

**REPORT NUMBER: SPNCAP-KAR-19-001
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST**

**SUBARU CORPORATION
2019 SUBARU ASCENT 5-DOOR MPV**

NHTSA No: O20195504

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



OCTOBER 2, 2018

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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FINAL REPORT ACCEPTANCE BY OCWS:


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

Date: _____


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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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		15. Supplementary Notes																												
16. Abstract A 32.20 km/h 75° rigid pole side NCAP impact test was conducted on the subject 2019 Subaru Ascent 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 September 18, 2018. The impact velocity was 32.04 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 34.2°C. The target vehicle's maximum post-test static crush was 468 mm located at level 2. 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" style="text-align: center;">Measurement Description</th> <th colspan="3" style="text-align: center;">Driver ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td style="text-align: center;">1000</td> <td style="text-align: center;">148.5</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td style="text-align: center;">g</td> <td style="text-align: center;">82</td> <td style="text-align: center;">52</td> </tr> <tr> <td>Total Pelvic Force (Sum of Acetabular and Iliac Forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">2835</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">38</td> <td style="text-align: center;">18</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">45</td> <td style="text-align: center;">16</td> </tr> </tbody> </table> The front struck side door of the vehicle was 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	148.5	Resultant Lower Spine Acceleration	g	82	52	Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2835	Maximum Thoracic Rib Deflection	mm	38	18	Maximum Abdominal Rib Deflection	mm	45	16
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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 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833																												
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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test is part of the MY 2019 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 2019 Subaru Ascent 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 2019 Subaru Ascent 5-door MPV. The subject vehicle was towed into the rigid pole at an angle of 75.1° and a velocity of 32.04 km/h. The test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California on September 18, 2018. 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	Passenger ATD (SID-IIs)	
		IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	148.5
Lower Spine (T12) Resultant Acceleration	g	82	52
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2835
Maximum Thoracic Rib Deflection	mm	38*	18
Maximum Abdominal Rib Deflection	mm	45*	16

*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	No

GENERAL COMMENTS

The front door on the struck side of the vehicle was jammed shut. There was no separation at the hinges or latches. The left rear, and non-struck side doors remained closed and latched. There were no ATD values that exceeded limits. The Left Floor Sill Y channel failed.

The NHTSA number in the placards used in Appendix A of this report are listed incorrectly with the first character as the numeral zero "0" instead of the letter "O".

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

CONVERSION FACTORS

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

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20195504
Model Year	2019
Make	Subaru
Model	Ascent
Body Style	5-Door MPV
VIN	4S4WMAAD0K3401874
Body Color	Magnetite Gray Metallic
Odometer Reading (km / mi)	77 / 48
Engine Displacement (L)	2.4
Type / No. of Cylinders	Boxer 4 Cylinder
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	Yes
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	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	No

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

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Subaru Corporation
Date of Manufacture	May-18
Vehicle Type	MPV

GVWR (kg)	2721
GAWR Front (kg)	1370
GAWR Rear (kg)	1495

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3	3	8	
Capacity Weight (VCW) (kg)				600.0	A
DSC x 68.04 (kg)				544.3	B
Cargo Weight (RCLW) (kg)				55.7	A-B

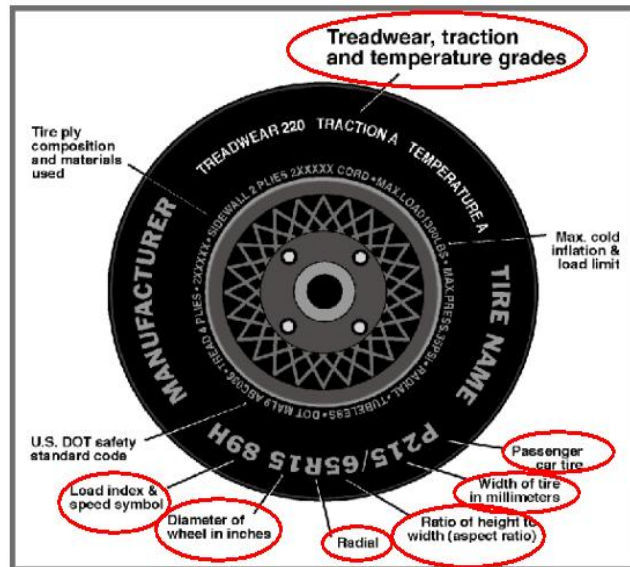
VEHICLE SEAT TYPE

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			Yes			Yes	

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



Measured Parameter	Front	Front
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P245/60R18	P245/60R18
Tire Size on Vehicle	P245/60R18	P245/60R18
Tire Manufacturer	Falken	Falken
Tire Model	ZIEX ZE001A A/S	ZIEX ZE001A A/S
Treadware	350	350
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	105H	105H
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	R8L2 DM2R 0418	R8L2 DM2R 0418
DOT Safety Code Right	R8L2 DM2R 0418	R8L2 DM2R 0418

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

TIRE PRESSURES

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

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	557.0	468.5		569.0	505.5		564.0	516.5	
Right	kg	538.0	443.5		550.5	478.5		541.5	488.5	
Ratio	%	54.6%	45.4%	100.0%	53.2%	46.8%	100.0%	52.4%	47.6%	100.0%
Total	kg	1095.0	912.0	2007.0	1119.5	984.0	2103.5	1105.5	1005.0	2110.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2007.0	A
Actual Weight of 1 P572V ATD Used	kg	49.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	55.7	C
Calculated Vehicle Target Wt (TVTW)	kg	2111.7	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	As Delivered	As Tested	Fully Loaded	Meets Requirement***
Driver Door Sill Angle (front-to-rear)*	°	-0.7	-0.5	-0.4	Yes
Front Passenger Sill Angle (front-to-rear)*	°	-0.6	-0.5	-0.4	Yes
Front Bumper-Line Angle (left-to-right)**	°	-0.4	-0.4	-0.4	Yes
Rear Bumper-Line Angle (left-to-right)**	°	-0.2	-0.3	-0.4	Yes
Vehicle CG (Aft of Front Axle)	mm	1312	1351	1375	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	18	18	19	

*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"

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Trim	6.0
Ballast / Equipment Added	81.5

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: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

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	4.2	0.0	2.1
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	2.1	681	Max			
			Mid	676	678	681
			Min			
Front Passenger Seat	Fixed	669	Max			
			Mid	666	667	669
			Min			
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	674	Max			
			Mid	674	674	674
			Min			
Non-Struck Side Rear Seat	Fixed	675	Max			
			Mid	675	675	675
			Min			
Rear Center Seat	Fixed	674	Max			
			Mid	674	674	674
			Min			

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

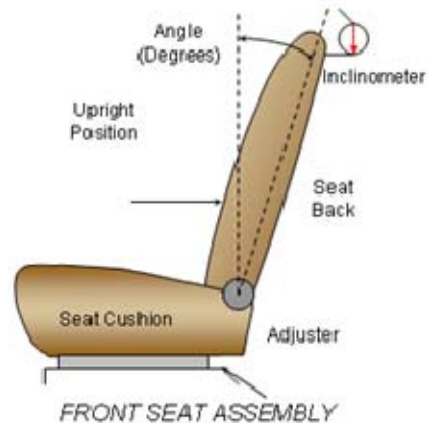
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	260	27	0	0
Front Passenger Seat	260	27	0	0
Front Center Seat				
Struck Side Rear Seat	110	12	110	11
Non-Struck Side Rear Seat	110	12	110	11
Rear Center Seat	110	12	110	11

*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 using the outboard head restraint post.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/Seated Dummy	77.6	24	1.5	4
Front Passenger Seat	73.9	26	1.5	4
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	17.8	10	-0.4	0
Non-Struck Side Rear Seat	17.7	10	2.7	0
Rear Center Seat	17.8	10	-0.4	0

*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: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18**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, M1, ..., L from top to bottom.

	Total No. of Positions	Placed in Position
Driver Seat	4	M1

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	3	Full Down

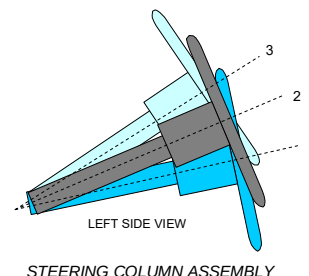
DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

STEERING COLUMN ADJUSTMENT

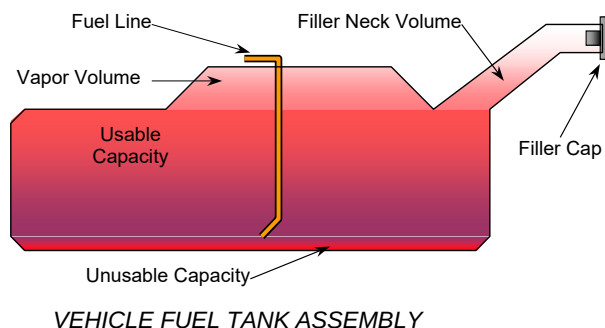
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of the geometric locus it describes when it moves through its full range of motion.



	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	25.6	69
Geometric Center - Position 2	27.5	95
Uppermost - Position 3	29.4	121
Telescoping Steering Wheel Travel		52
Test Position	27.5	95

FUEL PUMP

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



FUEL TANK CAPACITY

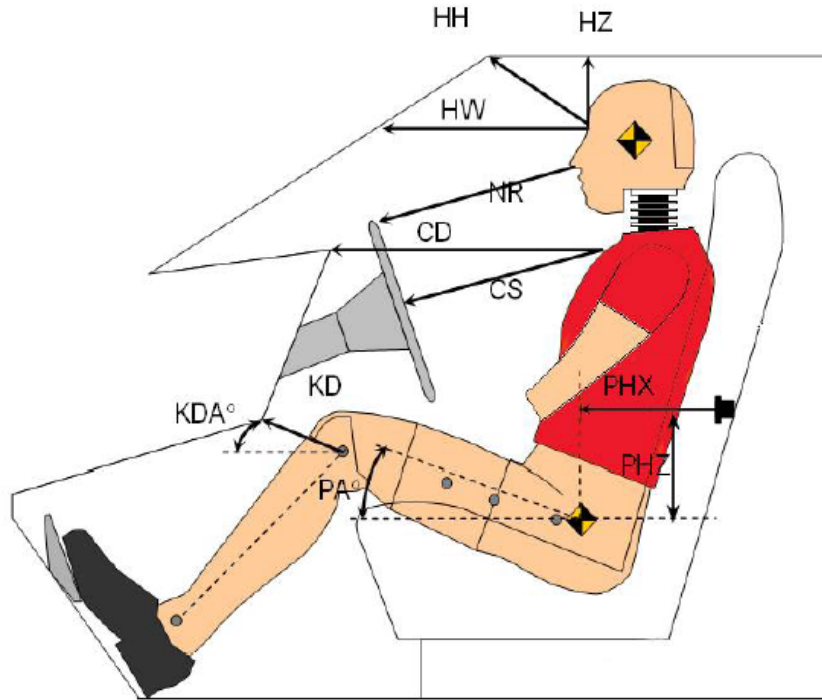
Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	73.05
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	73.05
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	67.94
Actual amount of Solvent Used in Test	67.94
1/3 of Usable Capacity	24.35

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: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	345	
HW	Head to Windshield	655	
HZ	Head to Roof	230	
NR	Nose to Rim	280	
CD	Chest to Dash	431	
CS	Chest to Steering Wheel	195	
KD(L)/KDA(L)°	Left Knee to Dash	105	12.5
KD(R)/KDA(R)°	Right Knee to Dash	95	42.1
PAX°	Pelvic Tilt Angle (x-axis)		22.1
PAY°	Pelvic Tilt Angle (y-axis)		0.1
PHX	Hip Point to Striker (x-axis)	334	
PHZ	Hip Point to Striker (z-axis)	166	

DATA SHEET NO. 4

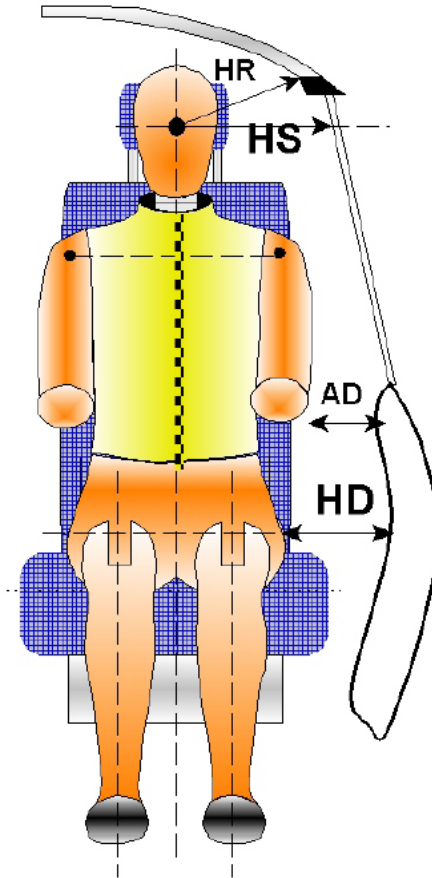
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV

NHTSA No. O20195504

Test Program: NCAP Side Pole Impact Test

Test Date: 09/18/18

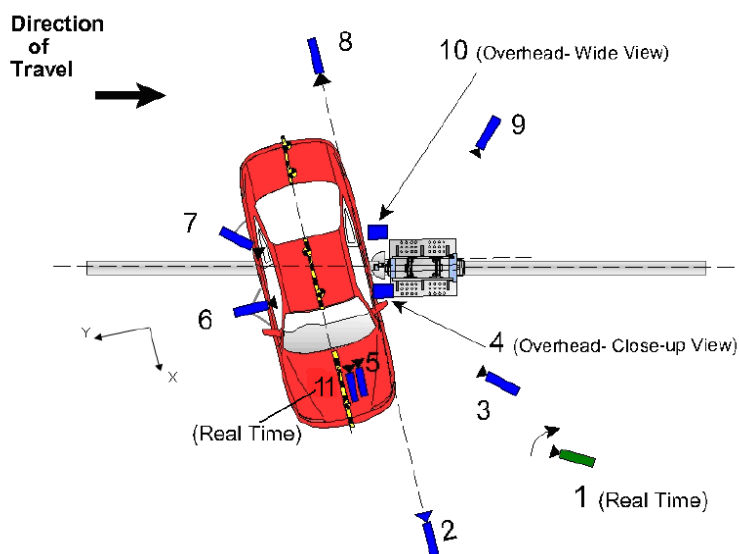


Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	310
HS	Head to Side Window	mm	415
AD	Arm to Door	mm	200
HD	Hip Point to Door	mm	195

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



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	1.35	0.59	-1.66	8.5	1000
6	On-Board - Dummy Side View	1.34	0.57	-1.47	8.5	1000
7	On-Board - Dummy Rear Oblique View	-0.03	1.86	-1.26	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	-1.00	1.86	-1.32		30

*All measurements accurate to ± 6 mm

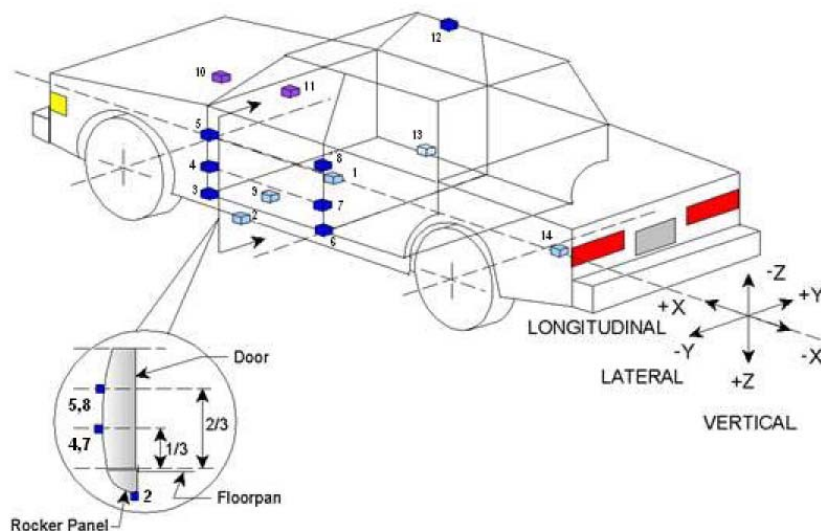
INSTRUMENTATION

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

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

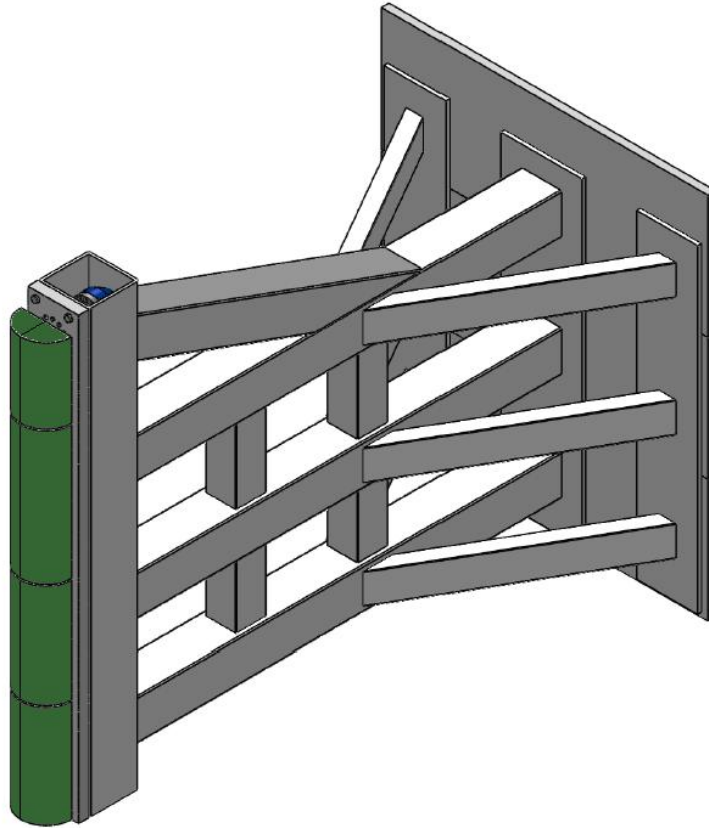


Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2290	0	-490
2	Left Floor Sill	3015	-780	-230
3	A-Pillar Sill	3280	830	-410
4	A-Pillar Low	3370	825	-500
5	A-Pillar Mid	3370	825	-700
6	B-Pillar Sill	2280	730	-500
7	B-Pillar Low	2275	725	-700
8	B-Pillar Mid	2280	725	-900
9	Driver Seat Track	2665	655	-500
10	Engine Top	4260	845	-800
11	Firewall	3740	1120	-880
12	Right Roof	2355	590	-1710
13	Right Floor Sill	3120	700	-440
14	Rear Floorpan	1260	0	-670

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: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



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: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

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, Side Airbag
Back of Head	Curtain Airbag, Headrest, Seatback
Left Shoulder	Curtain Airbag, Side Airbag
Upper Torso	Side Airbag, Seat
Lower Torso	Side Airbag, Seat
Left Hip	Door Panel, Seat
Left Knee	Knee Bolster

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	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

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	Driver front window broken
Other Notable Effects	None

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

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

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	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	No

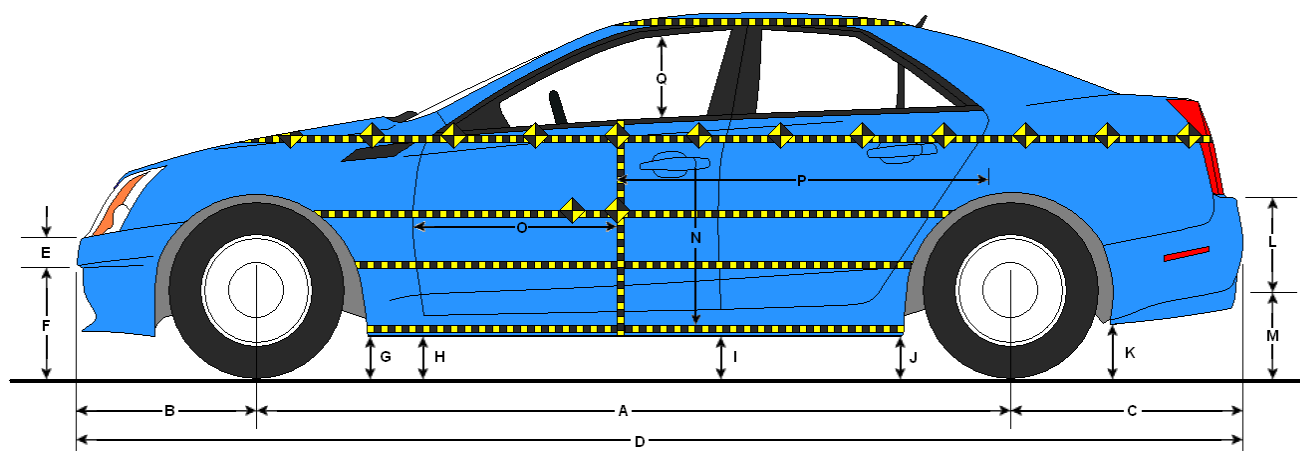
IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		1072
Actual Impact Point (Aft of Front Axle)	mm		1072
Horizontal Offset (+ forward / - rearward)	mm	± 38 of Intended Impact Point	0
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	°	75 ± 3	75.1
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.04
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.08

