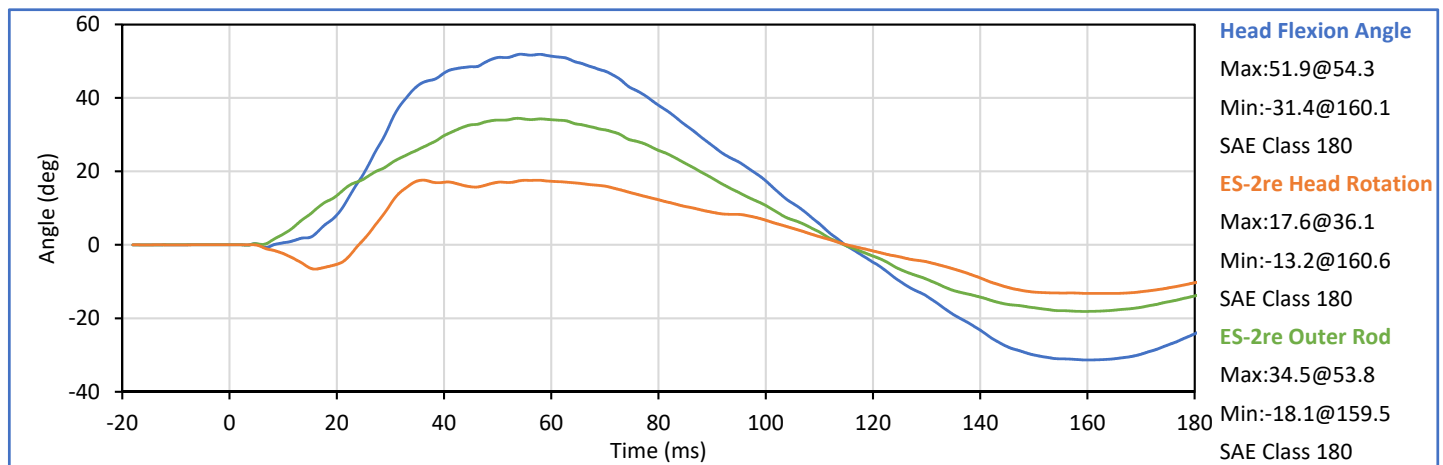
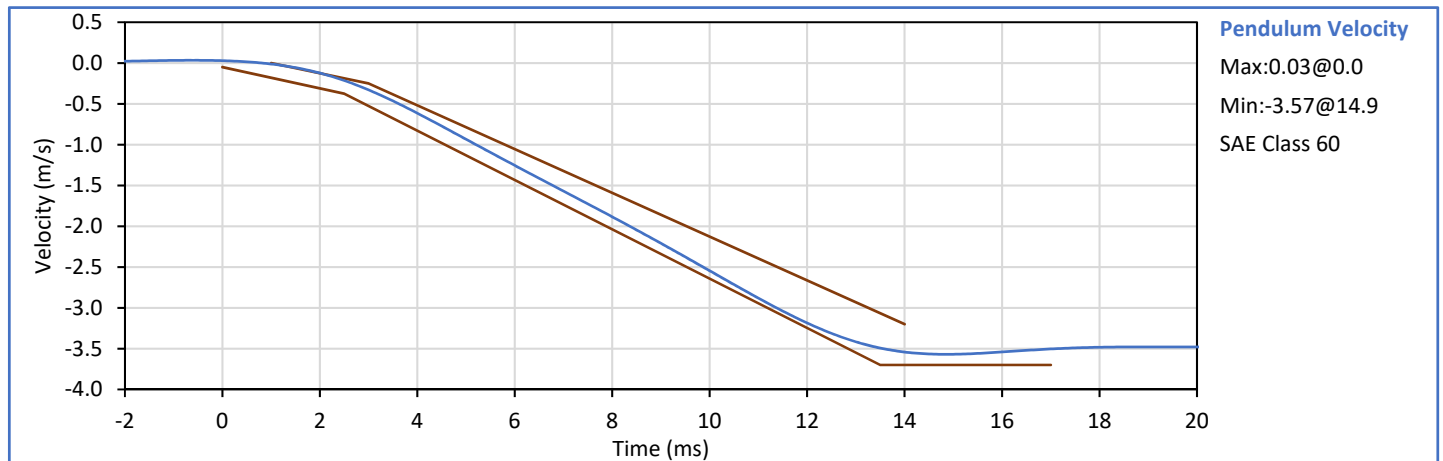
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	125.0	155.0	148.7	Pass
Peak Head Ax	g	-15.0	15.0	3.9	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	32	Pass
Pendulum Velocity	m/s	3.30	3.50	3.46	Pass
Peak Headform Flexion	deg	49.0	59.0	51.9	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	54.3	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	60.5	Pass
Overall Test Results				Pass	Pass



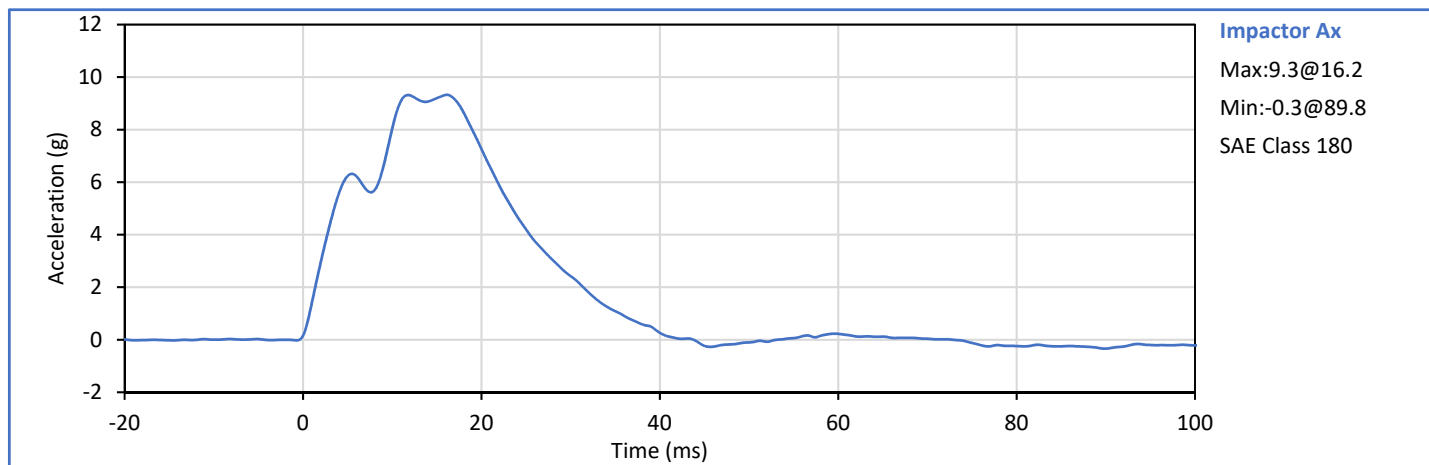
Technician: J. Hernandez

Approved By: P. Puzzuto

ATD Serial No.: F037

Test Date: 2019-11-22

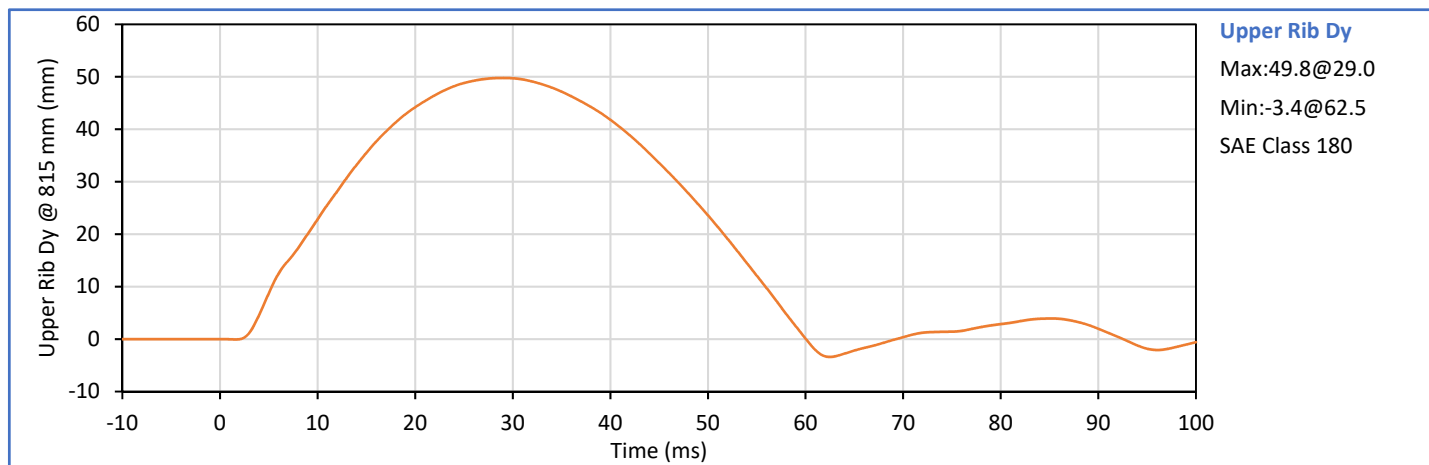
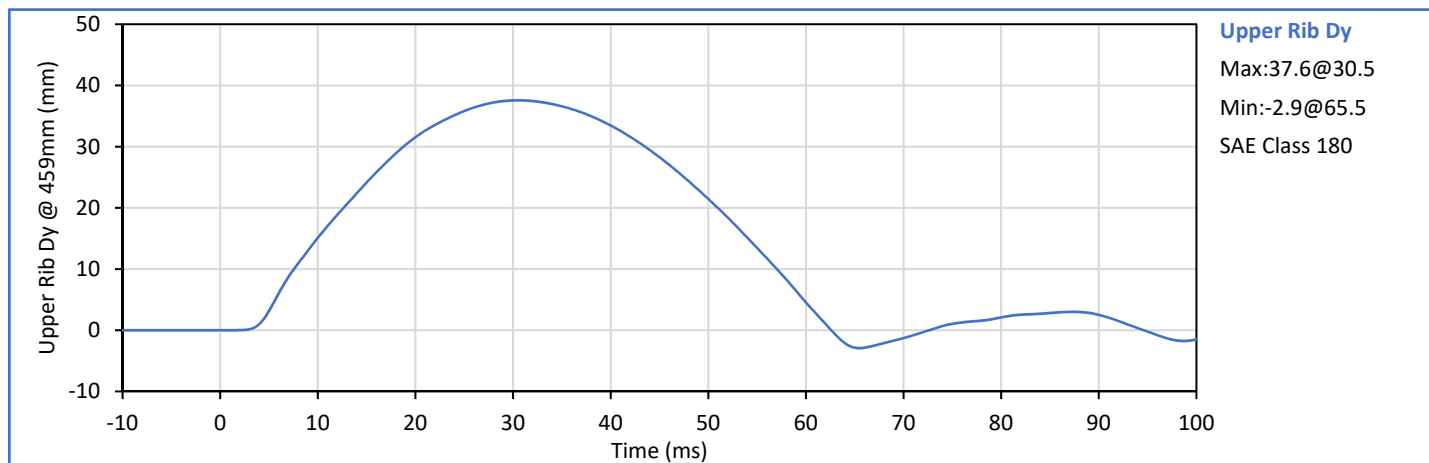
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	9.3	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

