

REPORT NUMBER: SideNCAPPole-KAR-23-001
NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

FCA US, LLC
2023 JEEP GRAND CHEROKEE ALTITUDE 5-DOOR SUV

NHTSA No: M20230300

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



FEBRUARY 22, 2023

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Approval Date: February 22, 2023

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract A 32.2 km/h 75° rigid pole side NCAP impact test was conducted on the subject 2023 Jeep Grand Cherokee Altitude 5-Door SUV 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 February 8, 2023. The impact velocity was 32.32 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 16.7°C. The target vehicle's maximum post-test static crush was 364 mm located at level 2. The test vehicle's occupant performance data is as follows:																														
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>458.165</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>41.142</td> </tr> <tr> <td>Total Pelvic Force (Sum of Acetabular and Iliac Forces)</td> <td>N</td> <td>5525</td> <td>2348.376</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>27.802</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45</td> <td>27.253</td> </tr> </tbody> </table>				Measurement Description	Driver ATD (SID-IIs)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	458.165	Resultant Lower Spine Acceleration	g	82	41.142	Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2348.376	Maximum Thoracic Rib Deflection	mm	38	27.802	Maximum Abdominal Rib Deflection	mm	45	27.253
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Both 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.																														
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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SECTION 1

TEST PURPOSE AND SUMMARY OF TEST

PURPOSE

This side impact test is part of the 2023 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 2023 Jeep Grand Cherokee Altitude 5-Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure date March 2020.

SUMMARY

A rigid pole side impact test was conducted on a 2023 Jeep Grand Cherokee Altitude 5-door SUV. The subject vehicle was towed into the rigid pole at an angle of 75.6° and a velocity of 32.32 km/h. The test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California on February 8, 2023. 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)
TEST 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	458.165
Lower Spine (T12) Resultant Acceleration	g	82	41.142
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2348.376
Maximum Thoracic Rib Deflection	mm	38*	27.802
Maximum Abdominal Rib Deflection	mm	45*	27.253

**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	Yes		
Knee Airbag	Yes	Yes		
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	

GENERAL COMMENTS

Both 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.

- Left Floor Sill AY, Channel Failed at 30.1 ms.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

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: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20230300
Model Year	2023
Make	Jeep
Model	Grand Cherokee Altitude
Body Style	5-Door SUV
VIN	1C4RJGAG1PC551653
Body Color	White
Odometer Reading (km / mi)	42 / 26
Engine Displacement (L)	3.6
Type / No. of Cylinders	V6
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	RWD
Roof Rack	Yes
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	No
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	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	Yes

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

N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US, LLC
Date of Manufacture	Dec-22
Vehicle Type	MPV

GVWR (kg)	2745
GAWR Front (kg)	1271
GAWR Rear (kg)	1520

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				476.0	A
DSC x 68 (kg)				340.0	B
Cargo Weight (RCLW) (kg)				136.0	A-B*

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

VEHICLE SEAT TYPE

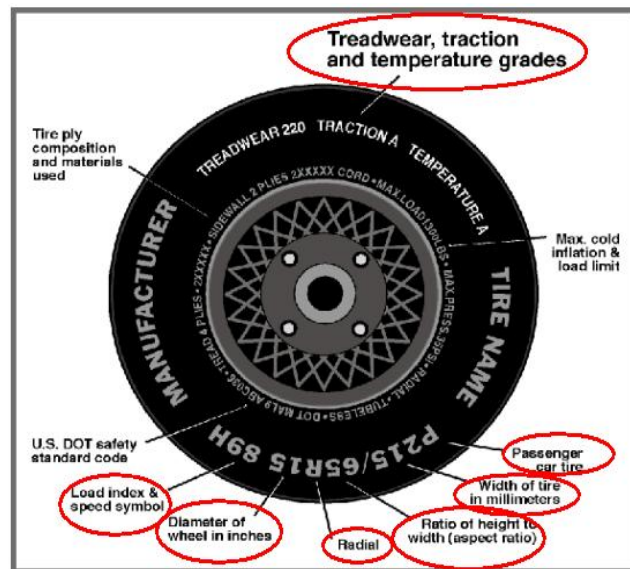
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	Yes						Yes
Rear or Second Row Seat			Yes			Yes	
Third Row Seat							

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	303	303
Cold Pressure (kPa)	250	250
Recommended Tire Size	265/50R20	265/50R20
Tire Size on Vehicle	265/50R20	265/50R20
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Dueler H/L	Dueler H/L
Treadware	600	600
Traction Grade	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	97S	97S
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	287991	287991
DOT Safety Code Right	401	401

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	250	250	250	250
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	502.0	476.0		528.0	562.0		506.5	567.5	
Right	kg	527.0	441.5		493.5	538.5		506.0	551.5	
Ratio	%	52.9%	47.1%	100.0%	48.1%	51.9%	100.0%	47.5%	52.5%	100.0%
Total	kg	1029.0	917.5	1946.5	1021.5	1100.5	2122.0	1012.5	1119.0	2131.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1946.5	A
Actual Weight of 1 SID II-s ATD Used	kg	49.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	135.8	C
Calculated Vehicle Target Wt (TVTW)	kg	2131.3	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	-0.7	-0.7	Yes
Front Passenger Sill Angle (front-to-rear)*	°	1.0	0.9	0.8	Yes
Front Bumper-Line Angle (left-to-right)**	°	0.7	0.4	0.3	Yes
Rear Bumper-Line Angle (left-to-right)**	°	-0.5	-0.3	-0.3	Yes
Vehicle CG (Aft of Front Axle)	mm	1395	1535	1554	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	5	25	7	

*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: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
N/A	N/A

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: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23**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	7.9	0.0	3.9
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	3.9	861	Max	865	877	879
			Mid	852	857	861
			Min	835	840	846
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
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: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

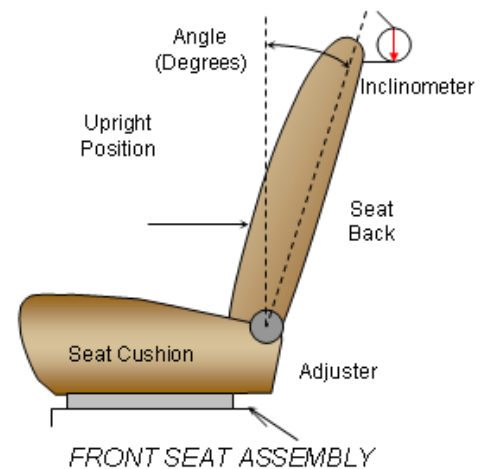
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	250		0	
Front Passenger Seat	255	37	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	87.2		1.8	
Front Passenger Seat	68.9	32	1.8	12
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy		9		0
Non-Struck Side Rear Seat		9		0
Rear Center Seat		9		0

*Detent zero (0) is the forward most detent

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

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	L

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	8	L

DATA SHEET NO. 2 ... (CONTINUED)

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

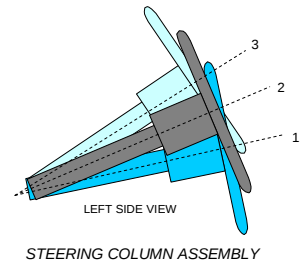
Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

STEERING COLUMN ADJUSTMENT

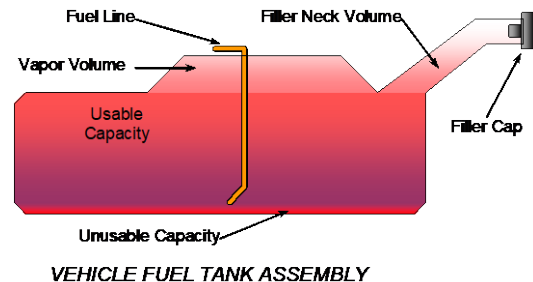
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of the geometric locus it describes when it moves through its full range of motion.

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	20.5	145
Geometric Center - Position 2	23.6	186
Uppermost - Position 3	26.6	227
Telescoping Steering Wheel Travel		82
Test Position	23.6	186



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)	87.06
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	80.97
Actual amount of Solvent Used in Test	80.97
1/3 of Usable Capacity	29.02

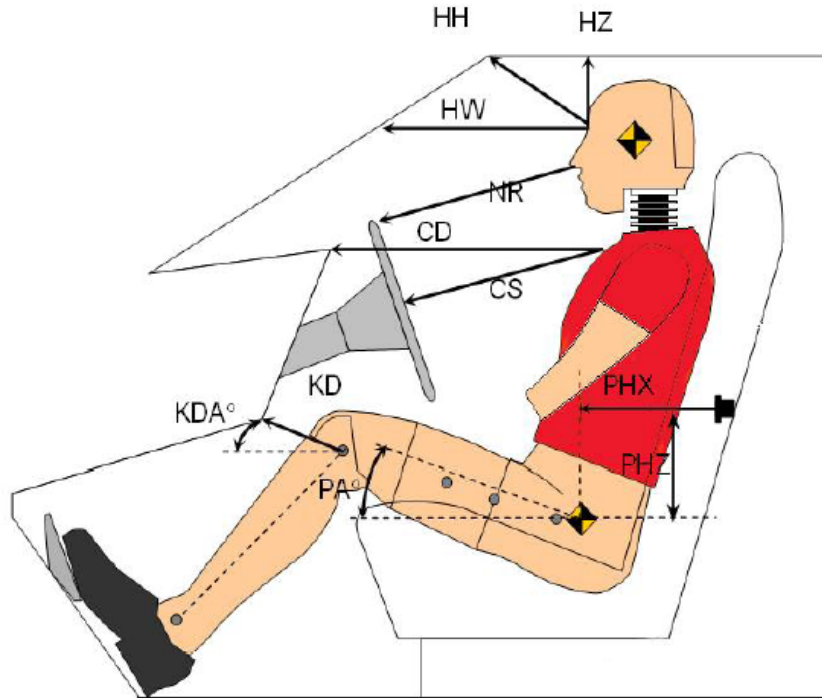
Is the Actual Amount of Solvent Used in the test equal to 93% $\pm$ 1% of the Usable Capacity stated in the Form No. 1? ☒ Yes ☐ No

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



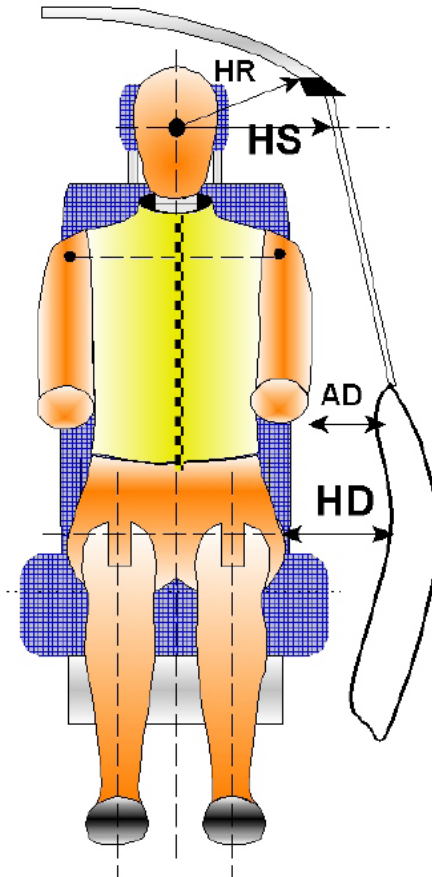
Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	355	
HW	Head to Windshield	704	
HZ	Head to Roof	255	
NR	Nose to Rim	277	
CD	Chest to Dash	475	
CS	Chest to Steering Wheel	224	
KD(L)/KDA(L)°	Left Knee to Dash	151	28.7
KD(R)/KDA(R)°	Right Knee to Dash	141	27.0
PAX°	Pelvic Tilt Angle (x-axis)		22.3
PAY°	Pelvic Tilt Angle (y-axis)		0.0
PHX	Hip Point to Striker (x-axis)	289	
PHZ	Hip Point to Striker (z-axis)	49	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



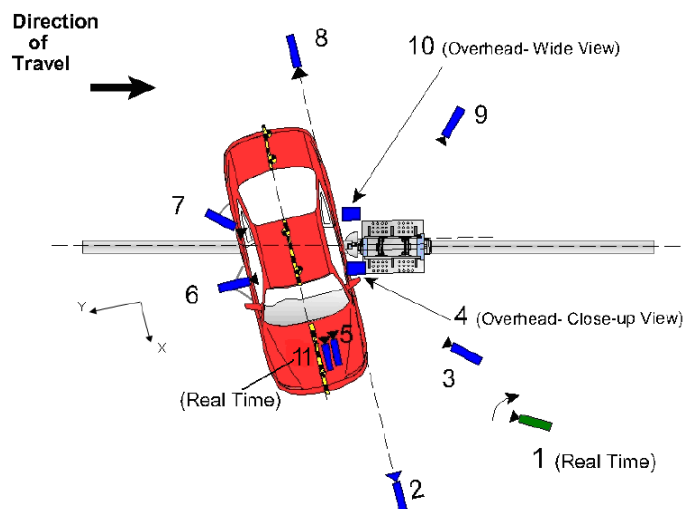
Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	293
HS	Head to Side Window	mm	421
AD	Arm to Door	mm	171
HD	Hip Point to Door	mm	169

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



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	0.96	1.67	0.96	8	1000
6	On-Board - Dummy Side View	-0.10	1.66	0.95	6	1000
7	On-Board - Dummy Rear Oblique View	-1.08	0.55	1.16	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	1.02	-0.84	0.24		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

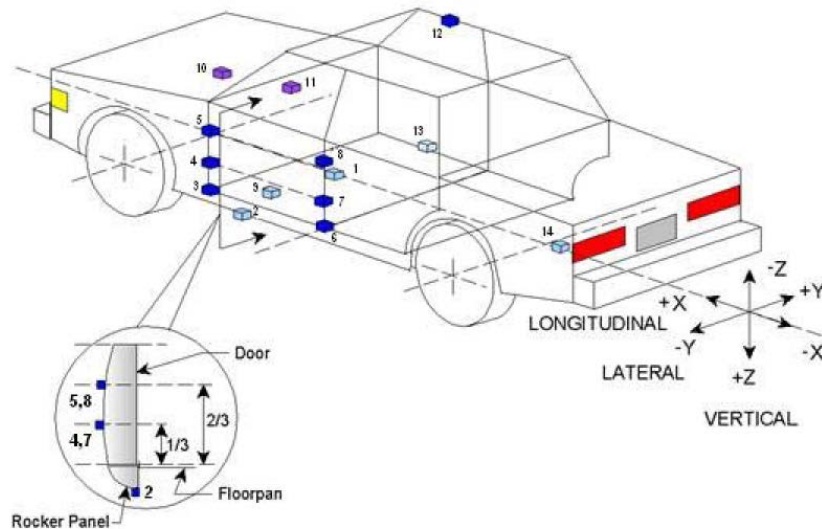
Driver Dummy Channels	19
Vehicle Structure Accelerometers	18
Pole Load Cells	8
Total	45

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2045	0	-645
2	Left Floor Sill	2822	-805	-280
3	A-Pillar Sill	3263	-817	-583
4	A-Pillar Low	3263	-817	-828
5	A-Pillar Mid	3263	-817	-1047
6	B-Pillar Sill	2232	-740	-585
7	B-Pillar Low	2232	-740	-857
8	B-Pillar Mid	2232	-740	-1198
9	Driver Seat Track	2224	-160	-580
10	Engine Top	3966	131	-1030
11	Firewall	3924	163	-1100
12	Right Roof	2176	465	-1787
13	Right Floor Sill	2060	165	-493
14	Rear Floorpan	1220	0	-713

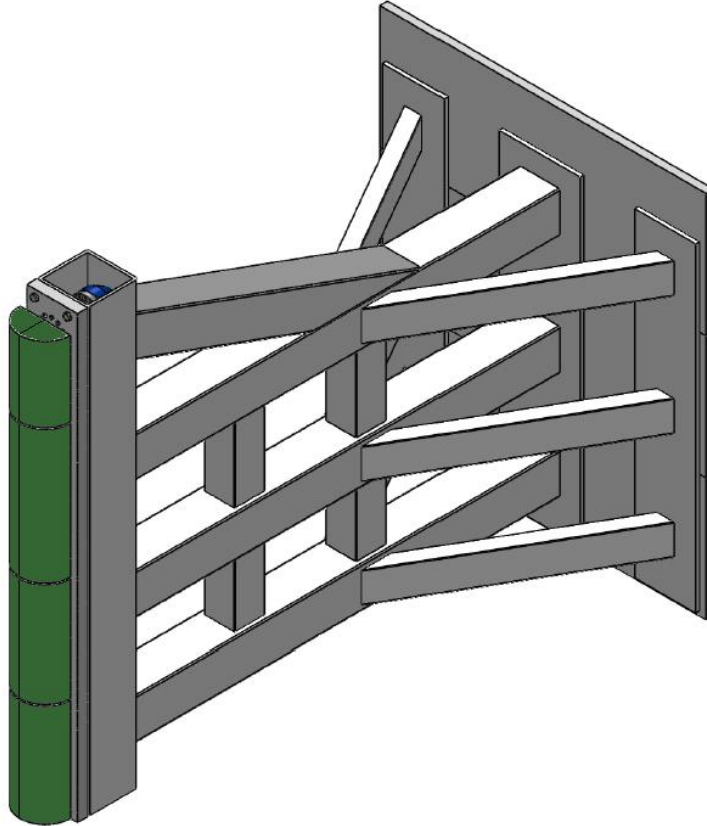
Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 7

RIGID POLE LOAD CELL DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



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: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300
 Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver SID-IIs Dummy
Face	Curtain Airbag, Frontal Airbag
Top of Head	Curtain Airbag
Left Side of Head	Curtain Airbag
Back of Head	Headrest
Left Shoulder	Torso/Pelvis Airbag, Seatback Bolster
Upper Torso	Torso/Pelvis Airbag, Seatback Bolster
Lower Torso	Torso/Pelvis Airbag, Seatback Bolster
Left Hip	Torso/Pelvis Airbag, Seat Cushion Bolster, Seatback Bolster
Left Knee	Knee Airbag, 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	
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: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23**POST-TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	None
Windshield Damage	Broken, Separated from Roof
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	Yes		
Knee Airbag	Yes	Yes		
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	

IMPACT POINT LOCATION DATA

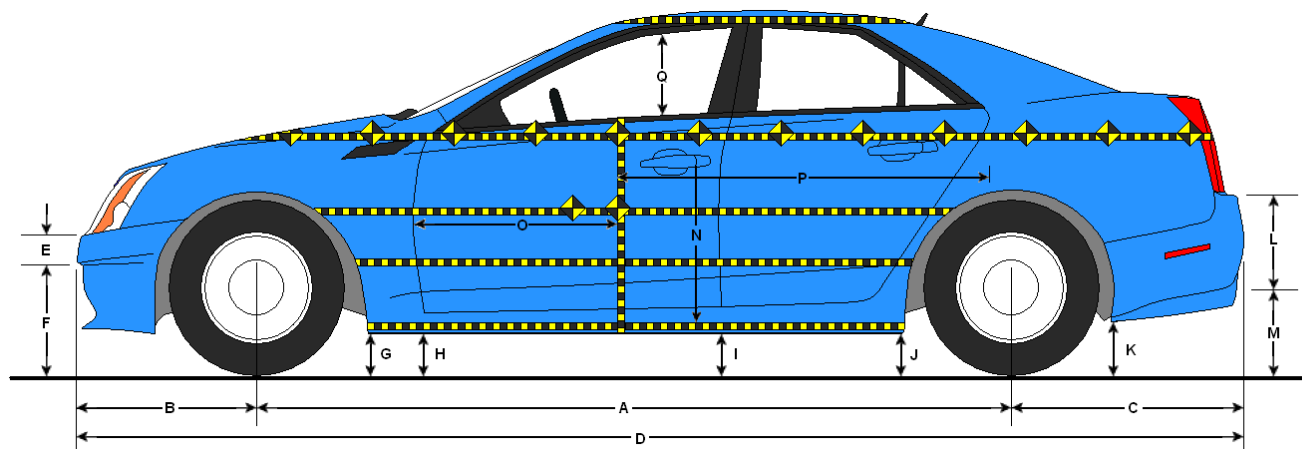
Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		1367
Actual Impact Point (Aft of Front Axle)	mm		1367
Horizontal Offset (+ forward / - rearward)	mm	± 38 of Intended Impact Point	0
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	°	75 ± 3	75.6
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.32
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.40

