

REPORT NUMBER: SideNCAPMDB-KAR-23-008
NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

BAYERISCHE MOTOREN WERKE AG
2023 BMW X1 XDRIVE28I 5-DOOR SUV

NHTSA No: M20234102

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



MAY 16, 2023

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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NHTSA, Office of Crashworthiness Standards

Date: _____

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		15. Supplementary Notes																																																			
16. Abstract A 61.9 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2023 BMW X1 xDrive28i 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on April 27, 2023. The impact velocity of the Moving Deformable Barrier was 61.86 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 31°C. The target vehicle's maximum post-test static crush was 158 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (ES-2re)</th> </tr> <tr> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>77.443</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>44</td> <td>20.768</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>632.896</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1469.425</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>102.337</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>43.169</td> </tr> <tr> <td>Total Pelvic Force (Sum of Acetubular and Iliac Forces)</td> <td>N</td> <td>5525</td> <td>3004.893</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>12.186</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>9.440</td> </tr> </tbody> </table> Both struck side doors were jammed shut and did not separate from the body at the hinges or latches. The opposite side doors did not open during the side impact event.				Measurement Description	Driver ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC ₃₆)		1000	77.443	Maximum Thoracic Rib Deflection	mm	44	20.768	Total Abdominal Force	N	2500	632.896	Pubic Symphysis Force	N	6000	1469.425	Measurement Description	Passenger ATD (SID-IIs)			Units	IARV	Result	Head Injury Criteria (HIC ₃₆)		1000	102.337	Resultant Lower Spine Acceleration	g	82	43.169	Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	3004.893	Maximum Thoracic Rib Deflection	mm	38*	12.186	Maximum Abdominal Rib Deflection	mm	45*	9.440
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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 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 2023 BMW X1 xDrive28i 5-Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

SECTION 2

SUMMARY OF TEST RESULTS

A 2023 BMW X1 xDrive28i 5-Door SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.86 km/h (38.44 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California, on April 27, 2023. Pre- and post-test photographs of the test vehicle, the MDB and the dummy (ES-2re and SID-IIs) are included in Appendix A of this report.

The dummies were placed in the driver and left rear designated seating position according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated March 2020. The side impact event was documented by 11 cameras. Camera locations are included in Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib and lower rib y-axis displacement potentiometers

Abdomen forward, middle, and rear y-axis load cells

Lower spine (12) tri-axial accelerometers

Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)

Primary and redundant head CG tri-axial accelerometers

Chest upper rib, middle rib and lower rib y-axis displacement potentiometers

Abdomen upper rib and lower rib y-axis displacement potentiometers

Lower spine (12) tri-axial accelerometers

Acetabulum and iliac wing y-axis load cells

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 of this report contains the test equipment and instrumentation calibration data.

Dummy injury readings were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	77.443
Maximum Thoracic Rib Deflection	mm	44	20.768
Combined Abdominal Force	N	2500	632.896
Pubic Symphysis Force	N	6000	1469.425

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	102.337
Lower Spine (T12) Resultant Acceleration	g	82	43.169
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3004.893
Maximum Thoracic Rib Deflection	mm	38*	12.186
Maximum Abdominal Rib Deflection	mm	45*	9.440

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

GENERAL COMMENTS:

None.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

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 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20234102
Model Year	2023
Make	BMW
Model	X1 xDrive28i
Body Style	5-Door SUV
VIN	WBX73EF04P5W21137
Body Color	Jet Black
Odometer Reading (km / mi)	49.9 / 31
Engine Displacement (L)	2.0
Type / No. of Cylinders	4
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	7
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	Yes
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	Yes
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	BAYERISCHE MOTOREN WERKE AG
Date of Manufacture	22-Dec
Vehicle Type	MPV

GVWR (kg)	2200
GAWR Front (kg)	1155
GAWR Rear (kg)	1145

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				451.0	A
DSC x 68 (kg)				340.0	B
Cargo Weight (RCLW) (kg)				111.0	A-B*

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

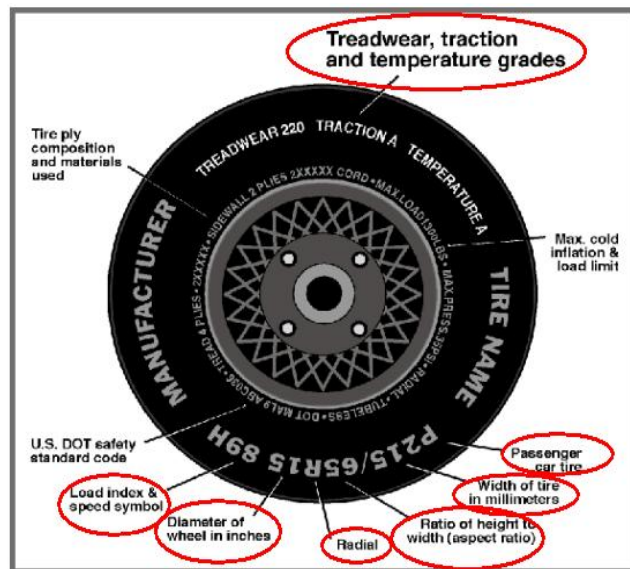
VEHICLE SEAT TYPE

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	340	340
Cold Pressure (kPa)	240	220
Recommended Tire Size	225/55R18	225/55R18
Tire Size on Vehicle	225/55R18	225/55R18
Tire Manufacturer	Hankook	Hankook
Tire Model	Ventus S1 AS	Ventus S1 AS
Treadware	620	620
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	102H	102H
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	12XOO IL HA 3522	12XOO IL HA 3522
DOT Safety Code Right	12XOO IL HA 3522	12XOO IL HA 3522

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	240	240	220	220
Tire Placard	kPa	240	240	220	220
Owner's Manual	kPa	240	240	220	220
As Tested	kPa	240	240	220	220

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	220	220	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	422.0	410.0		514.0	467.0		458.0	519.0	
Right	kg	529.0	309.0		475.0	442.0		519.0	409.0	
Ratio	%	56.9%	43.1%		52.1%	47.9%		51.3%	48.7%	
Total	kg	951.0	719.0	1670.0	989.0	909.0	1898.0	977.0	928.0	1905.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1670.0	A
Actual Weight of 2 P572 ATD Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	110.8	C
Calculated Vehicle Target Wt (TVTW)	kg	1905.8	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	Fully Loaded	As Tested	Meets Requirement***
LF	mm	787	777	Yes
RF	mm	777	770	Yes
LR	mm	795	785	Yes
RR	mm	785	775	Yes
Vehicle CG (Aft of Front Axle)	mm	1303	1281	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	20	27	

***The "As Tested" vehicle attitude measurements must be equal to or within ±10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirement"

DATA SHEET NO. 1 ... (CONTINUED)**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

Test Height Adjustable Setting (If Applicable)	
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WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Amount of Ballast Added	54.0

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	0
Aft 25 mm target	0
Pre-Impact Angle Line	63°

Parallel Track Target	X Location (mm)	Y Location (mm)
A	0	0
B	1355	689
C	1355	3756
D	0	3059

DATA SHEET NO. 2**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA**

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	21.2	14.0	17.6
Front Passenger Seat	21.0	12.9	17.0
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	17.6	721	Max	759	768	774
			Mid	737	744	751
			Min	714	721	728
Front Passenger Seat	17.0	746	Max	749	763	767
			Mid	730	755	748
			Min	710	746	728
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 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

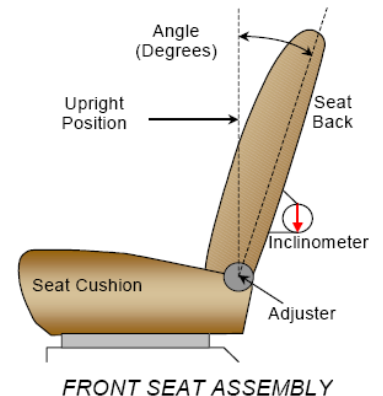
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	262	26	131	12
Front Passenger Seat	250	26	125	12
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 to the manufacturer's designated design angle. The right front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck side rear seat back. Seat back angle is measured with a straight edge on the seat back.



SEAT BACK POSITION

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/ Seated Dummy			16.9	
Front Passenger Seat	54.4		16.8	
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: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

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	Fixed	Fixed
Rear Seat	Fixed	Fixed

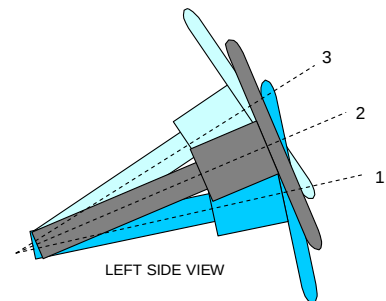
HEAD RESTRAINT ADJUSTMENT

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

	Total No. of Positions	Placed in Position
Driver Seat	4	H
Rear Seat	3	L

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.

**STEERING COLUMN POSITIONING**

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	62.8	227
Geometric Center Position, No. 2	65.0	201
Uppermost Position, No. 3	67.2	175
Telescoping Steering Wheel Travel		201
Test Position	65.0	201

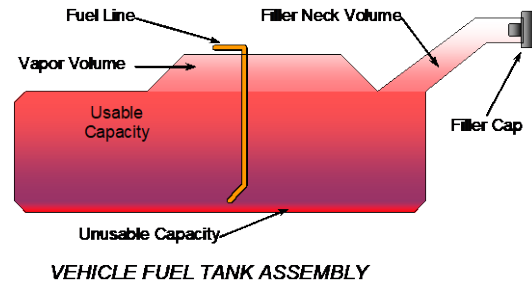
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Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel pump will operate for 5 seconds. After pressure has been built up the fuel pump switches to sleep mode until the engine will be started or the pressure decreases.



FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	54.10
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	54.10
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	50.31
Actual amount of Solvent Used in Test	50.31
1/3 of Usable Capacity	18.03

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

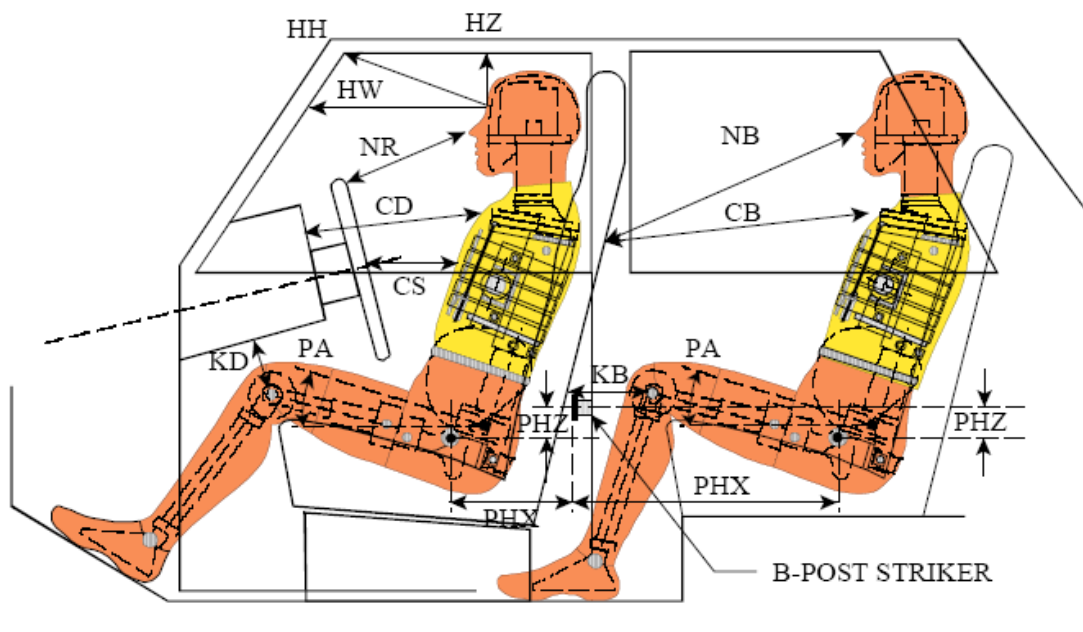
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV

NHTSA No. M20234102

Test Program: NCAP MDB Side Impact Test

Test Date: 4/27/23



LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN.
REAR DUMMY PHX & PHZ
MEASUREMENTS FOR A 4-DOOR
VEHICLE WOULD USE THE C-POST
STRIKER AS A REFERENCE POINT

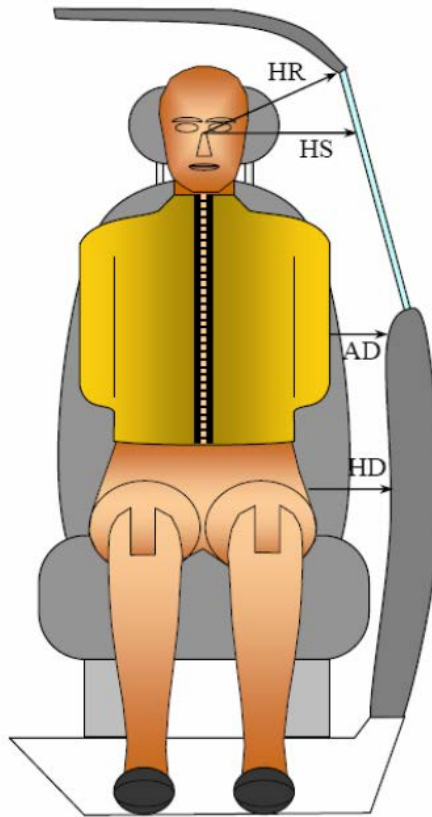
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	356			
HW		Head to Windshield	605			
HZ	HZ	Head to Roof	125		213	
NR	NB	Nose to Rim/Seat Back	441		520	
CD	CB	Chest to Dash/Seat Back	655		507	
CS		Chest to Steering Wheel	342			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	208	25.4	305	8.8
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	178	26.0	269	27.7
PAX°	PAX°	Pelvic Tilt Angle X		15.5		18.4
	PAY°	Pelvic Tilt Angle Y				0.0
PHX	PHX	Hip Point to Striker (x-axis)				
PHZ	PHZ	Hip Point to Striker (z-axis)				

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



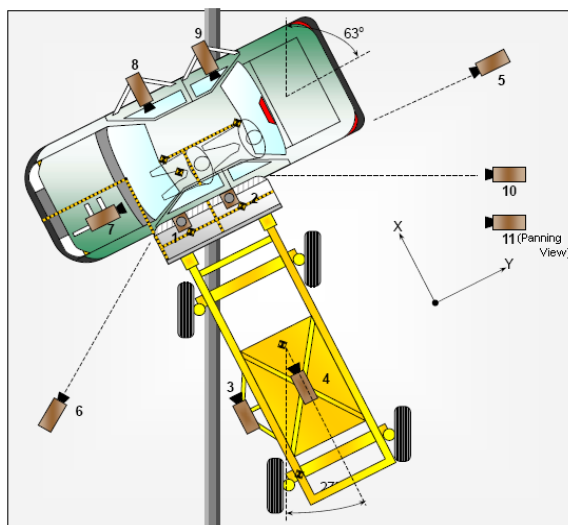
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	302	330
HS	Head to Side Window	mm	378	400
AD	Arm to Door	mm	95	188
HD	H-Point to Door	mm	159	215

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



CAMERA LOCATIONS AND DATA

No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1220	2287	-5486	14	1000
2	Overhead Close-Up	609	2287	-5102	35	1000
3	Left Impact Point (MDB)	-2134	0	-1143	25	1000
4	Side Overall (MDB)	-3912	838	-1829	12.5	1000
5	Rear	-64	2485	-1348	85	1000
6	Left Front	-2266	-3564	-1475	24	1000
7	Driver Front (On-Board)	316	-1424	608	8.5	1000
8	Driver Side (On-Board)	435	-1451	576	8	1000
9	Passenger Side (On-Board)	342	-1418	650	8	1000
10	Real Time Overall				Zoom	30
11	Real Time Inrun				Zoom	30

Reference: Impact Point Projected to Ground; +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

*All measurements accurate to ± 6 mm

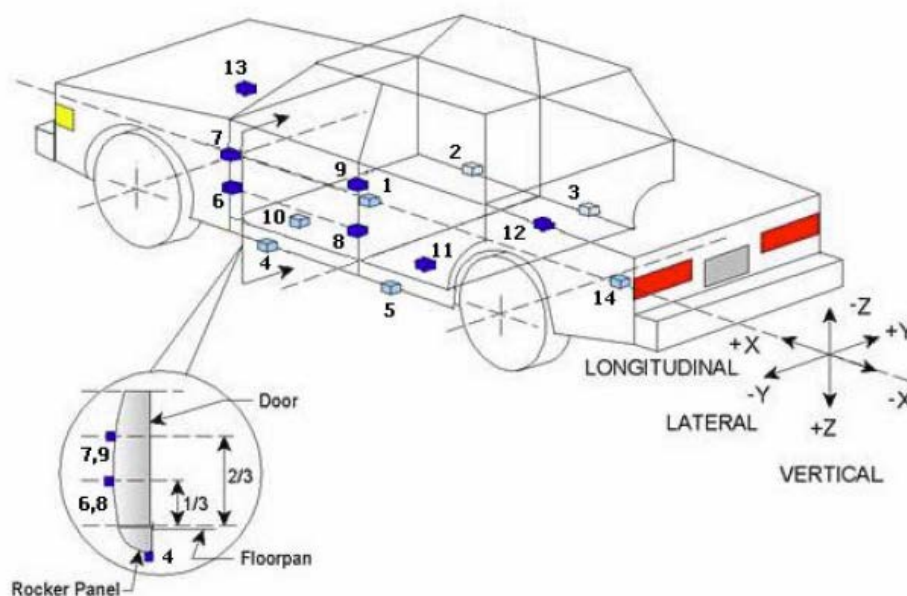
INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	19
Vehicle Structure Accelerometers	23
MDB Channels	5
Total	63

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

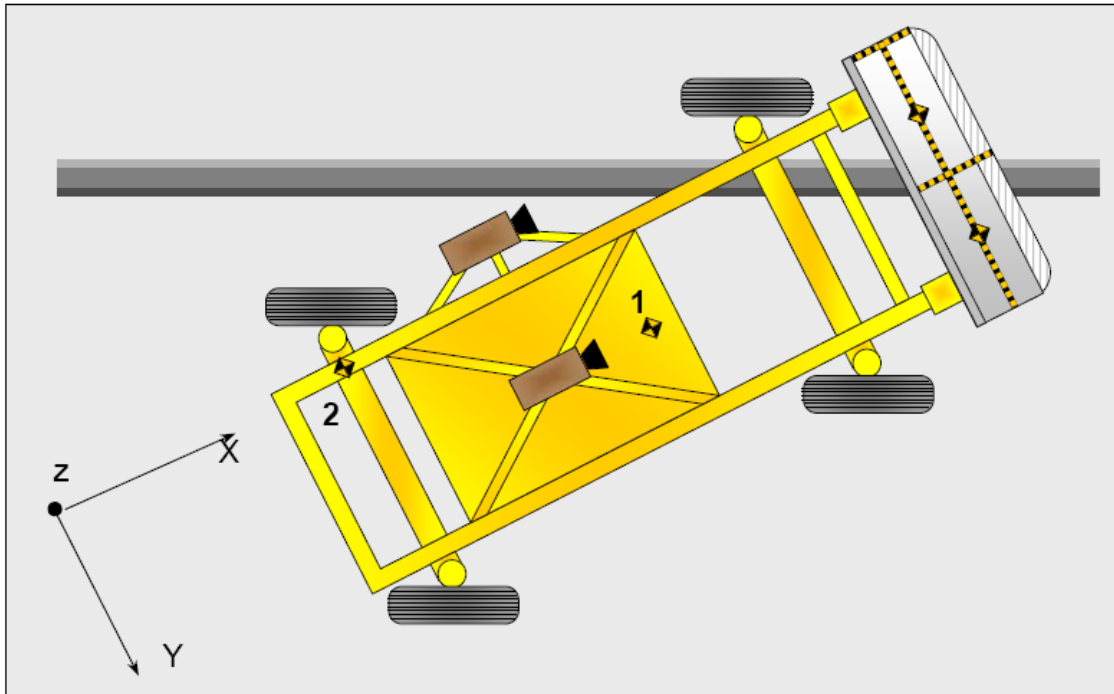
Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2515	0	-380
2	Right Sill at Front Seat	1710	730	-460
3	Right Sill at Rear Seat	2808	722	-510
4	Left Sill at Front Door	1710	-730	-380
5	Left Sill at Rear Door	2810	-720	-460
6	A-Pillar Lower	1405	-815	-740
7	A-Pillar Middle	1405	-815	-940
8	B-Pillar Lower	2402	-752	-670
9	B-Pillar Middle	2402	-755	-890
10	Front Seat Track	2111	-543	-460
11	Rear Seat Structure	2715	-281	-570
12	Right Rear Occupant Compartment	2938	379	-340
13	Engine Block	710	10	-880
14	Rear Floorpan Above Axle	3490	0	-570

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

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurement		
		X	Y	Z
1	MDB CG	-1195	0	-430
2	MDB Rear	-2642	-593	-608

Reference: X – Face of MDB (+ forward)
Y – MDB centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 8**POST-TEST OBSERVATIONS**

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Curtain Airbag, Headliner	Curtain Airbag, Headliner
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Headrest, Headliner, Curtain	Curtain Airbag, Head Rest
Left Shoulder	Curtain & T/P Airbag	Curtain & T/P Airbag
Upper Torso	T/P Airbag, Seat	T/P Airbag, Seatback
Lower Torso	T/P Airbag, Seat	T/P Airbag
Left Hip	T/P Airbag, Door Panel, Seat	T/P Airbag, Seat Pan, Door Panel
Left Knee	None	None

POST-TEST DOOR PERFORMANCE

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

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

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	No separation
Windshield Damage	None
Side Window Damage	Broken
Other Notable Effects	None

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

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheelbase	mm		2680
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		402
Actual Impact Point (Aft of Front Axle)	mm		402
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	0
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	13

DATA SHEET NO. 9**MDB SUMMARY OF RESULTS**

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length including Honeycomb Face	4115
Wheel Base of Framework Carriage	2595
CG location aft of Front Axle	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	402.0	297.5	699.5
Right	kg	377.0	290.0	667.0
Ratio	%	57.0%	43.0%	100.0%
Totals	kg	779.0	587.5	1366.5

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.86
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	91.1
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.2
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.9

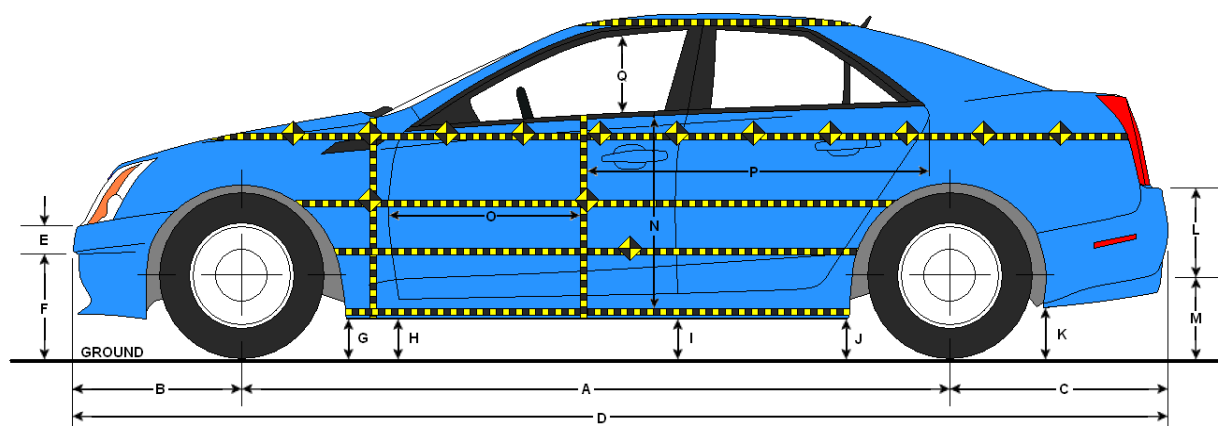
MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	248
B	Top of Bumper	533	800	Right	184
C	Mid Level	686	300	Right	146
D	Top of Stack	813	800	Left	181

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Change
A	Wheelbase	2680	2678	-2
B	Front Axle to FSOV	867	866	-1
C	Rear Axle to RSOV	945	935	-10
D	Total Length at Centerline	4487	4480	-7
E	Front Bumper Thickness	178	180	2
F	Front Bumper Bottom to Ground	599	588	-11
G	Sill Height at Front Wheel Well	394	384	-10
H	Sill Height at Front Door Leading Edge	385	372	-13
I	Sill Height at B-Pillar	415	397	-18
J1	Sill Height at Rear Wheel Well	460	462	2
J2	Pinch Weld Height at Rear Wheel Well	299	286	-13
K	Sill Height Aft of Rear Wheel Well	500	497	-3
L	Rear Bumper Thickness	73	74	1
M	Rear Bumper Bottom to Ground	655	650	-5
N	Sill Height to Bottom of Front Window Sill	719	647	-72
O	Front Door Leading Edge to Impact CL	731	733	2
P	Rear Door Trailing Edge to Impact CL	1272	1243	-29
Q	Front Window Opening	413	435	22
R	Right Side Length	3202	3202	0
S	Left Side Length	3199	3193	-6
T	Vehicle Width at B-Pillar	1819	1769	-50

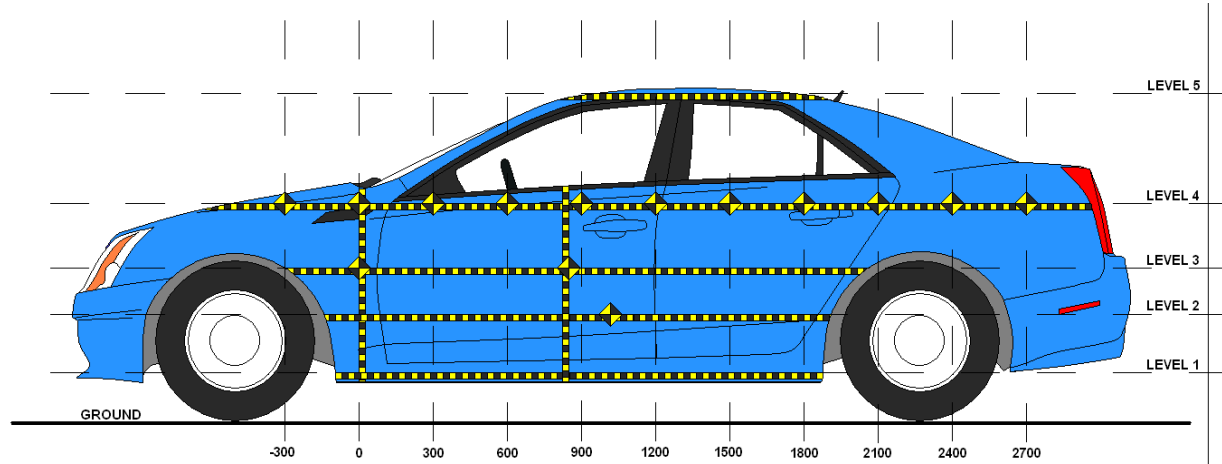
All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102

Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	427	90	1650
2	Occupant H-Point	712	144	1650
3	Mid-Door	810	158	1650
4	Window Sill	1104	47	1500
5	Window Top	1645	2	1950

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test (mm)					Post-Test (mm)					Exterior Crush (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150			586	698				565	676				-21	-22	
0	613	596	589	687		588	585	591	667		-25	-11	2	-20	
150	618	592	593	676		661	652	638	654		43	60	45	-22	
300	629	595	594	663		668	664	651	656		39	69	57	-7	
450	634	597	592	653		678	670	686	640		44	73	94	-13	
600	636	596	590	640		684	676	705	627		48	80	115	-13	
750	638	596	589	632		689	694	708	620	877	51	98	119	-12	
900	639	595	589	622	871	693	703	708	615	867	54	108	119	-7	-4
1050	640	595	589	617	876	699	685	689	611	871	59	90	100	-6	-5
1200	641	596	590	610	875	699	663	655	630	873	58	67	65	20	-2
1350	643	596	591	610	877	703	694	689	634	876	60	98	98	24	-1
1500	639	594	590	610	880	709	701	724	657	878	70	107	134	47	-2
1650	627	592	587	609	882	717	736	745	637	883	90	144	158	28	1
1800	617	589	583	610	888	640	698	722	611	888	23	109	139	1	0
1950			583	610	891			621	592	883			37	-18	2
2100				612	897				588	898				-24	1
2250				618	905				622	906				4	1
2400				624	915				626	917				2	2
2550				636					635					-1	
2700															
2850															

DATA SHEET NO. 11 ... (CONTINUED)

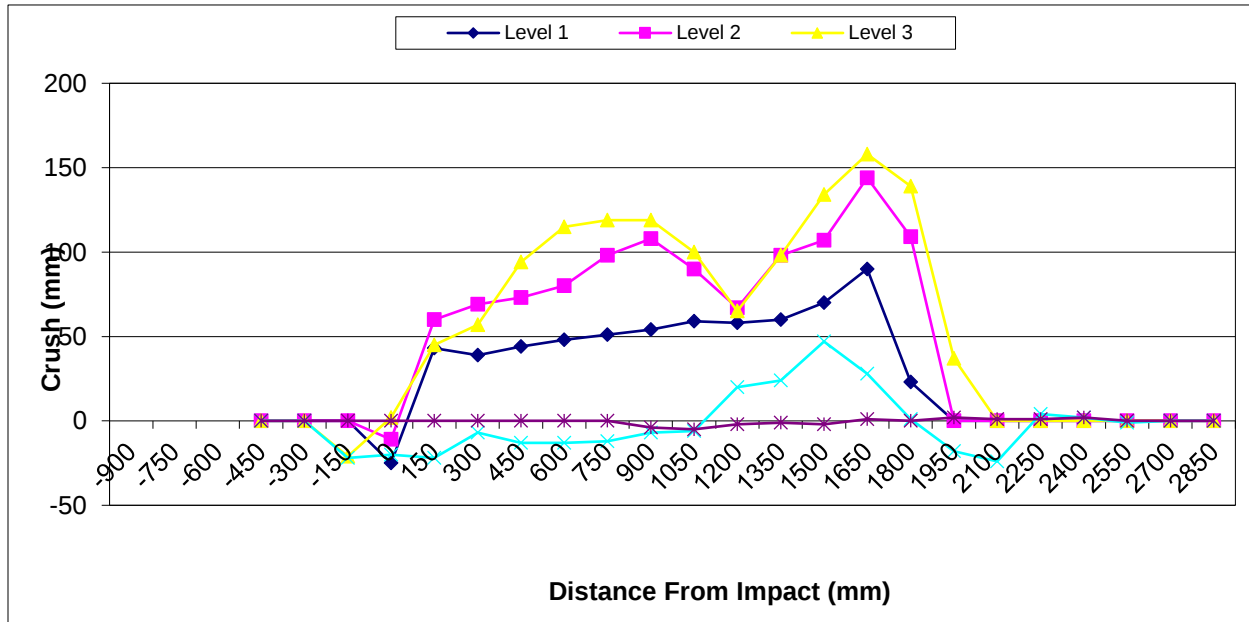
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV

NHTSA No. M20234102

Test Program: NCAP MDB Side Impact Test

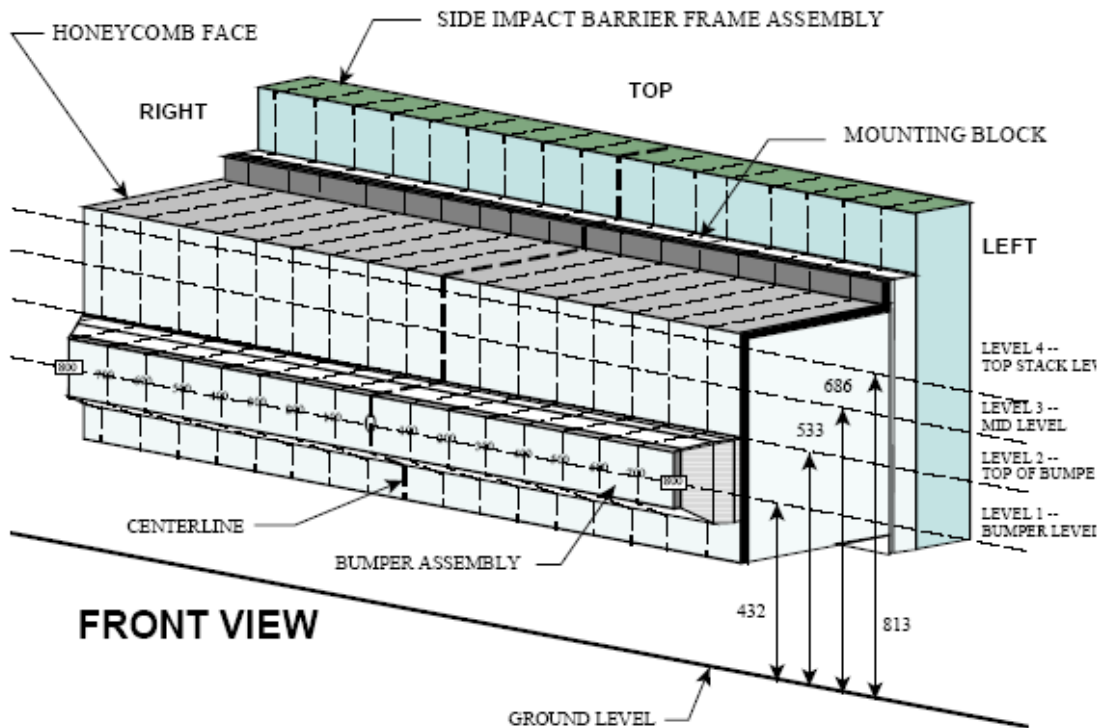
Test Date: 4/27/23



DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	248	220	210	210	208	203	204	197	200	193	192	187	182	182	183	183	198
2	184	171	156	156	145	148	141	137	138	138	139	137	141	137	136	139	145
3	107	113	124	125	124	146	132	108	86	81	78	82	86	91	103	126	136
4	111	106	120	124	137	171	143	111	96	87	87	86	96	101	123	151	181

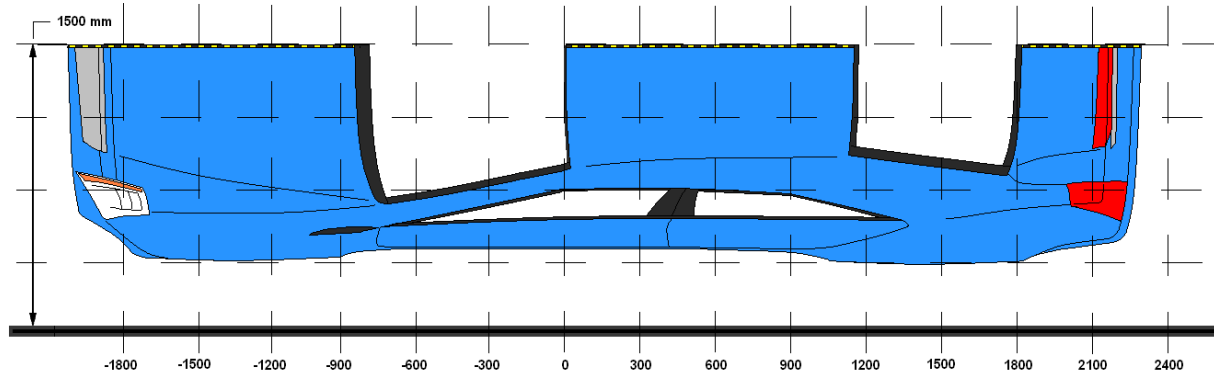
All dimensions in millimeters.

DATA SHEET NO. 13

VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102

Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2550	4	636	635	-1
2	2100	5	897	898	1
3	1500	3	590	724	134
4	900	3	589	708	119
5	300	2	595	664	69
6	-150	3	586	565	-21

MDB DAMAGE PROFILE DISTANCES

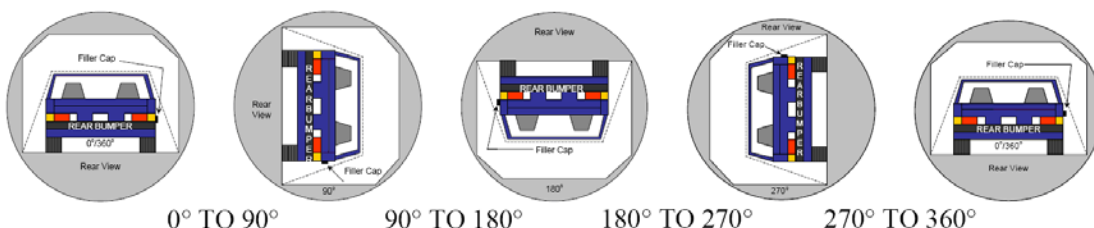
DPD	From MDB Centerline		Level	Crush (mm)
	Distance (mm)	Direction		
1	800	Left	1	198
2	500	Left	1	182
3	200	Left	1	192
4	200	Right	1	204
5	500	Right	1	210
6	800	Right	1	248

DATA SHEET NO. 14

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV NHTSA No. M20234102
 Test Program: NCAP MDB Side Impact Test Test Date: 4/27/23
 Temperature at Time of Impact: 31°C Test Time: 3:03 P.M.