DATA SHEET NO. 9

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



LEFT SIDE VIEW

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

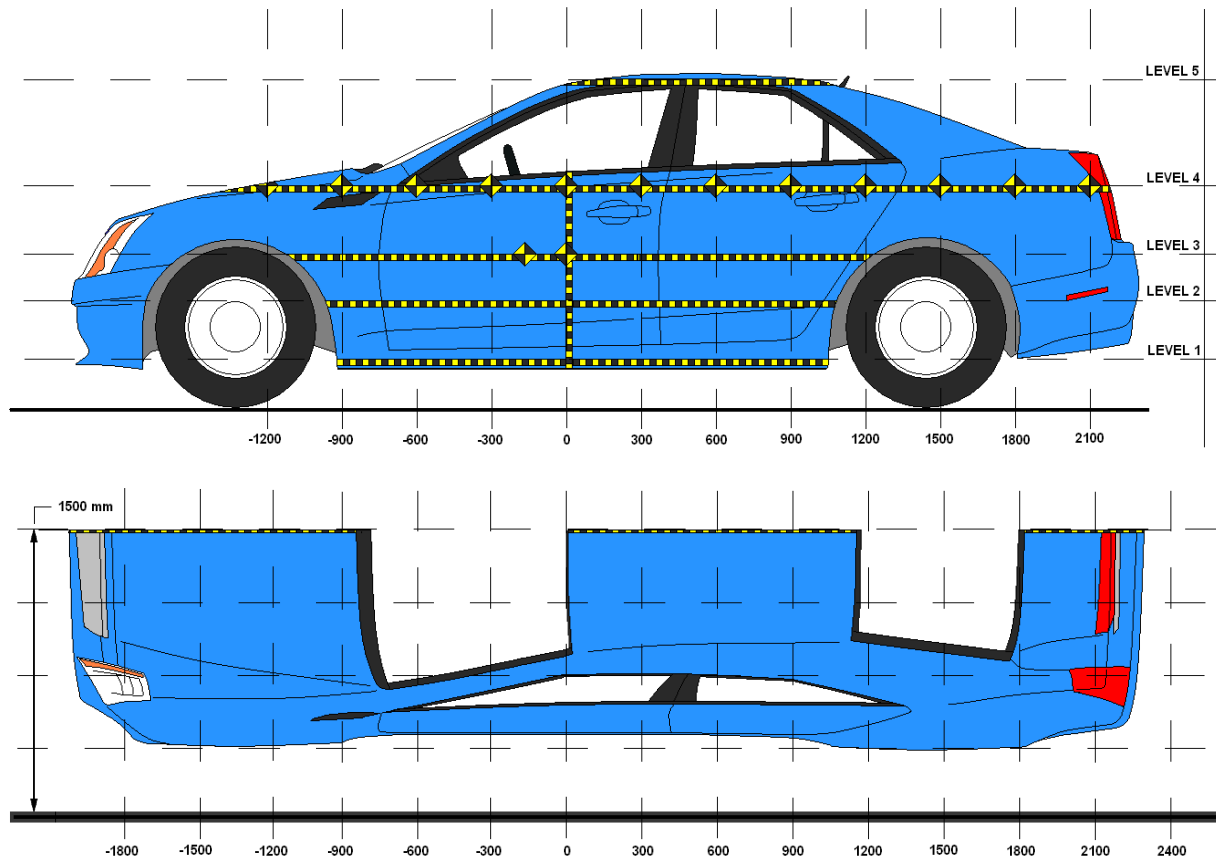
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2888	2796	-92
B	Front Axle to FSOV	1032	1059	27
C	Rear Axle to RSOV	1076	1103	27
D	Total Length at Centerline	4994	4959	-35
E	Front Bumper Thickness	329	330	1
F	Front Bumper Bottom to Ground	381	381	0
G	Sill Height at Front Wheel Well	396	372	-24
H	Sill Height at Front Door Leading Edge	399	383	-16
I	Sill Height at B-Pillar	375	381	6
J1	Sill Height at Rear Wheel Well	363	400	37
J2	Pinch Weld Height at Rear Wheel Well	265	306	41
K	Sill Height Aft of Rear Wheel Well	522	555	33
L	Rear Bumper Thickness	227	227	0
M	Rear Bumper Bottom to Ground	491	527	36
N	Sill Height to Bottom of Front Window Sill	769	782	13
O	Front Door Leading Edge to Impact CL	599	459	-140
P	Rear Door Trailing Edge to Impact CL	1621	1499	-122
Q	Front Window Opening	473	506	33
R	Right Side Length	3592	3612	20
S	Left Side Length	3594	3478	-116
T	Vehicle Width at B-Pillar	1931	1824	-107

DATA SHEET NO. 10

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



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	337	313	0
2	Occupant H-Point	748	468	0
3	Mid-Door	709	466	0
4	Window Sill	1111	429	150
5	Window Top	1650	259	0

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

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				605					667					62	
-750		535		606			623		681			88		75	
-600	578	537	538	616		686	629	630	704		108	92	92	88	
-450	577	541	542	616		697	713	714	752		120	172	172	136	
-300	585	546	548	605		770	818	824	831		185	272	276	226	
-150	580	544	546	599		830	917	919	907		250	373	373	308	
0	577	542	545	593	825	890	1010	1011	1010	1084	313	468	466	417	259
150	574	540	543	587	818	824	1008	1006	1016	1059	250	468	463	429	241
300	573	539	542	580	820	735	884	884	894	1008	162	345	342	314	188
450	573	538	542	577	824	651	752	753	782	966	78	214	211	205	142
600	575	540	544	574	828	719	693	698	724	937	144	153	154	150	109
750	577	542	546	572	829	698	672	675	703	917	121	130	129	131	88
900	580	545	549	575	830	677	651	654	685	906	97	106	105	110	76
1050	583	547	551	579	830	659	631	634	669	897	76	84	83	90	67
1200	584	545	548	583	830	634	606	608	653	892	50	61	60	70	62
1350	592	539	541	567	833	617	578	578	618	888	25	39	37	51	55
1500				579	835				607	884				28	49
1650				562	836				606	880				44	44
1800				558	838				598	877				40	39
1950				562	842				597	875				35	33
2100				575	848				604	878				29	30
2250															
2400															
2550															
2700															
2850															

DATA SHEET NO. 10 ... (CONTINUED)

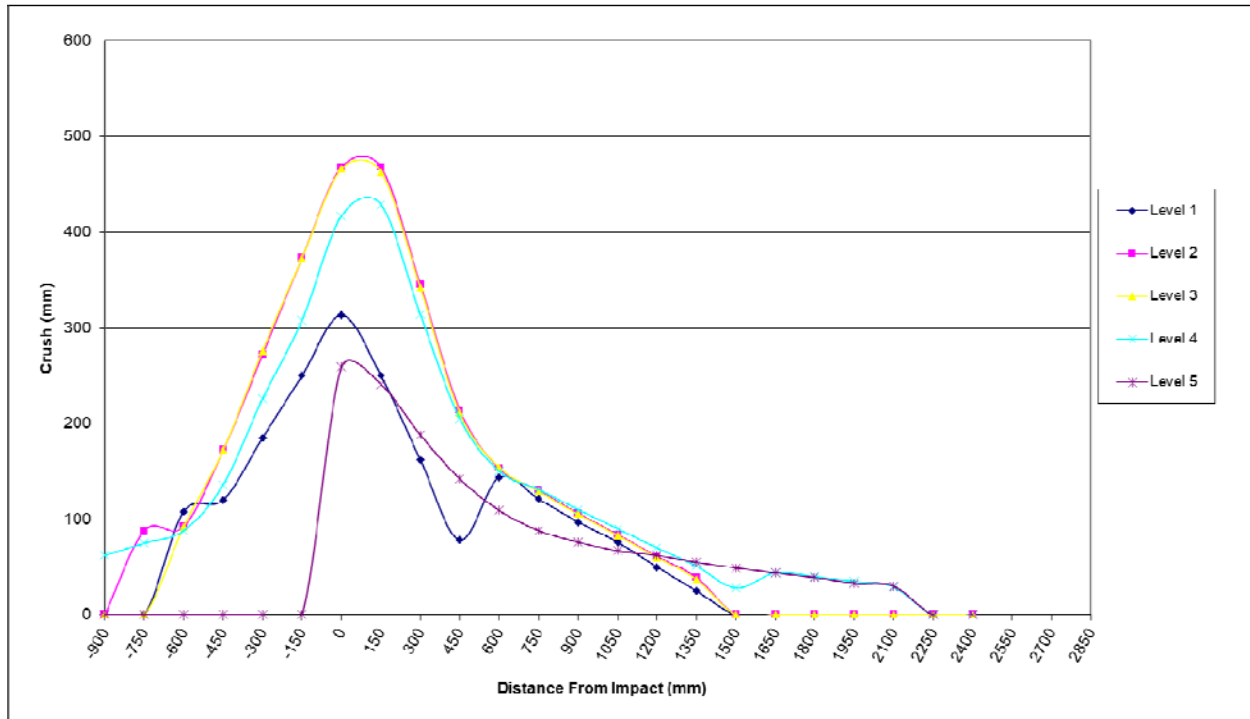
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV

NHTSA No. O20195504

Test Program: NCAP Side Pole Impact Test

Test Date: 09/18/18

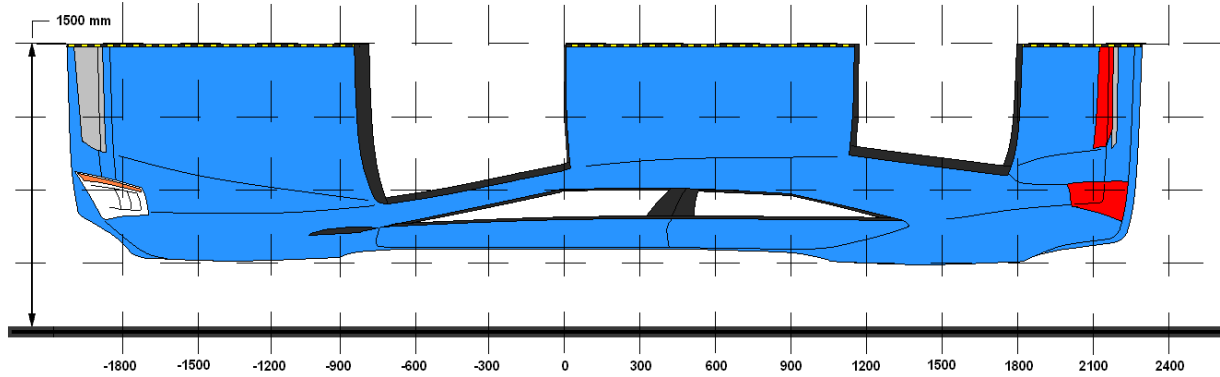


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504

Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2100	5	848	878	30
2	1500	5	835	884	49
3	900	4	575	685	110
4	300	2	539	884	345
5	-300	3	548	824	276
6	-900	4	605	667	62

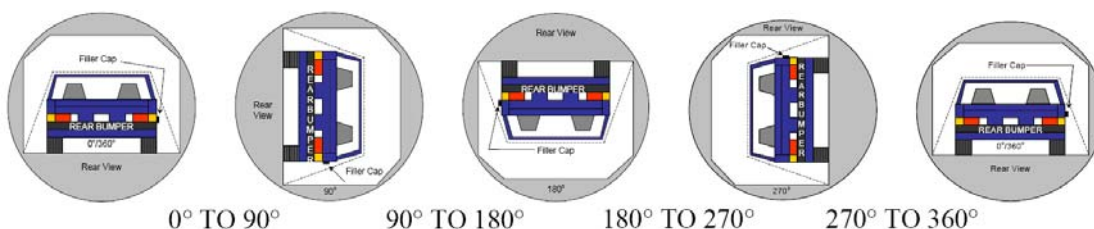
DATA SHEET NO. 12

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504
 Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18

Temperature at Time of Impact: 34.2° C Test Time: 3:31 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°	78	300	378
90° To 180°	83	300	383
180° To 270°	81	300	381
270° To 360°	80	300	380

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

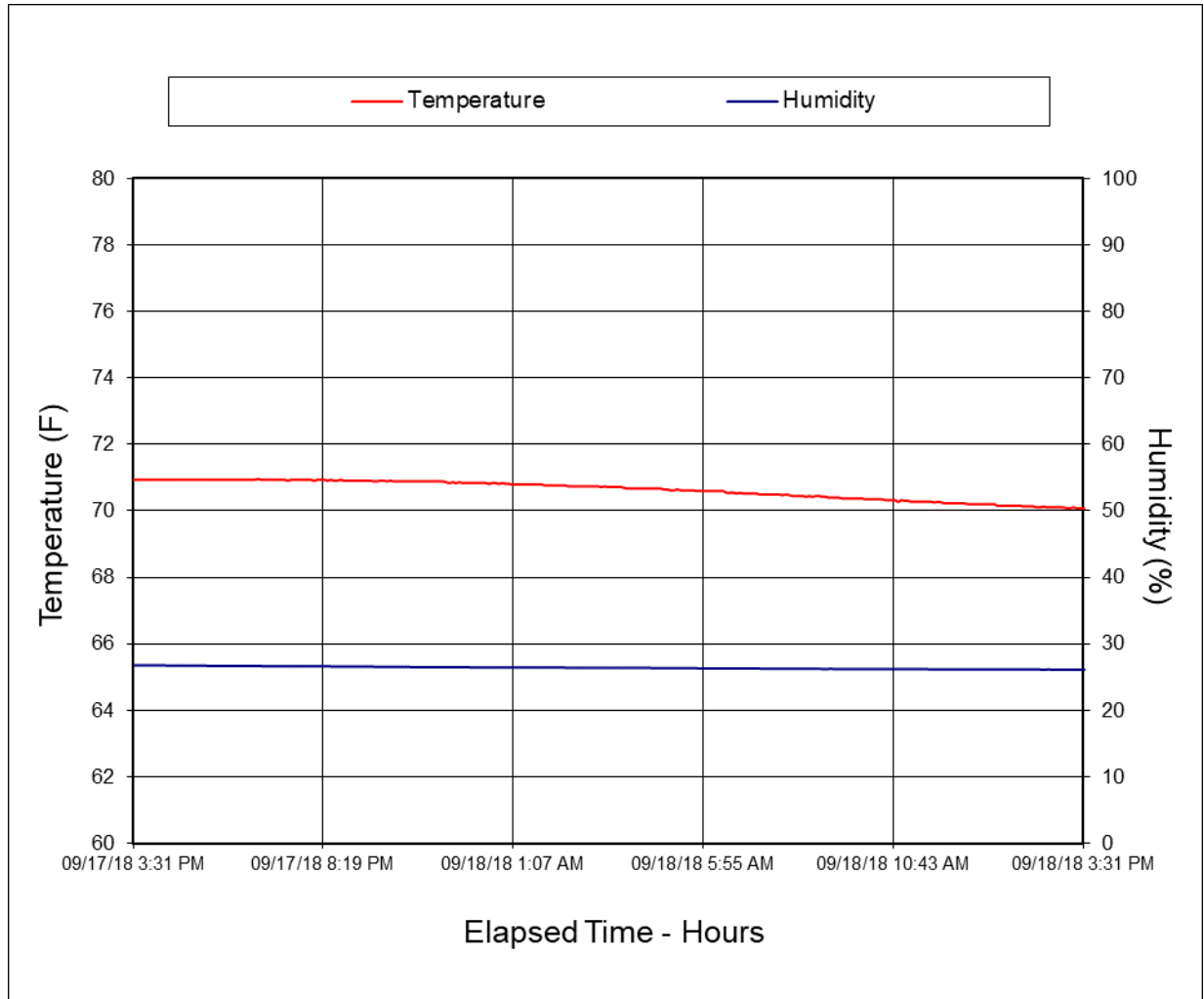
Test Phase	Spillage Location
0° To 90°	No Spillage Occurred
90° To 180°	No Spillage Occurred
180° To 270°	No Spillage Occurred
270° To 360°	No Spillage Occurred

