

**REPORT NUMBER: SINCAP-KAR-20-003**

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

**SUBARU CORPORATION  
2020 SUBARU LEGACY 4-DOOR SEDAN**

**NHTSA No: O20205501**

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



**NOVEMBER 27, 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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Approval Date: November 27, 2019

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

\_\_\_\_\_  
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NHTSA, Office of Crashworthiness Standards

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

## TECHNICAL REPORT DOCUMENTATION PAGE

<b>1. Report No.</b> SINCAP-KAR-20-003	<b>2. Government Accession No.</b>	<b>3. Recipient's Catalog No.</b>																												
<b>4. Title and Subtitle</b> Final Report of New Car Assessment Program Side Impact MDB Testing of a 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501		<b>5. Report Date</b> November 27, 2019																												
		<b>6. Performing Organization Code</b> KAR																												
<b>7. Authors</b> Mr. Bruno R. Haesbaert, Project Engineer, Applus IDIADA KARCO Mr. Steven D. Matsusaka, Engineering Manager, Applus IDIADA KARCO		<b>8. Performing Organization Report No.</b> TR-P39299-01-NC																												
		<b>10. Work Unit No.</b>																												
<b>9. Performing Organization Name and Address</b> Applus IDIADA KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA 92301		<b>11. Contract or Grant No.</b> DTNH22-14-D-00355L																												
		<b>13. Type of Report and Period Covered</b> Final Test Report, November 13 - November 27, 2019																												
<b>12. Sponsoring Agency Name and Address</b> 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		<b>14. Sponsoring Agency Code</b> NRM-110																												
		<b>15. Supplementary Notes</b>																												
<b>16. Abstract</b> A 55 / 28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2020 Subaru Legacy 4-door sedan in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on November 13, 2019.  The impact velocity of the Moving Deformable Barrier was 62.11 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 26.7°C. The target vehicle's maximum post-test static crush was 198mm located at level 3. The test vehicle's occupant performance data is as follows:																														
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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.																														
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																												
<b>19. Security Classification of this report</b> UNCLASSIFIED	<b>20. Security Classification of this page</b> UNCLASSIFIED	<b>21. No. of Pages</b> 154	<b>22. Price</b>																											

\* 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 Legacy 4-door sedan. 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 Legacy 4-door sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.11 km/h (38.59 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 13, 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 <sub>36</sub> )		1000	50.4
Maximum Thoracic Rib Deflection	mm	44	19
Combined Abdominal Force	N	2500	961
Pubic Symphysis Force	N	6000	1488

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC <sub>36</sub> )		1000	220.4
Lower Spine (T12) Resultant Acceleration	g	82	62
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2584
Maximum Thoracic Rib Deflection	mm	38*	18
Maximum Abdominal Rib Deflection	mm	45*	18

\*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. The accelerometers X, Y, and Z for the rear floorpan above axle failed during the test.

### SECTION 3

#### OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501

Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

#### 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 <sup>2</sup>	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 Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA Number	O20205501
Model Year	2020
Make	Subaru
Model	Legacy
Body Style	4-Door Sedan
VIN	4S3BWAB6XL3002999
Body Color	Ice Silver Metallic
Odometer Reading (km / mi)	11 / 7
Engine Displacement (L)	2.5
Type / No. of Cylinders	L4
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
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	No
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	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	Passenger Car

GVWR (kg)	4630
GAWR Front (kg)	2756
GAWR Rear (kg)	2690

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity	2	3		5
Capacity Weight (VCW) (kg)				385.0
DSC x 68.04 (kg)				340.2
Cargo Weight (RCLW) (kg)				44.8

A  
B  
A-B

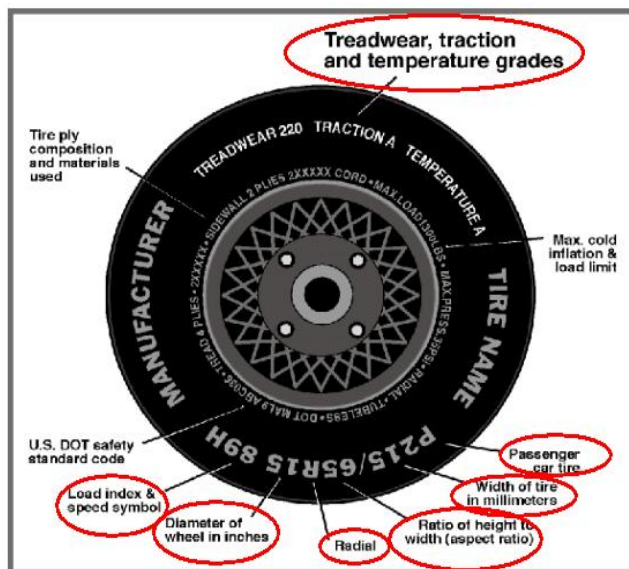
**VEHICLE SEAT TYPE**

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 Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Cold Pressure (kPa)	230	220
Recommended Tire Size	225/55R17	225/55R17
Tire Size on Vehicle	225/55R17	225/55R17
Tire Manufacturer	Yokohoma	Yokohoma
Tire Model	Avid GT	Avid GT
Treadware	400	400
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	97V	97V
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	4UUP 6AV 0219	4UUP 6AV 0119
DOT Safety Code Right	4UUP 6AV 0119	4UUP 6AV 0219

**DATA SHEET NO. 1 ... (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**TIRE PRESSURES**

	Units	LF	RF	LR	RR
As Delivered	kPa	214	214	214	214
Tire Placard	kPa	230	230	220	220
Owner's Manual	kPa	230	230	220	220
As Tested	kPa	230	230	220	220

**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 (UWW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	463.0	309.0		508.0	404.0		510.5	415.5	
Right	kg	459.0	336.0		463.0	355.5		458.0	353.0	
Ratio	%	58.8%	41.2%	100.0%	56.1%	43.9%	100.0%	55.8%	44.2%	100.0%
Total	kg	922.0	645.0	1567.0	971.0	759.5	1730.5	968.5	768.5	1737.0

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UWW)	kg	1567.0	A
Actual Weight of 2 P572 ATD Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	44.8	C
Calculated Vehicle Target Wt (TVTWT)	kg	1736.8	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	716	715	Yes
RF	mm	729	720	Yes
LR	mm	693	686	Yes
RR	mm	704	694	Yes
Vehicle CG (Aft of Front Axle)	mm	1212	1202	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	53	43	

\*\*\*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 Legacy 4-Door Sedan NHTSA No. O20205501  
Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

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

Component Description	Weight (kg)
Trim	6.0
Ballast / Equipment Added	44.5

Test Height Adjustable Setting (If Applicable)	
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## DATA SHEET NO. 2

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

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

#### 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	4.3	0.0	2.2
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	2.2	273	Max			
			Mid	260	273	283
			Min			
Front Passenger Seat	Fixed	288	Max			
			Mid	278	288	296
			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 Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

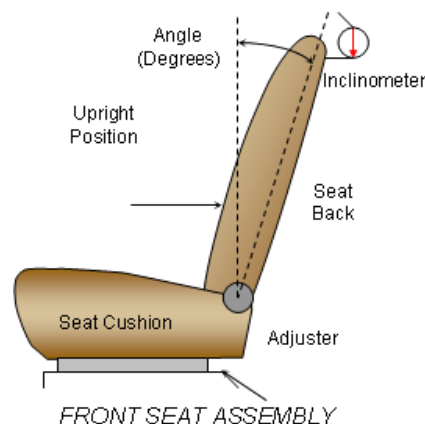
**SEAT FORE/AFT POSITION**

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	250	26	125	12
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	51.7	25	9.5	9
Front Passenger Seat	53.0	30	9.8	4
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 Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

#### 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

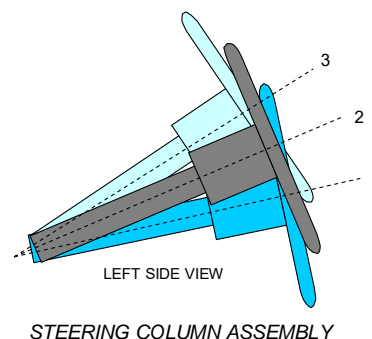
#### HEAD RESTRAINT ADJUSTMENT

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	3	H
Rear Seat	2	L

#### STEERING COLUMN ADJUSTMENT

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



	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	22.0	71
Geometric Center - Position 2	23.0	101
Uppermost - Position 3	24.0	130
Telescoping Steering Wheel Travel		59
Test Position	23.0	101

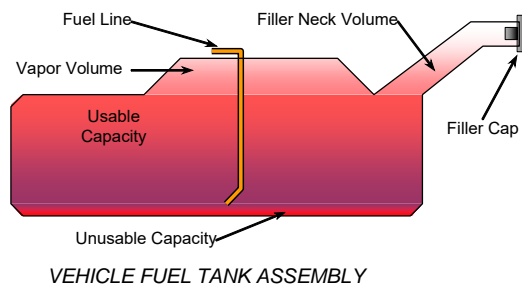
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**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**FUEL PUMP**

The vehicle is equipped with an electronic fuel pump. The pump operates a few seconds after the ignition switch is turned ON. After that the pump operates only while the engine is running.



**FUEL TANK CAPACITY**

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

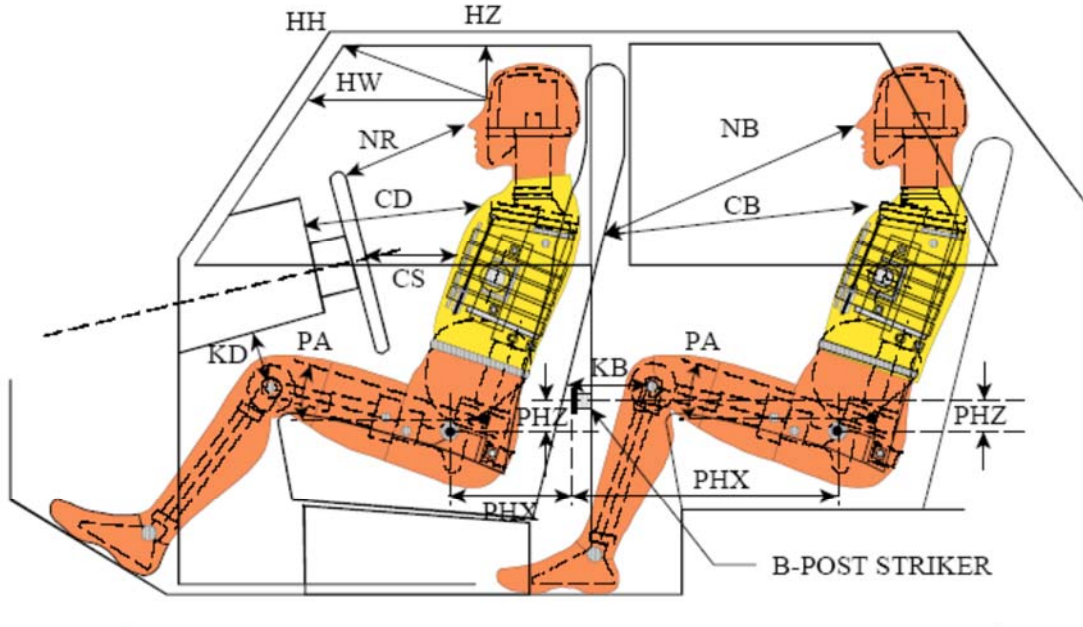
Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1?       **Yes**       **No**



**DATA SHEET NO. 3**

**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**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

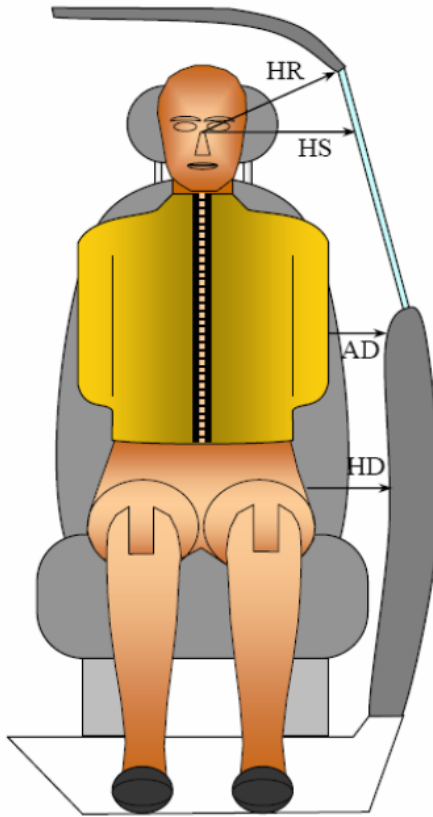
**DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION**

Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	386			
HW		Head to Windshield	684			
HZ	HZ	Head to Roof	201		255	
NR	NB	Nose to Rim/Seat Back	450		580	
CD	CB	Chest to Dash/Seat Back	571		573	
CS		Chest to Steering Wheel	319			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	142	30.7	308	33.9
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	115	28.2	314	13.9
PAX°	PAX°	Pelvic Tilt Angle X		22.5		22.4
	PAY°	Pelvic Tilt Angle Y		0.1		0.3
PHX	PHX	Hip Point to Striker (x-axis)	242		306	
PHZ	PHZ	Hip Point to Striker (z-axis)	193		287	

## DATA SHEET NO. 4

### DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



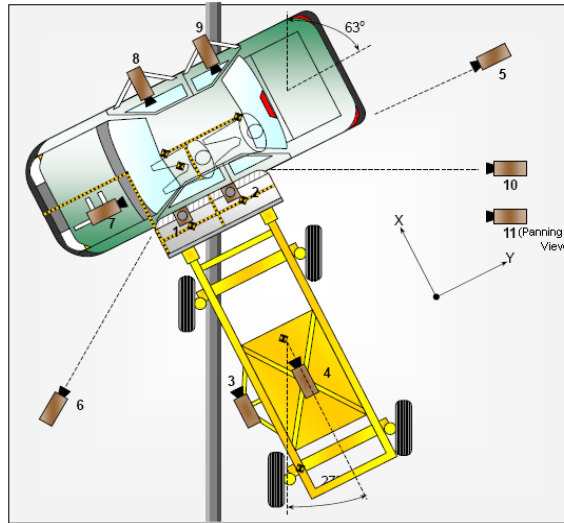
### DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	214	260
HS	Head to Side Window	mm	333	360
AD	Arm to Door	mm	104	179
HD	H-Point to Door	mm	166	186

**DATA SHEET NO. 5**

**CAMERA AND INSTRUMENTATION DATA**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**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

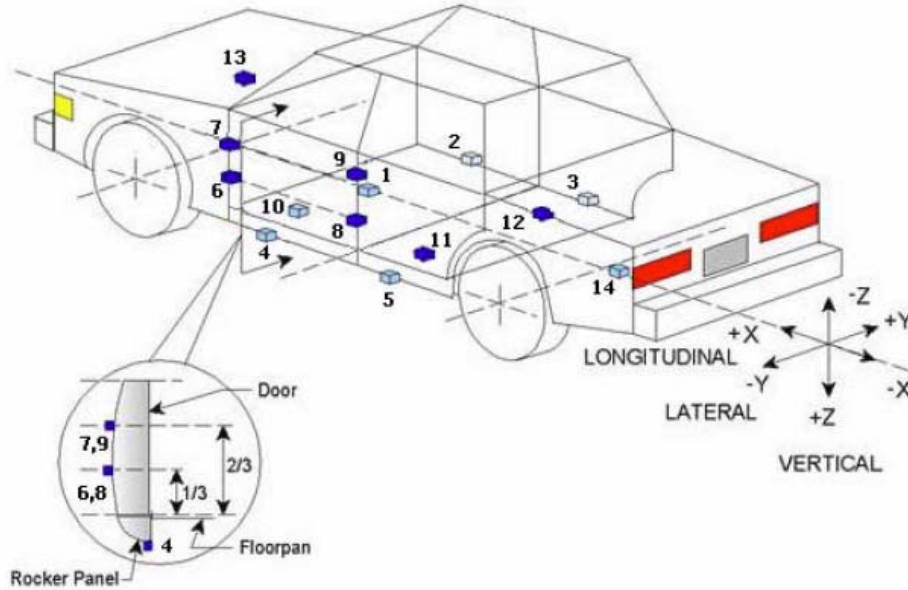
**INSTRUMENTATION**

Driver Dummy Channels	16
Passenger Dummy Channels	19
Vehicle Structure Accelerometers	23
MDB Channels	7
<b>Total</b>	<b>65</b>

**DATA SHEET NO. 6**

**TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2420	0	-420
2	Right Sill at Front Seat	2640	750	-350
3	Right Sill at Rear Seat	1900	735	-330
4	Left Sill at Front Door	2750	-750	-175
5	Left Sill at Rear Door	1700	-740	-170
6	A-Pillar Lower	3300	-810	-425
7	A-Pillar Middle	3371	-825	-780
8	B-Pillar Lower	2330	-735	-500
9	B-Pillar Middle	2260	-730	-780
10	Front Seat Track	2310	-575	-451
11	Rear Seat Structure	1930	-360	-410
12	Right Rear Occupant Compartment	1940	360	-410
13	Engine Block	3790	170	-620
14	Rear Floorpan Above Axle	9190	0	-680

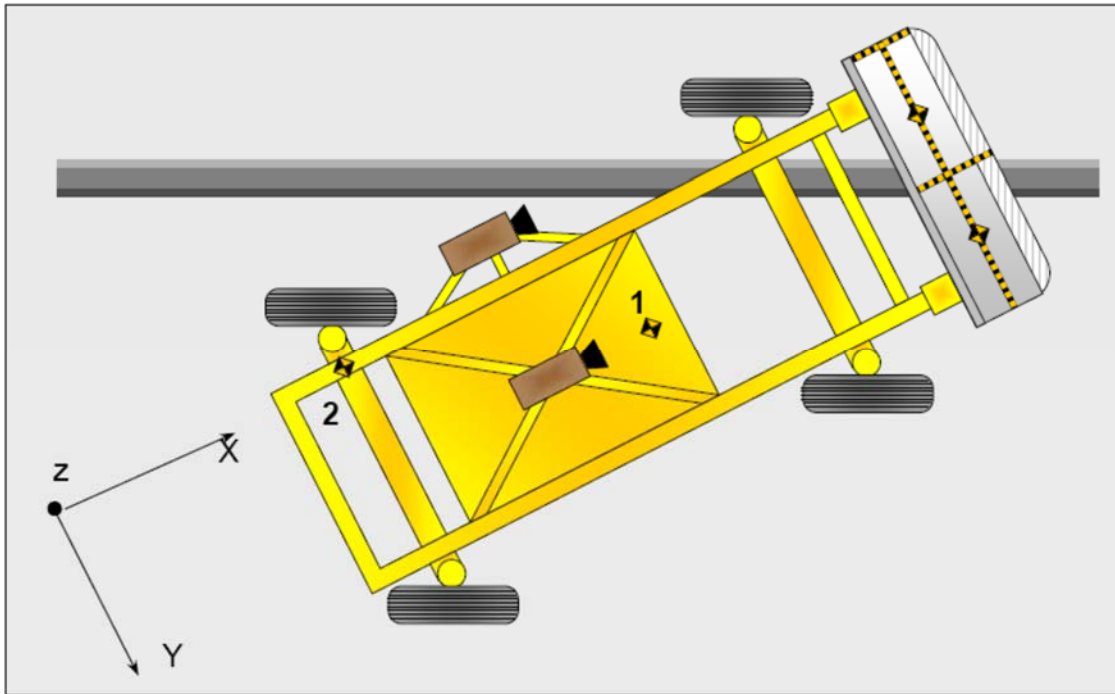
Reference: X – Rear surface of vehicle (+ forward)  
 Y – Vehicle centerline (+ to right)  
 Z – Ground plane (+ down)

**DATA SHEET NO. 7**

**MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501

Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**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 Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**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	Curtain Airbag, Side Header	Curtain Airbag, Side Header
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Headrest, Curtain Airbag, Side Header	Curtain Airbag, Headrest, Seat Back
Left Shoulder	Curtain Airbag, Side Airbag, Seat	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
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 Legacy 4-Door Sedan NHTSA No. O20205501  
Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**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 Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**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		2739
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		431
Actual Impact Point (Aft of Front Axle)	mm		435
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	-4
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	-2



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

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**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	62.11
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.05
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.9
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.4
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.5

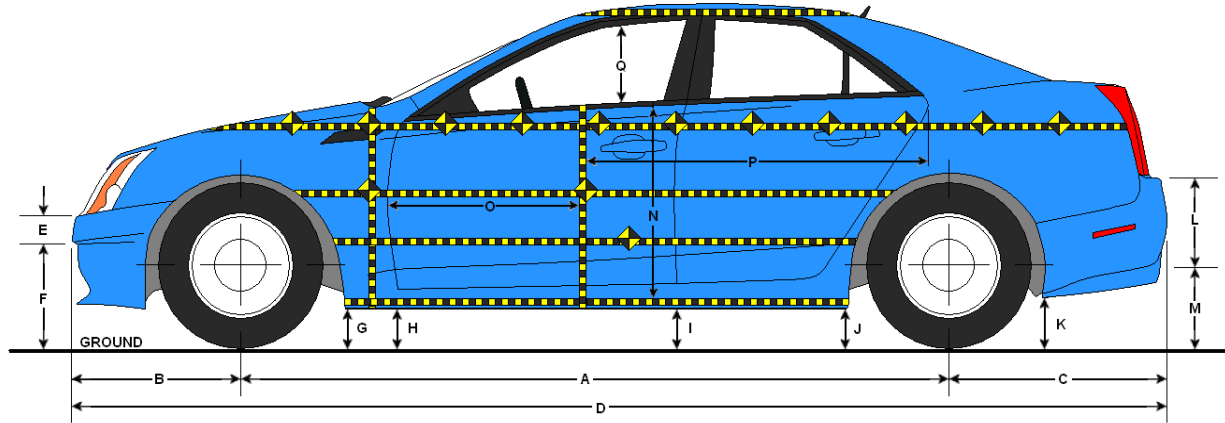
**MAXIMUM STATIC CRUSH OF HONEYCOMB FACE**

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	229
B	Top of Bumper	533	800	Right	137
C	Mid Level	686	400	Right	119
D	Top of Stack	813	300	Right	132

**DATA SHEET NO. 10**

**TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**LEFT SIDE VIEW**

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

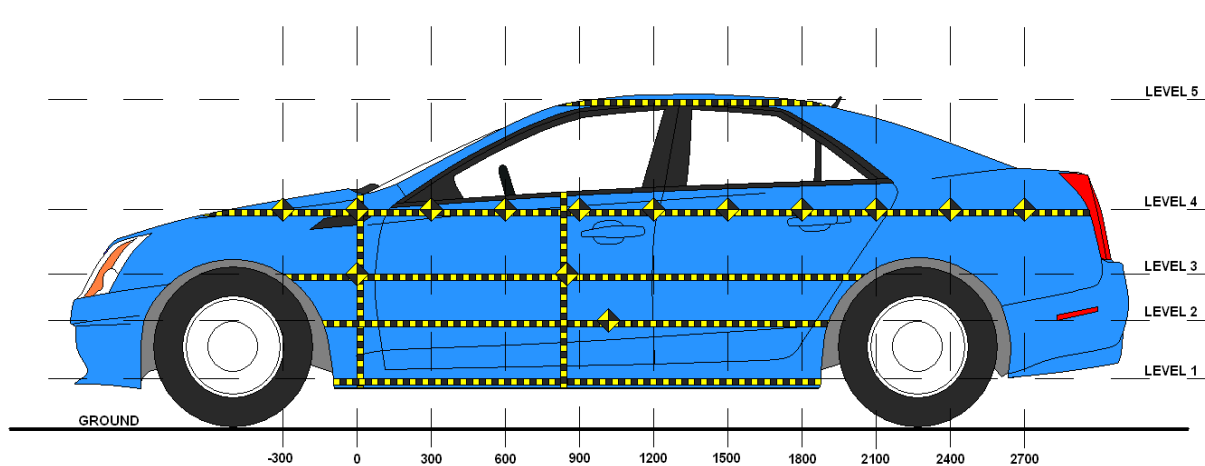
Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2739	2740	1
B	Front Axle to FSOV	1000	1012	12
C	Rear Axle to RSOV	1091	1085	-6
D	Total Length at Centerline	4831	4837	6
E	Front Bumper Thickness	102	102	0
F	Front Bumper Bottom to Ground	615	609	-6
G	Sill Height at Front Wheel Well	405	392	-13
H	Sill Height at Front Door Leading Edge	389	378	-11
I	Sill Height at B-Pillar	331	329	-2
J1	Sill Height at Rear Wheel Well	316	311	-5
J2	Pinch Weld Height at Rear Wheel Well	285	281	-4
K	Sill Height Aft of Rear Wheel Well	335	327	-8
L	Rear Bumper Thickness	201	200	-1
M	Rear Bumper Bottom to Ground	518	532	14
N	Sill Height to Bottom of Front Window Sill	664	663	-1
O	Front Door Leading Edge to Impact CL	764	728	-36
P	Rear Door Trailing Edge to Impact CL	1441	1366	-75
Q	Front Window Opening	415	431	16
R	Right Side Length	3313	3319	6
S	Left Side Length	3315	3305	-10
T	Vehicle Width at B-Pillar	1824	1735	-89

All measurements in mm with tolerance of  $\pm 3$ mm

**DATA SHEET NO. 11**

**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**LEFT SIDE VIEW**

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	385	14	1650
2	Occupant H-Point	674	156	1050
3	Mid-Door	777	198	900
4	Window Sill	1022	156	600
5	Window Top	1563	9	2250

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

**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

**EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL**

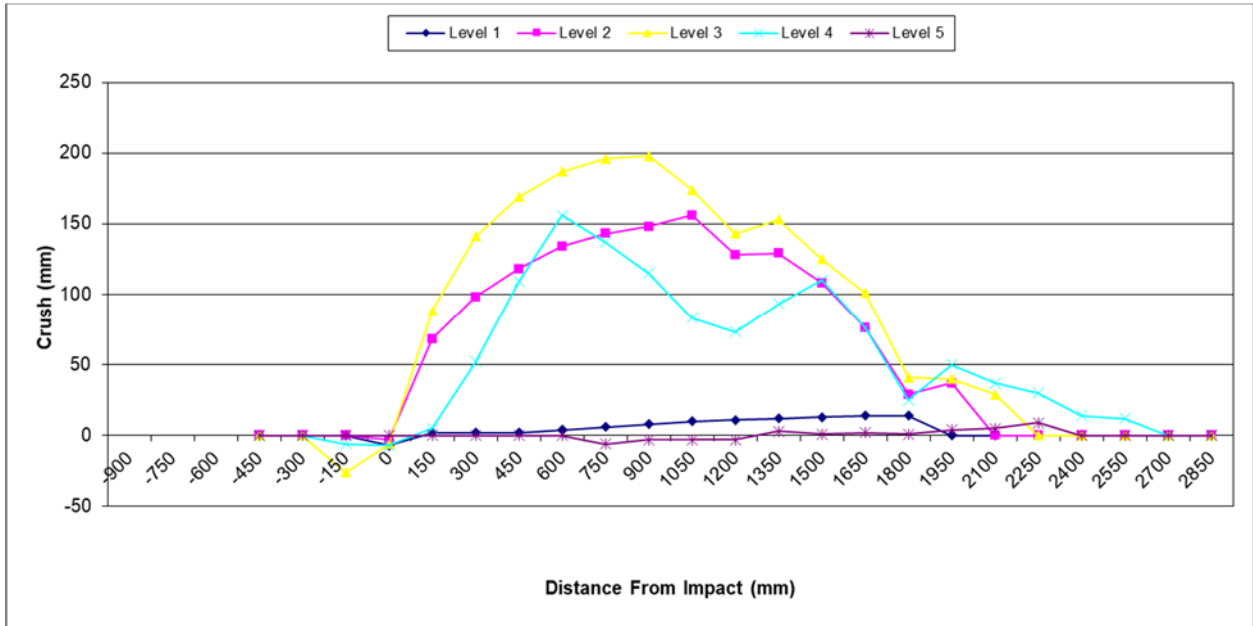
	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150			578	628				552	622				-26	-6	
0	606	590	586	633		599	587	580	626		-7	-3	-6	-7	
150	633	594	588	635		635	662	676	640		2	68	88	5	
300	639	594	587	629		641	692	728	681		2	98	141	52	
450	641	592	586	623		643	710	755	732		2	118	169	109	
600	640	592	585	617		644	726	772	773		4	134	187	156	
750	639	592	585	613	873	645	735	781	750	867	6	143	196	137	-6
900	639	592	585	609	880	647	740	783	724	877	8	148	198	115	-3
1050	639	593	586	608	886	649	749	760	691	883	10	156	174	83	-3
1200	639	595	588	604	892	650	723	731	677	889	11	128	143	73	-3
1350	640	597	590	606	892	652	726	743	699	895	12	129	153	93	3
1500	639	596	591	608	892	652	704	716	718	893	13	108	125	110	1
1650	635	594	588	609	890	649	670	689	685	892	14	76	101	76	2
1800	626	589	584	607	884	640	618	625	632	885	14	29	41	25	1
1950		584	582	593	875		621	622	643	879		37	40	50	4
2100			580	593	866			609	630	871			29	37	5
2250				604	860				634	869				30	9
2400				606					620					14	
2550				612					624					12	
2700															
2850															

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501

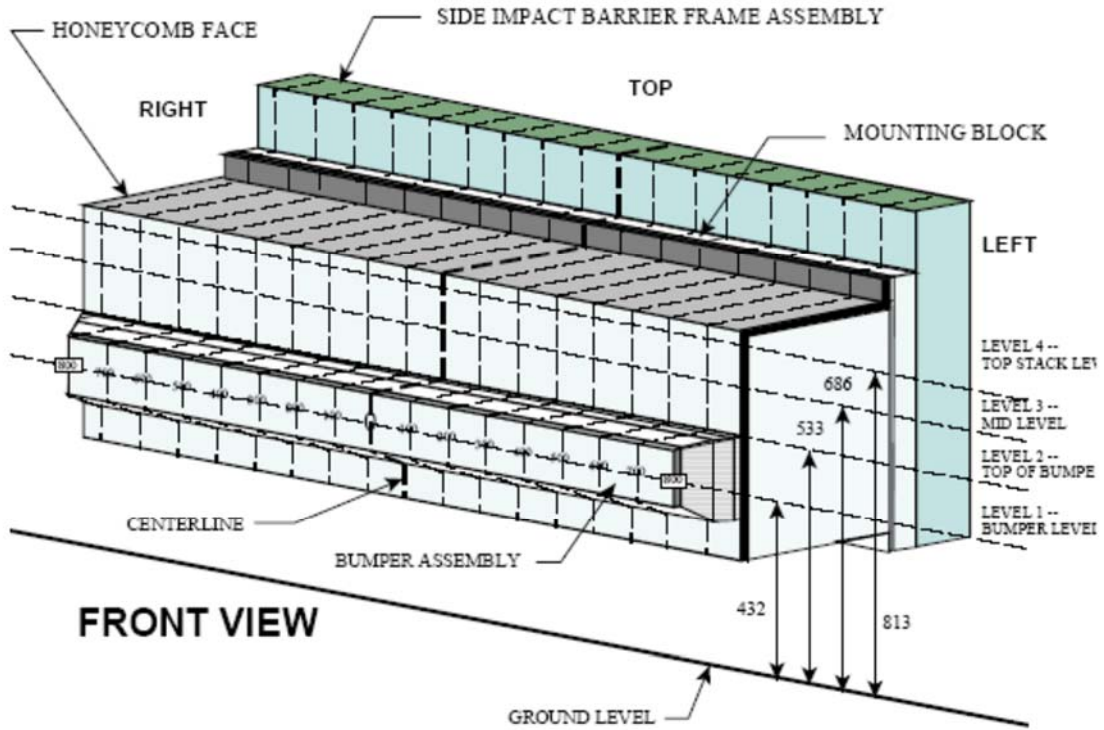
Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**DATA SHEET NO. 12**

**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



NOTE: Dimensions are shown in millimeters, mm

**DEFORMABLE BARRIER STATIC CRUSH**

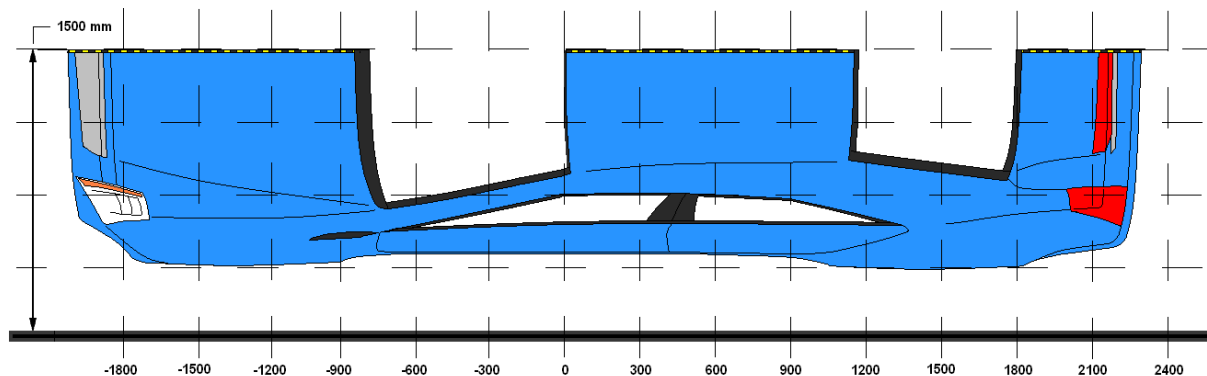
Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	229	199	194	196	199	209	196	189	183	172	169	167	162	163	164	182	222
2	137	124	121	122	124	127	114	102	72	80	77	65	59	70	89	97	128
3	57	52	51	52	119	92	97	84	37	21	14	9	12	22	39	65	100
4	47	27	32	47	72	132	127	99	57	42	19	10	2	17	52	80	122

All dimensions in millimeters.

### DATA SHEET NO. 13

#### VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan      NHTSA No. O20205501  
 Test Program: NCAP MDB Side Impact Test      Test Date: 11/13/19



#### VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2550	4	612	624	12
2	2100	4	593	630	37
3	1500	3	591	716	125
4	900	3	585	783	198
5	300	3	587	728	141
6	-150	4	628	622	-6

#### MDB DAMAGE PROFILE DISTANCES

DPD	From MDB Centerline		Level	Crush (mm)
	Distance (mm)	Direction		
1	800	Left	1	222
2	500	Left	1	163
3	200	Left	1	169
4	200	Right	1	196
5	500	Right	1	196
6	800	Right	1	229

**DATA SHEET NO. 14**

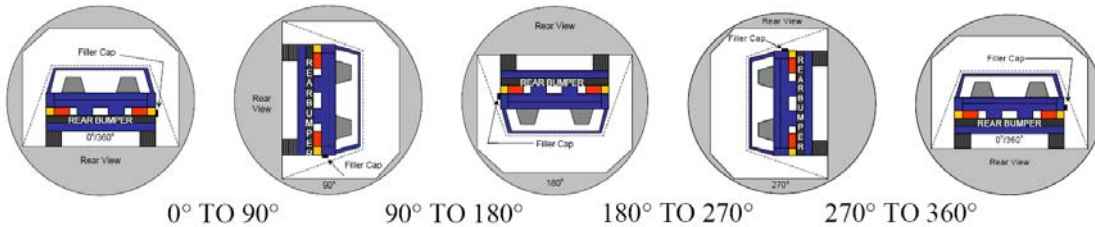
**FMVSS NO. 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501

Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19

Temperature at Time of Impact: 26.7 °C Test Time: 3:07 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°	84	300	384
90° To 180°	81	300	381
180° To 270°	81	300	381
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

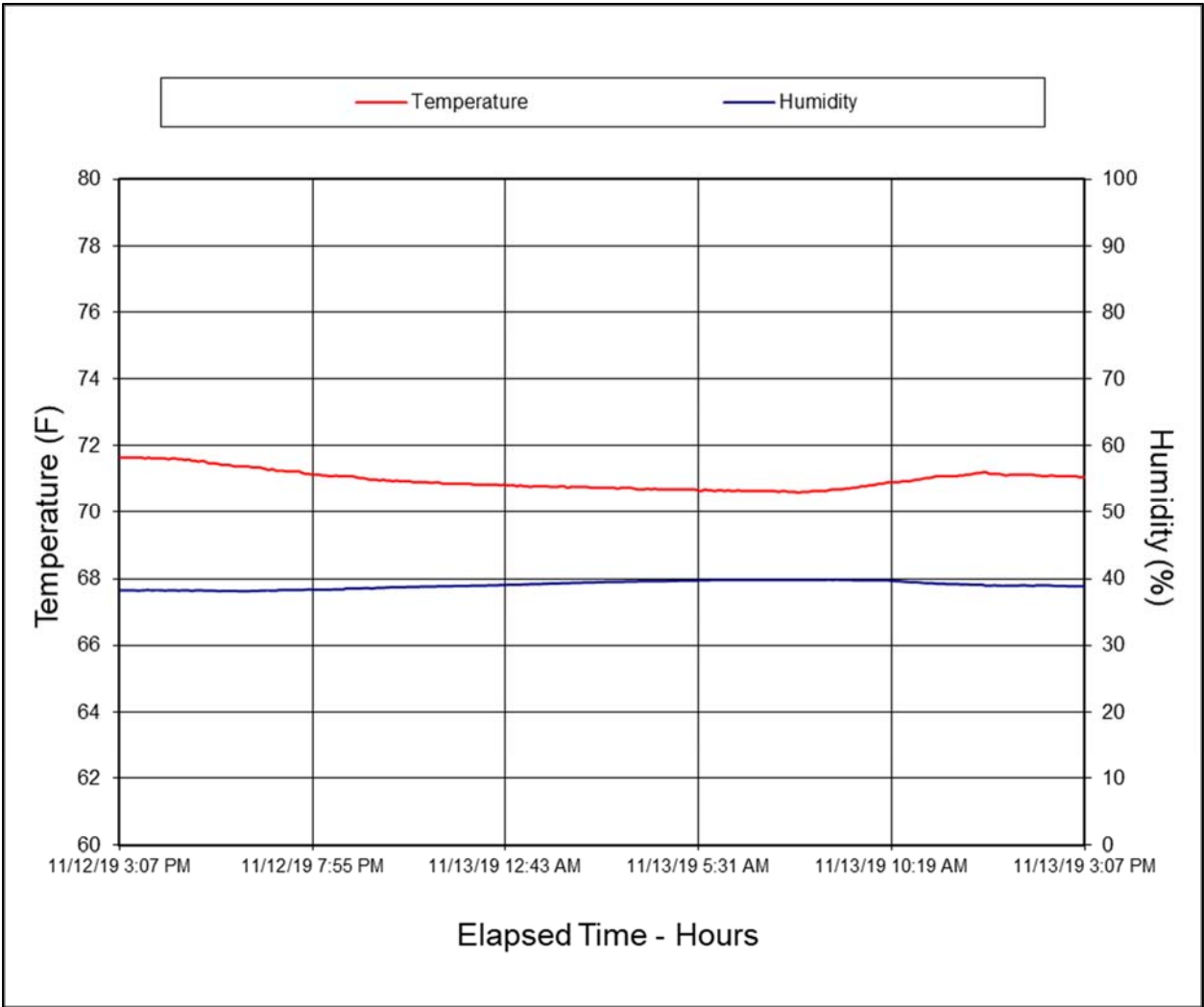


**DATA SHEET NO. 15**

**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION**

Test Vehicle: 2020 Subaru Legacy 4-Door Sedan NHTSA No. O20205501

Test Program: NCAP MDB Side Impact Test Test Date: 11/13/19



**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 ¾ View of Test Vehicle



FIGURE 10. Post-Test Left Rear ¾ 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