- A. From impact until vehicle motion ceases: N/A oz.
 (Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: N/A oz.
 (Maximum allowable = 5 oz.)
- C. For the following 25 minutes: N/A oz.
 (Maximum allowable = 1 oz./minute)
- D. Spillage Details: _____



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	80	300	380
90° To 180°	80	300	380
180° To 270°	80	300	380
270° To 360°	80	300	380

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. 15

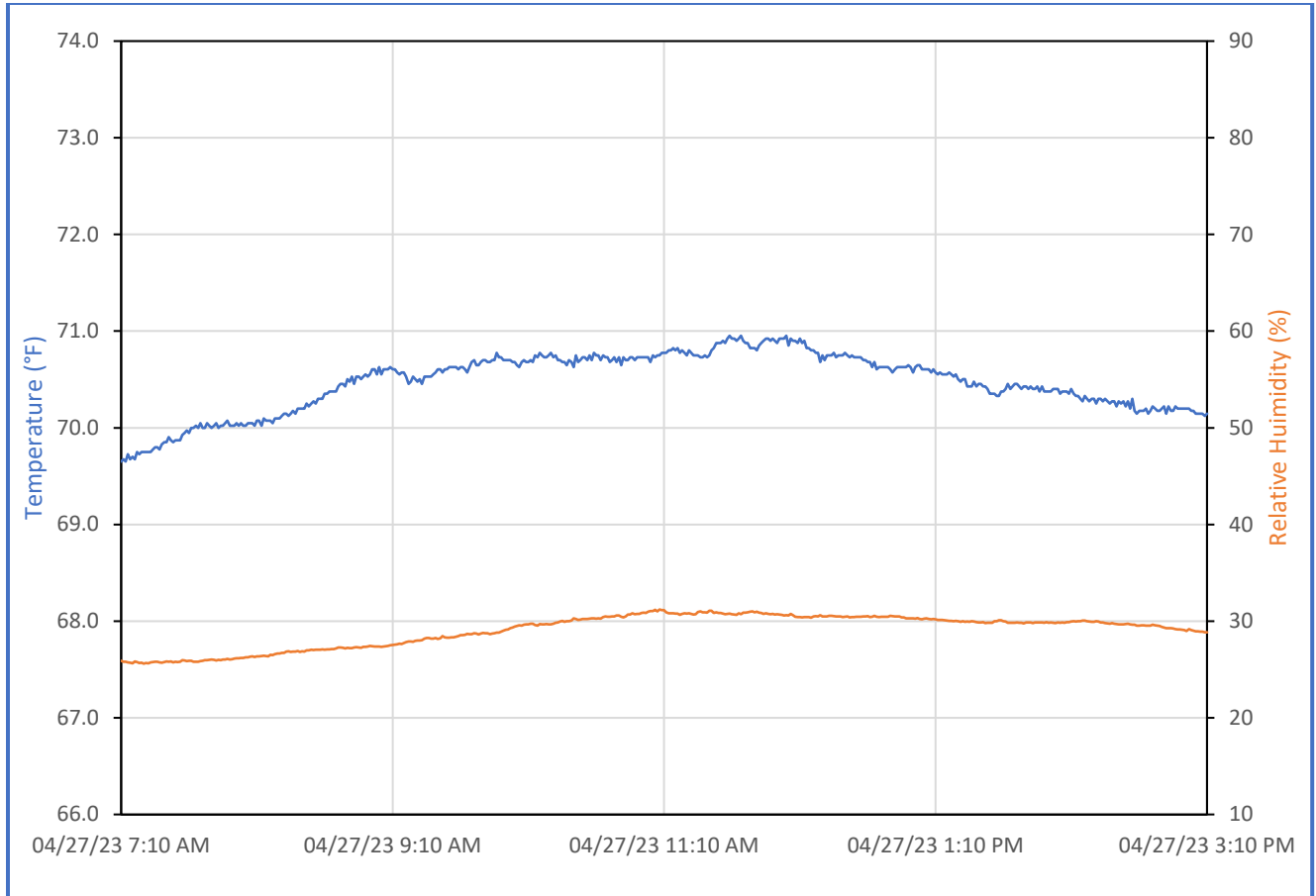
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV

NHTSA No. M20234102

Test Program: NCAP MDB Side Impact Test

Test Date: 4/27/23



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

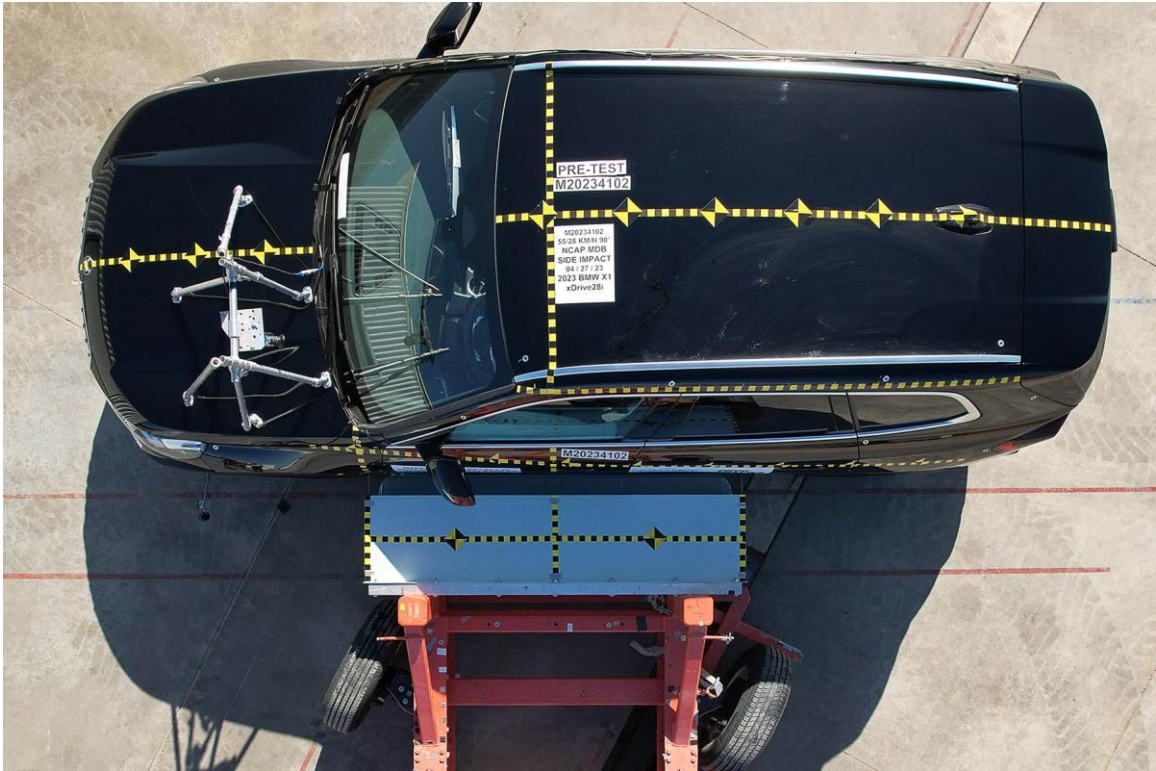


FIGURE 15. Pre-Test Overhead View of Test Area

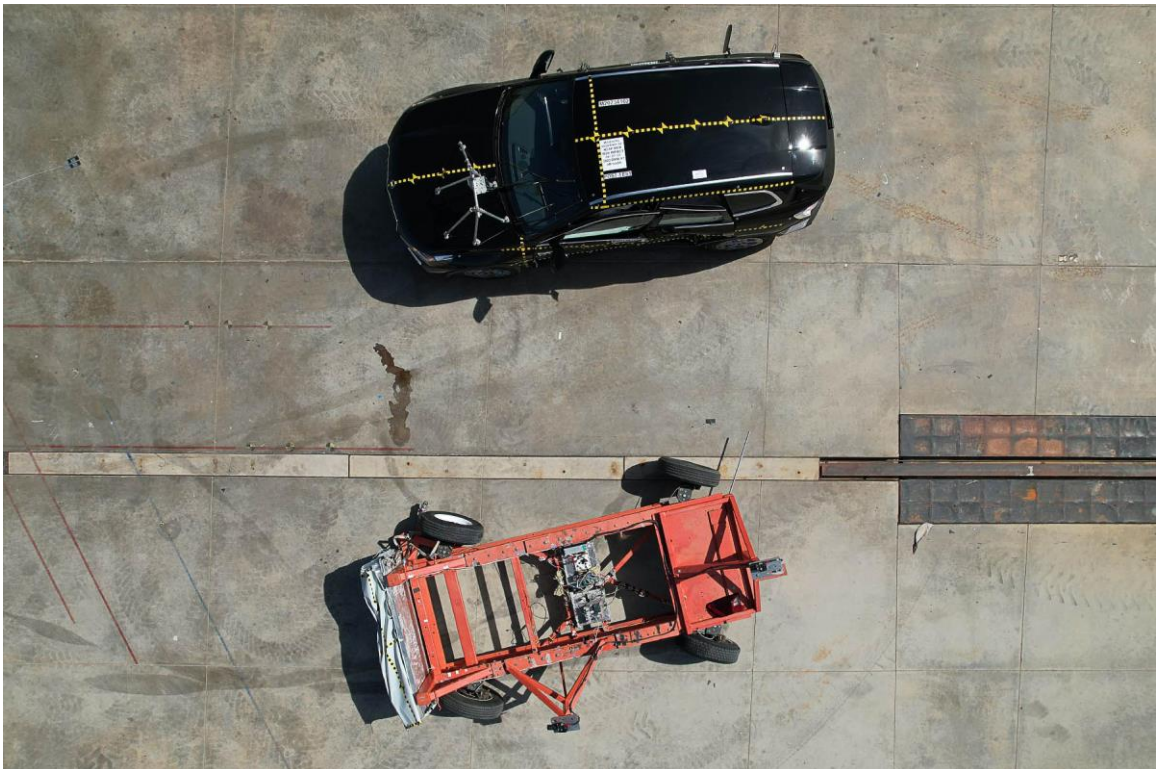


FIGURE 16. Post-Test Overhead View of Test Area



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



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

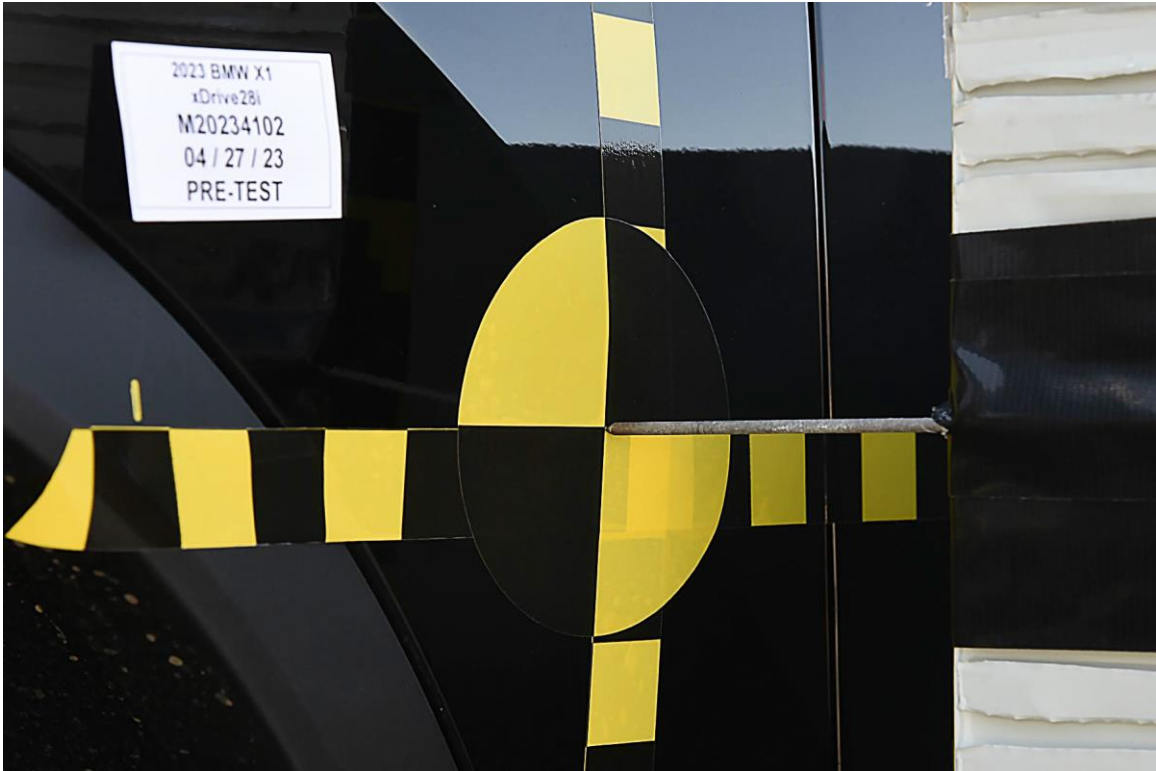


FIGURE 19. Pre-Test Close-Up View of Impact Point Target

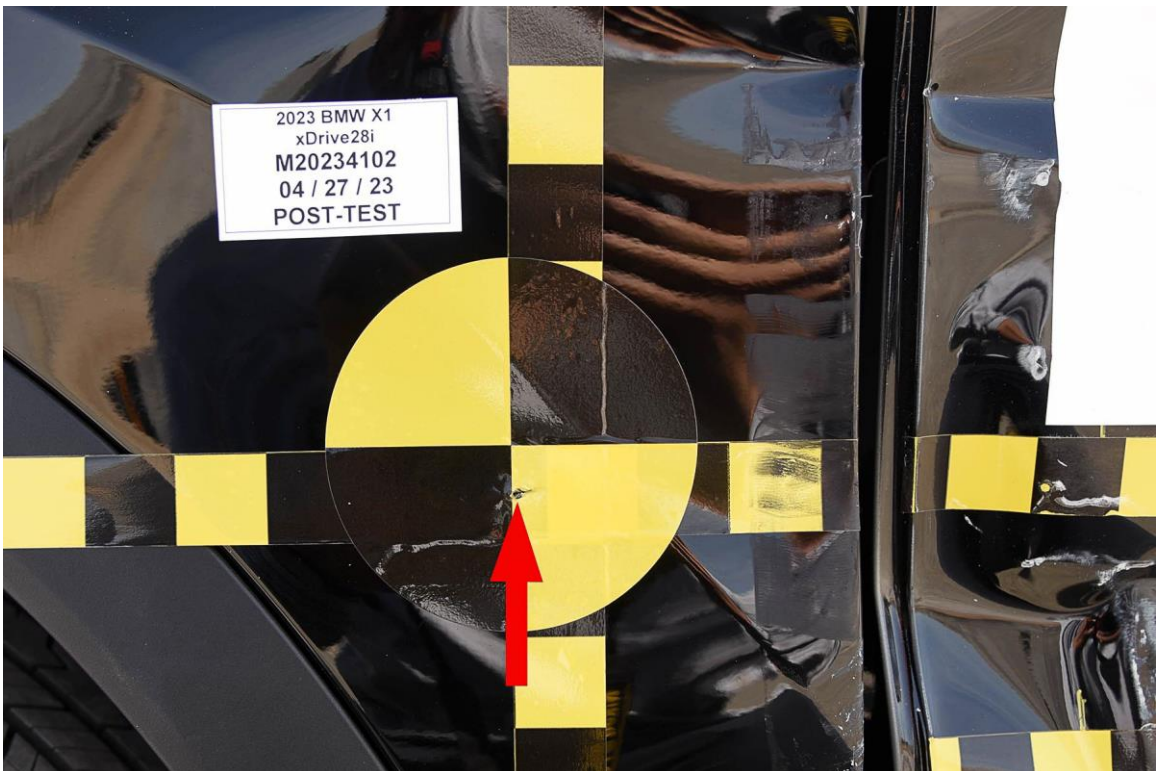


FIGURE 20. Post-Test Close-Up View of Impact Point Target



FIGURE 21. Pre-Test Left Front Door Latch Close-Up



FIGURE 22. Post-Test Left Front Door Latch Close-Up



FIGURE 23. Pre-Test Left Rear Door Latch Close-Up



FIGURE 24. Post-Test Left Rear Door Latch Close-Up



FIGURE 25. Pre-Test Front Close-Up View of Driver Dummy



FIGURE 26. Post-Test Front Close-Up View of Driver Dummy



FIGURE 27. Pre-Test Left Side View of Driver Dummy
Showing Belt and Chalking



FIGURE 28. Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

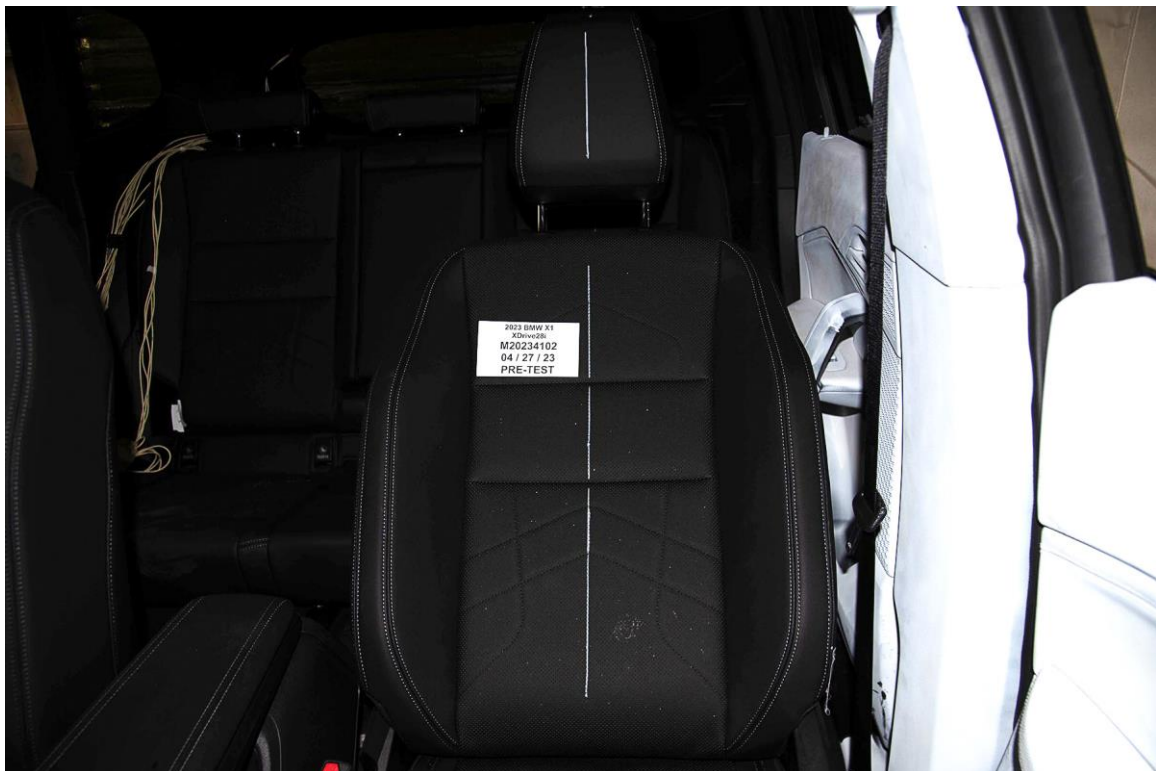


FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



FIGURE 31. Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



FIGURE 32. Pre-Test Overhead View of Driver Seat Pan Prior to Dummy Positioning



FIGURE 33. Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



FIGURE 34. Pre-Test Placement of Driver Dummy's Feet



FIGURE 35. Pre-Test View of Belt Anchorage for Driver Dummy



FIGURE 36. Pre-Test Left Side View of Steering Wheel



FIGURE 37. View of Disengaged Parking Brake



FIGURE 38. Pre-Test View of Parking Brake



FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Track



FIGURE 40. Pre-Test Close-Up Left Side View of Driver Seat Back



FIGURE 41. Pre-Test Close-Up View of Driver Seat Back or Head Restraint



FIGURE 42. Pre-Test Driver Dummy and Door Clearance View



FIGURE 43. Post-Test Driver Dummy and Door Clearance View



FIGURE 44. Pre-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment



FIGURE 45. Post-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment



FIGURE 46. Pre-Test Driver Inner Door Panel View



FIGURE 47. Post-Test Driver Inner Door Panel View
Showing Driver Dummy Contact Locations



FIGURE 48. Post-Test Driver Dummy Close-Up Head Contact
with Vehicle Interior View



FIGURE 49. Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View



FIGURE 50. Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



FIGURE 51. Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



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



FIGURE 53. Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View

Photograph Not Applicable
No Driver Dummy Close-Up Knee Contact

FIGURE 54. Post-Test Driver Dummy Close-Up Knee Contact View



FIGURE 55. Pre-Test Left Side View of Rear Passenger Dummy
Showing Belt and Chalking



FIGURE 56. Pre-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View



FIGURE 57. Post-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View



FIGURE 58. Pre-Test Frontal View of Rear Passenger Seat Back
Prior to Dummy Positioning



FIGURE 59. Pre-Test Frontal View of Rear Passenger Dummy
Head and Shoulders in Relation to Head Restraint



FIGURE 60. Pre-Test Overhead View of Rear Passenger
Seat Pan Prior to Dummy Positioning



FIGURE 61. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

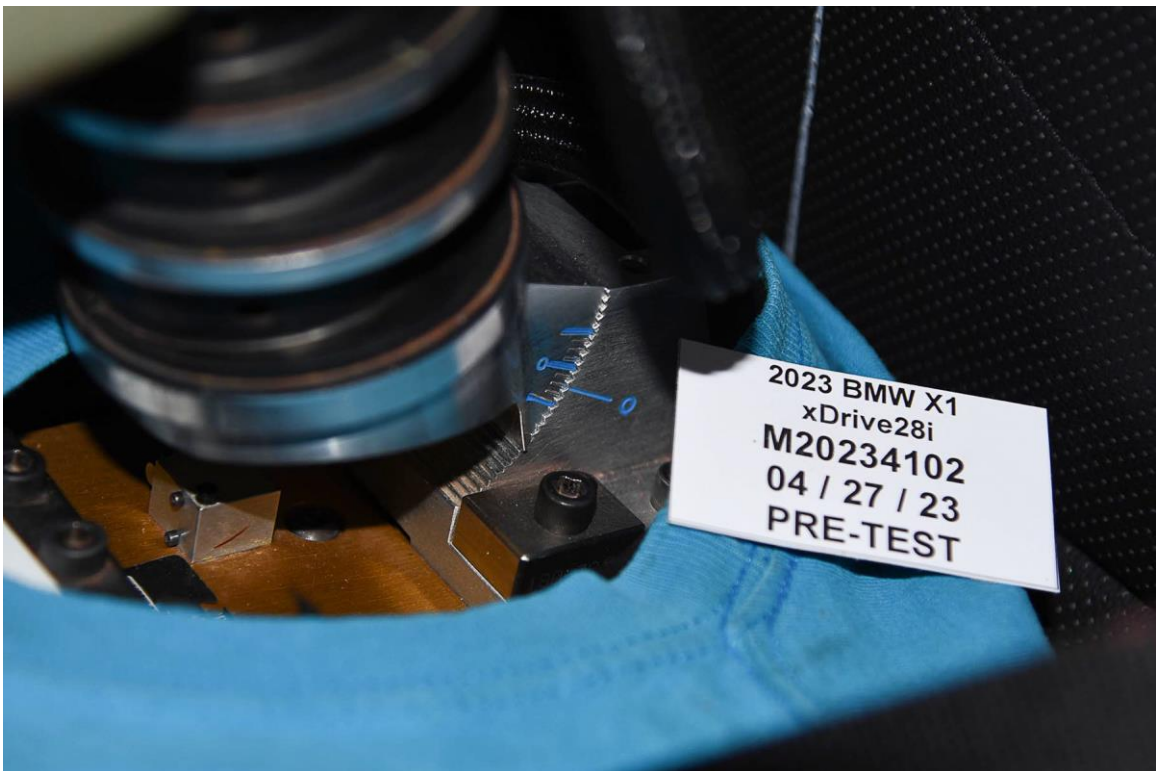


FIGURE 62. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket



FIGURE 63. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy's Head is Level



FIGURE 64. Pre-Test Placement of Rear Passenger Dummy's Feet



FIGURE 65. Pre-Test View of Belt Anchorage for Rear Passenger Dummy



FIGURE 66. Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



FIGURE 67. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



FIGURE 68. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



FIGURE 69. Pre-Test Rear Passenger Dummy and Door Clearance View



FIGURE 70. Post-Test Rear Passenger Dummy and Door Clearance View



FIGURE 71. Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



FIGURE 72. Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



FIGURE 73. Pre-Test Rear Passenger Inner Door Panel View



FIGURE 74. Post-Test Rear Passenger Inner Door Panel View
Showing Rear Passenger Dummy Contact Locations



FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle Interior View

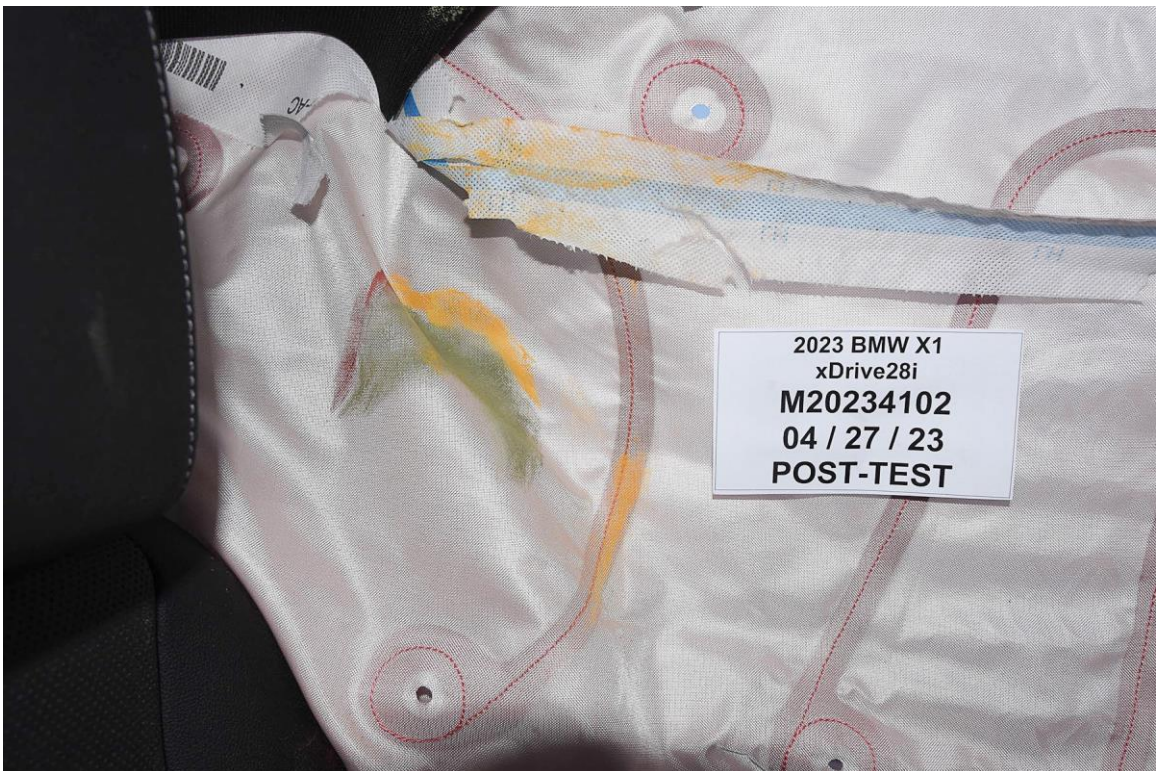


FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Side Airbag View



FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View



FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View



FIGURE 79. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Vehicle Interior View



FIGURE 80. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View

Photograph Not Applicable

No Passenger Dummy Close-Up Knee Contact

FIGURE 81. Post-Test Rear Passenger Dummy Close-Up Knee Contact View



FIGURE 82. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 83. Post-Test View of Fuel Filler Cap or Fuel Filler Neck



FIGURE 84. Pre-Test Front View of MDB Impactor Face



FIGURE 85. Post-Test Front View of MDB Impactor Face



FIGURE 86. Pre-Test Top View of MDB Impactor Face



FIGURE 87. Post-Test Top View of MDB Impactor Face



FIGURE 88. Pre-Test Left Side View of MDB Impactor Face



FIGURE 89. Post-Test Left Side View of MDB Impactor Face



FIGURE 90. Pre-Test Right Side View of MDB Impactor Face



FIGURE 91. Post-Test Right Side View of MDB Impactor Face



FIGURE 92. Close-Up View of Vehicle's Certification Label



FIGURE 93. Close-Up View of Vehicle's Tire Information Placard or Label

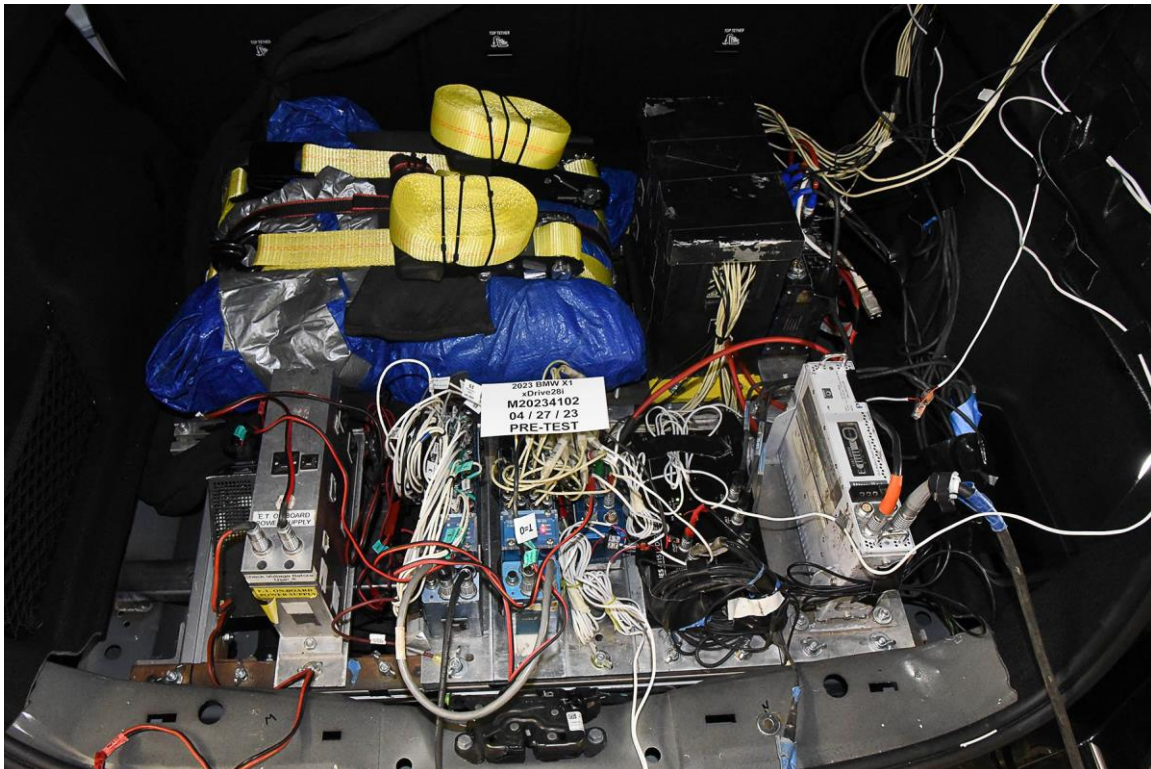


FIGURE 94. Pre-Test Ballast View



FIGURE 95. Post-Test Primary and Redundant Speed Trap Read-Out



FIGURE 96. FMVSS No. 301 Static Rollover 0 Degrees

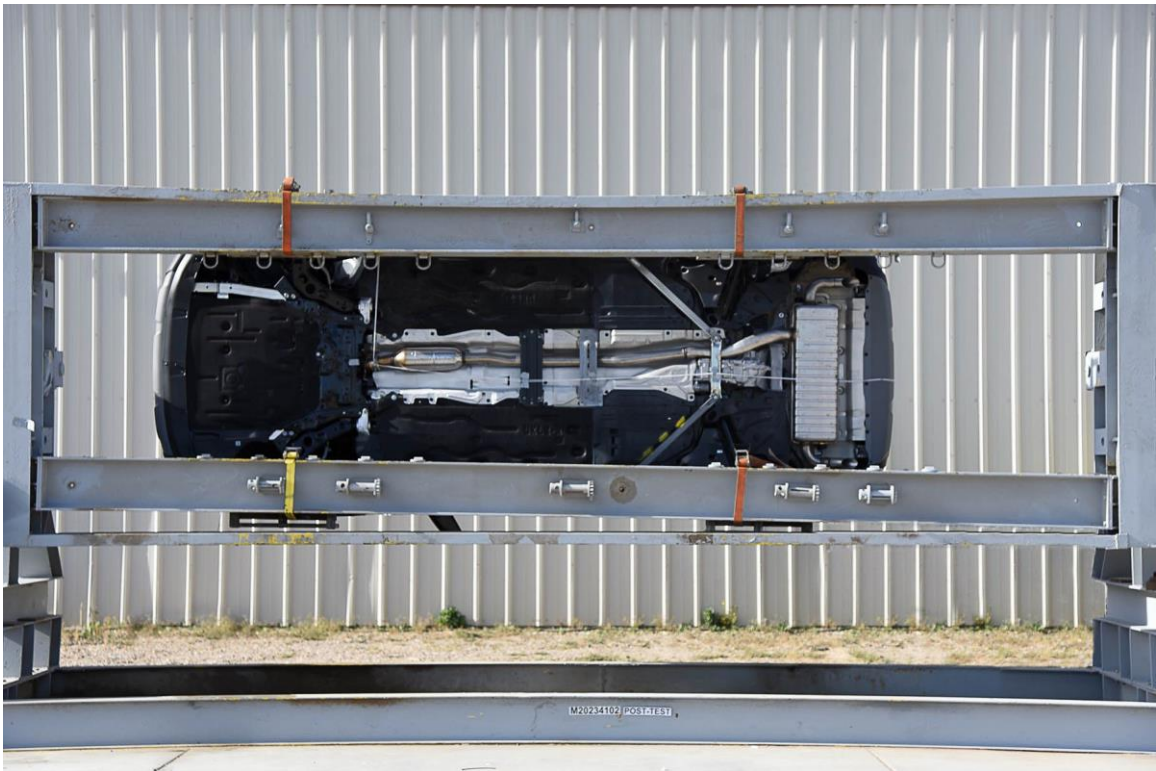


FIGURE 97. FMVSS No. 301 Static Rollover 90 Degrees



FIGURE 98. FMVSS No. 301 Static Rollover 180 Degrees



FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees

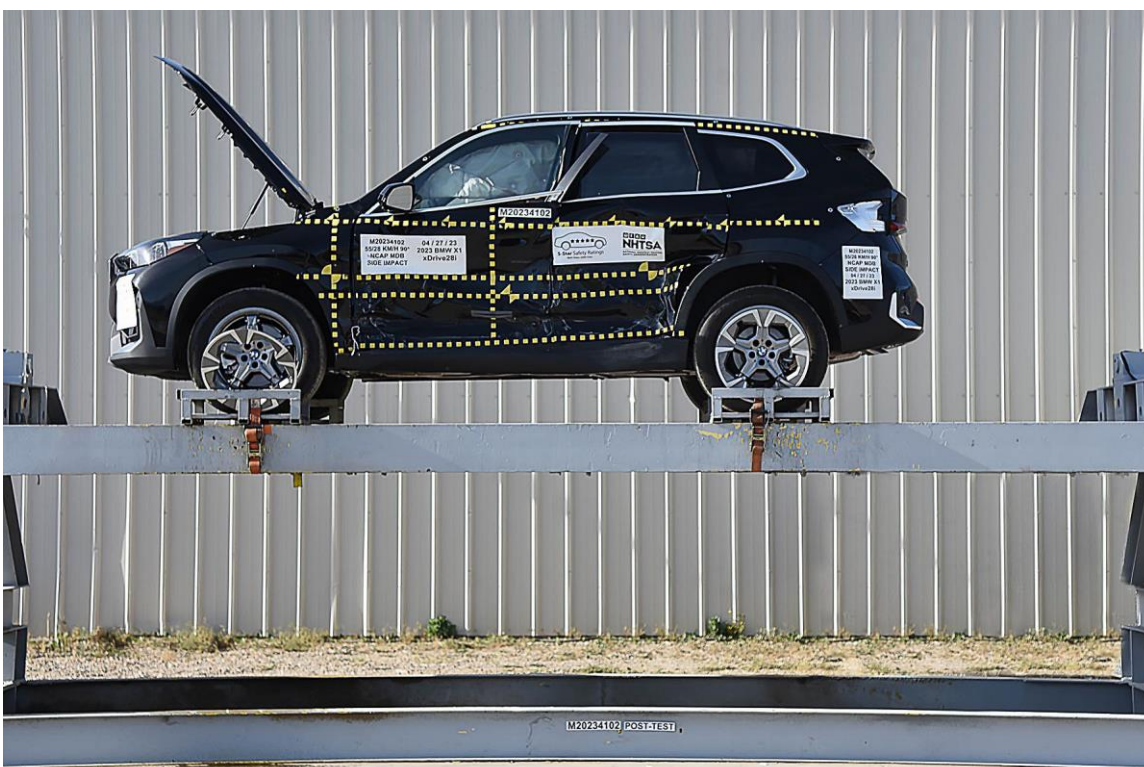


FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees



FIGURE 101. Impact Event

The Ultimate Driving Machine®

2023 BMW X1 xDrive28i

Manufacturer's Suggested Retail Price	\$ 38,600.00
Options and Additional Charges: (Optional equipment may supersede standard equipment; check with your authorized BMW center)	
Jet Black	Included
Black Perforated SenTec	Included
Standard Equipment	
• Black High Gloss Trim w/Arctic	Included
Active Blind Spot Detection	Included
Fit Col Warm w/Col Mitig	Included
Lane Departure Warning	Included
SULEV20 exhaust emission std	Included
18" V Spoke bi-color wheels, s	Included
7-Spd Dual Clutch Transmission	Included
Roof rails in Satin Aluminum	Included
Satin aluminum exterior trim	Included
Active Driving Assistant	Included
LED Headlights w/ Cornering	Included
Parking Assistant	Included
Connected Package Pro	Included
Wireless Display	Included
ServiceInterval with 360k + 1 year PI	Included
Anthracite headliner	Included
Refrigerant	Included
Destination Charge	\$ 915.00
Total Suggested Retail Price	\$ 39,595.00

Standard Features

Performance and efficiency

- 2.0-liter BMW TwinPower Turbo inline 4-cylinder, 16-valve engine with variable valve control (Double-VANOS) and Valvetronic and high-precision direct injection
- 7-Speed Dual Clutch Transmission

Handling, ride and braking

- Driving Dynamics Control with various driving modes
- Performance Control
- Dynamic Stability Control (DSC) with Dynamic Traction Control (DTC)
- 4-wheel ventilated anti-lock disc brakes (ABS) with Dynamic Brake Control (DBC) and Cornering Brake Control (CBC)
- X-Drive all-wheel-drive system

Connectivity

- Apple CarPlay and Android Auto compatibility
- Remote Software Upgrade capable
- Connected Package Pro features Real-Time Traffic, On-Street Parking, Intersect Alert, and BMW Remote Services

Exterior

- Satin Aluminum roof rails
- Satin Aluminum exterior trim

Interior trim

- Perforated SenTec upholstery
- Anthracite Headliner

Audio system

- HiFi Sound System
- SiriusXM Satellite Radio with 1 year subscription

Instrumentation and controls

- 3-spoke leather-wrapped sport steering wheel
- Live Cockpit Plus features Navigation, BMW Curved Display, operated by voice and touchscreens

Comfort and convenience

- Multi-zone Climate Control
- Rain-sensing windshield wipers
- Power front seats including driver seat memory
- Parking Assistant and Back-up Assistant

Safety and security

- Front and rear Head Protection System (HPS)
- Front-seat-mounted side-impact airbags
- Active Driving Assistant features Forward Collision Warning, Active Blind Spot Detection, and Lane Departure Warning
- Front and Rear Park Distance Control
- LED Headlights with Cornering Lights

Warranty

- 4-year/50,000-mile New Vehicle Limited Warranty for Passenger Cars and Light Trucks 2023 Models
- 12-year Unlimited Mileage Rust Perforation Limited Warranty
- 4-year Unlimited Mileage Roadside Assistance Program

BMW Ultimate Care™

Maintenance Program

For the first 3 years or 36,000 miles, whichever comes first on scheduled maintenance.