DATA SHEET NO. 13

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No. O20195504

Test Program: NCAP Side Pole Impact Test Test Date: 09/18/18



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

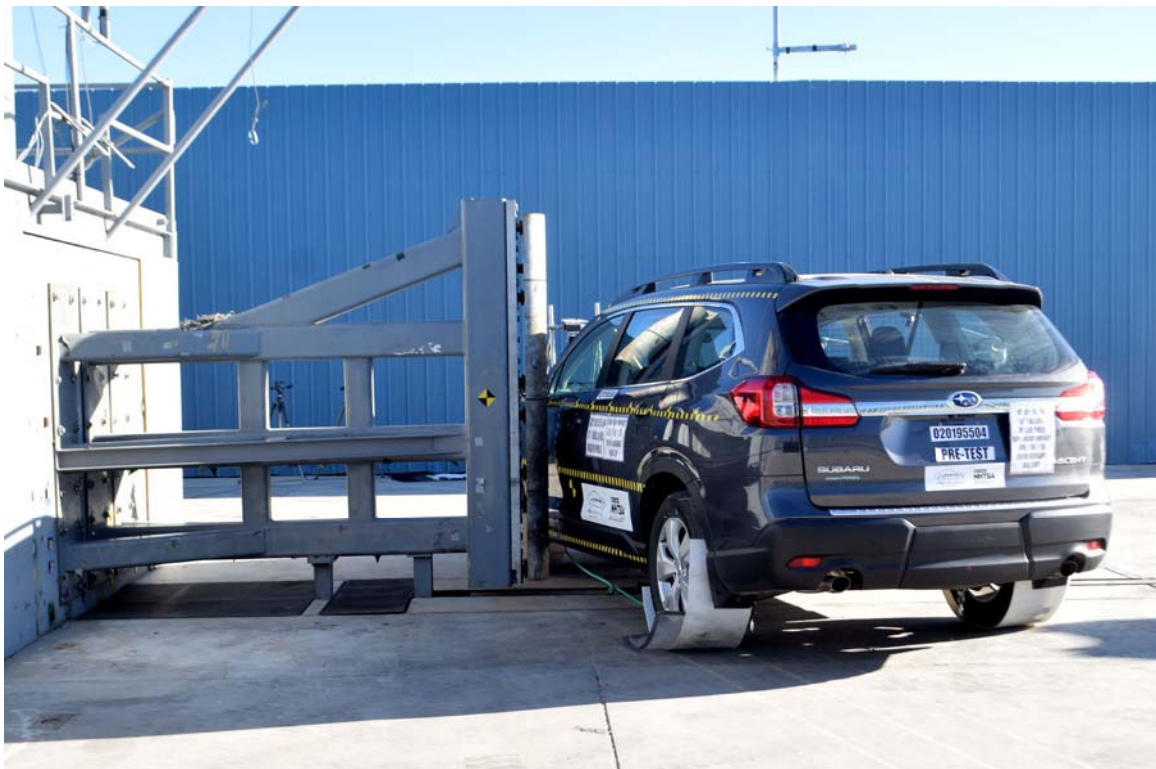


FIGURE 18. Pre-Test Right Side View of Pole Positioned Against Side of Vehicle



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

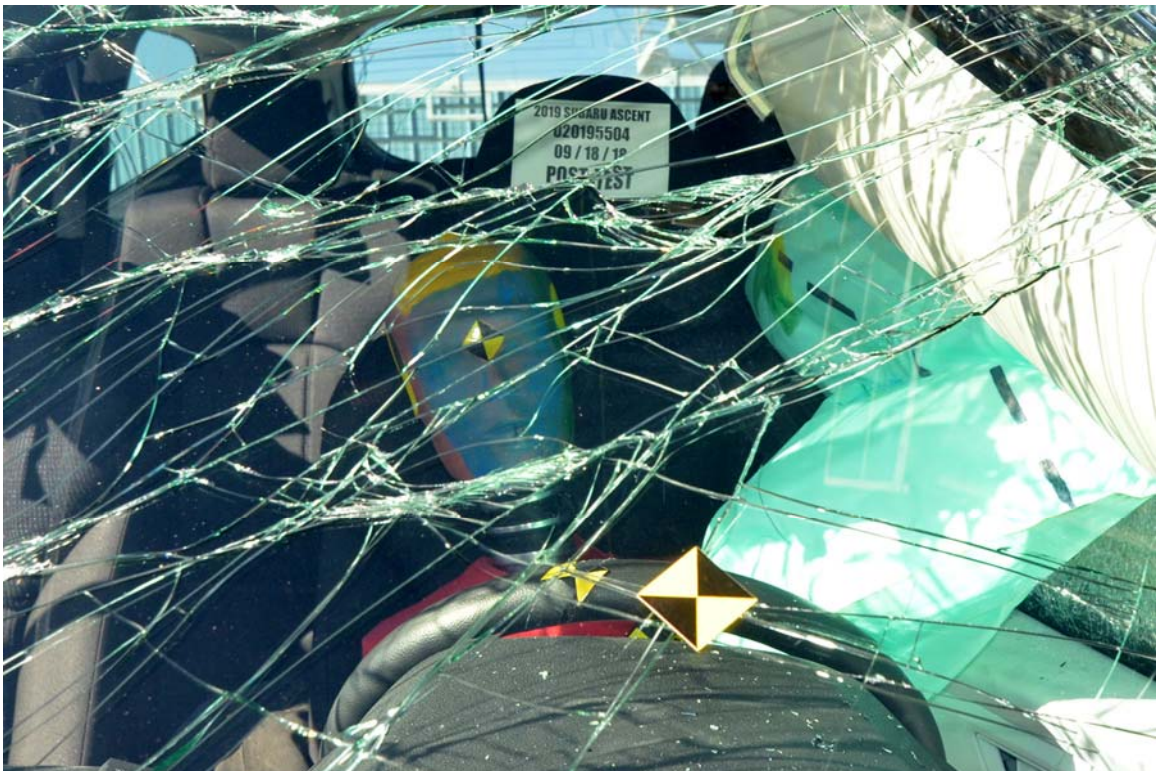


FIGURE 22. Post-Test Front Close-Up View of Dummy



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

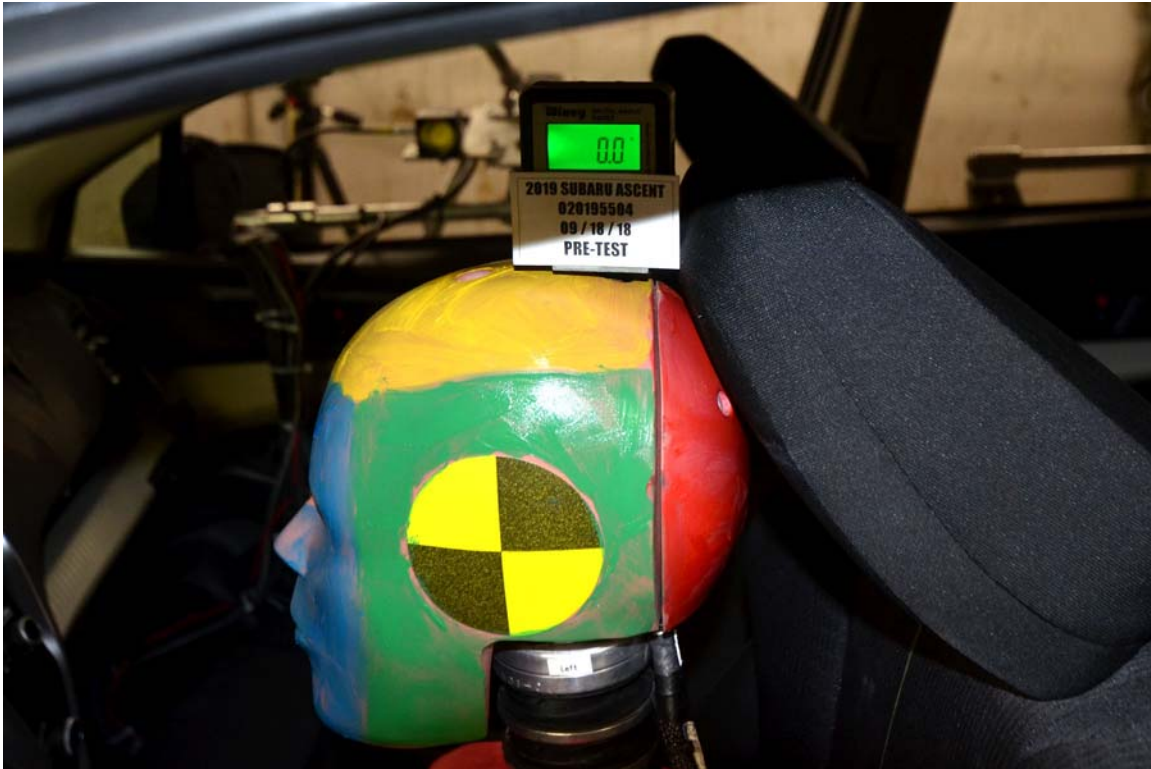


FIGURE 31. Pre-Test Left Side View of Dummy's Head
Showing Dummy's Head is Level



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

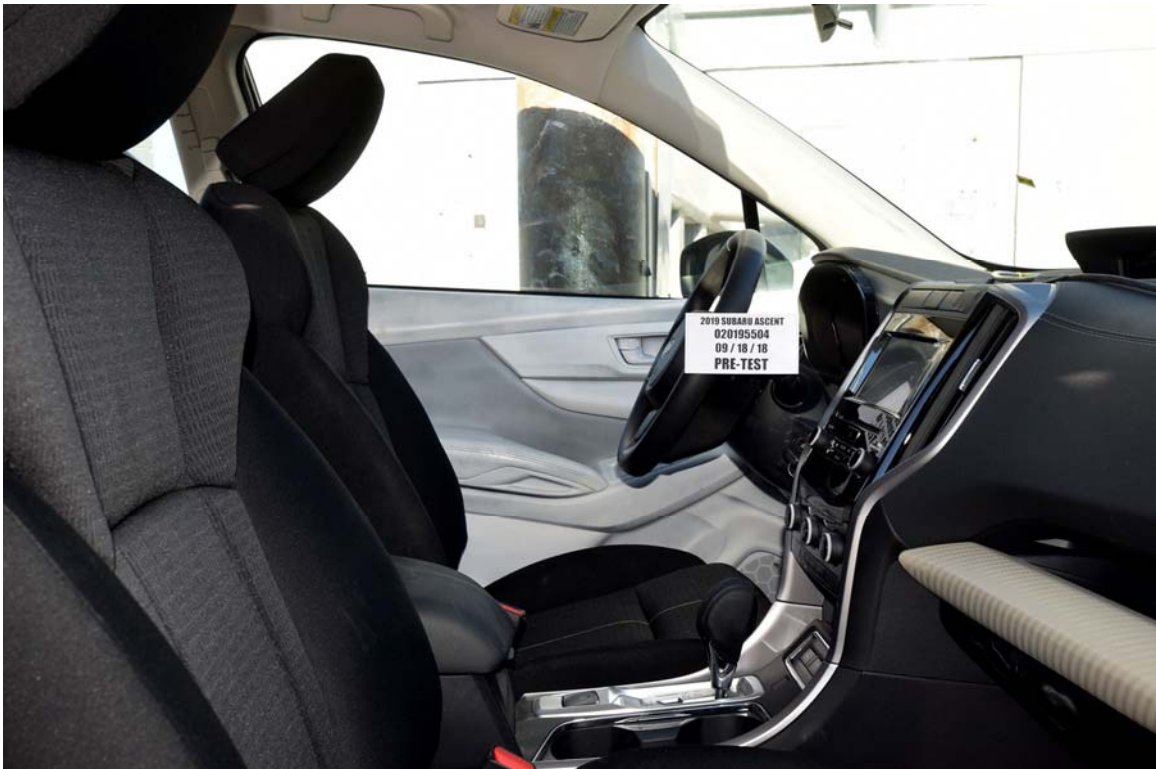


FIGURE 44. Pre-Test Inner Door Panel View



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

Photograph Not Applicable

No Driver Dummy Pelvis Contact with Side Airbag

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

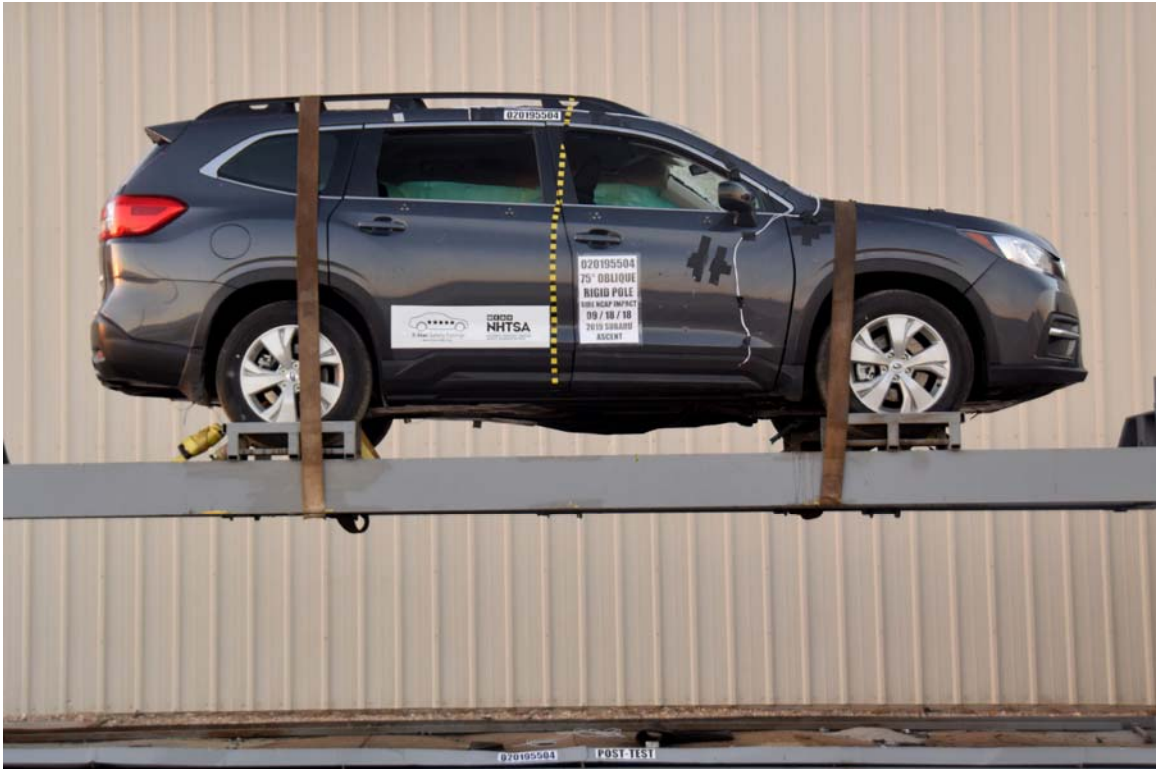


FIGURE 63. FMVSS No. 301 Static Rollover 0 Degrees



FIGURE 64. FMVSS No. 301 Static Rollover 90 Degrees



FIGURE 65. FMVSS No. 301 Static Rollover 180 Degrees

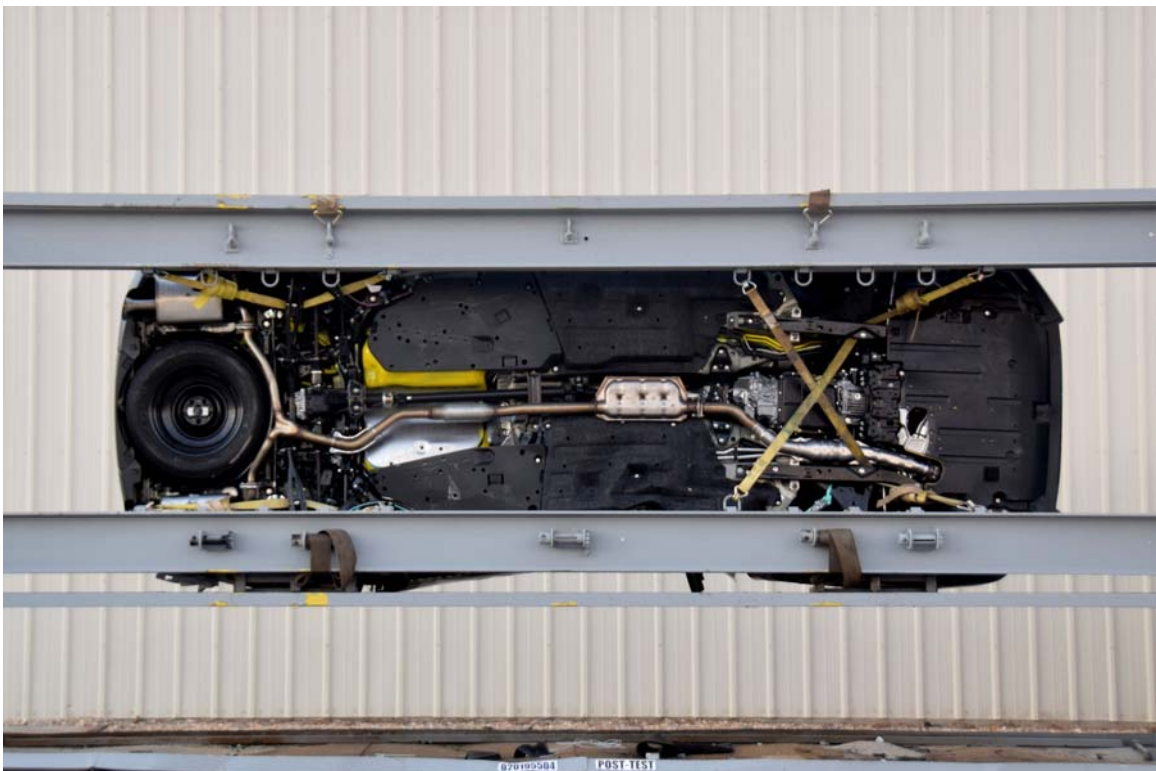


FIGURE 66. FMVSS No. 301 Static Rollover 270 Degrees



FIGURE 67. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 68. Impact Event

ASCENT

VIN 4S4VMAAD0K342874
Model/Code 2019 Subaru Ascent
Port / Assembly Boston, MA
Deliver by / Carrier Diversified Automotive, Inc.

SHIP TO: 629128
Van Bortel Motorcar, Inc.
6327 Route 96
Victor, NY 14564

SOLD TO: 629128
Van Bortel Motorcar, Inc.
6327 Route 96
Victor, NY 14564

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 Driver NOT RATED
Crash 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.

Side Front Seat NOT RATED
Crash Rear Seat NOT RATED
Based on the risk of injury in a side impact.

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 1-888-327-4235

STANDARD EQUIPMENT

SAFETY
Symmetrical All-Wheel Drive w/ Vehicle Dynamics Control
EyeSight Driver-Assist System, Automatic Emergency Braking
EyeSight Assist Monitor HUD
Lane Departure Warning, Adaptive Cruise Control w/ Lane Keep Assist
4-Wheel Anti-Lock Disc Brakes (ABS)
Rear Vision Camera with Adaptive Guidelines
Subaru Advanced Frontal Airbag System w/ Front Knee Airbags
Side-Curtain Airbags w/ Rollover Sensor & Seat-Side Airbags
Automatic Power Door Locks
3-Point Seatbelts with Front Pretensioners
LATCH System for Child Safety Seats, 2nd, 1st & 3rd Rows
Anti-Theft Alarm & Immobilizer System
Auto Vehicle Hold
Brake Override System & Electronic Brake-Force Distribution

PERFORMANCE AND EXTERIOR
2.4i DOHC 16V Direct Injection Turbocharged Boxer Engine
Lineartronic High Torque CVT w/ 8-Speed Manual Mode
Active Torque Vectoring with Quick Ratio Steering
Four-Wheel Independent Suspension w/ 8.7" Ground Clearance
X-Mode w/ Hill Descent Control
18" Silver Finish Alloy Wheels

COMFORT, CONVENIENCE / INTERIOR
6.5" STARLINK Multimedia Infotainment System
Bluetooth Hands-Free Phone & Streaming Audio
SiriusXM Radio, Sports, Weather, STARLINK Smartphone Connectivity
Apple CarPlay and Android Auto
4 USB Charge Ports, 2 Front
Tri-Zone Auto Climate Control
Tilt/Telescopic Steering Wheel w/ Audio Controls
2nd Row Seat with 60/40 Split Fold-Down Rear Seatback
3rd Row Seat with 60/40 Split Fold-Down Rear Seatback
Retained Accessory Power for Audio System & Front Windows
Auto-Up/Down Front Power Windows & Power Mirrors
Reading Lights in Front and 2nd Row
Convex Cabin View Mirror
Multi-Function Display
Til Cup and Bottle Holders
Carpeted Floor Mats with Ascent Logo

LIMITED WARRANTY/ROADSIDE ASSISTANCE
3 Years / 36,000 Miles Basic
5 Years / 60,000 Miles Powertrain
5 Yrs / Unlimited Mileage Rust Perforation
3 Yrs / 36,000 24/7 Roadside Assistance
See Owner Info Kit & Warranty For Details

OPTIONAL EQUIPMENT AND OTHER ITEMS

Manufacturer's Suggested Retail Price \$31,995.00
Exterior Color: Magnetite Gray Metallic INCLD
Full Tank of Gas INCLD
Standard Option: 01 INCLD
8-Passenger Bench Seating \$120.00
Rear Bumper Cover \$168.00
Splash Guards \$81.00
Cargo Tray \$92.00
Rear Seatback Protector \$132.00
All-Weather Floor Liners

Fuel Economy and Environment

Fuel Economy cars range from 11 to 93 MPG. The You spend
best vehicle rates 136 MPG.

23 MPG combined city/highway
21 city 27 highway
4.3 gallons per 100 miles

Annual fuel cost \$1,650
This vehicle emits 287 grams CO₂ per mile. The best emits grams per mile (tailpipe only). Producing and distributing fuel also creates emissions, learn more at fuel-economy.gov

Fuel Economy & Greenhouse Gas Rating (tailpipe only) Smog Rating (tailpipe only)

Parts Content Information
FOR VEHICLES IN THIS COUNTRY:
U.S./CANADIAN PARTS CONTENT: 50%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN 30%
Note: Parts content does not include final assembly, distribution, or other non-parts costs.

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

FIGURE 69. Monroney Label

Head restraints

WARNING
Do not change the head restraint to the head restraint from a different seat. The head restraints were each designed specifically for the front seat, second-row seat, and third-row seat.

NOTE
It is possible to adjust the angle of the front seat head restraints only. When installing the front seat head restraints, make sure that the angle of the head restraints can be adjusted.

From outside
4. While pulling the straps, fold down the seatbacks.

From inside
5. When returning the seatbacks to their original positions, either press up on the seatbacks from inside the vehicle, or from outside the vehicle pull up on the strap located on the back of the seatback. Lift the seat up securely until it locks in place.

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

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.

Each head restraint should be adjusted so that the center of the head restraint is closest to the top of the occupant's ears. After installing the head restraint, make sure it is securely locked.

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

**1) Head restraint
2) Release button**

Front seats

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

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.

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.

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

NOTE
When the head restraint cannot be pulled out or installed due to insufficient clearance between the head restraint and the roof, tilt the seat and then perform the installation and removal tasks.

**1) Head restraint
2) Release button**

Third-row seats

Head restraints are installed in all third-row seats, and can be adjusted as described below.

CAUTION
The head restraint is not intended to be used at 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. Press and hold the release button to lower the head restraint.

**1) Head restraint
2) Release button**

FIGURE 70. Head Restraint Use and Adjustment
Information from Vehicle Owner's Manual



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 Iliac Wing Force on Impact Side (Y)	B-3
10	Driver Acetabulum Force on Impact Side (Y)	B-3
11	Driver Total Pelvis Force on Impact Side (Y)	B-3

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.dot.gov

Additional Driver Dummy Instrumentation Data

Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection (Y)

Vehicle Instrumentation Data

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)

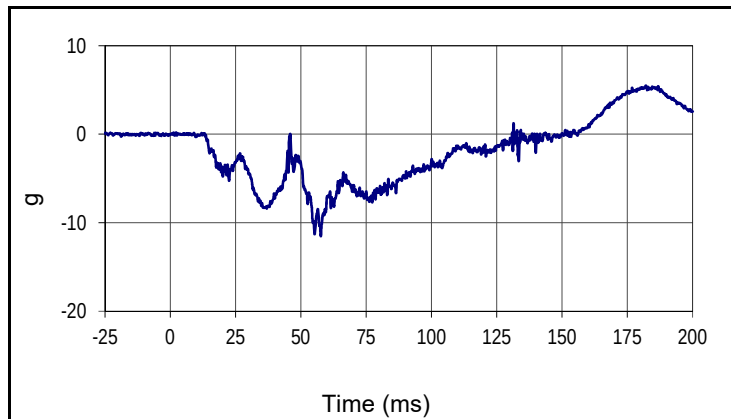
Left B-Pillar Sill Acceleration
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (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

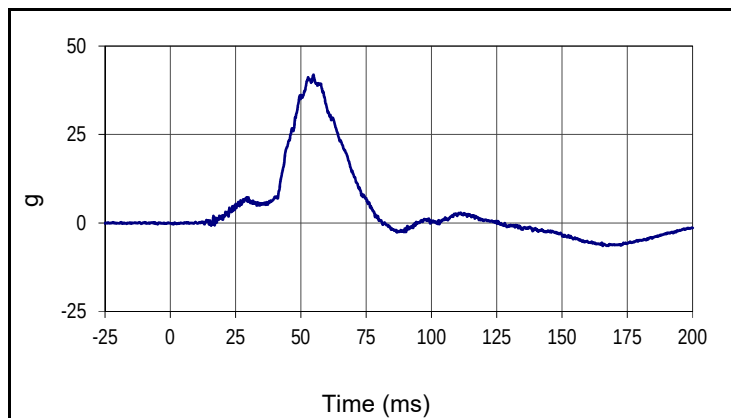
Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)

Test Vehicle: 2019 Subaru Ascent 5-Door MPV
 Test Program: NCAP Side Pole Impact Test

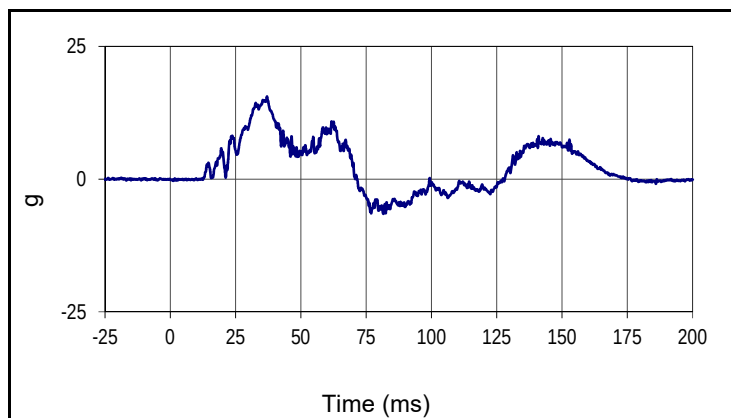
Test Date: 09/18/18
 NHTSA No.: O20195504



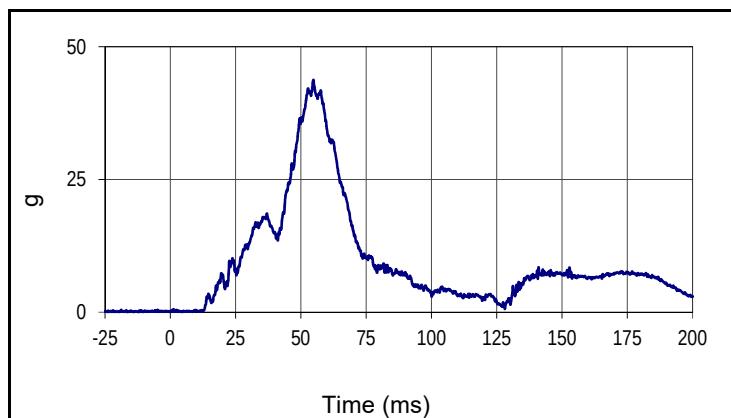
Curve Description			
Driver Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
5.5	182.1	-11.5	57.6