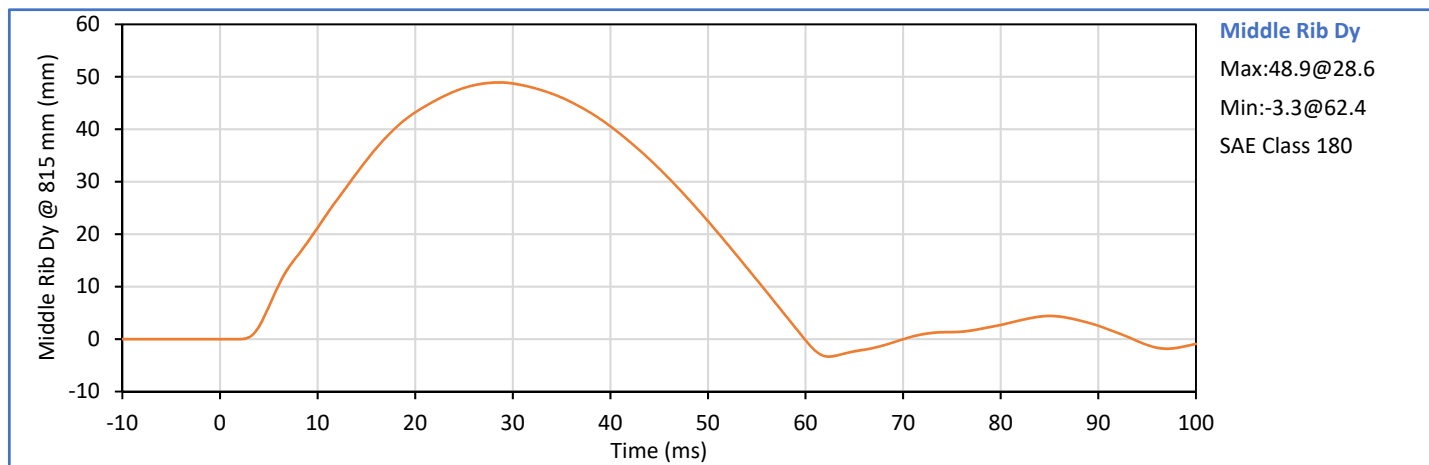
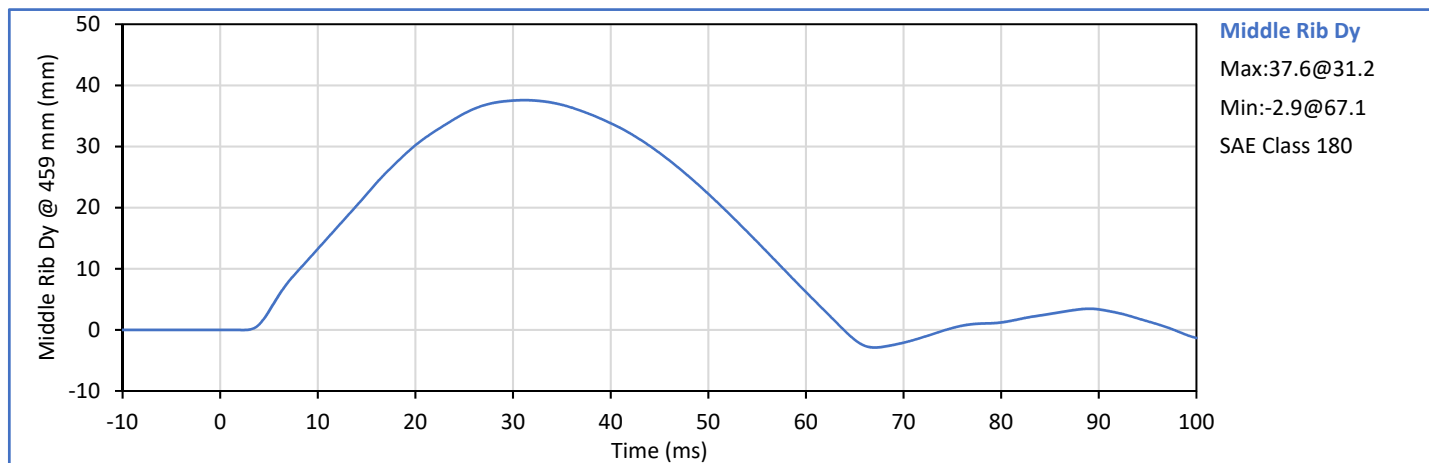
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	37.6	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	49.8	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

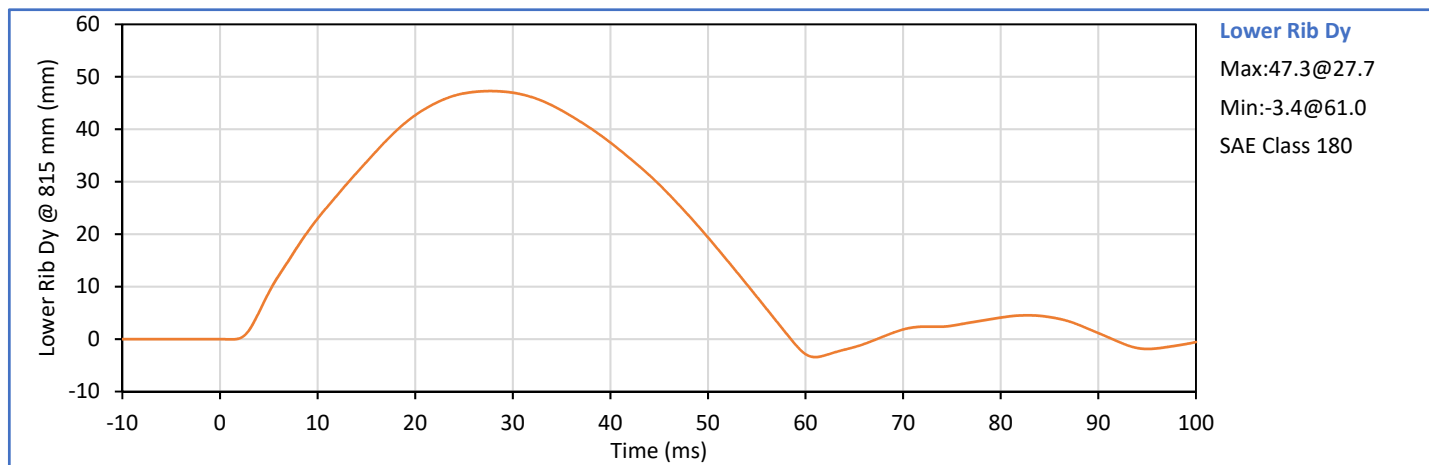
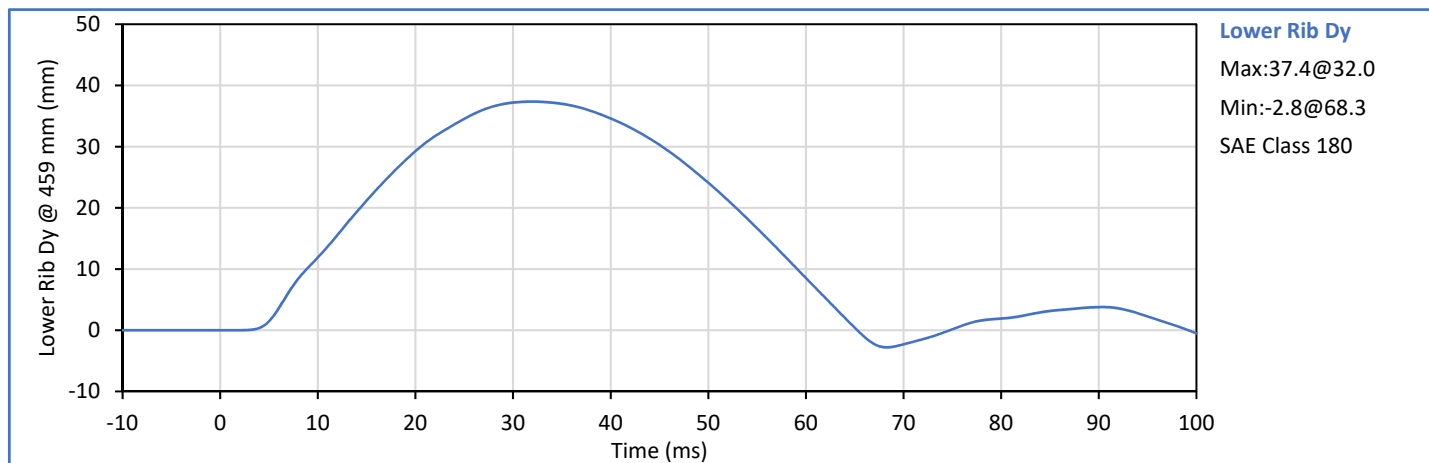
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	37.6	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	48.9	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

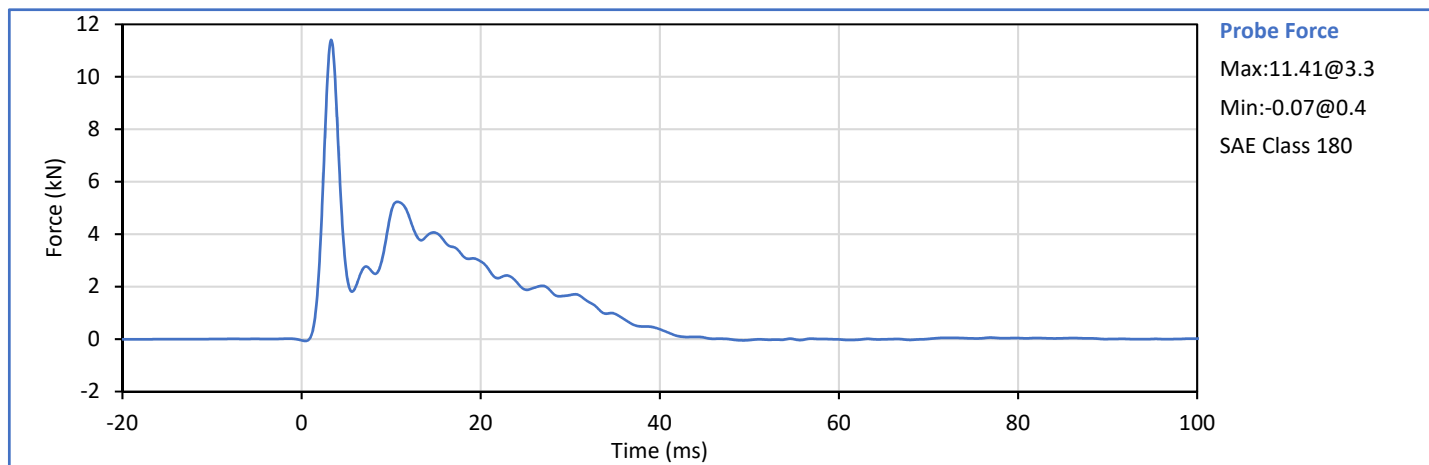
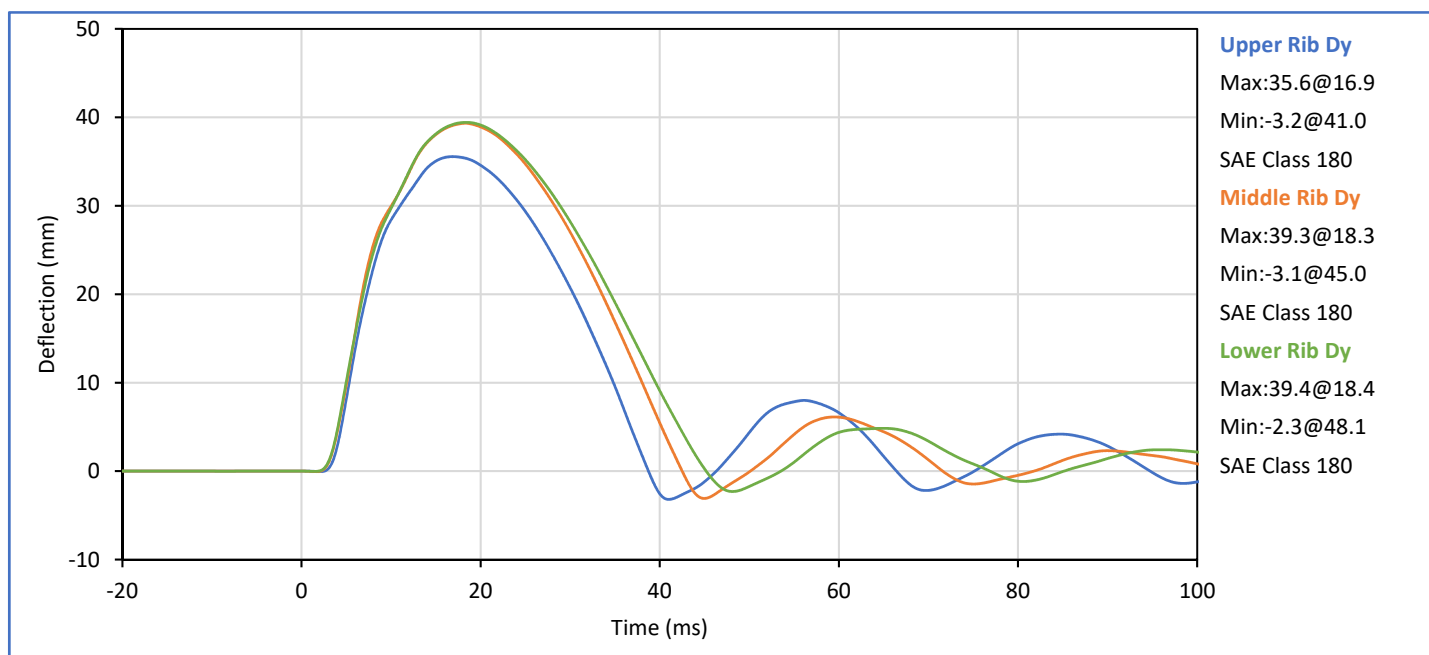
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.4	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	47.3	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