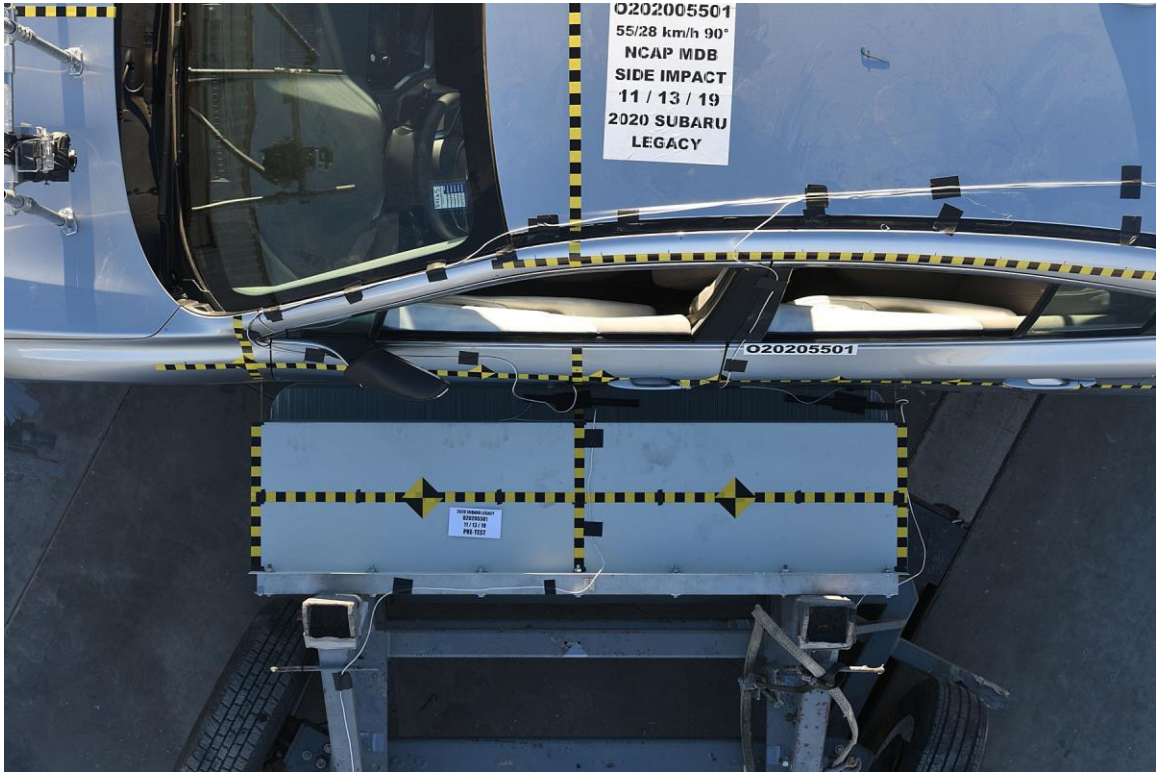


FIGURE 15. Pre-Test Overhead View of Test Area

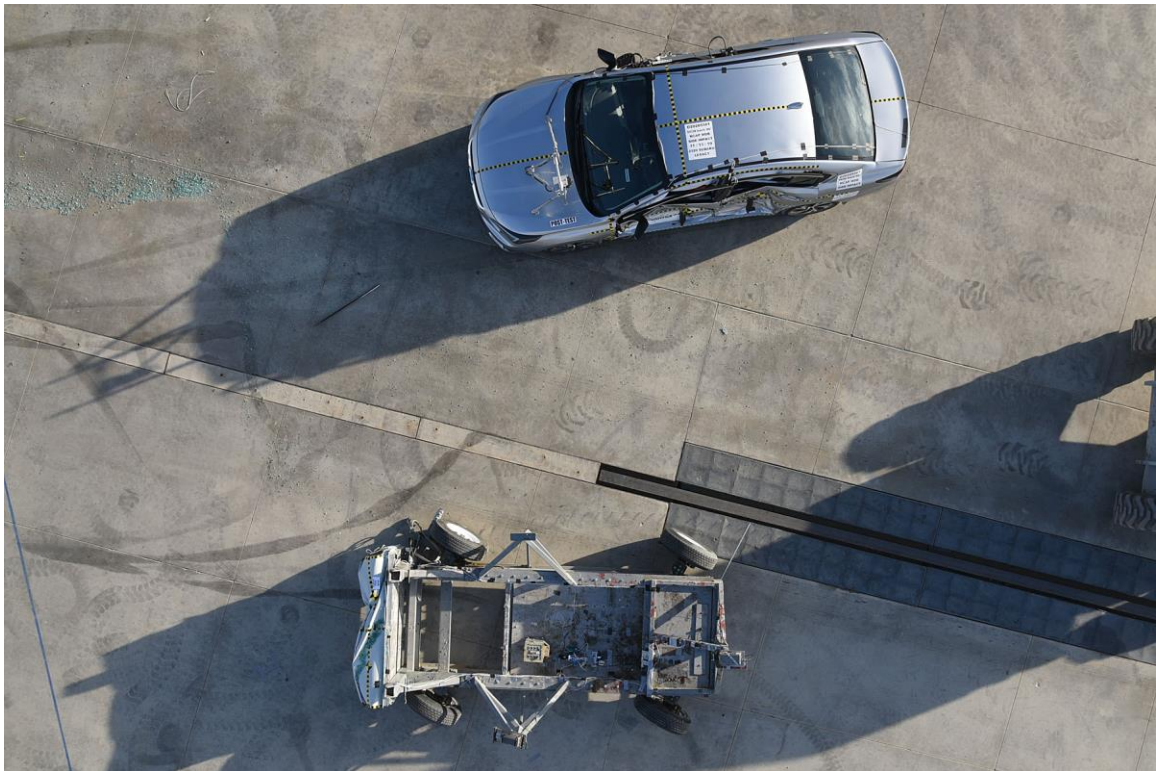


FIGURE 16. Post-Test Overhead View of Test Area



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

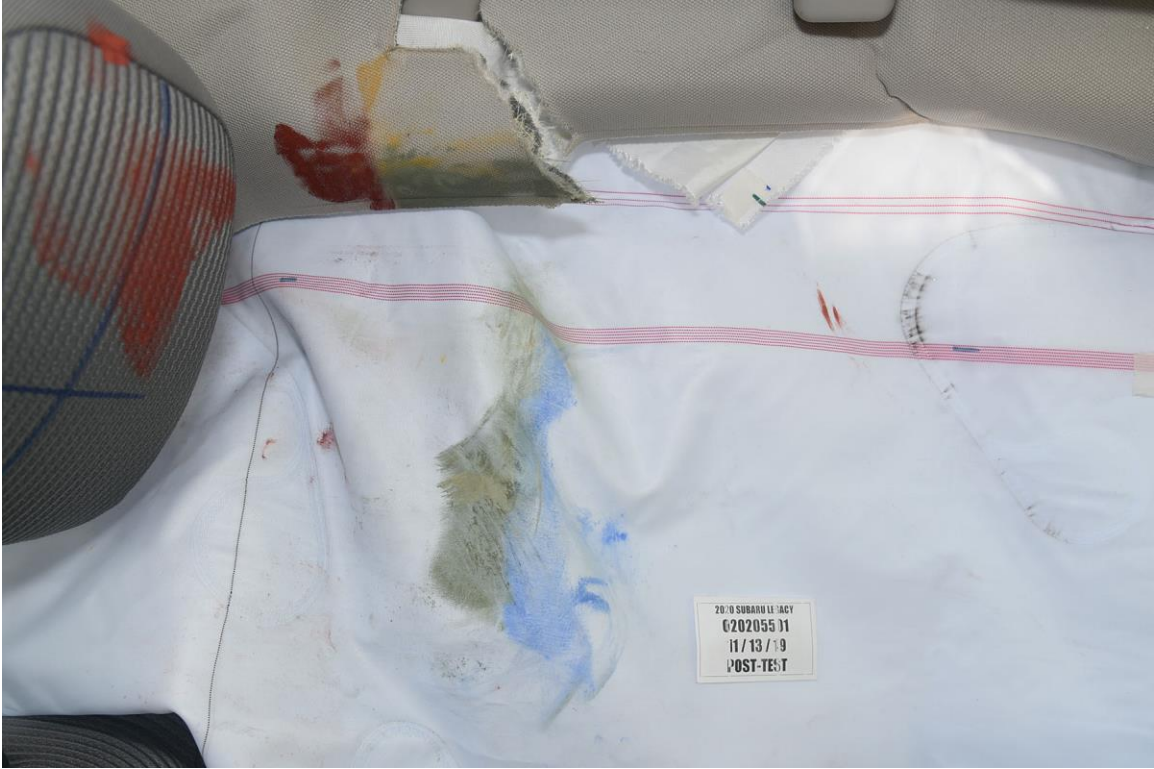


FIGURE 49. Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View



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

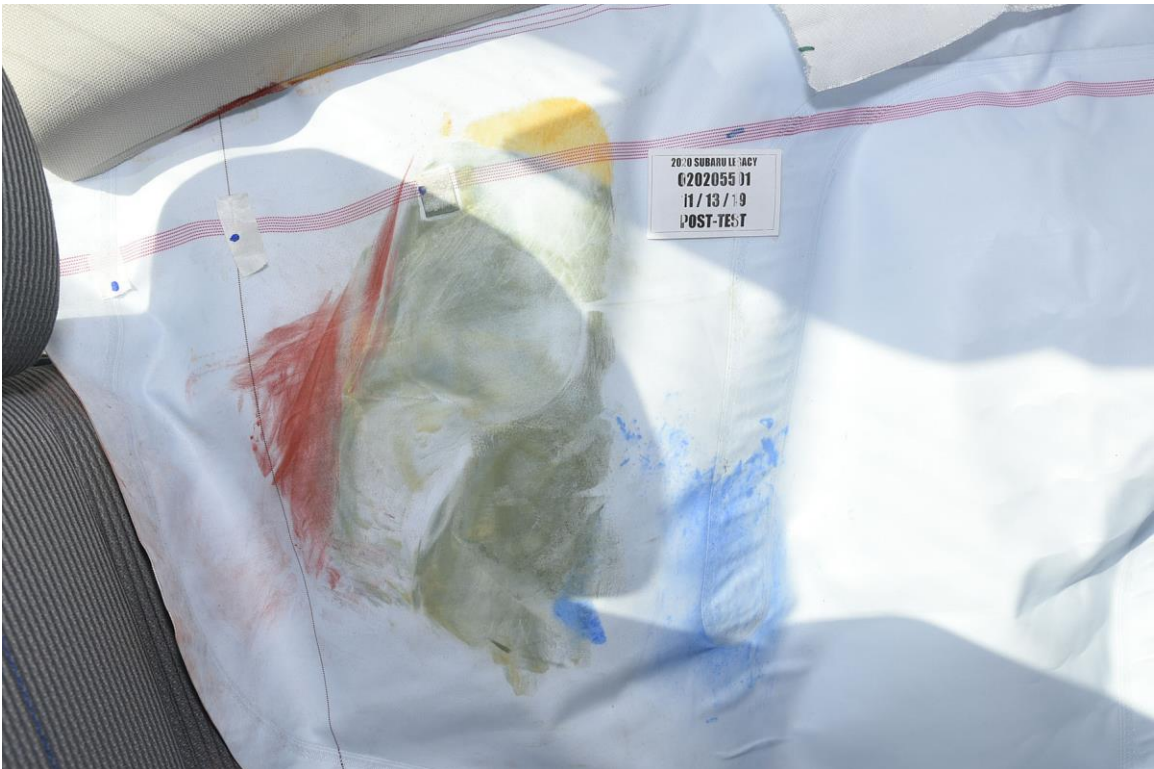


FIGURE 76. Post-Test Rear Passenger Dummy Close-Up  
Head Contact with Side Airbag View



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

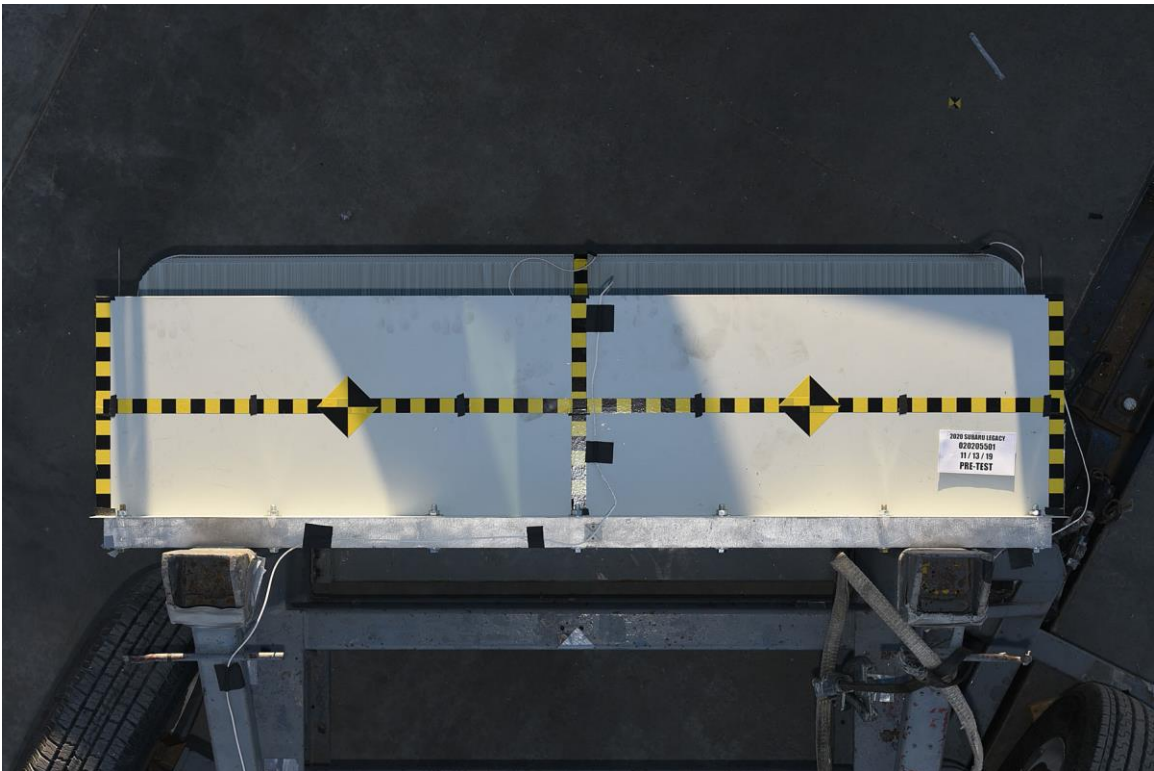


FIGURE 86. Pre-Test Top View of MDB Impactor Face





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

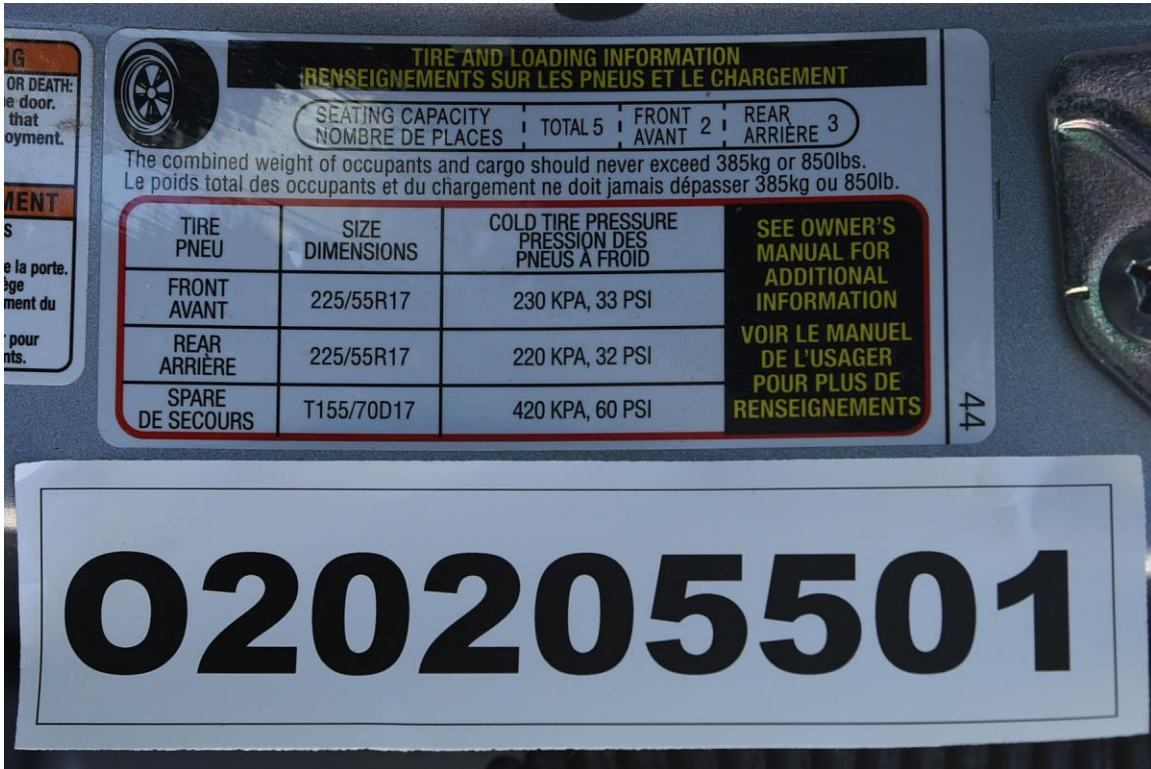


FIGURE 93. Close-Up View of Vehicle's Tire Information Placard or Label

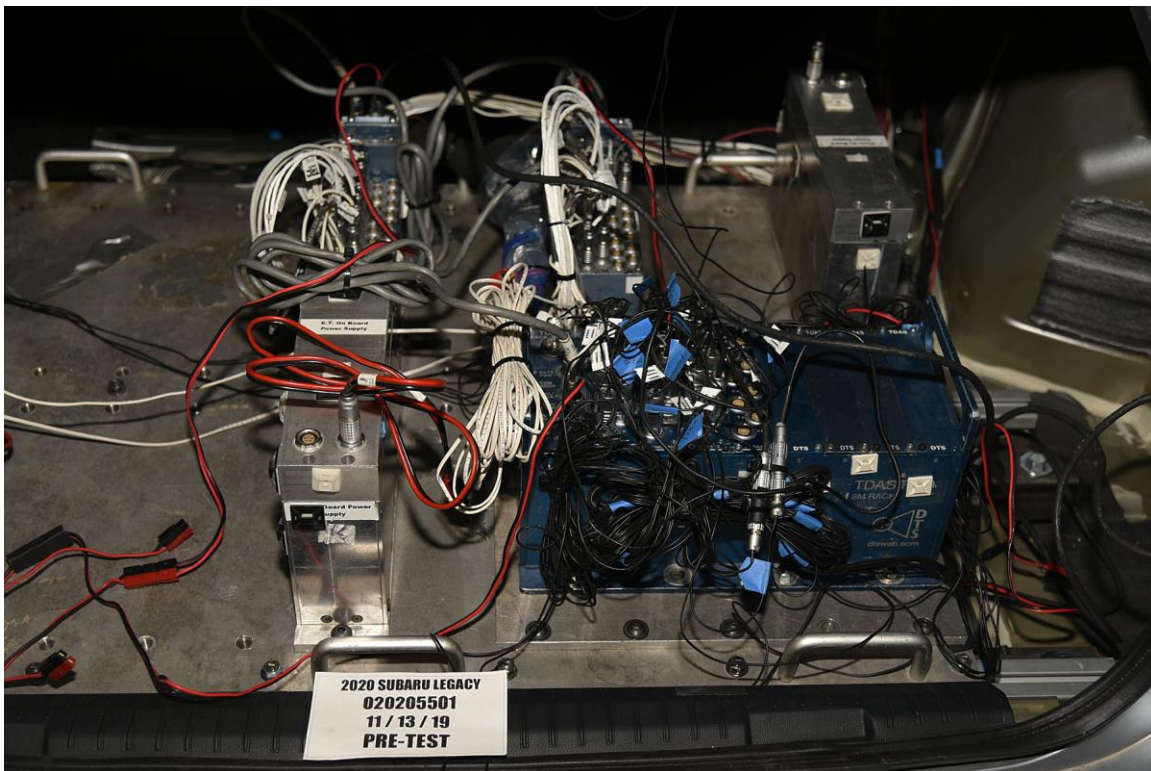


FIGURE 94. Pre-Test Ballast View



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

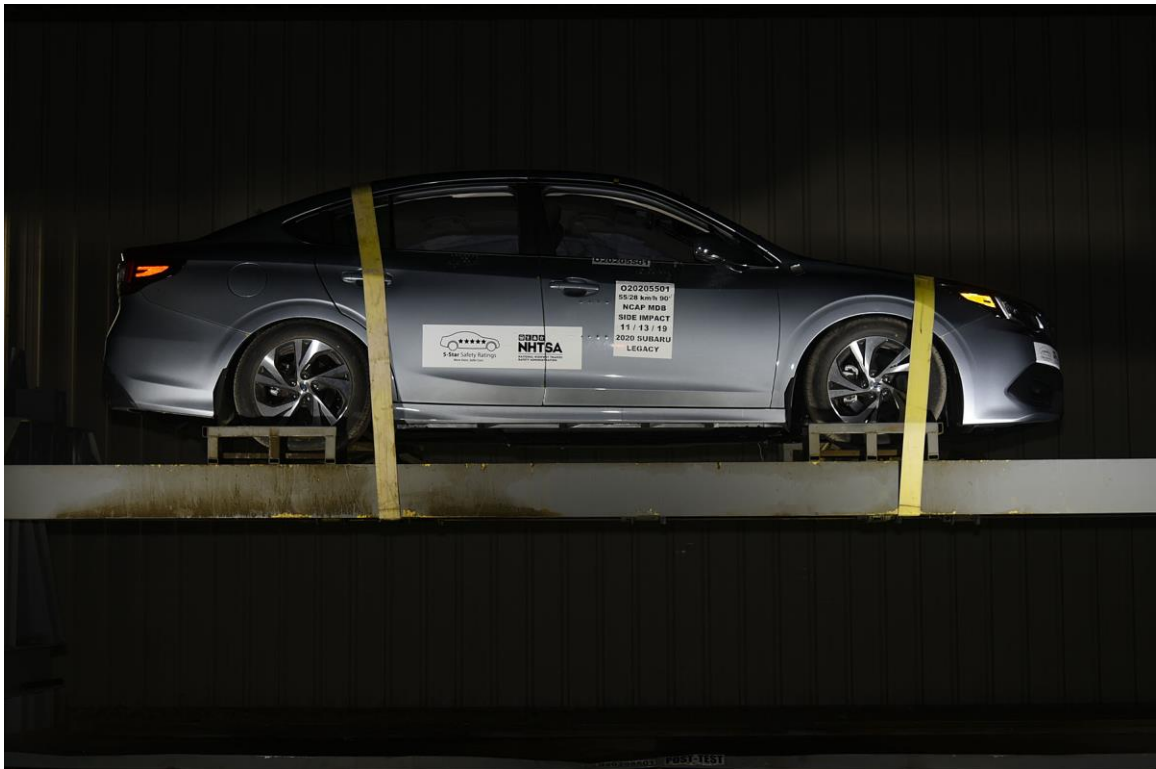


FIGURE 96. FMVSS No. 301 Static Rollover 0 Degrees

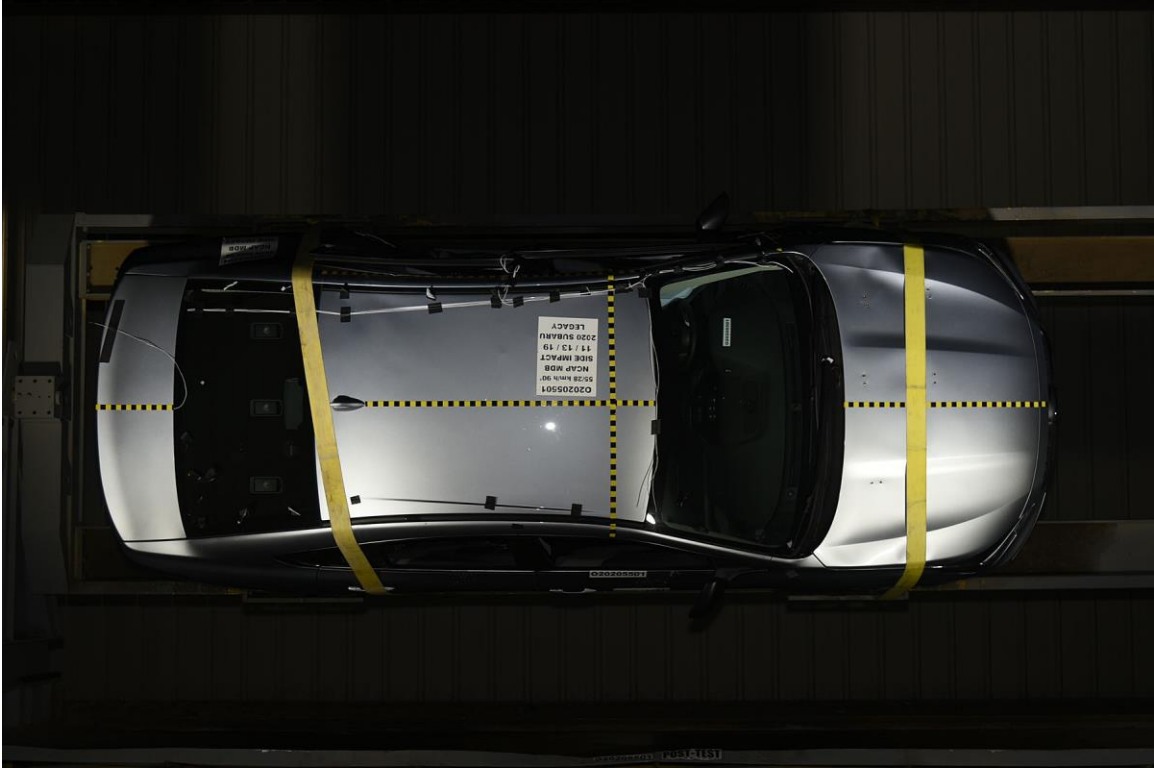


FIGURE 97. FMVSS No. 301 Static Rollover 90 Degrees

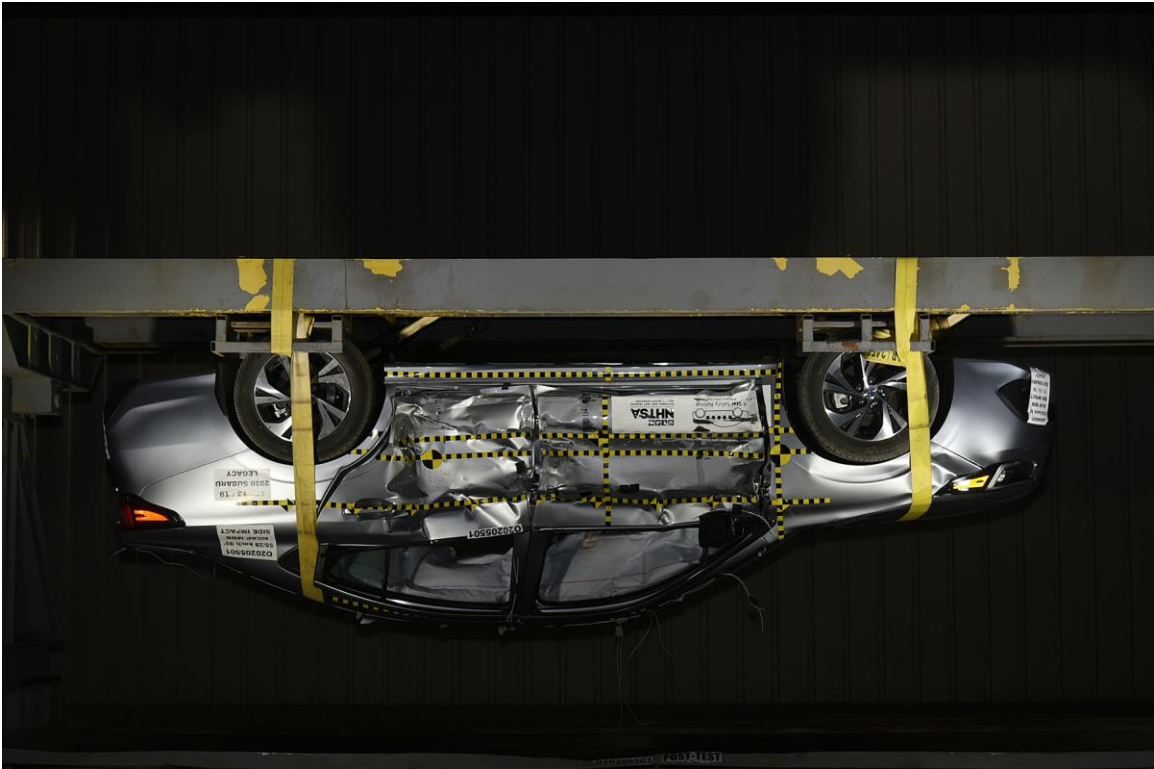


FIGURE 98. FMVSS No. 301 Static Rollover 180 Degrees

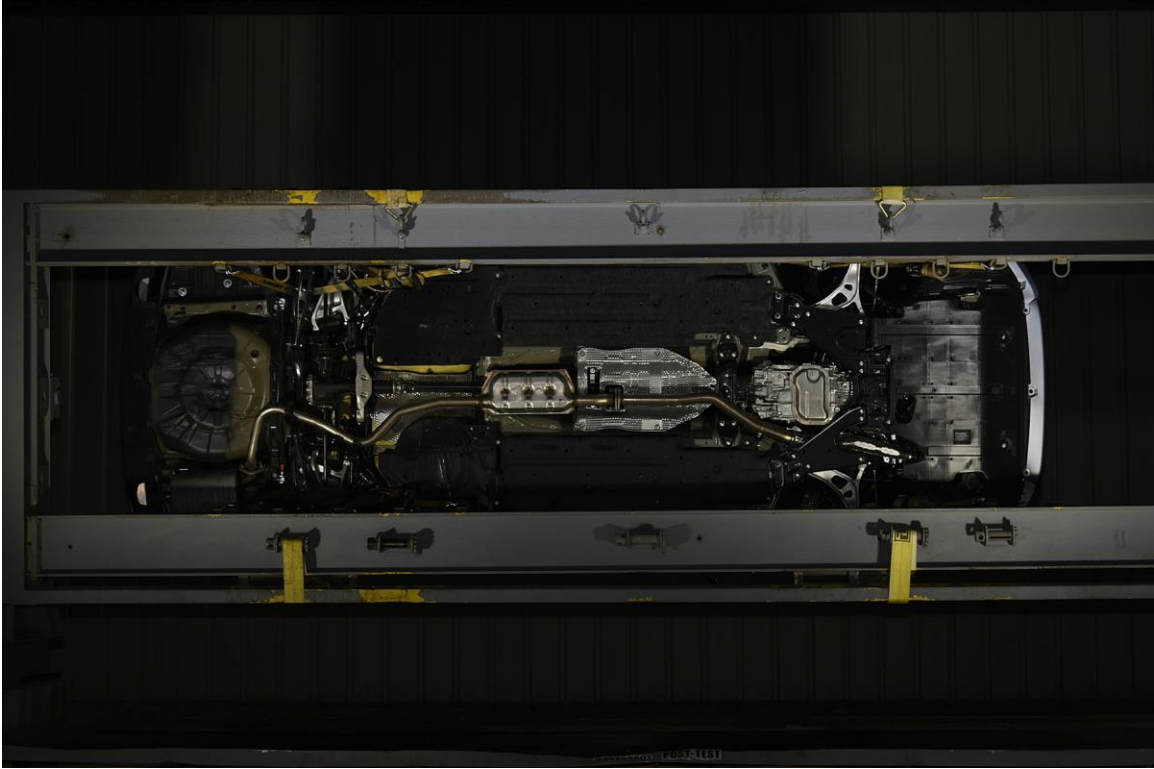


FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees

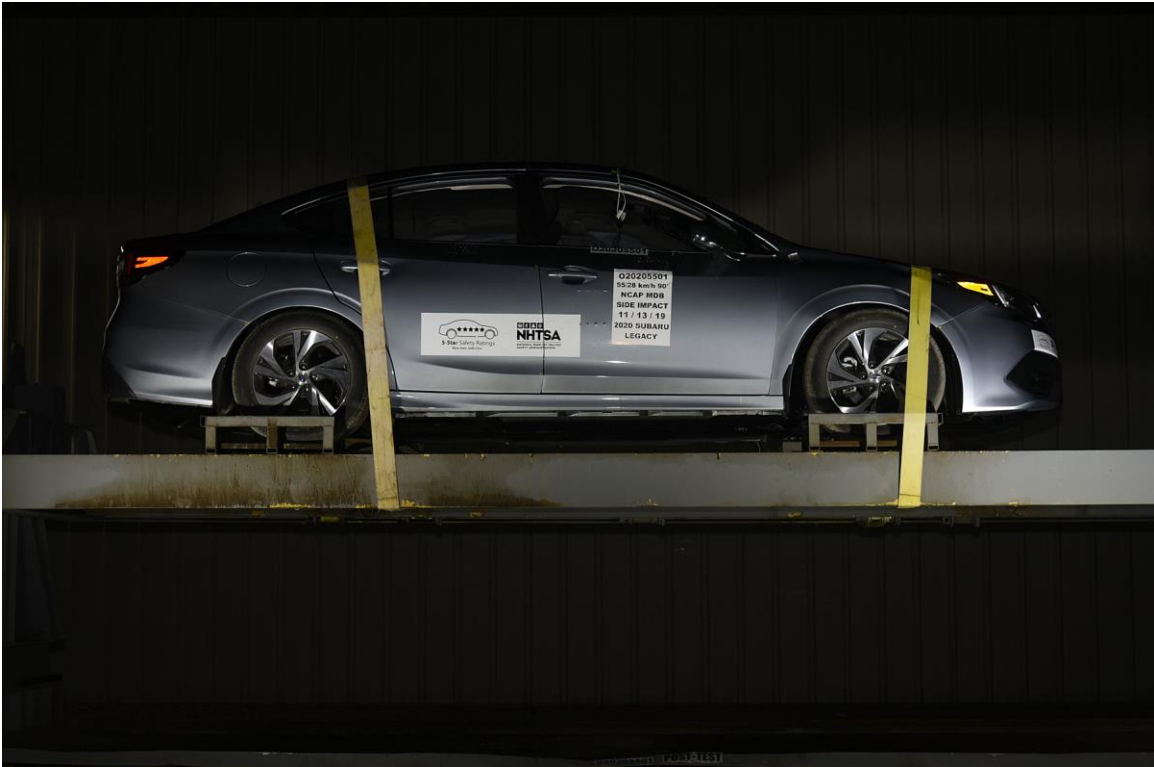


FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 101. Impact Event

**LEGACY** VIN: 4S8BWAB6XL3U02ANN  
 Model/Code: 2020 SUBARU LEGACY/LEAD  
 Delivery by Carrier: LA FAYETTE, TN  
 1TBCKR J43Z

SHIP TO: 401280  
 KNOXSHAW SUBARU  
 7900 SOUTH AVE  
 KNOXSHAW, TN 37618

SOLD TO: 401280  
 KNOXSHAW SUBARU  
 7900 SOUTH AVE  
 KNOXSHAW, TN 37618

**GOVERNMENT 5-STAR SAFETY RATINGS**

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

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.  
 Source: National Highway Traffic Safety Administration (NHTSA)  
[www.safercar.gov](http://www.safercar.gov) or 1-888-327-4235

**Fuel Economy and Environment** Gasoline Vehicle

**Fuel Economy** Large savings from 14 to 100 MPG. The best vehicle rates 130 MPG.

**30** MPG combined city/hwy  
**27** MPG city  
**35** MPG highway

**3.3** gallons per 100 miles

**You Save \$750 in fuel costs over 5 years** compared to the average rate vehicle.

**Annual fuel cost \$1,350**

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

**1** 2 3 4 5 6 7 8 9 10

This vehicle emits 296 grams CO<sub>2</sub> per mile. The best emits 160 grams per mile (city only). Prohibiting and restricting fuel use under various circumstances of vehicle operation.

**PARTS CONTENT INFORMATION**

FOR VEHICLES IN THIS COUNTRY: U.S./CANADIAN PARTS CONTENT: 50% MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN: 40%

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: Lafayette, IN COUNTRY OF ORIGIN: ENGINE: JAPAN TRANSMISSION: JAPAN

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

**STANDARD EQUIPMENT**

Symmetrical All-Wheel Drive w/ Vehicle Dynamics Control  
 EyeSight Driver-Assist System w/ Automatic Emergency Braking  
 Lane Departure and Sway Warning  
 Advanced Adaptive Cruise Control w/ Lane Centering  
 Rear Vision Camera w/ Adaptive Guidelines  
 Anti-Lock Brakes (ABS)  
 4-Wheel Disc Brakes with Brake Assist  
 Subaru Advanced Front Airbag System  
 Driver, Knee Airbag, Passenger Seat Cushion Airbags  
 Side Curtain Airbags with Roll-over Sensor and Seat Side Airbags  
 3-Point Seatbelts, Front/Rear Load Limiters & Pretensioners  
 LATCH System for Child Safety Seats  
 Air: Theft Alarm & Immobilizer System  
 Brake, Overdrive System  
 Electronic Brake-Force Distribution  
 Whiplash Protection Front Seats

**PERFORMANCE AND EXTERIOR**

2.5L Direct Injection 4-Cylinder DOHC 16-Valve Boxer Engine  
 Lineartronic CVT with 6-Speed Manual Mode  
 Auto Start - Stop  
 Active Torque Vectoring with Quick Ratio Steering  
 Front MacPherson Strut Suspension  
 Rear Double-Wishbone Suspension  
 Electric Power-Assisted Steering  
 LED Headlights w/ High Beam Assist and Welcome Lighting  
**COMFORT, CONVENIENCE & INTERIOR**  
 STARLINK Dual 7.0" Multimedia System  
 Bluetooth Hands-Free Phone Connectivity  
 Apple CarPlay and Android Auto  
 SiriusXM Radio, Sports and Weather - 4 Month Free  
 USB Port with iPod & iPhone Connectivity  
 Automatic Climate Control w/ Air Filtration System  
 Retained Accessory Power for Audio System & Power Windows  
 Auto-Up/Down Front Power Windows  
 Remote Keyless Entry, Power Locks & Power Mirrors  
 60/40 Split Fold-Down Rear Seatback  
 Tilt/Telescopic Steering Wheel with Cruise Control  
 Variable Intermittent Windshield Wipers  
 Height Adjustable Driver's Seat  
 Gaspedal Rear Mats & Cargo Area Mat  
 Automatic Power Door Locks

**LIMITED WARRANTY/ROADSIDE ASSISTANCE**

3 Years / 36,000 Miles Basic  
 5 Years / 100,000 Miles Powertrain  
 5 Year/Unlimited Mileage Rust Perforation  
 3 Yrs / 36,000 24/7 Roadside Assistance  
 See Owner's Info Kit Warranty For Details

**OPTIONAL EQUIPMENT AND OTHER ITEMS**

Manufacturer's Suggested Retail Price	\$22,746.00
Exterior Color: Ice Silver Metallic	
Full Tank of Gas	INCLD
<b>Option Package: 02</b>	
ALLOY WHEEL PACKAGE SUGGESTED VALUE	\$1,000.00
17-Inch Alloy Wheels: Black w/ Machine Finish	
ALLOY WHEEL PACKAGE DISCOUNT	-\$650.00
ALLOY WHEEL PACKAGE PRICE	\$350.00
Ext Int HL Auto Dim Mirrors	\$607.00
Ext Auto Dim Mirror	
Mirror Compass w/ homelink	
Splash Guards	\$172.00
All-Weather Floor Liners	\$132.00
Rear Door Bump Protector	\$164.00
Cargo Tray	\$101.00

**Destination and Delivery** \$900.00  
**Total Suggested Retail Price** \$25,111.00


FIGURE 102. Monroney Label



36 Front Seats

Utilizing of the seat position registered with access key fob

1. Hold the registered access key fob.



2. Unlock the driver's door by pressing the button or gripping the door handle.
3. Open the driver's door.

A chirp sounds and the seat moves to the registered position. When the select lever is moved to the "R" position, the outside mirror will move to the registered reverse tilt-down position.

**NOTE**

- If the registered seat position cannot be retrieved after performing the previous procedures, try the following procedures.
  - (1) Press the "SET" button on the driver's door.
  - (2) Press the "A" button on the access key fob or touch the door lock sensor to lock the doors.
  - (3) Perform the prior procedures again.
- If the keyless access function is disabled, the seat position cannot be retrieved by gripping the driver's door handle. However, the seat position can still be retrieved by pressing the "A" button on the access key fob. For information about how to enable/disable the keyless access function, refer to "Disabling Keyless Access Function" (P125).
- If a new position is registered for the same access key fob, the previously registered seat position is deleted.

Clearing the registered seat position with access key fob

1. Close the driver's door.
2. While holding the access key fob and pressing the "SET" button, press the button on the access key fob.

A chirp will sound, and the registered seat position will be cleared.

**Head Restraint Adjustment**

**WARNING**

- Never drive the vehicle with the head restraints removed because they are designed to reduce the risk of serious neck injury in the event that the vehicle is struck from the rear. Also, never install the head restraints the opposite way round. Doing so will prevent the head restraints from functioning as intended. Therefore, when you remove the head restraints, you must reinstall all head restraints correctly to protect vehicle occupants.
- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- The front seat head restraints are designed to be installed into the front seats only. The rear seat head restraints are designed to be installed into the rear seats.



37 Front Seats

Do not attempt to install the front seat head restraints into the rear seats, or the rear seat head restraints into the front seats.