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
41.9	54.8	-6.5	165.6



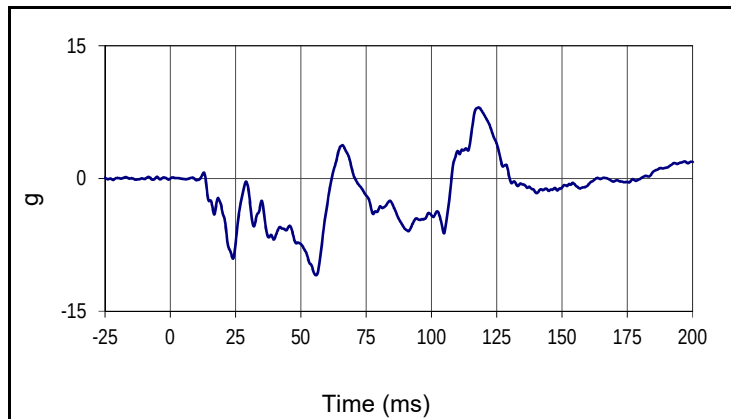
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
15.6	37.0	-6.5	81.6



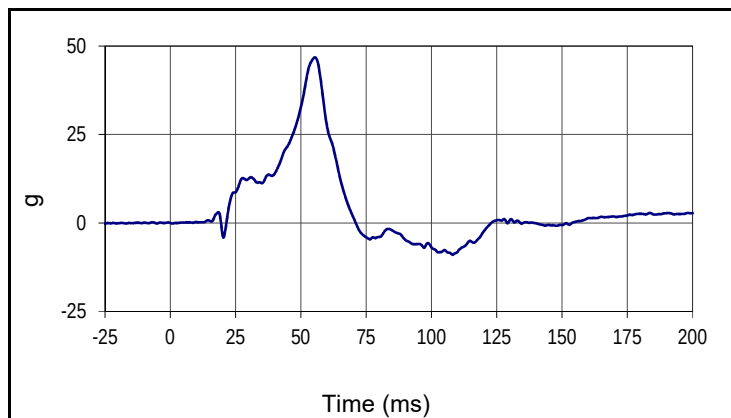
Curve Description			
Driver Head Acceleration Primary Resultant			
Plot No.		SAE Class	Units
004		1000	g
Max	Time	Min	Time
43.7	54.8	0.1	3.2

Test Vehicle: 2019 Subaru Ascent 5-Door MPV
 Test Program: NCAP Side Pole Impact Test

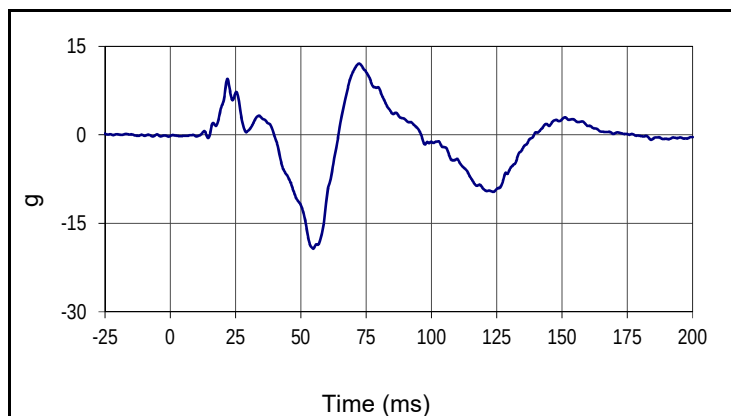
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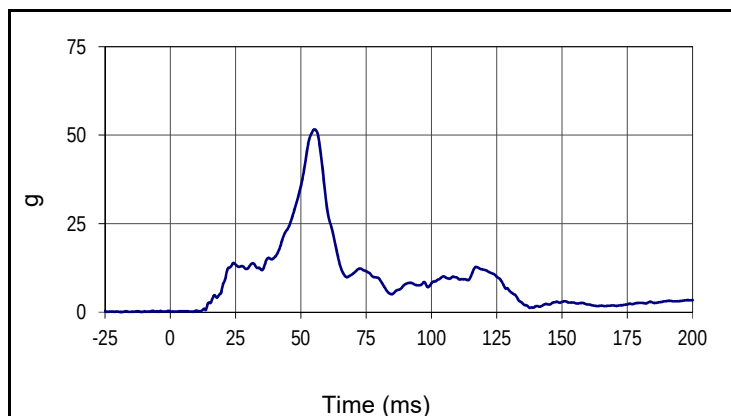
Curve Description			
Driver Lower Spine T12 Acceleration X			
Plot No.		SAE Class	Units
005		180	g
Max	Time	Min	Time
8.0	118.1	-10.9	55.8



Curve Description			
Driver Lower Spine T12 Acceleration Y			
Plot No.		SAE Class	Units
006		180	g
Max	Time	Min	Time
46.8	55.3	-9.0	108.1



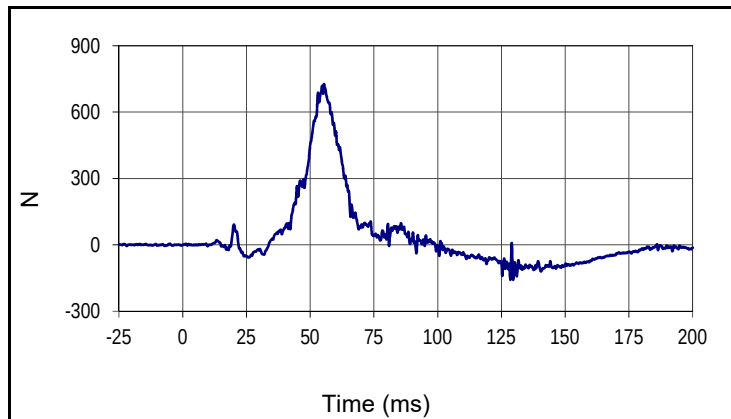
Curve Description			
Driver Lower Spine T12 Acceleration Z			
Plot No.		SAE Class	Units
007		180	g
Max	Time	Min	Time
12.1	72.3	-19.3	54.7



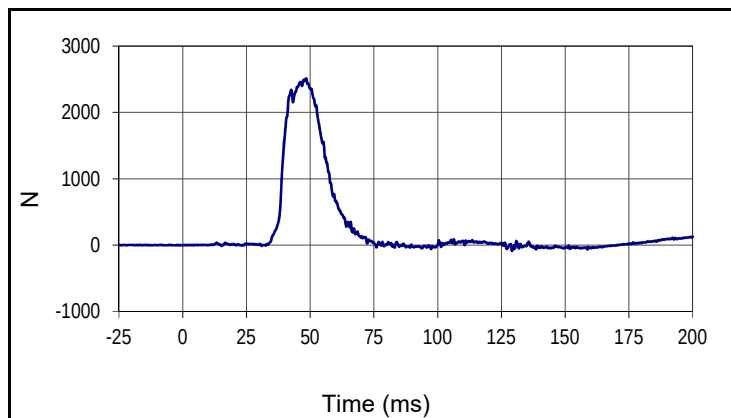
Curve Description			
Driver Lower Spine T12 Acceleration Resultant			
Plot No.		SAE Class	Units
008		180	g
Max	Time	Min	Time
51.6	55.2	0.1	8.9

Test Vehicle: 2019 Subaru Ascent 5-Door MPV
 Test Program: NCAP Side Pole Impact Test

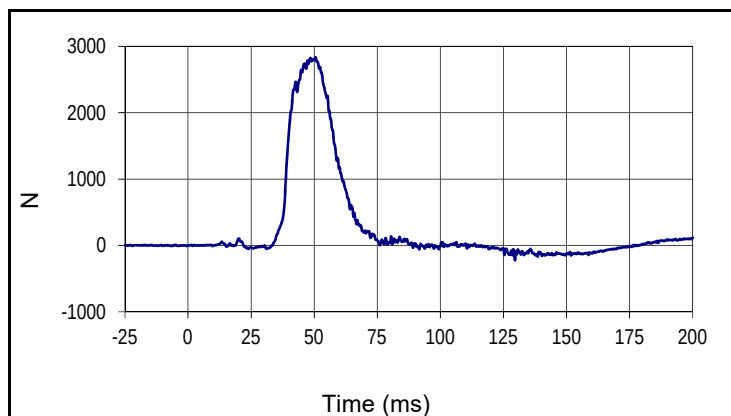
Test Date: 09/18/18
 NHTSA No.: O20195504



Curve Description			
Driver Iliac Wing Force on Impact Side Y			
Plot No.		SAE Class	Units
009		600	N
Max	Time	Min	Time
726.9	55.4	-158.2	129.6



Curve Description			
Driver Acetabulum Force on Impact Side Y			
Plot No.		SAE Class	Units
010		600	N
Max	Time	Min	Time
2510.3	48.5	-86.3	129.1



Curve Description			
Driver Total Pelvic Force on Impact Side Y			
Plot No.		SAE Class	Units
011		600	N
Max	Time	Min	Time
2834.5	50.5	-222.1	129.6

APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
PRE-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA



SID-IIs Small Side Impact Dummy
External Measurements

ATD Serial No.: 299

Test Date: 2018-08-23

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	778	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	146	Pass
E - Shoulder Pivot From Backline	mm	97	107	104	Pass
F - Thigh Clearance	mm	119	135	128	Pass
G - Head Breadth	mm	140	148	144	Pass
H - Head Back From Backline	mm	40	46	44	Pass
I - Head Depth	mm	178	188	184	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	531	Pass
L - Popliteal Height	mm	343	369	355	Pass
K - Knee Pivot To Floor Height	mm	392	409	401	Pass
N - Buttock Popliteal Length	mm	416	442	434	Pass
O - Chest Depth W/O Jacket	mm	195	211	203	Pass
P - Foot Length	mm	216	232	222	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	321	Pass
R - Arm Length	mm	249	259	256	Pass
S - Knee Joint To Seatback	mm	477	493	481	Pass
V - Shoulder Width	mm	341	357	347	Pass
W - Foot Width	mm	78	94	87	Pass
Y - Chest Circumference W/Jacket	mm	851	881	858	Pass
Z - Waist Circumference	mm	761	791	777	Pass
			Overall Test Results		Pass

Technician: _____

J. Hernandez

Approved By: _____

P. Puzzuto

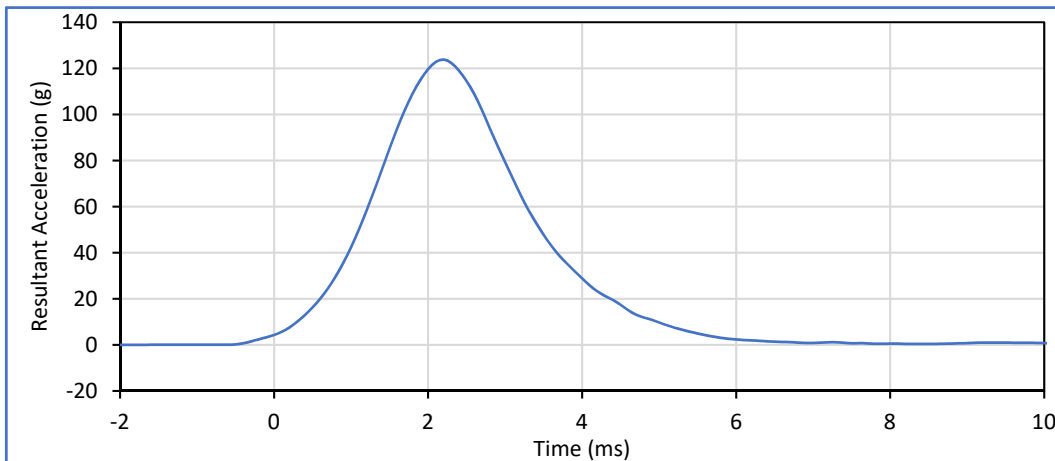


SID-IIs Small Side Impact Dummy Head Drop

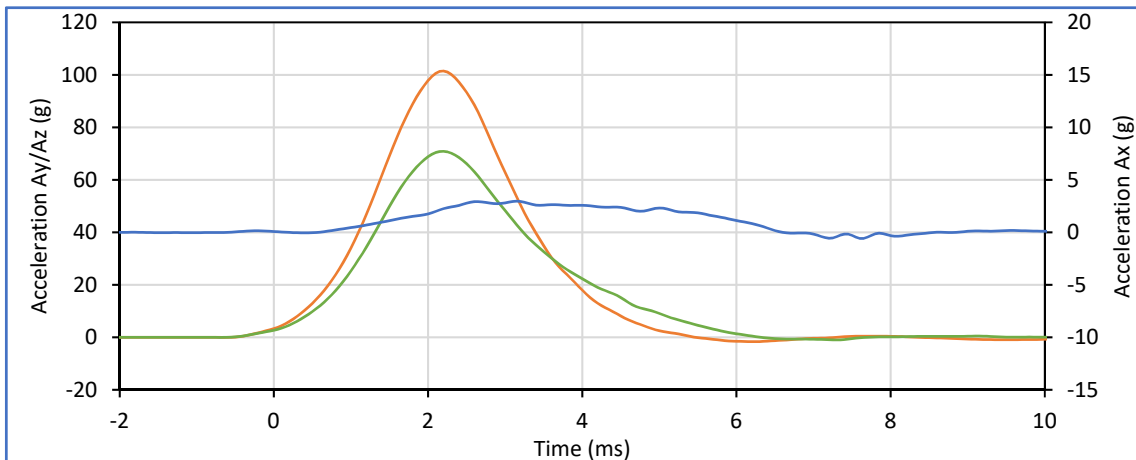
ATD Serial No.: 299

Test Date: 2018-08-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Humidity	%	10	70	15	Pass
Peak Resultant Acceleration	g	115.0	137.0	123.8	Pass
Peak Head Ax	g	-15.0	15.0	-0.6	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Head Resultant
 Max:123.8@2.2
 Min:0.4@8.3
 SAE Class 1000



Head Ax
 Max:3.0@3.2
 Min:-0.6@7.7
 SAE Class 1000
Head Ay
 Max:101.5@2.2
 Min:-1.7@6.3
 SAE Class 1000
Head Az
 Max:70.9@2.2
 Min:-1.0@7.3
 SAE Class 1000

Technician: J. Hernandez

Approved By: P. Puzzuto

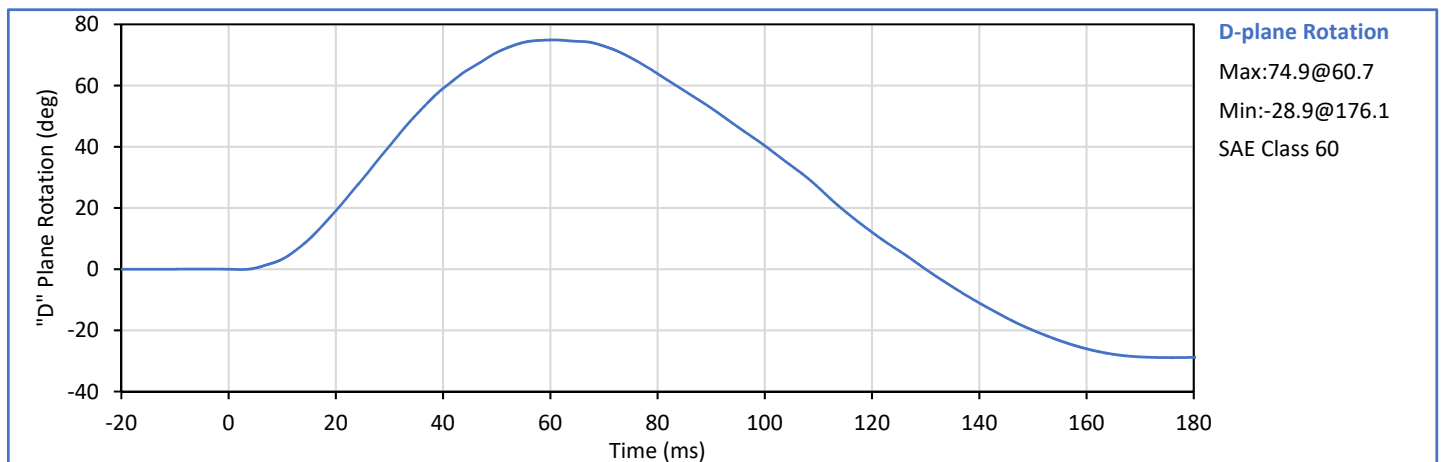
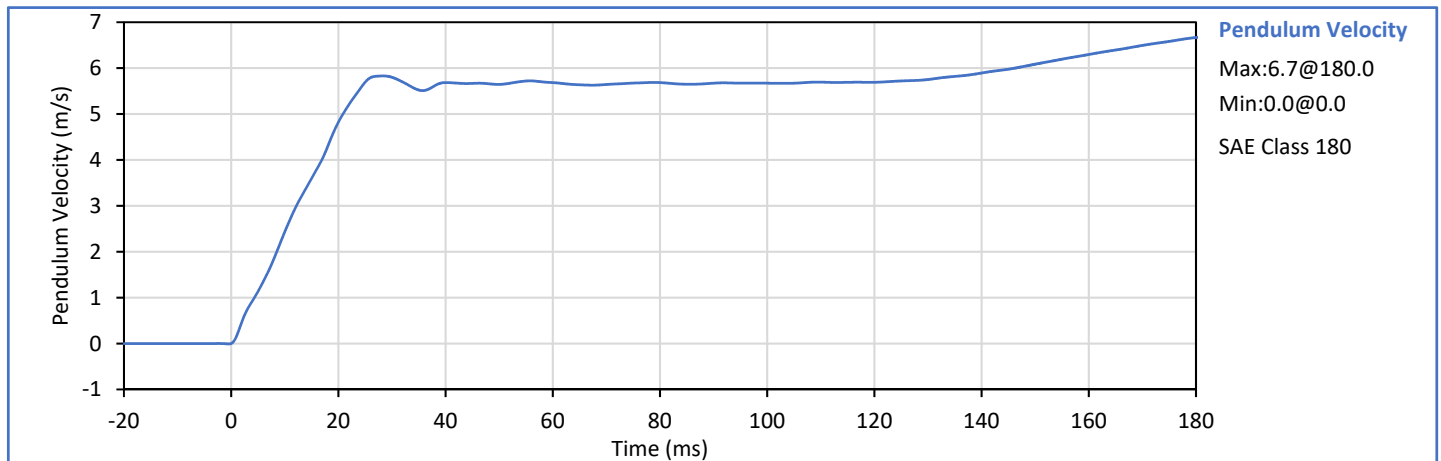


SID-IIs Small Side Impact Dummy Neck Flexion

ATD Serial No.: 299

Test Date: 2018-08-27

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	39	Pass
Pendulum Velocity	m/s	5.51	5.63	5.60	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.43	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	4.82	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.69	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.83	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	74.9	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.7	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-43.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	111.9	Pass
Overall Test Results				Pass	