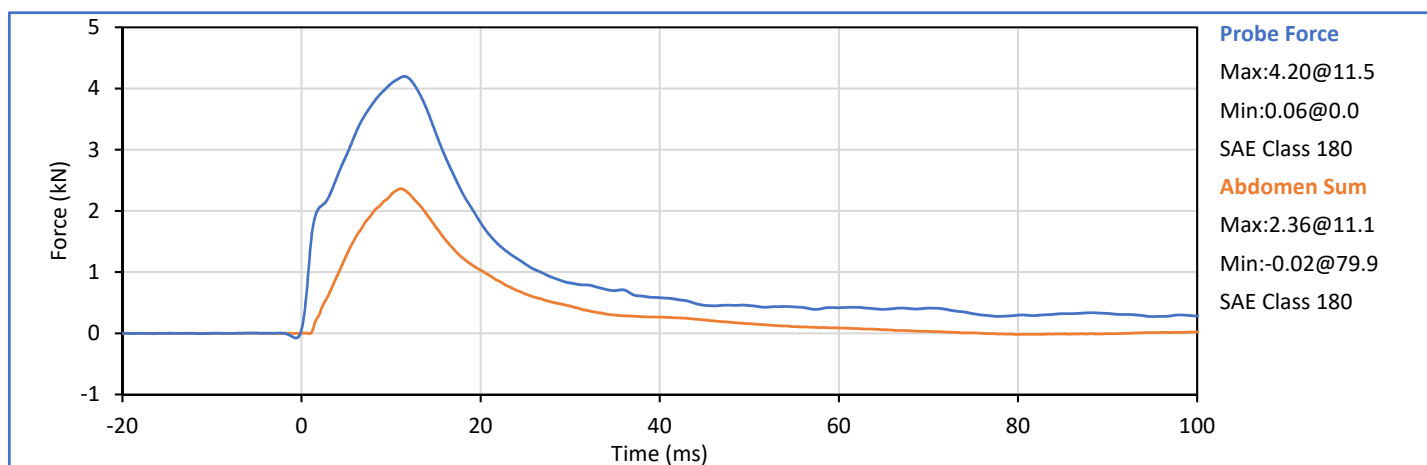
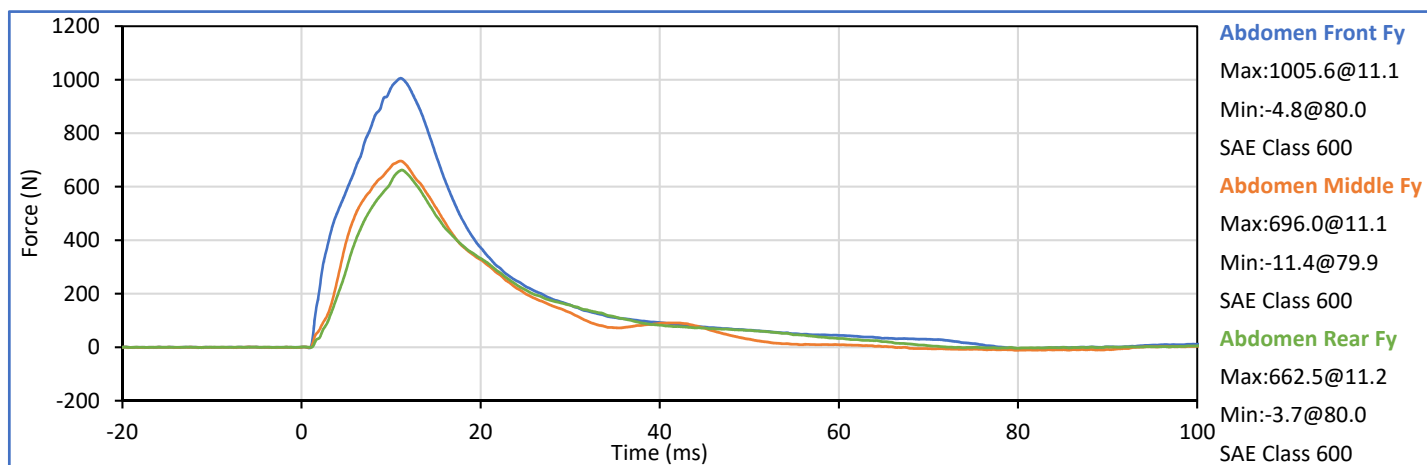
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	5.40	5.60	5.53	Pass
Peak Upper Rib Dy	mm	34.0	41.0	35.6	Pass
Peak Middle Rib Dy	mm	37.0	45.0	39.3	Pass
Peak Lower Rib Dy	mm	37.0	44.0	39.4	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.23	Pass
Overall Test Results				Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	3.90	4.10	4.02	Pass
Peak Impactor Force	kN	4.00	4.80	4.20	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.5	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.36	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	11.1	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

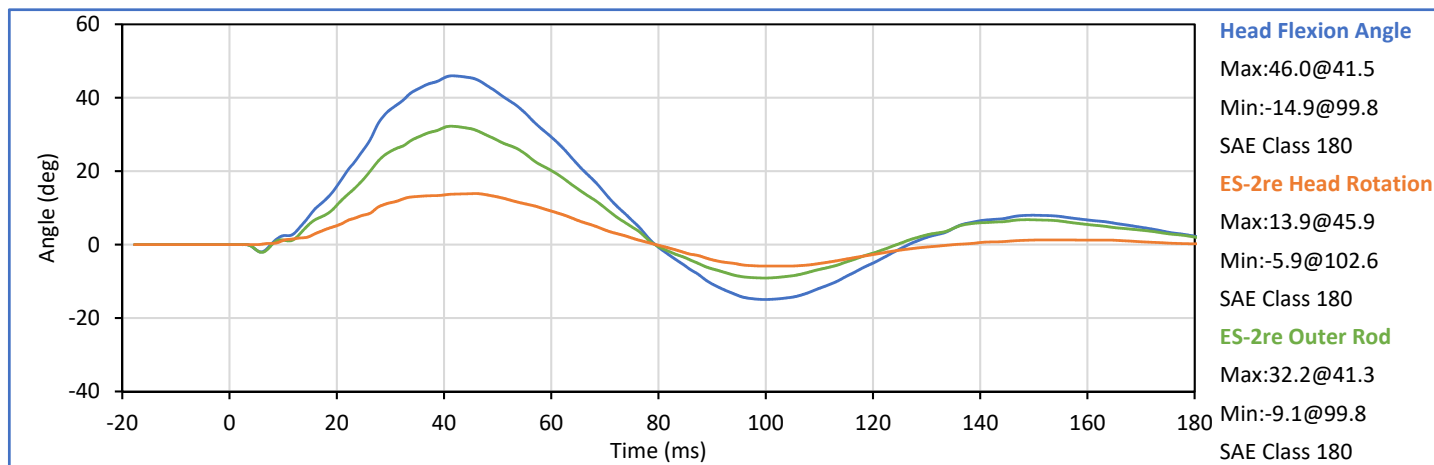
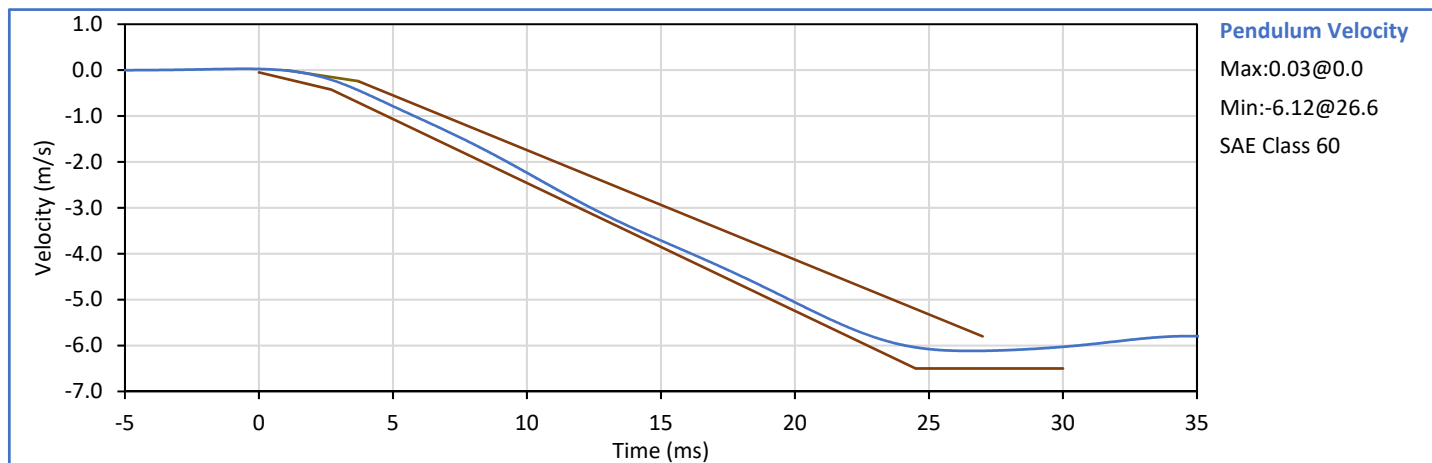
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	5.95	6.15	6.14	Pass
Peak Headform Flexion	deg	45.0	55.0	46.0	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	41.5	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	37.9	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