Both the driver's seat and front passenger's seat are equipped with head restraints. Both head restraints are adjustable in the following ways:

**Head restraint height adjustment**

1. Head restraint
2. Release button


**To raise:**  
Pull the head restraint up.

**To lower:**  
Push the head restraint down while pressing the release button on the top of the seatback.

**To remove:**  
While pressing the release button, pull out the head restraint.

**To install:**  
Install the head restraint into the holes that are located on the top of the seatback until the head restraint locks. Press and hold the release button to lower the head restraint.

**Head restraint angle adjustment**



The angle of the head restraint can be adjusted in several steps. While maintaining a suitable driving posture, adjust the head restraint to a position where the back of your head is as close to the head restraint as possible.

**To tilt:**  
Tilt the head restraint by hand to the preferred position. A click will be audible when the head restraint is locked.

**To return:**  
Tilt the head restraint once as far forward as it can go. The head restraint will automatically return to the fully upright position. Then, adjust the head restraint again to the preferred angle.

**NOTE**  
It is not possible to remove or install the head restraint without reclining the front seatback. Reclining the front seatback and then remove or install the head restraint.

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

44 Rear Seats

fold down in the event of sudden braking, or objects may move out from the cargo area, which could cause serious injury or death.

**Head Restraint Adjustment**  
Both the rear window side seats and the rear center seat are equipped with head restraints.

**WARNING**

- Never drive the vehicle with the head restraints removed because they are designed to reduce the risk of serious neck injury in the event that the vehicle is struck from the rear. Therefore, when you remove the head restraints, you must reinstall all head restraints to protect vehicle occupants.
- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- The front seat head restraints are designed to be installed into the front seats only. The rear seat head restraints are designed to be installed into the rear seats, or the rear seat head restraints into the front seats.

**Rear window side seating position**

1. Head restraint
2. Release button

**To raise:**  
Pull the head restraint up.

**To lower:**  
Push the head restraint down while pressing the release button on the top of the seatback.

**NOTE**  
For Legacy, it is not possible to remove or install the head restraint without folding down the rear seatback. Fold down the rear seatback and then re-



45 Rear Seats

move or install the head restraint.

**Rear center seating position**

**CAUTION**

The head restraint is not intended to be used in the retracted position. Before sitting on the seat, raise the head restraint to the extended position.

1. Head restraint
2. Release button

**To raise:**  
Pull the head restraint up.


**To lower:**  
Push the head restraint down while pressing the release button on the top of the seatback.

**To remove:**  
While pressing the release button, pull out the head restraint.

**To install:**  
Install the head restraint into the holes that are located on the top of the seatback until the head restraint locks.

When the rear center seating position is occupied, raise the head restraint to the extended position. When the rear center seating position is not occupied, lower the head restraint to improve rearward visibility.

**Armrest**



**WARNING**

To avoid serious injury and vehicle damage, passengers must never be allowed to sit on the center armrest.

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

**APPENDIX B**  
**DUMMY RESPONSE DATA**

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

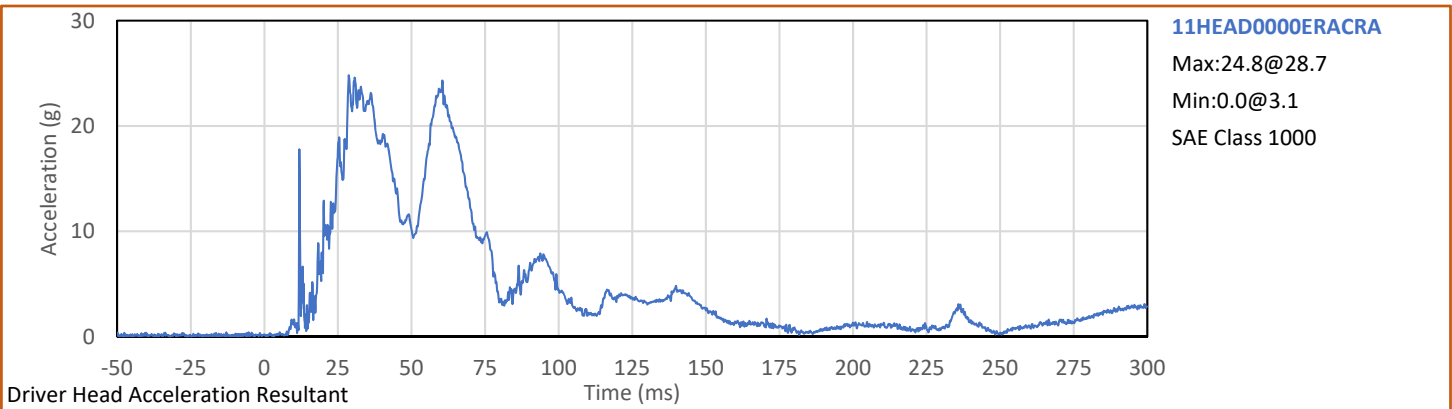
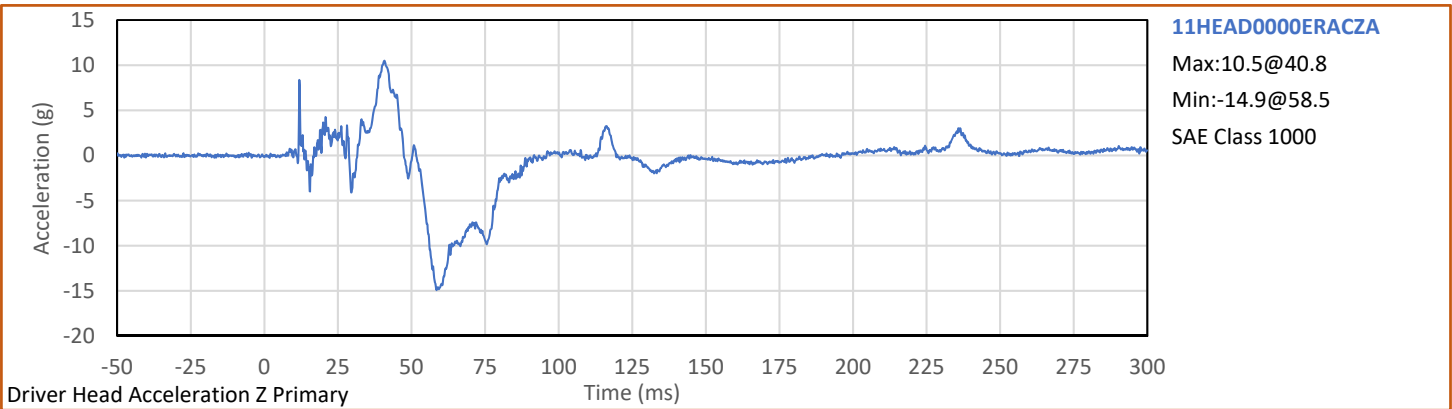
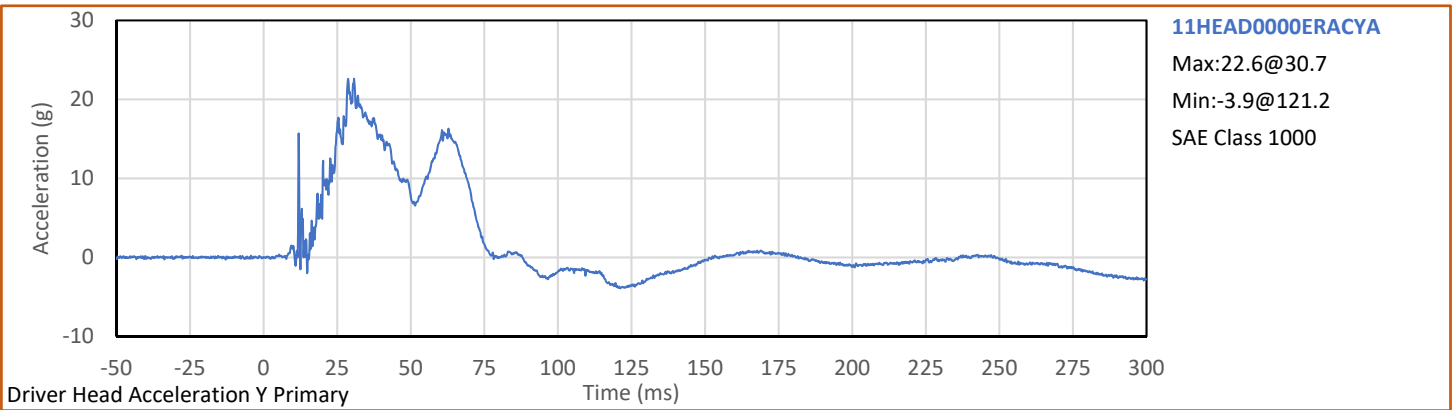
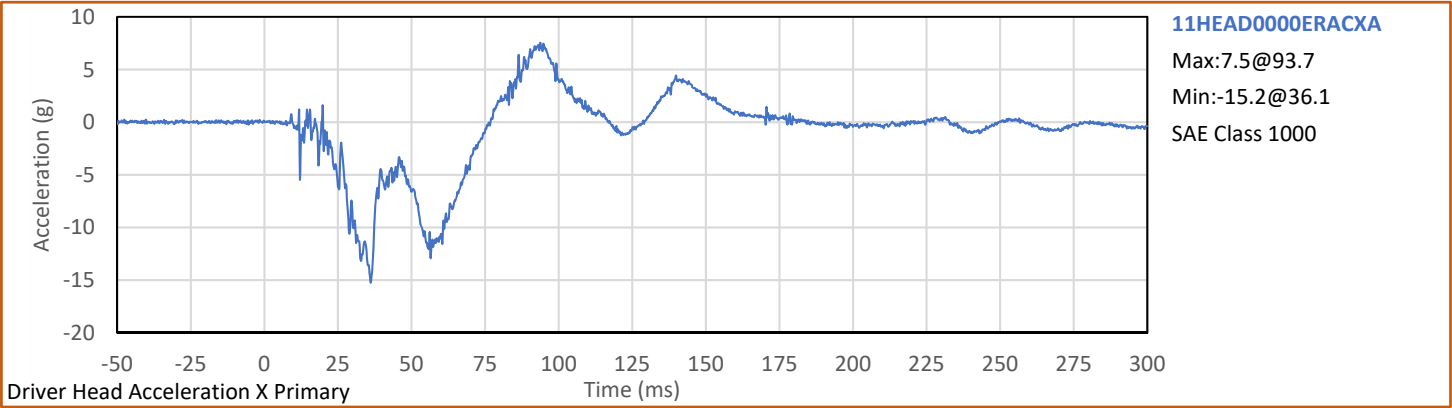
MDB Center of Gravity Acceleration (Z)

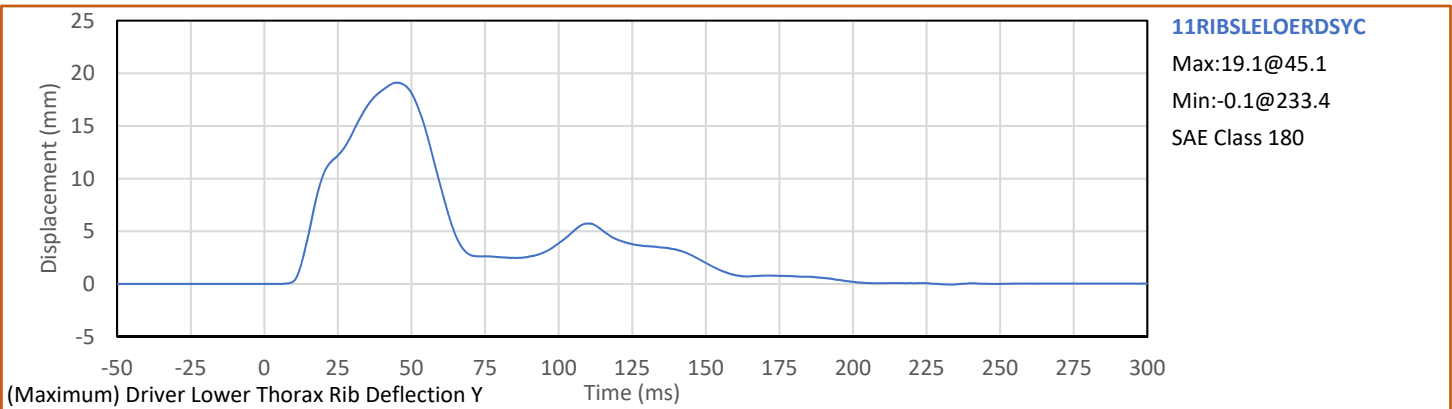
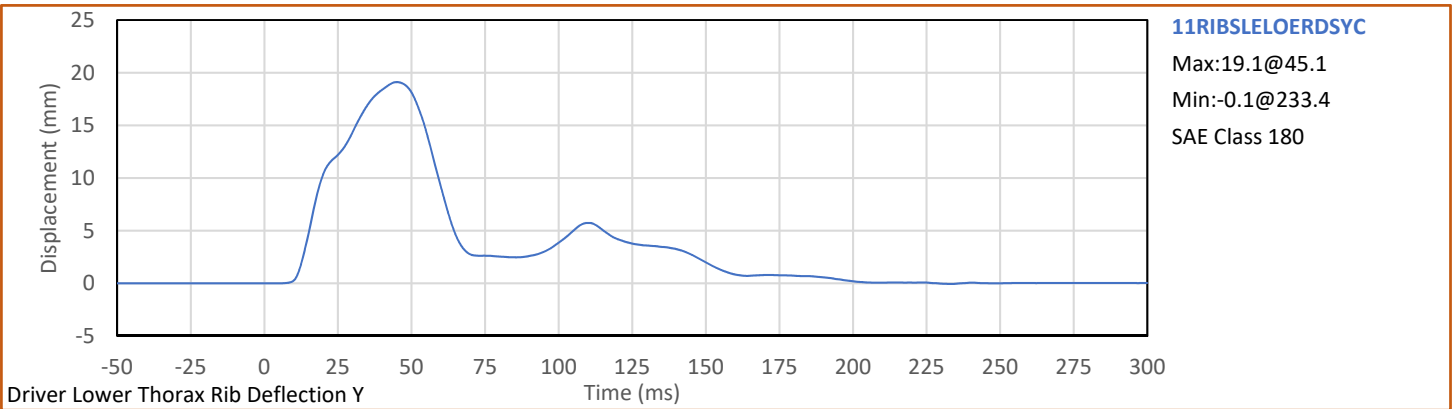
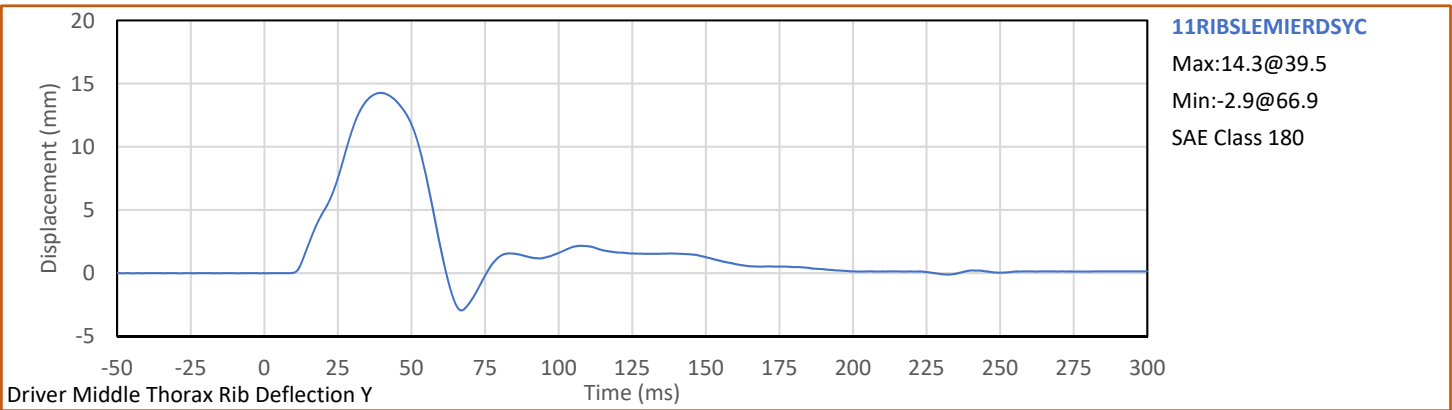
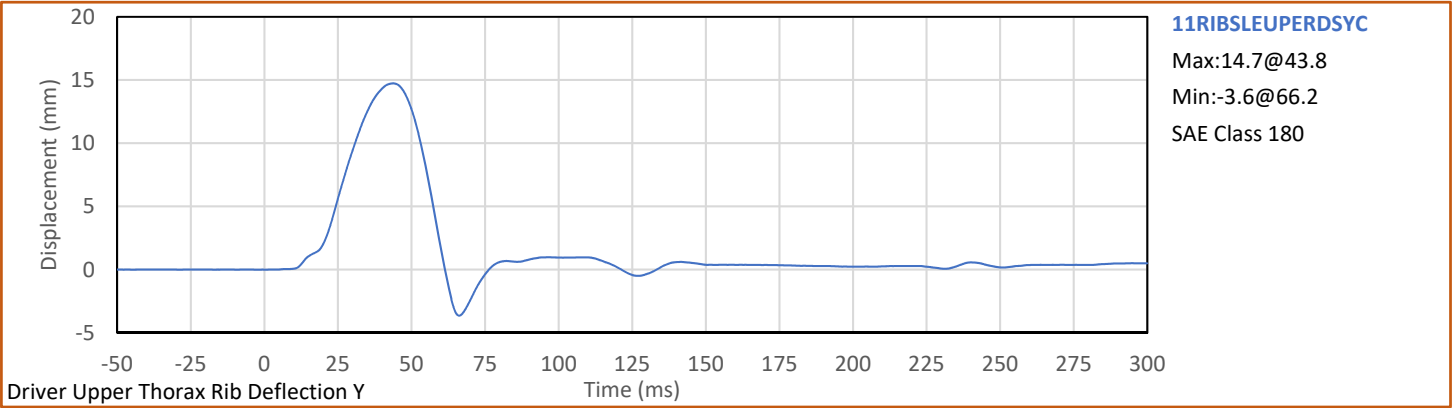
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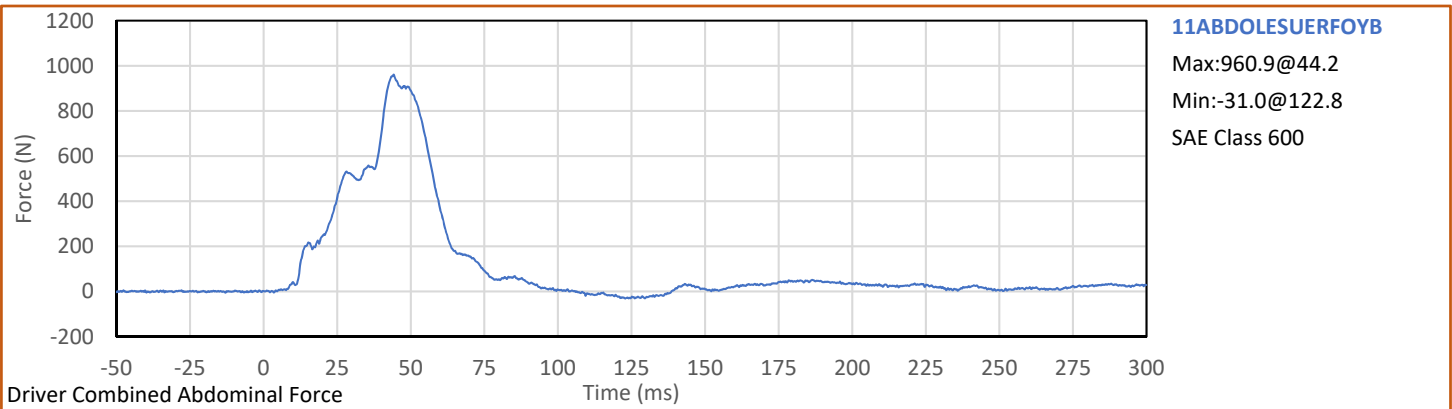
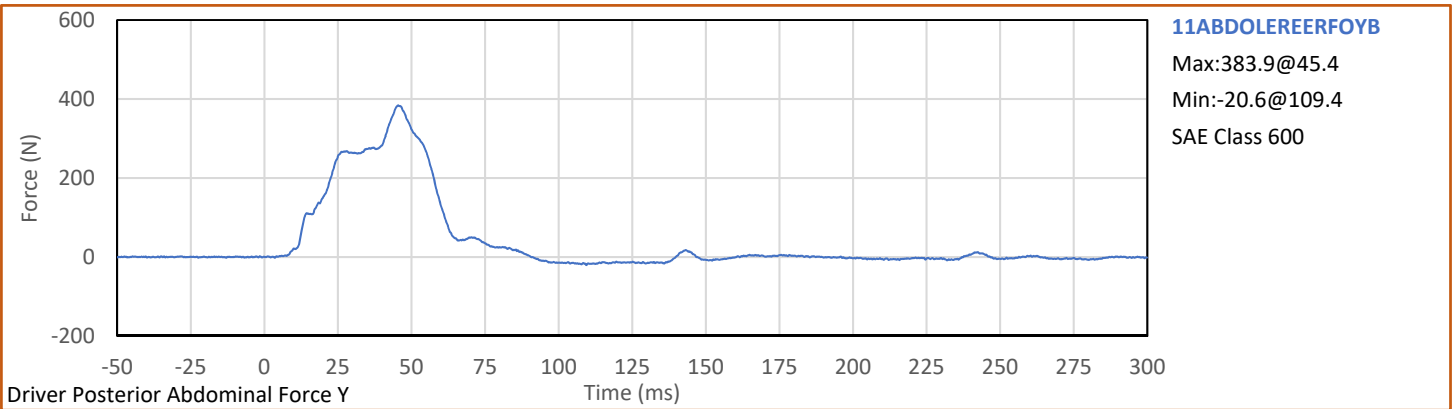
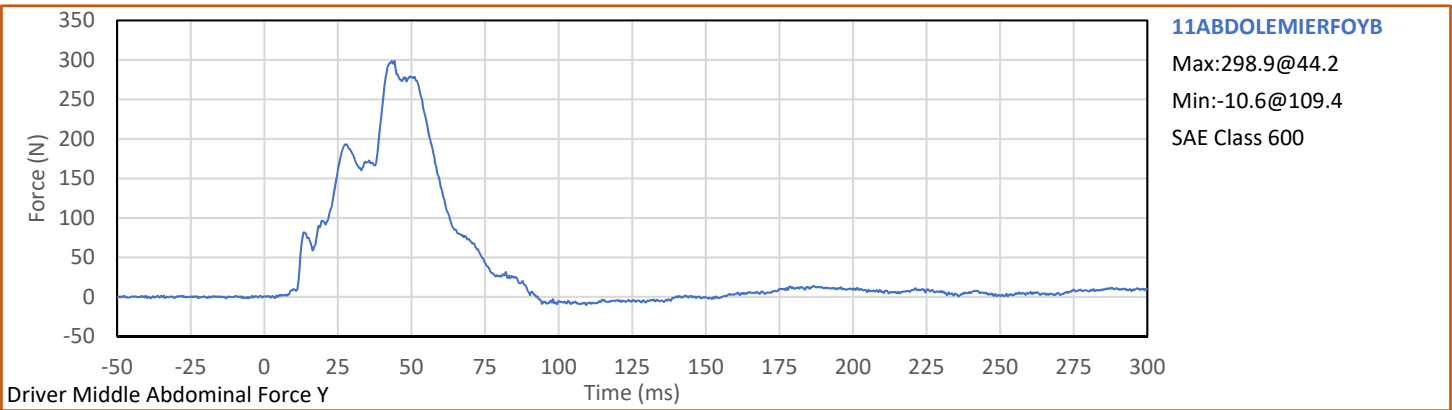
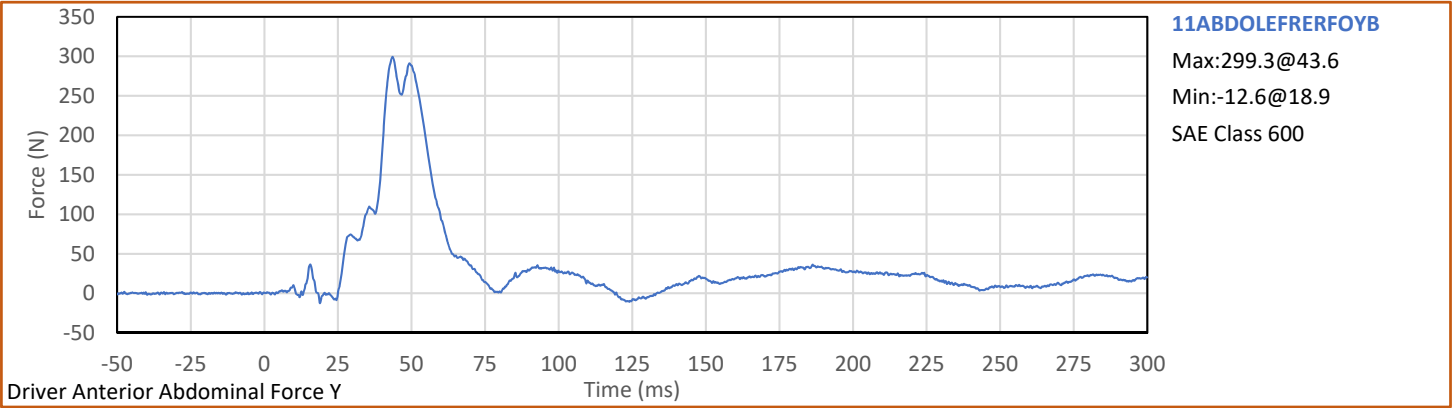
MDB Rear Acceleration (Y)

Left MDB Contact Switch

Right MDB Contact Switch



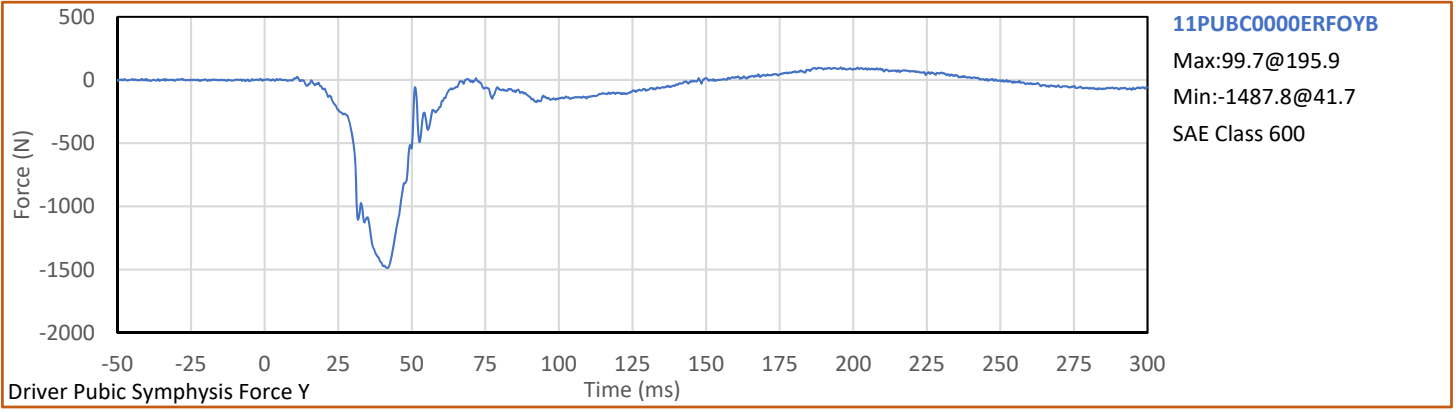


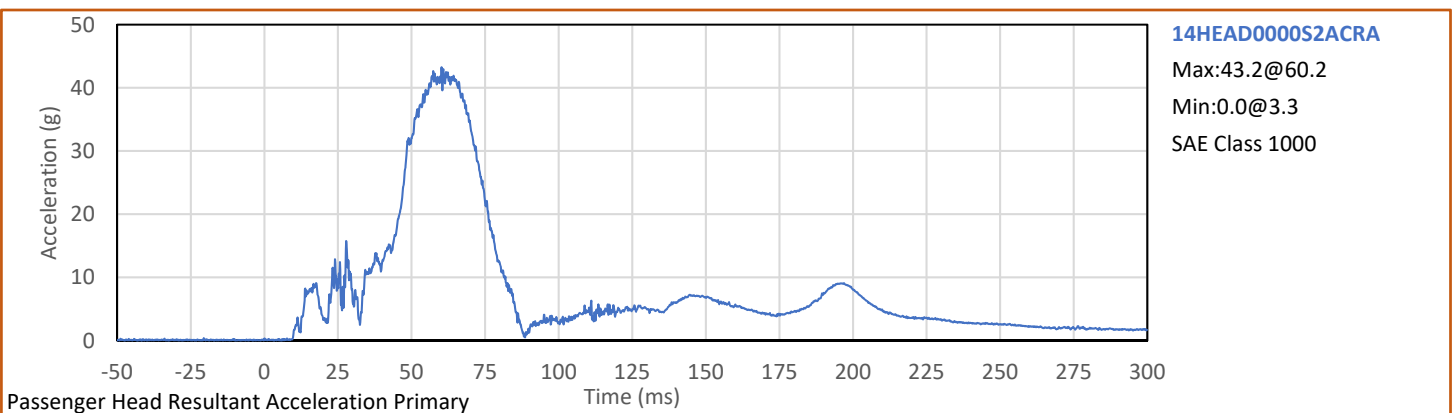
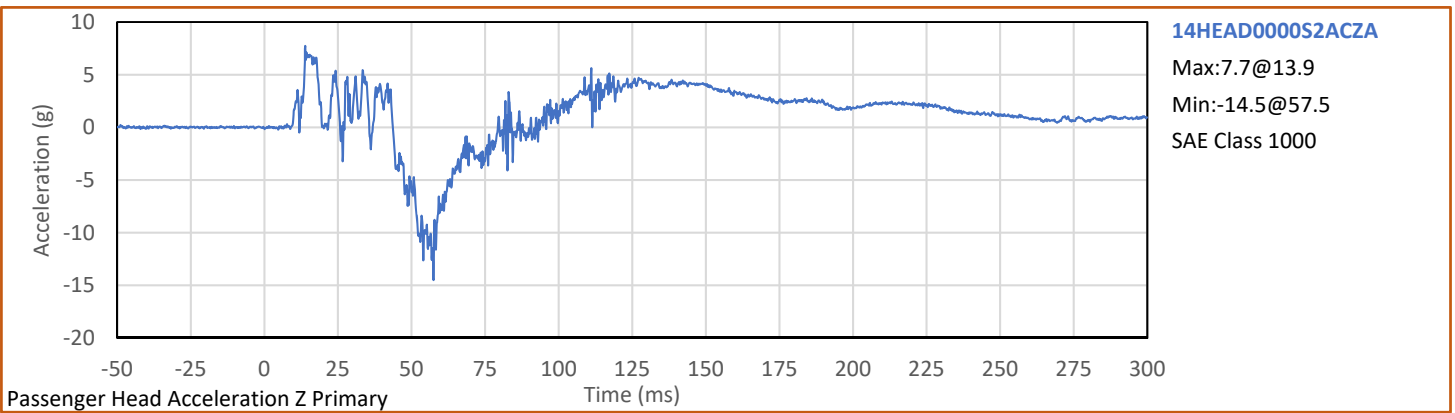
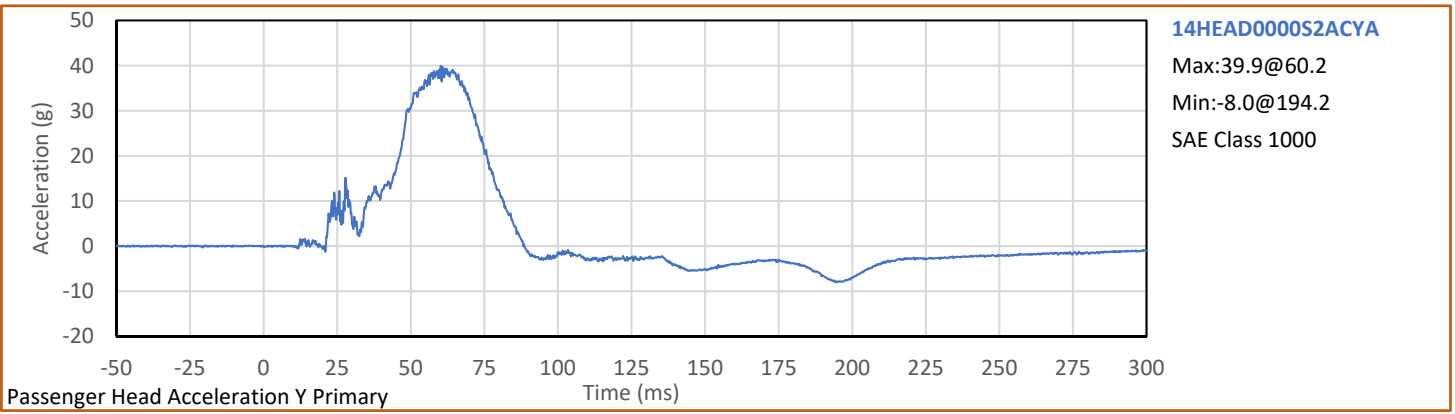
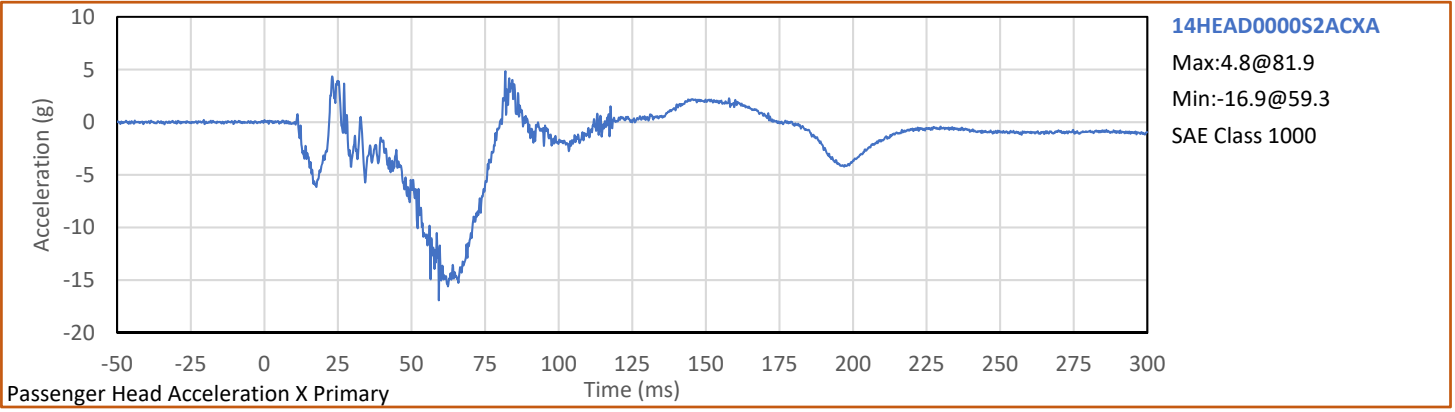


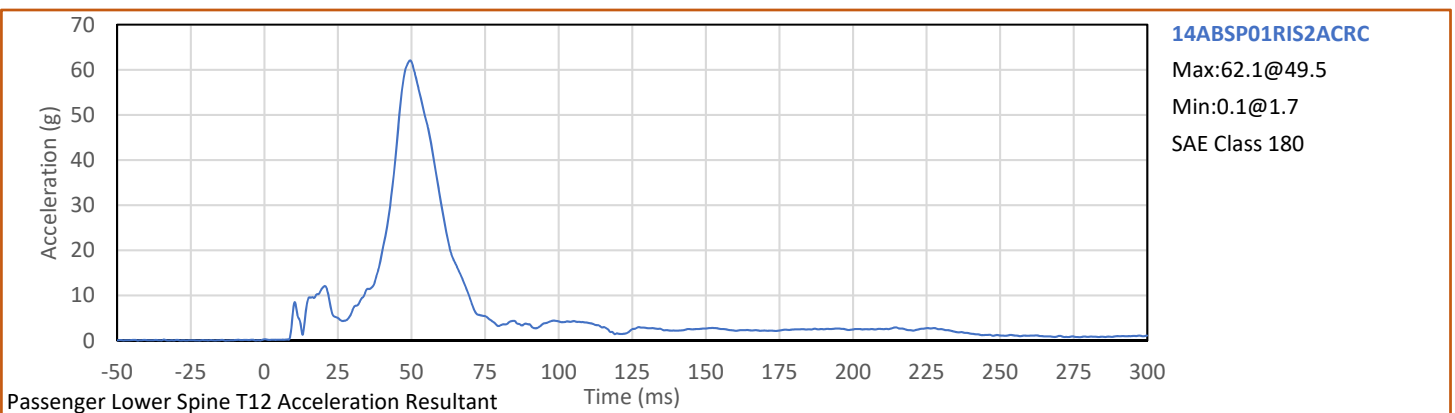
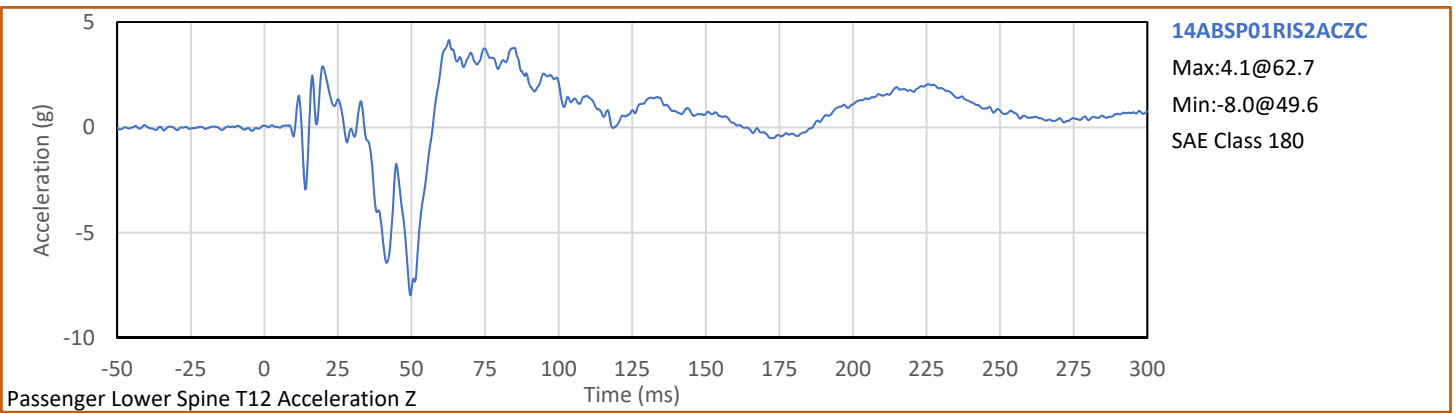
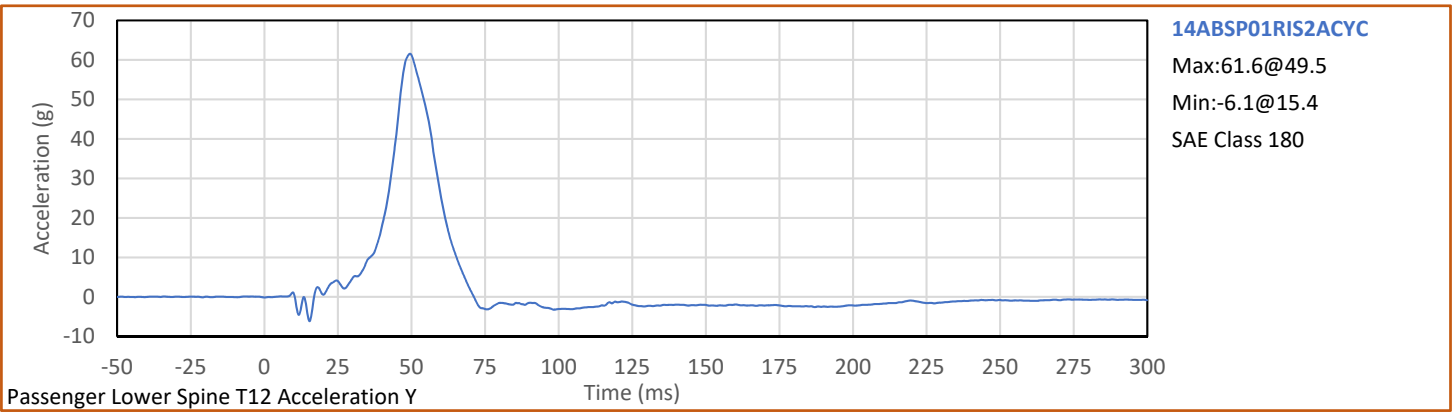
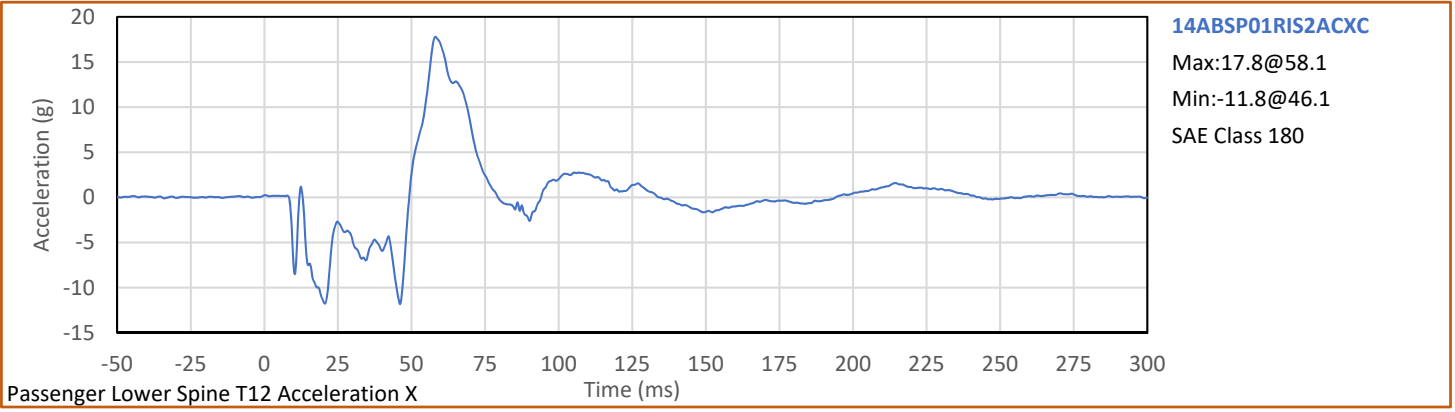


