

REPORT NUMBER: SideNCAPPole-KAR-22-012
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

SUBARU CORPORATION
2022 SUBARU WRX PREMIUM 4-DOOR SEDAN

NHTSA No: O20225501

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



DECEMBER 29, 2022

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Approval Date: December 29, 2022

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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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15. Supplementary Notes																														
16. Abstract A 32.2 km/h 75° rigid pole side NCAP impact test was conducted on the subject 2022 Subaru WRX Premium 4-Door Sedan 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 08, 2022. The impact velocity was 32.30 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 10.6°C. The target vehicle's maximum post-test static crush was 364 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" 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;">208.015</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;">47.826</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;">3640.925</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;">16.383</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;">26.229</td> </tr> </tbody> </table> The struck side doors and the front non-struck door of the vehicle were jammed shut and did not separate from the body at the hinges or latches. The remaining door did not open during the side impact event.				Measurement Description	Driver ATD (SID-IIs)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	208.015	Resultant Lower Spine Acceleration	g	82	47.826	Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	3640.925	Maximum Thoracic Rib Deflection	mm	38	16.383	Maximum Abdominal Rib Deflection	mm	45	26.229
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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. Office of Crashworthiness Standards (NRM-100) 1200 New Jersey Ave., SE Washington, DC 20590																												
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TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Purpose and Summary of the Test	1
2	Occupant and Vehicle Information / Data Sheets	3
<u>Data Sheet</u>		<u>Page</u>
1	General Test and Vehicle Parameter Data	4
2	Seat, Seat Belt, Steering Wheel Adjustment, and Fuel System Data	8
3	Dummy Longitudinal Clearance Dimensions	12
4	Dummy Lateral Clearance Dimensions	13
5	Camera and Instrumentation Data	14
6	Test Vehicle Accelerometer Locations	15
7	Rigid Pole Load Cell Data	16
8	Post-Test Observations	17
9	Test Vehicle Profile Measurements	19
10	Test Vehicle Exterior Crush Measurements	20
11	Vehicle Damage Profile Distances	23
12	FMVSS No. 301 Static Rollover Results	24
13	Dummy/Vehicle Temperature and Humidity Stabilization	25
<u>Appendix</u>		<u>Page</u>
A	Photographs	A
B	Dummy Response Data	B
C	Pre-Test ATD Qualification and Performance Verification	C
D	Test Equipment and Instrumentation Calibration Data	D

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This side impact test is part of the 2022 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number 693JJ920D000015. The purpose of this test is to generate comparative side impact performance in a 2022 Subaru WRX Premium 4-Door Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

SUMMARY

A rigid pole side impact test was conducted on a 2022 Subaru WRX Premium 4-Door Sedan. The subject vehicle was towed into the rigid pole at an angle of 74.6° and a velocity of 32.30 km/h. The test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California on December 8, 2022. 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 March 2020. 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.

SECTION 1 ...(CONTINUED)
PURPOSE AND SUMMARY OF TEST

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

Measurement Description	Units	Driver ATD (SID-IIs)	
		IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	208.015
Lower Spine (T12) Resultant Acceleration	g	82	47.826
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3640.925
Maximum Thoracic Rib Deflection	mm	38*	16.383
Maximum Abdominal Rib Deflection	mm	45*	26.229

**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 were jammed shut, the non-struck side doors remained closed and latched. There was no separation at the hinges or latches. There were no ATD values that exceeded limits.

- Left Floor Sill AY, Questionable Data at 34.4ms

SECTION 2

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20225501
Model Year	2022
Make	Subaru
Model	WRX Premium
Body Style	4-Door Sedan
VIN	JF1VBAF60N9017634
Body Color	Black
Odometer Reading (km / mi)	198 / 123
Engine Displacement (L)	2.4
Type / No. of Cylinders	4
Engine Placement	Longitudinal
Transmission Type	Manual
Transmission Speeds	6
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	Yes
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Other Safety Restraint	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-22
Vehicle Type	Passenger Car

GVWR (kg)	2100
GAWR Front (kg)	1140
GAWR Rear (kg)	1100

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

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

A

B

A-B*

*For trucks or MPVs, if A-B>136, RCLW=136 kg

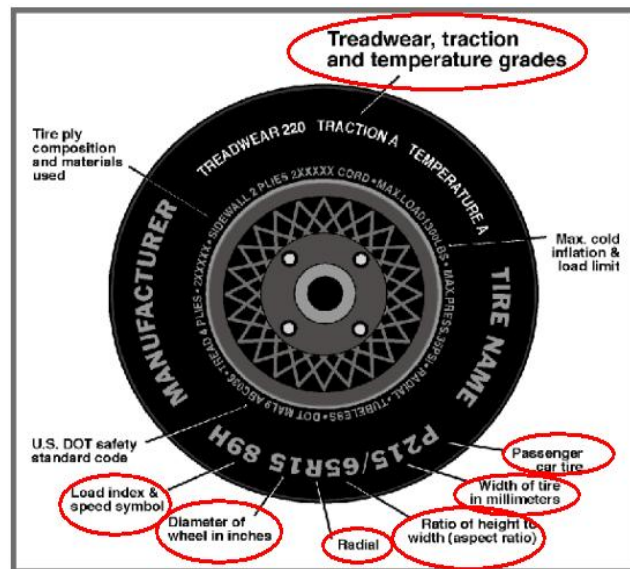
VEHICLE SEAT TYPE

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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	230	220
Recommended Tire Size	245/40R18	245/40R18
Tire Size on Vehicle	245/40R18	245/40R18
Tire Manufacturer	Dunlop	Dunlop
Tire Model	SP Sport MAXX GT 600A	SP Sport MAXX GT 600A
Treadware	200	200
Traction Grade	A	A
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	116T	116T
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	1V2JX HVY R2922	1V2JX HVY R2922
DOT Safety Code Right	1V2JX HVY R2922	1V2JX HVY R2922

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

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	480.5	303.0		501.0	339.5		477.5	330.0	
Right	kg	443.0	320.5		438.5	355.0		458.5	360.5	
Ratio	%	59.7%	40.3%	100.0%	57.5%	42.5%	100.0%	57.5%	42.5%	100.0%
Total	kg	923.5	623.5	1547.0	939.5	694.5	1634.0	936.0	690.5	1626.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1547.0	A
Actual Weight of 1 SID-IIs ATD Used	kg	49.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	44.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1640.8	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)*	°	-0.3	0.1	0.2	Yes
Front Passenger Sill Angle (front-to-rear)*	°	-1.2	-0.6	-0.7	Yes
Front Bumper-Line Angle (left-to-right)**	°	-0.7	-0.8	-0.9	Yes
Rear Bumper-Line Angle (left-to-right)**	°	0.2	0.0	0.0	Yes
Vehicle CG (Aft of Front Axle)	mm	1076	1135	1133	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	10	22	-6	

*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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Tail Lights	3.0
Tool kit	6.0

TEST SURFACE MARKINGS

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	0
Aft 25 mm target	0

DATA SHEET NO. 2**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA**Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022**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	9.2	0.0	4.6
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	4.6	515	Max	514	526	537
			Mid	492	504	515
			Min	470	482	493
Front Passenger Seat	Fixed	529	Max			
			Mid	511	520	529
			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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

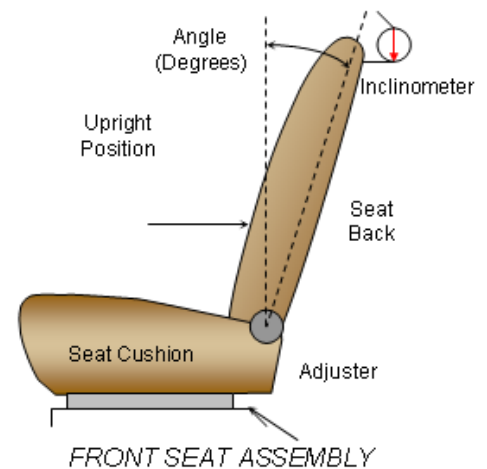
SEAT FORE/AFT POSITION

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 an inclinometer along the bottom of the headrest post.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/Seated Dummy	68.4	27	2.2	6
Front Passenger Seat	75.4	41	2.4	6
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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501

Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

SEAT BELT ANCHORAGE ADJUSTMENT

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

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

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	L

DATA SHEET NO. 2 ... (CONTINUED)

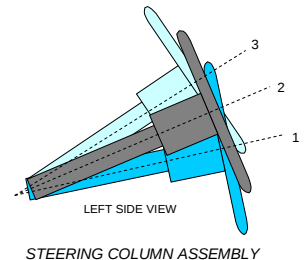
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

STEERING COLUMN ADJUSTMENT

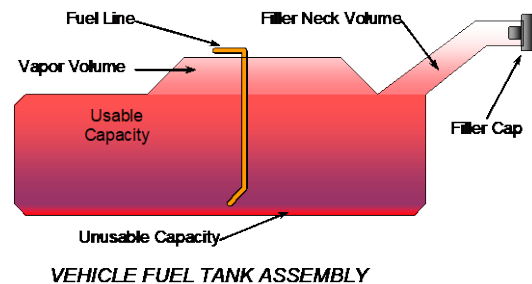
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of the geometric locus it describes when it moves through its full range of motion.

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	64.1	134
Geometric Center - Position 2	65.0	162.5
Uppermost - Position 3	65.8	191
Telescoping Steering Wheel Travel		57
Test Position	65.0	163



FUEL PUMP

The vehicle is equipped with an electric fuel pump. The pump will work at "ignition on" until pressure in the system has reached working pressure in the system; then it will stop pumping fuel until the engine has been started.



FUEL TANK CAPACITY

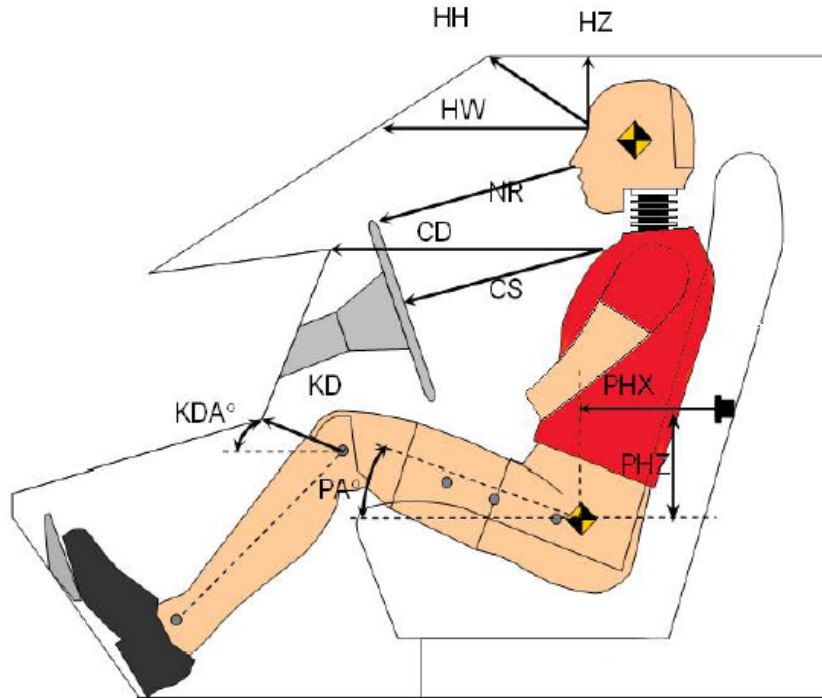
Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	62.84
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)*	
Usable Capacity of "Optional Tank" (see Owner's Manual)*	
93% of Usable Capacity	58.44
Actual amount of Solvent Used in Test	58.44
1/3 of Usable Capacity	20.95

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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	231	
HW	Head to Windshield	649	
HZ	Head to Roof	201	
NR	Nose to Rim	234	
CD	Chest to Dash	433	
CS	Chest to Steering Wheel	161	
KD(L)/KDA(L)°	Left Knee to Dash	105	36.2
KD(R)/KDA(R)°	Right Knee to Dash	105	46.1
PAX°	Pelvic Tilt Angle (x-axis)		21.6
PAY°	Pelvic Tilt Angle (y-axis)		0.4
PHX	Hip Point to Striker (x-axis)	382	
PHZ	Hip Point to Striker (z-axis)	185	

DATA SHEET NO. 4

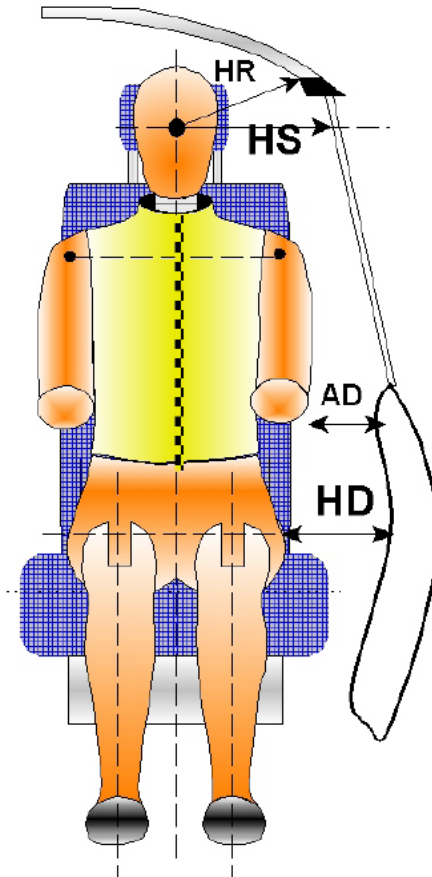
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan

NHTSA No. O20225501

Test Program: NCAP Side Pole Impact Test

Test Date: 12/08/2022

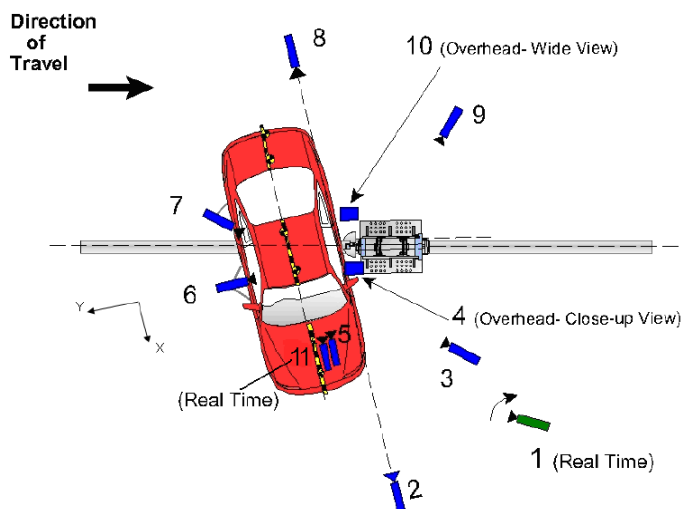


Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	265
HS	Head to Side Window	mm	384
AD	Arm to Door	mm	199
HD	Hip Point to Door	mm	185

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



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	35	1000
3	Impact Side 45° - Forward Pole View	4.10	-2.15	-1.15	25	1000
4	Overhead Close-Up View of Impact	0.00	0.00	-5.79	35	1000
5	On-Board - Dummy Front View	1.34	-0.53	-1.57	8	1000
6	On-Board - Dummy Side View	0.06	0.73	-1.32	6	1000
7	On-Board - Dummy Rear Oblique View	-0.97	0.70	-1.36	6	1000
8	Rear Ground Level - Impact View	-1.30	1.68	-1.26	35	1000
9	Impact Side 45° - Rearward Pole View	-8.02	0.04	-1.01	25	1000
10	Overhead Wide View of Impact	-0.06	0.22	-5.79	15	1000
11	Real Time Dummy Front View	1.34	-0.52	-1.56		30

*All measurements accurate to ± 6 mm

NOTE: Vehicle is at a 75 angle to the rigid pole.

If applicable, explain why camera(s) did not operate as intended: N/A

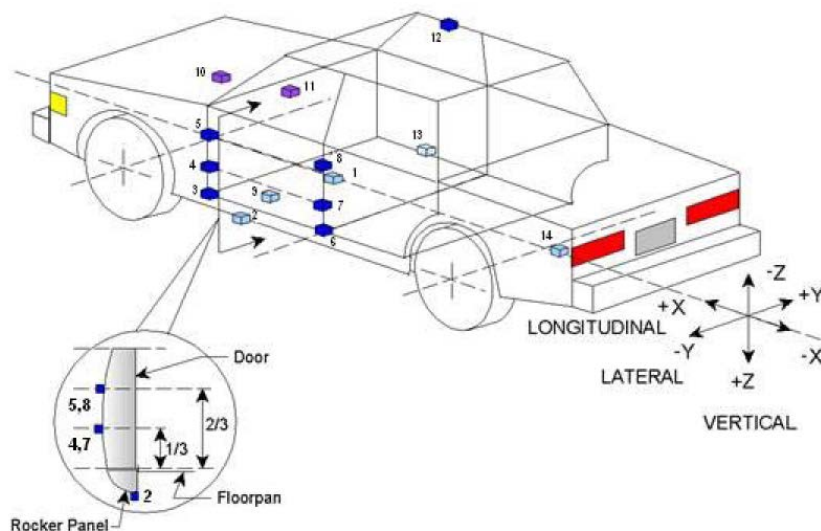
INSTRUMENTATION

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

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	1857	0	291
2	Left Floor Sill	2564	771	173
3	A-Pillar Sill	3130	-804	433
4	A-Pillar Low	3130	-804	618
5	A-Pillar Mid	3130	-804	862
6	B-Pillar Sill	1999	-731	305
7	B-Pillar Low	1999	-731	701
8	B-Pillar Mid	1999	-731	993
9	Driver Seat Track	2203	-157	263
10	Engine Top	3529	0	815
11	Firewall	3438	391	580
12	Right Roof	2145	485	1441
13	Right Floor Sill	1990	737	296
14	Rear Floorpan	942	0	461

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

DATA SHEET NO. 7

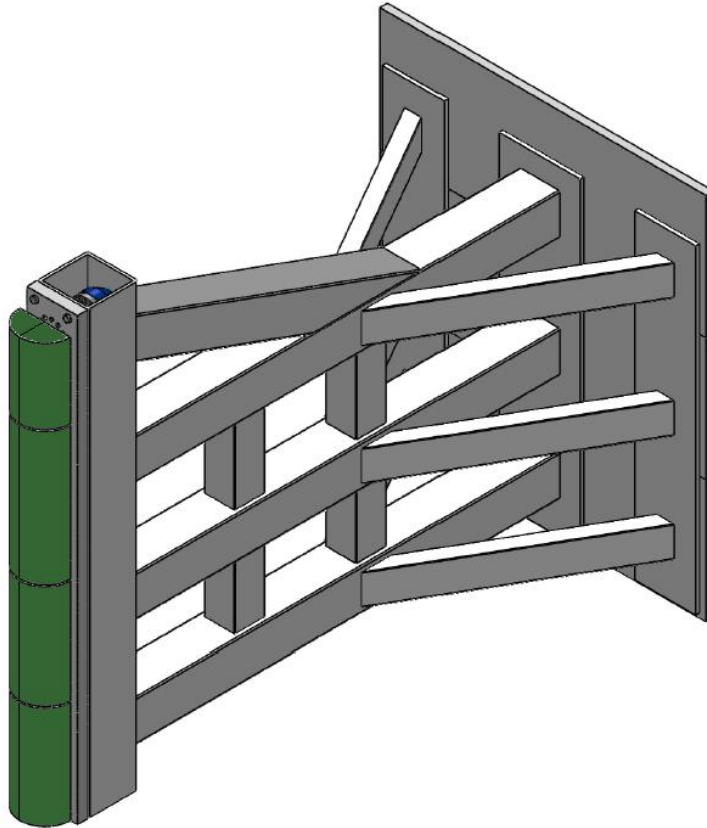
RIGID POLE LOAD CELL DATA

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan

NHTSA No. O20225501

Test Program: NCAP Side Pole Impact Test

Test Date: 12/08/2022



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: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

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
Left Shoulder	Torso/Pelvis Airbag
Upper Torso	Torso/Pelvis Airbag, Door Trim, Seat Bolster
Lower Torso	Torso/ Pelvis Airbag, Door Trim, Seat Bolster
Left Hip	Torso/Pelvis Airbag, Door Trim
Left Knee	Door Trim

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

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

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	None
Windshield Damage	Broken
Side Window Damage	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

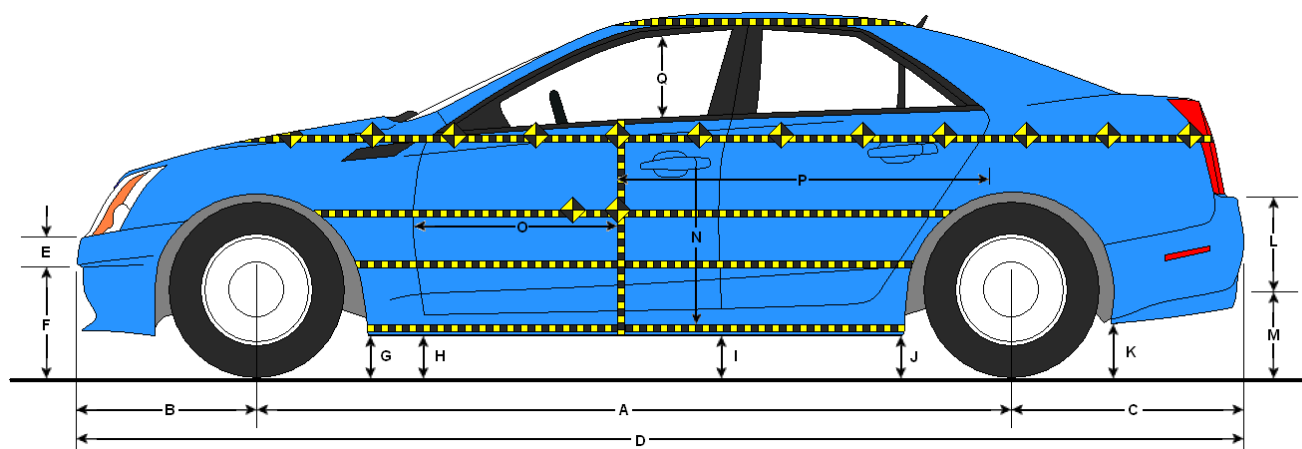
IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		1112
Actual Impact Point (Aft of Front Axle)	mm		1122
Horizontal Offset (+ forward / - rearward)	mm	± 38 of Intended Impact Point	-15
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	°	75 ± 3	74.6
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.30
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.37