DATA SHEET NO. 9

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



LEFT SIDE VIEW

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

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

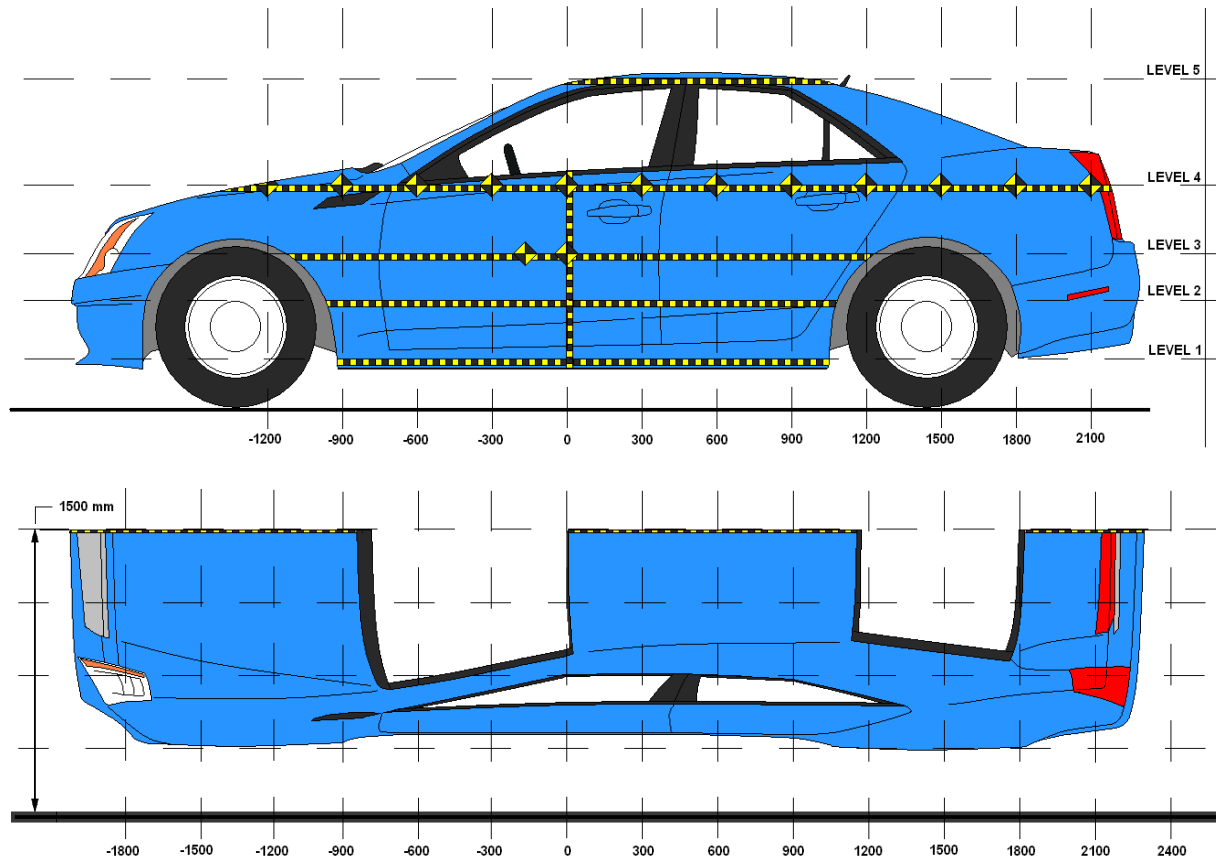
Code	Description	Pre-Test	Post-Test	Change
A	Wheelbase	2960	2953	-7
B	Front Axle to FSOV	913	894	-19
C	Rear Axle to RSOV	1027	1037	10
D	Total Length at Centerline	4900	4884	-16
E	Front Bumper Thickness	375	378	3
F	Front Bumper Bottom to Ground	32	18	-14
G	Sill Height at Front Wheel Well	276	222	-54
H	Sill Height at Front Door Leading Edge	65	19	-46
I	Sill Height at B-Pillar	240	236	-4
J1	Sill Height at Rear Wheel Well	335	360	25
J2	Pinch Weld Height at Rear Wheel Well	-49	-65	-16
K	Sill Height Aft of Rear Wheel Well	374	367	-7
L	Rear Bumper Thickness	245	249	4
M	Rear Bumper Bottom to Ground	104	97	-7
N	Sill Height to Bottom of Front Window Sill	620	590	-30
O	Front Door Leading Edge to Impact CL	741	677	-64
P	Rear Door Trailing Edge to Impact CL	1389	1331	-58
Q	Front Window Opening	466	487	21
R	Right Side Length	4486	4484	-2
S	Left Side Length	4293	4264	-29
T	Vehicle Width at B-Pillar	1895	1767	-128

DATA SHEET NO. 10

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



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

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	-24	310	0
2	Occupant H-Point	426	364	0
3	Mid-Door	676	351	0
4	Window Sill	832	266	0
5	Window Top	1323	124	0

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

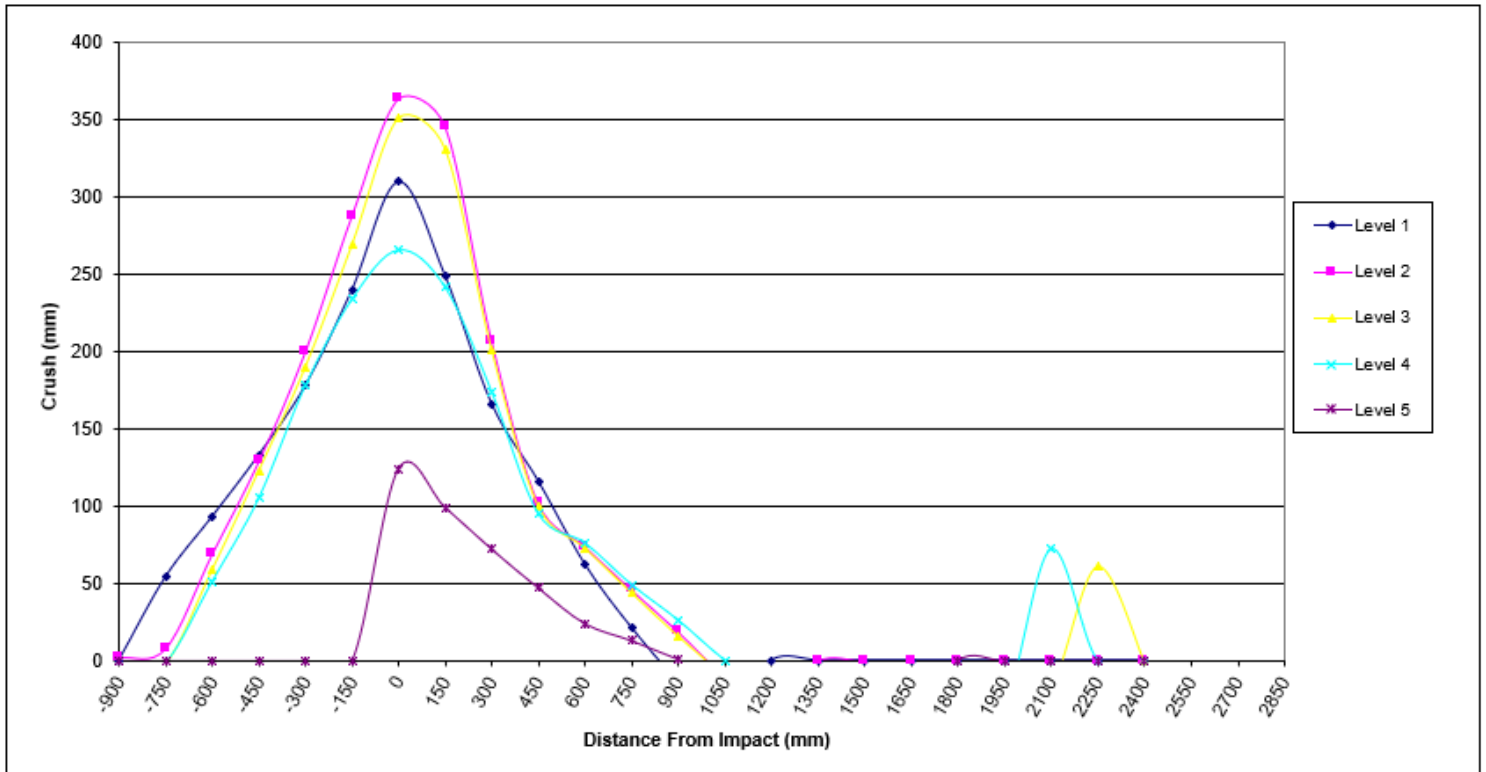
	Pre-Test (mm)					Post-Test (mm)					Crush (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900		519	553	643			521	540	625			2	-13	-18	
-750	601	541	554	629		655	549	552	627		54	8	-2	-2	
-600	610	548	556	622		703	617	615	673		93	69	59	51	
-450	614	549	555	620		747	678	678	725		133	129	123	105	
-300	614	549	555	621		792	749	745	799		178	200	190	178	
-150	613	549	553	621		853	837	822	855		240	288	269	234	
0	613	548	555	639	855	923	912	906	905	979	310	364	351	266	124
150	613	549	555	635	854	862	895	886	877	953	249	346	331	242	99
300	616	550	556	631	860	782	757	757	805	932	166	207	201	174	72
450	618	554	558	633	868	734	656	658	728	915	116	102	100	95	47
600	621	555	560	639	878	683	629	633	715	902	62	74	73	76	24
750	617	556	562	642	880	638	602	606	691	893	21	46	44	49	13
900	606	555	565	648	883	593	574	581	674	884	-13	19	16	26	1
1050	581	545	566	654	881	547	535	556	654	869	-34	-10	-10	0	-12
1200		531	567	660	885		501	530	640	862		-30	-37	-20	-23
1350			566	664	887			503	620	854			-63	-44	-33
1500			567	670	888			548	657	843			-19	-13	-45
1650			572	680	891			554	662	844			-18	-18	-47
1800			583	692				563	670	845			-20	-22	
1950			601	704				583	675				-18	-29	
2100			625	622				608	694				-17	72	
2250			571					632					61		
2400															
2550															
2700															
2850															

DATA SHEET NO. 10 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

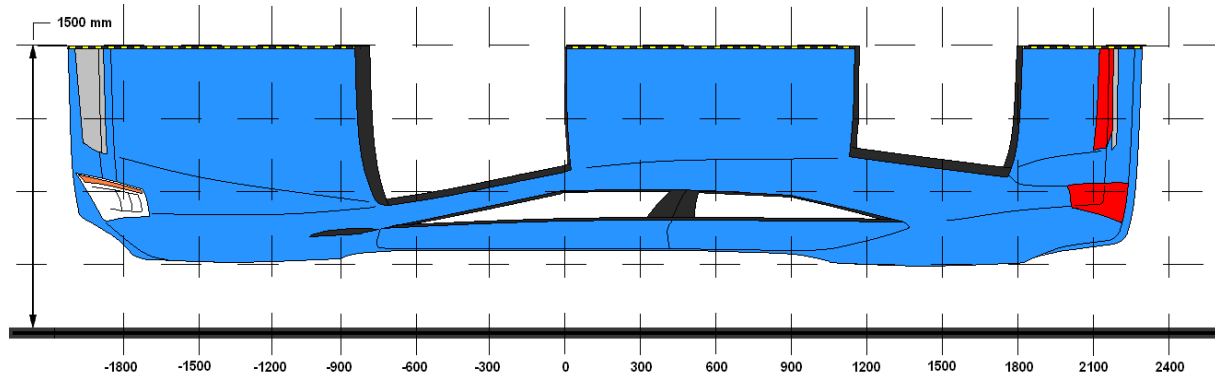


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2250	3	571	632	61
2	1650	5	891	844	-47
3	1050	1	581	547	-34
4	300	2	550	757	207
5	-300	2	549	749	200
6	-900	4	643	625	-18

DATA SHEET NO. 12

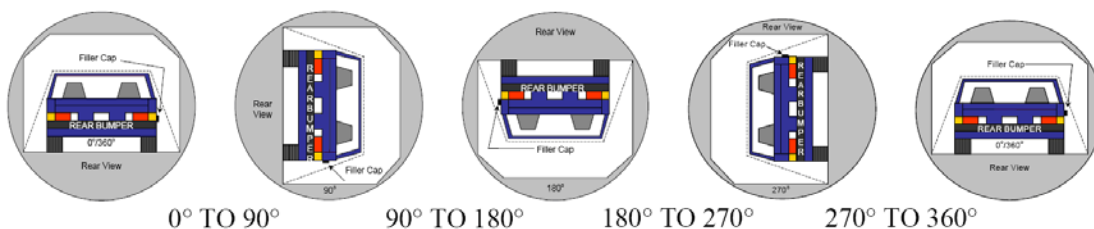
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23

Temperature at Time of Impact: 16.7° C Test Time: 2:40 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°	82	300	382
90° To 180°	80	300	380
180° To 270°	80	300	380
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

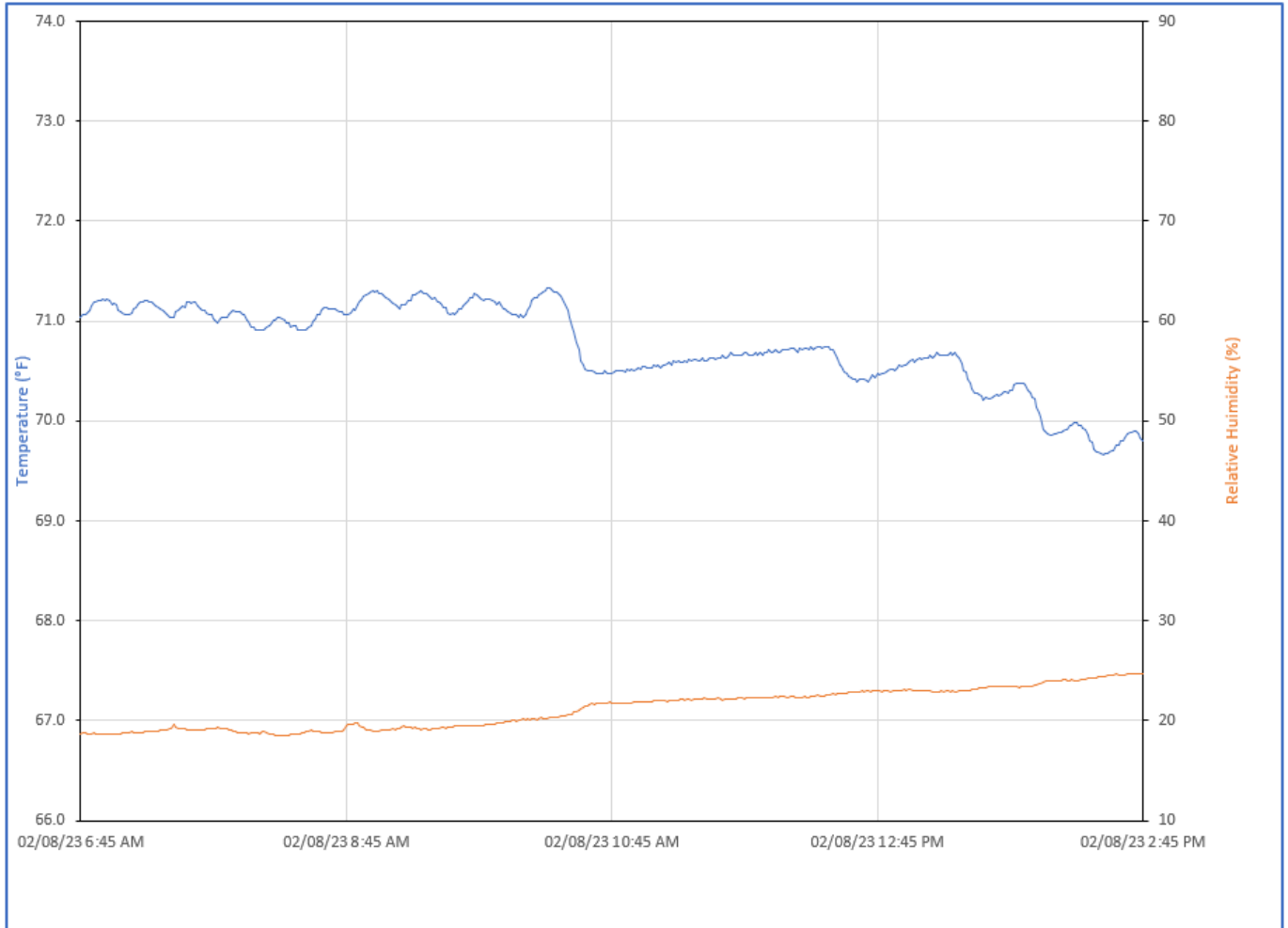
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 13