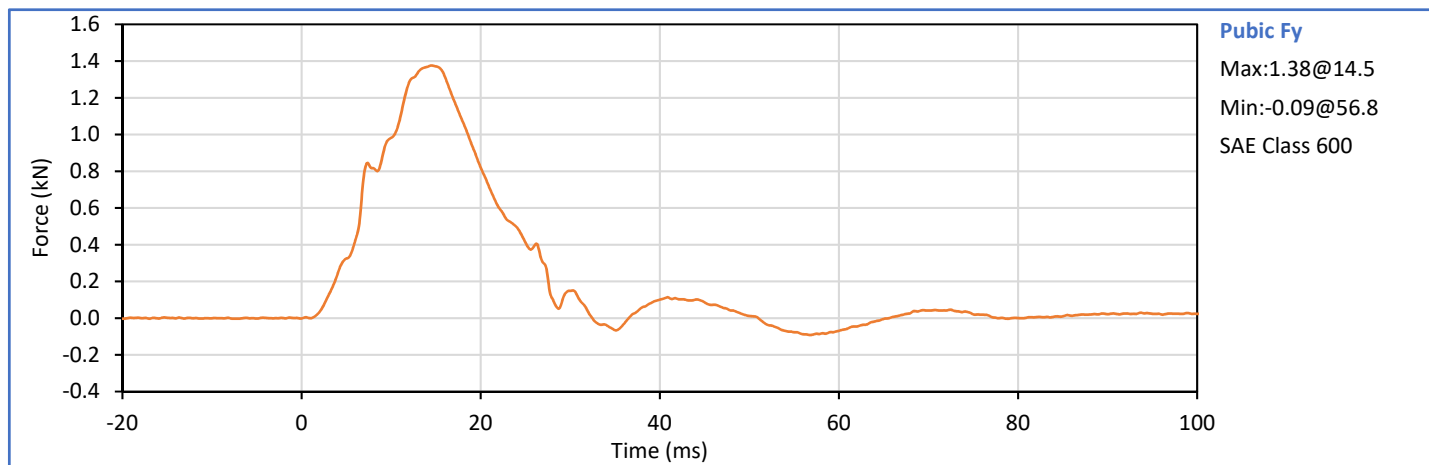
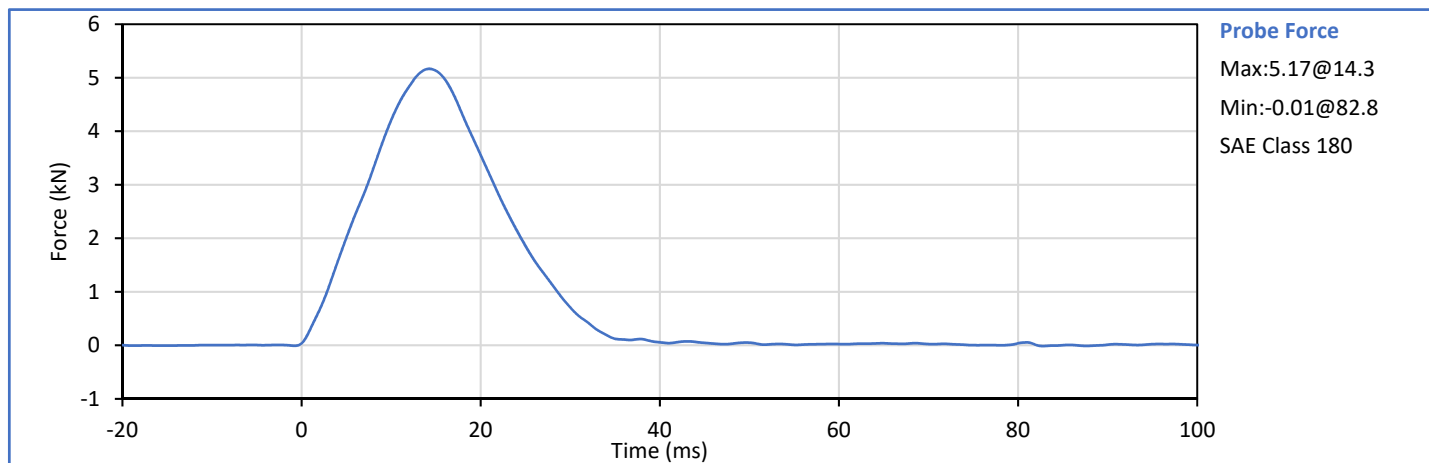
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Force	kN	4.70	5.40	5.17	Pass
Time of Peak Impactor Force	ms	11.8	16.1	14.3	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.38	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.5	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Post-Test ATD Qualification and Performance Verification
SID-IIs Small Side Impact ATD
S/N: 308

ATD Serial No.: 308

Test Date: 2019-11-14

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	25	Pass
A - Sitting Height	mm	772	788	778	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	82	Pass
D - H Point From Seatback	mm	141	151	148	Pass
E - Shoulder Pivot From Backline	mm	97	107	102	Pass
F - Thigh Clearance	mm	119	135	124	Pass
G - Head Breadth	mm	140	148	145	Pass
H - Head Back From Backline	mm	40	46	41	Pass
I - Head Depth	mm	178	188	187	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	526	Pass
L - Popliteal Height	mm	343	369	360	Pass
K - Knee Pivot To Floor Height	mm	392	409	397	Pass
N - Buttock Popliteal Length	mm	416	442	436	Pass
O - Chest Depth W/O Jacket	mm	195	211	208	Pass
P - Foot Length	mm	216	232	223	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	320	Pass
R - Arm Length	mm	249	259	253	Pass
S - Knee Joint To Seatback	mm	477	493	488	Pass
V - Shoulder Width	mm	341	357	350	Pass
W - Foot Width	mm	78	94	83	Pass
Y - Chest Circumference W/Jacket	mm	851	881	871	Pass
Z - Waist Circumference	mm	761	791	780	Pass
			Overall Test Results		Pass

Technician:



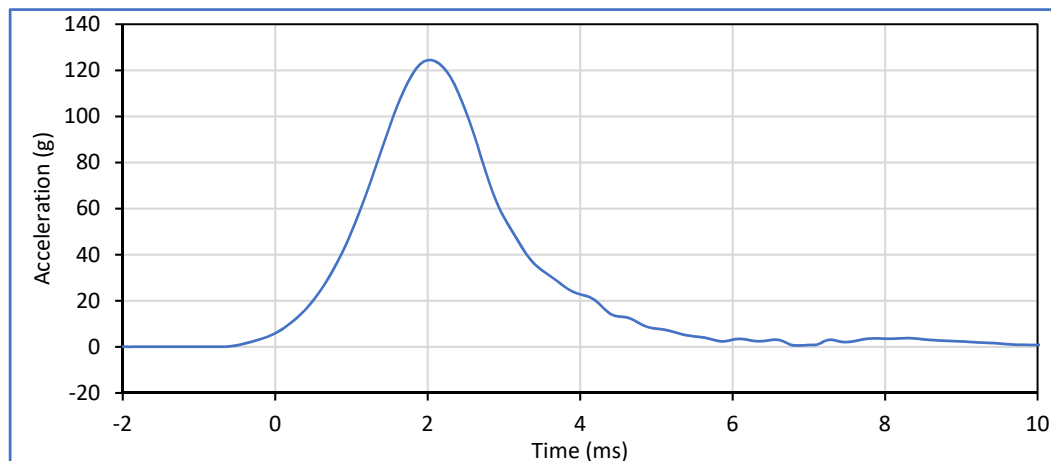
J. Hernandez

Approved By:



P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Peak Resultant Acceleration	g	115.0	137.0	124.4	Pass
Peak Head Ax	g	-15.0	15.0	-4.1	Pass
Oscillations After Main Pulse	%	0.0	15.0	3.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass

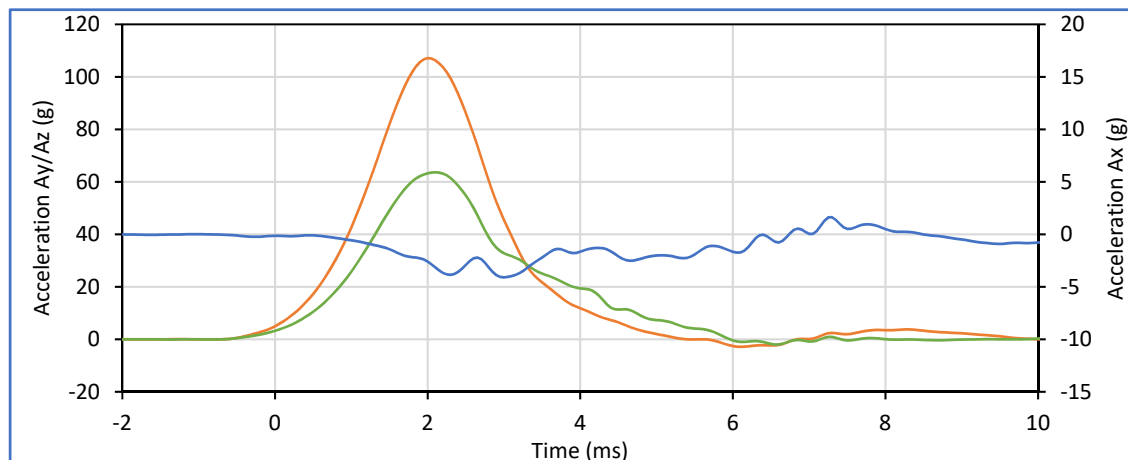


Head Resultant

Max:124.4@2.1

Min:0.6@6.9

SAE Class 1000



Head Ax

Max:1.6@7.3

Min:-4.1@3.0

SAE Class 1000

Head Ay

Max:107.1@2.0

Min:-2.8@6.1

SAE Class 1000

Head Az

Max:63.6@2.1

Min:-2.0@6.6

SAE Class 1000

Technician:

J. Hernandez

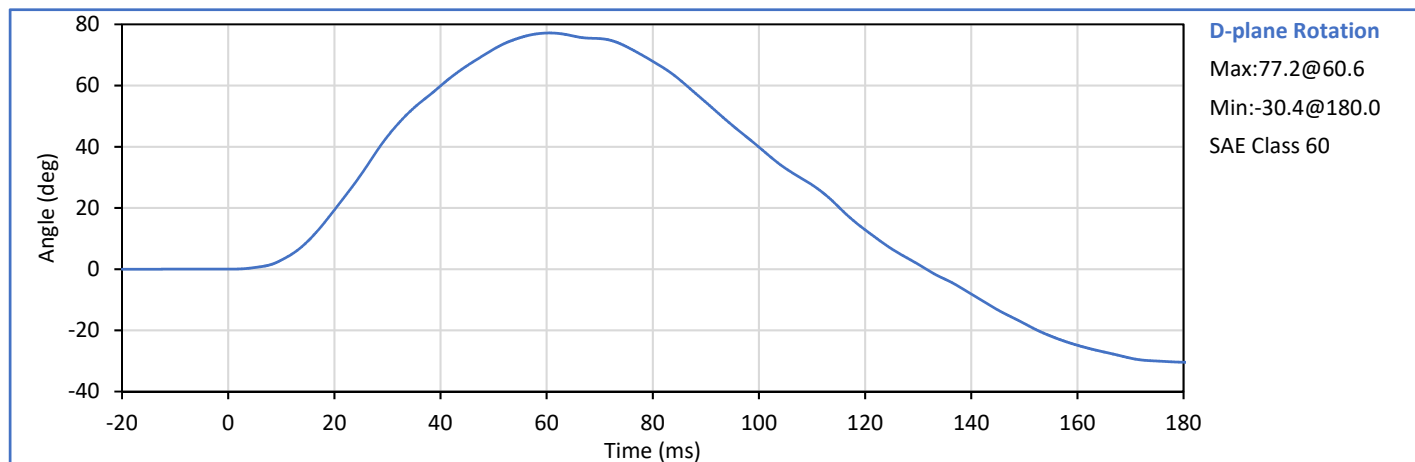
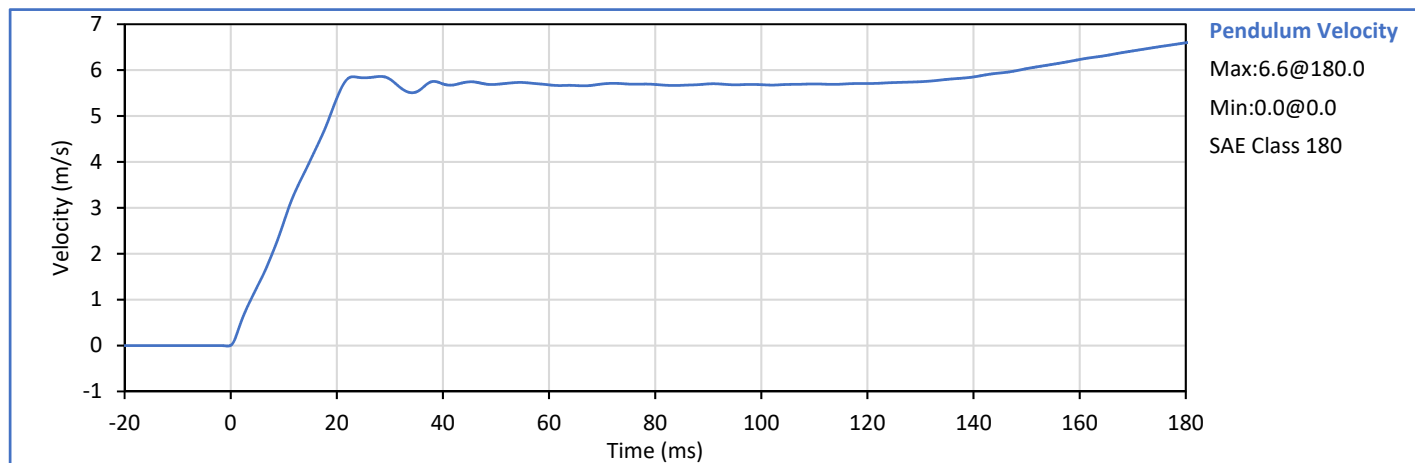
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	5.51	5.63	5.62	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.69	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	4.03	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	5.39	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.83	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.86	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	77.2	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-43.7	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	113.2	Pass
Overall Test Results				Pass	



Technician:

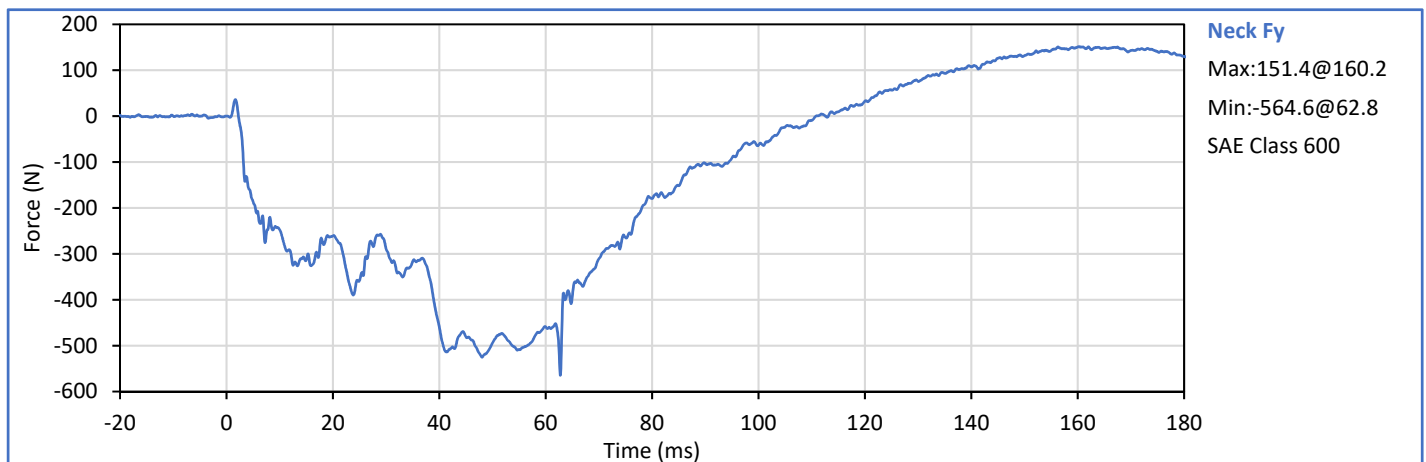
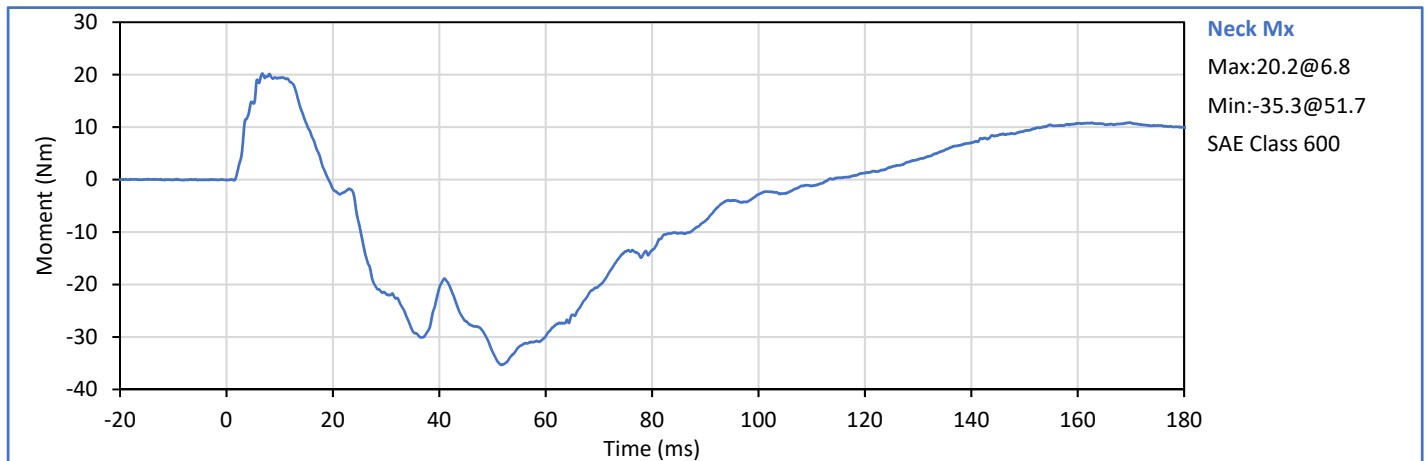
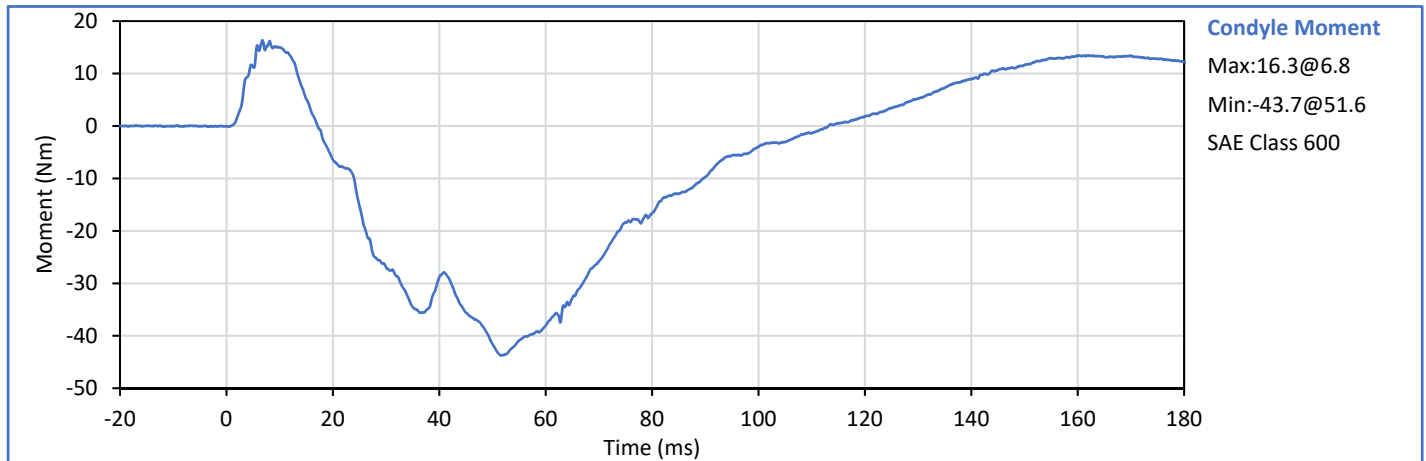
J. Hernandez