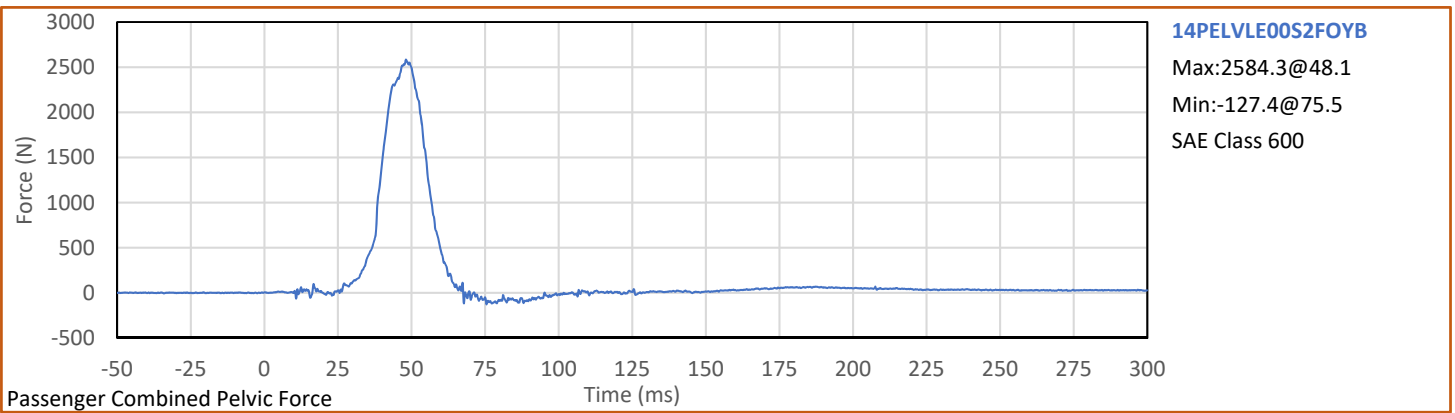
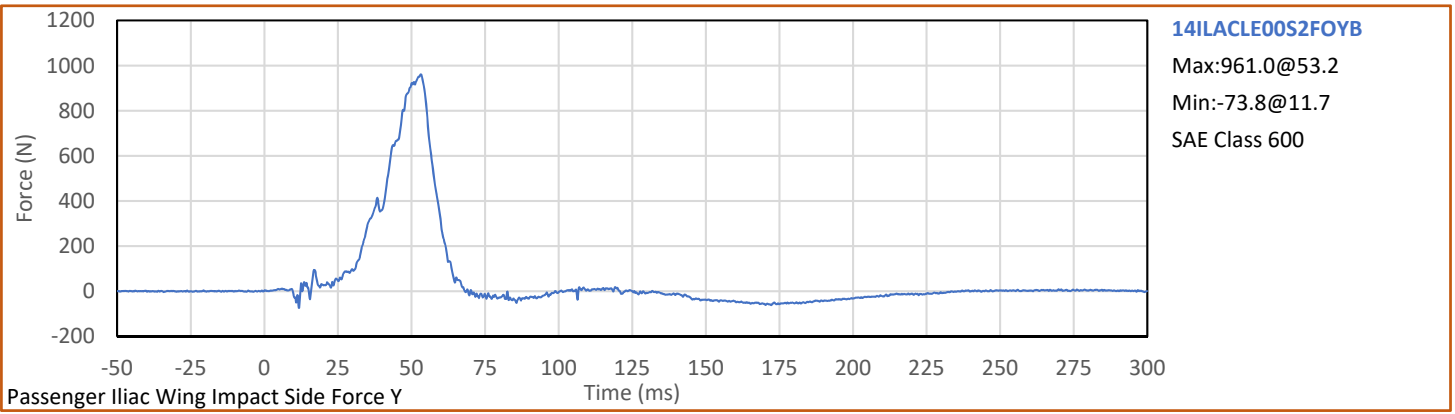
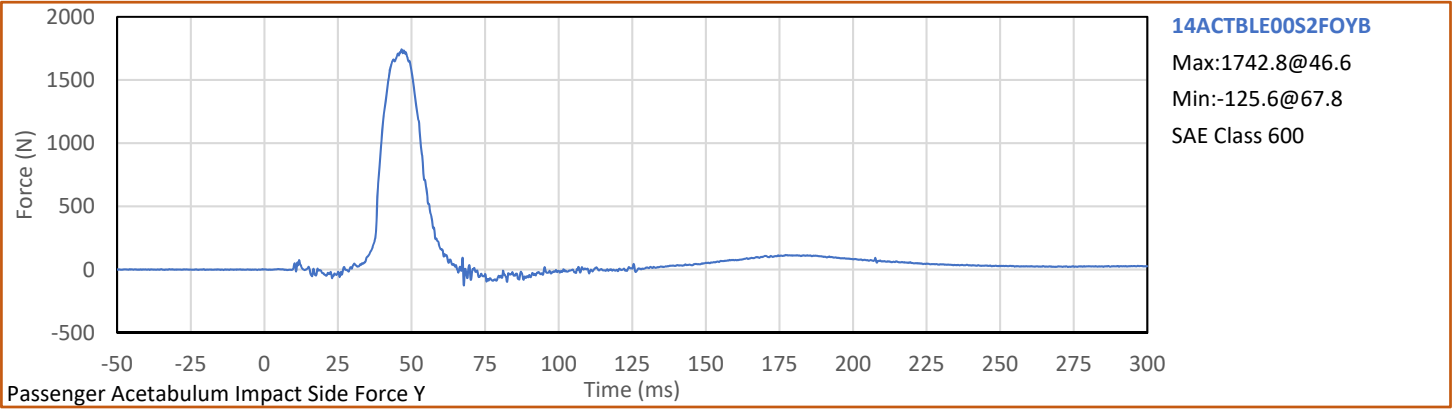
Test Vehicle: 2020 Subaru Legacy 4-Door Sedan  
Test Program: NCAP MDB Side Impact Test

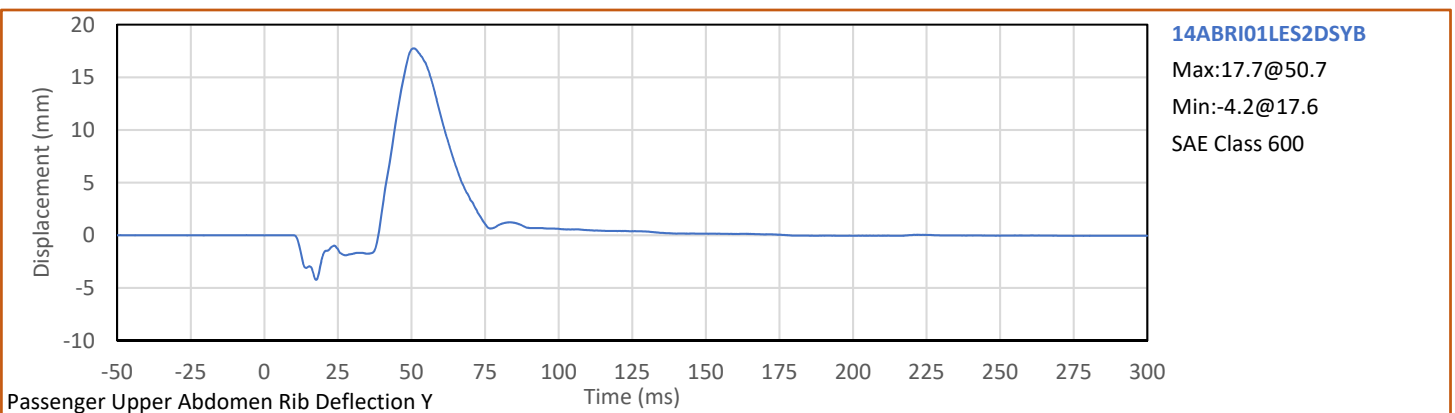
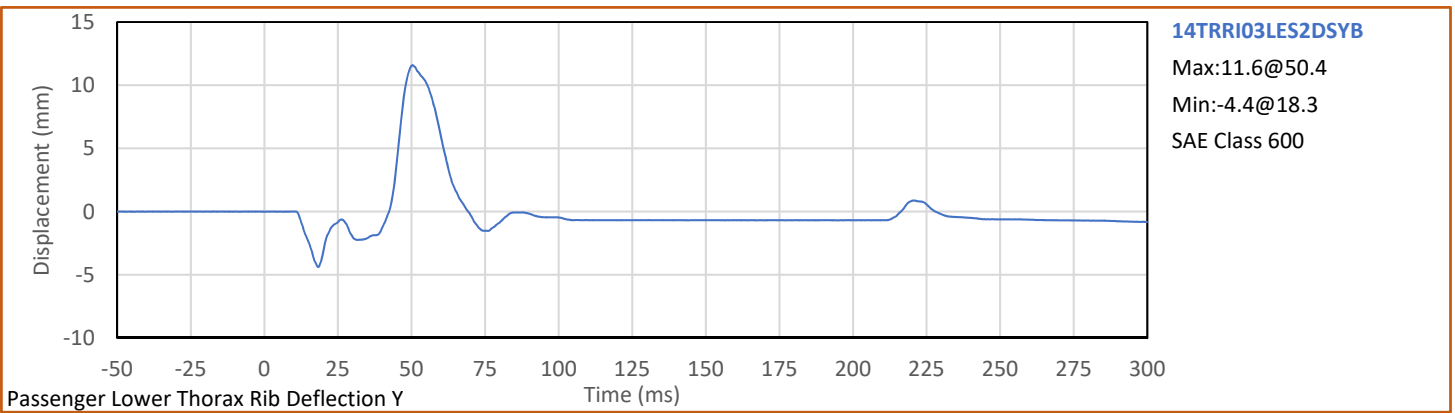
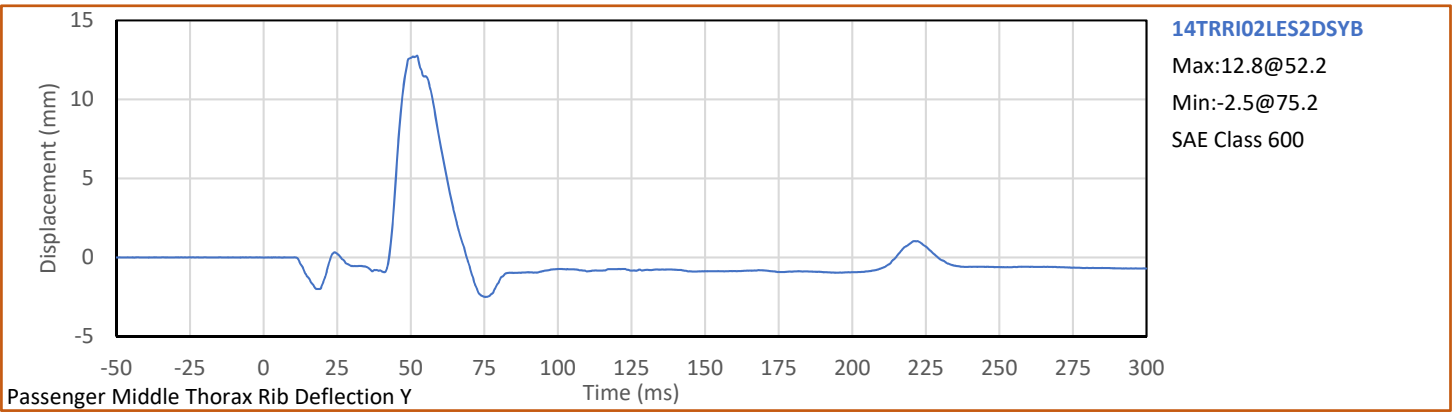
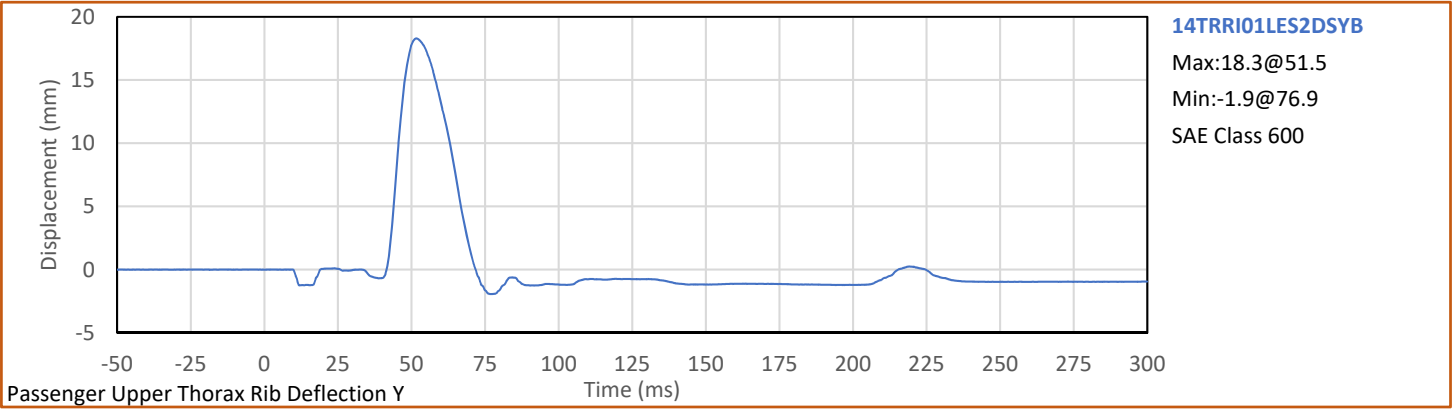
NHTSA No.: O20205501  
Test Date: 11/13/2019





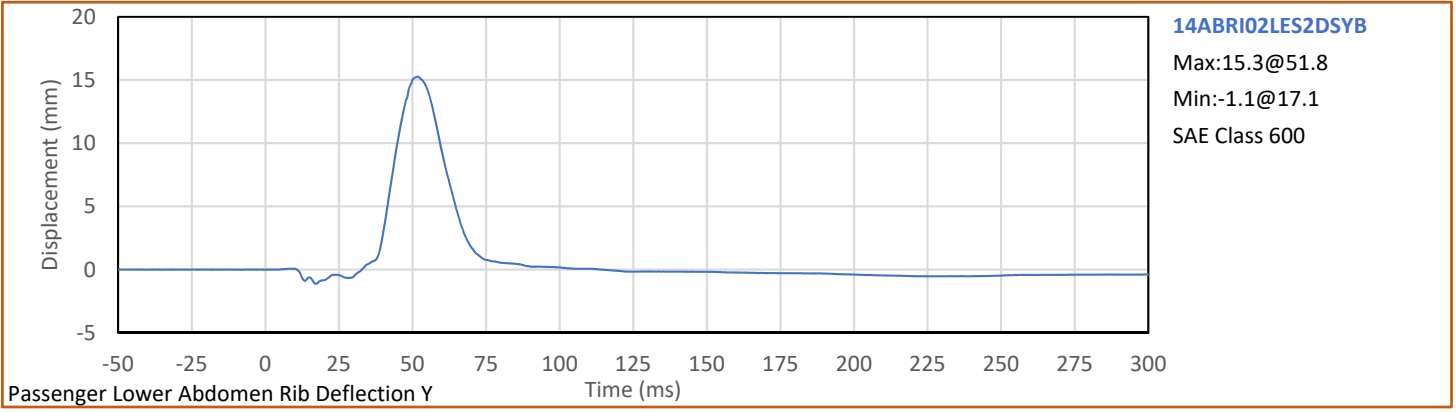






Test Vehicle: 2020 Subaru Legacy 4-Door Sedan  
Test Program: NCAP MDB Side Impact Test

NHTSA No.: O20205501  
Test Date: 11/13/2019



**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: F035**




ATD Serial No.: F035

Test Date: 2019-11-06

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	18	Pass
1 - Sitting Height	mm	900	918	908	Pass
2 - Seat to Shoulder Joint	mm	558	572	564	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	349	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	99	Pass
5 - Sole to Seat, Sitting	mm	433	451	437	Pass
6 - Head Width	mm	152	158	156	Pass
7 - Shoulder/Arm Width	mm	461	479	466	Pass
8 - Thorax Width	mm	322	332	330	Pass
9 - Abdomen Width	mm	273	287	281	Pass
10 - Pelvis Lap Width	mm	359	373	370	Pass
11 - Head Depth	mm	196	206	202	Pass
12 - Thorax Depth	mm	262	272	266	Pass
13 - Abdomen Depth	mm	194	204	199	Pass
14 - Pelvis Depth	mm	235	245	243	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	158	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	606	Pass
Overall Test Results					Pass

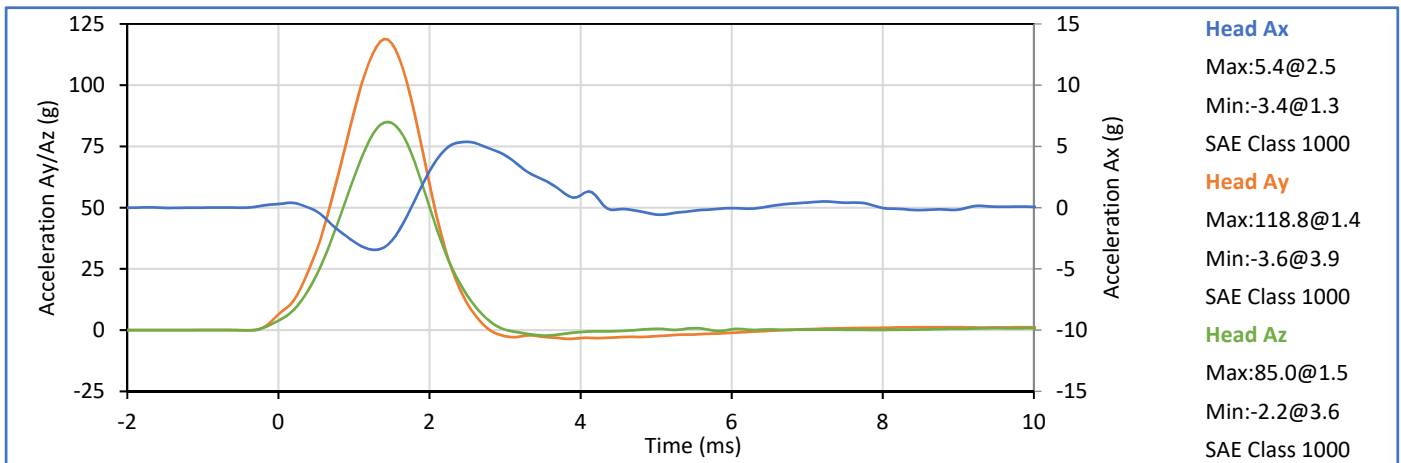
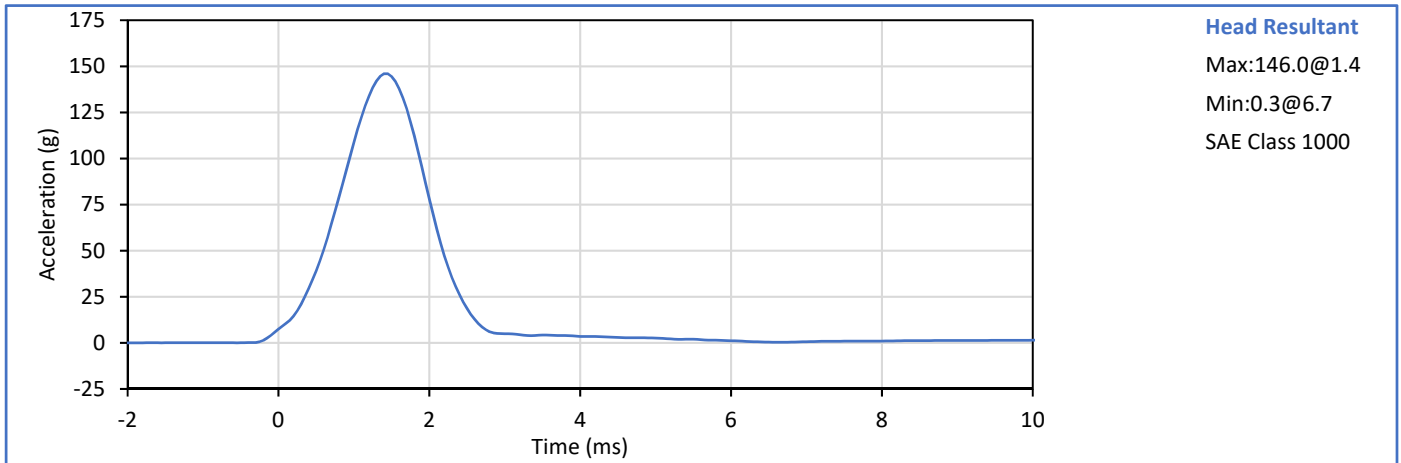
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto


ATD Serial No.: F035

Test Date: 2019-11-06

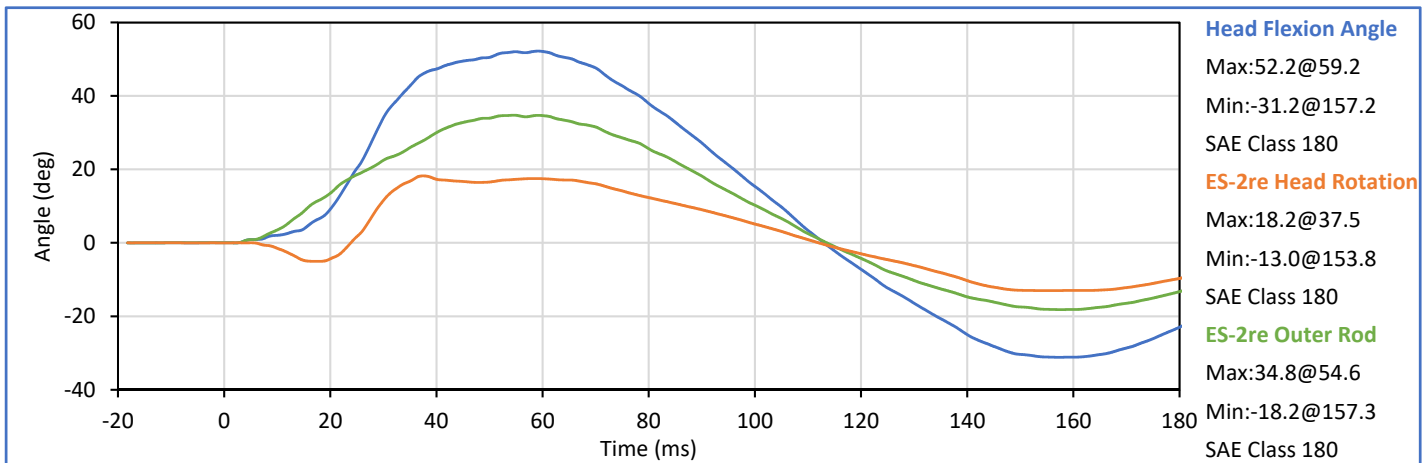
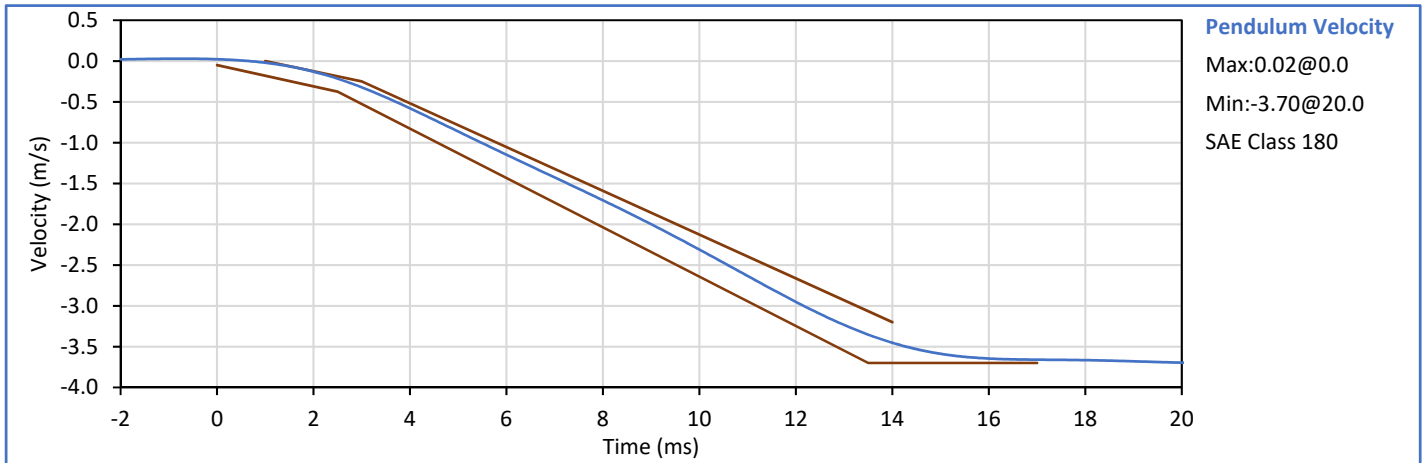
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	17	Pass
Peak Resultant Acceleration	g	125.0	155.0	146.0	Pass
Peak Head Ax	g	-15.0	15.0	5.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.4	Pass
Is Acceleration Unimodal?	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	19	Pass
Pendulum Velocity	m/s	3.30	3.50	3.48	Pass
Peak Headform Flexion	deg	49.0	59.0	52.2	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	59.2	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	53.9	Pass
Overall Test Results					Pass



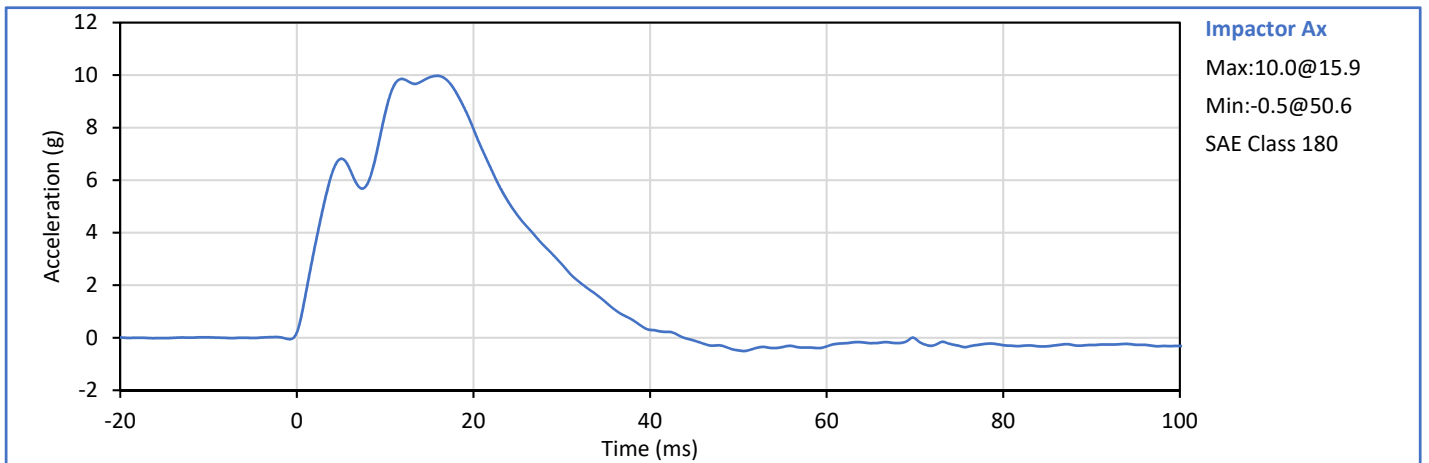
Technician: J. Hernandez


Approved By: P. Puzzuto


ATD Serial No.: F035

Test Date: 2019-11-08

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	17	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	10.0	Pass
Overall Test Results					Pass



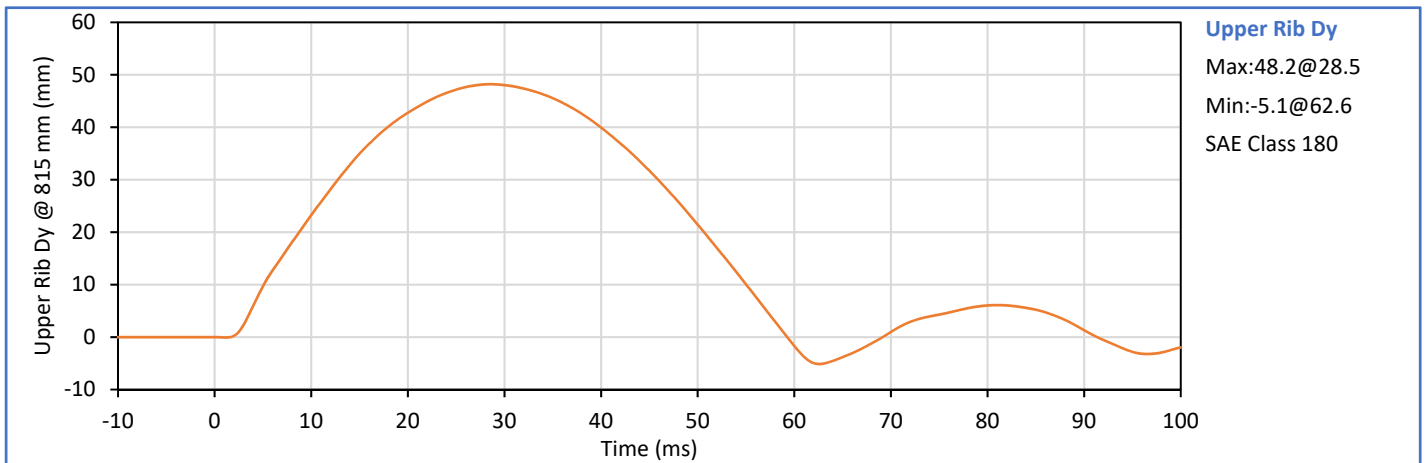
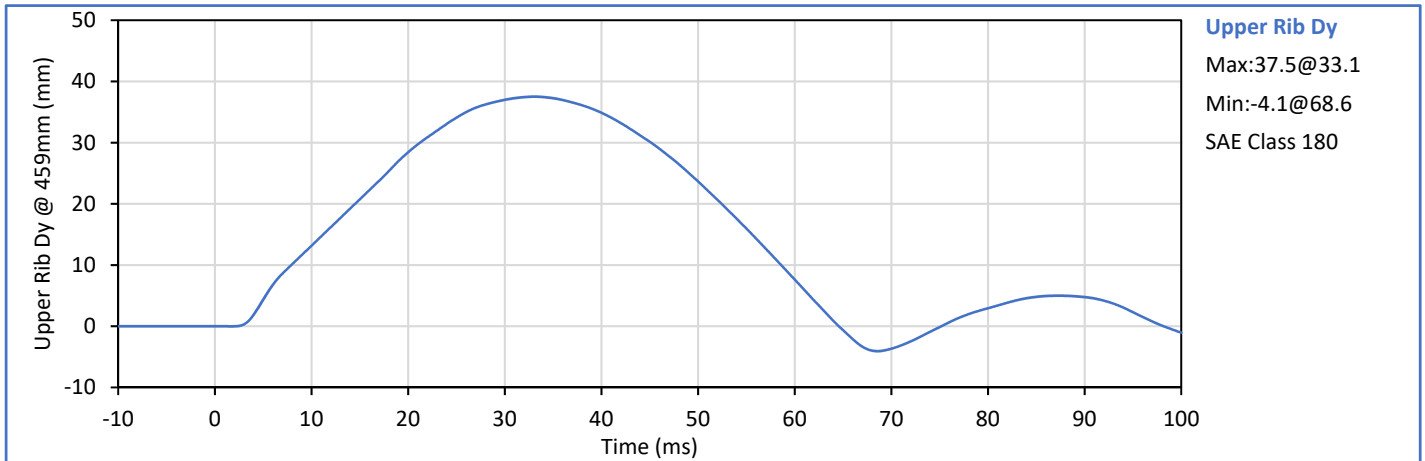
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto


ATD Serial No.: F035

Test Date: 2019-11-08

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	37.5	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.2	Pass
Overall Test Results					Pass



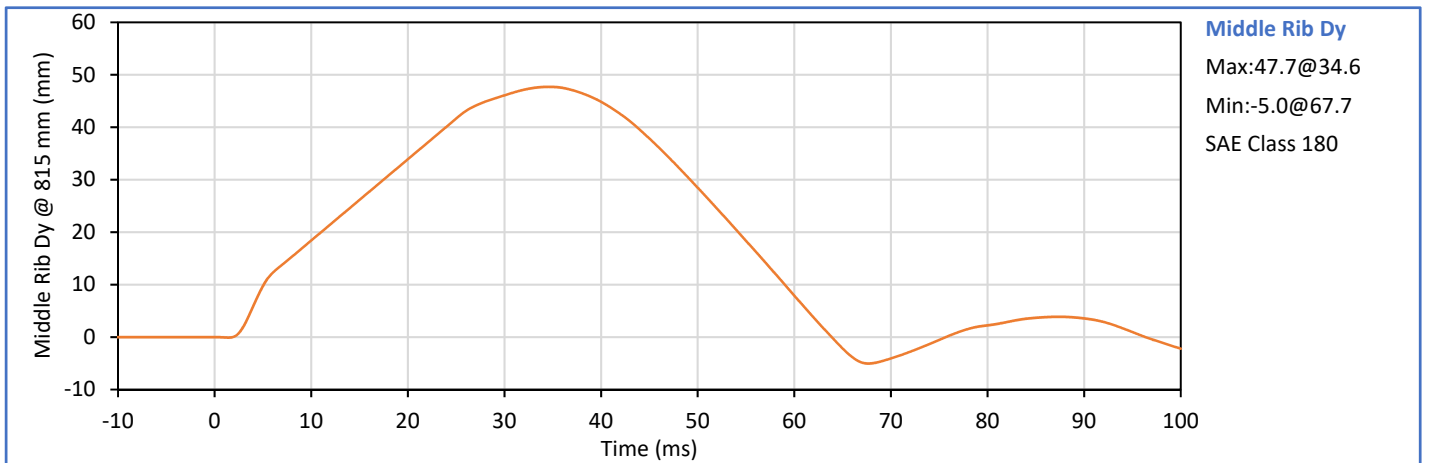
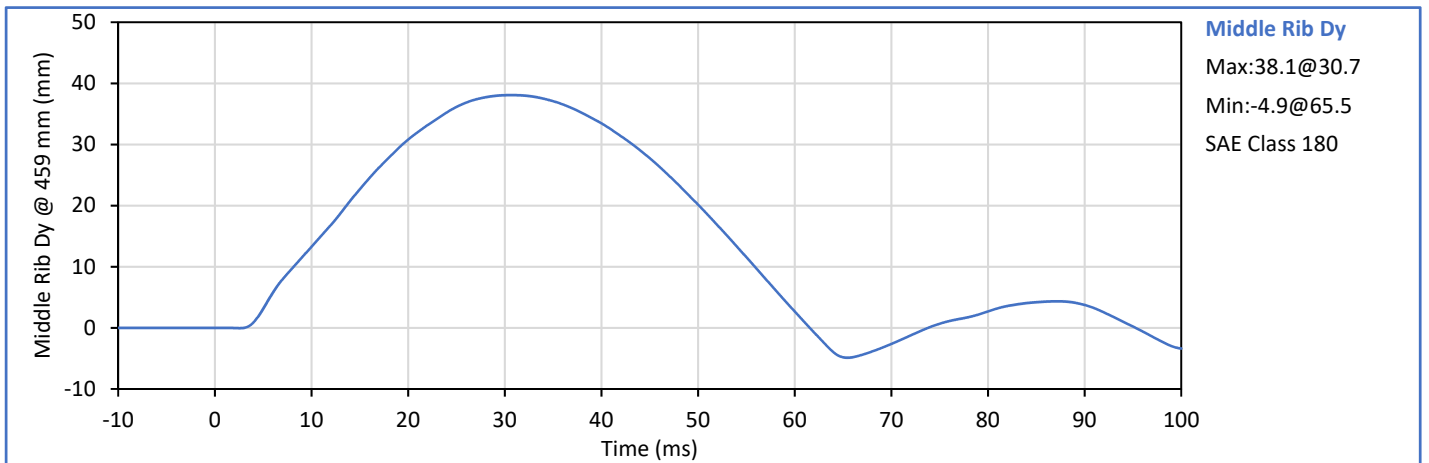
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto


ATD Serial No.: F035

Test Date: 2019-11-08

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
Middle Rib Dy @ 459mm	mm	36.0	40.0	38.1	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	47.7	Pass
Overall Test Results					Pass



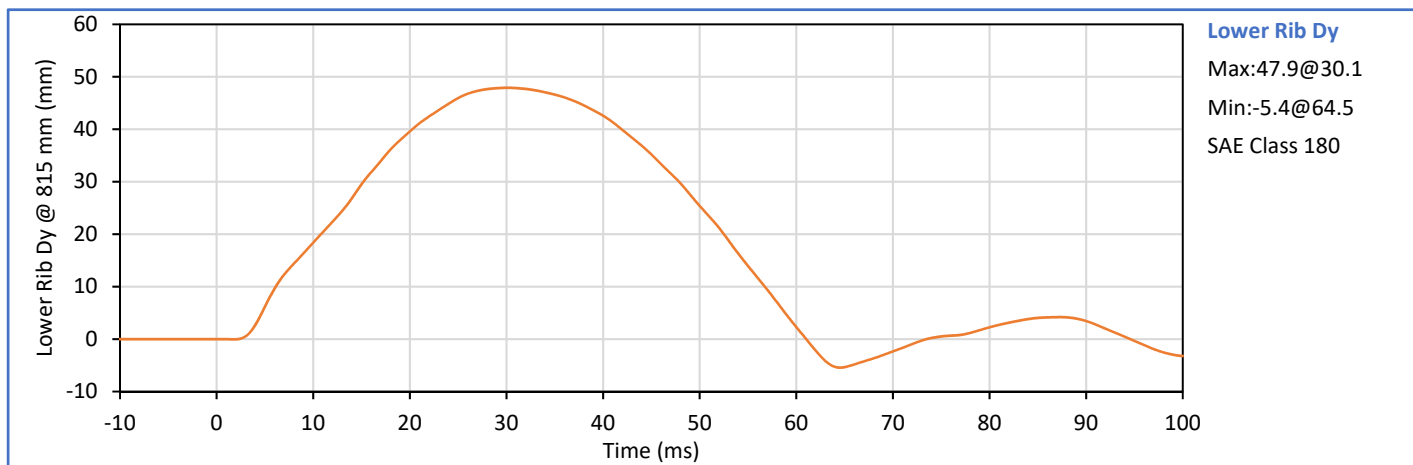
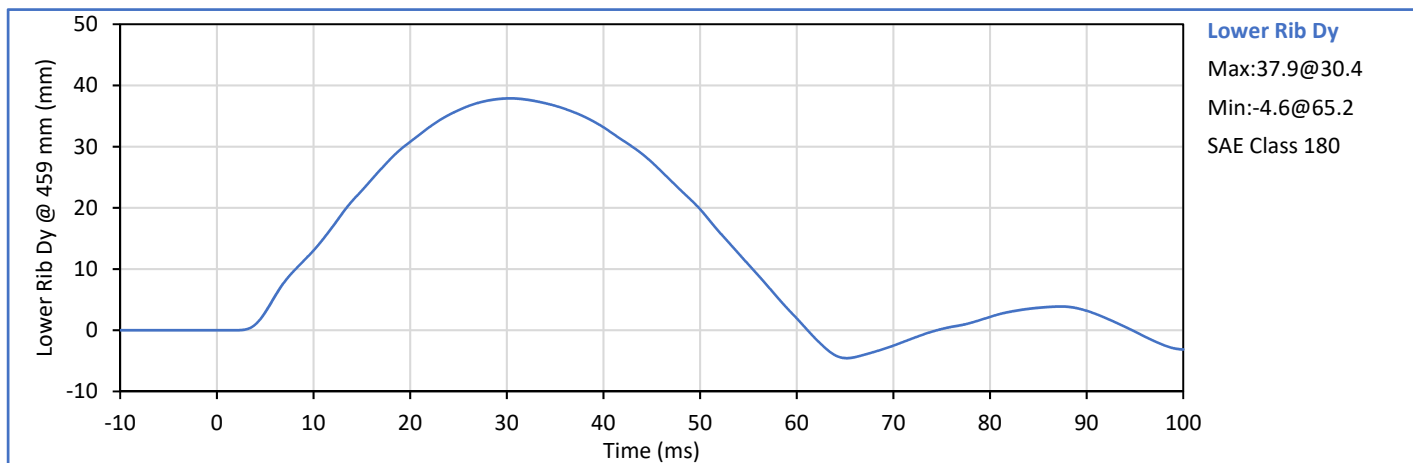
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto


ATD Serial No.: F035

Test Date: 2019-11-08

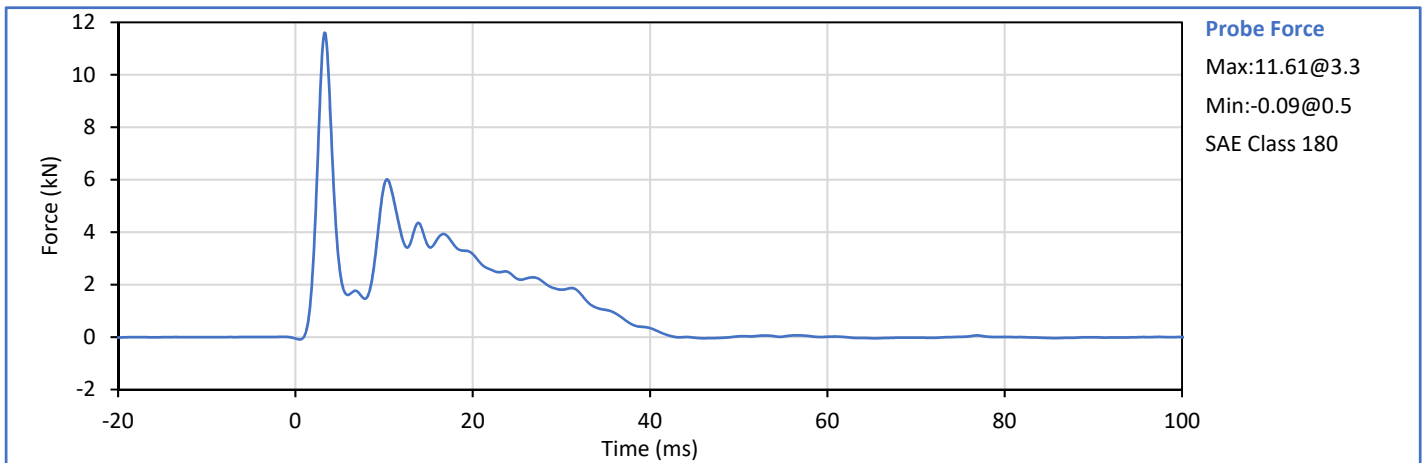
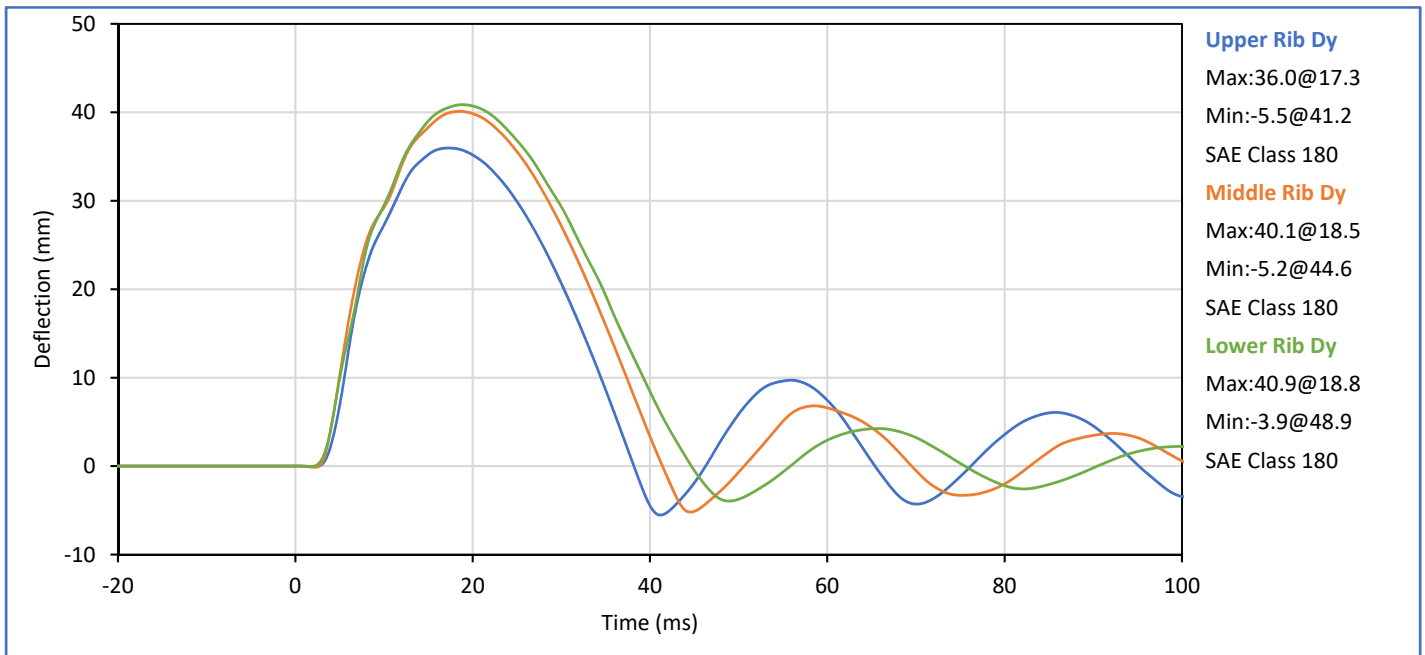
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Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.9	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	47.9	Pass
Overall Test Results					Pass




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	16	Pass
Impactor Velocity	m/s	5.40	5.60	5.45	Pass
Peak Upper Rib Dy	mm	34.0	41.0	36.0	Pass
Peak Middle Rib Dy	mm	37.0	45.0	40.1	Pass
Peak Lower Rib Dy	mm	37.0	44.0	40.9	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	6.01	Pass
<b>Overall Test Results</b>					<b>Pass</b>

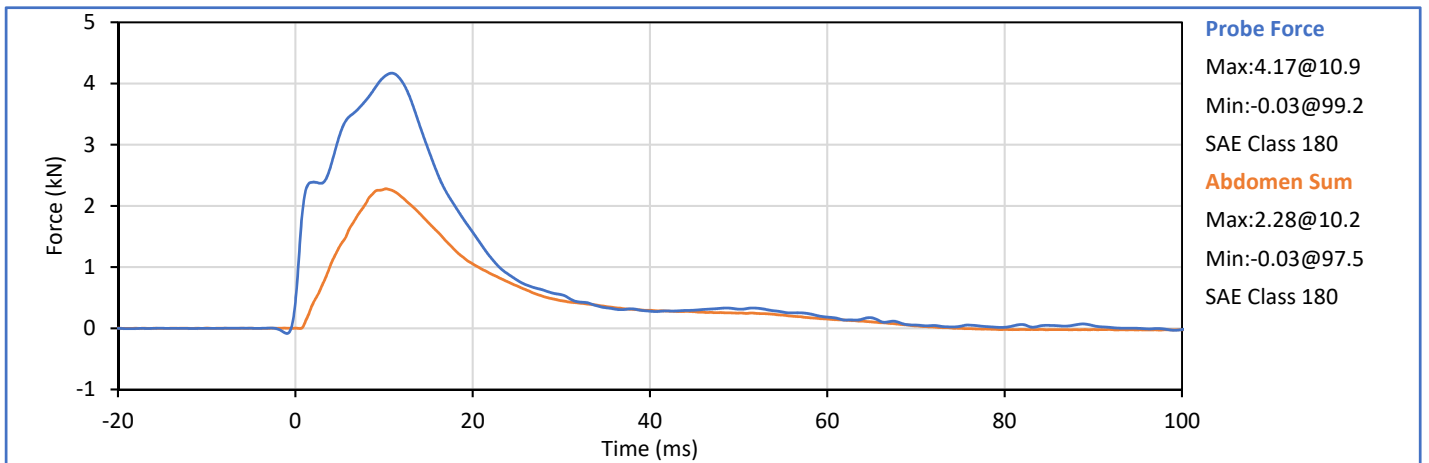
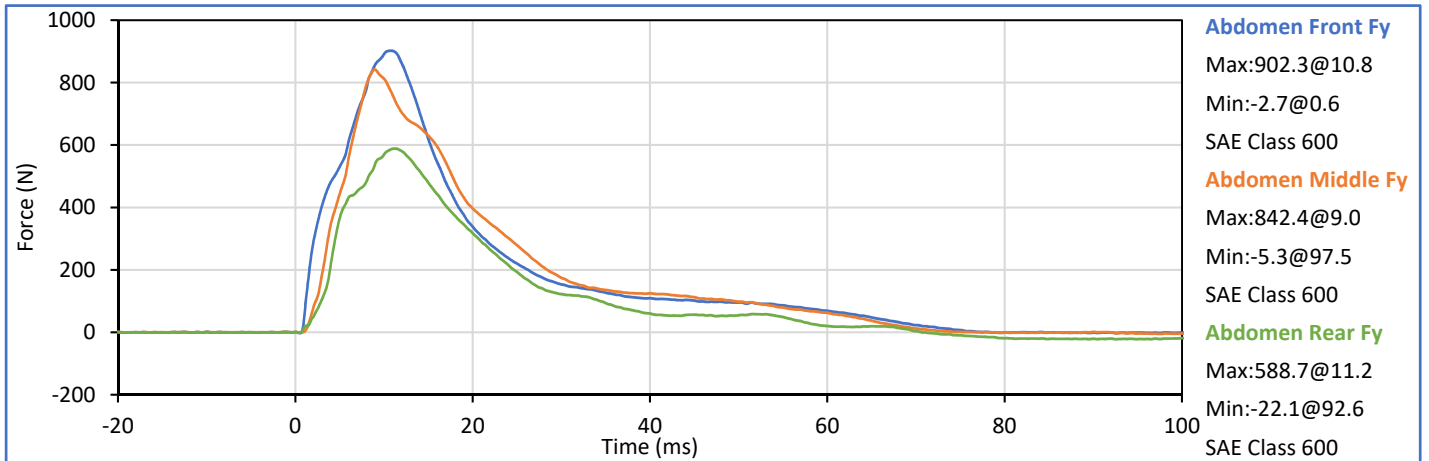



Technician:   
J. Hernandez


Approved By:   
P. Puzzuto



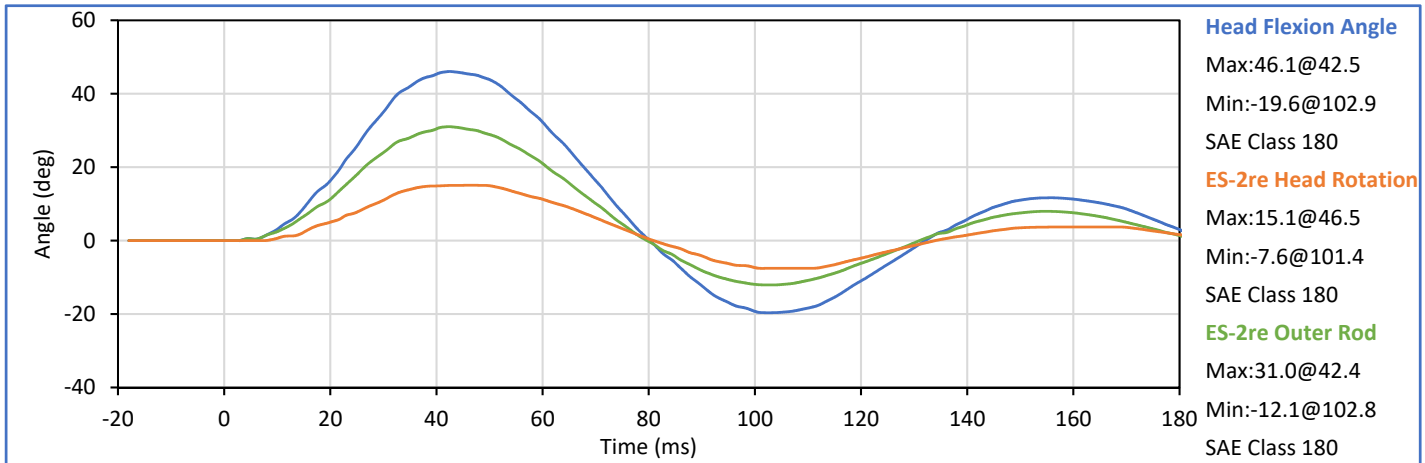
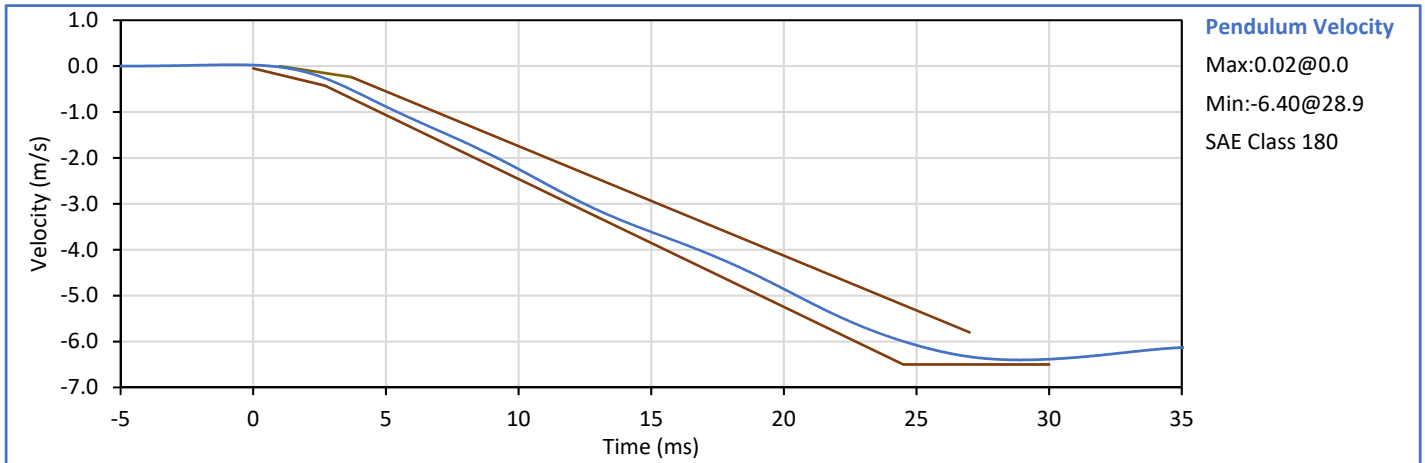
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	15	Pass
Impactor Velocity	m/s	3.90	4.10	4.09	Pass
Peak Impactor Force	kN	4.00	4.80	4.17	Pass
Time of Peak Impactor Force	ms	10.6	13.0	10.9	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.28	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.2	Pass
Overall Test Results					Pass





Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

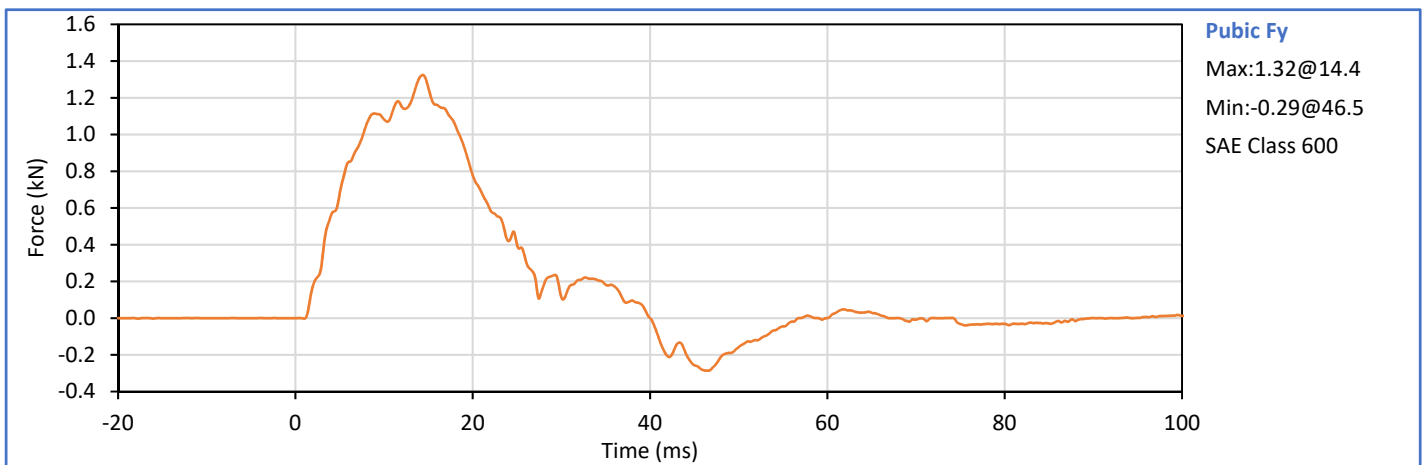
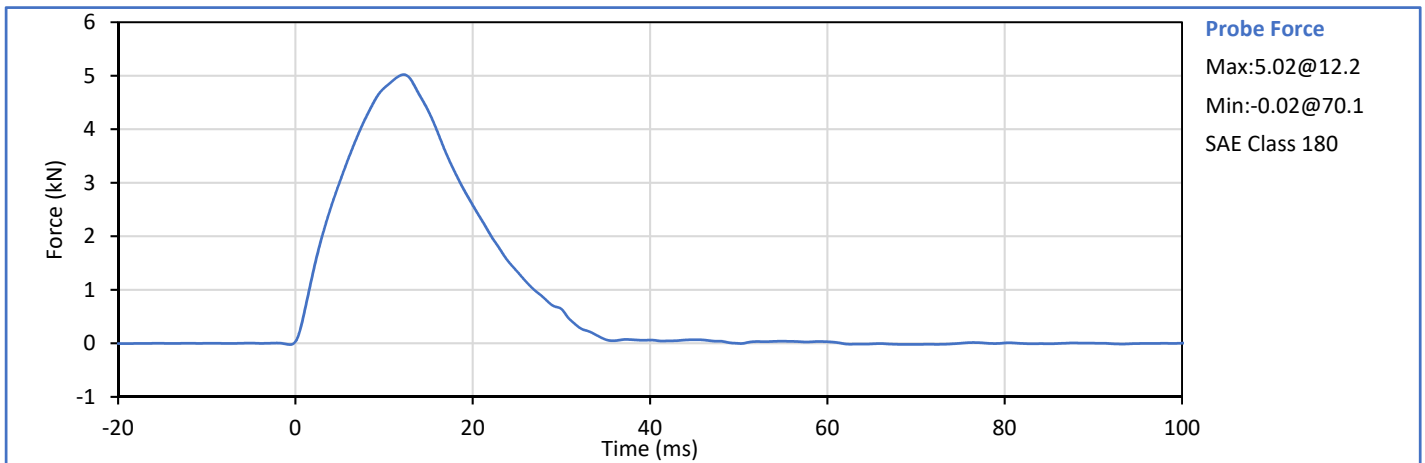
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	5.95	6.15	6.12	Pass
Peak Headform Flexion	deg	45.0	55.0	46.1	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	42.5	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	37.7	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	16	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Force	kN	4.70	5.40	5.02	Pass
Time of Peak Impactor Force	ms	11.8	16.1	12.2	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.32	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.4	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: 299**

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	17	Pass
A - Sitting Height	mm	772	788	779	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	147	Pass
E - Shoulder Pivot From Backline	mm	97	107	106	Pass
F - Thigh Clearance	mm	119	135	128	Pass
G - Head Breadth	mm	140	148	146	Pass
H - Head Back From Backline	mm	40	46	41	Pass
I - Head Depth	mm	178	188	184	Pass
J - Head Circumference	mm	541	551	546	Pass
K - Buttock To Knee Length	mm	514	540	529	Pass
L - Popliteal Height	mm	343	369	347	Pass
K - Knee Pivot To Floor Height	mm	392	409	396	Pass
N - Buttock Popliteal Length	mm	416	442	439	Pass
O - Chest Depth W/O Jacket	mm	195	211	203	Pass
P - Foot Length	mm	216	232	223	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	319	Pass
R - Arm Length	mm	249	259	253	Pass
S - Knee Joint To Seatback	mm	477	493	487	Pass
V - Shoulder Width	mm	341	357	345	Pass
W - Foot Width	mm	78	94	88	Pass
Y - Chest Circumference W/Jacket	mm	851	881	871	Pass
Z - Waist Circumference	mm	761	791	774	Pass
Overall Test Results					Pass

Technician: \_\_\_\_\_



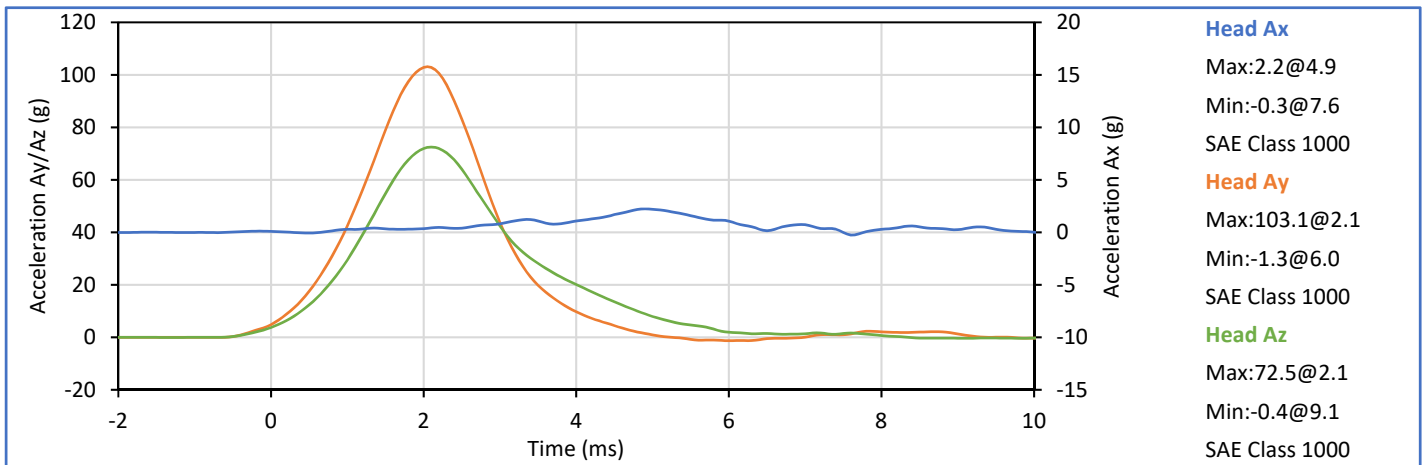
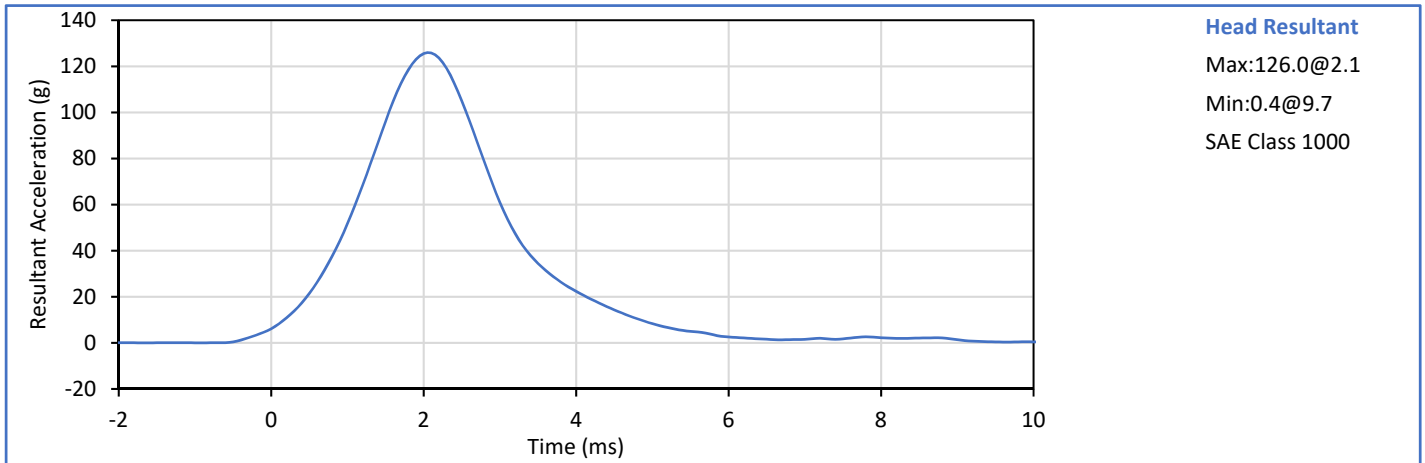
J. Hernandez


Approved By: \_\_\_\_\_




P. Puzzuto

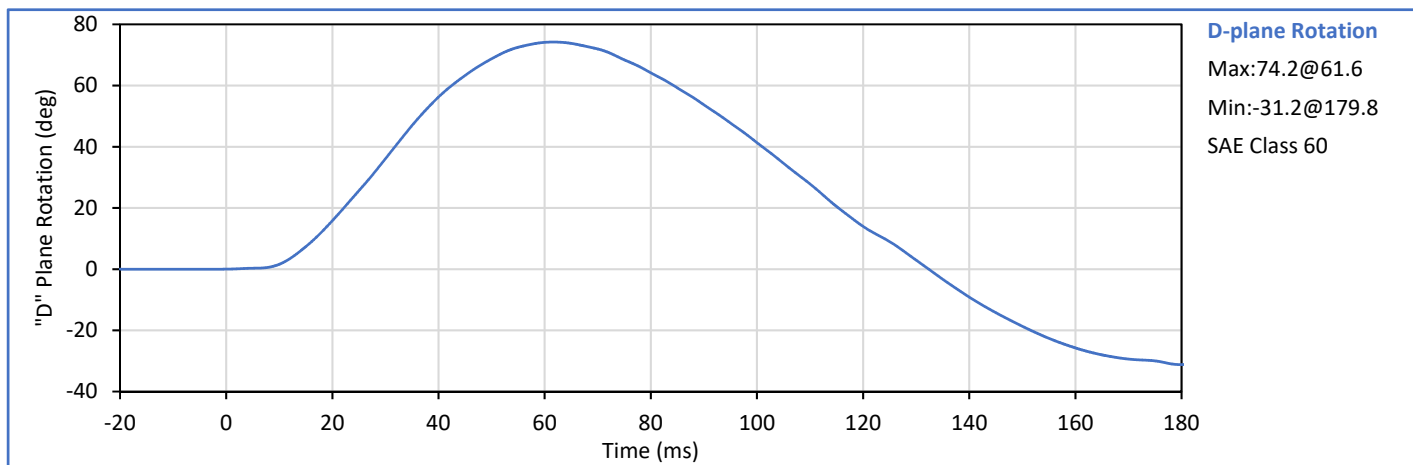
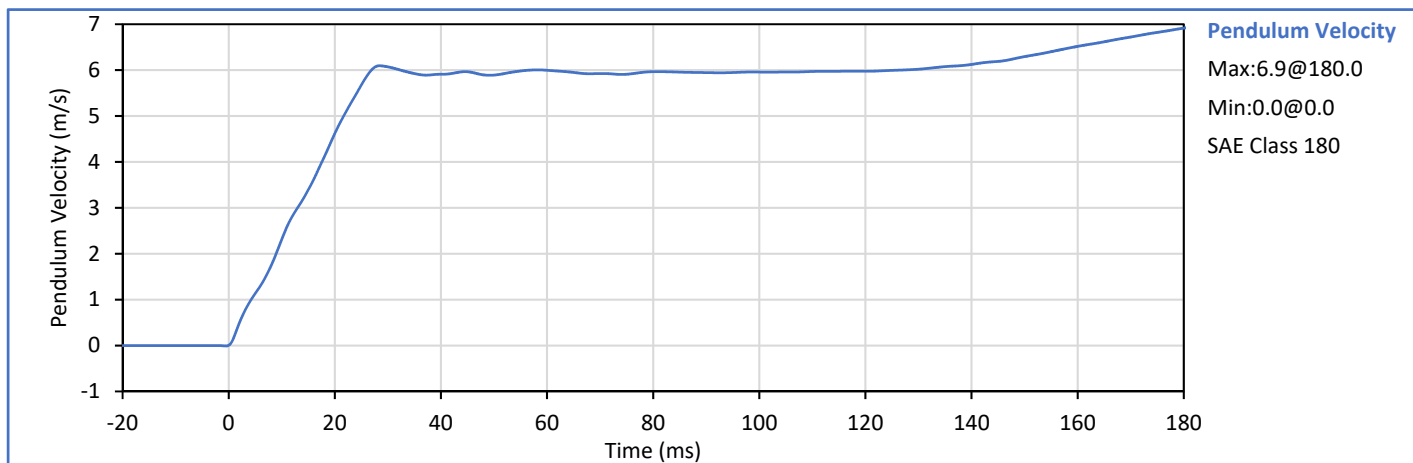
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	17	Pass
Peak Resultant Acceleration	g	115.0	137.0	126.0	Pass
Peak Head Ax	g	-15.0	15.0	-0.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass




Technician:   
J. Hernandez

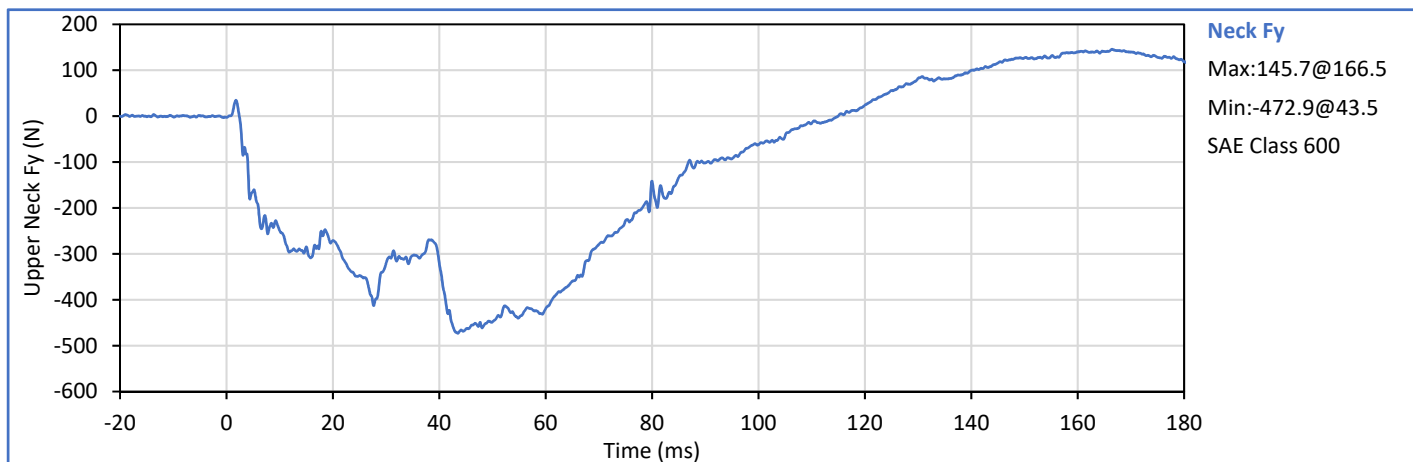
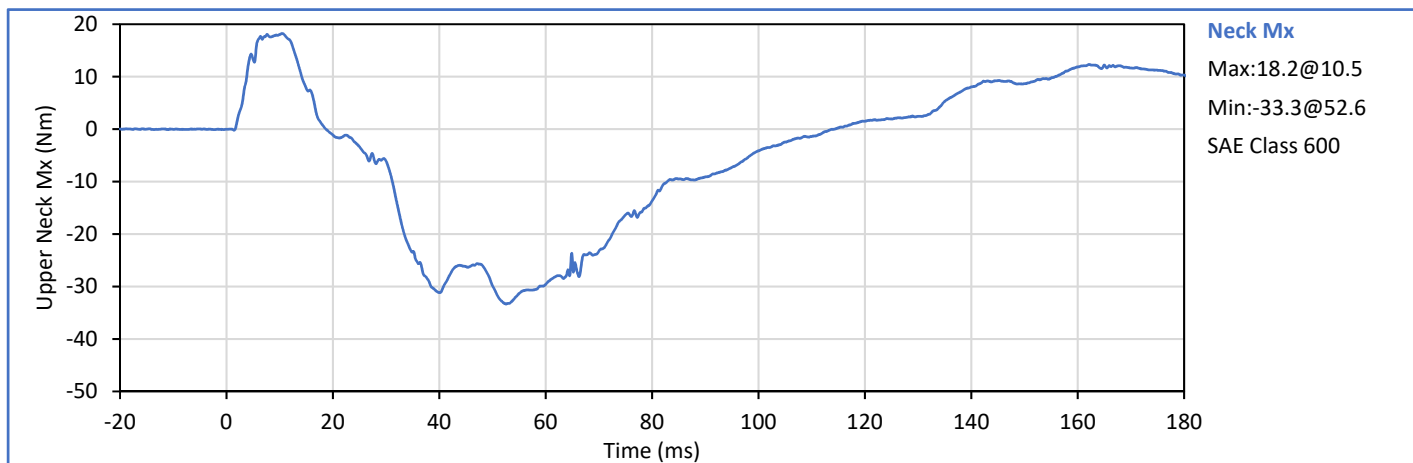
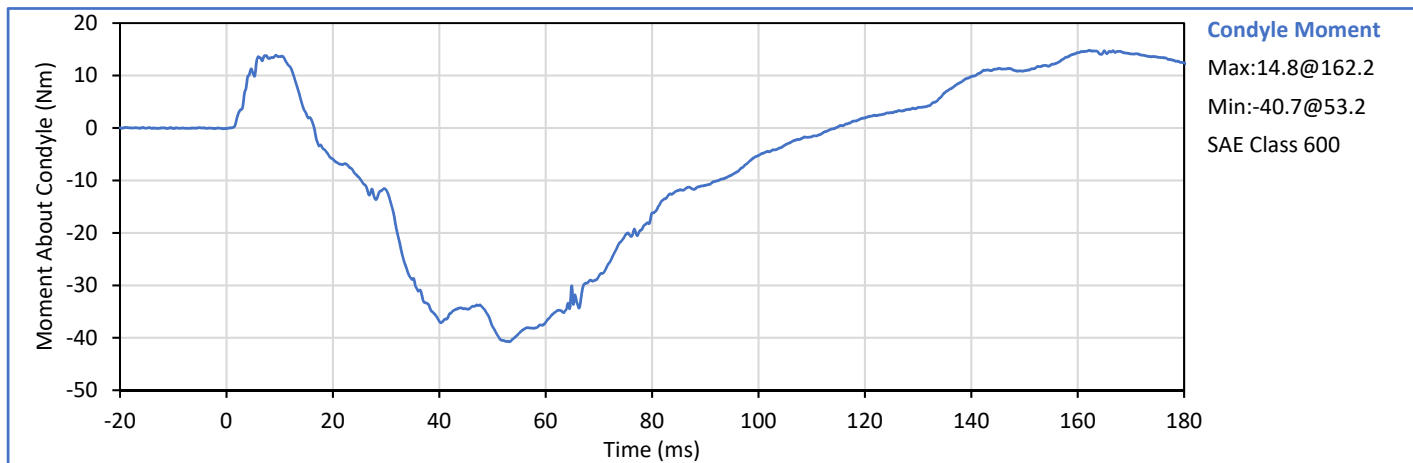
Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	16	Pass
Pendulum Velocity	m/s	5.51	5.63	5.60	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.31	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.39	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.62	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.68	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	6.10	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	74.2	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	61.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-40.7	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	114.5	Pass
<b>Overall Test Results</b>					<b>Pass</b>



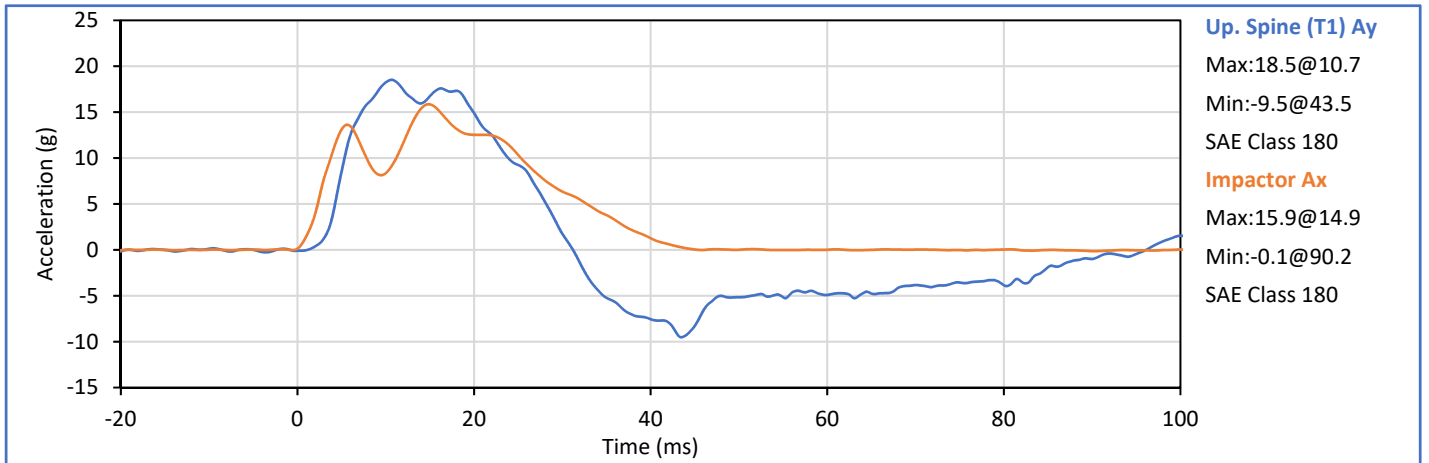
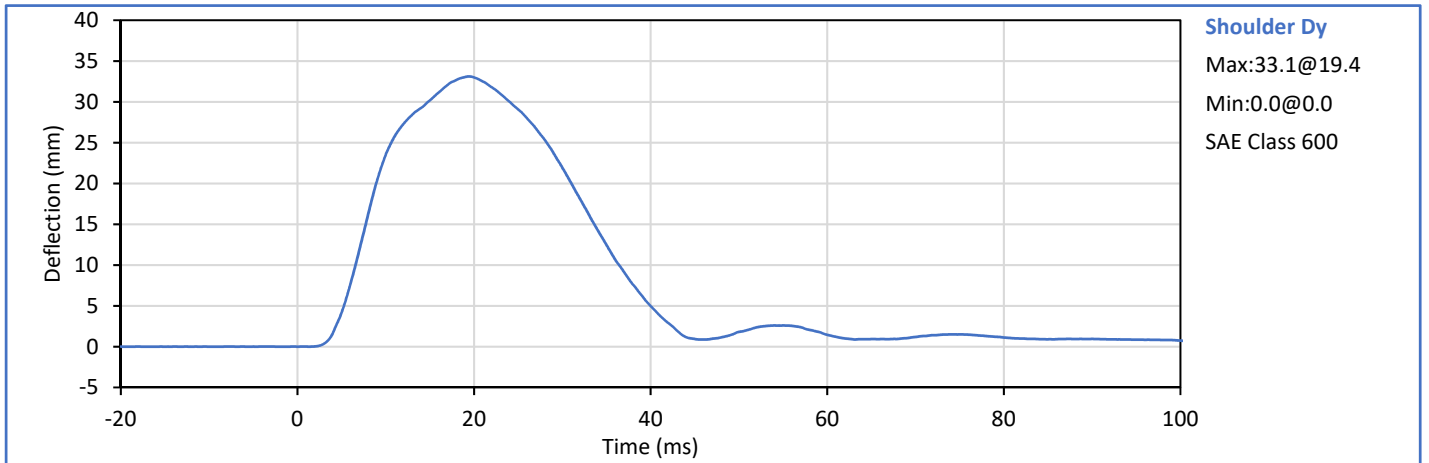
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto






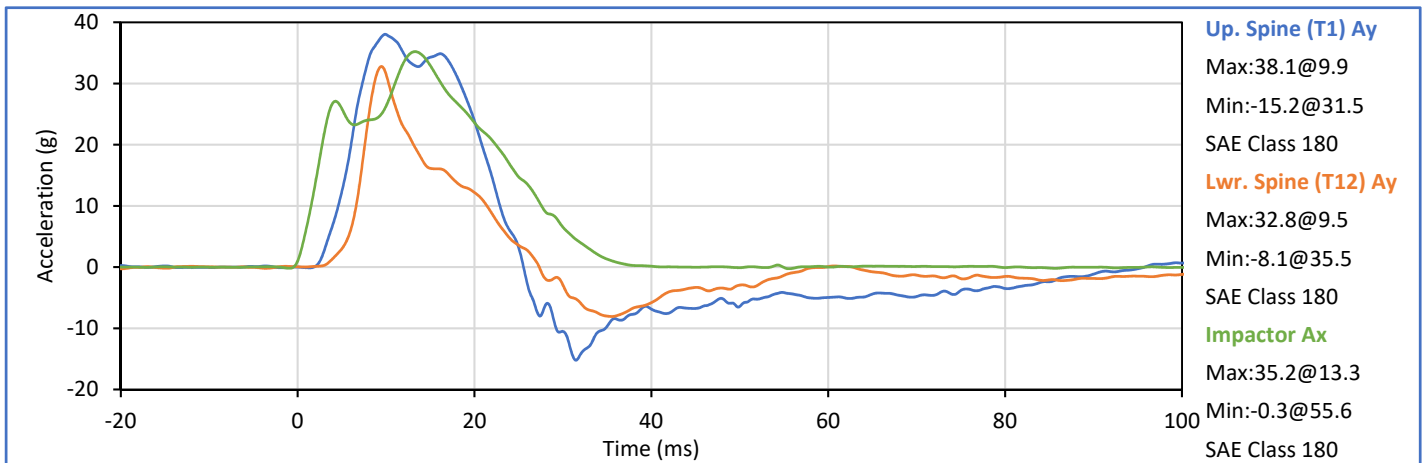
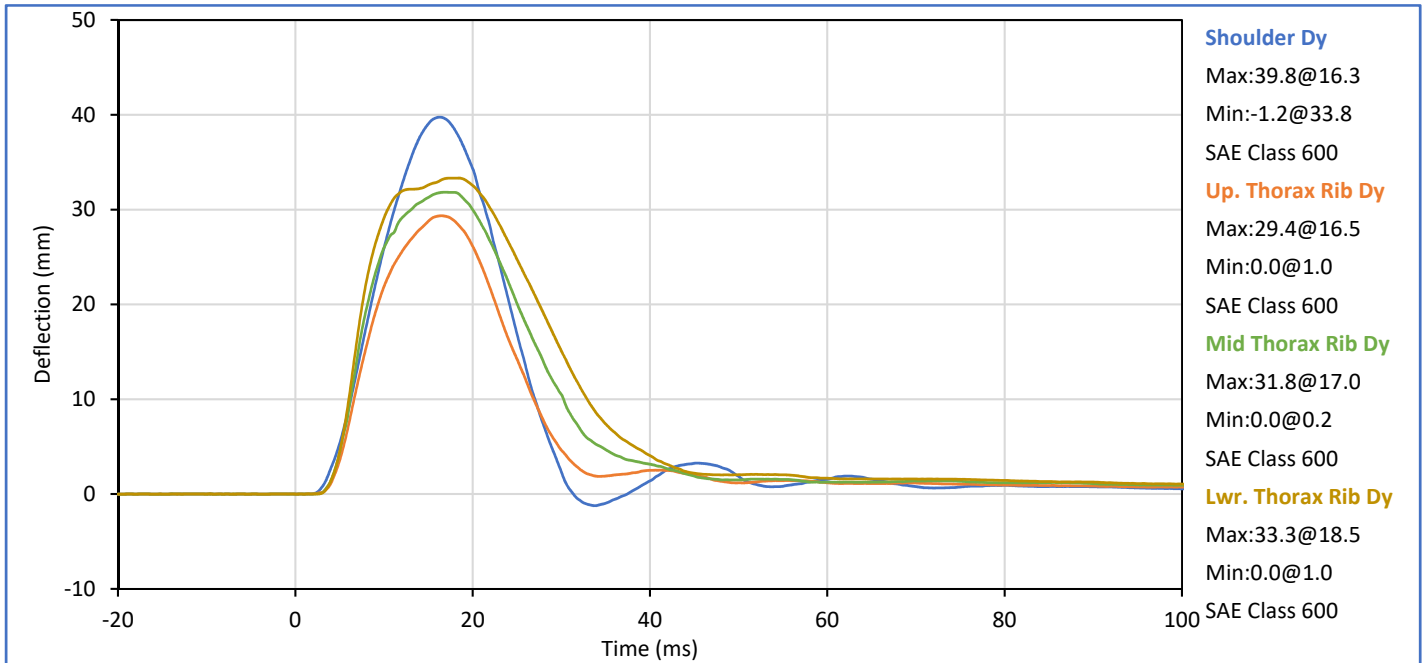
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	39	Pass
Impactor Velocity	m/s	4.20	4.40	4.28	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.1	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.5	Pass
Peak Impactor Ax	g	13.0	18.0	15.9	Pass
Overall Test Results					Pass





Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

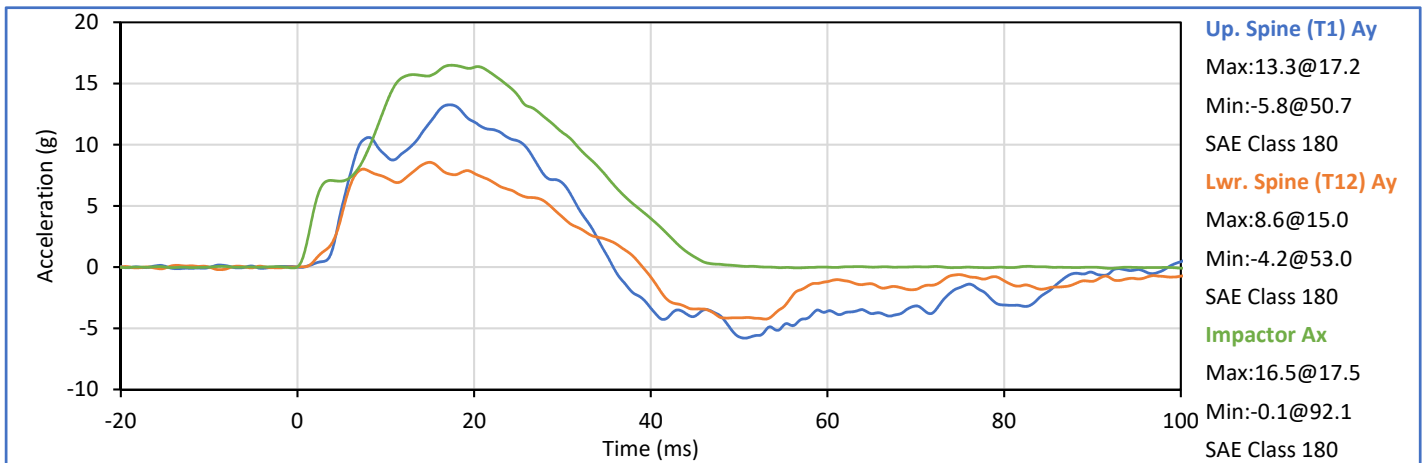
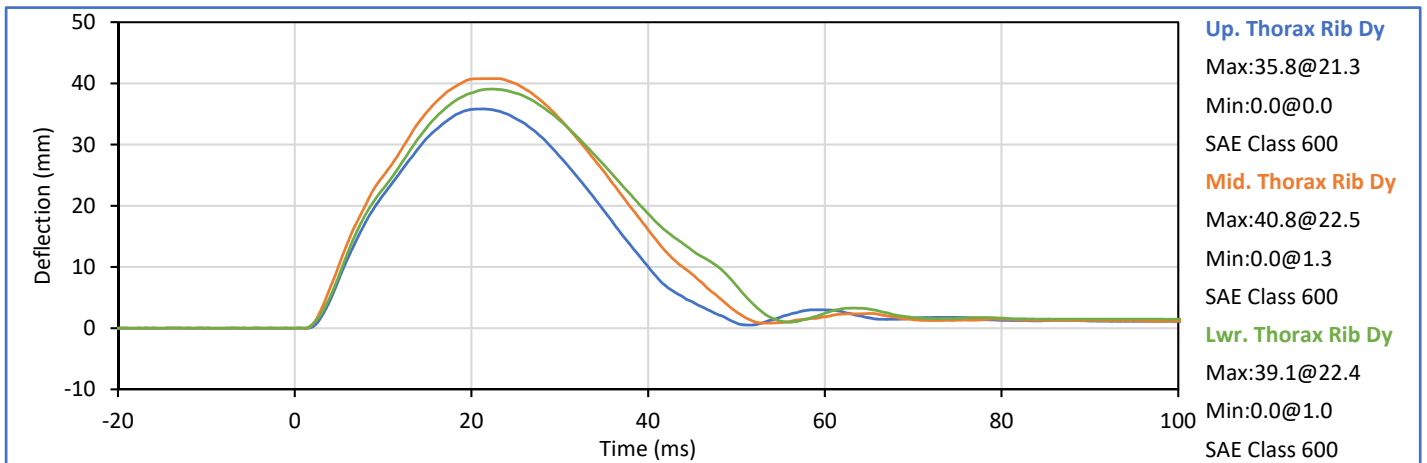
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	17	Pass
Impactor Velocity	m/s	6.60	6.80	6.75	Pass
Peak Shoulder Dy	mm	31.0	40.0	39.8	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.4	Pass
Peak Middle Rib Dy	mm	30.0	36.0	31.8	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.3	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	38.1	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	32.8	Pass
Peak Impactor Ax	g	30.0	36.0	35.2	Pass
<b>Overall Test Results</b>					<b>Pass</b>





Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

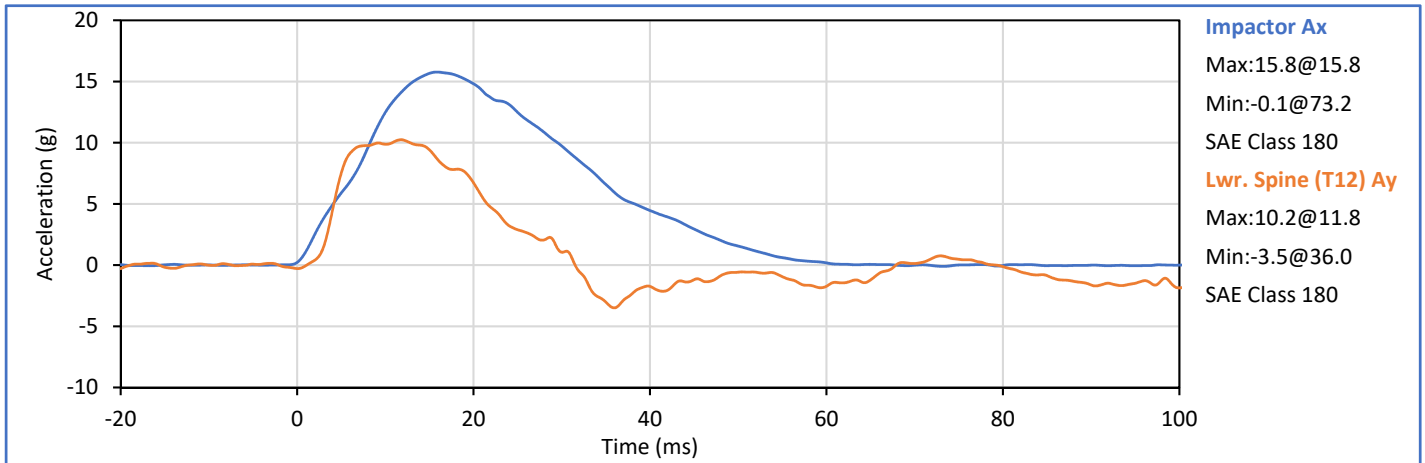
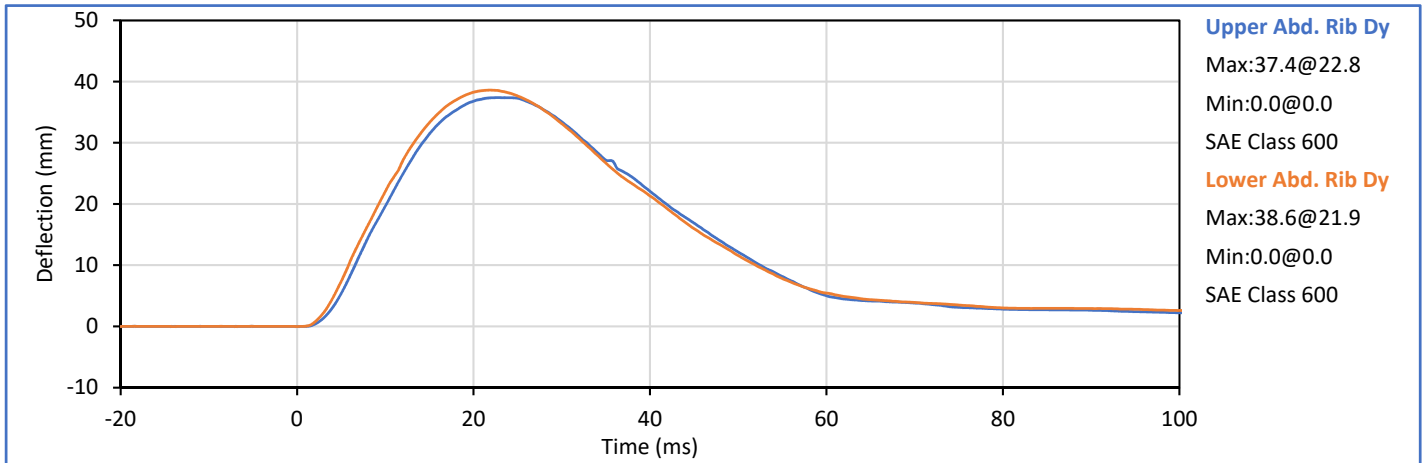
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	18	Pass
Impactor Velocity	m/s	4.20	4.40	4.38	Pass
Peak Upper Rib Dy	mm	32.0	40.0	35.8	Pass
Peak Middle Rib Dy	mm	39.0	45.0	40.8	Pass
Peak Lower Rib Dy	mm	35.0	43.0	39.1	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	13.3	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.6	Pass
Peak Impactor Ax	g	14.0	18.0	16.5	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	19	Pass
Impactor Velocity	m/s	4.20	4.40	4.36	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	37.4	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	38.6	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.2	Pass
Peak Impactor Ax	g	12.0	16.0	15.8	Pass
Overall Test Results					Pass



Technician:   
J. Hernandez

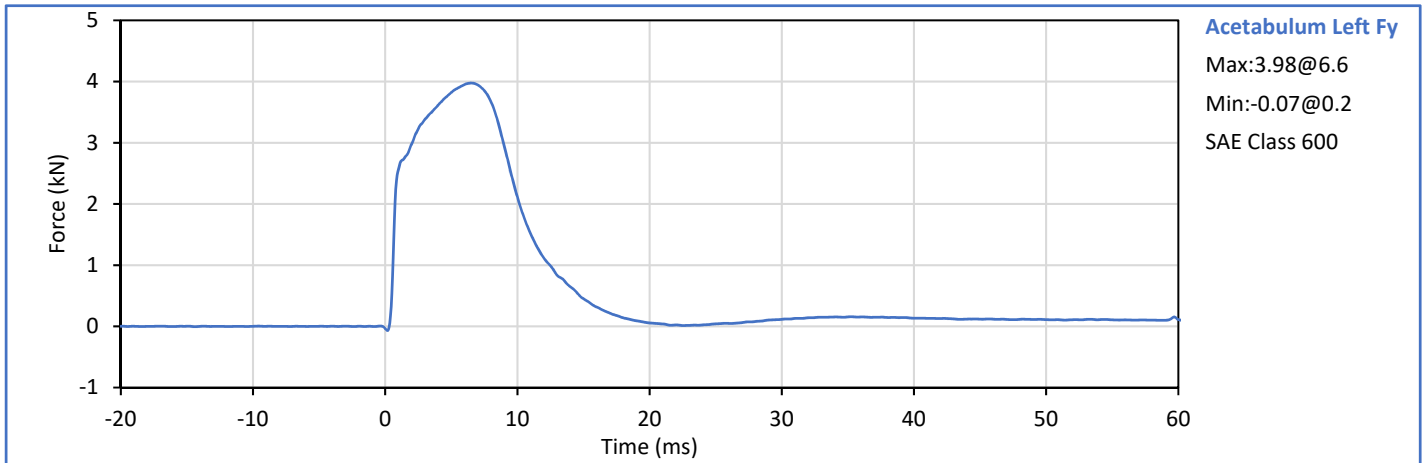
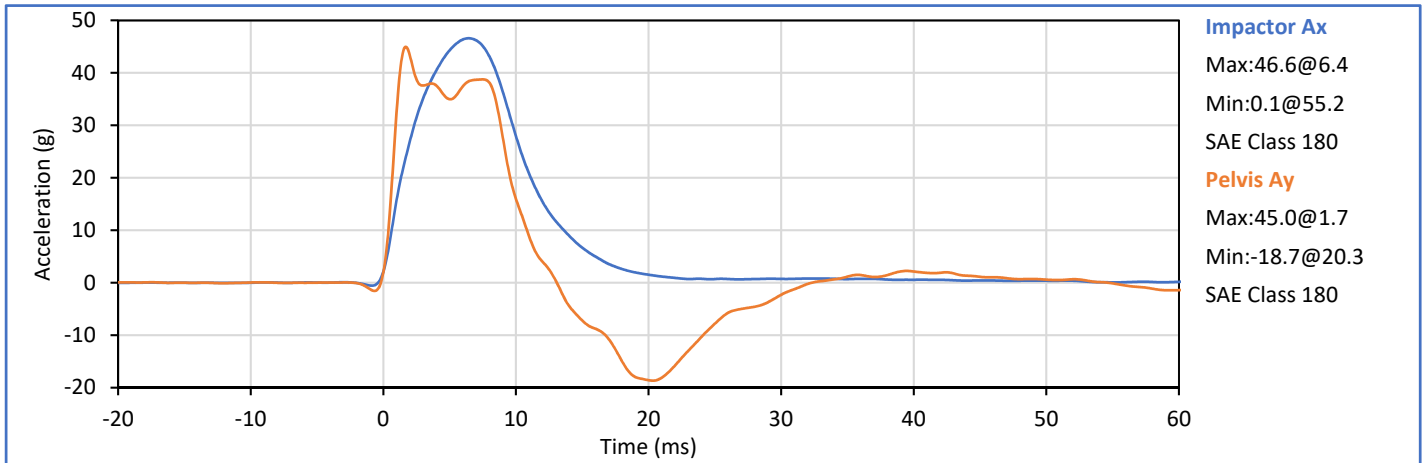
Approved By:   
P. Puzzuto


ATD Serial No.: 299


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 Humidity	%	10	70	16	Pass
Impactor Velocity	m/s	6.60	6.80	6.71	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.98	Pass
Pelvis Ay after 6ms	g	34.0	42.0	38.8	Pass
Peak Impactor Ax	g	38.0	47.0	46.6	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12379 (SACO)



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto



**SID-IIs Pelvis Plug Certification Test**

Plug S/N 12379

Test Number 6767

Report Number 6782

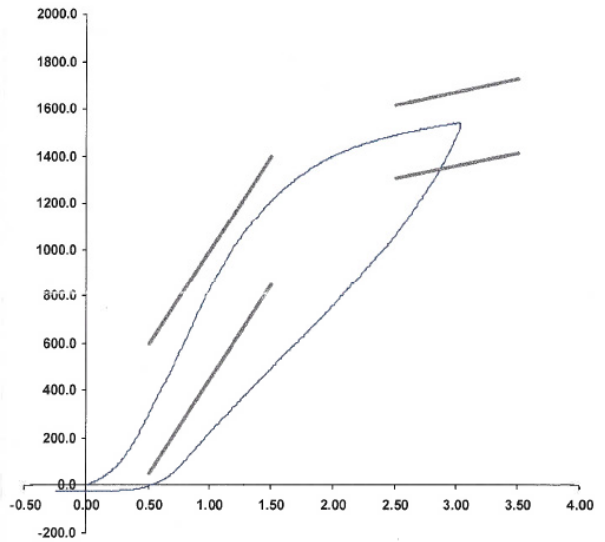
Test Date 3/23/2018 9:49:36 AM

	Test Results	Spec. Min	Spec. Max
Force @ 0.5 mm (N)	294.79	50.00	600.00
Force @ 1.5 mm (N)	1,214.22	850.00	1,400.00
Force @ 2.5 mm (N)	1,490.25	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,540.99	1,361.00	1,673.00

Testing Machine STM-20 5965542  
 Load Cell S/N (FI360947), 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 \_\_\_\_\_  
 Part Number 180-4450

Template No 107 23-Mar-18  
 SACO Research

By: DC Date: 3/23/18

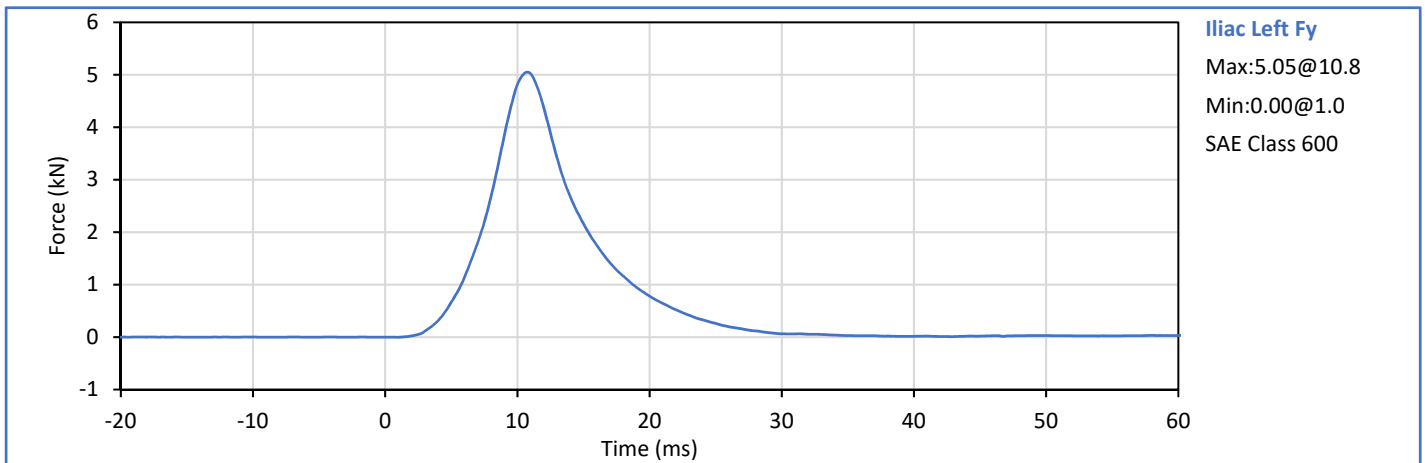
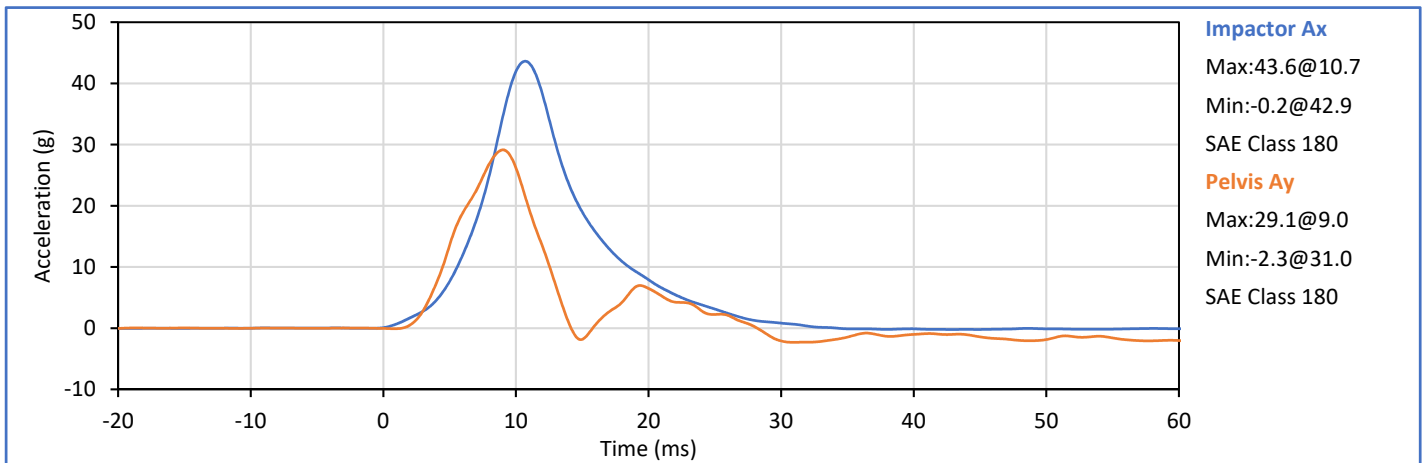
ATD Serial No.: 299


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 Humidity	%	10	70	44	Pass
Impactor Velocity	m/s	4.20	4.40	4.28	Pass
Peak Iliac Fy	kN	4.10	5.10	5.05	Pass
Pelvis Ay after 6ms	g	28.0	39.0	29.1	Pass
Peak Impactor Ax	g	36.0	45.0	43.6	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 (SACO) \*

\* Plug is not impacted and remains certified



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

**APPENDIX C**  
**Post-Test ATD Qualification and Performance Verification**  
**ES-2re 50th Male Side Impact ATD**  
**S/N: F035**




ATD Serial No.: F035

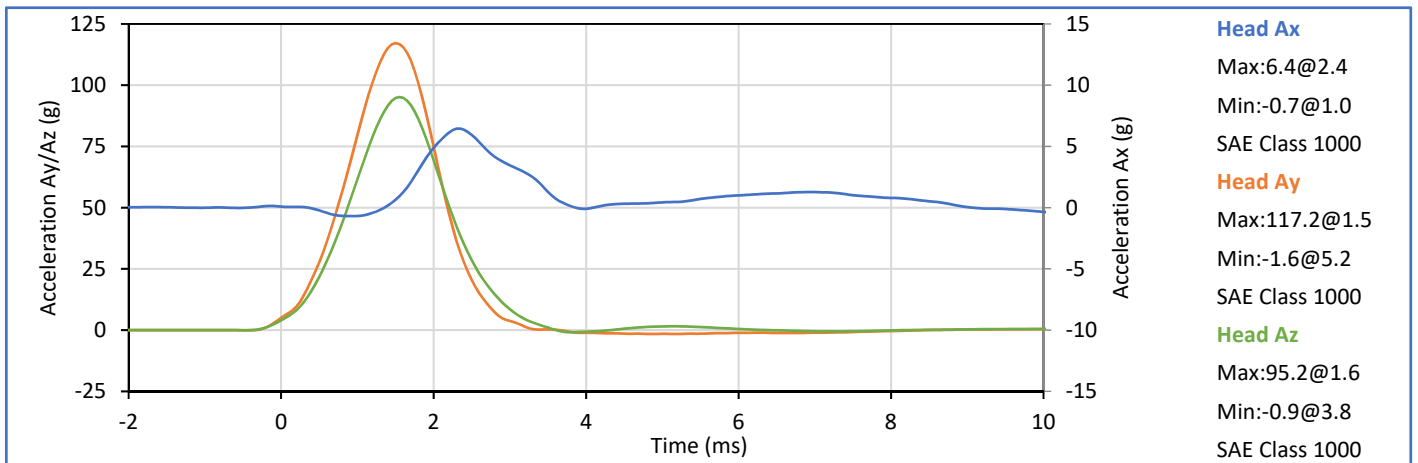
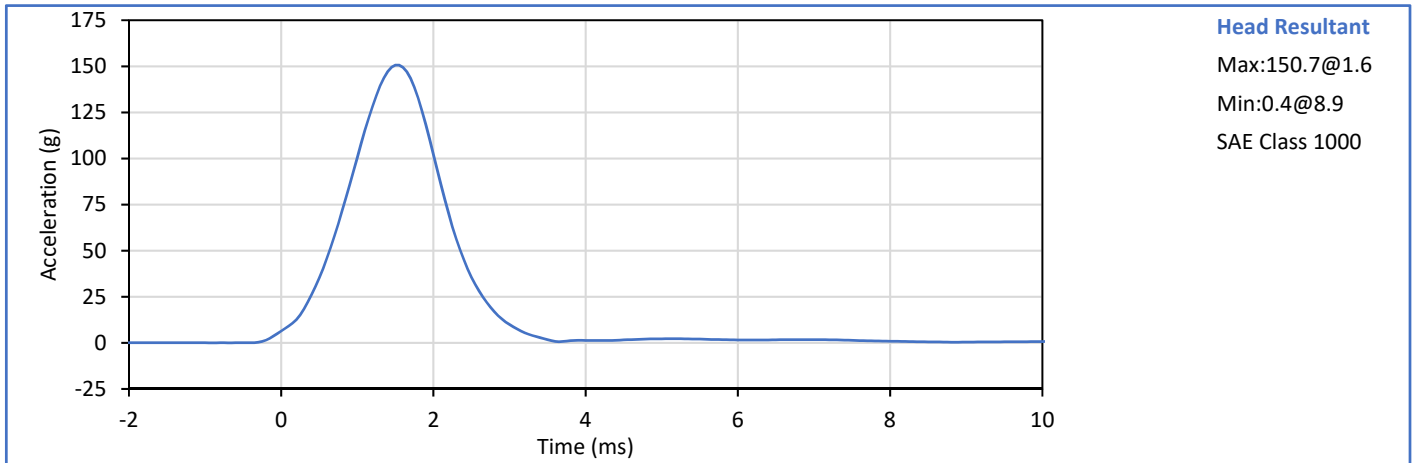
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Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
1 - Sitting Height	mm	900	918	909	Pass
2 - Seat to Shoulder Joint	mm	558	572	565	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	350	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	101	Pass
5 - Sole to Seat, Sitting	mm	433	451	443	Pass
6 - Head Width	mm	152	158	156	Pass
7 - Shoulder/Arm Width	mm	461	479	475	Pass
8 - Thorax Width	mm	322	332	326	Pass
9 - Abdomen Width	mm	273	287	277	Pass
10 - Pelvis Lap Width	mm	359	373	365	Pass
11 - Head Depth	mm	196	206	200	Pass
12 - Thorax Depth	mm	262	272	268	Pass
13 - Abdomen Depth	mm	194	204	198	Pass
14 - Pelvis Depth	mm	235	245	240	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	158	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	613	Pass
				Overall Test Results	Pass


Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

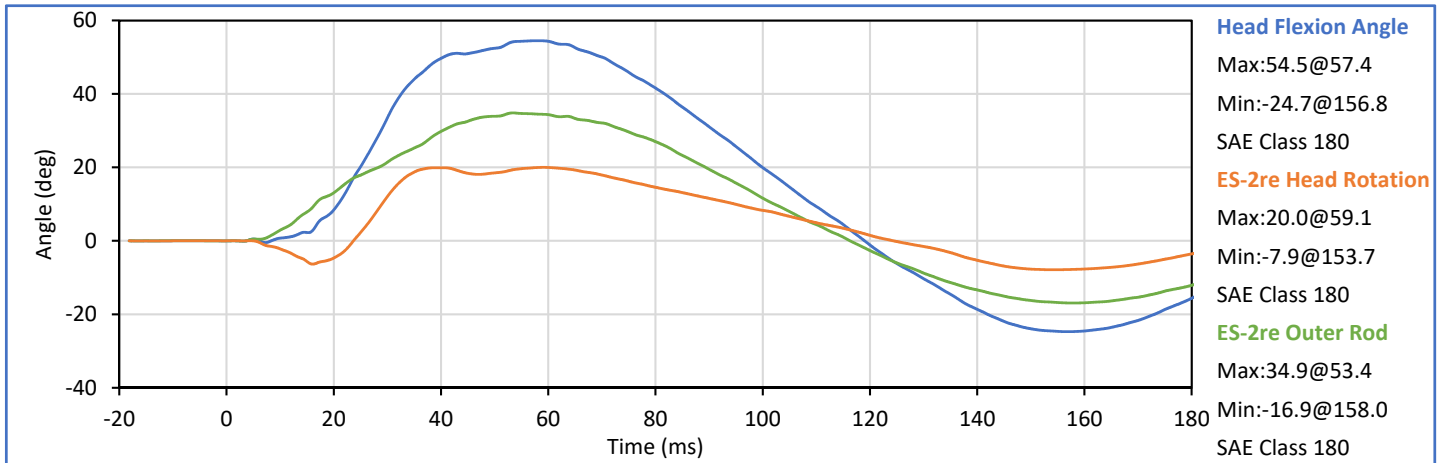
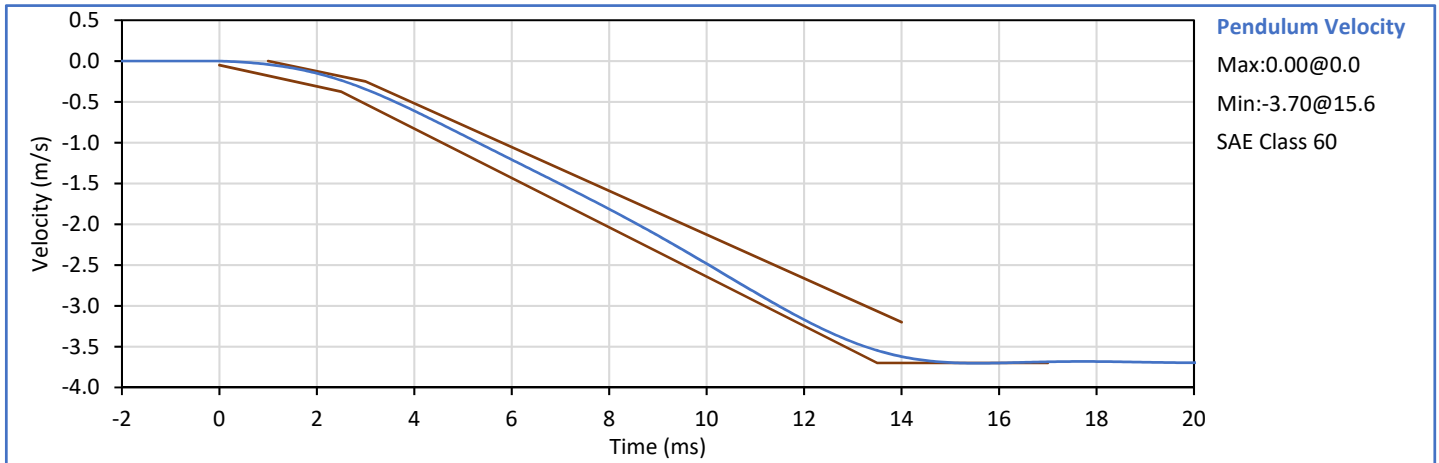
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	32	Pass
Peak Resultant Acceleration	g	125.0	155.0	150.7	Pass
Peak Head Ax	g	-15.0	15.0	6.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass




Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

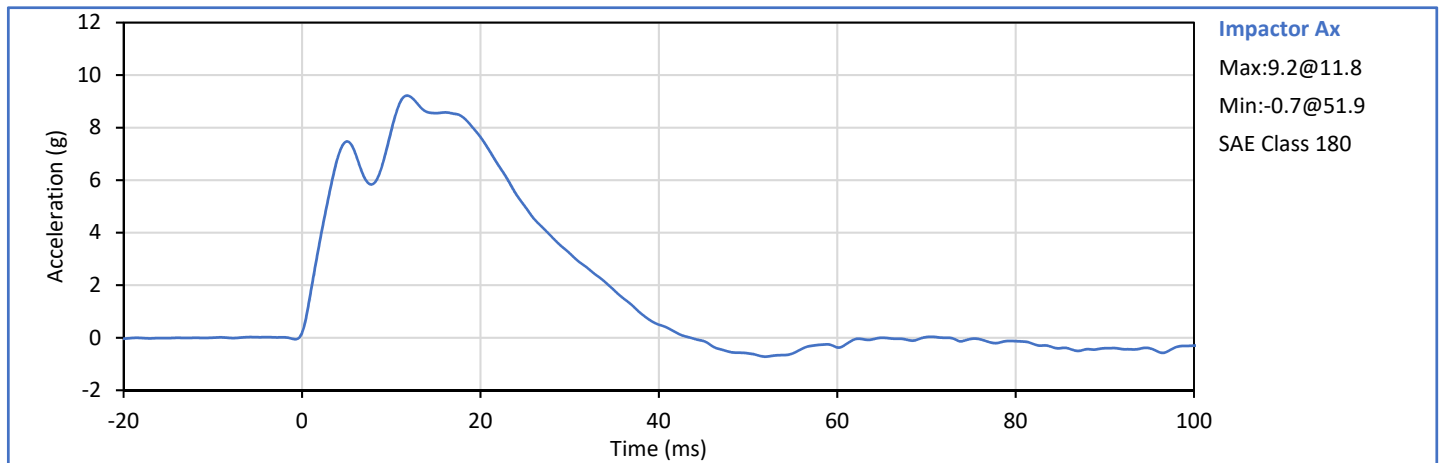
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	3.30	3.50	3.46	Pass
Peak Headform Flexion	deg	49.0	59.0	54.5	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	57.4	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	61.6	Pass
Overall Test Results					Pass



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

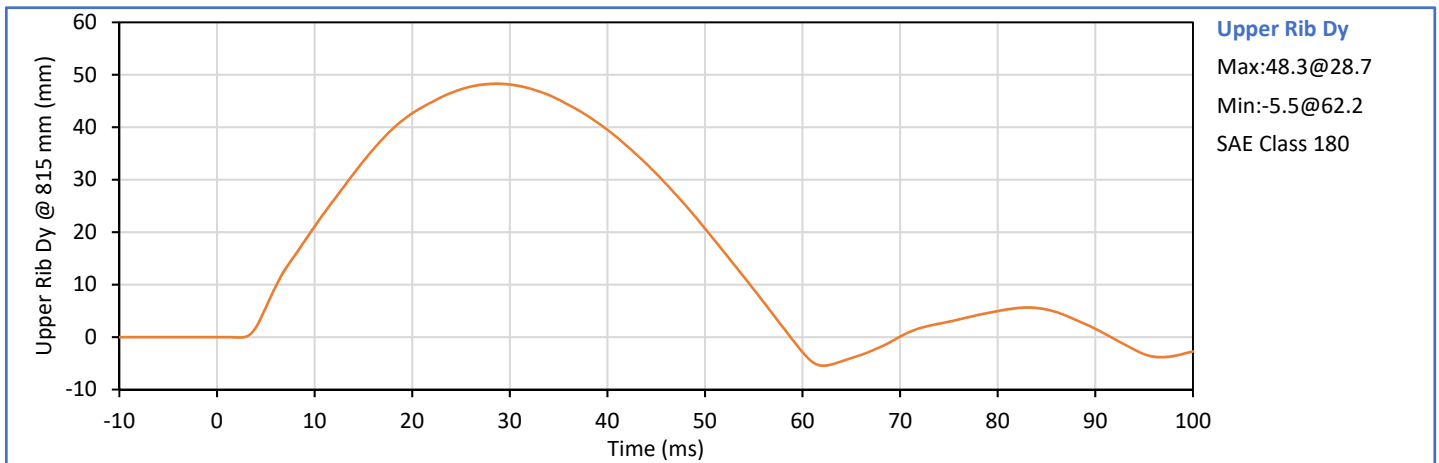
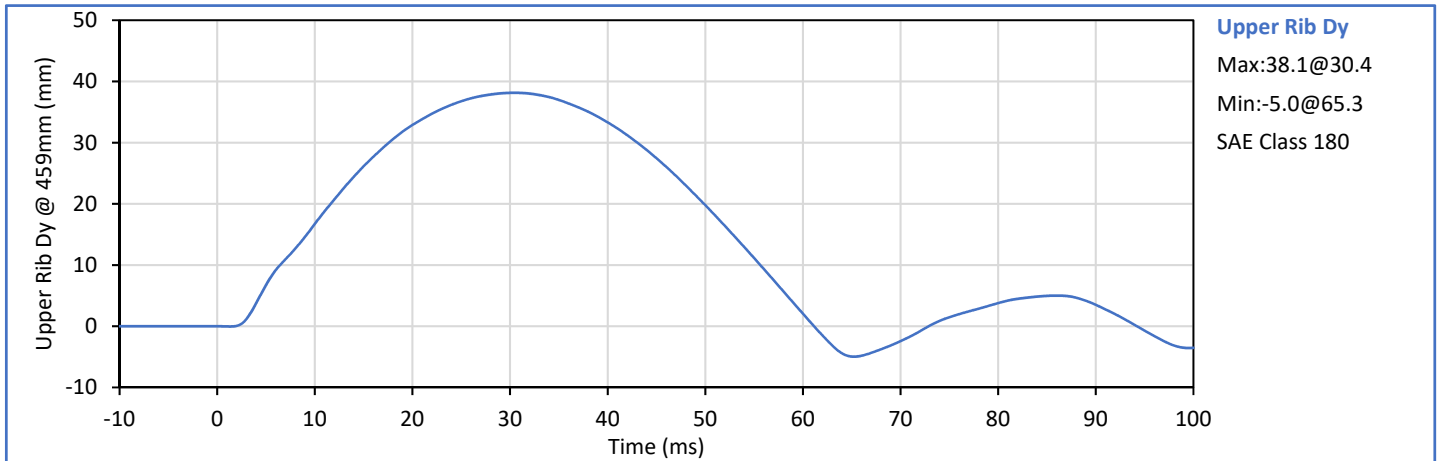
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	4.20	4.40	4.36	Pass
Peak Impactor Ax	g	7.5	10.5	9.2	Pass
Overall Test Results					Pass