Your Maintenance Costs:

Engine Oil Services: \$0
Air Filter: \$0
Cabin Microfilter: \$0
Spark Plugs: \$0
Vehicle Checks: \$0
Brake Fluid: \$0

PARTS CONTENT INFORMATION

For Vehicles in this Car Line:
US/Canadian Parts Content: **2%**
Major Source of Foreign Parts Content: **GERMANY: 21%**

Note: Parts content does not include final assembly, distribution, or other non-parts costs.

For this Vehicle:
Final Assembly Point: **REGENSBURG, GERMANY**
Country of Origin: **GERMANY**
Engine: **GERMANY**
Transmission: **GERMANY**

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score

Not Rated

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Crash	Driver	Not Rated
Crash	Passenger	Not Rated

Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.

Side	Front seat	Not Rated
Crash	Rear seat	Not Rated

Based on the risk of injury in a side impact.

Rollover: **Not Rated**

Based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (*****), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236

This vehicle is equipped with bumpers that can withstand an impact of 2.5 miles per hour with no damage to the vehicle's body and safety systems, although the bumper and related components may sustain damage. The bumper system on this vehicle conforms to the current federal bumper standard of 2.5 miles per hour.

EPA DOT Fuel Economy and Environment

Fuel Economy

28 MPG combined city/highway

Small SUVs range from 14 to 120 MPG. The best vehicle rates 132 MPG.

25 city **34** highway

3.6 gallons per 100 miles

You spend

\$1,750 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost

\$1,950

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

6 (out of 10)

This vehicle gets 313 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions, learn more at fuelconomy.gov.

Smog Rating (tailpipe only)

8 (out of 10)

Best

Actual results will vary for many reasons, including driving conditions and vehicle age. The average new vehicle gets 28 MPG city and 34 MPG highway. Fuel economy ratings are based on 15,000 miles per year at \$3.00 per gallon. Smog is measured in grams per mile (tailpipe only). Emissions are a significant cause of air pollution and global climate change.

fuelconomy.gov

Calculate personalized estimates and compare vehicles

BMW of North America, LLC

Woodcliff Lake, NJ 07677

VPC Location: OXNARD, CALIFORNIA

Port of Entry: HUENEME, CALIFORNIA

Carrier: DELUXE AUTO CARRIERS

Sold To: Century West BMW
PO Box 978
North Hollywood, CA
(818) 432-5900

Ship To: Century West BMW
4245 Lankershim Blvd
North Hollywood, CA
(818) 432-5900 91603-2802

FIGURE 102. Monroney Label

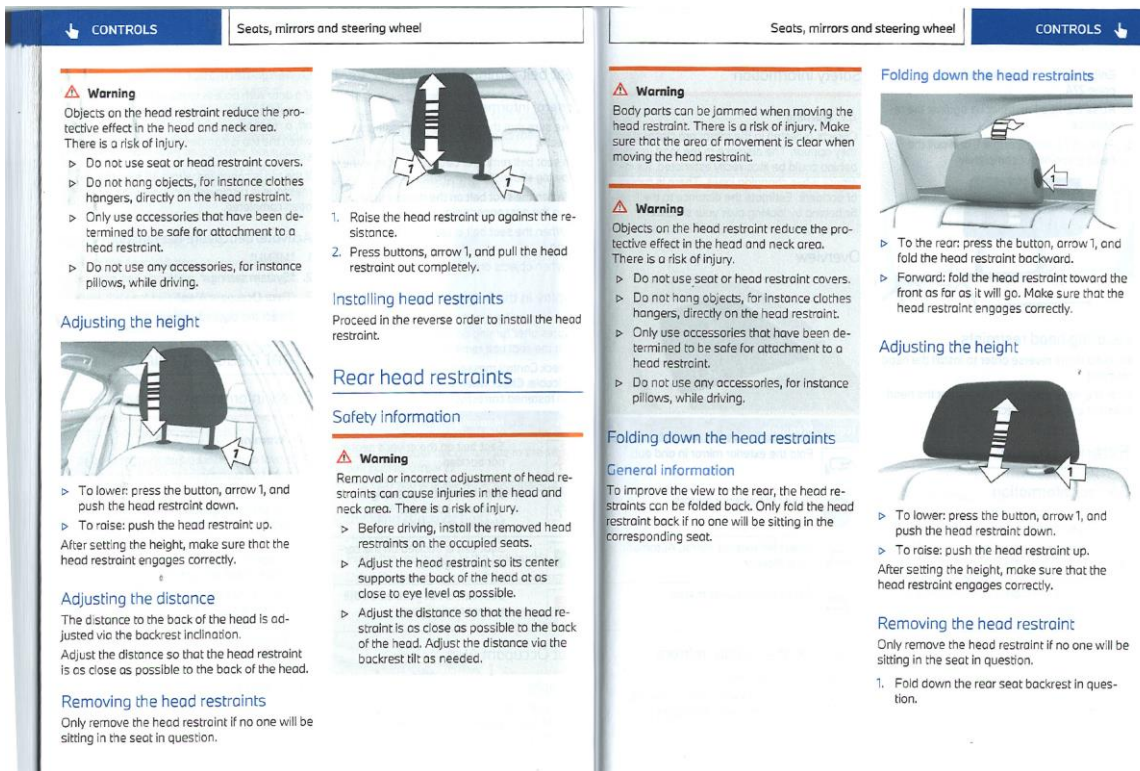


FIGURE 103. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

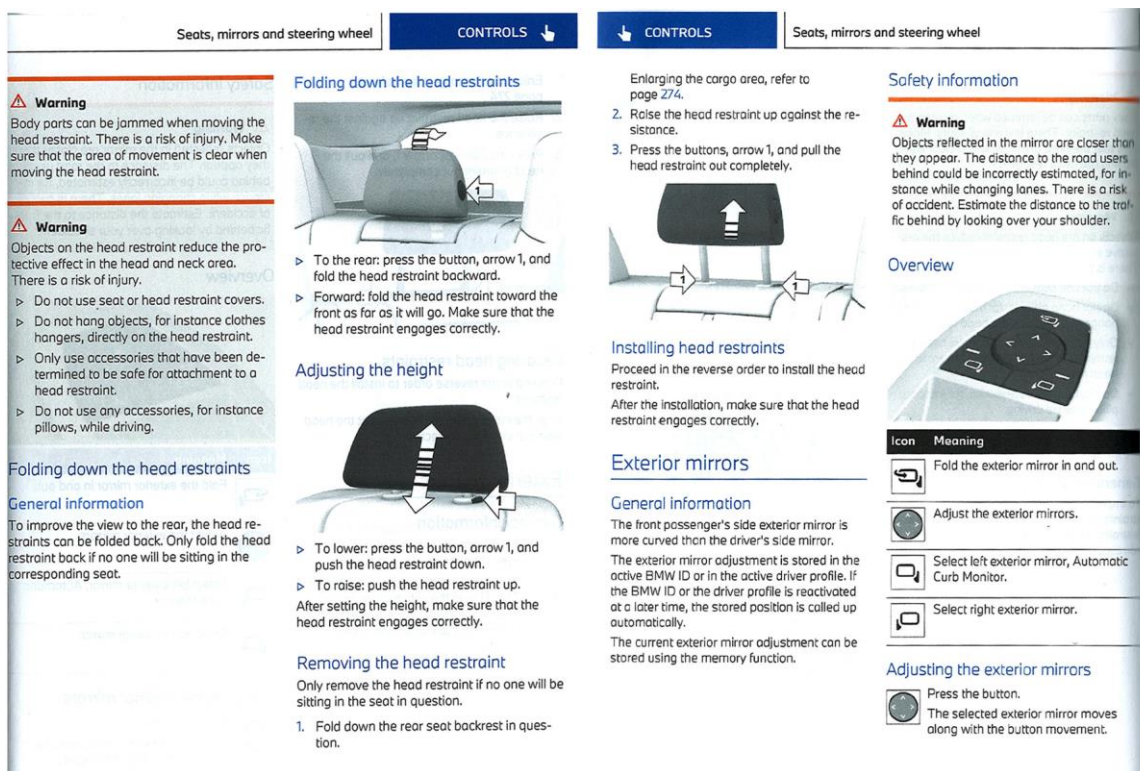


FIGURE 104. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

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The following additional data for this test can be obtained from the Research and Development section of the NHTSA website (www.NHTSA.gov)

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger 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)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

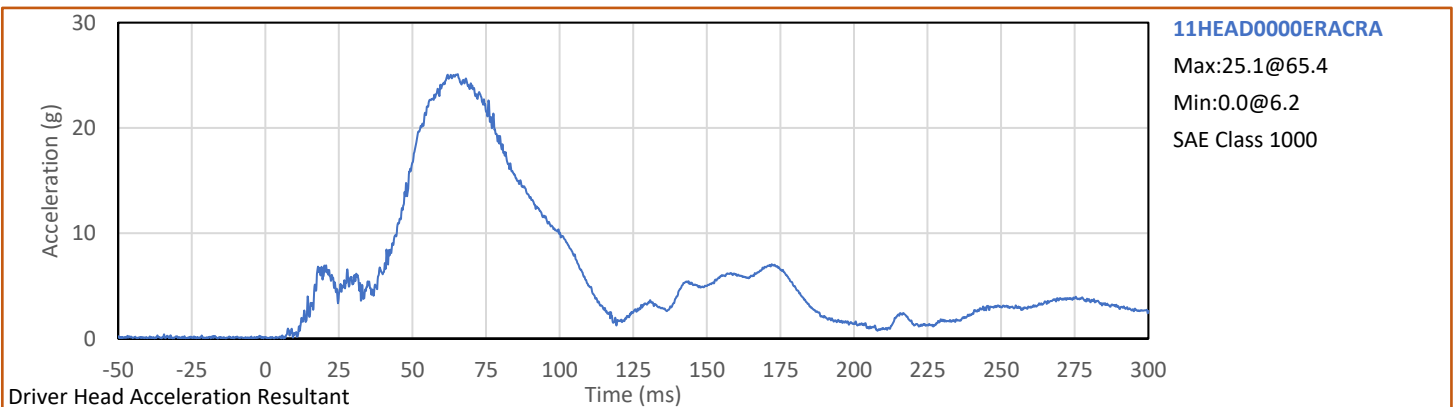
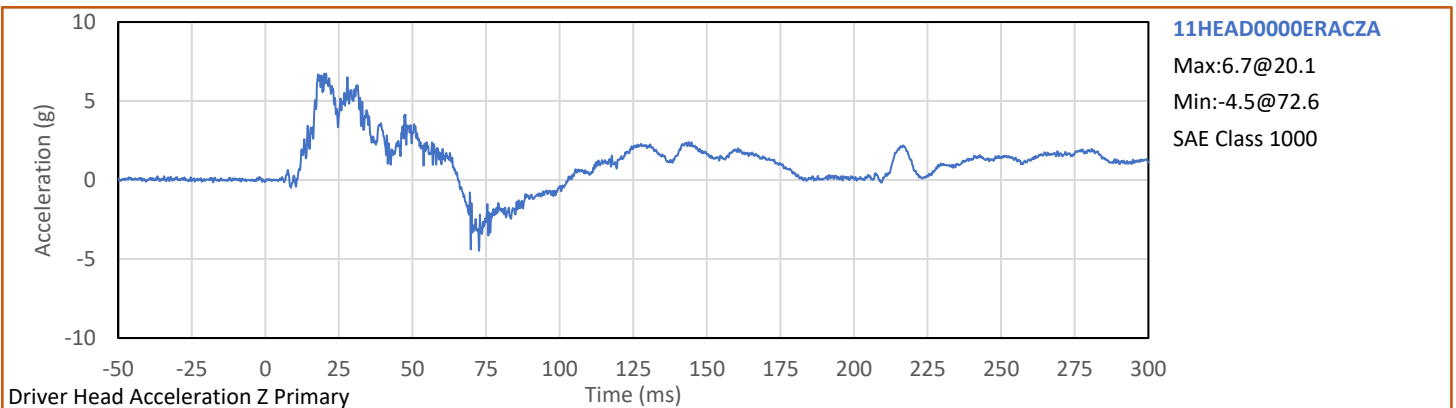
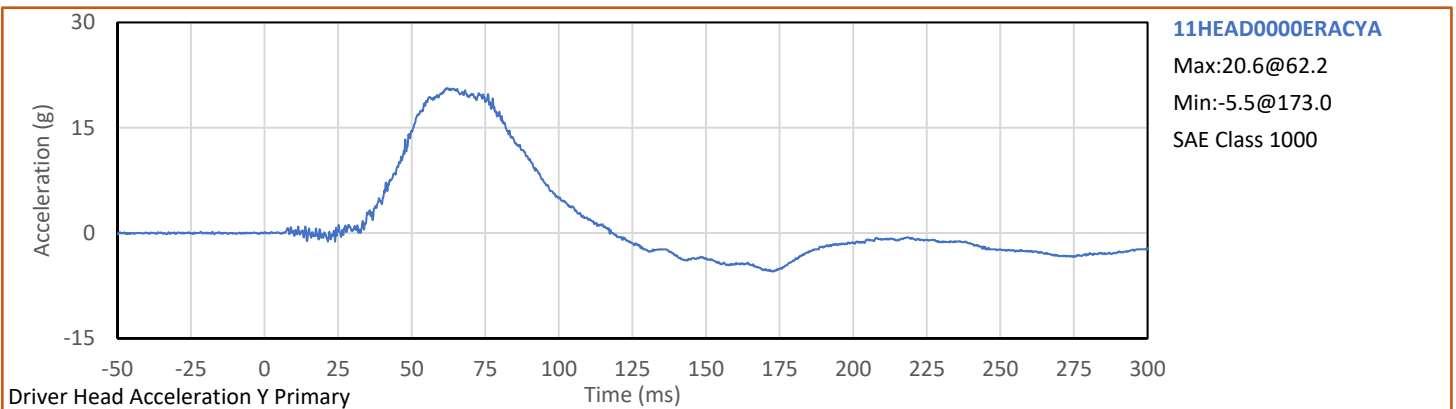
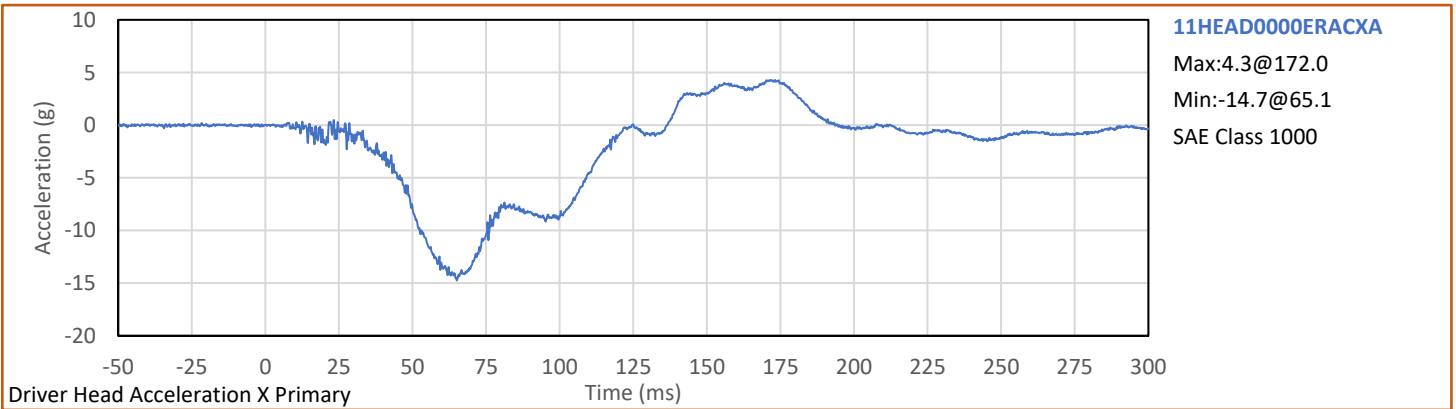
MDB Center of Gravity Acceleration (Z)

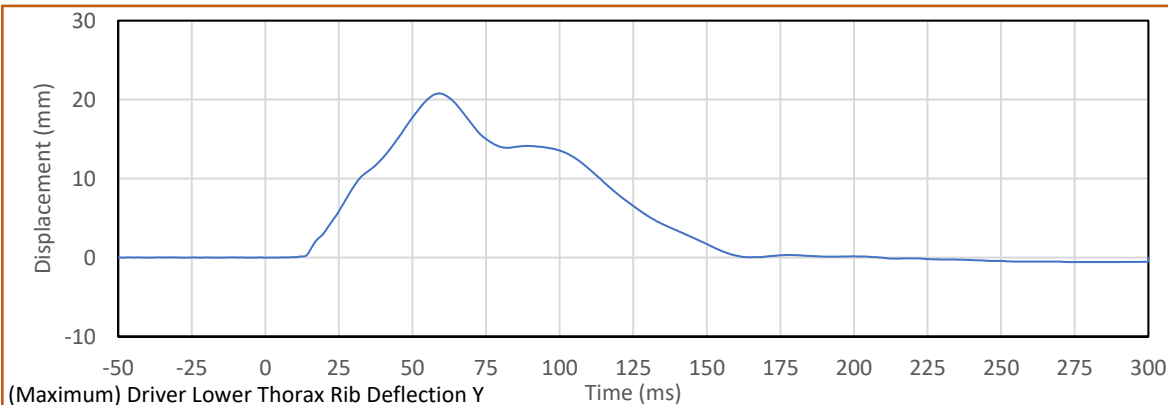
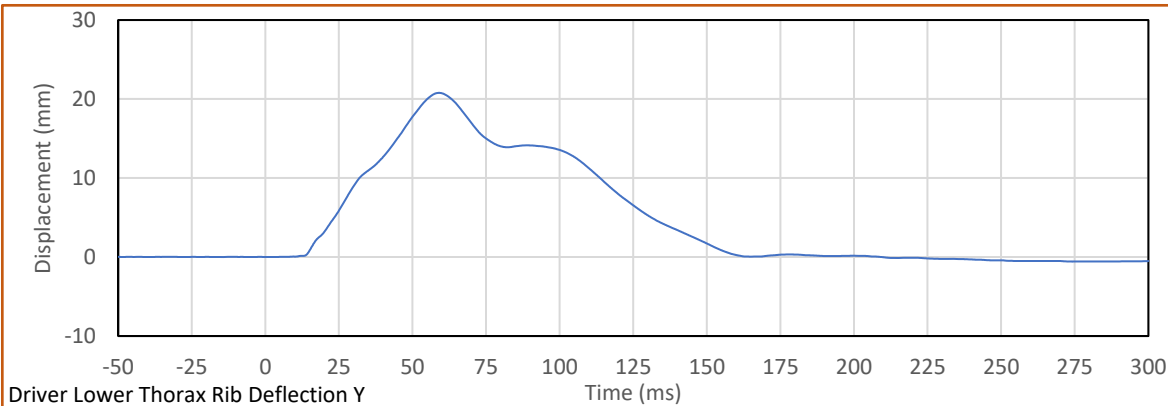
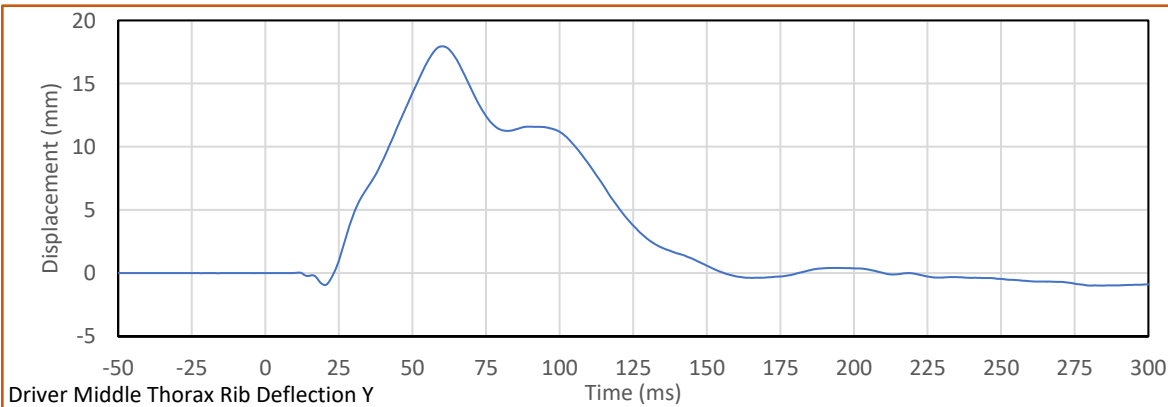
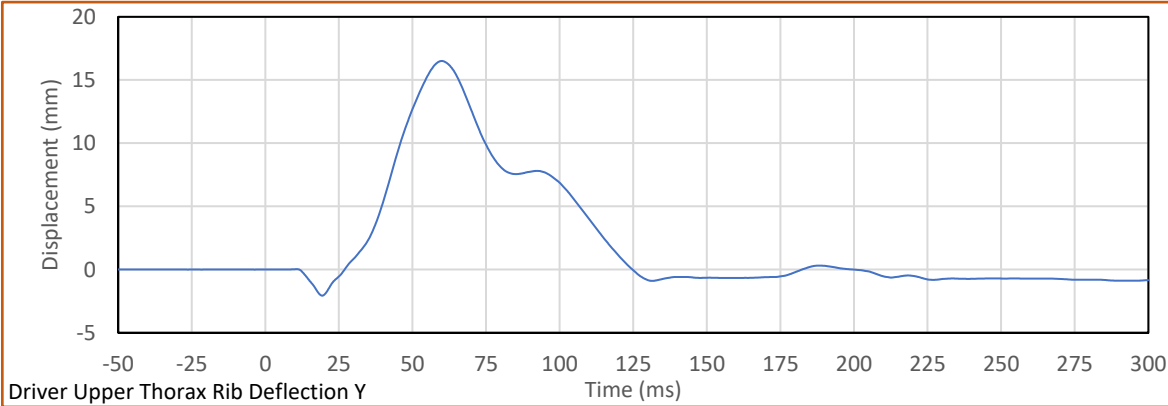
MDB Rear Acceleration (X)

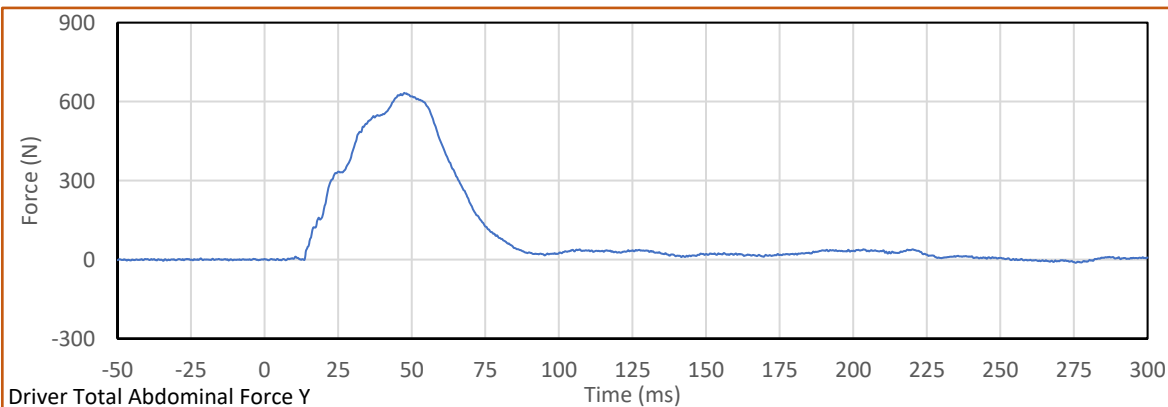
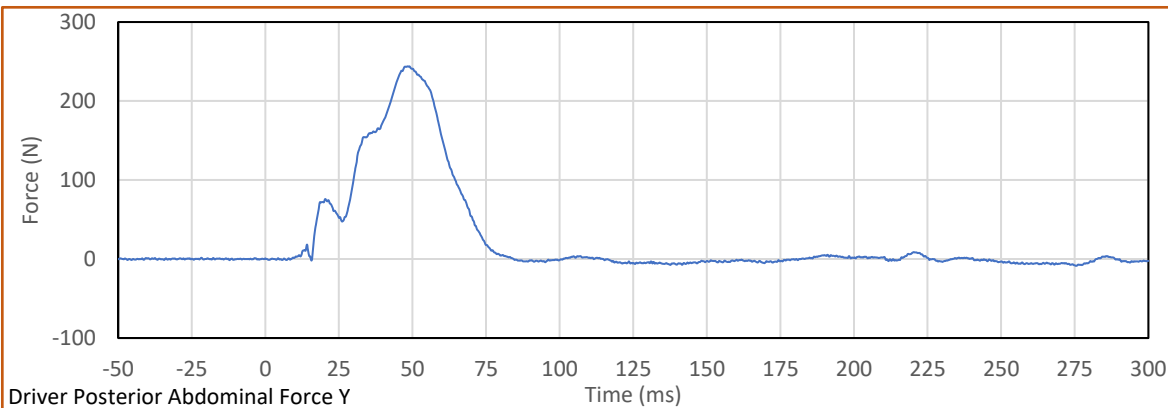
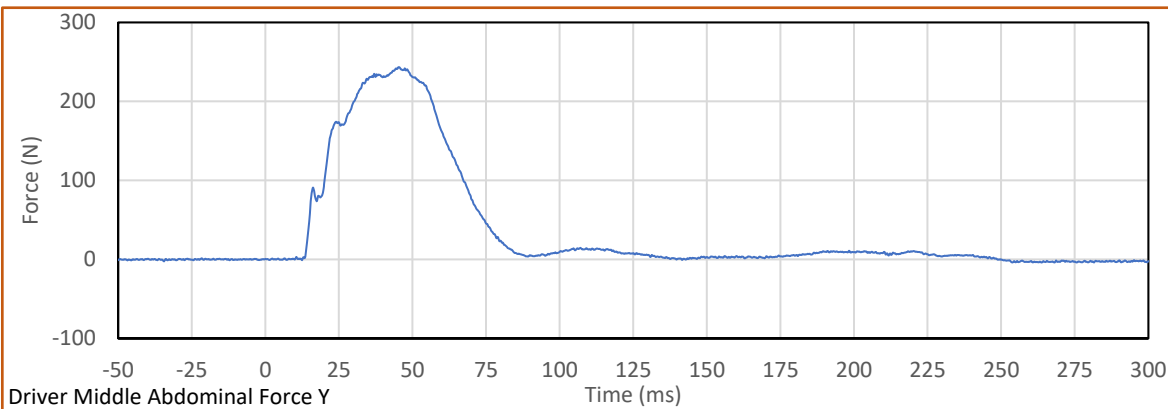
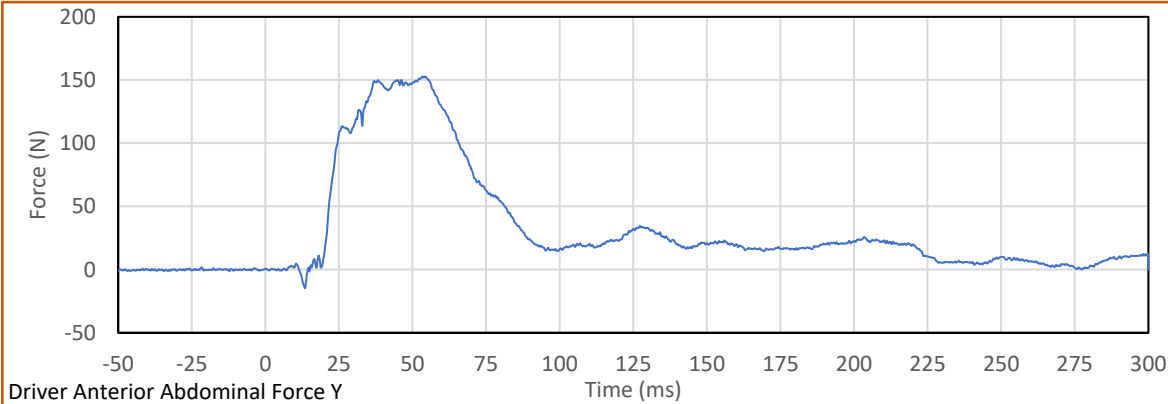
MDB Rear Acceleration (Y)

Left MDB Contact Switch

Right MDB Contact Switch

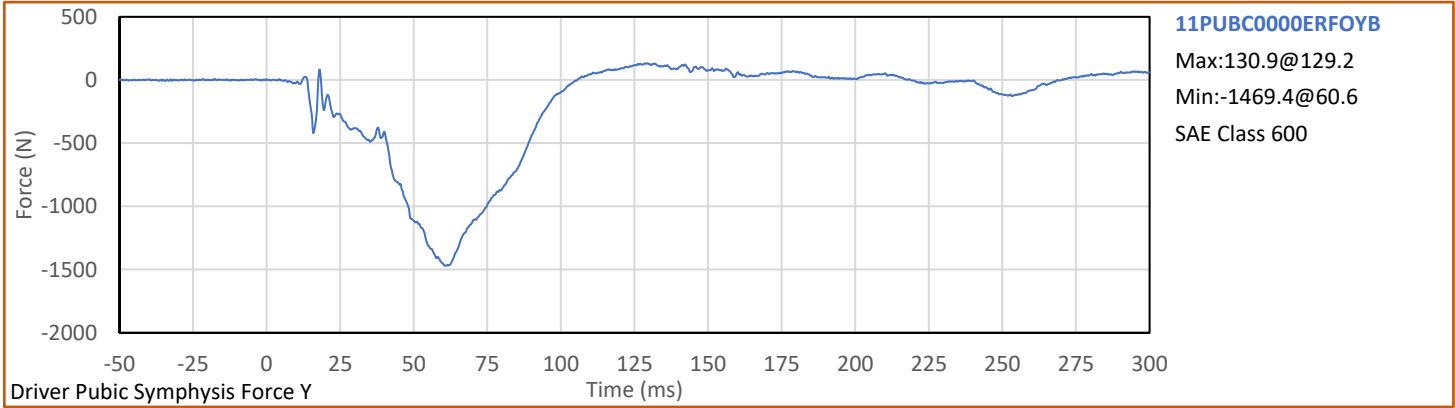


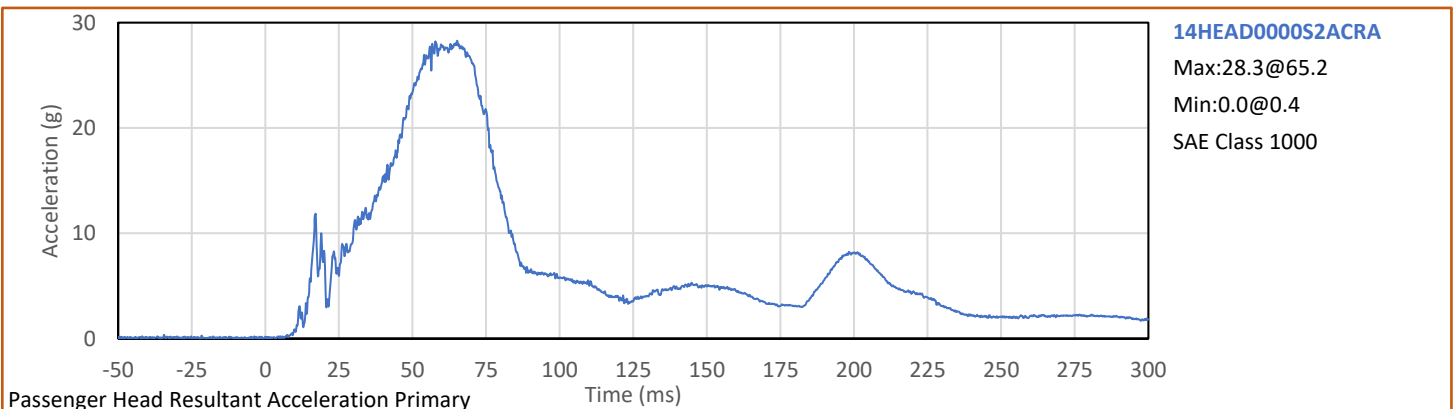
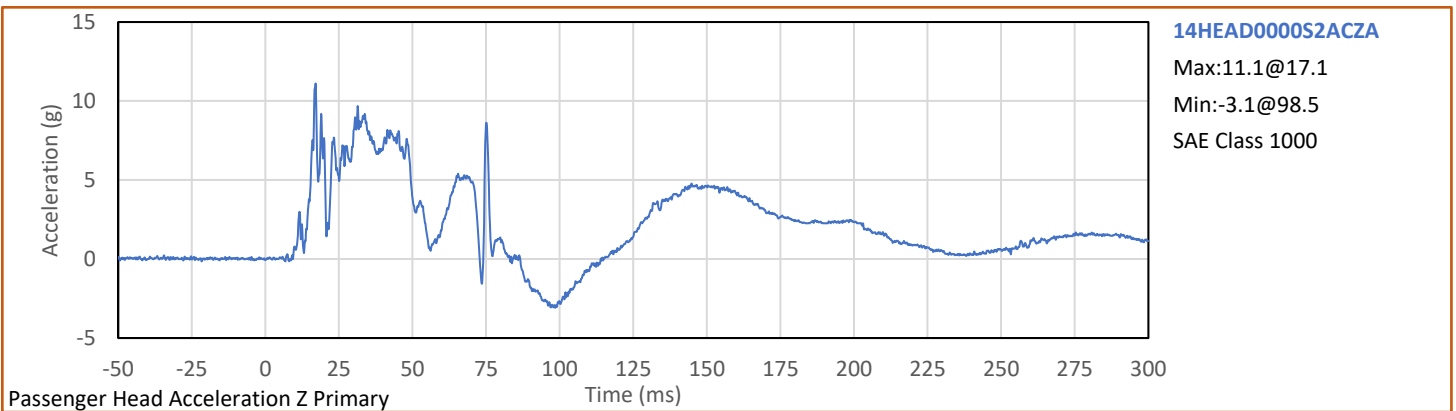
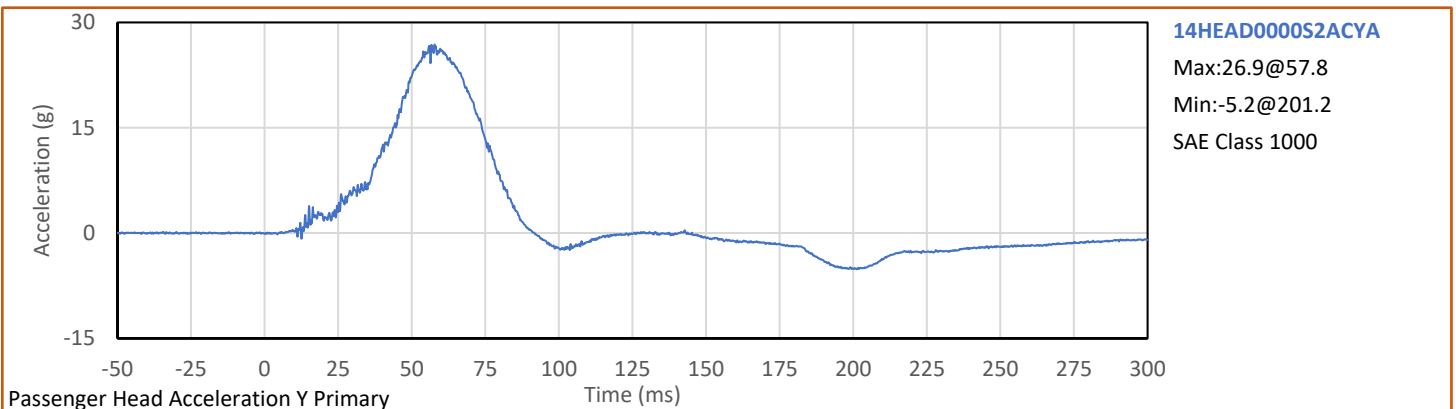
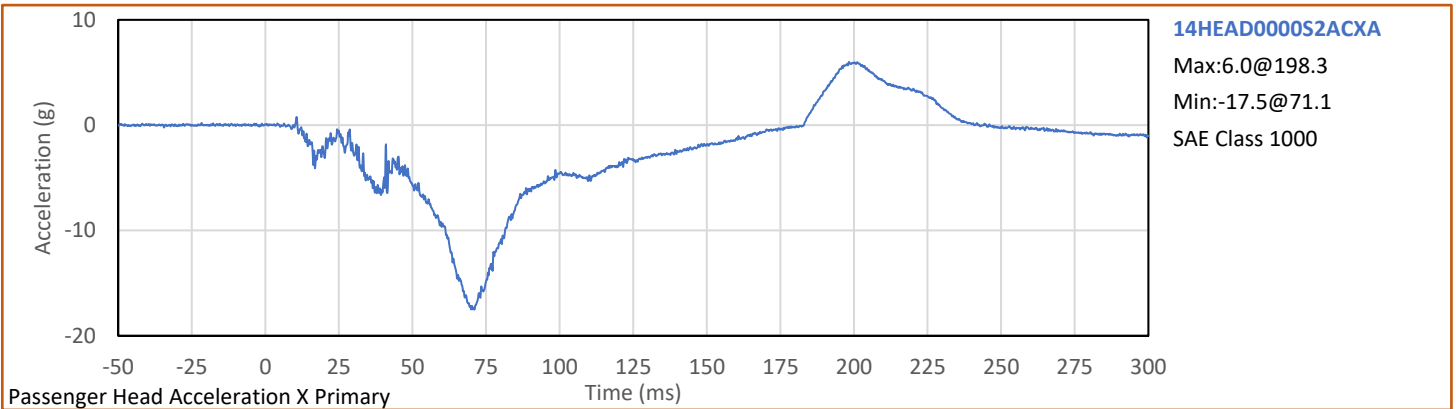