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230300

Test Program: NCAP Side Pole Impact Test Test Date: 02/08/23



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

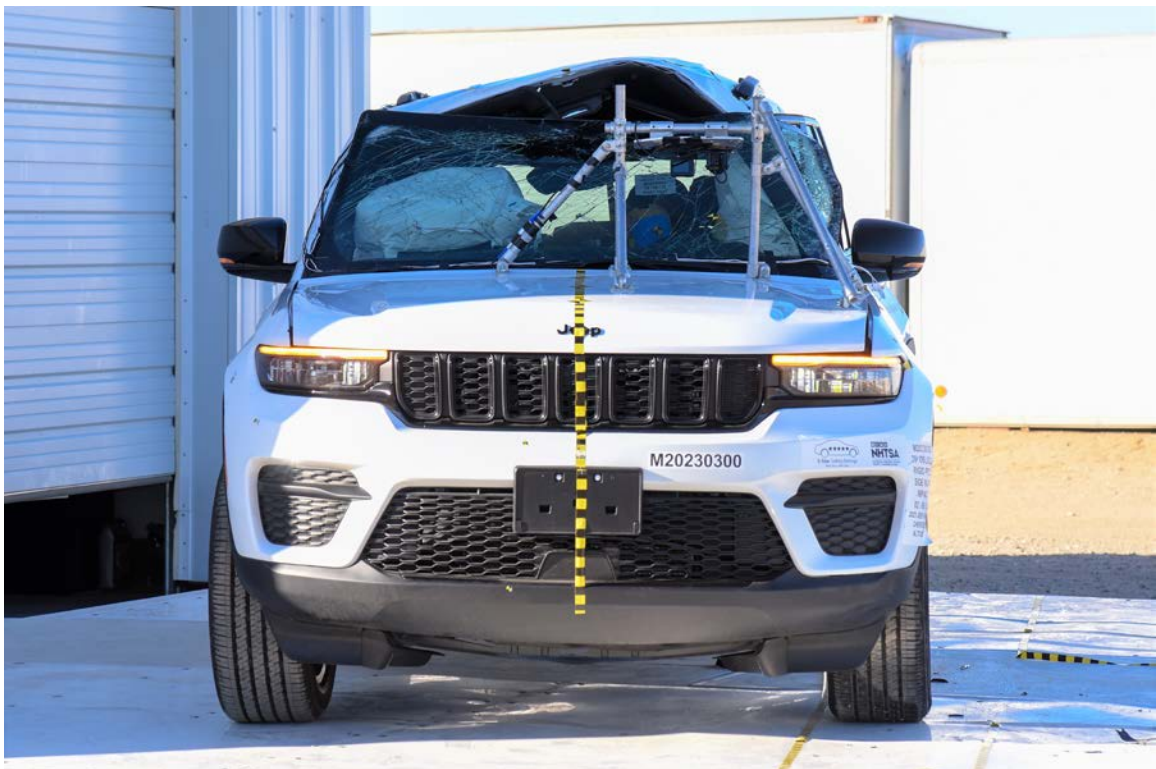


FIGURE 4. Post-Test Frontal View of Test Vehicle



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



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

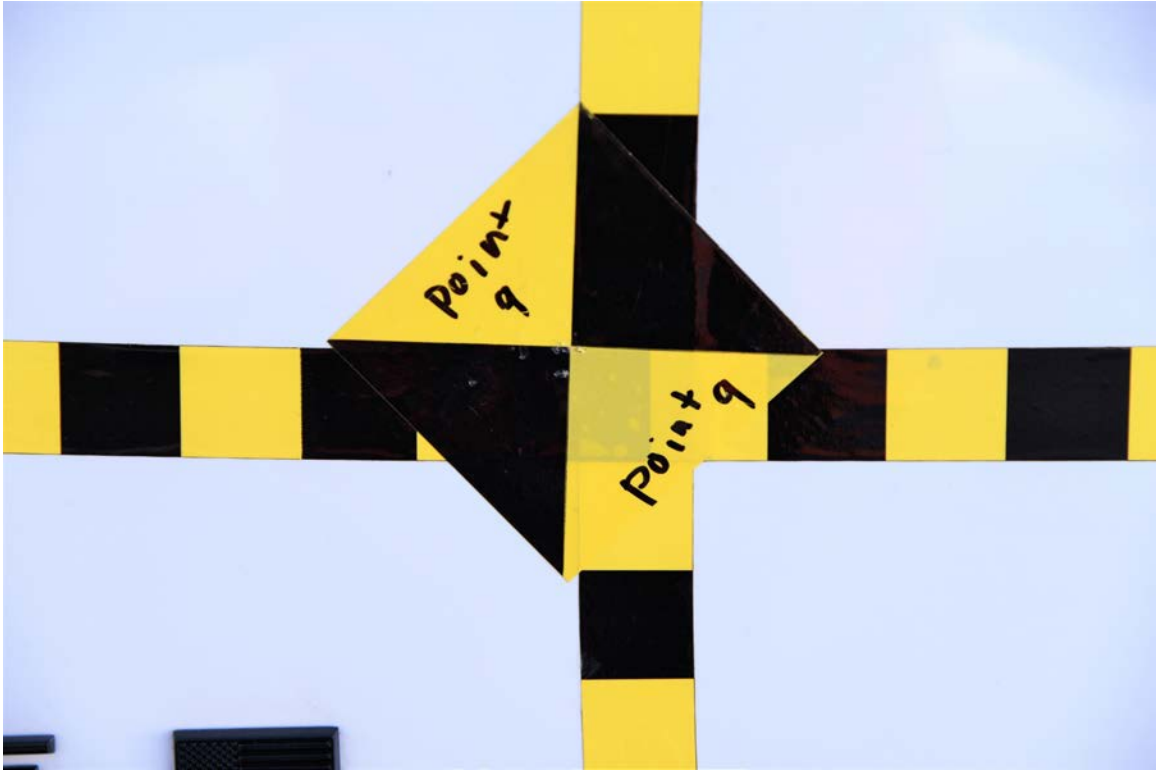


FIGURE 19. Pre-Test Close-Up View of Impact Point Target



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



FIGURE 35. View of Disengaged Parking Brake



FIGURE 36. Pre-Test View of Parking Brake



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



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



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



FIGURE 40. Pre-Test Dummy and Door Clearance View



FIGURE 41. Post-Test Dummy and Door Clearance View

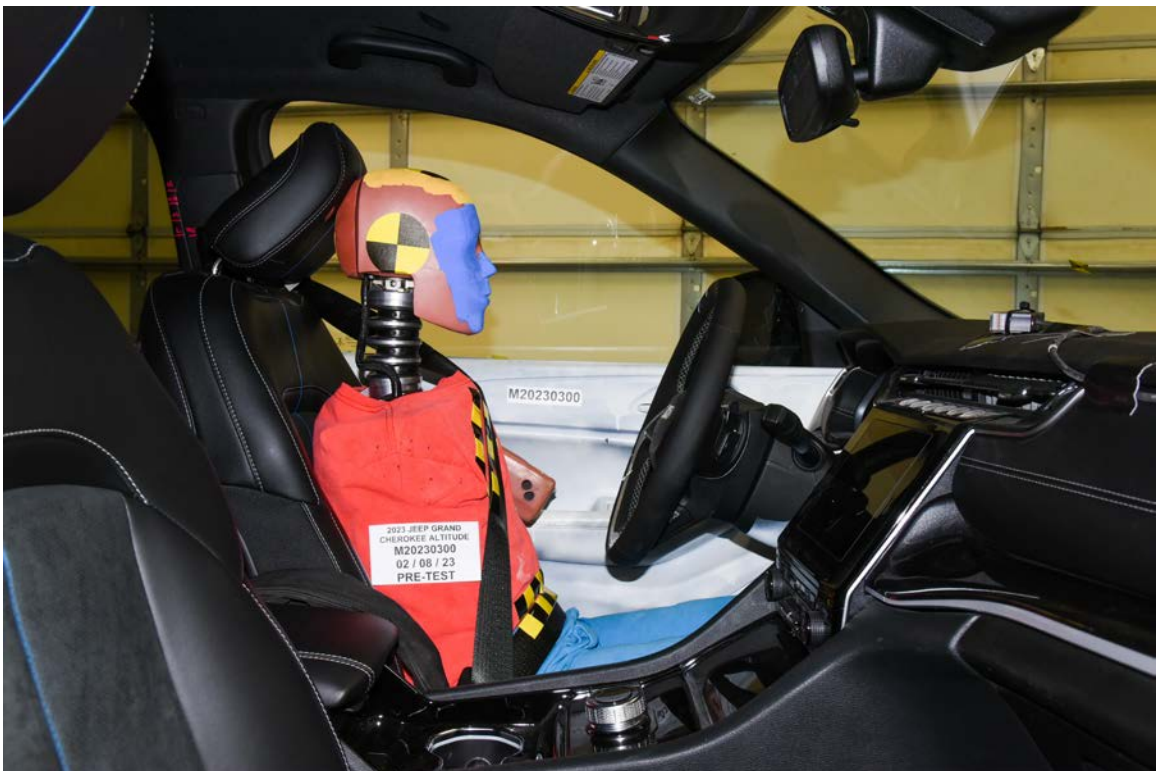


FIGURE 42. Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment



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



FIGURE 44. Pre-Test Inner Door Panel View



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



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

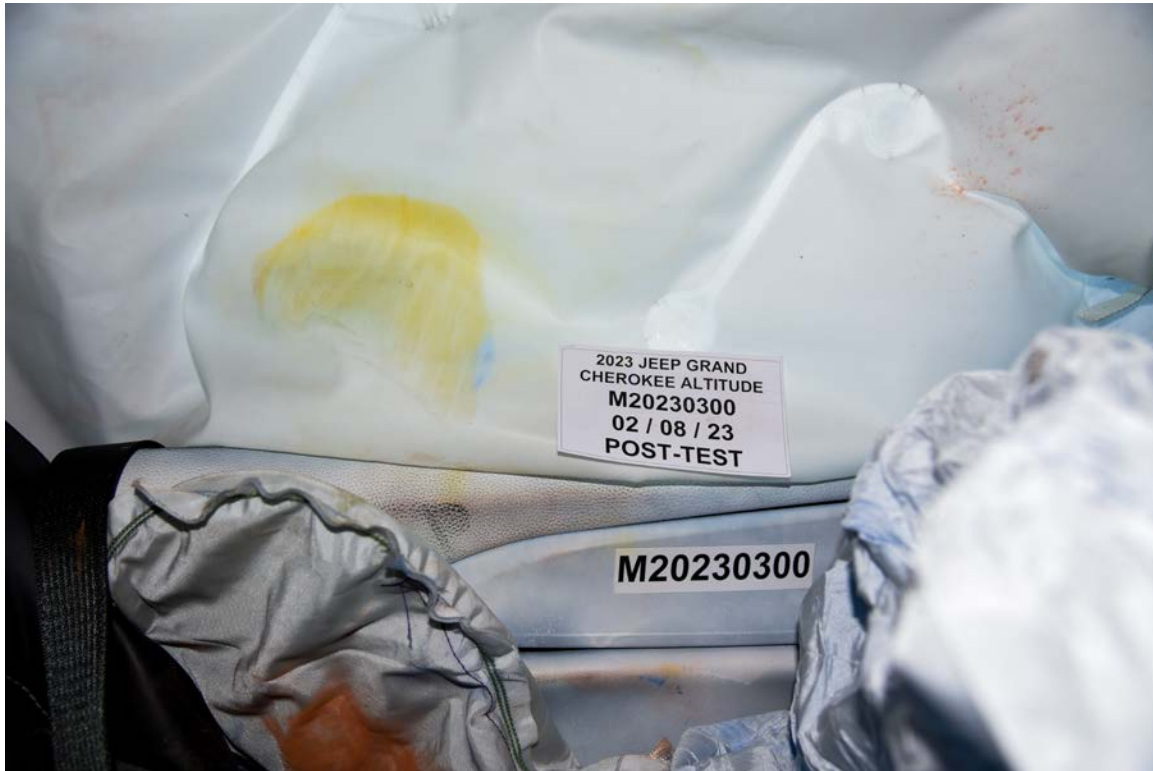


FIGURE 47. Post-Test Dummy Close-Up Head Contact With Side Airbag View



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



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



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



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

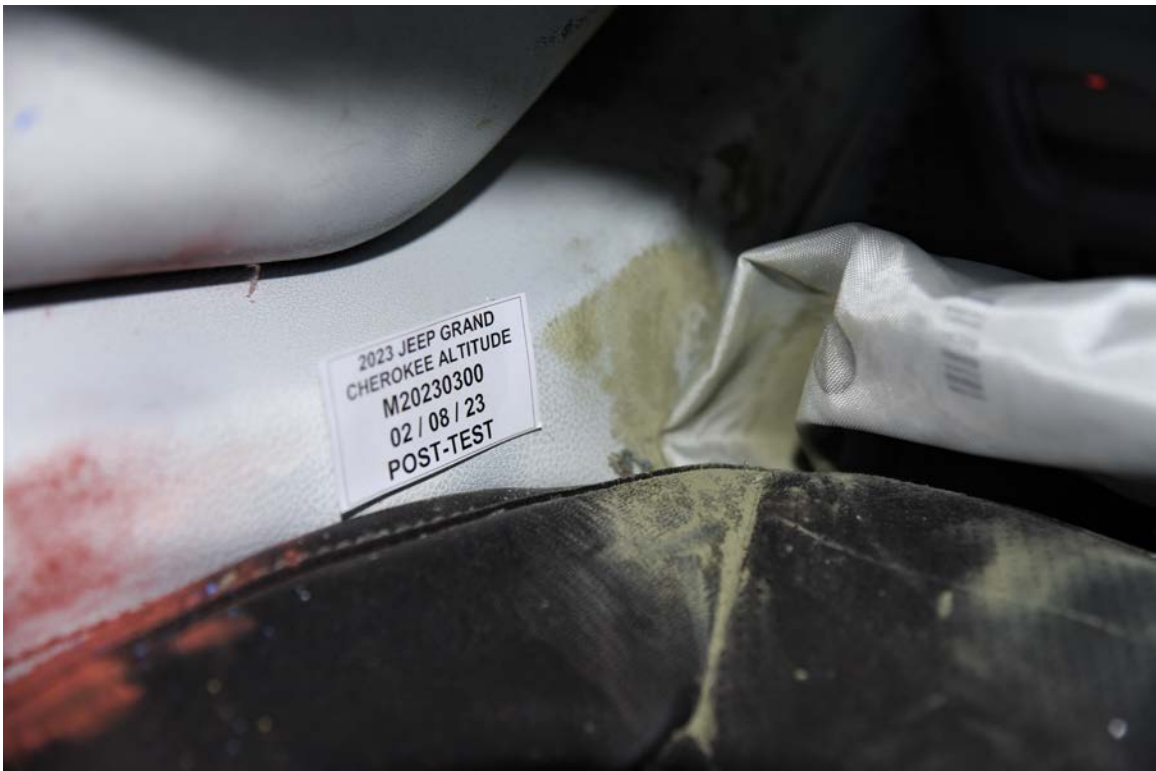


FIGURE 52. Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View



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

Photograph Not Applicable
No Rear Passenger Torso Airbag Deployment

FIGURE 54. Post-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

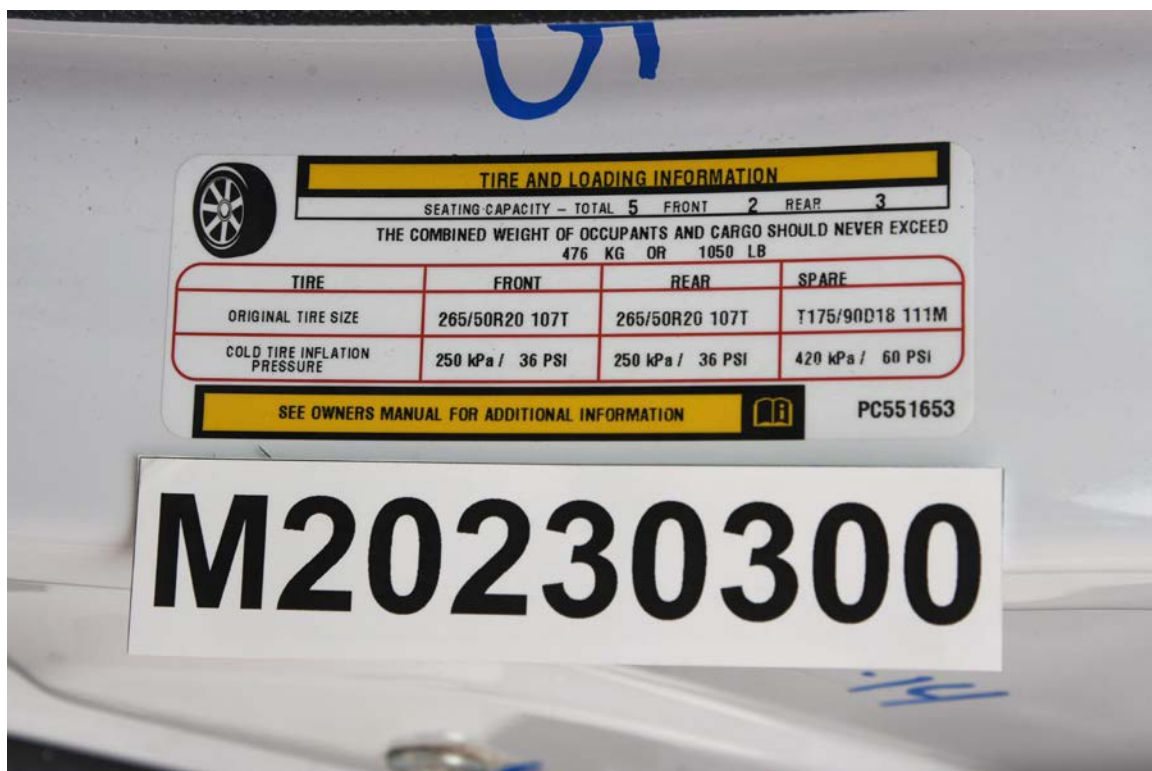


FIGURE 58. Close-Up View of Vehicle's Tire Information Placard or Label



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

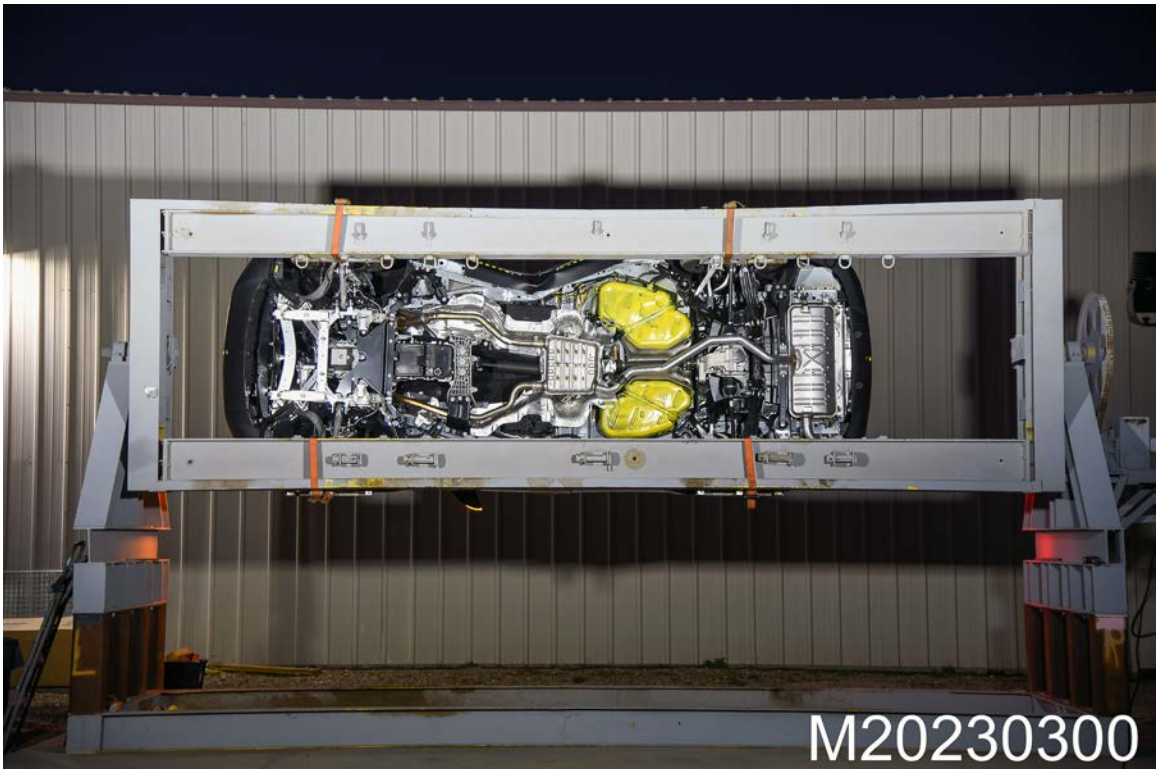


FIGURE 68. FMVSS No. 301 Static Rollover 270 Degrees



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)

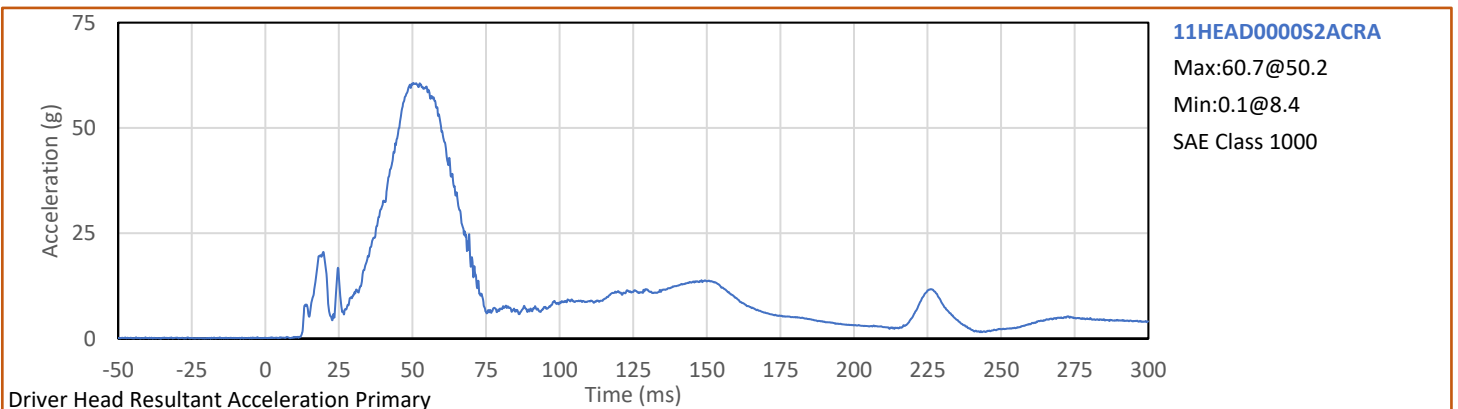
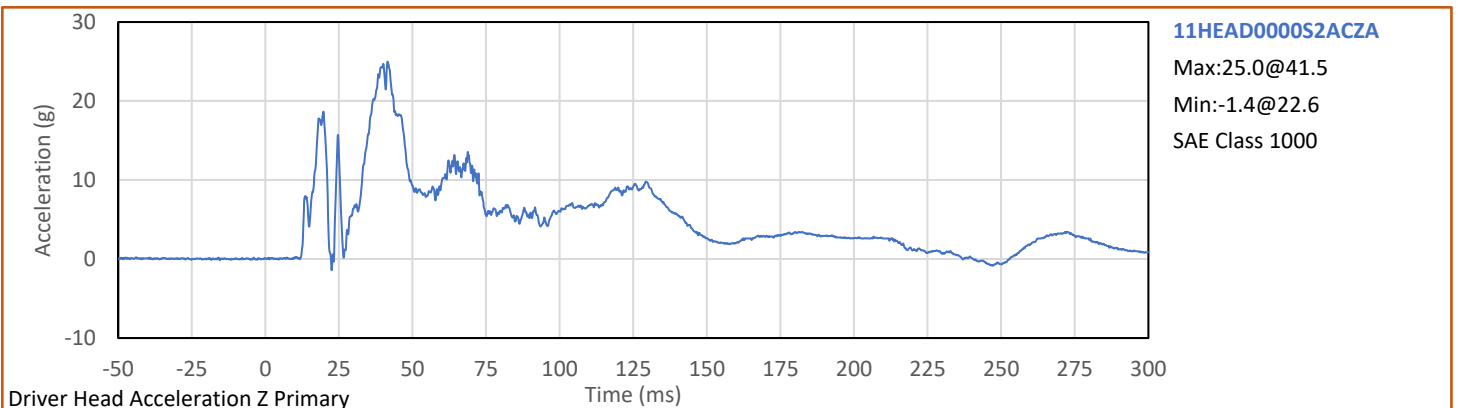
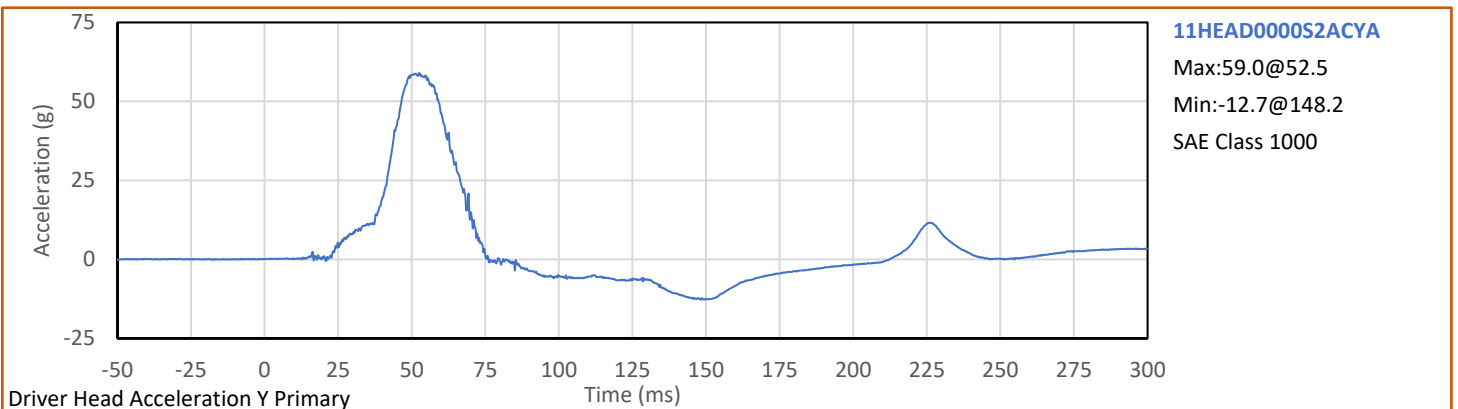
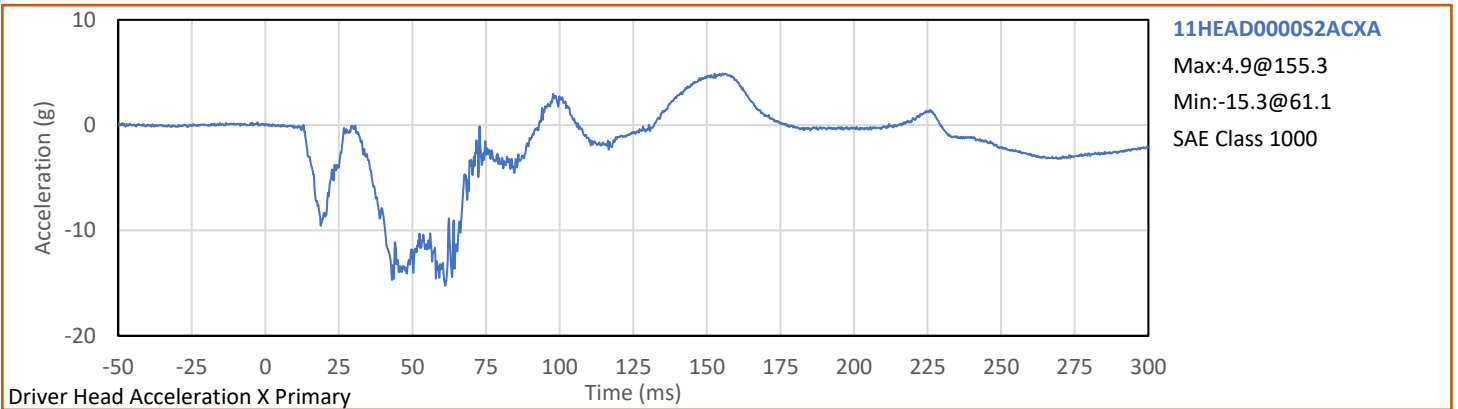
Driver Head Acceleration Redundant (Z)

