

**REPORT NUMBER: SPNCAP-KAR-19-008
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST**

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

NHTSA No: O20195501

**PREPARED BY:
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DECEMBER 28, 2018

FINAL REPORT

**PREPARED FOR:
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Approval Date: December 28, 2018

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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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16. Abstract <p>A 32.20 km/h 75° rigid pole side NCAP impact test was conducted on the subject 2019 Subaru Forester 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 December 11, 2018.</p> <p>The impact velocity was 32.10 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 15.9°C. The target vehicle's maximum post-test static crush was 409 mm located at level 3. The test vehicle's occupant performance data is as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th rowspan="2" style="text-align: left;">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 style="background-color: #cccccc;"></td> <td style="text-align: center;">1000</td> <td style="background-color: #ffffcc; text-align: center;">120.5</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="background-color: #ffffcc; text-align: center;">40</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="background-color: #ffffcc; text-align: center;">2995</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="background-color: #ffffcc; text-align: center;">25</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="background-color: #ffffcc; text-align: center;">15</td> </tr> </tbody> </table> <p>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.</p>				Measurement Description	Driver ATD (SID-IIs)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	120.5	Resultant Lower Spine Acceleration	g	82	40	Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2995	Maximum Thoracic Rib Deflection	mm	38	25	Maximum Abdominal Rib Deflection	mm	45	15
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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 Forester 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 Forester 5-door MPV. The subject vehicle was towed into the rigid pole at an angle of 74.4° and a velocity of 32.10 km/h. The test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California on December 11, 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	120.5
Lower Spine (T12) Resultant Acceleration	g	82	40
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2995
Maximum Thoracic Rib Deflection	mm	38*	25
Maximum Abdominal Rib Deflection	mm	45*	15

*Proposed IARV

Supplemental restraint information is given below:

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

GENERAL COMMENTS

The 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. Due to roof deformation the Right Roof Y channel did not return to zero. The Right Sill Y channel failed at 117.5 ms.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501

Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

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 Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20195501
Model Year	2019
Make	Subaru
Model	Forester
Body Style	5-Door MPV
VIN	JF2SKACC3KH409372
Body Color	Horizon Blue Pearl
Odometer Reading (km / mi)	16 / 10
Engine Displacement (L)	2.5
Type / No. of Cylinders	4 Cylinder
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	CVT
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	Aug-18
Vehicle Type	MPV

GVWR (kg)	2223
GAWR Front (kg)	1165
GAWR Rear (kg)	1130

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

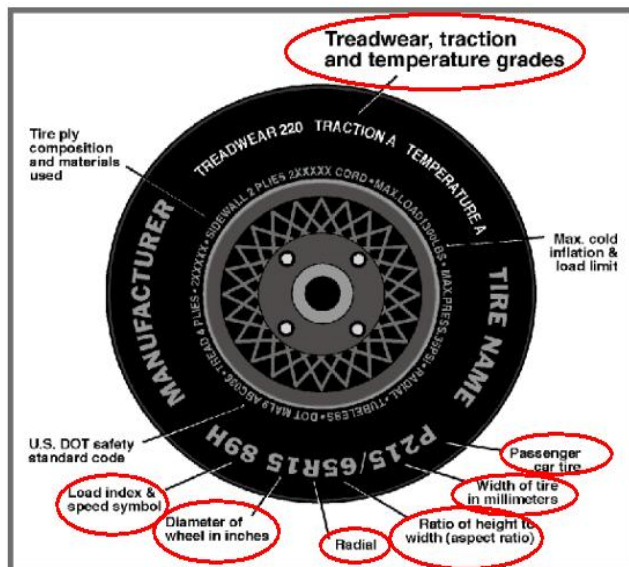
VEHICLE SEAT TYPE

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: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



Measured Parameter	Front	Front
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	220
Recommended Tire Size	P225/60R17	P225/60R17
Tire Size on Vehicle	P225/60R17	P225/60R17
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Ecopia H/L 422 Plus	Ecopia H/L 422 Plus
Treadware	600	600
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	99H	99H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	ELFC DMM 3118	ELFC DMM 3118
DOT Safety Code Right	ELFC DMM 3118	ELFC DMM 3118

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

TIRE PRESSURES

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

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	461.5	346.0		464.0	403.5		475.0	402.0	
Right	kg	450.5	323.5		447.0	377.5		449.0	371.0	
Ratio	%	57.7%	42.3%	100.0%	53.8%	46.2%	100.0%	54.4%	45.6%	100.0%
Total	kg	912.0	669.5	1581.5	911.0	781.0	1692.0	924.0	773.0	1697.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1581.0	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	1697.8	A+B+C

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

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

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	As Delivered	As Tested	Fully Loaded	Meets Requirement***
Driver Door Sill Angle (front-to-rear)*	°	-0.4	-0.1	-0.1	Yes
Front Passenger Sill Angle (front-to-rear)*	°	-0.4	-0.3	0.0	Yes
Front Bumper-Line Angle (left-to-right)**	°	-0.3	-0.4	-0.4	Yes
Rear Bumper-Line Angle (left-to-right)**	°	-0.4	-0.4	-0.5	Yes
Vehicle CG (Aft of Front Axle)	mm	1132	1234	1218	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	17	20	26	

*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 Forester 5-Door MPV NHTSA No. O20195501
Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Rear Trunk Trim	4.0
Spare Tire and Tools	7.0
Non-Struck Side Windows	12.0
Non-Struck Side Door Panels	10.0
Ballast / Equipment Added	75.5

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 Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

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	4.1	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	217	Max			
			Mid	209	214	217
			Min			
Front Passenger Seat	Fixed	205	Max			
			Mid	200	202	205
			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: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

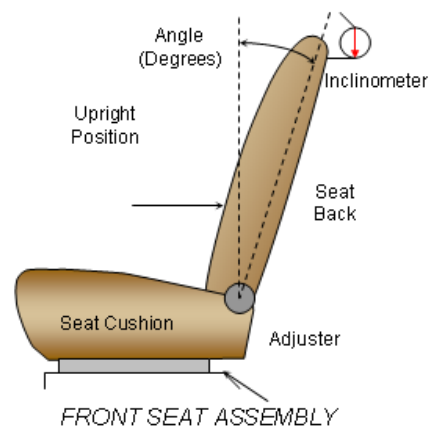
SEAT FORE/AFT POSITION

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	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 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	51.5	26	1.2	7
Front Passenger Seat	52.2	26	1.2	7
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: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501

Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

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, M2, ..., 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 Vertical, 5 Horizontal	Full Down, Full Forward

DATA SHEET NO. 2 ... (CONTINUED)

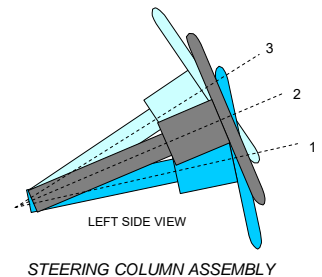
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

STEERING COLUMN ADJUSTMENT

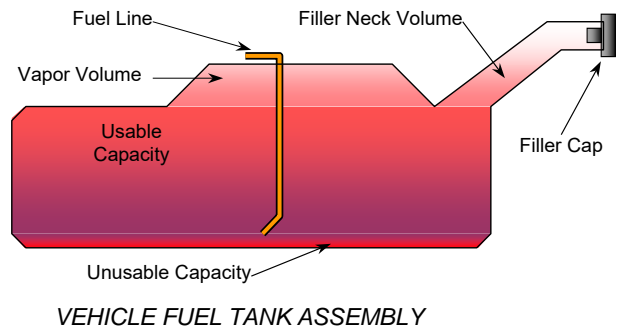
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of the geometric locus it describes when it moves through its full range of motion.

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	25.2	93
Geometric Center - Position 2	27.2	118
Uppermost - Position 3	28.9	143
Telescoping Steering Wheel Travel		50
Test Position	27.2	118



FUEL PUMP

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



FUEL TANK CAPACITY

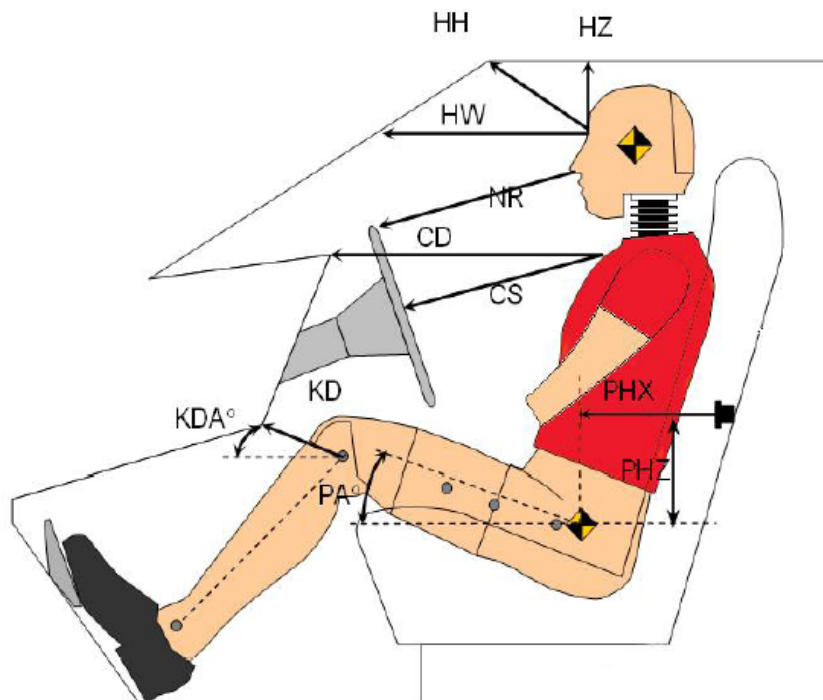
Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	62.83
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	62.83
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	58.44
Actual amount of Solvent Used in Test	58.44
1/3 of Usable Capacity	20.94

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

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

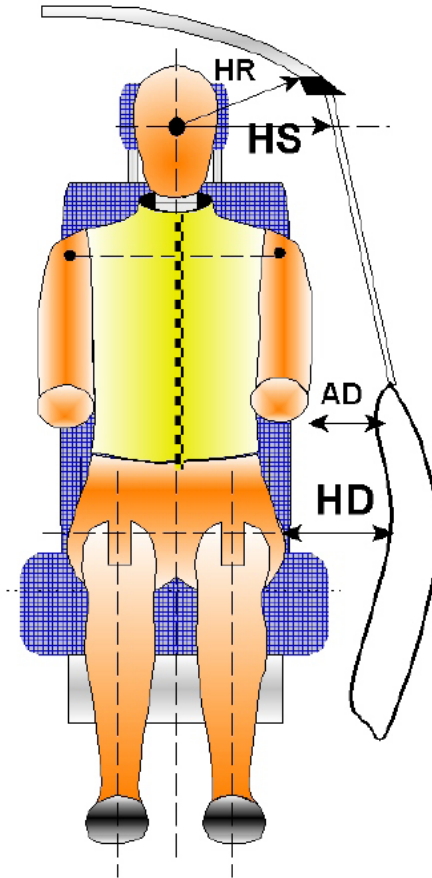


Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	295	
HW	Head to Windshield	645	
HZ	Head to Roof	238	
NR	Nose to Rim	262	
CD	Chest to Dash	419	
CS	Chest to Steering Wheel	176	
KD(L)/KDA(L)°	Left Knee to Dash	129	42.9
KD(R)/KDA(R)°	Right Knee to Dash	105	45.0
PAX°	Pelvic Tilt Angle (x-axis)		17.9
PAY°	Pelvic Tilt Angle (y-axis)		0.1
PHX	Hip Point to Striker (x-axis)	362	
PHZ	Hip Point to Striker (z-axis)	191	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

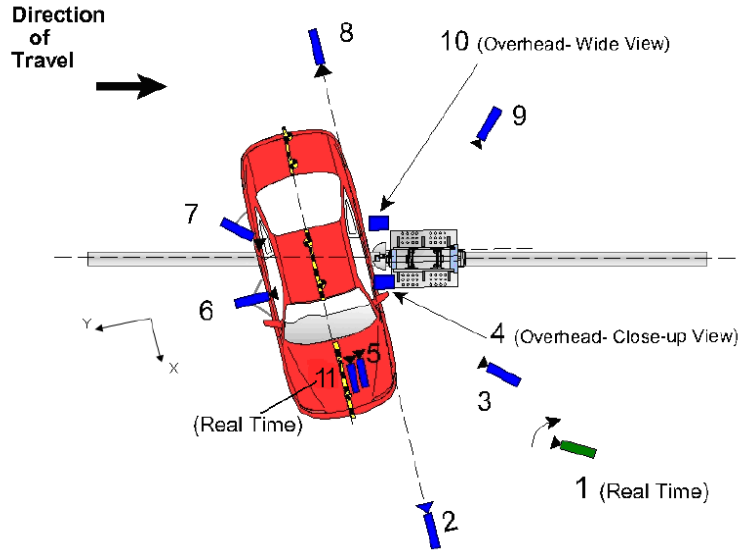


Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	281
HS	Head to Side Window	mm	378
AD	Arm to Door	mm	160
HD	Hip Point to Door	mm	183

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



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	1.23	0.51	-1.33	8.5	1000
6	On-Board - Dummy Side View	-0.18	1.88	-1.27	8.5	1000
7	On-Board - Dummy Rear Oblique View	-1.00	1.86	-1.34	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	1.22	0.54	-1.48		30

*All measurements accurate to ±6 mm

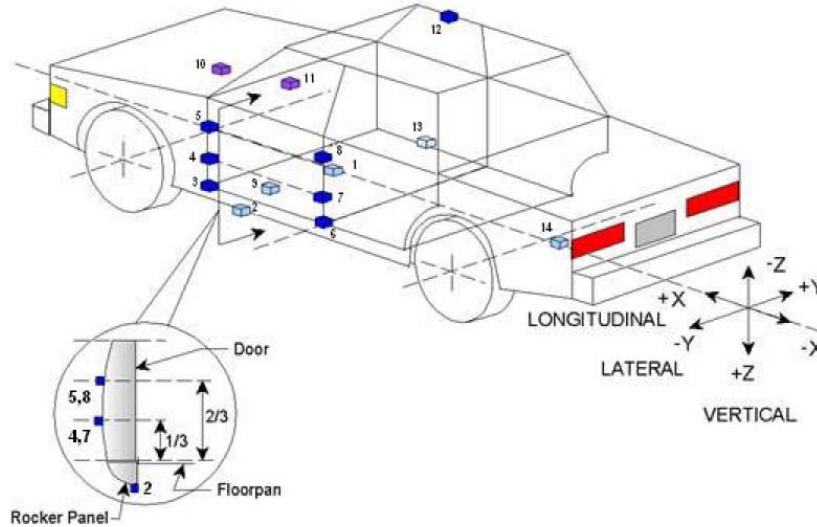
INSTRUMENTATION

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 Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

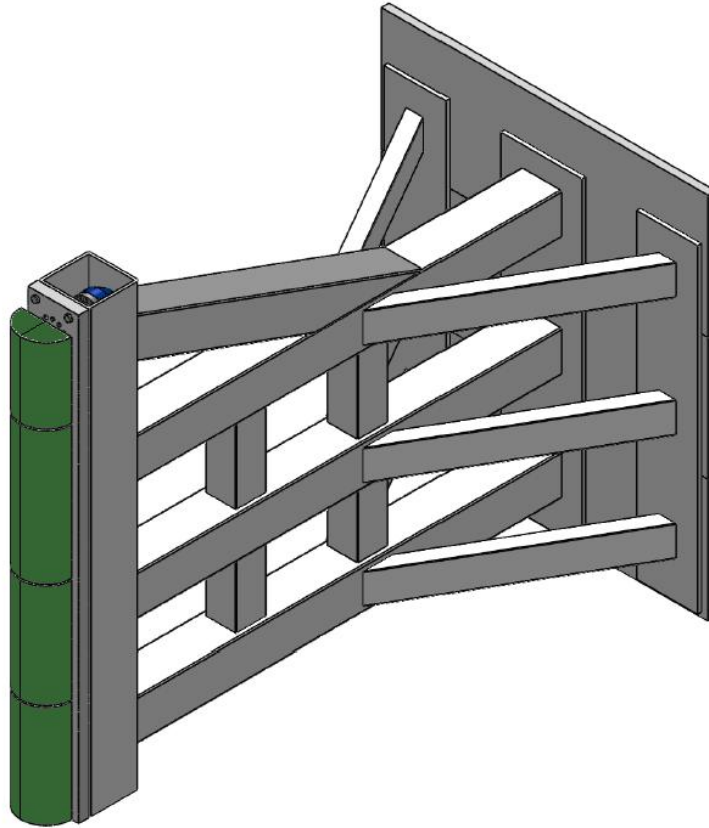


Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2100	0	-550
2	Left Floor Sill	2310	-770	-260
3	A-Pillar Sill	3150	-700	-520
4	A-Pillar Low	3190	-810	-600
5	A-Pillar Mid	3190	-810	-800
6	B-Pillar Sill	2125	-720	-520
7	B-Pillar Low	2060	-735	-660
8	B-Pillar Mid	2060	-735	-1020
9	Driver Seat Track	2420	-570	-480
10	Engine Top	4000	0	-680
11	Firewall	3430	450	-820
12	Right Roof	2350	500	-1660
13	Right Floor Sill	2720	640	-400
14	Rear Floorpan	1080	0	-690

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 Forester 5-Door MPV NHTSA No. O20195501
Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



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 Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

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

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

DATA SHEET NO. 8 ... (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

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	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

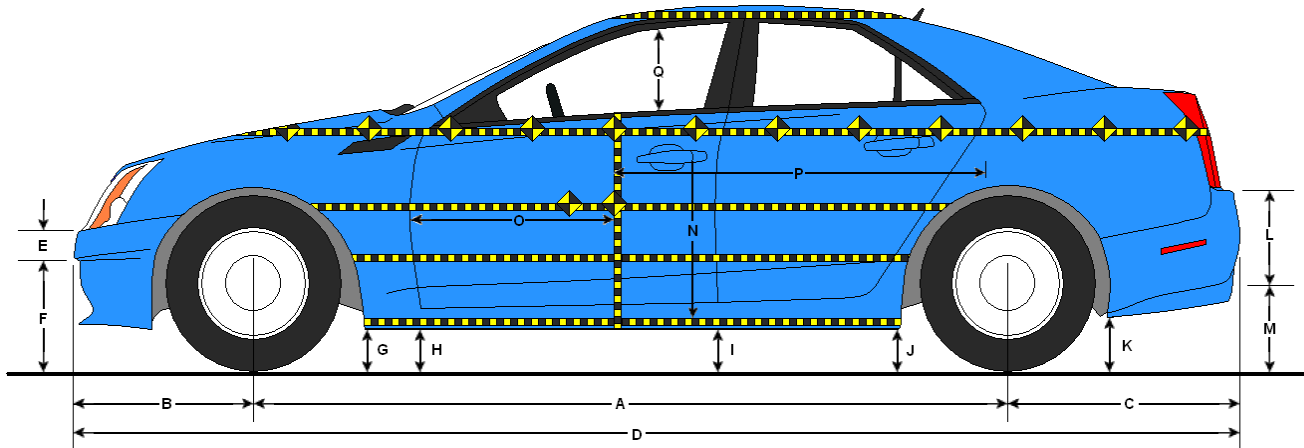
IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		1239
Actual Impact Point (Aft of Front Axle)	mm		1248
Horizontal Offset (+ forward / - rearward)	mm	± 38 of Intended Impact Point	-9
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	°	75 ± 3	74.4
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.10
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.09