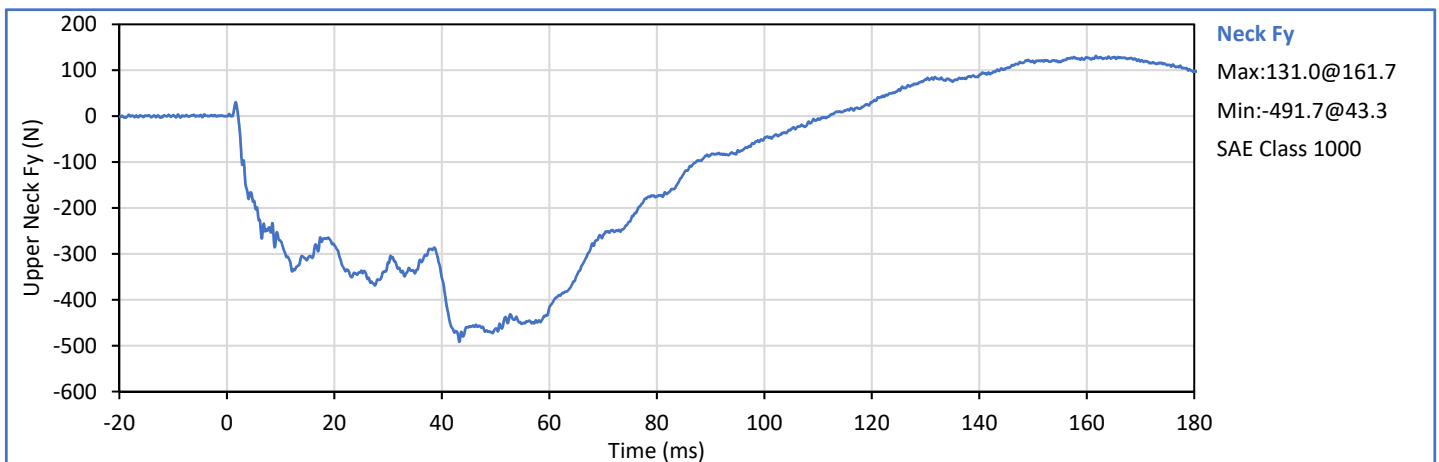
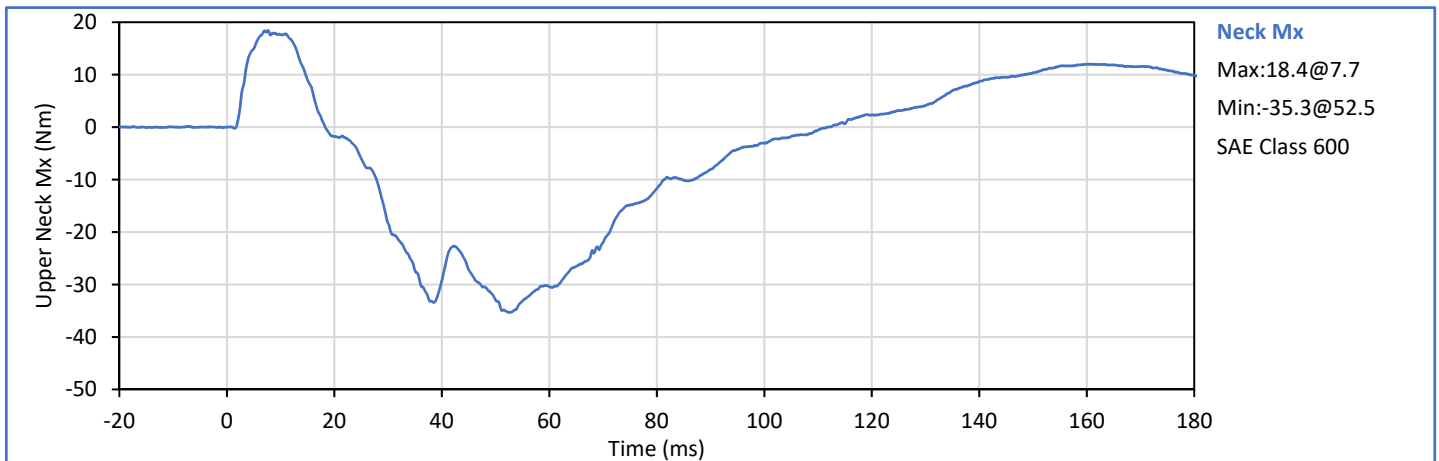
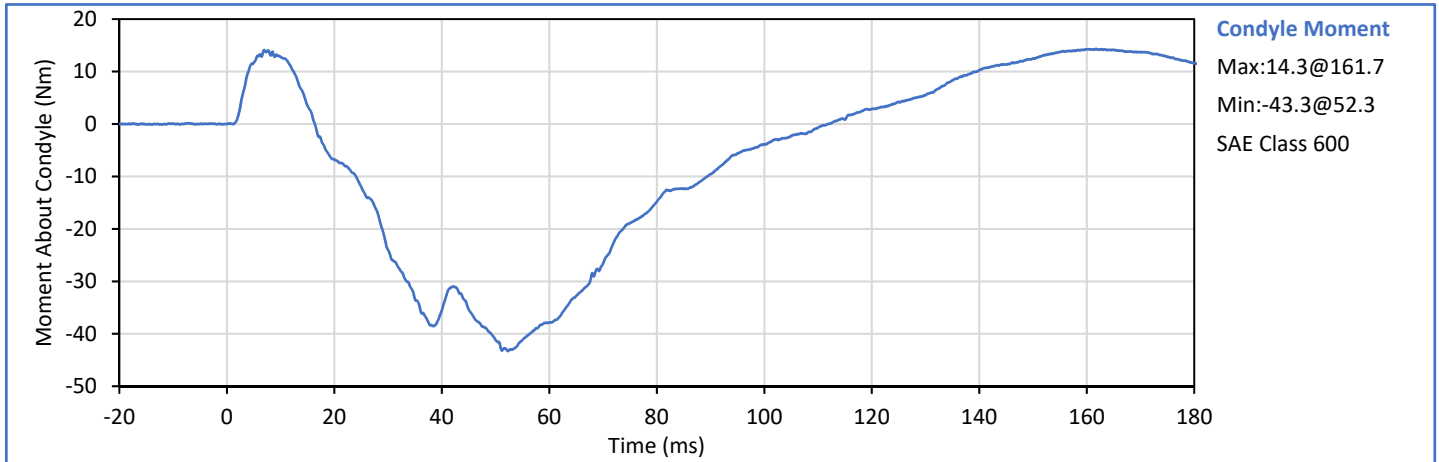


Technician: J. Hernandez

Approved By: P. Puzzuto

ATD Serial No.: 299

Test Date: 2018-08-27



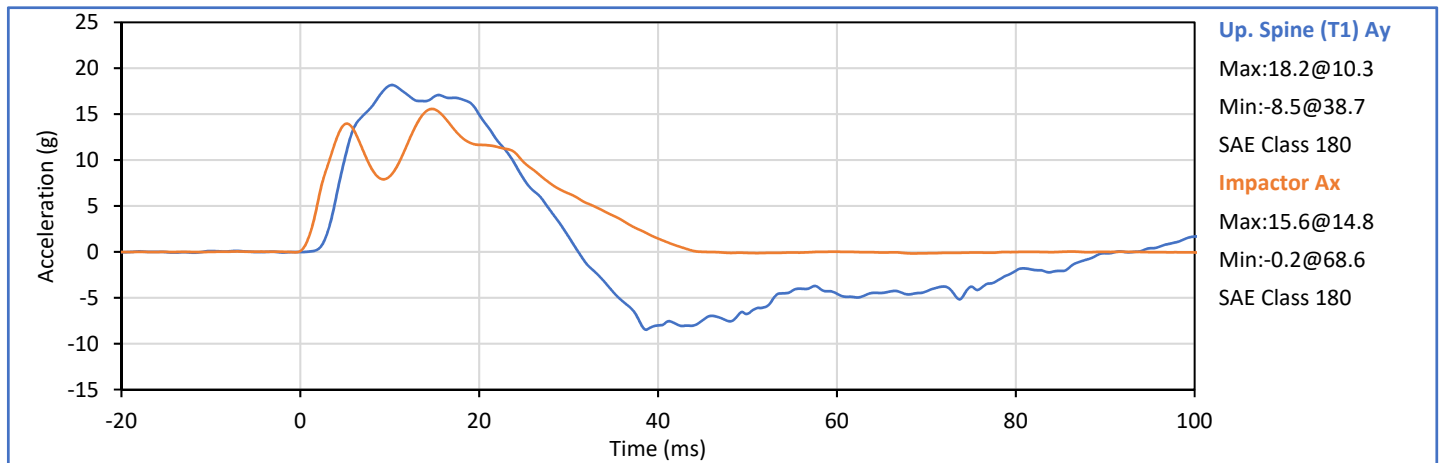
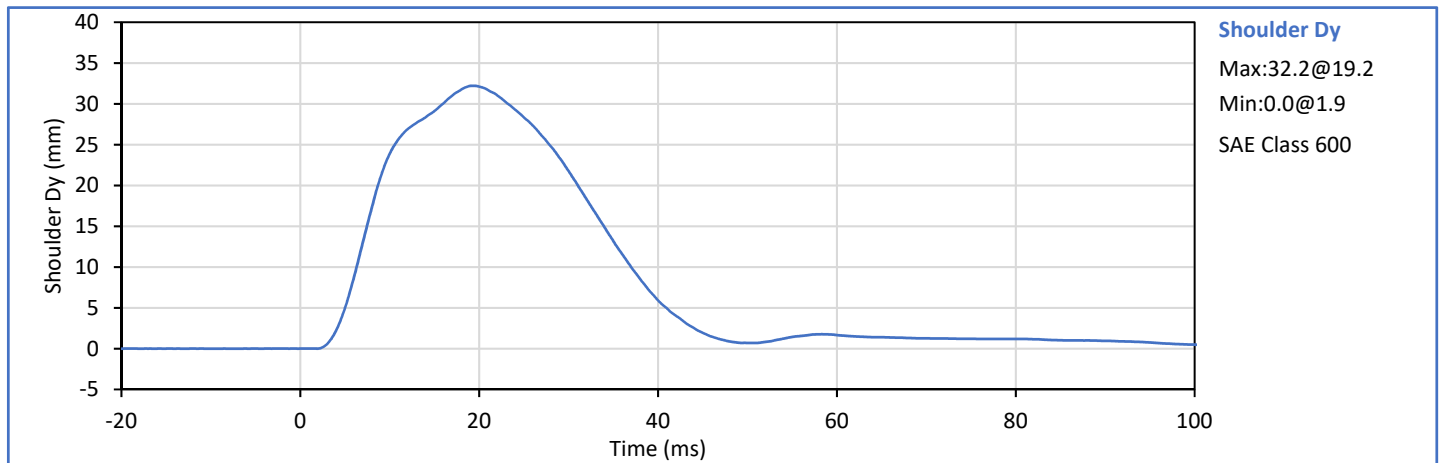


SID-IIs Small Side Impact Dummy Shoulder Impact Test

ATD Serial No.: 299

Test Date: 2018-08-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	40	Pass
Impactor Velocity	m/s	4.20	4.40	4.23	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.2	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.2	Pass
Peak Impactor Ax	g	13.0	18.0	15.6	Pass
Overall Test Results					Pass



Technician: _____

T Lowman

Approved By: _____

P. Puzzuto

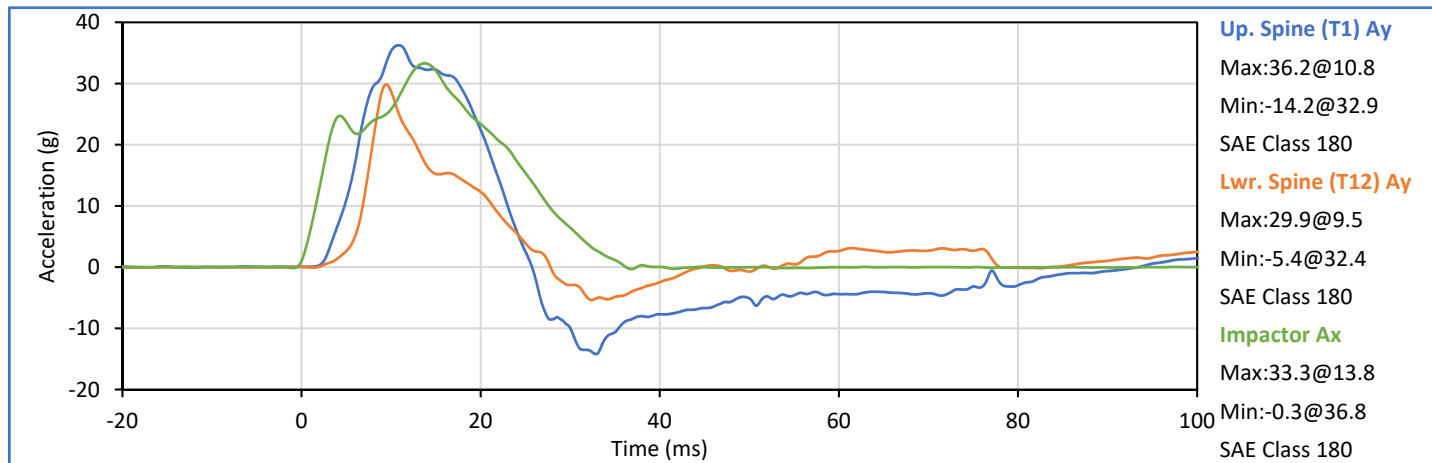
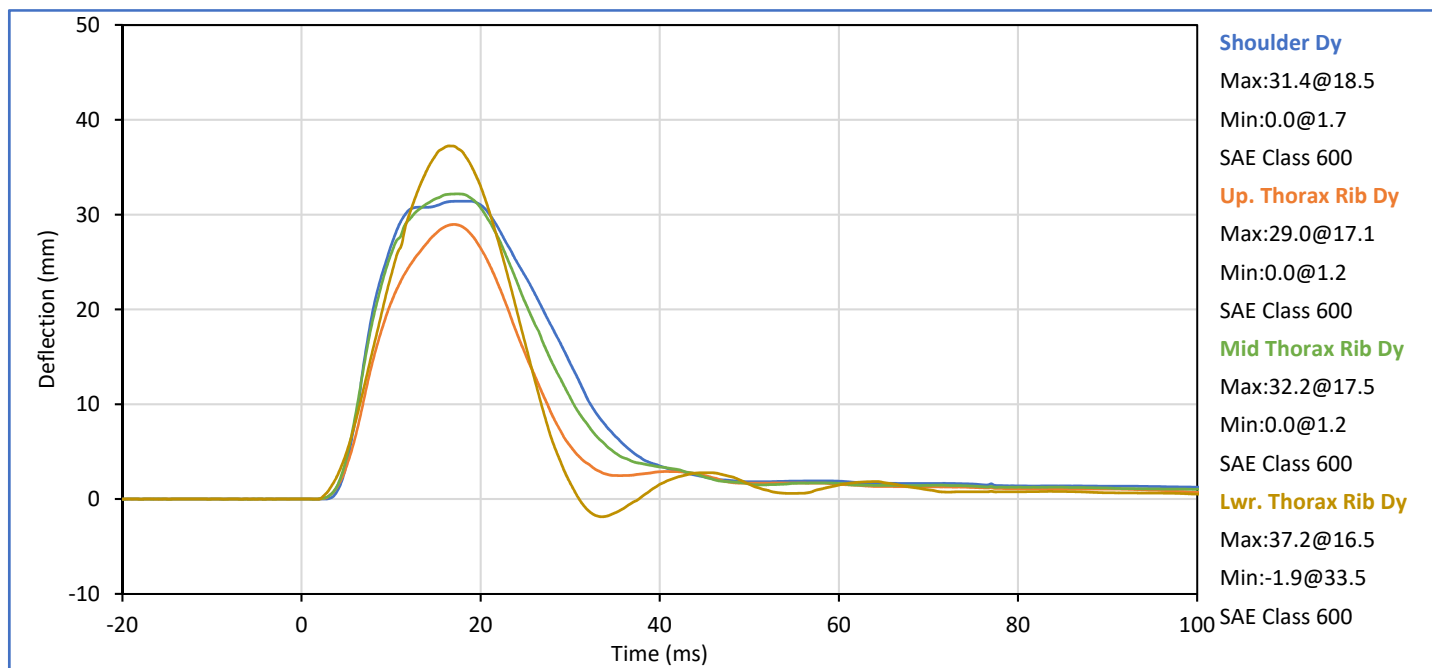


SID-IIs Small Side Impact Dummy Thorax (With Arm)

ATD Serial No.: 299

Test Date: 2018-08-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	44	Pass
Impactor Velocity	m/s	6.60	6.80	6.65	Pass
Peak Shoulder Dy	mm	31.0	40.0	31.4	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.0	Pass
Peak Middle Rib Dy	mm	30.0	36.0	32.2	Pass
Peak Lower Rib Dy	mm	32.0	38.0	37.2	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	36.2	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	29.9	Pass
Peak Impactor Ax	g	30.0	36.0	33.3	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

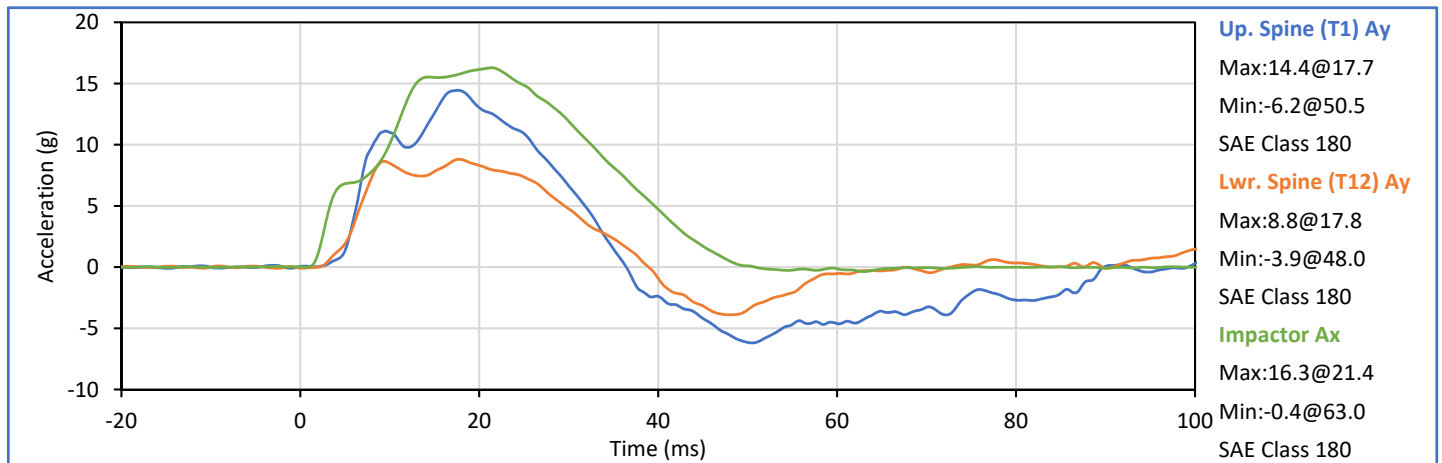
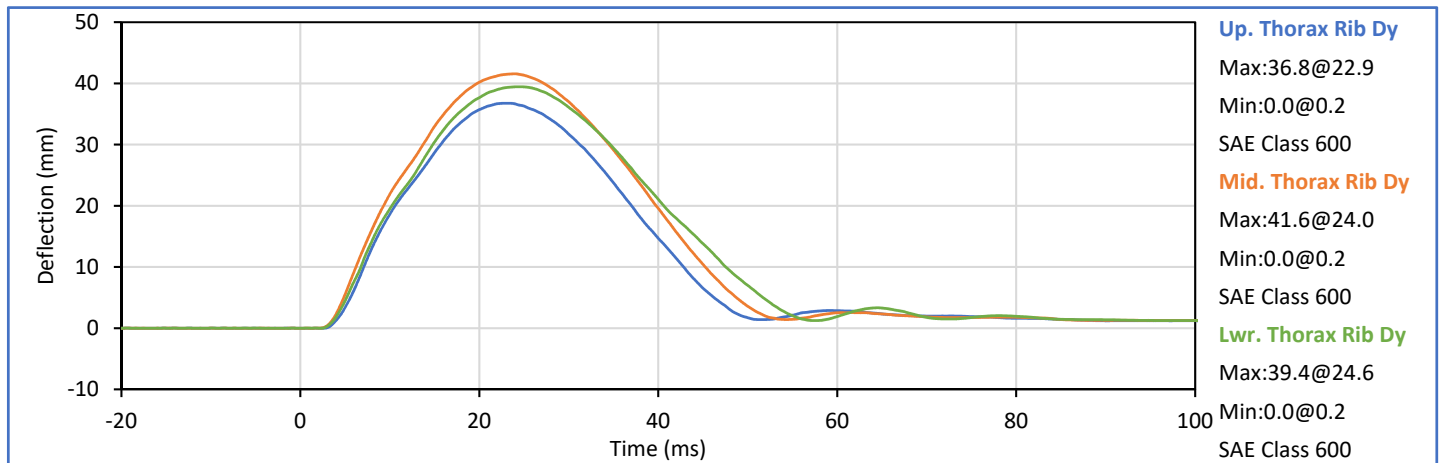


SID-IIs Small Side Impact Dummy Thorax (No Arm)

ATD Serial No.: 299

Test Date: 2018-08-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	40	Pass
Impactor Velocity	m/s	4.20	4.40	4.23	Pass
Peak Upper Rib Dy	mm	32.0	40.0	36.8	Pass
Peak Middle Rib Dy	mm	39.0	45.0	41.6	Pass
Peak Lower Rib Dy	mm	35.0	43.0	39.4	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	14.4	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.8	Pass
Peak Impactor Ax	g	14.0	18.0	16.3	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

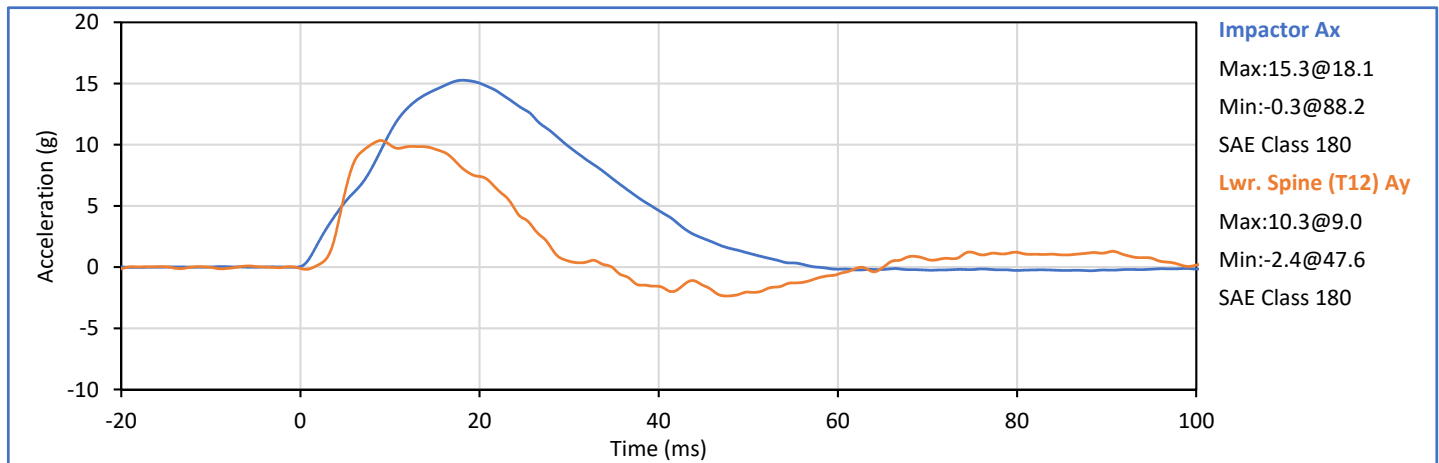
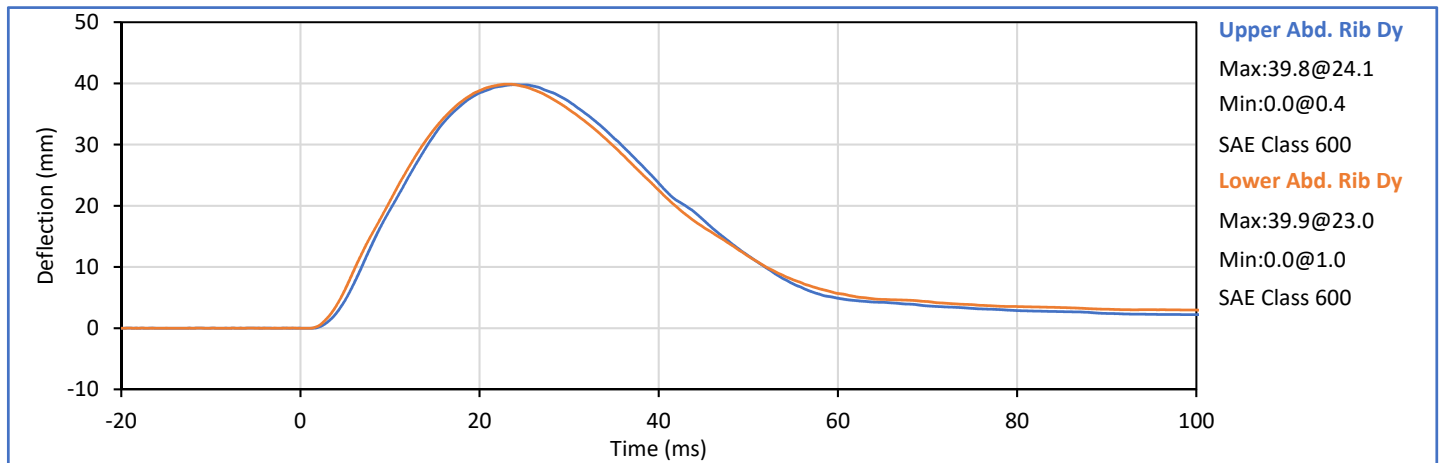