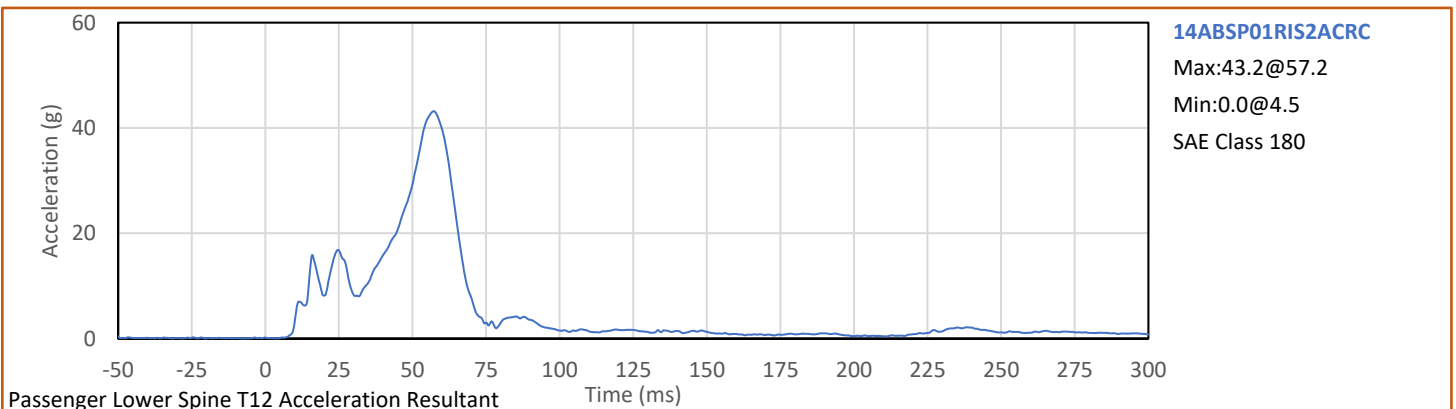
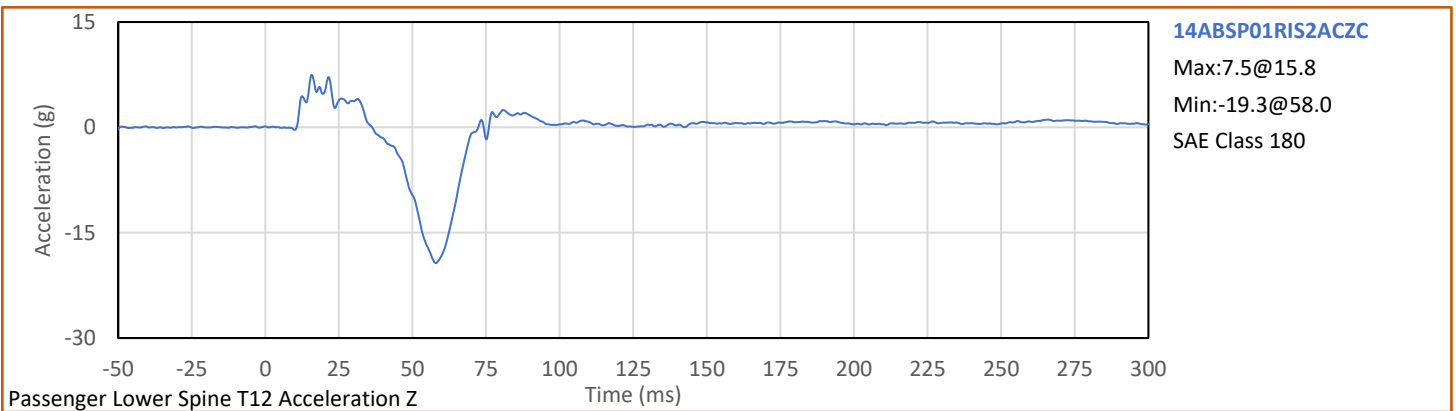
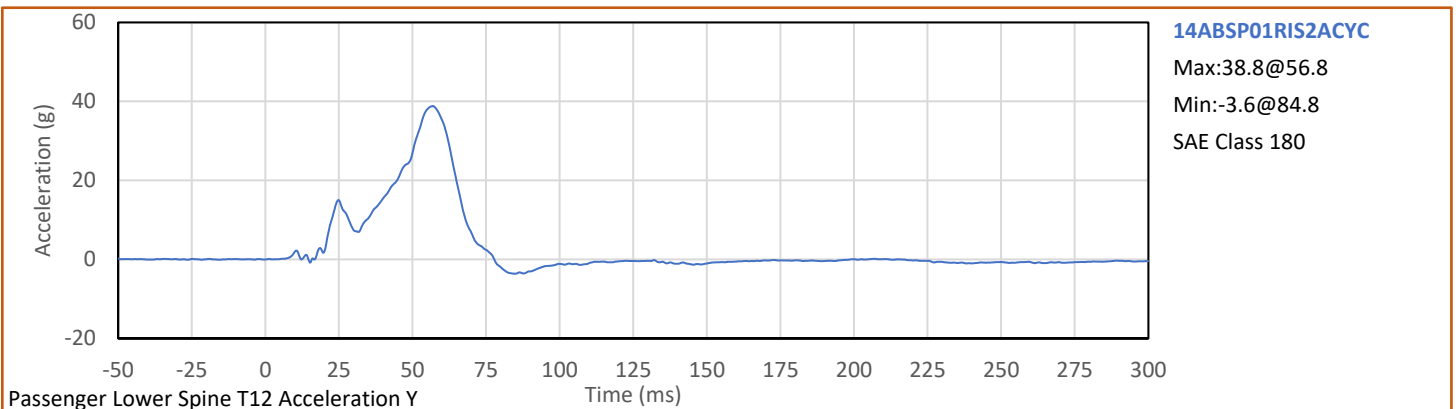
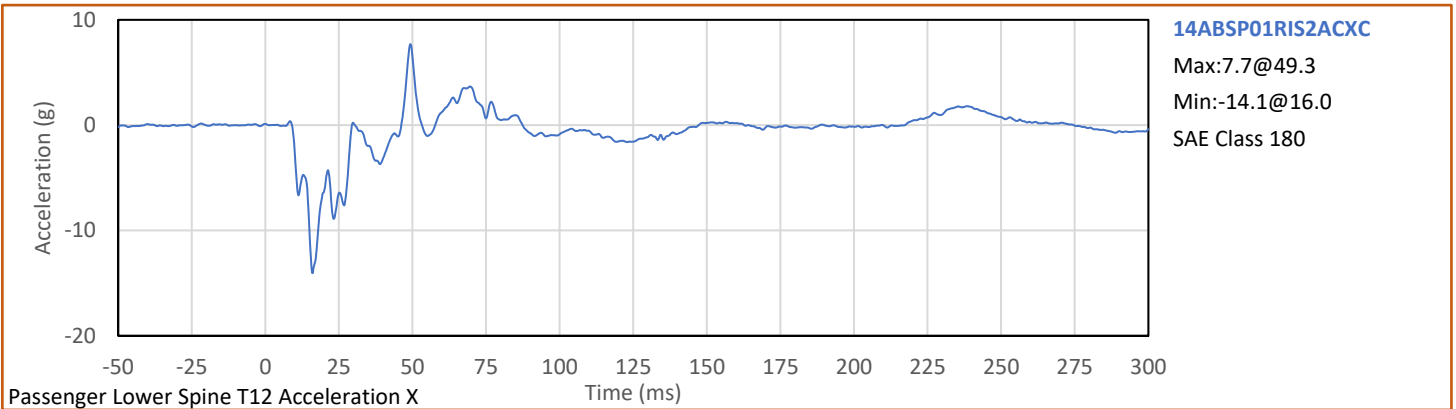


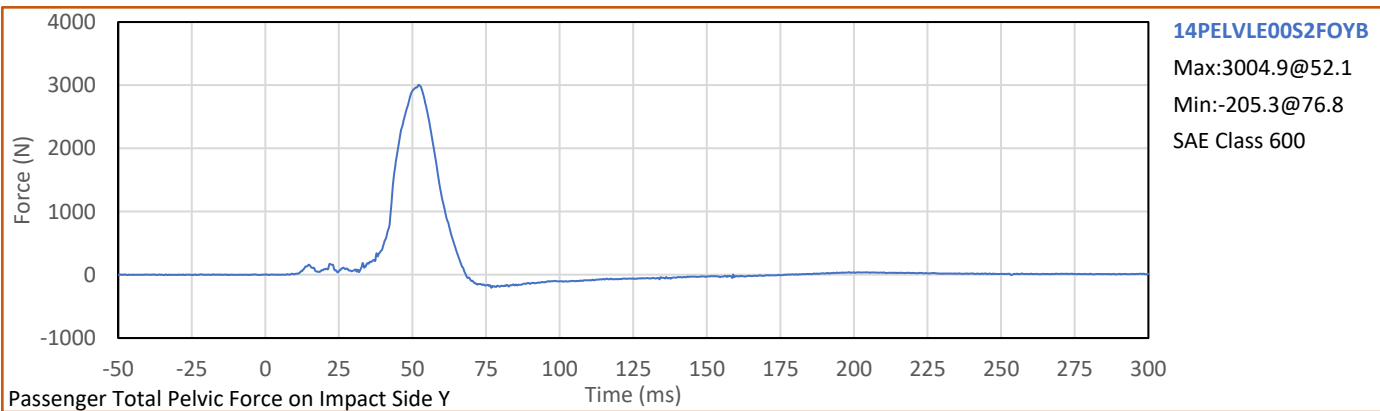
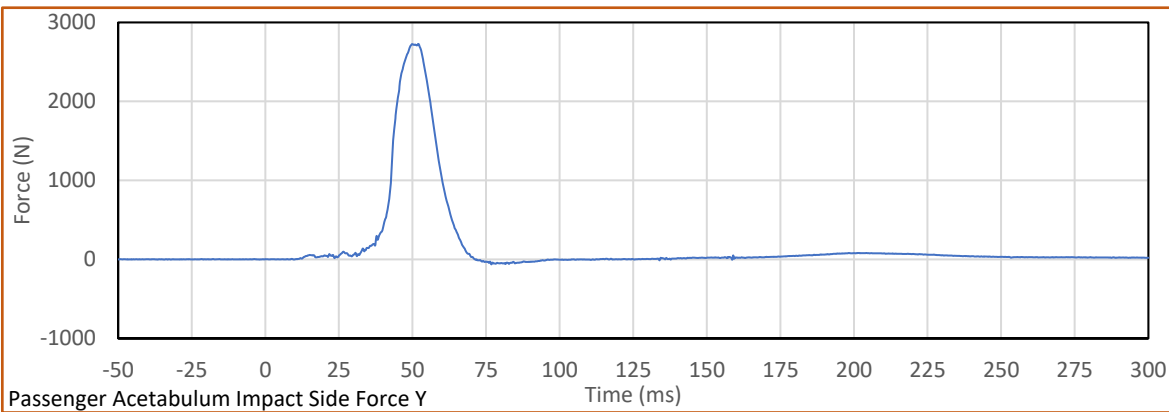
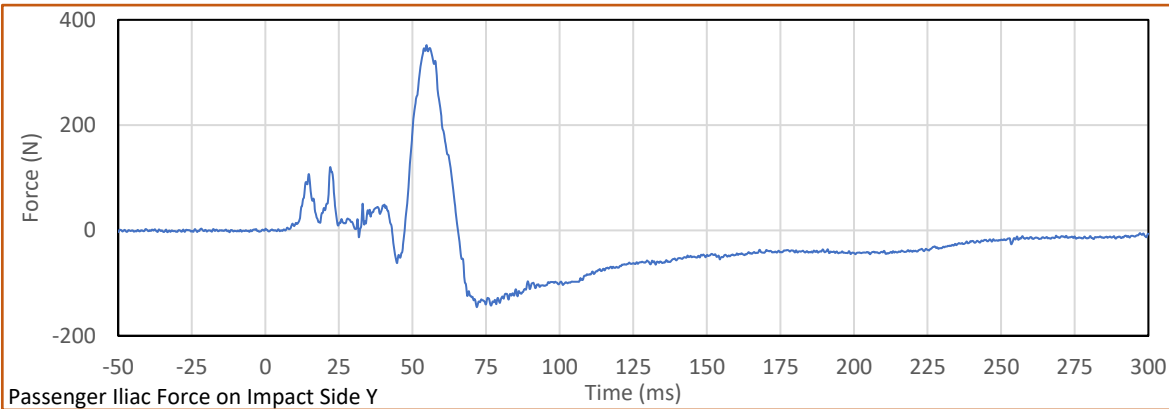
Test Vehicle: 2023 BMW X1 xDrive28i 5-Door SUV
Test Program: NCAP MDB Side Impact Test

NHTSA No.: M20234102
Test Date: 4/27/2023









APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
Pre-Test ATD Qualification and Performance Verification
ES-2re 50th Male Side Impact ATD, Left Side Configuration
S/N: F037

ATD Serial No.: F037

Test Date: 2023-04-24

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
1 - Sitting Height	mm	900	918	913	Pass
2 - Seat to Shoulder Joint	mm	558	572	566	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	350	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	102	Pass
5 - Sole to Seat, Sitting	mm	433	451	437	Pass
6 - Head Width	mm	152	158	154	Pass
7 - Shoulder/Arm Width	mm	461	479	472	Pass
8 - Thorax Width	mm	322	332	330	Pass
9 - Abdomen Width	mm	273	287	286	Pass
10 - Pelvis Lap Width	mm	359	373	370	Pass
11 - Head Depth	mm	196	206	201	Pass
12 - Thorax Depth	mm	262	272	266	Pass
13 - Abdomen Depth	mm	194	204	198	Pass
14 - Pelvis Depth	mm	235	245	244	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	155	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	609	Pass
				Overall Test Results	Pass

Technician:



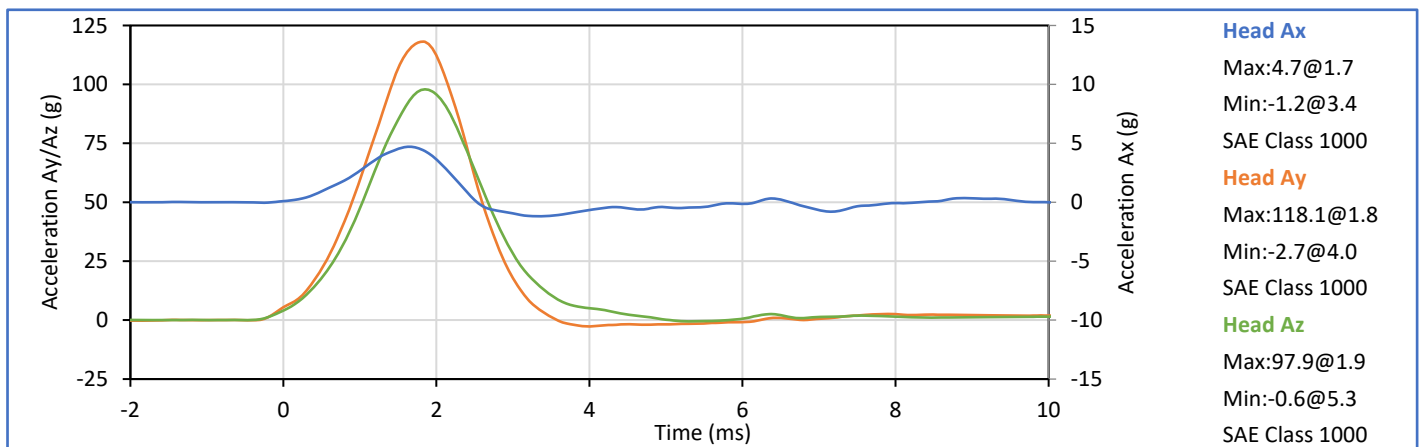
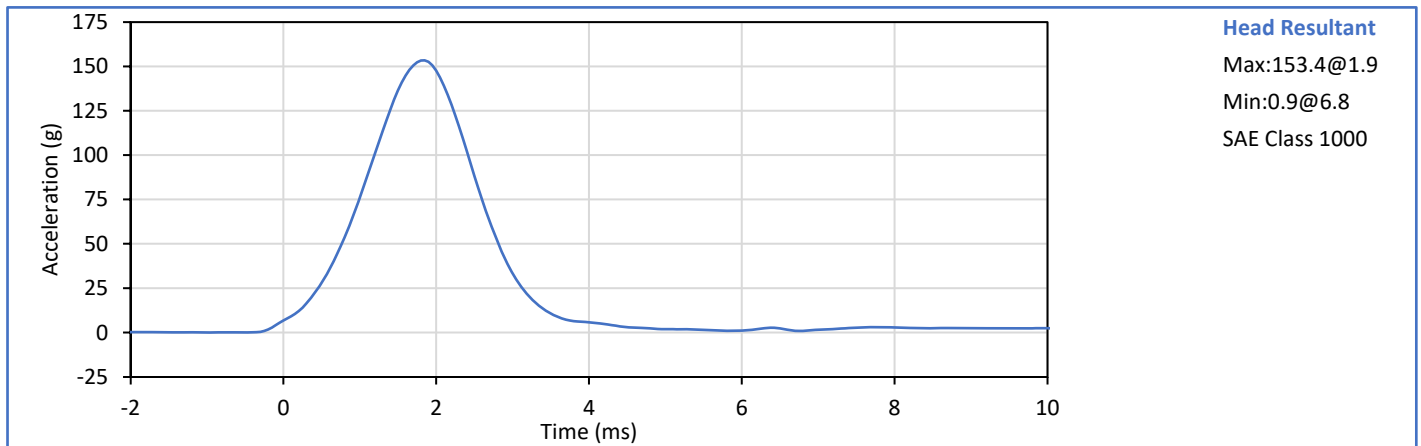
G. Fuentes

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	125.0	155.0	153.4	Pass
Peak Head Ax	g	-15.0	15.0	4.7	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass



Technician:

G. Fuentes

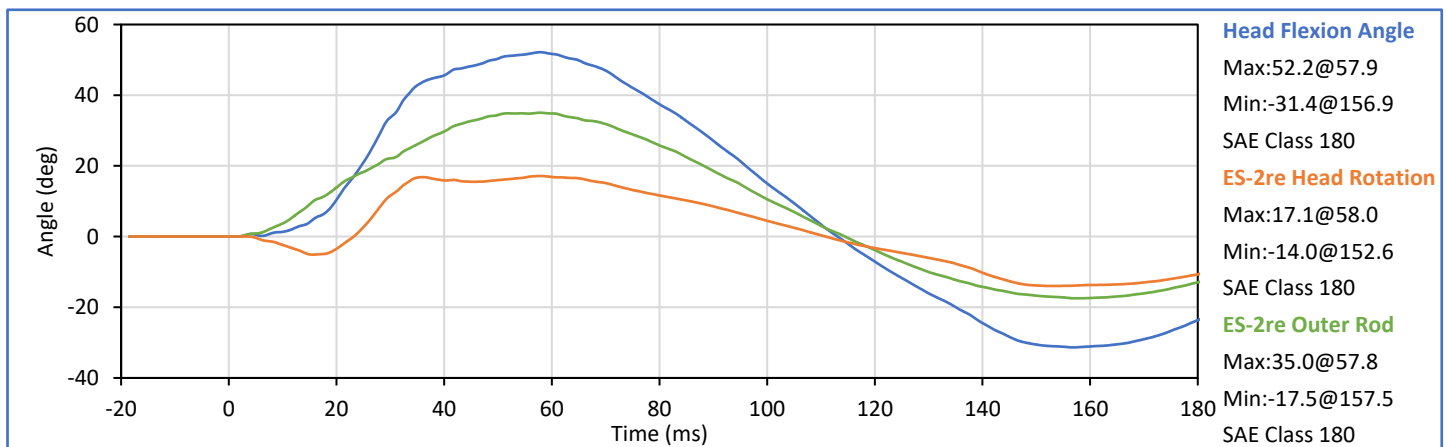
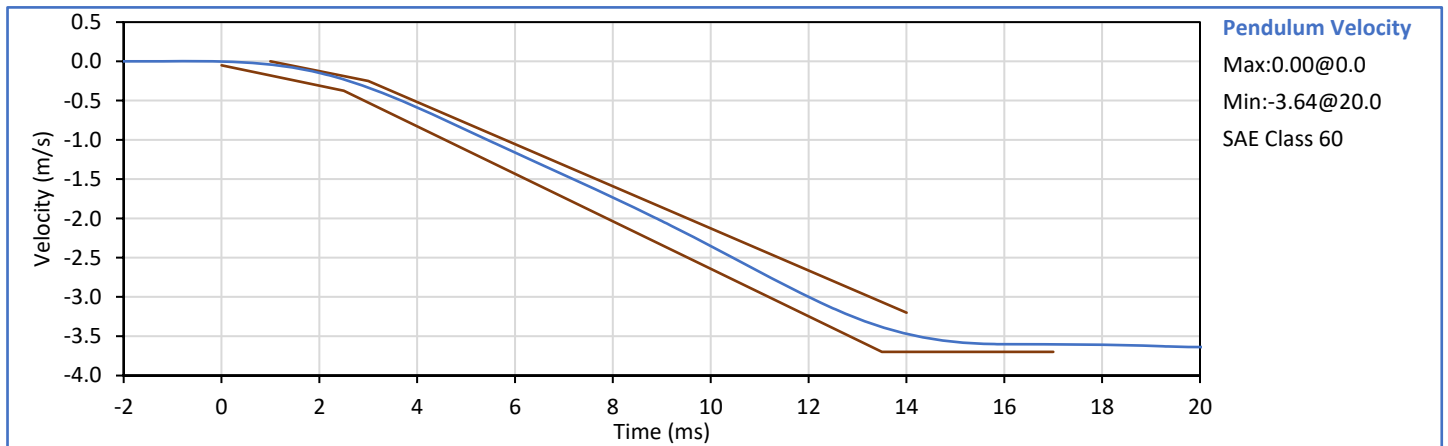
G. Fuentes

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	30	Pass
Pendulum Velocity	m/s	3.30	3.50	3.47	Pass
Peak Headform Flexion	deg	49.0	59.0	52.2	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	57.9	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	55.3	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

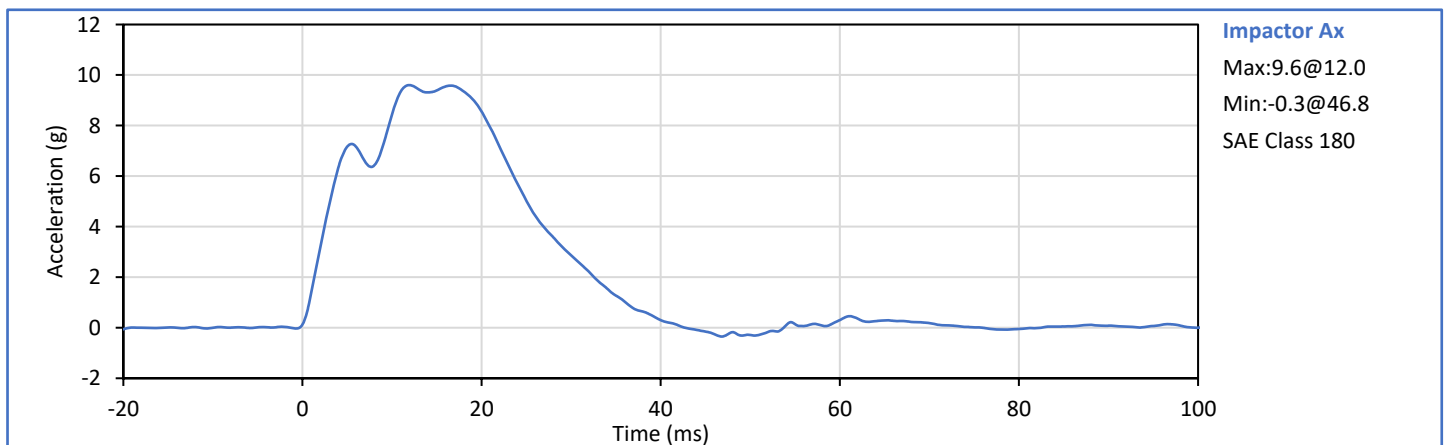
J. Hernandez

J. Hernandez

ATD Serial No.: F037

Test Date: 2023-04-25

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	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	9.6	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

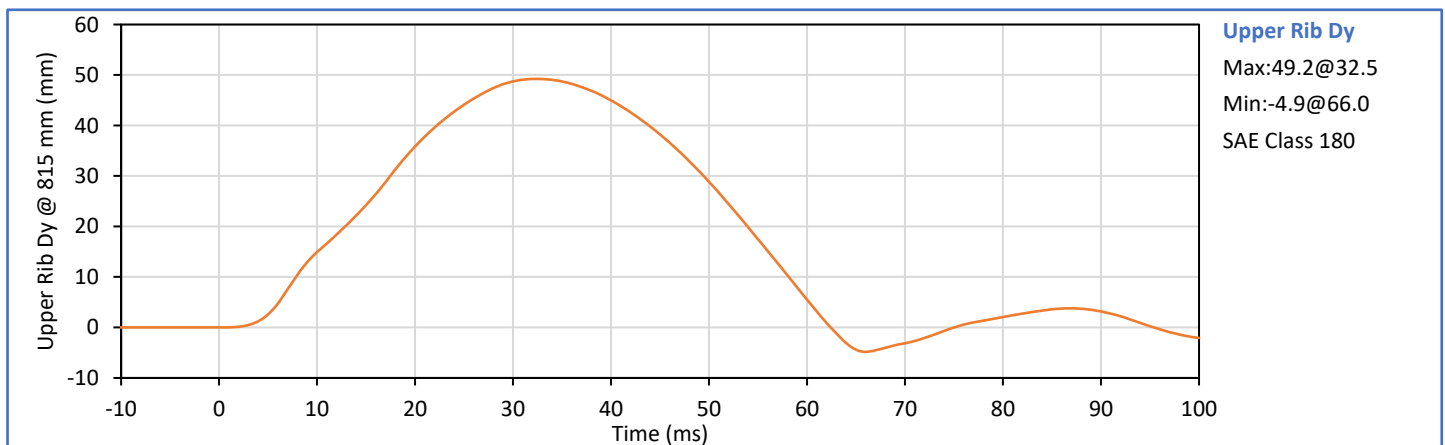
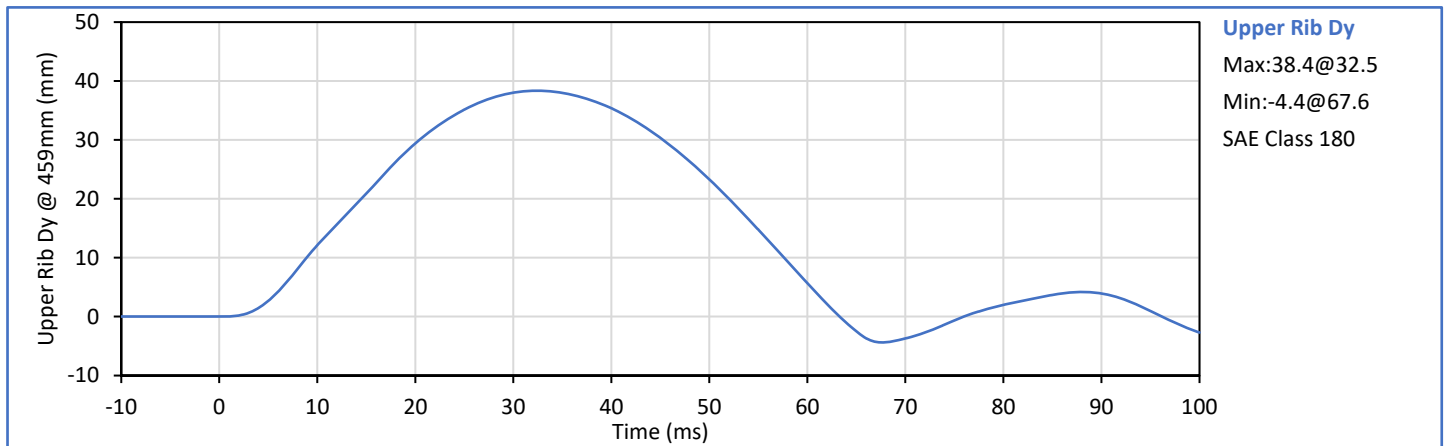
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	38.4	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	49.2	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

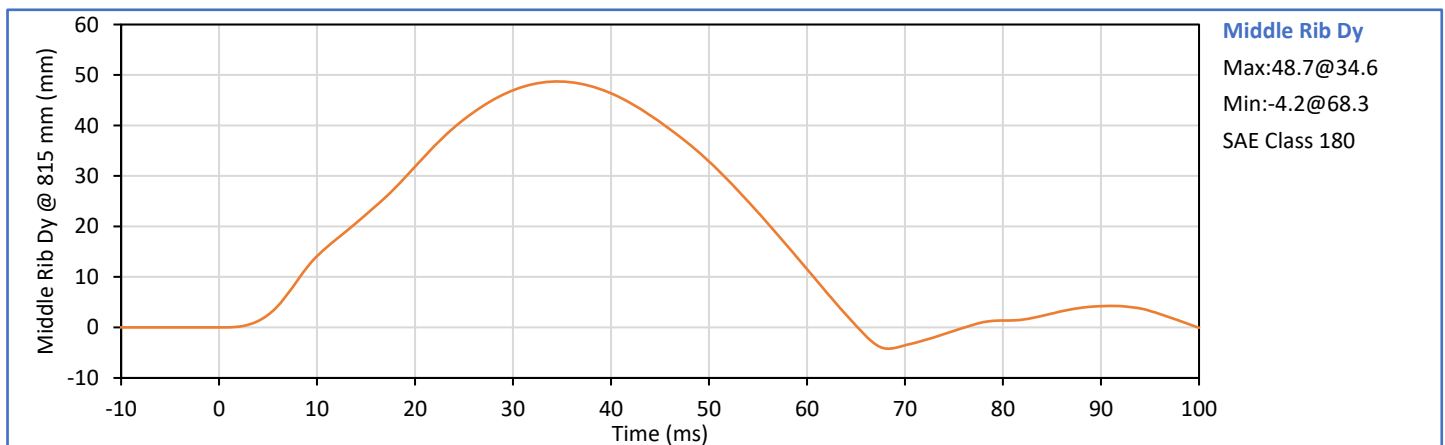
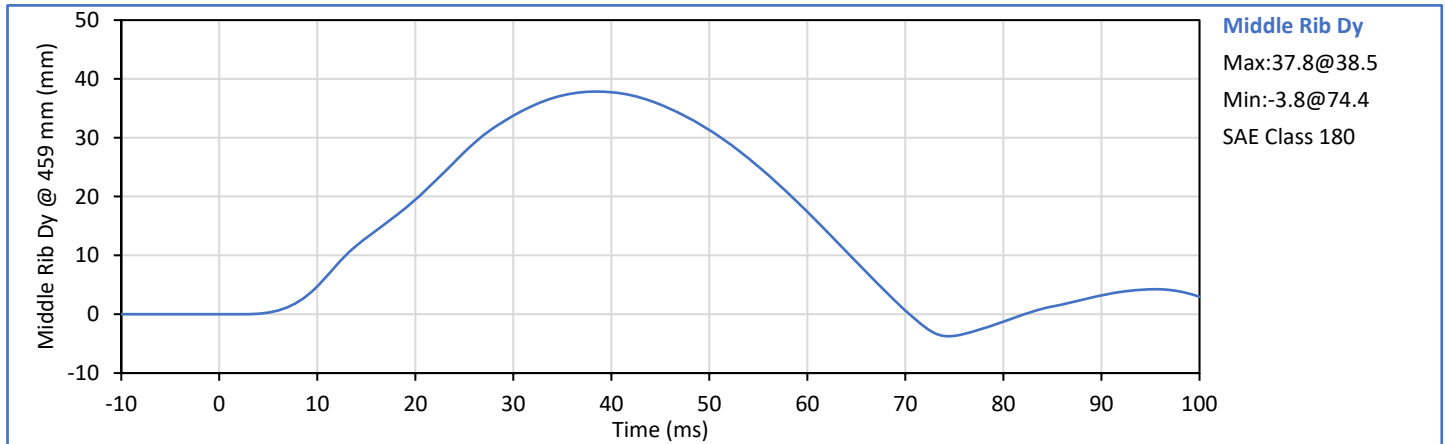
G. Fuentes

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
Middle Rib Dy @ 459mm	mm	36.0	40.0	37.8	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	48.7	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

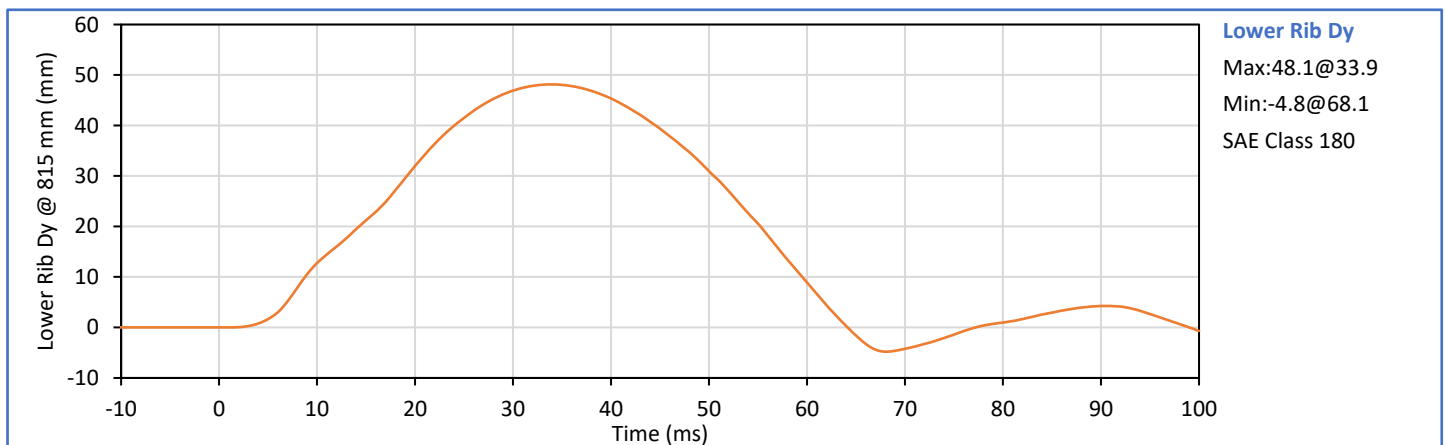
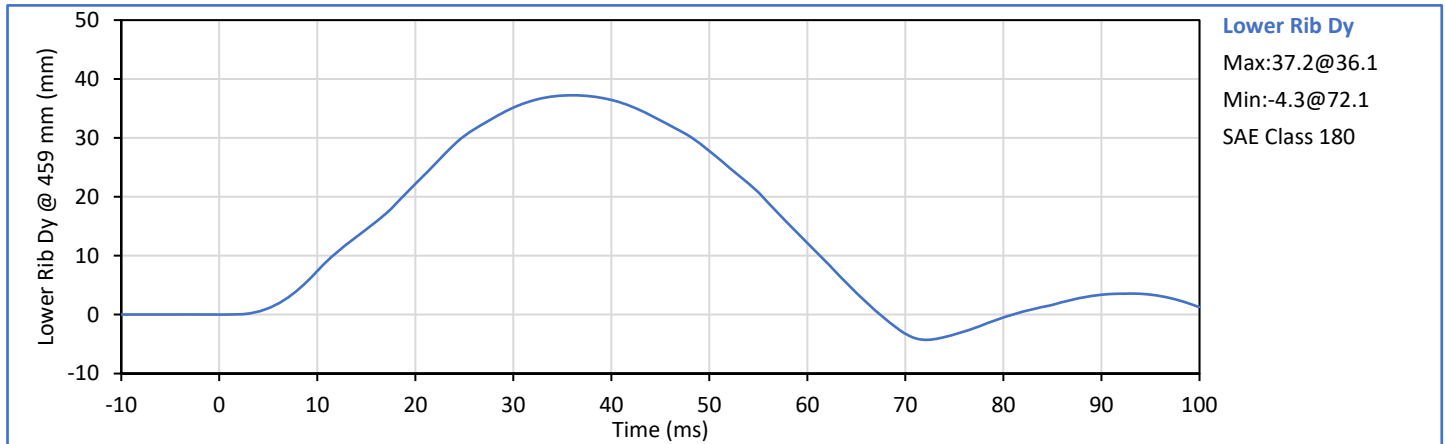
G. Fuentes

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
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.2	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	48.1	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