DATA SHEET NO. 9

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



LEFT SIDE VIEW

All measurements in mm with tolerance of ± 3 mm

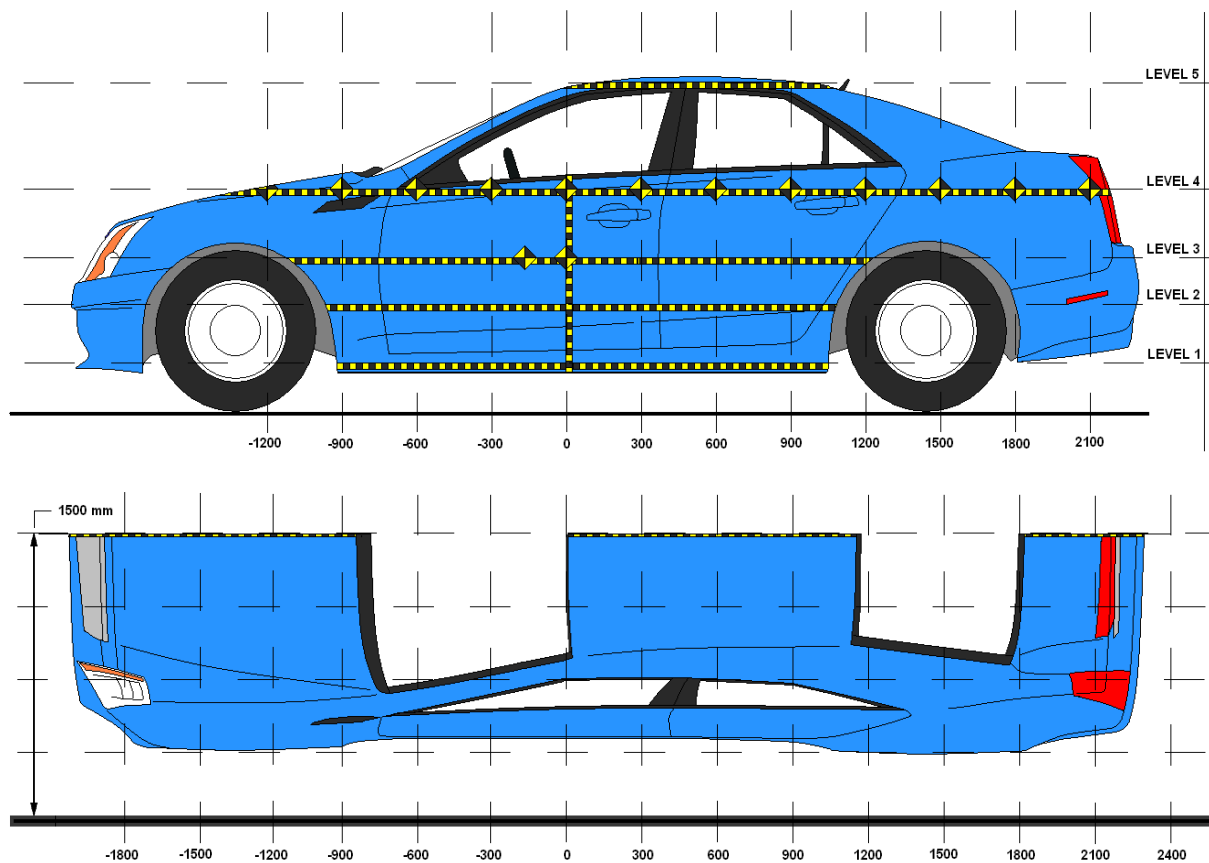
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2674	2580	-94
B	Front Axle to FSOV	960	992	32
C	Rear Axle to RSOV	991	1017	26
D	Total Length at Centerline	4623	4588	-35
E	Front Bumper Thickness	161	161	0
F	Front Bumper Bottom to Ground	485	508	23
G	Sill Height at Front Wheel Well	273	249	-24
H	Sill Height at Front Door Leading Edge	278	276	-2
I	Sill Height at B-Pillar	280	277	-3
J1	Sill Height at Rear Wheel Well	284	294	10
J2	Pinch Weld Height at Rear Wheel Well	254	271	17
K	Sill Height Aft of Rear Wheel Well	323	324	1
L	Rear Bumper Thickness	198	199	1
M	Rear Bumper Bottom to Ground	462	458	-4
N	Sill Height to Bottom of Front Window Sill	756	760	4
O	Front Door Leading Edge to Impact CL	628	531	-97
P	Rear Door Trailing Edge to Impact CL	1495	1415	-80
Q	Front Window Opening	487	493	6
R	Right Side Length	3223	3227	4
S	Left Side Length	3223	3134	-89
T	Vehicle Width at B-Pillar	1815	1710	-105

DATA SHEET NO. 10

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



NOTE: All measurements in mm with tolerance of ± 3 mm

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	299	397	0
2	Occupant H-Point	681	407	-150
3	Mid-Door	708	409	-150
4	Window Sill	1018	361	150
5	Window Top	1603	180	150

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

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				647					686					39	
-750		599	599	652			665	664	704			66	65	52	
-600	620	604	604	649		686	753	750	697		66	149	146	48	
-450	617	602	601	639		773	840	840	750		156	238	239	111	
-300	609	598	597	645		837	926	925	826		228	328	328	181	
-150	605	596	595	644		922	1003	1004	910		317	407	409	266	
0	601	595	594	641	870	998	983	986	998	1046	397	388	392	357	176
150	598	594	592	637	873	956	862	865	998	1053	358	268	273	361	180
300	595	593	592	631	878	861	756	756	891	1029	266	163	164	260	151
450	593	595	594	629	881	779	722	721	799	1009	186	127	127	170	128
600	594	597	596	623	884	709	701	701	753	990	115	104	105	130	106
750	595	598	597	619	886	688	677	678	729	973	93	79	81	110	87
900	601	595	595	614	889	672	650	651	703	962	71	55	56	89	73
1050	607	595	591	617	892	660	631	626	685	952	53	36	35	68	60
1200				620	896				668	943				48	47
1350				607	898				634	937				27	39
1500				621	900				654	932				33	32
1650				619	901				645	927				26	26
1800				630	903				653	924				23	21
1950				646					663					17	
2100				657					669					12	
2250															
2400															
2550															
2700															
2850															

DATA SHEET NO. 10 ... (CONTINUED)

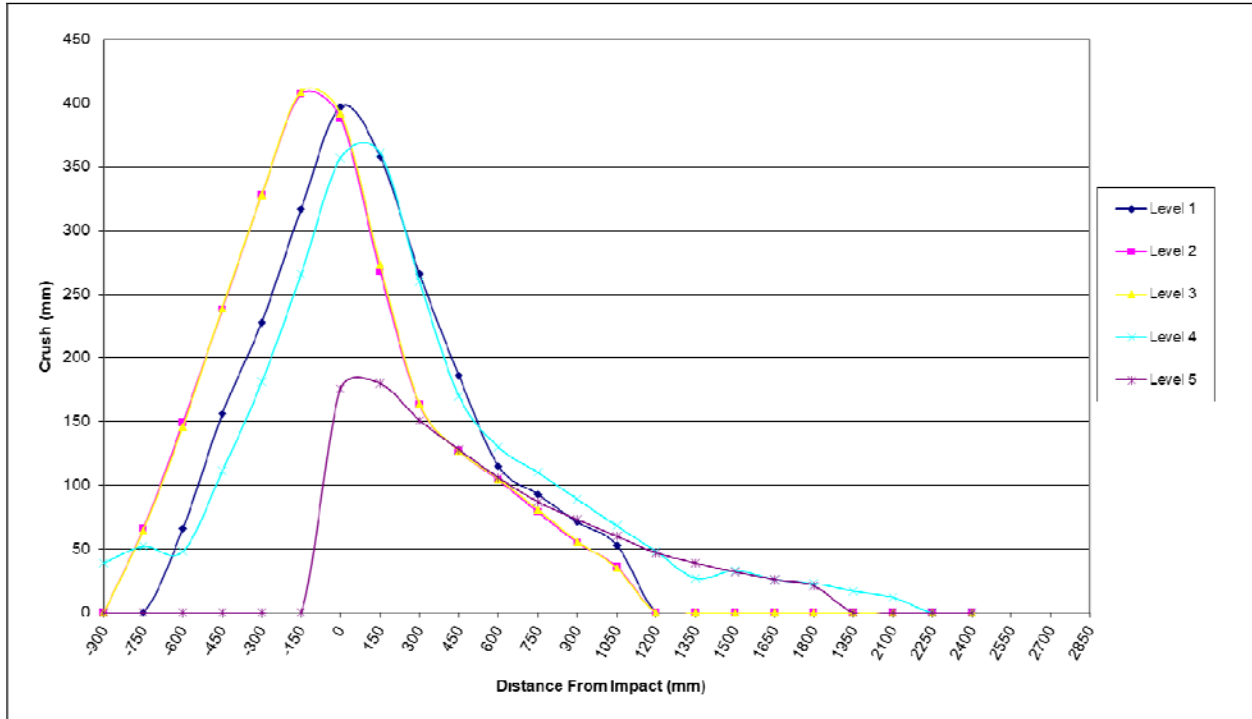
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Subaru Forester 5-Door MPV

NHTSA No. O20195501

Test Program: NCAP Side Pole Impact Test

Test Date: 12/11/18

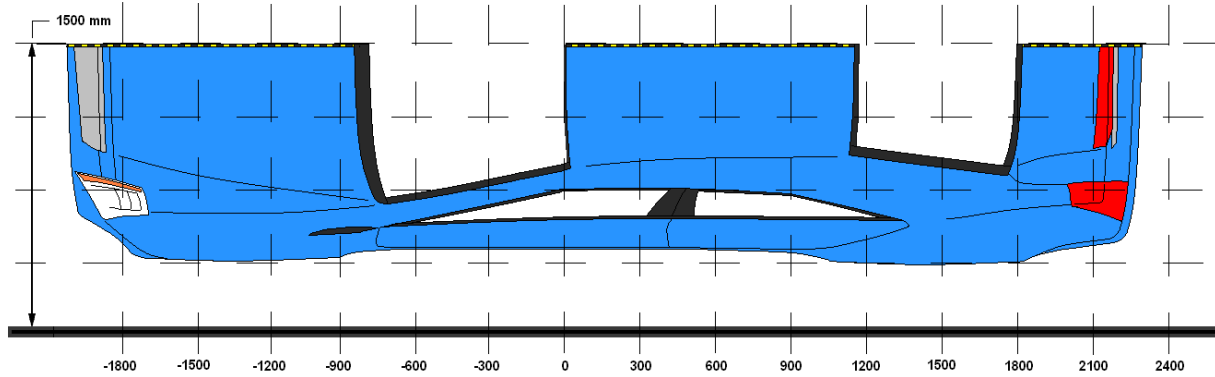


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501

Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2100	4	657	669	12
2	1500	4	621	654	33
3	900	4	614	703	89
4	300	1	595	861	266
5	-300	2	598	926	328
6	-900	4	647	686	39

DATA SHEET NO. 12

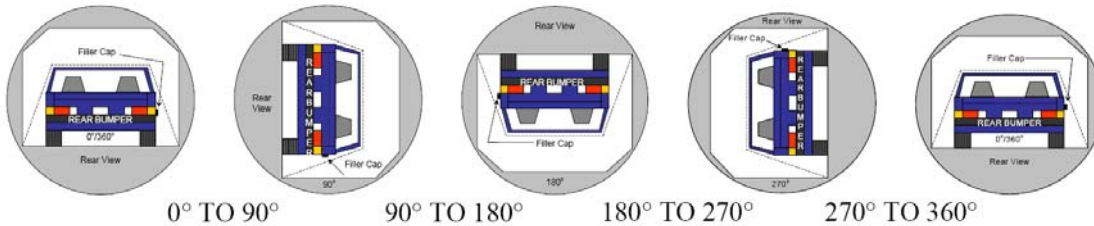
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501

Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18

Temperature at Time of Impact: 15.9° C Test Time: 12:06 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°	79	300	379
90° To 180°	82	300	382
180° To 270°	79	300	379
270° To 360°	82	300	382

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

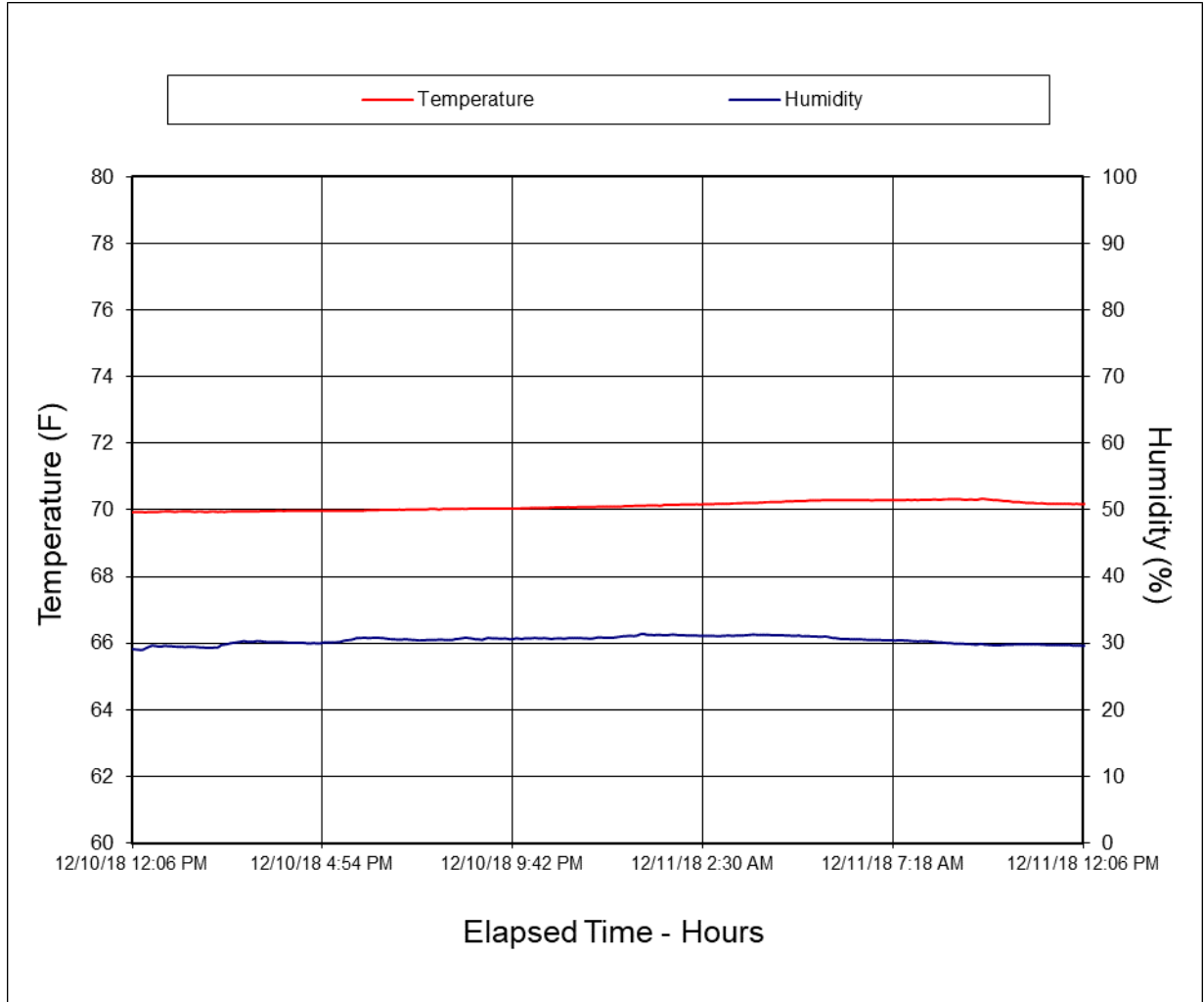
Test Phase	Spillage Location
0° To 90°	No Spillage Occurred
90° To 180°	No Spillage Occurred
180° To 270°	No Spillage Occurred
270° To 360°	No Spillage Occurred

DATA SHEET NO. 13

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2019 Subaru Forester 5-Door MPV NHTSA No. O20195501