DATA SHEET NO. 9

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



LEFT SIDE VIEW

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

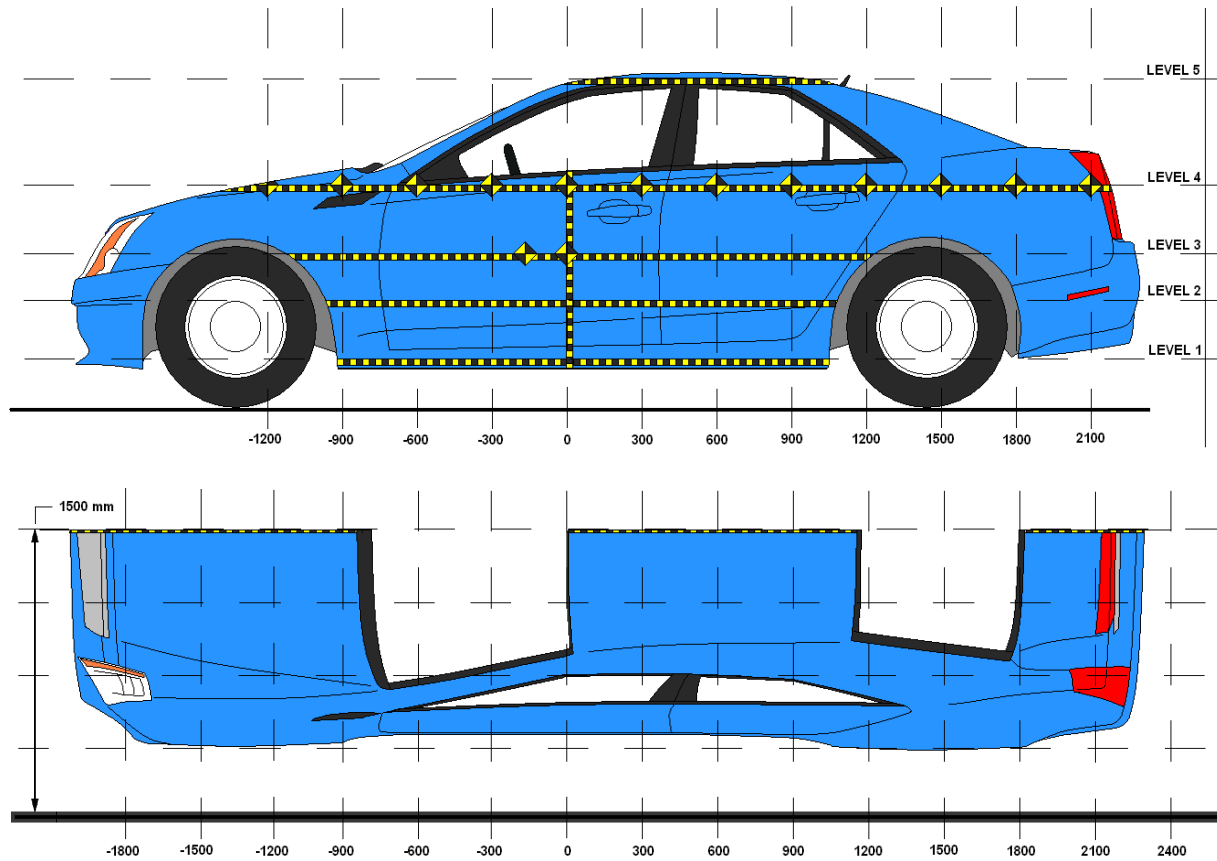
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Change
A	Wheelbase	2669	2577	-92
B	Front Axle to FSOV	1002	1051	49
C	Rear Axle to RSOV	999	1003	4
D	Total Length at Centerline	4671	4632	-39
E	Front Bumper Thickness	232	232	0
F	Front Bumper Bottom to Ground	427	423	-4
G	Sill Height at Front Wheel Well	252	224	-28
H	Sill Height at Front Door Leading Edge	240	219	-21
I	Sill Height at B-Pillar	248	242	-6
J1	Sill Height at Rear Wheel Well	179	208	29
J2	Pinch Weld Height at Rear Wheel Well	154	172	18
K	Sill Height Aft of Rear Wheel Well	296	302	6
L	Rear Bumper Thickness	146	147	1
M	Rear Bumper Bottom to Ground	416	415	-1
N	Sill Height to Bottom of Front Window Sill	672	680	8
O	Front Door Leading Edge to Impact CL	642	547	-95
P	Rear Door Trailing Edge to Impact CL	1550	1479	-71
Q	Front Window Opening	391	402	11
R	Right Side Length	3390	3402	12
S	Left Side Length	3388	3288	-100
T	Vehicle Width at B-Pillar	1760	1641	-119

DATA SHEET NO. 10

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



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	284	329	-150
2	Occupant H-Point	527	356	0
3	Mid-Door	625	364	0
4	Window Sill	875	322	0
5	Window Top	1375	132	0

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test (mm)					Post-Test (mm)					Crush (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900				659					616					-43	
-750	630			670		623			641		-7			-29	
-600	642	608	610	664		713	581	583	671		71	-27	-27	7	
-450	640	613	610	664		791	678	672	730		151	65	62	66	
-300	640	611	607	657		870	763	763	799		230	152	156	142	
-150	641	610	605	651		970	864	866	876		329	254	261	225	
0	642	609	604	645	892	928	965	968	967	1024	286	356	364	322	132
150	644	609	604	640	895	835	938	942	946	979	191	329	338	306	84
300	647	611	605	635	895	776	823	826	836	962	129	212	221	201	67
450	647	613	607	631	895	726	746	738	746	943	79	133	131	115	48
600	649	615	609	627	895	707	696	692	706	928	58	81	83	79	33
750	653	616	612	627	896	683	670	675	690	917	30	54	63	63	21
900	652	611	608	631	900	633	639	648	677	911	-19	28	40	46	11
1050		598	595	636	907		619	616	666	910		21	21	30	3
1200			585	640	916			592	653	919			7	13	3
1350				631					626					-5	
1500				616					597					-19	
1650				618					621					3	
1800				626					628					2	
1950				637					639					2	
2100				654					656					2	
2250															
2400															
2550															
2700															
2850															

DATA SHEET NO. 10 ... (CONTINUED)

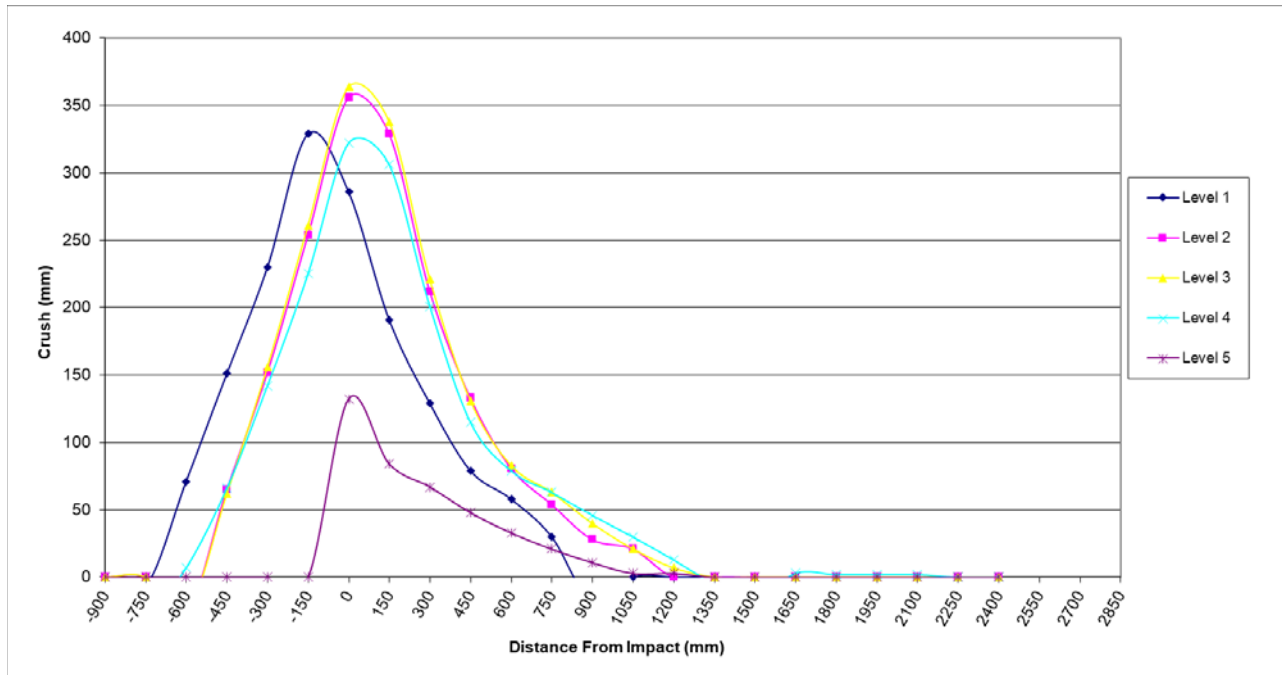
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan

NHTSA No. O20225501

Test Program: NCAP Side Pole Impact Test

Test Date: 12/08/2022

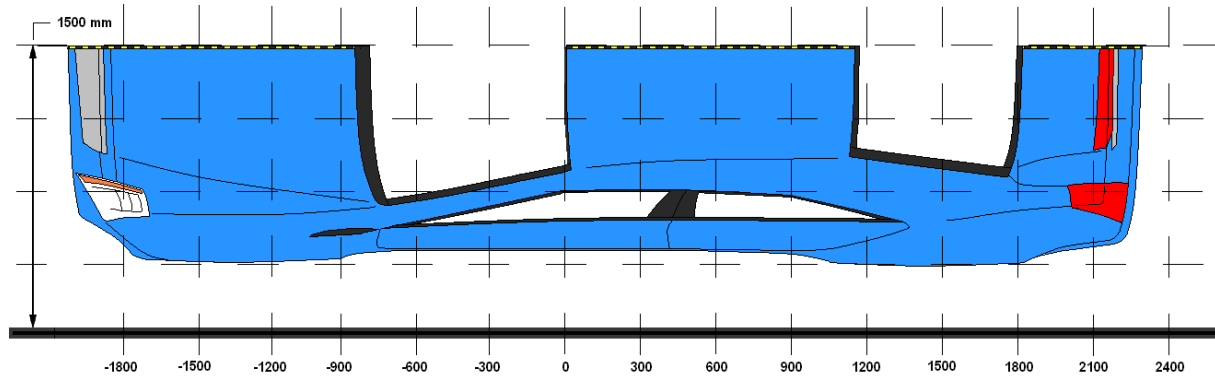


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501

Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022



DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2100	4	654	656	2
2	1500	4	616	597	-19
3	900	4	631	677	46
4	300	3	605	826	221
5	-300	1	640	870	230
6	-900	4	659	616	-43

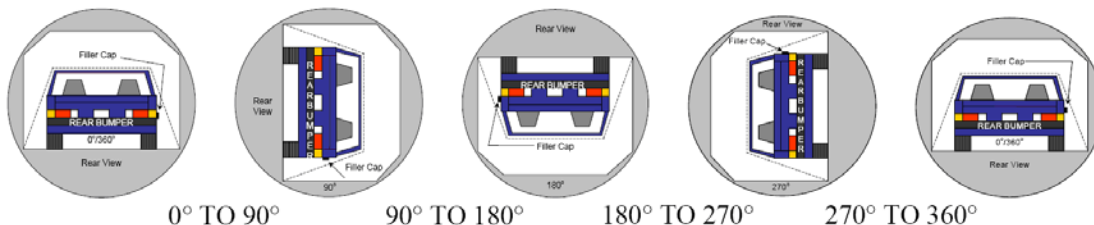
DATA SHEET NO. 12

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan NHTSA No. O20225501
 Test Program: NCAP Side Pole Impact Test Test Date: 12/08/2022

Temperature at Time of Impact: 10.6° C Test Time: 1:43 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°	84	300	384
90° To 180°	80	300	380
180° To 270°	82	300	382
270° To 360°	82	300	382

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 13

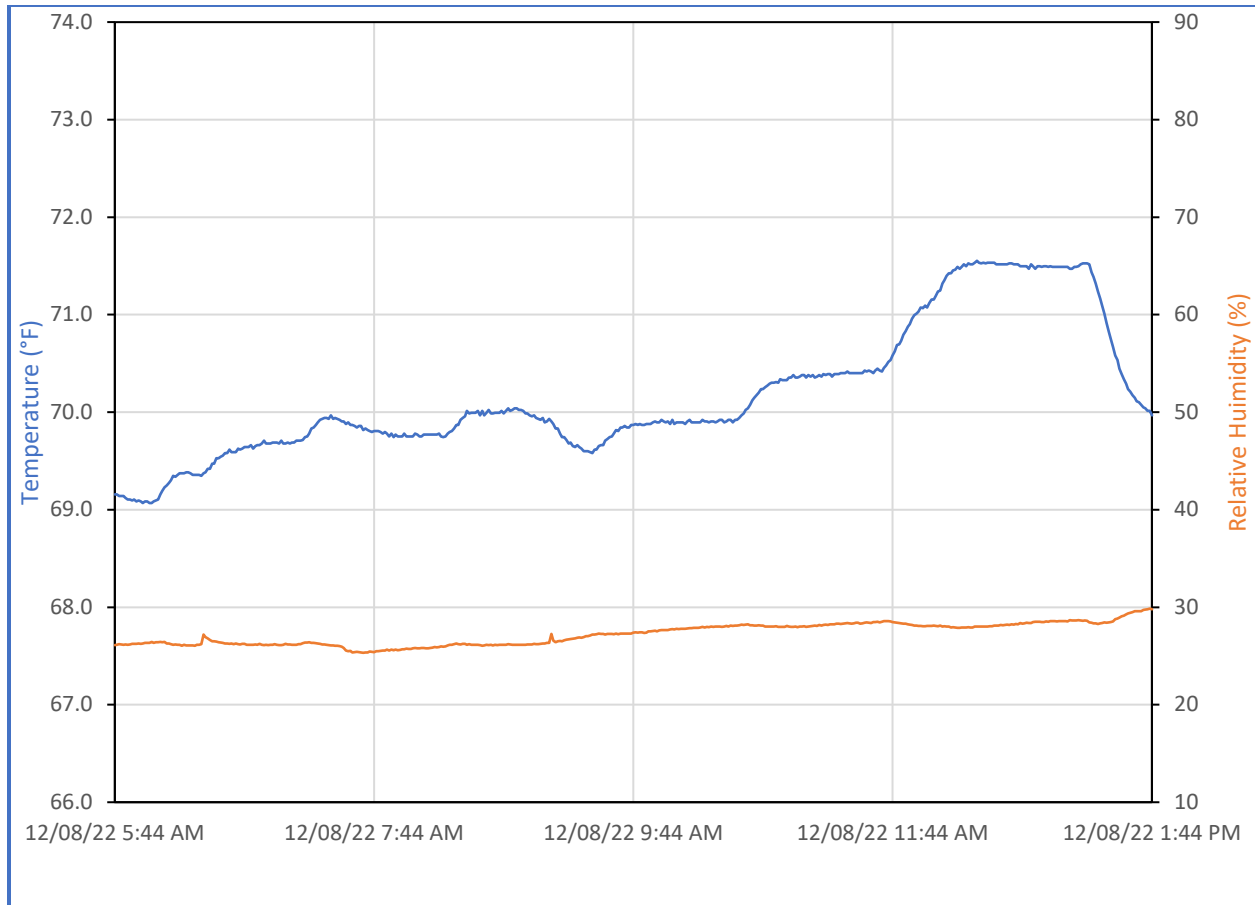
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan

NHTSA No. O20225501

Test Program: NCAP Side Pole Impact Test

Test Date: 12/08/2022



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure		Page
1	As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle	A-1
2	As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle	A-1
3	Pre-Test Frontal View of Test Vehicle	A-2
4	Post-Test Frontal View of Test Vehicle	A-2
5	Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle	A-3
6	Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle	A-3
7	Pre-Test Left Side View of Test Vehicle	A-4
8	Post-Test Left Side View of Test Vehicle	A-4
9	Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-5
10	Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-5
11	Pre-Test Rear View of Test Vehicle	A-6
12	Post-Test Rear View of Test Vehicle	A-6
13	Pre-Test Right Side View of Test Vehicle	A-7
14	Post-Test Right Side View of Test Vehicle	A-7
15	Pre-Test Overhead View of Test Area	A-8
16	Post-Test Overhead View of Test Area	A-8
17	Pre-Test Left Side View of Pole Positioned Against Side of Vehicle	A-9
18	Pre-Test Right Side View of Pole Positioned Against Side of Vehicle	A-9
19	Pre-Test Close-Up View of Impact Point Target	A-10
20	Post-Test Close-Up View of Impact Point Target Showing Impact Location	A-10
21	Pre-Test Front Close-Up View of Dummy Head and Chest	A-11
22	Post-Test Front Close-Up View of Dummy	A-11
23	Pre-Test Left Side View of Dummy Showing Belt and Chalking	A-12
24	Pre-Test Left Side View of Dummy Shoulder and Door Top View	A-12
25	Post-Test Left Side View of Dummy Shoulder and Door Top View	A-13
26	Pre-Test Frontal View of Seat Back Prior to Dummy Positioning	A-13
27	Pre-Test Frontal Close-Up View of Dummy Head and Shoulders in Relation to Head Restraint	A-14
28	Pre-Test Overhead View of Seat Pan Prior to Dummy Positioning	A-14
29	Pre-Test Overhead View of Dummy Thighs on Seat Pan	A-15
30	Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket	A-15
31	Pre-Test Left Side View of Dummy's Head Showing Dummy's Head is Level	A-16
32	Pre-Test Placement of Dummy's Feet	A-16
33	Pre-Test View of Belt Anchorage for Dummy	A-17
34	Pre-Test Left Side View of Steering Wheel	A-17
35	View of Disengaged Parking Brake	A-18

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
36	Pre-Test View of Parking Brake	A-18
37	Pre-Test Close-Up Left Side View of Driver Seat Track	A-19
38	Pre-Test Close-Up Left Side View of Driver Seat Back	A-19
39	Pre-Test Close-Up View of Driver Seat Back or Head Restraint	A-20
40	Pre-Test Dummy and Door Clearance View	A-20
41	Post-Test Dummy and Door Clearance View	A-21
42	Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment	A-21
43	Post-Test Right Side View of Dummy and Front Seat of Occupant Compartment	A-22
44	Pre-Test Inner Door Panel View	A-22
45	Post-Test Inner Door Panel View Showing Dummy Contact Locations	A-23
46	Post-Test Dummy Close-Up Head Contact with Vehicle Interior View	A-23
47	Post-Test Dummy Close-Up Head Contact with Side Airbag View	A-24
48	Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View	A-24
49	Post-Test Dummy Close-Up Torso Contact with Side Airbag View	A-25
50	Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View	A-25
51	Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View	A-26
52	Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View	A-26
53	Post-Test Right Side View of Dummy and Rear Seat of Occupant Compartment	A-27
54	Pre-Test Inner Rear Passenger Torso Airbag Deployment View	A-27
55	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	A-28
56	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	A-28
57	Close-Up View of Vehicle's Certification Label	A-29
58	Close-Up View of Vehicle's Tire Information Placard or Label	A-29
59	Pre-Test Pole Barrier Front View	A-30
60	Post-Test Pole Barrier Front View	A-30
61	Pre-Test Pole Barrier Side View	A-31
62	Post-Test Pole Barrier Side View	A-31
63	Pre-Test Ballast View	A-32
64	Post-Test Primary and Redundant Speed Trap Read-Out	A-32
65	FMVSS No. 301 Static Rollover 0 Degrees	A-33
66	FMVSS No. 301 Static Rollover 90 Degrees	A-33
67	FMVSS No. 301 Static Rollover 180 Degrees	A-34
68	FMVSS No. 301 Static Rollover 270 Degrees	A-34
69	FMVSS No. 301 Static Rollover 360 Degrees	A-35
70	Impact Event	A-35

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
71	Monroney Label	A-36
72	Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-36
73	Post-Test View of Shattered Vehicle Inner Door Panel	A-37



