

**REPORT NUMBER: SPNCAP-KAR-20-002
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST**

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

NHTSA No: O20205503

**PREPARED BY:
APPLUS IDIADA KARCO ENGINEERING, LLC.
9270 HOLLY ROAD
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NOVEMBER 26, 2019

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Approval Date: _____ November 26, 2019 _____

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract A 32.20 km/h 75° rigid pole side NCAP impact test was conducted on the subject 2020 Subaru Outback 5-door MPV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on November 12, 2019. The impact velocity was 32.54 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 24.4°C. The target vehicle's maximum post-test static crush was 350 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>145.6</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>43</td> </tr> <tr> <td>Total Pelvic Force (Sum of Acetabular and Iliac Forces)</td> <td>N</td> <td>5525</td> <td>2999</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>19</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45</td> <td>22</td> </tr> </tbody> </table> The struck side doors of the vehicle were jammed shut and did not separate from the body at the hinges or latches. The remaining doors did not open during the side impact event.				Measurement Description	Driver ATD (SID-IIs)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	145.6	Resultant Lower Spine Acceleration	g	82	43	Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2999	Maximum Thoracic Rib Deflection	mm	38	19	Maximum Abdominal Rib Deflection	mm	45	22
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17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Admin. Technical Information Services Division, NPO-411 1200 New Jersey Ave., SE Washington, DC 20590																												
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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test is part of the MY 2020 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-14-D-00355L. The purpose of this test is to generate comparative side impact performance in a 2020 Subaru Outback 5-door MPV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure date October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2020 Subaru Outback 5-door MPV. The subject vehicle was towed into the rigid pole at an angle of 75.9° and a velocity of 32.54 km/h. The test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California on November 12, 2019. Pre- and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated October 2015. Camera locations and other pertinent camera information are included in this report.

The Part 572V (SID-IIs) was instrumented accordingly:

- Primary and Redundant Head CG tri-axial accelerometers
- Thorax upper, middle and lower rib displacement potentiometers
- Abdomen upper and lower rib displacement potentiometers
- Lower spine (12) tri-axial accelerometers
- Iliac load cell
- Acetabulum load cell

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 contains the test equipment and instrumentation calibration data.

Injury readings for the SID-IIs dummy were recorded as follows:

Measurement Description	Units	Driver ATD (SID-IIs)	
		IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	145.6
Lower Spine (T12) Resultant Acceleration	g	82	43
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2999
Maximum Thoracic Rib Deflection	mm	38*	19
Maximum Abdominal Rib Deflection	mm	45*	22

**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	No
Seat Belt Load Limiter	Yes	Yes	Yes	No

GENERAL COMMENTS

The struck side doors of the vehicle were jammed shut. There was no separation at the hinges or latches. The remaining doors remained closed and latched. There were no ATD values that exceeded limits. The as-tested weight of the vehicle exceeded the target vehicle test weight. The Driver Seat Track Acceleration Y channel failed at 50.6 milliseconds and the Right Roof Acceleration Y channel failed at 54.5 milliseconds. The Vehicle CG Acceleration X channel failed and no data was collected.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

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	lb/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20205503
Model Year	2020
Make	Subaru
Model	Outback
Body Style	5-Door MPV
VIN	4S4BTACCXL3106725
Body Color	Magnetite Gray Metallic
Odometer Reading (km / mi)	121 / 75
Engine Displacement (L)	2.5
Type / No. of Cylinders	Inline 4
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8 Speed
Overdrive	Automatic
Final Drive	AWD
Roof Rack	Yes
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

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

No

DATA FROM CERTIFICATION LABEL

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

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

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

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

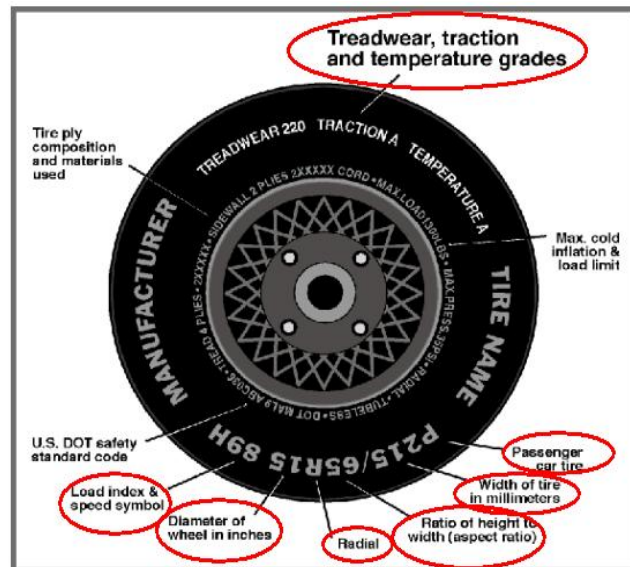
VEHICLE SEAT TYPE

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	230
Recommended Tire Size	225/65R17	225/65R17
Tire Size on Vehicle	225/65R17	225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	AVID GT	AVID GT
Treadware	400	400
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	102H	102H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	44F5 6JK 0919	44F5 6JK 0919
DOT Safety Code Right	44F5 6JK 0919	44F5 6JK 0919

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

TIRE PRESSURES

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

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	468.5	369.0		505.0	453.0		493.0	471.0	
Right	kg	461.0	353.0		451.5	420.5		437.0	432.5	
Ratio	%	56.3%	43.7%	100.0%	52.3%	47.7%	100.0%	50.7%	49.3%	100.0%
Total	kg	929.5	722.0	1651.5	956.5	873.5	1830.0	930.0	903.5	1833.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1651.5	A
Actual Weight of 1 P572V ATD Used	kg	49.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	67.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1768.3 ¹	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 ☒ No¹

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	As Delivered	As Tested	Fully Loaded	Meets Requirement***
Driver Door Sill Angle (front-to-rear)*	°	-0.4	0.2	0.2	Yes
Front Passenger Sill Angle (front-to-rear)*	°	-0.2	0.5	0.1	Yes
Front Bumper-Line Angle (left-to-right)**	°	0.2	0.3	-0.4	Yes
Rear Bumper-Line Angle (left-to-right)**	°	-0.7	0.3	-1.0	Yes
Vehicle CG (Aft of Front Axle)	mm	1193	1303	1345	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	11	36	39	

*ND=Nose Down (-), NU=Nose Up (+) **LD=Left Down (-), LU=Left Up (+)

***The "As Tested" vehicle attitude angle measurements must be within "As Delivered" and the "Fully Loaded" vehicle attitude measurements at each location. Indicate "Yes" or "No" for "Meets Requirement"

¹The As Tested weight of the test vehicle exceeded the Target Test Weight due to an error in calculating the Calculated Vehicle Target Weight.

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Trim	6.0
Ballast / Equipment Added	135.5

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 Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	6.6	0.0	3.3
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 SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	3.3	241	Max	239	250	260
			Mid	221	232	241
			Min	202	213	222
Front Passenger Seat	Fixed	238	Max			
			Mid	220	231	238
			Min			
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

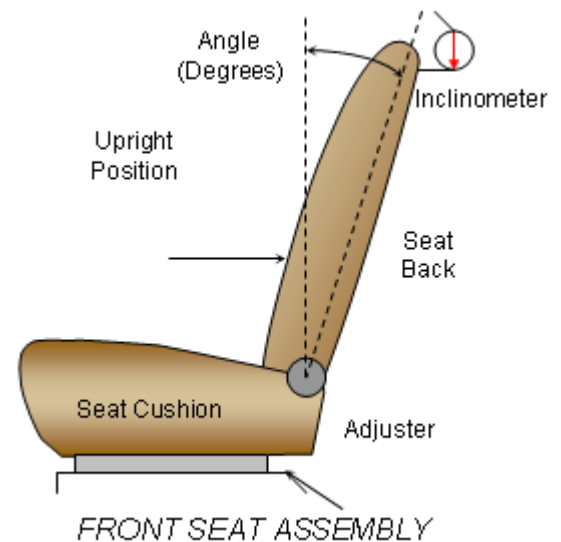
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	250		0	
Front Passenger Seat	250	26	0	0
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 such that the dummy's head is level. The front passenger's seat back is positioned in a similar manner to the driver's seat. The struck side rear passenger seat back is positioned in accordance with the information provided by the manufacturer in Form 1 for the 5th percentile female dummy in a Side NCAP MDB Test. The rear center and non-struck side rear passenger's seat back is set to match the struck side rear seat back. Seat back angle is measured from the headrest post.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/Seated Dummy	58.5		3.6	
Front Passenger Seat	53.2	30	3.6	0
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

*Detent zero (0) is the forward most detent

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503

Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

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

HEAD RESTRAINT ADJUSTMENT

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

	Total No. of Positions	Placed in Position
Driver Seat	4	L

DATA SHEET NO. 2 ... (CONTINUED)

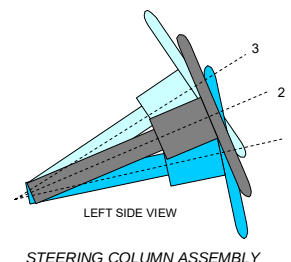
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

STEERING COLUMN ADJUSTMENT

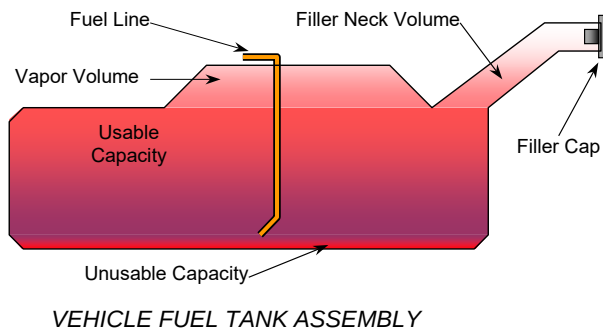
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of the geometric locus it describes when it moves through its full range of motion.

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	21.0	105
Geometric Center - Position 2	23.0	134
Uppermost - Position 3	24.9	163
Telescoping Steering Wheel Travel		58
Test Position	23.0	134



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

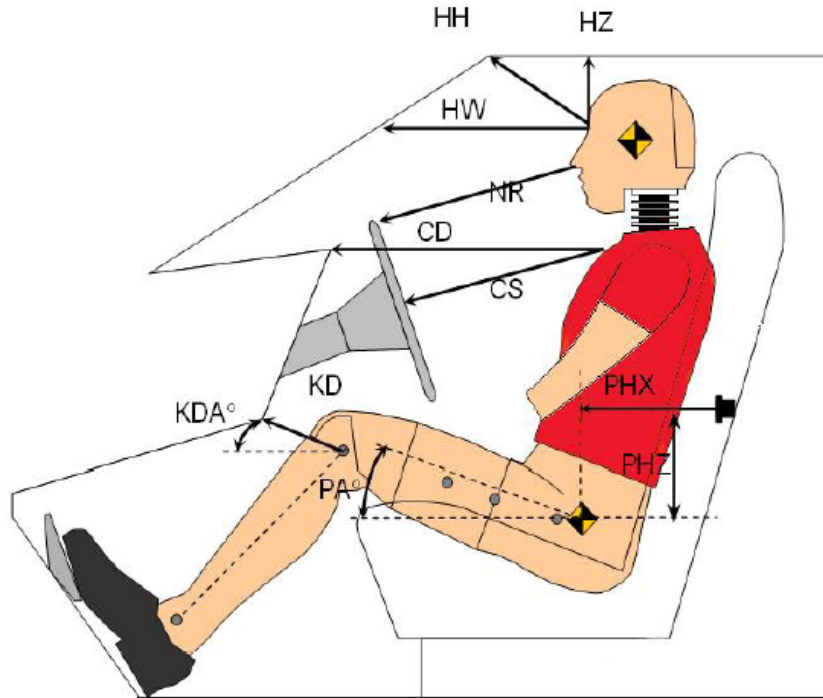
Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	70.03
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	70.03
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	65.13
Actual amount of Solvent 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% $\pm$ 1% of the Usable Capacity stated in the Form No. 1? ☒ Yes ☐ No

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	282	
HW	Head to Windshield	660	
HZ	Head to Roof	209	
NR	Nose to Rim	264	
CD	Chest to Dash	418	
CS	Chest to Steering Wheel	190	
KD(L)/KDA(L)°	Left Knee to Dash	112	38.8
KD(R)/KDA(R)°	Right Knee to Dash	97	47.5
PAX°	Pelvic Tilt Angle (x-axis)		20.4
PAY°	Pelvic Tilt Angle (y-axis)		0.1
PHX	Hip Point to Striker (x-axis)	365	
PHZ	Hip Point to Striker (z-axis)	196	

DATA SHEET NO. 4

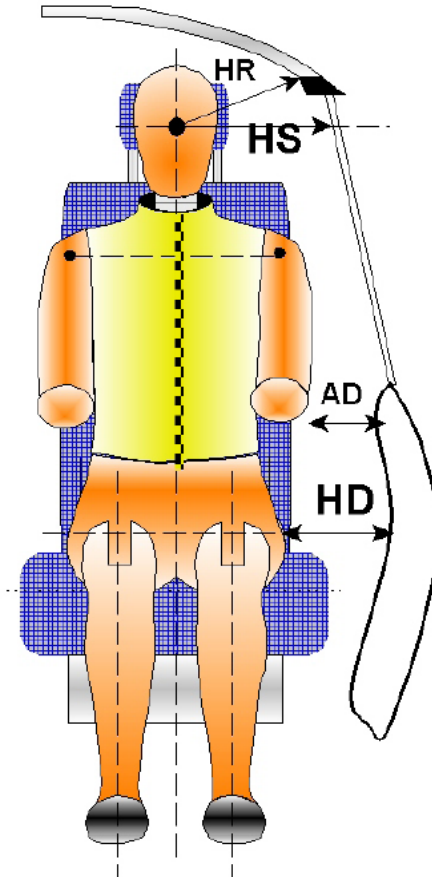
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No. O20205503

Test Program: NCAP Side Pole Impact Test

Test Date: 11/12/19

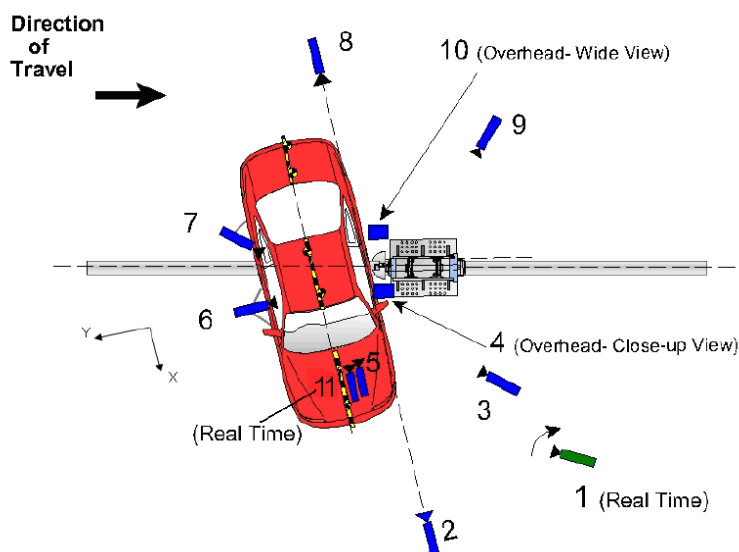


Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	265
HS	Head to Side Window	mm	405
AD	Arm to Door	mm	175
HD	Hip Point to Door	mm	174

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



Reference from Point of Impact for X and Y; from Ground for Z):
 +X = Forward of Vehicle, +Y = Right of Vehicle, +Z = Down

Camera No.	View	Coordinates (m)			Lens (mm)	Film Speed (fps)
		X*	Y*	Z*		
1	Real Time Pan View of Impact	8.89	46.57	-3.04		30
2	Front Ground Level - Impact View	8.34	-0.05	-0.93	24	1000
3	Impact Side 45° - Forward Pole View	4.10	-2.15	-1.15	8.5	1000
4	Overhead Close-Up View of Impact	0.00	0.00	-5.79	12.5	1000
5	On-Board - Dummy Front View	0.96	0.49	-1.27	8.5	1000
6	On-Board - Dummy Side View	0.96	0.49	-1.26	8.5	1000
7	On-Board - Dummy Rear Oblique View	-0.07	1.70	-1.02	8.5	1000
8	Rear Ground Level - Impact View	-6.12	-6.23	-0.96	24	1000
9	Impact Side 45° - Rearward Pole View	-8.02	0.04	-1.01	35	1000
10	Overhead Wide View of Impact	-0.06	0.22	-5.79	14	1000
11	Real Time Dummy Front View	-0.92	1.70	-1.09		30

*All measurements accurate to ± 6 mm

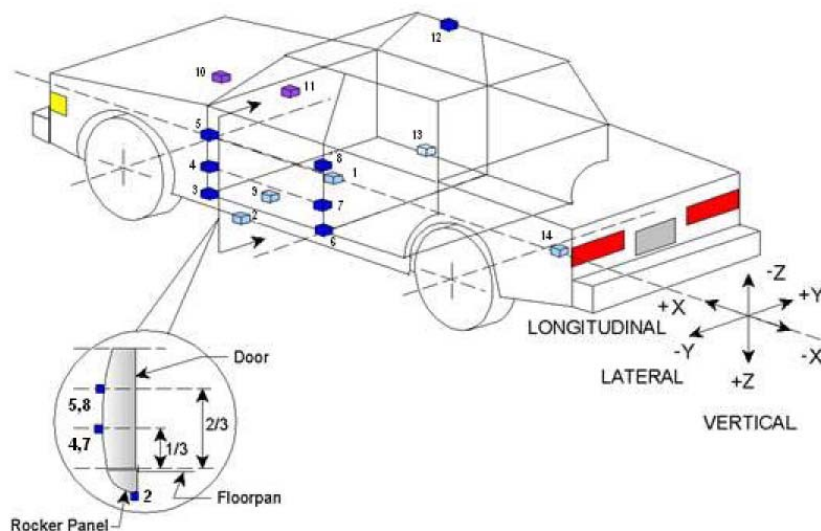
INSTRUMENTATION

Driver Dummy Channels	19
Vehicle Structure Accelerometers	18
Pole Load Cells	8
Total	45

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

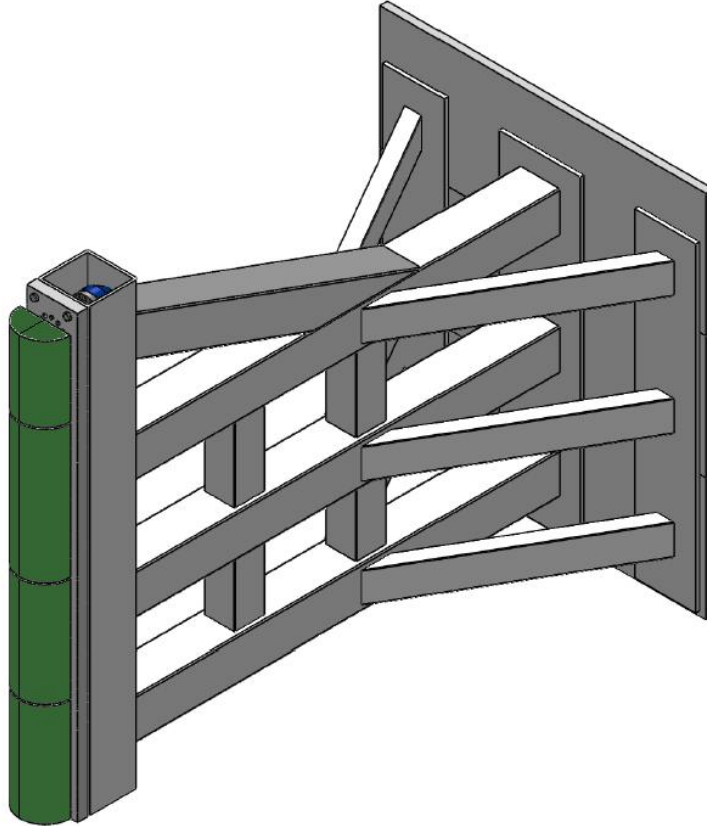


Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2320	0	-510
2	Left Floor Sill	2620	-760	-280
3	A-Pillar Sill	3300	-845	-430
4	A-Pillar Low	3330	-855	-540
5	A-Pillar Mid	3330	-850	-880
6	B-Pillar Sill	2350	-780	-490
7	B-Pillar Low	2260	-775	-600
8	B-Pillar Mid	2260	-775	-1110
9	Driver Seat Track	2410	-620	-530
10	Engine Top	3900	0	-750
11	Firewall	3600	150	-1000
12	Right Roof	2320	470	-1640
13	Right Floor Sill	2750	740	-455
14	Rear Floorpan	1200	0	-700

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

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



ID	Units	Height From Ground
1	mm	87
2	mm	468
3	mm	648
4	mm	978
5	mm	1168
6	mm	1651
7	mm	1816
8	mm	2057

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver SID-IIs Dummy
Face	Curtain Airbag
Top of Head	Curtain Airbag
Left Side of Head	Curtain Airbag
Back of Head	Curtain Airbag, Headrest
Left Shoulder	Side Airbag
Upper Torso	Side Airbag
Lower Torso	Side Airbag
Left Hip	Side Airbag
Left Knee	None

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

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

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

POST-TEST STRUCTURAL OBSERVATIONS

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

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side 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	No
Seat Belt Load Limiter	Yes	Yes	Yes	No

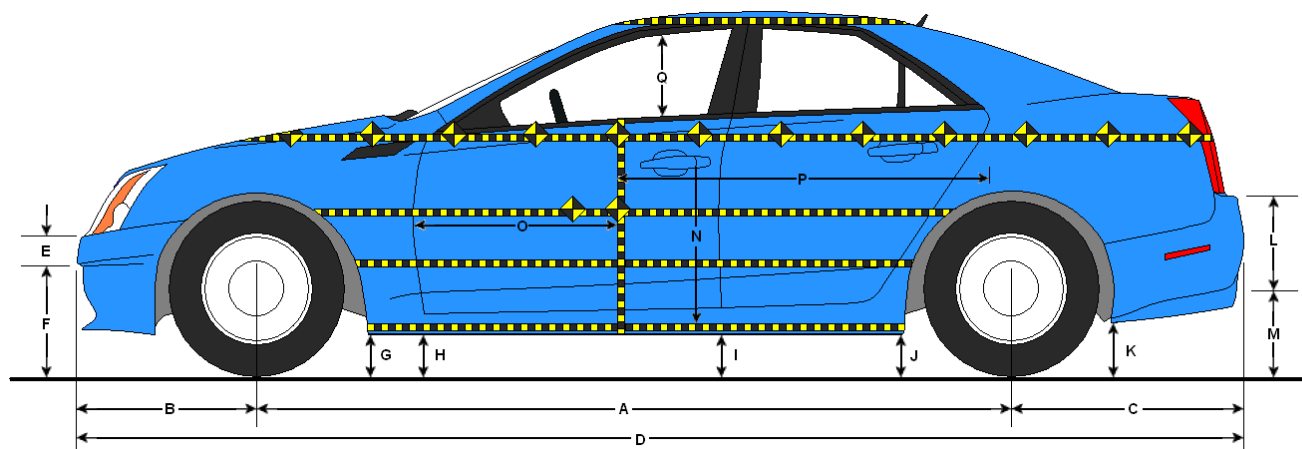
IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		1116
Actual Impact Point (Aft of Front Axle)	mm		1133
Horizontal Offset (+ forward / - rearward)	mm	± 38 of Intended Impact Point	-17
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	°	75 ± 3	75.9
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.54
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.56

DATA SHEET NO. 9

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



LEFT SIDE VIEW

All measurements in mm with tolerance of ± 3 mm

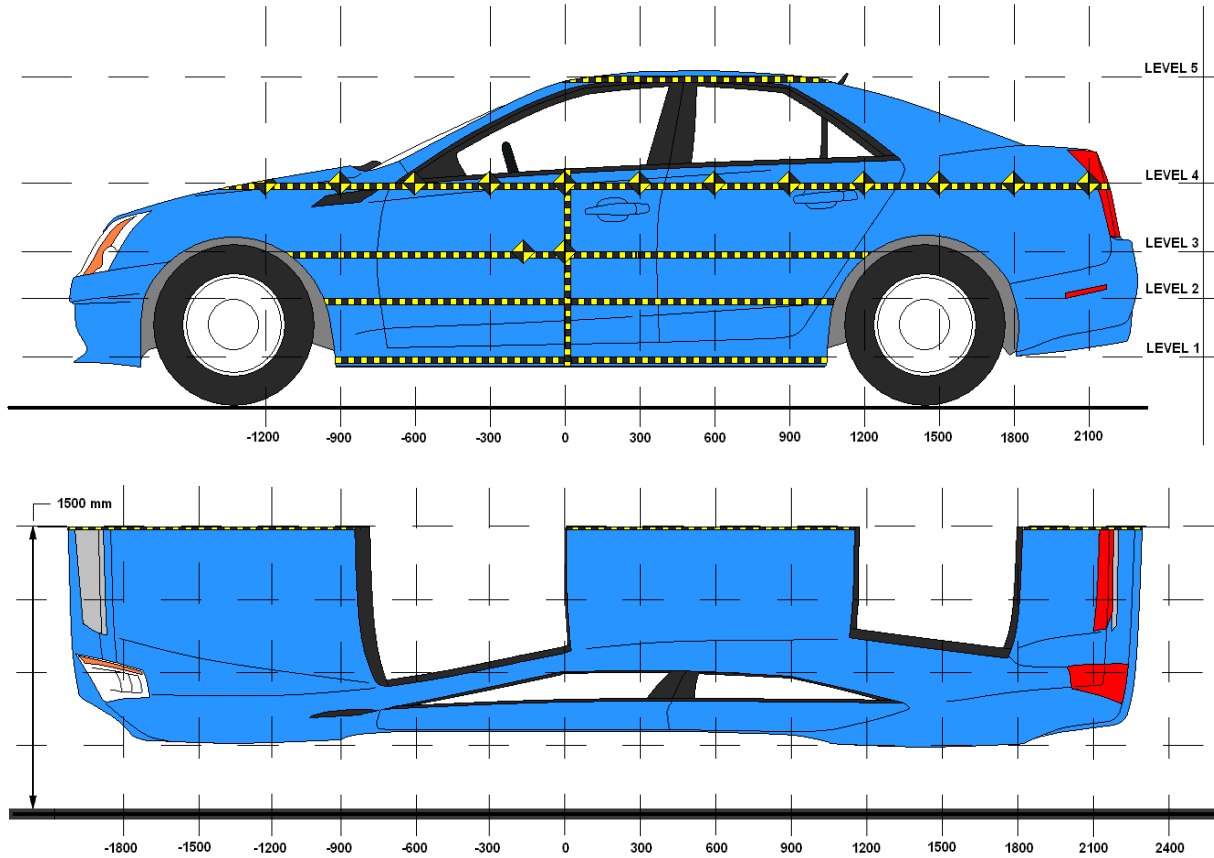
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2730	2674	-56
B	Front Axle to FSOV	1008	1022	14
C	Rear Axle to RSOV	1121	1099	-22
D	Total Length at Centerline	4839	4794	-45
E	Front Bumper Thickness	129	124	-5
F	Front Bumper Bottom to Ground	711	642	-69
G	Sill Height at Front Wheel Well	509	435	-74
H	Sill Height at Front Door Leading Edge	511	434	-77
I	Sill Height at B-Pillar	428	415	-13
J1	Sill Height at Rear Wheel Well	441	446	5
J2	Pinch Weld Height at Rear Wheel Well	414	420	6
K	Sill Height Aft of Rear Wheel Well	498	497	-1
L	Rear Bumper Thickness	153	155	2
M	Rear Bumper Bottom to Ground	609	606	-3
N	Sill Height to Bottom of Front Window Sill	669	684	15
O	Front Door Leading Edge to Impact CL	627	538	-89
P	Rear Door Trailing Edge to Impact CL	1578	1501	-77
Q	Front Window Opening	407	416	9
R	Right Side Length	3416	3431	15
S	Left Side Length	3418	3332	-86
T	Vehicle Width at B-Pillar	1824	1739	-85