Test Program: NCAP Side Pole Impact Test Test Date: 12/11/18



**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

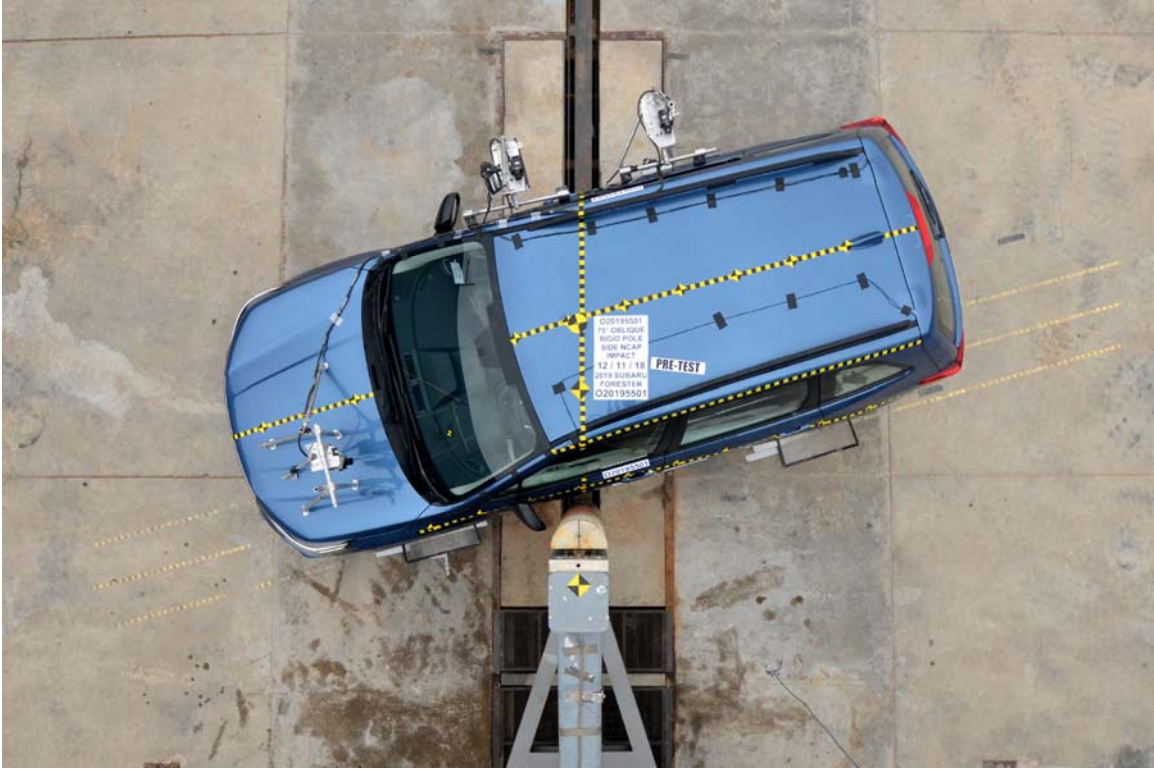


FIGURE 15. Pre-Test Overhead View of Test Area

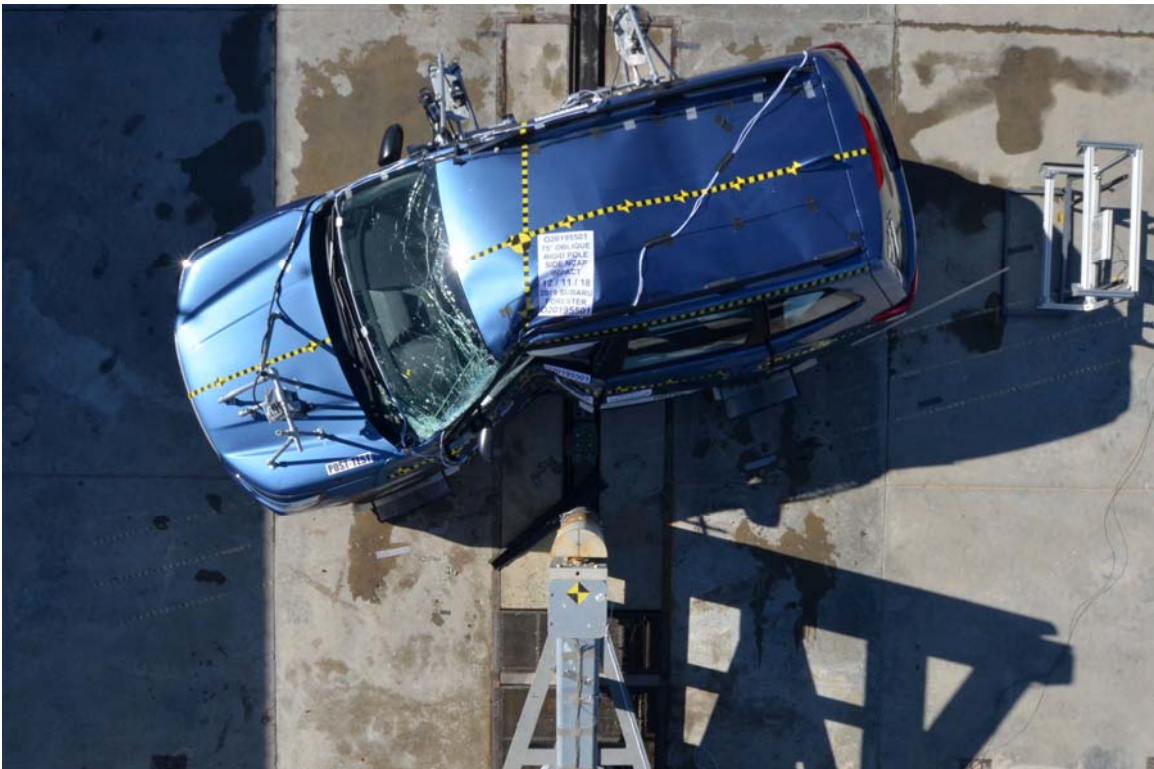


FIGURE 16. Post-Test Overhead View of Test Area



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



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

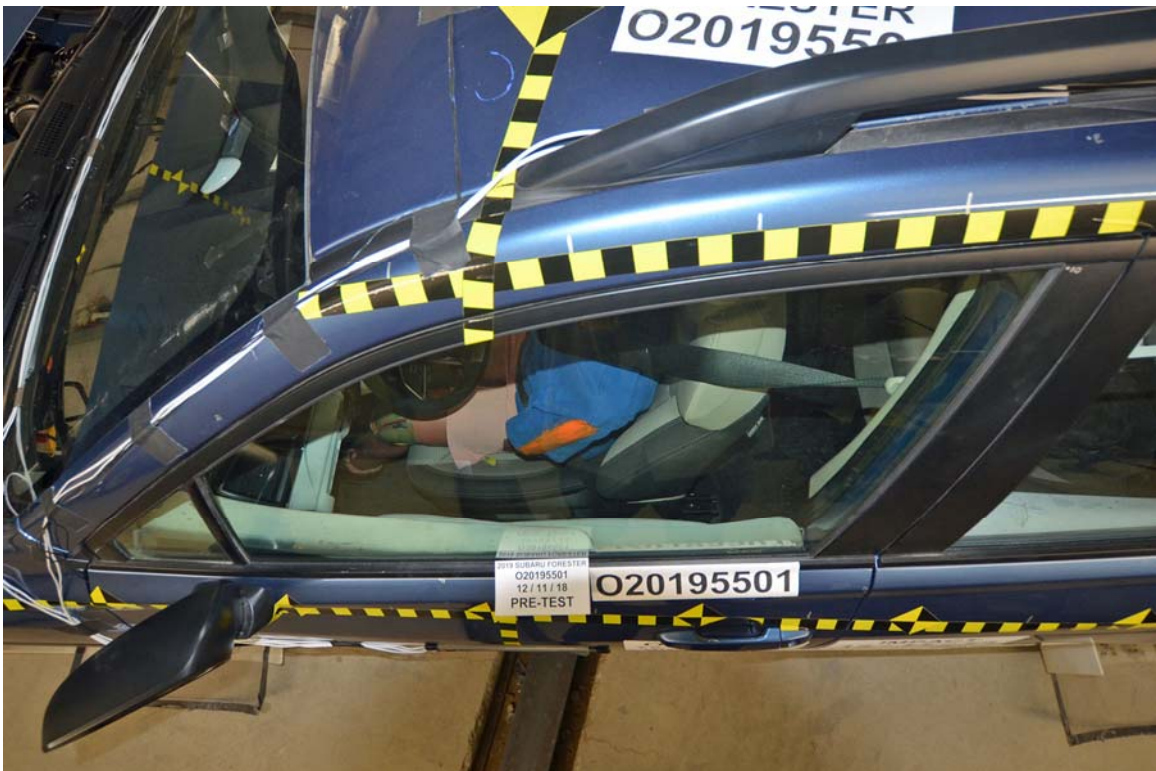


FIGURE 40. Pre-Test Dummy and Door Clearance View



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

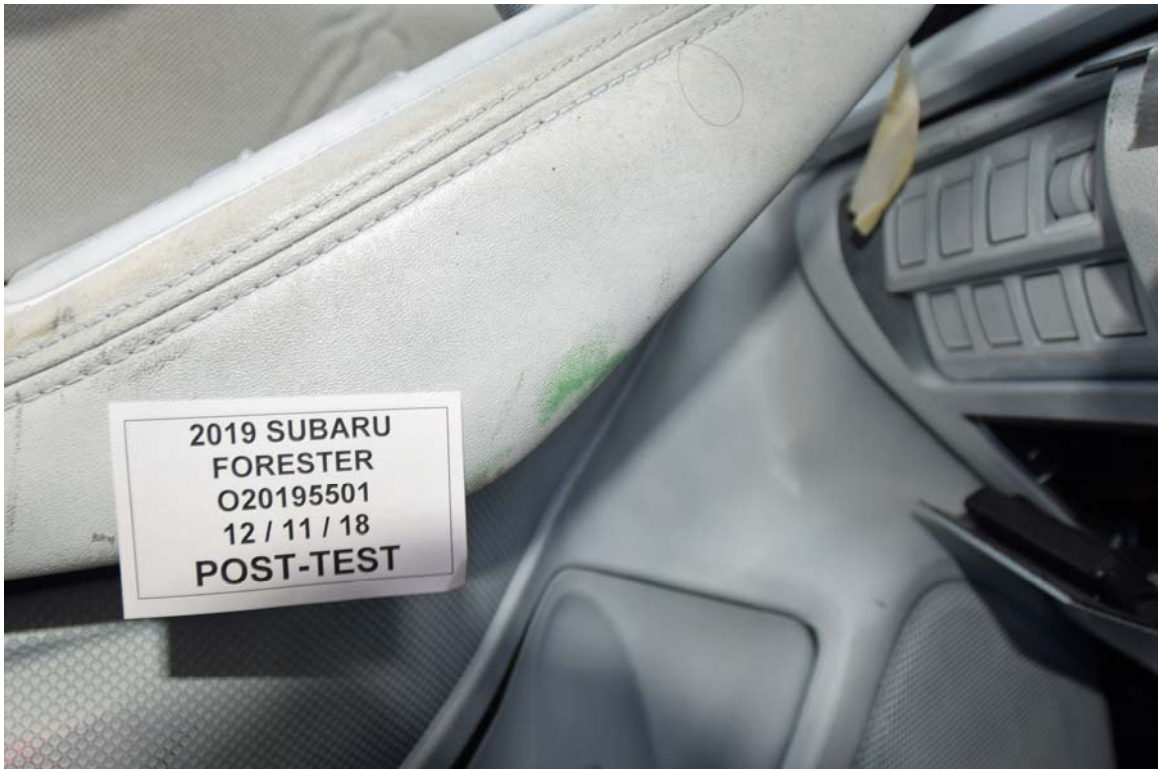


FIGURE 52. Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View



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

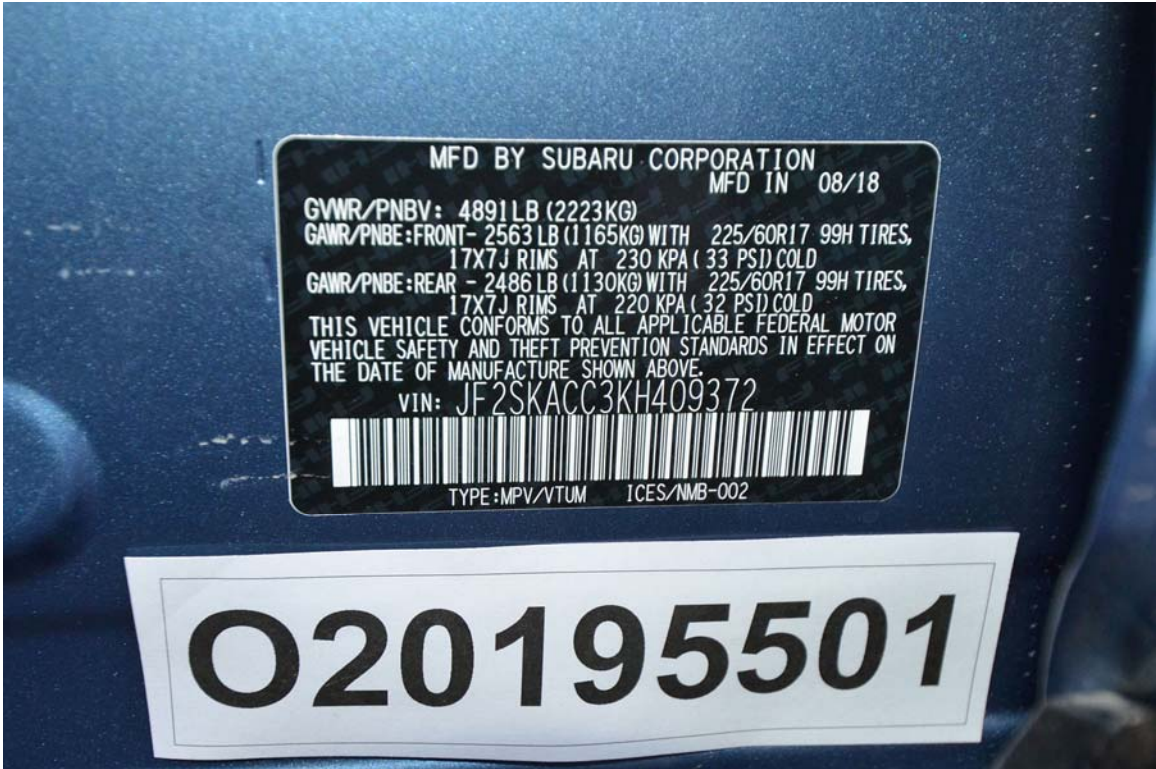


FIGURE 55. Close-Up View of Vehicle's Certification Label



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

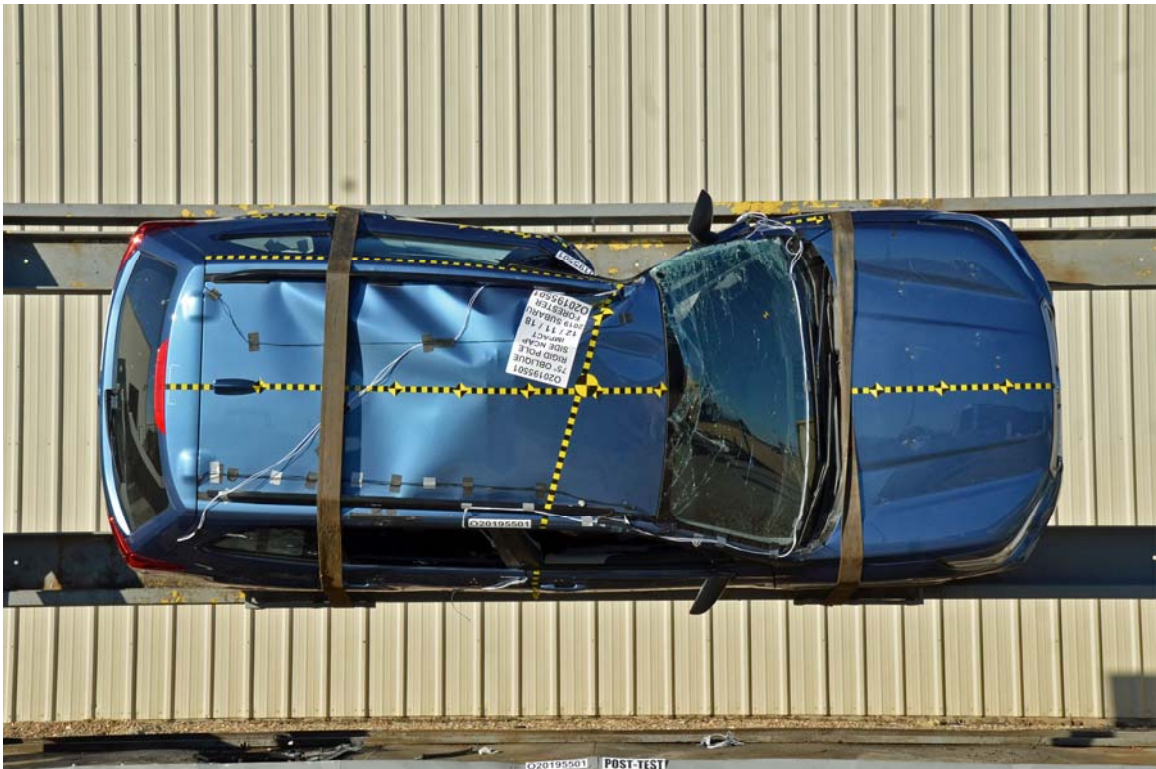


FIGURE 64. FMVSS No. 301 Static Rollover 90 Degrees



FIGURE 67. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 68. Impact Event

FORESTER VIN: JF2SKACC3KH409372
 Model/Code: 2015 SUBARU FORESTER/FN3
 Port/Assembly: VANCOUVER, WA TRUCK: 601-807081
 SHIP-TO: 401289
 KENOSHA SUBARU
 7000 120TH AVE
 MINNETONKA, MN 55342
 SOLD TO: 401289
 KENOSHA SUBARU
 7000 120TH AVE
 MINNETONKA, MN 55342

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 Not Rated, Passenger Not Rated
 Side Crash: Front seat Not Rated, 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

Protect Your Investment
 Subaru Added Security®™
 The Only Extended Service Agreement Backed By Subaru
 • Protection designed to fit 30-year driving needs, up to 10 years/100,000 miles of coverage
 • Maintenance plans also available
 • We use Genuine Subaru replacement parts - only the best
 • We use technicians trained by Subaru - those who know your vehicle best
 • Towing, rental and trip interruption benefits available
 • Transferable to the next owner
 Ask your sales representative for more details
 Accept nothing less than Added Security®

STANDARD EQUIPMENT
SAFETY
 Symmetrical All-Wheel Drive (AWD)
 Vehicle Dynamics Control (VDC)
 EyeSight Driver-Assist System
 4-Wheel Anti-Lock (ABS) Disc Brakes w/ Brake Assist
 Electronic Brake-Force Distribution
 Brake Over-ride System
 Subaru Advanced Frontal Airbag System
 Drivers' Side "Knee Airbag"
 Front Seat Side (Pelvis/Torso) Airbags
 Side-Curtain Airbags w/ Rollover Sensor
 Anti-Theft Alarm & Immobilizer System
 Daytime Running Lights
 Whiplash Protection Front Seats
 Safety Pedal System
PERFORMANCE AND EXTERIOR
 2.5L Horizontally-Opposed DOHC Engine w/ Auto Start-Stop
 Lineartronic Continuously Variable Transmission (CVT)
 17" Steel Wheels w/ Wheel Covers
 LED Headlights
 Variable Intermittent Windshield Wipers
 Electric Power-Assisted Steering
 Roof Rack Mounting Brackets
 Folding Exterior Mirrors
COMFORT, CONVENIENCE & INTERIOR
 Automatic Climate Control w/ Air Filtration System
 6.5" Infotainment System w/ CD, HD Radio & Dual USB Ports
 STARLINK Smartphone Connectivity/Apps
 SiriusXM Radio, Sports and Weather 4-Months Free
 Bluetooth® Hands-Free Phone Connectivity
 Tilt/Telescopic Steering Wheel w/ Bluetooth & Audio Switches
 Adaptive Cruise Control
 Power Door Locks and Dual Power Mirrors
 Remote Keyless Entry System
 Power Windows with Driver's Auto-Up/Down
 66/40 Split Fold-Down Rear Seatback
 Multi-Function Display
 Rear Vision Camera
 12V Outlet in Dash, Console & Cargo Area
 Electronic Parking Brake w/ Auto Vehicle Hold (AVH)
 S-Drive
 Automatic On/Off Headlights
 Height Adjustable Driver's Seat
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 into Kit/Warranty For Details

OPTIONAL EQUIPMENT AND OTHER ITEMS
 Manufacturer's Suggested Retail Price: \$24,295.00
 Exterior Color: Horizon Blue Pearl: INCLD
 Full Tank of Gas: INCLD
 Option Package: 02 ALLOY WHEEL PACKAGE SUGGESTED: \$1,100.00
 VALUE
 17" Alloy Wheels: \$1,100.00
 Roof Rails - Black Finish: \$500.00
 ALLOY WHEEL VALUE PACKAGE DISCOUNT: -\$500.00
 ALLOY WHEEL VALUE PACKAGE PRICE: \$600.00
 All Weather Floor Mats: \$132.00
 Rear Bumper Cover: \$118.00
 Cargo Tray: \$81.00

EPA DOT Fuel Economy and Environment
 Fuel Economy: 29 MPG (combined city/hwy), 26 city, 33 highway
 3.4 gallons per 100 miles
 You Save \$500 in fuel costs over 5 years compared to the average new vehicle.
 Annual fuel cost: \$1,300
 Smog Rating: 6
 Annual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$2,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.55 per gallon. MPG is miles per gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.
 fueleconomy.gov
 Calculate personalized estimates and compare vehicles.

PARTS CONTENT INFORMATION
 FOR THIS VEHICLE: FINAL ASSEMBLY POINT: OTA, GUNMA, JAPAN
 U.S./CANADIAN PARTS CONTENT: 0%
 MAJOR SOURCES OF FOREIGN PARTS: COUNTRY OF ORIGIN: ENGINE: JAPAN
 TRANSMISSION: JAPAN
 CONTENT: JAPAN: 85%
 Note: Parts content does not include final assembly, distribution, or other non-parts costs.

Destination and Delivery \$975.00
Total Suggested Retail Price \$26,201.00

FIGURE 69. Monroney Label

Head restraints 43

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
 3) Release button
To release:
 • Lowermost to the 1st step
 Pull the head restraint up to the 1st step.
To raise:
 • 1st step to the 3rd step
 Pull the head restraint up while pressing the release button on the top of the seatback.
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.

1-3. Head restraints
WARNING
 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 only. Do not attempt to install the front seat head restraints into the rear seats, or the rear seat head restraints into the front seats.
NOTE
 Pull the strap and adjust the seatback to the desired position. Then release the strap and make sure the seatback is securely locked into place.

44 Head restraints
To lower:
 Push the head restraint down while pressing the release button on the top of the seatback.
To remove:
 Use a key or other hard, pointed object to press the release button, then pull out the head restraint.
To install:
 Push the head restraint into the holes on the top of the seatback until it locks.
perform the installation and removal tasks.
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 sound when the head restraint is locked.
To return:
 Tilt the head restraint as far forward as it can go. The head restraint will automatically return to the fully upright position.
Rear seats
 Head restraints are installed in all second-row seats and can be adjusted as described below.
Window side seating position
 1) Head restraint
 2) Release button
To remove:
 Press the release button, and pull out the head restraint.
To install:
 Push the head restraint into the holes on the top of the seatback until it locks. Press and hold the release button to lower the head restraint.

Head restraints 45
CAUTION
 The head restraint is not intended to be used in the retracted position. Before sitting in the seat, raise the head restraint to the extended position.
Center seating position
 1) Incorrect (retracted position)
 2) Correct (extended position)
To raise:
 Pull the head restraint up.
To lower:
 Press the release button then push the head restraint down.
To remove:
 Press the release button, and pull out the head restraint.
To install:
 Push the head restraint into the holes on the top of the seatback until it locks. Press and hold the release button to lower the head restraint.
 When the rear center seating position is occupied, raise the head restraint to the extended position. When it is not occupied, lower it to improve rearward visibility.

FIGURE 70. Head Restraint Use and Adjustment

Photograph Not Applicable

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

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)

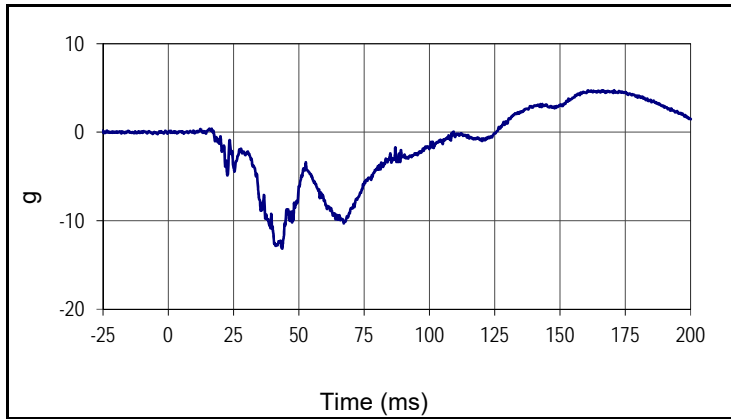
Left B-Pillar Sill Acceleration
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration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

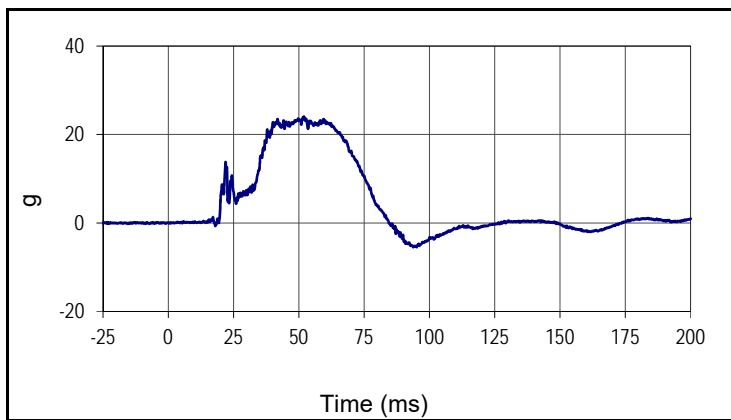
Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)

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

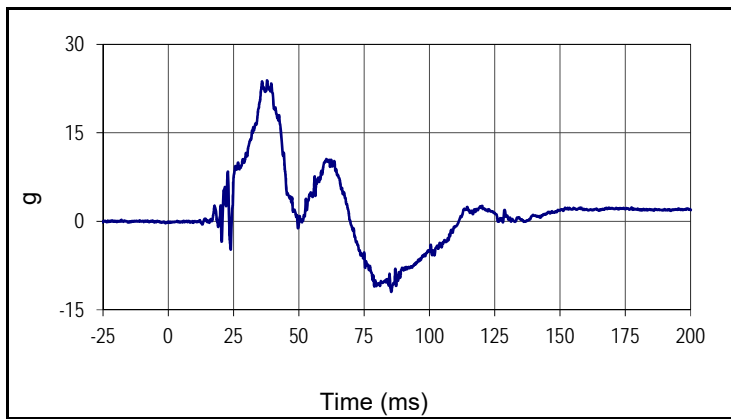
NHTSA No.: O20195501
 Test Date: 12/11/18