SID-IIs Small Side Impact Dummy Abdomen Impact

ATD Serial No.: 299

Test Date: 2018-08-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	40	Pass
Impactor Velocity	m/s	4.20	4.40	4.27	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	39.8	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	39.9	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.3	Pass
Peak Impactor Ax	g	12.0	16.0	15.3	Pass
Overall Test Results				Pass	



Technician: _____

J. Hernandez

Approved By: _____

P. Puzzuto



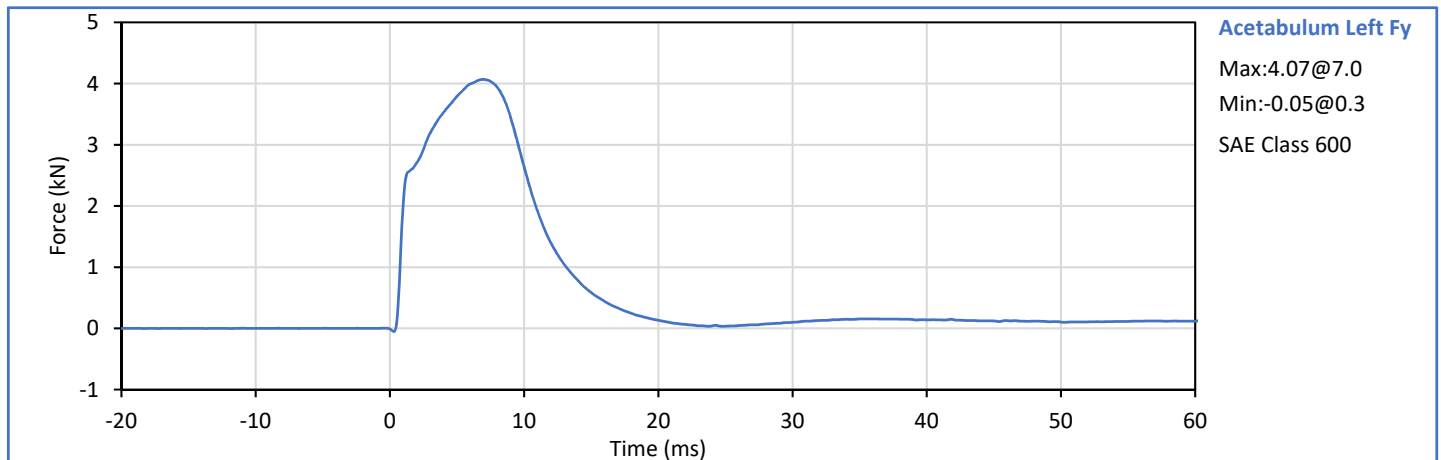
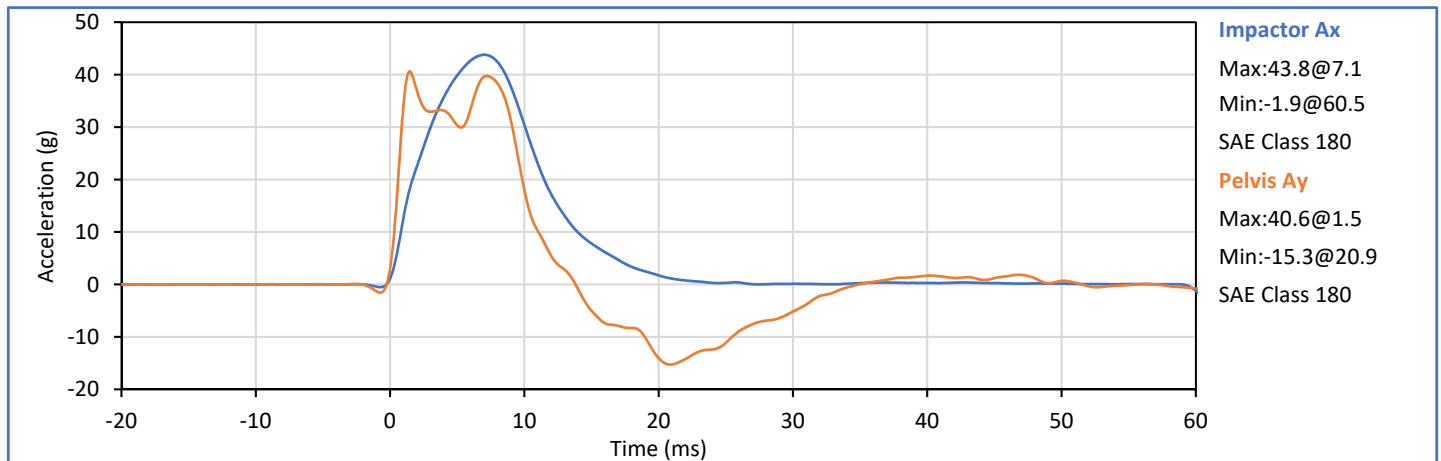
SID-IIs Small Side Impact Dummy
Pelvis Acetabulum Impact

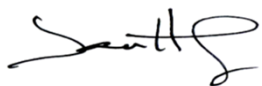
ATD Serial No.: 299

Test Date: 2018-08-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	42	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.07	Pass
Pelvis Ay after 6ms	g	34.0	42.0	39.8	Pass
Peak Impactor Ax	g	38.0	47.0	43.8	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12224 (SACO)



Technician: 
J. Hernandez

Approved By: 
P. Puzzuto



9270 Holly Road, Adelanto, CA 92301
Tel: +1 760 246 1672 Fax: +1 760 246 8112
Info@karco.com www.karco.com

SID-IIs Small Side Impact Dummy Pelvis Acetabulum Impact

ATD Serial No.: 299

Test Date: 2018-08-23

Pelvis Plug S/N: 12224 (SACO)



SID-IIs Pelvis Plug Certification Test

Plug S/N 12224

Test Number 6610

Report Number 6625

Test Date 3/14/2018 12:41:39 PM

	Test Results	Spec. Min	Spec. Max
Force @ 0.5 mm (N)	295.35	50.00	600.00
Force @ 1.5 mm (N)	1,152.91	850.00	1,400.00
Force @ 2.5 mm (N)	1,427.48	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,477.32	1,361.00	1,673.00

Testing Machine STM-20 5965542

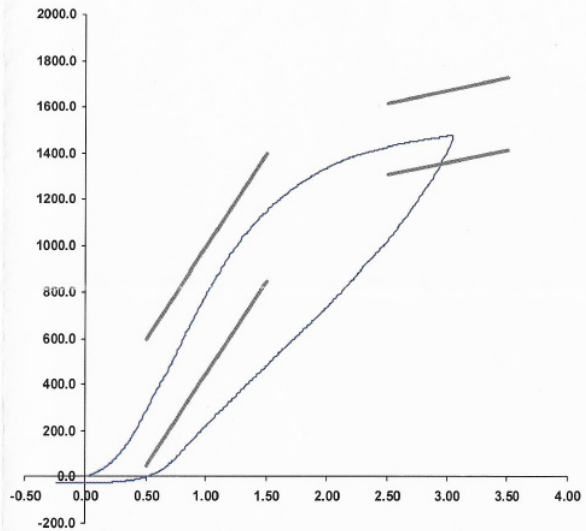
Load Cell S/N (FI360947), Units (LBS) 1000

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 14-Mar-18
SACO Research

By: DC Date: 3/14/18

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



SID-IIs Small Side Impact Dummy Pelvis Iliac Impact

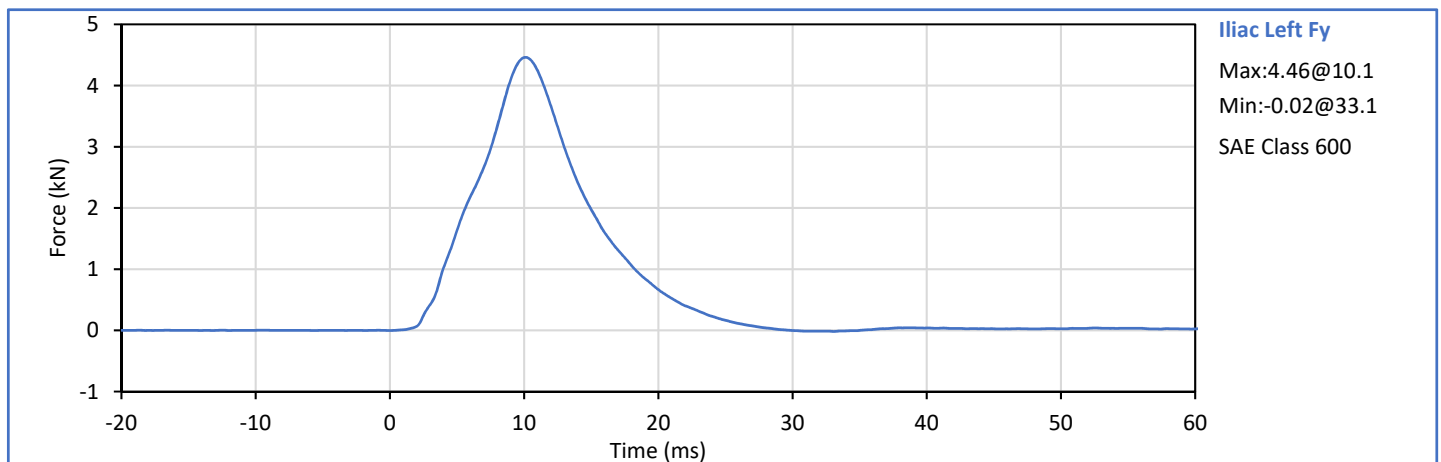
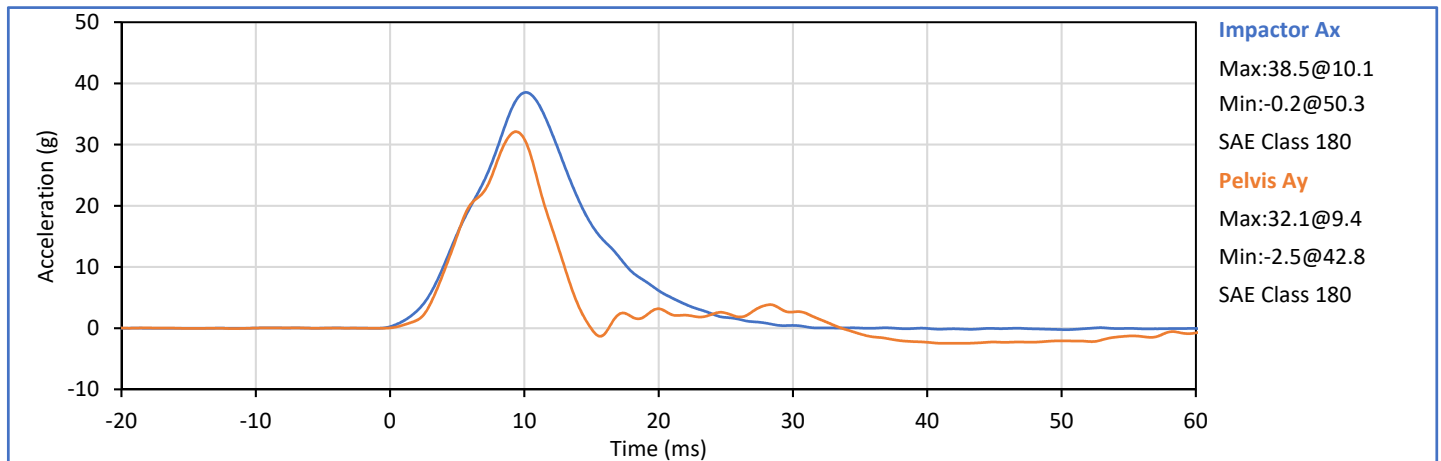
ATD Serial No.: 299

Test Date: 2018-08-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	42	Pass
Impactor Velocity	m/s	4.20	4.40	4.38	Pass
Peak Iliac Fy	kN	4.10	5.10	4.46	Pass
Pelvis Ay after 6ms	g	28.0	39.0	32.1	Pass
Peak Impactor Ax	g	36.0	45.0	38.5	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 C
POST-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
LEFT SIDE CONFIGURATION



SID-IIs Small Side Impact ATD
External Measurements

ATD Serial No.: 299

Test Date: 2018-09-19

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	781	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	85	Pass
D - H Point From Seatback	mm	141	151	149	Pass
E - Shoulder Pivot From Backline	mm	97	107	104	Pass
F - Thigh Clearance	mm	119	135	126	Pass
G - Head Breadth	mm	140	148	145	Pass
H - Head Back From Backline	mm	40	46	44	Pass
I - Head Depth	mm	178	188	185	Pass
J - Head Circumference	mm	541	551	548	Pass
K - Buttock To Knee Length	mm	514	540	521	Pass
L - Popliteal Height	mm	343	369	348	Pass
K - Knee Pivot To Floor Height	mm	392	409	399	Pass
N - Buttock Popliteal Length	mm	416	442	427	Pass
O - Chest Depth W/O Jacket	mm	195	211	203	Pass
P - Foot Length	mm	216	232	226	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	317	Pass
R - Arm Length	mm	249	259	253	Pass
S - Knee Joint To Seatback	mm	477	493	485	Pass
V - Shoulder Width	mm	341	357	351	Pass
W - Foot Width	mm	78	94	88	Pass
Y - Chest Circumference W/Jacket	mm	851	881	867	Pass
Z - Waist Circumference	mm	761	791	775	Pass
Overall Test Results				Pass	

Technician: _____

J. Hernandez

Approved By: _____

P. Puzzuto

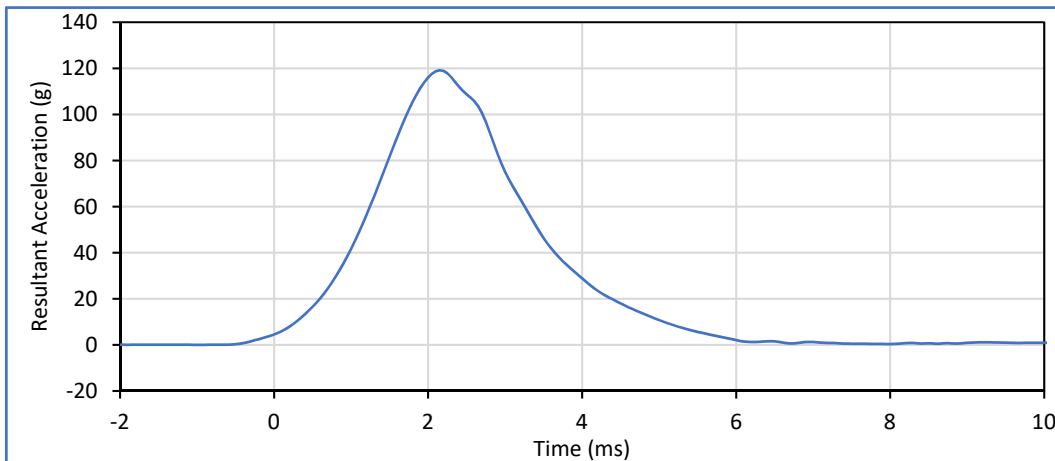


SID-IIs Small Side Impact ATD Head Drop

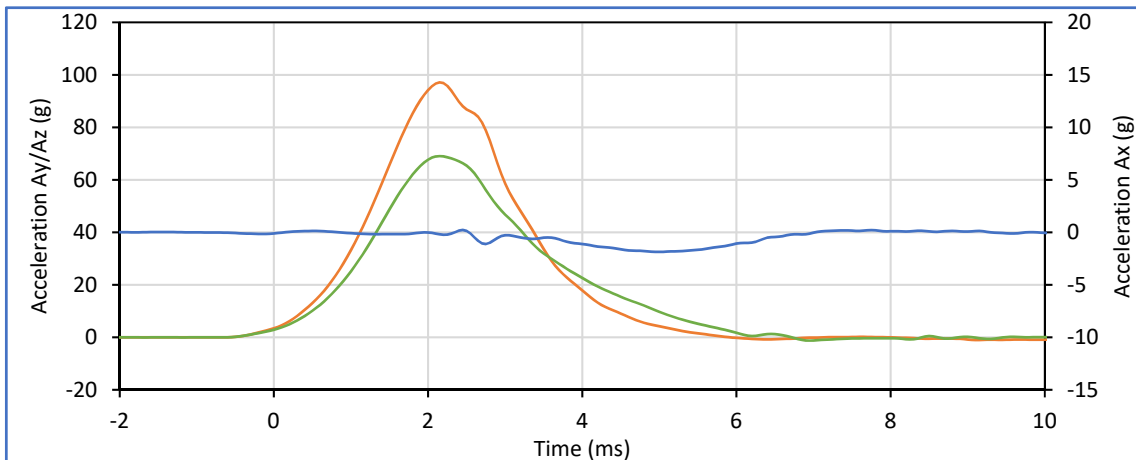
ATD Serial No.: 299

Test Date: 2018-09-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Humidity	%	10	70	28	Pass
Peak Resultant Acceleration	g	115.0	137.0	119.2	Pass
Peak Head Ax	g	-15.0	15.0	-1.9	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Head Resultant
 Max:119.2@2.2
 Min:0.4@8.0
 SAE Class 1000



Head Ax
 Max:0.2@2.5
 Min:-1.9@5.0
 SAE Class 1000
Head Ay
 Max:97.1@2.2
 Min:-1.0@9.1
 SAE Class 1000
Head Az
 Max:69.0@2.2
 Min:-1.3@7.0
 SAE Class 1000

Technician: T. Lowman

Approved By: P. Puzzuto

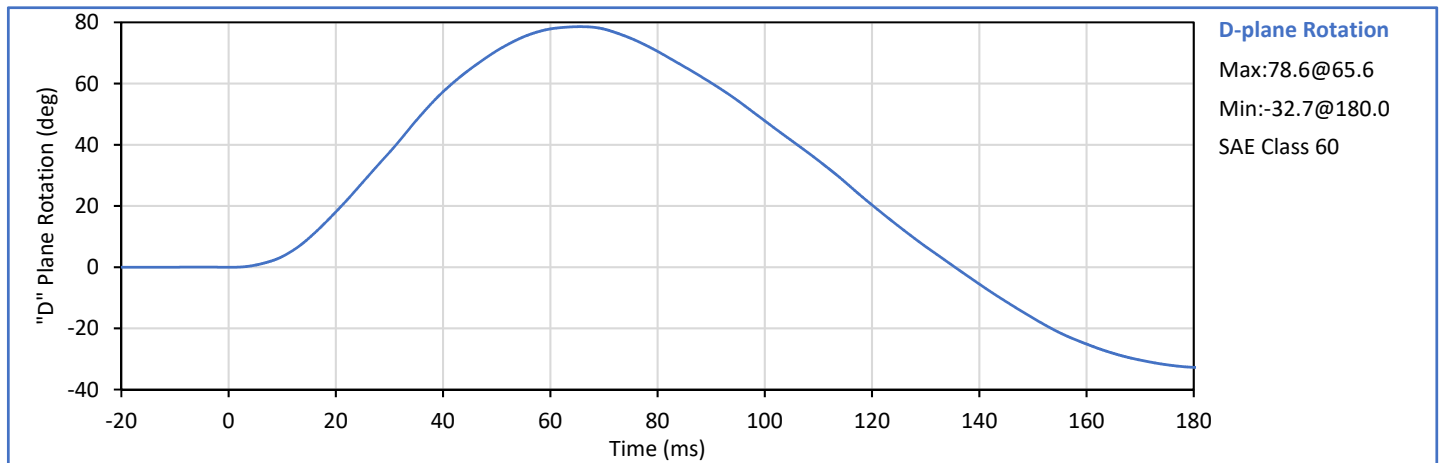
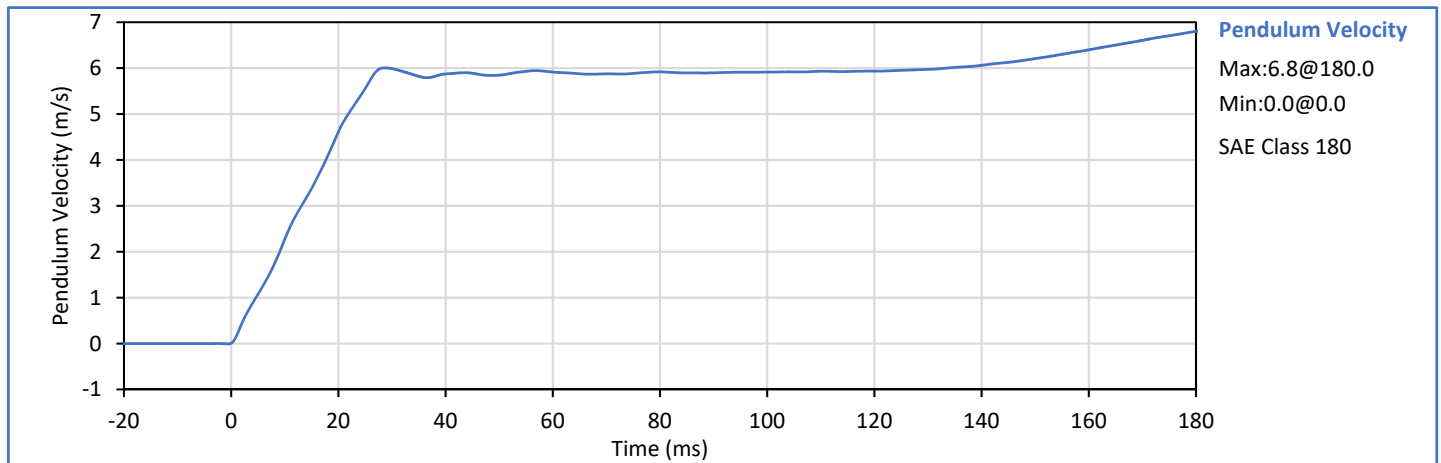