DATA SHEET NO. 10

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



NOTE: All measurements in mm with tolerance of $\pm 3\text{mm}$

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	503	317	0
2	Occupant H-Point	782	341	0
3	Mid-Door	856	350	0
4	Window Sill	1150	305	150
5	Window Top	1659	112	150

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503
 Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

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				673					638					-35	
-750		582	584	673			561	563	650			-21	-21	-23	
-600	623	591	588	672		638	596	585	648		15	5	-3	-24	
-450	622	591	587	648		634	689	686	682		12	98	99	34	
-300	609	590	586	658		721	765	769	757		112	175	183	99	
-150	607	589	585	651		824	847	856	842		217	258	271	191	
0	605	589	584	644	894	922	930	934	937	986	317	341	350	293	92
150	604	589	584	639	886	891	918	925	944	998	287	329	341	305	112
300	604	590	585	632	888	759	803	808	837	972	155	213	223	205	84
450	603	591	586	627	891	639	695	696	733	955	36	104	110	106	64
600	604	594	589	624	891	669	660	655	687	933	65	66	66	63	42
750	602	594	590	622	892	648	644	639	671	916	46	50	49	49	24
900	605	593	589	620	893	628	626	622	652	906	23	33	33	32	13
1050	604	589	585	616	895	606	606	603	634	899	2	17	18	18	4
1200	609	585	582	615	895	594	585	583	618	897	-15	0	1	3	2
1350			575	626	895			577	610	895			2	-16	0
1500				615	894				590	894				-25	0
1650				615	894				617	892				2	-2
1800				616	895				616	890				0	-5
1950				620	897				618	892				-2	-5
2100															
2250															
2400															
2550															
2700															
2850															

DATA SHEET NO. 10 ... (CONTINUED)

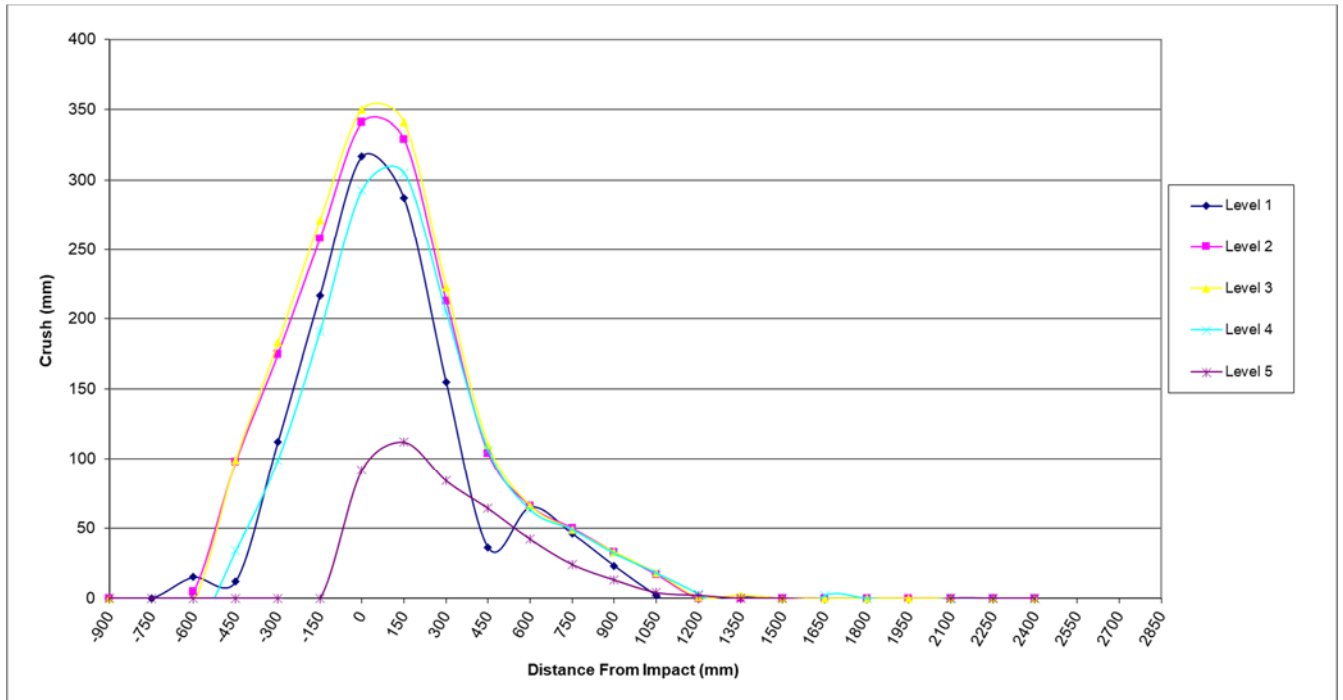
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No. O20205503

Test Program: NCAP Side Pole Impact Test

Test Date: 11/12/19

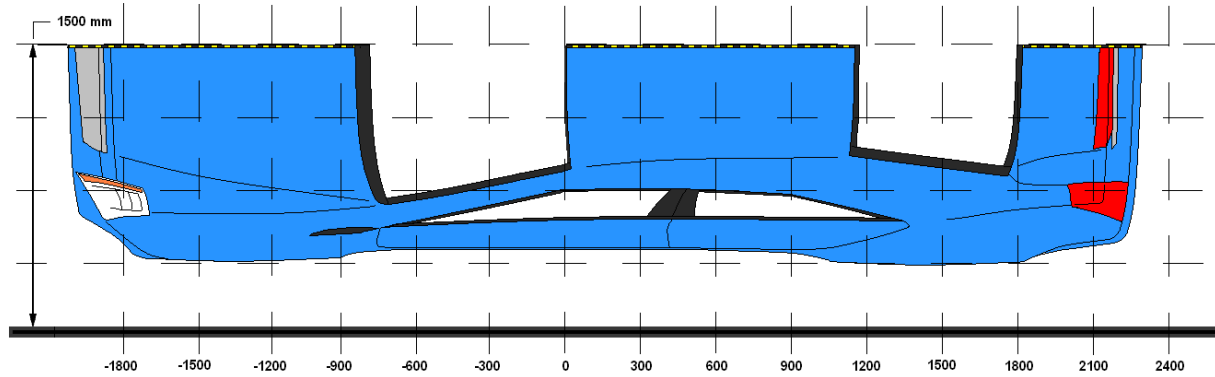


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503

Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19



DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	1950	4	620	618	-2
2	1350	3	575	577	2
3	750	2	594	644	50
4	300	3	585	808	223
5	-300	3	586	769	183
6	-900	4	673	638	-35

DATA SHEET NO. 12

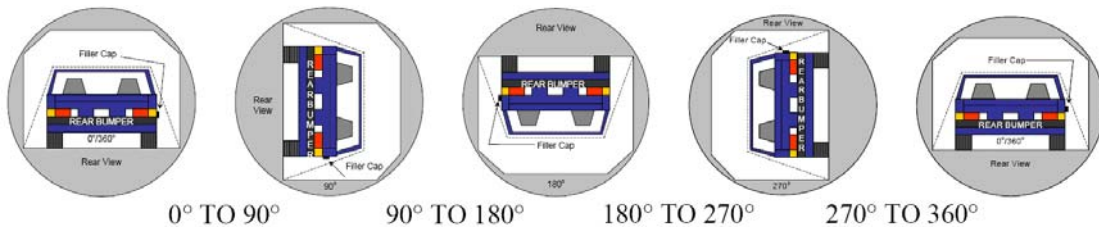
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No. O20205503

Test Program: NCAP Side Pole Impact Test Test Date: 11/12/19

Temperature at Time of Impact: 24.4° C Test Time: 12:24 PM

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



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	80	300	380
90° To 180°	81	300	381
180° To 270°	82	300	382
270° To 360°	79	300	379

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 13

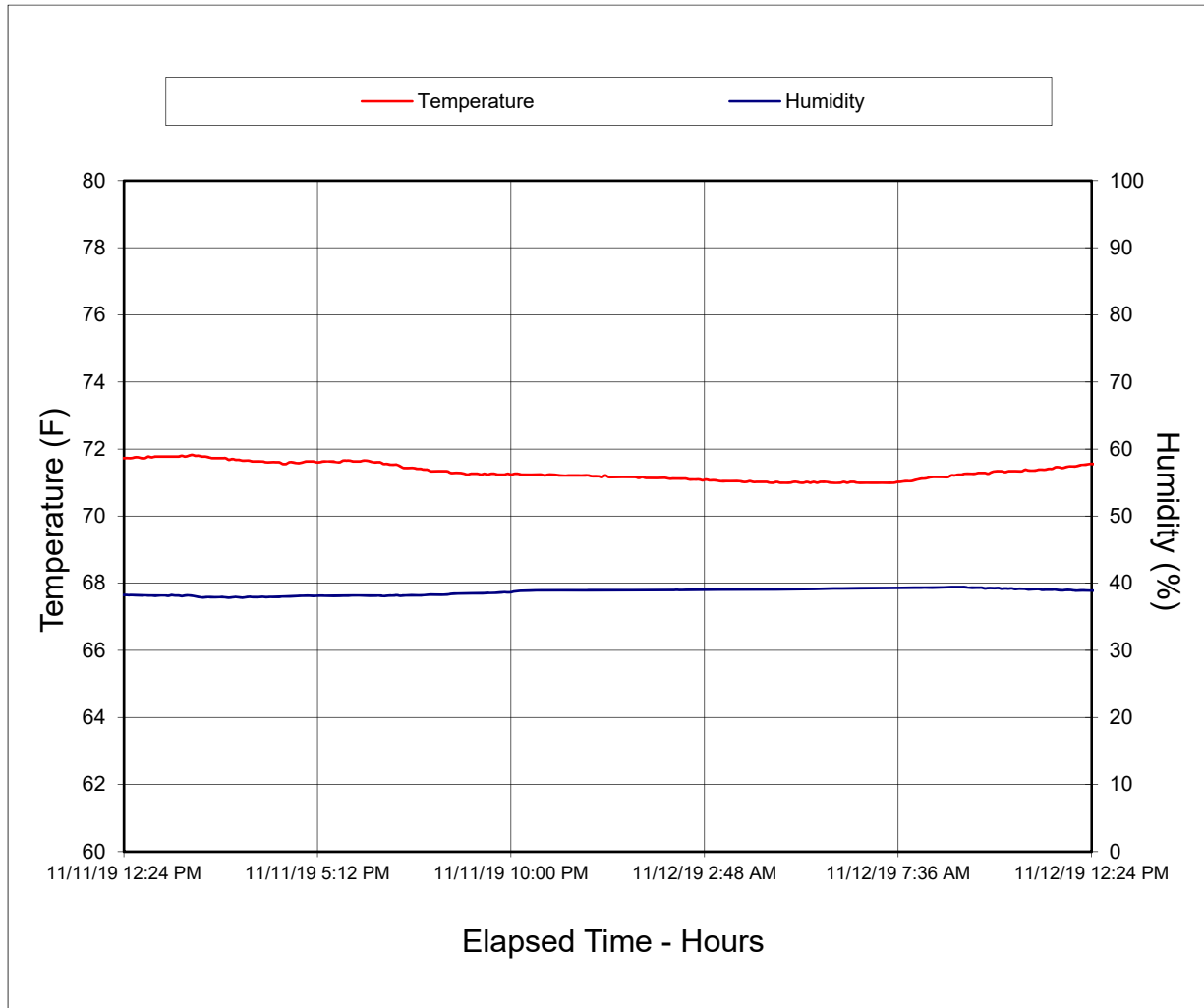
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No. O20205503