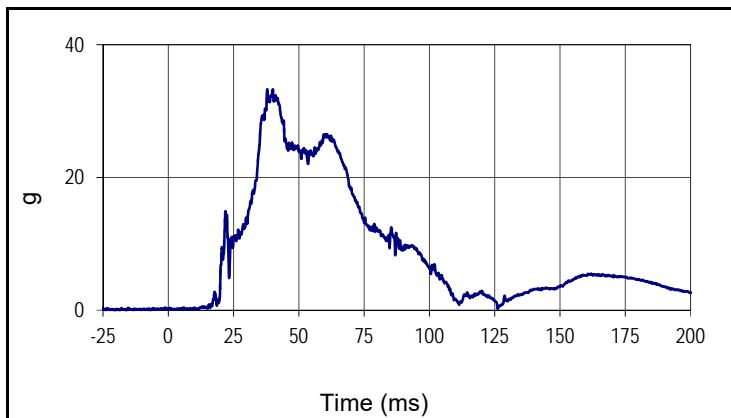
Curve Description			
Driver Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
4.7	170.7	-13.2	43.6



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
24.0	51.9	-5.4	93.8



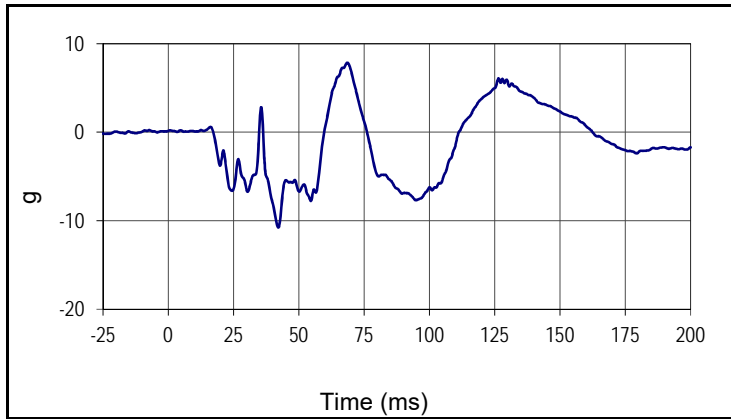
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
23.9	37.8	-12.0	85.4



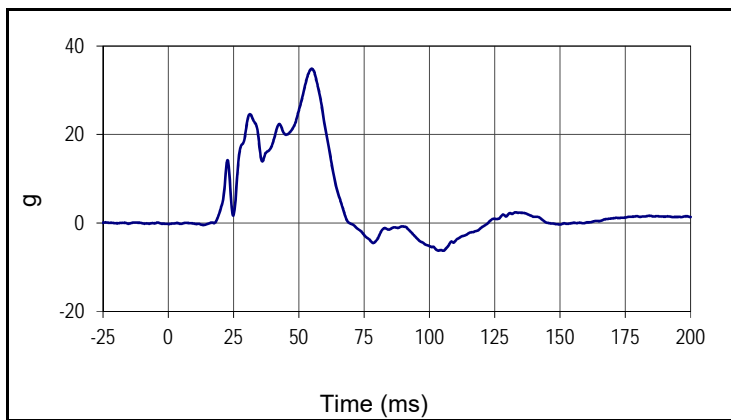
Curve Description			
Driver Head Acceleration Primary Resultant			
Plot No.		SAE Class	Units
004		1000	g
Max	Time	Min	Time
33.3	40.0	0.1	1.7

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

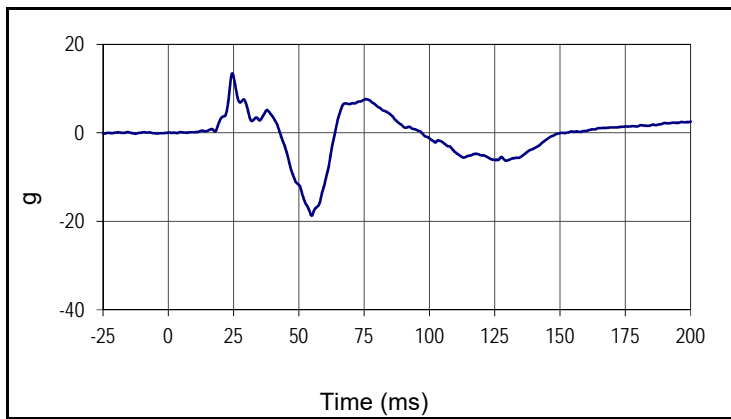
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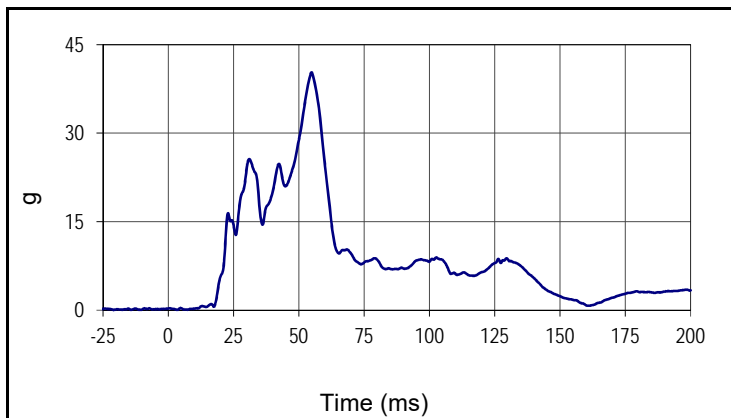
Curve Description			
Driver Lower Spine T12 Acceleration X			
Plot No.		SAE Class	Units
005		180	g
Max	Time	Min	Time
7.9	68.5	-10.8	42.1



Curve Description			
Driver Lower Spine T12 Acceleration Y			
Plot No.		SAE Class	Units
006		180	g
Max	Time	Min	Time
34.9	54.9	-6.3	105.3



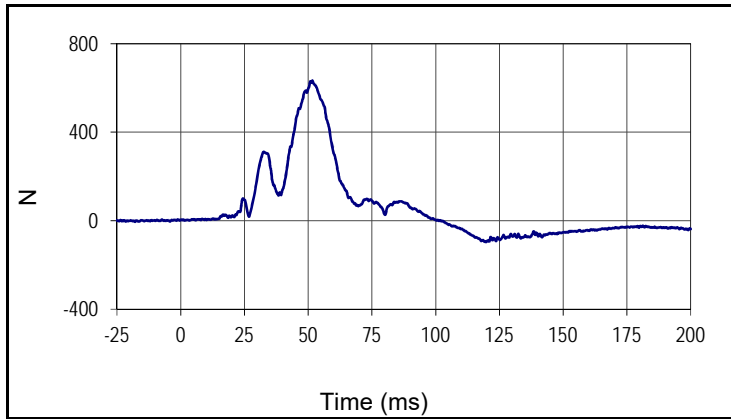
Curve Description			
Driver Lower Spine T12 Acceleration Z			
Plot No.		SAE Class	Units
007		180	g
Max	Time	Min	Time
13.4	24.5	-18.7	54.9



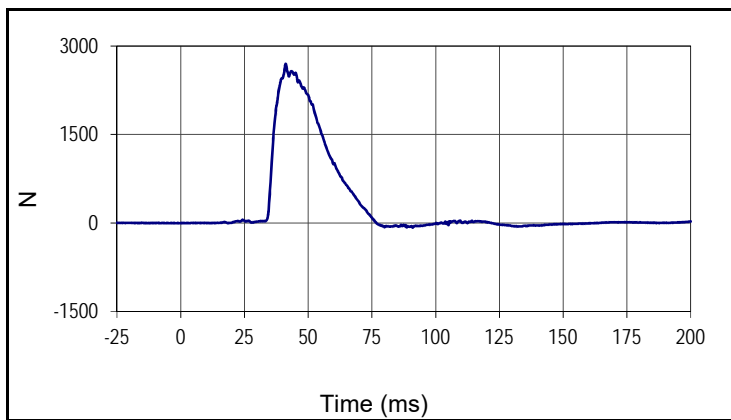
Curve Description			
Driver Lower Spine T12 Acceleration Resultant			
Plot No.		SAE Class	Units
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Max	Time	Min	Time
40.3	54.8	0.1	3.5

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

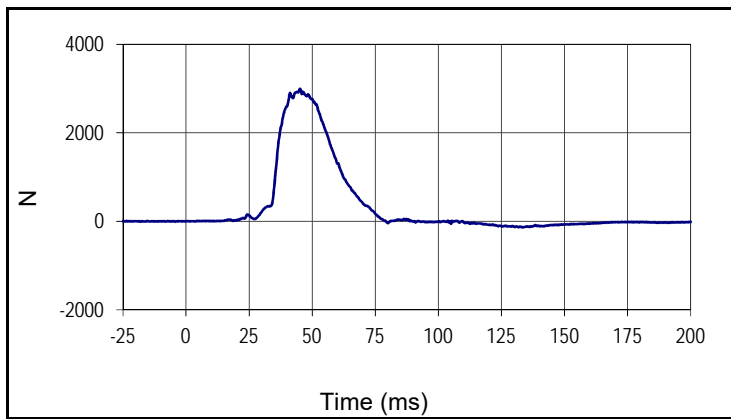
NHTSA No.: O20195501
 Test Date: 12/11/18



Curve Description			
Driver Iliac Wing Force on Impact Side Y			
Plot No.		SAE Class	Units
009		600	N
Max	Time	Min	Time
633.5	51.6	-96.8	119.7



Curve Description			
Driver Acetabulum Force on Impact Side Y			
Plot No.		SAE Class	Units
010		600	N
Max	Time	Min	Time
2698.2	41.2	-77.9	91.0



Curve Description			
Driver Total Pelvic Force on Impact Side Y			
Plot No.		SAE Class	Units
011		600	N
Max	Time	Min	Time
2994.6	45.1	-137.5	133.4

APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
PRE-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
LEFT SIDE CONFIGURATION




**SID-IIs Small Side Impact ATD
 External Measurements**

ATD Serial No.: 299

Test Date: 2018-12-03

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	22	Pass
A - Sitting Height	mm	772	788	779	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	144	Pass
E - Shoulder Pivot From Backline	mm	97	107	103	Pass
F - Thigh Clearance	mm	119	135	123	Pass
G - Head Breadth	mm	140	148	147	Pass
H - Head Back From Backline	mm	40	46	44	Pass
I - Head Depth	mm	178	188	181	Pass
J - Head Circumference	mm	541	551	548	Pass
K - Buttock To Knee Length	mm	514	540	528	Pass
L - Popliteal Height	mm	343	369	354	Pass
K - Knee Pivot To Floor Height	mm	392	409	403	Pass
N - Buttock Popliteal Length	mm	416	442	430	Pass
O - Chest Depth W/O Jacket	mm	195	211	207	Pass
P - Foot Length	mm	216	232	223	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	320	Pass
R - Arm Length	mm	249	259	256	Pass
S - Knee Joint To Seatback	mm	477	493	484	Pass
V - Shoulder Width	mm	341	357	347	Pass
W - Foot Width	mm	78	94	83	Pass
Y - Chest Circumference W/Jacket	mm	851	881	855	Pass
Z - Waist Circumference	mm	761	791	776	Pass
Overall Test Results					Pass

Technician: 
 J. Hernandez

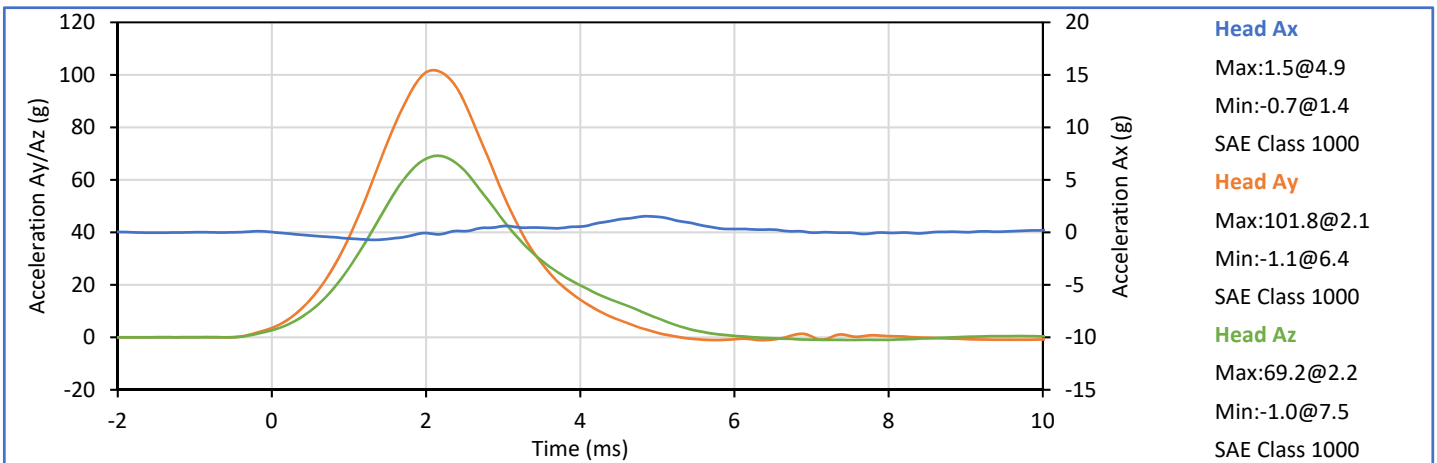
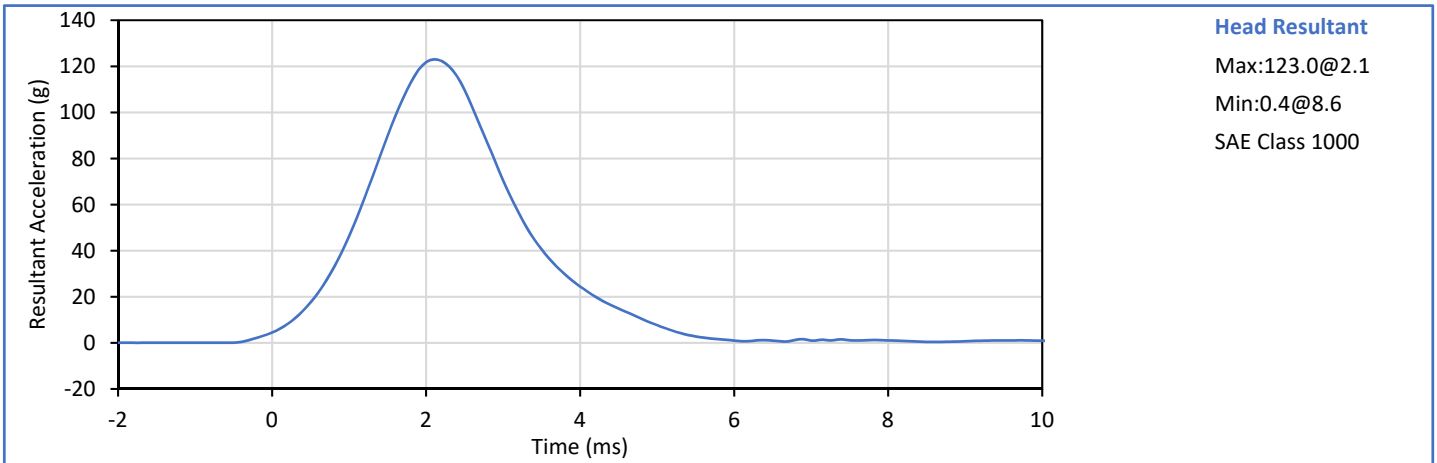
Approved By: 
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Humidity	%	10	70	22	Pass
Peak Resultant Acceleration	g	115.0	137.0	123.0	Pass
Peak Head Ax	g	-15.0	15.0	-0.9	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

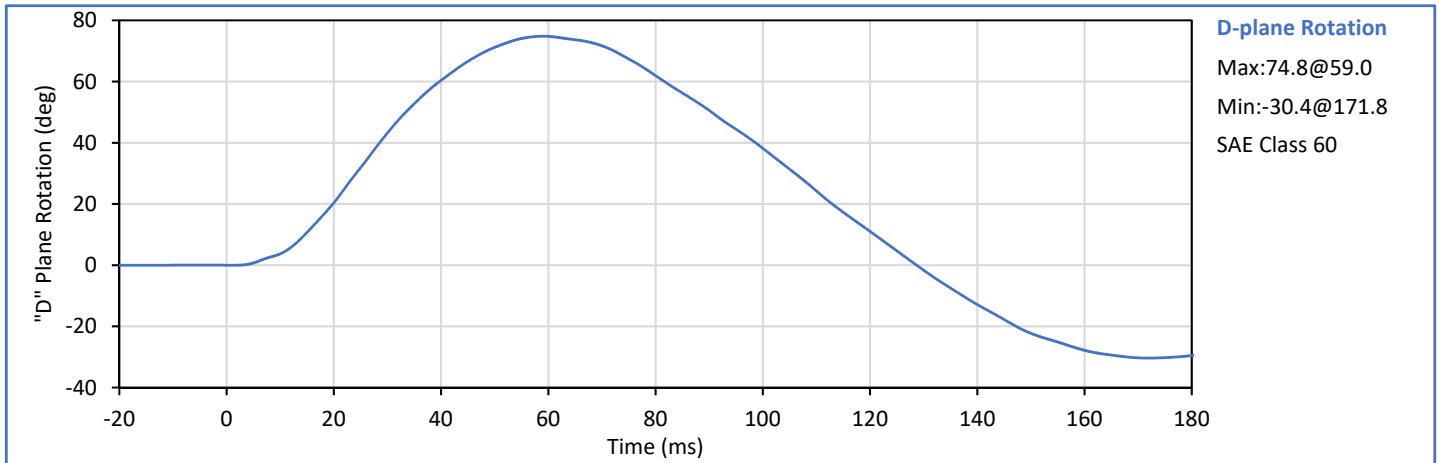
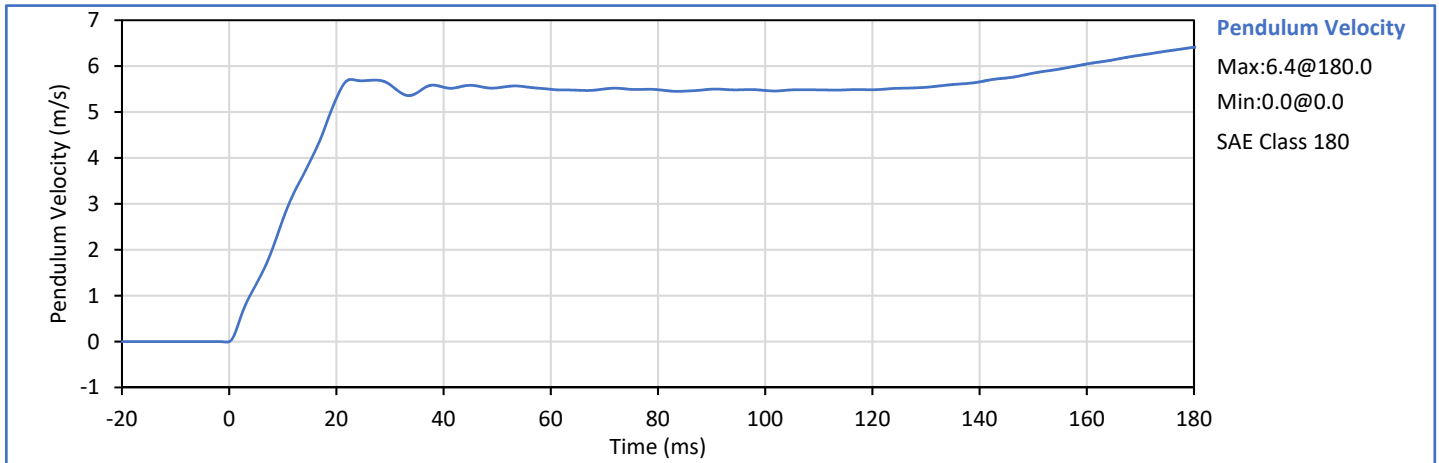
Approved By:
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-03

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	5.58	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.65	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.90	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	5.30	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.68	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.70	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	74.8	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	59.0	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-43.7	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	110.4	Pass
Overall Test Results					Pass