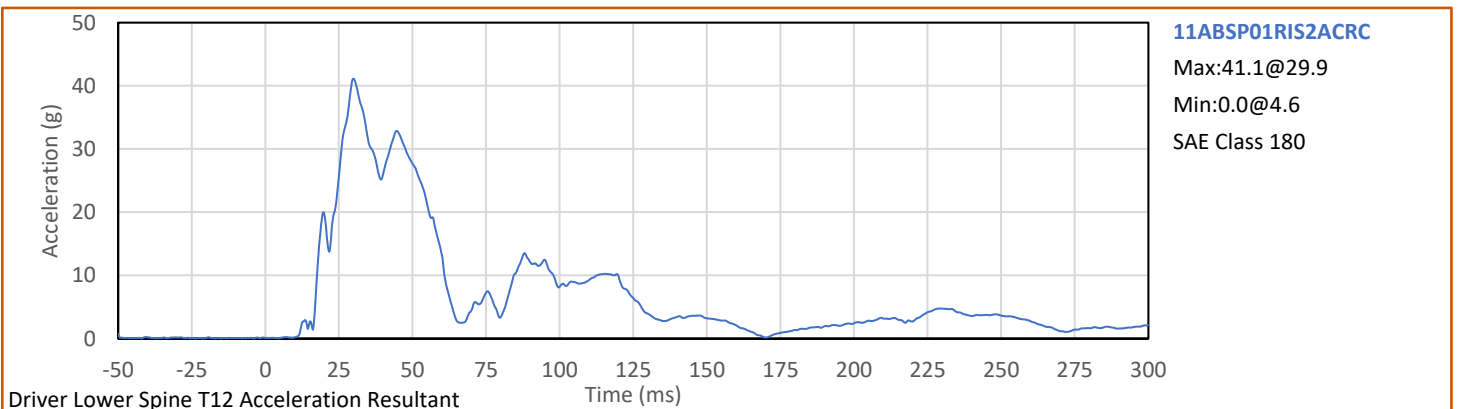
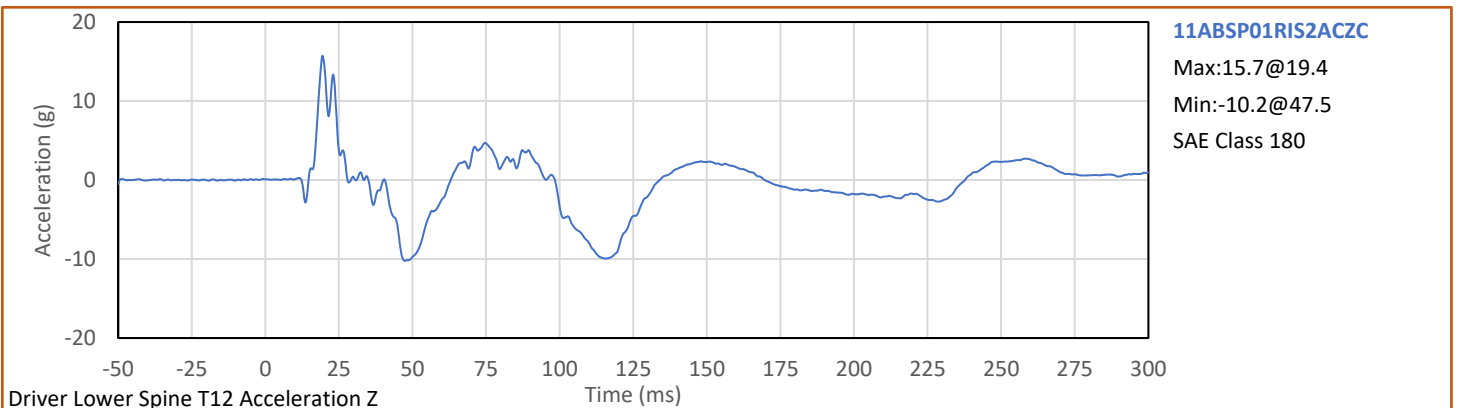
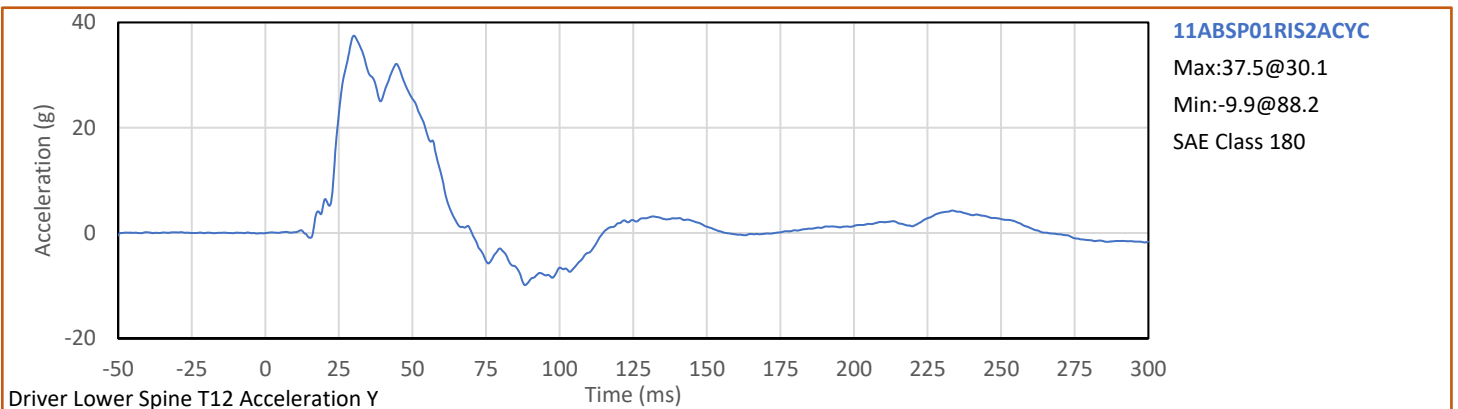
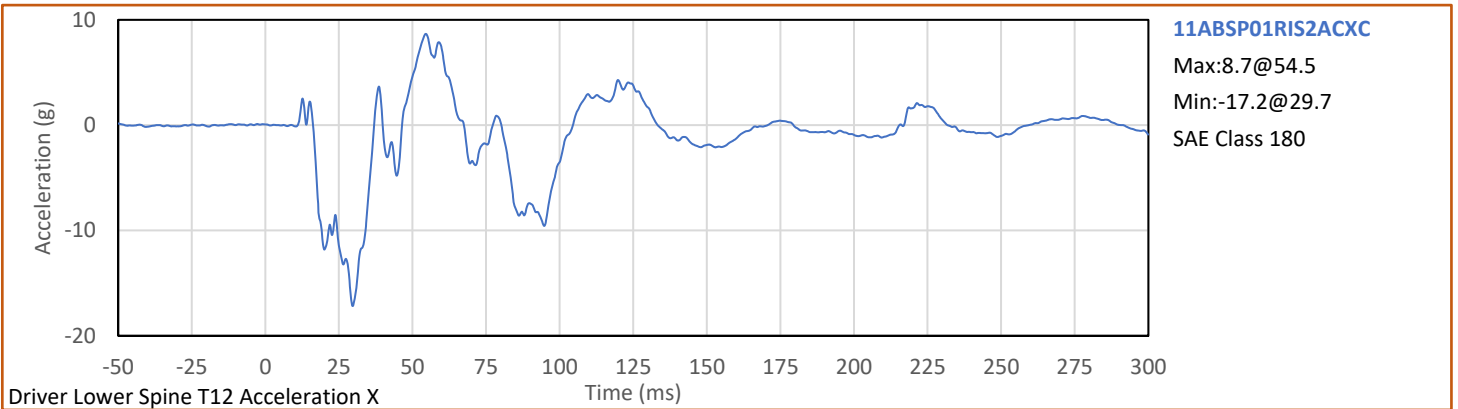
Vehicle Instrumentation Data

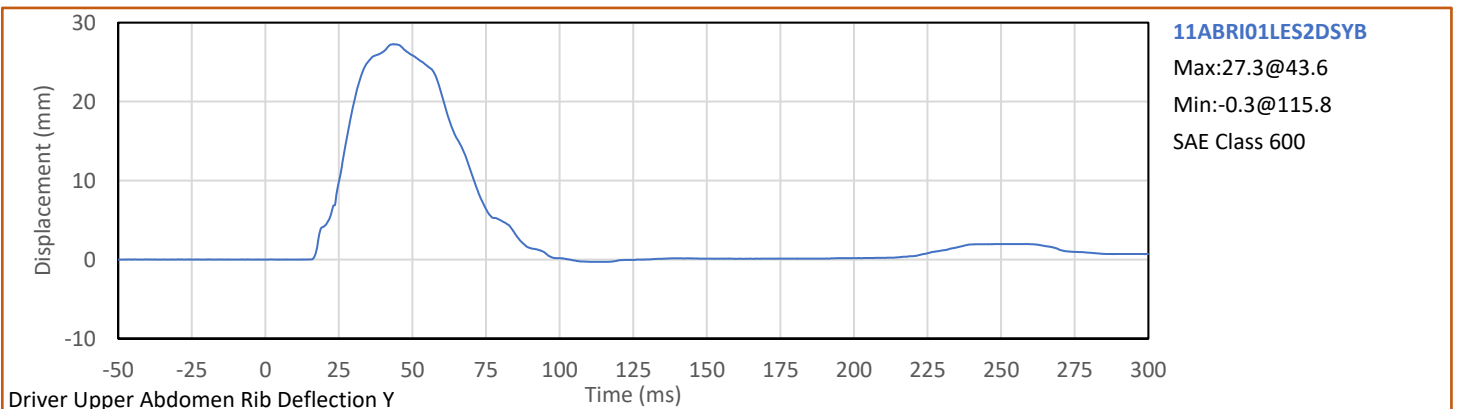
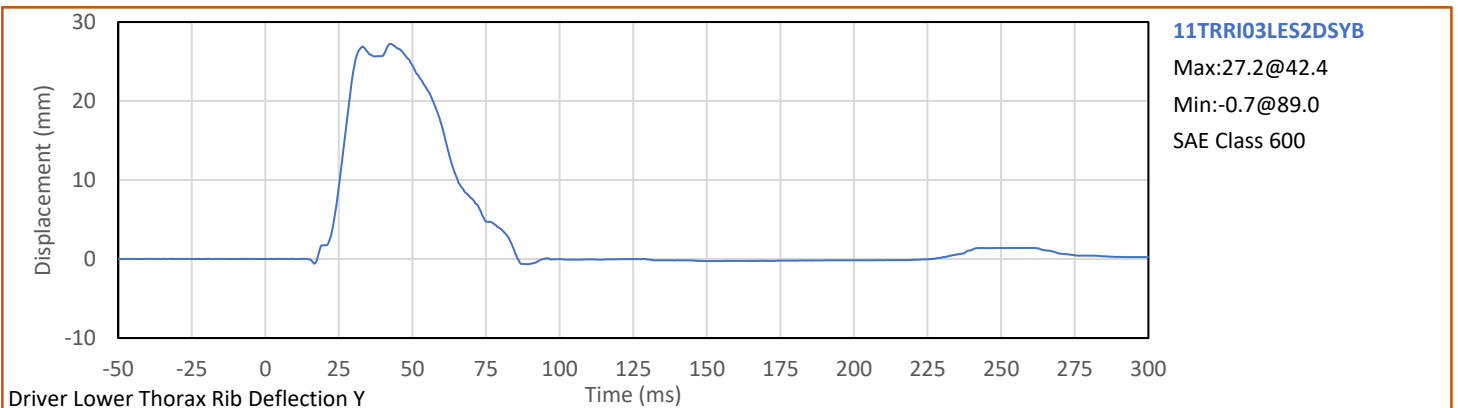
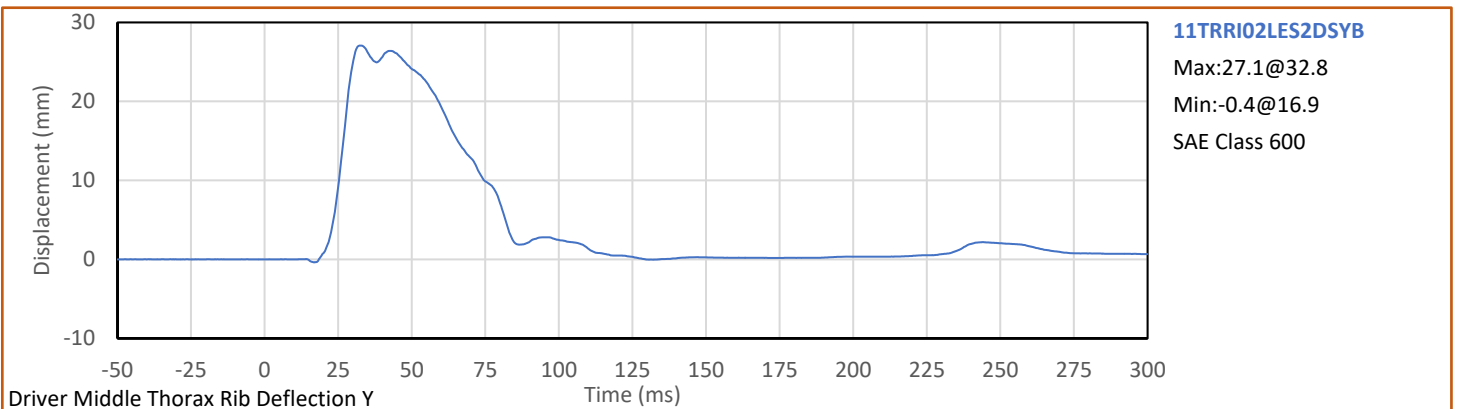
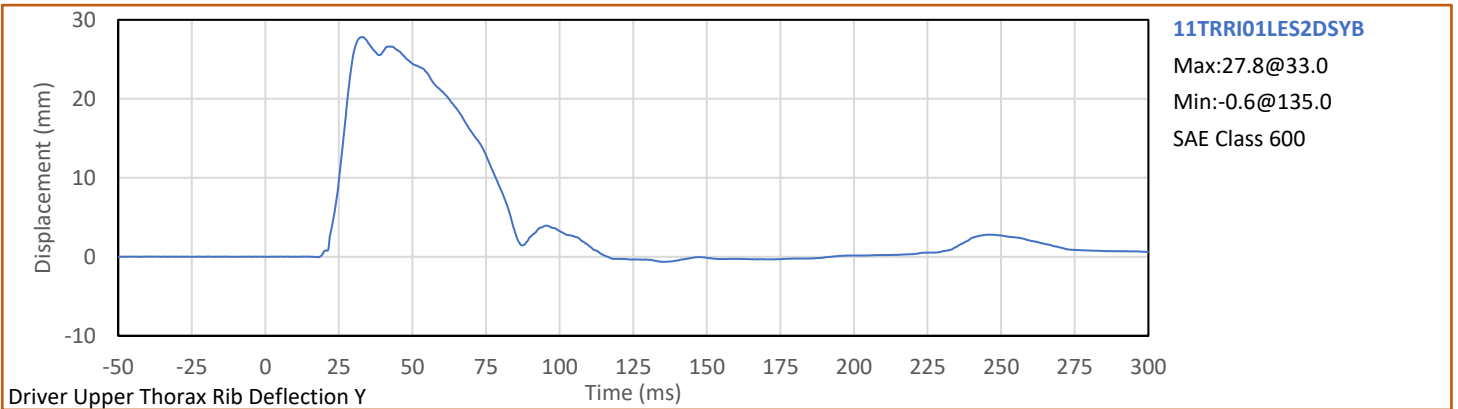
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration
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)

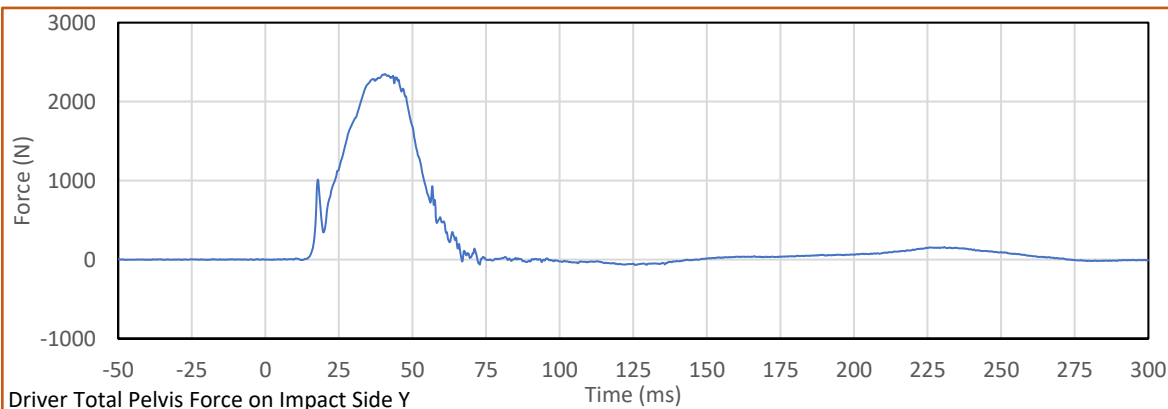
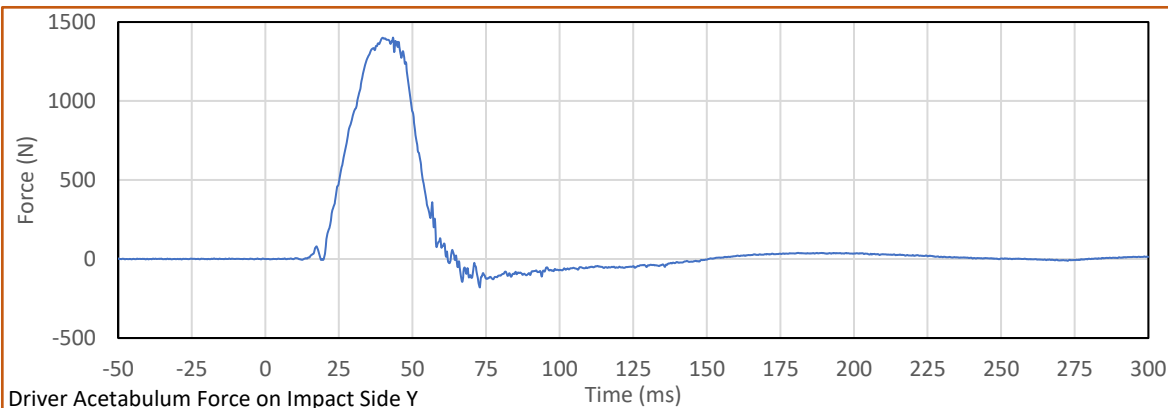
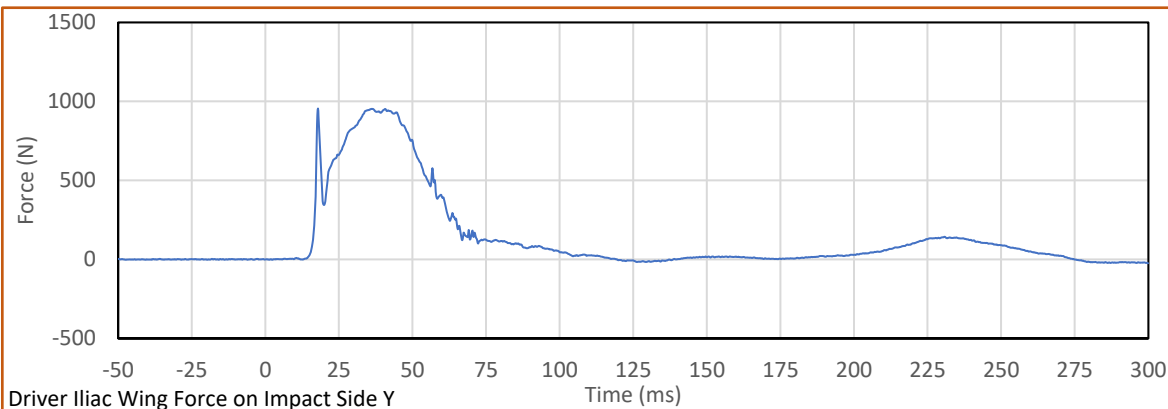
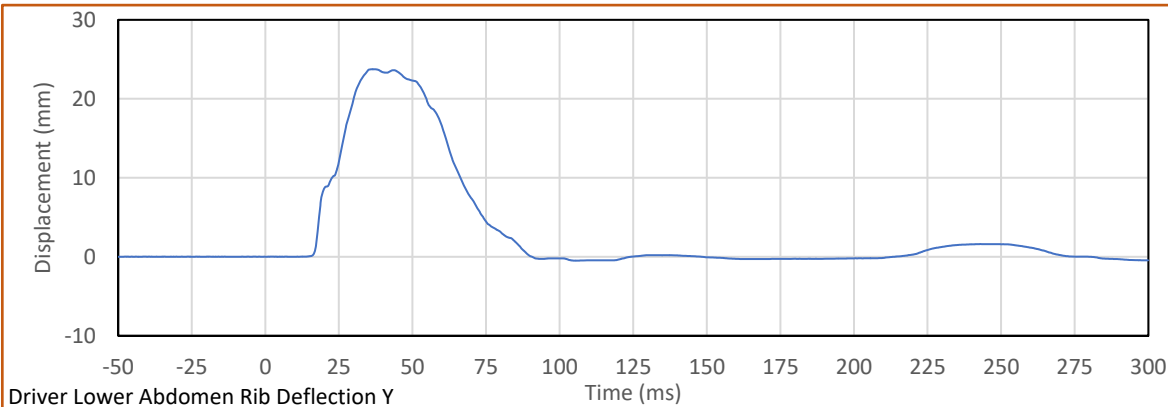
Pole Instrumentation Data

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)









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: 308

ATD Serial No.: 308

Test Date: 2023-01-30

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
A - Sitting Height	mm	772	788	782	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	85	Pass
D - H Point From Seatback	mm	141	151	148	Pass
E - Shoulder Pivot From Backline	mm	97	107	102	Pass
F - Thigh Clearance	mm	119	135	127	Pass
G - Head Breadth	mm	140	148	145	Pass
H - Head Back From Backline	mm	40	46	44	Pass
I - Head Depth	mm	178	188	182	Pass
J - Head Circumference	mm	541	551	543	Pass
K - Buttock To Knee Length	mm	514	540	519	Pass
L - Popliteal Height	mm	343	369	352	Pass
K - Knee Pivot To Floor Height	mm	392	409	403	Pass
N - Buttock Popliteal Length	mm	416	442	422	Pass
O - Chest Depth W/O Jacket	mm	195	211	208	Pass
P - Foot Length	mm	216	232	228	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	316	Pass
R - Arm Length	mm	249	259	257	Pass
S - Knee Joint To Seatback	mm	477	493	484	Pass
V - Shoulder Width	mm	341	357	345	Pass
W - Foot Width	mm	78	94	87	Pass
Y - Chest Circumference W/Jacket	mm	851	881	862	Pass
Z - Waist Circumference	mm	761	791	784	Pass
				Overall Test Results	Pass