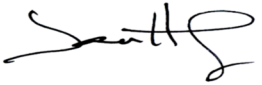



Technician: *J. Hernandez*  
J. Hernandez

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	33	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	38.1	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.3	Pass
Overall Test Results					Pass



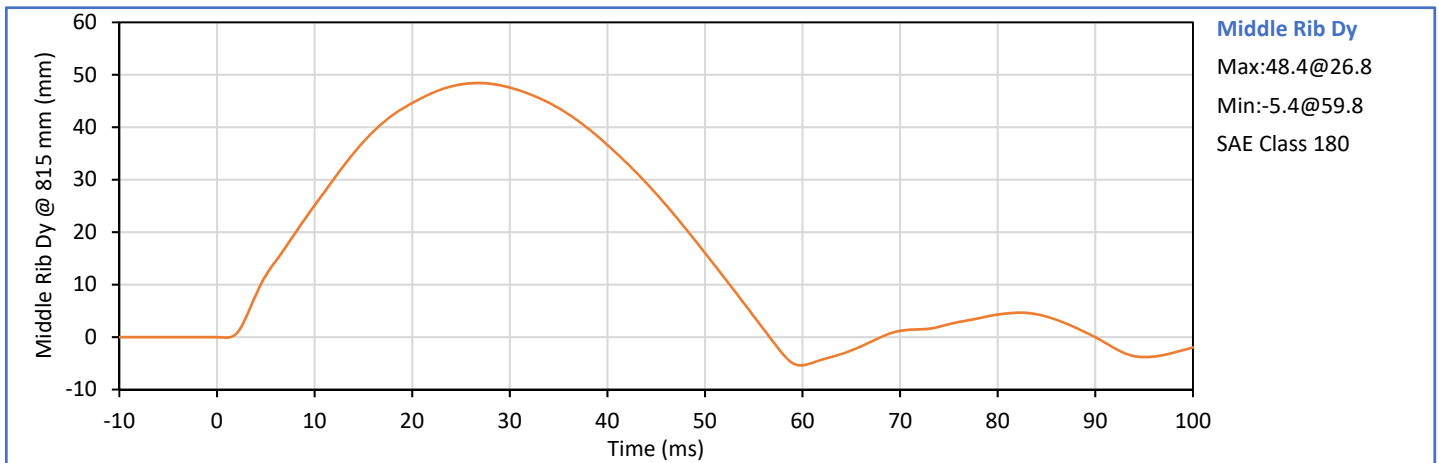
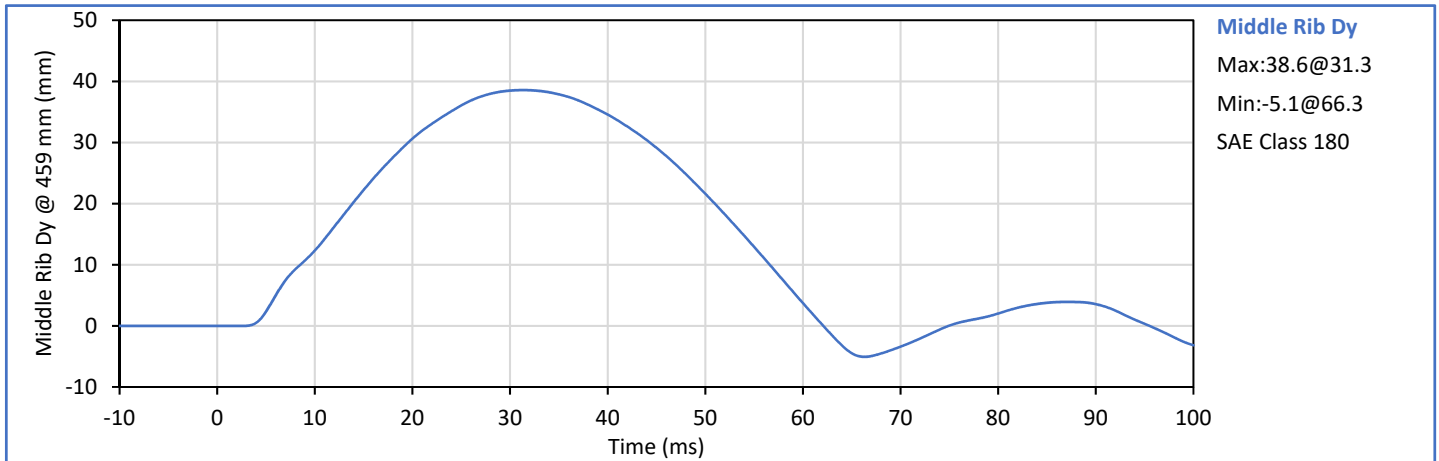
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

ATD Serial No.: F035

Test Date: 2019-11-20

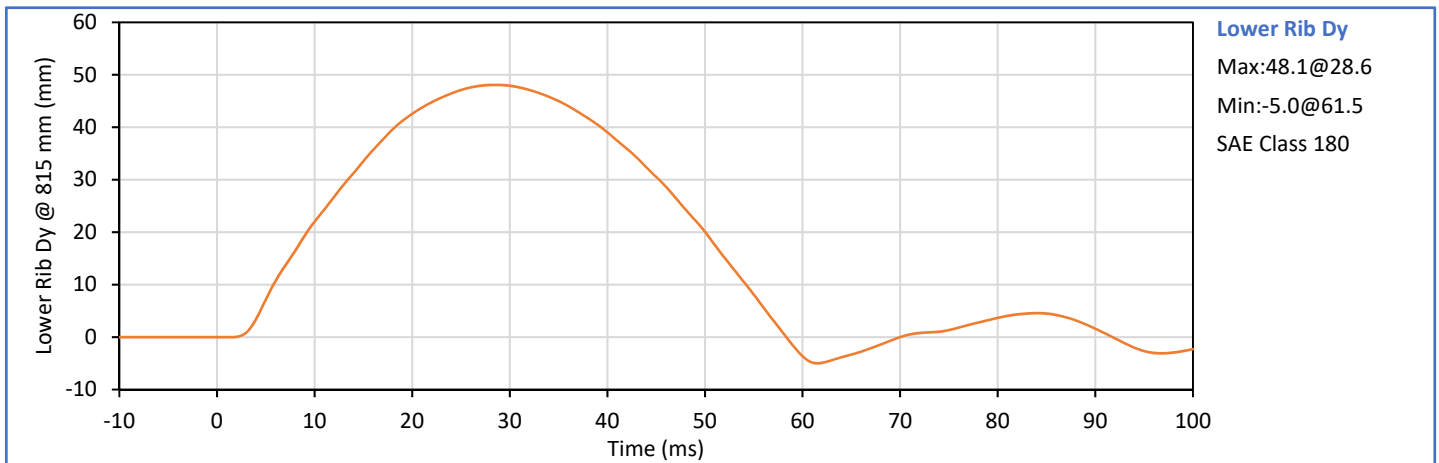
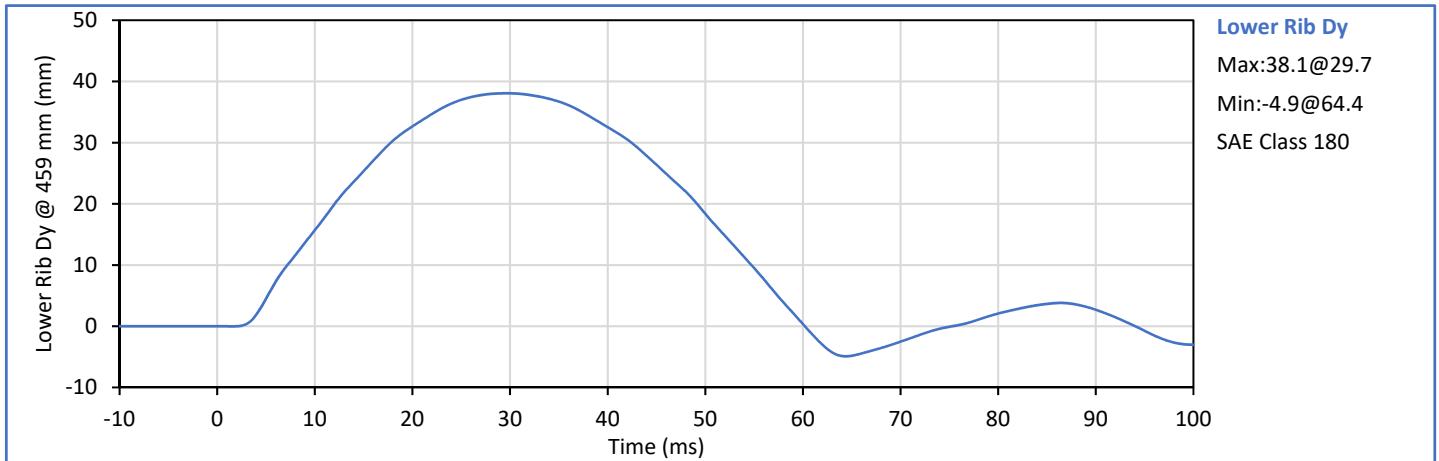
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	33	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	38.6	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	48.4	Pass
Overall Test Results					Pass

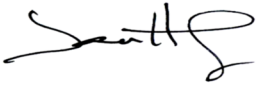



Technician: *J. Hernandez*  
J. Hernandez

Approved By: *P. Puzzuto*  
P. Puzzuto

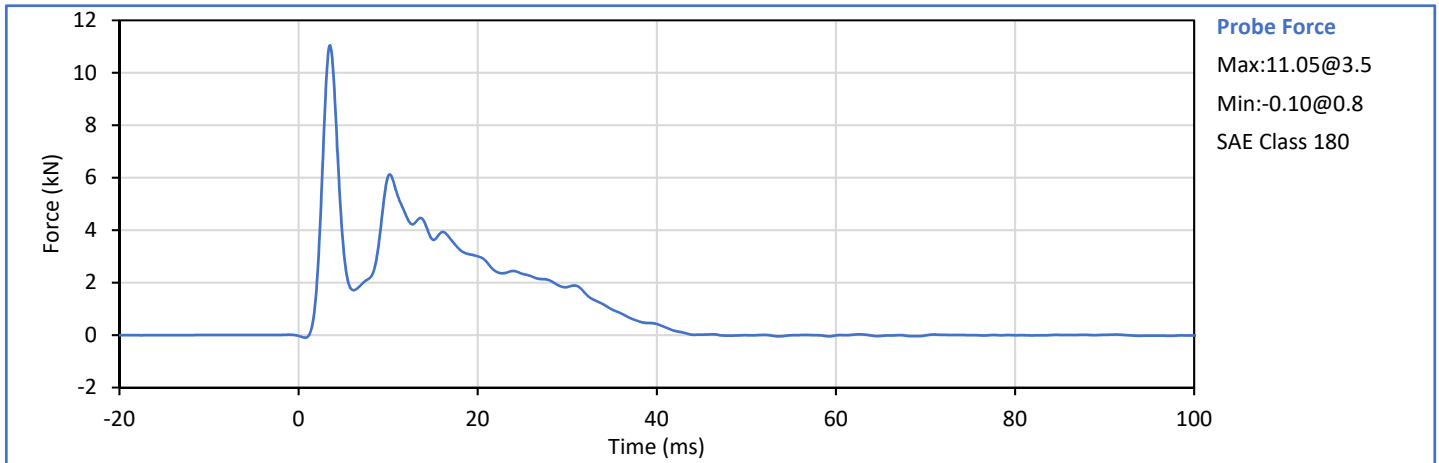
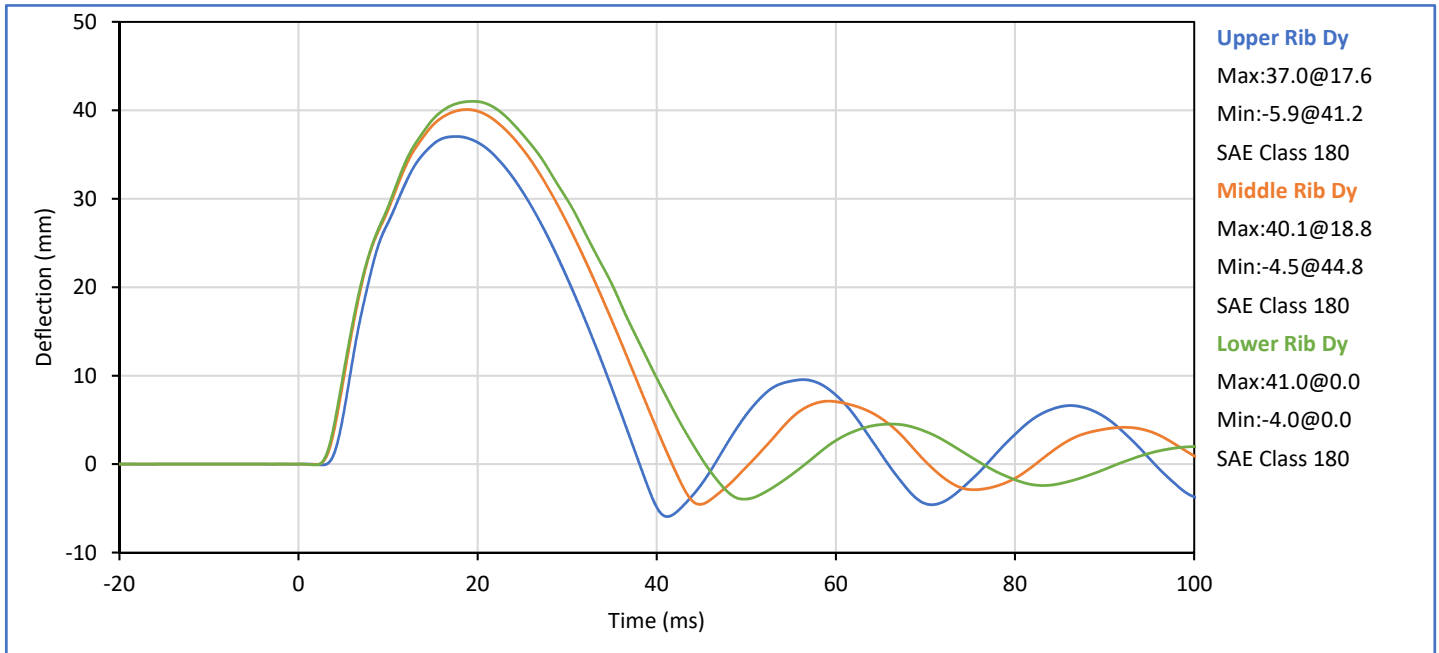
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	33	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	38.1	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	48.1	Pass
Overall Test Results					Pass



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
Impactor Velocity	m/s	5.40	5.60	5.50	Pass
Peak Upper Rib Dy	mm	34.0	41.0	37.0	Pass
Peak Middle Rib Dy	mm	37.0	45.0	40.1	Pass
Peak Lower Rib Dy	mm	37.0	44.0	41.0	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	6.13	Pass
<b>Overall Test Results</b>					<b>Pass</b>

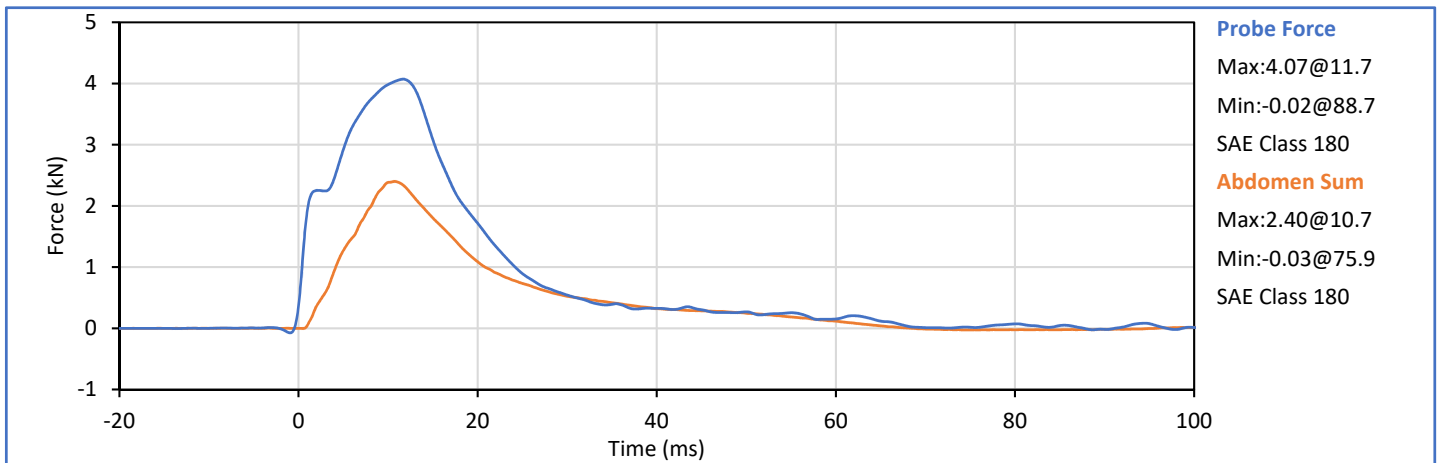
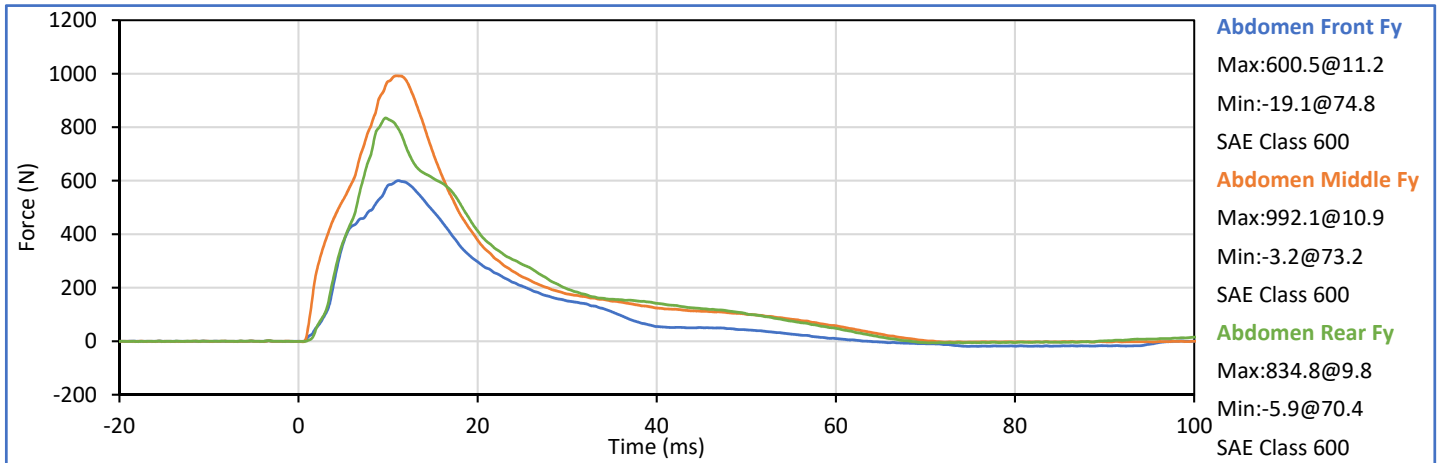


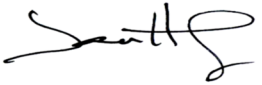
Technician: *J. Hernandez*  
J. Hernandez


Approved By: *P. Puzzuto*  
P. Puzzuto



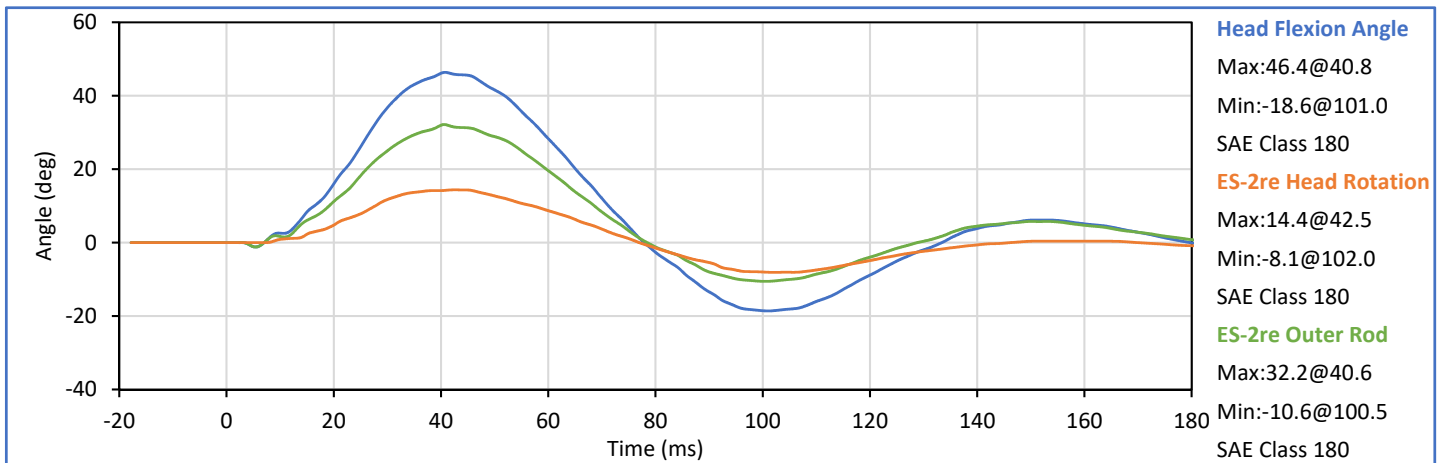
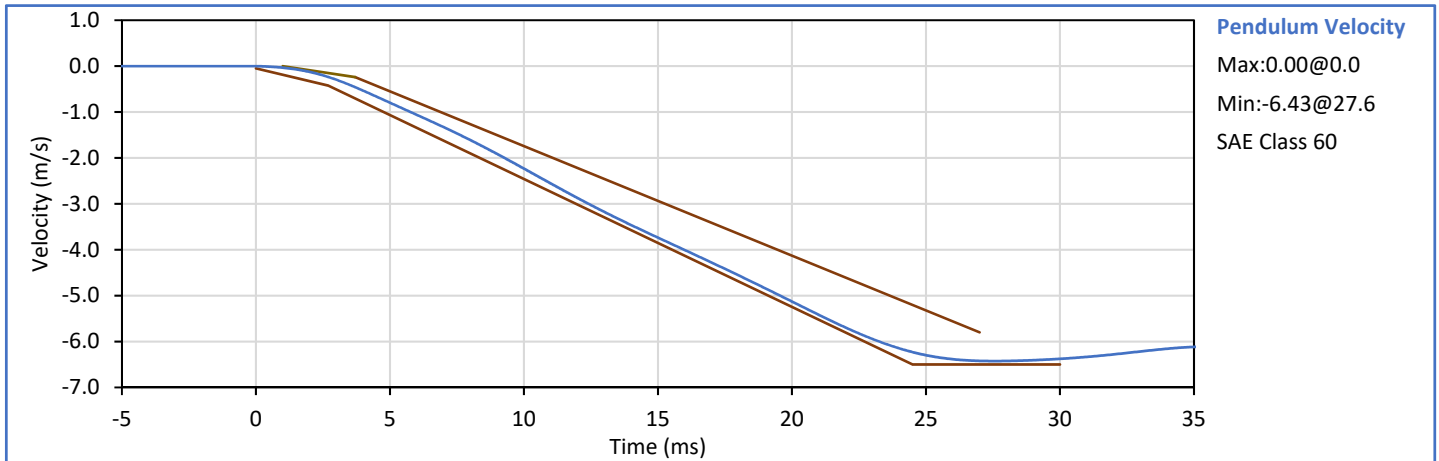
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	3.90	4.10	3.98	Pass
Peak Impactor Force	kN	4.00	4.80	4.07	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.7	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.40	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.7	Pass
<b>Overall Test Results</b>					<b>Pass</b>




Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

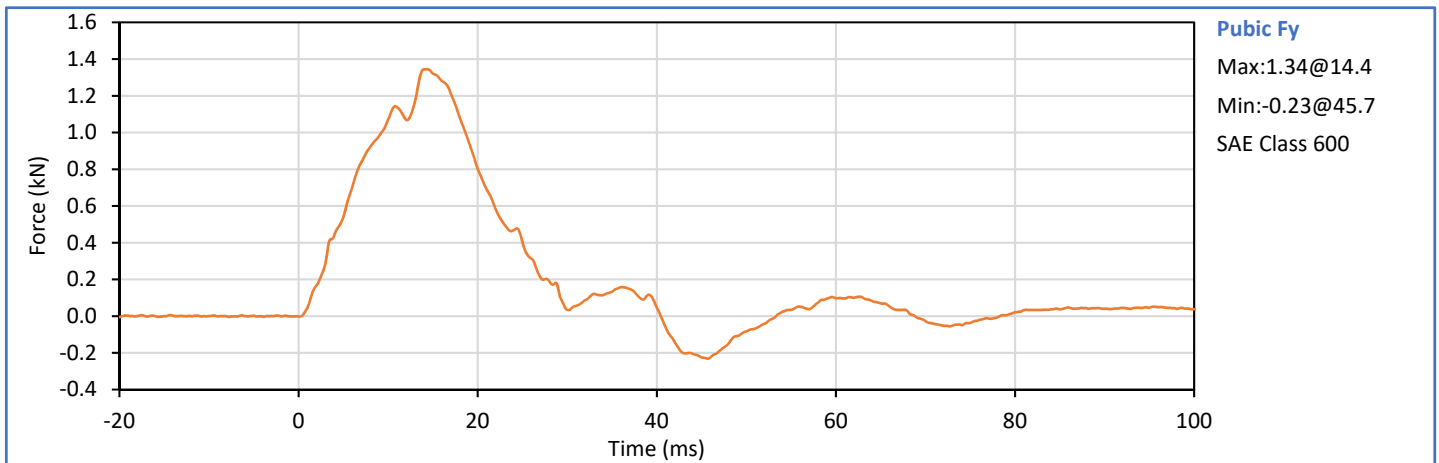
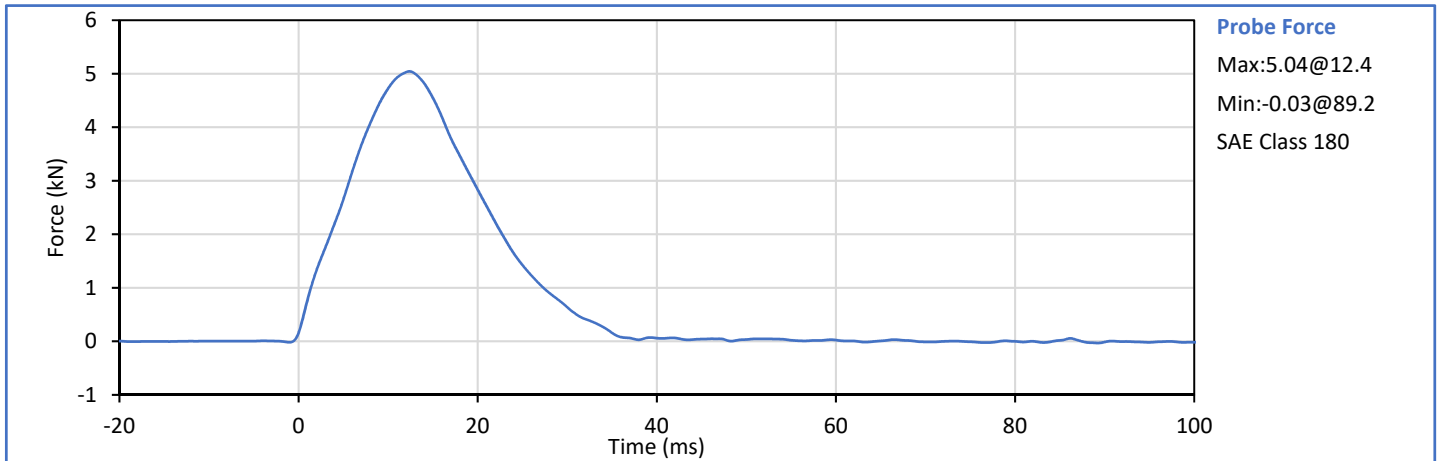
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	5.95	6.15	6.08	Pass
Peak Headform Flexion	deg	45.0	55.0	46.4	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	40.8	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	37.2	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
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Force	kN	4.70	5.40	5.04	Pass
Time of Peak Impactor Force	ms	11.8	16.1	12.4	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.34	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.4	Pass
<b>Overall Test Results</b>					<b>Pass</b>



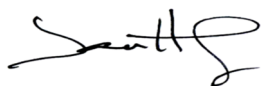
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

**APPENDIX C**  
**Post-Test ATD Qualification and Performance Verification**  
**SID-IIs Small Side Impact ATD**  
**S/N: 299**

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	782	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	81	Pass
D - H Point From Seatback	mm	141	151	150	Pass
E - Shoulder Pivot From Backline	mm	97	107	101	Pass
F - Thigh Clearance	mm	119	135	125	Pass
G - Head Breadth	mm	140	148	143	Pass
H - Head Back From Backline	mm	40	46	43	Pass
I - Head Depth	mm	178	188	182	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	520	Pass
L - Popliteal Height	mm	343	369	352	Pass
K - Knee Pivot To Floor Height	mm	392	409	401	Pass
N - Buttock Popliteal Length	mm	416	442	436	Pass
O - Chest Depth W/O Jacket	mm	195	211	203	Pass
P - Foot Length	mm	216	232	219	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	319	Pass
R - Arm Length	mm	249	259	255	Pass
S - Knee Joint To Seatback	mm	477	493	490	Pass
V - Shoulder Width	mm	341	357	348	Pass
W - Foot Width	mm	78	94	88	Pass
Y - Chest Circumference W/Jacket	mm	851	881	871	Pass
Z - Waist Circumference	mm	761	791	769	Pass
Overall Test Results					Pass

Technician: \_\_\_\_\_



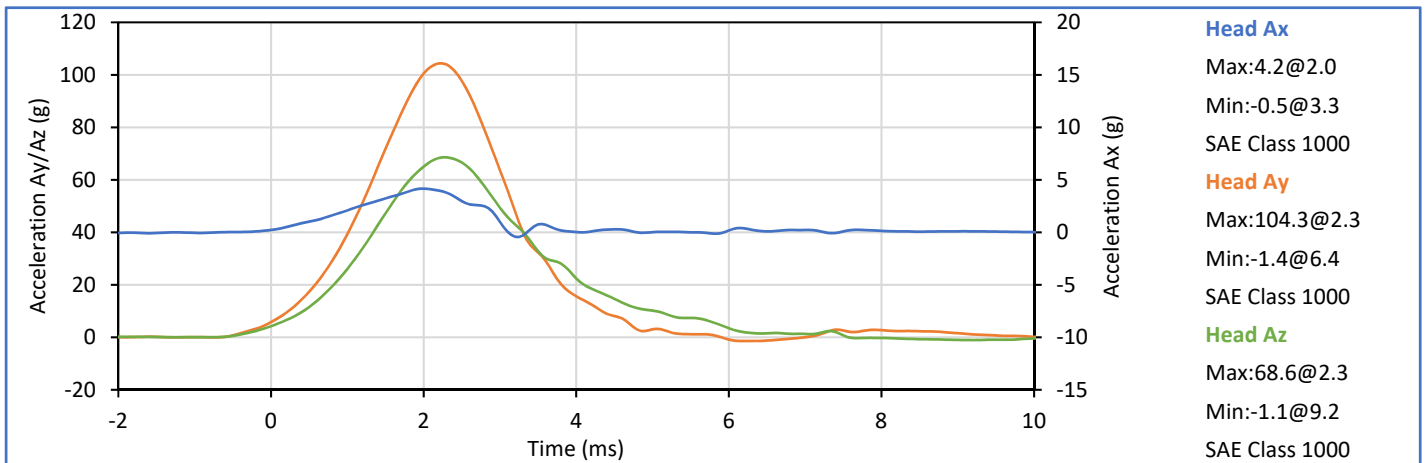
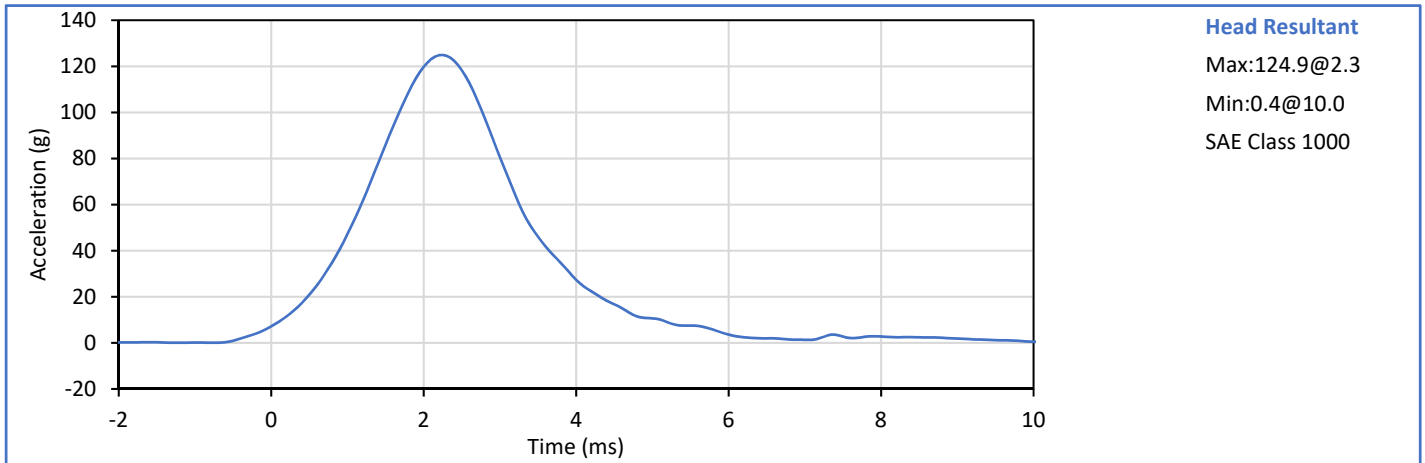
J. Hernandez


Approved By: \_\_\_\_\_




P. Puzzuto

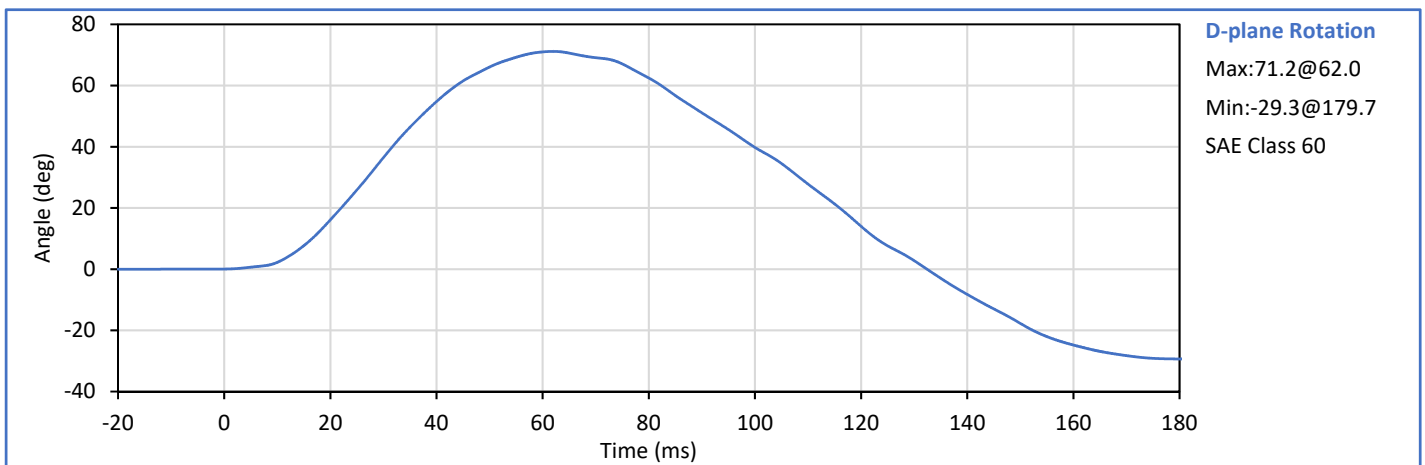
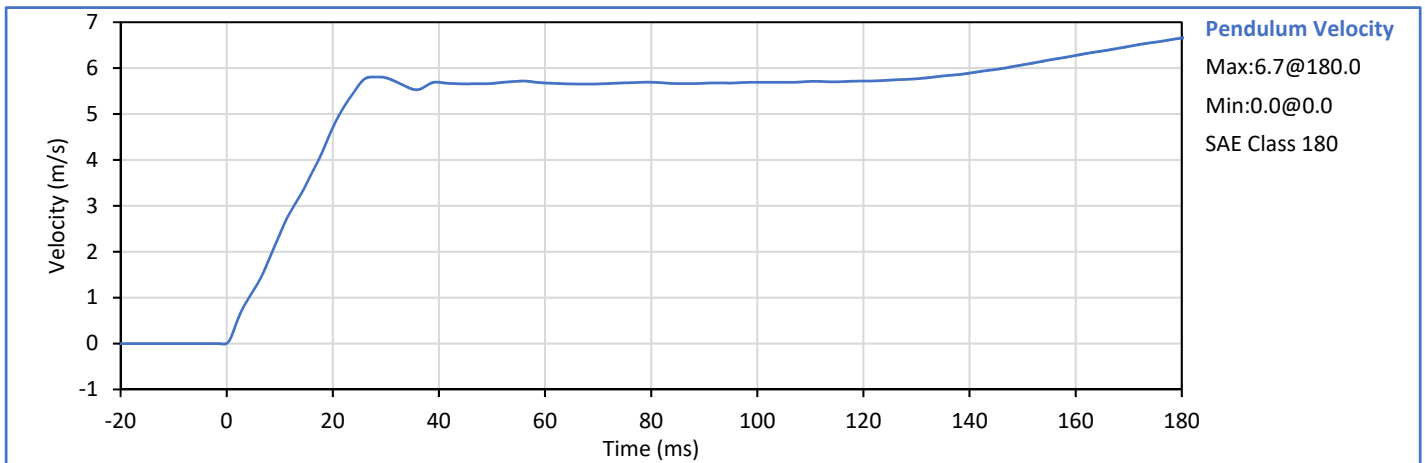
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	24	Pass
Peak Resultant Acceleration	g	115.0	137.0	124.9	Pass
Peak Head Ax	g	-15.0	15.0	-0.7	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass