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



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



FIGURE 3. Pre-Test Frontal View of Test Vehicle



FIGURE 4. Post-Test Frontal View of Test Vehicle



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



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



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



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



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



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



FIGURE 11. Pre-Test Rear View of Test Vehicle



FIGURE 12. Post-Test Rear View of Test Vehicle



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



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



FIGURE 15. Pre-Test Overhead View of Test Area

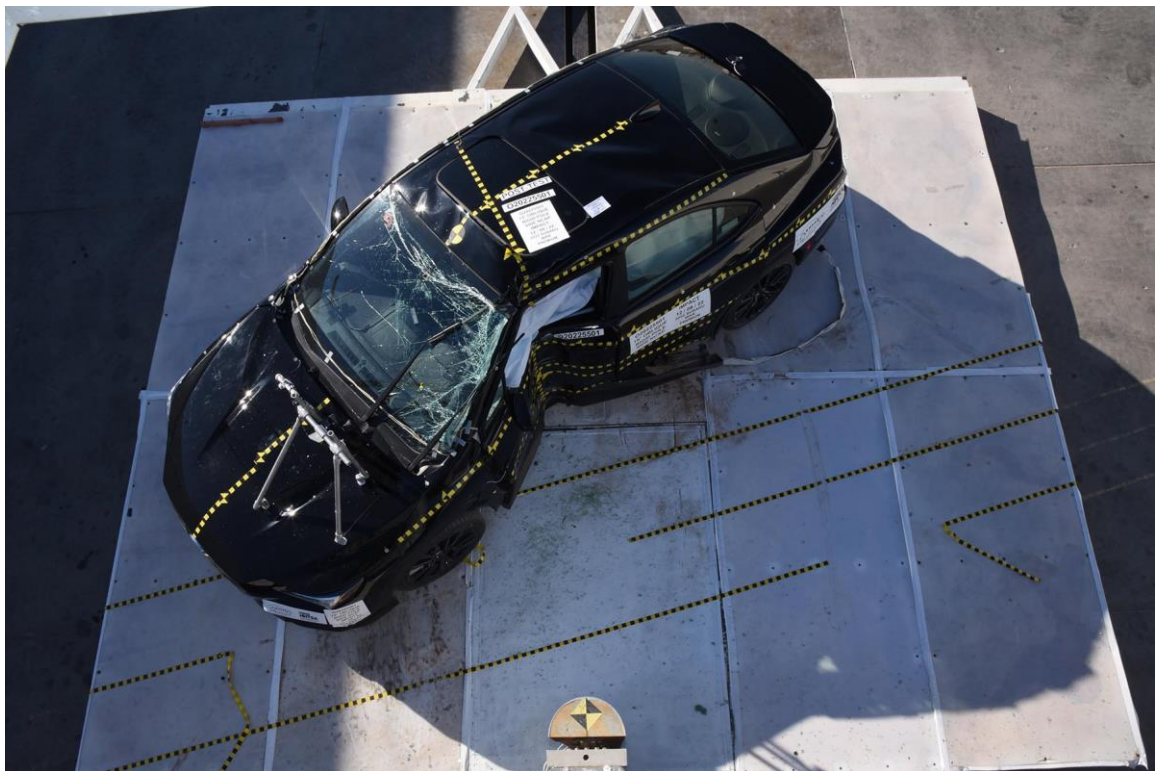


FIGURE 16. Post-Test Overhead View of Test Area



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



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



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



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



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

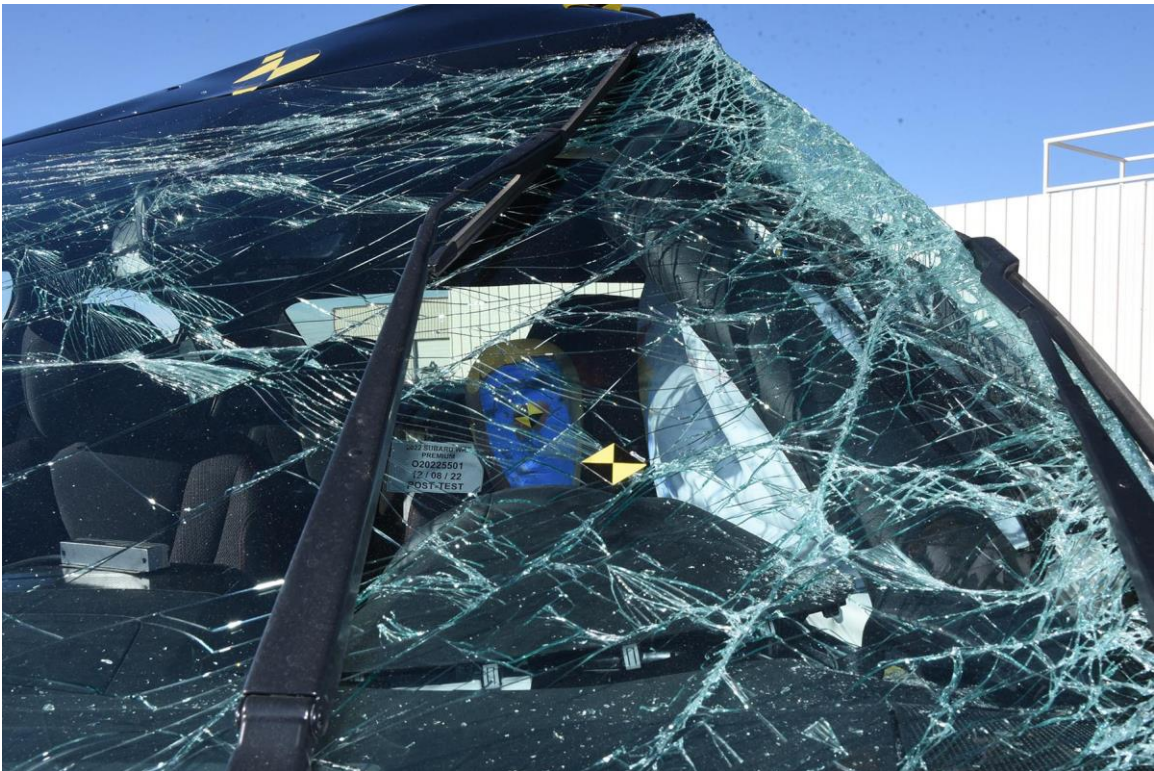


FIGURE 22. Post-Test Front Close-Up View of Dummy



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



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



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

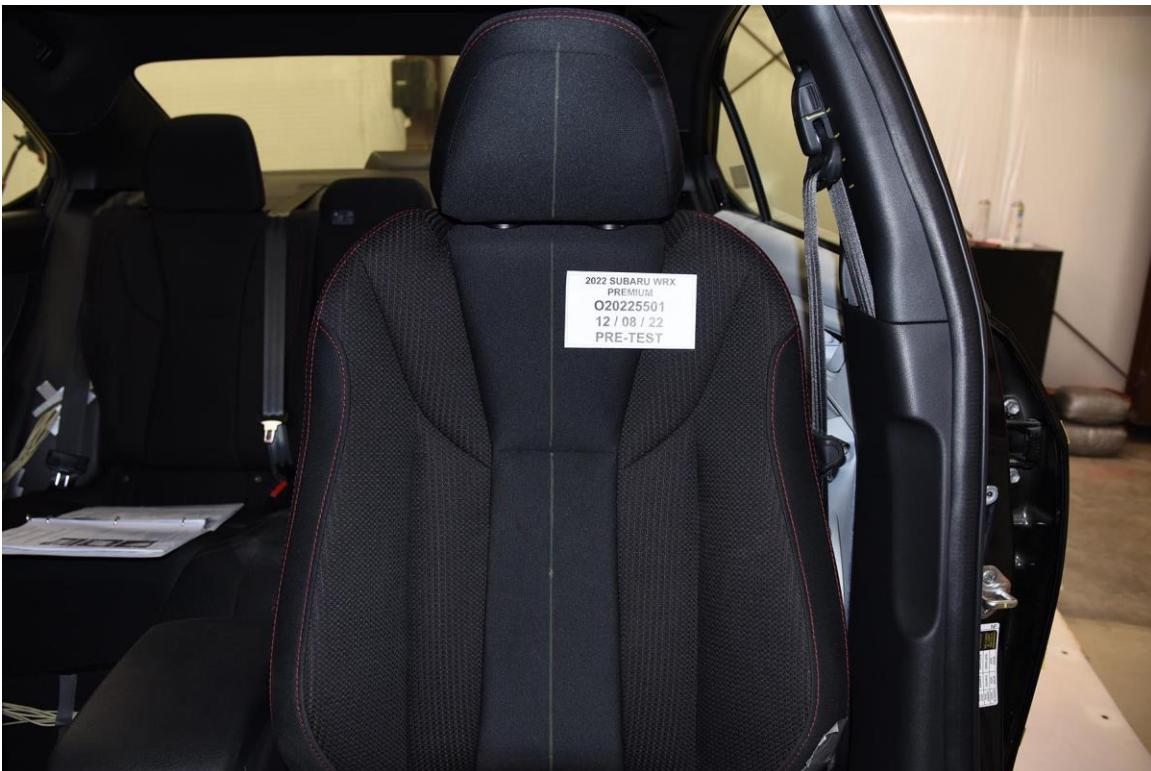


FIGURE 26. Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



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



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



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



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



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



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



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



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



FIGURE 35. View of Disengaged Parking Brake



FIGURE 36. Pre-Test View of Parking Brake



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



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



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



FIGURE 40. Pre-Test Dummy and Door Clearance View



FIGURE 41. Post-Test Dummy and Door Clearance View



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



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



FIGURE 44. Pre-Test Inner Door Panel View



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



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



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



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



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



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



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

Photograph Not Applicable

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



FIGURE 53. Post-Test Right Side View of Dummy and Rear Seat of Occupant Compartment

Photograph Not Applicable

FIGURE 54. Pre-Test Inner Rear Passenger Torso Airbag Deployment View



FIGURE 55. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 56. Post-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 57. Close-Up View of Vehicle's Certification Label