Technician:



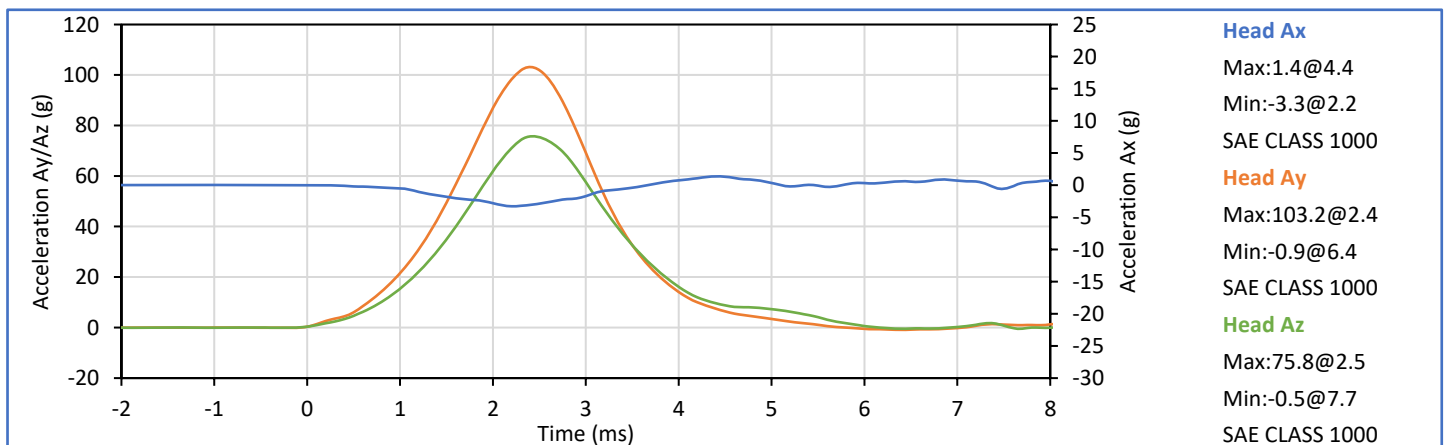
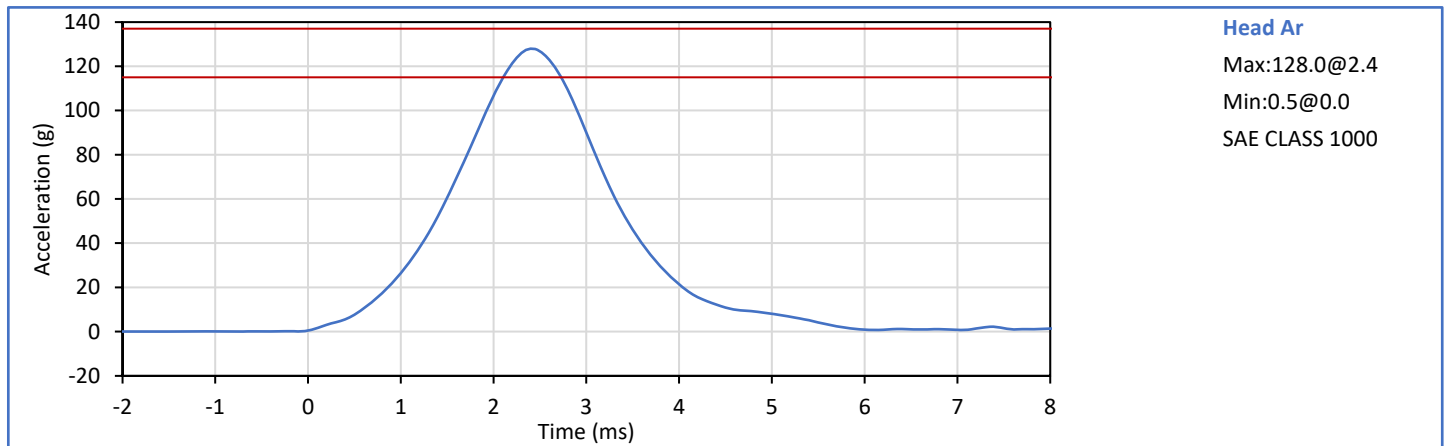
G. Fuentes

Approved By:



J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	115.0	137.0	128.0	Pass
Peak Head Ax	g	-15.0	15.0	-3.3	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Technician:

G. Fuentes

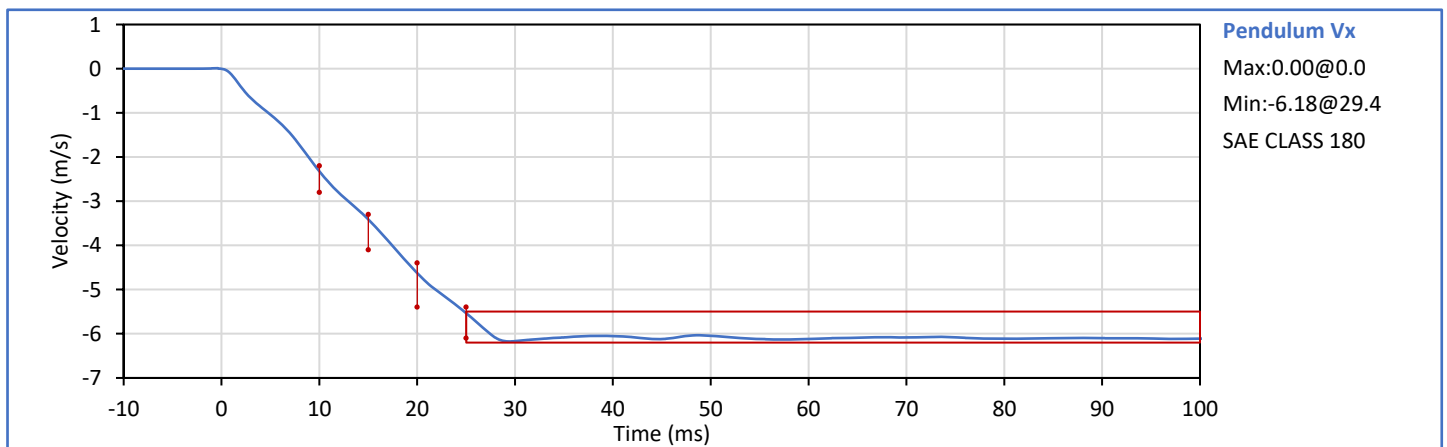
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	5.51	5.63	5.57	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.32	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.42	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-4.63	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.54	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-6.18/-5.54	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-74.4	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	63.6	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	41.4	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	112.0	Pass
				Overall Test Results	Pass



Technician:

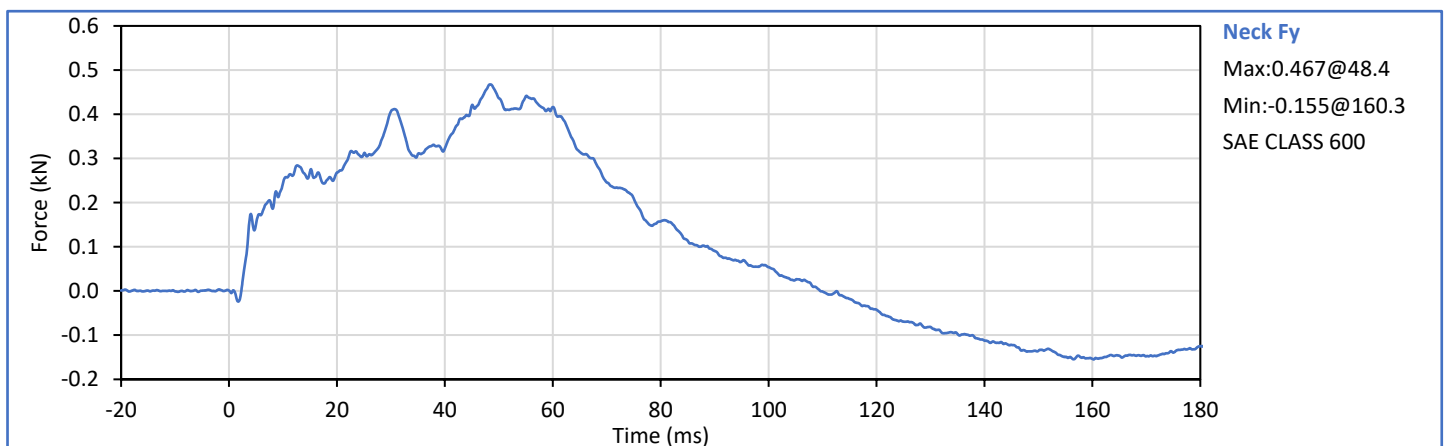
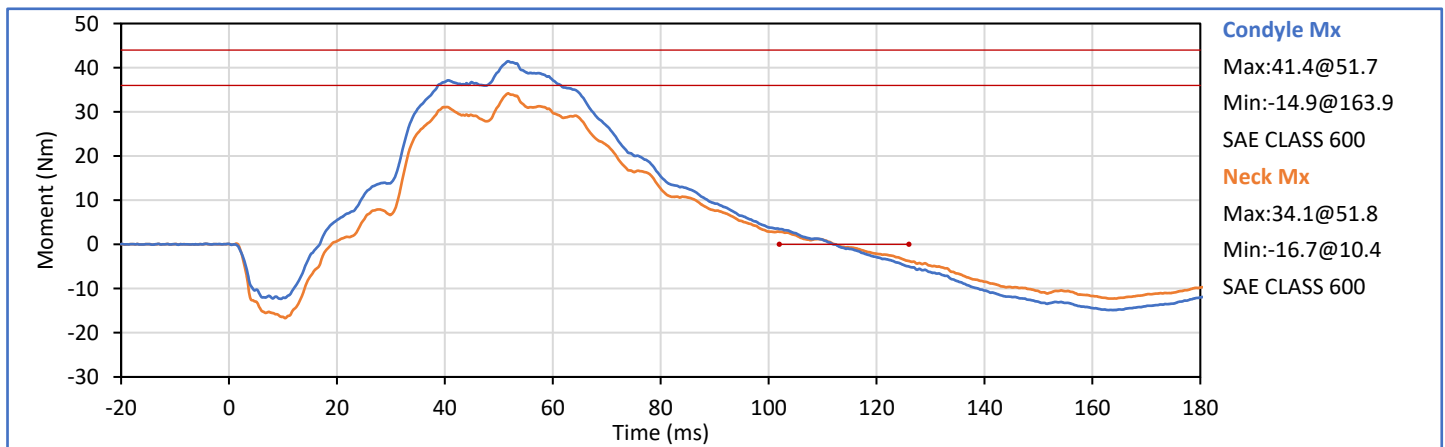
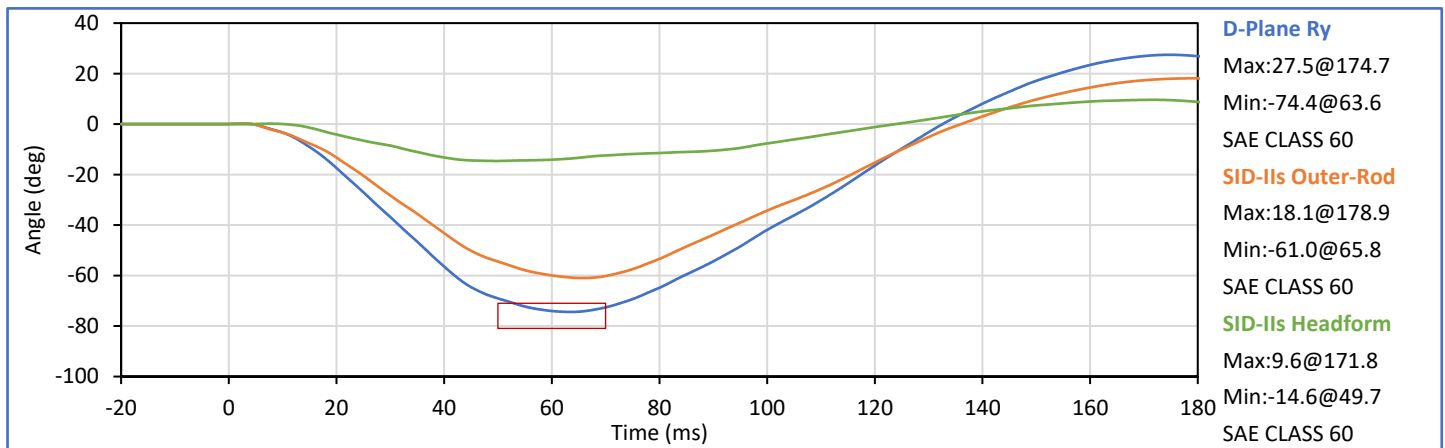
G. Fuentes

G. Fuentes

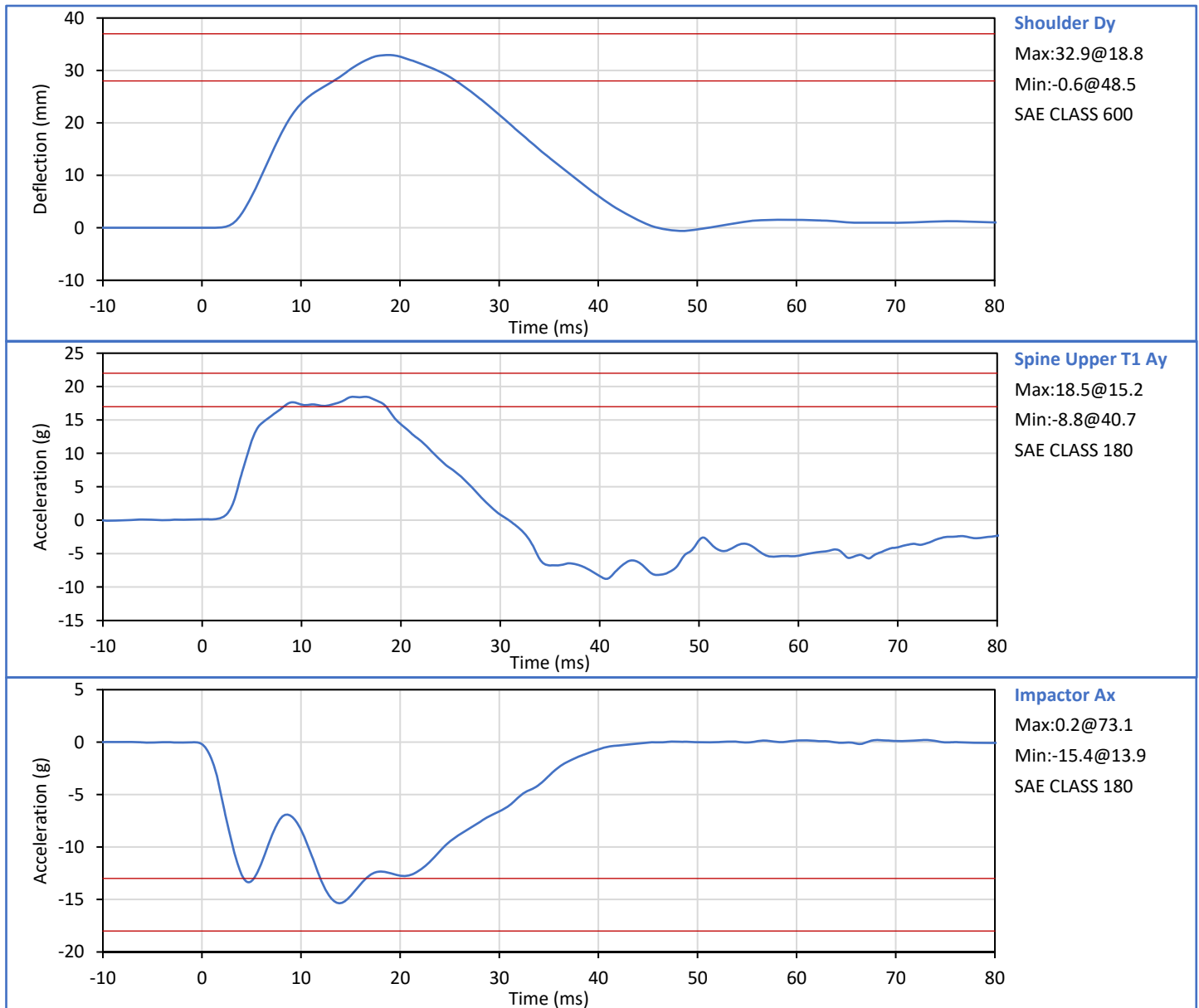
Approved By:

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
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.9	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.5	Pass
Peak Impactor Ax	g	-18.0	-13.0	-15.4	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

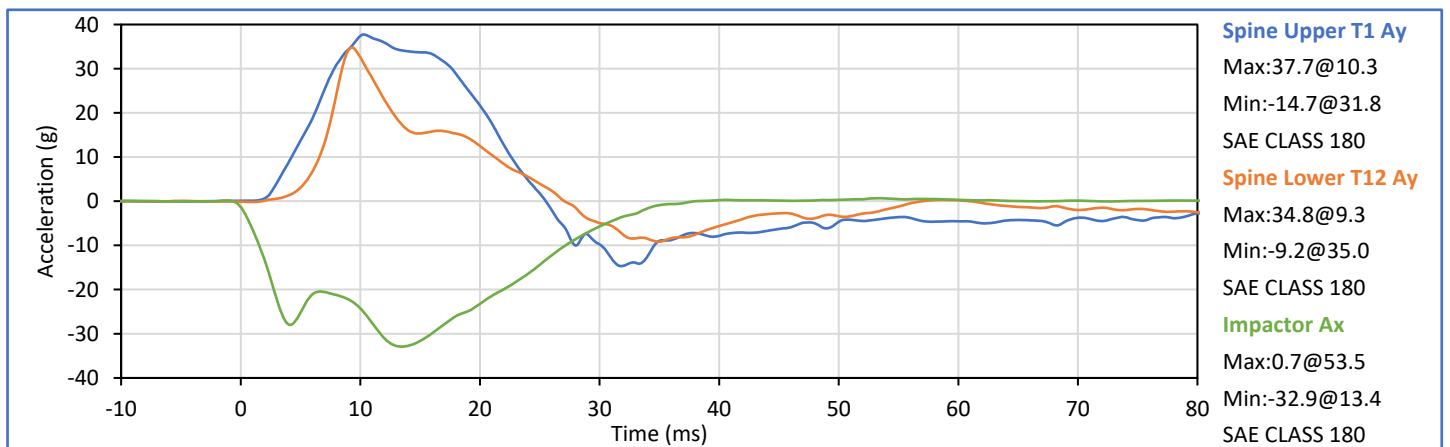
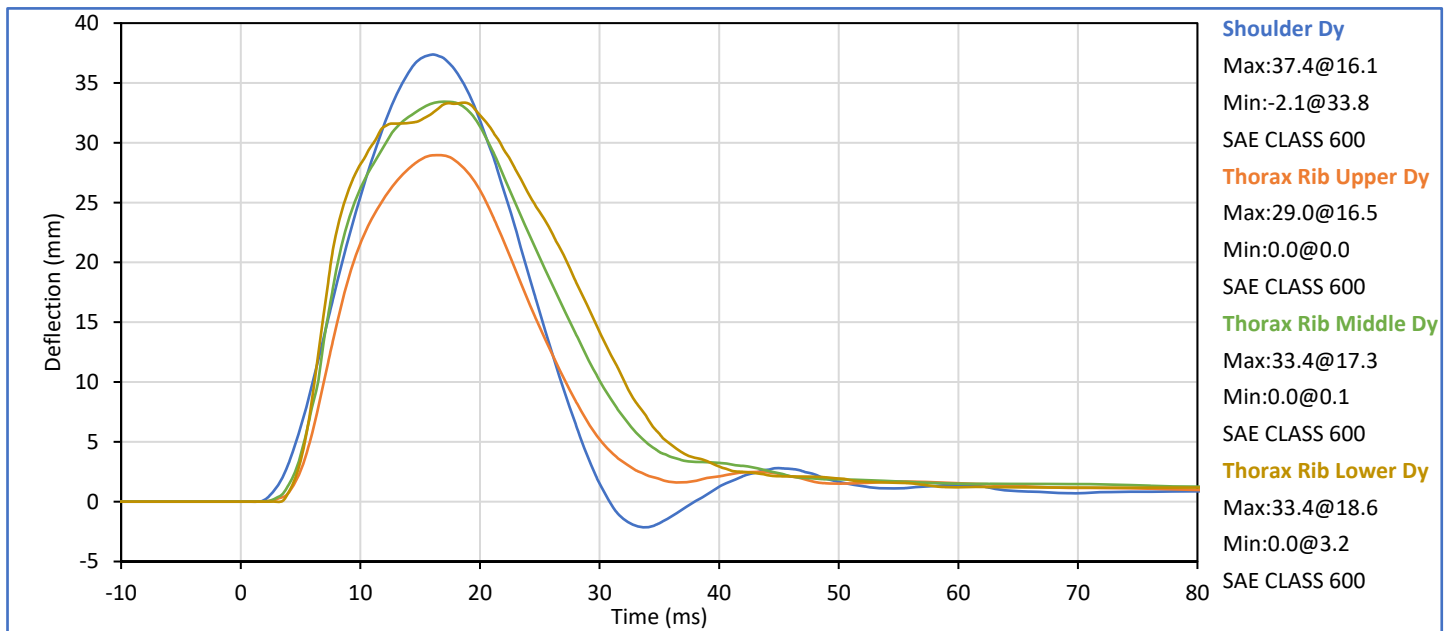
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Shoulder Dy	mm	31.0	40.0	37.4	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.0	Pass
Peak Middle Rib Dy	mm	30.0	36.0	33.4	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.4	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.7	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	34.8	Pass
Peak Impactor Ax	g	-36.0	-30.0	-32.9	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