**SID-IIs Small Side Impact ATD
Neck Flexion**

ATD Serial No.: 299

Test Date: 2018-09-20

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	5.51	5.63	5.57	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.27	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.38	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.61	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.55	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	6.01	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	78.6	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	65.6	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-39.5	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	117.8	Pass
Overall Test Results				Pass	



Technician: _____

J. Hernandez

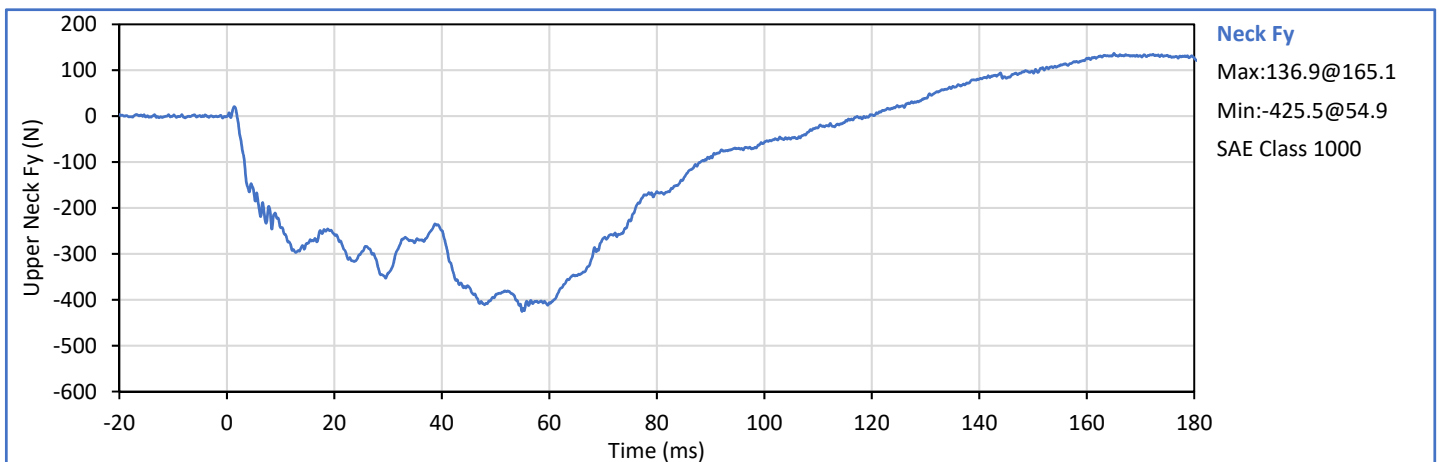
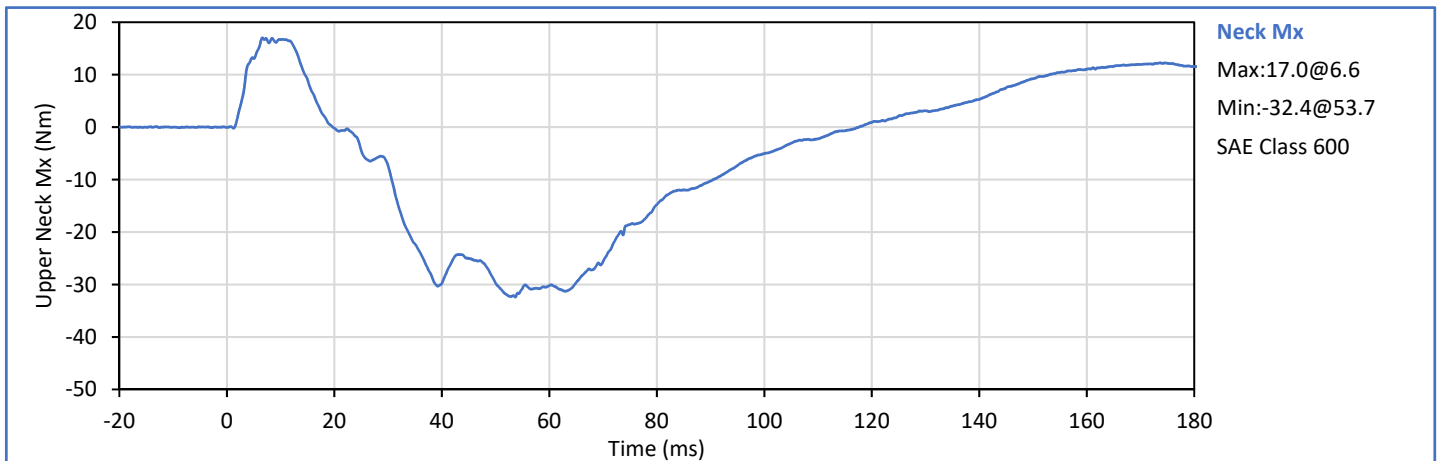
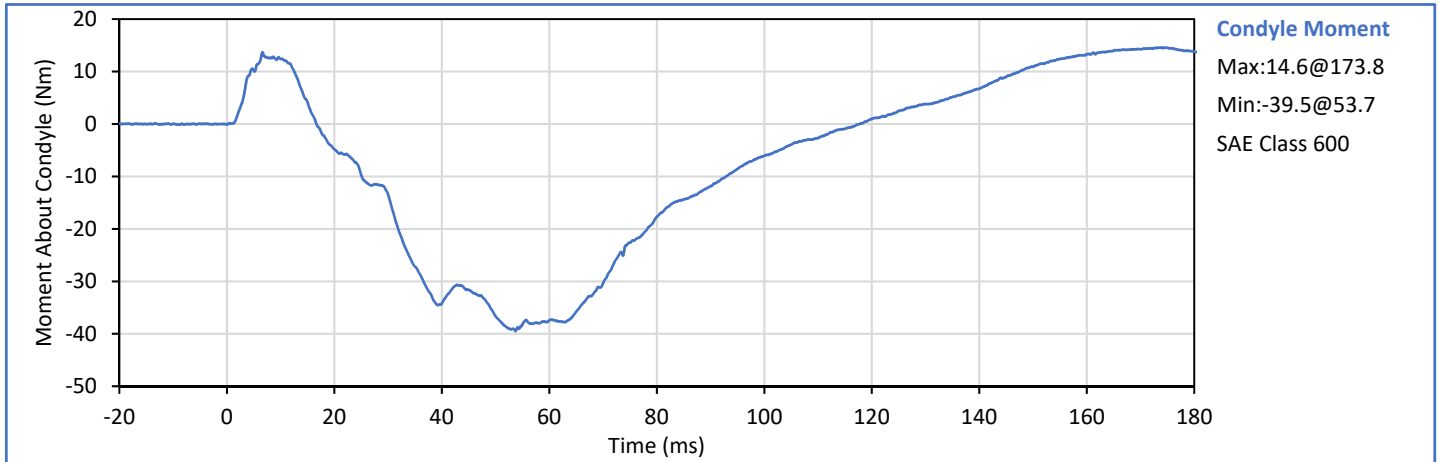
Approved By: _____

P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-09-20



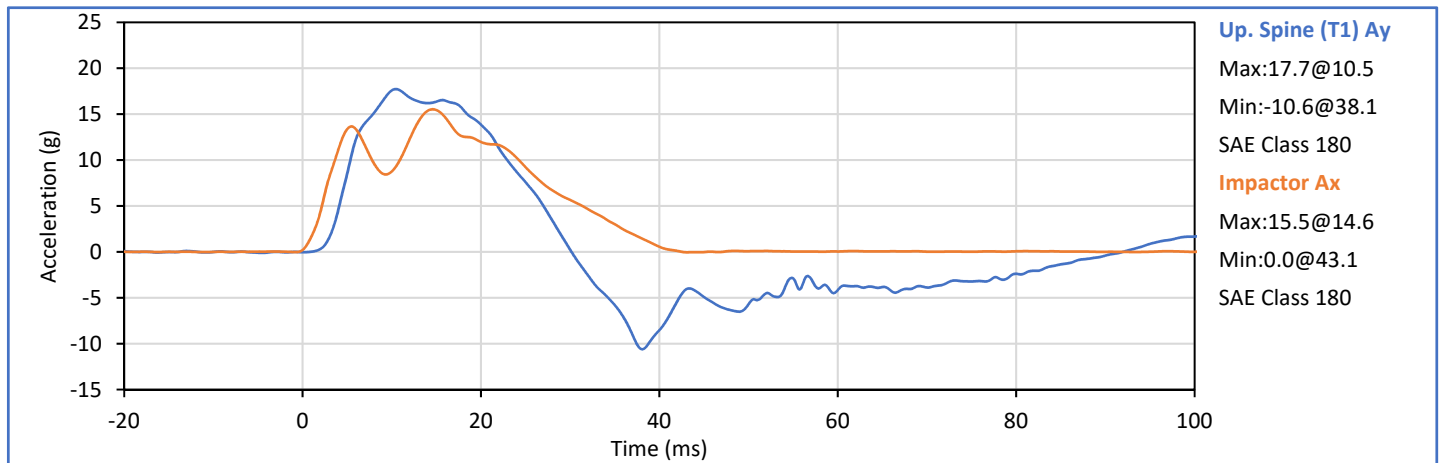
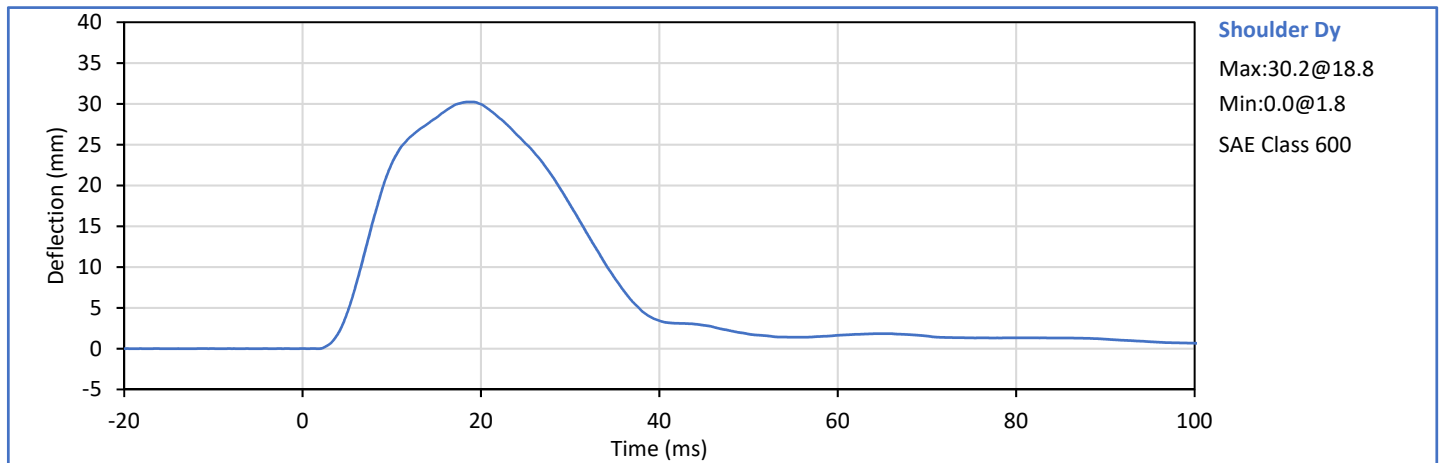


SID-IIs Small Side Impact ATD Shoulder Impact Test

ATD Serial No.: 299

Test Date: 2018-09-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	4.20	4.40	4.23	Pass
Peak Shoulder Dy	mm	28.0	37.0	30.2	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	17.7	Pass
Peak Impactor Ax	g	13.0	18.0	15.5	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

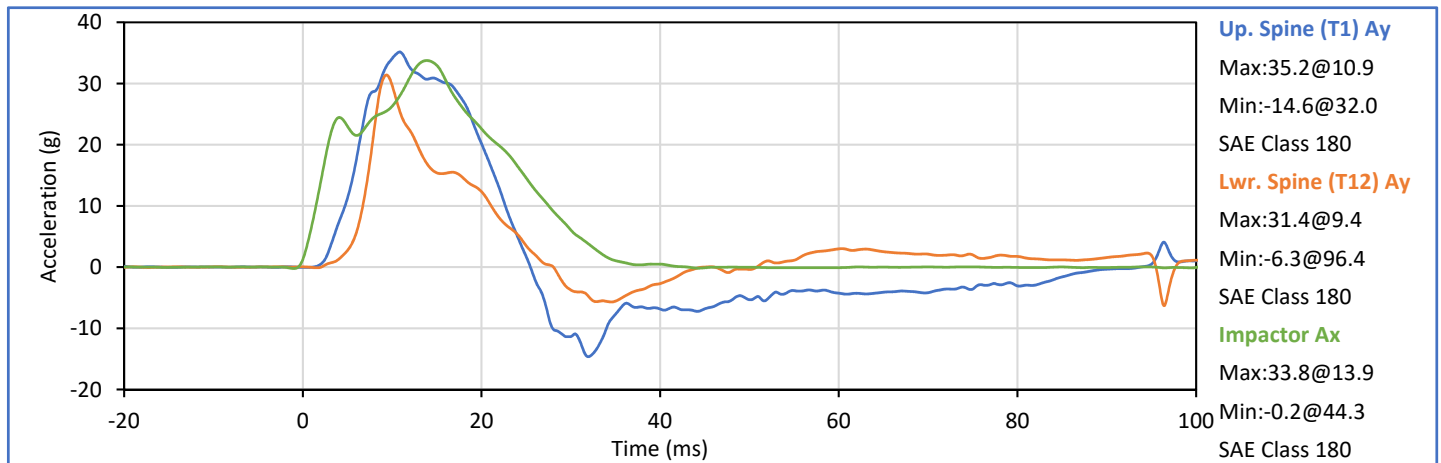
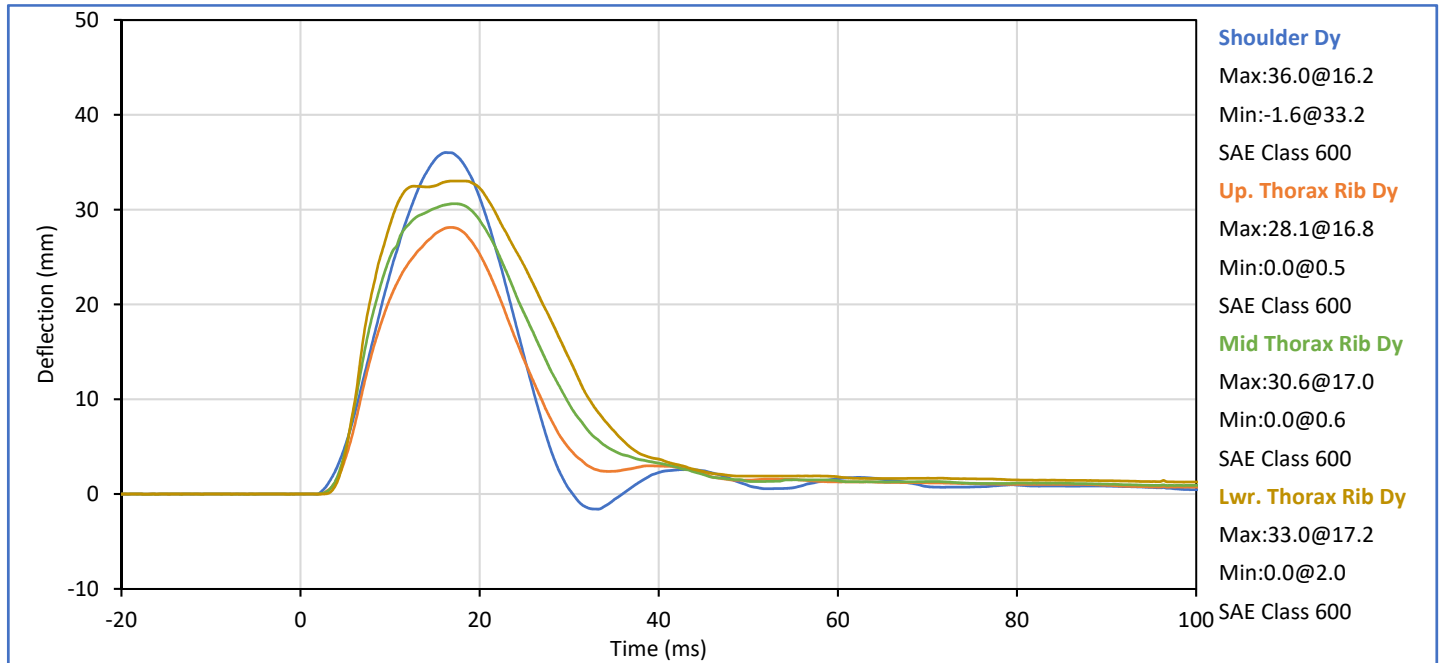


SID-IIs Small Side Impact ATD Thorax (With Arm)

ATD Serial No.: 299

Test Date: 2018-09-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	26	Pass
Impactor Velocity	m/s	6.60	6.80	6.65	Pass
Peak Shoulder Dy	mm	31.0	40.0	36.0	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.1	Pass
Peak Middle Rib Dy	mm	30.0	36.0	30.6	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.0	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	35.2	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	31.4	Pass
Peak Impactor Ax	g	30.0	36.0	33.8	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

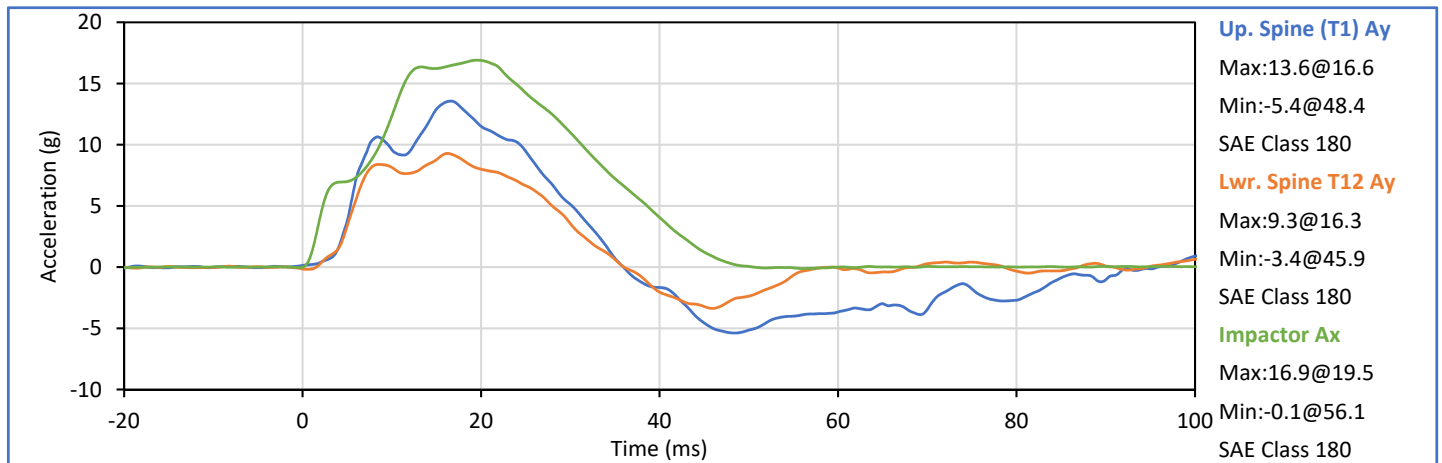
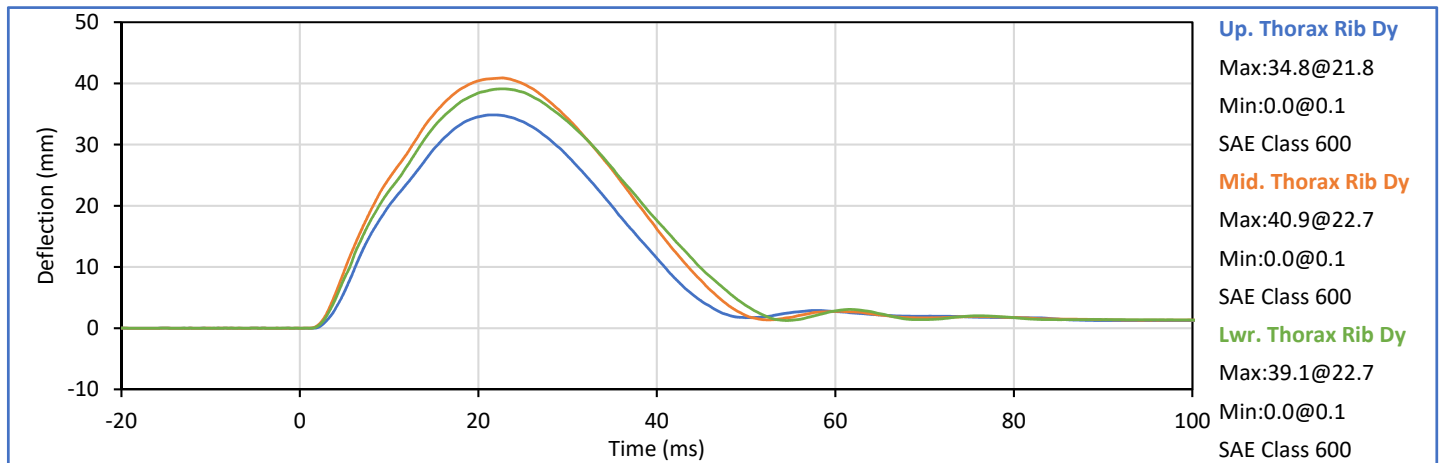