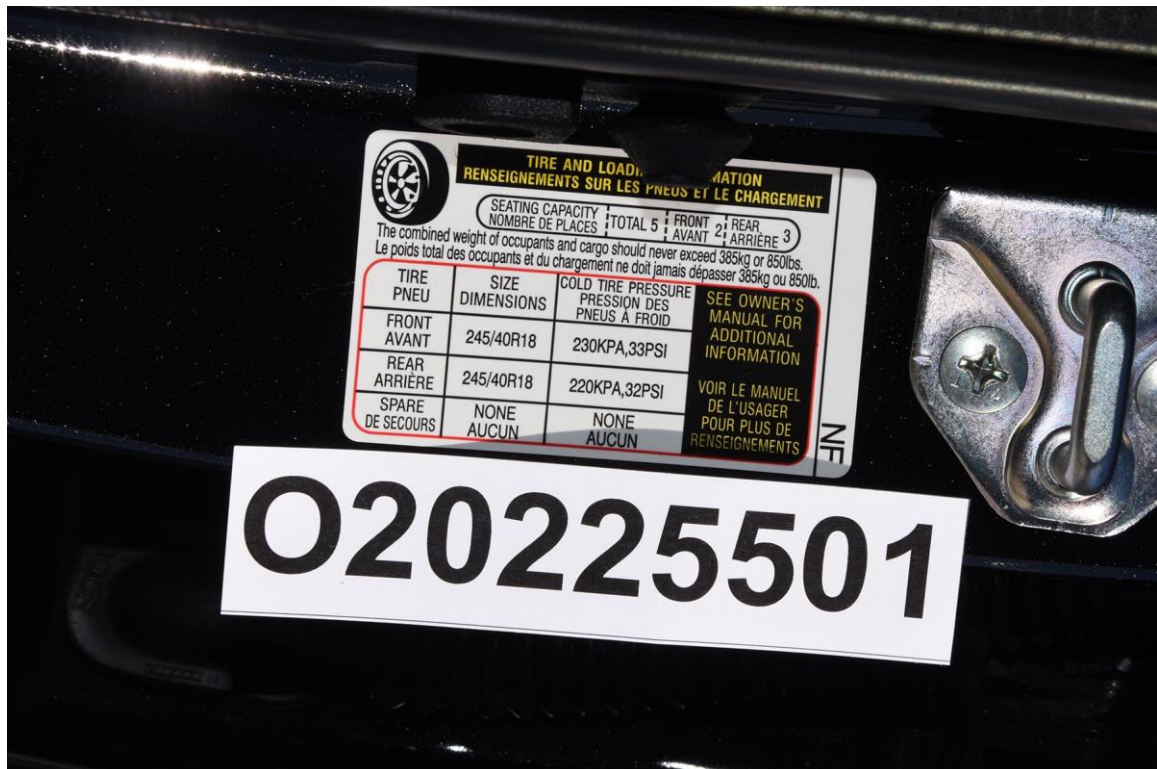


FIGURE 58. Close-Up View of Vehicle's Tire Information Placard or Label



FIGURE 59. Pre-Test Pole Barrier Front View



FIGURE 60. Post-Test Pole Barrier Front View



FIGURE 61. Pre-Test Pole Barrier Side View



FIGURE 62. Post-Test Pole Barrier Side View

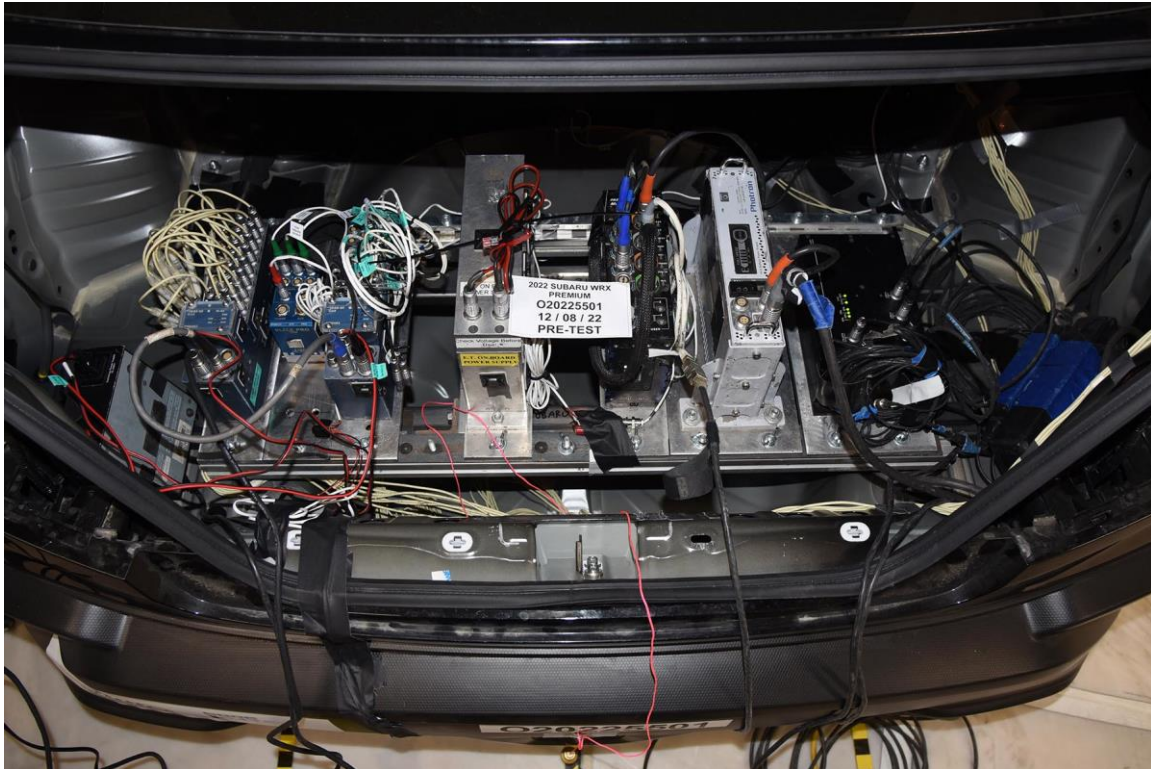


FIGURE 63. Pre-Test Ballast View



FIGURE 64. Post-Test Primary and Redundant Speed Trap Read-Out



FIGURE 65. FMVSS No. 301 Static Rollover 0 Degrees

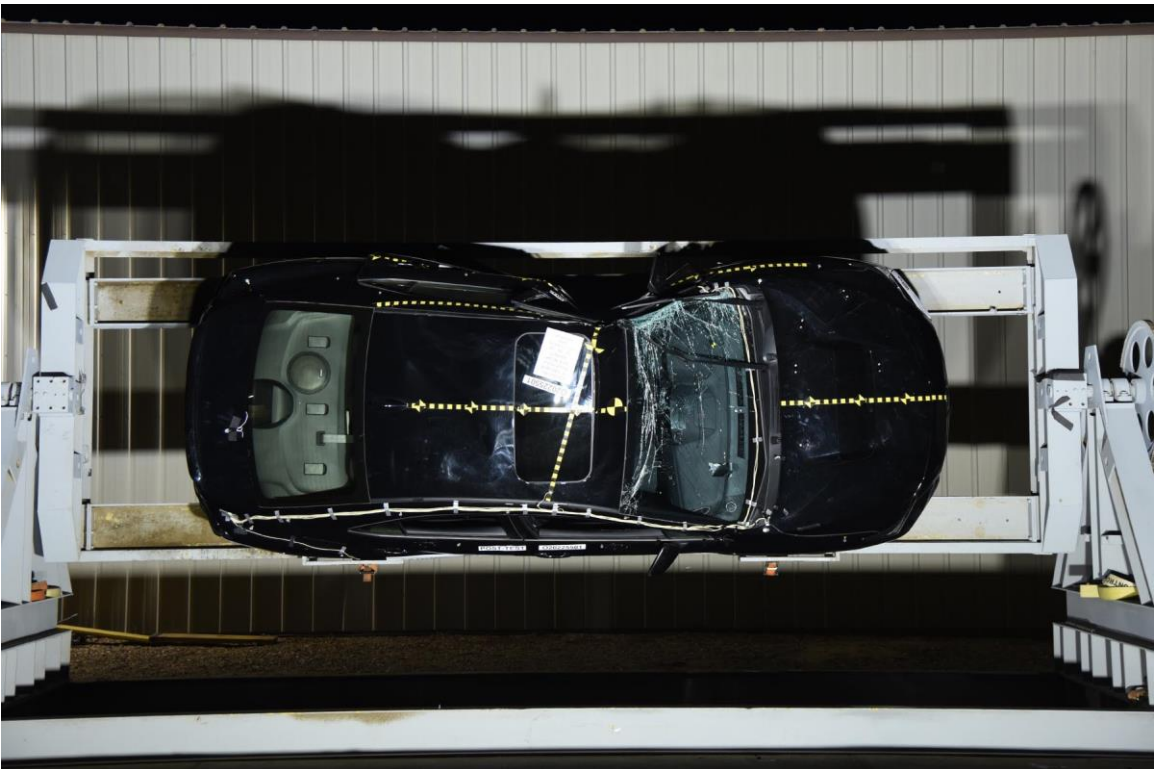


FIGURE 66. FMVSS No. 301 Static Rollover 90 Degrees

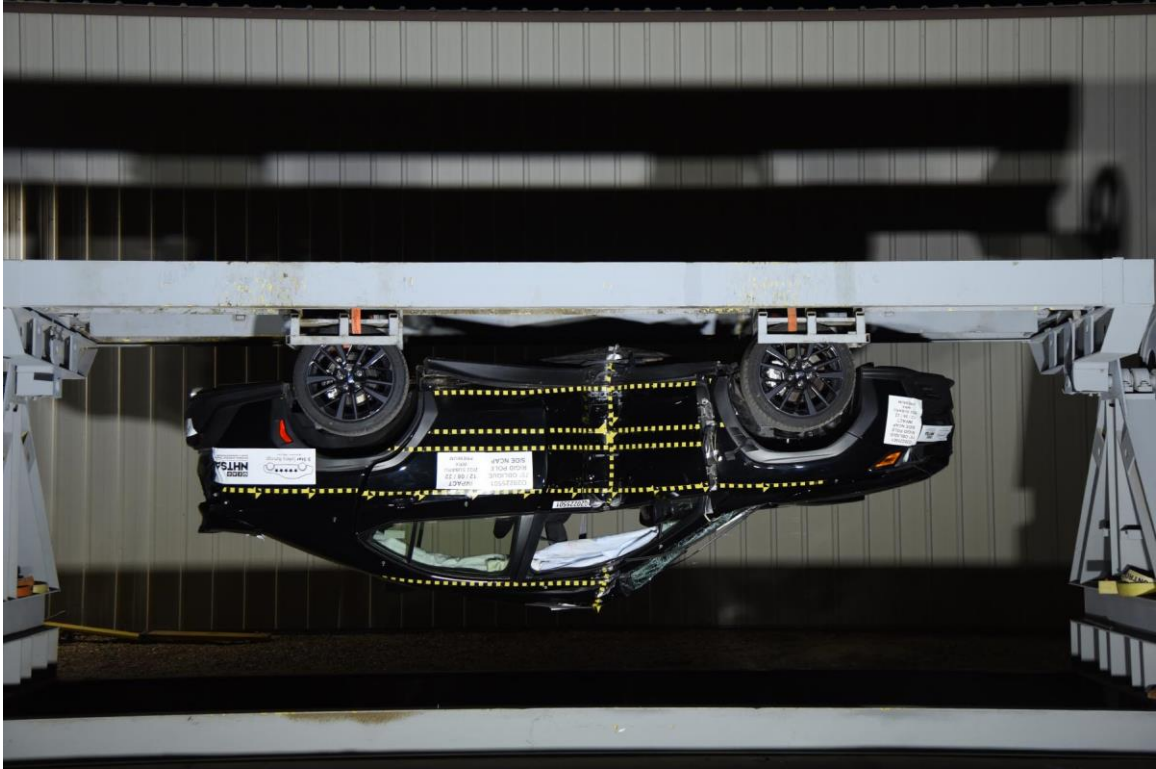


FIGURE 67. FMVSS No. 301 Static Rollover 180 Degrees

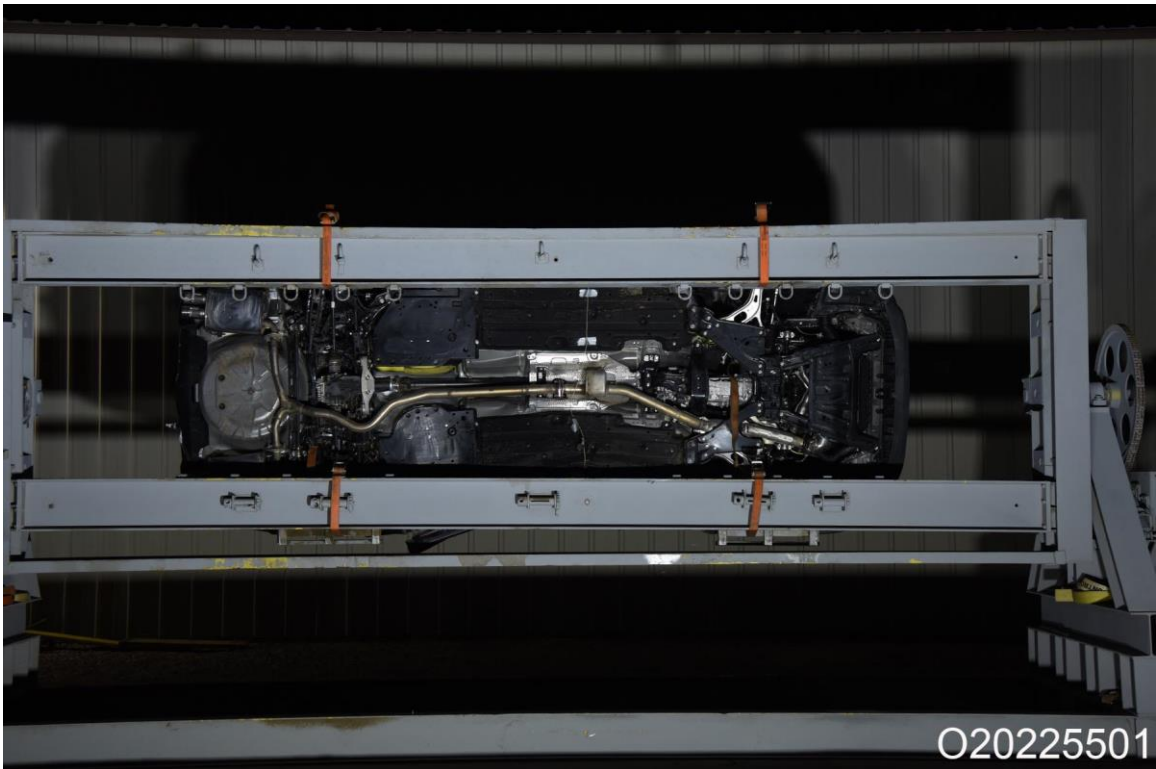


FIGURE 68. FMVSS No. 301 Static Rollover 270 Degrees



FIGURE 69. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 70. Impact Event

Photograph Not Applicable

FIGURE 73. Post-Test View of Shattered Vehicle Inner Door Panel

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

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

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

www.NHTSA.gov

Additional Driver Dummy Instrumentation Data

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

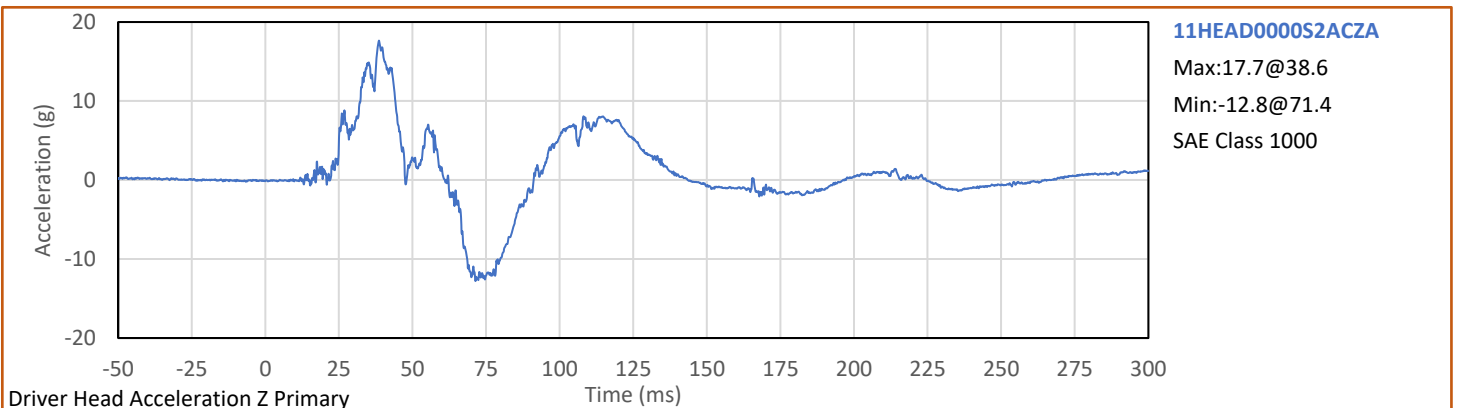
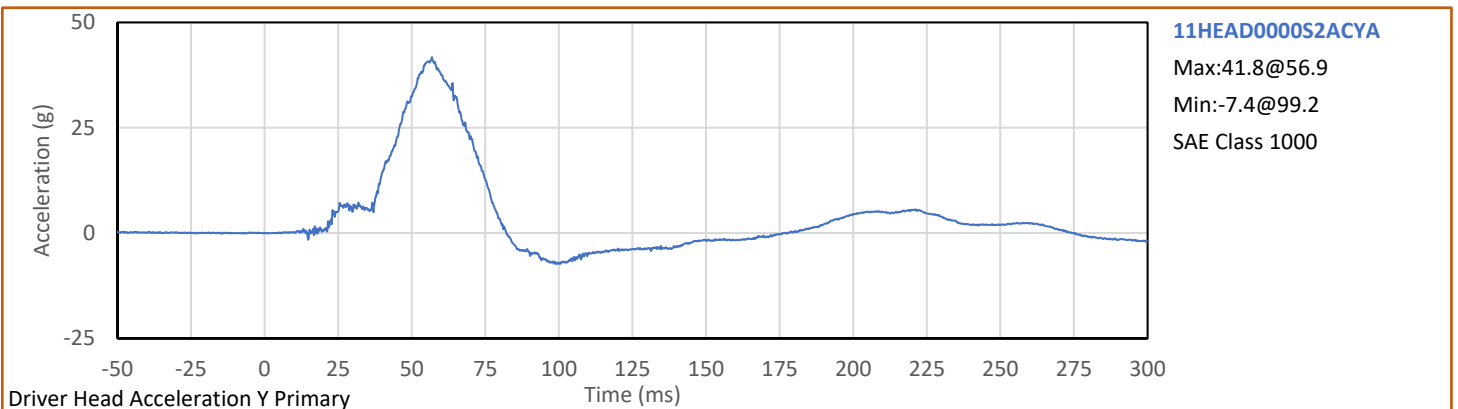
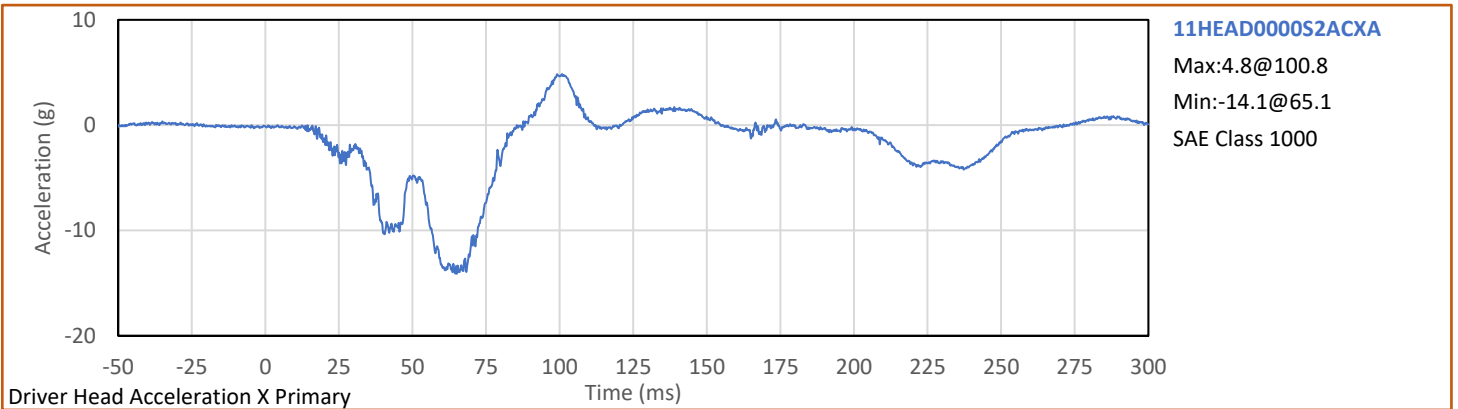
Driver Head Acceleration Redundant (Z)

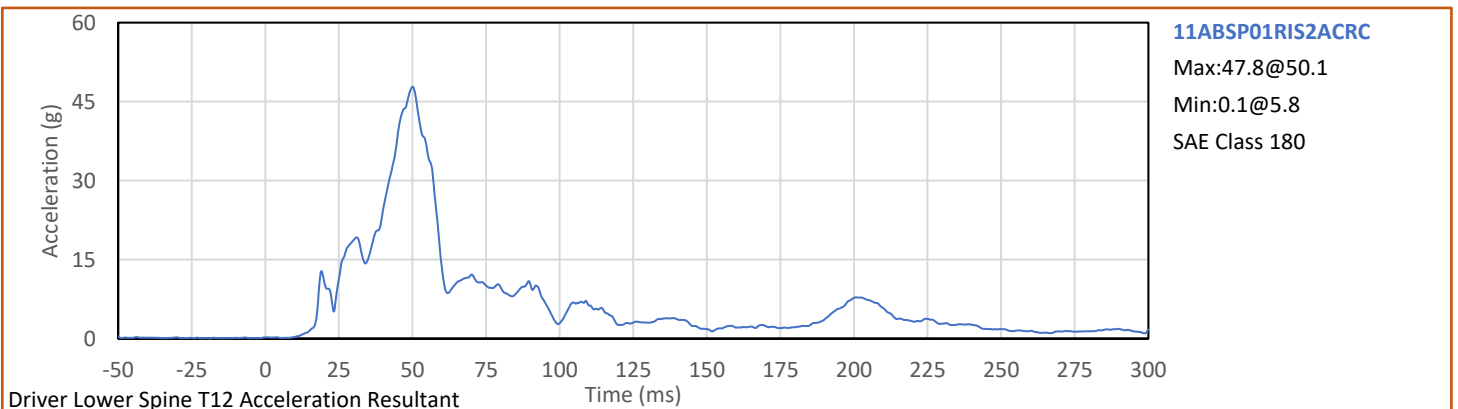
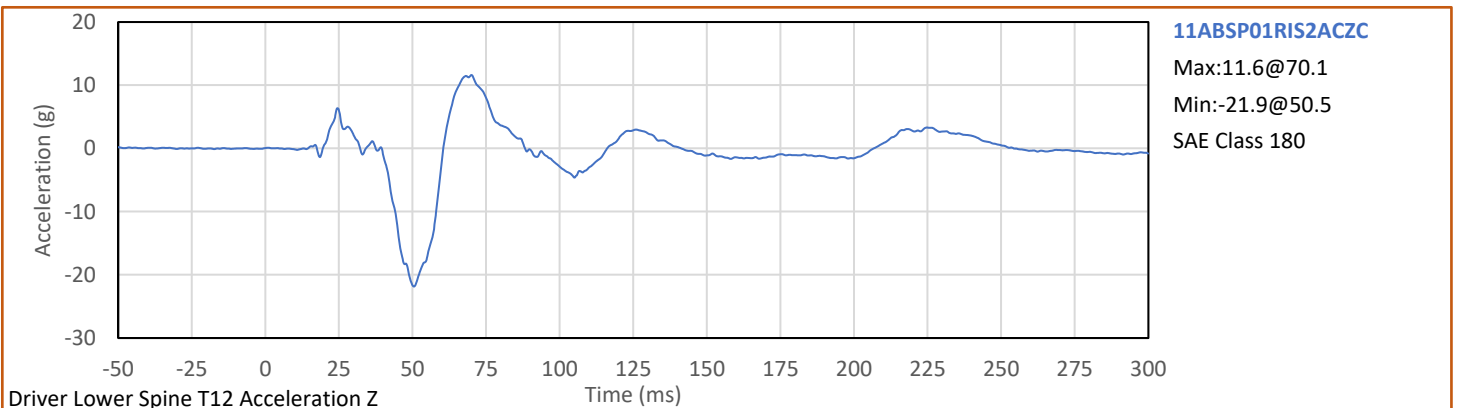
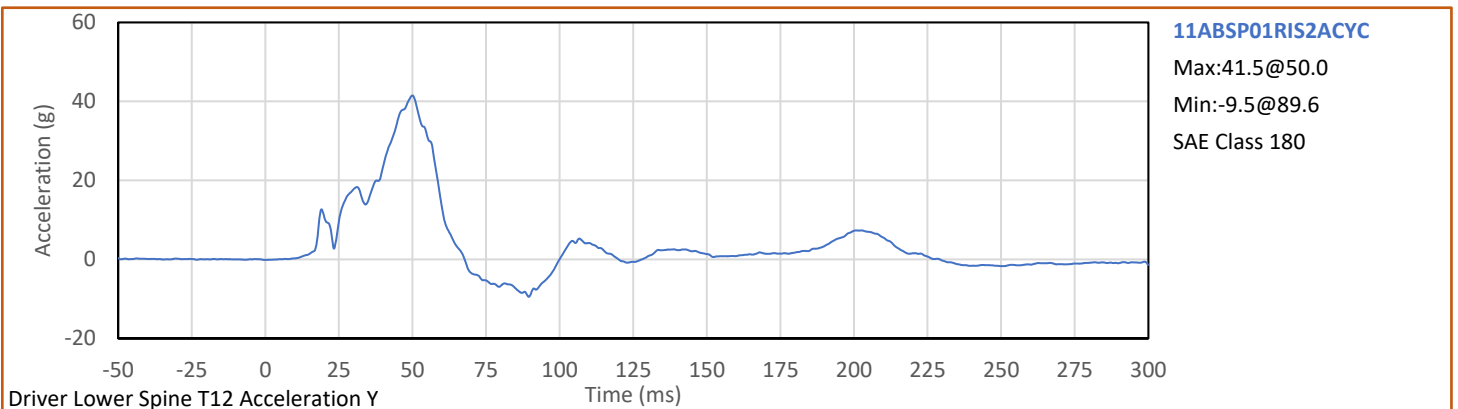
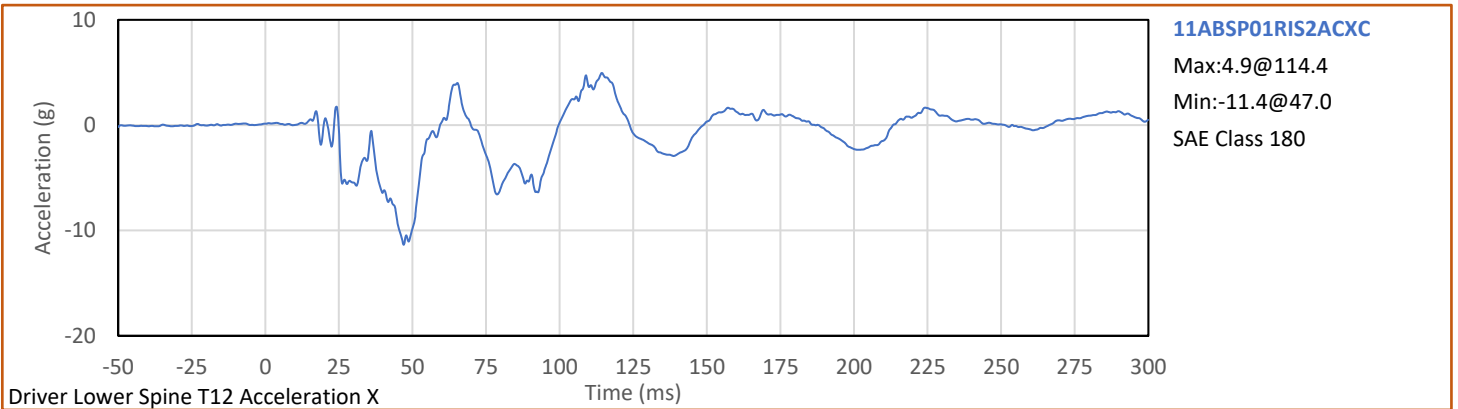
Vehicle Instrumentation Data

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

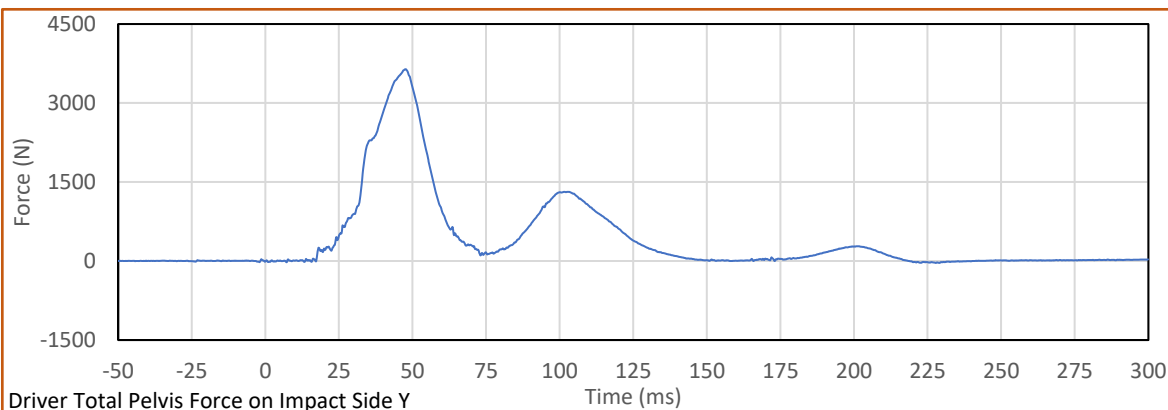
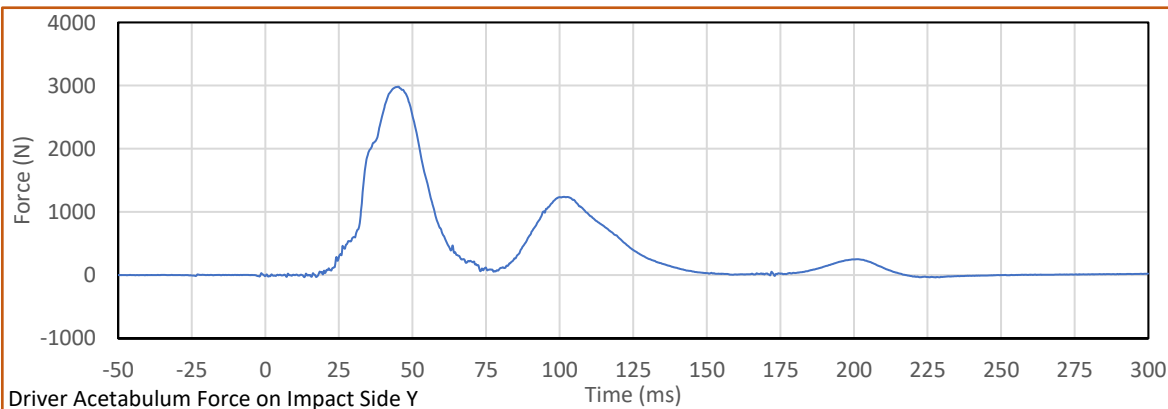
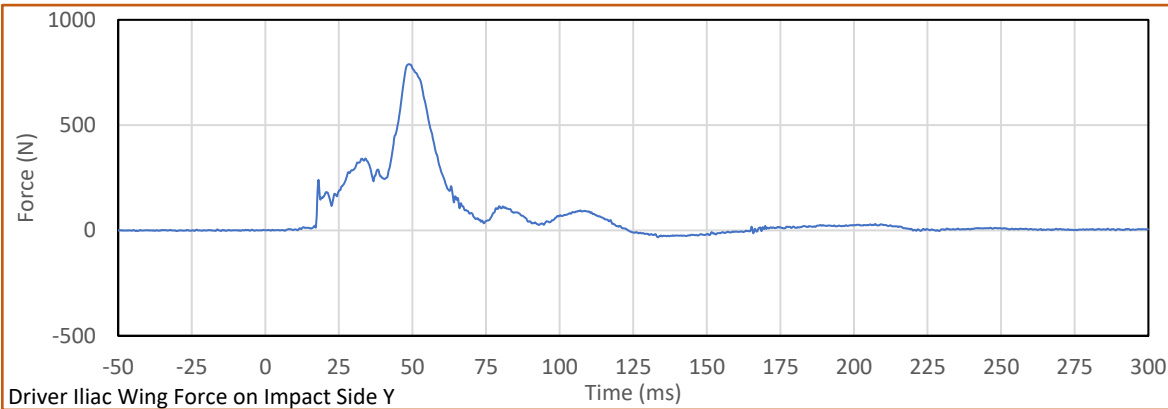
Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)





Test Vehicle: 2022 Subaru WRX Premium 4-Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20225501
Test Date: 12/8/2022



APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
Pre-Test ATD Qualification and Performance Verification
SID-IIs Small Side Impact ATD, Left Side Configuration
S/N: 299

ATD Serial No.: 299

Test Date: 2022-10-31

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
A - Sitting Height	mm	772	788	778	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	87	Pass
D - H Point From Seatback	mm	141	151	147	Pass
E - Shoulder Pivot From Backline	mm	97	107	102	Pass
F - Thigh Clearance	mm	119	135	125	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	182	Pass
J - Head Circumference	mm	541	551	543	Pass
K - Buttock To Knee Length	mm	514	540	525	Pass
L - Popliteal Height	mm	343	369	352	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	201	Pass
P - Foot Length	mm	216	232	223	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	321	Pass
R - Arm Length	mm	249	259	253	Pass
S - Knee Joint To Seatback	mm	477	493	487	Pass
V - Shoulder Width	mm	341	357	354	Pass
W - Foot Width	mm	78	94	88	Pass
Y - Chest Circumference W/Jacket	mm	851	881	866	Pass
Z - Waist Circumference	mm	761	791	769	Pass
				Overall Test Results	Pass

Technician:



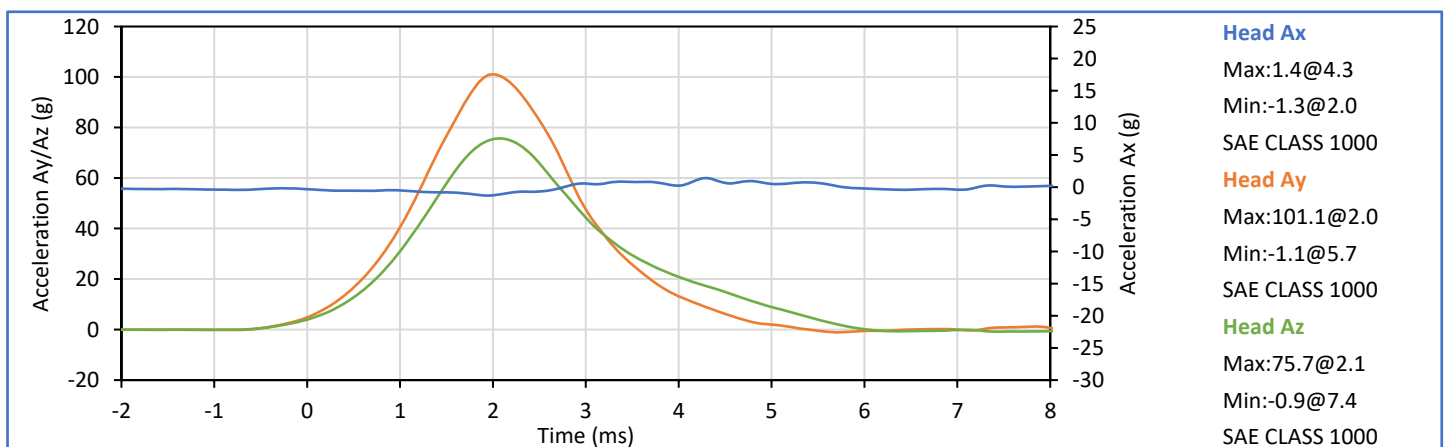
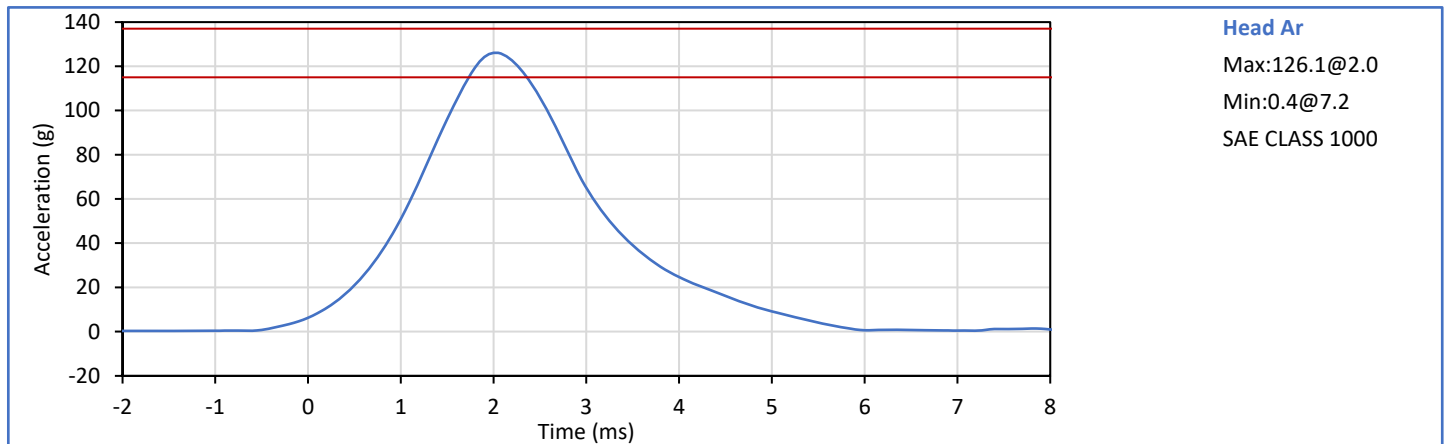
G. Fuentes

Approved By:



J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	115.0	137.0	126.1	Pass
Peak Head Ax	g	-15.0	15.0	1.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Technician:

G. Fuentes

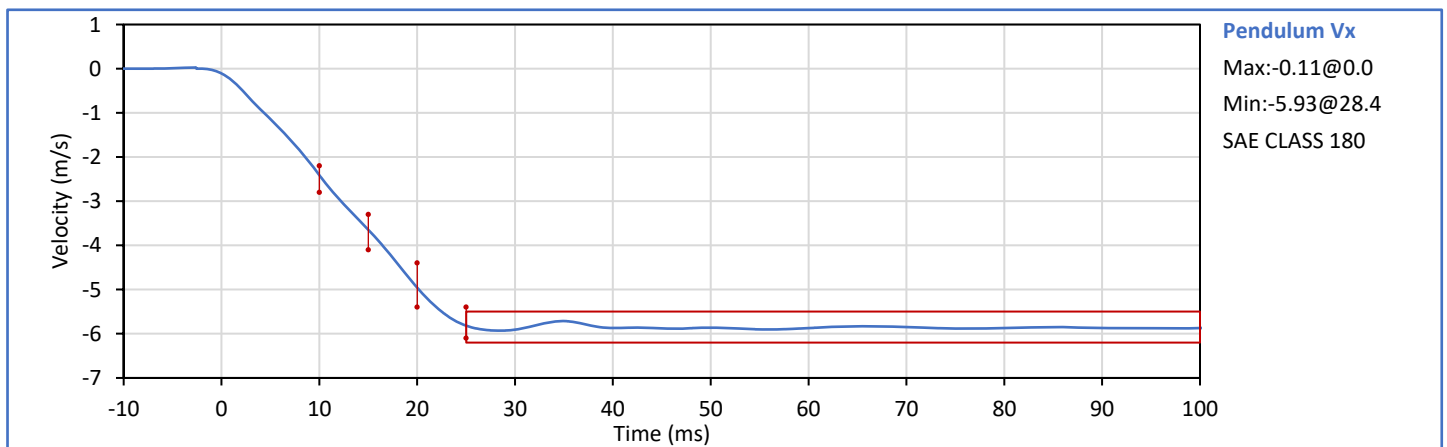
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

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	30	Pass
Pendulum Velocity	m/s	5.51	5.63	5.56	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.41	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.65	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-4.96	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.82	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.93/-5.72	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-76.3	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.8	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	42.5	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	114.4	Pass
				Overall Test Results	Pass



Technician:

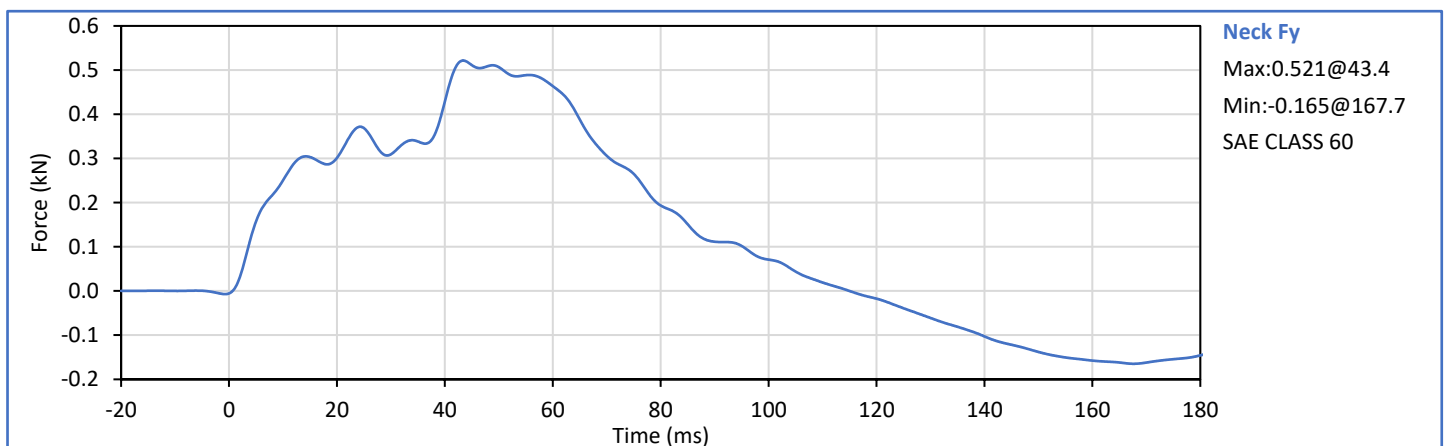
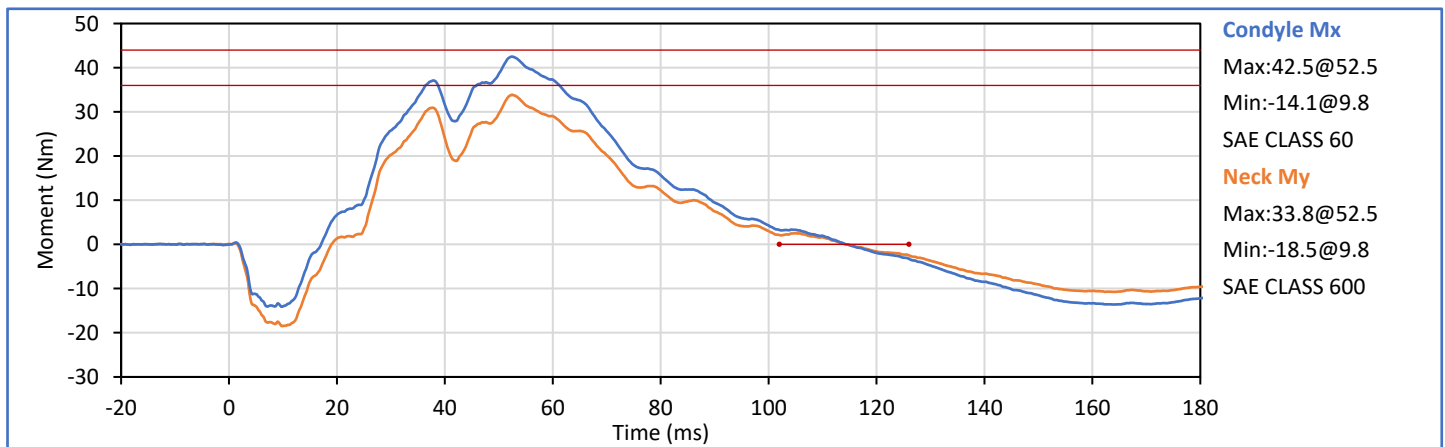
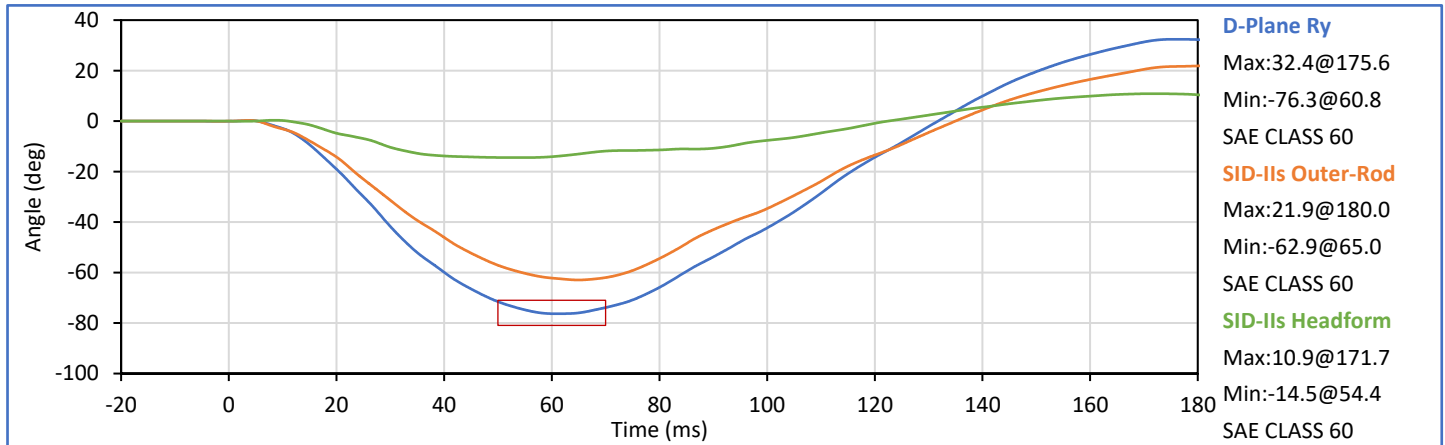
G. Fuentes

G. Fuentes

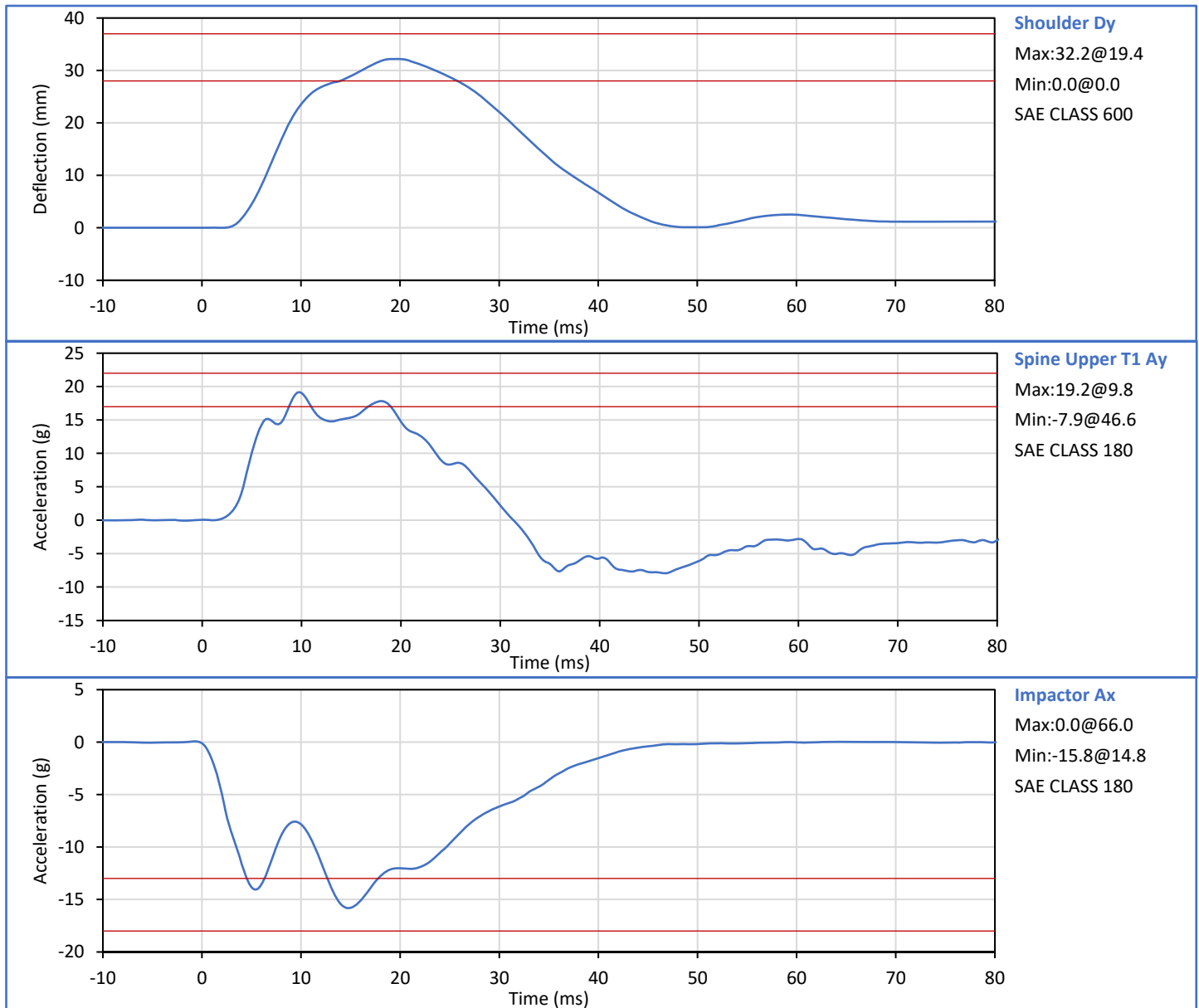
Approved By:

J. Hernandez

J. Hernandez



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.2	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	19.2	Pass
Peak Impactor Ax	g	-18.0	-13.0	-15.8	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

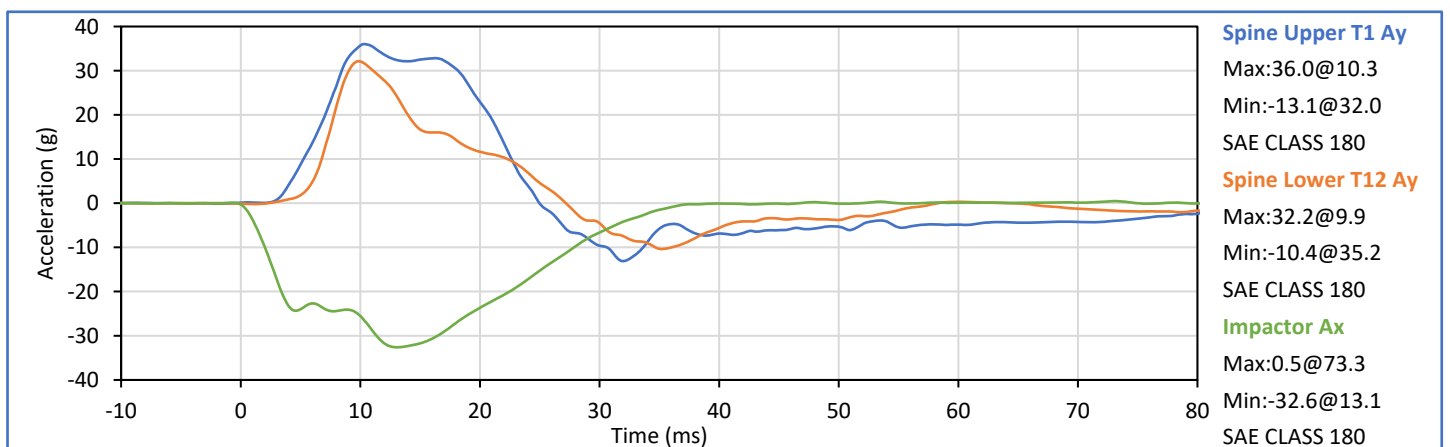
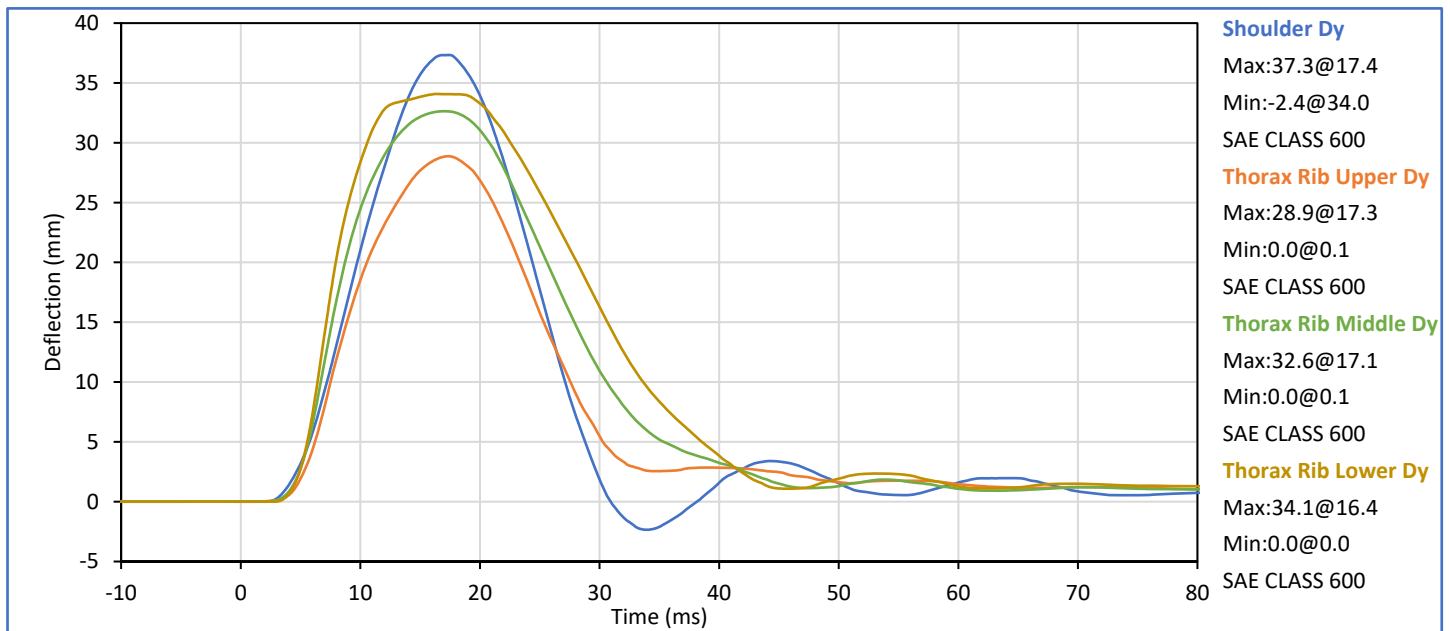
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.66	Pass
Peak Shoulder Dy	mm	31.0	40.0	37.3	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.9	Pass
Peak Middle Rib Dy	mm	30.0	36.0	32.6	Pass
Peak Lower Rib Dy	mm	32.0	38.0	34.1	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	36.0	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	32.2	Pass
Peak Impactor Ax	g	-36.0	-30.0	-32.6	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