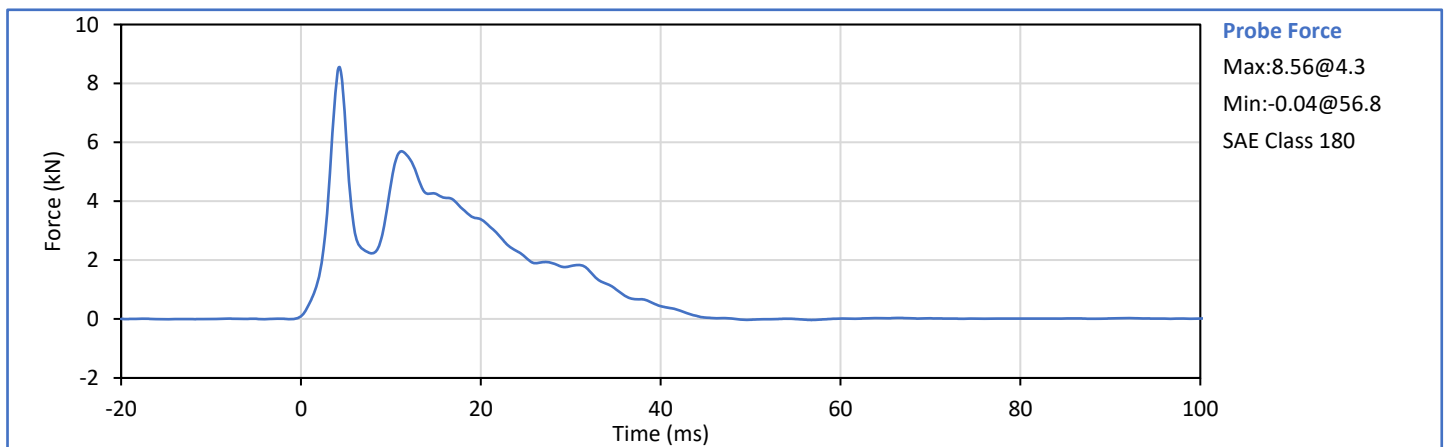
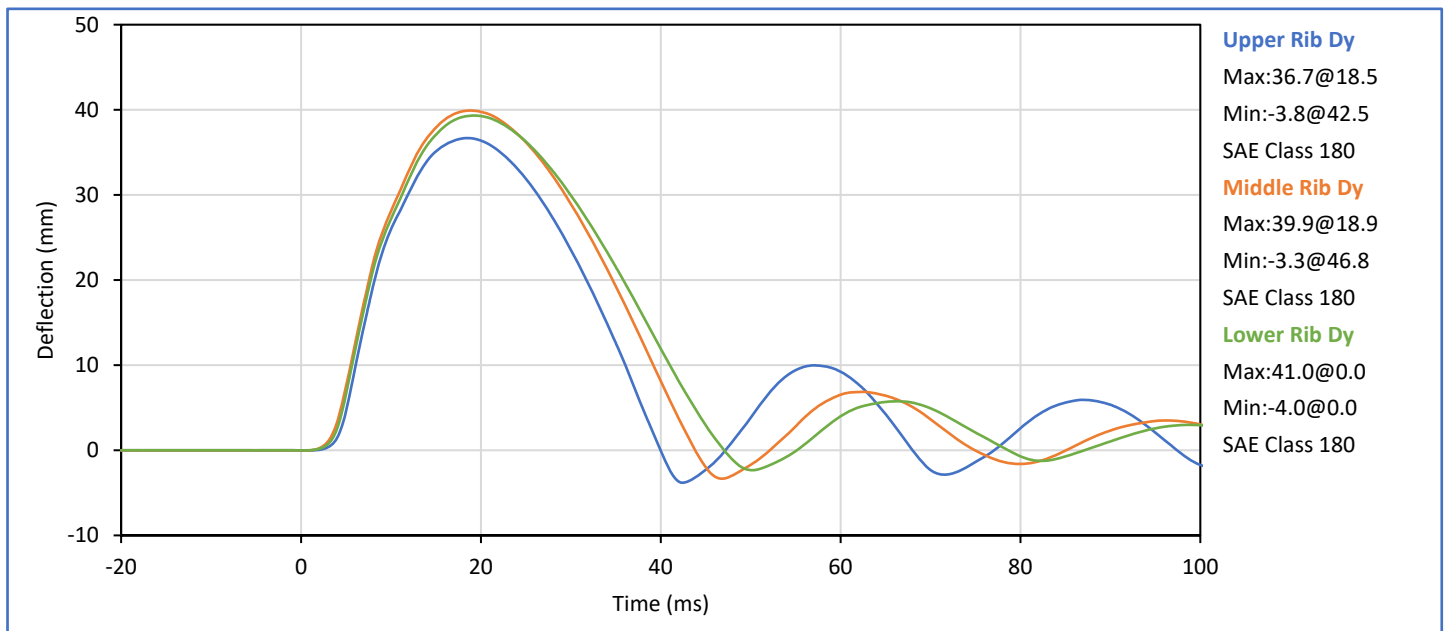
G. Fuentes

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	28	Pass
Impactor Velocity	m/s	5.40	5.60	5.50	Pass
Peak Upper Rib Dy	mm	34.0	41.0	36.7	Pass
Peak Middle Rib Dy	mm	37.0	45.0	39.9	Pass
Peak Lower Rib Dy	mm	37.0	44.0	39.3	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.69	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

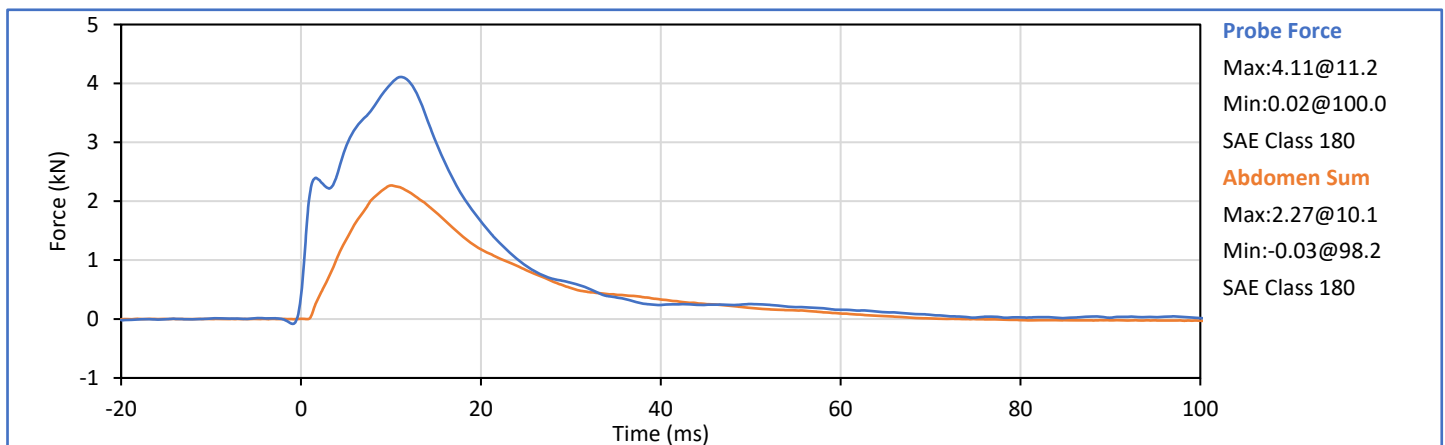
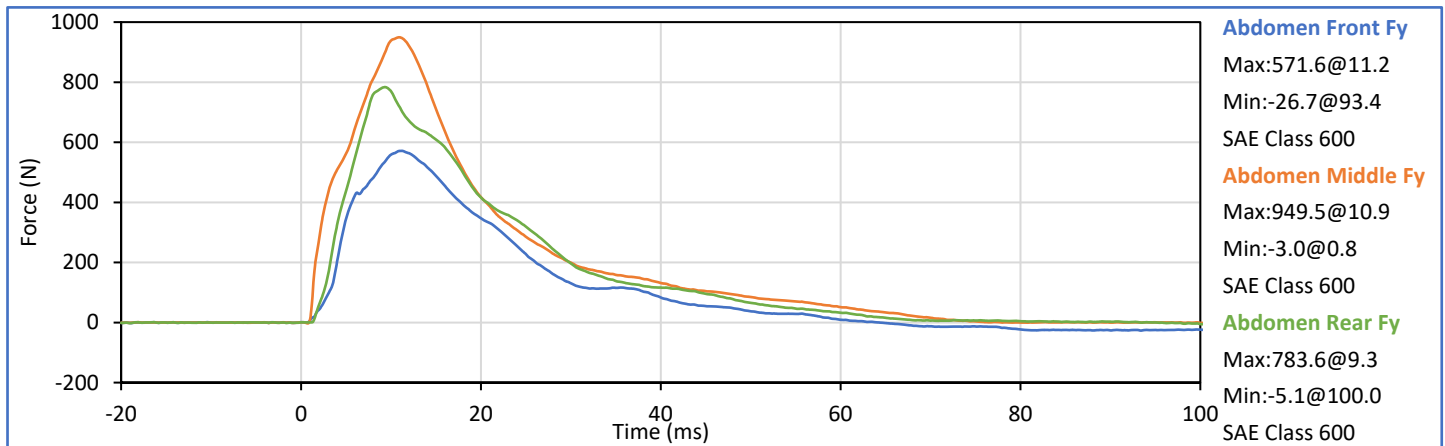
G. Fuentes

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	31	Pass
Impactor Velocity	m/s	3.90	4.10	4.03	Pass
Peak Impactor Force	kN	4.00	4.80	4.11	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.2	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.27	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.1	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

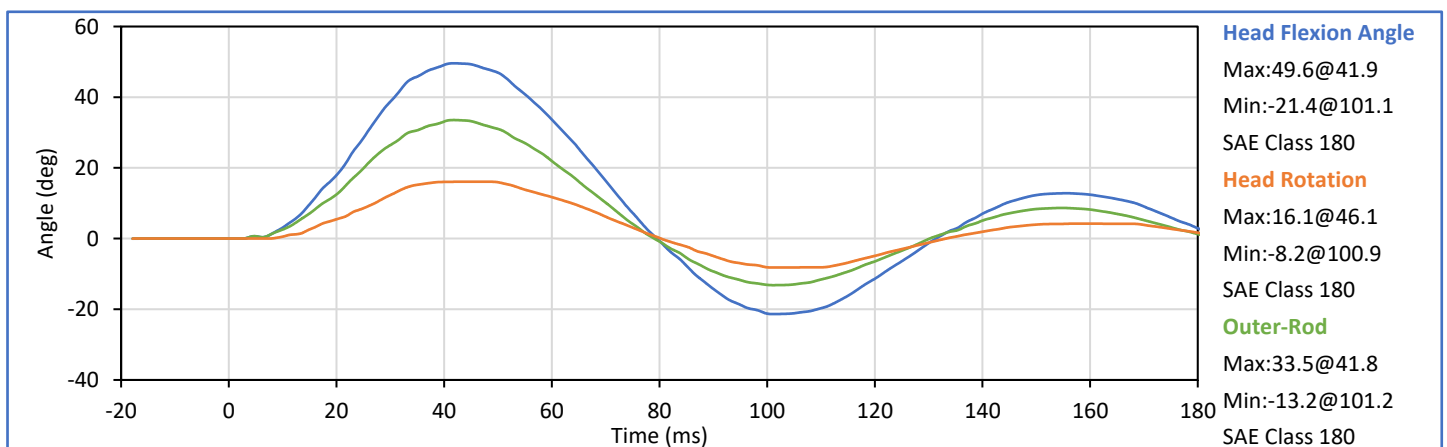
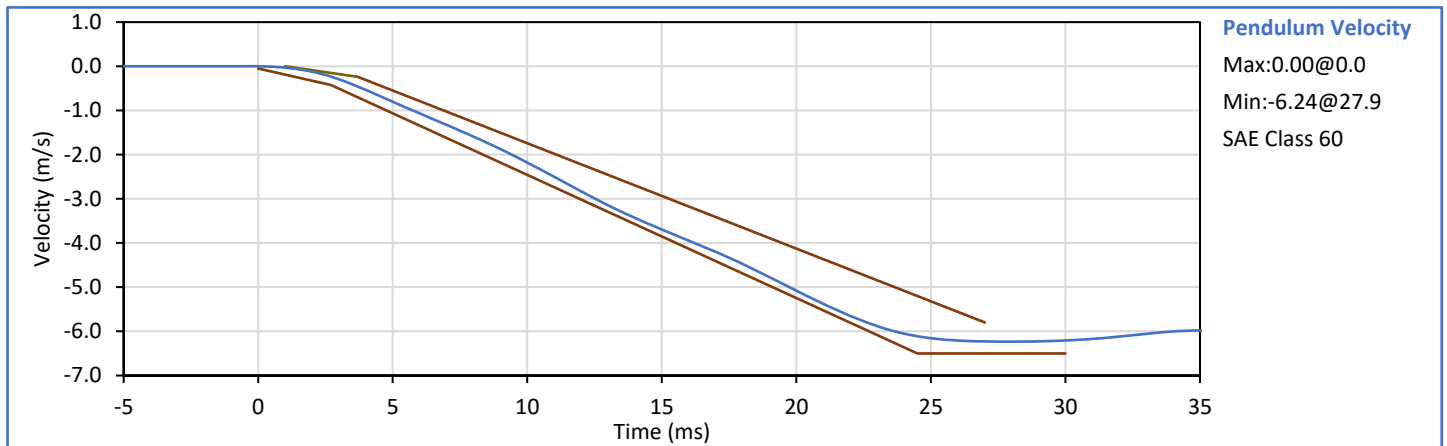
G. Fuentes

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	5.95	6.15	6.10	Pass
Peak Headform Flexion	deg	45.0	55.0	49.6	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	41.9	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	37.6	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

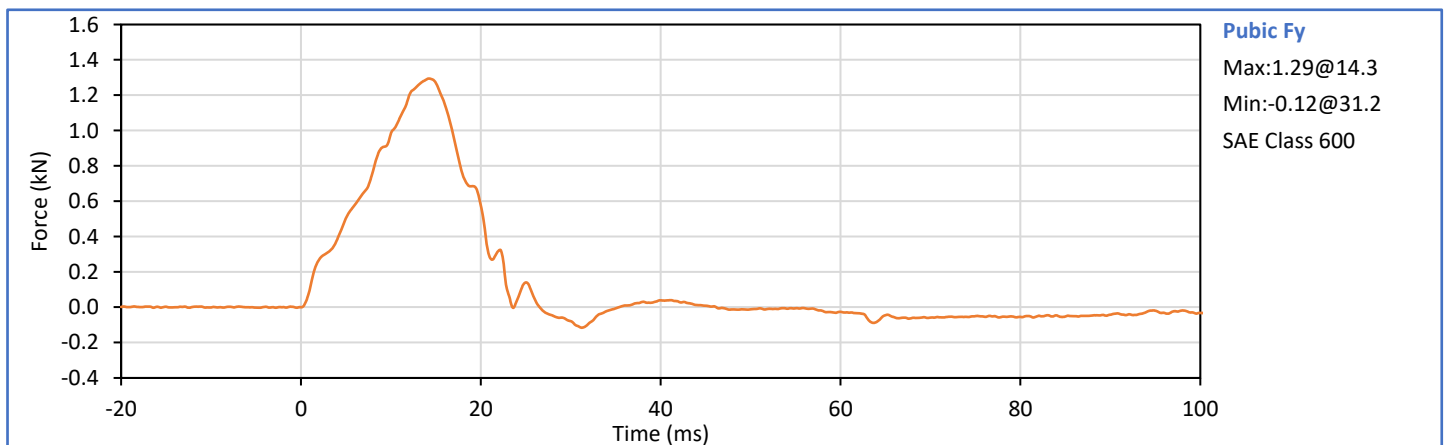
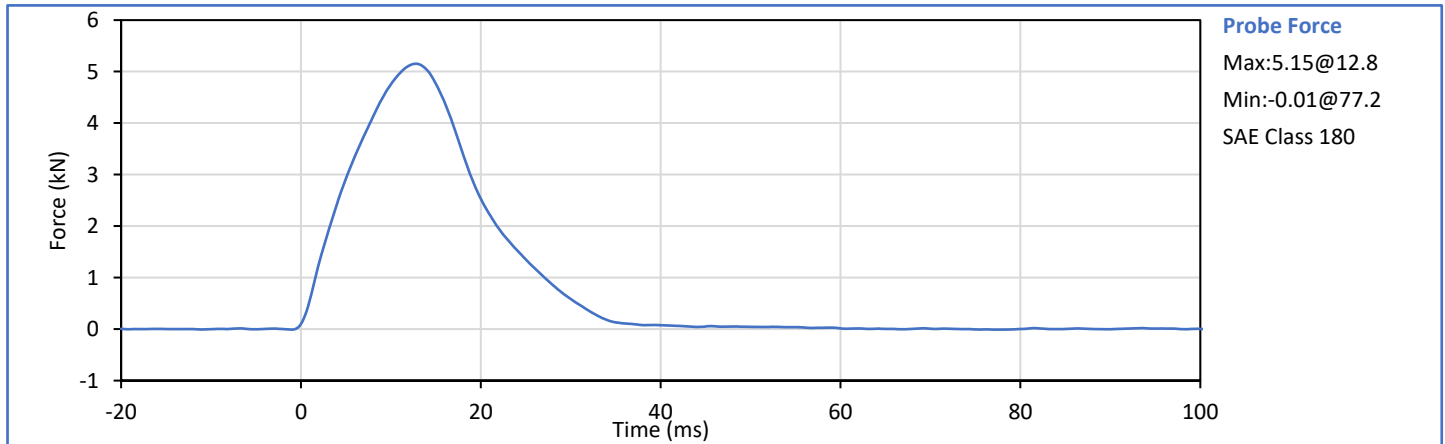
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.30	Pass
Peak Impactor Force	kN	4.70	5.40	5.15	Pass
Time of Peak Impactor Force	ms	11.8	16.1	12.8	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.29	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.3	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

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: 2023-04-20

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	775	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	84	Pass
D - H Point From Seatback	mm	141	151	148	Pass
E - Shoulder Pivot From Backline	mm	97	107	105	Pass
F - Thigh Clearance	mm	119	135	127	Pass
G - Head Breadth	mm	140	148	144	Pass
H - Head Back From Backline	mm	40	46	45	Pass
I - Head Depth	mm	178	188	187	Pass
J - Head Circumference	mm	541	551	544	Pass
K - Buttock To Knee Length	mm	514	540	526	Pass
L - Popliteal Height	mm	343	369	357	Pass
K - Knee Pivot To Floor Height	mm	392	409	399	Pass
N - Buttock Popliteal Length	mm	416	442	429	Pass
O - Chest Depth W/O Jacket	mm	195	211	203	Pass
P - Foot Length	mm	216	232	222	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	319	Pass
R - Arm Length	mm	249	259	254	Pass
S - Knee Joint To Seatback	mm	477	493	482	Pass
V - Shoulder Width	mm	341	357	349	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	782	Pass
			Overall Test Results		Pass

Technician:



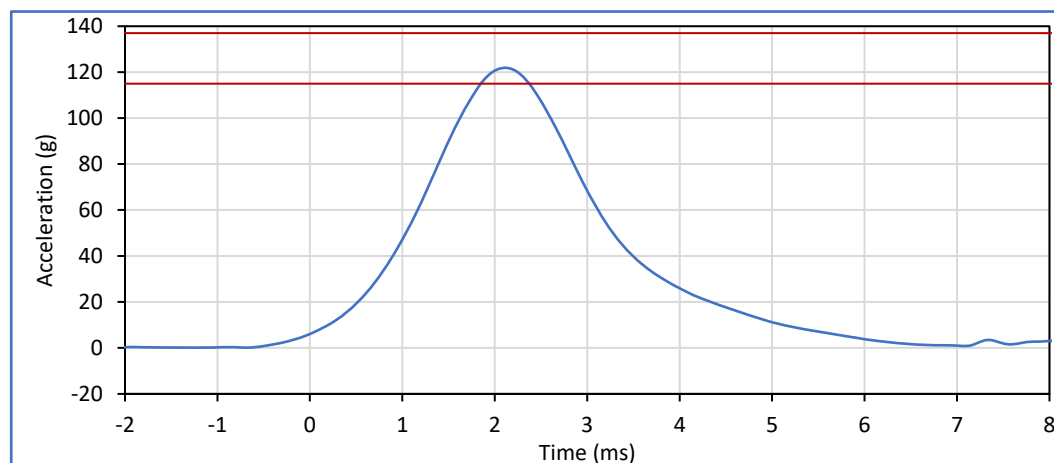
G. Fuentes

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	121.9	Pass
Peak Head Ax	g	-15.0	15.0	3.5	Pass
Oscillations After Main Pulse	%	0.0	15.0	3.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass

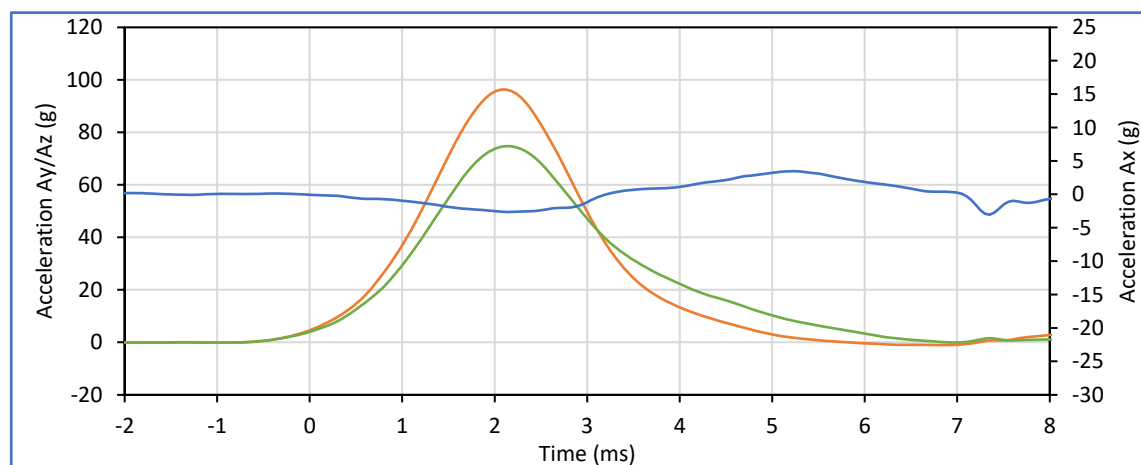


Head Ar

Max:121.9@2.1

Min:0.8@7.1

SAE CLASS 1000



Head Ax

Max:3.5@5.2

Min:-3.0@7.4

SAE CLASS 1000

Head Ay

Max:96.3@2.1

Min:-1.1@6.8

SAE CLASS 1000

Head Az

Max:74.7@2.2

Min:-0.1@7.0

SAE CLASS 1000

Technician:

G. Fuentes

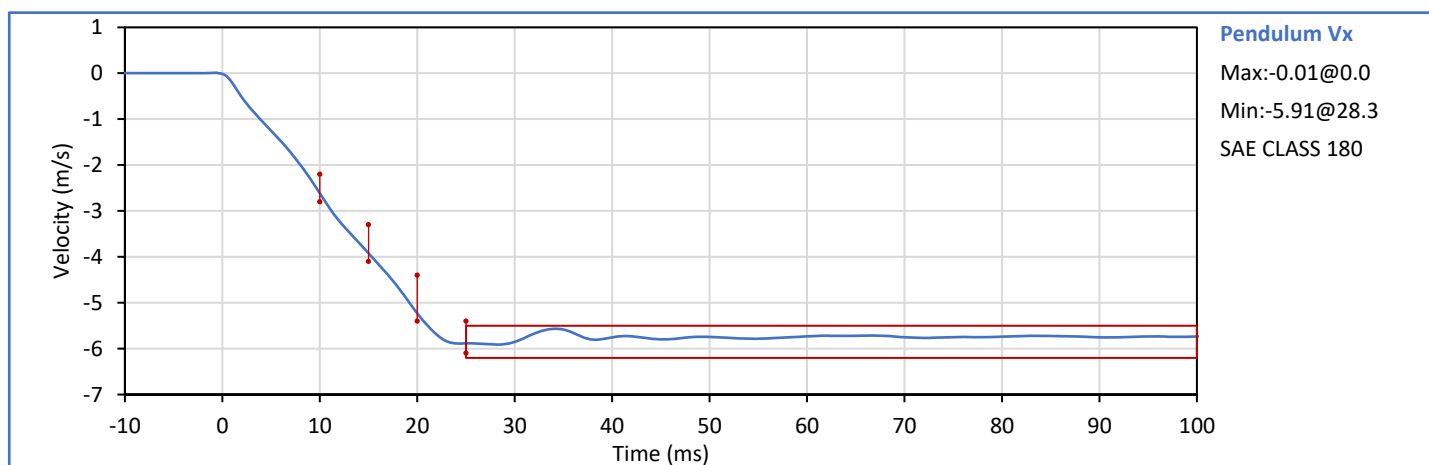
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.0	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	-2.61	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.92	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-5.23	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.89	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.91/-5.57	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-77.2	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.6	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	42.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	113.2	Pass
Overall Test Results				Pass	Pass



Technician:

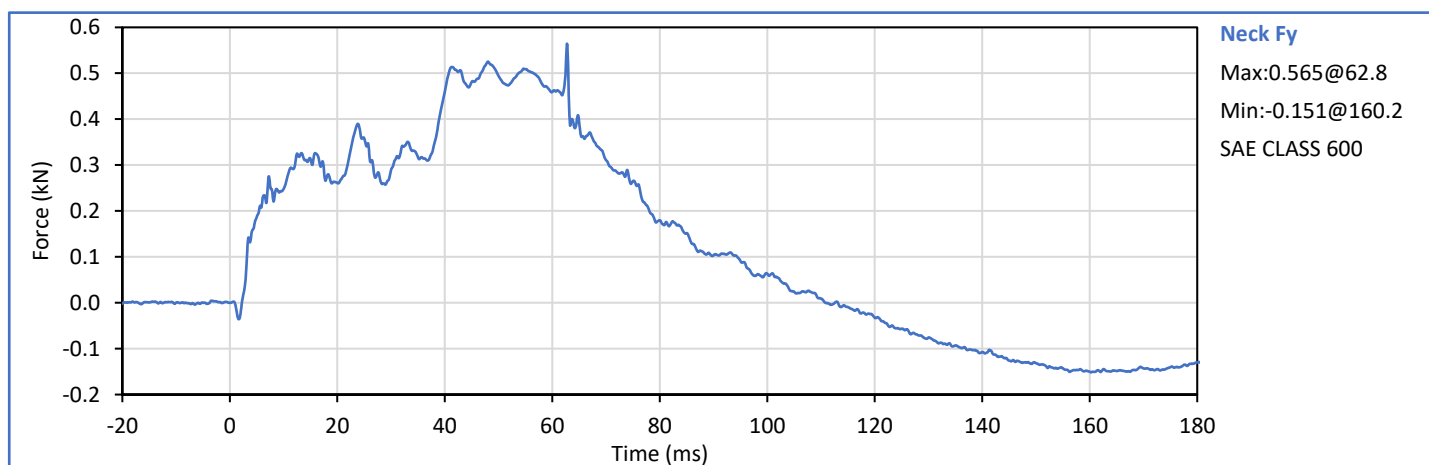
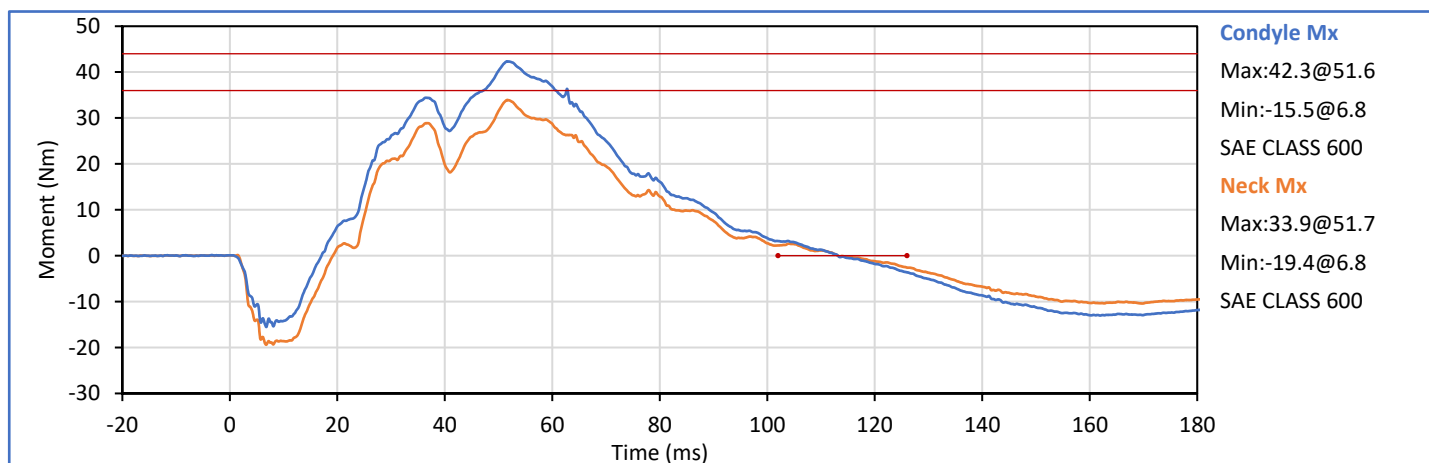
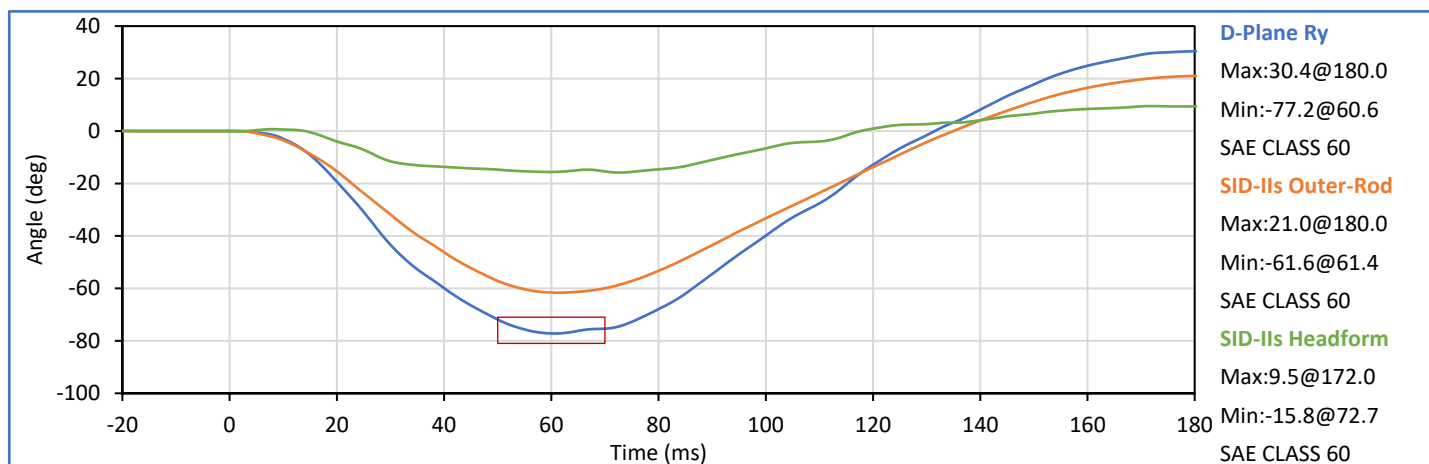
G. Fuentes

G. Fuentes

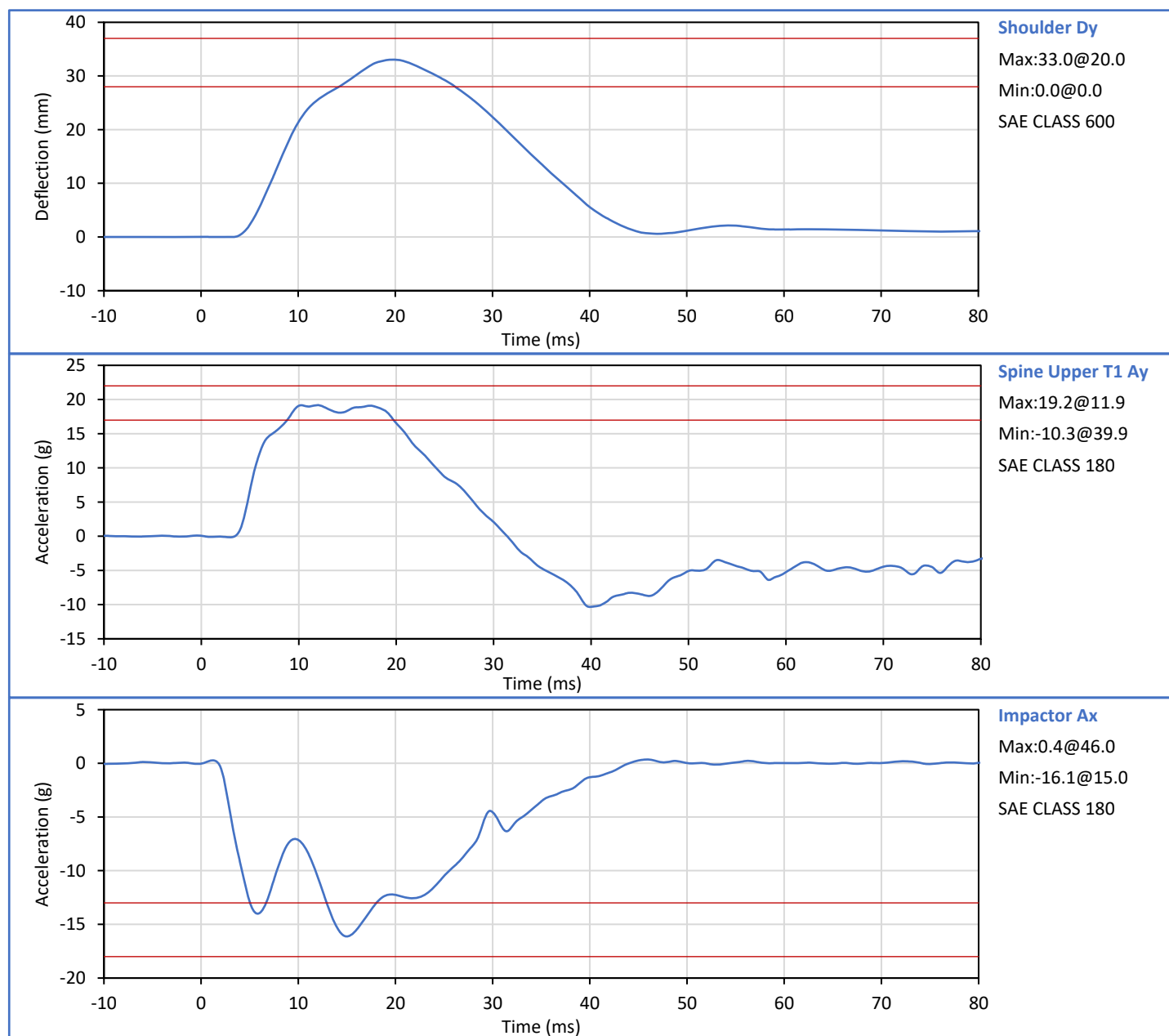
Approved By:

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 Shoulder Dy	mm	28.0	37.0	33.0	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	19.2	Pass
Peak Impactor Ax	g	-18.0	-13.0	-16.1	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

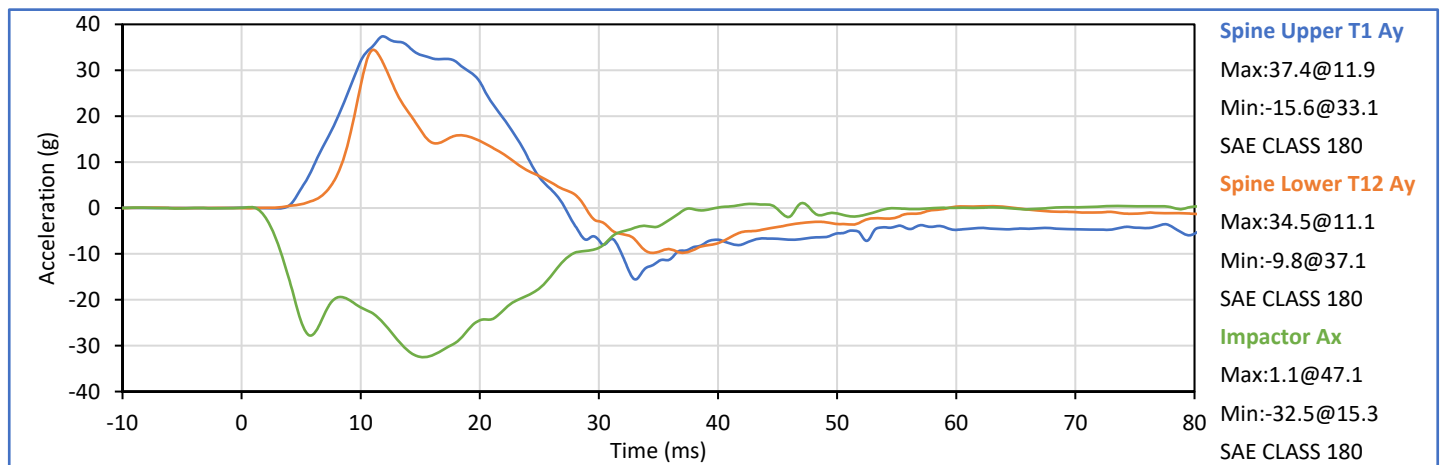
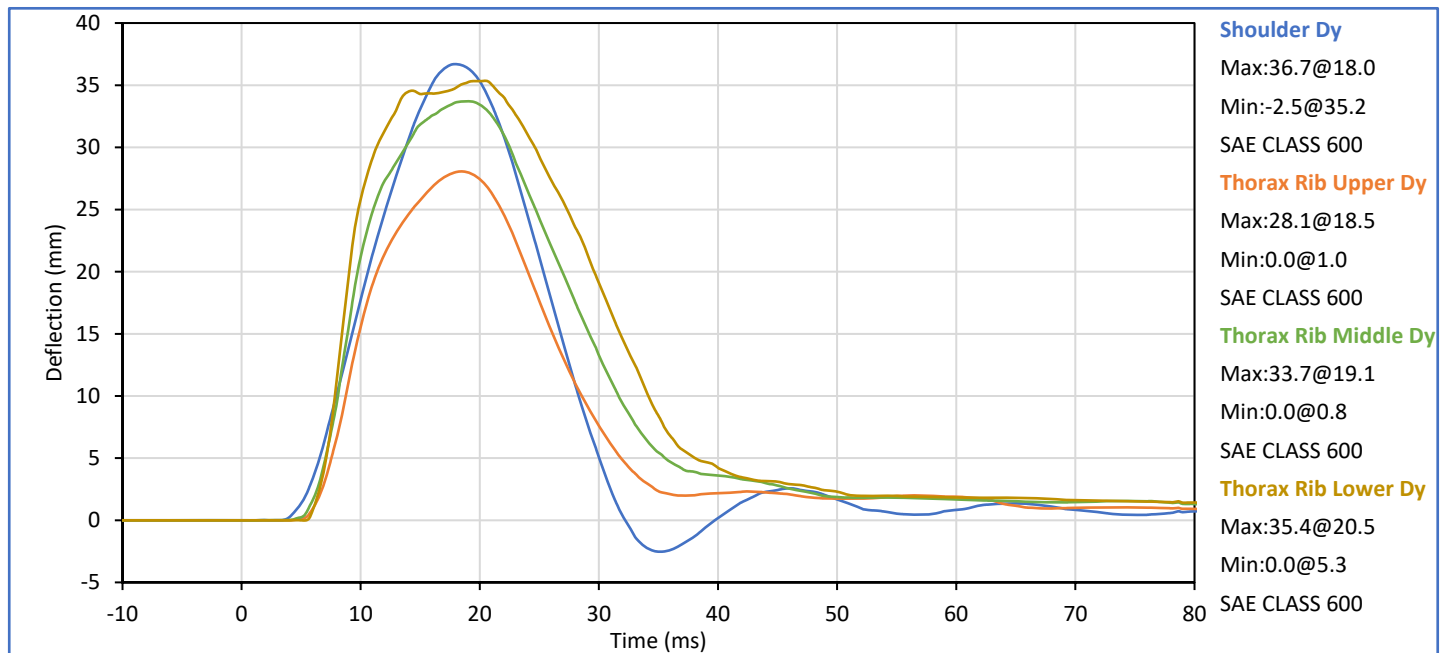
G. Fuentes