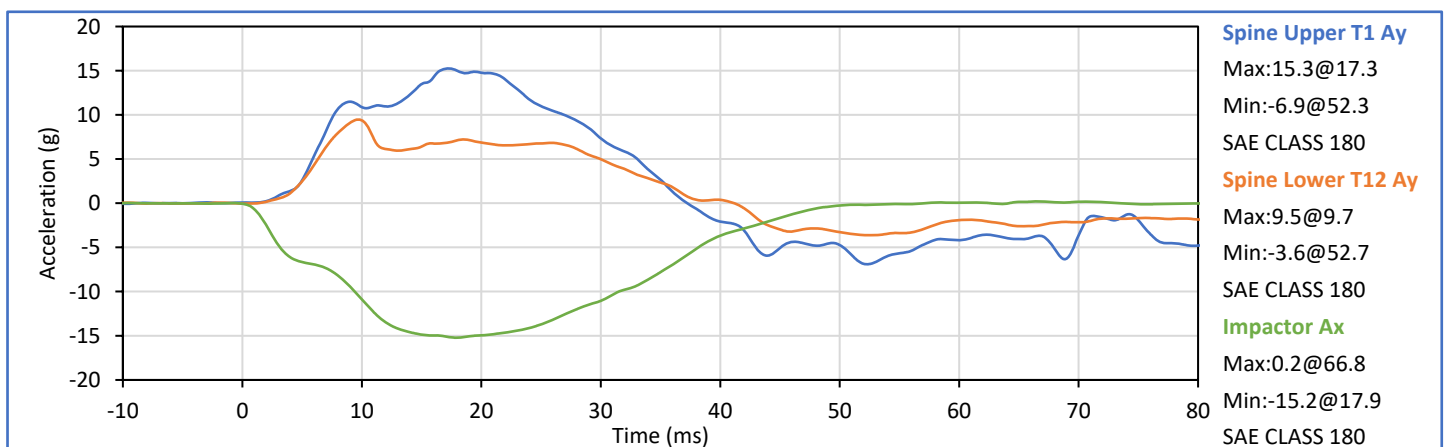
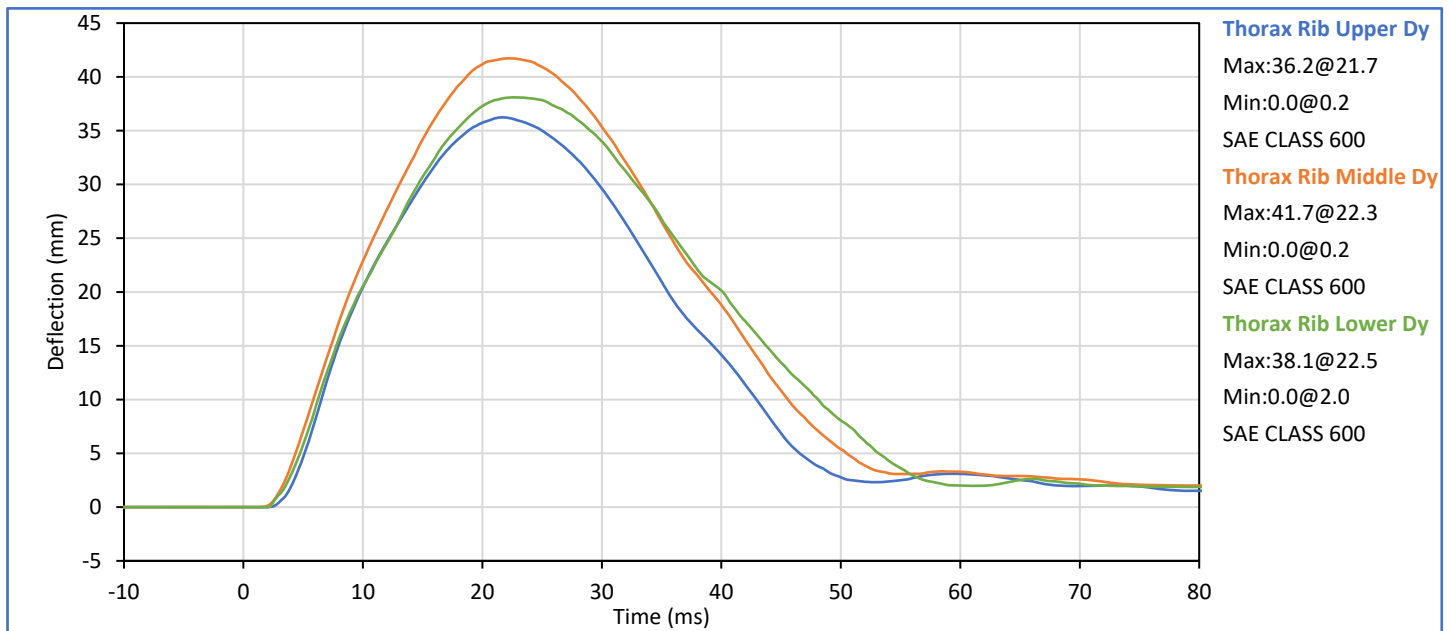
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Thorax Rib Upper Dy	mm	32.0	40.0	36.2	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	41.7	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	38.1	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	15.3	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	9.5	Pass
Peak Impactor Ax	g	-18.0	-14.0	-15.2	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

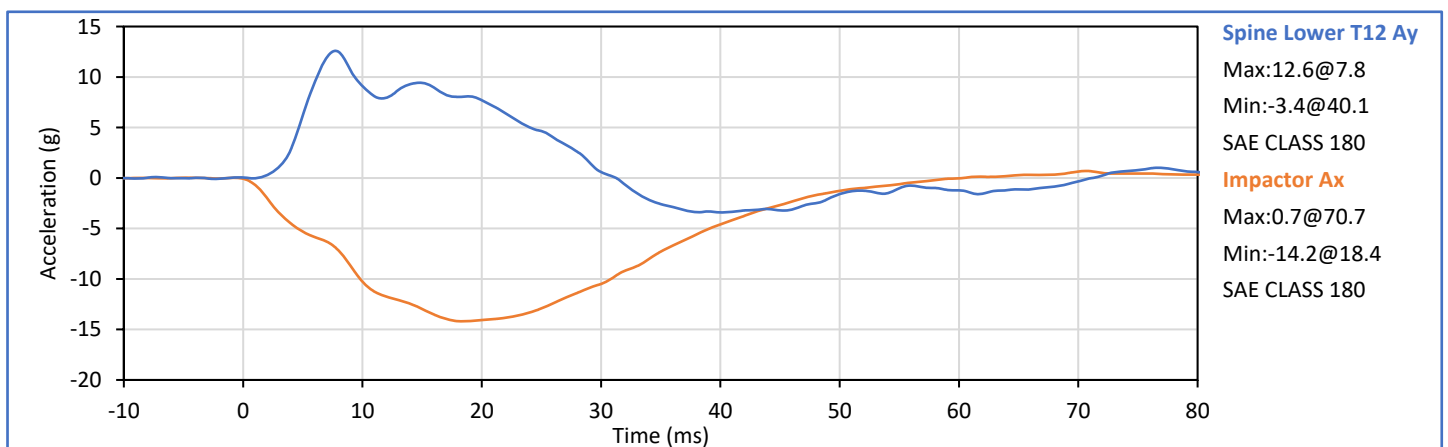
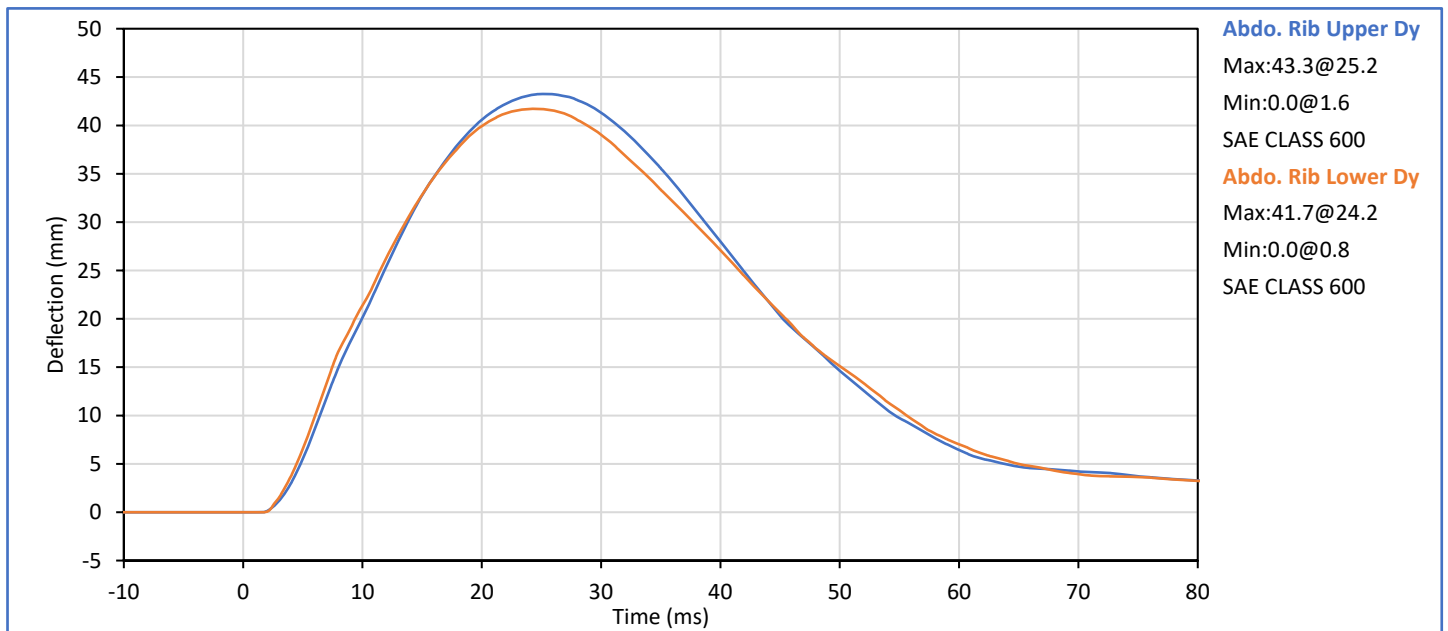
G. Fuentes

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
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	43.3	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	41.7	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	12.6	Pass
Peak Impactor Ax	g	-16.0	-12.0	-14.2	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

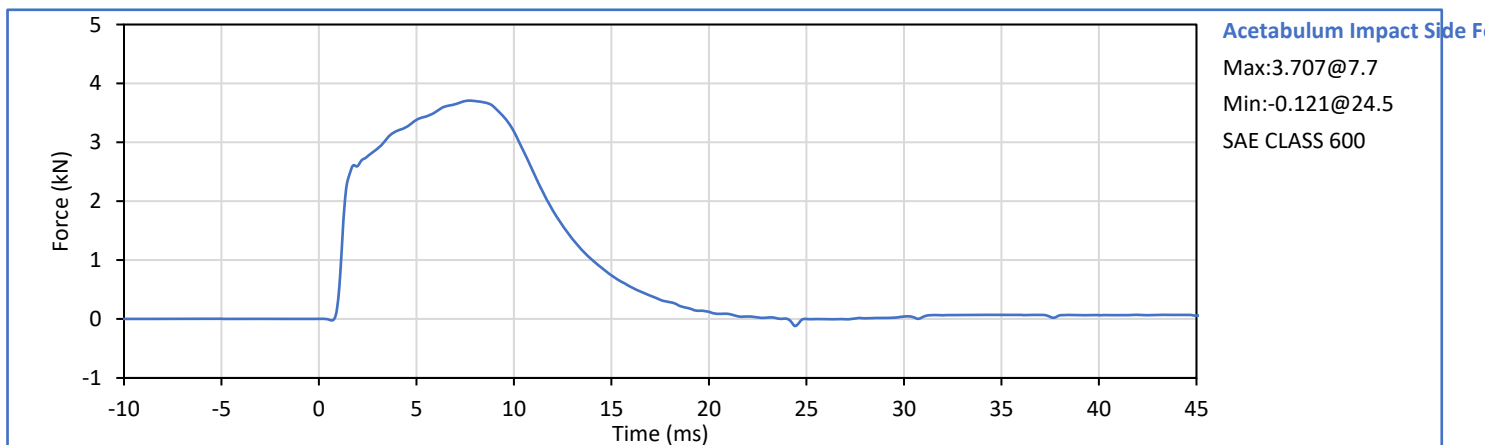
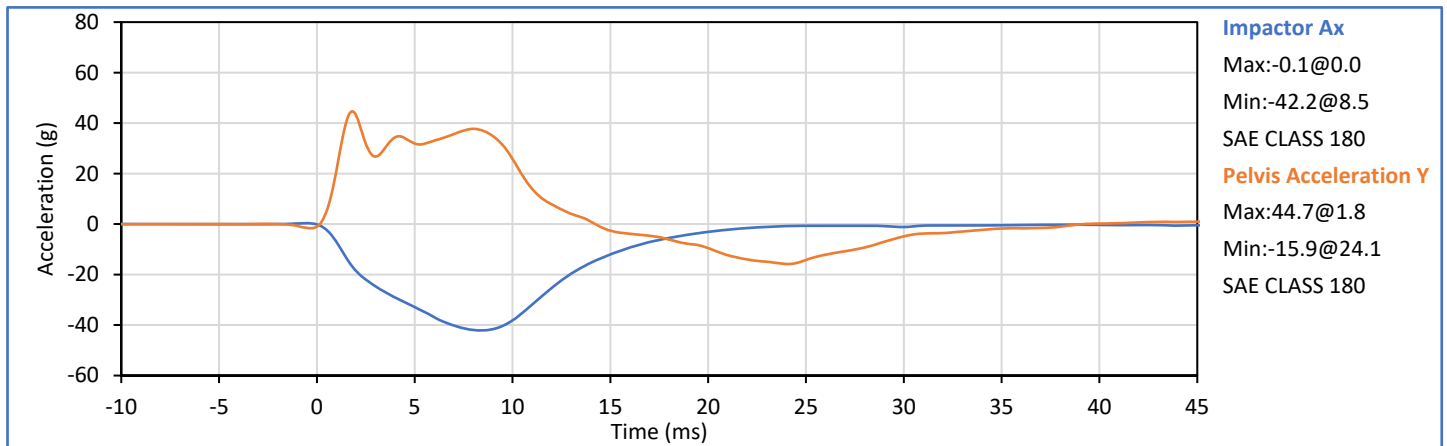
J. Hernandez

ATD Serial No.: 308

Test Date: 2023-01-31

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	29	Pass
Impactor Velocity	m/s	6.60	6.80	6.70	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.71	Pass
Pelvis Ay after 6ms	g	34.0	42.0	37.7	Pass
Peak Impactor Ax	g	-47.0	-38.0	-42.2	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 14751



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

ATD Serial No.: 308

Test Date: 2023-01-31

Pelvis Plug S/N: 14751



SID-IIs Pelvis Plug Certification Test

Plug S/N 14751

Test Number 16723

Report Number 16769

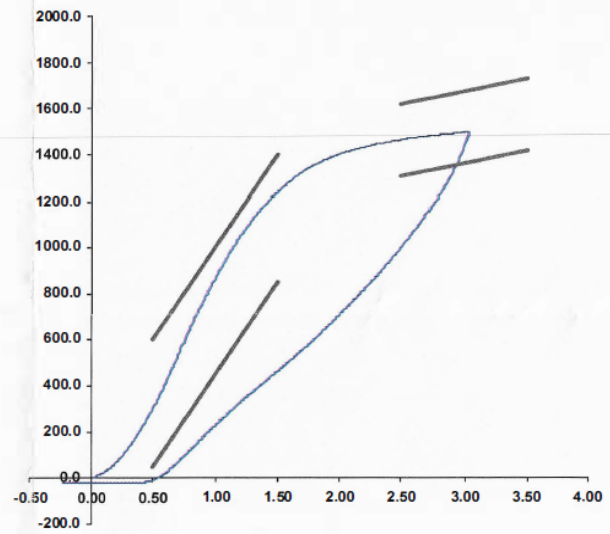
Test Date 12/23/2020 11:04:17 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	311.61	50.00	600.00
Force @ 1.5 mm (N)	1,241.54	850.00	1,400.00
Force @ 2.5 mm (N)	1,461.73	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,495.29	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), 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 14733

Part Number 180-4450

Template No 107 23-Dec-20

SACO Research

By: DL Date: 12/23/20

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

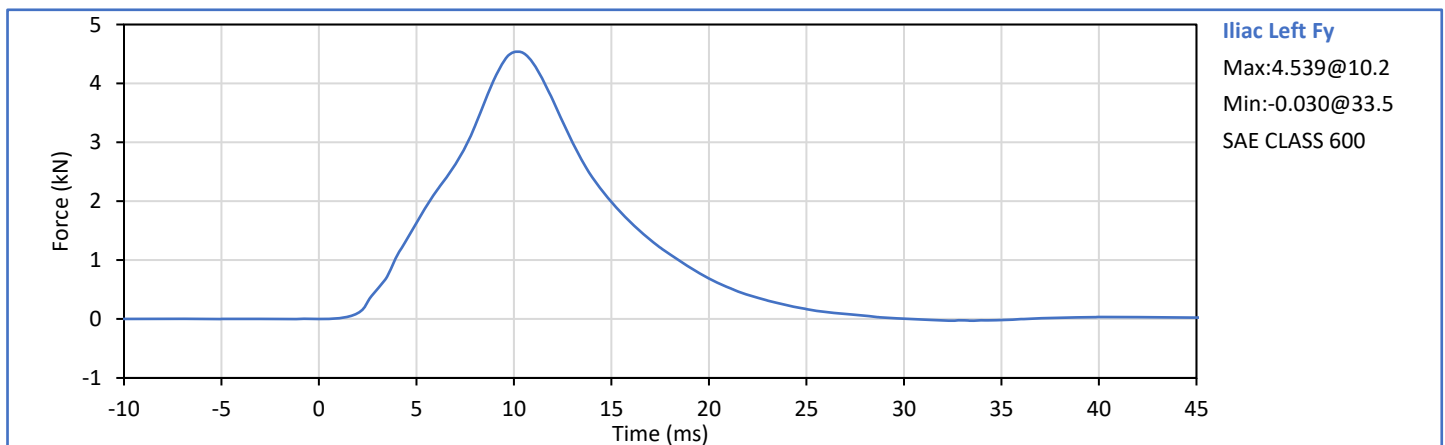
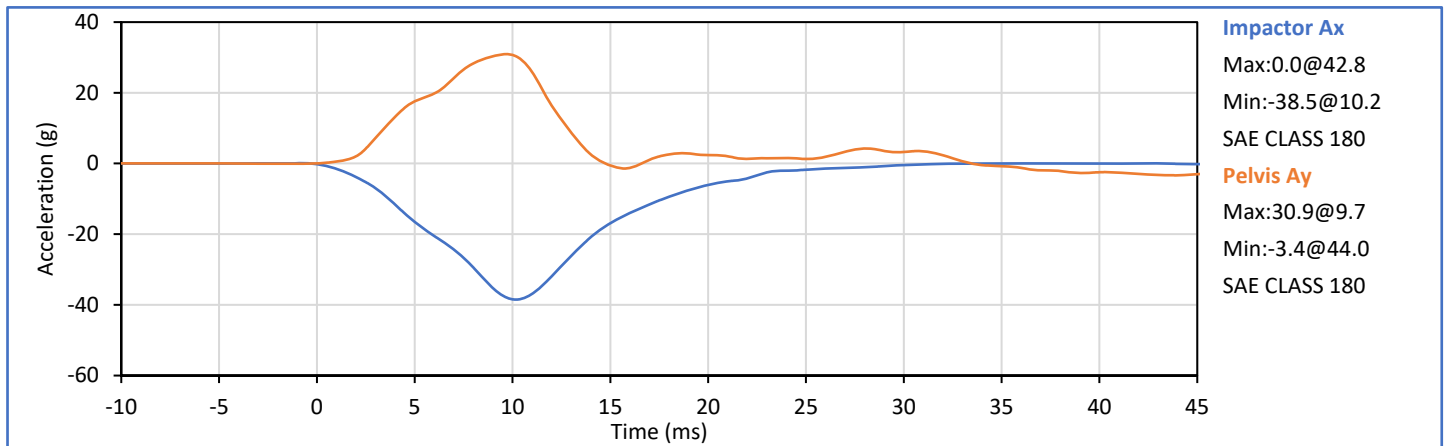
ATD Serial No.: 308

Test Date: 2023-01-31

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	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	4.54	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-38.5	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: 308

ATD Serial No.: 308

Test Date: 2023-02-13

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
A - Sitting Height	mm	772	788	782	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	85	Pass
D - H Point From Seatback	mm	141	151	146	Pass
E - Shoulder Pivot From Backline	mm	97	107	100	Pass
F - Thigh Clearance	mm	119	135	127	Pass
G - Head Breadth	mm	140	148	146	Pass
H - Head Back From Backline	mm	40	46	43	Pass
I - Head Depth	mm	178	188	185	Pass
J - Head Circumference	mm	541	551	544	Pass
K - Buttock To Knee Length	mm	514	540	523	Pass
L - Popliteal Height	mm	343	369	352	Pass
K - Knee Pivot To Floor Height	mm	392	409	404	Pass
N - Buttock Popliteal Length	mm	416	442	422	Pass
O - Chest Depth W/O Jacket	mm	195	211	205	Pass
P - Foot Length	mm	216	232	230	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	317	Pass
R - Arm Length	mm	249	259	255	Pass
S - Knee Joint To Seatback	mm	477	493	484	Pass
V - Shoulder Width	mm	341	357	351	Pass
W - Foot Width	mm	78	94	87	Pass
Y - Chest Circumference W/Jacket	mm	851	881	862	Pass
Z - Waist Circumference	mm	761	791	779	Pass
				Overall Test Results	Pass

Technician:



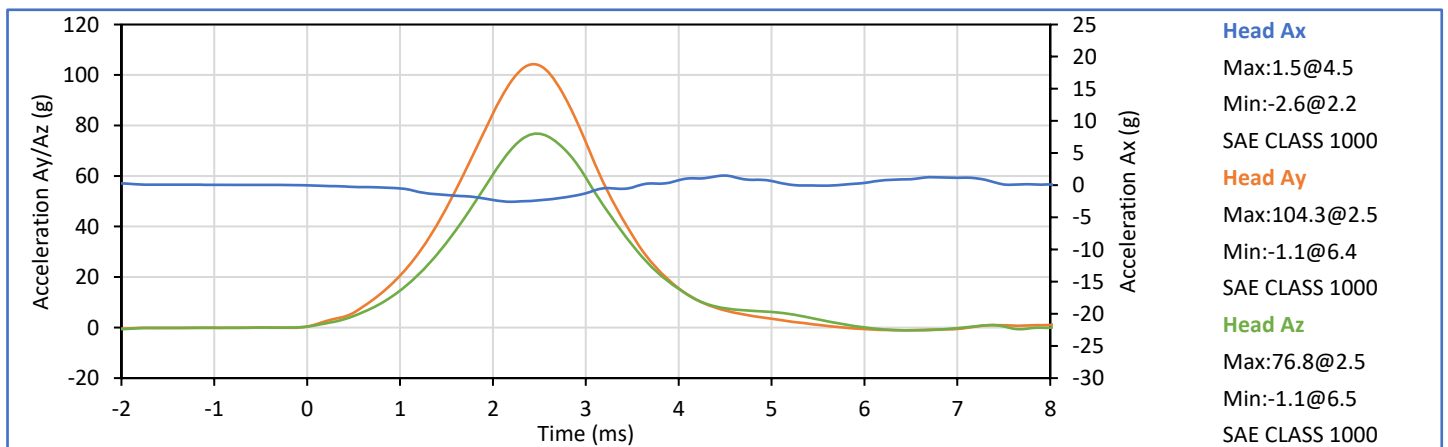
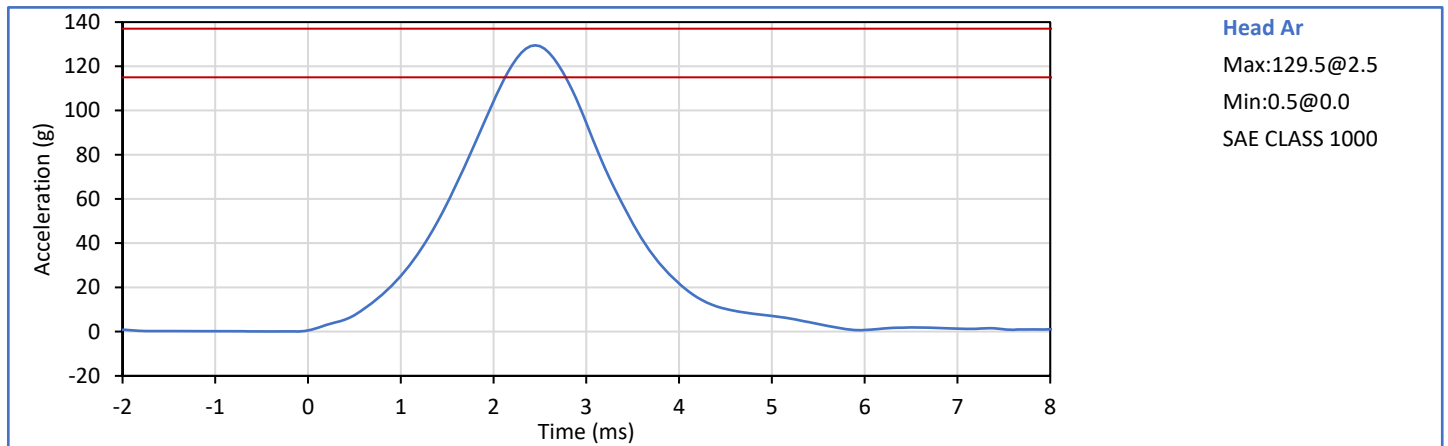
G. Fuentes

Approved By:



J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	115.0	137.0	129.5	Pass
Peak Head Ax	g	-15.0	15.0	-2.6	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Technician:

G. Fuentes

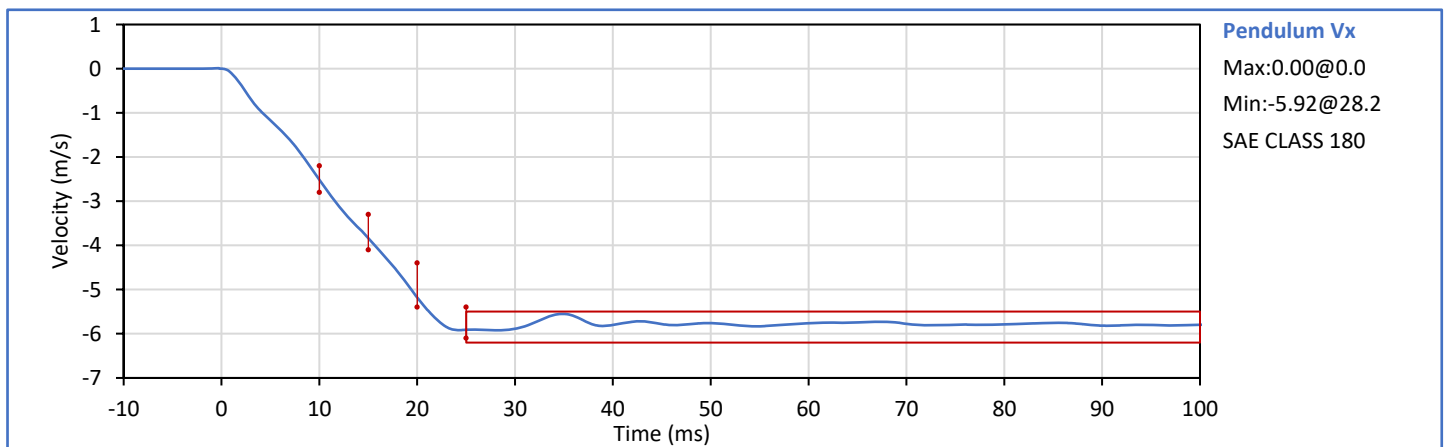
G. Fuentes

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	31	Pass
Pendulum Velocity	m/s	5.51	5.63	5.56	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.51	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.83	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-5.18	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.91	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.92/-5.55	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-75.2	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.1	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	42.8	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	109.8	Pass
				Overall Test Results	Pass



Technician:

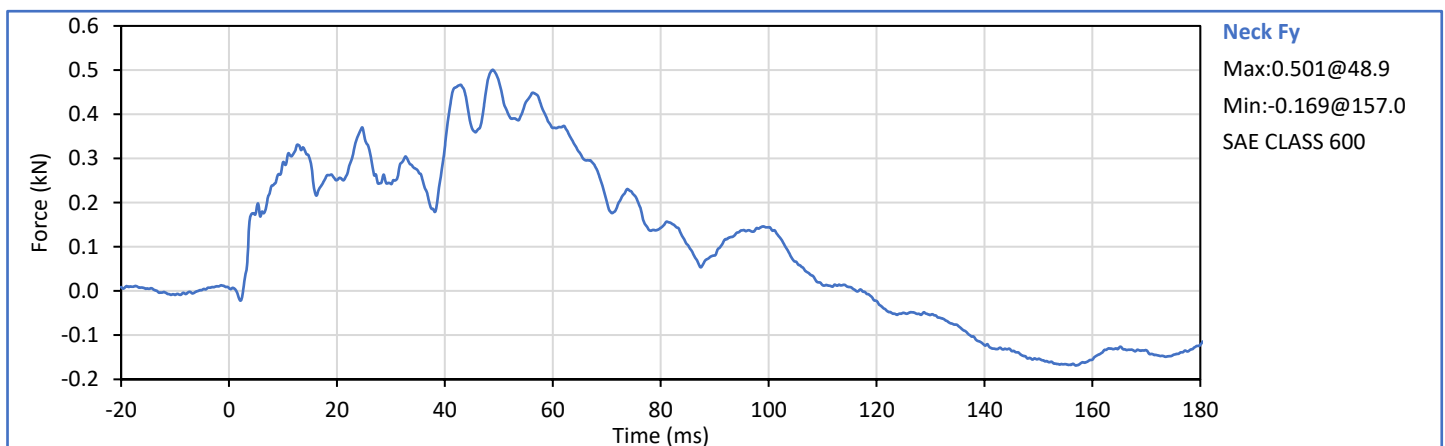
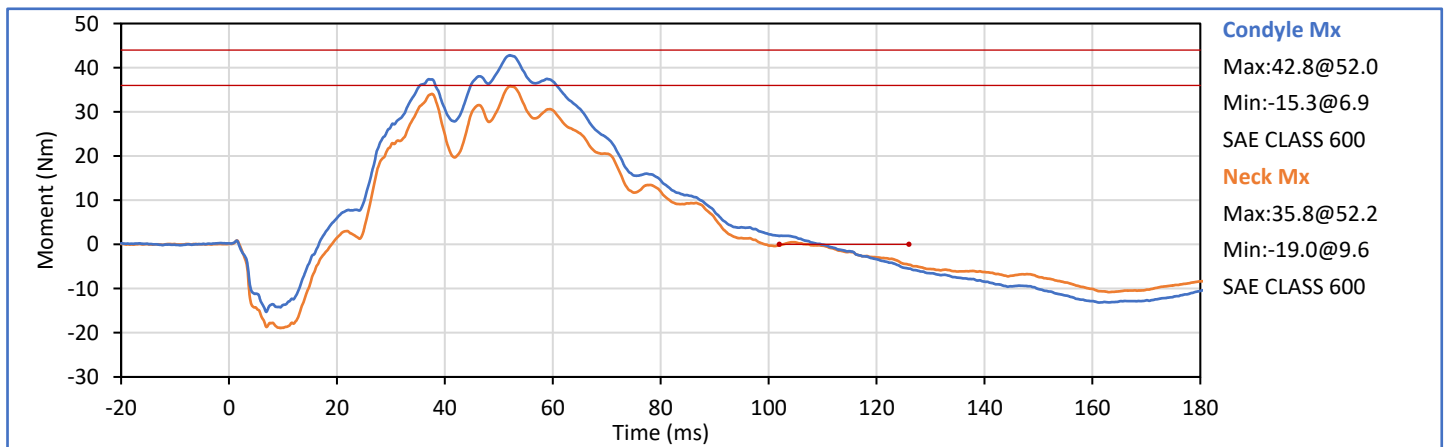
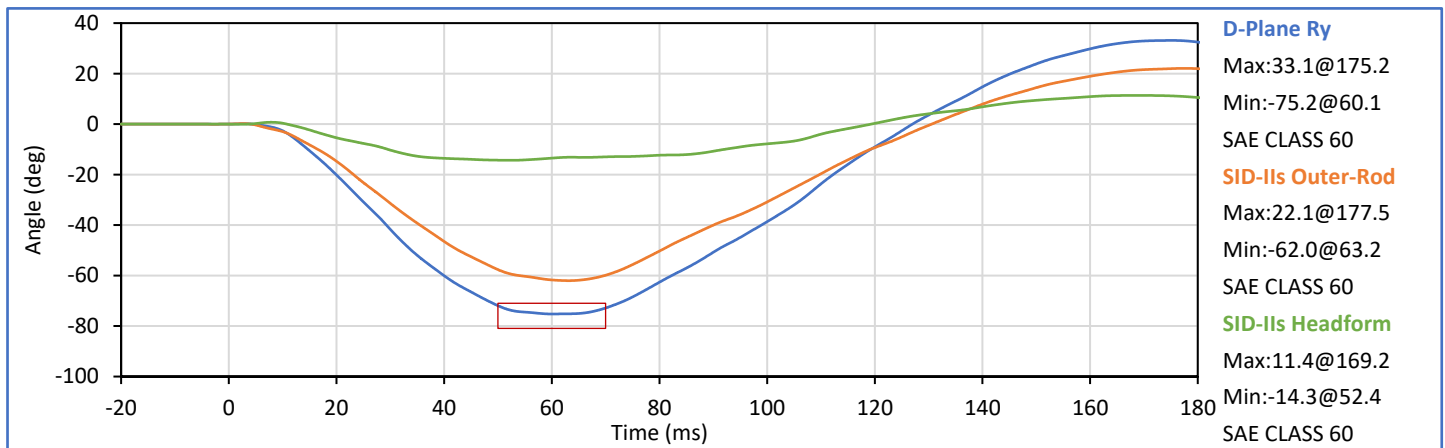
G. Fuentes

G. Fuentes

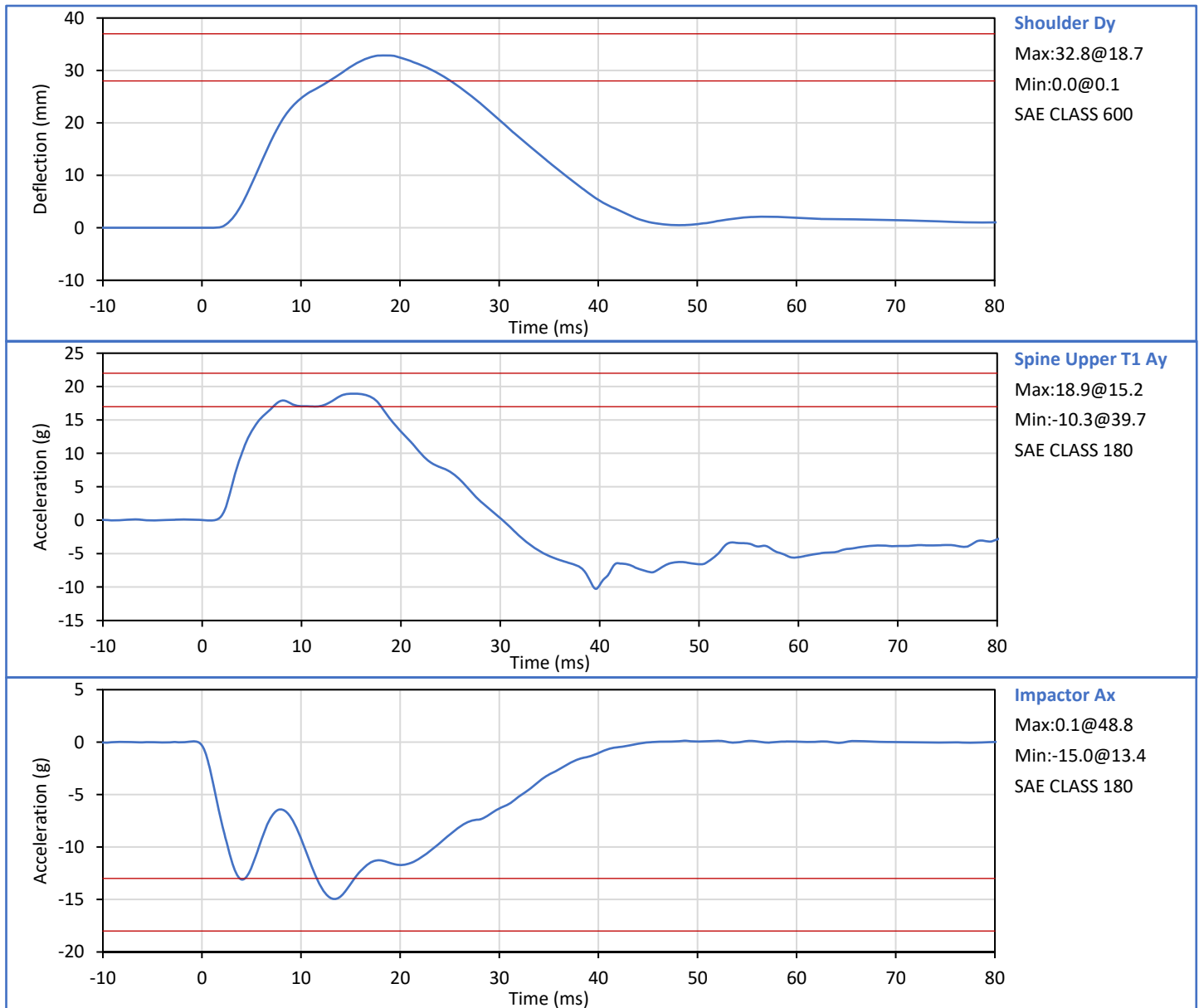
Approved By:

J. Hernandez

J. Hernandez



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.8	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.9	Pass
Peak Impactor Ax	g	-18.0	-13.0	-15.0	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

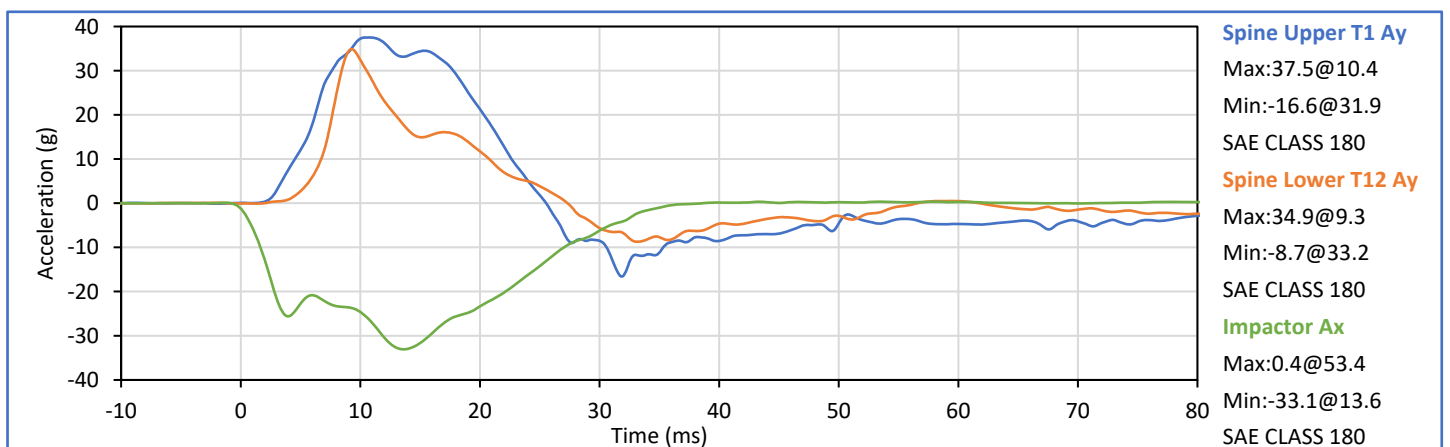
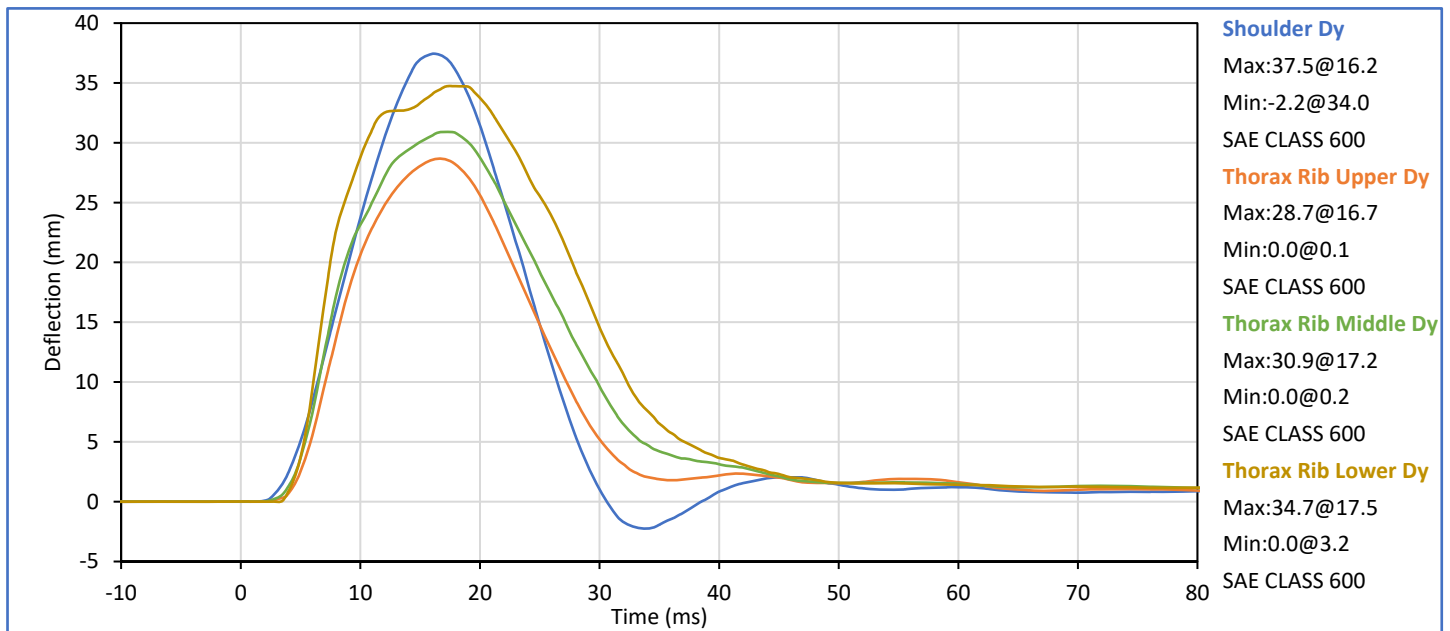
G. Fuentes

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	6.60	6.80	6.71	Pass
Peak Shoulder Dy	mm	31.0	40.0	37.5	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.7	Pass
Peak Middle Rib Dy	mm	30.0	36.0	30.9	Pass
Peak Lower Rib Dy	mm	32.0	38.0	34.7	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.5	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	34.9	Pass
Peak Impactor Ax	g	-36.0	-30.0	-33.1	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