Test Program: NCAP Side Pole Impact Test

Test Date: 11/12/19



APPENDIX A
PHOTOGRAPHS

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



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



FIGURE 3. Pre-Test Frontal View of Test Vehicle

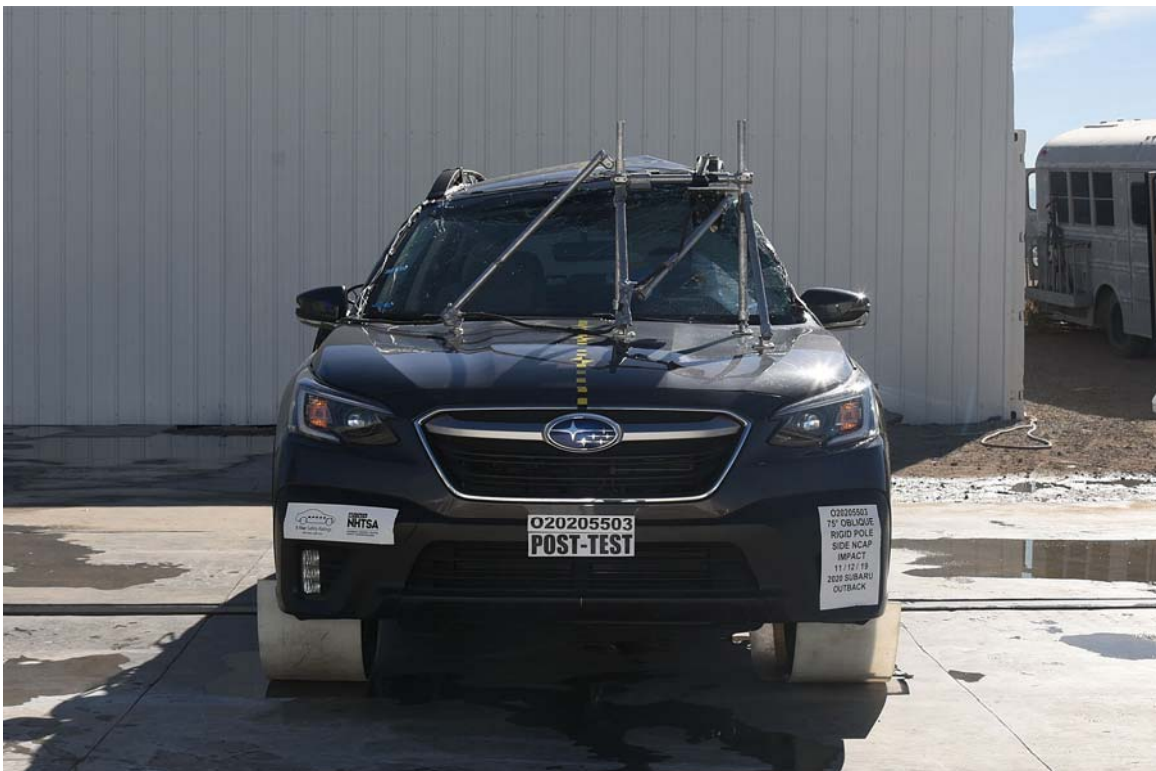


FIGURE 4. Post-Test Frontal View of Test Vehicle



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



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



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

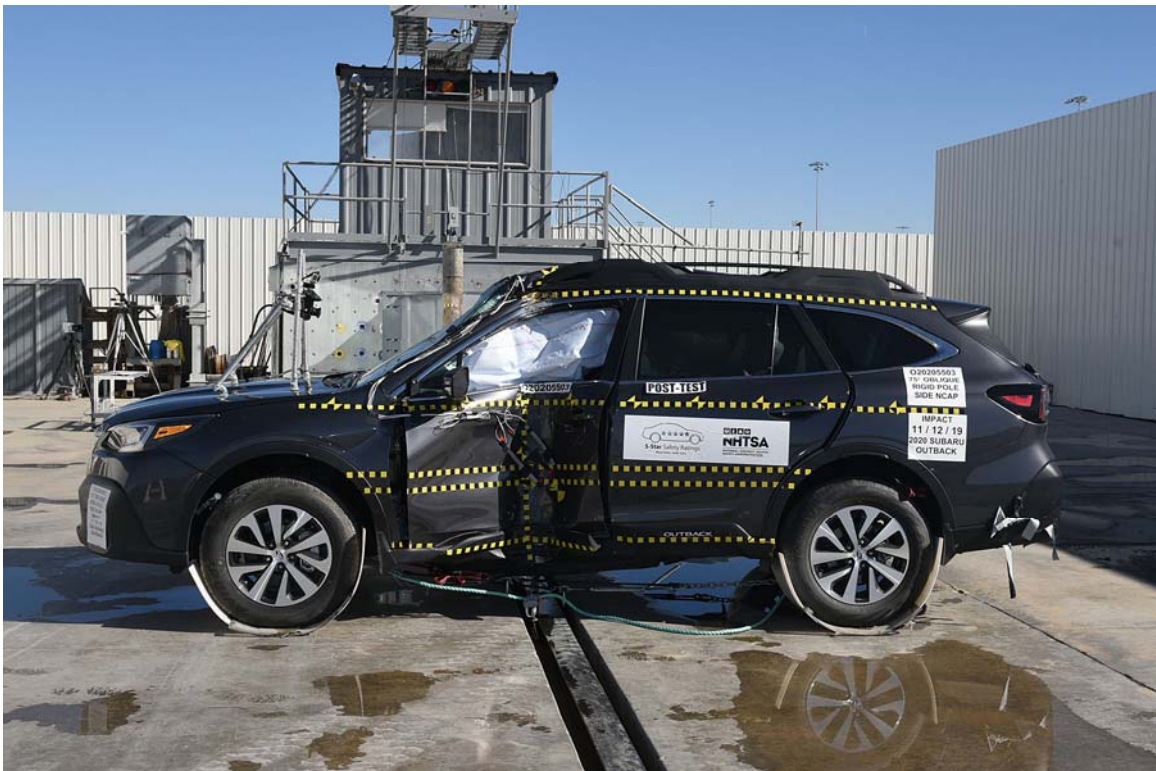


FIGURE 8. Post-Test Left Side View of Test Vehicle



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



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

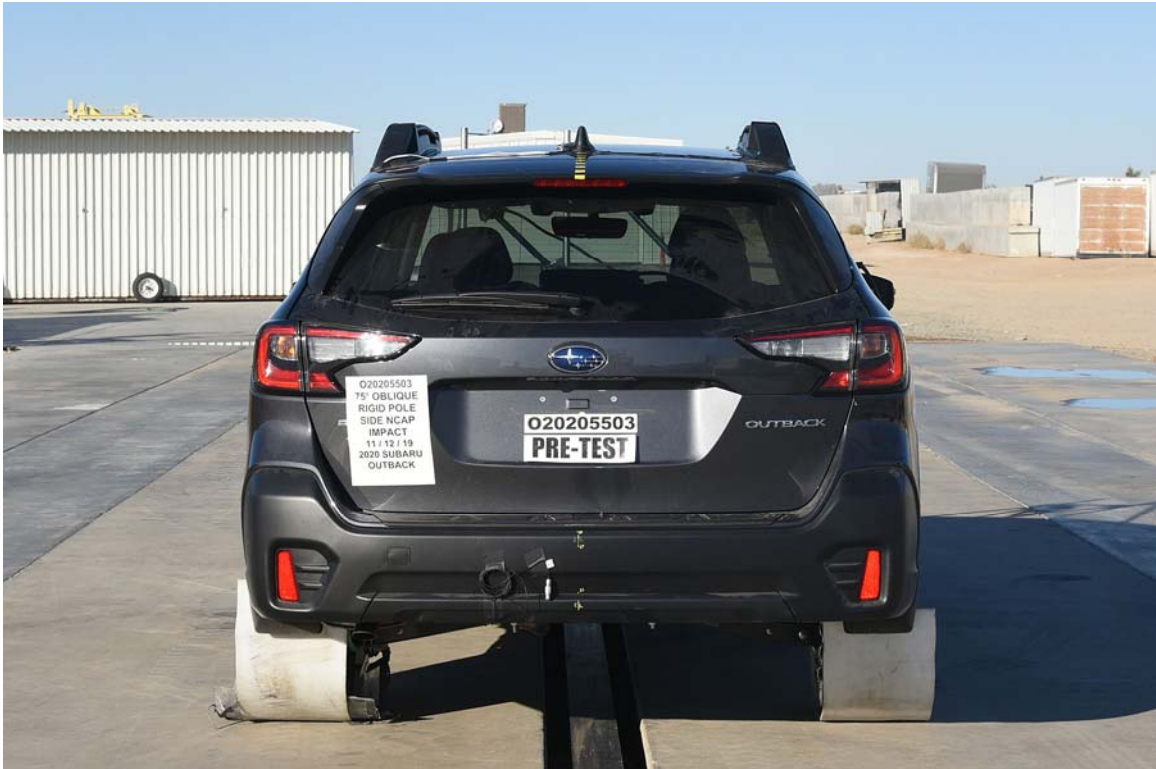


FIGURE 11. Pre-Test Rear View of Test Vehicle

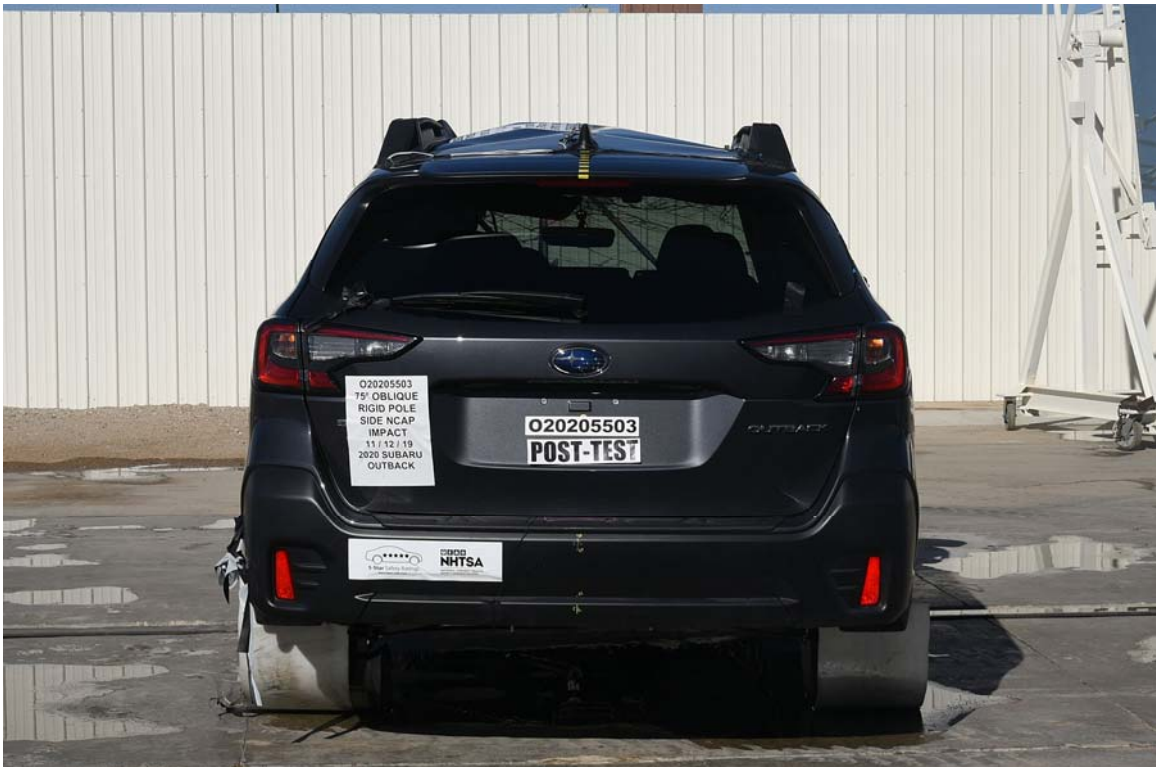


FIGURE 12. Post-Test Rear View of Test Vehicle



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



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



FIGURE 15. Pre-Test Overhead View of Test Area

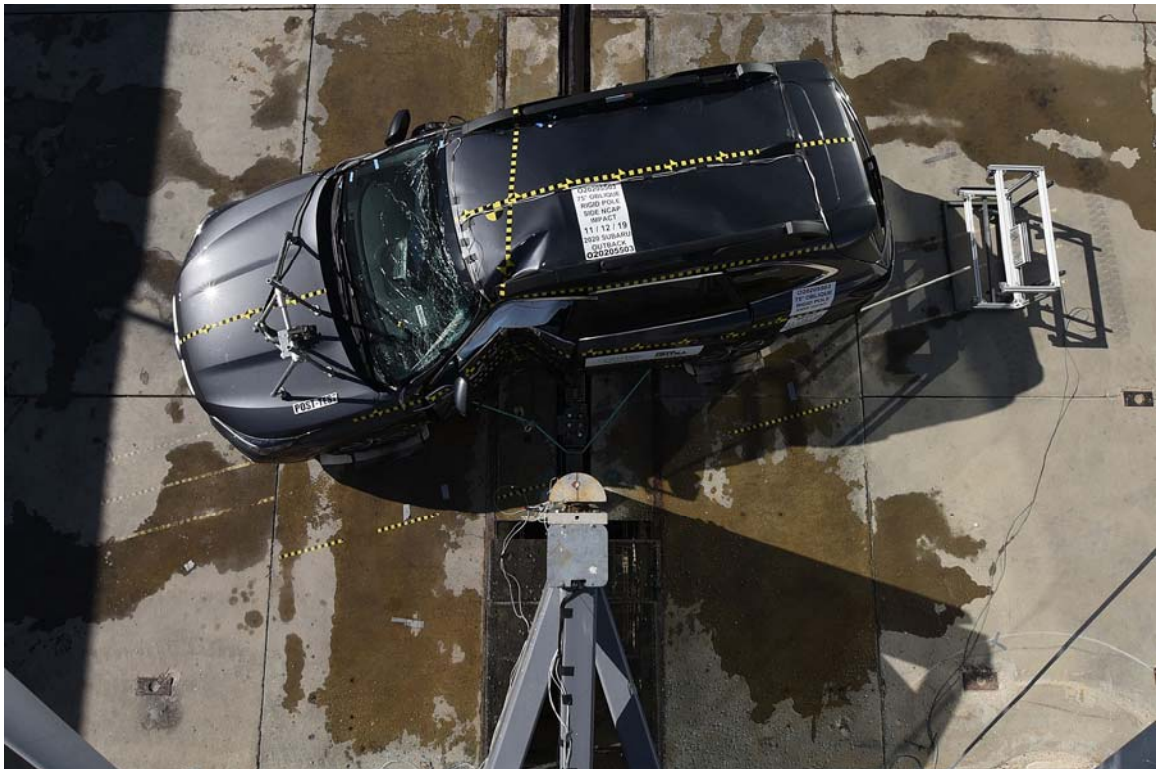


FIGURE 16. Post-Test Overhead View of Test Area



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



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



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



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



FIGURE 21. Pre-Test Front Close-Up View of Dummy Head and Chest



FIGURE 22. Post-Test Front Close-Up View of Dummy



FIGURE 23. Pre-Test Left Side View of Dummy Showing Belt and Chalking

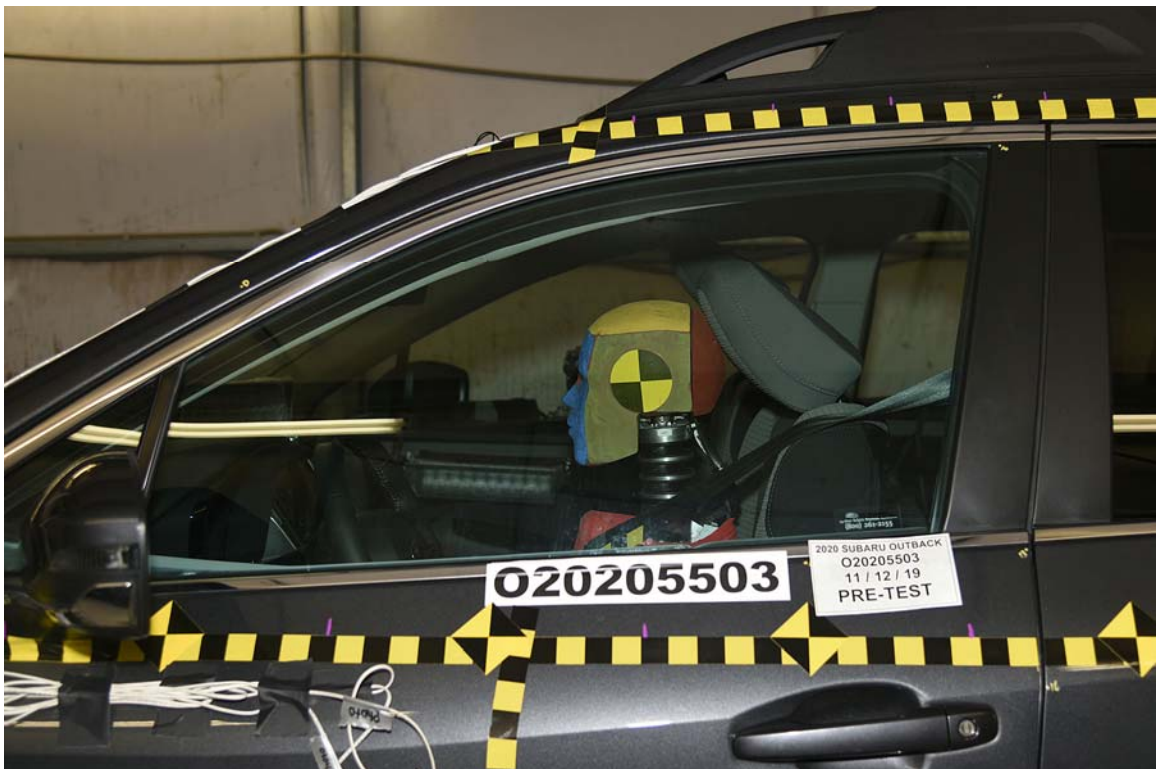


FIGURE 24. Pre-Test Left Side View of Dummy Shoulder and Door Top View



FIGURE 25. Post-Test Left Side View of Dummy Shoulder and Door Top View



FIGURE 26. Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



FIGURE 27. Pre-Test Frontal Close-Up View of
Dummy Head and Shoulders in Relation to Head Restraint

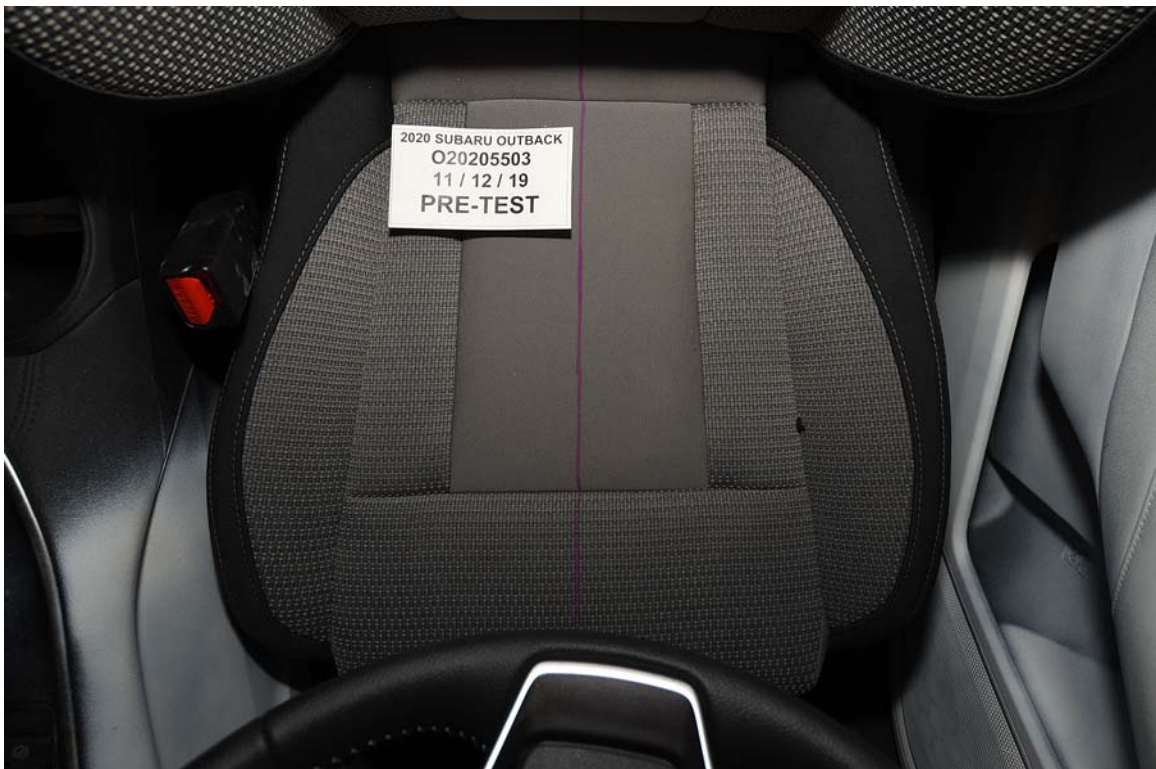


FIGURE 28. Pre-Test Overhead View of Seat Pan Prior to Dummy Positioning



FIGURE 29. Pre-Test Overhead View of Dummy Thighs on Seat Pan



FIGURE 30. Pre-Test Left Side View of Dummy's Neck
Showing Position of Adjustable Neck Bracket



FIGURE 31. Pre-Test Left Side View of Dummy's Head
Showing Dummy's Head is Level

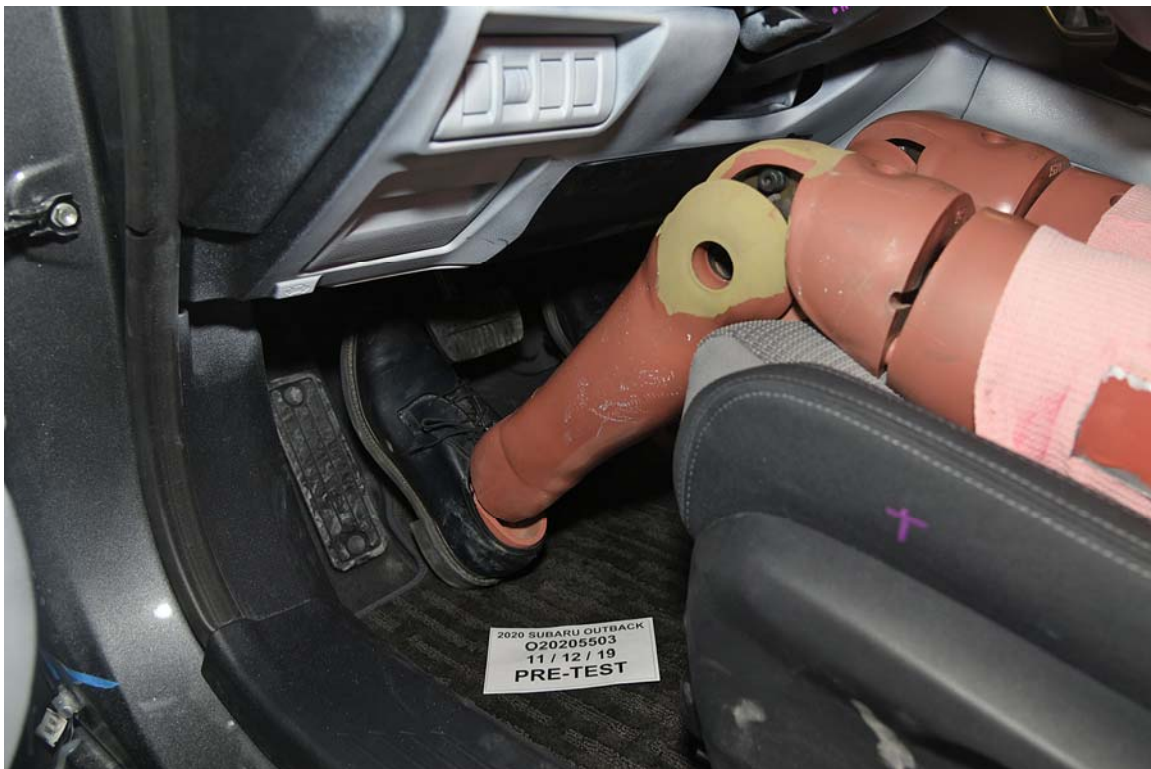


FIGURE 32. Pre-Test Placement of Dummy's Feet



FIGURE 33. Pre-Test View of Belt Anchorage for Dummy



FIGURE 34. Pre-Test Left Side View of Steering Wheel



FIGURE 35. View of Disengaged Parking Brake



FIGURE 36. Pre-Test View of Parking Brake



FIGURE 37. Pre-Test Close-Up Left Side View of Driver Seat Track



FIGURE 38. Pre-Test Close-Up Left Side View of Driver Seat Back



FIGURE 39. Pre-Test Close-Up View of Driver Seat Back or Head Restraint



FIGURE 40. Pre-Test Dummy and Door Clearance View



FIGURE 41. Post-Test Dummy and Door Clearance View



FIGURE 42. Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment



FIGURE 43. Post-Test Right Side View of Dummy and Front Seat of Occupant Compartment



FIGURE 44. Pre-Test Inner Door Panel View



FIGURE 45. Post-Test Inner Door Panel View Showing Dummy Contact Locations



FIGURE 46. Post-Test Dummy Close-Up Head Contact with Vehicle Interior View



FIGURE 47. Post-Test Dummy Close-Up Head Contact With Side Airbag View

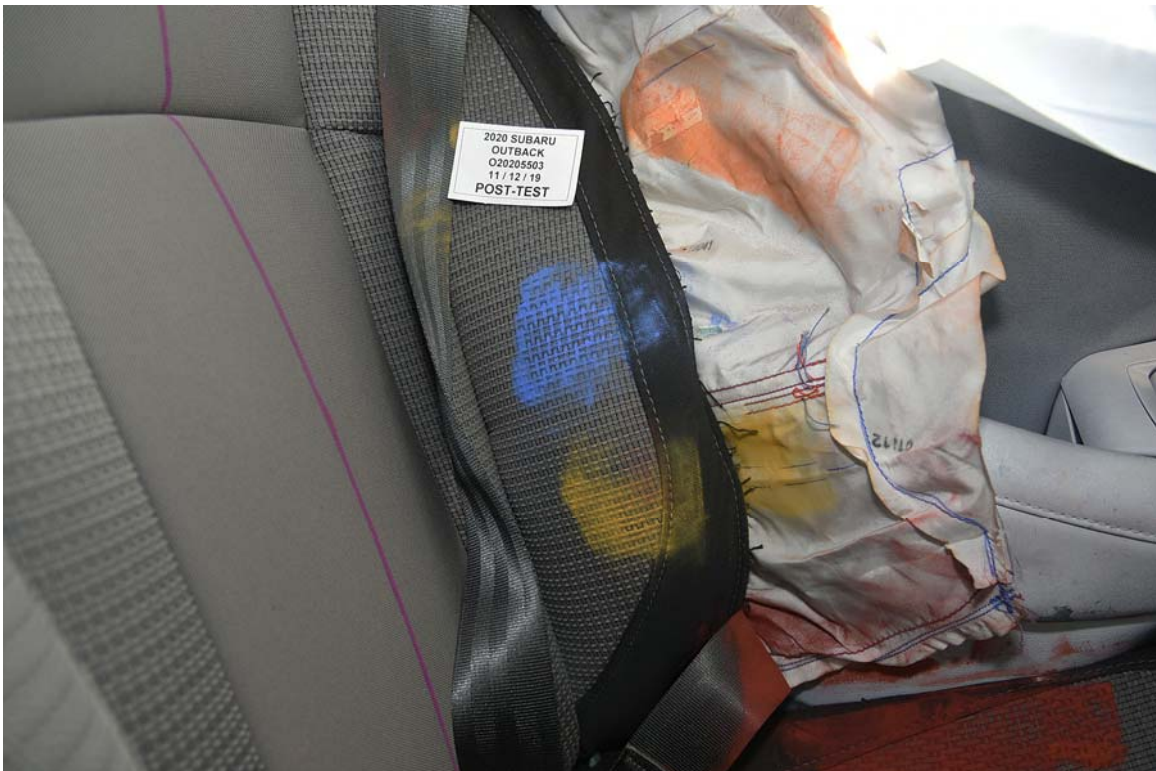


FIGURE 48. Post-Test Dummy Close-Up Torso Contact With Vehicle Interior View



FIGURE 49. Post-Test Dummy Close-Up Torso Contact With Side Airbag View



FIGURE 50. Post-Test Dummy Close-Up Pelvis Contact With Vehicle Interior View



FIGURE 51. Post-Test Dummy Close-Up Pelvis Contact With Side Airbag View



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



FIGURE 53. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 54. Post-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 55. Close-Up View of Vehicle's Certification Label