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	6.60	6.80	6.68	Pass
Peak Shoulder Dy	mm	31.0	40.0	36.7	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.1	Pass
Peak Middle Rib Dy	mm	30.0	36.0	33.7	Pass
Peak Lower Rib Dy	mm	32.0	38.0	35.4	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.4	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	34.5	Pass
Peak Impactor Ax	g	-36.0	-30.0	-32.5	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

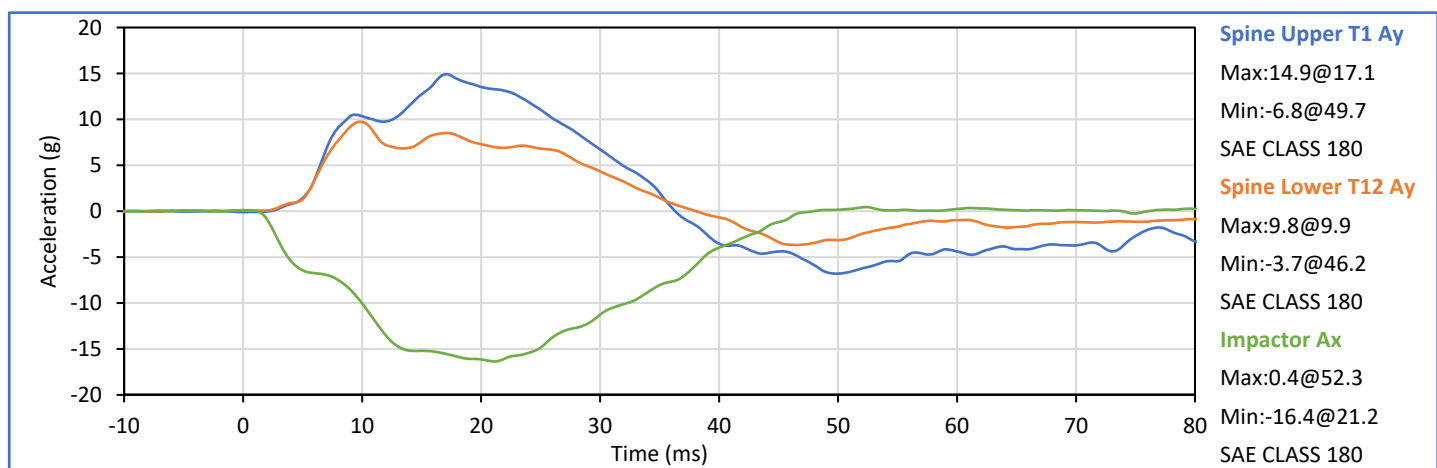
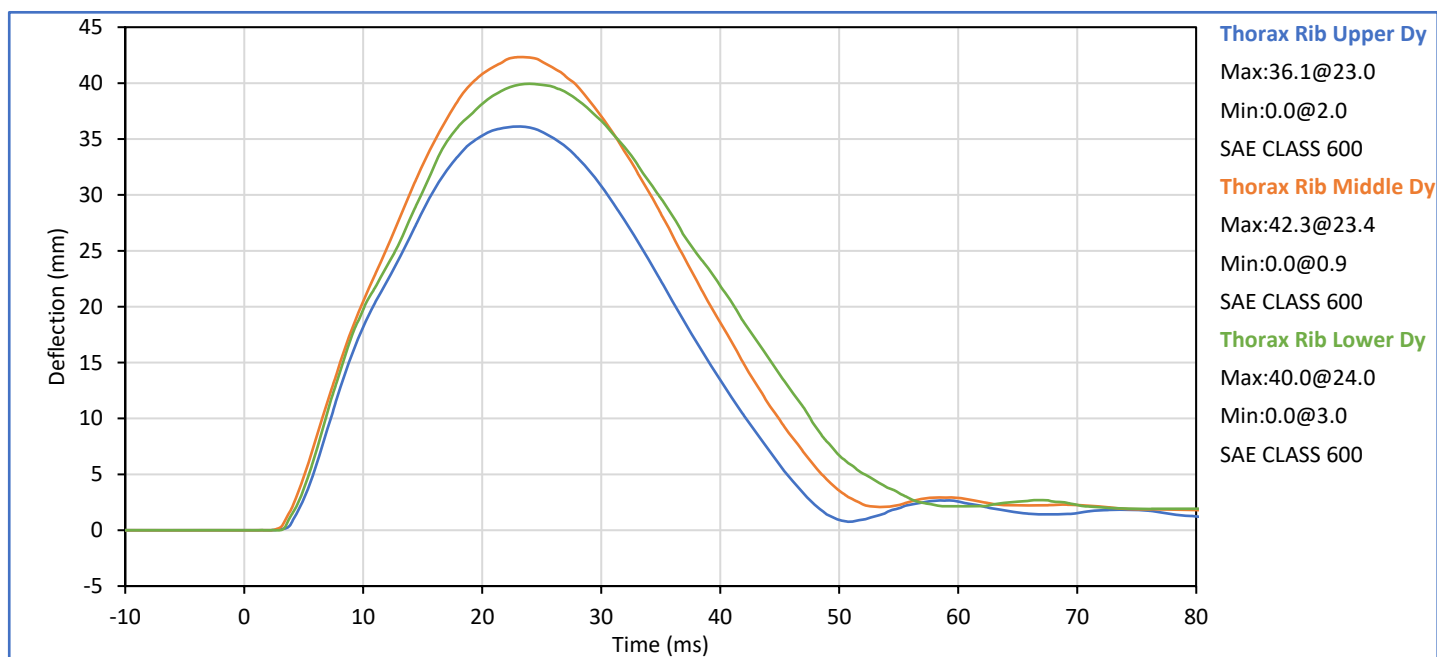
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Thorax Rib Upper Dy	mm	32.0	40.0	36.1	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	42.3	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	40.0	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	14.9	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	9.8	Pass
Peak Impactor Ax	g	-18.0	-14.0	-16.4	Pass
Overall Test Results				Pass	



Technician:

G. Fuentes

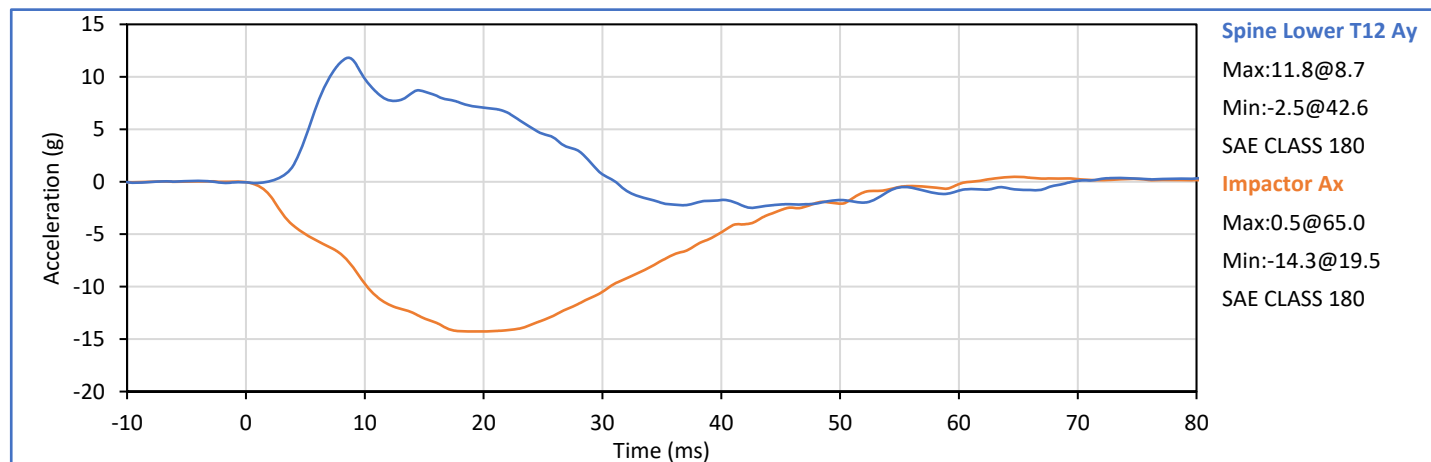
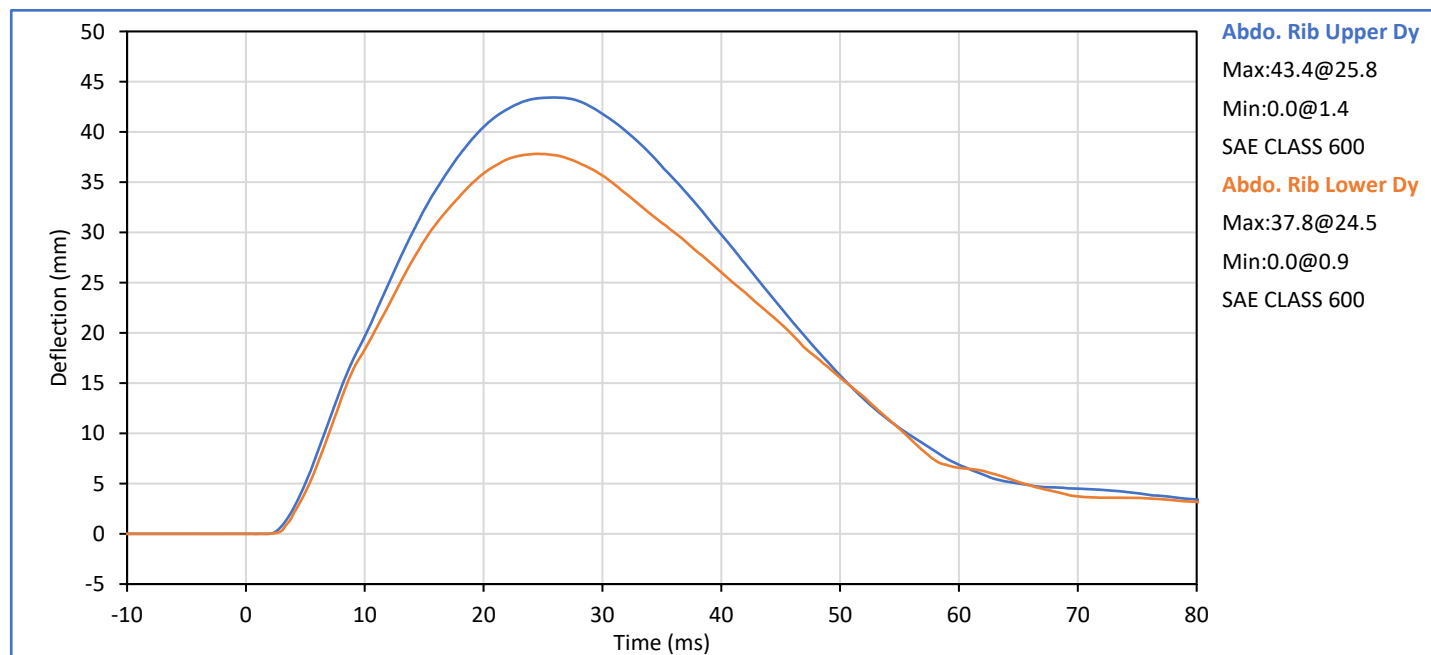
G. Fuentes

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	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	43.4	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	37.8	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	11.8	Pass
Peak Impactor Ax	g	-16.0	-12.0	-14.3	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

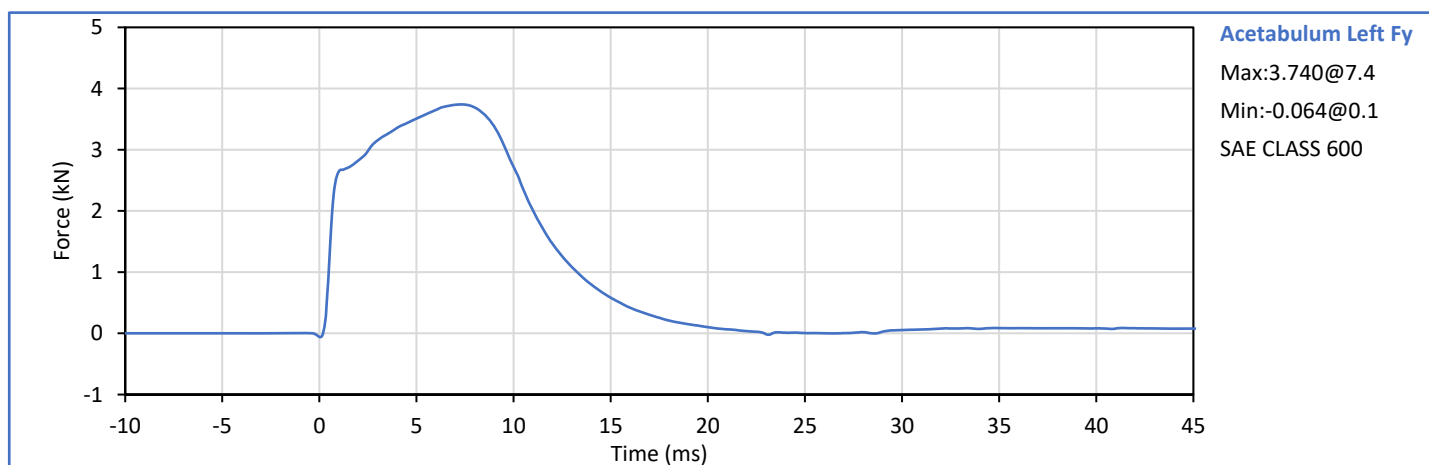
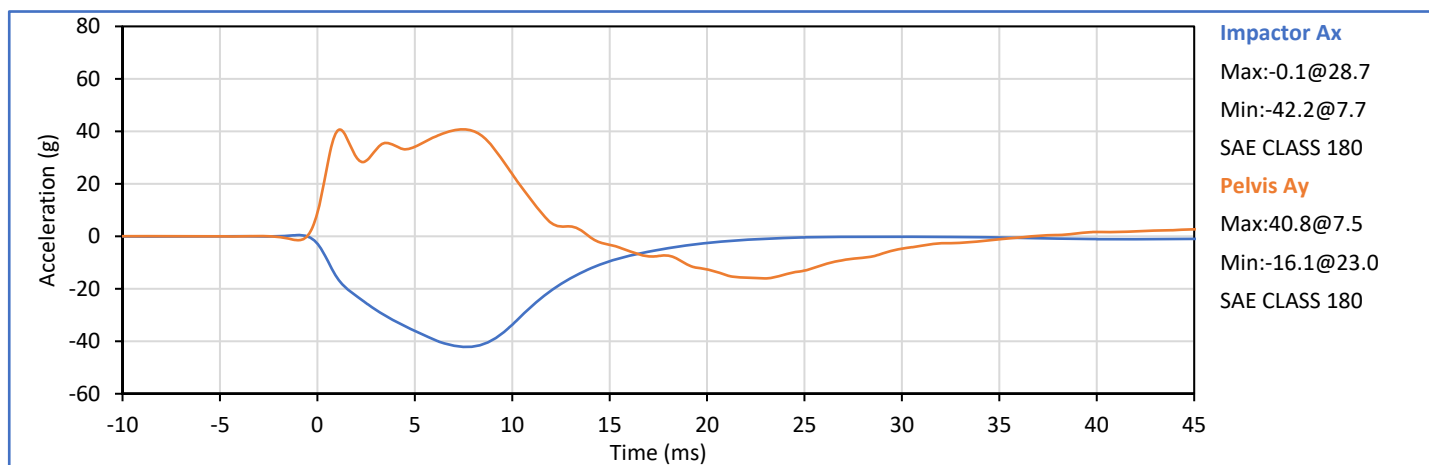
J. Hernandez

ATD Serial No.: 308

Test Date: 2023-04-25

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	6.69	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.74	Pass
Pelvis Ay after 6ms	g	34.0	42.0	40.8	Pass
Peak Impactor Ax	g	-47.0	-38.0	-42.2	Pass
Overall Test Results				Pass	Pass

Pelvis Plug S/N: 14752



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

ATD Serial No.: 308

Test Date: 2023-04-25

Pelvis Plug S/N: 14752



SID-IIs Pelvis Plug Certification Test

Plug S/N 14752

Test Number 16724

Report Number 16770

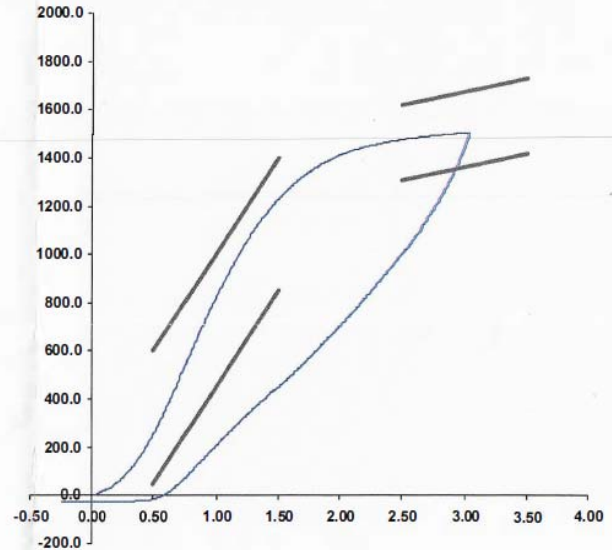
Test Date 12/23/2020 11:05:29 AM

	Test Results	Spec. Min	Spec. Max
Force @ 0.5 mm (N)	262.94	50.00	600.00
Force @ 1.5 mm (N)	1,232.79	850.00	1,400.00
Force @ 2.5 mm (N)	1,475.61	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,504.56	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: DC Date: 12/23/20

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

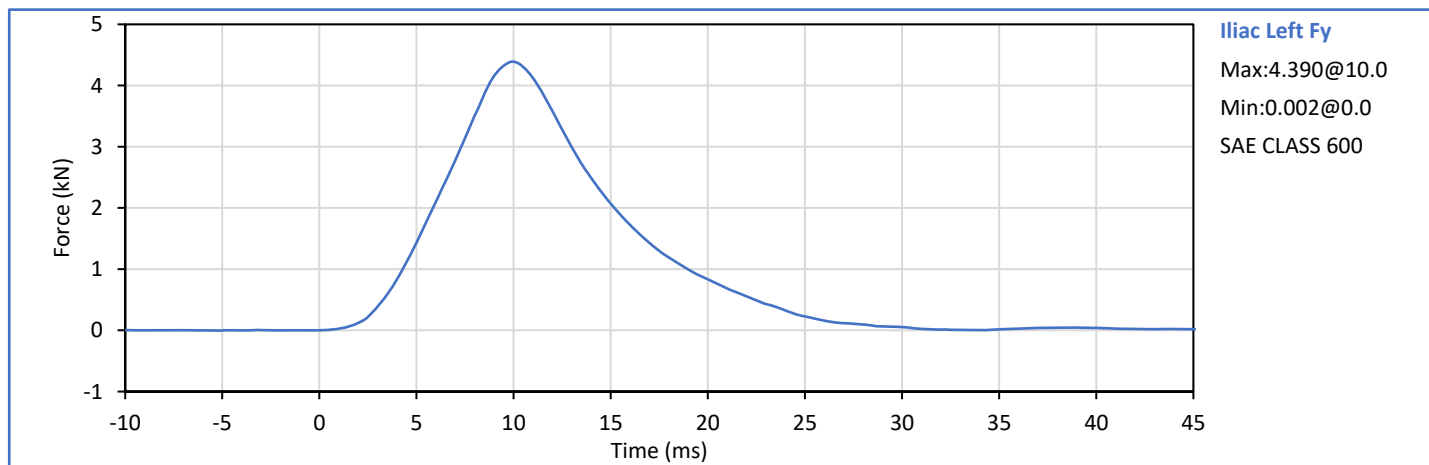
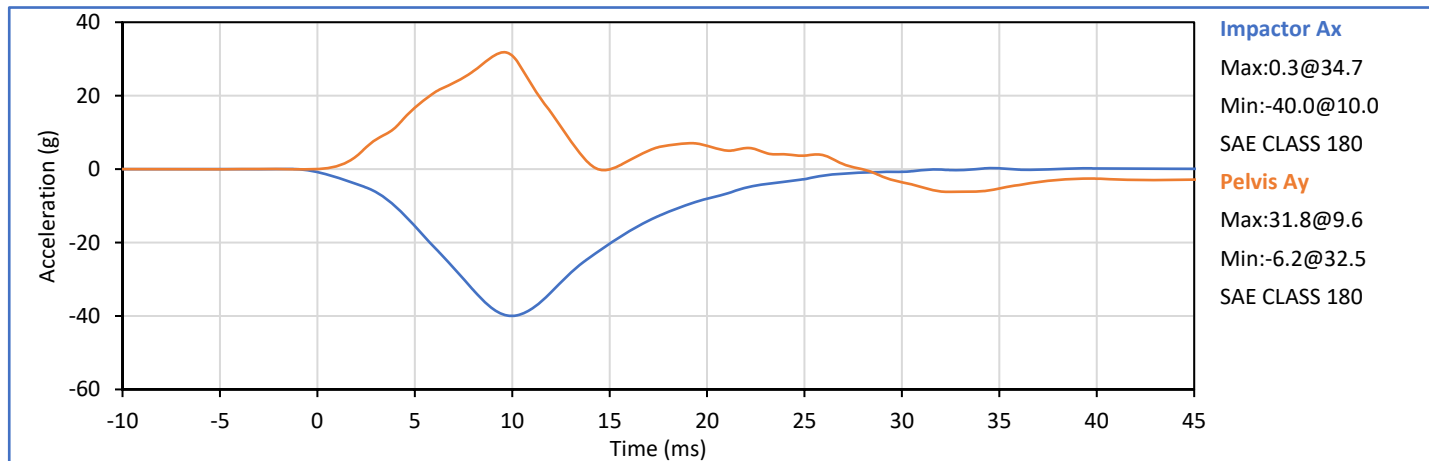
ATD Serial No.: 308

Test Date: 2023-04-25

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	4.39	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-40.0	Pass
Overall Test Results				Pass	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
ES-2re 50th Male Side Impact ATD, Left Side Configuration
S/N: F037

ATD Serial No.: F037

Test Date: 2023-05-01

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
1 - Sitting Height	mm	900	918	909	Pass
2 - Seat to Shoulder Joint	mm	558	572	562	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	352	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	100	Pass
5 - Sole to Seat, Sitting	mm	433	451	437	Pass
6 - Head Width	mm	152	158	155	Pass
7 - Shoulder/Arm Width	mm	461	479	469	Pass
8 - Thorax Width	mm	322	332	327	Pass
9 - Abdomen Width	mm	273	287	284	Pass
10 - Pelvis Lap Width	mm	359	373	368	Pass
11 - Head Depth	mm	196	206	199	Pass
12 - Thorax Depth	mm	262	272	269	Pass
13 - Abdomen Depth	mm	194	204	198	Pass
14 - Pelvis Depth	mm	235	245	242	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	154	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	607	Pass
				Overall Test Results	Pass

Technician:



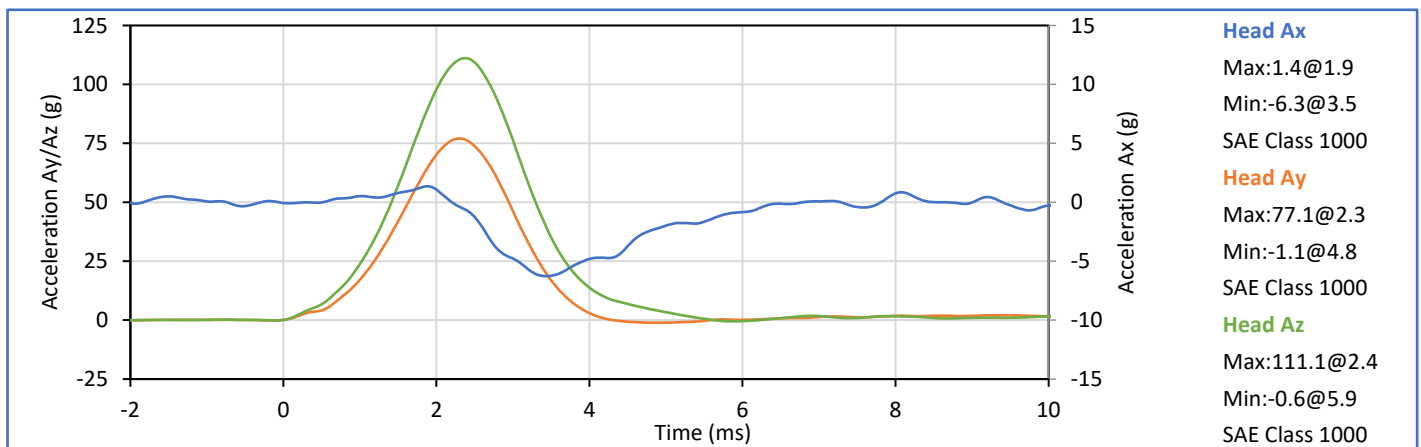
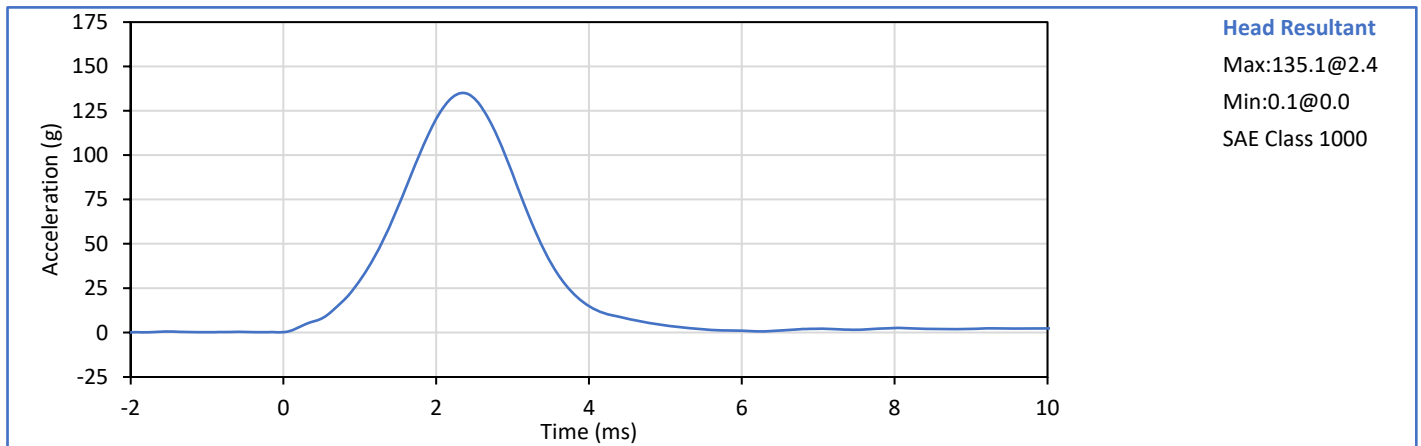
G. Fuentes

Approved By:



J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	125.0	155.0	135.1	Pass
Peak Head Ax	g	-15.0	15.0	1.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Technician:

G. Fuentes

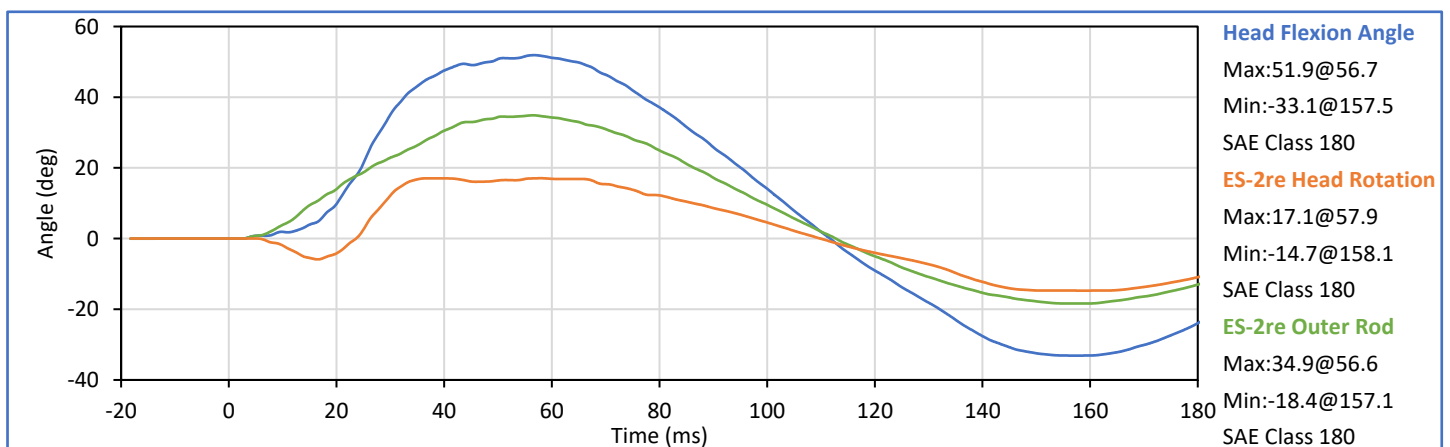
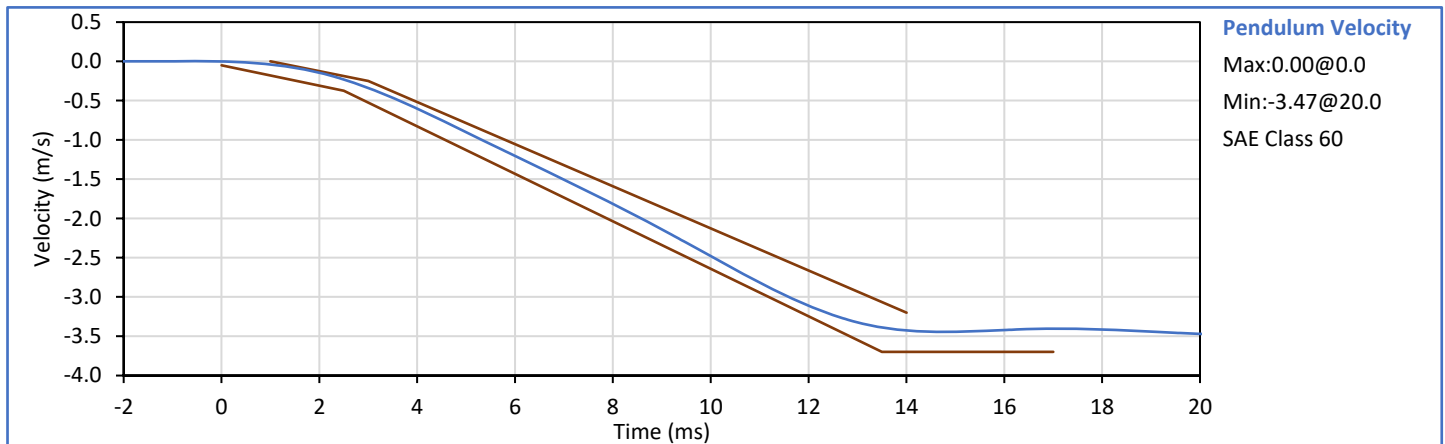
G. Fuentes

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	3.30	3.50	3.44	Pass
Peak Headform Flexion	deg	49.0	59.0	51.9	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	56.7	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	55.0	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

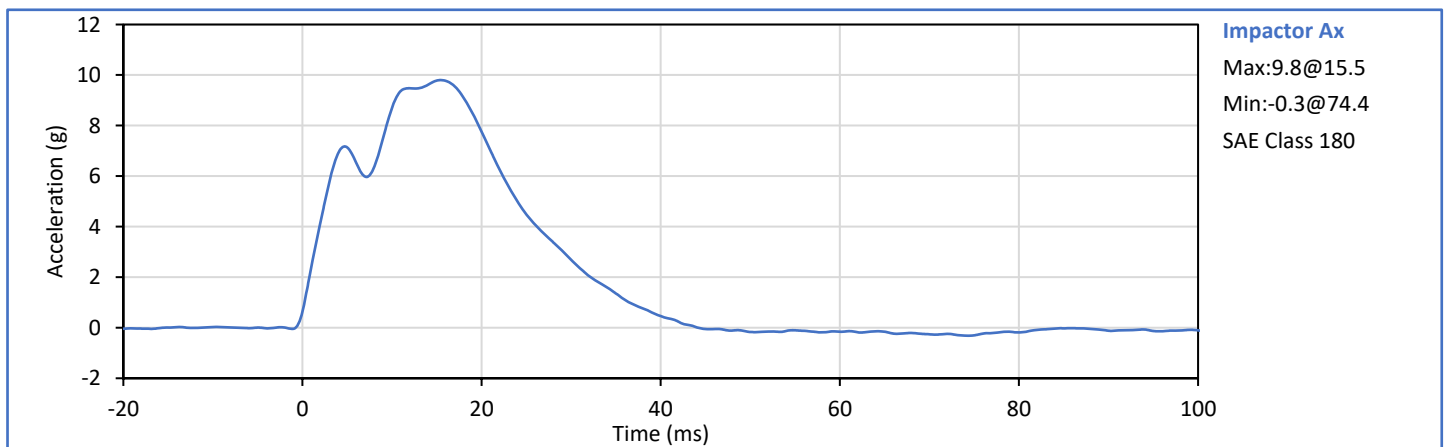
J. Hernandez

J. Hernandez

ATD Serial No.: F037

Test Date: 2023-05-01

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	36	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	9.8	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

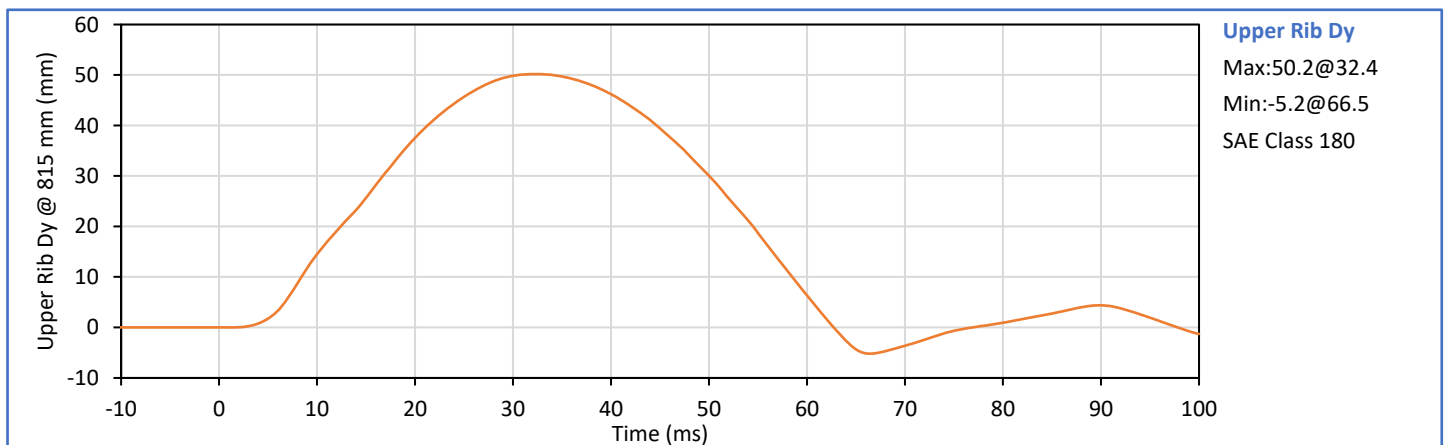
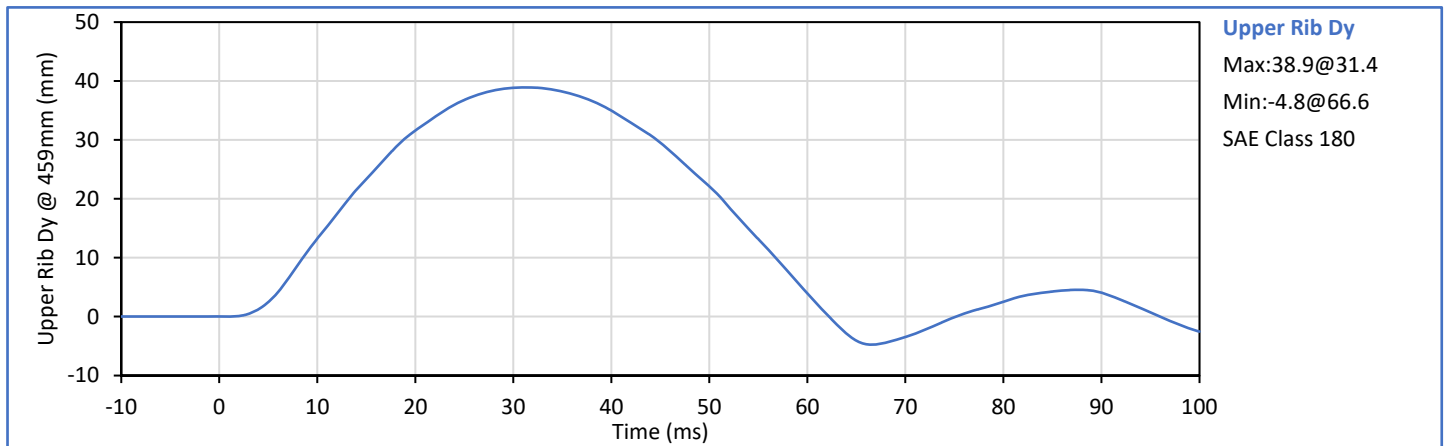
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	38.9	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	50.2	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