J. Hernandez

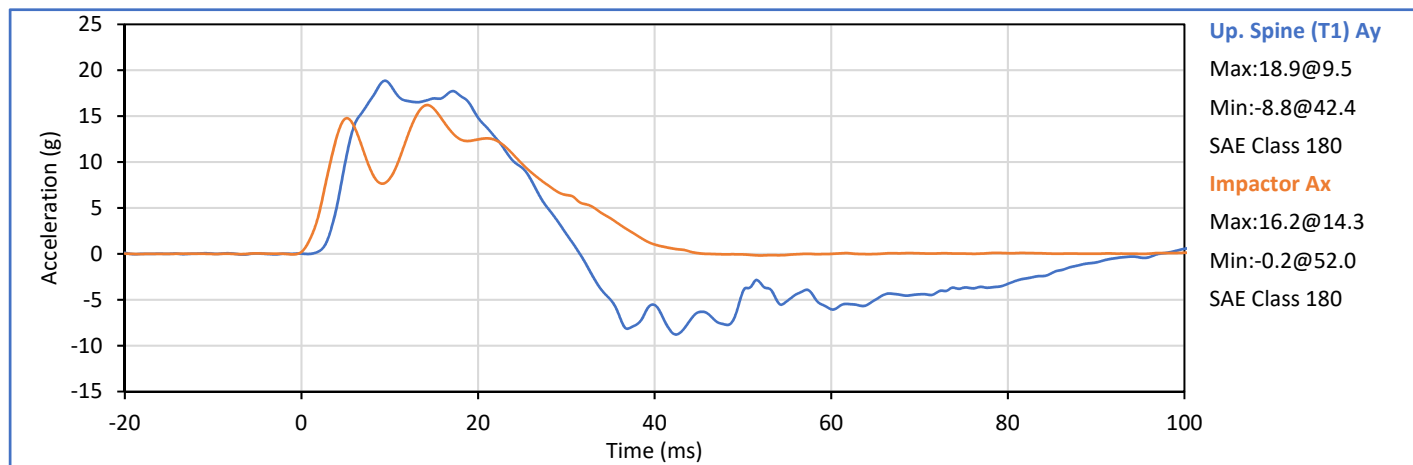
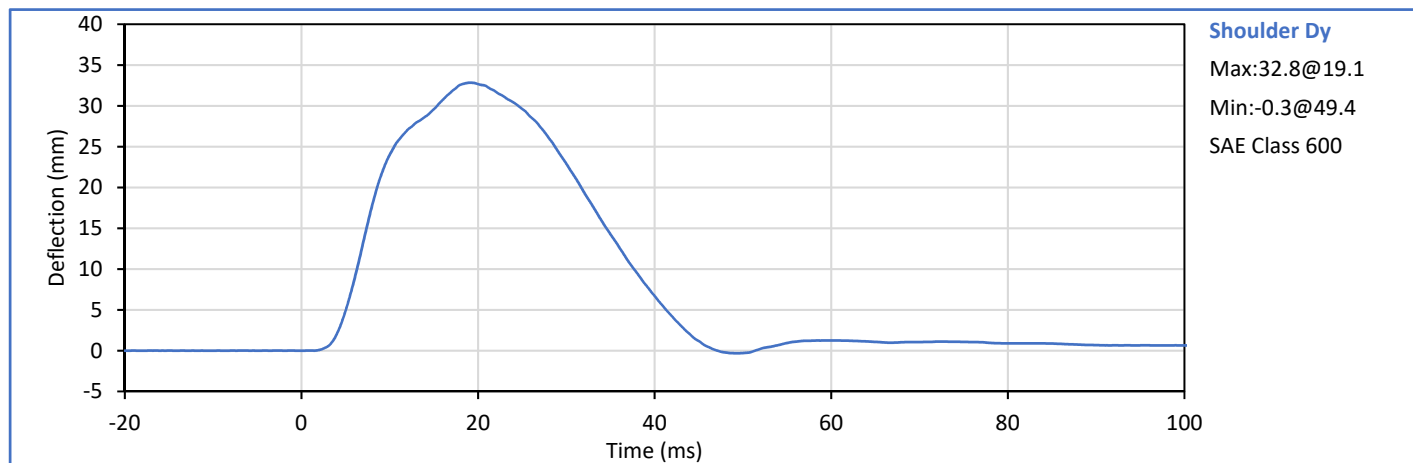
Approved By:

P. Puzzuto

P. Puzzuto



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	27	Pass
Impactor Velocity	m/s	4.20	4.40	4.27	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.8	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.9	Pass
Peak Impactor Ax	g	13.0	18.0	16.2	Pass
Overall Test Results					Pass



Technician:

J. Hernandez

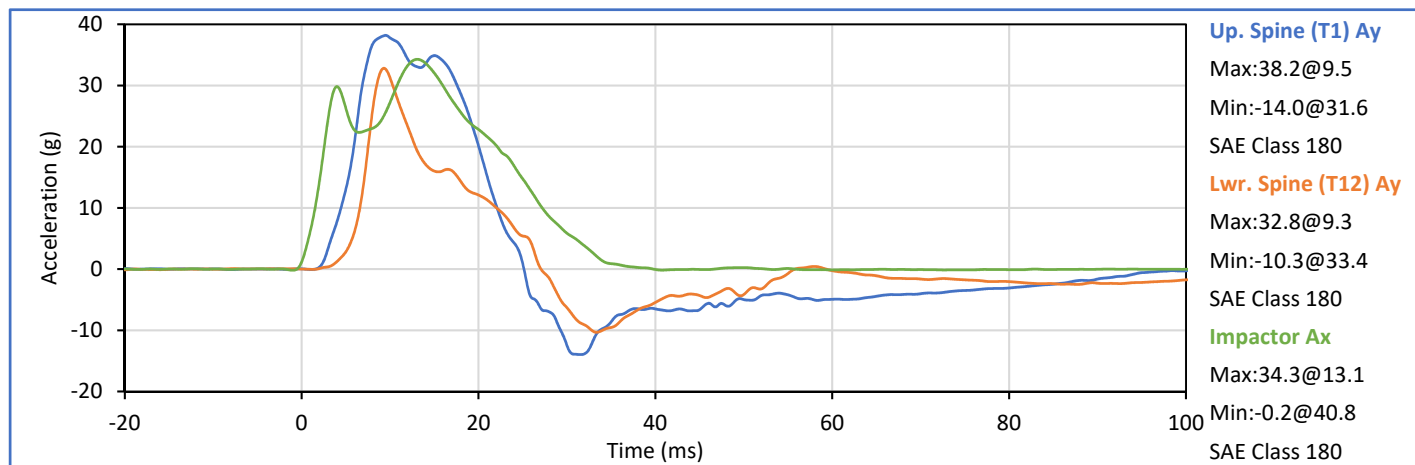
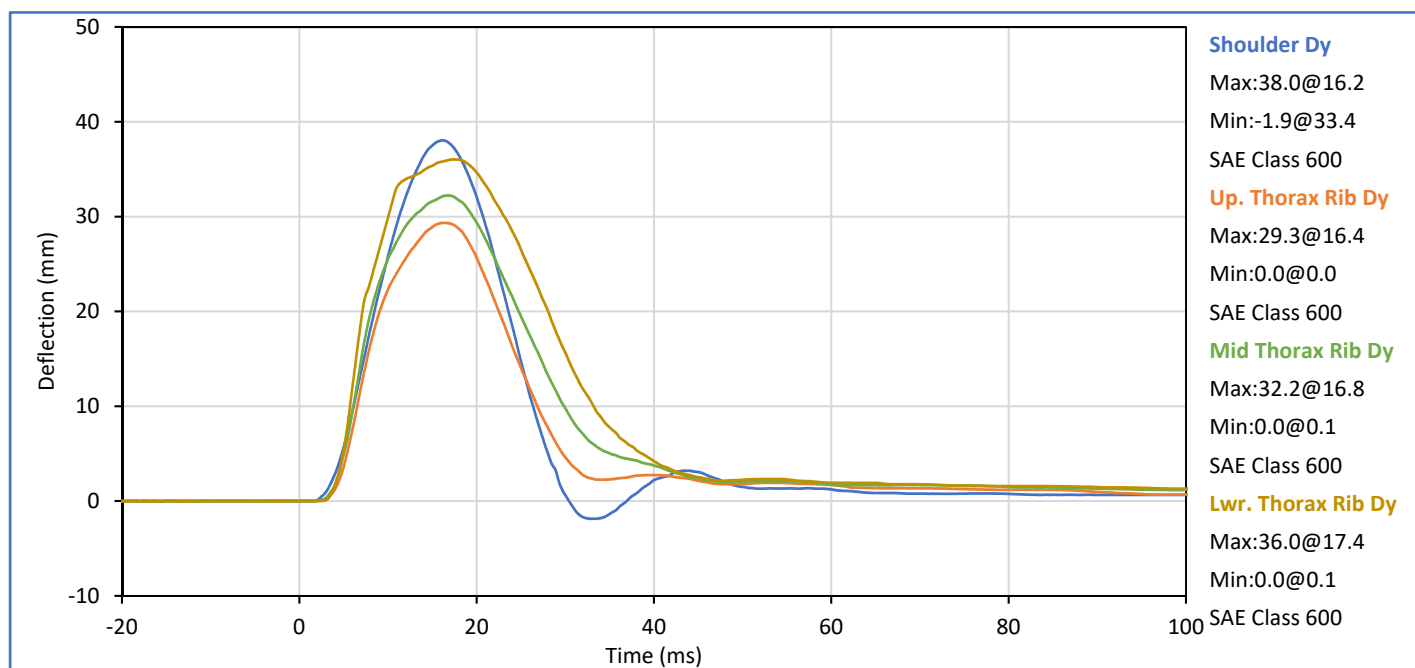
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	6.60	6.80	6.71	Pass
Peak Shoulder Dy	mm	31.0	40.0	38.0	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.3	Pass
Peak Middle Rib Dy	mm	30.0	36.0	32.2	Pass
Peak Lower Rib Dy	mm	32.0	38.0	36.0	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	38.2	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	32.8	Pass
Peak Impactor Ax	g	30.0	36.0	34.3	Pass
Overall Test Results				Pass	



Technician:

J. Hernandez

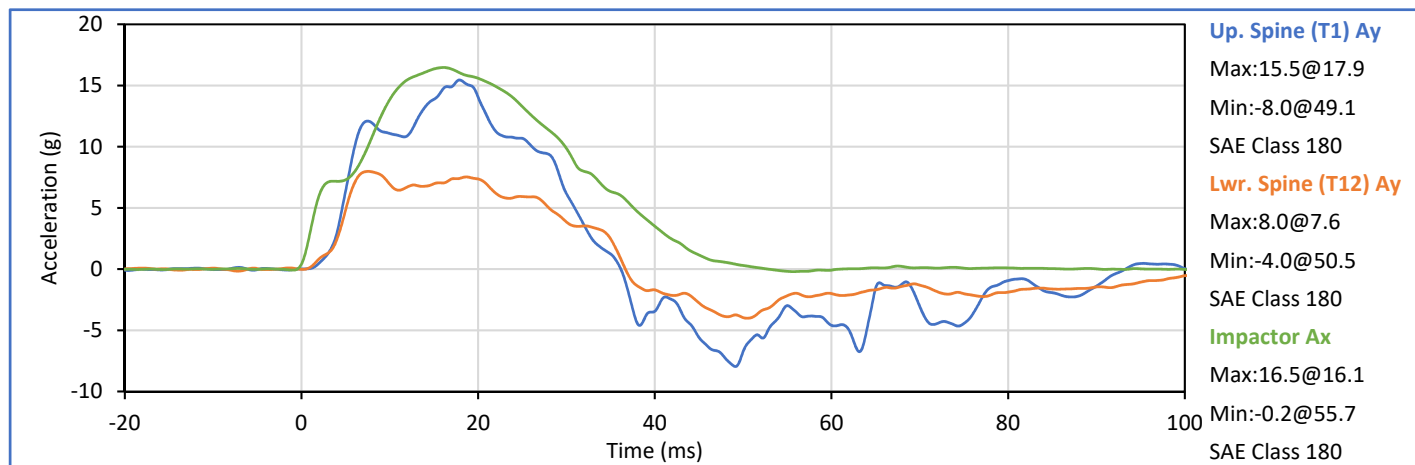
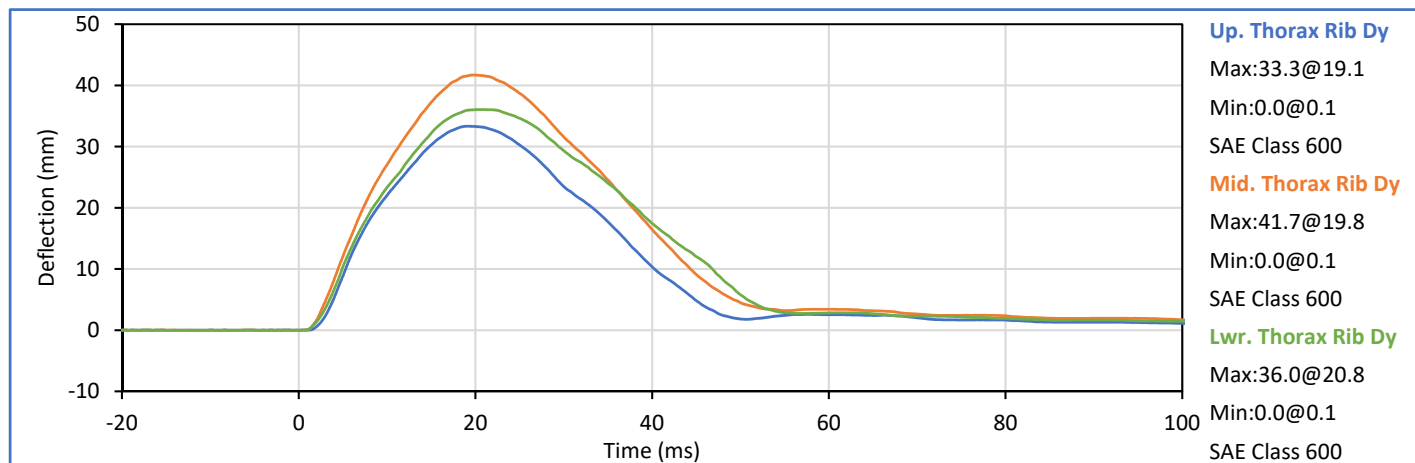
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Upper Rib Dy	mm	32.0	40.0	33.3	Pass
Peak Middle Rib Dy	mm	39.0	45.0	41.7	Pass
Peak Lower Rib Dy	mm	35.0	43.0	36.0	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	15.5	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.0	Pass
Peak Impactor Ax	g	14.0	18.0	16.5	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