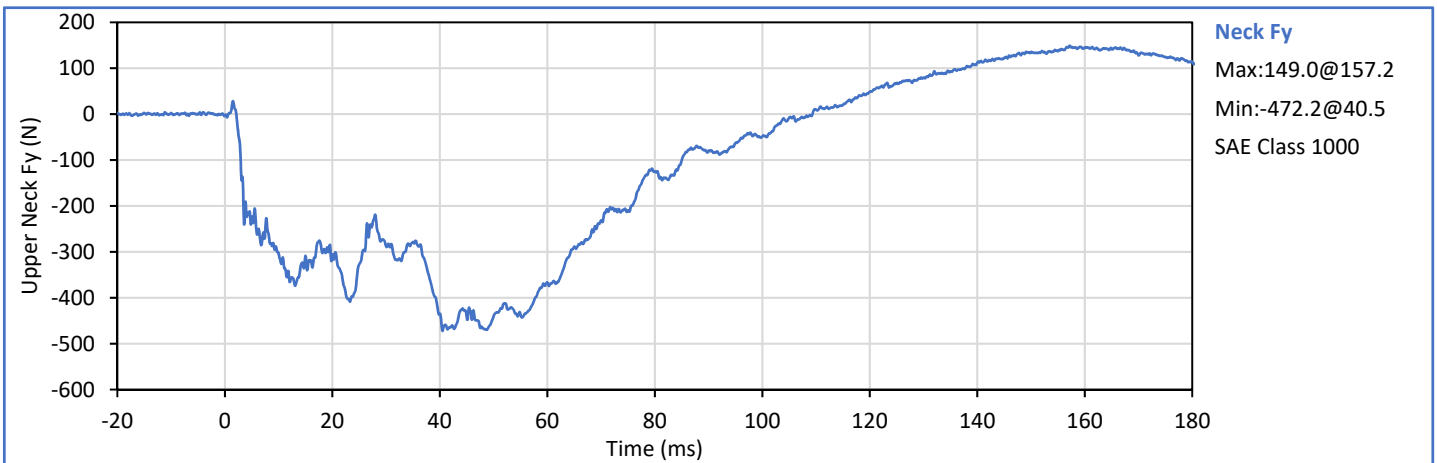
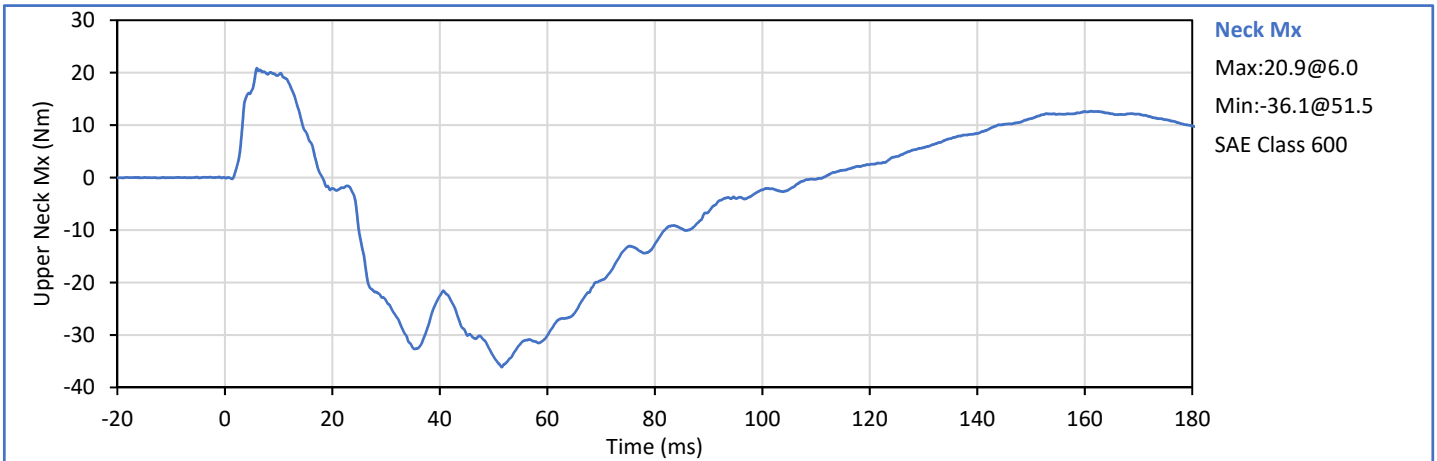
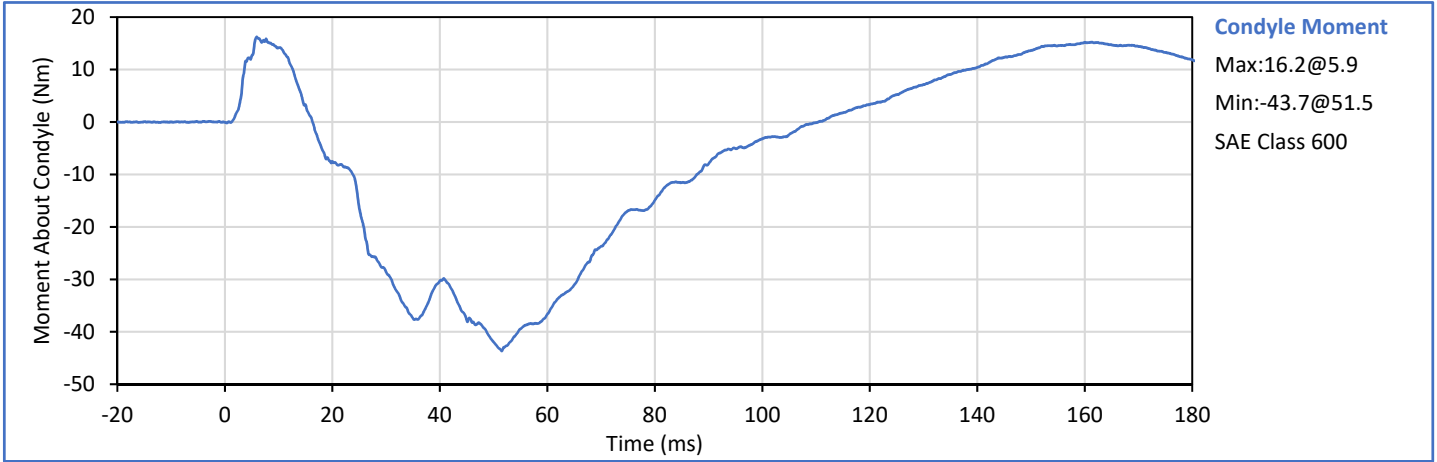
Technician: *J. Hernandez*
 J. Hernandez

Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-03

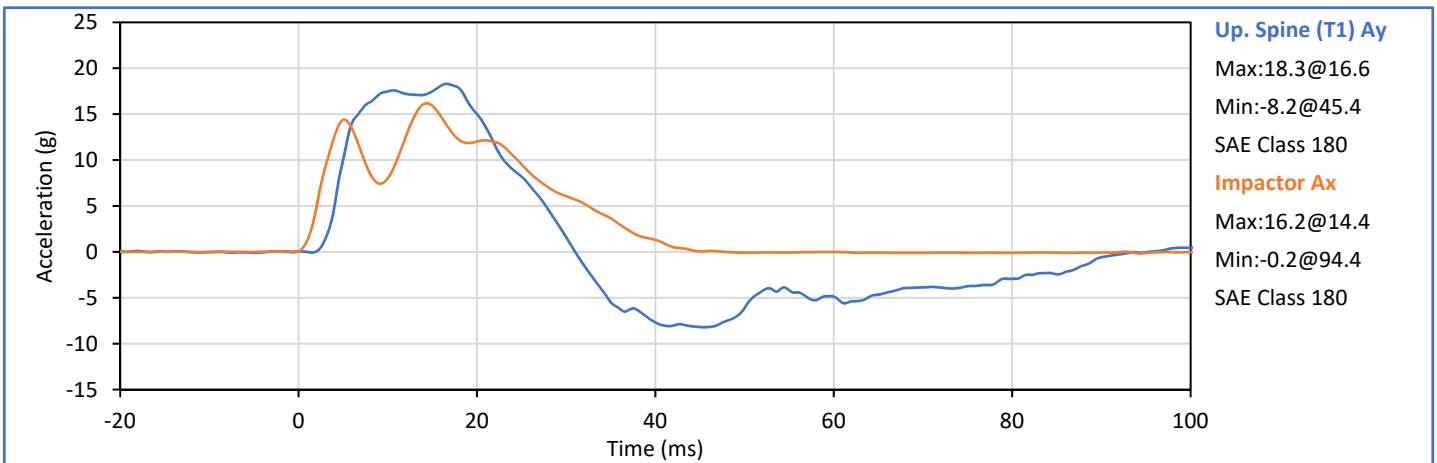
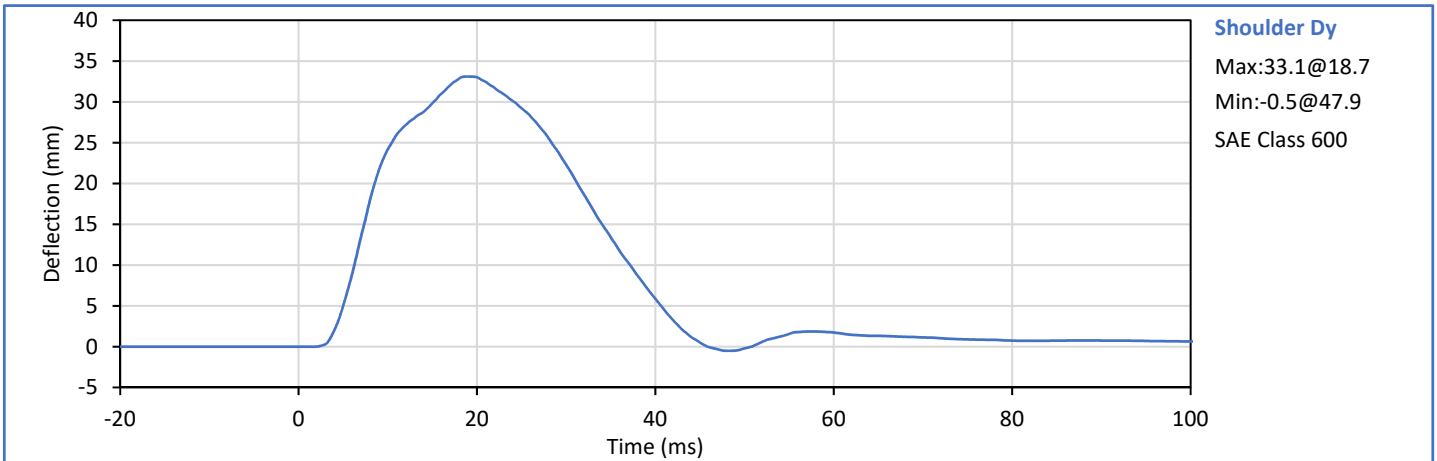




ATD Serial No.: 299

Test Date: 2018-12-05

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Humidity	%	10	70	26	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.1	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.3	Pass
Peak Impactor Ax	g	13.0	18.0	16.2	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

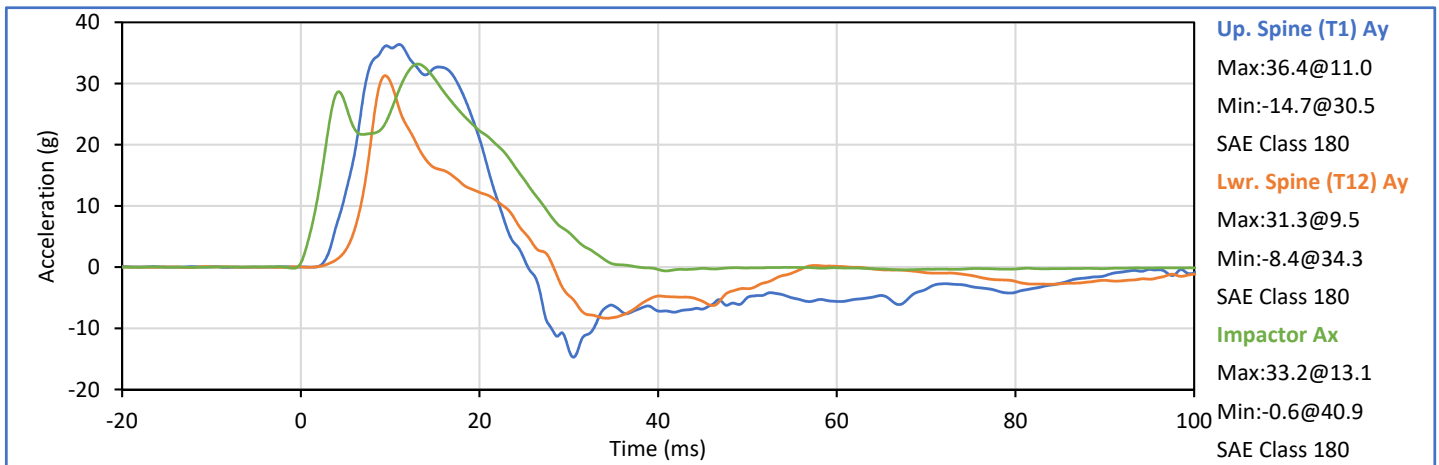
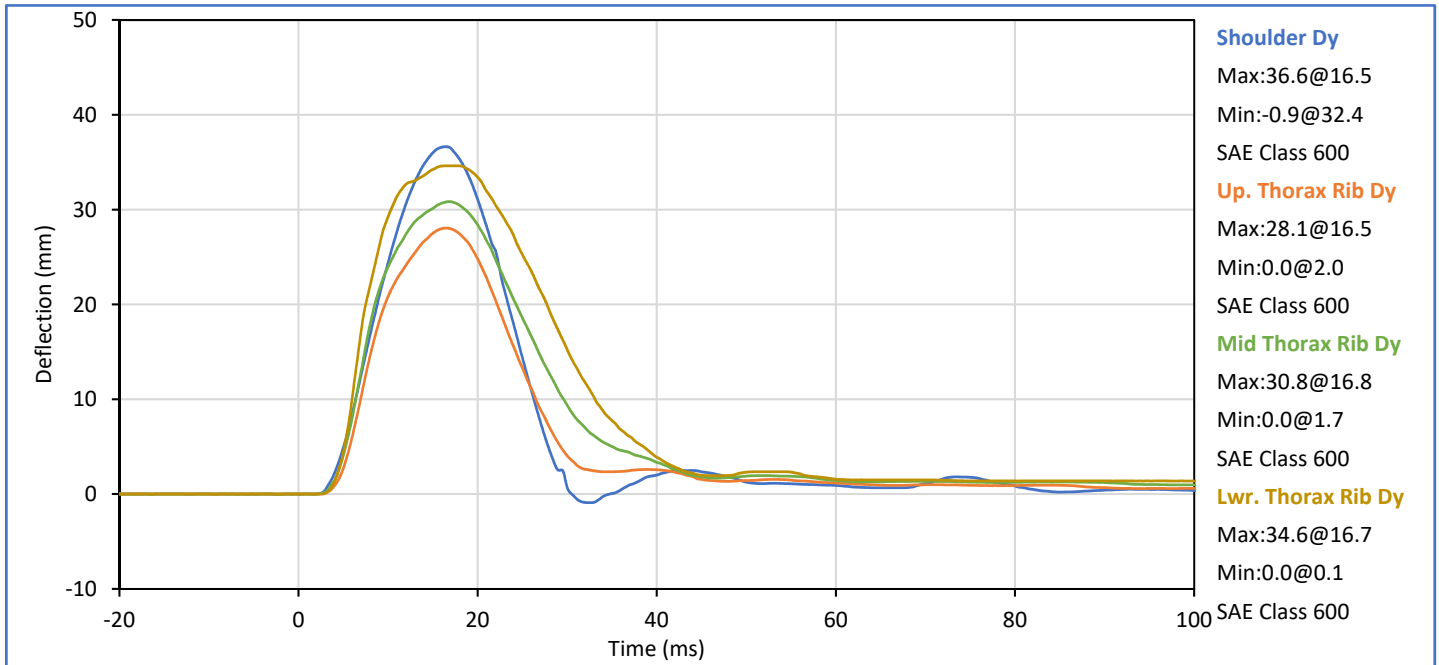
Approved By:
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-05

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	22	Pass
Impactor Velocity	m/s	6.60	6.80	6.71	Pass
Peak Shoulder Dy	mm	31.0	40.0	36.6	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.1	Pass
Peak Middle Rib Dy	mm	30.0	36.0	30.8	Pass
Peak Lower Rib Dy	mm	32.0	38.0	34.6	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	36.4	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	31.3	Pass
Peak Impactor Ax	g	30.0	36.0	33.2	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

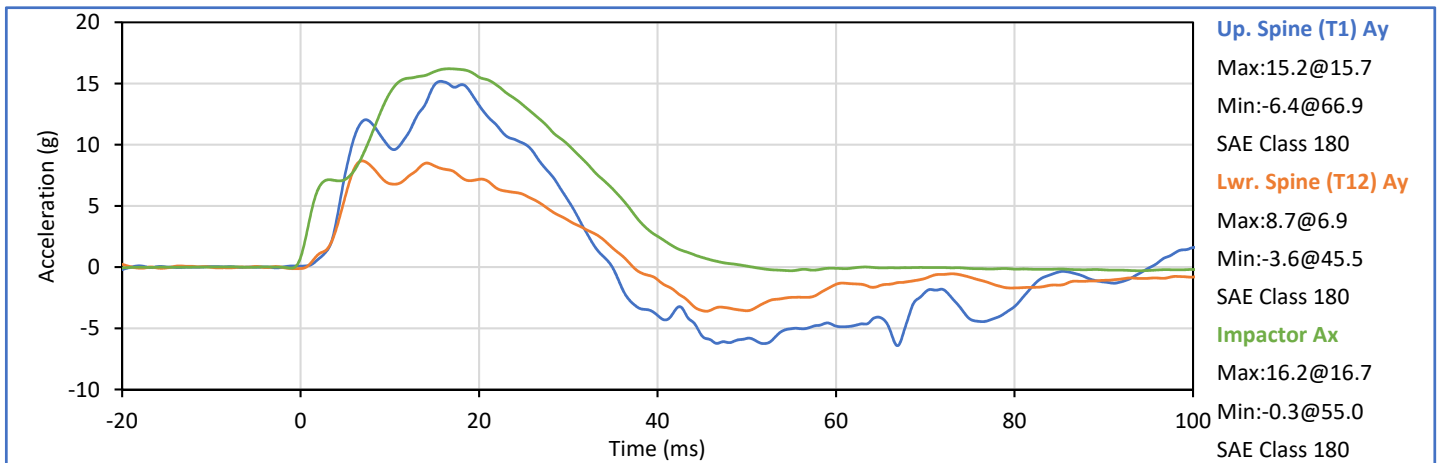
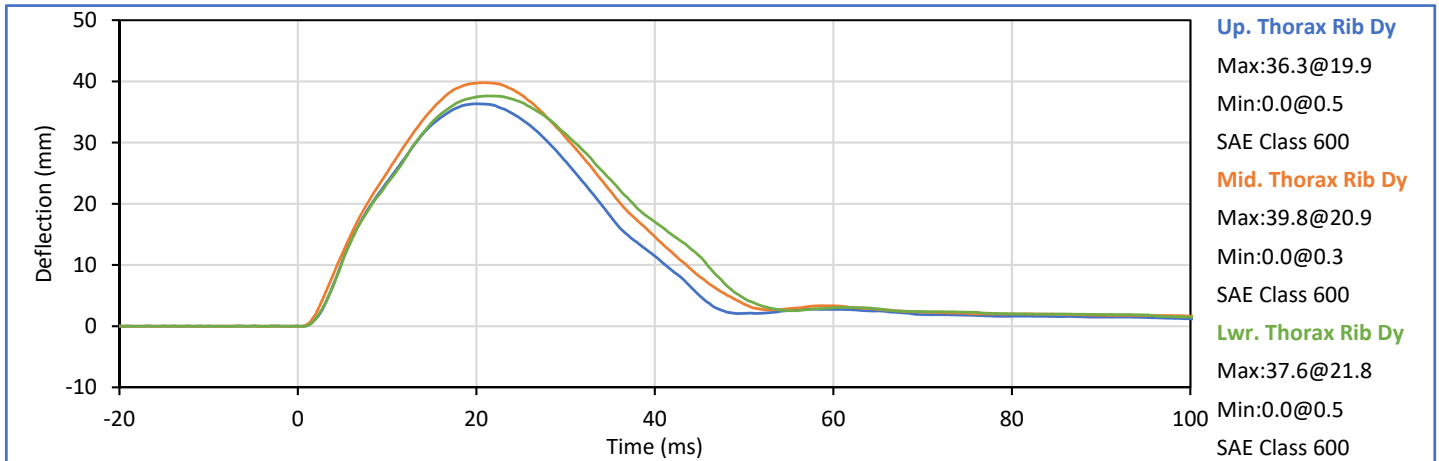
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-05

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	22	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Rib Dy	mm	32.0	40.0	36.3	Pass
Peak Middle Rib Dy	mm	39.0	45.0	39.8	Pass
Peak Lower Rib Dy	mm	35.0	43.0	37.6	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	15.2	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.7	Pass
Peak Impactor Ax	g	14.0	18.0	16.2	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