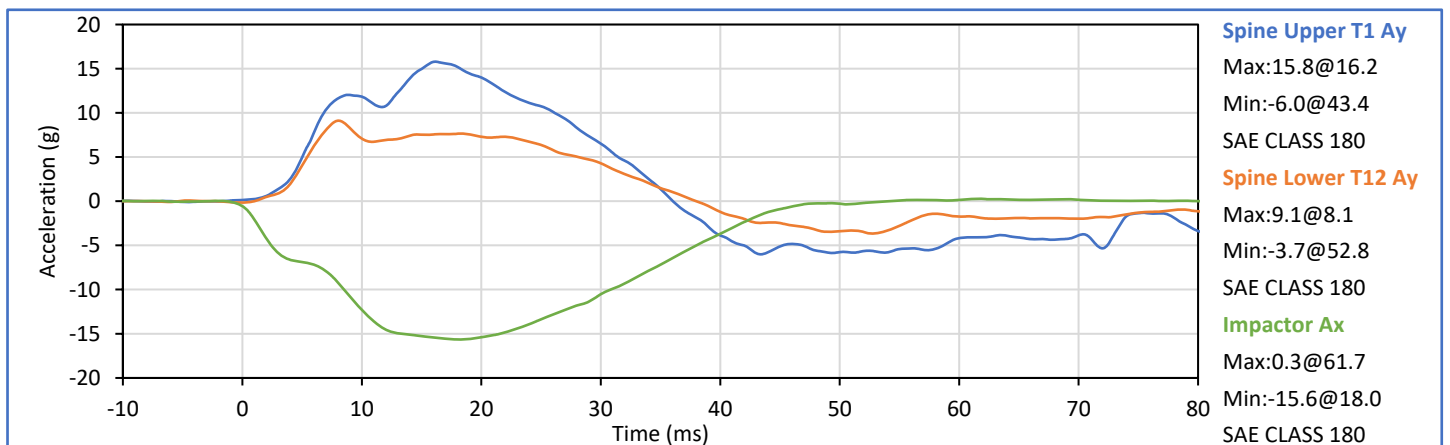
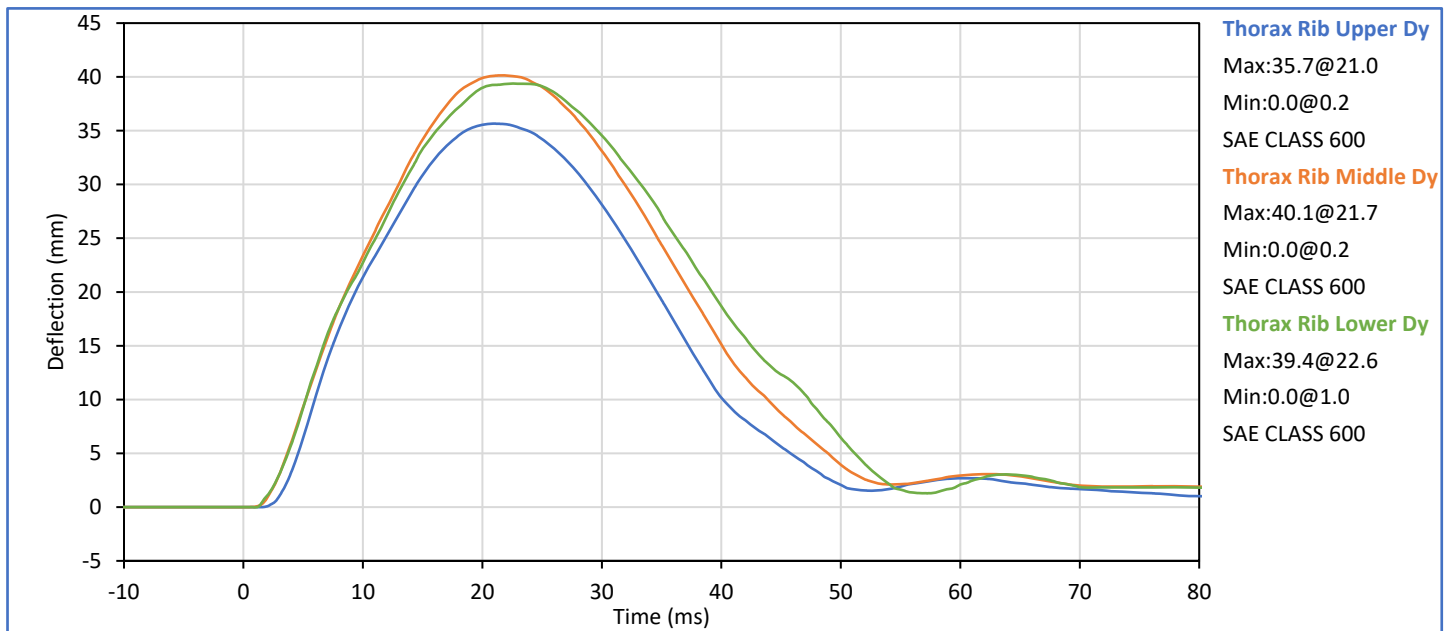
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	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	35.7	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	40.1	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	39.4	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	15.8	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	9.1	Pass
Peak Impactor Ax	g	-18.0	-14.0	-15.6	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

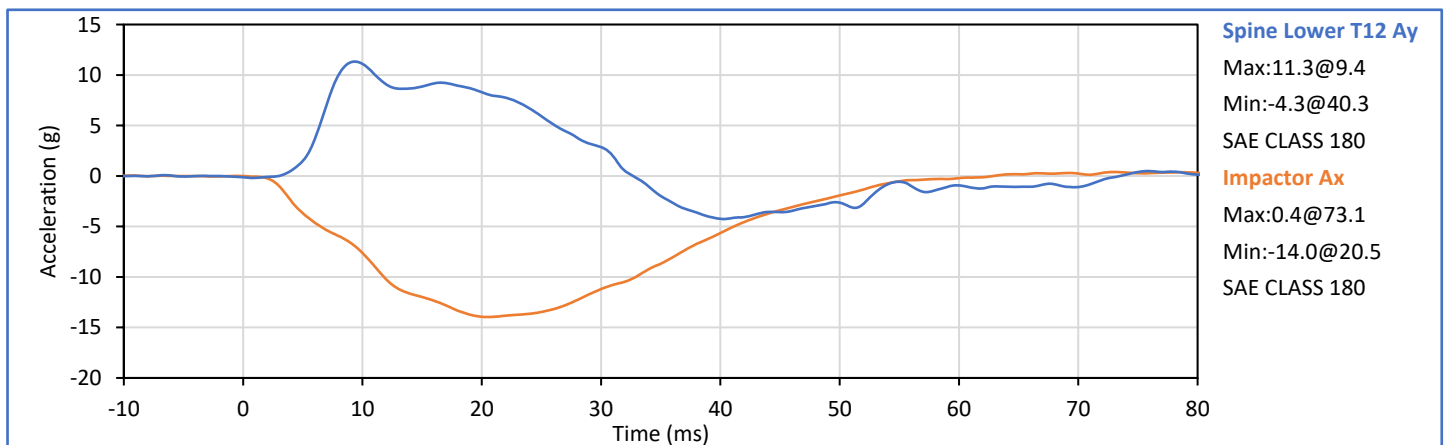
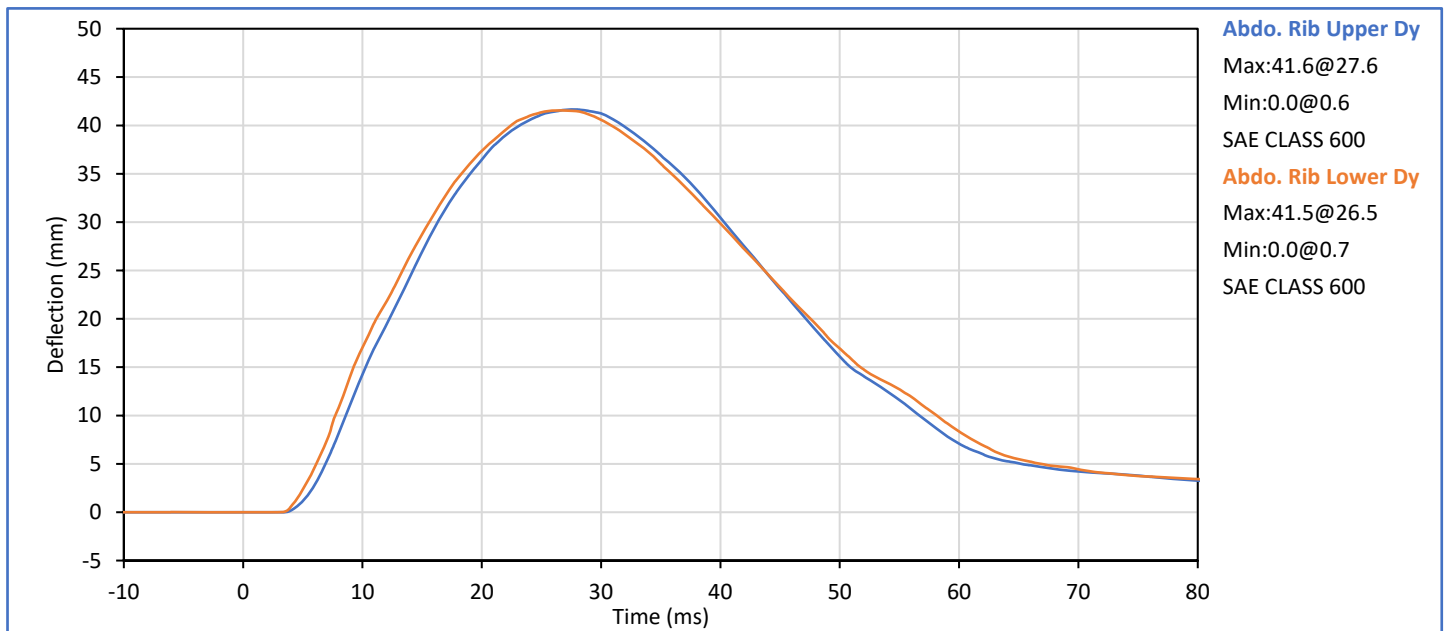
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.34	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	41.6	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	41.5	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	11.3	Pass
Peak Impactor Ax	g	-16.0	-12.0	-14.0	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

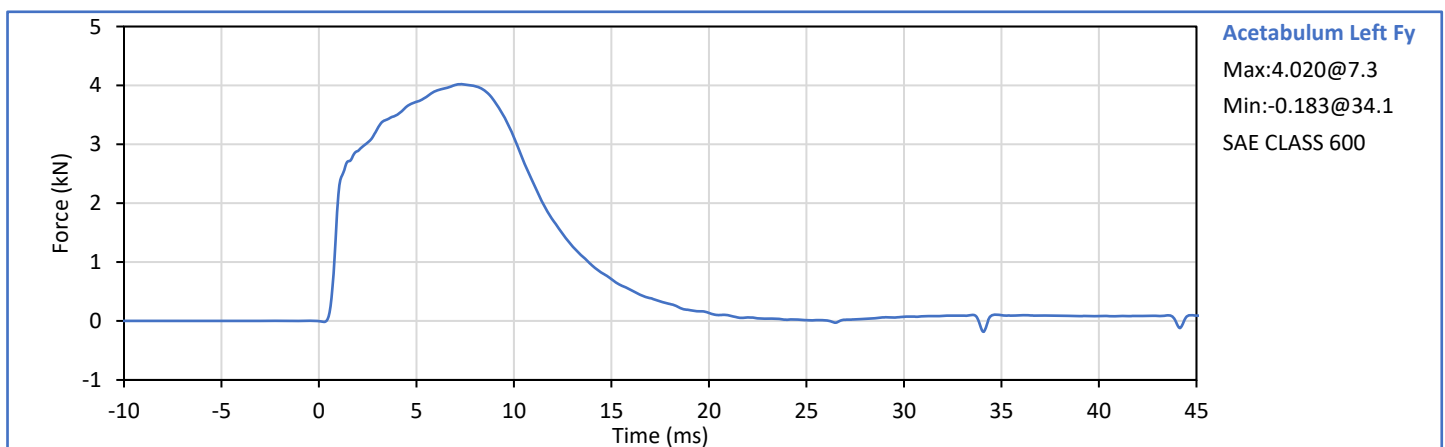
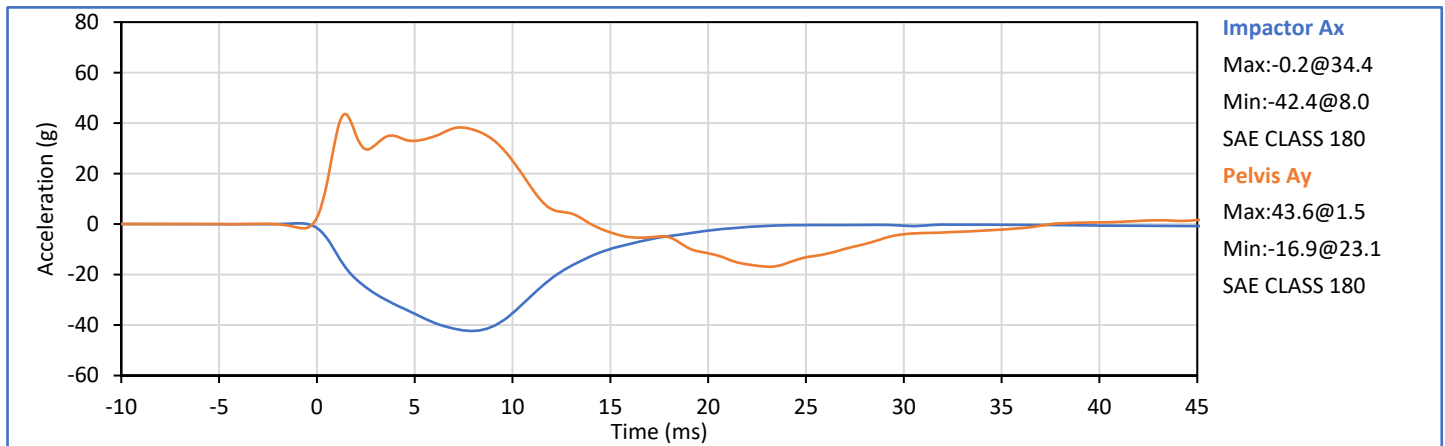
J. Hernandez

ATD Serial No.: 308

Test Date: 2023-02-14

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	6.60	6.80	6.71	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.02	Pass
Pelvis Ay after 6ms	g	34.0	42.0	38.3	Pass
Peak Impactor Ax	g	-47.0	-38.0	-42.4	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 14719



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

ATD Serial No.: 308

Test Date: 2023-02-14

Pelvis Plug S/N: 14719



SID-IIs Pelvis Plug Certification Test

Plug S/N 14719

Test Number 16682

Report Number 16728

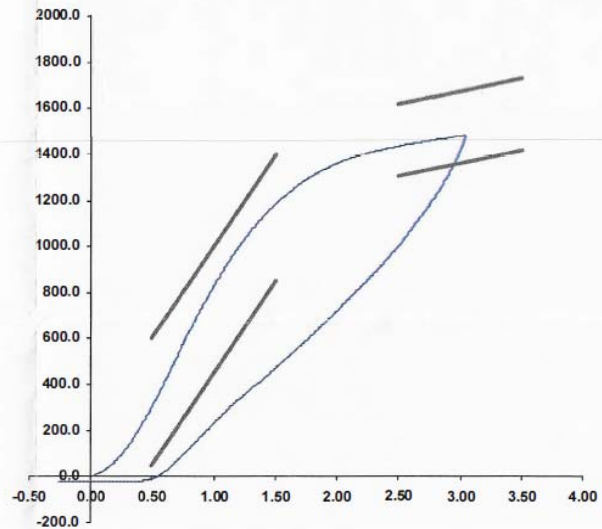
Test Date 12/22/2020 11:09:00 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	308.22	50.00	600.00
Force @ 1.5 mm (N)	1,188.62	850.00	1,400.00
Force @ 2.5 mm (N)	1,437.00	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,481.89	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), 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: DL Date: 12/22/20

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

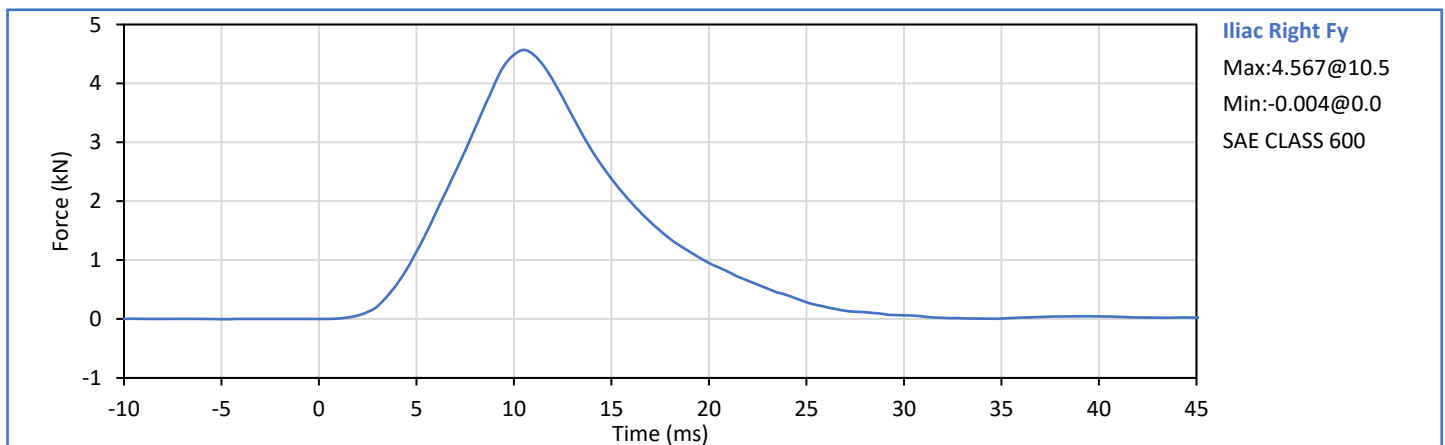
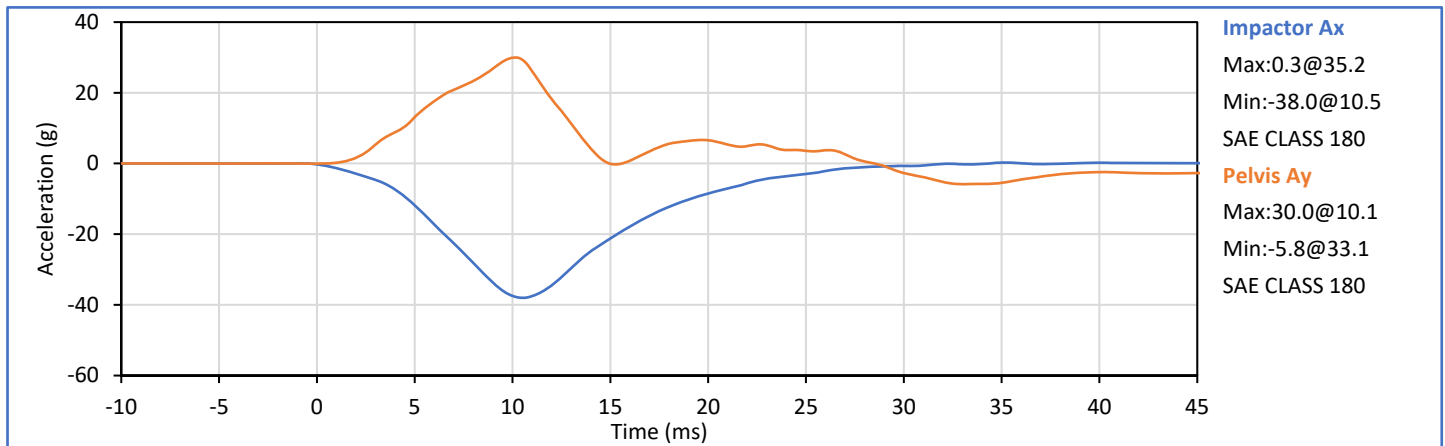
ATD Serial No.: 308

Test Date: 2023-02-14

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.34	Pass
Peak Iliac Fy	kN	4.10	5.10	4.57	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-38.0	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	P63980	Endevco	7264C-2k	2022-11-14
Head Acceleration Y Primary	P58861	Endevco	7264C-2k	2022-11-14
Head Acceleration Z Primary	P51261	Endevco	7264C-2k	2022-11-14
Head Acceleration X Redundant	P58808	Endevco	7264C-2k	2022-11-14
Head Acceleration Y Redundant	P63310	Endevco	7264C-2k	2022-11-14
Head Acceleration Z Redundant	P49189	Endevco	7264C-2k	2022-11-14
Head Rotation Rate X	ARS7449	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Y	ARS7510	DTS	ARS PRO-8k (2kHz)	2022-03-10
Head Rotation Rate Z	ARS7573	DTS	ARS PRO-8k (2kHz)	2022-03-15
Upper Thorax Rib Deflection Y	1249	Servo	08TCI-3725	2022-11-13
Middle Thorax Rib Deflection Y	1219	Servo	08TCI-3725	2022-11-13
Lower Thorax Rib Deflection Y	1221	Servo	08TCI-3725	2022-11-13
Upper Abdomen Rib Deflection Y	1252	Servo	08TCI-3725	2022-11-13
Lower Abdomen Rib Deflection Y	1233	Servo	08TCI-3725	2022-11-14
Lower Spine T12 Acceleration X	P52108	Endevco	7264C-2k	2022-11-14
Lower Spine T12 Acceleration Y	P63970	Endevco	7264C-2k	2022-11-14
Lower Spine T12 Acceleration Z	P51712	Endevco	7264C-2k	2022-11-14
Iliac Wing Impact Side Force Y	289 (Iliac)	R.A. Denton	3228J	2022-04-29
Acetabulum Impact Side Force Y	277 (Acetabulum)	R.A. Denton	3249J	2022-04-29

Table 2 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	220336	BST	11CF-2k	2022-12-12
Vehicle CG Ay	220311	BST	11CF-2k	2022-12-19
Vehicle CG Az	220315	BST	11CF-2k	2022-12-19
Left Floor Sill Ay	220312	BST	11CF-2k	2022-12-19
A-Pillar Sill Ay	220319	BST	11CF-2k	2022-12-19
A-Pillar Low Ay	220318	BST	11CF-2k	2022-12-19
A-Pillar Mid Ay	220331	BST	11CF-2k	2022-12-12
B-Pillar Sill Ay	220121	BST	11CF-2k	2022-12-08
B-Pillar Low Ay	220317	BST	11CF-2k	2022-12-19
B-Pillar Mid Ay	220327	BST	11CF-2k	2022-12-11
Driver Seat Track at H-Point Ay	220300	BST	11CF-2k	2022-12-11
Engine Top Ax	220325	BST	11CF-2k	2022-12-11
Engine Top Ay	220314	BST	11CF-2k	2022-12-19
Firewall Ay	220328	BST	11CF-2k	2022-12-11
Right Roof Ay	220282	BST	11CF-2k	2022-12-14
Right Floor Sill Ay	220326	BST	11CF-2k	2022-12-11
Rear Floorpan Ax	220310	BST	11CF-2k	2022-12-19
Rear Floorpan Ay	220267	BST	11CF-2k	2022-12-21

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