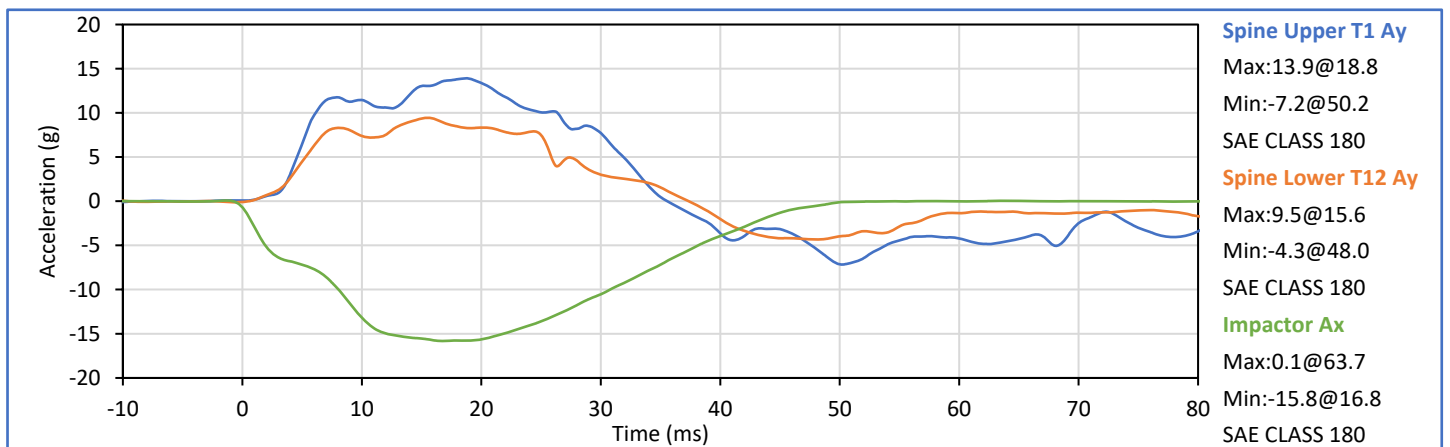
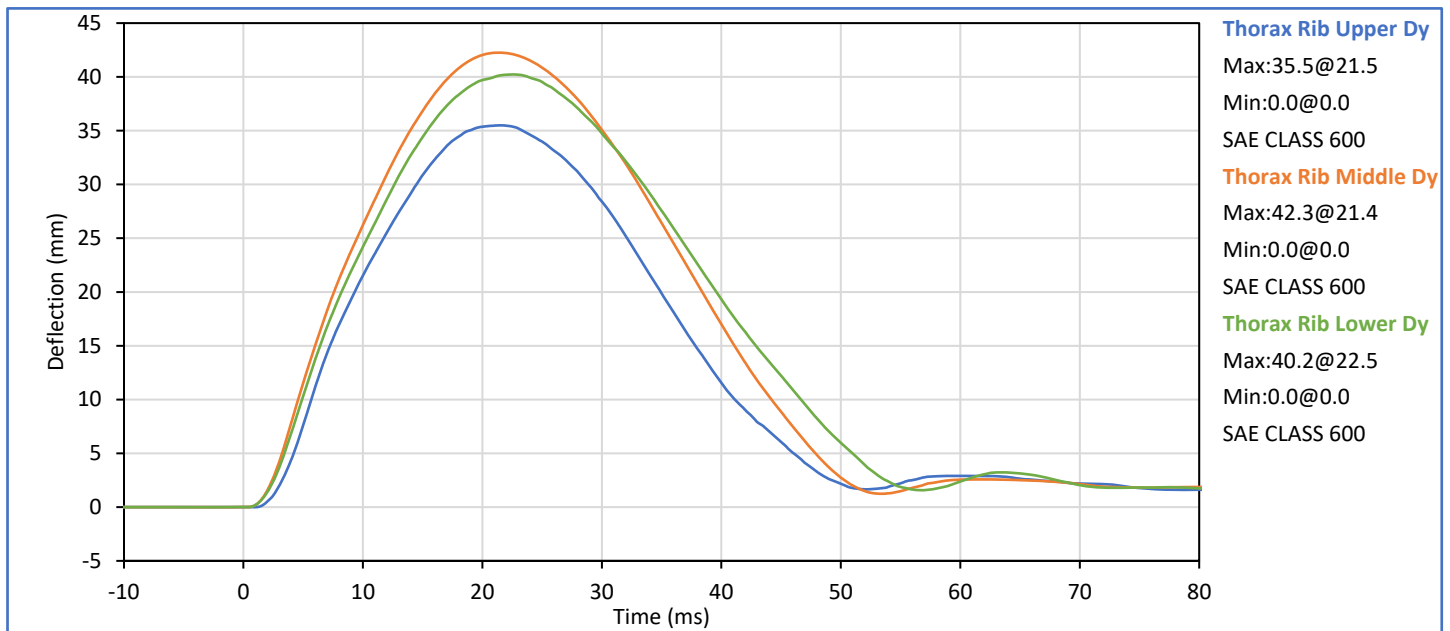
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Thorax Rib Upper Dy	mm	32.0	40.0	35.5	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	42.3	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	40.2	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	13.9	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	9.5	Pass
Peak Impactor Ax	g	-18.0	-14.0	-15.8	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

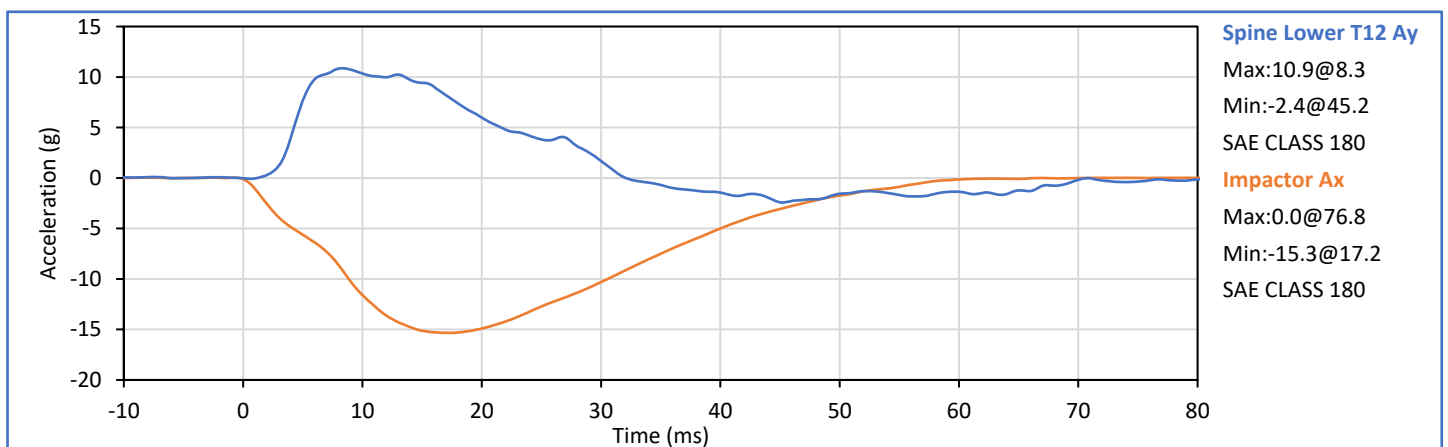
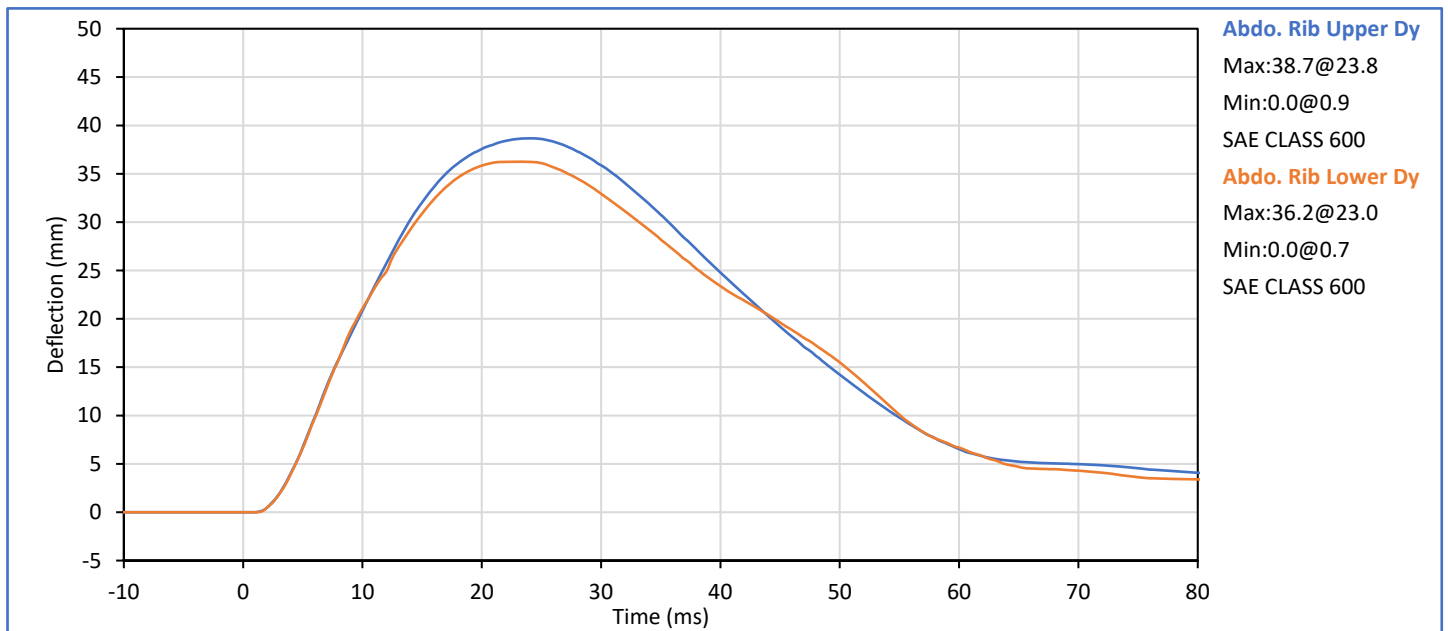
J. Hernandez

J. Hernandez

ATD Serial No.: 299

Test Date: 2022-10-31

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.30	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	38.7	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	36.2	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.9	Pass
Peak Impactor Ax	g	-16.0	-12.0	-15.3	Pass
Overall Test Results					Pass



Technician: G. Fuentes

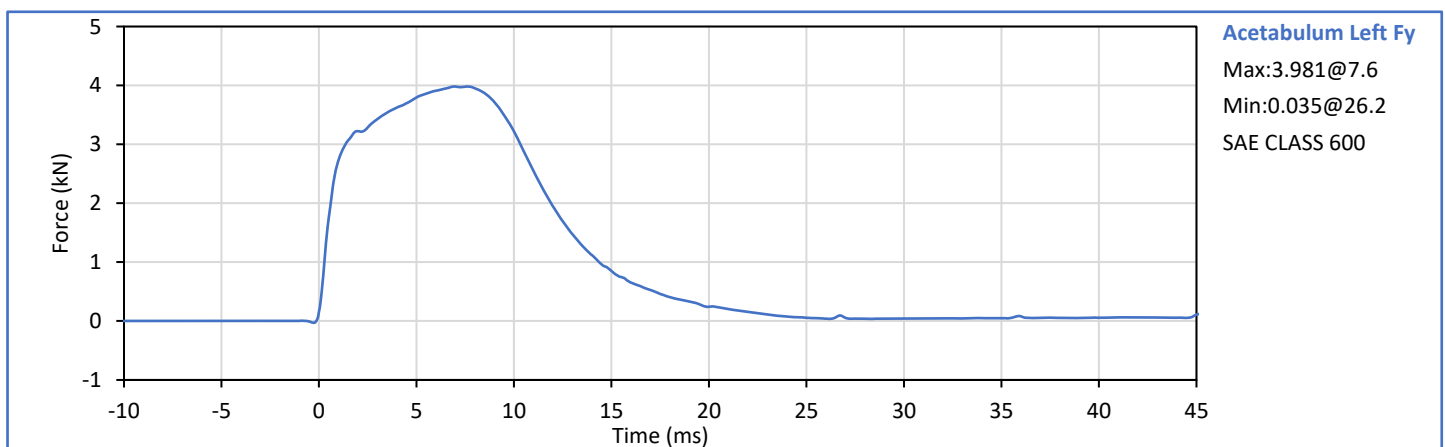
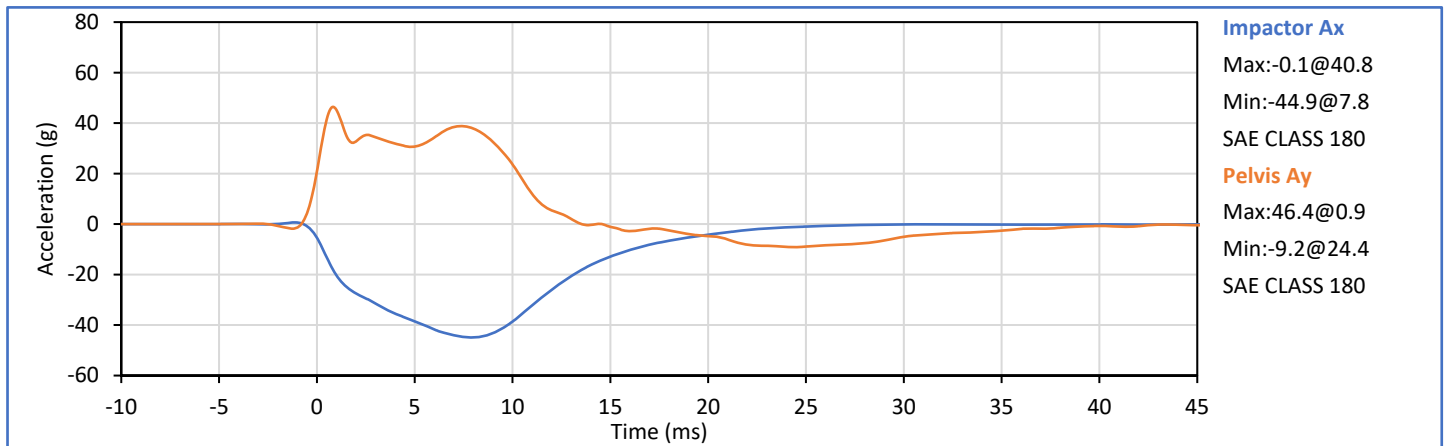
Approved By: J. Hernandez

ATD Serial No.: 299

Test Date: 2022-10-31

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.98	Pass
Pelvis Ay after 6ms	g	34.0	42.0	38.8	Pass
Peak Impactor Ax	g	-47.0	-38.0	-44.9	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 13944



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

ATD Serial No.: 299

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

Test Date: 2022-10-31

Pelvis Plug S/N: 13944



SID-IIs Pelvis Plug Certification Test

Plug S/N 13944

Test Number 13418

Report Number 13463

Test Date 5/20/2020 10:22:29 PM

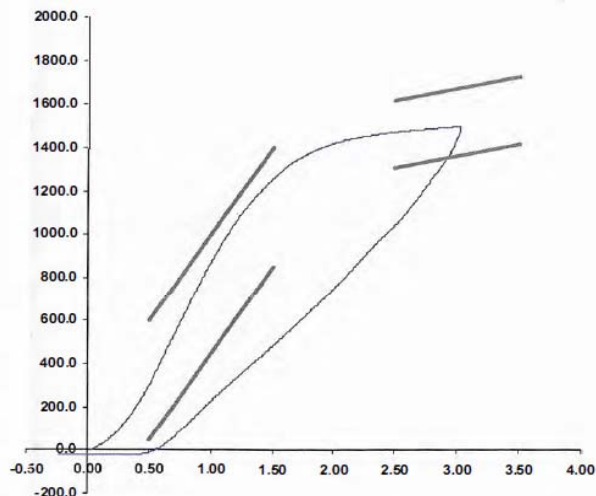
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	308.67	50.00	600.00
Force @ 1.5 mm (N)	1,257.12	850.00	1,400.00
Force @ 2.5 mm (N)	1,470.42	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,496.75	1,361.00	1,673.00

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 20-May-20
SACO Research

By: DC Date: 5/20/2020

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

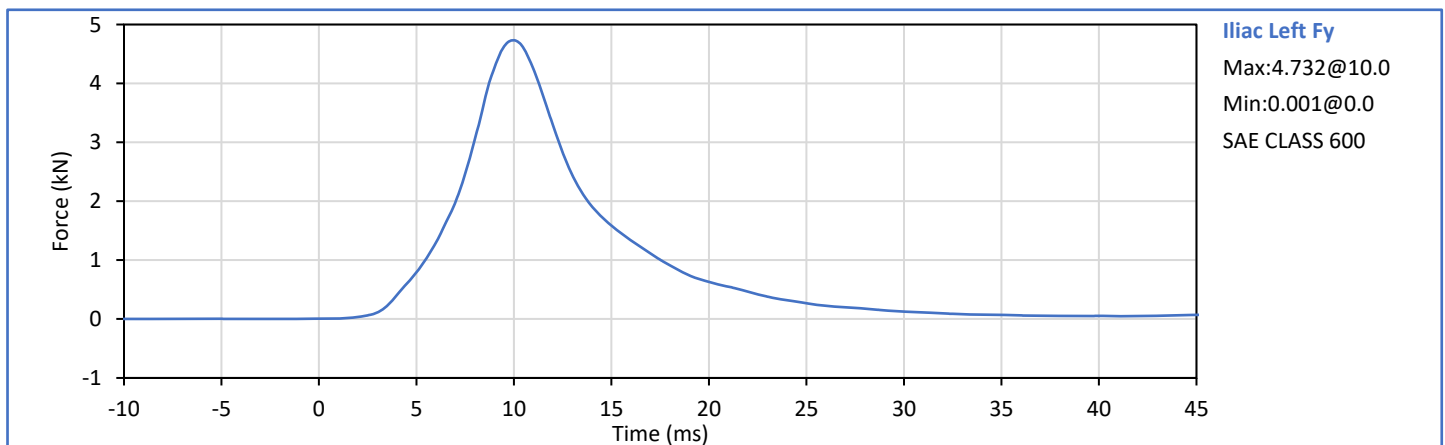
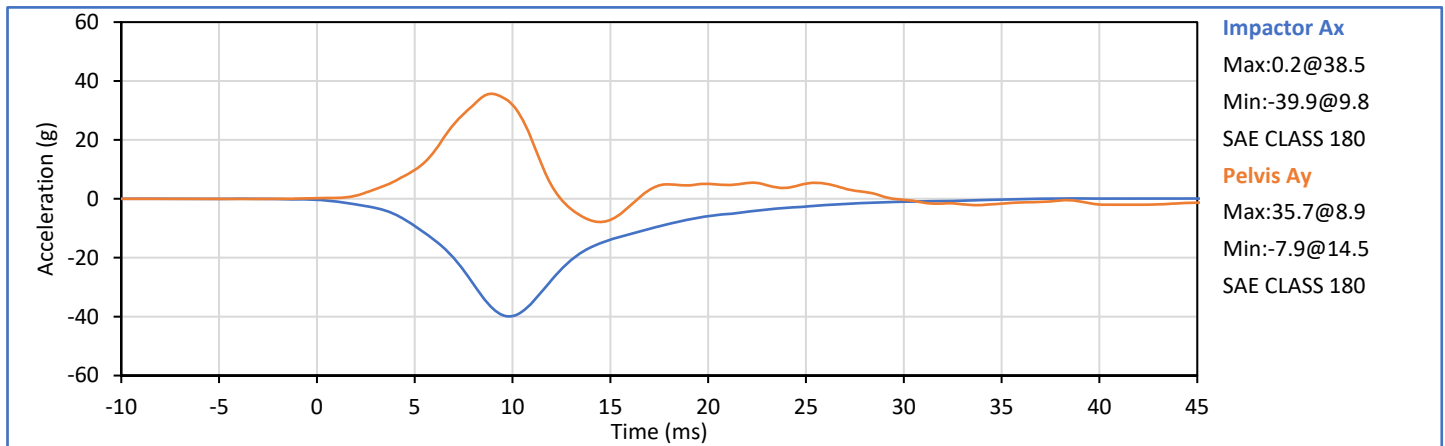
ATD Serial No.: 299

Test Date: 2022-10-31

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	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Iliac Fy	kN	4.10	5.10	4.73	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-39.9	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 *

* Plug is not impacted and remains certified



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

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

ATD Serial No.: 299

Test Date: 2022-12-12

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
A - Sitting Height	mm	772	788	778	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	87	Pass
D - H Point From Seatback	mm	141	151	147	Pass
E - Shoulder Pivot From Backline	mm	97	107	102	Pass
F - Thigh Clearance	mm	119	135	125	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	182	Pass
J - Head Circumference	mm	541	551	543	Pass
K - Buttock To Knee Length	mm	514	540	525	Pass
L - Popliteal Height	mm	343	369	352	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	201	Pass
P - Foot Length	mm	216	232	223	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	321	Pass
R - Arm Length	mm	249	259	253	Pass
S - Knee Joint To Seatback	mm	477	493	487	Pass
V - Shoulder Width	mm	341	357	354	Pass
W - Foot Width	mm	78	94	88	Pass
Y - Chest Circumference W/Jacket	mm	851	881	866	Pass
Z - Waist Circumference	mm	761	791	769	Pass
				Overall Test Results	Pass

Technician:



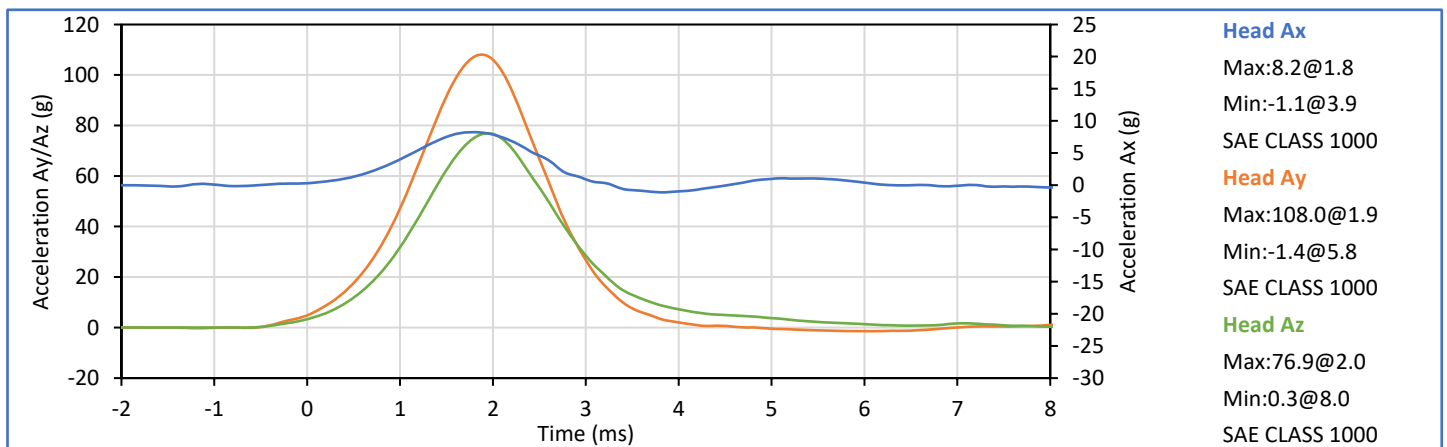
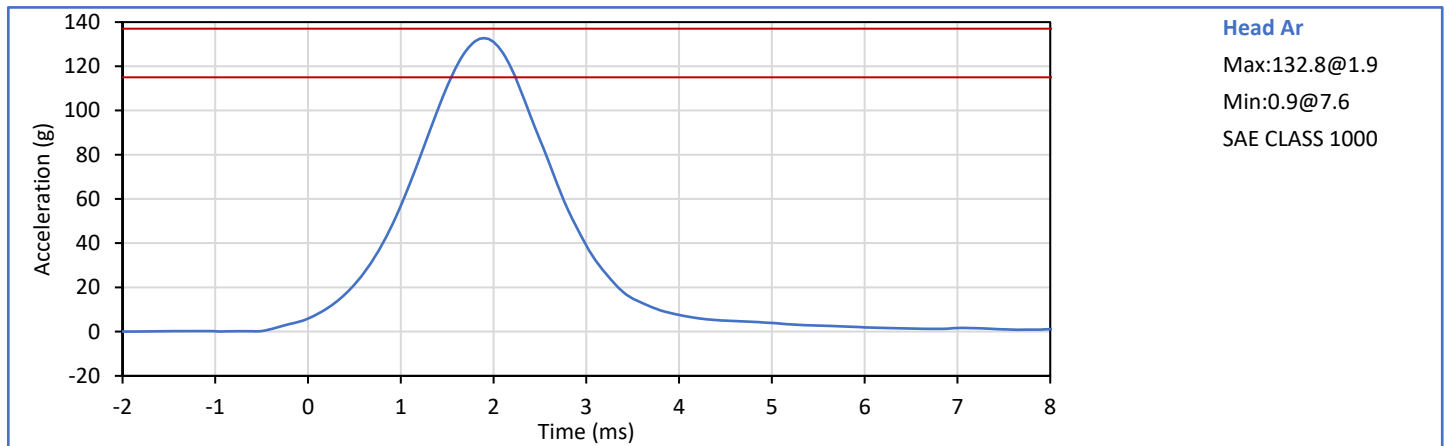
G. Fuentes

Approved By:



J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	20.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Peak Resultant Acceleration	g	115.0	137.0	132.8	Pass
Peak Head Ax	g	-15.0	15.0	8.2	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Technician:

G. Fuentes

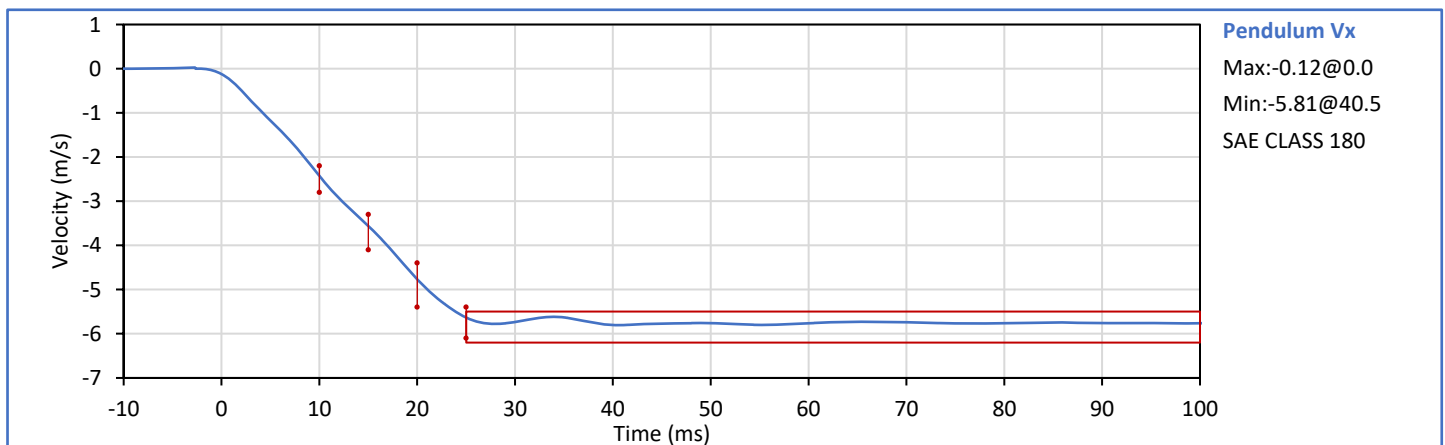
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

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	30	Pass
Pendulum Velocity	m/s	5.51	5.63	5.56	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.43	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.56	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-4.77	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.64	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.81/-5.62	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-74.1	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.6	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	41.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	115.7	Pass
				Overall Test Results	Pass



Technician:

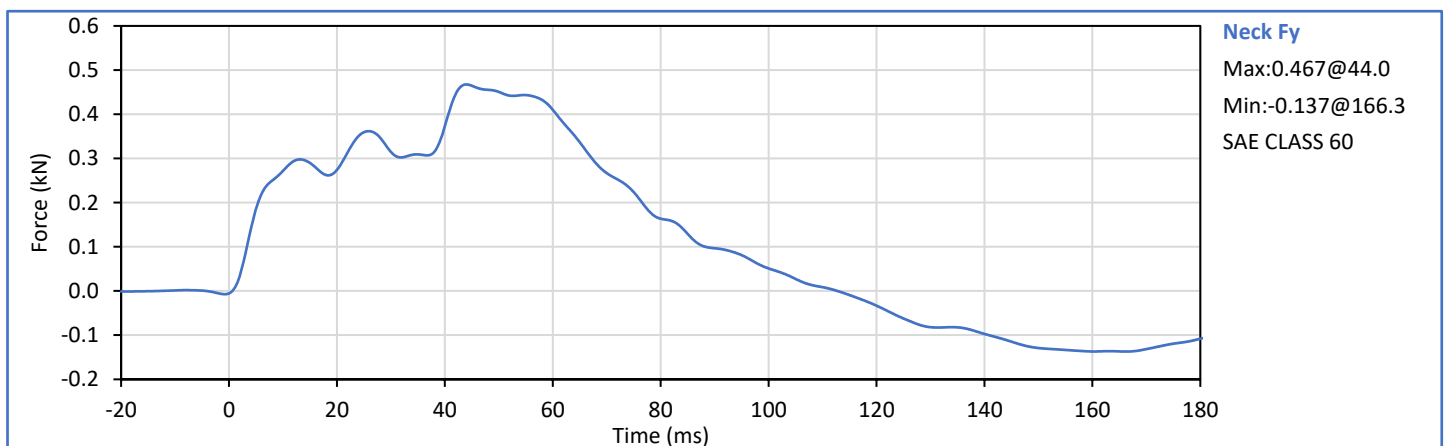
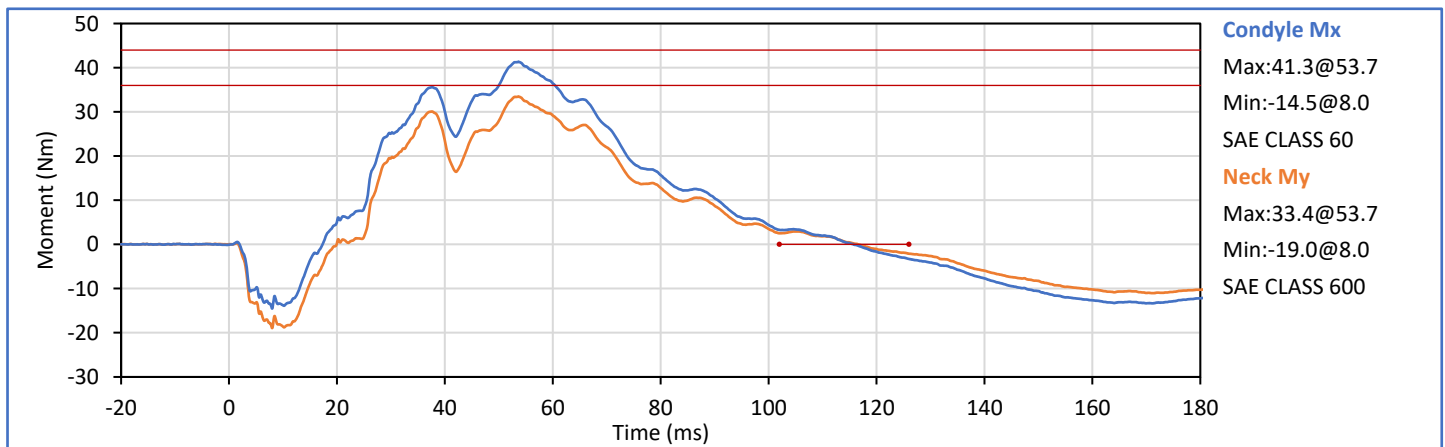
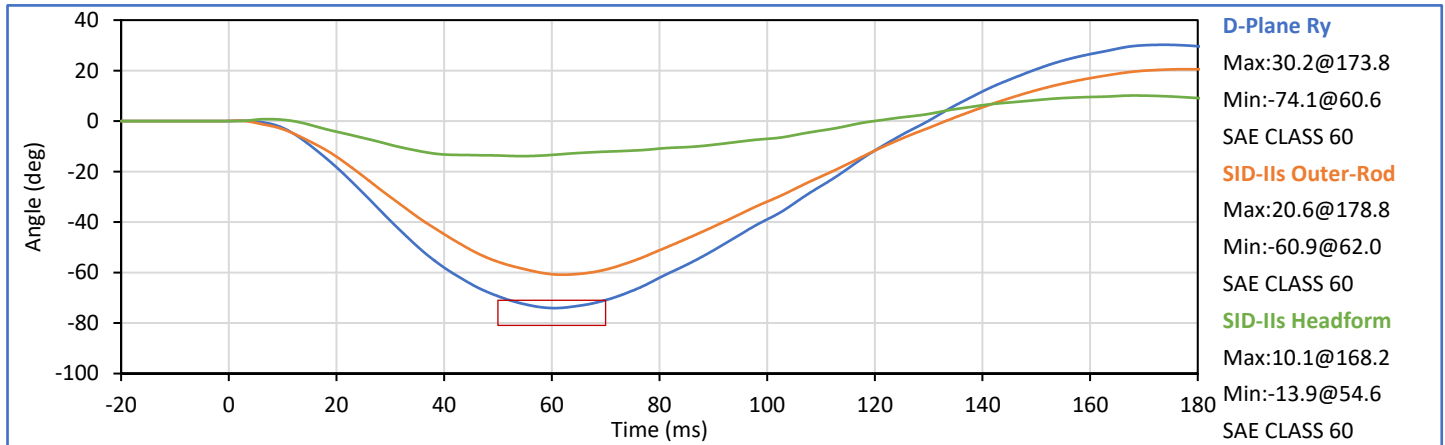
G. Fuentes

G. Fuentes

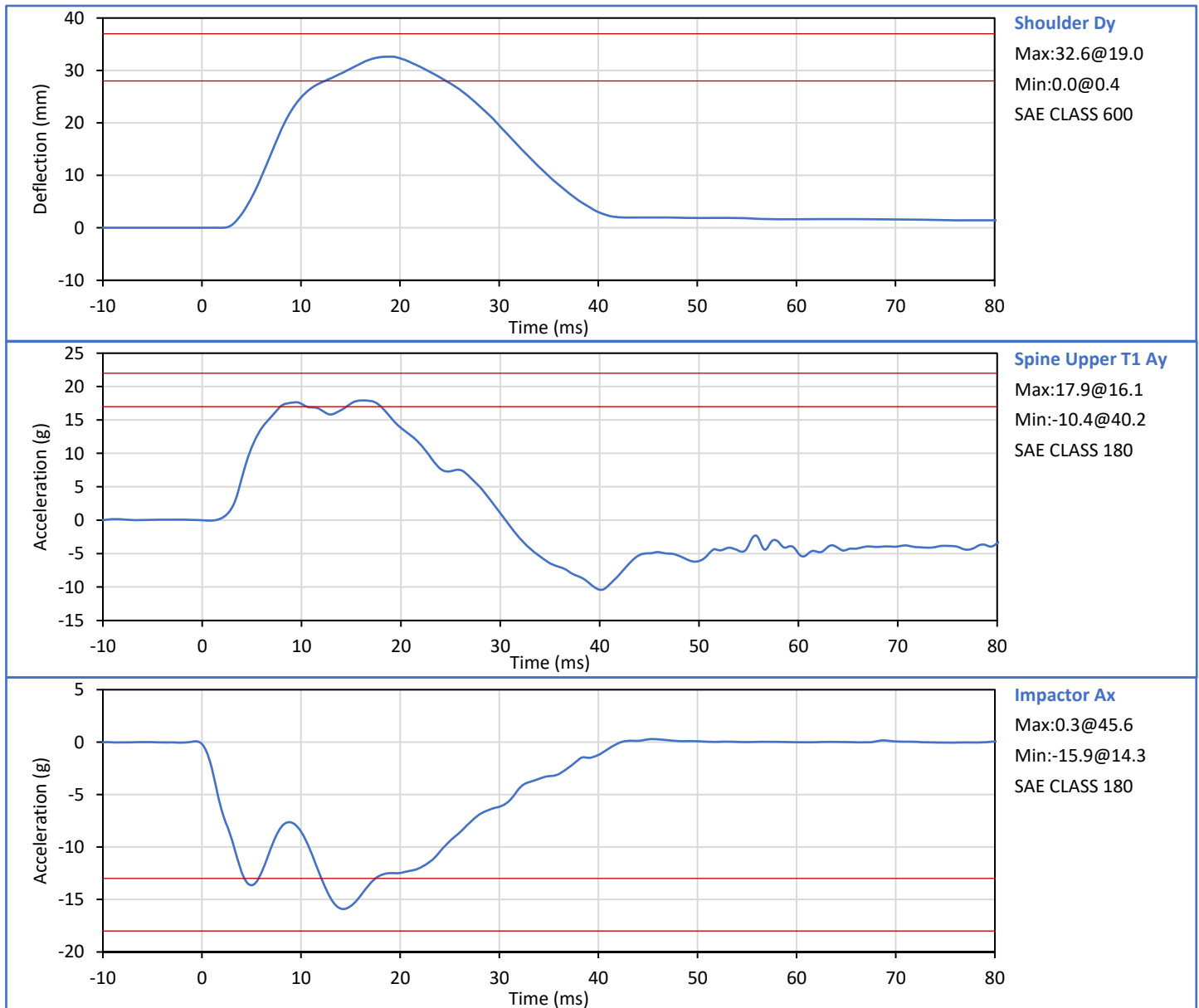
Approved By:

J. Hernandez

J. Hernandez



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.6	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	17.9	Pass
Peak Impactor Ax	g	-18.0	-13.0	-15.9	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

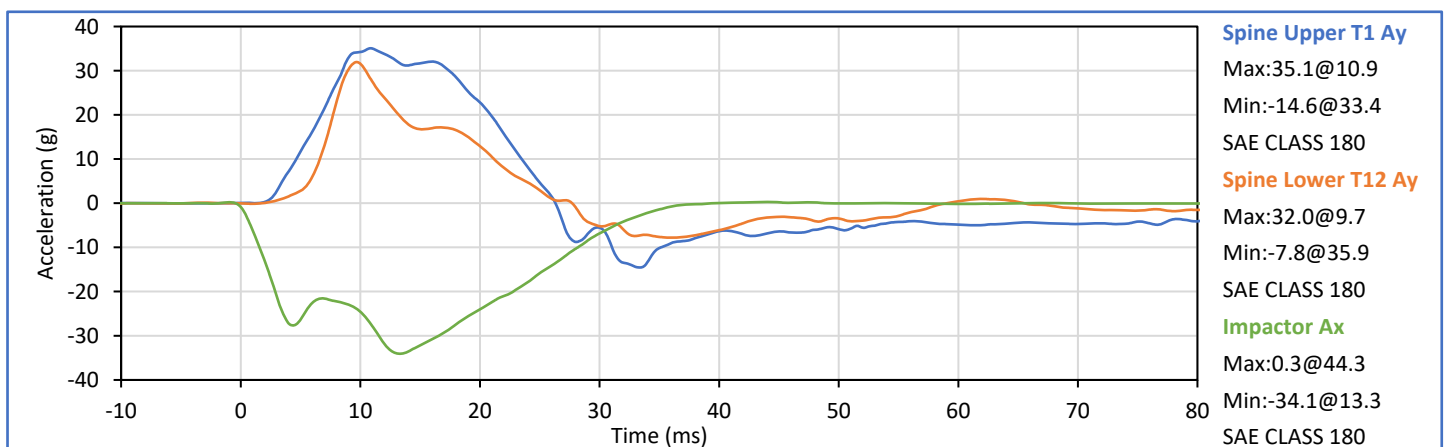
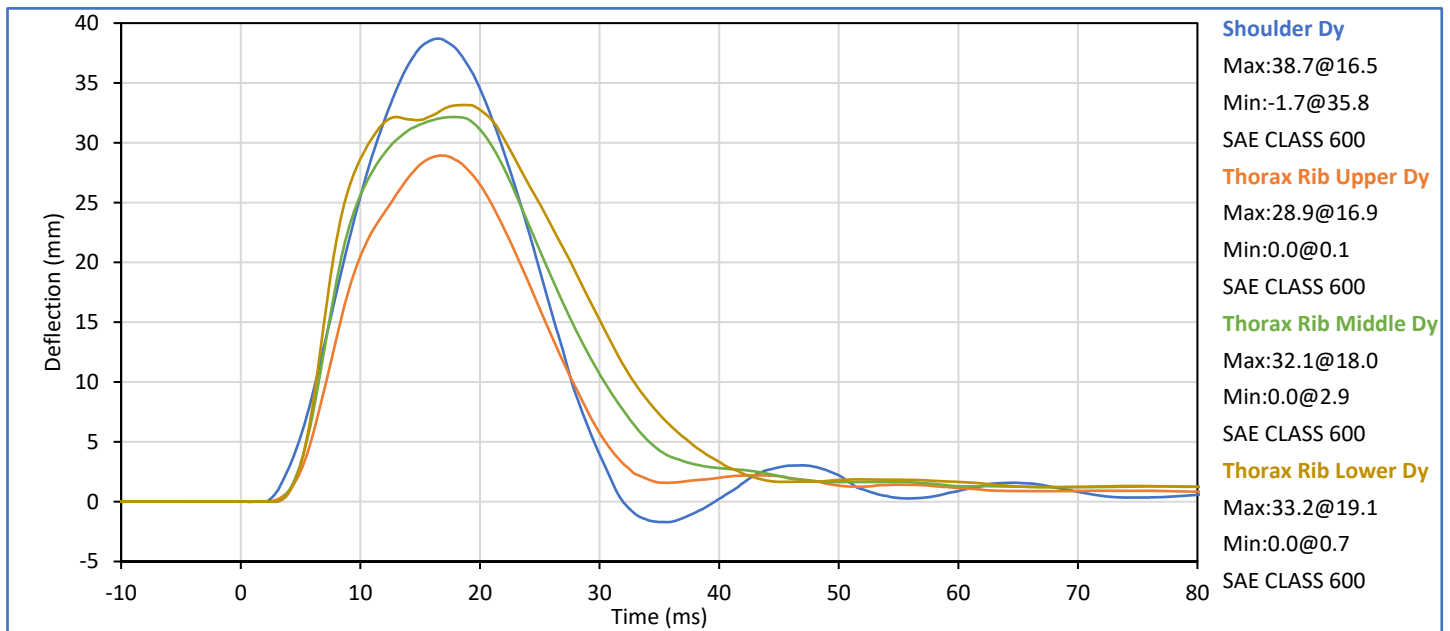
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.74	Pass
Peak Shoulder Dy	mm	31.0	40.0	38.7	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.9	Pass
Peak Middle Rib Dy	mm	30.0	36.0	32.1	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.2	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	35.1	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	32.0	Pass
Peak Impactor Ax	g	-36.0	-30.0	-34.1	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