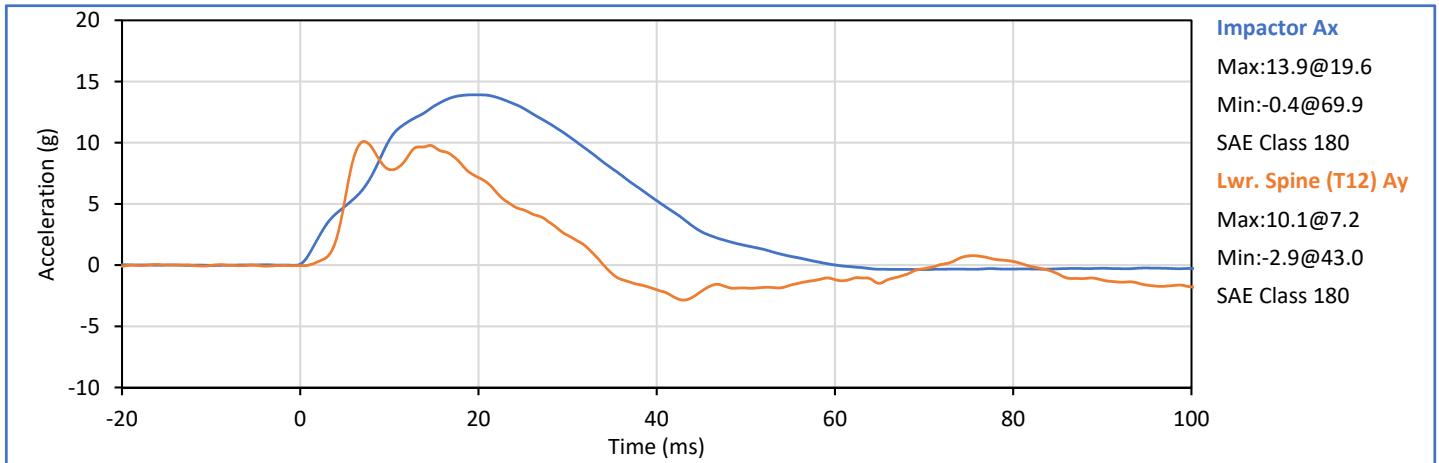
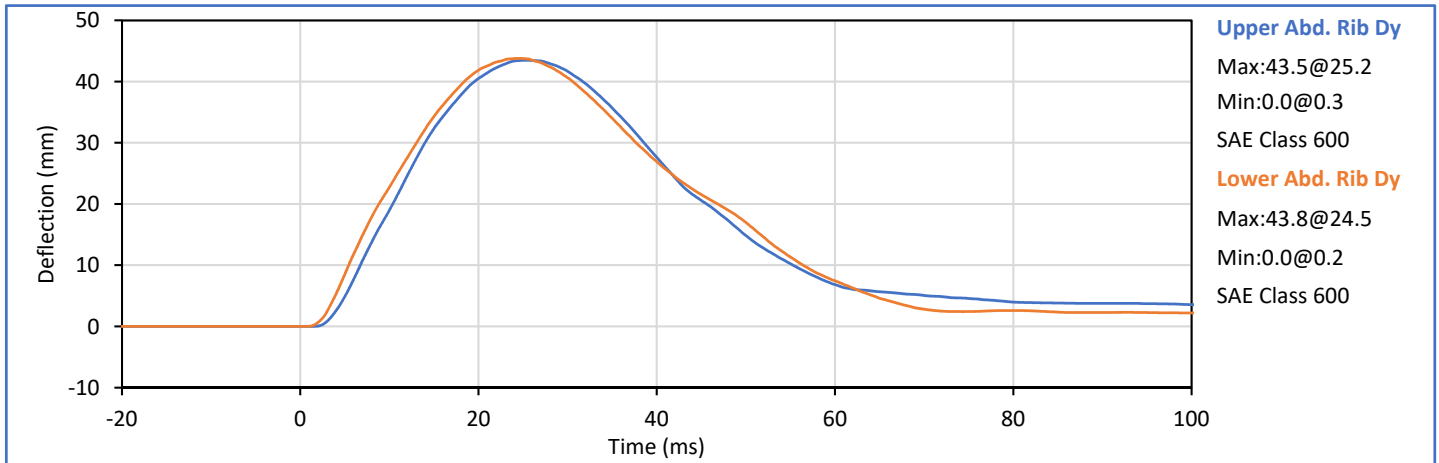
Approved By:
 P. Puzzuto




ATD Serial No.: 299

Test Date: 2018-12-05

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	4.31	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	43.5	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	43.8	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.1	Pass
Peak Impactor Ax	g	12.0	16.0	13.9	Pass
Overall Test Results					Pass



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

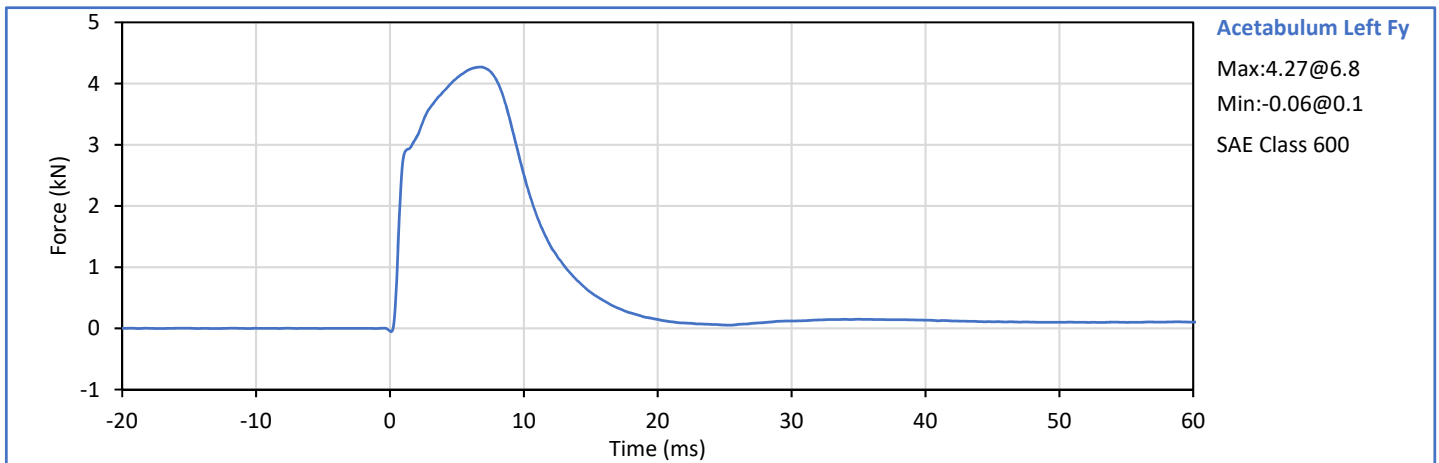
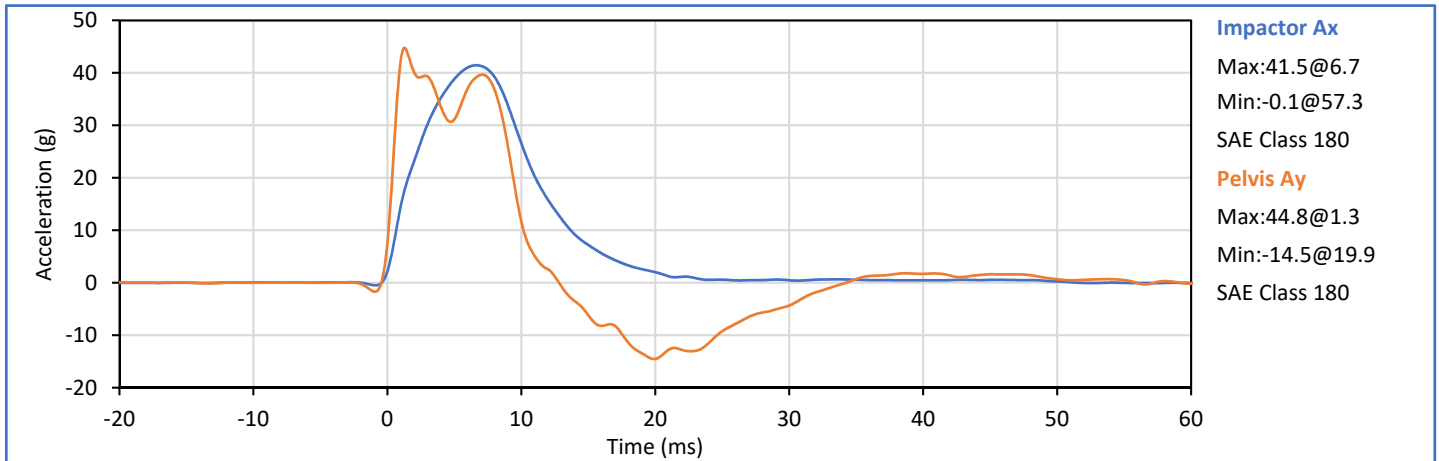


ATD Serial No.: 299

Test Date: 2018-12-05

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	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	4.27	Pass
Pelvis Ay after 6ms	g	34.0	42.0	39.7	Pass
Peak Impactor Ax	g	38.0	47.0	41.5	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12286 (SACO)



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto



9270 Holly Road, Adelanto, CA 92301
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 Info@karco.com www.karco.com

**SID-IIs Small Side Impact ATD
 Pelvis Acetabulum Impact**

ATD Serial No.: 299

Test Date: 2018-12-05

Pelvis Plug S/N: 12286 (SACO)



SID-IIs Pelvis Plug Certification Test

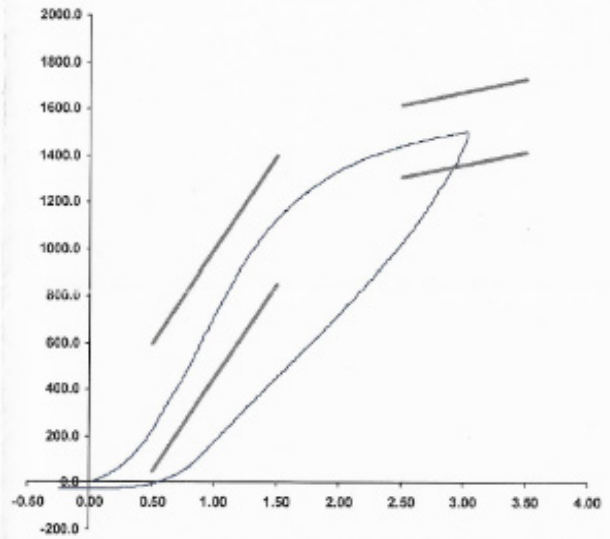
Plug S/N 12286
 Test Number 6671
 Report Number 6686
 Test Date 3/15/2018 11:35:26 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	228.39	50.00	900.00
Force @ 1.5 mm (N)	1,127.13	850.00	1,400.00
Force @ 2.5 mm (N)	1,440.54	1,306.00	1,818.00
Force @ 3.0 mm (N)	1,501.55	1,351.00	1,573.00

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 15-Mar-16
 SACO Research

By: DC Date: 3/15/18

SACO Research 41735 Elm St #401 Murietta, CA 92582 Tel 310-694-2082 FAX



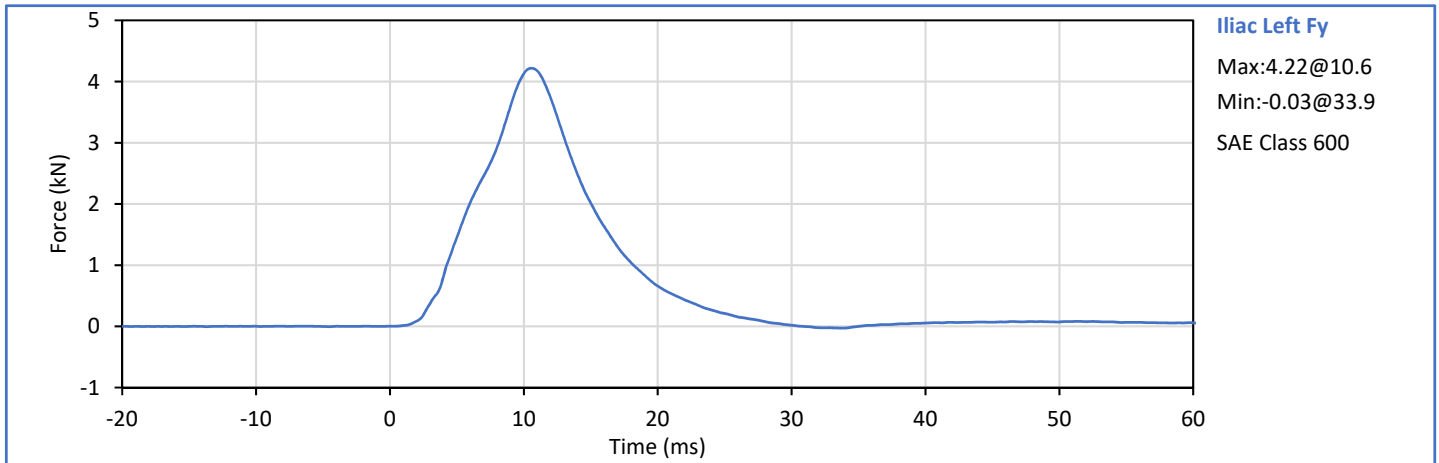
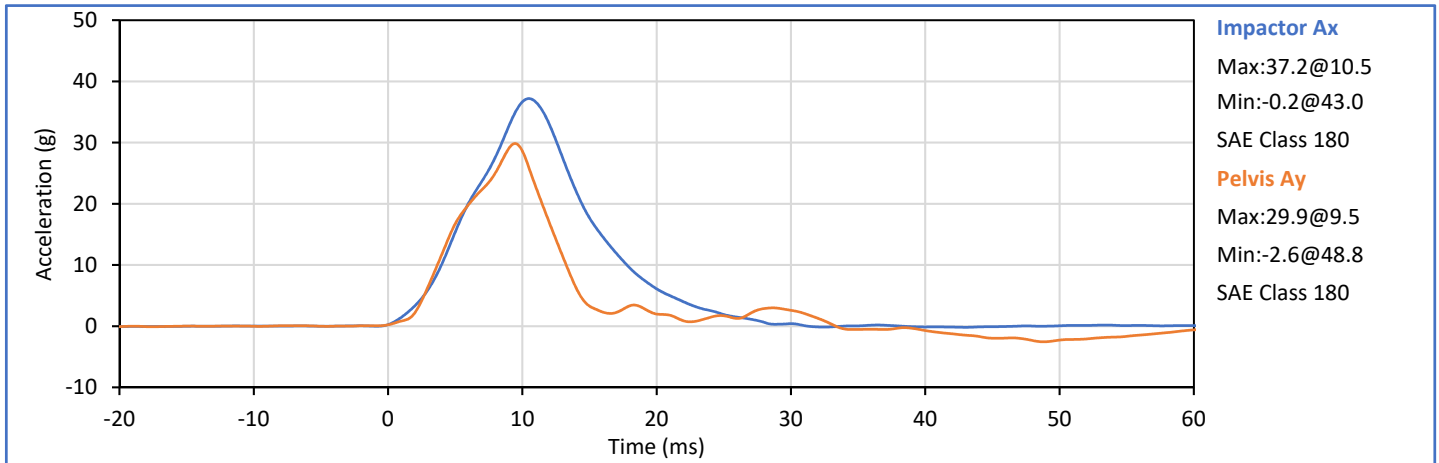
ATD Serial No.: 299

Test Date: 2018-12-05

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	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	4.22	Pass
Pelvis Ay after 6ms	g	28.0	39.0	29.9	Pass
Peak Impactor Ax	g	36.0	45.0	37.2	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician: *J. Hernandez*
 J. Hernandez

Approved By: *P. Puzzuto*
 P. Puzzuto

APPENDIX C
POST-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
LEFT SIDE CONFIGURATION

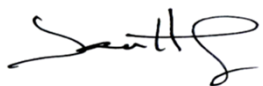



**SID-IIs Small Side Impact ATD
 External Measurements**

ATD Serial No.: 299

Test Date: 2018-12-13

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	148	Pass
E - Shoulder Pivot From Backline	mm	97	107	106	Pass
F - Thigh Clearance	mm	119	135	125	Pass
G - Head Breadth	mm	140	148	146	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	549	Pass
K - Buttock To Knee Length	mm	514	540	523	Pass
L - Popliteal Height	mm	343	369	351	Pass
K - Knee Pivot To Floor Height	mm	392	409	400	Pass
N - Buttock Popliteal Length	mm	416	442	431	Pass
O - Chest Depth W/O Jacket	mm	195	211	200	Pass
P - Foot Length	mm	216	232	225	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	482	Pass
V - Shoulder Width	mm	341	357	352	Pass
W - Foot Width	mm	78	94	87	Pass
Y - Chest Circumference W/Jacket	mm	851	881	867	Pass
Z - Waist Circumference	mm	761	791	774	Pass
Overall Test Results					Pass

Technician: 
 J. Hernandez

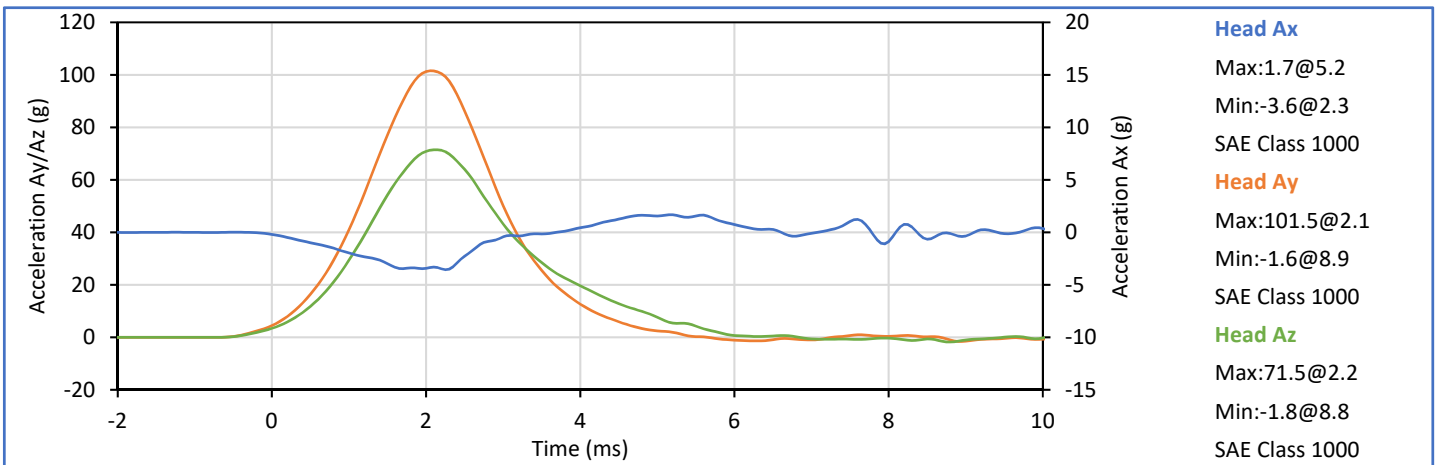
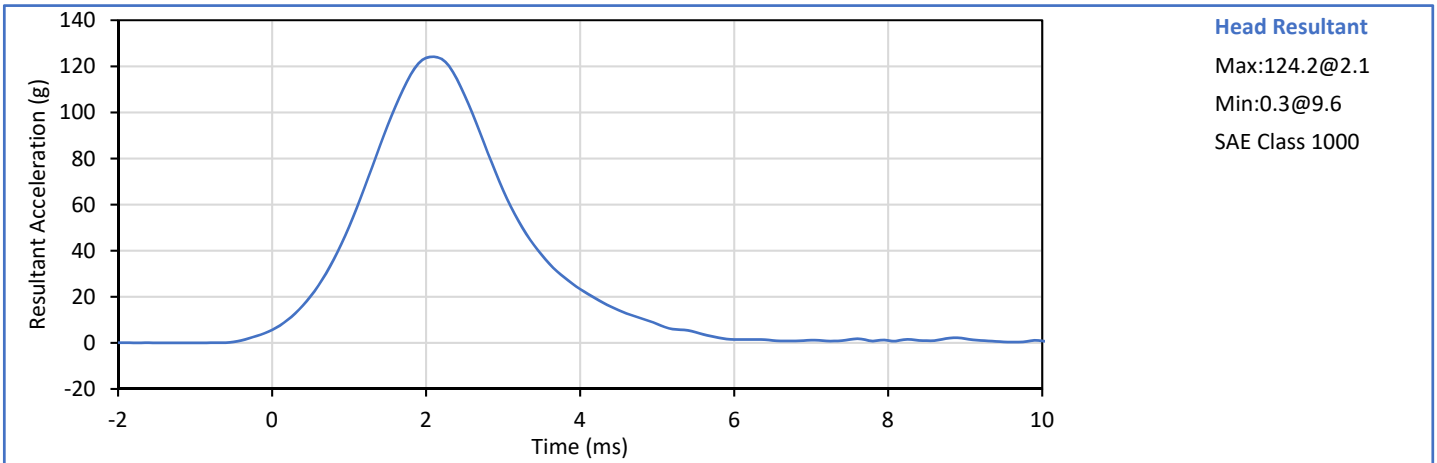
Approved By: 
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	20.8	Pass
Laboratory Humidity	%	10	70	29	Pass
Peak Resultant Acceleration	g	115.0	137.0	124.2	Pass
Peak Head Ax	g	-15.0	15.0	-3.6	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto

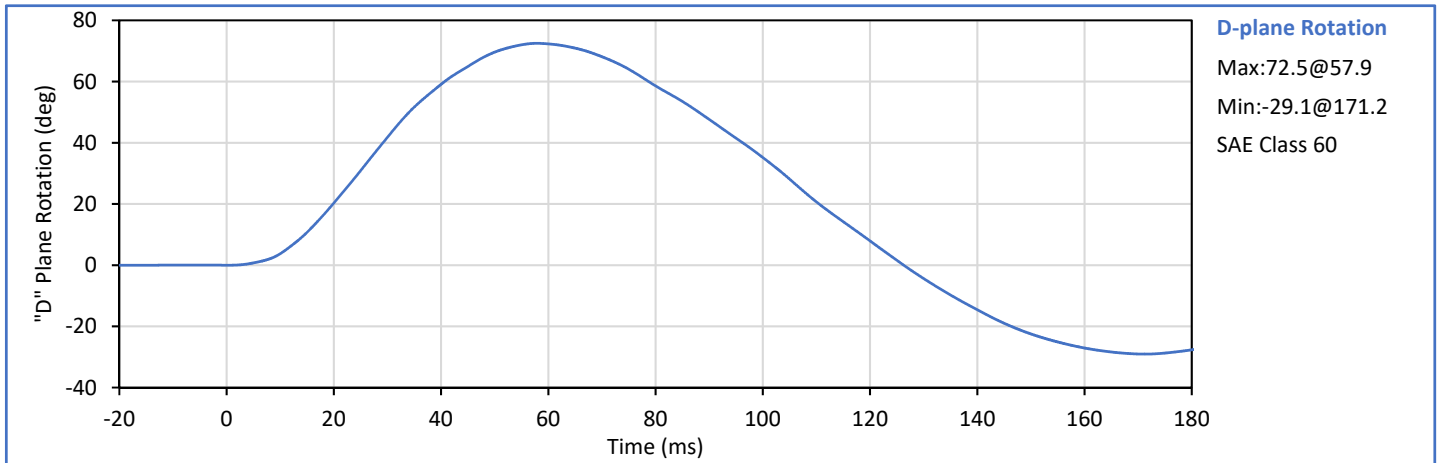
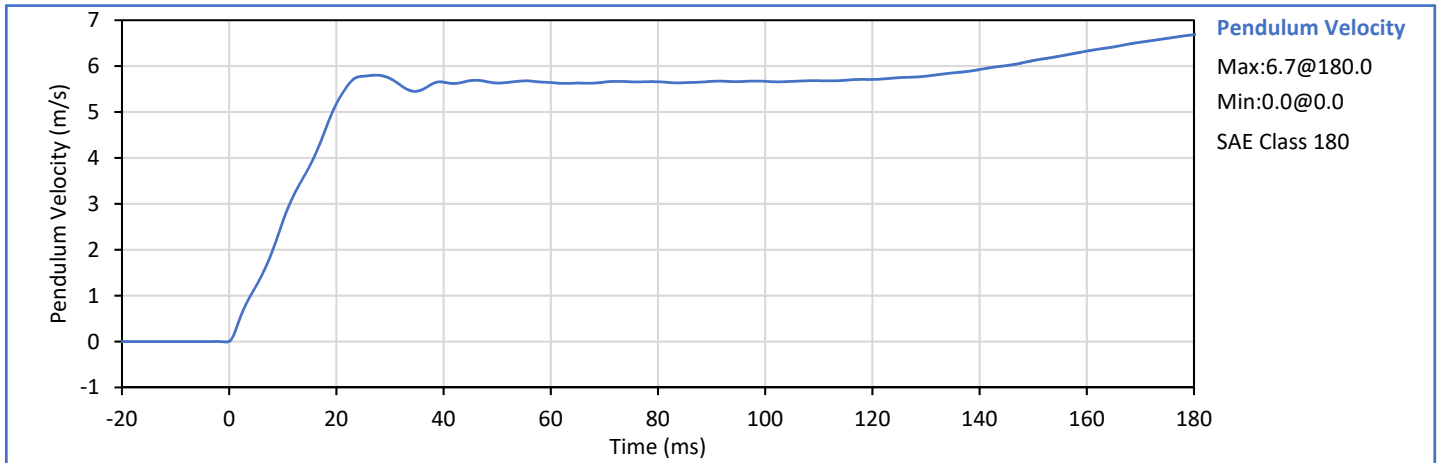


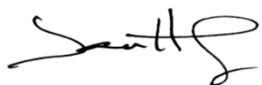
**SID-IIs Small Side Impact ATD
 Neck Flexion**


ATD Serial No.: 299

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.51	5.63	5.54	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.61	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.82	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	5.18	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.78	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.80	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	72.5	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	57.9	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-43.6	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	107.7	Pass
Overall Test Results					Pass



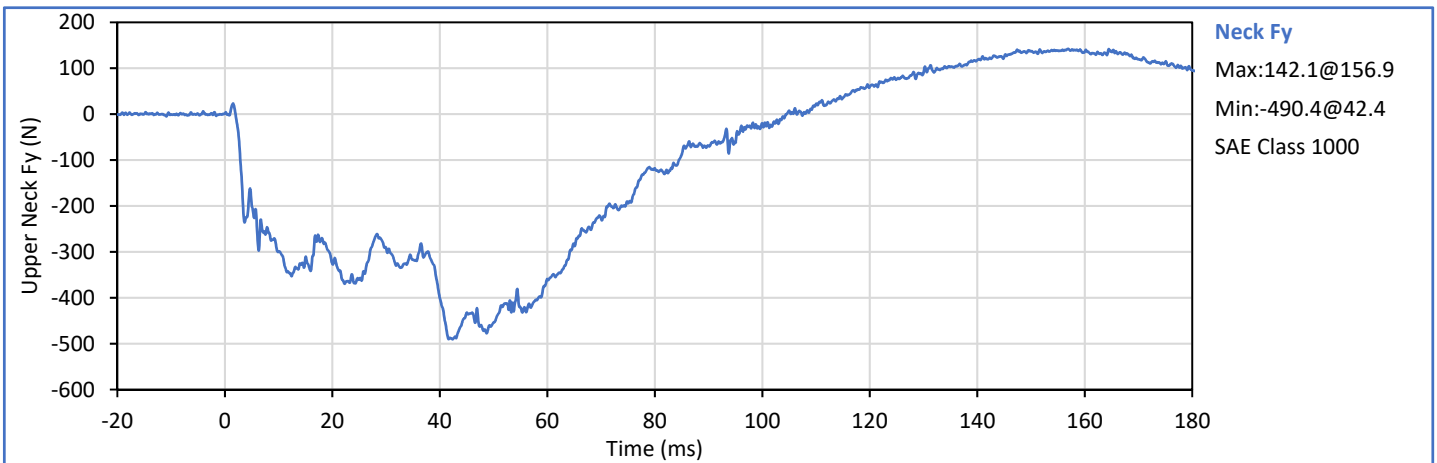
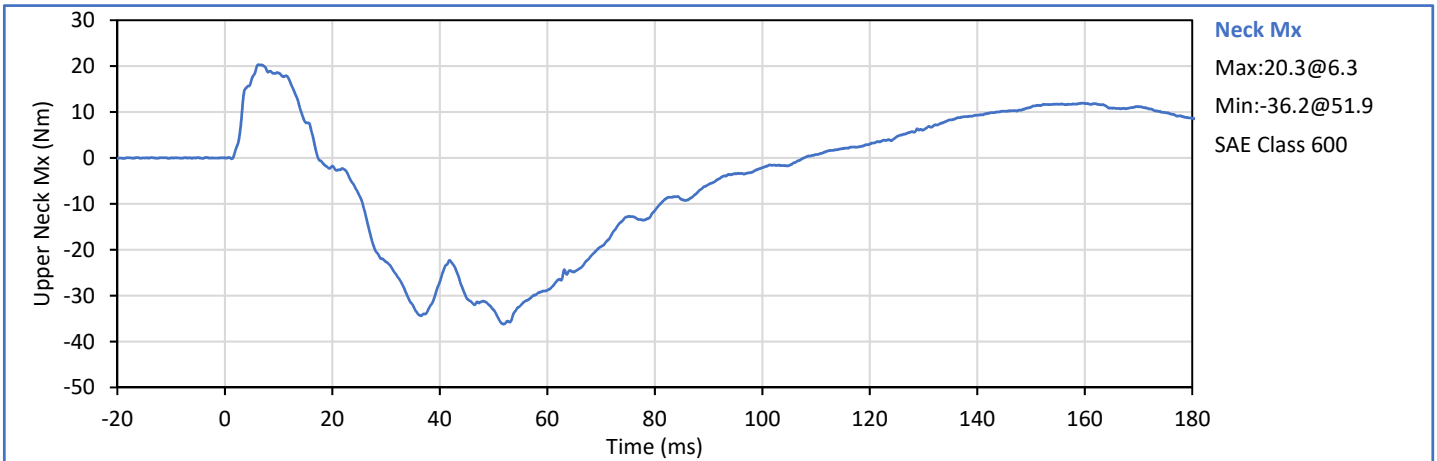
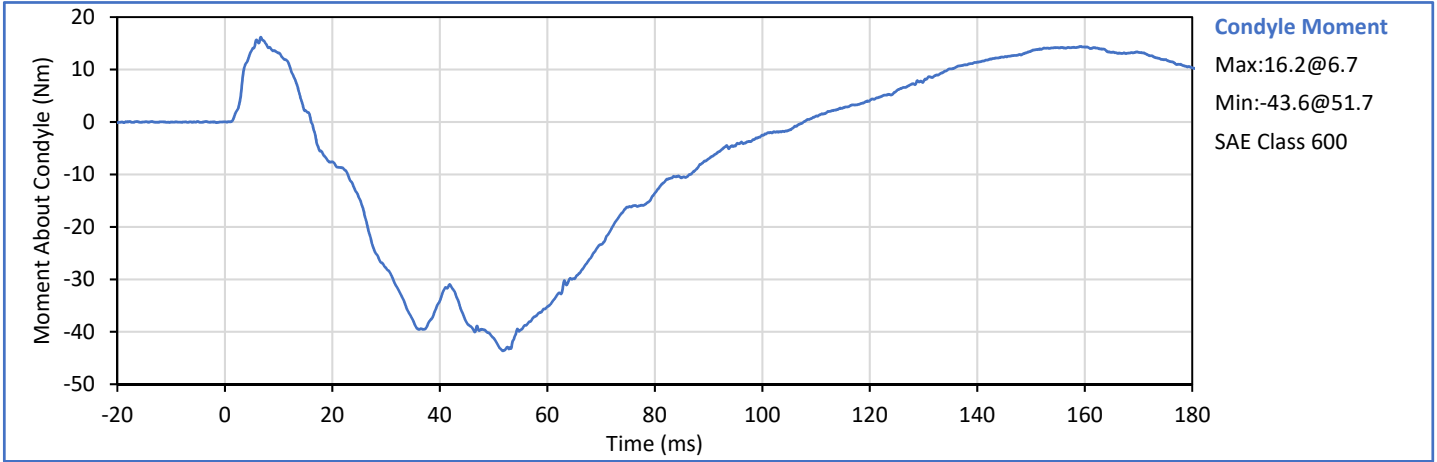
Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-14

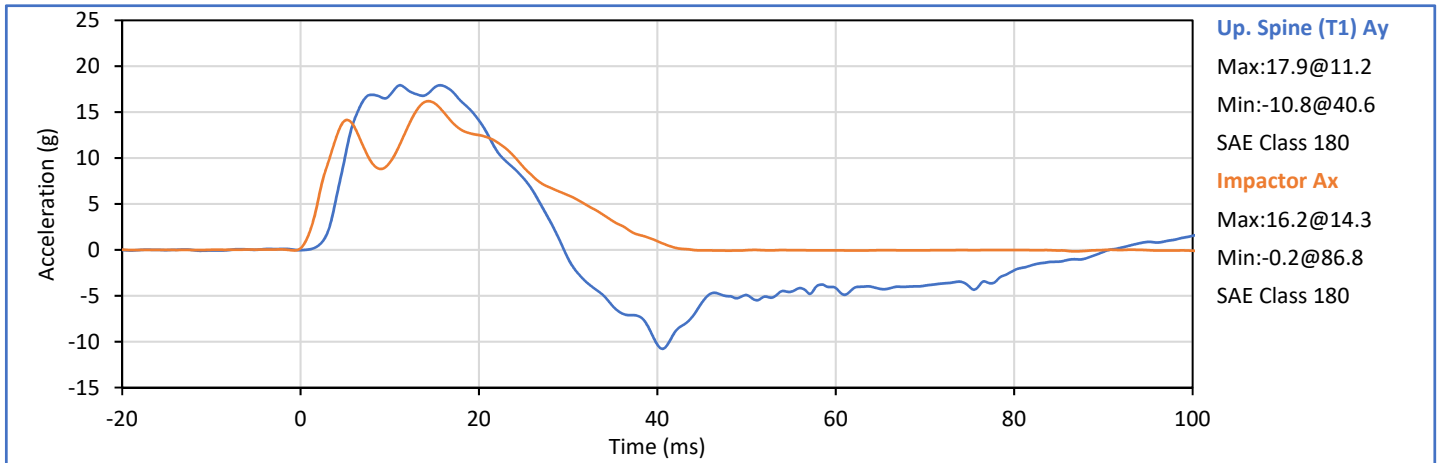
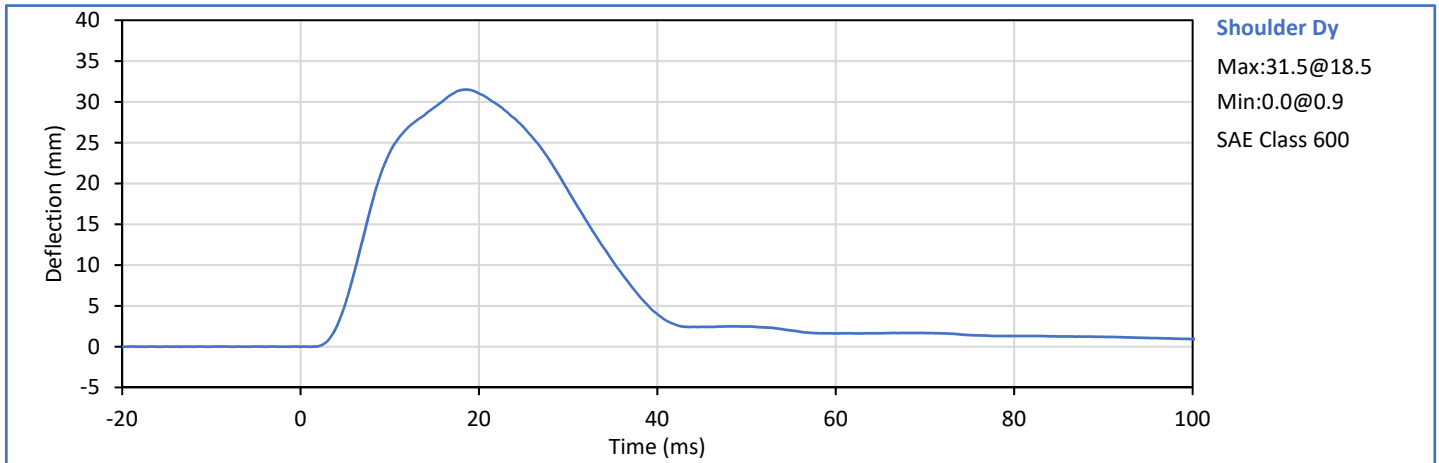




ATD Serial No.: 299

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.35	Pass
Peak Shoulder Dy	mm	28.0	37.0	31.5	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	17.9	Pass
Peak Impactor Ax	g	13.0	18.0	16.2	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

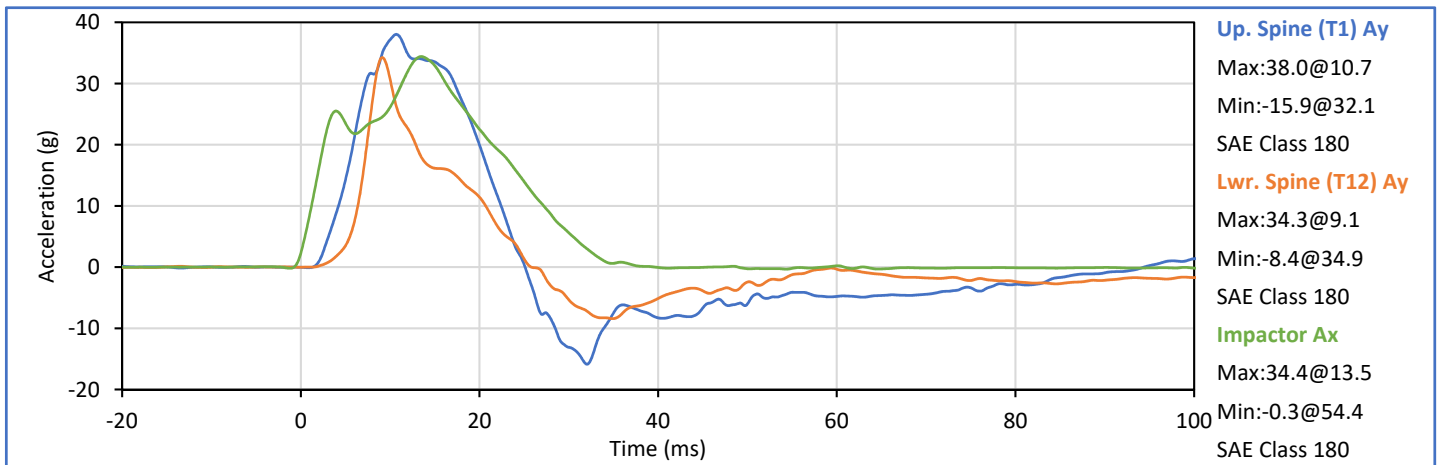
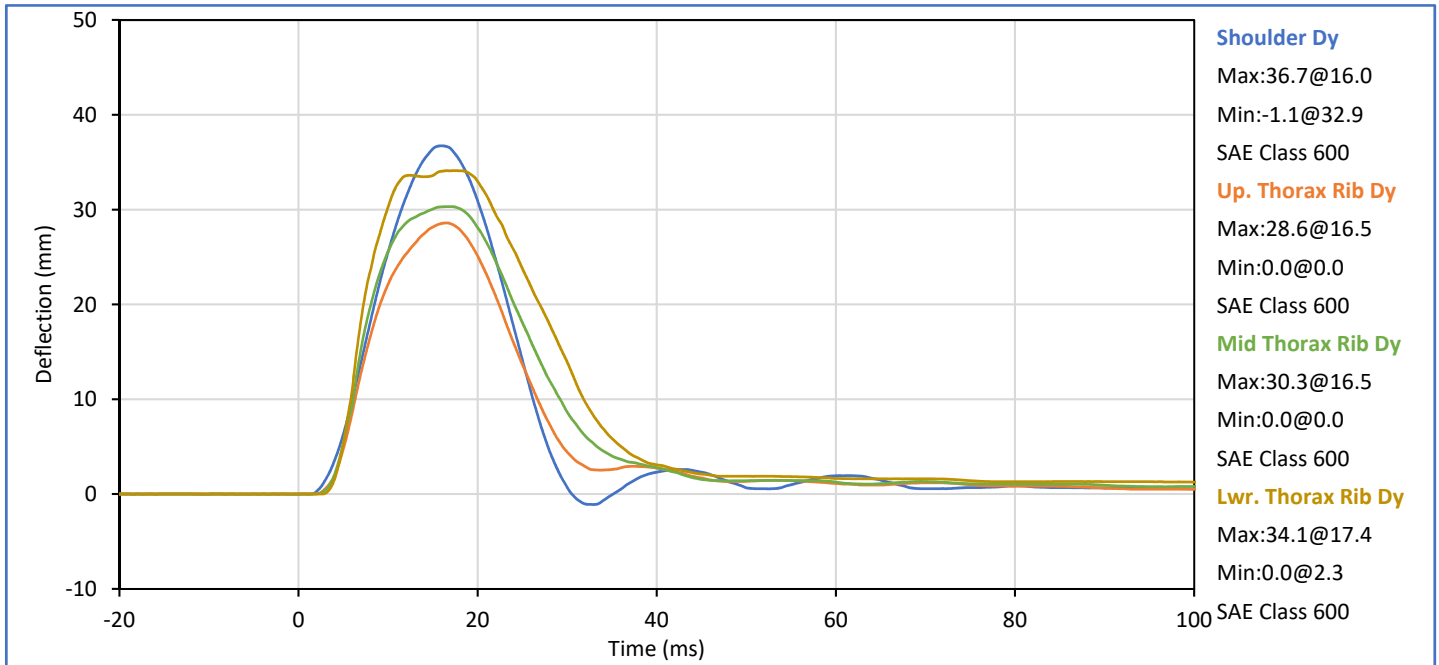
Approved By:
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.64	Pass
Peak Shoulder Dy	mm	31.0	40.0	36.7	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.6	Pass
Peak Middle Rib Dy	mm	30.0	36.0	30.3	Pass
Peak Lower Rib Dy	mm	32.0	38.0	34.1	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	38.0	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	34.3	Pass
Peak Impactor Ax	g	30.0	36.0	34.4	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