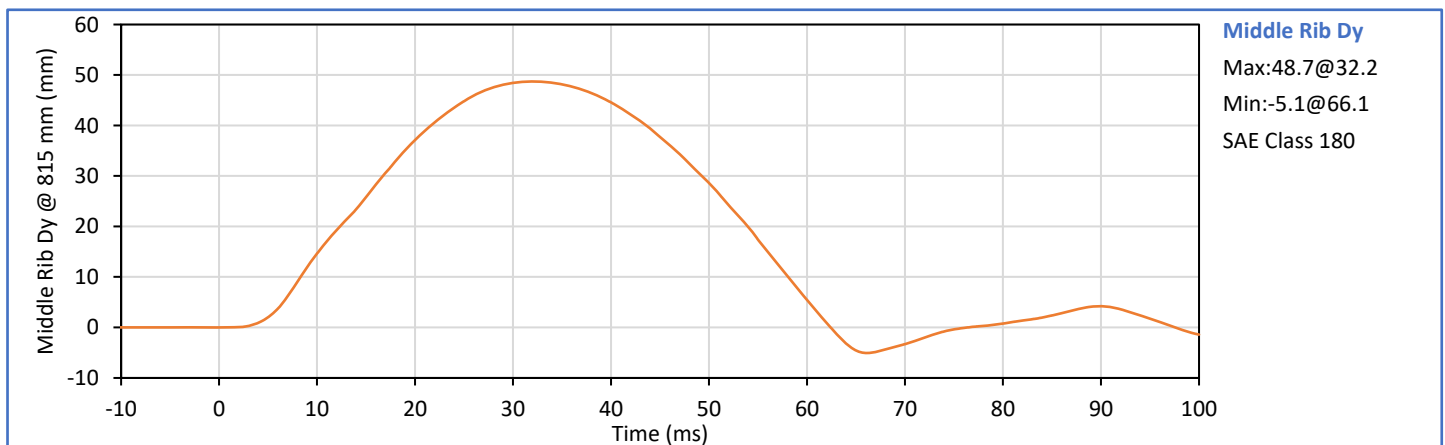
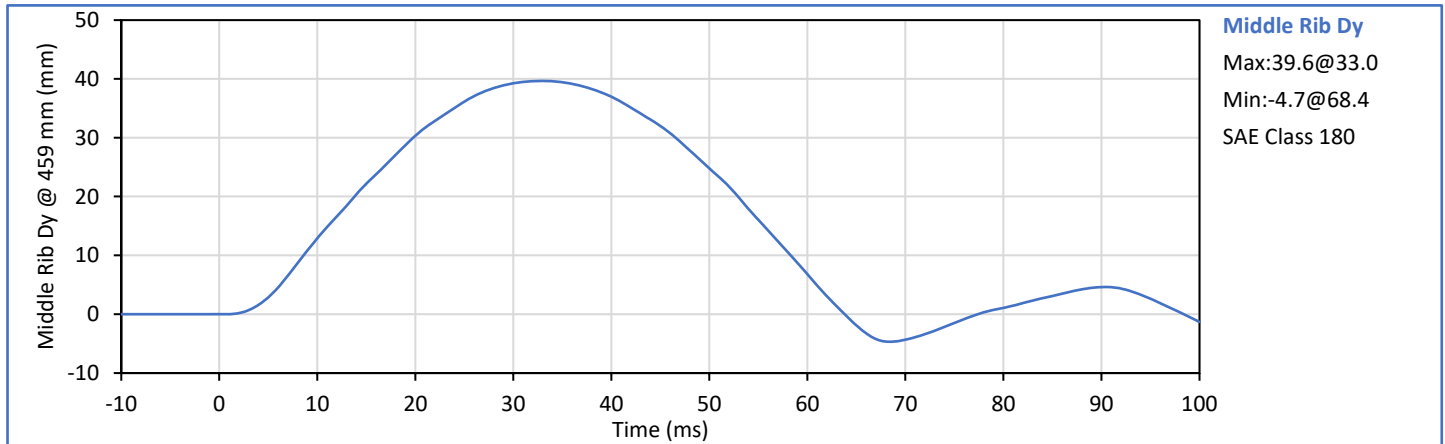
G. Fuentes

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
Middle Rib Dy @ 459mm	mm	36.0	40.0	39.6	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	48.7	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

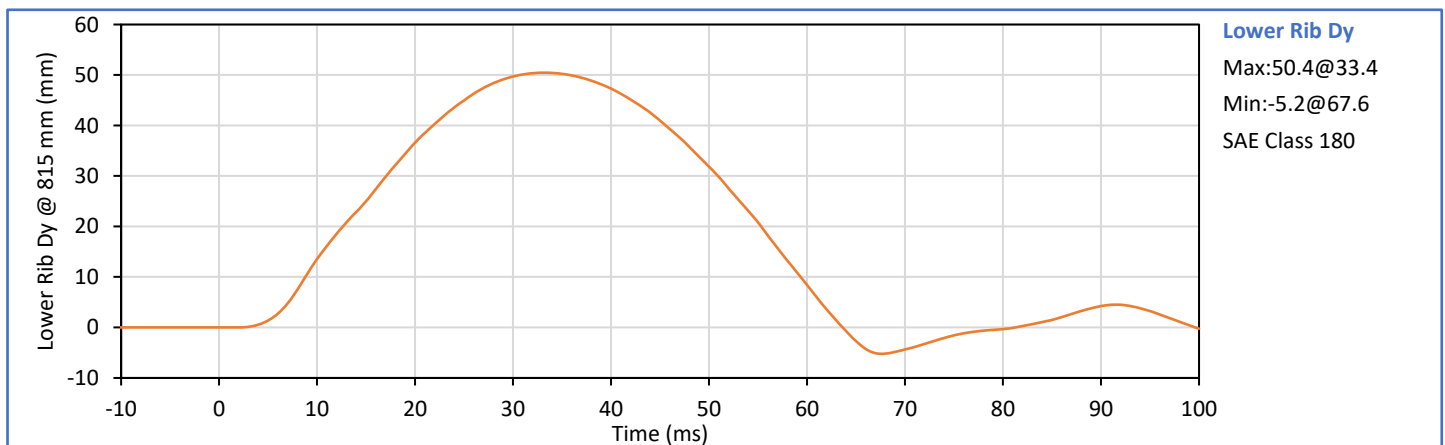
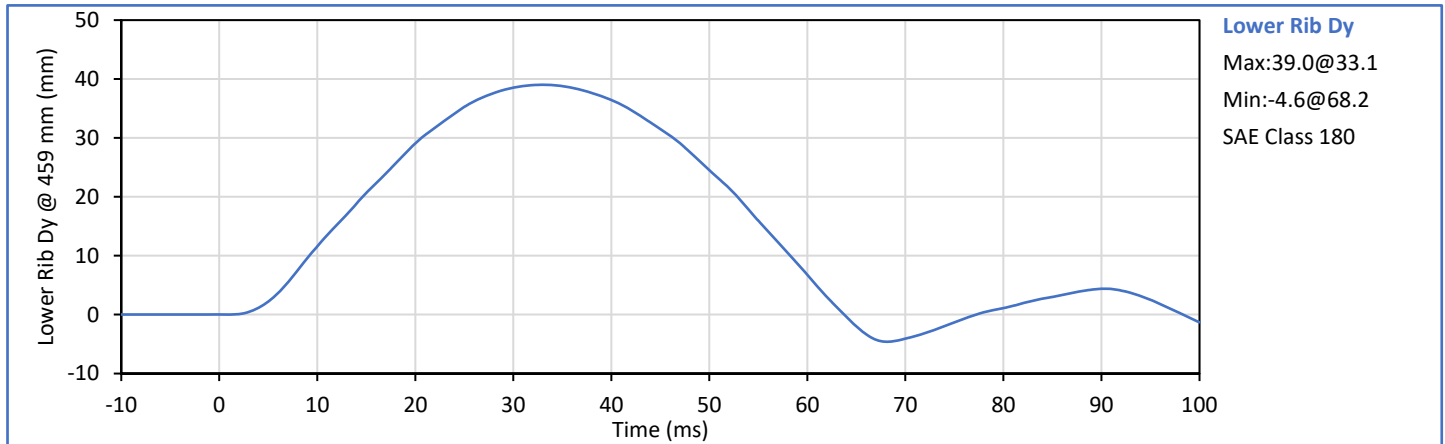
G. Fuentes

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
Lower Rib Dy @ 459mm	mm	36.0	40.0	39.0	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	50.4	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

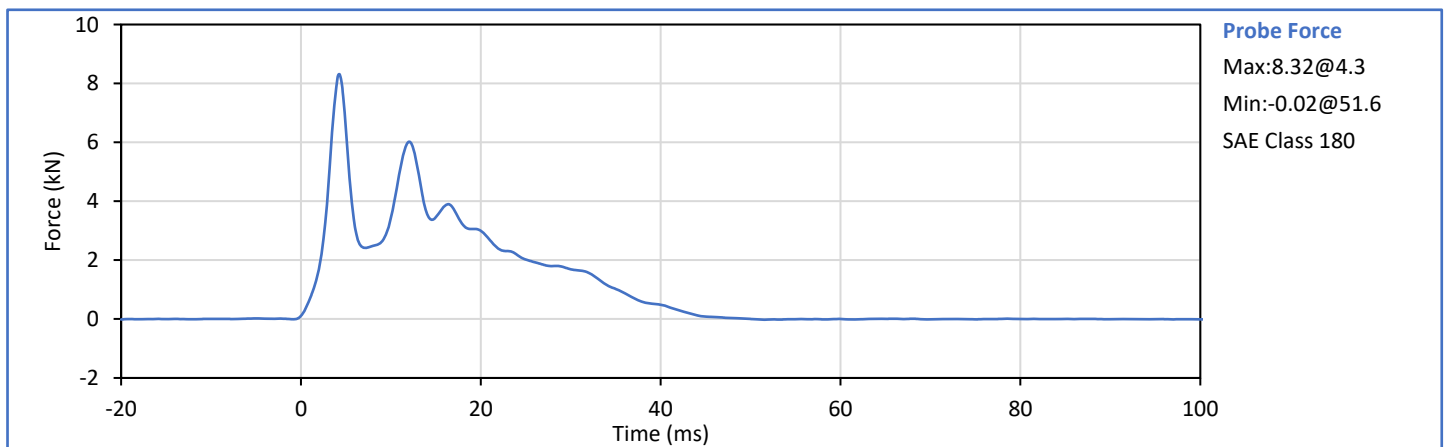
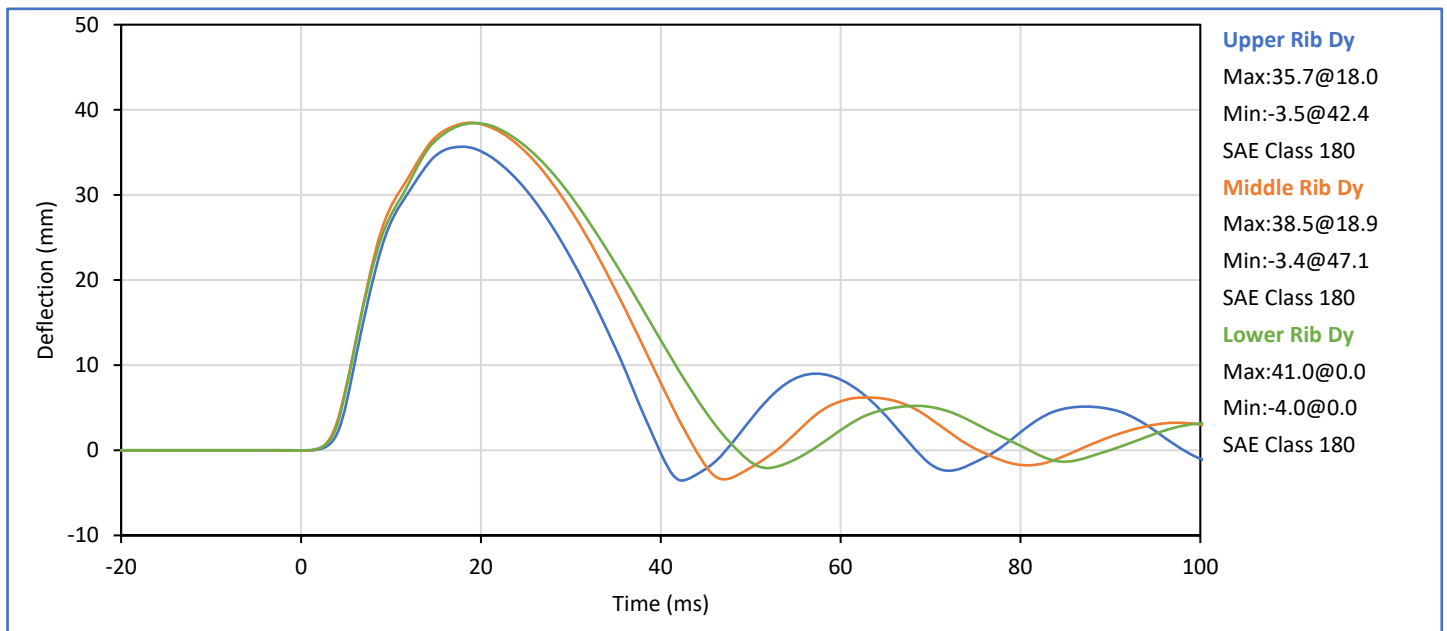
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	5.40	5.60	5.56	Pass
Peak Upper Rib Dy	mm	34.0	41.0	35.7	Pass
Peak Middle Rib Dy	mm	37.0	45.0	38.5	Pass
Peak Lower Rib Dy	mm	37.0	44.0	38.4	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	6.02	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

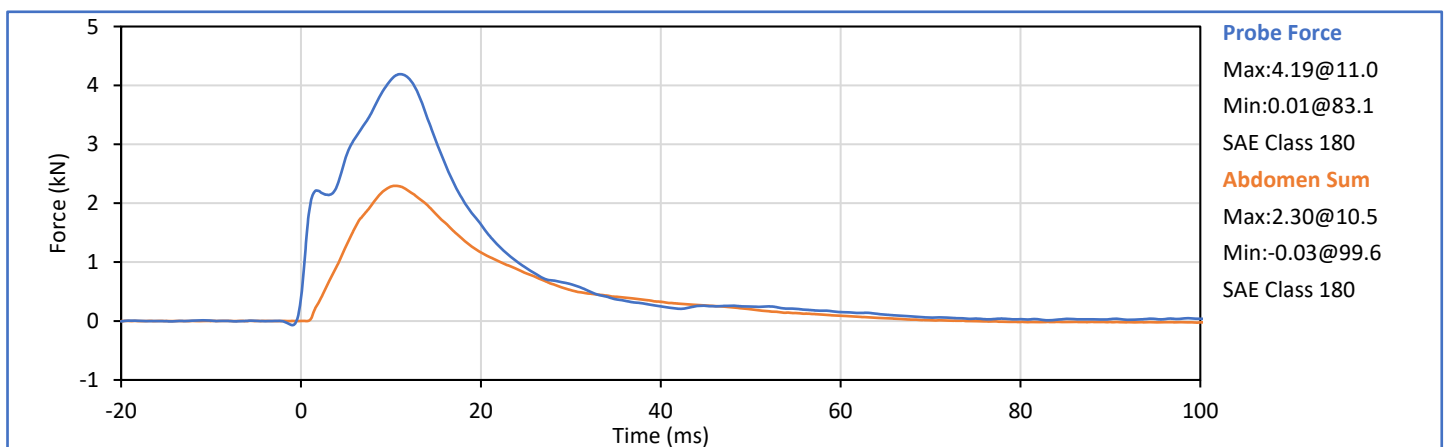
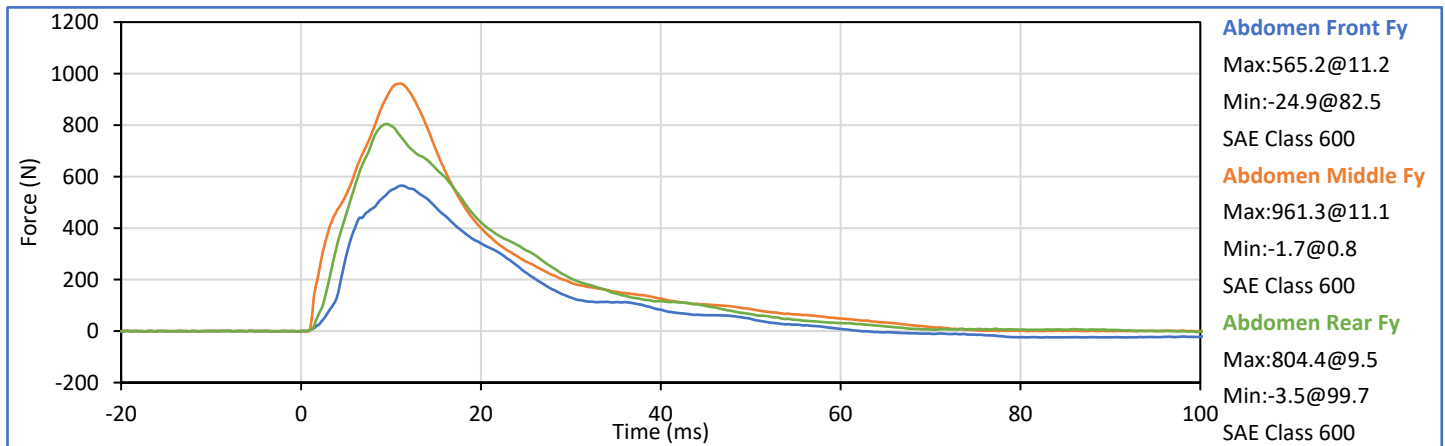
G. Fuentes

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	31	Pass
Impactor Velocity	m/s	3.90	4.10	4.06	Pass
Peak Impactor Force	kN	4.00	4.80	4.19	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.0	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.30	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.5	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

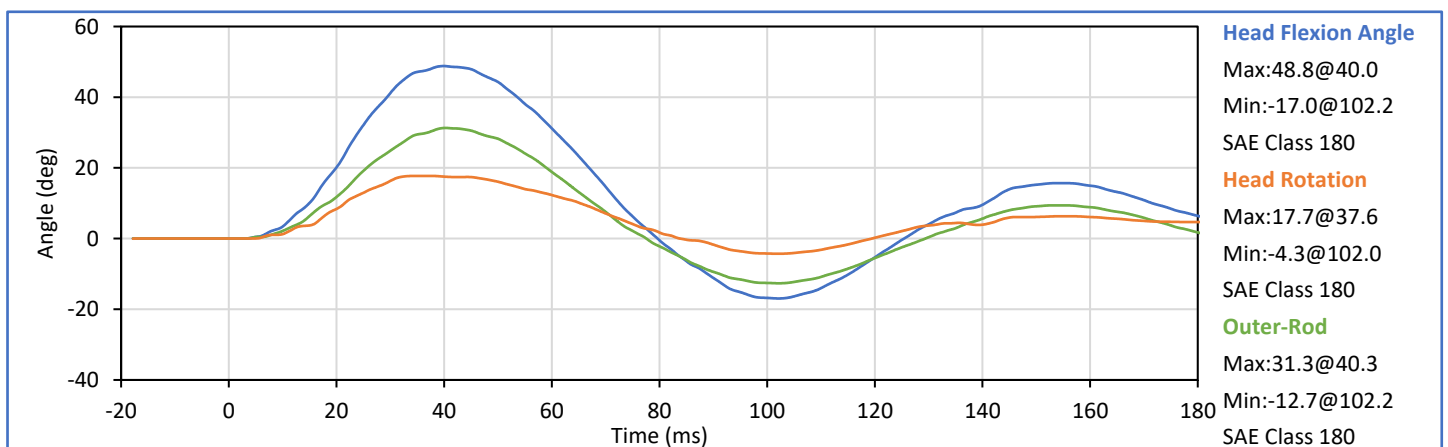
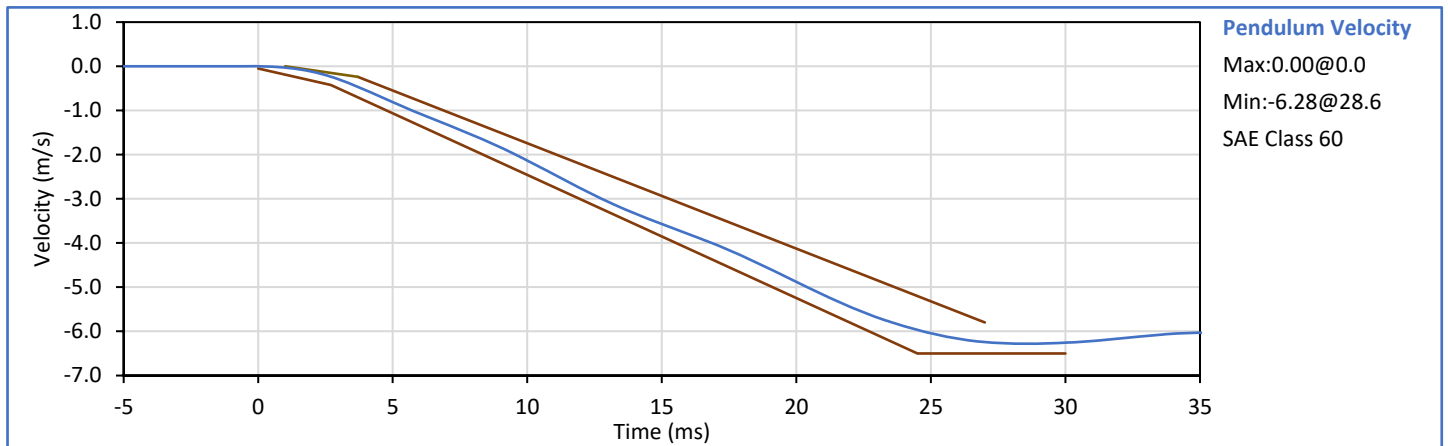
G. Fuentes

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	5.95	6.15	6.10	Pass
Peak Headform Flexion	deg	45.0	55.0	48.8	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	40.0	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	39.7	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

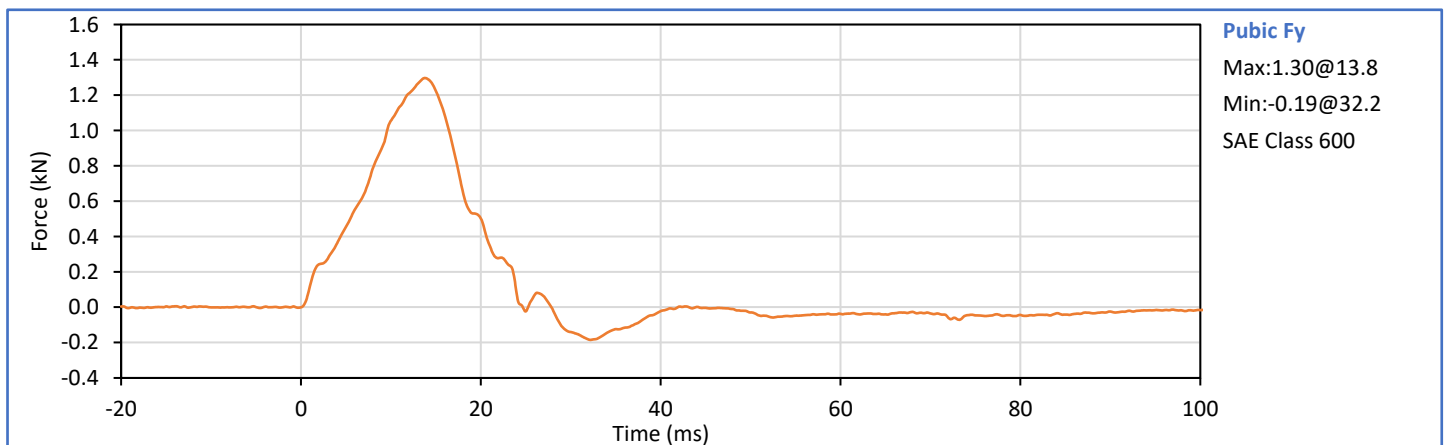
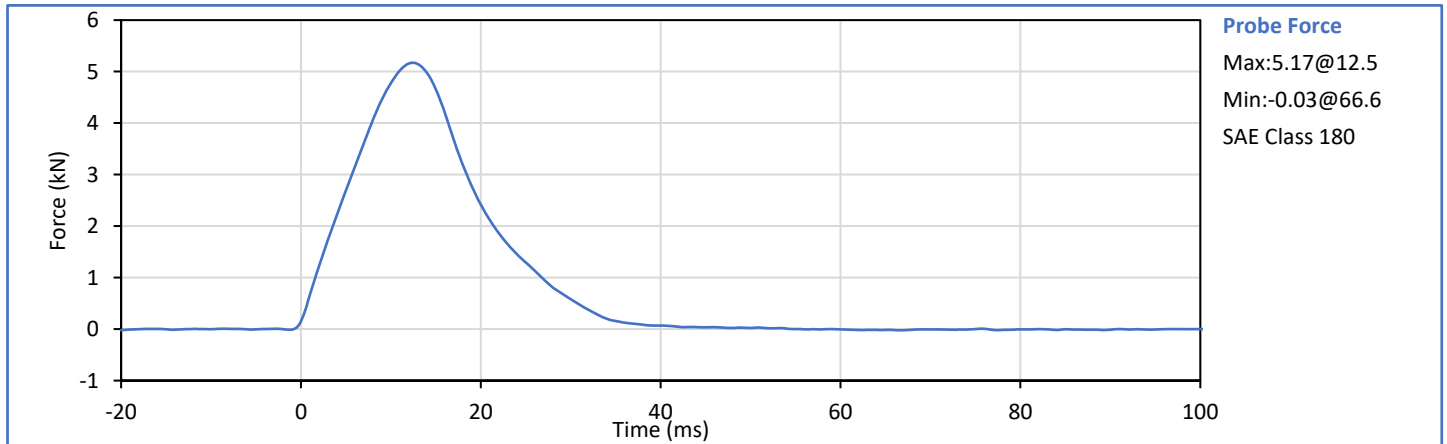
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Impactor Force	kN	4.70	5.40	5.17	Pass
Time of Peak Impactor Force	ms	11.8	16.1	12.5	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.30	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	13.8	Pass
Overall Test Results					Pass



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: 2023-05-02

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
A - Sitting Height	mm	772	788	778	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	83	Pass
D - H Point From Seatback	mm	141	151	149	Pass
E - Shoulder Pivot From Backline	mm	97	107	104	Pass
F - Thigh Clearance	mm	119	135	126	Pass
G - Head Breadth	mm	140	148	146	Pass
H - Head Back From Backline	mm	40	46	43	Pass
I - Head Depth	mm	178	188	187	Pass
J - Head Circumference	mm	541	551	543	Pass
K - Buttock To Knee Length	mm	514	540	530	Pass
L - Popliteal Height	mm	343	369	351	Pass
K - Knee Pivot To Floor Height	mm	392	409	399	Pass
N - Buttock Popliteal Length	mm	416	442	424	Pass
O - Chest Depth W/O Jacket	mm	195	211	202	Pass
P - Foot Length	mm	216	232	226	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	318	Pass
R - Arm Length	mm	249	259	252	Pass
S - Knee Joint To Seatback	mm	477	493	483	Pass
V - Shoulder Width	mm	341	357	345	Pass
W - Foot Width	mm	78	94	85	Pass
Y - Chest Circumference W/Jacket	mm	851	881	861	Pass
Z - Waist Circumference	mm	761	791	776	Pass
				Overall Test Results	Pass

Technician:



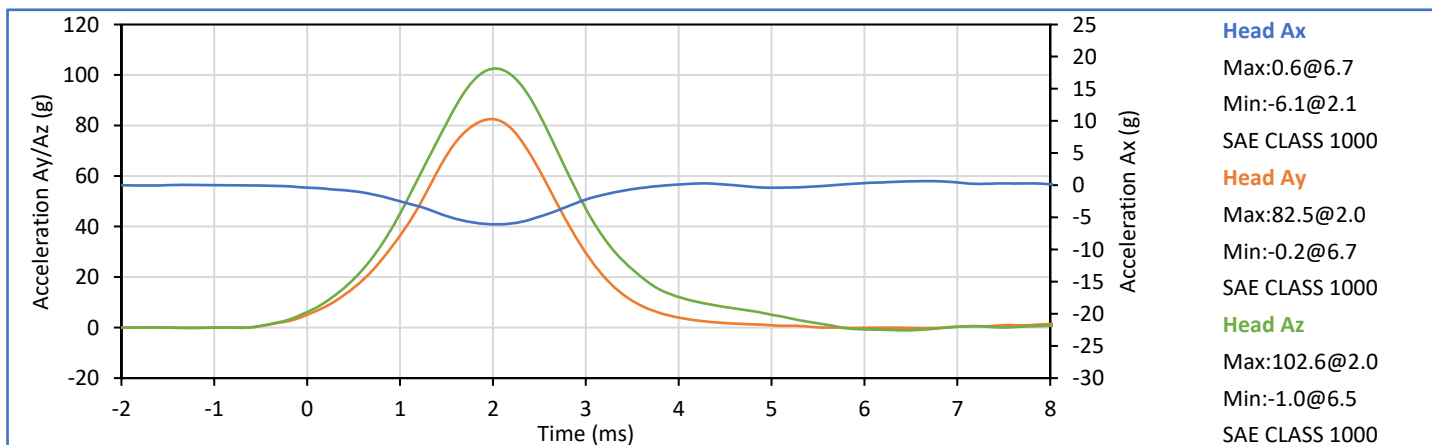
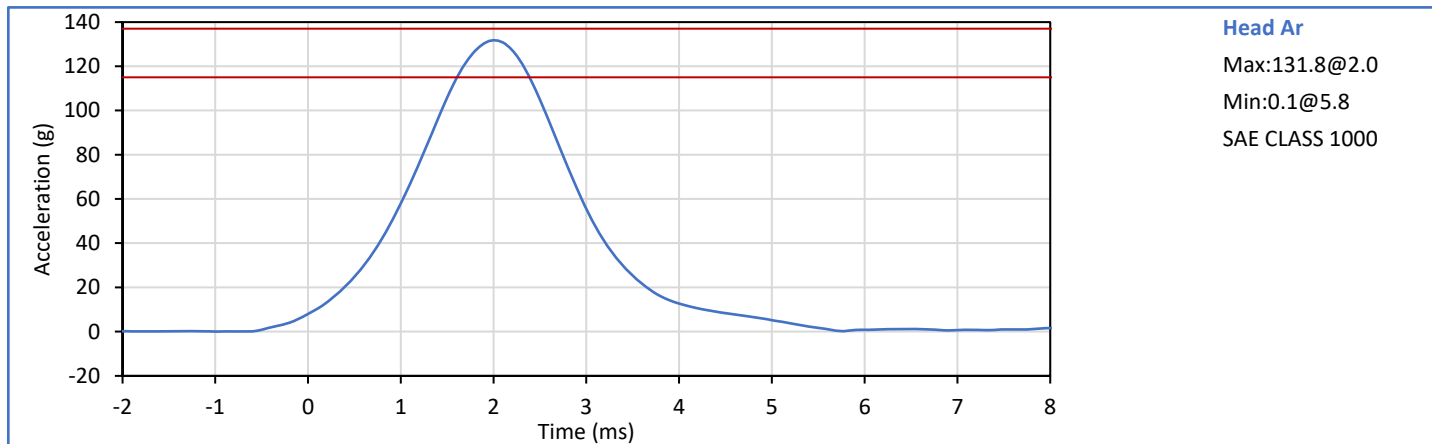
G. Fuentes

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	131.8	Pass
Peak Head Ax	g	-15.0	15.0	-6.1	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass



Technician:

G. Fuentes

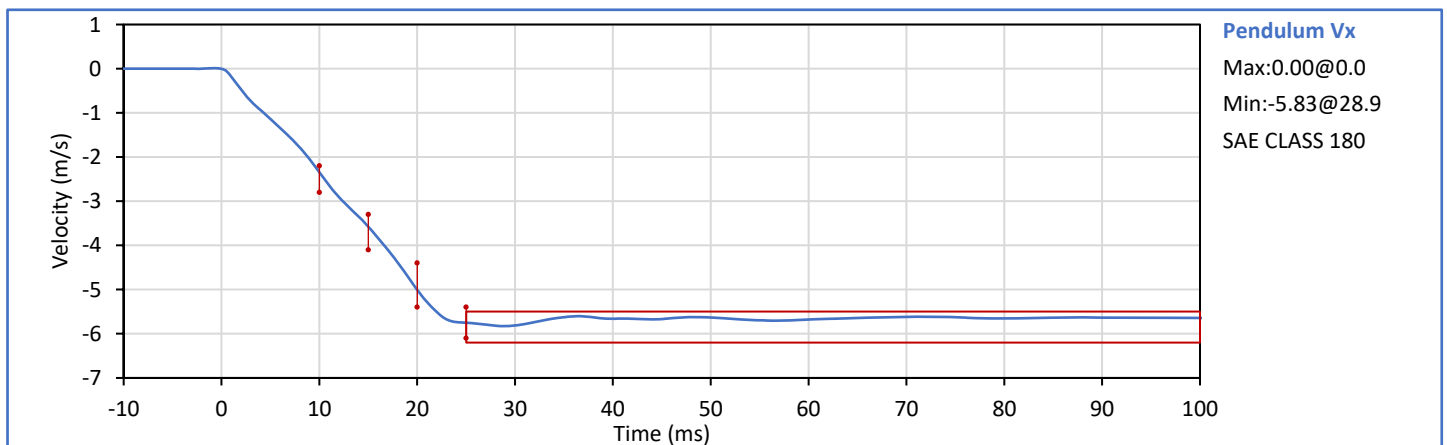
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	5.51	5.63	5.58	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.34	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.58	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-5.01	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.75	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.83/-5.61	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-74.6	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	63.6	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	38.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	115.8	Pass
				Overall Test Results	Pass



Technician:

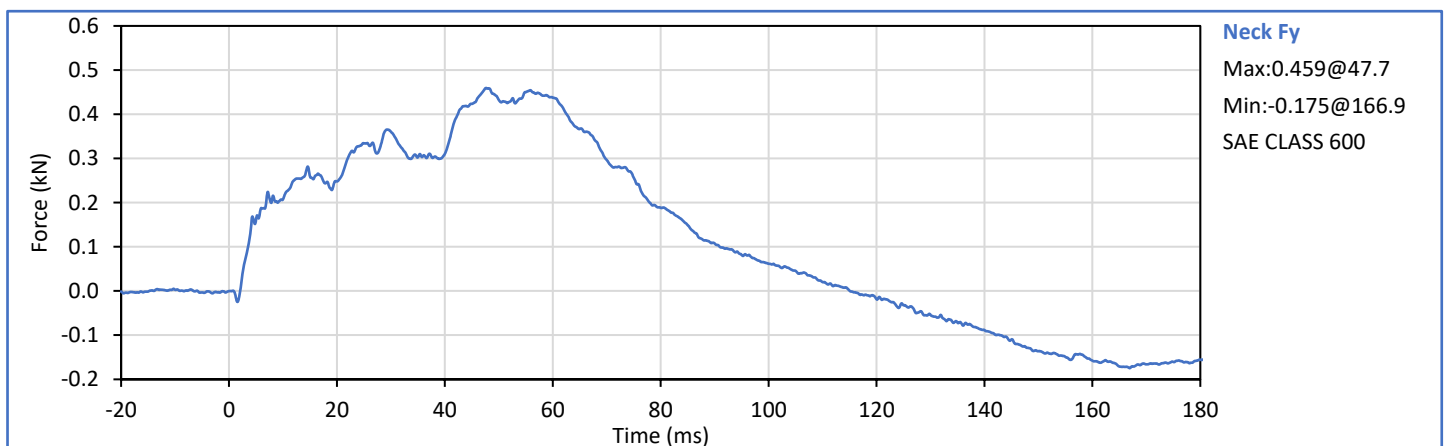
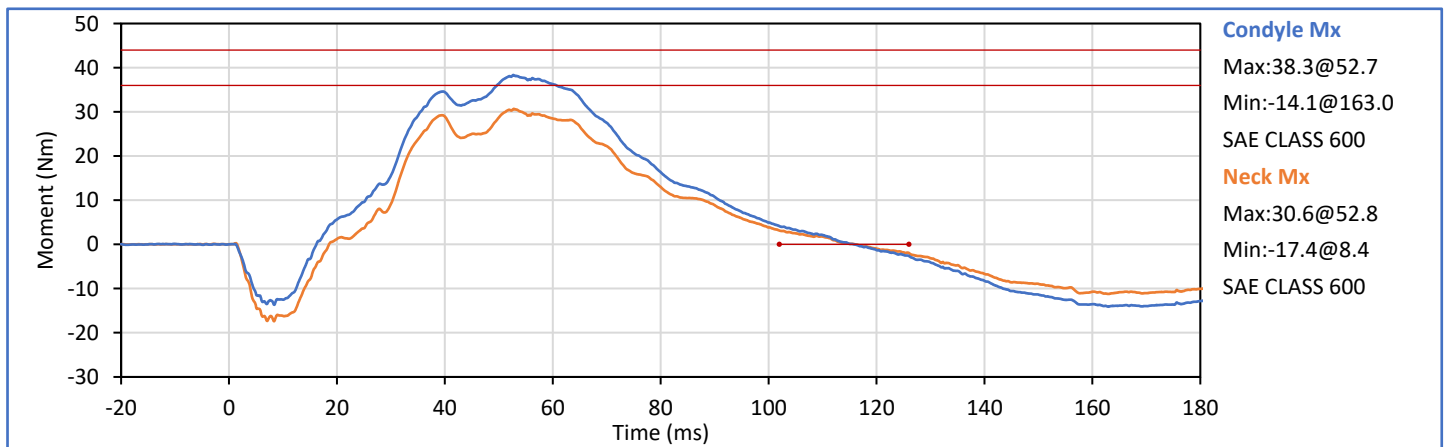
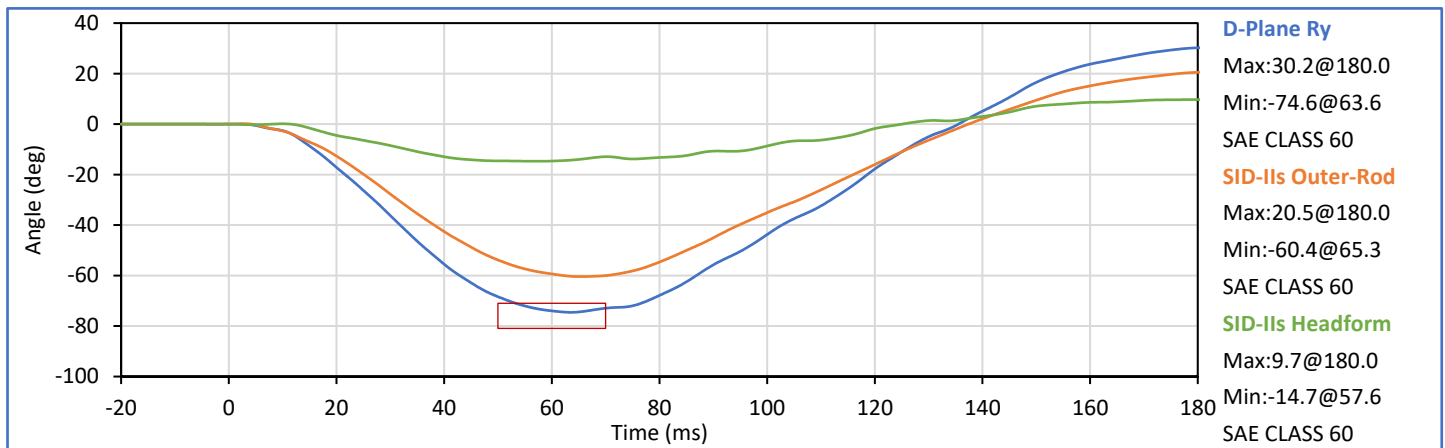
G. Fuentes