Technician:   
J. Hernandez

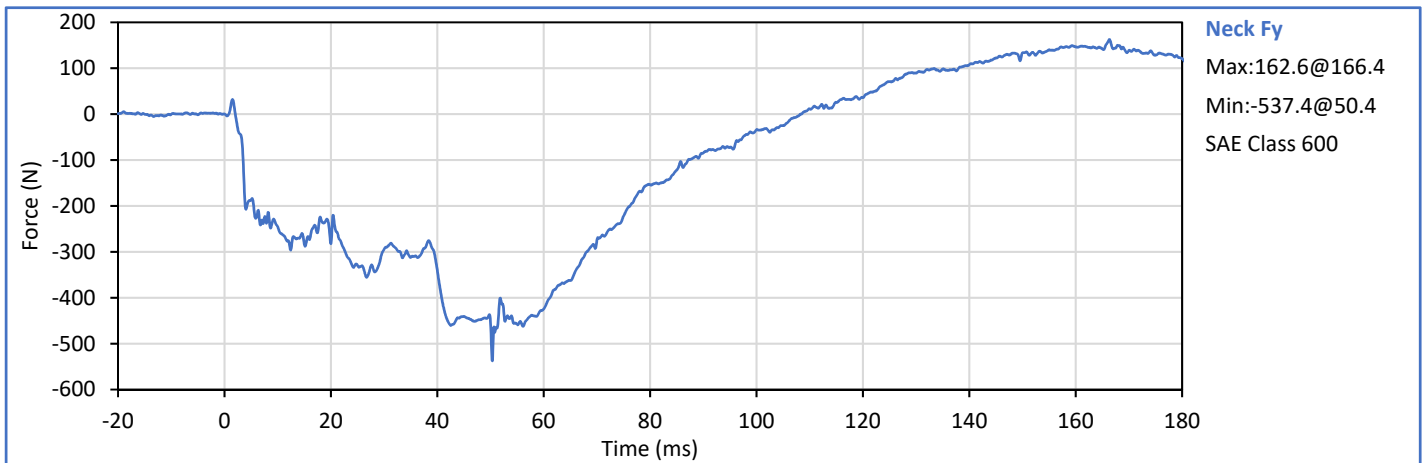
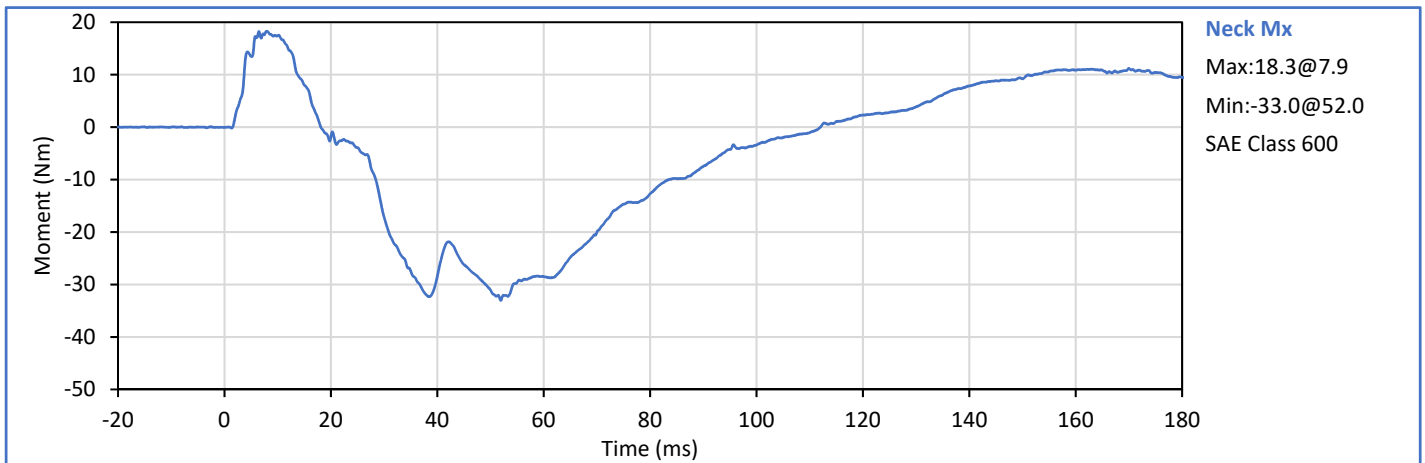
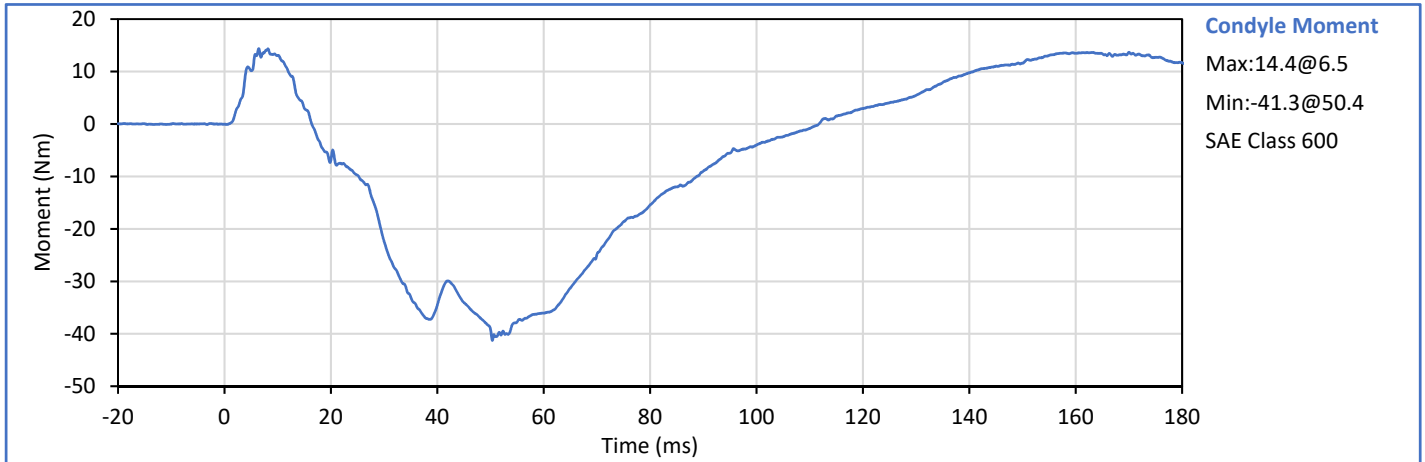
Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	5.51	5.63	5.58	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.38	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.47	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.71	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.65	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	71.2	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	62.0	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-41.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	111.8	Pass
<b>Overall Test Results</b>					<b>Pass</b>



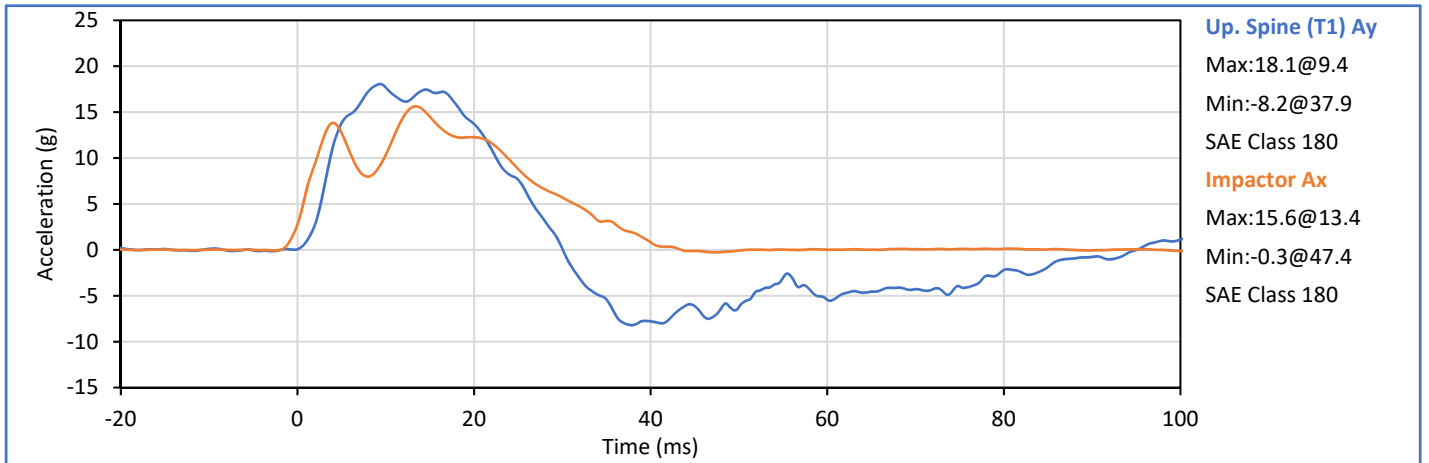
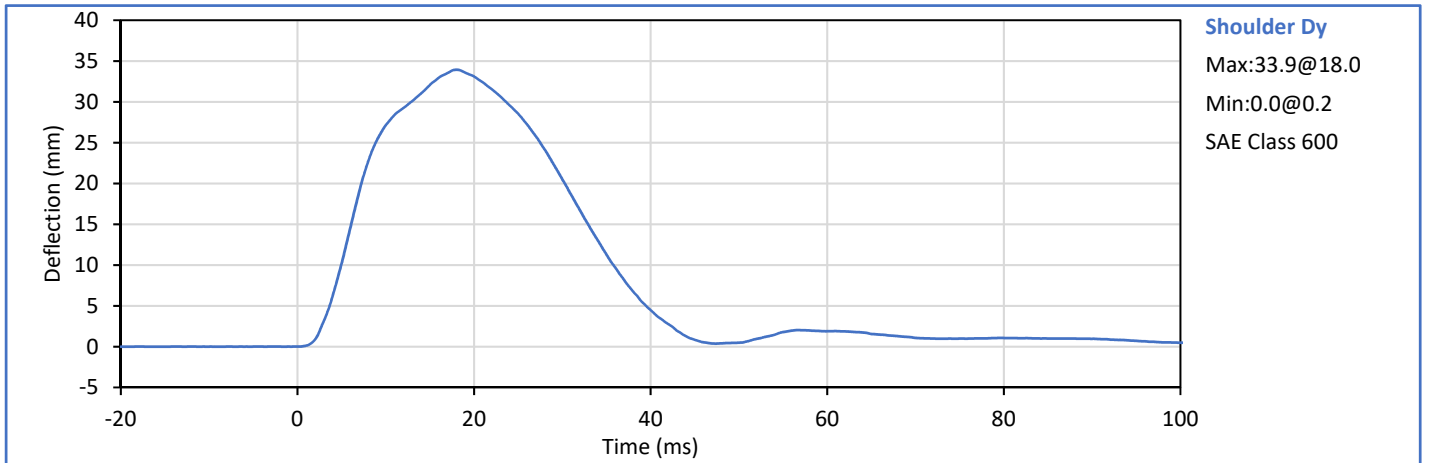
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto






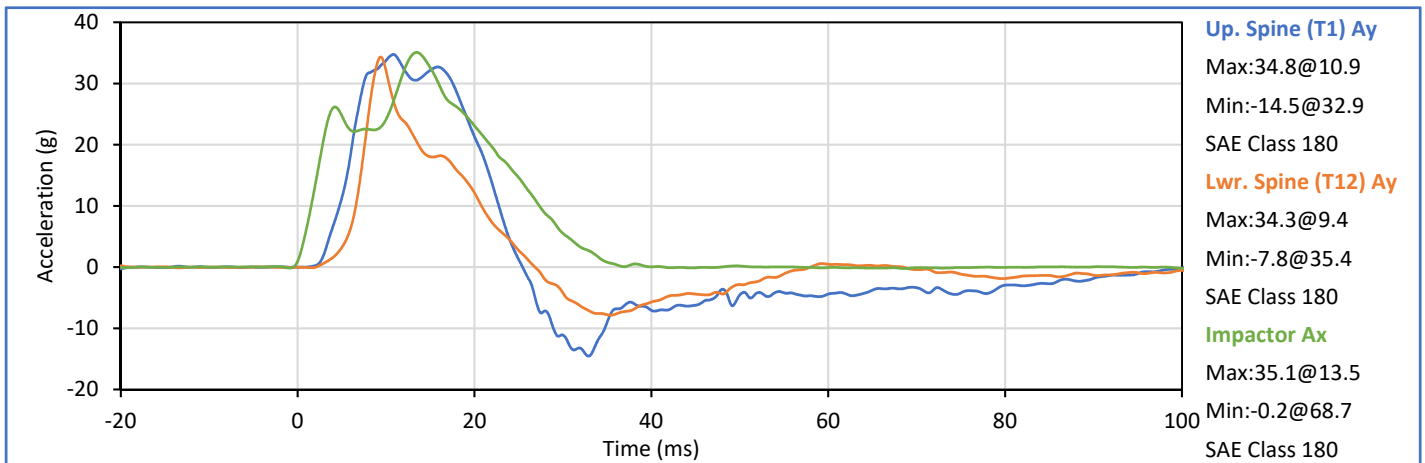
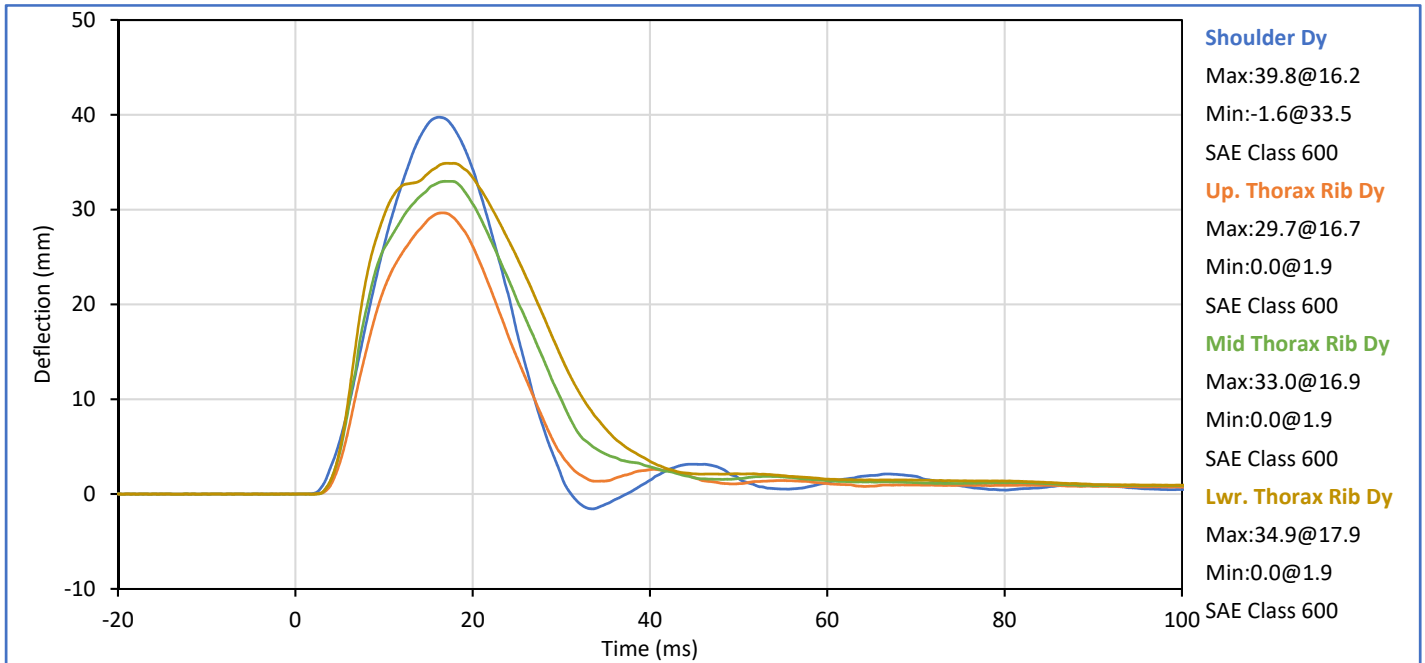
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	24	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.9	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.1	Pass
Peak Impactor Ax	g	13.0	18.0	15.6	Pass
Overall Test Results					Pass





Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

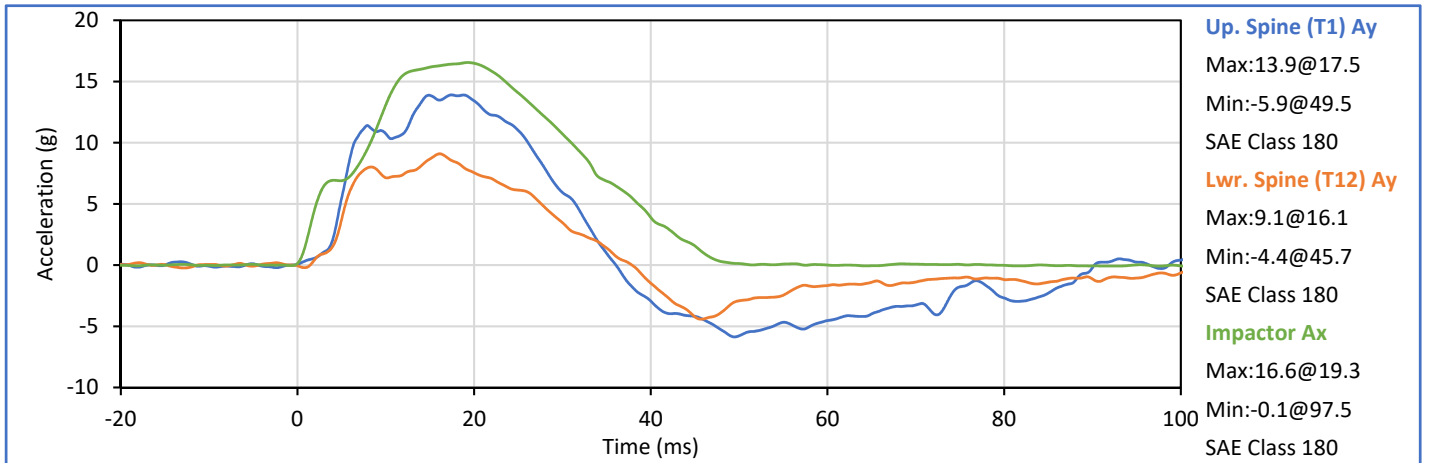
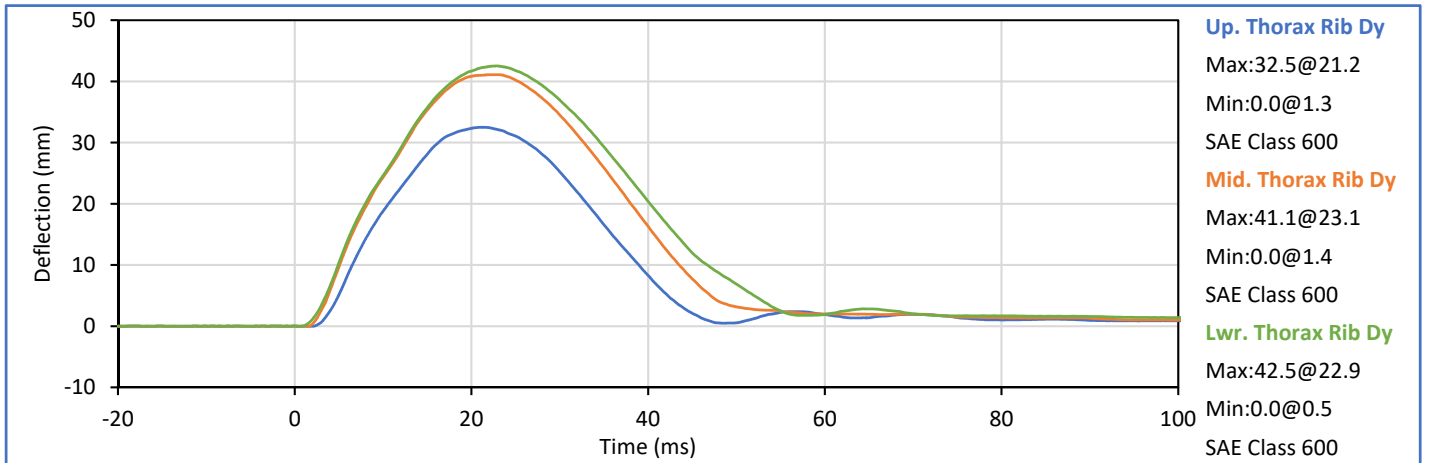
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	24	Pass
Impactor Velocity	m/s	6.60	6.80	6.70	Pass
Peak Shoulder Dy	mm	31.0	40.0	39.8	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.7	Pass
Peak Middle Rib Dy	mm	30.0	36.0	33.0	Pass
Peak Lower Rib Dy	mm	32.0	38.0	34.9	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	34.8	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	34.3	Pass
Peak Impactor Ax	g	30.0	36.0	35.1	Pass
<b>Overall Test Results</b>					<b>Pass</b>





Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

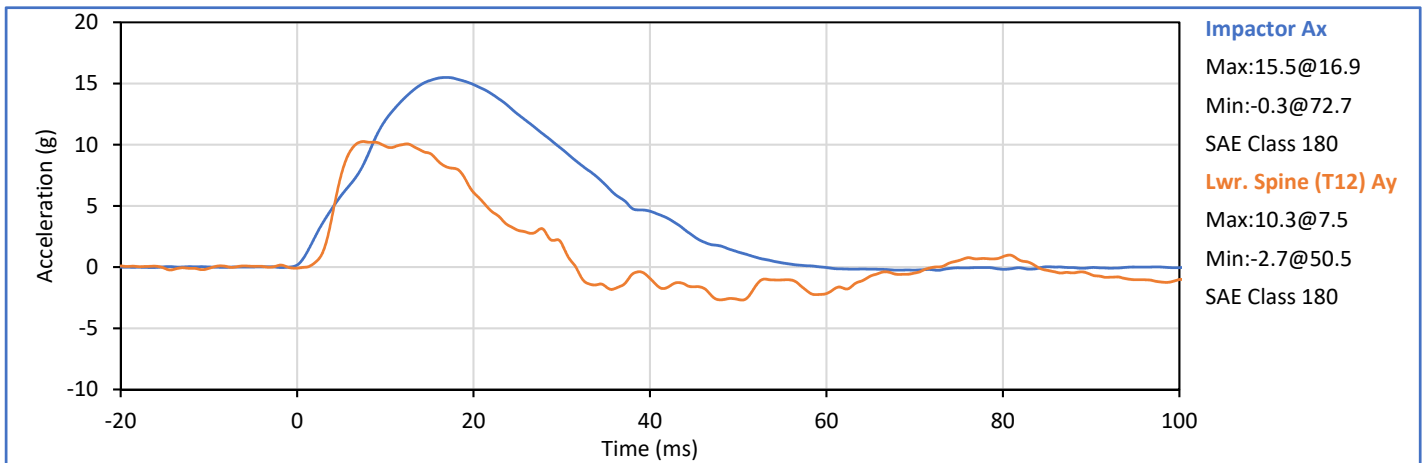
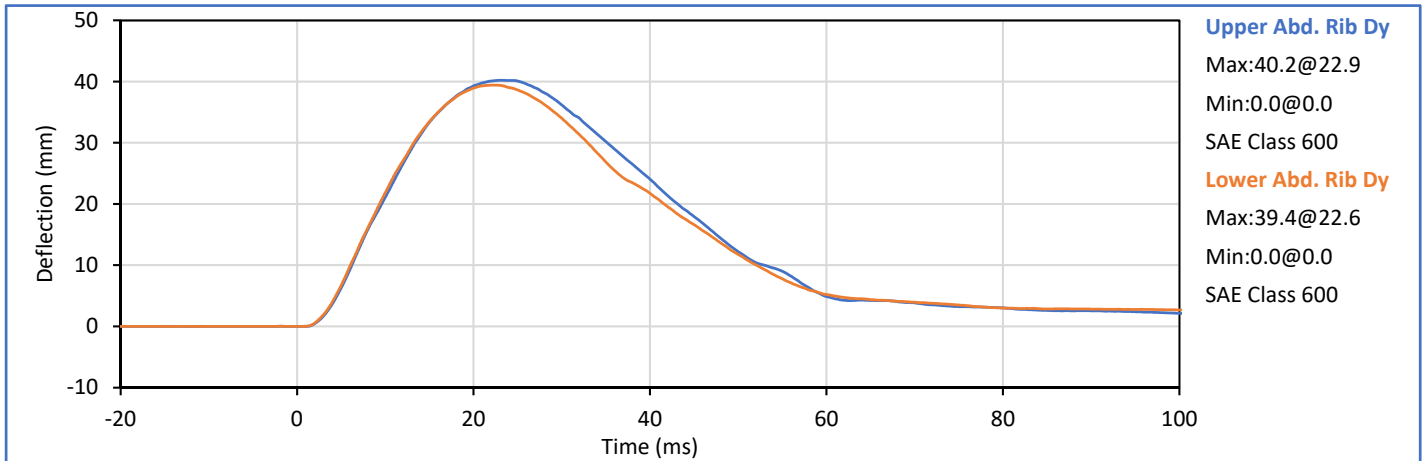
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	24	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Upper Rib Dy	mm	32.0	40.0	32.5	Pass
Peak Middle Rib Dy	mm	39.0	45.0	41.1	Pass
Peak Lower Rib Dy	mm	35.0	43.0	42.5	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	13.9	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	9.1	Pass
Peak Impactor Ax	g	14.0	18.0	16.6	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	25	Pass
Impactor Velocity	m/s	4.20	4.40	4.36	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	40.2	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	39.4	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.3	Pass
Peak Impactor Ax	g	12.0	16.0	15.5	Pass
Overall Test Results					Pass



Technician:   
J. Hernandez

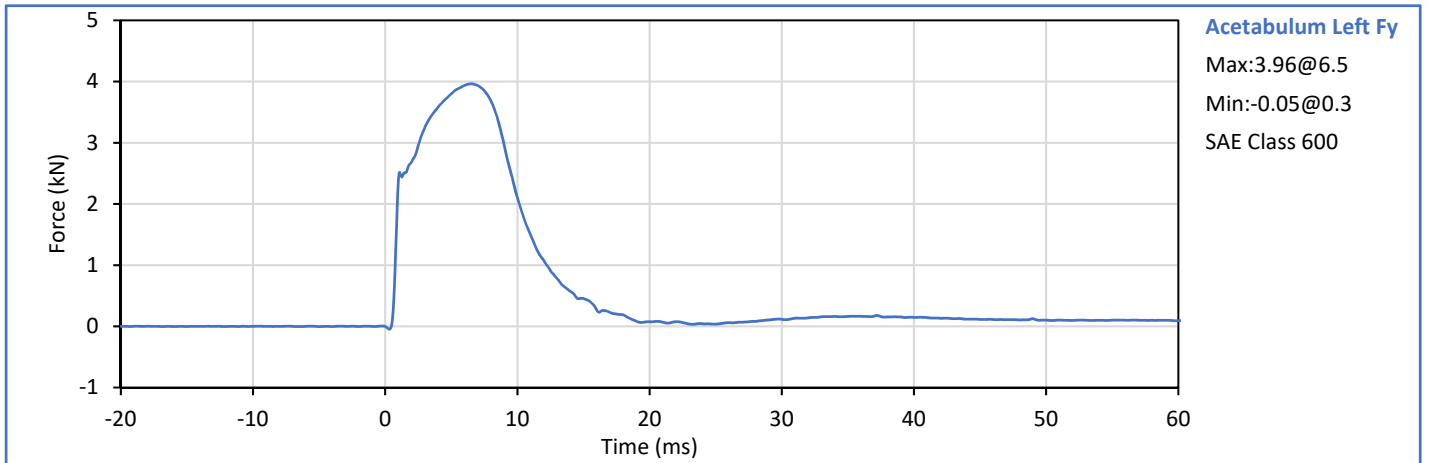
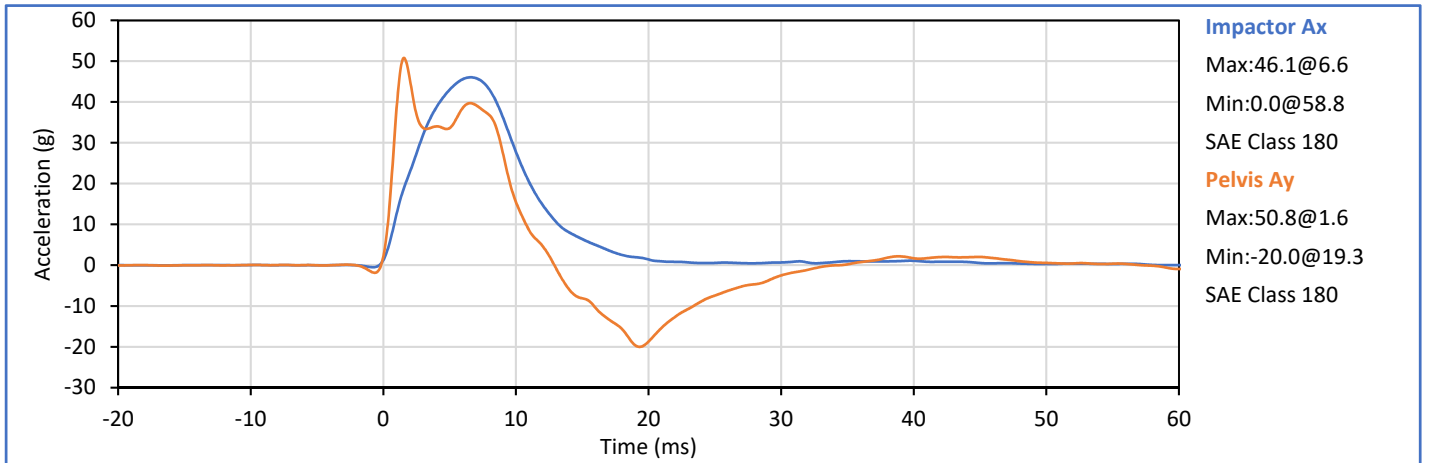
Approved By:   
P. Puzzuto


ATD Serial No.: 299


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 Humidity	%	10	70	24	Pass
Impactor Velocity	m/s	6.60	6.80	6.71	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.96	Pass
Pelvis Ay after 6ms	g	34.0	42.0	39.7	Pass
Peak Impactor Ax	g	38.0	47.0	46.1	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12345 (SACO)



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto



**SID-IIs Pelvis Plug Certification Test**

Plug S/N 12345

Test Number 6731

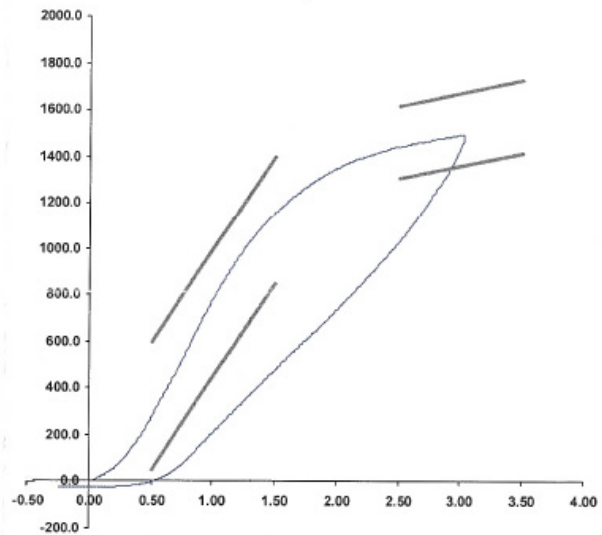
Report Number 6746

Test Date 3/21/2018 1:35:00 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	281.05	50.00	600.00
Force @ 1.5 mm (N)	1,156.02	850.00	1,400.00
Force @ 2.5 mm (N)	1,441.81	1,305.00	1,618.00
Force @ 3.0 mm (N)	1,494.42	1,361.00	1,673.00

Testing Machine STM-20 5965542  
 Load Cell S/N (FI360947), 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 \_\_\_\_\_  
 Part Number 180-4450

Template No 107 21-Mar-18  
 SACO Research

By: DC Date: 3/21/18

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

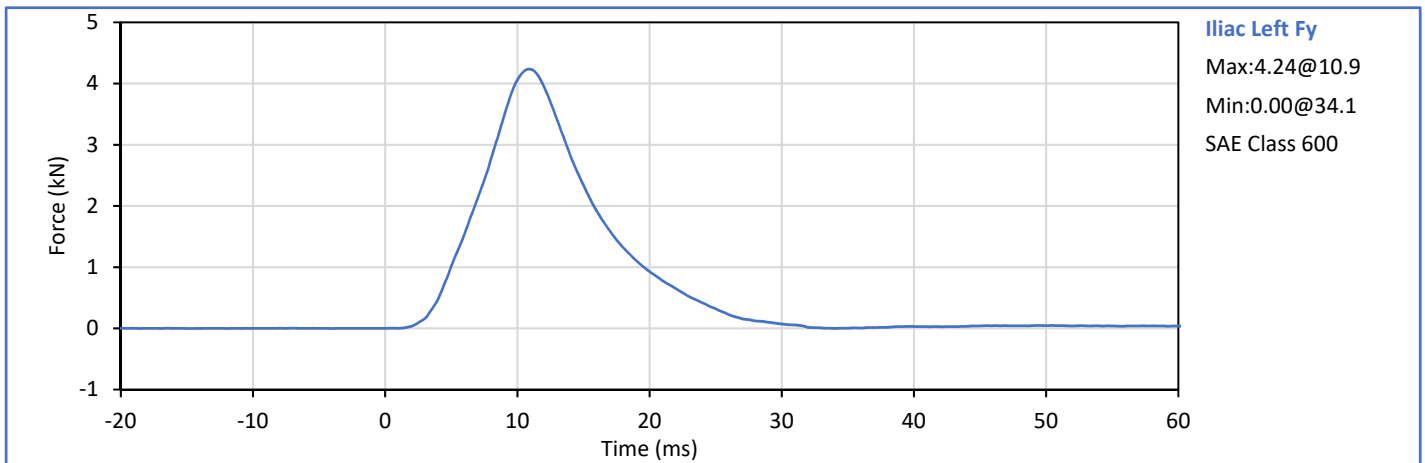
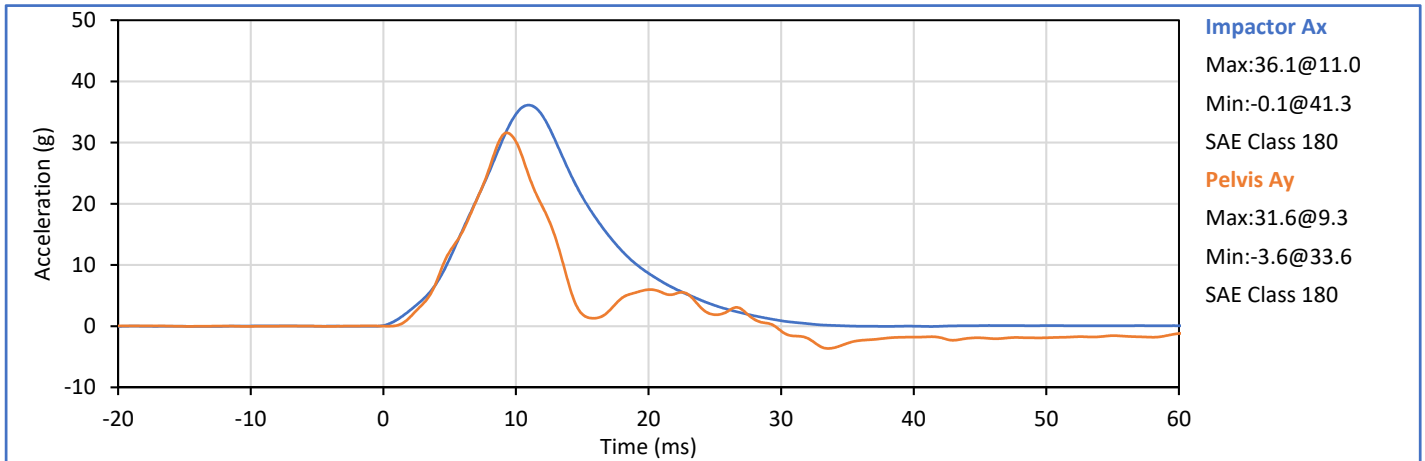
ATD Serial No.: 299


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 Humidity	%	10	70	24	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Iliac Fy	kN	4.10	5.10	4.24	Pass
Pelvis Ay after 6ms	g	28.0	39.0	31.6	Pass
Peak Impactor Ax	g	36.0	45.0	36.1	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 (SACO) \*

\* Plug is not impacted and remains certified



Technician:   
J. Hernandez

Approved By:   
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	P58760	Endevco	7264C-2k	2019-11-04
Head Acceleration Y Primary	P58763	Endevco	7264C-2k	2019-11-04
Head Acceleration Z Primary	P52093	Endevco	7264C-2k	2019-11-04
Head Acceleration X Redundant	P52072	Endevco	7264C-2k	2019-11-04
Head Acceleration Y Redundant	P58768	Endevco	7264C-2k	2019-11-04
Head Acceleration Z Redundant	P52074	Endevco	7264C-2k	2019-11-04
Upper Thorax Rib Deflection Y	180 (ES-2 Rib)	Honeywell	F38000203	2019-11-04
Middle Thorax Rib Deflection Y	177 (ES-2 Rib)	Honeywell	F38000203	2019-11-04
Lower Thorax Rib Deflection Y	186 (ES-2 Rib)	Honeywell	F38000203	2019-11-04
Anterior Abdominal Force Y	1504 Fy	R.A. Denton	2631J	2019-10-22
Middle Abdominal Force Y	1505 Fy	R.A. Denton	2631J	2019-10-22
Posterior Abdominal Force Y	1506 Fy	R.A. Denton	2631J	2019-10-22
Lower Spine T12 Acceleration X	P45011	Endevco	7264C-2k	2019-11-04
Lower Spine T12 Acceleration Y	P58992	Endevco	7264C-2k	2019-11-04
Lower Spine T12 Acceleration Z	P51700	Endevco	7264C-2k	2019-11-04
Pubic Symphysis Force Y	DG6784 Fy	FTSS	IF-556	2019-10-22

**Table 2a - Left Rear Passenger ATD Instrumentation**

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P51929	Endevco	7264C-2k	2019-10-30
Head Acceleration Y Primary	P50086	Endevco	7264C-2k	2019-10-30
Head Acceleration Z Primary	P51931	Endevco	7264C-2k	2019-10-30
Head Acceleration X Redundant	P68604	Endevco	7264C-2k	2019-10-30
Head Acceleration Y Redundant	P51934	Endevco	7264C-2k	2019-10-30
Head Acceleration Z Redundant	P58736	Endevco	7264C-2k	2019-10-30
Upper Thorax Rib Deflection Y	1143	Servo	08TCI-3725	2019-10-30
Middle Thorax Rib Deflection Y	1160	Servo	08TCI-3725	2019-10-30
Lower Thorax Rib Deflection Y	1213	Servo	08TCI-3725	2019-10-30
Upper Abdomen Rib Deflection Y	1218	Servo	08TCI-3725	2019-10-30
Lower Abdomen Rib Deflection Y	1177	Servo	08TCI-3725	2019-10-30
Lower Spine T12 Acceleration X	04I20-Z04	Entran	EGEB6Q-2k	2019-10-30
Lower Spine T12 Acceleration Y	06A07-R08	Entran	EGEB6Q-2k	2019-10-30
Lower Spine T12 Acceleration Z	P58795	Endevco	7264C-2k	2019-10-30
Iliac Wing Impact Side Force Y	278 Fy (Iliac)	R.A. Denton	3228J	2019-04-11
Acetabulum Impact Side Force Y	260 Fy (Acetabulum)	R.A. Denton	3249J	2019-04-11

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

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Rotation Rate X	ARS7571	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Y	ARS7316	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Z	ARS7330	DTS	ARS PRO-8k (2000Hz)	2019-07-08

**Table 3 - Vehicle Instrumentation**

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	10869	Endevco	757F-2k	2019-05-28
Vehicle CG Ay	11186	Endevco	757F-2k	2019-05-21
Vehicle CG Az	10823	Endevco	757F-2k	2019-05-25
Right Side Sill at Front Seat Ax	10853	Endevco	757F-2k	2019-05-24
Right Side Sill at Front Seat Ay	10888	Endevco	757F-2k	2019-05-28
Right Side Sill at Front Seat Az	10914	Endevco	757F-2k	2019-05-24
Right Side Sill at Rear Seat Ax	10887	Endevco	757F-2k	2019-05-28
Right Side Sill at Rear Seat Ay	10898	Endevco	757F-2k	2019-05-28
Right Side Sill at Rear Seat Az	11169	Endevco	757F-2k	2019-05-23
Left Side Sill at Front Seat Ay	10878	Endevco	757F-2k	2019-05-25
Left Side Sill at Rear Seat Ay	10877	Endevco	757F-2k	2019-05-25
Left Lower A-Pillar Ay	10857	Endevco	757F-2k	2019-05-23
Left Middle A-Pillar Ay	10892	Endevco	757F-2k	2019-05-25
Left Lower B-Pillar Ay	10895	Endevco	757F-2k	2019-05-28
Left Middle B-Pillar Ay	10886	Endevco	757F-2k	2019-05-28
Driver Seat Track at H-Point Ay	10854	Endevco	757F-2k	2019-05-24
Rear Seat Structure Ay	10912	Endevco	757F-2k	2019-05-28
Right Rear Occupant Comp. Ay	10900	Endevco	757F-2k	2019-05-28
Engine Block Top Ax	11188	Endevco	757F-2k	2019-05-21
Engine Block Top Ay	10891	Endevco	757F-2k	2019-05-28
Rear Floopan Above Axle Ax	10847	Endevco	757F-2k	2019-05-25
Rear Floopan Above Axle Ay	11151	Endevco	757F-2k	2019-05-23
Rear Floopan Above Axle Az	10907	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