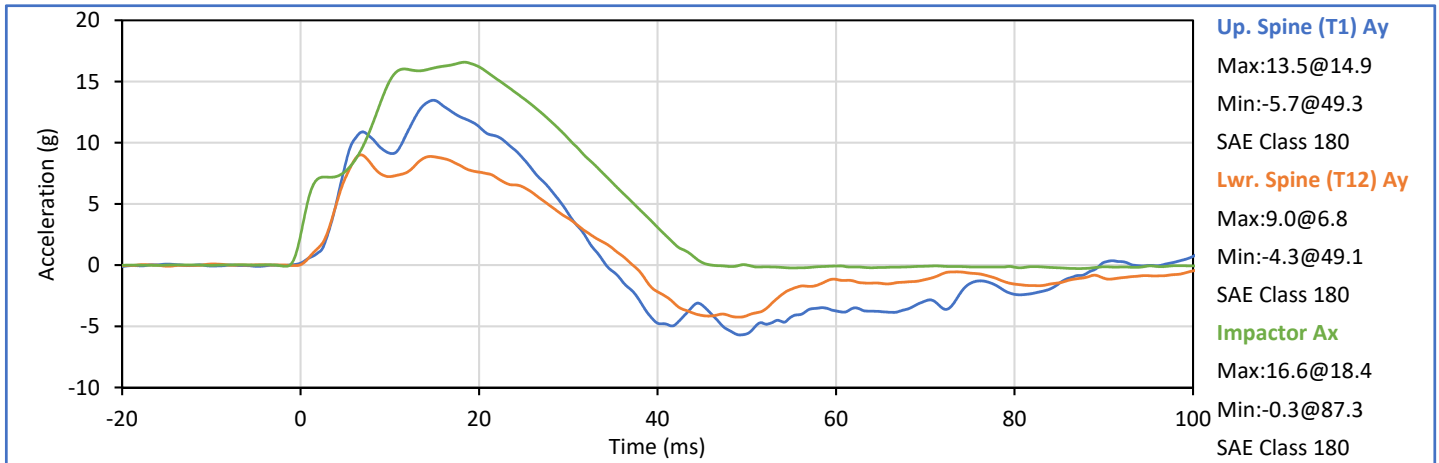
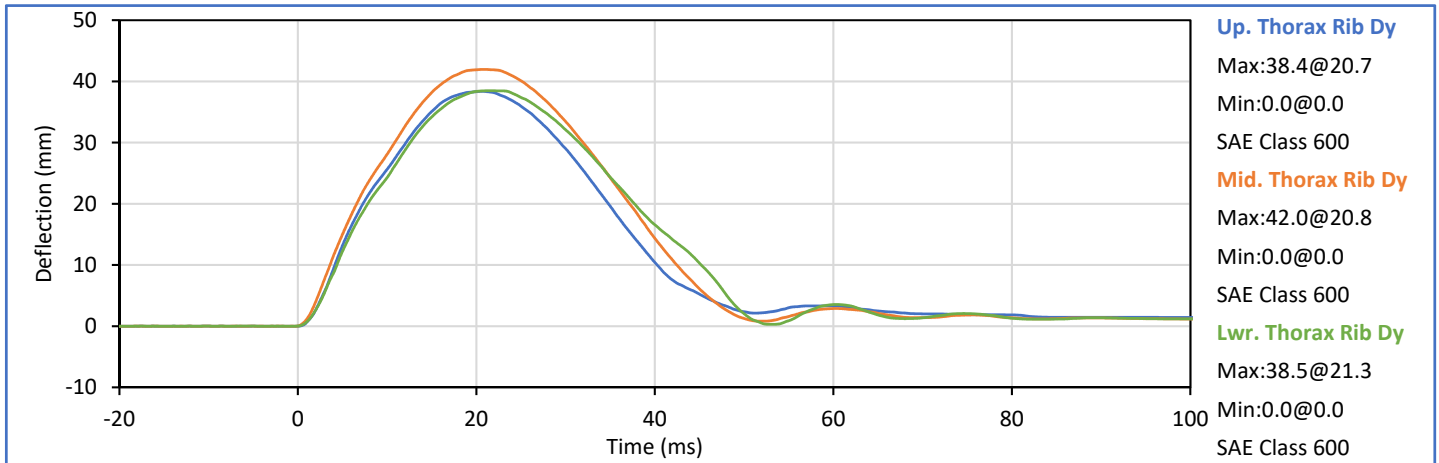
Approved By:
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Upper Rib Dy	mm	32.0	40.0	38.4	Pass
Peak Middle Rib Dy	mm	39.0	45.0	42.0	Pass
Peak Lower Rib Dy	mm	35.0	43.0	38.5	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	13.5	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	9.0	Pass
Peak Impactor Ax	g	14.0	18.0	16.6	Pass
Overall Test Results					Pass



Technician: *J. Hernandez*
 J. Hernandez

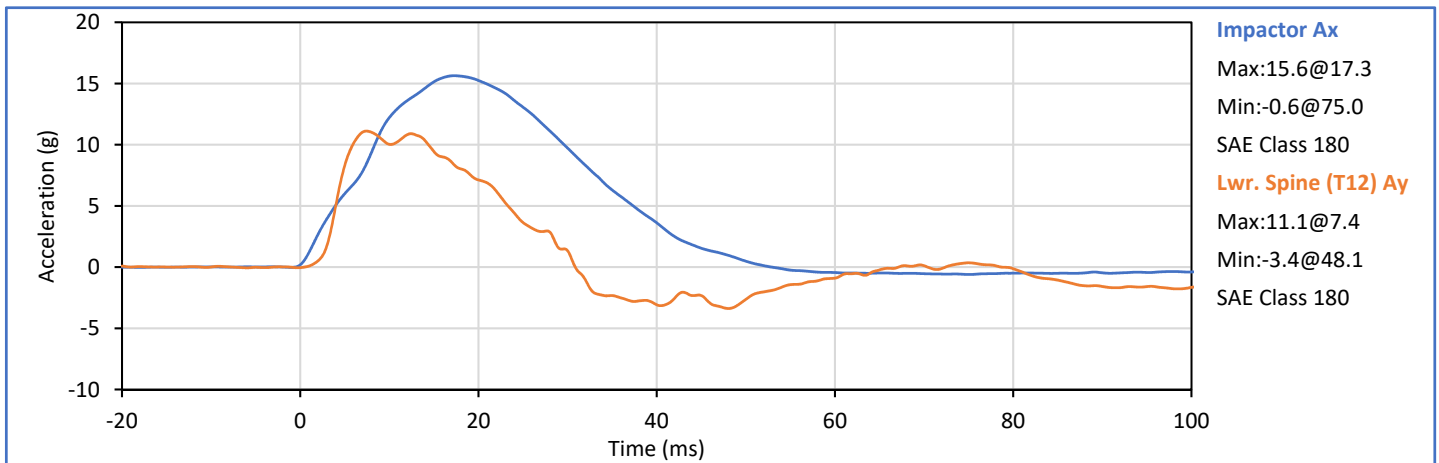
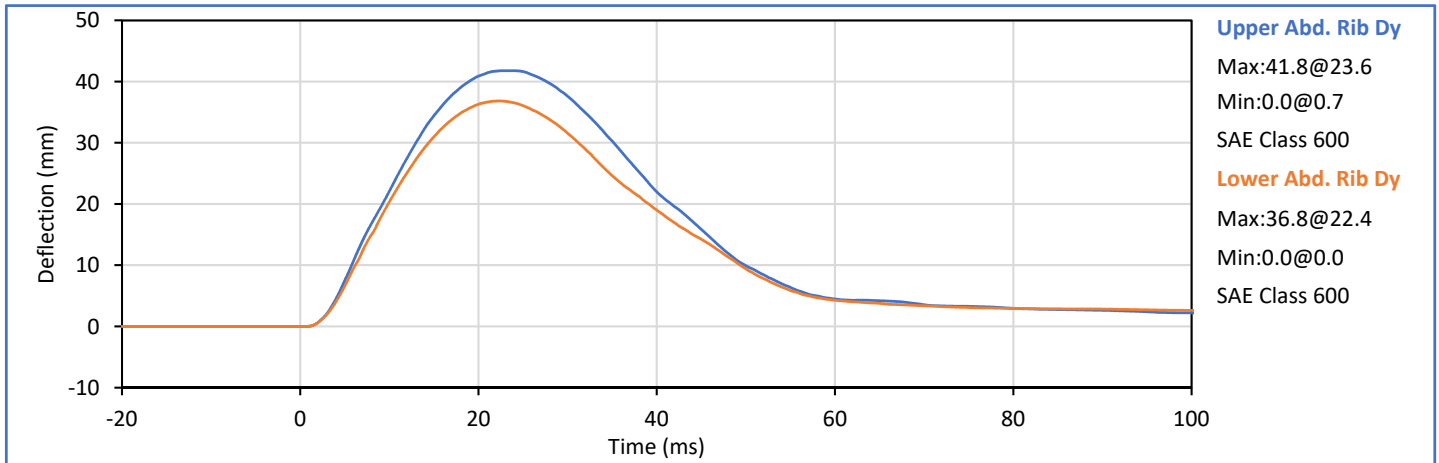
Approved By: *P. Puzzuto*
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	41.8	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	36.8	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	11.1	Pass
Peak Impactor Ax	g	12.0	16.0	15.6	Pass
Overall Test Results					Pass



Technician:
 J. Hernandez

Approved By:
 P. Puzzuto

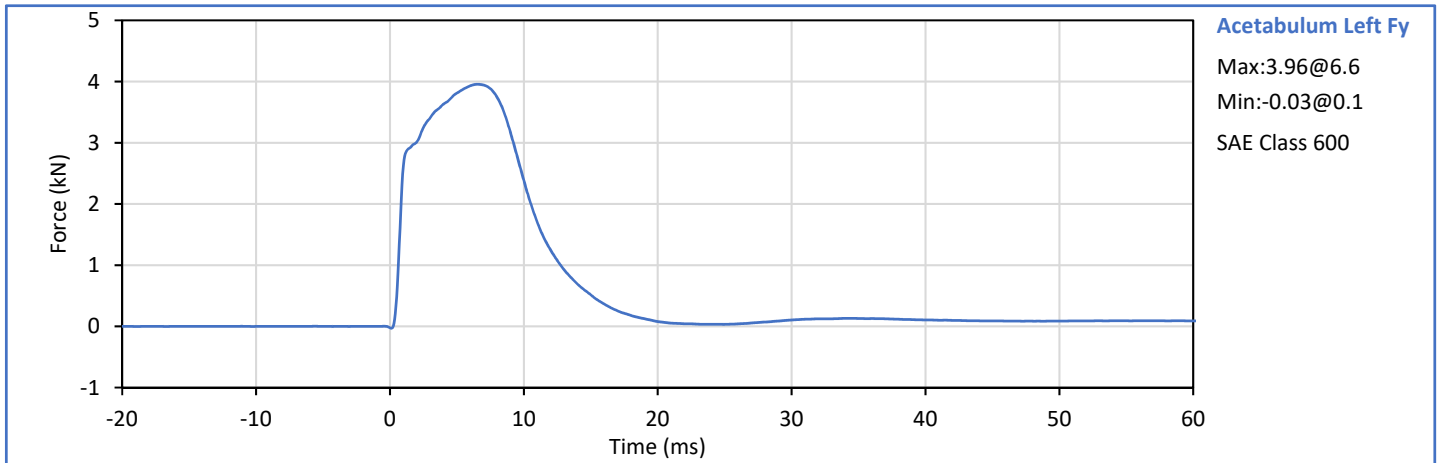
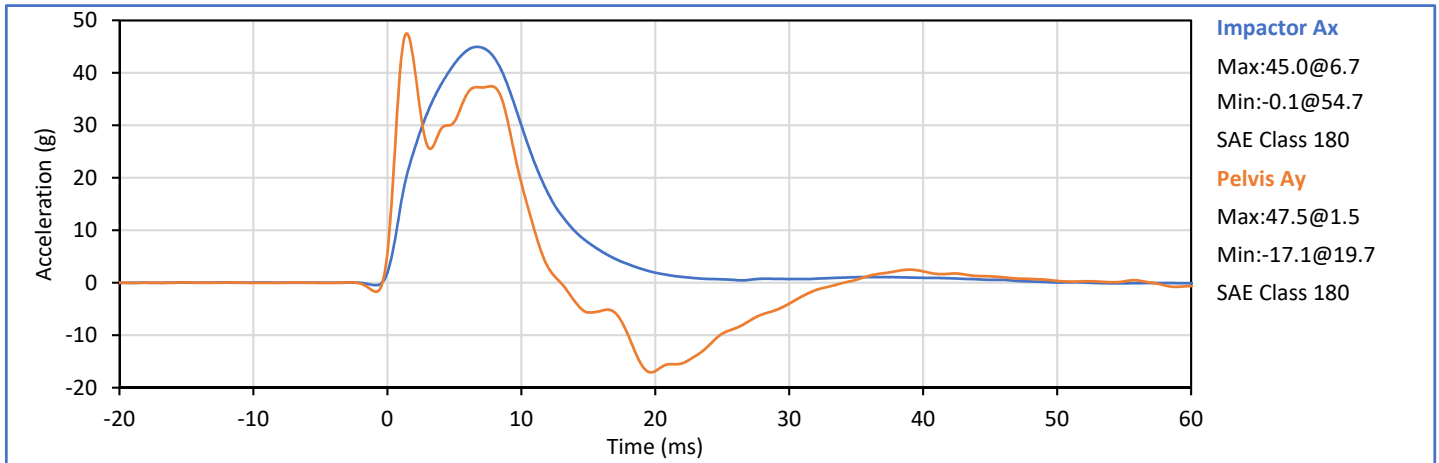


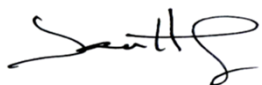
ATD Serial No.: 299


Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.67	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.96	Pass
Pelvis Ay after 6ms	g	34.0	42.0	37.5	Pass
Peak Impactor Ax	g	38.0	47.0	45.0	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 11407 (SACO)



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto



ATD Serial No.: 299

Test Date: 2018-12-14

Pelvis Plug S/N: 11407 (SACO)



SID-IIs Pelvis Plug Certification Test

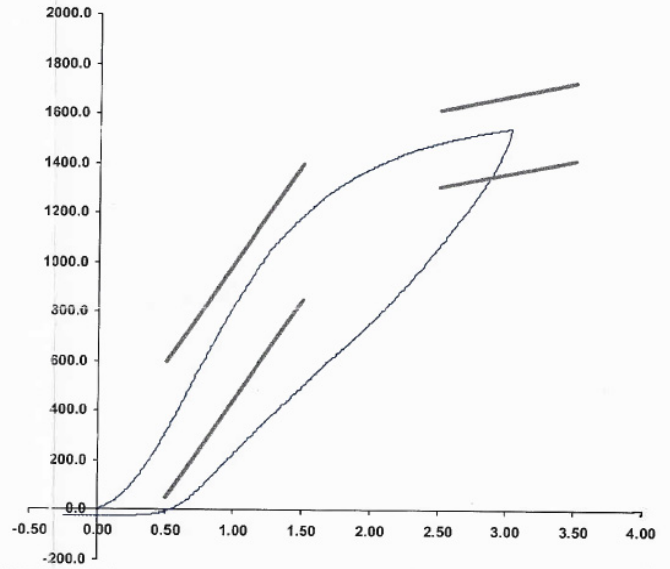
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 Test Number 2876
 Report Number 2873
 Test Date 8/29/2016 9:37:50 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	317.92	50.00	600.00
Force @ 1.5 mm (N)	1,190.92	850.00	1,400.00
Force @ 2.5 mm (N)	1,484.24	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,540.17	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 29-Aug-16
 SACO Research

By: DC Date: 8/29/16



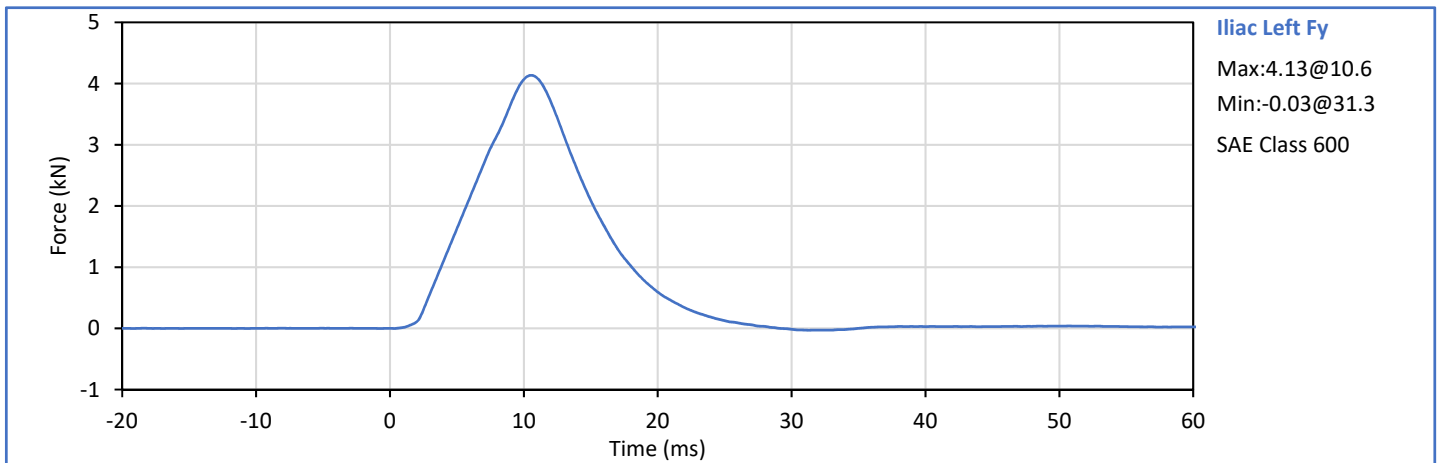
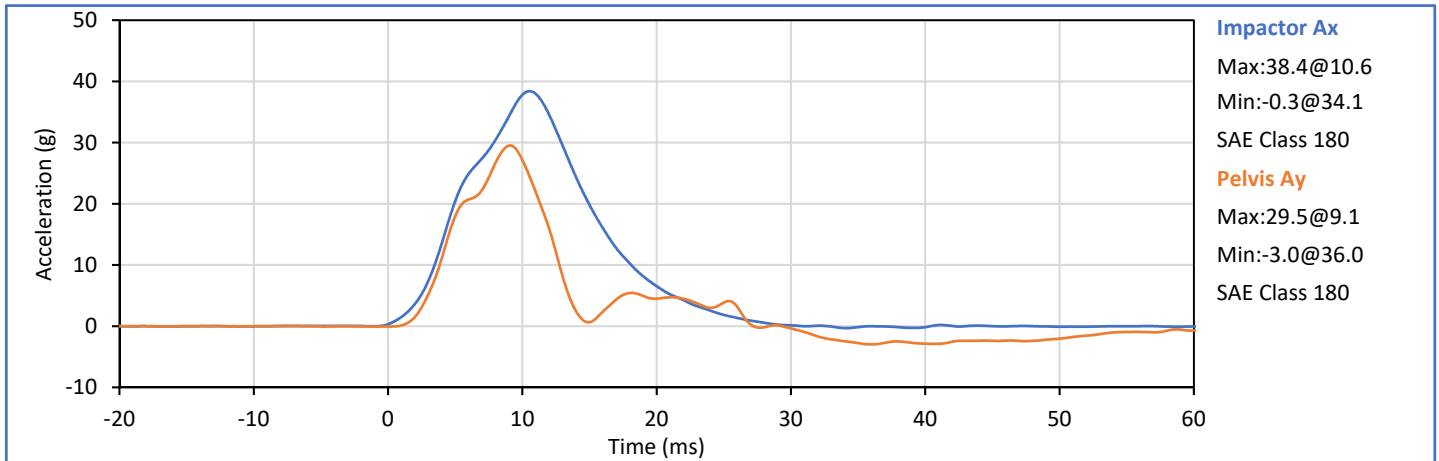
ATD Serial No.: 299

Test Date: 2018-12-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Iliac Fy	kN	4.10	5.10	4.13	Pass
Pelvis Ay after 6ms	g	28.0	39.0	29.5	Pass
Peak Impactor Ax	g	36.0	45.0	38.4	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified



Technician: *J. Hernandez*
 J. Hernandez

Approved By: *P. Puzzuto*
 P. Puzzuto

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

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
Iliac Wing Impact Side Force Y	289 Fy (Iliac)	R.A. Denton	3228J	2018-10-11
Acetabulum Impact Side Force Y	277 Fy (Acetabulum)	R.A. Denton	3249J	2018-10-11

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	A254926	MSI	52F-2000	2018-06-19
Vehicle CG Ay	A254924	MSI	52F-2000	2018-06-19
Vehicle CG Az	A254897	MSI	52F-2000	2018-06-19
Left Floor Sill Ay	A145534	MSI	52F-2000	2018-09-21
A-Pillar Sill Ay	10251	Endevco	757F-2k	2018-03-08
A-Pillar Low Ay	A254909	MSI	52F-2000	2018-06-19
A-Pillar Mid Ay	A217308	MSI	52F-2000	2018-11-07
B-Pillar Sill Ay	A145939	MSI	52F-2000	2018-09-26
B-Pillar Low Ay	A248860	MSI	52F-2000	2018-09-15
B-Pillar Mid Ay	A248845	MSI	52F-2000	2018-10-01
Driver Seat Track at H-Point Ay	A145439	MSI	52F-2000	2018-09-26
Engine Top Ax	A185633	MSI	52F-2000	2018-11-06
Engine Top Ay	A185688	MSI	52F-2000	2018-09-15
Firewall Ay	10438	Endevco	757F-2k	09-04-2018
Right Roof Ay	A224482	MSI	52F-2000	2018-09-25
Right Floor Sill Ay	A147428	MSI	52F-2000	2018-11-06
Rear Floorpan Ax	A148315	MSI	52F-2000	2018-11-06
Rear Floorpan Ay	10245	Endevco	757F-2k	2018-03-08

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