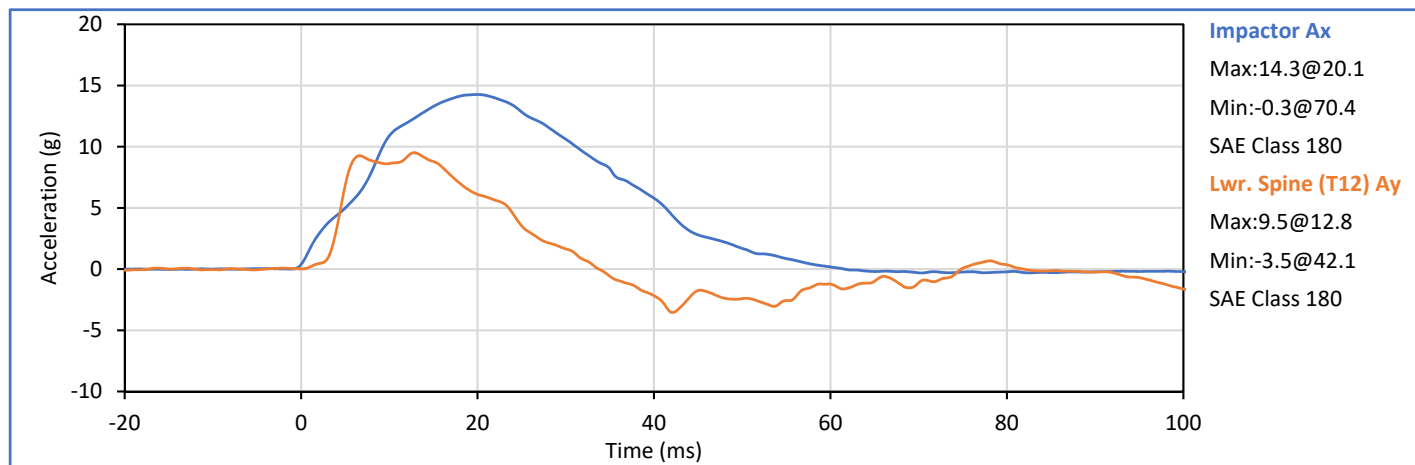
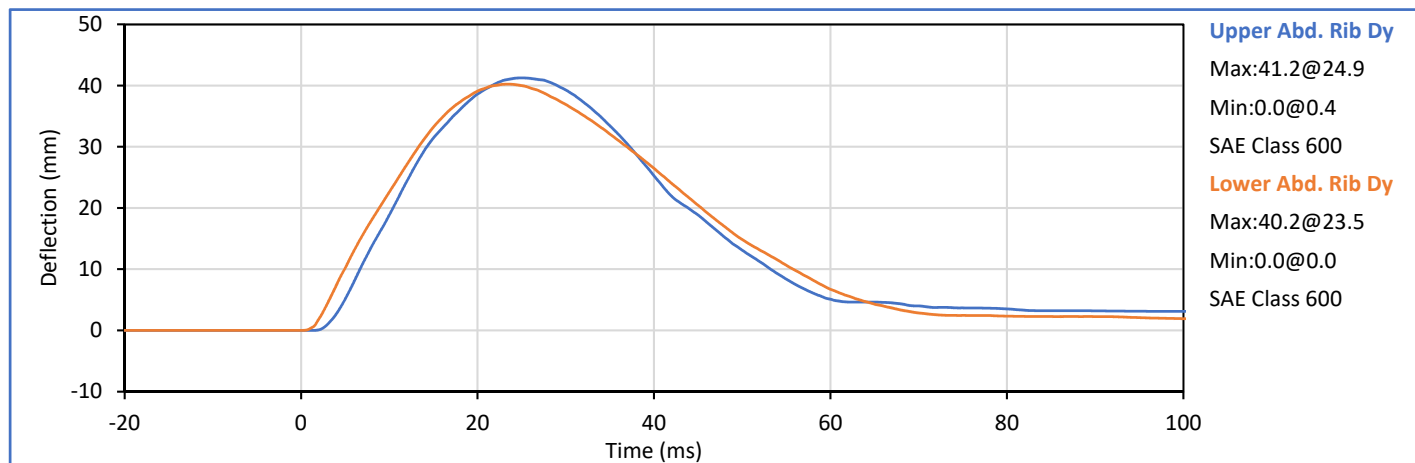
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	27	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	41.2	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	40.2	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	9.5	Pass
Peak Impactor Ax	g	12.0	16.0	14.3	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

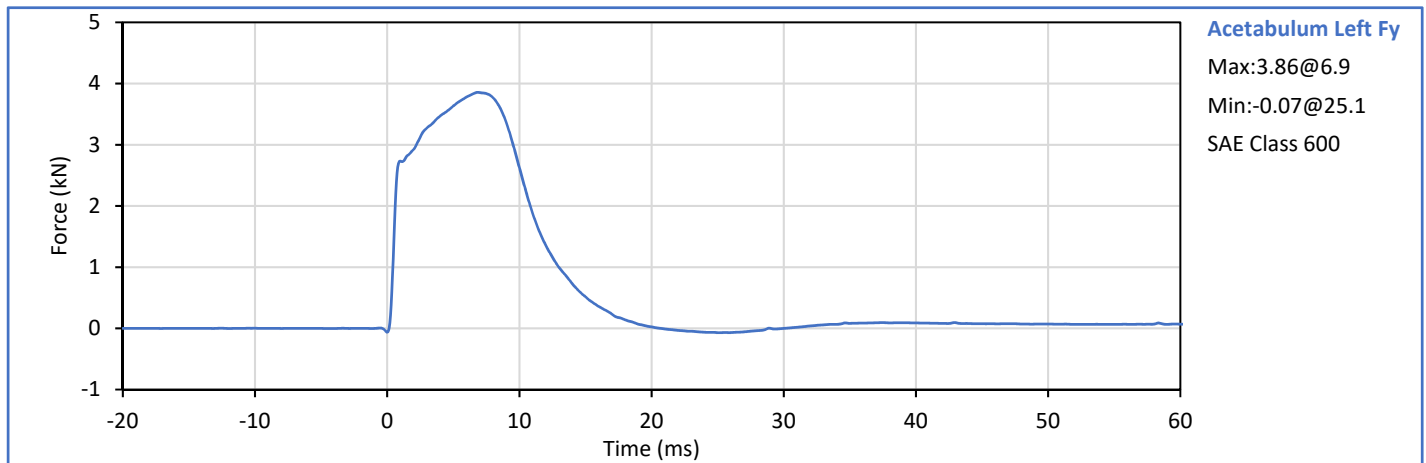
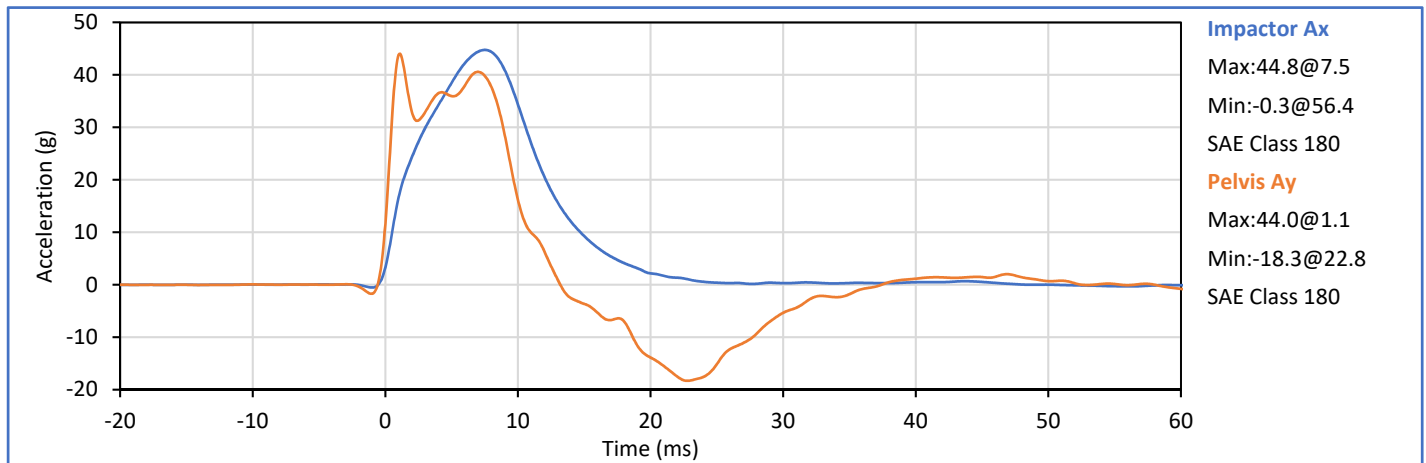
P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.86	Pass
Pelvis Ay after 6ms	g	34.0	42.0	40.6	Pass
Peak Impactor Ax	g	38.0	47.0	44.8	Pass
Overall Test Results				Pass	Pass

Pelvis Plug S/N: 11608 (SACO)



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-15

Pelvis Plug S/N: 11608 (SACO)