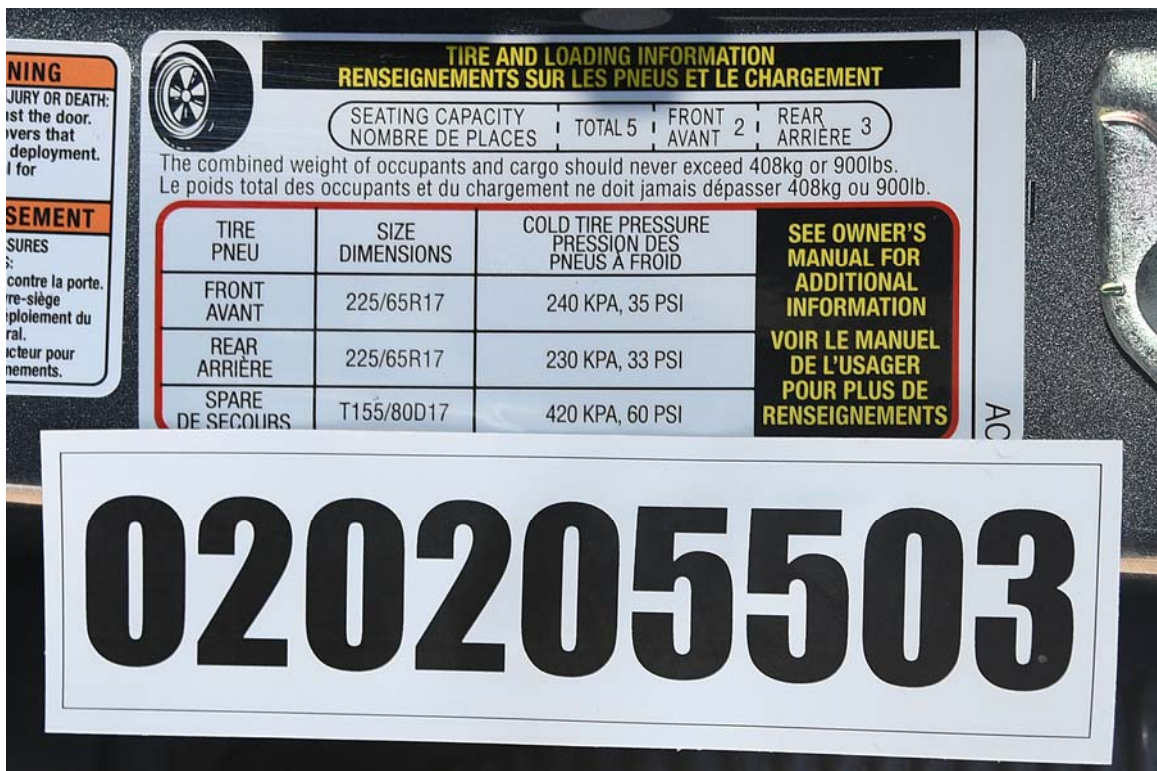


FIGURE 56. Close-Up View of Vehicle's Tire Information Placard or Label



FIGURE 57. Pre-Test Pole Barrier Front View



FIGURE 58. Post-Test Pole Barrier Front View



FIGURE 59. Pre-Test Pole Barrier Side View



FIGURE 60. Post-Test Pole Barrier Side View

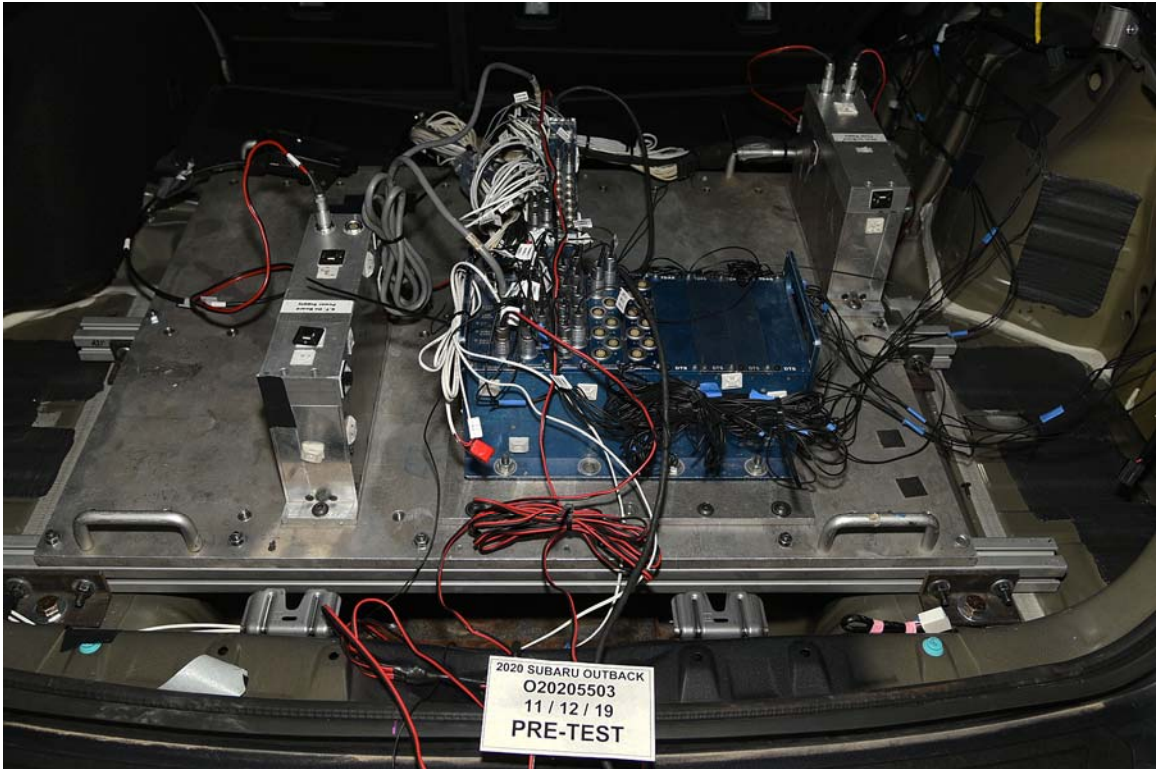


FIGURE 61. Pre-Test Ballast View



FIGURE 62. Post-Test Primary and Redundant Speed Trap Read-Out

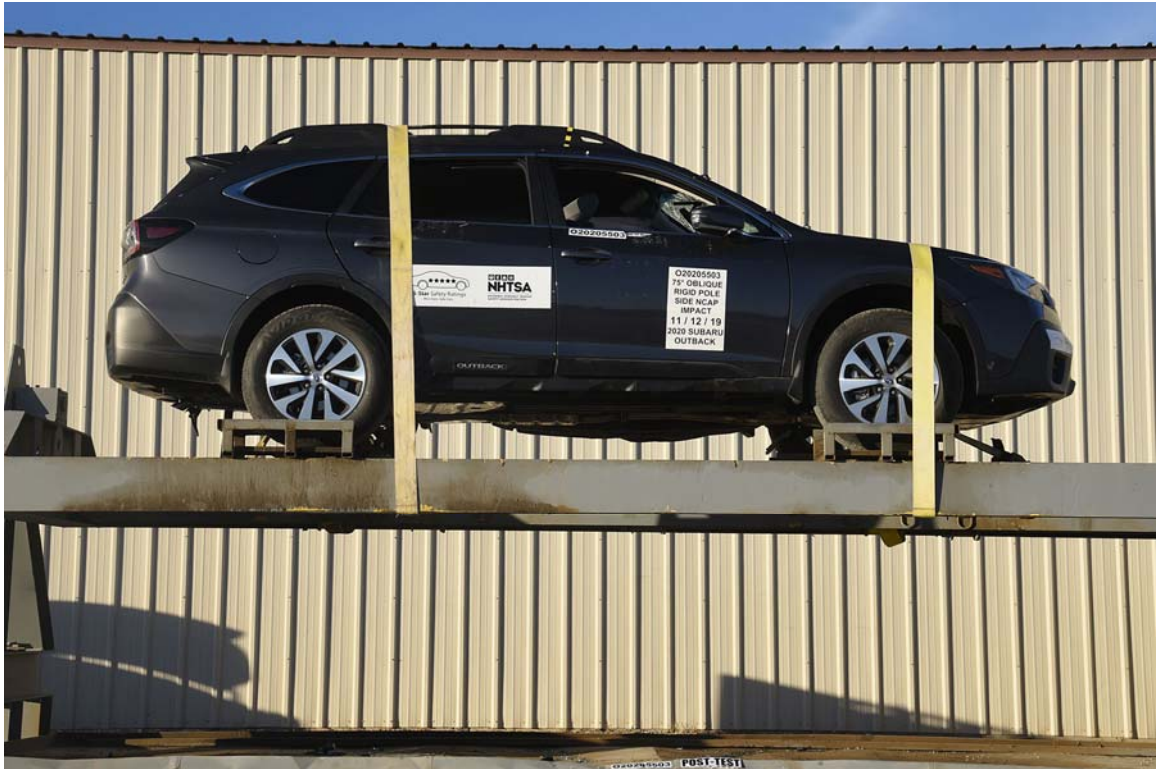


FIGURE 63. FMVSS No. 301 Static Rollover 0 Degrees



FIGURE 64. FMVSS No. 301 Static Rollover 90 Degrees



FIGURE 65. FMVSS No. 301 Static Rollover 180 Degrees

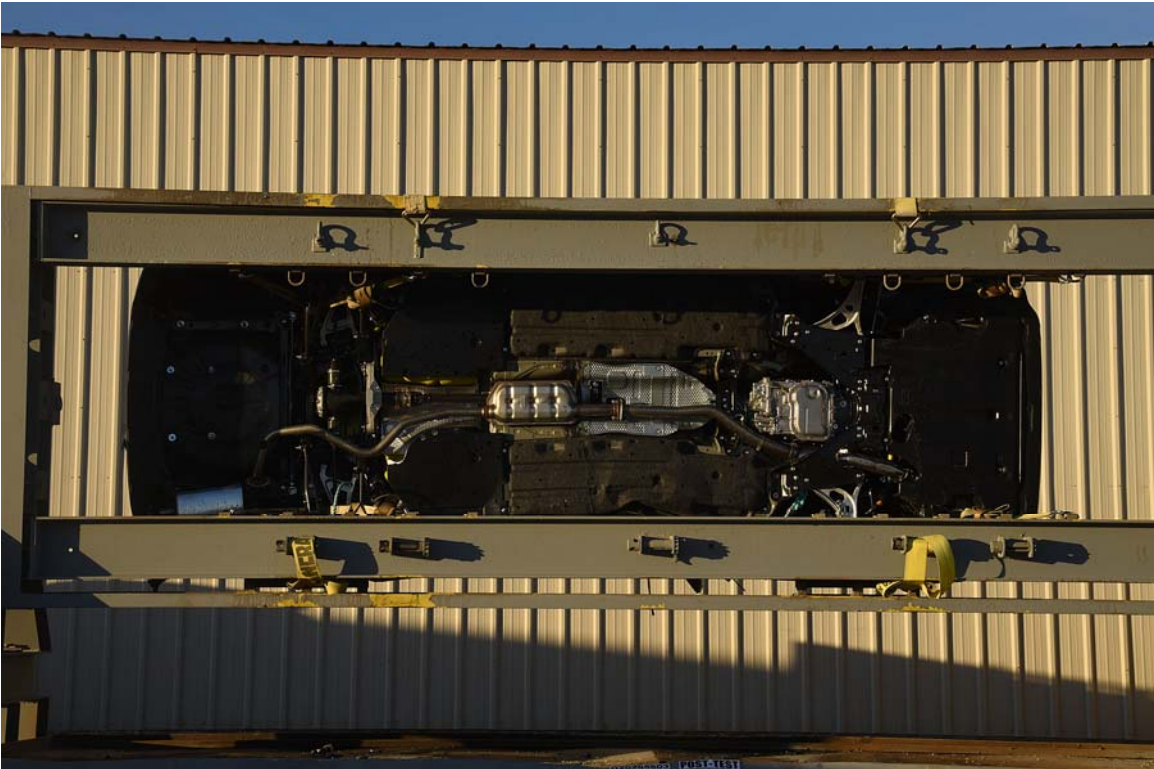


FIGURE 66. FMVSS No. 301 Static Rollover 270 Degrees

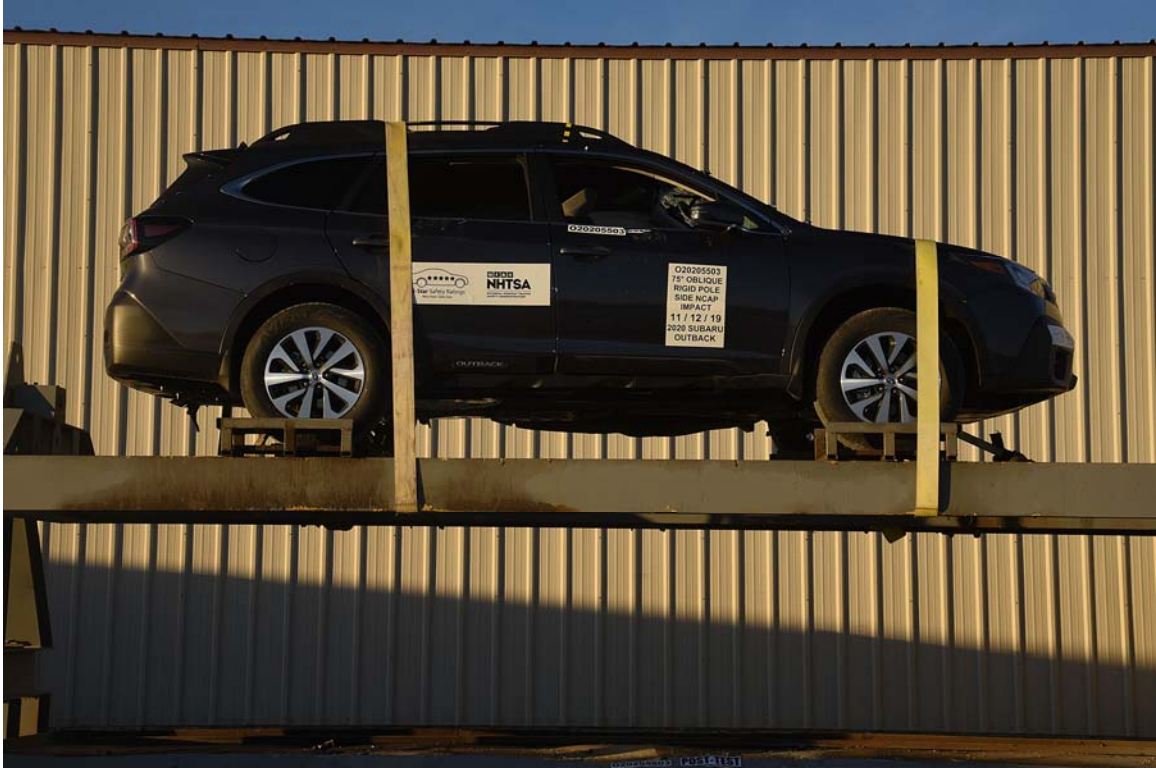


FIGURE 67. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 68. Impact Event

OUTBACK

VIN: 454BTACCXL3106725
 Model Code: SUBARU OUTBACK PREMIUM LDO
 Port of Assembly: LAFAYETTE, IN
 Delivered by: CarMax

SHIP TO: 070456
 COLUMBIA SUBARU
 7211 MEADOW RD
 MEADOW RIDGE, TN 37095

SOLD TO: 070456
 COLUMBIA SUBARU
 7211 MEADOW RD
 MEADOW RIDGE, TN 37095

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

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

Rollover 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 or 1-888-327-4236

Fuel Economy and Environment

Fuel Economy **29** MPG
combined city/hwy

26 MPG city
33 MPG highway

3.4 gallons per 100 miles

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

Annual fuel cost \$1,400
This vehicle emits 286 grams CO₂ per mile. The best emits 219 g/mi (40% less). Best-selling full-size sedans emit 245 g/mi.

fuelconomy.gov
Calculates personalized estimates and compares vehicles.

STANDARD EQUIPMENT

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

PERFORMANCE AND EXTERIOR
 2.5L Direct Injection 4-Cylinder DOHC 16-Valve Boxer Engine
 Lineartronic CVT with 8-Speed Manual Mode
 Auto Start - Stop
 X-Mode, Traction Management System
 Active Torque Vectoring with Quick-Steering
 Four-Wheel Independent Suspension
 6.7" Ground Clearance
 17" Aluminum Alloy Wheels, Black w/ Machine Finish
 LED Headlights w/ High Beam Assist, LED Fog Lights
 Integrated Roof Rack System with Swing-In Place Crossbars

COMFORT, CONVENIENCE & INTERIOR
 STARLINK 11.6" Multimedia Infotainment System
 Bluetooth Hands-Free Phone Connectivity
 SiriusXM Radio, Sports and Weather - 4 Months Free
 STARLINK Smartphone Connectivity/Apple
 SUBARU STARLINK Security Plus - 6 Months Free Trial
 Built-in 4G LTE Wi-Fi Hotspot
 Apple CarPlay and Android Auto
 Dual Front & Rear USB Ports, iPod/iPhone Connectivity
 10-Way Adjustable Power Driver's Seat w/ Lumbar Support
 Heated Front Seats, Heated Mirrors, Wiper De-Icer
 Dual Zone Automatic Climate Control w/ Air Filtration System
 Auto-Up/Down Front Power Windows & Power Side Mirrors
 Remote Keyless Entry (2 Fobs)
 60/40 Split Fold-Down Rear Seatback
 TriTelescopic Leather Steering Wheel with Cruise Control
 Carpeted Floor Mats & Cargo Area Mat

LIMITED WARRANTY/ROADSIDE ASSISTANCE
 3 Years / 36,000 Miles Basic
 5 Years / 60,000 Miles Powertrain
 5 Year/Unlimited Mileage Roadside Assistance
 3 Yrs / 36,000 Miles Roadside Assistance
 See Owner's Info Kit/Warranty For Details

OPTIONAL EQUIPMENT AND OTHER ITEMS

Manufacturer's Suggested Retail Price	
\$28,595.00	Exterior Color: Magistrate Gray Metallic
INCLD	Full Tank of Gas
\$607.00	Standard Option 11
	Ext Int HL Auto Dim Mirrors
	Ext Auto Dim Mirror
	Mirror Compass w/ homelink
\$172.00	Splash Guards
\$159.00	Rear Bumper Cover
\$132.00	All-Weather Floor Liners
\$104.00	Rear Seat Back Protector

DESTINATION AND DELIVERY

Destination and Delivery	Total Suggested Retail Price
\$1,010.00	\$31,079.00

FIGURE 69. Monroney Label

36 - Front Seats

Utilizing of the seat position registered with access key fob

- Hold the registered access key fob.

- Unfold the driver's door by pressing the "2" button or gripping the door handle.
- Open the driver's door.

A beep 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 180-degree position.

NOTE

- If the registered seat position cannot be retrieved after performing the previous procedures, try the following:

- Press the "SET" button on the driver's door.
- Press the "A" button on the access key fob or touch the door lock sensor to lock the doors.
- Perform the prior procedures again.

If the keyless access function is disabled, the seat position cannot 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" - P.125.

If a new position is registered for the same access key fob, the previously registered seat position is erased.

Clearing the registered seat position with access key fob

- Close the driver's door.
- While holding the access key fob and pressing the "SET" button, press the "A" 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 around. 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.

Head restraint height adjustment

1) Head restraint
2) Release button

To raise:
Push 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.

The head restraint should be adjusted so that the center of the head restraint is coldest to the top of the occupant's ears. When the seats are not occupied, lower the head restraints to improve rearward visibility.

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-

37 - Front Seats

Head restraint angle adjustment

The angle of the head restraint can be adjusted in several steps. While maintaining a suitable sitting posture, adjust the head restraint to a position where the back of your head is in line with 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.

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.

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.

Each head restraint should be adjusted so that the center of the head restraint is coldest to the top of the occupant's ears.

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. Also, never install the head restraints the opposite way around. 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.

Rear window side seating position

- Head restraint
- Release button

To raise:
Push 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.

The head restraint should be adjusted so that the center of the head restraint is coldest to the top of the occupant's ears. When the seats are not occupied, lower the head restraints to improve rearward visibility.

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.

- Head restraint
- Release button

To raise:
Push 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 should never be allowed to sit on the center armrest.

FIGURE 70. Head Restraint Use and Adjustment

Photograph Not Applicable

FIGURE 71. Post-Test View of Shattered Vehicle Inner Door Panel

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Plot		Page
1	Driver Head Acceleration (X) Primary	B-1
2	Driver Head Acceleration (Y) Primary	B-1
3	Driver Head Acceleration (Z) Primary	B-1
4	Driver Head Acceleration Primary Resultant	B-1
5	Driver Lower Spine T12 Acceleration (X)	B-2
6	Driver Lower Spine T12 Acceleration (Y)	B-2
7	Driver Lower Spine T12 Acceleration (Z)	B-2
8	Driver Lower Spine T12 Acceleration Resultant	B-2
9	Driver Upper Thorax Rib Deflection (Y)	B-3
10	Driver Middle Thorax Rib Deflection (Y)	B-3
11	Driver Lower Thorax Rib Deflection (Y)	B-3
12	Driver Upper Abdomen Rib Deflection (Y)	B-3
13	Driver Lower Abdomen Rib Deflection (Y)	B-4
14	Driver Acetabulum Force on Impact Side (Y)	B-4
15	Driver Iliac Wing Force on Impact Side (Y)	B-4
16	Driver Total Pelvis Force on Impact Side (Y)	B-4

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at

www.NHTSA.gov

Additional Driver Dummy Instrumentation Data

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

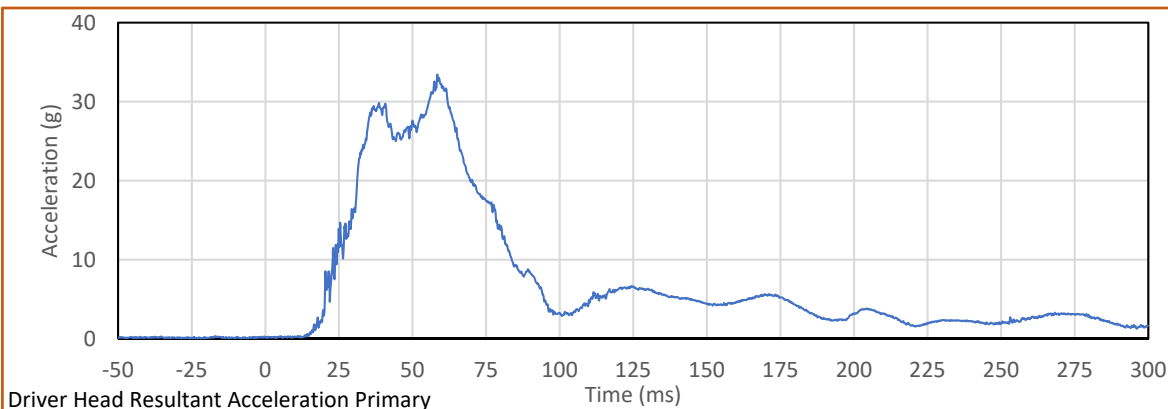
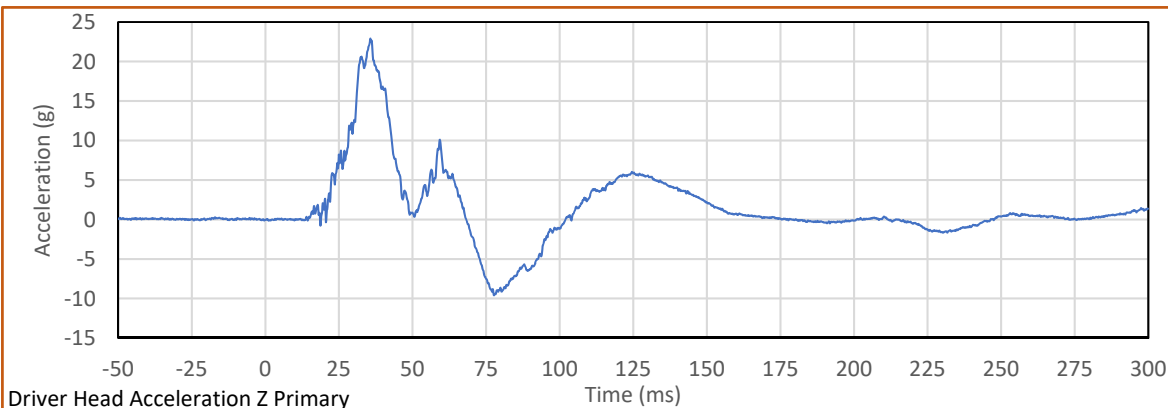
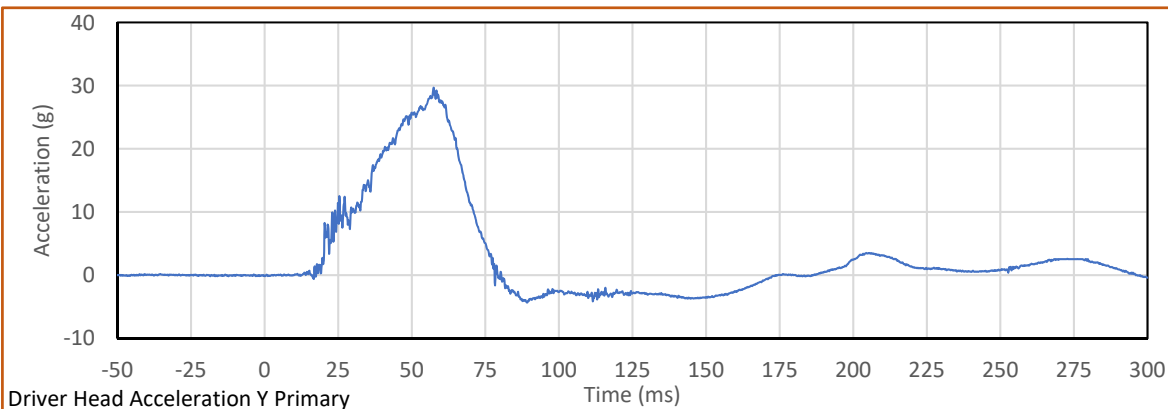
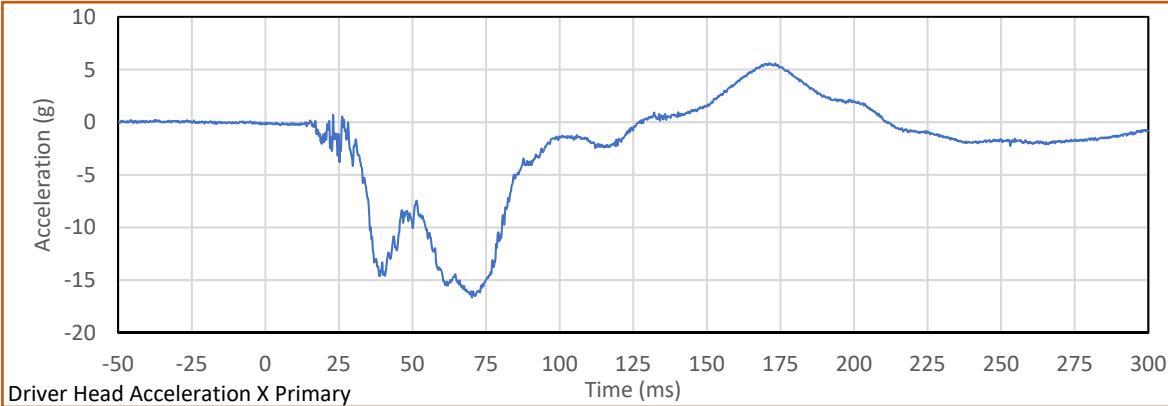
Driver Head Acceleration Redundant (Z)