**SID-IIs Small Side Impact ATD
 Thorax (No Arm)**

ATD Serial No.: 299

Test Date: 2018-09-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	4.20	4.40	4.27	Pass
Peak Upper Rib Dy	mm	32.0	40.0	34.8	Pass
Peak Middle Rib Dy	mm	39.0	45.0	40.9	Pass
Peak Lower Rib Dy	mm	35.0	43.0	39.1	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	13.6	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	9.3	Pass
Peak Impactor Ax	g	14.0	18.0	16.9	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

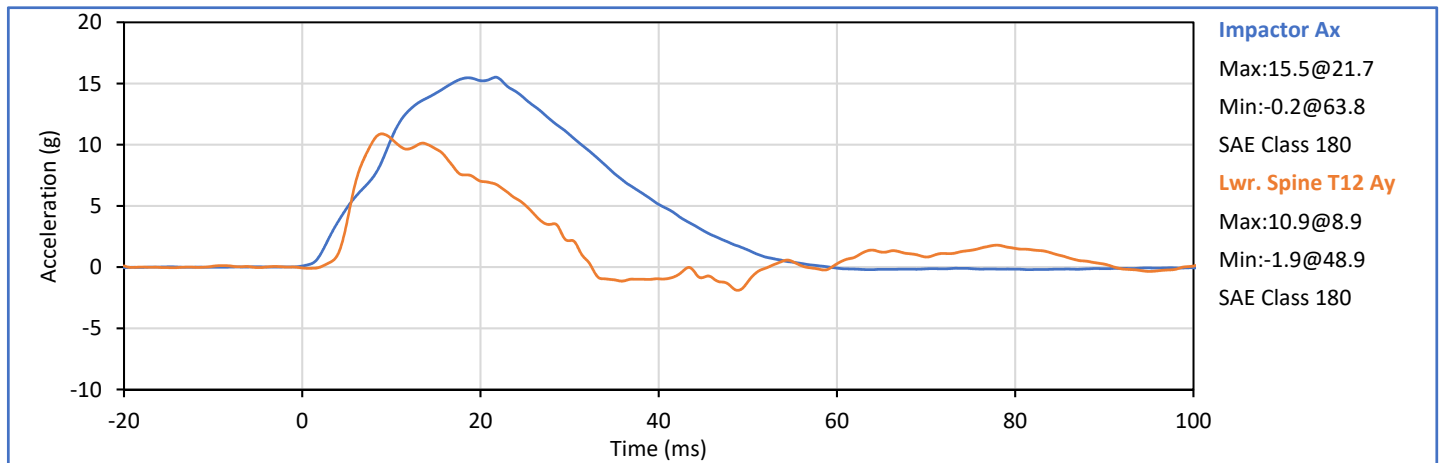
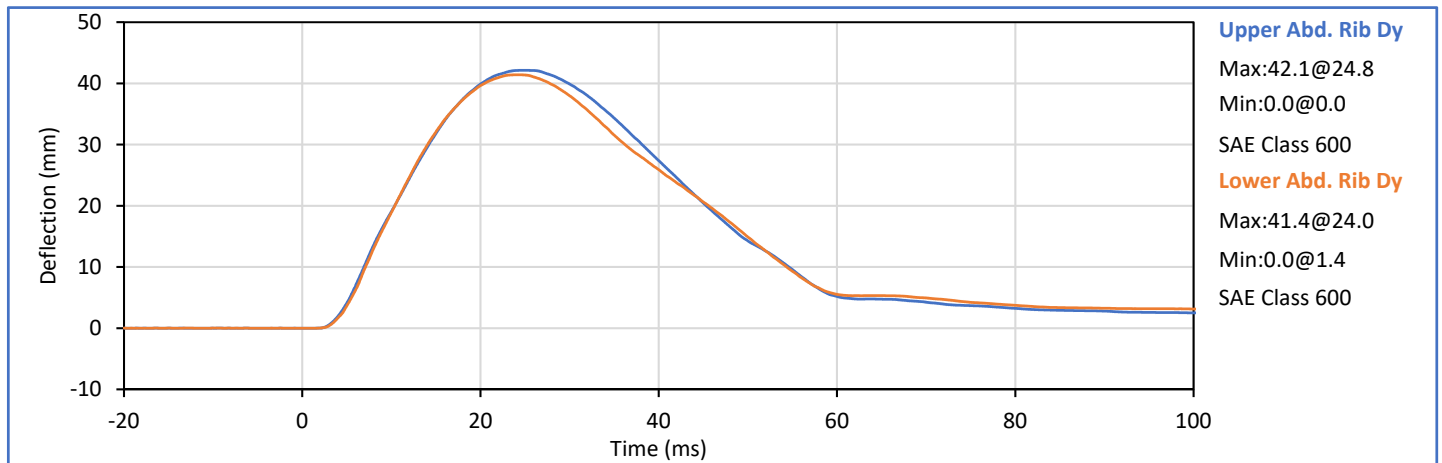


SID-IIs Small Side Impact ATD Abdomen Impact

ATD Serial No.: 299

Test Date: 2018-09-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	42.1	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	41.4	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.9	Pass
Peak Impactor Ax	g	12.0	16.0	15.5	Pass
Overall Test Results				Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto



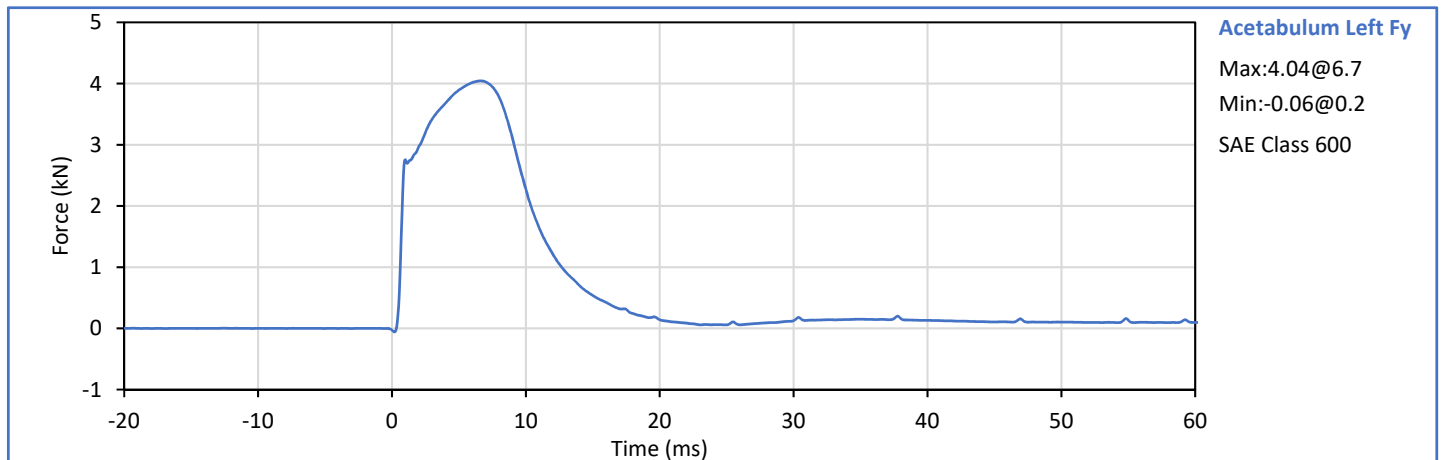
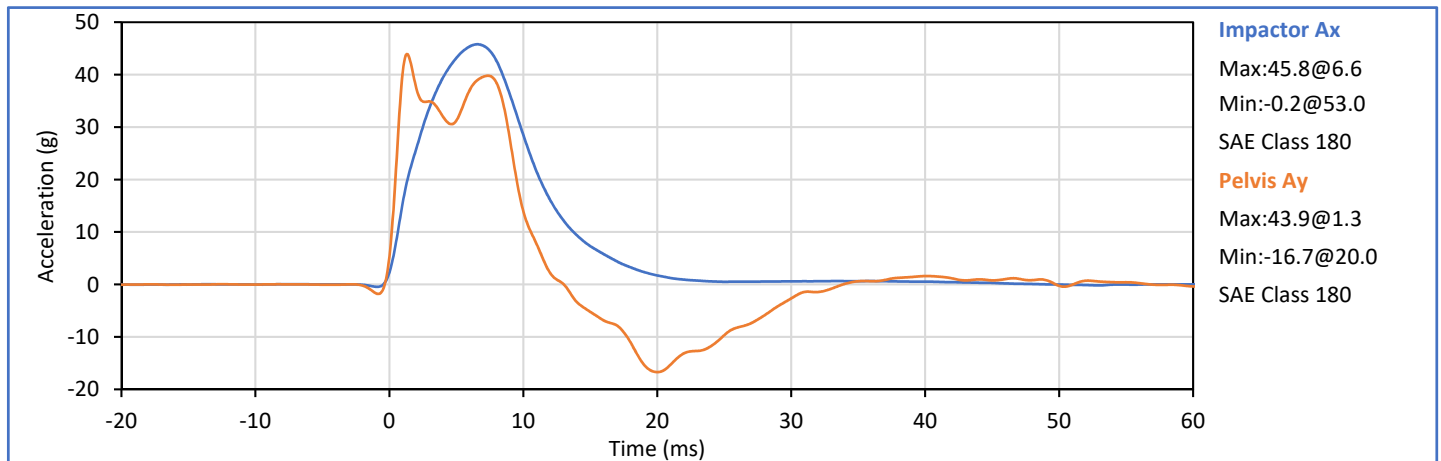
SID-II Small Side Impact ATD
Pelvis Acetabulum Impact

ATD Serial No.: 299

Test Date: 2018-09-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	25	Pass
Impactor Velocity	m/s	6.60	6.80	6.65	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.04	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

Pelvis Plug S/N: 12034 (SACO)



Technician: J. Hernandez

Approved By: P. Puzzuto



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Tel: +1 760 246 1672 Fax: +1 760 246 8112
Info@karco.com www.karco.com

SID-IIs Small Side Impact ATD Pelvis Acetabulum Impact

ATD Serial No.: 299

Test Date: 2018-09-19

Pelvis Plug S/N: 12034 (SACO)



SID-IIs Pelvis Plug Certification Test

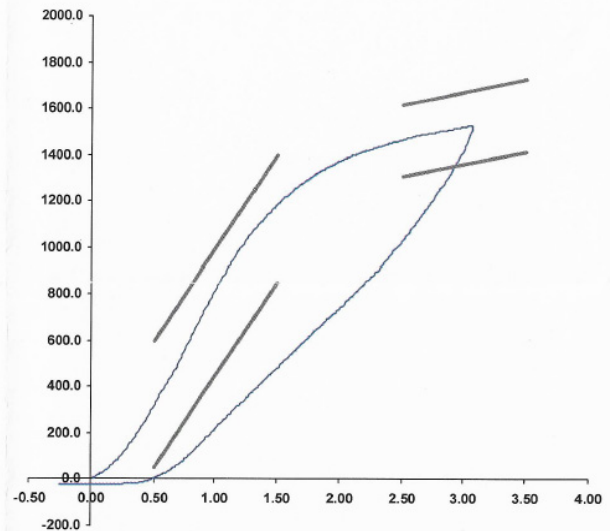
Plug S/N 12034
Test Number 6386
Report Number 6401
Test Date 2/26/2018 12:14:03 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	316.63	50.00	600.00
Force @ 1.5 mm (N)	1,188.44	850.00	1,400.00
Force @ 2.5 mm (N)	1,465.48	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,521.98	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), 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 26-Feb-18
SACO Research

By: DC Date: 2/26/18

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



SID-IIs Small Side Impact ATD
Pelvis Iliac Impact

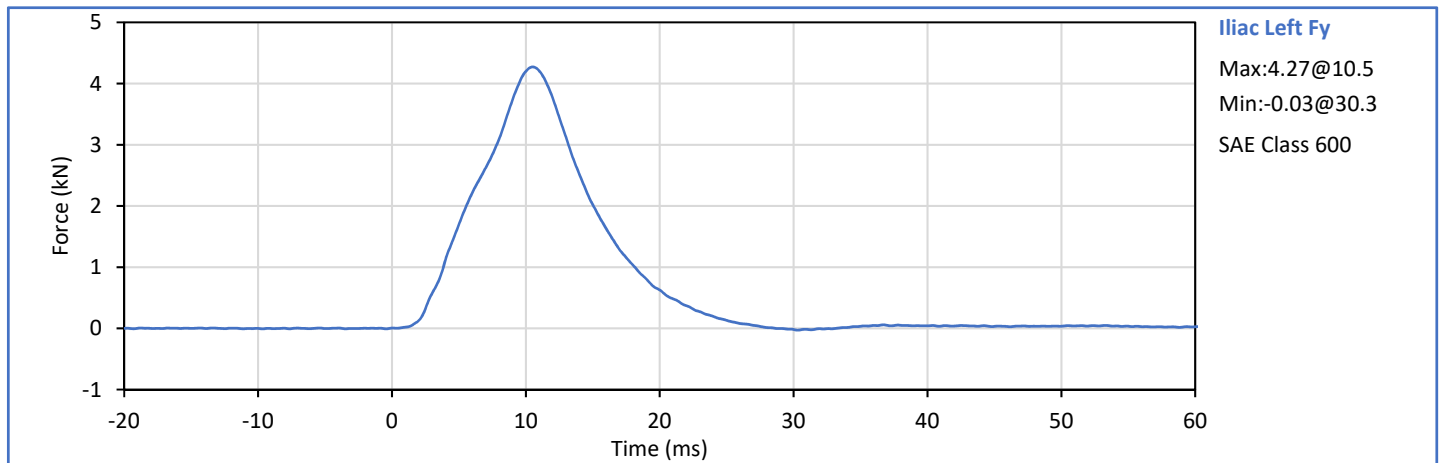
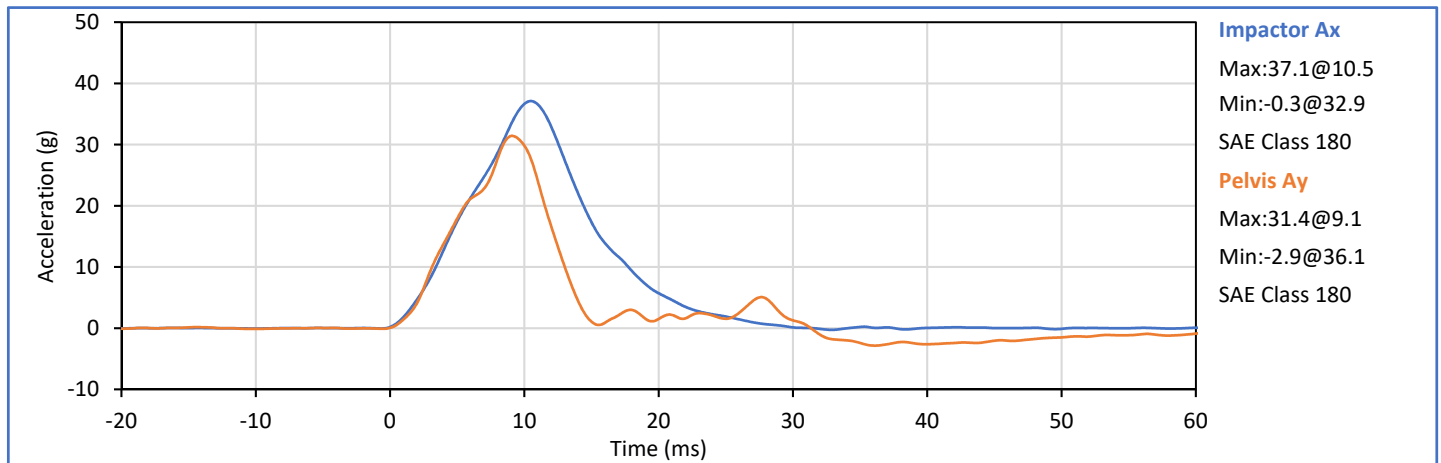
ATD Serial No.: 299

Test Date: 2018-09-22

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.35	Pass
Peak Iliac Fy	kN	4.10	5.10	4.27	Pass
Pelvis Ay after 6ms	g	28.0	39.0	31.4	Pass
Peak Impactor Ax	g	36.0	45.0	37.1	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

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Position:	Driver
ATD Type:	SID-IIs
ATD S/N:	299

Table 1a - Driver ATD Instrumentation

Sensor Location	Sensor S/N	Mfr	Model	Last Cal
Head Acceleration X Primary	P51929	Endevco	7264C-2k	2018-08-08
Head Acceleration Y Primary	P50086	Endevco	7264C-2k	2018-08-08
Head Acceleration Z Primary	P51931	Endevco	7264C-2k	2018-08-08
Head Acceleration X Redundant	P68604	Endevco	7264C-2k	2018-08-08
Head Acceleration Y Redundant	P51934	Endevco	7264C-2k	2018-08-08
Head Acceleration Z Redundant	P58736	Endevco	7264C-2k	2018-08-08
Upper Thorax Rib Deflection Y	1143	Servo	08TCI-3725	2018-08-15
Middle Thorax Rib Deflection Y	1160	Servo	08TCI-3725	2018-08-15
Lower Thorax Rib Deflection Y	1213	Servo	08TCI-3725	2018-08-15
Upper Abdomen Rib Deflection Y	1218	Servo	08TCI-3725	2018-08-15
Lower Abdomen Rib Deflection Y	1177	Servo	08TCI-3725	2018-08-15
Lower Spine T12 Acceleration X	04I20-Z04	Entran	EGEB6Q-2k	2018-08-16
Lower Spine T12 Acceleration Y	06A07-R08	Entran	EGEB6Q-2k	2018-08-16
Lower Spine T12 Acceleration Z	P58795	Endevco	7264C-2k	2018-08-16
Acetabulum Impact Side Force Y	260 Fy (Acetabulum)	R.A. Denton	3249J	2017-11-07
Iliac Wing Impact Side Force Y	272 Fy (Iliac)	R.A. Denton	3228J	2017-11-07

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

Sensor Location	Sensor S/N	Mfr	Model	Last Cal
Head Rotation Rate X	ARS7571	DTS	ARS PRO-8k (2000Hz)	2017-06-09
Head Rotation Rate Y	ARS7316	DTS	ARS PRO-8k (2000Hz)	2017-06-09
Head Rotation Rate Z	ARS7330	DTS	ARS PRO-8k (2000Hz)	2017-06-09

Table 2 - Vehicle Instrumentation

Sensor Location	Sensor S/N	Mfr	Model	Last Cal
Vehicle CG Ax	A224576	MSI	52F-2000	2018-09-15
Vehicle CG Ay	A185688	MSI	52F-2000	2018-09-15
Vehicle CG Az	A224505	MSI	52F-2000	2018-09-15
Left Floor Sill Ay	A145914	MSI	52F-2000	2018-09-15
A-Pillar Sill Ay	A227265	MSI	52F-2000	2018-09-15
A-Pillar Low Ay	A224489	MSI	52F-2000	2018-06-20
A-Pillar Mid Ay	A185698	MSI	52F-2000	2018-07-22
B-Pillar Sill Ay	A227278	MSI	52F-2000	2018-09-15
B-Pillar Low Ay	A160201	MSI	52F-2000	2018-06-19
B-Pillar Mid Ay	A224528	MSI	52F-2000	2018-06-16
Driver Seat Track at H-Point Ay	10251	Endevco	757F-2k	2018-03-08
Engine Top Ax	A248855	MSI	52F-2000	2018-01-19
Engine Top Ay	A224504	MSI	52F-2000	2018-05-20
Firewall Ay	A248866	MSI	52F-2000	2018-01-19
Right Roof Ay	A248860	MSI	52F-2000	2018-01-19
Right Floor Sill Ay	A217304	MSI	52F-2000	2018-06-20
Rear Floorpan Ax	A224526	MSI	52F-2000	2018-06-19
Rear Floorpan Ay	A145940	MSI	52F-2000	2018-07-22

Table 3 - Rigid Pole Instrumentation

Sensor Location	Sensor S/N	Mfr	Model	Last Cal
Load Cell Pole Barrier #1 Force Y	131822A	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #2 Force Y	132304A	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #3 Force Y	19477	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #4 Force Y	19325	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #5 Force Y	131827A	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #6 Force Y	132302A	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #7 Force Y	19267	Interface	1220-FS	2108-05-02
Load Cell Pole Barrier #8 Force Y	19321	Interface	1220-FS	2108-05-02