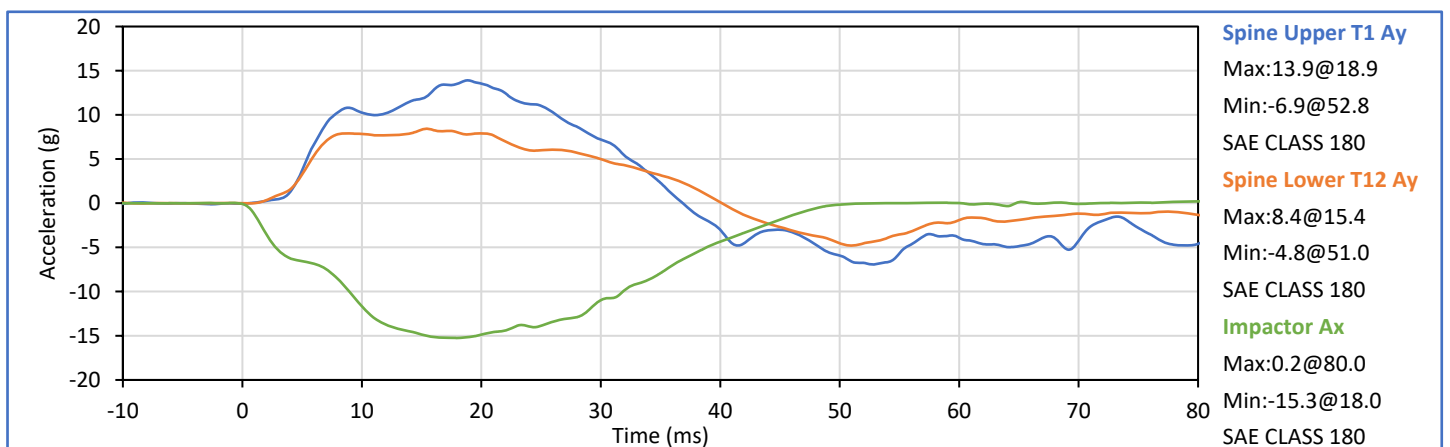
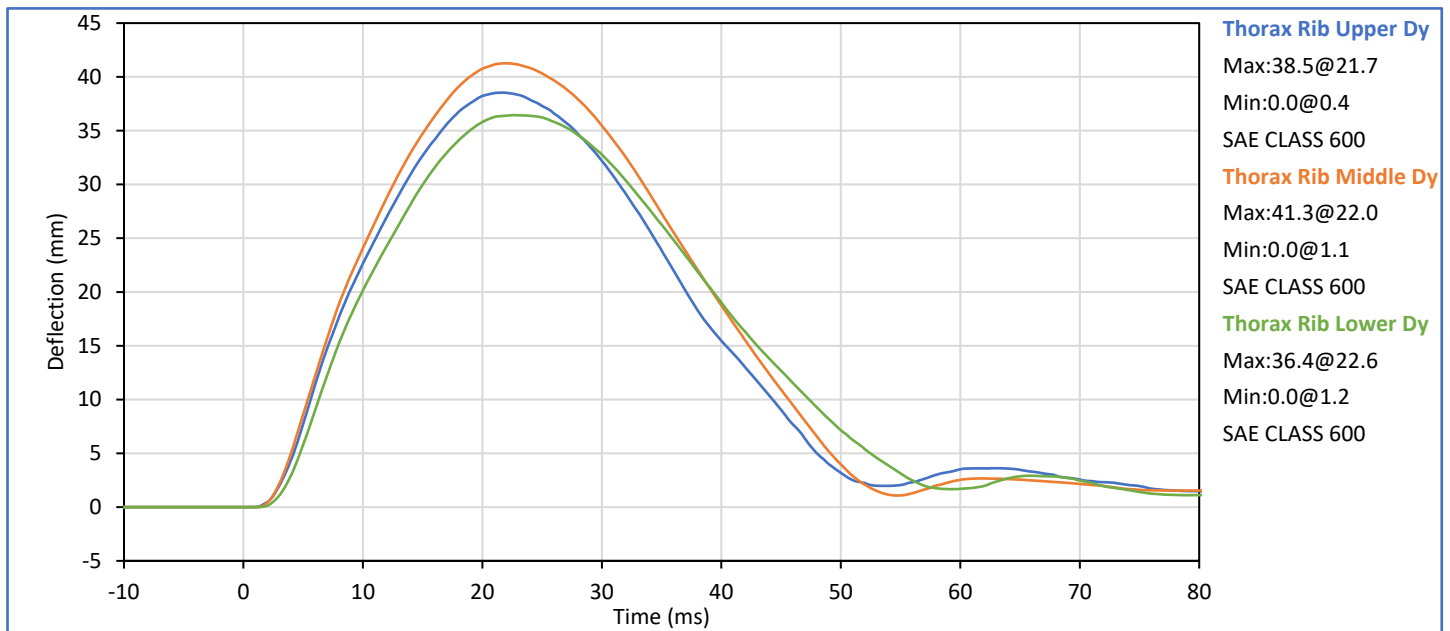
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.33	Pass
Peak Thorax Rib Upper Dy	mm	32.0	40.0	38.5	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	41.3	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	36.4	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	13.9	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	8.4	Pass
Peak Impactor Ax	g	-18.0	-14.0	-15.3	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

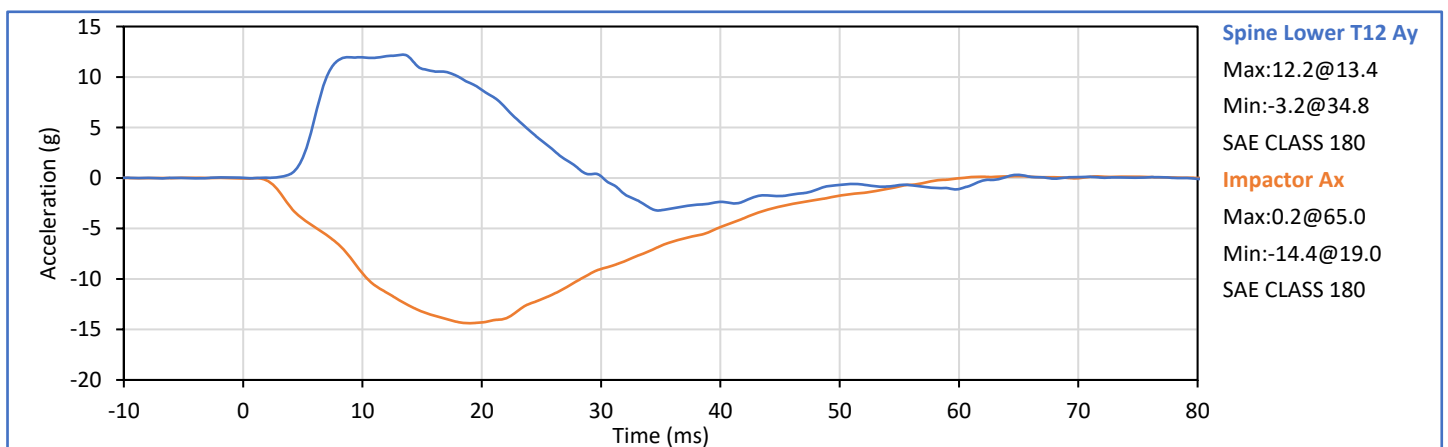
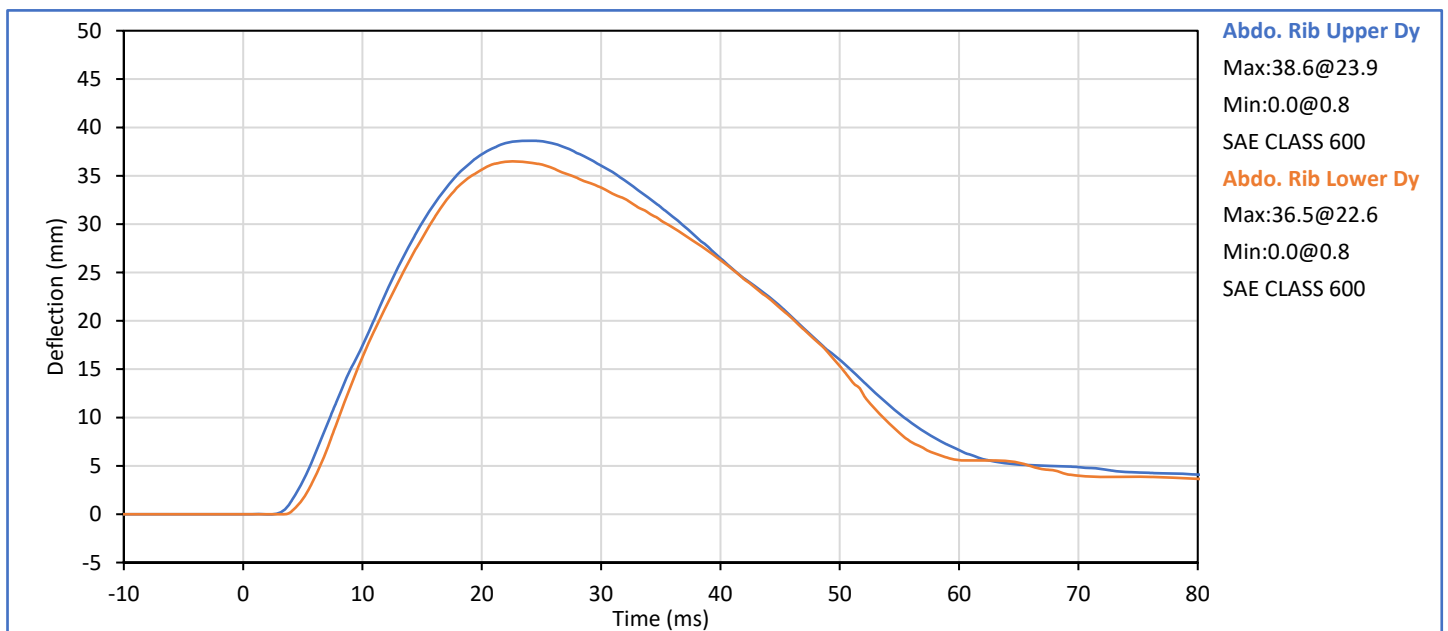
J. Hernandez

J. Hernandez

ATD Serial No.: 299

Test Date: 2022-12-16

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.30	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	38.6	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	36.5	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	12.2	Pass
Peak Impactor Ax	g	-16.0	-12.0	-14.4	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

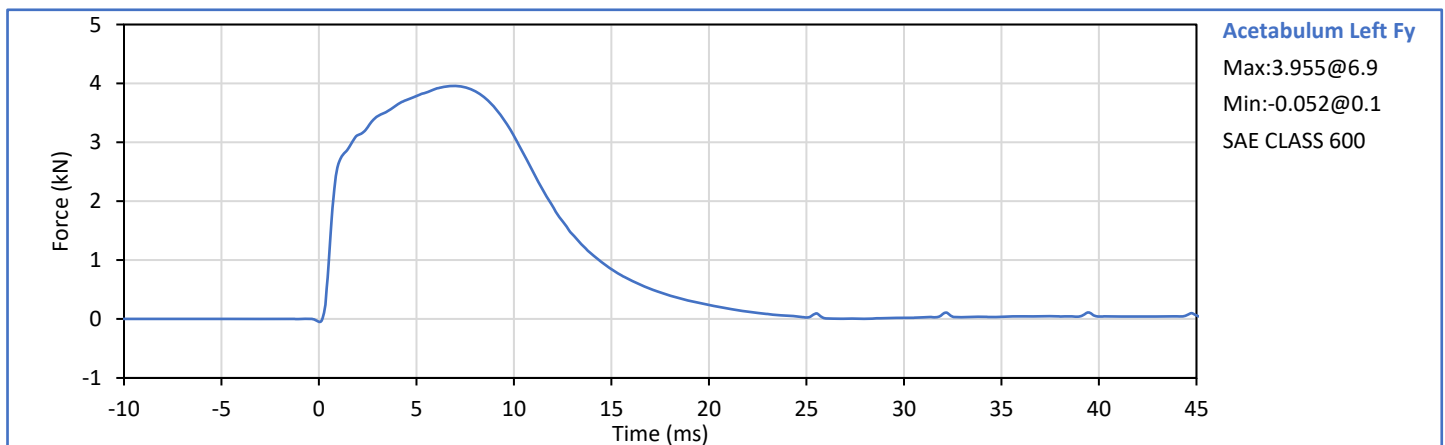
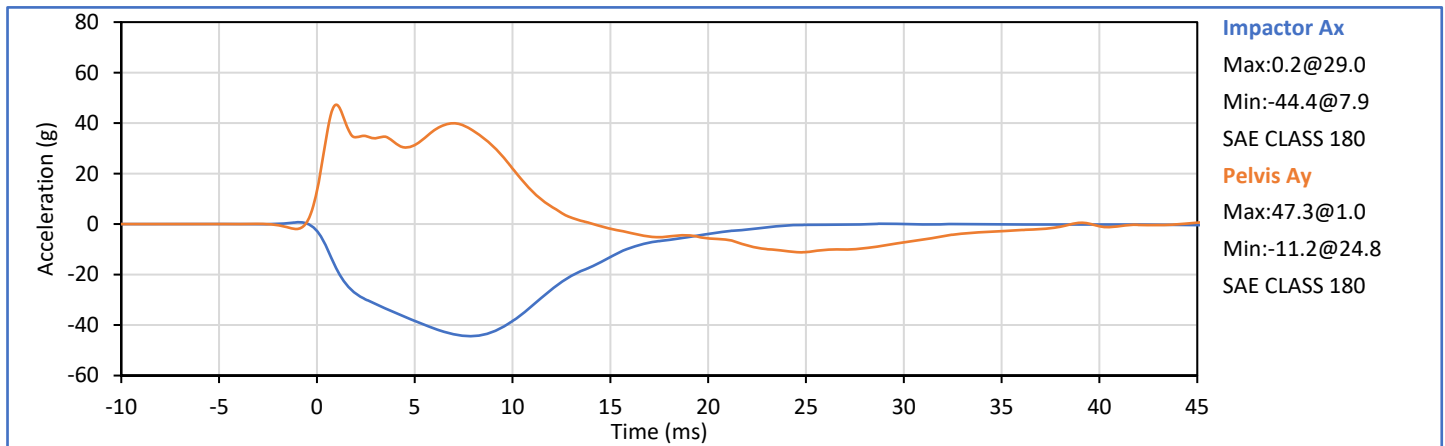
J. Hernandez

ATD Serial No.: 299

Test Date: 2022-12-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.95	Pass
Pelvis Ay after 6ms	g	34.0	42.0	39.9	Pass
Peak Impactor Ax	g	-47.0	-38.0	-44.4	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 14696



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

ATD Serial No.: 299

Test Date: 2022-12-15

Pelvis Plug S/N: 14696



SID-IIs Pelvis Plug Certification Test

Plug S/N 14696

Test Number 16659

Report Number 16705

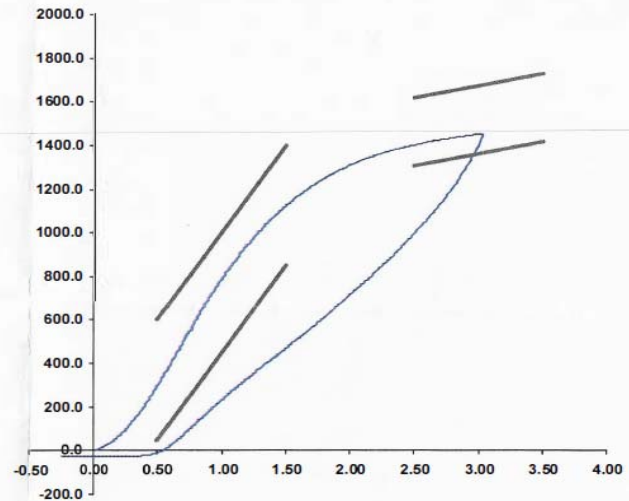
Test Date 12/22/2020 10:16:20 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	297.72	50.00	600.00
Force @ 1.5 mm (N)	1,125.66	850.00	1,400.00
Force @ 2.5 mm (N)	1,401.09	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,452.75	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000
Preload Value (-N) 22.24
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator 146

Part Number 180-4450

Template No 107 22-Dec-20
SACO Research

By: IX Date: 12/22/20

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

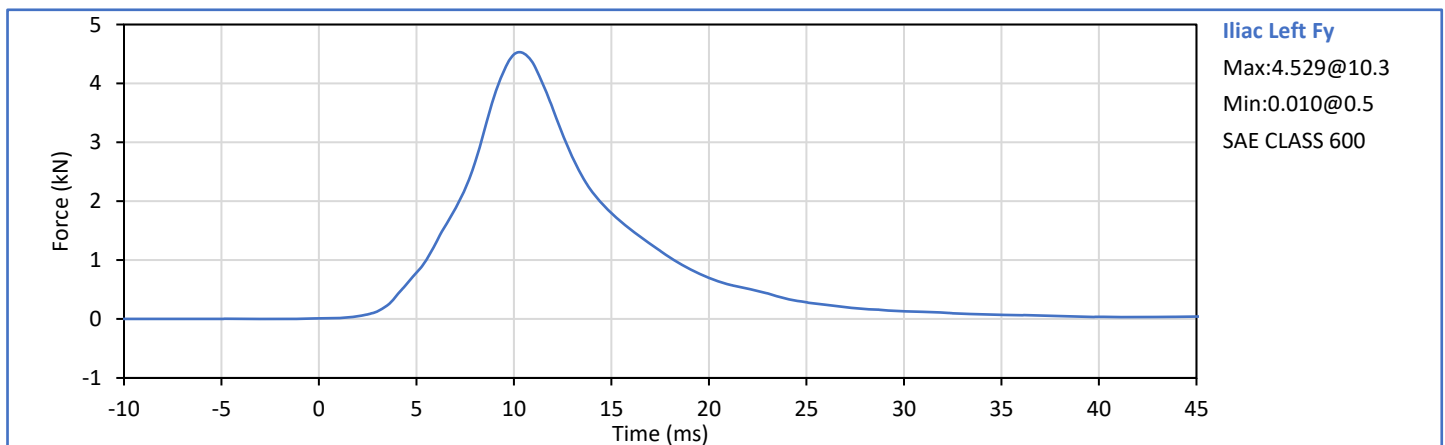
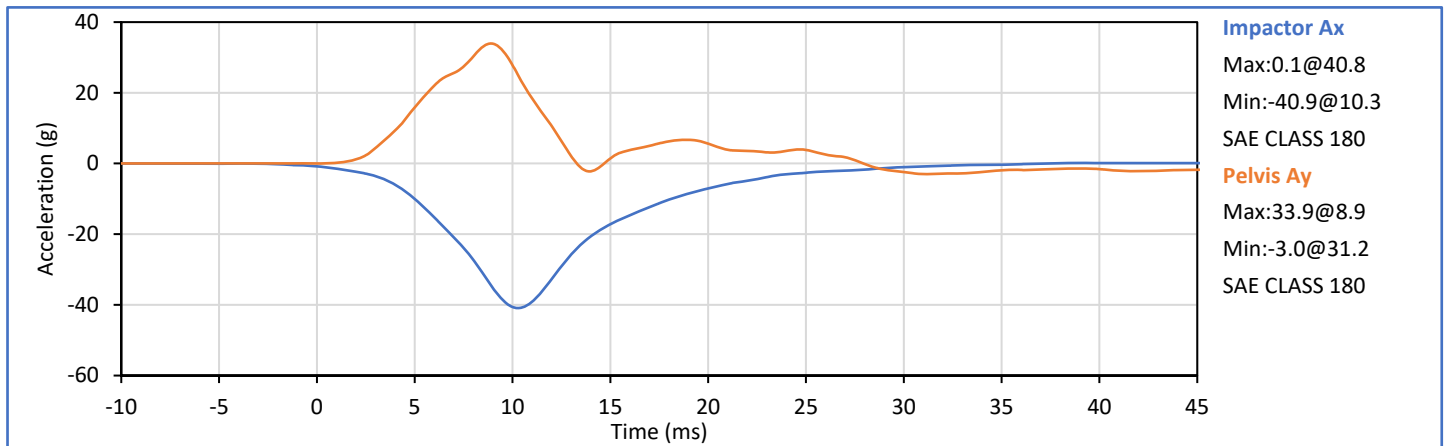
ATD Serial No.: 299

Test Date: 2022-12-16

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	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Iliac Fy	kN	4.10	5.10	4.53	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-40.9	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 *

* Plug is not impacted and remains certified



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 - Driver ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P51929	Endevco	7264C-2k	2022-10-06
Head Acceleration Y Primary	P50086	Endevco	7264C-2k	2022-10-06
Head Acceleration Z Primary	P51931	Endevco	7264C-2k	2022-10-06
Head Acceleration X Redundant	P68604	Endevco	7264C-2k	2022-10-06
Head Acceleration Y Redundant	P51934	Endevco	7264C-2k	2022-10-06
Head Acceleration Z Redundant	P58736	Endevco	7264C-2k	2022-10-06
Head Rotation Rate X	ARS7342	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Y	ARS7473	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Z	ARS7548	DTS	ARS PRO-8k (2kHz)	2022-03-15
Upper Thorax Rib Deflection Y	1143	Servo	08TCI-3725	2022-10-12
Middle Thorax Rib Deflection Y	1075	Servo	08TCI-3725	2022-10-10
Lower Thorax Rib Deflection Y	1213	Servo	08TCI-3725	2022-10-10
Upper Abdomen Rib Deflection Y	1218	Servo	08TCI-3725	2022-10-10
Lower Abdomen Rib Deflection Y	1177	Servo	08TCI-3725	2022-10-10
Lower Spine T12 Acceleration X	P58761	Endevco	7264C-2k	2022-10-10
Lower Spine T12 Acceleration Y	P50077	Endevco	7264C-2k	2022-10-10
Lower Spine T12 Acceleration Z	P58795	Endevco	7264C-2k	2022-10-10
Iliac Wing Impact Side Force Y	284 (Iliac)	R.A. Denton	3228J	2022-03-30
Acetabulum Impact Side Force Y	272 (Acetabulum)	R.A. Denton	3249J	2022-03-30

Table 2 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	M11181	Endevco	758H-2k	2022-11-10
Vehicle CG Ay	M11102	Endevco	758H-2k	2022-11-10
Vehicle CG Az	M11062	Endevco	758H-2k	2022-11-10
Left Floor Sill Ay	M11069	Endevco	758H-2k	2022-11-07
A-Pillar Sill Ay	M11257	Endevco	758H-2k	2022-10-11
A-Pillar Low Ay	M11134	Endevco	758H-2k	2022-11-09
A-Pillar Mid Ay	M11278	Endevco	758H-2k	2022-11-08
B-Pillar Sill Ay	M11269	Endevco	758H-2k	2022-11-03
B-Pillar Low Ay	M11183	Endevco	758H-2k	2022-11-08
B-Pillar Mid Ay	M11213	Endevco	758H-2k	2022-11-09
Driver Seat Track at H-Point Ay	M10908	Endevco	758H-2k	2022-11-13
Engine Top Ax	M11195	Endevco	758H-2k	2022-11-09
Engine Top Ay	M11087	Endevco	758H-2k	2022-11-09
Firewall Ay	M11122	Endevco	758H-2k	2022-11-03
Right Roof Ay	M11230	Endevco	758H-2k	2022-11-10
Right Floor Sill Ay	M11190	Endevco	758H-2k	2022-11-11
Rear Floorpan Ax	M11187	Endevco	758H-2k	2022-11-11
Rear Floorpan Ay	M11293	Endevco	758H-2k	2022-11-11

Table 3 - Barrier Pole Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Barrier Pole 01 Fx	131822A	Interface	1220AF-50k	2021-11-04
Barrier Pole 02 Fx	132304A	Interface	1220AF-50k	2021-11-04
Barrier Pole 03 Fx	19477	Interface	1220AF-50k	2021-11-04
Barrier Pole 04 Fx	19325	Interface	1220AF-50k	2021-11-04
Barrier Pole 05 Fx	131827A	Interface	1220AF-50k	2021-11-04
Barrier Pole 06 Fx	132302A	Interface	1220AF-50k	2021-11-05
Barrier Pole 07 Fx	19267	Interface	1220AF-50k	2021-11-05
Barrier Pole 08 Fx	19321	Interface	1220AF-50k	2021-11-05