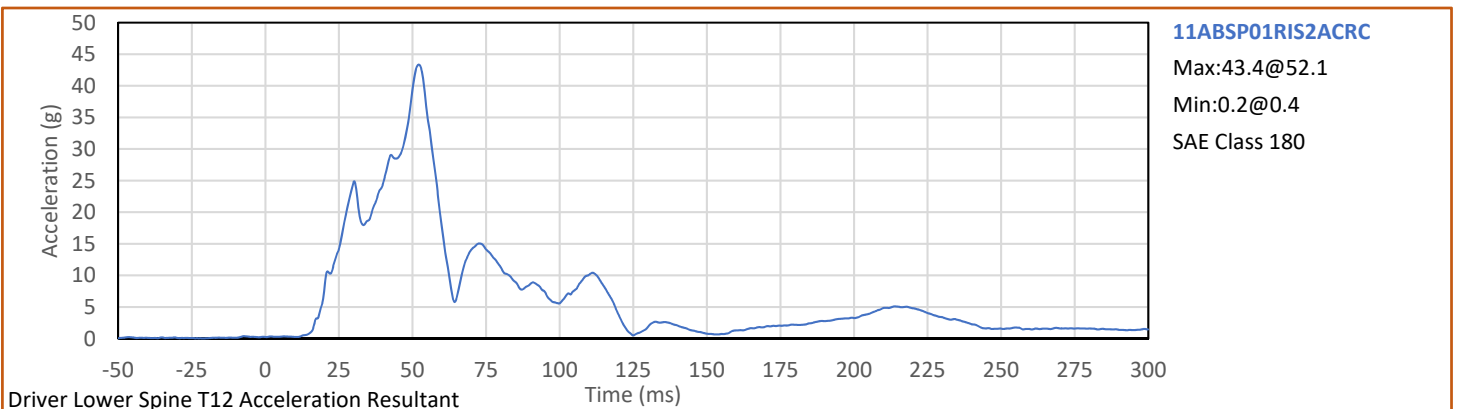
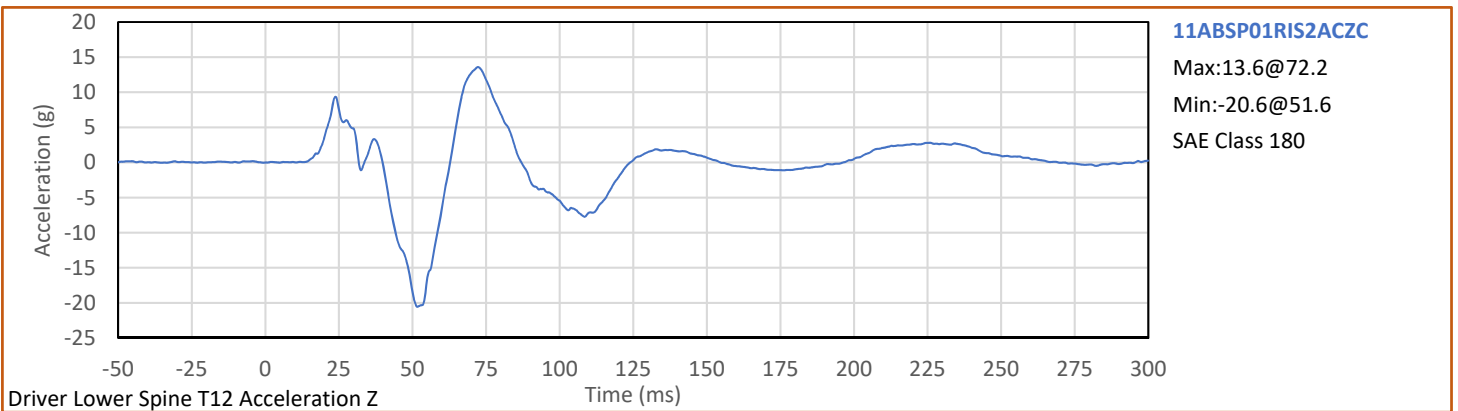
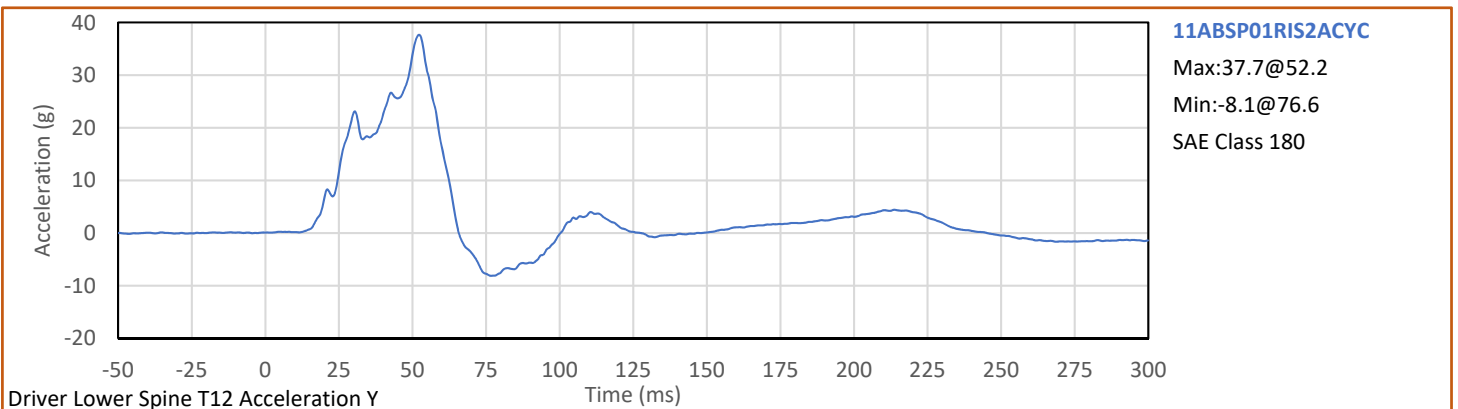
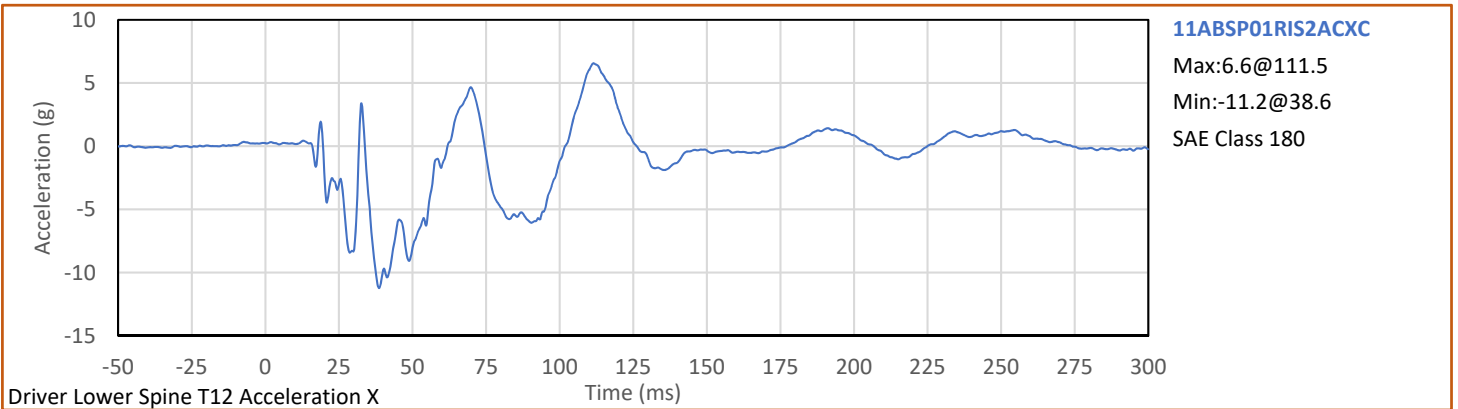
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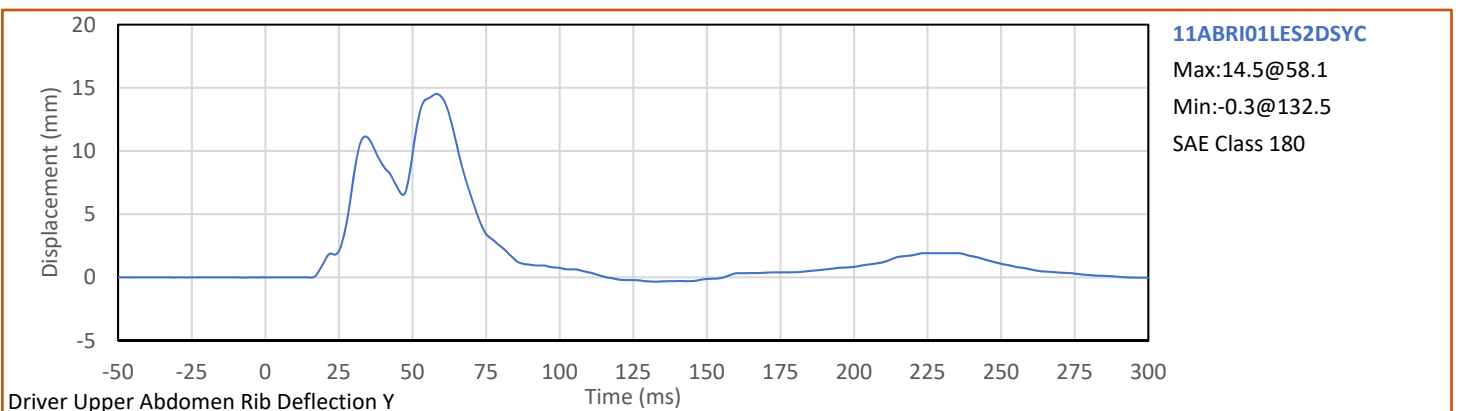
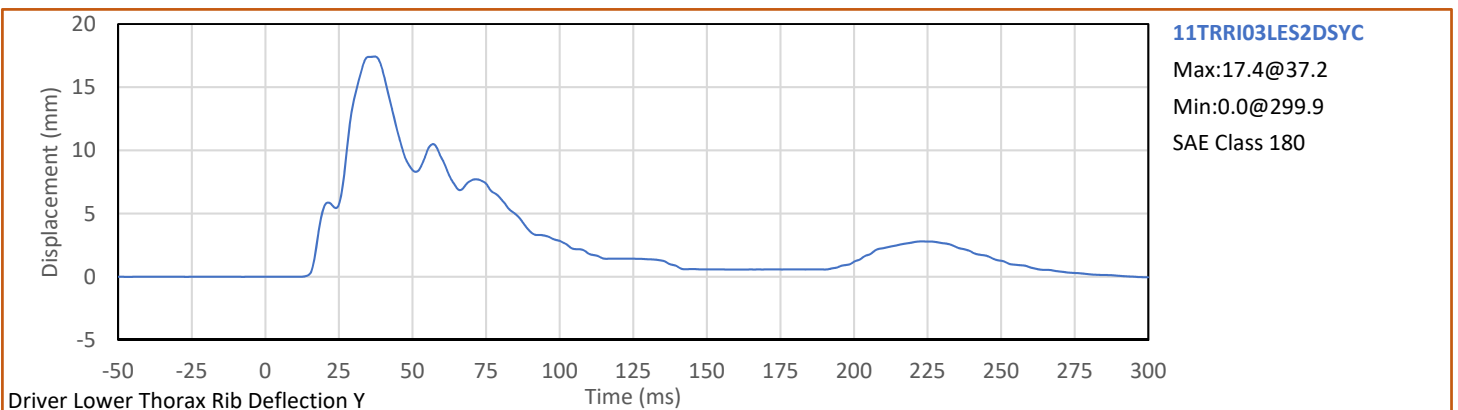
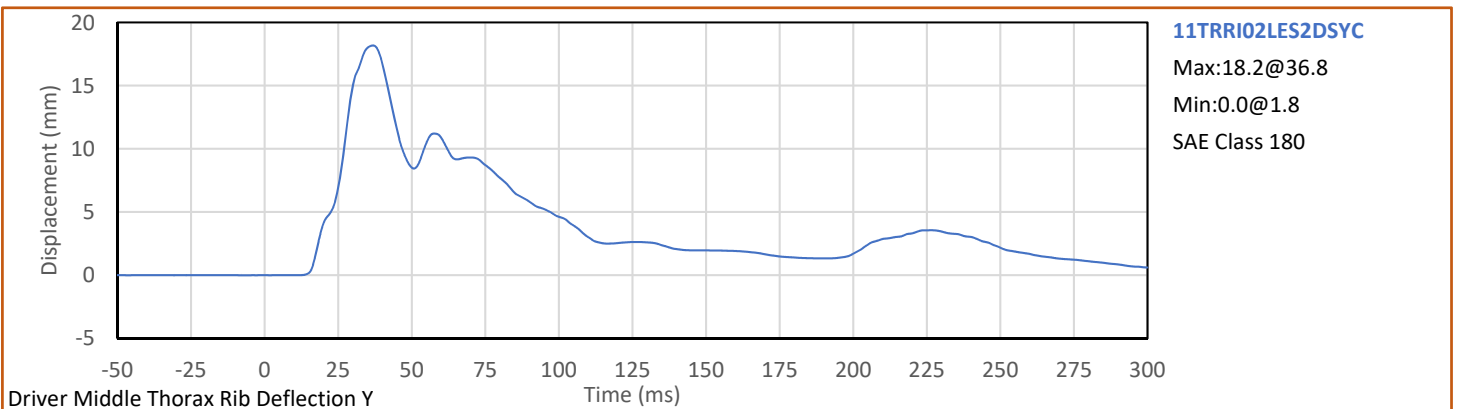
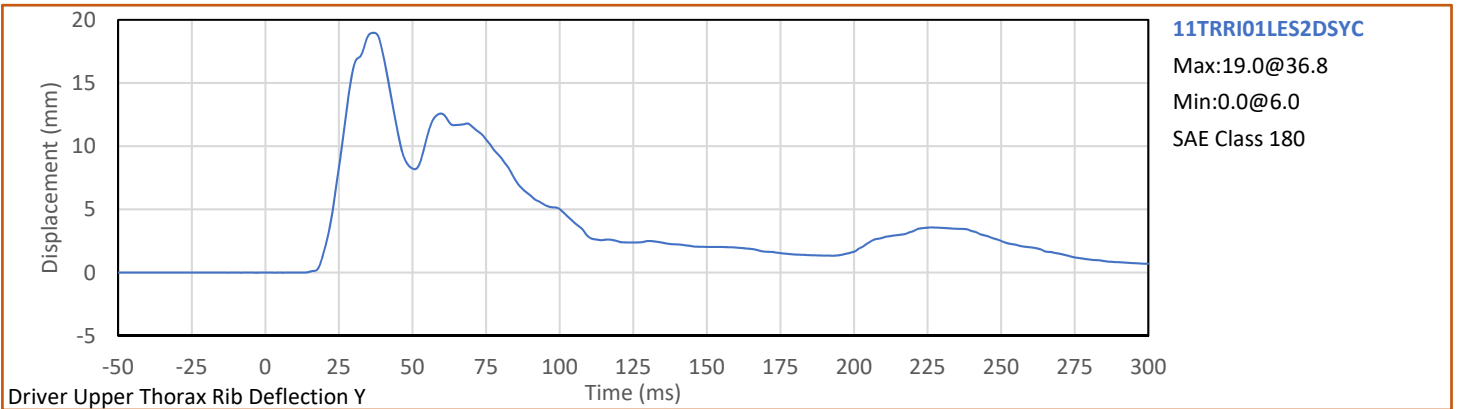
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

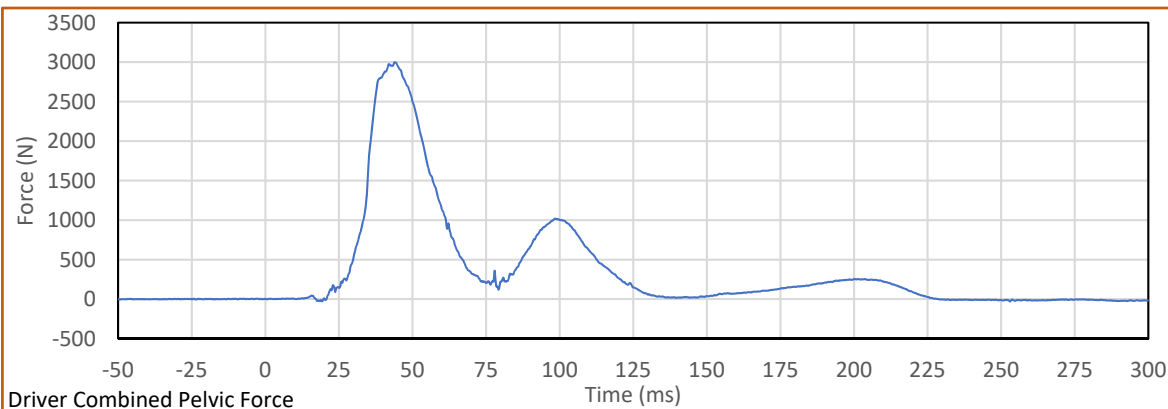
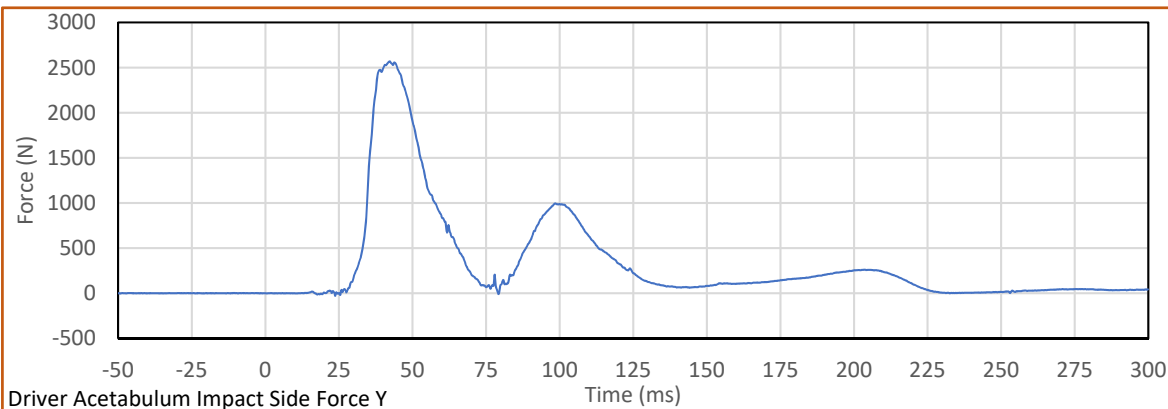
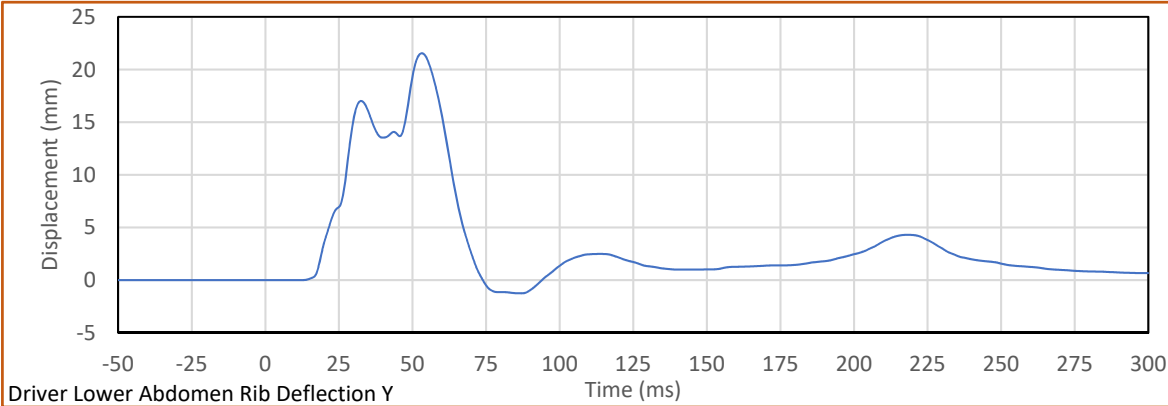
Pole Instrumentation Data

Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)









APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

ATD Serial No.: 308

Test Date: 2019-11-05

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	44	Pass
A - Sitting Height	mm	772	788	782	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	83	Pass
D - H Point From Seatback	mm	141	151	149	Pass
E - Shoulder Pivot From Backline	mm	97	107	105	Pass
F - Thigh Clearance	mm	119	135	126	Pass
G - Head Breadth	mm	140	148	143	Pass
H - Head Back From Backline	mm	40	46	42	Pass
I - Head Depth	mm	178	188	186	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	524	Pass
L - Popliteal Height	mm	343	369	350	Pass
K - Knee Pivot To Floor Height	mm	392	409	398	Pass
N - Buttock Popliteal Length	mm	416	442	437	Pass
O - Chest Depth W/O Jacket	mm	195	211	207	Pass
P - Foot Length	mm	216	232	221	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	318	Pass
R - Arm Length	mm	249	259	256	Pass
S - Knee Joint To Seatback	mm	477	493	486	Pass
V - Shoulder Width	mm	341	357	345	Pass
W - Foot Width	mm	78	94	84	Pass
Y - Chest Circumference W/Jacket	mm	851	881	862	Pass
Z - Waist Circumference	mm	761	791	779	Pass
Overall Test Results				Pass	

Technician:



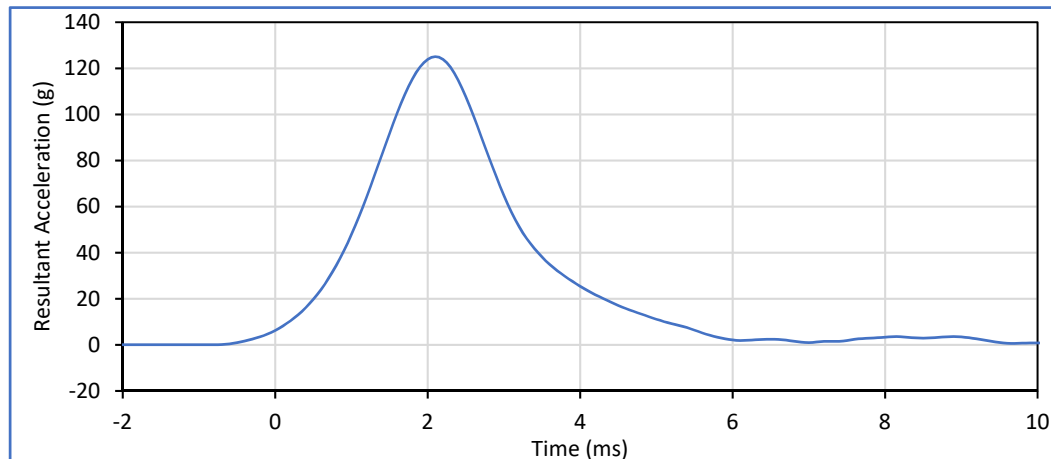
J. Hernandez

Approved By:

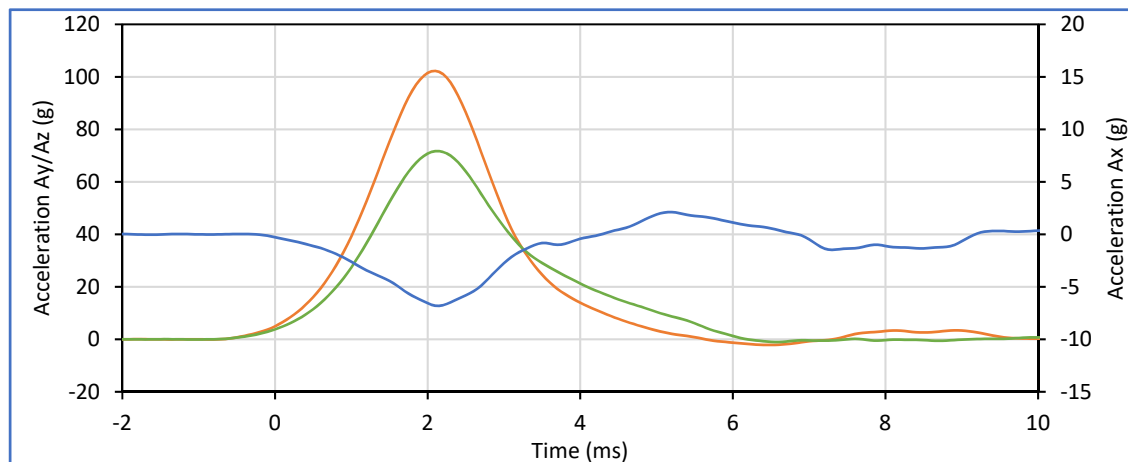


P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	22.2	Pass
Laboratory Humidity	%	10	70	18	Pass
Peak Resultant Acceleration	g	115.0	137.0	125.1	Pass
Peak Head Ax	g	-15.0	15.0	-6.8	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Head Resultant
Max:125.1@2.1
Min:0.6@9.7
SAE Class 1000



Head Ax
Max:2.1@5.2
Min:-6.8@2.2
SAE Class 1000
Head Ay
Max:102.3@2.1
Min:-2.1@6.5
SAE Class 1000
Head Az
Max:71.7@2.2
Min:-1.1@6.6
SAE Class 1000

Technician:

J. Hernandez

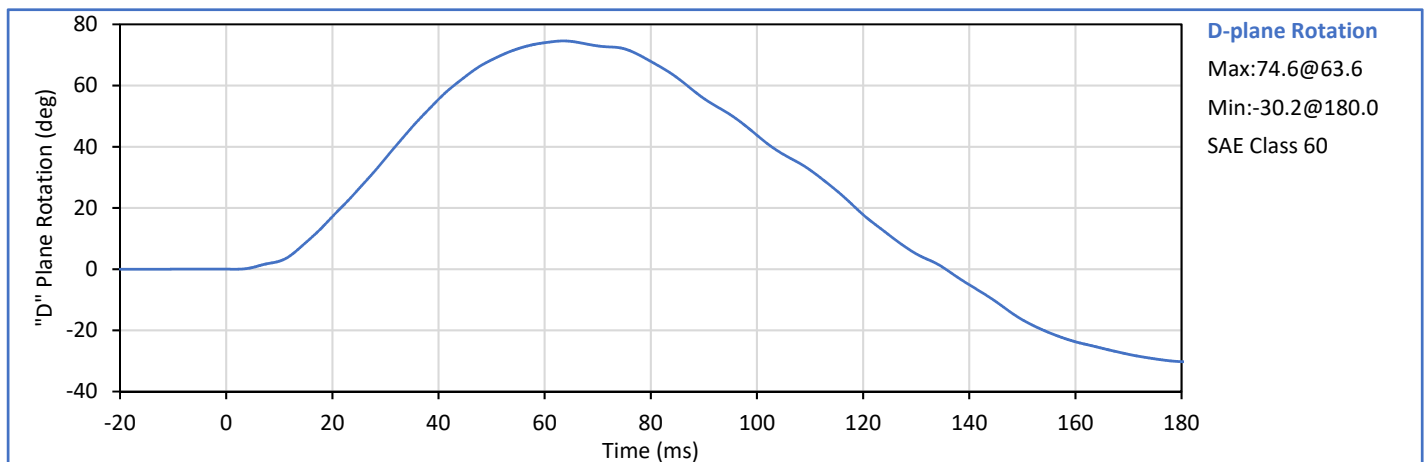
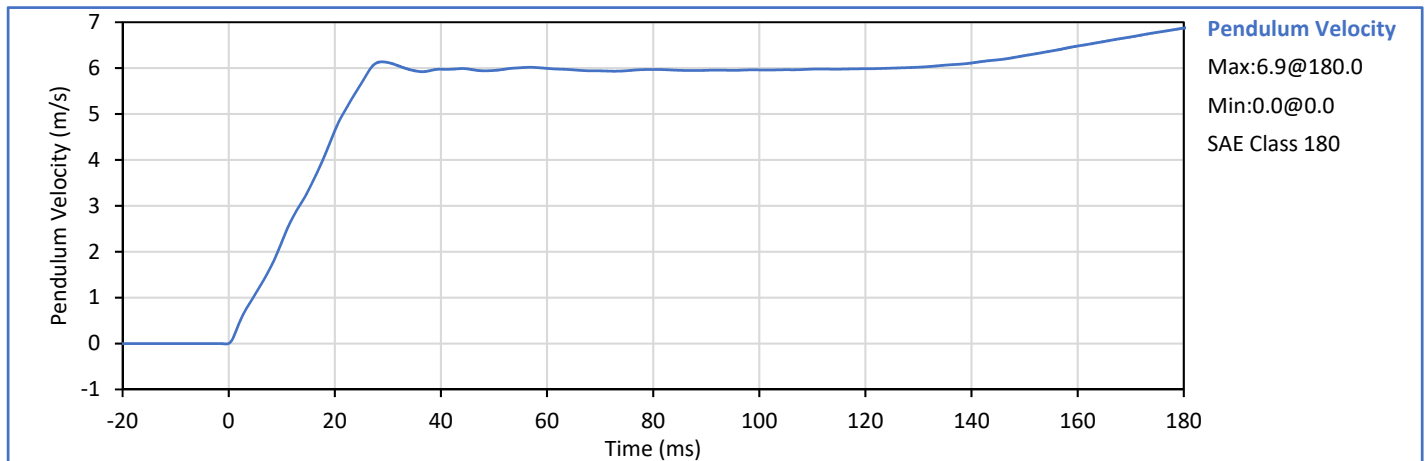
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	5.51	5.63	5.60	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.21	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.33	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.64	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.67	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	6.14	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	74.6	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	63.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-38.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	115.9	Pass
Overall Test Results				Pass	



Technician:

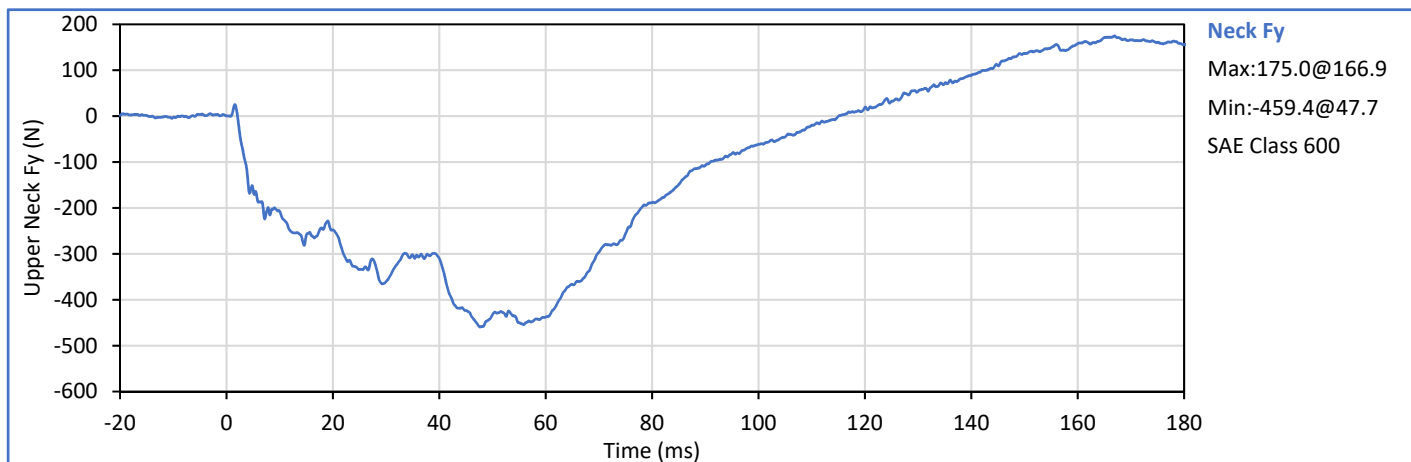
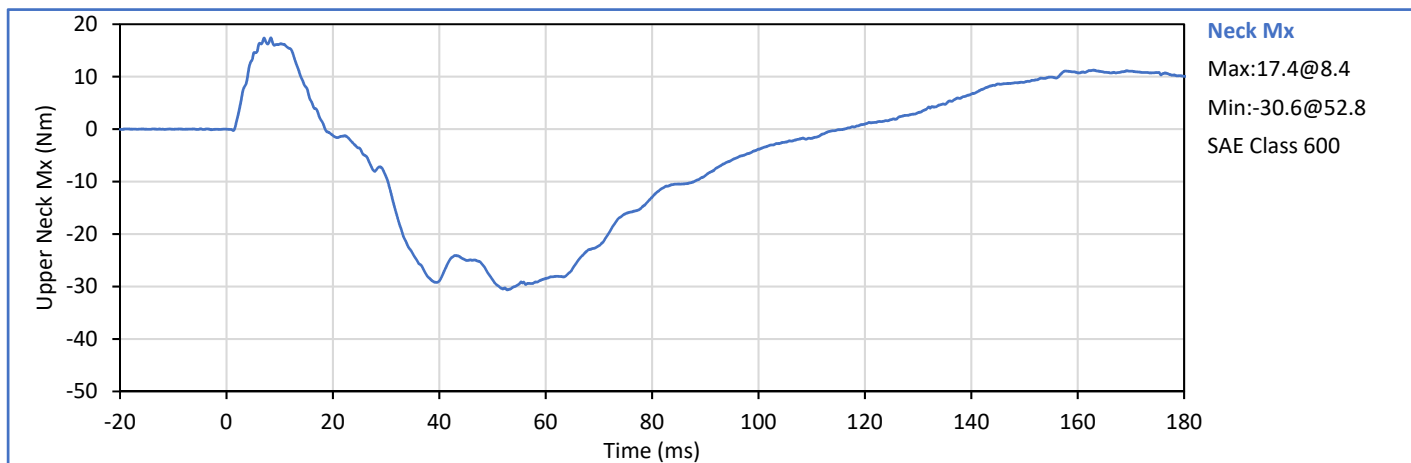
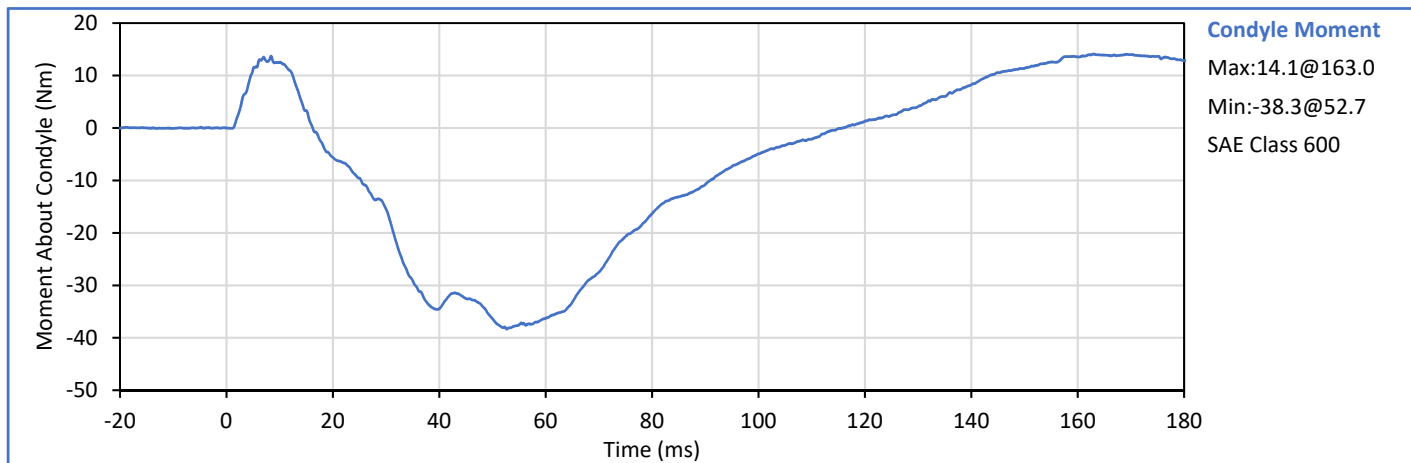
J. Hernandez