G. Fuentes

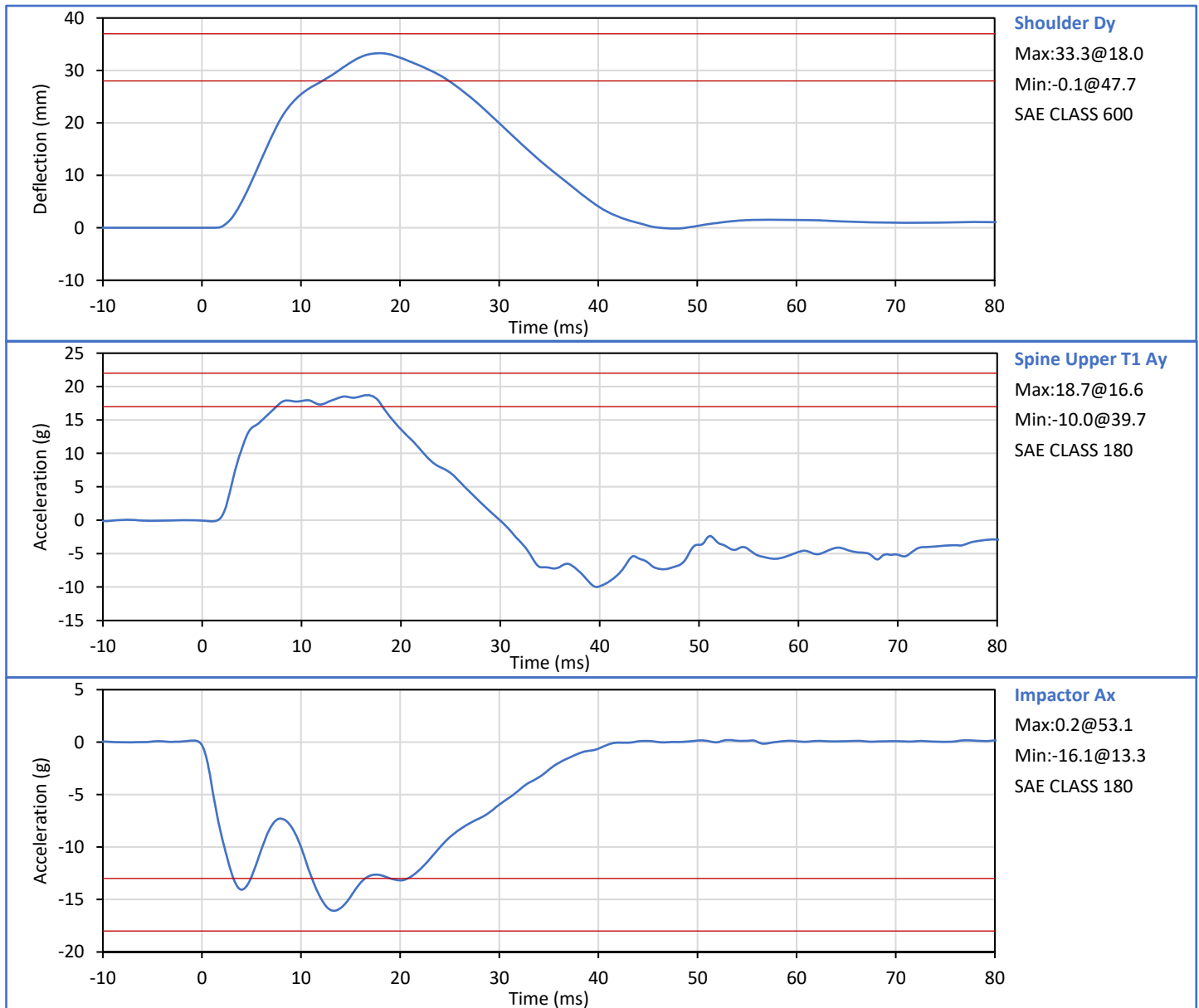
Approved By:

J. Hernandez

J. Hernandez



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.3	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.7	Pass
Peak Impactor Ax	g	-18.0	-13.0	-16.1	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

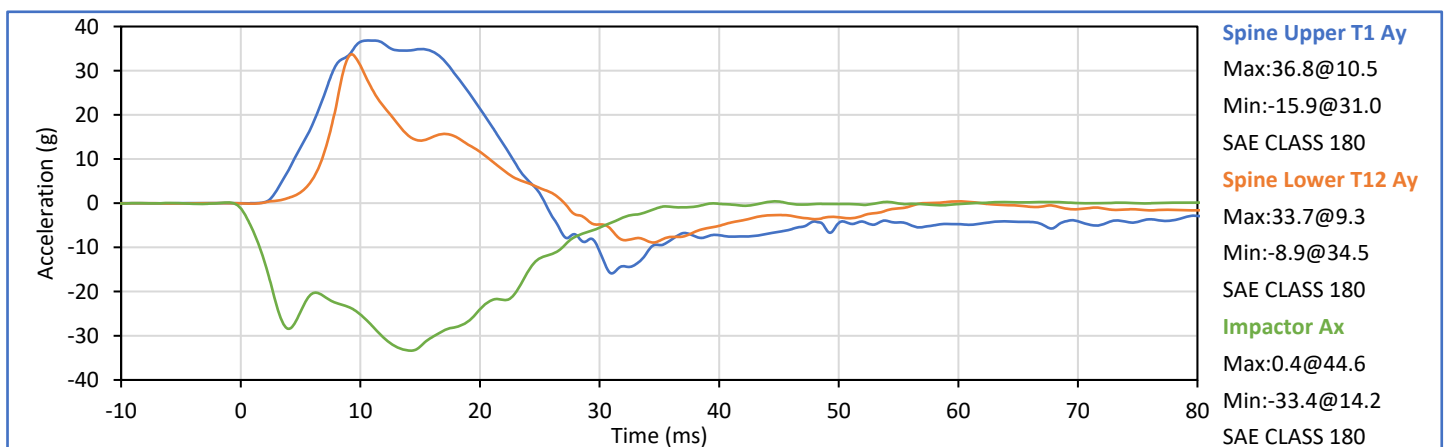
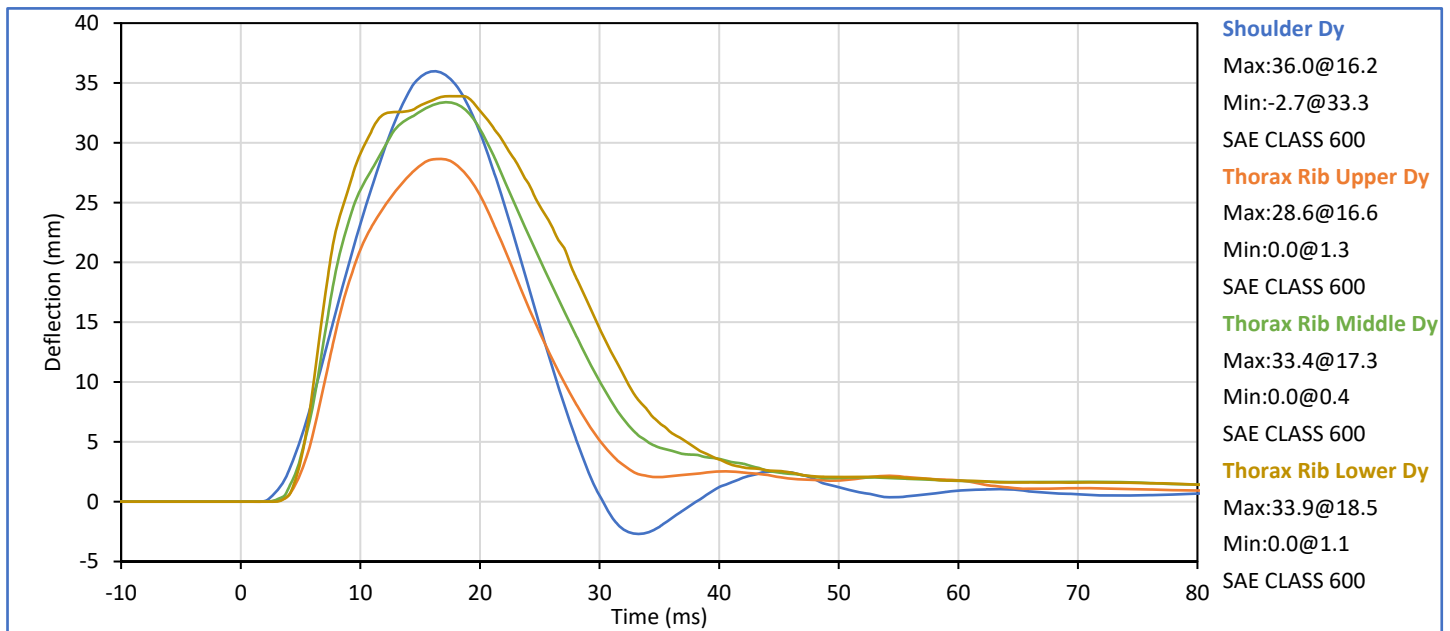
G. Fuentes

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	6.68	Pass
Peak Shoulder Dy	mm	31.0	40.0	36.0	Pass
Peak Upper Rib Dy	mm	25.0	32.0	28.6	Pass
Peak Middle Rib Dy	mm	30.0	36.0	33.4	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.9	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	36.8	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	33.7	Pass
Peak Impactor Ax	g	-36.0	-30.0	-33.4	Pass
Overall Test Results				Pass	Pass



Technician:

G. Fuentes

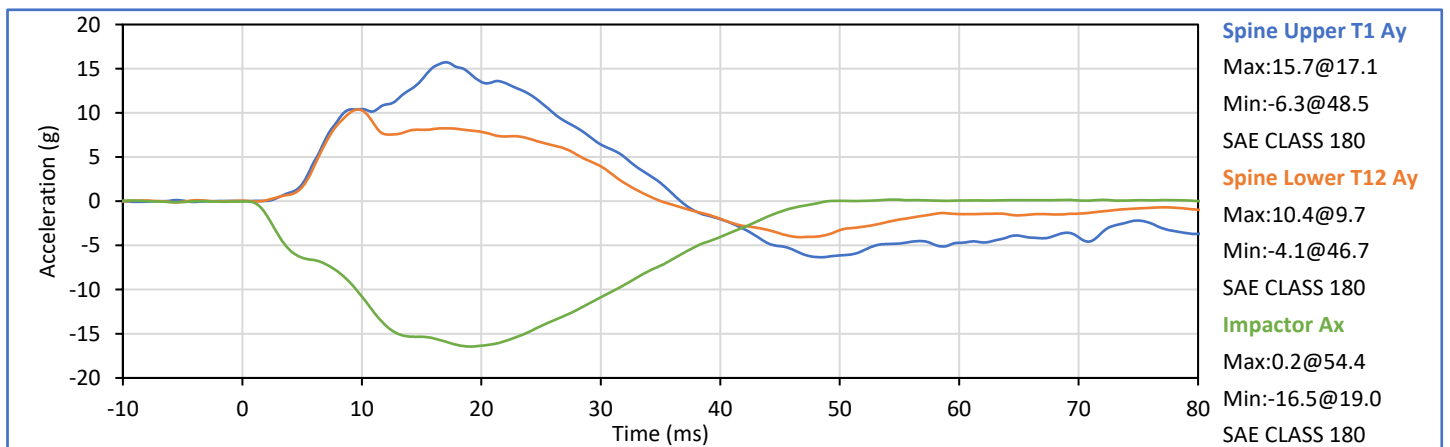
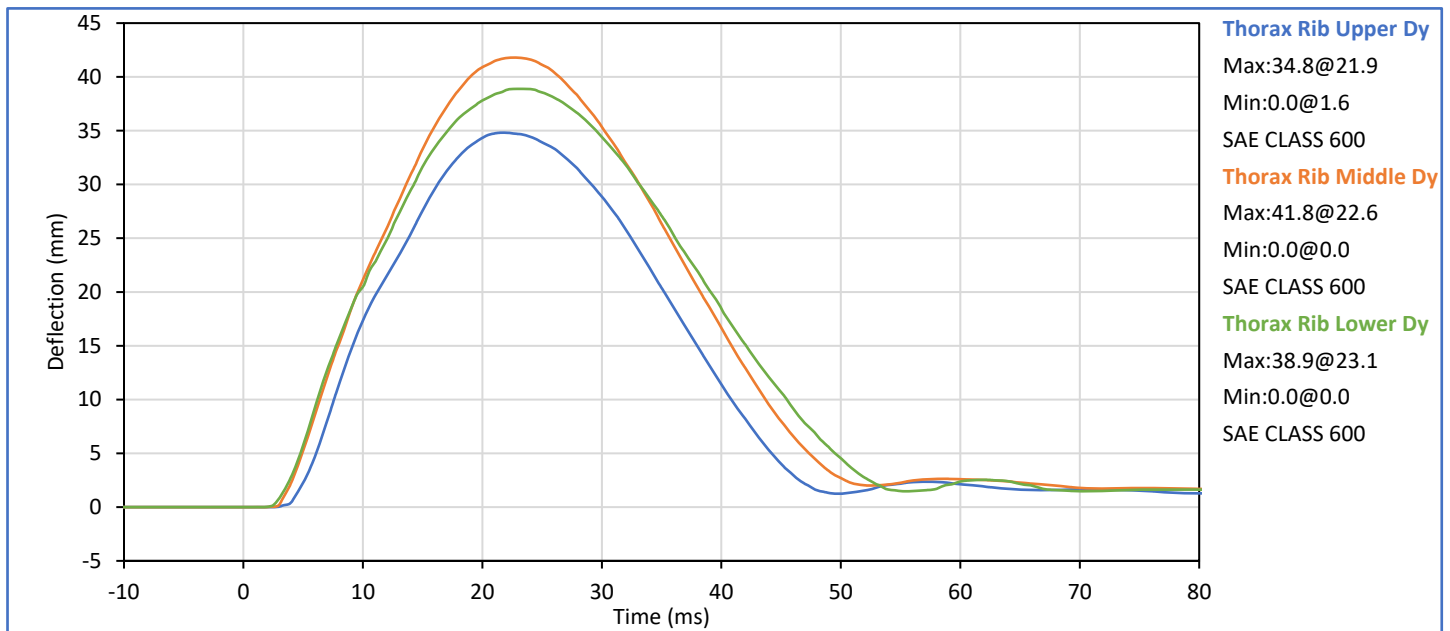
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	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	34.8	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	41.8	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	38.9	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	15.7	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	10.4	Pass
Peak Impactor Ax	g	-18.0	-14.0	-16.5	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

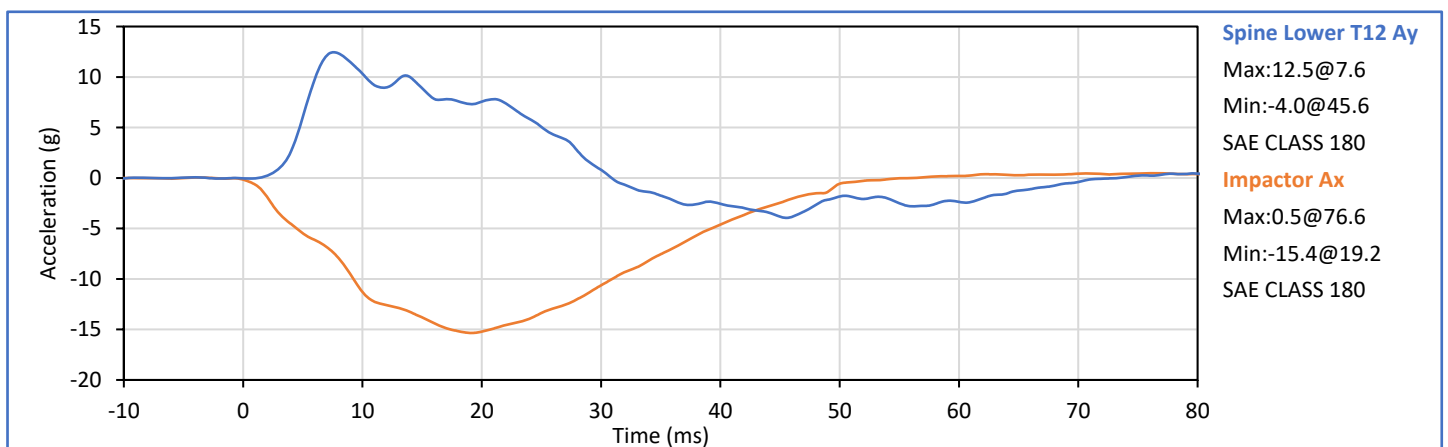
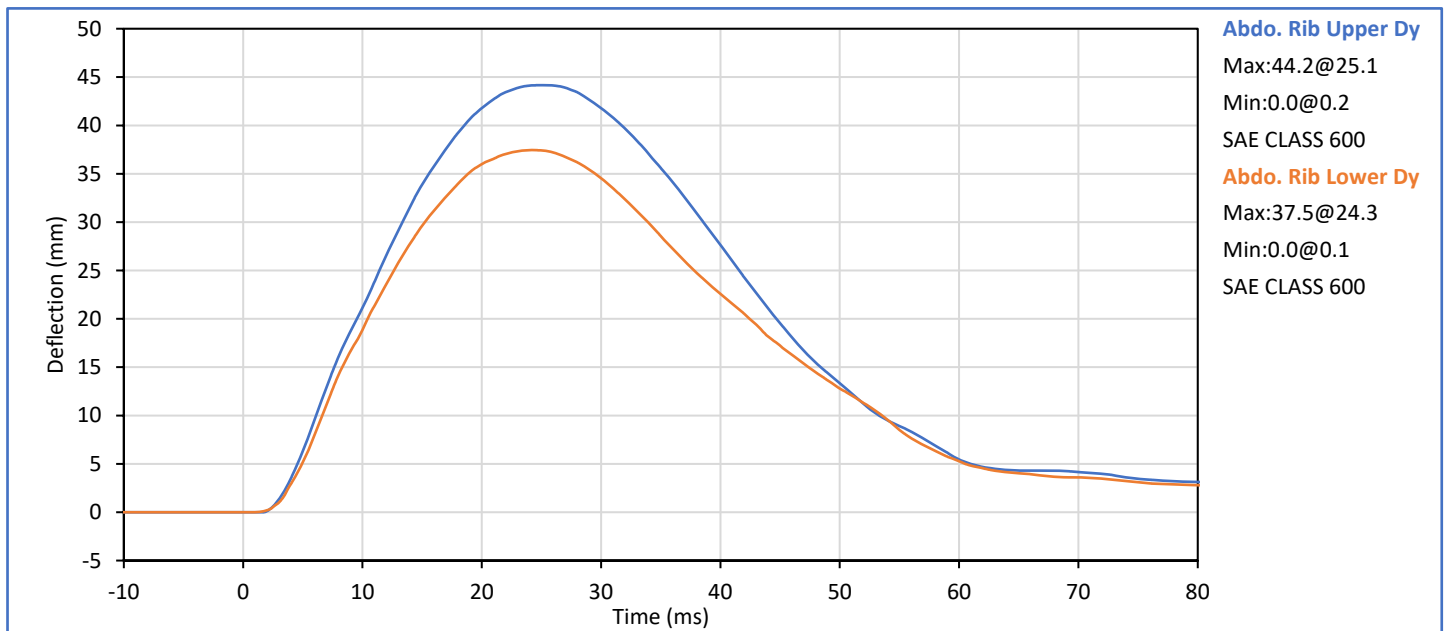
G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	44.2	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	37.5	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	12.5	Pass
Peak Impactor Ax	g	-16.0	-12.0	-15.4	Pass
Overall Test Results					Pass



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

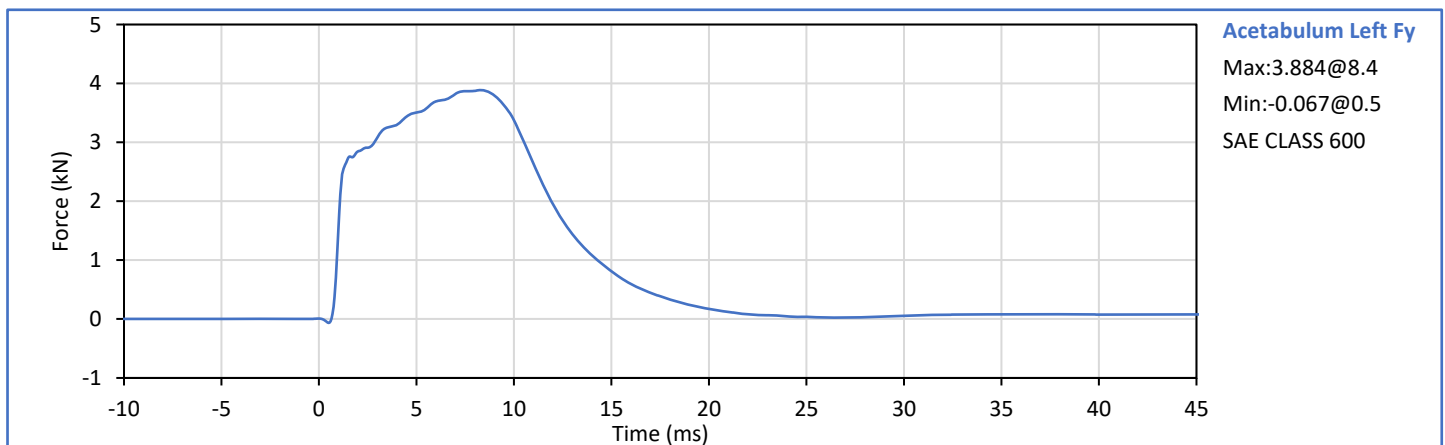
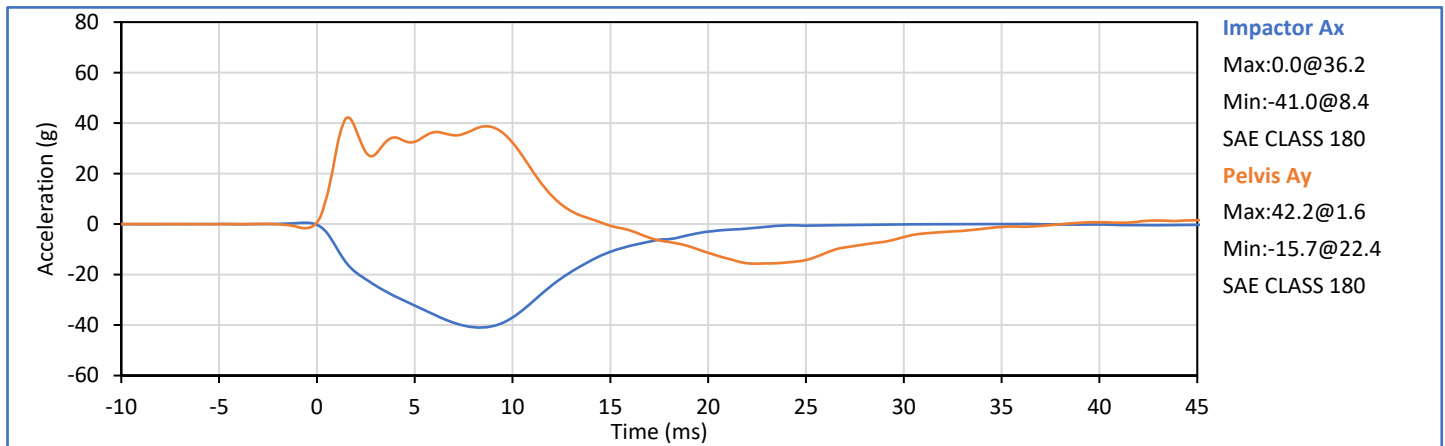
J. Hernandez

ATD Serial No.: 308

Test Date: 2023-05-02

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	6.60	6.80	6.71	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.88	Pass
Pelvis Ay after 6ms	g	34.0	42.0	38.8	Pass
Peak Impactor Ax	g	-47.0	-38.0	-41.0	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 14769



Technician:

G. Fuentes

G. Fuentes

Approved By:

J. Hernandez

J. Hernandez

ATD Serial No.: 308

Test Date: 2023-05-02

Pelvis Plug S/N: 14769



SID-IIs Pelvis Plug Certification Test

Plug S/N 14769

Test Number 16742

Report Number 16788

Test Date 12/29/2020 10:24:51 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	298.38	50.00	600.00
Force @ 1.5 mm (N)	1,231.95	850.00	1,400.00
Force @ 2.5 mm (N)	1,489.67	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,516.95	1,361.00	1,673.00

Testing Machine STM-20 5965542

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

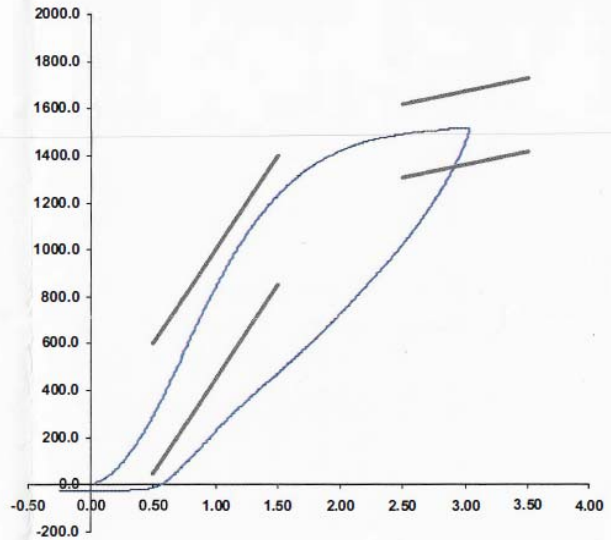
Preload Value (-N) 22.24

Crosshead Speed (mm/min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 29-Dec-20

SACO Research

By: DC Date: 12/29/20

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

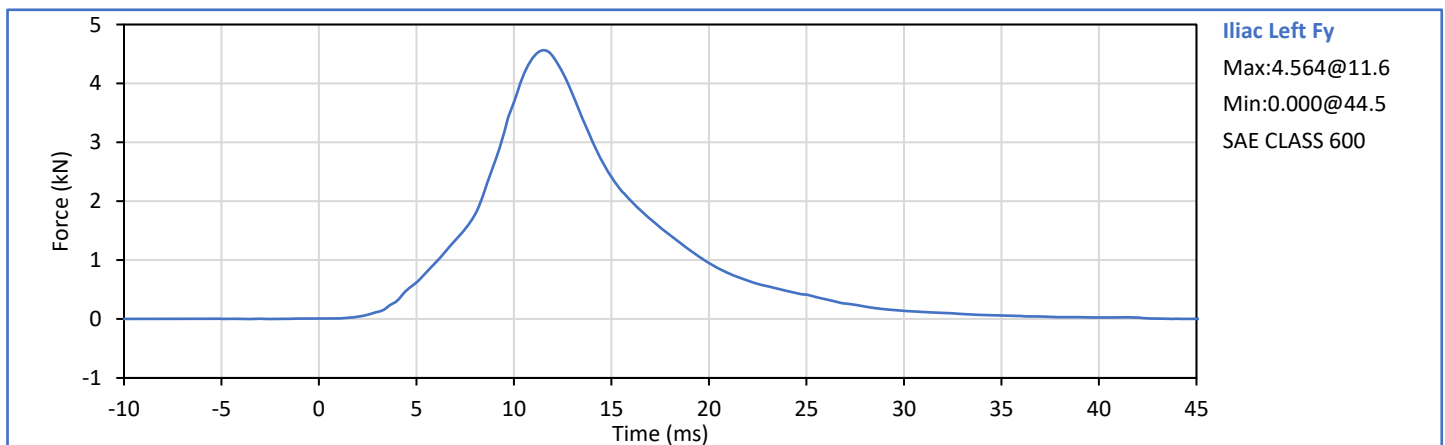
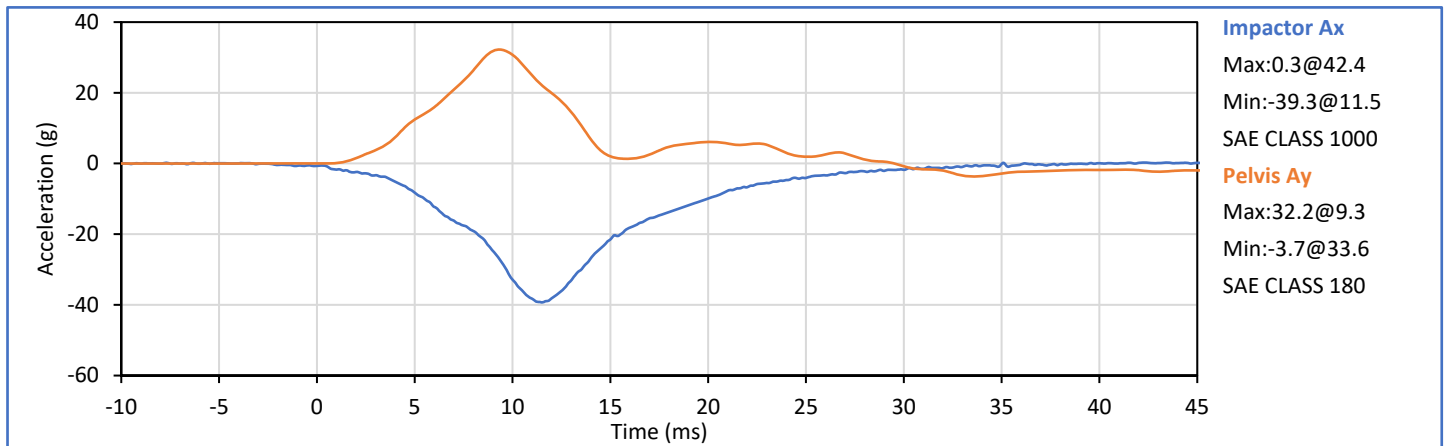
ATD Serial No.: 308

Test Date: 2023-05-02

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	29	Pass
Impactor Velocity	m/s	4.20	4.40	4.30	Pass
Peak Iliac Fy	kN	4.10	5.10	4.56	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-39.3	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	P58858	Endevco	7264C-2k	2023-04-05
Head Acceleration Y Primary	P58865	Endevco	7264C-2k	2023-04-05
Head Acceleration Z Primary	P58867	Endevco	7264C-2k	2023-04-05
Head Acceleration X Redundant	P58859	Endevco	7264C-2k	2023-04-05
Head Acceleration Y Redundant	P58866	Endevco	7264C-2k	2023-04-05
Head Acceleration Z Redundant	P58873	Endevco	7264C-2k	2023-04-05
Upper Thorax Rib Deflection Y	209 (ES-2 Rib)	Honeywell	F38000203	2023-04-07
Middle Thorax Rib Deflection Y	210 (ES-2 Rib)	Honeywell	F38000203	2023-04-07
Lower Thorax Rib Deflection Y	207 (ES-2 Rib)	Honeywell	F38000203	2023-04-07
Anterior Abdominal Force Y	1504 Fy	R.A. Denton	2631J	2023-02-16
Middle Abdominal Force Y	1505 Fy	R.A. Denton	2631J	2023-02-16
Posterior Abdominal Force Y	1506 Fy	R.A. Denton	2631J	2023-02-16
Lower Spine T12 Acceleration X	P63856	Endevco	7264C-2k	2023-04-05
Lower Spine T12 Acceleration Y	P50063	Endevco	7264C-2k	2023-04-06
Lower Spine T12 Acceleration Z	P51880	Endevco	7264C-2k	2023-04-06
Pubic Symphysis Force Y	DG6834 Fy	FTSS	IF-556	2023-02-16

Table 2 - Left Rear Passenger ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P63980	Endevco	7264C-2k	2023-04-03
Head Acceleration Y Primary	P58861	Endevco	7264C-2k	2023-04-03
Head Acceleration Z Primary	P51261	Endevco	7264C-2k	2023-04-03
Head Acceleration X Redundant	P58808	Endevco	7264C-2k	2023-04-03
Head Acceleration Y Redundant	P63310	Endevco	7264C-2k	2023-04-03
Head Acceleration Z Redundant	P49189	Endevco	7264C-2k	2023-04-03
Head Rotation Rate X	ARS14944	DTS	ARS PRO-18k (2kHz)	2022-09-13
Head Rotation Rate Y	ARS14954	DTS	ARS PRO-18k (2kHz)	2022-09-07
Head Rotation Rate Z	ARS4062	DTS	ARS PRO-18k (2kHz)	2022-09-07
Upper Thorax Rib Deflection Y	1249	Servo	08TCI-3725	2023-03-28
Middle Thorax Rib Deflection Y	1219	Servo	08TCI-3725	2023-03-28
Lower Thorax Rib Deflection Y	1221	Servo	08TCI-3725	2023-03-28
Upper Abdomen Rib Deflection Y	1252	Servo	08TCI-3725	2023-03-28
Lower Abdomen Rib Deflection Y	1233	Servo	08TCI-3725	2022-11-14
Lower Spine T12 Acceleration X	P52108	Endevco	7264C-2k	2023-04-04
Lower Spine T12 Acceleration Y	P63970	Endevco	7264C-2k	2023-04-03
Lower Spine T12 Acceleration Z	P51712	Endevco	7264C-2k	2023-04-03
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 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	M11265	Endevco	758H-2k	2023-03-07
Vehicle CG Ay	M11125	Endevco	758H-2k	2023-03-09
Vehicle CG Az	M11073	Endevco	758H-2k	2022-11-11
Right Side Sill at Front Seat Ax	M11195	Endevco	758H-2k	2022-11-09
Right Side Sill at Front Seat Ay	M11190	Endevco	758H-2k	2022-11-11
Right Side Sill at Front Seat Az	M11067	Endevco	758H-2k	2022-12-21
Right Side Sill at Rear Seat Ax	M11165	Endevco	758H-2k	2023-02-05
Right Side Sill at Rear Seat Ay	M11199	Endevco	758H-2k	2022-12-16
Right Side Sill at Rear Seat Az	M11044	Endevco	758H-2k	2022-12-01
Left Side Sill at Front Seat Ay	A331826	MSI	52F-2k	2022-12-15
Left Side Sill at Rear Seat Ay	A159420	MSI	52F-2k	2022-12-19
Left Lower A-Pillar Ay	A331785	MSI	52F-2k	2022-12-31
Left Middle A-Pillar Ay	220134	BST	11CF-2k	2023-03-11
Left Lower B-Pillar Ay	220309	BST	11CF-2k	2022-12-09
Left Middle B-Pillar Ay	220325	BST	11CF-2k	2022-12-11
Driver Seat Track at H-Point Ay	M11202	Endevco	758H-2k	2023-03-07
Rear Seat Structure Ay	M11177	Endevco	758H-2k	2023-03-07
Right Rear Occupant Comp. Ay	M11070	Endevco	758H-2k	2022-12-01
Engine Block Top Ax	M11183	Endevco	758H-2k	2022-11-08
Engine Block Top Ay	M11075	Endevco	758H-2k	2023-03-11
Rear Floopan Above Axle Ax	M11174	Endevco	758H-2k	2023-03-19
Rear Floopan Above Axle Ay	M11051	Endevco	758H-2k	2022-12-01
Rear Floopan Above Axle Az	M11063	Endevco	758H-2k	2023-03-07

Table 4 - Moving Deformable Barrier (MDB) Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
MDB CG Ax	M11181	Endevco	758H-2k	2022-11-10
MDB CG Ay	M11127	Endevco	758H-2k	2022-12-03
MDB CG Az	M11176	Endevco	758H-2k	2023-03-08
MDB Left Side at Rear Axle Ax	M11039	Endevco	758H-2k	2022-11-10
MDB Left Side at Rear Axle Ay	M11285	Endevco	758H-2k	2023-03-08