SID-IIs Pelvis Plug Certification Test

Plug S/N 11608

Test Number 3151

Report Number 3144

Test Date 10/4/2016 1:24:47 PM

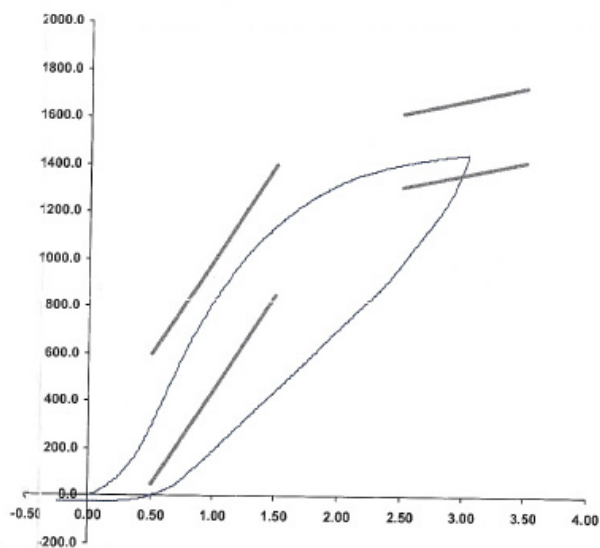
Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	296.75	50.00 600.00
Force @ 1.5 mm (N)	1,141.41	850.00 1,400.00
Force @ 2.5 mm (N)	1,402.61	1,306.00 1,618.00
Force @ 3.0 mm (N)	1,442.49	1,361.00 1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (T1240813), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 04-Oct-16
SACO Research

By: DC

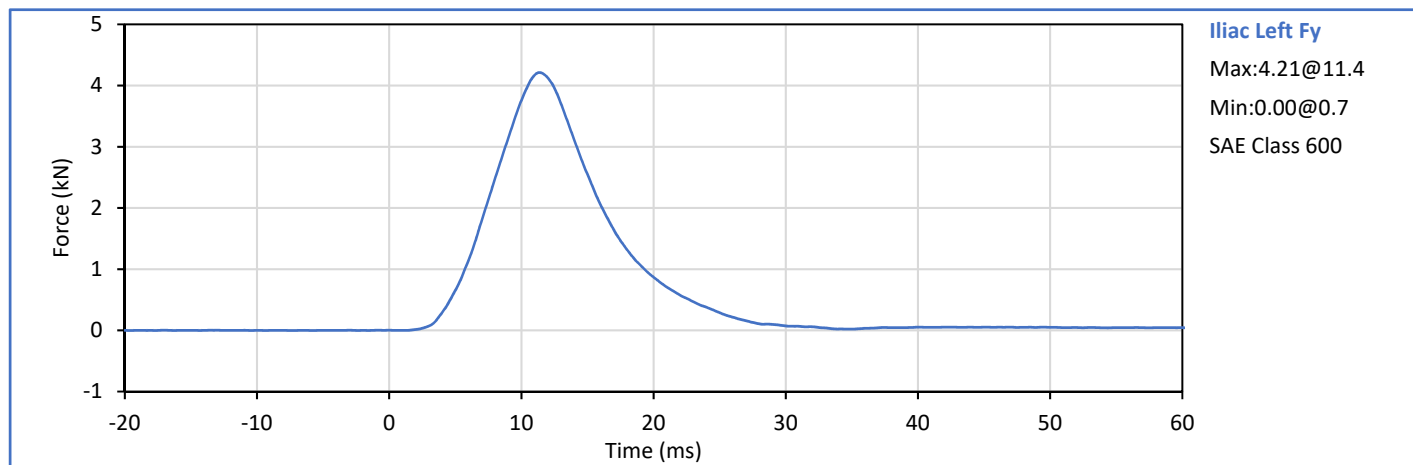
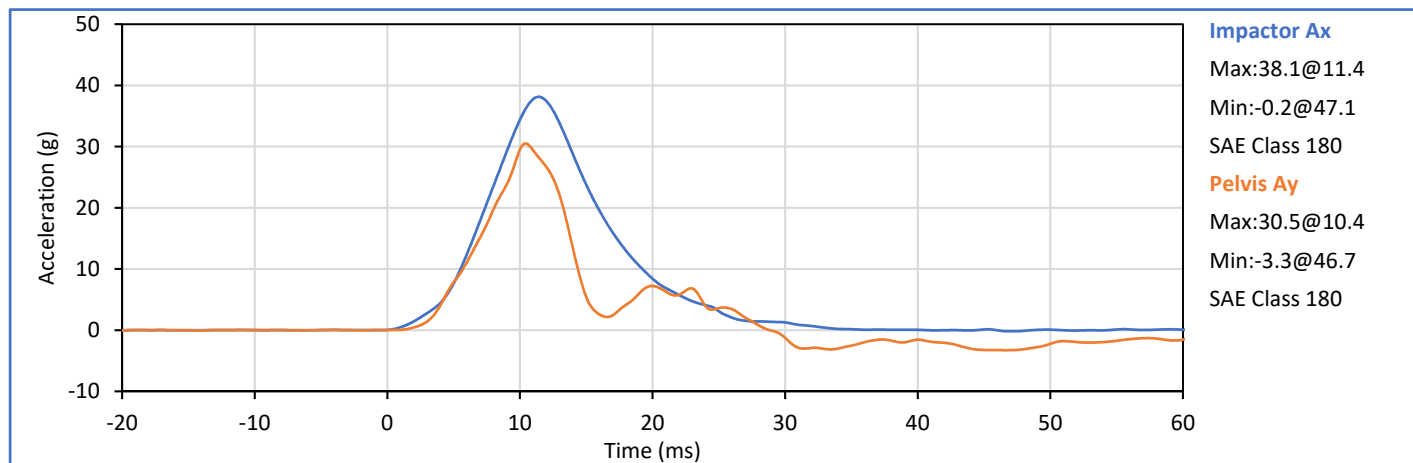
Date: 10/4/16

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	24	Pass
Impactor Velocity	m/s	4.20	4.40	4.34	Pass
Peak Iliac Fy	kN	4.10	5.10	4.21	Pass
Pelvis Ay after 6ms	g	28.0	39.0	30.5	Pass
Peak Impactor Ax	g	36.0	45.0	38.1	Pass
Overall Test Results				Pass	Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 - Driver ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P58858	Endevco	7264C-2k	2019-11-05
Head Acceleration Y Primary	P58865	Endevco	7264C-2k	2019-11-05
Head Acceleration Z Primary	P58867	Endevco	7264C-2k	2019-11-05
Head Acceleration X Redundant	P58859	Endevco	7264C-2k	2019-11-05
Head Acceleration Y Redundant	P58866	Endevco	7264C-2k	2019-11-05
Head Acceleration Z Redundant	P58873	Endevco	7264C-2k	2019-11-05
Upper Thorax Rib Deflection Y	209 (ES-2 Rib)	Honeywell	F38000203	2019-11-05
Middle Thorax Rib Deflection Y	210 (ES-2 Rib)	Honeywell	F38000203	2019-11-05
Lower Thorax Rib Deflection Y	207 (ES-2 Rib)	Honeywell	F38000203	2019-11-05
Anterior Abdominal Force Y	1510 Fy	R.A. Denton	2631J	2018-12-03
Middle Abdominal Force Y	1514 Fy	R.A. Denton	2631J	2018-12-03
Posterior Abdominal Force Y	1515 Fy	R.A. Denton	2631J	2018-12-03
Lower Spine T12 Acceleration X	P63856	Endevco	7264C-2k	2019-11-05
Lower Spine T12 Acceleration Y	P50063	Endevco	7264C-2k	2019-11-05
Lower Spine T12 Acceleration Z	P51880	Endevco	7264C-2k	2019-11-05
Pubic Symphysis Force Y	506 Fy	R.A. Denton	3096JFL	2018-12-03

Table 2a - Left Rear Passenger ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P63980	Endevco	7264C-2k	2019-10-31
Head Acceleration Y Primary	P58861	Endevco	7264C-2k	2019-10-31
Head Acceleration Z Primary	P51261	Endevco	7264C-2k	2019-10-31
Head Acceleration X Redundant	P58808	Endevco	7264C-2k	2019-10-31
Head Acceleration Y Redundant	P63310	Endevco	7264C-2k	2019-10-31
Head Acceleration Z Redundant	P49189	Endevco	7264C-2k	2019-10-31
Upper Thorax Rib Deflection Y	1172	Servo	08TCI-3725	2019-10-31
Middle Thorax Rib Deflection Y	1219	Servo	08TCI-3725	2019-10-31
Lower Thorax Rib Deflection Y	1221	Servo	08TCI-3725	2019-10-31
Upper Abdomen Rib Deflection Y	1252	Servo	08TCI-3725	2019-10-31
Lower Abdomen Rib Deflection Y	1283	Servo	08TCI-3725	2019-10-31
Lower Spine T12 Acceleration X	P52108	Endevco	7264C-2k	2019-10-31
Lower Spine T12 Acceleration Y	P63970	Endevco	7264C-2k	2019-10-31
Lower Spine T12 Acceleration Z	P51712	Endevco	7264C-2k	2019-10-31
Iliac Wing Impact Side Force Y	289 Fy (Iliac)	R.A. Denton	3228J	2019-10-17
Acetabulum Impact Side Force Y	277 Fy (Acetabulum)	R.A. Denton	3249J	2019-10-07

Table 2b - Left Rear Passenger ATD Instrumentation, Optional (Research Data Only)

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Rotation Rate X	ARS7498	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Y	ARS7367	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Z	ARS7377	DTS	ARS PRO-8k (2000Hz)	2019-07-08

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	11163	Endevco	757F-2k	2019-05-24
Vehicle CG Ay	10911	Endevco	757F-2k	2019-05-28
Vehicle CG Az	10876	Endevco	757F-2k	2019-05-25
Right Side Sill at Front Seat Ax	10836	Endevco	757F-2k	2019-05-25
Right Side Sill at Front Seat Ay	10858	Endevco	757F-2k	2019-05-23
Right Side Sill at Front Seat Az	10889	Endevco	757F-2k	2019-05-28
Right Side Sill at Rear Seat Ax	10880	Endevco	757F-2k	2019-05-25
Right Side Sill at Rear Seat Ay	A273456	MSI	52F-2000	2019-11-07
Right Side Sill at Rear Seat Az	11177	Endevco	757F-2k	2019-05-23
Left Side Sill at Front Seat Ay	10881	Endevco	757F-2k	2019-05-25
Left Side Sill at Rear Seat Ay	10851	Endevco	757F-2k	2019-05-25
Left Lower A-Pillar Ay	A253236	MSI	52M30-2000	2019-11-07
Left Middle A-Pillar Ay	11187	Endevco	757F-2k	2019-05-21
Left Lower B-Pillar Ay	10917	Endevco	757F-2k	2019-05-28
Left Middle B-Pillar Ay	10874	Endevco	757F-2k	2019-05-25
Driver Seat Track at H-Point Ay	10849	Endevco	757F-2k	2019-05-25
Rear Seat Structure Ay	10841	Endevco	757F-2k	2019-05-25
Right Rear Occupant Comp. Ay	10839	Endevco	757F-2k	2019-05-25
Engine Block Top Ax	10873	Endevco	757F-2k	2019-05-28
Engine Block Top Ay	10856	Endevco	757F-2k	2019-05-24
Rear Floopan Above Axle Ax	10824	Endevco	757F-2k	2019-05-25
Rear Floopan Above Axle Ay	10908	Endevco	757F-2k	2019-05-28
Rear Floopan Above Axle Az	10906	Endevco	757F-2k	2019-05-25

Table 4 - Moving Deformable Barrier (MDB) Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
MDB CG Ax	10390	Endevco	757F-2k	2019-11-07
MDB CG Ay	10405	Endevco	757F-2k	2019-11-07
MDB CG Az	10421	Endevco	757F-2k	2019-11-07
MDB Left Side at Rear Axle Ax	A224516	MSI	52F-2000	2019-11-08
MDB Left Side at Rear Axle Ay	A160734	MSI	52F-2000	2019-11-07