J. Hernandez

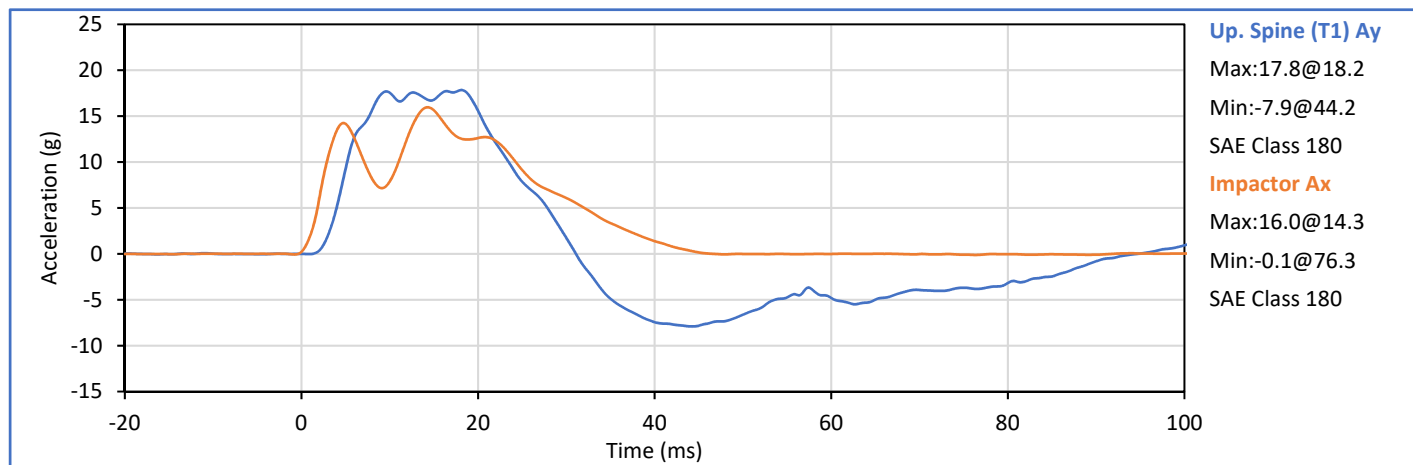
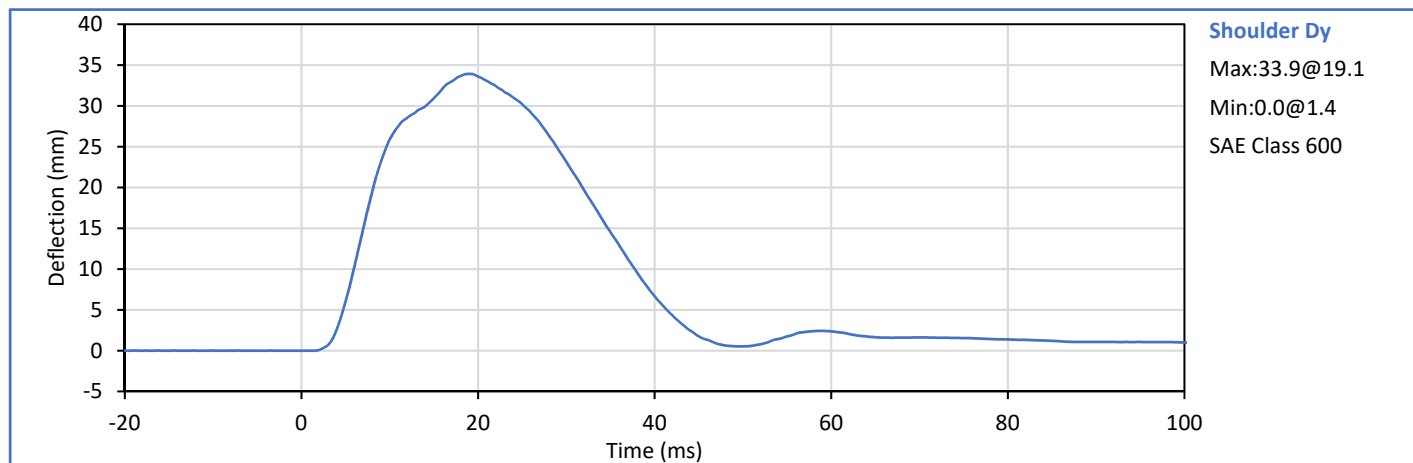
Approved By:

P. Puzzuto

P. Puzzuto



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	22	Pass
Impactor Velocity	m/s	4.20	4.40	4.27	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.9	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	17.8	Pass
Peak Impactor Ax	g	13.0	18.0	16.0	Pass
Overall Test Results					Pass



Technician:

J. Hernandez

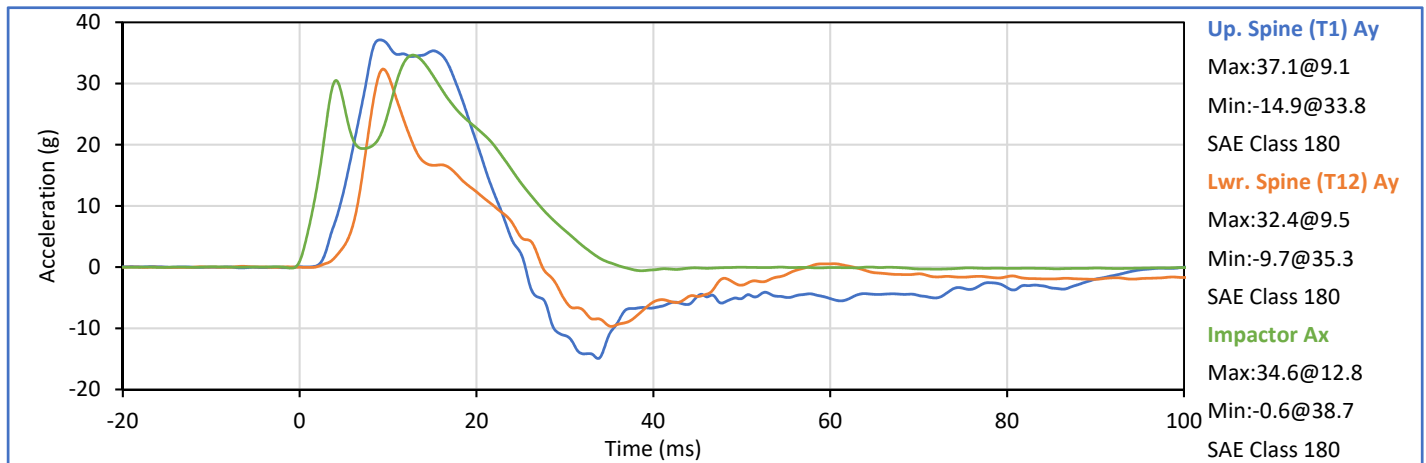
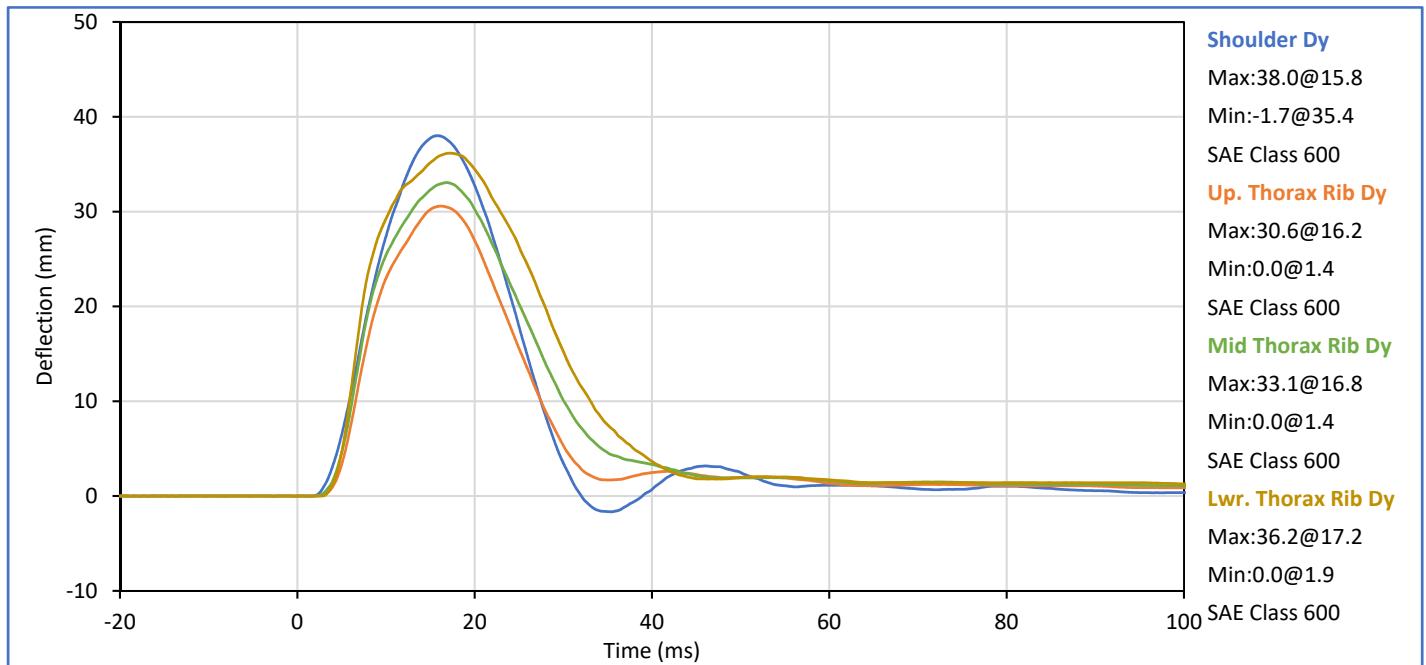
J. Hernandez

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	23	Pass
Impactor Velocity	m/s	6.60	6.80	6.74	Pass
Peak Shoulder Dy	mm	31.0	40.0	38.0	Pass
Peak Upper Rib Dy	mm	25.0	32.0	30.6	Pass
Peak Middle Rib Dy	mm	30.0	36.0	33.1	Pass
Peak Lower Rib Dy	mm	32.0	38.0	36.2	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.1	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	32.4	Pass
Peak Impactor Ax	g	30.0	36.0	34.6	Pass
Overall Test Results				Pass	



Technician:

J. Hernandez

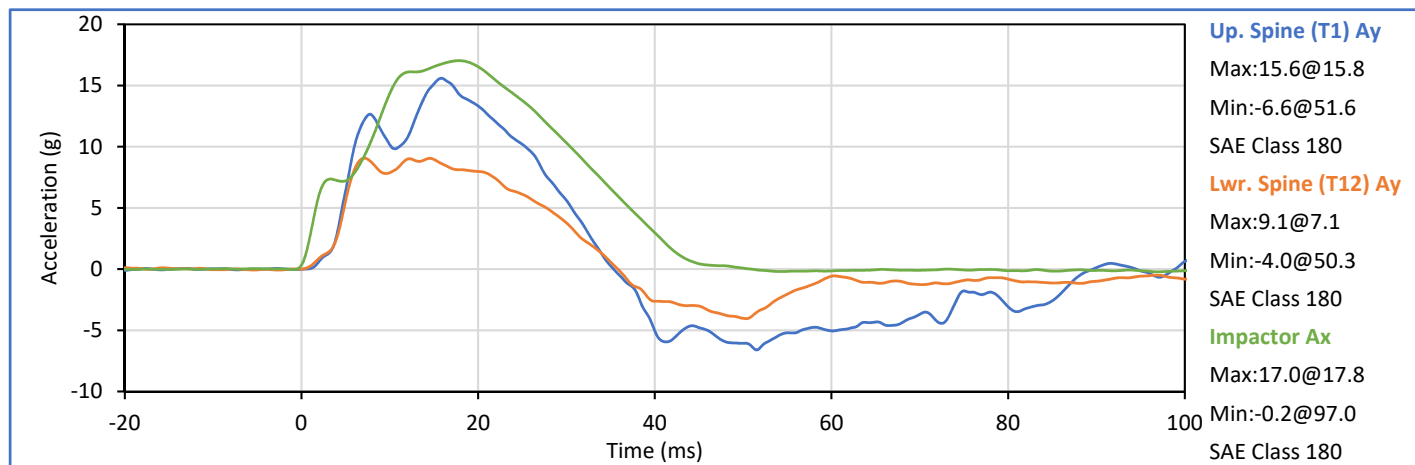
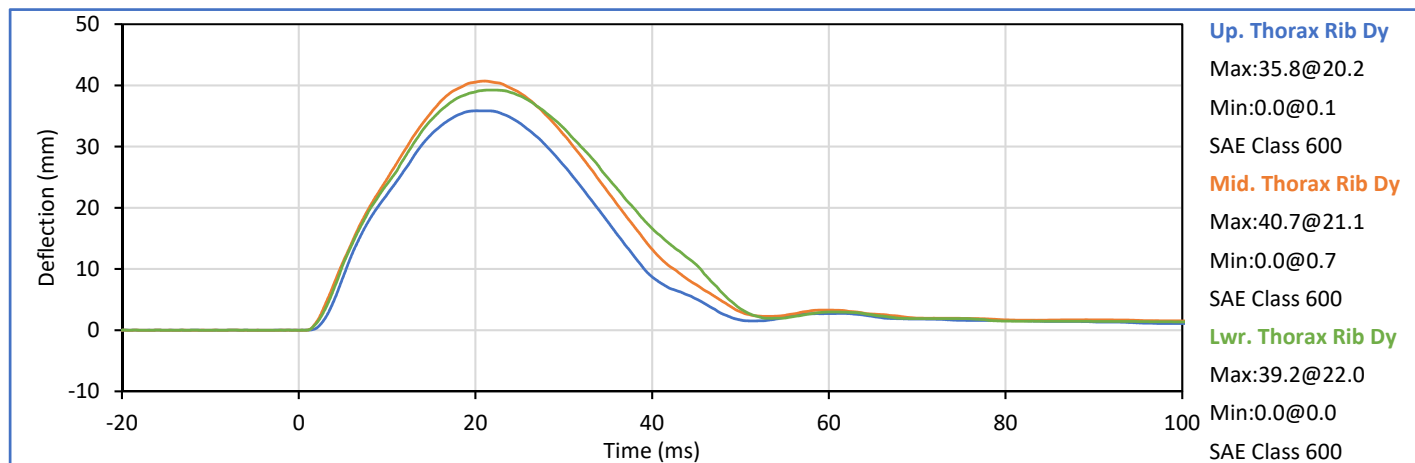
J. Hernandez

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	23	Pass
Impactor Velocity	m/s	4.20	4.40	4.27	Pass
Peak Upper Rib Dy	mm	32.0	40.0	35.8	Pass
Peak Middle Rib Dy	mm	39.0	45.0	40.7	Pass
Peak Lower Rib Dy	mm	35.0	43.0	39.2	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	15.6	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	9.1	Pass
Peak Impactor Ax	g	14.0	18.0	17.0	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

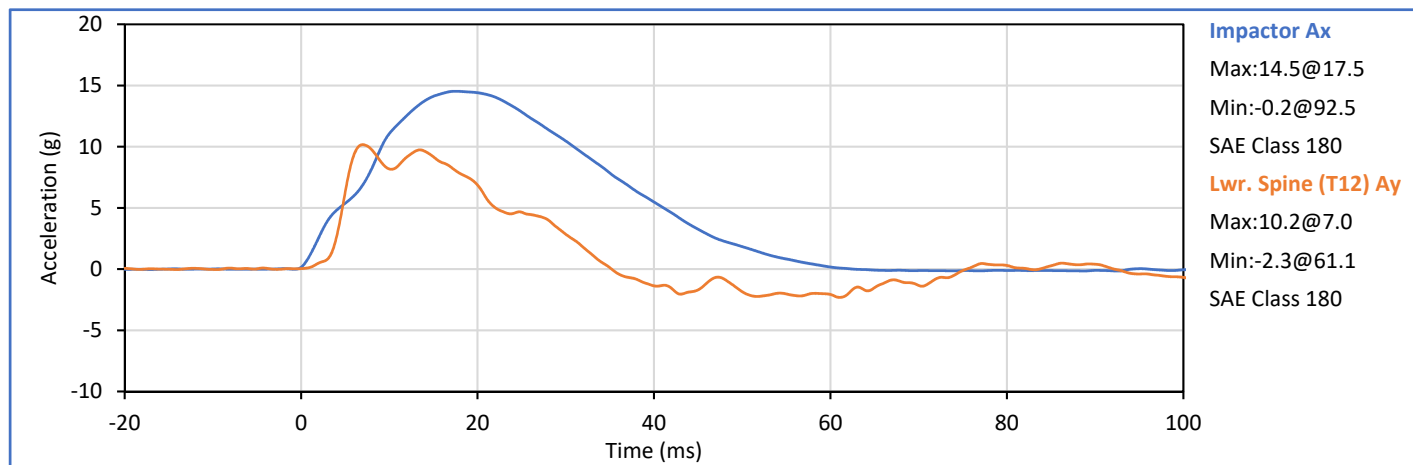
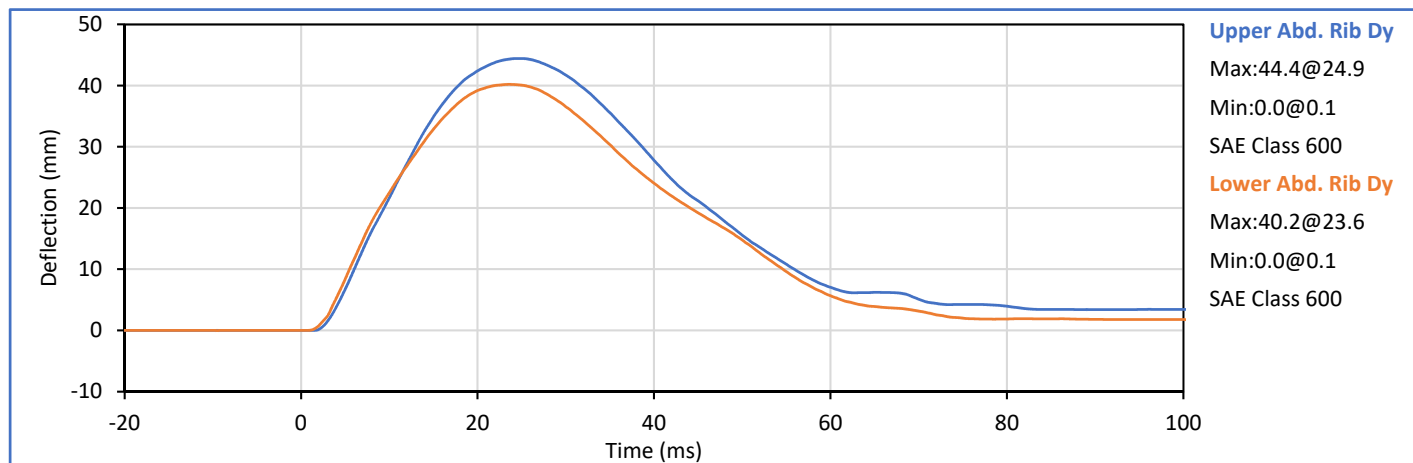
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	22	Pass
Impactor Velocity	m/s	4.20	4.40	4.21	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	44.4	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	40.2	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.2	Pass
Peak Impactor Ax	g	12.0	16.0	14.5	Pass
Overall Test Results				Pass	



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

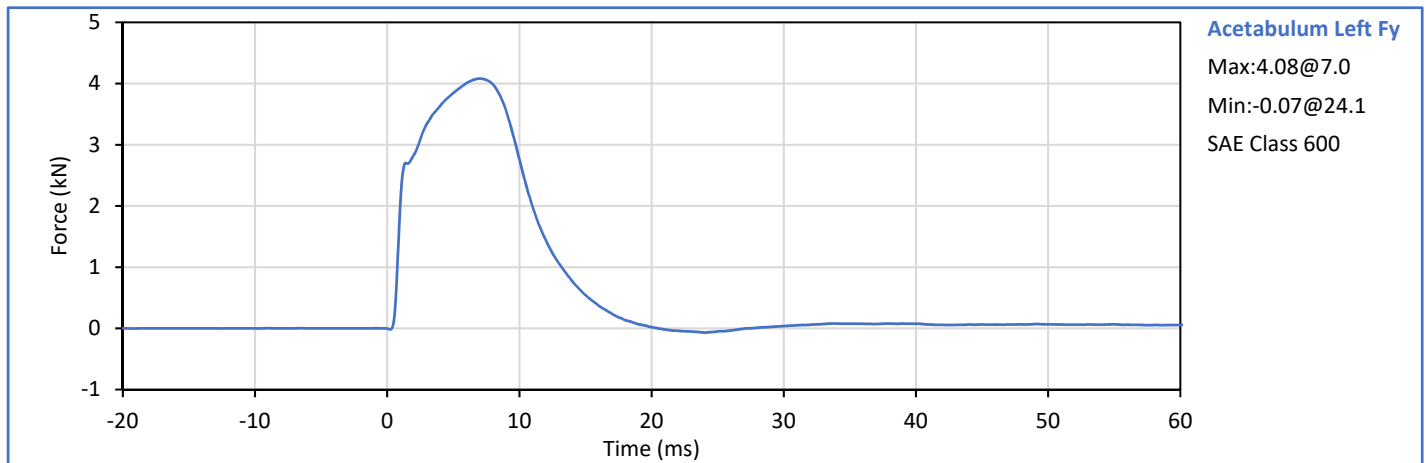
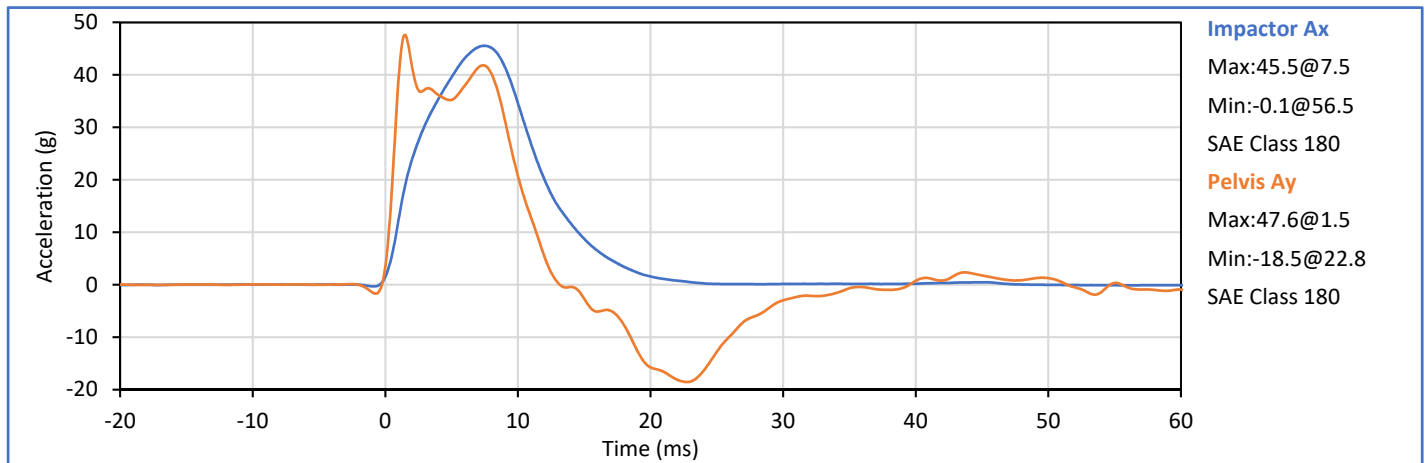
P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	6.60	6.80	6.70	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.08	Pass
Pelvis Ay after 6ms	g	34.0	42.0	41.8	Pass
Peak Impactor Ax	g	38.0	47.0	45.5	Pass
Overall Test Results				Pass	Pass

Pelvis Plug S/N: 12313 (SACO)



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto



SID-IIs Pelvis Plug Certification Test

Plug S/N 12313

Test Number 6698

Report Number 6713

Test Date 3/21/2018 12:18:59 PM

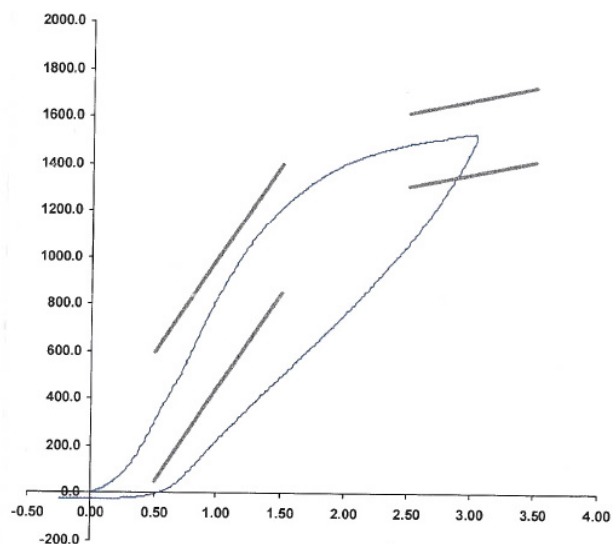
	Test Results	Spec. Min	Spec. Max
Force @ 0.5 mm (N)	297.73	50.00	600.00
Force @ 1.5 mm (N)	1,215.04	850.00	1,400.00
Force @ 2.5 mm (N)	1,483.56	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,528.49	1,361.00	1,673.00

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 22-Mar-18
SACO Research

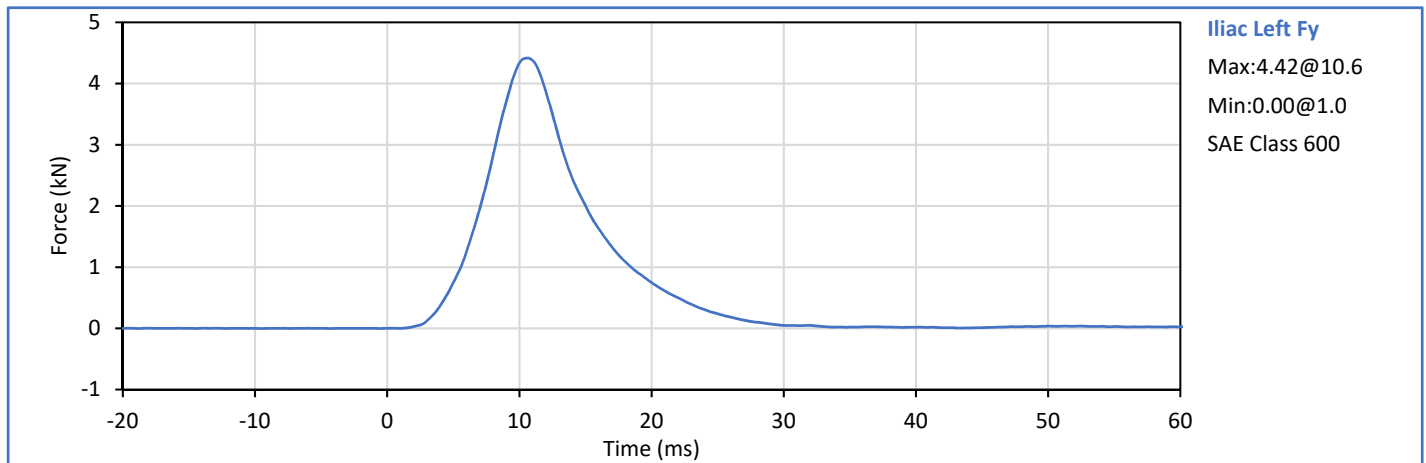
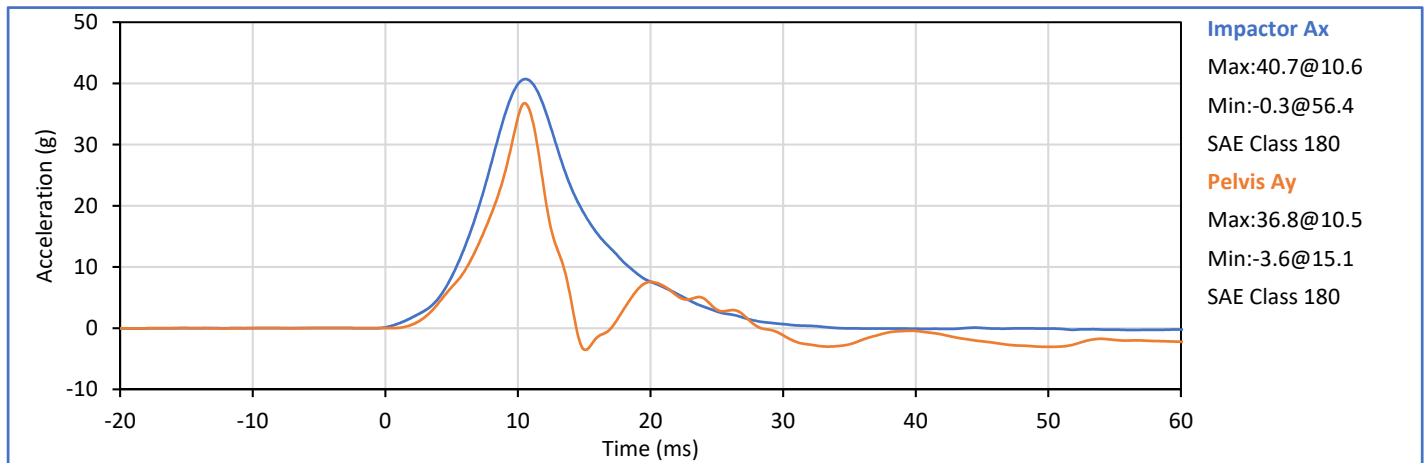
By: DC Date: 3/21/18

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

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Impactor Velocity	m/s	4.20	4.40	4.28	Pass
Peak Iliac Fy	kN	4.10	5.10	4.42	Pass
Pelvis Ay after 6ms	g	28.0	39.0	36.8	Pass
Peak Impactor Ax	g	36.0	45.0	40.7	Pass
Overall Test Results				Pass	

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician:

[Signature]

J. Hernandez

Approved By:

[Signature]

P. Puzzuto

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

ATD Serial No.: 308

Test Date: 2019-11-12

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

Technician:



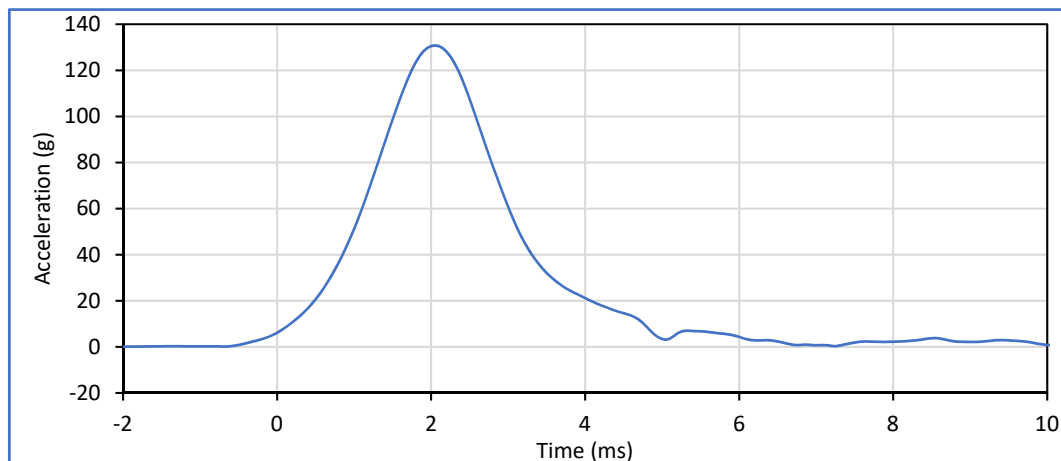
J. Hernandez

Approved By:



P. Puzzuto

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

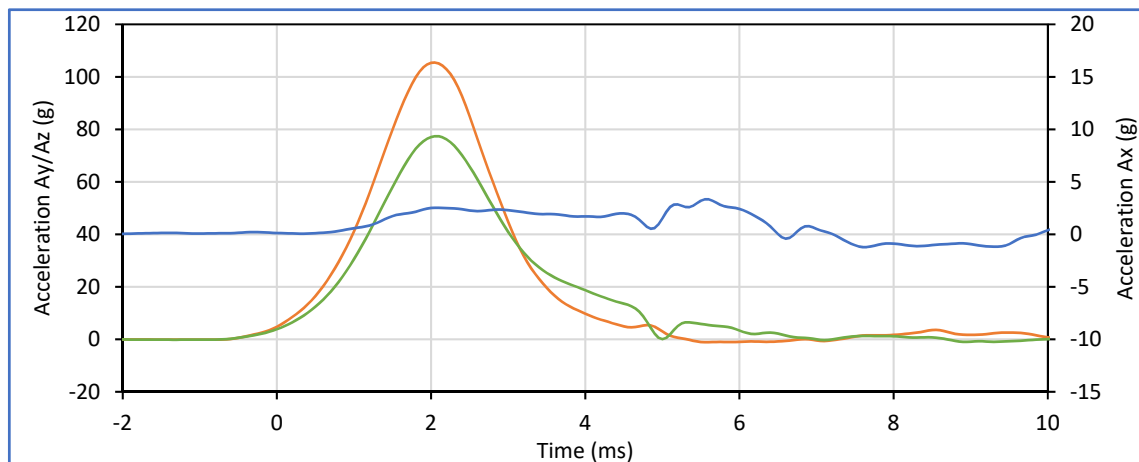


Head Resultant

Max:130.8@2.1

Min:0.3@7.3

SAE Class 1000



Head Ax

Max:3.3@5.6

Min:-1.2@7.7

SAE Class 1000

Head Ay

Max:105.5@2.1

Min:-1.1@5.6

SAE Class 1000

Head Az

Max:77.4@2.1

Min:-1.0@9.0

SAE Class 1000

Technician:

J. Hernandez

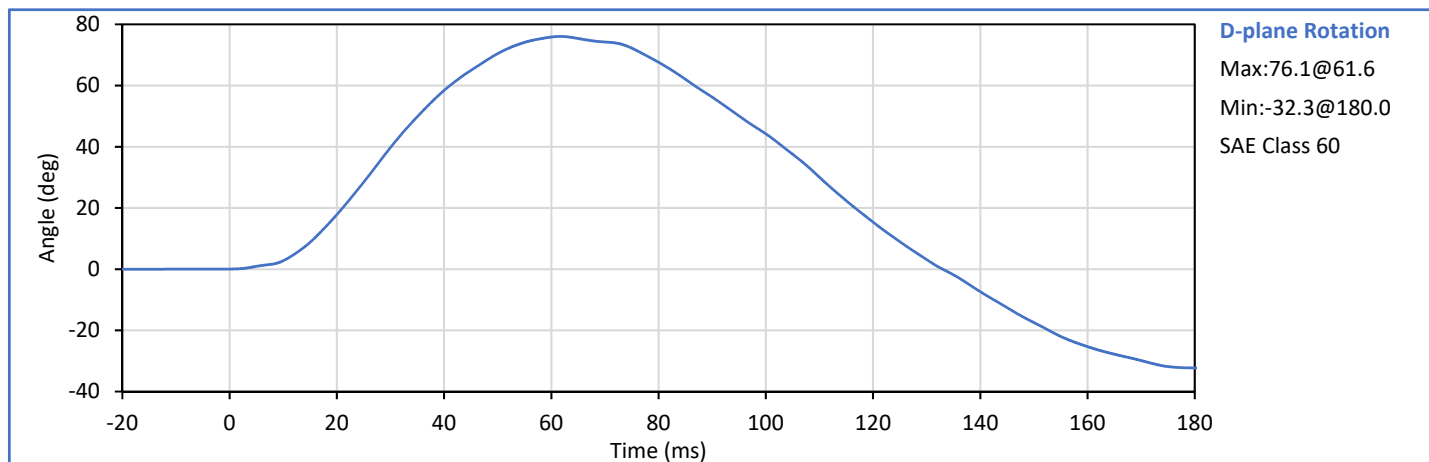
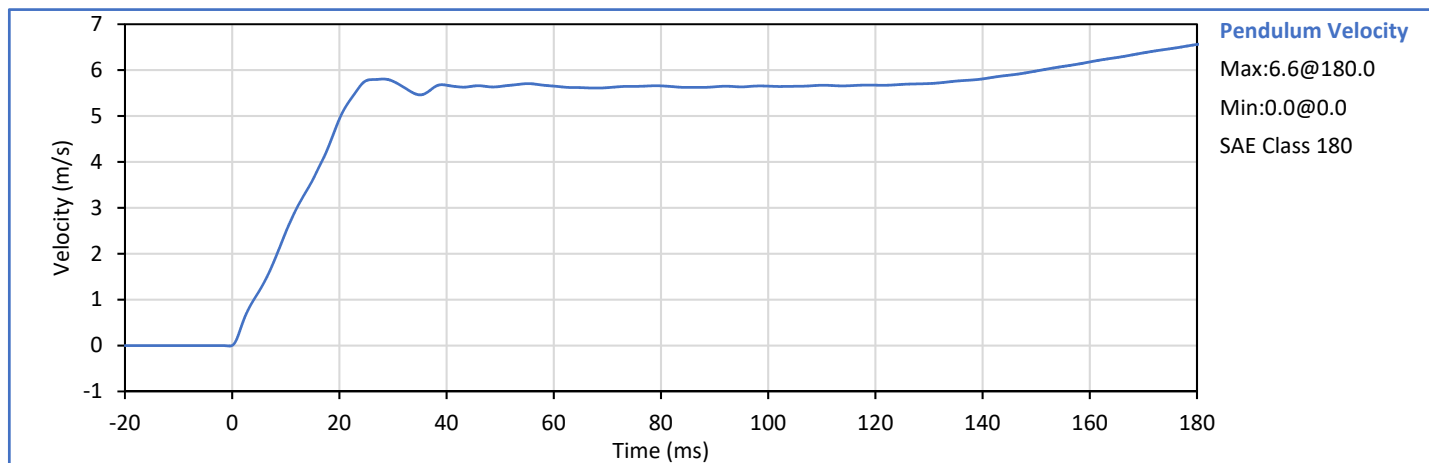
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

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



Technician:

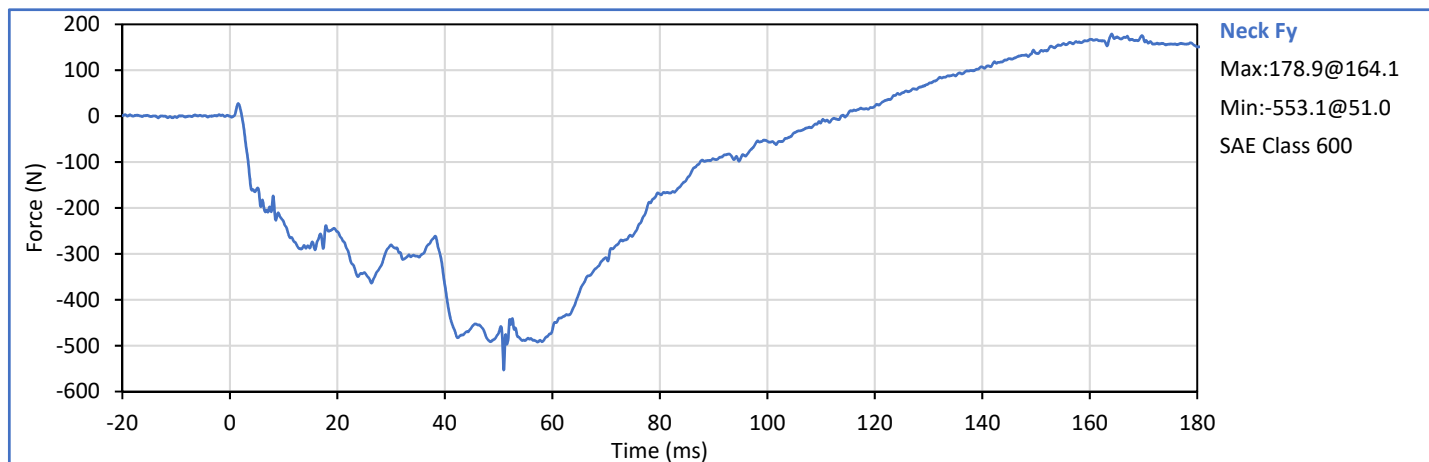
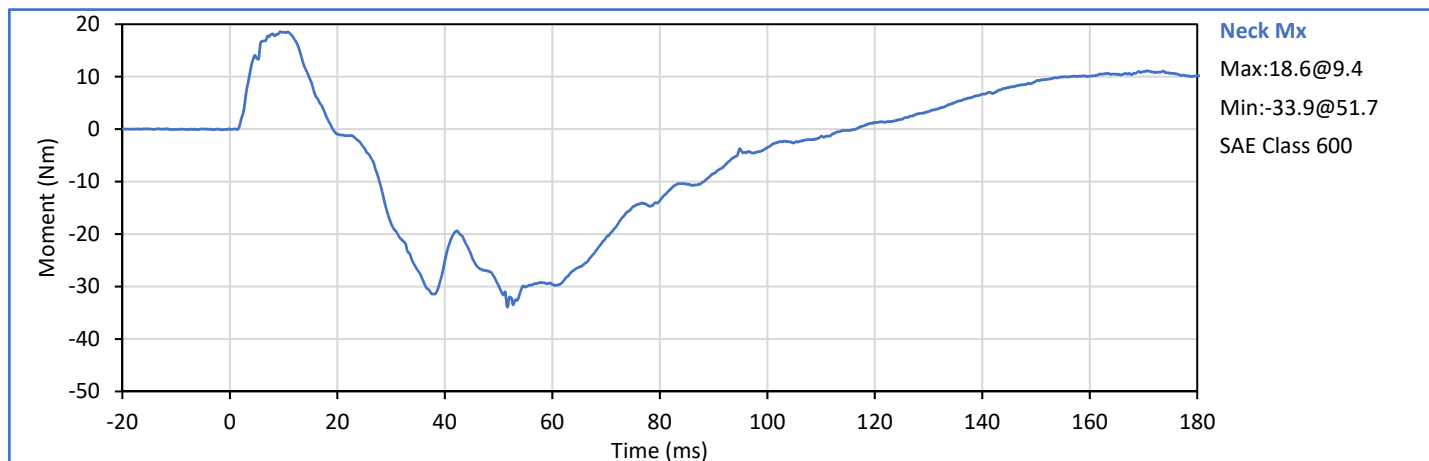
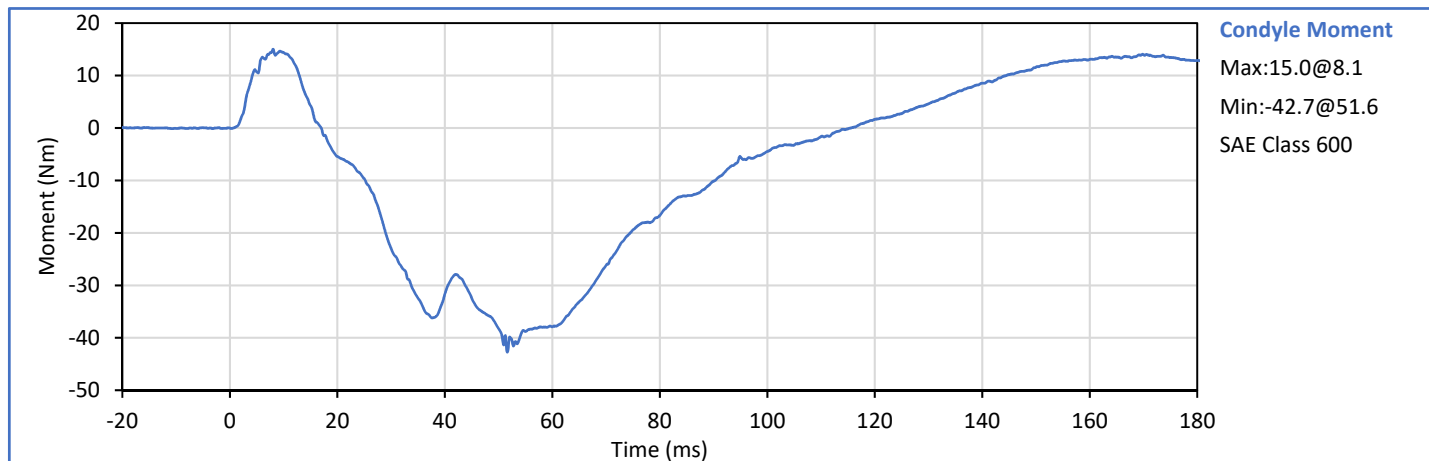
J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

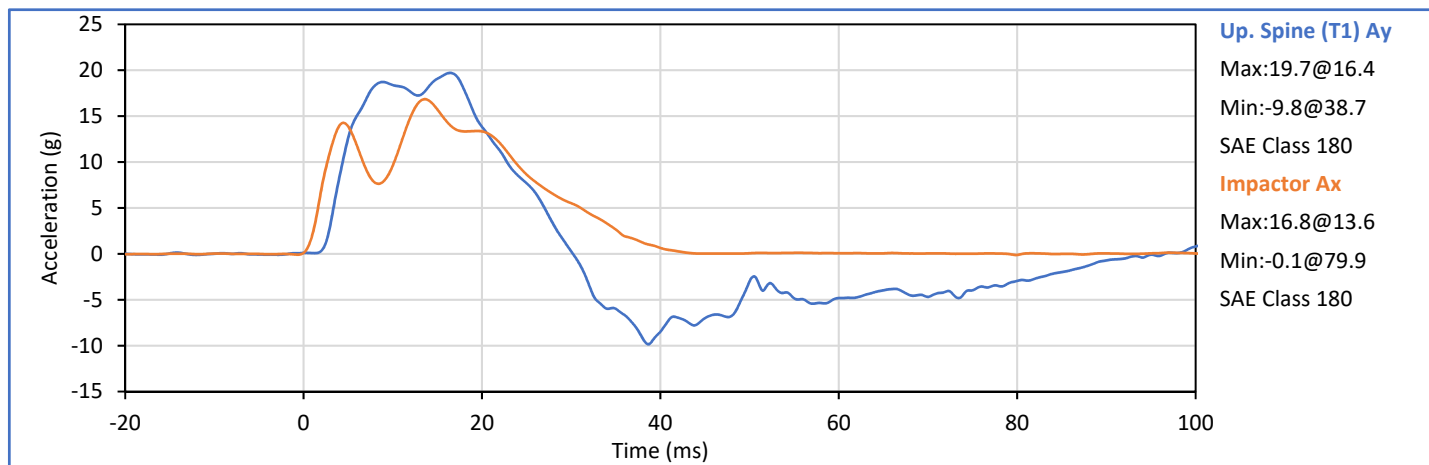
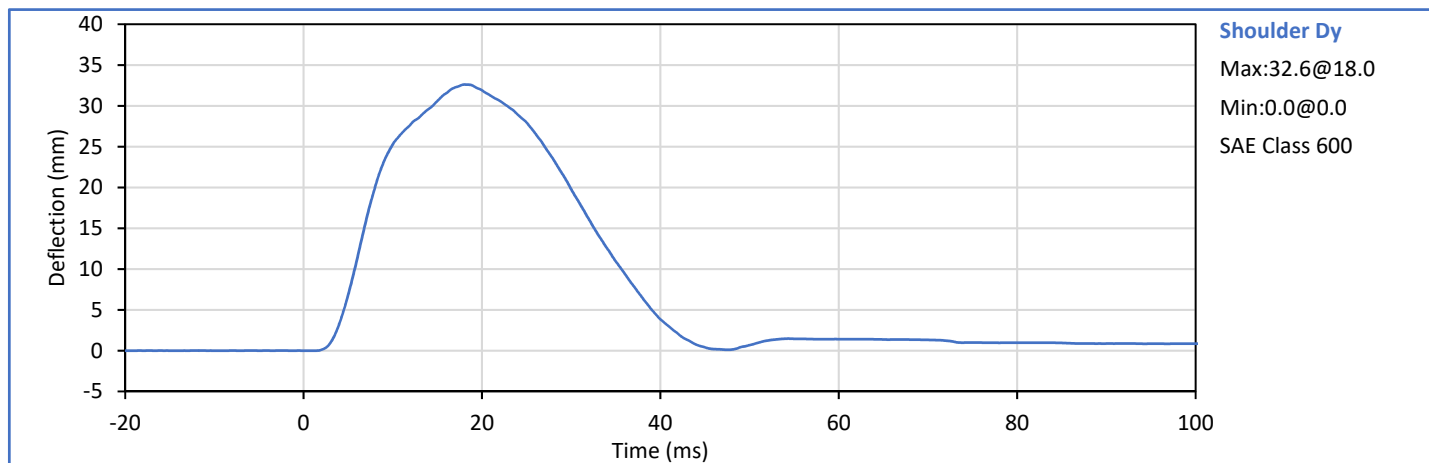
P. Puzzuto



ATD Serial No.: 308

Test Date: 2019-11-13

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



Technician:

J. Hernandez

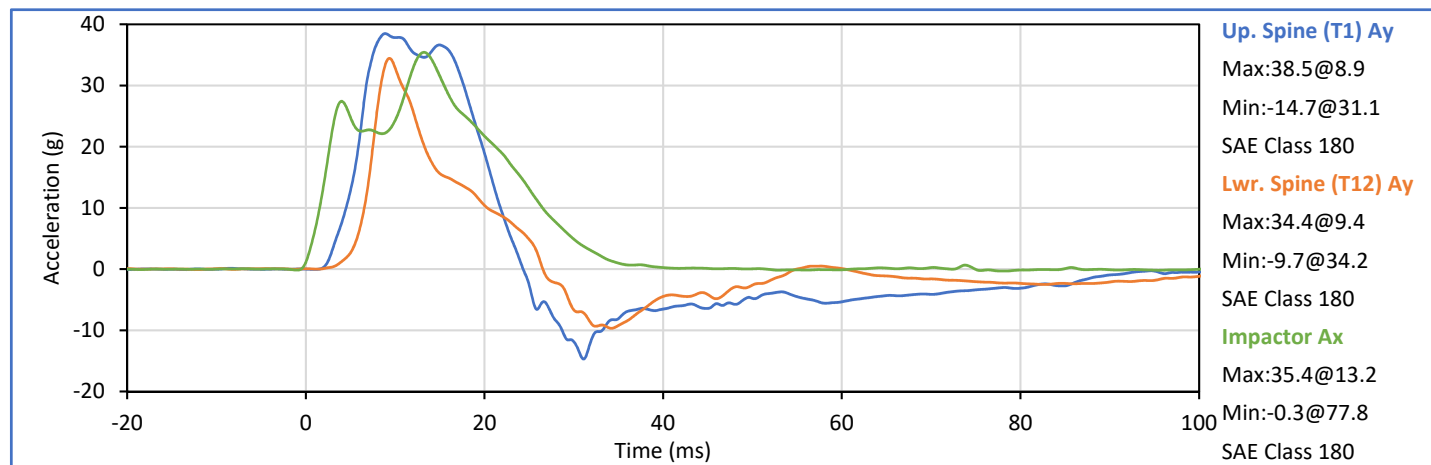
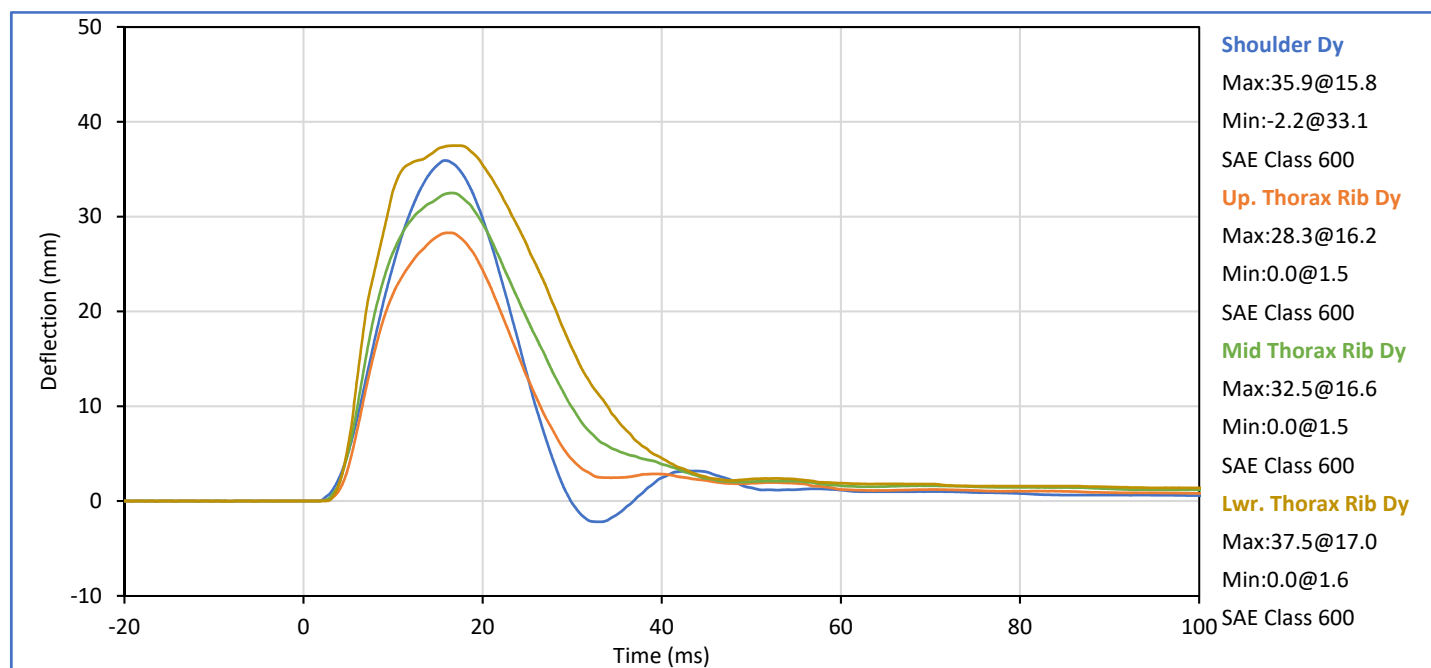
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

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



Technician:

J. Hernandez

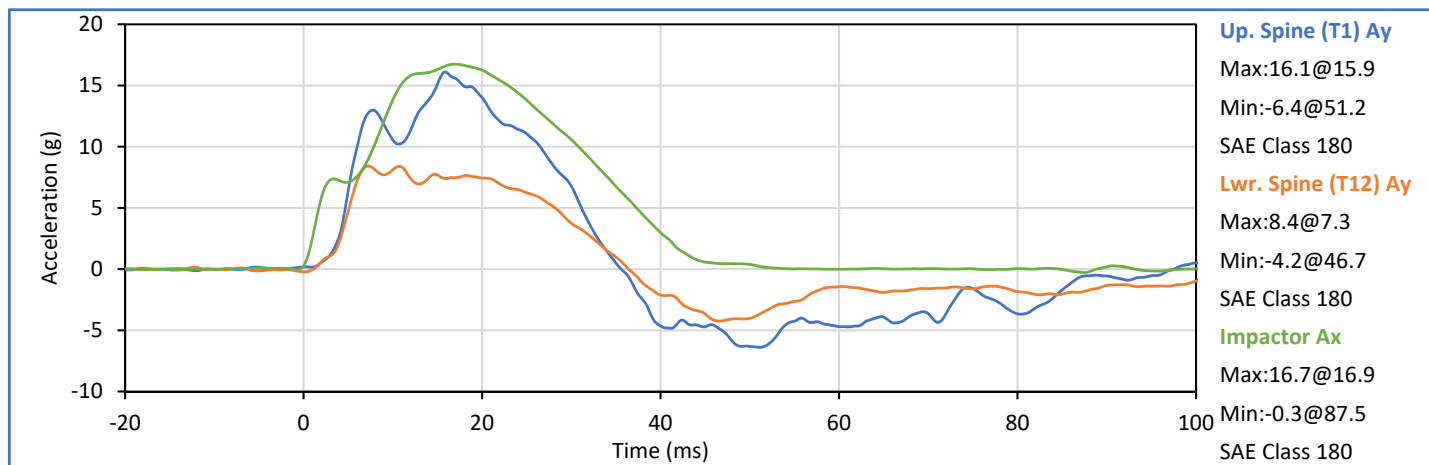
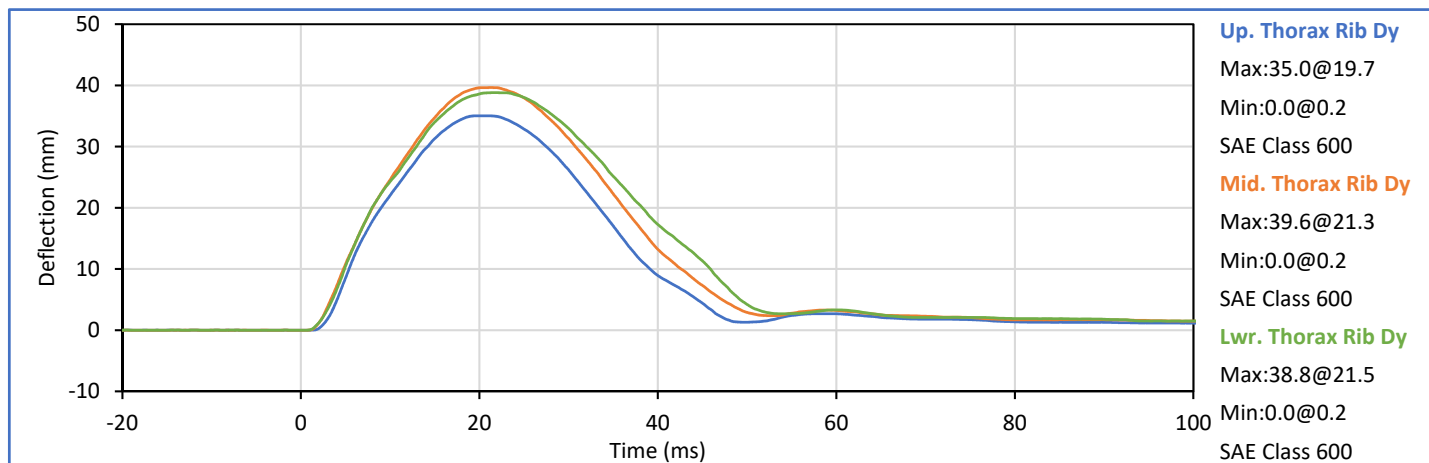
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

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



Technician:

J. Hernandez

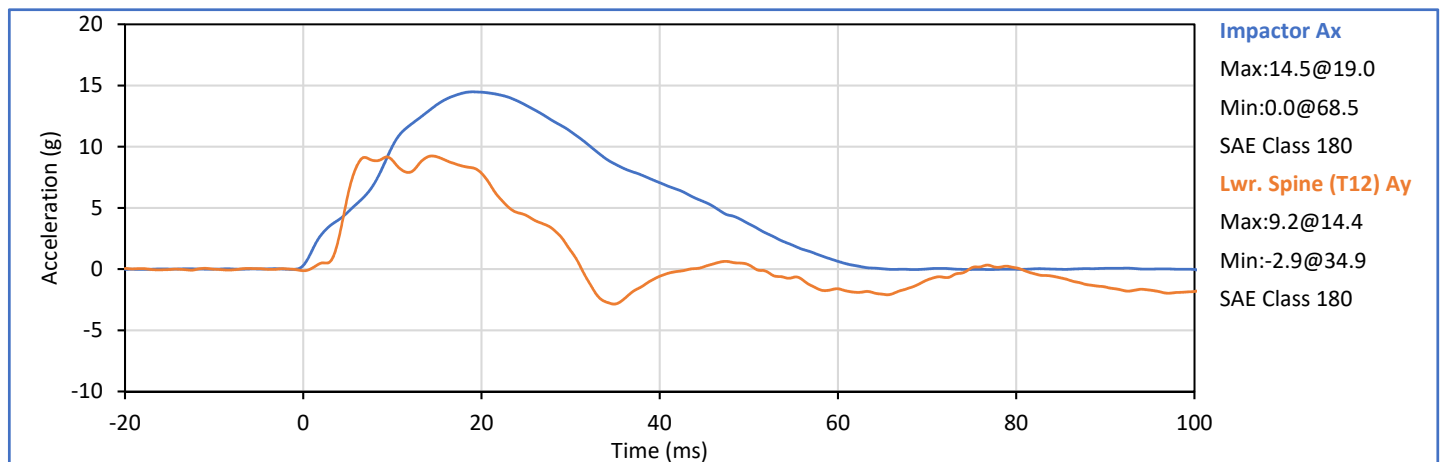
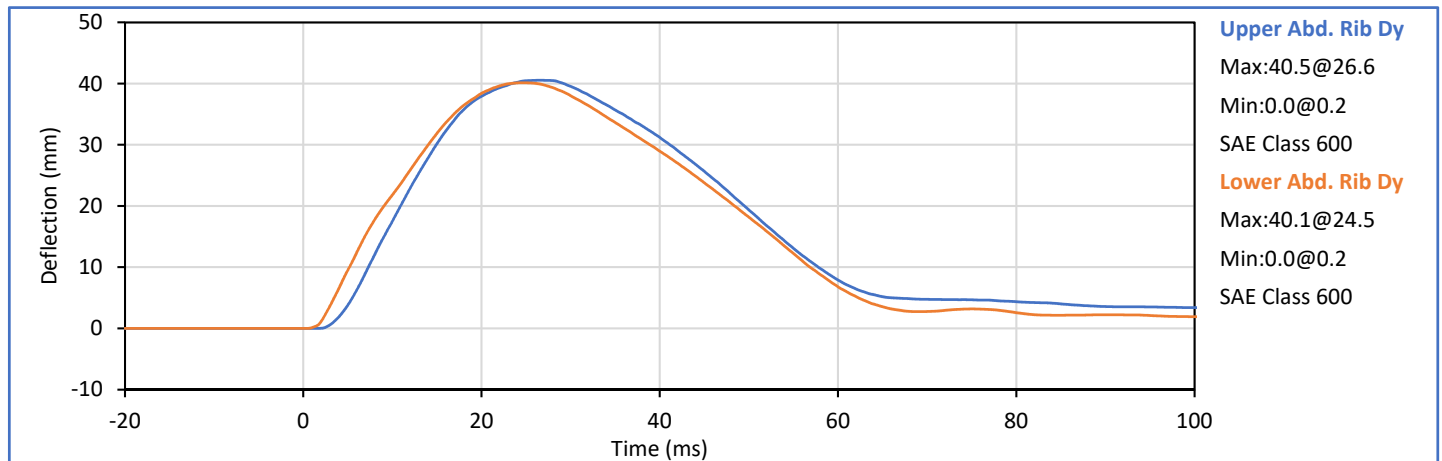
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

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



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

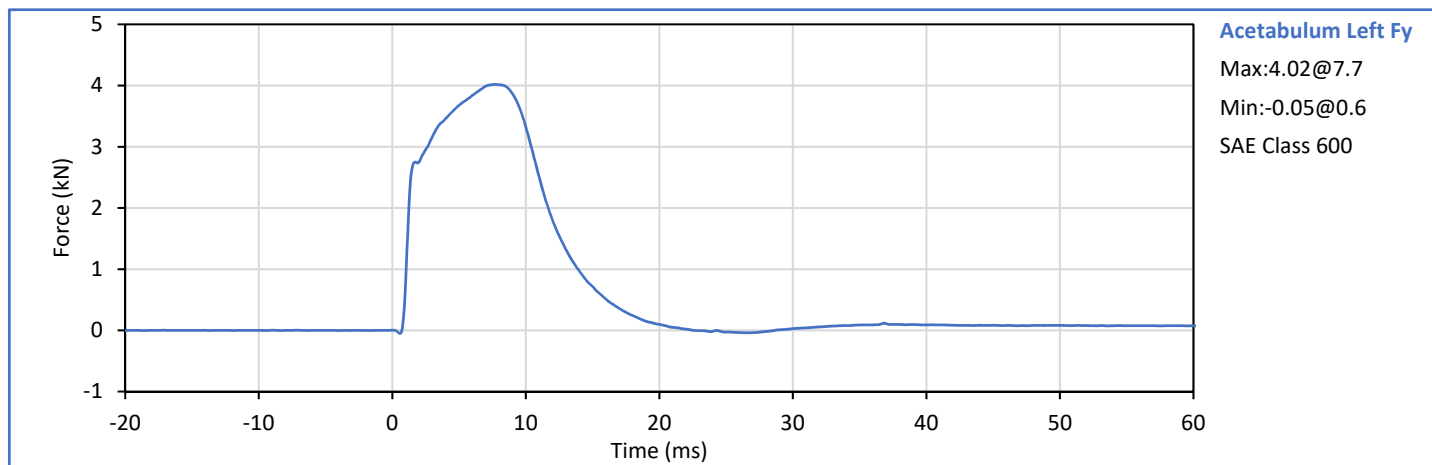
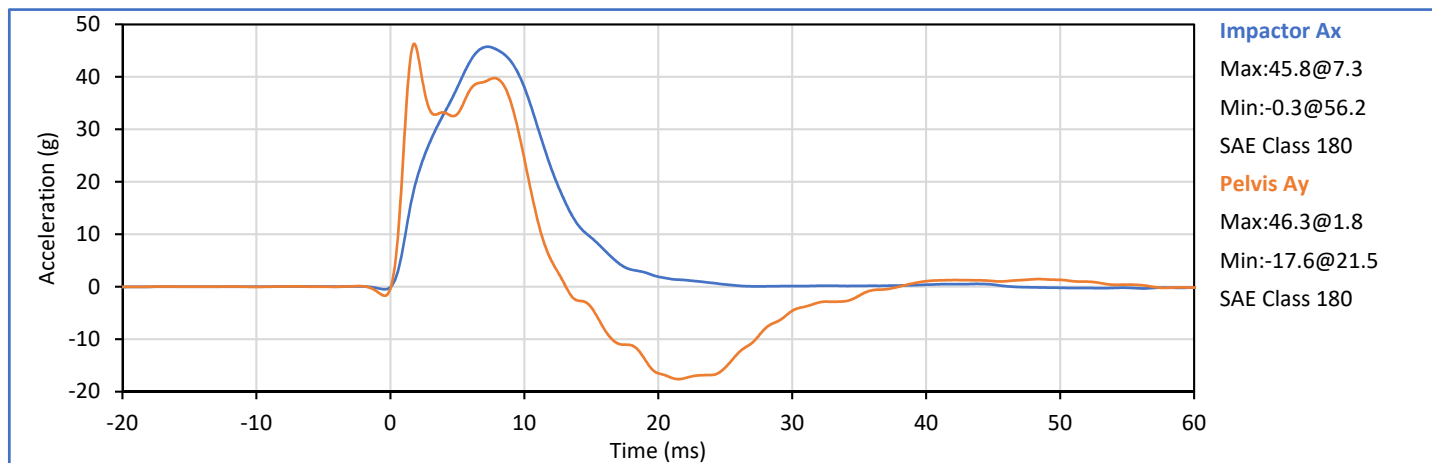
P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-13

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

Pelvis Plug S/N: 11695 (SACO)



Technician:

J. Hernandez

J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

ATD Serial No.: 308

Test Date: 2019-11-13

Pelvis Plug S/N: 11695 (SACO)



SID-IIs Pelvis Plug Certification Test

Plug S/N 11695

Test Number 3437

Report Number 3430

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

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

Testing Machine STM-20 5965542

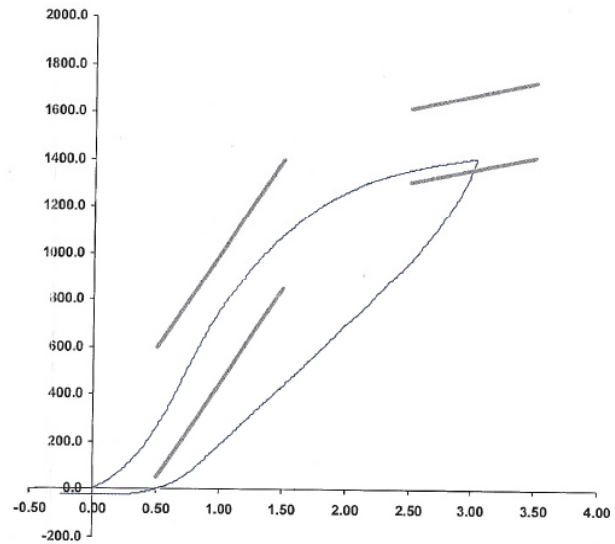
Load Cell S/N (TI240813), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 27-Mar-17
SACO Research

By: DC Date: 3/27/17

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

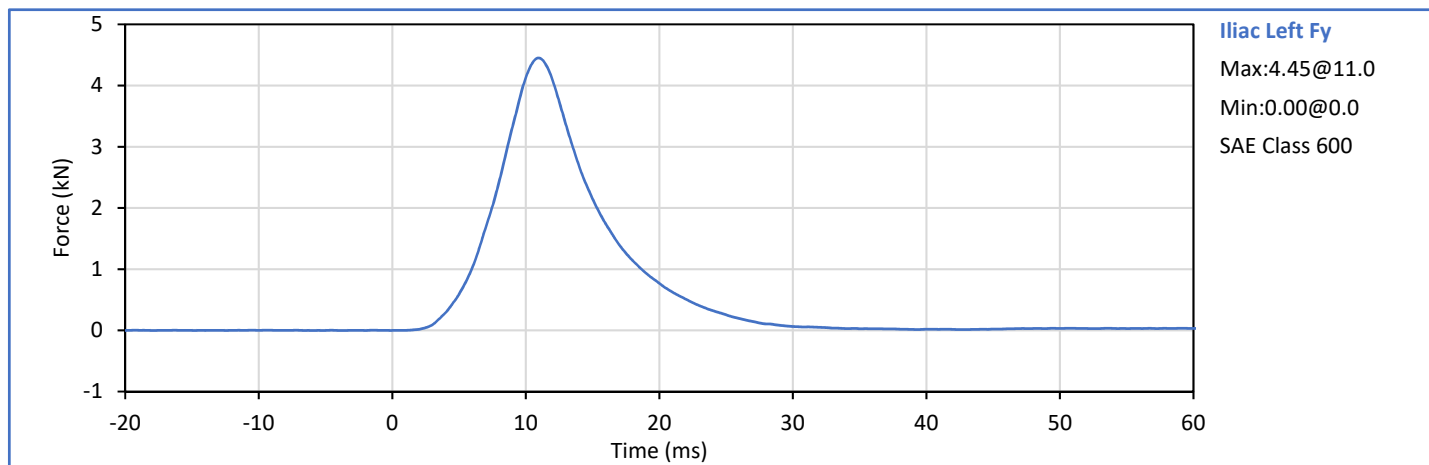
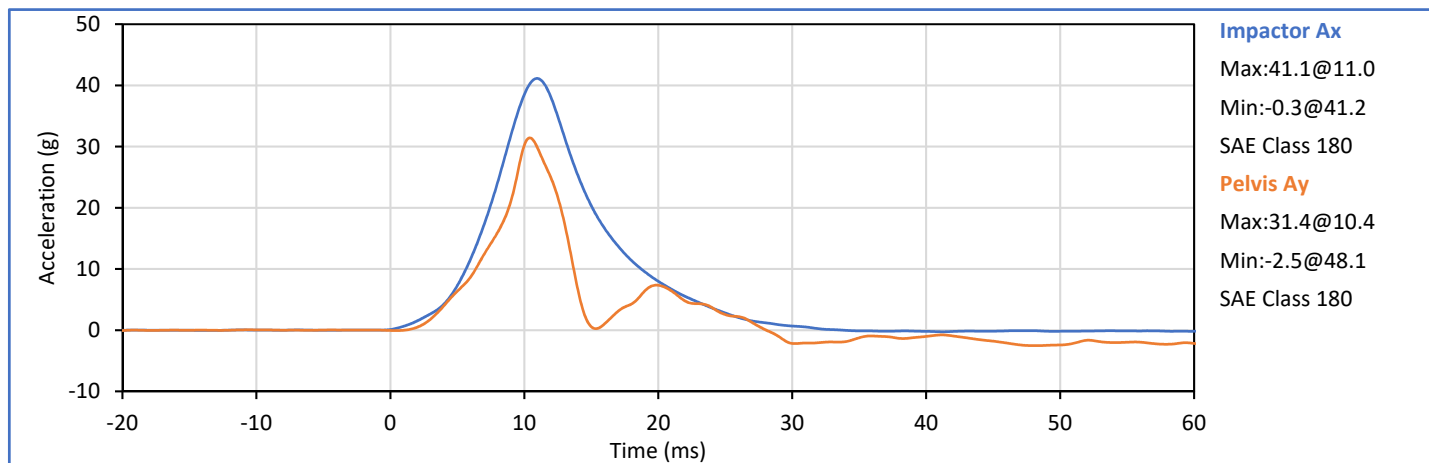
ATD Serial No.: 308

Test Date: 2019-11-13

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

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician: _____

J. Hernandez

Approved By: _____

P. Puzzuto

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1a - Driver ATD Instrumentation

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

Table 1b - Driver ATD Instrumentation, Optional (Research Data Only)

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

Table 2 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	10884	Endevco	757F-2k	05/28/2019
Vehicle CG Ay	10890	Endevco	757F-2k	05/28/2019
Vehicle CG Az	10913	Endevco	757F-2k	05/25/2019
Left Floor Sill Ay	10882	Endevco	757F-2k	05/28/2019
A-Pillar Sill Ay	10861	Endevco	757F-2k	05/24/2019
A-Pillar Low Ay	10867	Endevco	757F-2k	05/28/2019
A-Pillar Mid Ay	10897	Endevco	757F-2k	05/25/2019
B-Pillar Sill Ay	10868	Endevco	757F-2k	05/28/2019
B-Pillar Low Ay	11179	Endevco	757F-2k	05/24/2019
B-Pillar Mid Ay	10910	Endevco	757F-2k	05/25/2019
Driver Seat Track at H-Point Ay	10916	Endevco	757F-2k	05/28/2019
Engine Top Ax	11176	Endevco	757F-2k	05/21/2019
Engine Top Ay	10915	Endevco	757F-2k	05/24/2019
Firewall Ay	10893	Endevco	757F-2k	05/28/2019
Right Roof Ay	11155	Endevco	757F-2k	05/23/2019
Right Floor Sill Ay	10848	Endevco	757F-2k	05/25/2019
Rear Floorpan Ax	10842	Endevco	757F-2k	05/28/2019
Rear Floorpan Ay	10843	Endevco	757F-2k	05/25/2019

Table 3 - Rigid Pole Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Load Cell Pole Barrier #1 Force Y	131822A	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #2 Force Y	132304A	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #3 Force Y	19477	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #4 Force Y	19325	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #5 Force Y	131827A	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #6 Force Y	132302A	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #7 Force Y	19267	Interface	1220-FS	2019-05-07
Load Cell Pole Barrier #8 Force Y	19321	Interface	1220-FS	2019-05-07